

Abstract Submitted
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A flip-chip test set for complex permittivity measurement of thin-films up to 110 GHz NATHAN ORLOFF, CHRIS LONG, JAMES BOOTH, NIST — Complex permittivity measurement can be used to understand underlying physics in complex material systems and to identify potential industrial applications. With the development of new dielectrics sparked by materials-by-design, it has become increasingly important to develop a standardized complex permittivity metrology to test and measure materials. Test of new materials often requires the fabrication of electrodes on the material-under-test. For high frequency, coplanar waveguides are commonly used to measure the complex permittivity, while interdigitated capacitors are used at low frequency. Since many new dielectrics are grown on chips, the size of the material-under-test limits the design of electrodes, the number of devices, and the fabrication techniques. This limits the measurement accuracy and impedes materials discovery. Here, we develop a flip-chip technique for measuring the complex permittivity to 110 GHz. This flip-chip technique uses electrodes fabricated on a 75 mm wafer, a lithographically defined polymer stand-off to control the measurement sensitivity, and a test fixture to hold the material-under-test in place. Successful implementation of this flip-chip approach will allow for the rapid, nondestructive characterization of new materials without the need for chip-based fabrication.

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