Status of SuperKEKB and BELLE II

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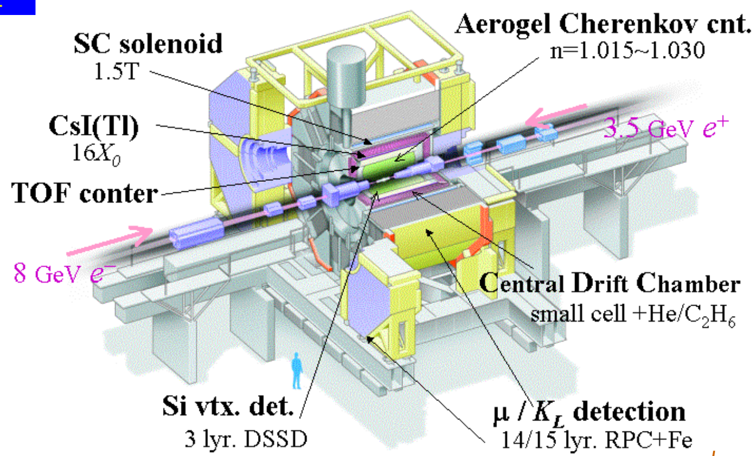
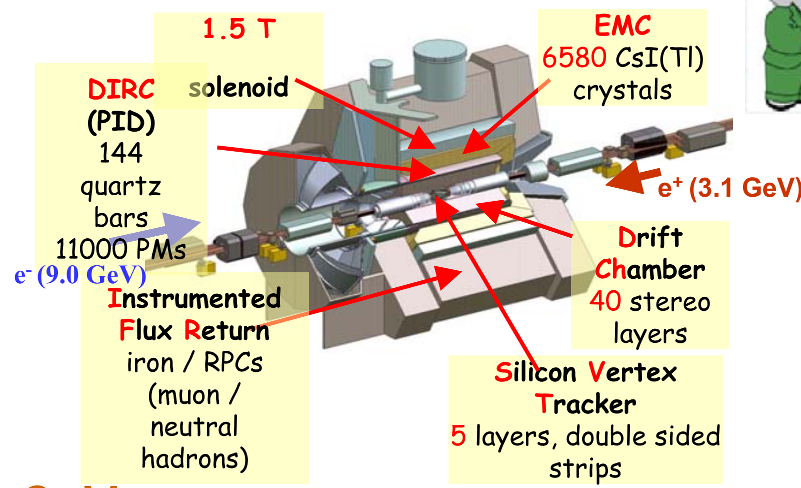
- Introduction
- B- and Super-B Physics
- Collider
- Detector

During last ten years a lot of physics results came from two B-factories – Belle and BaBar

Belle Detector



BaBar detector



$\sqrt{s}$=10.58 GeV

BaBar	$p(e^-)$=9 GeV	$p(e^+)$=3.1 GeV	$\beta\gamma$=0.56
Belle	$p(e^-)$=8 GeV	$p(e^+)$=3.5 GeV	$\beta\gamma$=0.42

Peak lumi record at KEKB: L=2.1 x 10^{34}/cm^2/sec with crab cavities

F/B asymmetric detectors

High vertex resolution, magnetic spectrometry, excellent calorimetry and sophisticated particle ID ability

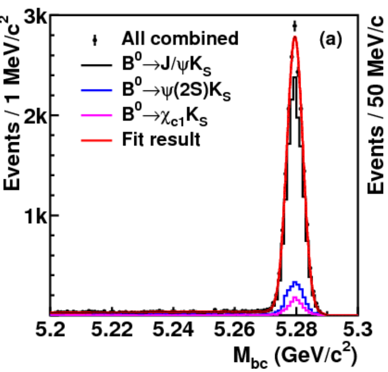
$$\sum_{BaBar}^{Belle} \int_{1999}^{2010} Ldt \approx 1.5ab^{-1}$$

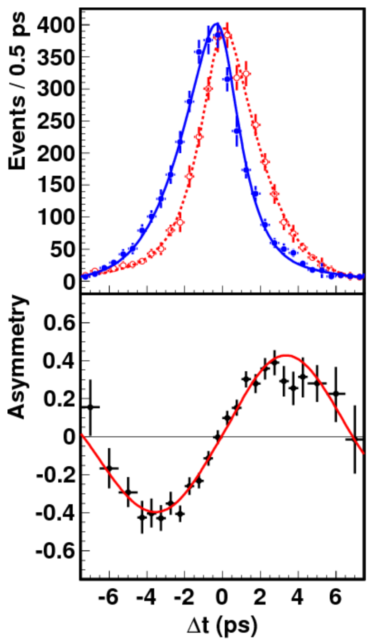
The primary goal of the Belle and BaBar experiments was to discover the CP violation in B mesons and to measure the parameters of CPV. This was achieved by both experiments in 2001

At present most precise result from Belle:

$\sin 2\varphi_1 = 0.667 \pm 0.023(\text{stat}) \pm 0.012(\text{syst})$
$A_f = 0.006 \pm 0.016(\text{stat}) \pm 0.012(\text{syst})$.

711 fb-1
(772M BB).



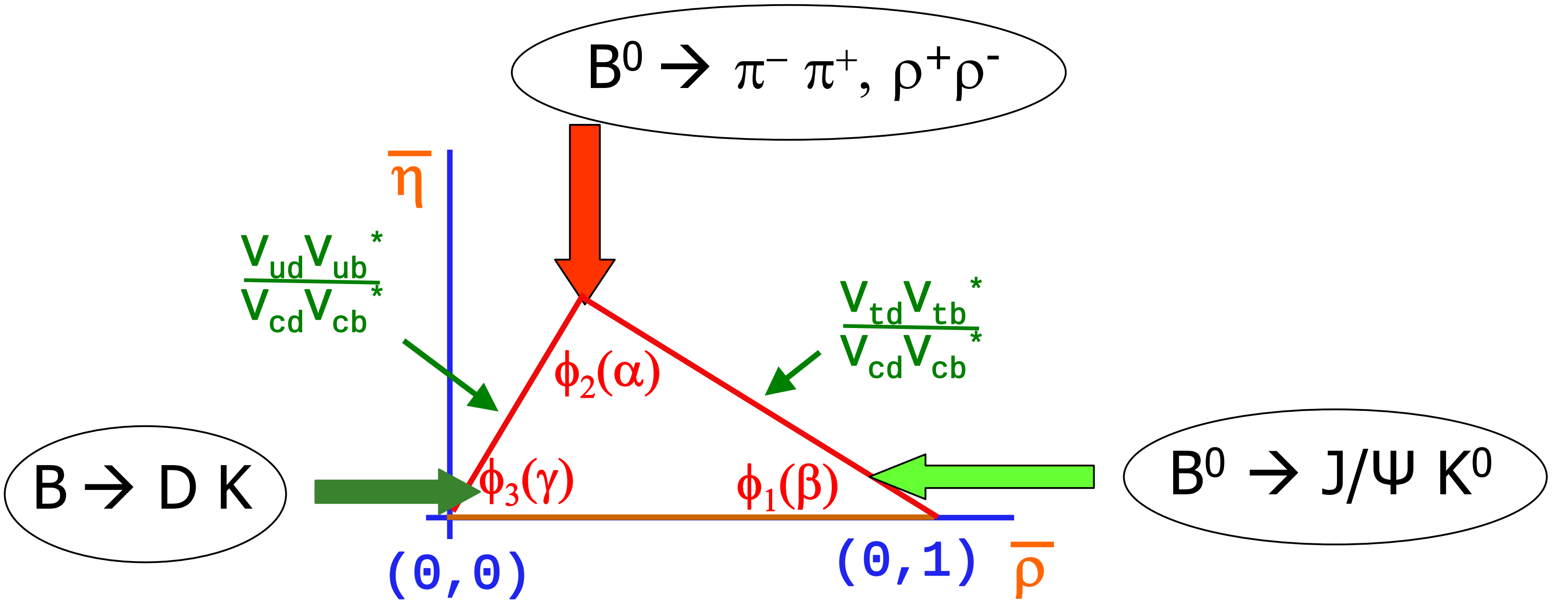


Belle and BaBar averaged (HFAG 2012)

Mode	Average
J/ψ KS (η CP=-1)	0.665 $\pm$ 0.024
J/ψ KL (η CP=+1)	0.663 $\pm$ 0.041
J/ψ K0	0.665 $\pm$ 0.022
ψ (2S)KS (η CP=-1)	0.807 $\pm$ 0.067
ψ (nS)K0	0.676 $\pm$ 0.021
χ c1KS (η CP=-1)	0.632 $\pm$ 0.099
All charmonium (incl. χ c0KS *etc.*)	0.679 $\pm$ 0.020

BaBar (PRD **79** (2009) 072009)
Belle (PRL **108** (2012) 171802)

CP violation in the B system and unitarity triangle



$\alpha + \beta + \gamma = \varphi_1 + \varphi_2 + \varphi_3 = (178\ ^{+11}_{-12})°$ (PDG 2012) in a good agreement with SM and theoretical prediction of Euclid.

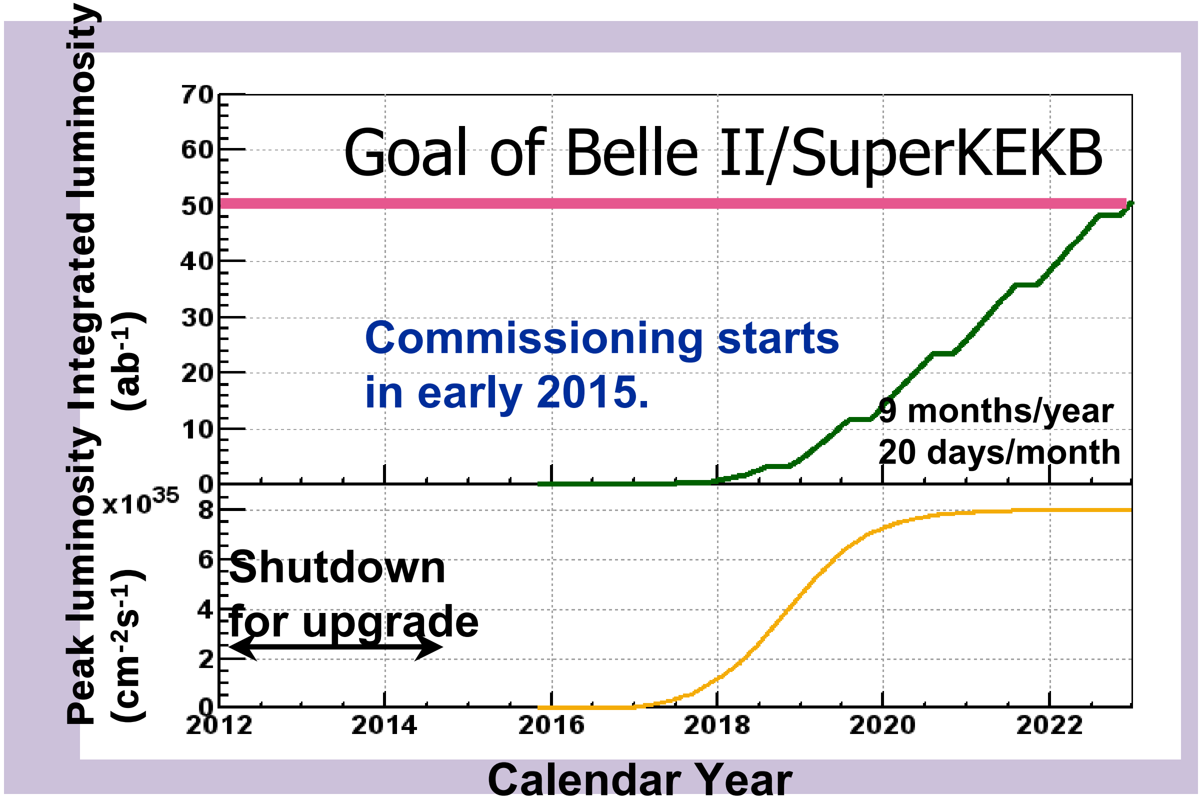
Still certain room for New Physics search exists…

However, a lot of other important results were obtained

- Observation of direct CP violation in B decays
- Measurements of the CPV parameters in different modes (ϕK^0, $\eta' K^0$, $K_S K_S K_S$, …)
- Measurements of rare decay modes (e.g., $B \to \tau\nu$, $D\tau\nu$)
- Observation of new charmonium-like and bottomonium-like hadronic states
- $b \to s$ transitions: probe for new sources of CPV and constraints from the $b \to s\gamma$ branching fraction
- Forward-backward asymmetry (A_{FB}) in $b \to s l^+ l^-$ has become a powerfull tool to search for physics beyond SM.
- Observation of D mixing
- Search for lepton flavour violation in τ decays
- Study of the hadronic τ decays
- Precise measurement of the hadronic cross sections in $\gamma\gamma$ and $e^+e^-(\gamma_{ISR})$ processes

So wide researches area become possible because of clean event environment and well defined initial state in the e^+e^- experiments as well as high luminosity and general purpose detector

At present SuperKEKB collider and Belle II detector are under construction at KEK (Japan)

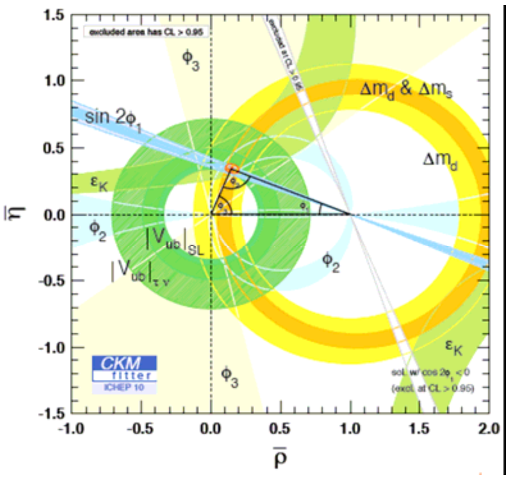


Why do we need these equipment in the LHC era?

