The physics capabilities of this project are documented in the following:

Conceptual Design Report: **arXiv:0709.0451**

Valencia Workshop Report: **arXiv:0810.1312**

White Paper: being finalised: SLAC-R-952, ~85p (available soon)

3rd Workshop on Theory, Phenomenology and Experiments in Heavy Flavour Physics, Capri 5-8th July 2010.

Adrian Bevan

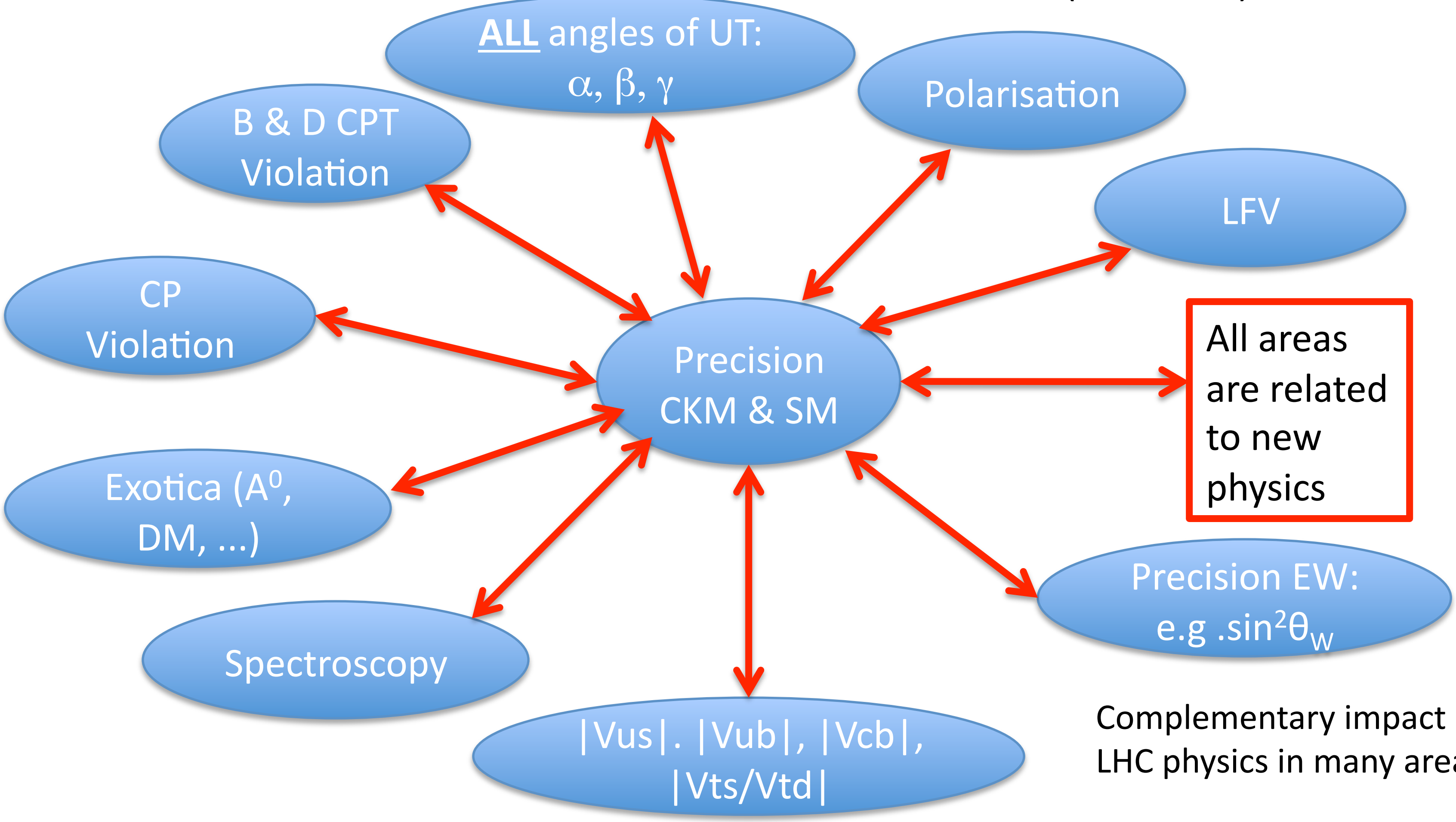
Queen Mary, University of London

SuperB: Physics

Operate between Charm threshold and $\Upsilon(6S)$.

Is a Super-CLEO/B/τ-charm (and more) rolled into one!

- See white paper for details (on archive soon).

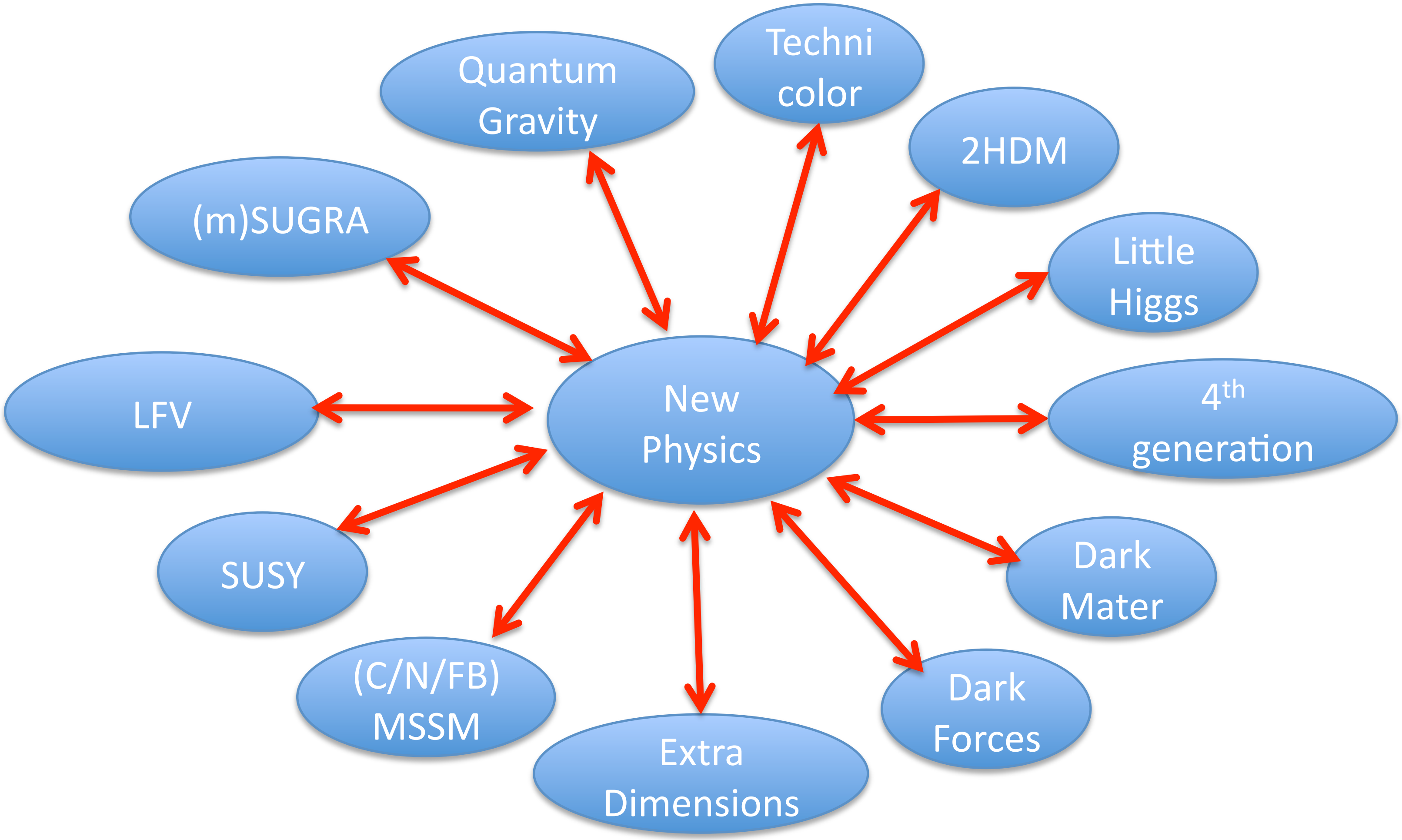


Complementary impact on LHC physics in many areas.

- The only experiment with access such a wide range of flavour observables.
- (theoretically cleaner) inclusive measurements only in e^+e^- environment.

SuperB: Physics

- See white paper for details



- Data from SuperB will be used to reconstruct the new physics Lagrangian

Goals

- 75ab^{-1} of data in 5 years of nominal running.
- 80% polarisation for electrons.
- Run at Υ(4S) and other resonances between ψ(3770) and Υ(6S).
- Even more of a flavour factory than the current generation of B factories!

>80 x10^9 B pairs (75ab-1)
70x10^9 τ pairs (75ab-1)
700x10^6 charm pairs at threshold (500fb-1)
+ B_S @ Υ(5S), + other resonances etc.

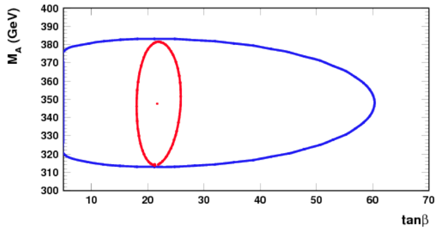
Polarisation:

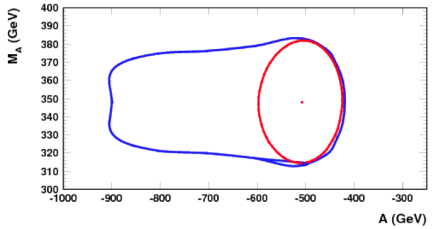
- $\sin^2\theta_W$ at 10.58 GeV (precision EW test, cleaner than & same precision as LEP).
- Improved background rejection for τ LFV searches.

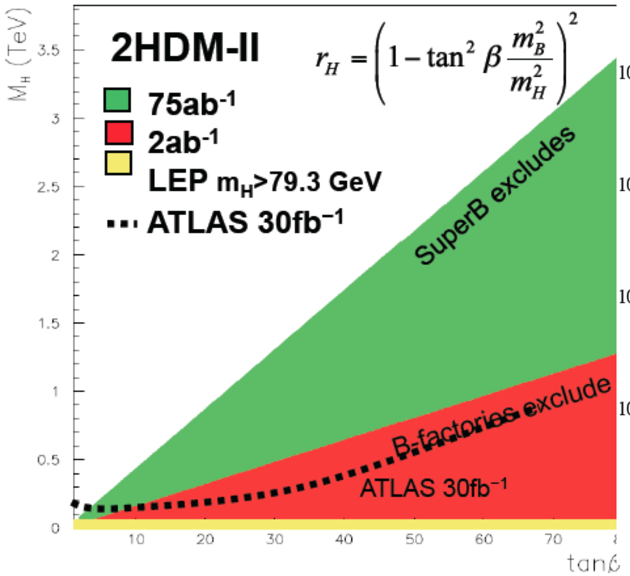
Charm Threshold Running:

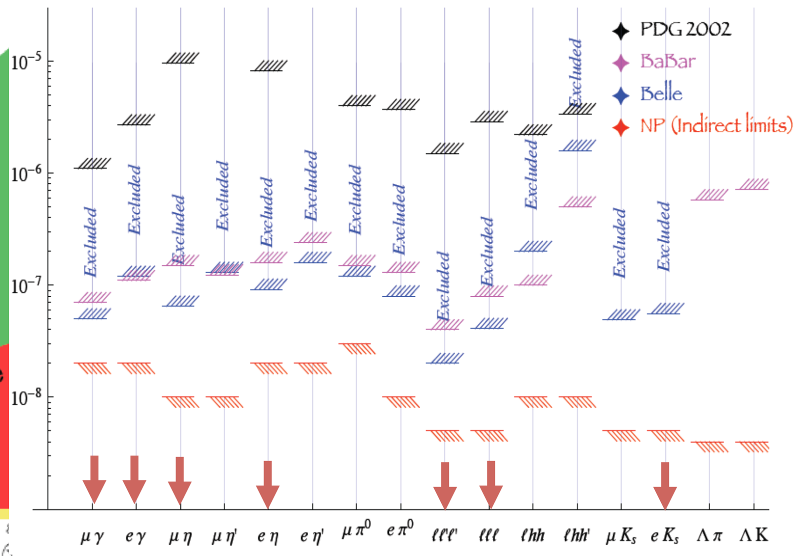
- 3months = 500fb^{-1}
- CP violation using quantum coherence of D^0-D^0bar.
- Precision SM (helps γ extraction from B decays).
- CPT violation in D decays.
- We are still working on studies to understand the full potential of this.

