

IRES Bonding Group
09/23/2005

IReS Backplane Bonding for R7 TEC Modules

TEC Ring7 Modules Production

I.	SUMMARY	3
II.	BACKPLANE BONDING SCENARIO FOR PRODUCTION.	4
III.	BACKPLANE WIRE BONDING DETAILS	7
III.	PETAL INTEGRATION TEST	9
IV.	QUALITY OF THE KAPTON GLUING	11
V.	ENCAPSULATION SCENARIO	12
VI.	ANNEXE	14

I. Summary

In order to improve the bonding contact quality of modules, the CMS collaboration decided to add metallic glue on the interface of kapton and silicium detector backplane.

This solution was perhaps not sufficient for long term life of modules and it's why the collaboration proposed to add another contact with backplane wire bonding.

Some preliminary report or presentations have been made previously like:

- Preliminary report for Ring7 production by Pierre Van-Hove (May 2005)
- Strasbourg TEC meeting presentation (Septembre 2005)
- CERN CMS week presentation by Francois Didierjean (Septembre 2005)

This report describes the scenario of this backplane bonding for Ring7 modules production at Strasbourg with preliminary conclusions like:

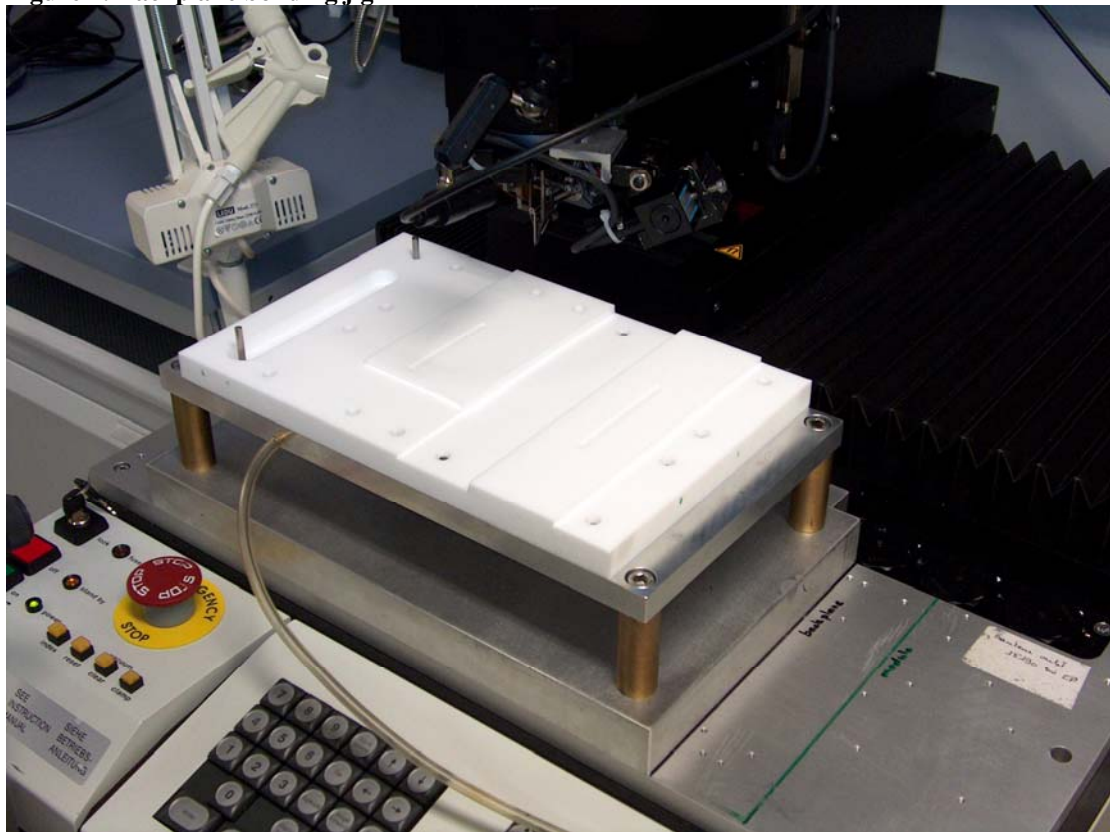
- The time needed to make this backplane bonding is 5 mn by modules (handling and wire bonding on Delvotec)
- We started this backplane bonding scenario since September 19th with a production of 28 modules.
- All modules will be produce by Strasbourg will be with backplane bonding scenario.
- We propose to make 16 wires bonding for each backplane connection point in two lines of 8 (up and down) like presented in chapter follow.
- We tested that no problem appears during petal integration with these new bondings if we use the tool integration for Ring7 developped at Strasbourg.
- At this time we don't use protection glue which cover the bonding but we tested this solution and we present advantages/disadvantages of this point that today must be fix by TEC collaboration.

