

INSTITUTO DE TELECOMUNICAÇÕES

Relatório de Actividades

1997

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1. Introdução

O Instituto de Telecomunicações (IT) é uma instituição privada sem fins lucrativos, de utilidade pública, resultante da associação de quatro instituições com experiência e tradições de investigação e desenvolvimento na área das Telecomunicações:

- o Instituto Superior Técnico (IST),
- a Universidade de Aveiro (UA),
- a Faculdade de Ciências e Tecnologia da Universidade de Coimbra (FCTUC),
- a Portugal Telecom, através do seu Centro de Estudos de Telecomunicações (CET).

O IT está organizado em três Pólos: um em Aveiro, no Campus Universitário da Universidade de Aveiro (UA), outro em Coimbra, no Pólo II da Universidade de Coimbra (UC) e o terceiro em Lisboa, no IST.

A constituição do IT beneficiou do apoio do programa CIENCIA, num montante total de 1,5 milhões de contos, através de três contratos celebrados em 1991. Este financiamento permitiu a construção de infraestruturas nos três Pólos e a aquisição de equipamentos para os respectivos laboratórios.

A instalação do Pólo de Aveiro ficou concluída em 1993 e a dos pólos de Lisboa e de Coimbra em 1994. Nesse sentido pode-se considerar que, desde 1995, o IT desenvolve uma actividade em regime normal. Resumem-se, em seguida, algumas das actividades mais marcantes realizadas em 1997 deixando para os relatórios das linhas de investigação o seu desenvolvimento.

2. Organização interna

Realizaram-se:

- duas Assembleias Gerais, uma em Março e outra em Dezembro, destinadas respectivamente a aprovar o “Relatório de Actividades e Contas de 1996” e o “Plano de Actividades e Orçamento para 1998”;
- reuniões mensais da Comissão Executiva;
- reuniões com o Revisor Oficial de Contas para análise de balanços e definição de procedimentos contabilísticos;
- uma reunião do Conselho Científico, em Novembro, em Coimbra, para apresentação do trabalho desenvolvido no âmbito das Linhas de Investigação e preparação da proposta de “Plano de Actividades para 1998” a submeter à Assembleia Geral em Dezembro.

3. Actividades em projectos de âmbito nacional

No âmbito do programa lançado pela JNICT para financiamento de projectos liderados por “Jovens Doutorados”, decorreram 10 projectos, que deverão ser concluídos no final de 1998:

- 7 no Pólo de Lisboa,
- 1 no Pólo de Coimbra,
- 2 no Pólo de Aveiro;

No âmbito do Programa PRAXIS XXI, medida 2, continuaram as actividades em 12 projectos envolvendo o Instituto de Telecomunicações:

- 8 envolvendo apenas um Polo do IT (2 do Pólo de Aveiro, 1 do Pólo de Coimbra e 5 do Pólo de Lisboa),
- 1 projecto liderado pelo Pólo de Aveiro, em colaboração com a Universidade do Algarve,
- 1 projecto liderado pelo INESC, envolvendo o Pólo de Coimbra,
- 1 projecto liderado pelo IST, envolvendo o Polo de Aveiro,
- 1 projecto envolvendo os Pólos de Lisboa e de Aveiro do IT.

Continuou no Pólo de Lisboa a colaboração com as OGMA (Oficinas Gerais de Material Aeronáutico) para o projecto e construção de antenas e de circuitos de radiofrequência de um terminal portátil para recepção via satélite. Este projecto termina no 1º semestre de 1998.

Foi concluído, no Pólo de Lisboa, o “Estudo de Viabilidade do Centro de Radiocomunicações da Serra d’Aire” para o ICP (Instituto das Comunicações de Portugal).

Foi continuada a colaboração do Pólo de Aveiro com a TEKA, com vista à implementação de um sistema de distribuição de serviços de televisão (projecto DISERT).

Prosseguiram os estudos e foi iniciada a construção de protótipos no âmbito do projecto ITCOM (Integração de Tecnologias em Comunicações Móveis), envolvendo equipas dos 3 Pólos do IT. Grupos dos Pólos de Lisboa e de Coimbra mantiveram actividade no projecto PRODIGIOS (Processamento Digital de Sinais de Audio e Video) liderado pelo INESC; Estes dois projectos deverão ser concluídos até ao final de 1998.

Por encomenda da Portugal Telecom, através do Centro de Estudos de Telecomunicações, o Pólo de Aveiro desenvolveu 14 projectos de I&D cobrindo as áreas de Redes (7) Rádio Microondas e Ondas Milimétricas (4) Sistemas e Circuitos Integrados (2) e Simulação e Caracterização de Componentes Electrónicos e Optoelectrónicos (1). Também por encomenda da Portugal Telecom, através do Centro de Estudos de Telecomunicações, o Pólo de Coimbra desenvolveu 2 projectos sendo um na área de reconhecimento automático da fala e outro na área de encaminhamento em redes de telecomunicações.

4. Actividades em projectos comunitários

As actividades no âmbito de projectos comunitários, em particular no programa ACTS (4º Programa Quadro da União Europeia), traduziram-se na participação num número significativo de projectos, dos quais se destacam:

- FRAMES (comunicações móveis),
- MOMUSYS (codificação de imagem),
- UPGRADE (comunicações ópticas),
- VITAL (serviços avançados de telecomunicações),
- TALISMAN (protecção dos direitos de cópia de sinais audio e video),
- SPEED (transmissão óptica com elevados débitos binários),
- BLISS (componentes ópticos activos),
- SAMBA (comunicações móveis de banda larga em ondas milimétricas),
- CABSINET (distribuição celular de televisão).

NOTA: Alguns dos projectos a que se faz referência neste relatório foram desenvolvidos em colaboração com as instituições associadas.

5. Outras actividades

O IT organizou a I Conferência Nacional de Telecomunicações, em Aveiro, no Centro de Cultura e Congressos, nos dias 10 e 11 de Abril de 1997. Nesta conferência, que contou com cerca de 360 participantes, foram apresentadas 137 comunicações das 147 submetidas. Dado o êxito da iniciativa é intenção do IT conferir uma periodicidade regular a esta conferência, estando já prevista a realização da II Conferência, em Lisboa, em Abril de 1999.

Na sequência de recomendações emitidas pelo painel de avaliadores estrangeiros que procedeu, em 1996, à avaliação das Unidades de Investigação, suportadas pelo 'Programa Plurianual de Financiamento das Unidades de I&D', o IT irá promover, em Coimbra, em 28 e 29 de Setembro de 1998 um encontro designado 'Matemática em Telecomunicações - Que Problemas?'. Este encontro, aberto a toda a comunidade científica interessada, pretende incrementar os laços de trabalho entre investigadores das áreas de Matemática e de Engenharia de Telecomunicações. Os trabalhos preliminares de preparação desta reunião, a cargo de uma comissão organizadora constituída sobretudo por elementos da linha de Matemática Aplicada às Telecomunicações, tiveram início em 1997.

Foram organizadas diversas reuniões no âmbito dos projectos comunitários e das Acções de Cooperação COST em que as equipas do IT estão envolvidas;

Regista-se, com muito agrado, que colaboradores do Instituto de Telecomunicações tenham sido distinguidos com os prémios Jovem Engenheiro - 1º, 2º e 3º lugares, pela Ordem dos Engenheiros - Região Sul e Comunicações - 97 (área de Engenharia) - 1º e 2º lugares, pelo ICP - Instituto das Comunicações de Portugal.

6. Recursos humanos

Os recursos humanos do IT referidos a Dezembro de 1997 são os seguintes:

- Pólo de Aveiro:
 - 20 investigadores, docentes da UA, dos quais 14 doutorados,
 - 20 investigadores do Centro de Estudos de Telecomunicações da Portugal Telecom, dos quais 1 doutorado,

- 75 outros colaboradores, estudantes de mestrado e doutoramento da UA e bolsiros BIC, dos quais 43 são bolsiros do IT, 20 são bolsiros PRAXIS XXI e 12 com outro tipo de bolsa (UA, UBI, TMN, ACTS fellowship,...),
 - 33 alunos finalistas de licenciatura da UA, em Projectos de Fim de Curso,
 - 6 funcionários a tempo inteiro,
 - 1 funcionários a tempo parcial.
- Pólo de Coimbra:
- 25 investigadores, docentes da FCTUC, dos quais 11 doutorados,
 - 18 investigadores, docentes de outras instituições de ensino superior, dos quais 3 doutorados,
 - 7 bolsiros, alunos de pós-graduação da FCTUC,
 - 18 alunos finalistas de licenciatura da FCTUC, em Trabalhos Finais de Curso
 - 2 funcionários administrativos a tempo inteiro,
 - 2 funcionários administrativos a tempo parcial.

Pólo de Lisboa:

- 47 investigadores, docentes do IST dos quais 37 são doutorados,
- 21 investigadores docentes de outras instituições de ensino superior, dos quais 4 doutorados, 1 mestre, 4 estudantes de doutoramento e 12 estudantes de mestrado
- 67 outros colaboradores, incluindo 18 estudantes de doutoramento e 38 estudantes de mestrado,
- 75 alunos finalistas de licenciatura, do IST, em Projectos Finais de Curso,
- 1 funcionário administrativo a tempo inteiro,
- 1 funcionário administrativo a tempo parcial,
- 1 técnico de laboratório a tempo parcial.

Para efeitos de avaliação externa este relatório é também apresentado em língua inglesa incluindo, em anexo, a descrição detalhada das actividades desenvolvidas no âmbito das linhas de investigação nos três pólos.

INSTITUTO DE TELECOMUNICAÇÕES

Annual Report

1997

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1. Introduction

“Instituto de Telecomunicações” (IT) is a private non-profit organisation, the result from the association of four institutions with experience and traditions in research and development in the field of Telecommunications:

- “Instituto Superior Técnico” (IST);
- “Universidade de Aveiro” (UA);
- “Faculdade de Ciências e Tecnologia da Universidade de Coimbra” (FCTUC);
- “Portugal Telecom” (PT), through its research centre “Centro de Estudos de Telecomunicações” (CET).

IT is organised around three poles: one in Aveiro, in the University Campus, another in Coimbra, in Pole II of the University of Coimbra and the third one in Lisbon, in IST.

Setting up of IT was the result of a 1.5 billion escudos grant from Programme CIENCIA, through three contracts signed in 1991. This investment enabled new infrastructures to be built and research laboratories to be equipped on every pole

Installation was concluded in Aveiro in 1993 and in Lisbon and Coimbra in 1994. Therefore, since 1995 IT activities proceed regularly. Key developments in 1997 are sketched below leaving the details for the report of each individual research line.

2. Management

The following management meetings were held:

- two meetings of the General Assembly, one in March to approve the “1996 Annual Report” and the other in December to approve the “Plan and Budget for 1998”;
- monthly meetings of the Executive Board;
- the Executive Board met the Official Auditor to examine the balance sheet and to set up improved accounting procedures;
- the Scientific Board met in November, to prepare a proposal for the “Plan and Budget for 1998”, to be submitted to the General Assembly in December.

3. National Projects

Following JNICT call for “Proposals Lead by Young Doctors” IT was awarded 10 contracts which will reach their end during 1998:

- 7 in Lisbon,
- 1 in Coimbra,
- 2 in Aveiro;

In the scope of Program PRAXIS XXI, Measure 2, 12 research projects were continued;

- 8 involving one IT-Pole alone (5 in Lisbon, 2 in Aveiro, 1 in Coimbra),
- 1 led by IT-Aveiro in co-operation with the University of Algarve,
- 1 led by INESC in co-operation with IT-Coimbra,
- 1 led by IST in co-operation with IT-Aveiro
- 1 involving the IT-Aveiro and IT-Lisbon.

IT-Lisbon continued a project with OGMA (Oficinas Gerais de Material Aeronáutico) to design antennas and radio frequency circuits for a portable satellite radio terminal;

IT-Lisbon carried out and finished the “Feasibility Study for the Radio Communication Centres of Serra d’Aire” for ICP (Instituto das Comunicações de Portugal);

IT-Aveiro continued its co-operation with TEKA and implemented a system to distribute television services (Project DISERT);

Activities on project ITCOM continued at the three poles. IT-Lisbon and IT-Coimbra continued their co-operation with INESC in the scope of project PRODIGIOS, led by INESC. Both these projects should be concluded until the end of 1998;

IT-Aveiro on contract with Portugal Telecom (CET), was involved in 14 projects in the areas of networks (7), radio microwave and millimetre waves (4), integrated circuits and systems (2) and electronic and optoelectronic components (1). IT-Coimbra also on contract with Portugal Telecom (CET) was involved in 2 projects, one in the area of algorithms for speech recognition over the telephone line and one in the area of routing algorithms for telecommunications networks.

4. European Community Projects

IT research teams participation in European Community research and developments projects, namely in Programme ACTS (European Union 4th Framework Programme) included:

- FRAMES, in mobile and personal communications;
- SAMBA, in wide band mobile communications in the millimetre band;
- CABSINET, in cellular radio distribution of television signals;
- MOMUSYS, in image coding;
- TALISMAN, in copyright protection for audio and video signals;
- BLISS, in active optical components;
- UPGRADE, in optical communications;
- VITAL, in advanced telecommunication services;
- SPEED, in optical transmission with high bit rates.

Remark: Some of the projects mentioned in this report were carried out in collaboration with the associates.

5. Other activities

The First National Conference on Telecommunications, organized by IT, took place in April 10 and 11 in Aveiro, in the City Congress Center, with a total of 360 participants and 137

papers (out of 147 that were submitted) were presented in oral and poster sessions. In view of the success of this first Conference, IT will organize this Conference in a regular basis, every two years. At the moment the Second Conference, to be held in Lisbon in April 1999, is being prepared.

Following suggestions by the panel of evaluators, which assessed IT research work of the Institute in 1996, IT will be organizing in Coimbra, in 28 and 29 September 1998 a workshop on the topic of 'Mathematical Problems in Telecommunications'. This workshop, opened to the whole scientific community, aims at joining together mathematicians and engineers with a common interest in the field of Telecommunications. The organization of this meeting started in 1997 and is led by members of the Applied Mathematics group of IT-Coimbra.

A number of COST and Community Project meetings in which IT research teams participated were organised and held.

Researchers of IT-Lisboa were distinguished with the following awards: 'Jovem Engenheiro' - 1st, 2nd and 3rd prizes from Ordem de Engenheiros - Região Sul and 'Comunicações 97' (Engineering) - 1st and 2nd prizes, from ICP - Instituto das Comunicações de Portugal.

6. Human resources

IT human resources referred to December 1996 are as follows:

IT-Aveiro:

- 20 researchers, of which 14 hold a doctor degree, staff members from UA,
- 20 researchers staff members from PT, of which 1 holds a doctor degree,
- 75 researchers, PhD and M.Sc. students at UA, and BIC students, of which 43 hold an IT grant, 20 hold a PRAXIS XXI grant and 12 hold another type of grant (UA, UBI, TMN, ACTS, ...),
- 33 UA students doing their final year project,
- 6 full-time administrative staff,
- 1 part-time administrative staff,

IT-Coimbra:

- 25 researchers, of which 11 hold a doctor degree, staff members from FCTUC,

- 18 researchers, of which 3 hold a doctor degree, staff members from other universities and polytechnic schools,
- 7 PhD and M.Sc students from FCTUC,
- 18 FCTUC students doing their final year project,
- 2 fulltime administrative staff,
- 1 part-time administrative staff,

IT-Lisbon:

- 47 researchers, of which 37 hold a doctor degree, staff members from IST,
- 21 researchers, of which 4 hold a doctor degree, staff members from other universities and polytechnic schools,
- 67 other collaborators, of which 18 are PhD students and 38 are M.Sc. students,
- 75 IST students doing their final year project,
- 1 full-time administrative staff,
- 1 part-time administrative staff,
- 1 part-time technician.

A detailed description of the activities performed by the research lines in the three poles is presented in annex.

7. ANNEX

7.1 Lisbon Pole

7.1.1 Radio, Microwaves and Millimeter Waves Research Line

Human Resources

Collaborators

- | | | |
|---------------------------|------------|--------------------------|
| • Afonso M. Barbosa | PhD | Full Professor, IST |
| • João Costa Freire | PhD | Associate Professor, IST |
| • Carlos A.C. Fernandes | PhD | Associate Professor, IST |
| • Carlos R. Paiva | PhD | Associate Professor, IST |
| • Maria João Rosário | PhD | Assistant Professor, IST |
| • Luís M. Correia | PhD | Assistant Professor, IST |
| • Custódio J. O. Peixeiro | PhD | Assistant Professor, IST |
| • António L. Topa | M.Sc. | Assistant, IST |
| • João Caldinhas Vaz | M.Sc. | Assistant, IST |
| • Jorge S. Silva | Technician | Lab. Technician, IST |
| • Carlos Brito | Technician | Lab. Technician, IST |

Other Collaborators

- | | | |
|------------------------------|---------------|---------------------|
| • João Filipe Tomás Cordeiro | PhD Student | Grant JNICT |
| • Jorge Alves Torres | PhD Student | Lecturer, ENIDH |
| • Fernando Fortes | PhD Student | Grant, PRAXIS XXI |
| • Carlos da Silva Alves | M.Sc. | Engineer, ANA |
| • Fernando Azevedo | M.Sc. Student | Assistant, ISEL |
| • Henrique José da Silva | M.Sc. Student | Assistant, ISEL |
| • Joaquim José Oliveira | M.Sc. Student | Assistant, EST-IPCB |
| • Guilherme Mascarenhas | M.Sc. Student | Assistant, ISECMAR |
| • Wojciech Sadowski | PhD Student | Grant TEMPUS |

• Jorge M. Costa	PhD Student	Grant, PRAXIS XXI
• Fernando M. Janeiro	PhD Student	Grant, PRAXIS XXI
• Fernando J. Velez	PhD Student	Assistant, Univ. Beira Interior
• Henrique T. Silva	M.Sc. Student	Assistant ISEL
• Pedro M. Ramos	PhD Student	Grant, PRAXIS XXI
• Ana M. Carvalho	M.Sc. Student	Grant, PRAXIS XXI
• Luís M. Manica	M.Sc. Student	Grant, PRAXIS XXI
• José L. Pereira	M.Sc. Student	Engineer, ANA
• Miguel A.L. Filipe	M.Sc. Student	Grant, IST
• Luís M. Anunciada	M.Sc. Student	Grant, IST
• Pedro Vasconcelos	M.Sc. Student	Engineer, TMN
• Nuno C. Gonçalves	M.Sc. Student	Grant, JNICT
• Ana Domingues	M.Sc. Student	Engineer, TMN
• Dragana Kristic	M.Sc. Student	Engineer, TELECEL
• Beniamino Barilese	B.Sc. Student	Grant ERASMUS
• Mayte Rodrigo	B.Sc. Student	SÓCRATES, U. Valencia
• Pedro Ferreira	Lic. Student	IST, Final Year Project
• André de Jesus	Lic. Student	IST, Final Year Project
• João Gomes	Lic. Student	IST, Final Year Project
• Célia Agostinho	Lic. Student	IST, Final Year Project
• António Rodrigues	Lic. Student	IST, Final Year Project
• João Palma	Lic. Student	IST, Final Year Project
• João Luís	Lic. Student	IST, Final Year Project
• Ana Alves	Lic. Student	IST, Final Year Project
• Carlos Ribeiro	Lic. Student	IST, Final Year Project
• Isabel Neto	Lic. Student	IST, Final Year Project
• Gerardo Ângelo	Lic. Student	IST, Final Year Project
• Valentina Garcia	Lic. Student	IST, Final Year Project
• Lívio Santos	Lic. Student	IST, Final Year Project

• Lúcio Ferreira	Lic. Student	IST, Final Year Project
• Ana Claro	Lic. Student	IST, Final Year Project
• José Ferreira	Lic. Student	IST, Final Year Project
• Sandra Almeida	Lic. Student	IST, Final Year Project
• José Queijo	Lic. Student	IST, Final Year Project
• Francisco Gil	Lic. Student	IST, Final Year Project
• Carlos Pardelinha	Lic. Student	IST, Final Year Project
• Filippo Gaggioli	Lic. Student	Pisa Univ., Italy, Final Year Project
• Elmano Pascual	Eng.	ICP
• Paulo O. Francês	Researcher	Engineer, TELECEL
• Micael Parente	Lic. Student	IST, Final Year Project
• Pedro Ferreira	Lic. Student	IST, Final Year Project
• Hugo Silvestre	Lic. Student	IST, Final Year Project
• Bruno Gomes	Lic. Student	IST, Final Year Project
• João Vinagre	Lic. Student	IST, Final Year Project
• Paulo Soares	Lic. Student	IST, Final Year Project
• Horácio Santos	Lic. Student	IST, Final Year Project
• Nuno Carvalho	Lic. Student	IST, Final Year Project
• Alcides Dias	Lic. Student	IST, Final Year Project
• Bruno Cabaço	Lic. Student	IST, Final Year Project

Projects

- PRAXIS XXI - 3/3.1/TIT/35/94 - ITCOM: Integration of Technologies for Mobile Communications
 Specification of the antenna requirements. Preliminary study of helical type of antennas for base station omnidirectional coverage with shaping in the elevation plane.
 Design, fabrication and test of an omnidirectional array of microstrip patches; this antenna is one of the alternatives to be used in the mobile terminal.
 Development of propagation models for mobile communications in outdoor environments at the 1.8 GHz band. The models are intended for the estimation of propagation loss, considering the specific characteristics of the scenario where the mobile exists .

Design and test of an up converter GaAs MMIC (300MHz Ø2GHz) for the mobile terminal. Mounting of the up and down converters MMICs on a soft substrate for integration and test (Carlos Fernandes, Custódio Peixeiro, Luís Correia, J.Costa Freire).

- JNICT - PBIC/C/TIT/2507/95 - Active Printed Antennas
Active elements such as amplifiers and phase shifters have been studied. GaAs MMICs amplifiers were fabricated, tested and mounted on soft substrates; antenna integration is under development. Characterization of wire bondings in a broad frequency range is under development (Custódio Peixeiro, M.J. Rosário).
- JNICT - PBIC/C/TIT/2531/95 - Propagation in Photonics: Complex Media in Integrated Optics; Solitons in Optical Fibers
Electromagnetic wave propagation and radiation in planar bianisotropic structures including chiral and pseudo-chiral media. Soliton propagation in birefringent optical fibers. Soliton switching in nonlinear fiber couplers. Wavelength-division multiplexing with fiber solitons. Dispersion management in soliton communication systems. Soliton transmission control. (Carlos Paiva, António Topa).
- JNICT PBIC/C/TIT/2501/95 - Shaped beam antennas - impact on the millimetrewave mobile communications propagation channel
Design of a set of shaped beam antennas for use in indoor mobile or portable applications at 60 GHz, including a switchable beam antenna. Evaluation of antenna performance with respect to coverage. Modelling of obstacles in indoor environments, and validation with measurements (Carlos Fernandes).
- JNICT - PBIC/C/TIT/2517/95 - MODPROP: Propagation Models for Urban Micro-Cells in Mobile Communication Systems
Development of propagation models both for indoor and outdoor environments for mobile communication systems working at the UHF and millimetre wavebands. Special attention is being given to the average power decay, fading and wideband characterisation of the propagation channel at the millimetre waveband. Also the particular case of street crossings and obstruction by urban structures, as well as penetration into buildings and other structures, is being considered for mobile systems at UHF, mainly GSM (Luís Correia).
- PRAXIS XXI - 2/2.1/TIT/1663/95 - Microwave and Optical Devices for Transmission and Switching Using Linear and Nonlinear Media
Surface and radiation modes in planar waveguides containing chiral or pseudo-chiral media with applications to microwave integrated circuits; leaky modes in chiral rib

- waveguides. All-optical switching in nonlinear optical fibers with solitonlike pulses: (i) self-routing switching; (ii) phase-controlled switching. Polarization-division multiplexing with fiber solitons. Soliton amplification in erbium-doped fiber amplifiers (Afonso Barbosa, Carlos Paiva, António Topa).
- PRAXIS XXI - 2/2.1/TIT/1562/95 - ISAC: Implementation Aspects of a Mobile Telecommunication Satellite Payload with Dynamic Channel Allocation
Start in October 1997 with the study of voltage controlled reactive elements to be used in active phase shifters of active antenna sub-arrays for a Mobile Telecommunication Satellite Payload with Dynamic Channel Allocation (J. Costa Freire, Custódio Peixeiro).
 - ACTS - SAMBA - System for Advanced Mobile Broadband Applications
Comparison of cellular development characteristics between the 40 and 60 GHz bands for Mobile Broadband Systems. Study of traffic aspects, considering user mobility in linear cell structures, the influence of cell structures and the influence of cell size and mobile speed on handover performance.
Preliminary study and proposal of the antenna configuration to be used in SAMBA trial scenarios at 40 GHz - dielectric lens antennas. Design, construction and test of the mobile terminal antenna, including the design and fabrication of the radome. Design, prototyping and test of the base station antenna for a “wide cell”.
Design and test of microstrip filters on soft substrates for 40GHz and design on alumina. Study of different microstrip/WG transitions (Carlos Fernandes, Luís Correia, Custódio Peixeiro, João Freire, M.João Rosário).
 - ACTS - CABSINET - Cellular Access to Broadband Services and Interactive Television
Survey of the literature on propagation channel characteristics at the 6 GHz band. Measurement of penetration losses for various building materials inside the IST campus, and of power decay with distance for several scenarios inside the IST campus as well. From these measurements general characteristics of wall losses and signal propagation have been inferred.
Implementation of a measurement system for transmission loss measurement of common building materials. Specification and installation of a CW channel sounder for the 5 GHz. Indoor and outdoor measurement campaigns. Interim reports (Carlos Fernandes, Luís Correia).
 - COST 245 - Active and Phased Array Antennas
Participation in the last Management Committee Meeting that took place in Brussels, 1-2 July (A.M. Barbosa).

- **COST 259: Wireless Flexible Personalised Communications**
Development of propagation models for outdoor environments in the UHF and millimetre wavebands: at the UHF band, models have been developed for urban scenarios and tested in the city of Lisbon for GSM with the collaboration of TELECEL; the work in the millimetre waveband has been focused in the characterisation of the propagation channel, both for the average decay of power and signal fading. Also some work on traffic aspects and optimisation of cellular planning has been done (Luís Correia).
- **COST 260 - Smart Antennas: Computer Aided Design and Technology**
Participation in the 1st Management Committee Meeting that took place in Brussels, Belgium, 3 July (A.M. Barbosa). Participation in the Workshop on Smart Antenna Design and Technology that was held in Dubrovnik, Croatia, 10-12 December (C. Peixeiro).
- **ICP - Estudo de Viabilidade do Centro de Radiocomunicações da Serra d'Aire (Feasibility Study of Radio-Site Serra d'Aire)**
Final studies on radio coverage, antennas, IM products, and building infra-structure. Economical feasibility study. Coverage studies were done, comparing the case of all antennas either mounted on the same mast or individual mounting, for frequencies ranging from 40 to 900 MHz. The analysis of the influence of the masts on the radiation pattern of the antennas was analysed from the coverage point of view. Preparation and delivery of the final report (Carlos Fernandes, Maria João Rosário).
- **OGMA - Modular RF System**
Design and test of hemispherical coverage quadrifilar helical antennas for a LEO portable ground station terminal. Optimisation of the configuration for hemispherical coverage and impedance. Study of modified structures. Design and test of the VHF power amplifier and UHF low noise receiver (Carlos Fernandes, J. Costa Freire).
- **ANA - Coverage Studies in Aeronautical Communications**
The problem of optimised location of base station in aeronautical communications with planes at both ground and the flight levels was analysed for specific airports. Also, new solutions for antennas were considered for coverage of control zones at flight levels (Luís Correia).
- **PRODEP - Power amplifiers optimization**
Study of design techniques to improve the performance of power amplifiers for mobile communications. Study of the influence of the harmonics on class C operation (M. João Rosário).

- Health safety analysis for mobile communication systems (internal project)
Some attention is being devoted to this area, by evaluating the maximum transmitted power that is possible at the mobile phone for mobile communications systems, due to limitation imposed by safety considerations. Also the case of buildings with GSM base stations on top or in the vicinity has been analysed (Luís Correia).
- Cellular planning for nonuniform traffic distributions (internal project)
Optimization of cellular planning parameters, like the ratio of division into micro and macro - cells and cell radius for both cell types, in the real case of nonuniform distributions of traffic in city environments. Deployment cost is being considered as well. Data from a real system is being used, given by TELECEL, a GSM operator (Luís Correia).
- MMICs on BiCMOS technology (internal project)
Design of microwave power amplifiers and antenna switch using conventional BiCMOS technology. Test of the power amplifier first prototype (M. João Rosário).
- Solid dielectric horn antennas (internal project)
Prototyping and test of solid dielectric horn antennas. Study of the integration of these structures with phase correcting and amplitude shaping dielectric lenses (Carlos Fernandes).

PhD Thesis

- António Topa (supervisor: Afonso Barbosa; co-supervisor: Carlos Paiva), Instituto Superior Técnico, concluded in 1997 (subject: Electromagnetic wave propagation and radiation in bianisotropic planar structures).
- Fernando J. Velez (supervisor: Luís M. Correia), Instituto Superior Técnico, in preparation (subject: Cellular planning for mobile broadband systems in urban environments).
- João Filipe Tomás Cordeiro (supervisors: João Costa Freire and Custódio Peixeiro), Instituto Superior Técnico, to be concluded in 1999 (subject: Active Printed Antennas).
- Pedro M. Ramos (supervisor: Carlos Paiva), Instituto Superior Técnico, started in 1997 (subject: Soliton switching in nonlinear fiber couplers).
- Jorge R. Costa (supervisor: Carlos Paiva), Instituto Superior Técnico, started in 1997 (subject: Soliton amplification in erbium-doped fiber amplifiers).

- Fernando M. Janeiro (supervisor: Carlos Paiva), Instituto Superior Técnico, started in 1997 (subject: Soliton transmission control).
- João Caldinhas Vaz (supervisor: J. Costa Freire), Instituto Superior Técnico, to be concluded February 1998 (subject: Monolithic Millimeterwave Power Amplifiers).
- Jorge Torres (supervisor: J. Costa Freire), Instituto Superior Técnico, in preparation (subject: Multifunction Monolithic Microwave Integrated Circuits).
- Fernando Fortes (supervisor: M. João Rosário), Instituto Superior Técnico, in preparation (subject: Monolithic Microwave Power Amplifiers).

M.Sc. Thesis

- Henrique Silva (supervisors: Maria João Rosário and Custódio Peixeiro), Instituto Superior Técnico, to be concluded in 1998 (subject: Active Printed Antennas).
- Fernando Azevedo (supervisor: Maria João Rosário), Instituto Superior Técnico, to be concluded in 1999 (subject: Monolithic DECT RF receiver front end).
- Ana M. Carvalho (supervisor: Carlos Paiva), Instituto Superior Técnico, concluded in 1997 (subject: Soliton propagation in birefringent optical fibers).
- Pedro M. Ramos (supervisor: Carlos Paiva), Instituto Superior Técnico, concluded in 1997 (subject: Soliton switching in nonlinear fiber couplers).
- Luís M. Manica (supervisor: Carlos Paiva), Instituto Superior Técnico, to be concluded in 1998 (subject: WDM soliton systems).
- José L. Pereira (supervisor: Carlos Paiva), Instituto Superior Técnico, to be concluded in 1998 (subject: Dispersion management in soliton communication systems).
- Miguel André Filipe (supervisor: Carlos Fernandes), Instituto Superior Técnico, to be concluded in 1998 (subject: Development of shaped beam antennas for millimetrewave mobile communications).
- Luís Manuel Anunciada (supervisor: Carlos Fernandes), Instituto Superior Técnico, to be concluded in 1998 (subject: Impact of shaped beam antennas on the millimetrewave mobile communications propagation channel).

