SuperB EMC Electronics status

SuperB 1st collaboration meeting London Sep 12-16 2011

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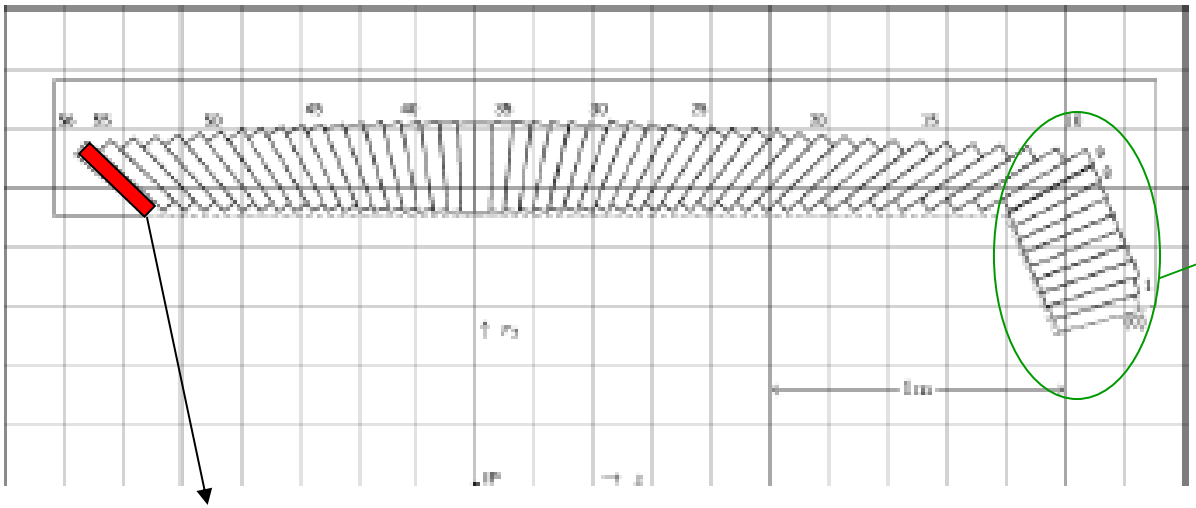
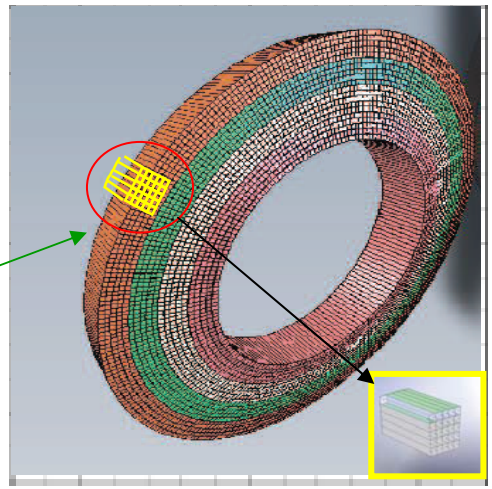
INFN Roma

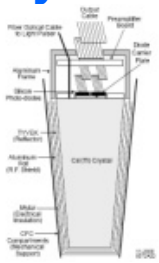
(activity from INFN Perugia INFN Roma,INFN Roma3)

SuperB EMC





EMC Barrel :
5760 CsI(Tl)
Crystals

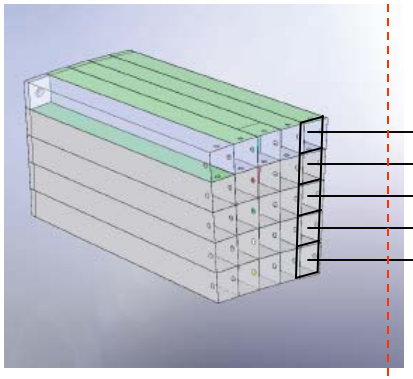


EMC Forward

Different hypothesis
under study

1) 4400 Lyso crystals (in the WP)
2) 4400 BGO crystals
3) 820 CsI crystals instead of CsI(Tl) but babar geometry
4) PWO.....