II. Backplane bonding scenario for production.

The new scenario of production which includes these new backplane bondings modify organisation by:

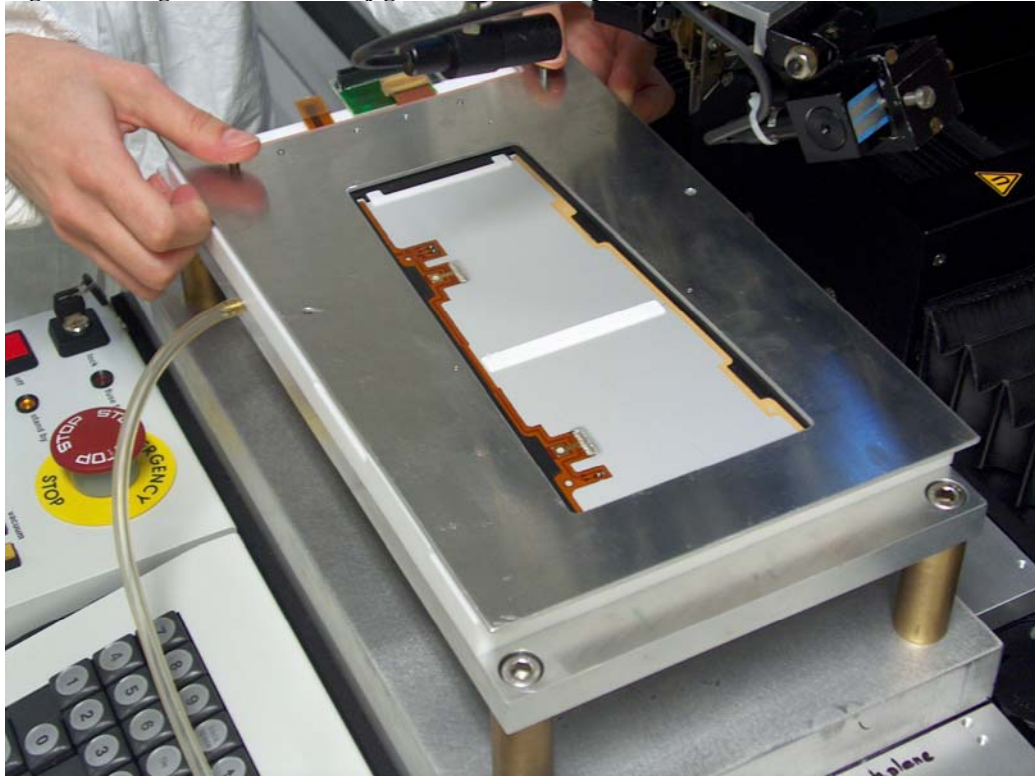
- Half a day production to make these backplane bonding with 5 minutes by modules for 32 modules by week and specific jig installation
- We developed a new jig in order to not dismount modules and transport aluminium tools like describe below.
- We studied this jig in April and tested it in May with good results.

Figure 1: Backplane bonding jig



The production flow for backplane bonding is:
We mount the specific jig on Delvotec machine

Figure 2: Ring 7 installation on jig with aluminium plate



We can see how easy is the module installation without any dismounting of the transport plate.

