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Reverse-time imaging using an ultra-wideband (uwb) antenna array with application to geophysics

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Previous Work Done

The use of narrowband microwave imaging, in a tomographic setting has been applied to a number of detection scenarios including landmine detection, buried pipe detection and determination of near-surface lithology. Recently [1] imaging of scattered electromagnetic waves from separated targets has been achieved using an 8 element ultra-wideband balanced Vivaldi antenna array, with a bandwidth from 2 to 8 GHz [2]. This array was developed at the Electronics, Antennas & Telecommunications Laboratory (LEAT), University of Nice, Sophia Antipolis.

Proposed Research

In this research we propose to investigate in detail the application of the principles of reverse-time imaging to obtain microwave images of the scattering targets, after illuminating them with the eight-element array described above. The scattered data will be imaged by an application of the reverse-time imaging technique, using a method completely analogous to downward continuation of the recorded electromagnetic wave field, with the image of the scattering target clearly identified with a focusing of the retro-propagated electromagnetic waves. For comparison, a synthetically generated wave field will be created using a variant of plane wave expansions, which will also

be imaged using the same algorithm. Central to the location of the target scatterers will be the application of an imaging stopping condition, that can be viewed from an entropy perspective.

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