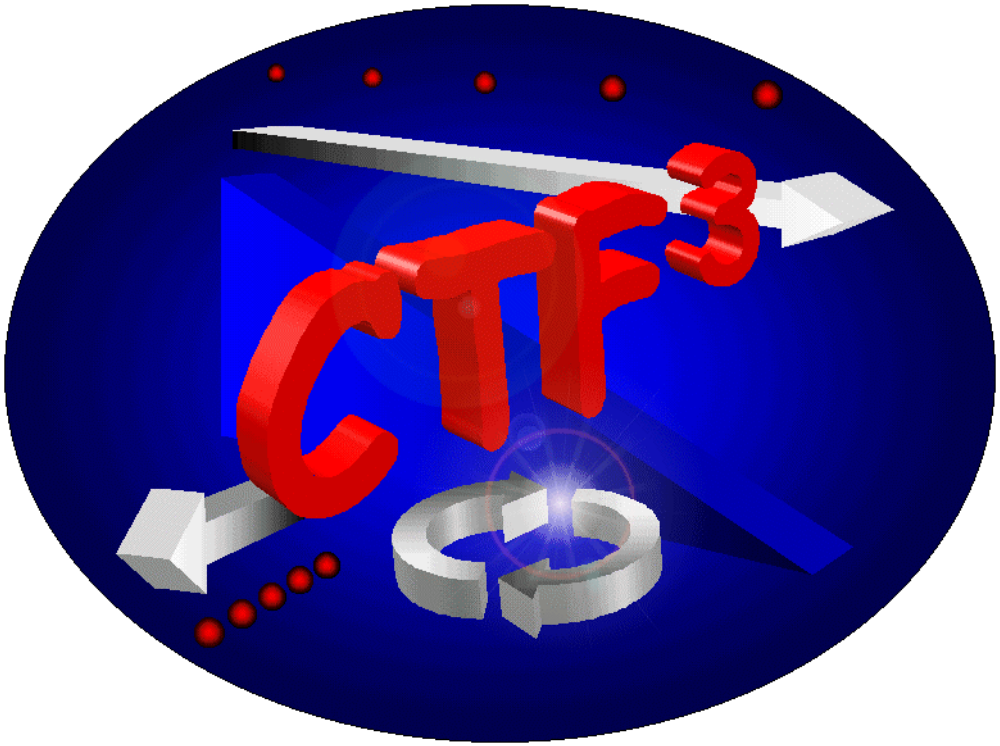
JOINT CLIC/CTF3 MEETING

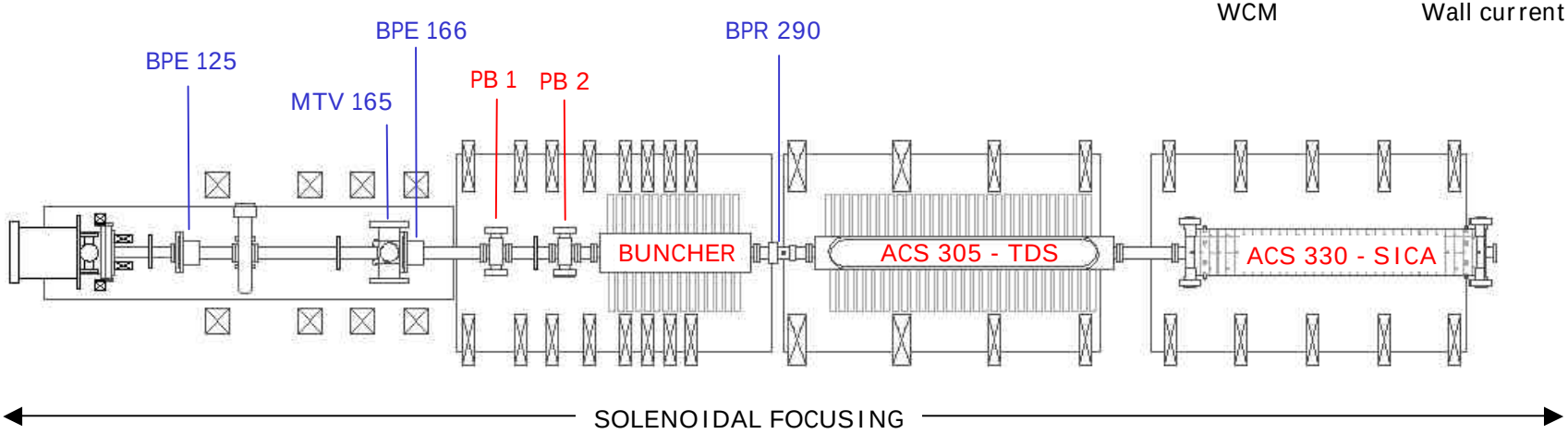


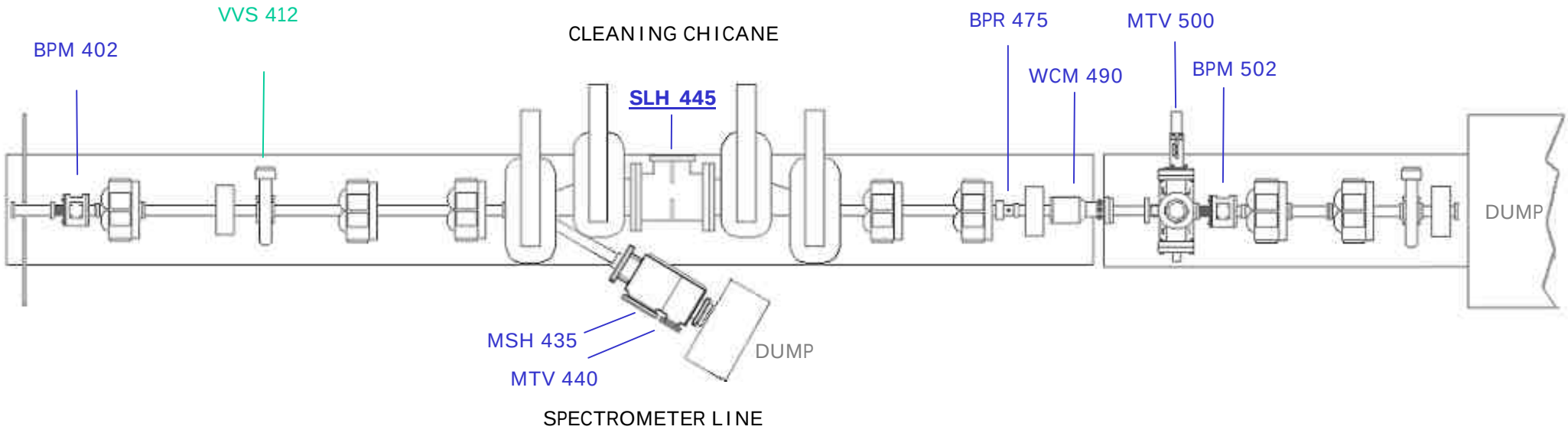
2003 Commissioning – Results of 2nd run

R. Corsini

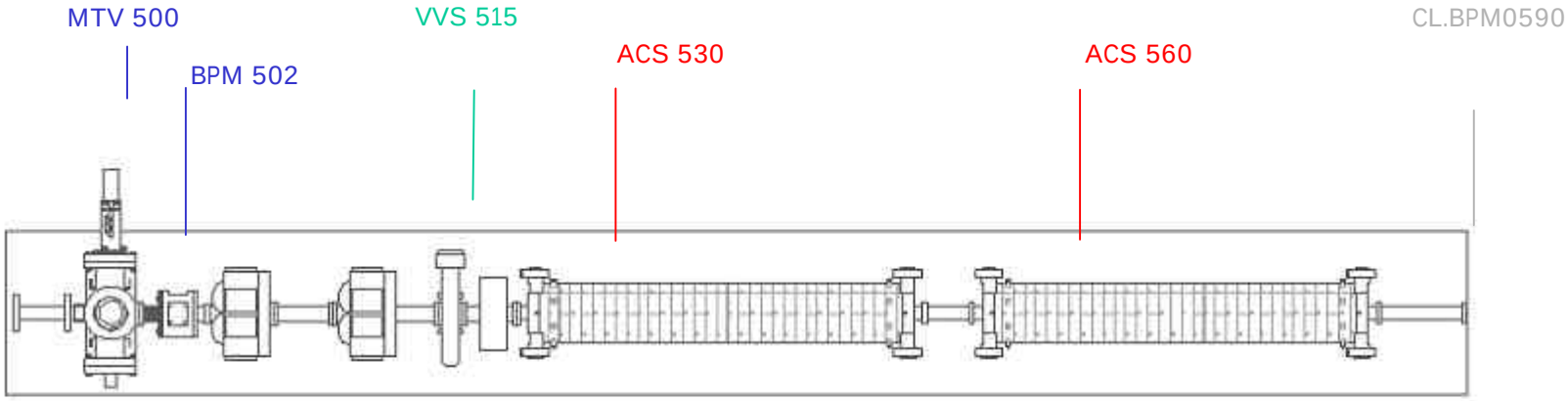
CTF3 layout (July-August 2003)

