DIPARTIMENTO DI INGEGNERIA
CORSO DI DOTTORATO IN INGEGNERIA INDUSTRIALE E DELL'INFORMAZIONE -
PHD COURSE IN INDUSTRIAL AND INFORMATION ENGINEERING - 35TH CYCLE

Title of the research activity:	**Modelling, simulation,and experimental characterization of magnetic materials and components in avionics and industrial applications.**
State of the Art:	Several industrial and avionics applications deal with magnetic components, such as, inductors, transformers, motors, power supplies, wireless power transfer systems, etc. The behavior of these components and systems is non linear, sometimes exhibits memory effects, and it is strongly dependent on the magnetic materials used: laminated electrical steels, ferrites, etc. It is therefore necessary to have at disposal effective and accurate models of such materials, either in transient, or in non sinusoidal steady-state, in order to properly design the devices to increase their efficiency. Typical frequency range is from few kHz to several MHz. The experimental characterization of the models must be done using suitable frames, such as Epstein, Disk Testers, Domain Viewers, and the waveform control is essential.
Short description and objectives of the research activity:	The research activity will be based on the following tasks: - Experimental characterization of innovative magnetic materials; - Engineering modelling of the non linear and hysteretic magnetic behavior of the materials, of the magnetic cores and of the devices; - Non invasive and non destructive magnetic testing; - Estimation of magnetic dynamic power losses; - Estimation of the produced waveforms; - Application to the design of magnetic components used in power electronics applications.
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