Computing Summary

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(SuperB Computing Group)

SuperB General meeting
Perugia
19 June 2009

Meeting Goals

- Review progress in all areas
  - Fastsim, fullsim, background, tools, sites, ...
- Technical discussions
  - computing experts in the same room as detector, physics, accelerator experts
- Planning for the next phases
  - Support for detector design and physics studies for EOY09 document and TDR
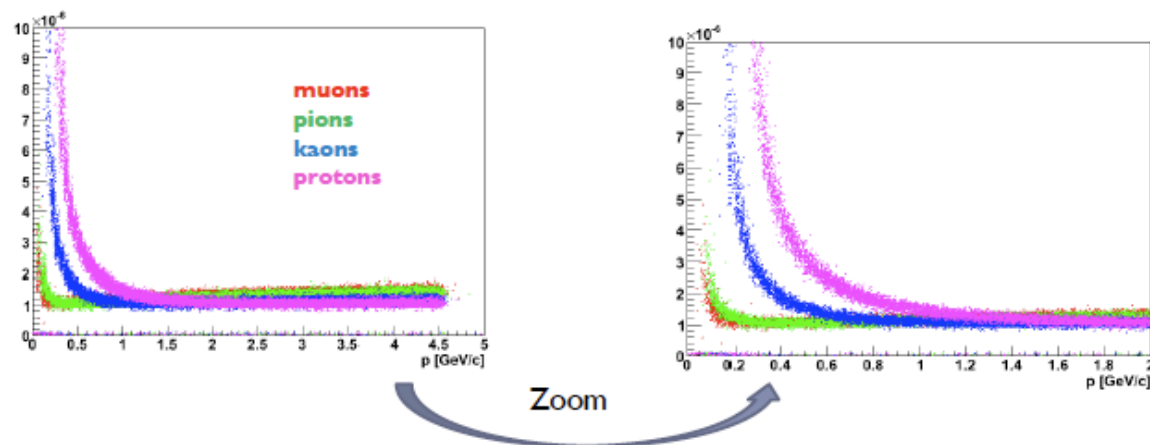 - Computing TDR planning

FastSim

- Technical discussion about FastSim
  - Improvements in particle swimming, MC match, Svt hit resolution model, IFR model, dE/dx
  - Still some issues with BReco, PID selectors
- Lots of results using FastSim

Old

New

Summary and plans

- New version of the DCH dE/dx measurement implemented in FastSim
- Code ready for commit to SVN
- Next steps:
  - commit the code
  - do performance studies to tune the dE/dx output
    - use BaBar detector configuration for tuning
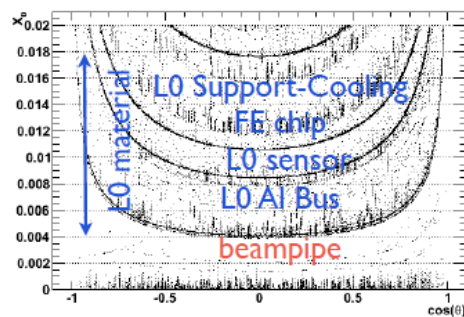 - work with PID group to develop PID selectors including dE/dx

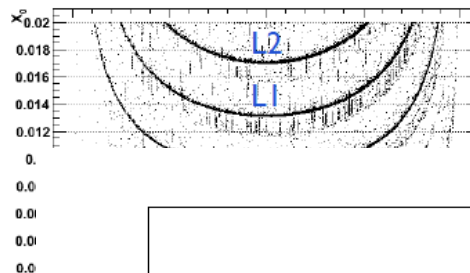Zoom

5

N. Neri

Radiation length vs cos(theta) in FastSim

SuperB

Radiation length vs cos(θ) SuperB inner layer

L0 Support-Cooling
FE chip
L0 sensor
L0 Al Bus
beampipe

BaBar

Radiation length vs cos(θ) BaBar inner layer

L2

L1

Total amount of L0 material is ~1.36% X_0 c
Relative amount of material for Al bus and sup

7

Resolution: Δm and ΔE

Deltam resolution vs Detector configuration

Δm
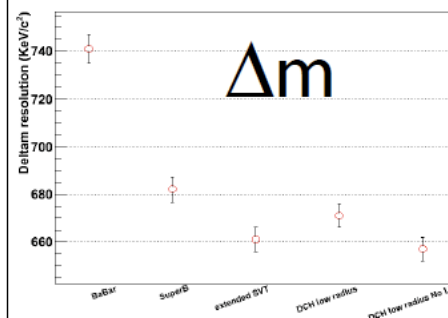
DeltaE resolution vs Detector configuration

