Upgrade and validation on plasma of the Tore Supra CW LHCD generator

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A one year-long major upgrade of the 3.7 GHz LHCD generator for the Tore Supra tokamak has been performed. It consisted in installing a first series of eight Thales Electron Devices (TED) 700 kW CW klystrons, new CW components and auxiliaries, and in modifying the transmitter control and protection software. Modifications and calibration of the sensors and the RF subsystems were completed as well.

A period of five months (May-September 2010) with the 700 kW CW klystrons connected to matched load was sufficient to commission the eight klystrons up to the nominal output power. The operation parameters were optimized with the major constraint that the same High Voltage Power Supply (HVPS) is shared by four klystrons.

The new klystrons were then connected to the Full Active Multijunction (FAM) antenna and entered into operation on plasma in October 2010. During plasma operation, the validation of the new software and the stability of the klystrons where carefully analysed. After eight days of operation, 3.5MW/40s were successfully launched from the RF generator to the FAM antenna with good stability and reproducibility.

The next steps of the upgrade will be to increase the power of the klystrons to reach the limits of the transmitter powering the FAM antenna, and, at the end of 2011, to connect the second series of eight new klystrons to the new Passive Active Multijunction (PAM) antenna in order to have a full CW LHCD generator available on Tore Supra in 2012.