Computing summary

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on behalf of the computing group

Summary

- Progressing:
  - Full sim
  - Fast Sim
- Planning:
  - next large productions
  - towards SuperB distributed production
- Longer term
- The Computing White Book

Full Simulation: selected results I

- So far used for:
  - Optimization studies in IFR, EMC, SVT
  - To study the effect of FW PID material on EMC
  - To estimate bkg hit rate in SVT, DCH, EMC, IFR

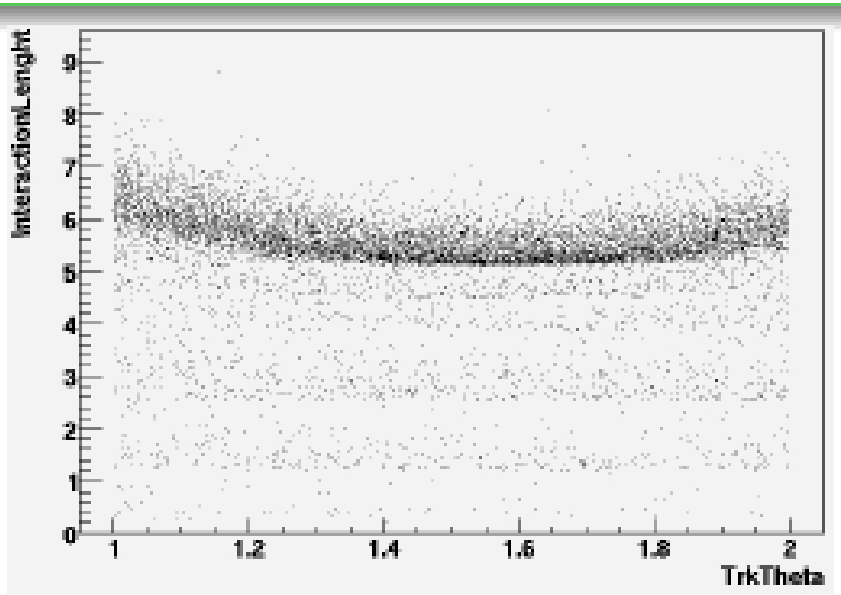


Figure: Interaction length vs θ for muons

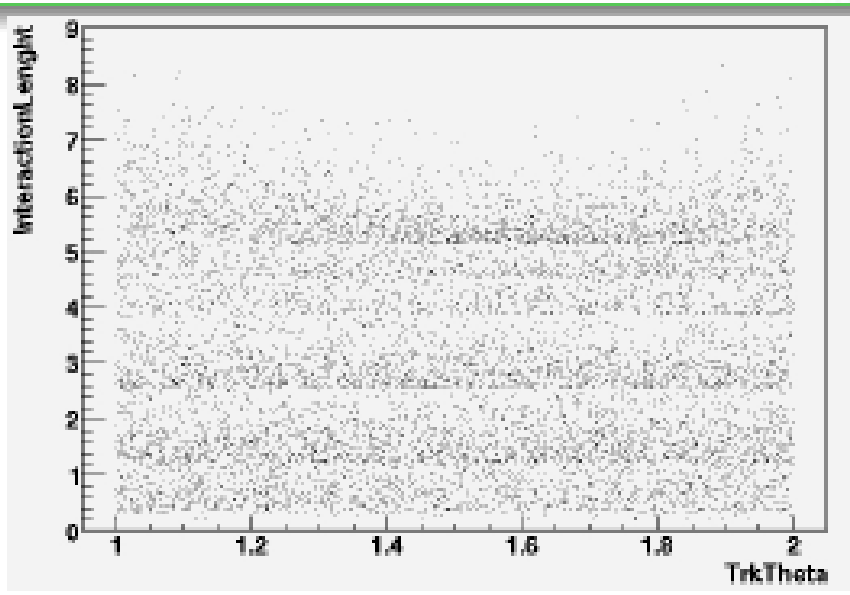
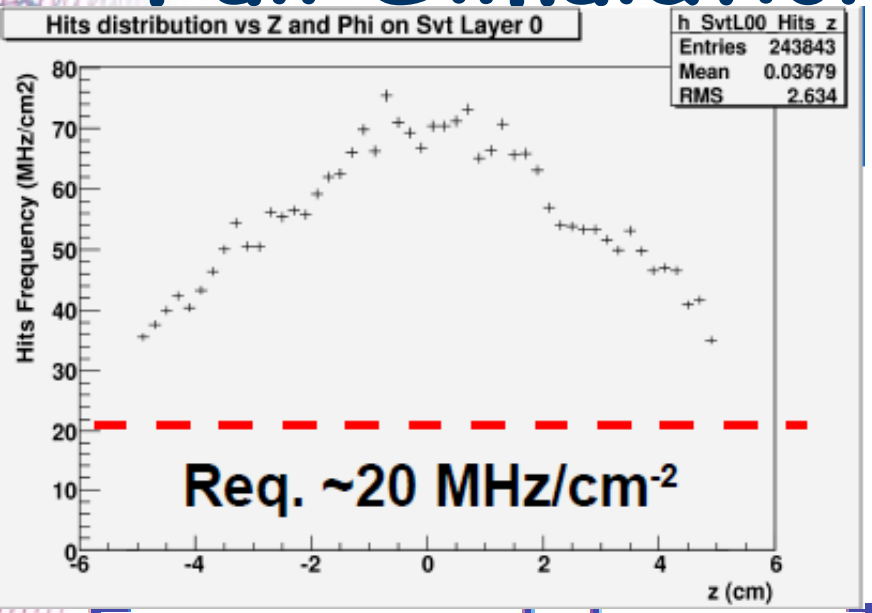
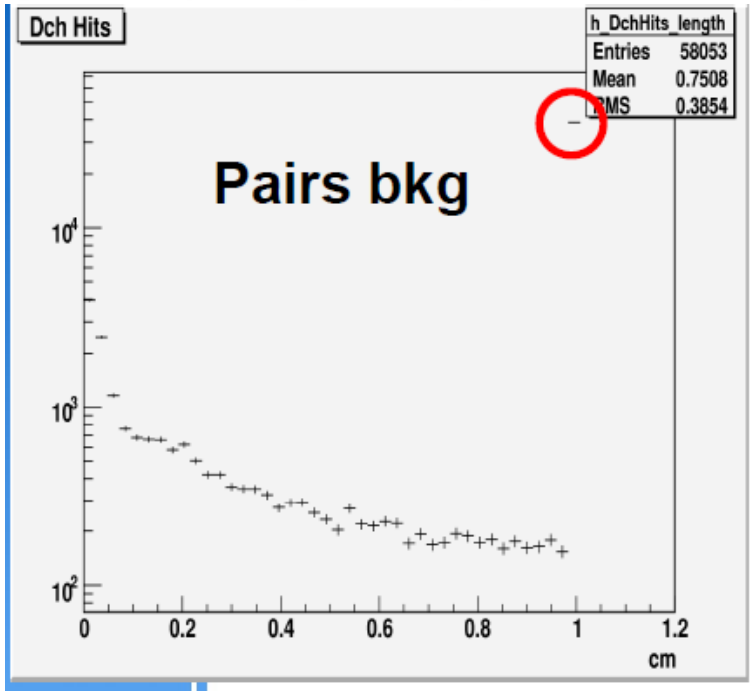


