Thematic Actions

Coordinating Universities for the Proposal: UCM and UPM

Title of Action	**Platform for the Design and Construction of Electromagnetic Sensors and Actuators**		
Participating partners	UCM, UPM, CIEMAT, CSIC	**Other participants**	
Personnel involved (indicate institution)	A. Hernando (IMA-UPM), G. Rivero (IMA-UPM), J. L. Vicent (UCM), C. Aroca (UPM), J. Sánchez (UPM), E. Ascasibar (CIEMAT), J. González (IMA-CSIC)		
Start date	2010	**End date**	2015
Cluster	Materials for the Future	**Other clusters**	Global Change and New Energies, i-Health
Areas of action	Research / Knowledge Transfer / Local and Territorial Interaction / Teaching Improvement and EHEA Deployment.		
Location	IMA and Moncloa Campus		
Infrastructures involved	ISOM, Advanced Microscopy		
Keywords	Magnetic materials; Magnetoresistance; Sensors; Actuators		

Objectives:

We aim to produce high quality research in the areas of magnetic materials and electromagnetic fields and to introduce researchers into the industrial fabric of technology through the design and construction of electromagnetic sensors and actuators with applications in medicine, radar technologies and railways. The overall aim is to demonstrate the compatibility and synergy of high level research and technological innovation by bringing together experts from several partner organisations.

Description of the action:

In an effort to study magnetic materials with a range of functionalities and applications, methods will be developed to obtain materials with shielding properties against magnetic fields, new materials combining the advantages of plastics and magnetism or changing their magnetisation properties as a function of voltage, among others.

Materials with giant/colossal magnetoresistance will also be studied, paying special attention to one of the most active and controversial fields in physics: that of dilute magnetic semiconductors. These materials simultaneously exhibit semiconductor and magnetic properties and are potential candidates for the fabrication of more efficient computers.

In addition, materials will be designed for bio-medical applications such as cancer therapy by local heat, drug delivery and diagnostics. Materials combining different functionalities open the door to simultaneous diagnosis and treatment.

As for technological innovation, electromagnetic sensors and actuators will be developed to enable the precise measurement of the electromagnetic fields from civil aviation radars, the study of electromagnetic compatibility, multiple sensors, antennae and beacon systems for the AVE high speed railway technology and the study of the effects on the human body of induced currents with a commercial 50-Hz frequency.

Key planned results:

The most important result will be the consolidation of a consortium competing at international level and with competences in the field of magnetic materials and electromagnetic fields and their application for development and technological innovation.

It is also expected that contracts will be drawn up with private firms for joint projects in the realms of high-speed railway technology and electromagnetic fields.

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Rationale for the action:

To fulfil the objectives, it is necessary to integrate a number of recognised research groups. The groups involved share medium and long-term strategic objectives meaning there is a firm commitment to collaboration and to a more effective joint operation.

For many years, groups from both universities (UPM and UCM) have been very active in research in these subjects. The Applied Magnetism Institute (IMA, UCM-ADIF-CSIC) should be highlighted as a research centre of reference for the study of new materials for railway technology and telecommunications with strong links with CSIC and CIEMAT. The competences of all these teams are complementary and are based on three lines of action: (a) research; (b) technology transfer and (c) advanced teaching (Master's and doctorate level).

International aspects:

The consortium undoubtedly has the scientific and organisational potential needed to become an international reference point and it possesses the commitment and experience to effectively transfer know-how to the private sector firms operating in its vicinity. Moreover, its previous experience in large project management guarantees the implementation of a lean management structure and the development of common procedures to share resources.

Planned impact:

With the proposed programme, the Moncloa Campus will become a hub for talent at international level within the field of magnetic materials and electromagnetic fields. This will strengthen initiatives such as CEI and, through collaboration and joint working, will reinforce the links with innovative firms leading to know-how transfer and personnel mobility in the planned applications: microwave shielding, giant magnetoresistance, hypothermia, sensors and actuators for railways, radar and medical technologies.