The status of SuperB Project

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Wokshop on Charm at threshold
Beijing
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Outline

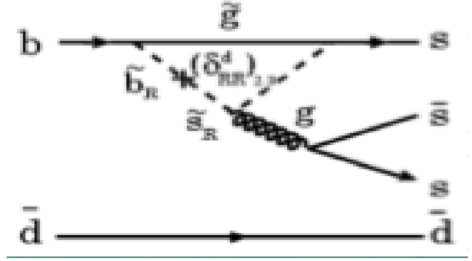
Question:

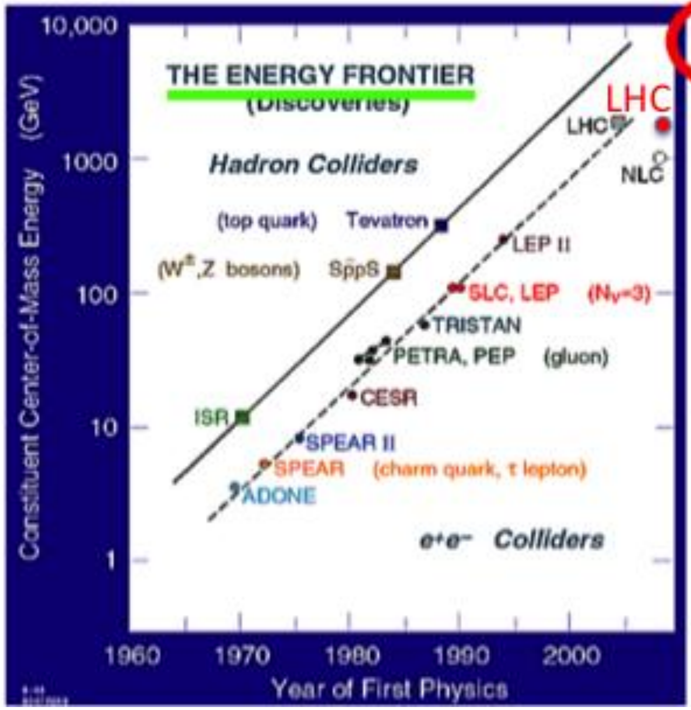
How to access physics BSM? Two paths:

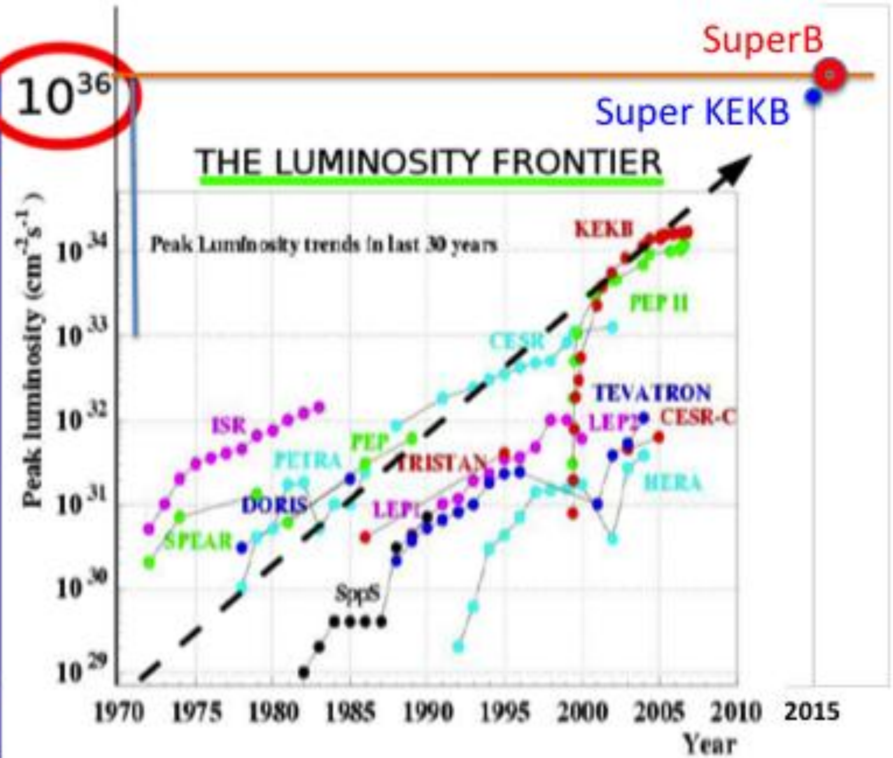
- Energy Frontier (LHC)
- Intensity Frontier (High Luminosity Flavor Factories, High Intensity beams)

- What precision measurements in a high intensity environment requires to collider and detector.
- SuperB progress
- Detector
- Site

Two Paths to New Physics







The high intensity path
The SuperB physics program in a nutshell

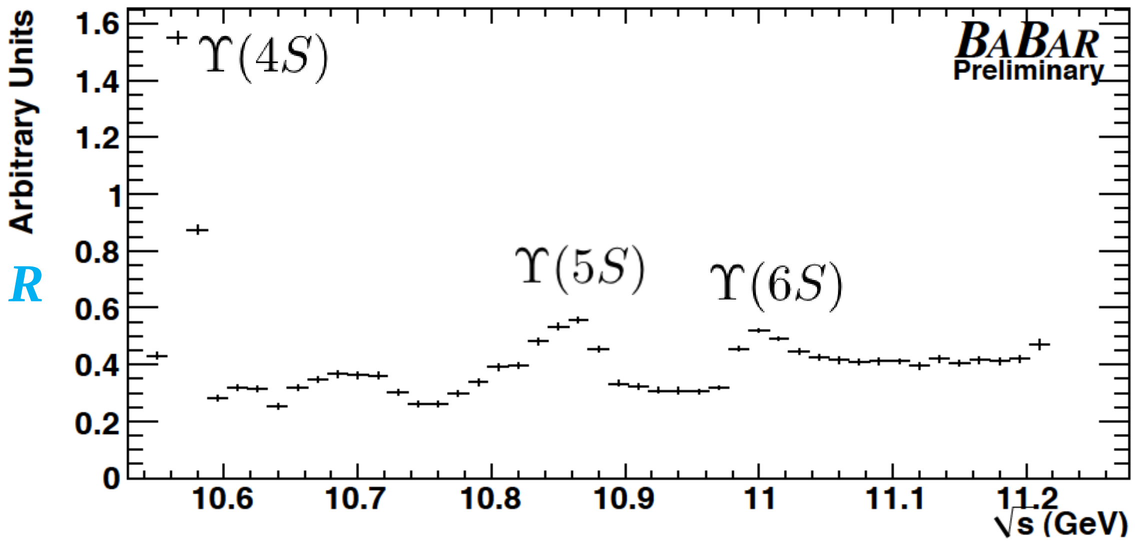
- Versatile flavour physics experiment
  - Probe new physics observables in wide range of decays.
    - Pattern of deviation from Standard Model can be used to identify structure of new physics.
    - Clean experimental environment means clean signals in many modes.
    - Polarised e^- beam benefit for τ LFV searches.
  - Best capability for precision CKM constraints of any existing/proposed experiment.
    - Measure angles and sides of the Unitarity triangle
    - Measure other CKM matrix elements at threshold and using τ data.

Data sample for SuperB

- Υ(4S) region:
  - 75ab−1 at the 4S
  - Also run above / below the 4S

  ~75 x10^9 B, D and t pairs

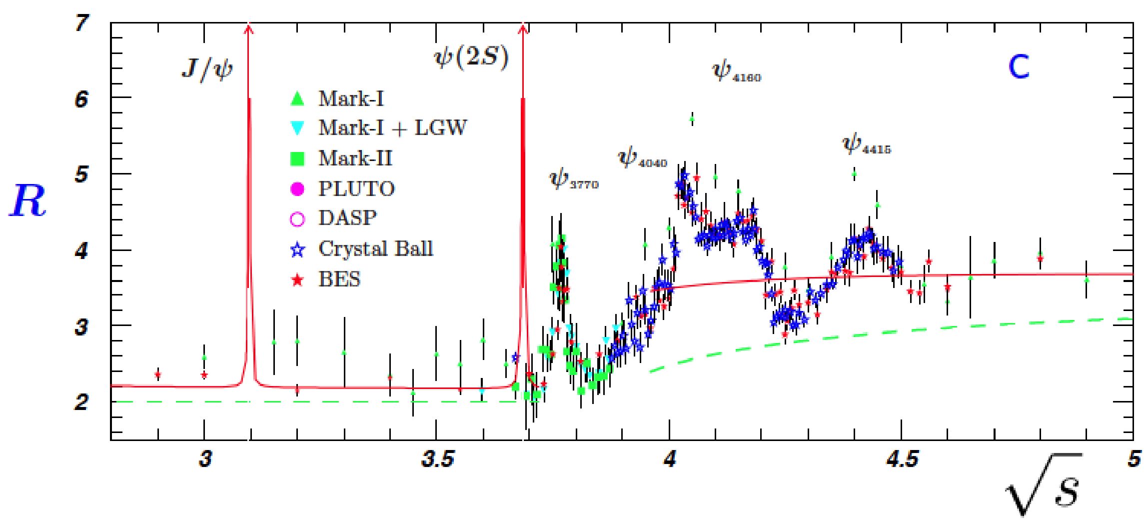
  (5 years run)



- ψ(3770) region:
  - 1 ab^{-1} at threshold
  - Also run at nearby resonances

  ~4 x 10^9 D pairs

  (< 1 year run)



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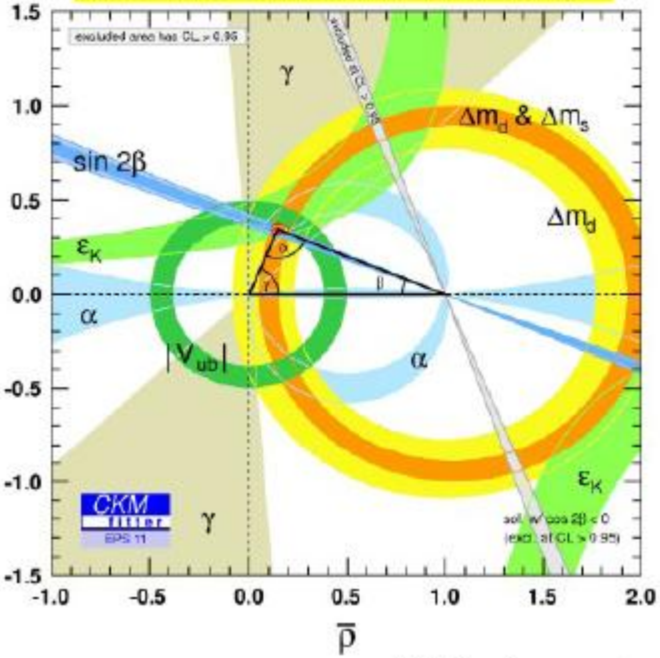
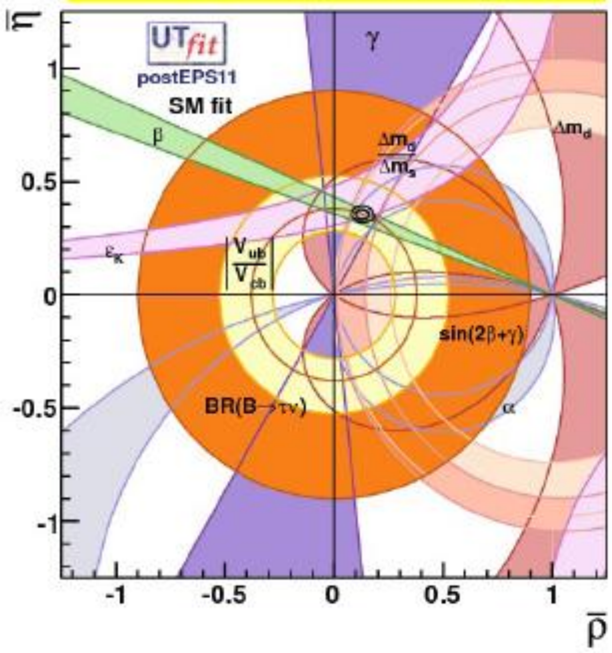
Triumph of CKM from LHCb data

Good agreement no evident discrepancy or “tension” , even with different statistical analysis

http://ckmfitter.in2p3.fr



http://www.utfit.org



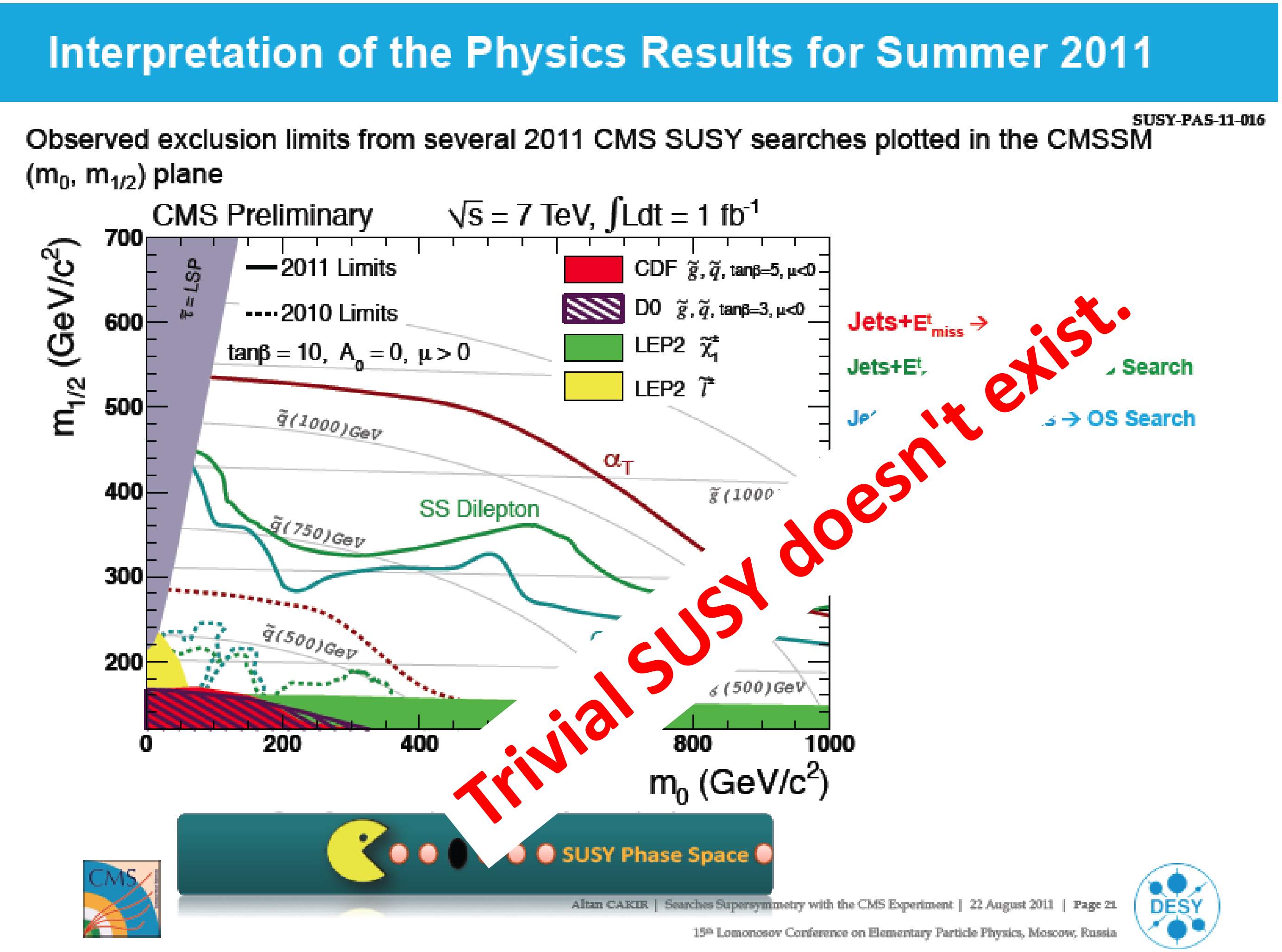
$$\bar{\rho} = 0.144^{+0.027}_{-0.018}\ (CKMfitter) = 0.132 \pm 0.020\ (UTfit)$$

$$\bar{\eta} = 0.343 \pm 0.014\ (CKMfitter) = 0.353 \pm 0.014\ (UTfit)$$

T.Gershon @LP11

LHC Results on SUSY (slide from A. Cakir, Lomonosov XV)

Summer 2011



So far no evidence for SUSY.

