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Fast Tunable Microwave Devices Using Self-driven Plasma Instabilities[1] DAVID BIGGS, MARK CAPPELLI, Stanford University — Tunable electromagnetic devices using plasmas are of interest for various applications such as high frequency communications and analog signal processing. At microwave frequencies of tens of gigahertz, low-pressure plasmas must be employed in order to avoid high wave damping from collisions. The drawback of low-pressure plasmas is that their diffusion timescales are long, on the order of hundreds of microseconds. Other mechanisms than diffusion must be employed to achieve fast tuning capabilities of these devices. One candidate mechanism is to use a self-driven plasma instability, which may allow for fast tuning of microwave resonant cavities. In this work, a microwave resonant cavity is studied consisting of a rectangular waveguide with two conducting posts spaced along the propagation direction to form a rectangular cavity. The cavity acts as a band pass filter and transmits microwave signals around its resonant frequency. Plasma may be introduced into the cavity between the conducting posts in order to change the refractive index and thus the resonant and transmission frequency of the device. The location of the plasma and its plasma density are important parameters in determining the resonant frequency, and both parameters are capable of being tuned with plasma instabilities.

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David Biggs
Stanford University

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