The SuperB Goals

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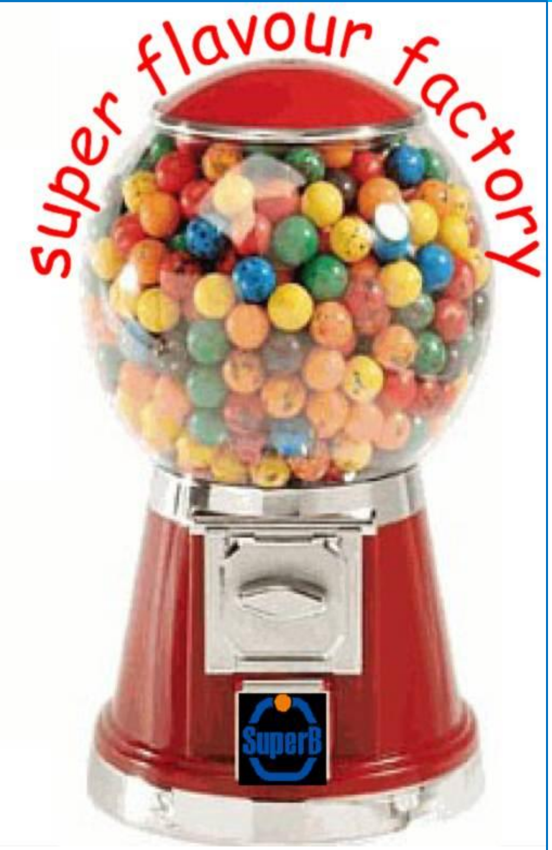
XVII SuperB Workshop and Kick off Meeting

SuperB is a Super Flavor Factory

High statistics production of

$b\bar{b}$, $b\bar{b}$, $\tau^+\tau^-$ pairs.

Follow the high intensity route to New Physics , look at signals through high precision measurements in Flavor/



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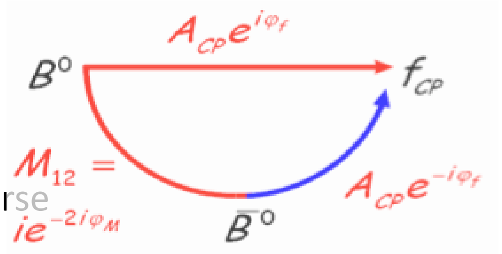
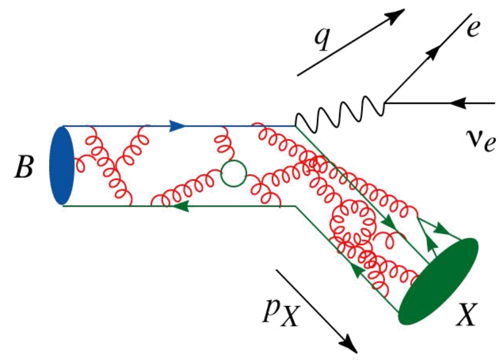
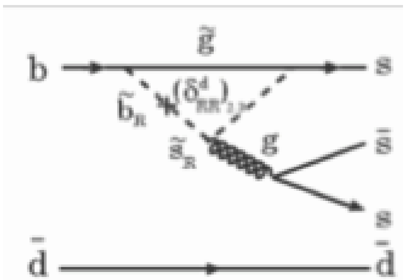
Toward New Physics

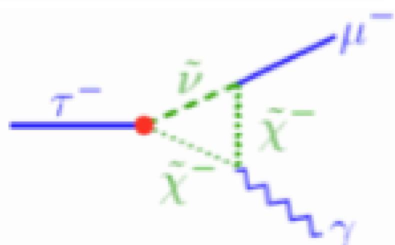
Statistic

1. Explore the origin of CP violation
   - Key element for understanding the matter content of our present universe
   - Established in the B meson in 2001
   - Direct CPV established in B mesons in 2004
2. Precisely measure parameters of the standard model
   - For example the elements of the CKM quark mixing matrix
   - Disentangle the complicated interplay between weak processes and strong interaction effects
3. Search for the effects of physics beyond the standard model in loop diagrams
   - Potentially large effects on rates of rare decays, time dependent asymmetries, lepton flavour violation, …
   - Sensitive even to large New Physics scale, as well as to phases and size of NP coupling constants









Physics programme 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.
    - Polarized 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.

$B_{u,d}$ physics: Rare Processes and Precision Measurements

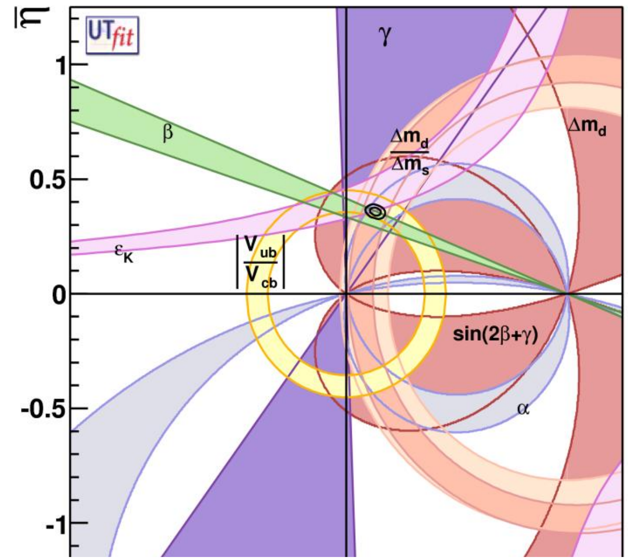
- Goal: Reveal presence of New Physics (NP) using two-pronged attack:
  - Search for **Rare Processes**: NP contributions can be as large as Standard Model ones
    - Large sensitivity to NP
    - Ability to distinguish among NP models
  - Make **Precision Measurements** of many quantities: over constrain the Standard Model predictions
    - NP will often lead to discrepancies in global analyses of measured processes
- SuperB will build on experience of current B-factories.

CKM constraints

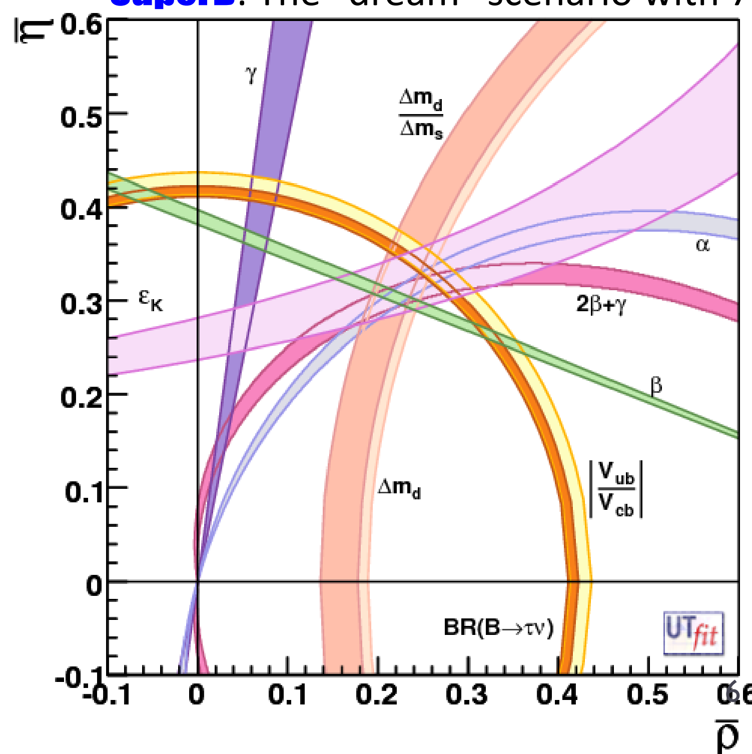
SuperB measures the sides and angles of the Unitarity Triangle (UT)

- Many measurements constrain the sides and angles of the UT: the SM predicts that all measurements "intersect" at apex of the triangle
- When NP is present, the measurements do not yield a unique apex, but you need the high precision of a Super Flavour Factory.