The SUSY mass scale is now looking likely to be above 1TeV.

This has interesting implications for some of our measurements.

We need to make sure our benchmark processes and assumed scales are still valid.

Hone our case for indirect constraints.

Nevertheless: Golden Measurements of CKM

- Comparison of relative benefits of SuperB ($75ab^{-1}$)

Observable/mode	Current (now)	LHCb (2017)	Super$B$ (2021)	LHCb upgrade (2030?)	Theory
α	Blue	Blue	Green	Blue	Yellow
β from $b \to c\bar{c}s$	Blue	Blue	Green	Green	Green
$B_d \to J/\psi\pi^0$	Yellow	Red	Green	Red	Green
$B_s \to J/\psi K^0_S$	Red	Yellow	Red	Blue	Green
γ	Yellow	Blue	Green	Green	Green
$\lvert V_{ub}\rvert$ inclusive	Blue	Yellow	Green	Blue	Blue
$\lvert V_{ub}\rvert$ exclusive	Blue	Yellow	Green	Blue	Blue
$\lvert V_{cb}\rvert$ inclusive	Blue	Yellow	Green	Blue	Blue
$\lvert V_{cb}\rvert$ exclusive	Blue	Yellow	Green	Blue	Blue

LHCb can only use ρπ

βtheory error B_d
βtheory error B_s

Need an e^+e^- environment to do a precision measurement using semi-leptonic B decays.

Experiment: Red – No Result; Yellow – Moderate Precision; Blue – Precise; Green – Very Precise

Theory: Yellow – Moderately clean; Blue – Clean Need lattice; Green – Clean

Charm @ SuperB

- *Run at Υ(4S):* $\mathcal{L} = 10^{36}\ \mathrm{cm}^{-2}\ \mathrm{sec}^{-1};\ \int \mathcal{L}\, dt = 75\ \mathrm{ab}^{-1}$ at the $\Upsilon(4S)$

βγ=0.238

✓ Large improvement in D^0 mixing and CPV: factor 12 improvement in statistical error wrt BaBar (0.5 ab^{-1});

✓ time-dependent measurements will benefit also of an improved (2x) D^0 proper-time resolution. [≈1KHz of $c\bar{c}$]

Unique feature of SuperB

- *Run at ψ(3770):* $\mathcal{L} = 10^{35}\ \mathrm{cm}^{-2}\ \mathrm{sec}^{-1};\ \int \mathcal{L}\, dt = 500\ \mathrm{fb}^{-1}$ at the $\Psi(3770)$

βγ from 0.237 to 0.56 (and polarization?)

✓ $D\bar{D}$ coherent production with 100x BESIII data and CM boost up to βγ=0.56;

✓ almost zero background environment;

✓ possibility of time-dependent measurements exploiting quantum coherence.

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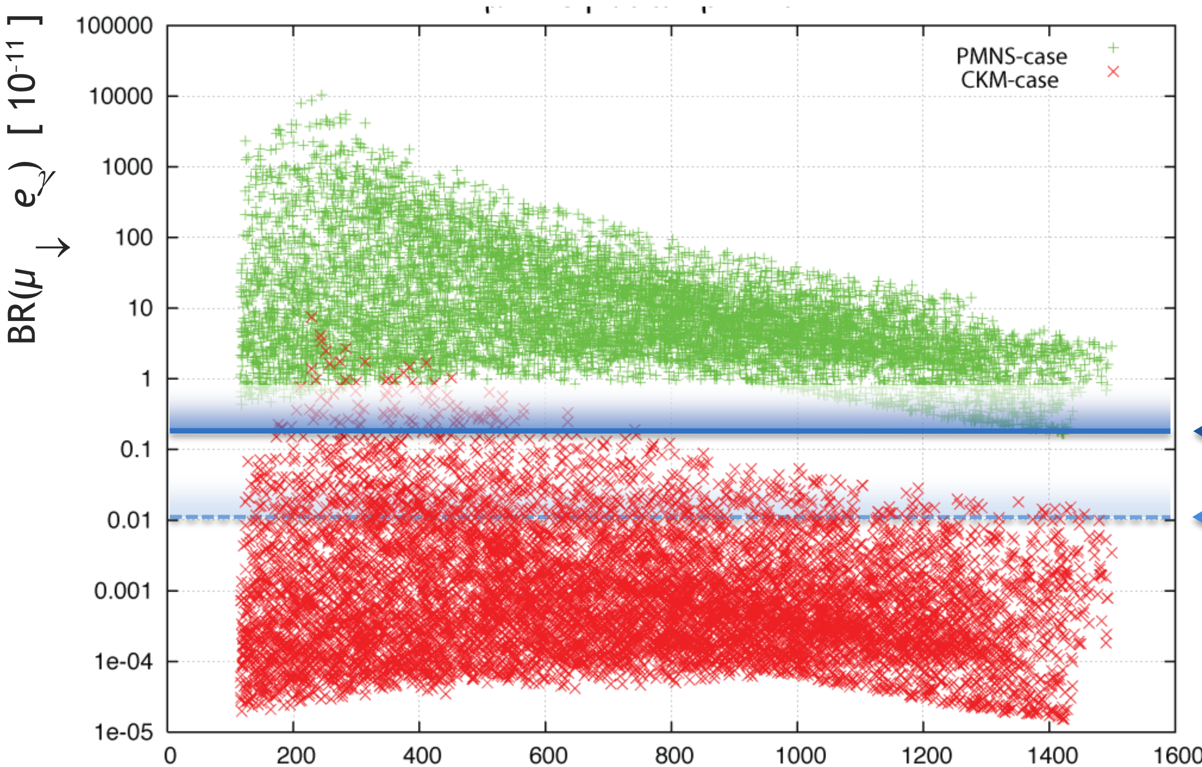
LFV:MEG results



Interpretation in terms of SUSY-GUT SO(10) MSUGRA models:

- CKM case: min. mixing
- PMNS case: max. mixing

MEG 2009+2010

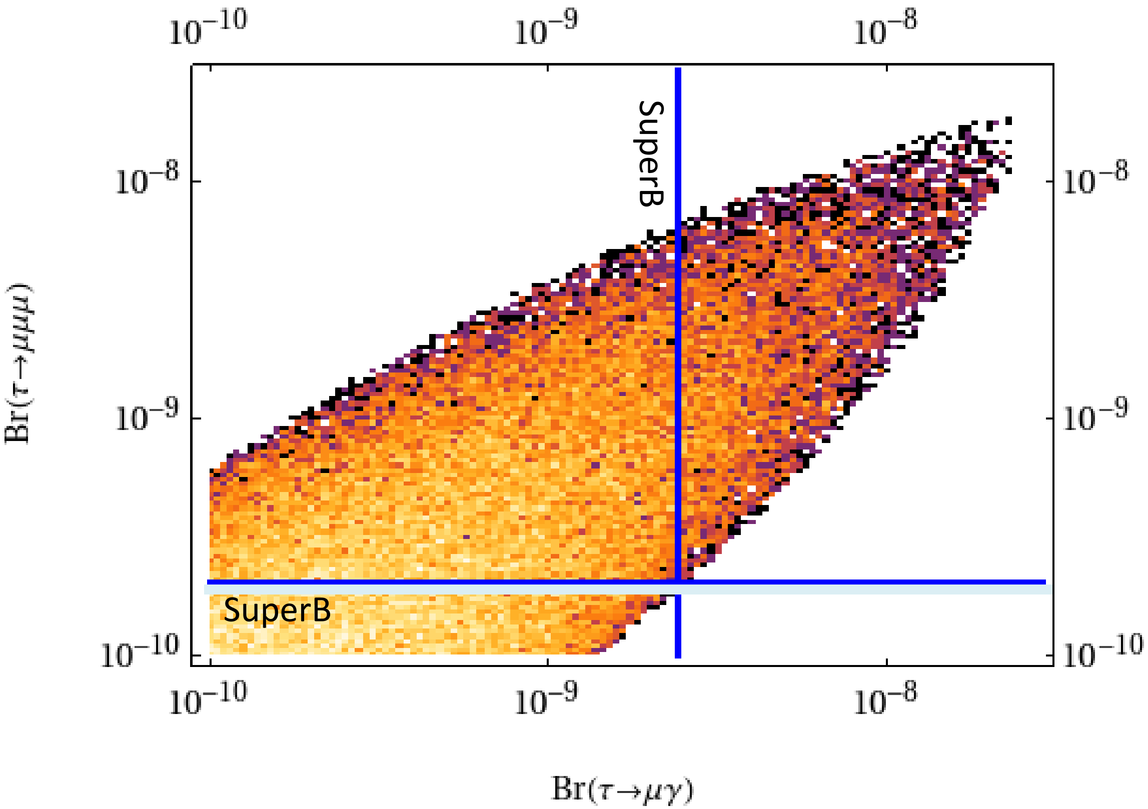
MEG 2009-2012

90% CL (Feldman-Cousins) upper limit:

$$BR(\mu^+ \to e^+\gamma) < \begin{cases} 2.4 \cdot 10^{-12} & \text{(observed)} \\ 1.6 \cdot 10^{-12} & \text{(expected for no signal)} \end{cases}$$

The golden LFV $\tau \to \mu\gamma, 3\mu$ modes

- Symmetry breaking scale assumed: 500GeV.



NP scale assumed: 500GeV.

Current experimental limits are at the edges of the model parameter space

SuperB will be able to significantly constrain these models, and either find both channels, or constrain a large part of parameter space.

c/o M. Blanke

M. Blanke et al. arXiv:0906.5454

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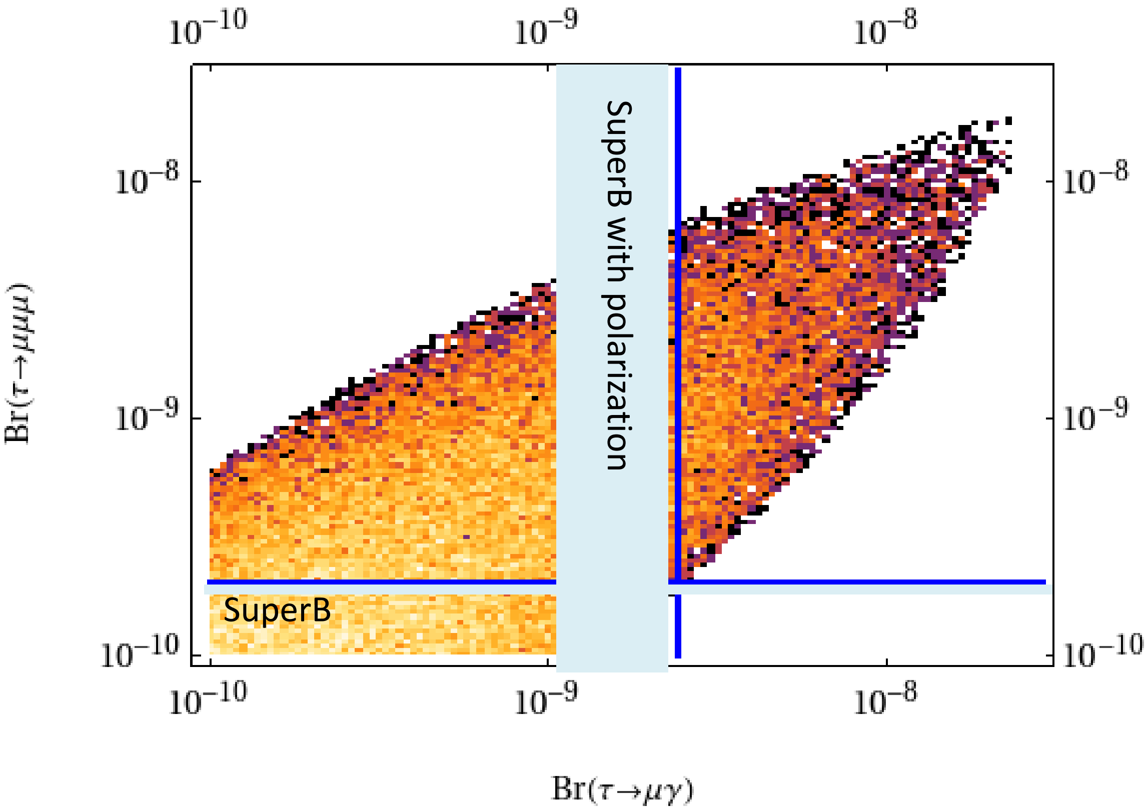

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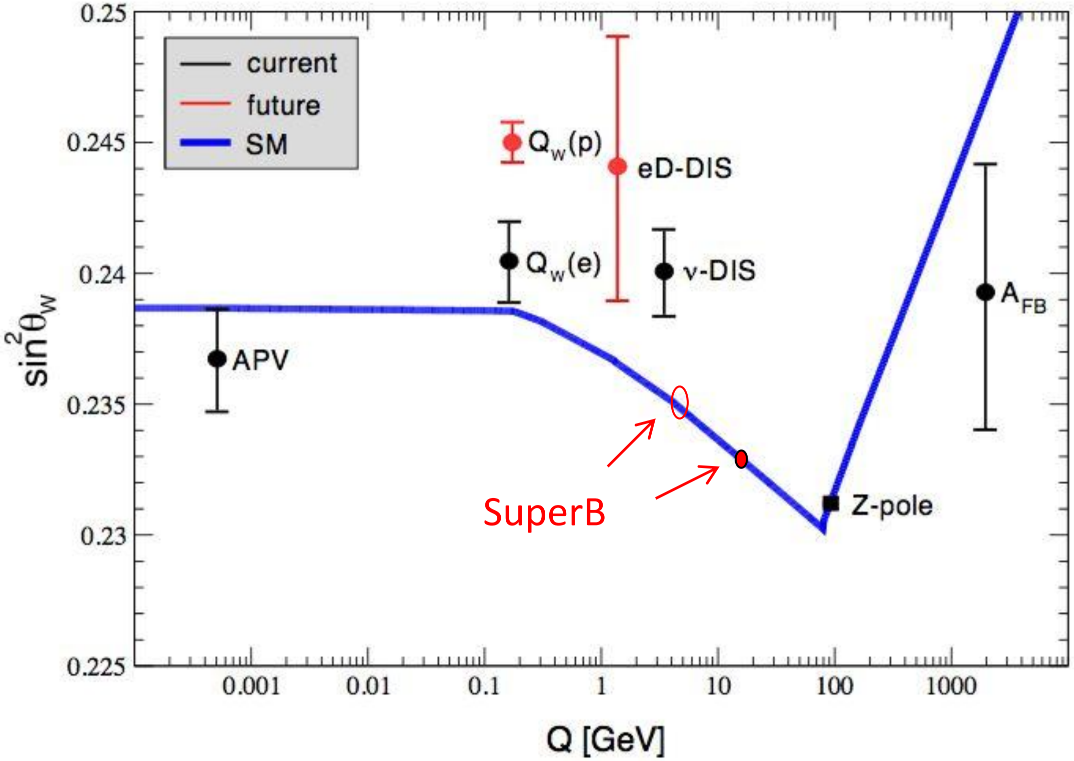
POLARISATION: Precision Electroweak

- $\sin^2\theta_W$ can be measured with polarised e^- beam at $\sqrt{s}=\Upsilon(4S)$ is theoretically clean, c.f. b-fragmentation at Z pole



Measure LR asymmetry in

$$e^+e^- \to b\bar{b}$$

$$e^+e^- \to \mu^+\mu^-$$

$$e^+e^- \to \tau^+\tau^-$$

at the $\Upsilon(4S)$ to same precision as LEP/SLC at the Z-pole.

