Boštjan Golob
University of Ljubljana/Jožef Stefan Institute
& Belle/Belle II Collaboration

University of Ljubljana

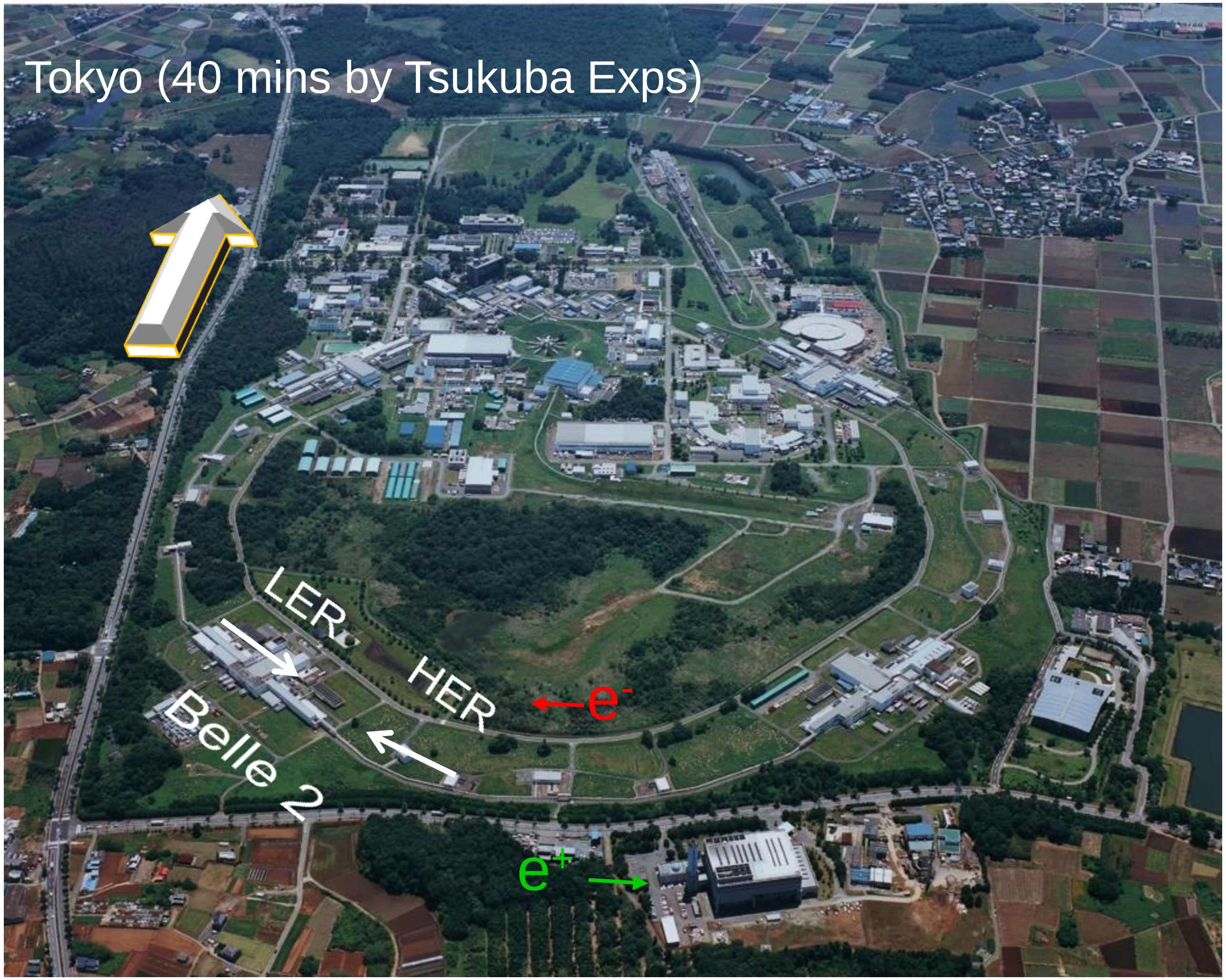
"Jožef Stefan" Institute

Belle II: Introduction

- Introduction
- Missing energy
- (Semi)Inclusive decays
- Neutrals
- Summary & Future (Belle perspective)

MIAPP, Flavour Physics with High-Luminosity Experiments

ACCELERATOR
"SUPERKEKB"



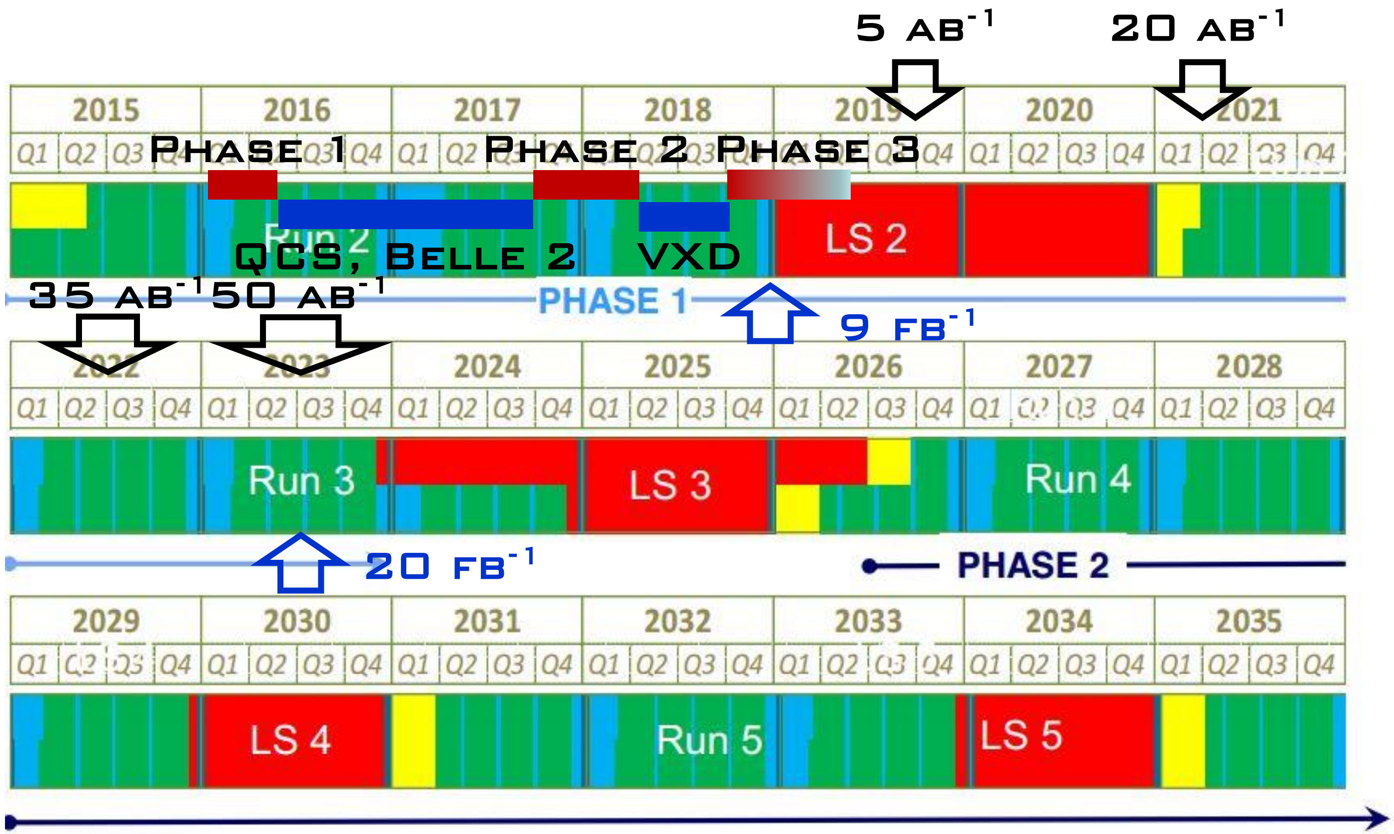
SUPERKEKB:

e⁻ (HER): 7.0 GeV
e⁺ (LER): 4.0 GeV

$E_{CMS} = M(\Upsilon(4S))c^2$

$dN_F/dt = \sigma(e^+e^- \to f)\,\mathcal{L}$
$\mathcal{L} = 8\times10^{35}\ cm^{-2}\ s^{-1}$

SUPER KEKB LUMINOSITY PLANNING



Phase 1:
w/o QCS
w/o Belle 2

Phase 2:
w/ QCS
w/ Belle 2
(no VXD)

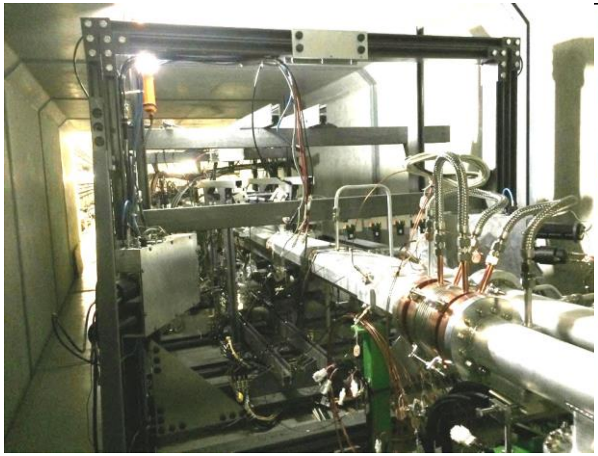
Phase 3:
full Belle 2

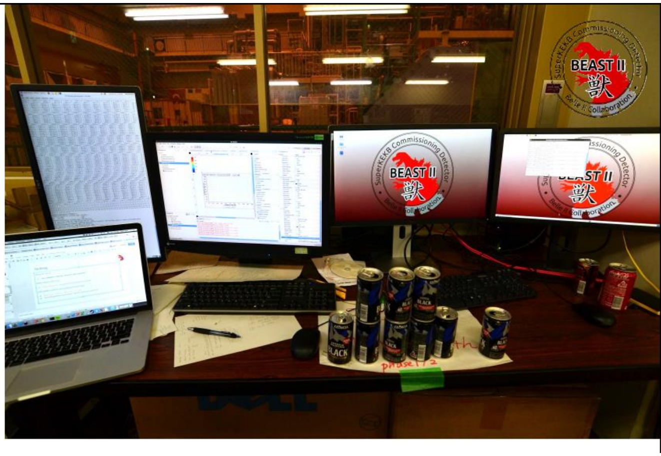
http://lhc-commissioning.web.cern.ch/lhc-commissioning/schedule/LHC%20schedule%20beyond%20LS1%20MTP%202015_Freddy_June2015.pdf

