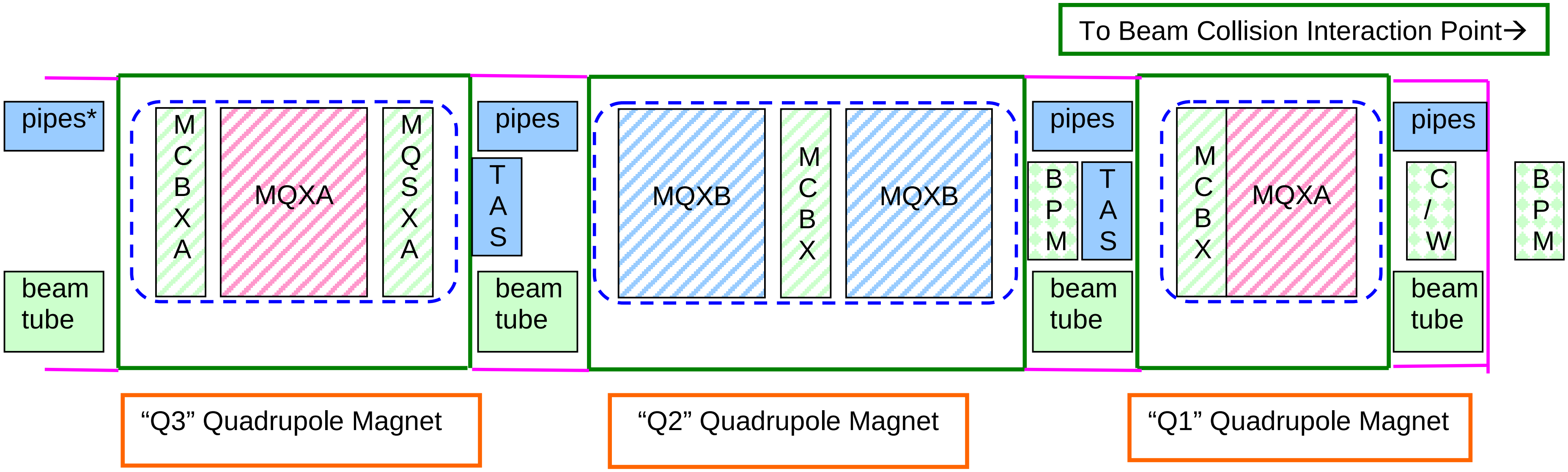
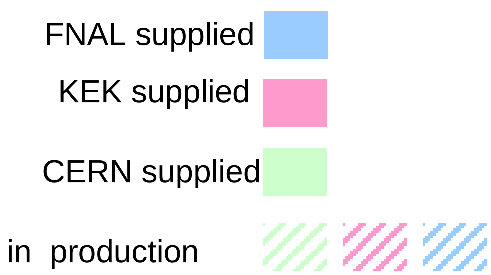
U.S. LHC Accelerator Project Progress- 1st Quarter, FY02

LHC Accelerator "Inner Triplet" (Q1-Q2-Q3) Quadrupole Assembly



The LHC Inner Triplet (shown schematically above) includes the superconducting quadrupole magnets which provide final focusing of the LHC beams at the interaction points. They must provide a field gradient of 205-215 T/m over a 70 mm aperture. They operate at 1.9 K, under heavy heat load due to secondary particles from beam-beam collisions.



