

**KEKB
Beam Transport Line
Issues**

2001 February 24

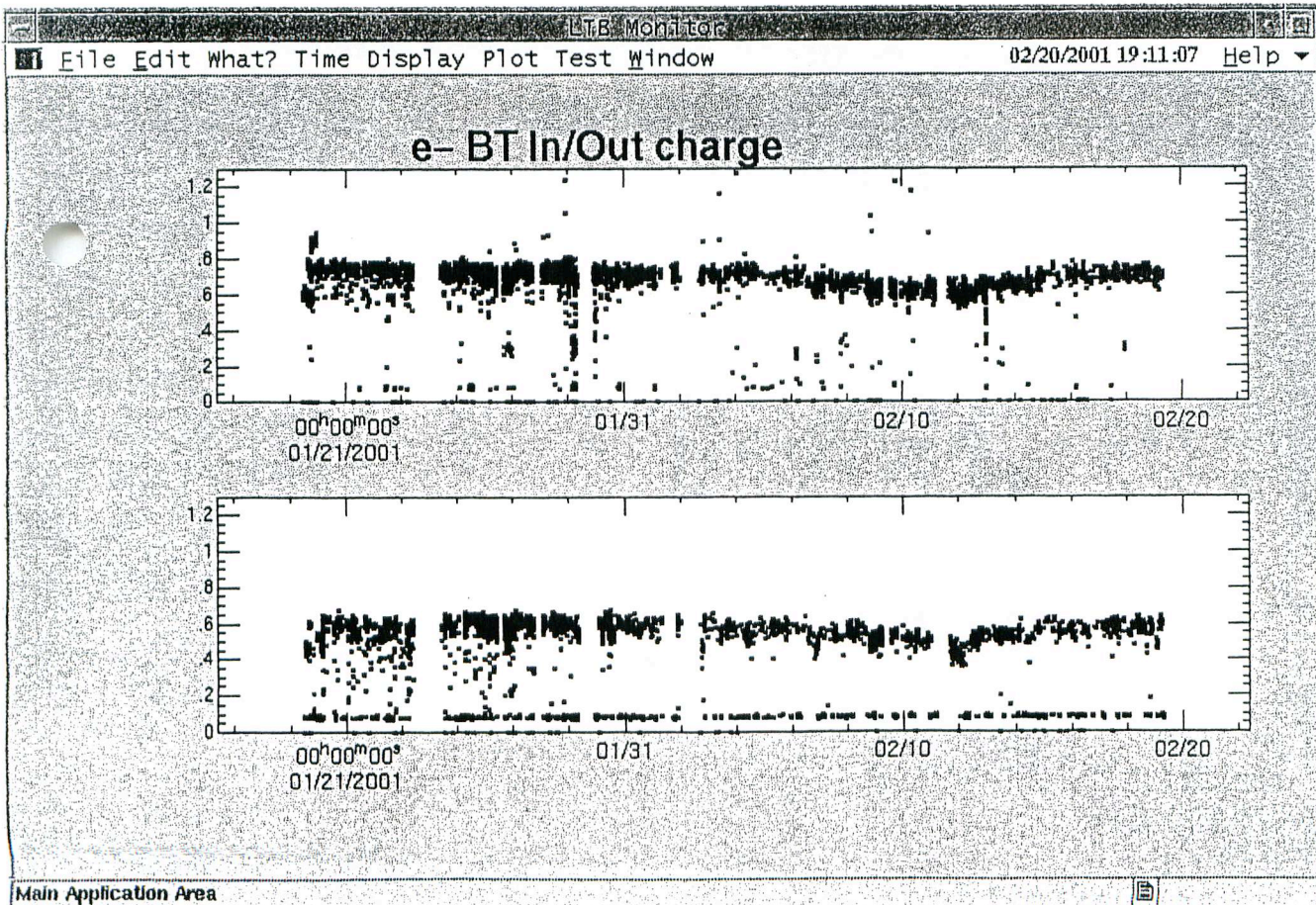
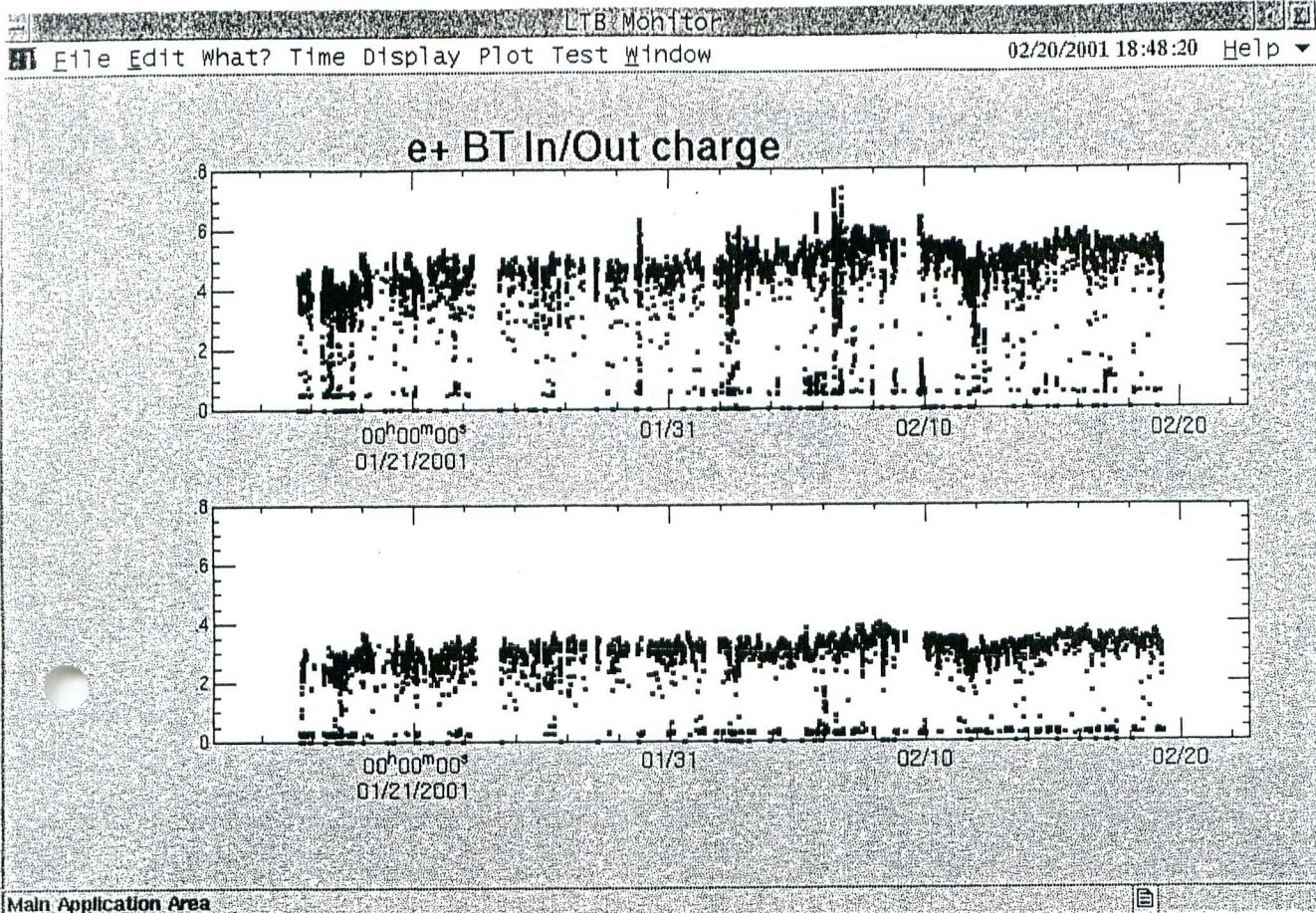
Toshihiro Mimashi

