The Super*B* Project

(*Super Flavor Factory*)

Marcello A. Giorgi
Università di Pisa & INFN Pisa

November 28,2008

Plenary ECFA

CERN

SuperB: a 10^{36} cm^{-2} s^{-1} accelerator

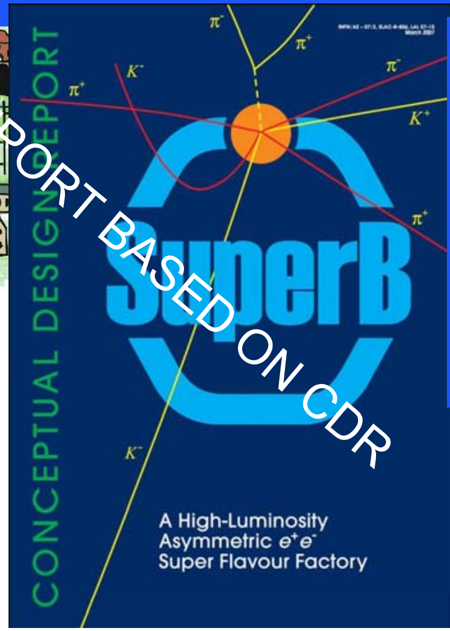
SuperB is a project sustained by an international collaboration aiming at a regional project:

- the construction of a very high luminosity (10^{36} cm^{-2} s^{-1}) asymmetric e^+e^- Super Flavor Factory, with location at the campus of the University of Rome Tor Vergata, near the INFN Frascati National Laboratory
- A Super Flavor Factory such as *SuperB* will open a window on NEW PHYSICS complimentary to LHC and ILC
- The physics studies possible at such a machine will provide a uniquely important source of deeper understanding of the NP found at LHC, and if not found, will bring a sensitivity to seeing signs of NP at even higher energies than LHC to help set the scale of NP
- A Conceptual Design Report, signed by 85 Institutions was published in March 2007 (arXiv:0709.0451 [hep-ex])

Previous presentations of the Project

Manchester ('07) :

320 Signatures
About 85 institutions
174 Babar members
65 non Babar.



REPORT BASED ON CDR

Lisbon (March'08)

Some Highlight on Physics Program
Quick update on Detector
Accelerator : preliminary results from test on Super*B* concepts in DaΦne upgrade at LNF.

CERN (Nov"08):

Quick update on Physics Program and Detector
Accelerator test results
Update on Process and Organization for TDR

After CDR

SuperB workshops and reviews of Physics motivation and machine project.

- Topical meetings on Machine, Detector and Physics (main physics meeting in Valencia Jan.7-15,2008).
- Main General meeting in Elba may 30-june 2,2008.

IRC appointed by the President of INFN in summer 2007:

- Preliminary meeting in Rome end July 2007 (committee with INFN management and proponents)
- First review meeting in LNF Nov. 12-13 , 2007.
- Final meeting before report to President of INFN in Rome, Apr. 29-30, 2008 .

Machine advisory committee (MiniMac) appointed after Elba.

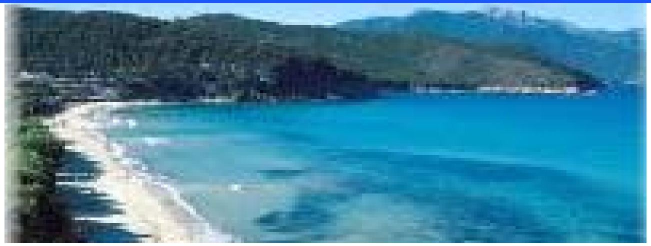
- Meeting on July 16-17,2008 in Frascati.

Super*B major meetings*

Proceedings
of
Super*B* Workshop VI

New Physics
at the
Super Flavour Factory

Valencia, Spain
January 7-15, 2008



May 2008 SuperB Meeting

La Biodola, Isola d'Elba

May 31st-June 3rd, 2008

Istituto Nazionale Fisica Nucleare - Sez. Pisa
Universita' di Pisa, Dipartimento di Fisica
Scuola Normale Superiore

Attended by ECFA ad hoc Subcommittee

Update on physics (potential discovery of New Physics with a 75 ab-1 in 5 years) for B, Charm, Tau's and new Spectroscopy . Examine carefully the potential benefits of running at 4 GeV c.m.s. Energy and of the Polarization.
Organize the preparation of the simulation tools to evaluate the correct experimental sensitivity to the most relevant physics channels

Reviews

INFN Internation Review Committee

- John Dainton – UK/Daresbury, chair
- Jacques Lefrancois – F/Orsay
- Antonio Masiero – I/Padova
- Rolf D.Heuer *– D/ Desy
- Daniel Schulte – CERN
- Abe Seiden – USA/UCSC
- Young-Kee Kim – USA/FNAL
- Hiroaki Aihara – Japan/Tokyo

\+ Tatsuya Nakada (RECFA)
\+ Steve Myers – accel expert

Report released at the end of May 2008

They

"recommend strongly continuation of work for 10^{36} cm^{-2} s^{-1} asymmetric e^+e^- collider."

(*)R.D.Heuer attended only the last meeting

DOE Particle Physics Project Prioritization Panel (P5)

Report released May 2008

Recommend significant US Participation in offshore flavour factory in the intermediate funding scenario

Mini Machine Advisory Committee

- Klaus Balewski (DESY)
- John Corlett (LBNL)
- Jonathan Dorfan (SLAC, Chair)
- Tom Himel (SLAC/ DESY)
- Claudio Pellegrini (UCLA)
- Daniel Schulte (CERN)
- Ferdi Willeke (BNL)
- Andy Wolski (Liverpool)
- Frank Zimmermann (CERN)

First meeting in July 16-17,2008

No glaring showstoppers

Form a management structure

Comments on reviews

- Link to meetings and reports:
  http://www.pi.infn.it/SuperB/reviews
- Dainton committee →
- Mini MAC

John Dainton
INFN SuperB
La Biolada
June 1st 2008

IRC First report

UNIVERSITY OF LIVERPOOL

5. Conclusion

- recommend strongly continuation of work for 10^{36} cm^{-2} s^{-1} asymmetric e^+e^- collider
- even more concerted effort to fully evaluate physics potential ↔ machine specifications
- major design program to establish credibility of machine now critical ← showstoppers?
- MAC now essential
- preservation of detectors
  PEP2 components

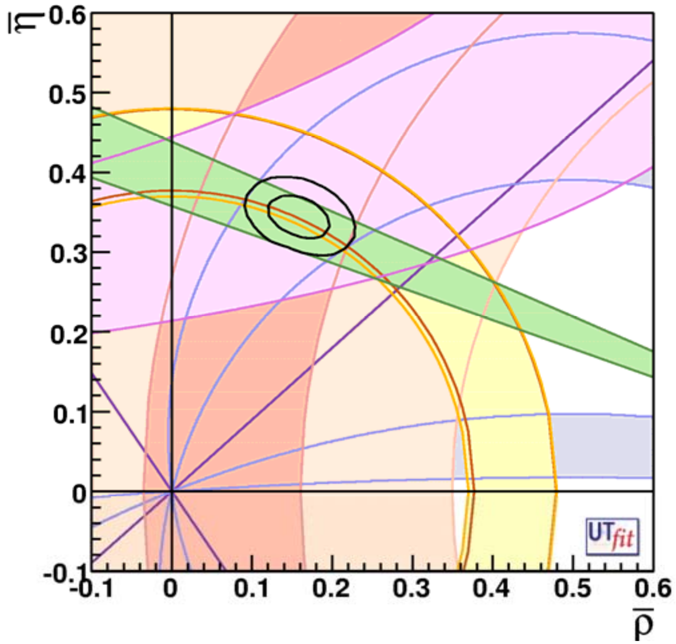
↳ increasing global involvement if timescale for a TDR is to be met

•Very exciting project -- Committee is exhilarated by the challenge
•Physics requirement of 10**36 cm-2 sec-1 or 75 ab-1/5yr is very demanding
•Committee considers the SINGLE MOST ESSENTIAL ingredient for moving forward is the formation of a sanctioned management structure which formally incorporates a dedicated machine design team. The team members must have the strong support of their home institutions to work on the design. The team needs a designated leader, who is as close to full time as is possible

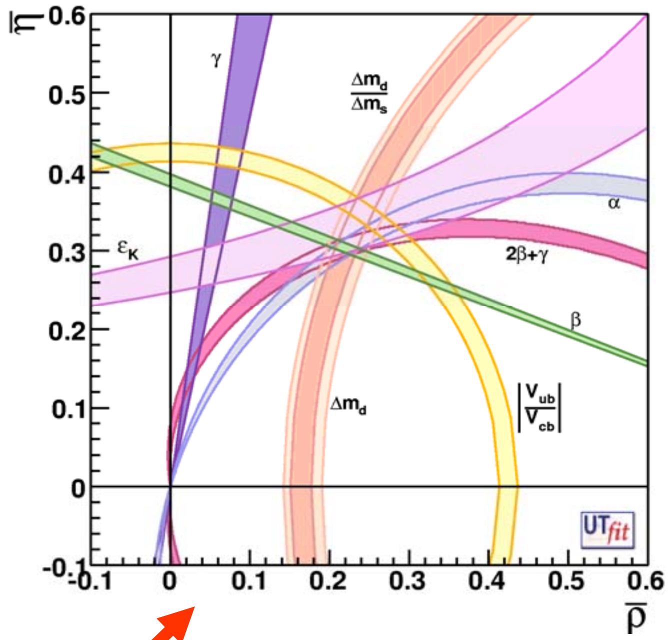
•The Committee sees no glaring showstoppers wrt achieving the design performance. However, in several key areas, more work is needed before the design can be blessed

Still on CKM:NP sensitivity with 75 ab^{-1}

Today



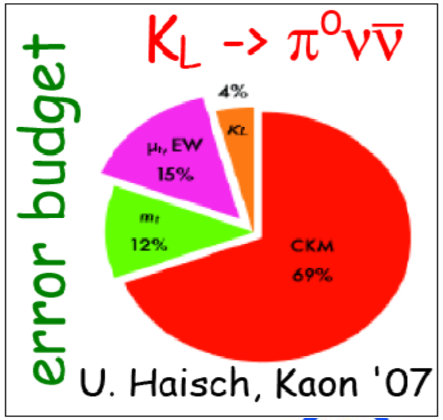
SuperB+Lattice improvements



$\rho = 0.163 \pm 0.028$
$\eta = 0.344 \pm 0.016$

$\rho = \pm 0.0028$
$\eta = \pm 0.0024$

Improving CKM is crucial to look for NP



B Physics @ Y(4S)

