nBLM Front-End Electronics

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nBLM CDR1.1

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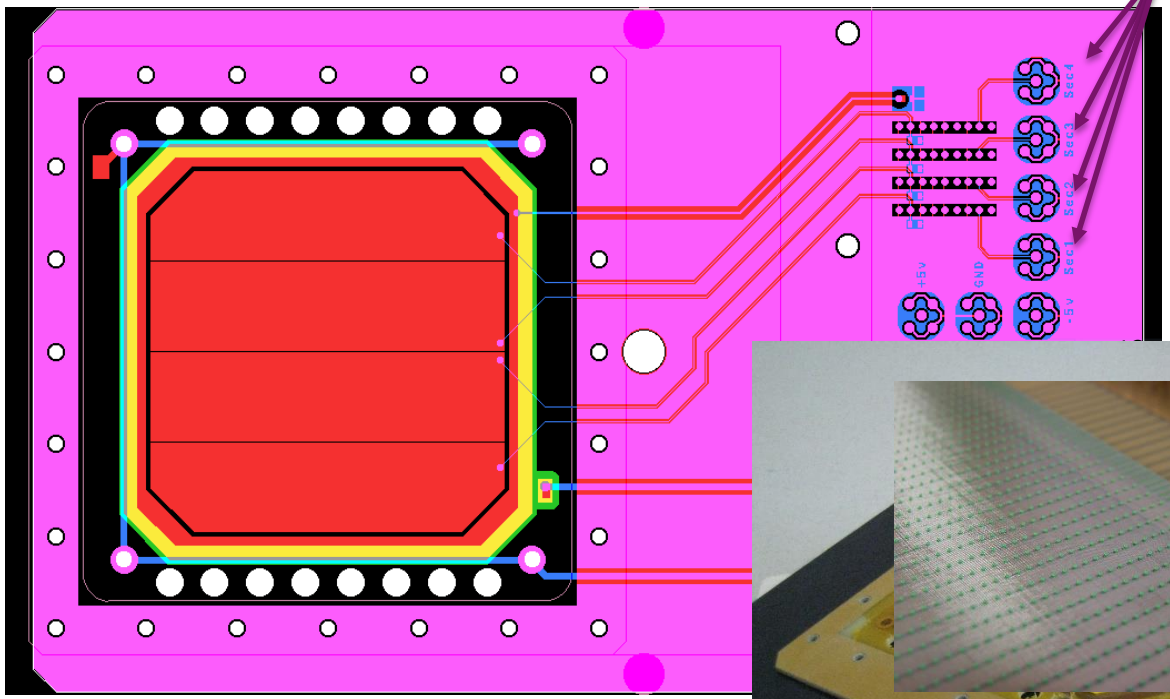
OUTLOOK

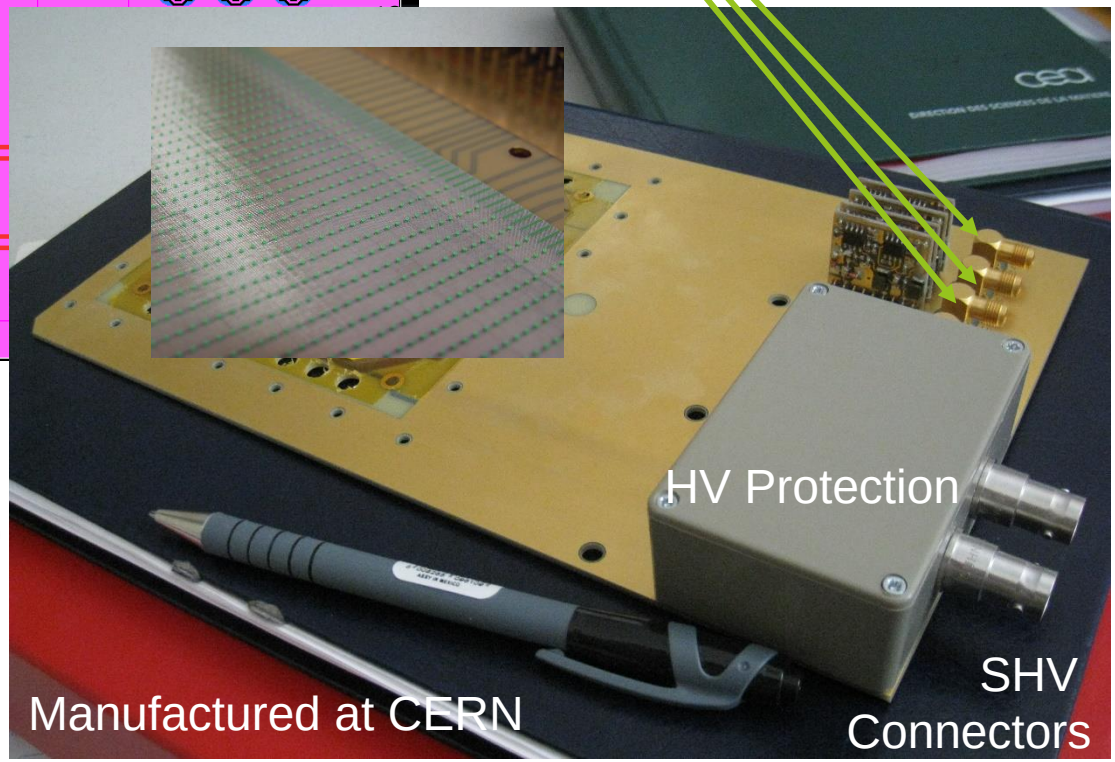
- Detector design
- Amplifiers
- Cables and connectors

