Bonding Working Group Status

Tuesday 5 Mar 2002 at 16:00-18:00 in 40-R-C10

Agenda:

1) reports from bonding centres (news on 2nd bond test, m200 expressline work, readiness for m200 production): in particular I would like to hear the status of jigs, test systems, and database. I would also like to hear experiences with dummy or real hybrids or modules.

2) discussion on potential problems in production (I will have a short list of items for this but others are invited to contribute).

3) discussion on bonding procedures and checklists - I would like to see proposed or actual checklists for the M200 bonding from sites ready to or already doing this bonding.

4) schedule and planning

5) AOB

Aachen
Bari
Catania
CERN
Fermilab
Florence
Karlsruhe
Padova
Pisa
Santa Barbara
Strasbourg
Torino
Vienna
Zurich

Bonding jigs

- TOB, 1st prototype made, 2nd prototype ready soon from Santa Barbara.
- TEC, one R6 jig at each TEC centre.
- TIB, 1st prototype done, one to be given to each TIB centre, 2nd proto in 2 weeks.

DAQ test stations

- All centres have ARC or CMS-like or both. Many ARC systems are not commissioned (lack test hybrids). Most CMS-like systems are commissioned

Database

- Much progress by S. Costa (Catania) on bonding. First DB user interface shown at this meeting, hope to refine and connect with DB by next meeting.

- All centres should have identified DB responsible who can implement local DB.

Procedures and checklists for production bonding

- As of yet no standard procedure and checklist exist for M200 (only the procedures document from last October). Need a practical version to assure bonding quality at all centres. I have requested this from centres about to start or already started but as yet have no replies.

“Qualification” status

- 2nd bond pull test (ST and HPK test structure bonding, check of damage to silicon) have been completed by at least 10/14 centres. Most have been given to Karlsruhe for pinholes test and IV curve. Should get results on these in several weeks.

- Dummy modules: Some dummy modules have been constructed and are available to some centres. Not sure that all centres will have dummy modules.

- Dorazil and FR4 hybrids: 13 TEC hybrids have been delivered to Lyon and Vienna, modules should be ready for bonding in Vienna, Karlsruhe and Strasbourg starting now. Two TEC modules made and bonded in Strasbourg with hybrid assembly done there. 2 TOB hybrids will go to US this week for first US made TOB modules. 1 TOB hybrid made into module and has been bonded at CERN to go to Torino for thermal cycling tests. 3 TIB hybrids have been made, 2 are in Italy and have been made into modules. 1 has been bonded in Pisa. Thus, at least 4 more modules have made and bonded recently.