Observable	B Factories (2 ab^{-1})	SuperB (75 ab^{-1})
$\sin(2\beta)$ $(J/\psi K^0)$	0.018	0.005 (†)
$\cos(2\beta)$ $(J/\psi K^{*0})$	0.30	0.05
$\sin(2\beta)$ (Dh^0)	0.10	0.02
$\cos(2\beta)$ (Dh^0)	0.20	0.04
$S(J/\psi\,\pi^0)$	0.10	0.02
$S(D^+D^-)$	0.20	0.03
$S(\phi K^0)$	0.13	0.02 (∗)
$S(\eta' K^0)$	0.05	0.01 (∗)
$S(K^0_S K^0_S K^0_S)$	0.15	0.02 (∗)
$S(K^0_S \pi^0)$	0.15	0.02 (∗)
$S(\omega K^0_S)$	0.17	0.03 (∗)
$S(f_0 K^0_S)$	0.12	0.02 (∗)
γ $(B\to DK,\ D\to CP$ eigenstates)	$\sim 15°$	2.5°
γ $(B\to DK,\ D\to$ suppressed states)	$\sim 12°$	2.0°
γ $(B\to DK,\ D\to$ multibody states)	$\sim 9°$	1.5°
γ $(B\to DK$, combined)	$\sim 6°$	1–2°
α $(B\to\pi\pi)$	$\sim 16°$	3°
α $(B\to\rho\rho)$	$\sim 7°$	1–2° (∗)
α $(B\to\rho\pi)$	$\sim 12°$	2°
α (combined)	$\sim 6°$	1–2° (∗)
$2\beta+\gamma$ $(D^{(*)\pm}\pi^\mp,\ D^\pm K^0_S\pi^\mp)$	20°	5°

Observable	B Factories (2 ab^{-1})	SuperB (75 ab^{-1})
$\lvert V_{cb}\rvert$ (exclusive)	4% (∗)	1.0% (∗)
$\lvert V_{cb}\rvert$ (inclusive)	1% (∗)	0.5% (∗)
$\lvert V_{ub}\rvert$ (exclusive)	8% (∗)	3.0% (∗)
$\lvert V_{ub}\rvert$ (inclusive)	8% (∗)	2.0% (∗)
$\mathcal{B}(B\to\tau\nu)$	20%	4% (†)
$\mathcal{B}(B\to\mu\nu)$	visible	5%
$\mathcal{B}(B\to D\tau\nu)$	10%	2%
$\mathcal{B}(B\to\rho\gamma)$	15%	3% (†)
$\mathcal{B}(B\to\omega\gamma)$	30%	5%
$A_{CP}(B\to K^*\gamma)$	0.007 (†)	0.004 († ∗)
$A_{CP}(B\to\rho\gamma)$	~ 0.20	0.05
$A_{CP}(b\to s\gamma)$	0.012 (†)	0.004 (†)
$A_{CP}(b\to(s+d)\gamma)$	0.03	0.006 (†)
$S(K^0_S\pi^0\gamma)$	0.15	0.02 (∗)
$S(\rho^0\gamma)$	possible	0.10
$A_{CP}(B\to K^*\ell\ell)$	7%	1%
$A^{FB}(B\to K^*\ell\ell)s_0$	25%	9%
$A^{FB}(B\to X_s\ell\ell)s_0$	35%	5%
$\mathcal{B}(B\to K\nu\bar\nu)$	visible	20%
$\mathcal{B}(B\to\pi\nu\bar\nu)$	–	possible

Charm mixing and CP

Mode	Observable	$\Upsilon(4S)$ (75 ab^{-1})	$\psi(3770)$ (300 fb^{-1})
$D^0\to K^+\pi^-$	x'^2	3×10^{-5}	
	y'	7×10^{-4}	
$D^0\to K^+K^-$	y_{CP}	5×10^{-4}	
$D^0\to K^0_S\pi^+\pi^-$	x	4.9×10^{-4}	
	y	3.5×10^{-4}	
	$\lvert q/p\rvert$	3×10^{-2}	
	ϕ	2°	
$\psi(3770)\to D^0\overline{D}^0$	x^2		$(1-2)\times10^{-5}$
	y		$(1-2)\times10^{-3}$
	$\cos\delta$		$(0.01-0.02)$

Charm FCNC

Channel	Sensitivity
$D^0\to e^+e^-$, $D^0\to\mu^+\mu^-$	1×10^{-8}
$D^0\to\pi^0e^+e^-$, $D^0\to\pi^0\mu^+\mu^-$	2×10^{-8}
$D^0\to\eta e^+e^-$, $D^0\to\eta\mu^+\mu^-$	3×10^{-8}
$D^0\to K^0_S e^+e^-$, $D^0\to K^0_S\mu^+\mu^-$	3×10^{-8}
$D^+\to\pi^+e^+e^-$, $D^+\to\pi^+\mu^+\mu^-$	1×10^{-8}
$D^0\to e^\pm\mu^\mp$	1×10^{-8}
$D^+\to\pi^+e^\pm\mu^\mp$	1×10^{-8}
$D^0\to\pi^0e^\pm\mu^\mp$	2×10^{-8}
$D^0\to\eta e^\pm\mu^\mp$	3×10^{-8}
$D^0\to K^0_S e^\pm\mu^\mp$	3×10^{-8}
$D^+\to\pi^-e^+e^+$, $D^+\to K^-e^+e^+$	1×10^{-8}
$D^+\to\pi^-\mu^+\mu^+$, $D^+\to K^-\mu^+\mu^+$	1×10^{-8}
$D^+\to\pi^-e^\pm\mu^\mp$, $D^+\to K^-e^\pm\mu^\mp$	1×10^{-8}

τ Physics

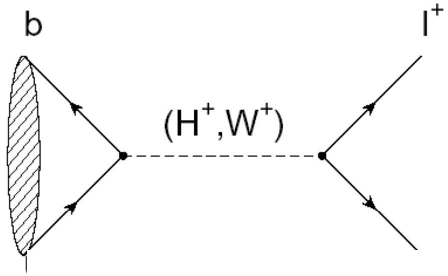
	Sensitivity
$\mathcal{B}(\tau\to\mu\gamma)$	2×10^{-9}
$\mathcal{B}(\tau\to e\gamma)$	2×10^{-9}
$\mathcal{B}(\tau\to\mu\mu\mu)$	2×10^{-10}
$\mathcal{B}(\tau\to eee)$	2×10^{-10}
$\mathcal{B}(\tau\to\mu\eta)$	4×10^{-10}
$\mathcal{B}(\tau\to e\eta)$	6×10^{-10}
$\mathcal{B}(\tau\to\ell K^0_S)$	2×10^{-10}

B_s Physics @ Y(5S)

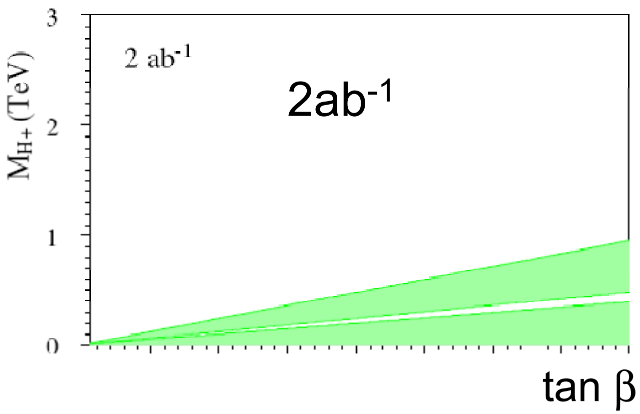
	ab^{-1}	Error with 30 ab^{-1}
$\Delta\Gamma$	0.16 ps^{-1}	0.03 ps^{-1}
Γ	0.07 ps^{-1}	0.01 ps^{-1}
β_s from angular analysis	20°	8°
A^s_{SL}	0.006	0.004
A_{CH}	0.004	0.004
$\mathcal{B}(B_s\to\mu^+\mu^-)$	-	$< 8\times10^{-9}$
$\lvert V_{td}/V_{ts}\rvert$	0.08	0.017
$\mathcal{B}(B_s\to\gamma\gamma)$	38%	7%
β_s from $J/\psi\phi$	10°	3°
β_s from $B_s\to K^0\bar K^0$	24°	11°

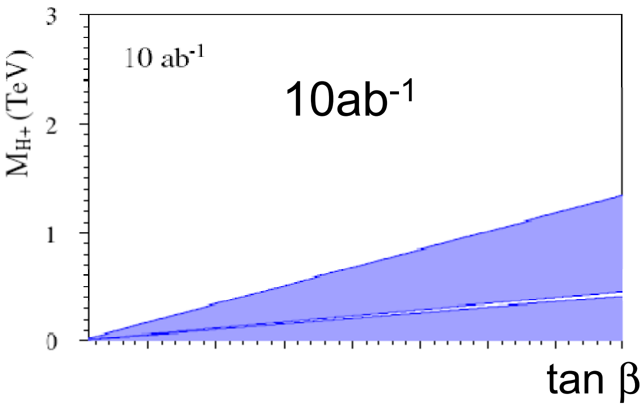
some EXAMPLES:

Higgs-mediated NP in MFV at large tanβ



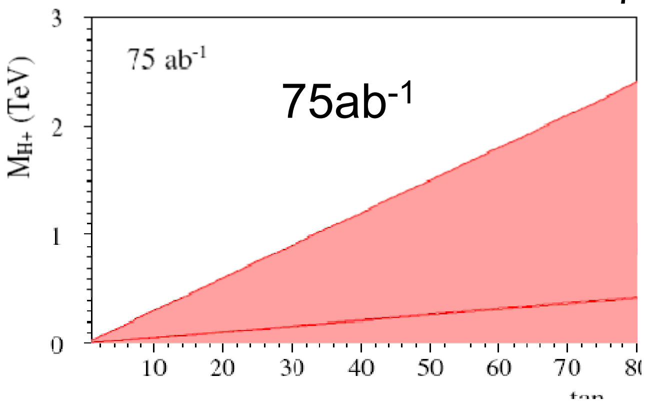
$$BR(B\to\tau\nu) = BR_{SM}(B\to\tau\nu)\left(1-\frac{m_B^2}{M_H^2}\tan^2\beta\right)^2$$





