

Minutes of Meeting #2

Wednesday, 11 October, 1 PM GMT

Meeting by WebEx. Present: Eckhard Elsen, Susanna Guiducci, Tom Mattison, Mark Palmer, Mauro Pivi, Junji Urakawa (for item 1), Marco Venturini, Andy Wolski.

1. ATF R&D plan.

Junji Urakawa presented one slide summarizing the R&D topics to be studied at ATF. Priority items for the near term are demonstration of low-amplitude kicker achieving timing and stability specifications, followed by development of kicker for extraction of bunches for ATF2. Other topics include studies of fast ion instability, and study of impedance and CSR effects. In the longer term, it is hoped to achieve a vertical emittance as low as 1 pm: this could have benefits for the ATF2 studies. There will also be a continuing R&D program on instrumentation and diagnostics.

2. Revised guidelines for assigning R&D priorities.

The latest draft guidelines were accepted. There were still some concerns as to whether the issues regarding items with long lead time (e.g. the 650 MHz RF system) were addressed in the guidelines with sufficient clarity. There may be grounds for assigning a high or very high priority to such items to ensure that the necessary work is started in a timely fashion, even though they may not satisfy the other general criteria. Such items can be addressed on a case-by-case basis; and the reasons for assigning priority in such cases should be clearly recorded. The guidelines for assigning R&D priorities should be applied with some flexibility.

3. Review of R&D Priorities.

R&D priorities in the following categories were reviewed:

- 2.2 Multi-particle dynamics
- 3.3 Normal-conducting magnets
- 3.4 Superconducting magnets
- 3.5 Kickers

2.2.1.1 Develop single-bunch impedance models: High Priority

There was some discussion as to whether this should be classed as Very High priority, because of the time required to construct an accurate, detailed model, and because objective 2.2.1.2 (Characterize single-bunch impedance-driven instabilities), which is Very High Priority, relies on such a model being available. In the end, it was agreed to leave 2.2.1.1 as High Priority, as long as it is made clear that this objective needs a steady, ongoing effort with an early start.

2.2.1.2 Characterize single-bunch impedance-driven instabilities: Very High Priority.

The existing priority was agreed.

2.2.2.1 Develop long-range wakefield models: High Priority

The existing priority was agreed.

2.2.2.2 Characterize multi-bunch instabilities: High Priority

The existing priority was agreed.

2.2.2.3 Characterize the effects of injection transients: High Priority

The existing priority was agreed.

2.2.3.1 Characterize electron-cloud build-up: Very High Priority

There has been significant progress in characterizing the build-up in most areas of the damping rings, and the simulations have been benchmarked and are believed to be reliable. However, there are still uncertainties in the wiggler sections, where the electron cloud could have a significant impact. Further experimental studies are needed.

2.2.3.2 Develop electron-cloud suppression techniques: Very High Priority

The existing priority was agreed.

2.2.3.3 Develop modelling tools for electron-cloud instabilities: Very High Priority

The priority level was raised to Very High Priority, because this objective provides essential input for objective 2.2.3.4, which is classed as Very High Priority.

2.2.3.4 Determine electron-cloud instability thresholds: Very High Priority

The existing priority was agreed.

2.2.4.1 Characterize ion effects: Very High Priority

This involves experimental validation of the theories and simulations, as well as predictions for the damping rings. The existing priority was agreed.

2.2.4.2 Specify techniques for suppressing ion effects: Very High Priority

The existing priority was agreed.

2.2.5.1 Characterize space-charge effects: Moderate Priority

Based on the configuration studies performed in 2005, space-charge effects are reasonably well understood, and should be avoidable in the damping rings.

2.2.5.2 Estimate the impact from CSR: Moderate Priority

There has been a substantial amount of work on CSR in general in the past few years, including theoretical development and experimental studies at ALS and BESSY-2. Previous estimates for damping rings suggests that the threshold for CSR instability should be as high as 20 times the nominal current, which may justify reducing the Priority from Moderate to Low. However, there are still some uncertainties regarding the impact of CSR in the wiggler that should be resolved. The existing priority level was agreed.