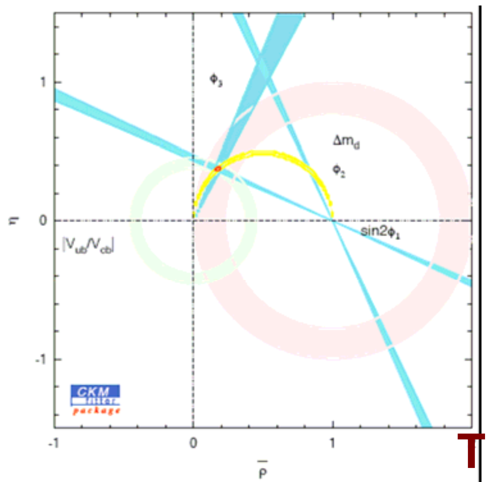
Search of New Physics – is a primary goal!

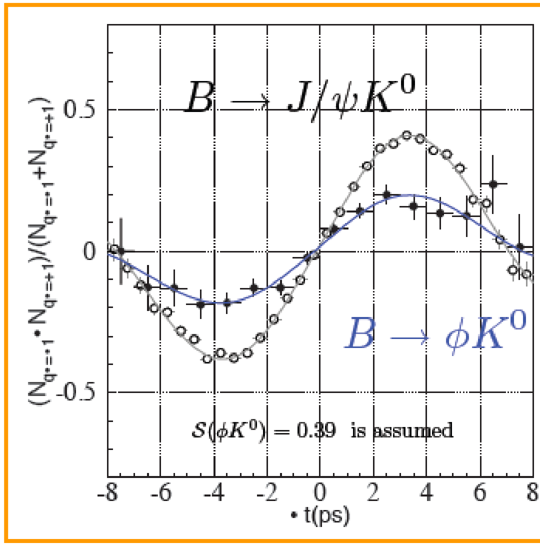
Physics at 50/ab, a few examples

2010 ICHEP



202X@50/ab





T. Aushev, et al., arXiv:1002.5012

B → sγ direct CPV

ACP = (−0.8 ± 2.9)%
(HFAG, Aug 2012)

SM: ACP ~ (0.44±0.24)%
(T. Hurth et al., Nucl.Phys. B704 (2005) 56)

50 ab-1: O(0.1%) exp. sensitivity

B → K*γ t-dependent CPV

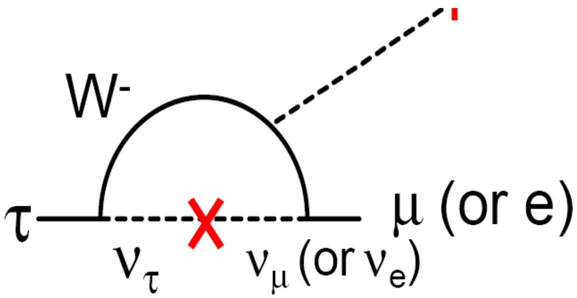
SM: $S_{CP}^{K^*\gamma} \sim (2m_s/m_b)\sin 2\phi_1 \sim -0.04$

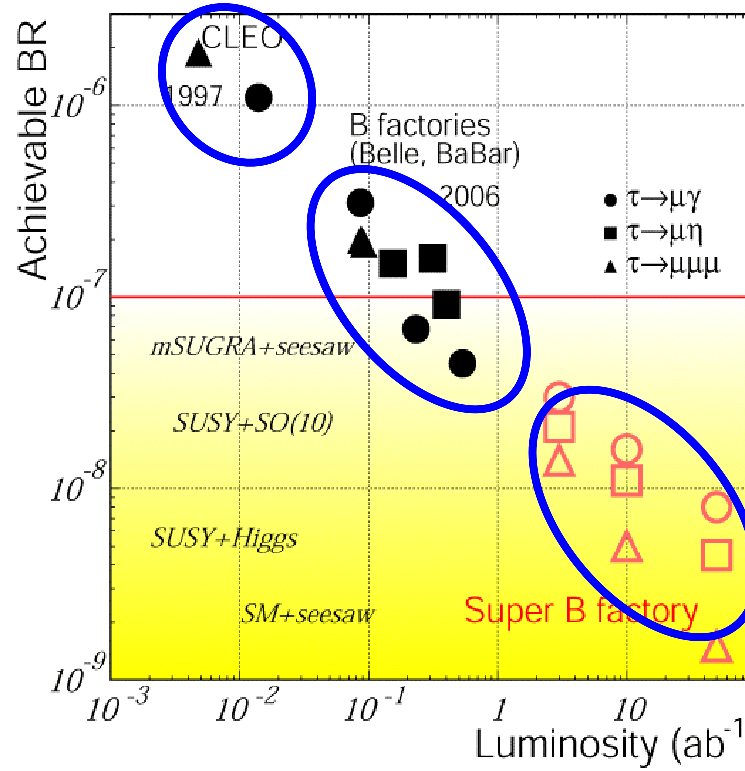
$S_{CP}^{K_S\pi^0\gamma} = -0.15 \pm 0.20$
$A_{CP}^{K_S\pi^0\gamma} = -0.07 \pm 0.12$

Expected sensitivity - 0.03 for

S in Ks pi0 gamma with 50 ab-1

Searches for lepton flavour violation in tau decays

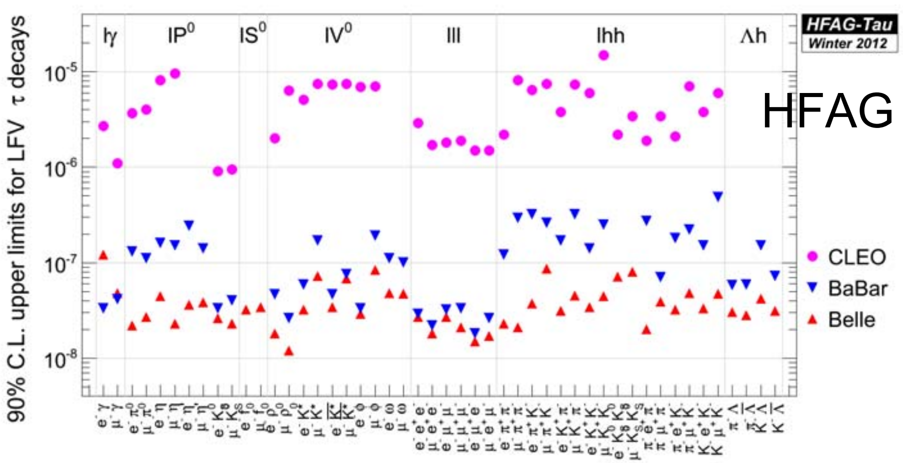




In the SM the lepton flavour violation decays are extremely small:

$Br(\tau \to l\gamma) \sim 10^{-54}$

$Br(\tau \to 3\ \text{leptons}) \sim 10^{-14}$



HFAG 2012

Expected sensitivity

$\tau \to \ell\gamma$ $Br \sim O(10^{-8\sim9})$

$\tau \to \ell\ell\ell$, l+meson $Br \sim O(10^{-9\sim10})$

Complementarity

to other intensity frontiers experiments (LHCb, BES III, ...);

Super B factory

LHCb

K experiments

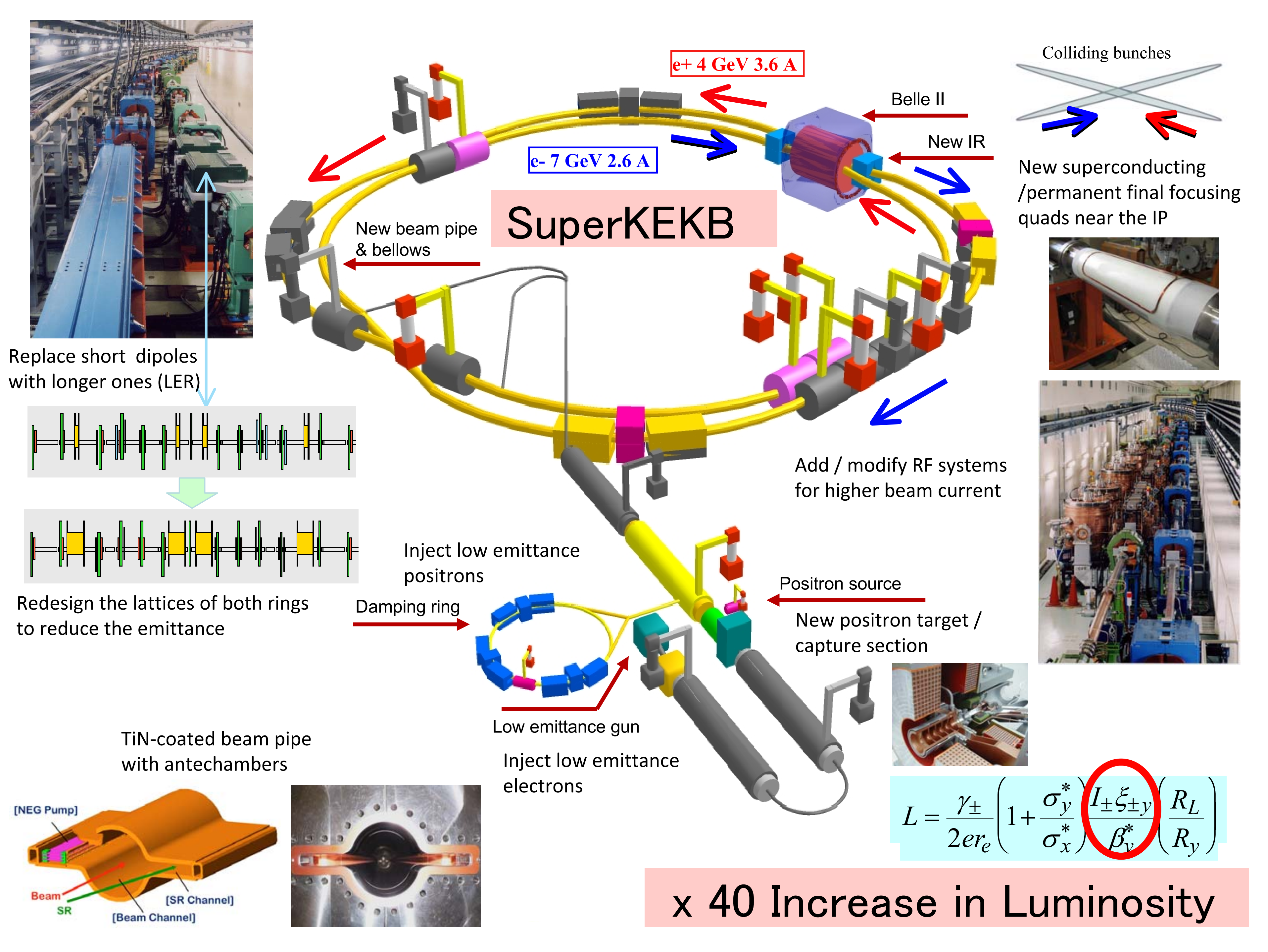
G. Isidori et al., Ann.Rev.Nucl. Part.Sci. 60, 355 (2010)