DETECTOR PCB



SMA Connectors

First prototypes

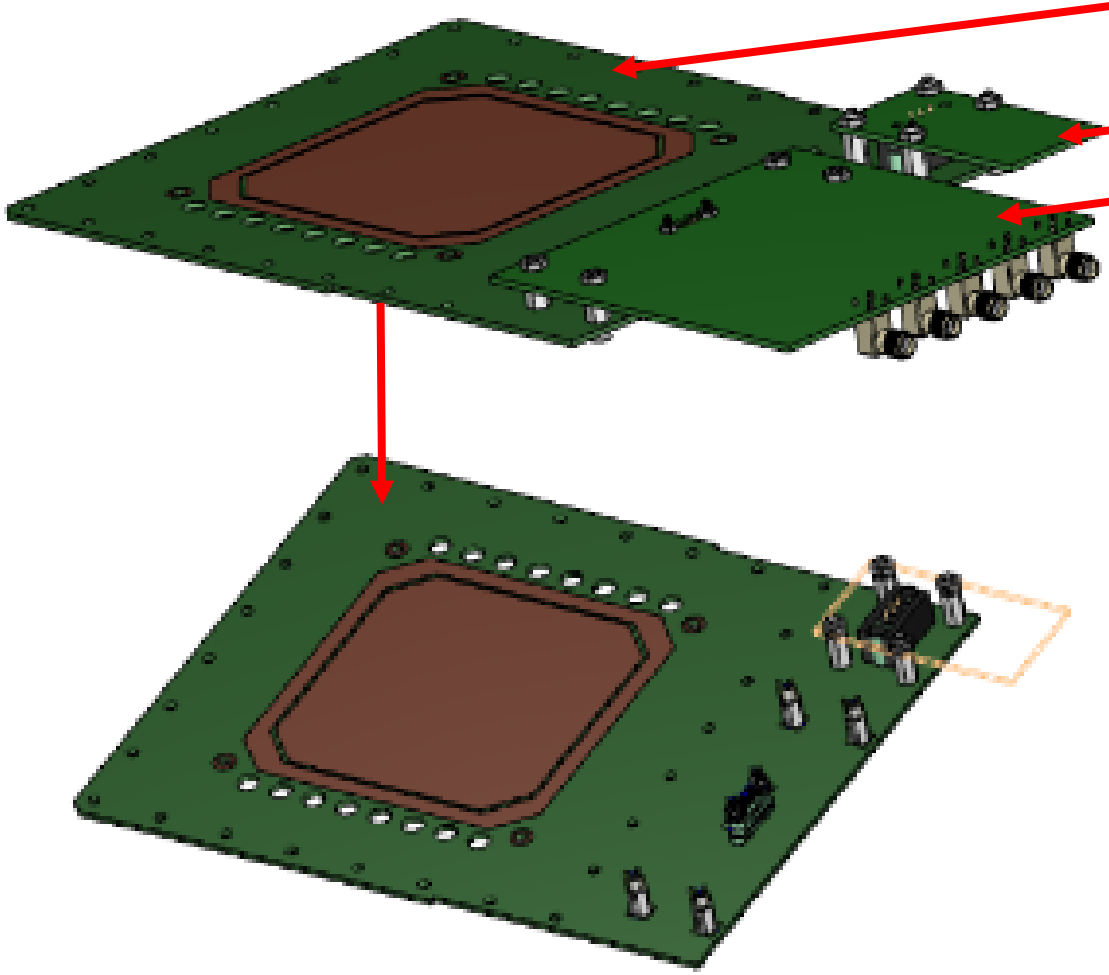


- **Detector:**
  - EMC « design »
  - Signal integrity from strip to preamplifier
    - crosstalk
    - adaptation pb

