KEKB Overview

2/16/2004 @ KEKB Review
K. Oide

Since the last Review, two design goals were achieved

(1) Peak luminosity

11.6 /nb/s   (design: 10, 8.3@last LCPAC)
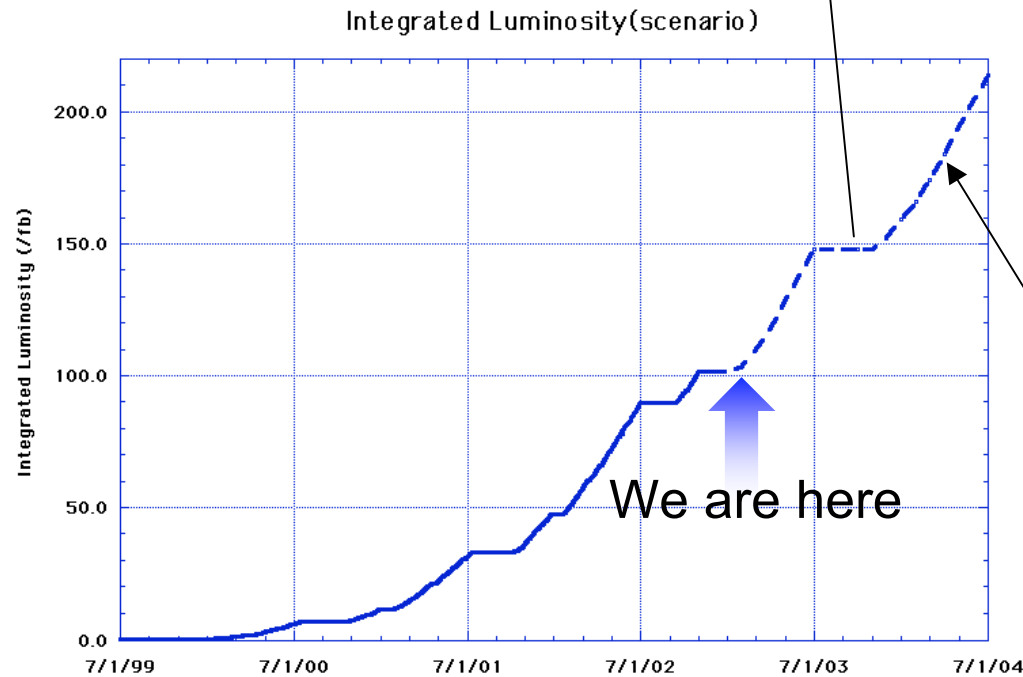
(2) Daily integrated luminosity

819 /pb   (design≈600, 434@last LCPAC)

Next milestone

- Design luminosity : 10^{34} /cm^2/s
- 100 /fb/year

Integrated Luminosity(scenario)

Long summer shutdown
(replacement of SVD/IP chamber)

We are here

Next LCPAC
~170 /fb

We got 197!

