REFRIGERATION SYSTEM FOR THE ATLAS EXPERIMENT

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The proposed ATLAS detector for the 27 km circumference LHC collider is of unprecedented size and complexity. The magnet configuration is based on an inner superconducting solenoid and large superconducting air-core toroids (barrel and two end-caps) each made of eight coils symmetrically arranged outside the calorimetry. The total cold mass approaches 600 tons and the stored energy is 1.7 GJ. The cryogenic infrastructure will include a 6 kW @ 4.5 K refrigerator, a precooling unit and distribution systems and permits flexible operation during cool-down, normal running and quench recovery. A dedicated LN₂ refrigeration system is proposed for the three liquid argon calorimeters (84 m³ of LAr). Magnets and calorimeters will be individually tested prior to their definitive installation in a large scale cryogenic test area on the surface. The experiment is scheduled to be operational in 2005.


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Distribution
REFRIGERATION SYSTEM FOR THE ATLAS EXPERIMENT

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Abstract

The proposed ATLAS detector for the 27 km circumference LHC collider is of unprecedented size and complexity. The magnet configuration is based on an inner superconducting solenoid and large superconducting air-core toroids (barrel and two end-caps) each made of eight coils symmetrically arranged outside the calorimetry. The total cold mass approaches 600 tons and the stored energy is 1.7 GJ. The cryogenic infrastructure will include a 6 kW @ 4.5 K refrigerator, a precooling unit and distribution systems and permits flexible operation during cool-down, normal running and quench recovery. A dedicated LN\textsubscript{2} refrigeration system is proposed for the three liquid argon calorimeters (84 m\textsuperscript{3} of LAr). Magnets and calorimeters will be individually tested prior to their definitive installation in a large scale cryogenic test area on the surface. The experiment is scheduled to be operational in 2005.

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surface area which will be converted into a cryogenics test facility permitting individual tests
of BT and ECT magnets and the three liquid argon calorimeters. Equipment which will be
needed for the test programme includes four test stands for the BT magnets, helium precooler
units for the magnets and calorimeters and an existing helium cryoplant with a capacity of
1200 W @ 4.5 K. The stringent schedule, especially the arrival of a pre-series prototype
barrel magnet coil with approximately 1/3 of the length of the final magnets will require this
test facility to be available in 1999, well before the start of delivery of the series magnets
planned for 2001.

REFERENCES

1 ATLAS collaboration, "ATLAS Technical Proposal", CERN/LHCC/94-43, Geneva,
   1994.
   ICEC 16, Kitakyushu, Japan, 1996.
3 Baze J.M. et al., "Progress in the Design of a Superconducting Toroidal Magnet for the
   ATLAS Detector of LHC", 14th Int. Conference on Magnet Technology, Tampere,
   Finland, 1995.
4 Cragg D., "The Cryogenic System of the ATLAS Experiment End Cap Toroids",
   ICEC 16, Kitakyushu, Japan, 1996.
5 Mayri C., Curé C., Duthil R., Cragg D., Haug F., Passardi G., "Barrel Toroid Cryogenic
   System for the ATLAS Detector", ICEC 16, Kitakyushu, Japan, 1996.
6 Tanaka K., Yamamoto A., Doi Y., Haruyama T., Kondo T., Makida Y., "Cryogenic
   Design of the ATLAS Thin Superconducting Solenoid Magnet", ICEC 16, Kitakyushu,
   Japan, 1996.