



OO/UC3M/27 - RESEARCH AND INNOVATION IN POWER ELECTRONICS SYSTEMS APPLIED TO ENERGY MANAGEMENT

The Power Electronics Systems Group (GSEP) at University Carlos III de Madrid (Spain) offers its wide experience and background in consultancy, R&D projects with private and public funding and pre-industrial prototype building in four main topics: energy conversion (design, modelling and prototyping of equipments and systems), magnetic components modelling and design, photovoltaic systems and electromagnetic compatibility (EMC).

Description of the technology

GSEP is formed by an expert team of doctors and engineers with a wide experience in Power Electronics. The group works in consulting activities and R&D projects with private and public funding. Regarding public funding, the group usually participates in national and regional funding programmes, by its own or in association with private companies. Regarding private funding, stable relationships have been established with important companies by means of short, medium and long term projects. The collaborating companies belong to different industrial areas: electric, aeronautic, telecom, medicine, railway, etc.

The current activity of GSEP is focused on the following topics:

- Modelling, analysis and design of distributed power systems for aircrafts, railways and power systems for critical loads.
- Solar photovoltaic power systems: design of converters with maximum power point tracking and inverters.
- Power systems based on fuel cells, oriented to portable applications, transport and aeronautic.
- New control techniques applied to power supplies: converters with fast dynamic response, digital control based on microcontrollers or programmable devices such as FPGAs, new modulation techniques for three-phase inverters, etc.
- Design, building and testing of pre-industrial prototypes: background in design of switching DC/DC converters and DC/AC inverters with different control techniques.
- Finite element analysis and analytical methods applied to the modelling and design of low and high frequency magnetic components and to the modelling of the connecting cables in aircrafts (feeders).
- Diagnosis of power transformers by means of the frequency response analysis.
- Pre-compliance of electronic equipments. Technical assistance to obtain the compliance of these equipments and experience in the design of EMI filters.
- Environment evaluation of electromagnetic field level in cities, factories, airports, etc. Study of the human security due to the electromagnetic radiation.
- Teaching courses for companies: simulation tools, modelling of systems and converters, etc.
- Development of interactive material for teaching purposes.

GSEP facilities have all the necessary equipment to accomplish the offered projects, from high reliability instrumentation to medium size facilities (even an anechoic chamber). Also the latest version of the necessary software is available: electric simulators, finite elements tools, mathematic tools, etc.

The results obtained from these projects have obtained national and international acknowledgment by means of its publication in some of the most relevant journal regarding Power Electronics. Some patents have been carried out as well.

Innovative aspects

GSEP can offer to the companies its background and expertise in design, analysis and modelling of power electronics systems and power electronics circuits, as long as some of the most actual research topics with maximum industrial interest. Some of these research results have been already patented.



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Competitive advantages

GSEP facilities have all the necessary equipment to accomplish the offered projects, from high reliability instrumentation to medium size facilities (even an anechoic chamber).

Current state of intellectual property: Patent applied

Keywords

Systems, modelling, design, electronics, electrical, energy, power, photovoltaic, fuel cell, EMC, magnetic, power supplies, inverters.

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