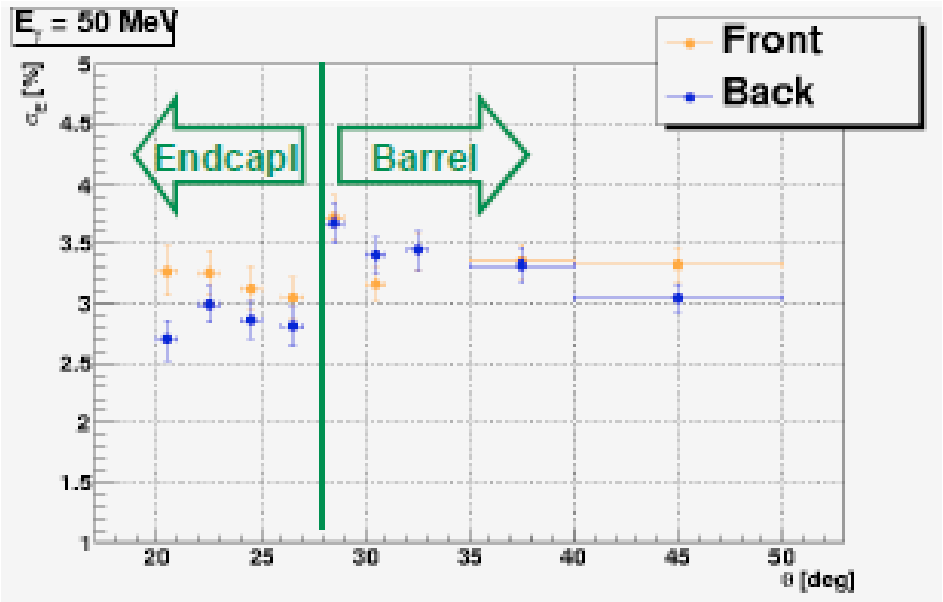
Figure: Interaction length vs θ for pions

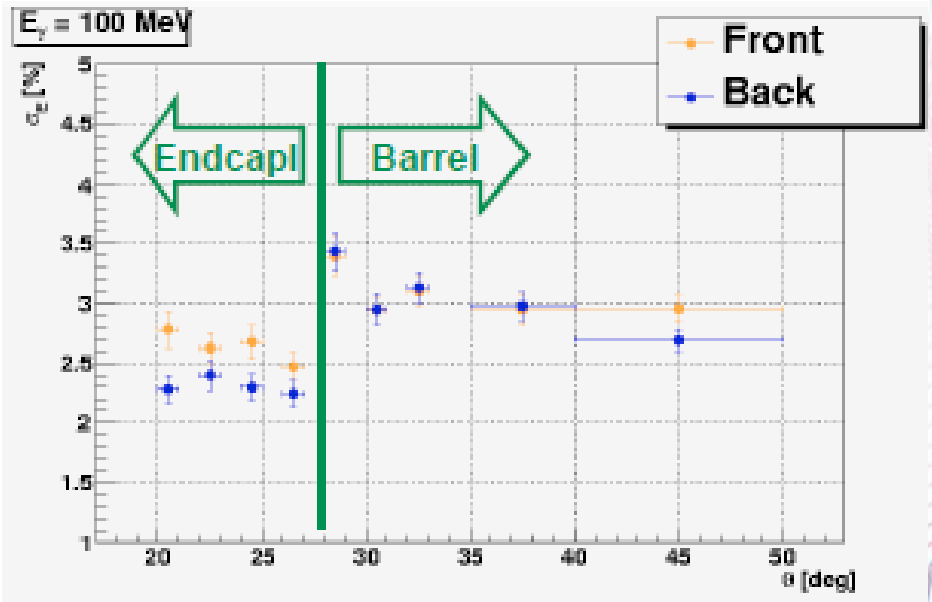
Full Simulation: selected results II





Energy resolution vs Theta





... exploiting further Full Sim

- require active coordination/ cooperation with detector groups
- e.g.: for bkg studies we could now aim at delivering a standard tool for assessing bkg levels in appropriate units for all subsystems

Todo list for Background study with FullSim

- **General**
  - Understand hit sources (new tools: followers)
  - Other bkg sources, embed them into Bruno (if possible)
  - Check geometry at all levels (SVT, EMC)
  - Add error bars on bkg plot

  HIGH PRIORITY
- **SVT**
  - Test with increased magnetic field, globally or locally
- **DCH**
  - Add stereo layers
  - Test other geometrical configuration (interest from McGill)
    - smaller inner radius
    - wedding cake or domed end-plate
- **No bkg plots for DRC and IFR**

- **General**: Improve geometry description according last designs, clean-up the code and std naming for classes
- **Interaction region:** Test different tungsten shielding configuration
- **SVT:** Test different rad length for BP (0.4-0.6%) and clearance BP-L0 (0.5-1mm)
- **DCH:** Cell shape, staggering

