

## Minutes of Meeting #3

Tuesday, 17 October, 23:00 GMT

*Meeting by WebEx. Present: Tom Mattison, Mark Palmer, Mauro Pivi, Junji Urakawa, Marco Venturini, Andy Wolski.*

### 1. Comments on, and corrections to, previous minutes

The priority of R&D Objective 3.5.1.3 (Develop engineering designs for kicker striplines) was incorrectly recorded in the minutes of Meeting #2. The priority agreed at the meeting was “Moderate”.

**Action:** A. Wolski to distribute corrected minutes.

Some clarification was requested on the priorities agreed at the previous meeting for two R&D Objectives:

2.2.1.1 Develop single-bunch impedance models: High Priority

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

As discussed at the Cornell damping rings workshop in September, the intention is to use relatively simple models for early characterization of the single-bunch instabilities. Such models can be assembled from existing machines (with appropriate scaling), while more detailed design work on the vacuum systems is in progress. The vacuum design work is needed to develop a complete and accurate impedance model, but will take some time to complete, and will also require guidance based on early estimates of the instability thresholds. Development of a detailed R&D plan, which will specify the process towards achieving the stated objectives, will be the responsibility of the S3 Task Force following our review of the R&D Priorities (to be completed shortly).

### 2. (Continuing) review of R&D priorities

R&D priorities in the following categories were reviewed:

3.6 Damping Ring RF Systems

3.7 Instrumentation and Diagnostics

#### 3.6 Damping Ring RF Systems: High Priority

Some general comments were made regarding the R&D for the 650 MHz damping rings RF systems. Although there can be confidence that a suitable system can be developed, the damping rings RF will be a complex system requiring attention to many details. For this reason, an expeditious start on the development of the system is required if the project is not to be delayed later on. Development starting in 2008 would allow testing of a prototype system (including klystron and cryomodule) in 2011 at the earliest. It is envisaged that development can proceed in parallel with industrialization.

In general for Objectives in this category, development of the damping rings RF systems should continue to be High Priority.

**Action:** M. Palmer to send A. Wolski revised statement of R&D Objectives, more accurately and appropriately reflecting the work needing to be done.

Both Cornell and KEK have expressed an interest in the development of the damping rings RF system. It is unclear at the moment how the work could best be organized.

**Action:** M. Palmer to make necessary contacts at KEK, to discuss coordination of the RF system development work.

#### 3.7.1.1 Develop beam lifetime instrumentation: Moderate Priority

Capability of measuring the beam lifetime during operation (when each beam is stored for 200 ms) could be very useful, but not necessarily essential. The existing priority classification was agreed.

#### 3.7.1.2 Develop fast loss monitors: Moderate Priority.

The existing priority was agreed.

#### 3.7.2.1 Develop beam position monitors: Moderate Priority

Modern BPM electronics can achieve good performance. Test of Echotek BPMs have been carried out at the ATF, demonstrating the resolution and stability in the range expected to be required for the damping rings (although interfacing the Echotek boards to the control system in a reliable fashion was found to be a challenge). Design work on the buttons (for effective pick-up and low machine impedance) is required. The existing priority was agreed.

#### 3.7.2.2 Develop feedforward for extraction kicker stabilization: High Priority

The existing priority was agreed.

#### 3.7.3.1 Develop high-precision beam size monitor: Moderate Priority

Significant progress has been made at the ATF with various types of high-precision beam size monitor (including X-ray SR monitor, laser wire, and interferometer). The required performance has been demonstrated, with resolution of around 1 micron for the X-ray SR monitor, and a few microns for other instruments. There is potential (by using shorter wavelength X-rays, for example) further to improve the resolution. Measurement rates of the order of 1 kHz are feasible. However, more work is needed to develop the instrumentation to the point where it can be used reliably and routinely. It was agreed to reduce the priority classification from High to Moderate.

#### 3.7.3.2 Develop precision bunch-by-bunch beam size monitor: Moderate Priority

There have been successful demonstrations of bunch-by-bunch beam size measurements at ATF using the laser wire, though accumulation of the raw data is rather slow. A project to develop a bunch-by-bunch beam size monitor is in progress at Cornell, and some tests have already been performed at CESR. The challenges involved in developing an effective diagnostic are significant; however, it is felt that while very useful (particularly for studies of multi-bunch instabilities that develop along a bunch train, e.g. e-cloud), such instrumentation may not prove critical for operations. The existing priority level (Moderate) was agreed.

