Automatic Laser beam alignment for Thomson scattering diagnostic

Abstract

Background: Thomson scattering diagnostic consist of multiple high power Nd:YAG lasers placed at a lab far away from the tokamak. The laser beam travels nearly 60 meter to interact with tokamak plasma. The laser beam path consist of multiple mirror, which need to be precisely controlled to obtain a proper laser beam alignment for the diagnostics.

Objective: Automatic laser beam alignment is essential for positioning the laser beam path aligned with the imaging lens system. It will also help to couple maximum power to the plasma for the diagnostics to improve the signal-to-noise ratio. Laser beam position has to be monitored at multiple locations using cameras and based on the information at different locations, appropriate feedbacks need to be performed. The student will be working on the required instrumentation to interface the camera, pico-motors, etc. to take the feedback and then execute appropriate control signals to correct the laser beam position using the pico-motor actuators.

Deliverables:

(1) Laser beam position measurement using camera assembly.

(2) Alignment of mirror position manual/ automatic using feedback control for desired position.

(3) Development of instrumentation program for laser beam position measurement and correction using picomotor control.

(4) A complete feedback alignment system based on the camera and Picomotor actuators for the laser transport lines from SST-1 laser lab to ADITYA.

Academic Project Requirements:

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

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

3) Academic Project duration:

(a) Total academic project duration: 48 Weeks

(b) Student's presence at IPR for academic project work: 1 Full working Days per week

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