Figure 3: Wire bonding at first point on modules backplane

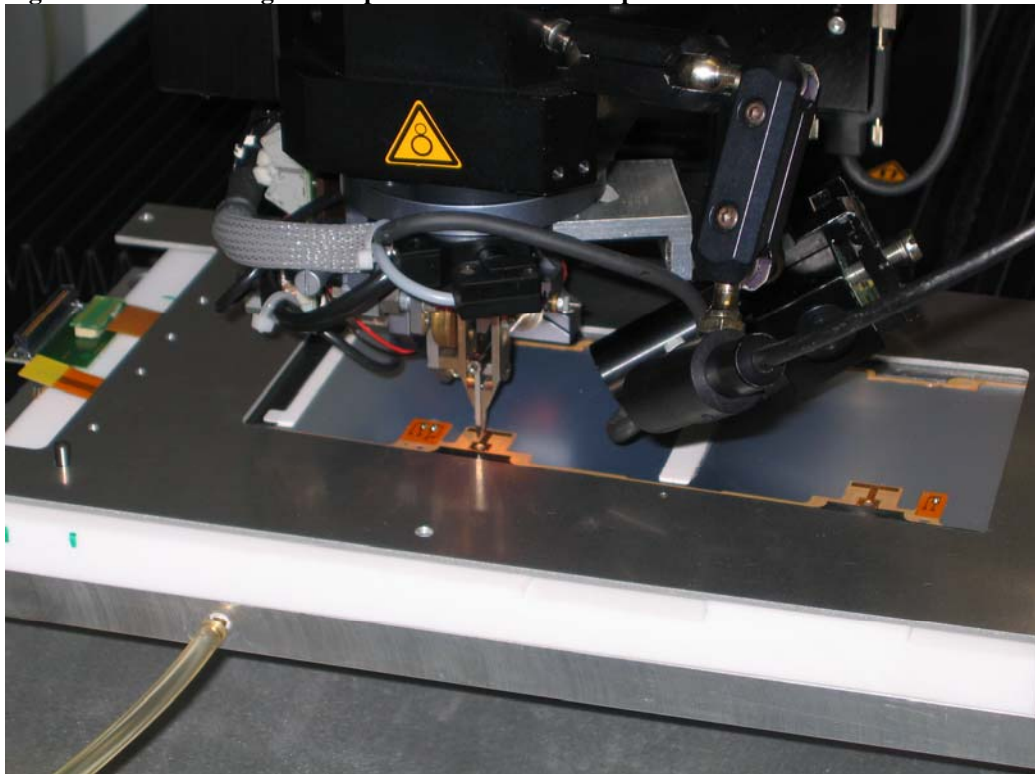
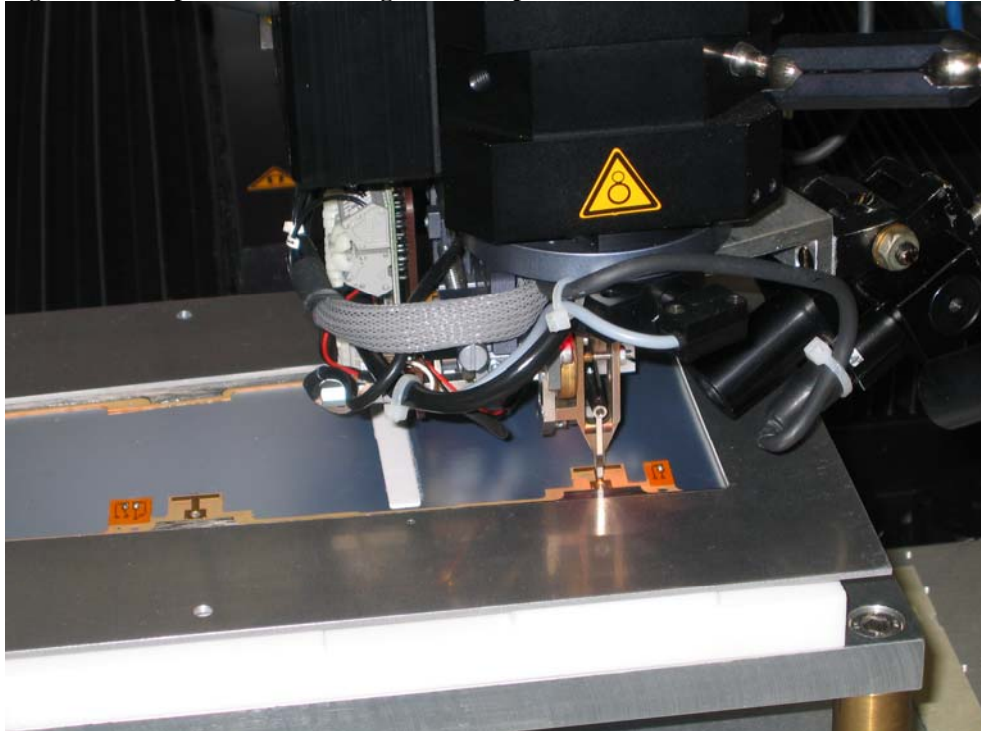


Figure 4: Backplane wire bonding at second point



We made a lot of tests in order to study the quality of wire bonding some problems appeared that we discuss in chapter V, but concerning production scenario the backplane bonding is not a big issue despite the time needed (0.5 day/week).

III. Backplane wire bonding details

The bonding proposal is made directly between the kapton and the module backplane contact like describes in figure below:

Figure 5: Backplane bonding precise location

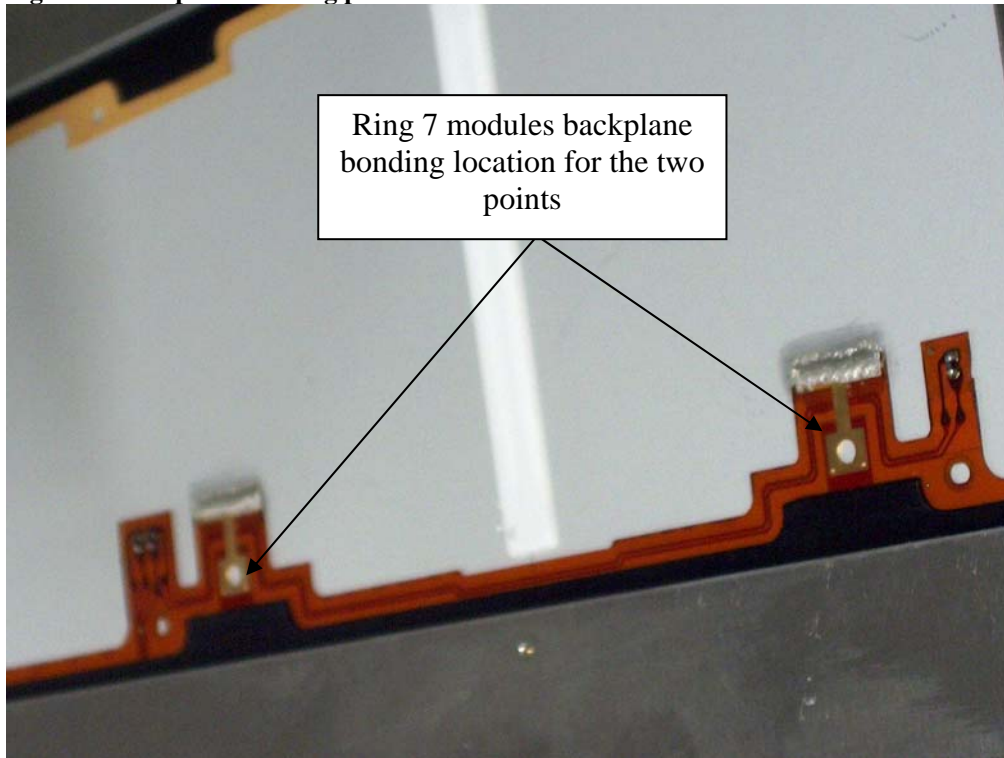


Figure 6: Details bonding (similar for the two locations)