LOW PRIORITY

Riccardo Cenci 1 SuperB General Meeting, Oct 6-9th 2009

Recent Developments

- Several developments since Perugia (see presentation by A. Di Simone in Full Simulation parallel)
  - Improved Truth configuration
  - New ROOTGenerator allows easy data interchange with external generators
  - Particle Follower: tool for production of bkg frames for FastSim may actually be very useful also for FullSim studies
  - Staged simulation is now possible and it may prove to be very effective in reducing our CPU time usage

Splitting Full Simulation Code in Packages I

- Distinguish between "Core" and "Detector" code
  - Within those domains, the level of splitting depends on the actual amount of code involved
  - Most likely, will start with a minimal set of packages, aiming at having a more complex structure in the longer term, to reflect the growing complexity of the simulation code
- Aim is to also split the geometry gdml description for the different sub-detectors
  - In practice, this means that each sub-detector will manage its own geometry description
  - Keep in "Core" only top volumes, to better handle space allocation and volume clashes

Splitting Full Simulation Code in Packages II

- Advantages are obvious and this is clearly the way to go
- Several modifications will have to be done to fullsim
  - C++ side (ADS + EP + ???)
  - Build procedure (???)
  - Repository structure (RS?)
  - Releasing and distributions (RS?)
  - Validation (???)
- Main issue will be manpower
  - Any involvement of present human resources in this packaging will disrupt normal development and user support.
  - However the more we delay this step, the larger will be the amount of work to do.

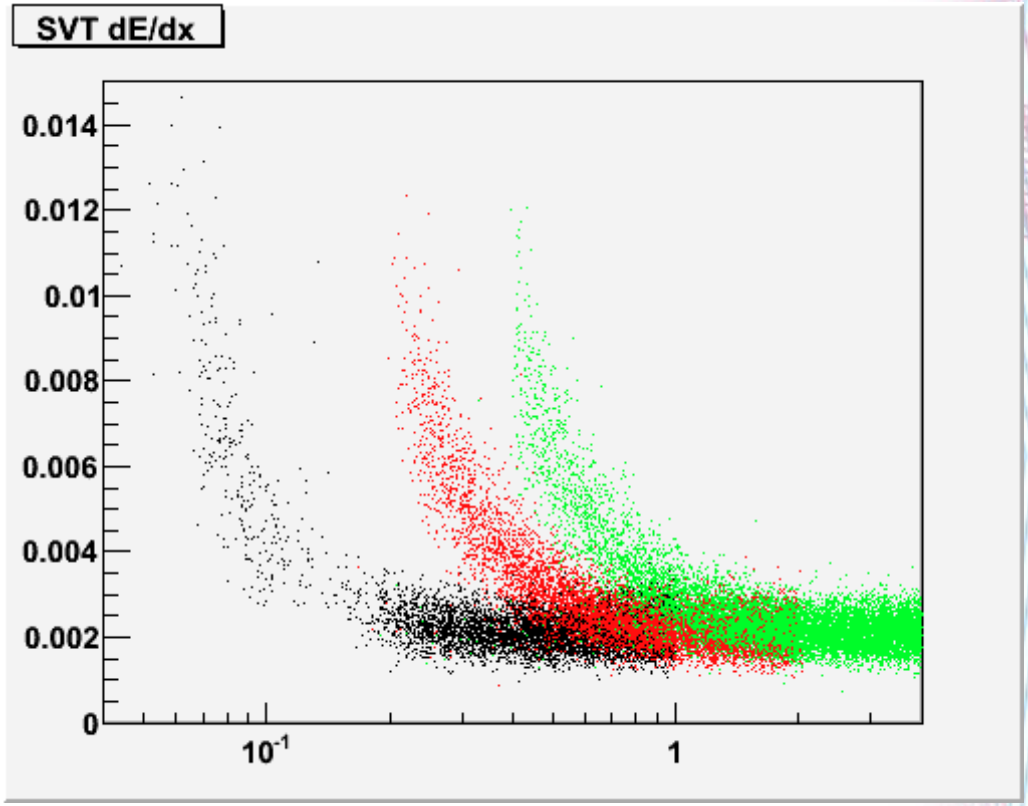
We will need the tight cooperation of the detector Full Sim experts!

