Optical technologies towards improving the Far-infrared laser Polarimeter-Interferometer system on HL-2A tokamak

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\textbf{Abstract}

Since the first performance of the HCOOH laser Polarimeter-Interferometer (PIfer) in 2015 HL-2A experimental campaign, several optical technologies have been applied to improve the PIfer system, including: (1) Optical alignment of the HCOOH laser at the long distance was implemented by the optical setup integrated by a lens and a high-sensitivity Pyroelectric Array Camera. (2) Due to application of the orthogonal waves transmission in the PIfer system, some spurious intermediate frequency (IF) might be generated in the interferometry beat signal. For this problem, an effective optical adjustment method based on the single-polarization response characteristic of the Schottky diode detector was summarized in practice. (3) For double-passing type Faraday-effect polarimeter, analysis indicated that the severe oscillation disturbance in Faraday rotation angle was mainly caused by the stray lights or the feedback lights. Experimental results on HL-2A successfully validated that the unwanted feedback lights mainly came from the detector surface and was able to be effectively suppressed by the optical isolator which was composed of a polarizer and a quarter-wave plate.