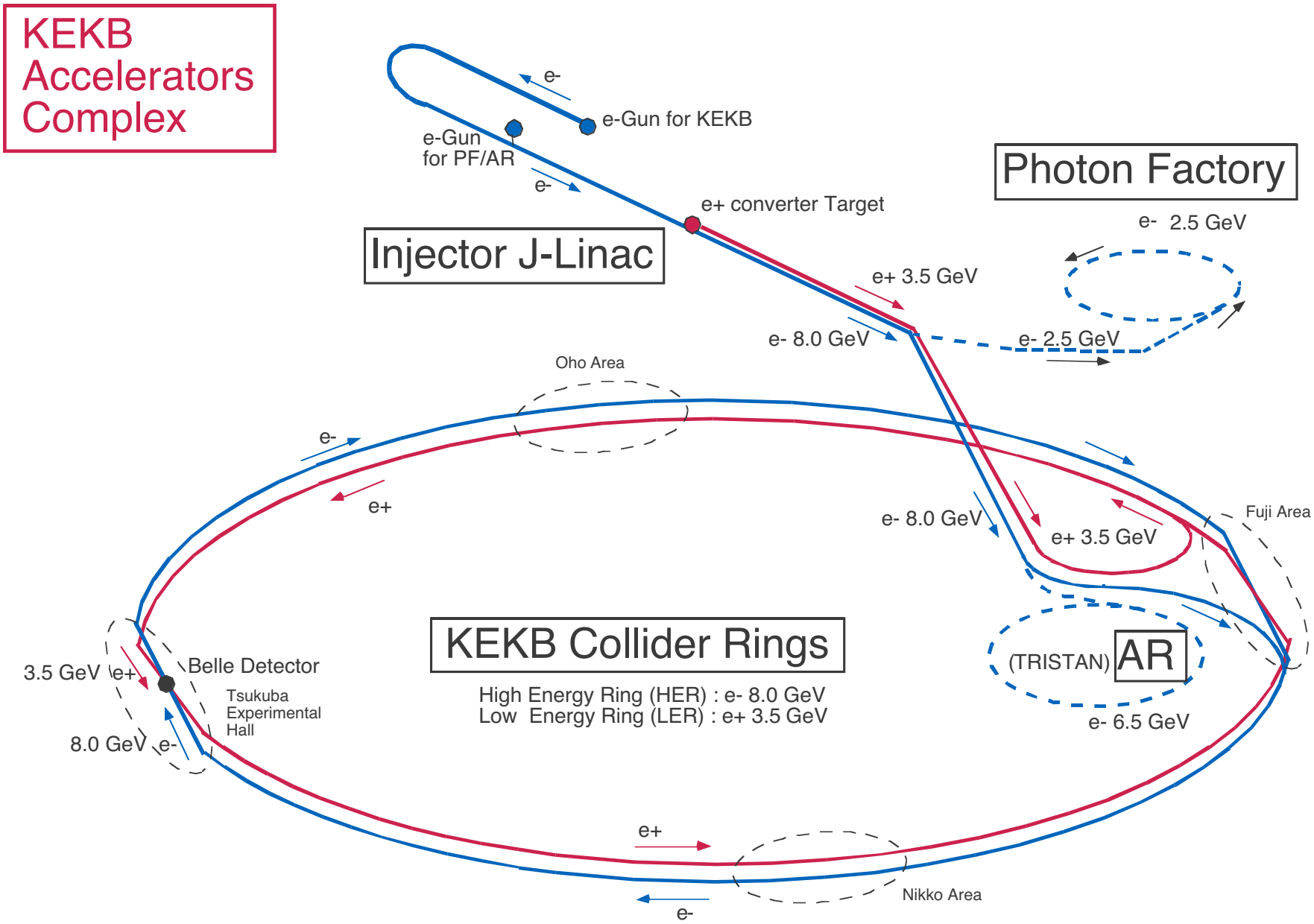
KEKB Injector Linac Status

1. Two-bunch Injection
2. Pulse Coil Breakdown

KEKB Review
2003.Feb.10
By Takuya Kamitani

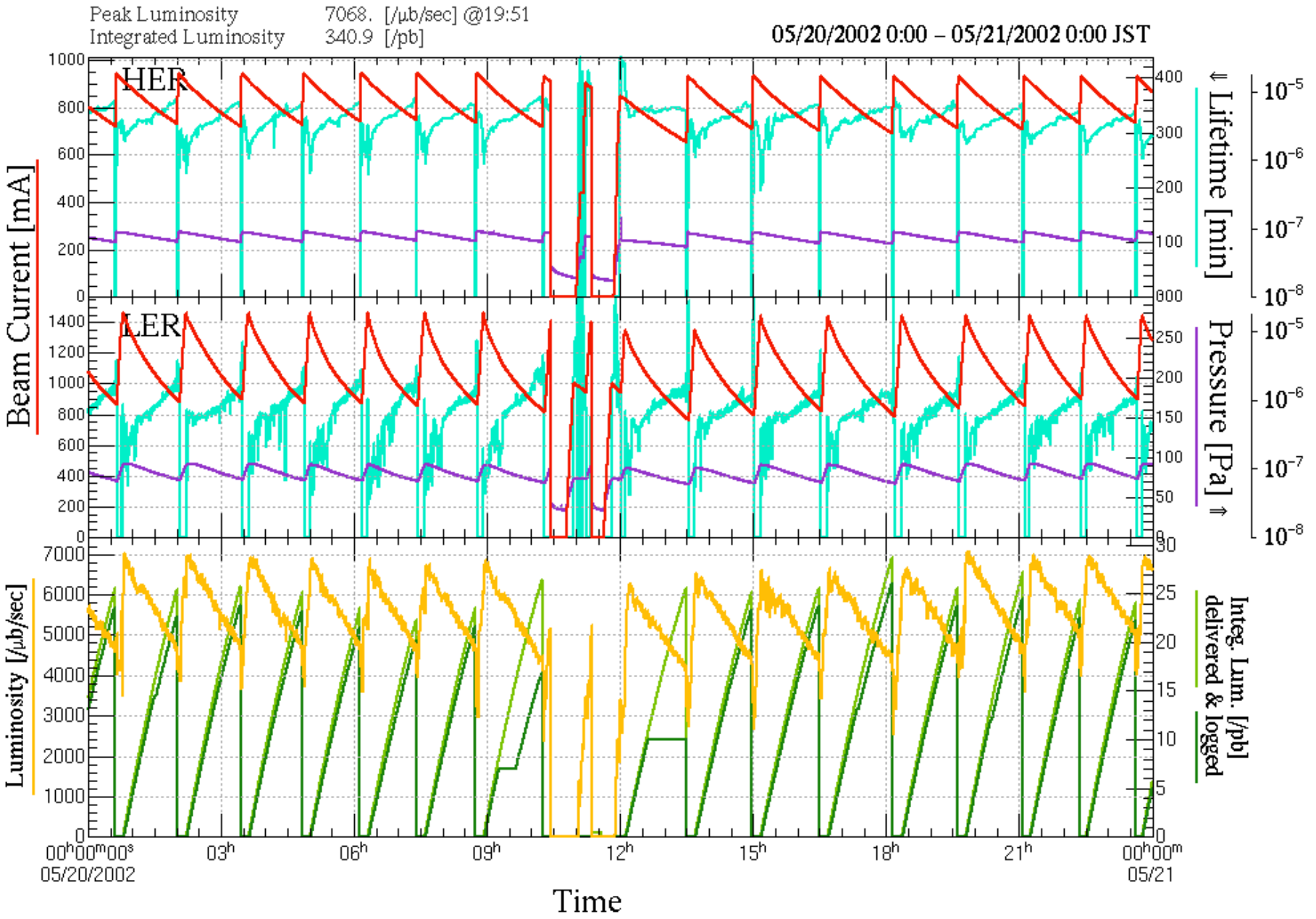

KEKB
Accelerators
Complex
e-
e-Gun for KEKB
e-Gun
for PF/AR
e-
e+ converter Target
Injector J-Linac
Photon Factory
e- 2.5 GeV
e+ 3.5 GeV
e- 8.0 GeV
e- 2.5 GeV
Oho Area
e-
e+
e- 8.0 GeV
e+ 3.5 GeV
Fuji Area
KEKB Collider Rings
High Energy Ring (HER) : e- 8.0 GeV
Low Energy Ring (LER) : e+ 3.5 GeV
(TRISTAN) AR
e- 6.5 GeV
3.5 GeV e+
Belle Detector
Tsukuba
Experimental
Hall
8.0 GeV e-
e+
e-
Nikko Area

