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Selex assesses lightning protection systems for Radar with CST MWS

The design of lightning protection systems (LPS) is a challenging task, particularly for a mobile Radar system. A detailed study of the current path resulting from a lightning strike through an external lightning protection system, and the induced currents in the system to be protected, enable a reliable design of all relevant parts.

Ing. Americo Dominicis of Selex-SI in collaboration with Prof. A.Orlandi of University of L'Aquila investigated the impact of a lightning strike on a mobile 3D radar using CST MICROWAVE STUDIO® (CST MWS)ⁱⁱⁱ. Such a unit consists of three separate parts, an antenna pallet unit (APU), the power generator group and the equipment shelter group, which are only connected by cables and the soil. After identifying the most adverse position of the lightning channel with respect to the APU, the induced current as a function of the ground resistance – reflecting different soil conditions - was simulated. The specification of the split ring ground channel is a direct result. Further studies were carried out after extracting an equivalent circuit model from the full 3D simulation of the APU using Thevenin's theorem.

The application of 3D simulation to this complex problem resulted in a better understanding of the impact of a lightning strike on the various components of a mobile radar unit and therefore in the improved design of the LPS.

“Protecting a mobile Radar unit from lightning strike is a very demanding task,” commented Americo Dominicis, Selex-SI. “CST MWS, in particular its time domain simulation capabilities, helped us to understand the impact of various parameters on the specification of an LPS before running expensive, time-consuming tests.”

“The investigation of a lightning strike on a complex system such as a mobile radar is a challenging problem,” said Dr. Martin Timm, Marketing Director, CST. “Using 3D simulation to extract a circuit model that replaces the lightning induced fields by a equivalent voltage source is an intriguing idea which has been applied successfully in the design of this lightning protection system.”

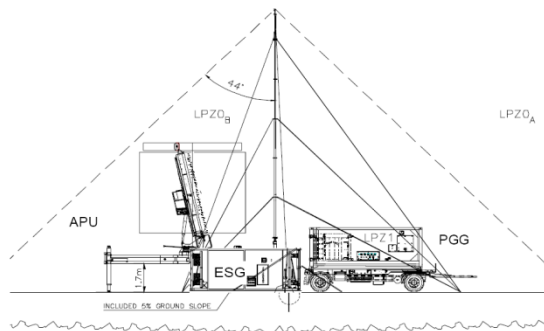


Figure 1: Mobile radar system with lightning rod

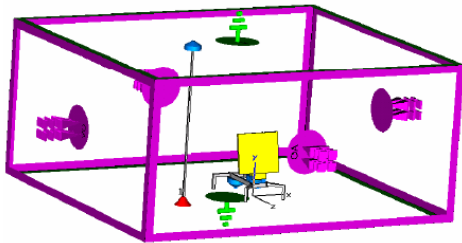


Figure 2: Antenna model and boundary conditions

About CST

CST develops and markets high performance software for the simulation of electromagnetic fields in all frequency bands. Its success is based on the implementation of unique, leading edge technology in a user-friendly interface. CST's customers operate in industries as diverse as Telecommunications, Defence, Automotive, Electronics, and Medical Equipment, and include market leaders such as IBM, Intel, Mitsubishi, Samsung, and Siemens. With 160 employees worldwide and a network of qualified distributors, over 190 people are dedicated to the development and support of its EM products in more than 30 countries.

CST's flagship product, CST MICROWAVE STUDIO® (CST MWS) is the market leader in Time Domain simulation. It enables the fast and accurate analysis of high frequency (HF) devices such as antennas, filters, couplers, planar and multi-layer structures and SI and EMC effects. CST MWS can offer considerable product to market advantages such as shorter development cycles, virtual prototyping before physical trials, and optimization instead of experimentation.

Further information about CST is available on the web at <http://www.cst.com>.

ⁱ A. Dominicis, G. Antonini, A. Orlandi, M. Cocchini, M. Italiani,

“Induced currents due to nearby lightning strike to a mobile radar system: an hybrid 3d/circuit analysis” in
Proc. of *EMC Conference*, Zurich, September 2007

ⁱⁱ A. Annunziata, A. Dominicis, G. Antonini, A. Orlandi, F. Fiamingo, C. Mazzetti , “Protection of radar
systems against nearby or direct lightning strokes,” in *Proc. of 2008 IEEE Radar Conference*, Rome, June
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