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A High Power High Frequency Maser Based on a Two-Dimensional Structure LORNA FISHER, IVAN KONOPLEV, ADRIAN CROSS, ALAN PHELPS, University of Strathclyde — High power millimetre-wave sources operating in the W-band (75GHz-110GHz) frequency range are important for a number of applications. In order to achieve the desired high power coherent radiation, the use of an oversized annular electron beam is suggested. This will allow problems associated with high electromagnetic power density inside the interaction space (such as millimetre-wave pulse shortening) to be overcome. A 2D periodic lattice will be used to synchronize the radiation from different parts of the oversized electron beam as well as to ensure spatial and temporal coherence of the radiation. There are a number of radiation sources capable of generating continuous millimetre-wave radiation at MW power levels. Analysis of different beam-wave interaction mechanisms used to produce the radiation will be presented. Various models will be studied and compared for suitability for single mode operation at high frequency and power. The design of a high power source based on the optimum beam wave interaction mechanism for operation in the W-band frequency region will be presented.

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