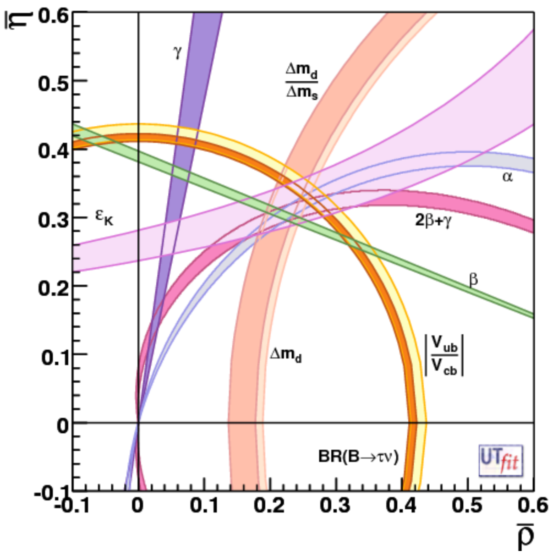
Some generic examples...

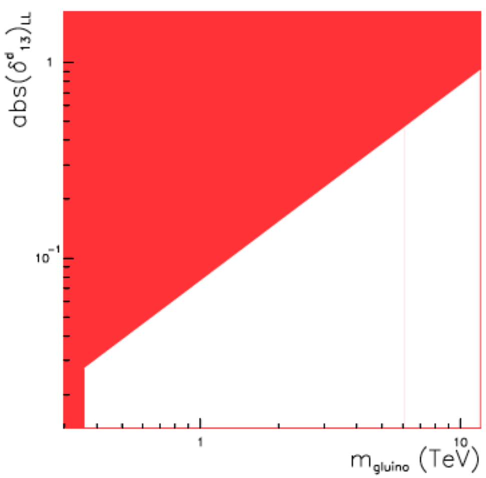


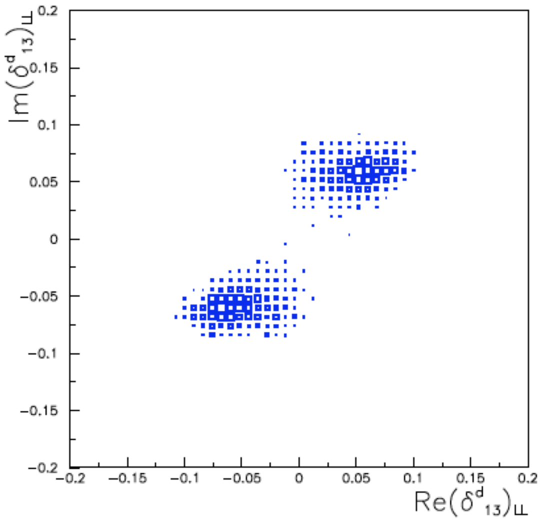












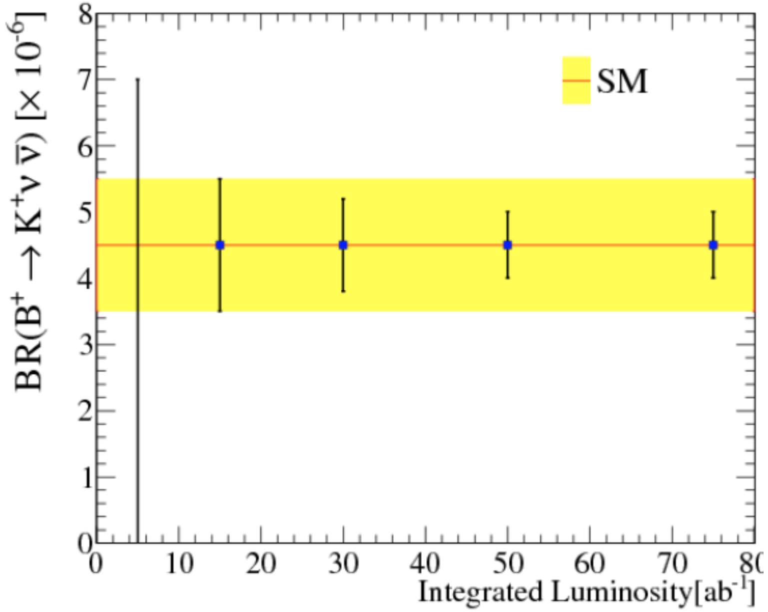
Specific examples: $B \to K^{(*)}\nu\overline{\nu}$

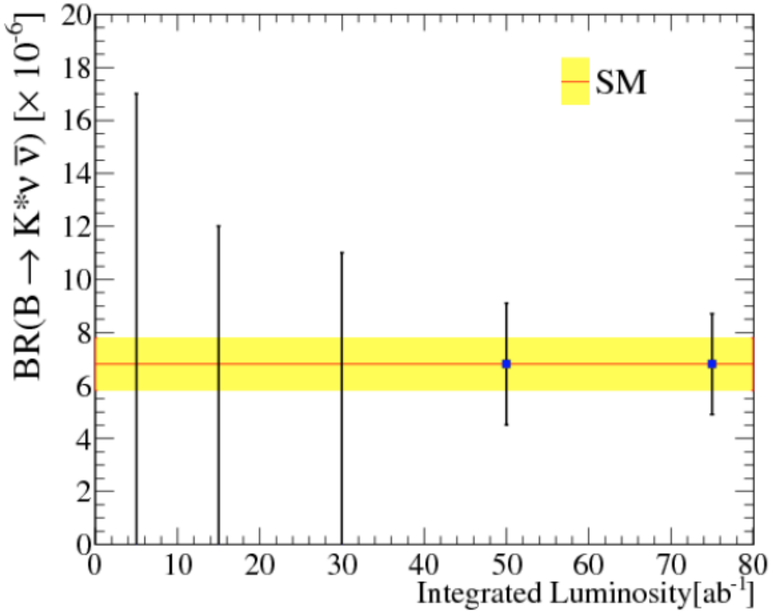
- Only accessible in e^+e^-
- Really need ~75ab^{-1} to observe this mode.

Not in SM

$$\mathcal{H}_{\rm eff} = -\frac{4\,G_F}{\sqrt{2}} V_{tb}V_{ts}^{*}\left(C_L^{\nu}\mathcal{O}_L^{\nu} + C_R^{\nu}\mathcal{O}_R^{\nu}\right) + \text{ h.c.}$$

- BSM: Right handed currents and complex Wilson coefficients.





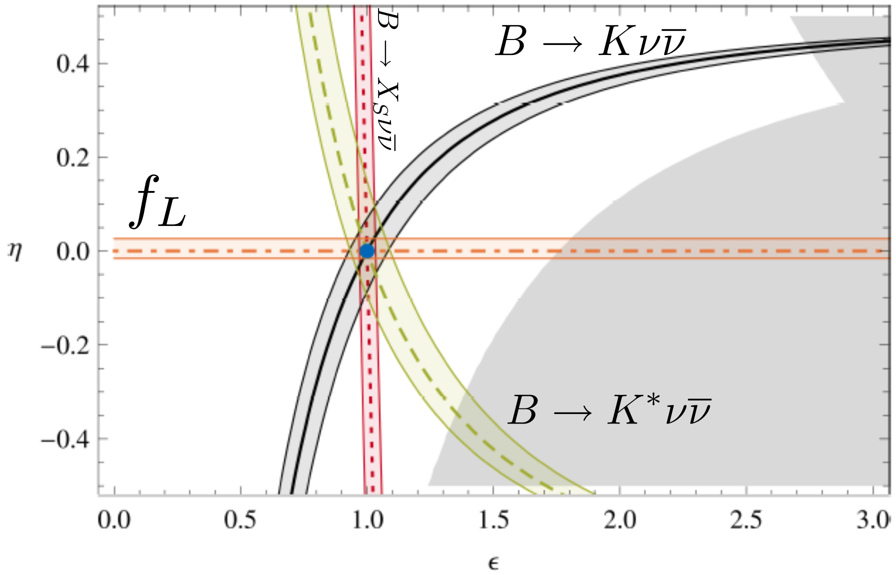
Specific examples: $B \to K^{(*)} \nu \bar{\nu}$

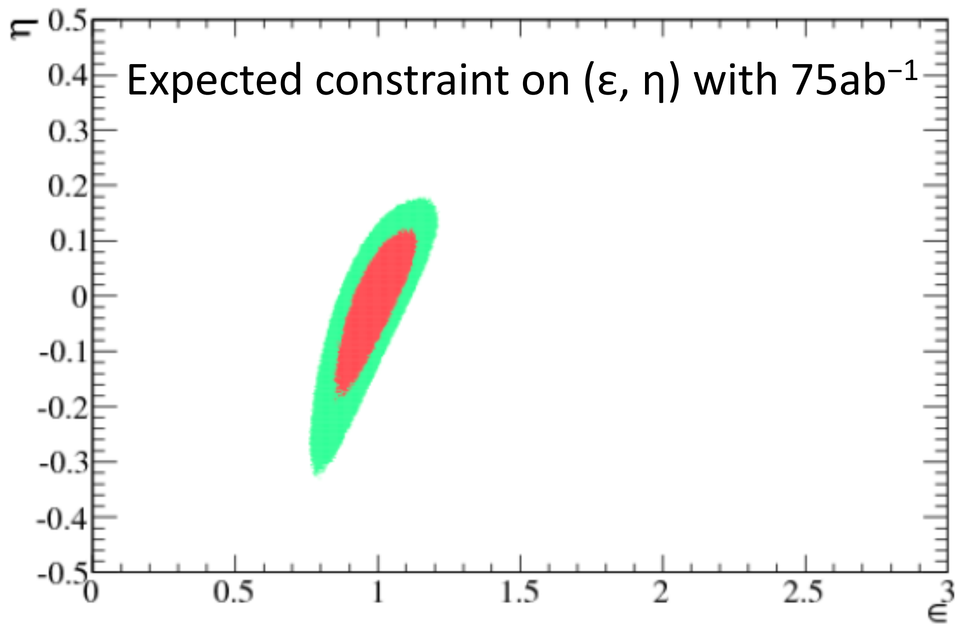
- Only accessible in e^+e^-
- Really need ~75ab^{-1} to observe this mode.
- NP sensitive observables in BF of K and K* mode.
- Also have f_L in K*mode as additional constraint.

$$\epsilon = \frac{\sqrt{|C_L^\nu|^2 + |C_R^\nu|^2}}{|(C_L^\nu)^{\rm SM}|}, \qquad \eta = \frac{-{\rm Re}\,(C_L^\nu C_R^{\nu *})}{|C_L^\nu|^2 + |C_R^\nu|^2}$$

Sensitive to models with Z penguins and RH currents.

e.g. see Altmannshofer, Buras, & Straub





Specific examples: $\tau \rightarrow \mu\gamma$

- Only accessible in e^+e^- (golden modes: μγ, 3 lepton)
- Expect to retain background free searches with polarised electron beam.

Model dependent NP constraint.

$m_{\tilde{q}} = 300\,GeV$ BLUE

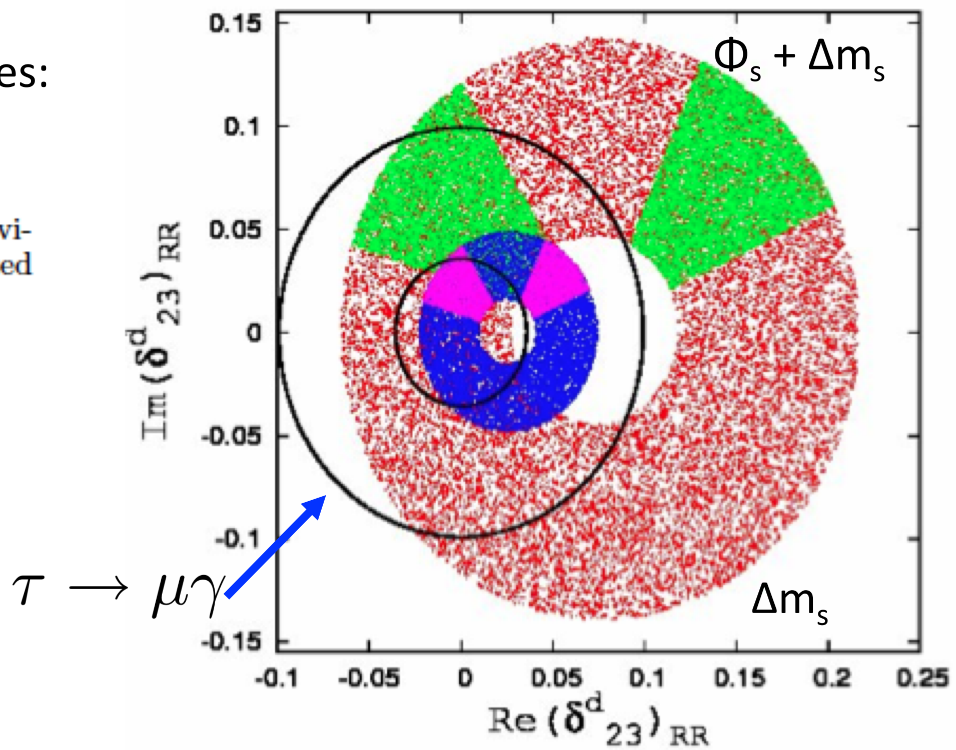
$m_{\tilde{q}} = 500\,GeV$ RED

Golden channel for finding LFV.

Correlated with other flavour observables: MEG, LHCb etc.

