

# Curriculum vitae

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## 1. Personal data

**Full name**

Luis Paulo Mota Capitão Lemos Alves

**National Identity Card**

6298987

**Birthplace and date**

Lisbon, 01-12-1964

**Nationality**

Portuguese

**Marital status**

Married, four children

**Institutional address**

Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico  
Av. Rovisco Pais  
1049-001 Lisboa  
PORTUGAL

**Contact data**

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## 2. Academic degrees

Year	Academic degree	Domain	Institution	Classification
2006	AGREGAÇÃO	Physics Engineering	Instituto Superior Técnico	Aprovado por unanimidade
2006	DOUTORAMENTO (Diploma equiv.)	Physics	Spain (Universidad de Sevilla)	Homologado
2006	LICENCIATURA (Diploma equiv.)	Physics	Spain (Min. Educación y Ciencia)	Homologado
2006	PROFESSEUR UNIVERSITÉS	Energétique, génie des procédés	France (Min. d'Éducat. Nationale)	Qualifié
2006	PROFESSEUR UNIVERSITÉS	Milieux dilués et optique	France (Min. d'Éducat. Nationale)	Qualifié
1993	DOUTORAMENTO	Physics	Instituto Superior Técnico	Aprovado com distinção e louvor
1987	LICENCIATURA	Physics Engineering	Instituto Superior Técnico	18/20

### 3. Previous and current scientific and/or professional activities

Period	Position or category	Institution
***** CURRENT POSITIONS *****		
since February 2012	Elected member of the Permanent Strategy Committee	Departamento de Física Instituto Superior Técnico
since 2008	Researcher	Instituto de Plasmas e Fusão Nuclear Instituto Superior Técnico
since November 2006	Professor Associado	Departamento de Física Instituto Superior Técnico
***** SCIENTIFIC / PROFESSIONAL CAREER *****		
since 2008	Researcher	Instituto de Plasmas e Fusão Nuclear Instituto Superior Técnico
1998-2007	Researcher	Centro de Física dos Plasmas Instituto Superior Técnico
from 1986 to 1997	Researcher	Centro de Electrodinâmica Instituto Nacional de Investigação Científica
from July 1st to July 31st 2010	Invited professor	Université Polytech de Nantes (Nantes, France)
from February 2nd to February 25th 2009	Invited researcher	Université de Paris XI (Orsay, France)
from October 1 <sup>st</sup> 2006 to July 30th 2007	Invited researcher	Instituto de Ciencias de Materiales de Sevilla (Sevilla, Spain)
from September 1st to September 30th 2006	Invited professor	Université de Paris XI (Orsay, France)
from January 1st to June 30th 2000	Invited researcher (Poste Rouge)	Centre National de la Recherche Scientifique (France)
March 1995 - March 1996	Post-Doc fellowship (PRAXIS XXI)	Junta Nacional de Investigação Científica e Tecnológica
March 1986 - February 1988	Fellowship (initiation to scientific research)	Instituto Nacional de Investigação Científica
since November 2006	Professor Associado	Departamento de Física Instituto Superior Técnico
July 1993 - November 2006	Professor Auxiliar (permanent position in September 1998)	Departamento de Física Instituto Superior Técnico
March 1990 - July 1993	Assistente	Departamento de Física Instituto Superior Técnico
October 1987 - March 1990	Assistente Estagiário	Departamento de Física Instituto Superior Técnico
since January 2013	Elected member of the Permanent Strategy Committee	Departamento de Física Instituto Superior Técnico
February 2012 - December 2012	Elected member of the Permanent Strategy Committee	Departamento de Física Instituto Superior Técnico
January 2008 - March 2010	Member of the Directive Board	Instituto de Plasmas e Fusão Nuclear Instituto Superior Técnico
January 2005- September 2006	Vice-coordinator of the Licenciatura em Engenharia Física Tecnológica	Departamento de Física Instituto Superior Técnico
January 2005- September 2006	Member of the Executive Board	Departamento de Física Instituto Superior Técnico
September 2002- December 2004	Member of the Executive Board	Departamento de Física Instituto Superior Técnico
September 1996- September 1997	Member of the Executive Board	Departamento de Física Instituto Superior Técnico

