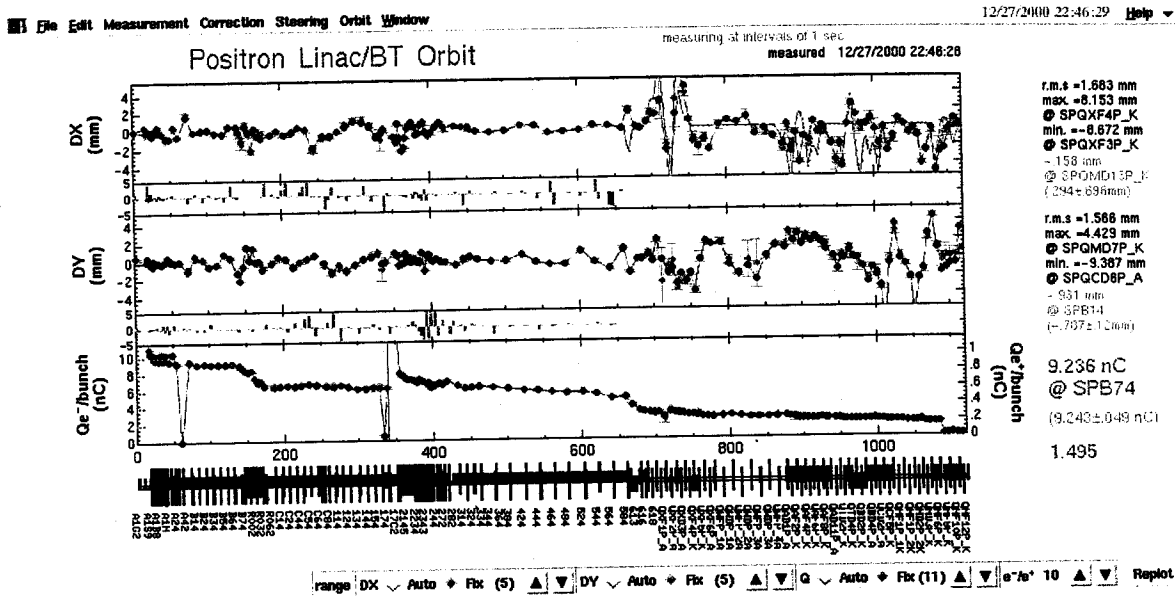
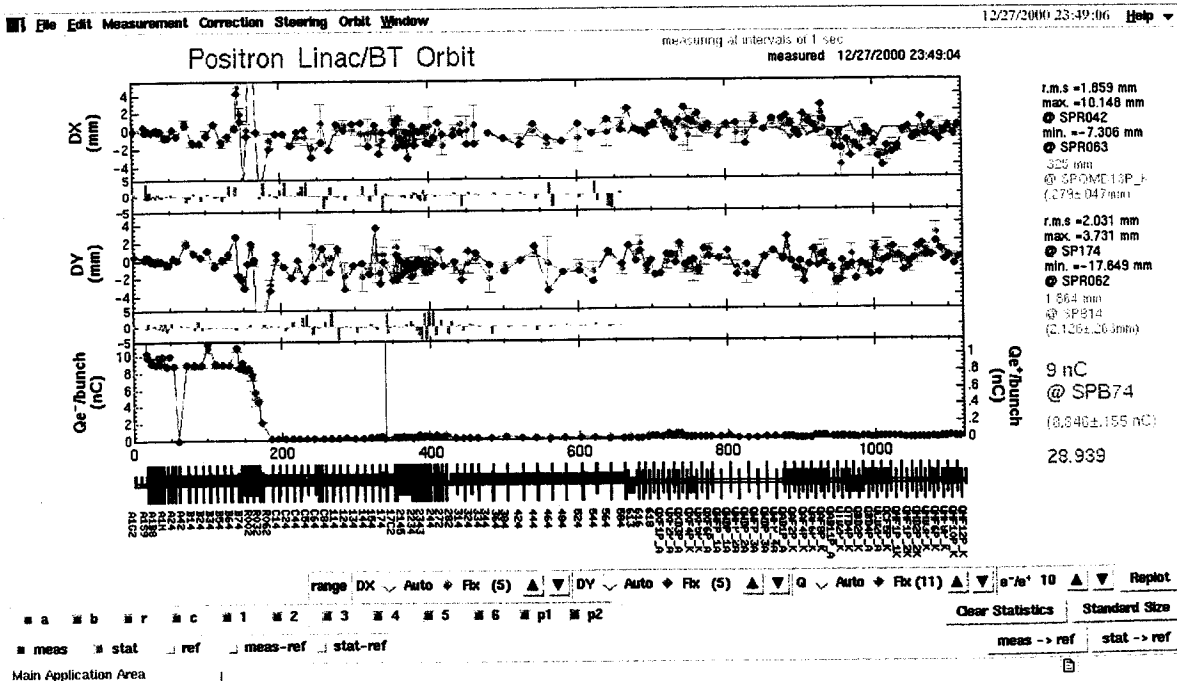


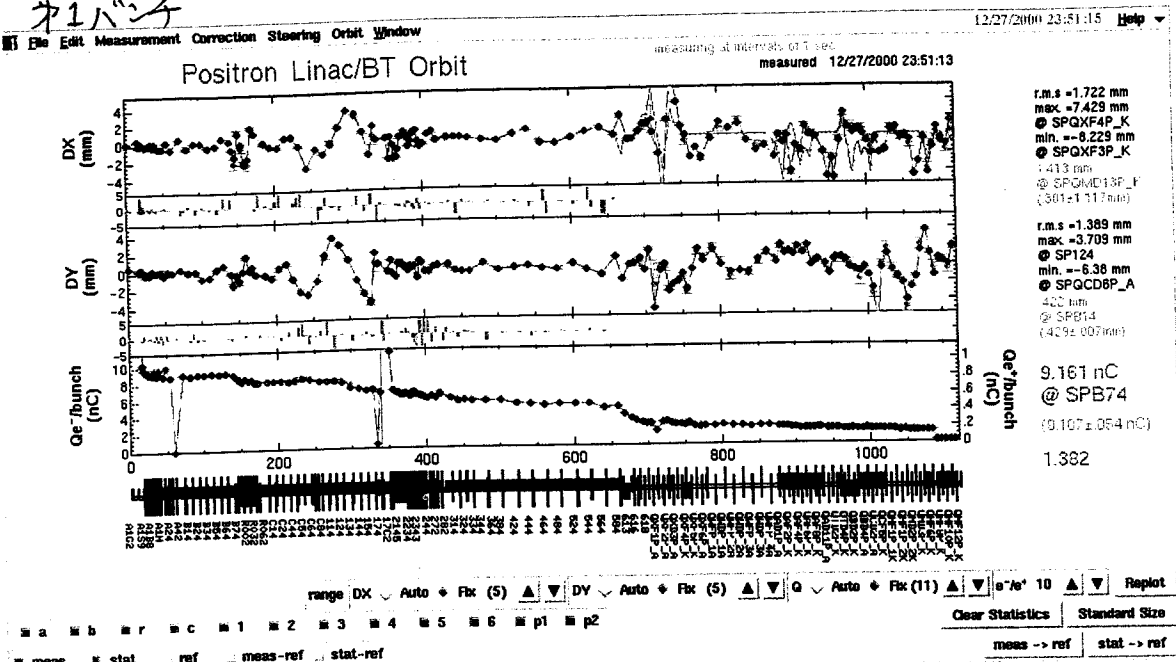
エネルギー補償前

第1バンチ (0.0 ns)

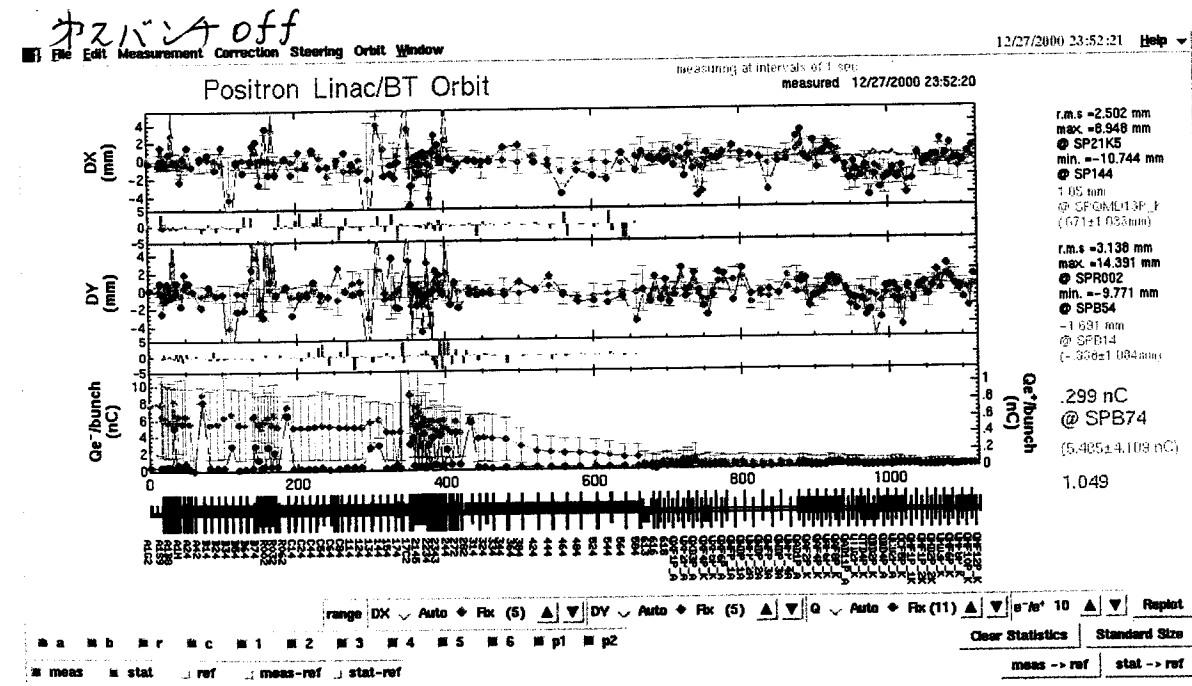
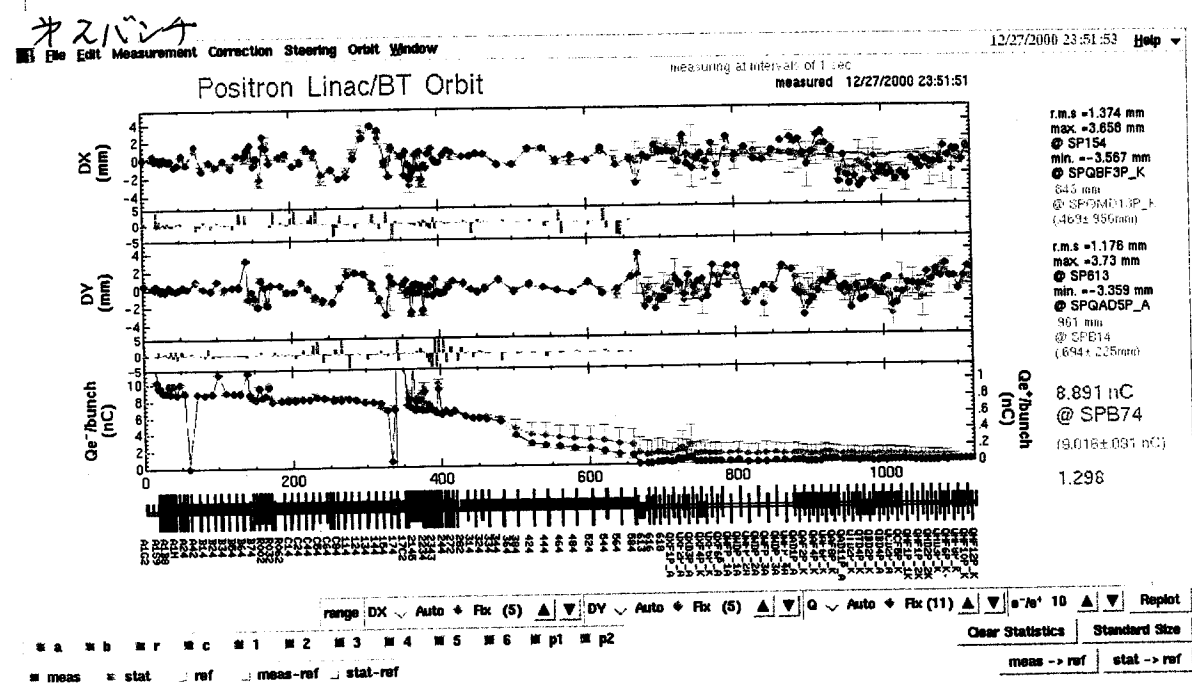