Belle 2 planning

P. Križan, Nov 11 afternoon

BEAST PHASE I: Simple background commissioning detector (diodes, TPCs, crystals). No final focus (i.e. no luminosity, single beam background studies possible). — Feb – Jun 2016



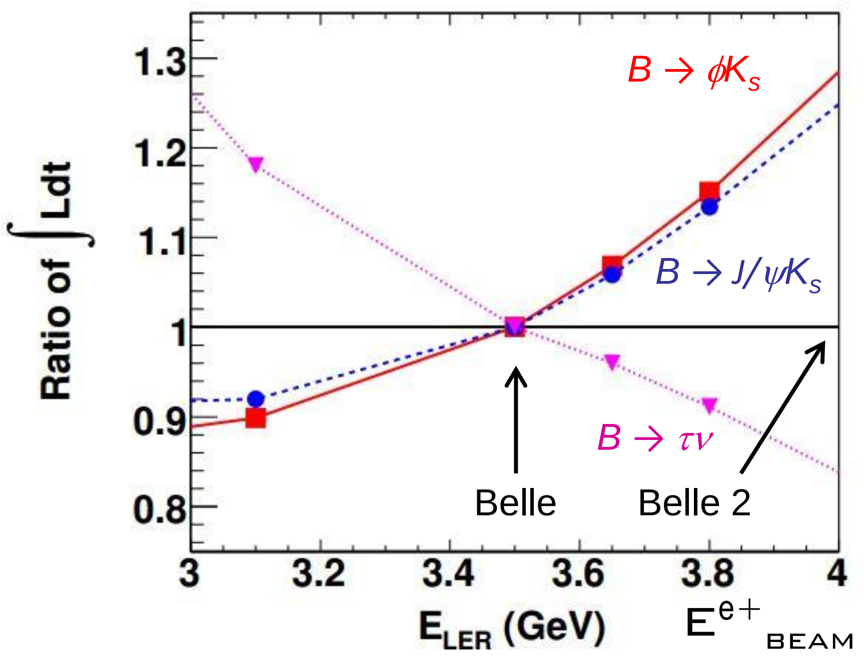


BEAST PHASE II: More elaborate inner background commissioning detector & full Belle II outer detector. Superconducting final focus, no vertex detectors. — Oct 2017 – Jan 2018

Physics Running — Oct 2018 $\rightarrow$

Introduction

Lumi ratio for same sensitivity



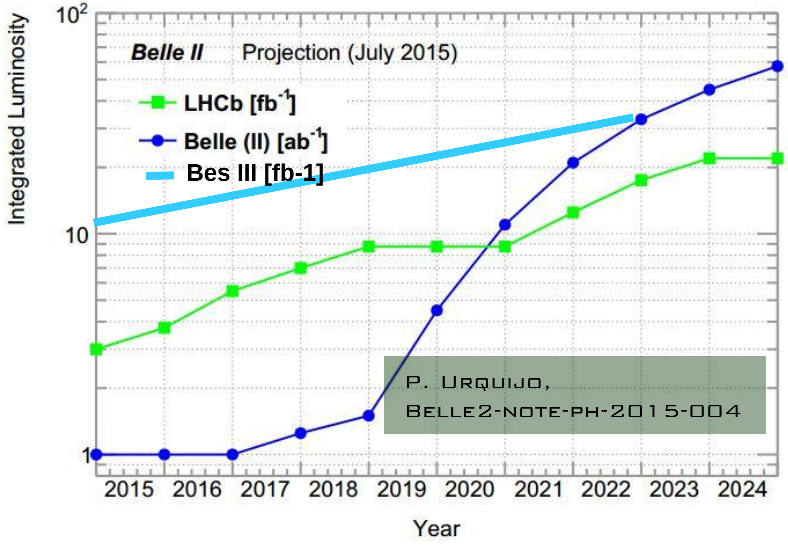
E^{e-}_{beam} from $\Upsilon(4S)$ mass

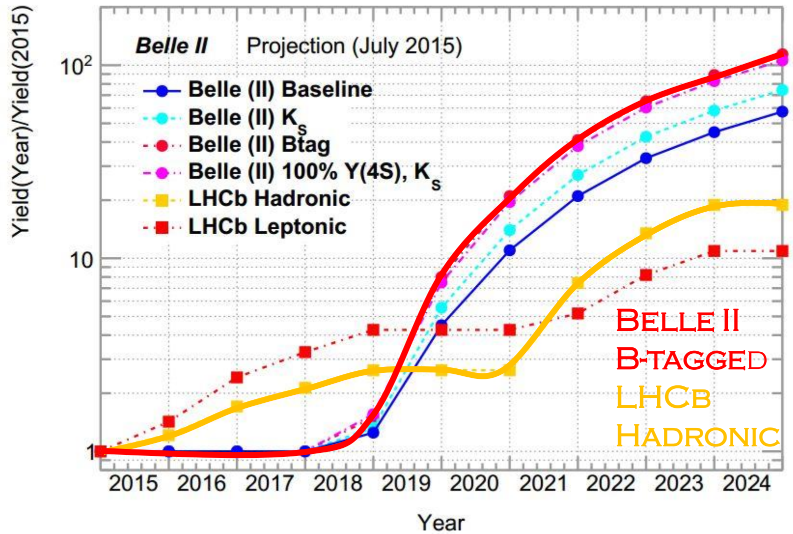
B. Golob, K. Trabelsi, P. Urquijo, Belle2-note-ph-2015-002

Belle 2: improved K_S reconstr.;
improved hadr. B tagging;

LHCb: $\sigma \propto \sqrt{s}$;
run 2 50% less eff. for hadronic triggers than run 1;
run 3 increase eff. for hadr. triggers by 2x w.r.t. run 1;

LHCb EPJC 73, 2373

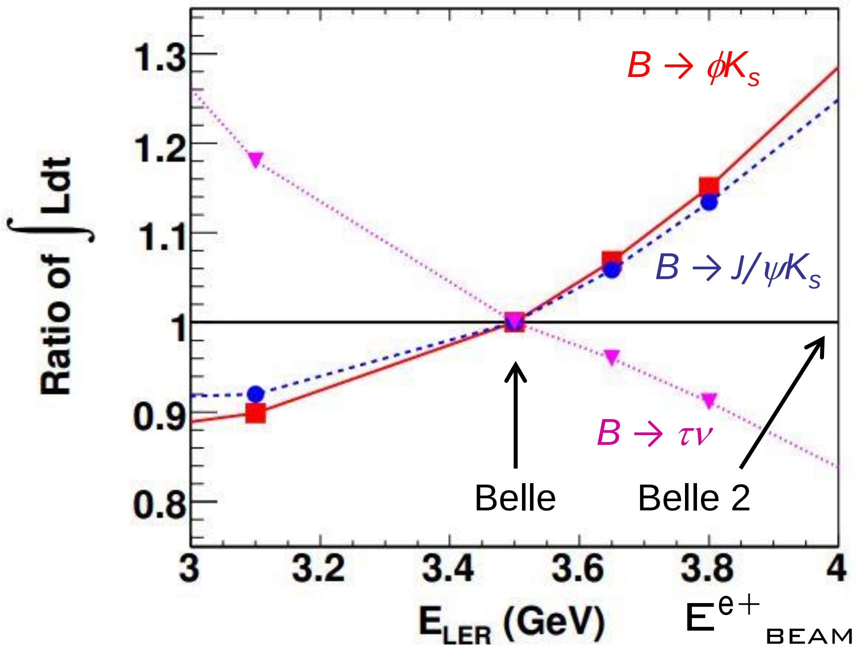




Relative yield increase

INTRODUCTION

LUMI RATIO FOR SAME SENSITIVITY



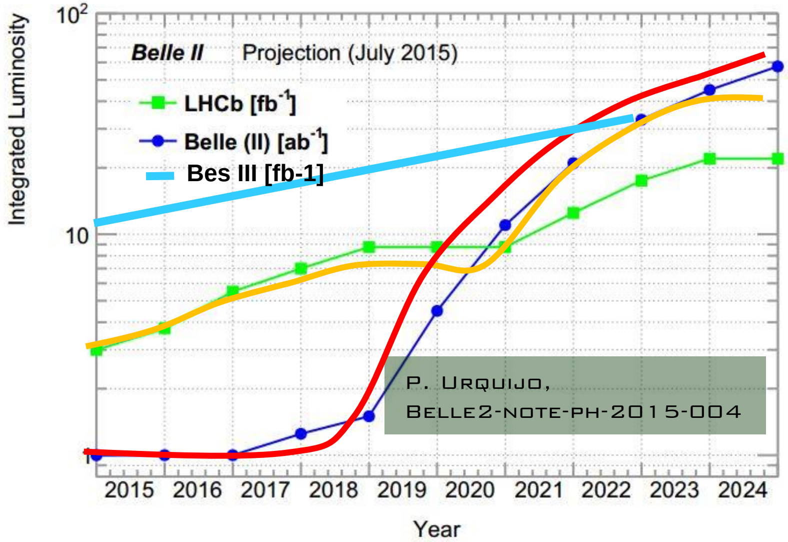
E^{e-}_{BEAM} FROM $\Upsilon(4S)$ MASS

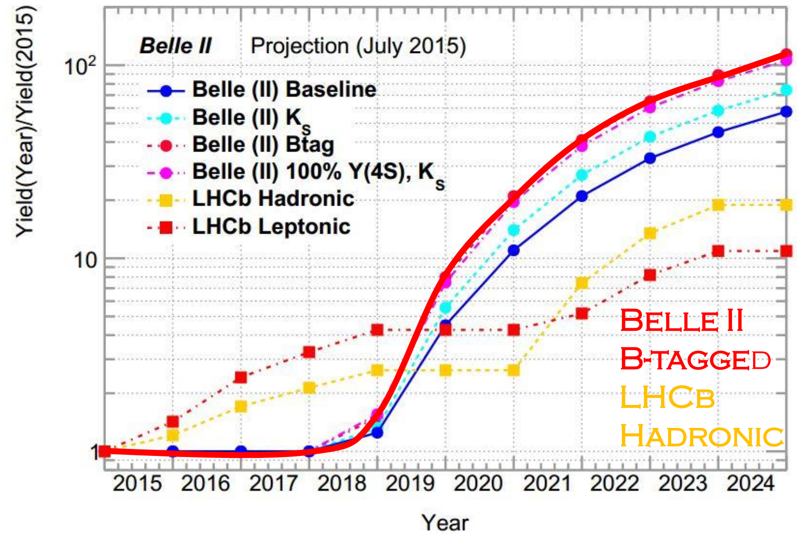
B. GOLOB, K. TRABELSI, P. URQUIJO, BELLE2-NOTE-PH-2015-002

