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10.55 Development of thermal image plate using ceramics luminescence materials for aligning and stabilizing beam axis of CO₂ laser

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CO₂ laser interferometer is one of the most important diagnostics to evaluate line averaged electron density of magnetic confinement plasmas. In order to align and stabilize the beam axis, the beam axis and profile should be monitored. So far, a thermal imaging plate (TIP) on the market (Macken instruments Inc.) has been used as the beam profile monitor. This TIP is using thermal quenching effect. However, the commercial TIP cannot be used for a long time (~ 1 day) because the commercial TIP discolors from yellow to black by the ultraviolet light ($\lambda \sim 360$ nm) for excitation. In addition, the commercial TIP is burnable. These characteristics are not appropriate for the use in a radiation controlled area. In order to resolve these problems, the thermal imaging plate using a ceramics luminescence material which is excited by visible light has been developed for visualizing a CO₂ laser beam. One of the promising ceramics luminescence materials is CaAlSiN₃:Eu²⁺, which is excited by blue light ($\lambda \sim 450$ nm) and emits red light ($\lambda \sim 680$ nm). A fireproof characteristic of the CaAlSiN₃:Eu²⁺ TIP has been confirmed. Moreover, the beam diameter evaluated by the CaAlSiN₃:Eu²⁺ TIP has been approximately same as that evaluated by the commercial TIP.

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