25 crystals tower readout electronics



Crystals Mechanics

X 5

X 5

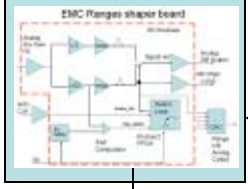
X 5

4X

VFE Board

5

Shaper Range Board



Ranges Lvds

5

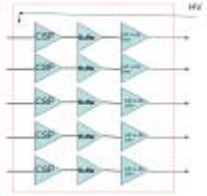
5

ranges analog Coded

ADC CLK

Differential ADC Board

PIN Or APD



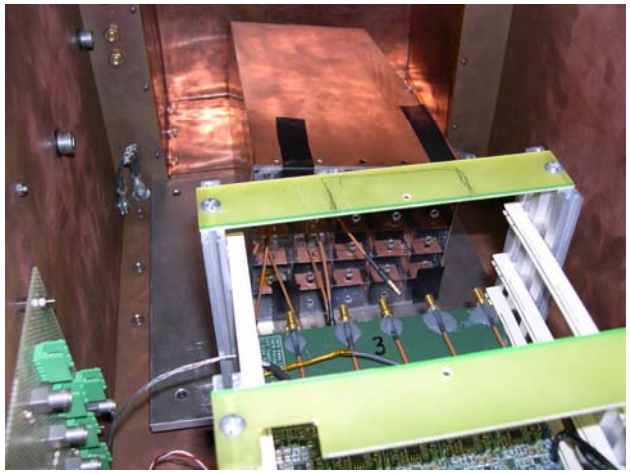
I2c

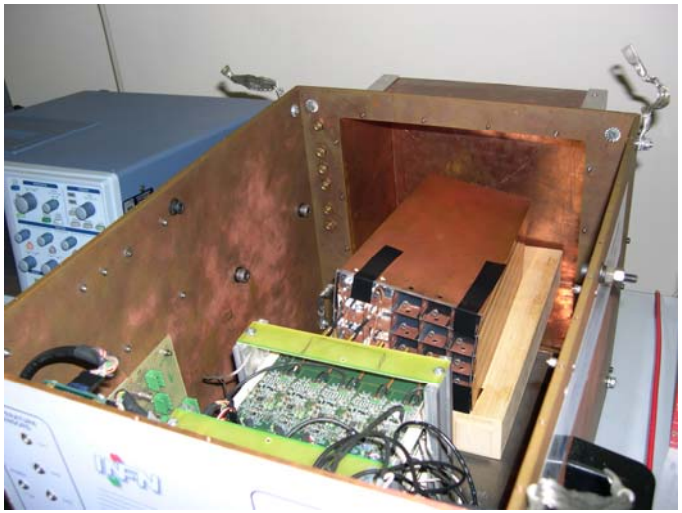
VME

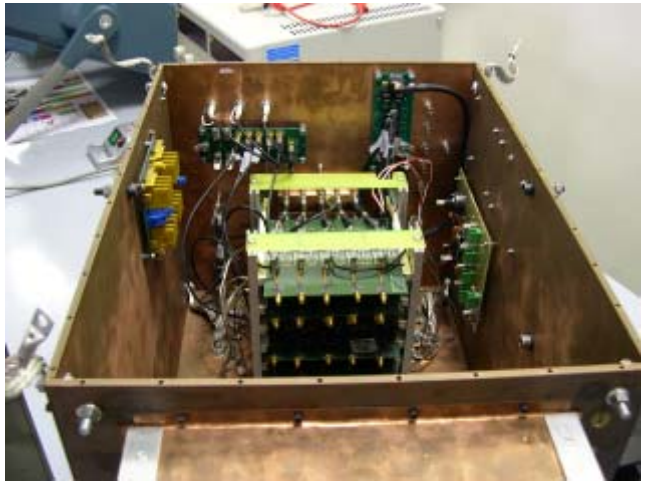
- 25 channels (full module readout)
- All boards produced