BELLE 2: IMPROVED K_S RECONSTR.;
IMPROVED HADR. B TAGGING;

LHCB: $\sigma \propto \sqrt{s}$;
RUN 2 50% LESS EFF. FOR HADRONIC TRIGGERS THAN RUN 1;
RUN 3 INCREASE EFF. FOR HADR. TRIGGERS BY 2X W.R.T. RUN 1;

LHCB EPJC 73, 2373





RELATIVE YIELD INCREASE

EARLY RUNNING

- NEED TIME FOR CALIBRATION OF DETECTORS AT Υ(4S);
- MEASUREMENTS NOT REQUIRING SOPHISTICATED PID AND/OR VERTEX DETERMINATION;
- MAXIMIZE IMPACT ON EXISTING DATA SAMPLES (E.G. Υ(3S));

P. URQUIJO, NOV 1 MORNING

DARK MATTER

$e^+e^- \to \gamma A' \to \gamma \chi\chi$
($M_\chi < M_{A'}/2$)

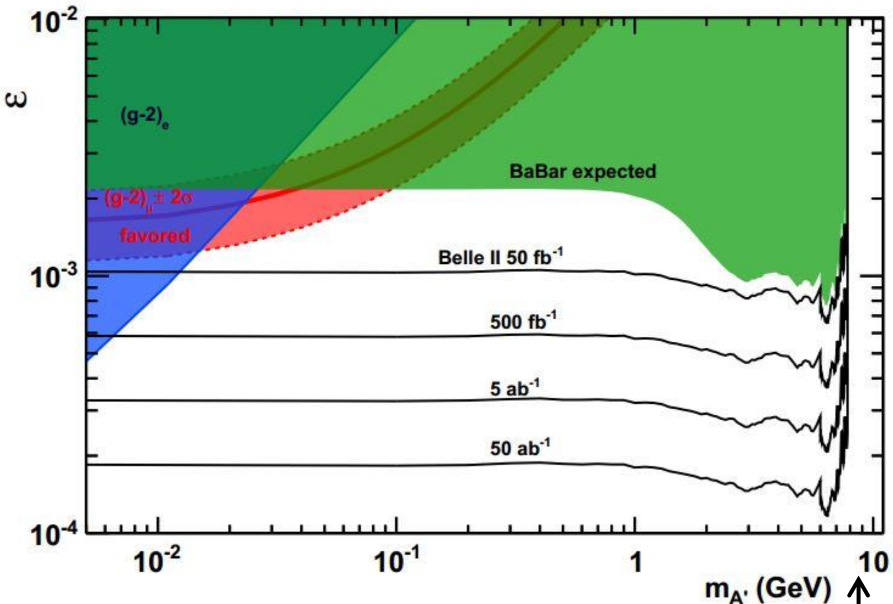
SINGLE γ TRIGGER REQUIRED;
SIMPLIFIED: SINGLE γ, $E_\gamma > E_{CUT}$;

HIGH BKG, HIGH TRIGGER RATE — LOW ε

E_{CUT}

MAIN BACKGROUNDS:
$e^+e^- \to \gamma e^+e^-$
$e^+e^- \to \gamma\gamma$

A. BONDAR ET AL., BELLE2-NOTE-PH-2015-003



ε: $\gamma A'$ COUPLING

$$M_{A'} < \sqrt{s - 2\sqrt{s}E_{cut}}$$

SUBJECTS

METHODS AND PROCESSES WHERE BELLE 2 CAN PROVIDE IMPORTANT INSIGHT INTO NP COMPLEMENTARY TO OTHER EXPERIMENTS:

E_{MISS}:
$\mathcal{B}(B \to \tau\nu)$, $\mathcal{B}(B \to X_c\tau\nu)$, $\mathcal{B}(B \to h\nu\nu)$,...

(SEMI)INCLUSIVE:
$\mathcal{B}(B \to s\gamma)$, $A_{CP}(B \to s\gamma)$, $\mathcal{B}(B \to s\ell\ell)$, ...

NEUTRALS:
$S(B \to K_S\pi^0\gamma)$, $S(B \to \eta' K_S)$, $S(B \to K_SK_SK_S)$, $\mathcal{B}(\tau \to \mu\gamma)$, $\mathcal{B}(B_s \to \gamma\gamma)$, ...

DETAILED DESCRIPTION OF PHYSICS PROGRAM AT BELLE 2 IN:

A.G. AKEROYD ET AL., ARXIV: 1002.5012

SuperB Progress Reports Physics

B. O'LEARY ET AL., ARXIV: 1008.1541

Physics at Super B Factory

ED. A.J. BEVAN, B. GOLOB, TH. MANNEL, S. PRELL, AND B.D. YABSLEY, EUR. PHYS. J. C74 (2014) 3026

B.G.,, K, TRABELSI, P. URQUIJO, BE LLE2-NOTE- PH-2015-002

IMPACT OF BELLE II ON FLAVOR PHYSICS

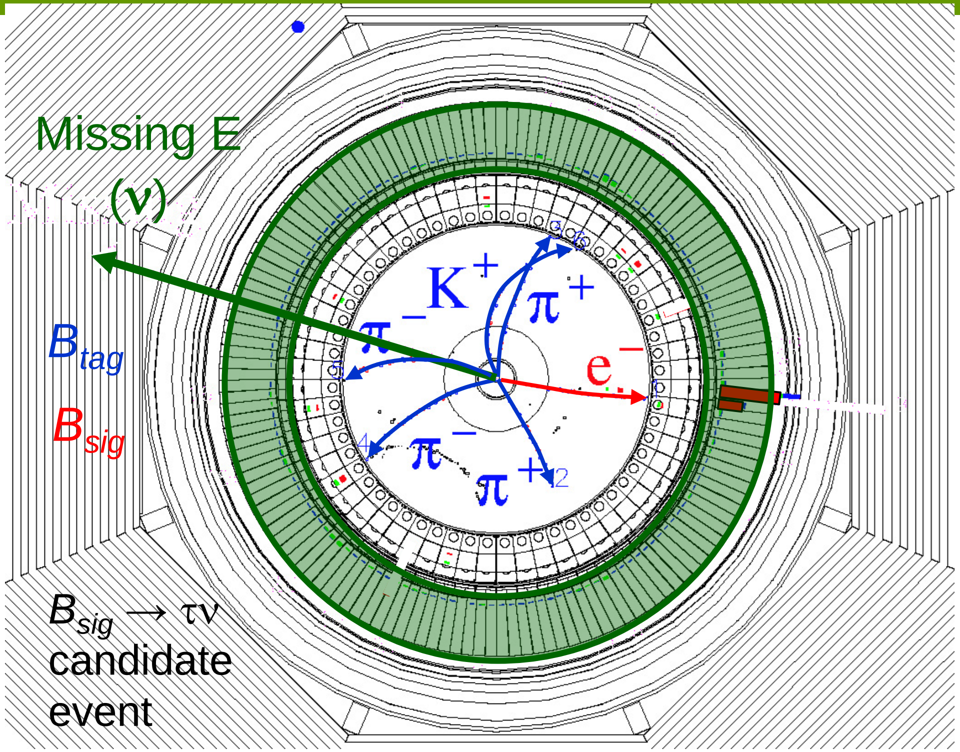
P. URQUIJO, BE LLE2-NOTE- PH-2015-002

BELLE II - LHCB MEASUREMENT EXTRAPOLATION COMPARISONS

ALSO:
B2TIP REPORT TO BE PREPARED

Missing energy

$B \to \tau\nu,\ H\nu\nu,\ X_c\tau\nu, \ldots$

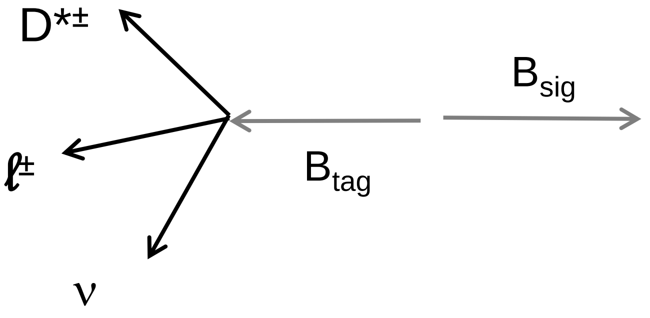


POSSIBLE TO RECONSTRUCT EVENTS WITH ν'S;

FULLY (PARTIALLY) RECONSTRUCT B_{TAG};
RECONSTRUCT $H^{\pm}$ FROM B_{SIG};
NO ADDITIONAL ENERGY IN EM CALORIM.;
SIGNAL AT $E_{ECL} \sim 0$;

PARTIAL RECONSTRUCTION (SEMILEPTONIC TAGGING):

$$\cos\theta_{B\text{-}D^*\ell} \equiv \frac{2E_{\rm beam}E_{D^*\ell} - m_B^2 - M_{D^*\ell}^2}{2|\vec{p}_B| \cdot |\vec{p}_{D^*\ell}|}$$



