BLOGGIF

SuperB Groups Potential in Belle-II

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INFN

A brief history of SuperB

- 2003 – Babar high luminosity studies
  - Hope to upgrade PEP-II to 10^36
- 2004 – Joint workshops in Hawaii
  - http://www.phys.hawaii.edu/~superb04/ etc.
- 2005 – inclusion in the INFN Roadmap
  - Linear nano-beam option
- 2007 – Machine and detector CD
  - Circular machine with crab-waist
- 2010 – Approval in the Italian Na
- 2011 – Formation of the Cabibbo
  - Funds start flowing, but not at the r
- 2012 – Cancellation of the projec
- 2013 – ???


The 6th SuperB Collaboration Meeting (INFN-LNF)
Photo by Claudio Federici 2012

Lots of people: Italian groups

2010

SEZ	FTE RIC	FTE TEC	FTE TOT
BO.DTZ	0.6	0.2	0.8
FE	3.4	1.2	4.6
LNF	2	0.3	2.3
MI	2.8	1.2	4
NA.DTZ	1	0.2	1.2
PD	3.6	1.3	4.9
PG.DTZ	2	0	2
PI	5	2.5	7.5
PV	1	3.3	4.3
RM1.DTZ	1.2	0.1	1.3
RM3.DTZ	0	0.2	0.2
TO	1.4	0.9	2.3
TS	2.2	0.5	2.7
TOT	26.2	11.9	38.1

2011

SEZ	FTE RIC	FTE TEC	FTE TOT
BA	1.4	0.6	2
BO.DTZ	1.5	0.3	1.8
FE	4.9	1.2	6.1
LNF	2	0.3	2.3
MI	1.7	0.4	2.1
NA.DTZ	1.5	0.2	1.7
PD	4.5	3.2	7.7
PG	2	0	2
PI	6.1	2.4	8.5
PV	0.5	3.8	4.3
RM1.DTZ	1	0.2	1.2
RM3.DTZ	0.7	0.2	0.9
TO	1.1	0.9	2
TS	2.8	0.5	3.3
TOT	31.7	14.2	45.9

2012

Sede	N Fis	N Tec	N Star	FTE Fis	FTE Tec	FTE Tot
BA	13	5		4.3	1.2	5.5
BO	17	3	3	4.3	0.5	4.8
CNAF		2			0.8	0.8
CA	8	1		1.8	0.2	2
FE	10	4	3	6.9	1.2	8.1
LE	3	3		0.9	2	2.9
LNF	7	4		3	1	4
LNL.DTZ		4			0.8	0.8
MIB.DTZ	3	0		1.5		1.5
MI	5	5	1	2.8	2.6	5.4
NA	10	3	8	4.3	0.9	5.2
PD	8	6	2	5.3	2.7	8
PG	5	1	1	2.6	0.5	3.1
PI	14	4		7.9	2.2	10.1
PV	1	6		0.5	3.8	4.3
RM1	8	4	6	2.6	1.1	3.7
RM3	5	1		1.7	0.3	2
RM2	9	1	4	1.8	0.3	2.1
TO	6	2		2.4	0.6	3
TN	0	4	2	0	2.1	2.1
TS	4	2	1	2.7	0.9	3.6
TOTALI	136	65	31	57.3	25.7	83

SuperB Group Composition 2013

2013

About
52 FTE Physicist
26 FTE Engineers

Large Group

Sede	N Fis	N Tec	FTE Fis	FTE Tec	FTE Tot
BA	10.0	2.0	3.8	0.4	**4.2**
BO	17.0	2.0	4.6	0.3	**4.9**
CNAF		3.0		1.6	**1.6**
FE	8.0	4.0	5.0	1.3	**6.3**
LE.DTZ		1.0		0.6	**0.6**
LNF	6.0	4.0	2.7	1.9	**4.6**
MIB.DTZ	3.0	1.0	1.5	0.1	**1.6**
MI	4.0	5.0	2.4	3.0	**5.4**
NA	11.0	2.0	4.5	0.8	**5.3**
PD	8.0	7.0	5.2	3.6	**8.8**
PG	6.0	1.0	3.3	0.5	**3.8**
PI	13.0	5.0	7.6	3.0	**10.6**
PV	1.0	6.0	0.5	3.8	**4.3**
RM1	7.0	3.0	1.7	0.7	**2.4**
RM3	5.0	2.0	1.6	0.6	**2.2**
RM2	10.0	1.0	2.0	0.3	**2.3**
TO	5.0	2.0	2.1	0.4	**2.5**
TN	1.0	4.0	0.7	2.3	**3.0**
TS	4.0	2.0	3.4	0.9	**4.3**
TOTALI	**119.0**	**57.0**	**52.6**	**26.1**	**78.7**