⇒ Fast signals capability

DETECTOR PCB

Final design



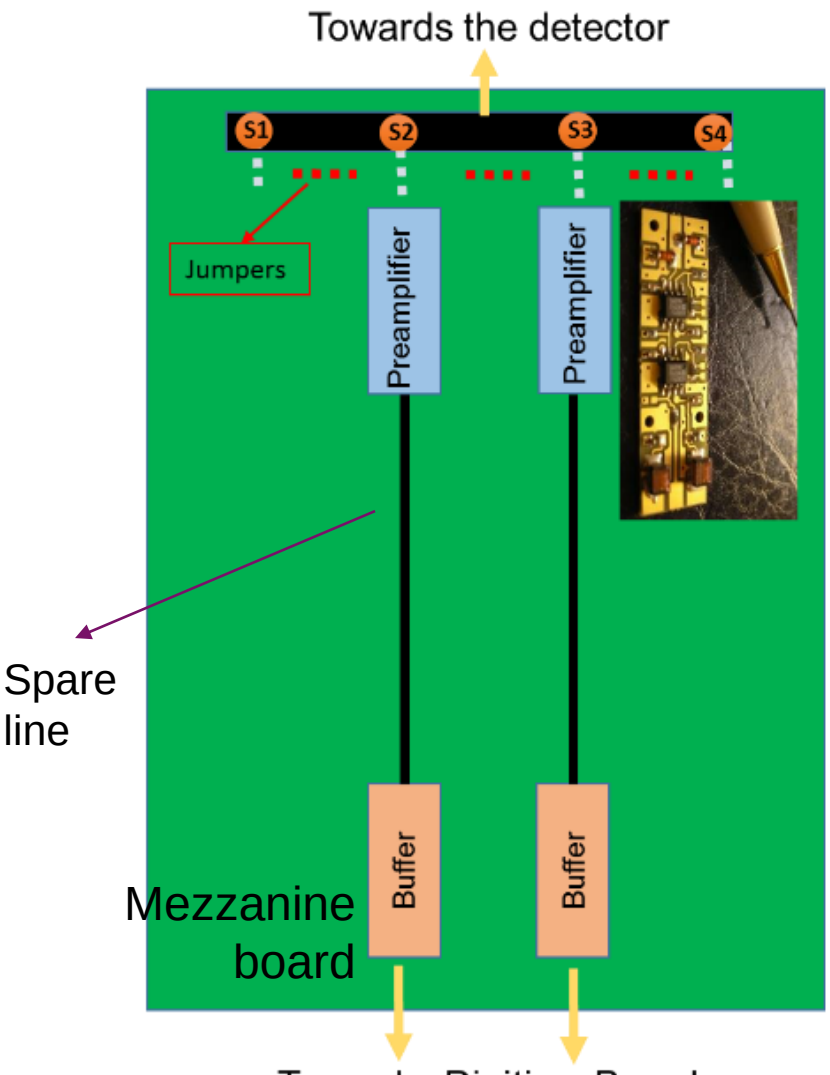
- Separate cards
- Mother board:
  MMs detector
- Mezzanine cards:
  - HV and LV
  - Signals
- Signal is amplified before sending it to the back-end electronics
- Detector same as in prototypes