B. Golob, KEK FF Workshop, Feb. 2012

Observable	SM prediction	Theory error	Present result	Future error	Future Facility
$\|V_{us}\|$ $[K \to \pi \ell \nu]$	input	$0.5\% \to 0.1\%_{\rm Latt}$	0.2246 ± 0.0012	0.1%	K factory
$\|V_{cb}\|$ $[B \to X_c \ell \nu]$	input	1%	$(41.54 \pm 0.73) \times 10^{-3}$	1%	Super-B
$\|V_{ub}\|$ $[B \to \pi \ell \nu]$	input	$10\% \to 5\%_{\rm Latt}$	$(3.38 \pm 0.36) \times 10^{-3}$	4%	Super-B
γ $[B \to DK]$	input	$< 1^\circ$	$(70^{+27}_{-30})^\circ$	3°	LHCb
$S_{B_d \to \psi K}$	$\sin(2\beta)$	$\lesssim 0.01$	0.671 ± 0.023	0.01	LHCb
$S_{B_s \to \psi \phi}$	0.036	$\lesssim 0.01$	$0.81^{+0.12}_{-0.32}$	0.01	LHCb
$S_{B_d \to \phi K}$	$\sin(2\beta)$	$\lesssim 0.05$	0.44 ± 0.18	0.1	LHCb
$S_{B_s \to \phi \phi}$	0.036	$\lesssim 0.05$	—	0.05	LHCb
$S_{B_d \to K^* \gamma}$	few $\times$ 0.01	0.01	-0.16 ± 0.22	0.03	Super-B
$S_{B_s \to \phi \gamma}$	few $\times$ 0.01	0.01	—	0.05	LHCb
$A^d_{\rm SL}$	-5×10^{-4}	10^{-4}	$-(5.8 \pm 3.4) \times 10^{-3}$	10^{-3}	LHCb
$A^s_{\rm SL}$	2×10^{-5}	$< 10^{-5}$	$(1.6 \pm 8.5) \times 10^{-3}$	10^{-3}	LHCb
$A_{CP}(b \to s\gamma)$	< 0.01	< 0.01	-0.012 ± 0.028	0.005	Super-B
$\mathcal{B}(B \to \tau \nu)$	1×10^{-4}	$20\% \to 5\%_{\rm Latt}$	$(1.73 \pm 0.35) \times 10^{-4}$	5%	Super-B
$\mathcal{B}(B \to \mu \nu)$	4×10^{-7}	$20\% \to 5\%_{\rm Latt}$	$< 1.3 \times 10^{-6}$	6%	Super-B
$\mathcal{B}(B_s \to \mu^+ \mu^-)$	3×10^{-9}	$20\% \to 5\%_{\rm Latt}$	$< 5 \times 10^{-8}$	10%	LHCb
$\mathcal{B}(B_d \to \mu^+ \mu^-)$	1×10^{-10}	$20\% \to 5\%_{\rm Latt}$	$< 1.5 \times 10^{-8}$	[?]	LHCb
$A_{\rm FB}(B \to K^* \mu^+ \mu^-)_{q_0^2}$	0	0.05	(0.2 ± 0.2)	0.05	LHCb
$B \to K \nu \bar{\nu}$	4×10^{-6}	$20\% \to 10\%_{\rm Latt}$	$< 1.4 \times 10^{-5}$	20%	Super-B
$\|q/p\|_{D-{\rm mixing}}$	1	$< 10^{-3}$	$(0.86^{+0.18}_{-0.15})$	0.03	Super-B
ϕ_D	0	$< 10^{-3}$	$(9.6^{+8.3}_{-9.5})^\circ$	2°	Super-B
$\mathcal{B}(K^+ \to \pi^+ \nu \bar{\nu})$	8.5×10^{-11}	8%	$(1.73^{+1.15}_{-1.05}) \times 10^{-10}$	10%	K factory
$\mathcal{B}(K_L \to \pi^0 \nu \bar{\nu})$	2.6×10^{-11}	10%	$< 2.6 \times 10^{-8}$	[?]	K factory
$R^{(e/\mu)}(K \to \pi \ell \nu)$	2.477×10^{-5}	0.04%	$(2.498 \pm 0.014) \times 10^{-5}$	0.1%	K factory
$\mathcal{B}(t \to cZ, \gamma)$	$\mathcal{O}(10^{-13})$	$\mathcal{O}(10^{-13})$	$< 0.6 \times 10^{-2}$	$\mathcal{O}(10^{-5})$	LHC ($100\,{\rm fb}^{-1}$)

$B(B \to X_s \gamma)$	6%	Super-B	
$B(B \to X_d \gamma)$	20%	Super-B	
$S(B \to \rho \gamma)$	0.15	Super-B	
$B(\tau \to \mu \gamma)$	$3 \cdot 10^{-9}$	Super-B	(90% U.L.)
$B(B^+ \to D \tau \nu)$	3%	Super-B	
$B(B_s \to \gamma \gamma)$	$0.25 \cdot 10^{-6}$	Super-B	($5\ {\rm ab}^{-1}$)
$\sin^2\theta_W$ @ $Y(4S)$	$3 \cdot 10^{-4}$	Super-B	

How to do it?
→ upgrade KEKB and Belle


SuperKEKB
e+ 4 GeV 3.6 A
e- 7 GeV 2.6 A
Belle II
New IR
Colliding bunches
New superconducting /permanent final focusing quads near the IP
New beam pipe & bellows
Replace short dipoles with longer ones (LER)
Redesign the lattices of both rings to reduce the emittance
Add / modify RF systems for higher beam current
Inject low emittance positrons
Damping ring
Positron source
New positron target / capture section
Low emittance gun
Inject low emittance electrons
TiN-coated beam pipe with antechambers
[NEG Pump]
Beam
SR
[SR Channel]
[Beam Channel]
$L = \frac{\gamma_\pm}{2er_e}\left(1+\frac{\sigma_y^*}{\sigma_x^*}\right)\left(\frac{I_\pm \xi_{\pm y}}{\beta_y^*}\right)\left(\frac{R_L}{R_y}\right)$
x 40 Increase in Luminosity

Design Concept of SuperKEKB

- Increase the luminosity by 40 times based on "Nano-Beam" scheme, which was first proposed for SuperB by P. Raimondi.

Luminosity Gain

- Vertical β function at IP: 5.9 → 0.27/0.30 mm (× 20)
- Beam current: 1.7/1.4 → 3.6/2.6 A (× 2)
- Beam-beam parameter: .09 → .09 (× 1)

$$L = \frac{\gamma_{\pm}}{2er_e}\left(1+\frac{\sigma_y^*}{\sigma_x^*}\right)\left(\frac{I_{\pm}\xi_{\pm y}}{\beta_y^*}\right)\left(\frac{R_L}{R_y}\right) = 8 \times 10^{35}\ \mathrm{cm^{-2}s^{-1}}$$

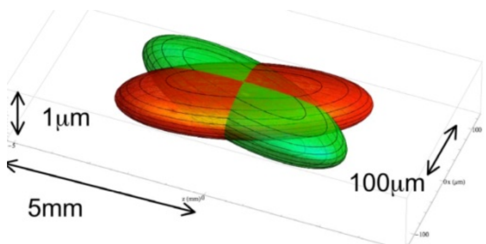
- Beam energy: 3.5/8.0 → 4.0/7.0 GeV

LER : Longer Touschek lifetime and mitigation of emittance growth due to the intra-beam scattering
HER : Lower emittance and lower SR power

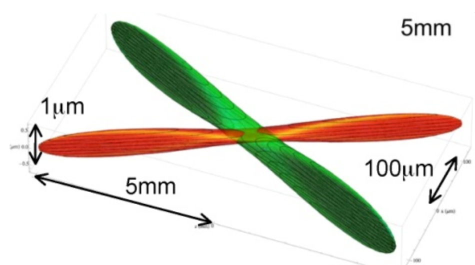
❖Re-use the KEKB tunnel.
❖Re-use KEKB components as much as possible.
❖Preserve the present cells in HER.
❖Replace dipole magnets in LER, re-using other main magnets in the LER arcs.

Nano-Beam SuperKEKB

KEKB



σ_x~100μm,σ_y~2μm



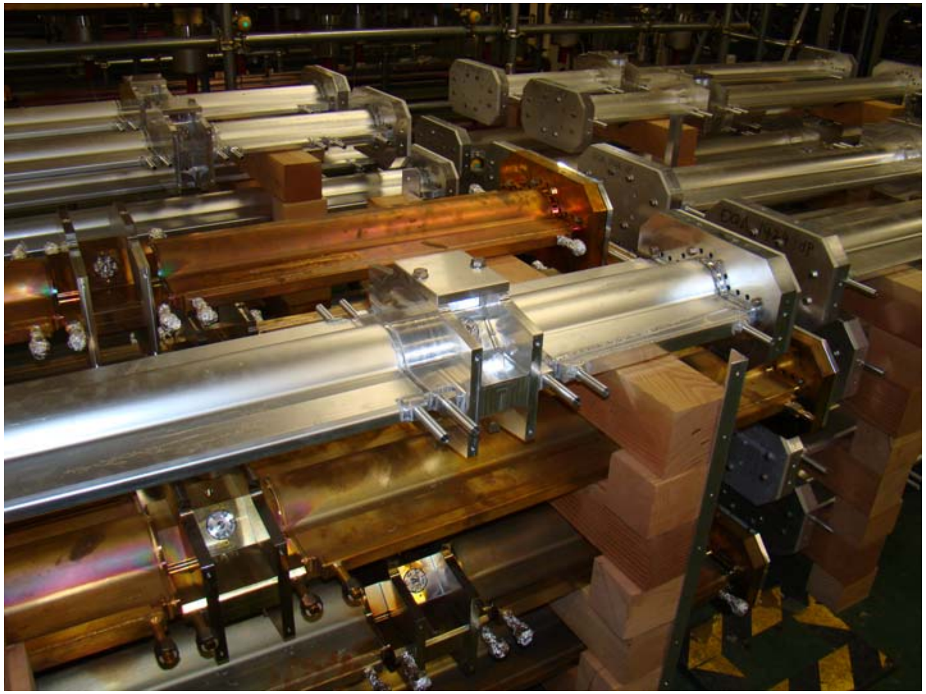
σ_x~10μm,σ_y~60nm

Machine design parameters

parameters		KEKB LER	KEKB HER	SuperKEKB LER	SuperKEKB HER	units
Beam energy	E_b	3.5	8	4	7	GeV
Half crossing angle	ϕ	11		41.5		mrad
Horizontal emittance	ε_x	18	24	3.2	4.6	nm
Emittance ratio	κ	0.88	0.66	0.37	0.40	%
Beta functions at IP	β_x^* / β_y^*	1200/5.9		32/0.27	25/0.30	mm
Beam currents	I_b	1.64	1.19	3.60	2.60	A
beam-beam parameter	ξ_y	0.129	0.090	0.0881	0.0807	
Luminosity	**L**	**2.1×10^{34}**		**8×10^{35}**		**$cm^{-2}s^{-1}$**

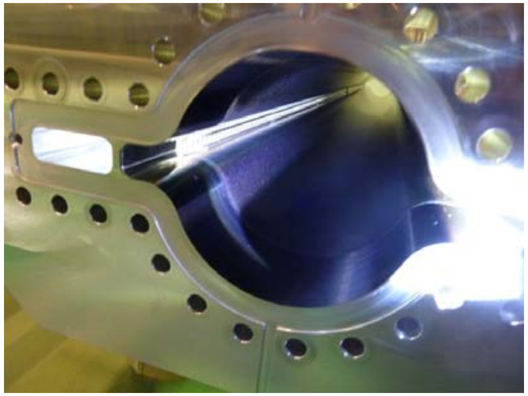
- **Nano-beams and a factor of two more beam current** to increase luminosity
- **Large crossing angle**
- **Change beam energies** to solve the problem of short lifetime for the LER

Entirely new LER beam pipe with ante-chamber and Ti-N coating



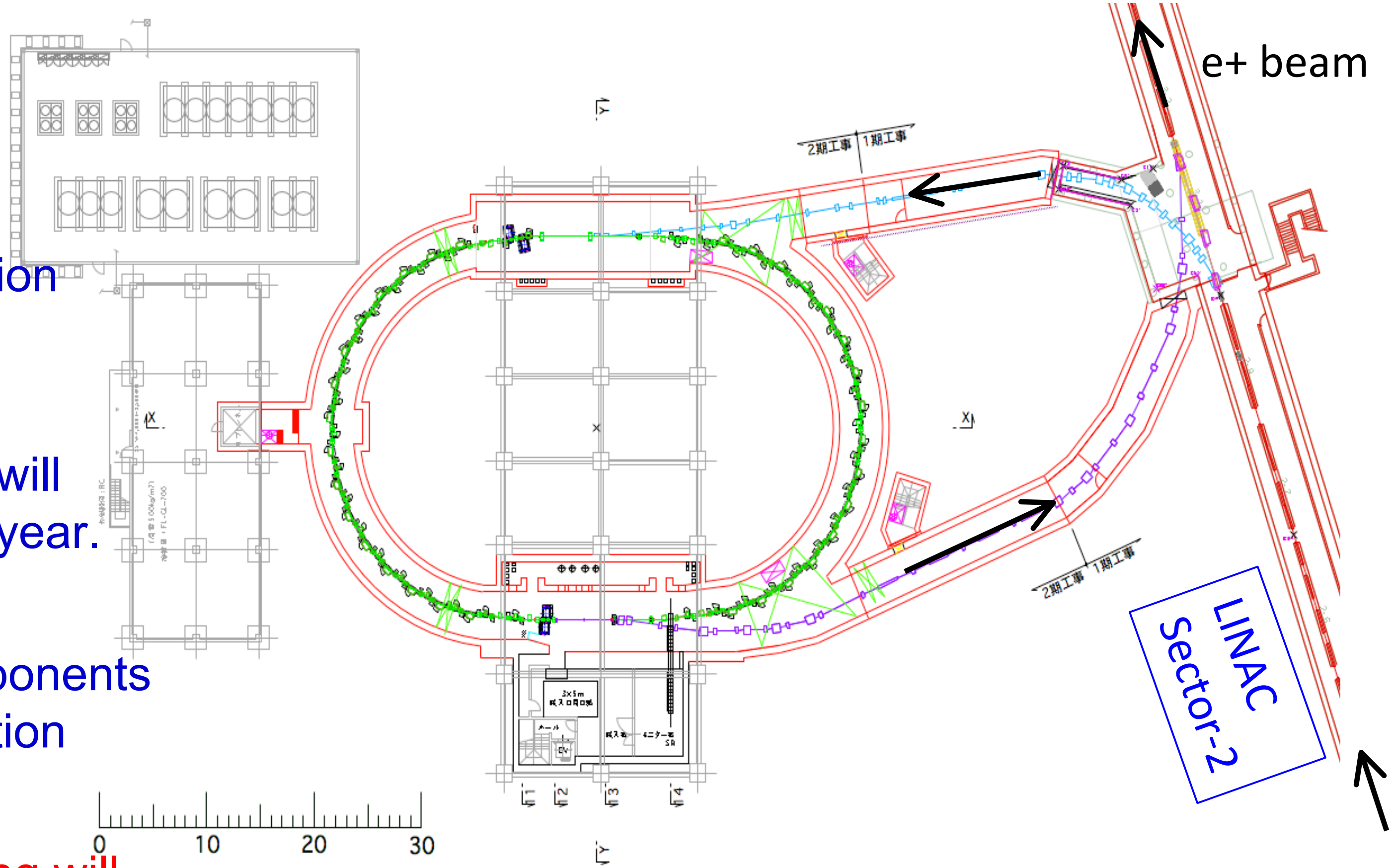
Installation of 100 new LER bending magnets done

After TiN coating



Plain view of e$^+$ DR

- Tunnel construction finished
- Construction of buildings for DR will start in April this year.
- Fabrication of accelerator components ongoing. Installation starts in 2014.
- DR commissioning will start in 2015.