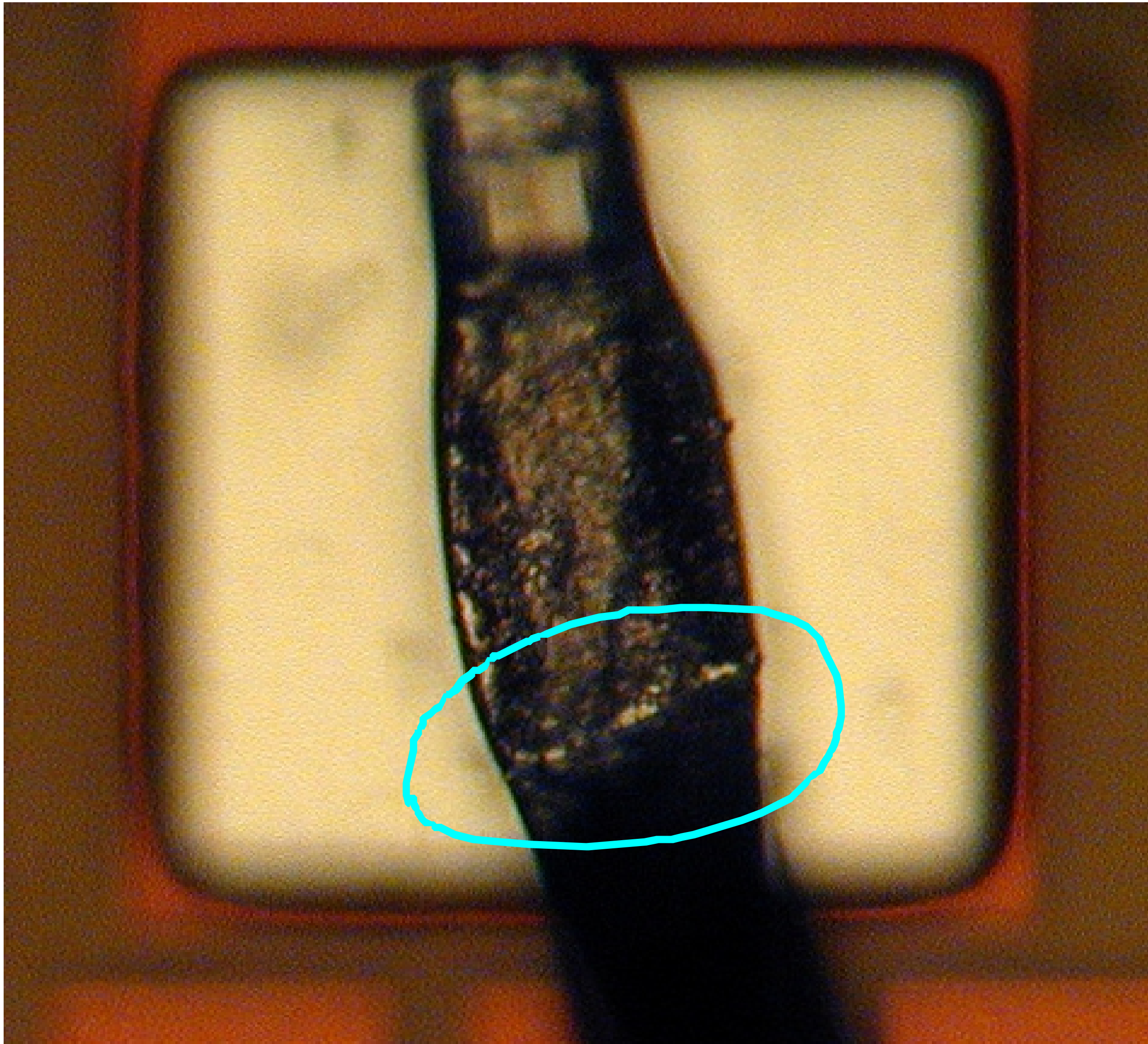
Recent bonding experiences

- Several reports of problematic bonding on various parts of the 2nd bond test. However, in most cases, bonding was done without difficulties although test on ST structure is compromised by leakage current increase problem on many structures that occurred just after mounting the structures and before any bonding was done.