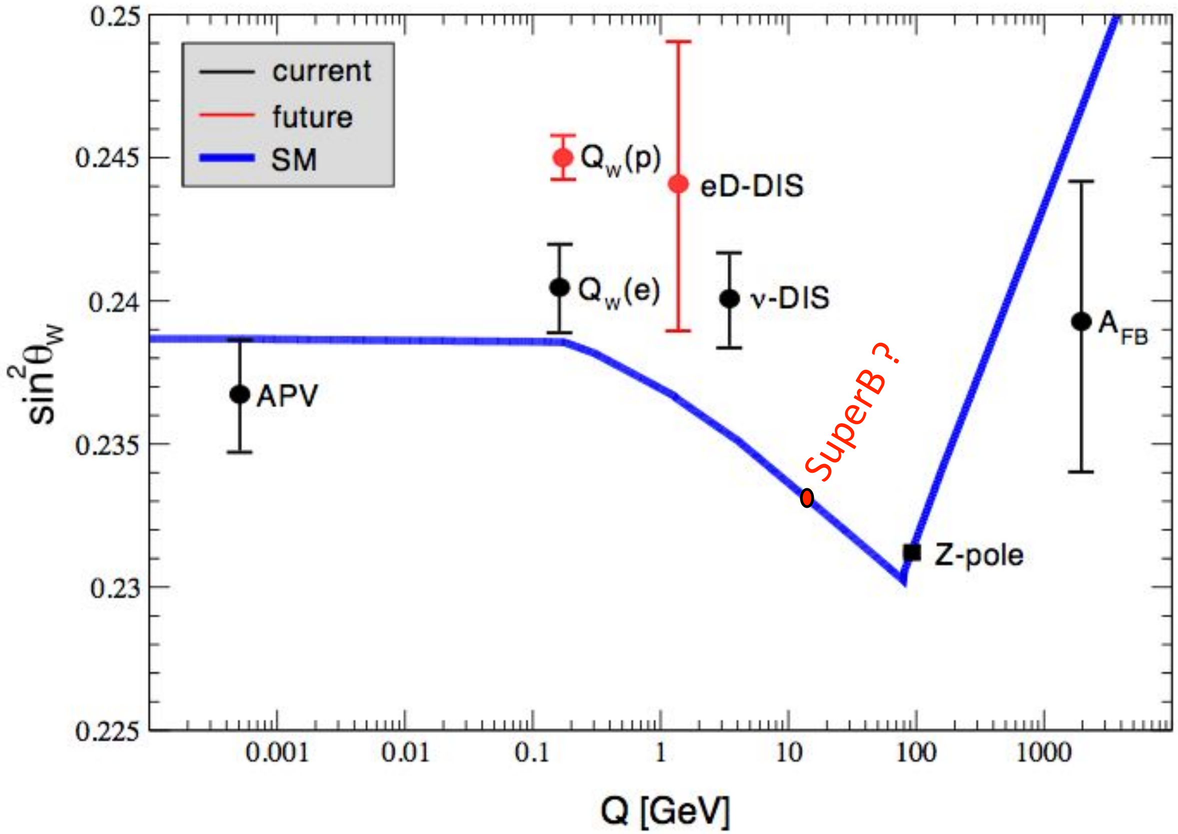
TABLE III: Expected 90% CL upper limits and 3σ evidence reach on LFV decays with 75 ab^{-1} with a polarized electron beam.

Process	Expected 90% CL upper limit	3σ evidence reach
$\mathcal{B}(\tau \rightarrow \mu\gamma)$	2.4×10^{-9}	5.4×10^{-9}
$\mathcal{B}(\tau \rightarrow e\gamma)$	3.0×10^{-9}	6.8×10^{-9}
$\mathcal{B}(\tau \rightarrow \ell\ell\ell)$	$2.3\text{–}8.2 \times 10^{-10}$	$1.2\text{–}4.0 \times 10^{-9}$



Specific examples: Precision $\sin^2\theta_W$

- Only accessible in e^+e^- with polarised electron beam.
- Theoretically clean test of SM (cleaner than LEP result).

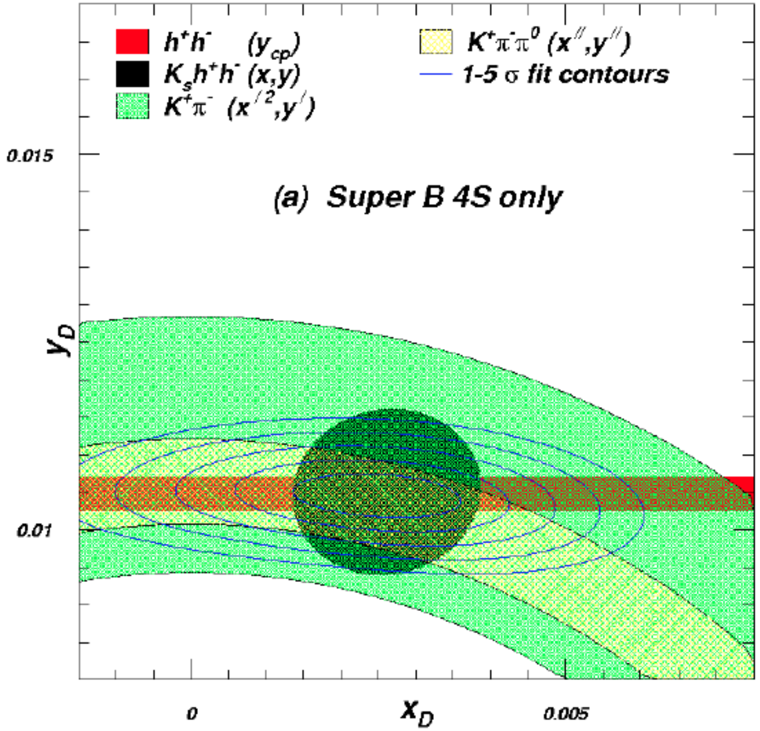


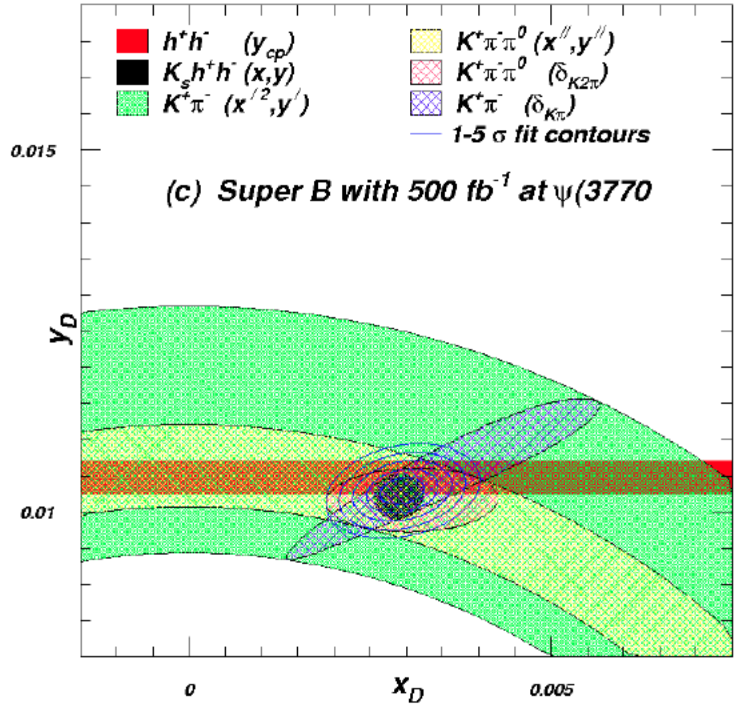
• With Polarised e^- beam, SuperB can measure $\sin^2\theta_W$ as accurately as LEP.

• If an interesting result is found, this measurement can be repeated at charm threshold: *precision to be studied for ψ(3770)*.

Specific examples: Charm Threshold

- 3 months of running will give 500fb^{-1}: 50x BES-III





- Precision charm mixing.
- + CPT Violation, Rare Decays, CPV using quantum correlations, decay constants, ...

Work in progress!

Summary

- SuperB:
  - Can do everything that Belle II will cover, but with 50% more data than Belle II (*same is true Re: BES-III*).
    - (so won't repeat the Belle II physics conclusion here)

  - Unique potential to search for new physics:
    - Polarisation: Precision EW tests: $\sin^2\theta_W$.
      Improved background rejection: τ LFV.
    - Charm Threshold:
      - Do everything that KLOE(2) and B Factories have done with K^0 and B^0 decays, but with D^0 decays and other final states at $\psi(3770)$.
      - CPV, CPT, Lepton universality, Dark Forces, DM, ... [Will also run at other $\sqrt{s}$; e.g. $\Upsilon(5S)$].

  - Will measure the widest range of flavour observables of any existing or proposed facility.

http://web.infn.it/superb/

Additional slides

Case studies:

1. **Lepton Flavour Violation**: τ decay as an example of many LFV measurements possible at SuperB.
2. **Neutral Higgs A0**: what can the flavour sector add to high p_T searches?
3. **Charged Higgs:** what do we know; what will LHC tell us; what does SuperB add?
4. **ΔS measurements**: high mass particle interferometry.

Physics Case in the LHC era

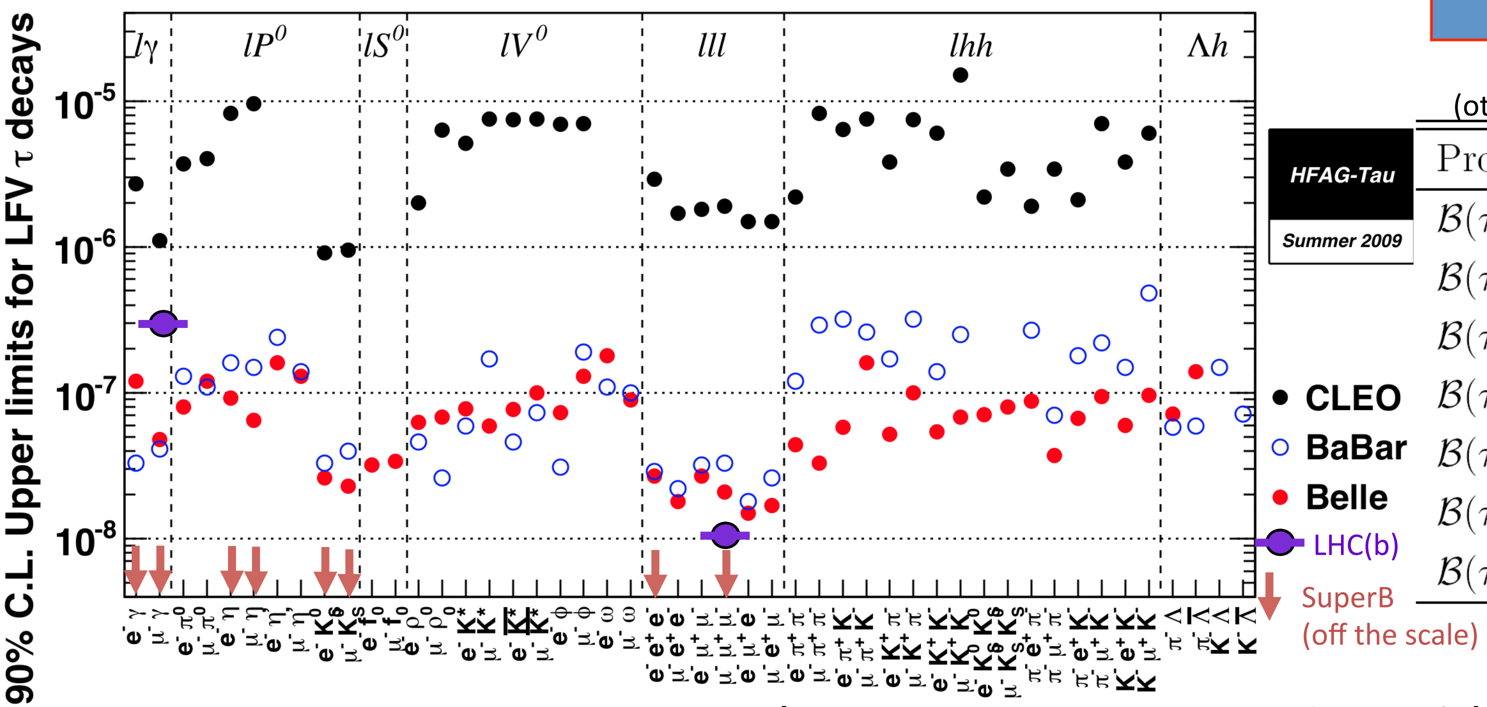
Why is a Super Flavour Factory like SuperB relevant when we have the energy frontier experiments and LHCb?

What is the minimum data set to make sure that we are doing something sensible?

Charged Lepton Flavour Violation

Lepton Flavour Violation (τ decay)

SuperB Sensitivity ($75ab^{-1}$ assumed)



(other modes not yet studied)

Process	Sensitivity
$\mathcal{B}(\tau \to \mu\,\gamma)$	2×10^{-9}
$\mathcal{B}(\tau \to e\,\gamma)$	2×10^{-9}
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$\mathcal{B}(\tau \to eee)$	2×10^{-10}
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- LHC is ***not*** competitive (Re: ATLAS, CMS, and LHCb).
- 80% polarised e^- beam helps reduce SM background.
- SuperB sensitivity ~10 – 50× better than New Physics allowed branching fractions.