Demands on the detector

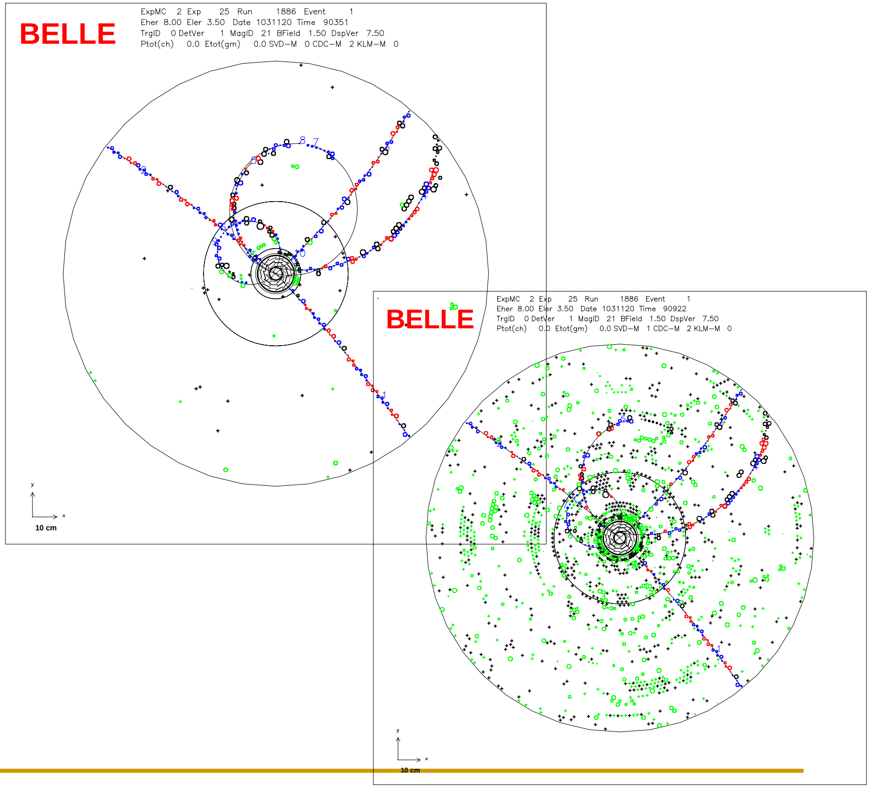
Total cross section and trigger rates with L = 8×10^{35} cm^{-2} s^{-1} from various physics processes at Υ(4S).

Physics process	Cross section (nb)	Rate (Hz)
Υ (4S) →BB	1.2	960
Hadron production from continuum	2.8	2200
$\mu^+\mu^-$	0.8	640
$\tau^+\tau^-$	0.8	640
Bhabha (θlab> 17°)	44	350[(a)]
γγ (θlab> 17°)	2.4	19 [(a)]
2γ processes (θlab> 17°, pt > 0.1GeV/c)	~80	~ 15000
Total	~130	~20000

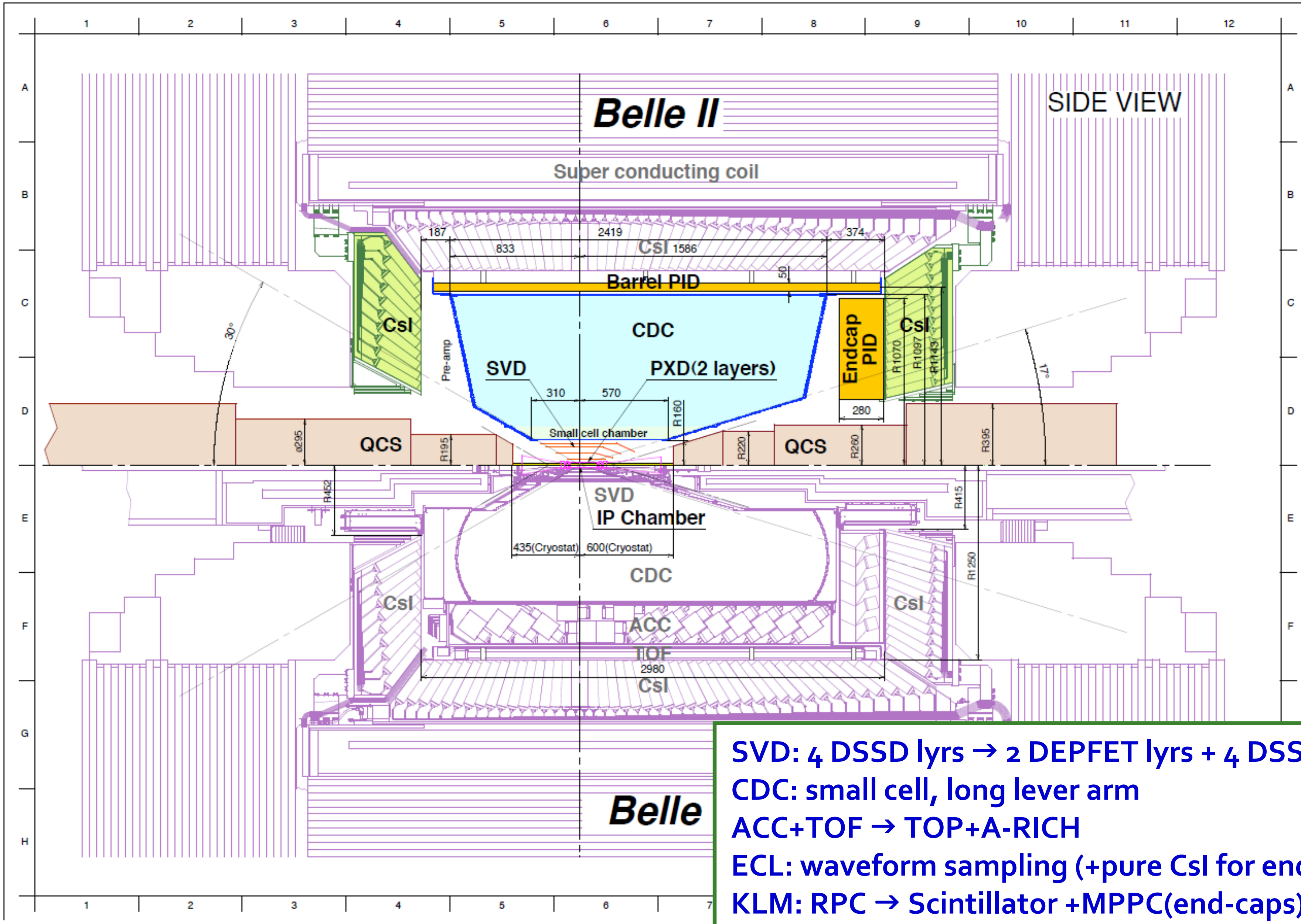
(a) rate is pre-scaled by a factor of 1/100

The requirements for the trigger system are:

1. high efficiency for hadronic events;
2. maximum average trigger rate of 30 kHz;
3. fixed latency of about 5 μs;
4. timing precision of less than 10 ns;
5. minimum two-event separation of 200 ns;
6. trigger configuration that is flexible and robust.

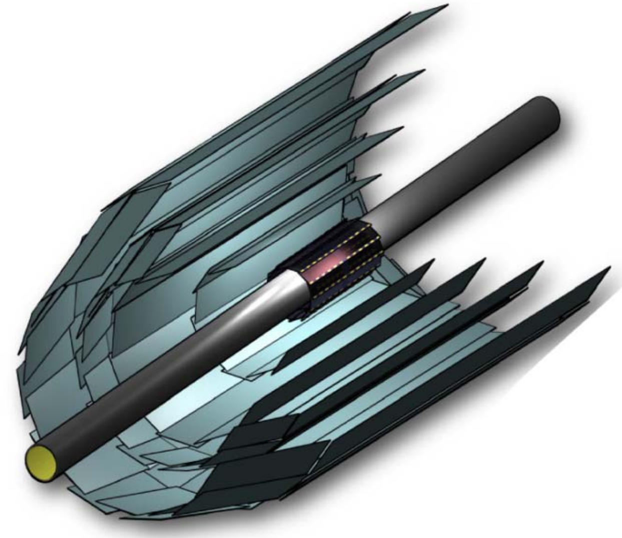


Belle II Detector (in comparison with Belle)

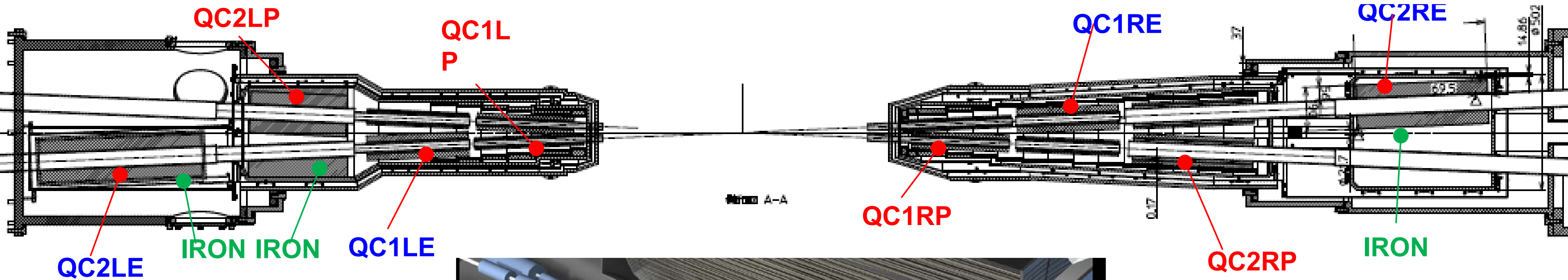


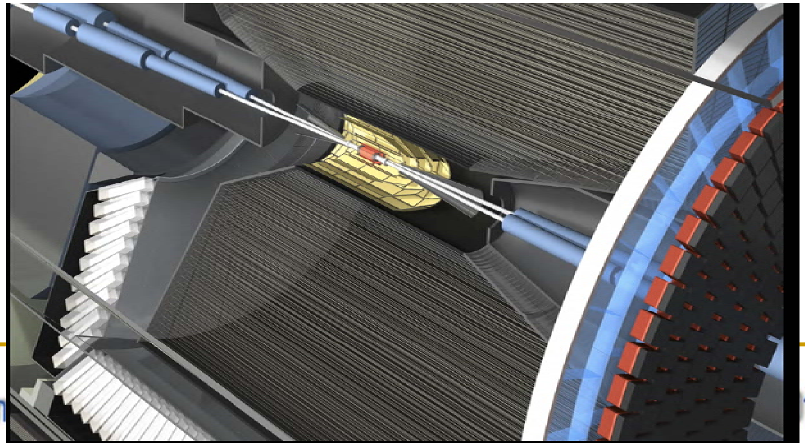
SVD: 4 DSSD lyrs → 2 DEPFET lyrs + 4 DSSD lyrs
CDC: small cell, long lever arm
ACC+TOF → TOP+A-RICH
ECL: waveform sampling (+pure CsI for end-caps)
KLM: RPC → Scintillator +MPPC(end-caps)

SuperKEKB/Belle II Interaction Region



Many new superconducting magnets at the IP; Belle detector currently aligned with LER will have to be *rotated*.