- Pedro Vasconcelos (supervisor: Luís M. Correia), Instituto Superior Técnico, to be concluded in 1998 (subject: Characterisation of the propagation channel in mobile broadband systems at the millimetre waveband).
- Nuno C. Gonçalves (supervisor: Luís M. Correia), Instituto Superior Técnico, to be concluded in 1998 (subject: Propagation models for mobile communication systems in micro-cells structures at the UHF band).
- Ana Domingues (supervisor: Luís M. Correia), Instituto Superior Técnico, in preparation (subject: Models for penetration and indoor propagation in mobile communication systems at the UHF band).
- Dragana Kristic (supervisor: Luís M. Correia), Instituto Superior Técnico, in preparation (subject: Optimisation of cellular planning for nonuniform traffic distributions in mobile communication systems at the UHF band).

Publications

Books and Book Chapters

Luís M. Correia, "Broadband Systems: Material Characterisation", Luís M. Correia and Per H. Lehne, "Broadband Systems: Outdoor Radio Channel", in Eraldo Damosso (ed.), "*Digital Mobile Radio: COST 231 View on the Evolution Towards 3rd Generation Systems*", Springer-Verlag, Berlin, 1997.

C. Salema, C. Fernandes and R. Jha, "*Solid Dielectric Horn Antennas*", edited by Artech House, (to appear in April 1998).

Papers in Journals

P.M. Ramos and C. R. Paiva, "Influence of cross-phased modulation on self-routing pulse switching in nonlinear optical fibers", *Microwave and Optical Technology Letters*, vol. 15, pp. 91-95, June 1997.

P. M. Ramos and C. R. Paiva, "Optimization and Characterization of Phase-Controlled All-Optical Switching with Fiber Solitons", *IEEE Journal of Selected Topics in Quantum Electronics*, vol. 3, No.5, pp. 1224-1231, October 1997.

C.A. Fernandes.; V. Brankovic, S. Zimmermman; M. Filipe, L. Anunciada, "Dielectric Lens Antenna for Wireless Broadband Communications, Accepted for publication in *Wireless Personal Communications Magazine*, special issue on Wireless Broadband Communications, 1998.

Peter F.M. Smulders and Luís M. Correia, "Characterisation of the Propagation Channel at 60 Ghz Band", *IEE Electronics & Communication Engineering Journal*, Apr. 1997, pp. 73-80.

Luís M. Correia and Ramjee Prasad, "An Overview of Wireless Broadband Communications", *IEEE Communications Magazine*, Vol. 35, No. 1, Jan. 1997, pp. 28-33.

A. L. Topa, C. R. Paiva, A. M. Barbosa, "Full Wave Analysis of a Nonradiative Dielectric Waveguide with a Pseudochiral Ω -slab", accepted for publication, *IEEE Transactions on Microwave Theory and Techniques*, 1998.

Papers in Conference Proceedings

Fernando Fortes, Maria João do Rosário, João Costa Freire, "Class A power amplifier with monolithic Technology" (in Portuguese) *Actas da I Conf. Nacional de Telecomunicações*, pp.119-122, Aveiro, Portugal, April 1997.

Afonso Coelho Nunes, Maria João Rosário, J. Costa Freire, " Efficiency improvement of Class C power amplifiers for mobile communications" (in Portuguese) *Actas da I Conf. Nacional de Telecomunicações*, pp.115-118, Aveiro, Portugal, April 1997.

Jorge Alves Torres, João Costa Freire, "Monolithic LNA Inmarsat Terminal" (in Portuguese) *Actas da I Conf. Nacional de Telecomunicações*, pp.499-502, Aveiro, Portugal, April 1997.

Fernando Fortes, Maria João do Rosário, João Costa Freire, "Monolithic Low Voltage Power Amplifier for Portable Low Range Transceiver", *27th European Microwave Conference*, pp. 1159-1163, Jerusalem, Israel, September 1997.

Jorge Alves Torres, João Costa Freire, "Low Noise Monolithic Down Converter for a L Band Mobile Hand Set Terminal", *27th European Microwave Conference*, pp. 1164-1168, Jerusalem, Israel, September 1997.

Afonso Coelho Nunes, Maria João Rosário, J. Costa Freire, "A Microstrip Matching Network for Class C Power Amplifiers Optimization", *27th European Microwave Conference*, pp. 761-766, Jerusalem, Israel, September 1997.

Fernando Fortes, Maria João do Rosário, João Costa Freire, "MESFETs Modelling for an Optimum Saturated Class A MMIC Power Amplifier Design", *Asia Pacific Microwave Conference*, pp.549-552, Hong Kong, Dezembro 1997.

C. Peixeiro, "Microstrip Patch Antenna Research Activities at the Technical University of Lisbon", *Proc. ACES'97*, pp. 1219-1226, Monterey, California, USA, March 1997.

J. Cordeiro, C. Peixeiro, and J.Costa Freire, "Design, Fabrication and Test of an Active Microstrip Patch Antenna" (in Portuguese) *Actas da I Conf. Nacional de Telecomunicações*, pp. 159-162, Aveiro, Portugal, April 1997.

A. Armogida and C. Peixeiro, "Microstrip Patch Antenna Array for a Mobile Communication System Base Station", *Proc. 1997 IEEE AP-S International Symposium*, pp. 430-433, Montreal, Canada, July 1997.

T. Rutkowski and C. Peixeiro, "Microstrip Patch Array for the Mobile Terminal Omnidirectional Antenna of a Mobile Communication System", *Proc. 27th European Microwave Conference*, pp. 579-583, Jerusalem, Israel, September 1997.

T. Rutkowski and C. Peixeiro, "Dual-Band Omnidirectional Microstrip Patch Array Antenna for a Mobile Communication System", *Proc. 1997 Asia Pacific Microwave Conference*, pp. 429-432, Hong-Kong, PRC, December 1997.

B. Barilese and C. Peixeiro, "Wide-Band Microstrip Patch Antenna Element", submitted for presentation at the *1998 AP-S International Symposium*, Atlanta, Georgia, U.S.A., June 1998.

C. Peixeiro, "Teaching Microstrip Patch Antennas to Undergraduate Students", submitted for presentation at the *1998 AP-S International Symposium*, Atlanta, Georgia, U.S.A., June 1998.

P.M. Ramos and C.R. Paiva, "Combined effect of cross-phase modulation and higher-order dispersion on soliton switching in nonlinear fiber couplers", *Proc. PIERS 1997*, City University of Hong-Kong, p. 506, Jan. 1997.

A.L. Topa, C.R. Paiva, and A.M. Barbosa, "Radiation modes of an asymmetric chiral slab waveguide - a general approach to a new canonical problem", *Proc. PIERS 1997*, City University of Hong-Kong, p. 684, Jan. 1997.

A.L. Topa, C.R. Paiva, and A.M. Barbosa, "A Linear-Operator Formalism for the Analysis of Inhomogeneous Pseudochiral Planar Waveguides", *1997 North American Radio Science Meeting*, URSI, Montréal, Canada, p. 81, July 1997.

P.M. Ramos and C.R. Paiva, "A New Variational Approach for the Cross-Phase Modulation Effect on Self-Routing Pulse Switching in Nonlinear Optical Fibers", *1997 Conference on Lasers and Electro-Optics / Pacific Rim*, Chiba, Japan, pp. 113-114, July 1997.

C.A. Andrade, C.R. Paiva, A.L. Topa, and A.M. Barbosa "Leaky Modes in Chiral Rib Waveguides", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, pp. 269-272, Abril 1997.

P.M. Ramos and C.R. Paiva, "Soliton Switching in Twin-Core Nonlinear Fiber Couplers: A Comparative Study Between Analytical and Numerical Methods", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, pp. 273-276, Abril 1997.

A.M. Carvalho, J.L. Pereira, and C.R. Paiva, "Effect of Higher-Order Dispersion on Solitonlike Pulse Propagation in Birefringent Optical Fibers", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, pp. 233-236, Abril 1997.

A.L. Topa, C.R. Paiva, and A.M. Barbosa "A Linear-Operator Formalism for the Analysis of Planar Layered Waveguides Containing π -Media: Application to Microwave Devices", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, pp. 111-114, Abril 1997.

J.R. Costa, F.M. Janeiro and C.R. Paiva, "Transmissão de Solitões em Sistemas de Comunicação Óptica", *3º Encontro Nacional do Colégio de Engenharia Electrotécnica*, Ordem dos Engenheiros, Porto, pp. 401-408, Junho 1997.

P.M. Ramos and C.R. Paiva, "Comunicação Fotónica de Solitões em Acopladores Não-Lineares de Fibras Ópticas", *3º Encontro Nacional do Colégio de Engenharia Electrotécnica*, Ordem dos Engenheiros, Porto, pp. 393-400, Junho 1997.

P.M. Ramos and C.R. Paiva, "Optimization of Phase-Controlled Soliton Switching in Nonlinear Optical Fiber", *IEEE Lasers and Electro-Optics Society (LEOS'97) - 10th Annual Meeting*, pp. 373-374, San Francisco, USA, November 1997.

L.M. Manica, J.R. Costa and C.R. Paiva, "Wavelength Division Multiplexing with Fiber Solitons Launched Near the Zero-Dispersion Wavelength", *IEEE Lasers and Electro-Optics Society (LEOS'97) - 10th Annual Meeting*, pp. 377-378, San Francisco, USA, November 1997.

J.L. Pereira, F.M. Janeiro and C.R. Paiva, "Polarization Division Multiplexing with Subpicosecond Solitons", *IEEE Lasers and Electro-Optics Society (LEOS'97) - 10th Annual Meeting*, pp. 379-380, San Francisco, USA, November 1997.

A.L. Topa, C.R. Paiva, and A.M. Barbosa "NRD Pseudo-chiral Nonradiative Dielectric Waveguide", *Asia Pacific Microwave Conference (APMC'97)*, pp. 597-600, Hong Kong, SAR, PRC, December 1997.

C. Salema; C. Fernandes; "Design of rectangular cross section shielded dielectric horns", *Actas da I Conf. Nacional de Telecomunicações*, Aveiro, 163-166, Abr. 97.

J. Pinto; N. Gonçalves; C. Fernandes; "Modelação de Edifícios em Comunicações Móveis", *Actas da Conf. Nacional de Telecomunicações*, Aveiro, 167-170, Abr. 97.

C.A. Fernandes; M. Filipe; L. Anunciada; "Lens Antennas for the SAMBA mobile terminal", *Proc. ACTS Summit 97*, 635-640, Aalborg, Oct. 1997.

L.B. Mata, P. Rocha e L.M. Correia, "Propagation Models for Mobile Communications in Indoor Scenarios" (in Portuguese), *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Portugal, Apr. 1997.

N.C. Gonçalves e L.M. Correia, "Propagation Models for GSM and DCS in Urban Scenarios" (in Portuguese), *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Portugal, Apr. 1997.

L.M. Correia, J.J. Reis and P.O. Francês, "Analysis of the Average Power to Distance Decay Rate at the 60 GHz Band", *IEEE 47th Vehicular Technology Conference*, Phoenix, Arizona, USA, May 1997.

P. Vasconcelos and L.M. Correia, "Fading Characterization of the Mobile Radio Channel at the Millimeter Waveband", *IEEE 47th Vehicular Technology Conference*, Phoenix, Arizona, USA, May 1997.

R. Prasad and L.M. Correia, "Wireless Broadband Multimedia Communications", *International Workshop on Telecommunication Systems*, Saha Alam, Malaysia, May 1997.

V. Degli-Esposti, G. Riva, L.M. Correia and G. Falsiasecca, "Wideband Characterisation of mm-wave Propagation in Indoor Scenarios for WLANs", *EPMCC'97 - 2nd European Personal Mobile Communications Conference*, Bonn, Germany, Sep. 1997.

N.C. Gonçalves and L.M. Correia, "Analysis of Propagation in Street Crossings for Cellular Communication Systems" (in Portuguese), *15th Brazilian Symposium on Telecommunications*, Recife, Brazil, Sep. 1997.

F.J. Velez and L.M. Correia, "Optimization Criteria for Cellular Planning of Mobile Broadband Systems in Linear and Urban Coverages", *ACTS Mobile Communications Summit*, Aalborg, Denmark, Oct. 1997.

L.M. Correia, "Wireless Broadband Communications at the Millimetre Waveband: Differences and Similarities between WLANs and MBSs", *Colloquium on Indoor Communications*, Delft, The Netherlands, Oct. 1997 (invited paper).

Project Deliverables and Reports

Beniamino Barilese, "Wide-Band Microstrip Patch Antennas", Laurea Degree Project, ERASMUS PROJECT ICP 1208/06, October 1997.

Miscellaneous

- Carlos R. Paiva reviewer for *Optics Letters* (Optical Society of America).
- Afonso Barbosa reviewer of papers submitted to the *27th European Microwave Conference*, Jerusalem, Israel.
- Afonso Barbosa National Delegate to Actions COST 245 and COST 260.
- Afonso Barbosa member of the Executive Board of Instituto de Telecomunicações.
- Luís M. Correia reviewer for *Wireless Personal Communications* and *IEEE Transactions on Vehicular Technology*.
- Luís M. Correia co-editor, with Prof. Masao Nakagawa (Keio University, Japan), of a special issue of *Wireless Personal Communications* on Wireless Broadband Systems.
- Luís M. Correia auditor of projects in the ACTS programme in Feb. 1997 and in the ESPRIT programme in June 1997.
- Luís M. Correia member of the Technical Committee of *International Conference on Telecommunications*, Thessaloniki, Greece, Jun. 1998.
- Luís M. Correia elected Vice-chairman of COST 259 in Sep. 1997.

- J. Costa Freire member of the Management Committee of the *European Microwave Conference*.
- J. Costa Freire reviewer of papers presented to the *27th European Microwave Conference* and *European GaAs and related III-V compounds Application Symposium*.
- M. João Rosário reviewer for *IEEE Transactions on Circuits and Systems*.

7.1.2 Integrated Circuits and Systems Research Line

Human Resources

Collaborators

- José E. Franca PhD Associate Professor, IST
- Carlos A. Leme PhD Assistant Professor, IST
- João C. Vital PhD Assistant Professor, IST

Other Collaborators

- Rui P. Martins PhD Director FCT/Univ. Macau
- Maria H. Fino PhD Assistant Professor FCT/UNL
- Orlando Chou Research Assistant Univ. Macau
- Nuno Franca PhD Student Research Assistant INETI
- Alexandre Almeida PhD Student Grant, JNICT
- João Goes PhD Student Grant, IST
- João P. Carreira PhD Student Engineer ATMEL-ES2
- Jorge Guilherme PhD Student Assistant, IPT
- Nuno Garrido PhD Student Grant, PRAXIS XXI
- Nuno Horta PhD Assistant Professor FCT/UNL
- Paulo J. Santos PhD Student Grant, PRAXIS XXI
- Rui Neves PhD Student Grant, PRAXIS XXI
- Wang Ping PhD Student
- David Guilherme Research Student
- Marco Pereira M.Sc. Student
- Ricardo Reis PhD Student
- Pun Pang PhD Student Grant, IST
- Eduardo Viegas M.Sc. Student
- Guan Xiang Researcher Student Tsinghua Univ.

Engineering, in support of our research activities in the area of mixed-signal integrated circuit design for communications.

- **PARTNERSHIP FOR NANOPOWER RESEARCH WITH NOKIA MOBILE PHONES:** A framework agreement has been established between Nokia Mobile Phones and the Instituto Superior Técnico for the research of new nanopower circuits employing NMP's propriety SSCT technique (Self-Controlled Charge Transfer). This technique has been successfully demonstrated by IST in the form of a CMOS prototype filter chip dissipating about 100 μ W.
- **CREATION OF THE PORTUGUESE INTER UNIVERSITY NETWORK FOR THE PROMOTION AND DIFFUSION OF MICROELECTRONICS (RPM NETWORK):** The RPM network for the promotion and diffusion of microelectronics was created by Instituto Superior Técnico (IST), Instituto Tecnológico para a Europa Comunitária (ITEC), Universidade do Minho (UM), and Instituto para a Inovação e Desenvolvimento Tecnológico do Minho (IDITE Minho).
- **SSCT TECHNOLOGY FOR NANOPOWER ELECTRONICS:** Research and development of new ultra low power CMOS circuits employing Self-Controlled Charge Transfer techniques for portable applications. Sponsor: Nokia Mobile Phones.
- **LOGADC: HIGH-FREQUENCY LOGARITHMIC CMOS ANALOG-TO-DIGITAL CONVERTER:** Research of new architectures for the realization of high-frequency logarithmic analog-to-digital converters in CMOS technology. It is envisaged the implementation of a fully differential 50 MHz, 8-bits, 60 dB ADC using a DMDP 0.8 μ m CMOS technology. Sponsor: Austria Mikro Systeme.
- **DIGITAL HSADC:** High-Frequency analog-to-digital converters for digital CMOS technology. Participants: IST Centre of Microsystems and Telebrás of Brasil. Sponsor: International Telecommunications Union.
- **ECOCLIMAT:** Research and development of sensorial microsystems and power line carrier modems for home system applications, notably for automatic management of energy. Sponsor: Ministry of Industry through the PEDIP program.
- **CATALYST: HIGH-LEVEL SYNTHESIS AND MODELING OF MULTI-STEP ADCs:** Research and development of computer-aided methodologies and techniques for high-level synthesis and modeling of high-frequency multi-step analog-to-digital converters. Sponsor: JNICT.

- **MINIAN: MINIMUM ANALOG CONTENT SIGMA-DELTA MODULATORS:** Research, development and experimental demonstration of new sigma-delta modulators with minimum analog content for oversampling analog-to-digital converters. Sponsor: JNICT.
- **PAPRICA: POWER AN PART COUNT REDUCTION INNOVATIVE COMMUNICATION ARCHITECTURE:** Specify design, build and validate the DECT and DCS application Demonstration Board. Participants: ATMEL/ES2 (France), IST (Portugal), Matra Communications (France).
- **ASIC4PMR: ARCHITECTURE FOR SINGLE CHIP FOR PRIVATE MOBILE RADIO COMMUNICATION:** The project will provide telecommunication equipment manufacturers the capability to integrate on a single chip a baseband and control circuitry of a digital radio terminal. Participants: ATMEL ES2 (France), ARM (United Kingdom), THERA (Italy), IST (Portugal), Matra Communication (France), OTE (Italy).
- **POLICOM : POWER LINE COMMUNICATION ASIC:** The objective of this project is the design of a low-cost, easy-installation, robust system to allow communication between different equipment using the low-voltage power line. It will cover a whole range of applications from remote power reading to home-automation and remote control for industrial applications. Participants: SAINCO (Spain), ATMEL ES2 (France), Instituto Superior Técnico (Portugal), SANTEL (Sweden).

PhD Thesis

- N. Franca, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Automatic synthesis of circuit components for mixed-signal VLSI integration).
- W. Ping, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Analog 2D multirate signal processing techniques and integrated circuit design).
- A. Gano, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Design and applications of sensorial microsystems combining monolithic and thick film hybrid integrated technologies).
- N. C. Horta, (supervisor: José E. Franca), Instituto Superior Técnico, concluded in 1997, (subject: Automatic synthesis of data converter architectures from formal description of algorithms).

- A. Almeida, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Analog circuit techniques for neural networks and applications).
- P. Jorge Santos, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Decimation and interpolation switched-capacitor circuits for high-frequency application in radiocommunications).
- J. P. Carreira, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Current-mode data converters in sub-micron technologies).
- N. Garrido, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Design of adaptive analog filters for magnetic front-end read channels).
- R. Neves, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Signal processing and conversion techniques for narrow bandwidth applications).
- J. P. Oliveira, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Video frequency A/D converters using current processing techniques).
- J. Goes, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: High-resolution and high-speed analog-digital converters using linearization techniques).
- J. C. Guilherme, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Design techniques for logarithmic analog-digital conversion in CMOS technology).
- R. Reis, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Nanopower delta-sigma modulators).
- P. Pang, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: CMOS analog techniques for quadrature modulators in RF front-ends).

M.Sc. Thesis

- M. Pereira, (supervisor: José E. Franca), Instituto Superior Técnico, in preparation, (subject: Automatic layout generation methodologies of analogue modules for CMOS integrated circuits).

Publications

Books and book chapters

Wang Ping, José E. Franca, "Multirate Switched-Capacitor Circuits for 2-D Signal Processing", Kluwer Academic Publishers.

José E. Franca, Carlos Azeredo Leme, João C. Vital, "Analog-digital Conversion", Encyclopedia of Electrical Engineering, Wiley, to be published.

Papers in Journals

Wang Ping, José E. Franca, "A CMOS 1.0- μm Two-Dimensional Analog Multirate System for Real-Time Image Processing", *IEEE Journal of Solid-State Circuits*, Vol.32, No. 7, July 1997.

José Franca, António Petraglia, Sanjit K. Mitra, "Multirate Analog-Digital System for Signal Processing and Conversion", *Proceedings of the IEEE*, Vol.85, No.2, February 1997.

N. C. Horta, J. E. Franca, "Algorithm-Driven Synthesis of Data Conversion Architectures", *IEEE Trans. CAD*, Vol. 16, Oct. 1997.

N. Horta, J. E. Franca, "Dynamic Synthesis of Data Conversion Architectures", to appear in *IEEE Transactions on Computer-Aided Design*.

B. G. Henriques, K. Kananen, J. E. Franca, J. Rapeli, "A 10b Low-Power CMOS D/A Converter for portable Communications", to appear in *IEEE Journal of Solid-State Circuits*.

C. A. Leme, J. E. Franca, "A Low-Power 40 MHz Comparator with Self-Compensated Offset", to appear in *IEEE Journal of Solid-State Circuits*.

J. Goes, J. Vital, J. E. Franca, "Systematic Design Methodology for Power and Area Optimization of High-Resolution Pipeline A/D Converters", to appear in *IEEE Transactions on Circuits and Systems Part II*.

Papers in Conference Proceedings

Nuno de Figueiredo Garrido, José E. Franca, G. Kenney, "A Comparative Study of Two Adaptive Continuous-Time Filters for Decision Feedback Equalization Read Channels", *International Symposium on Circuits and Systems*, June 9-12, Hong Kong, 1997.

C. Azeredo Leme, J. E. Franca, "Analog-Digital Design in Submicrometric Digital CMOS Technologies", *International Symposium on Circuits and Systems*, June 9-12, Hong Kong, 1997.

João Pedro A. Carreira, Christian Dupuy, José E. Franca, "A Compact Three-Step Pipelined CMOS Current-Mode A/D Converter", *International Symposium on Circuits and Systems*, June 9-12, Hong Kong, 1997.

Wang Ping, José E. Franca, "Area-and Power-efficient 2D Analog Filters Employing Multirate Signal Processing Techniques", *International Symposium on Circuits and Systems*, June 9-12, Hong Kong, 1997.

Orlando H. W. Chou, José E. Franca, João C. Vital, Carlos A. Leme, Rui P. Martins, "A 21.4 MHz Gm-C Bandpass Filter in 0.8 μm Digital CMOS With On-Chip Frequency and Q-factor Tuning", *IEEE-CAS Region 8 Workshop on Analog and Mixed IC Design*, Baveno, Italy, 12-12 September 1997.

J. Goes, C. Azeredo Leme, J. Vital, J. Franca, G. Bracmard, C. Dupuy, "Low-Power Offset-Calibrated CMOS I/Q Transmit Interface for Portable Communications", *European Solid-State Circuits Conference*, Southampton, UK, 16-18 September 1997.

R. Neves, J. E. Franca, S. Mitra, A. Petraglia, "Discrete-Time N-Path Decimating Filters", in *Proc. IEEE Int. Symposium on Circuits and Systems*, June 1997, Hong Kong.

U. Seng Pan, R. P. Martins, J. E. Franca, "Intermittent Polyphase Switched-Capacitor Structures for FIR Rational Interpolation", in *Proc. IEEE Int. Symposium on Circuits and Systems*, June 1997, Hong Kong.

7.1.3 Signal and Image Processing Research Line

7.1.3.1 Communication Theory and Pattern Recognition Group

Human Resources

Collaborators

- | | | |
|-----------------------------------|--------------------------|-----------------------------|
| • José Manuel Nunes Leitão | PhD | Full Professor, I.S.T. |
| • Mário A. Teles de Figueiredo | PhD | Assistant Professor, I.S.T. |
| • Ana Luisa Nobre Fred | PhD | Assistant Professor, I.S.T. |
| • Fernando Duarte Nunes | PhD | Assistant Professor, I.S.T. |
| • José Manuel Bioucas Dias | PhD | Assistant Professor, I.S.T. |
| • José Eduardo C. R. C. Sanguino | M.Sc. (PhD student, IST) | Assistant, I.S.T. |
| • Francisco Alberto Sena da Silva | M.Sc. (PhD student, IST) | Assistant, I.S.T. |

Other Collaborators

- | | | |
|-------------------------------|--------------------------|-----------------------------|
| • Fernando M. Gomes de Sousa | M.Sc. (PhD student, IST) | Adjoint Professor, I.S.E.L. |
| • Luis Rocha Pontes | M.Sc. student | Grant, PRAXIS XXI |
| • Paulo Faria | M.Sc. student | |
| • Carlos A. M. B. T. de Sousa | M.Sc. student | |
| • Tiago Silva | M.Sc. student | |

Projects

- SICNAP - Integrated System for Harbour Control and Navigation.
This is a multidisciplinary and multi-institutional project, coordinated by LNEC (*National Laboratory of Civil Engineering*) and financially supported by NATO through the *Science for Stability* program (PO-NAVIGATION project). Its goals are to develop and implement a harbor traffic control system, to be installed in Sines. It involves navigation and positioning systems (GPS - *global positioning system*), radar, and telecommunications aspects.
Participants from the group: José M. N. Leitão, José E. C. R. C. Sanguino, Luis R. Pontes.

- SARA – Sistema aéreo de reconhecimento automático (Automatized Systems for Air Surveillance) (PRAXIS XXI).

It is a multi-disciplinary and multi-institutional project coordinated by the Department of Mechanical Engineering of IST. We are dealing with the communications (data-links) and navigation (differential GPS – Global Positioning System) aspects.

Participants from the group: José M. N. Leitão, José E. C. R. C. Sanguino, F. D. Nunes.

- μ EEG - Microstructural Characterization of Sleep EEG.

This project is supported by JNICT under grant PECS/C/SAU/212/95. It deals with the hierarchical analysis of the microstructure of sleep electroencephalographic data using stochastic models, in a lower level, and syntactic models (stochastic grammars) at a higher level.

Participants from the group: Ana L. N. Fred (project co-ordinator).

- ENN - European Neurological Network.

Approved under the *Telematics Applications Program* of the European Union. It is headed by ISTEEL (*Institute of Sleep and Telemedicine*, of Portugal) and involves teams from 9 European countries. Goals are the creation of a multimedia telematic network in the areas of sleep and epilepsy. Our domains of participation include signal processing and artificial intelligence aspects.

Participants from the group: Ana L. N. Fred.

- SIN - Integrated Systems for Communication and Navigation.

Approved by PRAXIS XXI during 1996, this project started in January 1997. It deals with differential GPS navigation, in which the communication between the mobile platform and the base station plays an essential role. This project emerges from the group participation in the above mentioned SICNAP and ARMOR projects.

Participants from the group: José M. N. Leitão (project coordinator), Fernando D. Nunes, José E. C. R. C. Sanguino, Francisco A. S. Silva, Fernando M. G. Sousa, and Luis R. Pontes.

- IMAPA - Integration of Stochastic and Structural Models in Image and Pattern Analysis.

Like the previous one, this project was also approved by PRAXIS XXI during 1996, and started in January 1997. Its goals are the development of image/pattern analysis techniques combining stochastic and structural models and methods. Application areas considered will include: medical imaging, remote sensing images, and financial document images.

Participants from the group: José M. N. Leitão (project coordinator), Mário A. T. Figueiredo, Ana L. N. Fred, and José M. B. Dias.

- **HIPNOS - Automatic Sleep Classification.**
Supported by PRAXIS XXI, this is a collaboration project involving the electroencephalography laboratory of the *Centro de Estudos Egas Moniz* (Egas Moniz Study Center) of *Santa Maria* hospital, the Center for Sleep Medicine of the University of Parma, and the Medical Physics Institute of the University of Warsaw.
Participants from the group: Ana L. N. Fred.
- **SAMI - Segmentation and Analysis of Medical Images: A Content-Based Retrieval Approach.**
This project is supported by a NATO Collaborative Reserach grant (NATO #CRG 960010) and involves collaboration with the Pattern Recognition and Image Processing Laboratory (Department of Computer Science) of the Michigan State Unversity (Prof. Anil K. Jain). The goal of the project is to develop integrated segementation/analysis techniques for medical images, by approaching the problem from a content-based image retrieval perspective.
Participants from the group: José M. N. Leitão, Mário A. T. Figueiredo.

PhD Thesis

- José Eduardo Charters Ribeiro Cunha Sanguino (supervisor: José M. N. Leitão), Instituto Superior Técnico, in preparation, (subject: Positioning and navigation based on differential GPS).
- Francisco Alberto Sena da Silva (supervisor: José M. N. Leitão). Instituto Superior Técnico, in preparation, (subject: Importance sampling for communication systems simulation).
- Fernando Manuel Gomes de Sousa (supervisor: José M. N. Leitão), Instituto Superior Técnico, in preparation, (subject: Open loop structures for digital communications; DSP based implementations).

M.Sc. Thesis

- J. Cordeiro, (supervisor: José M. B. Dias), Instituto Superior Técnico, concluded in 1997, (title: Automatic segmentation of ultrasound intravascular images).
- D. Coutinho, (supervisor: José M. N. Leitão), Instituto Superior Técnico, concluded in 1997, (title: Loading Programs and Data into Automatic Payment Terminals. An Application of Universal Source Coding).

- Milho, (supervisor: José M. N. Leitão), Instituto Superior Técnico, concluded in 1997, (title: Recognition of Printed Caracteres in Normalized Financial Documents).
- P. Marques, (supervisor: José M. N. Leitão), Instituto Superior Técnico, concluded in 1997, (title: Long Distance Echo Cancelation by using Transversal Centered Short Filters).
- Luis Rocha Pontes (supervisor: José M. N. Leitão), Instituto Superior Técnico, in preparation, (subject: Satellite positioning and navigation as a nonlinear estimation problem: application to GPS).
- Paulo Faria (supervisor: Ana L. N. Fred), Instituto Superior Técnico, in preparation, (subject: Auxiliary diagnostic system for neurological diseases).
- Carlos Alberto Martin Benito Teixeira de Sousa (supervisor: José M. B. Dias), Instituto Superior Técnico, in preparation, (subject: synthetic aperture sonars).

Publications

Books and Book Chapters

M. Figueiredo, J. Leitão and A. K. Jain, “Adaptive parametrically deformable contours” in *Energy Minimization Methods in Computer Vision and Pattern Recognition*, pp. 35-50, Springer Verlag, 1997.

Papers in Journals

M. Figueiredo and J. Leitão, “Unsupervised image restoration and edge location using compound Gauss-Markov random fields and the MDL principle”, in *IEEE Transactions on Image Processing - TIP*, vol. 6, no. 8, pp. 1089-1102, August 1997.

F. Nunes, P. Varela, *et al*, “A two-dimensional regularization algorithm for density profile evaluation from broadband reflectometry”, *Review of Scientific Instruments*, vol. 68, no. 1 (part 2), pp. 906-909, January, 1997.

J. Leitão and M. Figueiredo, “Absolute phase image reconstruction: A stochastic nonlinear filtering approach” in *IEEE Transactions on Image Processing – TIP* (accepted in 1997, to appear in 1998).

M. Figueiredo, J. Leitão and A. K. Jain, “Adaptive B-spline contour representation and estimation using a minimum description length criterion”, *IEEE Transactions on Pattern Analysis and Machine Intelligence – PAMI* (under review).

