

Minutes of Meeting #7

WebEx, Wednesday, 6 December

Present: Eckhard Elsen, Susanna Guiducci, Tom Mattison, Mark Palmer, Mauro Pivi, Junji Urakawa, Marco Venturini, Andy Wolski, Mike Zisman.

1. Comments on Minutes of Meeting #6 (WebEx, 22 November).

No corrections.

2. Discussion of Damping Rings R&D Plan Work Package 2.2.1 – Single Bunch Impedance-Driven Instabilities.

Thanks to Marco for preparing a draft of Work Package 2.2.1.

There are two Objectives in this Work Package. Objective 2.2.1.1 (Development of single-bunch impedance models) has high, rather than very high, priority, but is necessary to provide input for Objective 2.2.1.2 (Characterization of single-bunch impedance-driven instabilities), which has very high priority. The importance of 2.2.1.1 needs to be made clear to funding agencies.

Ideally, the impedance model should be assembled from technical designs of all significant components in the vacuum chamber. However, it is recognised that resources are unlikely to be available to support this. Therefore, initial models will be constructed using data from existing machines (e.g. KEK-B), and will be improved and updated as technical designs for vacuum components become available. While data from existing machines will be valuable (including, for example, earlier studies for TESLA) no two machines are exactly alike, and it will be necessary eventually to complete a thorough study based on technical designs of components specifically for the ILC damping rings.

It is desirable to have a system for storage and maintenance of impedance data, and for ensuring effective sharing of this data between those who need it. Some resources should be included in the plan to support the maintenance of data and the communication.

The present version of the work package includes some discussion of the resources that are likely to be available over the next two years. It is hoped that the manpower will be sufficient to carry out the basic tasks (including cataloguing the important components, and constructing an impedance model based on scaling from existing machines); but further resources are desirable to complete the studies necessary to produce more reliable results, as well as to perform comparisons of different design options.

Some resources have already been approved (not all from earmarked ILC funds), and some work started. For example, Kwok Ko's group at SLAC have been in contact with Cornell, to obtain information on the CESR superconducting cavities.

Emphasising the iterative nature of the tasks in this Objective could address concerns regarding prioritisation and funding. In particular, while it will be useful to construct an impedance model based on existing data, it will eventually be

necessary to produce a model based on the specific ILC design. Improvements of the model can be made as the designs of components are produced. Developing the model in conjunction with technical design work will help guide the designs, and lead to a more optimal final design.

No experimental studies are included as part of the plan for this Objective. Experimental studies on impedance issues are planned at the ATF (including an updated impedance model to take account of various changes, e.g. the replacement of the wiggler chambers, since the previous model was developed). The advanced diagnostics at the ATF (e.g. to make precise measurements of bunch lengthening and energy spread increase) will provide a valuable opportunity for benchmarking tools and calculations used for the ILC damping rings. While it is appropriate to include references to experimental studies at the ATF and their relevance for benchmarking, detailed description of these studies belongs elsewhere in the R&D plan (for example, under the Test Facilities category).

No funds for M&S are presently indicated, but may be required (e.g. for computers and software). SLAC have their own tools already in place for the work they plan to do. ANL have recently acquired new computing facilities, and more may be provided by SciDAC (though this is still under discussion).

It was noted that the information in the database includes a large request for M&S at ANL for single-bunch instability studies.

Action: Andy to check database information on ANL resources.

Objective 2.2.1.2 (Characterization of single-bunch impedance-driven instabilities) is a very high priority item; the reliability of results obtained under this Objective depend on the quality of input provided by Objective 2.2.1.1.

Tools for characterization of single-bunch instabilities with a given impedance model are available, and some benchmarking and comparisons have already begun (with early results presented at the Cornell ILC Damping Rings Workshop in September, 2006).

The proposed resources for Objective 2.2.1.2 may be sufficient if all proposals are funded, but more resources would enable more thorough studies and comparisons to be made. It is possible to work incrementally, with impedance sources being added to the instability models as the impedance information becomes available. This has the benefit of allowing a better understanding to be developed of the significance and impact of the various impedance sources.

The main deliverable from this Objective will consist of the feedback provided to those working on lattice design and on design of vacuum system components. The importance of this deliverable should be emphasised.

The tables of resources as presently shown are misleading, in that the "Proposed" resources are those that have been included in funding bids already submitted, and are not those required to complete the tasks specified in the R&D plan. The resources presently listed in the tables in the R&D plan under the heading "Proposed" should be removed completely from the R&D plan, and replaced with a summary of resources needed to complete the tasks specified in the R&D plan (under the heading "Required"). A record of resources included in funding proposals will still be available from the damping rings R&D database.

It is expected that the processes of planning and preparing and submitting funding proposals will proceed iteratively. At any given time, the R&D plan needs to be compatible with a reasonably optimistic view of the resources likely to be available.

It will be useful to have some justification for the required resources included in the R&D plan; however, this document is not intended as a funding proposal in itself. It is to be expected that more complete justification will be included separately in each specific funding bid that is made.

Action: Marco and Mauro to revise existing drafts of R&D Plan Work Packages 2.2.1 (single-bunch instabilities) and 2.2.3 (electron cloud), to remove “Proposed” resources, and replace them with “Required” resources (i.e. an estimate of the resources actually needed to complete the tasks detailed in the R&D Plan).

Action: Andy to circulate information on present resource levels integrated over all damping ring activities, to provide context for estimates made for specific work packages.

3. Progress with R&D Plan Work Packages.

- Lattice design (Mike Zisman): it is possible to outline the likely contents of the Work Package, but nothing has yet been documented. It is hoped to produce a basic draft in time for the MAC, in the second week of January 2007.
- Low emittance tuning (Mike Zisman): no documentation as yet.
- Single bunch impedance (Marco Venturini): a draft was discussed at this meeting (agenda item 2); it already looks good, but some comments were made for revisions.
- Electron cloud (Mauro Pivi): a draft is already available and discussed (agenda item 2 at meeting #6, 22 November). Some further updates have been suggested as a result of discussions at this meeting.
- Ion effects (Marco Venturini/Mauro Pivi): will require some work, and expected to take a little longer than preparation of the WP on single bunch impedance.
- Injection/Extraction Kickers (Tom Mattison): the Cornell damping rings meeting in September provided an outline for this Work Package, but some work is needed to get it written down. A draft will be prepared for discussion at the next meeting.

Action: Those designated should continue preparation of the Work Packages.

4. Next Damping Rings Mini-Workshop.

The proposed dates, 5-7 March 2007, were confirmed, as were the proposed topics (lattice design and dynamic aperture; low-emittance tuning; ion effects.)

Action: Andy to send a preliminary announcement to the damping rings email list.

5. Next meeting.

WebEx, Wednesday, 20 December, 14:00 GMT.

Agenda (to be distributed) should focus on discussion of R&D Work Packages, and preliminary arrangements for the next damping rings mini-workshop. Please forward any other agenda items to Andy.