Bachelor Thesis Subject

«Analyzing simple antenna structures for the emission of electromagnetic bullets»

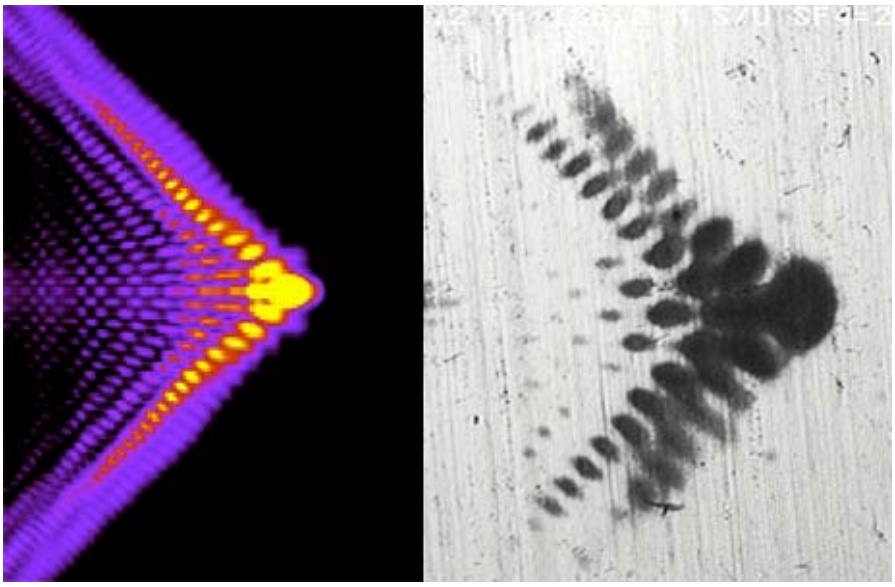

Figure 1: Propagating electromagnetic «bullet». © Polynkin, University of Arizona

Electromagnetic «bullets» respective «missiles» are known as a peculiar pulse solutions to the Maxwell's equations where the energy is localized in space and time during propagation along a finite distance that may significantly extend into the far-field. As a consequence the involved radiation field amplitudes are decaying less rapidly than the well-known 1/*r* behavior even for distances far beyond the Rayleigh distance. Such solitary pulses may become advantageous if we think of e.g. high-speed indoor wireless data communication, where the low power level at the receiver location is usually one of the major limitations in such communication channels. In order to outsmart the 1/*r* field decay tailored radiation sources – i.e. antennas – are needed, which support a specific protocol with respect to spatial and temporal aspects of e.g. the underlying surface currents.

The goal of this bachelor thesis is to investigate a simple dipole antenna where few current sources are accordingly distributed along the antenna arms, and each of these sources is controlled by e.g. a similar temporal pulse profile but having an individual time delay. Hence, profiles, time delays and source positions are subject to optimization in order to achieve the desired bullet emission.
The investigations are carried out numerically using our easy-to-use computational electromagnetics simulation platform *openEMS* (www.openems.de). The described bachelor thesis will be part of our own research in the laboratory and therefore carefully supervised and largely supported

Pre-requisite: experienced in MATLAB, interested in «crazy» electromagnetics.

Character of work: 10% theory, 20% programming, 70% numerical investigations.

We offer: advanced research topic, stimulating work environment.

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