Beam-Line in PANDA

Some Considerations on Dimensions and Connections

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Dimensions of the HESR beam-line in the PANDA region were defined in April 2013 by Raimund Tölle:

There are 3 dipole magnets which form a chicane. The deflection angles of the dipoles are

- -13.4 mrad (entrance dipole)
- +40.0 mrad (big PANDA dipole)
- -26.6 mrad (exit dipole)

The positions of the virtual inflexion points (in meters of the HESR coordinate system):

- x = 46.2940, y = -12.7597 (entrance dipole)
- x = 46.5282, y = 4.7165 (big PANDA dipole)
- x = 46.2940, y = 13.5204 (exit dipole)

Position of the PANDA Interaction Point

The position of the PANDA-IP (target) is now slightly below the x-axis of the HESR, namely at y = - 0.0361 m (x = 46.4645 m). It follows that the distance between the IP and the virtual inflexion point of the big PANDA dipole is 4.753 m (this value is important for the design and the installation of the curved dipole beam tube).

Entrance and exit of the PANDA dipole are not symmetric. There is an uncertainty about the exact position of the virtual magnetic inflexion point. This point has to be found by field measurements.

The assumed position is according to field maps generated for PANDAroot in 2009.
For the calculation of the inflexion point two aspects were not considered:

- A cut in the maps at the dipole exit
- A necessary modification of the field clamp at the dipole entrance

Recent calculations, which included these aspects, showed that the distance between IP and dipole inflexion point will rather be 4.775 m instead of 4.753 m.

However, this difference of 22 mm would imply a lateral displacement of only 0.88 mm with respect to the center of the downstream beam-tube.

Flanges, Bellows, and Gaskets for the Beam Tubes

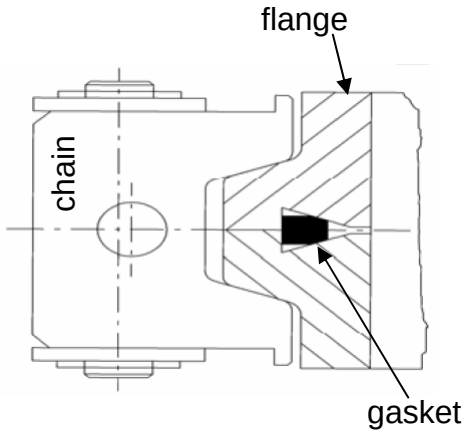
For high-vacuum applications usually CF or ISO-F flanges with metal gaskets are chosen. These types require quite some space for the mounting procedure. Given the limited access to some of the flanges - for instance in the region of the Forward Trackers FT1 & FT2 (between solenoid and dipole) - it may not be possible to place screws where needed, and to tighten them with wrenches.

Apart from this disadvantage, for the copper sealed CF-flanges a high sealing force is needed (410 N/mm for copper gasket).

We cannot bake the beam pipes in the region of the detectors, so there is no necessity to use CF-flanges or copper seals.

Chain clamps seem to be a feasible solution for areas with limited access, s. for instance the tapered ISO-CeFIX, page 5 and 7 in http://www.neyco.fr/pdf/Composants_UHV_Ce_FIX.pdf .

The sealing force of the CeFIX type is the comparatively low (70 N/mm for aluminum gasket).



Questions concerning the design of the PANDA beam-line

- Flange types
- Flange positions and dimensions
- Amount of bellows in the beam-line (4 ?) and length compensation level (5 mm ?)
- RF-continuation requirements (for bellows and special flanges?)
- Installation procedure