Progress in the development of the CXRS diagnostic system for ITER

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ITER (International Thermonuclear Experimental Reactor) – the world's first experimental thermonuclear reactor, the construction of which is now underway in France in Cadarache. The aim of this international project is to demonstrate the scientific and technical feasibility of a controlled thermonuclear D – T reaction and a positive energy yield. Managing the operation of the ITER reactor requires the development and creation of the necessary diagnostic tools for thermonuclear plasma.

One of them is the so-called Charge Exchange Recombination Spectroscopy (CXRS) method. CXRS with the use of diagnostic or heating beam of atoms is widely used practically in all modern tokamaks. CXRS allows to measure such parameters as ion temperature, the speed of toroidal and poloidal plasma rotation, the concentration of light impurities (including helium ash) throughout the cross section of the plasma chord with high spatial resolution.

The report describes the status and level of development of the diagnostic system CXRS at the end of 2018. The report describes the state of the CXRS diagnostic system as a whole, as well as the results of development and testing of the most important components of this diagnostic system. The report presents the results of the development of systems for remote calibration of optical path transmission and precision calibration of calibration of spectroscopic equipment by wavelength.

The report also presents the results of thermomechanical tests inside the vacuum optical components, and the results of laboratory studies of the parameters of the optical elements included in the light collection system of the CXRS diagnostic system.

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