Letters

Reply to Comments on "Microwave Diffraction Tomography for Biomedical Applications"

J. CH. BOLOMEY, A. IZADNEGAHDAR, L. JOFRE, CH. PICHOT, G. PERONNET, AND M. SOLAIMANI

The comment made by Drs. L. Larsen, T. Guo, and W. Guo is worth noting and requires further explanations. Our reconstruction process is effectively based on a spectral domain approach, but does not involve identity (1), which is no longer valid inside the object under investigation. Instead, we use the relation existing between the Fourier-Transform of the normalized current distribution and the Fourier-Transform of the scattered field in the plane of measurement. The relevant equations are derived in [1] and a paper has been sumbitted for publication in the IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION [2].

On the other hand, L. Larsen, T. Guo, and W. Guo take profit from their comment to suggest another approach based on the inverse scattering theorem. This approach seems to be very attractive from its generality. It can be seen as a reaction matching technique applied to the integral equation relating the scattered field to the equivalent currents [3]. This integral has been considered recently by other authors [4] who have shown that using regularization techniques is absolutely necessary in order to get reasonable accuracy with noise corrupted samples of the scattered field.

Perhaps the reaction concept will improve the behavior of the reconstruction process. But, the practical problem remains the selection of the test functions $\{\vec{J}_n\}$ in order to get a pulse response $\vec{A}_w$ of acceptable sharpness. From a purely theoretical point of view, the pulse response can be as sharp as desired, even with a limited extent of the support of the testing functions. The price to pay is oversampling and the result is very high and oscillatory values of $\{\vec{J}_n\}$ which make that the reconstruction process is very noise sensitive. Such phenomena are usual as far as superresolution or superdirectivity is involved. This is the reason why we are expecting practical results with a great interest.

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REFERENCES

[1] Ch. Pichot, Thèse de Doctorat es Sciences, University of Paris-XI, Apr. 1982 (available from the author).

[2] Ch. Pichot, L. Jofre, G. Peronnet, and J. Ch. Bolomey, "Active microwave imaging of inhomogeneous bodies," submitted to *IEEE Trans. Antennas Propagat.*

[3] J. H. Richmond, "A reaction theorem and its application to antenna impedance calculations," *IRE Trans. Antennas Propagat.*, pp. 515–520, 1961.

[4] M. M. Ney, S. S. Stuchly, A. M. Smith, and M. Goldberg, "Electromagnetic imaging using moment methods," in *Proceed. URSI Symp.*, Aug. 23–26, 1983, (Santiago de Compostela, Spain).

Patent Abstracts

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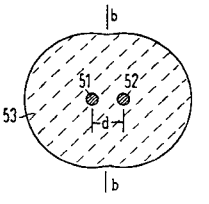
Optical Directional Coupler and Method of Manufacture

Inventor: Gerhard Schiffner.
Assignee: Siemens Aktiengesellschaft.
Filed: Feb. 2, 1981.

Abstract—An interferometer with single-mode optical waveguide wound in a coil which waveguide has a surface at each end for the acceptance of light into the waveguide and for the display of light in the waveguide characterized by at least one polarizing filter being arranged in the path of light emerging from each end surface of the waveguide. Preferably, the interferometer includes a light source such as a laser, at least one beam dividing element which is arranged in the path of a light beam and a coupling arrangement for coupling the light of one of the partial beams into one of the end surfaces and the other partial beam into the other end surface. While the interferometer utilizes a device for detecting the superimposed images of the light exiting both end surfaces of the waveguide, preferably two devices are utilized which can be either a screen or a light sensitive element such as a photo diode.

5 Claims, 5 Drawing Figures



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