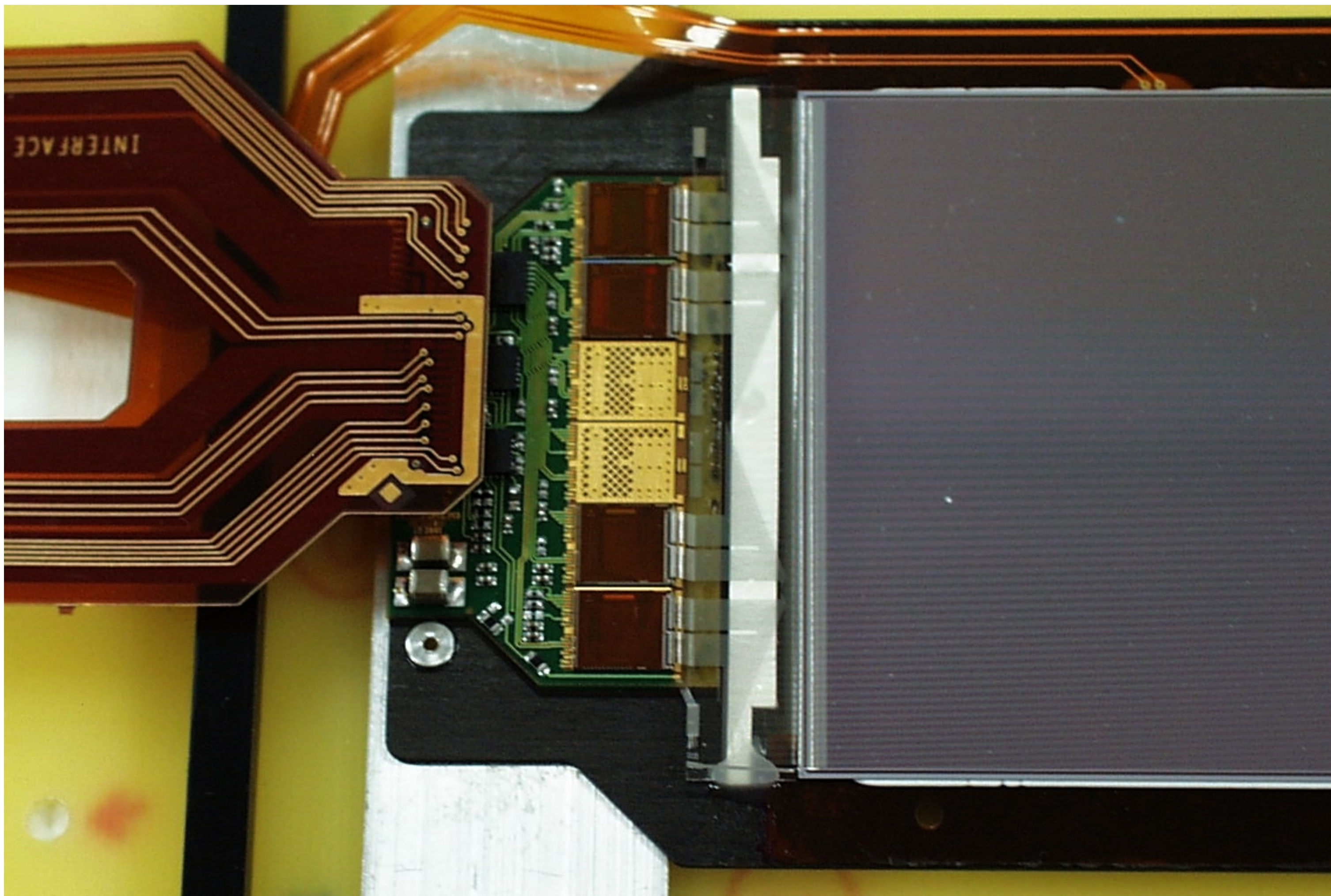
It is not clear why these problems occurred, it may have been a problem with the ST structures which came from an early batch.

- Karlsruhe reported accident with 2nd bond test, crash of tool into pitch adapter due to mistake in operation of machine. Luckily, the test structure was not damaged and the test not compromised but the PA is now badly cracked and the bond tool was destroyed. The machine was not damaged but needed expert advice to readjust it properly. Lesson: more care needed when going from manual to automatic mode (bonding heights are different in the two modes).

- Massive bond breakage failure (about 300 out of a row of 512) of a TEC module constructed and bonded at Strasbourg was reported after thermal cycling to –30C. It is not completely clear if failure was due to thermal cycling or mechanical stress in handling although the former is more likely. Examination under microscope of still unbroken bonds revealed unexpected marks on all bond feet of 1st bond (PA side of PA to sensor bonds). Inspection of bonding tool showed tool was broken (back side was missing). Still need to prove that the tool was responsible for the failed bonds but it is very likely. Bond pull tests using broken and new tool gave nearly identical and satisfactory results. Sensor to sensor bonds using same broken tool had no failures. This problem is probably the most serious and worrying one I have seen, as it was not something we had anticipated. Since it was so difficult to detect (visually or via pull tests) it will be very difficult to come up with methods to prevent this sort of problem in the future. Tool inspection will now have to get higher priority.



- Bonding of first TIB module (FR4 hybrid) successful at Pisa with only one failure out of about 1000 bonds. Achieved 4 Hz bond rate on new K&S 8090. 2nd module received from Perugia and will be bonded at Pisa soon.



- Bonding of TOB module for Torino thermal tests went well although there were some areas of bonding difficulties on the PA (PA to APV row). The module has one pair of bad channels that look like a short but was not verified in visual inpection.

- I have asked that leakage current tests be done prior to bonding of M200 modules at those centres with the equipment (probe station) and experience for doing this.

- Module bonding should proceed slowly and with high scrutiny of completed modules such that problems in construction are caught early and fully understood and corrected.

- We need more study of the movement and stresses caused by thermal cycling in order to see if the bond loop is adequate and if the module design is not leading to unexpected stresses to the bonding.