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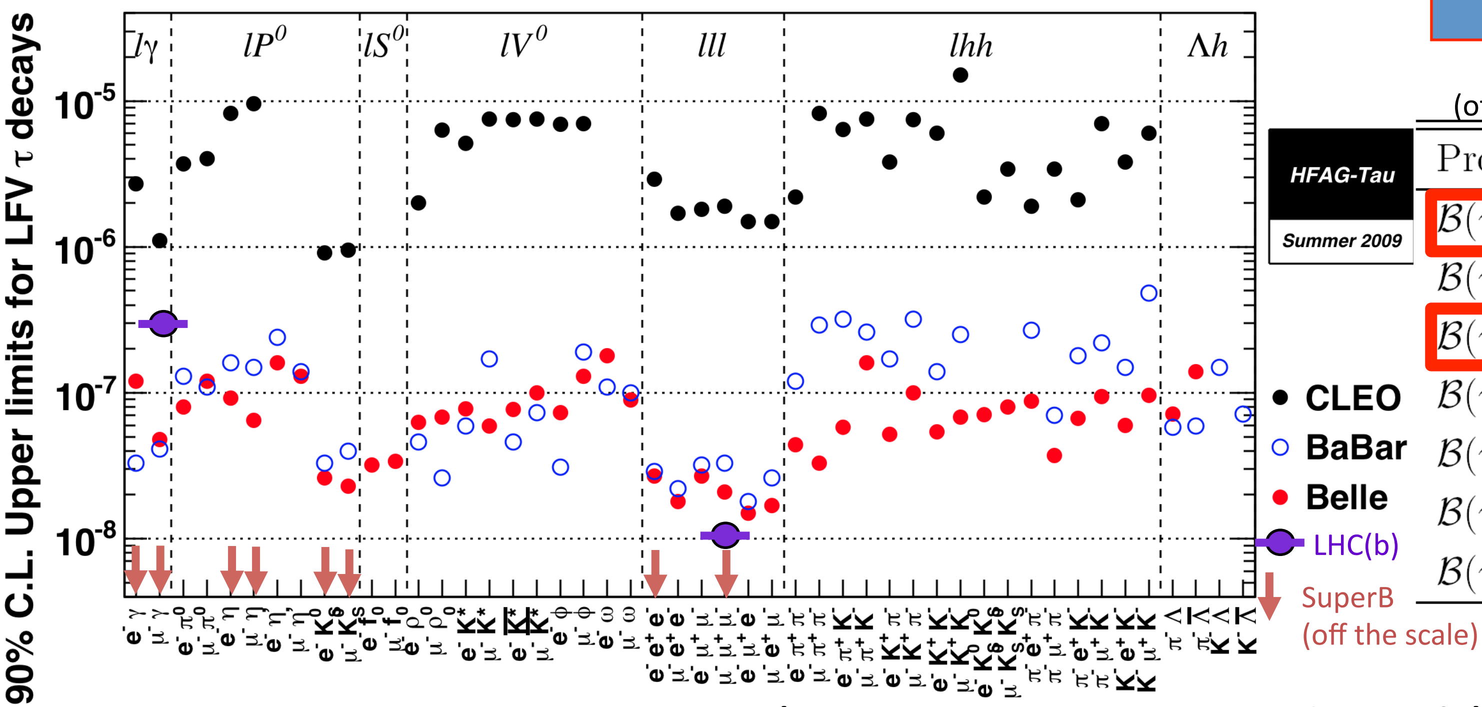

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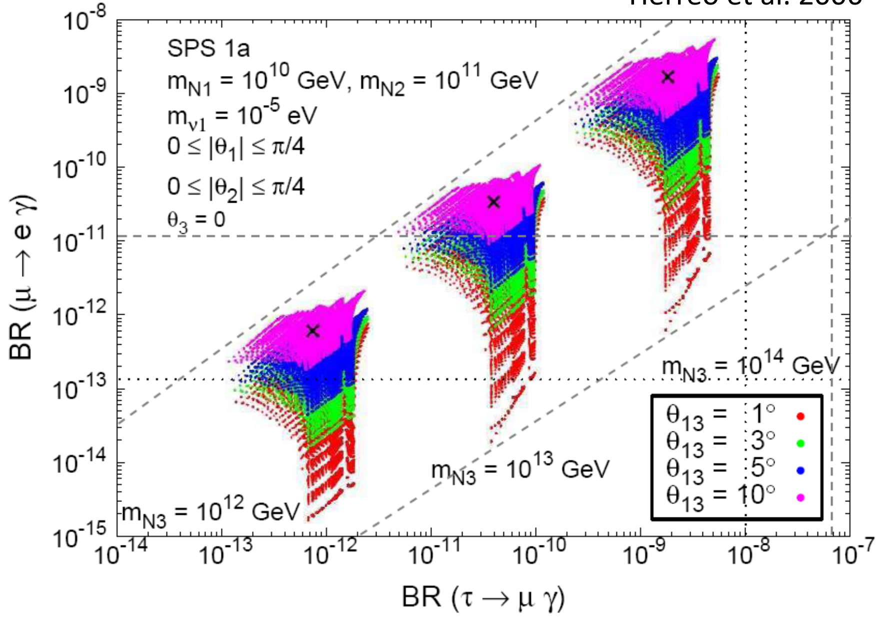
- $\tau \to \mu\gamma$ upper limit can be correlated to θ_{13} (neutrino mixing/CPV, T2K etc.) and also to $\mu \to e\gamma$.
- Complementary to flavour mixing in quarks.
- Golden modes:
  - $\tau \to \mu\gamma$ and 3μ.
- e^- beam polarization:
  - Lower background
  - Better sensitivity than competition!
- e^+ polarization may be used later in programme.
- CPV in $\tau \to K_S \pi \nu$ at the level of $\sim 10^{-5}$.
- Added Bonus:
  - Can also measure τ g-2 (polarization is crucial).
  - σ(g-2) $\sim 2.4 \times 10^{-6}$ (statistically dominated error).

SUSY seasaw = CMSSM + $3\nu_R$ + $\tilde{\nu}$

Herreo et al. 2006



Use $\mu\,\gamma/3l$ to distinguish SUSY vs. LHT.

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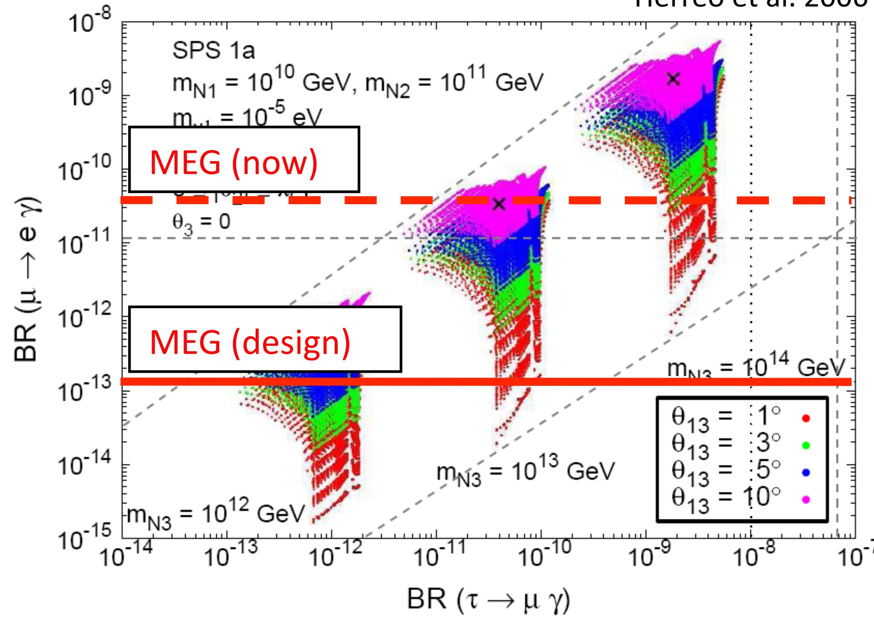

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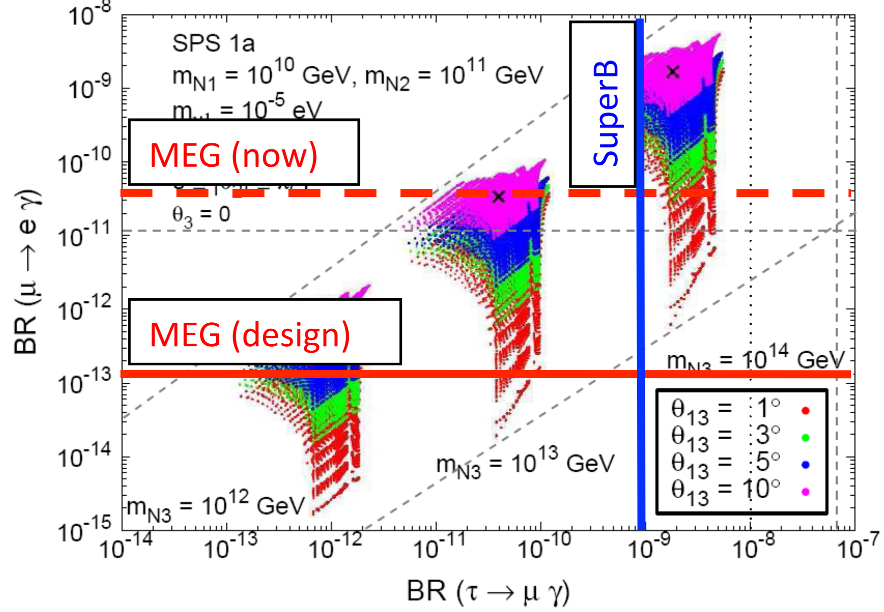

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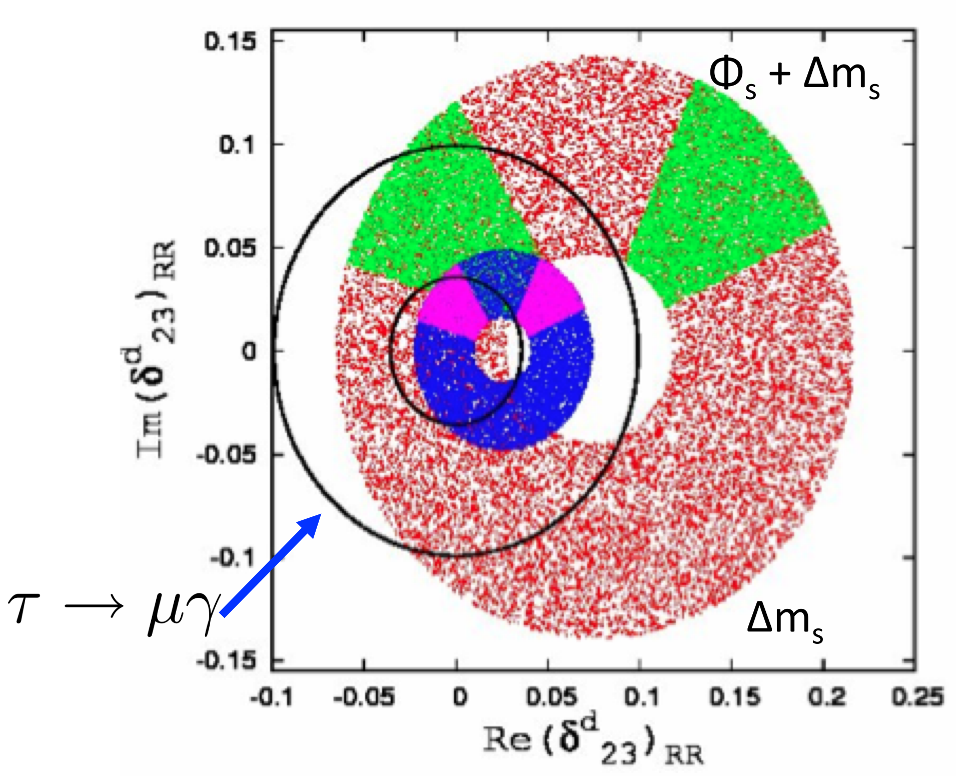
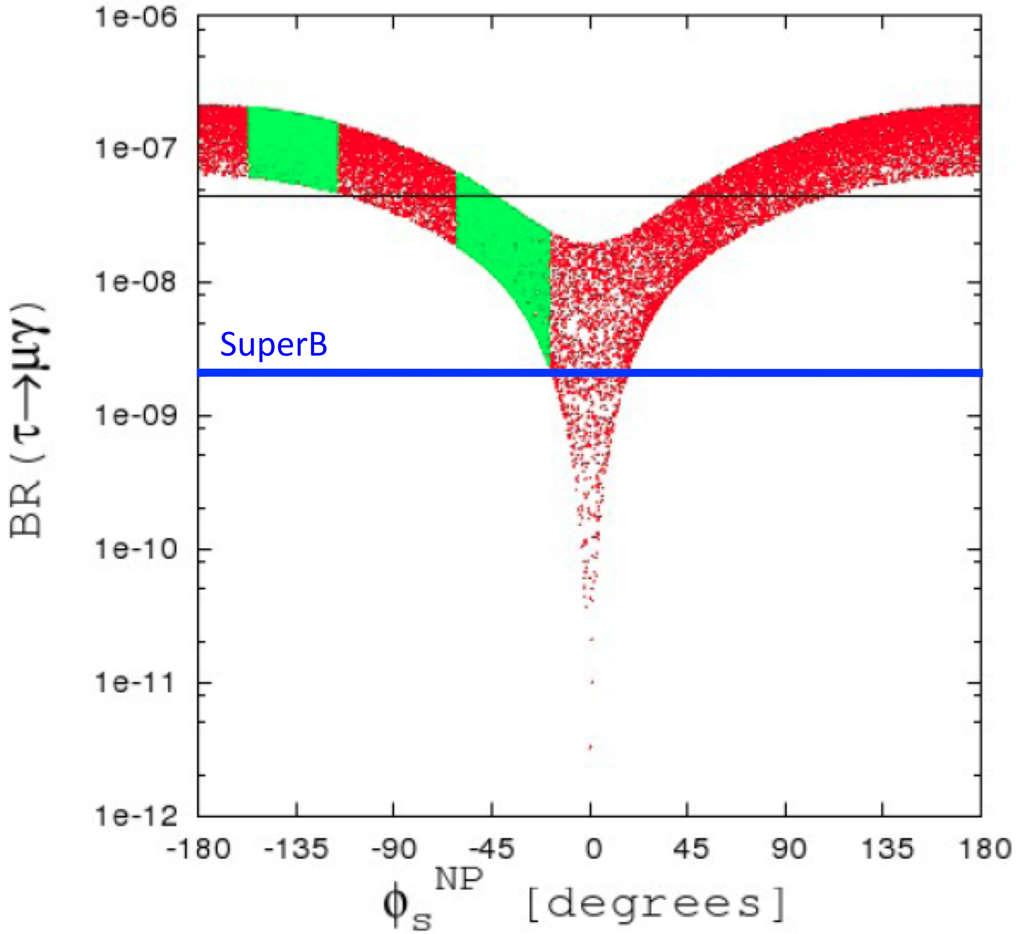


