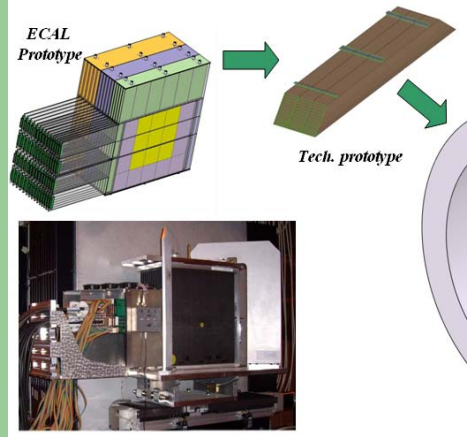

LABORATOIRE DE L'ACCÉLÉRATEUR LINÉAIRE ELECTRONIQUE

# Interconnection of ASUs
# CALICE meeting at CERN
## 21 May 2011

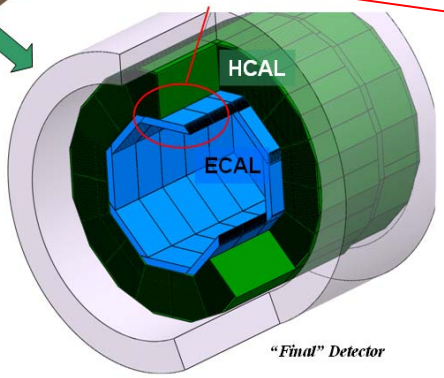
R.Poeschl P.Cornebise

# Contents

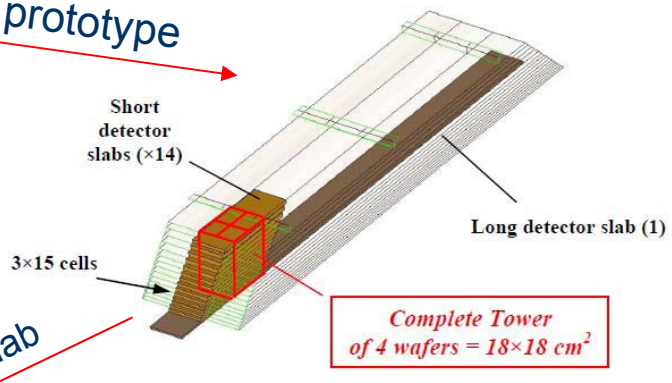
# 1 Introduction





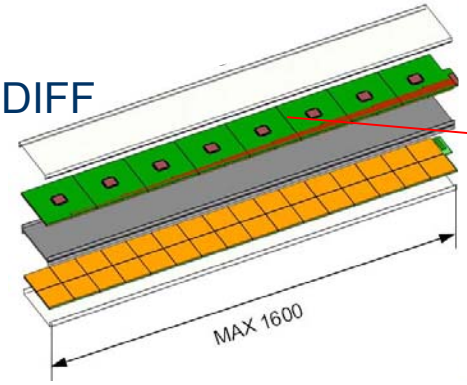




EUDET prototype

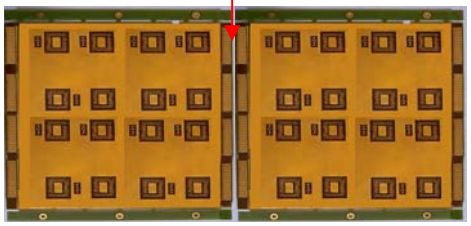


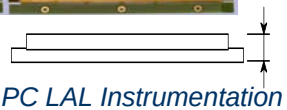

Long detector slab

With:
7 ASUs+1DIFF

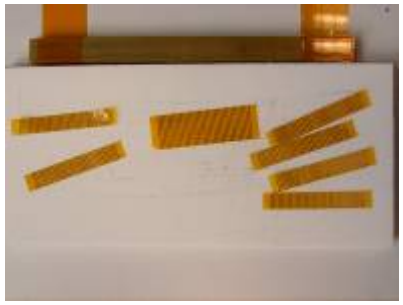



**This presentation focuses on the ASUs interconnections study**

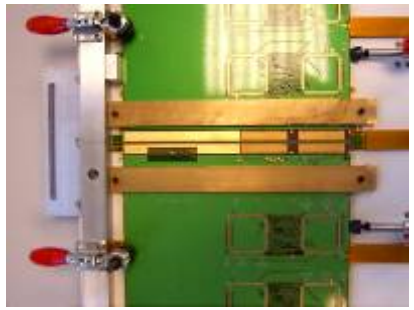




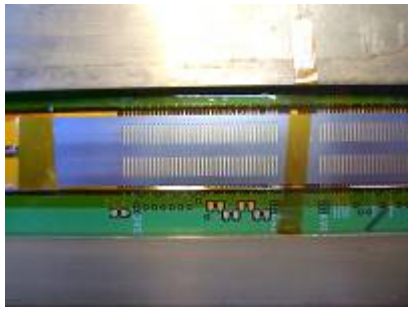
# 2
# Current method of interconnection



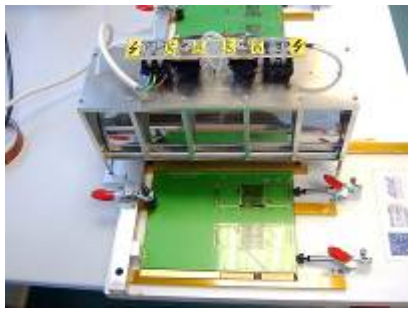