## 4. Area of scientific activity

Plasma Physics and Engineering – Modeling and Simulation

## 5. Specialization

### Domain of specialization

Modeling and simulation of discharge plasmas

### Present research interests

Modeling and simulation of plasma sources in view of their optimization

Plasma Reactors

RF and Microwave Discharges

Plasma-assisted thin film deposition / etching

Plasma-surface interaction

Physical chemistry of non-equilibrium plasmas

Transport phenomena in cold and fusion plasmas

### Simulation codes that has developed

- Simulation tool for a microwave transmission line with a plasma charge
- 2D Hybrid model (fluid + kinetic) for capacitive coupled rf discharges in N<sub>2</sub>
- 1D fluid model for charged particle transport in microwave micro-plasmas
- 2D hydrodynamic model for the transport of a neutral gas (with a plasma heat source), under high-flow regime
- 2D electromagnetic model for the distribution of fields within microwave devices, in the presence of plasma
- 1D fluid model for charged particle transport in dc and microwave discharges
- 2D fluid model for charged particle transport in rf discharges
- 1D (energy space) solver for the kinetic electron Boltzmann equation, with variable energy step
- 0D collisional-radiative models in atomic (He, Ar) and molecular (H<sub>2</sub>, SiH<sub>4</sub>+H<sub>2</sub>, N<sub>2</sub>) gases
- 2D hydrodynamic model for multi-component reactive transport in discharge gases
- 1D energy balance model for a gas/plasma system
- 2D PIC-MCC models for charged particle transport in dc and microwave discharges
- MC model for the breakdown of a discharge gas
- 2D (configuration+energy space) kinetic model for the electron Boltzmann equation

## 6. Other skills/activities

### Committees of national and international conferences

- Member of the International Scientific Committee on Plasma Science and Technology of the 19<sup>th</sup> International Vacuum Congress (IVC19), 2013
- Member of the "Local Organizing Committee" of the XXI Europhysics Conference on the Atomic and Molecular Physics of Ionised Gases" (ESCAMPIG), 2012
- Chairman of the International Scientific Committee, International Colloquium on Plasma Processes (CIP), 2011
- Member of the "Comissão Científica" (Física dos Plasmas) of the "17ª Conferência Nacional de Física" (FÍSICA - 2010), 2010
- Member of the Programme Committee, 21<sup>st</sup> International Conference on Numerical Simulation of Plasmas (ICNSP), 2009
- Member of the International Scientific Committee, International Colloquium on Plasma Processes (CIP), 2009
- Member of the Organizing Committee of the "1º Encontro Ibérico para la Enseñanza de la Física", XXIII Reunión Bienal de la RSEF, RSEF e SPF, Valladolid, España 1991.

### Editor of journals and special issues

- Editor of special issue Eur. Phys. J. Appl. Phys. **56**, 24001 (2011), 18th International Colloquium on Plasma Processes (L.L. Alves and Y. Ségui, eds)
- Editor of special issue Eur. Phys. J. Appl. Phys. **49**, 13101 (2010), 17th International Colloquium on Plasma Processes (L.L. Alves and Y. Ségui, eds)
- Editor of special issue IEEE Trans. Plasma Sci. **38**, 2082 (2010), Special issue on the Numerical Simulation of Plasmas (L.L. Alves, J.P.S. Bizarro and R. Fonseca, eds)
- Associate Editor, European Phys. J.: Appl. Phys., since 2005

### Refereeing and consulting

- Consultant of the Agence National de la Recherche (ANR), France
  - o (PNANO, "Programme National en Nanosciences et Nanotechnologies"), 2005-2009
  - o Programme Blanc, 2012-
- Consultant of the Czech Science Foundation (GACR), Czech Republic, 2012-
- Regular referee, European Phys. J. - Appl. Phys. (EDP-Sciences); J. Phys. D: Appl. Phys. (IOP); Plasma Sources Sci. Technol. (IOP)

### Main management duties

- Member of the Evaluation Committee for the Licenciatura em Engenharia Física Tecnológica, Departamento de Física, Instituto Superior Técnico, 1994 and 2003
- Responsible for the 1st Prova de Aferição de Física, Instituto Superior Técnico, 2003
- Member of Teaching Board, International Summer School in "Low Temperature Plasma Physics: Basics and Applications", since 2002
- Head of Plasma Physics Section, Sociedade Portuguesa de Física, from 2001 to 2012

## 7. Languages

Language	Reading	Writing	Conversation
English	Very Good	Very Good	Very Good
French	Very Good	Very Good	Very Good
Spanish	Very Good	Very Good	Very Good

## 8. Supervising experience

MSc supervisor of Miguel Santos

Master: Engenharia Física Tecnológica

Institution: Instituto Superior Técnico

Framework: Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico

Subject: Modelo colisional-radiativo de descargas microondas em hélio à pressão atmosférica

Date: 2011/2012

PhD co-supervisor of Ivo de Bragança

Institution: Departamento de Engenharia Mecânica and Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico, Universidade Técnica de Lisboa

Framework: PhD scholarship (Fundação para a Ciência e a Tecnologia)

Subject: Análise experimental do processo de micro-electroerosão

Startup: January 2009

MSc supervisor of António Dias

Master: Engenharia Física Tecnológica

Institution: Instituto Superior Técnico

Framework: Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico

Title: Modeling of low-pressure plasmas in CH<sub>4</sub>-H<sub>2</sub> mixtures

Date: 2011/2012

Classificação: 18/20 valores

Current position: PhD thesis at CERN (CH)