第2バンチ (96.3 ns)



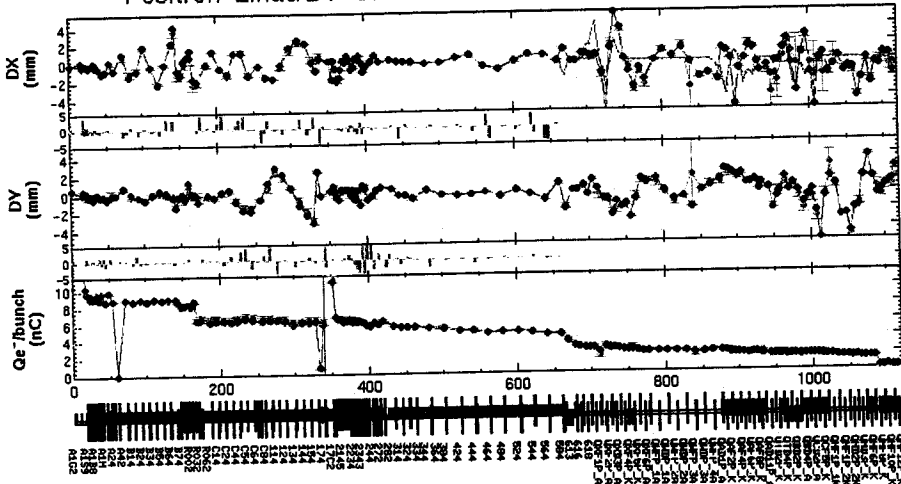


工ネルギー補償後  
 SLED反転タイマ  
 70ms遅らせ  
 (全バッチオン)



### Positron Linac/BT Orbit

measuring at intervals of 1 sec  
measured 12/27/2000 23:53:02



r.m.s = 1.544 mm  
 max = 5.421 mm  
 @ SPQXF4P\_K  
 min. = -5.828 mm  
 @ SPQXF3P\_K  
 -1.919 mm  
 @ SPQMD13P\_K  
 (-585 ± 939mm)

r.m.s = 1.288 mm  
 max = 3.71 mm  
 @ SPQMD7P\_K  
 min. = -3.373 mm  
 @ SPQCD6P\_A  
 895 mm  
 @ SPB74  
 (780 ± 128mm)

3.956 nC  
 @ SPB74  
 (9.001 ± 0.045 nC)

1.523

range DX Auto Fbx (5) DY Auto Fbx (5) Q Auto Fbx (11) s/a\* 10 Replot

Clear Statistics Standard Size  
 meas -> ref stat -> ref

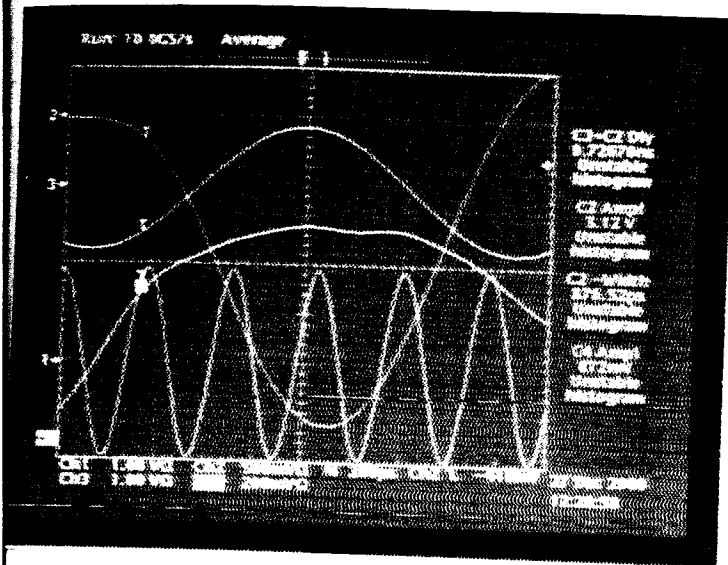
a b r c 1 2 3 4 5 6 pl p2  
 meas a stat ref meas-ref stat-ref

KEKB e<sup>+</sup> 入射時

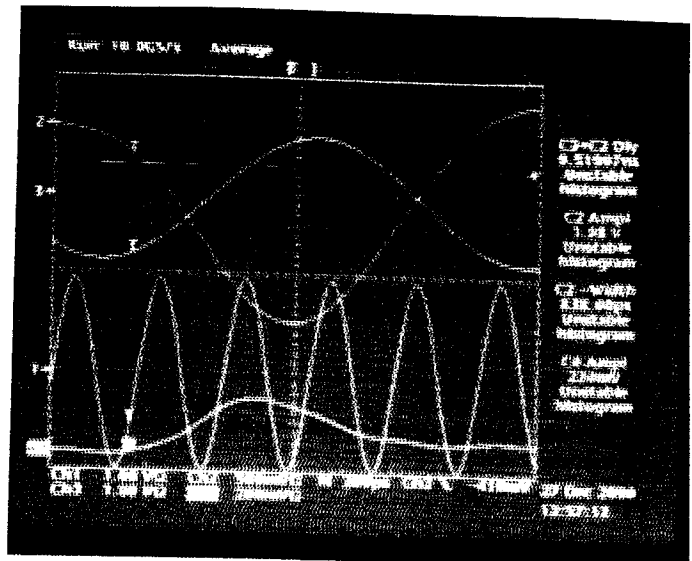
2000. 12. 27

KEKB e<sup>-</sup> 入射時

2000.

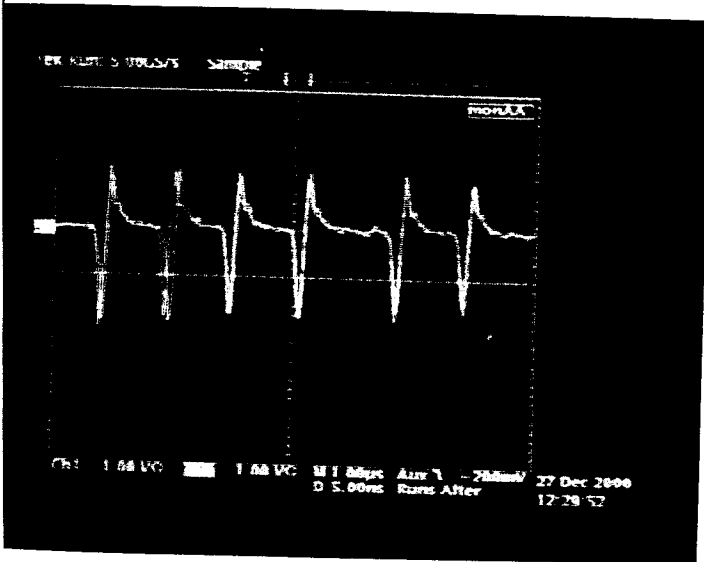


9.72ns  
 3.12V  
 876.4ps  
 872.0V

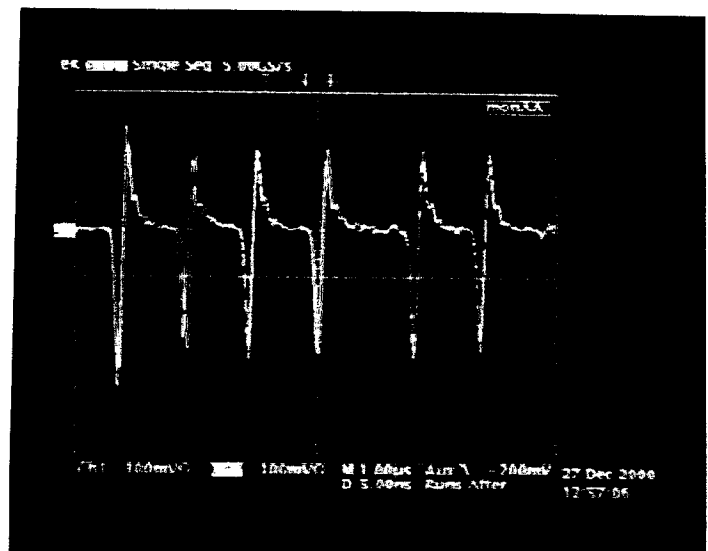


GU-A1 オシロスコープ

GU-A1 オシロスコープ



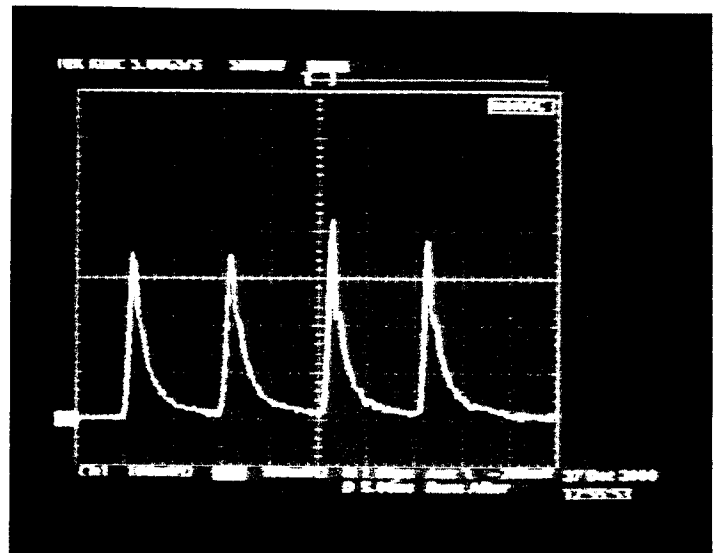
monAA オシロスコープ



monAA オシロスコープ



monAC オシロスコープ



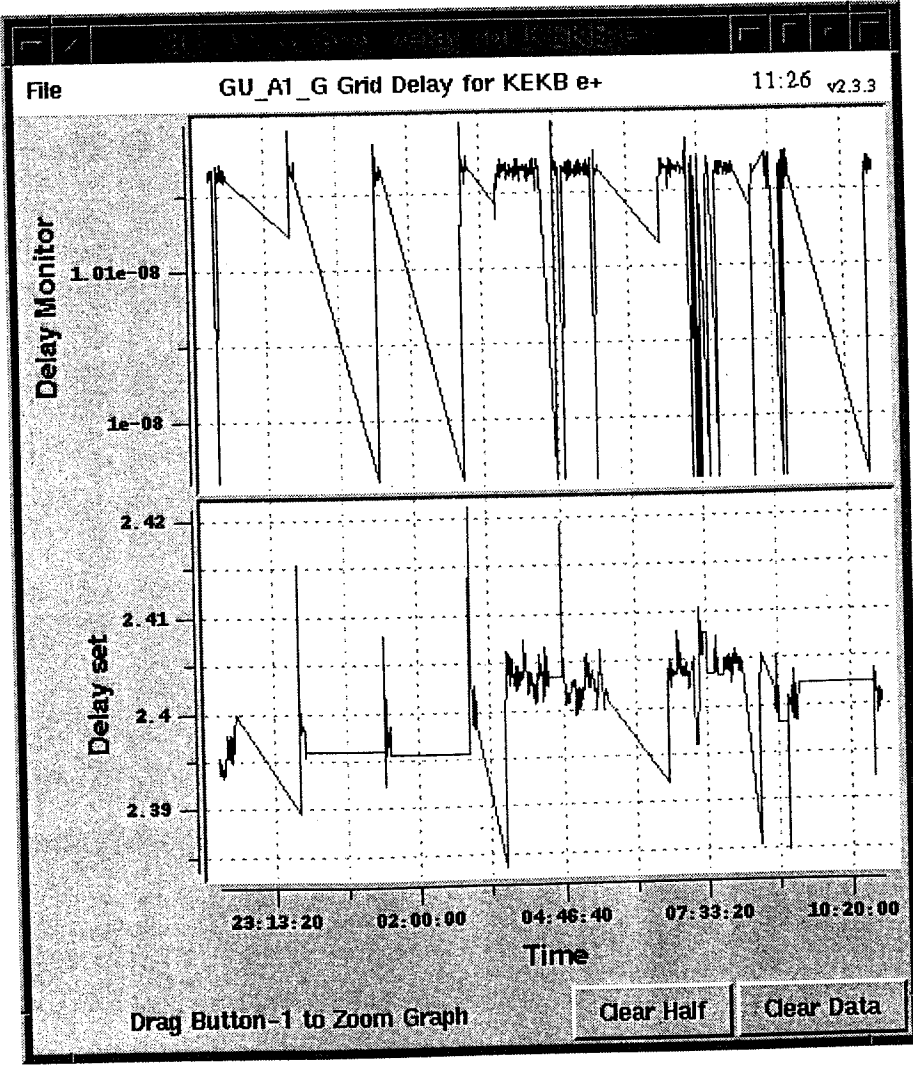
monAC オシロスコープ

Single bunch 加速時の grid pulser fine delay control

e+用  
15X-7

File GU\_A1\_G Grid Delay for KEKB e+ Feedback 11:26 v1.4.4

get command (source) <b>retry_exec gu_a1</b>	get command (target) <b>retry_exec gu_a1</b>
acquisition interval (sec) <b>30</b>	loop interval (count) <b>1</b>
current source <b>1.0161205e-08</b>	offset <b>10.165e-9</b>
average count <b>1</b>	difference <b>-3.795e-12</b>
averaged source <b>1.0161205e-08</b>	gain <b>-3.0e8</b>
minimum <b>10.00e-9</b>	feedback <b>0.0011385</b>
maximum <b>10.40e-9</b>	current target <b>2.400</b>
Beam onA Denied	new target <b>2.4011385</b>
<b>Start</b>	minimum <b>2.335</b>
<b>Stop</b>	maximum <b>2.435</b>
<b>Beam Condition</b>	<b>Satisfied</b>
	put command (output) <b>retry_exec gu_a1</b>