$\varepsilon_{TAG} \sim 1\%$

Missing energy

$B \to D^* \tau \nu$

A. Zupanc, Nov 11 morning

Belle, arXiv:1603.06711, 700 fb-1

ℓ =e,μ

R(D(*))

$$M^2_{\rm miss} = (p_{e^+e^-} - p_{\rm tag} - p_{D^{(*)}} - p_\ell)^2/c^2$$

R(D)$_{SM}$=0.300 ±0.008

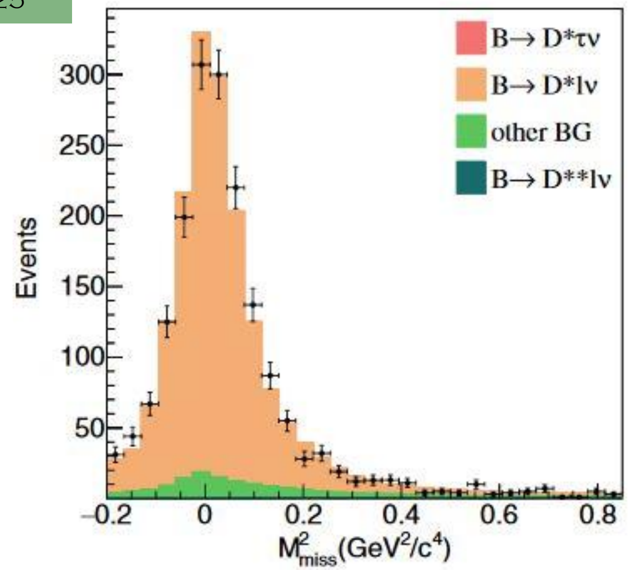
H. Na et al., Phys.Rev.D 92, 054410 (2015)

R(D*)$_{SM}$ =0.252 ±0.003

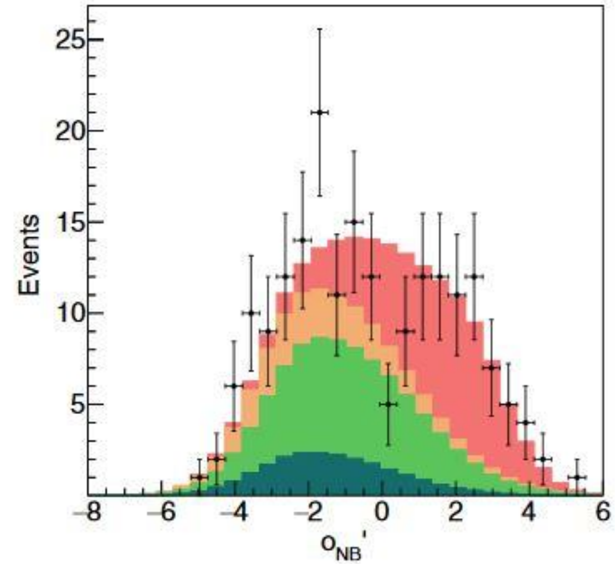
S.Fajfer et al., Phys.Rev.D85(2012) 094025

use NN with M^2_{miss}, E_{vis}, $\cos\theta^{sig}_{B\text{-}D^*\ell}$.

data sample with low M^2_{miss} used to fit the background contribution



signal is to the right →



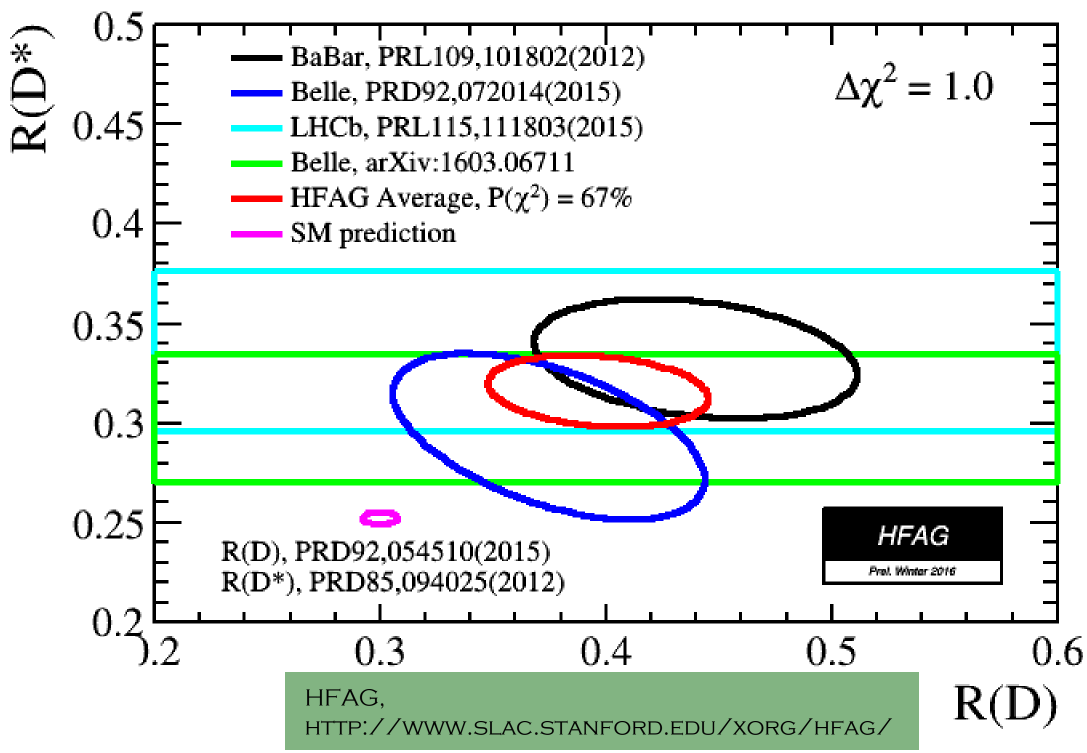
NN output for data with M^2_{miss} > 0.85 GeV^2

Missing energy

$B \to D^* \tau \nu$

$R(D^*) = 0.302 \pm 0.030 \pm 0.011$

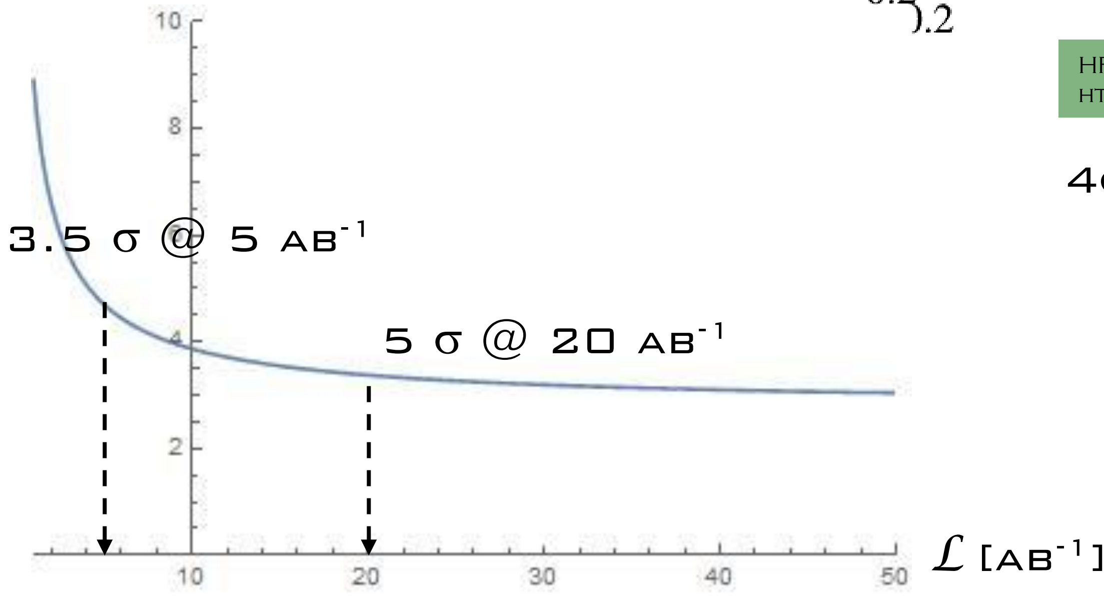
BELLE, ARXIV:1603.06711, 700 FB^{-1}



HFAG, HTTP://WWW.SLAC.STANFORD.EDU/XORG/HFAG/

4σ DISCREPANCY WITH SM

$\sigma(R(D^*))/R(D^{(*)})[\%]$



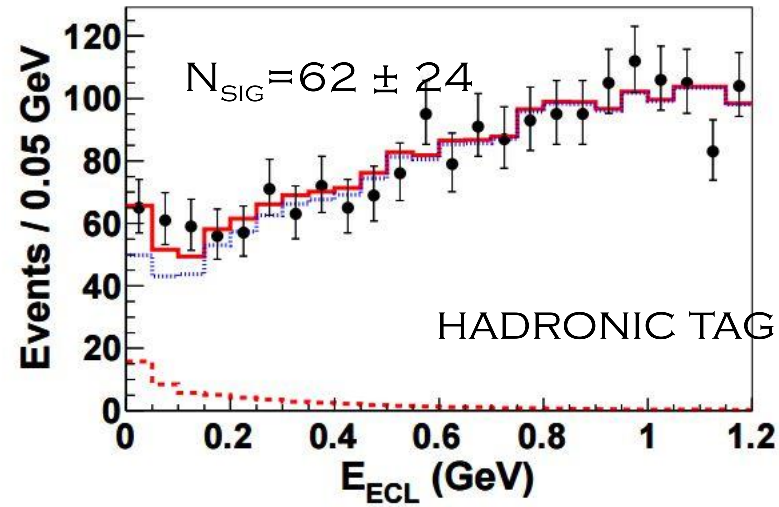
$B \to \tau\nu$

$\mathcal{B}(B^+ \to \tau^+\nu)=(0.72 \pm 0.26 \pm 0.11) \cdot 10^{-4}$

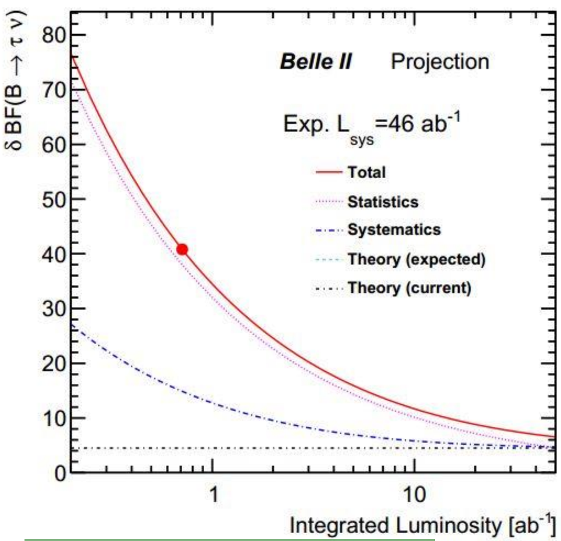
Belle, PRL110, 131801 (2013), 700 fb^{-1}