Kapton comb 1 connector



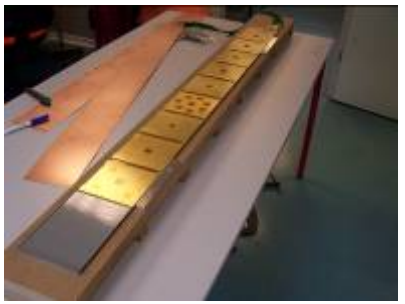
Solder bench



Silk screen for
Manual solder paste laying
(very delicate operation)



Halogen lamp for the solder
200°C for 2.30 minutes



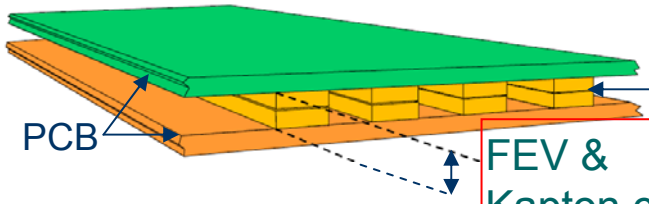
We developed this method with the Cambridge University
and used for interconnect 8 FEV temp

# 3 PCB FEV interconnection with ACF 3M
## Anisotropic Conductive Film adhesives
## ACF 7303 use characteristics

**Meet specification for the ACF employment**

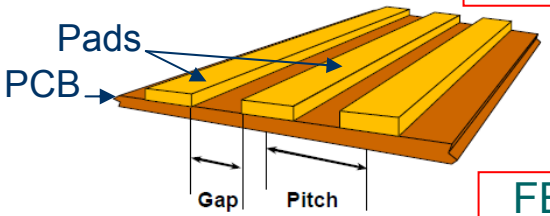
FEV
2.5mm²

Minimum Pad Overlap = 0.75mm² (3M)



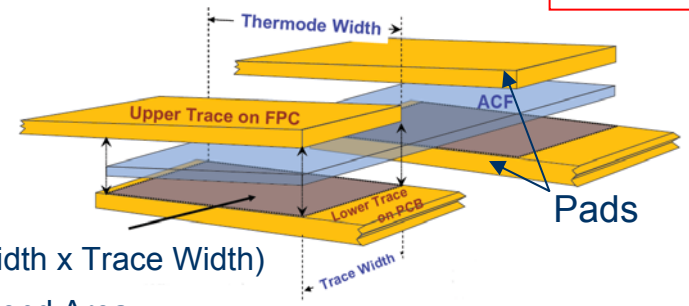

FEV &
Kapton combs
70µm

Maximum height 75µm(3M)