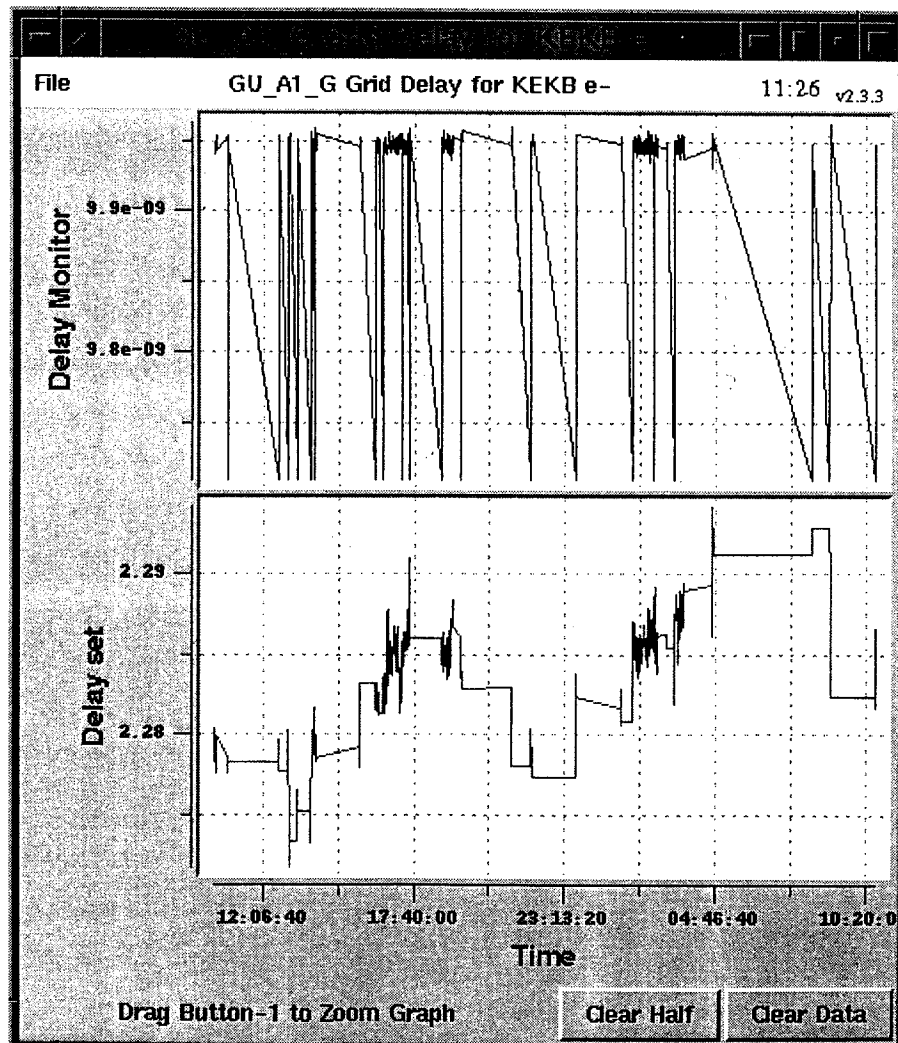
e-用  
113X-9

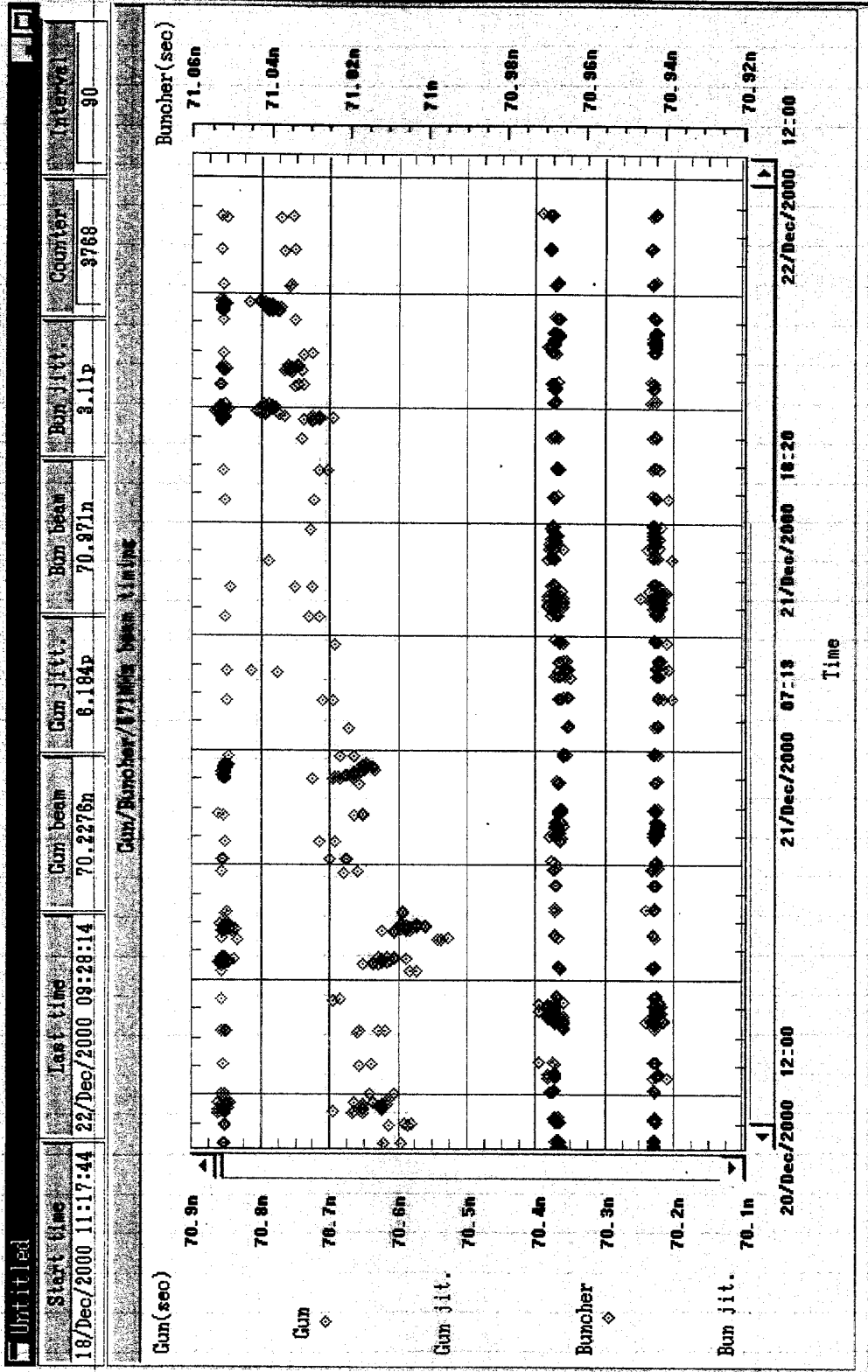
File GU\_A1\_G Grid Delay for KEKB e- Feedback 11:26 v1.4.4

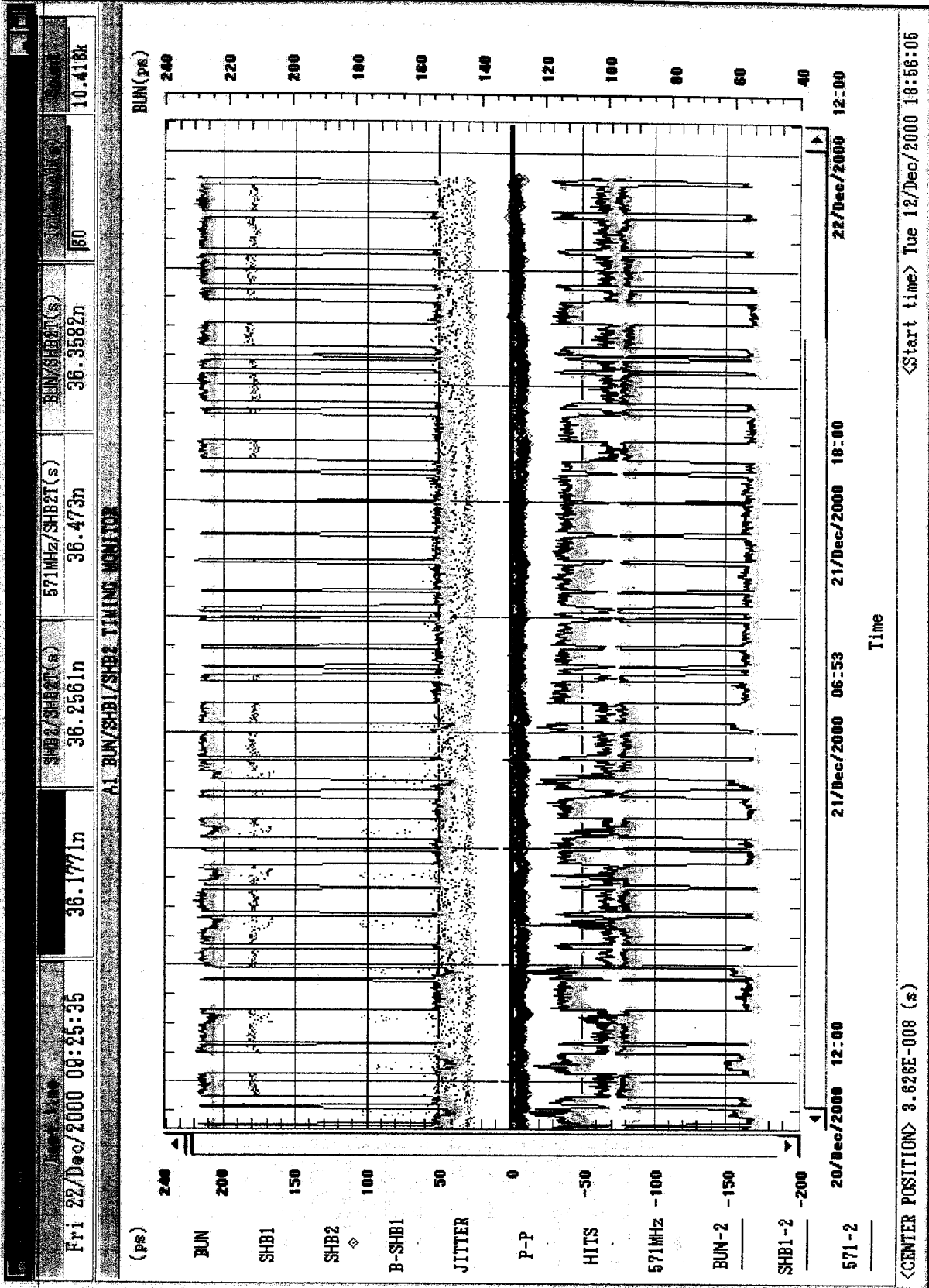
get command (source)	<input type="text" value="retry_exec gu_a1"/>	get command (target)	<input type="text" value="retry_exec gu_a1"/>
acquisition interval (sec)	<input type="text" value="30"/>	loop interval (count)	<input type="text" value="1"/>
current source	9.93875e-09	offset	<input type="text" value="9.947e-9"/>
average count	<input type="text" value="1"/>	difference	-8.25e-12
averaged source	9.93875e-09	gain	<input type="text" value="-2.0e8"/>
minimum	<input type="text" value="9.75e-9"/>	feedback	0.00165
maximum	<input type="text" value="10.15e-9"/>	current target	2.285
		new target	2.28665
		minimum	<input type="text" value="2.18"/>
		maximum	<input type="text" value="2.32"/>
		Satisfied	
		put command (output)	<input type="text" value="retry_exec gu_a1"/>