2.2.5.3 Estimate emittance growth from IBS: Moderate Priority

The existing priority was agreed.

2.2.5.4 Determine the Touschek lifetime: Moderate Priority

The existing priority was agreed.

2.3.1.1 Perform integrated beam dynamics simulations: Moderate Priority

The existing priority was agreed, but should be accompanied by a clear statement that this is an important objective for developing a complete understanding of the beam dynamics in the damping rings, and will take some time to complete. It should therefore be supported at some level at an early stage.

3.3 Normal-conducting magnets

In general, the classification of the development of physics designs as Moderate Priority, and the development of engineering designs as Low Priority is appropriate. However, it should be remembered that in most cases, at least an initial outline engineering design is needed to validate a physics design. An additional objective (2.1.2.3) should be added to the list, to involve the specification of field quality in the magnets, based on studies of acceptance. This should probably be High Priority. Further objectives should be added: 3.3.8 for the physics and engineering design of “other multipole correctors”; and 2.1.4.5 for specification of the orbit and coupling correction scheme (BPMs and steering magnets).

3.4.6.1 Develop physics design for damping wigglers: Moderate Priority

Significant progress has been made at Cornell recently, and it is expected that a report will be available before the end of the year. It is hoped that this report will justify lowering the Priority for this objective from Moderate to Low.

3.4.6.2 Develop engineering designs for damping wigglers: High Priority

An engineering design for the wigglers is long lead-time item, which has an important impact on other difficult areas (particularly the vacuum system). This justifies raising the Priority of this objective from Moderate to High.

3.5.1.1 Develop a fast high-power pulser for injection/extraction kickers: Very High Priority

The existing priority was agreed.

3.5.1.2 Develop physics designs for kicker striplines: High Priority

The existing priority was agreed.

3.5.1.3 Develop engineering designs for kicker striplines: Moderate Priority

The existing priority was agreed.

In addition to the existing kicker objectives, there should be additional R&D objectives to include wider issues for the kickers, including: optics and beamline design specifically for the kicker sections in the damping rings; investigation of techniques to relax the kicker specifications (e.g. closed orbit bumps, RF-separated bypass); general timing issues (e.g. extraction of bunches from the middle of bunch trains, or from the ends).

Action: AW to update the objectives in the R&D database according to the discussions in the meeting.

Action: TM and AW to write additional objectives for kickers R&D.

4. Arrangements for Damping Ring R&D Subtopic phone meetings

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

MPivi and MV have agreed to have joint meetings on electron cloud, and on impedance issues. This will improve coordination and create a more manageable situation, with fewer meetings to keep track of. It is still under consideration whether to have meetings once a month, or once a fortnight.

Action: MPivi and MV to initiate regular meetings on electron cloud and impedance issues.

b. Kickers.

Action: TM to arrange regular meetings.

It would be helpful to have space available on the damping rings wiki site, set up and maintained by Cornell, for announcements and records of the various meetings. The wiki site is already proving invaluable for maintaining information on the damping rings.

It would also be helpful to have space specifically for the work of the RDB S3 Task Force. Part of this space could be open; but a part that is password protected would also be useful.

Action: MPalmer to arrange setting up of space on the damping rings wiki site for:

- Electron cloud and impedance meetings;
- Kickers meetings;
- RDB S3 meetings (including part that is password protected).

5. Dates of future meetings.

It would be helpful to make further progress with the review of damping rings R&D priorities in advance of the Americas Regional Team meeting next Wednesday, 18 October. It was therefore agreed to try to set up a meeting on Tuesday 17 October.

We will try to set up a meeting during the GDE meeting in Valencia in November, which eight members of the Task Force will attend. There should be phone connection available for those wishing to call in.

Action: AW to arrange dates of future meetings.