AvTF Meeting Summary 02.09.2009

Attendance: Walker, Carwardine, Paterson, Himel, Elsen, Shidara,..

Ross could not attend due to travel, so Walker chaired the meeting.

Brief summary of KEK discussions

- Walker, Shidara commented on the discussions had at a recent meeting between the KEK group and Marc Ross (Walker on WebEx).
- The KEK group (Fukuda et al) will produce a comprehensive report on the DRFS high-availability measures for ALCPG.
- Walker noted it remains to be discussed if this should be a 'stand-alone' report, or integrated into AvTF report. A similar section/write-up should be commissioned for the KCS.

New AVAILSIM results for Main Linac Single-Tunnel studies (Himel)

- Himel present a summary excel sheet of the most recent studies for the ML single-tunnel (SB2009) options. See attached sheet.
- AVAILSIM has undergone several detailed modifications to support the studies as requested:
    - Low-P option (50% klystron count from RDR)
    - Scheduled regular down-time (scheduled 16 hours access + 8 hours recover)
    - 18% of cyro-related problems (and all other faults) repaired during long annual shutdown (assumed 5 month run)
    - Implemented MTBF's as proposed by Carwardine (Himel noted in passing that these are better than his best knowledge of achieved numbers in existing accelerators). Most numbers have not changed. Improvements tend to agree with Himel's already stated improvement factors. Elsen ask how improvement factors were determined: look at largest contributors and adjust corresponding MTBF accordingly.
- Primary conclusions of studies (TBC):
    - Impact of going from two to one tunnel for the Main Linacs is ~2% effect in availability.
    - An energy overhead of 4-5% is sufficient
    - There is little or no difference between KCS and DRFS (DRFS may required ~1% higher energy overhead)
- Attached sheet contains the summary results for 25 scenarios. Analysis of these scenarios highlighted some interesting caveats and discussion amongst the group:
    - Initial studies assumed 20% energy overhead to effectively zero the impact of RF failures, so that the impact of other equipment (PS, controls etc.) could be studied independently
        - Himel noted he increased the overhead for the injector RF to 20% to remove it from the availability statistics, as it was causing significant downtime in the results.
    - Scheduled maintenance downs (16+8 hours every 4 weeks) – with no repairs – was accounted for in availability (4-5% drop in annual integrated luminosity). Some disussion followed on how to account for scheduled downs. It was noted that it is difficult to foresee/predict the exact downtime/maitenance model that management will adopt. Scheduled downs (runs) are likely to differ from year to year depending

on programme and state of the machine. Requirements of the detector(s) – including push-pull time and scheduling, have also note been taken into account.
    - In AVAILSIM, allowing repairs during scheduled maintenance decreases availability. This is because repair work generally runs over the 'scheduled' total period of 16+8 hours. Everything broken gets repaired during scheduled maintenance periods.
    - When studying required energy overhead, it was observed that the low-P option requires a larger relative overhead than the RDR. This was attributed to the lower number of stations (50%) and the quantum nature of the statistics.
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- Elsen commented that there are many subtle effects in AVAILSIM that effect the details of the results, and it would be good to catelogue them and attempt to clearly explain them for the benefit of the rest of the community (part of the report). Elsen and Walker will attempt to make a first pass.
- The complexity of the AVAILSIM model was brieflt discussed. Noted that many 'parameters' and assumptions have leverage on the results. Walker commented addressing these 'sensitivities' was one of the charges for Group 2 but this had not really been worked on (yet). It would be good to quantify which assumptions have the biggest leverage/impact.

ALCPG presentation, Report and further work

- Himel will give a 30' report on the AvTF work/findings during the first ADI plenary session at ALCPG. He will distribute a draft outline of the talk for comment/iteration.
- A written report is also required (first draft time-scale is DESY ADI meeting 2-3.12). Walker/Elsen will provide a draft outline.
- Both report and presentation need to represent consensus of the AvTF.
- Walker noted that although SB2009 was the rationale for forming AvTF, it is foreseen to maintain the group/momentum on this important subject into TD phase 2. Walker also noted the hope to extend the group to include CERN contributions (both LHC and for CLIC).