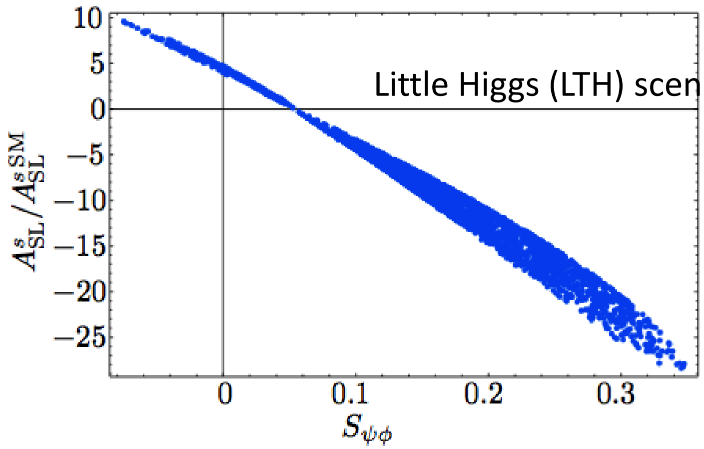
Can also perform crosscheck at $\psi(3770)$ and use $c\bar{c}$ instead of $b\bar{b}$

B_s physics

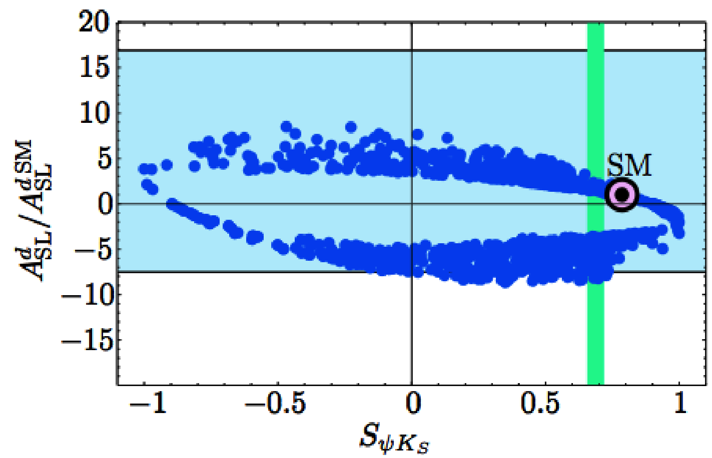
- Can cleanly measure A^s_{SL} using 5S data

$$A^s_{\rm SL} = \frac{\mathcal{B}(B_s \to \overline{B}_s \to D_s^{(*)-} l^+ \nu_l) - \mathcal{B}(\overline{B}_s \to B_s \to D_s^{(*)+} l^- \nu_l)}{\mathcal{B}(B_s \to \overline{B}_s \to D_s^{(*)-} l^+ \nu_l) + \mathcal{B}(\overline{B}_s \to B_s \to D_s^{(*)+} l^- \nu_l)} = \frac{1 - |q/p|^4}{1 + |q/p|^4}.$$

$$\sigma(A^s_{SL}) \sim 0.004 \text{ with a few } ab^{-1}$$



Little Higgs (LTH) scenario



- SuperB can also study rare decays with many neutral particles, such as $B_s \to \gamma\gamma$, which can be enhanced by SUSY.

Many unique quality measurements

Physics Group

Experiment: No Result (red), Moderate Precision (yellow), Precise (blue), Very Precise (green)

Theory: Moderately clean (yellow), Clean Need lattice (blue), Clean (green)

Observable/mode	Current (now)	LHCb (2017)	Super$B$ (2021)	LHCb upgrade ')	theory
τ Decays					
$\tau \to \mu\gamma$	Yellow	Yellow	Green	Yellow	Green
$\tau \to e\gamma$	Yellow	Yellow	Green	Yellow	Green
$B_{u,d}$ Decays					
$B \to \tau\nu, \mu\nu$	Yellow	Red	Blue	Red	Blue
$B \to K^{(*)+}\nu\overline{\nu}$	Red	Red	Green	Red	Green
S in $B \to K^0_S\pi^0\gamma$	Yellow	Red	Green	Red	Yellow
S in other penguin modes	Yellow	Yellow	Green	Blue	Yellow
$A_{CP}(B \to X_s\gamma)$	Blue	Yellow	Green	Yellow	Green
$BR(B \to X_s\gamma)$	Blue	Yellow	Green	Yellow	Yellow
$BR(B \to X_s\ell\ell)$	Yellow	Red	Green	Red	Green
$BR(B \to K^{(*)}\ell\ell)$	Yellow	Blue	Green	Green	Yellow
B_s Decays					
$B_s \to \mu\mu$	Red	Blue	Red	Green	Green
β_s from $B_s \to J/\psi\phi$	Red	Blue	Red	Green	Green
$B_s \to \gamma\gamma$	Red	Red	Blue	Red	Green
a_{sl}	Red	Red	Green	Red	Green
D Decays					
mixing parameters	Yellow	Blue	Green	Green	Green
CPV	Red	Blue	Green	Green	Green
Precision EW					
$\sin^2\theta_W$ at $\Upsilon(4S)$	Red	Red	Green	Red	Green
$\sin^2\theta_W$ at Z-pole	Green	Blue	Red	Green	Yellow

Benefit from polarised e⁻ beam

very precise with improved detector

Statistically limited: Ang. analysis with >75ab^{-1}

Right handed currents

SuperB measures many more modes

systematic error is main challenge

control systematic error with data

SuperB measures e mode well, LHCb does μ

Clean NP search

Theoretically clean

b fragmentation limits interpretation

REQUIREMENTS FROM PHYSICS

Parameter	Requirement	Comment
Luminosity (top-up mode)	10^{36} cm^{-2}s^{-1} @ $\Upsilon(4S)$	Baseline/Flexibility with headroom at 4. 10^{36} cm^{-2}s^{-1}
Integrated luminosity	75 ab^{-1}	Based on a “New Snowmass Year” of 1.5 x 10^{7} seconds (PEP-II & KEKB experience-based)
CM energy range	τ threshold to $\Upsilon(5S)$	For Charm special runs (still asymmetric……)
Minimum boost	$\beta\gamma$ ≈0.237 ~(4.18x6.7GeV)	1 cm beam pipe radius. First measured point at 1.5 cm
e^{-} Polarization Boost up to 0.56 in runs at low energy under evaluation for charm physics	≥80%	Enables τ *CP* and *T* violation studies, measurement of τ *g*-2 and improves sensitivity to lepton flavor-violating decays. Detailed simulation, needed to ascertain a more precise requirement, are in progress.

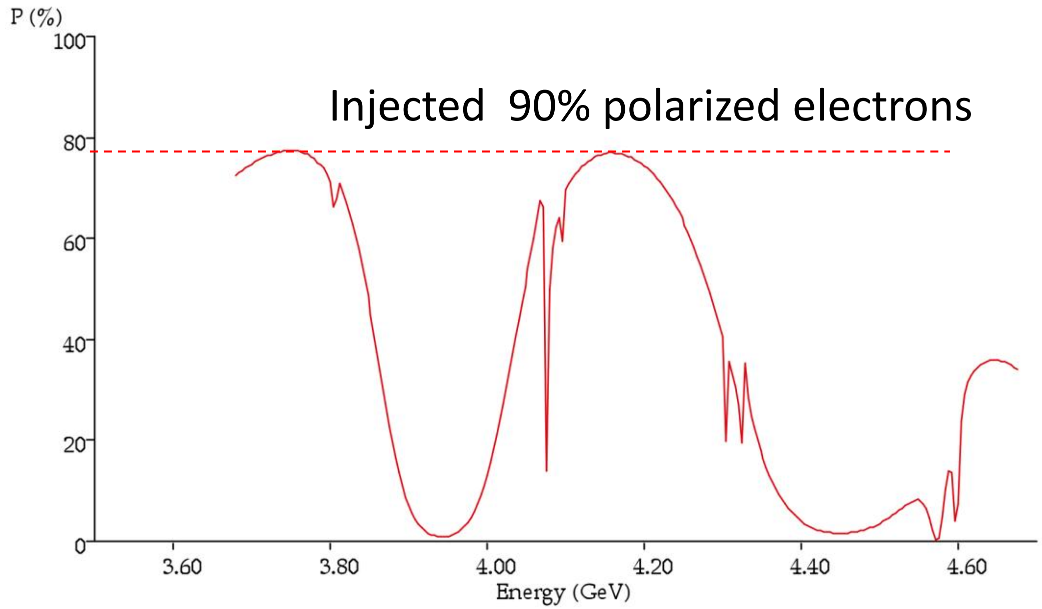
Future Super B Factories

	SuperB	Super KEKB
Peak Luminosity	$>10^{36}$	0.8×10^{36}
Integrated Luminosity	75 ab^{-1}	50 ab^{-1}
Site	Non Green Field (Tor Vergata)	KEKB Laboratory
Collisions	mid 2016	2015
Polarization	80% electron beam	No
Low energy running	10^{35} @ charm threshold	No
Approval status	Approved	Approved

Baseline Collider parameters

		Base Line	
Parameter	Units	HER (e+)	LER (e-)
LUMINOSITY (10^{36})	$cm^{-2}\ s^{-1}$	1	
Energy	GeV	6.7	4.18
Circumference	m	1258.4	
X-Angle (full)	mrad	60	
Piwinski angle	rad	20.80	16.91
β_x @ IP	cm	2.6	3.2
β_y @ IP	cm	0.0253	0.0205
Coupling (full current)	%	0.25	0.25
ε_x (without IBS)	nm	1.97	1.82
ε_x (with IBS)	nm	2.00	2.46
ε_y	pm	5	6.15
σ_x @ IP	μm	7.211	8.872
σ_y @ IP	μm	0.036	0.036
Σ_x	μm	11.433	
Σ_y	μm	0.050	
σ_L (0 current)	mm	4.69	4.29
σ_L (full current)	mm	5	5
Beam current	mA	1892	2447
Buckets distance	#	2	
Buckets distance	ns	4.20	
Ion gap	%	2	
RF frequency	MHz	476	
Harmonic number		1998	
Number of bunches		465	
N. Particle/bunch (10^{10})		5.08	6.56
Tune shift x		0.0026	0.0040
Tune shift y		0.1067	0.1069
Long. damping time	msec	13.4	20.3
Energy Loss/turn	MeV	2.11	0.865
σ_E (full current)	$\delta E/E$	6.43E-04	7.34E-04
CM σ_E	$\delta E/E$	5.00E-04	
Total lifetime	min	4.23	4.48
Total RF Power	MW	16.38	

The baseline peak luminosity at Y(4s) is 1.0 10 ^{36} $cm^{-2}\ s^{-1}$.
It ca be increased by adding RF power up to a factor of 4 .
The runs near charm threshold $\Psi(3770)$ pay a factor O(10) in luminosity.
At charm threshold the boost($\beta\gamma$) can be increased up to 0.5 for time dependent measurements , still with a reasonable polarization.

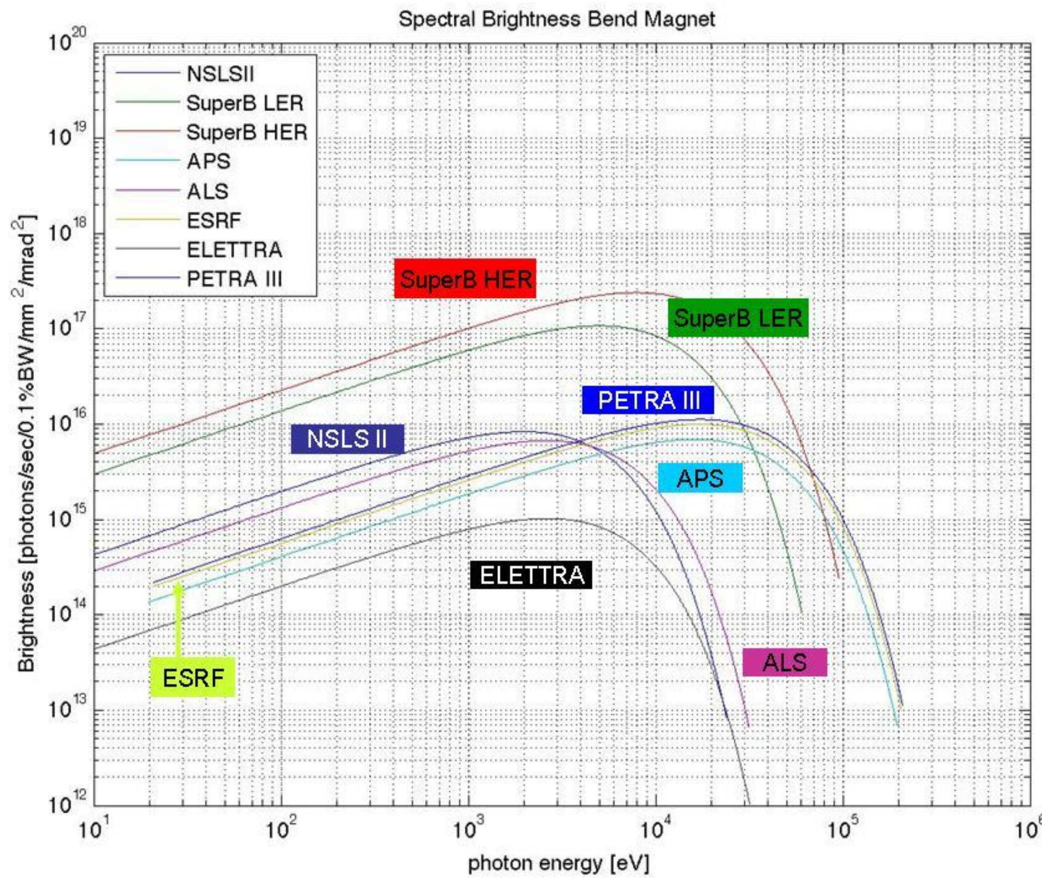


3.5 min beam lifetime . → CONTINUOUS INJECTION as in PEPII

Synchrotron light options @ SuperB

- Comparison of brightness and flux for different energies dedicated SL sources & SuperB HER and LER from bending magnets .

