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## Design of the internal embedded joints for the EU DEMO TF coils

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Within the frame of the R&D activities carried out in Europe for the Toroidal Field (TF) Coils of the nuclear fusion device DEMO, different proposals have been given so far. All of them rely on superconducting (SC) Low Tc wires (Nb3Sn). The present paper deals with a Wind & React solution based on Cable-In-Conduit Conductors (CICCs). The TF coil is a graded layer one, with varying SC, Cu and SS quantities every 2 layers, thus permitting an optimized distribution of the materials and consequent cost savings. The whole Winding Pack (WP) is formed by 6 Double Layers (DLs), each wound over the previous one. This solution makes the internal joints connecting two different DLs a crucial topic for a sound performance of the coil. Basing on previous successful experiences, as for instance the EDIPO and the NAFASSY Nb3Sn coils, our team is designing a proposal for such intermediate joint so to possibly “embed” it in the WP. This is feasible only if the whole junction is kept within the same external dimension of the two joined conductors. A complete description of the joint design for each connected DL is given here, along with hints about the manufacturing of a SULTAN sample, foreseen to be tested in order to confirm the joint electrical performances, both in terms of ohmic resistance and AC losses under variable magnetic field and temperature.

### Submitters Country

ITALY

**Primary authors:** DI ZENOBIO, Aldo (ENEA); AFFINITO, luigi (ENEA); Dr ANEMONA, Alessandro (ICAS Scrl); Mr ARABI, Mohammed (ICAS Scrl); Mr CHIARELLI, Sandro (ENEA); CORATO, Valentina (ENEA)

**Co-authors:** Dr MUZZI, Luigi (ENEA); TURTU', Simonetta (ENEA/ICAS); Dr DELLA CORTE, Antonio (ENEA); Dr RIGHETTI, Riccardo (ICAS Scrl); Dr MORICI, Luigi (ENEA)

**Presenter:** DI ZENOBIO, Aldo (ENEA)

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