FEV
500µm
1000µm

Minimum gap 250µm (3M)
Minimum pitch 500µm (3M)




Overlap Area
(=Thermode Width x Trace Width)

Bond Area
(=Thermode Width x Length across All Traces)

The ACF technology is used to:
-Flat screen
-Laptop
-Smartphone…

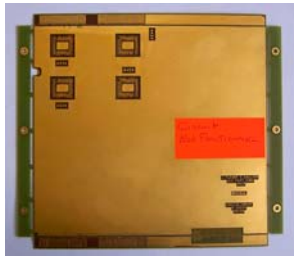
### General Properties of ACF 7303

Adhesive Type: Epoxy/Acrylate Blend
Particle Type : Silver-coated glass
Particle Size : 43 µm
Liner Type: Polyester-coated Kraft with Silicone Release
Adhesive Thickness: 74 µm
Liner Thickness: 100 µm

# 3.1
# First test results from 3M Beauchamps (95)

## Components

1 FEV7 CIP



1 Kapton comb
1 connector

ACF 3M 7303 film
width=5mm length= 25meters

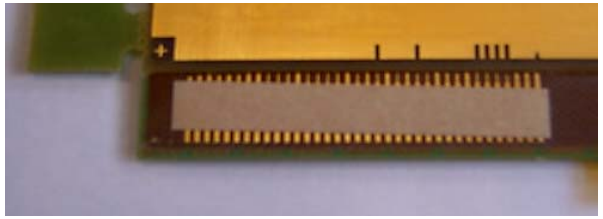
Miyachi thermode test bench


3M Adhesive has a lifetime of 30 days at room temperature if stored in a freezer

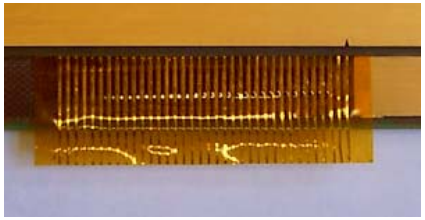
# 3.1 Process

The ACF 3M looks like double-sided tape

Put the ACF on FEV
Remove the protect film (brown)



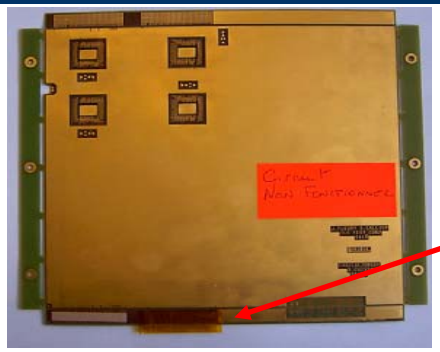
Positioning of the comb
(It's possible to repeat the positioning)



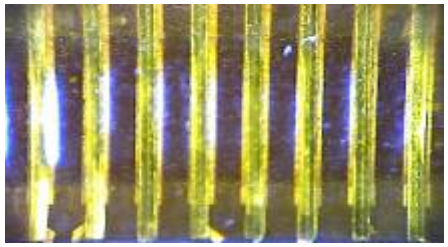
Using
Myachi
Thermode

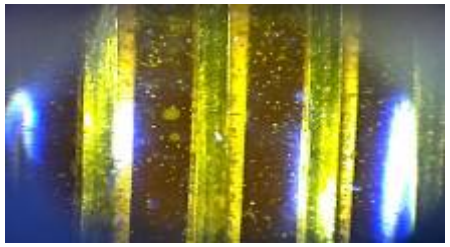
Temperature 150°C
Time 25 seconds
Pressure 18 Bar

