

Minutes of Meeting #4

Tuesday, 24 October, 13:00 GMT

Meeting by WebEx. Present: Susanna Guiducci, Mark Palmer, Mauro Pivi, Junji Urakawa, Marco Venturini, Andy Wolski, Mike Zisman.

1. (Continuing) review of R&D priorities

R&D priorities in the following categories were reviewed:

- 2.1 Single-particle dynamics
- 3.1 Vacuum
- 3.8 Feedback systems
- 3.10 Supports and alignment systems
- 3.13 Multiple systems (systems integration)

2.1.1 Lattice design

The lattice design work for the baseline configuration has still not converged; since specification and design of subsystems and many other studies (e.g. beam dynamics) depend strongly on the lattice design, it was felt that the priority of the lattice design work should be increased to Very High Priority.

Work on alternative configurations (e.g. 3 km or 17 km lattices) can continue at Moderate Priority.

2.1.1.5 Lattice design for injection/extraction lines: High Priority

The existing priority was agreed.

2.1.1.6 Lattice design for kicker insert: High Priority

This is a new objective, which is considered important because of the challenges presented by the injection and extraction systems generally (including design of the optics).

2.1.2.1 Characterized the damping rings acceptance: High Priority

The existing priority was agreed.

2.1.2.2 Optimize the damping rings acceptance: High Priority

The existing priority was agreed.

2.1.3.1 Develop techniques for optics measurement and correction: Moderate Priority

The existing priority was agreed.

2.1.4.1 Develop strategies for low-emittance tuning: High Priority

The existing priority was agreed.

2.1.4.2 Specify requirements for survey, instrumentation etc: High Priority

The existing priority was agreed.

2.1.4.3 Demonstrate < 2 pm vertical emittance: Very High Priority

The existing priority was agreed.

2.1.4.4 Specify support schemes for damping rings magnets: High Priority

The existing priority was agreed.

2.1.4.5 Specify orbit and coupling correction schemes: High Priority

This is a new objective.

3.1.1.1 Specify vacuum chamber material and geometry: High Priority

The existing priority was agreed.

3.1.1.2 Develop technical design of principal vacuum chamber components: High Priority

Note the change from “engineering design” to “technical design” in the statement of this objective. At this stage, some conceptual development is needed, including such things as transitions, pumping arrangements etc. This should be High Priority.

3.1.1.3 Characterize vacuum system performance: High Priority

The existing priority was agreed.

3.1.2.1 Specify vacuum pumps: Low priority

Low priority is sufficient for this objective.

3.1.3.1 Specify vacuum diagnostics and controls: Low priority

Low priority is sufficient for this objective.

3.1.4.1 Specify vacuum valves: Moderate priority

The valves have the potential for some impact on the design and operation of the vacuum system.

3.8.1.1 Specify bunch-by-bunch feedback systems: Moderate Priority

The existing priority level was agreed.

3.8.1.2 Model bunch-by-bunch feedback systems: Moderate Priority

The existing priority level was agreed.

3.8.1.3 Develop bunch-by-bunch feedback systems: Moderate Priority

The existing priority level was agreed.

3.8.1.4 Experimental tests of bunch-by-bunch feedback systems: High Priority

This is a new objective. The tests should aim to demonstrate the performance of feedback systems in specified key areas, including very fast damping rates while maintaining very low beam emittance. There has generally been good experience with modern digital feedback systems at operating facilities, which justifies the Moderate Priority rating for the specification and development of the damping rings feedback systems. However, there are some key areas in which the damping rings will be pushing the limits, including the damping rates and operation with very low beam emittance: this motivates experimental demonstration in an appropriate parameter regime as a high priority.

3.10.1 Normal-conducting magnets supports.

The single objective previously stated in category 3.10.1 has been split as follows:

3.10.1.1 Specify alignment techniques appropriate to different sections of the ring: Moderate Priority

Mostly, alignment techniques are well known; the specifications for the ring are not fully defined, though expected to be challenging. Use of two stacked rings is not a major obstacle, though will add some complications to the alignment. Some areas of the ring (e.g. with the RF and wigglers) will involve large components in tight spaces, and may need more careful and urgent study, once the issues are better known.