ΔE
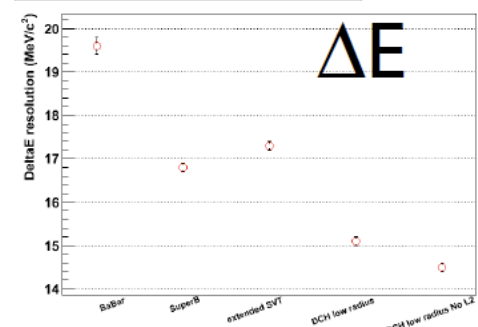
Δm (soft pion) resolution improves wrt BaBar configuration.
ΔE resolution reflects the improvements in momentum
reconstruction for DCH with lower radius.

15

It was recently proposed to reduce the asymmetry of the HER/LER energies from 7.0/4.0 GeV to 6.7/4.18 GeV, in

C. Cheng

- Study the S and C terms in time-dependent CP fit to $B^0 \to \varphi K_S$ decays using the two beam energy configurations.
- Tool: fast simulation V0.0.9 + development up to ~June10.
- Mode: signal only; $B^0 \to \varphi K_S$,
  - ‣ BF= 1.45×10^{-6}.
  - ‣ Generator at: $\sin 2\beta = 0.7033$, C=
- Layer 0: Si hybrid pixels at R
  z_resolution= 10 µm.
- Beam spot $\sigma_x = 5.7$ µm, $\sigma_y = 3$

3

2M-event fits

~1.25 M events in the fit
$\beta\gamma$= 0.283
$\beta\gamma$= 0.238
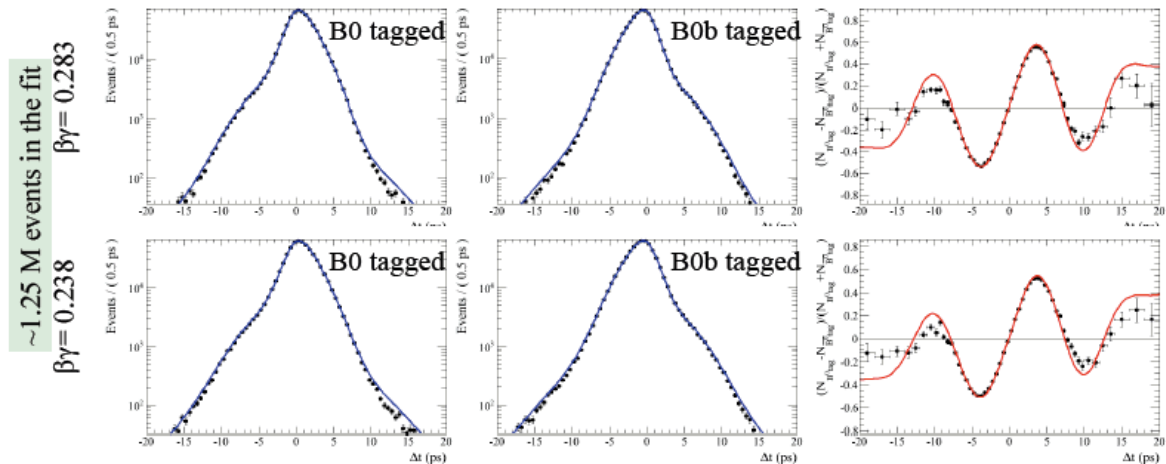
$\beta\gamma$	0.283	0.238
S	0.70414 ± 0.00175	0.70325 ± 0.00187
C	-0.00105 ± 0.00122	-0.00289 ± 0.00125
b_core	-0.1158 ± 0.0038	-0.0929 ± 0.0034
b_tail	-0.8376 ± 0.0241	-0.7653 ± 0.0204
f_out	0.0078 ± 0.0004	0.0100 ± 0.0002
f_tail	0.1773 ± 0.0027	0.1779 ± 0.0023
s_core	1.1230 ± 0.0056	1.1314 ± 0.0049

- Resolution function is not perfect, but does not cause bias in uncertainty comparison.
- Error on S changes by +6.9%.