Fermilab is responsible for

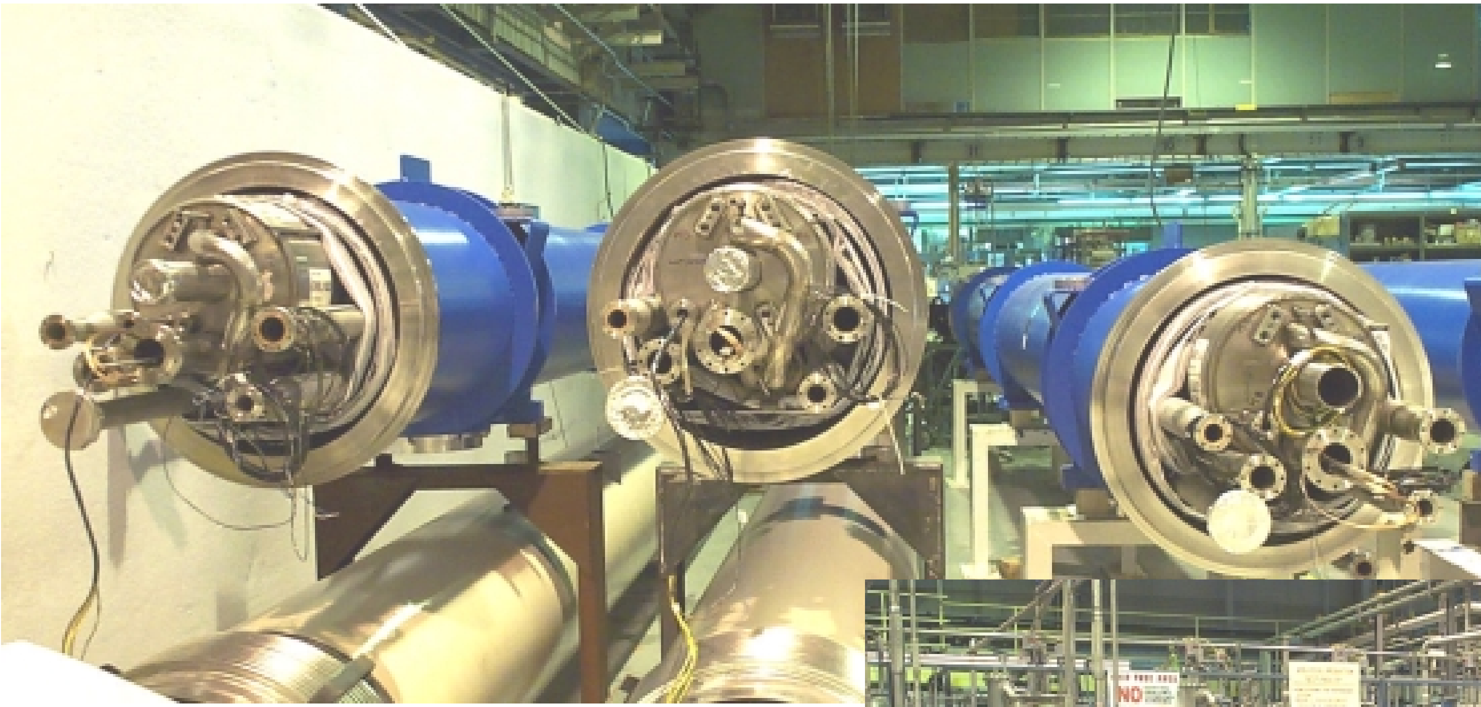
- design and fabrication of inner triplet MQXB cold masses
- design and fabrication of all inner triplet cryostats
- complete tests of the MQXB in Q2 assembly
- verification / alignment tests of the MQXA in Q1/Q3 assemblies