SuperB Italy Perspective

- Collaboration originating from Babar
  - With many positive additions
- Added value of very good working relationship
- Try to maintain reasonable cohesion
  - But it is very hard to remain all together
- We are still convinced that flavour is the key to new physics discoveries
- Two main interests:
- Other options:
  - NA62, BESIII, Mu2E, … … …

Potential interest in Belle-II

- Roberto Mussa stimulated a move towards Belle-II
  - Presentation in INFN Scientific Committee
- Various interactions to identify possible activities.
- Some groups have express potential interest
  - (Y) means technology-oriented group, intereted only if there is a technological development
- In all cases the groups will be modified
  - Both directions, people leave, people come.

Sede	Belle Inte
BARI	Y
BOLOGNA	
CNAF	(Y)
FERRARA	
LECCE	
LNF	Y
MI BICOCCA	(Y)
MILANO	
NAPOLI	Y
PADOVA	
PERUGIA	Y
PISA	Y
PAVIA	(Y)
ROMA1	
ROMA3	Y
ROMA2	
TORINO	Y
TRENTO	(Y)
TRIESTE	Y

Pros and cons

PROS

- Great physics
  - very similar to SuperB
- Data taking soon
  - 2015/2016
- Reasonably certain project
  - Performance ?
- Detector in construction
  - Possible to contribute
- Not LHC
  - Avoid monothematic INFN
  - Avoid expensive MOFs

CONS

- Geographically distant
  - Japan can be intimidating
- Detector fully defined
  - No contribution to design
  - Time pressure to build
  - No future developments
- Large and structured collaboration
  - Is there room for us ?
- Yet another line
  - Maybe too many for INFN ?

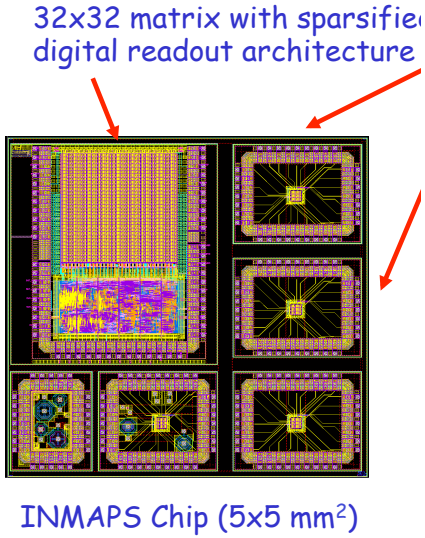
Area of interest/experience

- Silicon pixels and strips
  - Pisa, Milano Bicocca, Pavia/Bergamo, Trento, Trieste
- Drift Chamber
  - LNF, Roma3
- Particle identification
  - Bari
- Calorimeter
  - Perugia, Napoli
- Electronics/ Trigger
  - Roma3, Napoli
- Computing
  - Torino, Napoli, Bari, Pisa, CNAF

Main interest is to extract physics !