Beam onA Denied

Start Stop Beam Condition









01.1.4

### Two bunch 加速テスト

#### fine delay 調整

delay-1 08FB → 0900  
(0.88ns)

delay-2 0200 → 0A5D  
(0.39ns) } (1.91ns)

TD4R-2 DD3C → DD3B

→ No2Bunchのサテライトを小さくする。

Bias Volt. 0100 → 0270  
(54.8V) (77.0V)

サテライトのサテライト (1.4ns 後) が消える。

#### Data Same

Gun Parameter "ZPT0109-10" = "KEKB#2"

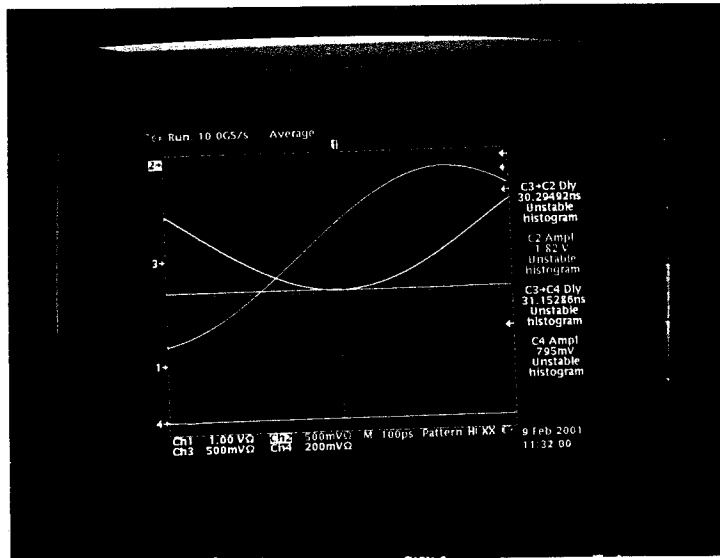
TD4R "Data2"

2001. 2. 9 (金)

Two bunch study

5Hz, averaging mode 2<sup>nd</sup> beam current 測定

\*1バッチ



Buncher beam (SP1)  
 $\text{delay vs. } 2856 \text{ MHz} = 71.0137 \text{ ns. /}$   
 $Q = 9.2 \sim 9.3 \text{ mC,}$

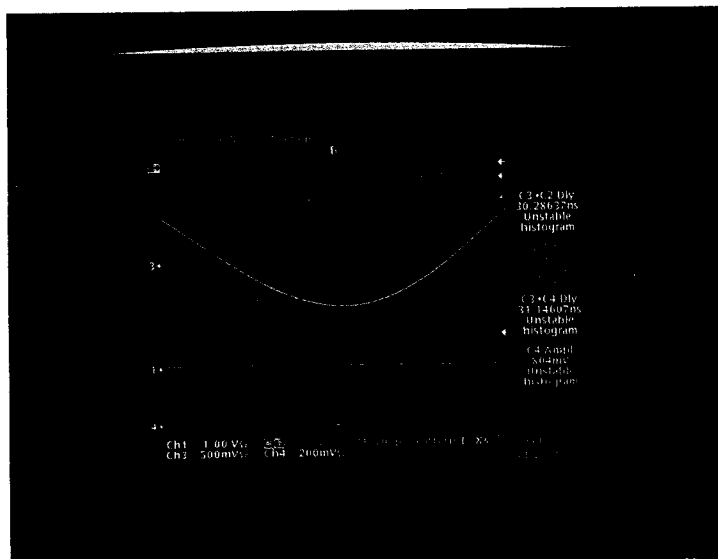
30.291 ns  
 30.298 ns

1.82 V  
 1.82 V

31.150 ns  
 31.155 ns

794 mV  
 792 mV

\*2バッチ



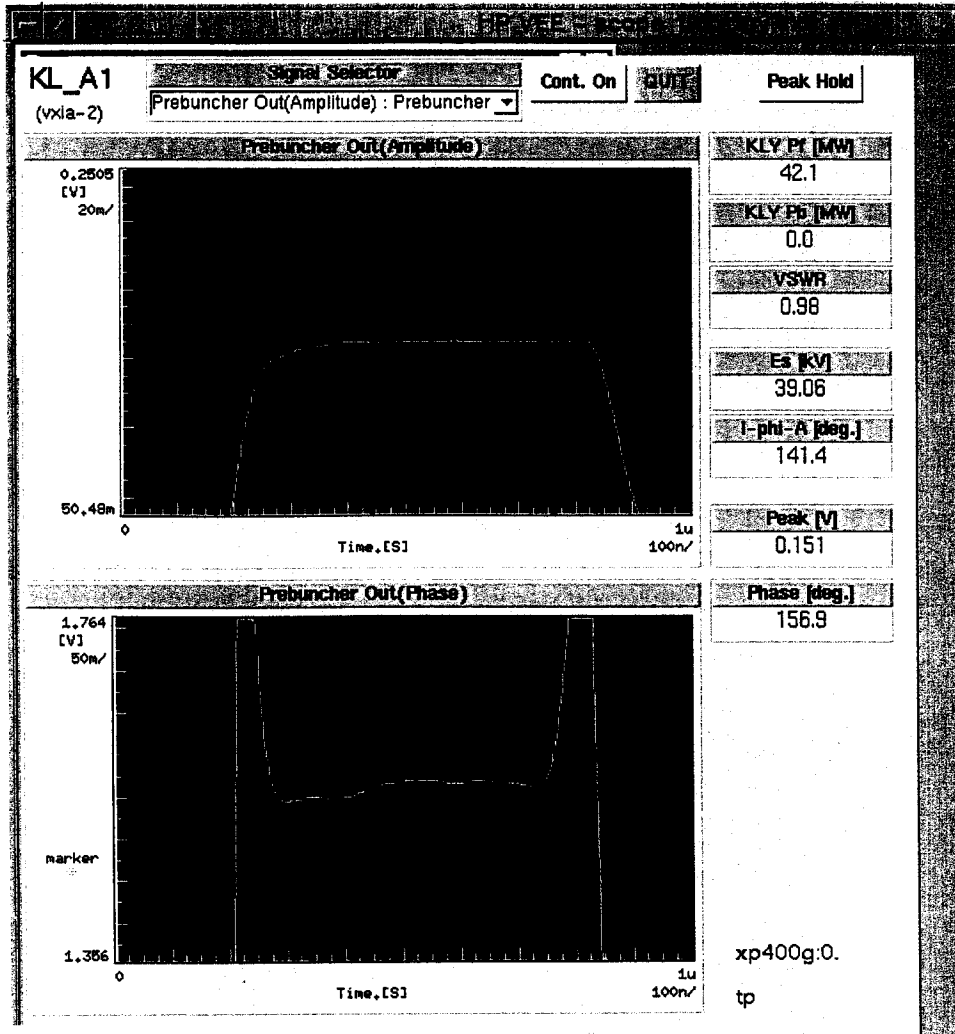
$\text{delay vs. } 2856 \text{ MHz} =$   
 $Q =$