Today:



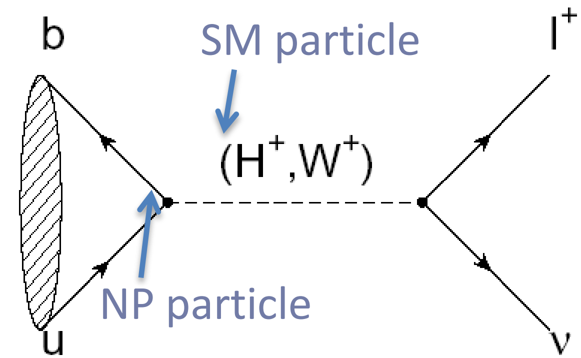
SuperB: The "dream" scenario with $75ab^{-1}$

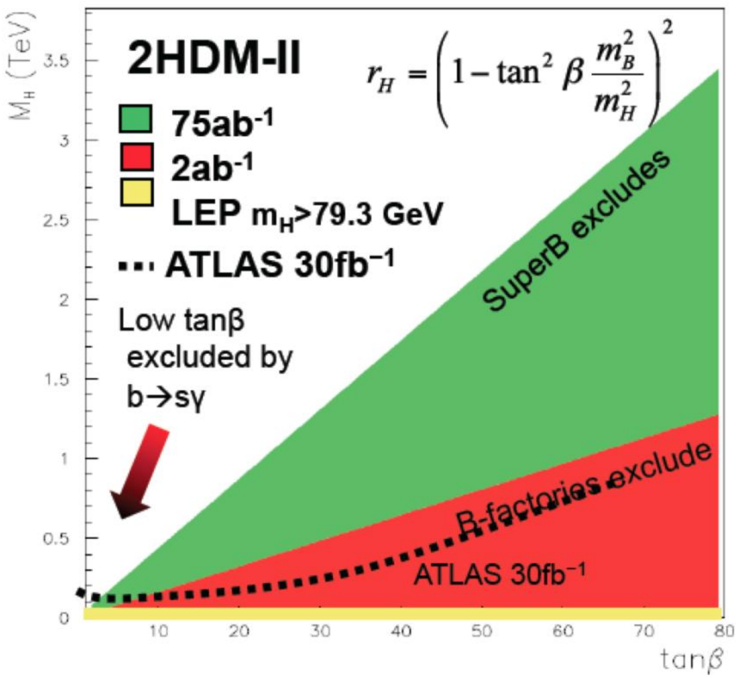


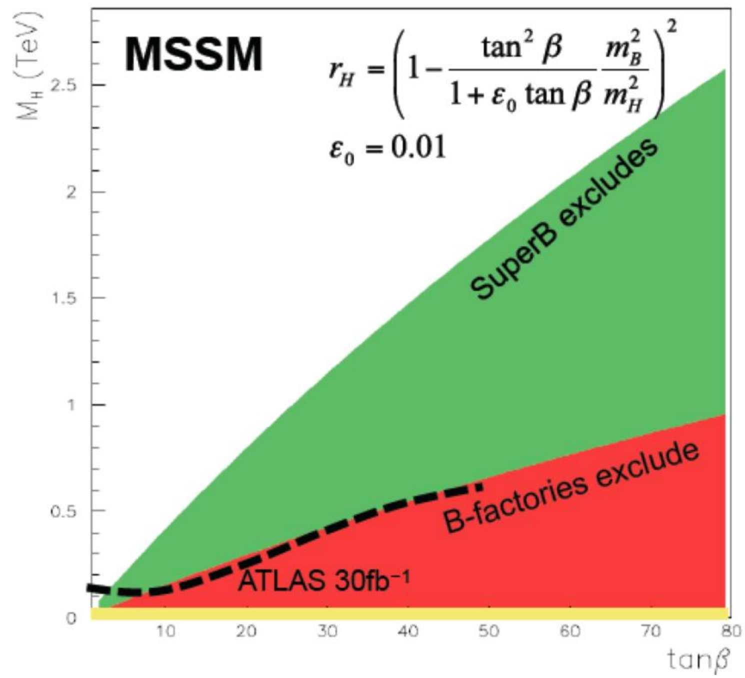
$B_{u,d}$ physics: Rare Decays

- Example: $B^{\pm} \to \tau^{\pm}\nu$
  - Rate modified by presence of H^+

$$r_H = \frac{\mathcal{B}_{SM+NP}}{\mathcal{B}_{SM}}$$







Charm@SuperB: goals

- *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 $c\bar{c}$]

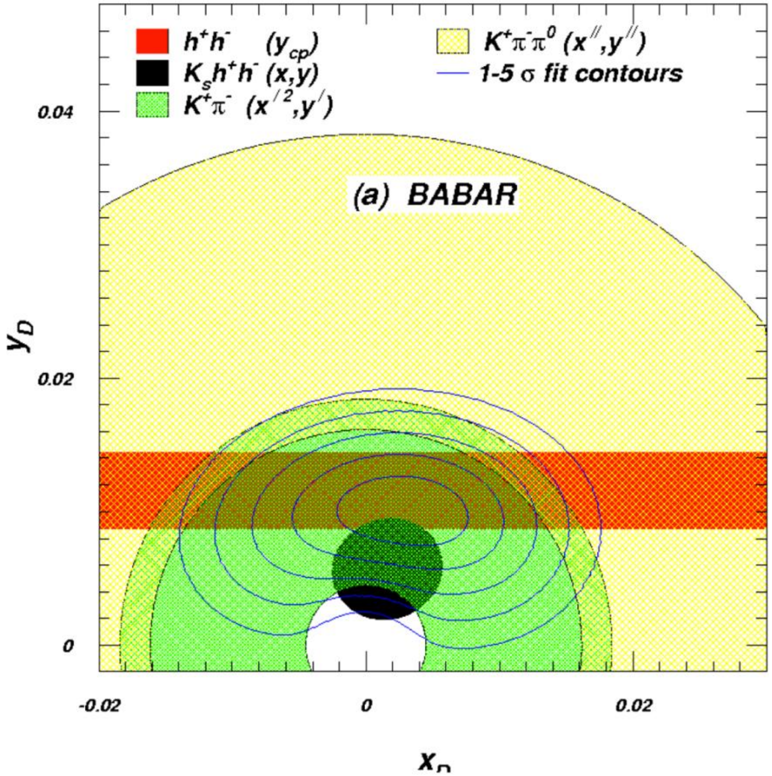
Unique feature of SuperB

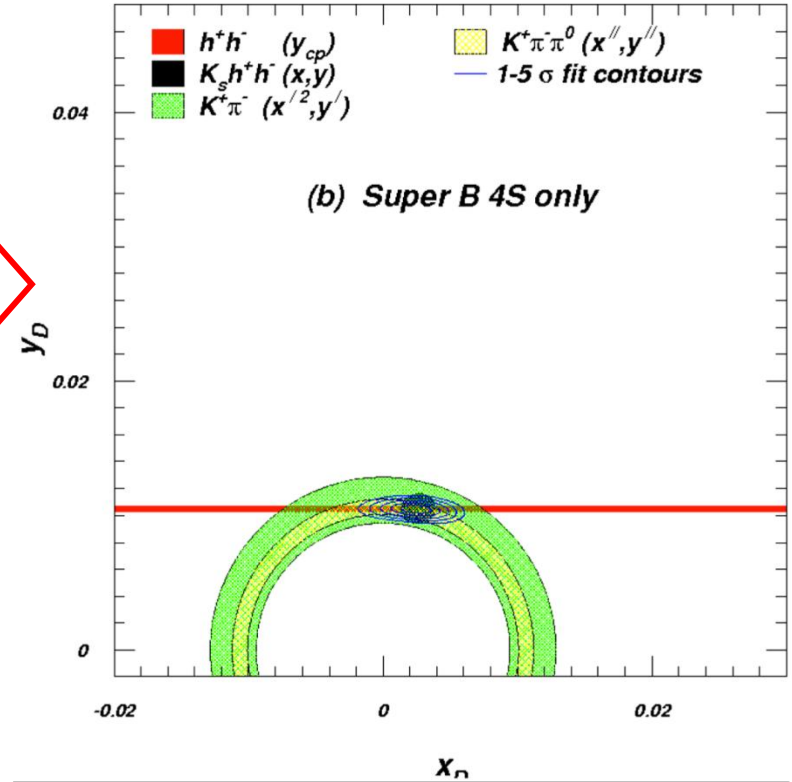
- *Run at ψ(3770):* $\mathcal{L} = 10^{35}\ \mathrm{cm}^{-2}\ \mathrm{sec}^{-1};\ \int \mathcal{L}\, dt = 500\ \mathrm{fb}^{-1}$ at the $\Psi(3770)$

  βγ up to 0.9

✓ $D\bar{D}$ coherent production with 100x BESIII data and CM boost up to βγ=0.9;
✓ almost zero background environment;
✓ possibility of time-dependent measurements exploiting quantum coherence.