Parameters *	SuperB HER	SuperB LER	NSLS II
	IVU20	IVU20	IVU20
E [GeV]	6.7	4.18	3
I [mA]	1892	2447	500
σx [mm]	60.0 E-3	66.5 E-3	33.3 E-3
σy [mm]	2.4 E-3	2.6 E-3	2.9 E-3
σx' [mrad]	33.3 E-3	37.0 E-3	16.5 E-3
σy' [mrad]	2.1 E-3	2.7 E-3	2.7 E-3
N [1]	148	148	148
λu [mm]	20	20	20
Kmax [1]	1.83	1.83	1.83
Kmin [1]	0.1	0.1	0.1



Synchrotron light options @ SuperB

- Comparison of brightness and flux for different energies dedicated SL sources & SuperB HER and LER with undulators.
- Light properties from undulators better than most SL

Parameters *	SuperB HER	SuperB LER	NSLS II
	IVU20	IVU20	IVU20
E [GeV]	6.7	4.18	3
I [mA]	1892	2447	500
σx [mm]	60.0 E-3	66.5 E-3	33.3 E-3
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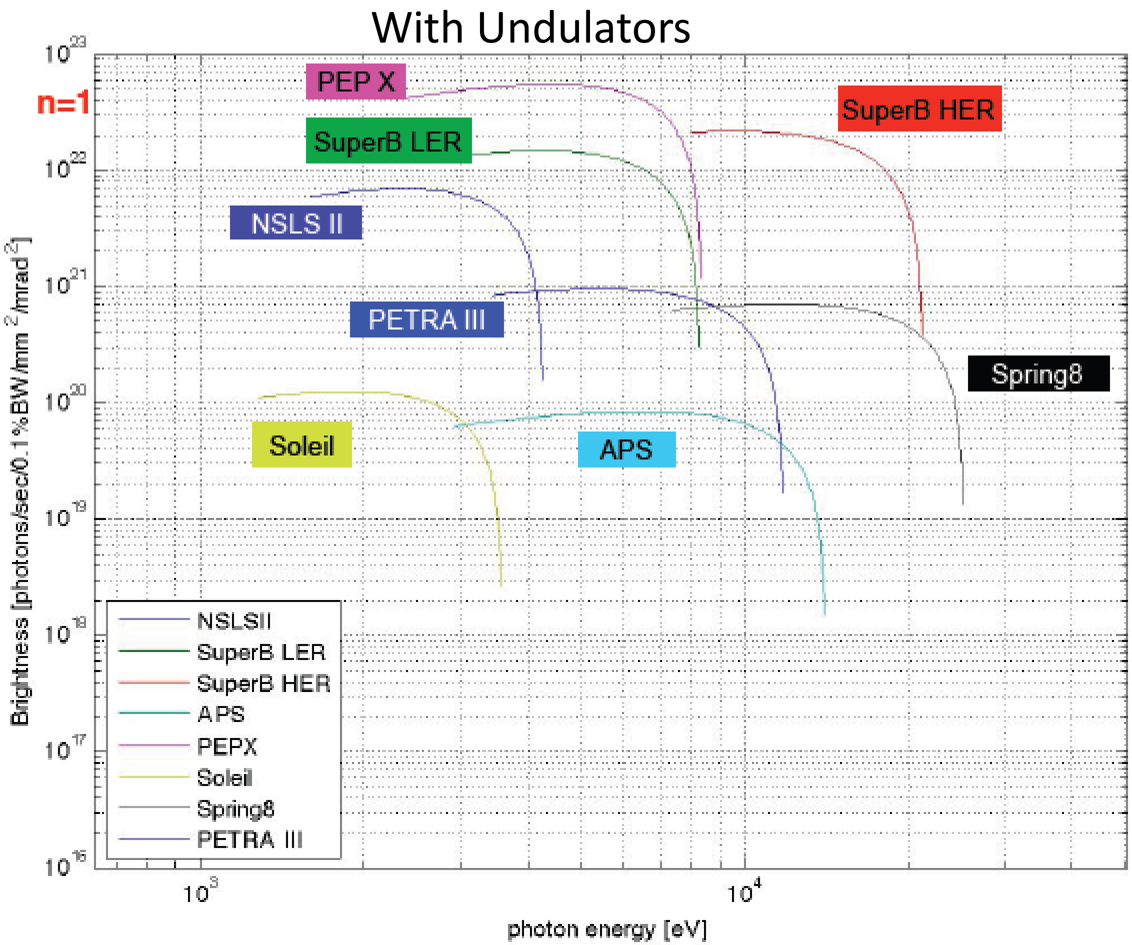
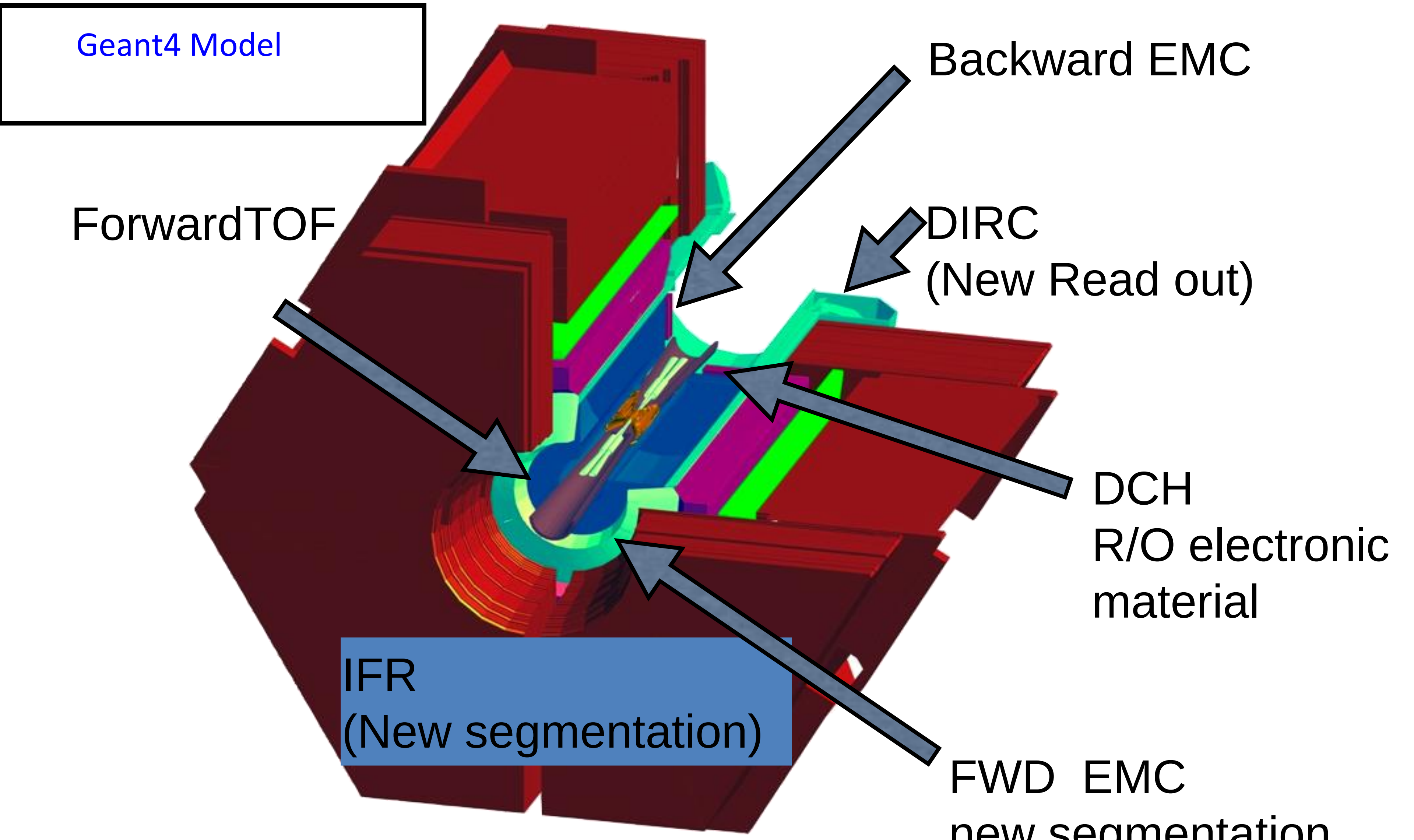
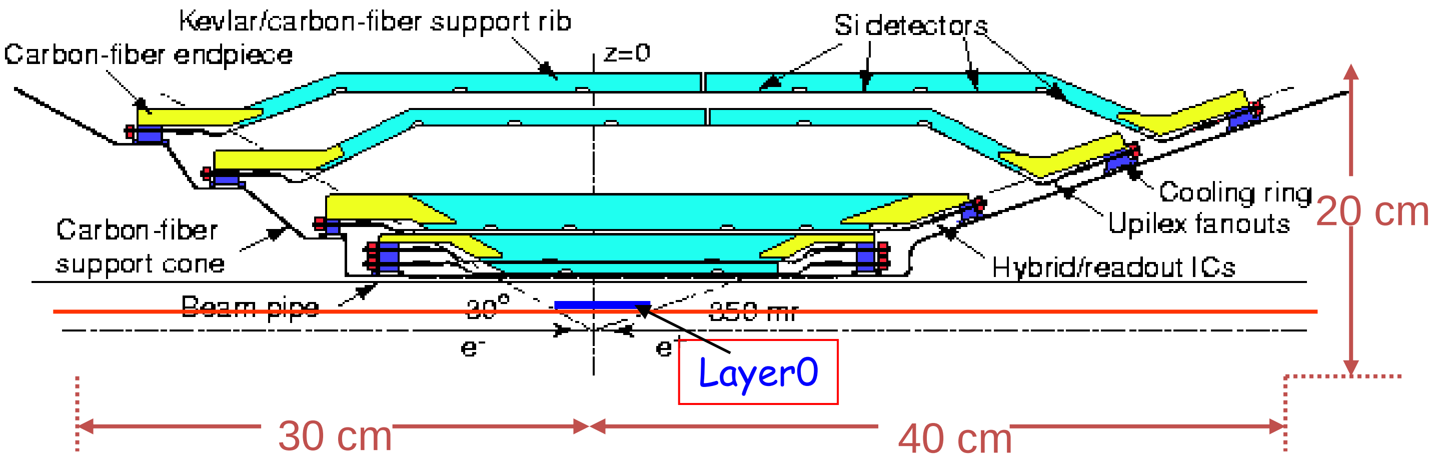


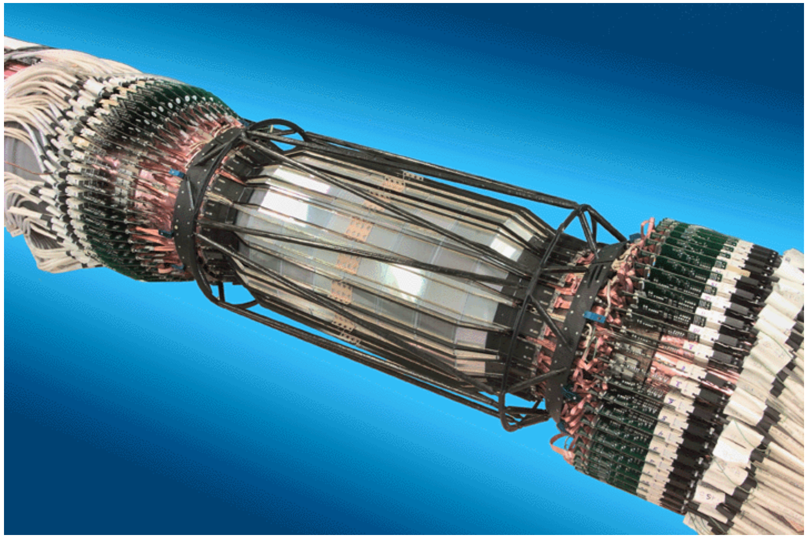
Detector and simulation



Vertex Detector (SVT)



Bergamo
Bologna
Milano
Pavia
Pisa
Torino
Trieste
QMUL
RAL



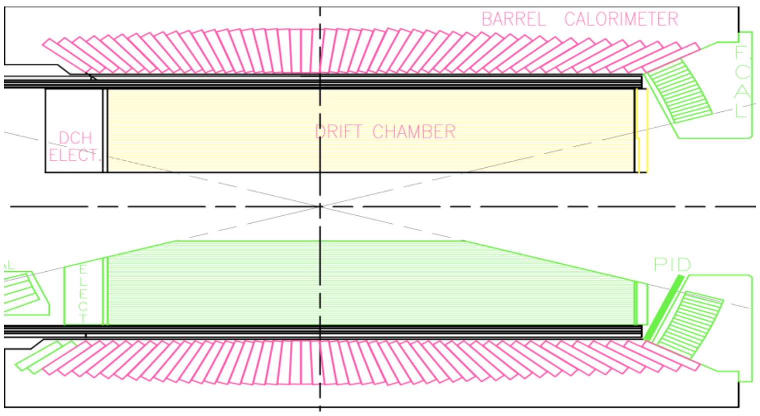
in BABAR

DCH Baseline Design

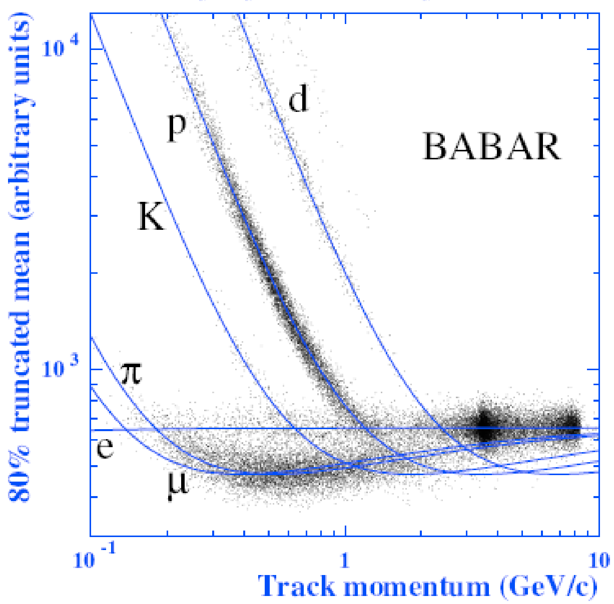
- Provides precision momentum
- Provides particle ID via dE/dx for all low momentum tracks, even those that miss the PID system.
- A new DCH (similar to now aged BaBar DCH, which must be replaced)
  - Similar gas & cell shape (small improvements may be possible)
  - Carbon Fiber end plates (to reduce material before endcaps)
  - New electronics with location optimized.
- R&D Issues including:
  - Electronics location and/or mass to reduce effect on backward EMC,
  - Low Mass Endplates
  - Can we do better on dE/dx (counting clusters)?
  - Conical/stepped endplates or other ways to reduce sensitivity close to the beam.
  - Background simulation/shielding optimization.
- R&D has been started.
- Need to test all solutions on prototype,