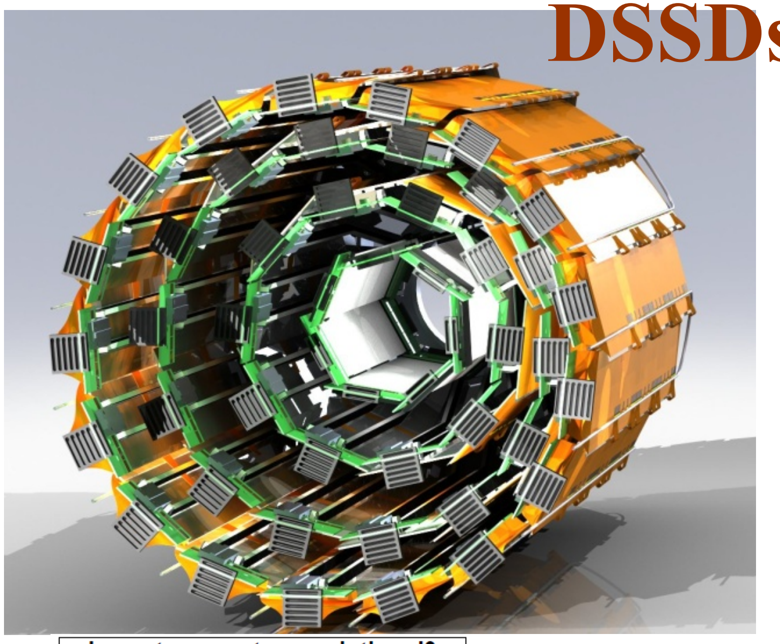


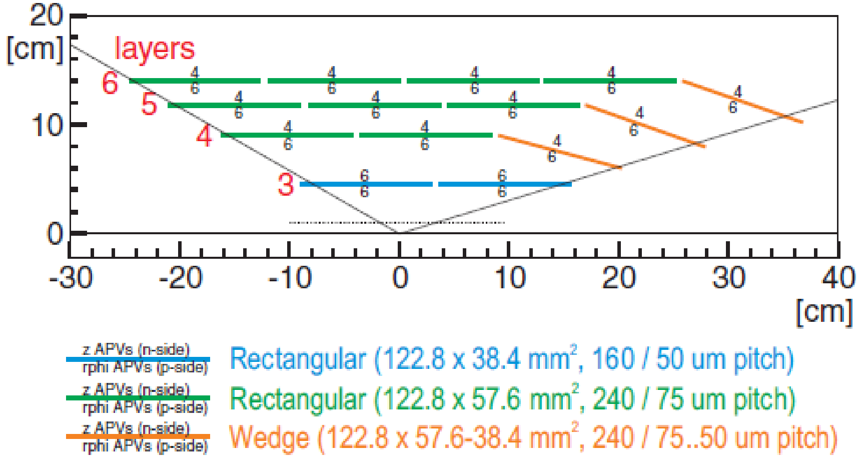


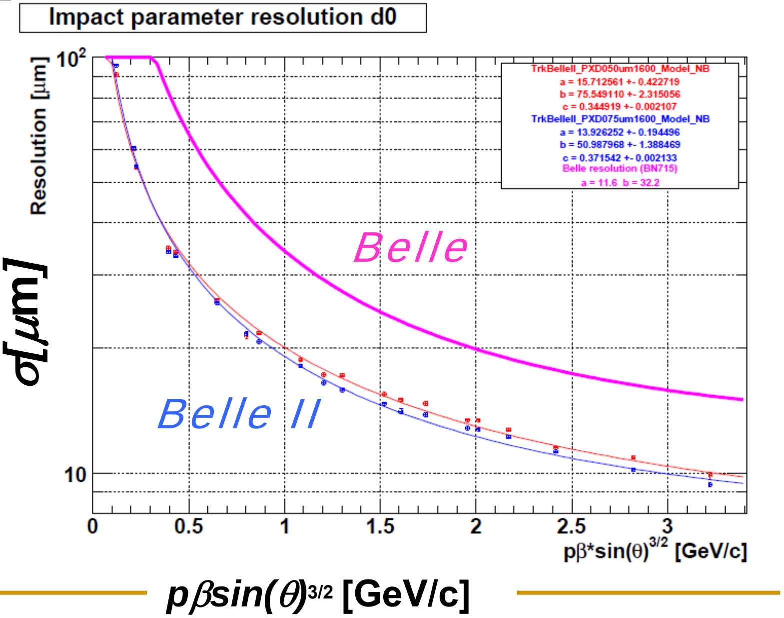
New vertex detector

DSSDs

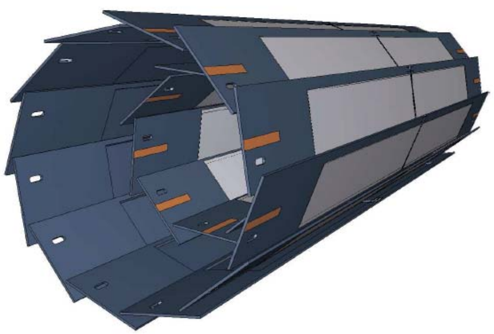
	Belle II	Belle
Beam Piper =	10mm	15mm
DEPFET		
Layer 1	r = 14mm	
Layer 2	r = 22mm	
DSSD		
Layer 3	r = 38mm	20mm
Layer 4	r = 80mm	43.5mm
Layer 5	r = 104mm	70mm
Layer 6	r = 135mm	88mm



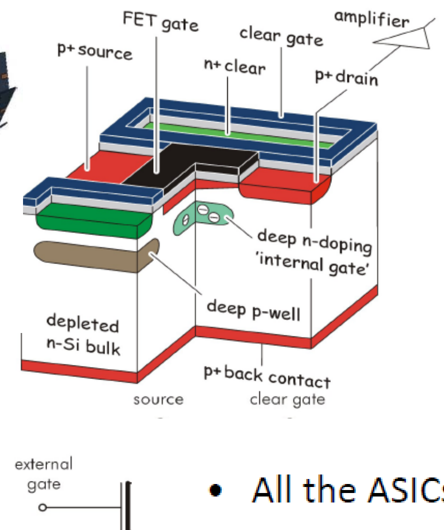


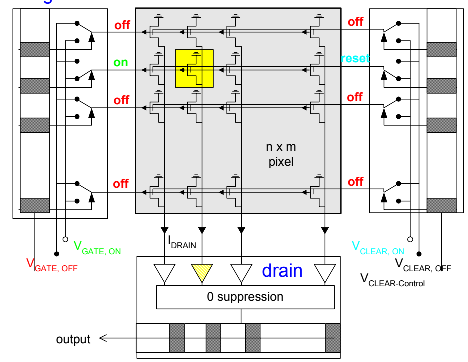


Pixel Vertex Detector



DEpleted P-channel FET

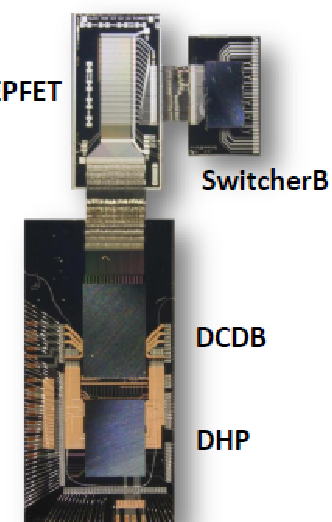


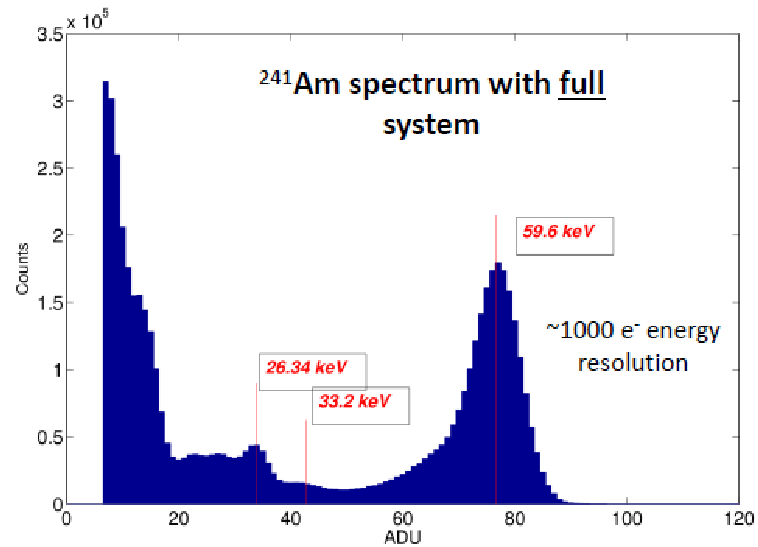


DEPFET pixel sensor

- All the ASICs + Belle II DEPFET working together
- Trigger-less zero suppression readout

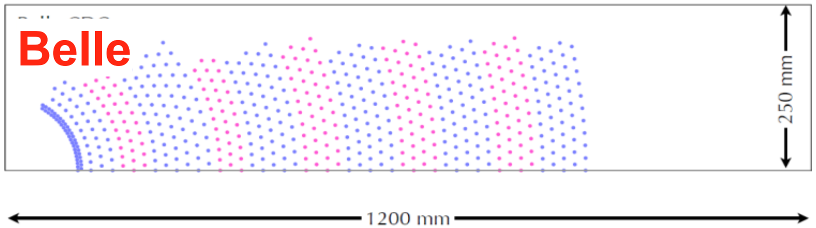
Milestone!

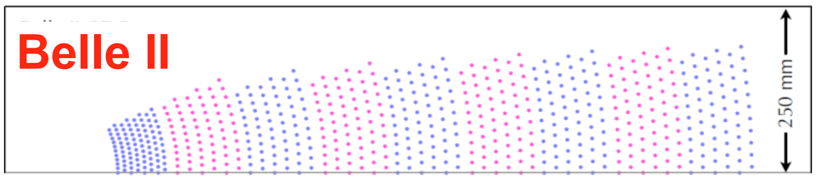




DEPFET:
http://aldebaran.hll.mpg.de/twiki/bin/v

Central Drift Chamber





longer lever arm

Improved momentum resolution and dE/dx

$$\sigma_{P_t}/P_t = 0.19P_t \oplus 0.30/\beta$$

$$\sigma_{P_t}/P_t = 0.11P_t \oplus 0.30/\beta$$

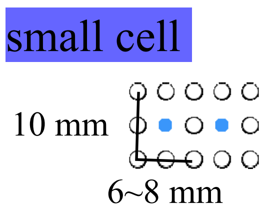
new readout system

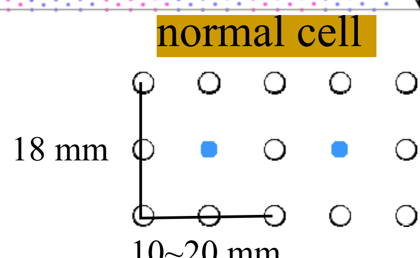
dead time 1-2μs → 200ns

small cell

smaller hit rate for each wire

shorter maximum drift time



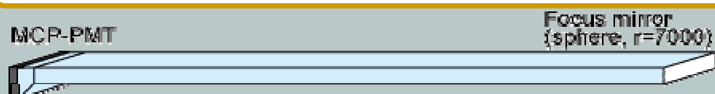


	Belle	Belle II
inner most sense wire	r=88mm	r=168mm
outer most sense wire	r=863mm	r=1111.4mm
Number of layers	50	56
Total sense wires	8400	14336
Gas	$He:C_2H_6$	$He:C_2H_6$
sense wire	W(Φ30μm)	W(Φ30μm)
field wire	Al(Φ120μm)	Al(Φ120μm)

Aug. 31: The number of installed wires in main and conical part is 35331, corresponding to 68% of total 51456 wires.

Particle Identification in Belle II

Barrel PID: Time of Propagation Counter (iTOP)



Quartz radiator

Focusing mirror

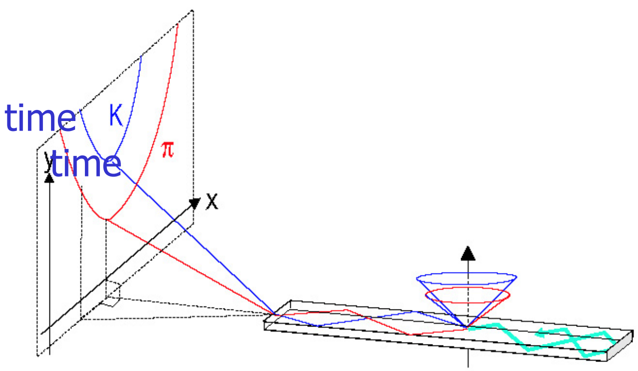
Small expansion block

Hamamatsu MCP-PMT (measure t, x and y)

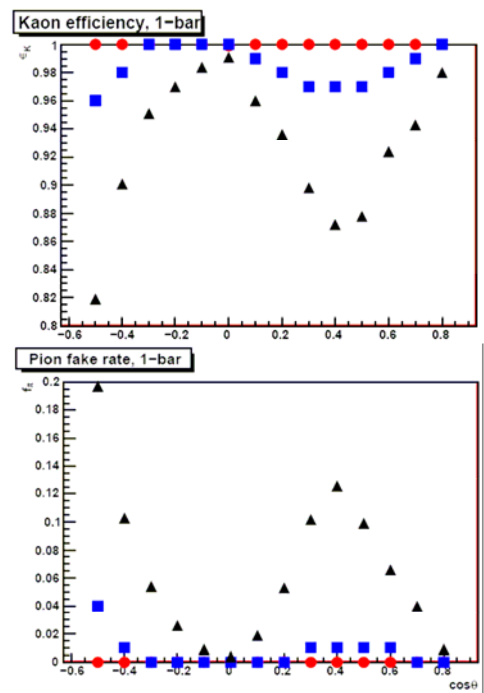
Cherenkov ring imaging with precise time measurement.