Sensitivity projections with 75 ab^{-1} at $\Upsilon(4S)$





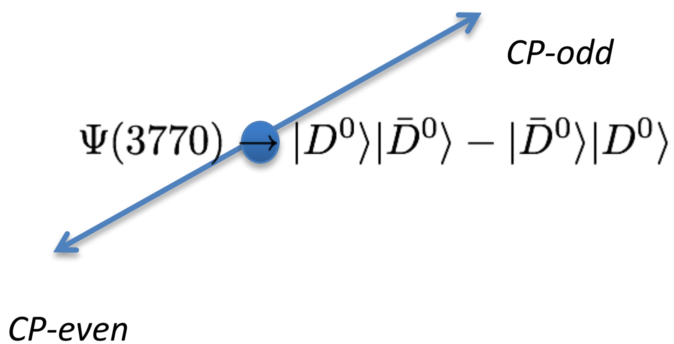
Fit	$x \times 10^3$	$y \times 10^3$	$\delta^\circ_{K^+\pi^-}$	$\delta^\circ_{K^+\pi^-\pi^0}$
(a)	$3.01^{+3.12}_{-3.39}$	$10.10^{+1.69}_{-1.72}$	$41.3^{+22.0}_{-24.0}$	43.8 ± 26.4
Stat.	(2.76)	(1.36)	(18.8)	(22.4)

Fit	$x \times 10^3$	$y \times 10^3$	$\delta^\circ_{K^+\pi^-}$	$\delta^\circ_{K^+\pi^-\pi^0}$
(b)	$xxx^{+0.72}_{-0.75}$	$xxx \pm 0.19$	$xxx^{+3.7}_{-3.4}$	$xxx^{+4.6}_{-4.5}$
Stat.	(0.18)	(0.11)	(1.3)	(2.9)

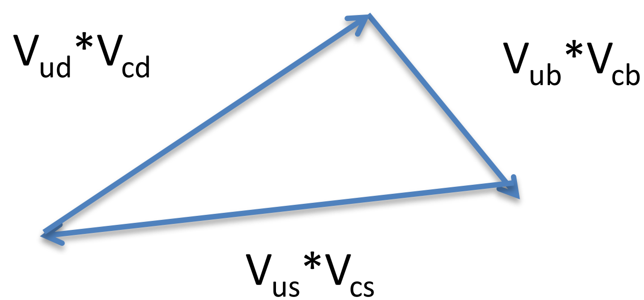
Uncertainties shrink:
$x_D \rightarrow x_D/4$; $y_D \rightarrow y_D/10$
Precision in x_D is limited by Dalitz plot model.

Charm at $D\bar{D}$ threshold

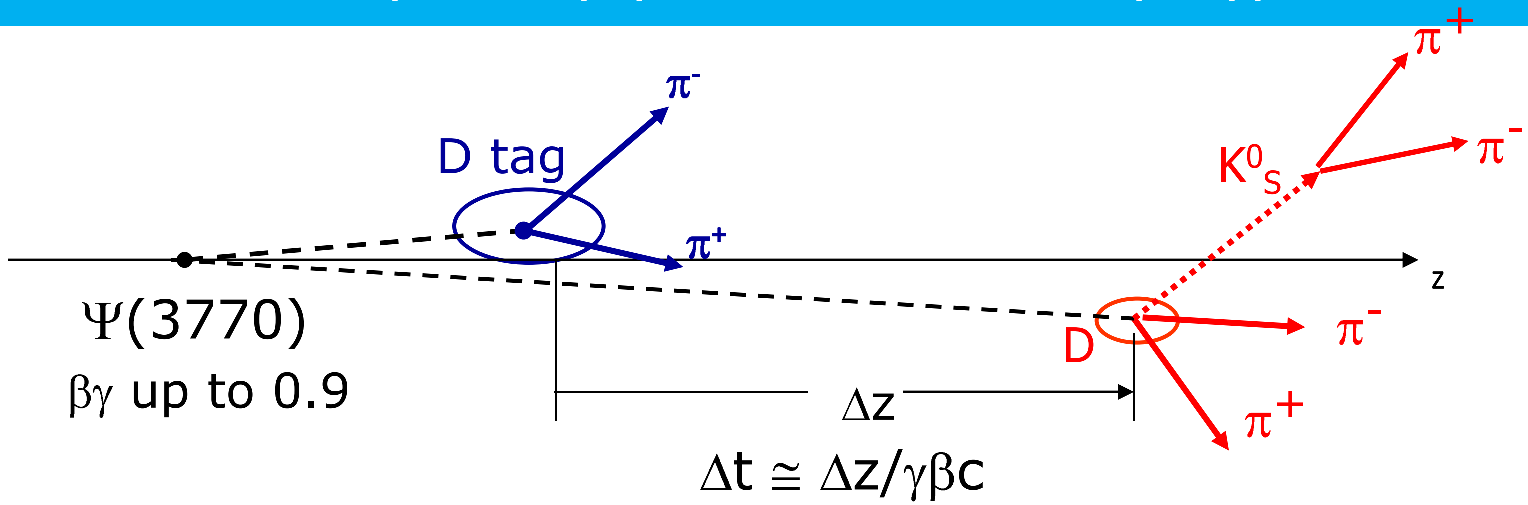
- Almost zero background analyses: search for rare/forbidden decays, precise measurement of relative D^0-$\bar{D}^0$ strong phases, search for CPV in wrong sign (WS) semileptonic (SL) D^0 decay modes.
- Unique possibilities of time-dependent measurements at $D\bar{D}$ threshold currently under study:
  - coherent production allows time-dependent measurements also withCP-tagged events;
  - CP, T, CPT conservation tests similar to those in K^0-$\bar{K}^0$ and B^0-$\bar{B}^0$ systems;
  - measure of the unitarity triangle in the Charm sector.



$$\Psi(3770) \to |D^0\rangle|\bar{D}^0\rangle - |\bar{D}^0\rangle|D^0\rangle$$



Time dependent measurements at the $\Psi(3770)$ (same as for $\Upsilon(4s)$)



1. Reconstruct the decay vertex of the two D mesons

2. Compute the proper time difference Δt

$$\sigma(\Delta t) \propto \frac{\sigma(\Delta z)}{\beta\gamma c}$$

minimum boost needed to achieve the required Δt resolution

Experimental considerations of running at $D\bar{D}$ threshold with boost

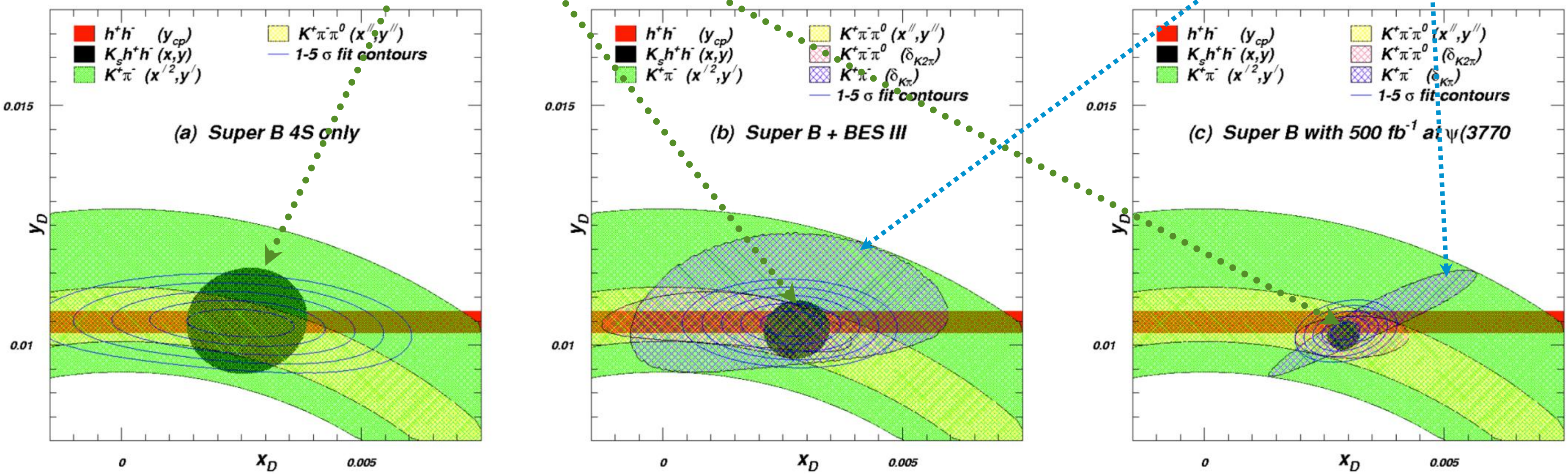
- Pro:
  - Very clean environment, backgroud extremely low;
  - Quantum coherence: mixing and CP, T, CPT analyses;
  - Access to D^0-$\bar{D}^0$ relative phases and possibilities of time-dependent Dalitz plot analyses with a model independent approach;
  - Systematic errors reduction due to background and Dalitz model uncertainties;