1. Operation status

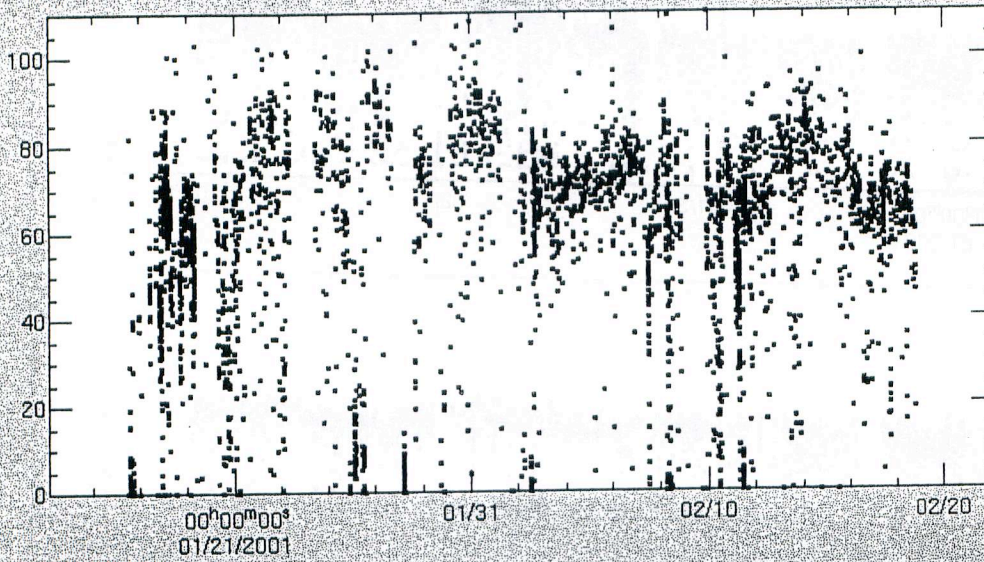
1.1 Transport Line

		Transmission	Inj. efficiency	Inj. Rate
e+	best	80%	100%	1.8 mA/s
	typ.	70%	80%	1.4 mA/s
e-	best	100%	100%	4.0 mA/s
	typ.	95%	80%	2.8 mA/s

- (1) Inj. efficiency strongly depends on the mask positions.**
- (2) Inj. rate depends on the energy spread of the beam as well.**
- (3) Initial setup of beta match between Linac and BT typically holds one month.**
- (4) Empirical beta match from BT to ring sometimes helps injection efficiency.**