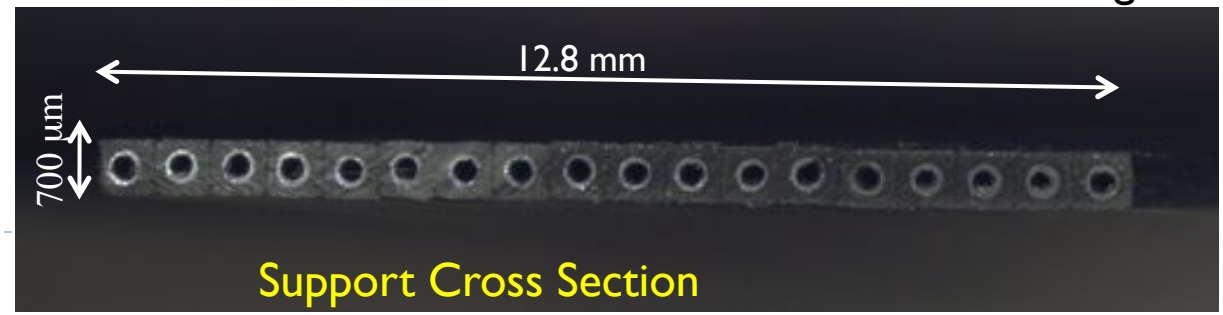
Silicon group (PI,PV,BG,MIB,TN,TS)

- R&D on fast and thin pixel systems, including mechanical structure and microchannel cooling.
  - New 3D-MAPS chip to be submitted in 2013
  - Strip readout chip with derived architecture planned
- Full design of of SuperB SVT.
- Group has assembled Babar SVT.
  - Capability of complex silicon system design and assembly
- Electronics engineers are only interested if there is a chance of advanced front-end electronics development.
- "Just" working in the SVD assembly is considered not too attractive.
  - Maybe OK if there is some future perspective



INMAPS Chip (5x5 mm^2)

Microchannel cooling



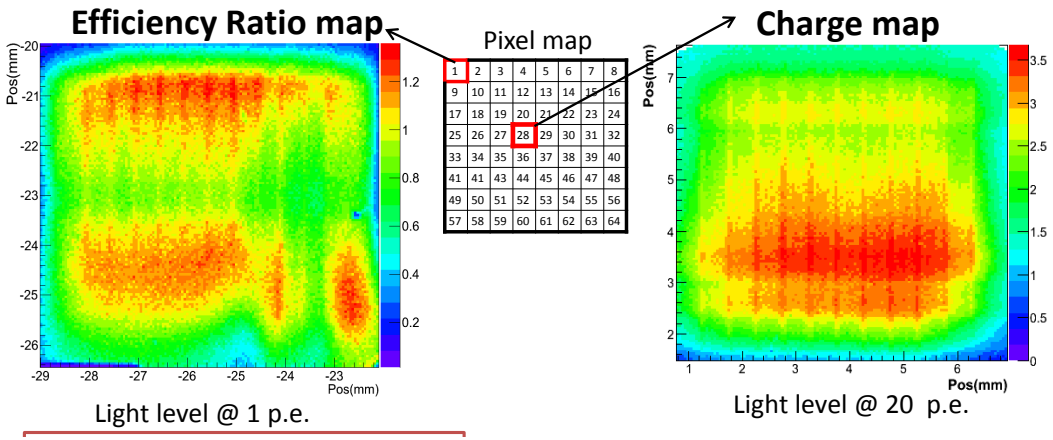
Cleanroom in Pisa (about 500m^2)

DCH (LNF, RM3)

- Prototype for cluster counting studies @BTF
- *2.5m* long prototype with 28 sense wires arranged in 8 layers
  - Goal: study DCH response from single clusters in a realistic environment, and serve as a test bench for the final FEE and for test of DCH trigger implementation

PID (Bari)

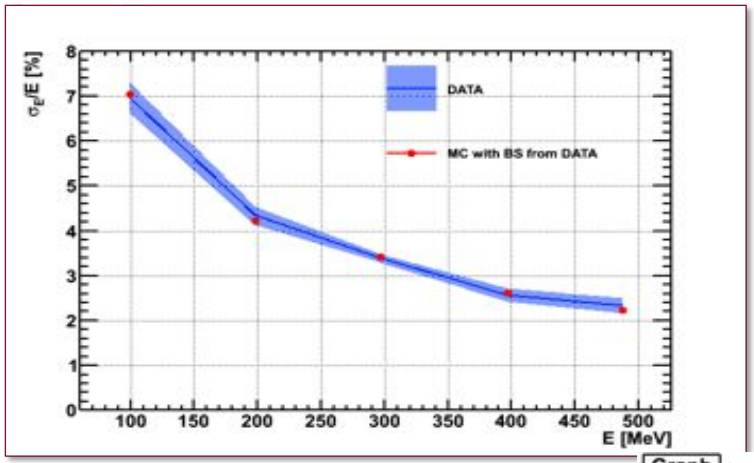
- Setup dedicated infrastructure for detailed studies of MaPMT
  - Efficiency, charge, transit time, magnetic field