F. Nunes and J. Leitão, “Signal processing aspects of fusion plasma broadband reflectometry”, *IEEE Transactions on Signal Processing – TSP* (under review).

F. Nunes and J. Leitão, “A nonlinear filtering approach to estimation and detection in mobile communications”, *IEEE Journal on Selected Areas in Communications – JSAC* (under review).

Papers in Conference Proceedings

V. Almeida, V. Ribeiro, A. Fred, “An Error-Correcting Parser for Context-Free Grammars”, *Proceedings of RecPad 97*, Coimbra (Portugal), March, 1997.

D. Coutinho, F. Sousa and J. Leitão, “Compressão de dados para carregamento remoto em terminais de pagamento automático” in *Actas da I Conferência Nacional de Telecomunicações*, pp. 377-380, Aveiro, April 1997.

M. Figueiredo, J. Leitão and A. K. Jain, “Adaptive B-splines and boundary estimation” in *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition – CVPR’97*, pp. 724-729, San Juan (Puerto Rico), June 1997.

A. Fred, J. Marques and P. Jorge, “Hidden Markov models vs syntactic modelling in object recognition” in *Proceedings of the IEEE International Conference on Image Processing - ICIP 97*, Santa Barbara (CA), October 1997.

I. Milho, F. Sousa, and J. Leitão, “A system for printed character recognition on normalized financial documents” in *Proceedings of the 9th Portuguese Conference on Pattern Recognition RECPAD’97*, pp. 161-167, Coimbra, March 1997.

P. Marques, F. Sousa, and J. Leitão, “A DSP-based long distance echo canceller using short length centered adaptive filters” in *Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing - ICASSP’97*, pp. 1885-1888, Munich, April 1997.

P. Marques, F. Sousa and J. Leitão, “Cancelamento de eco de longo atraso” in *Actas da I Conferência Nacional de Telecomunicações*, pp. 329-332, Aveiro, April 1997.

F. Nunes and J. Leitão, “Doppler shift robust receiver for digital parallel signaling in fading channels” in *GLOBECOM 97*, pp. 1225-1229, Phoenix (Az), November 1997.

T. Silva and J. Dias, "The effect of forest understory on synthetic aperture radar backscatter" in *Proceedings of the International Geoscience and Remote Sensing Symposium*, pp. 773-776, Singapore, August 1997.

Miscellaneous

Editorial activity

- José M. B. Dias Associate Editor for IEEE Transactions on Circuits and Systems.

Refereeing activities:

- José M. N. Leitão reviewer for IEEE Transactions on Signal Processing, IEEE Transactions on Biomedical Engineering, IEEE Transactions on Circuits and Systems.
- Mário A. T. Figueiredo reviewer for IEEE Transactions on Image Processing, IEEE Transactions on Signal Processing, IEE Proceedings, IEE Electronics Letters.
- Ana L. N. Fred reviewer for International Journal of Pattern Recognition and Artificial Intelligence
- José M. B. Dias reviewer for IEEE Transactions on Signal Processing.

7.1.3.2 Image Group

Human Resources

Collaborators

- | | | |
|------------------------------------|-------|--------------------------|
| • Carlos Eduardo R. Costa Salema | PhD | Full Professor, IST |
| • Fernando M. Bernardo Pereira | PhD | Assistant Professor, IST |
| • Maria Paula Santos Queluz | PhD | Assistant Professor, IST |
| • Paulo Luis Serras Lobato Correia | M.Sc. | Assistant, IST |

Other Collaborators

- | | | |
|------------------------------|---------------|-------------------------|
| • Manuel Menezes de Sequeira | PhD Student | Assistant, ISCTE |
| • Paulo Jorge Lourenço Nunes | PhD Student | Grant, PRAXIS XXI |
| • Luís Ducla Soares | PhD Student | Grant, PRAXIS XXI |
| • Gabriel Antunes Abrantes | M.Sc. Student | Grant, PRAXIS XXI |
| • Carla Raquel Zibreira | Lic. Student | IST, Final Year Project |
| • Eva Lúcia Serafim | Lic. Student | IST, Final Year Project |
| • Mónica Alexandra Santos | Lic. Student | IST, Final Year Project |
| • João Manuel Valentim | Lic. Student | IST, Final Year Project |
| • João Miguel Ascenso | Lic. Student | IST, Final Year Project |

Projects

- **PRODÍGIOS** - Processamento Digital de Audio e Vídeo (sponsored by PRAXIS programme): Research on audio-visual processing, coding and digital transmission, notably for low bitrates.

Partners: IT, INESC and Grundig. Duration: 3 years starting in March 1995.

The work was mainly related to the segmentation of video sequences and the extraction of features relevant to improve the final coding performance. A general video analysis scheme entitled **Integrated Segmentation and feature extraction Tools - IST** has been

developed. Work on feature extraction for video indexing was also started in view of the emerging MPEG-7 audiovisual description standard.

- Advanced Methods Normalization for Video Representation (sponsored by JNICT): Participation in the audio-visual representation standardisation activities of ISO/MPEG, notably MPEG-4. Duration: 3 years starting in December 1995.

The main topics of work has been: identification of MPEG-7 objectives and specification of requirements, definition of MPEG-4 profiles, and specification of MPEG-4 Object Content Information.

- MOMUSYS (ACTS 098) - Mobile Multimedia System (sponsored by the European Commission DG XIII): European platform for the development of the MPEG4 standard including the implementation of an MPEG4 mobile audio-visual prototype providing content-based functionalities.

Partners: about 20 companies, telecoms and universities notably Bosch, Siemens and Philips). Aims at European consensus. Duration: 3 years starting in November 1995. Note: participation through IST.

The activity was mainly concentrated on the specification of MPEG-4 Object Content Information, implementation of the MPEG-4 Video Verification Model, notably the error resilient modes, implementation of a MPEG-4 compliant 3D facial animation system and coordination of European Concertation activities.

- TALISMAN (ACTS) - Tracing Authors' Rights by Labelling Image Services and Monitoring Access Network (sponsored by the European Commission DG XIII): protection of copyrights for digital audio-visual signals; labelling and watermarking.

Partners: Thomson-CSF, UCL, RTBF, HISPASAT, CSELT, EPFL, FRAUNHOFER-IGD among others. Duration: 3 years starting in October 1995. Note: participation through IST.

The TALISMAN project is setting up an evolutive and open framework based upon authors' societies, contents providers and broadcasters' requirements, allowing integration of a hierarchy of solutions for protecting video contents. Instances of such solutions encompassing low end systems based upon header description associated with the bitstream (called labelling) up to high end sophisticated, holographically inlayed, undeletable systems (called watermarking) will be developed within the TALISMAN project. Associated hardware implementation to support and exploit such realisations in a cost efficient way will be provided. The main work carried out during 1997 can be summarised as follows:

- detailed specifications of all devices (labeller, watermarker, monitor, copyright authorities, registration database) together with the detailed specification of their interactions;

- specifications to be proposed to DAVIC;
- labelling and watermarking software development on workstations (ongoing work).
- ISO/MPEG-4 and 7 (no sponsor): Research and standardisation of object-based audiovisual representation and indexing methodologies. Participation of hundreds of universities and companies from all over the world.
In 1997 the work has mainly addressed the following topics: MPEG-7 objectives and requirements, MPEG-4 profiling, error resilient video coding, 3D facial animation, shape coding, video analysis, rate control.
- PRAXIS XXI - 3/3.1/TIT/35/94 - ITCOM: Integration of Technologies for Mobile Communications
Project coordination and management (Carlos Salema).
- ICP - Estudo de Viabilidade do Centro de Radiocomunicações da Serra d'Aire (Feasibility Study of Radio-Site Serra d'Aire)
Project coordination. Economical feasibility study (Carlos Salema).

PhD Thesis

- Manuel Menezes Sequeira (supervisor: Prof. Carlos Salema), Instituto Superior Técnico, in preparation (subject: Image segmentation based on texture and motion).
- Paulo Luis Serras Lobato Correia (supervisor: Prof. Fernando Pereira), Instituto Superior Técnico, in preparation (subject: Video analysis for object-based representation environments).
- Luis Ducla-Soares (supervisor: Prof. Fernando Pereira), Instituto Superior Técnico, in preparation (subject: Object-based error resilient video representation techniques).
- Paulo Jorge Lourenço Nunes (supervisor: Prof. Fernando Pereira), Instituto Superior Técnico, in preparation (subject: Join rate control for object-based video representation schemes).

M.Sc. Thesis

- Gabriel Antunes Abrantes (supervisor: Prof. Fernando Pereira), Instituto Superior Técnico, in preparation (subject: MPEG-4 compliant 3D facial animation systems).

- Jorge Rocha (supervisor: Maria Paula Queluz), Instituto Superior Técnico, in preparation. (subject: Automatic classification of urban areas using satellite images and non-spectral information).

Publications

Books and Book Chapters

Carlos Salema, Carlos Fernandes and Rama Kant Jha (from the Hindu University, Baranas, India), “*Solid Dielectric Horn Antennas*”, Artech House (to appear in April 1998).

Carlos Salema, “*Feixes Hertzianos*”, IST Press (to appear in June 1998)

Papers in Journals

F. Pereira, T. Alpert, “MPEG-4 video subjective tests procedures and results”, *IEEE Transactions on Circuits and Systems for Video Technology*, Special Issue on MPEG-4, vol.7, nº1, February 1997.

T. Alpert, V. Baroncini, D. Choi, L. Contin, R. Koenen, F. Pereira, H. Peterson, “Subjective evaluation of MPEG-4 video codec proposals: methodological approach and test procedures”, *Signal Processing: Image Communication*, Special Issue on MPEG-4, vol. 9, nº 4, May 1997.

R. Koenen, F. Pereira, L. Chiariglione, “MPEG-4: context and objectives”, *Signal Processing: Image Communication*, Special Issue on MPEG-4, vol. 9, nº 4, May 1997.

F. Pereira, “A revolução multimédia: o papel da normalização”, *Jornal ‘Informação & Informática’*, Instituto de Informática, Ministério das Finanças, nº 19, June 1997.

M. M. Sequeira, D. Cortez, "Partitions: a taxonomy of types and representations and an Overview of Coding Techniques", *Signal Processing: Image Communication*, Special Issue on MPEG-4, 10(1-3): 5-19, July 1997.

F. Pereira, “Tele-visões: novas tecnologias, novos serviços”, *Jornal ‘Tendências XXI’*, Associação Portuguesa para o Desenvolvimento das Comunicações, nº 2, pp. 6-18, September 1997.

P. Correia, F. Pereira, "The role of analysis in content-based video coding and interaction", *Signal Processing Journal*, Special Issue on Video Sequence Segmentation for Content-Based Processing and Manipulation, accepted for publication in 1998.

L. Ducla Soares, F. Pereira, "Error resilience and concealment techniques for content-based video coding", submitted to the Special Issue on Error Resilience from *Signal Processing: Image Communication*.

P. Nunes; F. Marques; F. Pereira; T-Gasull, "A contour-based approach to binary shape coding using a multiple grid chain code", submitted to the Special Issue on Shape Coding from *Signal Processing: Image Communication*.

G. Abrantes, F. Pereira, "Implementation and evaluation of the MPEG-4 facial animation profiles", submitted to Special Issue on SNHC of *IEEE Transactions on Circuits and Systems for Video Technology*.

Papers in Conference Proceedings

P. Nunes, F. Marqués, F. Pereira, "Binary shape coding using multi-grid chain code with motion compensation", *9th Portuguese Conference on Pattern Recognition*, Coimbra - Portugal, March 1997.

M. M. Sequeira, "Time recursive split & merge segmentation of video sequences", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro-Portugal, April 1997.

C. Salema, C. Fernandes e R. K. Jha, "Design of rectangular cross section shielded dielectric horns", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro-Portugal, April 1997.

C. Pires, C. Salema, "Digital TV: statistical characterization of MP@ML MPEG2 video bitstreams", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro-Portugal, April 1997.

L. Ducla-Soares, F. Pereira, "Protecção de informação de vídeo através de códigos entrópicos bidireccionalmente descodificáveis", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro - Portugal, April 1997.

P. Geada, F. Pereira, "Codificação de imagens videotelefónicas baseada em modelos", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro - Portugal, April 1997.

P. Nunes, P. Correia, F. Pereira, "Coding video objects with the emerging MPEG-4 standard", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro - Portugal, April 1997.

P. Correia, F. Pereira, "Video analysis for coding: objectives, features and methods", *2cd Erlangen Symposium 'Advances in Digital Image Communication'*, Erlangen - Germany, April 1997.

G. Abrantes, F. Pereira, "3D facial animation using the MPEG-4 SNHC verification model", *ECMAST'97 Workshop on SNHC*, Milan - Italy, May 1997.

P. Correia, F. Pereira, "Segmentation of video sequences in a video analysis framework", *Workshop on Image Analysis for Multimedia Interactive Services*, Louvain-La-Neuve, Belgium, June 1997.

F. Pereira, "Very low bitrate video: the content-based approach", *Workshop on Coding Techniques for Very Low Bit-rate Video*, Linkoping - Sweden, July 1997.

G. Abrantes, F. Pereira, "An MPEG-4 SNHC compatible implementation of a 3D facial animation system", *Int. Workshop on Synthetic-Natural Hybrid Coding and Three Dimensional Imaging*, Rhodes - Greece, September 1997.

P. Nunes, F. Pereira, "Rate control for scenes with multiple arbitrarily shaped video objects", *Picture Coding Symposium'97*, Berlin - Germany, September 1997.

P. Nunes, F. Pereira, F. Marqués, "Multi-grid chain coding of binary shapes", *1997 Int. Conf. on Image Processing*, Santa Barbara - USA, October 1997.

F. Pereira, "MPEG-7: a standard for content-based audiovisual description", invited speech at *Sec. Int. Conference on Visual Information Systems (VISUAL'97)*, San Diego - EUA, December 1997.

Miscellaneous

Main Research Topics:

Error resilient video coding - Study and classification of the techniques related to the introduction and exploitation of error resilience in a content-based coded video bitstream. Evaluation of the performance of the MPEG-4 error resilience syntax (work done by L.Ducla-Soares).

Video analysis for coding - Proposal of a video analysis framework for video analysis, which is modular and thus very flexible in the way it can be developed and used. On one side, its functionality can be increased by the activation of further branches and modules, producing good results for a larger set of applications. On the other side, its complexity may be adequately reduced, for each application, by just using the relevant subset of the branches and modules necessary. (work done by P.Correia).

Contour coding - Continuation of the work on Multi-grid chain coding. The proposed approach for shape coding allows several modes of operation depending on the application requirements namely lossless and near-lossless coding modes. Also both INTRA and INTER prediction modes can be used. For the INTER mode, motion compensation is applied without coding the residues (work done by P.Nunes).

Facial animation using 3D wireframe models - Implementation of an MPEG-4 compliant facial animation, considering the 3 profiles. Specification of the standard syntax and semantics (work done by G.Abrantes).

Join rate control for scenes with multiple objects - Proposal of an algorithm to efficiently distribute, for each time instant, the available bitrate among the various (arbitrarily shaped) video objects (VOs) in the scene (work done by P.Nunes).

- C. Salema President of the Executive Board of Instituto de Telecomunicações.
- C. Salema President of the Organising Committee of I Conferência Nacional de Telecomunicações.
- C. Salema President of the Evaluation Committee for the IBM, Young Engineer - Ordem dos Engenheiros and ICP Awards.
- C. Salema National Delegate to ACTS Programme.
- F.Pereira member of the Program Committee of *European Conference on Multimedia Applications, Services and Techniques (ECMAST'97)*, hold in Milan - Italy, in May 1997.
- F.Pereira member of the Steering Committee of *Workshop on Image Analysis for Multimedia Interactive Services*, hold in Louvain-la-Neuve - Belgium, in June 1997.
- F.Pereira panel member of invited international experts at *Int. Workshop on Coding Techniques for Very Low Bit-rate Video*, hold in July 1997, in Linkoping - Sweden.
- F.Pereira member of the Organising Committee of *Multimedia Technical Exposition*, hold in Fribourg - Switzerland, in November 1997.

- F.Pereira general chairman of Seminar on MPEG-4, hold in Fribourg - Switzerland, in November 1997.
- F.Pereira guest editor of Special Issue on MPEG-4 of *IEEE Transactions on Circuits and Systems for Video Technology*, published in February 1997.
- F.Pereira guest editor of Special Issue on MPEG-4 of *Signal Processing: Image Communication Journal*, published in May and June 1997.
- F.Pereira Associate Editor of *IEEE Transactions of Circuits and Systems for Video Technology* since April 1997.
- F.Pereira chairman of the sub-domain “Multimedia Content Manipulation and Management” from the ACTS Programme of the European Commission, since February 1997.
- F.Pereira chairman of MPEG Ad Hoc Group on MPEG-4 and MPEG-7 Requirements.
- F.Pereira chairman of MPEG Ad Hoc Group on Object Content Information (OCI).

7.1.3.3 Radio Communication Systems Group

Human Resources

Collaborators

- | | | |
|---|-----|--------------------------|
| • Américo Manuel Carapeto Correia | PhD | Assistant Professor, IST |
| • Francisco António Bucho Cercas | PhD | Assistant Professor, IST |
| • Jorge Manuel Nunes Pereira | PhD | Assistant Professor, IST |
| • Antonio José Castelo Branco Rodrigues | PhD | Assistant Professor, IST |

Other Collaborators:

- | | | |
|--|---------------|-------------------------|
| • Augusto Afonso de Albuquerque | PhD | Full Professor, ISCTE |
| • José Pedro Cabral Diogo Pinto | M.Sc. Student | Grant, JNICT |
| • Luis Filipe Carvalho Antunes | M.Sc. Student | |
| • Alberto Amaral Lopes | M.Sc. Student | |
| • Pedro Joaquim Amaro Sebastião | M.Sc. Student | Assistant ISEL |
| • Pedro Manuel de Almeida Carvalho Vieira | M.Sc. Student | Assistant ISEL |
| • Henrique Martins dos Santos Cunha | M.Sc. Student | |
| • Rui Filipe Efigénio Gomes | M.Sc. Student | |
| • José Manuel Pires Braz de Oliveira Antunes | M.Sc. Student | |
| • Mário Pedro Guerreiro Marques da Silva | M.Sc. Student | |
| • Pedro Jorge Ferraz Marques | M.Sc. Student | |
| • José Maria Saiago Tito Martins | M.Sc. Student | |
| • José António Pereira Velez | M.Sc. Student | |
| • Carlos Miguel Vasques Lopes | M.Sc. Student | |
| • Cristina Maria Oliveira Silva Parente | Lic. Student | IST, Final Year Project |
| • Isabel Maria Capucho Luís | Lic. Student | IST, Final Year Project |
| • Ana Isabel Andrez Duarte | Lic. Student | IST, Final Year Project |

• Rui Filipe Gonçalves Soares Lopes	Lic. Student	IST, Final Year Project
• Nuno Moisés de Sá Vilarica	Lic. Student	IST, Final Year Project
• Carlos M. Formigal de Oliveira Santos Silva	Lic. Student	IST, Final Year Project
• Luis Miguel Ribeiro Coimbra	Lic. Student	IST, Final Year Project
• Sérgio Alexandre Castelo Catalão	Lic. Student	IST, Final Year Project
• Jorge Marques Santana	Lic. Student	IST, Final Year Project
• Miguel de Jesus Mendes Moutinho	Lic. Student	IST, Final Year Project
• Raul Alexandre da Silva Almeida	Lic. Student	IST, Final Year Project
• João Filipe Santos Belchior	Lic. Student	IST, Final Year Project
• Sérgio Miguel Santos Vaz	Lic. Student	IST, Final Year Project
• José Manuel Pinto Pinela	Lic. Student	IST, Final Year Project
• Bruno Ruben Nóbrega Sales Gomes	Lic. Student	IST, Final Year Project
• Nelson Duarte Nunes Resendes	Lic. Student	IST, Final Year Project
• Rui Miguel Almeida Fernandes	Lic. Student	IST, Final Year Project
• Paulo Alexandre C. Santos	Lic. Student	IST, Final Year Project
• João Francisco Branco Barreira	Lic. Student	IST, Final Year Project
• Ana Paula Jorge	Lic. Student	IST, Final Year Project
• José Carlos Martinho de Brito	Lic. Student	IST, Final Year Project
• Artur Paulo Goulart Vargas	Lic. Student	IST, Final Year Project
• Miguel Ângelo Outrim Bentes	Lic. Student	IST, Final Year Project
• Elizabete Marisa Pinto Vidal	Lic. Student	IST, Final Year Project
• Francisco António T. B. Nunes Monteiro	Lic. Student	IST, Final Year Project
• Sónia Ricardo Simões Pinto	Lic. Student	IST, Final Year Project
• Sónia Lopes de Oliveira	Lic. Student	IST, Final Year Project
• Ricardo Jorge Gaspar Freire	Lic. Student	IST, Final Year Project
• Mário Fernando Bernardo da Rosa	Lic. Student	IST, Final Year Project
• Carlos Manuel Gonçalves Cotrim	Lic. Student	IST, Final Year Project
• João Tiago de Oliveira Marques Fonseca	Lic. Student	IST, Final Year Project

Projects

- ACTS 090 - FRAMES “Future Radio wideband Multiple access System” :
Design of Reed-Solomon hopping sequences pointing out their main capabilities and possible applications in the design of FMA (Frames Multiple Access).
Detailed description of non-linear TCH block codes.
Evaluation of modulation/coding schemes for UMTS satellite channels.
- COST 252 “Evolution of Satellite Personal Communications from 2nd to Future Generation Systems”
During this year, this COST action was divided into three different working groups: WG1 for studying different satellite orbits and scenarios for the future S-UMTS services including the protocols to be used, i.e. B-ISDB, ATM, etc; WG2 for studying network architecture, protocol compatibility for future integration and network algorithms and control; WG3 for studying the so-called air interface, i.e. , efficient coding modulation techniques, channel models, multiple-access schemes, synchronisation issues, etc. IST/IT activities lie in the WG3 area and the contributions presented are related to the use of efficient coding and modulation schemes using TCH codes.
- COST 255 “Radiowave Propagation Modeling for New SatCom Services at Ku-Band and Above”
According to the main objective of improving the design and planning of present and future telecom systems and services through the development of tools for the evaluation of their performance, this year’s activity progressed in defining several case study examples which the several partners, including IST, will study in detail. IST participated in the study of multiple access techniques regarding the new personal and mobile satcom services foreseen for the new constellations, e.g. IRIDIUM, etc. Other activities included collaborative European propagation measurement campaigns and work towards expanding propagation prediction models.
- COST 259 “Wireless Flexible Personalised Communications”
During this year contributions were presented to working group 1 dealing with systems aspects such as the choice of optimum spreading sequences for spread spectrum CDMA mobile systems and the development of flexible solutions for new services to be supported in future mobile and personal communications systems.

PhD Thesis

- António José Castelo Branco Rodrigues (supervisors: Prof. Carlos Eduardo do Rego Costa Salema and Prof. Paul Delogne), Catholic University of Louvain, Belgium, April 1997 (subject: Multi-h CPM in Terrestrial and Satellite Mobile Fading Channels).

M.Sc. Thesis

- José Pedro Cabral Diogo Pinto (supervisor: Prof. Carlos Eduardo do Rego Costa Salema and Prof. António José Castelo Branco Rodrigues), Instituto Superior Técnico, to be concluded in 1998 (subject: Multi-*h* CPM Modulations with Direct Sequence Spread Spectrum for Wideband Satellite Mobile Communications)
- Pedro Joaquim Amaro Sebastião (supervisor: Prof. Francisco António Bucho Cercas), Instituto Superior Técnico, to be concluded in 1998 (subject: Performance Evaluation of TCH Codes)
- Luís Filipe Carvalho Antunes (supervisor: Prof. Francisco António Bucho Cercas), Instituto Superior Técnico, to be concluded in 1998 (subject: Performance Evaluation of TCH Sequences in CDMA Systems)
- Alberto Amaral Lopes (supervisor: Prof. Américo Manuel Carapeto Correia), Instituto Superior Técnico, to be concluded in 1998 (subject: Efficient Coding Schemes for Radio Packet Transmission in Limited Bandwidth Systems)
- Mário Pedro Guerreiro Marques da Silva (supervisor: Prof. Américo Manuel Carapeto Correia), Instituto Superior Técnico, started 1997 (subject: CDMA with Multiple Codes and Bit Rates)
- José António Pereira Velez (supervisor: Prof. Francisco António Bucho Cercas), Instituto Superior Técnico, to be concluded in 1998 (subject: Study and Implementation of a TCH Receiver using a DSP)
- Pedro Carlos Miguel Vasques Lopes (supervisor: Prof. Francisco António Bucho Cercas), Instituto Superior Técnico, started 1997 (subject: Study and Design of a Spread Spectrum System for Satellite Communications)
- Pedro Jorge Ferraz Marques (supervisor: Prof. Francisco António Bucho Cercas), Instituto Superior Técnico, started 1997 (subject: Study and Implementation of a Satellite Modem using a DSP)

- José Maria Saiago Tito Martins (supervisor: Prof. Francisco António Bucho Cercas), Instituto Superior Técnico, started 1997 (subject: Study and Implementation of Synchronisation Techniques in a DSP)
- Pedro Manuel de Almeida Carvalho Vieira (supervisor: Prof. António José Castelo Branco Rodrigues), Instituto Superior Técnico, started 1997 (subject: Wideband CDMA Systems for Personal Communications)
- Henrique Martins dos Santos Cunha (supervisor: Prof. António José Castelo Branco Rodrigues), Instituto Superior Técnico, started 1997 (subject: Interference Between Fixed and Terrestrial Mobile Services)
- Rui Filipe Efigénio Gomes (supervisor: Prof. António José Castelo Branco Rodrigues), Instituto Superior Técnico, started 1997 (subject: Mobility Management in Personal Communications Systems)
- José Manuel Pires Braz de Oliveira Antunes (supervisor: Prof. António José Castelo Branco Rodrigues), Instituto Superior Técnico, started 1997 (subject: Overlay/Underlay Techniques in Personal Communications Systems)

Publications

Books and Book Chapters

A. Rodrigues, contribution to chapter “Advanced Radio Interface Techniques and Performance” in *Digital Mobile Radio Towards Future Generation Systems*, Edited by E. Damosso, European Commission, (accepted for publication).

Papers in Conference Proceedings

J. Pinto, A. Rodrigues, “Multi-h CPM TDMA and CDMA for Satellite Mobile Systems”, (in portuguese), *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Portugal, 10-11th April 1997, pp. 131-134

F. Cercas, “The New Class of TCH Codes”, *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Portugal, 10-11th April 1997, pp. 349-352

A. Correia, “Commutation Signaling”, (in portuguese), *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Portugal, 10-11th April 1997, pp. 353-356

J. Pinto, A. Rodrigues, "Multi-h Modulation with Spread Spectrum", *15th Brazilian Telecommunications Symposium*, Recife, Brazil, 8-11th September 1997, pp.377-380

L. Antunes, F. Cercas, "A Simple CDMA-IC Scheme Based on TCH Sequences", *XII Symposium Nacional de la Union Cientifica Internacional de Radio*, September 15-17, 1997, Bilbao, Spain, pp. II 129-132.

A. Miranda, S. Marques and F. Cercas, "Overview of Codes and Signals used in the Global Positioning System", *XII Symposium Nacional de la Union Cientifica Internacional de Radio*, September 15-17, 1997, Bilbao, Spain, pp. II 385-388.

A. Duarte, I. Luís, C. Parente and F. Cercas, "Comparison of Different PN Sequences for a CDMA VSAT Network", *XII Symposium Nacional de la Union Cientifica Internacional de Radio*, September 15-17, 1997, Bilbao, Spain, pp. I 403-406.

R. Àguas, N. Marzia, N. Costa and F. Cercas, "TCH Satellite Receiver Simulator", *XII Symposium Nacional de la Union Cientifica Internacional de Radio*, September 15-17, 1997, Bilbao, Spain, pp. II 365-368.

F. Cercas, J. Torres, A. Cartaxo and P. Sebastião, "Evaluation of the Performance of TCH Codes Using Interval Simulation", *XII Symposium Nacional de la Union Cientifica Internacional de Radio*, September 15-17, 1997, Bilbao, Spain, pp. I 227-230.

J. Velez, J. M. Martins, P. Marques and F. Cercas, "DSP-Based Digital Radio", *XII Symposium Nacional de la Union Cientifica Internacional de Radio*, September 15-17, 1997, Bilbao, Spain, pp. I 215-218.

R. Lopes, N. Vilariça, C. Formigal and F. Cercas, "Frequency Hopping Spread Spectrum", *XII Symposium Nacional de la Union Cientifica Internacional de Radio*, September 15-17, 1997, Bilbao, Spain, pp. II 125-128.

L. Antunes, F. Cercas, "A Great Capacity CDMA System Based on TCH Sequences", *1997 IEEE International Conference on Personal Wireless Communications*, December 17-19, 1997, Mumbai, India, pp. 475-478.

A. Correia, F. Cercas, "On Channel Coding for CDMA over Multipath Rayleigh Fading Channels", *1997 IEEE International Conference on Personal Wireless Communications*, December 17-19, 1997, Mumbai, India, pp. 479-483.

Project Deliverables

A. Correia “Design of Reed-Solomon Hopping Sequences”, FRAMES internal report AC090/IST/AI1/DN/I/005/a1 version 1.0, January 1997.

A. Correia, A. Rodrigues and F. Cercas, “Land Mobile Satellite Wideband Channel Model”, FRAMES internal report AC090/IST/AI1/DN/I/004/a1, February 1997.

A. Correia, A. Rodrigues and F. Cercas, “Adaptive Frequency Hopping for FMA Mode 1 in Pico Cells”, FRAMES internal report AC090/IST/RI/DN/I/001/a1, March 1997.

A. Correia, A. Rodrigues and F. Cercas, “On Channel Coding and Pulse Shaping for CDMA (FMA2)”, FRAMES internal report AC090/IST/PT/DN/I/001/a1, April 1997.

A. Correia, A. Rodrigues and F. Cercas, “On Channel Coding for CDMA over Multipath Rayleigh Fading Channels”, FRAMES internal report AC090/IST/PT1/DN/I/002/a1, May 1997.

F. Cercas, A. Correia and A. Rodrigues, “Research Results on TCH Codes”, FRAMES internal report AC090/IST/PT/I/003/a1, June 1997.

F. Cercas, A. Correia and A. Rodrigues, “TCH Sequences for FMA2”, FRAMES internal report AC090/IST/PT/DN/I/004/a1, June 1997.

A. Correia, A. Rodrigues and F. Cercas, “Adaptative Frequency-Hopping for FMA1 with Spreading”, FRAMES internal report AC090/IST/PT1/DN/I/004/a1, September 1997.

F. Cercas, L. Antunes, A. Correia and A. Rodrigues, “A Great Capacity CDMA System based on TCH Sequences”, FRAMES internal report AC090/IST/PT/I/005/a1, September 1997.

A. Correia, A. Correia and A. Rodrigues, “Design of Reed-Solomon Hopping Sequences”, FRAMES internal report AC090/IST/AI1/DN/I/005/a1 version 2.0, October 1997.

A. Correia, A. Rodrigues and F. Cercas “Design of Reed-Solomon Hopping Sequences”, FRAMES internal report AC090/IST/PT1/DN/I/008/a1, December 1997.

J. Pinto, A. Rodrigues, “Optimization of Spreading Sequences for Spread Sequences for Spread Spectrum Multi-h CPM”, COST 259 TD(97)37, 24-26th September 1997, Lisbon, Portugal.

L. Antunes, F. Cercas, “A Simple CDMA-IC Scheme Based on TCH Sequences”, COST 259 TD(97)37, 24-26th September 1997, Lisbon, Portugal.