Injector Linac Performance

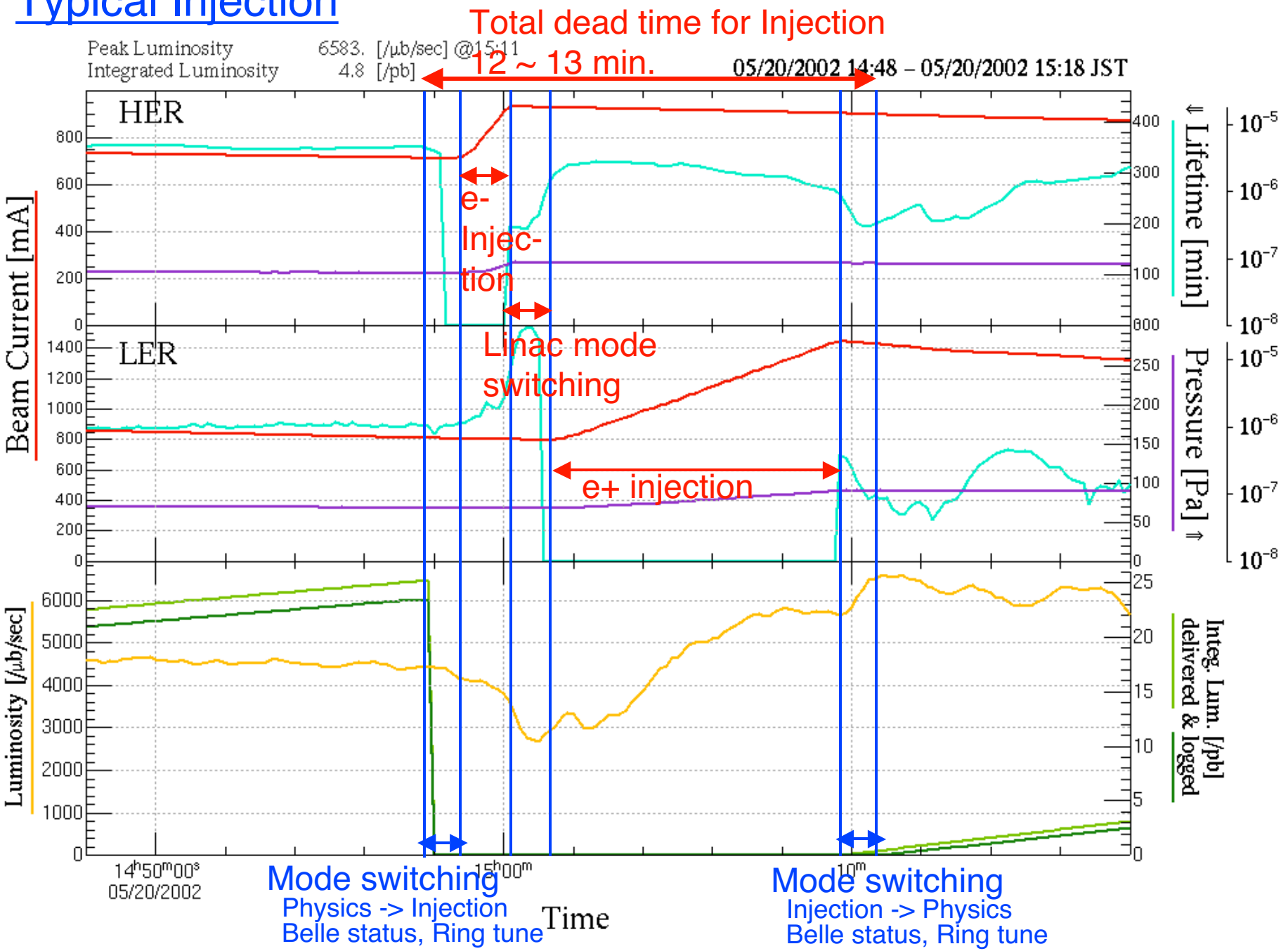
	Electron (e-)	Positron (e+)
Beam Energy	8.0 GeV	3.5 GeV
Charge	1.0 nC/pulse	0.6 (1.2) nC/pulse
Emittance	0.4×10^{-3} m	2.1×10^{-3} m
Energy spread (1σ)	0.05 %	0.15 %
Injection rate	3.0 mA/sec	1.5 (3.0) mA/sec

(for two-bunch injection)

Typical Daily Run Status (2002.May)



Typical Injection



Two-bunch Injection

Most of the injection time is spent for positrons !