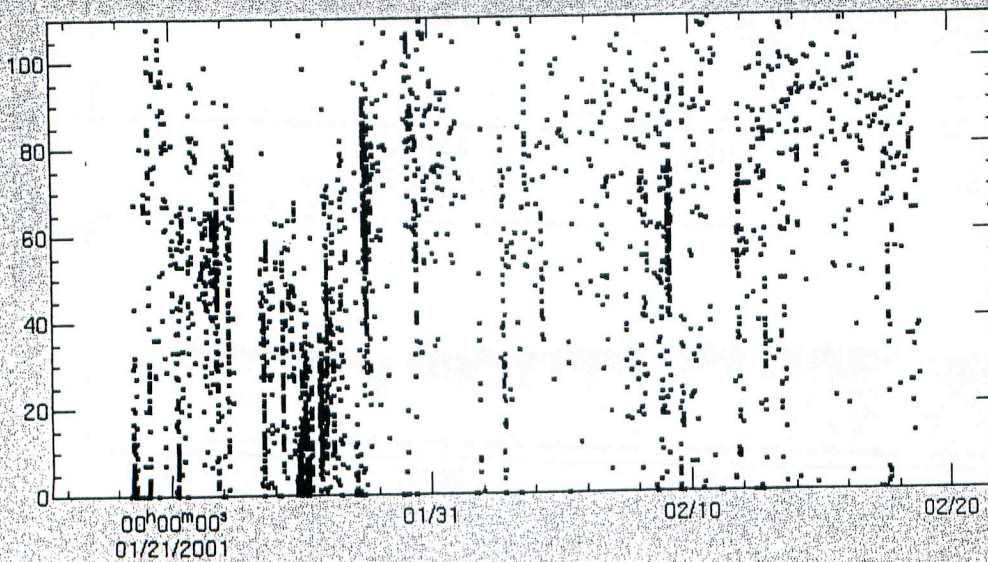


e+ Injection Efficiency

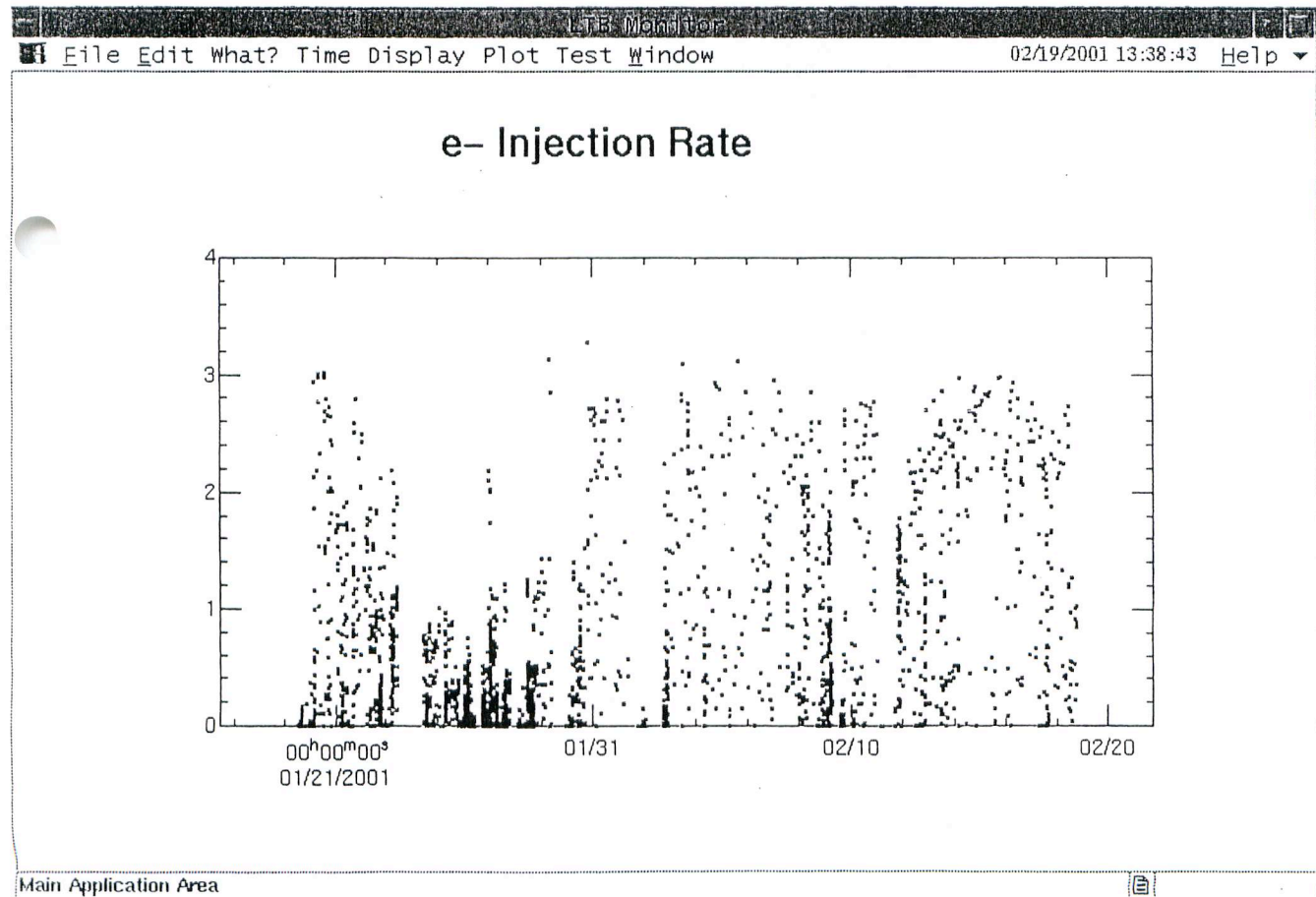
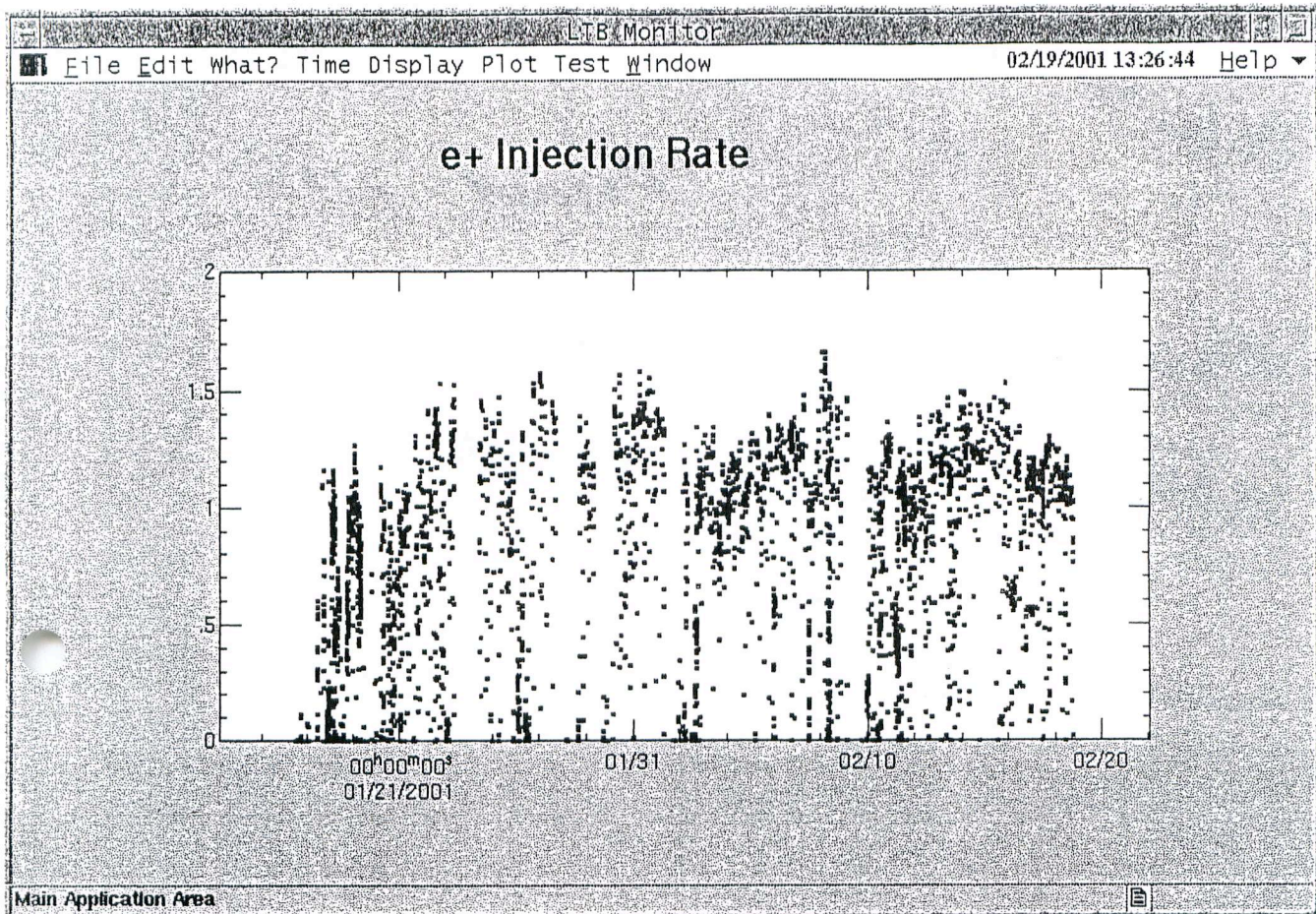


