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P4.215 Laser resistance of plasma-facing diagnostic components in ITER

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The development of plasma-facing components with a high laser-induced damage threshold (LIDT) is an important part of R&D program for laser-aided diagnostics in ITER. A number of papers have been published studying LIDT of ITER materials. Most of them, however, are the investigations of integrity of first wall materials using laser radiation for simulation of pulsed plasma impact during transient events in ITER. Laser testing of in-vessel optical elements have been also reported, but were limited with a single laser impact without account taken of synergy effects during simultaneous/successive laser and plasma irradiation. The requirements to laser components of the Divertor Thomson scattering (DTS) diagnostics, driven by high-energy neutron and gamma radiation, intense particle fluxes and thermal loads, include also a high laser resistance throughout the diagnostic life cycle. The DTS laser elements are developed to withstand irradiation of the high-power probing Nd:YAG lasers (1064 nm and 946nm) with the pulse duration of 3 ns and energy of 2 J. The laser beam dump is the last element along one of the DTS probing chords absorbing laser irradiation to prevent damage of the ITER construction elements. Fatigue degradation of tungsten, molybdenum and silicon, as possible materials of laser dump, were tested for the multi-pulse laser irradiation. The effect of plasma treatment and enhanced temperature on the LIDT has been assessed. The implementation of the laser dump for DTS and its performance under the high-number pulsed (up to 108 pulses) laser impact is discussed.

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Presenter: RAZDOBARIN, Alexey (Ioffe Institute)

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