It does not change the result if we relax $\sigma(\Delta t)$ cut in reduced boost so that #events in the fit are the same.
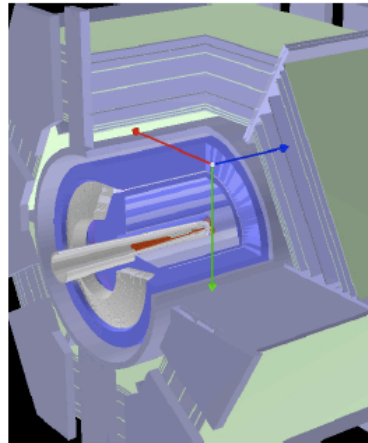
9

Full Sim

- Large improvements in Bruno geometry, core

  - New G4 version, stepping tuning, physics lists, ...

  - Digitization

- Focus on critical elements for TDR

  - Emc forward + transition region

  - Ifr iron

  - scoring volume for background simulation
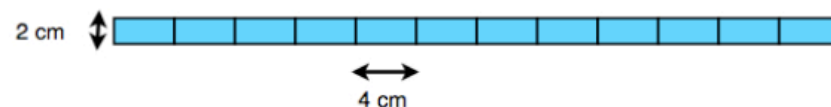
- Becoming a useful tool

M. Munerato

IFR @ Orsay vs IFR @ Perugia

The IFR configuration at Orsay was like BaBar with some layers filled with iron. Now we have improved this configuration and we have one CDR-like.

Number of gap	Material	thickness
1	scintillator	2cm
	air	0.5cm
	iron	2 cm
2	scintillator	2cm
	air	0.5cm
	iron	2cm
3	scintillator	2cm
	air	0.5cm
	iron	16cm
4	scintillator	2cm
	air	0.5cm
	iron	26cm
5	scintillator	2cm
	air	0.5cm
	iron	26cm
6	scintillator	2cm
	air	0.5cm
	iron	10cm
7	scintillator	2cm
	air	0.5cm
	iron	10cm
8	scintillator	2cm

Outline
Digitization
Clusterization
Conclusions

Introduction to digitization
Previous setup
New setup

New digitization setup I

2 cm

4 cm

⇒ For digitizing we subdivide the layer into strip of 4x2cm.
⇒ We check in what strip is the Ghit considered.
⇒ We compare the Ghit considered with other hits memorized.
⇒ Hit memorized will be in the middle of bar (x:y view) but the z position will be the average (see next slide).

Fwd ECAL Geometry Envelop

C. Cecchi, S. Germani

- Fill the same BaBar angular region but
  - leave space for TOF: ΔZ = (100 mm)*cos(22.7)
  - Xtals material : LSO (LYSO)
    - Xtal depth = 200 mm (~17.5 X_0)

Graph

BaBar

SuperB
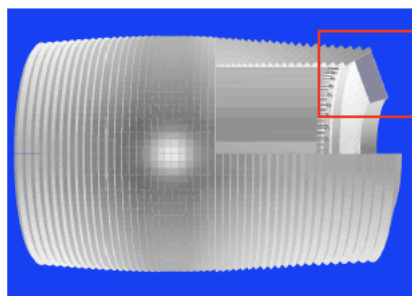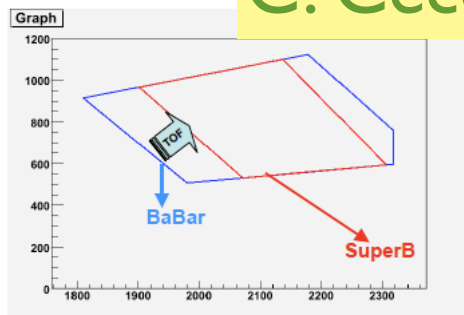
18/06/09   ECA

Investigate Barrel-Fwd Transition Region

- Quick scan in theta angle to investigate the effect of Barrel-Fwd transition region and Fwd postion with respect to the barrel
  - Backward alignemnt (room for Fwd PID)
  - Front alignement