Continuous Injection™

Luminosity of KEKB
Oct. 1999 - Feb. 2004

Peak Luminosity
11.61 /nb/s

819/pb/day

4.75/fb/7 days
17.24 /fb/30 days

LER

HER

197.5 /fb
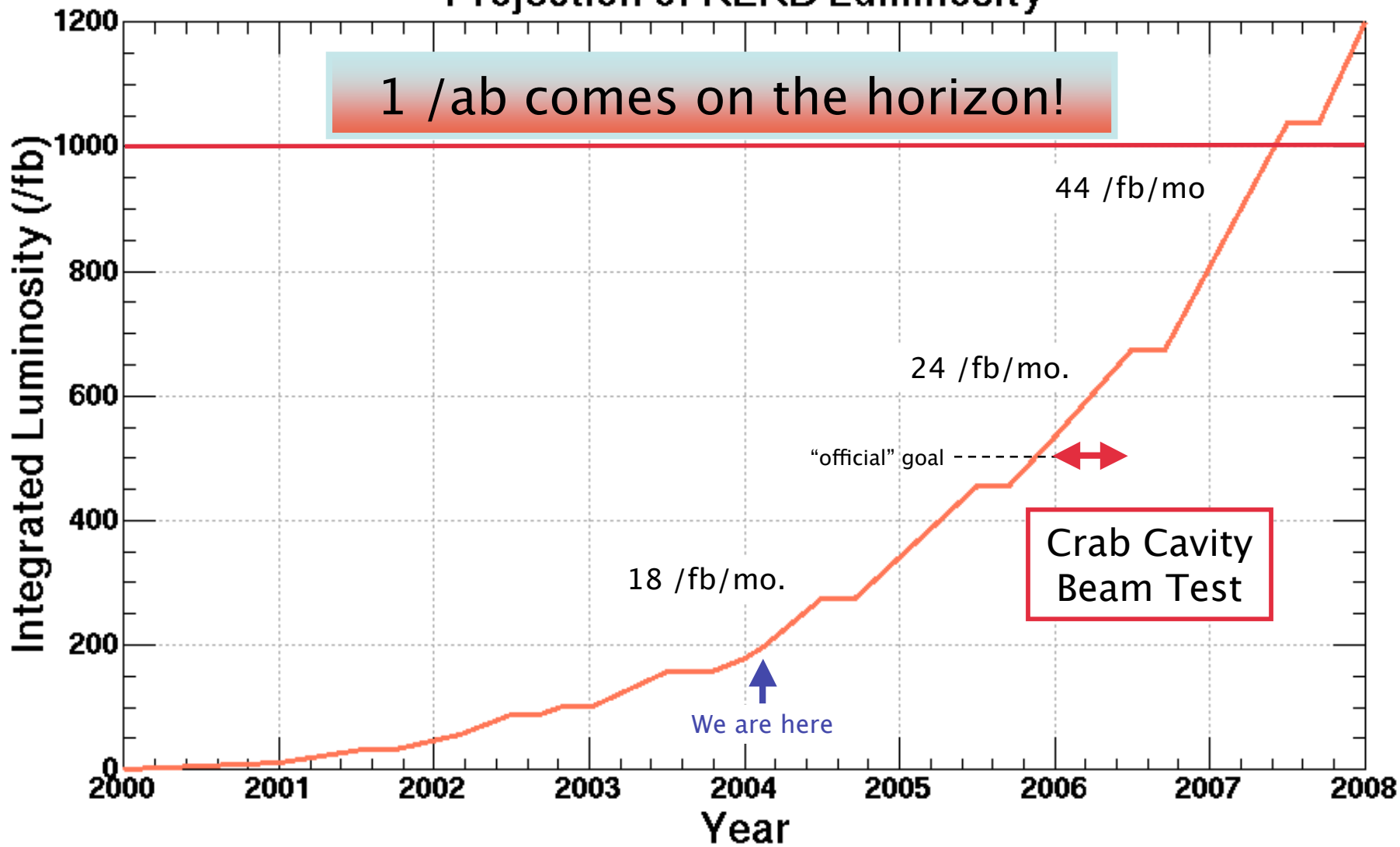
