

# Minutes and Actions of Site Qualification Task Force

## Phone Conference – 13<sup>th</sup> of January 2005

*Present:* (A. Andreazza), (J.C. Clemens), G. Darbo, M. Garcia-Sciveres, P. Gerlach, D. Giugni, F. Huegging, L. Rossi, (S. Vahsen), E. Vigeolas.

### **CPPM.**

Four modules of stave S4031 have been replaced: the 3 modules that had electrical problems (mod. 6C, 5C, 3C) plus a new module (1C) that was found having 2 FE-chip dies (#6 and #7) cracked. This probably happened during the several transfers of the stave to other sites for performing tests. The LOAD electrical test performed on the replaced and neighbor modules did not show any degradation. Thermal cycles and STAVE test is ongoing. The thermal resistance of the new 4 loaded modules is in the limit for all modules, but one is sensibly higher: 2.18, 1.69, 1.58, 1.55 °C/W. Survey of the new modules will be made after electrical test completion.

The production test setup has been upgraded with the replacement of the power switchboard designed in CPPM with two SURFs.

A new stave is almost completed (S4015) having 12 modules already loaded. More information about the activities in CPMM is in:

[http://www.ge.infn.it/ATLAS/SQTF/Minutes/Minutes\\_05-01-13\\_aux/CPPM\\_status.rtf](http://www.ge.infn.it/ATLAS/SQTF/Minutes/Minutes_05-01-13_aux/CPMM_status.rtf)

*Modules are soon needed for a new stave to be loaded. Attilio, Claudia and Fabian will have to select 15 of them. CPPM keep asking to have a larger batch of modules in their site to be used when required for a new stave.*

### **Genova**

A new stave (the 4<sup>th</sup> one, S4048) has been loaded before Christmas. It is currently under survey. The previous stave (S4024) is under electrical test. The survey has been made but it was forgot to unscrew and tight again the screws fixating the stave to the cradle. It is suspected that the noticed bow of the module position in X could be due to thermal expansion of the aluminum cradle (~5°C between loading and survey room temperatures). Survey will be repeated after electrical test completion.

To improve the precision of the loading robot, 3 additions to the setup are under way:

1. Temperature will be monitored by a temperature logger with 4 channels. Temperature probes have been put in thermal contact with support parts of the robot and also air temperature is monitored.
2. A linear encoder from Heidenhain, mod. LS-487C, having 5 µm precision, have been ordered. The encoder has a travel of 92 cm and will be used to monitor and correct the linear Z movement of the robot stage.
3. A digital measuring microscope has been bought and it will be used to measure the position of the modules in the garage position or on stave. The microscope is from

Keyence, mod.VHX-100 with two zoom lens (25÷175 X and 100÷1000 X). It has 18 MPixels resolution and can do calibrated distance measurements on the images.

The production test setup for the stave uses two SURFs, other two will be added as soon as they will arrive. The movement of the source is controlled under the ambush program. For next stave the test should run in completely automatic way. Some new analysis cuts have been defined to overcome to the "bias effect" on HV off when a module is tested with the SURF. More information

[http://www.ge.infn.it/ATLAS/SQTF/Minutes/Minutes\\_05-01-13\\_aux/Genova\\_status.rtf](http://www.ge.infn.it/ATLAS/SQTF/Minutes/Minutes_05-01-13_aux/Genova_status.rtf)

### **Wuppertal.**

The first stave (pre-production stave S4018) has been completed before Christmas. Survey has been made and results show that the modules are well in the  $\pm 50 \mu\text{m}$  tolerances for X, Z. Only two modules have X slightly out of the specs (respectively  $51 \mu\text{m}$  and  $67 \mu\text{m}$ ). Presumably the larger error comes from the modules moving from deposition position before complete glue polymerization. Indeed the time passed from module deposition to robot head removal was of only one hour for those modules.

Survey results are available at:

[http://www.ge.infn.it/ATLAS/SQTF/Minutes/Minutes\\_05-01-13\\_aux/S4018\\_13Jan05.xls](http://www.ge.infn.it/ATLAS/SQTF/Minutes/Minutes_05-01-13_aux/S4018_13Jan05.xls)

Wuppertal did several test of screwing and unscrewing staves to their cradle and from found that the bow of the used stave did not change.