- SU(5) SUSY GUT Model (arXiv: 0710.5443, Parry and Zhang).
- Model has non-trivial SUSY squark couplings.
- Current B_S mixing measurement favours $B(\tau \rightarrow \mu\gamma) > 3 \times 10^{-9}$.
- Need SuperB to probe to this sensitivity.

N.B. Different New Physics Models have different features, and different hierarchies!

Lepton Flavour Violation (τ decay)



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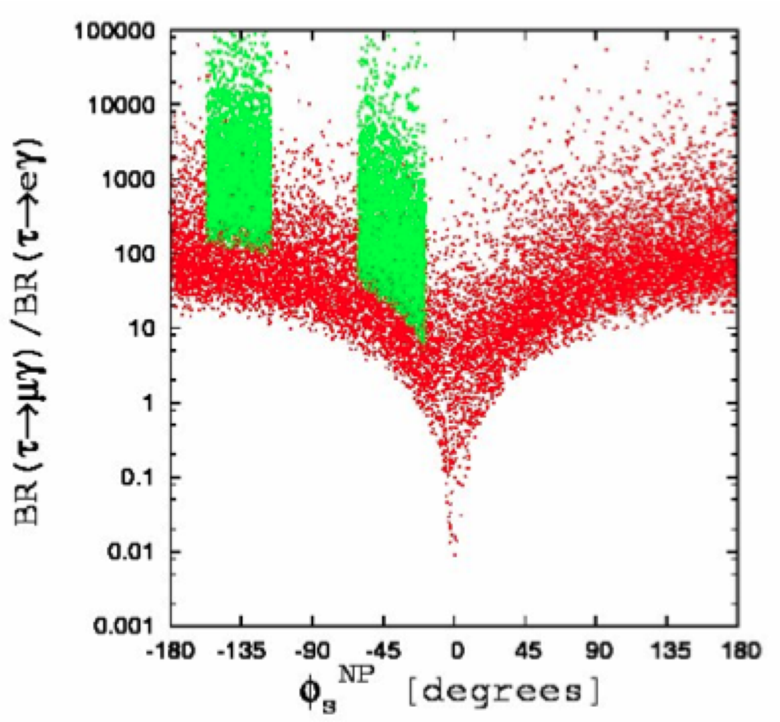

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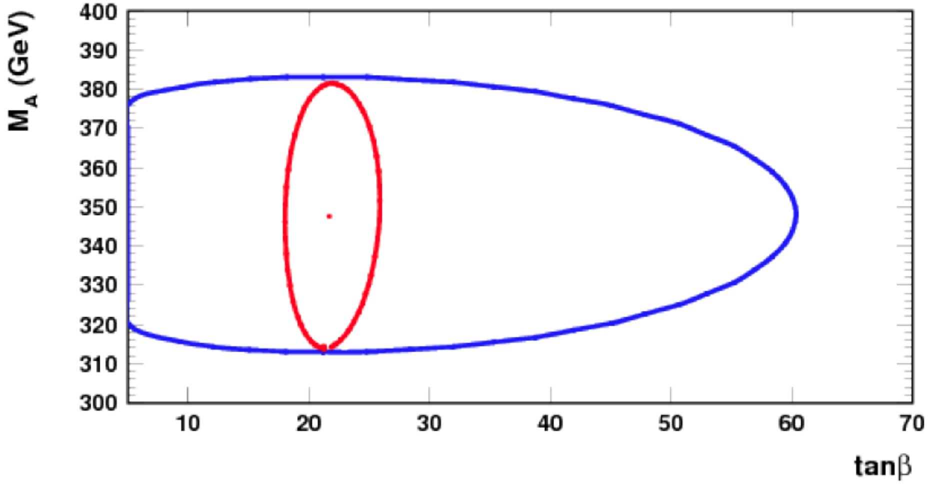
N.B. Different New Physics Models have different features, and different hierarchies!

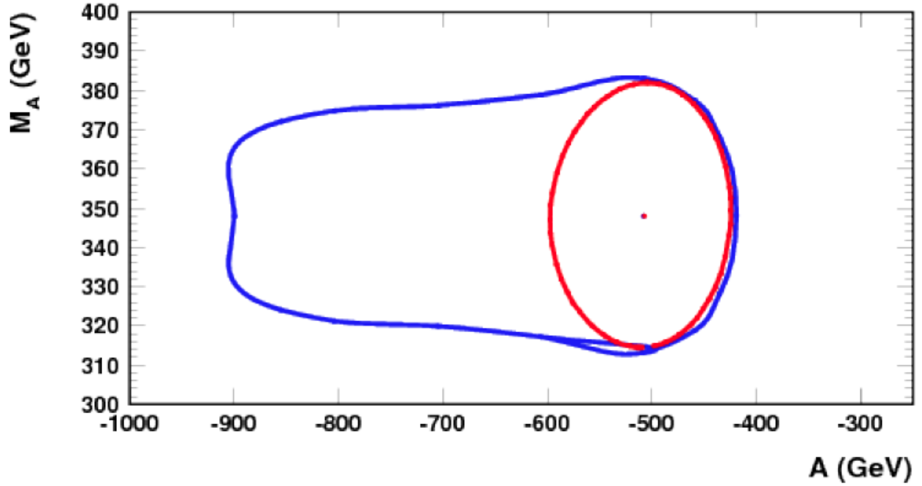
Some Higgs Phenomenology

N.B. The SM Higgs (within CMSSM) can also be constrained using b to sγ, g-2 and Ω_{CDM}. SuperB has input to sγ and the g-2 constraints.
e.g. See: Weiglein et al. arXiv:0707.3447

Here I show two non-SM scenarios.

CMSSM: LHC/SuperB complementarity





Current analysis of data prefers tanβ~10. EPJC **57** 183-307 (2008).

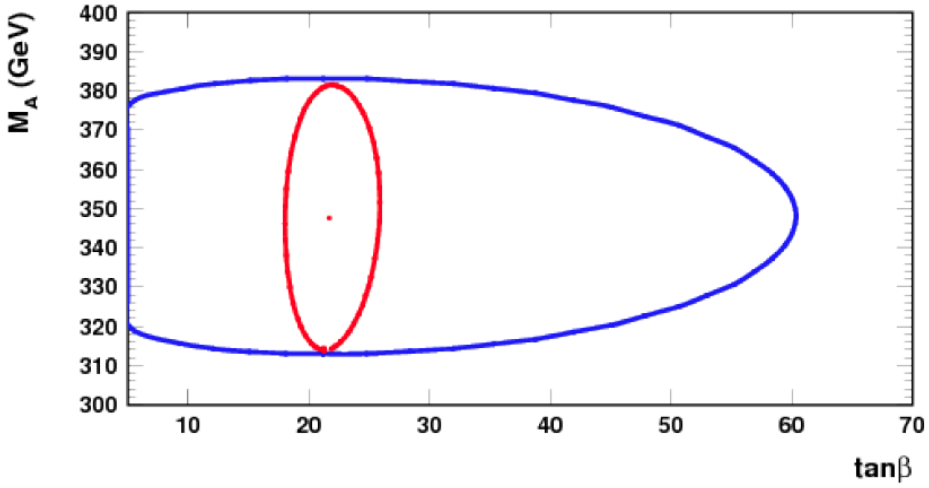
Blue = LHC:

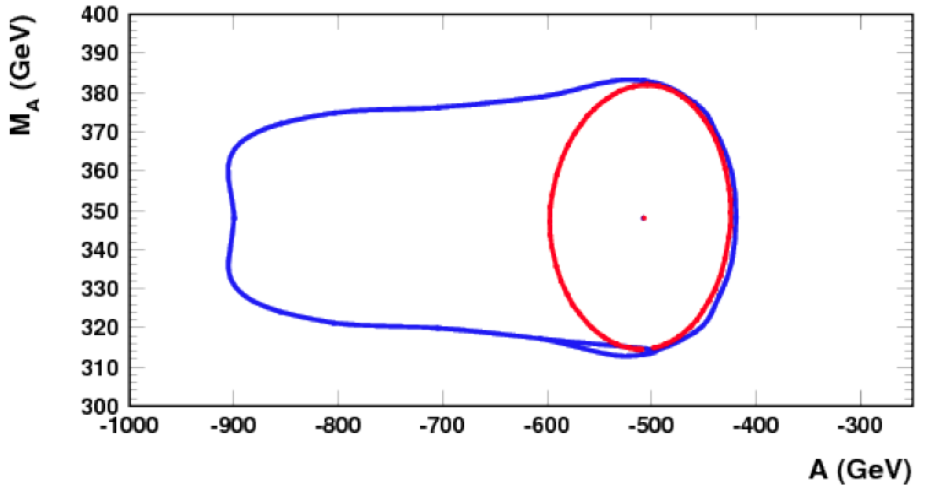
- Will be able to measure m(A) [CP odd Higgs mass]
- Poor sensitivity to tanβ [ratio of Higgs vevs]
- Poor sensitivity to A [coupling]

Red=LHC+EW/Low-energy constraints (includes SuperB):

Observable	Constraint	theo. error
$R_{BR_{b\to s\gamma}}$	1.127 ± 0.1	0.1
$R_{\Delta M_s}$	0.8 ± 0.2	0.1
$BR_{b\to\mu\mu}$	$(3.5 \pm 0.35) \times 10^{-8}$	2×10^{-9}
$R_{BR_{b\to\tau\nu}}$	0.8 ± 0.2	0.1
Δa_μ	$(27.6 \pm 8.4) \times 10^{-10}$	2.0×10^{-10}
M_W^{SUSY}	80.392 ± 0.020 GeV	0.020 GeV
$\sin^2\theta_W^{SUSY}$	0.23153 ± 0.00016	0.00016
M_h^{light}(SUSY)	> 114.4 GeV	3.0 GeV

CMSSM: LHC/SuperB complementarity





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- Will be able to measure m(A) [CP odd Higgs mass]
- Poor sensitivity to tanβ [ratio of Higgs vevs]
- Poor sensitivity to A [coupling]

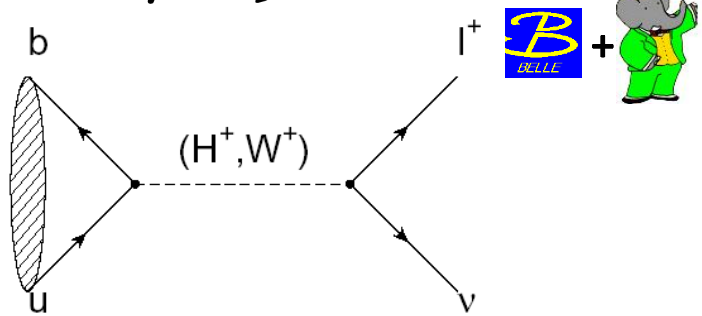
Red=LHC+EW/Low-energy constraints (includes SuperB):

- Can build on the m(A) measurement to measure tanβ.

Again LHC and SuperB are complementary experiments. Each can contribute significantly to the knowledge of new physics.