$\mathcal{B}(B^+ \to \tau^+\nu)=(1.25 \pm 0.28 \pm 0.27) \cdot 10^{-4}$

Belle, arXiv:1503.05613, 700 fb^{-1}



MAIN SYST. IS REDUCIBLE: BKG. ECL SHAPE, ε B_{TAG})



P. Urquijo,
BE LLE2-NOTE- PH-2015-002

PROJECTED ACCURACY ON $\mathcal{B}(B^+ \to \tau^+\nu)$

5x10^{-6}

CORRESPONDING $|V_{UB}|$ UNCERTAINTY (EXP.):

SEMIL. TAG, 50 ab^{-1}: 4.5%
HADR. TAG, 50 ab^{-1}: 3.5%

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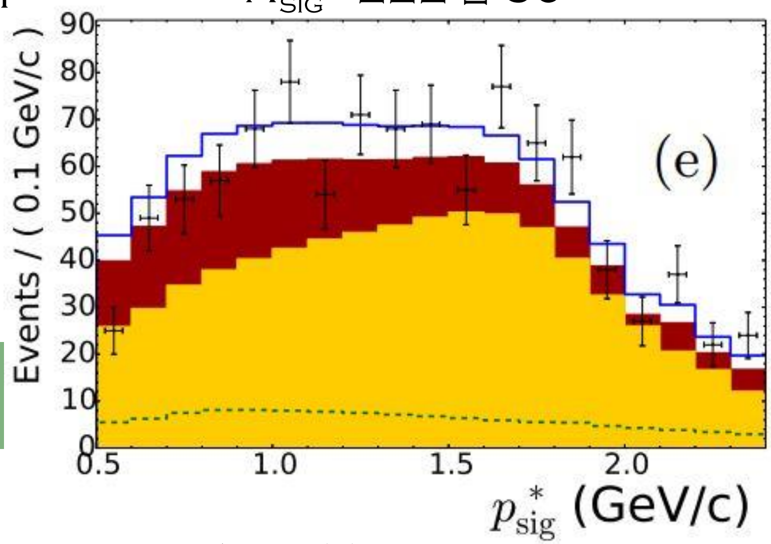
P. Urquijo,
Belle2-note-ph-2015-002

N_{SIG}=222 ± 50



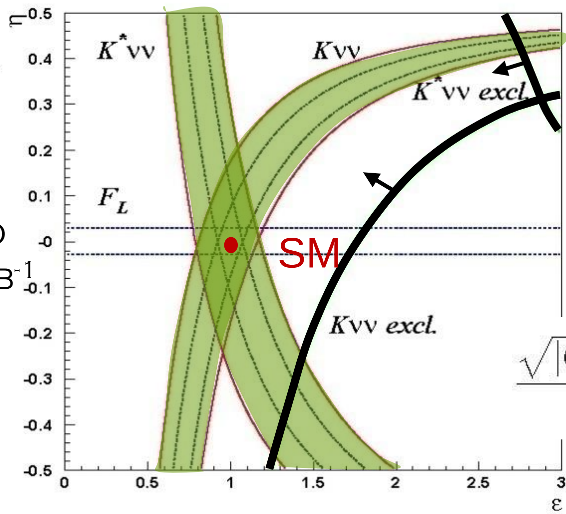
SEMIL. TAG

B →K(*)νν

BR'S EXPECTED TO BE „MEASURED" TO 30%

$$\frac{-\mathrm{Re}\,(C_L^{\nu} C_R^{\nu *})}{|C_L^{\nu}|^2 + |C_R^{\nu}|^2}$$

APPROX. EXPECTED PRECISION @ 50 AB^{-1}



$$\frac{\sqrt{|C_L^{\nu}|^2 + |C_R^{\nu}|^2}}{|(C_L^{\nu})^{\mathrm{SM}}|}$$

W. ALTMANNSHOFER ET AL., ARXIV:0902.0160

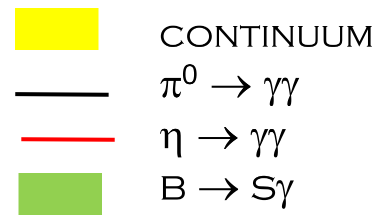
A. ISHIKAWA, NOV 9 AFTERNOON
T. HURTH, NOV 14 MORNING

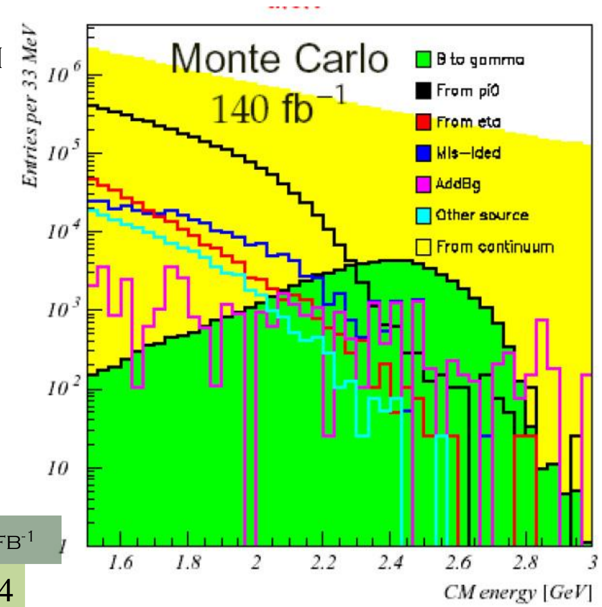
Inclusive

B → s(+d) γ

Experimental challenge:
huge bkg;
only γ reconstructed in the signal side

$1.26\ \text{GeV} < E < 2.20\ \text{GeV}$

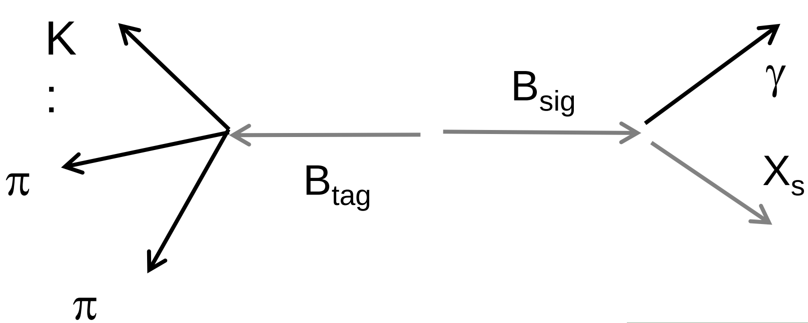


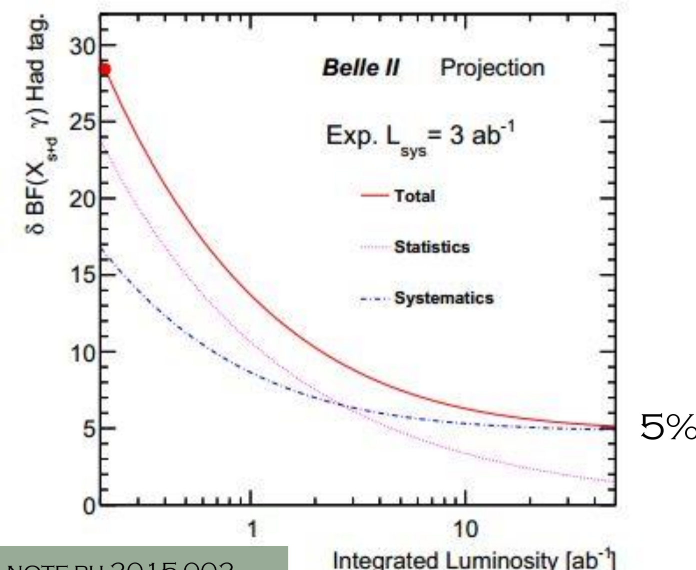


Belle, PRL103, 241801, (2008), 605 fb^{-1}

$$Br(B \to X_s\gamma; 1.7\,GeV < E_\gamma) = (3.47 \pm 0.15 \pm 0.40)\cdot 10^{-4}$$

different method: hadronic tagging (= full reconstruction of B_{TAG});
reduction of system.uncertainty on the account of lower efficiency (ε_{HAD} ~ 0.5%);





B. Golob, K. Trabelsi, P. Urquijo,, BELLE2-NOTE-PH-2015-002

B → D γ

WITHIN SM: $Br(B \to d\gamma) / Br(B \to s\gamma) = (3.8 \pm 0.5) \cdot 10^{-2}$

T. HURTH ET AL., NUCL.PHYS. B704, 56 (2005)

(RATIO CAN BE USED TO DETERMINE $|V_{TD}/V_{TS}|$)

$Br(B \to s\gamma) = 3.4 \cdot 10^{-4}$

$Br(B \to d\gamma)$ SHOULD BE MEASURED WITH AN ACCURACY OF $\sim 2 \cdot 10^{-6}$

