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Glow Plasma Discharges inside Externally Excited Porous Spherical Cavity Resonators[1] PAUL BERNHARDT, ARNE FLIFLET, Plasma Physics Division, Naval Research Laboratory — A porous spherical cavity resonator (PSCR) provides amplification of externally incident electric fields a resonant frequencies corresponding to discrete modes. The PSCR has a mesh surface with a large number of polygon (hexagon and pentagon) holes. The size of the holes is adjusted to maximize the Q of the resonator for production of maximum internal electrical fields. Amplification factors for a PSCR are about 1000. The high resonator Q requires precise tuning of the incident wave frequency to a resonant frequency. The PSCR is placed in a low-pressure (1 T) gas chamber and excited by an external microwave horn for a chosen spherical cavity resonator mode. At the resonant frequency, a glow discharge occurs inside the cavity producing a plasma cloud in the shape of electric field modes. Varying the neutral gas pressure inside the chamber (1) yields variations in the glow discharge light intensity and (2) affects the shapes of the plasma cloud. If the plasma frequency in the electron cloud approaches the incident wave frequency, self-action produces localized regions of dense plasmas. The PSCR apparatus can be used to study cavity resonator modes in the low pressure environment and electromagnetic wave interactions in high pressure plasmas.

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