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Characterization of Resonant Cavities in Terahertz Parallel Plate Waveguides[1] BLAKE MCCRACKEN, VICTORIA ASTLEY, RAJIND MENDIS, DAN MITTLEMAN, Rice University — Parallel-plate waveguides are among the most common low-loss broadband waveguides in the terahertz frequency regime with a large variety of applications. One application is microfluidic detection. Adding a groove into one of the waveguide plates leads to a resonant feature of relatively high quality factor, which will shift to different frequencies when the groove is filled with different liquids. We experimentally investigate the resonant frequencies and transmission characteristics of different-sized grooves in aluminum plates in order to determine which groove will be most suitable for microfluidic sensing. This apparatus is formed by machining grooves of varying geometries into aluminum plates which are then used to form parallel-plate waveguides. Sub-picosecond terahertz pulses are used to excite the lowest-order transverse-electric (TE1) mode in the waveguides and the output spectrum is analyzed to determine the resonant frequency and Q-factor of each groove geometry. We can use the information gathered in order to determine which groove gives the highest quality factor (Q-factor), increasing the sensitivity of a groove-based microfluidic sensor.

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