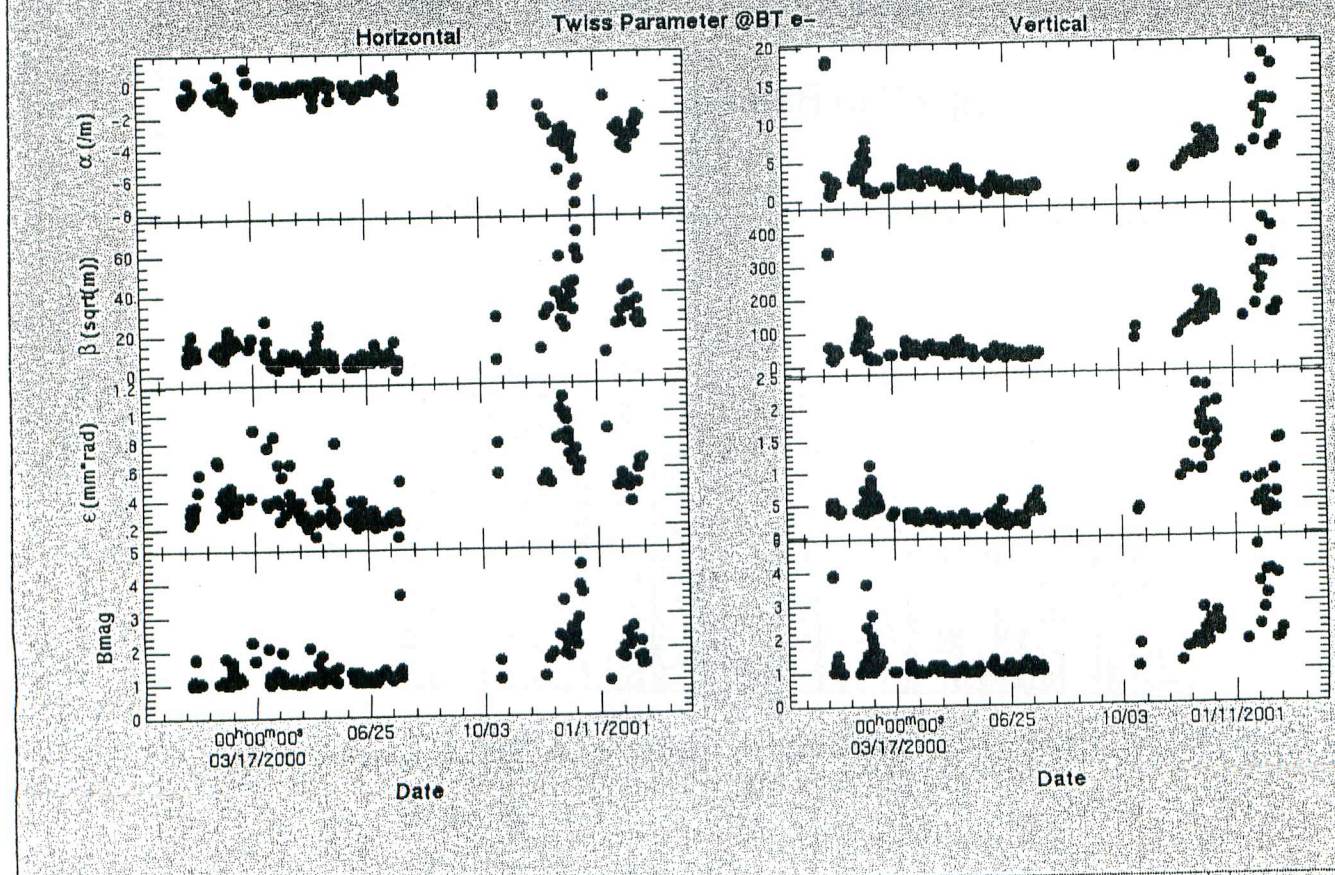
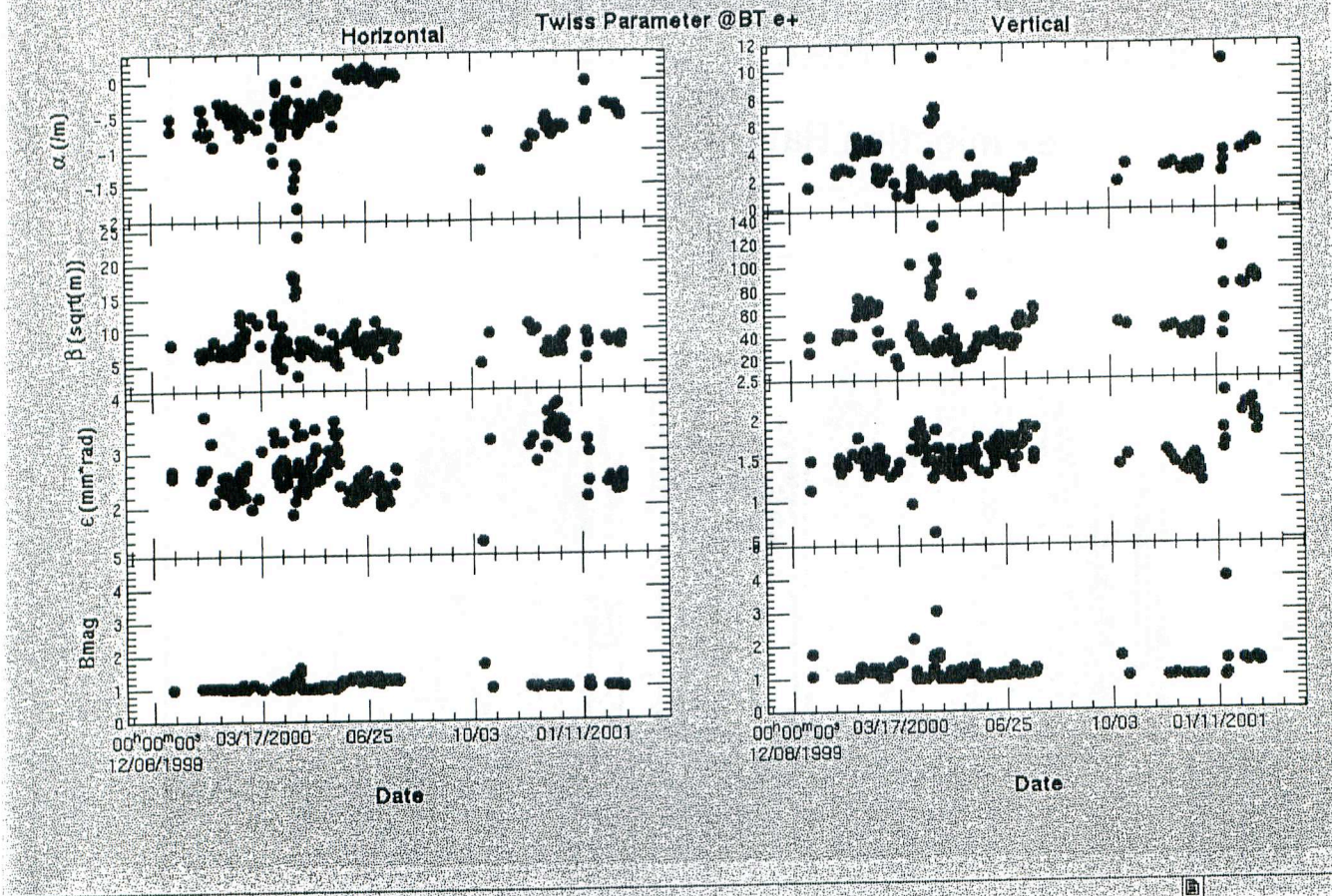
Main Application Area

e- Injection Efficiency

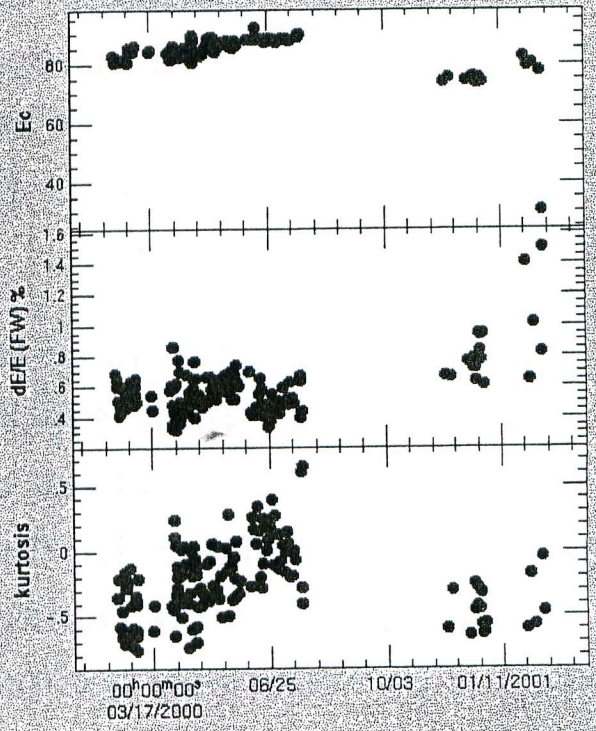
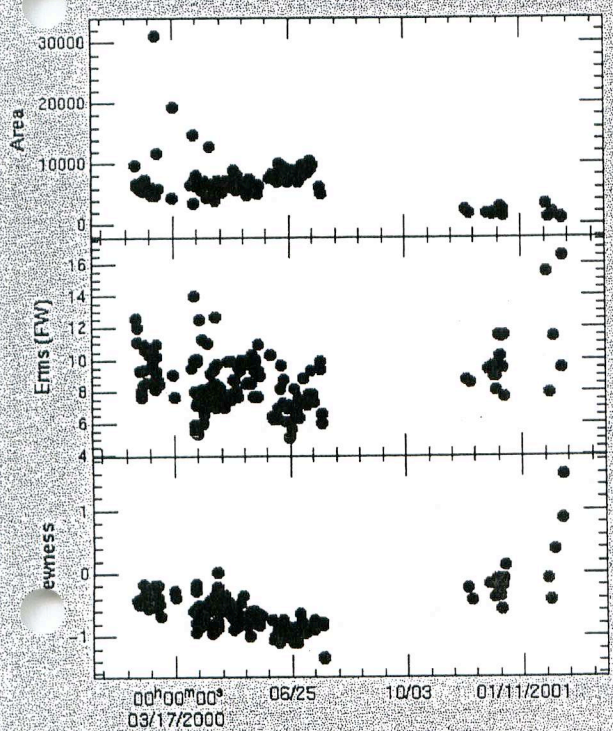


