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Modulation of microwaves using rotating magnetron discharges ANDREA MARCOVATI, DAVID BIGGS, NICOLAS GASCON, MARK CAPPELLI, Stanford Univ — The frequency modulation of microwaves (1-100 GHz) with unsteady plasmas can be performed with pulsed plasma discharges that can absorb or scatter microwaves, depending on the wavelength and plasma properties. This kind of modulation is limited by the timescales of gas ionization and decay, which can limit the possible bandwidths to a few MHz or less. Here we present simulations and experiments on the feasibility of modulating microwaves using dc magnetron plasmas. In these discharges, "spoke" type density instabilities can develop and rotate in a circular zone where the electric and magnetic fields are perpendicular. Modulation of microwaves can be obtained with bandwidths that are depending on the number of spokes and their frequency of gyration. Different magnetron discharge and wave coupling configurations are simulated and presented using Ansys HFSS. The plasma dielectric properties are modeled as function of frequency of the microwave passing through, following the Drude model. Simulations show that such modulation is possible. In the experiments, microwaves in the range of 1 to 20 GHz are sent through a circular (19 mm diameter), low pressure (100-300 mTorr) dc magnetron discharge and the wave transmission properties are measured as function of time.

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