

UC3M R&D FOR INNOVATION in Space Area

IDENTIFICATION OF RESEARCH ACTIVITY, TECHNOLOGIES,
PATENTS, INFRASTRUCTURES AND OTHER CAPABILITIES
OF UC3M IN SPACE AREA

Central Pacific Ocean at Night (NASA, International Space Station, 09/18/11)



Universidad **Carlos III** de Madrid
Vicerrectorado de Política Científica
Servicio de Apoyo al Emprendimiento y la Innovación



Typhoon Halong (NASA, International Space Station, 08/05/14)

The Entrepreneurship and Innovation Support Service (SEI) of the Universidad Carlos III de Madrid wants to present the potential of the university in this "knowledge map" through the research areas developed in the frame of R & D projects, both national and international, patents and other results of UC3M investigators, in Space Area.

The global knowledge obtained, the experience of collaborating with the industry, the existence of infrastructures and proper laboratories and, above all, the multidisciplinary nature of UC3M are characteristics that provide an added value so that our support towards the innovation of institutions, big companies and SMEs has an integral quality.

We invite you to deepen the knowledge of the UC3M and to collaborate in new R & D and innovation projects.

Entrepreneurship and Innovation Support Service
Universidad Carlos III de Madrid

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R&D GROUP	DESCRIPTION	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
CENTER FOR AEROSPACE AND SECURITY SYSTEMS			
<u>Communications and Signal Processing Laboratory</u> Directors: Ana García Armada, Fernando Díaz de María	<p>Communications and Signal Processing Laboratory is formed by a team of experts in:</p> <ul style="list-style-type: none"> The study, design and implementation (HW) of signal processing and communications system, based on wireless technologies, specifically using OFDM and MIMO technologies The design of algorithmic solutions in the field of voice, audio, image and video processing, with special emphasis on machine vision, video coding and voice technologies 	<ul style="list-style-type: none"> Communications: signal processing and transmission (A. Gª. Armada) <ul style="list-style-type: none"> Cooperative transmission in sensor networks. Robust wireless communication system design and prototyping (OFDM, MIMO technologies). High spectral efficiency techniques. Base station cooperation and interference cancellation in cellular systems. Multimedia processing: Machine Vision and Video Coding (F. Díaz de María) <ul style="list-style-type: none"> Video coding Video coding standards Machine Vision Voice technologies 	Scientific-Technological Services: <ul style="list-style-type: none"> Communications: signal processing and transmission <ul style="list-style-type: none"> Cooperative transmission in sensor networks Robust wireless communication system design and prototyping (OFDM, MIMO technologies) High spectral efficiency techniques Multimedia processing: Machine vision, medical imaging, speech technologies and video coding. <ul style="list-style-type: none"> Machine vision: <ul style="list-style-type: none"> Detection of events in video-surveillance (video analytics) Detection and recognition of objects/places/people/ events Indexation and automatic annotation of multimedia contents Image/video segmentation, restoration, tracking, classification Medical imaging: aid in diagnosis Brain tumor classification by means of automatic MRI analysis Early detection of melanomas Speech technologies Video coding: Design of a proprietary algorithm for H.264/AVC, HEVC, 3D, SVC image or video coding Exploitation of special equipment <ul style="list-style-type: none"> DSP Platform for prototyping of communications systems E4438C-ESG vector signal generator DSO90604A-Infiniium Oscilloscope II Probe Amplifier High performance Vector Signal Analyzer

R&D GROUP	DESCRIPTION	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
CENTER FOR AEROSPACE AND SECURITY SYSTEMS			
<p><u>IR and Spectral Sensor Laboratory (SPECTRALAB)</u></p> <hr/> <p>Director: Fernando López</p>	<p>Thanks to the properties that presents the material in the IR as a large number of molecular transitions taking place in this region of the electromagnetic spectrum, the laboratory is able to apply these techniques to infrared thermography (IR), gas detection and non-destructive testing of composite materials</p>	<ul style="list-style-type: none"> • Use of hyper- and multispectral sensors • Infrared spectral imaging for remote detection • IR spectral thermography applied in non-destructive analysis 	<p>Scientific-Technological Services:</p> <ul style="list-style-type: none"> • IR tomography: remote temperature measurement • Use of hyper- and multispectral sensors • Detection of gases with well-defined IR emissions, with possible applications in defense, security and the environment • IR spectral imaging for remote detection • SAFETY: personal rescue, maritime surveillance, fires, mining, and night vision • SECURITY: Detection of hot spots and heat sources. Night vision and surveillance <p>Exploitation of special equipment:</p> <ul style="list-style-type: none"> • Quantum Cascade Laser • Developer Laser Module • Control Module • XEVA-CL camera 320 x 256 60HzT4
 • SWIR hyperspectral lenses • Narrow-Angle Telescope • Visible Boresight Camera • Infrared spectrophotometer