VFE inside the copper Box

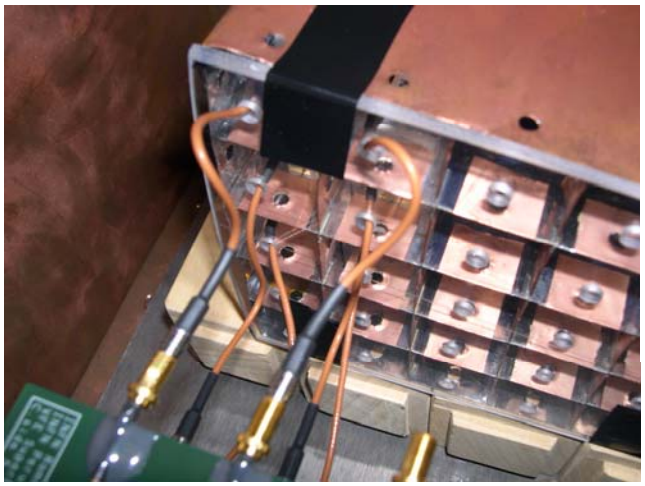
(INFN Perugia,INFN Roma)



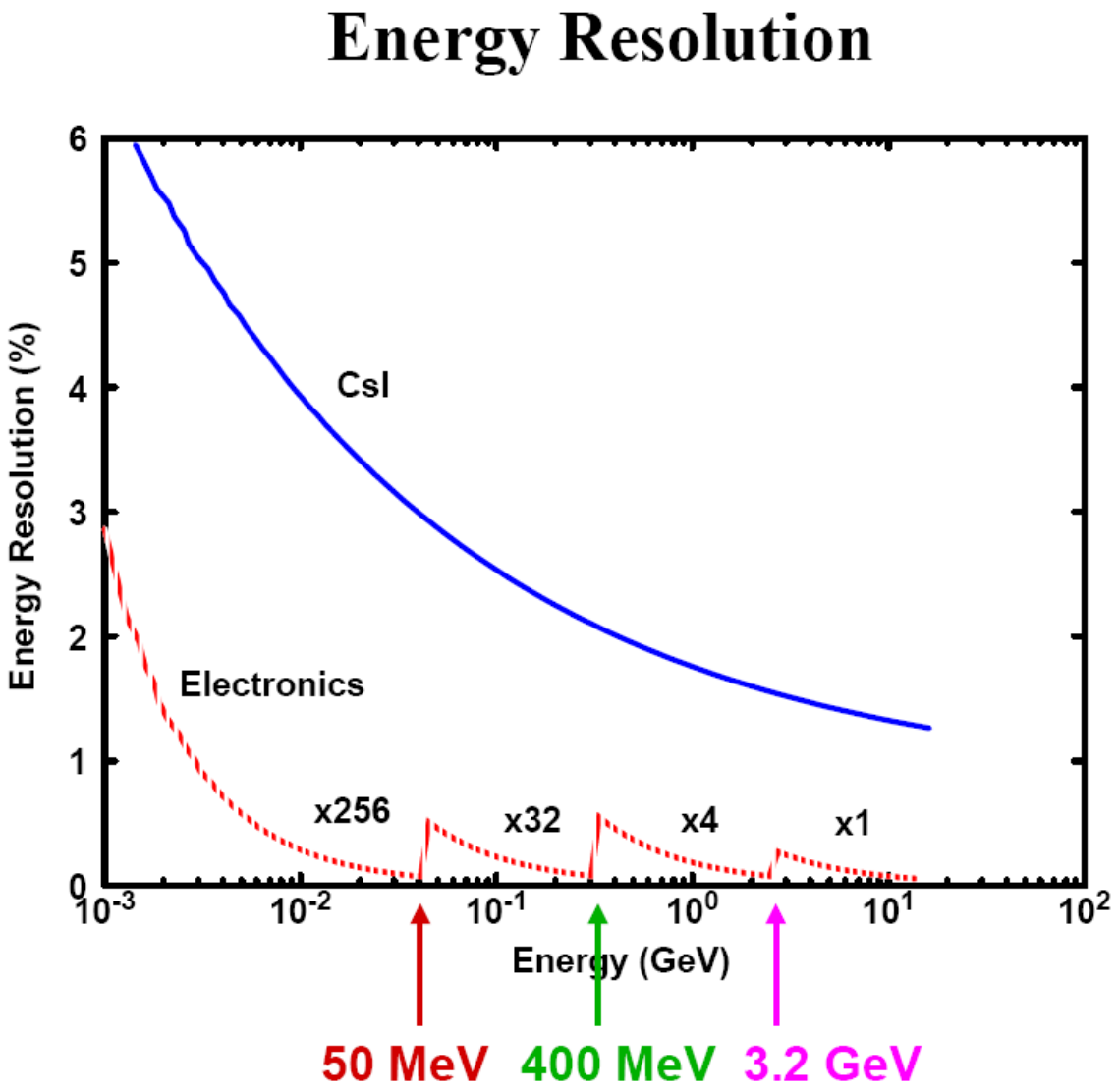




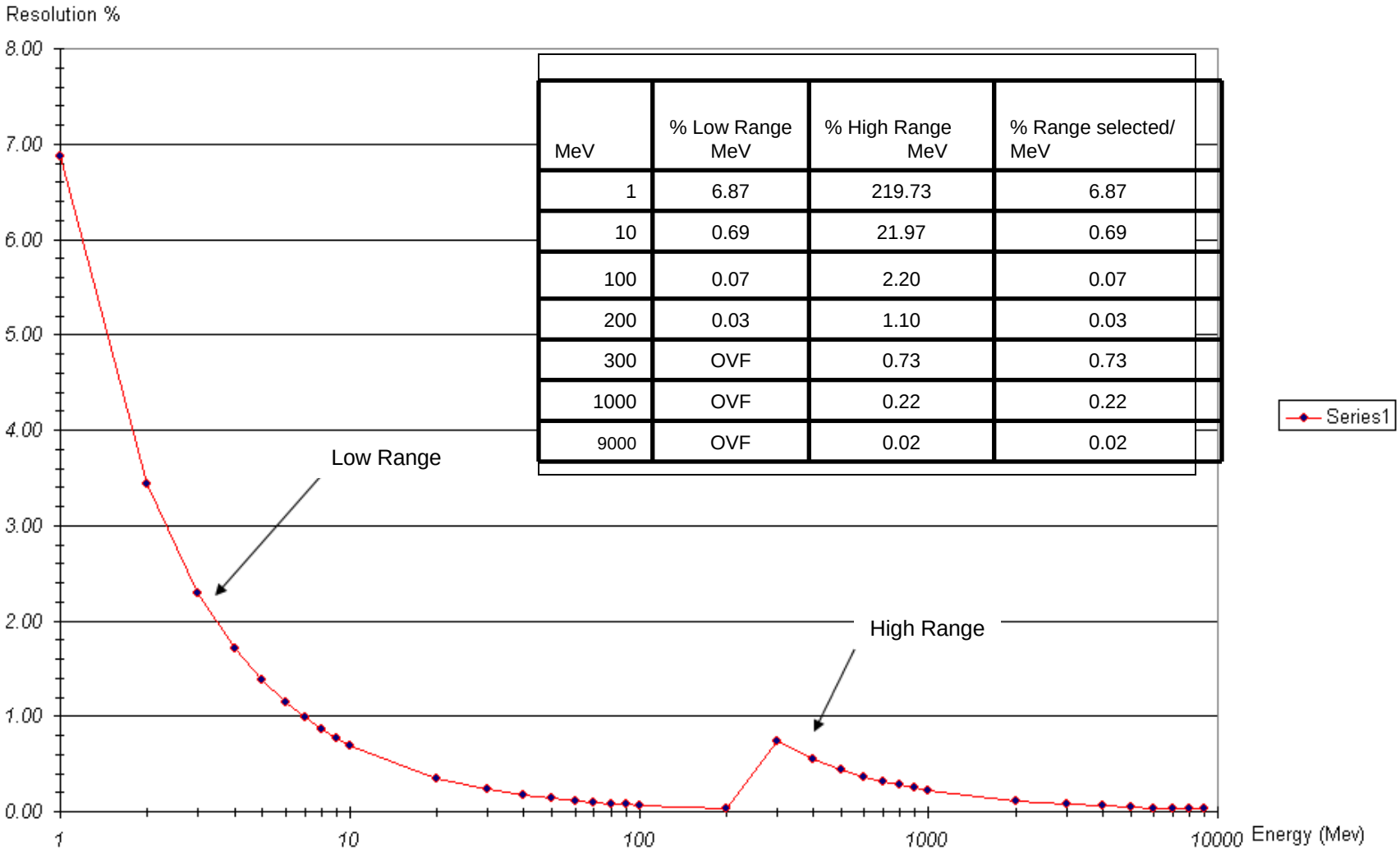
Cabling by M.Bizzarri



Babar Energy resolution



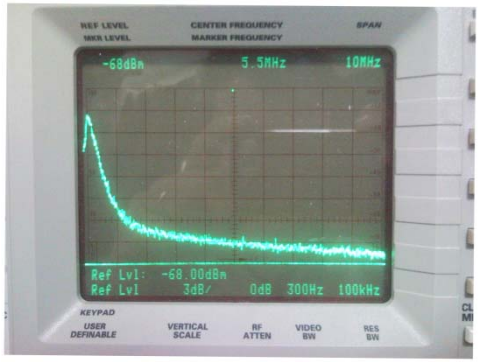
Energy Resolution SuperB



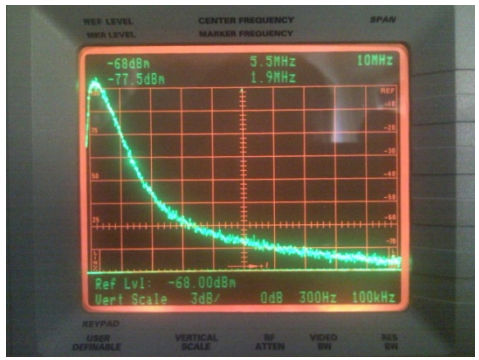
