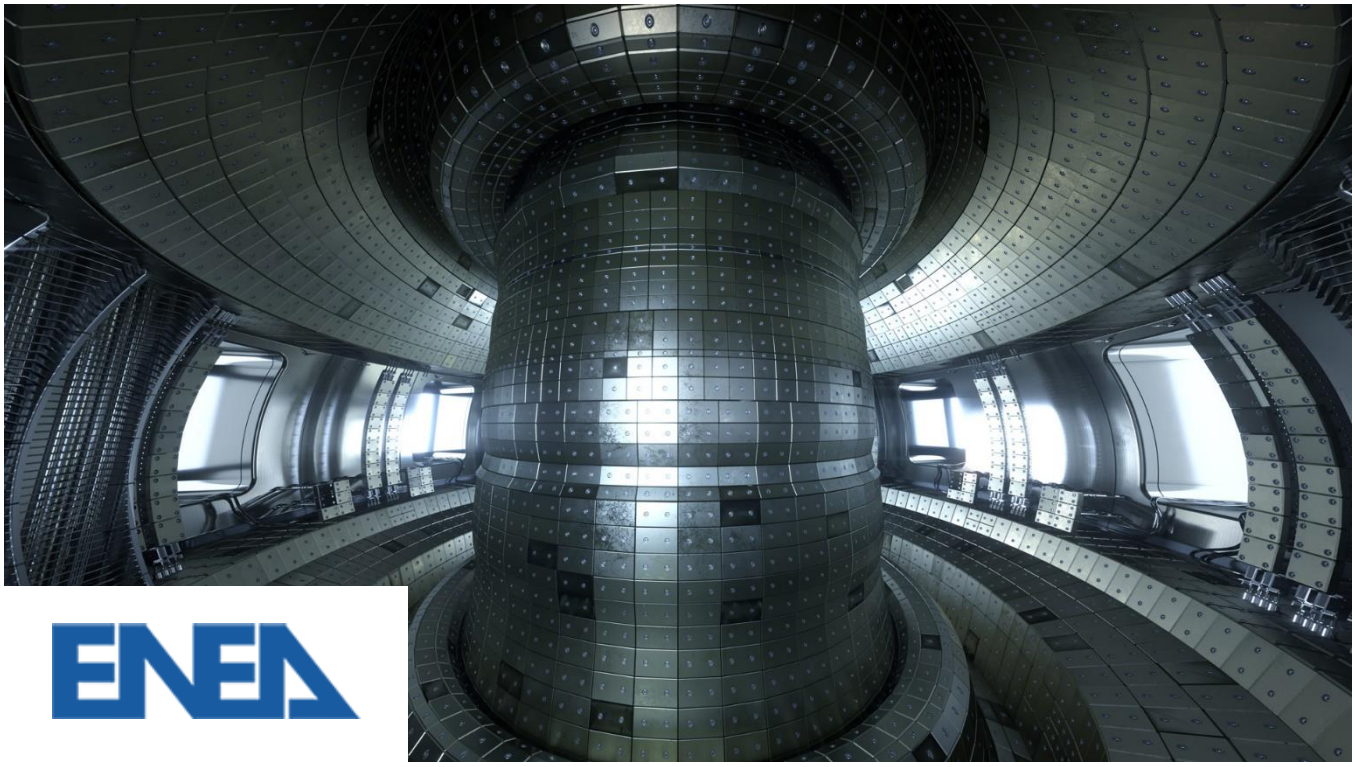
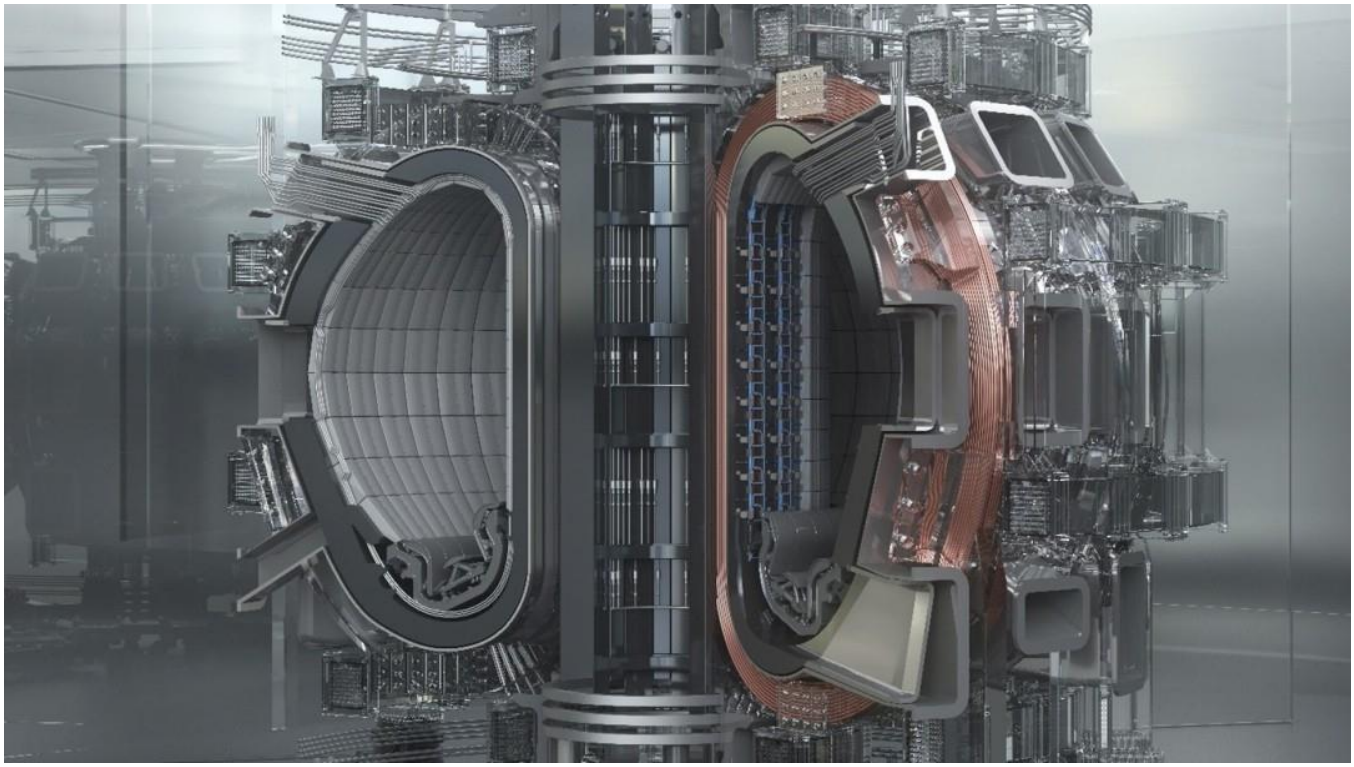


