Contribution ID: **69** Type: **Contributed Poster**

Electromagnetic and heat loads on tokamak walls as a consequence of disruption

Tuesday 3 September 2024 13:55 (1 hour)

The structural integrity of the Vacuum Vessel (VV) of Pakistan's Metallic Tokamak-I (MT-I), a small spherical tokamak, was tested by simulating a 10 ms input current event on a 180° sector model. During this event, the energy from the plasma is entirely transferred to the VV's first wall. This study is based on the law of conservation of energy, demonstrating that the extent of damage is inversely proportional to the surface area over which the energy is deposited. Simulations are performed using ANSYS to assess the structural response of the MT-1 tokamak VV under different plasma disruption scenarios. Radiation-induced energy deposition lead to uniform heat flux with minimal temperature rise (<3℃) and negligible stress increases. Vertical disruptions induce powerful heat loads, but stresses remain within the elastic limit of stainless steel, though repeated events could lead to fatigue. Horizontal disruptions cause significant localized heating and deformation, posing a risk of irreversible damage. Overall, the VV demonstrates resilience to single-event disruptions, but cumulative effects necessitate further fatigue analysis and enhanced protective measures.

Speaker's title

Ms

Speaker's email address

saira.gulfam@yahoo.com

Speaker's Affiliation

Pakistan Tokamak Plasma Research Institute, Islamabad

Member State or IGO

Pakistan

Primary author: Ms GULFAM, Saira (Pakistan Tokamak Plasma Research Institute)

Co-authors: Mr YAQOOB, Asad (Pakistan Tokamak Plasma Research Institute); Mr AHMAD, Kamran (Pakistan Tokamak Plasma Research Institute); Dr AHMAD, Zahoor (Pakistan Tokamak Plasma Research Institute)

Presenter: Ms GULFAM, Saira (Pakistan Tokamak Plasma Research Institute)

Session Classification: Posters

Track Classification: Consequences