A. Correia, F. Cercas, “On Channel Coding for CDMA over Multipath Rayleigh Fading Channels”, COST 259 TD(97)37, 24-26th September 1997, Lisbon, Portugal.

F. Cercas, “TCH satellite receiver simulator”, COST 252 TD(97)13, 17-18th November 1997, Munich, Germany.

R. Águas, N. Marzia, N. Costa, F. Cercas, “TCH satellite receiver simulator”, COST 255 CP43004, 27-29th October 1997, Brussels, Belgium.

Miscellaneous

- F. Cercas, National Portuguese Delegate to COST 252 project “Evolution of Satellite Personal Communications from 2nd to Future Generation Systems”.
- F. Cercas, National Portuguese Delegate to COST 255 project “Radiowave Propagation Modeling for New SatCom Services at Ku-Band and Above”.
- A. Rodrigues, National Portuguese Delegate to COST 259 project “Wireless Flexible Personalised Communications”.
- A. Rodrigues auditor of ACTS program – Multimedia Line – by invitation of the Commission of European Communities.
- A. Correia, reviewer for *IEEE Transactions on Communications*.

7.1.4 Optical Communications Research Line

Human Resources

Collaborators

- António Moreira PhD Associate Professor, IST
- Adolfo Cartaxo PhD Assistant Professor, IST
- João Pires PhD Assistant Professor, IST

Other Collaborators

- Luis Cancela M.Sc. Student
- José Morgado M.Sc. Student Part-time researcher
- João Correia M.Sc. Student

Projects

- ACTS 049 SPEED (“Superhighway by Photonically and Electronically Enhanced Digital Transmission”) - The work developed within this project included: multi-quantum well distributed feedback laser modelling, characterisation and fitting to experimental data; characterisation of influence of fibre nonlinearity on the relative intensity noise at fibre output and fitting to experimental data; various 20 Gbit/s and 40 Gbit/s system models were investigated on the basis of DST respect to optimization of laser driving conditions and bandwidth equalisation.
- JNICT PBIC/C/TIT/2525/95 - Optical switching in the Access Network - The work developed within this project included: the development of the control system demonstrator; continuation of the analysis of impact of multipath crosstalk on the passive optical switch performance; study of optical networks with logical topology using integrated add-drop multiplexers.
- Optical protection - This project started in 1997 and its objective is the implementation of an optical ring network composed by two add-drop multiplexers. The development of the interfaces and software necessary to control the network has started.

- JNICT PBIC/C/TIT/2499/95 TÓPICO - Multigigabit per second optical transmission with electrical signal processing at the receiver. We optimised by simulation the 20 and 40Gbit/s binary / multilevel linear transmission over standard single-mode fibre with electrical signal processing at the receiver to compensate the fibre dispersion. The small-signal optical fibre analysis which takes into account the dispersion and nonlinearity of the optical fibre has been applied in the evaluation of relative intensity noise at fibre output and fibre transfer function and the theory has been confirmed by extensive numerical simulations. The impact of the enhancement of phase modulation to intensity modulation caused by fibre nonlinearity on the intensity modulation direct detection and dispersion supported transmission systems has been investigated.

M.Sc. Thesis

- Luís Cancela (supervisor: João Pires), Instituto Superior Técnico, concluded in 1997 (subject: Coherent Crosstalk in Optical Space Switches).
- José Vicente P. Morgado (supervisor: Adolfo Cartaxo), Instituto Superior Técnico, to be concluded in 1998 (subject: Analysis and Simulation of Laser Phase Noise influence on Direct Detection Fibre Optic Systems).
- João M. Bôto Correia (supervisor: Adolfo Cartaxo), Instituto Superior Técnico, in preparation (subject: Simulation and Analysis of Direct Detection Optical Communication Systems).

Publications

Papers in Conference Proceedings

Paula R. N. Laurêncio, João J. O. Pires, “Influência do efeito de mistura de quatro ondas nos sistemas de comunicação óptica, com multiplexagem por divisão no comprimento de onda, que utilizam amplificadores ópticos de fibra associados em cadeia”, *Actas da I Conferência Nacional de Telecomunicações*, pp. 289-292, Aveiro, Portugal, 10-11 April, 1997.

Luís G. C. Cancela, João J. O. Pires, “Factores limitativos no projecto de comutadores ópticos espaciais”, *Actas da I Conferência Nacional de Telecomunicações*, pp. 285-288, Aveiro, Portugal, 10-11 April, 1997.

João J. O. Pires, Luís G. C. Cancela, “Coherent Multipath Crosstalk in Benes and Dilated Benes Optical Switches”, Proc. *LEOS'97*, vol. 2, pp. 544-545, S. Francisco, EUA, 10-13 Nov., 1997.

Adolfo Cartaxo, Bernd Franz, Berthold Wedding, “Impact of fiber nonlinearity on the relative intensity noise at fiber output”, *Conf. Lasers and Electro-Optics / Pacific Rim'97*, paper TuP3, pp. 50-51, Chiba, Japan, July 1997.

José Morgado, Adolfo Cartaxo, “Enhancement of laser phase noise to intensity noise conversion by fiber nonlinearity and its impact on the intensity modulation system performance”, *SPIE's Intern. Symp. on Voice, Video, and Data Communications*, vol. 3230, paper 3230-04, pp. 30-41, Dallas, USA, Nov. 1997.

Adolfo Cartaxo, José Morgado, “Impact of fiber nonlinearity on the fiber transfer function of intensity modulation transmission systems”, *SPIE's Intern. Symp. on Voice, Video, and Data Communications*, vol. 3230, paper 3230-05, pp. 44-55, Dallas, USA, Nov. 1997.

João Correia, Adolfo Cartaxo, “Duobinary coding for 20Gbit/s intensity modulation direct detection optical fiber transmission”, *SPIE's Intern. Symp. on Voice, Video, and Data Communications*, vol. 3230, paper 3230-09, pp. 92-103, Dallas, USA, Nov. 1997.

José Morgado, Adolfo Cartaxo, “Impact of relative intensity noise enhancement by fiber nonlinearity on IM-DD systems performance”, *10th IEEE Lasers and Electro-Optics Society Annual Meeting, LEOS'97*, paper TuS5, pp. 295-296, San Francisco, USA, Nov. 1997.

João Correia, Adolfo Cartaxo, “Rigorous assessment of the impact of intersymbol interference on the performance of optically preamplified receivers”, *Actas da I Conf. Nacional das Telecomunicações*, pp. 293-296, Aveiro, Portugal, 10-11 April, 1997.

João Correia, Adolfo Cartaxo, “Duobinary coding for dispersion supported transmission at 20 Gbit/s”, *Actas da I Conf. Nacional das Telecomunicações*, pp. 241-244, Aveiro, Portugal, 10-11 April, 1997.

Paulo Goulart, Adolfo Cartaxo, “Optimization of 20 Gbit/s nonlinear transmission over standard single-mode fiber,” *Actas da I Conf. Nacional das Telecomunicações*, pp. 277-280, Aveiro, Portugal, 10-11 April, 1997.

Project Deliverables

António Teixeira, Rui Ribeiro, José F. da Rocha, Adolfo Cartaxo, Paulo Goulart, João Correia, Wilfried Idler, Berthold Wedding, Device and system simulations based on 20

Gbit/s FM laser models, Deliverable n°15 of ACTS 049 project SPEED (Superhighway by Photonically and Electronically Enhanced Digital transmission), October 1997.

J. Pires, Report on node performance as a function of the number of wavelengths, OPEN (AC066) project, University of Essex, December 1997.

Miscellaneous

- The frequency dependence of cross-phase modulation effect in intensity modulation direct detection wavelength division multiplexing systems has been investigated by Adolfo Cartaxo.
- António Alves Moreira expert in Fusion Technology Steering Committee - Implementation, representing the Euratom / IST Association.
- Adolfo Cartaxo reviewer of *IEE Proceedings - Part J* and *IEEE/OSA Journal of Lightwave Technology*.

7.1.5 Electronic and Opto-electronic Components Research Line

Human Resources

Collaborators

- | | | |
|--|---------------|--------------------------|
| • Artur Lopes Ribeiro | PhD | Assistant Professor, IST |
| • Jorge Torres Pereira | PhD | Associate Professor, IST |
| • Carlos Ferreira Fernandes | PhD | Assistant Professor, IST |
| • António Cruz Serra | PhD | Assistant Professor, IST |
| • M ^a Conceição L. M. C. Macedo | M.Sc. student | Assistant, IST |
| • Francisco A. Corrêa Alegria | M.Sc. student | Assistant, IST |

Projects

- ACTS-BLISS - (AC065) - “Broadband Lightwave Sources and Systems”:
This project was initiated in September 1995. In 1997 several modelling tools were developed to study the cross-talk problem between the emitter laser diode and the diode detector in an integrated transceiver module, to work in the subscriber loop in an communications environment compatible with the “fibre to the home” perspective. These modelling tools were constructed to study the electric cross-talk due to capacitances and conduction currents through the substrate. Two types of integrated transceivers were considered, corresponding to the devices being fabricated by the industrial partners in the consortium. In the first component, grown on n-doped Indium Phosphide (n-InP), the conduction currents through the substrate were investigated, and in the second, grown on semi-insulating Indium Phosphide (InP:Fe) the direct coupling capacitances were determined.
- SCCEO - PRAXISXXI - 2/2.1/TIT/1591/95 - “Simulation and Characterisation of Electrical and Optoelectronic Components”:
The work carried out in this project during 1997, was mainly concerned with the development of mathematical modelling tools necessary in the study of different devices:
 - Construction of a finite element method processor to solve the Laplace equation.
 - Development of the Transfer Matrix method to study the hole-burning problem in Distributed Feedback Lasers.
 - Investigation of the time-domain behaviour in DFB and Fabry-Perot lasers.

M.Sc. Thesis

- Francisco André Corrêa Alegria, thesis concluded in 1997, in IST.

Publications

Papers in Conference Proceedings

A. Lopes Ribeiro, “Avaliação das Diafonias de Origem Eléctrica em Emissores-Receptores Integrados da Banda Óptica”, *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, pp. 529-532, 1997.

A. Lopes Ribeiro, “The COALA program computer analysis of lasers”, “Second International Conference on Low Dimensional Structures & Devices”, *LDSD’97*, Lisboa em Maio de 1997. Submitted for publication in *Materials Science & Engineering B: Solid State Materials for Advanced Technology*.

C. Ferreira Fernandes, “Transfer Matrix modelling in DFB lasers”, “Second International Conference on Low Dimensional Structures & Devices”, *LDSD’97*, Lisboa em Maio de 1997. Submitted for publication in *Materials Science & Engineering B: Solid State Materials for Advanced Technology*.

J. M. Torres Pereira, C. A. Ferreira Fernandes, “Transitórios em Lasers de Poços Quânticos Múltiplos do Tipo Fabry-Perot”, *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, pp. 533-536, 1997.

Miscellaneous

- A. Cruz Serra, M^a Conceição Monteiro and F. Corrêa Alegria started, during 1997, the Instrumentation and Measurement Research Line with other new collaborators (see 7.1.10).

7.1.6 Power Systems Research Line

Human Resources

Collaborators

- | | | |
|------------------------|-----|--------------------------|
| • Mário Lança | PhD | Full Professor, IST |
| • M. I. Castro Simas | PhD | Associate Professor, IST |
| • M. Beatriz V. Borges | PhD | Assistant Professor, IST |
| • Victor Anunciada | PhD | Assistant Professor, IST |

Other Collaborators

- | | | |
|--------------------------|--------------------|-------------------|
| • Pedro Santos | M.Sc., PhD Student | |
| • António Pedro Casimiro | M.Sc., PhD Student | |
| • João Beirante | M.Sc. Student | |
| • Nuno Pereira | M.Sc. Student | |
| • M. Manuel Sousa | M.Sc. Student | |
| • Raul Monteiro | M.Sc. Student | |
| • Floriberto Lima | M.Sc. Student | |
| • Paulo Tavares | M.Sc. Student | Grant, PRAXIS XXI |
| • 7 undergrad. students | | |

Projects:

- Smart Power - CIIP - Intelligent Power Integrated Circuits - Project PRAXIS XXI “Integrated Circuits for High Efficiency Power Conversion, Using CMOS Technologies”. High performance power conversion solutions were studied and new solutions were developed, namely: Optimisation, development and fabrication of new power switching structures in a standard low cost CMOS technology. Special attention was given to cell, through thorough 2-dimensional simulation (SPICES) and function simulation (PSICE and SABER). Devices implemented in 13 prototypes were tested and characterised.

- HARDIS – Harmonic distortion on mains network – This project is resumed due to the interruption of financing support (JNICT and Min. of Defense). In 1997 we developed the last structures of a single machine rotative UPS – the power DC-AC converter and the input AC switch.
- SWITCH – Switch mode power supplies and converters – the group worked on the following subjects:
 - improvement of soft switching capabilities for the full-bridge phase modulation converter (2 MSc thesis to be presented in 1998)
 - development of a new soft switching technique for 3 phase inverters operating in motoring and braking modes (MSc thesis to be presented in 1998)
 - analysis of stability of average and peak current mode control processes (MSc thesis to be presented in 1998)
 - development of new topologies of parallel converters for current waveshaping (sinusoidal input current and power factor correction)
- CEM - Internal project - Continuing Education for Electromagnetic Compatibility. Efforts are being carried out to create the skills to solve CEM problems, which are arising in Industry, Services and Research Institutes. Two tutorial courses were lectured for professionals involved in the design and implementation of telecommunication systems
- Smart power research work has been jointly developed with a brasilian team from CNPq/ICCTI:

Prof. Frank Behrens	Assistant Prof. PUCCAMP
MSc Saulo Finco	Research Assistant FCTI

PhD Thesis

- Saulo Finco (supervisor: M. I. Castro Simas), Universidade Estadual de Campinas, started in 1996, (subject: Cost Effective Smart Power ICs using Standard CMOS Technologies and NMOS Based Blocks).
- António Pedro Padez Casimiro (supervisor: M. I. Castro Simas), Instituto Superior Técnico, started in 1997, (subject: Cost Effective Smart Power ICs using Standard CMOS Technologies and Programmable Arrays).
- Pedro Nuno Mendonça Santos (supervisor: M. I. Castro Simas), Instituto Superior Técnico, started in 1997, (subject: Characterization and Optimization of Power Switching Cells Towards Smart Power ICs using Standard CMOS Technologies).

M.Sc. Thesis

- João Pedro Ruivo Beirante (supervisor: Beatriz Borges), Instituto Superior Técnico, in preparation (subject: Soft Switching Techniques for Fullbridge DCDC Converters).
- Nuno Filipe Pereira (supervisor: Beatriz Borges), Instituto Superior Técnico, in preparation (subject: Soft Switching Techniques for Fullbridge DCDC Converters).
- Raul Monteiro (supervisor: A. Victor Anunciada), Instituto Superior Técnico, in preparation (subject: Soft switching techniques for 3 phase inverters).
- M^a Manuel Sousa, (supervisor: A. Victor Anunciada), Instituto Superior Técnico, in preparation (subject: Stability of current mode controlled converters).
- Floriberto Lima, (supervisor: A. Victor Anunciada), Instituto Superior Técnico, in preparation (subject: Soft switching converters for mains interactive VPS systems).

Publications

Papers in Conference Proceedings

S. Finco, B. Behrens, J. Guilherme, M. I. Castro Simas, M. Lança, Circuito Integrado Inteligente de Potência para Regulação de Potência em Sistemas de Comunicações Móveis, *Actas da I Conferência Nacional de Telecomunicações*, pp. 447-450, Aveiro, Portugal, Abril de 1997.

P. Santos, A. Casimiro, M. I. Castro Simas, M. Lança, Tecnologias CMOS em Aplicações de Potência para Sistemas de Telecomunicações, *Actas da I Conferência Nacional de Telecomunicações*, pp. 451-454, Aveiro, Portugal, Abril de 1997.

Nuno Filipe Pereira, Beatriz Vieira Borges, Victor Anunciada, Nova Topologia para a Redução de Perdas de Comutação de um Conversor CC-CC MLI-Ressonante, *Actas da I Conferência Nacional de Telecomunicações*, pp. 451-454, Aveiro, Portugal, Abril de 1997.

João Beirante, Beatriz Vieira Borges, Stanimir Valtchev, Análise Teórica, Simulação, Optimização e Caracterização Experimental do Conversor CC-CC em Ponte Completa, com Modulação de Fase, Comutação no Zero da Tensão e Bobina de Coeficiente de Auto-Indução Variável, *Actas da I Conferência Nacional de Telecomunicações*, pp. 451-454, Aveiro, Portugal, Abril de 1997.

Vasco Anunciada, João Garcia, Victor Anunciada, Ondulador Trifásico com Controlo de Corrente, *Actas da I Conferência Nacional de Telecomunicações*, pp. 451-454, Aveiro, Portugal, Abril de 1997.

M. I. Castro Simas, P. Santos, P. Casimiro, M. Lança, Smart Power in MOS Technologies – An Overview, *Proceedings of the IEEE International Symposium on Industrial Electronics, ISIE '97*, Vol. 2, pp. 371-376, Guimarães, Portugal, July 97.

P. Santos, P. Casimiro, M. I. Castro Simas, M. Lança, New Challenges Toward Smart Power, *Proceedings of the 7th European Conference on Power Electronics and Applications, EPE '97*, Vol. 3, pp. 1-8, Trondheim, Norway, September 97.

Internal Reports

P. Casimiro, P. Mendonça Santos, CÉLULAS DE TESTE EM TECNOLOGIA CMOS DE 0.7mm, IT/GSET – Julho de 1997.

P. Tavares, DIMENSIONAMENTO DE VCO PARA ASIC EM TECNOLOGIA CMOS DE 0.7mm, IT/GSET – Julho de 1997.

P. Tavares, REVISÃO DO PROJECTO CON.PROT 4, IT/GSET – Novembro de 1997.

P. Casimiro, P. Mendonça Santos, MATRIZES DE POTÊNCIA EM TECNOLOGIA CMOS DE 0.7mm, IT/GSET – Dezembro de 1997.

P. Tavares, CARACTERÍSTICAS DE SAÍDA DE UM APARELHO DE ESTIMULAÇÃO ELÉCTRICA TRANSCUTÂNEA, IT/GSET – Agosto de 1997.

Miscellaneous

- A. Anunciada member of the Management Committee of the Lisbon Pole of Instituto de Telecomunicações and a deputy member of the Executive Board

7.1.7 Networks Research Line

Human Resources

Collaborators

- José Manuel R. L. Brázio PhD Associate Professor, IST
- João Luis C. C. G. Sobrinho PhD Lecturer, IST

Other Collaborators

- Manuel Afonso M. Barbosa M.Sc. Student
- Nuno Miguel Valero Ribeiro M.Sc. Student Lecturer, I. P. Setúbal
- Renata Carvalho Lic. Student IST, Final Year Project

Projects

- COST 257 "Impact of New Services on the Architecture and Performance of Broadband Networks": In the framework of the participation in the COST257 project work has been performed in the area of multiservice traffic modeling and analysis, having as application domain the cellular design of mobile communication systems.
- "Transport of Real-Time Traffic in Data Networks": Within the activities of this project research has been done into multiple access mechanisms for guaranteeing bounded access delays and ordered delivery for real-time traffic in local networks. Overlay access methods have been devised for established local area networks which provide good delay and ordering properties for real-time traffic and do not require the access methods of pre-existing data stations to be changed. Their properties and performance have been assessed. Studies for both wired (IEEE 802.3) and wireless (IEEE 802.11) systems have been performed.
- ITCOM, "Integration of Technologies for Mobile Communications": In this project were developed activities on multiple access for wireless local networks.

M.Sc. Thesis

- Manuel Afonso M. Barbosa (supervisor: José M. Brázio), Instituto Superior Técnico, in preparation (subject: Design and implementation of an IPv6 router).
- Nuno Miguel Valero Ribeiro (supervisor: José M. Brázio), Instituto Superior Técnico, in preparation (subject: Systems for electronic commerce).

Publications

Papers in Conferences Proceedings

R. Lopes, J. Brázio, "An Object-Oriented Framework for the Modeling and Simulation of a Mobile Cellular Radio System", *Proc. Object-Oriented Simulation Conference 97, OOS'97*, Phoenix, AZ, USA, Jan 1997.

N. Silva, J. Brázio, "Capacity of a Metropolitan Area Network-Based Architecture for the Support of Personal Communication Systems," *Proc. IEEE 47th Vehicular Technology Conference (VTC'97)*, Phoenix, AZ, USA, May 5–7, 1997.

7.1.8 Integrated Communications and Multimedia Research Line

Human Resources

Collaborators

- | | | |
|--|-------|-----------------------------|
| • Carlos Alberto Carvalho Belo | PhD | Associate Professor, IST |
| • António Carlos Matias Almeida | M.Sc. | Assistant, IST |
| • João Luís C. Campos Gonçalves Sobrinho | PhD | Assistant, IST ¹ |

Other Collaborators

- | | | |
|---------------------------|---------------|-------------------------|
| • João Paulo Costa Rebelo | M.Sc. Student | |
| • Kindoki Kimanima | M.Sc. Student | Grant, Rep. Angola |
| • Valter Bouça | M.Sc. Student | |
| • Paulo Chainho | M.Sc. Student | |
| • Ricardo Gonçalves | Lic. Student | IST, Final Year Project |
| • Nuno M. S. Vitória | Lic. Student | IST, Final Year Project |
| • Pedro N. A. Pires | Lic. Student | IST, Final Year Project |

Projects

- TELEMATICS, HC1014 - ENN (“European Neurological Network”). This project involves neurological laboratories spread over Europe from Finland to Portugal (Lisboa and Açores). Within the project this group dealt with the communications infrastructure. After the study of several technologies a network based on ISDN has been agreed upon and has being built and tested. In particular, inverse multiplexing techniques were used to support applications with bandwidth requirements above the 64kbps. Also, firewall mechanisms have been implemented to guarantee security in the communications among Health Care Centres. To reduce the need for long distance calls a proxy/cache server was implemented to provide for data in local environments.

¹ Also a collaborator of the Networks research line.

- ACTS, AC204 - SAMBA (“System for Advanced Mobile Broadband Applications”). The main contribution, within this project, is focused on the interworking of the mobile with fixed broadband networks. Several options have been discussed along with the requirements for the mobile network. Constraints, including delay, capacity and availability, are analysed to evaluate the feasibility of several degrees of integration of the mobile network in the fixed network structure. New Internet protocols like Mobile IP and RSVP are being investigated to evaluate the possibility of providing the quality of service required for real time applications as well as for the necessary mobility functionalities.

PhD Thesis

- António Carlos Matias Almeida (supervisor: Carlos A. Carvalho Belo), Instituto Superior Técnico, in preparation (subject: Quality of service in broadband networks).

M.Sc. Thesis

- Paulo Guilherme Gonçalves Chainho (supervisor: Carlos A. Carvalho Belo), Instituto Superior Técnico, discussed in February 1997 (title: “Modelação de um Sistema para o Suporte de Serviços de Telecomunicações Orientados para os Requisitos Empresariais”)
- João Paulo Costa Rebelo (supervisor: Carlos A. Carvalho Belo), Instituto Superior Técnico, discussed in December 1997 (title: “Aproximação de Processos ON-OFF por um processo MMPP para análise do atraso médio numa fila de espera ATM”).
- Kindoki Kimanima (supervisor: Carlos A. Carvalho Belo), Instituto Superior Técnico, in preparation (subject: analysis and implementation of inverse multiplexing protocols).
- Valter Bouça (supervisor: Carlos A. Carvalho Belo), Instituto Superior Técnico, in preparation (subject: mobility support in broadband networks).

Publications

Papers in Journals

J. Salles Dias, R. Galli, A. Almeida, C. Belo, J. Rebordão, “mWorld: A Multiuser 3D Virtual Environment”, *IEEE Computer Graphics and Applications*, pp. 55-65, March-April, 1997.

Papers in Conference Proceedings

Paulo Chainho, Carlos Belo, “Agentes Inteligentes para um Mercado Aberto em Telecomunicações”, *Actas da I Conferência Nacional de Telecomunicações*, pp. 79-82, Aveiro, April, 1997.

7.1.9 Technology and Materials Research Line

Human Resources

Collaborators

- | | | |
|--------------------|-----|-------------------------|
| • L. Alcácer | PhD | Full Professor, IST |
| • R. T. Henriques | PhD | Associate Professor IST |
| • J. M. F. Morgado | PhD | Assistant Professor IST |

Other Collaborators

- | | | |
|---------------------|---------------|----------------------|
| • Nunzio Barbagallo | PhD Student | Grant, UNIV. BOLOGNA |
| • A. C. Ribeiro | M.Sc. Student | Grant, PRAXIS XXI |
| • Ana Charas | M.Sc. Student | Grant, PRAXIS XXI |

Projects

- JNICT PBIC/C/CTM/1913/95 — Electronic Devices based on conjugated polymers and oligomers
The activities of this project consisted on the construction of devices such as FETs and LEDs using conjugated polymers as active materials, namely poly(thienylvinylene), PTV, derivatives, and their characterisation by conventional methods. A detailed study was performed on the influence of the processing temperature of the (poly(p-phenylenevinylene), PPV, precursor, on the electroluminescent properties and on the LED characteristics of the ITO/PPV/M (M=Ca, Al) type devices.
- PRAXIS XXI n° 2/2.1/QUI/203/94 — Charge Transfer Solids. From Transition Metal Dichalcogenates to Synthetic Metals.
The work done under this project consisted on the synthesis and characterization of charge transfer complexes containing transition metal bis-dithio(seleno)lenes. Single crystals of these materials were obtained and the determination of their crystal structure and the detailed study of their electric and magnetic properties is under way.
- JNICT PBIC/C/CTM/1965/95 — Synthesis and characterisation of luminescent polymers
Polymer electrolytes containing luminescent centers, namely Eu^{3+} ions, were synthesized and characterized. One of the series was based on polymer-salt complexes in which the

polymer (poly(ethyleneimine)) acts as a complexing agent to the rare-earth ion (Eu^{+3}). Others are based on ORMOLYTES (ORganically MODified silicate electroLYTES) obtained via sol-gel.

Thin films of these materials were characterized by thermal and morphological studies (DSC, DTA, TGA, X-ray and SEM). The study of the luminescent properties is under way.

- PRAXIS/3/3.1/MMA/1792/95— POLYMER LED ACTIVE MATRIX

Polymers and oligomers were synthesized based on PPV and derivatives. Particular attention was devoted to substituted oligomers, studying the effect of both the size of lateral groups (or pending groups) (alkyl and alcoxid) and distribution along the chain of the oligomers. Soluble derivatives of PPV and oligomers were synthesized. The structural and morphologic characterization of the synthesized materials was made by conventional analysis and by adequate spectroscopic techniques (I R, Raman, UV-Visible).

M.Sc. Thesis

- Antonieta Caneco Ribeiro (Supervisor: L. Alcacer); Instituto Superior Tecnico. To be concluded in 1998 (subject: Ionic Conducting Polymers for Microsystems).
- Ana Maria Matos Charas (Supervisor: J. Morgado); Instituto Superior Tecnico. To be concluded in 1998 (subject: Electroluminescent Devices based on Conducting Polymers).

Publications

Papers in Journals

Isabel C. Santos, Manuel Almeida, Jorge Morgado, M. Teresa Duarte, Luís Alcácer, "Perylo[1,12-b,c,d]thiophene; *Acta Cryst.* (1997) C53, 1640.

J. Morgado, M. T. Duarte, L. Alcácer, I. C. Santos, R. T. Henriques And M. Almeida, "New Compounds Based on Tetrathiafulvalene and $\text{Au}(\text{pds})_2^-$, $\text{pds}=\text{pyrazine-2,3-diselenolate}$ " ; *Synthetic Metals* **86**, 2187 (1997).

J. Morgado, J. B. Christensen, R. T. Henriques, L. Alcácer And M. Almeida; "Electrical and Magnetic Properties of the New Conductors: $(\text{TMDTP})_2\text{AsF}_6$ and $(\text{TMDOP})_2\text{AsF}_6$ "; *Synthetic Metals* **86**, 1967 (1997).

C. Rovira, J. Veciana, E. Ribera, J. Tarrés, E. Canadell, R. Rousseau, M. Mas, E. Molins, M. Almeida, R. T. Henriques, J. Morgado, J.-P. Schoeffel And J.-P. Pouget, "An Organic Spin-Ladder Molecular Material"; *Angewandte Chemie Int. Ed. Engl.* **36**, 2324-6 (1997).

J. Morgado, I. C. Santos, L. F. Veiros, R. T. Henriques, M. T. Duarte, M. Almeida And L. Alcácer, "Perylene Derivative Charge Transfer Salts: Synthesis, Crystal Structure and Characterisation of $(\text{pet})_3[\text{Ni}(\text{mnt})_2]_2$ "; *J. Mater. Chem.* **7**(12), p2387-2392 (1997).

J. Morgado, J. Grüner, S. P. Walcott, T. M. Yong, R. Cervini, S. C. Moratti, A. B. Holmes And R. H. Friend, "4-AcNI a new polymer for light-emitting diodes"; *Synth. Metals*, accepted for publication.

L. F. Veiros and J. Morgado, "Ability of substituted Perylenes to Form Organic Conductors", submitted to *Synth. Metals*..

Papers in Conference Proceedings

E. Ribera, J. Tarrés, J. Veciana, C. Rovira, E. Canadell, R. Rousseau, E. Molins, M. Mas, J. Morgado, R. T. Henriques And M. Almeida, "Comparison of the Structural, Electrical and Magnetic Properties of $(\text{BET-TTF})\text{-M}(\text{mnt})_2$ and $(\text{DT-TTF})_2\text{M}(\text{mnt})_2$ "; *International Symposium on Crystalline Organic Metals Superconductors and Ferromagnets (ISCOM)*, Sesimbra, Portugal, 22-27 de Março, 1997.

J. Morgado, I. C. Santos, L. F. Veiros, R. T. Henriques, M. T. Duarte, M. Almeida And L. Alcácer, "Organic Conductors based on the Perylene Derivative PET"; *International Symposium on Crystalline Organic Metals Superconductors and Ferromagnets (ISCOM)*, Sesimbra, Portugal, 22-27 de Março, 1997.

J. Morgado, I. C. Santos, R. T. Henriques, M. T. Duarte, L. Alcácer And M. Almeida, "Electrical and Magnetic Properties of two TTF - $\text{Au}(\text{pds})_2$ Conductors"; *Towards Molecular Electronics - TME'97*, Srem, Polónia, 23-28 Junho, 1997.

A. Charas, J. Morgado, A. França, P. T. Gomes And L. Alcácer, "Synthesis and Electrical Properties of Poly(3-hexyl-2,5-thienylene vinylene) Derivatives"; *European Conference on Molecular Electronics (ECME'97)*, Cambridge, UK, 7-10 September, 1997.

J. Morgado, "Influência das Interfaces nas Características de Diodos Emissores de Luz à Base de Poli(p-fenileno vinileno)", *3ª Encontro Nacional de Química-Física da S.P.Q.*, FCT/UNL, Monte de Caparica, 20-22 Novembro 1997.

A. Charas, J. Morgado, A. Gomes, P. T. Gomes E L. Alcácer, “Novos Derivados do Poli(3-hexil-2,5-tienileno vinileno) (PTV) com Aplicações em Transistores de Efeito de Campo”, 3^a *Encontro Nacional de Química-Física da S.P.Q.*, FCT/UNL, Monte de Caparica, 20-22 Novembro 1997.

