

RD51 test beam @ SPS/H4:

experimental area hazards and
operational procedures

(preliminary version, to be discussed with Safety Experts)

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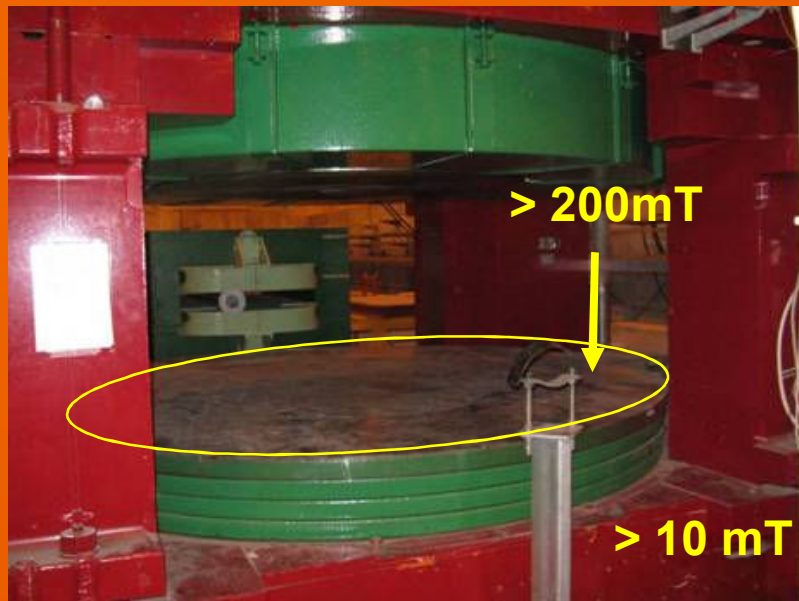
Outline

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 - Goliath magnet specifications and hazards
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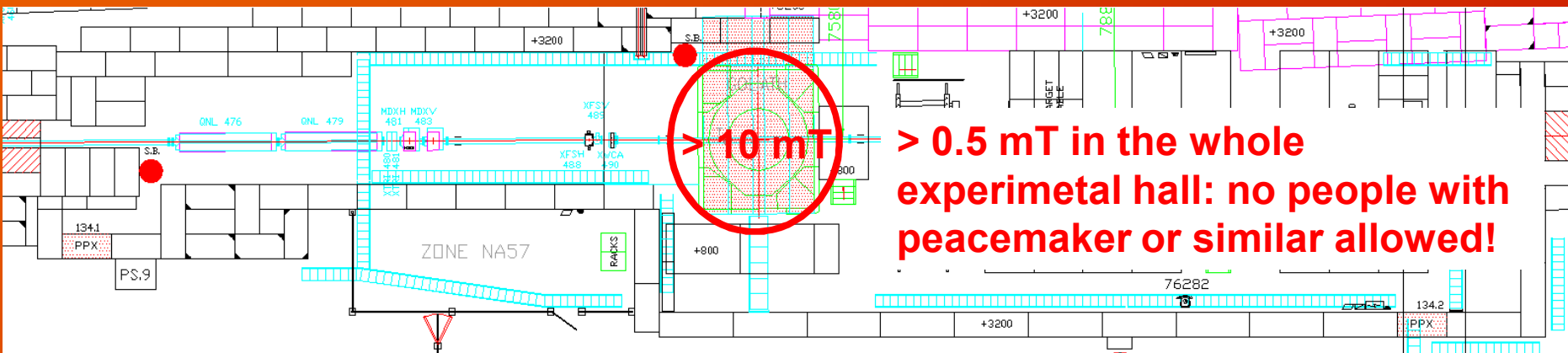
Goliath magnet safe operation

Before going on please have a look to the
general presentation by CERN safety
commission about hazards related to static
magnetic field
(available in RD51 web page)

Specifications and hazards



- The magnet reaches 1.4T in the central part of the yoke
- All the yoke and coil surfaces has a magnetic field larger than 200mT , the limit for the worker
- Around the magnet a line on the floor delimits the area of 10mT , the limit for the public
- The whole experimental hall is affected by a magnetic field larger than 0.5mT , the limit for people wearing peacemaker or similar device



Access limitations and rules

- No people wearing pacemakers or metal implants or similar sensitive devices are allowed in the experimental area. Check with your medical service if this is your case.
- You are allowed to work in the experimental area after reading carefully this presentation and the general presentation by CERN Safety Commission about static magnetic field hazards, and after learning the position of emergency equipment (red button, emergency button..)
- Check with the medical service of your home institute for special autorizations or procedures to work with magnetic field. CERN people must communicate their names to the medical service.
- Remember that: workers can operate at fields larger than 10mT, but recordings must be produced with exposure start, duration and value; the exposure of workers must be avoided if it is not strictly necessary; nobody can stand for a 8h working day inside a magnetic field larger than 200mT.