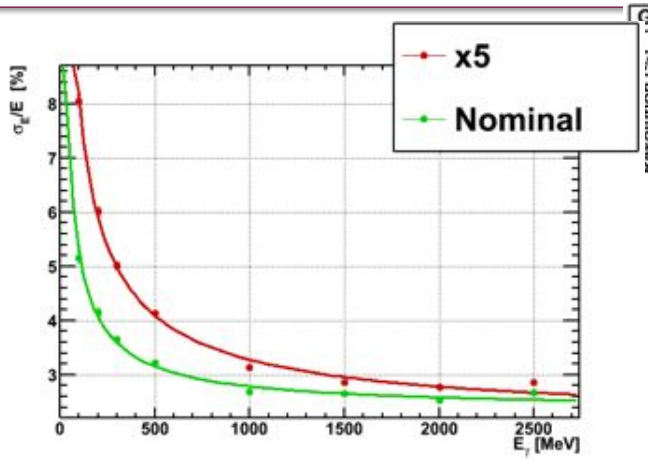
EMC (PG, NA)

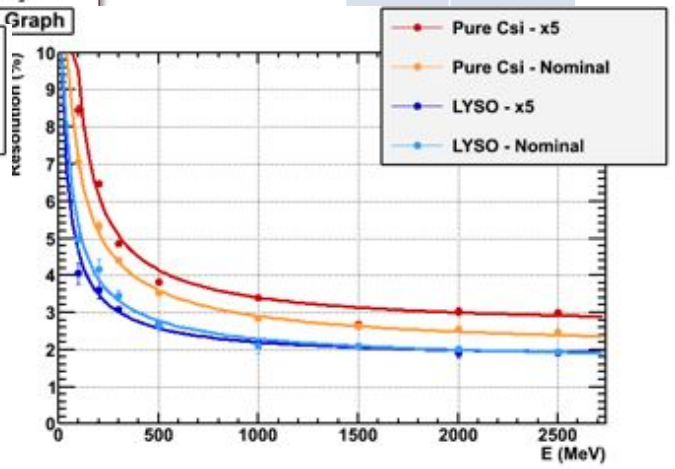
- Study of barrel refurbishment
- Study of forward calorimeter technology

R&D on LYSO has been completed



En (MeV)	σ(E)/E (%)
99	6.96 ± 034
198	4.34 ± 0.20
297	3.39 ± 0.10
397	2.57 ± 0.14
487	2.33 ± 0.17





EMC ongoing R&D

1) **Continue the R&D on pure CsI**
    1) **Lab test on electronics, reduction of noise**
    2) **Radiation hardness test on crystals**
    3) **TB on a 5x5 pure CsI matrix after point 1 and 2 have been fulfilled (first half of 2013)**
2) **By June 2013 pure CsI YES/NO**

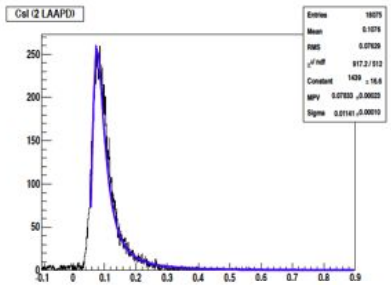
- **R&D for the pure CsI has already started at PG**
    - **lab test for the readout and FE are ongoing in PG will continue in collaboration with RM1**
    - **the aim is to understand the noise level with APD readout**

