Contribution ID: **115** Type: **Oral**

DESIGN AND SIMULATION OF A RELATIVISTIC INVERTED MAGNETRON

Monday, 19 June 2017 11:15 (15 minutes)

A high power inverted relativistic magnetron was designed and simulated using the massively parallel electromagnetic particle-in-cell code ICEPIC in conjunction with single particle smooth bore relativistic analysis. This Inverted Magnetron also known as the Inverted Magnetron Oscillator (IMO) has two design variations, the IMO-1 and the IMO-2. Both IMO models are designed to operate in L-band at very low magnetic fields (B < 0.1 T). Common to both designs is an axial RF power extraction structure. This structure consists of a conducting ring mounted to alternating vanes of the IMO slow wave structure. The IMO-2 employs two such rings. These rings achieve RF coupling to the downstream cylindrical waveguide where the TM01 electromagnetic mode is excited. ICEPIC simulations predict that the above features combined with the IMO's stable, robust and reliable performance in the desired π mode over a large voltage range yield a class of high power microwave source notable for absence of downstream current loss as well as low confinement field performance. The IMO achieves high RF power output for input voltages ranging from 250 kV –450 kV, a range that may be considered low voltage for an L-band relativistic magnetron.

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Session Classification: Oral session 3 - High Power Microwave Systems and Sources - Session Chair : Steve Calico

Track Classification: High Power Microwaves, RF Sources and Antennas