

Modulo 2:

Riferimento a linee guida	FORM N.: 8 PROGRAM EVALUATION FORM
3	Nome programma:
	Industrial Electromagnetic Compatibility & Computational Electrical Science
3	Responsabile programma
	prof. Maschio Alvise
3	Obiettivi specifici del programma
	<p>The program foresees both experimental activities and numerical simulation developments.</p> <p>A laboratory is used for experimental EMC research activities. In-house measurement facilities are developed. Industrial applications are studied, like: energy cable shielding; electric and magnetic fields analysis under MV power lines; magnetic field emission of electrical devices, also with reference to human exposure; magnetic field immunity of industrial components. Analytical models are studied for the electromagnetic analysis of systems and devices, applied to the field of the industrial electromagnetic compatibility. The performances and the impact on the harmonic content of the electrical grid voltage and current due to the operation of the ac/dc converters and inverters of large power supply systems are evaluated.</p> <p>Novel numerical methods and codes for computational electrical science are developed. Their applications to complex configurations like composite, non linear and anisotropic structures or to complex systems presenting coupled aspects, like thermal and magnetic configurations, are performed. Applications to electromagnetic devices, in order to evaluate their performances, and to achieve optimum design configurations are done.</p>
3	Progetti in corso
	<p>Project 1: <i>... "Implementation of numerical codes for the solution of coupled electromagnetic and thermal problems making use of finite formulations based on the Cell Method"</i>, Murst National Research Project 2002</p> <p>The research program is focussed to the development of finite numerical formulations of coupled problems (electromagnetic and thermal), based on the Cell Method, in cooperation with researchers of the Universities of Genova, Milano, Torino, Trieste, and Udine. A model has been implemented, suitable for analyzing problems in two dimensional geometries, in stationary and dynamic conditions.</p> <p>Project 2: <i>... "Applications of finite formulations based on the cell method to coupled electromagnetic, thermal and fluidodynamic problems"</i>, Murst National Research Project 2004</p> <p>The Project arises from a cooperation with researchers of the Universities of Genova, Milano, Torino, Trieste, and Udine and is aimed to develop Cell Method based numerical codes for the analysis of coupled electromagnetic and thermal problems in non-linear and time-varying conditions for two and three dimensional geometries, suitable for large scale power devices and medical applications. A further aim is foreseen in the analysis of magnetic shielding systems. From the methodological point</p>

of view, the code convergence and stability features will be investigated.

Project 3:

...*"Determinazione e rilevazione dei campi elettrico e magnetico di una linea trifase a media tensione in prossimità di un palo di cemento armato"* & *"Studio del campo elettrico ambientale alla frequenza industriale sotto una linea aerea trifase in Media Tensione in presenza di strutture di sostegno conduttrici"*, University of Padova Research Activity ex 60% funds, 2002 & 2005

The electric field under a MV three-phase power line supported by concrete poles is studied. With these two Projects, the development of an analytical model for the electric field in the vertical plane of symmetry containing the power line direction, up to a level non exceeding one quarter of the pole height, has been carried out. A numerical analysis has also been done and finally both numerical data and analytical results have been validated experimentally. The results are relevant in the electromagnetic compatibility field for environmental analysis at industrial frequency. Moreover an application related to low-cost detection systems of zero-sequence voltage has been indicated. This activity has included also a research contract with CREI Ven S.c.ar.l. - Consorzio di Ricerca in Elettronica Industriale - Padova.

Project 4:

...*"Caratterizzazione di dispositivi di interruzione della corrente in bassa tensione dal punto di vista dell'immunità al campo magnetico stazionario"*, University of Padova Research Activity ex 60% funds, 2004

Magnetic compatibility of standard components for electrical installations is important in systems with a very high magnetic field, like the one that is planned in plasma fusion for ITER Tokamak Building. Aim of the Project is to extensively test a wide topologies of breakers, contactors and protection relays up to 80 mT and a complete Low Voltage Distribution Board at 40 mT, in order to assess their behaviour when subjected to stationary magnetic fields of these high values, and to establish a magnetic field limit for their regular operation.

