

**4th ICFA Mini-Workshop on Space Charge**  
**November 4<sup>th</sup> – 6<sup>th</sup> , 2019**  
**CERN (Geneva, Switzerland)**

**Minutes of Q & A: Monday, November 4<sup>th</sup>, 2019 - morning session**

Reported by Daniel Noll

**Status of the LIU project**

Giuliano Franchetti: What is the most challenging accelerator scenario?

In one year time: recommissioning the PS will be very challenging.

For the ions, slip stacking

For Protons, the SPS remains to be demonstrated, while sufficient intensity has been shown in the PS.

Elias Métral: Do the figures on slide 18 have a margin? Would be tight for intensity of  $2.6 \times 10^{11}$ .

Plots take into account the loss budget and are projected values at the exit of the SPS.

**Status of the FAIR project**

Yannis Papaphilippou: Concerning the magnets, were these measured in a static setup or was the magnet cycled? Components might change between static and ramped case.

Measurement were performed while ramping the magnet, with faster and slower ramping rates

Yannis Papaphilippou: Concerning the integrated components, are there any 3d maps to understand the fringe fields? Fringe fields can give strange kicks.

Beam should be small enough; measurements were at five positions longitudinally.

For the first magnet prototype, higher multipole components were particularly strong at one edge, since coils were drifting away.

Alexander Huschauer: Is there a magnetic model and does it compare to the measurements?

Yes, using Opera and other software. When the problems with the first prototype were discovered, models were used to find more or less successfully the error.

First measurements & model completely different, guess it is improved now

Giuliano Franchetti: Do you conclude that the field is good? 30% variation for the B3 field component? (slide 24)

30 % is large, but there is no single magnet in the Gaussian tail.

Frank Schmidt: Will the magnets be sorted?

Not necessary because error the components are small.

Elias Métral: why does the plot on slide 30 not show a tune scan below the half integer, i.e. tunes between 18 to 18.5?

The picture will be similar.

For fast extraction, it's not possible to go lower, because of systematic resonances.

Giuliano Franchetti: on slide 27, which errors were included?

For good tunes, there is no difference in losses

For bad tunes, there is a big difference in losses

Hannes Bartosik: is it correct there is a factor 6 in intensity missing for SIS18 to reach design intensity?

Assumption: for the fast cycle, the vacuum deteriorates between cycles due to dynamic vacuum.

To achieve the difference, vacuum improvements and multi-turn injection improvements under investigation.

## **Status of PIP2 at FNAL**

Yannis Papaphilippou: What is the plan to handle losses in the booster?

Effort to increase the intensity with present linac @ 400 MeV to understand how to collimate losses.

Losses @ 800 MeV will be reduced because the sc footprint is reduced.

Studies are ongoing, we think that losses will not be an issue.

Bucket to bucket injection and painting will also reduce the footprint.

Elias Métral: When is beam to experiments foreseen?

There will be beam to booster in 2027, followed by a ramping of intensity to meet the target at the end of 2027.

Giuliano Franchetti: PIP2 is an in-kind project with Europa. What is the experience considering different criteria between DOE/Europe?

First large project with a significant number of contributions. How did it work? Needs to be seen. FNAL tries to learn from ESS.

From the DOE view, the culture is different in terms of project organisation and timing, but seen positively by DOE.

FNAL tries to involve partners in decision-making.

### **Status of the ISIS upgrade**

Suzie Sheehy: What are the plans for the more complex injection patterns? Machine learning?

People in the group are interested in machine learning approaches. There is a layered approach in place, first use model, 2D PIC and then 3d PIC.

?: Why are 7 foil hits considered too high?

The foil will melt.