Design & Simulation of a Gaussian Beam Polarization Selective Wave Collection System for ECE Diagnostics

Abstract

Michelson interferometer (MI) diagnostic is installed on SST-1 tokamak and is capable of measuring broadband intensity spectra in the microwave and near infrared spectral range. The diagnostic probes full electron cyclotron emission (ECE) spectrum emitted by high-temperature plasmas from SST-1 tokamak and determines plasma electron temperature profile. The ECE radiations from the plasma are broadband & contain emissions in various polarizations. It is necessary to select the desired polarization and bandwidth and direct towards a specific system.

A quasi-optical Gaussian beam wave collection system needs to be designed which may select the desired polarization and filter out the undesired components.

Following work has to be done to realize above mentioned objective:

1. Study of Gaussian beam and understanding their nature and behavior.
2. Design & simulation of quasi optical Gaussian beam wave collection system with mirrors, wire-grid polarizers, mode-converters etc. using microwave simulation software such as CST / HFSS.
3. Design optimization for finer selectivity of vertical and horizontal polarizations with minimum insertion loss by the wave collection system.
4. Fabricating a prototype of the designed model & characterizing it with MI system during calibration.

Academic Project Requirements:

1) Required No. of student(s) for academic project: **1 (ONE)**
2) Name of course with branch/discipline: **Electronics and Communication (or related fields)**
3) Academic Project duration:
(a) Total academic project duration: **1 Year**
(b) Student's presence at IPR for academic project work:
Student can either Work from Home OR Visit IPR as per COVID situation.

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