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Far-infrared laser diagnostics for fusion devices

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Far-infrared diagnostics are essential diagnostics to measure electron density and internal magnetic field of high temperature plasma for present and future devices. Multi-channel far-infrared laser system was developed on EAST tokamak. This system uses three tubes laser. Co-axial two laser beam is injected with right and left handed circularly polarized light and measured Faraday rotation from the phase difference of two polarization light. Also, each polarization light provides phase shift due to electron density relative to external reference chord. Faraday rotation is multiple products of electron density and magnetic field parallel to the laser beam axis. Then, simultaneous measurements of electron density and internal magnetic field become possible. Muti-chord measurements provide radial profile of electron density and poloidal magnetic field, which can be converted to plasma current profile.