Scientific supervisor of Miguel Santos

Institution: Instituto de Plasmas e Fusão Nuclear of the Instituto Superior Técnico

Framework: BIC scholarship (Fundação para a Ciência e a Tecnologia, PTDC/FIS/65924/2006)

Subject: Modelização de uma tocha microondas a plasma - Modelo colisional-radiativo de um plasma de hélio

Date: September 2010 – August 2011

MSc supervisor of Tiago Silva

Master: Engenharia Física Tecnológica

Institution: Instituto Superior Técnico

Framework: Instituto de Plasmas e Fusão Nuclear of the Instituto Superior Técnico

Title: Modelização hidrodinâmica de uma tocha microondas a plasma

Date: 2010/2011

Classification: 18/20 valores

Current position: Post-Doc at U. Mons (BE)

MSc supervisor of Paulo Jorge Pereira Gaspar

Master: Mechanical Engineering

Institution: Instituto Superior Técnico

Framework: Secção de Tecnologia Mecânica of the Departamento de Engenharia Mecânica and Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico

Title: Modelação experimental do mecanismo de remoção de material por electroerosão

Date: 2009/2010

Classification: 19/20 valores

Current position: Portugal Telecom (PT)

Scientific supervisor of Miguel Santos

Institution: Instituto de Plasmas e Fusão Nuclear of Instituto Superior Técnico

Framework: BII/2008 scholarship (Fundação para a Ciência e a Tecnologia)

Subject: Transporte de radiação numa tocha a plasma

Date: April 2009 – April 2010

Follow-up: MSc thesis

PhD supervisor of José Gregório

Institution: Universidade Técnica de Lisboa and Université Paris XI (co-tutored thesis)

Framework: PhD scholarship (Fundação para a Ciência e a Tecnologia, SFRH/BD/29294/2006)

Title: Estudo de micro-plasmas criados por microondas a pressão atmosférica

Date: December 2010

Classificação: Aprovado

Current position: Post-Doc at LAPLACE (FR)

PhD supervisor of João Santos e Sousa

Institution: Université Paris XI and Universidade Técnica de Lisboa (co-tutored thesis)

Framework: PhD scholarship (Fundação para a Ciência e a Tecnologia, SFRH/BD/28668/2006)

Title: Micro-plasma generation of high fluxes of singlet delta oxygen at atmospheric pressure for biomedical applications

Date: December 2010

Classification: Aprové (mention: Très Honorable)

Current position: Researcher CNRS (Chargé Recherche 2eme classe) (FR)

Scientific supervisor of Rafael Álvarez Molina  
Institution: Centro de Física dos Plasmas / Instituto de Plasmas e Fusão Nuclear  
Framework: Post-Doc scholarship (Fundação para a Ciência e a Tecnologia, SFRH/BPD/26420/2005)  
Subject: 2-D Model of Microwave Plasma Sustained by an Axial Injection Torch  
Date: September 2006 – September 2008  
Current position: Post-Doc at ICMSE (SP)

PhD supervisor of Simon Letout  
Institution: Universidade Técnica de Lisboa and Université Paris XI (co-tutored thesis)  
Title: Couplage onde de surface-plasma en présence de résonances, dans une décharge micro-onde à basse pression  
Date: September 2007  
Classification: Aprovado  
Current position: ESSEC Grande École de Commerce (FR)

MSc supervisor of José Cruz  
Master: Engenharia Física Tecnológica  
Institution: Instituto Superior Técnico  
Framework: Centro de Física dos Plasmas of IST and Instituto de Engenharia Sistemas e Computadores (Micro-sistemas e Nano-tecnologias)  
Title: Estudo de um reactor de acoplamento indutivo com um sistema de feixe iónico: Modelização e caracterização experimental  
Date: 2006/2007  
Classification: 19/20  
Current position: EDP Renováveis (PT)

Project supervisor of Undergraduate Student João Santos e Sousa  
Licenciatura: Engenharia Física Tecnológica  
Institution: Instituto Superior Técnico  
Title: Plasma assisted deposition of Nanocrystalline Diamond (NCD) and Ultrananocrystalline Diamond (UNCD)  
Date: 2005/2006  
Classification: 19/20  
Follow-up: PhD thesis

Project supervisor of Undergraduate Student José Gregório  
Licenciatura: Engenharia Física Tecnológica  
Institution: Instituto Superior Técnico  
Title: Modelização de um reactor ICP para a gravura de óxidos intermetálicos a plasma fluorcarbonado  
Date: 2005/2006  
Classification: 19/20  
Follow-up: PhD thesis