R&D GROUP	LINES OF RESEARCH	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
BIOENGINEERING AND AEROSPACE ENGINEERING DEPARTMENT			
<u>Aerospace</u> <u>Engineering</u> <u>Research Group</u> <hr/> PI: Eduardo Ahedo	<ul style="list-style-type: none"> • Plasma space propulsion <ul style="list-style-type: none"> · Hall-effect thrusters · Helicon Thrusters and Magnetic Nozzles · Expansion of plasma beams · Plasma-spaceship and plasma-surface Interactions · Space debris de-orbiting with plasma beam • Computational fluid mechanics <ul style="list-style-type: none"> · Unsteady Aerodynamics of flapping wings · Spray diffusion flame · Stratified flows · Multiphase fluids · Wall bounded turbulent flows · Flow separation • Experimental fluid mechanics <ul style="list-style-type: none"> · Infrared thermography · Tomographic Particle Image Velocimetry (PIV) · Convective heat transfer · Swirl Flows · Flapping wings • Space flight dynamic <ul style="list-style-type: none"> · Space tether dynamic · Trajectories Optimisation • Air navigation and control <ul style="list-style-type: none"> · Flight plan optimisation · Conflict detection and resolution algorithms · Persistent contrails mitigation strategies · Stochastic optimal control 	<ul style="list-style-type: none"> • FP7 and H2020 Projects <ul style="list-style-type: none"> · 'Improving LEO Security With Enhanced Electric Propulsion (LEOSWEEP)' (Grant 607457) · 'HeliconPlasmaHydrazine.COrnbiniedMicro (HPHCOM)' (Grant 218862) · AFDAR (Advanced Flow Diagnostics for Aeronautical Research. (FP7/2007-2013) · HALA! SESAR WP-E Project • ESA Projects (European Space Agency) <ul style="list-style-type: none"> · 'Ion Beam Shepherd for Contactless Debris Removal' (A0/1-6411/10/NL/CBI) · 'Helicon Plasma Thrusters for Space Missions' (4000107292/12/NL/CO) · 'Ion Beam Shepherd IOD Mission (IBS-IOD)' (4000109292/13/NL/MV) · 'Modification of the orbit of a small asteroid with ionic collisions(MOSAIC)' (4000107023/12/F/MOS) · 'Specific testing equipment and methodology for sputtering tests of electric propulsion materials' • US-AFOSR Projects <ul style="list-style-type: none"> · 'Analysis of the rotating-spoke oscillation in Hall thrusters and its role on turbulent transport' (Award FA8655-13-1-3033) · 'Plasma detachment mechanisms in propulsive magnetic nozzles' (Award FA8655-12-1-2043) · 'Magnetic nozzles for plasma thrusters: acceleration, thrust, detachment mechanisms' (Award FA8655-10-1-3085) · 'Two-dimensional modelling of the Hall thruster discharge' 	<p>Space Technologies Capacity:</p> <ul style="list-style-type: none"> • Magnetised plasma discharge simulation code. Info: aero.uc3m.es/ep2 • Magnetic nozzle for directing plasma beam. Info: aero.uc3m.es/ep2 • Three-dimensional unsteady aerodynamic simulation code (TUCAN). Info: aero.uc3m.es/cfd • Tomographic PIV codes. Info: aero.uc3m.es/EFMlab • Electrodynamic tether dynamic simulation codes. Info: aero.uc3m.es/sfd • Low-thrust trajectory optimisation tool. Info: aero.uc3m.es/sfd <p>Equipment and installations:</p> <ul style="list-style-type: none"> • Research Laboratories: <ul style="list-style-type: none"> · Water tunnel · Vacuum chamber for plasma space thruster testing · Tomographic PIV • Aerospace Technology Laboratories: <ul style="list-style-type: none"> · Aerodynamics Lab <ul style="list-style-type: none"> · Subsonic Aerodynamic Tunnel: 0.4x0.4m, Vmax=20m/s, turb. intensity. <1% · Propulsion Lab <ul style="list-style-type: none"> · Hybrid Rocket Thruster · Gas Turbine (131 mm diameter, max thrust 230 N) · Fire-proof installation for combustion experiments



