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4.23 The First Operation of a Tangential Two-Color Interferometer in KSTAR

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A two-color interferometer (TCI) has been developed for the Korean Superconducting Tokamak Advanced Research (KSTAR) machine. The TCI is demonstrated first with a single tangential chord that traverses the innermost of the five chord planned. The long and short wavelengths for vibration compensation are 10.6 μm and 632.8 nm, respectively. Each wavelength beam is provided by commercial CO₂ and He-Ne lasers. Under the KSTAR tokamak floor, a main optical table was installed for two lasers, a beam merging / splitting optics and detectors. Electronic devices and signal processing circuits are placed next to the optical table to lower the intermediate frequency (IF) to 10 MHz and detect the phase. The original IF is 40 and 80 MHz for CO₂ and He-Ne lasers, respectively. The down-converted signal is injected into a quadrature demodulator to obtain the final phase signal. The effective vibration level is so large, causing multi-fringe data process like any other conventional interferometer, such as far-infrared or microwave. Therefore, fringe calculation errors may still occur. However, since the pure response of the phase to the plasma density is small in principle, it has been confirmed that even the newly installed pellet injector does not cause any fringe error in the TCI.

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