

Characterization and testing of X-mode Reflectometry hardware to measure plasma density

Abstract

Lower hybrid current drive (LHCD) power coupling strongly depends on of edge plasma density and its gradient. So reliable measurement of edge plasma density and its gradient is important to couple LHCD power efficiently. To measure the edge plasma density an X-mode reflectometer system has been designed and developed. Reflectometer launches microwave power using a free-running voltage control oscillator (VCO) and suitable frequency multiplier in 26 -36 GHz to probe the plasma and receive the reflection by the density cut-off layer. The system covers a density range from SOL to $2 \times 10^{18} \text{ m}^{-3}$ at a toroidal magnetic field of 1.5 Tesla. A heterodyne detection system has been developed to measure the phase change of the reflected signal.

In this project, the functional testing of the reflectometry hardware will be performed in the laboratory environment to be utilized for the reflectometry diagnostic system. Extraction of distance from phase information will be carried out for a known fixed distance which will serve as a cut-off layer. After the successful completion of this part, a metal plate will be used as a vibrating reflector, then from the phase information, this preset vibrating frequency will be calculated.

Finally, the diagnostics will be used as an interferometer to extract line integrated density in STARMA device in LHCD Lab.

Academic Project Requirements:

1) Required No. of student(s) for academic project: 1

2) Name of course with branch/discipline: B.E./B.Tech. Electronics and Instrumentation Engineering

3) Academic Project duration:

(a) Total academic project duration: 26 Weeks

(b) Student's presence at IPR for academic project work: 3 Full working Days per week

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