Participation in International Scientific Meetings

- International Symposium on Crystalline Organic Metals Superconductors and Ferromagnets (ISCOM), Sesimbra, Portugal, 22-27 de Março, 1997.
- Towards Molecular Electronics - TME'97, Srem, Polónia, 23-28 Junho, 1997.
- European Conference on Molecular Electronics (ECME'97), Cambridge, UK, 7-10 September, 1997.
- 3^a Encontro Nacional de Química-Física da S.P.Q., FCT/UNL, Monte de Caparica, 20-22 Novembro 1997.

7.1.10 Instrumentation and Measurement Research Line

Human Resources

Collaborators

- Pedro Manuel Brito da Silva Girão PhD Associate Professor, IST
- António Manuel da Cruz Serra PhD Assistant Professor, IST
- Helena Maria dos Santos Geirinhas Ramos PhD Assistant Professor, IST
- Francisco André Corrêa Alegria M.Sc. Assistant, IST
- Manuel José Freire Fonseca da Silva Lic. Assistant, IST
- Maria da Conceição F. L. M. C. Macedo Lic. Assistant, IST
- Raul Daniel Lavado Carneiro Martins Lic. Assistant, IST

Other Collaborators

- José Miguel Dias Costa Pereira M.Sc. Lecturer, IPS
- Mouhaydine Tlemçani B.Sc. Assistant, U. Évora
- Paulo Jorge Maia dos Santos B.Sc. Assistant, U. Algarve
- José Fernando M. Lopes Mariano B.Sc. Assistant, U. Algarve
- Mário Jorge Trindade B.Sc. Assistant, IPS
- Pedro Miguel Pinelo Cruz Lic. Student IST, Final Year Project
- Daniela M. S. Campos Lic. Student IST, Final Year Project

Projects

- PRAXIS XXI - 2/2.1/TIT/1591/95 - SCCEO (“Simulation and Characterisation of Electronic and Optoelectronic Devices”).

An automatic calibration system for measuring instruments was developed. It assures the required accuracy and a good control of the uncertainty in the measurements carried out with the equipment in use within the project. The system can perform manual or automatic calibrations of measuring instruments equipped or not with a digital interface to

the controlling computer. By using computer vision techniques, the system is able to obtain the readings of any analog or digital measuring instrument.

The characterisation of Analog to Digital Converters (ADC) was studied. The development of an automated test system to obtain the dynamic transfer function of ADCs, using the histogram method over gaussian noise as the stimulus signal was initiated. The transfer function is used to derive merit figures like SNDR, THD and effective number of bits.

- Telematics Applications Programme HC 1020 - HECTOR (“Health Emergency management and Coordination through Telematic Operational Resources”).

The Implementation of a data acquisition and transmission system for the INEM was initiated.

PhDThesis

- Manuel José Freire Fonseca da Silva (supervisor: António M. C. Serra), Instituto Superior Técnico, started in 1997 (subject: Impedance measurement system based in self-adjusted bridges).
- José Miguel Dias Costa Pereira (supervisor: Pedro M.B. S. Girão and António M. C. Serra), Instituto Superior Técnico, started in 1997 (subject: Automatic characterisation of high frequency devices).
- Francisco André Corrêa Alegria (supervisor: António M. C. Serra), Instituto Superior Técnico, to be started in 1998 (subject: Error correction methods in automatic measurement systems).
- Mouhaydine Tlemçani (supervisor: António M. C. Serra), Instituto Superior Técnico, to be started in 1998 (subject: Simulation and characterisation of Analog to Digital Converters).

M.Sc. Thesis

- Francisco André Corrêa Alegria (supervisor: António M. C. Serra), Instituto Superior Técnico, concluded in 1997 (subject: Automatic calibration of measuring instruments by using computer vision techniques).
- Maria da Conceição Falcão Líbano Monteiro Costa Macedo (supervisor: António M. C. Serra), Instituto Superior Técnico, to be concluded in 1998 (subject: Real time sound analyser).

- Raul Daniel Lavado Carneiro Martins (supervisor: António M. C. Serra), Instituto Superior Técnico, to be concluded in 1998 (subject: Interbit modulation in Analog to Digital Converters. Characterisation by using gaussian noise as the stimulus signal).
- Mário Jorge Trindade (supervisor: Helena M. G. Ramos), Instituto Superior Técnico, to be started in 1998 (subject: Test methods of A/D and D/A converters).
- Paulo Jorge Maia dos Santos (supervisor: Pedro M.S. Girão), Instituto Superior Técnico, to be started in 1998 (subject: Monitorisation of water quality: measuring transducers, data acquisition and telemetry).
- José Fernando Morais Lopes Mariano (supervisor: Helena M. G. Ramos), Instituto Superior Técnico, to be started in 1998 (subject: Vibrating sampling magnetometer).

Publications

Papers in Journals

J. Dias Pereira, A. Cruz Serra, P. Girão, "Sistema de temporização e disparo para aquisição e processamento digital de sinais periódicos", *Ingenium - Revista da Ordem dos Engenheiros*, 2ª série, nº 19, pp. 60-63, July 1997.

Papers in Conference Proceedings

J. Dias Pereira, A. Cruz Serra, P. M. B. Girão, "High accuracy data acquisition of periodic signals", *IMEKO TC-4, 9th International Symposium on Development in Electrical Instruments in Industry Proceedings*, pp. 141-144, Glasgow, Scotland, September 1997.

J. Dias Pereira, A. Cruz Serra, P. M. B. Girão, "Minimising truncation errors in digital wattmeters", *IMEKO TC-4, 9th International Symposium on Development in Electrical Instruments in Industry Proceedings*, pp. 113-116, Glasgow Scotland, September 1997.

H. Geirinhas Ramos, A. Cruz Serra, "Using a VXI based system to characterise Analog to Digital Converters", *2nd International Workshop on ADC Modelling and Testing*", *XIV IMEKO World Congress proceedings*, vol. IVB, pp. 245-250, Tampere, Finland, June 1997.

M. Fonseca da Silva, A. Cruz Serra, "Teaching Wien bridge oscillators in the lab", *XIV IMEKO World Congress New Measurements - Challenges and Visions Proceedings*, vol. II, pp. 35-40, Tampere, Finland, June 1997.

F. Correa Alegria, A. Cruz Serra, "Automatic calibration system for analog measurement instruments", *XIV IMEKO World Congress New Measurements - Challenges and Visions Proceedings*, vol. IVA, pp. 292-297, Tampere, Finland, June 1997.

P. M. B. Girão, "Automation of testing processes: VXI and IEEE 488/VXI mixed systems", *XIV IMEKO World Congress New Measurements - Challenges and Visions Proceedings*, vol. IVA, pp. 305-310, Tampere, Finland, June 1997.

P. M. B. Girão, A. Cruz Serra, "VXI instrumentation: message based or register based devices?", *IEEE Instrumentation and Measurement Technology Conference, IMTC/97 Proceedings*, Vol. 2, catalog number 97CH36022, pp. 237-240, Ottawa, Canada, May 1997.

M. Fonseca da Silva, A. Cruz Serra, "Study of the sensitivity in an automatic capacitance measurement system", *IEEE Instrumentation and Measurement Technology Conference, IMTC/97 Proceedings*, Vol. 1, catalog number 97CH36022, pp. 329-334, Ottawa, Canada, May 1997.

C. Monteiro, A. Cruz Serra, "Real time sound analyzer", *IEEE Instrumentation and Measurement Technology Conference, IMTC/97 Proceedings*, Vol. 1, catalog number 97CH36022, pp. 414-417, Ottawa, Canada, May 1997.

H. Ramos, M. Silva, A. Cruz Serra, "A measurement system to automate laboratory testing in soils", *IEEE Instrumentation and Measurement Technology Conference, IMTC/97 Proceedings*, Vol. 2, catalog number 97CH36022, pp. 1048-1051, Ottawa, Canada, May 1997.

F. Alegria, H. Ramos, "A remote controlled automated measurement system", *IEEE Instrumentation and Measurement Technology Conference, IMTC/97 Proceedings*, Vol. 2, catalog number 97CH36022, pp. 1186-1189, Ottawa, Canada, May 1997.

O. Postolache, M. D. Pereira, M. Cretu, P. M. B. Girão, "An aAnn method for correction of time drift error in virtual measurement system", *Proceeding of SCS'97 International Symposium on Signal Circuits and Systems*, Vol. 2, pp. 595-598, Iasi, Romania, October 1997.

O. Postolache, M. Cretu, M. D. Pereira, P. M. B. Girão, "Aplicatie a combinatieri LASER-Fotodioda in masurarea temperaturii", *SIELMEC'97 Prima Conferinta Internationala de Sisteme Electromecanice*, Vol. II, pp. 163-166, Chisnau, Moldavia, October 1997.

M. Cretu, O. Postolache, M. D. Pereira, P. M. B. Girão, "Modelarea caracteristicilor senzorilor de tip magnetorezistiv folosind RNA", *SIELMEC'97 Prima Conferinta*

Internationala de Sisteme Electromecanice, Vol. II, pp. 167-170, Chisnau, Moldavia, October 1997.

Miscellaneous

- Since the Instrumentation and Measurement research line was created in 1997, only some of the collaborators (that were already collaborators in the SCCEO line) had a significant contribution to this year report.
- Prof. António M. Cruz Serra member of the Technical Committee on Measurement of Electrical Quantities (TC-4) of the Instrumentation and Measurement Confederation (IMEKO) since 1994. In June of 1997, during the meeting of this committee in Tampere, Finland, was elected Scientific Secretary of the committee.
- Prof. António M. Cruz Serra referee and member of the International Technical Committee of IMEKO TC-4, *9th International Symposium on Development in Electrical Instruments in Industry*, Glasgow, Scotland September 1997.
- Prof. P. M. B. S. Girão member of the Scientific Committee of “Caderno do CEFAT” from the Faculty of Engineering of Oporto University.
- Prof. P. M. B. S. Girão member of the Organising Committee of *9th EAEEIE International Conference on Education in Electrical and Information Engineering*.

7.2 Coimbra Pole

7.2.1 Signal and Image Processing Research Line

Human Resources

Collaborators

- | | | |
|----------------------|-------|----------------------------|
| • Luís Vieira de Sá | PhD | Associate Professor, FCTUC |
| • Vitor Mendes Silva | PhD | Assistant Professor, FCTUC |
| • Eduardo Sá Marta | M.Sc. | Assistant, FCTUC |
| • Fernando Perdigão | M.Sc. | Assistant, FCTUC |
| • Luís Alberto Cruz | M.Sc. | Assistant, FCTUC |
| • Paulo Monteiro | M.Sc. | Assistant, FCTUC |
| • Emanuel Martins | M.Sc. | Assistant, FCTUC |

Other Collaborators

- | | | |
|---------------------------|---------------|--|
| • Sérgio Maciel de Faria | PhD | Adjunct Professor, IPL |
| • António Navarro | PhD | Assistant Professor, ISBB |
| • Pedro Assunção | PhD | Assistant Professor, IPL |
| • João Carlos Silvestre | M.Sc. | Assistant, ISEC |
| • Fernando Lopes | M.Sc. | Assistant, ISEC |
| • Rui Amaral | M.Sc. student | |
| • Nuno Serra Antunes | M.Sc. student | |
| • Maria Beatriz Henriques | Lic. | IT Grant (until 9/97) |
| • Paulo Valente da Cruz | Lic. | IT Grant (until 9/97) |
| • Rui Coimbra Lopes | Lic. Student | 96/97 Project
IT Grant (from 10/97) |
| • Nuno Miguel Borges | Lic. Student | 96/97 Project
IT Grant (from 10/97) |
| • Gonçalo Marques Redinha | Lic. Student | 96/97 Project |

• Luís Miguel de Sousa	Lic. Student	96/97 Project
• João António Marques	Lic. Student	96/97 Project
• Manuel Jorge Catarino	Lic. Student	96/97 Project
• Carla Sofia Sebastião	Lic. Student	96/97 Project
• José Fernando Morais	Lic. Student	96/97 Project
• José Miguel Jorge	Lic. Student	96/97 Project
• Paulo Oliveira	Lic. Student	96/97 Project
• Paulo Jorge Bernardino	Lic. Student	96/97 Project
• José Rui Simões	Lic. Student	97/98 Project
• Mário Gonçalo Silveirinha	Lic. Student	97/98 Project

Projects

- **ADVANCED TELEPHONIC INFORMATION SERVICES (SAIT)** - This project was initiated in 1996 under a research contract between IT and Portugal Telecom and ended in September of 1997. As a result of the project a demonstrator was built incorporating speech recognition with keyword spotting over the telephone. The demonstration service is "Tele-Balcão" which is an automatic dialogue system through which an user can obtain information about telecommunication equipment available at Portugal Telecom shops. The interaction with the system is both speech and DTMF keying. Several tools to automate the design and development of voice driven services were produced under the project. At the end of the project, a workshop, including on-line demonstrations of speech recognition techniques, was organized in Centro de Estudos de Telecomunicações.
- **REC - SPEECH RECOGNITION APPLIED TO TELECOMMUNICATIONS** - This project was initiated in April 1997 under a PRAXIS XXI research contract. The project is led by INESC (Lisbon) and has the participation of IT (Coimbra) and FEUP(Porto). The specific goals of the project include the study and development of automatic recognition techniques with a particular emphasis on the Portuguese language and on the applications to telecommunications. The work of the Signal and Image Processing Research Line has concentrated on the following 4 areas:
 - Spectral pre-processing based on auditory models: The effect of pre-processing based on auditory models on the performance of speech recognizers was evaluated. A cochlear model which simulates the operation of the periphery auditory system was built and integrated in an isolated digit recognizer working in the telephone network. It is expected

to test this recognizer in order to assess the performance of the cochlear model in comparison to existing spectral pre-processing schemes.

- Speaker independent phoneme recognition: We have conducted extensive studies on human communication of stop consonants, in order to replicate human-like tolerance of non-native speakers and channel conditions. An automatic model of some plausible auditory mechanisms has already achieved <1.5% errors for the difficult /pi/-/ti/ discrimination for Portuguese speakers and, with no retraining, <3% errors for American English speakers. The model exhibits graceful degradation for telephone-filtered sounds.
- Word spotting : Word spotting techniques were studied for isolated keyword recognition in telephone network applications. The approach is based on the use of "garbage" or "sink" models for the parts of the signal unrelated to the keyword to be recognized. The technique has been applied in the project SAIT described above.
- Automatic segmentation and labelling : We have labelled the "digit part" of the TELEFALA speech database using a segmentation in acoustic-phonemic units followed by a fuzzy sets based classifier.
- PRODIGIOS (Praxis/3/3.1/TIT/39/94) - Prodigios started in 1995 and it is a project on Digital Signal Processing of Audio and Video with the participation of IT (Lisbon and Coimbra) and INESC. In the year of 1997 the Signal and Image Research Line worked on the area of multiresolution analysis. The work was directed to the resolution of the problem of filtering finite size signals near the borders. A recursive algorithm was developed to determine the extension to apply to the signal, in order to produce a non-expansive decomposition. Research has also initiated in the area of image analysis and 3D modelling.
- ARMA AND MA MODELLING - The research activity in this area has continued. It was developed a new method to generate an ARMA (with only real poles) system which globally minimizes the quadratic error between a specified impulse response and the impulse response of the ARMA system, over an interval of length N. Current research is directed towards generalizing this algorithm for real and complex conjugate poles.
- COST 249 - CONTINUOUS SPEECH RECOGNITION OVER THE TELEPHONE LINE" - The Signal and Image Research Line of IT-Coimbra has participated in the third year of this COST 249 action together with 21 other research labs from European Universities and Telecommunications Operators. Luis Vieira de Sá has participated in the 2 meetings organized by the action, in Rome and in Rhodes. A grant has been given to extend the action for a further 2 year period.

PhD Thesis

- Fernando Perdigão, (supervisor: Luís Vieira de Sá) , Universidade de Coimbra, with examination due in March 1998 (title: Auditory Models for Automatic Speech Recognition).
- Eduardo Sá Marta, (supervisor: Luís Vieira de Sá) , Universidade de Coimbra, in preparation (subject: Speaker Independent Phoneme Transmission).
- João Carlos Silvestre, (supervisor: Luís Vieira de Sá) , Universidade de Coimbra, in preparation (subject: Processing of Finite Size Signals in Multiresolution Analysis).

M.Sc. Thesis

- Filipe Neves, (supervisor: Luís Vieira de Sá) , Universidade de Coimbra, concluded in 1997 (title: Automatic Acquisition System of a Telephone Speech Database in Portuguese).
- Rui Baroteo Amaral, (supervisor: Luís Vieira de Sá) , Universidade de Coimbra, with examination due in February 1998 (title: Segmentation and Labelling of Telephone Speech Data).
- Nuno Serra Antunes, (supervisor: Luís Vieira de Sá) , Universidade de Coimbra, in preparation (subject: Primary Access ISDN Network Interface for a Videotelephone).

Publications

Papers in Journals

P. Assuncao and M. Ghanbari, "Fast Computation of MC-DCT for video transcoding", *IEE Electronics Letters*, 33(4):284-286, February 1997.

P. Assuncao and M. Ghanbari, "Optimal bit rate conversion of MPEG-2 bit streams", *IEE Electronics Letters*, 33(8):675-677, April 1997.

P. Assuncao and M. Ghanbari, "Transcoding of single-layer MPEG video into lower rates", *IEE Proceedings on Vision, Image and Signal Processing*, 144(6):377-383, December 1997.

Papers in Conference Proceedings

A. Navarro and C.R. Allen, "Adaptive Classifier Based on K-means Clustering and Dynamic Programming", *Int. Conf. on Image Processing Methods*, San Jose-USA, February 1997.

A. Navarro and C.R. Allen, "Distortion Compensation Method Applied to Hand-written Character Recognition", *Conference Proceedings of RecPad'97*, Coimbra, March, 1997.

A. Navarro and C.R. Allen, "Dynamic Programming and Clustering", *Fourth International Conference on Document Analysis and Recognition*, Ulm, Germany, August 1997.

A. Navarro and L. de Sá, "Interfacing a TMS320C31 DSP to the PC Bus", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Abril, 1997.

C.R. Allen and A. Navarro, "The Recognition of Roman Handwritten Characters Using Dynamic Information Recovery", *IEE International Conference on Document Analysis and Recognition*, July 14-17, Dublin, Ireland, 1997.

Eduardo Marta and Luís de Sá, "Impact of Ascending Sequence AI (Auditory Primary Cortex) Cells on Stop Consonant Perception", *Proceedings of 5th European Conference on Speech Communication and Technology*, EuroSpeech'97, vol. 5 pp. 2503-2506, Rhodes, September 1997.

Emanuel Martins, Vitor Silva e Luís de Sá, "Subband coding of image sequences using multiple vector quantizers", *Proc. SPIE: Visual Communications and Image Processing' 97*, vol. 3024, pp.1354-1359, San Jose, February, 1997.

Fernando Perdigão and Luís de Sá, "Properties of Auditory Model Representations", *Proceedings of 5th European Conference on Speech Communication and Technology*, EuroSpeech'97, vol. 5 pp. 2499-2502, Rhodes, September 1997.

João Silvestre, Luís de Sá, "Um método iterativo para Extensão de Sinais em Codificação por Subbandas", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Abril, 1997.

João Silvestre, Vitor Silva, Luís de Sá, "An Iterative Method for Signal Extension in Subband Coding", *Conference Proceedings of RecPad'97*, Coimbra, March, 1997.

Nuno Antunes, M. Veríssimo, Luis de Sá, "Interface Dinâmica para Acesso RDIS Primário (2.048 Mbit/s)", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Abril, 1997.

P. Assuncao and M. Ghanbari, "Optimal transcoding of compressed video", *IEEE International Conference on Image Processing, ICIP'97*, vol. 1, pp 739-742, Santa Barbara - USA, October 1997.

P. Assuncao and M. Ghanbari, "Congestion control of video traffic with transcoders", *IEEE International Conference on Communications, ICC'97*, pp. 523-527, Montreal - Canada, June 1997.

P. Assuncao and M. Ghanbari, "Transcoding of MPEG-2 video in the frequency domain", *IEEE International Conference on Acoustics, Speech, and Signal Processing, ICASSP'97*, vol. 4, pp. 2633-2636, Munich - Germany, April 1997.

Paulo Paiva Monteiro, Luís Vieira de Sá, "A New Method to Evaluate in Closed-form the Response of a Stable Continuous-time ARMA system to a Periodic Input Avoiding Fourier Series", *Conference Proceedings of RecPad'97*, Coimbra, March, 1997.

R. Amaral, F. Perdigão, P. Placido, E. Sá Marta, L. Vieira de Sá, "Automatic Segmentation and Labelling of a Portuguese Telephone-Speech Digit Database", *Conference Proceedings of RecPad'97*, Coimbra, March, 1997.

R. Amaral, F. Perdigão, P. Placido, E. Sá Marta, L. Vieira de Sá, "Sistema Automático de Segmentação e Etiquetagem de uma Base de Dados de Fala Telefónica em Português", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Abril, 1997.

Sérgio Faria, "Geometric Transform Motion Compensation for Low Bit Rate Video Coding", *9th Portuguese Conference on Pattern Recognition*, Coimbra, March 1997.

Project Deliverables

Luís de Sá et al, "Project SAIT - Final Report", IT-Coimbra internal report (contribution contract SAIT/RT3), September 1997.

Luis de Sá, "Applications of Speech Recognition over the Telephone", tutorial included in the intensive course of the TEMPUS project "Modernisation of Teaching in Electronic Systems for Telecommunications Networks", Cracow, Poland, July 1997.

Sérgio Faria, "Motion Estimation with Geometric Transforms", tutorial included in the intensive course of the TEMPUS project "Modernisation of Teaching in Electronic Systems for Telecommunications Networks", Cracow, Poland, July 1997.

Miscellaneous

- The following final year projects (DEE - FCTUC) were orientated by members of the Signal and Image Processing Research Line: "Image Compression and Decompression on the Internet" (Luis Lopes de Sousa and Gonçalo Nuno Redinha); "Multi-channel Telephone Applications with Speech Recognition" (Rui Coimbra Lopes and Nuno Micaelo Lopes); "Design and Development of Teaching Aids for the Laboratory of Electronic for Telecommunications" (Carla Sofia Sebastião, José Fernando Morais, José Miguel Jorge, Paulo Oliveira and Paulo Jorge Bernardino); "Video Acquisition Board for the PCI bus" (João António Marques and Manuel Jorge Catarino).
- Fernando Perdigão gave the talk "Reconhecimento de Voz no Atendimento Telefónico" included in the Workshop "Atendimento Telefónico" organized by Portugal Telecom, Aveiro, February, 1997.
- Three members of the Signal and Image Processing Line participated in the Organizing Committee of the *9th Conference Portuguese Conference on Pattern Recognition* held in Coimbra in March 1997.
- Pedro Assunção, finished his PhD studies in the University of Essex, UK, on the area of "Video Transmission over ATM Networks".
- Luis Alberto Cruz continued his PhD studies in the Rensselaer Polytechnic Institute, U.S.A., on the area of "Vector Quantization of Motion Information".
- Fernando Lopes continued, in the University of Essex, UK, a PhD programme on Video Coding.
- The Signal and Image Research Line collaborated with the Optical Communications Research Line in Project TEMPUS (JEP 7589/94) - "Modernization of Teaching in Electronic Systems for Telecommunications Networks", which ended in July 1997.
- Luís Vieira de Sá member of the Executive Board of Instituto de Telecomunicações.

7.2.2 Optical Communications Research Line

Human Resources

Collaborators

- Henrique J. A. da Silva PhD Assistant Professor, FCTUC
- Lúcia M. R. A. Martins M.Sc. Assistant, FCTUC
- Álvaro M. F. de Carvalho B.Sc. Assistant, FCTUC

Other Collaborators

- António L. F. Marques M.Sc. Assistant, ISEC
- João G. P. T. dos Reis Lic. Engineer, Portugal Telecom
- João M. A. Martins Lic. Engineer, Portugal Telecom
- João M. P. C. Gil M.Sc. Assistant, IPL
- Luís M. M. Mendes Lic. Assistant, IPL
- Mário M. C. A. dos Reis Lic. Engineer, CENEL
- Mário Marques Freire M.Sc. Assistant, UBI
- Paulo Mateus Mendes Lic. Assistant, IPCB
- Telmo R. C. C. Fernandes Lic. Assistant, IPL

Projects

- ITCOM (PRAXIS/3/3.1/TIT/35/94 - "Integration of Technologies for Mobile Communications"): the Optical Communications research line participates in activities 3100 and 5100; WP3100 is concerned with the design and implementation of a system for measuring the impulse response and fading in radio propagation channels; WP5100 consists in designing and building an optical transmitter and an optical receiver for a SCM system in the band of 2GHz, for the optical links between the central node and the base stations (*downlink*).
- TEMPUS (JEP 7589/94 - "Modernisation of Teaching in Electronic Systems for Telecommunications Networks"): a joint venture with the Signal and Image Processing

Research Line, this was a project in collaboration with the Institut National des Télécommunications (INT), Évry, France, and with the University of Mining and Metallurgy (UMM), Krakow, Poland; it started in September 1994, and was concluded in September 1997.

- “Study of the Introduction of Dynamic Routing in the Network of Portugal Telecom”: a specific contract with Portugal Telecom, in the scope of the IATE programme, started in February 1997.
- NEURALTEL ("Neural Networks in Telecommunications"): this project had its definition phase during 1997, as one of the activities of the LAESEC (Latin-American and European Scientific and Educational Co-operation) network, framed by the European programme ALFA; the Optical Communications research line contributed for the R&D plan of this project in two application domains, "Telecommunications Networks" and "Signal Processing".

PhD Thesis

- Mário Marques Freire (supervisor: Henrique J. A. da Silva), Universidade da Beira Interior, started in 1997 (subject: Non Linear Applications of Semiconductor Optical Amplifiers in Multichannel Optical Communications Systems).

M.Sc. Thesis

- António L. F. Marques (supervisor: Henrique J. A. da Silva), Universidade de Coimbra, concluded in July 1997 (subject: Drive Circuits for Injection Laser Diodes).
- João M. P. C. Gil (co-supervisors: Henrique J. A. da Silva and Nick G. Riley), Universidade de Coimbra, concluded in September 1997 (subject: Mobile Indoor Radio Channel Measurement System).
- Álvaro M. F. Carvalho (supervisor: Henrique J. A. da Silva), Universidade de Coimbra, to be concluded in 1998 (subject: Soliton Transmission in Strongly Perturbed Systems).
- João M. A. Martins (supervisor: Henrique J. A. da Silva), Universidade de Coimbra, to be concluded in 1998 (subject: Modelling and Simulation of Digital Switches).
- João G. P. T. dos Reis (supervisor: Henrique J. A. da Silva), Universidade de Coimbra, to be concluded in 1998 (subject: Modelling and Characterisation of Spatial Optical Switches).

- Mário C. A. Reis (supervisor: Henrique J. A. da Silva), Universidade de Coimbra, to be concluded in 1998 (subject: Measurement Techniques for Characterisation of Semiconductor Lasers).
- Paulo M. Mendes (supervisor: Henrique J. A. da Silva), Universidade de Coimbra, to be concluded in 1998 (subject: Performance Assessment of Optical Networks with CDMA).
- Luís M. M. Mendes (supervisor: Henrique J. A. da Silva), Universidade de Coimbra, started in 1997 (subject: Transmission Interfaces for SCM Optical Communication Systems).
- Telmo R. C. Fernandes (supervisor: Henrique J. A. da Silva), Universidade de Coimbra, started in 1997 (subject: Dynamic Carrier Assignment in Cellular Mobile Communication Systems).

Publications

Books and Book Chapters

Mário M. Freire and Henrique J. A. da Silva, "Performance Improvement of 10-Gbit/s Four-Channel WDM Dispersion-Supported Transmission by Using Multi-Layer Thin Film Interference Filters as Demultiplexers", in *Photonic Networks, Optical Technology and Infrastructure*, D. W. Faulkner and A. L. Harmer (editors), IOS Press, The Netherlands, 1997.

Papers in Journals

Mário M. Freire, José A. R. Pacheco de Carvalho, Álvaro M. F. de Carvalho, and Henrique J. A. da Silva, "Impact of Double Cavity FP Demultiplexers on the Performance of WDM Dispersion Supported Transmission", *European Transactions on Telecommunications*, Vol. 8, No. 2, pp. 201-204, 1997.

Papers in Conference Proceedings

Mario M. Freire, and Henrique J. A. da Silva, "Performance Assessment of High Density Wavelength Division Multiplexing Systems with Dispersion Supported Transmission at 10 Gbit/s", *Proc. 2nd IEEE Symposium on Computers and Communications 1997 (ISCC'97)*, pp. 318-322, Alexandria, Egypt, July 1-3, 1997.

Mário M. Freire and Henrique J. A. da Silva, "Performance Improvement of 40-Gb/s Capacity Four-Channel WDM Dispersion-Supported Transmission by Using Broadened Passband Arrayed-Waveguide Grating Demultiplexers", *Proc. Pacific Rim Conference on Lasers and Electro-Optics 1997 (CLEO/Pacific Rim'97)*, pp. 13-14, Chiba, Japan, July 14-18, 1997, paper TuD4.

Alexandre G. Melo and Henrique J. A. da Silva, "Improved Performance QPSK Demodulator for Digital Satellite Radio", *Proc. International Conference on Communications 1997 (ICC '97)*, paper 5.4, Montréal, Canada, 8-12 June 1997.

Lúcia A. Martins, José Sequeira, Henrique J. A. da Silva, Fátima Ribeiro, and Clara Janeira, "Data Base Model for Capacity Management of Telecommunications Network Resources", *Proc. Workshop "Traffic Engineering for Developing Countries", 15th International Teletraffic Congress (ITC-15)*, pp. 103-108, Washington, D.C., U.S.A., June 23-27, 1997.

Mário M. Freire, and Henrique J. A. da Silva, "Performance Improvement of Dispersion Supported Transmission at 10 Gbit/s by Partial Chirp Compensation in a Travelling-Wave Amplifier", in *Book of Abstracts of the COST 240 Workshop: SOA-Based Components for Optical Networks*, pp. 16-1/4, Prague, The Czech Republic, October 27-28, 1997.

Carlos Ribeiro, Tiago Sá, José Vilela, e Henrique J. A. Silva, "Placa de Interface ATM para PC", *Workshop "Encontro sobre redes"*, FCCN, Lisboa, 4 de Março de 1997.

Luís M. M. Mendes e Henrique J. A. da Silva, "Transmissor LASER e Receptor Óptico Sintonizado para um Sistema SCM em 2GHz", *Actas da Iª Conferência Nacional de Telecomunicações (Iª CNT)*, pp. 309-312, Aveiro, Portugal, 10/11 Abril, 1997.

António L. F. Marques, Luís M. M. Mendes, e Henrique J. A. da Silva, "Circuito de Controlo de Temperatura de Precisão para Lasers Semicondutores", *Actas da Iª Conferência Nacional de Telecomunicações (Iª CNT)*, pp. 305-308, Aveiro, Portugal, 10/11 Abril, 1997.

João M. P. C. Gil, Henrique J. A. da Silva, e Nick G. Riley "Sistema de Medição da Resposta a Impulso e de "Fading" do Canal no Interior de Edifícios, na Banda de 2.4 GHz", *Actas da Iª Conferência Nacional de Telecomunicações (Iª CNT)*, pp. 139-142, Aveiro, Portugal, 10/11 Abril, 1997.

João G. P. T. dos Reis e Henrique J. A. da Silva, "Análise e Simulação de Comutadores e Matrizes de Comutação Ópticos Baseados em Acopladores Direcctionais", *Actas da Iª Conferência Nacional de Telecomunicações (Iª CNT)*, pp. 281-284, Aveiro, Portugal, 10/11 Abril, 1997.

Carlos Ribeiro, Tiago Sá, José Vilela, e Henrique J. A. da Silva, “Placa de Interface ATM para PC”, *Actas da 1ª Conferência Nacional de Telecomunicações (1ª CNT)*, pp. 93-96, Aveiro, Portugal, 10/11 Abril, 1997.