Main Application Area





dE @BT e+

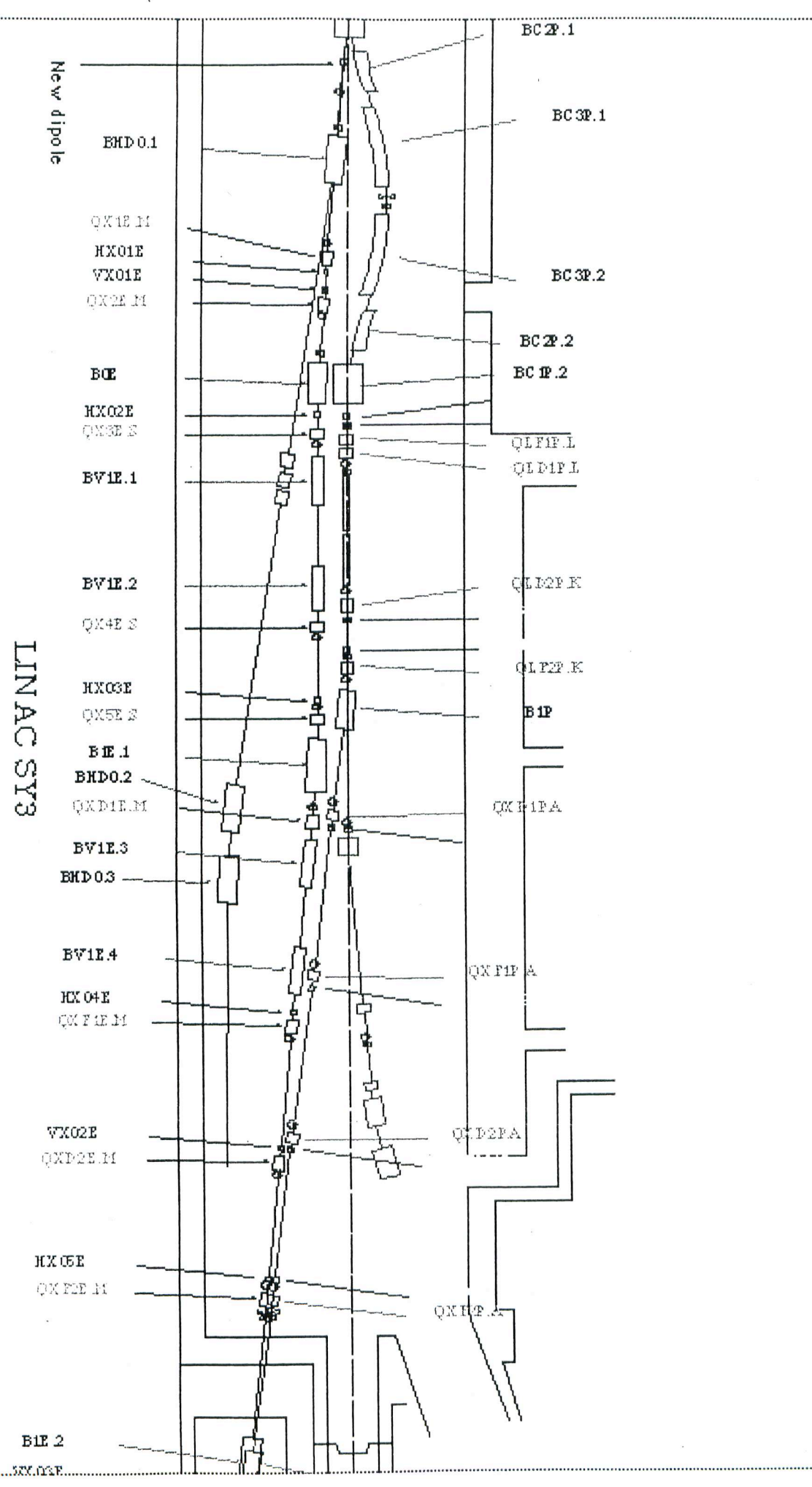


(5) Poor transmission of positrons stems from the loss of low energy tails at the ECS bends. To accommodate lower energy particles in the aperture of the bends, smaller bend angle is adopted than the nominal value, which produces 5mm excursion at the center of ECS bends. Since the first bend of ECS is common to electron beam this manoeuvre also generates 10mm excursion of electron beam, which sometimes results beam loss when the energy spread is accidentally large.

In order to cure this situation we plan to install a small dipole after the first ECS bend, which serves as an energy adjuster. Also in order to decrease the loss of the positron beam replacement of the chamber with wider one is considered.

Bend \curvearrowright Quad \square H-Steer \curvearrowright Y-steer \curvearrowright BPM \square Screen+VCM

Collimator \parallel Acc. Structure



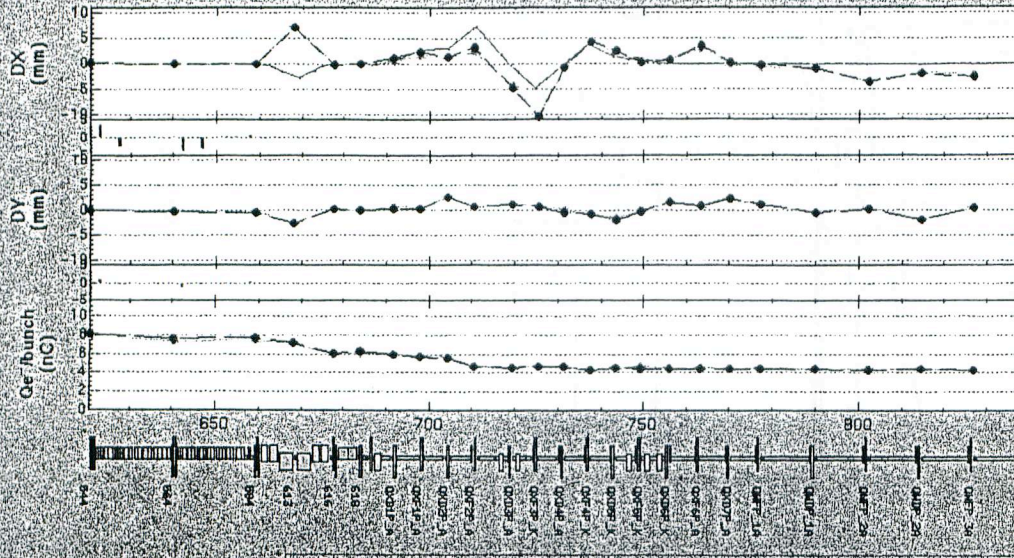
10
 20
 30
 40
 50

LINAC SY3

BE 2
SX03E

Positron Linac/BT Orbit

measuring at intervals of 1 sec
measured 02/14/2001 17:26:47



r.m.s. = 2.247 mm
 max. = 7.107 mm
 @ SPB13
 min. = -11.391 mm
 @ SPQCF5P_K
 -1.107 mm
 @ SPQD13P_K
 (-1.778 mm)

 r.m.s. = 1.202 mm
 max. = 3.592 mm
 @ SPQAD1P_A
 min. = -5.844 mm
 @ SPQCD8P_A
 585 mm
 @ SPQMD13P_K
 (-352.193 mm)

313 nC
@ SPQMD13P
 (-8124.007 nC)

04

goldp 02-04-2001-17:54:19.dat

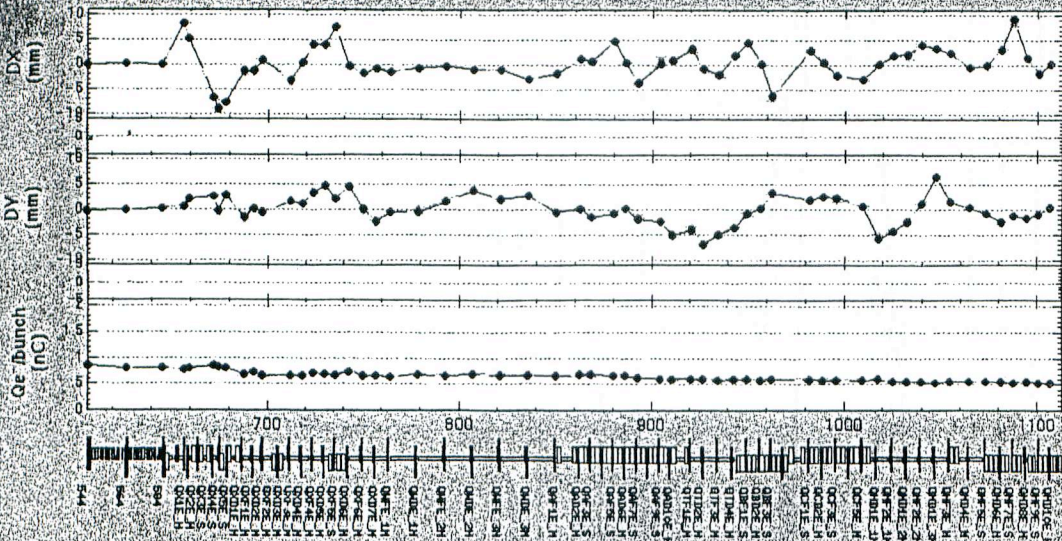
range DX Auto Fk (10) DY Auto Fk (10) Q Auto Fk (11) beta 10 Replot