Scientific supervisor of Rafael Álvarez Molina  
Institution: Centro de Física de Plasmas  
Framework: Post-Doc fellow (Ministério de Educación y Ciencia, Spain)  
Subject: Two-dimensional model of microwave plasma produced by an Axial Injection Torch (TIA)  
Date: July 2005 – July 2006  
Follow-up: Post-Doc financed by FCT

PhD supervisor of Luís Alves Marques  
Institution: Universidade Técnica de Lisboa and Université Paris XI (co-tutored thesis)  
Title: Modelização e caracterização em função da frequência dum reactor de acoplamento capacitivo rf para misturas  $H_2+SiH_4$   
Date: May 2005  
Classification: Aprovado  
Current position: Assistant Professor at U. Minho (PT)

Project supervisor of Undergraduate Student Luís Novo  
Licenciatura: Engenharia Física Tecnológica  
Institution: Instituto Superior Técnico  
Title: Caracterização de um reactor a plasma de Onda de Superfície em geometria coaxial: análise experimental e modelização predictiva  
Date: December 2004  
Classification: 18/20

PhD supervisor of Aurel Salabas  
Institution: Universidade Técnica de Lisboa  
Title: Modelização duma descarga rf, em misturas  $SiH_4+H_2$ , para depósitos de silício amorfo hidrogenado  
Date: October 2003  
Classification: Aprovado  
Current position: Researcher at Oerlikon (CH)

Scientific co-supervisor of Cédric Punset  
Institution: Centro de Física de Plasmas

Framework: Post-Doc fellow (PRAXIS XXI)  
Subject: Self-consistent modeling of inhomogeneous dc and hf discharges at intermediate pressures  
Date: January 1999 - December 2000

MsC supervisor of Luís Alves Marques  
Institution: Universidade Técnica de Lisboa  
Title: Estudo da influência da cinética do hidrogénio no funcionamento dum reactor PECVD, para o depósito de a-Si:H  
Date: September 1999  
Classification: Aprovado  
Follow-up: PhD thesis

Scientific co-supervisor of Olivier Leroy  
Institution: Centro de Física de Plasmas  
Framework: Post-Doc fellow (PRAXIS XXI)  
Subject: Desenvolvimento dum modelo fluido multicomponentes, 2D-espacio temporal, para o estudo duma descarga rf, numa mistura SiH<sub>4</sub>+H<sub>2</sub> a baixa pressão  
Date: February - September 1998  
Current position: Researcher CNRS (Chargé Recherche 1ere classe) (FR)

PhD co-supervisor of Ana Lacoste  
Institution: Universidade Técnica de Lisboa and Université Paris XI (co-tutored thesis)  
Title: Amorçage et entretien en cavité résonante d'une décharge micro-onde d'hydrogène en impulsions de haute puissance  
Date: January 14th 1998  
Classification: Très honorable avec felicitations  
Current position: Prof. Université Grenoble (FR)

Training co-supervisor of Aurel Salabas  
Institution: Centro de Física de Plasmas  
Framework: NATO fellow  
Date: 1997

## 9. Participation in research projects

### Responsible of Scientific Projects

Title: Simulation Tools for Atmospheric Pressure Microwave-Driven Mini-Plasmas  
Framework: Projectos de I&D em Todos os Domínios Científicos  
Leadership: L. L. Alves  
Project: PTDC/FIS/65924/2006  
Institution: Fundação para a Ciência e a Tecnologia, Ministério da Ciência, Tecnologia e Ensino Superior  
Funding: 85 k€  
Period: 2008-2012

Description: The main objective with this Project is the development of simulation tools describing the operation features of microwave-driven mini-plasmas at atmospheric pressure, in view of optimizing their use in high-performance environmental control. In particular, this Project is interested in the following microwave plasma devices:

- Axial Injection Torch (AIT), as a high intensity plasma source, capable of producing very hot flows of plasma species that can be applied in waste treatment, to the destruction of dangerous chemical compounds.
- Micro-Discharge (MD), as a high-density, low-power plasma device, which will open the way for a new concept of "plasma on chip", very interesting for industrial applications such as portable detectors of heavy metal gaseous traces, in ambient air or aerosols.

Title: Estudo de Plasmas de radio-frequência usados na simulação de atmosferas planetárias  
Framework: Projet International de Cooperation Scientifique (PICS)  
Leadership: C.D. Pintassilgo, L.L. Alves, G. Cernogora  
Institution: Fundação para a Ciência e Tecnologia, Ministério da Ciência, Tecnologia e Ensino Superior  
Collaboration: Laboratoire Atmosphères, Milieux, Observations Spatiales (Versailles, França)  
Funding: 28 k€  
Period: 2008-2012

Description: Experimental and simulations study of the physical-chemical characteristics of Titan's atmosphere, using capacitively coupled radio-frequency plasma produced in low-pressure N<sub>2</sub>-CH<sub>4</sub> mixtures. The plasma parameters are measured using optical and mass spectrometry at the LATMOS laboratory (experiment PAMPRE). Simulations use a two-dimensional hybrid code describing the dynamics of charged and neutral particles with the plasma.

