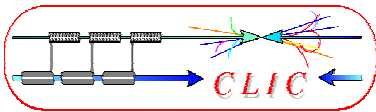


# CTF3 RESULTS - 1<sup>ST</sup> RUN 2004

(7th JUNE - 16th JULY)

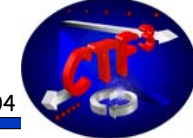
## Outline

- Review of planned strategy, schedule and objectives
- Main results
- Overview of run history & main problems encountered
- What has been left out...
- Highlights on hardware, beam studies and 30 GHz production

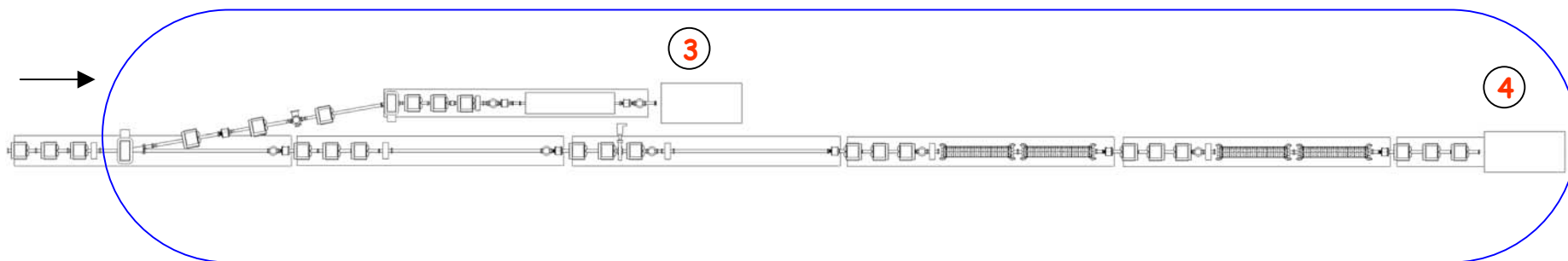
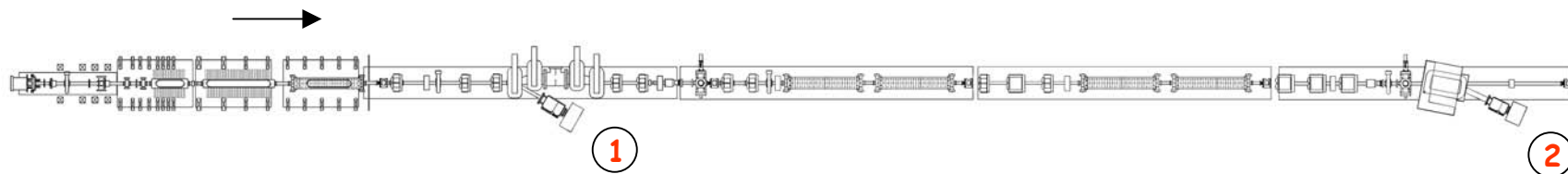


# STAGES

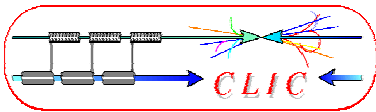
R. Corsini, 27 Aug 2004



- Several "stages" depending on the dump where the beam is sent.
- Allows operation in parallel to RF conditioning

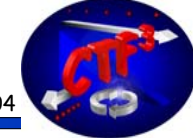


- ① Need MKS02 & MKS03
- ② ③ Need MKS05 & MKS06
- ④ Need MKS11 & MKS12



# SCHEDULE

R. Corsini, 27 Aug 2004

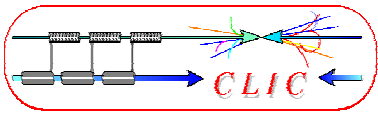


CTF3 start with beam in parallel with conditioning

	Jun			Jul				
Wk	23	24	25	26	27	28	29	30
Mo	Whit. 31	7	14	21	28	5	12	19
Tu								
We		1	2					
Th					3	4		
Fr								
Sa								
Su								
		HB	FT	RC	HB	FT	RC	

E  
P  
A  
C

R  
E  
S  
E  
R  
V  
E



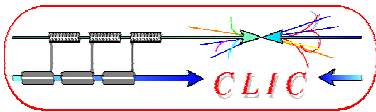
# CTF3 COMMISSIONING PROGRAM

1st RUN

(7th JUNE - 16th JULY)

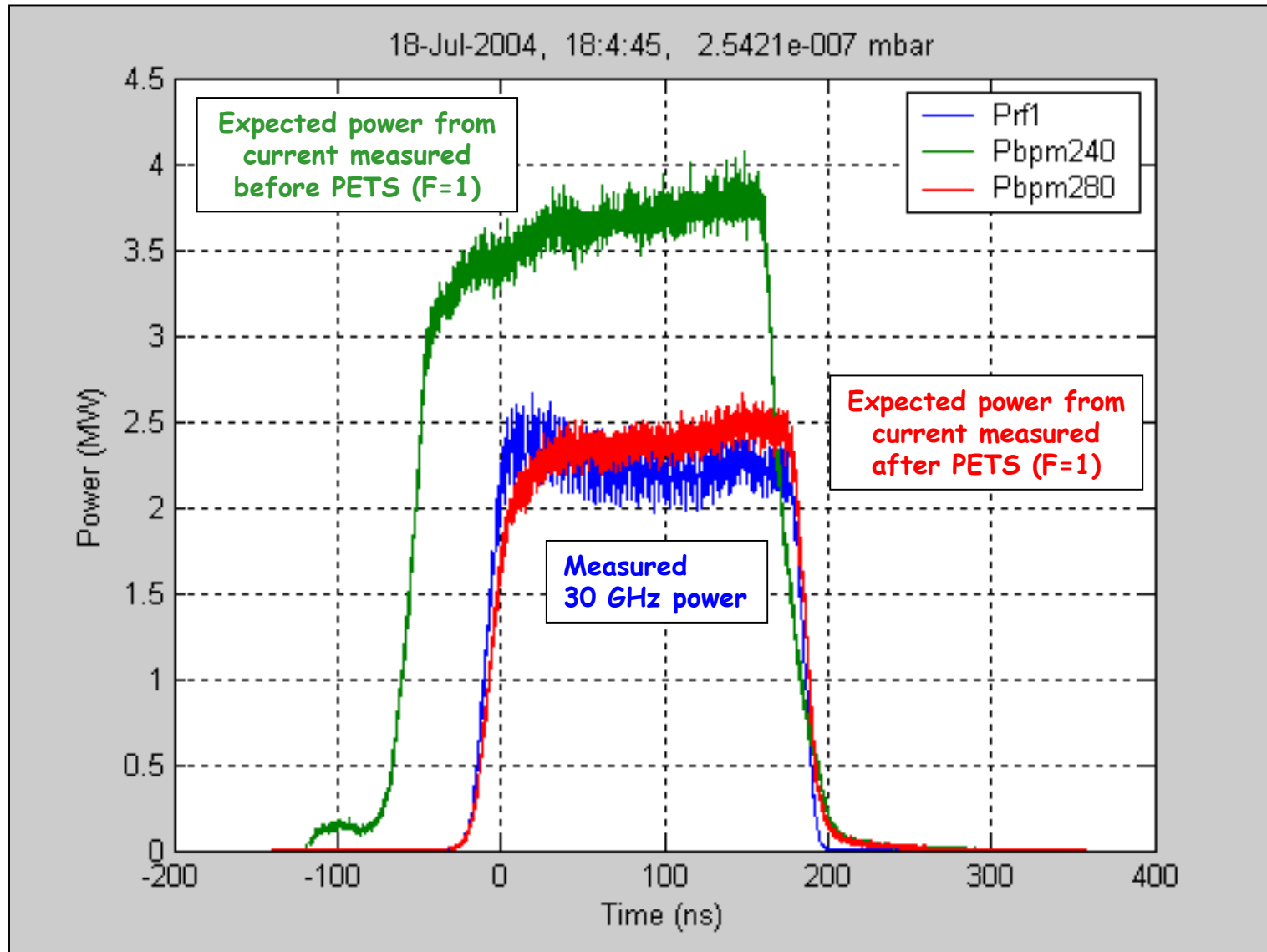
## Main Goals:

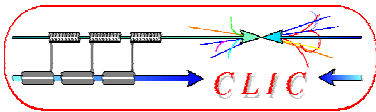
- Commission hardware & software modified since last year ( up to girder 8 )
- Set-up beam transport (power mode) through PETS line
- Check 30 GHz power production in PETS line
- Commission new hardware (after girder 8)
- Nominal beam transport to dump in girder 13



# 30 GHz RF POWER PRODUCTION

R. Corsini, 27 Aug 2004





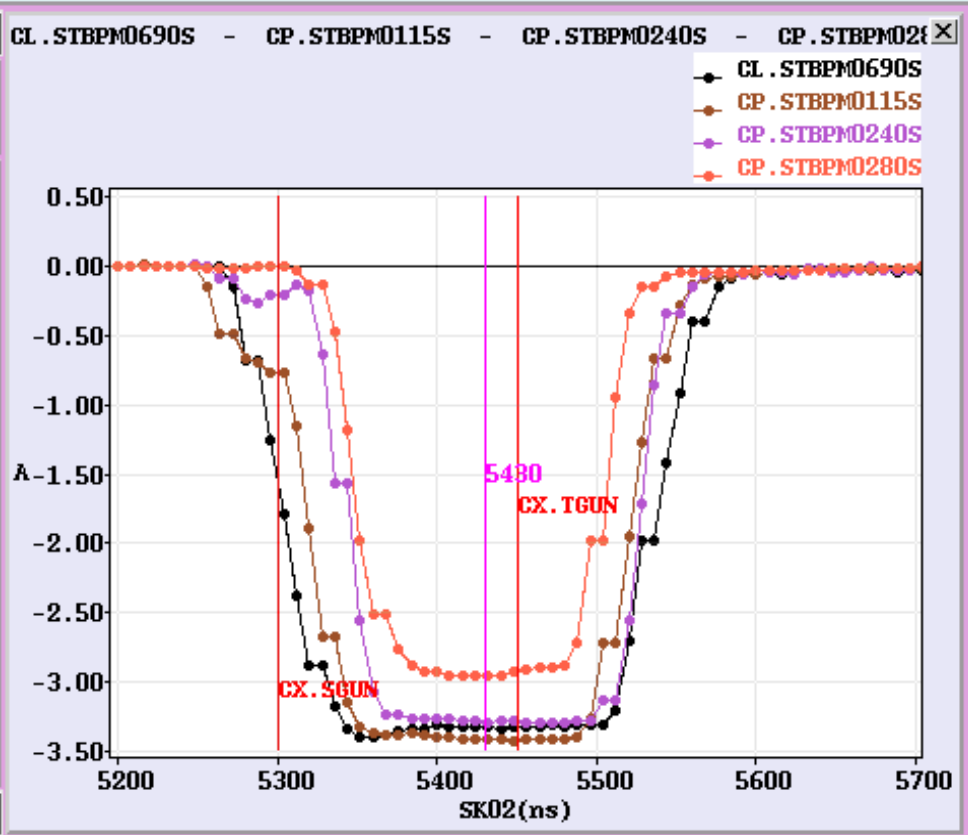
# 30 GHz RF POWER PRODUCTION

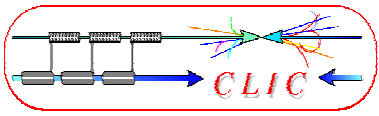
R. Corsini, 27 Aug 2004



Cycle from	<input type="checkbox"/> CX.SGUN	<input type="checkbox"/> CX.SKLY0	<input type="checkbox"/> CX.ERFPO	<input type="checkbox"/> CX.TGUN	SETUP[1] DUMP_LIN
SK02(ns) 00000.000	5300.0000	0.00000	5950.0000	5450.0000	2004 Jul 18 18:00:38