SuperB

Barrel   l=47   l=48   r=20   r=19   Fwd   γ γ

Barrel   l=47   l=48   r=20   r=19   Fwd   γ   γ
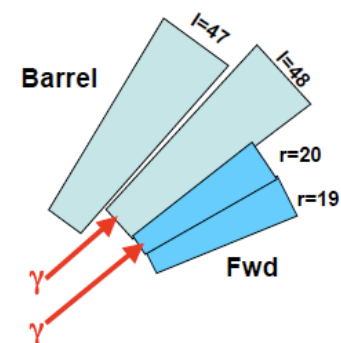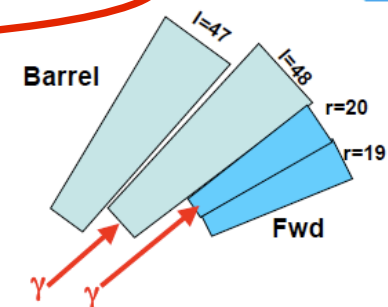
18/06/09   ECAL Simulation   8

Background Simulation

- The most important outstanding issue for physics

- Dedicated session during this meeting

  - Discussion of progress

  - Refinement of the technical design

  - adoption of a schedule

Conclusions

- The cleaner solution for the creation of background frames is the use of parallel geometries
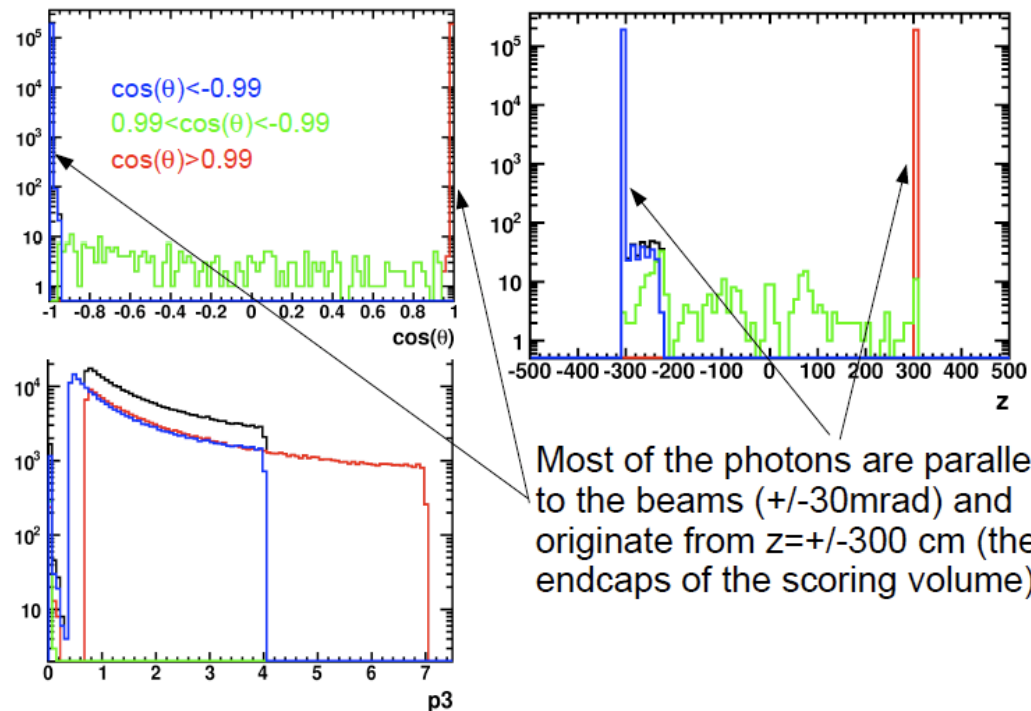 - From the Bruno side, everything is working
- On the other hand, we can't afford to be stopped by the occasional G4 bug
- Highest priority now in implementing fallback solution
  - Prototype already working
  - Very short (~days) timescale for re
  - Aim is to have both solutions in pl with each other, so that
    - parallel navigation can be thoroughly
    - Background frame production can go

G. Simi

Bkg distributions

$\cos(\theta) < -0.99$

$0.99 < \cos(\theta) < -0.99$

$\cos(\theta) > 0.99$

Most of the photons are parallel to the beams (+/-30mrad) and originate from z=+/-300 cm (the endcaps of the scoring volume)

Software Releases

- First standalone software release V0.1.0 (R. Stroili)

    - 189 former BaBar packages imported to Padova SVN server

        - Approved for public use by BaBar

        - Release of physics code under negotiation (approval at Valencia?)

