



Contribution ID: 602

Type: **not specified**

## P2.029 Review of the JET ILA Scattering-Matrix Arc Detection System

*Tuesday, 18 September 2018 11:00 (2 hours)*

Arc detection is an essential protection system for high power RF systems. It is commonly realised by monitoring the Voltage Standing Wave Ratio (VSWR) in the transmission lines. The JET ILA is a load tolerant ICRF antenna composed of 8 short straps grouped in 4 Resonant Double Loops (RDLs). In this type of antenna, there is a low impedance section in which the standard VSWR protection is ineffective.

The Scattering-Matrix Arc Detection (SMAD) was proposed and installed on JET [1] to protect the low impedance section around the T-junction against arcing. It is based on a consistency check of the RF signals around this section using a table of correlation coefficients obtained from RF modelling.

This contribution reviews the SMAD protection system and its recent improvements, the conditions in which it is essential to protect the antenna during operation, the commissioning of the system and its sensitivity to the input signal levels and accuracy.

The SMAD error remains small in the full ILA operation frequency range (28-51MHz) during operation on L-mode and H-mode plasmas, showing that both the RF model of the antenna circuit and the measurements are sufficiently accurate for protection purposes. Moreover, due to its insensitivity to the RF coupling properties and the fast (2 $\mu$ s) FPGA error calculation, the SMAD is suitable for detecting arcs during the ELM cycles.

The time delay to issue a SMAD trip is typically set to 6-8 $\mu$ s (3-4 FPGA cycles), which is confirmed by scope measurements and fast data signals analysis. The time delay between the trip signal and the effective removal of the power in the generator output transmission line is measured to be about 25 $\mu$ s, which is within the general protection specifications of the ICRH system in JET.

[1] M. Vrancken et al., Fus. Eng. Des. 84 (2009) 1953-1960.

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**Session Classification:** P2