MT 26
International Conference on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: **1092** Type: **Poster Presentation**

Wed-Mo-Po3.10-02 [76]: Conductor Design of the Madmax 9 T Large Dipole Magnet

Wednesday 25 September 2019 09:30 (1h 45m)

Madmax (MAgnetized Disc and Mirror AXion) project is an experiment dedicated to the discovery of the axion particle, the mass of which is expected in the range of 100 μeV. A square-field integral value of 100 T^2m^2 with a ⊠ 5 % homogeneity over 2 meters along the axis is required. The conductor has been designed to minimize the global magnet cost while fulfilling the following constraints: the hot spot temperature must kept below 100 K, the voltage below 2 000 V, and mechanical Von Mises stress below 165 Mpa. This has led us to design the largest world dipole with a warm bore of 1.3 m and a central field of 9 T. Its overall total length is of 6 m, the total weight is of 200 tons, including 40 tons for the windings. We made the choice of NbTi technology. The engineer current density is of 50 A/mm^2 and the nominal current 25 kA. With such large dimensions and field, a pre-stressed coil is difficult to obtain. As a consequence, the large forces over the conductor blocks during current ramping will induce some displacement and thus heat losses by friction. So to guarantee the magnet stability during that phase, we made the choice of a wetted magnet: a superfluid helium channel will take place in the conductor stabiliser. Then, the stress must be carefully managed around this hole. At last, the protection aspects will be also reviewed.

Author: BERRIAUD, Christophe Paul (DAPNIA)

Co-authors: Dr ABDEL MAKSOUD , Walid (CEA / Irfu); Dr CALVELLI, Valerio (CEA); Dr DILASSER, Guillaume (CEA); JUSTER, Francois-Paul (CEA); NUNIO, Francois (CEA); RIFFLET, Jean-Michel; Prof. SCOLA, Loris (CEA)

Presenter: BERRIAUD, Christophe Paul (DAPNIA)

Session Classification: Wed-Mo-Po3.10 - Conductors for Large Scale Applications