SHEET BEAM FOR W-BAND EXTENDED INTERACTION KLYSTRON (EIK)*

John Pasour, Franklin Wood, and Baruch Levush
Naval Research Laboratory, Washington, DC 20375

Edward Wright and Khanh Nguyen
Beam Wave Research, Bethesda, MD 20814

Adam Balkcum, John Atkinson, and Michael Cusick
Communications & Power Industries, Palo Alto, CA 94303

Both the generation and the stable transport of high-perveance, relatively low-voltage sheet beams suitable for millimeter wave and submillimeter wave amplifiers are quite challenging. We have designed and fabricated a beam stick to validate our design[1] of a 19.5 kV, 3.5 A sheet beam having a cross section of 0.3 x 4 mm, whose parameters were selected to drive a W-band extended interaction klystron (EIK). The electron gun uses a shielded cathode at an average loading of 8 A/cm^2, with single-plane focusing to achieve a final beam density of ~275 A/cm^2. The beam is transported through a 0.4 x 5 mm beam tunnel by a permanent magnet solenoid that produces a field of ~8.5 kG over a distance of 1.8 cm, which is sufficient for a 3-cavity EIK interaction structure having a gain of ~30 dB. A single-stage depressed collector collects the exiting beam.

The beam stick has been fabricated at CPI Palo Alto, with assembly and initial testing also to be performed there. Details of the design, fabrication, and assembly will be presented along with the latest test results. Measurements will be compared to the predictions of the design codes: MICHELLE[2] for beam generation and transport and Maxwell-3D (Ansoft) and Analyst (AWR/STAAR) for the magnet design.

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1. K. Nguyen, et al., "High-perveance W-band Sheet-beam Electron Gun Design," *IVEC 2008 Conference Record,* p. 179.

2. J. Petillo, et al., "The MICHELLE Three-Dimensional Electron Gun and Collector Modeling Tool: Theory and Design," IEEE Trans. Plasma Sci., **30**, 1238, 2002.

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