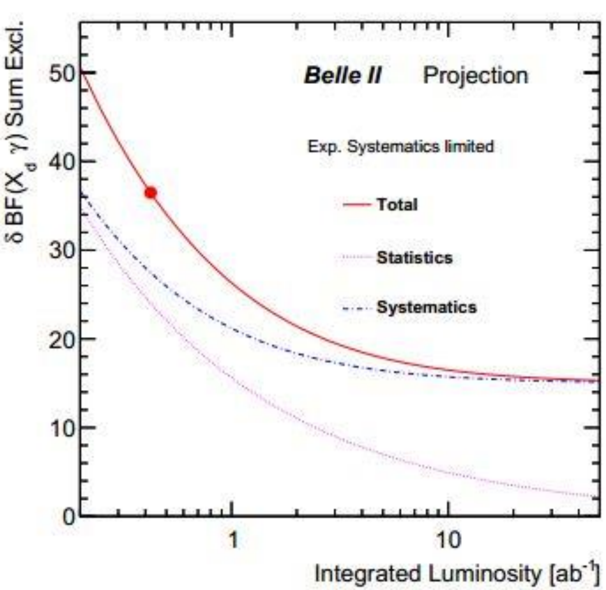
SUM OF EXCLUSIVE MODES: $\sigma(Br(d\gamma)) = (\pm 3 \pm 1) \cdot 10^{-7}$ LOW X_D MASS REGION

BABAR, PRD82, 051101 (2010), 0.4AB-1 $\sigma(Br(d\gamma)) = (\pm 20 \pm 22) \cdot 10^{-7}$ HIGH X_D MASS REGION

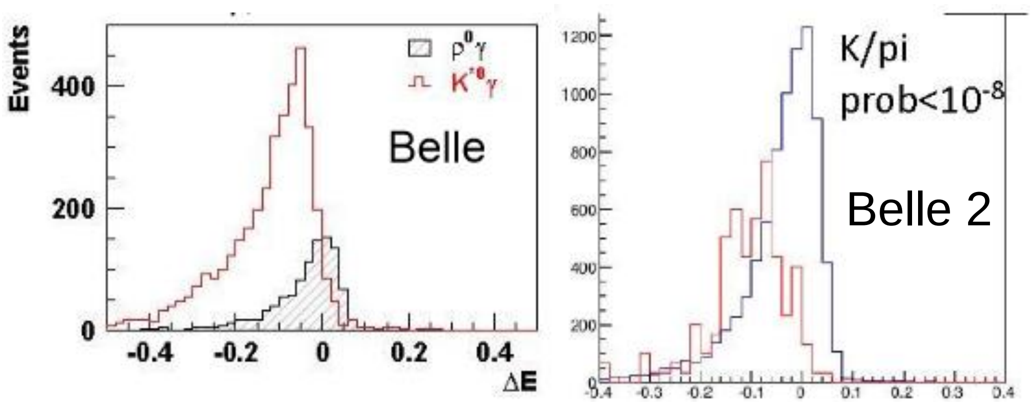
LARGEST SYST. UNCERTAINTY:
$B \to s\gamma$ BKG.;
MISSING (>= 5 BODY) MODES;

SIGNIFICANT IMPROVEMENT NECESSARY

BELLE/BELLE 2 FULL SIMULATION:



15%



$B^0 \to K^*(K\pi)\gamma$, $B^0 \to \rho(\pi\pi)\gamma$,
$\Delta E = E_B^* - E_{BEAM}$

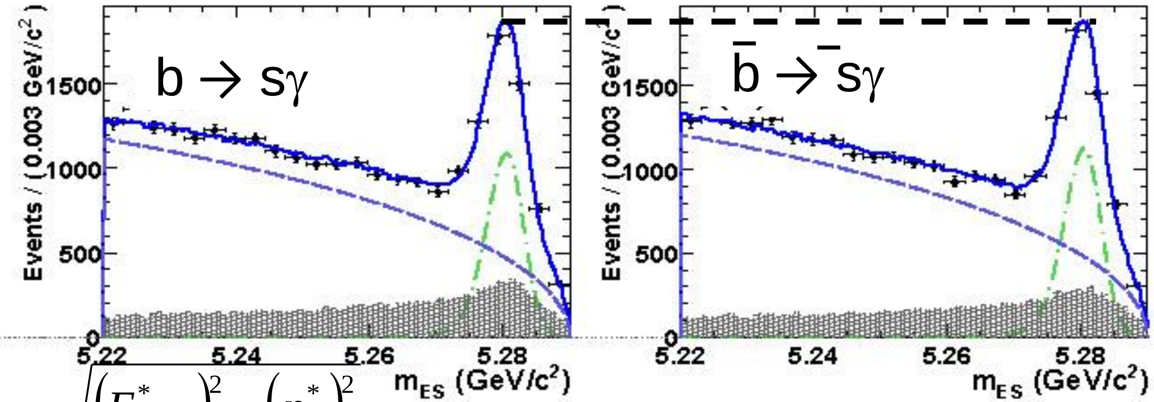
$B \rightarrow s\gamma$ direct CPV

BaBar, PRL101, 171804(2008),350 fb[-1]

$$\frac{N_b - N_{\bar{b}}}{N_b + N_{\bar{b}}} = \langle D \rangle A_{CP} + \Delta D + A_{det}$$

Semi-inclusive, sum of many exclusive states:

all flavor specific final states;



$$M_{bc} = \sqrt{\left(E^*_{beam}\right)^2 - \left(p^*_B\right)^2}$$

<D>: average dilution due to flavour mistag, ~1

ΔD: difference between flavour mistag for B and B̄, << 1

A_{DET}: detector induced asymmetry

A_{DET}: careful study of K/π asymmetries in (p, θ_{lab}) using *D* decays or inclusive tracks from fragmentation;

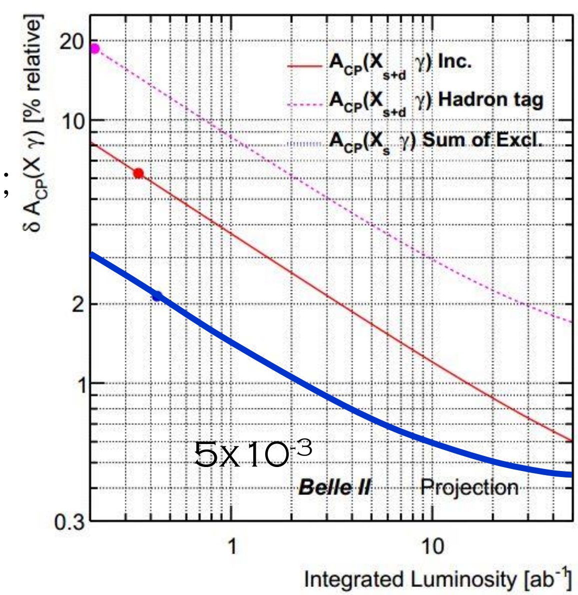
$$A_{CP} = (-0.8 \pm 2.9)\%$$

HFAG, 2014

SM: $A_{CP} \sim (0.44 \pm^{0.24}_{0.14})\%$

T. Hurth et al., Nucl.Phys. B704, 56 (2005)

lots of work on system.,
→ few 10^{-3}
exp. sensitivity



A. Lenz, Oct 26 morning
L. LiGioi, Oct 26 afternoon
T. Hurth, Nov 14 morning

DCPV PUZZLE:

TREE+PENGUIN PROCESSES, $B^{+(0)} \to K^+\pi^{0(-)}$

$\Delta A_{K\pi} = A(K^+\pi^-) - A(K^+\pi^0) = -0.147 \pm 0.028$

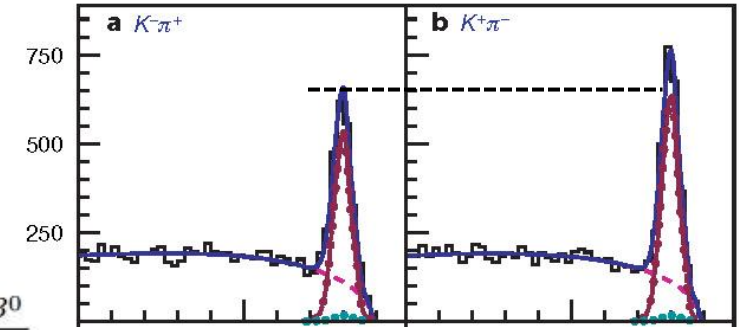
BELLE, NATURE 452, 332 (2008), 480 FB^{-1}

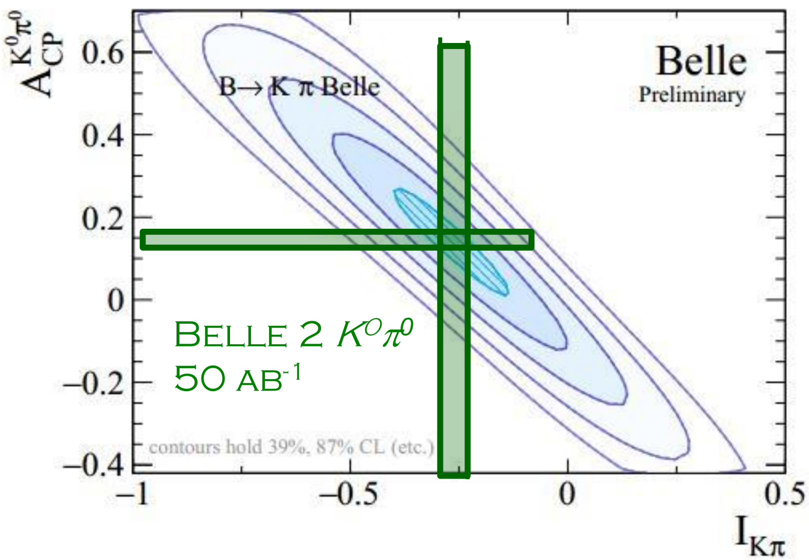
$I_{K\pi}\,\mathcal{B}(B^0 \to K^+\pi^-)$

$$= A_{CP}^{K^+\pi^-} \cdot \mathcal{B}(B^0 \to K^+\pi^-) + A_{CP}^{K^0\pi^-} \cdot \mathcal{B}(B^+ \to K^0\pi^-)\frac{\tau_{B^0}}{\tau_{B^+}}$$
$$- 2A_{CP}^{K^0\pi^0} \cdot \mathcal{B}(B^0 \to K^0\pi^0) + 2A_{CP}^{K^+\pi^0} \cdot \mathcal{B}(B^+ \to K^+\pi^0)\frac{\tau_{B^0}}{\tau_{B^+}}$$