meas stat ref meas-ref stat-ref gold mea-gold sta-gold

meas -gold meas -ref stat -ref

Electron Linac/BT Orbit

measuring at intervals of 1 sec
measured 02/14/2001 17:23:37



r.m.s. = 2.276 mm
 max. = 9.298 mm
 @ SPQMF7E_S
 min. = -8.821 mm
 @ SPQX5E_S
 3.71 mm
 @ SPQMD10E_M
 (-1534.771 mm)

 r.m.s. = 1.785 mm
 max. = 6.522 mm
 @ SPQMD1E_3M
 min. = -6.925 mm
 @ SPQD2E_M
 347 mm
 @ SPQMD10E_M
 (-1504.180 mm)

54 nC
@ SPQMD10E
 (-8424.078 nC)

354

goldp 01-24-2001-13:22:03.dat

range DX Auto Fk (10) DY Auto Fk (10) Q Auto Fk (2) beta 4 Replot

meas stat ref meas-ref stat-ref gold mea-gold sta-gold

meas -gold meas -ref stat -ref

2.Issues

2.1 An issue pointed out at the last MAC meeting

“The electron injection efficiency to HER is reported to have a lower value of 30-40%.

Therefore, the committee would like to recommend that the KEKB team carry out further studies on this subject.”

→ “The electron injection efficiency becomes 80-100%”

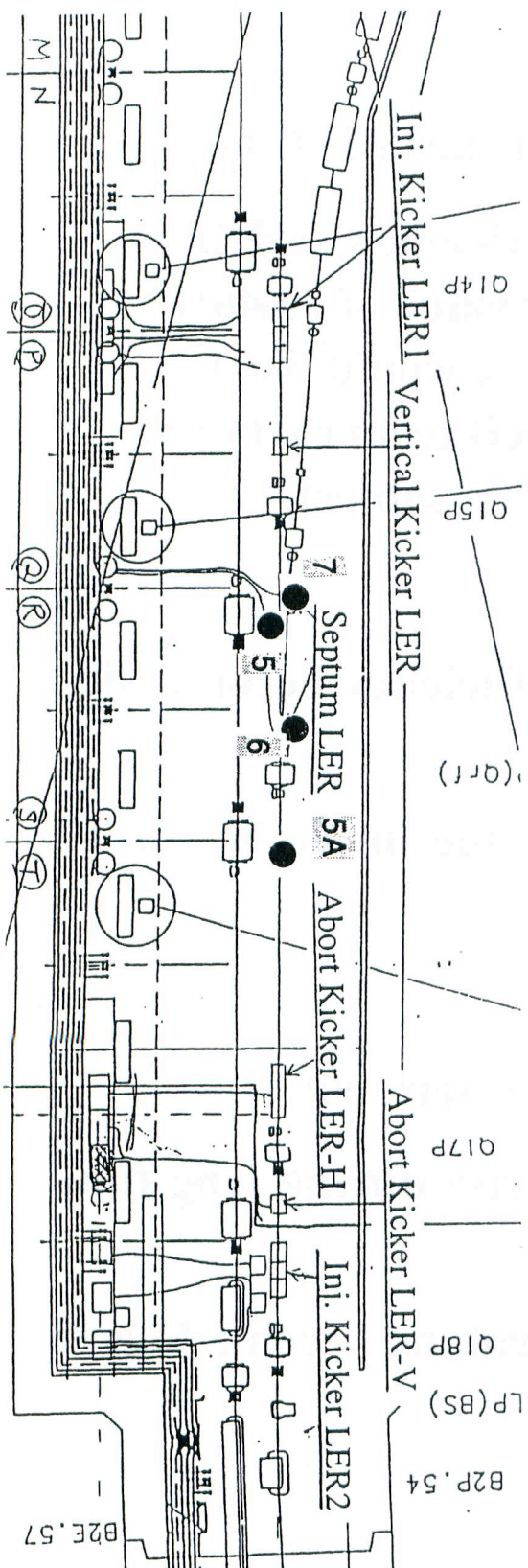
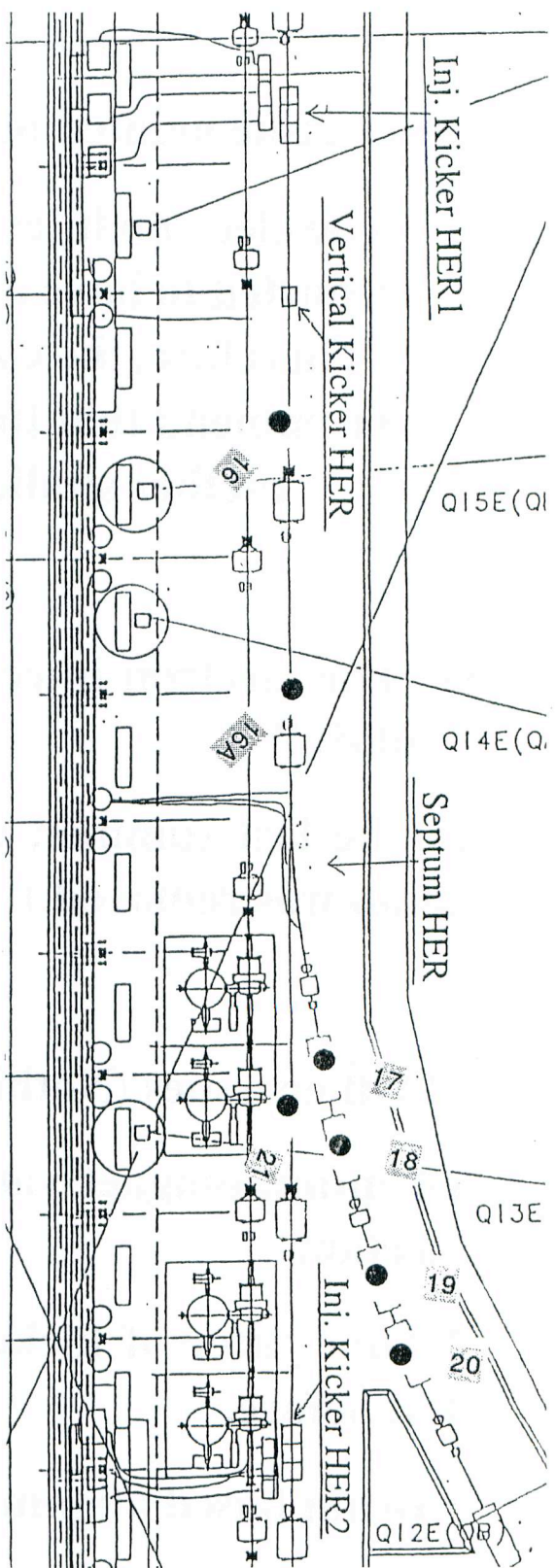
(In the last summer, one of the masks in the IP region was removed.)