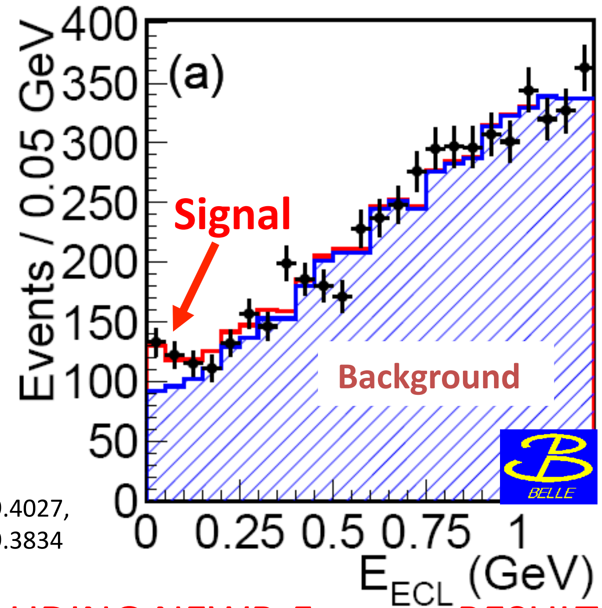
Charged Higgs: $B^\pm \to \tau^\pm \nu$

- Within the SM, sensitive to f_B and $|V_{ub}|$: $\mathcal{B}_{SM}$~1.6×10^{-4}.
- $\mathcal{B}$ affected by new physics.
  - MFV models like 2HDM / MSSM.
  - Unparticles.
- Fully reconstruct the event (modulo ν).

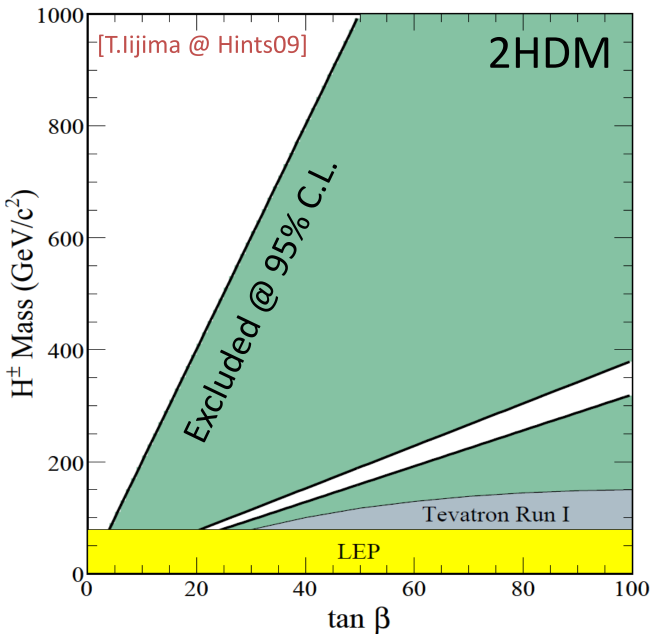


$$\mathcal{B}_{SM}(B^+ \to l^+\nu_l) = \frac{G_F^2 m_B m_l^2}{8\pi}\left(1-\frac{m_l^2}{m_B^2}\right) f_B^2\, |V_{ub}|^2\, \tau_B$$

$$\mathcal{B}_{WA} = (1.73 \pm 0.35)\times10^{-4}$$



arXiv:0809.4027,
arXiv:0809.3834



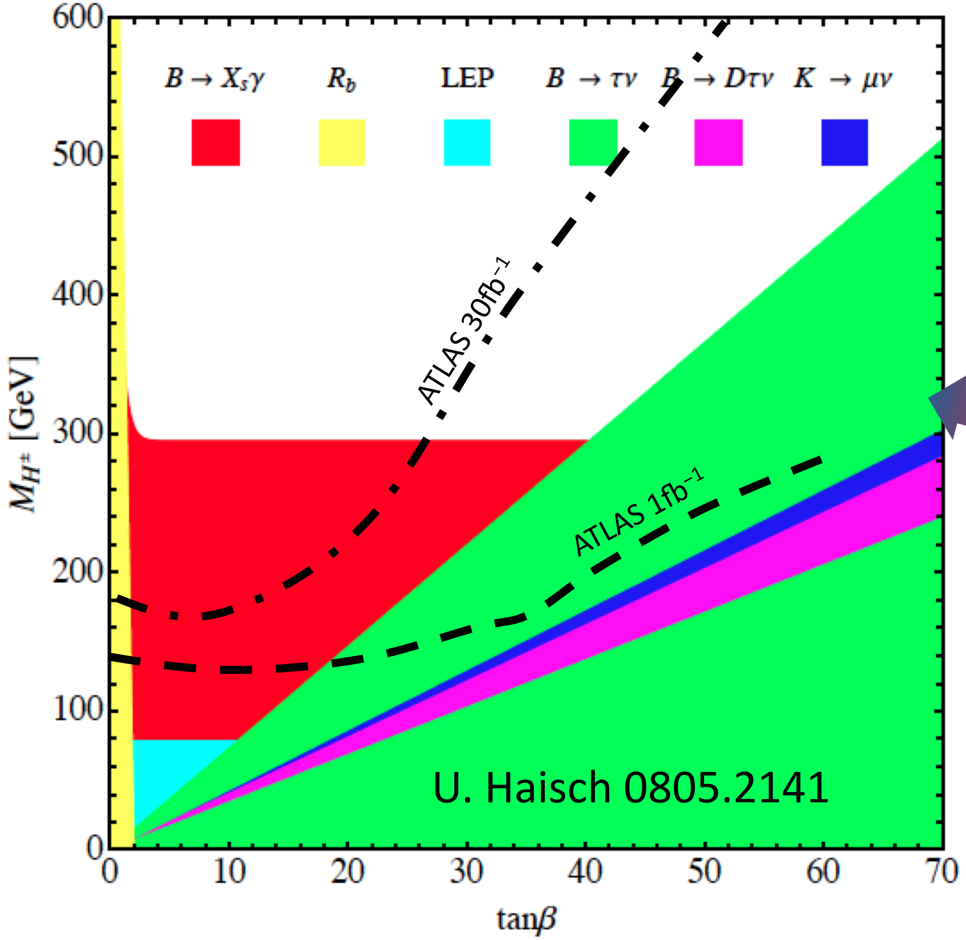
! NOT INCLUDING NEWB-Factory RESULTS !

2HDM: W.-S Hou PRD **48** 2342 (1993)
MSSM: G. Isidori arXiv:0710.5377
Unparticles: R. Zwicky PRD**77** 036004 (2008)

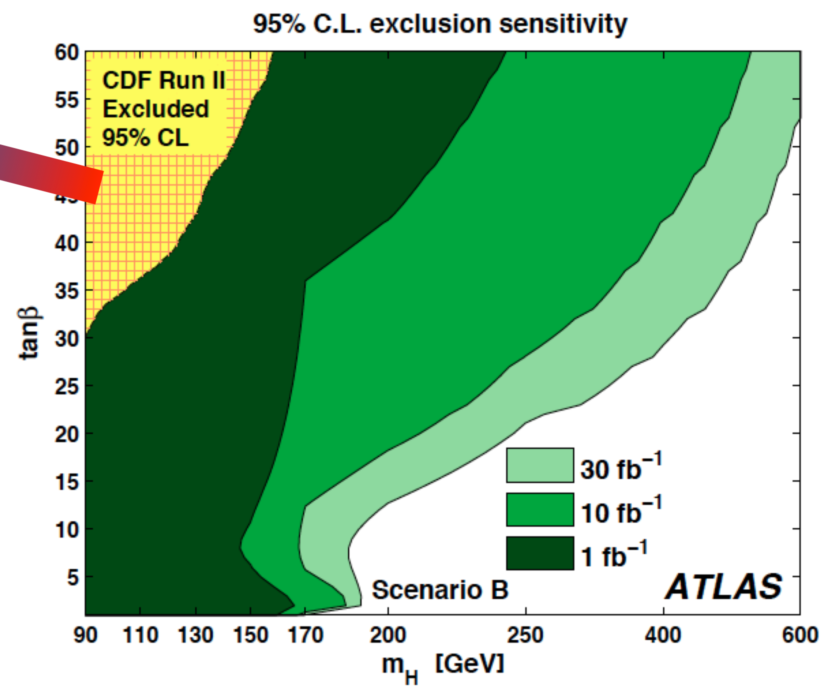
Charged Higgs

- B-factory searches competitive with LHC era: e.g. 2HDM

Existing Constraints from BaBar and Belle.
Combined Higgs search constraint from ATLAS: arXiv:0901.1502 @14TeV



Converted constraints expected from ATLAS onto the plot by hand.



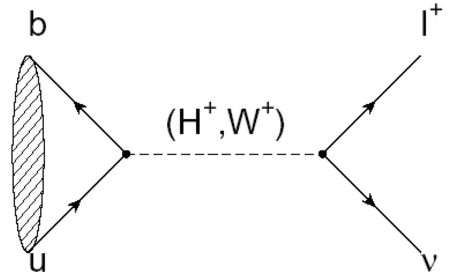
LHC expected to have 5fb-1 @14TeV ~ 2015.

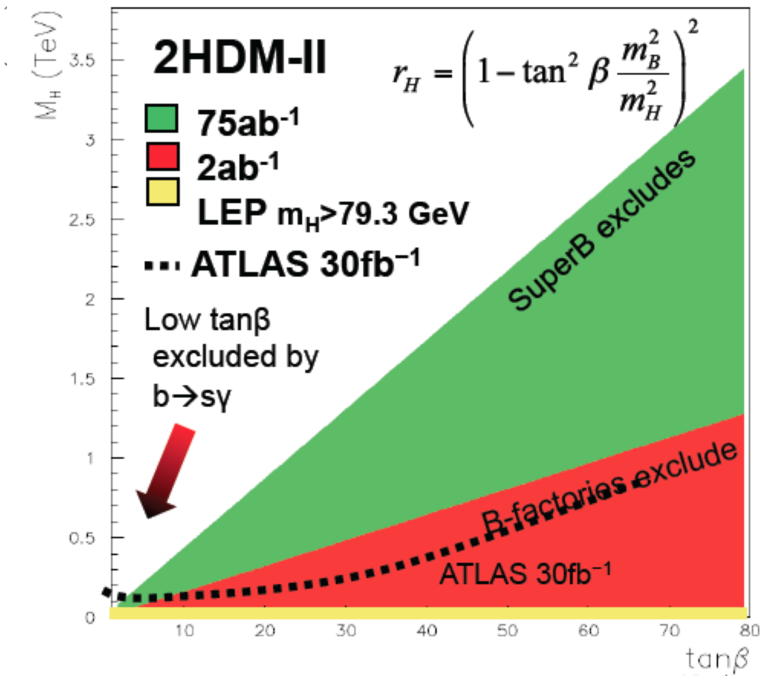
Charged Higgs

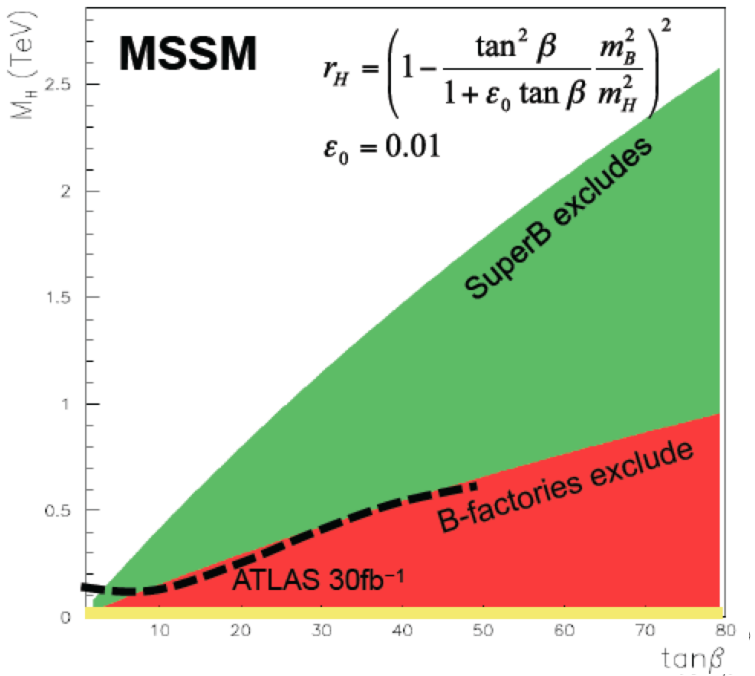
- Higgs mediated Minimal Flavour Violation:

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

(Assuming SM branching fraction is measured)







- Includes SM uncertainty ~20% from V_{ub} and f_B.

Charm equivalent: $D_s^+ \to \mu^+\nu$, $\tau^+\nu$

B-factories actually have 1.5ab^{-1} of data: ATLAS sensitivity sketched from combined sensitivity plots in arXiv:0901.0512.

