Contribution ID: **178** Type: **Poster Presentation of 1h45m**

Optimization of the ITER Pre-Compression Ring Test Rig Flange

Wednesday 30 August 2017 13:15 (1h 45m)

The Pre Compression Ring (PCR) is an important element of the ITER magnetic system since it improves the force distribution among the Toroidal Field magnets during plasma operation. An experimental campaign has been planned at Iter Organization (IO) to characterize the mechanical behaviour of the ring in a test rig able to simulate the ITER assembly conditions. In particular the testing machine aims at simulating the effect of the preload by means of a system of hydraulic cylinders capable to deliver 36K ton of radial pushing force. A steel "cushion"flange acts as interface between the cylinders and the ring distributing the pressure on the surface and preventing the PCR from local breakage. In this paper the shape optimization of such flange is addressed, identifying the optimal geometry basing on the contact stress on the inner surface of the PCR. The study shows how the stress peaks can be avoided obtaining a reasonably homogeneous distribution limiting the risks of peak stresses that might compromise the integrity of the component. The results of this study can also be used as a basis of future studies aiming at optimizing the Iter flange design and the behaviour of the PCR in operative conditions.

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Session Classification: Wed-Af-Po3.02

Track Classification: B1 - Superconducting Magnets for Fusion