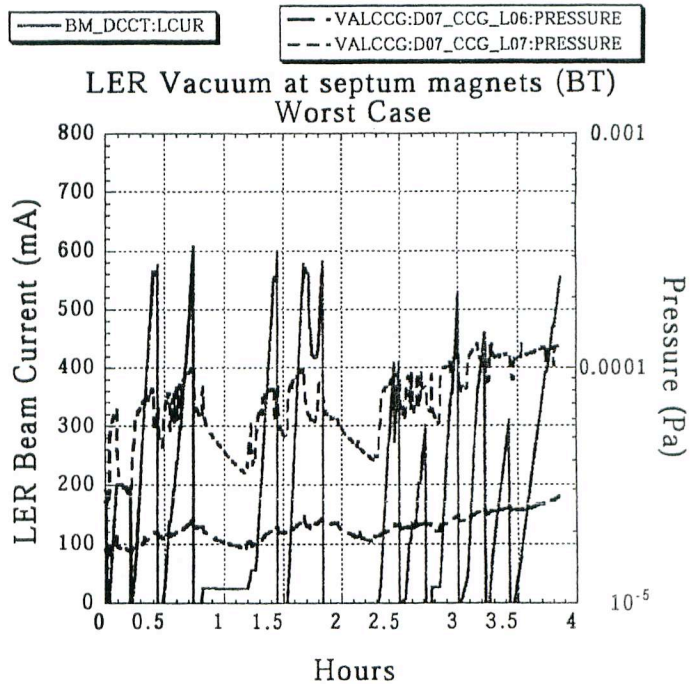
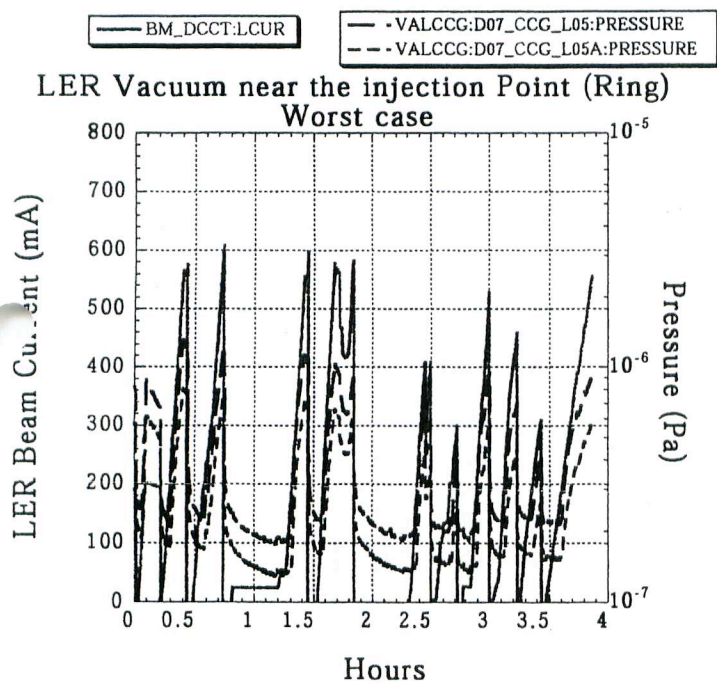
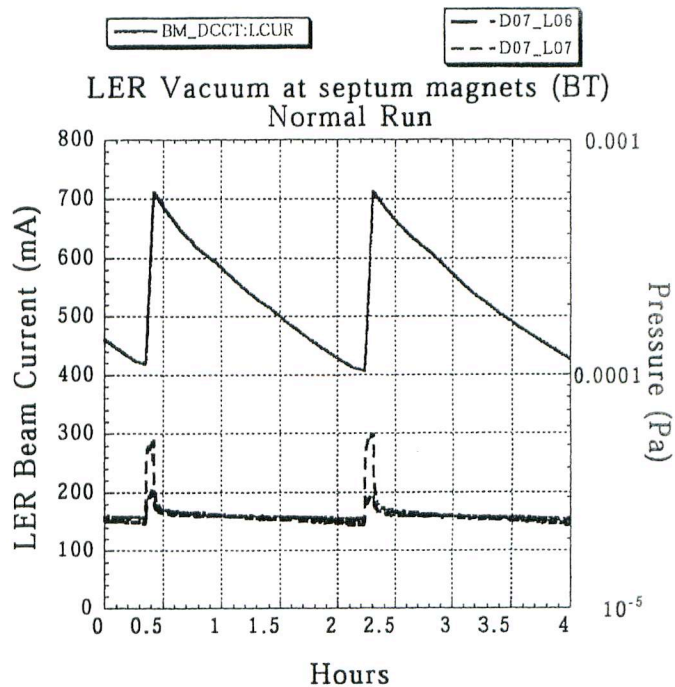
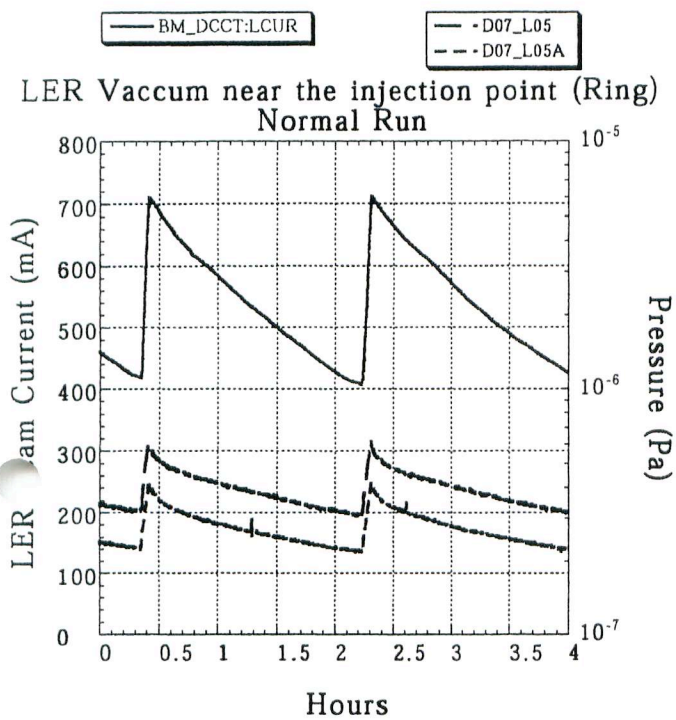
2.2 Other issues (Nothing is so serious)