-> Increase positron intensity !

How ?

(1) Increase primary electron charge ?

-> present 10 nC/bunch is already limited by Wake effect

(2) Increase positron collection efficiency

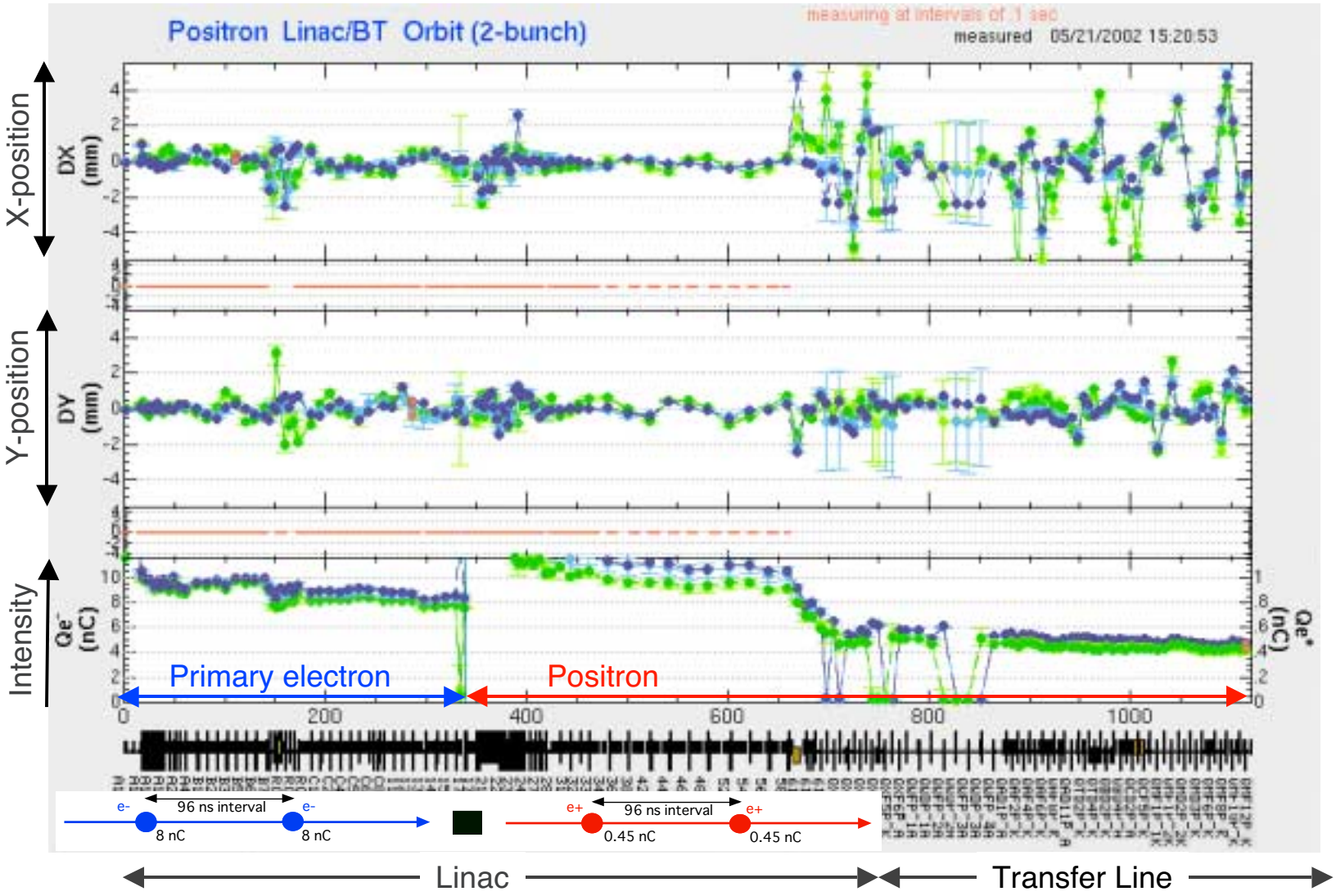
-> expensive !

