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Radiated susceptibility of complex cable harnesses: From deterministic to statistical modeling

The development of statistical approaches for radiated susceptibility prediction in setups involving complex wiring harnesses has recently gained increasing attention from the Electromagnetic Compatibility (EMC) Community. Indeed, the inherently-random nature of both the interfering electromagnetic field, whose characteristics are usually partially unknown, and of the cable harness, whose geometrical and electrical parameters are known with a certain degree of uncertainty, may significantly weaken the validity of deterministic modeling. Within the speech, explicative examples of wiring structures involving twisted-wire pairs running above ground and illuminated by external electromagnetic fields will be presented. Modeling of such wiring structures will be firstly addressed from the deterministic viewpoint. The problem will be then reconsidered from the statistical viewpoint, with the objective to develop computationally-efficiency prediction models accounting for random variations of EM-field characteristics and geometrical/electrical parameters of the cable harness. The statistics of the common-mode and differential-mode noise induced at the terminations of the wiring structures under analysis will be eventually investigated.