

Circuits and EMC Laboratory

This laboratory provides the facilities for experimental characterizations and validations related to the modeling activity of the EMC Group. In addition, the lab is used for experimental thesis work in the EMC and circuit fields. The lab is equipped with basic instrumentation, an impedance analyzer, a network analyzer, a 3GHz digital scope and standard EMC testing tools.

Interdepartmental Mechatronics Laboratory

The Mechatronics Laboratory (Laboratorio Interdipartimentale di Meccatronica, The Mechatronics Laboratory (Laboratorio Interdipartimentale di Meccatronica, LIM) at the Politecnico di Torino is an interdepartmental structure founded in 1993 as a “joint-venture” by a number of people of the Departments of Electronics and Telecommunications, of Control and Computer Sciences and of Mechanics of Politecnico di Torino. Its main objective was that to constitute a common ground where researchers and postgraduate students working in the mechatronic field could perform theoretical and experimental research and exchange experiences in a true interdisciplinary environment. In addition to the research activity, the same people who founded the LIM promoted the establishment of a full education track in Mechatronics Engineering with of a Doctoral degree in 1999, a Bachelor degree in 2000, and a Master degree in 2003. A list of topics for theses is also available. LIM activities are organized in terms of projects where different disciplinary expertises are integrated to yield the best overall performance. A number of projects concern experimental investigations about the integration of advanced technologies and methodologies and usually lead to the construction of test rig or demonstrators. In several cases these projects start on internal funding. A growing number of projects are commissioned by private enterprises and lead to the design, construction and testing of industrial prototypes. Industrial is explicitly added to mean both a functional and working prototype of an innovative product and a demonstrator of the actual technological components to be used for production. Responsabile: Marcello Chiaberge

MINES - Micro&Nano Electronic Systems Laboratory

The main goals of the Micro&Nano Electronic Systems Laboratory (MiNES) of Politecnico di Torino are the study and the realisation of micro&nano systems for several application fields, in particular for electronics and sensors. The laboratory facilities were setup to cover the different technological requests for the implementation of complete systems, where the integration has a key role. For these reasons MiNES joins both technological and design competences for the development of novel devices, circuits and systems at different levels, from nano to micro and to the final realisation of solutions for signal and data management. MiNES deals with the design and fabrication of Silicon based MEMS and NEMS, technological transfer, education. Responsible: Pierluigi Civera. Web site: <http://www.mines.polito.it/>

MWL - Microwave Electronics Laboratory

Sito web:

http://www.det.polito.it/the_department/internal_structures/research_labs/mwl_microwave_electronics_laboratory

Responsabile: Marco Pirola

Descrizione: This lab has a long tradition in microwave linear and non-linear measurements. From 1982, when the first Network Analyzer was acquired, many important achievements were established, starting from the active loop technique for load tuning, to the generalized multiport calibration theory and to the most recent differential load-pull system.

Nowadays, MWL counts four Network Analyzers (covering the 0.1-40 GHz bandwidth), a four-port Network Analyzer extension, two Spectrum Analyzers (in the 0-26.5 GHz bandwidth), two microwave probe stations, several multi-octave power amplifiers covering the 0.8-18 GHz bandwidth, two active loops for active load-pull, four manual tuners, several RF and microwave CW and modulated signal sources, microwave power meters, and generic low frequency instrumentation (signal generators, oscilloscopes, digital multimeters, power supplies).

Microwave characterization facilities managed by the group can also be found in the PhotonLab laboratory and in the CERCOM laboratory at Istituto Boella.

Micro EMC Laboratory

Sito web: <http://www.uemc.polito.it/uemc.htm>

Responsabile: Franco Fiori

Descrizione: This laboratory provides the tools needed for the design and the experimental characterization of analog and mixed-signal circuits. Software tools like Cadence Virtuoso, Spectre, Spice, are available to perform the concept phase and design phase of integrated circuits and electronic modules. A probing stations to perform measurements at the wafer level, an RF probing station for the characterization of multi-chip-modules (MCMs) and a semiautomatic wire bonder for IC and MCM assembly are available. Furthermore, the laboratory is equipped with the instruments needed for the EMC characterization of ICs and electronic modules in accordance with international standards like SAE 1752/3, IEC-61967, IEC-62132, ISO-11452, CISPR 16.

This laboratory hosts Master and PhD students in Electronics Engineering.