Project 5:

...*"Alimentazioni elettriche per sistemi di riscaldamento addizionale del plasma"*, University of Padova Research Activity ex 60% funds, 2001

The power supply systems for an experimental fusion reactor are expected to draw large amount of power from the electric grid, with large amount of harmonic content. Aim of the project is to sort out the design criteria of the power supply for the plasma auxiliary heating. Simulation programs for the analysis of behaviour of the power supply systems will be developed, in order to evaluate their performances and the impact on the harmonic content the electrical grid voltage and current due to the operation of their ac/dc converters and inverters.

Project 6:

...*"Formazione di ingegnere progettista di apparecchiature elettromeccaniche per alta tensione"*, Fondo Sociale Europeo - Regione del Veneto, Obiettivo 3, misura D4, 2005

Aim of the Project is the training of an electrical science engineer (five years degree) in the high voltage field, related to electromechanical devices. The Project is intended to add, to the traditional training of electrical science engineers, knowledge in the fields of high temperature gas (plasma) behaviour, use of electric and magnetic fields for thermal treatments and modelling of complex electromechanical systems.

The Project has been implemented in the sector of detection of charged particles in gas

	<p>isolated electric systems. Such particles, under the effect of the electric field, start to move inside the gas and can reach one of the walls, increasing their electric charge and subsequently the force which is applied to them. Eventually the kinetic energy of the particle is big enough for starting the ionisation of the gas molecules and originating a discharge between the conductors.</p> <p>The research activity should result in the design of particle traps, able to drive the particles in areas with an electric field low enough to prevent further movements of the particles themselves.</p> <p>Project 7: <i>... "Sustainable development of distributed generation for an effective exploitation of energy resources, reduction of transmission & distribution network congestions and improvement of the technical and economic performances of independent power producers"</i>, University of Padova Research Project 2004-2006</p> <p>Aim of the Project is to carry out an integrated study of distributed generation, i.e. a system of small sized electric generation unit. Technical and economical aspects are investigated; commercially available solutions are identified and innovative solutions are foreseen. One of the research point is devoted to the problems of interface between network and distributed generation, among which have to be considered the electromagnetic compatibility aspects.</p>
4.b	Risorse personale
	<p><i>[professori ordinari, associati, ricercatori e dottorandi, borsisti post dottorato, assegnasti, personale tecnico-amministrativo]</i></p> <p>Prof. Alotto Piergiorgio (associate professor) (from 01.10.2005) Prof. Desideri Daniele (associate professor) Prof. Guarnieri Massimo (full professor) Prof. Maschio Alvise (associate professor) Dr-ing. Forzan Michele (university researcher) (partially) Dr-ing. Moro Federico (PhD student) (partially) Dr-ing. Bullo Marco (PhD student) (partially) Mr Zanin Lorenzo (technical staff) (partially)</p>
5.b	Risorse finanziarie [media quinquennale]
	<p><i>[la somma di finanziamento ordinario d'Ateneo finanziamenti specifici d'ateneo, finanziamenti specifici da enti di ricerca locali, nazionali e internazionali, finanziamenti da contratti con enti privati.]</i></p> <p>~ 40.000,00 € / year</p>
7	Rapporti con altri istituti di ricerca a livello locale, nazionale e internazionale
7.a	<i>[specificare concretamente quanto indicato sotto collaborazioni istituzionalizzate indicate al punto 1 della scheda di Dipartimento]</i>
7.b	<i>[Indicare collaborazioni personali non istituzionalizzate ma rilevanti per il programma]</i>
9	Altre attività rilevanti per la ricerca, a livello di Programma
	<i>[organizzazione di seminari e convegni, partecipazione a seminari e convegni, ecc..]</i>

	<p>Attendances to International Conferences: COMPUMAG - Conference on the Computation of Magnetic Fields (years: 2001, 2003, 2005); EPTR – International Conference on Engineering Problems of Thermonuclear Reactors (year: 2002); CEFC - Conference on Electromagnetic Field Computation (year: 2004); HES-04 - Symposium on Heating by Electromagnetic Sources (year: 2004).</p> <p>Attendances to National Conferences: National Meeting of the Researchers of Electrical Science (years: 2001, 2003, 2004, 2005)</p>																																																	
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P.S. Nel caso in cui le informazioni disponibili non siano compatibili con il presente modulo è possibile allegare documentazione cartacea indicando negli appositi campi i numeri dei relativi allegati.