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2.45 High magnetic field test of the ITER outer vessel steady-state magnetic field Hall sensors at ITER relevant temperatures

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The outer vessel steady-state magnetic field sensors constitute a part of the ITER magnetic diagnostics. The sensor set consists of a poloidal array of 60 sensors placed on the vacuum vessel outer skin and distributed toroidally in three vacuum vessel sectors. Each sensor unit features a pair of metallic Hall sensors with a sensing layer made of bismuth measuring tangential and normal components of the magnetic field. Before the installation on ITER, the sensors will be calibrated in the magnetic field of a few mT, whereas the magnetic field to be measured by the sensors in ITER is up to a few T. A characteristic feature of the bismuth Hall sensors, found in earlier experiments, is the Hall coefficient exponential dependence on temperature and Gaussian dependence on the magnetic field. In the new experiment, the sensors were tested at magnetic field ranging from -12 T to +12 T and ITER relevant temperatures from room temperature to 130 °C, and the two-dimensional non-linear bismuth Hall coefficient function of temperature and magnetic field was found. These results allow constructing a model for the correct interpretation of the sensor calibration.

Primary author(s) : ENTLER, Slavomir (Institute of Plasma Physics of the CAS)

Co-author(s) : SEBEK, Josef (JLMS Institute of Physics of the CAS); DURAN, Ivan (Institute of Plasma Physics of the CAS); KOCAN, Martin (ITER Organization); VAYAKIS, George (ITER Organization)

Presenter(s) : ENTLER, Slavomir (Institute of Plasma Physics of the CAS); SEBEK, Josef (JLMS Institute of Physics of the CAS); DURAN, Ivan (Institute of Plasma Physics of the CAS); KOCAN, Martin (ITER Organization); VAYAKIS, George (ITER Organization)

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