Title: Laboratory for High Performance Computing and Computing Time Management  
Framework: Programa Nacional de Re-equipamento Científico (investigador co-responsável)  
Leadership: L. O. Silva, L. L. Alves, J. P. Bizarro  
Project: CONC-REEQ/65/2001  
Institution: Fundação para a Ciência e a Tecnologia, Ministério da Ciência Inovação e Ensino Superior.  
Funding: 300 k€  
Period: 2001-2006

Description: To establish a Parallel Computing Laboratory for High Performance Computing in Plasma Physics (a large scale Linux Beowulf cluster, with 80 processors), capable of addressing Grand Challenge problems in Plasma Physics, providing access to resources that can enhance the leadership of the IST research programs in the field of Theoretical and Computational Plasma Physics. The project will also foster the use of parallel computing in science and technology, training a new generation of scientists and engineers capable of taming and fully explore the tremendous computing power available in parallel clusters.

### Responsible of Projects for Scientific and Technical Cooperation

Title: Sistema inovador de micro-ondas para a produção de mini-plasmas à pressão atmosférica  
Framework: Cooperação Científica e Técnica Luso-Francesa: Acordo GRICES / CNRS (2007-2008)  
Leadership: L. L. Alves, C. Boisse-Laporte  
Project: 4.1.1 / FRANÇA  
Collaboration: Laboratoire de Physique des Gaz et des Plasmas, Université de Paris-Sud (Orsay, France)  
Training: Co-tutored PhD thesis

Description: This project aims to project and build a microwave (2.45 GHz) innovative system (strip-line terminated by a 100-300µm gap) for the production of mini-plasmas at atmospheric pressure (in ambient air or in controlled atmospheres of argon, xenon, nitrogen or oxygen), in view of environmental applications. The research program follows a double strategy (experimental and modeling) with a double purpose (fundamental and applications). The project (i) will develop simulation tools to describe the transport and the thermal balance of the gas/plasma system; (ii) will carry out electrical and spectroscopic diagnostics to characterize the plasmas produced.

Title: Mecanismos de dissociação em plasmas de H<sub>2</sub>, O<sub>2</sub> e misturas com Ar, utilizados na modificação e depósito de materiais  
Framework: Cooperação Científica e Técnica Luso-Espanhola: Agreement GRICES / CSIC (2006-2007)  
Leadership: L. L. Alves, J. Cotrino Bautista  
Collaboration: Instituto de Ciencias de Materiales de Sevilla, Instituto Mixto del Consejo Superior de Investigaciones Científicas y la Universidad de Sevilla (Sevilla, España)



Description: This project allowed the characterization of the dissociation mechanisms in microwave plasmas of hydrogen, oxygen and their mixtures with argon, produced within a surface-wave driven reactor for material modification and/or deposition. Plasma analysis was carried out by comparing simulation results with experimental diagnostics for the electron density, temperature and the densities of the main plasma species.

Title: Modelização multi-escala de um reactor ICP para a gravura de óxidos intermetálicos a plasma fluorcarbonado

Framework: Cooperação Científica e Técnica Luso-Francesa: Agreement GRICES / EGIDE (2005/2006)

Leadership: L. L. Alves, A. Rhallabi

Project: 4.1.1 / FRANÇA

Collaboration: Laboratoire des Plasmas et des Couches Minces, Institut des Matériaux Jean Rouxel de Nantes (Nantes, France)

Description: This project will develop a multi-scale model of an inductively coupled reactor for metallic oxide etching. The final simulation tool is to integrate three different calculation modules: electromagnetic and charge particle transport, chemistry and surface. Results on the plasma potential, the densities of species, and the evolution of submicrometer etching profiles are to be compared with in situ measurements performed at LPCM of the IMN.

Title: Estudo duma descarga micro-ondas para o desenvolvimento de reactores de tratamento de superfícies a plasma

Framework: Cooperação Científica e Técnica Luso-Francesa: Agreement GRICES / EGIDE (2004/2005)

Leadership: L. L. Alves, C. Boisse-Laporte

Project: 4.1.1 / FRANÇA

Collaboration: Laboratoire de Physique des Gaz et des Plasmas, Université de Paris-Sud (Orsay, France)

Training: Co-tutored PhD thesis

Description: The project will contribute to enhance the understanding of the basic mechanisms controlling the operation of a surface-wave plasma co-axial reactor, for material processing. The project is based on a strong interplay between experimental measurements and numerical simulations, particularly in what concerns the plasma behavior near the reactor walls.

