TELP Accelerator meeting

Notes from the meeting held on 18th November 2013

To start the meeting A. Blondel gave a short summary on the current situation. CERN is launching the FCC (Future Circular Collider) study of a collider facility in a 80-100 km tunnel. The target if the study is the construction of a hadron collider, with a lepton collider as intermediate stage (similar to LEP-LHC). A kick-off meeting will be held 12-14 February, hosted by the University of Geneva.

1. Optics & Lattice - status and future work - (B. Holzer)

B. Holzer gave a brief update on the optics status. The current lattice design is focused for 175 GeV, work on the lower energies will begin soon. The requirements for the lattice magnets at 175 GeV: ~600 G and 20 T/m. One idea to maintain a reasonable horizontal emittance is to increase the cell length by switching off some quadrupoles. The integration of correctors (dipole and sextupole) is starting. Nested correctors are being considered since good experience was accumulated at ALBA and PETRA3. The location and space for the absorbers will also be fine-tuned in collaboration with the FLUKA team. L. Lari commented that the protection of the magnets and coils will also depend on the magnet design, for example if a HTS 2-in-1 design would be used. To the question asked in the audience about wigglers, Bernhard replied that he had not yet installed them. A. Blondel wondered if one could not install the absorbed inside the dipoles. An important work that is going to start soon is to evaluate the vertical emittance for a realistic misaligned lattice with orbit correction. This is important to judge if the performance figures and parameters are credible. W. Kozanecki commented that this was also discussed at length at a recent KEKB commissioning workshop.

B. Holzer also informed the audience that two new doctoral students join the TLEP optics team: Bastian Här has stated to work on optics and lattice design while Roman Martin will join soon to work on the final focus with R. Tomàs.

B. Holzer complained (justified !) that the parameter table on the TLEP Web page is not up to date. This will be fixed by M. Koratzinos and J. Wenninger. It must also be noted that with the launch of the FCC study, the TLEP Web sites will be integrated into the FCC sites.

2. Chromaticity correction and FFS - (H. Garcia Morales)

H. Garcia Morales presented an update on the work for the final focus. They have significantly revised their parameters for QD0 (the last V focusing quad) which is now much shorter. L* is still 3.5m. As a consequence the aperture requirements have gone down by a factor 2, and the peak beta function is significantly lower. For the horizontal plane the tune versus dp/p is now looking rather good, but the dynamic aperture is still way too low. J. Wenninger proposed to try to find a stable

solution with a reasonable dp/p aperture by realizing either beta* or L*. This would also allow start building a complete lattice that could be used by other people. Once a relaxed solution is found one could then work towards nominal parameters. In addition a discussion on L* should be launched with the colleagues from the experiments.

After the meeting it was also decided to make available a lattice by the end of the year.

3. A first look at separation and recombination schemes - (J. Wenninger)

J. Wenninger presented 3 basic schemes to separate/recombine the beams: Pretzel schemes, LHC-like separation-recombination and large crossing angle at the IP. The Pretzel should be easy to implement, but it may be limited in the number of bunches. J. Jowett commented that for LEP the limitation to 8 bunches arose from the experiments, the scheme itself had been designed for 36 bunches per beam. It is clear from the simple estimates that a large crossing angle scheme will imply strong dipoles very close to the IP, which may not be acceptable – tbc. B. holzer commented that for small crossing angle (both beams in the same chamber in the low-beta quads) one can always steer the incoming beam to the quad center/axis, which concentrates the synchrotron radiation on the outgoing beam.

4. Performance issues: single vs double beampipe, multi-turn beamstrahlung - (M. Koratzinos)

M. Koratzinos discussed the limit in the number of bunches for a single vacuum chamber, and he arrives at ~150 bunches at the Z. But the corresponding horizontal emittance is 2000 nm – huge ! – to maintain the beam-beam tune shift below 0.03. He also tried to estimate if beamstrahlung (BS) is mainly a single turn effect or if multiple turns need to be considered. From his simple simulation and the probably estimates he concludes that BS is dominantly a single turn effect. R. Talman commented that the situation may improve with multiple/distributed RF systems, M. Koratzinos indicated that he was using 4 distributed RF stations. A. Blondel commented that the energy spread in the beam would reduce the lifetime or the effective dp/p aperture. A. Bogomyagkov pointed out that the energy spread is increased due to BS, and that the combination between increased energy spread and large energy BS event reduces the lifetime. The increase of the beam energy spread by BS is de facto a multi-turn effect.