30.286 ns

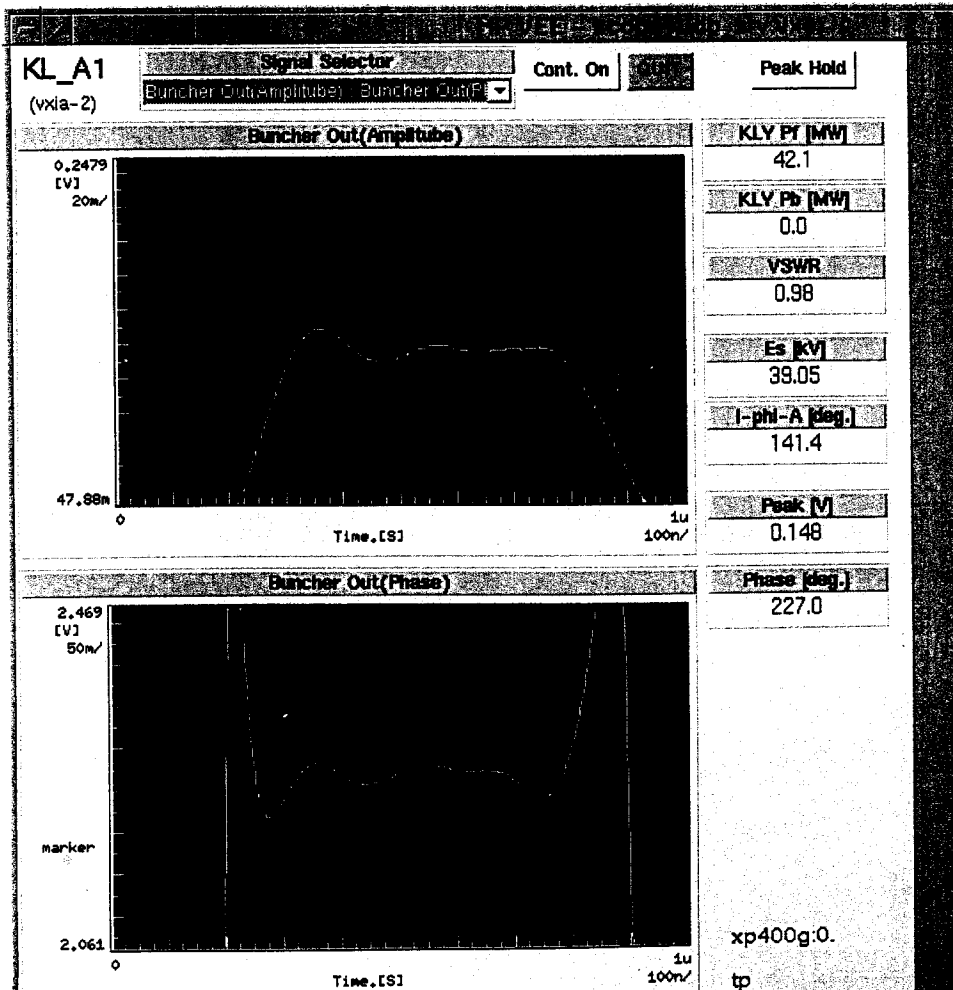
1.98 V

31.143 ns

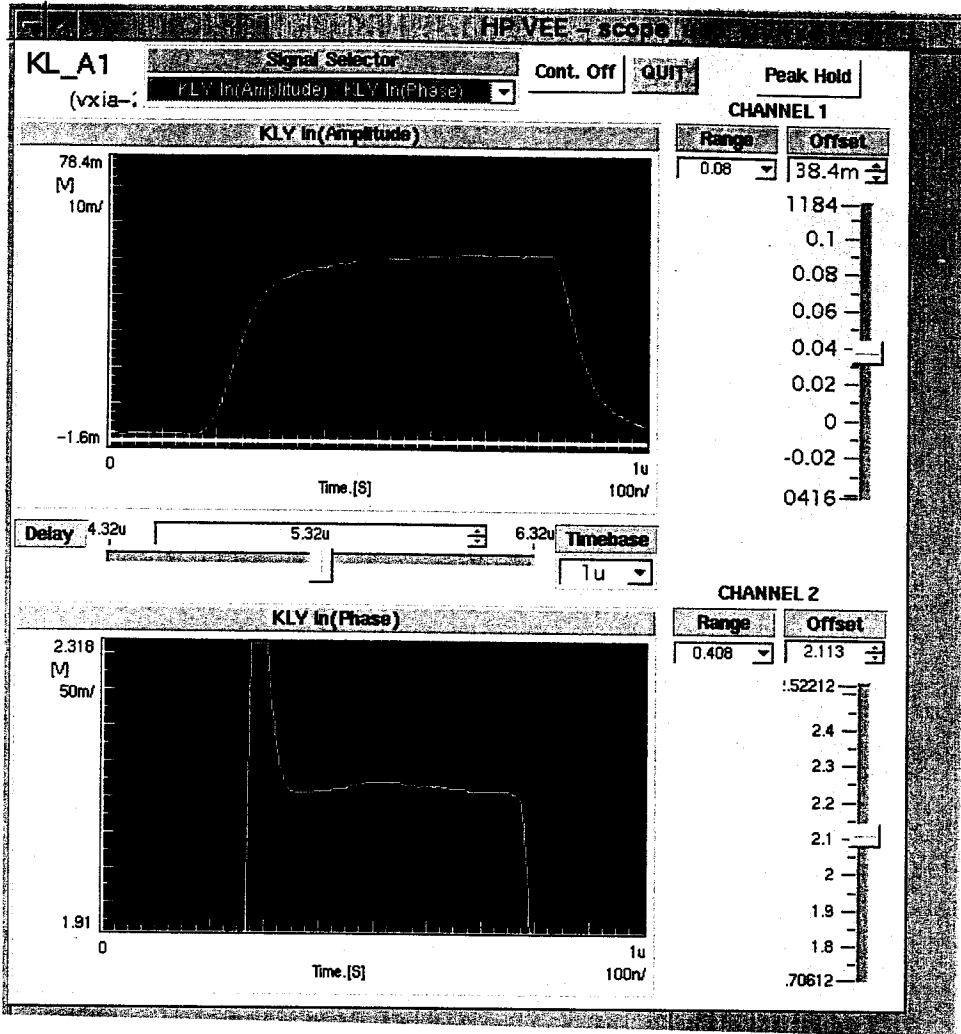
803 mV



Prebuncher 出口  $P_f, \theta$   
 1.162幅のホト  
 0.34



Buncher 出口  $P_f, \theta$



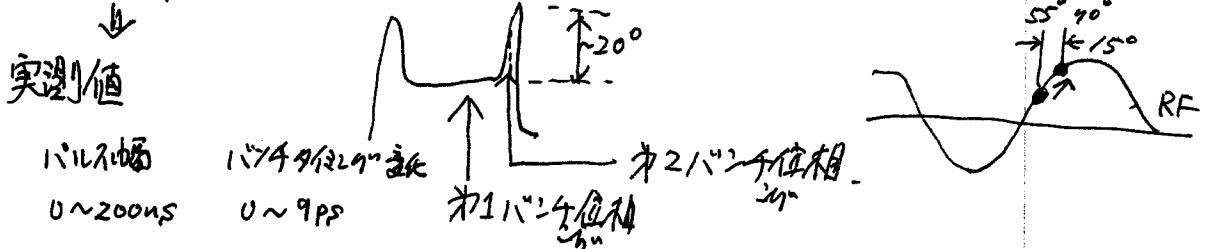
カ2加速管出口 P<sub>1</sub> (

Buncher 出口のビームエネルギー

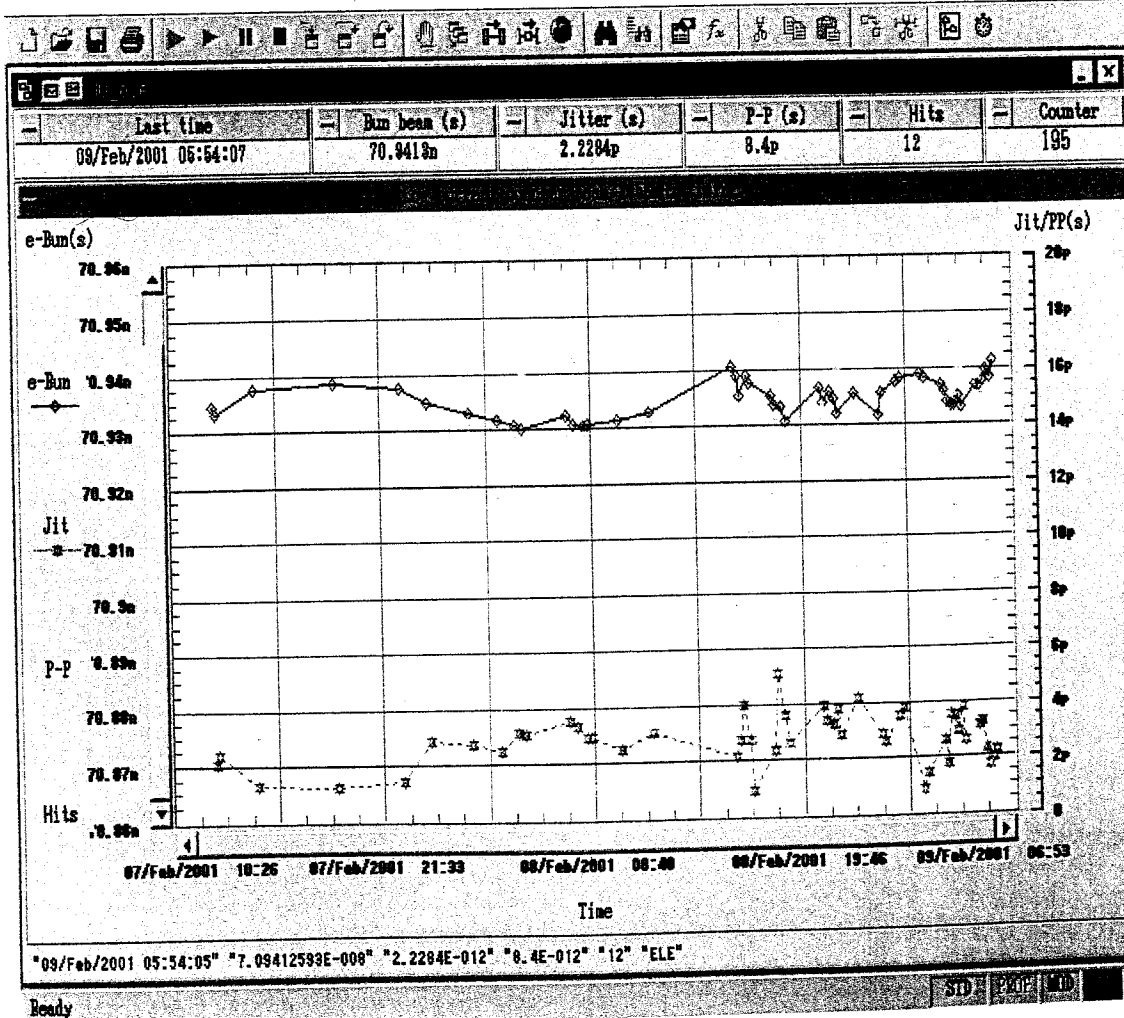
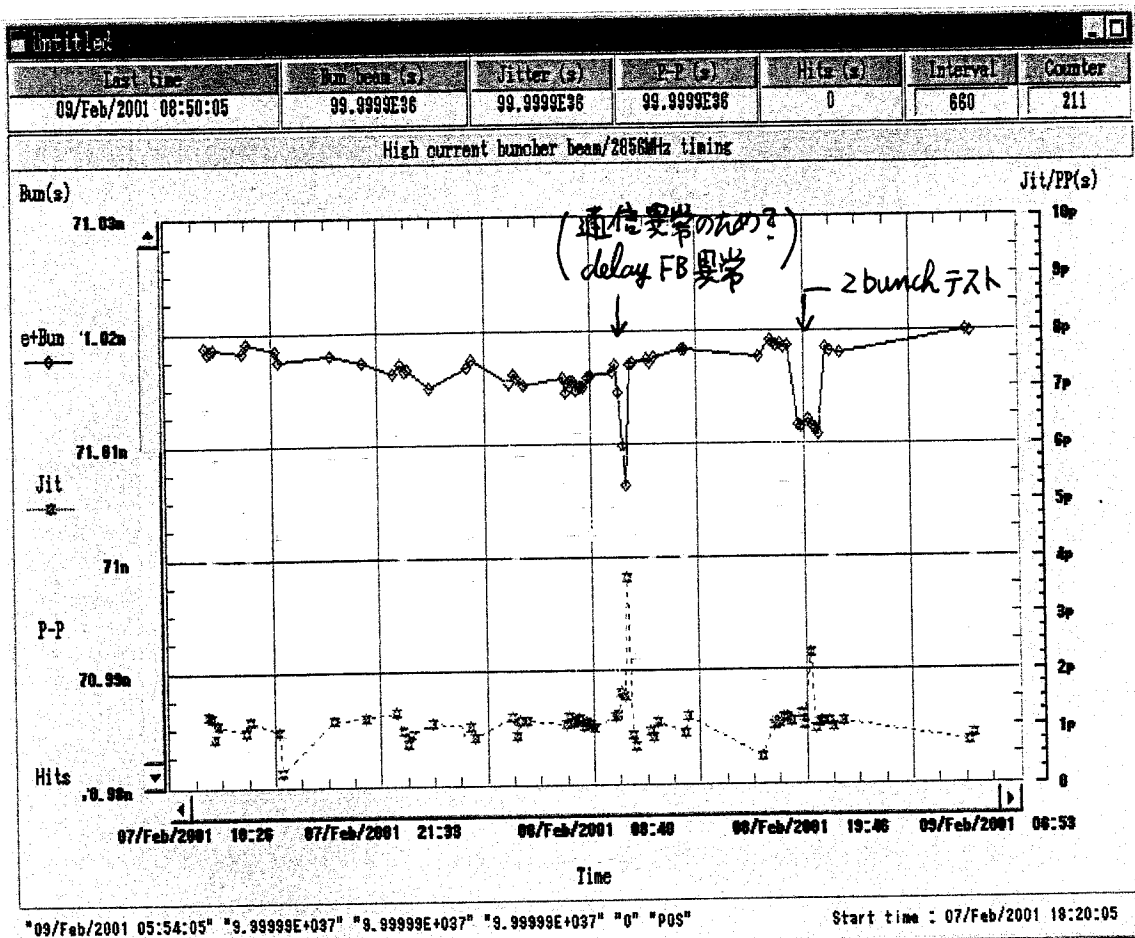
「紙谷氏の測定によると、カ2バンチのほうが、約15% エネルギーが  
高い。」 ⇒ バンチ位相  $\theta$  が、<sup>位相は</sup>  $55^\circ$  と  $70^\circ$  の場合にこのエネルギー差が生じる

原因 (可能性)

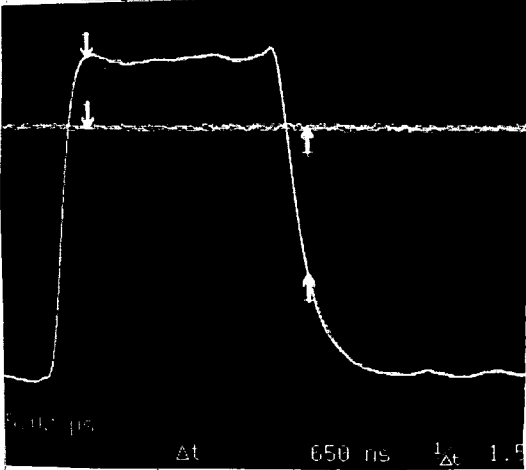
- (1) RFパルス幅が短かく、カ2バンチのバンチ位相が、RF位相の大きく遅れた所である。⇒ バンチではエネルギーが高くなる。



- (2) (1)の場合、後続の加速管のエネルギーは減少する。



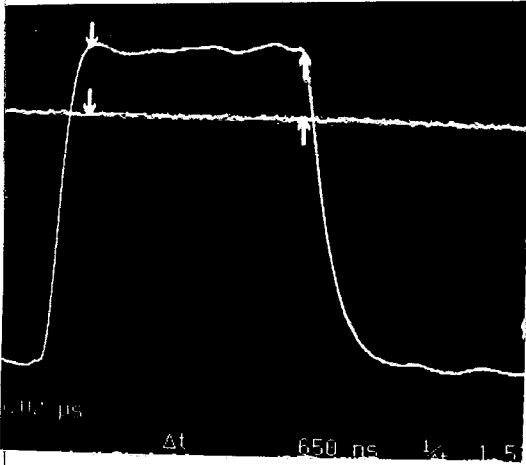
Kly A1 RF パルス幅



Kly A1 のパルス幅 (RF)

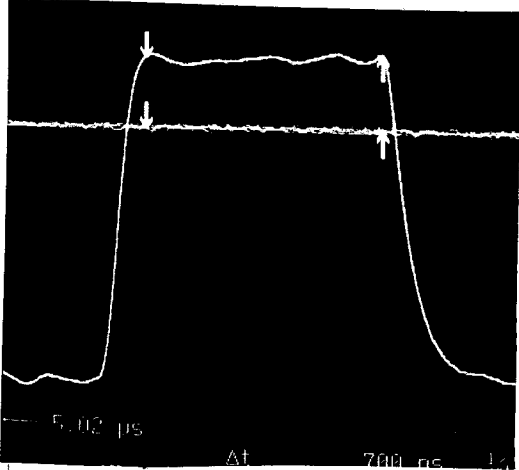
元	パルス幅	ヘルツ	ストリーク幅
	~550 ns	0.34	0
	650 ns	0.54	-5 PF
	700 ns	0.67	-9 PF
	750 ns	0.79	-6 PF