Title: Optimização dum reactor a plasma de onda de superfície para o depósito de filmes finos

Framework: Acções Integradas Luso-Espanholas (2003/2004)

Leadership: L. L. Alves, J. Cotrino Bautista

Project: E-51/03

Collaboration: Departamento de Física Atómica Molecular Y Nuclear, Facultad de Física, Universidad de Sevilla (Sevilla, Spain). Laboratório de Ciências de Materiales, Instituto Mixto del Consejo Superior de Investigaciones Científicas y la Universidad de Sevilla (Sevilla, Spain)

Description: The project allowed optimizing the working conditions of a surface-wave plasma reactor for thin film deposition. We have developed a 32 levels collisional-radiative model for argon (including an extensive revision of the corresponding direct electron cross-sections) and a thermal balance model for the buffer gas.

Title: Modelização e caracterização em função da frequência dum reactor de acoplamento capacitivo rf para misturas H<sub>2</sub>+SiH<sub>4</sub>

Framework: Cooperação Científica e Técnica Luso-Francesa: Agreement ICCTI / French Embassy (2001-2003)

Leadership: L. L. Alves, G. Gousset

Project: 539-B4

Collaboration: Laboratoire de Physique des Gaz et des Plasmas, Université de Paris-Sud (Orsay, France). Laboratoire de Physique et Technologie des Plasmas, École Polytechnique (Palaiseau France)

Training: Co-tutored PhD thesis

Description: The project has successfully contributed to develop and validate a simulation tool for the modeling of a capacitively coupled radio-frequency PECVD reactor, running in H<sub>2</sub>+SiH<sub>4</sub> mixtures for a-Si:H thin film deposition. Model validation was ensured by extensive comparisons between calculation results and experimental measurements of the coupled power, the self-bias voltage and the densities, energies, and currents of the main species in the discharge.

Title: Optimização de reactores a plasma para o tratamento de superfícies

(Reactor capacitivo RF/VHF; Descarga HF produzida em argon por uma onda de superfície; Reactor magnetron para tratamento de superfícies)

Framework: Cooperação Científica e Técnica Luso-Francesa: Agreement ICCTI / CNRS (2001-2003)

Leadership: L. L. Alves, G. Gousset

Project: 423 / FRANÇA

Collaboration: Laboratoire de Physique des Gaz et des Plasmas, Université de Paris-Sud (Orsay, France)

Description: The project has successfully contributed to initiate the development of simulation tools for the different plasma reactors considered here: capacitively coupled RF/VHF reactors, running at frequencies from 13.56MHz to 80MHz; surface-wave cylindrical and co-axial plasma reactors, running at 2.45GHz frequency; DC magnetron reactor for surface treatment.

### **Responsible of Bilateral Agreements for Higher Education**

Framework: Program Sócrates / Erasmus -2011/2015

Domain: Physics, Mechanical Engineering, Civil Engineering, Eco-technology in Electronics and Optics  
Foreign University: Polytech'Orléans, Ecole Polytechnique de l'Université d'Orléans, Orléans, France  
Portuguese University: Universidade Técnica de Lisboa, Instituto Superior Técnico  
Degrees: BSc / MSc

Framework: Program Sócrates / Erasmus – 2005/2008, 2009/2012  
Domain: Physics  
Foreign University: Universidad de Sevilla, Sevilla, Spain  
Portuguese University: Universidade Técnica de Lisboa, Instituto Superior Técnico  
Degrees: MSc / PhD

Framework: Program Sócrates / Erasmus – 2003/2006, 2006/2008, 2009/2012  
Domain: Physics  
Foreign University: Université de Paris-Sud, Orsay, France  
Portuguese University: Universidade Técnica de Lisboa, Instituto Superior Técnico  
Degrees: MSc / PhD

### **Participation in Research Projects as senior scientist**

Title: IMP3 – Transport Code and Discharge Evolution  
Framework: Integrated Tokamak Modelling Task Force (2009 - 2012)  
Leadership: G. Falchetto (leader), R. Coelho, D. Coster (deputies)  
Funding: European Fusion Development Agreement (EFDA)

Title: Desarrollo y optimización de métodos basados en plasmas de microondas para la destrucción de compuesto BETX y derivados  
Framework: Plan National de R+D+I (2004-2007)  
Leadership: A. Rodero Serrano  
Project: CTQ2005-04974/PPQ  
Institution: Ministerio de Educación y Ciencia Español  
Host institution: Departamento de Física Aplicada, Universidad de Córdoba