Biolab Laboratory

The activities of the researchers belonging to the BioLab cover several aspects of the biomedical engineering. The main activity areas are:

A1 - Biomedical instrumentation (Leader Marco Knaflitz, Full Professor)

Design of biomedical instrumentation and novel strategies for biomedical signal processing. People active in this area also offer expertise to companies working in the area of medical devices to support the design and the development of their products, and to healthcare facilities to support healthcare technology management. The more recent activities were focused on the development of innovative wireless body networks of wearable sensors and the development of non-invasive systems for the assessment of brain autoregulation.

A2 – Medical imaging (Leader Filippo Molinari, Associate Professor)

The core activity is the development of fully automated algorithms to aid clinical diagnosis, particularly in the field of ultrasound imaging. Other activities include the automation of the workflow in pathology, the development of innovative texture analysis strategies, the multiscale imaging “from cell-to-function”. People active in this area also offer support to several companies for the development of new diagnostic systems and for the implementation of specific functions onboard the medical imaging devices.

A3 – Health information systems (Leader Gabriella Balestra, Assistant Professor)

The area of Health Information Systems includes (a) design and evaluation of systems for computerized therapy prescription and administration; (b) assessment of medical software; (c) development of intelligent systems to support clinical processes. A new research line is the development of advanced ICT systems to support integrated care models that have the potential to improve care in chronic disease management, to deal with the complexity of co-morbidities, and to handle the issues of active and healthy ageing.

WEB site: <http://socrate.polito.it/biolab/>

VLSI Laboratory

The VLSI laboratory was founded in 1987 and is active in a broad range of research areas related to the field of Very Large Scale Integrated circuits and digital architectures. The VLSI Lab has a vivacious activity as is involved in many research projects together with national and international academic and industrial partners, has a wide database of published scientific and technical papers and of theses (past and available) and encourages an active collaboration with Italian and foreign institutions aimed at the exchange of students (graduate and PhD) and researchers. Responsible: Maurizio Zamboni. Web site: www.vlsilab.polito.it

PhotonLab

PhotonLab is an inter-disciplinary laboratory, jointly managed by Politecnico di Torino and Istituto Mario Boella.

PhotonLab is a shared facility and 5 groups cooperate in tight coordination within it:

- The OptCom Group (TLC- DET)
- The Optical Networking Group (TLC- DET)
- The Optoelectronics and Components Group (DET)
- The Electro-Magnetics Group (DET)
- The Materials Group (DISAT)

PhotonLab is a 300 square meters laboratory that includes an optical system and network experiment area, plus a clean room, an electronics lab, a machine shop and a dark room. The whole facility is in filtered air, with the clean room being class 1000. The whole floor is large concrete blocks suspended on giant coils to isolate the lab from external vibrations.

The system experiment section is equipped with state-of-the-art Test and Measurement equipment, encompassing a 50 Gbit/s BER tester, 50 GHz oscilloscopes, 100 GSa/s real-time oscilloscope, coherent receivers, Optical Spectrum Analyzers, Optical and Electrical Network Analyzers up to 40 GHz, EDFAs, several hundreds km of fiber, and hundreds of optical and electro-optical components.

In addition PhotonLab has access to 8 rings for a total of 240 km of dark installed fiber in the whole city of Torino, supplied by the operator Fastweb. The rings go through busy avenues, over bridges, along railway tracks, through residential as well as industrial areas. They also go through several POPs of the operator. This testbed enables actual field measurements to be carried out from within the lab, where the dark fiber is terminated, which is something of great value to give significance to experimental results.

Responsible: Pierluigi Poggiolini, Web site: <http://www.optcom.polito.it/>

LACE - Lab. for Antennas and EMC

The Istituto Boella Laboratory for Antennas and Electromagnetic Compatibility (LACE) hosts the Politecnico Electronics and Telecommunications Department High Quality laboratory, funded by the university in 2002. Its main activities are: (1) studying, designing, producing and assessing prototypes of innovative antennas, with particular attention to new applications in the telecommunications field; (2) modelling, characterising and assessing the electromagnetic channel; (3) carrying out research into Electromagnetic Compatibility and testing for the certification of apparatus in a reverberating chamber and shielded anechoic chamber. Responsible: Mario Orefice. Web site: <http://www.ismb.it/index.php?id=282&navCmd=reset>

Neuronics and Power Electronics Laboratory

Founded in early '80s by prof. Pasero, the Neuronica Laboratory has the mission to study and apply the theory of Artificial Neural Networks. Together to this activity the laboratory studies and builds special sensors for meteorological and environmental applications. The meteorological site of the Politecnico of Torino is handled by neuronica lab. The strong applicative inclination of the neuronica lab produced in 2004 a spin off, n-lab where 4 engineers, coming from the laboratory, found occupation and received the interest of both public and private investors. Today some of the ideas of the laboratory are patented and n-lab builds and sells these technological devices. Responsible: Eros Pasero.

