Development of 320 GHz interferometer system in Heliotron J

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Measurement of density profiles is critical for studying plasma confinement and transport. In helical device, Heliotron J, some advanced fuelling techniques have been used for studying high density plasmas.[1] To measure the density profile with high time resolution, a new multi-channel heterodyne Michelson interferometer with 320 GHz solid-state source has been designed and is being constructed in Heliotron J for high-density plasma operation.

For multichannel measurement, the beam is converted to a sheet beam by two off-axis one-dimension parabolic mirrors and injected to the plasma which makes the system compact. The injected probing beam passes through the plasma, reaches the retroreflector on the facing wall of the vacuum chamber and returns back in the original direction after reflection.

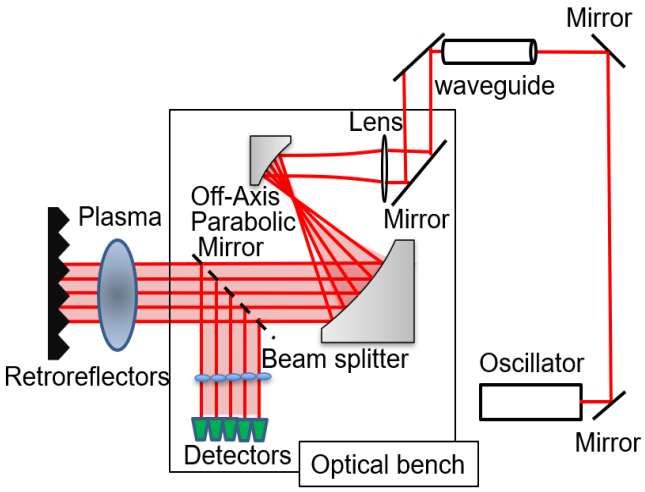

Figure 1. Schematic drawing of the main optical layout of the interferometer.

To make sure the influence on the beam profile with the retroreflector, an optical test experiment has been done to compare the reflection effects between metal mirror and retroreflector.

Figure 2 shows the experiment setup in the optical test experiment. The beam profile was measured by moving a detector in the horizontal and vertical directions.

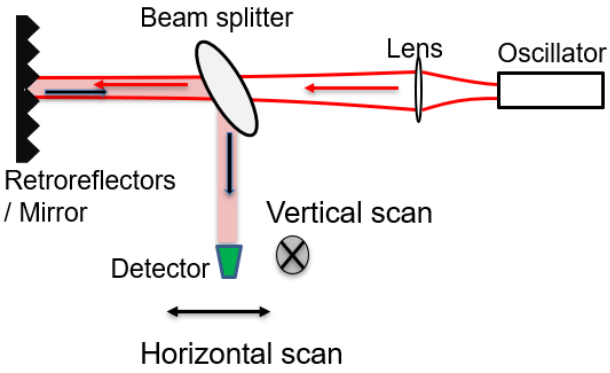

Figure 2. The setup of the table experiment

Figure 3 shows the measure beam profiles in the metal mirror and the retroreflector. The beam profile in the retroreflector is more peaked than that in the flat metal mirror, indicate that the retroreflector works for beam transmission.

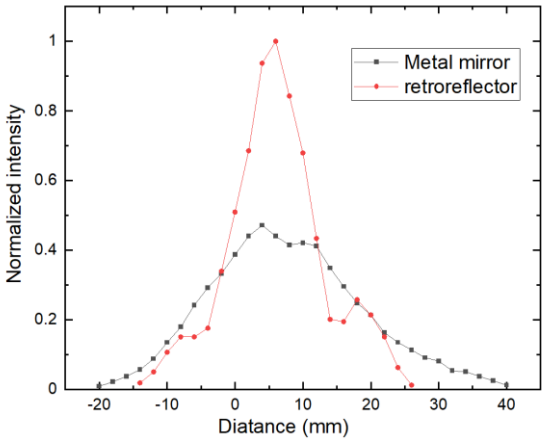

Figure 3. The profile of the table experiment in the horizontal direction

[1] T. Mizuuchi et al., Journal of Nuclear Materials 438 (2013) .