

Fringe Field in DH

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The Push-Pull require self-shielded detector minimizing the magnetic and radiations stray fields in the detector hall

Regional authorities will ultimately dictate the upper limits for personal safety.

As example the values in force at CERN :

- 5 Gauss (0.5 mTesla) for people wearing pacemakers
- 100 Gauss (10 mTesla) for the general public
- 2000 Gauss (200 mTesla) for occupational exposure

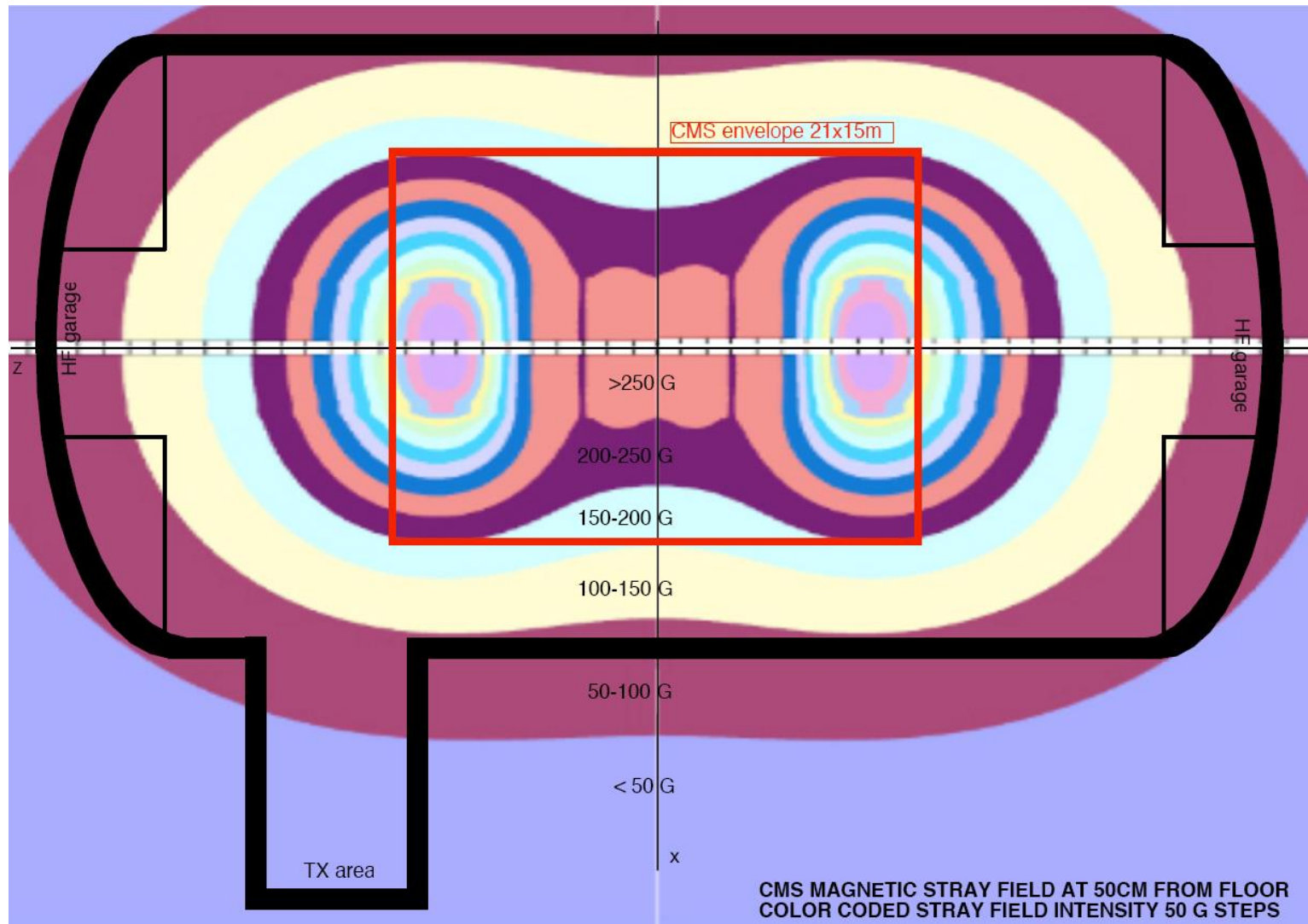
Regions of interest

- The garage area housing the off-beamline detector
- The area on and around the on-beamline detector

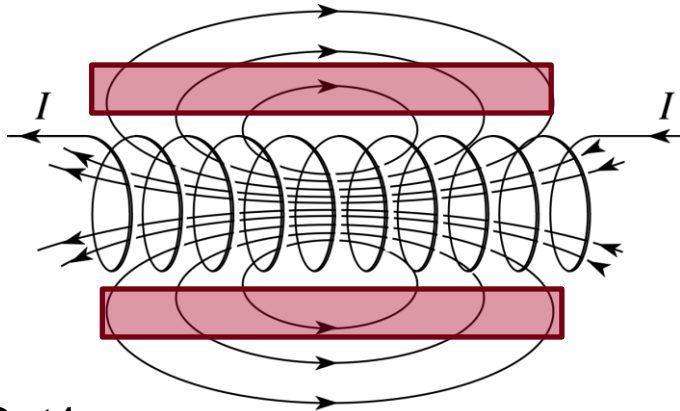
The garage area housing the off beamline detector

A magnetic environment suitable for personnel access to the off-beamline detector during beam collisions must be guaranteed by the beamline detector using their chosen solution. We take the limiting field as 50 Gauss, which will allow the use of iron-based tools and assume that individuals wearing pacemakers will be excluded from this area when the on-beamline detector is operational.

