



## RF discharge technology for remote optics cleaning in harsh environments

*The University of Basel and F4E have developed an original methodology dedicated to the control and monitoring of the cleaning process of metallic optics exposed to polluted environments (like the dusty ITER plasma discharges). This methodology may be applied to effectively and remotely clean optics used in demanding environments where manual cleaning is impossible, thanks to RF plasma discharges.*

### The Technology

The ITER operation requires the fusion device and the plasma to be accurately monitored. Optical diagnostics systems are used in ITER, and the optics located inside the plasma chamber experience quite severe dust pollution and need to be regularly cleaned. Periodic cleaning plasma discharges will be performed to do so. The University of Basel has developed a methodology to perform the most effective and homogeneous cleaning, depending on the optics geometry, and to accurately determine an End-of-Cleaning Indicator (ECI).

### A systematic methodology to ensure a consistent level of cleanliness

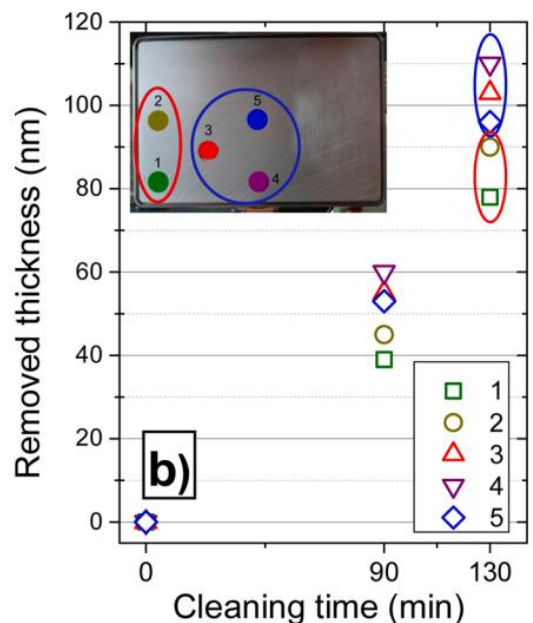
The research team investigated the relationship between the cleaning time, the optics geometry, the RF power and the type of coating. This led to the determination of the best parameters for a given optic. In addition, optical emission spectroscopy was used to determine the optics cleanliness, enabling a remote determination of the mirrors state.

### Extending the lifetime of optics operating in dirty conditions becomes possible

The University of Basel research team has obtained a valuable knowledge in the field of cleaning plasma discharges applied to metallic optics. The team is now able to clean different types optics (shape, size, curved) and to monitor it in real time to stop the process at the right time, saving energy. This knowledge may be used in several applications in which optics need to be regularly cleaned, like in the space propulsion sector, industrial plasma processes, furnace, electronics and biomedical fields.

### Collaboration opportunities

The know-how is available for technical adaptation for new applications.



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