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BIOENGINEERING AND AEROSPACE ENGINEERING DEPARTMENT			
<u>Aerospace</u> <u>Engineering</u> <u>Research Group</u> <hr/> <u>PI: Eduardo</u> <u>Ahedo</u>	<ul style="list-style-type: none"> National R&D Plan Projects <ul style="list-style-type: none"> Spray Diffusion Flames. Consolider-Ingenio 2010 project, SCORE (CSD2010-00011) Unsteady Aerodynamics of flapping wings. (TRA 2012-37714) 'Propulsion Espacial por Plasma' (Plasma Space Propulsion)(AYA2010-16699) Propulsion Espacial por Plasma: Simulación y Experimentación (Plasma Space Propulsion: Simulation and Experimentation) (ESP2013-41052-P) 'Cámara de ensayo de propulsión eléctrica'(Electric propulsion test chamber) (UNC313-4E-1552) 'System de medida simultánea de flujos 3D y de transferencia de calor en pared en un túnel hidrodinámico'(Simultaneous measurement system of 3D flows and heat transfer in hydrodynamic tunnel wall) (UNC313-4E-2231) 	<ul style="list-style-type: none"> Navigation and Flight Mechanics Lab <ul style="list-style-type: none"> EyasSat Rev C+ nano satellite trainer Hexapod (Steward platform) Cockpit instrument demonstrator Flight simulator with integrated avionics Aerospace Design Lab <ul style="list-style-type: none"> 3D printer (max. Size 254x381x203 mm) Manual winch Orthogonal cutting test machine (with force measurement system) Computer clusters <ul style="list-style-type: none"> 156 cores (26 Intel Xeon X650 processors), 632GB of total RAM Cluster with 2 redundant RAID5 and 2x 10TB 	

R&D GROUP	LINES OF RESEARCH	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
MATERIALS SCIENCE AND ENGINEERING AND CHEMICAL ENGINEERING			
Behaviour of materials in service (CSM) <hr/> Directors: Miguel Ángel Martínez Casanova, Francisco Javier Velasco López	<ul style="list-style-type: none"> • Electrochemistry: corrosion and protection • Surface treatments and adhesion: adhesives and paints • Tribology: friction and wear • Durability in reinforced concrete structures • Performance in materials service 	<ul style="list-style-type: none"> • European Projects <ul style="list-style-type: none"> • PARTICOAT: New Multipurpose coating systems based on novel particle technology for extreme environments at high temperatures • National R&D Plan Projects <ul style="list-style-type: none"> • Study of open cell foams and microcellular and adhesive joints with other construction elements: Mechanical behavior and durability • In-house projects (Funded by UC3M) <ul style="list-style-type: none"> • TPSS: Thermo Plastics for Space Structures • MULTIPLY-2: Multi-material layered lightweight structures using atmospheric pressure plasma technology and adhesive bonding manufacturing • Private funding <ul style="list-style-type: none"> • Improving the adhesiveness of polymeric materials by treatment by atmospheric plasma torch for adhesive joints 	<p>Technological Offer:</p> <ul style="list-style-type: none"> • Resolution of problems that numerous materials of industrial applications present against adherence and that need to be glued and/or painted to form part of structures • Analysis of pieces that have presented problems in their service life and trying to dictate the possible causes of failure. Moreover, the group is able to design new materials that can present an optimized behavior in these circumstances • Characterization of the wear that materials suffer or can suffer • Improvement of the durability of metals and structures with metallic components <p>The Group of Investigation "Behavior of materials in service" is a member of the Interuniversity Group of Investigation of Structural Adhesives with the Universidad Pontificia Comillas-ICAI</p>

R&D GROUP	LINES OF RESEARCH	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
MATERIALS SCIENCE AND ENGINEERING AND CHEMICAL ENGINEERING			
<u>Numerical Modelling, Simulation and Industrial Mathematics Group (GMSMI)</u> Director: Luis López Bonilla	<ul style="list-style-type: none">• Non-linear electronic transport in nano-structures• Numeric methods in engineering problems. Meshless numeric methods• Defect models in solids and multi-scale simulations• Treatment of images and inverse problems		<p>Technological Offer:</p> <ul style="list-style-type: none">• Modeling and control software for geostationary satellites• Update of software for the optimum control of geostationary satellites <p>Scientific-Technological Services:</p> <ul style="list-style-type: none">• Space Astrodynamics and Geodesy<ul style="list-style-type: none">· Orbital control of geostationary satellites· Space geodesy and navigation

