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Electric Field Measurement in a Microwave Beam MILKA

NIKOLIC, SVETOZAR POPOVIC, LEPOSAVA VUSKOVIC, Center for Accelerator Science, Department of Physics, Old Dominion University, Norfolk, VA, GREGORY C. HERRING, NASA Langley Research Center, Hampton, VA — We have developed a simple technique to infer electric field in a polarized microwave beam. The method is based on the measurement of breakdown at the surface of a conducting sphere facing the direction of the field. The concept is based on two approximate relations, the field on the sphere is threefold the ambient field [1], and the breakdown field increases linearly with pressure. The enhancement of the electric field at the sphere is strictly valid for the electrostatic field but is also applicable for the polarized microwave beam when the diameter of the sphere is smaller than the wavelength. It was readily utilized in a number of experiments [2]. The second relation is satisfied when the field frequency is negligible in comparison to the electron collision frequency. We demonstrate the technique by the measurement of axial distribution of the electric field in the beam emitted from a rectangular horn antenna at sub-atmospheric pressure. Measured field distribution is in accordance to the calculation. This technique can be used for free-space beam diagnostics and beam power reduction measurement in the presence of surface plasma at the aperture of the horn.

[1] J. D. Jackson, *Classical electrodynamics, 3rd Ed.*, J. Willey and Sons, ISBN 0-471-30932-X.

[2] S. Popović *et al*, Appl. Phys. Lett., **81** (2002) p. 1964.

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