$2ab^{-1}$

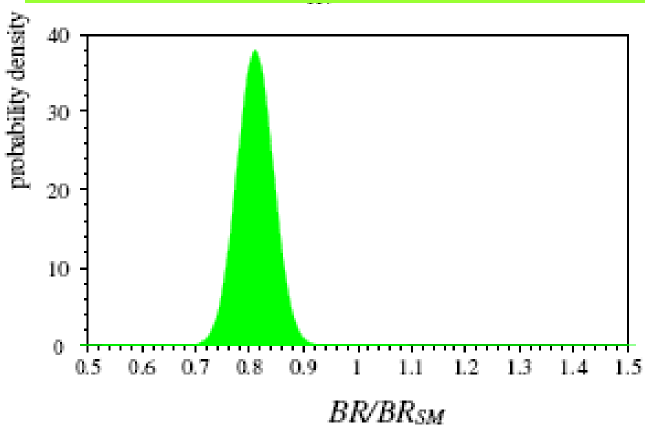
M_H~0.4-0.8 TeV for tanβ~30-60



SuperB -$75ab^{-1}$

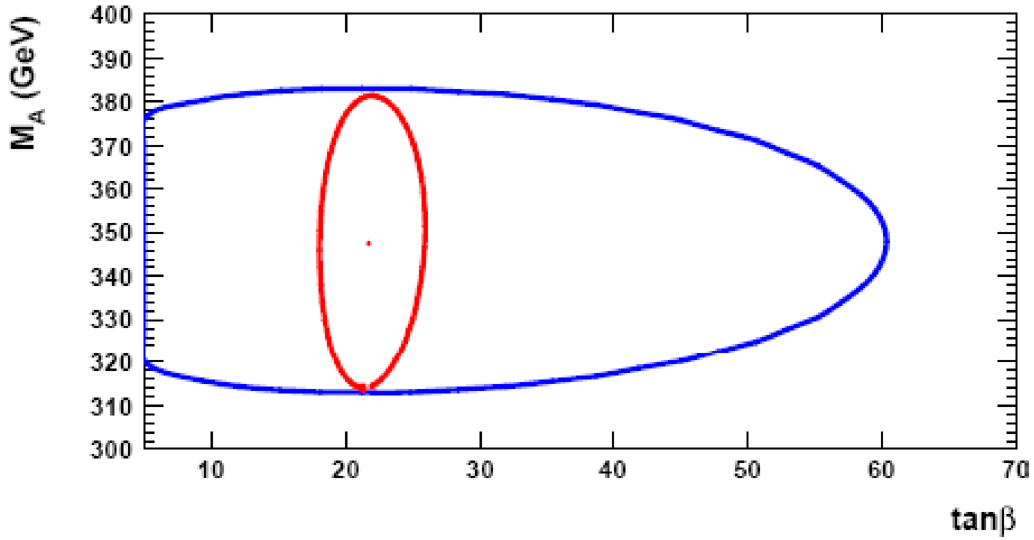
M_H~1.2-2.5 TeV for tanβ~30-60

How signal would like with MH=350GeV



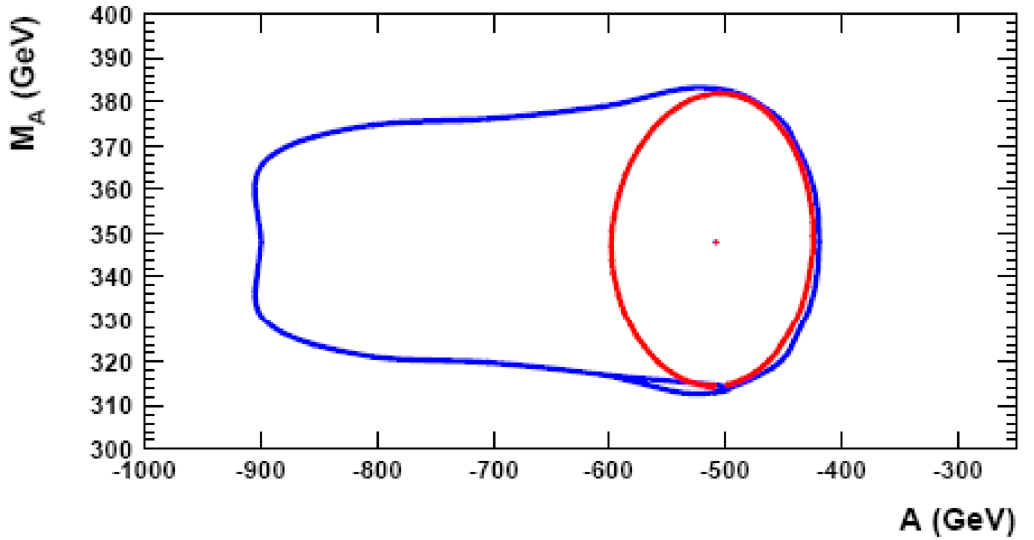
Importance of having very large sample ≥$75ab^{-1}$

COMPLEMENTARY: LHC and Flavour with 75 ab^{-1}



IF LHC DISCOVERS SUPERSYMMETRY

some EXAMPLES:



Red are LHC+EW constraints+SuperB

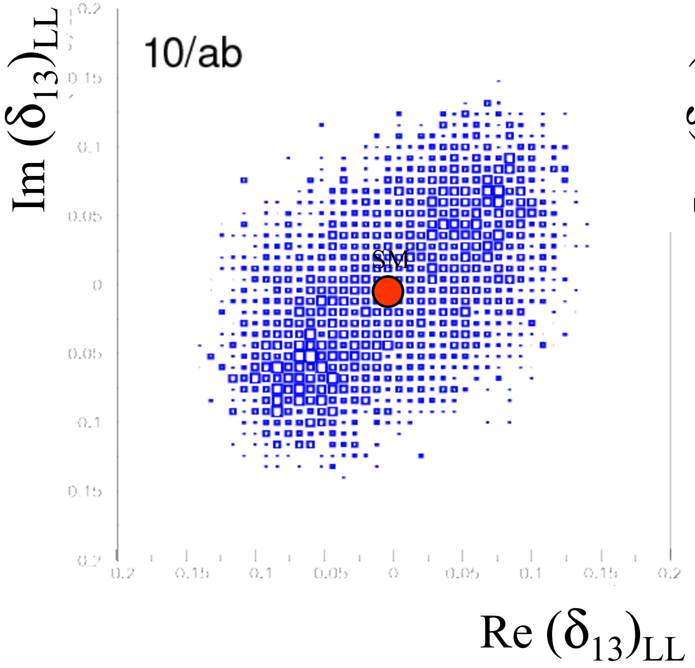
Blue is LHC alone

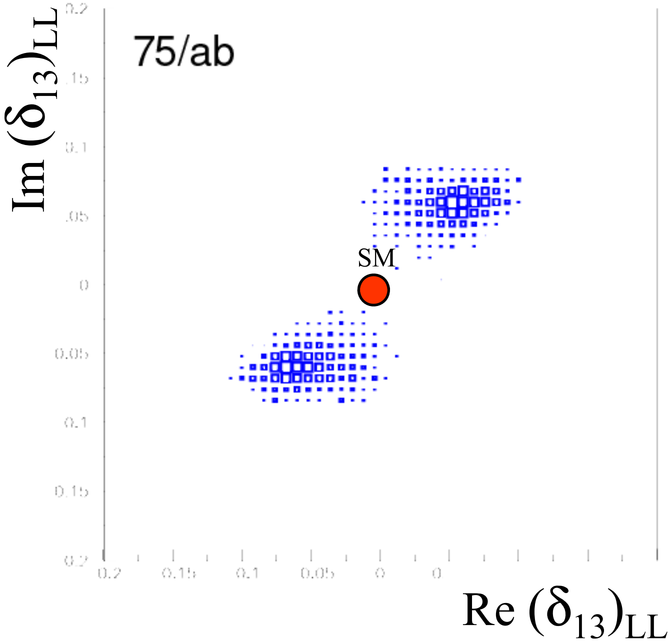
Importance of having very large sample >75ab^{-1}

Determination of coupling [in this case : $(\delta_{13})_{LL}$]

with 10 ab^{-1} and 75 ab^{-1}

some EXAMPLES:

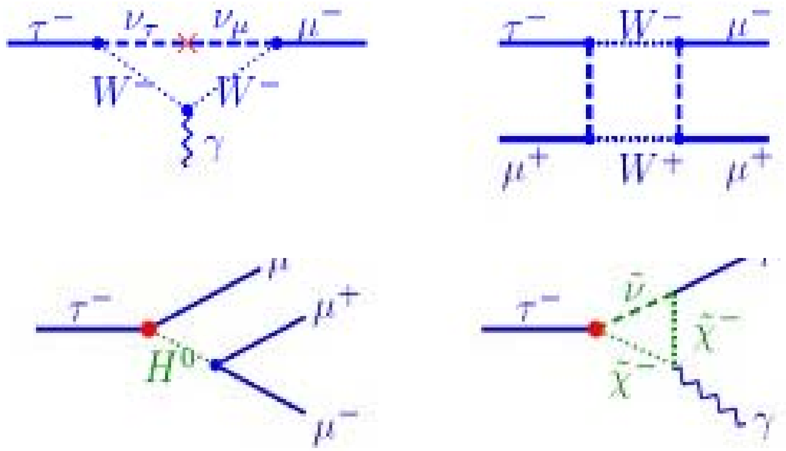




SuperB is also a τ factory → golden measurement LFV

(Complementary to $\mu \rightarrow e\gamma$)

Process	Sensitivity
$\mathcal{B}(\tau \rightarrow \mu\gamma)$	2×10^{-9}
$\mathcal{B}(\tau \rightarrow e\gamma)$	2×10^{-9}
$\mathcal{B}(\tau \rightarrow \mu\mu\mu)$	2×10^{-10}
$\mathcal{B}(\tau \rightarrow eee)$	2×10^{-10}
$\mathcal{B}(\tau \rightarrow \mu\eta)$	4×10^{-10}
$\mathcal{B}(\tau \rightarrow e\eta)$	6×10^{-10}
$\mathcal{B}(\tau \rightarrow \ell K^0_s)$	2×10^{-10}



Further improvements if polarized beams.

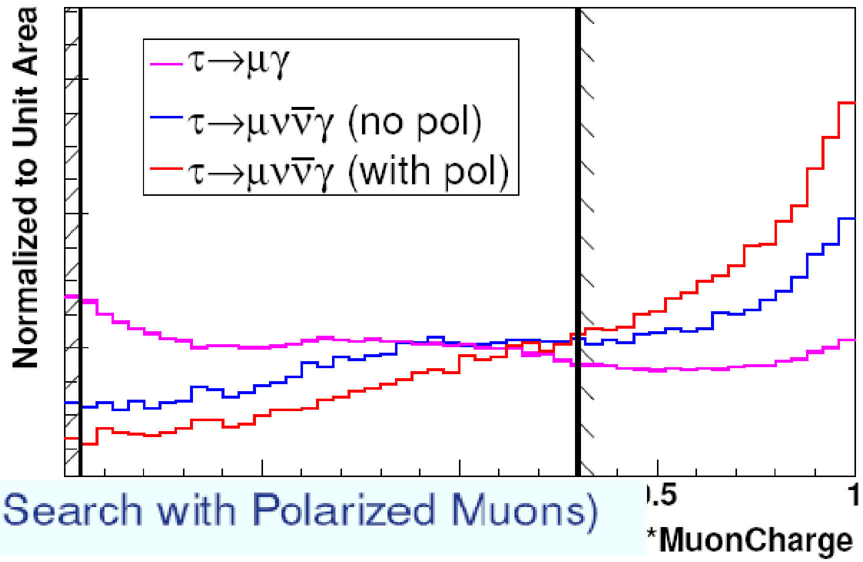
90% CL limits

Br ($\tau^- \rightarrow e^-\gamma$) < 12×10^{-8}

Br ($\tau^- \rightarrow \mu^-\gamma$) < 4.1×10^{-8}

Br ($\tau^- \rightarrow e^-\gamma$) < 11×10^{-8}

Br ($\tau^- \rightarrow \mu^-\gamma$) < 6.7×10^{-8}



Optimization of BKG rejection is in progress. Pol. Helps also to discriminate models. In some model there is a strong effect on the angular distribution