- Cons:
  - Time-dependent measurement require larger CM boost compared to the B^0-$\bar{B}^0$ case to achieve adequate time resolution;
  - reconstruction efficiency decreases with large CM boost. Need to optimize the boost value.

- Two improvements in mixing precision come from threshold data:

CAVEAT: NO TIME-DEPENDENT STUDIES INCLUDED YET

- Dalitz plot model uncertainty shrinks
- Information on overall strong phase is added



Fit	$x \times 10^3$	$y \times 10^3$	$\delta^\circ_{K^+\pi^-}$	$\delta^\circ_{K^+\pi^-\pi^0}$
(b)	$xxx^{+0.72}_{-0.75}$	$xxx \pm 0.19$	$xxx^{+3.7}_{-3.4}$	$xxx^{+4.6}_{-4.5}$
Stat.	(0.18)	(0.11)	(1.3)	(2.9)

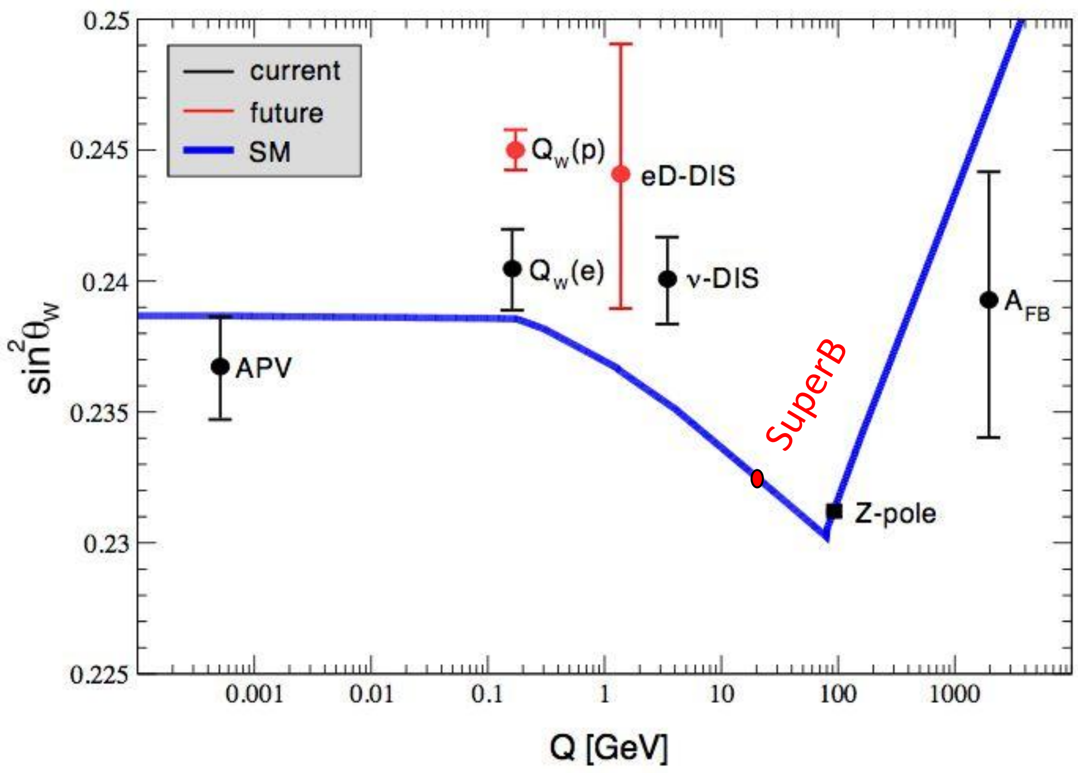
Fit	$x \times 10^3$	$y \times 10^3$	$\delta^\circ_{K^+\pi^-}$	$\delta^\circ_{K^+\pi^-\pi^0}$
(c)	$xxx \pm 0.42$	$xxx \pm 0.17$	$xxx \pm 2.2$	$xxx^{+3.3}_{-3.4}$
Stat.	(0.18)	(0.11)	(1.3)	(2.7)

Fit	$x \times 10^3$	$y \times 10^3$	$\delta^\circ_{K^+\pi^-}$	$\delta^\circ_{K^+\pi^-\pi^0}$
(d)	$xxx \pm 0.20$	$xxx \pm 0.12$	$xxx \pm 1.0$	$xxx \pm 1.1$
Stat.	(0.17)	(0.10)	(0.9)	(1.1)

Measurements with Polarization

Precision Electroweak

- $\sin^2\theta_W$ can be measured with polarised e^-



Measure LR asymmetry in

$$
\begin{aligned}
e^+e^- &\rightarrow c\bar{c} \\
e^+e^- &\rightarrow \mu^+\mu^- \\
e^+e^- &\rightarrow \tau^+\tau^-
\end{aligned}
$$

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

Can also perform crosscheck at ψ(3770).

Is this measurement also possible with Charm?

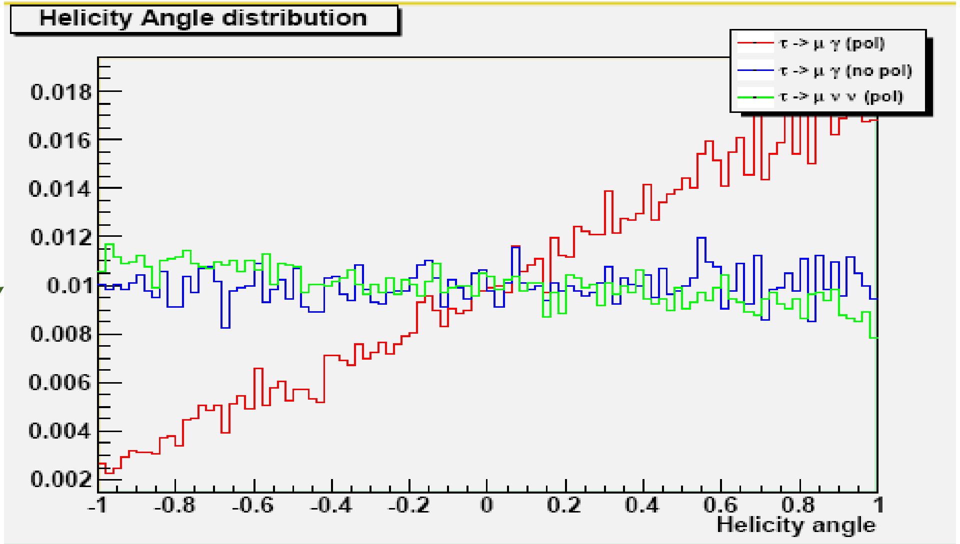
1. @ Υ(4S) . But hadronization correction.
2. Operate at a ccbar vector resonance above open charm threshold Ψ(3770), use the same analysis method as for b.

