Minutes for S0S1 teleconference 21.6.2007

1. S0 Tight-loop status

    a. List of Phil

The list of potential cavites relevant to S0S1 is available at:
http://tdserver1.fnal.gov/project/ILC/S0/S0_coord.html
People at the labs should crosscheck the list.

    b. HPR Problem at KEK Hayano

The HPR system at Nomura shows problems when longer rinse times are used e.g. for nine-cell cavities. After some time an oil contamination is observed. Now the system has to be thoroughly cleaned. At DESY, the cleaning of the system after a severe problem with the HPR caused a downtime of several weeks This means that KEK would be ready for the reception of cavities not before November 2007.

    c. JLab/FNAL Vertical testing

Detailed mode measurements on both AES and ACCEL cavities are needed. In the AES case a few cells seem to be limiting. It needs to be understood, what are the fields in the others: 20, 25, 35MV/m? What is the limitation for each mode? Preliminary test results on resistors on the outside of the cavities are not yet conclusive.
Further questions: Is mode measurement data available on ACCEL cavities? If so, can the changes in the pi-mode measurements be attributed always to the same pair of cells or are different cells limiting for the different tests?

The task force would like to encourage systematic mode measurements on further tests. Furthermore, temperature mapping systems need to be used on as many tests as possible (also at DESY and KEK) to understand the limiting mechanisms better (see discussion on next topic below).

Due to the unavailability of the KEK system, the ACCEL ACC6 and ACC7 cavities should be tested at FNAL after the vertical test stand has been set up with the AES cavities. This includes the test whether it is feasible to have cavities prepared at JLab and then be tested at FNAL, as the ANL/FNAL system for cavity preparation is not available yet.

Two Ichiro cavities will be send to JLab for starting the tight-loop effort. The two ACC cavities at Cornell are currently being prepared for test at Cornell. After these tests, which should be done within one month, the cavities are going to be tested at JLab as they are candidates for S0.

DESY has now received the detergent from JLab. It is currently being analyzed. Then it is proposed to repeat the tests made at JLab and not to mix alcohol rinse and ultrasound cleaning, but have separate tests.

2. Hasan's additional topics Hasan

Please find the mail from Hasan out lining his interpretation of the data in Appendix.

In the discussion several points where made:

- T-maps at DESY on 11 cavities from the last production suggest that 6 cavities quench on the equator. At least one more cavity shows an field emission induced quench.
- Camille's data analysis on the mode measurements should be re-done with a cut on cavities better than 28 MV/m to see whether these cavities show a stronger tendency to be limited at the end cells. This could hint to problems at the HOMs.
- The Multipacting simulations on the HOMs should be re-visited:
    - Does the insertion of the antenna tips change the Multipacting behaviour?
    - What happens if the SEEC is increased to a maximum of 2?
- More t-maps are needed. It would be useful to equip the vertical test stands with a few flexible sensors which could be put to the HOM location.

3. More Observers to S0S1

A request by Mark Champion and Rongli Geng was made to join the S0S1meetings as observers. Task force members should send their opinions to Lutz within a week. He will compile them.

4. Costing excersise

The template for the costing of the S0S1 cavity preparations will be supplied by John. Phil will follow up on this.

5. Next face-to-face meeting

The meeting will take place at KEK on 16th and 17th august 2007. It will not start before the afternoon of the 16th. A Webex/telephone connection should be available.

Appendix A – Hasan's email

Dear S0 Task Force Members

After the very informative Hamburg LCWS and other meetings, a few topics occured to me that bear on the charge of our S0 Task Force. Please refer to Figures in attached file.

Bottom Line:: Recent results from KEK (3micron closed EP), DESY (ethanol rinisng) and Jlab (soap and water rinsing) suggest that as field emission comes under control, quench becomes the dominant cause for gradient spread. Our task force needs to address what are the possible sources of quench spread and what measures our parallel program should get ready to address the gradient spread due to quench.

Here are more details and interpretation of data presented recently that lead me to the above

1) KEK results

Figure 1 reproduces the one cell results at KEK, where the spread is broad: Eav= 39.1 +- 8.2 MV/m. The color code (red/blue) indicates that all (except one) results are limited by quench (red). From here I conclude that most of the spread in the "regular treatment" of single cells at KEK comes from QUENCH, not field emission.

Figure 2 shows the famous "narrow spread" in the KEK results after a new final preparation which is 20 micron EP plus 3 micron closed EP. Again Q vs E and color code says that there is no field emission, and the results are limited by quench, but these results are close to the max magnetic field. so quench as a limit is expected.

From these two figures I conclude that "regular treatment" of Figure 1 may be leaving "bad spots" on the surface which produce a significant spread in quench field (not field emission), and that the treatment of Figure 2 (closed 3 micron EP) avoids such quench producing bad spots.

The new treatment does NOT offer help to solve the field emission related spread problem, because the 1-cell cavities of Figure 1 are not limited by field emission.

2) DESY results

Figure 3 shows the nice results presented by Dieter/Reschke at the Hamburg meeting working group. It was said that 9-cell cavities tested on the right half of the collection all had ethanol rinsing, and the results show that field emission is greatly reduced as compared to the test results on the left half of the figure.
But now QUENCH is responsible for a large spread from 15 - 42 MV/m

3) Jlab results

Figure 4 shows a collection of eight Q vs E curves on two ACCEL cavities tested at Jlab,

all ultrasound rinsed with soap and water. The transparency which Lutz showed at the MAC mentions that only one of these tests showed field emission (which did process). Once again there is a large spread from 24 - 42 MV/m due to QUENCH. (I leave out the the first qualifying test on A6 as perhaps due to an error of EP or not enough material removal).

Next steps: Identigy possible sources of quench limits, associated spread, and identify possible remedies.

1) Bad spots: EP leaves bad spots on the surface, kek closed EP helps reduce these. More labs need to try closed EP to to see if this reduces the quench spread.

2) Multipacting: At Hamburg, Solyak presented new simulations of multipacting in the TESLA HOM coupler for the ILC cavity case in the range from 27 - 42 MV/m. See Figure 5 attached. He shows a dangerous value for the enhanced counter function which could actually be much larger if the real secondary emisison coefficient in the HOM coupler is larger than the simulations assumed. I have asked Nikolai to look for the impact energy of these barriers. Could MP in the HOM coupler be responsible for gradient/quench spread in ILC cavities? We need to add thermometers at the HOM couplers to the next tests at DESY, JLAB...to confirm or eliminate this source of quench

3) Is the RRR of our cavities not high enough? We need to look for correlations between RRR values and quench fields in cavities that show little or no field emission. I believe Camille Ginzburg is already looking for this as we discussed in previous emails.

4) We need to add thermometry to every 9-cell test to understand the sources of quench.. Since we are early in our tight loop program it is best to do this as soon as possible

Hasan