Contribution ID: **93** Type: **Contribute Oral**

Determining Absolute VUV Fluxes for Assessing the Relevance of Photon-Surface Interaction in Ion Sources

Friday, 22 September 2023 10:10 (20 minutes)

The ion source discharge influences the plasma-facing surfaces by impinging fluxes of ions, radicals and photons. This plasma surface interaction is particularly important for, but not limited to, caesiated ion sources for negative hydrogen ions due to its influence on the surface work function and possible photo-emission of electrons into the plasma sheath. While the role of ions and radicals is widely accepted in the course of plasma surface interaction and quantitative measurements have been performed throughout the literature, VUV photons (< 200 nm) are often disregarded. The reason is mostly the complicated setup to measure such fluxes absolutely and energy-resolved. However, they impact the surface with at least 6.2 eV and several studies have already confirmed that comparable fluxes to the ion fluxes can easily occur [Barton2000, Fantz2016].
To overcome the drawback of complex VUV-spectroscopic systems including their calibration, several alternative solutions have been applied in the past, where a VUV-sensitive photo diode with optical filters was already employed in the ion source community [Komppula2015]. This contribution takes up the basic concept and enhances it by direct in-house absolute calibration of the system down to 46 nm against a VUV spectrometer [Fröhler-Bachus2021]. The system is calibrated for energy-resolved absolute VUV flux measurements up to photon energies of 27 eV in a variety of gases and gas mixtures, including Ar, H2, O2 and N2 [Friedl2023].
Demonstration of the system is presented at the ion source of the BATMAN Upgrade facility. The system was used to measure the VUV fluxes of the hydrogen plasma in the driver region as well as in the region close to the extraction surface. Using solid angle calculations and a ray tracing code, the total energy-resolved flux onto the plasma grid was determined. Comparable fluxes to the impinging ion flux could be shown, and the major contribution to this flux originates from the driver plasma.

Funding Agency

German Research Foundation (DFG): FR 3881/1-1.

Email Address

I have read the Code of Conduct to attend ICIS2023.

Yes

Presenter if not the submitter of this abstract

Primary author: FRIEDL, Roland (AG Experimentelle Plasmaphysik (EPP), University of Augsburg)

Co-authors: FRÖHLER-BACHUS, Caecilia (AG Experimentelle Plasmaphysik (EPP), University of Augsburg); FANTZ, Ursel (Max-Planck-Institut für Plasmaphysik (IPP))

Presenter: FRIEDL, Roland (AG Experimentelle Plasmaphysik (EPP), University of Augsburg)