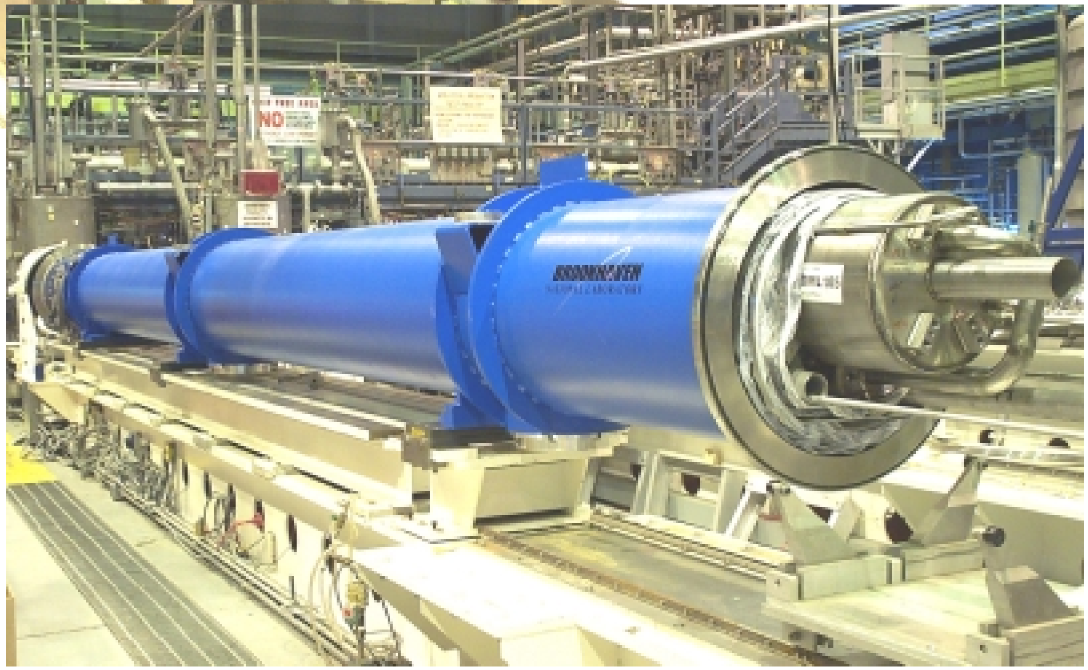
U.S. LHC Accelerator Project Progress- 1st Quarter, FY02

Three individual interaction region inner triplet quadrupole magnets, shown in various stages of production production at Fermilab. Starting at top, and clockwise: completed cold-mass for the first production magnet (MQXB01); electromechanical assembly of the second production magnet (MQXB02); and coil winding for the third production magnet (MQXB03).

As shown in the nearby schematic, two MQXB quads will be assembled together into a single “Q2” quadrupole magnet element, within the overall inner triplet assembly. There will be an inner triplet assembly on each side of the beam collision interaction points.

U.S. LHC Accelerator Project Progress- 1st Quarter, FY02



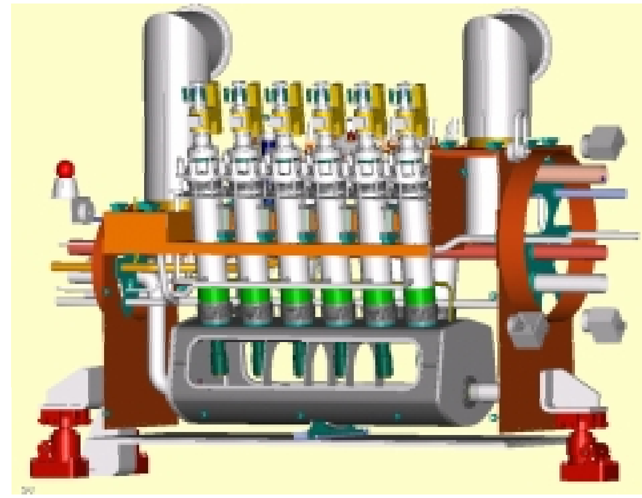


Completed interaction region single aperture dipole magnets are shown at Brookhaven National Laboratory (BNL), where they are built.

All five required LHC D1 dipoles have been constructed, and magnet quench performance and field quality testing is underway at BNL. These superconducting D1 magnets will be used in the lower-luminosity LHC interaction regions.

U.S. LHC Accelerator Project Progress- 1st Quarter, FY02

Right- An LBNL computer model of the interaction region Distributed Feedbox (DFBX), showing complexity of design. This unit provides cryo, power, vacuum and instrumentation connections between the LHC and interaction regions. Design is 95% complete, with model and prototype work underway (see other pictures). DFBX production planning is also proceeding.



Left- An LBNL High-Temperature Superconducting (HTS) electrical current lead, such as that to be used in the LHC DFBX (in "chimney" structures shown in computer model, at right). A prototype pair was delivered to CERN and successfully tested in November, '01.

Above- An LBNL model of the Helium Box for the DFBX (He box is the element shown at the bottom of the DFBX computer model above).

Above- A "lambda plate" component under development at LBNL. The lambda plate is an insulating plate that separates 1.9 K, 1 atm superfluid Helium from 4.6 K liquid Helium in the lead chamber. The quadrupole current buss bars and instrumentation leads penetrate the lambda plate.