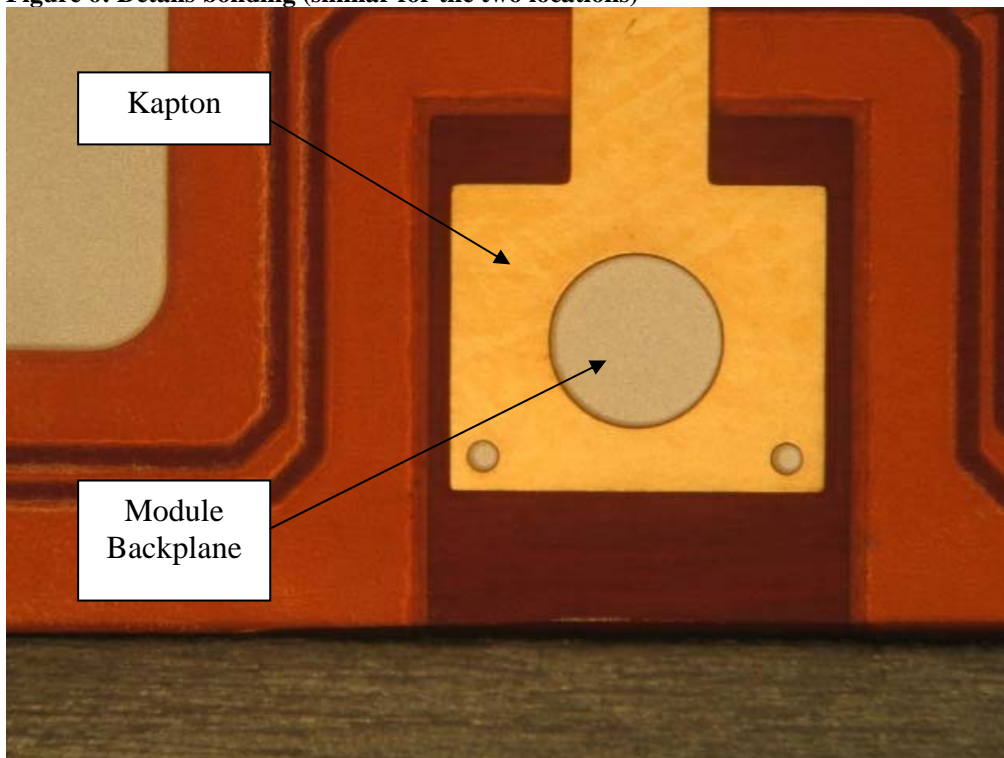
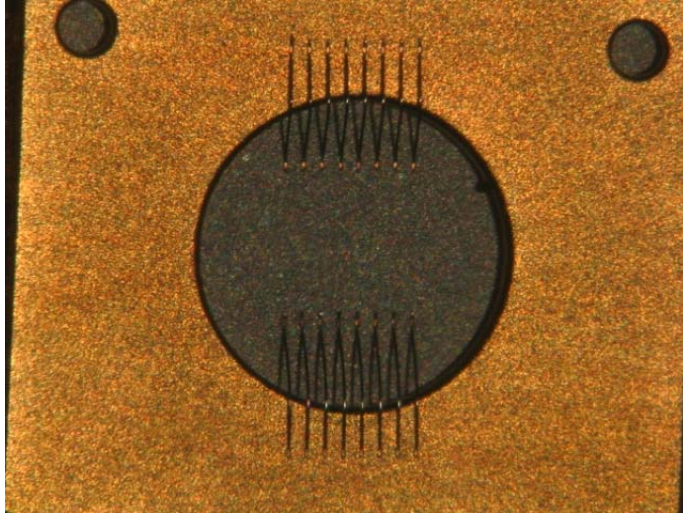


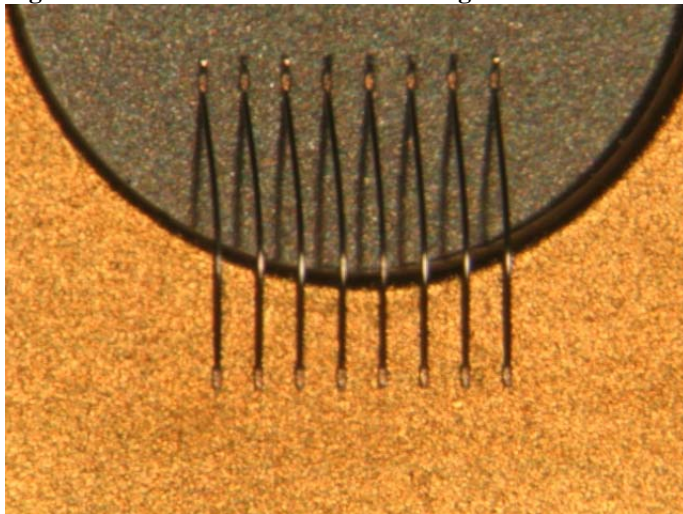
Figure 7: Details bondings with the 16 wires bonding



In this picture you can see the wires bonds in two lines (bottom and top)
In this case the height of wire is maximum 300 microns.