(3) Increase number of the bunches ?

-> Constraint from frequencies of Linac and Ring,

Maximum **Two Bunches** but possible

Two-bunch injection

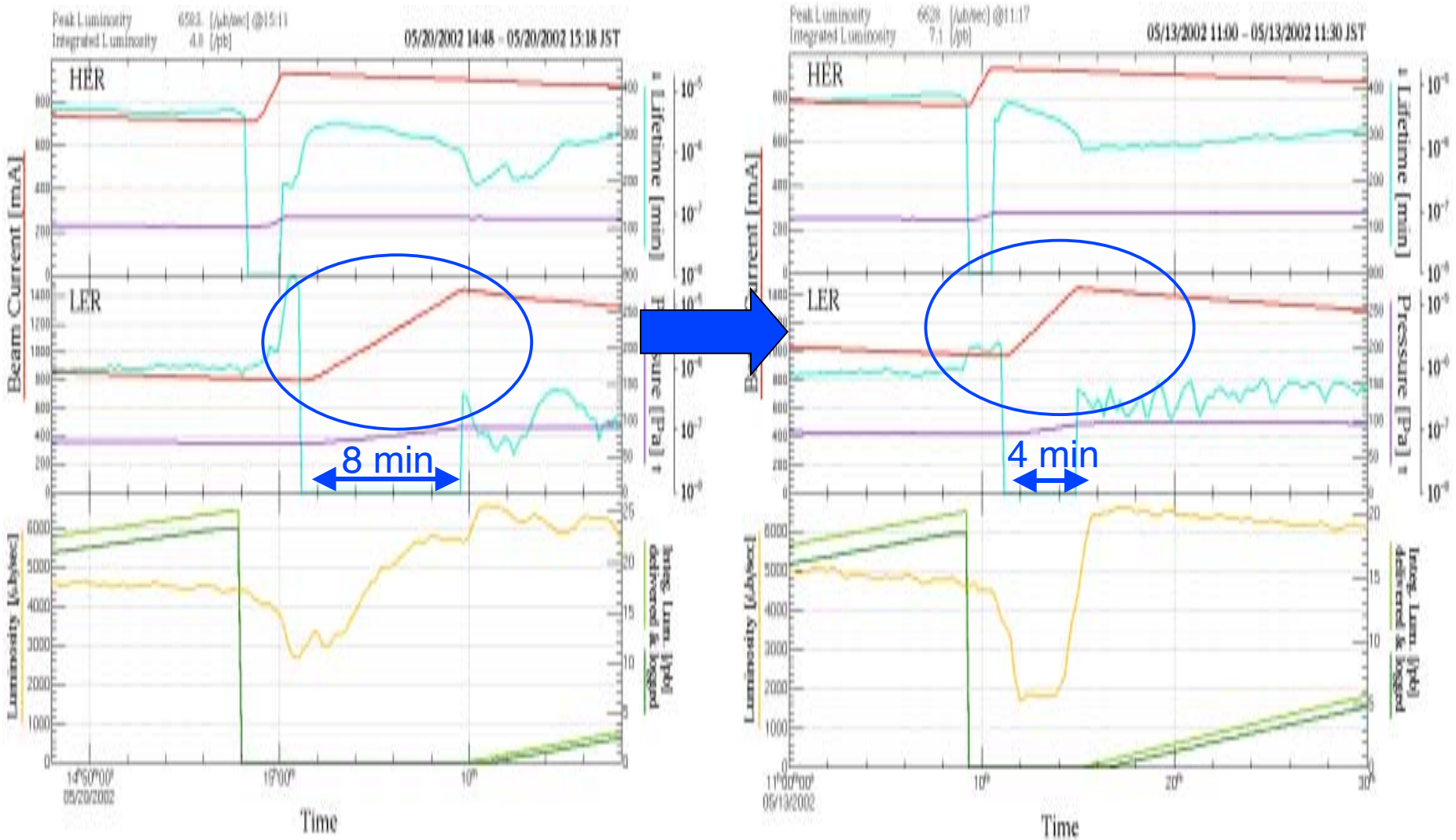


- 1-st bunch
- 2-nd bunch

e+ intensity is doubled !

