



Thematic Actions

Coordinating Universities for the Proposal: UCM and UPM

Title of Action	Advanced Scientific Instrumentation Laboratory (LICA)		
Participating partners	UCM, UPM, UNED	Other participants	CAB, INTA, CSIC, LAEFF, IAC, UNED, GMV, FRACTAL, LIDAX
Personnel involved (indicate institution)	UCM (Colleges of Physics and Mathematics), UNED (Computing College) UPM (Technical Engineering Colleges: Telecommunications, Aeronautics)		
Start date	2010	End date	2013
Cluster	Global Change and New Energies	Other clusters	Materials for the Future
Areas of action	Teaching Improvement and EHEA Deployment / Research / Knowledge Transfer		
Location	CIMAM Building and involved Centres		
Infrastructures involved	Space Instruments Laboratory (Aeronautics), Electronics Laboratory (Technical Engineering College of Telecommunications). Calar Alto Astronomic Centre, Roque de los Muchachos Observatory, Teide Observatory, Gran Telescopio Canarias (Canary Islands Telescope).		
Keywords	Sensors; Astronomical Instrumentation, modelling, imaging and data processing; Satellite; Astronomy and Astrophysics.		
Objectives:			
<ol style="list-style-type: none"> 1. Development of sensors onboard aircraft and satellites (infrared and visible spectrum cameras, radar and Lidar) and ground-level sensor networks to gather specific information on critical parameters that allow for the better monitoring of the Earth System. 2. Creation of an advanced astronomical instrumentation laboratory. 			
Description of the action:			
<p>Creation and maintenance of a laboratory for the design, development and integration of all types of astronomical instrumentation for large ground facilities and space missions. Development of new sensors for monitoring environmental variables both on land and for aircrafts. Optimisation for high-energy, optical and near infrared (cryogenics) areas.</p> <ul style="list-style-type: none"> • The Moncloa Campus Astronomical Instrumentation Group (http://guaix.fis.ucm.es/) leads in the design, development and construction of the following two instruments: a) FISIR: The cryogenic tunable filter for the Spanish 10m near-infrared telescope (GTC). Budget: ~ 0.5 million Euros. b) MEGARA: Integral-field optical fibre multi-object spectrograph with a high spectral resolution. Budget: ~ 8 million Euros. • On the other hand, the space instrumentation groups at the Aeronautic and Communications Colleges have extensive experience in the development of aboard-aircraft sensors. In the framework of this CEI, sensors and sensor systems will be specifically designed to monitor environmental variables (in collaboration with the ISOM). • Development and optimisation of algorithms for simulation, data processing and analysis of astronomical and space applications. Development of software related to instrument control. Development of tools for working with the Spanish and European Virtual Observatory, and the future Astrophysical Software Laboratory. At the time this paper is written, the FRIDA and EMIR instrument data-reduction chains are responsible for the GTC. • Consolidating the International School of Advanced Instrumentation (IScAI), providing teachers, students, infrastructures, and management and coordination resources. The Moncloa Campus is expected to host the 2011 edition. 			



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<p>Planned key results:</p> <ul style="list-style-type: none">• Development of network monitoring systems.• New instrumental projects to be used in major infrastructures such as the Gran Telescope Canarias, the Roque de los Muchachos Observatory, observatories in orbit or the future European giant 42-metre telescope.• New software methodologies and tools for the processing and analysis of astronomical and space data.• Conducting multi and pluri-disciplinary studies.• Worldwide consolidation of an International School of Advanced instrumentation as a source of researchers with training in technological developments, capable of leading future instrumentation projects for large scientific facilities.	
<p>Rationale for the action:</p> <p>The study of the impacts of global change and natural hazards requires the use of easy-to-install and low consumption sensor networks for measuring different parameters (soil moisture, temperature, etc.). Only with adequate monitoring is it possible to develop evolutionary models and early warning systems for natural disasters. Moreover, there is an increasing demand for advanced instrumentation specially designed for use on satellites and aircrafts.</p> <p>Astrophysics is an area of great scientific as well as experimental development, with a high involvement of companies, with a great ability to raise resources and a high return to society. Large-scale science projects in Astrophysics are linked to cutting-edge instrumental developments (with budgets of several M €) associated with large astronomical facilities on land and in space. Given the huge international market potential in this area (new instruments for GTC, ESO, space missions, European Extremely Large Telescope E-ELT) today there are too few centres in Spain developing astronomical instrumentation (IAC, INTA). Taking advantage of this new niche in R&D, Astrophysics in the Moncloa campus is undergoing a dramatic improvement, taking on a very important role (and in some cases taking a leading position) in a number of major R&D projects for the development astronomical instrumentation for large-scale scientific projects. These instrumental developments have created the need to design, test, integrate and verify different modules of optics, mechanics and engineering. It is therefore essential to have the human and material resources to carry out and warrant such activities.</p> <p>Interaction between physicists, engineers, mathematicians and computer experts will be a huge step in the development of this laboratory.</p>	
<p>International aspects:</p> <p>Research groups of participating entities now involved in R&D projects funded through international programmes: European Framework Programm (FP7), GMES, European Space Agency (ESA), European Southern Observatory (ESO), etc.</p> <p>This laboratory will allow the groups involved to participate in new instrumental development projects at an international level. It will address high-impact projects, designed to provide instrumentation to infrastructures such as the Gran Telescopio Canarias, the telescopes at the European Southern Observatory, the 42-metre European Extremely Large telescope E-ELT and future space missions.</p>	
<p>Planned impact:</p> <ul style="list-style-type: none">• Participants will be placed in a unique position to develop cutting-edge instrumentation used in the study of the Earth and the Universe, thus attracting several million Euros from the various funding agencies involved in its development.• It will allow groups to take a qualitative leap in excellence and research standards, thanks to the multidisciplinary collaborative effort of engineers and scientists from different fields, hardly feasible separately and without such cooperation.• The interdisciplinary network to be built at the Astronomical Instrumentation Laboratory will help businesses within the sector to develop their Research and Development projects abroad.• Finally, the collaboration sought will place the Moncloa Campus and Spain at the head of R&D projects in this line of activity.	