# 3.1 Results



**Kapton comb pictures with binocular**





Results of electrical test made with a precision multimeter Keithley

Resistance between wires in PCB = 0.2 ohms

Isolation between wires in PCB = ∞

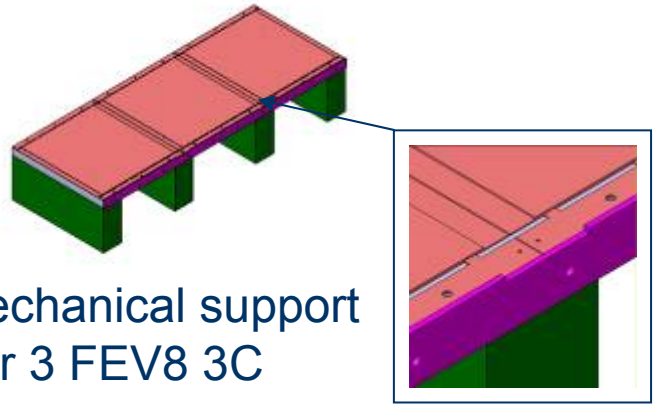
Advantage of the ACF is:

- Ease to use, low stress for PCBs
- **Industrialization of process is very easy**

R&D issues:

- Currently limited information on the lifetime,
  Requires further electrical and aging tests

# 3.2 Second test with the current thermode : Components

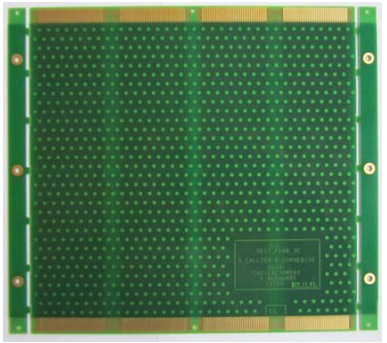


Mechanical support
For 3 FEV8 3C

FEV8 3C

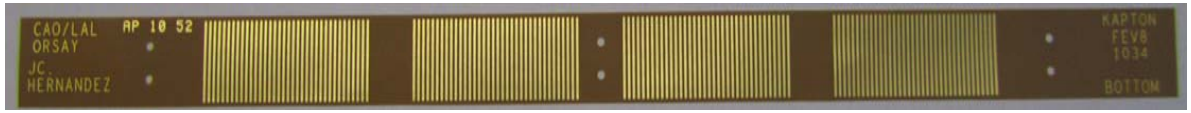
4 connectors each with 36 channels

Wire by wire



4 connectors each with 36 channels

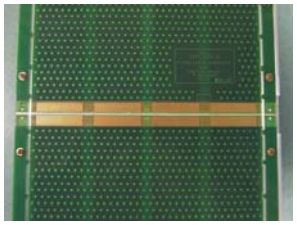
Kapton combs

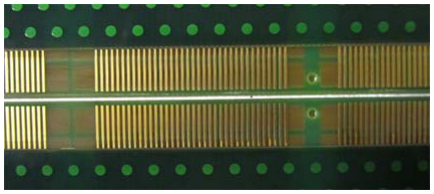



4 connectors with 36 copper pads length=14mm width=0.5mm thickness 35µm
Thickness of kapton = 50µm
**Total thickness = 85µm**

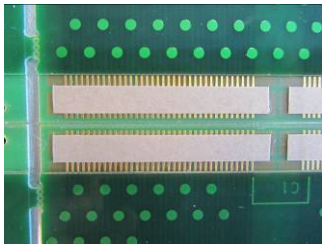
# 3.2
# Preparation of test bench and interconnect

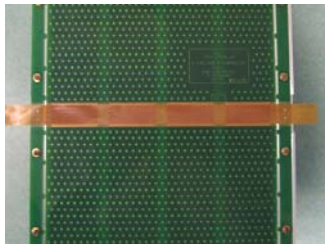
Positioning FEV8 3C
to mechanical support