Title: Laboratório de Engenharia de Plasmas para Aplicações Ecológicas  
Framework: Projectos de I&D em Todos os Domínios Científicos (2004-2006)  
Leadership: C. M. Ferreira  
Project: POCTI/FIS/61679/2004  
Institution: Fundação para a Ciência e Tecnologia, Ministério da Ciência Inovação e Ensino Superior  
Host institution: Centro de Física dos Plasmas, Instituto Superior Técnico

Title: Large-scale HF molecular plasma sources  
Framework: Program SAPIENS Proj99 (2000-2003)  
Leadership: C. M. Ferreira  
Project: 36294/99  
Institution: Fundação para a Ciência e Tecnologia, Ministério da Ciência e Tecnologia  
Host institution: Centro de Física dos Plasmas, Instituto Superior Técnico

Title: Descargas Eléctricas em Gases Moleculares  
Framework: Agreement ICCTI/CNRS (1999-2001)  
Leadership: C. M. Ferreira, G. Gousset  
Project: 423/CNRS  
Collaboration: Laboratoire de Physique des Gaz et des Plasmas, Université de Paris-Sud (Orsay, France)

Title: Mixed Project in Fundamental Studies on Mixed-gas Plasmas intended for Spectrochemical analysis (1997-1998)  
Leadership: J. Margot Chaker  
Host institution: Départements de Physique et Chimie, Université de Montréal (Canada)

Title: Criação, Diagnóstico e Modelização de Plasmas Reactivos  
Framework: Redes Formação-Investigação (1996-1998)  
Leadership: C. M. Ferreira, G. Gousset  
Project: 96/RFR 35  
Collaboration: Laboratoire de Physique des Gaz et des Plasmas, Université de Paris-Sud (Orsay, France)

Title: Criação, Diagnóstico e Modelização de Plasmas Reactivos  
Framework: Program PRAXIS XXI (1996-1999)  
Leadership: C. M. Ferreira  
Project: PRAXIS/2/2.1/FIS/377/94  
Institution: Junta Nacional de Investigação Científica e Tecnológica, Ministério da Ciência e Tecnologia  
Host institution: Centro de Física dos Plasmas, Instituto Superior Técnico

Framework: Agreement JNICT/BMFT (1992-1995)  
Leadership: C. M. Ferreira, H. Schlüter

Collaboration: Institute für Experimentalphysik II, Rhur Universität (Bochum, Germany)

Frameworks: Agreements INIC/CNRS and JNICT/CNRS (1989-1991)

Leadership: C. M. Ferreira, others

Collaboration: Laboratoire de Physique des Gaz et des Plasmas, Université de Paris-Sud (Orsay, France)

## 10. Publications

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L.L. Alves  
"Modelização cinética de plasmas de hélio mantidos por campos de alta frequência"  
PhD Thesis, Universidade Técnica de Lisboa (1993).

### Edition of books

Europhysics Conference Abstracts Vol. 36A, P.C.G. Almeida, L.L. Alves and V. Guerra, eds. (ISBN: 2-914771-74-6, <http://escampig2012.ist.utl.pt/Proceedings/index.htm>); e-Proceed 21th ESCAMPIG, Europhysics Conference on the Atomic and Molecular Physics of Ionised Gases, Viana do Castelo, Portugal 2012.

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L.L. Alves and G. Gousset  
"Wave-plasma energy coupling in cylindrical surface wave discharges"  
Microwave Discharges: Fundamental and Applications, Proceed. Vth International Workshop on Microwave Discharges: Fundamental and Applications (A. Ohl ed.), INP Greifswald, Germany 2003, pp. 90-99.

L.L. Alves and G. Gousset  
"Modelo hidrodinâmico de deriva-difusão em grelha adaptativa, para plasmas de descarga micro-ondas em geometria coaxial"  
Métodos Numéricos en Ingeniería 2005 (J.L. Pérez Aparicio, A. Rodríguez Ferran, J.A.C. Martins, R. Gallego and J.C. de Sá eds.; ISBN 84-95999-74-9), Granada, Espanha 2005, p. 432 (+article in CD-ROM).

S. Letout, P. Leprince, L. Teulé-Gay, L.L. Alves and C. Boisse-Laporte  
"Hot anisotropic electron population in a low-pressure coaxial microwave discharge"  
Microwave Discharges: Fundamental and Applications, Proceed. VIth International Workshop on Microwave Discharges: Fundamental and Applications (Yu. A. Lebedev ed.; ISBN 5-8037-0343-5), Yanus-K, Moscow, Rússia 2006, pp. 51-56.

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"2D electromagnetic model of a microwave plasma torch reactor"  
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L. Marques, C.D. Pintassilgo, G. Alcouffe, L.L. Alves and G. Cernogora  
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"Microwave micro-plasma sources at atmospheric pressure: simulation and experiment"  
Microwave Discharges: Fundamental and Applications, Proceed. VIIth International Workshop on Microwave Discharges: Fundamental and Applications (M. Kando and M. Nagatsu eds.; ISBN 978-4-9905002-0-7), Scientific Council of RAS on Physics of Low Temperature Plasma, Hamamatsu, Japan 2009, pp. 3-12.