Next meeting: Wednesday 09.09.09 (all the nines!). Agenda to be announced.

Run Number	LC description	Simulated % time down incl forced MD	Simulated % time fully up integrating lum or sched MD	% time scheduled maintenance	Simulated % time integrating lum	Simulated % time scheduled MD	Simulated % time actual opportunistic MD	Simulated % time useless down
ILC5	Pre-RDR, undulator e+, KAS	17.7	82.3	0.0	76.7	5.6	1.9	15.8
ILC105	Updated towards RDR and SB2009 repair fraction of cryo and all other devices each long down, 5 month run, fix extra things during unsched downs, no sched downs, table D MTBFs, 20% energy overhead, low P	13.2	86.8	0.0	80.9	5.9	1.6	11.6
ILC106	ILC 105 but linac in 1 tunnel	15.6	84.4	0.0	78.9	5.5	2.0	13.6
ILC107	ILC 105 but no extra repairs during unsched down	13.9	86.1	0.0	80.6	5.5	2.0	11.9
ILC108	ILC 107 but add sched downs with no repairs made	13.0	81.0	6.1	75.3	5.7	1.8	11.2
ILC109	ILC 107 but add sched downs with repairs made (incl klys) (2 tunnel 10 MW)	13.4	79.7	6.8	74.1	5.6	1.9	11.5
ILC113	ILC109 but 1 tunnel and KlyClus	14.3	78.7	6.8	73.7	5.0	2.5	11.8
ILC114	ILC109 but 1 tunnel and DRFS	14.3	78.6	6.8	73.6	5.0	2.5	11.8
ILC115	ILC109 but 1 tunnel	14.3	78.7	6.7	73.7	5.0	2.5	11.8
	20% energy overhead							
ILC109	ILC 107 but add sched downs with repairs made (incl klys) (2 tunnel 10 MW)	13.4	79.7	6.8	74.1	5.6	1.9	11.5
ILC113	ILC109 but 1 tunnel and KlyClus	14.3	78.7	6.8	73.7	5.0	2.5	11.8
ILC114	ILC109 but 1 tunnel and DRFS	14.3	78.6	6.8	73.6	5.0	2.5	11.8
ILC115	ILC109 but 1 tunnel	14.3	78.7	6.7	73.7	5.0	2.5	11.8
	3% energy overhead							
ILC109	ILC 107 but add sched downs with repairs made (incl klys) (2 tunnel 10 MW)	18.3	74.6	6.9	70.3	4.3	3.2	15.1
ILC113	ILC109 but 1 tunnel and KlyClus	16.7	76.3	6.7	72.0	4.2	3.3	13.5
ILC114	ILC109 but 1 tunnel and DRFS	21.1	71.8	6.7	68.3	3.6	3.9	17.2
ILC115	ILC109 (10MW) but 1 tunnel	32.2	60.8	6.4	57.5	3.3	4.2	28.0
	4% energy overhead							
ILC109	ILC 107 but add sched downs with repairs made (incl klys) (2 tunnel 10 MW)	14.6	78.4	6.8	73.2	5.3	2.3	12.3
ILC113	ILC109 but 1 tunnel and KlyClus	14.5	78.5	6.7	73.7	4.8	2.7	11.8
ILC114	ILC109 but 1 tunnel and DRFS	17.0	76.0	6.7	71.8	4.2	3.4	13.7
ILC115	ILC109 (10MW) but 1 tunnel	26.7	66.2	6.6	62.8	3.4	4.1	22.6
	6% energy overhead							
ILC109	ILC 107 but add sched downs with repairs made (incl klys)	13.2	79.8	6.8	74.2	5.6	1.9	11.3
ILC113	ILC109 but 1 tunnel and KlyClus	14.3	78.7	6.8	73.7	5.0	2.5	11.8
ILC114	ILC109 but 1 tunnel and DRFS	14.4	78.6	6.8	73.6	5.0	2.5	11.8
ILC115	ILC109 (10MW) but 1 tunnel	20.1	72.6	6.9	68.5	4.1	3.4	16.7