MeV	% Low Range MeV	% High Range MeV	% Range selected/ MeV
1	6.87	219.73	6.87
10	0.69	21.97	0.69
100	0.07	2.20	0.07
200	0.03	1.10	0.03
300	OVF	0.73	0.73
1000	OVF	0.22	0.22
9000	OVF	0.02	0.02

As we know the noise spectrum depends from the shaping time we do not find any noise source with an heavy contribution.

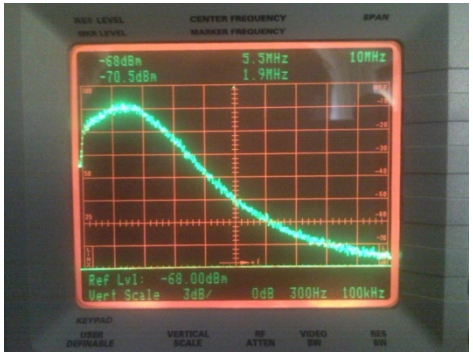
Power Spectrum 500 ns Shaper

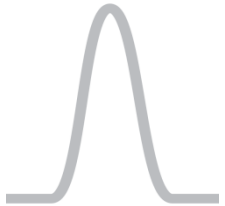


Power Spectrum 250 ns Shaper



Power Spectrum 100 ns Shaper





More noise

We integrate the noise spectrum and we have evaluated the noise level in Veff

- **100ns -> 745 uVeff**(0.5-10.5 MHz)
- **200 ns -> 565 uVeff** (0.5-3.5 MHz)
- **500 ns -> 418 uVeff (0.1-2.1 MHz**)