Last LCPAC

New SVD

Update: 02/16/2004 06:05:16
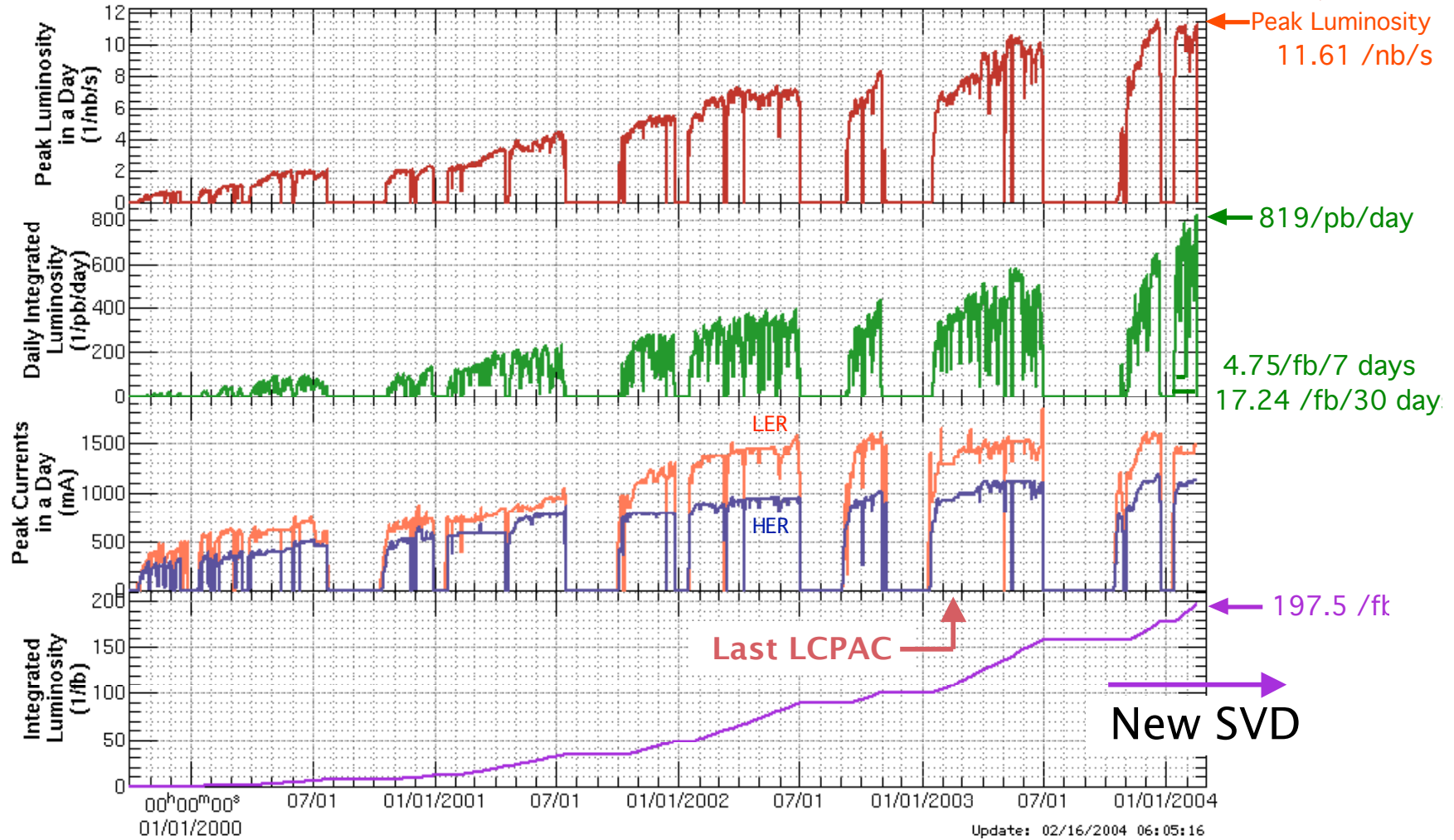
C-Yoke: (1) 800 m (2) 800 m Solenoid: 800 m 1250 m 1350 m 2150 m 2200 m 2250 m PM 25 m-50 m 230

