

COMPLEX REFLECTION COEFFICIENT DETERMINATION USING PROBE MEASUREMENTS

Complex reflection coefficient measurements are widely used in materials characterization. The aim of this paper is to develop a method for complex reflection coefficient measurement using electrical probes. For the case of three probes placed an arbitrary distance apart, a biquadratic equation that relates the complex reflection coefficient magnitude to the currents of the semiconductor detectors connected to the probes is derived. Due to the fact that the complex reflection coefficient magnitude is no greater than unity, it is unambiguously determined from that equation as its smaller positive root. The complex reflection coefficient phase is determined from two quadrature signals, which are easy to find from the semiconductor detector currents once the complex reflection coefficient magnitude is known. To measure the complex reflection coefficient over a frequency range, it is convenient that the interprobe distance be equal to one eighth of the guided operating wavelength at the maximum frequency. The proposed method allows one to eliminate the incident wave electric field amplitude, this making it possible to greatly alleviate the requirements for oscillator output power stability. A distinctive feature of the proposed method is the simplicity of its hardware implementation, which opens up the way to the development of a new class of vector reflectometers.

Keywords: *complex reflection coefficient, electrical probe, semiconductor detector, generator output power, interprobe distance.*

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