Splitting Full Simulation Code in Packages: Planning

- Create a Bruno tag with:
  - Recent development from A. Di Simone
  - Simplified DIRC SOB & simplified PID volume (E. Paoloni)
- Freeze it (only bug fixes on top of it)
  - Sub-detector studies and central production can continue using that tag.
- Perform the splitting of Bruno into packages
  - Both coding and validation
  - Create a new tag of Bruno with splitting in packages
  - We hope to be finished in less than two months from now

Progress in Fast Sim

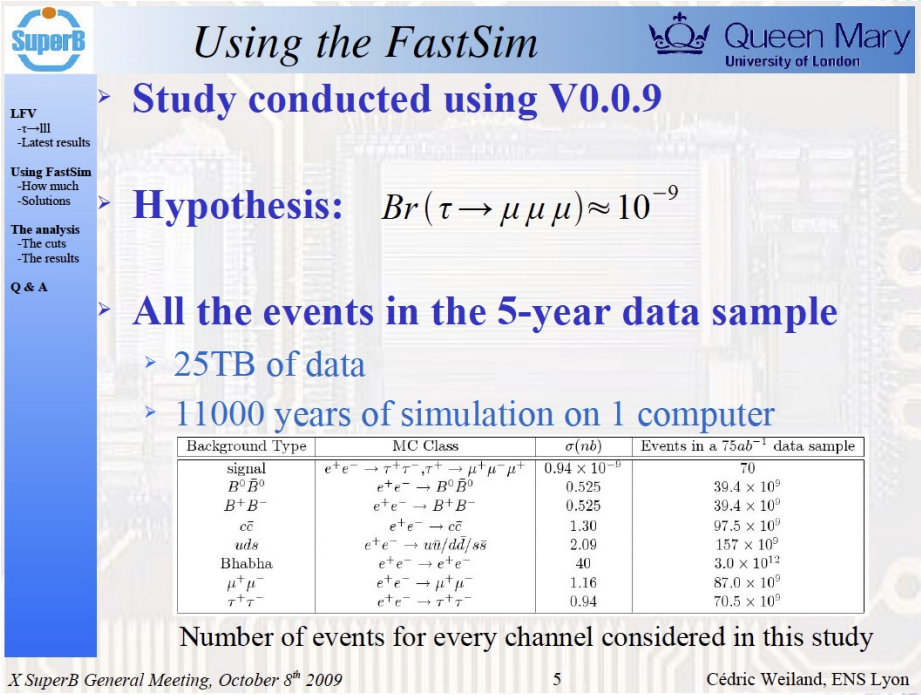
- many results shown at parallel session
  - some will be reported in other plenary talks
- first presentation at this meeting of the SVT dE/dx implementation



- SVT dE/dx now implemented in Fastsim
- Reasonable results already available via the BtaPidQual object ⇒ PID algorithms can start using SVT dE/dx
- Crude calibration gives correct resolution for MIPs

Fast sim productions

- "private" productions
  - now being performed for several Physics and performance studies
  - already shown results from very large production
- "coordinated" productions
  - large generics productions
  - bkg mixing
  - various analysis streams
  - different detector geometries
  - managed via a bookkeeping DB



Background Type	MC Class	$\sigma(nb)$	Events in a $75ab^{-1}$ data sample
signal	$e^+e^- \to \tau^+\tau^-, \tau^+ \to \mu^+\mu^-\mu^+$	0.94×10^{-9}	70
$B^0\bar{B}^0$	$e^+e^- \to B^0\bar{B}^0$	0.525	39.4×10^9
B^+B^-	$e^+e^- \to B^+B^-$	0.525	39.4×10^9
$c\bar{c}$	$e^+e^- \to c\bar{c}$	1.30	97.5×10^9
uds	$e^+e^- \to u\bar{u}/d\bar{d}/s\bar{s}$	2.09	157×10^9
Bhabha	$e^+e^- \to e^+e^-$	40	3.0×10^{12}
$\mu^+\mu^-$	$e^+e^- \to \mu^+\mu^-$	1.16	87.0×10^9
$\tau^+\tau^-$	$e^+e^- \to \tau^+\tau^-$	0.94	70.5×10^9

Production Plans (Perugia)

- "July 09 test production"
- August 09 FullSim production
  - ~1M beamstrahlung background frames produced
- September 09 FastSim production
  - planned ~1ab^{-1} generic B^0B^0, udsc, 2-photon, ...
  - Multiple detector geometries
  - Multiple analyses in parallel
- January 09 production
- July 09 production (TDR)

Test production: a success but...

