

Availability meeting Notes – July 21 / July 22, 2009

Marc Ross, Chair

Notes provided by Nick Walker. This summary was written by Marc and lists his conclusions.

Attendees: Carwardine, Elsen, Fukuda, Himel, Michizono, Paterson, Ross, Terunuma, Toge, Walker, Yamamoto, Yokoya

Presentation material by Chris Adolphsen and Shigeki Fukuda.

Indico meeting location: <http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=3739>

Note that the Availability Task Force has a dedicated area with ILC-EDMS where all material is posted in addition to the indico site.

**NEXT Availability meeting: August 4 (2100 SLAC, 2300 Fermilab)/August 5 (0600 DESY, 1300 KEK) 2009. Several members from KEK will attend the annual meeting of the Particle Accelerator Society of Japan and may not be able to connect.**

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The meeting consisted of reports on the 'klystron cluster scheme' and the 'distributed RF scheme' – specifically answering questions from Tom.

#### **Review:**

The goal of the availability task force is to provide viable availability models for SB2009. These are to be presented at the upcoming GDE meeting "ALCPG09", Sept 29 - Oct 3, 2009 for review and comment by the GDE community at large. The models (possibly revised) will be submitted to the Project Director by the end of 2009 along with the recommendation that they become part of the ILC TDP2 baseline. It is important to note that the components of SB2009 which most strongly impact ILC availability are the ML single tunnel, the low power option and the two HLRF options (KCS and DRFS) and the task force work will be limited to these dominantly ML issues. *Work on combinations of SB2009 components and Reference Design – RDR - components, (for example a single tunnel high power configuration), will be very limited.*

#### **Summary:**

(What follows is perhaps more a set of highlights than a summary and reflects Marc's conclusions.)

#### Klystron Cluster (KCS):

The system can be divided into three segments – 1) the klystron / modulators – up to (but not including) the wrap-around mode converter (called 'tap-in CTO') that feeds the large circular wave guide, 2) the long over-moded waveguide itself from tap-in CTO to tap-off CTO, and 3) the local RDR-like WR650/770 distribution system. Segment 1 includes 2 spare klystrons (out of ~16). Replacing a klystron requires a short shut-off (1 minute) to close an isolation valve. No downtime is expected, since replacement can take place during operation and it is assumed that the fault is repaired before a second failure in that distribution system occurs. Segment 3 is virtually identical to the RDR. Segment 2 – the passive waveguide system – must be kept quite reliable since those failures would be 'common mode' and would be expected to stop operation. Based very roughly on experience with similar (X-band) systems, we assume two types of failures – 1) 'short', from which recovery is ~one minute and 2) 'requiring replacement'.

There will be a temptation with KCS to combine magnet circuits etc, which will raise the chance of common mode failure.

#### Distributed RF (DRFS):

The system overview was presented July 8. It has been adapted, through the application of redundancy, to suit expected MTBF. Three components were discussed: 1) klystron – preventative maintenance is effective at KEK for predicting end-of-life based on emission data, 2) DC power supply – this scheme may require a redundant DC supply, 3) mod-anode pulser – already made redundant in the scheme which was presented (an isolation fuse is an important part which makes the redundancy possible).

#### Operations and Maintenance Model:

Availsim includes a 'staff-limit' parameter which limits the repair work that can be done in a given operations model. For the DRFS, this may prove important. At the July 15 meeting, three models were proposed: 1) a single long downtime with 'opportunistic repairs' that are done in parallel with unrelated interruptions, 2) a single long downtime without 'opportunistic repairs' and 3) annual downtime divided into three components – 2 moderate length downtimes (e.g. one month each) and scheduled maintenance. *We propose the adoption of the latter model for further development.* This model best fits the operations / maintenance scheme used at light sources, and may prove useful in dealing with the reliability of devices listed in RDR table 2.9-1, most of which are not related to energy overhead. (John Carwardine

will discuss the performance of such devices, including the connection to the operations and maintenance model and to the preventative maintenance program, at our next meeting).

**Discussion:**

(Key Q/A raised).

Q: KCS waveguide isolation valves have been questioned before. Are these likely to be effective?

A: Yes. The waveguide pressurization system is an important detail.

Q: Will we compare DRFS and KCS as part of a summary of task force work?

A: We don't plan to. There will be different optimum operations and maintenance models and different energy overheads. There will be different 'risk' levels associated with ongoing R & D. A very important output from the task force is the development of a *workable availability model* for each scheme, including an understanding of single tunnel accessibility issues and etc.

Q: Input is needed from RTML- especially since our working assumption is that the support equipment for the main linac section of the RTML will be inaccessible.

A: Nikolay has provided much of this information.

**Task force planning and homework:**

At the next meeting we will have a report from subgroup 2 (Carwardine) on MTBF for 'off the shelf' items and items with a substantial experience base. His presentation will include input from ANL.

I believe two face-face meetings (~1 1/2 day elapsed time) would be useful during this initial phase (up to ALCPG09) of the task force:

1) At Slac - with a focus on initial Availsim output and analysis. Not yet scheduled.

2) At kek - with a focus on Hlrf and subgroup 3 activities. This meeting is tentatively scheduled in the window 1330 – 1730 Aug 27, JST (2130 – 0130 Aug 26 / 27 SLAC, 0630 – 1130 Aug 27 DESY). Because of this, the meeting nominally scheduled for August 25/26 will not be held.

