

ASDEX Upgrade SPI: design, status and plans

ASDEX Upgrade (AUG) is installing a Shattered Pellet Injector (SPI), expecting start of operation in the 2021 campaign. The primary goal of the project is to study the impact of different SPI shard size distributions [1] – realized by different shatter angles – on the disruption mitigation characteristics of SPI. The project will also aid the understanding of pellet shard penetration and material assimilation. The injector will consist of 3 independently operated barrels, with each barrel feeding into a separate shatter tube with different shatter angles (currently planning 0° , 5° and 20°). The 0° tube is to be utilized for the experimental validation of pellet ablation and runaway electron seed generation models. The pellet guide tubes will be installed through an existing flange, about 375 mm above midplane. MHD simulations of deuterium injection using the JOREK code [2] have been applied to assess the impact of pellet and injection parameters on disruption dynamics.

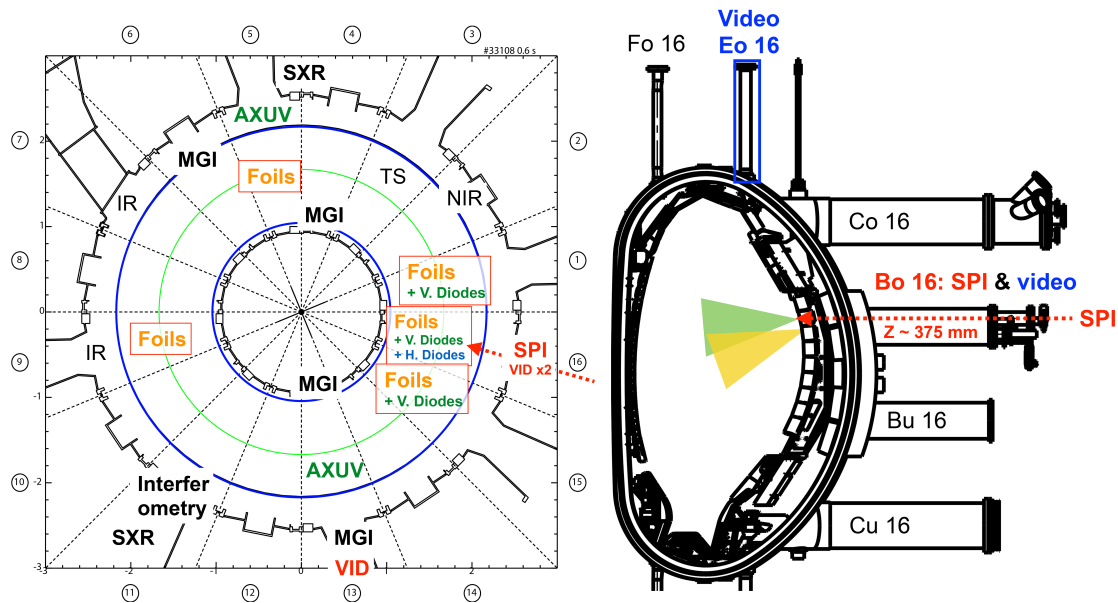


Figure 1: (left) AUG top-down view, with the locations of SPI and relevant diagnostics. (right) AUG sector 16 poloidal cross-section with the planned SPI location.

The installation is accompanied by significant diagnostic extensions (see figure 1). Three visible camera views (equipped with filter wheels) installed in sectors 13 and 16 (x2) will provide a 3-axis observation of the SPI pellet cloud. The existing bolometer capabilities (set up for massive gas injection [3] in sectors 4, 6 and 13) will be expanded with 5 new 4-channel foil bolometers and 4 AXUV diode cameras (see figure 1 for locations), a total of 144 channels. These, combined with the existing systems will provide excellent spatial coverage for measuring the distribution of heat loads.

In this contribution we will discuss the status of design and present experimental plans to inform the disruption community and to gather feedback for possible improvements.

References

- [1] T. E. Gebhart et al., IEEE Transactions on Plasma Science (2019)
- [2] M. Hoelzl et al., PoP 27, 022510 (2020)
- [3] G. Pautasso et al., NF 55 033015 (2015)

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