Microstructural characterization of materials and components for fusion reactor development using Neutron diffraction, Neutron Small-angle scattering and Neutron Imaging

The Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) is a public Institution aimed at research, technological innovation, and the provision of advanced services to enterprises, public administration and citizens in the following main sectors: energy (renewable sources, fission, fusion), environment and sustainable economic development. More specifically, ENEA is the Italian leading actor and coordinator of research on thermo-nuclear, controlled fusion reactors, interfacing with the Euratom Fusion Program, the JET and the ITER Project.

Materials for plasma-facing components (the first wall of the tokamak and the divertor, designed to contain plasma instabilities) are the most critical ones, since they will be directly exposed to the 14 MeV radiation damage and to intense thermo-mechanical loads originated by the pulsed operation mode of the tokamak. Innovative ferritic steels are being developed for the first wall, while high heat flux materials, such as tungsten (W), are needed for the divertor.



ANAXAM is assisting ENEA in the non-destructive, micro-structural characterization of such materials by means of neutron techniques, such as Small-angle Neutrons Scattering, Neutron Diffraction and Neutron Imaging. These techniques enable ENEA to characterize defects and microstructural changes induced by neutron irradiation inside the fusion reactor in variety of materials, e.g., micro-voids in high-purity W, stress distribution of W tiles joint to cupper/chromium/zirconium (CuCrZr) and crystallographic phases, defects, and residual stresses in Eurofer97 samples.

For this customer project, ANAXAM used the SANS-1 and POLDI beamlines at the Paul Scherrer Institute.

> **“The collaboration with ANAXAM enables ENEA to utilize neutron techniques for non-destructive characterization of fusion materials and components, including also irradiated samples.”**
>
> Ing. Paolo Del Prete,
> Head of Technical and Administrative Support Unit,
> Fusion and Techonolgies for Nuclear Safety Department,
> — *ENEA-Frascati*

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