M. GRONAU, PLB627, 82 (2005);
D. ATWOOD, A. SONI, PRD58, 036005 (1998)

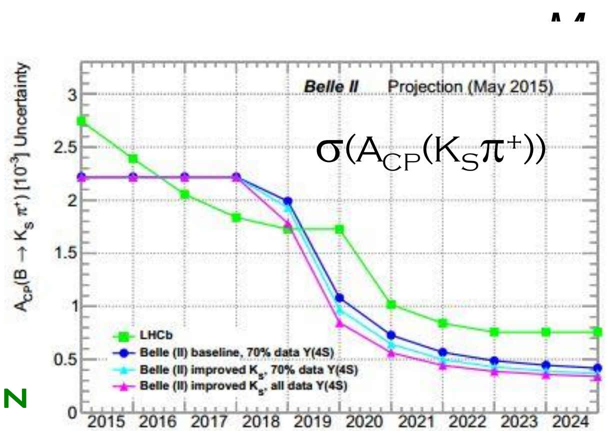
$B^0 \to K^+\pi^-$

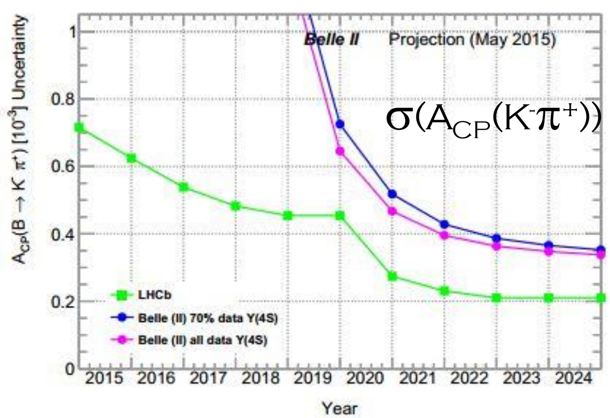




B. GOLOB, K. TRABELSI, P. URQUIJO,, BELLE2-NOTE-PH-2015-002

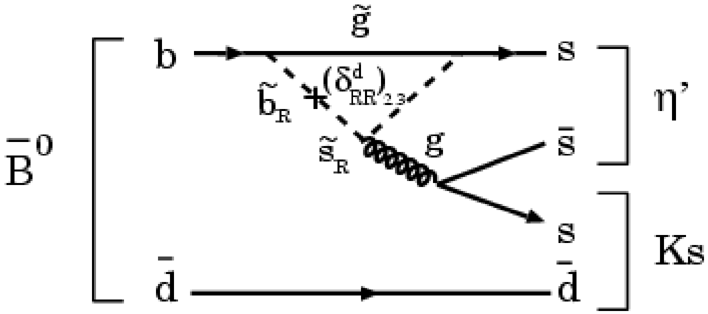
P. GOLDENZWEIG,
NOV 8 AFTERNOON



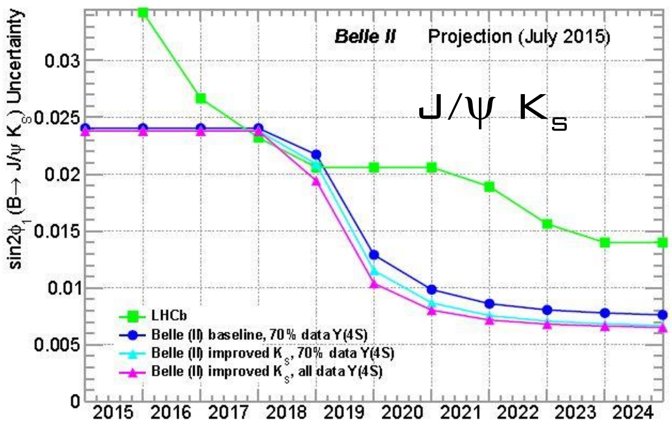


CPV in $B \to SQQ$

some uncertainties cancel in ΔS
(vtx reconstr., flavor tag, likelihood fit) ;
better K_S eff. with vtx hits - larger vtx radius, 30%);
vtx reconstr. improved with better tracking;

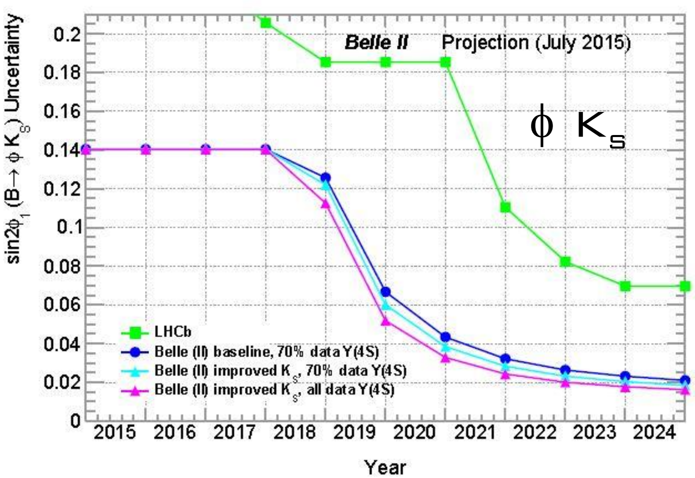


41 new phases in MSSM
$\Delta S = \sin 2\phi_1^{eff} - \sin 2\phi_1$



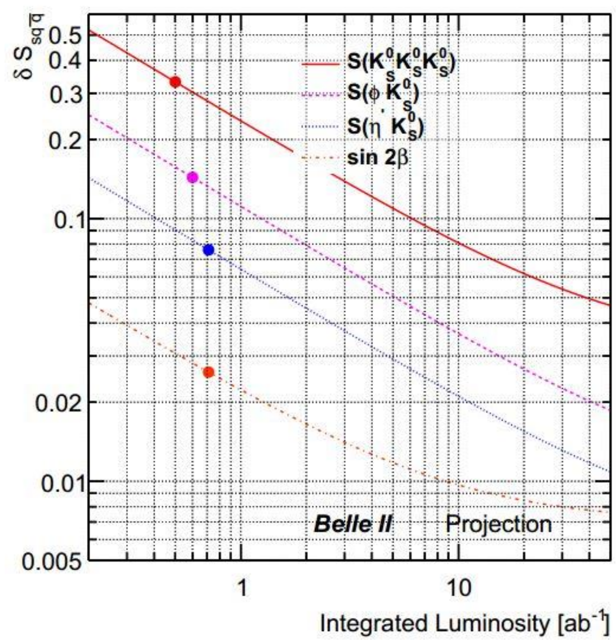
0.007

A. Lenz, Oct 26 morning
L. LiGioi, Oct 26 afternoon



0.02

P. Urquijo, Belle2-note-ph-2015-004



0.045
0.020

B. Golob, K. Trabelsi, P. Urquijo, Belle2-note-ph-2015-002

SUMMARY (BELLE PERSPECTIVE)

	Observables	Belle or LHCb* (2014)	Belle II 5 ab^{-1}	Belle II 50 ab^{-1}	LHCb 8 fb^{-1} (2018)		LHCb 50 fb^{-1}
UT angles	$\sin 2\beta$	$0.667 \pm 0.023 \pm 0.012 (0.9^\circ)$	0.4°	0.3°	0.6°	~	0.3°
	α [°]	85 ± 4 (Belle+BaBar)	2	1			
	γ [°] ($B \to D^{(*)} K^{(*)}$)	68 ± 14	6	1.5	4	!	1
	$2\beta_s (B_s \to J/\psi\phi)$ [rad]	$0.07 \pm 0.09 \pm 0.01^*$			0.025	!	0.009
Gluonic penguins	$S(B \to \phi K^0)$	$0.90^{+0.09}_{-0.19}$	0.053	0.018	0.2	?	0.04
	$S(B \to \eta' K^0)$	$0.68 \pm 0.07 \pm 0.03$	0.028	0.011			
	$S(B \to K^0_S K^0_S K^0_S)$	$0.30 \pm 0.32 \pm 0.08$	0.100	0.033			
	$\beta_s^{\text{eff}} (B_s \to \phi\phi)$ [rad]	$-0.17 \pm 0.15 \pm 0.03^*$			0.12	!	0.03
	$\beta_s^{\text{eff}} (B_s \to K^{*0} \bar{K}^{*0})$ [rad]	–			0.13		0.03
Direct CP in hadronic Decays	$\mathcal{A}(B \to K^0 \pi^0)$	$-0.05 \pm 0.14 \pm 0.05$	0.07	0.04		?	
UT sides	$\lvert V_{cb} \rvert$ incl.	$41.6 \cdot 10^{-3} (1 \pm 2.4\%)$	1.2%				
	$\lvert V_{cb} \rvert$ excl.	$37.5 \cdot 10^{-3} (1 \pm 3.0\%_{\text{ex.}} \pm 2.7\%_{\text{th.}})$	1.8%	1.4%		~	
	$\lvert V_{ub} \rvert$ incl.	$4.47 \cdot 10^{-3} (1 \pm 6.0\%_{\text{ex.}} \pm 2.5\%_{\text{th.}})$	3.4%	3.0%		!	
	$\lvert V_{ub} \rvert$ excl. (had. tag.)	$3.52 \cdot 10^{-3} (1 \pm 10.8\%)$	4.7%	2.4%		!	
Leptonic and Semi-tauonic	$\mathcal{B}(B \to \tau\nu)$ $[10^{-6}]$	$96(1 \pm 26\%)$	10%	5%		~	
	$\mathcal{B}(B \to \mu\nu)$ $[10^{-6}]$	< 1.7	20%	7%			
	$R(B \to D\tau\nu)$ [Had. tag]	$0.440(1 \pm 16.5\%)^\dagger$	5.6%	3.4%		~	
	$R(B \to D^*\tau\nu)^\dagger$ [Had. tag]	$0.332(1 \pm 9.0\%)^\dagger$	3.2%	2.1%	...	!	
Radiative	$\mathcal{B}(B \to X_s\gamma)$	$3.45 \cdot 10^{-4} (1 \pm 4.3\% \pm 11.6\%)$	7%	6%			
	$A_{CP}(B \to X_{s,d}\gamma)$ $[10^{-2}]$	$2.2 \pm 4.0 \pm 0.8$	1	0.5			
	$S(B \to K^0_S \pi^0 \gamma)$	$-0.10 \pm 0.31 \pm 0.07$	0.11	0.035			
	$2\beta_s^{\text{eff}} (B_s \to \phi\gamma)$	–			0.13	!	0.03
	$S(B \to \rho\gamma)$	$-0.83 \pm 0.65 \pm 0.18$	0.23	0.07			
	$\mathcal{B}(B_s \to \gamma\gamma)$ $[10^{-6}]$	< 8.7	0.3	–			
Electroweak penguins	$\mathcal{B}(B \to K^{*+} \nu\bar{\nu})$ $[10^{-6}]$	< 40	< 15	30%			
	$\mathcal{B}(B \to K^{+} \nu\bar{\nu})$ $[10^{-6}]$	< 55	< 21	30%			
	C_7/C_9 $(B \to X_s \ell\ell)$	~20%	10%	5%			
	$\mathcal{B}(B_s \to \tau\tau)$ $[10^{-3}]$	–	< 2	–			
	$\mathcal{B}(B_s \to \mu\mu)$ $[10^{-9}]$	$2.9^{+1.1}_{-1.0}$*			0.5	!	0.2
		20..	20	23	18		27?