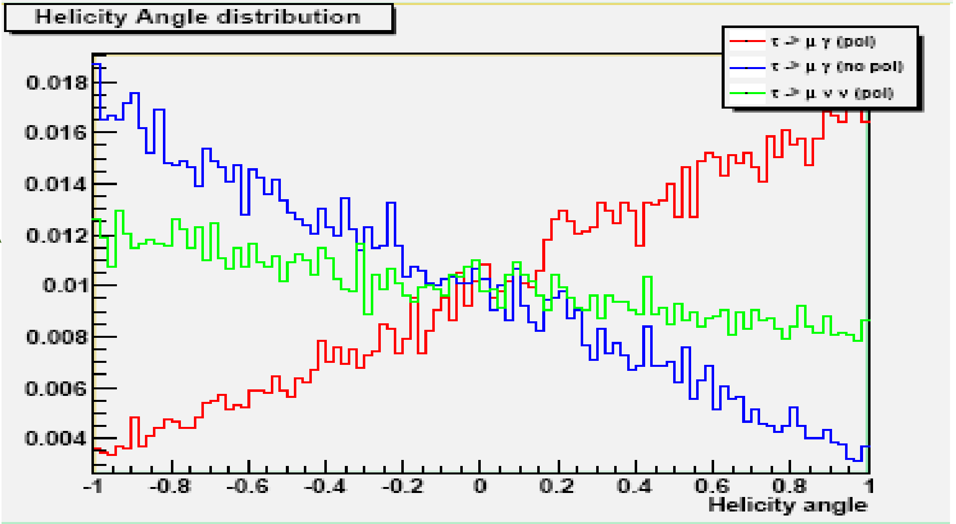
Polarization at low energies with high luminosity is needed

That is included in the SuperB design

Polarization: a tool to handle and reduce Background

$$\theta_h = \tau^{\text{tag}}_{\text{charge}} \cdot \theta_{h-tag}$$





$\tau \rightarrow \mu\gamma$:Bkg extrapolation (using BaBar analysis)

BaBar expects 5.1 events in the 2σ signal region

1.7 from lepton tags
1.4 from 3 hadron tags
2.0 from $\pi+\rho$ tags

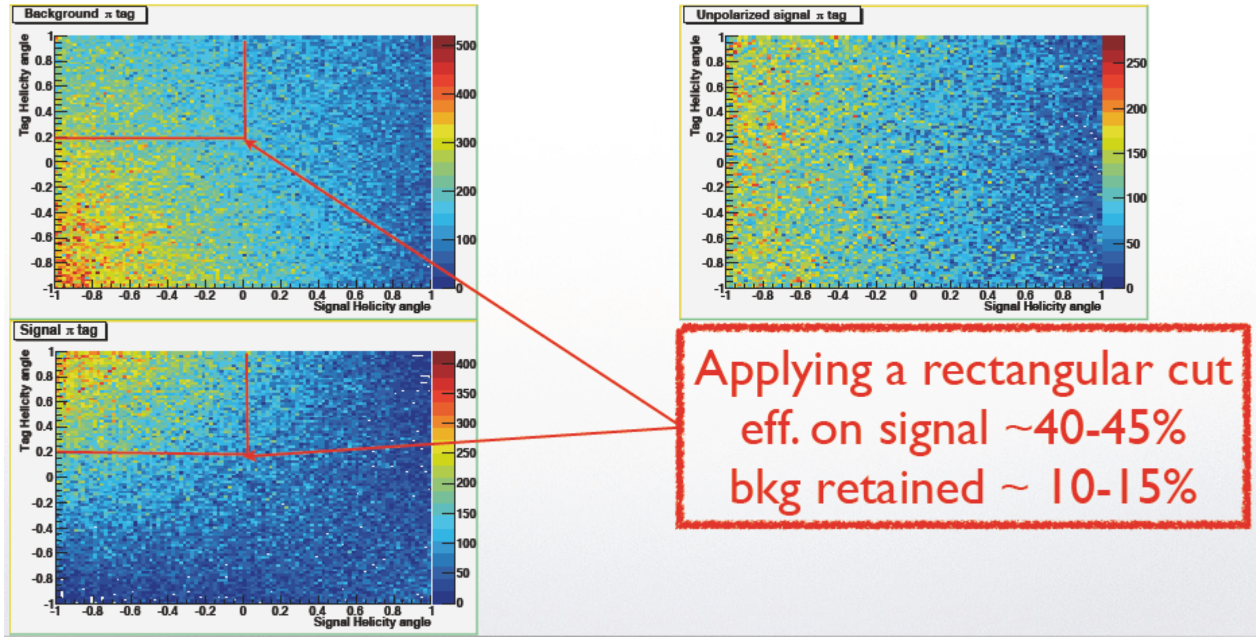
96% comes from real τ decays (86% from $\mu\nu\nu\gamma$)

Background from taus is considered irreducible

Bkg extrapolated to SuperB gives
300 events in the signal box.
It can be reduced thanks to:
Improved resolutions
Improved EMC coverage
~250 events expected

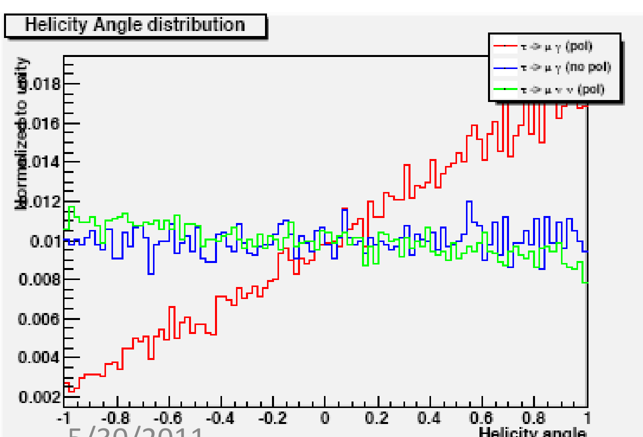
Need to reduce backgrounds to an acceptable level to scale better than $\sqrt{L}$

Polarized beam and tag on leptons and on hadrons (t→ p n /t→ r n) reduces irreducible background!



75 ab^{-1}

Sensitivity improves at least by a factor 2. Equivalent to a factor 4 increase in luminosity.



$B(\tau \rightarrow \mu\gamma)\ 2\times\ 10-9$

$B(\tau \rightarrow e\,\gamma)\ 2\times\ 10-9$

$B(\tau \rightarrow \mu\gamma)\ 1\times\ 10-9$

$B(\tau \rightarrow e\,\gamma)\ 1\times\ 10-9$

Polarisation is
- -an important issue for LFV
- -opens the possibility of measuring (g-2)
- -opens measurement of EW parameters

B physics @Y (4S)

Variety of measurements for any observable

Observable	B Factories (2 ab^{-1})	Super$B$ (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
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° (∗)
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°
$2\beta + \gamma$ $(D^{(*)\pm}\pi^\mp$, $D^\pm K^0_S\pi^\mp)$	20°	5°
$S(\phi K^0)$	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 (∗)
$\lvert V_{cb}\rvert$ (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% (∗)

Observable	B Factories (2 ab^{-1})	Super$B$ (75 ab
$\mathcal{B}(B \to \tau\nu)$	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

Possible also at LHCb

Similar precision at LHCb

Example of «SuperB specifics»

inclusive in addition to exclusive analyses

channels with π^0, γ's, ν, many Ks…

physics (polarized beams)

Process	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}
$\mathcal{B}(\tau \to \ell K_S^0)$	2×10^{-10}

Charm at Υ(4S) and threshold

Mode	Observable	B Factories ($2\ \mathrm{ab}^{-1}$)	Super$B$ ($75\ \mathrm{ab}^{-1}$)
$D^0 \to K^+K^-$	y_{CP}	2–3×10^{-3}	5×10^{-4}
$D^0 \to K^+\pi^-$	y'_D	2–3×10^{-3}	7×10^{-4}
	x'^2_D	1–2×10^{-4}	3×10^{-5}
$D^0 \to K_S^0\pi^+\pi^-$	y_D	2–3×10^{-3}	5×10^{-4}
	x_D	2–3×10^{-3}	5×10^{-4}
Average	y_D	1–2×10^{-3}	3×10^{-4}
	x_D	2–3×10^{-3}	5×10^{-4}
$D^0 \to K^+\pi^-$	x'^2		3×10^{-5}
	y'		7×10^{-4}
$D^0 \to K^+K^-$	y_{CP}	*To be evaluated at LHCb*	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°

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}
$D^0 \to K_S^0e^+e^-$, $D^0 \to K_S^0\mu^+\mu^-$	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}
$D^0 \to K_S^0e^\pm\mu^\mp$	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}

