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Recent improvement of the design of the ITER steady-state magnetic sensors

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The outer vessel steady-state sensors (OVSS), a subsystem of the ITER magnetic diagnostics, will contribute to the measurement of the plasma current, plasma-wall clearance, and local perturbations of the magnetic flux surfaces near the wall. The diagnostic consists of a poloidal array of sixty sensors welded to the vacuum vessel outer surface. Each OVSS contains a pair of bismuth Hall sensors with the measurement axes parallel and normal to the vacuum vessel surface. The OVSS measurement accuracy relies on a precise temperature measurement at the Hall sensors location. This measurement is performed by an on-board thermocouple inserted between the two Hall sensors. The paper describes the recent improvement of the OVSS design to achieve high precision (within 0.1 ℃) measurement of the Hall sensor temperature. An explosion-bonded copper plate has been incorporated in the sensor housing to ensure temperature homogeneity between the Hall sensor and the thermocouple. An indium capsule with the volume of about 0.5 cm3 has been introduced around the thermocouple to allow for in-situ recalibration of the thermocouple during each ITER baking cycle. The design modification has been validated both in thermal simulations and in experiment.

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Eligible for student paper award?

Yes

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