



Large bore magnet for RF R&D experiments

What we are hunting for ?

Idea:

Looking at CERN for availability of a large bore ($R > 60$ cm) magnet able to provide a ~ 2 T solenoid field on axis that could be either shipped to FNAL for the MTA RF experiments or used at CERN for a RF R&D experiment in support of the tests performed at the MTA.

Investigated:

MERIT solenoid magnet was used in pulsed mode but could be configured to do 2T DC. Only 15 cm diameter for the bore.

M1 is a Helmholtz-type magnet is composed of two SC coils mounted on square Fe plates held apart by four cylindrical bars. Provides 3T on axis in the center. Distance between the coils is 82 cm and diameter is 150 cm / 210 cm (inner/outer).

M1 is maybe our beast !

M1 magnet

History:

Built in the 1970's. Used first by NA22 experiment in 1984. Followed by NA27-RD5... In 1990 started to be used by the CMS experiment and is still currently in use for pixel detector tests for CMS. As far as I have been told it is now CERN property.

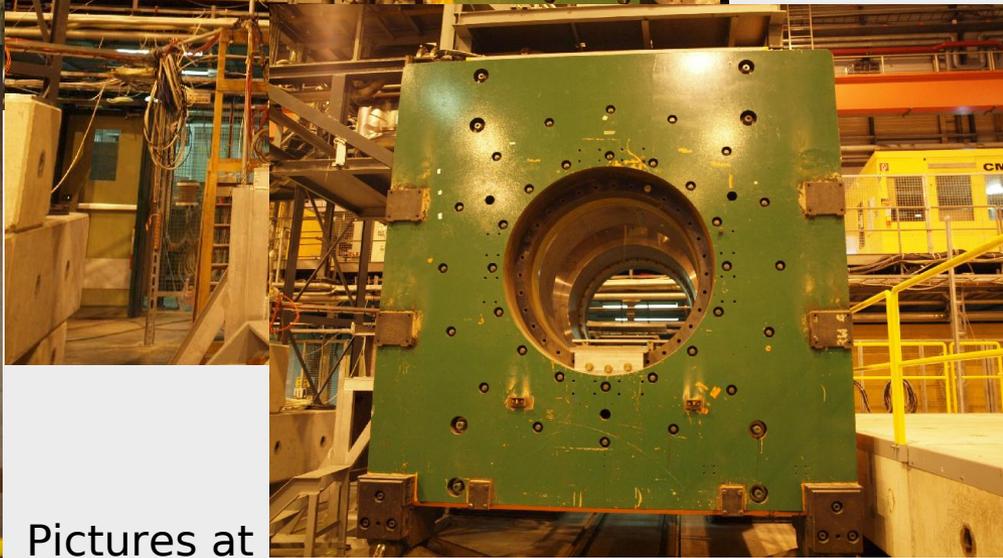
Magnet:

Complete and operating but:

- no return yoke (beware of the stray field)
- 2/3 retired CERN technicians as the magnet experts
- controls (cryo, power) old (upgrade, repair, safety)

list of upgrade and operation/maintenance being done.

M1 magnet



Pictures at
<http://gprior.web.cern.ch/gprior/m1pic/>
(ask user & passwd).

