

Insertion of the Front-end parameters in the Neutrino Factory parameters spreadsheet (2)

Gersende Prior (CERN)
Ajit Kurup (Imperial College)
Chris Rogers (STFC RAL)



References

- Anton Akimov (CERN summer student, 2011) website:
 - <http://muonstoragerings.web.cern.ch/muonstoragerings/Students/aakimov>
- IDR report (IDS-NF-020 version):
 - <https://www.ids-nf.org/wiki/FrontPage/Documentation/IDR>
- Costing spreadsheet (front-end only) – engineering & parameters notes:
 - <http://gprior.web.cern.ch/gprior/NF-PARAMS/>
- ICOOL reference files:
 - http://hepunx.rl.ac.uk/uknf/wp1/idsfrontend/Beams_and_Lattices/
 - ICOOL-2010-04-01 (FrontEnd v1.1 IDR discrete)

Buncher conventions

- The buncher section starts in the middle of the first coil:
 - 50 cm long coils with 25 cm spacing between coils.
 - The buncher length is 33 m.
 - The cavities are positioned symmetrically with respect to the coils:
 - A cavity length is either 40 cm or 45 cm.
 - Cavities are forming groups with the same frequency.
 - 33 cavities in total arranged in 13 groups of 1-2 or 3 cavities.
- In the IDR report, some numbers in Tables IX, X, XII and section 2.4.2 & 2.4.6 are incorrect (cf. comparison tables from A. Akimov website).

Buncher Schematics

- IDR report has no schematic.
 - Anton website:
 - Schematic from ICOOL with groups arrangement and cavities/Be windows z-references.
 - Be windows and RF cavities radius are the same in ICOOL.
- From xls spreadsheet, can provide input to G4BL and produce schematics.
- Neil Bliss has also produced schematics for the buncher.

Design/Engineering (1/)

• Magnets:

- 0.5 m length
- 0.68 m inner radius
- 0.04 m radial thickness
- 0.25 m spacing between coils
- 47.5 A/mm² current density

→ These numbers have been entered in the spreadsheet, if need modifications will go in the next version/iteration of simulation + spreadsheet.

Design/Engineering (2/)

- RF cavities:

- 0.4 m (320 - 294 MHz) and 0.45 m (285 – 234 MHz) length
- 0.30 m radius
- 3-10 MV/m gradient

- Be windows:

- 0.0002 m thickness
- 0.30 m radius

→ These numbers have been entered in the spreadsheet, if need modifications, will be entered in the next round of simulation & spreadsheet.

Costing spreadsheet

- Level of precision (reference is ICOOL):
 - Dimension - 10^{-4} m
 - Frequency 10^{-2} MHz
 - Field gradient - 10^{-2} MV/m
 - Current density - 10^{-1} A/mm²
 - Reference numbers:
 - ICOOL files chosen as reference (v1.1 IDR discrete).
 - Buncher section:
 - Complete.
 - Listing engineering issues for next iteration.
 - Producing G4 BL input for verification & schematics.
- need to insert rotator and cooler.

Buncher engineering issues

● Comments from Neil Bliss (1/2):

- Be windows
 - In the study II document the windows have 50 mm between them for a clamping system to attach the windows to the cavities.

ACTION:

- can probably run a simulation with 25 mm space each side of the windows and verify/compare with current lattice performance.

PROBLEM:

- ICOOL allows to define a space between the window and cavity G4BL does not !

VICTIM/VOLUNTEER ?

Buncher engineering issues

● Comments from Neil Bliss (2/2):

- RF and coils arrangement
 - Arrange spacing of the cavities and coils such as there will always be a gap between the coils at the center line of a cavity to get the RF in.
 - If the coils stay at the same geometry then can the cavities be spaced at 750 mm centre or the coil geometry changed relative to the cavities ?

Problematic groups are 2-13

ACTION

- Can we consider a design for a RF feed for those different groups without changing the coil and RF configuration ?
- Can we find a coil spacing/size arrangement that don't break the cell length/symmetry and allow for enough space to put the RF load in ?
- Can we space the cavities in a given cell such that the center is at a gap between coils ?

VICTIM/VOLUNTEER

- Need a magnet expert
- Need a RF expert (would Neil be available to look into that ?)
- Study new buncher configuration (same performance but increased space between the cavities) ?

Buncher engineering issues

• Others:

- Cavity radius at 30 cm in ICOOL

ACTION

- set cavity radius to 60 cm or pillbox-type size (<60 cm changing with frequency) ?
- run a simulation with new configuration and check performance.

VICTIM/VOLUNTEER