R&D GROUP	LINES OF RESEARCH	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
<u>Sensor, Remote Detection and Infrared Images Laboratory (LIR-InfraRed LAB)</u>	<p>PHYSICS DEPARTMENT</p> <ul style="list-style-type: none"> • Advanced multispectral IR sensor and microsensor design and manufacture for space applications • Gas detection by means of infrared spectral imaging • Infrared sensors for detecting suspended particles and dust • Modelling and simulation of synthetic IR images • Leak-tightness analysis in fuel tanks • High spectral and spatial resolution multi- and hyperspectral IR image for specific analyses and applications • Advanced IR Thermography • Quality Control by means of NDT-IR (Non-destructive and non-invasive analysis technique) • Analysis of the behaviour of materials subjected to fire • Microsensors and microsystems design 		
PI: Fernando López		<ul style="list-style-type: none"> • National R&D Plan Projects <ul style="list-style-type: none"> • JEM-EUSO Mission: Infrared remote detection of cloud temperature and manufacture of <i>breadboard</i> models based on microbolometer focal plane arrays • MEIGA-METNET Martian dust Sensor. Based on a infrared spectral microsensor and on a dust wiper • In-house Projects(Funded by UC3M) <ul style="list-style-type: none"> • Infrared scientific applications particularly those related to IR System Modelling and Simulation • Industrial applications of infrared Optics particularly in the Safety- and Environment-related Aerospace Industry • Strategic Action in Advanced Multispectral Infrared Image Sensor. (2011-2020) • Private Funding <ul style="list-style-type: none"> • SENSIA CHAIR of advanced studies in Applied Optics and Infrared Sensors (2009-2017) • Checking the Leak-tightness in Fuel Tanks by means of using Spectral Infrared IR Image Analysis Techniques • Development of a Sensor Parametric Model and Tasks for Supporting the Analysis and Design related to EO/IR sensors of Systems 	<p>Technological Offer:</p> <ul style="list-style-type: none"> • Dust and gas microsensor suitable for space missions • Detection of microleaks in fuel tanks • System for detecting and quantifying gas by means of IR <p>Patents:</p> <ul style="list-style-type: none"> • Differential autonomous detection system. Patent ES2190308 • Method of detecting gases by infrared absorption using solid state Fabry-Perot filters. Patent ES2109166 <p>Laboratories:</p> <ul style="list-style-type: none"> • LATIR: Laboratory specializing in the calibration and test by means of thermographic and infrared imaging analyses • LABSENS: Hyperspectral Sensor Laboratory <p>Equipment:</p> <ul style="list-style-type: none"> • IR Chambers: MIR, LWIR and VIS/NIR • FTIR Spectrophotometer and Spectroradiometry • High resolution hyperspectral imaging system • Calibration black bodies • IR detectors and electronic instrumentation for the prototype manufacture <p>Technical Scientific Services:</p> <ul style="list-style-type: none"> • Designing and incorporating IR techniques in the performance of Tests and Calibrations of materials, devices and systems • Designing and developing low-weight and volume IR sensors for specific applications

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COMPUTER DEPARTMENT			
<u>Computer, Communications and Systems Engineering (ARCOS)</u> <hr/> Director: Jesús Carretero Pérez	<ul style="list-style-type: none"> Real time systems: <ul style="list-style-type: none"> Real time simulation systems in planes and trains Wireless network sensors Remote monitoring systems High performance computing: <ul style="list-style-type: none"> Scalable massive data management Cloud and grid computing Parallel file systems Distributed and parallel systems: <ul style="list-style-type: none"> High performance data retrieval and transmission system Social network data analysis Peer to peer systems 	<ul style="list-style-type: none"> Private funding <ul style="list-style-type: none"> HIDDRA: Research in Advanced methods and techniques of "Hot Data" distribution from Earth observation missions 	Technological Offer: <ul style="list-style-type: none"> Tool for the efficient management of massive data storage. ParFiSys, Parallel File System, compatible with UNIX, which can be run outside the operating system Adaptive, fault-tolerant and light data storage system (AFTSYS)