(see hep-ph/9604296, Y.Kuno, Y.Okada, $\mu \rightarrow e\gamma$ Search with Polarized Muons)

Comparison with Snowmass points on Tau using also Polarization

SuperB with 75 ab-1, evaluation assuming the most conservative scenario about syst. errors

SPS	$M_{1/2}$ (GeV)	M_0 (GeV)	A_0 (GeV)	$\tan\beta$	μ
1 a	250	100	-100	10	> 0
1 b	400	200	0	30	> 0
2	300	1450	0	10	> 0
3	400	90	0	10	> 0
4	300	400	0	50	> 0
5	300	150	-1000	5	> 0

- NP predictions for experimentally constrained SUSY in a number of standard scenarios
  B.C.Allanach *et al.*, hep-ph/0202233

	Snowmass points predictions						SuperB	
	1 a	1 b	2	3	4	5	90% UL	4σ disc.
$BF(\tau \to \mu\gamma) \times 10^{-9}$	4.2	7.9	0.18	0.26	97	0.019	2	5
$BF(\tau \to 3\mu) \times 10^{-12}$	9.4	18	0.41	0.59	220	0.043	200	880

SuperKEKB worse by a factor 2.5 and 4.5 in $\tau \to \mu\gamma$ and >5 in $\tau \to 3\mu$

Tau g-2

Start with the expt. with μ

$$\Delta a_\mu = a_\mu^{exp} - a_\mu^{SM} \approx (3 \pm 1) \times 10^{-9}$$

assume Super*B* at 75 fb^{-1}, 80% e^- beam polarization

extend to all tau decay channels

combine 2 measurement methods for $Re\{F_2\}$

studies on simulated events show no limiting syst. effects

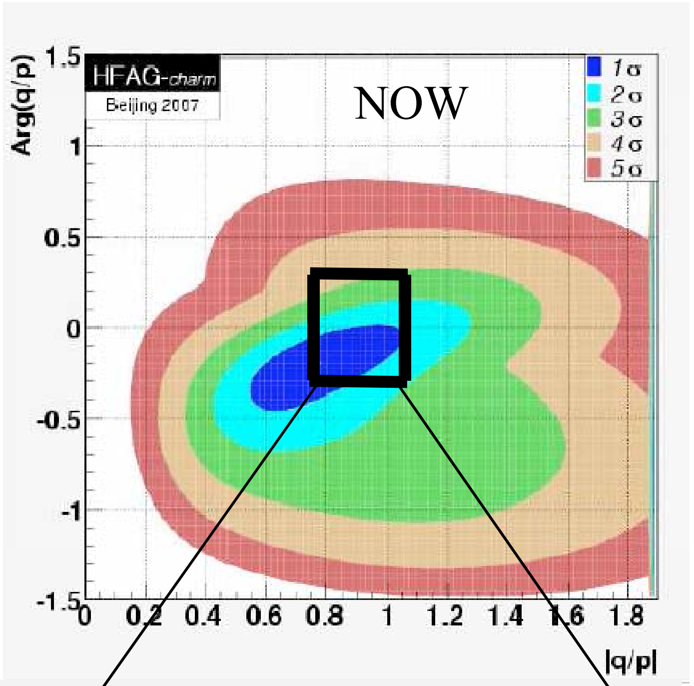
	Snowmass points predictions						Super*B*
	1 a	1 b	2	3	4	5	exp. resolution
$\Delta a_\mu \times 10^{-9}$	3.1	3.2	1.6	1.4	4.8	1.1	
$\Delta a_\tau \times 10^{-6}$	0.9	0.9	0.5	0.4	1.4	0.3	**<1**

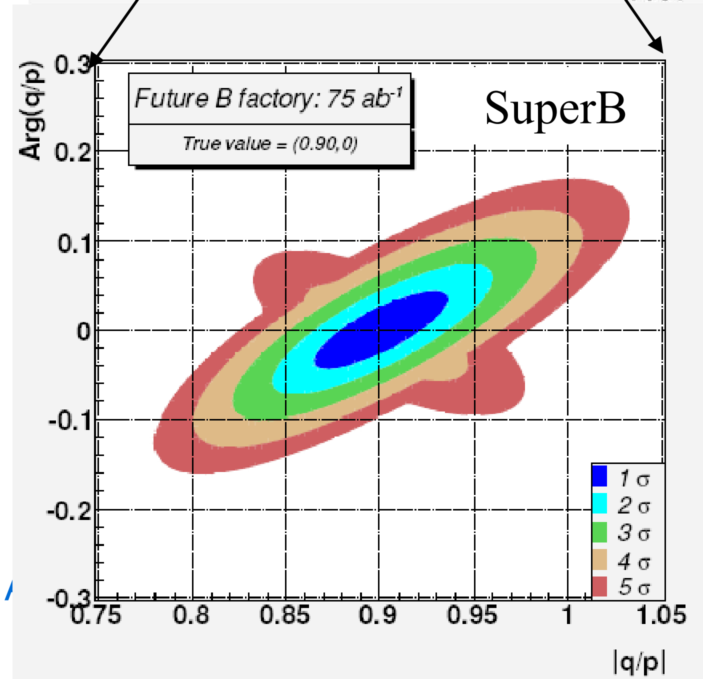
SuperKEKB, without beam polarization, expected worse by factor ≈ 10, and worse systematics

Make use of all the informations (total x-section,angular distribution, f-b asymmetry.
Measure Re and Im parts

CP Violation in charm

Mode	Observable	$\Upsilon(4S)$ (75 ab^{-1})	$\psi(3770)$ (300 fb^{-1})
$D^0 \to K^+\pi^-$	x'^2	3×10^{-5}	
	y'	7×10^{-4}	
$D^0 \to K^+K^-$	y_{CP}	5×10^{-4}	
$D^0 \to K_S^0\pi^+\pi^-$	x	4.9×10^{-4}	
	y	3.5×10^{-4}	
	$\lvert q/p \rvert$	3×10^{-2}	
	ϕ	2°	
$\psi(3770) \to D^0\overline{D}^0$	x^2		$(1-2) \times 10^{-5}$
	y		$(1-2) \times 10^{-3}$
	$\cos\delta$		$(0.01-0.02)$





Charm at threshold

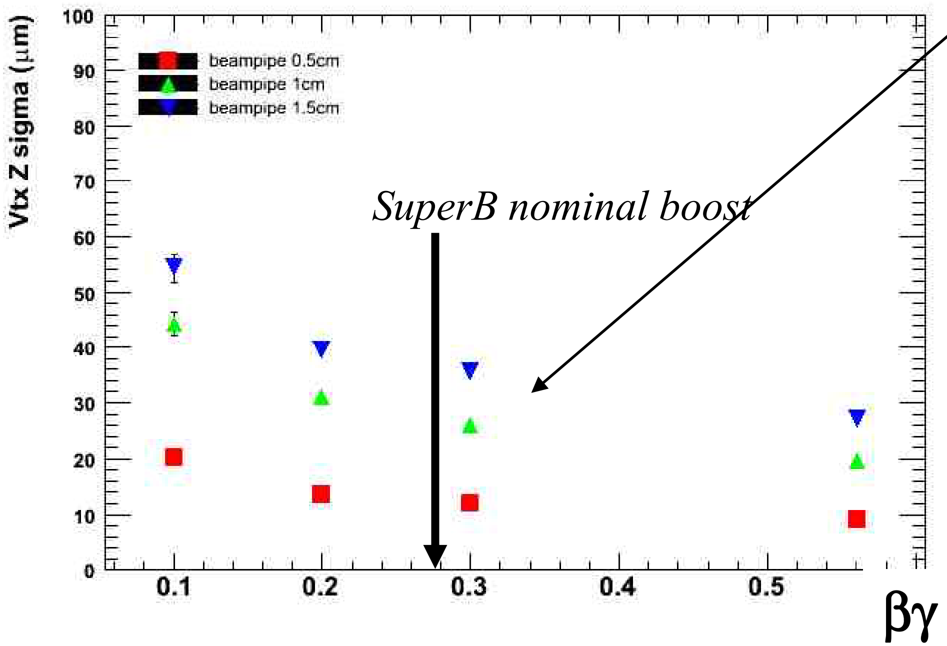
- Charm events at threshold are very clean: pure DD, no additional fragmentation
- High signal/bkg ratio: optimal for decays with neutrinos.
- Quantum Coherence: new and alternative CP violation measurement wrt to $\Upsilon(4S)$. Unique opportunity to measure D^0-D^0 relative phase.
- Increased statistics is not an advantage running at threshold: cross-section 3x wrt 10GeV but luminosity 10x smaller.
- SuperB lumi at 4 GeV = 10^{35} $cm^{-2}s^{-1}$ produces $\sim 10^9$ DD pairs per month of running. (using Cleo-c cross-section measurement

$\sigma(e^+e^- \rightarrow D^0D^0) \sim 3.6$ nb + $\sigma(e^+e^- \rightarrow D^+D^-) \sim 2.8$ nb ~ 6.4 nb)

- Time-dependent measurements at 4 GeV only possible at SuperB.