Canada (UBC,Victoria, McGill, Un. Montreal)
LNF

DCH

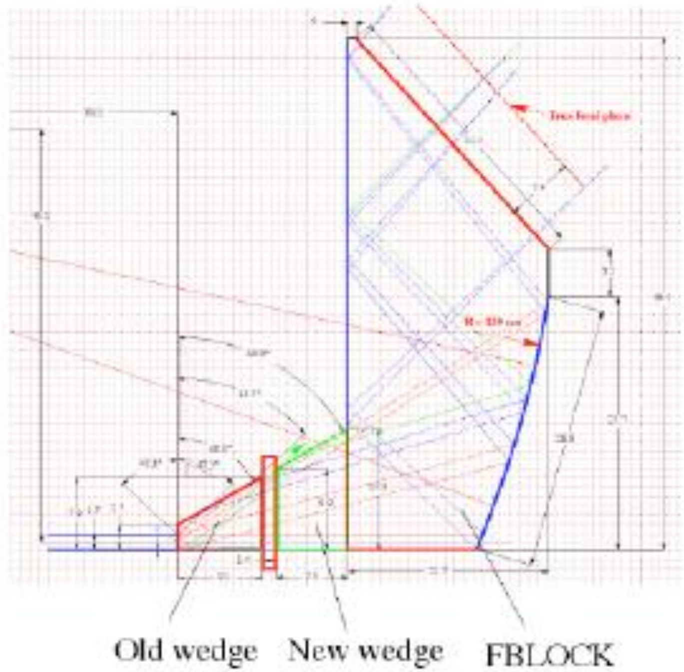


dE/dx vs momentum



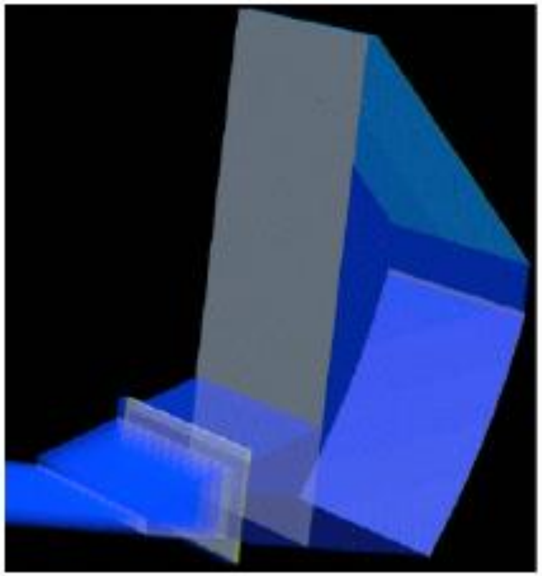
Barrel PID similar to Babar

(a)



(a) FDIRC optical design (dimensions in cm).

(b)



(b) Its equivalent in the GEANT 4 MC model.

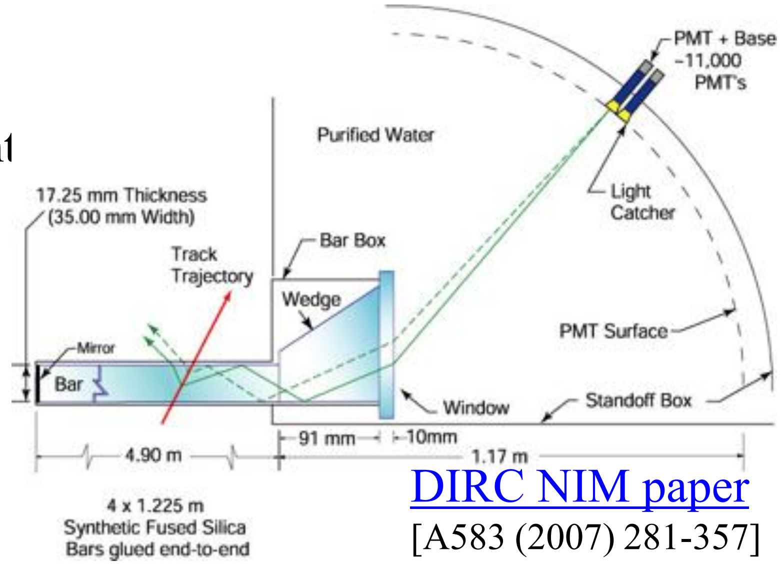
DPR Design

Figure 17: Barrel FDIRC Design.

The Focusing DIRC (FDIRC)

Based on the successful BaBar DIRC:

- Detector of Internally Reflected Cherenkov light [SLAC-PUB-5946]



DIRC NIM paper
[A583 (2007) 281-357]

Main PID detector for the SuperB barrel

- K/π separation up to 3-4 GeV/c
- Performance close to that of the BaBar DIRC

To cope with high luminosity (10^{36} $cm^{-2}s^{-1}$) & high background:

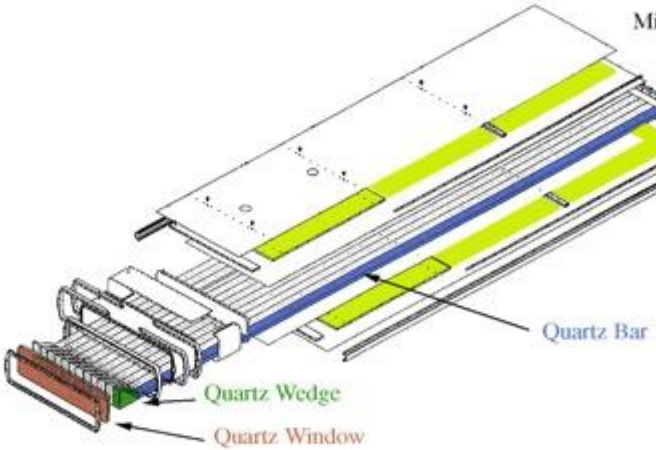
- Complete redesign of the photon camera (SLAC-PUB-14282)
- A true 3D imaging using:

- - 25× smaller volume of the photon camera
- - 10× better timing resolution to detect single photons
- - Optical design is based entirely on Fused Silica glass

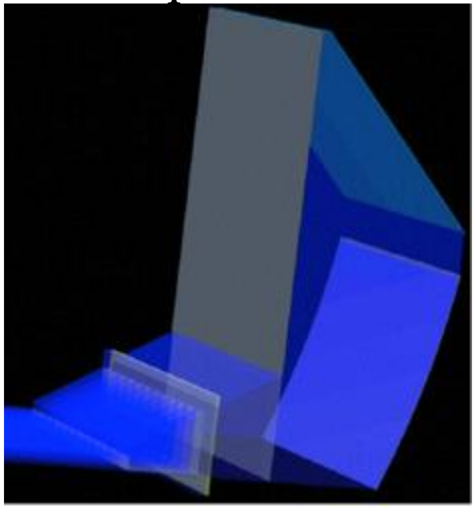
→ avoid water or oil as optical media

FDIRC concept

Re-use BaBar DIRC quartz bar radiators

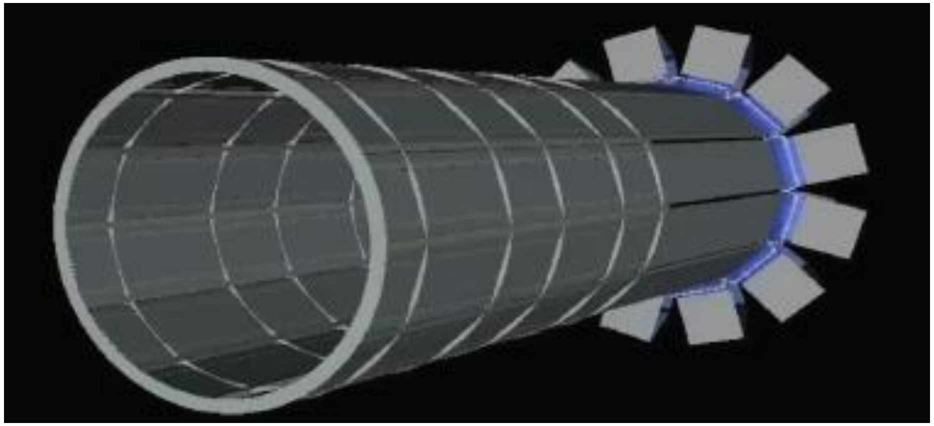


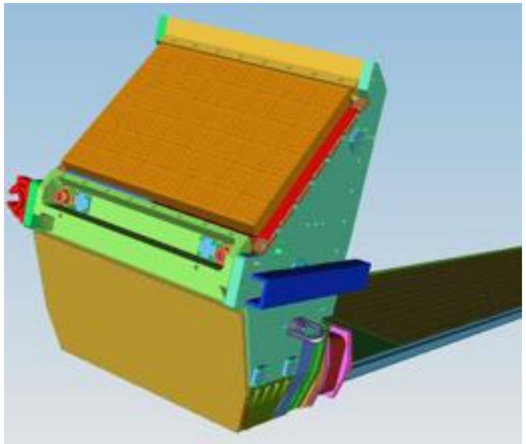
New photon camera



Geant4 simulation

Photon cameras at the end of bar boxes





Current mechanical design

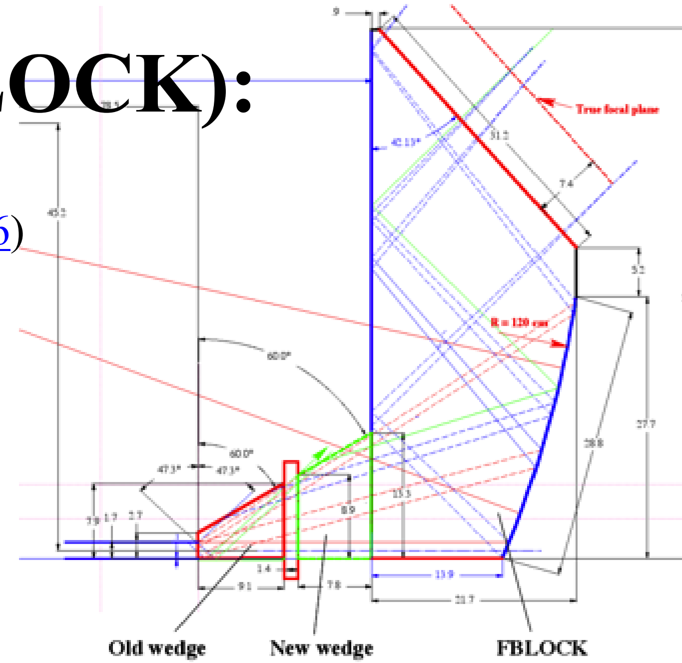
FDIRC photon camera (12/system)

- **Photon camera design (FBLOCK):**

- Initial design by ray-tracing (SLAC-PUB-13763)

- Experience from the 1rst FDIRC prototype (SLAC-PUB-12236)

- Geant4 model now (SLAC-PUB-14282)



- **Main optical components**

- New wedge (old bar box wedge was not long enough)

- Cylindrical mirror to remove bar thickness

- Double-folded mirror optics to provide access to detectors

- **Photon detectors: highly pixilated H-8500 MaPMTs**

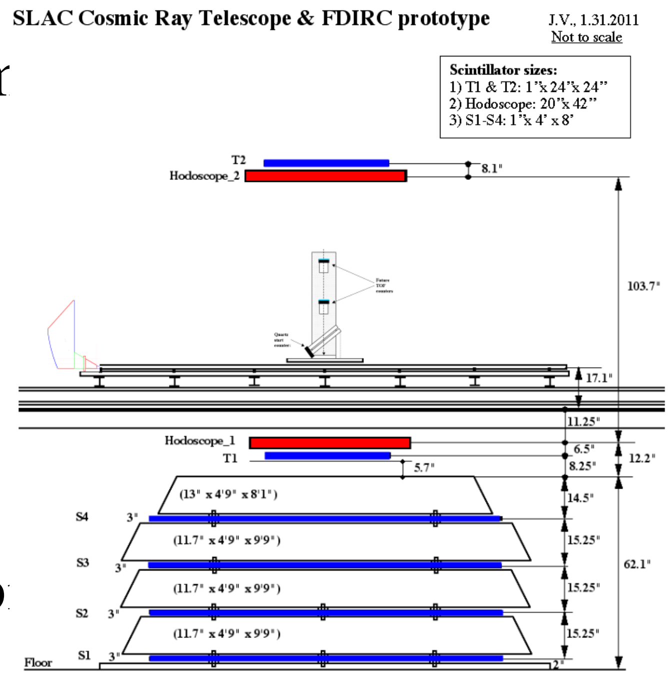
- Total number of detectors per FBLOCK: 48

- Total number of detectors: 576 [12 FBLOCKs]

- Total number of pixels: 576 × 32 = 18,432

FDIRC Status

- FDIRC prototype to be tested this summ
  - In the SLAC Cosmic Ray Telescope



- Activities
  - Validation of the optics design
  - Mechanical design & integration
  - Front-end electronics
    TDC: 70 ps resolution; rate: a few MHz/p
  - Simulation: background, reconstruction…

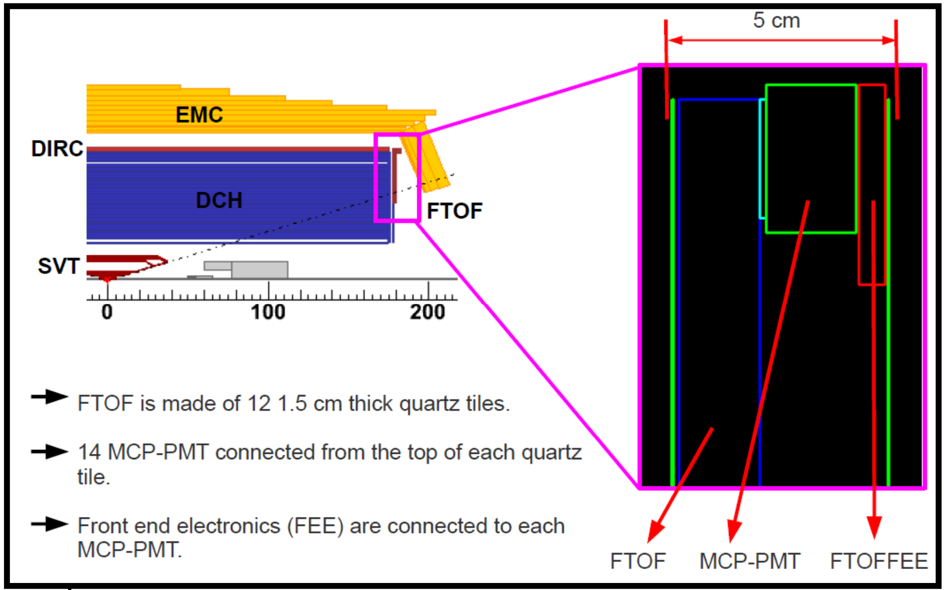
- Design to be frozen for the TDR (early 2012)

- Main future challenge
  - Move from R&D to construction phase!