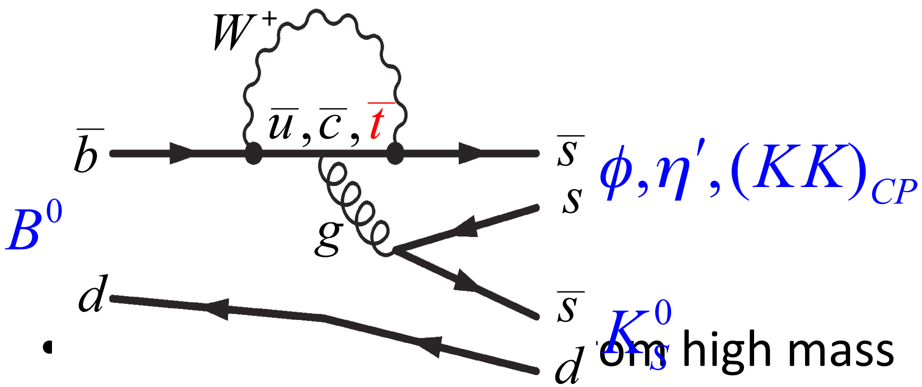
Time-dependent CP Violation as a New Physics probe

ΔS measurements

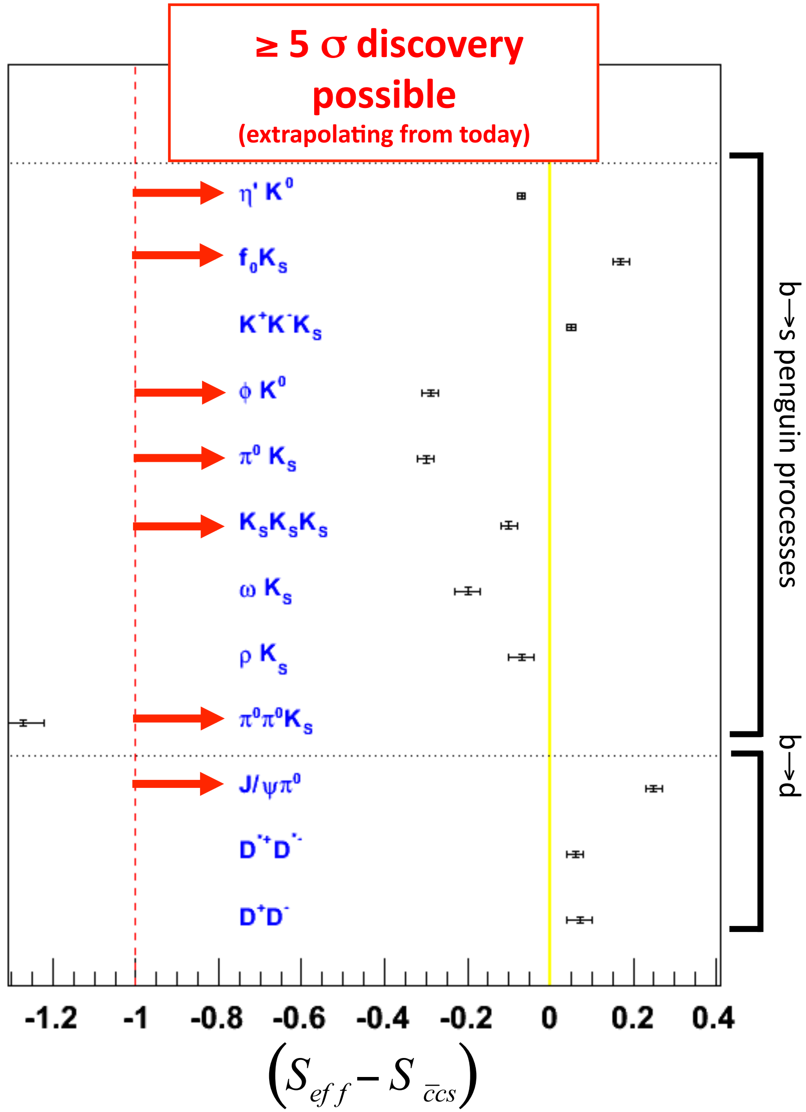
- β=(21.1±0.9)° from Charmonium decays.

- Look in many different b→s and b→d decays for sin2β deviations from the SM:

- The golden channel is:

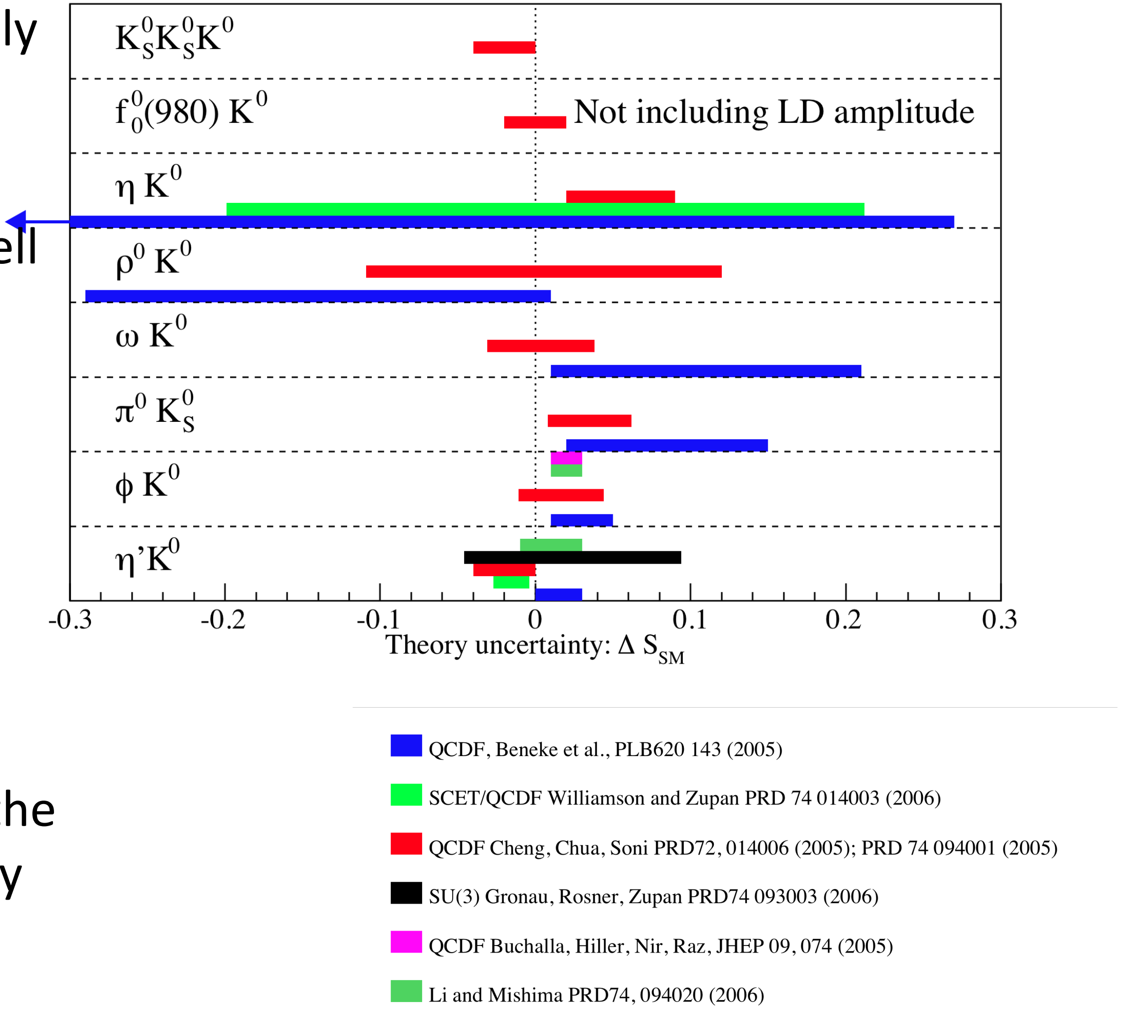


- …om high mass particles in loops: H, χ, ...



ΔS measurements

- The SM uncertainty is strongly mode dependent.
- Golden modes have to be well measured and theoretically clean.
- Prefer to also have robust constraints from more than one theoretical approach.
- Precision measurements of the reference Charmonium decay also have a small SM uncertainty.



ΔS measurements

- We were reminded that we should be careful with what we compare:
  - New Physics could affect ccs sin2β.

1) Predict sin2β from indirect constraints.

$$[\sin(2\beta)]^{prediction}_{\text{no}V_{ub}} = 0.87 \pm 0.09.$$

2) Compare to $c\bar{c}s$ measurement.

$$[\sin 2\beta]_{c\bar{c}s} = 0.672 \pm 0.023$$

3) Compare to clean penguin measurements.

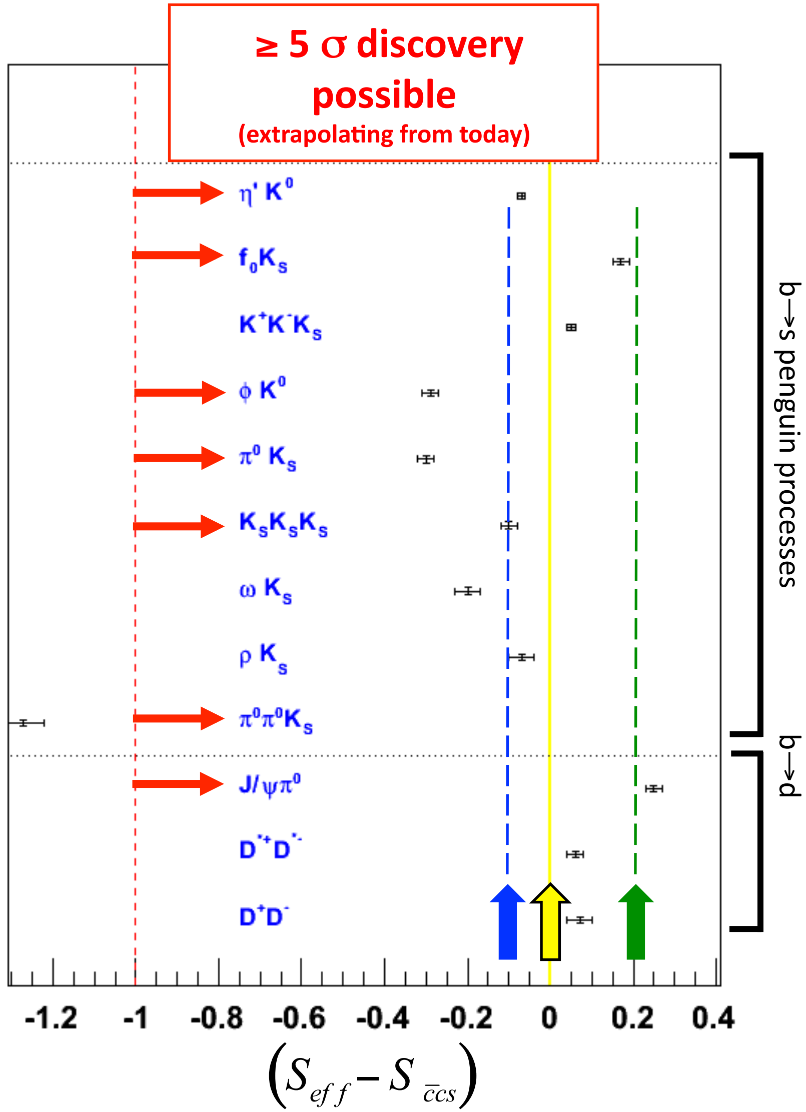
$$[\sin 2\beta]^{clean}_{b\rightarrow s-penguin} = 0.58 \pm 0.06$$

(or the average of the two)

Are these 2.1-2.7σ hints for new physics?

Lunghi and Soni, Phys.Lett.B**666** 162-165 (2008).
Buras and Guadagnoli Phys Rev D **78** 033005 (2008).