### **LBL.**

Maurice presented the status of the sector production at LBL that is summarized in the table:

<b>Sector</b>	<b>Loading complete</b>	<b>"Load" tests complete</b>	<b>"Burn-in" test complete</b>	<b>"Thermal soak" complete</b>	<b>"Stave" tests complete</b>
9006	24-Sep-04	17-Nov-04	21-Nov-04	-	29-Nov-04
9007	30-Sep-04	11-Nov-04	03-Nov-04	12-Oct-04	09-Nov-04
9008	18-Nov-04	02-Dec-04	01-Dec-04	07-Dec-04	17-Dec-04
9009	19-Oct-04	09-Dec-04	18-Dec-04	13-Dec-04	04-Jan-05
9010	29-Nov-04	03-Dec-04	02-Dec-04	07-Dec-04	09-Dec-04
9011	06-Dec-04	20-Dec-04	14-Jan-05	04-Jan-05	15-Jan-04
9012	10-Dec-04	04-Jan-05	07-Jan-05	08-Jan-05	11-Jan-05
9014	20-Dec-04	07-Jan-05	10-Jan-05	11-Jan-05	12-Jan-05
9013	07-Jan-04				
9015	14-Jan-05				

**complete**  
**expected**

LBL has two more sectors to go (after 9015) to complete out 10 sector qualification set. They would like to carry out the qualification evaluation on whatever sectors have been

completely tested at the time of the loading of the 10th sector. In this way they can reduce the loading down time due to the evaluation exercise. Seems reasonable to proceed in this way and ask them to complete the exercise when all 10 sector will be fully evaluated.

### ***Stave / Sector ranking.***

We discussed how to proceed to stave ranking (sector will follow a similar procedure). The final ranking will account for input variables and already assigned penalties to the modules. The input variables will come from measurements of sub-assembly items: BareStave, Modules, StaveAssembly. For each of the former items there are variables measured during qualification that will be used to calculate penalties. From a first analysis identified variables are:

- BareStave.
  - Geometry: bow(s), tilt angle and planarity of shingles.
  - Thermal.
- Modules.
  - Initial penalty before loading plus added penalty after loading. Not all the variables used for the initial penalty are re-measured after loading. The variables measured after loading must be compared with their value before and the added penalty will be a function of their change.
  - Thermal performance ( $\Delta T/W$ ).
  - Loading variables: glue shear value, ...
  - Reworking after loading. If rework is done the penalty must be added.
- StaveAssembly
  - Survey variables. X,Z and bow of modules enter in the penalty.
  - Reworking of stave.

Attilio and Maurice will make a proposal on how to evaluate the “Module” added penalty. Attilio will prepare an application to extract, as happen for the modules ranked before loading, the penalty from the database. It is planned to present a first proposal at the Pixel Week of February.

### ***A.o.B.***

Next ID Week of February will have 1.5 hours for the module loading talks in the combined “Module and Module loading” meeting. We have decided to have the following talks:

1. Status of Module Loading – Peter Gerlach
2. Short report from module reworking on stave – Jean-Claude Clemans
3. Ranking
4. Production Planning – Giovanni Darbo.

Sites must provide infos for the speakers.

Peter raised a worry on the precision of the relative humidity sensors used to evaluate the dew point in the cold box used for thermal cycles. He claimed that the 2 % precision of the Honeywell HIH3602C sensor is not enough to guarantee that the dew point is below  $-30^{\circ}\text{C}$  used in the thermal cycle. From the table shown in appendix it results that if the

temperature of the box is below 0°C a RH = 8% has a dew point below -30°C. So even an uncertainty of  $\pm 2\%$  can be managed by reducing further the RH needed. It has been asked to post to EDMS the TDAQ macros used for LOAD/STAVE tests. Giovanni asked (again) to load the summary spreadsheet and the survey results to the Raw PDB as soon as are available.

Next Meeting: (ID Week).

