

## The Pre-compression System of the Toroidal Field Coils in ITER

Juan Knaster(1), Marco Ferrari(2), Cees Jong(1), Thomas Vollmann(1)

1. ITER Garching Joint Work Site, Max-Planck-Institut für Plasmaphysik Boltzmannstrasse 2 D-85748 Garching Germany  
2. EFDA CSU-Garching Boltzmannstr. 2 D-85748 Garching bei München Germany

The Toroidal Field (TF) coils of ITER will undergo out-of-plane forces caused by the machine poloidal fields required to maintain the toroidal stability of the plasma. These forces will be supported against overturning moments by links between the coils. In turn, these links consist of the Inner Intercoil Structure (IIC), which are composed by 2 sets of 4 poloidal shear keys inserted in slots between adjacent coils placed at the top and bottom part of the inboard leg, and the Outer Intercoil Structure (OIS) formed by 4 bands of shear panels at the outboard leg. The magnetic forces during energization of ITER would cause at IIC locations a toroidal gap between adjacent TF coils of 0.35 mm; during plasma operation this value could reach >1 mm causing a loosening of the keys and intensifying stress concentrations. This undesired effect will be suppressed by the application of a centripetal force of 70 MN per coil (35 MN at both the bottom and top part of the inboard leg of each of the 18 TF coils) that will be provided by 2 sets of 3 fibre-glass epoxy composite rings submitted to a toroidal hoop force of 100 MN per set. The calculated maximum stress in the rings will occur during the installation phase at room temperature, where the maximum radial elongation (~25 mm) is required, and it will be less than 30% of its ultimate stress. The imposed elongation to reach that force and the lower Young modulus of the composite compared with the stainless steel one will ease component tolerances and/or settlement effects in the final assembly.