3.10.1.2 Specify support and stabilization hardware: High Priority

The upper ring in a two-ring configuration is expected to be challenging.

3.13.1.1 Develop integrated mechanical design: High Priority

Mechanical integration is something that needs continuing attention as the design develops; some areas of the ring in particular (e.g. RF and wiggler sections) will present particular challenges in making all components fit together.

Action: A. Wolski to update the priorities on the list of objectives, and circulate to members of S3.

2. Arrangements for damping rings R&D subtopic phone meetings

a. Electron cloud, and impedance and impedance-related effects.

A meeting on October 31 by WebEx (at 13:00 GMT) has been scheduled, and an announcement will be sent out shortly.

b. Kickers.

Work in progress.

Action: T. Mattison to arrange regular meetings.

The damping rings Wiki site at Cornell has been extended to provide space for the subtopic meetings, as well as for the main S3 meeting (together with password protected space for private documents). Members of S3 should make sure they are registered to use the Wiki site. Mark Palmer will ensure appropriate privileges, to enable members of the Task Force to edit the pages.

3. 2 K option for damping rings RF

The GDE Executive Committee has advised that, for the RDR, the RF voltage in the damping rings be reduced to give an increased bunch length of 9 mm. This provides a cost saving, while allowing an upgrade (by installing additional RF) to reduce the bunch to the present specification of 6 mm. This is expected to be the subject of a change control request.

Hasan Padamsee has suggested an alternative way to save RF costs, by reducing the cavity temperature from 4.5 K to 2 K. This would allow the necessary power and voltage for a 6 mm bunch length to be provided by 16 cavities, rather than the

nominal 32 cavities (at 4.5 K). The power through the couplers would still be within safe limits with 16 cavities; there would be some additional load on the cryogenics, but initial indications from Tom Peterson are that the increased demands would be manageable.

The existing 4.5 K RF system design looks reasonably safe, and should probably be classed generally as moderate priority, rather than the high priority agreed in S3 Meeting #3. If a change is made to a 2 K RF system, the issues regarding design of the cryostats become significantly more challenging, and the R&D (including demonstration of 2 K cavities operating at the required power and voltage levels) should be high priority.

Action: A. Wolski to contact a member of the Executive Committee (G. Dugan) to seek advice on how to proceed.

4. Layout change to two-shaft configuration

Further guidance from the Executive Committee on cost-reduction options included a change to a configuration with two access shafts, instead of the present four. A lattice is available that could potentially be used as the basis for the costing for such a configuration. If the changes to the various components (e.g. the magnet specifications) are not significant, then we can consider switching the RDR cost basis to the new lattice. This will in any event entail a significant amount of work. An initial look at the magnet strengths will give some indication of the feasibility of this approach.

Action: A. Wolski and M. Palmer to compare magnet strengths in the potential new lattice, with those in OCS6.

5. Valencia ILC workshop

There will be an open meeting of S3 at Valencia, 9 am – 1 pm on Wednesday, November 8. This will be a discussion, rather than a series of presentations. Items for the agenda will include:

- Developing the damping rings R&D plan.
- Resolving duplications, filling gaps, and coordinating activities.
- Configuration changes for the RDR, including RF system and lattice layout.

A telephone link should be available for those members of S3 who will not be able to attend the meeting in person. Additional damping rings sessions are scheduled for meetings with the CF&S group (Thursday, 9 am – 10 am) and with the magnets group (Thursday, 5 pm – 7 pm). At present, it is not believed that many people from the magnets technical group will be attending the meeting in person. A telephone connection may be a possibility for the magnets meeting.

Action: A. Wolski to draft an agenda for the S3 meeting at Valencia.

Action: S. Guiducci to contact T. Lackowski regarding the schedule for the joint damping rings/CF&S meeting; in particular to put discussion of requirements for the RF systems on the agenda.