This configuration is better for lower height of wires and number of wires available on these connections.

Figure 8: Details of lower line of bonding



We remark that if we start the bonding from kapton to module backplane the wires bonding seems better in terms of quality, we continue the tests in order to precise this point and specifically modify the bonding program in order to incorporate this point.

III. Petal integration test

In order to qualify this backplane bonding proposal we tested these modules bonded with this solution in real petal integration scenario.

Like described in previous chapter, the height of wire bonding is maximum 300 microns and if we use the Ring7 tools during petal integration we verified that we have any problem with backplane bonding.

Figure 9: Ring7 mounted inside tool for petal integration

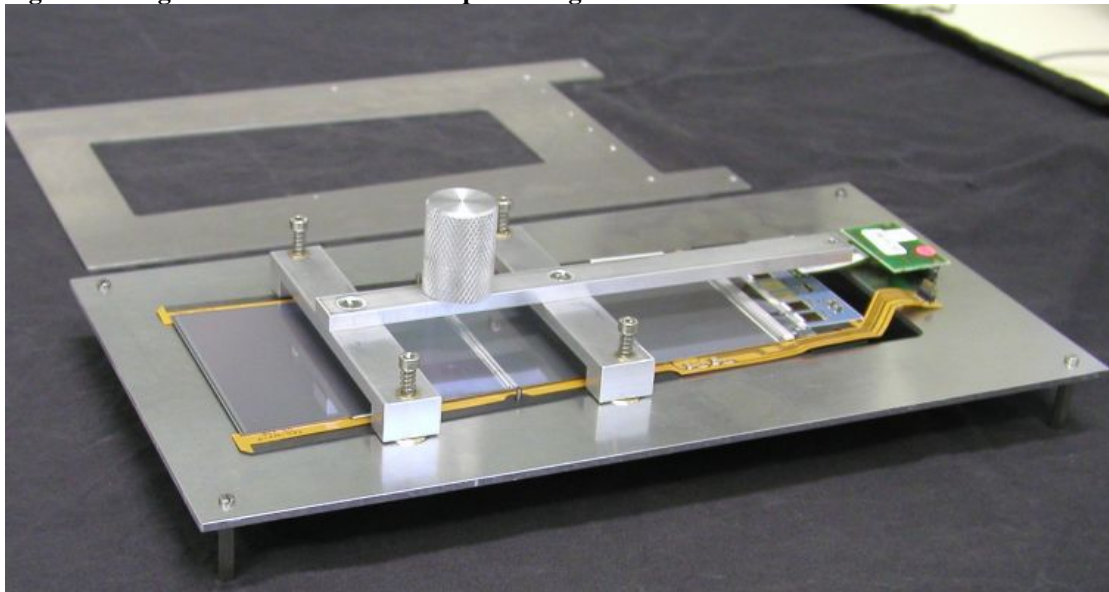
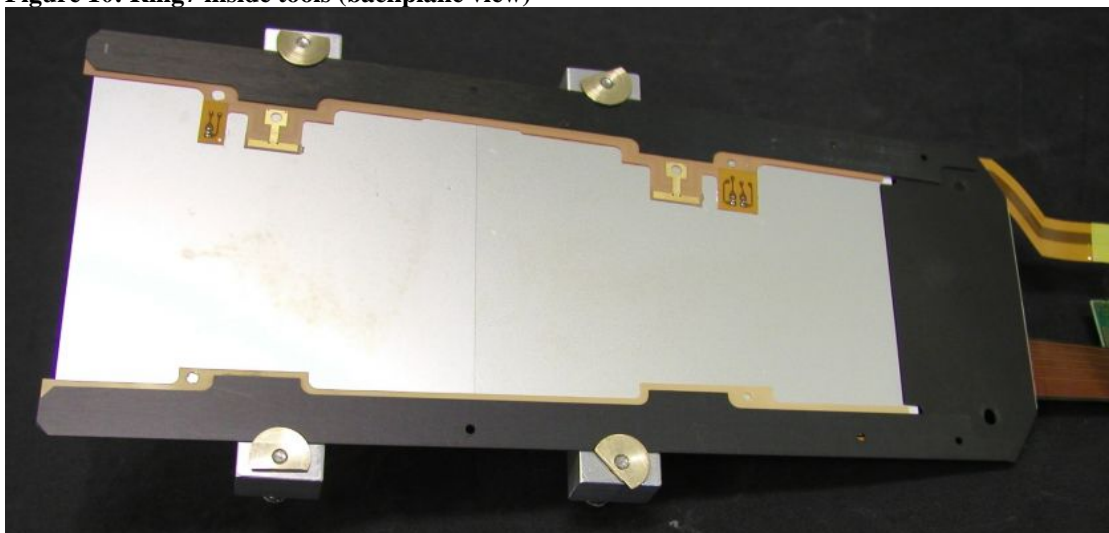


Figure 10: Ring7 inside tools (backplane view)



Using the specific tool we have developed for Ring7 handling is safe for backplane bonds.