Time dependent measurements at DD threshold: only possible at SuperB

- Proper time resolution dominated by decay vertex resolution.
  - Production vertex precisely determined thanks to nm beamspot dimensions



SuperB lumi at 4 GeV = 10^{35} $cm^{-2}s^{-1}$ produces ~10^9 DD per month

$\beta\gamma ct = 0.28 \times 120\ \mu m \sim 30\mu m$

Average flight distance similar to vertex resolution → $\sigma_t \sim \tau$

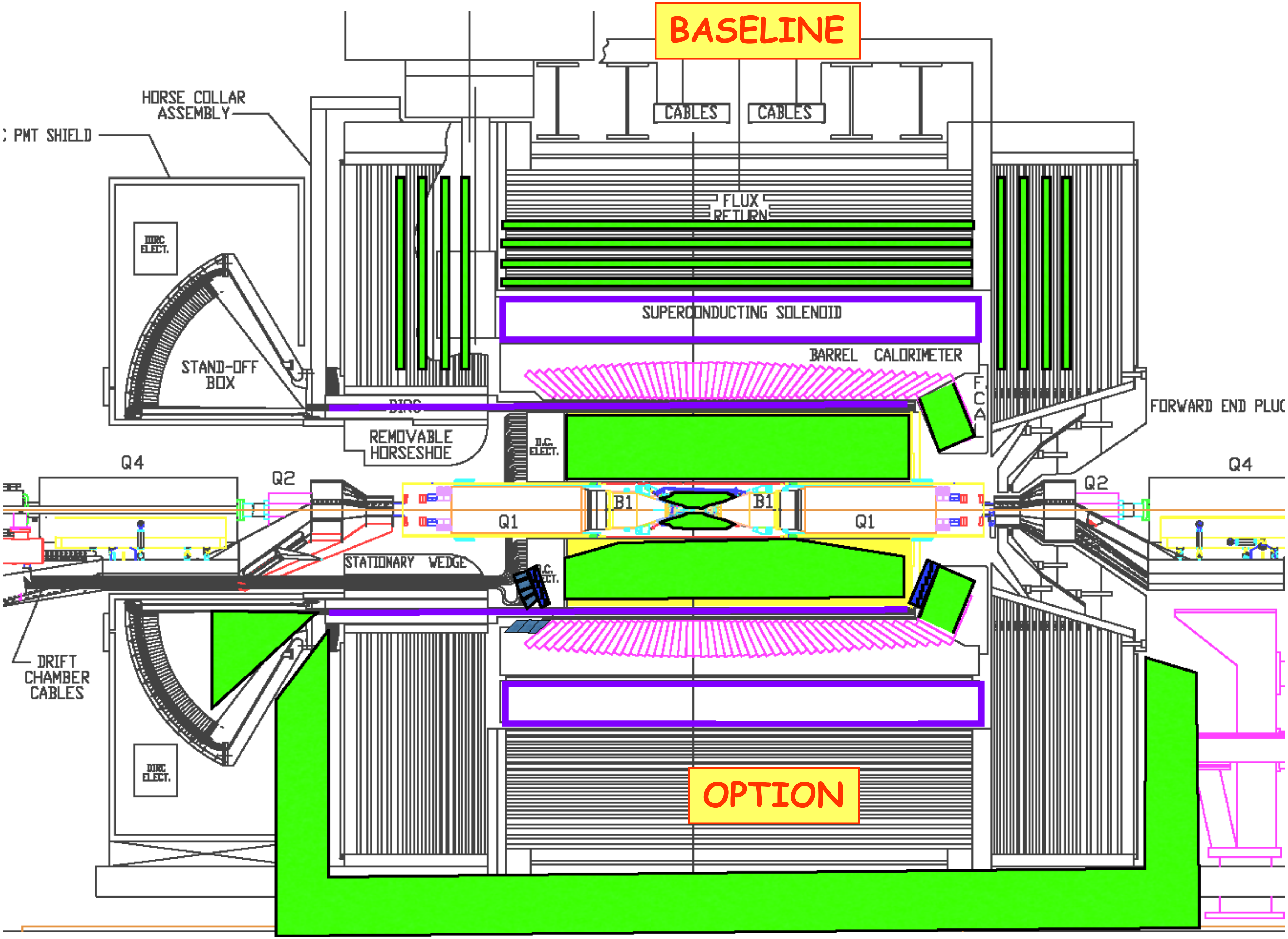
Resolution is still adequate for time dependent measurements

Error on lifetime $\approx \sqrt{\dfrac{\tau^2 + \sigma_t^{\ 2}}{N}} = \sqrt{2}\,\dfrac{\tau}{\sqrt{N}}$ (wrt perfect resolution)

SuperB Detector

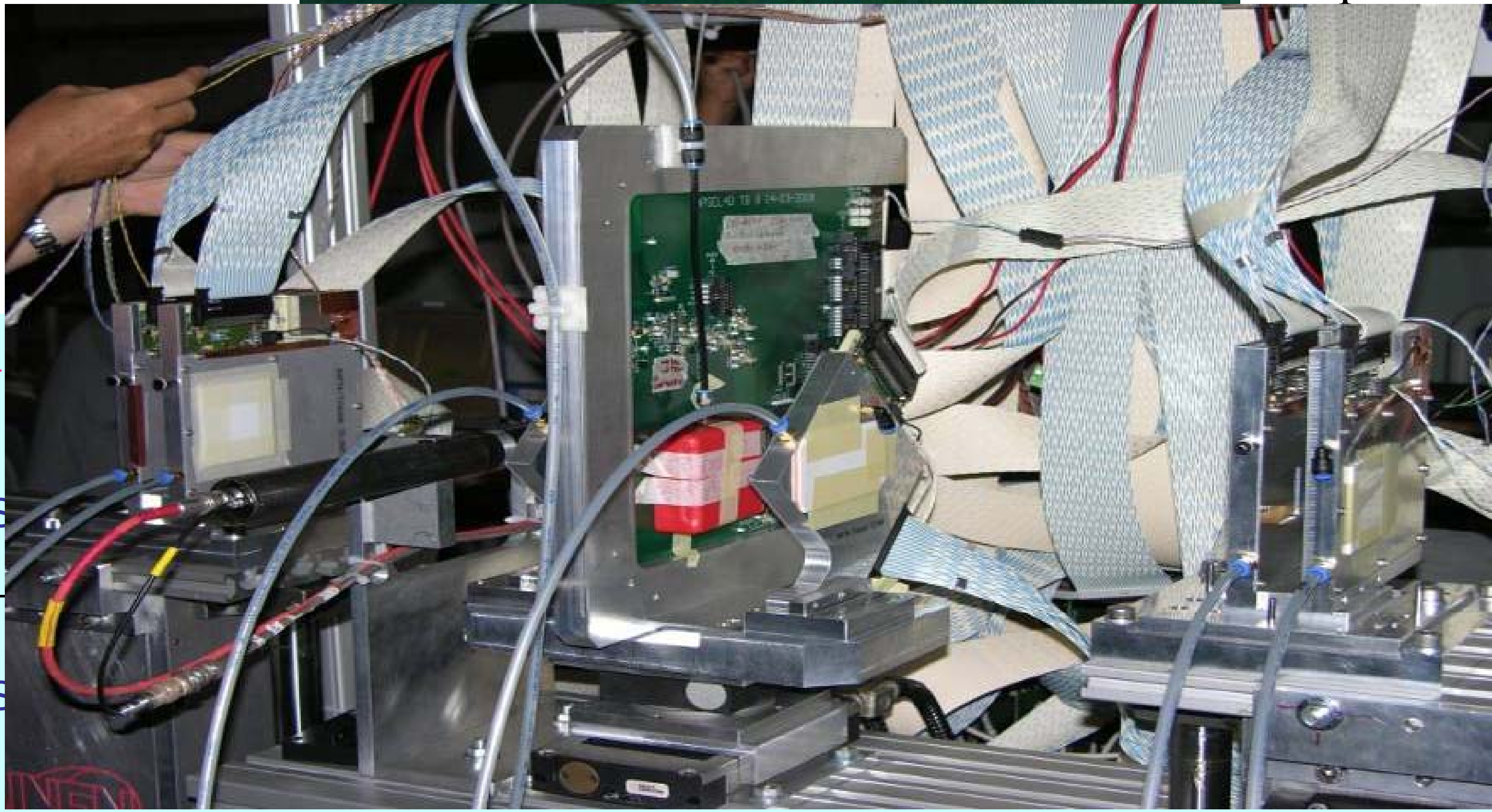
- Babar and Belle designs have proven to be very effective for B-Factory physics
  - Follow the same ideas for SuperB detector
- A SuperB detector is possible with today's technology. Main issues:
  - Machine backgrounds – somewhat larger than in Babar/Belle
  - Beam energy asymmetry – a bit smaller
  - Strong interaction with machine design
- Try to reuse parts of Babar as much as possible
  - Quartz bars of the DIRC
  - Barrel EMC CsI(Tl) crystal and mechanical structure
  - Superconducting coil and flux return yoke.
- Moderate R&D and engineering required
  - Small beam pipe technology
  - Thin silicon pixel detector for first layer
  - Drift chamber CF mechanical structure, gas and cell size
  - Photon detection for DIRC quartz bars
  - Forward PID system (TOF or focusing RICH)
  - Forward calorimeter crystals (LSO)
  - Minos-style scintillator for Instrumented flux return
  - Electronics and trigger
  - Computing – large data amount

Detector Layout – Reuse parts of Babar (or Belle)



..and R&D for new components

- Beam test september '08 @ CERN (T9). Main goals:
  - D
  - T ... ips



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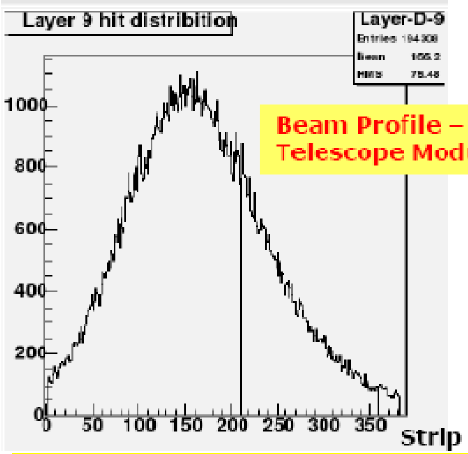
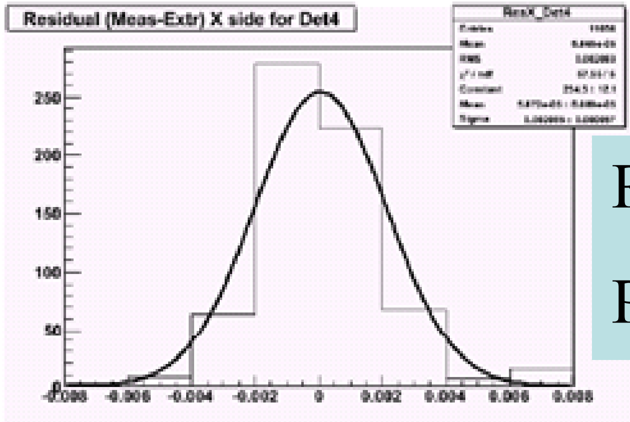
S