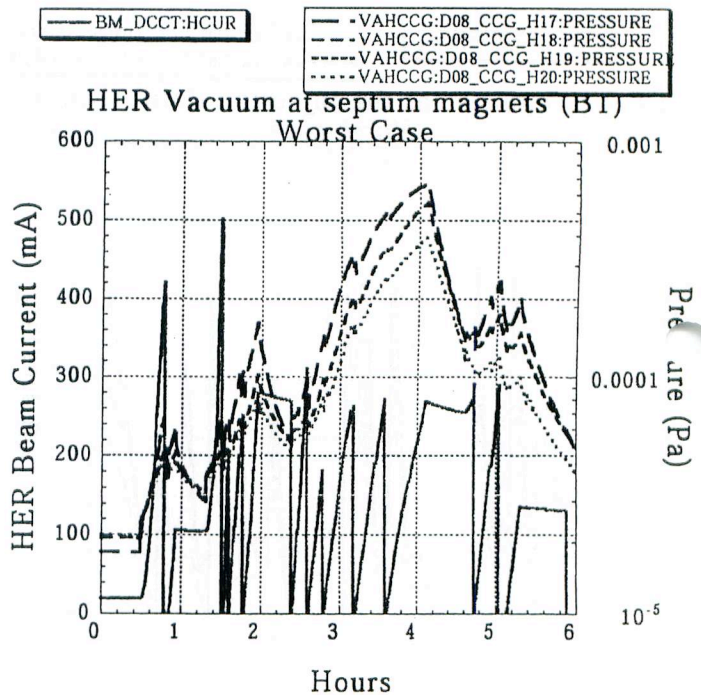
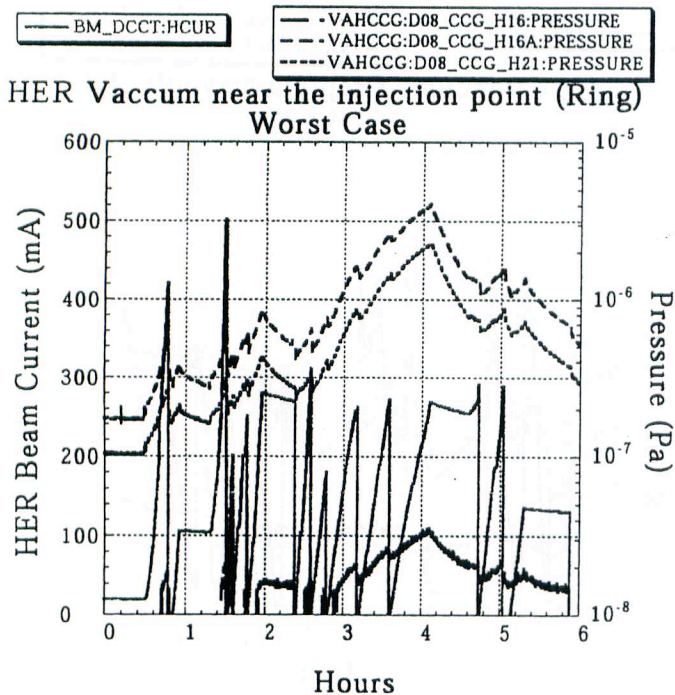
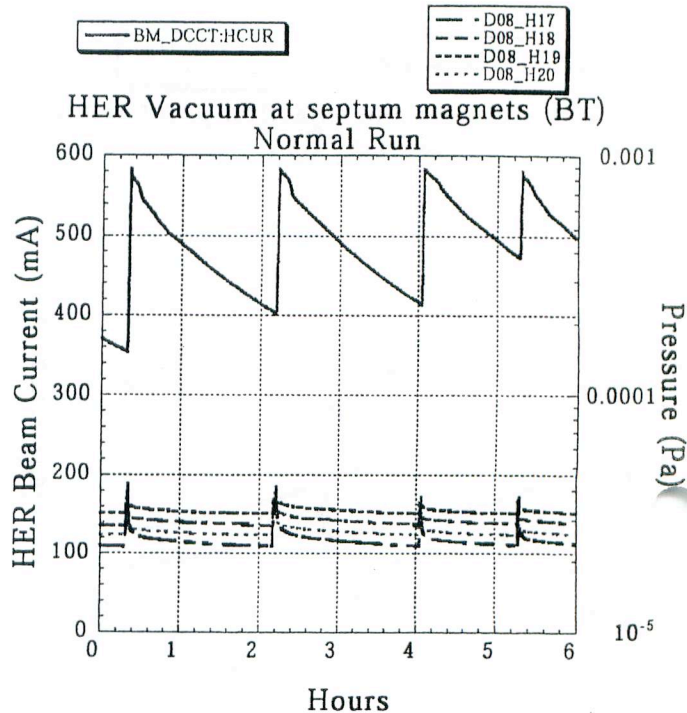
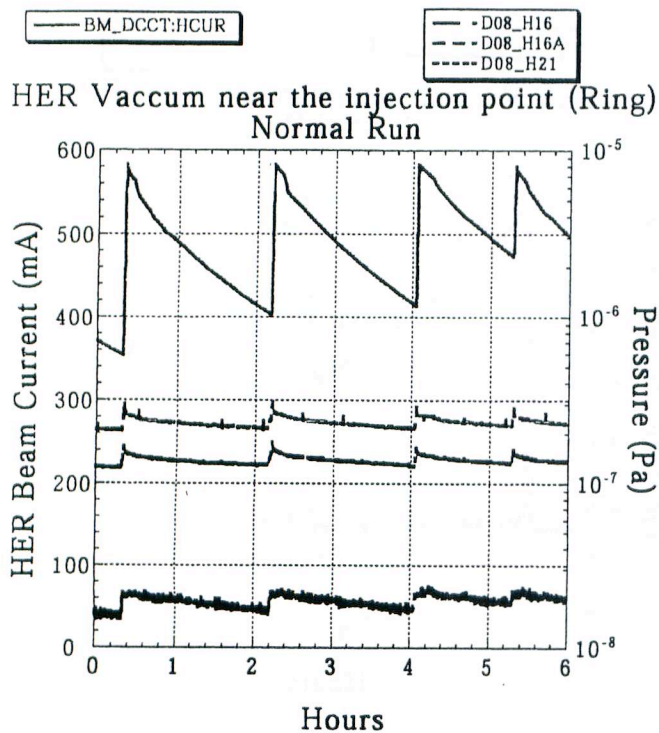
(1)Septum magnet vacuum rise during long time injection.

(2)Time jitter of kicker thyratons become bigger than before.

(3)Beam based alignment







3.Upgrade plans

3.1 R&D status for the Bypass Line

R&D of the permanent-magnet dipole is underway.

- (1) 1-m 0.25T dipole was constructed.**
- (2) Field strength was 10% lower than the design value.**
- (3) Temperature dependence of the field strength is approximately $-5.10^{-4}/\text{deg}$ that means temperature coefficient of the Fe-Ni alloy compensator is 10% smaller than the specification.**

3.2 Beam position monitor upgrade for 2-bunch acceleration

- (1) Add another VXI digital oscilloscope**
- (2) Reorganized signal delay**

Waveform Raw DATA

Param Save

Trigger

Delay

Range

EXIT

HOME

DIVIDE

Positron ARW1

STOP

START

2.0000e-01

6.44000000e-06

2.000e-01

2.0000e-01

6.44000000

2.000e-01

CH1 MAX 19728 MIN 13241

CH2 MAX 13056 MIN 8237

CH3 MAX 15506 MIN 9435

CH4 MAX 19307 MIN 11498

BTpBPM:QTD2P_K

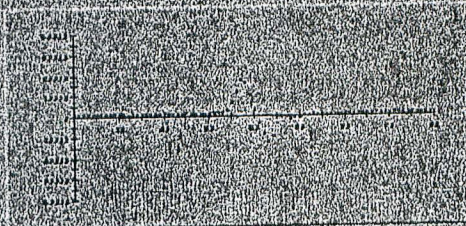
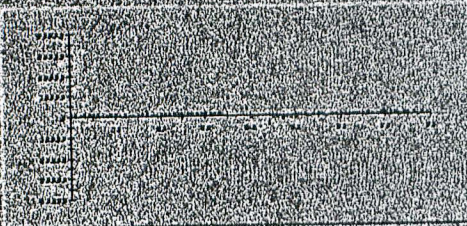
860

940

CLOSE

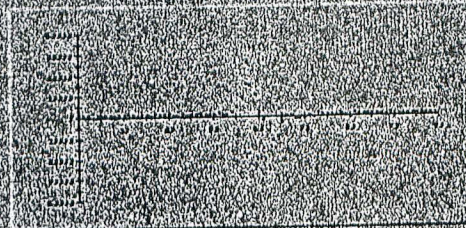
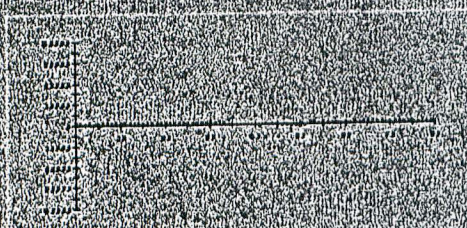
A 26519

B 29349



C 29137

D 26342



X Y: 10⁻¹⁰
(nm)



X 1.21503
Y 0.01504
SUM 113707.3563