Figure 11: Ring7 integration in petal integration scenario

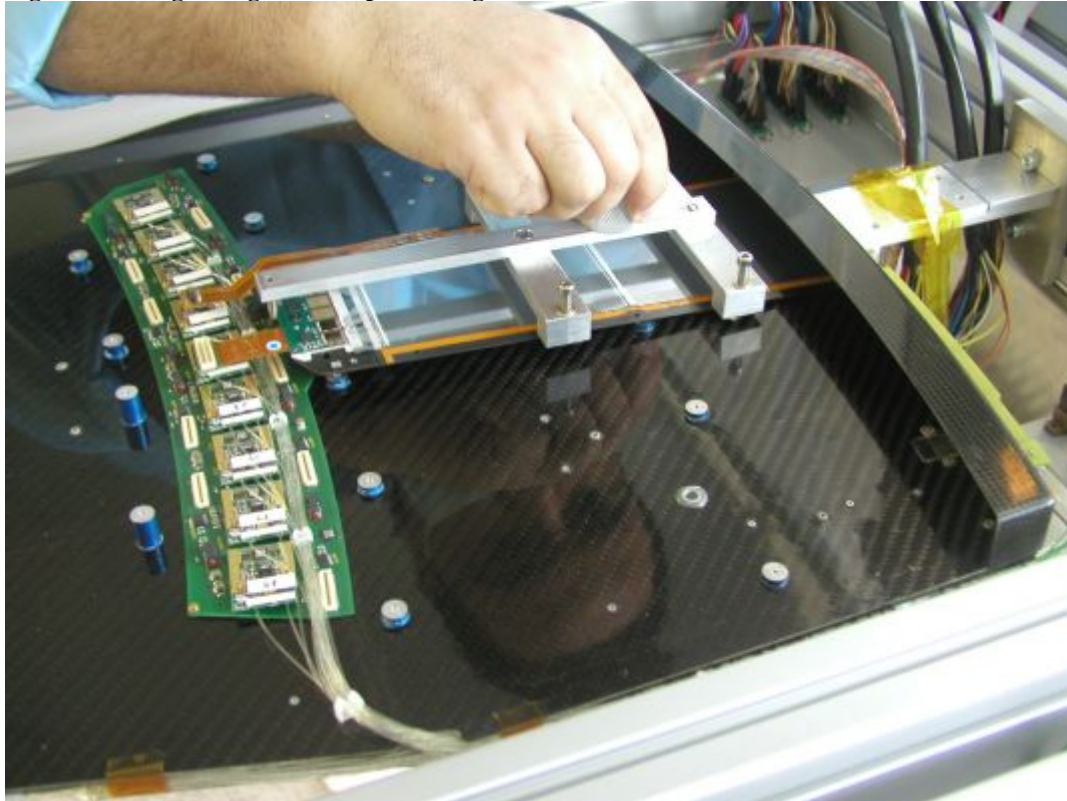
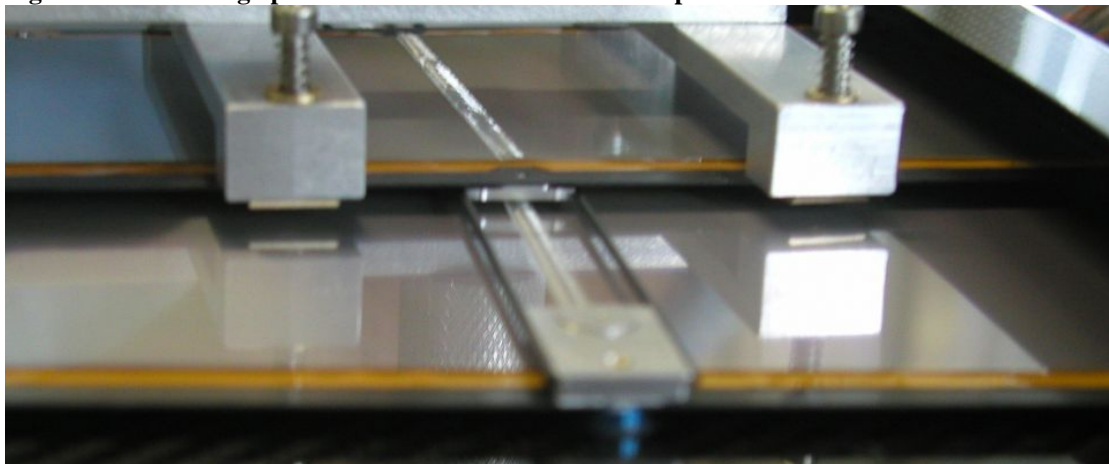


Figure 12: Final Ring7 position with lower others modules placed



The R7 assembled using the new procedure shwos that the modules are perfectly fine: we didn't damage the backplane bonds.