(VAC 悪化,  $0.8 \rightarrow 1.8 \times 10^{-9}$  Pa)

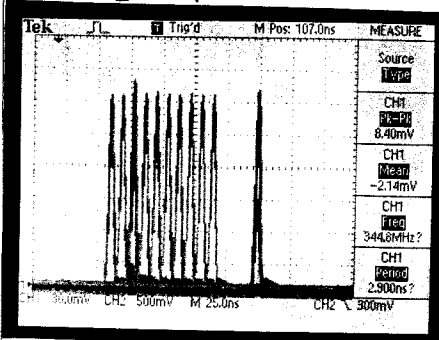


A1のRFパルス幅とバンチ位相

① RFのパルス幅を変える<sup>ホ2</sup>とバンチの中に位相が-5~9 変化する。しかし、ボルトキ-以降の軌道はほとんど変化し



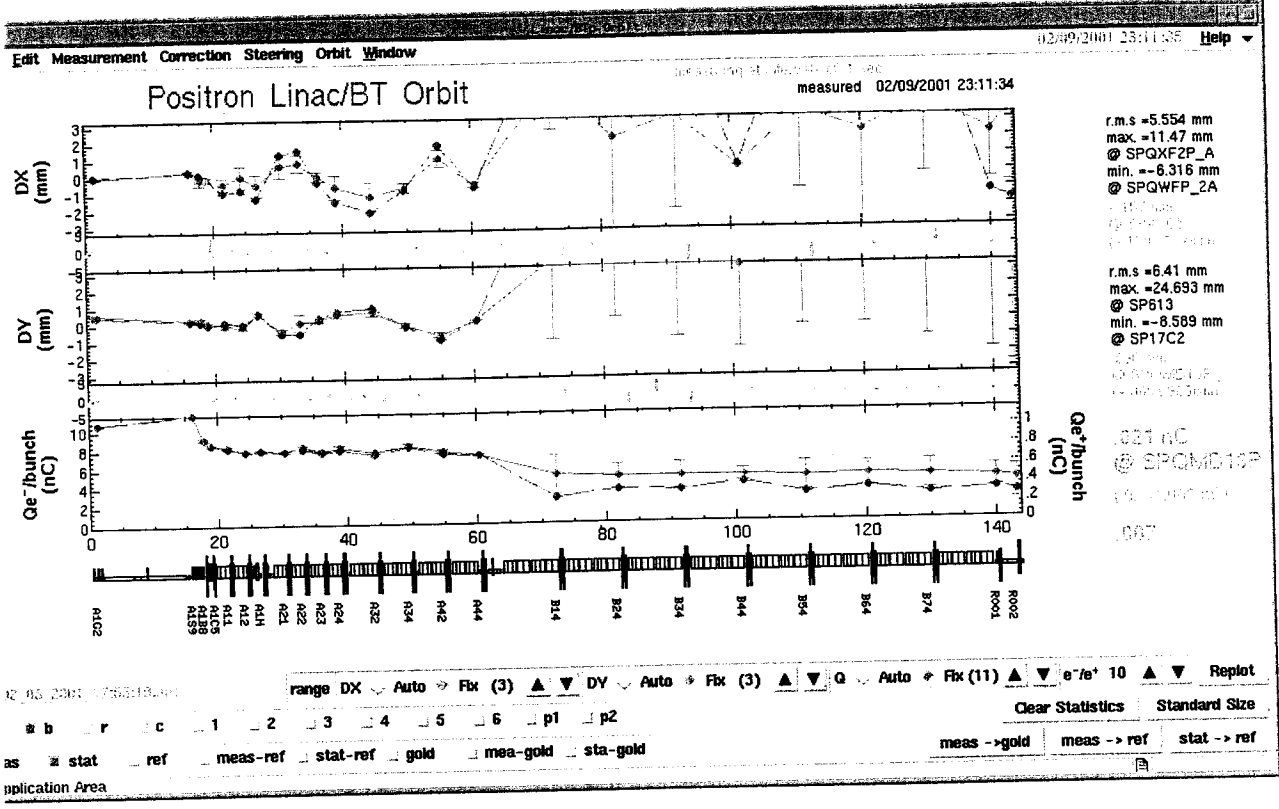
GUN E-G



↑  
96.288 ns  
↑  
ホ2バンチ用E-G

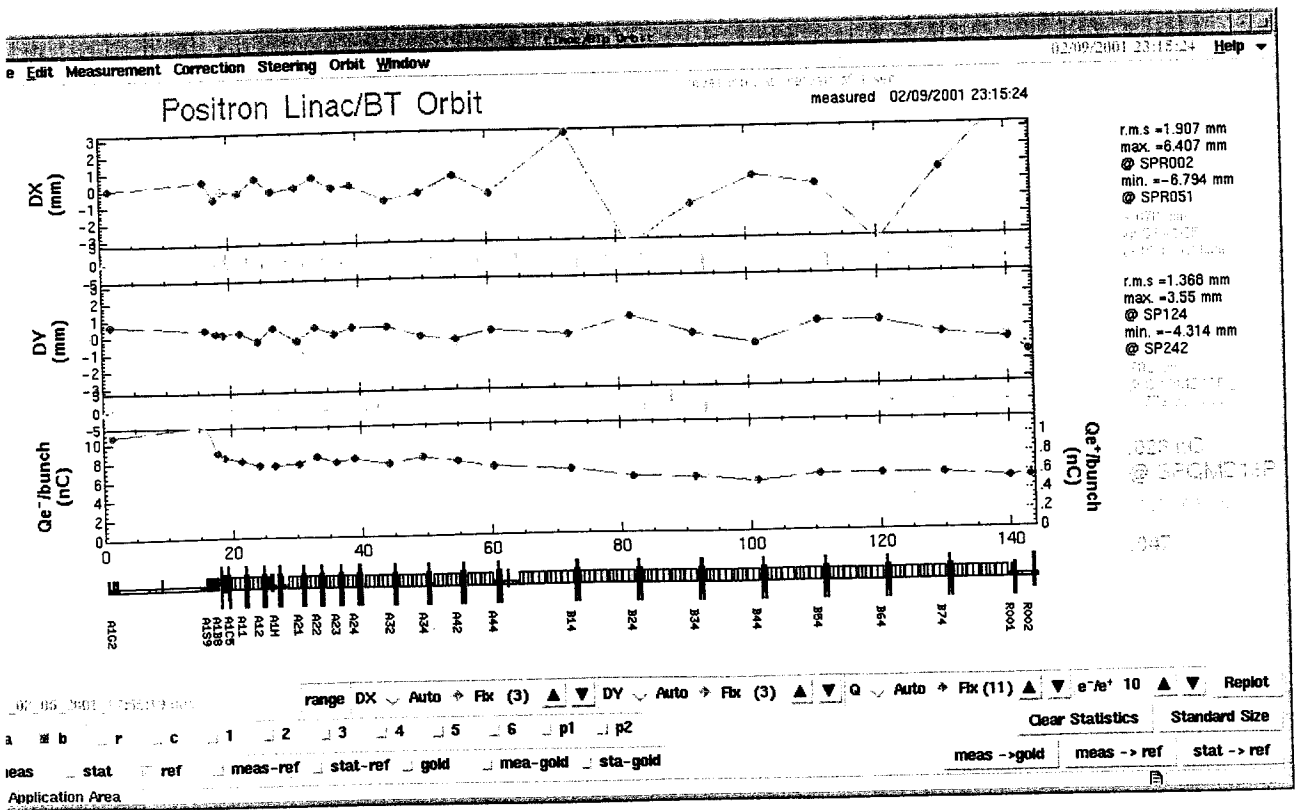
- ホ1バンチのタイミングとホ2バンチの軌道  
ホ1バンチタイミングを  $-2\pi \sim +7\pi$  ( $\tau = 114 \text{ MHz}$  の) <sup>=8.8 ns</sup> 変えると、ホ2バンチの軌道が変化する。  
(E-Gの5ステップ)
- ホ1バンチ電荷とホ2バンチ軌道。  
ホ2バンチ軌道は、ホ1バンチの電荷によって変化する。

第2バッチの軌道変化  
 第1バッチタイミングを変えて、第2バッチ軌道変化を測定した。

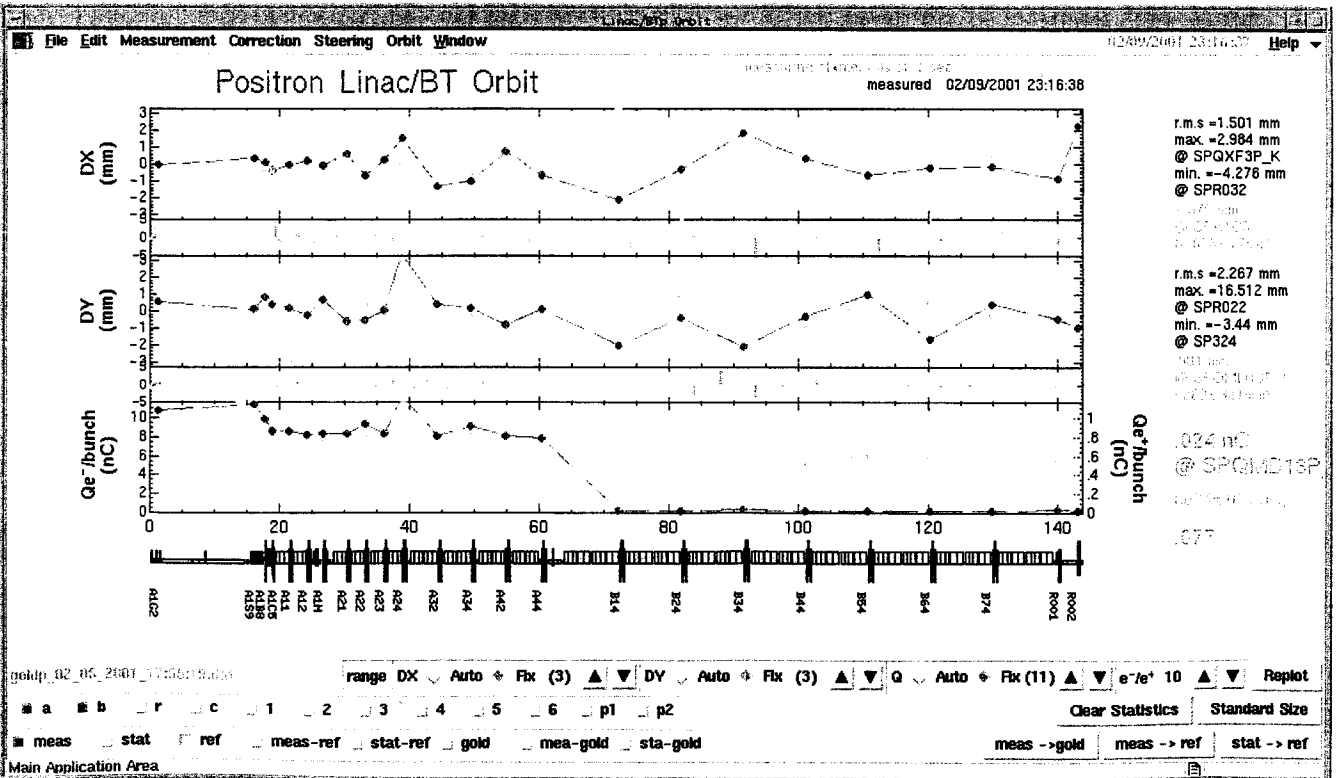
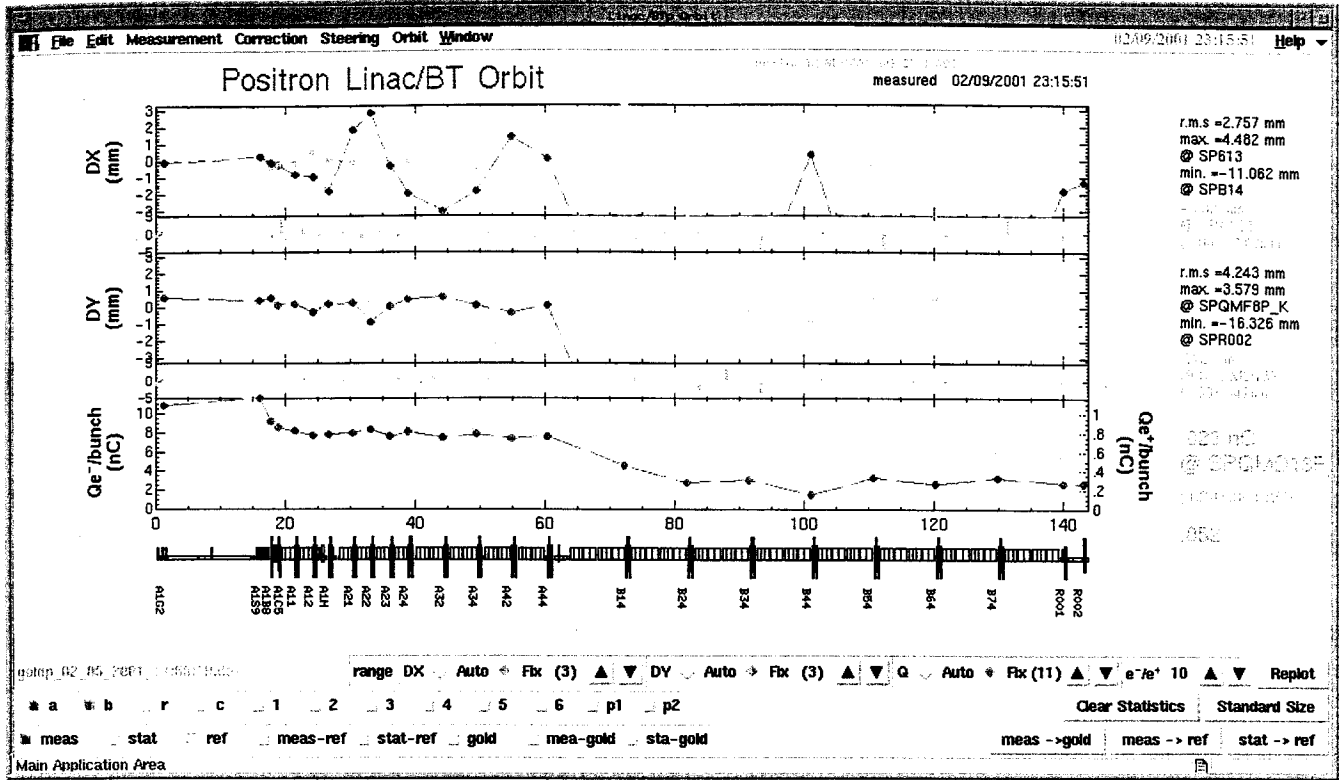


