

### **Design of the RFX-mod2 first wall**

Mauro Dalla Palma, Giovanni Berton, Alessandra Canton, Roberto Cavazzana, Giulio Gambetta, Paolo Innocente, Simone Peruzzo, Marco Siragusa, Silvia Spagnolo, Monica Spolaore

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Abstract:

RFX-mod2 is the latest upgrade of the reversed field pinch machine operated at Consorzio RFX. A significant modification consists of replacing the first wall tiles, proposed as a key factor to improve the gas density with reduction of hydrogen retention. Polycrystalline graphite has been identified as tile material given its high thermal conductivity (up to about  $165 \text{ Wm}^{-1} \text{ K}^{-1}$ ), uniformity and small grain size (about  $20 \mu\text{m}$ ), and high mechanical strength (100 MPa compressive strength, 30 MPa tensile strength). With respect to RFX-mod, the mechanical resistant section of tiles has been increased coherently with the magnetic front-end modification that foresees the tiles supported by the existing MHD passive stabilising shell, so decreasing the maximum stress at 3.5 MPa calculated from finite element analysis that simulates the operating condition. This low stress level together with a measurement of the experimental loads during next RFX-mod2 operations could qualify the use of extruded graphite for a possible further first wall change in the future. Indeed, extruded graphite is considered attractive given its high directional thermal diffusivity (about 50 % better than polycrystalline graphite) to enhance the heat transmission and so improving the gas density control, and the low stress induced may allow use of this mechanically less performing graphite.