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COMPUTER SCIENCE DEPARTMENT			
<u>Planning and Learning (PLG)</u> <hr/> PI: Carlos Linares López	<ul style="list-style-type: none"> • Heuristic search • Automatic task planning • Learning • Robotics • Artificial Intelligence, Programming Paradigms and Automatic Planning 	<ul style="list-style-type: none"> • In-house Projects (Funded by UC3M) <ul style="list-style-type: none"> • DESSERT: Design for Safety and efficiency of Autonomous Robots. (PPI-A: Proposal Preparation Aid) • Private Funding <ul style="list-style-type: none"> • Complexity, Cost and Change Impact Based on Models (GMV and ESA) • DC-II Prototype Tasking & Data Centres (GMV and ESA) • Conceptual design and viability study in the AMPinC technological project (Cassidian) • SSADCII WP2: Space Situational Awareness - DCII Prototype Tasking & Data Centres - WP2 Sensor Planning Services (GMV and ESA) 	<p>Technological Offer:</p> <ul style="list-style-type: none"> • Mission Planning: Autonomous systems, Single spacecraft/constellations, Mission Planning Systems • Scheduling: ESTRACK-Planning-System, maintenance and use of multiservice antennas (individual or in group) • Decision making: Automatic validation of civil/military flight plans (AMPinC). Cost, effort and quality prediction (Complexity, Cost and Change Impact Based on Models)

R&D GROUP	LINES OF RESEARCH	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
TELEMATIC ENGINEERING DEPARTMENT			
<u>Advanced Switching and Communication Technologies (ADSCOM)</u> <hr/> PI: David Larrabeiti	<ul style="list-style-type: none"> • Multimedia Networks • Design of networks for real time multimedia data transport (RTP/RTCP) • Traffic modelling for efficient bandwidth and delay communications 	<ul style="list-style-type: none"> • European Projects: <ul style="list-style-type: none"> • AFFERENT: Application-Favouring Facilitation Environment for Resource-Enabled Networking Technology • Fed4FIRE - Ultra Access • BONE (Building the future Optical Network in Europe) • FIERRO (Future Internet: Efficiency in High Performance Networks) • National R&D Plans <ul style="list-style-type: none"> • Integrated Metro-Access Optical Network Architecture • In-house Projects (Funded by UC3M) <ul style="list-style-type: none"> • BONE: Building the Future Optical network in Europe: The e-Photon/One Network • MobiToken: Secure Mobile Token for Access Control • NASDAC: Next Generation Wireless Architectures based on Distributed Antenna Systems with Centralised Processing and Transport over Optical Networks • SYMBIOTIC: Smart Energy-Efficient Symbiotic Data Centre Design • TERAMAN: Terabit/s Smart and Converged Metro-Access Network 	Technological Offer: <ul style="list-style-type: none"> • Secure multipath ad-hoc communication networks • On board multimedia networks, multipoint optical networks • Telecommunication network optimisation

R&D GROUP	LINES OF RESEARCH	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
SYSTEMS ENGINEERING AND AUTOMATION DEPARTMENT			
<p><u>Robotics</u> <u>Laboratory</u> <u>(Robotics Lab)</u></p> <hr/> <p>PI: Miguel A. Salichs, Carlos Balaguer, Luis Moreno</p>	<ul style="list-style-type: none"> • Aerospace systems • Visual tracking and servoing • Robotics for space <p>The activity of Robotics Laboratory in the aerospace sector focuses on two different areas: visual navigation of autonomous satellites and simulation of some general systems of the Eurofighter aircraft</p>	<ul style="list-style-type: none"> • European Projects <ul style="list-style-type: none"> • MEIGA3. Development and exploitation of surface a pyrometer, a sensor and actuator of dust opacity for the mars mission Meiga-Metnet precursor • STAMAS. Smart technology for artificial muscle applications in space • National R&D Plan Projects <ul style="list-style-type: none"> • ASIROV. Docking and capture of satellites by means of Vision-based Robotics Systems • RISANAR. Satellite Recognition and Inspection via Relative Autonomous Navigation • Private Funding <ul style="list-style-type: none"> • EADS Simulations of ECS, ETC and LFE systems • MARS-DW. Martian dust wiper • eSEAL Project. New electronic seal with remote supervision via satellite 	<p>Technological offer:</p> <ul style="list-style-type: none"> • <i>Platform for satellite identification and recovery.</i> Scale experimental platform allows satellite recognition and inspection in orbit by means of vision systems located in other satellites • <i>Mobile outdoor robot.</i> Applicable in the aerospace, navigation and planning sector, the propulsion system thereof also being autonomous

