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Design of a Dual-Beam Electron Gun MICHAEL LAMBRECHT, MICHAEL HAWORTH, WILKIN TANG, PETER MARDAHL, Air Force Research Laboratory — A dual beam electron gun is being designed as the driver for a microwave amplifier utilizing the two-stream instability. The two-stream amplifier was designed to use relativistic electron beams, and has achieved 30 dB gain at 9 GHz in 2-D ICEPIC simulations. Two annular electron beams are launched with different current, radii, and energies, co-propagating down a cylindrical waveguide to create the two-stream instability used for amplification. The parameters for the electron gun to create these beams simultaneously are stringent. The beam temperature must remain less than 0.5%, and the amount of transverse energy of the beam as it enters the drift tube must be as close to zero as possible, as both of these parameters seriously degrade the amplification and efficiency of the amplifier. The dual-beam electron gun will be designed with TRAC (Field Precision, LLC), and will initially utilize a Friedman-style electron gun for the outer radius beam co-located with a “cookie-cutter” electron gun to create the inner radius beam. The design will seek to minimize beam spin and energy spread.

Wilkin Tang
Air Force Research Laboratory

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