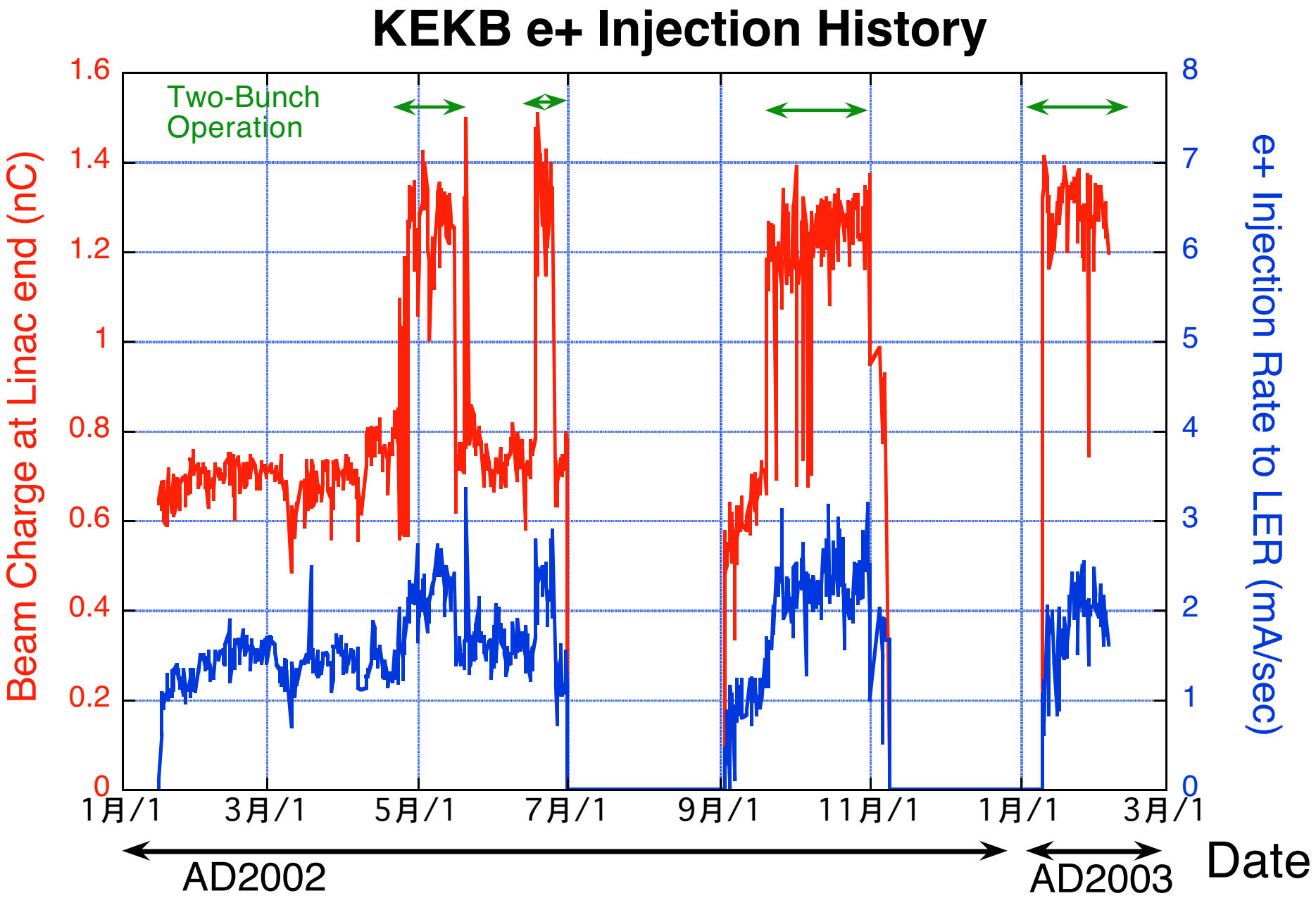
Single-bunch injection mode

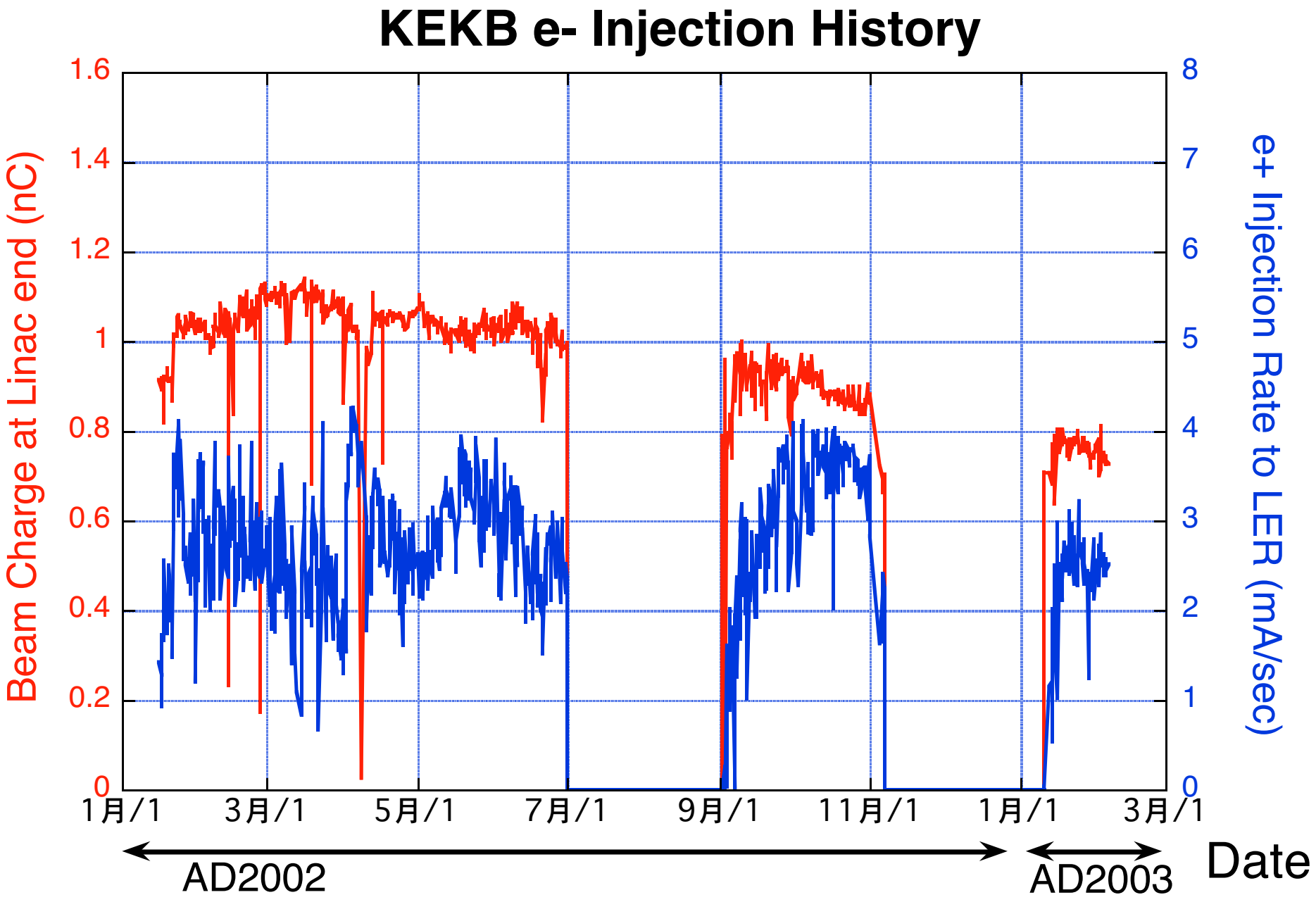
Two-bunch injection mode



e+ Injection Rate is doubled !

-> Shorter Injection Time


KEKB e+ Injection History
Two-Bunch
Operation
Beam Charge at Linac end (nC)
e+ Injection Rate to LER (mA/sec)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8
7
6
5
4
3
2
1
0
1月/1
3月/1
5月/1
7月/1
9月/1
11月/1
1月/1
3月/1
AD2002
AD2003
Date


KEKB e- Injection History
Beam Charge at Linac end (nC)
e+ Injection Rate to LER (mA/sec)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8
7
6
5
4
3
2
1
0
1月/1
3月/1
5月/1
7月/1
9月/1
11月/1
1月/1
3月/1
AD2002
AD2003
Date

e+ capture section (cut model)