A HIGH DIRECTIVITY BROADBAND CORRUGATED HORN FOR W-BAND GYRO-DEVICES


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A quasi-optical corrugated horn has been constructed for a W-band gyro-TWA\textsuperscript{1,2} based on a cusp electron beam source\textsuperscript{3,5} with a helically corrugated interaction region\textsuperscript{6,8}. The design is intended to provide an effective method to decouple the radiation and the beam so that a depressed collector energy recovery system may be used\textsuperscript{9,11}. The horn converts a cylindrical TE\textsubscript{11} mode into a free-space TEM\textsubscript{00} mode over a frequency band of 84 to 104 GHz. This Gaussian mode can pass through the collector system unperturbed. This type of mode converter was chosen due to the performance advantages of greater bandwidth and continuous operation over this bandwidth. The design was optimized using a mode matching method that predicts a reflection of better than -35 dB and a Gaussian coupling efficiency of 97.8%. The prototype, which has been constructed and tested, demonstrates a close agreement with these figures.