These restrictions will apply in every RD51 test beam, even if your team is not involved in the setup inside the magnet, even when the magnet is off.

The only exception is when the RD51 test beam has been declared without magnet (so the magnet power supplies will be physically interlocked)

Limitations for detectors and other devices in the magnetic field

- Any device that will equip the setup inside the magnet must be checked for ferromagnetic material
- These devices must be strongly fixed in the setup
- Take into account that metallic devices are subject to eddy currents when the magnetic field change too fast (e.g. for a magnet quench). Eddy currents can induce movements on such devices

Installation or intervention inside the experimental hall

During the installation or in case of intervention on the setup the magnet must be OFF.

- Check your pockets for objects that could be ferromagnetic or could be damaged in the magnetic field (credit card, CERN access card..). Remove them if not necessary during the intervention.
- As you enter in the area, be sure that the magnet warning lights are not flashing. Do not get close before the magnet is completely OFF.
- Before starting to operate on the setup, press the RED BUTTON to be sure that nobody can switch on the magnet during your intervention.
- When your intervention is finished, recover your tools and keep the magnet area very clean. Do not leave any ferromagnetic object close to the magnet or in the passageways, even if you plan another intervention in few minutes. In case of doubts, remove anyway the object.
- Release the RED BUTTON

This procedure must be followed by any team working in experimental area, even if they do not work in the setup inside the magnet.

After the first installation the effect of magnet on the setup will be tested with people inside the experimental area, but other exceptional intervention with active magnet can be allowed only in case of real need, and must discussed with the GLIMOS.

Operative procedure: beam and magnet

It is recommended to SWITCH OFF THE BEAM before any current modification is operated on the magnet.

E.g. when you need an access to the experimental hall, it is recommended the following procedure:

- Switch off the beam
- Switch off the magnet
- Enter the area following the procedure of the previous slides

When your intervention is finished:

- Close the area following the standard procedure
- Let the magnet reach the selected current setting before switching on the beam

Operative procedure: radioactive sources

The use of calibration radioactive source inside the magnetic field must be avoided.

E.g. the casing of the actual ^{90}Sr source contains ferromagnetic components and it would be attracted by the field.

Any exception, if really necessary, must be discussed with the GLIMOS

Calibration source cannot be exposed to beam: before leaving the area they should be locked in the safe.

Emergency buttons and Red Button

- The **Red Button** is situated on the Goliath structure, on the upstream face.
- **When pressed the current setting is forced to zero.** In the remote console, you will see “RB” in the warnings and you will be not able to raise the current
- **Keep it pressed during any intervention** in the experimental area
- If pressed when magnet is on, the current will drop fast to zero. Be careful, **eddy currents** will be generated on all metallic objects in the magnet, even if they are not ferromagnetic. These currents can also induce movements on such objects
- Two emergency button are present in the area, on supports close but not connected to the Goliath structure
- They cut the current on the magnet power supplies, **use only for emergency and do not mix their purpose with the one of Red Button!**
- **Be careful with eddy currents generated also in this case!**

Flammable gas safe operation

(this section is still preliminary, to be discussed with the FGSO)

Further documentation can be
found on RD51 web page

Description of RD51 gas system

- The RD51 gas system is composed by five independent lines running from the competent gas zone up to a panel on the wall of the experimental area, close to the two RD51 experimental setup. Stainless steel 6/4mm outer/inner diameter pipes are used.
- Other five lines, made by 10/8mm outer/inner stainless steel pipes, run back to the gas zone where they can be connected to the main gas exhaust of the building.
- In the gas zone the main gas distribution of the building provide Ar, CO₂, N₂, He, isobutan, methane, ethane. The flammable gas rack is inside a large retention bucket equipped for flammable gas leak detection, and it is covered by an hut for flammable gases lighter than air.
- The large retention bucket has enough space for two additional racks for RD51 gas mixing systems or flammable premixed bottles, but if you use methane or other light gases, the hut must be provided.
- In the experimental area, detector must be connected to the panel on wall with metallic pipes. Plastic pipes exceptions must be discussed.

Detectors installation and commissioning

- The gas system has been tested, but the leak rate must be tested again after the installation of the detectors that use flammable mixtures and leak problems must be solved.
- When the detector installation is completed, it will be inspected by the FGSO to obtain the authorization for flammable gas use.

Initial and final purging procedure

- Before flushing the flammable mixture, an inert gas must be flushed to remove the air from the gas system.
- Before dismounting the detector, an inert gas flow is required again to remove the residual flammable mixture from the system.
- If the flammable mixture is not required for several time (e.g. no data is taken during the night), it is advisable to switch to inert gas.
- For practical purpose, changing 2 to 4 times the whole gas volume is sufficient. The volume of the gas pipes can be considered a bit less than 1 litre.