- only two analysis
  - working with BaBar code is difficult
- lot of manual work for job submission and merging of output files, DB only partially used
  - production tools improvments needed
- no systematic code validation
  - will have to organize QA team
- performance less than expected
- only one type of machine background
- backgrounds only partially dealt with in the simulation
  - main problem: neutrons not simulated properly and efficiently

- no show stoppers, all the issues are being addressed
- good progress during this meeting

Fast Sim Bkg simulation model extended

- γ and high Pt tracks
  - TParticle
    - Save position and momentum of particles exiting a scoring volume, convert them into GTracks and simulate their passage trough the Fast-Sim detector
- Neutrons in EMC and IFR
  - Energy deposit
    - Use EMC and IFR response to determine the fast sim hits
- Low Pt tracks, neutrons, DCH spirals in Tracking volume
  - Fluence
    - Generate random hits according to fluence

07 Oct 2009 G. Simi - X SuperB General Meeting, SLAC 10

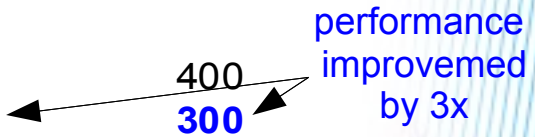
- also electronic noise can be dealt with

November production tests

- there is hope that in a few weeks from now many bug fixes and improvements can be already in
- it would be important to perform a second test production in the second half of November
  - could provide additional data for physics and detector studies to be presented at the December general meeting
- after some discussions we decided to aim at
  - a November production of roughly the same statistics as the September one (a few hundreds million events)
  - limited improvements to the production tools not to disrupt major ongoing effort towards the development of a ditributed production environment