第1バッチのタイミング

第1、第2バッチの間隔が96.28μsの時、第2バッチ軌道をF.B.でよく通すようにし、その後F.B.が

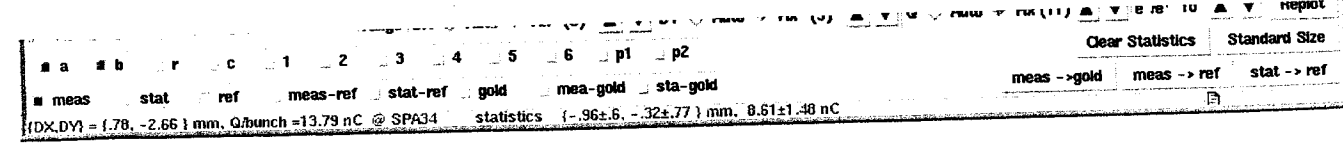
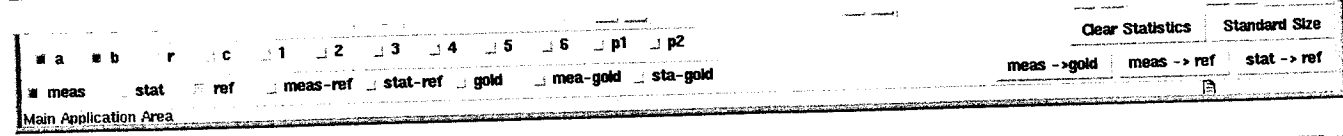
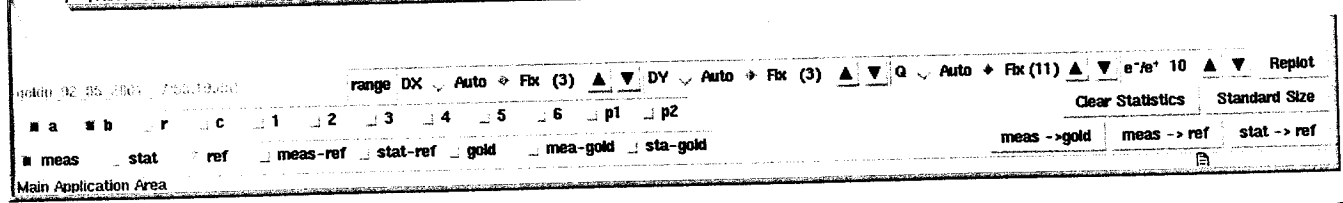
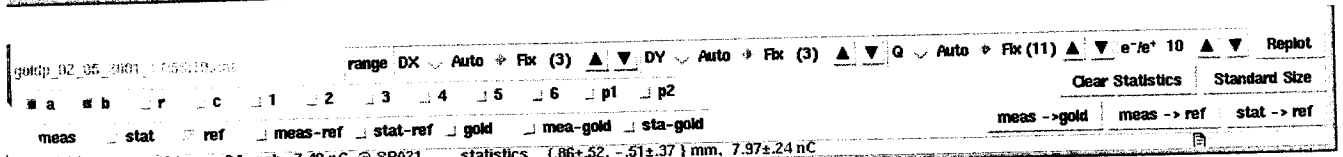
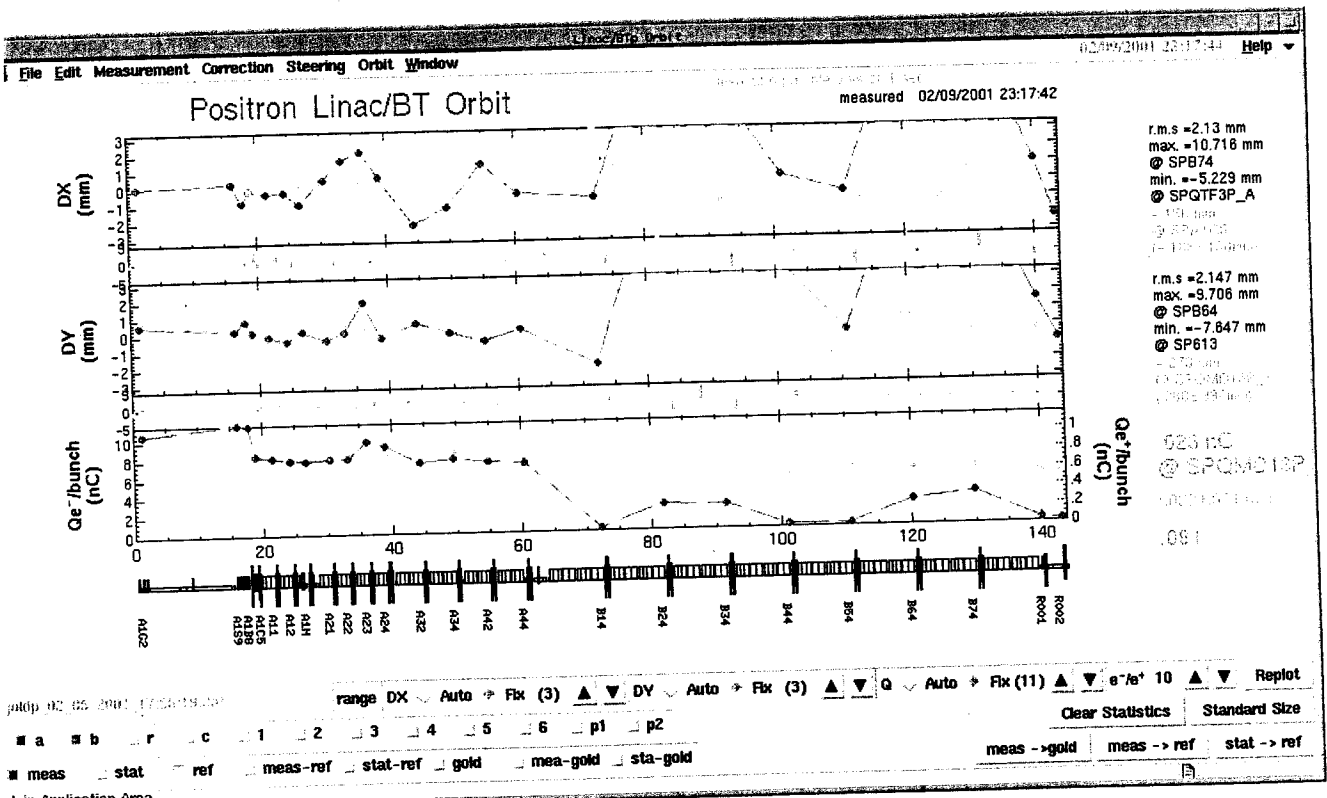


SP124





カ1,カ2バンチ間タイドクを変えると、軌道(カ2バンチ)が変化する。  
 カ1加速管後のQの所で、 $\Delta x \sim 1\text{mm}$  である。



42

x方向運動量変化量.

Buncher (出口カブロー?) 出口における。カ1とカ2バンチには  
x方向の運動量が異なる。カ1加速管後では、この変化量は、  
軌道変位に $\sim 1\text{mm}$ である。これを運動量にする。

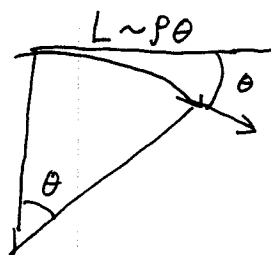
$$\Delta p_x \sim p \cdot \frac{\Delta x}{x} = 30 \text{ MeV}/c \times \frac{1}{3000} \approx 10 \text{ KeV}/c \sim 30 \text{ KeV}/c$$

(1000)

パルスマグネットでの運動量を変える必要な磁場強度

$$B_p = \frac{\Delta p c}{300} , \quad \frac{\Delta p}{p} \sim \theta , \quad L \sim p \theta$$

$$B = \frac{\Delta p c}{300 p} = \frac{p c \theta}{300 L} = \frac{\Delta p c}{300 L}$$



[Ex.]

$$\Delta p c = 100 \text{ KeV} = 0.01 \text{ MeV} \times 10$$

$$L = 0.05 \text{ m}$$

$$B = \frac{0.01 \times 10}{300 \times 0.05} = \frac{10}{1500} \text{ (T)} = 70 \text{ Gauss.}$$

e+ パルスコイルの場合.

$\left. \begin{array}{l} 10 \text{ kA} \\ 2 \text{ kV} \\ 100 \mu\text{s} \end{array} \right\}$	$\left. \begin{array}{l} 2 \text{ T} \\ 100 \text{ A}/\mu\text{s} \end{array} \right\}$	$\Rightarrow$	$\left. \begin{array}{l} 50 \text{ A} \\ 10 \text{ kV} \\ 100 \text{ ns} \end{array} \right\}$	$\left. \begin{array}{l} 0.1 \text{ T} = 100 \text{ Gauss} \\ 0.5 \text{ A}/\mu\text{s} \end{array} \right\}$
---	---	---------------	--	---

↓ パルス幅を短くする

$\left. \begin{array}{l} 50 \text{ A} \\ 10 \text{ kV} \\ 100 \text{ ns} \end{array} \right\}$	$\left. \begin{array}{l} 2 \text{ T} \\ 500 \text{ A}/\mu\text{s} \end{array} \right\}$	$100 \text{ Gauss}$
--	---	---------------------