1 Mev 600 uv High Gain during CERN test Beam
1 Mev 180 uv Low Gain during CERN test Beam

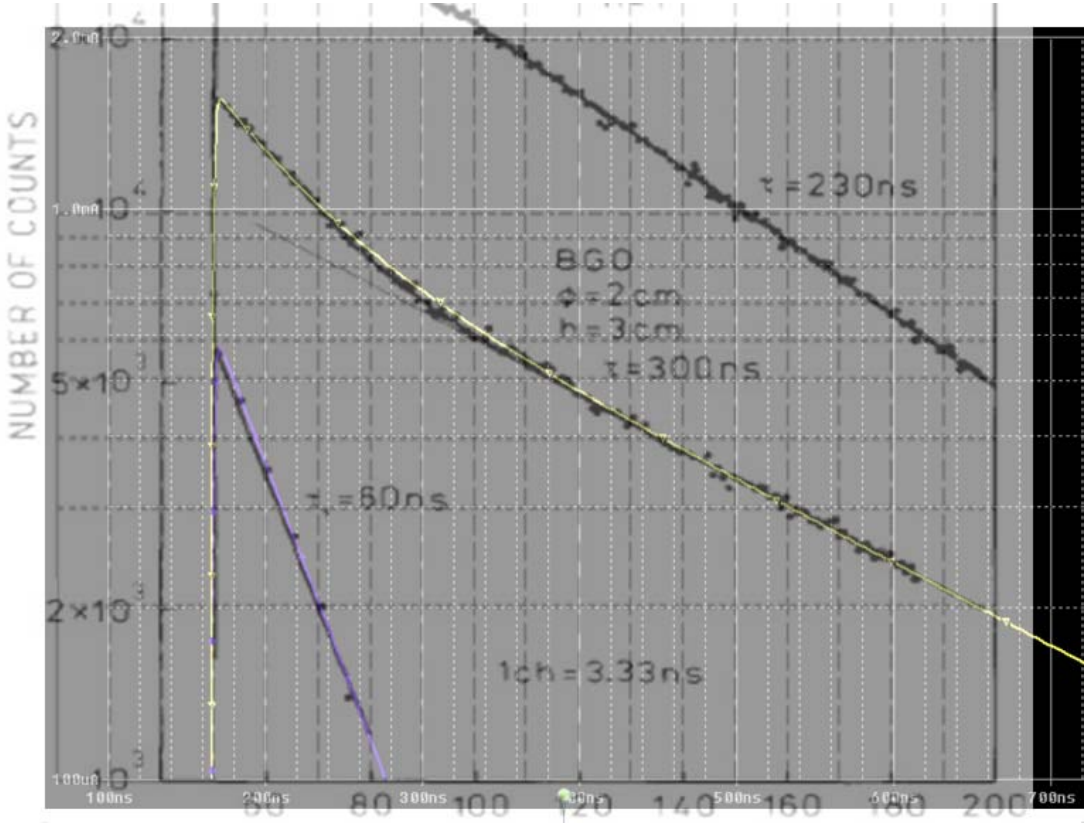
EMC Barrel questions

- Respect to babar we want to have better time response (needed from the trigger)
- The time information is there (see P.Branchini presentation trigger session) than we can keep the detector part (we are lucky).
- Can we re-use the old babar PINs in the EMC barrel readout?
  or
  we need to add or substitute with new light detectors APD, SiPM(good for trigger but probably not enough dynamics) ?
- FE replacement is mandatory
- The problem is under study first indications