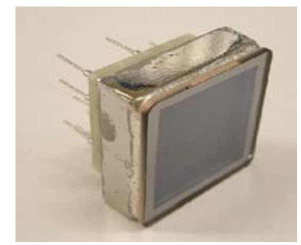
Device uses internal reflection of Cerenkov ring images from quartz like the BaBar DIRC

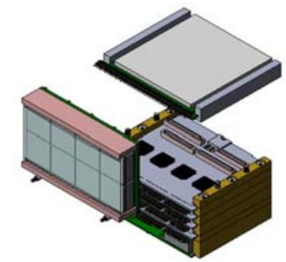
Cherenkov angle reconstruction from two hit coordinates and the time of propagation of the photon



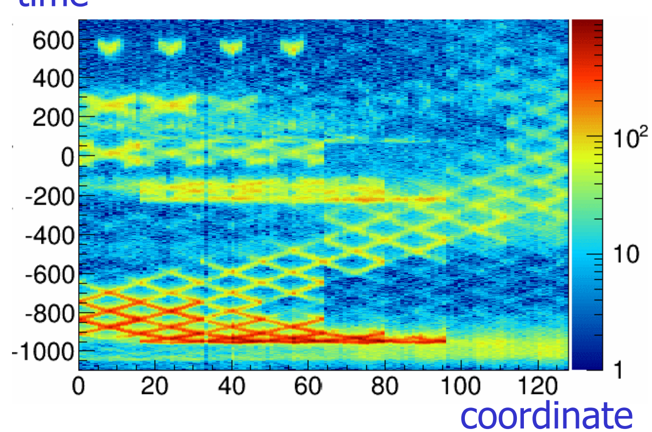
●1.5, ■2.5, ▲3.5 GeV/c







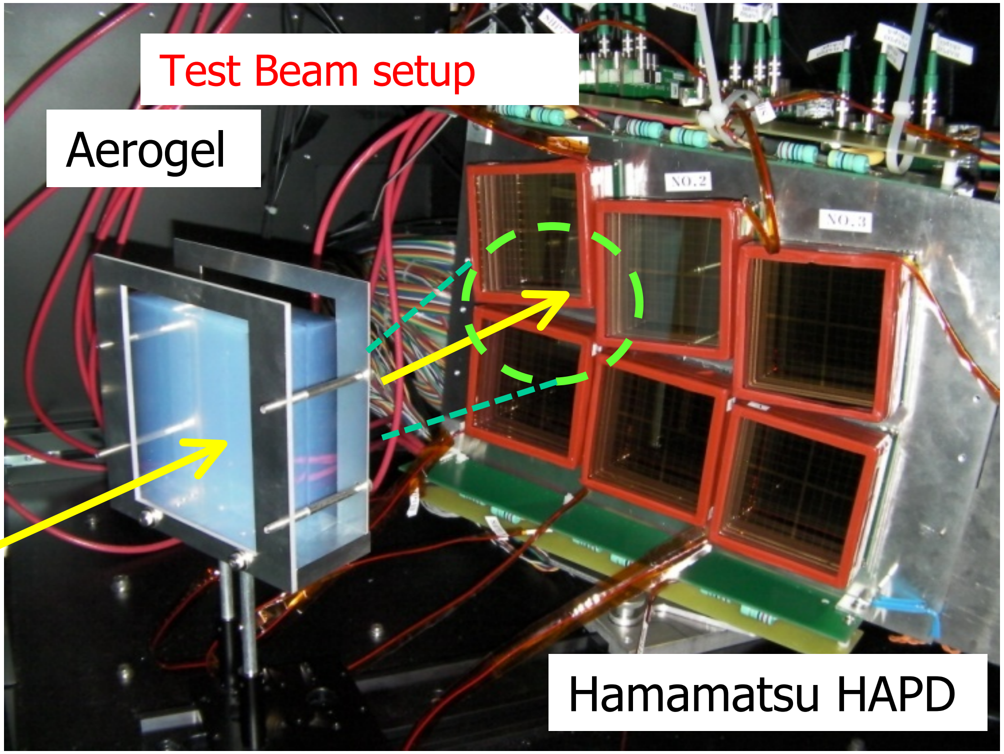
x-t diagram from beam-test

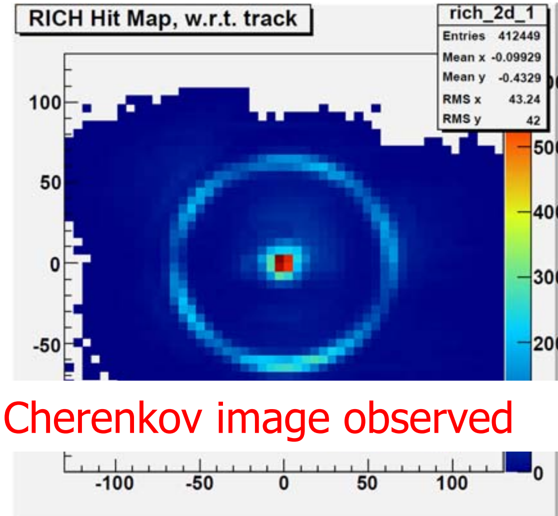


Quartz radiator
- **2.6m^L x 45cm^W x 2cm^T**
- **Excellent surface accuracy**

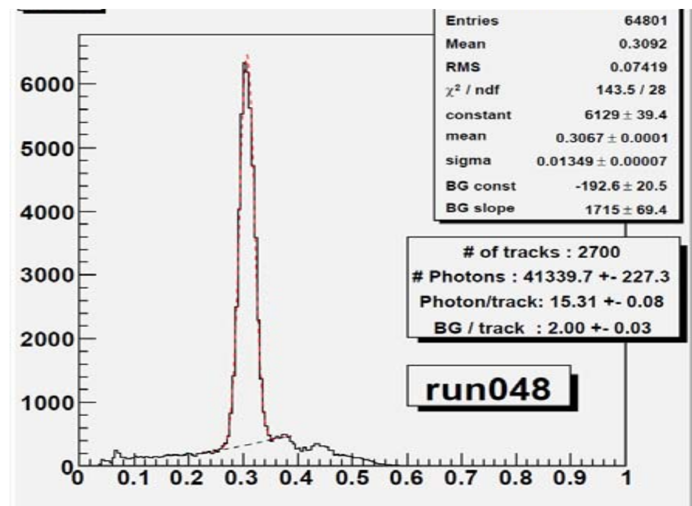
MCP-PMT
- **Hamamatsu 16ch MCP-PMT**
  - **Good TTS (<35ps) & enough lifetime**
  - **Multialkali photo-cathode → SBA**

Aerogel RICH (endcap PID)



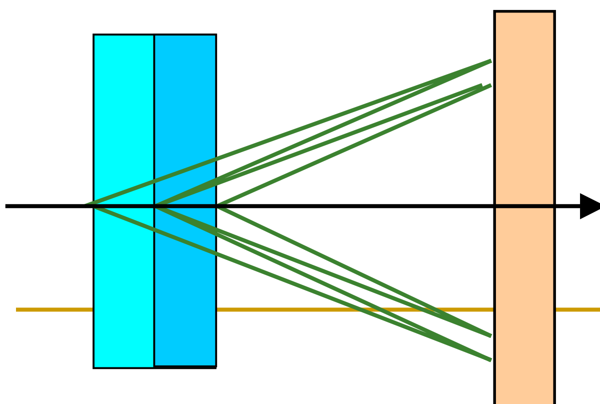


Cherenkov angle distribution



RICH with a novel "focusing" radiator – a two layer radiator

Employ multiple layers with different refractive indices→ Cherenkov images from individual layers overlap on the photon detector.

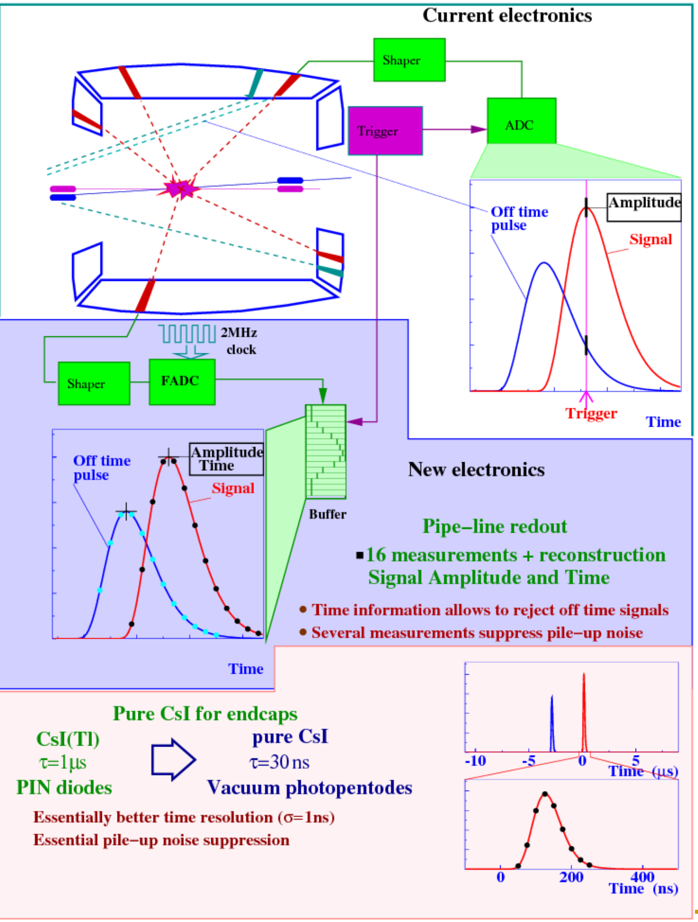


6.6 σ π/K at 4GeV/c !

ECL (Electromagnetic Crystal Calorimeter)

1. Upgrade electronics to do waveform sampling & fitting
2. Upgrade endcap crystal (baseline option: pure CsI + photomultipliers); upgrade will have to be staged.

100 ShaperDSP boards in hand, tested.



Modification of the electronics.

❖ Pipe-line readout with waveform analysis:

❖ 16 points within the signal are fitted by the signal function F(t):

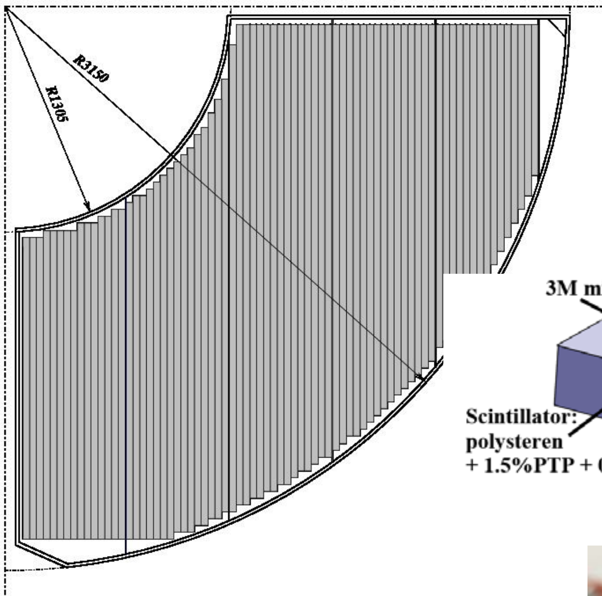
$F(t) = H \cdot f(t - t_0)$

❖ Both amplitude (H) and time (t_0) are obtained by the on-line shape fit:

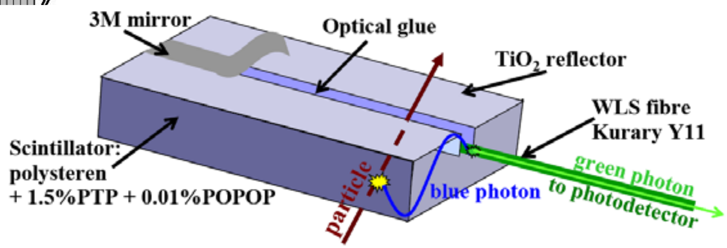
$$\chi^2 = \sum_{i,j} (A_i - F(t_i)) S_{ij} (A_j - F(t_j))$$

KLM: K_L&Muon detector

RPC → Scintillator (Endcap)
also inner 1,2, or 3 layers of Barrel(TBD)



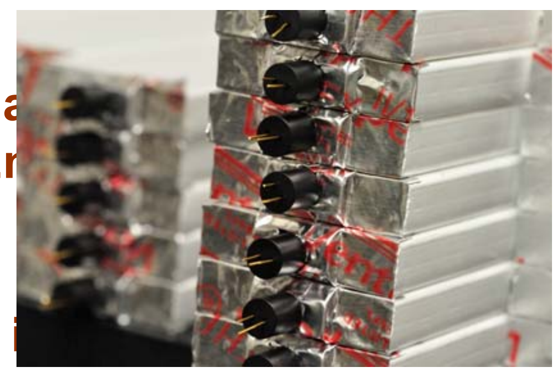
KL and muon detector:
Resistive Plate Counter (barrel)
Scintillator + WLSF + MPPC
(end-caps + barrel 2 inner layers)



