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# FIBER-OPTICS CURRENT SENSOR CONCEPTION FOR THE T-15MD TOKAMAK *)

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Tokamak T-15MD is an experimental Russian fusion facility [1], one's important element is the study of the MA plasma currents behavior in long pulses. Nowadays, there are no operating tokamaks in Russia with a plasma current $I_{pl} \geq 1$ MA and a current plateau duration $t_{plateau} \geq 1$ s.

The main instruments for plasma current measurements in tokamaks are Rogovskii coils and Hall sensors. However, the interpretation of their results is often complicated by taking into account inductive effects (for the Rogowski coil) or the locality of the magnetic field measurement (for the Hall sensor).

A fiber-optic current sensor (FOCS) is been considered for the T-15MD tokamak as a Rogovskii coil duplicate diagnostic. The one's operating principle is based on measuring the state of polarization (SOP) rotation of laser wave in a magnetic field (magneto-optical Faraday effect). The advantage of this method is the linear dependence of the SOP rotation angle on the magnetic field. By creating a closed loop of optical fiber around the measured current, the angle of rotation depends only on the currents passing through this loop and eliminates the influence of installation stray fields. Such a diagnostic is actively used and demonstrate high accuracy and reliability on such global machines as JET [2] and EAST [3] and is planned for operation in the ITER tokamak.

For the T-15MD tokamak proposes a new scheme (Fig. 1) for measuring the plane of polarization rotation angle, which creates a change in the laser light oscillations phase. It is proposed to measure the phase shift at an intermediate frequency relative to the generator using a phasemeter successfully used in the T-15MD tokamak microwave interferometer [4]. This approach will able real time plasma current measurements in the MA range in long pulses. The diagnostic parameters are considered - the accuracy of the measurements and the dynamic range in various plasma scenarios are assessed.

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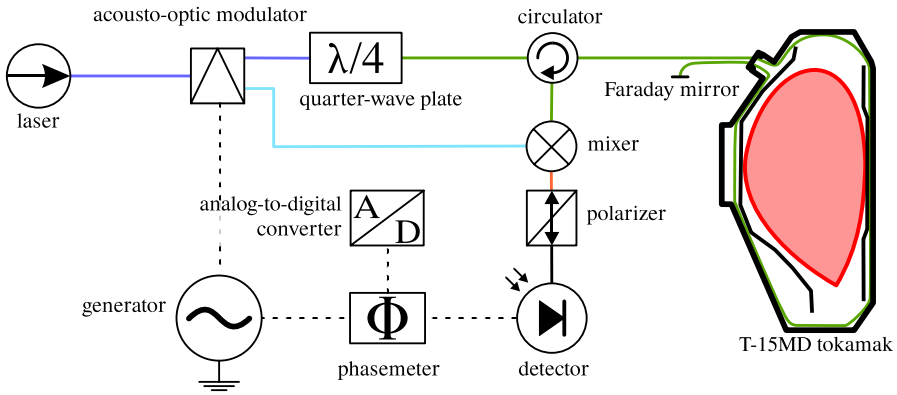
*Fig. 1. Conceptual design FOCS for T-15MD tokamak*

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*) abstracts of this report in Russian