Plasma radiation dynamics with the upgraded AXUV tomographical system in the TCV tokamak

B. Tal\textsuperscript{1}, R. Chavan\textsuperscript{2}, B. Duval\textsuperscript{2}, B. Labit\textsuperscript{2}, D. Nagy\textsuperscript{1}, G. Veres\textsuperscript{1} and the TCV Team\textsuperscript{2}

\textsuperscript{1}Wigner Research Centre for Physics, Association EURATOM - HAS, H-1525 Budapest, Hungary

\textsuperscript{2}Ecole Polytechnique Fédérale de Lausanne (EPFL), Centre de Recherches en Physique des Plasmas, CH-1015 Lausanne, Switzerland

The spectral sensitivity of the Absolute eXtreme UltraViolet photodiodes spreads from the visible through the XUV to the soft X-ray range. Their fast (\(\mu s\)) time response is often exploited in spatio-temporal radiation emission estimations across fast transients, although the absolute accuracy of these measurements can be poor due to the non-flat spectral response of the detectors.

We introduce here an upgraded version of a tomographical system\textsuperscript{[1]}, which is built employing 200 of this type of detector and is installed on the TCV tokamak. The major recent upgrade involved the installation of protective shutters against particle deposition during boronization and inter-shot cleaning glow discharges. Some additional modifications were performed to correct initial design errors and decrease UV exposure to the detectors. The data evaluation technique was also enhanced by implementing, and improving the anisotrop smoothing model\textsuperscript{[2]}.

The short-term sensitivity degradation of the detectors, caused by the plasma radiation, was monitored with a unique twin camera structure. The aging effect is found to be extremely severe on TCV, the decrease in detector response is exceeding 40 percent for some chords after only 60 discharges of long UV exposure. Only by assuming the most deleterious spectral range (approximately 10 eV) and the photocurrents of the \(\mu A\) order-of-magnitude this is consistent with the theoretical aging curve. Inspite of these problems, the results provided by the system are consistent with the measurements obtained with the standard foil bolometers. Several examples of the application of this system will be presented that exploit the high temporal resolution, that have revealed new physical insights of fast transient radiation phenomena, such as disruptions.

References