The best 24 hours
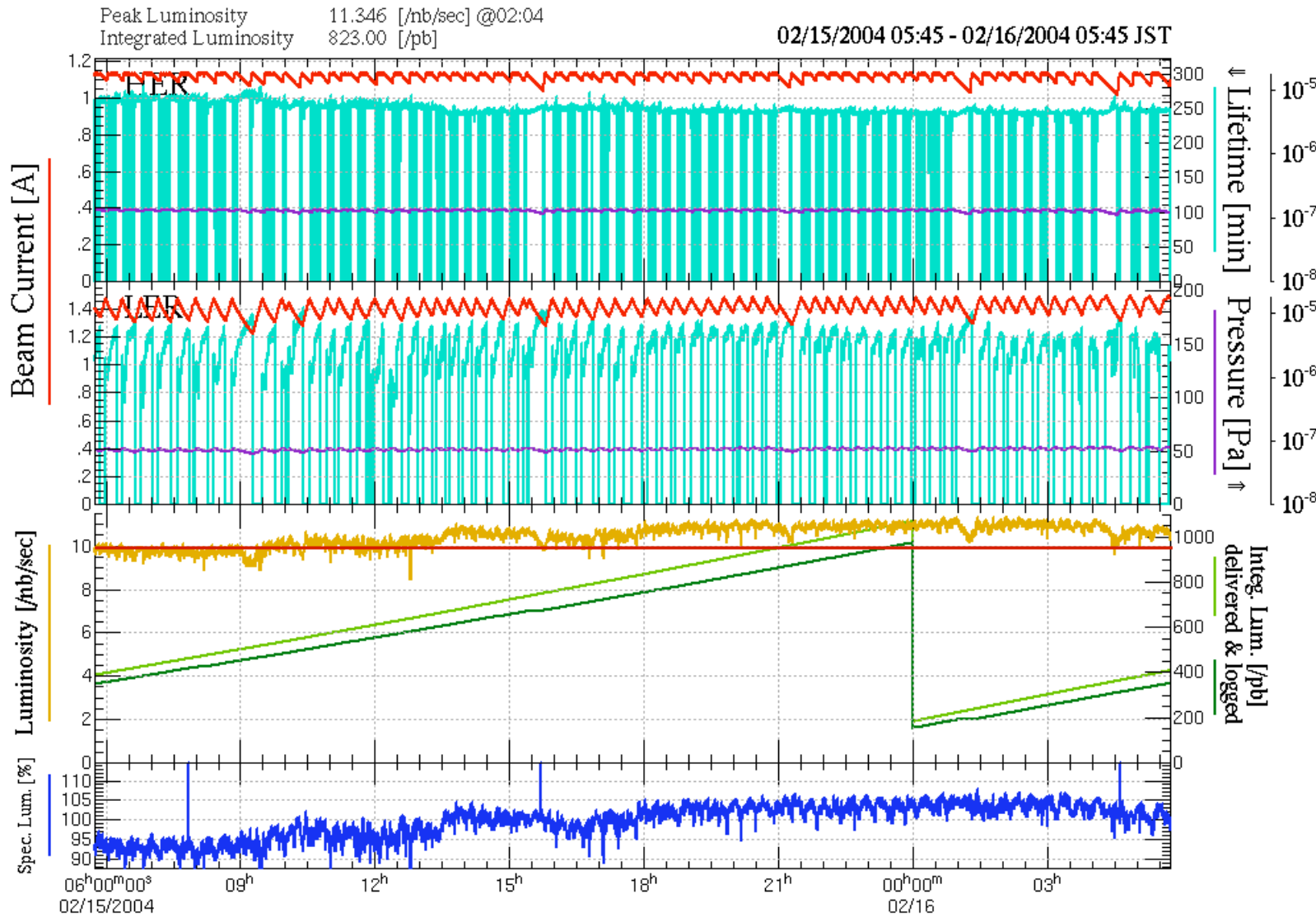
Projection of KEKB Luminosity

Crab Cavity

● In JFY2005, one cavity will be installed in one ring.

● Before July 2006, hopefully, another cavity will be installed in another ring.

● If they are successful, the luminosity will reach 3×10^{34} cm^{-2}s^{-1}.

Upgrade Scenarios

$$L \approx \frac{\gamma_{\pm}}{2er_e} \frac{I_{\pm}\xi_{\pm y}}{\beta_y^*} \frac{R_L}{R_y}$$

	L (/nb/s)	I_{LER} (A)	β_y^* (mm)	ξ_y	P (MW)	
Present Performance						
PEP–II	7.9	2.2	12	0.05	~50	Head–on
KEKB	11.6	1.5	6	0.05	~50	±11 mrad
Upgrade before 2007 (without major funding issues)						
PEP–II	33	4.5	6 σ_z?	0.05	~60?	Head–on or small crossing angle?
KEKB	30	1.6	6	0.14	~50	crab crossing
Major Upgrade						
PEP–II	1000	23	1.5 HOM? CSR?	0.10	~150	High freq rf, New tunnel?
KEKB	250	9.4	3	0.14	~90	New beam pipe, more rf

Higher Current:
- More rf power, cooling, injector, …
- More HOM heating (more bunches)
- Beam Instabilities
- Electron clouds, fast ions, …

$$L \approx \frac{\gamma_\pm}{2er_e} \frac{I_\pm \xi_{\pm y}}{\beta_y^*}$$

Head-on collision:
- Parasitic crossing for large number of bunches
- Background due to separation bends