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ELECTRONIC TECHNOLOGY DEPARTMENT			
<p>Displays and Photonic Applications (GDAF)</p> <hr/> <p>PI: José Manuel Sánchez Pena and Carmen Vázquez García</p>	<ul style="list-style-type: none"> • Electro-optic devices and applications • Advanced Instrumentation and Sensors • Photonic Devices for Optical Networks Augmented Reality and Virtual Reality 	<ul style="list-style-type: none"> • European Projects <ul style="list-style-type: none"> • BONE. Building the Future Optical Network in Europe • COST Action IC1208: Integrating Devices And Materials: A Challenge For New Instrumentation In ICT • Novel and Reliable Optical Fibre Sensor Systems for Future Security and Safety Applications (OFSeSa) Funding Entity: VII PM UE, COST TD1001 • National R&D Plan Projects <ul style="list-style-type: none"> • Self-Referenced Fibre Optic Intensity Configurations for Single and Multi-Sensors • A New Generation of Photonic Devices based on Self-organised Materials: Characterisation (Ref. TEC2013-47342-C2-2-R) • DiACriLOLED-3D, CICYT • New Switching and Sensing Techniques in Optical Networks • Photonic Devices for Networks with Wavelength Multiplexing for Communications and Instrumentation" (FOTOCOMIN) • SACEC, REF. Ref. TSI-020110-2009-363 • Regional R&D Plan Projects. CM. (Community of Madrid) <ul style="list-style-type: none"> • Applied Photonics for the Creation of Optical Technologies and its Transfer to Madrid companies (FACTOTEM I-II) • Sensors and Instrumentation in Photonics Technologies (SINFOTONCM, REF. P2013/MIT-2790) 	<p>Scientific capacities:</p> <ul style="list-style-type: none"> • Capacity for the development of instrumentation systems which allow multipoint monitoring by means of developing quasi-distributed fibre optic -based systems • Software applications and hardware design were developed for deep space optical communications link • Collaboration with the CSIC in a development for quantum key distribution in a free-space laser link. Furthermore, reusing certain big telescopes is being proposed in such deep space communications

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ELECTRONIC TECHNOLOGY DEPARTMENT			
<u>Displays and Photonic Applications (GDAF)</u> PI: José Manuel Sánchez Pena and Carmen Vázquez García		<ul style="list-style-type: none">• Private Funding<ul style="list-style-type: none">· Optical Communications Viability Study for deep space missions· Study of the use of a single Cherenkov telescope and an array of Cherenkov telescopes for Optical Communications· Study of the Atmospheric Propagation of Optical Communications with Haps and Design of a Tracking System for an earth optical station (OPTILINK)· Research project in Advanced Systems for a more eco-efficient plane (PROSAVE)· Contribution to the development of aiming technologies for UAV sailplanes· Unmanned Systems Aimed at Zero Environmental Impact	