beam



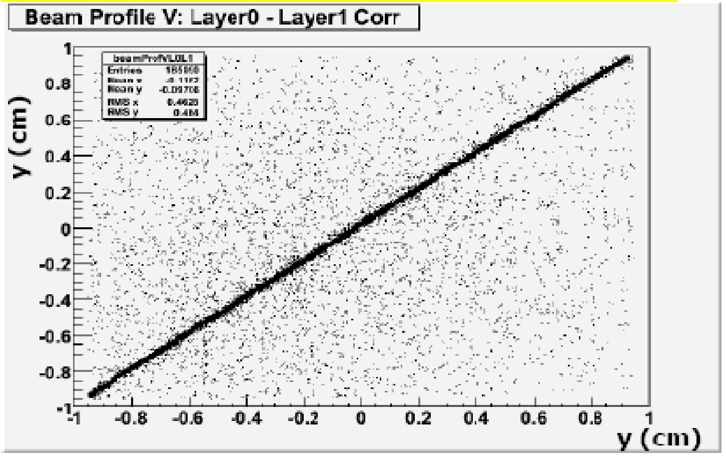
Beam Profile – Telescope Module



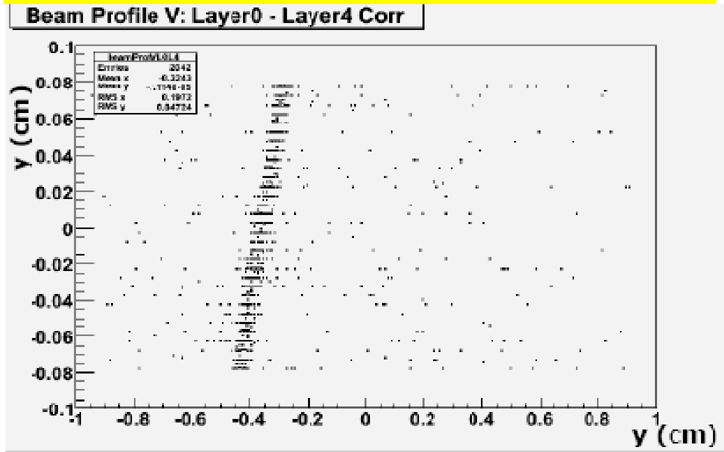
Resolution $\leq$ 18μm

Pixel size 50μm x 50 μm

Y hit correlation Telescope T2 vs T1



Y hit correlation MAPS vs Telescope T1



Efficiency plateau 80÷90%

ACCELERATOR : High Luminosity for physics requirements

- For gaussian bunches:

$$\mathcal{L} = f_{\text{coll}} \times \frac{N_{e^+} N_{e^-}}{4\pi\, \sigma_x\, \sigma_y} \times R_l$$

Geometrical Reduction factor

N_e^+ (N_e^-) is the number of positrons (electrons) in a bunch

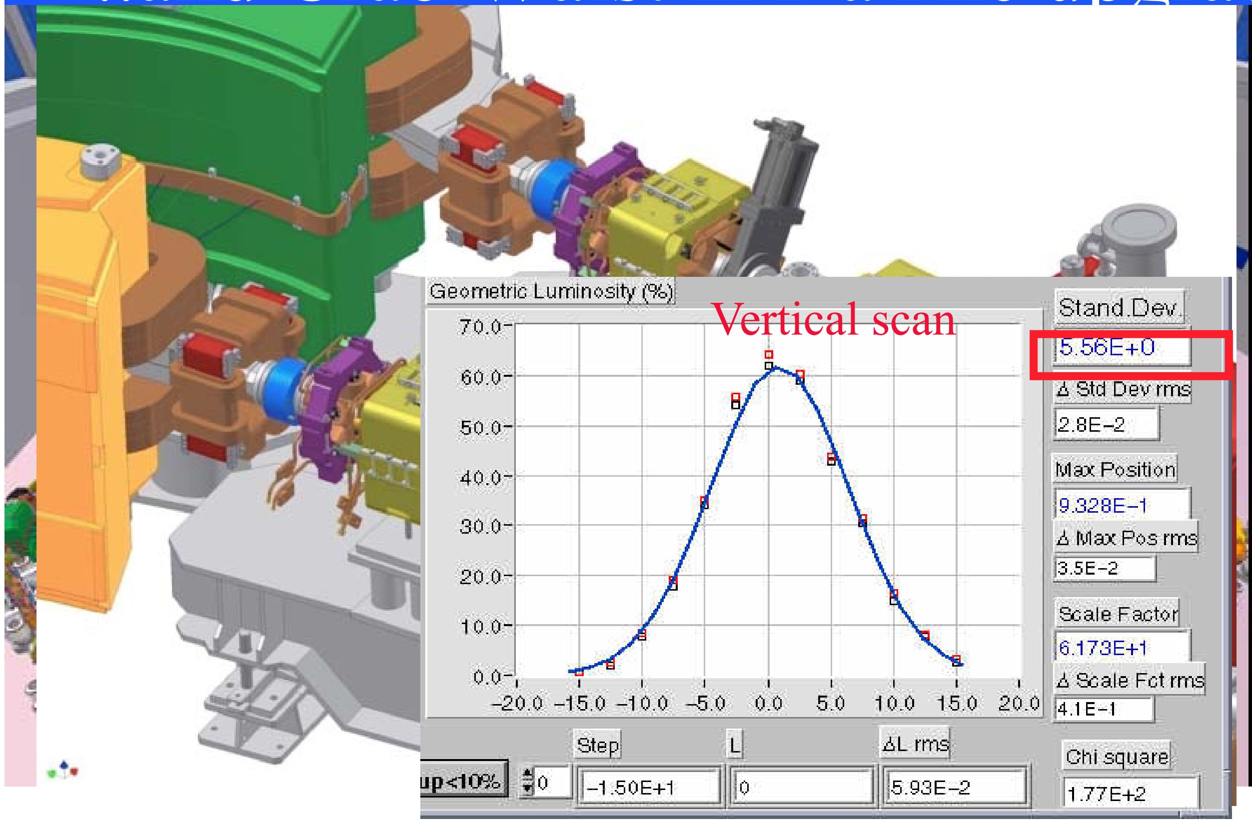
f_{coll} is the collision frequency

σ_x (σ_y) is the horizontal (vertical) r.m.s. size at the I.P.

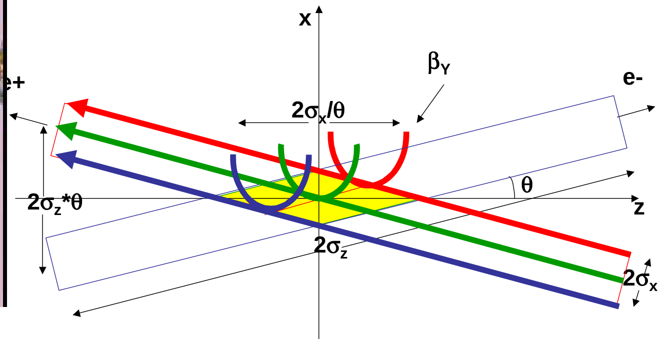
R_l is the Luminosity Reduction factor by incomplete overlap: crossing angle and "hour glass" effect.

- TRADITIONAL (brute force): increase the numerator Currents increase: from 1A on 2 A up to 4.1 A on 9.4 A- **Wall Plug Power**, HOM,CSR: hard to surpass 5 10^{35} cm^2s^{-1} **Crab <u>Crossing</u>** to increase $\mathbf{R_l}$ and to optimize beam dynamic
- Super*B*: decrease the denominator (same currents as PEP-II) Bunch sizes: from $\sigma_y = 3\mu m$ down to $\sigma_y = 40$ nm Luminosity: 10^{36} cm^2s^{-1} (baseline) . **Crab <u>Waist</u>** and large **Piwinsky** angle to optimize beam dynamic

..and Crab Waist in DaΦne upgrade at FRASCATI



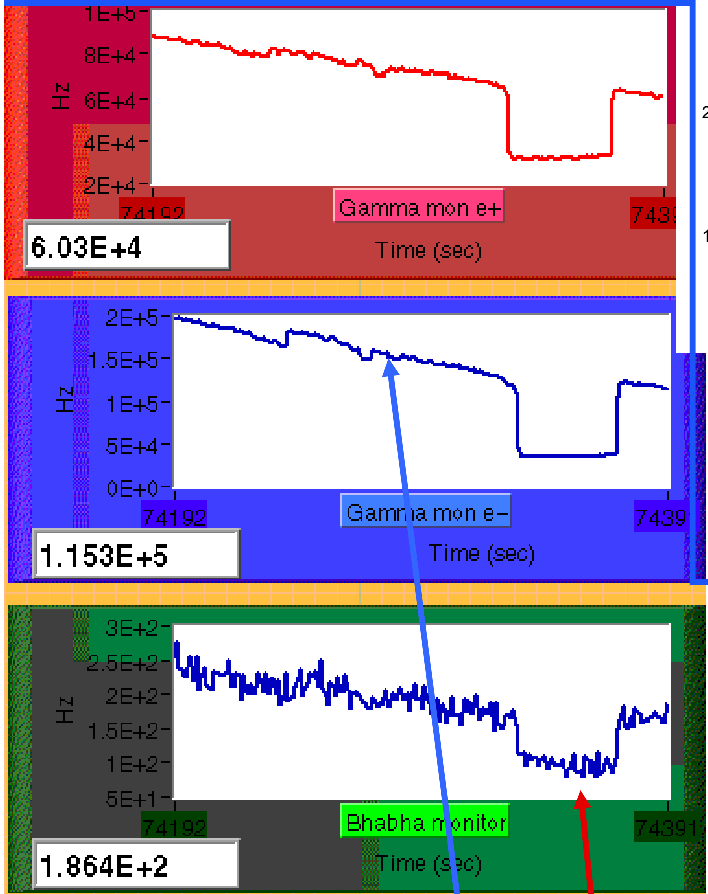
$\sigma_y \approx 3.5\mu m$

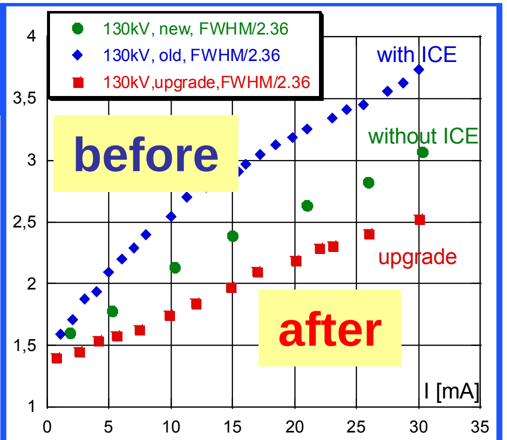


$$\Sigma_y = \sqrt{\sigma_{yp}^2 + \sigma_{ye}^2} \qquad \Sigma_y = \Sigma_y^{meas} * 0.88$$

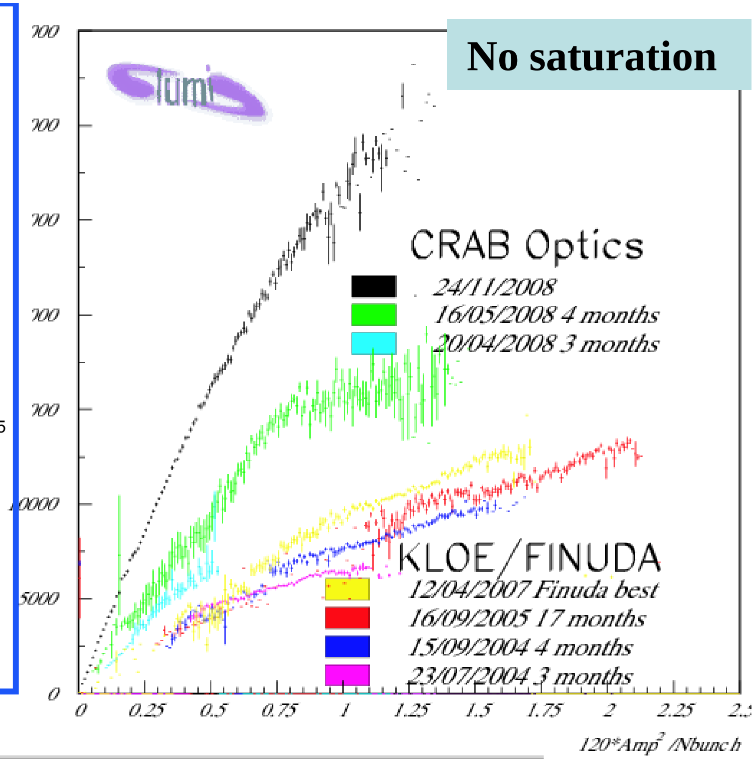
Large Piwinsky angle and "*crab waist*" with a pair of sextupoles/ring ($\Phi = tg(\theta)\sigma_z/\sigma_x$)
Currents comparable to present Factories,lower backgrounds, less HOM and instabilities.