Crossing angle:
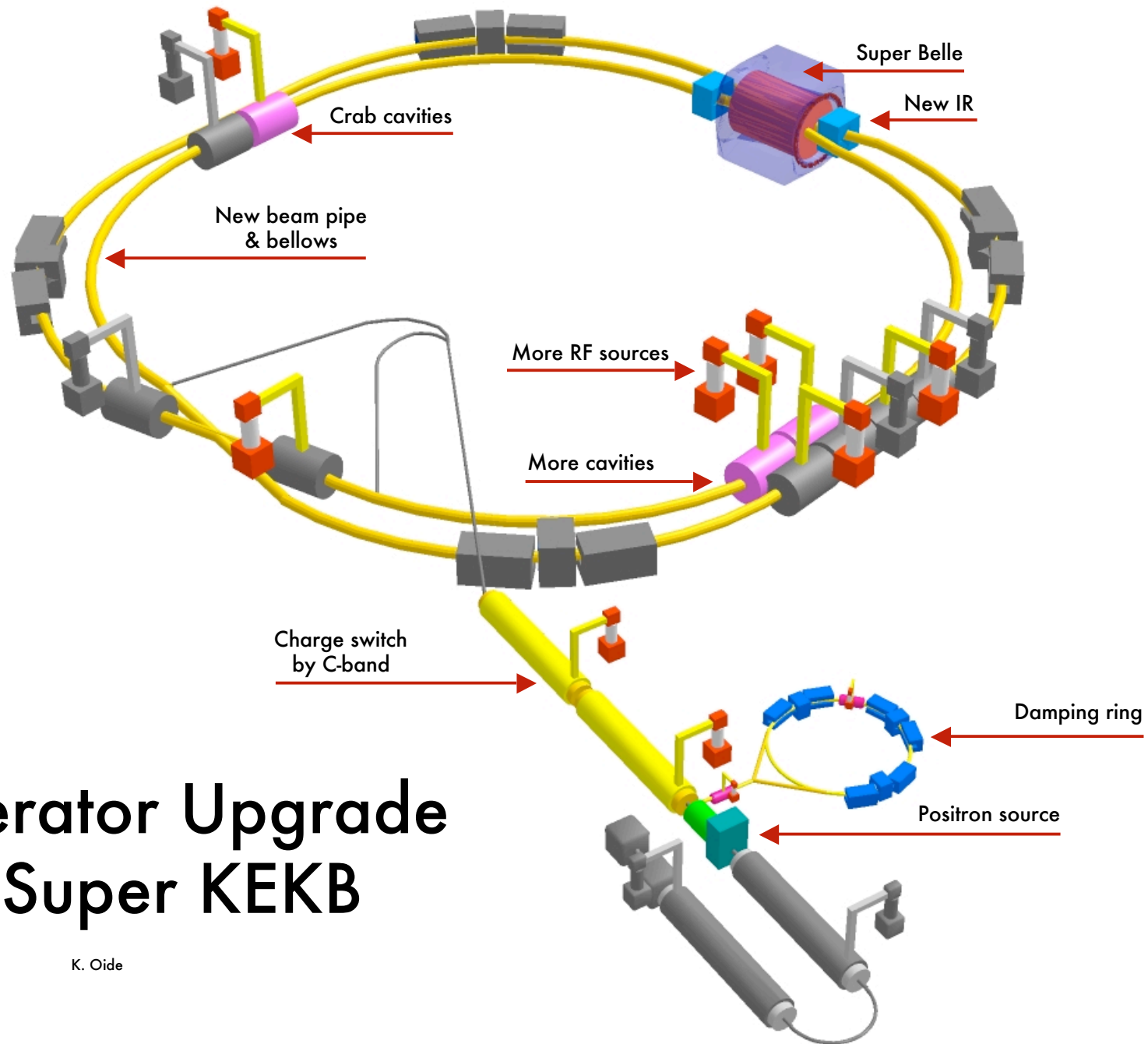- degrades ξ_y, < 0.06
- restored by crab crossing

$$\sigma_z \leq \beta_y^*$$

Smaller β_y^*:
- Smaller physical/dynamic aperture
- Shorter lifetime, more background, …

Shorter σ_z:
- More HOM heating
- Coherent synch. rad.
- Shorter lifetime, more background