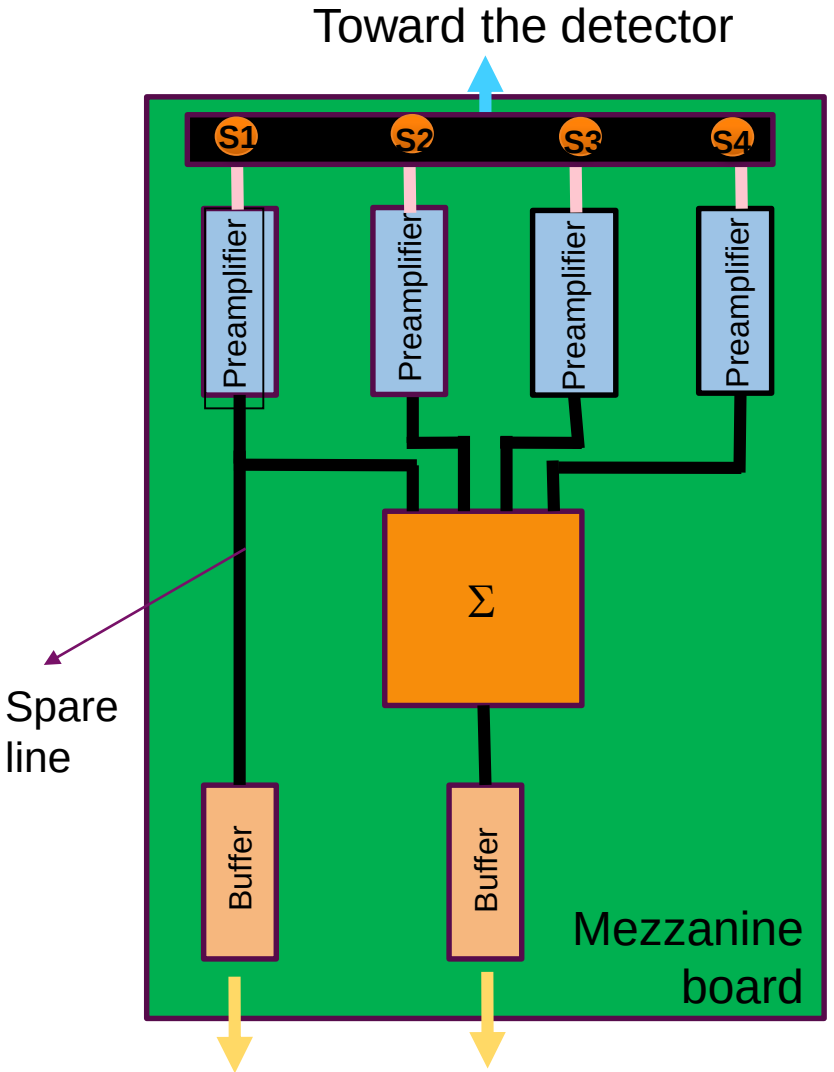
Mezzanine cards

- Separate HV, LV from signals
- Easier maintenance
- Flexibility for the replacement or
- Reduce the manipulation on the detector card after the bulking process

FRONT END BOARD

- Two options for testing, similar principle





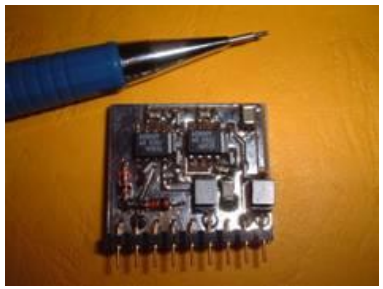
FRONT END BOARD

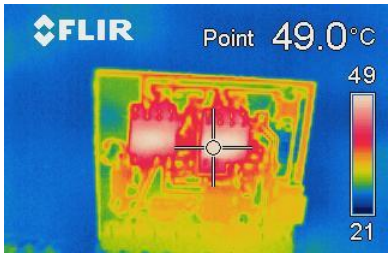
- Two options for testing, similar principle

  - Flexibility in summing 1 to 4 strips to be adaptable to flux
  - Front End Board Size ≈ 10 x 6 cm
  - Output : SMA Connectors
  - Buffer : even if we have low Attenuation cables
  - One buffer 15mA →120mW

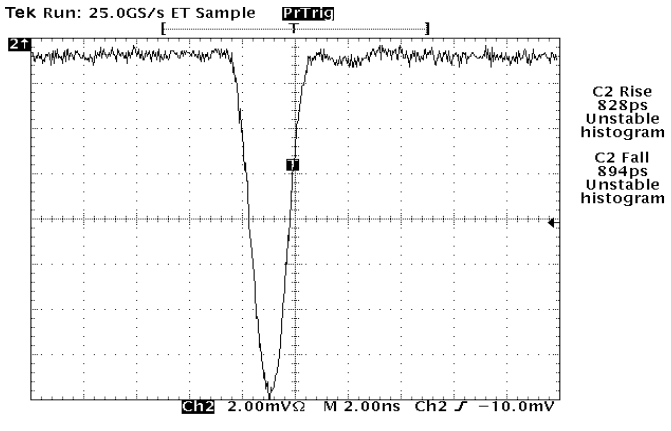
Front end module

FAMMAS front-end module
(Fast Amplifier Module for Micromegas ApplicationS)