Mário M. Freire e Henrique J. A. da Silva, “Melhoria de Desempenho da Transmissão Suportada por Dispersão de Quatro Canais WDM a 10 Gbit/s Usando Filtros de Interferência como Desmultiplexadores”, *Actas da 1ª Conferência Nacional de Telecomunicações (1ª CNT)*, pp. 313-316, Aveiro, Portugal, 10/11 Abril, 1997.

Mário M. Freire e Henrique J. A. da Silva, “Melhoria do Desempenho de Sistemas WDM-DST Usando Desmultiplexadores de Grelhas Baseadas em Agregados de Guias de Onda com Banda Passante Alargada”, *Actas do 3º Encontro Nacional do Colégio de Engenharia Electrotécnica*, pp. 409-412, Ordem dos Engenheiros, Porto, Portugal, 5/6 de Junho de 1997.

António L. F. Marques, e Henrique J. A. da Silva, “Circuito de Comando para Laser Semicondutor – Modulação FSK Directa”, *Actas do 3º Encontro Nacional do Colégio de Engenharia Electrotécnica*, pp. 381-384, Ordem dos Engenheiros, Porto, Portugal, 5/6 de Junho de 1997.

Miscellaneous

- COST 240 (techniques for modelling and measuring advanced photonic telecommunications components): Henrique J. A. da Silva, Mário M. Freire, and Álvaro M. F. de Carvalho participation in the activities of the Working Group 1, dedicated to modelling and characterisation of semiconductor laser diodes and optical amplifiers.
- Henrique J. A. da Silva, “WDM in the Optical Telecommunications Network”, lecture presented at the *3rd Summer School and Workshop* of the *TEMPUS JEP 7589/94*, entitled “Future of Electronic Systems for the Telecommunications Network”, in Zakopane, Poland, July 1997.

7.2.3 Applied Mathematics Research Line

Human Resources

Collaborators

- | | | |
|-----------------------------|-------|----------------------------|
| • Joaquim Joao Júdice | PhD | Associate Professor, FCTUC |
| • Maria Esmeralda Gonçalves | PhD | Associate Professor, FCTUC |
| • Madalena Gomes Martins | PhD | Associate Professor, FCTUC |
| • Maria Celeste Gouveia | PhD | Associate Professor, FCTUC |
| • Paulo Eduardo Oliveira | PhD | Associate Professor, FCTUC |
| • Luis Nunes Vicente | PhD | Assistant Professor, FCTUC |
| • Cristina Maria Martins | M.Sc. | Assistant, FCTUC |
| • Joao Luis Soares | Lic. | Assistant, FCTUC |
| • Ana Paula Nascimento | M.Sc. | Assistant, FCTUC |
| • Cristina Requejo Agra | M.Sc. | Assistant, FCTUC |
| • Luis Filipe Portugal | M.Sc. | Assistant, FCTUC |

Other Collaborators

- | | | |
|------------------------|-------|--------------------------|
| • Maria Leonor Alves | M.Sc. | Lecturer, ISEC, Coimbra |
| • Luis Merca Fernandes | M.Sc. | Lecturer, E. S. T. Tomar |
| • Joao Manuel Patrício | Lic. | Lecturer, E. S. T. Tomar |

Projects

- Praxis 2/2.1/MAT/346/94
Solution of linear algebra and optimization problems and applications to structural engineering, genetics, and finance.
- Praxis PCEX/P/MAT/38/96
Variational models and optimization.

PhD Thesis

- C. Requejo Agra, (supervisor: L. Gouveia), Univ. Lisboa, started in 1997 (subject: Topological Design of Local Access Networks).
- L. M. Fernandes, (supervisor: J. J. Júdice), Departamento de Matemática da FCTUC, to be concluded in 1998 (subject: Global optimization and complementarity).
- C. M. Martins, (supervisors: E. Gonçalves and N. M. Lopes), Departamento de Matemática da FCTUC, started in 1996 (subject: Nonlinear models for time series).
- A. P. Nascimento, (supervisors: M. Hallin and N. M. Lopes), Univ. Livre de Bruxelles, started in 1997 (subject: Semiparametric statistics).
- J. L. Soares, (supervisors: S. Ceria), Univ. de Columbia, to be concluded in 1998 (subject: Disjunctive programming).
- L. F. Portugal, (supervisor: J. J. Júdice), Departamento de Matemática da FCTUC, to be concluded in 1998 (subject: Interior-point methods for linear network problems).

M.Sc. Thesis

- L. M. Costa (supervisor: E. Gonçalves), Departamento de Matemática da FCTUC, concluded in 1997 (subject: Jackknife estimation).
- M. Cruz, (supervisors: A. M. Faustino and J. J. Júdice), Univ. Porto, concluded in 1997 (subject: Linear and quadratic bilevel).
- M. Fonseca, (supervisor: J. J. Júdice), Departamento de Matemática da FCTUC, concluded in 1997 (subject: Quadratic programming and applications).
- J. M. R. Gama, (supervisor: P. E. Oliveira), Departamento de Matemática da FCTUC, concluded in 1997 (subject: Density estimation using orthogonal functions and wavelets).
- R. M. Gaspar, (supervisor: P. E. Oliveira), Departamento de Matemática da FCTUC, started in 1997.
- J. Santos, (supervisor: J. J. Júdice), Univ. Aveiro, to be concluded in 1998 (subject: Portfolio selection models).
- M. C. Soares, (supervisor: J. J. Júdice), Departamento de Matemática da FCTUC, concluded in 1997 (subject: Complementarity and variational models).

Publications

Books and Book Chapters

L. Fernandes, J. Júdice and L. Portugal, "A truncated Newton interior-point algorithm for the solution of a multicommodity spatial equilibrium model", *Complementarity and Variational Problems*, Eds. M. Ferris e J. Pang, SIAM, Philadelphia, 1997, 315-344.

L. N. Vicente, Bilevel Programming: introduction, history, and overview, to appear in *Encyclopedia of Optimization*, Kluwer Academic Publishers.

Papers in Journals

D. Andrews and L. N. Vicente, "Characterization of the smoothness and curvature of a marginal function for a trust-region problem", to appear in *Mathematical Programming*.

J. Corado and J. Júdice, "Um modelo para a selecção da melhor carteira obrigacionista", *Investigação Operacional* 17 (1997) 101-111.

J. E. Dennis, M. Heinkenschloss and L. N. Vicente, "Trust-region interior-point SQP algorithms for a class of nonlinear programming problems", to appear in *SIAM Journal on Control and Optimization*..

J. E. Dennis and L. N. Vicente, "On the convergence theory of trust-region-based algorithms for equality constrained optimization", *SIAM Journal on Optimization*, 7 (1997) 527-550.

E. Gonçalves and N. Mendes Lopes, "Some statistical results on autoregressive conditionally heteroscedastic models", to appear in *Journal of Statistical Planning and Inference*, 1997.

M. C. Gouveia, "Regular Hankel matrices over integral domains", *Linear Algebra and its Applications*, 255 (1997) 335-347.

P. Jacob and P. E. Oliveira, "Kernel estimators of general Radon-Nikodym derivatives", *Statistics*, 30 (1997), 25-46.

C. M. Martins, "A note on the autocorrelations related to a bilinear model with non-independent shocks", *Statistics and Probability Letters* 36 (1997), 245-250.

L. N. Vicente, "On interior-point Newton algorithms for discretized optimal control problems with state constraints", to appear in *Optimization Methods & Software*..

Papers in Conference Proceedings

L. Fernandes, I. Figueiredo e J. Júdice, “Solution of nonlinear obstacle problems by complementarity algorithms”, *Actas da Quinto Encontro Nacional de Mecânica Computacional*, Universidade do Minho, Guimarães, 1997, 395-404.

E. Gonçalves and N. Mendes Lopes, “Separação assintótica de leis de probabilidade: uma aplicação aos modelos bilineares”, to appear *Actas do V Congresso Anual da Sociedade Portuguesa de Estatística*, 1997.

M. C. Gouveia, “Some results on generalized inverses of Toeplitz matrices”, *Proceedings of EAMA-97*, Meeting on Matrix Analysis and Applications, Sevilla, Sept. 10-12, 1997.

J. Júdice, L. Portugal, M. Resende and G. Veiga, “Um método de pontos interiores para a resolução de um problema de fluxo de custo mínimo com varias mercadorias numa rede não orientada”, *Actas da I Conferência Nacional de Telecomunicações*, 381-384, Aveiro, 1997.

L. N. Vicente, “Optimization methods for optimal control and design engineering”, *Actas da I Conferência Nacional de Telecomunicações*, 437-440, Aveiro, 1997.

Technical Reports and Papers Submitted to Publication

E. Gonçalves and N. Mendes Lopes, “A consistent test for a vectorial AR(1) model with a non-independent error process”, Departamento de Matemática da FCTUC, Preprint 97-05, 1997.

E. Gonçalves and N. Mendes Lopes, “Exponential decay of the convergence rate of a non-classical test for an AR model”, Departamento de Matemática da FCTUC, Preprint 97-20, 1997.

P. E. Oliveira and C. Suquet, “Weak convergence in $L_p(0,1)$ of the uniform empirical process under dependence”, Preprint, Publications de l'IRMA de Lille, vol. 41, VI, 1997.

P. Jacob and P. E. Oliveira, “Using non embedded partitions in histogram estimation”, Departamento de Matemática da FCTUC, Preprint 97-25, 1997.

C. M. Martins, “A note on the third-order moment structure of a bilinear model with non-independent shocks”, Departamento de Matemática da FCTUC, Preprint 97-03, 1997.

C. M. Martins, “On the autocorrelation structure of a bilinear model with non-independent shocks”, Departamento de Matemática da FCTUC, Preprint 97-04, 1997.

L. N. Vicente, "An Analysis of Newton's Method for Equivalent Karush-Kuhn-Tucker Systems", Departamento de Matemática da FCTUC, Preprint 97-14, 1997.

Miscellaneous

Organization of Conferences

- E.Goncalves: Member of the Organizing Committee of the Workshop on nonparametric and semiparametric statistical methods, Centro Internacional de Matematica and Human Capital and Mobility Network, Departamento de Matemática da FCTUC, Nov 1997.

Research Topics

- Algebra
 - (i) Preconditioning technics to accelerate the convergence of iterative methods. Error bounds for some iterative methods. Iterative methods for the solution of least squares problems.
 - (ii) Von-Neumann regular inverses of lower-triangular Toeplitz matrices over general rings and some applications in the computation of other generalised inverses.
- Optimisation
 - (i) Development and implementation of interior-point methods and preconditioning techniques for linear network and equilibrium problems.
 - (ii) Solution of global optimisation problems using complementarity.
 - (iii) Development, analysis of local and global convergence, and and implementation of interior-point and trust-region methods for optimal control and engineering design problems.
 - (iv) Minimal spanning and Steiner tree problem with hop constraints.
- Probabilities and Statistics
 - (i) Tests and forecasting in conditionally heteroscedatic models for time series. Nonlinear models: statistical and probabilistic analysis.
 - (ii) Convergence of the empirical process functions. Applications to statistics. Conditions for dependence.
 - (iii) Statistics for point processes.

7.2.4 Power Systems Research Line

Human Resources

Collaborators

- | | | |
|----------------------------------|---------------|----------------------------|
| • Eduardo de Sousa Saraiva | PhD | Full Professor, FCTUC |
| • António João Marques Cardoso | PhD | Assistant Professor, FCTUC |
| • André Manuel dos Santos Mendes | M.Sc. Student | Assistant, FCTUC |
| • Sérgio Manuel Ângelo da Cruz | M.Sc. Student | Assistant, FCTUC |

Other Collaborators

- | | | |
|---|---------------|--------------------|
| • Maria Teresa Barroca Delgado | M.Sc. Student | Assistant, IPViseu |
| • Manuel António Marques Esteves | M.Sc. Student | Assistant, IPL |
| • Luís Manuel Ramos de Oliveira | M.Sc. Student | Assistant, UALG |
| • Natália dos Santos Gameiro | M.Sc. Student | Assistant, IPL |
| • Nuno José de Abreu e Sousa Cabete Gil | Lic. Student | Final Year Project |
| • Pedro Manuel Meco Girão Veloso | Lic. Student | Final Year Project |
| • Carlos Frederico de Almeida Mendes | Lic. Student | Final Year Project |
| • Jorge Filipe Pinheiro Martins | Lic. Student | Final Year Project |
| • José Augusto de Almeida Mota | Lic. Student | Final Year Project |
| • Fernando José Silva. Jerónimo | Lic. Student | Final Year Project |

Projects

- PBIC/C/CEG/2441/95 ("Fault Analysis and Diagnostics in Electrical Variable Speed Drives") — Funded by JNICT (1996/1998), this project is intended to explore adequate strategies for diagnosing the occurrence of faults in electrical variable speed drives, which are widely used in many sectors of activity. During this second year of the project, a prototype was developed for the control module of the Electrical Variable Speed Drive and a simulation study, concerning its global operation, was also performed. Regarding the motor fault diagnosis, both simulation and experimental research has been conducted

concerning, mainly, the use of the Park's Vector Approach for diagnosing rotor cage faults. Laboratory tests were also performed, on the use of a similar approach for stator windings fault diagnosis, with very promising results.

- PEGO — Funded by PEGOP Energia Eléctrica S. A., this project is related to the condition monitoring of three-phase induction motors, of 400 V and 6 kV, at Pego Power Plant. Several tests were conducted on-site and the corresponding Technical Reports were prepared.
- SOPORCEL — Funded by SOPORCEL - Sociedade Portuguesa de Celulose S. A., this project is related to the condition monitoring of three-phase induction motors of 400 V and 6 kV. Several on-site tests were conducted both at Castela Water Pumping Station and Lavos Pulp and Paper Mills, and the corresponding Technical Reports were prepared.
- TRANSFOS ("Fault Analysis and Diagnostics of Three-Phase Power Transformers") — This is an exploratory project, which aims to assess the suitability of several techniques, for diagnosing transformer winding faults under various load conditions, and when supplied directly from the mains or fed from inverters . A special fault producing test rig was developed and used to investigate, among others, the occurrence of inter-turn short-circuits in the transformer coils. Meanwhile, a computational simulation study has also been undertaken, in order to allow for the correlation of the results.

M.Sc. Thesis

- Maria Teresa Barroca Delgado (supervisor: Eduardo de Sousa Saraiva), Universidade de Coimbra, in preparation (subject: Control of slip power).
- André Manuel dos Santos Mendes (supervisors: António João Marques Cardoso e Eduardo de Sousa Saraiva), Universidade de Coimbra, in preparation (subject: Power Electronics Fault Diagnosis).
- Sérgio Manuel Ângelo da Cruz (supervisor: António João Marques Cardoso), Universidade de Coimbra, in preparation (subject: Rotor Cage Fault Diagnosis in Three-Phase Induction Machines).
- Luís Manuel Ramos de Oliveira (supervisor: António João Marques Cardoso), Universidade de Coimbra, in preparation (subject: Fault Analysis and Diagnostics of Three-Phase Power Transformers).

Publications

Papers in Journals

E. S. Saraiva, "O Estado da Arte em Electromecânica", Ordem dos Engenheiros, Lisboa, *Anais da Engenharia e Tecnologia Electrotécnica*, ANO II, Nº 3, Março de 1997, pp. 9-11.

Papers in Conference Proceedings

E. S. Saraiva, "Efeitos do Campo Electromagnético Sobre a Saúde Humana na Gama dos 300 Hz aos 300 GHz", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Portugal, pp. 83-87, 10-11 Abril, 1997.

A. J. M. Cardoso and A. M. S. Mendes, "Thyristor-Controlled-Rectifiers Fault Diagnosis in Telecommunications Power Supply Systems, by Park's Vector Approach", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Portugal, pp. 475-478, 10-11 Abril, 1997.

A. J. M. Cardoso, S. M. A. Cruz and D. S. B. Fonseca, "Inter-Turn Stator Winding Fault Diagnosis in Three-Phase Induction Motors, By Park's Vector Approach", *Proceedings of the 1997 IEEE International Electric Machines and Drives Conference*, Milwaukee, Wisconsin, USA, pp. MB1-5.1 — MB1-5.3, May 18-21, 1997.

A. J. M. Cardoso and A. M. S. Mendes, "Converter Fault Diagnosis in Variable Speed DC Drives, by Park's Vector Approach", *Proceedings of the IEEE International Symposium on Industrial Electronics*, Guimarães, Portugal, Vol. 2, pp. 497-500, July 7-11, 1997.

A. J. M. Cardoso, "The Park's Vector Approach: A General Tool for Diagnostics of Electrical Machines, Power Electronics and Adjustable Speed Drives", *Record of the 1997 IEEE International Symposium on Diagnostics for Electrical Machines, Power Electronics and Drives*, Carry-le-Rouet, France, pp. 261-269, September 1-3, 1997.

Project Deliverables

A. J. M. Cardoso, "Controlo de Condição em Motores de 380 V e de 6 kV na Indústria de Cimentos", Technical Report, DIANA, Coimbra, Portugal, Março 1997.

A. J. M. Cardoso, A. M. S. Mendes and M. A. M. Esteves, "SOPORCEL - Estação de Bombagem de Castela", Technical Report DIANA-SOPORCEL 01/97, Coimbra, Portugal, Outubro 1997.

A. J. M. Cardoso, A. M. S. Mendes and M. A. M. Esteves, "PEGOP - Central Termoelétrica do Pego", Technical Report DIANA-PEGOP 01/97, Coimbra, Portugal, Novembro 1997.

Miscellaneous

Eduardo de Sousa Saraiva:

- Organizer and main lecturer of a "Summer Course in Power Electronics", in cooperation with BEST (Board of European Students of Technology), the Department of Electrical Engineering of the University of Coimbra, and Schneider. (28 of July of 1997, to 9 of August of 1997, two weeks course with theoretical and laboratory experiments, all documentation and lectures in English).

Main topics:

1. Introduction to Power Electronics.
 2. Synthesis of Converters.
 3. Theoretical introduction and laboratory utilization of "RECTIVAR 4" and "ALTIVAR 18" of Schneider.
 4. Simulation in Power Electronics with theoretical and computer utilization of SIMULINK and PSPICE.
 5. Complex representation of instantaneous three-phase voltages, currents and fluxes. Characteristics and laboratory utilization of Park Vector Visualizer MV 4212 of TERCO.
 6. Detection of faults using the Vector visualizer.
- Supervisor of Estágio Profissional (PRODEP II), José Augusto A. Mota, MIRALAGO - Águeda, concluded in 1997 (subject: " Maintenance and Energy Management in a factory ").
 - Supervisor of Estágio Profissional (PRODEP II), Fernando José Silva. Jerónimo, MAFIROL - Águeda, concluded in 1997 (subject: " Maintenance and Energy Management in a factory ").
 - Member of the Editorial Board of *Anais da Engenharia e Tecnologia Electrotécnica*, Ordem dos Engenheiros.

António João Marques Cardoso:

- Supervisor of Provas de Aptidão Pedagógica e Capacidade Científica, David Sérgio Baptista da Fonseca, Universidade da Beira Interior, in preparation (subject: "Fault Tolerance in Electromechatronic Systems").
- Supervisor of Estágio Profissional (PRODEP II), Luís Miguel Pedro Filipe, Cimpor - Centro de Produção de Souselas, concluded in 1997 (subject: " Predictive Maintenance: Suitability Assessment of the Rotor Current Spectrum Analysis for Diagnosing Three-Phase Slip-Ring Induction Motors").
- Supervisor of Estágio Profissional (PRODEP II) and Estágio Formal (ORDEM DOS ENGENHEIROS), Manuel António Marques Esteves, CECAP - Centro Cerâmico de Assistência Portuguesa Lda, concluded in 1997 (subject: Project, Construction and Instalation of an Industrial Ceramic Kiln").
- Presenter of a seminar "Controlo de Condição em Motores de Indução Trifásicos, na Indústria de Produção de Energia Eléctrica" at the Central Termoeléctrica do Pego, Abrantes, Portugal, Maio 1997.
- Organiser of *II Jornadas de Diagnóstico e Análise de Avarias em Sistemas Electromecatrónicos* (DIANA'97), Laboratório de Máquinas Eléctricas, DEE/FCTUC, Coimbra, Portugal, Julho 1997.
- Actively involved, as an expert, in the field of standardisation on condition monitoring and diagnostics, both at a national and international level, where he has been acting as a Convenor of ISO/TC 108/SC 5 Advisory Group C (Condition monitoring of electrical motors and generators, for the purposes of diagnostics) and member of several Working Groups of ISO, IEC and CEN.
- Reviewer for *IEEE Transactions on Industry Applications* and *IEEE Transactions on Power Electronics*.
- Honorary Member of the International Biographical Centre Advisory Council, Cambridge, England.
- Honorary Member of the International Editorial Panel of *International Journal of Condition Monitoring and Diagnostic Engineering Management*, published by COMADEM International, Birmingham, UK.

7.3 Aveiro Pole

7.3.1 Radio, Microwaves and Millimetre waves Research Line

Human Resources

Collaborators

- | | | |
|---------------------------|-------------|-------------------------|
| • José Carlos Neves | PhD | Associate Professor, UA |
| • José Rocha Pereira | PhD | Associate Professor, UA |
| • José Carlos Pedro | PhD | Assistant Professor, UA |
| • João Nuno Matos | PhD | Assistant Professor, UA |
| • Armando Rocha | PhD | Assistant Professor, UA |
| • José Fernandes | PhD | Assistant Professor, UA |
| • António Navarro | PhD | Assistant Professor, UA |
| • Nuno Borges de Carvalho | PhD Student | Assistant, UA |
| • Luis Travassos | Lic. | Engineer, PT - CET |
| • Manuel Dinis | Lic. | Engineer, PT - CET |

Other Collaborators

- | | | |
|--------------------------|---------------|-------------------|
| • Arlindo Marques | M.Sc. | Grant, PRAXIS XXI |
| • Francisco Costa | M.Sc. | Grant, IT |
| • António Costa | M.Sc. Student | Grant, PRAXIS XXI |
| • Carla Raquel Madureira | M.Sc. Student | Grant, IT |
| • Ilidio Chaves | M.Sc. Student | Grant, PRAXIS XXI |
| • Paulo Marques | M.Sc. Student | Grant, PRAXIS XXI |
| • Pedro Pinho | M.Sc. Student | Grant, PRAXIS XXI |
| • Victor Santos | M.Sc. Student | Grant, PRAXIS XXI |
| • Rui Silva | M.Sc. Student | Grant, IT |
| • Pedro Ribau | M.Sc. Student | Grant, IT |

• Carlos Santiago	Lic.	Grant, PRAXIS XXI
• Guilherme Andrade	Lic.	Grant, IT
• José Ferreira	Lic.	Grant, IT
• Mário Rui Santos	Lic.	Grant, IT
• Paulo Jesus	Lic.	Grant, IT
• Pedro Silva	Lic.	Grant, IT
• António Guerra	Lic. Student	UA, Final Year Project
• Belmiro Lapa	Lic. Student	UA, Final Year Project
• Bruno Jorge R.S.R. Candeias	Lic. Student	UA, Final year project
• Carla Helena da Rocha Gomes	Lic. Student	UA, Final year project
• Carlos Jorge Flor	Lic. Student	UA, Final year project
• Filipe Joel Ferreira	Lic. Student	UA, Final year project
• Isabel Almeida	Lic. Student	UA, Final Year Project
• Joana M. da Cruz M. Ramos	Lic. Student	UA, Final year project
• João Figueiredo	Lic. Student	UA, Final Year Project
• José Emanuel Garcia	Lic. Student	UA, Final Year Project
• Luís Filipe Lopes	Lic. Student	UA, Final year project
• Manuel Gonçalves	Lic. Student	UA, Final Year Project
• Mário Gomes Monteiro	Lic. Student	UA, Final year project
• Nuno Miguel Amaral	Lic. Student	UA, Final year project
• Paulo Peixoto	Lic. Student	UA, Final Year Project
• Pedro Direito	Lic. Student	UA, Final Year Project
• Pedro Jorge Salvador	Lic. Student	UA, Final year project
• Pedro Mónica	Lic. Student	UA, Final Year Project
• Pedro Oliveira	Lic. Student	UA, Final Year Project
• Pedro Pinho	Lic. Student	UA, Final Year Project
• Pedro Ribeiro	Lic. Student	UA, Final Year Project
• Sérgio Martins	Lic. Student	UA, Final Year Project

Projects

- LAMBADA - ("Mobile Broadband Communications Field Trials). Planning of the field trials with the EXPO'98 organisers and the RIA National Host. Preparation of the integration tests. Studies on integration and inter-networking with the fixed ATM network.
- COST 252 - ("Evolution of Satellite Personal Communications from Second to Future Generations Systems"). No activities during 1997 due to a lack of manpower. Hopefully IT will participate during 1998.
- COLORS - ("Spread Spectrum System for ISDN Local Loop"). Definition of the system architecture. Identification of the requirements. Protocols adaptation. Baseband processing definition.
- CORAL — ("Radio Communications for a Wide Band Local Access"). Development of an Asymmetrical Communication System using RF (2Mbit/s for the downlink and 64Kbit/s for the uplink). Development of RF transceivers at 1.5 GHz. Development of pre-codification modules and QPSK and DS-CDMA modulation modules. Simulation and performance evaluation of a pre-coding algorithm to mitigate the multipath dispersion to be implemented in the project demonstrator.
- PRAXIS XXI - 3/3.1/TIT/35/94 - ITCOM — ("Integration of Technologies in Mobile Communications"). Development of a 2 GHz frequency synthesiser with small switching time, high spectral purity and frequency step of 5MHz. Development of the RF circuitry necessary for the optical return-link. For that, an MMIC tuned receiver front-end was designed and sent for fabrication. Also, the previously designed handset MMIC power amplifier was tested. A saturated output power of 19mW with 52% power added efficiency was measured. Inclusion of transmitted rays and single diffracted rays on a ray tracing tool. First studies for the inclusion of high order rays suffering at least one diffraction.
- RADICAL — ("High bit rate Digital Cellular Mobile Radio"). Characterisation of the radio propagation channel taking into account the antenna configuration for the evaluation of single-carrier and multi-carrier transmission techniques for mobile broadband systems. A complex channel impulse model of the multipath radio channel was also refined.
- AGORA — ("Antenna array with electronic beam steering"). The antenna array made of eight radiating elements was designed, built and tested. The first RF prototype for

amplitude and phase control of the signal feeding the antenna was also built and tested. The eight RF blocks are now being assembled and calibrated.

- DISERT — (“Television Services Distribution System”). Design and development of a flexible allocation unit. This work involved the study, project and test of : low noise amplifiers, low phase noise VCO’s, PLL frequency synthesisers and tracking filters. An industrialisation suitable prototype was built and tested by assembling developed wide band power combiners and voltage controlled attenuators.
- LIRA — (“Linearity and Efficiency in Power Amplifiers”). The activities under project LIRA were dedicated to the development of an efficient non-linear circuit simulator appropriate for multi-tone distortion analysis. The addition of a non-linear device model approximant, based on Hermite rationals, allowed the comparison of measured and simulated results of a power amplifier spectral regrowth test.
- PRAXIS XXI - 2/2.1/TIT/1562/95 - ISAC - (“Implementation Aspects of a Mobile Telecommunications Satellite System Payload with Dynamic Channel Allocation”). ISAC duties have just started and some preliminary work on non-linear two-port representation, based on two double Volterra series, has already been done. Also, exploratory work on electron device physical simulation was done, which enabled the development of a small one-dimensional simulator.
- COST 255 - (“Radiowave Propagation Modelling for New SatCom Services”). A contribution for the Final Report on the tropospheric channel structure was prepared with Fondazione Ugo Bordoni,.
- COST 260 - (“Smart Antenna: Computer Aided design and Technology”). Participation in two management committee meetings. Contribution in antenna design topics.

PhD Thesis

- Manuel Jesus Dinis, (supervisor: José Carlos Neves), Universidade de Aveiro, to be concluded in 1998 (subject: Mobility and Resource Management in Mobile Satellite Systems for Global Communications).
- Nuno Borges de Carvalho (supervisor: José Carlos Pedro), Universidade de Aveiro, started in 1996 (subject: Optimization of Non Linear Distorsion Intermodulation in Multicarrier Signal Amplifiers).

M.Sc. Thesis

- Arlindo Marques (supervisor: José Carlos Neves), Universidade de Aveiro, concluded in 1997 (title: Characterization of the Reflection of Electromagnetic Waves in Rough Surfaces).
- Francisco Costa (supervisor: José Carlos Neves), Universidade de Aveiro, concluded in 1997 (title: Mobility Management in Mobile Satellite Networks).
- António Arsénio Costa (supervisor: José Carlos Neves), Universidade de Aveiro, to be concluded in 1998 (subject: Inter-satellite Handover in Mobile Satellite Networks).
- Victor Santos (supervisor: José Carlos Neves), Universidade de Aveiro, to be concluded in 1998 (subject: Resource Management in Mobile Satellite Constellations).
- Ilidio Chaves (supervisor: José Carlos Neves), Universidade de Aveiro, to be concluded in 1998 (subject: Network Architecture in Mobile Satellite Constellations).
- Paulo Jorge Marques (supervisors: José Fernandes and José Neves), Universidade de Aveiro, to be concluded in 1998 (subject: Radio Propagation Channel Modelling for Broadband Mobile Systems).
- Luis Gomes (supervisor: José Carlos Pedro), Universidade de Aveiro, to be concluded in 1998/ started 1996 (subject: Highly Efficient Power Amplifiers).
- Carla Raquel Madureira, (supervisor: José Carlos Pedro), Universidade de Aveiro, to be concluded in 1998/ started 1996 (subject: Modelling and Linearization of Diode Lasers).

Publications

Papers in Journals

J. C. Pedro, "Evaluation of MESFET Nonlinear Intermodulation Distortion by Channel Doping Control", *IEEE Trans. on Microwave Theory and Tech.*, vol. MTT-45, pp.1989-1997, Nov, 1997.

Victor Santos, Pedro Tavares, José Ferreira, Manuel Dinis, "Tráfego e Gestão de Canais em Redes Móveis Via Satélite", *Anais de Engenharia e Tecnologia Electrotécnica*, Ano II, Nº 4, June 1997, pg. 29-32.

Nuno Borges de Carvalho, José Carlos Pedro, "Alternativa ao Spice para Simulação do Estado Estacionário de Circuitos Não Lineares", *Revista do Departamento de Electrónica e Telecomunicações da Universidade de Aveiro*, Vol.1, N°7, Janeiro, 1997.

Pedro Tavares, José Ferreira, Manuel Dinis, "Simulador de Trafego para Redes Moveis via Satélite", *Revista do Departamento de Electrónica e Telecomunicações da Universidade de Aveiro*, Vol.2, N°1, pg. 37 a 45, September 1997.

J. Fernandes, J. Neves, "Modelo de Propagação de Banda Larga para a Faixa das Ondas Milimétricas", *Revista do Dept. de Elect. e Telecom. da Universidade de Aveiro*, Vol. 1, No 7, pp. 685-693, Jan. 1997.

J. N. Matos, J. Perez, J. C. Neves, "Sincronização de Osciladores", *Revista do Departamento de Electrónica e Telecomunicações*, Universidade de Aveiro, Vol. 1, n°7, pp.723-728, Janeiro de 1997.

A. Rocha, " Sobre a Influência da Sonda em Medições com Linha Ranhurada", *Revista do Departamento de Electrónica e Telecomunicações*, Universidade de Aveiro, Vol. 1, n°7, pp.723-728, Janeiro de 1997.

Papers in Conference Proceedings

Victor Santos, Manuel Dinis, José Neves, "Gestão de Recursos em Sistemas de Comunicação Moveis via Satélite", *Actas da I Conferencia Nacional de Telecomunicações*, Aveiro, 10-11 de April 1997.

