

PiAI Seminar Series: Physics informed AI in Plasma Science
10:00-11:00, 8 April 2024 (CEST)
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Web Seminar

**Image Reconstruction of Lensless Microwave Cameras
Using Machine Learning**

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Abstract

Plasma imaging is crucial for a fusion plasma study. Sub-microwave and microwave diagnostic techniques, such as reflectometry, offer the advantage of straightforward measured point identification. However, they suffer from low spatial resolution due to their long wavelength. To address this limitation, we propose a lens-less microwave imaging approach.

In our imaging method, microwaves are injected into the object, and the reflected waves are directly received by an antenna array. Since there is no focus, reconstructing an object image is necessary. In general, this task is challenging due to the ill-conditioned nature of the inverse problem caused by the low resolution of the detector. However, leveraging machine learning for object image reconstruction holds promise for obtaining various sizes of plasma spatial structures. Moreover, this method is easy to setup because there is no need to build an optical system.

In this talk, I will introduce the concept of lensless microwave cameras and our approach to image reconstruction. Additionally, I will present several examples of image reconstructions conducted using our proposed method.