This procedure is safe enough and is from now the default procedure at Strasbourg-PIC.

IV. Quality of the Kapton gluing

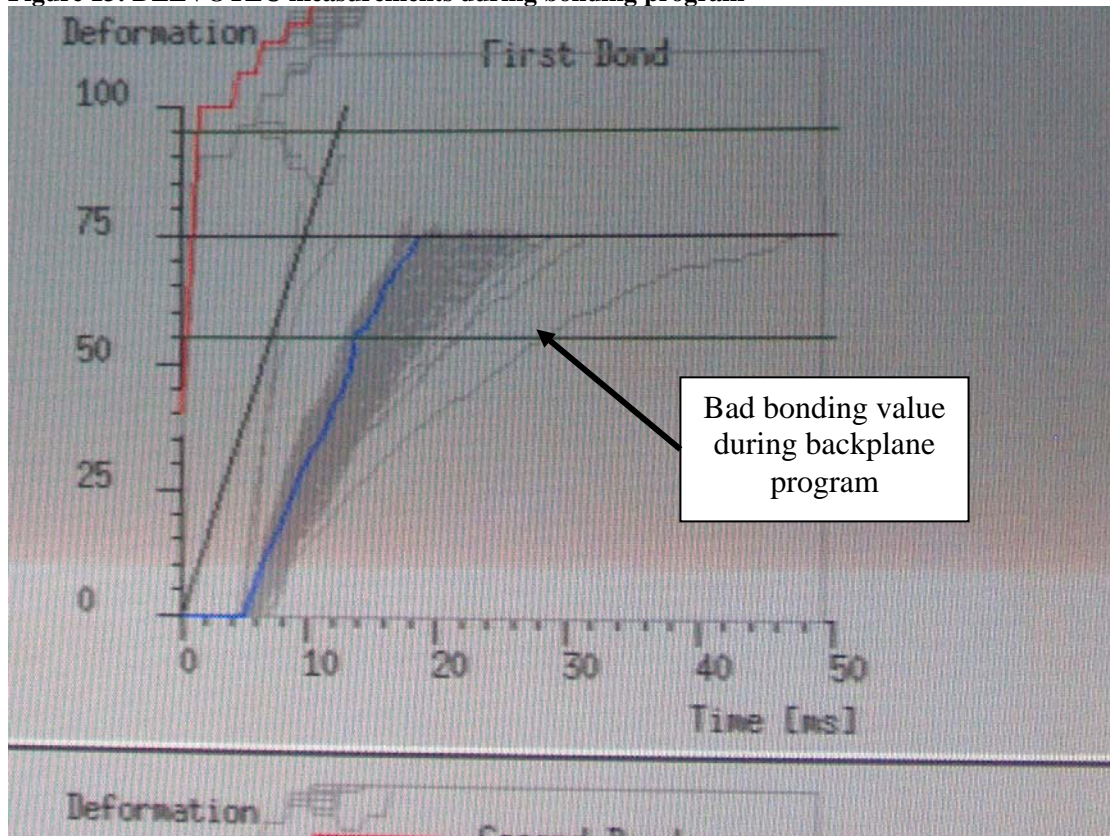
Preliminary measurements of bond pull test strength, done on backplane bonded modules usually, shows good values (mean of 9.5 gr).

Some times we remark that not perfect glue deposit under kapton hole produce some lower values (few at 3 or 4 gr).

Anyway the 28 modules produced last week we found that the kapton can move during bonding process in this case the DELVOTEC machine indicates a standard deviation for bonding characteristic (see figure 13).

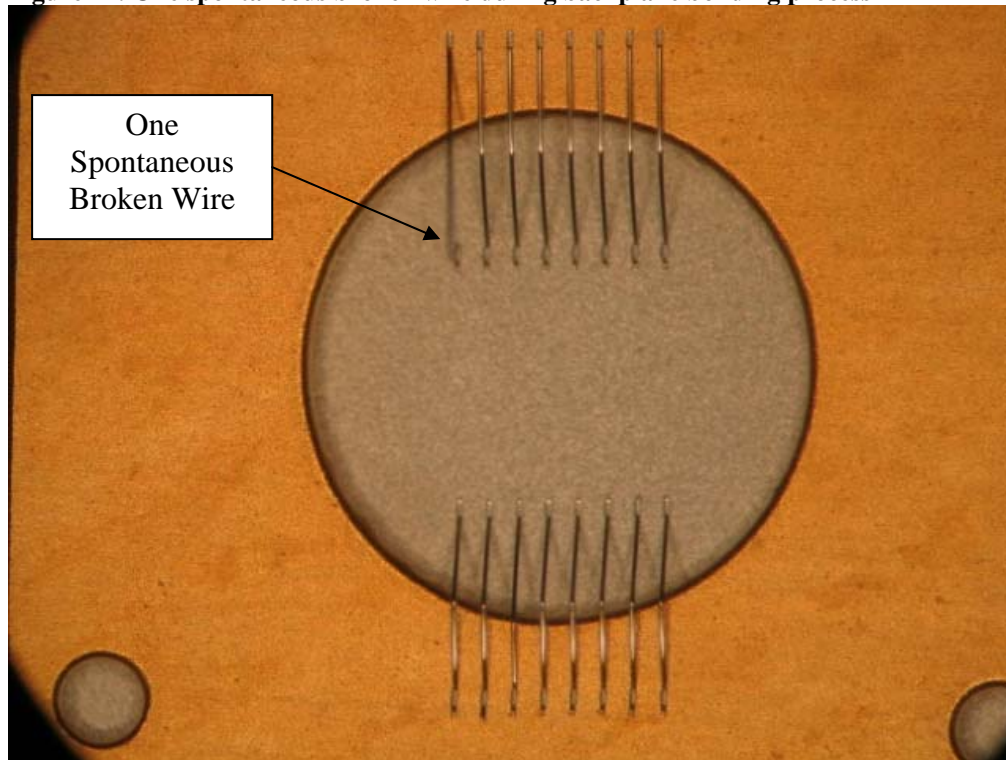
Another case is 3 wires which are broken and can be a problem (3 in comparison of 448 wires for 28 modules), a example of this case is describes on figure 14.