Test with 2LAAPDV1

- MVP : 78 mV1
- x2.1 LAAPD1
- Noise = 2.6mV*1.09/21

  .1= 6.6MeV1

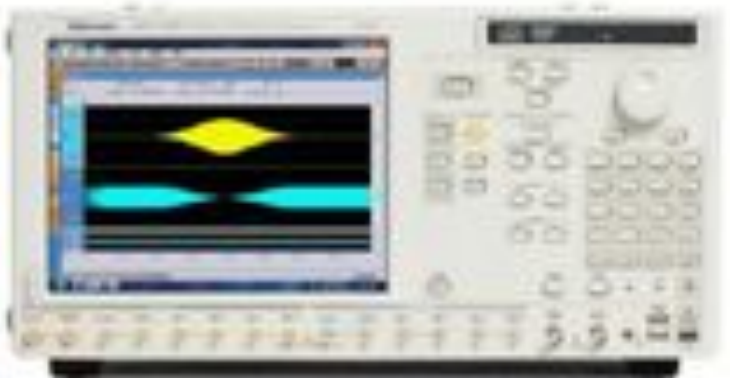
  – Still too high1



- Noise level of the order of 12 MeV with 1LAAPD and 6.6MeV with 2LAAPD
- Need to check the effect of limited oscilloscope resolution on the noise evaluation

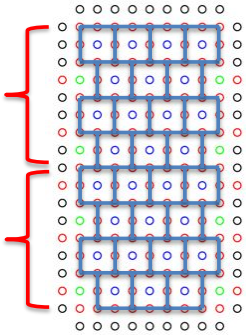
Electronics / Trigger

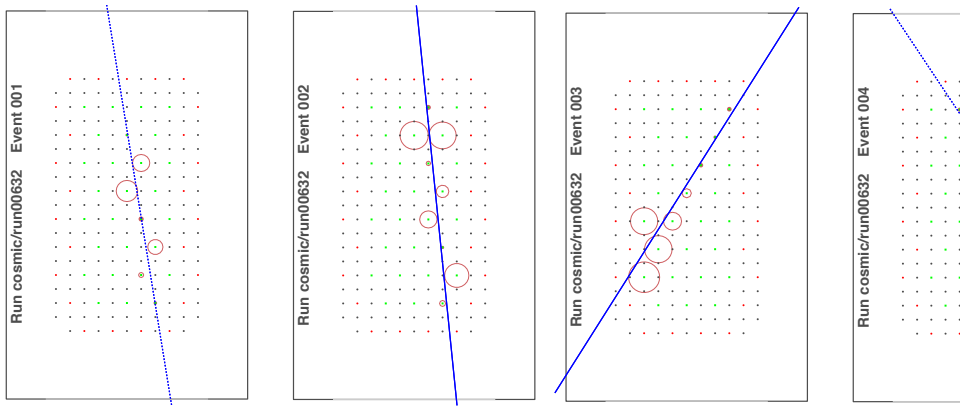
- Optical Links (NA)
  - R&D on rad tolerant links
  - Study rad tolerance of FPGA, trasducers, components
- Trigger (RM3)
  - Study DCH and EMC trigger



DCH Trigger with Prototype2

- The 8 layers of prototype two are grouped in two 4-layer Super Layers
- DCH Trigger is asserted whenever at least 1 SL has a “good” track segment
- Rate ~25Hz





Computing (TO,PI,BA,NA,CNAF)

- Very developed expertise in distributed computing
  - Advanced production system
- PON-RECAS infrastructure may be in part usable

Computing Infrastructure (1)

- In Italy:
  - CNAF
  - 4 new centers in Bari, Catania, Cosenza, Napoli
- + centers in other participating countries

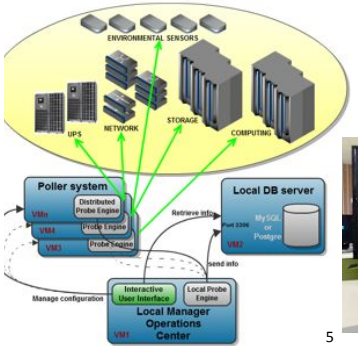
Computing R&D

- Very expert team
- Bleeding edge of development

D. Del Prete

Computing: R&D

- Distributed computing monitoring activities for SuperB:
  - The distributed computing system that will support the SuperB project will need a valid software tool for the management and monitoring
    - A geographically distributed monitoring system
    - This will be particularly important for the "Computing sites for SuperB in Italy (ReCaS)"



