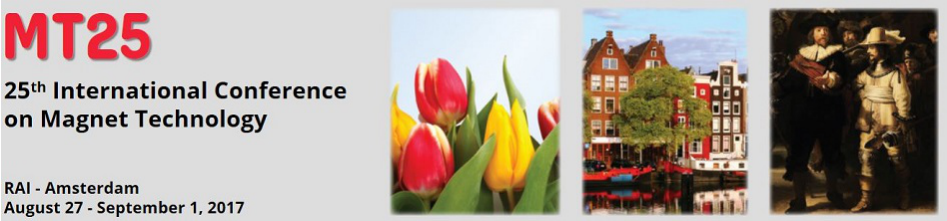

Contribution ID: **734** Type: **Poster Presentation of 1h45m**

Tail Component Qualification for the EU ITER PF Coils

Tuesday, 29 August 2017 13:15 (1h 45m)

The ITER Poloidal Field (PF) magnet system is composed of six circular coils, consisting of winding packs (WP) made up from a stack of Double Pancakes (DP) wound of NbTi cable-in-conduit superconductor. The largest coil has a diameter of 24 meters, the heaviest weighs 400 tons, and they are designed to produce a total magnetic energy of 4 Giga Joules at a maximum magnetic field of 6 Tesla for 30,000 inductively driven plasma pulses. The ends of the conductors (in the outer-most coil turns) of the top and bottom DPs are coil terminations which are connected to the superconducting bus bars of the feeders, being these conductor exits one of the structural weakest points of the coils. The main function of the tail is to reinforce this region by linking the outer-most termination to the last-but-one turn, thus guaranteeing the transfer of longitudinal tensile force, through an electrically insulated mechanical connection featuring a fiberglass strap. The PF Coils are subject to electromagnetic forces induced from their own magnetic field and the magnetic field generated from the rest of the ITER magnet system, the thermal stresses during cooldown and warmup cycles and DC/AC high voltage levels. Therefore, the tail components shall withstand these conditions while staying within the geometrical boundaries imposed by the conductor dimensions, in order to avoid any protrusion on the winding pack surface. This paper aims to describe the adopted solution throughout its lifecycle, from the design validation, by the electromagnetic and mechanical analyses, to the design qualification of the set of imposed requirements through the manufacture and testing of a set of full-size mock-ups.

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Session Classification: Tue-Af-Po2.09

Track Classification: G6 - Mechanical Behavior, Stress and Strain