Development of an HCN dual laser for the interferometer on a small tokamak device

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A dual hydrogen cyanide (HCN) laser interferometer has been designed and developed for measuring plasma electron density in a small tokamak device (R=0.65m, a=0.20m, BT≥15kG, and IP≥150kA). The dual HCN laser system comprises two terahertz continuous wave (CW) discharge pumped HCN lasers with an output frequency of 0.89 THz and an output power up to 100 mW. Different from the conventional method of modulating the intermediate frequency (IF) with a rotating grating, the dual laser's difference of cavity length is modified and maintained to generate the IF. The IF can reach up to 1 MHz, and the temporal resolution is 1 μs. We describe the detailed optical design for the dual HCN laser interferometer, and we verify the feasibility of the dual HCN laser interferometer system by simulating the plasma using a wedge, after which preliminary experimental results were obtained from the small tokamak device.

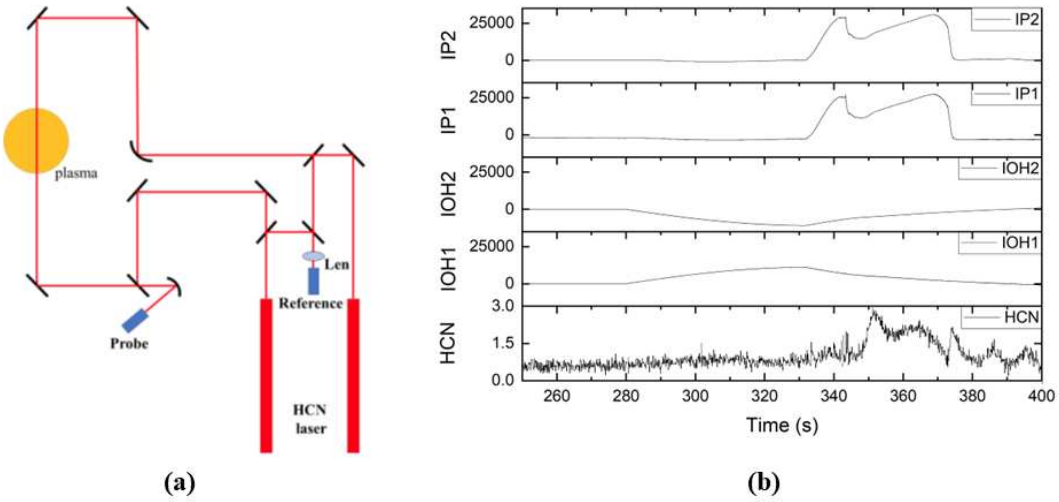

Figure 1. (a) Schematic of the interferometer system, (b) Line-integrated electron density.

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