R&D on a forward PID detector

- Goal: to improve charged particle identification in the SuperB forward region
  - In BaBar: only dE/dx information from drift chamber
- Challenges
  - Limited space available
  - Any additional detector should have a small X_0
  - Gain limited by the small solid angle [θ_{polar}~15÷25 degrees]
    $\rightarrow$ The new detector must be efficient
- Different technologies being studied
  - Time-Of-flight: ~100ps resolution needed
  - RICH: great performances but thick and expensive

- FTOF geometry



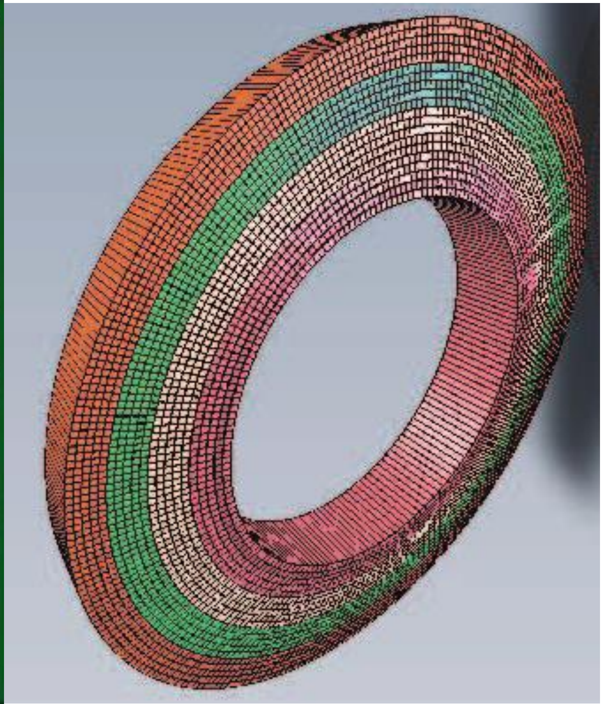
- Decision by the TDR time
  - Task force set inside SuperB to review proposals:
  - There is merit to leave some space (5cm) but more would damage the DCH performance.
  - Building an innovative forward PID detector would require additional manpower & abilities

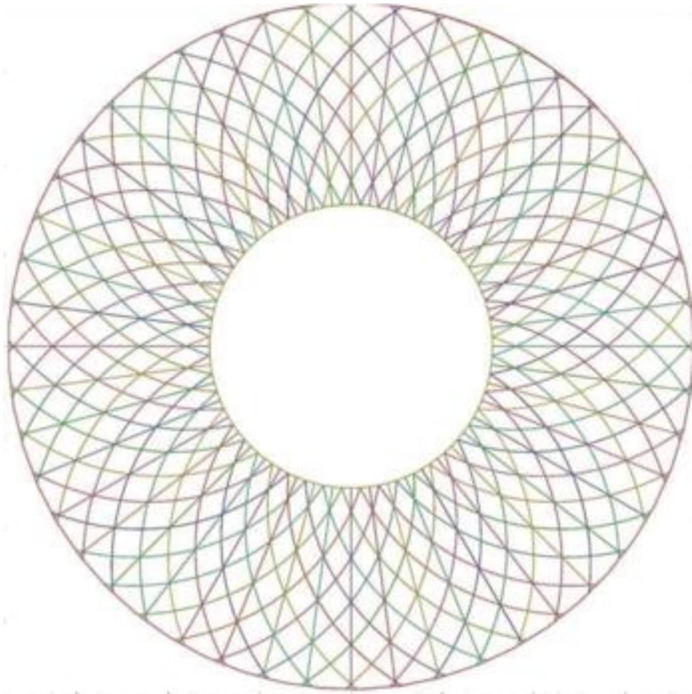
Electromagnetic calorimeter (EMC) what is it?

System to measure electrons and photons, assist in particle identification

Three components

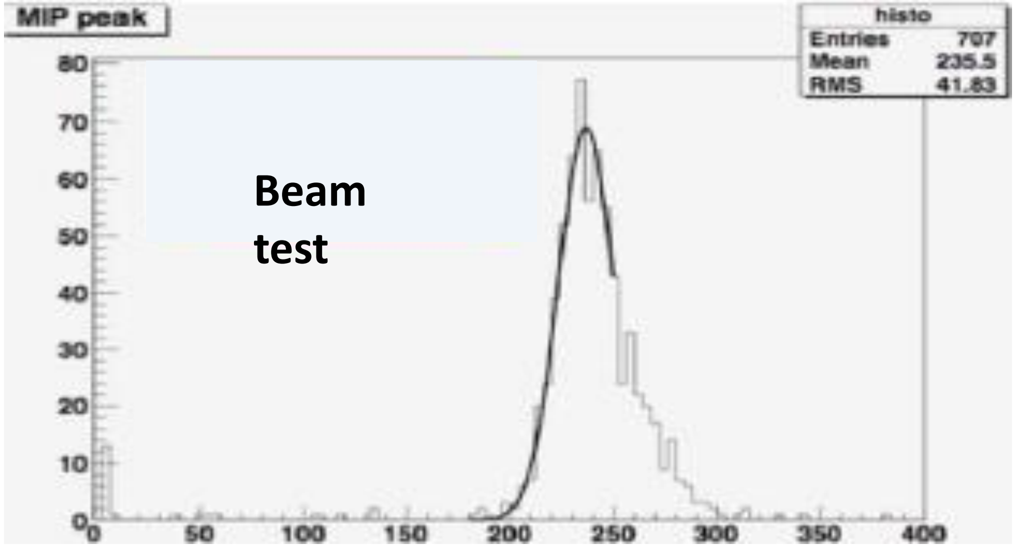
1. Barrel EMC: CsI(Tl) crystals with PiN diode readout
2. Forward EMC: LYSO(Ce) ? crystals with APD readout
3. Backward EMC: Pb scintillator with WLS fiber to SiPM/MPPC





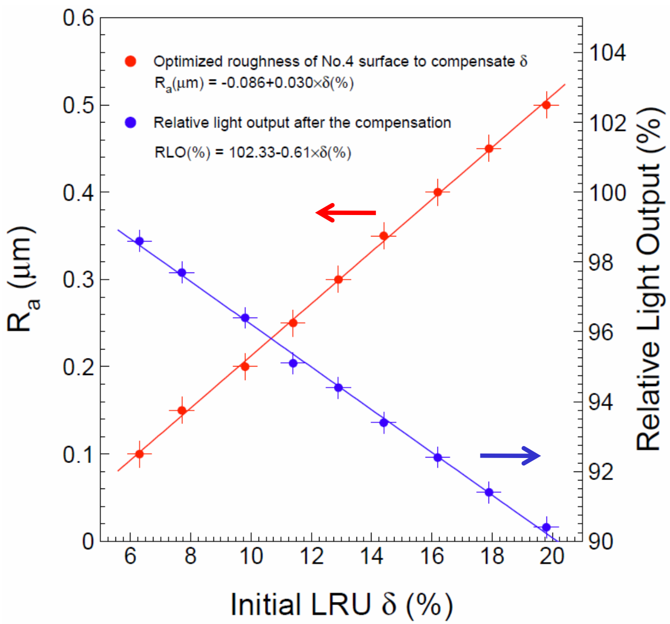
EMC recent results and activities

Test Beam at CERN



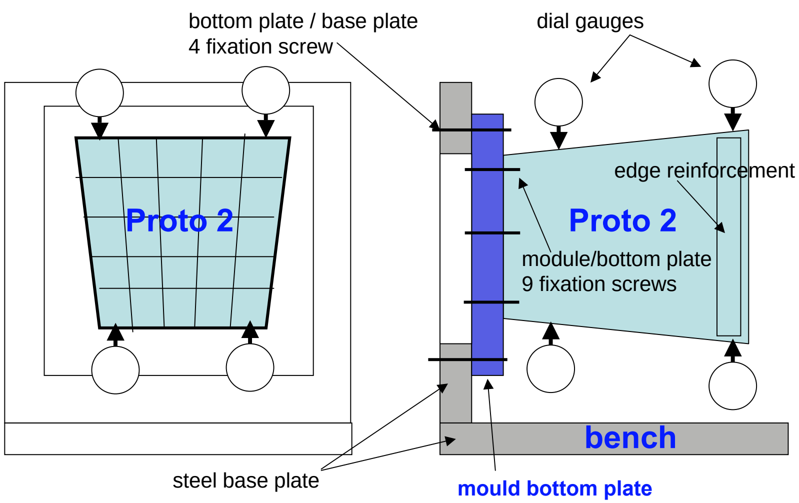
Planning test beam at Frascati

LYSO crystal uniformization: used ink band in beam test, studying roughening a surface, with promising results from simulation.



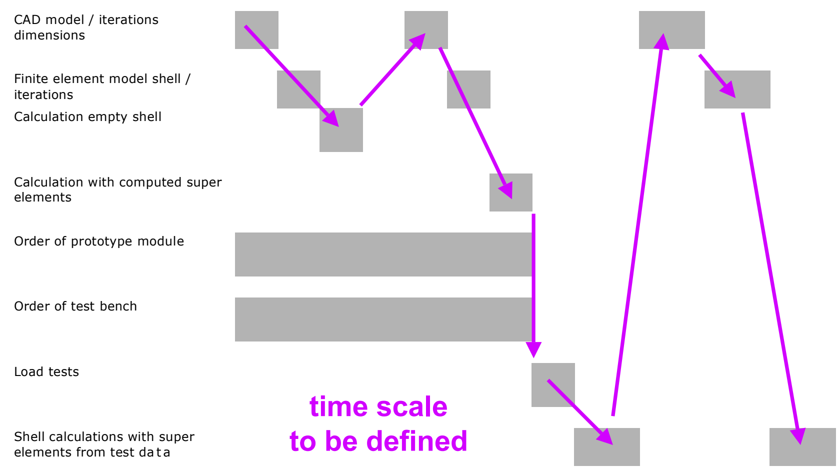
EMC recent results and activities

Forward EMC mechanical design - protoype and CAD/FEA

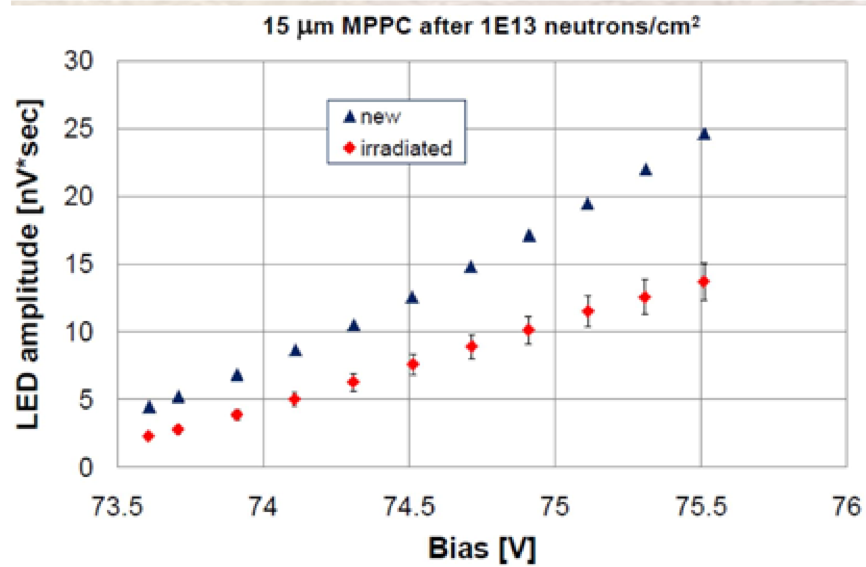


The test setup

Steps of the analysis

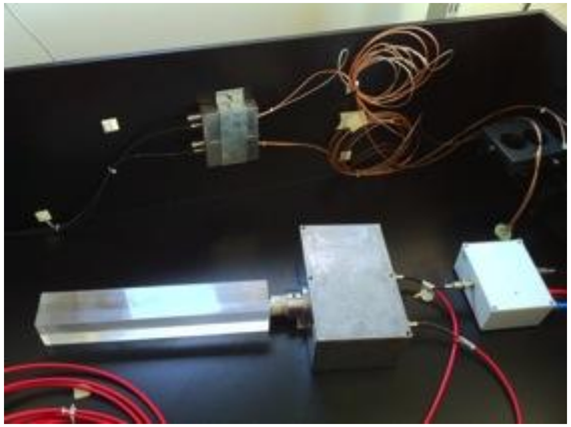


Backward EMC prototype, MPPC news



LYSO + possible alternatives

- LYSO -> finalizing results from Beam Test at BTF, roughening of crystals is ongoing, readout with 2 APD's per crystals is ready….but….
….beam lines not available until beginning of 2012 (we are in contact with people for BTF, Mainz, SLAC) more news soon



1) CsI pure, readout VPT and Photopentode
   Measurements in LAB have started

2) PWO-II (second generation of crystals L.O. increased by 85%) + LAAPD
   In contact with producers to order one crystal

3) BGO readout PMT
   already some studies have been carried out → PMT readout + APD (to be done)

4) BGO and PWO measurments of LY with radiation damage at Caltech

- FULL MATRIX TEST with ONE of the alternatives (1-2-3) in 2012 after measurements in LAB and simulation studies

Forward & Backward Calorimeter options

The SuperB calorimeter will reuse the Babar barrel of CsI crystals. In the forward endcap CsI will be replced with YLSO crystals, while for the backward the solution is lead+scintillating fibers 2.8 mm Pb alternated with scintillator for different layers there are different

patterns :

- Right handed logarithmic spiral
- Left-handed logarithmic spiral
- Radial wedge

The readout fibers are embedded in grooves cut in scintillator.

As Photo-Detector a pixel device will be used Either MPPC or SiPM.