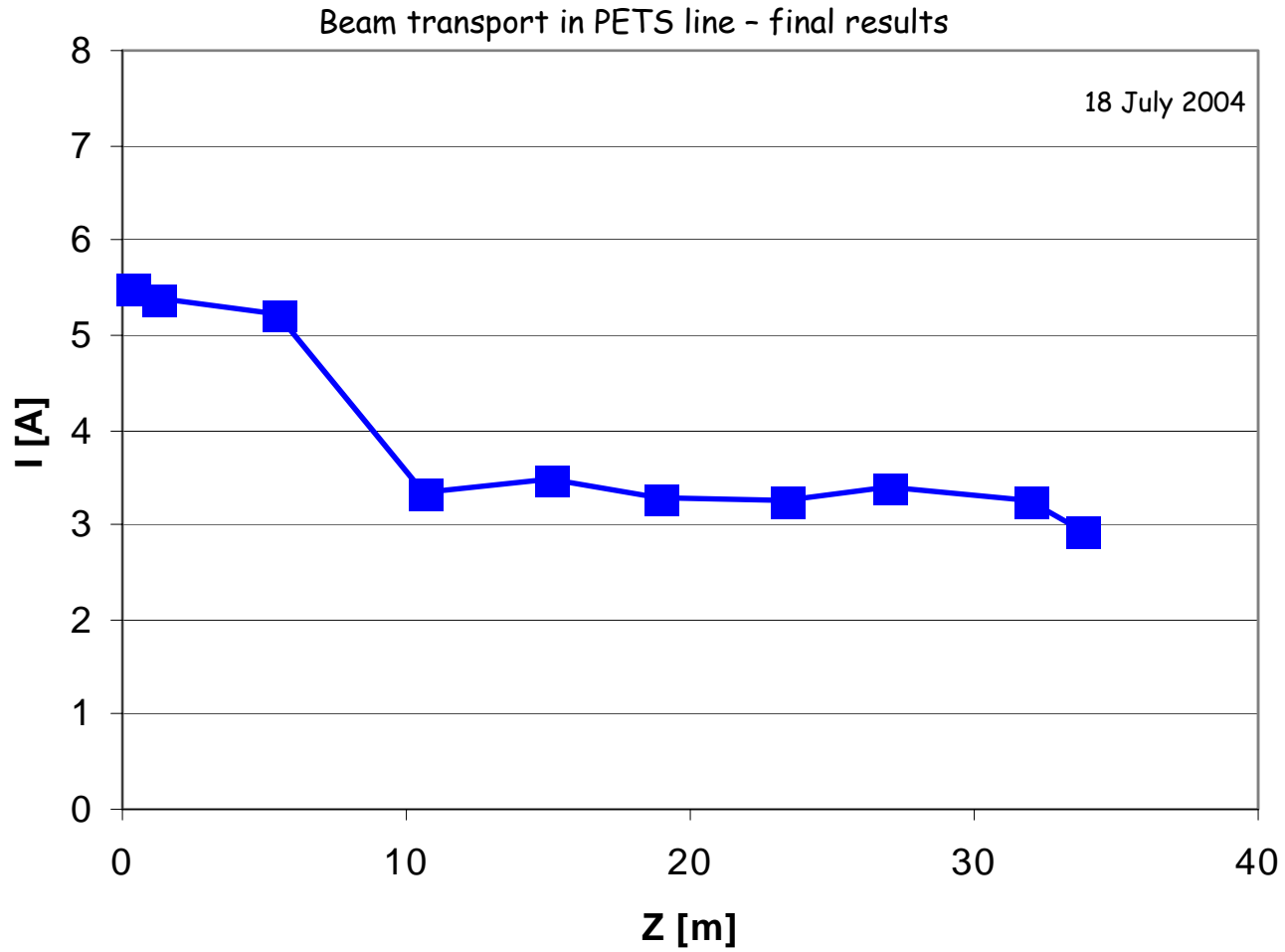
Snap to Point	
SK02(ns)	<input type="checkbox"/>
5430	
CL.STBPM06	-3.32568
CP.STBPM01	-3.41250
CP.STBPM02	-3.28650
CP.STBPM02	-2.95800
Link Marker & Cursor	

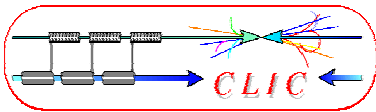




# 30 GHz RF POWER PRODUCTION

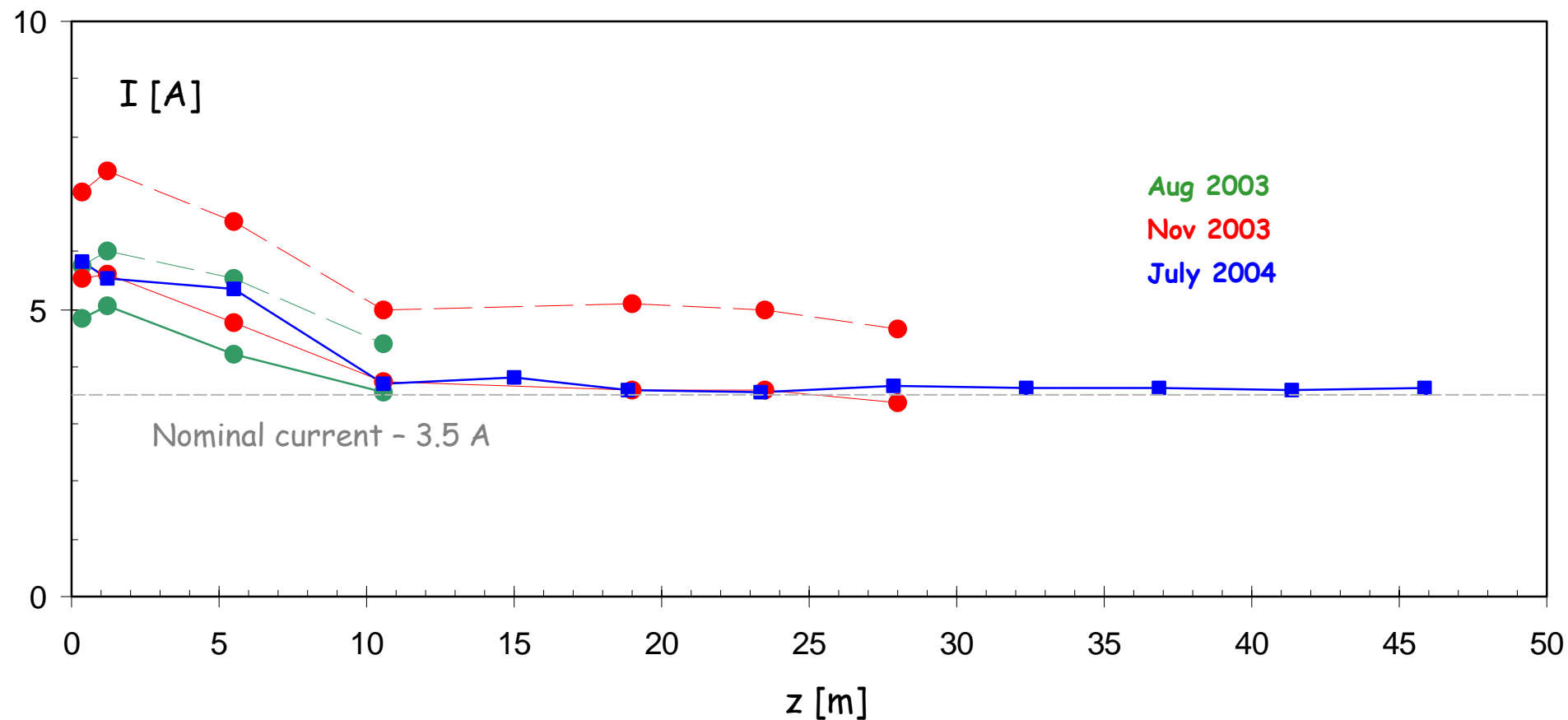
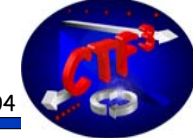
R. Corsini, 27 Aug 2004



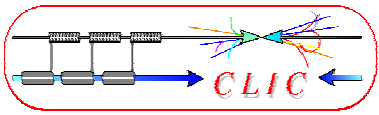


# NOMINAL BEAM TO DUMP 13

R. Corsini, 27 Aug 2004

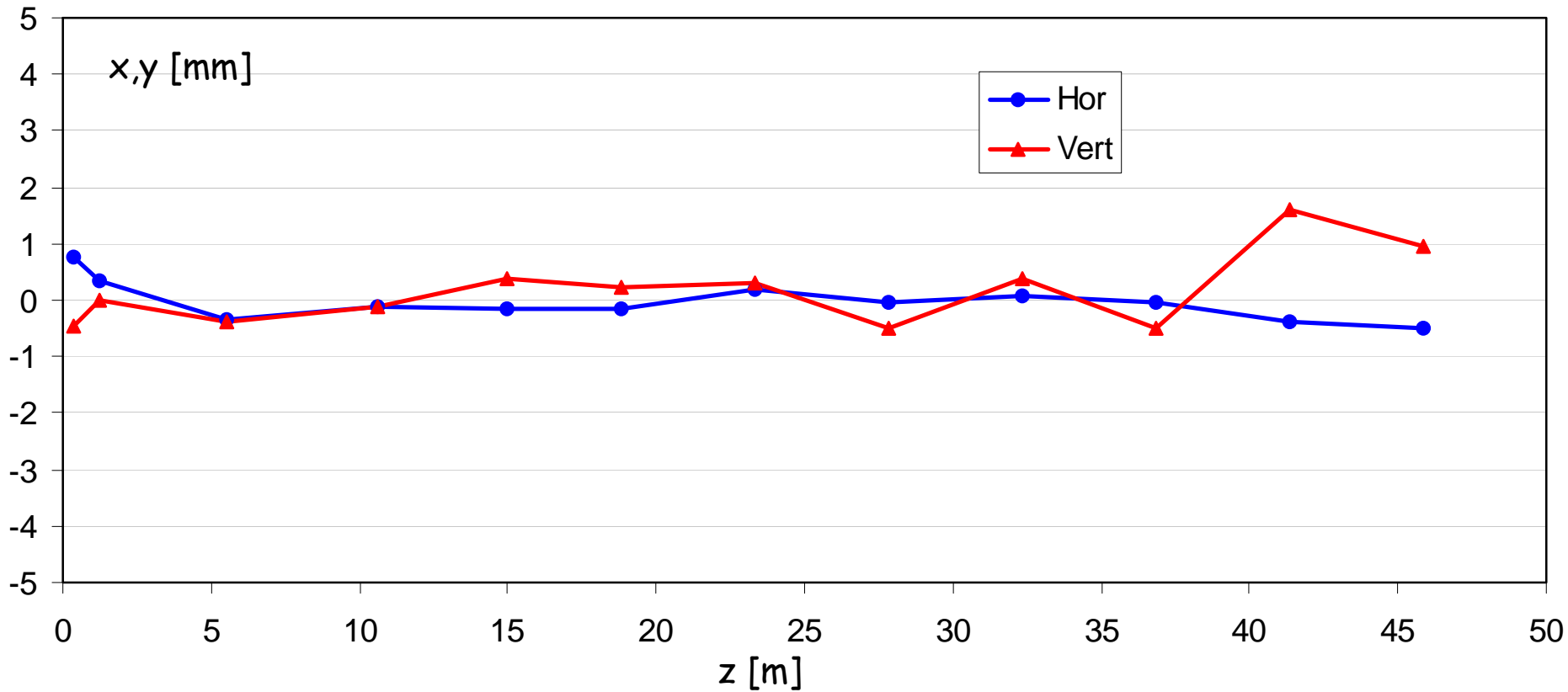


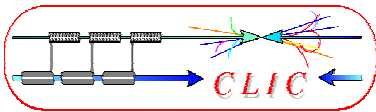




# NOMINAL BEAM TO DUMP 13

R. Corsini, 27 Aug 2004





# RUN OVERVIEW

R. Corsini, 27 Aug 2004



CTF3 start with beam in parallel with conditioning

Jun

Jul

Wk	23	24	25	26	27	28	29	30
Mo	Whit. 31	7	14	21	28	5	12	19
Tu	MACHINE CLOSED	FIRST BEAM	NOMINAL RF in 02,03	0.4 → 0.2 A PETS				
We			FIRST 30 GHz POWER		0.4 A , 90% PETS		NOMINAL BEAM TO DUMP 13	
Th								
Fr					1 A , 70% PETS			
Sa								
Su							3.3 → 3 A PETS	

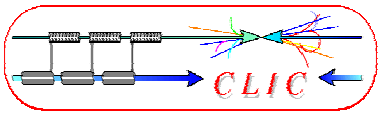
E  
P  
A  
C

Problems with water distribution, leaks etc..