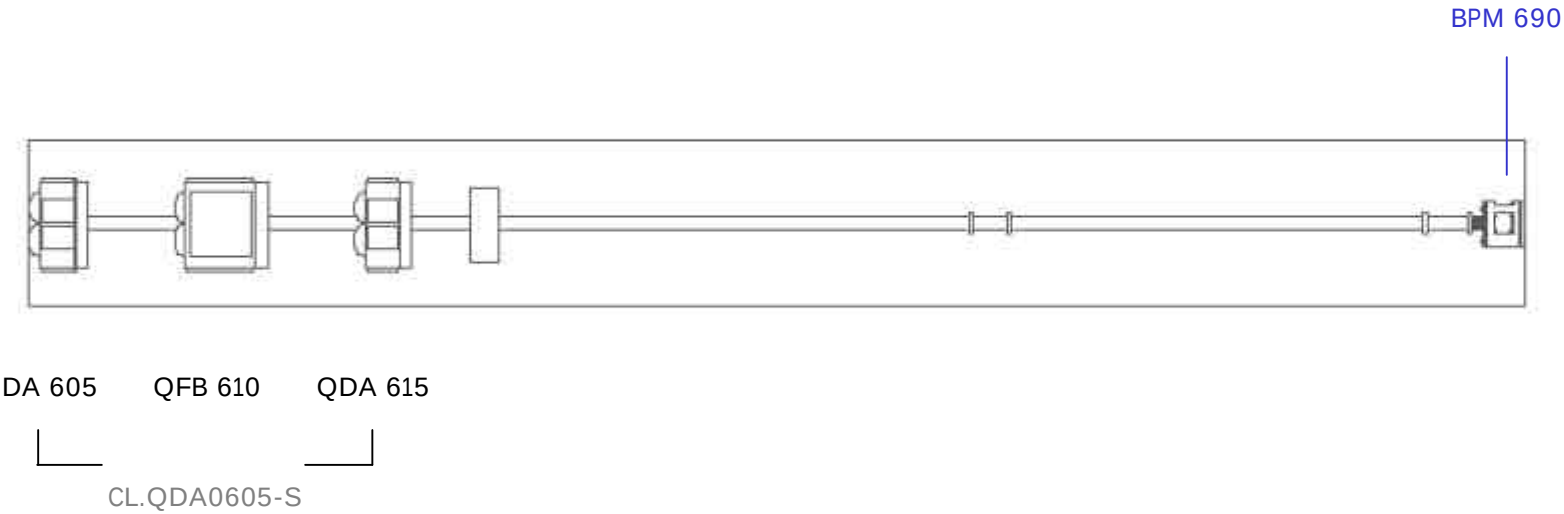
BPE, BPR, BPM	Beam position monitors
MTV	Screens
MSH	SEM-Grid
WCM	Wall current monitor



