256. Title: TSV Technology for Millimeter-wave and Terahertz Design and Applications

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Abstract: The through silicon via (TSV) technology provides a promising option to realize a compact millimeter-wave (mmW) and terahertz (THz) system with high performance. As the fundamental elements in this system, transmission lines (T-lines) and interconnects are very important and therefore studied in this paper. A TSV-based substrate integrated waveguide (SIW) is also characterized. The results show that, the T-lines and interconnects are viable at frequencies lower than ~150 GHz whereas SIW can operate relatively well up to 300 GHz. In addition, two mmW components, i.e., a hairpin filter and a patch antenna, are designed by the TSV technology. Results of all the above passive components indicate that the low-resistivity silicon is the main cause of the total loss. Afterwards, two novel TSV-based topologies are proposed to efficiently integrate an antenna with active circuits for the mmW and THz applications.