B_s at Υ(5S)

Observable	Error with $1\ \mathrm{ab}^{-1}$	Error with $30\ \mathrm{ab}^{-1}$
$\Delta\Gamma$	$0.16\ \mathrm{ps}^{-1}$	$0.03\ \mathrm{ps}^{-1}$
Γ	$0.07\ \mathrm{ps}^{-1}$	$0.01\ \mathrm{ps}^{-1}$
β_s from angular analysis	20°	8°
A^s_{SL}	0.006	0.004
A_{CH}	0.004	0.004
$\mathcal{B}(B_s \to \mu^+\mu^-)$	-	$< 8 \times 10^{-9}$
$\lvert V_{td}/V_{ts} \rvert$	0.08	0.017
$\mathcal{B}(B_s \to \gamma\gamma)$	38%	7%
β_s from $J/\psi\phi$	16°	6°
β_s from $B_s \to K^0\bar{K}^0$	24°	11°

Bs : Definitively better at LHCb

Many unique quality measurements

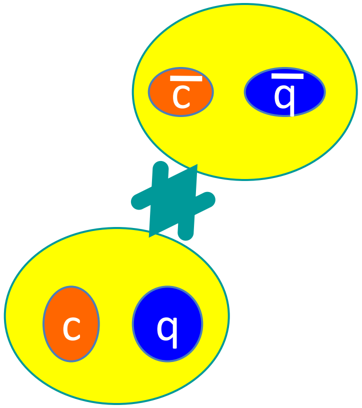
Experiment: No Result | Moderate Precision | Precise | Very Precise

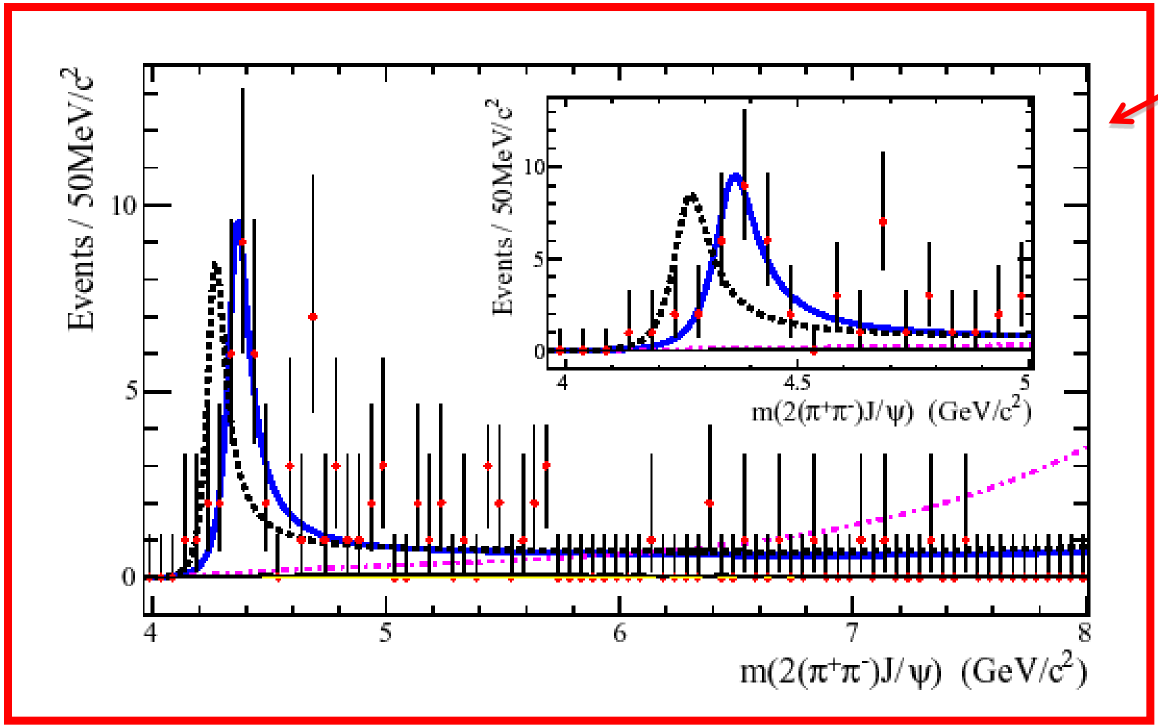
Theory: Moderately clean | Clean Need lattice | Clean

Observable/mode	Current (now)	LHCb (2017)	SuperB (2021)	LHCb upgrade ')	theory	
τ Decays						
$\tau \to \mu\gamma$	yellow	yellow	green	yellow	green	Benefit from polarised e⁻ beam
$\tau \to e\gamma$	yellow	yellow	green	yellow	green	
$B_{u,d}$ Decays						
$B \to \tau\nu, \mu\nu$	yellow	red	blue	red	blue	very precise with improved detector
$B \to K^{(*)+}\nu\overline{\nu}$	red	red	green	red	green	Statistically limited: Ang. analysis with >75ab^{-1}
S in $B \to K^0_S\pi^0\gamma$	yellow	red	green	red	yellow	Right handed currents
S in other penguin modes	yellow	yellow	green	blue	yellow	SuperB measures many more modes
$A_{CP}(B \to X_s\gamma)$	blue	yellow	green	yellow	green	systematic error is main challenge
$BR(B \to X_s\gamma)$	blue	yellow	green	yellow	yellow	control systematic error with data
$BR(B \to X_s\ell\ell)$	yellow	red	green	red	green	
$BR(B \to K^{(*)}\ell\ell)$	yellow	blue	green	green	yellow	SuperB measures e mode well, LHCb does μ
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	Clean NP search
Precision EW						
$\sin^2\theta_W$ at $\Upsilon(4S)$	red	red	green	red	green	Theoretically clean
$\sin^2\theta_W$ at Z-pole	red	blue	red	green	yellow	b fragmentation limits interpretation

