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TOWARDS A LONG PULSE ECRH SYSTEM FOR WEST

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The objective of WEST experiments is to master long-pulse operation (1000 s) while exposing actively cooled ITER-like tungsten divertor to power fluxes up to 10 MW/m2. To increase the margins to reach H-Mode regime and to control W-impurities in the plasma core, the WEST ECRH system is under major upgrade with the objective to reach the capabilities of injecting 3 MW during up to 1000 s at a frequency of 105 GHz.
The former ECRH system in Tore Supra was designed for shorter pulse duration and lower power per gyrotron (~210 s and 500 kW per gyrotron). Transmission lines, DC breaks, bellows, waveguides, antenna, and diagnostics were not qualified for this new level of power and duration (1 MW per line with 1000 s duration).
To match these new requirements for WEST, the system has been re-designed and will be equipped with:
• A new antenna actively water-cooled (30 bar, 70℃) with a temperature monitoring of the mirrors;
• Transmission line components with dedicated cooling system with also a temperature monitoring;
• A few dedicated water cooling loops for gyrotrons (6 bar, 25℃) and the transmission lines (5 bar, 25 ℃).

Diagnostics already designed for the previous system will be also used, like:
• Embedded thermocouples in the gyrotrons to protect the electron beam collector;
• RF measurement for the spectral quality at the output of the gyrotrons and a power detection of mode loss during the pulse;
• Arcs monitoring in the transmission lines.

All these diagnostics will be used in a fast safety system able to stop the RF pulse within few µs in case of issues of overheating or overpressure in the gyrotrons, transmission lines and antenna.
The paper will provide an overview of the major revisions and upgrades of the ECRH system for WEST long pulse operation in the W environment.

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