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Plasma Tunable LC Resonator for High-Power Electromagnetic Applications ABBAS SEMNANI, SERGEY MACHERET, DIMITRIOS PEROULIS, Purdue University — High-power tunable filters are in high demand in transmitters found in radars and many communication systems such as satellite and broadcasting stations. Limited power handling renders most semiconductor technologies inherently suboptimal options for these systems. Therefore, mechanically-tunable cavity-based filters are often employed in such cases, resulting in bulky, slow, and heavy systems. In this work, we study the application of plasma as an alternative frequency tuning mechanism for high-power applications even in environmentally and/or mechanically harsh conditions. For a given gas type and pressure, the real and imaginary parts of the dielectric permittivity of a plasma can be varied by changing the electron density, which, depending on the discharge regime, can be implemented by changing the discharge current, voltage, or the magnitude of an auxiliary electric field. In this work, a simple LC resonator tuned to several hundred MHz was fabricated and tested. The tunable capacitor of the resonator was implemented by a commercially available gas discharge tube (GDT), a mm-scale plasma device with gas pressure of 100s of mTorr. Measurement results reveal a continuous tuning range of more than 50% when the applied discharge current is increased from zero to 90 mA.

Abbas Semnani
Purdue University

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