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### **Other publications**

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## 11. Communications

### Oral communications by invitation

L.L. Alves

"Modelização cinética dum plasma de hélio produzido por uma descarga de micro-ondas a baixas pressões"

Proceed. Física 90, ed. Sociedade Portuguesa de Física, Lisbon, Portugal 1990, p.69.

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L.L. Alves

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III Iberian Joint Meeting on Atomic and Molecular Physics, Mira, Portugal 1998.

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"Modelização e diagnósticos de descargas rádio-frequência em SiH<sub>4</sub>+H<sub>2</sub> para o depósito de filmes de a-Si:H"

XXI CBRAVIC, Congresso Brasileiro de Aplicações de Vácuo na Indústria e na Ciência, São Paulo, Brazil 1999.

L.L. Alves and G. Gousset

"Wave-plasma energy coupling in cylindrical surface wave discharges"

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L.L. Alves

"Fluid description of the energy absorption in microwave discharges: a new perspective"

14th International Colloquium on Plasma Processes (CIP'2003), Antibes, France 2003.

L. Marques, J. Jolly, G. Gousset and L.L. Alves

"Capacitively coupled hydrogen discharges: modeling vs. experiment"

The European Material Conference, E-MRS Spring Meeting, European Materials Research Society, Strasbourg, France 2004.

L.L. Alves

"Modelo hidrodinâmico de difusão-convexão em grelha adaptativa, para plasmas de descarga micro-ondas em geometria coaxial"

Congreso de Métodos Numéricos en Ingeniería (CMNI-05), Granada, Spain 2005.

L.L. Alves

"New features on surface-wave discharges: boundary phenomena and power deposition"

XIth Conference on Plasma Physics and Applications, Iasi, Rumania 2005.

L.L. Alves

"Model of gas heating in a microwave discharge"

9th High Technology Plasma Processes (HTTP9), St-Petersburg, Russia 2006.

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L. Marques, J. Jolly and L.L. Alves

"Electrical characterization of capacitively-coupled radio-frequency discharges in hydrogen"

Proceed. 10th PSE, International Conference on Plasma Surface Engineering, Garmisch-Partenkirchen, Germany 2006.

R. Alvarez, L. Marques and L.L. Alves

"Modeling of an axial injection torch"

Proceed. 3rd International Workshop and Summer School on Plasma Physics (E. Benova, ed.), Kiten, Bulgaria 2008.

R. Álvarez and L.L. Alves  
"Electromagnetic modeling of axis-symmetric microwave devices"  
Proceed. 3rd International Workshop and Summer School on Plasma Physics (E. Benova, ed.), Kiten, Bulgaria 2008.

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L.L. Alves, J. Loureiro and C.M. Ferreira  
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NATO ADVANCED STUDY INSTITUTE in "Non-equilibrium processes in partially ionised gases", Acquafreda di Maratea, Italy 1989.

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ADVANCED RESEARCH WORKSHOP in "Electron kinetics and applications of glow discharges", St. Petersburg, Russia 1997.

L.L. Alves and G. Gousset  
"Self-consistent electromagnetic modelling of cylindrical surface wave discharges"  
Vth International Workshop on Microwave Discharges: Fundamental and Applications, Geifswald, Germany 2003.

R. Álvarez and L.L. Alves

"Construction of an electromagnetic model for axis-symmetric microwave devices"  
3rd International Workshop and Summer School on Plasma Physics, Kiten, Bulgaria 2008.

**Lisbon, April 2013**

**Luís Lemos Alves**

An academic degree is a qualification awarded to students upon successful completion of a course of study in higher education, usually at a college or university. These institutions commonly offer degrees at various levels, usually including bachelor's, master's and doctorates, often alongside other academic certificates and professional degrees. The most common undergraduate degree is the bachelor's degree, although in some countries there are lower level higher education qualifications that are also Candidates of Sciences proceed to their Doctoral Degree (the second Degree to confirm the scientist status), which is awarded following successful defence of their doctoral dissertation. A POSTGRADUATE MILITARY COURSE is the equivalent of a university postgraduate course; however, it is only related to the Russian Ministry of Internal Affairs and Ministry of Defence.Â Academic qualification certificate. Postgraduate Degree certificate. Medical internship certificate. Traditionally, academic degree courses held more value, but the popularity of professional courses in recent times have firmly established their ground in the job market. A professional course is one that provides you with practical skills, making you job-ready at the completion of the course. In comparison, the goal of a degree course is to provide you with a strong academic foundation in a particular subject, not necessarily making you "job-ready"™.