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# Radiation-Hardened Hall Sensors: From ITER Deployment to DEMO Readiness

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Hall sensors based on antimony-sensitive layers are being deployed on ITER within the Outer Vessel Steady-State magnetic field Sensors (OVSS) system and are also considered for the future European DEMOnstration fusion power reactor (EU-DEMO). Their primary role is to support the determination of key tokamak plasma parameters such as plasma position, shape, and plasma current. Ensuring long-term stability and robustness under high radiation loads—expected to be significantly higher on EU-DEMO—is a critical design challenge. This contribution presents a new generation of antimony-based Hall sensors housed in alumina substrates metallized using Thick Printed Copper (TPC) technology. The integration of TiW diffusion barriers has proven effective in suppressing copper contamination of the antimony layer, significantly improving high-temperature stability. A summary of sensor design, parameters, and laboratory testing results will be provided.

In addition, we present the design and initial results of a high-fluence neutron irradiation experiment carried out at the LVR-15 (10 MW) research fission reactor. Eight Hall sensors with varying design features are being exposed in the reactor core, targeting radiation damage levels up to 0.5 dpa. Unlike earlier non-instrumented tests, this experiment allows real-time monitoring of sensor sensitivity, input/output resistance, and temperature during irradiation. The experimental setup required the development of a compact magnetic field source (several tens of mT) operational within the reactor's active zone, as well as robust control and safety systems adapted to strong radiation heating and space constraints.

Initial data from the first irradiation cycle—ongoing at the time of the conference—will be presented alongside key technological challenges and lessons learned from the experiment design and execution.

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