Exotic hadronic spectroscopy

Hints of a new type of particles with more than 3 quarks

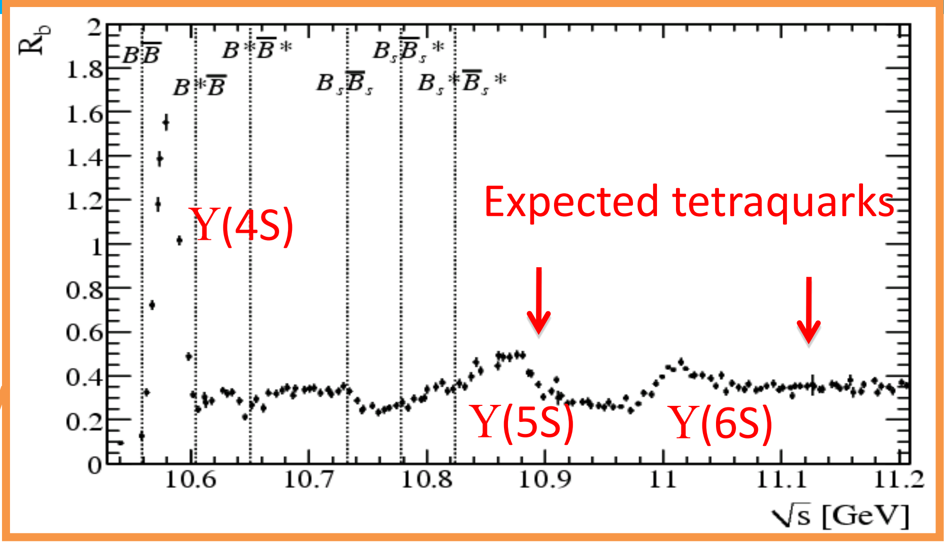


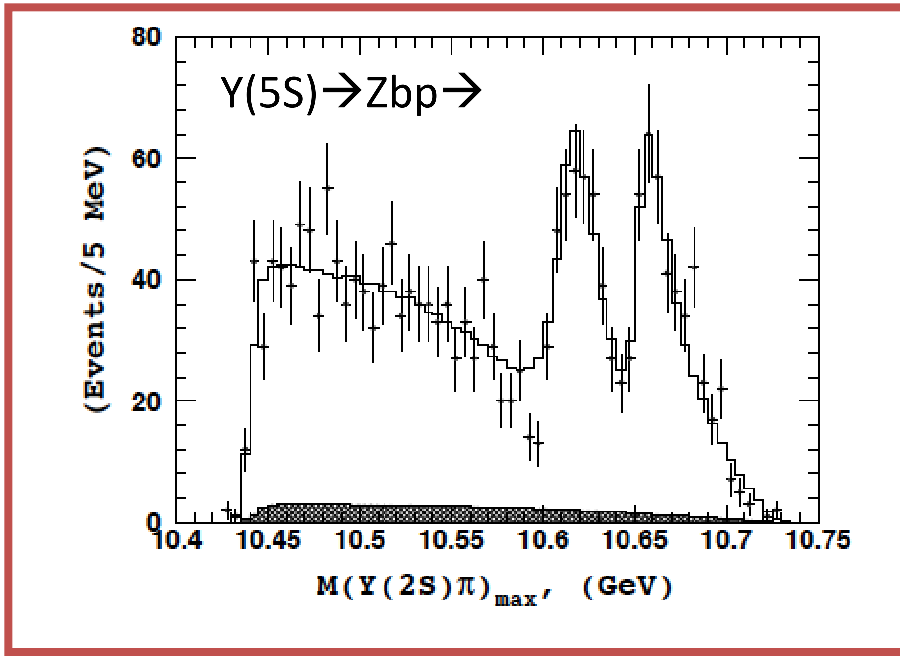


B-Factories produced a lot of results but …

Exotic hadrons @ SuperB

- **Much larger statistics** @Y(4S) needed
- High luminosity energy scan needed:
  - produce resonances directly (E~4-4.5 GeV)
  - Exploit recent evidence of exotic states produced at Y(5S)





and Panda :Hadron Spectroscopy e^+e^- vs $\bar{p}p$

e^+e^- collisions

direct formation
two-photon production
initial state radiation (ISR)
B meson decay

+ low hadronic background
+ high discovery potential
- direct formation limited to vector states
- limited mass and width resolution for non vector states

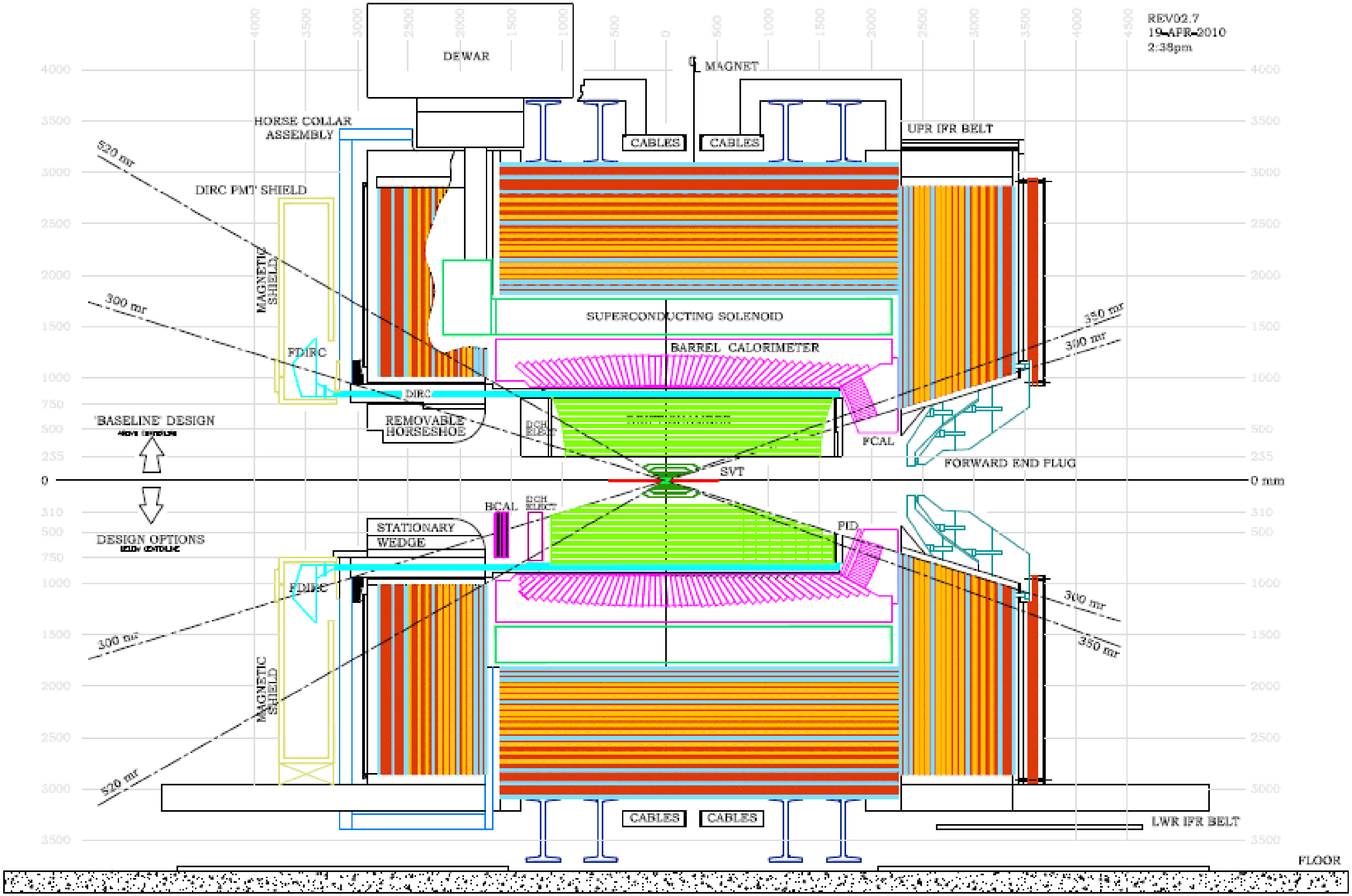
$\bar{p}p$ annihiliation

- high hadronic background
+ high discovery potential
+ direct formation for all (non-exotic) states
+ excellent mass and width resolution for all states

REQUIREMENTS FROM PHYSICS

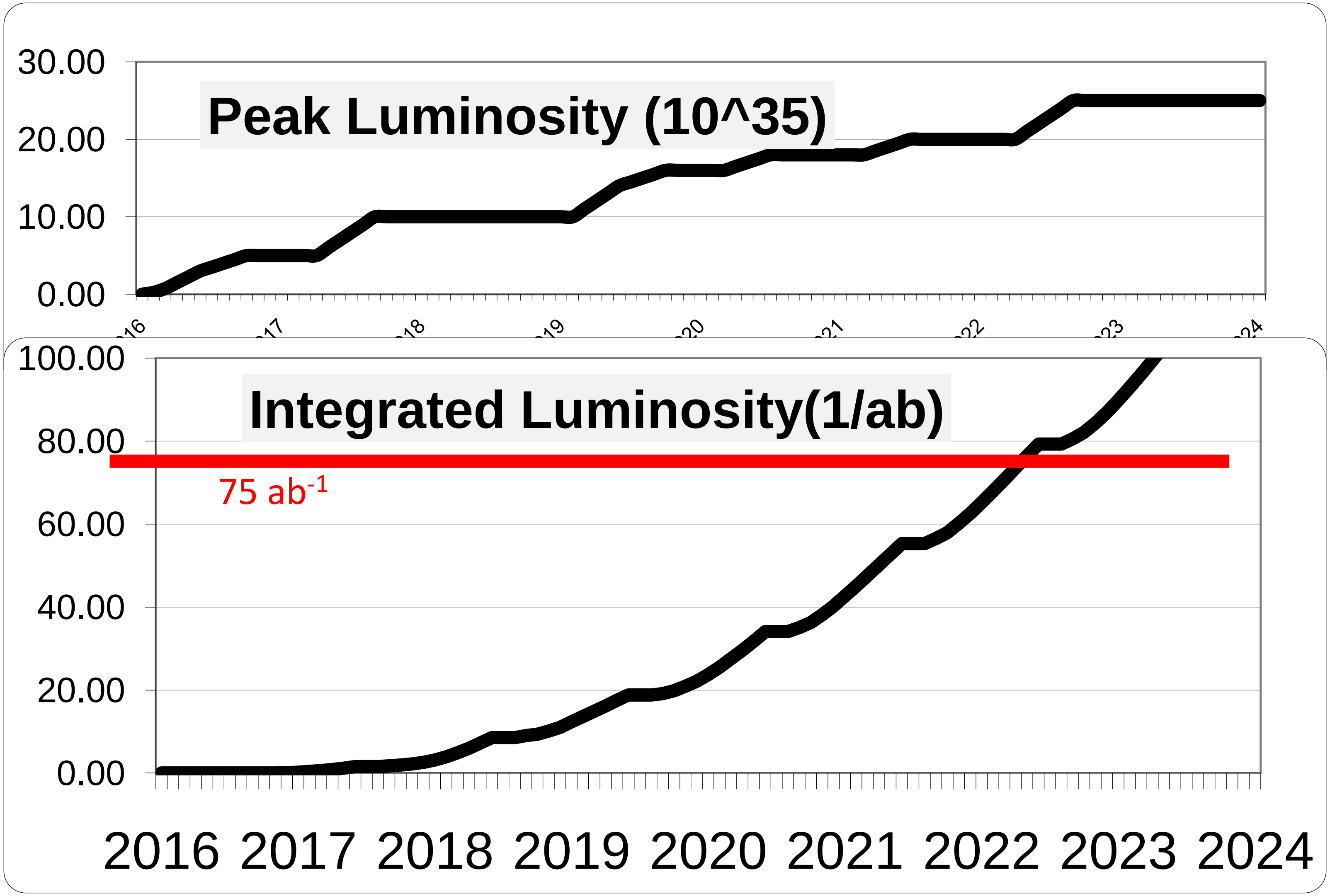
Parameter	Requirement	Comment
Luminosity (top-up mode)	10^{36} cm^{-2}s^{-1} @ $\Upsilon(4S)$	Baseline/Flexibility with headroom at 4. 10^{36} cm^{-2}s^{-1}
Integrated luminosity	75 ab^{-1}	Based on a "New Snowmass Year" of 1.5 x 10^7 seconds (PEP-II & KEKB experience-based)
CM energy range	τ threshold to $\Upsilon(5S)$	For Charm special runs (still asymmetric……)
Minimum boost	$\beta\gamma \approx 0.237$ ~(4.18x6.7GeV)	1 cm beam pipe radius. First measured point at 1.5 cm
e^- Polarization Boost up to 0.9 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.

