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**Abnormal glow discharge as a variable capacitor for tunable RF systems** SERGEY MACHERET, ABBAS SEMNANI, DIMITRIOS PEROULIS, Purdue University — For frequency-tunable resonators and filters in high-power applications, conventional semiconductor devices are easily damaged, while mechanically-tunable systems are bulky and slow. In this regard, weakly ionized plasmas can offer an attractive solution. In this work, an LC resonator circuit where a commercial gas discharge tube (GDT) serves as a variable capacitor was studied experimentally and theoretically. The experiments show continuous decrease of the resonant frequency by up to 50 percent with increase in the DC current through the GDT. Analysis of the current-voltage characteristic and the breakdown parameters, combined with lumped-parameter equivalent-circuit RF simulations, allowed us to determine the gas pressure, the electrode coating material and the secondary emission coefficient, and to achieve a very good agreement between the calculated and measured transmittance values. The analysis reveals that reduction in the cathode sheath thickness with increase in the DC current in the abnormal glow discharge regime is the key factor responsible for the experimentally observed tunability.

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