Contribution ID: **237**   Type: **not specified**

Combining research with safety: the Wendelstein 7-X video diagnostic system

Tuesday, 18 September 2018 16:00 (20 minutes)

A ten-channel overview video diagnostic system was installed and commissioned at Wendelstein 7-X (W7-X) optimised stellarator. The cameras serve both for surveillance of the first wall (ensuring safe device operation) and allow for physics studies. The wide range of applications is ensured by a highly flexible data acquisition and on-board data processing. Combination with magnetic field line simulations even allow to reveal 3D structures which are relevant to the development of island divertor scenarios on W7-X.

In the second operation phase of W7-X, OP1.2a, eight channels were equipped with EDICAMs, 1.3 Mpixel intelligent CMOS cameras and two Photron (SA5 and SX-2) 1.0 Mpixel fast CMOS cameras, observing the visible radiation emitted by the plasma. The fast cameras can be equipped with interference filters as well; most of the measurements were done using a C-III filter.

The supervision of the complete torus interior (typically at 100 Hz) is provided by the EDICAMs, featuring non-destructive region-of-interest (ROI) readout capability; this feature allows the monitoring of smaller areas in parallel to the full frame overview at much higher rates (up to 10 kHz). The small ROIs can be used, among others, to study hot-spot evolution (e.g. strike lines on the divertor). Video data taken by the EDICAMs is streamed through a powerful FPGA board, suitable for real-time image processing. The user can define events, such as light intensity thresholds to provide automatically provide trigger signals for the plasma control system or other diagnostics, including the EDICAM system itself.

Extremely fast phenomena in the 10 microsecond timescale are observed with Photron cameras, revealing 3D the rotation of filamentary structures. These capabilities make the cameras a diagnostics for 3D SOL transport providing new insights in the turbulence of the SOL plasma.

Co-author: SZEPESI, Tamas (Plasma Physics Wigner RCP)

Presenter: SZEPESI, Tamas (Plasma Physics Wigner RCP)

Session Classification: O2.B