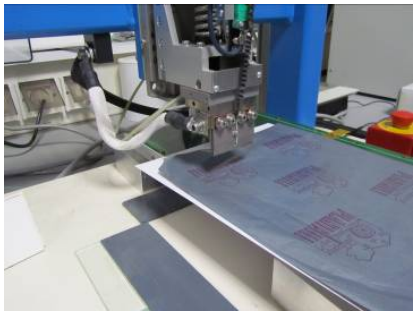


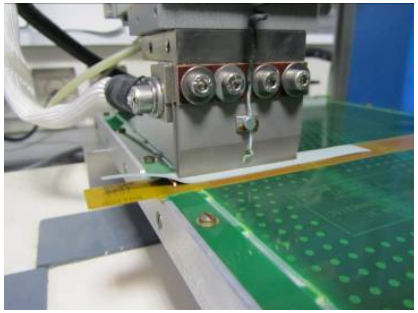
Put the ACF on boards and
positioning kapton combs

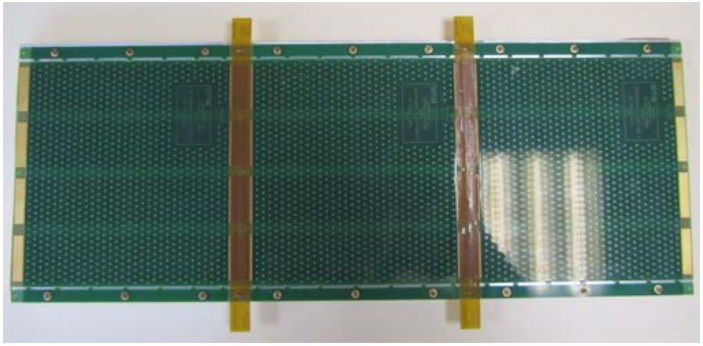




The test was done last March at 3M Beauchamps with the help of R. Cornat LLR



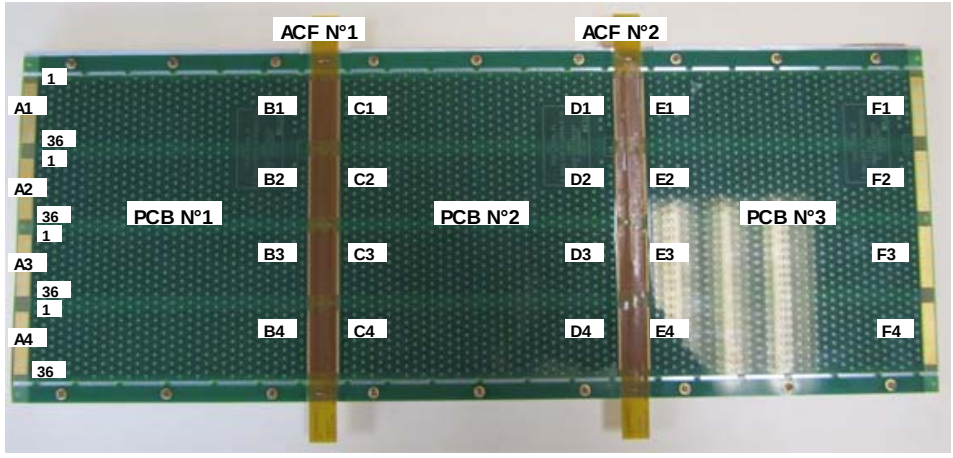




# 3.2

# Results of the second test

- Problems encountered during the test, we struggled to achieve the interconnection due to the lack of mechanical support planéarity FEV8 3c, and a non-adaptability of the nozzle of the Myachi thermode for our boards .
- Due to this problem many connections are defective, as shown in the results table,(résults=values in ohms)(in red, bad values or not conduction)




