

MuCol WP 6.1 Meeting Notes (7th meeting) – 11/09/2023, <https://indico.cern.ch/event/1324592/>, via Zoom

Participants:

CERN: Fabian Batsch, Alexej Grudiev, Ivan Karpov, Leonard Thiele, Elias Metral, Shahnam Gorgi Zadeh, David Amorim, Graeme Burt, Igor Syratchev

Univ. Rostock: Ursula van Rienen, Simon Adrian, Sosoho-Abasi Udongwo

INFN: Dario Giove, Giorgio Mauro, Maria Masullo, Michelle Betrucci

Fermilab: David Neuffer

University of Strathclyde: Liang Zhang, Kevin Roland

Welcome and News:

- New Gentner-funded Ph.D. student started in June (Leonard)
- Sosoho (University of Rostock) will continue under the EU fund to work on MuCol for one year from January 2024

Report from CERN (Fabian Batsch, Alexej Grudiev):

Title: Updates on HOM power studies (Fabian)

- Karl Bane's formalism is not valid with the given bunch length
- Induced voltage gets calculated for multi- and single turns for one HOM mode and then summed up
- Overview note on HOMs in TESLA cavities:
https://flash.desy.de/sites2009/site_vuvfel/content/e403/e1644/e1693/e1694/infoboxContent1727/tesla2001-33.pdf
- Voltage is only calculated for buckets of interest, and not all buckets
- Benchmarking against BLOND code not done yet
- If the loaded Q is left at the optimal value of $2.2e6$, parts of the bunch are lost at each turn
- Lower values of Q_L look a lot better in that less particles are lost
- Additional voltage has to be supplied during acceleration → 1.4 for a synchronous phase of 45°
- Counter-rotating bunches planned to be implemented

Remarks:

- Alexej: A comparison of induced voltage between multi-turn and high Q-factor could be a good benchmark
- Ulla: Where did "default" Q_L of $2.2e6$ come from → optimal values for minimum power consumption
- Igor: Why is the higher voltage necessary? → Higher voltage is necessary due to beam loading
- Ulla: buckets of interest? → Only the ones included that hold a bunch
- Ivan: In reality, the power on the FPC will not be higher by a factor of 1.4 but by a factor of 2

Title: Cost model for the SRF system for the muon collider RCS: (Alexej)

- The cost model of the system has to be optimized against the RCS-magnet system
 - o Magnetic ramp gradient has to be balanced with the SRF system
 - o Power supplies of magnets → sinusoidal ramp would be optimal
 - o RF: linear ramp would be optimal → less additional voltage needs to be provided
- ILC cost was the starting point → it was used to create a zero-order cost model
- Cost model has to take various parameters of different RCS into account (FPC as well as HOM couplers will probably need to be individualized as well)
- Zero-order model:
 - o Only takes accelerating voltage as a parameter
 - o Probably too simple: cost of components per GV
- First-order cost model includes different parameters on multiple RCSs, cryogenics
 - o FPC cost scales with beam power
 - o Cryogenic losses scale with the duty cycle
 - o No dependence on average power
 - o Cost is significantly higher with these more realistic costs included
 - o Will be used for optimization

Remarks:

- Alexej: FPCs are very important for cost as well as design (might have implications on number of cells)

Round table discussions & AOB:

- Next meeting 16.10.2023