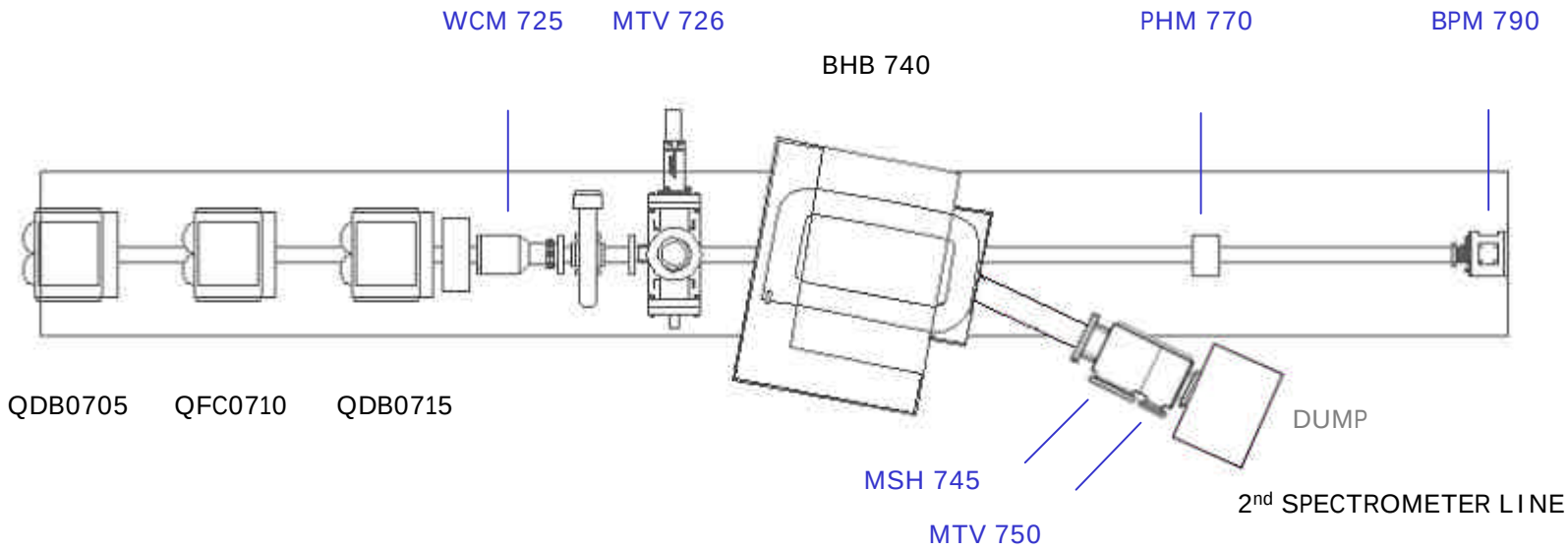


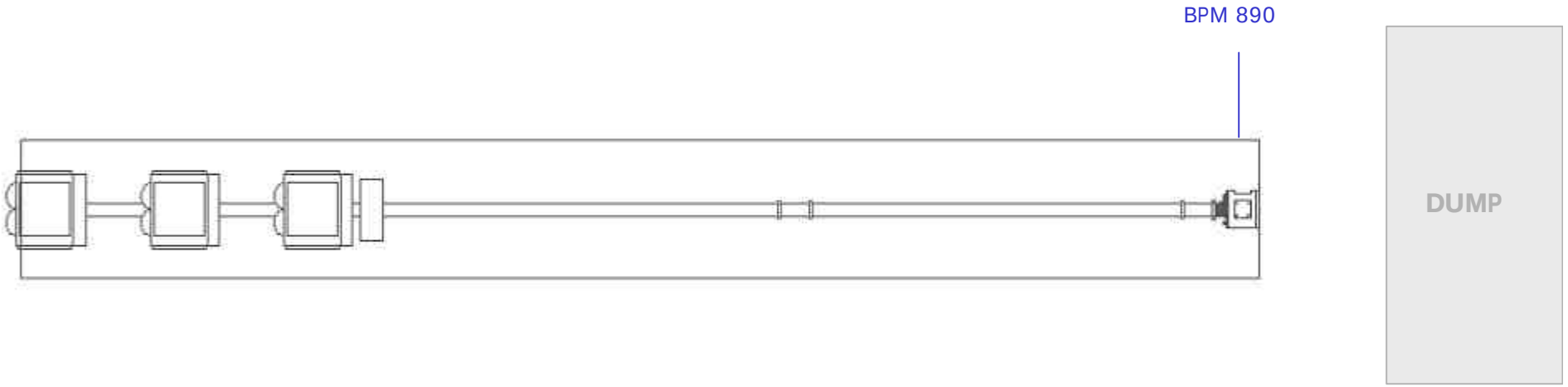
CTF3 layout


MTV 500
BPM 502
VVS 515
ACS 530
ACS 560
CL.BPM0590

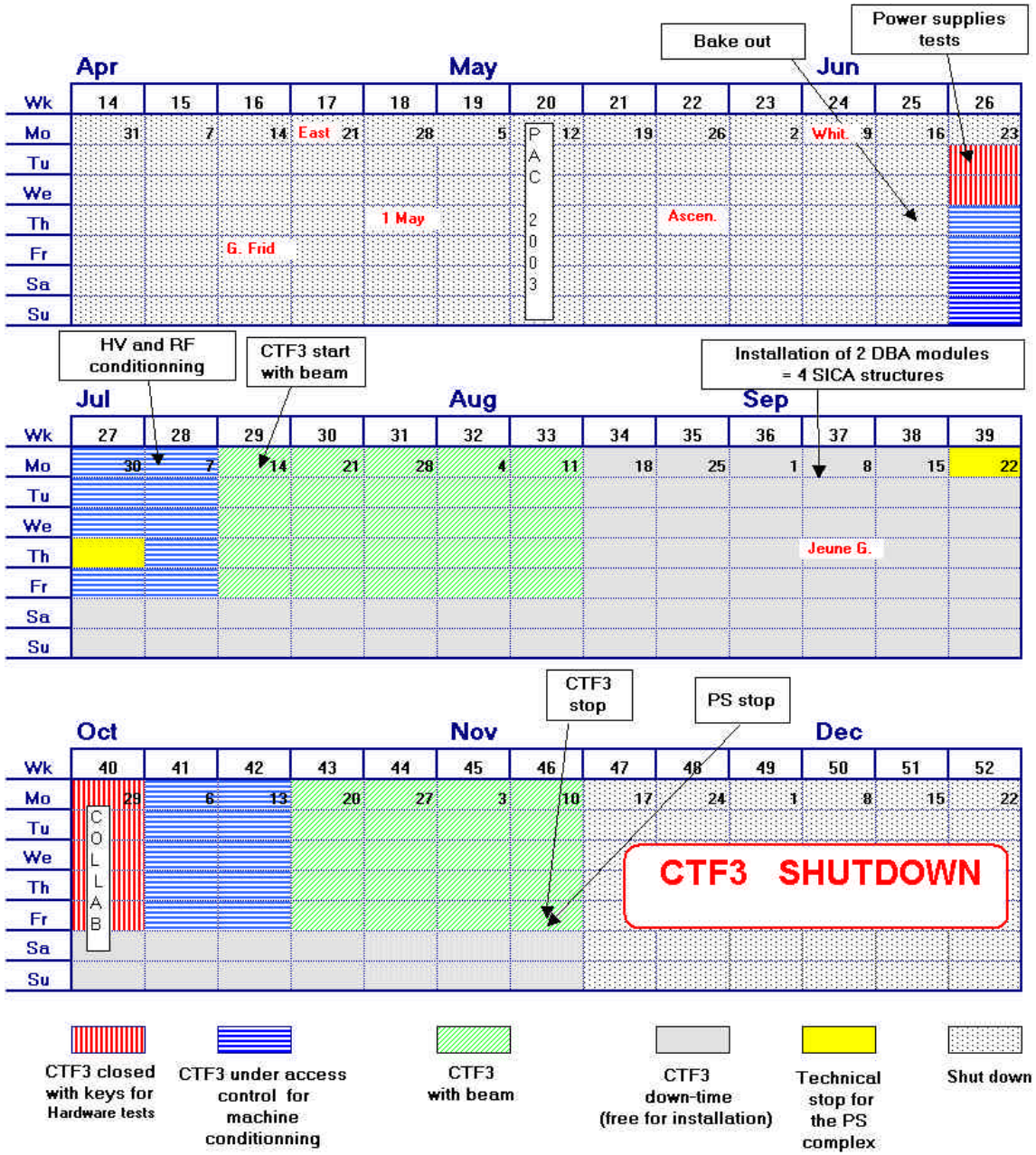

BPM 690
QDA 605
QFB 610
QDA 615
CL.QDA0605-S

CTF3 layout


WCM 725
MTV 726
PHM 770
BPM 790
BHB 740
QDB0705
QFC0710
QDB0715
DUMP
MSH 745
2nd SPECTROMETER LINE
MTV 750

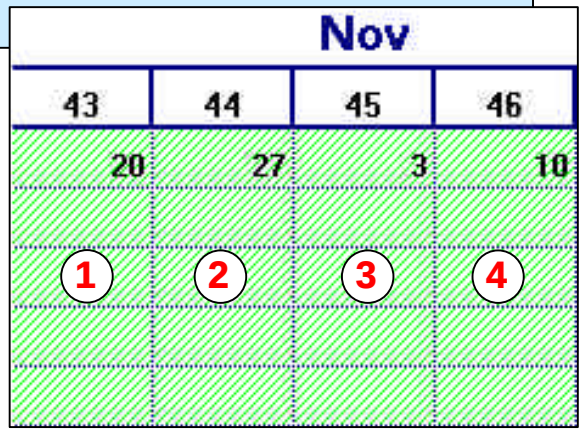

BPM 890
DUMP

CTF3 commissioning schedule



CTF3 commissioning program (2nd run)

- Test operation without PB1, beam cleaning chicane, study SEM-grid problems
- Optimization and complete characterization of the nominal beam
- Test bunch compression with cleaning chicane
- Obtain “power mode” beam parameters (5 A, 200 ns)



- Diagnostics, slits & new ACSs commissioning, PB1 studies (R. Roux), beam to dump
- Nominal beam studies (transport, emittance, bunch length), gun studies 2 (M. Bernard), SEM-grid, test bunch compression
- Power mode beam studies
- Reserve

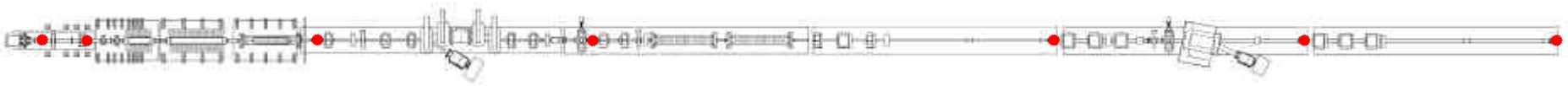
Beam performances

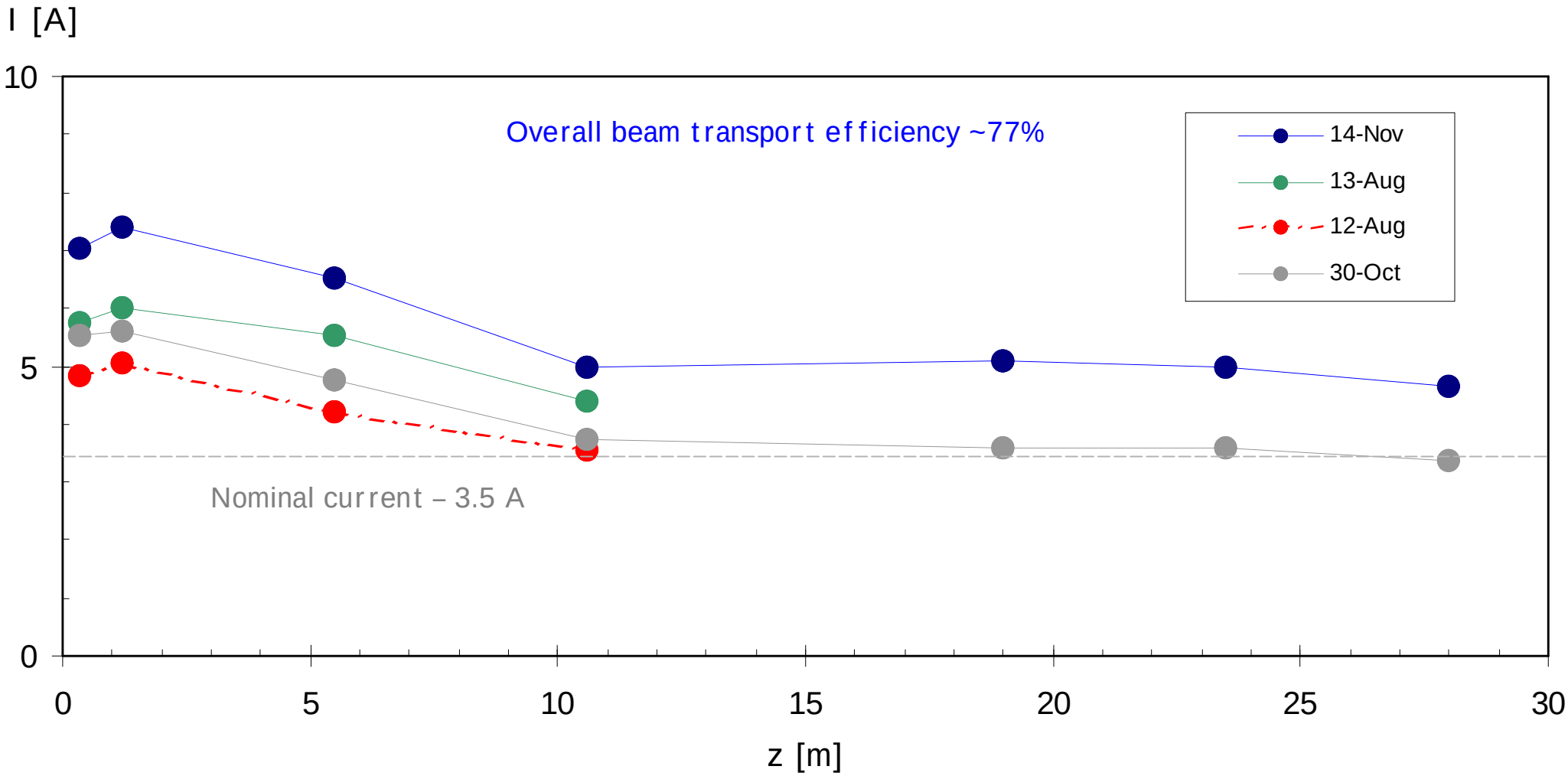
Main beam parameters

	Nominal	Achieved
I	3.5 A	5 A
τ_p	1.5 μs	1.5 μs
E	35 MeV	35 MeV
$\varepsilon_{n,rms}$	100 π mm mrad	100 (240) π mm mrad *
$\tau_{bunch,rms}$	5 ps	$\lesssim$ 4 ps *