| 3 PCB N° 1-2-3 with 2 ACF wire by wire | | | | | | | |
|---|---|---|---|---|---|---|---|
| A1-F1 | | A2-F2 | | A3-F3 | | A4-F4 | |
| Wire | Résults | Wire | Résults | Wire | Résults | Wire | Résults |
| 1 | 1.3 | 1 | 1.5 | 1 | 1.2 | 1 | 1.2 |
| 2 | 2.6 | 2 | | 2 | 1.2 | 2 | 1.4 |
| 3 | | 3 | | 3 | 1.3 | 3 | 1.3 |
| 4 | 11 | 4 | | 4 | 1.3 | 4 | 1.3 |
| 5 | | 5 | | 5 | 1.2 | 5 | 1.3 |
| 6 | 8 | 6 | | 6 | 1.3 | 6 | 1.3 |
| 7 | | 7 | | 7 | 1.3 | 7 | 1.3 |
| 8 | | 8 | | 8 | 1.3 | 8 | 1.3 |
| 9 | 1.8 | 9 | | 9 | 1.3 | 9 | 1.3 |
| 10 | | 10 | | 10 | 1.3 | 10 | 1.3 |
| 11 | | 11 | | 11 | 1.3 | 11 | 1.3 |
| 12 | | 12 | 2.7 | 12 | 1.3 | 12 | 1.3 |
| 13 | | 13 | | 13 | 1.3 | 13 | 1.3 |
| 14 | | 14 | | 14 | 1.3 | 14 | 1.3 |
| 15 | | 15 | | 15 | 1.3 | 15 | 1.3 |
| 16 | 21.5 | 16 | | 16 | 1.3 | 16 | 1.3 |
| 17 | | 17 | | 17 | 1.3 | 17 | 1.3 |
| 18 | | 18 | | 18 | 1.4 | 18 | 1.3 |
| 19 | | 19 | 17 | 19 | 1.3 | 19 | 1.3 |
| 20 | | 20 | | 20 | 1.3 | 20 | 1.3 |
| 21 | | 21 | | 21 | 1.3 | 21 | 1.3 |
| 22 | | 22 | | 22 | 1.3 | 22 | 1.4 |
| 23 | | 23 | | 23 | 1.3 | 23 | 1.3 |
| 24 | | 24 | | 24 | 1.3 | 24 | 1.9 |
| 25 | | 25 | | 25 | 1.3 | 25 | 1.3 |
| 26 | | 26 | | 26 | 1.4 | 26 | 1.6 |
| 27 | | 27 | | 27 | 1.3 | 27 | 1.4 |
| 28 | | 28 | | 28 | 1.3 | 28 | 2.2 |
| 29 | | 29 | | 29 | 1.3 | 29 | 1.4 |
| 30 | | 30 | | 30 | 1.5 | 30 | 1.6 |
| 31 | | 31 | | 31 | 1.3 | 31 | 2 |
| 32 | | 32 | | 32 | 1.3 | 32 | 3.8 |
| 33 | | 33 | | 33 | 1.6 | 33 | 2.3 |
| 34 | | 34 | 2.5 | 34 | 1.5 | 34 | 1.7 |
| 35 | 3.3 | 35 | | 35 | 1.5 | 35 | 3.4 |
| 36 | 2.4 | 36 | 2.5 | 36 | 1.8 | 36 | 1.9 |

# 3.3
# Next steps

- Making a new support at LAL with a good planéarity.
- Use for the new test 3FEV8 3C with glued below the square glass or waffers from LLR & LPNHE to test the resistance to pressure when we use the Myachi thermode.
- The next test will be conducted at 3M Beauchamp (95) or Myachi at St Germain en Laye (78)
  **but if we use this thermode unsuitable, we may have the same result, the easiest solution would be to make a thermode suited to our boards, but estimated costs, 15000 euros ...**
- Buy a freezer to store ACF (and beers)
- These operations are not yet scheduled.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# Thank's for your attention