Web site: <http://www.neuronica.polito.it/default.asp?view=home&lang=en>

iXem Laboratory

iXem Labs are mainly active in the assembling of wireless transmission systems and the realization and management of wireless networks. Another important field of research is Electromagnetic Compatibility, in particular related to high frequency shielding, electromagnetic measurements, human electromagnetic exposition assessment. Responsible: Trincherio Daniele. Web site: http://www.ixem.polito.it/index_e.htm

LISiN laboratory

Il Laboratorio di Ingegneria del Sistema Neuromuscolare e della riabilitazione motoria (LISiN) è un laboratorio di ricerca del Dipartimento di Elettronica e Telecomunicazioni del Politecnico di Torino. e uno dei centri di riferimento nel campo dell'ingegneria del sistema neuromuscolare in Europa.

La principale attività del LISiN riguarda lo studio del sistema neuromuscolare tramite lo sviluppo di metodi non invasivi (elettromiografia di superficie, EMG) per il prelievo e l'interpretazione dei segnali elettrici prodotti durante contrazioni muscolari. In particolare il LISiN è attivo 1) nello sviluppo di strumenti innovativi per l'acquisizione del segnale elettromiografico di superficie, 2) nello sviluppo di metodi di elaborazione del segnale per l'estrazione di informazioni relative alle proprietà periferiche e centrali del sistema neuromuscolare e 3) nell'applicazione delle tecniche sviluppate in studi di fisiologia di base, riabilitazione motoria, medicina del lavoro, medicina dello sport e medicina dello spazio.

LISiN è stato coordinatore del Progetto Europeo "Neuromuscular assessment in the Elderly Worker (NEW)" e partner dei Progetti Europei "Surface EMG for Non Invasive Assessment of Muscles (SENIAM)", "Prevention of muscle disorders in Operation of Computer Input Devices (PROCID)" e "Cybernetic Manufacturing Systems (CyberManS)". Il LISiN è stato inoltre coordinatore del progetto ESA "Microgravity Effects on Skeletal Muscles investigated by surface EMG and mechanomyogram (MESM)" e partner del progetto ESA "Resistance training using fly-wheel technology for crew stationed in space" e del progetto ASI "Osteoporosi ed Atrofia Muscolare (OSMA)". LISiN è stato inoltre partner del progetto Italo-Tedesco OASIS (On ASymmetry In Sphincters) e TASI (Technologies for anal sphincter analysis and incontinence).

Dal 1999 il LISiN ha pubblicato due libri internazionali, oltre 200 pubblicazioni in peer reviewed journals, è stato guest editor di due numeri speciali delle riviste Medical Engineering and Physics e Journal of Electromyography and Kinesiology e di un numero di Critical Reviews. Svolge attività di review per 15 riviste internazionali.

Automatic Measurement Systems Laboratory

The activities carried out in this laboratory are devoted to the definition of new measuring techniques and to the development and the metrological characterization of innovative measurement systems. Prototypes for both electrical and not electrical quantities have been developed that are usually managed by means of micro-controllers. Also innovative calibration techniques have been developed for stand-alone instruments and for distributed measurement systems. The laboratory is equipped with general purpose low-frequency instrumentation, such as

digital oscilloscopes, multimeters, arbitrary signal generators, power supplies, and data acquisition boards. Responsible: Alberto Vallan.

Testing and Calibration Laboratory

This laboratory provides the facilities for the test and the metrological characterization of instruments and sensors prototypes. The laboratory is equipped with facilities for thermal tests (climatic chamber programmable in the range of -40 °C to +190 °C and of 10 %UR to 90 %UR), vibration tests (electrodynamic shaker, $F_{max} = 400 \text{ N}$), calibration (8.5 digit multimeter, multifunction calibrator, standard sensors for temperature, humidity and acceleration) and mechanical working (column drill, milling cutting). Responsible: Alessio Carullo.