    - Code distribution through Linux RPM

    - Wiki instructions, web-browsable history, ...

- Few non-expert adopters

    - problems installing into protected (protective) areas

    - lack of tools (critical manpower need)

Computing Facilities

- CNAF
  - SuperB V0.1.0 release installed
  - interactive access
  - 100s of CPUs available for batch
- SLAC
  - dedicated machine(s) should be setup soon
- UK, Canada
  - cycles available in grid farms

A. Fella

http://mailman.fe.infn.it/superbwiki/index.php/CNAF_services/How_to_work_on_Fast_Simulation

CNAF services/How to work on Fast Simulation

From SuperBWiki

0) You need a valid BaBar account at CNAF, please refere to the official procedure reported at the link CNAF services/Account request procedure

1) Login to bastion.cnaf.infn.it (CNAF gateway) and to bbr-serv08.cr.cnaf.infn.it (BaBar SL4 i386 frontend machine SuperB enabled)

```
ssh -X <user>@bastion.cnaf.infn.it
ssh -X <user>@bbr-serv08.cr.cnaf.infn.it
```

2) Follow the Fastsim Wiki tree instruction

http://mailman.fe.infn.it/superbwiki/index.php/FastSimDoc/standalone#Working_with_a_standalone_SuperB_FastSim_release

3) [Still not working, stay tuned] Running on CNAF batch system (LSF)

- Create your directory into the dedicated disk space

```
mkdir /storage/gpfs_babar6/sb/afella
```

- Write the job script:

```
-----------------------------------------------------------------------------------------------------
bbr-serv08(~/SuperB/FastSim/V0.1.0_test/workdir)>cat ./FastSim-job.csh
#!/bin/tcsh

echo "Starting FastSim-job"

echo "Setup the environment"
source $SBROOT/bin/superb-env.csh

echo "PacMCApp test launch"
$SBROOT/releases/FastSim/V0.1.0/bin/Linux26SL4_i386_gcc346/PacMCApp PARENT/PacMC/snippet.tcl > \
 /data/PacMC.root

echo "end"
bbr-serv08(~/SuperB/FastSim/V0.1.0_test/workdir)>
-----------------------------------------------------------------------------------------------------

chmod 755 FastSim-job.csh
```

- Submit on batch system (queue superb)

```
bsub -o FastSim-job.log -e FastSim-job.err -q superb \
-f "/storage/gpfs_babar6/sb/afella/PacMC.root < /data/PacMC.root" ./FastSim-job.csh
```

Production

- Major milestone for supporting TDR activity

- must integrate ALL aspects of computing

  - fullsim, fastsim, background, physics, users, grid, releases, bookkeeping, ...

  - major technical challenge for computing

- Good discussions during session

- Agreement on a technical implementation plan by all concerned parties

- Critical need for support manpower

  - Possibility of new manpower from UK

Production Model

- (Full) Simulate and store background Frames
  - Separate collections for Bhabha, pairs, Touschek, ...
- (Fast) Simulate generic backgrounds + signals
  - Overlay bkg frames
  - hit and cluster merging
- Analysis software in User packages
  - filters, sequences, output specification, macros
    - In release, allows non-experts to perform a (basic) analysis
  - Validation by WG (content) and computing (performance)
  - All validated analyses run in parallel
- Central bookkeeping, submission (manpower!)

Computing Schedule

- Freeze Release V0.1.1 (+V0.0.9) in early July
  - V0.0.9 will be the last BaBar parasitic release
- First test production in early fall 2009
  - aim for ~100 fb-1 size samples
  - main goal: verify production model
- Preliminary production in early 2010
  - ~1->10 ab-1 samples
  - all sources, analyses, geometries
- Final TDR production in summer 2010

Computing TDR

- Existing computing model is provisional
  - Will not work for the actual experiment
- Must look to new developments for TDR
  - gpu, multi-core, low-E, cloud computing, ...
  - experience and tools from LHC (+ LHC R&D)
- Planning for TDR R&D must start now
- Opportunities for new contributors!

Conclusions

- SuperB computing is supporting Detector + Physics TDR work

  - Impressive results from users

- Outstanding issue: background simulation

- Production planning started

  - clear agreement, schedule from this meeting

  - major effort over the next months

- Planning for Computing TDR work started

  - Intensive R&D needed independent of Detector +Physics TDR support work