Figure 13: DELVOTEC measurements during bonding program



This problem would be solved in future module production by improvement of glue deposit.

Figure 14: One spontaneous broken wire during backplane bonding process



V. Encapsulation scenario

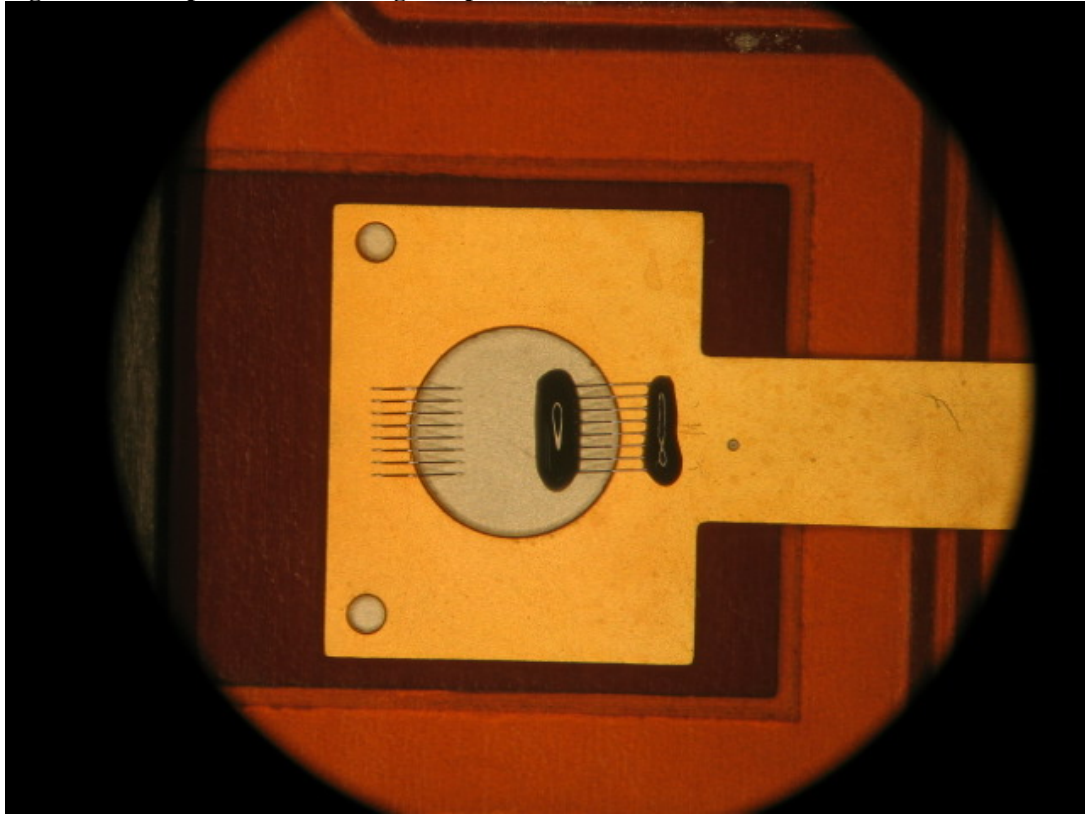
It may appear in the future that encapsulation is required like for TOB.

The problem with this solution of encapsulation is the time needed for glue drying (more than 48 hours) and an increase of time for this backplane bonding with glue deposit.

We tested this encapsulation with standard glue used in TOB modules, you can see the test results.

We deposit only glue on bonding contact in order to be sure no thermal dilation between backplane and kapton.

Figure 15: Backplane wire bonding encapsulation test



VI. Annexe

Standard glue for wire bonding encapsulation is : SYLGARD 186 from DOW CORNING Company.

Modules production follow status for Strasbourg; web address:<http://ireswww.in2p3.fr/ires/recherche/cms/abl/statmod.php>