M1 field map

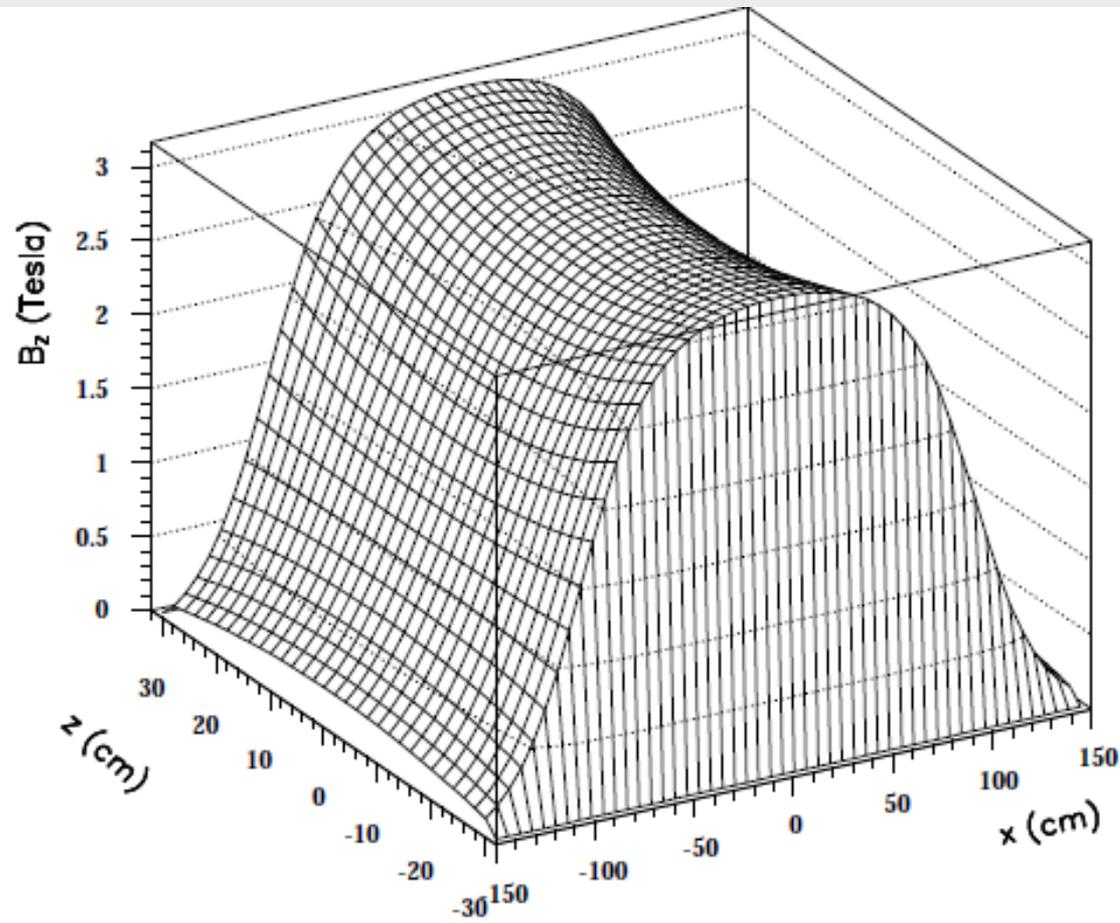


Figure 2: The z-component of the magnetic field in M1, plotted as a function of x and z . The x-direction is parallel to the beam, while z-direction is transverse to the beam.

If new field map needs to be taken, probes and tools are available.
May 11th 2010

Experimental hall

CMS detector test area:

SPS T2-H2 beam line (receives 300-350 GeV ions from SPS).

Upstream NA61 experiment + beam stopper.

Downstream no beam request for the time being.

Request from T2-H2 and other beam lines users for no field when running their experiments.

All tables and rails available.

Lot of space on one side of the magnet and one side of the bore.

Winter shutdown for chilled water maintenance.

Space for storage in other areas could also be used.

Current magnet configuration with $B \perp$ to the beam, rotating the magnet may be difficult if willing to use the beam.

need to time for when magnet can be on.

Use #1: shipment to MTA

Con's:

- CMS pixel detector people would need a replacement magnet (can be worked out as smaller bore ok).
- need approval from CERN scientific director & management.
- estimate risks of transport of ~30-40 years old magnet.
- cryo and power units cannot be shipped, controls would have also to be redone.
- need to ship the CERN retired technicians too.
- probably would never come back to CERN.

Is it worth the cost & pain ?

Pro's:

- use available RF cavities and MTA infrastructure.

Use #2: RF R&D exp. at CERN

Con's:

- need RF cavities and power units and ...RF experts.
- need to ship MTA people/MTA breakdown measurements tools.
- risk to duplicate work and overload NF people if not timed/thought carefully.
- constrained by SPS experiment schedule & CMS use of the area.
- need additional shielding/safety when running RF cavities.
- need to decide soon (end of this month) if want to keep magnet cool over winter and if wanting to put a request for next year.

Do we want to start looking for a RF cavity ?

Pro's:

- can use M1 magnet people expertise for magnet operation.
- can use CERN T2-H2 experimental area infrastructure.

Conclusion

Need to decide if:

1 we want to start work on possible magnet shipment.

or

2 we want to have a RF R&D experiment at CERN.

or

3 we give up and consider this is not worth the efforts.

biggest stringent deadline:

request for keeping magnet cold during winter 2010-2011.