- **Can theory error be reduced for other modes?**



ΔS measurements

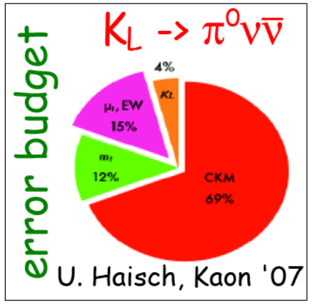
Mode	Current Precision			Predicted Precision (75 ab^{-1})			Discovery Potential	
	Stat.	Syst.	Th.	Stat.	Syst.	Th.	3σ	5σ
$J/\psi K_S^0$	0.022	0.010	< 0.01	0.002	0.005	< 0.001	0.02	0.03
$\eta' K_S^0$	0.08	0.02	0.014	0.006	0.005	0.014	0.05	0.08
$\phi K_S^0 \pi^0$	0.28	0.01	–	0.020	0.010	–	0.07	0.11
$f_0 K_S^0$	0.18	0.04	0.02	0.012	0.003	0.02	0.07	0.12
$K_S^0 K_S^0 K_S^0$	0.19	0.03	0.013	0.015	0.020	0.013	0.08	0.14
ϕK_S^0	0.26	0.03	0.02	0.020	0.010	0.005	0.09	0.14
$\pi^0 K_S^0$	0.20	0.03	0.025	0.015	0.015	0.025	0.10	0.16
ωK_S^0	0.28	0.02	0.035	0.020	0.005	0.035	0.12	0.21
$K^+ K^- K_S^0$	0.08	0.03	0.05	0.006	0.005	0.05	0.15	0.26
$\pi^0 \pi^0 K_S^0$	0.71	0.08	–	0.038	0.045	–	0.18	0.30
ρK_S^0	0.28	0.07	0.14	0.020	0.017	0.14	0.41	0.61
$J/\psi \pi^0$	0.21	0.04	–	0.016	0.005	–	0.05	0.08
$D^{*+} D^{*-}$	0.16	0.03	–	0.012	0.017	–	0.06	0.11
$D^+ D^-$	0.36	0.05	–	0.027	0.008	–	0.09	0.14

Decreasing error
Increasing importance

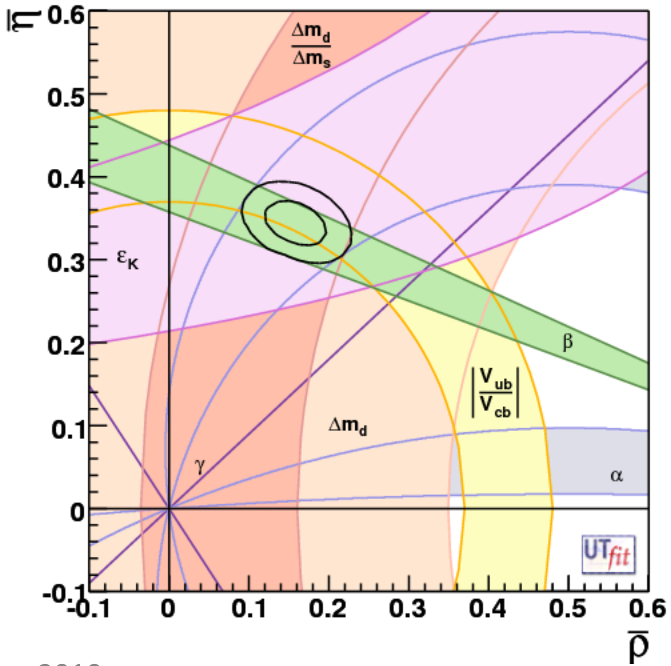
Precision CKM

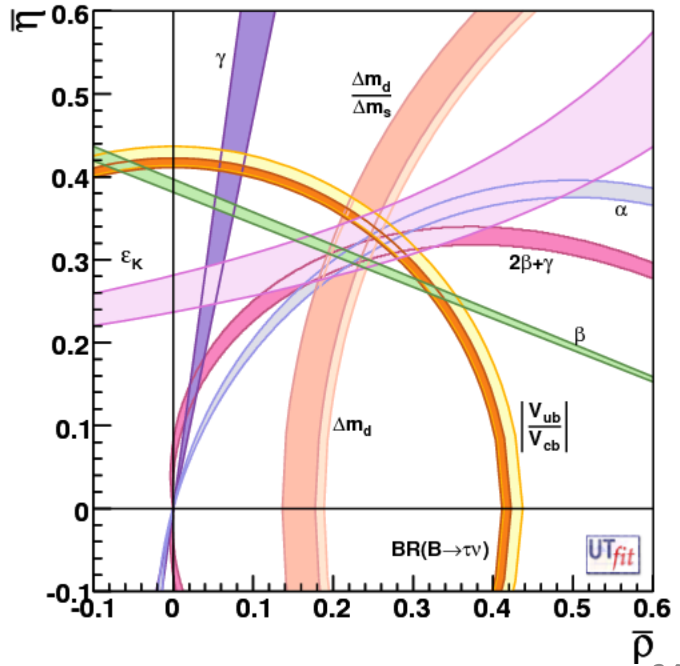
- CKM is a 36 year old ansatz.
- Works at the 10% level.
- No underlying physical insight.
- Small new physics contributions not ruled out (% level).

Precision CKM from SuperB will open up more new physics search opportunities: e.g. $K \rightarrow \pi\nu\nu$:



K^+ decay has a similar error budget.





B physics @ Υ(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 $(B \to \pi\pi)$	$\sim 16^\circ$	3°
α $(B \to \rho\rho)$	$\sim 7^\circ$	1–2° (∗)
α $(B \to \rho\pi)$	$\sim 12^\circ$	2°
α (combined)	$\sim 6^\circ$	1–2° (∗)
γ $(B \to DK,\, D \to CP$ eigenstates)	$\sim 15^\circ$	2.5°
γ $(B \to DK,\, D \to$ suppressed states)	$\sim 12^\circ$	2.0°
γ $(B \to DK,\, D \to$ multibody states)	$\sim 9^\circ$	1.5°
γ $(B \to DK$, combined)	$\sim 6^\circ$	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…

τ 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}
$\mathcal{B}(\tau \to \ell K^0_S)$	2×10^{-10}

Charm at Y(4S) and threshold

Mode	Observable	B Factories (2 ab^{-1})	Super$B$ (75 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}
$D^0 \to K^0_S\pi^+\pi^-$	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}		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°

To be evaluated at LHCb

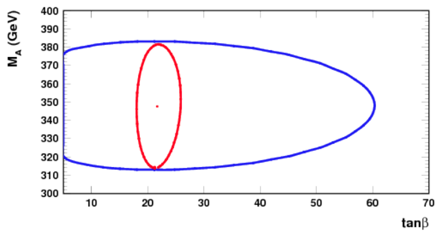
Channel	Sensitivity
$D^0 \to e^+e^-$, $D^0 \to \mu^+\mu^-$	1×10^{-8}
$D^0 \to \pi^0e^+e^-$, $D^0 \to \pi^0\mu^+\mu^-$	2×10^{-8}
$D^0 \to \eta e^+e^-$, $D^0 \to \eta\mu^+\mu^-$	3×10^{-8}
$D^0 \to K^0_S e^+e^-$, $D^0 \to K^0_S\mu^+\mu^-$	3×10^{-8}
$D^+ \to \pi^+e^+e^-$, $D^+ \to \pi^+\mu^+\mu^-$	1×10^{-8}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

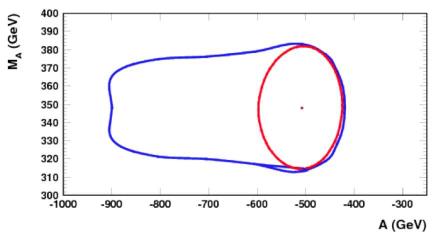
B_s at Y(5S)

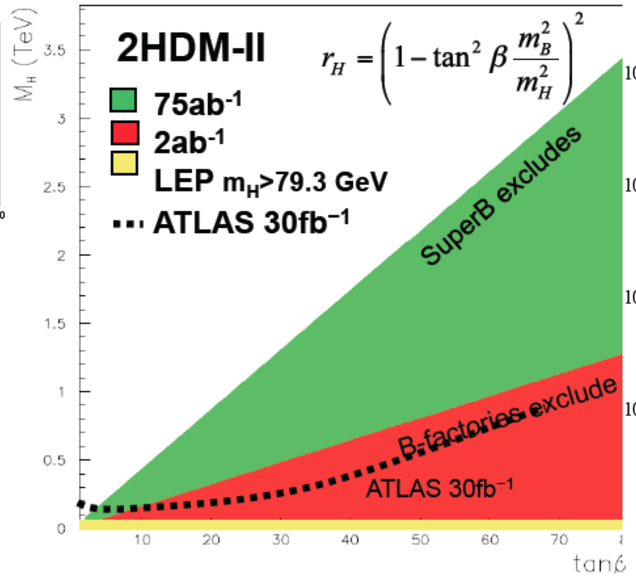
Observable	Error with 1 ab^{-1}	Error with 30 ab^{-1}
$\Delta\Gamma$	0.16 ps^{-1}	0.03 ps^{-1}
Γ	0.07 ps^{-1}	0.01 ps^{-1}
β_s from angular analysis	20°	8°
$A^s_{\rm SL}$	0.006	0.004
$A_{\rm CH}$	0.004	0.004
$\mathcal{B}(B_s \to \mu^+\mu^-)$	-	$< 8 \times 10^{-9}$
$\lvert V_{td}/V_{ts}\rvert$	0.08	0.017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

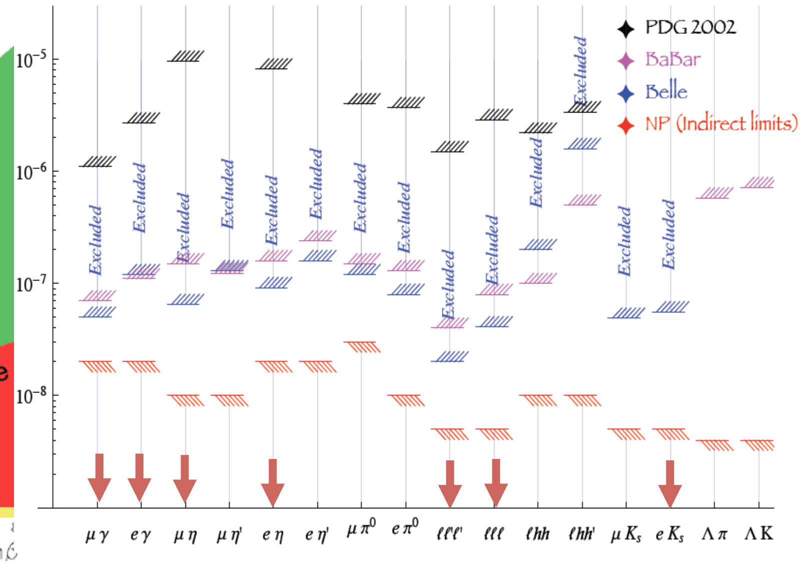
Bs : Definitively better at LHCb

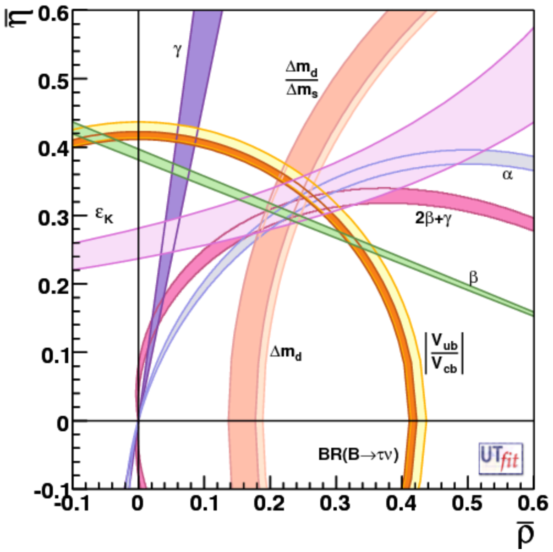
The Physics Case in 1 Page

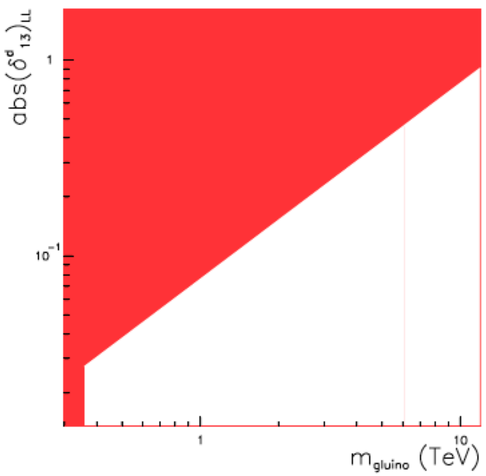


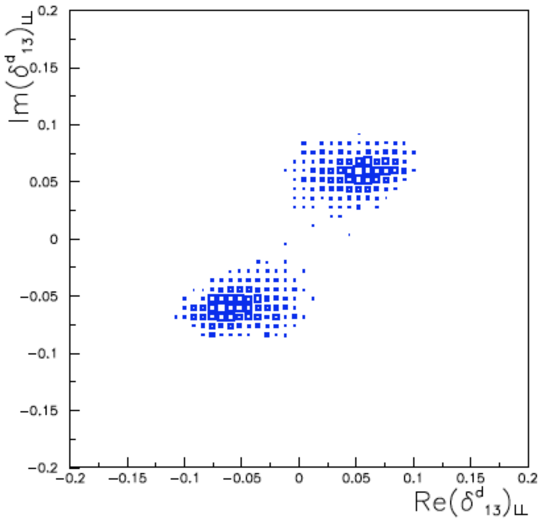












The Golden Matrix

- Each mode is a golden signature of new physics.
  – A priori we need to measure them all!

	H^+ high $\tan\beta$	MFV	Non-MFV	NP Z-penguins	Right-handed currents	LTH	SUSY
$\mathcal{B}(B \to X_s\gamma)$		L	M		M		
$\mathcal{A}_{CP}(B \to X_s\gamma)$			L		M		
$\mathcal{B}(B \to \tau\nu)$	L-CKM						
$\mathcal{B}(B \to X_s\ell\ell)$			M	M	M		
$\mathcal{B}(B \to K\nu\overline{\nu})$			M	L			
$S_{K_S\pi^0\gamma}$					L		
The angle β (ΔS)			L-CKM		L		
$\tau \to \mu\gamma$							L
$\tau \to \mu\mu\mu$						L	

... + charm + spectroscopy (DM /Light Higgs etc).

  – The physics white paper has a section on the task of trying to reconstruct features of the NP Lagrangian using SuperB.