CMS Stray Field at 50cm from floor

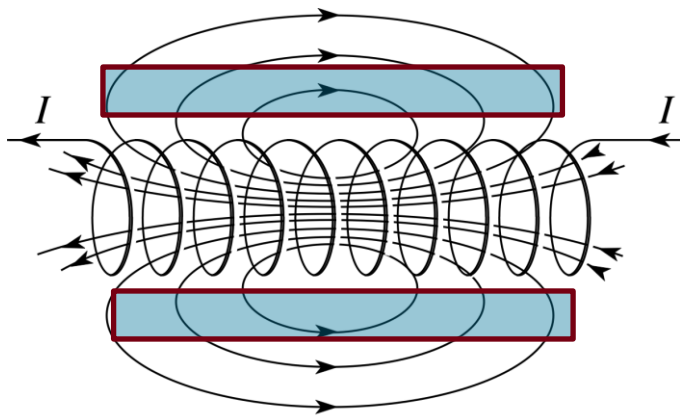


Push-pull and B(r)



Det1

$$B(r) \propto \frac{1}{r^n}, \quad \text{with } 2.5 < n < 3$$



Det2

$\Delta = +3 \text{ m}$

B(r) decreases 50%

$\Delta = +3 \text{ m}$

The area around the on beamline detector

- ❑ Human Safety: < 2,000 Gauss, with denial of access for people with pacemakers and the general public
- ❑ Operation of magnetically sensitive equipment: at the complete discretion of the detector group < 1,000 Gauss
- ❑ The off-beamline detector may wish to operate its solenoid while in its garage for measurement or test purposes. The distortion of the magnetic field map of the on-beamline detector due to such operation must be less than 0.01% of the field anywhere inside the on-beamline detector's tracking volume.
- ❑ While administrative and engineering protocols can be used to protect personnel in the zone of a detector exercising its magnetic field, it is incumbent on that detector (normally the on-beamline detector) to guarantee the safety of personnel working in the zone of the second detector (normally the off-beamline detector) against any transitory event that could conceivably provoke an accident.

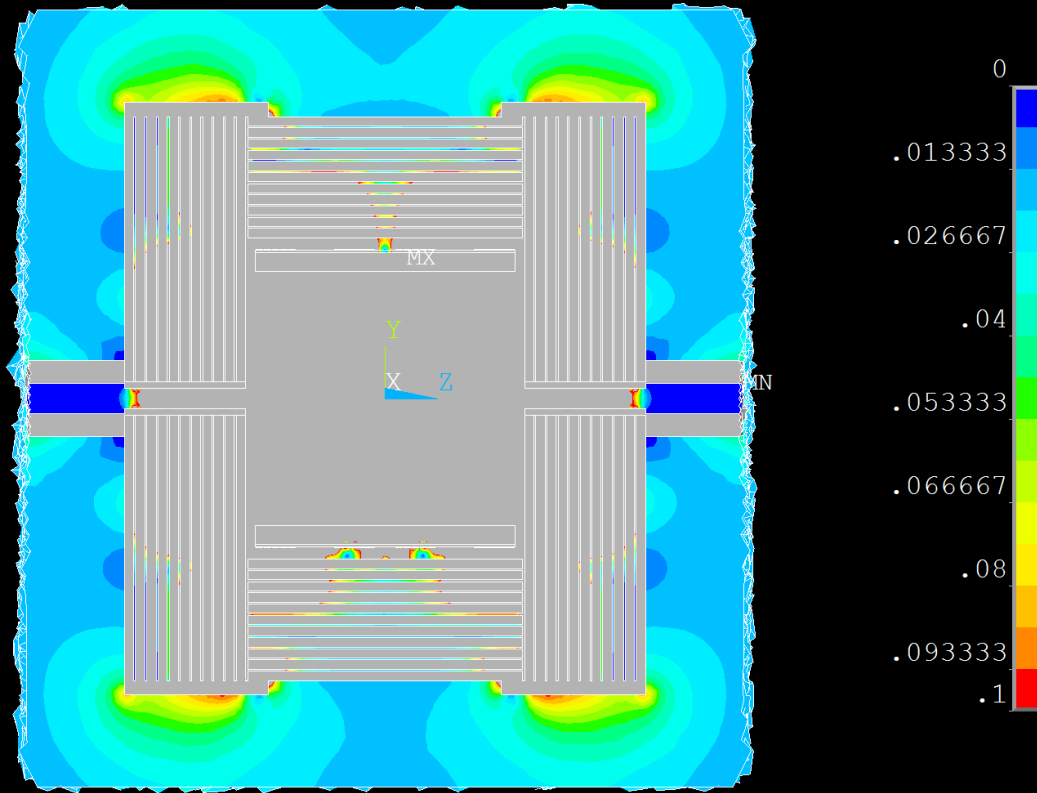
SID Fringe Fields

1
NODAL SOLUTION

STEP=8
SUB =999999
TIME=8
BSUM (AVG)
RSYS=0
SMN =.937E-04
SMX =5.97366

ANSYS
R15.0

MAY 9 2014
13:35:31



SiD (case 11c) 3D Fringe Fields; Horiz Plane Cut; 2 m from Iron surface

My conclusions

- 50 Gauss at the off-line detector area is safe number to consider and we should not change it.
- No technical reason founded why this limit should be fulfilled at 15m.
- It should be probably restated as “Maximum field at the edge of the platform”
- If a concern, the additional cost of the iron should be traded of with a longer (+ 3m) push-pull, i.e. a longer DH. Now it is the right time !
- The 1,000 Gauss limit in the proximity of the beamline detector looks a safe value for components and personnel safety....and iron is needed !
- I am afraid that the access of the personnel above/under an energized solenoid of 1.5 GJ class will be anyway very limited.
- Field reduction with compensating magnets is doable but a passive solution is still preferable under many aspects.