

## Retro-reflected channels of the Tore Supra FIR interfero-polarimeter for long pulse plasma operation

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On Tore Supra, five far infrared (FIR) retro-reflected channels have been installed to double the existing crossing ones, in order to increase the spatial resolution of the electron and current density measured by the interfero-polarimeter diagnostic. The electron density is evaluated by a two colour (119 mm and 195mm) interferometric technique, thus the two wavelengths are superposed when crossing the plasma. The current is evaluated by a two detector polarimetric technique based on amplitude and phase measures of the 195 mm beam, which needs a calibration set up.

The new channel geometries are similar to those of the intended ITER polarimeter and have been designed for long pulse plasma operation. Inside the tokamak, the beams are reflected on edge cooled copper alloy corner cube mirrors (CC), designed to endure the plasma radiations. During the 2003-2004 TS campaign, a CC prototype and reference plan mirrors had been exposed to plasma. Their surface appearances show zones of erosion and others of deposition. Quantitative SIMS deposit analysis estimate the thickness of the carbon up to 700 nm at the centre of the CC. FIR measurements confirmed that the surface changes were too small to modify the reflectivity of the mirrors .

The transport of the FIR beams is done by plan and spherical mirrors that are fixed in dried air boxes made of an aluminium frame and honey comb slabs.

Minimizing the crosstalk produced by the incoming beams and reducing the plasma refraction misalignment effects are key issues for polarimetry. So, ray tracings through plasma and mirrors have been done to rightly design and position the windows, the detectors and the separation grids.

First results of both interferometric and polarimetric reflected channel signals show a good consistency with the crossing ones and allow resolving more accurately the profiles.