## Appendix: Air Dew Point Calculation.

Here is the formula for calculating dew point:

Set  $x = (1 - 0.01 \text{ RH})$

where RH is the relative humidity expressed as a percent (a number between 1 and 100).

Then calculate

$$\text{DPD} = (14.55 + 0.114T) x + ((2.5 + 0.007T) x)^3 + (15.9 + 0.117T) x^{14}$$

where T is the temperature in degrees Celsius. This calculation yields the difference between the temperature and dew point in degrees Celsius. Finally, compute the dew point  $\text{TD} = T - \text{DPD}$ . The answer is in degrees Celsius.

### DEW POINT TEMPERATURE

T (°C)	Relative Humidity (%) - RH																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
-10	-52	-50	-48	-46	-44	-42	-41	-39	-38	-37	-36	-35	-34	-33	-32	-32	-31	-30	-30	-29	-29
-9	-52	-49	-47	-45	-43	-41	-40	-39	-37	-36	-35	-34	-33	-32	-32	-31	-30	-30	-29	-28	-28
-8	-51	-49	-46	-44	-42	-41	-39	-38	-37	-35	-34	-33	-32	-32	-31	-30	-29	-29	-28	-28	-27
-7	-51	-48	-46	-44	-42	-40	-38	-37	-36	-35	-34	-33	-32	-31	-30	-29	-29	-28	-27	-27	-26
-6	-50	-47	-45	-43	-41	-39	-38	-36	-35	-34	-33	-32	-31	-30	-29	-28	-28	-27	-27	-26	-25
-5	-49	-47	-44	-42	-40	-39	-37	-36	-34	-33	-32	-31	-30	-29	-28	-28	-27	-26	-26	-25	-25
-4	-49	-46	-44	-42	-40	-38	-36	-35	-34	-32	-31	-30	-29	-28	-28	-27	-26	-25	-25	-24	-24
-3	-48	-45	-43	-41	-39	-37	-36	-34	-33	-32	-30	-29	-28	-28	-27	-26	-25	-25	-24	-23	-23
-2	-47	-45	-42	-40	-38	-36	-35	-33	-32	-31	-30	-29	-28	-27	-26	-25	-25	-24	-23	-23	-22
-1	-47	-44	-42	-39	-37	-36	-34	-33	-31	-30	-29	-28	-27	-26	-25	-24	-24	-23	-22	-22	-21
0	-46	-43	-41	-39	-37	-35	-33	-32	-31	-29	-28	-27	-26	-25	-24	-24	-23	-22	-22	-21	-20
1	-45	-43	-40	-38	-36	-34	-33	-31	-30	-28	-27	-26	-25	-24	-24	-23	-22	-21	-21	-20	-20
2	-45	-42	-40	-37	-35	-34	-32	-30	-29	-28	-27	-26	-25	-24	-23	-22	-21	-21	-20	-19	-19
3	-44	-41	-39	-37	-35	-33	-31	-30	-28	-27	-26	-25	-24	-23	-22	-21	-20	-20	-19	-18	-18
4	-44	-41	-38	-36	-34	-32	-30	-29	-27	-26	-25	-24	-23	-22	-21	-20	-20	-19	-18	-18	-17
5	-43	-40	-38	-35	-33	-31	-30	-28	-27	-25	-24	-23	-22	-21	-20	-20	-19	-18	-17	-17	-16
6	-42	-39	-37	-35	-33	-31	-29	-27	-26	-25	-23	-22	-21	-20	-20	-19	-18	-17	-17	-16	-15
7	-42	-39	-36	-34	-32	-30	-28	-27	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-16	-15	-14
8	-41	-38	-36	-33	-31	-29	-27	-26	-24	-23	-22	-21	-20	-19	-18	-17	-16	-16	-15	-14	-14
9	-40	-37	-35	-33	-30	-28	-27	-25	-24	-22	-21	-20	-19	-18	-17	-16	-16	-15	-14	-13	-13
10	-40	-37	-34	-32	-30	-28	-26	-24	-23	-22	-20	-19	-18	-17	-16	-16	-15	-14	-13	-13	-12