DESIGN OF A SUB-HARMONIC ARC DETECTOR FOR ITER

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Arc detection systems are developed for ICRH on ITER to prevent arcs from damaging the ICRF components. One of the detectors, the Sub-Harmonic Arc Detector (SHAD) is based on the detection of the frequencies emitted in the MHz range by arcs [1], and is, thus, resilient to fast load changes. A prototype has been in operation on ASDEX-Upgrade for ten years and has demonstrated its capability to detect arcs. However, to reach the safety level required by ITER, the design has to be modified to eliminate the spurious detections triggered by plasma emission in the MHz range (vacuum vessel arcs, ion cyclotron emission) and to enhance the sensitivity to low-voltage arcs. These improvements, which must preserve the simplicity of the system to guarantee its reliability, are based on the experience of RF arcs in resonant structures acquired on ASDEX-Upgrade and on dedicated test-benches. We present the main features of arcs in time and frequency domains and their impact on the behavior of the SHAD system. Several technological solutions are based on these data and have to support the harsh environment of a burning plasma experiment. The shielding, the location of the detector, the efficiency can be affected by the nuclear radiations. These elements are integrated in the design to make from the SHAD detector a primary safety system for ICRF heating.

[1] A F. Braun et al., An ARC Detection System for ICRF heating, 19th Symposium On Fusion Technology, Lisbon, 1996, p.601-603