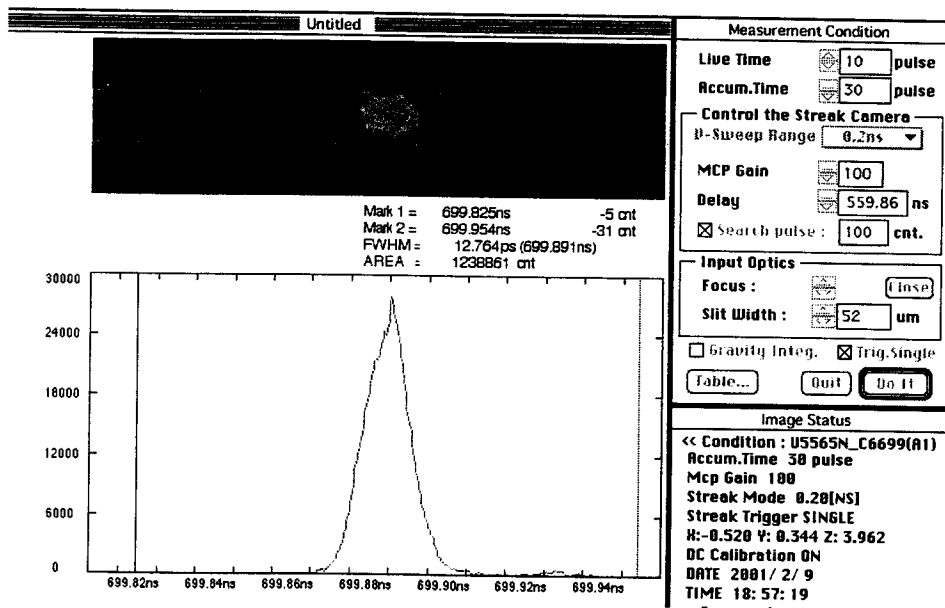
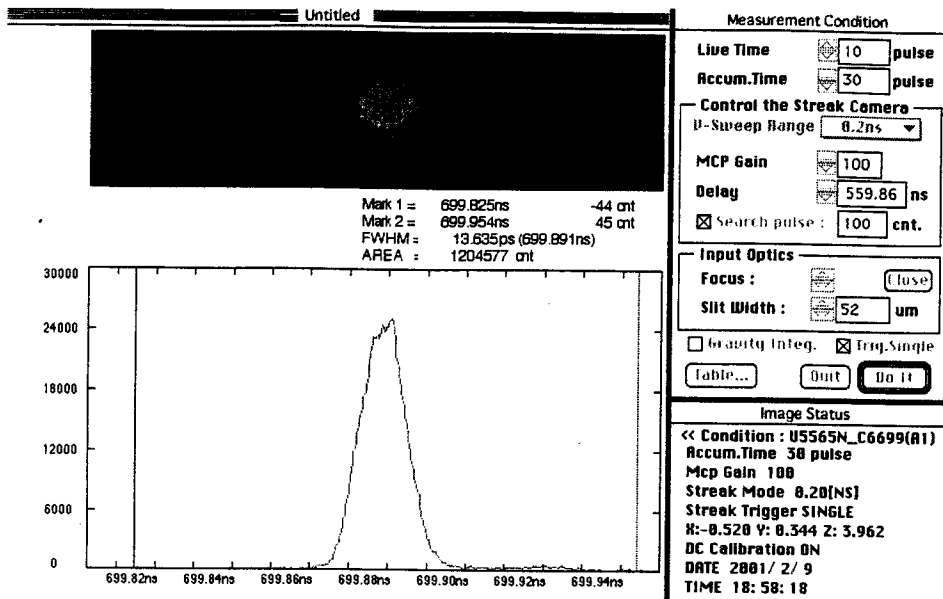
平均パワー  $\bar{w} = 50 \times 10^4 \times 10^{-7} \times 50 = 2.5 \times 10^0 = 2.5 \text{ W}$

LC回路.  $L = 10 \mu\text{H}, C = 1000 \text{ pF}$

$$f \sim \frac{1}{\sqrt{LC}} = \left( \frac{1}{10^{-5} \cdot 10^{-9}} \right)^{1/2} = 10^7 = 10 \text{ MHz.}$$

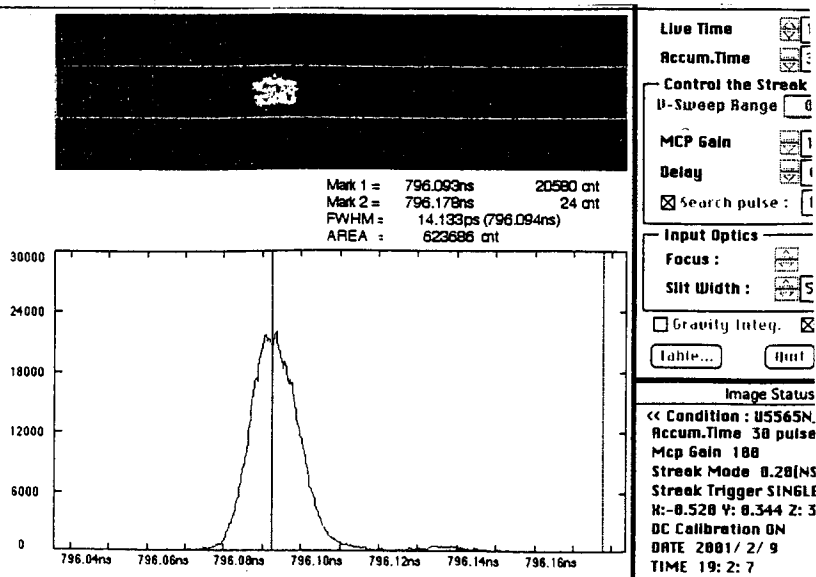
カ1バンダ

9127 ~ 699.888 ns



カ2バンダ

9127 ~ 796.093 ns

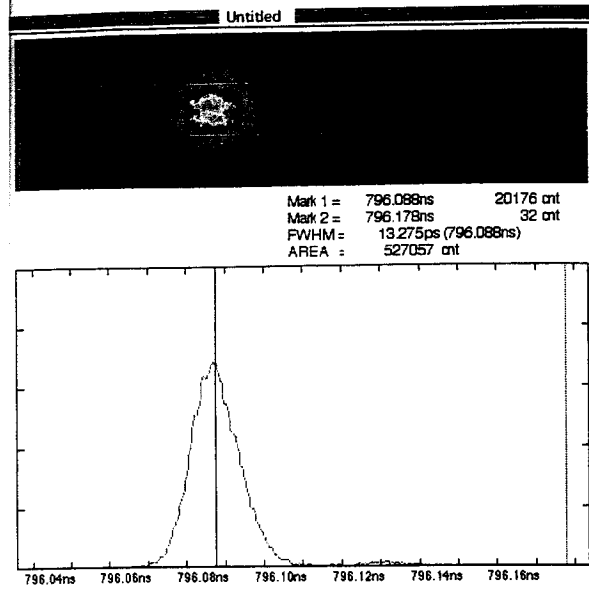


ホ2バンチ

RF幅 +100ns (05)

バンチ位置変化

$\Delta t = -5ns$



Measurement Condition

Live Time 10 pulse  
Accum.Time 30 pulse

Control the Streak Camera  
D-Sweep Range 0.2ns

MCP Gain 100  
Delay 656.08 ns

Search pulse : 100 cnt.

Input Optics  
Focus:   
Slit Width: 52 um

Gravity Integ.  Trig.Single

Table... Quit

Image Status  
Condition : U5565N\_C6699(R1)  
Accum.Time 30 pulse  
Mcp Gain 100  
Streak Mode 0.20[NS]  
Streak Trigger SINGLE  
K:-0.520 Y: 0.344 Z: 3.962  
DC Calibration ON  
DATE 2001/2/9  
TIME 19:35:52  
Comment >>

Measurement Condition

Live Time 10 pulse  
Accum.Time 30 pulse

Control the Streak Camera  
D-Sweep Range 0.2ns

MCP Gain 100  
Delay 656.08 ns

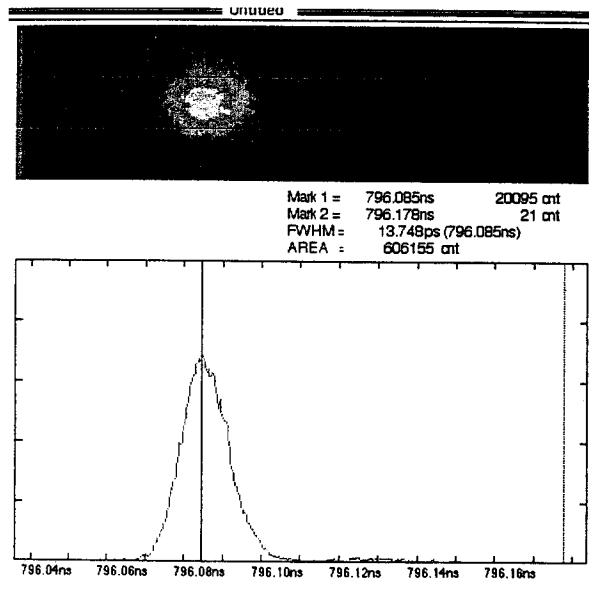
Search pulse : 100 cnt.

Input Optics  
Focus:   
Slit Width: 52 um

Gravity Integ.  Trig.Single

Table... Quit

Image Status  
Condition : U5565N\_C6699(R1)  
Accum.Time 30 pulse  
Mcp Gain 100  
Streak Mode 0.20[NS]  
Streak Trigger SINGLE  
K:-0.520 Y: 0.344 Z: 3.962  
DC Calibration ON  
DATE 2001/2/9  
TIME 19:33:14  
Comment >>



Measurement Condition

Live Time 10 pulse  
Accum.Time 30 pulse

Control the Streak Camera  
D-Sweep Range 0.2ns

MCP Gain 100  
Delay 656.08 ns

Search pulse : 100 cnt.

Input Optics  
Focus:   
Slit Width: 52 um

Gravity Integ.  Trig.Single

Table... Quit

Image Status  
Condition : U5565N\_C6699(R1)  
Accum.Time 30 pulse  
Mcp Gain 100  
Streak Mode 0.20[NS]  
Streak Trigger SINGLE  
K:-0.520 Y: 0.344 Z: 3.962  
DC Calibration ON  
DATE 2001/2/9  
TIME 19:39:37  
Comment >>

Measurement Condition

Live Time 10 pulse  
Accum.Time 30 pulse

Control the Streak Camera  
D-Sweep Range 0.2ns

MCP Gain 100  
Delay 656.08 ns

Search pulse : 100 cnt.

Input Optics  
Focus:   
Slit Width: 52 um

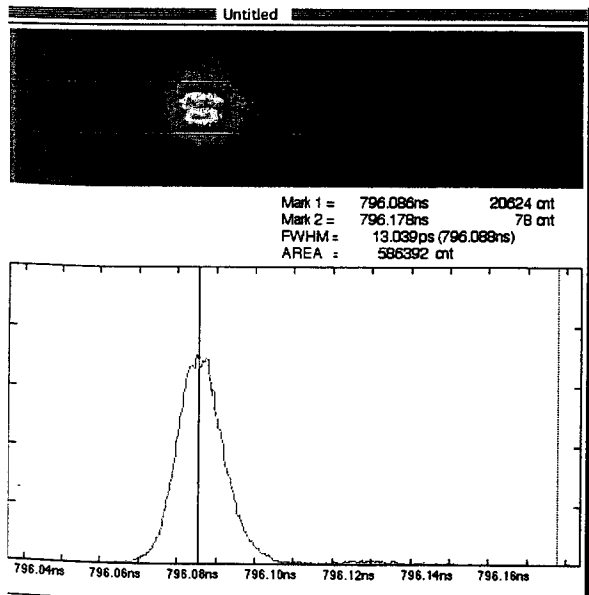
Gravity Integ.  Trig.Single

Table... Quit

Image Status  
Condition : U5565N\_C6699(R1)  
Accum.Time 30 pulse  
Mcp Gain 100  
Streak Mode 0.20[NS]  
Streak Trigger SINGLE  
K:-0.520 Y: 0.344 Z: 3.962  
DC Calibration ON  
DATE 2001/2/9  
TIME 19:38:35  
Comment >>

+150ns (067)

$\Delta t = -8 \sim -9ns$



Measurement Condition

Live Time 10 pulse  
Accum.Time 30 pulse

Control the Streak Camera  
D-Sweep Range 0.2ns

MCP Gain 100  
Delay 656.08 ns

Search pulse : 100 cnt.

Input Optics  
Focus:   
Slit Width: 52 um

Gravity Integ.  Trig.Single

Table... Quit

Image Status  
Condition : U5565N\_C6699(R1)  
Accum.Time 30 pulse  
Mcp Gain 100  
Streak Mode 0.20[NS]  
Streak Trigger SINGLE  
K:-0.520 Y: 0.344 Z: 3.962  
DC Calibration ON  
DATE 2001/2/9  
TIME 19:42:14  
Comment >>

Measurement Condition

Live Time 10 pulse  
Accum.Time 30 pulse

Control the Streak Camera  
D-Sweep Range 0.2ns

MCP Gain 100  
Delay 656.08 ns

Search pulse : 100 cnt.

Input Optics  
Focus:   
Slit Width: 52 um

Gravity Integ.  Trig.Single

Table... Quit

Image Status  
Condition : U5565N\_C6699(R1)  
Accum.Time 30 pulse  
Mcp Gain 100  
Streak Mode 0.20[NS]  
Streak Trigger SINGLE  
K:-0.520 Y: 0.344 Z: 3.962  
DC Calibration ON  
DATE 2001/2/9  
TIME 19:41:35  
Comment >>

+200ns (049)

$\Delta t = -6 \sim -7ns$