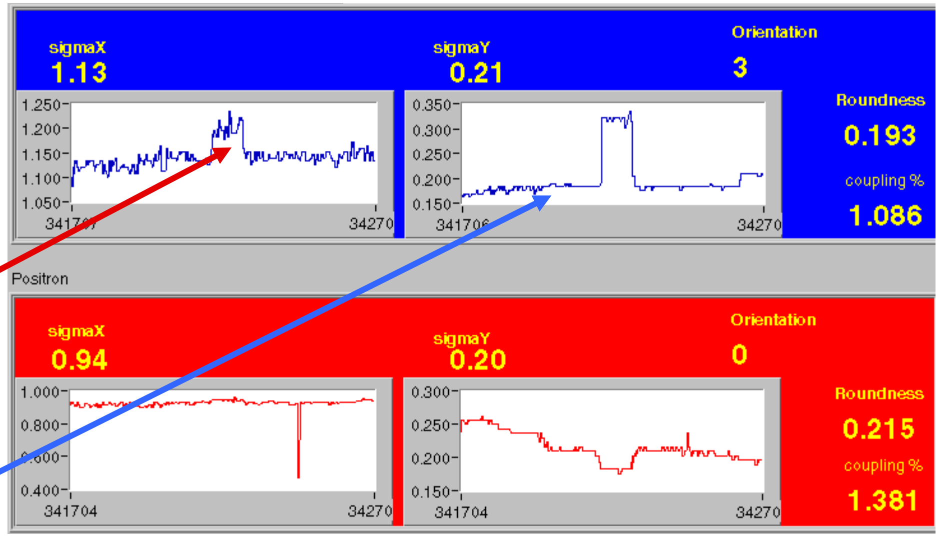
DaΦne test





e⁻ bunch lenght vs bunch current as measured before and after upgrade





Crab OFF

Crab ON

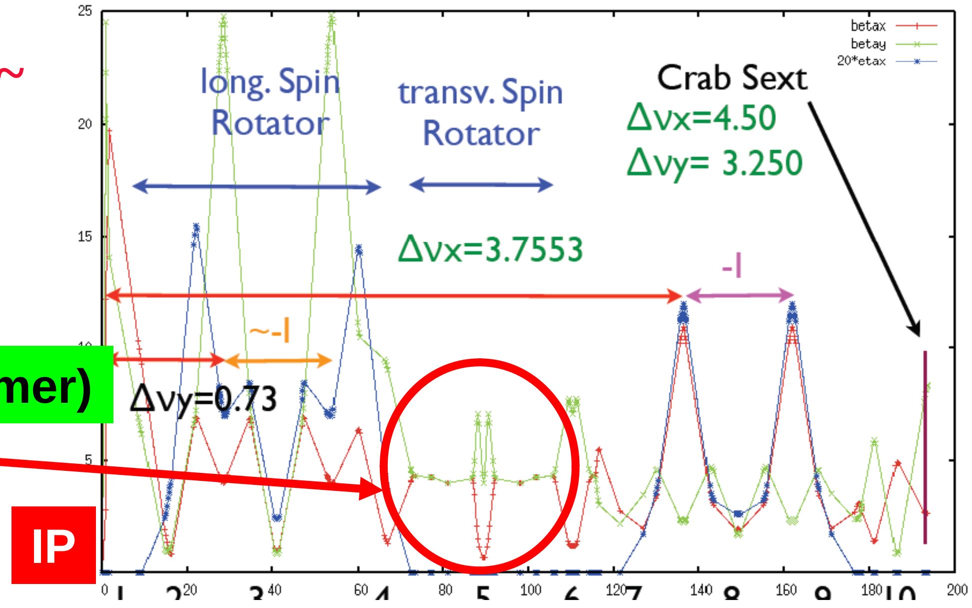
Blow-up in beam sizes and decrease Bhabha rates with crab sexts for one ring OFF (other ring ON)

Polarization

- Polarization of one beam is included in *SuperB*
  - Either energy beam could be the polarized one
  - The LER would be less expensive, the HER easier
  - HER was chosen
- Longitudinal polarization times and short beam lifetimes indicate a need to inject vertically polarized electrons.
  - The plan is to use a polarized e^- source similar to the SLAC SLC source.
- There are several possible IP spin rotators:
  - Solenoids look better at present (vertical bends give unwanted vertical emittance growth)

- Expected longitudinal polarization at IP ~ 87%(inj) x 97%(ring) = 85%(effective)
- Polarization section implementation in lattice is in progress

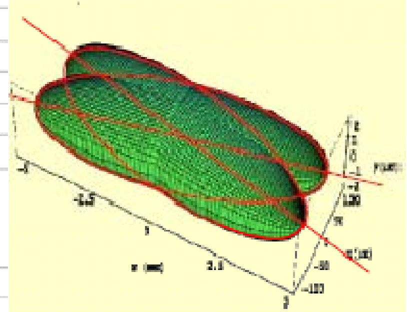
Half IR with spin rotator (Wienands, Wittmer)

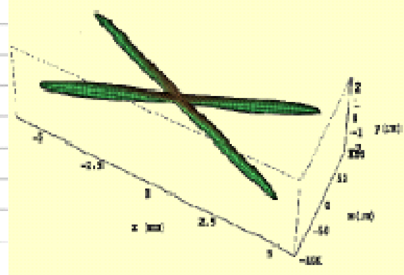


SuperB parameters wrt SuperKEKB

	Nominal		Upgrade		Ultimate		SuperKEKB	
PARAMETER	LER (e+)	HER (e-)	LER (e+)	HER (e-)	LER (e+)	HER (e-)	LER (e+)	HER (e-)
Energy (GeV)	4	7	4	7	4	7	3.5	8
Luminosity x 10^{36}	1.0		2.0		4.0		0.8 (0.4)	
Circumference (m)	1800	1800						
Revolution frequency (MHz)	0.167							
Eff. long. polarization (%) →	0	80						
RF frequency (MHz)	476							
Momentum spread ($\times 10^{-4}$)	7.9	5.6	9.0	8.0				
Momentum compaction ($\times 10^{-4}$)	3.2	3.8	3.2	3.8				
Rf Voltage (MV)	5	8.3	8	11.8	17.5	27		
Energy loss/turn (MeV)	1.16	1.94	1.78	2.81				
Number of bunches	1251				2502		5000	
Particles per bunch ($\times 10^{10}$)	5.52				6.78		12	5
Beam current (A) →	1.85				3.69		9.4	4.1
Beta y* (mm)	0.22	0.39	0.16	0.27			3	
Beta x* (mm)	35	20					200	
Emit y (pm-rad)	7	4	3.5	2			45	
Emit x (nm-rad)	2.8	1.6	1.4	0.8			9 (24)	
Sigma y* (microns)	0.039	0.039	0.0233	0.0233			0.367	
Sigma x* (microns)	9.9	5.66	7	4			42	
Bunch length (mm)	5		4.3				3	
Full Crossing angle (mrad)	48						30	
Wigglers (#) 20 meters each	0	0	2	2				
Damping time (trans/long)(ms)	40/20	40/20	28/14	28/14				
Luminosity lifetime (min)	6.7		3.35					
Touschek lifetime (min)	20	40	38	20				
Effective beam lifetime (min)	5.0	5.7	3.1	2.9				
Injection rate pps ($\times 10^{11}$) (100%)	2.6	2.3	5.1	4.6	10	9.1		
Tune shift y (from formula) →	0.15		0.20				0.405	
Tune shift x (from formula) →	0.0043	0.0025	0.0059	0.0034			0.209	
RF Power (MW)	17		25		58.2		83	