R&D GROUP	LINES OF RESEARCH	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
ELECTRONIC TECHNOLOGY DEPARTMENT			
<p><u>Microelectronic Design and Applications (DMA)</u></p> <p>PI: Luis Entrena Arrontes, Luis Hernández Corporales</p>	<ul style="list-style-type: none"> Analogue and mixed signal circuit design for power consumption optimisation in analogue-digital converters Topologic design of analogue-digital converters for communications applications, biomedical instrumentation and digital sensors Evaluation of the sensitivity of digital systems and circuits with respect to ionizing radiation (Single-Event Effects (SEEs)) Techniques for the mitigation of <i>soft</i> errors due to SEEs in digital systems and circuits in different abstraction levels Design of digital applications on different technologies (ASIC or FPGAs), for signal processing optimisation (Image processing hardware acceleration, biometrics, cryptography, etc.) 	<ul style="list-style-type: none"> European Projects <ul style="list-style-type: none"> OPTImisation of Mitigations for Soft, firm and hard Errors (OPTIMISE CATRENE CA30) Parasitic Extraction and Optimization for Efficient Microelectronic System Design and Application (PARACHUTE, MEDEA + 2A701) Automatic Tool for Insertion and Simulation of Fault Tolerant Architectures (AMATISTA, IST-1999-11762) National R&D Plan Projects <ul style="list-style-type: none"> Space research platforms and Orbital tests (PERIGEO, CDTI 2011) Comprehensive digital system and circuit analysis for aerospace applications, "Design and verification of robust digital systems" (RENASER+, TEC2010-22095-C03-03) Mixed signal circuits in deep-submicronic technologies for processing time-coded signals (CIRTES, TEC2010-) Private Funding <ul style="list-style-type: none"> Radiation Hardening of a FFT Polyphase-Demultiplexer (Thales Alenia Space France) Radiation tolerant analogue mixed signal technology survey and test vehicle design - ASIC SEDUCE HF (ESA) Front-end readout ASIC technology study and development test vehicles for front-end readout ASICs - ASIC SEDUCE MF (ESA) Mixed signal ASIC digital control for controlling the MCCMs of the ELSA DRAA antenna in the REDSAT AG1 satellite (Arquimea Ingeniería SL) 	<p>Technological Offer:</p> <ul style="list-style-type: none"> Design and characterisation of robust circuits with respect to ionizing radiation for aerospace applications, by means of applying selective hardening and validation techniques by means of fault injection by emulation or irradiation campaigns Tools for SEU and SET type fault injection by means of FPGA emulation with very high injection rates (1 million faults per second): AMUSE (<i>Autonomous MUltilevel emulation system for Soft Error Evaluation</i>) CPU checker – IP module for monitoring and detecting errors <i>on-line</i> in microprocessors from the trace interface. (LEON2 and LEON3)

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R&D GROUP	LINES OF RESEARCH	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
ELECTRONIC TECHNOLOGY DEPARTMENT			
<u>Microelectronic Design and Applications (DMA)</u> PI: Luis Entrena Arribes, Luis Hernández Corporales		<ul style="list-style-type: none">Architecture and Design of Dual-Slope-ADC for Digital PMU Applications (Arquimea Ingeniería SL)Implementation and validation of 2 interpolar modules in an FPGA of Xilinx XC5VSX95T (Arquimea Ingeniería SL)Application for CPLD Coolrunner-II Test (Instituto Nacional de Técnica Aeroespacial)Design and development of two digital circuits for controlling the movement of SONDA ROSETTA solar panels (Alcatel Espacio, Spain)	

R&D GROUP	LINES OF RESEARCH	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
SIGNAL AND COMMUNICATIONS THEORY DEPARTMENT			
<p><u>Radiofrequency, electromagnetics, Microwaves and Antennas (GREMA)</u></p> <p>PI: Daniel Segovia, Magdalena Salazar</p>	<ul style="list-style-type: none"> • Antennas, devices and systems in the millimetric and submillimetric bands (30 GHz -2 THz) • Active arrays and antennas • Ultra Wideband RF systems and antennas • Design and development of independent frequency antennas • Computational Electromagnetics. Scientific Software. High Performance Computing • Advanced synthesis methods for the design of filters and multiplexers for satellite communications • Design and development of low noise amplifiers • Design and development of metamaterial structures and negative impedances • Design and manufacture of metamaterial-based sensors for industrial and biomedical applications 	<ul style="list-style-type: none"> • National R&D Plan Projects <ul style="list-style-type: none"> • Terahertz Technology for Electromagnetic Sensing Applications • New electronic and optical techniques for the development of IMAGING ARRAYS (chambers) in millimetric and terahertz (THz) waves. Applications • New Radiating Materials, Devices and Systems for Miniaturising and Improving Radiofrequency Head Performances • Analysis of Regular and Irregular Finite Periodic Structures by means of Domain Decomposition in parallel with Automatic hp-Adaptive Techniques • Radiofrequency and photonic instrument developments and applications to space geodesy experimental techniques (macro groups CAM, Group Coordinator) • Development of an integrated wireless communications system having a high capacity in the THz range • Antenna miniaturisation for the aeronautic sector • Other competitive projects <ul style="list-style-type: none"> • Design and construction of a UWB antenna for radio astronomy instrumentation • Supply of broadband feed for the radio telescope VLBI2010 receivers of RAEGE project • Metamaterial-based immunosensors 	<p>Technological Offer:</p> <ul style="list-style-type: none"> • Antenna arrays • New technologies in antenna construction • High performance broadband active antennas • Multifrequency antennas improved with metamaterials for adjustable bandwidths • Analysis of major electromagnetic problems (planes, vessels...) • Comprehensive hardware/software technological service for high performance electromagnetic simulation • Design of microwave filter • Design and analysis of on-board antennas • Wireless communications link from 2 GHz to 2 THz • Measurement and characterisation of antennas and systems in the 0 – 2 THz. bands • Spectroscopy from 0 to 2 THz • Capacity of manufacturing antennas and microwave circuits with micro-precision: track 30 microns, gaps 25 microns, resolution 0.5 micron • Analysis and study of reflectors <p>Patents:</p> <ul style="list-style-type: none"> • Antena apilada multifrecuencia con metamateriales (Stacked multifrequency antenna with metamaterials) • Patent P200930859