Manuel Dinis, José Fernandes, Luís Travassos, José Neves, Vasco Lagarto, "Sistema de Comunicações Móveis para Aplicações de Banda Larga", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, 10-11 de April 1997.

José Ferreira, Pedro Tavares, Victor Santos, Manuel Dinis, José Neves, "Estudo e Modelos de Tráfego para Redes de Satélites que Usem Constelações do Tipo LEO e ICO", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, 10-11 de April 1997.

Francisco Costa, Manuel Dinis, José Neves, "Gestão de Mobilidade em Sistemas de Comunicações Móveis Usando Redes de Satélites", *Actas da I Conferencia Nacional de Telecomunicações*, Aveiro, 10-11 de April 1997.

António Arsénio, Manuel Dinis, José Neves, "Gestão de Handovers Inter-satélite em Sistemas de Comunicações Móveis por Satélite não Geoestacionários", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, 10-11 de April 1997.

Rui Silva, Manuel Dinis, Atílio Gameiro “Dimensionamento de Sistemas Baseados em Spread Spectrum para RDIS”, *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, 10-11 de April 1997.

Victor Santos, José Ferreira, Pedro Tavares, Manuel Dinis, "Trafego e Gestão de Canais em Redes Moveis via Satélite", *3º Encontro Nacional do Colégio de Engenharia Electrotécnica*, Porto, 5-6 June 1997.

José Ferreira, Pedro Tavares, Manuel Dinis, Victor Santos, Rui Silva, José Neves, "Traffic and Channel Management in Satellite Mobile Networks", *XII Simposium Nacional de la URSI '97*, Bilbao, Spain, 15-17 September 1997.

Manuel Dinis, “Mobile Broadband System”, *Wireless Broadband Communications Workshop*, Brussels, Belgium, 29 September 1997.

Manuel Dinis, Max Prögler, John Zubrzycki, Vasco Lagarto, “SAMBA: a Step to Bring MBS to the People”, *ACTS Mobile Communications Summit '97*, Aalborg, Denmark, 7-10 October 1997.

José Ferreira, Pedro Tavares, Manuel Dinis, Victor Santos, Rui Silva, "Traffic Models and Resource Management in Satellite Mobile Networks", *ECSC-4*, Rome, Italy, 18-20 November 1997.

Manuel Dinis, Pedro Tavares, José Ferreira, Victor Santos, “Traffic Simulator for LEO and ICO Type Mobile Satellite Networks”, Submitted to *VTC '98*, May 18-21, Ottawa, Canada, 1998.

Victor Santos, Manuel Dinis, José Neves, “Performance Evaluation of Prioritisation Techniques Used in Satellite Networks Based on an Iterative Method”, Submitted to *VTC '98*, May 18-21, Ottawa, Canada, 1998.

J. N. Matos, ”Aplicação de Osciladores Sincronizados por Injecção em Receptores Spread Spectrum”, *Actas da I Conferência Nacional de Telecomunicações*, pp. 151-153, Aveiro, Abril de 1997.

M. J. Lima, P. P. Monteiro, J. F.da Rocha, J. N. Matos, A. L. Teixeira, ”Realização de Circuitos em Tecnologia Monolítica de Arsenieto de Gálio para a Recuperação de Relógio em sistemas Multigigabit”, *Actas da I Conferência Nacional de Telecomunicações*, pp. 237-240, Aveiro, Abril de 1997.

J. N. Matos, Atílio Gameiro, "Técnicas de Espalhamento de Espectro para Sistemas de Acesso Local", *3º Encontro Nacional do Colégio de Engenharia Electrotécnica*, pp. 375-380, Porto, Junho de 1997.

J. N. Matos, P. Silva, "Direct Sequence Spread Spectrum Transceiver Simulation", *XII Symposium Nacional de la Unión Científica Internacional de Radio*, vol. I, pp. 419-422, Bilbao, Setembro 1997

A. Gameiro, J. N. Matos, "Direct Sequence Spread Spectrum System for Wireless Local Loop", *XII Symposium Nacional de la Unión Científica Internacional de Radio*, vol. I, pp. 677-680, Bilbao, Setembro 1997

J. Fernandes and J. Neves, "New Wide-band Propagation Channel Model for the mm-Wave Band", *2nd International Symposium on Mathematical Modelling*, Vienna, Austria, pp. 509-515, Feb. 1997.

A. Marques, J. Fernandes, A. Rocha e J. Neves, "Caracterização das Reflexões em Superfícies Rugosas", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, pp. 215-218, Abril 1997.

P. Marques, J. Fernandes e J. Neves, "Diversidade Espacial em Sistemas de Comunicação Móveis de Banda Larga", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, pp. 207-210, Abril 1997.

J. Fernandes e J. Neves, "Avaliação do Impacto do Cenário e das Antenas no Desempenho de Transmissão", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, pp. 211-214, Abril 1997.

C. Caseiro, P. Torres, J. Fernandes, R. Dinis e A. Gusmão, "Avaliação de uma Técnica de Controlo de Erros para o MBS", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, pp. 135-138, Abril 1997.

A. Gameiro, J. Fernandes, J. N. Matos, P. Ribau and P. Silva, "Asymmetrical Wireless Radio System for Local Access", *II Seminario de Comunicaciones Móviles*, Vigo, Spain, July 1997.

J. Fernandes, "Mobile Broadband Communications", *II Seminario de Comunicaciones Móviles*, Vigo, Spain, July 1997.

V. Degli-Esposti, G. Riva, L. Correia, J. Fernandes, G. Falciasecca, "Wideband Characterization of Mm-Wave Propagation in Indoor Scenarios for WLANs", *2nd European*

Personal Mobile Communications Conference (EPMCC'97), Bonn, Germany, Sept.-Oct.1997

R. Dinis, A. Gusmão and J. Fernandes "Adaptive Transmission Techniques for the Mobile Broadband System", *ACTS Mobile Communications Summit '97*, Aalborg, Denmark, pp.635-640, Oct. 1997.

R. Pereira, M. Himdi, J. P. Daniel, "Estudo de Estruturas para Dupla Frequência e Dupla Polarização usando Patches com Fendas", *Actas da I Conferência Nacional de Telecomunicações*, pp. 151-153, Aveiro, April de 1997.

A. Rocha, J. Neves, "Two XPD Frequency Scaling Models using Quasi-physical Parameters to Characterize Earth Satellite Propagation Channel", *Proceedings of the IEEE Antennas and Propagation Symposium*, Vol. 4, pp 2548-2551, Montreal, Canada, June, 1997.

A. Rocha, J. Neves, "Results on Earth-Satellite Propagation Medium Structure", *Proceedings of International Conference on Antennas and Propagation (ICAP'97)*, pp. 2.157-2.160, Edimburgh, Scotland, April, 1997

J. C. Pedro, N. B. Carvalho and R. C. Madureira, "Nonlinear Distortion Study of FM Transmission Systems Composed By a VCO-PLL Association", *1997 IEEE Intern. Symposium on Circuits and Systems*, pp.957-960, Hong Kong, Jun., 1997.

J. A. Garcia, A. Mediavilla, A. Tazón, J. L. Garcia and J. C. Pedro, "Accurate Characterization Procedure of MESFET's Reactive Nonlinearity for Intermodulation Analysis", *1997 European GAAS Symposium*, pp.87-90, Bologna, Sept., 1997.

J. C. Pedro and P. G. Domingues, "Evaluation of 2nd and 3rd Order Intermodulation Distortion of Cascaded MESFET's", *27th European Microwave Conference*, pp.739-744, Jerusalem, Sept. 1997.

J. C. Pedro and P. G. Domingues, "Distorção Não-Linear em Amplificadores Multi-Oitava a GaAs MESFET", *Actas da I Conferência Nacional de Telecomunicações*, pp.459-462, Aveiro, April, 1997.

J. C. Pedro, "Análise de Cascatas de Quadripolos Fracamente Não-Lineares", *Actas da I Conferência Nacional de Telecomunicações*, pp.463-466, Aveiro, April, 1997.

R. C. Madureira and J. C. Pedro, "Microwave Non-Linear Small Signal Model for Computer Added Design of Semiconductor LASER Analogue Transmitters", *Actas del XII Simposium Nacional de URSI*, pp.II-449-II-452, Bilbao, Sept., 1997.

J. A. Garcia, F. Marante, A. Mediavilla, A. Tazón, J. L. Garcia and J. C. Pedro, "Caracterización Experimental de las No Linealidades Reactivas en Transistores FET para la Descripción de Su Comportamiento en Intermodulación", *Actas del XII Simposium Nacional de URSI*, pp.I-271-I-274, Bilbao, Sept., 1997.

J. A. Garcia, E. R. Denis, A. Mediavilla, A. Tazón, J. L. Garcia, N. Borges and J. C. Pedro, "Contribución de la No Linealidad $I_{ds}(V_{gs}, V_{ds})$ a la Distorsión de Intermodulación en Transistores MESFETs y HEMTs", *Actas del XII Simposium Nacional de URSI*, pp.I-5-I-8, Bilbao, Sept., 1997.

J. M. Zamanillo, J. A. Garcia, A. Mediavilla, A. Tazón and J. C. Pedro, "Modelado de Dispositivos PHEMT Con Encapsulado Plástico Incluyendo Efectos de Intermodulación", *Actas del XII Simposium Nacional de URSI*, pp.I-9-I-12, Bilbao, Sept., 1997.

J. C. Pedro, "Analysis and Design of Very Linear Microwave Power Amplifiers for Telecommunications Applications", *Actas de la 9ª Conferencia Científica de Ingeniería y Arquitectura*, pp. 61-62, Ciudad de La Habana, Nov. 1997.

J. A. Garcia, E. R. Denis, A. Mediavilla, A. Tazón, J. L. Garcia, N. Borges and J. C. Pedro, "Distorsión de Intermodulación de la Fuente no Lineal de Corriente I_{ds} en MESFET y HEMT de Microondas", *Actas de la 9ª Conferencia Científica de Ingeniería y Arquitectura*, pp.83-, Ciudad de La Habana, Nov. 1997.

J. A. Garcia, F. Marante, A. Mediavilla, A. Tazón, J. L. Garcia and J. C. Pedro, "Caracterización Experimental del Comportamiento en Intermodulación de las No Linealidades Reactivas en Transistores Microondas", *Actas de la 9ª Conferencia Científica de Ingeniería y Arquitectura*, pp.64, Ciudad de La Habana, Nov. 1997.

Nuno Borges de Carvalho, José Carlos Pedro, "Simulação da Resposta Estacionária de Circuitos Não-Lineares de Rádio Frequência -Estado da Arte 1996-", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, 10-11 Abril de 1997.

Nuno Borges de Carvalho, José Carlos Pedro, "Simulação de Circuitos Não-Lineares para Aplicação em Comunicações Móveis", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, 10-11 Abril de 1997.

Nuno Borges de Carvalho, José Carlos Pedro, "Simulating Strong Nonlinear Microwave Circuits Driven By a Large Number of Input Tones", *27th European Microwave Conference Proceedings*, Jerusalem, Israel, 1997.

Nuno Borges de Carvalho e José Carlos Pedro, "A Fast Spectral Balance Method for Non-linear Circuit Simulation in the Frequency Domain", *URSI 97 Proceedings*, Bilbao, Espanha, 1997.

Project Deliverables

Manuel Dinis, Vasco Lagarto, "Definition of the Trial Infrastructure and Applications", CEC Deliverable Number A0204/PT/CET/DS/P/005/b1, 30/09/97, SAMBA project.

P. Marques and J. Fernandes, "Performance Evaluation of Space Diversity", SAMBA Internal Report, SAMBA/IT211021, January, 1997.

J. Fernandes and P. Marques, "Contribution to the Air Interface Deliverable", SAMBA Internal Report, SAMBA/IT211031, April, 1997.

P. Jesus, J. Ferreira, J. Fernandes and J.R. Pereira, "Specifications of the demonstrator - First Version", AGORA Internal Report, May, 1997.

P. Jesus, J. Ferreira, J. Fernandes and J.R. Pereira, "Final Specifications of Demonstrator", AGORA Internal Report, November, 1997.

J. Fernandes and A. Marques, "Procedures for the Integration and System Tests of the Trial Platform", SAMBA Internal Report, SAMBA/IT325031, September, 1997.

M. Santos, G. Andrade, J. Neves, "Flexible Allocation Unit, Phase 2", DISERT Report for business partner TEKA Portuguesa, DISERT, September, 1997

M. Santos, G. Andrade, J. Neves, "Technical Report: Flexible Allocation Unity", DISERT Internal IT Report, DISERT, October, 1997

M. Santos, G. Andrade, J. Neves, "Fase 1 e 3", "Fase 2 e 4", DISERT Reports for PEDIP, DISERT, July, 1997

M. Santos, G. Andrade, J. Neves, "Progress Report" DISERT Report for PEDIP, DISERT, September, 1997

Miscellaneous

- Manuel Dinis member of the Technical Committee of "*ACTS Mobile Communications Summit '97*" held in Aalborg, Denmark, 7-10th October.

- J. C. Pedro member of the Organising Committee of *I Conferência Nacional de Telecomunicações*, 1997.
- Armando Rocha, Chairman of the Organising Committee, and José Neves, member of the Scientific Committee, started the preparation of “*URSI Commission F Symposium on Wave Propagation and Remote Sensing*” to be held in Aveiro, September 1998.
- Arlindo Marques, member of the Organising Committee, participated in the preparation of the “*URSI Commission F Symposium on Wave Propagation and Remote Sensing*” to be held in Aveiro, September 1998.
- R. Pereira established a joint French-Portuguese research project in Dual Frequency Microstrip Antennas involving University of Aveiro, IST and University of Rennes I, supported by the French Embassy in Portugal and Fundação para a Ciência e Tecnologia.
- José Neves member of the Executive Board of Instituto de Telecomunicações.

7.3.2 Networks Research Line

Human Resources

Collaborators

• Artur Calado	Lic.	Director, PT - CET
• Rui T. Valadas	PhD	Assistant Professor, UA
• Amaro F. de Sousa	Lic.	Assistant, UA
• Luís Silva	Lic.	Head of Division, PT - CET
• Nuno Silva	Lic.	Engineer, PT - CET
• Jorge M. Carapinha	M.Sc.	Engineer, PT - CET
• Bernardete Tavares	M.Sc.	Engineer, PT - CET
• H. Teixeira de Sousa	Lic.	Director, PT - CET
• Jorge Gonçalves	M.Sc.	Engineer, PT - CET
• José Pedro Fernandes	M.Sc.	Engineer, PT - CET
• Paula Fonseca	PhD	PT - CET
• Telma Mota	Lic.	Engineer, PT - CET
• Clara Guerra	Lic.	Engineer, PT - CET
• José Maio	Lic.	Engineer, PT - CET

Other Collaborators

• João Gregorio	Lic.	
• Isabel Gomes	Lic.	
• António José Silva	Lic.	
• Paula Cristina Couto	PhD student	Grant, PRAXIS XXI
• António Duarte Nogueira	PhD student	Grant, PRAXIS XXI
• Carlos Manuel Oliveira	M.Sc. student	Grant, PRAXIS XXI
• Celso Ribeiro Lemos	M.Sc. student	Grant, UA
• Luís António Pinheiro	M.Sc. student	Grant, PRAXIS XXI

• Alberto J. Nascimento	M.Sc. student	Engineer, TMN
• Rui Pereira Coelho	M.Sc. student	Engineer, TMN
• Luís Pedro Cardoso	Lic.	Grant, IT
• Susana Isabel Sargento	Lic.	Grant, IT
• Lisa Silva	Lic.	Grant, IT
• Carlos Paiva	Lic.	Grant, IT
• António Carvalho	Lic.	Grant, IT
• Gustavo P. Basto	Lic.	Grant, IT
• Pedro Brandão	Lic.	Grant, IT
• Jorge Carvalho	Lic.	Grant, IT
• Paulo Rocha	Lic.	Engineer, IT
• Paulo Loureiro	Lic.	Grant, IT
• António Lopes	Lic.	Grant, IT
• Paulo Pereira	Lic.	Grant, IT
• António Aragão	Lic.	Grant, IT
• Pedro Claro	Lic.	Grant, IT
• Alexandre Almeida	Lic.	Grant, IT
• Rui Machado	Lic.	Grant, IT
• Vitorino Cunha	Lic.	Grant, IT
• António Neves Rocha	Lic.	Grant, IT
• Frederico Costa	Lic.	Grant, IT
• Manuel Aguiar	Lic.	Grant, IT
• Vitor Oliveira	Lic.	Grant, IT

Projects

- CESTA — Statistical characterisation and simulation of ATM traffic, sponsored by Portugal Telecom. The project started in 1997. The main objective of the project is the development of a dimensioning tool for ATM networks that integrates traffic model fitting and selection procedures with optimisation routines for cost-effective resource management. The main results were: (i) survey of traffic models and statistical inference

techniques for ATM traffic, (ii) survey of resource management methods for ATM networks, (iii) development of a routine to calculate the equivalent bandwidth of the statistical multiplexing of multiple homogeneous on-off sources, (iii) development of an optimisation routine for ATM networks based on end-to-end VPCs with statistical multiplexing at the access point of each VPC (the optimisation routine uses a subgradient optimisation algorithm with lagrangean relaxation).

- PLANRI - Integrated Network Planning, sponsored by Portugal Telecom, jointly executed by CET.

The main results were achieved:

- Design and implementation of a ORACLE database.
- Design and implementation of a Visual C++ based GUI for database management and planning execution .
- Specification and implementation of a C++ module to planning/dimensioning the PSTN network.
- Execution of several tests to the PSTN module.
- Specification and implementation of a C++ module to planning/dimensioning the SSN7 network.
- SSN7 module testing initiation.

- GISA - Management of Integrated SDH and ATM networks

Related with MISA ACTS project, IT acting as CET subcontractor.

Main results:

- Final edition of QATM management interface specification addressing configuration, fault and performance.
- Implementation and testing of QATM agent.
- Specification and implementation of the multitechnology (ATM and SDH) alarm correlation component of the MISA OS.

- GRESA - Development of ATM Network and Services integrated solution

Sponsored by Portugal Telecom, in collaboration with CET.

The following results were achieved:

- Specification of the RIA ATM OS architectural solution based on the TINA Connection Management architecture.
- Implementation and test of a first version of Service Layer OS, with functionality for end-to-end VP management and customer administration. Integration of Service Layer OS and the Network Layer RIA ATM OS component for configuration and fault functionality.

- Design and implementation of the RIA ATM OS main computational objects for the Connection Management (CM) and Resource Configuration Management (RCM) management subsystems.
- VITAL/LATIV - Development of a prototype for the validation of the TINA architecture. Related with ACTS VITAL project. IT is a project partner, involved in the development of support applications that will exercise the platform; it also provides collaborative effort with CET (LATIV) for the specification and development of some modules of the TINA architecture.
Main results:
 - specification, implementation and integration of the Connection Session Manager (CSM) and Connection Coordinator (CC) computational objects of the Vital V2 architecture
 - development of the services Shared Whiteboard and Slide Presentation, which are part of the Teletraining Application implemented in Vital V2 Demonstrator
 - Integration and field trial of Vital V2 Demonstrator at the Portuguese National Host (RIA) environment
- MUXATM - ATM services multiplexer
Project sponsored by Portugal Telecom, jointly executed with CET
The following results were achieved:
 - Implementation of the MUXATM element manager.
- MEGABIT - Management of a 2 Mbits cross-connect
Project sponsored by Portugal Telecom, jointly executed with CET
The following results were achieved:
 - Implementation of the network management application
 - Implementation of the service management application.

PhD Thesis

- Amaro Fernandes de Sousa (supervisor: Anibal Oliveira Duarte), University of Aveiro, in preparation, (subject: Transport protocols for multimedia communications in broadband networks).
- António Duarte Nogueira (supervisor: Rui Valadas), University of Aveiro, started in 1997 (subject: Statistical characterization of ATM traffic).

- Paula Cristina Couto (supervisor: Rui Valadas), University of Aveiro, in preparation, (subject: Wireless ATM Local Area Networks).

M.Sc. Thesis

- Bernardete Tavares, University of Aveiro, to be concluded in 1998, (subject: A Tool to Planning/Dimensioning the PSTN and SSN7 Networks).
- Carlos Manuel Oliveira (supervisor: Rui Valadas), University of Aveiro, to be concluded in 1998, (subject: Study and implementation of RSVP protocols).
- Celso Ribeiro Lemos (supervisor: Rui Valadas), University of Aveiro, to be concluded in 1998, (subject: Topological design of telecommunication networks).
- Luís António Pinheiro (supervisor: Rui Valadas), University of Aveiro, to be concluded in 1998, (subject: Dynamic routing in telecommunication networks).
- Alberto J. Nascimento (supervisor: Rui Valadas), University of Aveiro, to be concluded in 1998, (subject: Teletraffic engineering for mobile communication networks).
- Jorge M. Carapinha (supervisor: Rui Valadas), University of Aveiro, to be concluded in 1998, (subject: ATM virtual private networks).
- Rui Pereira Coelho (supervisor: Oliveira Duarte), University of Aveiro, concluded in 1997, (subject: Planning and dimensioning aspects of ATM networks).

Publications

Papers in Journals

C. Bertin , A. de Sousa, G. Figuera, M. Friedrich, M. Guglielmo, "RACE MARS Project for the Experimentation of Multimedia Interactive Services: Architecture Solutions and Results", *European Transactions on Telecommunications (ETT)*, Vol. 8, No. 4, July/August 1997.

R. Valadas, A. Moreira, C. Lomba, A. Tavares, L. Moreira, C. Oliveira, R. Aguiar, A. de Sousa, A. Duarte, "Contribuições da Universidade de Aveiro para a Especificação da Rede de Área Local não-cablada IEEE 802.11", *Revista do Departamento de Electrónica e Telecomunicações da Universidade de Aveiro*, Vol. 1, No 7, pp. 695 — 704, January 1997.

R. Coelho, R. Aguiar, A. de Sousa, A. Duarte, "Integração dum Plataforma ATM no Campus da Universidade de Aveiro", *Revista do Departamento de Electrónica e Telecomunicações da Universidade de Aveiro*, Vol. 1, No. 7, January 97.

P. Couto, R. Valadas, A. Duarte, "Estudo e Desenvolvimento da Subcamada MAC da Rede de Área Local sem Fios IEEE802.11", *Revista do Departamento de Electrónica e Telecomunicações da Universidade de Aveiro*, Vol. 2, No 1, pp. 95 — 105, September 97.

7.3.3 Optical Communications Research Line

Human Resources

Collaborators

- | | | |
|---------------------------|------|-------------------------|
| • José Ferreira da Rocha | PhD | Full Professor, UA |
| • Mário Rui Ferreira | Lic. | Engineer, PT-CET |
| • Atilio da Silva Gameiro | PhD | Assistant Professor, UA |
| • Paulo Pereira Monteiro | Lic. | Assistant, UA |
| • Rui F. Gomes Ribeiro | PhD | Assistant Professor, UA |
| • Rui Valadas | PhD | Assistant Professor, UA |
| • Teresa Almeida | Lic. | Engineer, PT-CET |

Other Collaborators

- | | | |
|--------------------------|---------------|-------------------|
| • António Manuel Tavares | PhD Student | Grant, PRAXIS XXI |
| • António Domingos Reis | PhD Student | Assistant, UBI |
| • António Teixeira | PhD Student | Grant, PRAXIS XXI |
| • Rui Alves | PhD Student | Grant, PRAXIS XXI |
| • João Miguel Figueiredo | Lic. | Grant, IT |
| • Pedro Tavares | Lic. | Grant, IT |
| • Mário Lima | M.Sc. Student | Grant, IT |
| • Pedro Silva | Lic. | Grant, IT |
| • Pedro Ribau | M.Sc. Student | Grant, IT |
| • Albano Loureiro | M.Sc. Student | Grant, PRAXIS XXI |

Projects

- UPGRADE (ACTS Project Ac045)-Continuation of the design and production of new transimpedance amplifiers and active post-detection filters to be embedded in the optical front-end modules to be used within the project.

Simulation work showed that the multi-section laser can effectively extract a 10 GHz component from a data modulated signal. According to simulation results optical injection locking the linewidth of a free run self-pulsating laser, can be strongly enhanced. However, the optical power, both of the injected signal and that emitted by devices in the optical PLL is very important. All the devices used have been carefully characterised and particular attention was paid to the efficiency of the optical coupling to/from the devices using optimised fibre tappers. A complete set-up with micro-positioning, temperature control, drive and processing electronics and acquisition software has been developed.

- EMITON (Soliton Optical Emitter) (funded by Portugal Telecom). Project in collaboration with SCCEO Research line.

During 1997, the following results were achieved:

- Modelling of DFB module to be embedded in the final set-up.
- Theoretical study of chirp: standard fibre and an EDFA module were used, as well as a MZ interferometer loop.
- The specification of the short pulses transmitter aimed at in this project has been defined.

- CORAL (Funding Portugal Telecom). Project in collaboration with RMOM research line.

During 1997, the main following results were achieved:

- Specifications of the system issued.
- An all digital QPSK 2Mbit/s receiver to be used at the customer premises was built and tested.
- The precoder circuit to compensate for the channel multipath distortion was designed using CPLD technologies.

- COLORS (Funding Portugal Telecom). Project in collaboration with RMOM research line.

During 1997, the main following results were achieved:

- Completion of the RF part of the system. The assembly completed in 1997 and the tests continued in 1998.
- Specifications of the spread-spectrum part of the system, and design of a first version for the board, containing this part.

- Comunicações Rádio de Banda Larga (Funding JNICT). Project in collaboration with RMOM research line.

This project aims at providing theoretical support for the CORAL project, and during 1997, the main following results were achieved:

- Study through simulation of the precoding technique and validation of it.

- Studies on the channel models to be used for the CORAL project.
- PRAXIS XXI 2/2.1/TIT/9578/95 IRWLAN – Advanced Technologies for Wireless Infrared Local Area Networks. The project started in 1997. The main results were: (i) study and definition of signal and noise propagation models, (ii) study and definition of the optical configuration of the sectored receiver, (iii) study of techniques for estimating the signal-to-noise ratio, (iv) study of error correcting codes for the indoor optical channel, (v) development of a discrete version of the sectored receiver, (vi) study and implementation of low noise wide dynamic range front-ends.
- PRAXIS XXI 3/3.1/TIT/35/94 - ITCOM – The main results were (i) development of infrared transceivers, medium access controller and Ethernet access point, (ii) development of fiber optic modules for transport of radio signals.

PhD Thesis

- Adriano Jorge Cardoso Moreira (supervisor: Rui Valadas and Oliveira Duarte), University of Aveiro, concluded in 1997 (subject: Transmission systems for wireless infrared local area networks).
- Cipriano Rogério Alves Tavares Lomba (supervisor: Rui Valadas and Oliveira Duarte), University of Aveiro, concluded in 1997 (subject: Characterization of the indoor optical channel for wireless infrared local area networks).
- Paulo Miguel Nepomuceno Pereira Monteiro (supervisor: J. Ferreira da Rocha), University of Aveiro, to be presented in 1998 (subject: Optimal receivers for multigigabit systems).
- Rui Pedro O. Alves (supervisor: Rui Valadas and A. Gameiro), University of Aveiro, started in Sept. 1997 (subject: Coding techniques for wireless infrared communication systems).
- António Manuel Rodrigues Tavares (supervisor: Rui Valadas and Oliveira Duarte), University of Aveiro, in preparation (subject: Signal processing techniques to combat multipath dispersion and ambient light interference for infrared wireless local area networks).
- António Domingos Reis (supervisor: J. Ferreira da Rocha and A. Gameiro), University of Aveiro, in preparation (subject: Synchronization in broadband communication systems).

- António Teixeira (supervisor: J. Ferreira da Rocha), University of Aveiro, in preparation (subject: Optical Equalization in WDM systems).

M.Sc. Thesis

- António Francisco Pinto de Oliveira (supervisor: J. Ferreira da Rocha), University of Aveiro, presented and approved in 1997 (subject: Impact of the optical technology on cellular radio).
- Mário Lima (supervisor: J. Ferreira da Rocha), University of Aveiro, to be presented in 1998 (subject: Clock recovery in multigigabit systems).
- Rui Silva (supervisor: A. Gameiro), University of Aveiro, to be presented in 1998 (subject: Spread Spectrum technique for ISDN transmission).
- Pedro Ribau (supervisor: A. Gameiro), University of Aveiro, in preparation (subject: Digital signal processing techniques for data regeneration).
- M. Isabel Borges Ribeiro (supervisor: J. Ferreira da Rocha), University of Aveiro, in preparation (subject: Access Techniques Evaluation).

Publications

Papers in Journals

A. Moreira, R. Valadas, A. Duarte, "Optical Interference Produced by Artificial Light", *ACM Wireless Networks Journal*, Baltzer Science Publishers, Vol. 3, pp. 131-140, May 1997.

R. Valadas, A. Tavares, A. Duarte, "Angle Diversity to Combat the Ambient Noise in Indoor Optical Wireless Communication Systems", *International Journal of Wireless Information Networks*, Plenum Press, accepted for publication.

A. Nolasco Pinto, Govind P. Agrawal, J. Ferreira da Rocha, "Effect of Soliton Interaction on Timing Jitter in Communication Systems", *IEEE Journal of Lightwave Technology*, (To be published in April 98).

Papers in Conferences

A. Tavares, R. Valadas, A. Duarte, "Design and implementation of a maximal-ratio angle-diversity receiver for optical wireless communication systems", *Proceedings of the SPIE*

International Symposium on Voice, Video, and Data Communications - MM-Wave and Optical Wireless, Dallas, Texas, USA, November 2-5, 1997, accepted for publication.

A. Moreira, R. Valadas, A. Duarte, "Performance Evaluation of the IEEE 802.11 Infrared Physical Layer", *Proceedings of the First International Symposium on Communication Systems and Digital Signal Processing*, 6-8 April, 1998, UK, accepted for publication.

C. Lomba, R. Valadas, A. Duarte, "A System using Combined Emitter and Receiver Diversity to Combat the Multipath Dispersion of the Diffuse Optical Channel", *Proceedings of the First International Symposium on Communication Systems and Digital Signal Processing*, 6-8 April, 1998, UK, accepted for publication.

Tavares, R. Valadas, A. Duarte, "Performance of Wireless Infrared Transmission Systems considering both Ambient Light Interference and Inter-Symbol Interference due to Multipath Dispersion", *Proceedings of the First International Symposium on Communication Systems and Digital Signal Processing*, 6-8 April, 1998, UK, accepted for publication.

R. Silva, M. Dinis, A. Gameiro, "Dimensionamento de sistemas 'Spread-Spectrum' para distribuição de serviços RDIS", *Actas da I Conferência Nacional de Telecomunicações*, Aveiro, Abril 97.

A. Gameiro, J. Fernandes, N. Matos, P. Ribau and P. Silva, "Asymmetrical wireless radio system for local access", Vigo, July 97.

A. Gameiro, N. Matos, R. Silva and J. Figueiredo, "Direct Sequence Spread Spectrum System for Wireless Local Loop", *Proceedings of URSI'97*, pp. 677-680, Sept. 97.

A. Gameiro, "Optical balanced PLL with pattern jitter cancellation for homodyne PSK"; *Proceedings of Third Asian Pacific Conference on Communications (APCC'97)*, pp. 711-715, Sydney, 7-10 Dec. 1997.

A. Nolasco Pinto e J. Ferreira da Rocha, "Bit error rate degradation due to timing jitter in soliton communication systems", *OSA'97*, California, USA, 1997.

A. Nolasco Pinto, J. Ferreira da Rocha, "Análise da Influência do Tempo de Chegada no Desempenho de Sistemas Ópticos Baseados em Solitões", *Actas da I Conf. Nacional de Telecomunicações*, Aveiro, Abril de 1997.

