PREFACE

Recent years have seen resurgence in focussed R&D in the area of high power microwaves (HPM) for civilian and military applications, with the aim of intentionally disturbing or destroying electronic equipment without damaging infrastructure or hurting the professionals. There are many HPM sources for generating high power using relativistic beams like Relativistic Magnetron, Relativistic Klystron, Relativistic BWO, Fast wave devices like Gyro devices and space-charge devices like Vircator and FEL and these devices still under active research investigation in many countries. Above all, Magnetically Insulated Line Oscillator (MILO) is one of the most prominent slow-wave relativistic device used in many applications like E-bomb and Directed Energy Weapons (DEW) applications.

MILO is M-type, cross field slow wave device, relatively compact capable of generating gigawatts of power in L- to Ku-bands. It needs no externally applied magnetic field to insulate the electron flow between the anode-to-cathode gap and operates at low impedance of the order of 10 Ω. It provides good impedance match to low impedance pulsed power sources.

Initial research and development work on the magnetron was mainly concentrated at France, China and US, but with growing applications of this device, several other groups around the globe have also emerged out. In India, MTRDC, Bangalore is indigenously putting its effort in the research and development of the MILO.

In the present thesis, the author has designed the S-band MILO using analytical formulations for obtaining all parameters, and simulated the device to get pi-mode frequency from dispersion characteristics and verified by cold test measurements. Further this device has been simulated by introducing electron beam using CST particle studio for obtaining high RF output power and efficiency. Using Particle optimisation technique, this device has been optimized for the parameters for getting high RF power. Vlasov Antenna with Perspex window is designed and simulated for radiating RF power in free space and it would act as a mode convertor for MILO device to convert from TM_{01} to TE_{11} mode. The whole device has been fabricated and experimentally tested for meeting electrical specifications.

The author has reported the present work at national conferences and reputed international journals and he would consider his efforts a success, if it proves to be useful in the design, development and experimentation of MILO device.