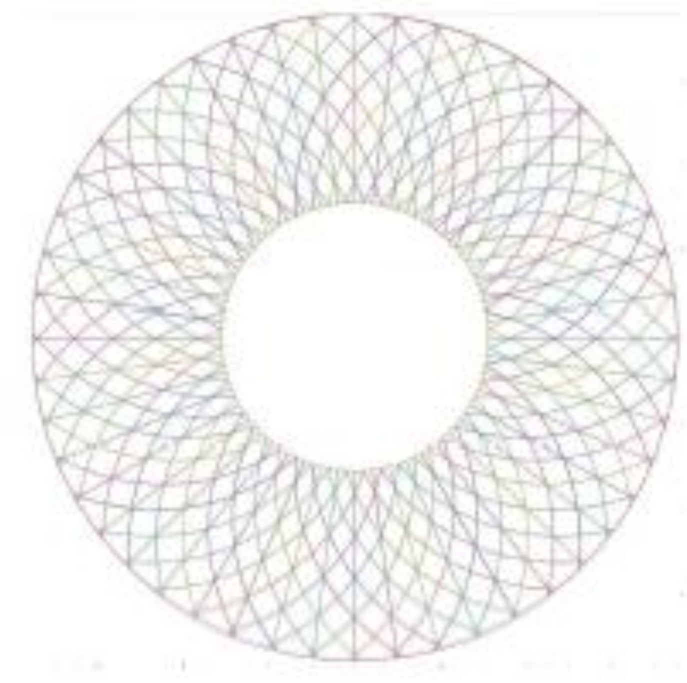


Figure 27: The backward EMC, showing the scintillator strip geometry for pattern recognition.

IFR Advancements): Simulations

Fast Simulation

PID tables for muons and pions, based on optimization results, are in preparation and will replace the BaBar tables in the next event production

Ferrara
Krakow

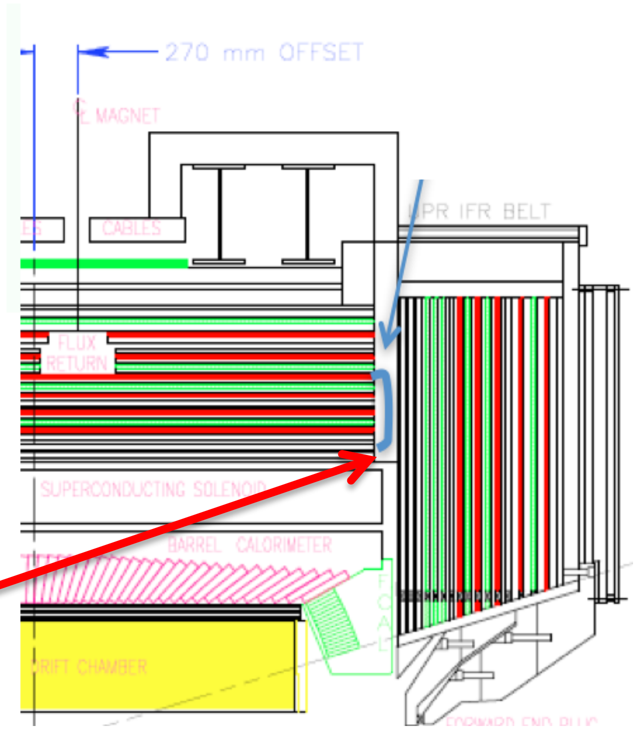
Detector Optimization

Added and tested a 9-layers configuration

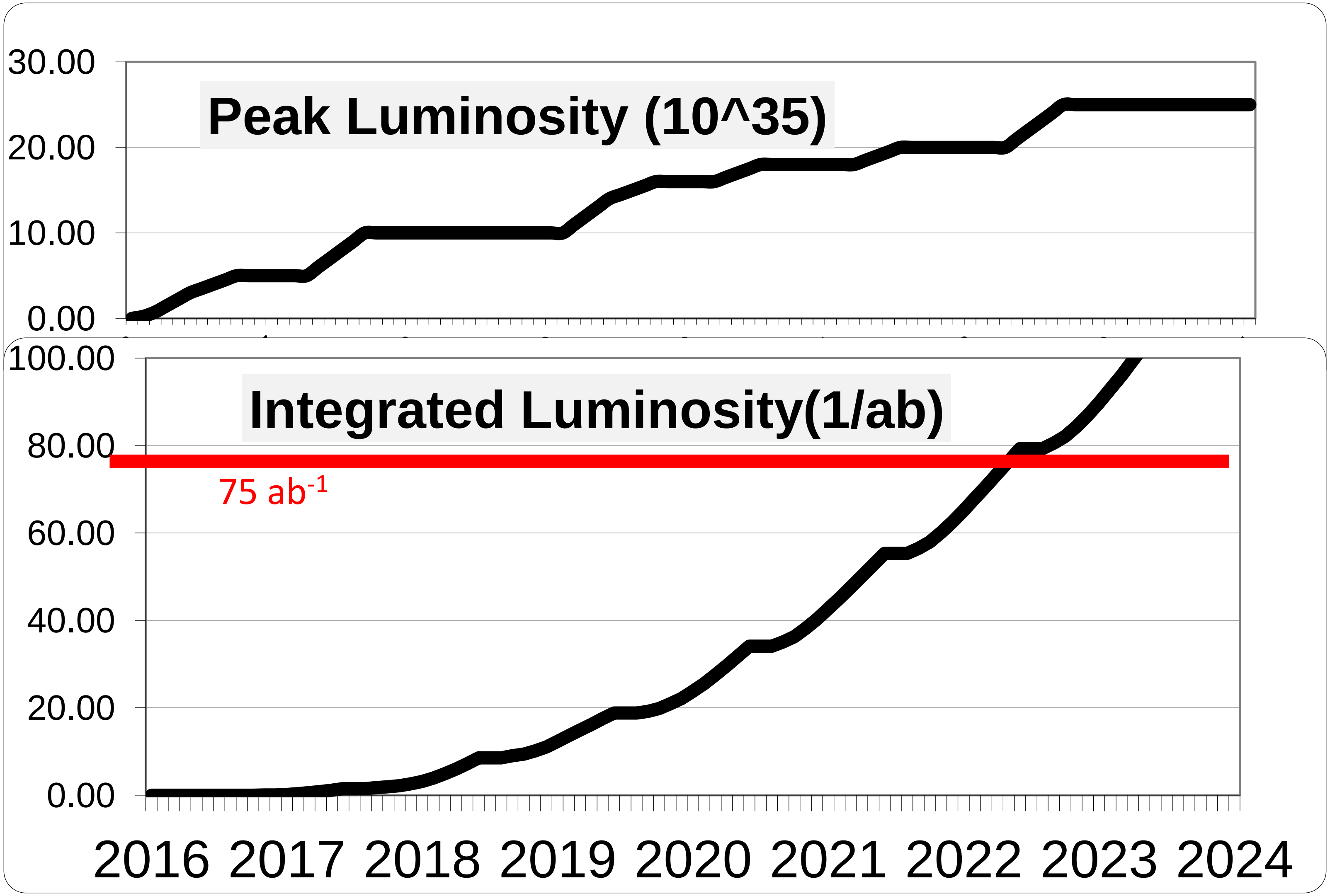
Started with K_L study.

Background studies

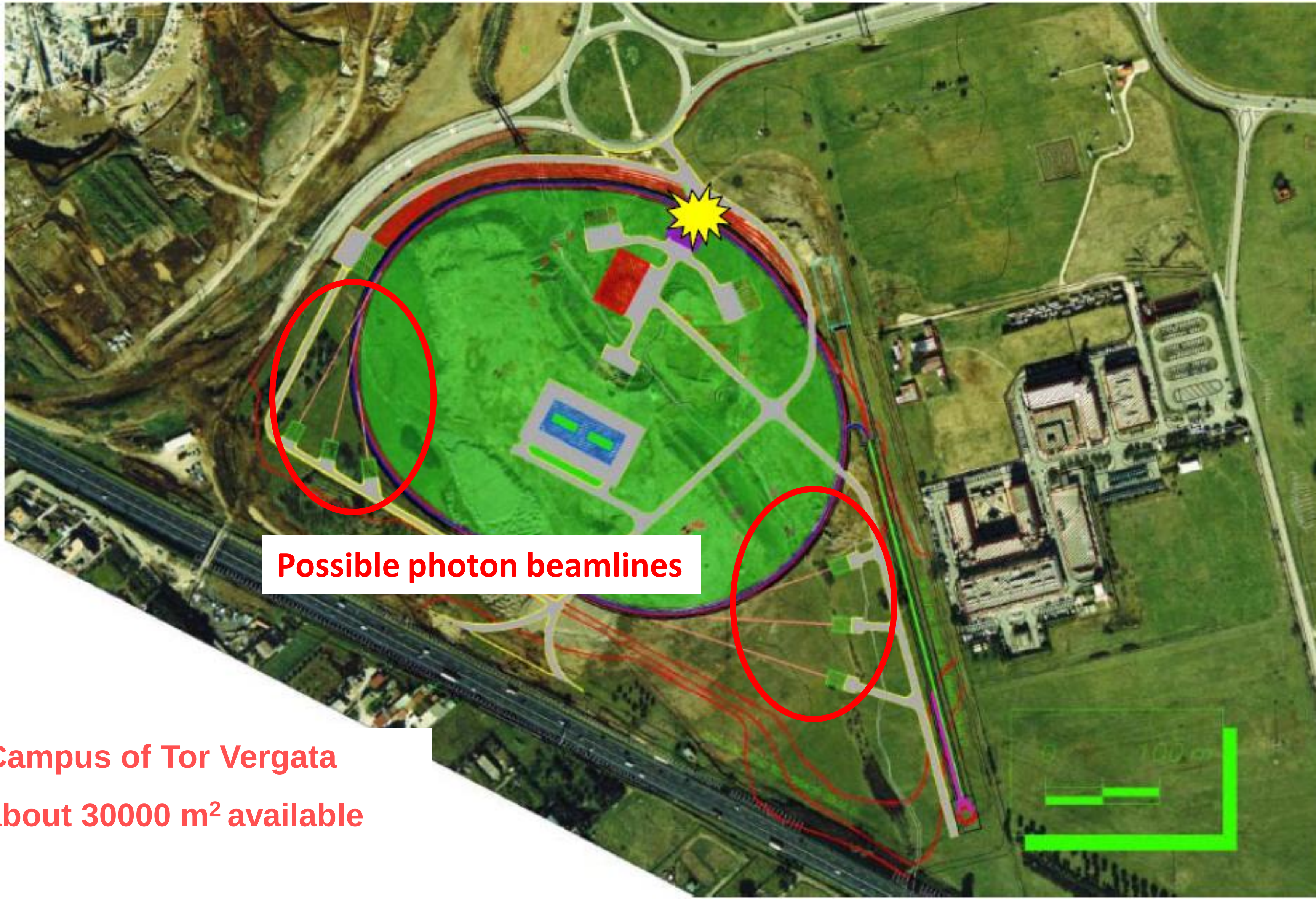
Neutron background analysis continues with the study of possible shielding and remediation: added polyethylene shielding, investigating the possibility to move the SiPM of the inner layers in a outer gap.



SuperB Luminosity model



SuperB site @ Tor Vergata



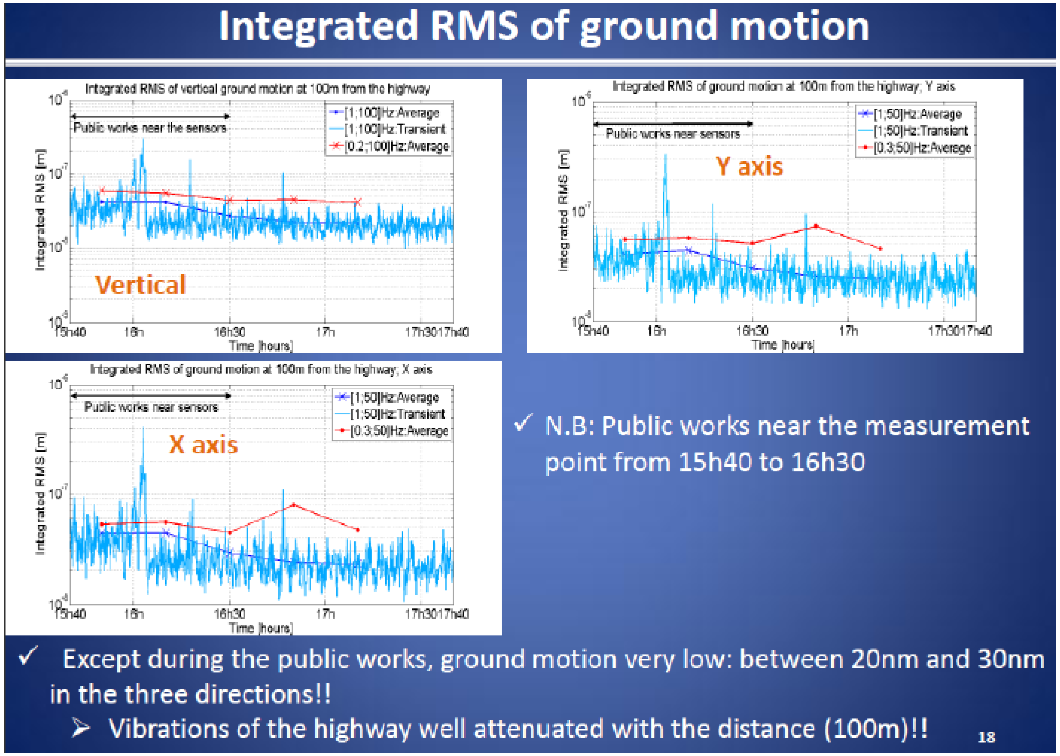
Campus of Tor Vergata

about 30000 m^2 available


Site
About 4.5 Km
LNF
Via di Passolombardo
SP77b
SS215
A1
dir
© 2011 Tele Atlas
Image © 2011 DigitalGlobe

Ground motion measurements 100 m from highway vs requirements

(B. Bolzon et al)

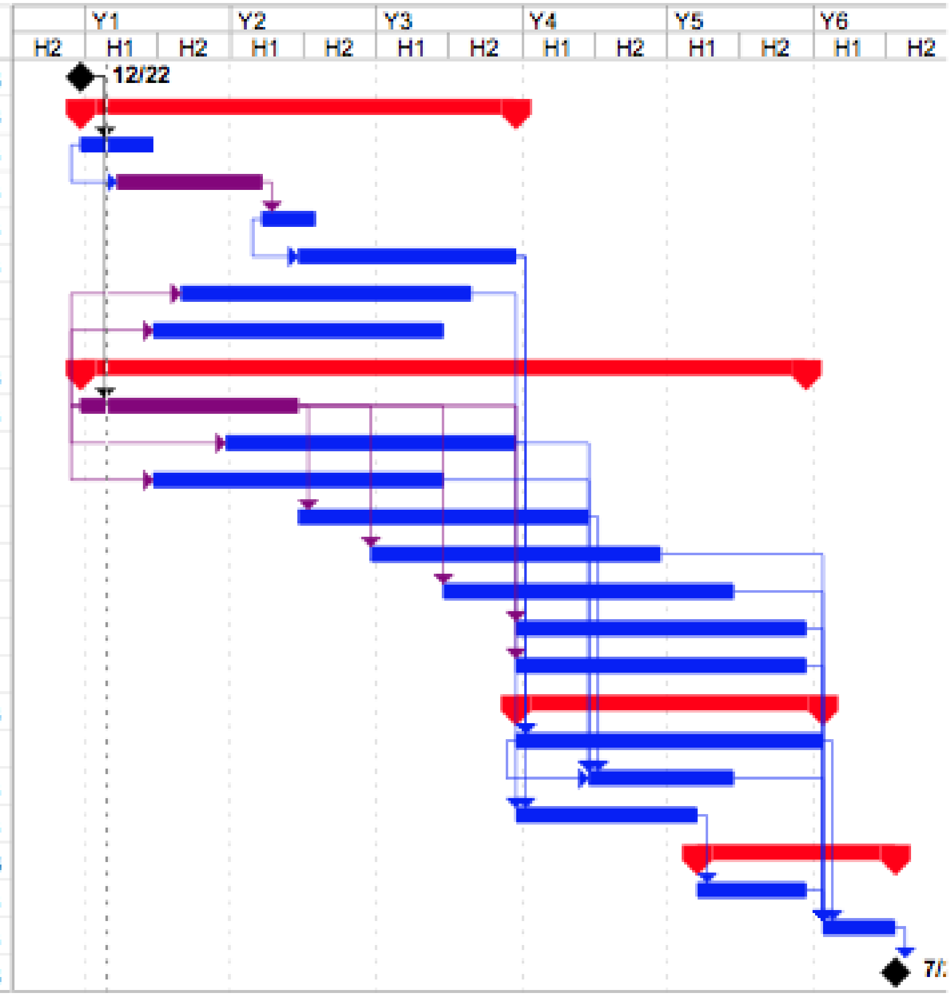


- Vibration measurements on site (April2011) show «solid» ground in spite of the vicinity of the Rome-Naples Highway 100 m away
- The Highway is at higher level with respect to the site, and the traffic vibrations («cultural noise») are well damped .