LAYOUT

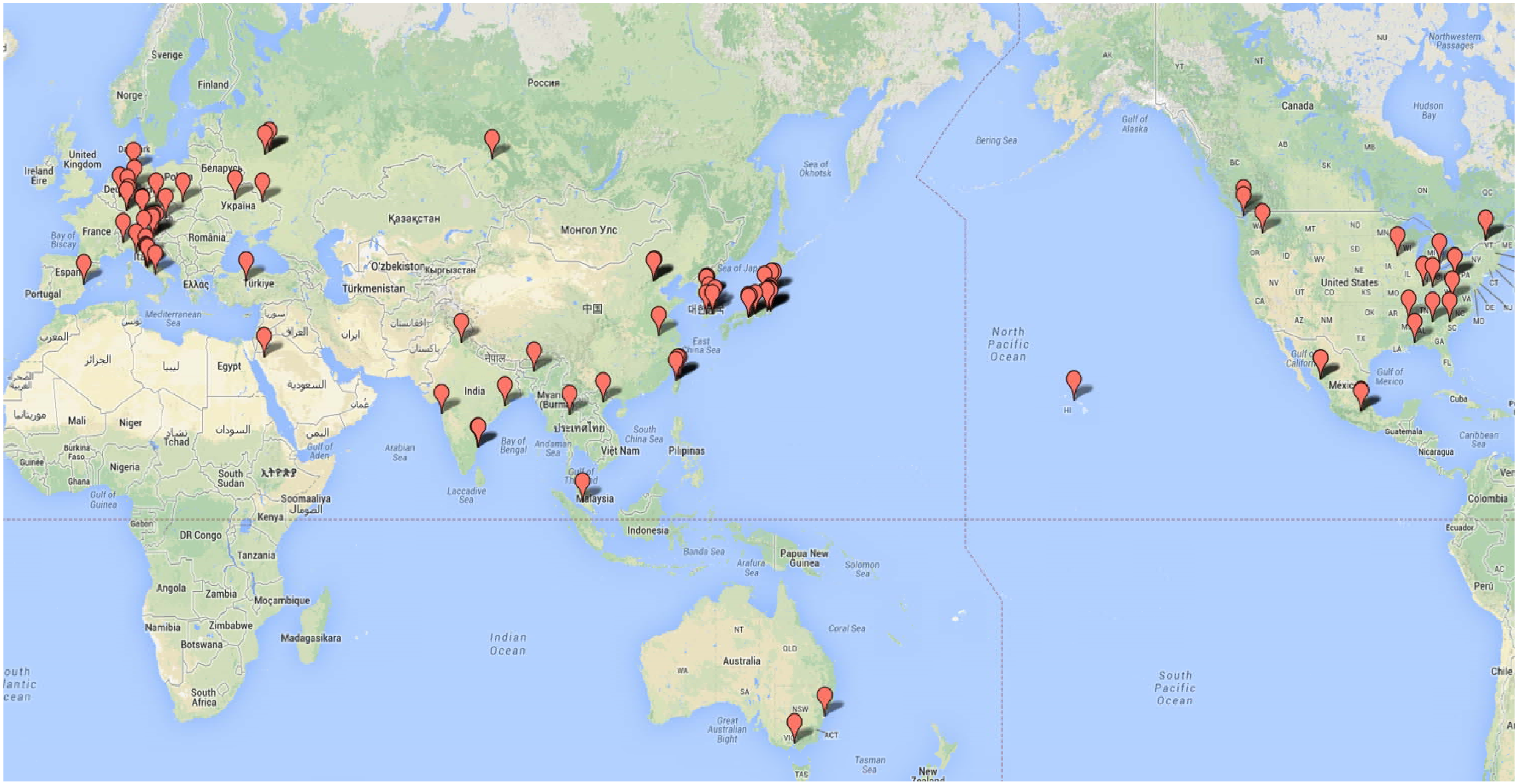
- **One layer: 75 strips (4 cm width)/sector**
- **5 segments**
  1 segment = 15strips
- **Two orthogonal layer = superlayer**
- **F&B endcap KLM:**
  - **Total area ~1400 m²**
  - **16800 strips (total ~30000)**
  - **the longest strip 2.8 m; the shortest 0.6 m**
- **WLS fiber in each strip**
- **Hamamatsu MPPC at one fiber end**
- **mirrored far fiber end**

Endcap muon detecton is a
limited by backgrounds. En
RPCs will not work at full
luminosity and higher
backgrounds. Inner barrel i
marginal.



MPPC: Hamamatsu
1.3×1.3 mm 667 pixels
(used in T2K Near Detector)

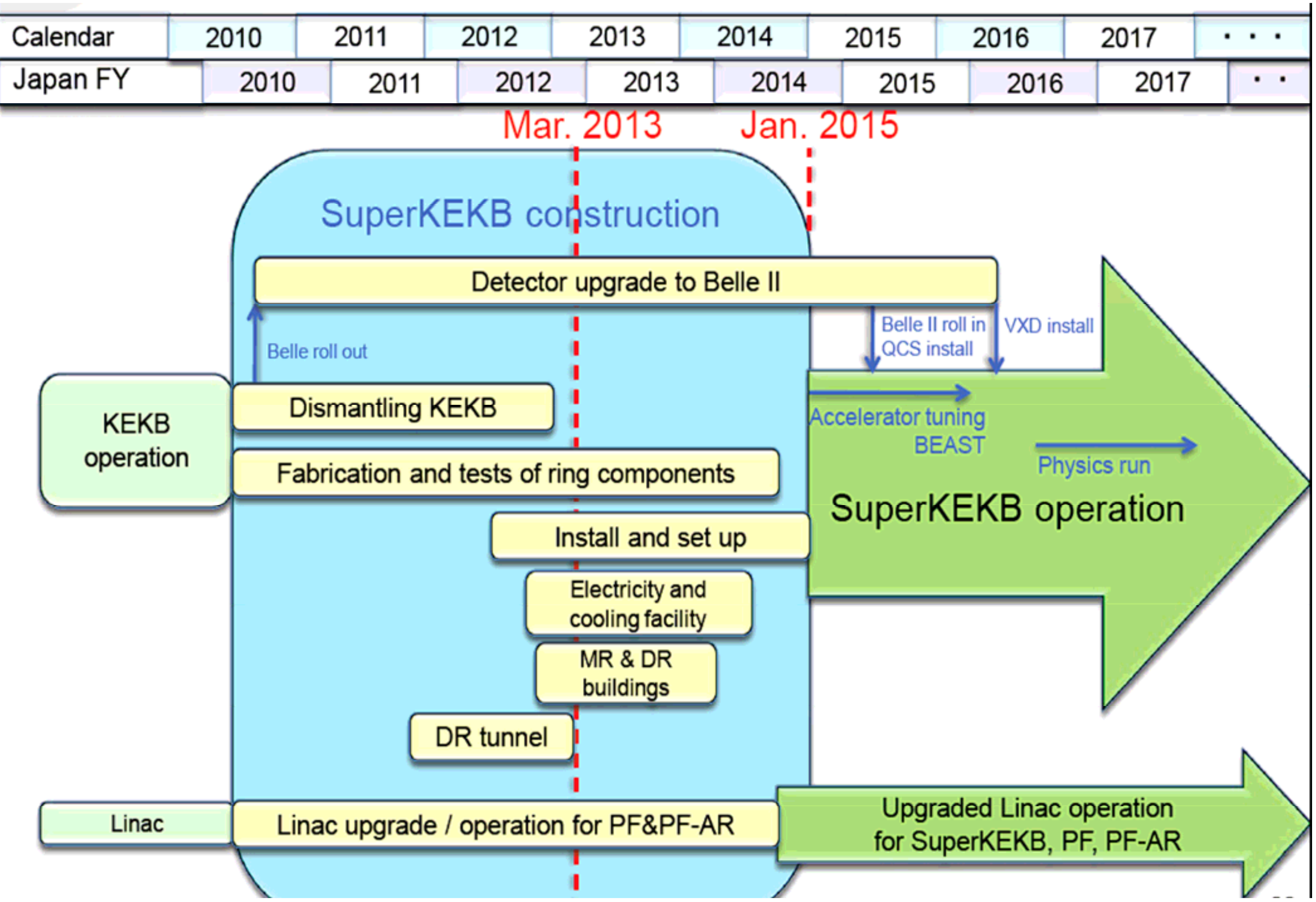
Belle II Collaboration



23 countries/regions, 94 institutions, >500 collaborators

SuperKEKB/Belle II schedule

→construction started in 2010!
Ground breaking ceremony in November 2011



Commissioning in three phases:

- Phase 1: w/o final quads, w/o Belle II
  - basic machine tuning
  - low emittance beam tuning
  - vacuum scrubbing
    - At least one month at beam currents of 0.5~1A.
  - Damping ring commissioning
- Phase 2: with final quads and Belle II, but no VXD
  - low beta* beam tuning
  - small x-y coupling tuning
  - collision tuning
  - study beam background
    - careful checks beam background before VXD installation.
- Phase 3: with QCS and full Belle II
  - physics run
  - luminosity increase

Conclusion

•Last decade demonstrated the fruitfulness and efficiency of the flavor “factory” approach in the particle physics.

•Huge amount of results was obtained at the B-factories, but many new questions were put and the large field of researches will be opened by the super B factories.

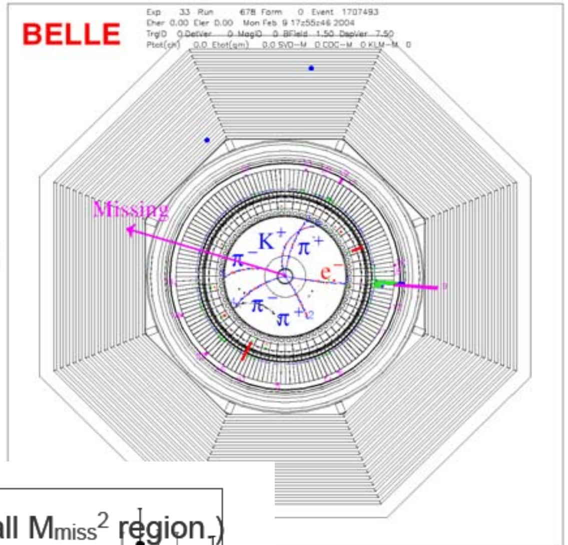
• It is clear that the super B factories will produce the information complementary to the LHC.

•At present superKEKB/Belle II project is under construction

• We can wait for new exciting results in the next decade.

Back up

$B^- \rightarrow \tau^- \nu_\tau$



$B^+ \to D^0\pi^+$
$(\to K\pi^-\pi^+\pi^-)$
$B^- \to \tau(\to e\nu\bar{\nu})\nu$

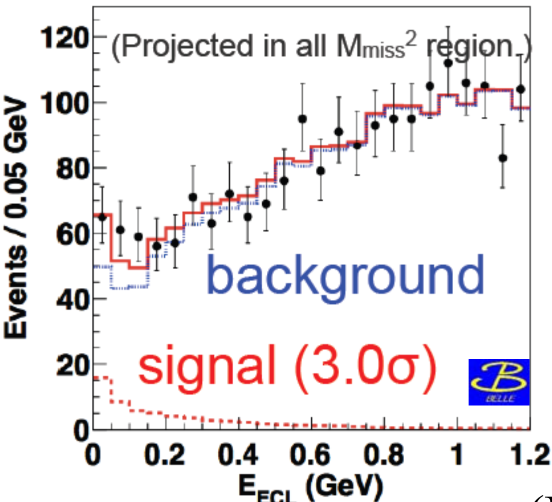
$BF(B \to \tau\nu)$

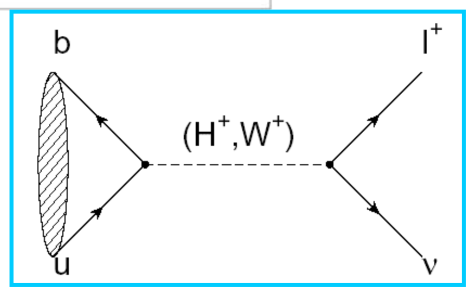
Belle: $(0.72^{+0.27}_{-0.25} \pm 0.11) \times 10^{-4}$

BaBar: $(1.83^{+0.53}_{-0.49} \pm 0.24) \times 10^{-4}$

All measurements combined

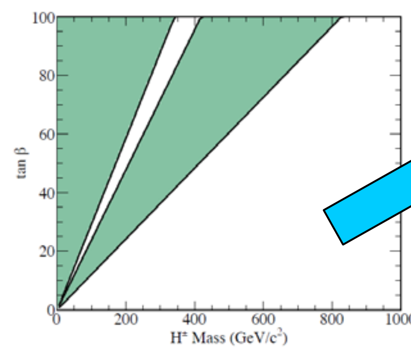
$$r_H = \frac{BF(B\to\tau\nu)_{meas}}{BF(B\to\tau\nu)_{SM}} = 1.14 \pm 0.40$$

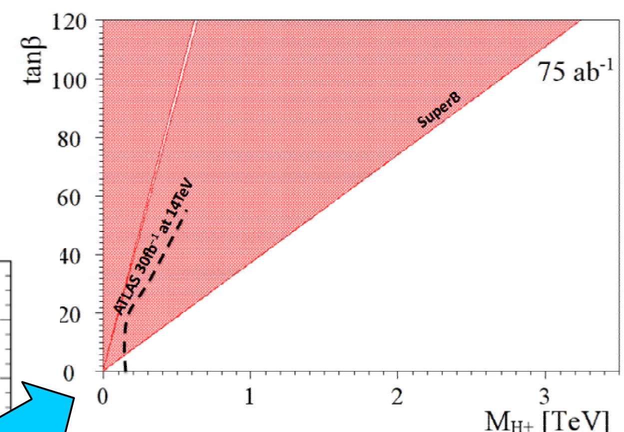




$\sigma(\Gamma/\Gamma_{SM}) \approx 0.08$

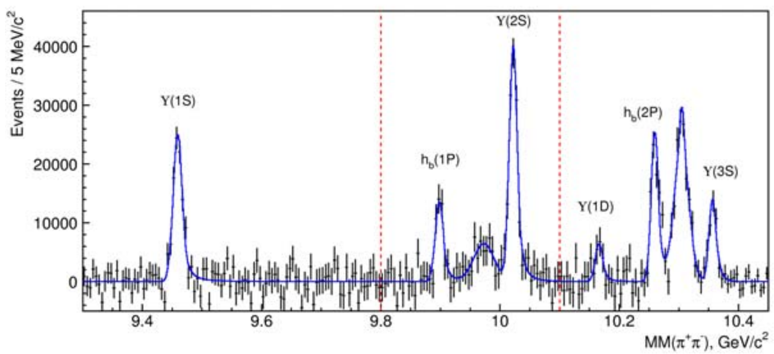
includes uncertainties from theory (on Vub and f_B), 0.04 purely exp.