Problems with MKS06 (controls, power supplies, breakdowns...) and with MKS11 (breakdowns)

2.5 MW





## (Some) activities during RF conditioning

R. Corsini, 27 Aug 2004



### RF pulse compression system:

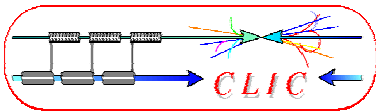
1. Signals calibration (MW scale) not yet completed
2. Remote temperature control ?
3. RF pulse shaping OK

### Magnets:

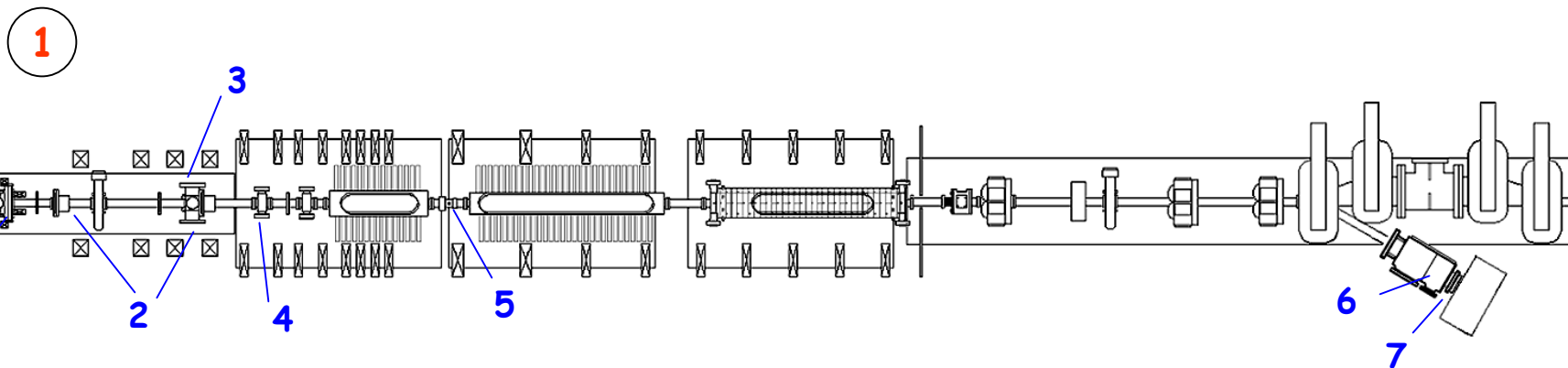
1. Check stray fields around gun (solenoids on) OK
2. Polarity check OK (but not everywhere...)

### Others:

1. Set-up software interlocks OK ?
2. ...



# STAGE 1

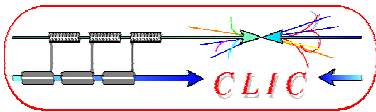


Modified hardware & software, instrumentation:

- |    |  |                       |
|----|--|-----------------------|
| 1. | Gun pulser timing (short pulse length)                 | NO                    |
| 2. | BPEs increased bias (avoid charging-up & signal drift) | Tried - does not work |
| 3. | MTV 165 CCD camera, Proxitronic control                | OK, NO                |
| 4. | PB1 disconnected                                       | OK                    |
| 5. | BPR 290 ADC calibration, waveguide                     | NO, OK                |
| 6. | MTV 440 (spectrometer)                                 | OK                    |
| 7. | Segmented dump in spectro                              | OK                    |

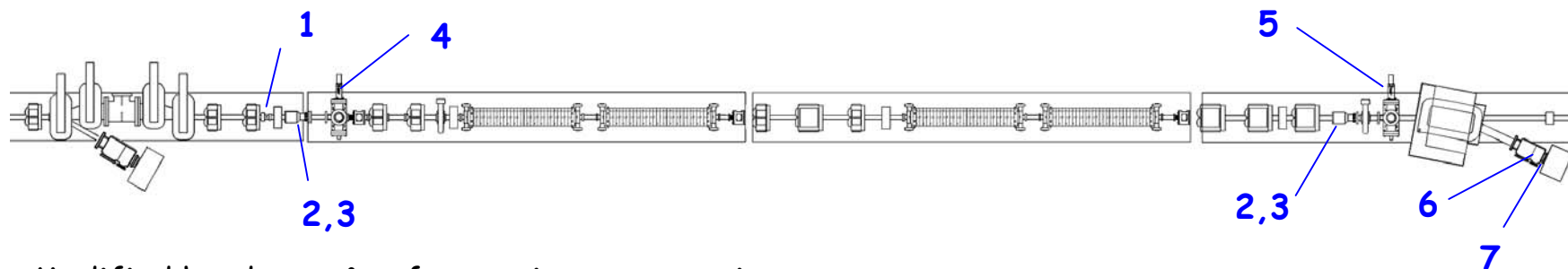
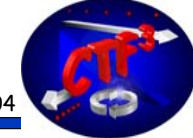
Beam studies:

- |    |  |    |
|----|--|----|
| 1. | Beam transport in solenoid (behaviour of corrector 120, elliptical beam/coupling, beam oscillations) | NO |
|----|--|----|



# STAGE 2

R. Corsini, 27 Aug 2004



Modified hardware & software, instrumentation:

1. BPR 475 ADC calibration, waveguide
2. WCM 490, WCM 725 (influence of corrector, dep. on position)
3. Machine protection system (based on WCMs)
4. MTV 500
5. MTV 730
6. MTV 750 (spectrometer)
7. Segmented dump in spectro

NO, OK

NO ?

First tests

OK

OK

OK

OK

Beam studies:

1. Transverse optics (re-match from last year quad scans, new quads scans in MTV 730, iteration...)
2. Identify RF crest (beam loading vs. BPR wguides)  
+ bunch compression
3. Establish PETS pilot beam (200 mA, 200 ns)
4. Establish power mode beam (minimum bunch length)

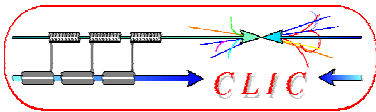
Quad scan only

NO

Not full study

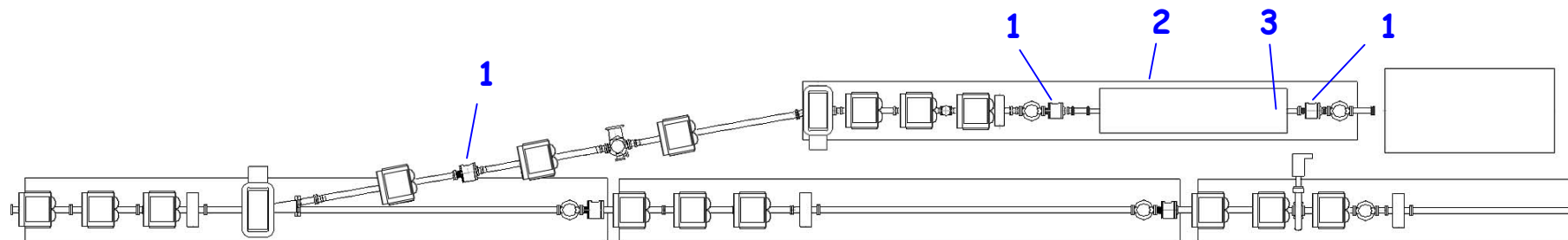
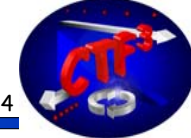
OK

OK (not max 3 GHz power)



# STAGE 3

R. Corsini, 27 Aug 2004

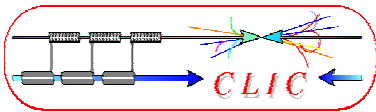


## New hardware & software, instrumentation:

- |    |                           |    |
|----|---------------------------|----|
| 1. | BPMs 115, 240, 280        | OK |
| 2. | BLM system                | OK |
| 3. | 30 GHz signal acquisition | OK |

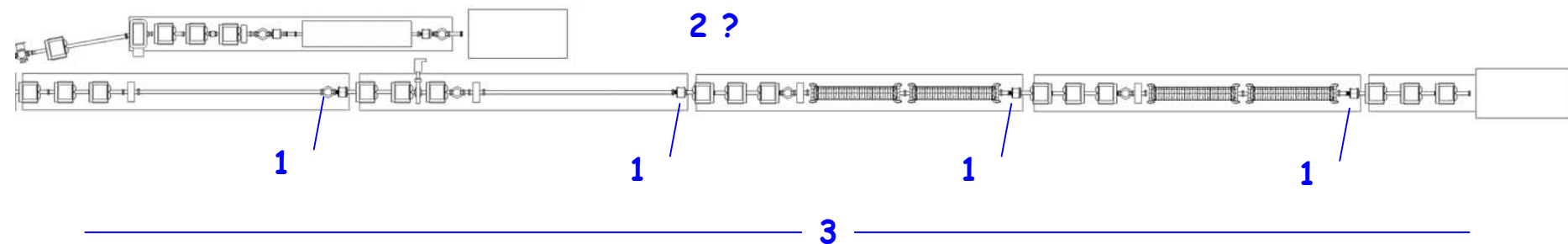
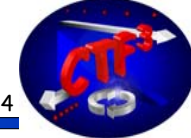
## Beam studies:

- |    |  |                  |
|----|--|------------------|
| 1. | Set-up dispersion in PETS line (BPMs)  | OK (qualitative) |
| 2. | Pilot beam momentum optimization<br>(clean transient in chicane, minimize transient<br>from MKS 05 & MKS 06, measure spread in BPM115) | Not complete     |
| 3. | Pilot beam through PETS  | OK               |
| 4. | Raise current, power mode beam through PETS<br>(monitor vacuum, 30 GHz power, BPMs, BLMs)  | OK               |
| 5. | Beam phase swing for pulse compression   | NO               |



# STAGE 4

R. Corsini, 27 Aug 2004

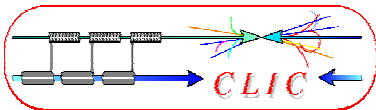


Modified hardware & software, instrumentation:

- |    |                             |                       |
|----|-----------------------------|-----------------------|
| 1. | BPMs 990, 1090, 1190, 1290  | OK                    |
| 2. | New BLM chambers ?          | Tested - did not work |
| 3. | Extend automatic steering ? | NO                    |

Beam studies:

- |    |                                      |    |
|----|--------------------------------------|----|
| 1. | Transport nominal beam to final dump | OK |
|----|--------------------------------------|----|



# AUTOMATIC BEAM STEERING 1

R. Corsini, 27 Aug 2004

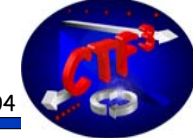
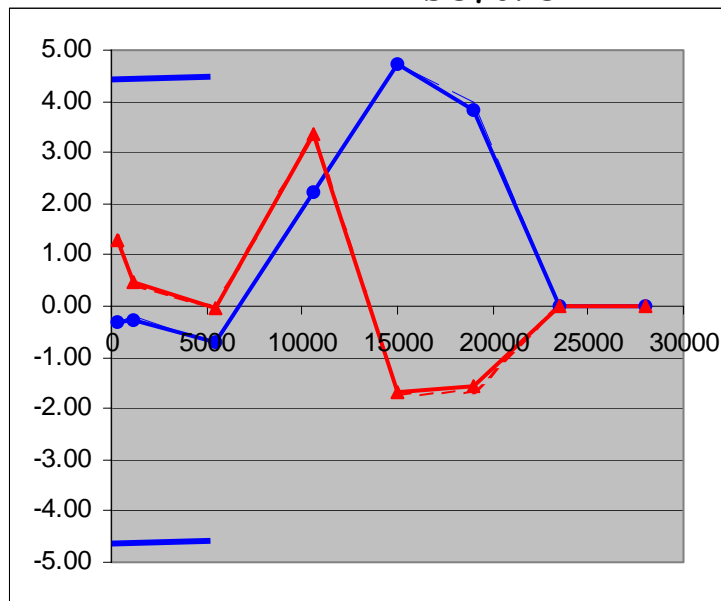


Table hor	CCV
CL.DHA0120	-1.20
CL.DHA0150	-5.00
CL.DHA0230	0.08
CL.DHB0270	0.01
CL.DHB0315	-7.00
CL.DHB0340	-7.09
CL.DHC0410	0.70
CL.DHC0470	0.00
CL.DHC0520	0.79
CL.DHC0620	0.88

Table vert	CCV
CL.DVA0120	0.00
CL.DVA0150	-1.79
CL.DVA0230	0.01
CL.DVB0270	0.00
CL.DVB0315	-4.21
CL.DVB0340	-6.32
CL.DVC0410	0.00
CL.DVC0470	-0.19
CL.DVC0520	-0.19
CL.DVC0620	0.36

28 June 2004

before

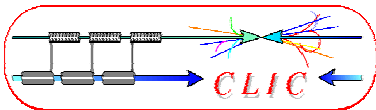


Steering also in solenoidal region

Table hor	CCV
CL.DHA0120	-0.50
CL.DHA0150	-3.08
CL.DHA0230	-1.76
CL.DHB0270	-2.10
CL.DHB0315	-5.86
CL.DHB0340	-7.62
CL.DHC0410	-0.87
CL.DHC0470	0.08
CL.DHC0520	0.89
CL.DHC0620	0.91

Table vert	CCV
CL.DVA0120	-0.21
CL.DVA0150	-0.34
CL.DVA0230	0.25
CL.DVB0270	-0.54
CL.DVB0315	-1.11
CL.DVB0340	-5.83
CL.DVC0410	0.96
CL.DVC0470	-1.31
CL.DVC0520	0.60
CL.DVC0620	0.00





