

ALADInO (Antimatter Large Acceptance Detector IN Orbit) is a large acceptance magnetic spectrometer based on a novel superconducting magnet technology, equipped with a silicon tracker and a 3D isotropic calorimeter. It is conceived to study anti-matter components of the cosmic radiation in an unexplored energy window which can shed light on new phenomena related to the origin and evolution of the Universe, as well as on the origin and propagation of cosmic rays in our galaxy. The generation of the magnetic field within ALADInO is provided by a superconducting toroidal magnet. A toroidal magnet allows confining its field within the coils, leaving light stray field on other parts of the satellite. Moreover, it minimizes the dipole moment thus limiting the interaction with the environmental field (either geomagnetic or interplanetary) and consequently forces and torques on the spacecraft.

The coils will be wound with tapes based on High Temperature Superconductors (HTS), specifically REBCO (Rare Earths Barium Copper Oxide) tape. Such a conductor allows operating the magnet at temperature up to 40 K, thus avoiding liquid helium cryogenics and providing high stability with respect to quench-trigger disturbances. The latter is related to the specific heat capacity at 40 K of solid materials which is two order of magnitude higher respect to the values at 4.2 K, so that dramatically increases the enthalpy margin of the magnet.

The ALADInO magnet is assumed to operate at $T \approx 40\text{ K}$, cooled by cryocoolers. To minimize the heat load, the magnet is meant to operate in persistent mode. Two methods are possible to charge the magnet: a power supply with disconnectable current leads or a flux pump. The latter is an attractive solution which avoid moving parts and limit the power supply size.

MAIN CHARACTERISTICS OF THE TOROIDAL MAGNET	
Number of coils	10
Number of turns / coil	1800
Operating current	244 A
Total current	4.4 MA-turns
Inductance	120 H
Average magnetic flux density	0.8 T
Bending power	1.1 T·m
Stored energy	3.6 MJ
Mass	1200 kg