Super Belle
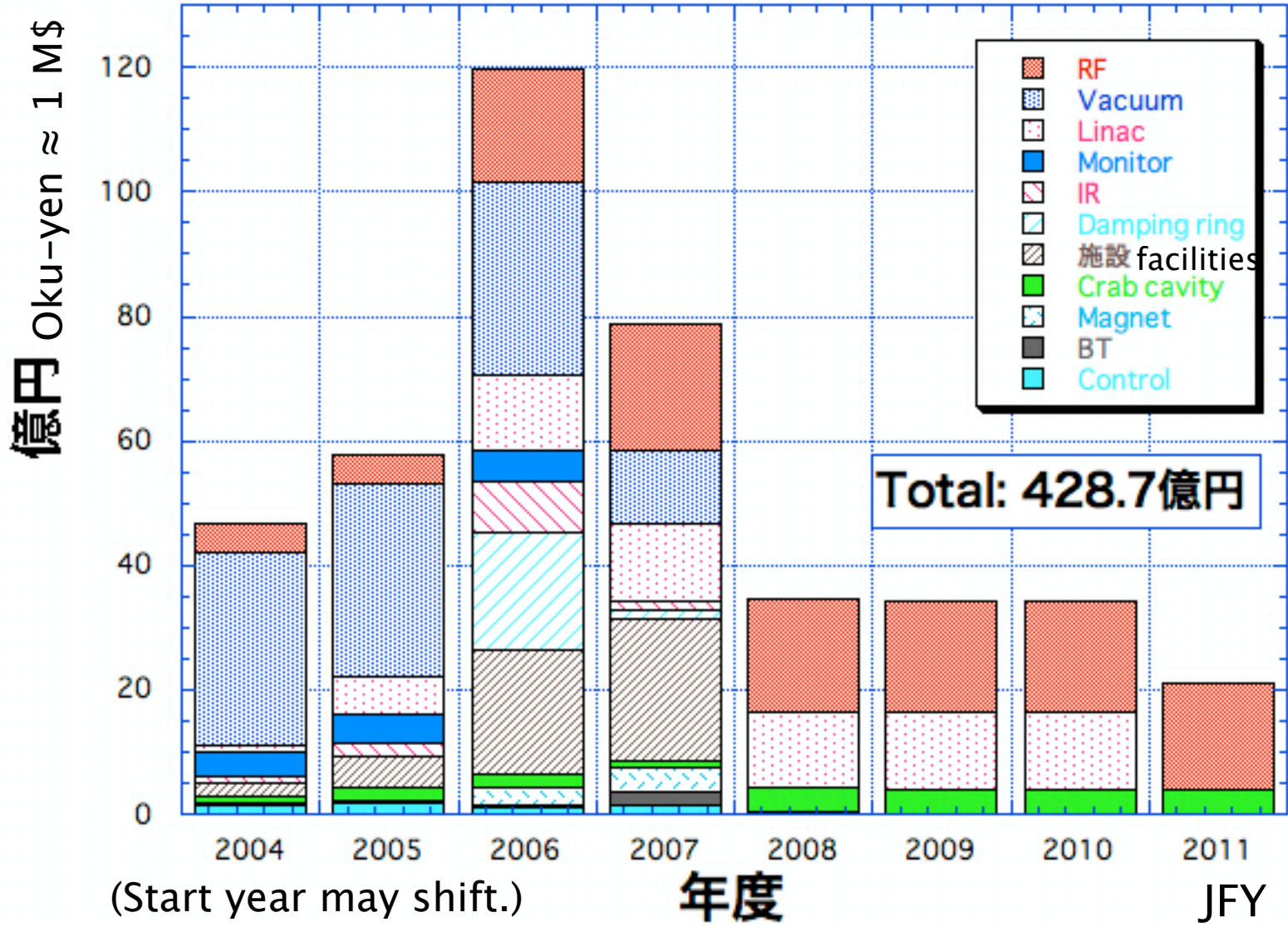
New IR

Crab cavities

New beam pipe & bellows

More RF sources

More cavities

Charge switch by C-band

Damping ring

Positron source

Accelerator Upgrade for Super KEKB

K. Oide

SuperKEKB年次計画
Budget Profile

Preliminary

Total: 428.7億円

億円 Oku-yen ≈ 1 M$

Legend:
- RF
- Vacuum
- Linac
- Monitor
- IR
- Damping ring
- 施設 facilities
- Crab cavity
- Magnet
- BT
- Control

(Start year may shift.)

年度

JFY

Special Talk by J. Seeman

"PEP–II Progress"

11:00 am (or after the committee ends),

Wednesday, February 18

This meeting room