

**Call for application for research scholarships
for post-graduate international candidates**

RESEARCH PROJECT N. 19

Title

CAD-BASED ENHANCED MODELING OF CABLE BUNDLES

Scientific responsible (name, surname, role)

Igor S. STIEVANO, Associate Professor, DET (igor.stievano@polito.it)

Short description of the research activity (max 250 words)

Complex cable networks are used in several real engineering applications for data communication. A well-known example is provided by the vehicular (e.g., automotive or aerospace) data link structures. In this scenario, numerical simulations in the early design stage help reduce time- and cost-expensive redesign by flagging potential problems prior to actual fabrication such as by predicting the shape of the electrical signals flowing through the wires or the crosstalk interference among different cables. Cable bundles are usually described in terms of the cascade connection of uniform transmission line structures with a random placement of wires. The above modeling idea is a simple abstraction that unavoidably leads to possible wrong predictions due to the unrealistic and unphysical description of the wire location at the interface between adjacent pieces. To overcome the above limitation, a different modeling approach is desirable and becomes an important challenging problem that will be addressed in the proposed activity. Standard 3D tools well-known in the mechanical or engineering drawing domains are used to create a physics-consistent representation of the bundle. The cable is then modeled in terms of either a cascade connection of cells (now with a realistic description) or via a nonuniform transmission line structure. For the former case, a classical transmission-line approach is used. In the latter case, the governing equations, that turn out to be defined by a system of non uniform first order partial differential equations, are solved via approximate techniques (e.g., via discretization and/or decomposition in terms of known analytical solution for specific geometric profiles).

Specific requirements (experiences, skills)

Circuit theory and basic electromagnetics

Website of the research group (if any)

<http://www.emc.polito.it>

Keywords (min 3, max 6)

Electrical eng., modeling, circuit simulation, electromagnetic compatibility, transmission lines

Research Area (max 1)

Electronics, Control and Telecommunication Engineering