* for 3.5 A, 1.5 μs beam

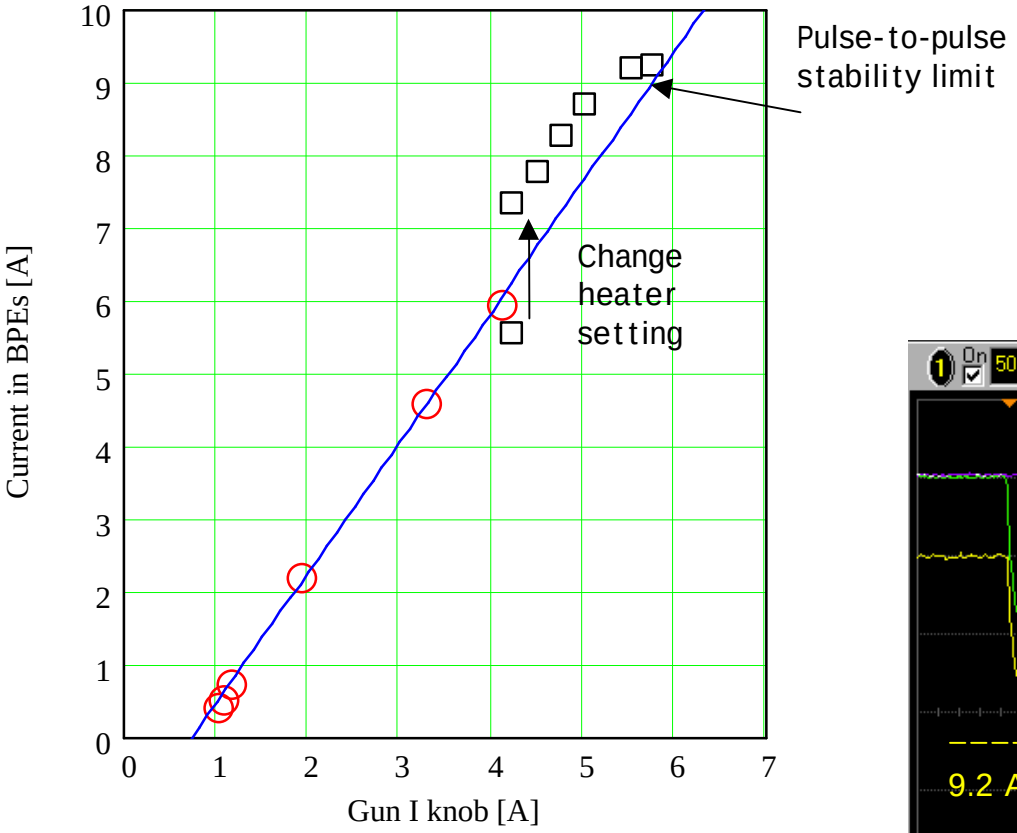
Beam transport





Gun current tests

Gun current

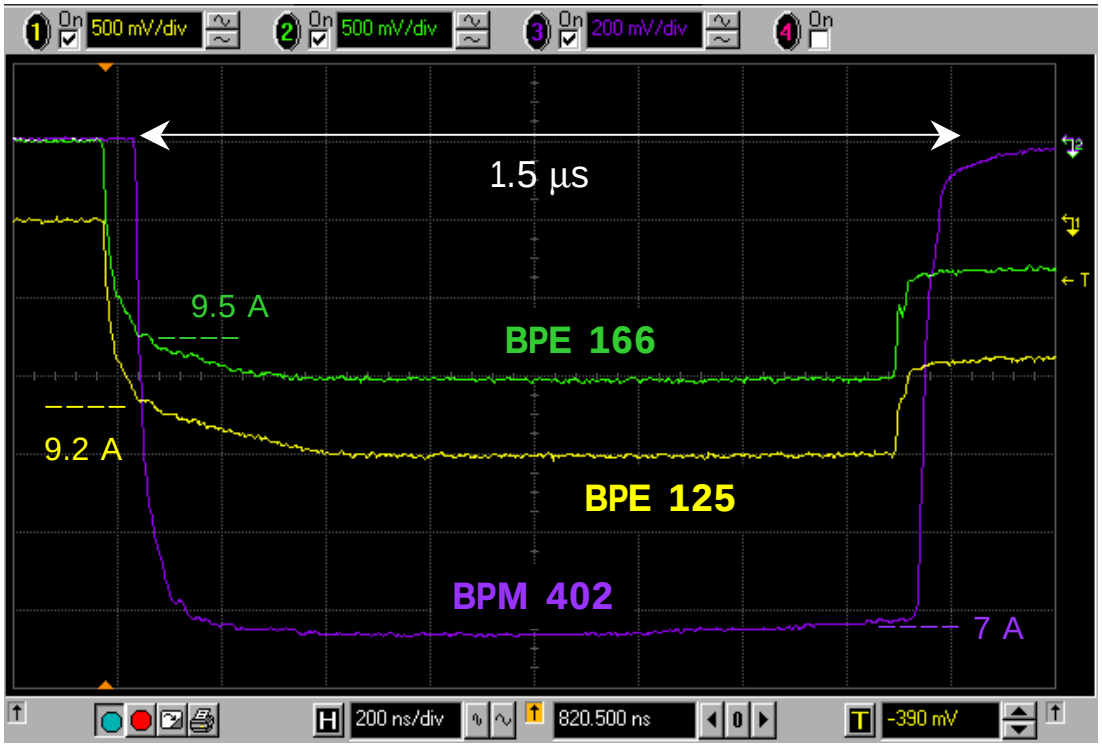


○ Data (BPE 125) – 1st run

□ Data (BPE 125) – 2nd run

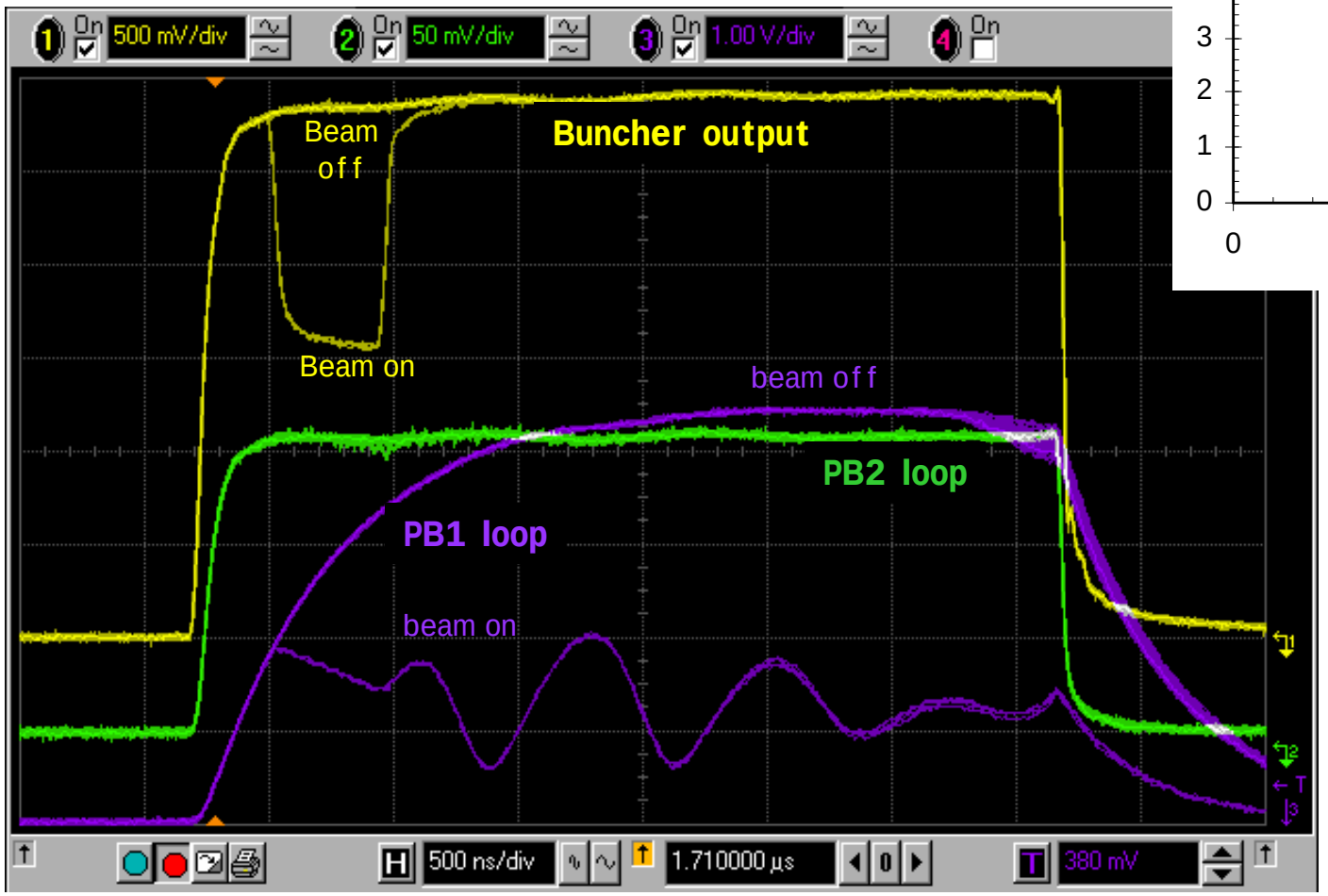
—— 1.796 * I_knob – 1.33

Beam signals in BPE 125, BPE 166 and BPM 402

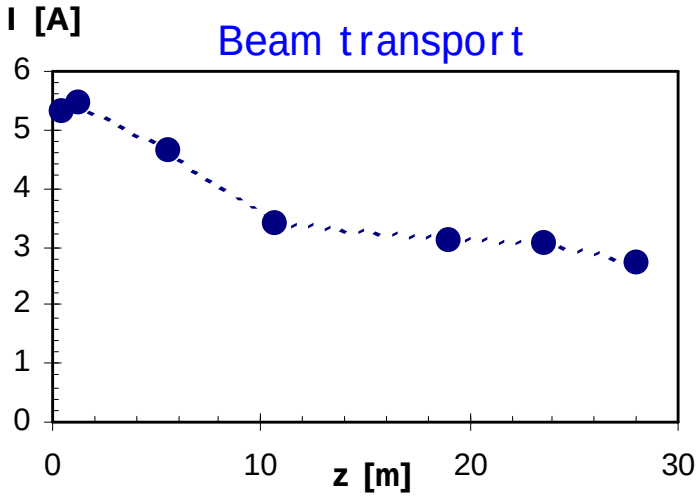


Operational limit with PB1

RF signals



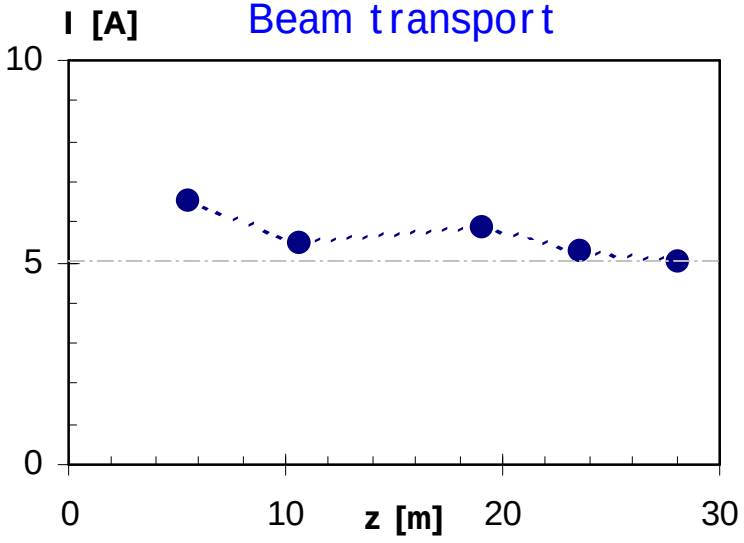
Beam transport