SuperB Detector (with options)



END

SuperB Luminosity model



g-2 Reach (Valencia Report 2008)

Δa_μ is not in good agreement with SM

Measuring differential cross section of tau production would lead to measurement of the real part of tau form factor.

SPS	1a	1b	2	3	4	5
$\Delta a_\mu \times 10^{-9}$	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

$$\frac{d\sigma}{d\cos(\theta)} = a \cdot \cos(\theta)^2 + b$$

$$a \propto \beta^2 |F_1|^2$$

$$b \propto (2-\beta^2) \cdot |F_1|^2 + 4\mathrm{Re}[F_2]$$

We began considering 1-3 prong

whose experimental selection is cleaner

Need to tag the sample:

Lepton tag: higher purity & higher diluition (at least 3 neutrinos)

Hadronic tag: lower purity & lower diluition (2 neutrinos)

Systematics come mainly from tracking

Should be able to measure the

real part (0.75-1.7)x10^{-6}

EXPERIMENT $\Downarrow$	Cross Section $Re\{F_2\}$	Normal Asymmetry $Im\{F_2\}$
Babar+Belle $2ab^{-1}$	4.6×10^{-6}	2.1×10^{-5}
Super B/Flavor Factory (1 yr. running) $15ab^{-1}$	1.7×10^{-6}	7.8×10^{-6}
Super B/Flavor Factory (5 yrs. running) $75ab^{-1}$	7.5×10^{-7}	3.5×10^{-6}

Questions

- Are SuperKEKB and SuperB discovery machines in the LHC era ?
- Why is a luminosity > 10^{36} required ?
- Why LHCb is not enough for flavor studies ?
- Is it important running at the charm/tau threshold ?
- How important to have polarization ?

Future Super B Factories

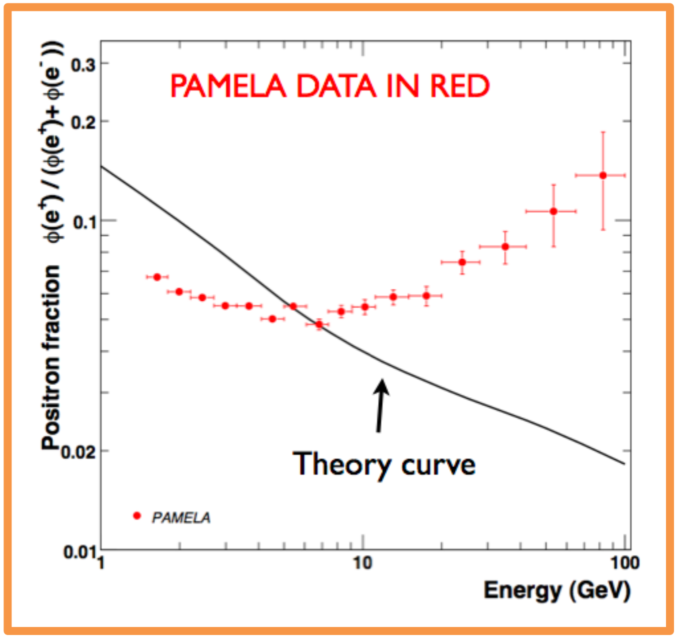
	SuperB	Super KEKB
Peak Luminosity	$>10^{36}$	0.8×10^{36}
Integrated Luminosity	75 ab^{-1}	50 ab^{-1}
Site	Green Field	KEKB Laboratory
Collisions	mid 2016	2015
Polarization	80% electron beam	No
Low energy running	10^{35} @ charm threshold	No
Approval status	Approved	Approved

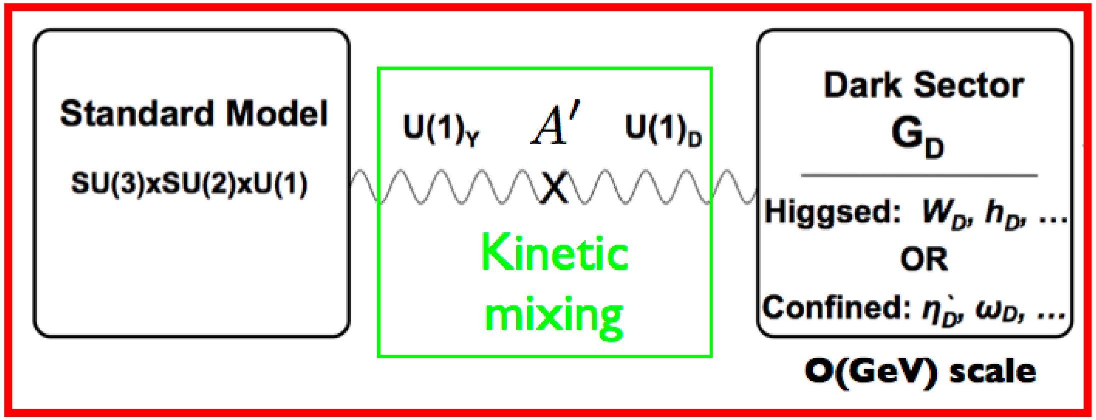
Search for Dark Forces

Results from Pamela/Fermi: excess of positrons of astrophysical origin

➔Due to particles decaying into e^+e^- with $m<2m_p$?

➔ "Dark" gauge sector

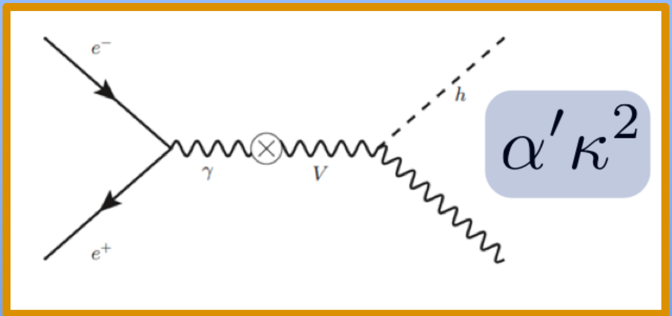




SuperB Sensitivity to dark forces

Discovery modes:

- Direct production



- B decays