P. Monteiro, A. Borjak, F. da Rocha, J.J. O'Reilly, I. Darwazeh "10 Gbit/s Pulse Shaping Distributed Based Transversal Filter Front-end for Optical Soliton Receivers", accepted for publication on *IEEE Microwave and Guided Wave Letters*..

Paulo P. Monteiro, Pedro L. Antunes, José F. da Rocha, "Filtros de Formatação de Sinal para Sistemas de Comunicação Multigigabit", *Actas da I Conferência Nacional de Telecomunicações*, pp. 253-256, Aveiro, Abril 1997.

A. Borjak, J. O'Reilly, P. Monteiro and I. Darwazeh, "High Speed Generalised Distributed Transversal Filter Topology for Optical Communication Systems", *IEEE Transactions on Microwave Theory and Techniques*, Vol. 45, Nº 8, August 1997, pp. 1453-1457.

Mário J. N: Lima, Paulo Monteiro, J. Ferreira da Rocha, J. Nuno Matos, António L. J. Teixeira, "Realização de Circuitos em Tecnologia Monolítica de Arsenieto de Gálio para a Recuperação de Relógio em Sistemas Multigigabit", *Actas da I conferência Nacional de Telecomunicações*, pp. 237-240, Aveiro, Abril 1997.

Pedro L. Antunes, Paulo P. Monteiro, J.F. da Rocha "Desenvolvimento de Receptores ópticos para sinais retorno a zero a 10 Gbit/s", *Actas da I conferência Nacional de Telecomunicações*, pp. 257-260, Aveiro, Abril 1997.

Mário J. N. Lima, Paulo Monteiro, António L. J. Teixeira J. Ferreira da Rocha, J. Nuno Matos, "Design of GaAs MMIC Circuits for Multigigabit Clock Extraction", *Telecommunications Research Symposium*, London, July 97.

António L.J. Teixeira, Rui F. S. Ribeiro, José R. F. da Rocha, "Equaliser optimisation for multi-level Dispersion Supported Transmission systems", *TSR 97*, University College of London, London, UK, 21-22 of July 1997.

António L.J. Teixeira, Rui F. S. Ribeiro, José R. F. da Rocha, "Laser optimisation for multi-level Dispersion Supported Transmission systems", *LEOS 97*, San Francisco, Califórnia, 7-13 November 1997.

Technical Reports

J.M. Rodrigues, J.C. Pedro, A. Gameiro, J. Figueiredo and J. da Rocha, "Fibre Optics Link for Multiple SS signals", ACTS Deliverable, AC083-UAV-GCO-DS-P-D323, November 1997.

P. Antunes, P. Monteiro, F. da Rocha, C. Wong, E. Pennings, D. Oostra, J. Reid, C. Dorschky, H. Haunstein, R. Seitz, B. Teichmann; "Performance Analysis of OFE modules for RZ soliton transmission"; Deliverable D3321 project AC045 UPGRADE - High bit Rate 1330 nm upgrade of the European standard single mode fibre network, April 97.

P. Franco, P. Monteiro, W. Warzanskyj, S. Cascelli, M. Vidmar, "Modification of the receiver front-end of the commercial SDH terminal equipment", Deliverable 11 of ACTS project AC063 ESTHER -Exploitation of Soliton Transmission Highways for the European Ring, June 1997

Mário J. N. Lima, Paulo P. Monteiro, António L. J. Teixeira J. Ferreira da Rocha, Deliverable 08 of ACTS project AC049 SPEED - Superhighway by Photonically and Electronically Enhanced Digital Transmission (SPEED), July 97.

António Teixeira, Rui Ribeiro, Ferreira da Rocha, Hielfred Geupel,"Multivalued codes for very high bit rate transmission systems "Deliverable 11 of the European project AC049-SPEED, March 1997.

António Teixeira, Rui Ribeiro, J. Ferreira da Rocha, Adolfo V. T.Cartaxo,Paulo A.S. Goulart, Joao M.B. Correia, W. Idler, B. Wedding,"Device and system simulations based on 20Gbit/s FM laser models",Deliverable 15 of the >European project AC049-SPEED, November 1997.

Miscellaneous

- Rui Valadas reviewer for *International Journal of Wireless Information Networks*, Plenum Press.
- A. Gameiro reviewer for *International Journal of Wireless Systems*, KAP
- Contribution to engineering education programs of Portugal Telecom staff.

7.3.4 Electronic and Opto-electronic Components Research Line

Human Resources

Collaborators

- João Lemos Pinto PhD Associate Professor, UA
- José Marcelino Pousa Lic. Researcher, PT - CET

Other Collaborators

- Armando Nolasco Pinto PhD Student Grant, Praxis XXI
- Paulo Sérgio de Brito André Lic. Grant, IT
- Yves Hernandez Lic. Student Final Year Project

Projects

- EMITON: Project IT_018: Development of an optical transmitter for optical fibre soliton transmission systems at 10 Gbps. The main research activities during 1997 can be summarised as follows: (i) definition of technological options related to source, (ii) a comparative study of different modulation techniques, (iii) a study of alternative techniques for solitons generations, (iv) an analytical study and simulation of optical pulse propagation in 10 Gbps systems.

PhD Thesis

- Armando Nolasco Pinto (supervisor: J. Ferreira da Rocha), University of Aveiro, in progress (subject: Optical Soliton Systems).

Publications

Papers in Journals

Paulo S. André, J. L. Pinto, J. C. Vasco, "Optimização de um Sistema de Gravação Laser Nd:YAG", *Anais da Engenharia e Tecnologia Electrotécnica*, Ano II nº4, pp 28 - 27 Julho 1997.

A. Nolasco Pinto, Govind P. Agrawal, J. Ferreira da Rocha, "Effect of Soliton Interaction on Timing Jitter in Communication Systems", *IEEE Journal of Lightwave Technology*, to be published in April 98.

Papers in Conference Proceedings

Paulo S. André, J. L. Pinto, J. C. Vasco, "Optimização de um Sistema de Gravação Laser Nd:YAG", *III Encontro Nacional de Colégio de Engenharia Electrotécnica da Ordem dos Engenheiros*, Porto, Junho 1991.

A. Nolasco Pinto e J. Ferreira da Rocha, "Bit error rate degradation due to timing jitter in soliton communication systems", *OSA '97*, California, USA, 1997.

A. Nolasco Pinto, J. Ferreira da Rocha, "Análise da Influência do Tempo de Chegada no Desempenho de Sistemas Ópticos Baseados em Solitões", *Actas da I Conf. Nacional de Telecomunicações*, 1997, Aveiro.

Deliverables

J. L. Pinto, A. Nolasco Pinto, Paulo S. André, "Estudo das Técnicas Alternativas para a geração de Solitões", Technical Report 01, IT – Aveiro, Fevereiro 1997.

J. L. Pinto, A. Nolasco Pinto, Paulo S. André, EMITON – Progress Report 01, IT – Pólo Aveiro, Março 1997.

J. L. Pinto, A. Nolasco Pinto, Paulo S. André, EMITON – Progress Report 02, IT – Pólo Aveiro, Julho 1997.

J. L. Pinto, A. Nolasco Pinto, Paulo S. André, "Especificação do Emissor de Solitões", Technical Report 02, IT – Pólo Aveiro, Julho 1997.

J. L. Pinto, A. Nolasco Pinto, Paulo S. André, EMITON – Progress Report 03, IT – Pólo Aveiro, Dezembro 1997.

7.3.5 Integrated Circuits and Systems Research Line

Human Resources

Collaborators

- | | | |
|-------------------------------------|-------|--------------------|
| • Dinis Magalhães Santos | PhD | Full Professor, UA |
| • Pedro Falcão Fonseca ² | Lic. | Engineer, PT-CET |
| • José Luís Cura | M.Sc. | Assistant, UA |
| • Rui Luís Aguiar | M.Sc. | Assistant, UA |
| • José Miguel Santos | Lic. | Engineer, PT-CET |

Other Collaborators

- | | | |
|--|---------|---------------|
| • Eduardo Vasconcelos Cardoso | Student | Grant, IT |
| • António Sarsfield Rodrigues ³ | Student | Grant, IT |
| • Miguel A. Osório ⁴ | Student | Grant, IT |
| • António de Deus | Student | Grant, IT |
| • Armindo Carreiró | Student | Grant, PRAXIS |
| • David Quaresma Marques ⁵ | Student | Grant, PRAXIS |
| • Ivete Pinto | Student | Grant, IT |
| • António Guimarães | Student | Grant, IT |

Projects

- NTBL – SDH Network Termination SDH low cost STM-1 Terminal Multiplexer development. This equipment allows the SDH 155 optical or electrical section termination at the SDH client's premises taking the Operator Management network. As an option this equipment can have two PDH tributary interfaces: 3x34Mb/s or 1 x 140Mb/s.

² Until July 31, 1997

³ Until September 30, 1997

⁴ Until May 31, 1997

⁵ From October 1, 1997

- GIGANTE – Communication Systems in CMOS Technology, for SONET/SDH up to 1244 Mb/s. Development of macro-simulation and macro-modeling techniques to the study of high bit rate transmission systems. Development and simulation of parallel to serial conversion, clock recovery and frame detection systems. Implementation and test of the integrated circuit produced.
- PRAXIS XXI 2/2.1/TIT/1591/95 - GENCLOCK – Architectures for High-Speed Clock Generation and Synchronization. This work started nominally on October 1, 1996, but so far no financing is forthcoming. Some bibliographical preliminary research has been started. Participants: Dinis Magalhães Santos; António M. S. Rodrigues; José L. Cura and Rui L. Aguiar.
- PRAXIS XXI 2/2.1/TIT/1578/95 - IRWLAN – This research group participates in the project through the intervention of Dinis Magalhães Santos; Armindo Carreiró and Rui L. Aguiar. Development of low-noise, high-speed front ends for optical communications is under way.
- MICROSS – Solution study for a Micro Cross-Connect SDH 4/4 of small dimension and modular configuration up to 16 gates 155Mb/s (SMT-1) interfaces or up to 4 gates 622Mb/s (STM-4) interfaces.
- PRAXIS XXI 2/2.1/TIT/1655/95 - Smart Power Integrated Circuits, collaboration with IT-Lisbon (Dinis M. Santos, Rui L. Aguiar).

PhD Thesis

- José L. Cura, (supervisor: Dinis M. Santos) Universidade de Aveiro, in preparation (subject: High-Speed Analog-Digital Conversion Techniques).
- Rui L. Aguiar (supervisor: Dinis M. Santos) Universidade de Aveiro, in preparation (subject: Clock Synchronization and Generation).

Publications

Papers in Journals

José L. Cura, Dinis M. Santos, "Delay Analysis of a Current Source CMOS Inverter For Use in Voltage Controlled Delay Lines", *Revista do DETUA*, Vol 1 N°7, pp. 679-684, January 1997

António Maria Sarsfield, Eduardo de Vasconcelos, Rui Aguiar, Dinis M. Santos, "Sistema de Transmissão para Fibra Óptica a 622 Mb/s", *Revista do DETUA*, Vol 1 N°7, pp. 705-710, January 1997

José L. Cura, "Conversor Tempo-Digital CMOS de Elevada Resolução e Gama Dinâmica", *Anais da Engenharia e Tecnologia Electrotécnica - Revista do Colégio de Engenharia Electrotécnica - Ordem dos Engenheiros*, Ano II, N°5, pp. 13-16, December 1997

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Pedro Falcão Fonseca, José Miguel Santos, "Restauro Distribuído "Sender-Chooser" em Redes de Telecomunicações SDH", *Actas da I Conferência Nacional de Telecomunicações*, pp. 45-48, Aveiro, April 1997

António Maria Sarsfield, Eduardo de Vasconcelos, Rui Aguiar, Dinis M. Santos, "Link para Fibra Óptica a Muito Alta Velocidade", *Actas da I Conferência Nacional de Telecomunicações*, pp. 443-446, Aveiro, April 1997

Dinis M. Santos, "A 100MHz Resistorless Differential Amplifier Architecture", *Actas da I Conferência Nacional de Telecomunicações*, pp. 479-482, Aveiro, April 1997

José L. Cura, "A CMOS Delay Element for Interpolating Time Functions", *Actas da I Conferência Nacional de Telecomunicações*, pp. 483-486, Aveiro, April 1997

José L. Cura, "Conversor Tempo-Digital CMOS de 12 bits de Gama Dinâmica e 1ns de Resolução", *3º Encontro Nacional do Colégio de Engenharia Electrotécnica - Ordem dos Engenheiros*, pp. 193-196, Porto, June 1997

António Maria Sarsfield, Eduardo de Vasconcelos, Rui Aguiar, Dinis M. Santos, "Sistema de Comunicação SDH para Fibra Óptica: Implementação de 622Mb/s em CMOS", *3º Encontro Nacional do Colégio de Engenharia Electrotécnica - Ordem dos Engenheiros*, pp. 385-392, Porto, June 1997

Project Deliverables

Armindo Carreiró, "Topologias de Pré-amplificadores de Baixo Ruído (Front End)", Universidade de Aveiro, Departamento de Electrónica e Telecomunicações, May 1997

Luís Nero Alves, "Receptor IV Sectorizado a 10Mbps", Universidade de Aveiro, Departamento de Electrónica e Telecomunicações, May 1997

Armindo Carreiró, "Desenvolvimento de um Front End para Detecção de Sinais Ópticos", Universidade de Aveiro, Departamento de Electrónica e Telecomunicações, September 1997

Eduardo de Vasconcelos, José L. Cura, "Front End de Ganhos Comutados", Data-sheet, Universidade de Aveiro, Departamento de Electrónica e Telecomunicações, November 1997

Miscellaneous

- Front End and data readout for radiation detector electronics (project PET, in collaboration with LIP, FCTUC and FMUC). Involvement: Dinis Magalhães Santos and José L. Cura.
- Flash ADC's for Telecommunications and scientific applications (last year project). Involvement: Dinis Magalhães Santos.

7.3.6 Integrated Communications and Multimedia Research Line

Human Resources

Collaborators

- Manuel de Oliveira Duarte PhD Associate Professor, UA
- Vasco Lagarto M.Sc. Director for Research, PT-CET
- Manuel Violas M.Sc. Assistant, UA
- Amaro de Sousa ⁶ M.Sc. Assistant, UA

Other Collaborators

- Victor Marques PhD Student Grant, PRAXIS + UA
- Nuno Delgado M.Sc. Student Grant, ACTS Fellowship + UA
- Pedro Roldao M.Sc. Student Grant, ACTS project
- Henrique Vale M.Sc. Student Grant, Ericsson Portugal + UA
- Manuel António Batista M.Sc. Student Grant, UA
- António Pinto Basto Researcher Grant, ACTS project
- Ricardo Cadime M.Sc. Student Grant, ACTS project
- Pedro Mostardinha Researcher Grant, ACTS project
- Mário Jorge Oliveira Lab. Technician Grant, UA
- Fernando Azevedo Lic. Student UA, Final Year Student
- Carlos Lopes Lic. Student UA, Final Year Student
- Firmino Costa Lic. Student UA, Final Year Student
- João Oliveira Lic. Student UA, Final Year Student
- José Pimentel Lic. Student UA, Final Year Student
- José Ruivo Lic. Student UA, Final Year Student
- José Teixeira Lic. Student UA, Final Year Student

⁶ Is also a collaborator with the Networks Research Line

- Miguel Oliveira Lic. Student UA, Final Year Student
- Nicolau Ramos Lic. Student UA, Final Year Student
- Paulo Salvador Lic. Student UA, Final Year Student

Projects

- MPEG-4 DMIF implementation over IP Networks
This was a 6 month project carried out jointly with CSELT (Centro Studi I Laboratori Telecomnucazioni), Italy, with the support of an ACTS Fellowship. The objective of the project has been the practical implementation of a Delivery Multimedia Integration Framework (DMIF) over IP networks. The work has been conducted in close relationship with the DMIF standardization activities, and has provided feedback that allowed the finalization of the DMIF Committee Draft during the MPEG meeting in Friburg in October '97.
- DECT/WLL/BROADBAND
This was a one year project sponsored by Ericsson Portugal. The main objectives were:
 - To study the utilisation of radio technologies (eg: DECT) in the access network.
 - To study the problems of mobility and localisation associated with radio technologies in the access network.
- BROADBANDLOOP (ACTS.038)
Project sponsored by the ACTS programme, European Union. The main objectives of the project are to define and demonstrate, in live field trials, a concept for a full service access network which migrates fibre gracefully into the local loop when bandwidth demand increases, with an offer of services that targets two customer groups: small to medium size businesses and residential customers. BBL supports the needs of network operators to provide both narrowband and broadband services such as high speed Internet Access and Video on Demand that are economically justified in a competitive environment. The field trial sites located in Denmark, Portugal and Poland, have been purposely selected to enable analysis of typical problems which may be encountered when legacy networks, such as those using the existing copper and/or coax for broadband access or those with little or old telephony infrastructures, are expanded for new service.
- OPTIMUM - Optimised Architectures for Multimedia Networks (ACTS.0226)
Project sponsored by the ACTS programme, European Union. The main objective of OPTIMUM is to establish guidelines for introduction of advanced communication networks and services in a competitive multi-service environment. The guidelines will be

based on techno-economic evaluation of different multimedia network business cases derived from field trials and projects within the ACTS programme and external projects of relevance. The guidelines will emphasise the impact of key cost elements and the risk related to the introduction of new services and advanced networks. The guidelines will take into account the influence of different regulatory and boundary conditions.

- **TELA: Telecommunications and Production Systems Competitiveness: the case of the district of Aveiro.**

This is a project funded by PRAXIS XXI (Social and Human Sciences), involving a multidisciplinary team of researchers (members of the Department of Electronics and Telecommunications – Institute of Telecommunications and members of the Department of Environment and Planning) and also benefiting from the collaboration of Portugal Telecom through its R&D Centre in Aveiro and the University of St. Andrews, UK.

The main objective of this project is to study the role of advanced telecommunications services as fundamental factors conditioning the competitiveness of the productive structures and trying to put forward a set of guidelines and recommendations for the elaboration of an integrated services telematic platform for the region of Aveiro.

- **“The New Information and Communication Technologies and the Teacher: A Synergistic Relationship or the Fall Down from the Stand?”**

Project funded by the Institute for Educational Innovation of the Ministry of Education, Portugal. This projects addressed a set of issues relative to situations faced by teachers when confronted with the utilisation of new information and communication technologies (stress, fear, anxiety, etc) and tried to propose some measures capable of circumventing these problems.

- **Acquisition of Know-How in Planning , Operation, Administration and Management of ATM Networks**

This is an activity partially funded by the Research Institute of the University of Aveiro. Its implementation is carried out in cooperation with the Department of Electronics and Telecommunications, the Centre for Informatics and Communications of the University of Aveiro and the local branch of INESC (Institut for Computers and Systems Engineering).

The main objective of this activity is to plan, to install, to configure and to operate an ATM network covering most of the University Campus and providing R&D facilities for a number of studies relative to broadband communications and services. Consideration is given to the requirements of as many as possible types of potential users of the network within the Campus. A survey of the relevant ATM standards and/or recommendations and of the available equipment from the main ATM vendors was done as a way to anticipate possible evolution and implementation scenarios. A number of training actions was

carried out in order to disseminate the know-how acquired relative to planning, operation and management of ATM Networks.

PhD Thesis

- Amaro Fernandes de Sousa (supervisors: A.Manuel de Oliveira Duarte and Rui Valadas), University of Aveiro, in preparation, (subject: Transport protocols for multimedia communications in broadband networks).
- Lídia de Jesus Oliveira Loureiro da Silva (supervisors: A.Manuel de Oliveira Duarte and Armando Oliveira) University of Aveiro, in preparation, (subject: Cognitive and Social Impact of the Globalisation of Communication Networks).
- Manuel Alberto O. R. Violas (supervisors: A.Manuel de Oliveira Duarte and David Heatley, British Telecom Research Laboratories, UK), University of Aveiro, in preparation, (subject: Optical Receivers for Several GigaHertz of Bandwidth).

M.Sc. Thesis

- Rui Pereira Coelho (supervisor: A.Manuel de Oliveira Duarte), University of Aveiro, concluded in 1997, (subject: Planning and dimensioning aspects of ATM networks).
- Victor Manuel Letra Macedo Marques (supervisor: A.Manuel de Oliveira Duarte), University of Aveiro, concluded in 1997, (subject: Services in ATM Networks).
- Nuno Miguel Bravo Lima Nunes Delgado (supervisor: A.Manuel de Oliveira Duarte), University of Aveiro, submitted in 1997, (subject: Digital Video Transmission using MPEG over Broadband Networks).
- Manuel António Esteves Batista (supervisor: A.Manuel de Oliveira Duarte), University of Aveiro, in preparation, (subject: New Telematics and Home Automation Technologies for the Support of Disabled People with Special Needs).
- Henrique Manuel Fadigas do Vale (supervisor: A.Manuel de Oliveira Duarte), University of Aveiro, in preparation, (subject: Radio in the Access Network the Case for DECT Technologies).
- Ângelo J. S. Almeida (supervisor: A.Manuel de Oliveira Duarte), University of Aveiro, submitted in 1997, (subject: Access Networks A Comparative Study).

- José Morais (supervisor: A.Manuel de Oliveira Duarte), University of Aveiro, in preparation, (subject: CATV Networks Aspects of Planning and Dimensioning).
- Alfredo França, (supervisor: A.Manuel de Oliveira Duarte), University of Aveiro, submitted in 1997, (subject: Access Networks the case for xDSL Technologies).

Publications

Books and Book Chapters

Eduardo de Castro, A.Manuel de Oliveira Duarte, "Model for mixed demographic structure" chapter V in Leif Imms (ed.), "*Introduction Strategies and Techno-Economic Evaluation of The Access Network*", edited by Chapman and Hall, London, to be published in 1998.

A.J. Ferrer Correia, A.Manuel de Oliveira Duarte, Lídia J. O. L. Silva, "*Comunicação, Redes e o Processo Educacional – Communication, Networks and the Educational Process*", *University Manuals Editorial Plan*, Calouste Gulbenkian Foundation, Lisbon; in press; expected to be published in 1998.

Papers in Journals

Rui Valadas, Adriano Moreira, Cipriano Lomba, António Tavares, Luís Moreira, Carlos Oliveira, Rui Aguiar, Amaro de Sousa, A. M. de Oliveira Duarte, "Contribuições da UA para a Especificação de Rede de Área Local não-cablada IEEE 802.11, *Revista do Departamento de Electrónica e Telecomunicações da UA*, Vol.1, nº7, Jan 97.

Rui Pereira Coelho, Rui Aguiar, Amaro F. de Sousa, A. Manuel de Oliveira Duarte, "Integração numa Plataforma ATM no Campus da Universidade de Aveiro", *Revista do Departamento de Electrónica e Telecomunicações da UA*, Vol.1, Nº7, Jan 97.

Paula Loureiro, Manuel A. Esteves Batista, A. Manuel de Oliveira Duarte, M.J.Loureiro, R.Cadanhó, F.Castro, L.Mota,"Aplicação dum Sistema Multimédia na Educação e Reabilitação de Pessoas com Deficiência Mental Grave e Profunda", *Integrar*, nº12, pp.28-39, Jan-Abr 97.

C. Bertin , A. de Sousa, G. Figuera, M. Friedrich, M. Guglielmo, "RACE MARS Project for the Experimentation of Multimedia Interactive Services: Architecture Solutions and Results", *European Transactions on Telecommunications (ETT)*, Vol. 8, No. 4, July/August 1997.

A.J.C. Moreira, R.T. Valadas, A.M. de Oliveira Duarte, "Optical Interference Produced by Artificial Light", *ACM Wireless Networks Journal*, Baltzer Science Publishers, Vol.3, nº2, pp.131-140, Maio 97.

N.E.Andersen, Paulo M.N.Nordeste, A. M. de Oliveira Duarte, H.E.Lassen, A.Ekblad, A.R.Pach, K.Amborski, L.Dittmann, "Broadbandloop: A Full Service Access Network for Residential and Small Business Users", *IEEE Communications Magazine*, Dez. 97, vol. 35, nº 12, pp. 88, 93.

Henrique M.F. Vale, Jorgen Bruhn, "Rádio na Rede de Acesso: Projecto DECT/WLL/Broadband - Um projecto entre a Universidade de Aveiro e a Ericsson Telecomunicações, Lda", *Comunicações*, APDC, nº 12, pp.71-74, Janeiro 98.

Leif Aarthun Ims, Kjell Stordahl, Nils Kristian Elnegaard, Fernando Azevedo, Borgar Torre Olsen, "Broadband access network competition – analysis of technology and market risk", submitted for publication at *IEEE Globecom 98*, Sydney, November 8-12, 1998

Kjell Stordahl, Nils Kristian Elnegaard, Fernando Azevedo, Leif Aarthun Ims, Borgar Torre Olsen, "Evaluating broadband strategies in a competitive market using risk analysis", submitted for publication at *IEEE Networks 98*, Sorrento, October 18-23, 1998

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Rui Valadas, Adriano Moreira, C.Lomba, A.Tavares, Luís Moreira, Carlos Oliveira, R.Aguiar, A.Sousa, A. M. de Oliveira Duarte,"Contribuições da UA para a Especificação de Rede de Área Local não-cablada IEEE 802.11, *Actas da I Conferência Nacional de Telecomunicações*, pp.65-70, Aveiro, Abril de 1997.

Rui Aguiar, José Domingues, Vasco Lagarto, A. Manuel de Oliveira Duarte, "European-Wide Advanced Broadband Communications Summer Schools: Four Years of Experiences", *Actas da I Conferência Nacional de Telecomunicações*, pp.41-44, Aveiro, Abril de 1997.

Rui Aguiar, José Domingues, Vasco Lagarto, A. Manuel de Oliveira Duarte, "Escolas de Verão em Comunicações Avançadas: Aspectos Técnicos e Humanos – Advanced Broadband Communications Summer Schools: Human and Technical Aspects", *3º Encontro do Colégio de Engenharia. Electrotécnica, Ordem dos Engenheiros*, pp.339-346, Porto, 5-6 Junho 1997.

A. Manuel de Oliveira Duarte, "Cálculo de Funções Geradoras de Probabilidades em Processos Markovianos Discretos: um Abordagem da Teoria dos Sistemas - The Calculation of Probability Generating Functions in Discrete Markov Processes: a Systems Theory

Approach", *V Annual Congress of the Portuguese Society for Statistics*, Curia, 11-14 Junho 97.

A. Manuel de Oliveira Duarte, Niels E. Andersen, " Broadbandloop: A cost-effective techno-economic solution for residential and business broadband access", *Workshop on Techno-Economics on Multimedia Networks*, Universidade de Aveiro, 20-22 Outubro 1997.

Lídia J. Oliveira Loureiro Silva, Anabela M. de Sousa Pereira, A.J Ferrer Correia, A.Manuel de Oliveira Duarte, Carlos Leite, "O Professor e as Novas Tecnologias da Informação e da Comunicação: uma relação de sinergia ou o tombar do pedestal?", *4ª Conferência Nacional de Ciências da Educação*, Aveiro, 18-20 de Fevereiro de 1998

Delgado N., Franceschini G., De Sousa A. F., Oliveira Duarte A. M., "An MPEG-4 DMIF Implementation over IP Networks", submitted to *7th IFIP/ICCC Conf. on Information Networks and Data Communications (INDC'98)*, Aveiro, Portugal, 15-17 June, 1998.

Project Deliverables

The following list includes a selected choice of the most relevant deliverables issued in 1997 by the projects where this research line has been involved.

Project ACTS.226 – OPTIMUM (Optimised Architectures for Multimedia Services)

- ACTS.226, Deliverable 5: Adaptation of a software tool for introduction scenarios and techno economical evaluation of access networks (TITAN tool) to a number of selected business cases.
- ACTS.226, Deliverable 6: Demographic and geographic descriptions of a number of business cases and a first techno economical evaluation.
- ACTS.226, Deliverable 7: Users requirements and demand forecasts of the services studied in the business cases.
- ACTS.226, Deliverable 8: Risk analysis of the impact of market evolution.
- ACTS.226, Deliverable 9: Risk analysis of the impact of technology evolution.

Project ACTS.038 - Broadbandloop

- ACTS.038, Del.3.1.5 Specification of Aveiro Field Trial Infrastructure and Services (Field trial description report phase 1)
- ACTS.038, Del.3.1.6 Specification of Network Infrastructure for Trials Phase 1
- ACTS.038, Del. 3.1.10 Installation Report for the field trial phase 1
- ACTS.038, Del 3.1.13 Field Trial description report phase 2
- ACTS.038, Del 3.1.14 Specification of network infrastructure for trials phase2
- ACTS.038, Del 3.2.2 Service and application implementation report for phase 1

- ACTS.038, Del. 1.2.2 Network Modelling: Simulation Results
- ACTS.038, Del. 1.3.9 Life Cycle Cost calculations including field trials

Project DECT/WLL/Broadband

- Training and project planning, April 1997.
- DRA1900 Evolution scenarios for services and network solutions, July 1997.
- Field trial installation, October 1997.
- DRA1900 Short Message System development, December 1997.
- Identification of possible solutions for the DRA1900 antennae system optimisation, December 1997.
- DET's CATV Network Optimisation, December 1997
- DRA 1900 Fault Report: Installation and Evaluation, December 1997

Miscellaneous

- Creation of Experimental Telecommunications Infrastructures
This Research Line has promoted the submission of an application to the Research Institute of University of Aveiro for the installation of an ATM network in the Aveiro Campus. This application was done jointly with INESC - pole of Aveiro, DETUA (Dep. of Electronics and Telecommunications) and CICUA (Informatics and Communications Center). This application was successful. The equipment was acquired and most of its installation was completed in 1997 being now in operation and interworking with the already existing experimental telecommunications infrastructures.
- Organisation of the *Workshop on Techno-Economics of Multimedia Networks*, Aveiro, Portugal, 20-22 October 1997.
The objective of this workshop has been the presentation of an overview of techno-economic methodologies and case studies related to modern communications infrastructures with a special emphasis being put on the emerging multimedia networks and services. The workshop addressed a variety of issues that included market factors (demand, service uptake, risk, competition, liberalisation), methodologies for techno-economic assessment of telecommunications networks and services, social and demographic factors (impact of telecommunications services in the social and economic development of regions and economic sectors), technological factors (reuse of existing networks, new network technologies), economic factors (investments, operational costs, revenues, and price elasticity), etc.
Most of the presentations reflected the views and work done in project AC226 OPTIMUM (Optimised Network Architectures for Multimedia Services). The perspectives of some telecommunications operators and manufacturers as well as work

currently undergoing in other ACTS and EURESCOM projects were also presented. Several invited speakers external to ACTS and other European programmes were also present.

The Workshop, received support from the European Union (DGXIII ACTS Programme), University of Aveiro, (Department of Electronics and Telecommunications and Department of Planning and Environment) and Fundação para a Ciência e Tecnologia (Science and Technology Foundation) Portugal.

- Manuel de Oliveira Duarte Deputy Member of the ACTS Management Committee.
- Vasco Lagarto member of the Telematics Applications Programme Management Committee
- Manuel de Oliveira Duarte collaboration in the cycle of conferences “ A Ciência tal qual se faz” (organization of a local forum at the University of Aveiro).
- Manuel de Oliveira Duarte coordinator of studies for the Master of Science course in Electronics and Telecommunications at the University of Aveiro.
- Manuel de Oliveira Duarte member of the review/editorial board of *Cadernos do Centro de Física , Acústica e Telecomunicações*, Fac. Eng. Univ. Porto and *Revista do Departamento de Electrónica e Telecomunicações* da Univ. Aveiro.
- Manuel de Oliveira Duarte, supervisor of final year projects (WEB Server, Internet Access Through CATV Networks, Multimedia Information Production Integrated Systems).

