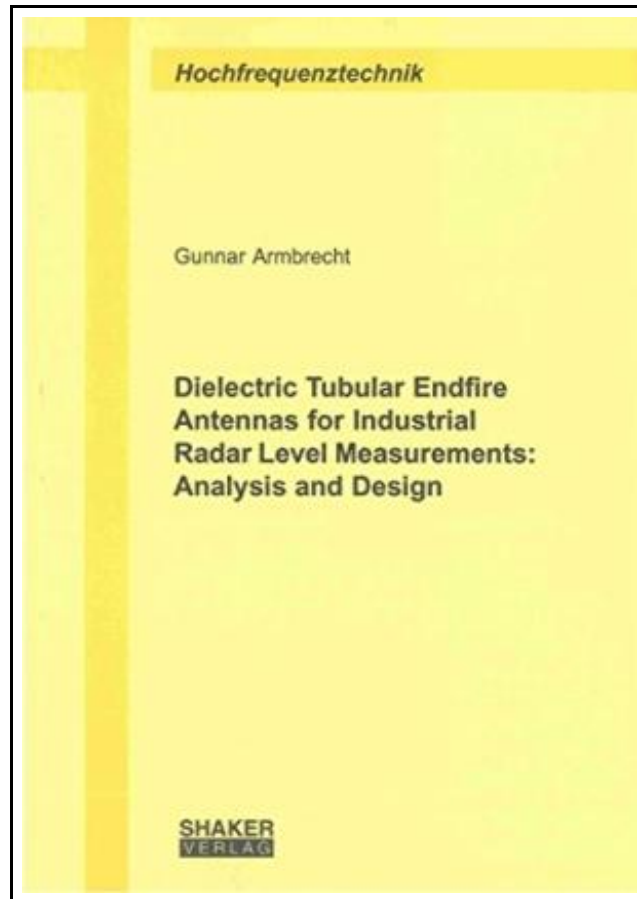


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## DIELECTRIC TUBULAR ENDFIRE ANTENNAS FOR INDUSTRIAL RADAR LEVEL MEASUREMENTS: ANALYSIS AND DESIGN



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Shaker Verlag Okt 2011, 2011. Taschenbuch. Book Condition: Neu. 233x146x17 mm. Neuware - This thesis concerns dielectric antenna design for monostatic radar operation as well as guided still pipe measurement techniques in electrically large tank-mounted metal tubes. The application is for the use in the field of industrial level gauging for process automation industry within the frequency range of 8.5 to 10.5 GHz. At first, Maxwell's theory for cylindrical hollow metallic waveguides as well as for dielectric rods with solid and tubular geometries is revisited in order to derive a combined analytical field approach. This approach aims to be valid for each type of waveguide being considered within this work by solely adapting the boundary conditions. The antenna optimization starts with an intensive evaluation of the modal radiation properties of cylindrical dielectric waveguides for the purpose to design optimized traveling wave endfire antennas made of polytetrafluoroethylene (PTFE) and polypropylene (PP). Therefore, the theoretical directivity limits, particularly that of the hybrid non-cylindrical symmetric HE/EH eigenmodes in mono- and multimode configurations, are estimated analytically. Based on the eigenmode approach, the applicability of a commercially available state-of-the-art 3D field simulator, that numerically solves Maxwell's equations based on the finite integration technique (FIT), is evaluated with regard to the accurate computation of infinitely extended dielectric mode distributions at finite solver domains. By this means, dielectric and metallo-dielectric waveguide transitions can be separately analyzed from any parasitic influence of field disturbances, that are conventionally caused by feeding structures. This is important, because transitions of this kind are an integral part of optimized dielectric endfire antennas. In order to exploit the promising theoretical directivity limits of single-moded, thin-walled tubes of more than 20 dBi, two classes of mode-preserving waveguide transitions are optimized in particular: Metallo-dielectric waveguide transitions between circular metallic feeding waveguides and dielectric solid...



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