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Disclaimer:
personal statements
on importance of ind. processes;

? probably not so interesting because SM value can be reached/tested

~ medium interesting, may depend on other measurements

! important to improve

Summary (Belle perspective)

	Observables	Belle or LHCb* (2014)	Belle II 5 ab^{-1}	Belle II 50 ab^{-1}	LHCb 8 fb^{-1} (2018)		LHCb 50 fb^{-1}	
UT angles	$\sin 2\beta$	$0.667 \pm 0.023 \pm 0.012 (0.9°)$	0.4°	0.3°	0.6°	~	0.3°	Depending on $\vert V_{ub}\vert$
	α [°]	85 ± 4 (Belle+BaBar)	2	1				
	γ [°] $(B \to D^{(*)}K^{(*)})$	68 ± 14	6	1.5	4	!	1	„standard candle“
	$2\beta_s(B_s \to J/\psi\phi)$ [rad]	$0.07 \pm 0.09 \pm 0.01^*$			0.025	!	0.009	
Gluonic penguins	$S(B \to \phi K^0)$	$0.90^{+0.09}_{-0.19}$	0.053	0.018	0.2	?	0.04	SM expectation reached
	$S(B \to \eta' K^0)$	$0.68 \pm 0.07 \pm 0.03$	0.028	0.011				
	$S(B \to K^0_S K^0_S K^0_S)$	$0.30 \pm 0.32 \pm 0.08$	0.100	0.033				
	$\beta_s^{\rm eff}(B_s \to \phi\phi)$ [rad]	$-0.17 \pm 0.15 \pm 0.03^*$			0.12	!	0.03	reaching SM prediction (≤ 0.02)
	$\beta_s^{\rm eff}(B_s \to K^{*0}\bar{K}^{*0})$ [rad]	–			0.13		0.03	
Direct CP in hadronic Decays	$\mathcal{A}(B \to K^0\pi^0)$	$-0.05 \pm 0.14 \pm 0.05$	0.07	0.04		?		$\sigma(I_{K\pi}) \sim \sigma(A_{K0\pi0})$, $I_{K\pi} = -0.27 \pm 0.14$
UT sides	$\vert V_{cb}\vert$ incl.	$41.6 \cdot 10^{-3}(1 \pm 2.4\%)$	1.2%					
	$\vert V_{cb}\vert$ excl.	$37.5 \cdot 10^{-3}(1 \pm 3.0\%_{\rm ex.} \pm 2.7\%_{\rm th.})$	1.8%	1.4%		~		exceeding SM precision
	$\vert V_{ub}\vert$ incl.	$4.47 \cdot 10^{-3}(1 \pm 6.0\%_{\rm ex.} \pm 2.5\%_{\rm th.})$	3.4%	3.0%		!		to reach SM precision
	$\vert V_{ub}\vert$ excl. (had. tag.)	$3.52 \cdot 10^{-3}(1 \pm 10.8\%)$	4.7%	2.4%		!		Probably most precise determination
Leptonic and Semi-tauonic	$\mathcal{B}(B \to \tau\nu)$ [10^{-6}]	$96(1 \pm 26\%)$	10%	5%		~		Depending on $\vert V_{ub}\vert$, current SM ±13%
	$\mathcal{B}(B \to \mu\nu)$ [10^{-6}]	< 1.7	20%	7%				
	$R(B \to D\tau\nu)$ [Had. tag]	$0.440(1 \pm 16.5\%)^\dagger$	5.6%	3.4%		~		current SM precision (~5%) will probably be improved
	$R(B \to D^*\tau\nu)^\dagger$ [Had. tag]	$0.332(1 \pm 9.0\%)^\dagger$	3.2%	2.1%	...	!		To reach SM precision (~1%-2%)
Radiative	$\mathcal{B}(B \to X_s\gamma)$	$3.45 \cdot 10^{-4}(1 \pm 4.3\% \pm 11.6\%)$	7%	6%				
	$A_{CP}(B \to X_{s,d}\gamma)$ [10^{-2}]	$2.2 \pm 4.0 \pm 0.8$	1	0.5				
	$S(B \to K^0_S\pi^0\gamma)$	$-0.10 \pm 0.31 \pm 0.07$	0.11	0.035				
	$2\beta_s^{\rm eff}(B_s \to \phi\gamma)$	–			0.13	!	0.03	
	$S(B \to \rho\gamma)$	$-0.83 \pm 0.65 \pm 0.18$	0.23	0.07				
	$\mathcal{B}(B_s \to \gamma\gamma)$ [10^{-6}]	< 8.7	0.3	–				
Electroweak penguins	$\mathcal{B}(B \to K^{*+}\nu\overline{\nu})$ [10^{-6}]	< 40	< 15	30%				
	$\mathcal{B}(B \to K^{+}\nu\overline{\nu})$ [10^{-6}]	< 55	< 21	30%				
	C_7/C_9 $(B \to X_s\ell\ell)$	~20%	10%	5%				
	$\mathcal{B}(B_s \to \tau\tau)$ [10^{-3}]	–	< 2	–				
	$\mathcal{B}(B_s \to \mu\mu)$ [10^{-9}]	$2.9^{+1.1*}_{-1.0}$			0.5	!	0.2	to reach SM precision
		20..	20	23	18		27?	

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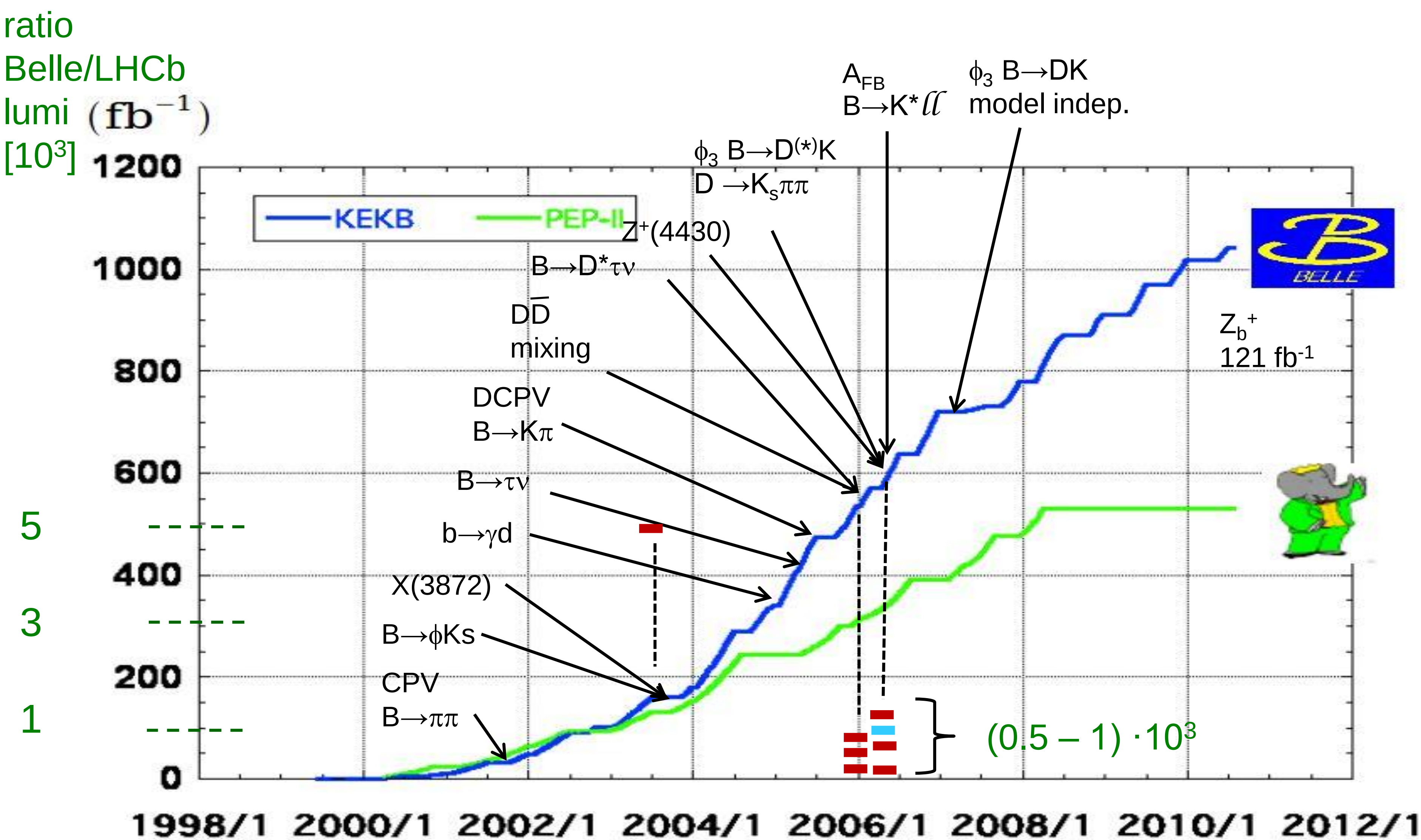
Summary (Belle perspective)



ratio Belle II / LHCb projected int. luminosity

clearly also in terms of int. luminosity LHCb & Belle II are complementary (at least once SuperKEKB & Belle II start with serious luminosity)