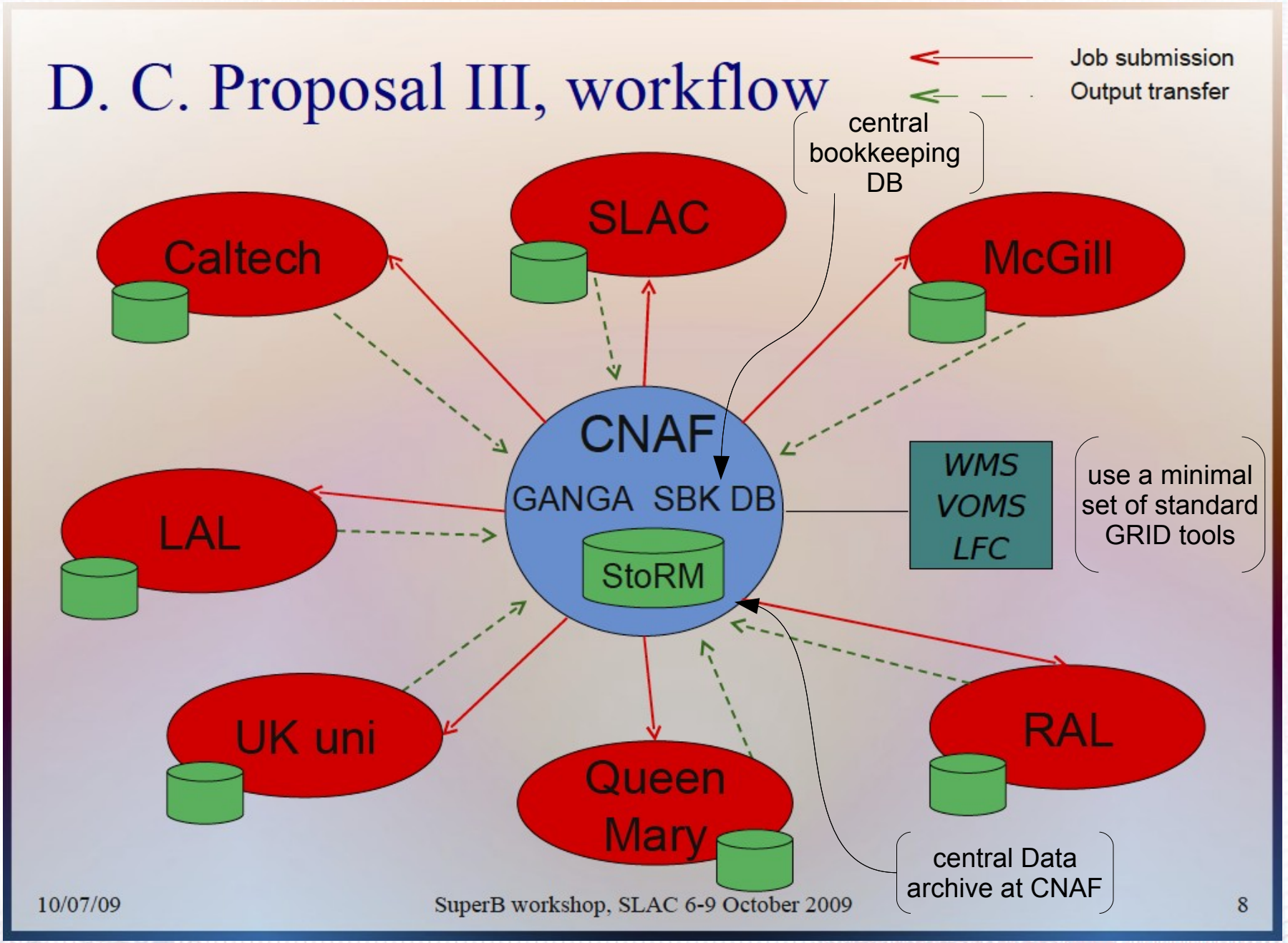
2010 productions: the scaling problem

		Sept.'09 test production	Jan. '10 production	Summer '10 production
Statistics	ab^{-1}	0,1	1	5
Cross section	nb	1,1	5	5
N. of geometries		2	3	5
Analysis streams		2	5	5
Background processes				
Beamstrahlung		Y	Y	Y
Pairs		N	Y	Y
Touscheck		N	Y	Y
Beam gas		N	Y	Y
bunch crossing per event		100	400	400
CPU time per event	ms	350	**300**	**300**
Nof generated events	$*10^9$	0,22	15	125
Filtering fractions		100%	100%	100%
Total CPU needed	core-day	891,2	52083	434028
Duration CNAF only (200 cores)	days	**4**	**260**	**2170**
Duration distribut. prod. (1300 cores)	days	**1**	**40**	**334**
largest storage selection fraction		7,0%	7,0%	7,0%
average storage per event	kB	6	6	6
Nof stored events	$*10^9$	0,015	1,050	8,750
Total disk space	GB	**92**	**6300**	**52500**



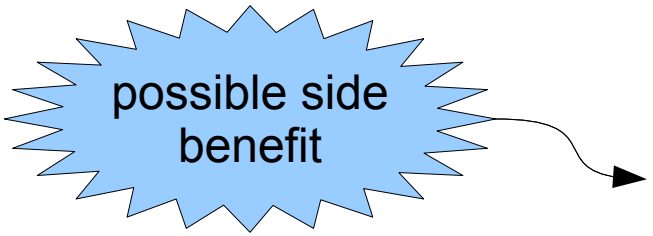
understanding the goals

- unless there are drastic performance improvments, the January production will require the coordinated use of all resources available to SuperB worldwide
  - and LHC will be hopefully producing some real data too...
- it's going to be a pretty large effort
- production tools for distributed productions will have to be in place by January 15: tight schedule
- it's really important now to assess:
  - the performance and requirements of analysis code
    - see E. Manoni contribution at the Det./Comp. session for a model
  - what the real “luminosity goals” are for the TDR and physics studies: how much ? when ?