# AUTOMATIC BEAM STEERING 1

R. Corsini, 27 Aug 2004

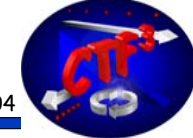
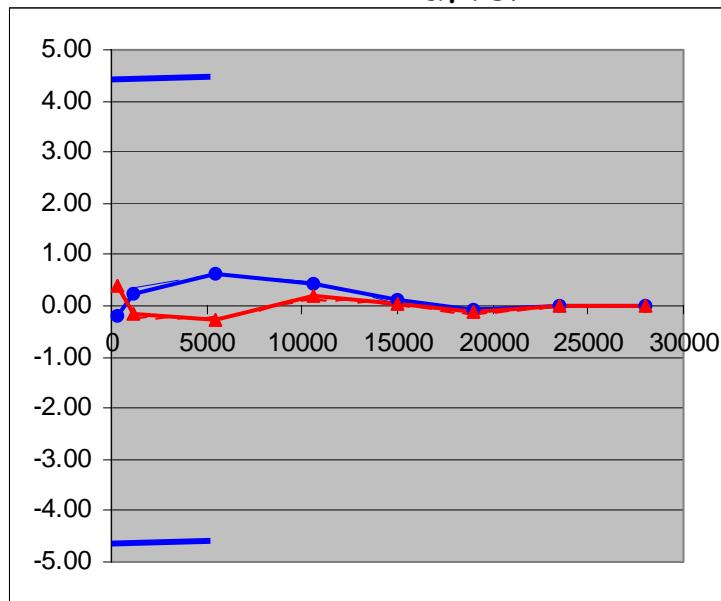


Table hor	CCV
CL.DHA0120	-1.20
CL.DHA0150	-5.00
CL.DHA0230	0.08
CL.DHB0270	0.01
CL.DHB0315	-7.00
CL.DHB0340	-7.09
CL.DHC0410	0.70
CL.DHC0470	0.00
CL.DHC0520	0.79
CL.DHC0620	0.88

Table vert	CCV
CL.DVA0120	0.00
CL.DVA0150	-1.79
CL.DVA0230	0.01
CL.DVB0270	0.00
CL.DVB0315	-4.21
CL.DVB0340	-6.32
CL.DVC0410	0.00
CL.DVC0470	-0.19
CL.DVC0520	-0.19
CL.DVC0620	0.36

28 June 2004

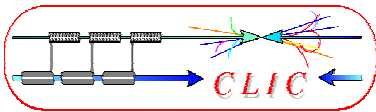
after



Steering also in *solenoidal region*

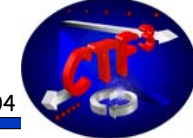
Table hor	CCV
CL.DHA0120	-0.50
CL.DHA0150	-3.08
CL.DHA0230	-1.76
CL.DHB0270	-2.10
CL.DHB0315	-5.86
CL.DHB0340	-7.62
CL.DHC0410	-0.87
CL.DHC0470	0.08
CL.DHC0520	0.89
CL.DHC0620	0.91

Table vert	CCV
CL.DVA0120	-0.21
CL.DVA0150	-0.34
CL.DVA0230	0.25
CL.DVB0270	-0.54
CL.DVB0315	-1.11
CL.DVB0340	-5.83
CL.DVC0410	0.96
CL.DVC0470	-1.31
CL.DVC0520	0.60
CL.DVC0620	0.00



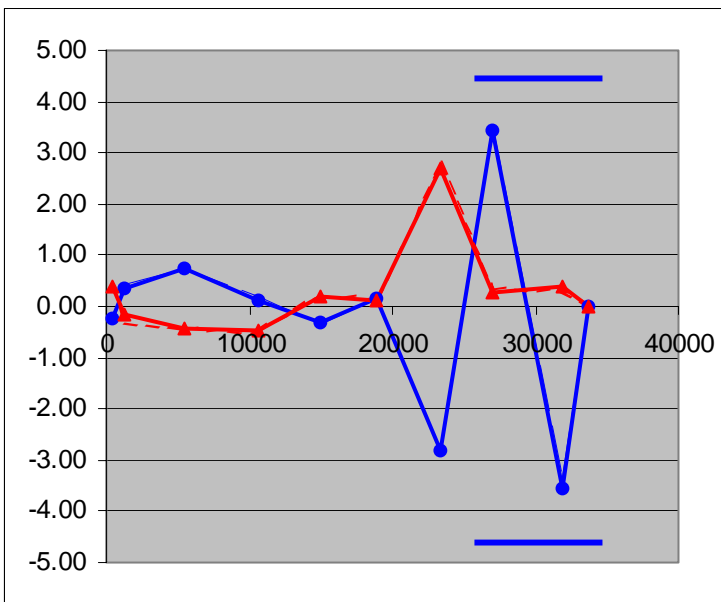
# AUTOMATIC BEAM STEERING 2

R. Corsini, 27 Aug 2004



30 June 2004

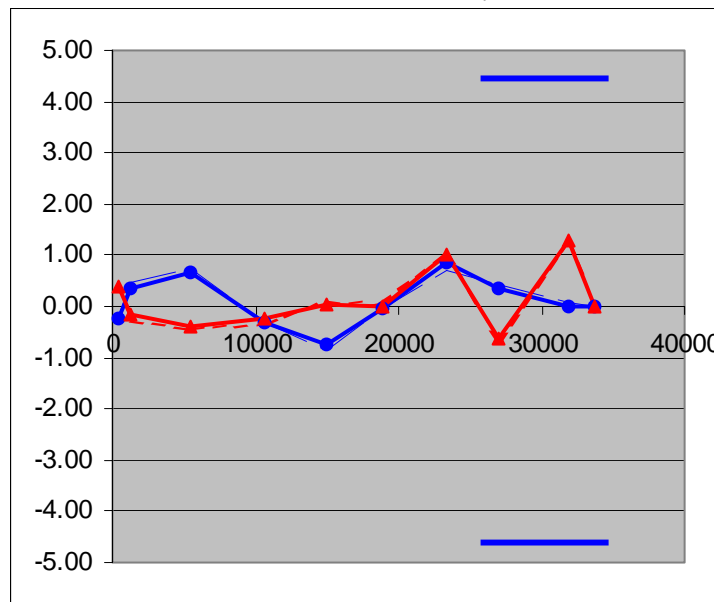
before



CL.DHC0620	1.16
CL.DHC0712	1.43
CL.DHC0820	0.25

CL.DVC0620	0.05
CL.DVC0712	-0.49
CL.DVC0820	-0.10

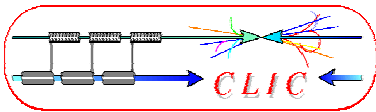
after



CL.DHC0620	1.29
CL.DHC0712	-0.38
CL.DHC0820	3.60

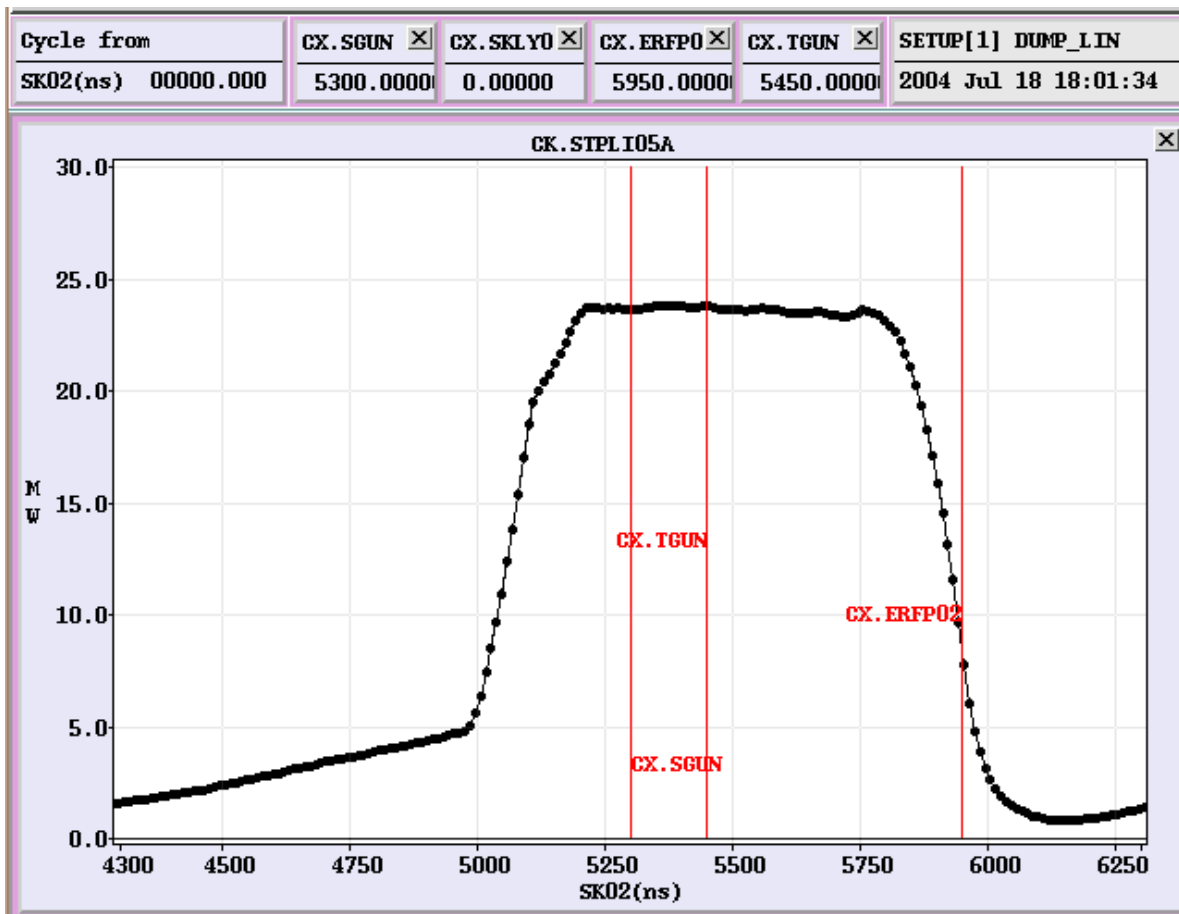
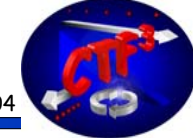
CL.DVC0620	0.08
CL.DVC0712	0.47
CL.DVC0820	-0.11

