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Mon-Af-Or5-04: Madmax: design of a very large-scale 9 T dipole for dark matter experiment

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The MADMAX (Magnetized Disc and Mirror AXion) project is a dark matter experiment that aims at finding axion particles with masses in the range of 100 μeV . In order to achieve this goal, the chosen approach is to use a detector comprised of many magnetized dielectric discs put in parallel in front of a mirror. The relevant level of magnetic induction needed to increase the probability of detecting axions is expressed by physics laws as the square field integral over the disc surface, and fixed at a Figure Of Merit of 100 T^2m^2 over an axial length of 2 meters. In the framework of an innovation partnership with the Max Plank Institute, CEA proposed a conceptual design for a large NbTi dipole creating a field of 9 T in a warm bore of 1.3 m in diameter. This paper will give an overview of the magnet main features. First, the technical specifications, constraints and strategic choices are introduced. Then, the overall design approach is described including magnetic, mechanics, cryogenic, conductor and quench studies. Finally, technological aspects, development plan and cost optimization will be discussed.

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