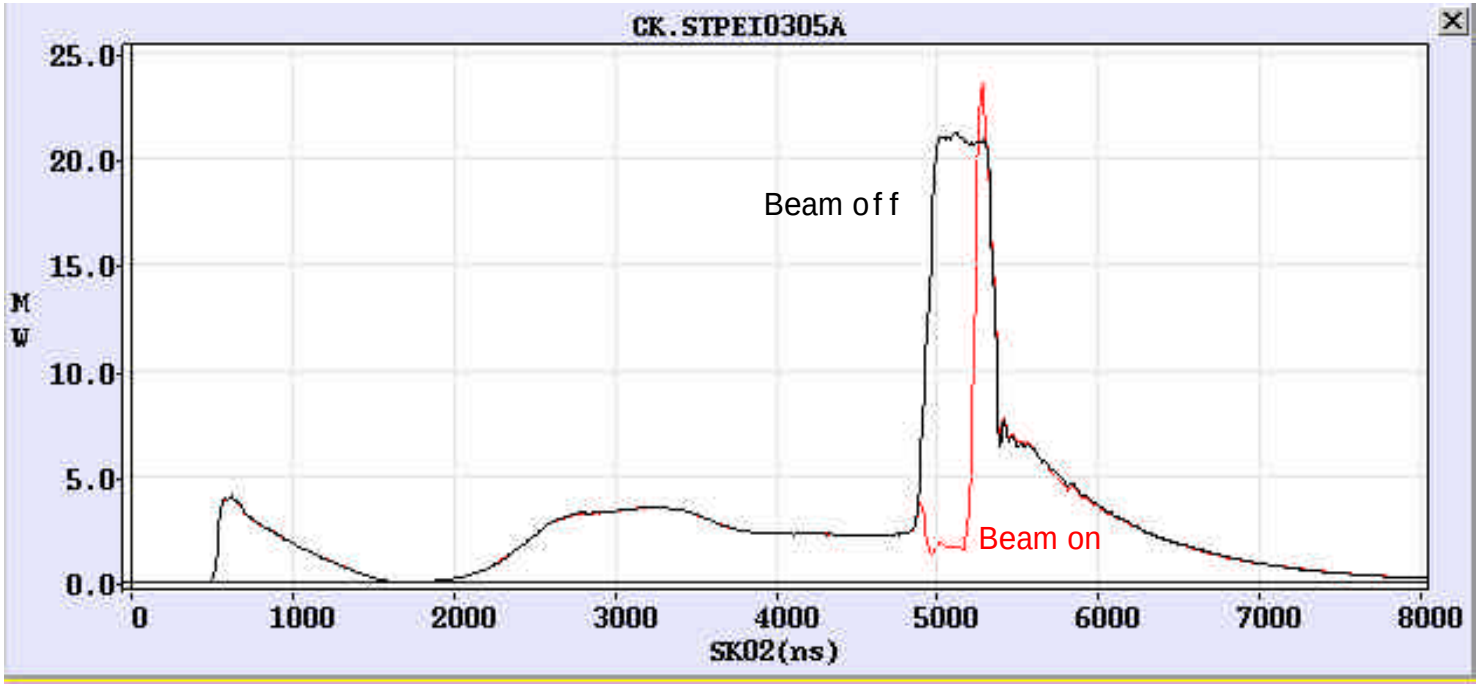
Power mode test

P_{MKS03}	=	100	MW
P_{MKS05}	=	96	MW
T_{PULSE}	=	300	ns
E_{BEAM} (BHA 425)	=	19.5	MeV/c
E_{BEAM} (BHB 740)	=	32.9	MeV/c
I_{BEAM}	=	5	A

Beam transport

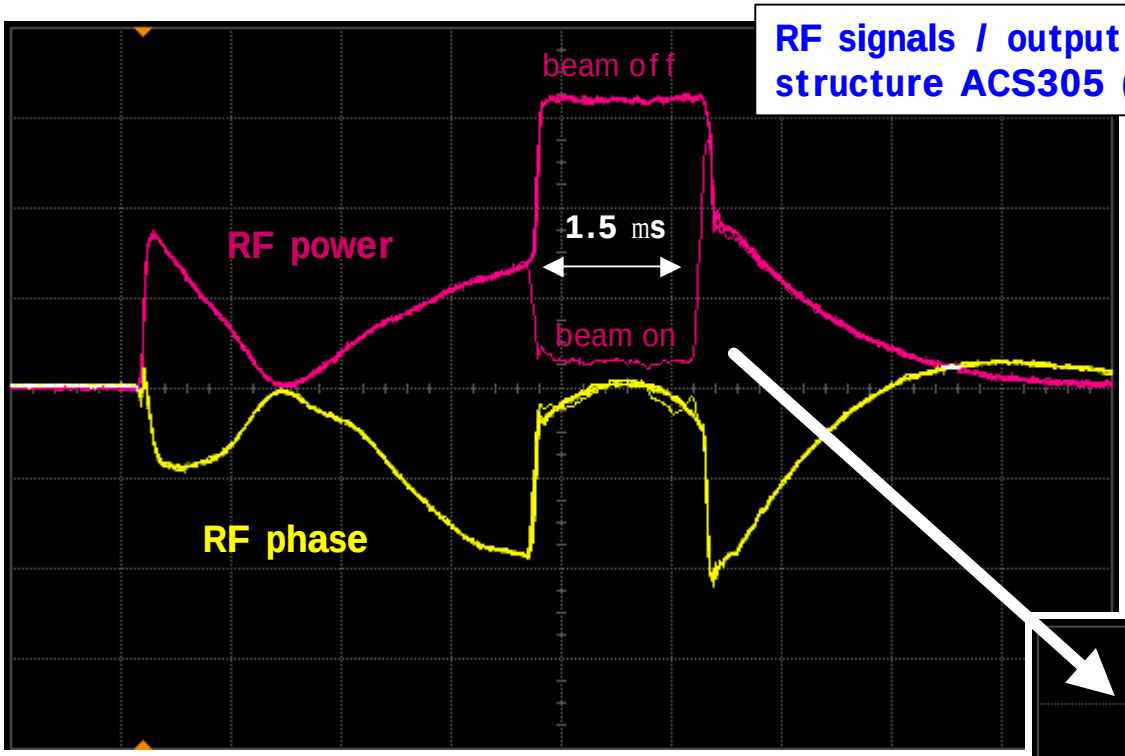


RF signals – output from ACS305 (TDS)

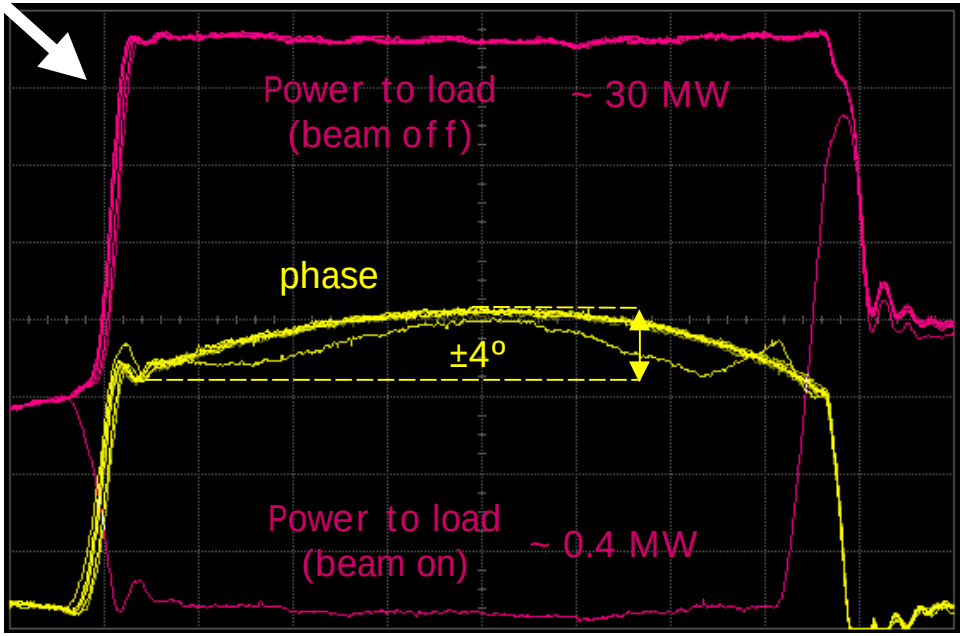


RF pulse compression optimization

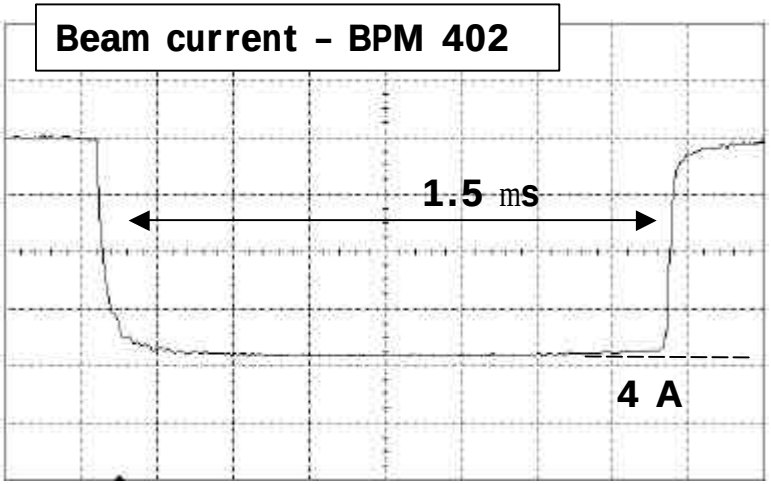
RF signals / output coupler of structure ACS305 (TDS)