EMC Forward consideration

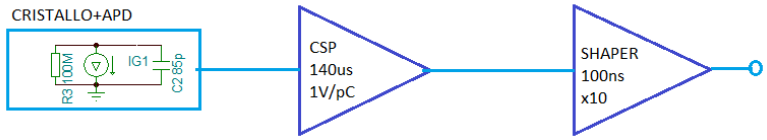
- LYSO seems to expensive respect to performance.
- LYSO vs BGO more or less the same electronics design (BGO is slower but faster than CsI(Tl)) (see D.Pinci presentation in EMC session).
- The light yeld of CsI (non doped with Tl) is very low, need a new light detector pentode (see A.Rossi presentation in EMC session) a completley new electronic design.
- We can affort BGO tests with little modification in the FE electronics than we start to work in the simulation and first tests.

BGO modelling

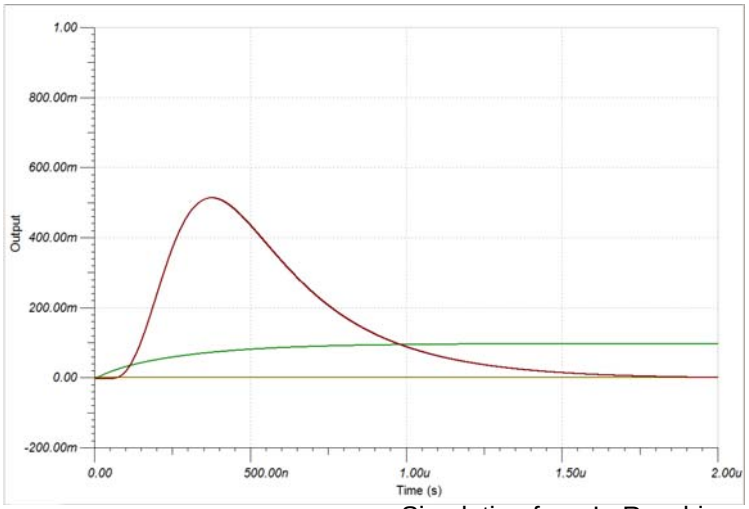


From literature we extract the time characteristics of the BGO crystals to create spice model

BGO vs LYSO
100 fc processed with same electronics

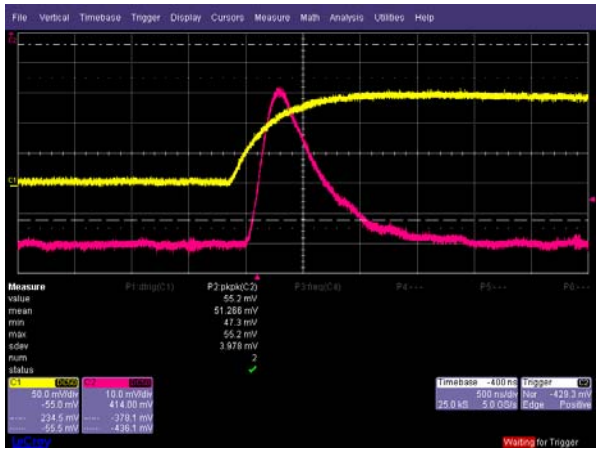


BGO response simulated

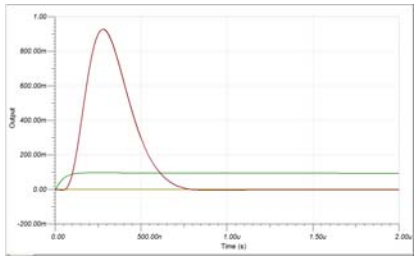


Simulation from L. Recchia

BGO real response



LYSO response



Conclusions

- The electronics follow detector discussion
- The EMC Barrel readout need a new design of the electronics to accomodate SuperB request from trigger time response and resolution.
- The EMC forward can reuse LYSO experience in the case of BGO, a new design to readout pentode for CsI.