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Lower Hybrid current drive long pulse operation state of the art on WEST

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Abstract:

The objective of WEST experiments is to master long-pulse operation (1000 s) while exposing the actively cooled ITER-grade tungsten divertor to power fluxes up to 10 MW/m2. The reliability and performance of the Lower Hybrid Current Drive (LHCD) system are critical for the success of long pulse operation on WEST as it allows to drive significant non-inductive current in the plasma and reduce the magnetic flux consumption in the central solenoid [1].
The two LHCD launchers, each one powered by eight klystrons capable of delivering 600 kW during 1000 s each, can provide a total of 7 MW of power to the plasma at a frequency of 3.7 GHz. The complete system is actively cooled and each part has been qualified to support power for 1000 s. Safe plasma operation is ensured by simultaneously monitoring the infrared signals on the launcher and copper impurity density. These signals are feedback controlled in real time with the LHCD power to protect the LH launchers against excessive heat.
The LHCD system has been routinely used on WEST since 2018 with achieved performances ranging from 5.8 MW for 5 s and 3-4 MW for 364 s [2]. Continuous efforts have been made to update the tools required to maintain high level of reliability of such a complex system. In particular, a local acquisition system has been developed to operate and test all klystrons individually on water load during shutdown periods. This acquisition system is being improved further to monitor in real-time the safety-relevant parameters of the 16 klystrons.
In this contribution, we present an overview of the current status of the LHCD system on WEST, as well as the recent upgrades developed and implemented to overcome the limitations and the issues encountered on the system when both power level and pulses duration are increased.

[1] R. Nouailletas et al., this conference.
[2] T. Fonghetti et al., this conference

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