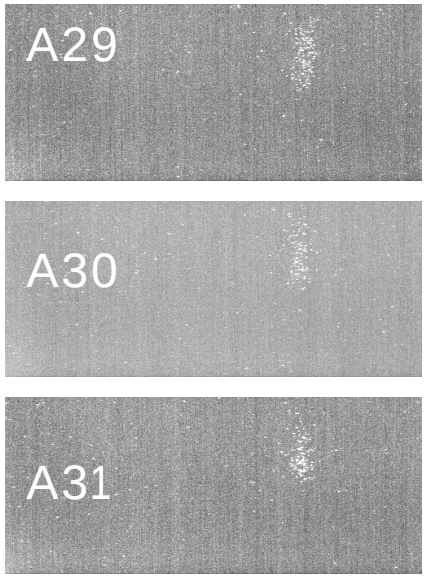
Beam current	4 A
Beam pulse lenght	1.5 µs
Power input/structure	35 MW
Ohmic losses (beam on)	1.6 MW
RF power to load (beam on)	0.4 MW
RF-to-beam efficiency	~ 94%
Phase variation along pulse	±4°



Beam current – BPM 402

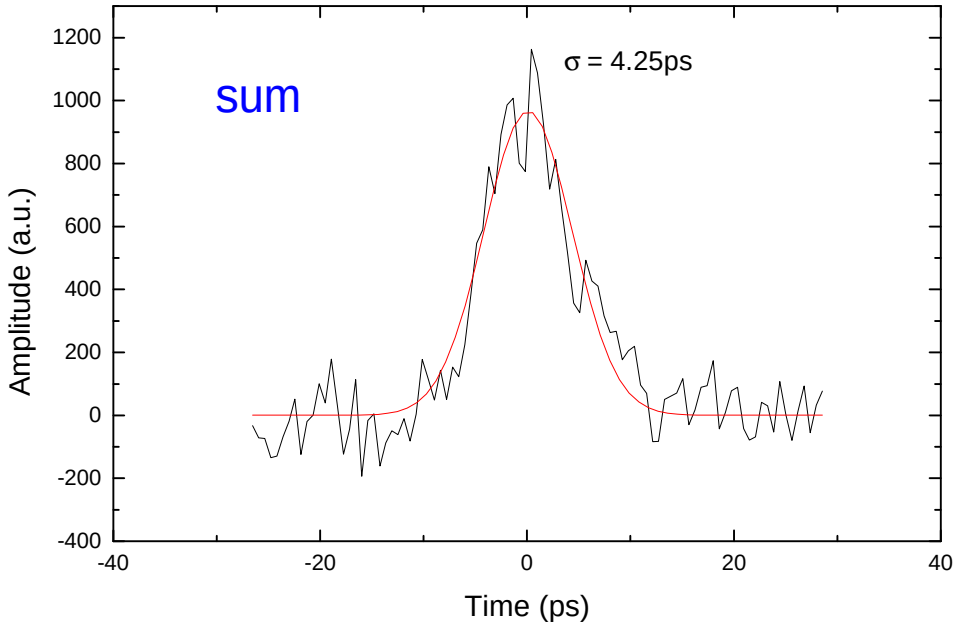


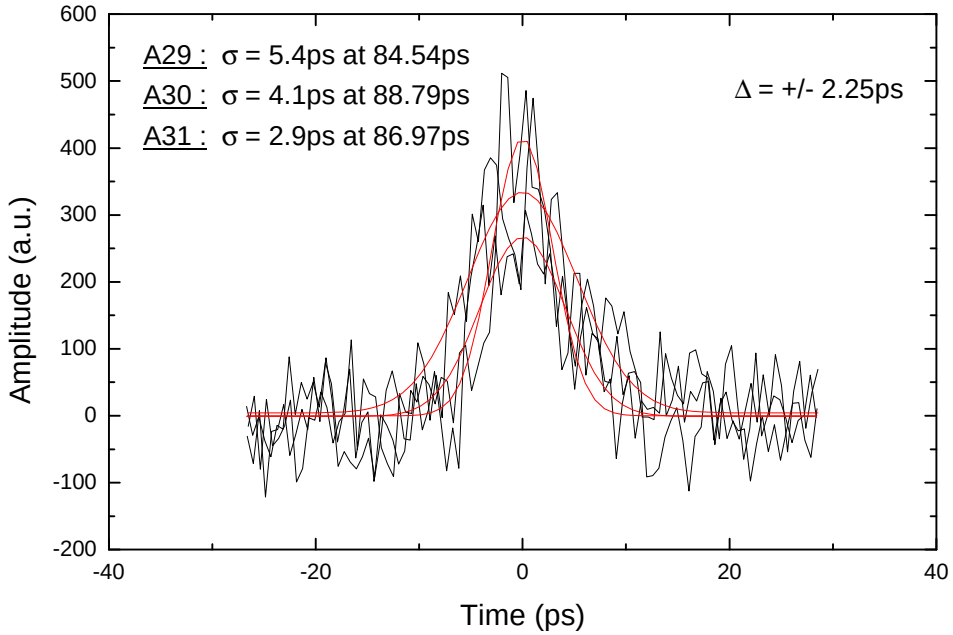
Bunch length measurement – streak camera



T. Lefevre

single shots



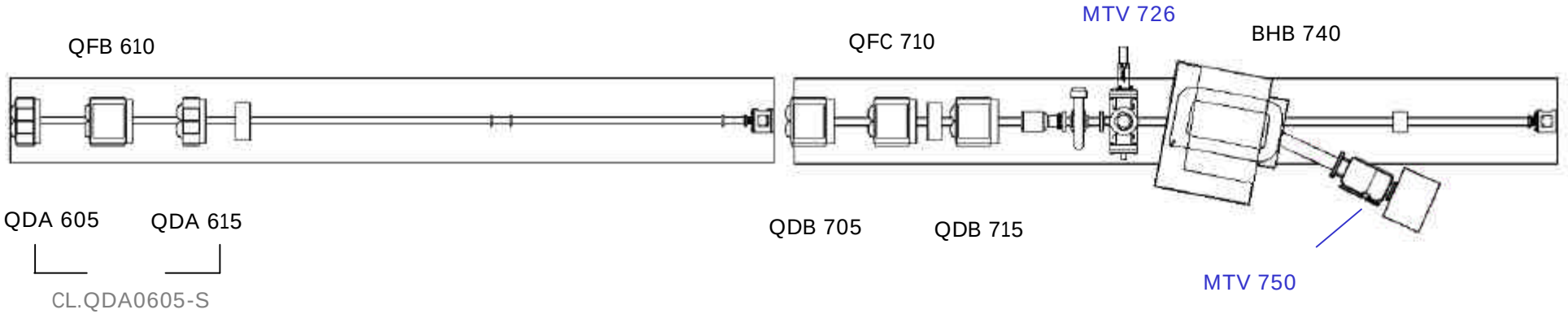


σ_{aver} = 4.1 [3.3] ps

σ_{sum} = 4.25 [3.6] ps

corrected for slit contribution

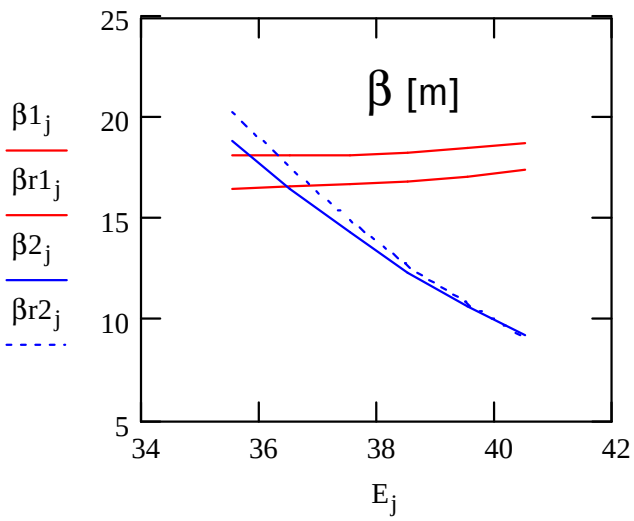
Emittance & Twiss parameters measurements