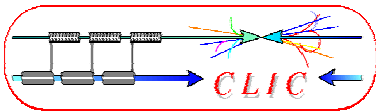
Steering also in **PETS**



# RF PULSE COMPRESSION - PHASE PROGRAM

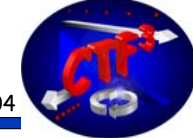
R. Corsini, 27 Aug 2004



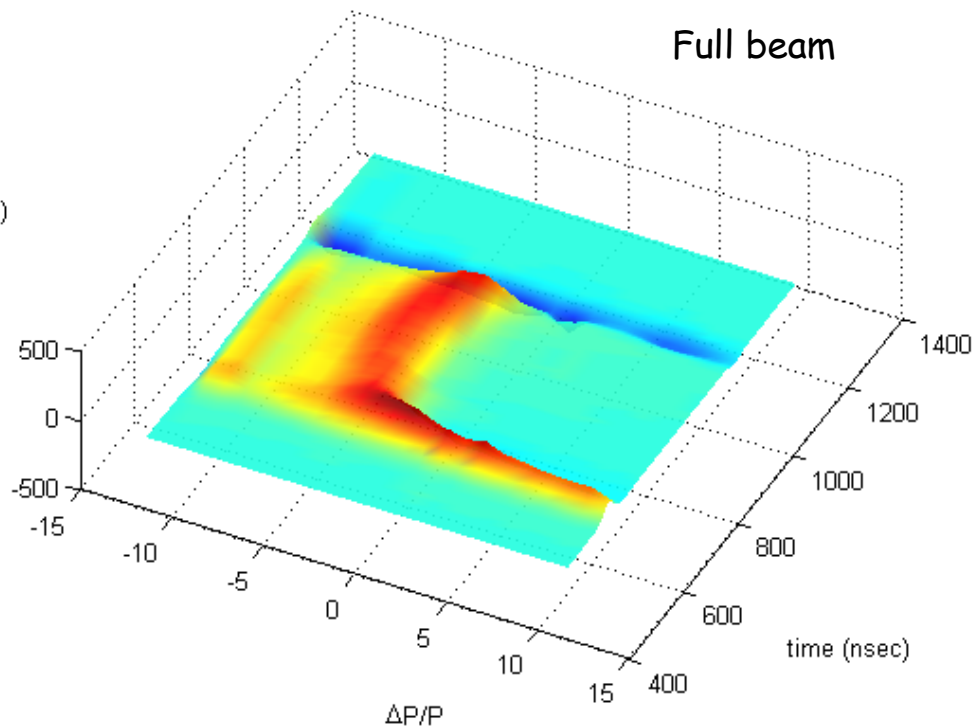
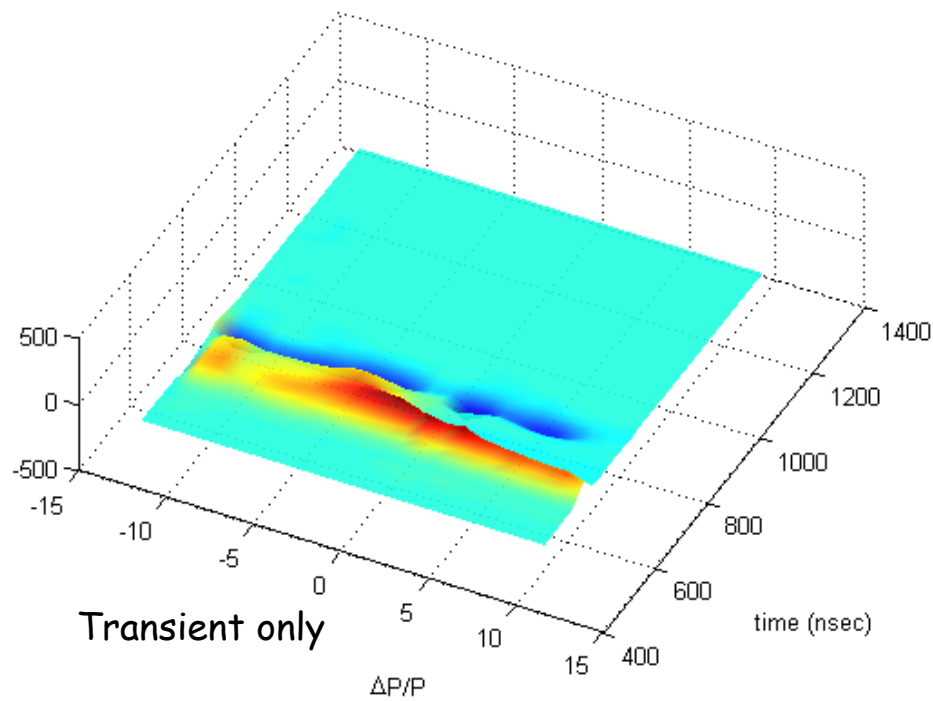


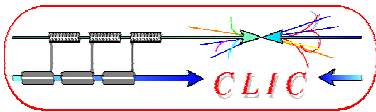
# SEGMENTED BEAM DUMP

R. Corsini, 27 Aug 2004



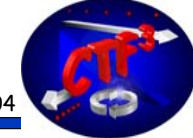
16 July 2004 - during quad scan



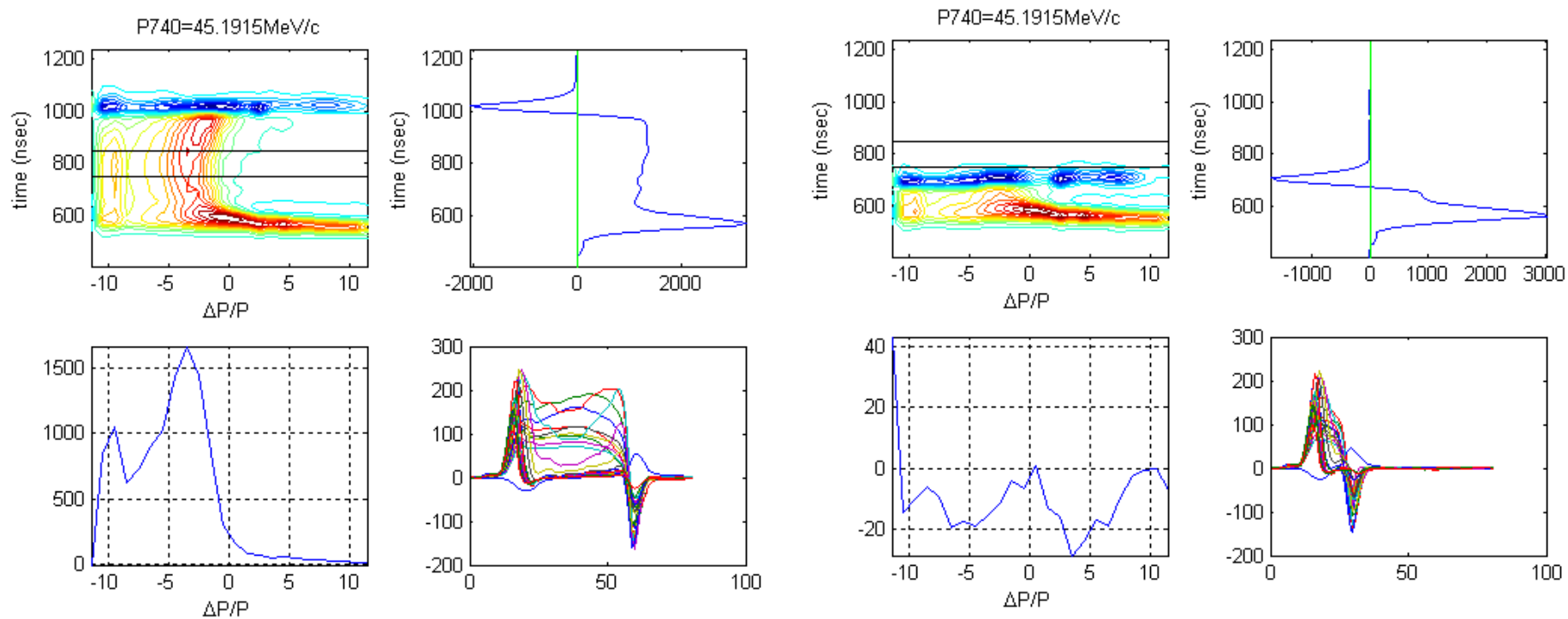


# SEGMENTED BEAM DUMP

R. Corsini, 27 Aug 2004

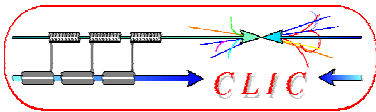


16 July 2004 - during quad scan



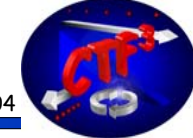
Full beam

Transient

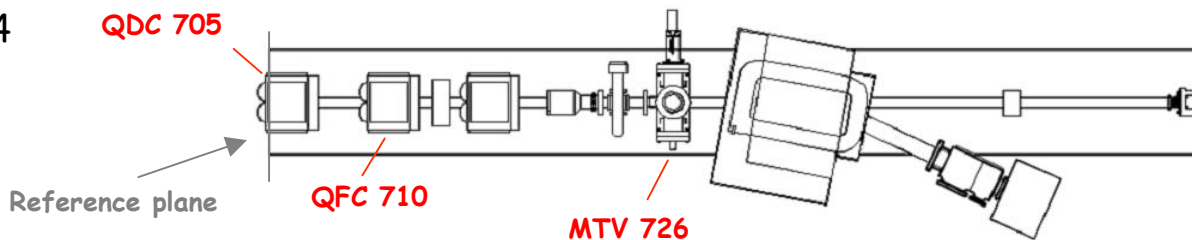


# QUAD SCAN - EMITTANCE

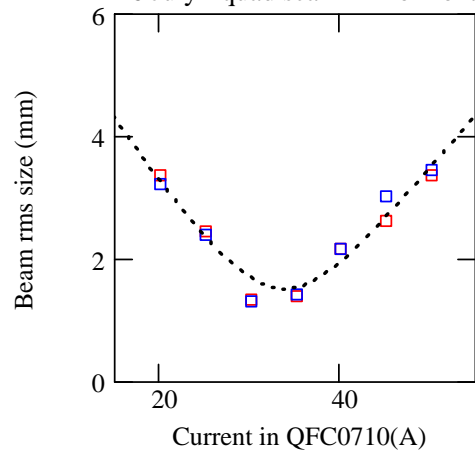
R. Corsini, 27 Aug 2004



16 July 2004



16 July - quad scan 1 - Horizontal



$$\beta = 0.43$$

$$\alpha = 0.09$$

$$\varepsilon \cdot \gamma = 1.07 \times 10^{-4}$$

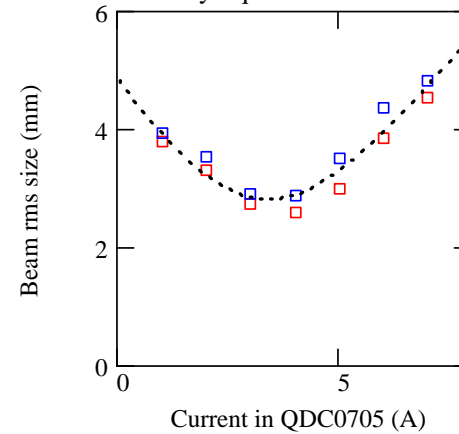


$$\beta = 1.28$$

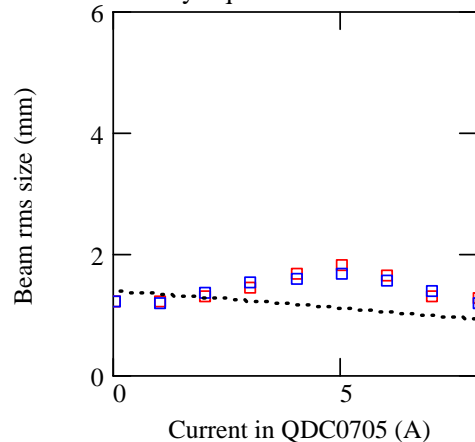
$$\alpha = 0.38$$

$$\varepsilon \cdot \gamma = 7.97 \times 10^{-5}$$

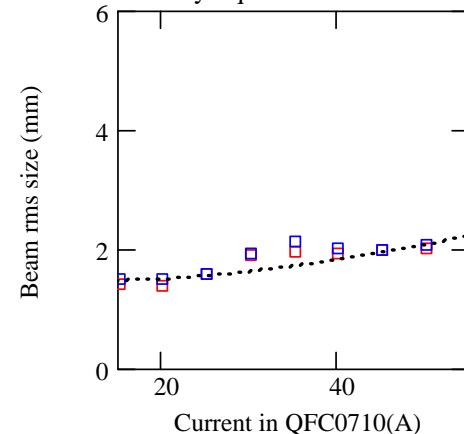
16 July - quad scan 2 - Vertical

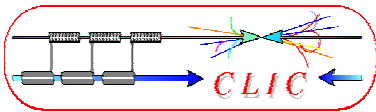


16 July - quad scan 2 - Horizontal



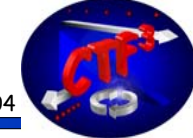
16 July - quad scan 1 - Vertical



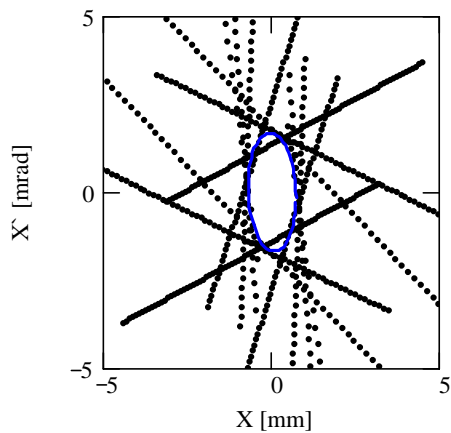
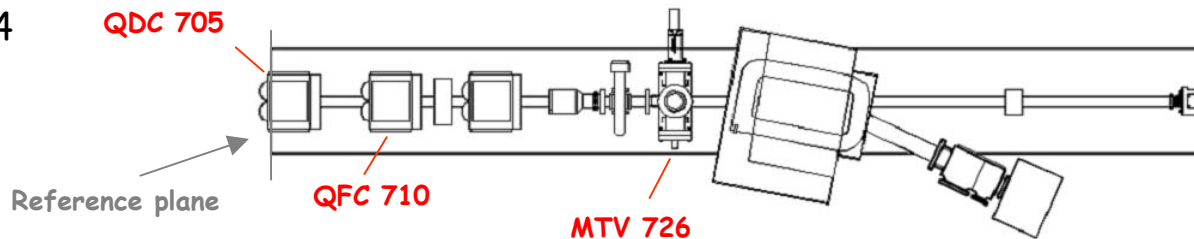


