Characterization of Microwave Power and Frequency on Chip by Scanning Probe Microscopy

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For the miniaturization and integration of microwave devices, a high-resolution characterization method for microwave power and frequency is proposed based on scanning probe microscopy (SPM). The theoretical model is established by leveraging the signal coupling between the tip and the sample surface in the near-field region, in conjunction with the vector network analysis technique. The peak-to-peak value of the S_{11} parameter curve represents the intensity of microwave power on the sample surface, with a minimum detection power better than 1 nW. Furthermore, the center frequency of the S_{11} oscillation curve has been analyzed within a wide frequency range, enabling the precise measurement of single-frequency and multi-frequency signals with low power consumption (–20 dBm) and minimal error (8 Hz). The characterization method has a wide range of potential applications in microwave device design, signal detection, and performance analysis.

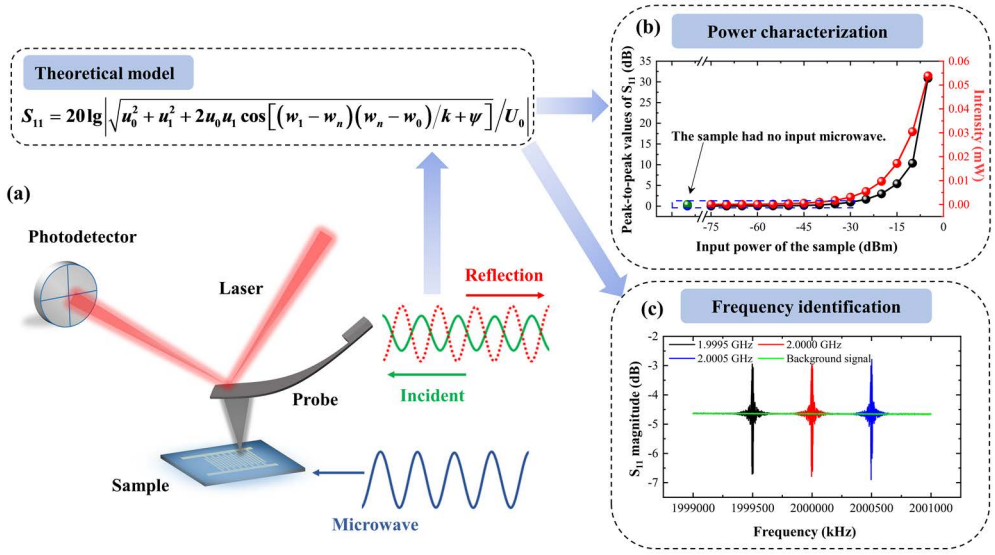

Figure 1. The detection of microwave power and frequency in scanning probe microscopy. (a) Diagram of the measurement. (b) The characterization of S_{11} peak-to-peak values for microwave power. (c) Frequency detection of microwave signals.

Reference

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