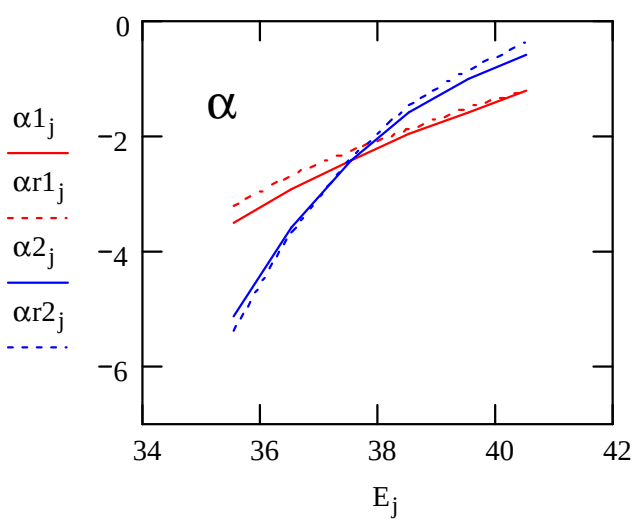


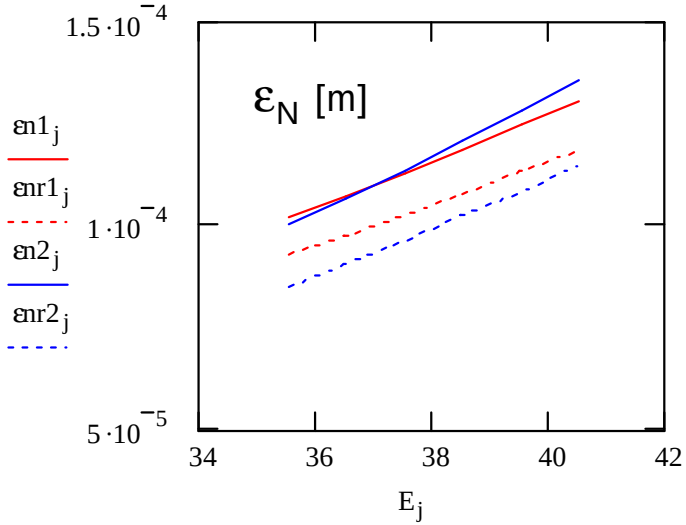
- Several quad scans made in different conditions, both in MTV 500 and MTV 726
- Only measurements in MTV 726 done on November 14th analyzed here
- Four scans (two for each plane) were done, with different quad settings in QDB 710, QFC 710, and QDB 715 – only one quad current varied for each scan
- For the "waist" of each scan, the current of both triplets in girders 6 and 7 was varied in a range of ± 10 %, and the beam size (both planes) was recorded (Chrom scans)
- Beam energy measured in BHB 740 / MTV 750 ⇒ 38.2 MeV/c
- The currents in QDA 605/615 and QDA 610 were accidentally changed during the scans – had to use a reference plane at the entrance of QDA 605

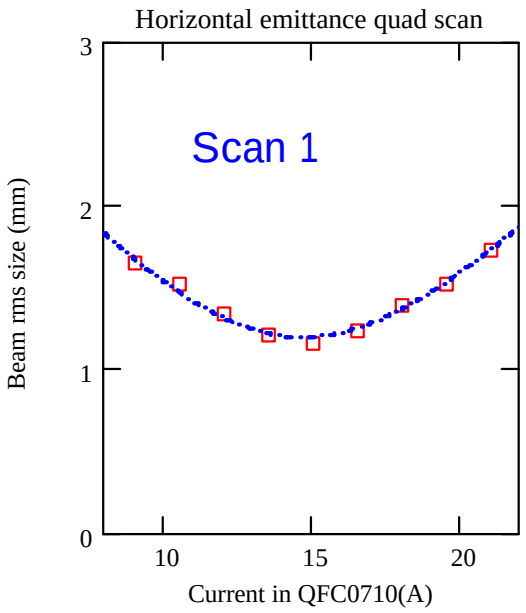
Quad scans - horizontal

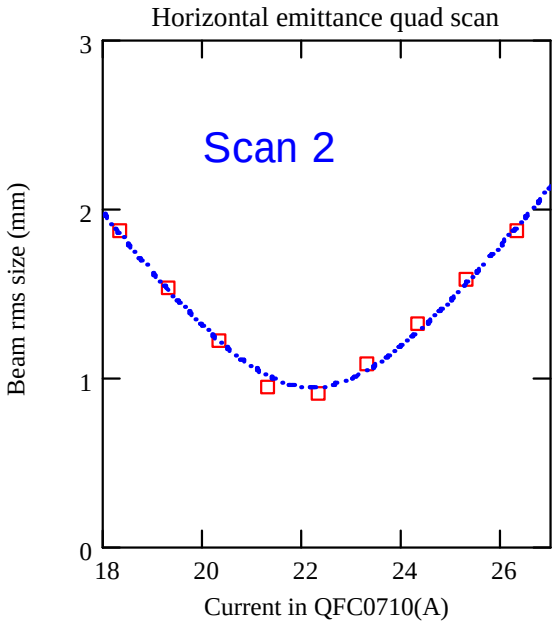
Horizontal scans - energy dependence







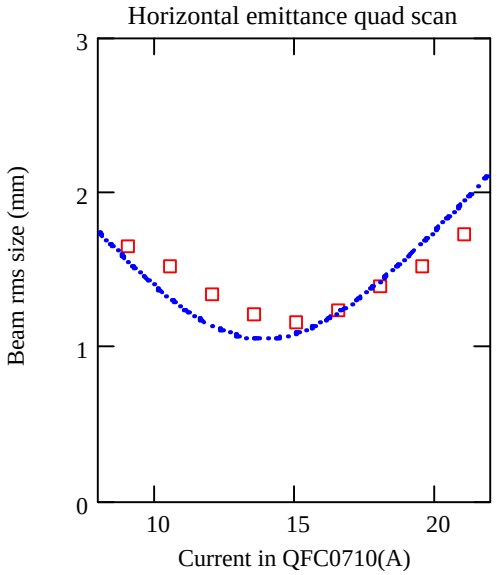




Horizontal scans – results at 37.5 MeV/c

Scan 1	Scan 2
$\beta = 18.17$	$\beta = 14.29$
$\alpha = -2.42$	$\alpha = -2.45$
$\varepsilon\cdot\gamma = 1.11\times 10^{-4}$	$\varepsilon\cdot\gamma = 1.12\times 10^{-4}$

Quad scans - horizontal

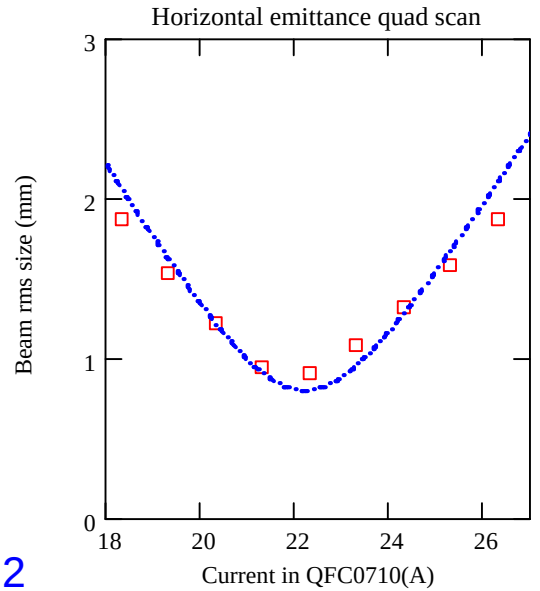


Horizontal scans – "average"

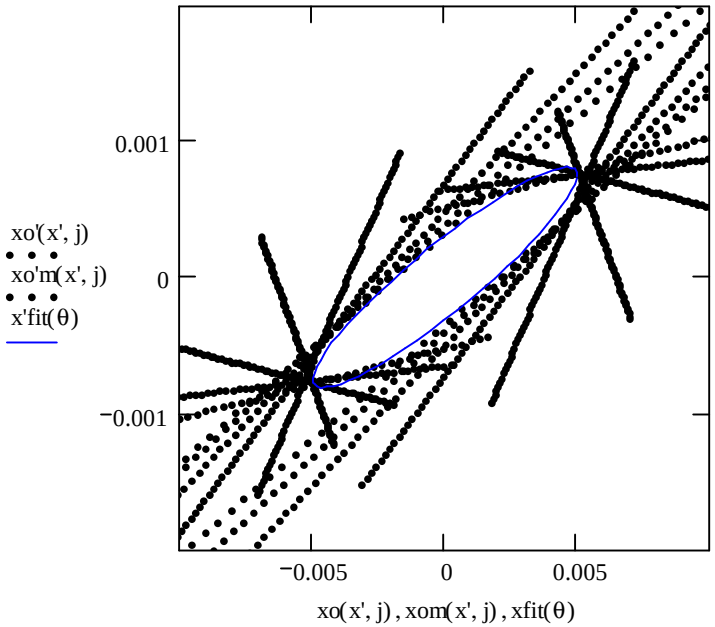
$\beta = 16.23$

$\alpha = -2.44$

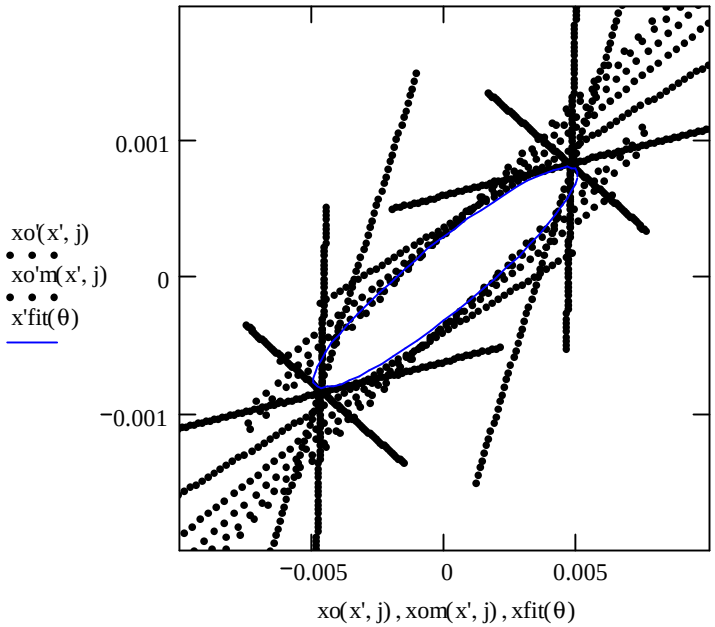
$\varepsilon \cdot \gamma = 1.12 \times 10^{-4}$