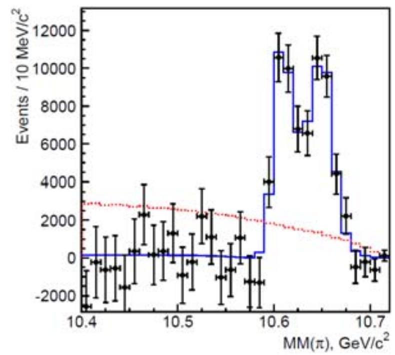




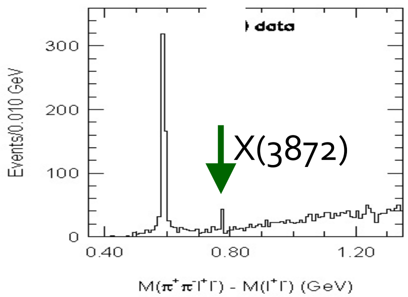
Hadron spectroscopy at B factories - examples

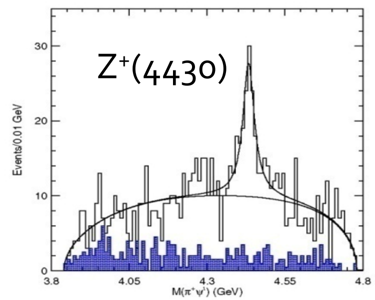
B family – new states





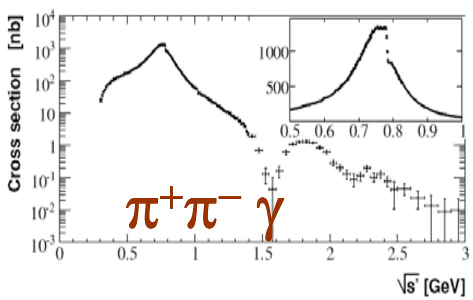
C family – XYZ states

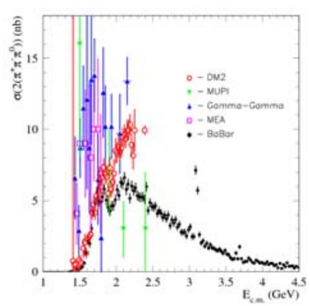


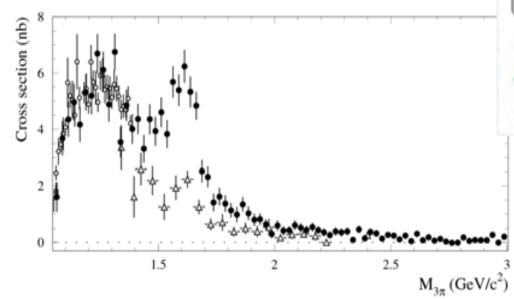


(see talk A.Bondar, E.Solodov, J.Crnkovic, V.Druzhinin)

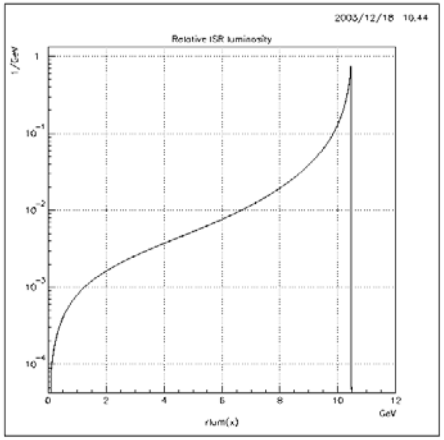
Light hadrons spectroscopy via ISR







Potential of ISR: competition or complementarity?



$$\frac{dl}{Ldm} = \frac{2\alpha m}{\pi s}\left\{\frac{s+m^4}{s(s-m^2)}\left(\ln\frac{s}{m_e^2}-1\right)\right\}$$

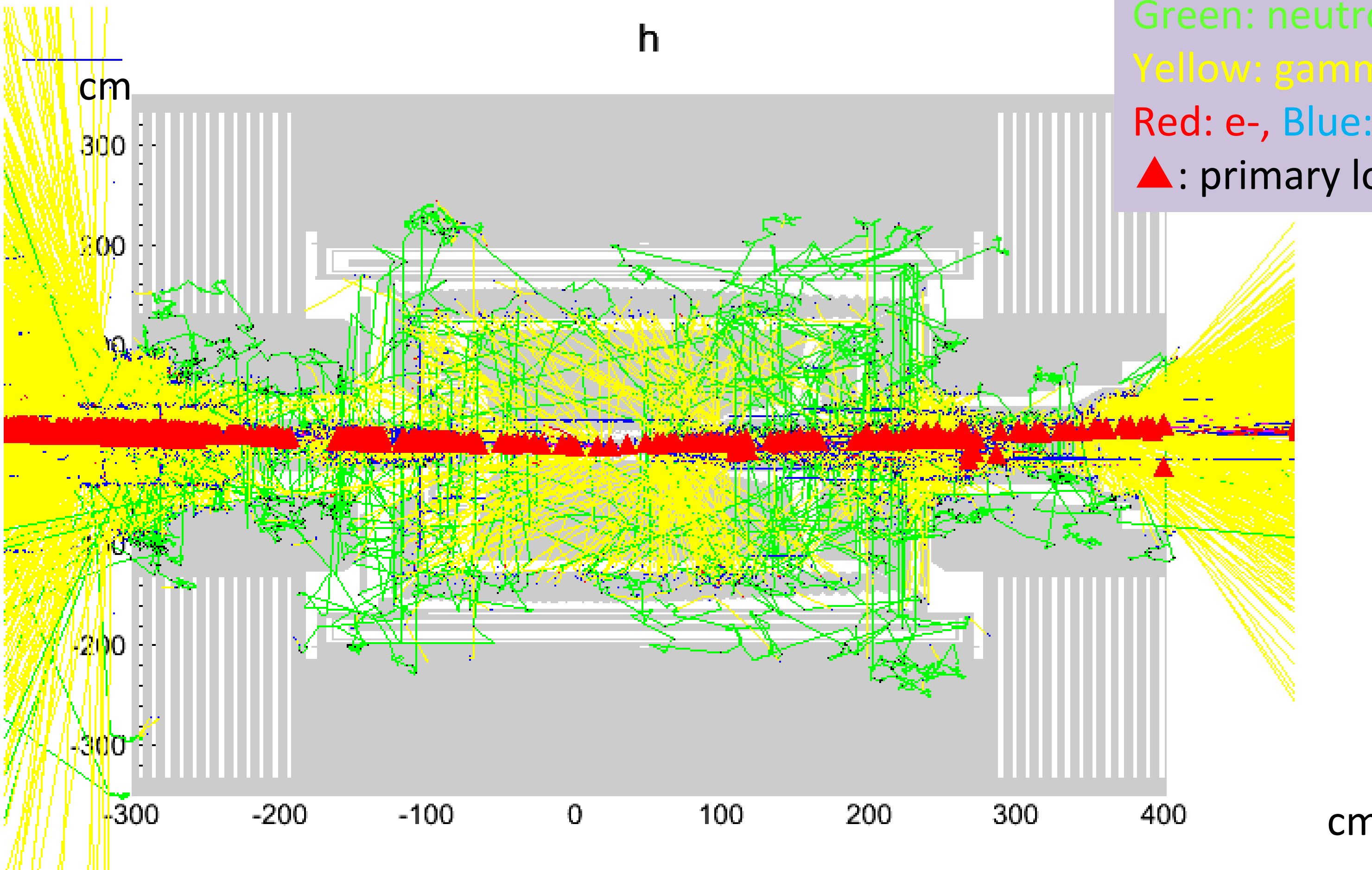
Number of events of the vector meson production at 8000 fb^{-1} (@Υ(4s))

φ	1.5×10^8
ψ	2.3×10^8
ψ(2S)	7.8×10^7
ψ(3770)	9.7×10^6
Υ(1s)	1.3×10^8
Υ(2s)	1.2×10^8
Υ(3s)	2.4×10^8

	KEKB	VEPP-2000	BEPC-II
Luminosity, cм$^{-2}$ s^{-1}	$8\cdot10^{35}$	10^{32}	10^{33}
Integrated lum. (per 10^7 s)	8000 fb^{-1}	1 fb^{-1}	10 fb^{-1}
Integrated in the range [1-2] GeV	8 fb^{-1} (~0.8 @ θ>0.7)	1 fb^{-1}	
Integrated in the range [2-3] GeV	20 fb^{-1} (~2 @ θ>0.7)		10 fb^{-1}

Background event display

100ns, shown E>1MeV
Green: neutrons
Yellow: gammas
Red: e-, Blue: e+
▲: primary loss position

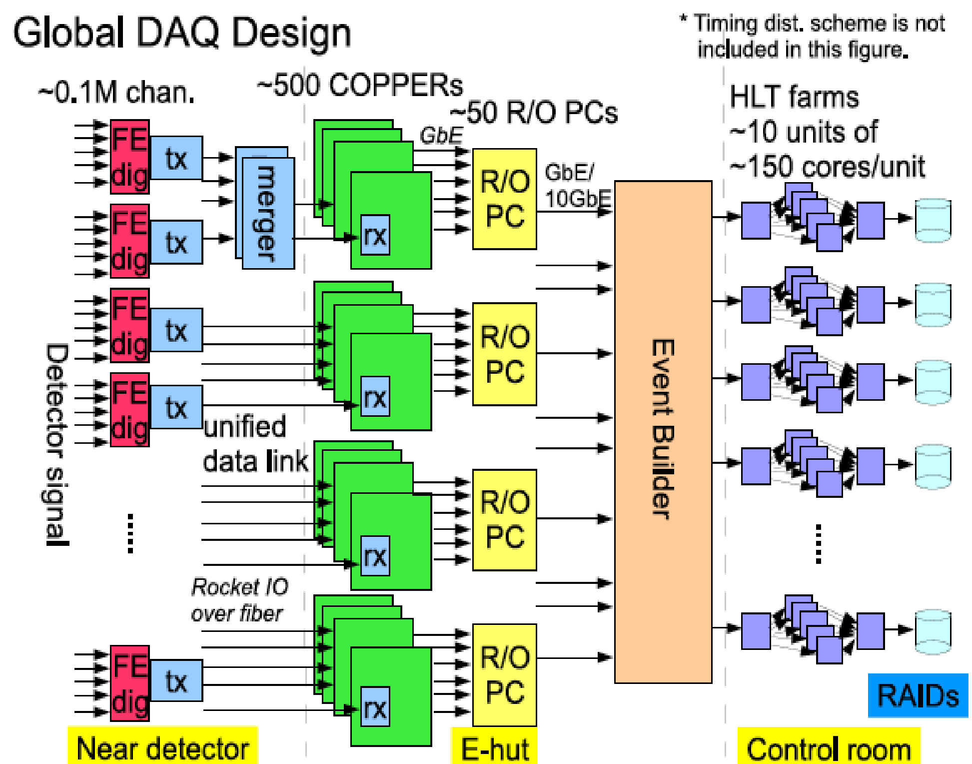


Neutrons: background hits in the muon and KL detection system (KLM) → reduce the efficiency of muon and KL detection → replace RPCs in the endcaps and 2 barrel layers.

DAQ Overview

- At full luminosity, the data rate is 600 MB/sec.
- A high performance DAQ system is being designed by KEK and IHEP Beijing

		Belle	Belle II
Level 1 Trigger	Trigger rate (kHz)	0.3-0.5	20-30
	Event size (kBytes)	40	300
	Data rate (MB/s)	20	6000
High Level Trigger	Reduction	1/ 2	1/10
	Storage Bandwidth (MB/s)	20	600



A snapshot of the Belle II computing model