# QUAD SCAN - EMITTANCE

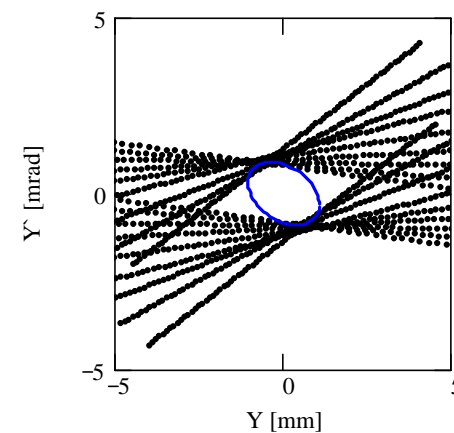
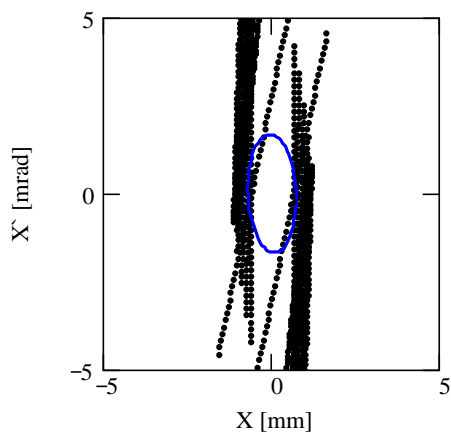
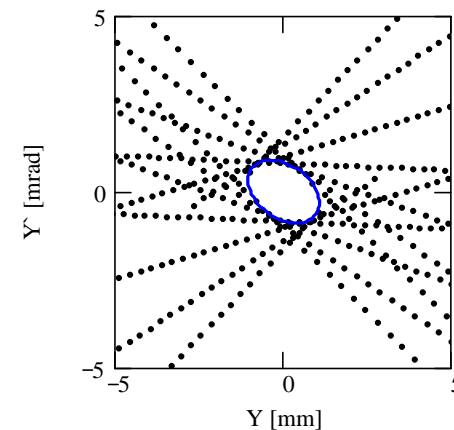
R. Corsini, 27 Aug 2004

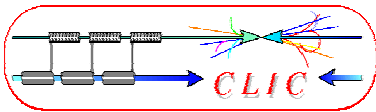


16 July 2004



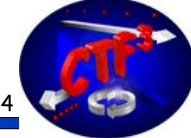
$$\begin{aligned} \beta &= 0.43 \\ \alpha &= 0.09 \\ \varepsilon \cdot \gamma &= 1.07 \times 10^{-4} \end{aligned}$$



