A LONG PULSE (>1 μsec) FIELD EMISSION ELECTRON GUN WITH STABLE CROSS SECTION FOR HPM SOURCES *

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Field emission guns, such as those used in many HPM devices, are effected by the plasma formed on both the cathode and anode surfaces by the high voltage pulse. Both the gun impedance and the electron beam cross-section change during the pulse because the plasma rapidly expands (>2mm/μsec). This may reduces the beam-wave interaction efficiency since the beam is no longer at the correct position for optimum rf interaction, and may lead to beam interception and early termination of the microwave pulse. Intense, relativistic, long pulse electron guns designed to minimize these effects is therefore a major issue in the development of long pulse HPM sources. We report the results of a foil-less, long pulse (1μsec), relativistic field emission gun with a stable beam cross section. The gun is immersed in a magnetic field of unique geometry. The figure demonstrates the temporal stability of the beam cross section by showing the radial distribution of the electron beam current density J(r) [kA/cm^2] vs. time [nsec].

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