D. C. Proposal III, workflow
Job submission
Output transfer
central bookkeeping DB
SLAC
Caltech
McGill
CNAF
GANGA SBK DB
StoRM
WMS
VOMS
LFC
use a minimal set of standard GRID tools
LAL
UK uni
Queen Mary
RAL
central Data archive at CNAF
10/07/09
SuperB workshop, SLAC 6-9 October 2009
8

longer term planning

- on Thursday morning we had a meeting of the Computing Planning group
  - main task of the group: elaborate a plan for the SuperB computing R&D program
- to make progress it was felt necessary to organize a dedicated workshop that will likely take place in Europe in late January or early February 2010



Computing white paper goals (I)

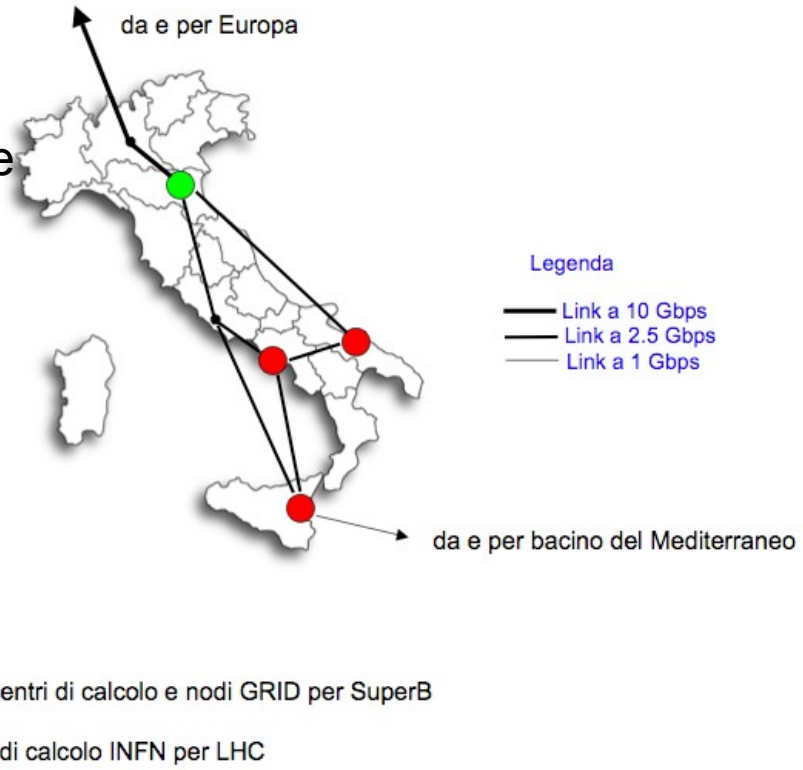
- will provide:
  - a description of the **baseline computing model** (extrapolated from BaBar)
  - a general plan for the development of SuperB computing system
  - an overview of the computing tools and services that we are building for completing the detector TDR and the status of development
    - with special emphasis on the distributed computing approach
- can be used immediately for interaction with colleagues interested to collaborate as well as with funding agencies willing to provide computing resources, institutional oversight bodies, etc.
- can serve as
  - a basis for publication(s) documenting the original work done by the computing group in the SuperB TDR phase
  - material for filling the computing section of the SuperB Web site

Computing white paper goals (II)

- second longer term goal: describe the plan of R&D activities that should precede the definition of the SuperB computing Model to be reported in the Computing TDR
  - useful to motivate the request of human resources we need in the R&D phase implementing
  - and to get more people interested and involved with the development of the SuperB Computing system
- timescale could be the March collaboration meeting, if we succeed in organizing an effective R&D workshop

Distributed resources model ?

- the SuperB computing resources
  - combined offline and lattice QCD needs
  - the distributed approach
    - justification (CDR)
    - the GRID paradigm (CDR)
    - services and resources at the experimental site (new)
    - services and resources elsewhere (new)
  - INFN computing centers (new)
    - participation of the Italian sites
    - the model



Conclusions

- due to the enthusiastic and dedicated efforts of several people (+ the BaBar legacy):
- it's probably fair to say that SuperB has at his disposal
  - the **most sophisticated simulation tools**
  - the **largest amount of computing resources**

  than any HEP experiments has ever had at such early stage of development

nearly for free

- for being part of a “record setting” enterprise like SuperB, Computing is on the right track
  - but cooperation with detector and physics groups really essential
- excitement is growing (as well as the scale of problems)