Infrared tests performed



In few figures …

- *Power supply : + 5V -5V*
- *Consumption ≅50 mW*
- *Input: positive or negative*
- *Noise:* ***600 µV rms***
- *Rise time :* ***< 1ns***
- *weight : 4g*
- *Size: 22 x 20 x 5 mm*

Same design for final electronics. After tests final tuning in
- Gain
- Noise filtering (decide bandwidth)

CONNECTORS

3 Levels:

1. In rack
2. After stubs before repartition to each detector
3. In the boards

For the racks

- HV: Adaptor is a patch panel, SHV outputs
- LV: small patch panel for distribution
- Signal: small patch panel before going to the FMC card

Patch-panel in tunnel

- One per group of detector. The maximum number of detectors per group is 12. Assuming an extra 25% spare connector → connectors for 15 detector.
  - 60 HV connector (30 SHV IN, 30 SHV OUT)
  - 48 LV connectors (3 IN, 45 OUT):
  - 30 signal connectors (15 IN, 15 OUT)

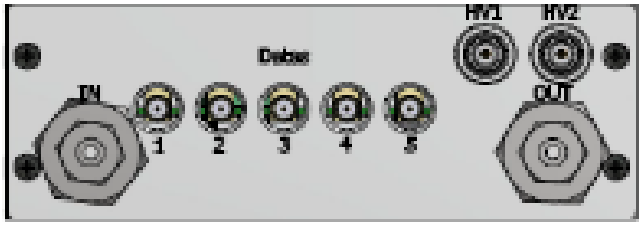
CONNECTORS

3 Levels:

1. In rack
2. After stubs before repartition to each detector
3. In the boards

For the detectors

- Connectors in the chamber of the detector
  - 5 SMA (2 signal, 2LV, 1 GND)
  - 2 SHV
- In the boards
  - High reliability connectors appropriate for high radiation environments (Harwin connectors)



Signal
Harwin Gecko Screw-Lok Vertical DIL PC Tail G125-MV11005M2P G125-FV11005F1P

HV and LV
Harwin M300 SIL Vertical PC Tail Connector. The exact reference is M300-FV1034500 and M300-MV10345M1

CABLES

- Each nBLM detector needs:
  - ✓ 2 HV cables (mesh and cathode)
  - ✓ 1 signal output cable
  - ✓ 3 cables for the LV: +5V, -5.2V, GND
    - ➢ Decided to bring to tunnel 1 pair of cables for each patch panel and from them distribute a set of 3 to each detector

	Cable ref ESS	
LV	3C2OSHF	3 cables
	LCF38-50J	Coaxial + shielding, 3.7Ω/km
Signal	Triax_1C20RG-58_20kV	Triaxial, 50Ω, 102 pF/m,but ?Ω/km
	Hf43e_0.pdf	Triaxial, 50Ω, 101 pF/m,but 37Ω/km
HV	2xC(st)H	Triaxial, 50Ω

Product Data Sheet **LCF38-50J**

3/8" CELLFLEX® Low-Loss Foam-Dielectric Coaxial Cable

Cable caracteristics :

- Low Attenuation
- Complete Shielding
- Halogene Free

Electrical Properties

Characteristic impedance	[Ω]	50 +/- 1.5
Relative propagation velocity	[%]	88
Capacitance	[pF/m (pF/ft)]	76 (23.2)
Inductance	[µH/m (µH/ft)]	0.19 (0.058)
Max. operating frequency	[GHz]	13.5
Jacket spark test RMS	[V]	5000
Peak power rating	[kW]	15.4
RF Peak voltage rating	[V]	1240
DC-resistance inner conductor	[Ω/km (Ω/1000ft)]	3.8 (1.16)
DC-resistance outer conductor	[Ω/km (Ω/1000ft)]	2.9 (0.88)

We plan to use an extra shield around coaxial cables to increase the shielding

BACK-UP