IP beam distributions for KEKB

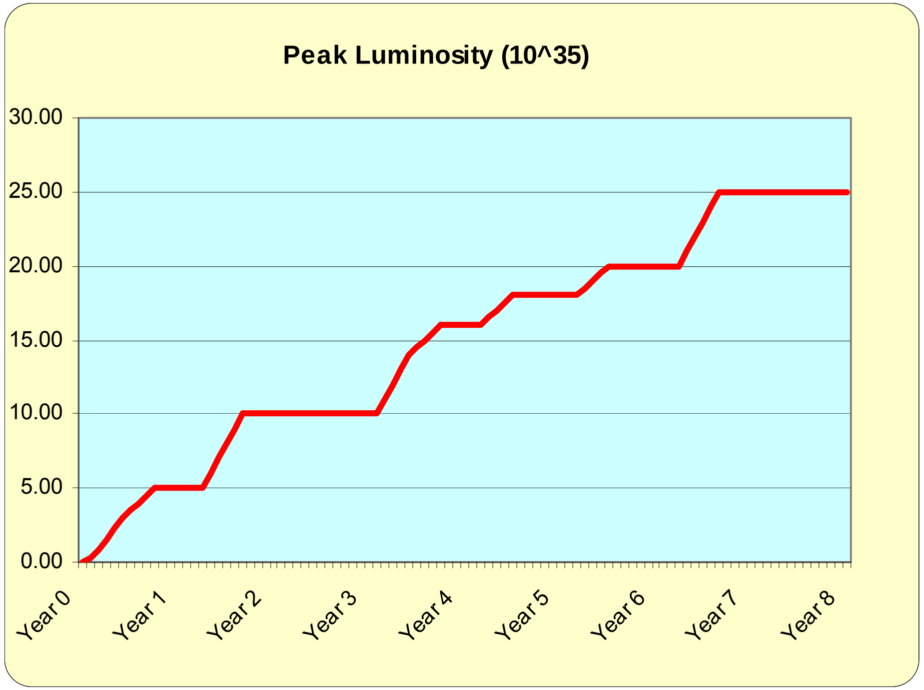


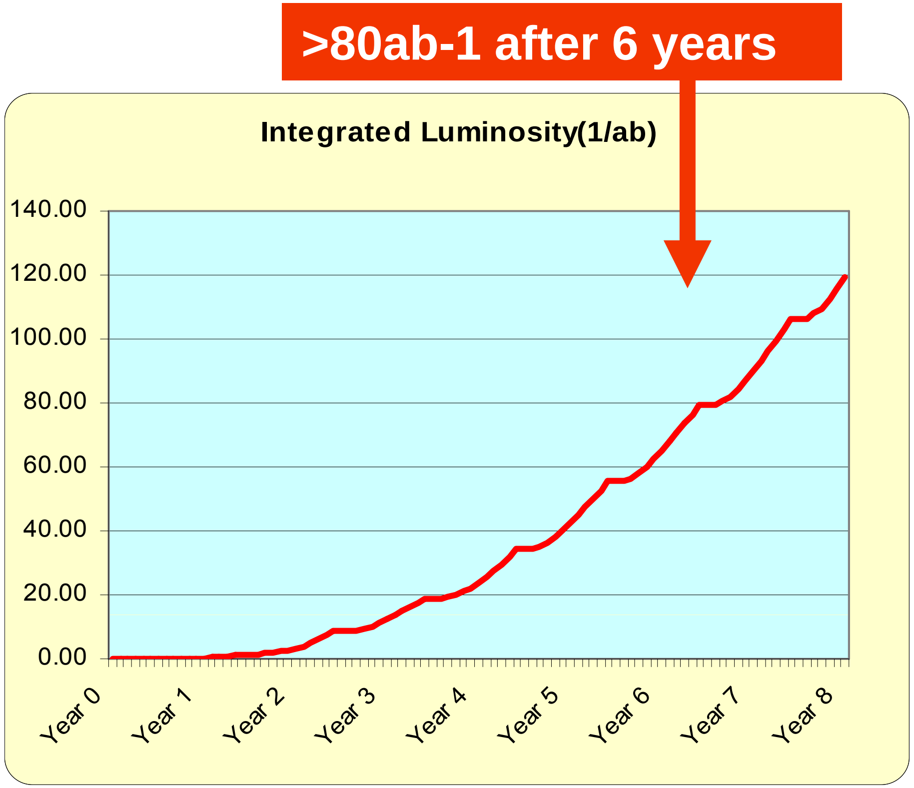


IP beam distributions for SuperB *(without transparency conditions)*

Luminosity doubled by doubling currents and wall power by a factor 2

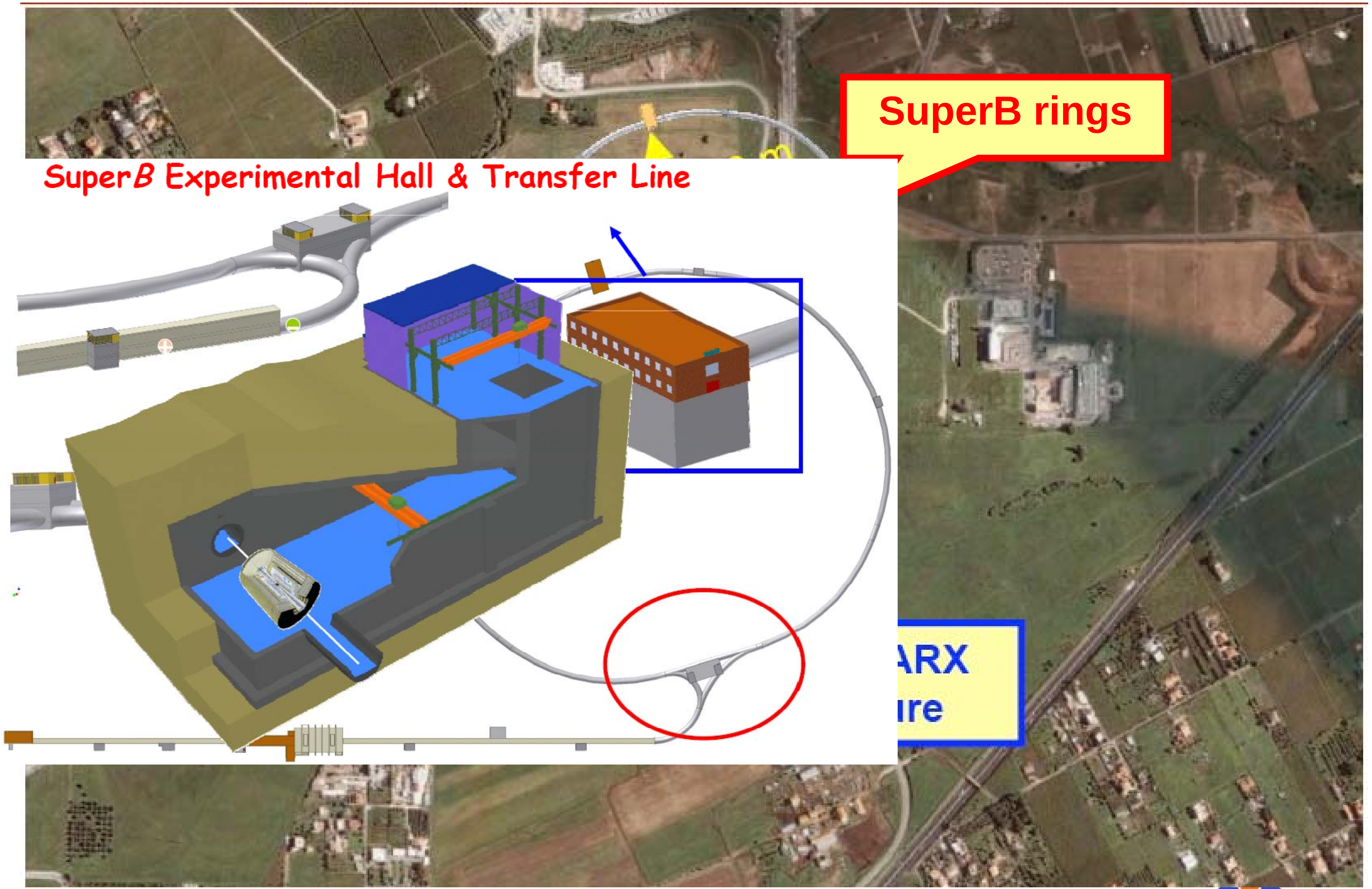
SuperB expected LUMI





With 7th year integrated Luminosity can grow at rate of ~40 ÷ 60 ab^{-1}/year

SuperB on Tor Vergata site



Cost estimate

The total estimated Project costs is ~500 M€.

Expected :

- in kind contribution from SLAC with a large fraction of the PEP-II components.
- From Lazio government for the infrastructure and TDR

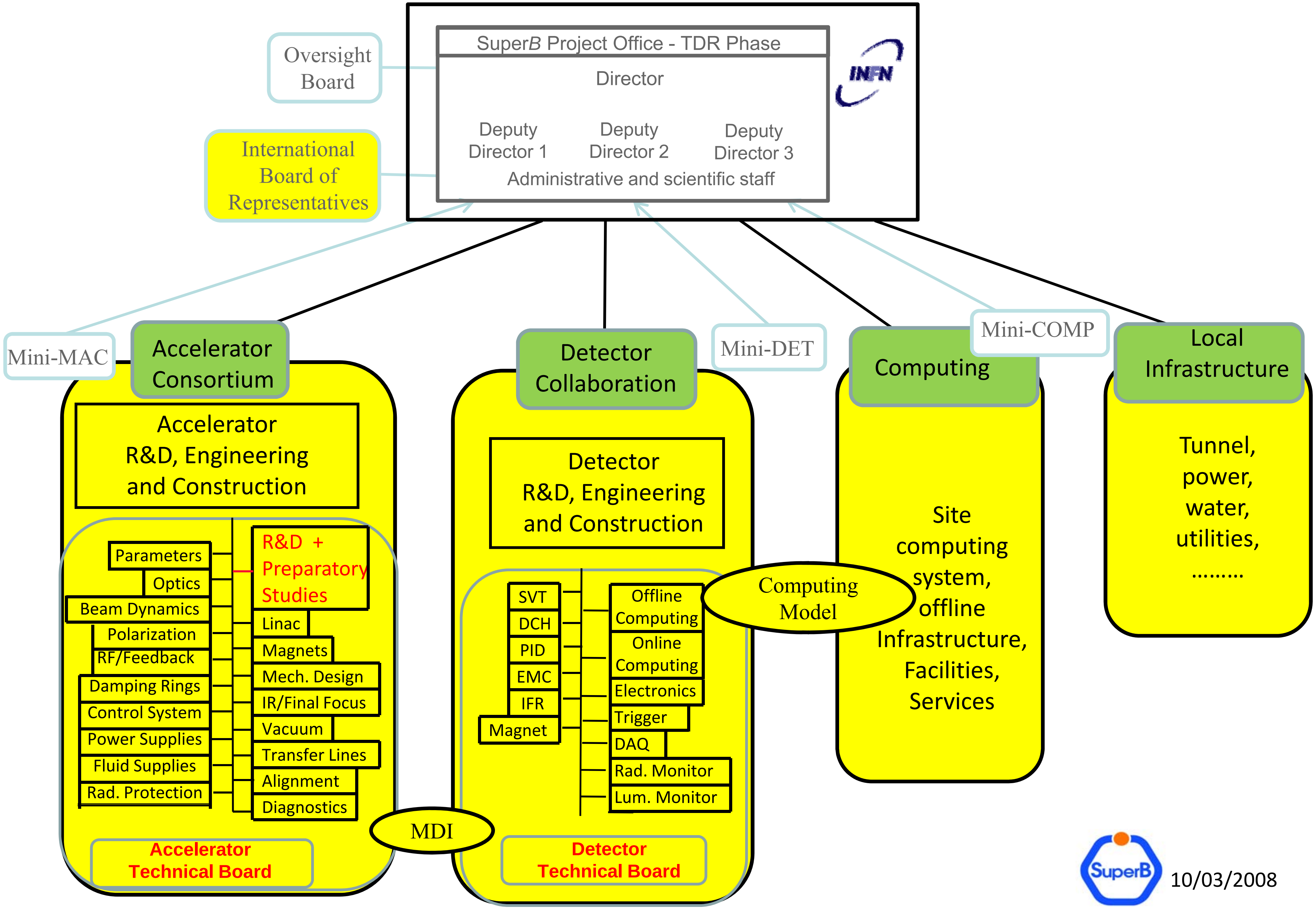
Still the remaining cost is ~200 M€ including detector after reuse of large part of BaBar components

An international consortium is foreseen for the construction phase and for the operation operation

A project office for TDR is being built.

We are in the phase of building a strong team for TDR

SuperB Organization Chart for TDR Phase



Conclusions

The result of crab waist tests has been satisfactory.

SuperB is entering in the TDR phase.

Project Office is being completed and project team is being assembled.

First organization meeting of collaboration to start officially the TDR phase in Paris (LAL) on Feb 15-18 2009.

MiniMAC review soon after (possibly contiguous).

Physics workshop in Warwick on April 16-19,2009.