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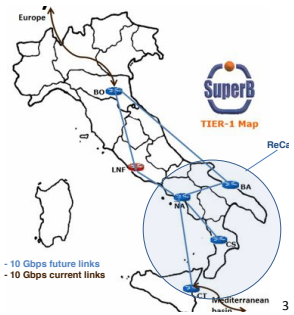

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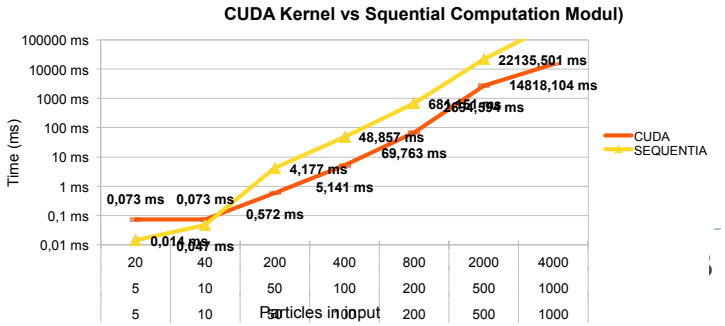
S. Pardi

Computing: R&D

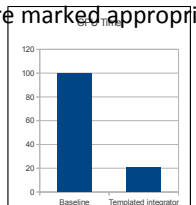
- GPU Evaluation – Update:
  - Achieve know-how on the GPU architectures in order to test the versatility and investigate the adoption for some specific tasks interesting for SuperB
    - 1U rack NVIDIA Tesla S2050
    - 4 GPU Fermi
    - Memory for GPU: 3.0 GB
    - Core for GPU: 448
    - Processor core clock: 1.15 GHz
  - B-meson reconstruction algorithm
    - Understand the impact, benefits and limits of using the GPU architecture for this use case, through the help of a toy-model, in order to isolate part of the computation

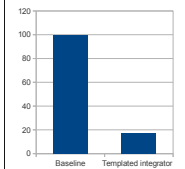


F. Giacomini

Computing: R&D

- Porting EvtGen to the Intel MIC Architecture:
  - MIC: Many-Integrated Core Architecture
  - Target is (part of) EvtGen
    - Limited to the function EvtBtoXsgammaKagan::computeHadronicMass( )
  - First step to understand if and under which conditions MIC is suitable for HEP software
  - Longer-term goal is to smoothly integrate the possibility to offload computation to an accelerator (such as a MIC or a GPU) directly in the software framework of an experiment
  - Native compilation:
    - The whole application is compiled only for the MIC Instruction Set
  - Heterogeneous compilation:
    - Some parts of the code are marked appropriately and compiled both for the host IS and the MIC IS





Conditions for participation

- There must be something to do now
  - Verify space availbility in an experiment in construction
- It has to be commensurate with our experience and funds
  - Time is so short that we have to make use of what we have in terms of infrastructure, experience, funds.
- It has to be reasonably identifiable and visible
  - Essential to formulate a reasonable proposal
  - Probably diluting on too many different items is not a good idea
- It must be welcome by the collaboration
- There must be something to do also in perspective
  - Good fraction of the group interested in R&D and technological developments

Conditions we are asking to INFN

- Building a participation of a large group to an experiment in Japan does not come for free.
- INFN has to provide:
  - Capital investement for construction
    - Limited for the initial construction phase
    - More substantial for the upgrades/phase II
  - Support for some sort of summer student program
  - Support for a post-doc hiring program
  - Support for long stays of staff personnel (fellow program)
  - Computing resources to do analysis
- In return we promise great physics

Participation perspective and next steps

- A two step process from INFN point of view

1. Identify possible contributions to ongoing construction. Join with relatively small financial contribution, fitting in currently planned budgets. (Starting 2013)

2. Identify activities for phase 2 or upgrades.
   - Perform R&D work needed
   - Present a funding plan to INFN CTS (Technical and Scientific Committee) who decides on major projects. (2014 or 2015)

See you in Tsukuba - つくば