CHAPTER 7

CONCLUSION AND FUTURE SCOPE

CONTENTS

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7.1 Conclusion

The analytical and simulation investigation of an S-band RBWO is carried out and discussed in various chapters of the present thesis. The work is mainly concentrated to increase the efficiency of the device in single and dual frequency, and to examine the performance the device at high and low guiding magnetic field of the device with TM01 output mode. The present work is also highlighted the RF breakdown causes the pulse shortening by various mechanisms through MAGIC-PIC simulations. In addition, the direct generation of TE11 output mode from an RBWO for Gaussian output is also studied using bragg reflector for both single-band and dual-band operation. The present work includes the detailed design aspects, rigorous analysis, and vast simulation results to understand the beam-wave interaction mechanism in S-band and C-band HPM source, RBWO and its performance enhancement studies are also presented with help of RR, TRR, and bragg reflector.

7.2 Limitations of the Present Work and Future Scope

In the present thesis, the generation of RF power with high conversion efficiency by replacing RR to TRR presented. Also, the mechanisms of pulse shortening using MAGIC-PIC simulations studied for its impact over RF generation at low guiding magnetic field. Finally, to obtain Gaussian output for direct generation of HE_{11}/TE_{11} mode, sectional Bragg reflector is used in RBWO as reflector and simulated through PIC simulation. In addition, TM01 generation using sectional SWS and direct generation of HE_{11}/TE_{11} mode for Gaussian output using Bragg structure for dual-band operation of RBWO device designed and simulated using MAGIC-PIC simulation.

During the research study, some research gaps were found, and these gaps listed below for future research studies:

1. The device can be made more efficient at low guiding magnetic field with modulation and extractor cavities.
2. The pulse shortening studies can be extends to the operation of RBWO with a strong guiding magnetic field, and ions such as oxygen, nitrogen can also be considered for the formation of collector plasma, as well as anode plasma in the SWS.
3. Direct generation of HE_{11} / TE_{11} modes for dual-band operation with single interaction structure can be designed and taken as a point for detailed study.
4. Direct generation of HE_{11} / TE_{11} mode RF output power of RBWO devices for longer RF pulse duration at low and high guiding magnetic fields can be taken as a point for detailed study.