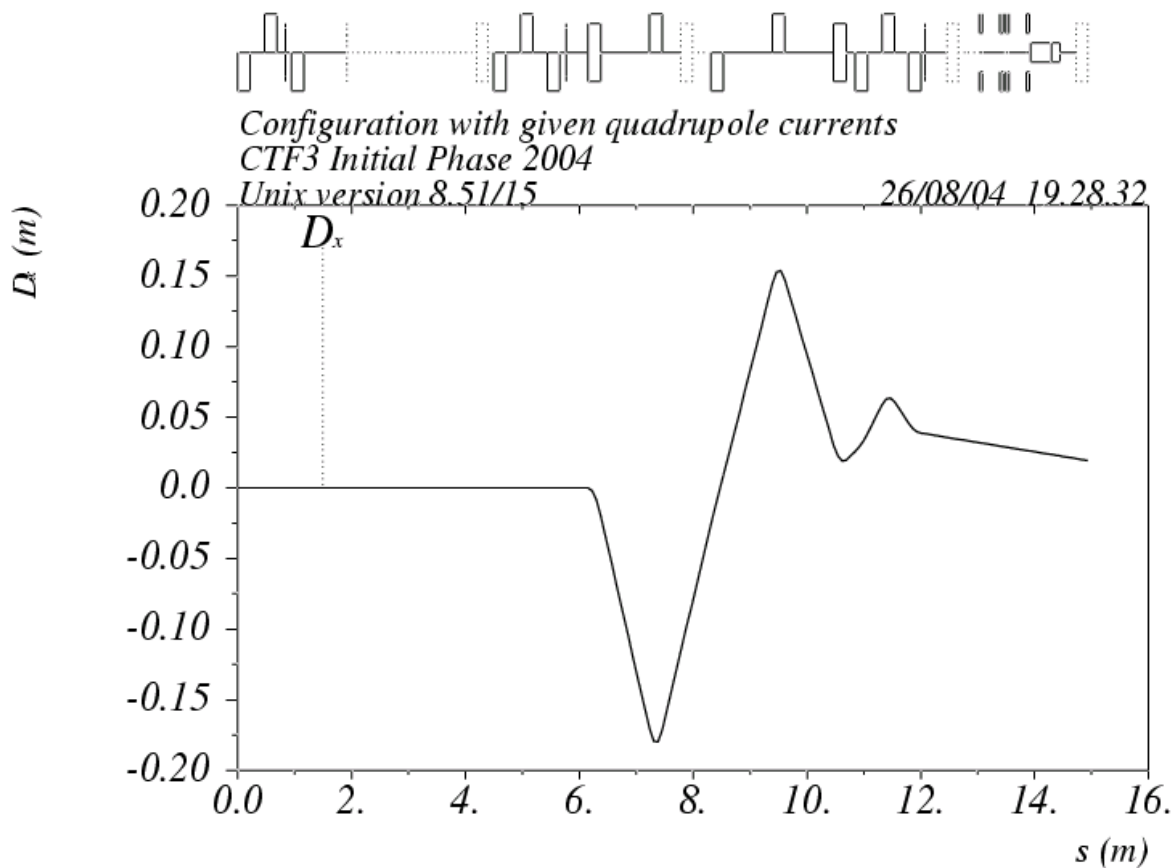


# MAD MODEL RESULTS - PETS LINE

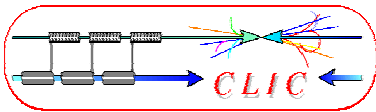
R. Corsini, 27 Aug 2004



Running conditions of 16 July 2004 - before quad scan -  $E = 43.8$  MeV

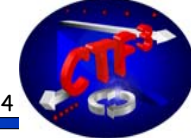




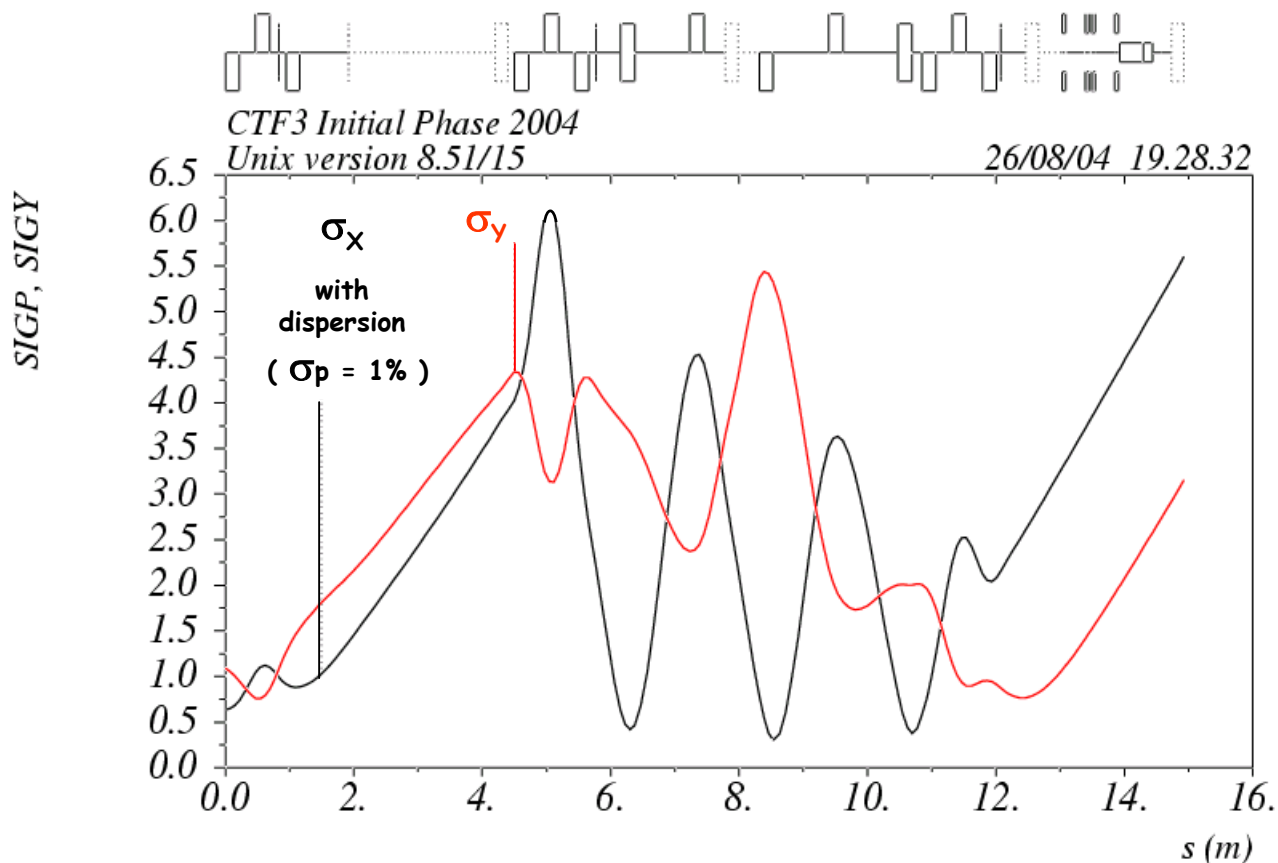


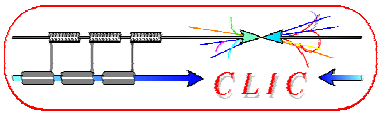
# MAD MODEL RESULTS - PETS LINE

R. Corsini, 27 Aug 2004



Running conditions of 16 July 2004 - before quad scan -  $E = 43.8$  MeV



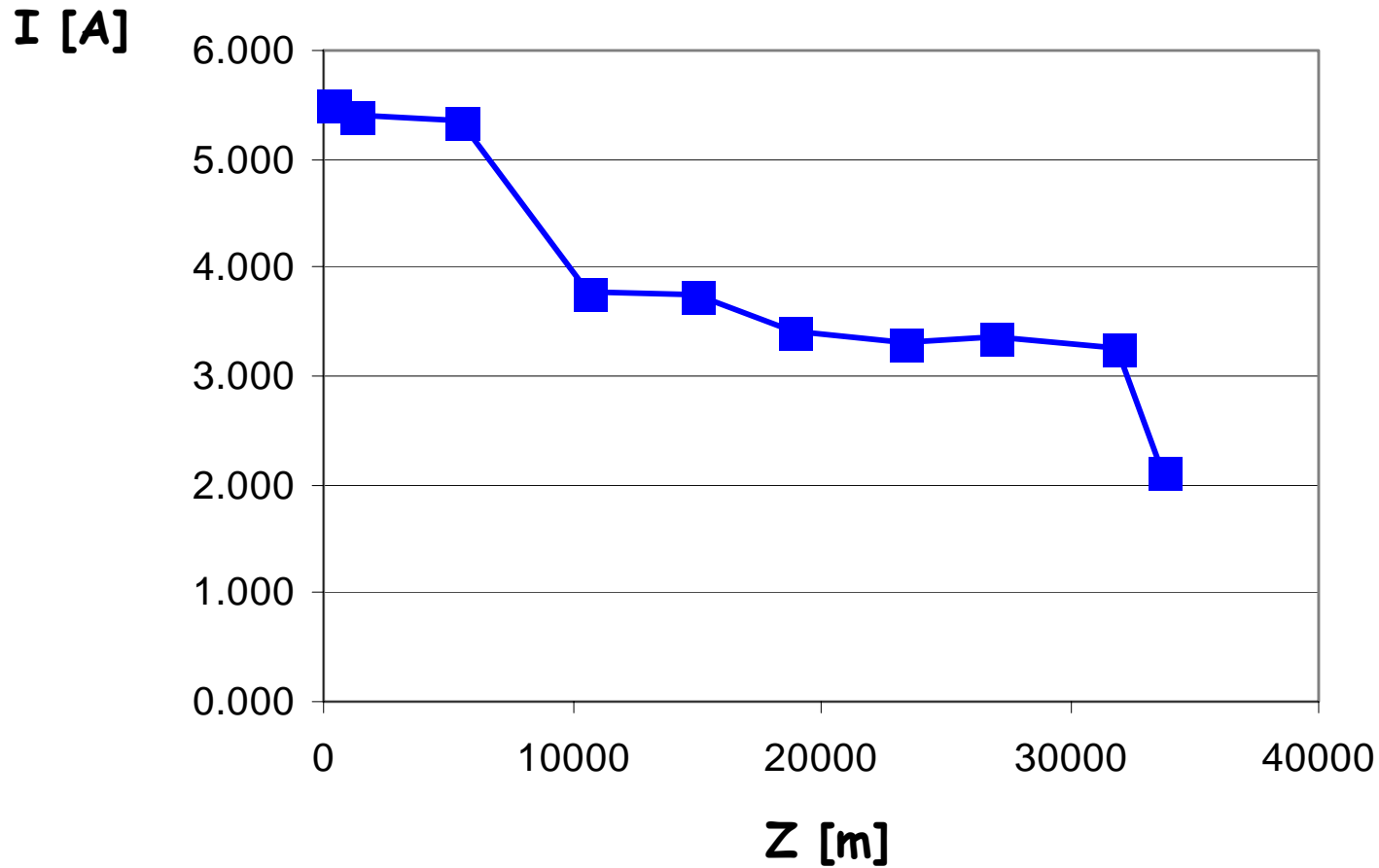


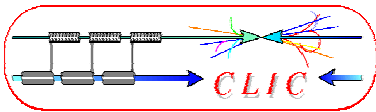
# MAD MODEL RESULTS - PETS LINE

R. Corsini, 27 Aug 2004



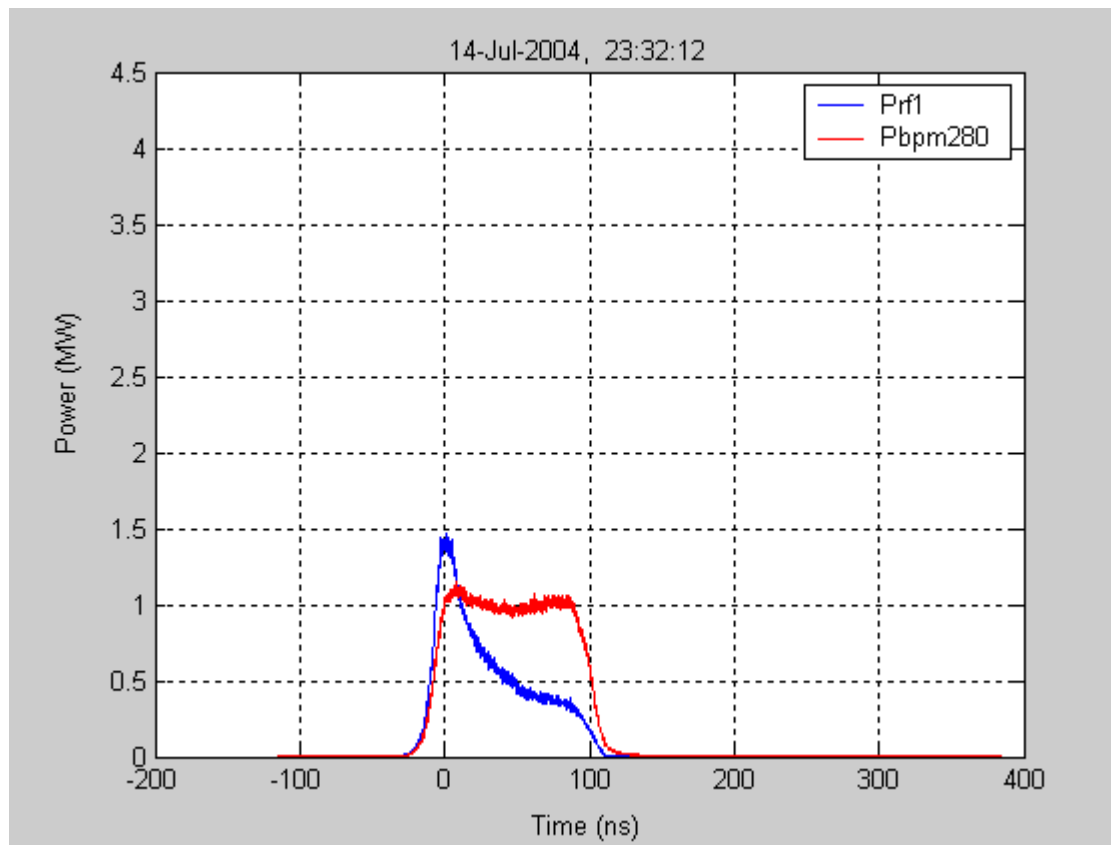
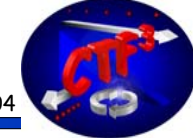
Running conditions of 16 July 2004 - before quad scan -  $E = 43.8$  MeV

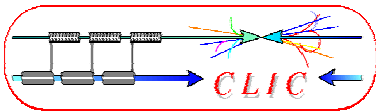




# 30 GHz RF - PETS "CONDITIONING"

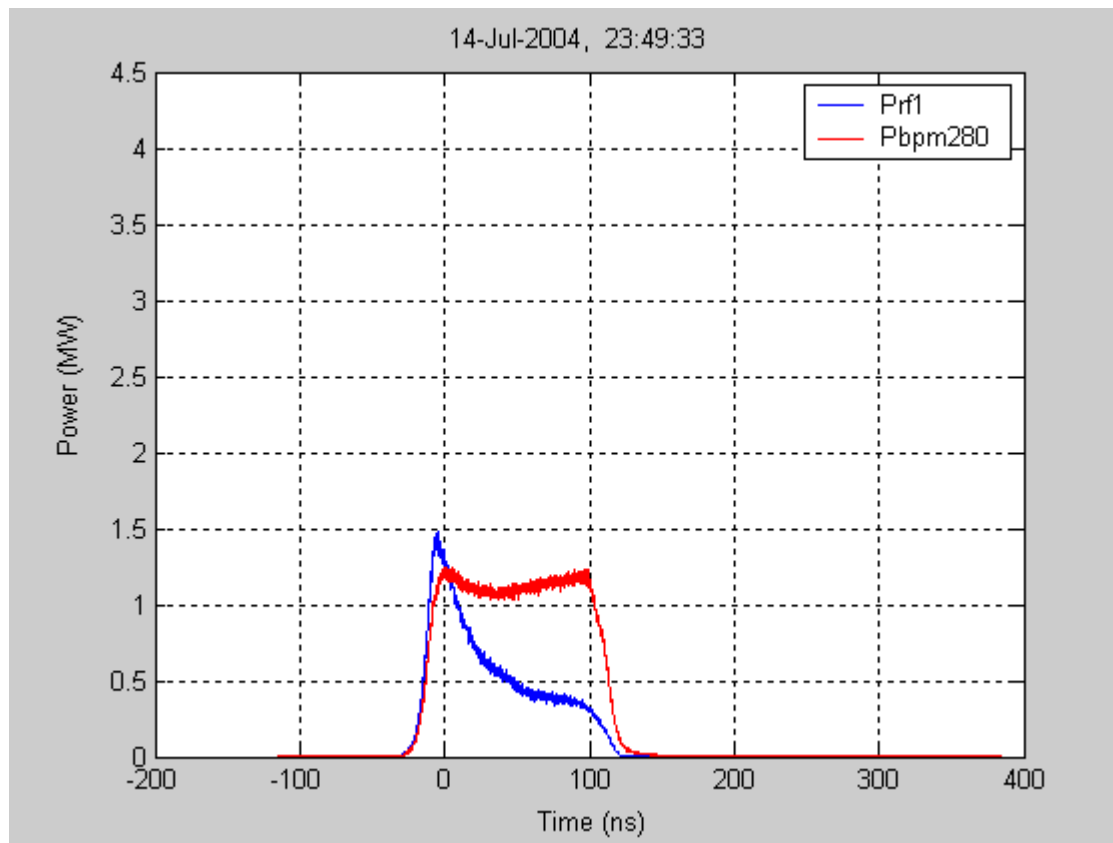
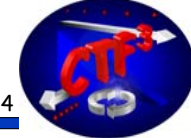
R. Corsini, 27 Aug 2004

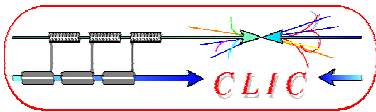




# 30 GHz RF - PETS "CONDITIONING"

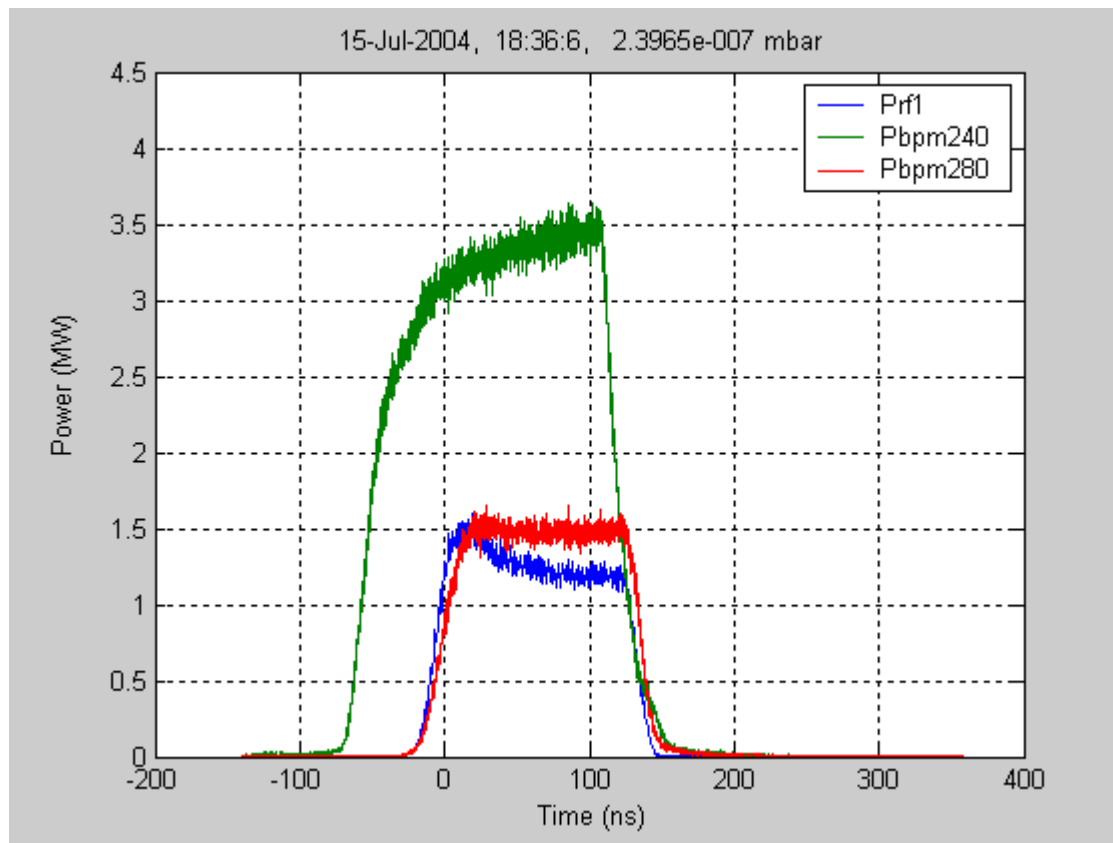
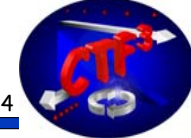
R. Corsini, 27 Aug 2004

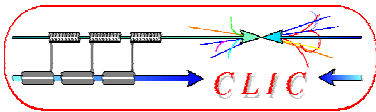




# 30 GHz RF - PETS "CONDITIONING"

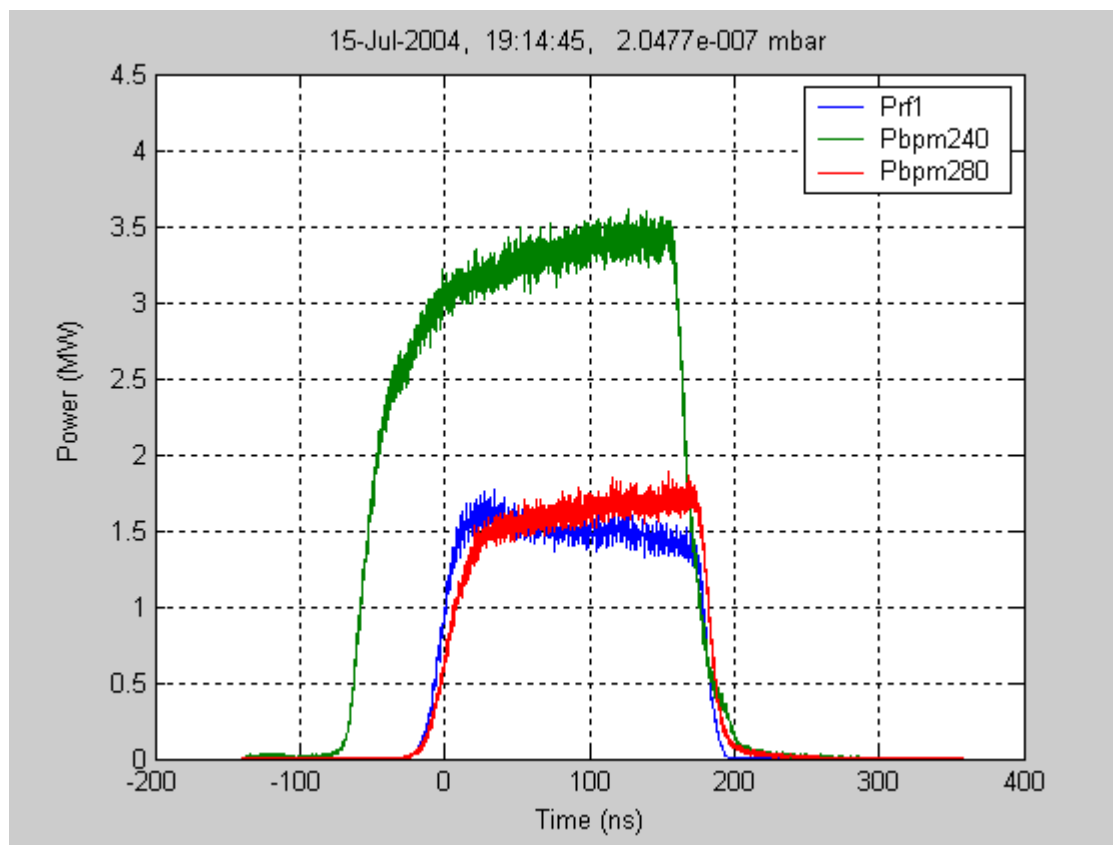
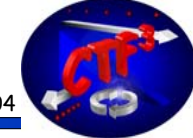
R. Corsini, 27 Aug 2004