### 3.7.3.3 Develop instrumentation for measuring injected phase space: Moderate Priority

Some techniques are known, and could be used for tuning the machine, rather than monitoring during operation. This would probably be sufficient. The existing priority was agreed.

### 3.7.3.4 Develop instrumentation for monitoring emittance damping: High Priority

The requirements include the need to run for continuous monitoring during operations, and with bunch-by-bunch capability to diagnose instabilities. These requirements make the instrumentation somewhat challenging. The existing priority classification was agreed.

### 3.7.3.5 Develop fast coupling monitor: Moderate Priority

Cornell has a project in progress, based on a visible SR monitor with bunch-by-bunch and turn-by-turn capability. While challenging, it is expected that an appropriate instrument can be developed. The existing priority level was agreed.

### 3.7.4.1 Develop coherent signal receivers: Moderate Priority (to be reviewed)

Coherent signal receivers would be used for diagnosing instabilities. The requirements need to be clarified.

**Action:** M. Palmer and J. Urakawa to clarify requirements and recommend the appropriate priority classification at a later meeting.

### 3.7.5.1 Develop tune monitors: Moderate Priority (to be reviewed)

Good instrumentation for tune measurement exists; however, the specific requirements for the damping rings may present challenges (e.g. if continuous tune measurements are needed during operations).

**Action:** M. Palmer and J. Urakawa to clarify requirements and recommend the appropriate priority classification at a later meeting.

### 3.7.5.2 Develop instrumentation for fast dispersion measurements: Moderate Priority

Fast dispersion measurements would be useful for continuous tuning of the machine to minimize vertical emittance during operations. Some techniques are possible, and have been tried; more development and experience is needed. The existing priority level was agreed.

The overall requirements for instrumentation and diagnostics need to be clarified, and an instrumentation “scheme” for the damping rings specified, i.e. numbers and locations of instruments, performance capabilities, modes of operation and special requirements (during machine operation, or tuning).

**Action:** A. Wolski to add an R&D Objective to category 3.7, for specification of general instrumentation capabilities and requirements. This should be High Priority.

### 3. Arrangements for damping rings R&D subtopic phone meetings

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

A possible date (Tuesday 31 October) has been tentatively identified for the first joint meeting of the ecloud/impedance group.

**Action:** M. Pivi and M. Venturini to initiate regular meetings on electron cloud and impedance issues.

- b. Kickers.

Work in progress.

**Action:** T. Mattison to arrange regular meetings.

### 4. S3 web space

Thanks to Mark Palmer and his colleagues at Cornell, areas within the damping rings Cornell wiki site are being set up for S3 and the specialist R&D groups. There is still some work needed to fully configure these areas.

### 5. Future business

Following the review of R&D priorities, the next jobs for the S3 Task Force will be:

- Identification of activities that duplicate effort, and resolution of such duplications.
- Identification (and fixing) of gaps in the R&D program (high priority items that are not being addressed).
- Preparation of a detailed R&D plan, including milestones and deadlines.

These activities should form the main part of the business during the S3 meeting in Valencia.

**Action:** A. Wolski to prepare outline for R&D plan, for discussion at Valencia.

### 6. Other issues

There was a query as to the status of the “central injector” configuration, which would put the two damping rings (electron ring and positron ring) into a single tunnel close to (or around) the interaction region. This is being actively pursued, and Ewan Paterson has submitted a Configuration Change Request (CCR) to the CCB. There will be a CCB teleconference regarding this configuration change on Monday, 23 October.

**Action:** A. Wolski to circulate information regarding the central injector CCR.

**Action:** All to contact Ewan Paterson and Nobu Toge, to comment on the implications of the central injector configuration for the damping rings, particularly as regards the injection/extraction systems, and the timing scheme.

## 7. Dates of future meetings

We will try to meet on Tuesday 24 October by WebEx, to complete the review of R&D priorities. This depends on M. Zisman being available, to provide recommendations on priorities for classifications 2.1 (Single Particle Dynamics) and 3.1 (Vacuum Systems).

**Action:** A. Wolski to confirm availability of M. Zisman on 24 October, and arrange meeting on this date by WebEx.

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:** A. Wolski to arrange meeting at Valencia.