h-alpha and visible spectroscopy Iter diagnostics status [[1]](#footnote-1)\*)

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1Shestakov E.A., 2Alekseev A.G., 2Asadulin G.M., 2Vukolov D.K., 2Gorshkov A.V., 2Drapiko E.A., 2Kapustin Yu.M., 2Kachkin A.G., 2Orlovskiy I.I., 2Rogov A.V.

1Institution “Project center ITER”, Russian Federation, Moscow  
2Non-profit organization International fusion projects Coordinating center “Fusion Centre”,  
 Russian Federation, Moscow

One of the systems supplied by the Russian Federation as an in-kind contribution to support the international ITER project is the H-Alpha and visible spectroscopy (H-Alpha) diagnostic system.

The physical start-up of the ITER reactor is scheduled for 2025. Currently, the ITER project is in the phase of actively equipping the vacuum chamber with components, laying communications, placing captive elements of various diagnostic and service systems.

According to the latest version of the ITER Research Plan (24QSG6), the tokamak will be brought to the design mode with a deuterium-tritium mixture through several stages: First plasma (FP), Pre-Fusion Operation (PFPO), Fusion Power Operation (FPO). At the same time, according to the System Requirements Document (28B39L), H-Alpha is necessary for work already at the first stage of FP.

H-Alpha is one of the main diagnostic systems of ITER, which allows one to measure the following plasma parameters: influx of impurities (berillium, carbon, tungsten, oxygen, copper, neon, argon, krypton) into the plasma, intensity of edge localized modes (ELM), transition to a mode with improved confinement (L-H transition) , the content of deuterium and tritium in the edge region, the supply of deuterium and tritium from the wall, etc.

Plasma parameters measured by H-Alpha are needed not only for research purposes, but also many of them are used in feedback circuits to control the plasma column and protect the machine. That is why the H-Alpha should be equipped at the tokamak by the time of the physical launch to the FP stage.

Given the fact that many systems for the first plasma will be still at the development stage, at the moment their design and integration with other systems, including first-plasma ones, has not yet been approved. Therefore, in order to determine the specific requirements for the H-Alpha for the first plasma, including taking into account the uncertainty of integration and the limited requirements for the measured parameters for the first plasma, a memorandum was issued (462ENA).

This report presents the current progress in the development of diagnostics of H-Alpha, including taking into account the ITER requirements for the system parameters for the first plasma, prescribed in the memorandum. The main components of the H-Alpha are considered: in-vessel components, control system, ex-vessel components. The schedule of work on diagnostics is also presented.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVIII/E/ru/IM-Shestakov.docx) [↑](#footnote-ref-1)