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Analysis and Development of Ka- and Q-Band Waveguide Impedance Standards

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Abstract
This paper reports the salient design features and performance analysis of a precision waveguide, standard mismatches of voltage standing wave ratios (VSWRs) 1.10, 1.20 and 1.30 at Ka-band frequencies. Also standard waveguide sections and flush shorts are developed at Ka-band and Q-band and these are analyzed based on their physical dimensions, respectively. The performances of precision waveguide and standard mismatches are observed based on their dimensions and compared with measured values using slotted line technique at Ka-band. The calibration results of mismatch set are found with good agreement for their designated VSWRs with expanded uncertainties <0.03 and their traceability is established through the precision waveguide. These standards will serve as transfer standards of impedance at Ka-band and Q-band ranges and to assign the accuracy of impedance measuring instruments.

Keywords
Waveguide standard – Measurement uncertainty – Impedance – Slotted line technique – Traceability