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SIGNAL AND COMMUNICATIONS THEORY DEPARTMENT			
<u>Radiofrequency, electromagnetics, Microwaves and Antennas (GREMA)</u> <u>PI: Daniel Segovia, Magdalena Salazar</u>		<ul style="list-style-type: none">• Private Funding<ul style="list-style-type: none">• Design, construction and measurement of an S and C dual antenna• Design of a patch with metamaterial structures in the 160 MHz band• Numerical Methods for Antenna Analysis and Design: A New Full Wave Electromagnetic Simulator• General Multiplexer Synthesis Programme• Self-Adaptive Electromagnetic Solver Using hp-Finite Elements for the Analysis of the Scattering and Radiation of Electromagnetic Waves". FA8655-07-1-3041 Funding Entity.: European Office of Aerospace Research & Development (EOARD), Air Force Office of Scientific Research (AFOSR)• Metamaterial-based radiofrequency sensors for detection and monitoring	

R&D GROUP	LINES OF RESEARCH	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
SIGNAL AND COMMUNICATIONS THEORY DEPARTMENT			
<p>Communications</p> <p>PI: Ana García Armada</p>	<ul style="list-style-type: none"> • Multi-antenna systems (MIMO) for broadband communications • Multicarrier modulation OFDM • Turbo-coding • Cooperative transmission and Relays • Signal processing in digital communications • Wireless optical transmission systems • Communications system prototyping • Satellite communications systems 	<ul style="list-style-type: none"> • European Projects <ul style="list-style-type: none"> • CRUISE, CReating Ubiquitous Intelligent Sensing Environments • NEXWAY, Network of Excellence in Wireless Applications and Technology • National R&D Plan Projects <ul style="list-style-type: none"> • LTEXTREME, Optimización de Servicios Multiusuario y Multimedia sobre LTE y LTE-Advanced (Optimization of Multimedia and Multiuser Services on LTE and LTE-Advanced) • COMONSENS, Foundations and Methodologies for Future Communication and Sensor Networks • GRE3N, General Radio concepts for ENergy cogNizant mobile communications • MULTI-ADAPTIVE, Sistemas Multi-Portadora con Diversidad Multi-Antena y Codificación Adaptativa: Tecnologías Basadas en Banco de Filtros y OFDM (Multicarrier Systems with Multi-Antenna Diversity and Adaptive Coding: Filter Bank- and OFDM-based Technologies) • MACAWI, Modelado de canal, Algoritmos y Capacidad para comunicaciones WiMax (Channel modelling, Algorithms and Capacity for WiMax communications) 	<p>Laboratories:</p> <ul style="list-style-type: none"> • Multimedia Processing and Communications Laboratory in the Science Park and Communications Laboratory in the Leganés Campus <p>Technical Scientific Services:</p> <ul style="list-style-type: none"> • COMMUNICATIONS: Signal processing and Transmission <ul style="list-style-type: none"> • Cooperative transmission in Sensor Networks • Robust wireless communications system design and prototyping (OFDM, MIMO technologies) • High spectral efficiency techniques • Cooperation of base station and cancelation of interferences in cellular systems

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SIGNAL AND COMMUNICATIONS THEORY DEPARTMENT			
<u>Communications</u> PI: Ana García Armada		<ul style="list-style-type: none">• Private Funding<ul style="list-style-type: none">· Analysis of New Multipath Mitigation Techniques for Navigation Receivers· Smart Li-fi: Wireless Internet access through the light from public light fixtures· Identification of improvements in 3G video transmission· Identification of signals on the ELVIRA platform· Research for the Automated Control of Agricultural Processes· Consultation and support for Emergency Communications	