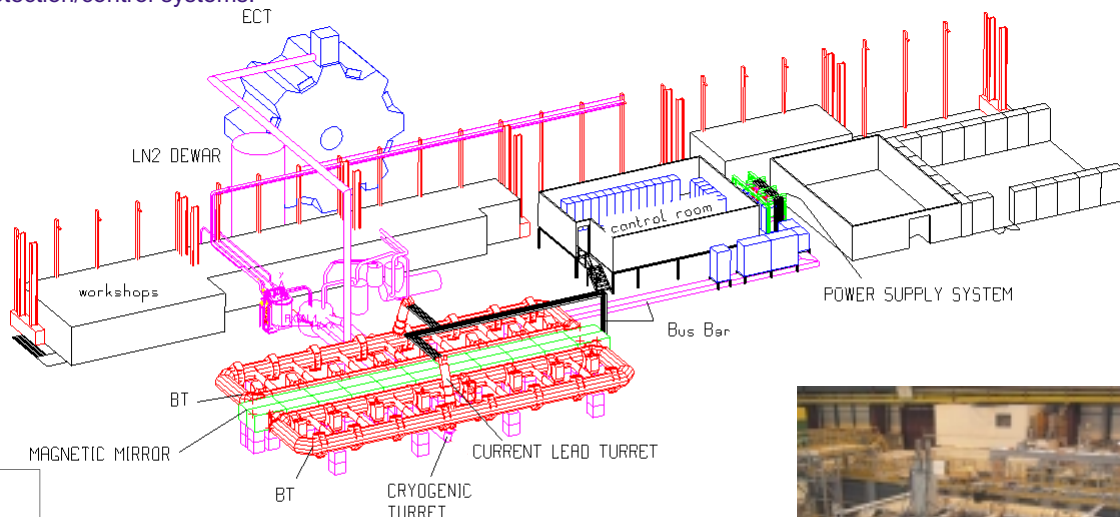


Toroid magnet test facility

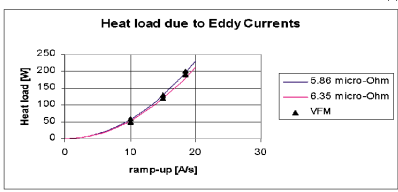
Because of its exceptional size, it was not feasible to assemble and test the Barrel Toroid - made of eight coils - as an integrated toroid on the surface, prior to its final installation underground in LHC interaction point 1.

It was therefore decided to test these eight coils individually in a dedicated test facility representing, as closely as possible, real operating conditions from both magnetic and cryogenic points of view. This test facility is equipped with a magnetic mirror simulating the electromagnetic force induced by the entire system. The facility consists of a helium refrigerator with an entropy-equivalent cooling power of 1.2 kW at 4.5 K, a liquid nitrogen precooling unit of 10 kW in the range 300 — 100 K, a cryostat housing two immersed liquid helium centrifugal pumps, a distribution valve box and transfer lines feeding the test benches.

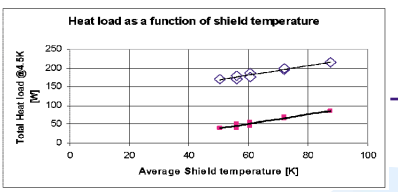
In addition to verify the operational performance of these individual coils, the purpose of this test facility was also to check the correct operation of all subsystems: the cryogenics, the 24 kA / 6 V electrical system including the current leads, and the magnet protection/control systems.



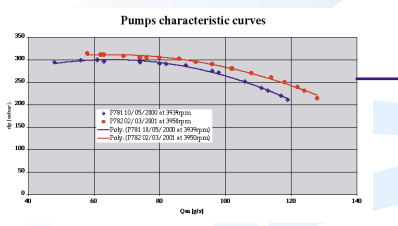
B0-coil connected to the test facility



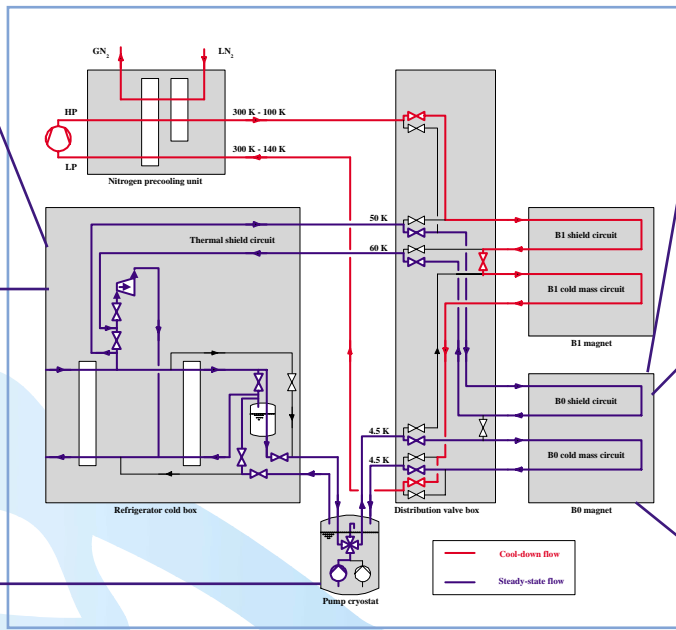
Dynamic heat load (dI/dt) produced during current ramp-up



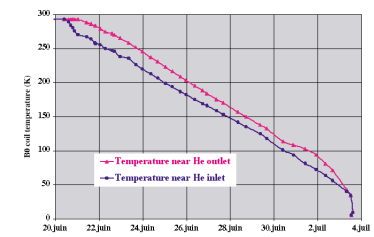
Heat load measured at 4.5 K function of the average shield temperature



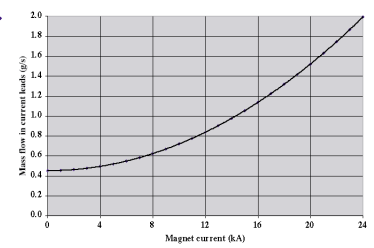
Pump pressure head vs mass flow at nominal speed



Simplified Process Flow Diagram of the cryogenic plant



Time evolution of the B0 coil temperatures during the two-week cool-down.



Cooling mass flow in current leads vs magnet current