	Request (vertical displacement)	Measured (vertical displacement)
IP	300 nm	20-40 nm
Final Focus	300 nm	20-30 nm
Arcs	500 nm	20-30 nm

SuperB Accelerator Schedule

Task Name	Duration
Approvazione	0 wks
Infrastrutture	**156 wks**
Scelta del sito	26 wks
Progettazione edilizia civile	52 wks
Gara edilizia civile	19 wks
Costruzione Tunnel, Edifici, e Sala sperim.	78 wks
Progetto/gara Linac, DR, & BTL	104 wks
Progetto e gara Elettr., Raffredd., Cryo.	104 wks
Progetto & Costruzione Acceleratore	**260 wks**
Progettazione acceleratore	78 wks
Costruzione magneti	104 wks
Costruzione sistema vuoto	104 wks
Costruzione supporti	104 wks
Costruzione utilities	104 wks
Costruzione controlli	104 wks
Costruzione RF	104 wks
Costruzione alimentatori	104 wks
Installazione Acceleratore	**110 wks**
Installazione nel tunnel	110 wks
Installazione Zona Interazione	52 wks
Installazione Linac, DR, & BTL	65 wks
Commissioning Acceleratore	**71 wks**
Commissioning Linac	39 wks
Commissioning Fasci	26 wks
Prime collisioni	0 wks



Cabibbo LAB

- on Jul. 26 the INFN Board of directors approved:
  - the MoU with the University of Tor Vergata for the collaboration aimed at the realization of the SuperB project (Nicola Cabibbo Lab) on the Tor Vergata Campus
  - the Statute of the Consortium who will be responsible for he construction and the management of the Cabibbo Lab.

MoU INFN – Universita' di TorVergata

- the MoU with the University of Tor Vergata for the collaboration implies:
  – the constitution of a Consortium (Laboratorio Nicola Cabibbo) under the Italian law between INFN and the Univ. of Tor Vergata
  – subsequently, an evolution towards an European Reasearch Infrastructure Consortium (ERIC)
- the MoU specifies that the SuperB project will be implemented in two phases:
  – the first phase the Consortium will build the accelerator including the experimental hall and will put the machine in operation
  – a second phase, the Consortium (or the ERIC) will manage the accelerator and the associated laboratory infrastructure and will start the experimental program

Consortium Statute

- main elements: (still potentially subject to be changed on request of the Ministry)
  - duration: initially 6 years with possibility of continuation for an additional period or transformation in an ERIC;
  - object: construction and operation of a high-luminosity electron- positron collider, as described in the National Research Program 2011-2013
  - contributions: specific Ministerial funds will support the activities of the Consortium; the partners will participate with in-kind providing resources in terms of personnel, general services infrastructure, areas. The initial share of the Consortium common fund will be: 35% UTV, 65% INFN

Consortium statute (II)

- Structure of the Consortium; main elements:
  - Assembly of the partners
    - tasks: admission of new partners; Statute modifications; appointment of the General Director and the Area Directors; approval of the management structure proposed by the General Director; approval of budgets including the personnel plan; etc. ....
  - General Director
    - legal representative of the Consortium, responsible for the execution of the Consortium programs
    - chairs the board of Directors who manage the four areas:
      - Accelerator
      - Research
      - Administration and Finance
      - Synchrotron light

Consortium statute (III)

- Technical-scientific advisory committee
  - composed by at most 5 members appointed by the Assembly; members will have specific competence:
  - in design and construction of accelerator machines (first phase)
  - scientific exploitation of the laboratory (second phase)
- Financial Auditing office
  - three members appointed by the assembly on indications provided by INFN, TVU and the Ministry

More

- Consortium approved by the by the Minister of Research last September 28 .
- Cabibbo Lab officially registered last October7.

Before the end of October part of directorate will be in place.

Director for light physics will come later.

Mou’s can be started immediately.

Other partners from inside/outside Italy are expected to join soon with ad hoc Mou’s

Final Goal: ERIC (European Research Infrastructure Consortium)

- At least 3 European Member States as initiator of ERIC
- It gives Cabibbo Lab the European rules, but it requires some time to be established, .

More

- Some mebers of Directorate including DG are idenntified, so that costruction phase can start.

Example for the accelerator:

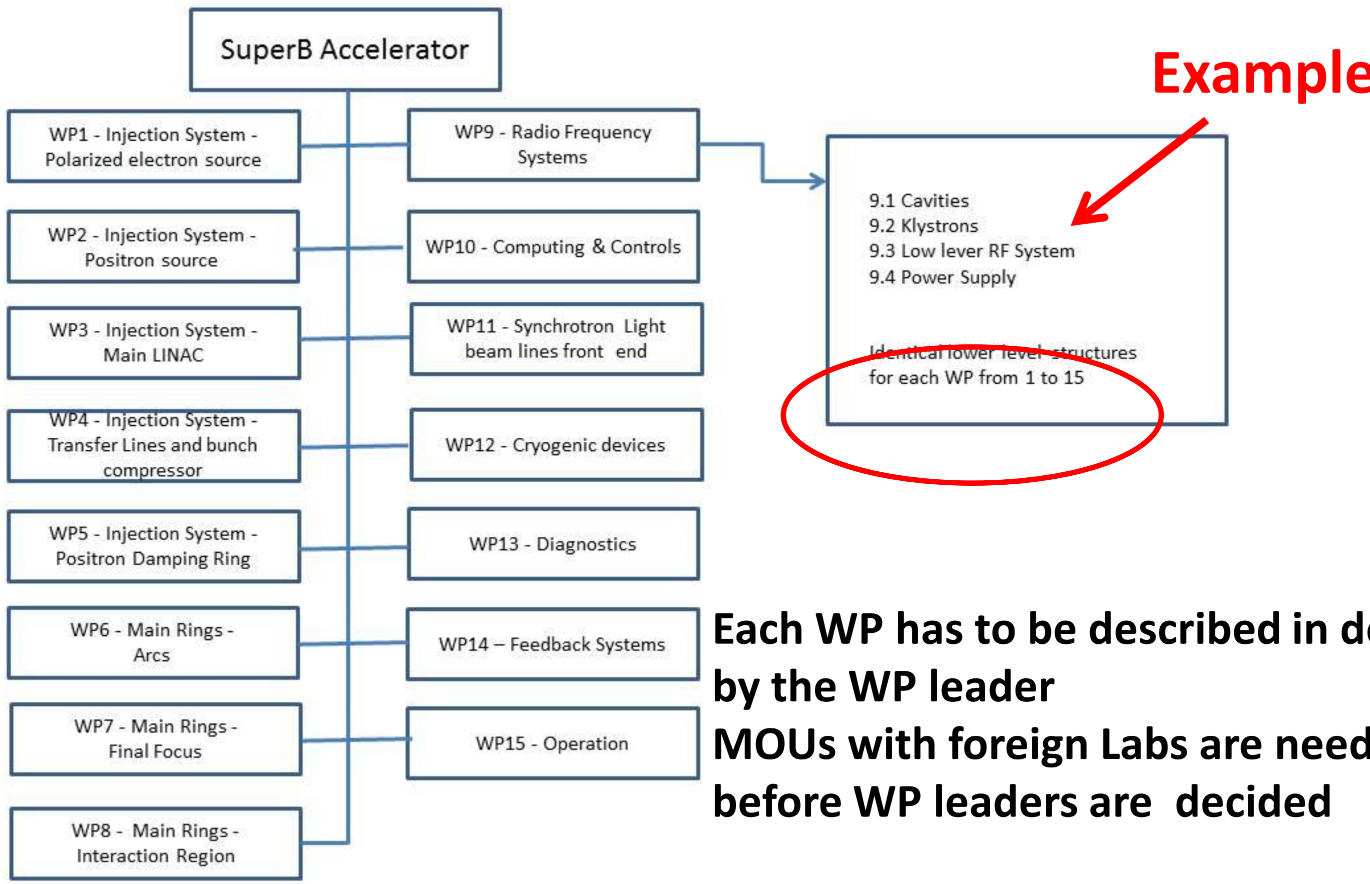
Director (scientific) -identified

Deputy Director (construction)- identified

Chief engineer – not yet

Accelerator construction will work based on Work-packages as usual in Detector construction

Work packages structure for Accelerator



Each WP has to be described in detail by the WP leader

MOUs with foreign Labs are needed before WP leaders are decided

Example of WP description (P. Fabbricatore for WP12) with deliverables and milestones

Work Package 12 Description

Work package number	**12**	**Start date or starting event:**			**2011**		
Work package title	**Cryogenic devices**						
Participant	INFN Genova	INFN Pisa	INFN LNL	INFN LNF	INFN Na	SLAC	
Person-months per participant:	150	48	36	--	36	--	

Objectives: In synthesis the objectives are the design, construction, installation and commissioning of all the cryogenic devices. Indeed the situation is more complex because SuperB includes a variety of superconducting magnets, very different from each other and some very challenging. In particular the objectives are:

1) *The main Superconducting Solenoid of the Experiment*. This solenoid is existing (presently it was dismantled and stored at SLAC). The needed activities are related to its delivery to SuperB site, re-assembly and re-commissioning. Part of the ancillaries shall be upgraded or redone.

2) *The Spin Rotators Solenoids*. These magnets (8 in total) including their cryostats shall be designed, constructed, tested and then installed and commissioned.

3) *Interaction region magnets*. At the two side of the IP, inside the detectors there are the focussing quadrupoles for both beams. These magnets are shielded by sc anti-solenoids. There are critical issues related to the very high current density of the magnets and the few allowed space creating mechanical interferences among magnets and between magnets and cryostats. Preliminarily to the final design of the magnets an R&D activities has been started for fixing an upper level of the obtainable field gradient.

4) *Power supplies and protection systems*. The superconducting magnets require specific power supplies integrated in special circuits including protecting systems (breakers, resistors, diodes). The quadrupoles of the IR may be electrically fed through a more complex system involving superconducting transformers.

Etc…

WP12 deliverable & milestones

Deliverables:

1) Overall design of the cryogenic plants
2) Quadrupole prototypes design and test
3) Design of the IR magnets and cryostat
4) Design of the cooling system and proximity cryogenics of the IR magnets
5) Design of the spin rotators (including cryostats)
6) Construction, installation and commissioning of all systems

Milestones and expected result:

1) Test of the first quadrupole model	October 2011
2) Design of the cryoplants	Dec 2012
3) Test of 2 prototype quadrupole magnets	Sept 2012
4) Finalization of the IR magnets conceptual design	March 2013
5) Conceptual design of IR Cryostat and proximity cryogenics	March 2013
6) Conceptual design of the spin rotators	June 2013
7) Technical specification of IR magnets and associate cryogenics	Sept. 2013
8) Technical specification of the spin rotators	Oct 2013
9) Technical specification of the power supplies	Dec 2013
10) Cryogenic plant installed	June 2014
11) Main solenoid reassembled	Sept. 2014
12) Commissioning of the cryogenic plants	Dec 2014
13) Construction of the power supplies	Dec. 2014
14) Commissioning of the main solenoid	March 2015
15) Magnetic measurements on main solenoids	June 2015
16) Construction of IR magnets and cryostats including test	Dec 2015
17) Construction of the spin rotators and cryostats including test	Dec 2015
18) Commissioning on site of IR magnets and associated cryogenics	March 2016
19) Commissioning on site of the spin rotators	April 2016

Documents

- The Discovery Potential of a Super B Factory Slac-R-709
- Physics at Super B Factory: hep-ex/0406071
- SuperB report: hep-ex/0512235
- SuperB Conceptual Design Report arxiv.org/abs/0709.0451
- New Physics at the Super Flavor Factory arxiv.org/abs/0810.1312
- Detector Progress Report: arxiv.org/abs/1007.4241
- Physics Progress Report: arxiv.org/abs/1008.1541
- Accelerator Progress Report: arxiv.org/abs/1009.6178
- See http://superb.infn.it

END

Budget (10 years)

Tab. 4.4: Scaletta temporale del Progetto SuperB e stima dei costi	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Sviluppo Acceleratore (130 M€) Costruzioni infrastrutture. sviluppo damping rings. sviluppo transfer lines messa in funzione Linac, damping lines, transfer lines, costruzioni facility end-user	20	50	60							
Sviluppo centri Calcolo (43 M€) Sviluppo progettazione costruzione centro di calcolo per analisi dati	5	15	23							
Completamento acceleratore (126 M€) Installazione componenti negli archi acceleratore, installazione zona interazione, messa in funzione acceleratore				42	42	42				
Utilizzo installazione (80 M€) Costi operazione e manutenzione acceleratore							20	20	20	20
Totale infrastrutture tecniche (379 M€)	25	65	83	42	42	42	20	20	20	20
Overheads INFN (34.3 M€ equivalente al 9%)	2.3	5.9	7.5	3.8	3.8	3.8	1.8	1.8	1.8	1.8
Cofinanziamento INFN (150 M€)	15	15	15	15	15	15	15	15	15	15
Costo Totale del progetto (563.3 M€)	42.3	85.9	105.5	60.8	60.8	60.8	36.8	36.8	36.8	36.8

End construction

Construction + running Euro 650M
250M from Ministry of Science
+43M from Ministry of science for computing
+150 M INFN co-funding
+Components of PEPII from Slac
Expected contribution from IIT to SuperB as a Light source machine to be defined at their meeting before the end of the year.
Other in ind contribution to the accelerator mainly as a man power expected from Mou's about work packages.