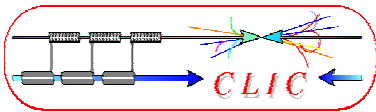




# 30 GHz RF - PETS "CONDITIONING"

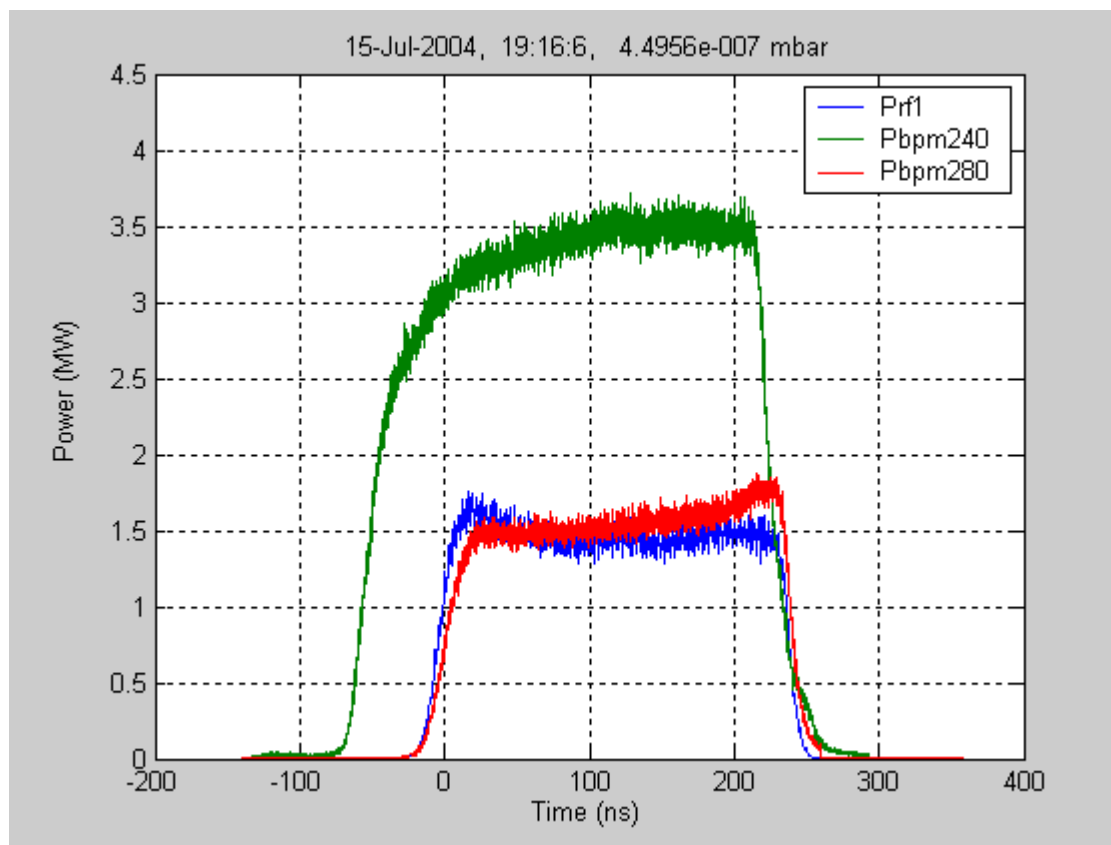
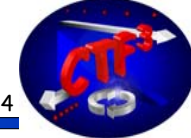
R. Corsini, 27 Aug 2004

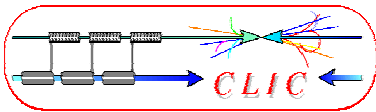




# 30 GHz RF - PETS "CONDITIONING"

R. Corsini, 27 Aug 2004



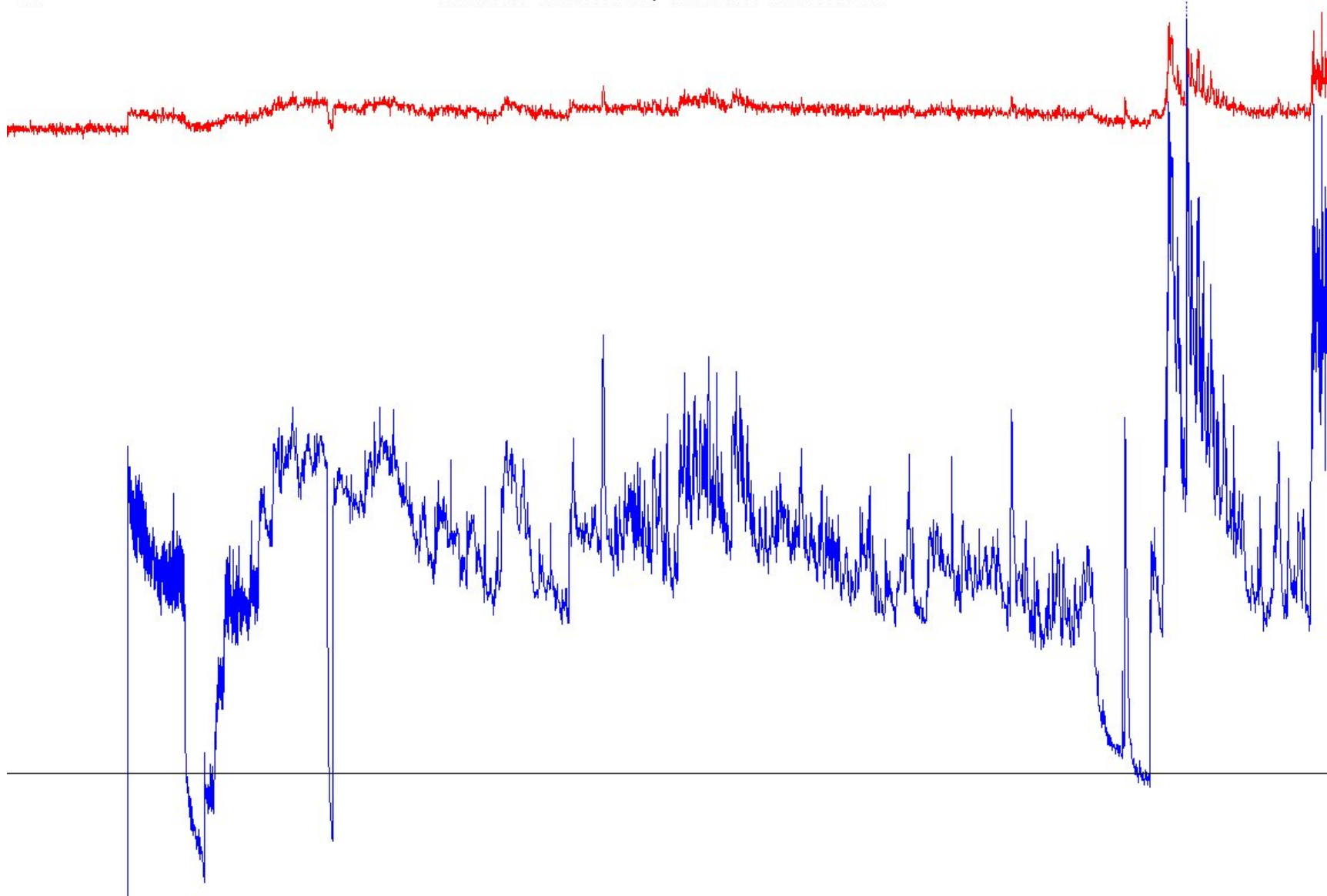


# 30 GHz RF - PETS "CONDITIONING"

R. Corsini, 27 Aug 2004



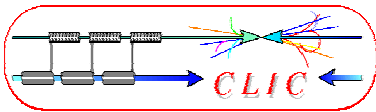
CTF3 DBGUN History Buffer  
-5.5  
CP.VGP0230=2.23e-006 mbar, CP.VGP0260=1.08e-006 mbar



Jul 15 17:16:57

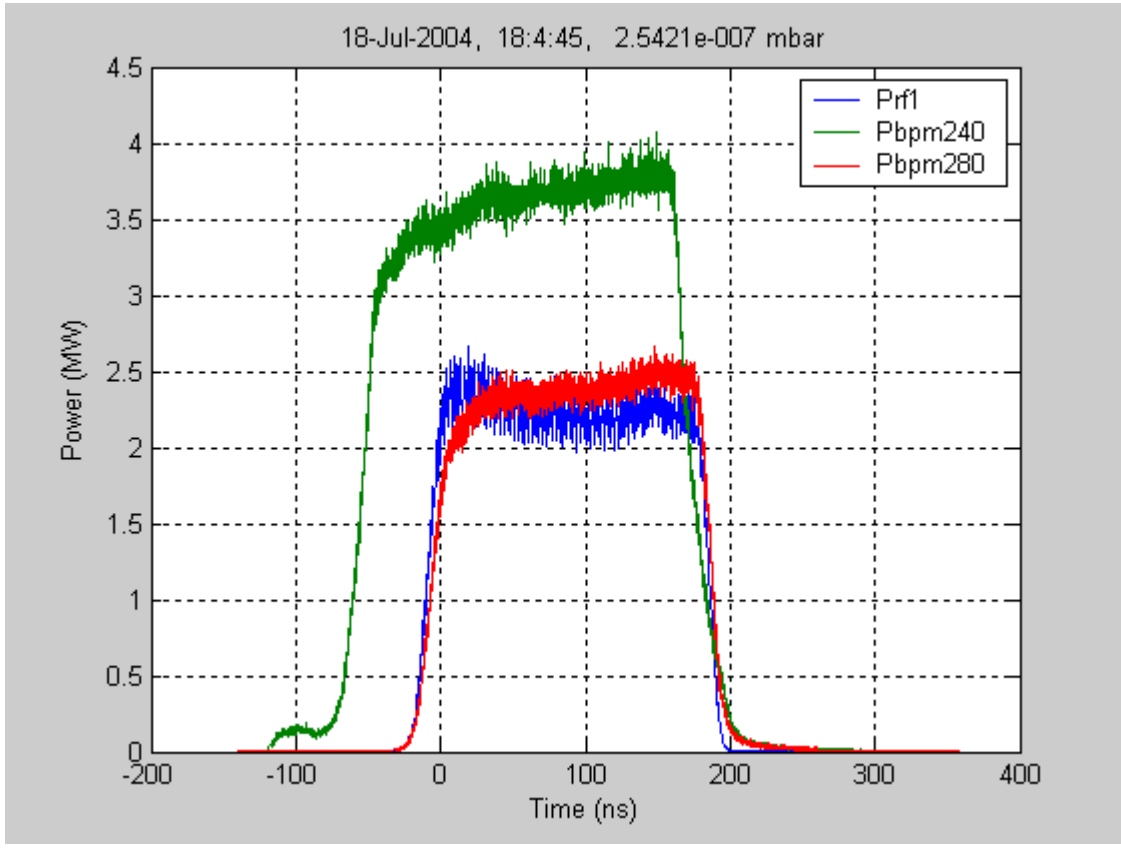
Jul 15 19:17:06

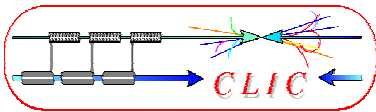




# 30 GHz RF - PETS "CONDITIONING"

R. Corsini, 27 Aug 2004





# 30 GHz RF - PETS "CONDITIONING"

R. Corsini, 27 Aug 2004

