MuCol WP 6.1 Meeting Notes (10ᵗʰ meeting) – 29/07/2024, https://indico.cern.ch/event/1441763/, via Zoom

Participants:

CERN: Fabian Batsch, Alexej Grudiev, Leonard Thiele, Oliver Smedt, Roberto Losito, Simon Albright, Carmelo Barbagallo

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

INFN: Michelle Betrucci, Daniele Sertore

University of Strathclyde: Liang Zhang, Kevin Roland, Roger Ruber

Uppsala University: Roger Ruber

Université Paris-Saclay: Juliette Plouin

STFC: Chris Rogers

Report from CERN (Fabian Batsch, Leonard Thiele):

Title: CERN-based options for the RCS chain (Fabian)

- To get the parameters, the tool by David, Fabian and Leonard was used (https://gitlab.cern.ch/muon-collider-bd/rcsparameters)
- Assumptions: const. survival rate of 0.7, $B\_Nc=1.8$, $B\_SC=10T$
- Possible scenarios for the LHC
    - 3RCS: 1 NC in SPS and 2 in LHC (NC + hybrid)
    - 3RCS: 2 in SPS (NC + hybrid) and 1 hybrid in the LHC
    - 1 NC in SPS and 1 hybrid in LHC
- Scenario 2xSPS, 1x LHC:
    - Ejection at 3.95 TeV → quite low compared to other options
    - Non-distributed RF (also not optimized yet
    - Not chosen for further analysis
- Scenario 1xSPS, 2x LHC
    - Staging possible (first 2 TeV, then 4.5 TeV ejection energy)
    - Quite high number of cavities in RCS2 → to be optimized and adjusted
    - Large number of cavities in general
- Scenario 1xSPS, 1x LHC
    - Ejection at 3.58 TeV
    - Cheapest approach (least number of cavities and least tunnel length necessary)
    - Large energy swing would mean a large aperture for SC magnets → more expensive
- HTS options
    - One NC in SPS (63 -> 400 GeV)
    - One SC-HTS in LHC from 400 GeV to 3000 GeV with 3T dipoles and 500T/s
    - One NC Hybrid from 3000 to 5000 GeV in LHC
- Cost and RF-optimization still to be done, focussing on 1xSPS and 2x LHC option

- Chris: Are the tables based on linear ramping or sinusoidal ramping → only linear is considered, but the difference is not very large (up to 5%).

Title: Updates on transient beam loading in the RCS chain: (Leonard)
- Last time: cavity phase and voltage did not end have their equilibrium point where it was expected.
- The Optimum Quality factor was adjusted to include the different cavity detuning → helped, but not enough.
- For MuCol, the beam current is only present in one bucket → there is a large difference between the average and peak.
- If one tries to distribute the beam over the whole turn instead, the equilibrium voltage is perfectly hit. → time resolution is not good enough.
- After adjusting the time resolution, the voltage oscillates around the setpoint as expected.
- The same effect can be reached when distributing the beam in 10 buckets instead of one.
- The setpoint is then adjusted to avoid overvoltage inside the cavity (linear multiplication with the overvoltage factor). → slightly more cavities are required.
- Next steps: integration into beam dynamics simulation.
- Perform TB simulations for CERN-site based options.

Remarks:
- Simon Albright: Why does the distribution of the beam over 10 t_rf help the same way as the increase of the simulation time does? → For each time step, the simulation needs the value of the current voltage and phase. Since one of the two values must be taken from the last step, an error will be introduced. The smaller the change in voltage and phase per simulation step, the smaller this error gets. If one distributes the beam, this change from step to step will be smaller.
- Alexej: Why is not the optimal detuning used → Robinson stability limit would be broken in this working point

Round table discussions & AOB:
- Next meeting 16.09.2024, 13:30 o'clock

Kommentiert [vR1]: Das war aber nicht Simon Adrian, soweit ich mich erinnere, oder?