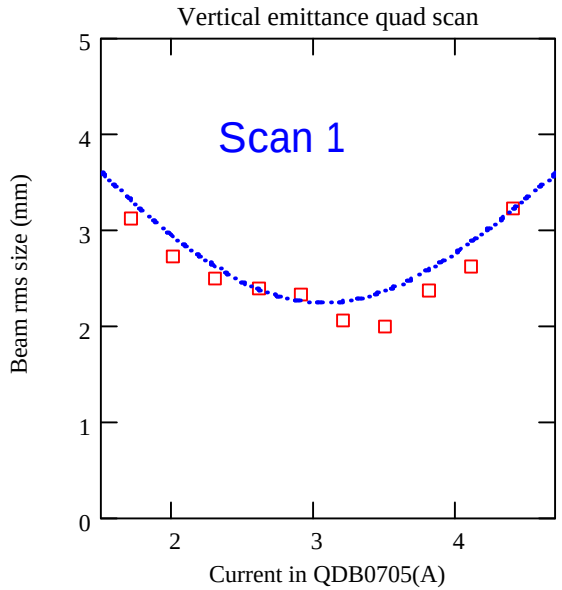
Scan 1



Scan 2



Quad scans - vertical

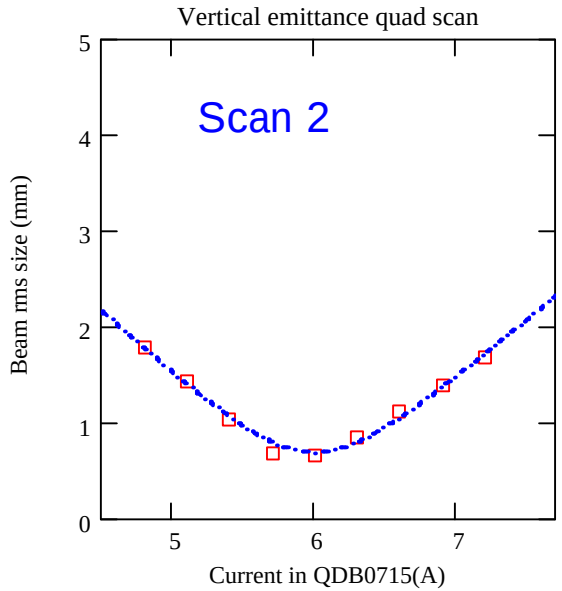


$\beta = 7.21$

$\alpha = -1.21$

$\varepsilon \cdot \gamma = 1.02 \times 10^{-4}$

37.5 MeV/c



$\beta = 18.03$

$\alpha = -4.62$

$\varepsilon \cdot \gamma = 2.44 \times 10^{-4}$

37.5 MeV/c

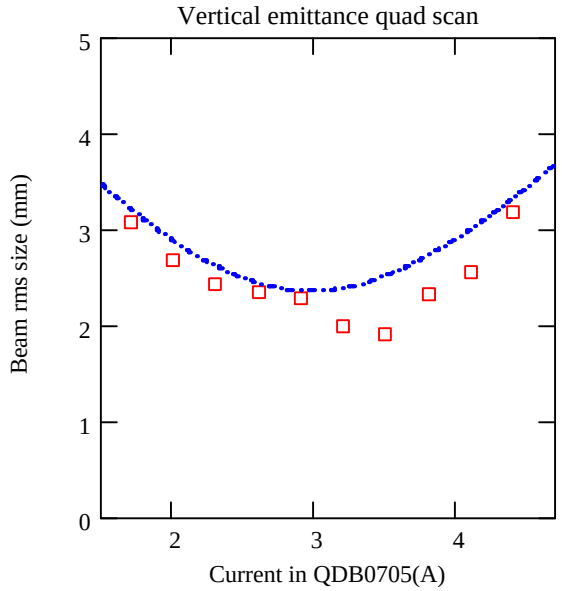
The vertical scans are not consistent !

But:

- Scan 1 is consistent with all but 1 “Chrom” scan
- Scan 2 and the anomalous “Chrom” scan have both much smaller beam sizes than the others
- The picture is more consistent if one assumes about 0.5 mm resolution of the screen (“out of focus” effect ?)

… need more analysis

Quad scans - vertical

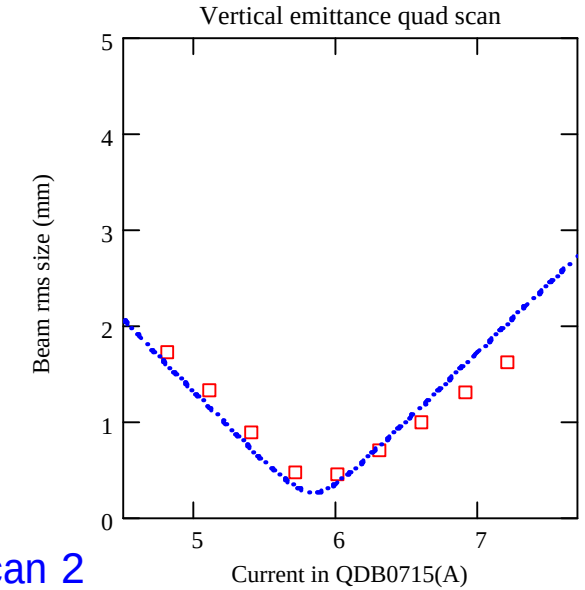


Vertical scans – "average"

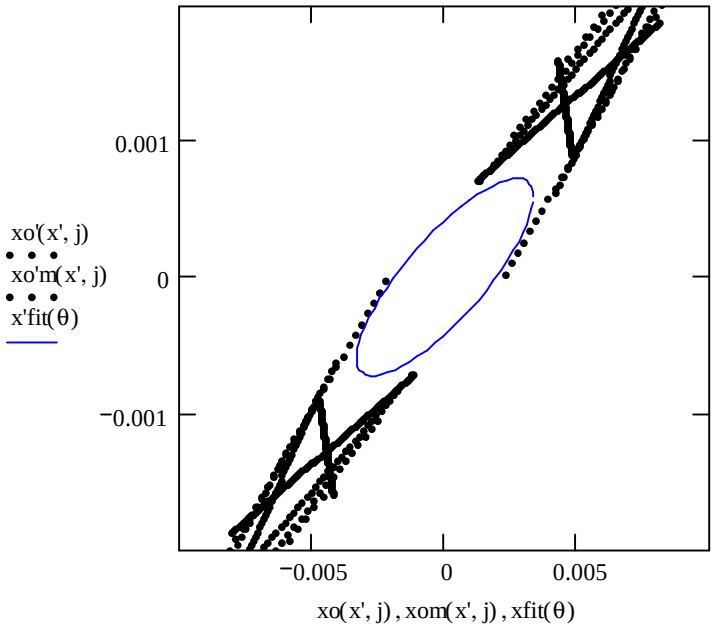
$\beta = 7.93$

$\alpha = -1.41$

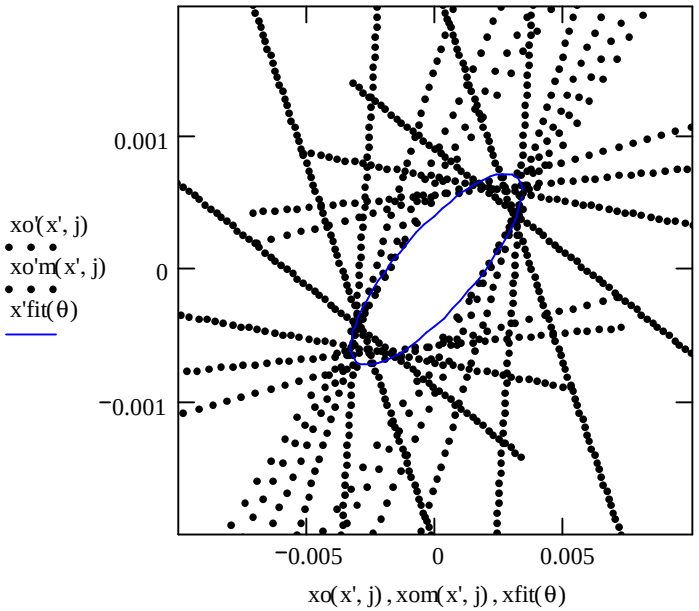
$\varepsilon \cdot \gamma = 1.03 \times 10^{-4}$



Scan 1



Scan 2



The CTF3 little shop of horrors n. 2

J. Hansen

Sign of beam damage in vacuum valve VVS 412