Status of the Australian Synchrotron Project

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acility Overview

ccelerator Systems

nitial Beamlines

ccelerator Commissioning

torage Ring Performance

onclusions

The Australian Synchrotron is a synchrotron light facility based on a 3-Ge
electron storage ring.

Located in metropolitan Melbourne.

Built by a project team from Major Projects Victoria (MPV), a part of the Victorian State Government.

The funding for the building and accelerators has been provided by the Victorian State Government.

The initial nine beamlines are being funded by a group of interested partie
including universities, research organisations, other state governments, a
New Zealand.

Storage ring commissioning, and beamline installation and commissionin
continue through March 2007, after which the facility will become operatio


Australian Synchrotron

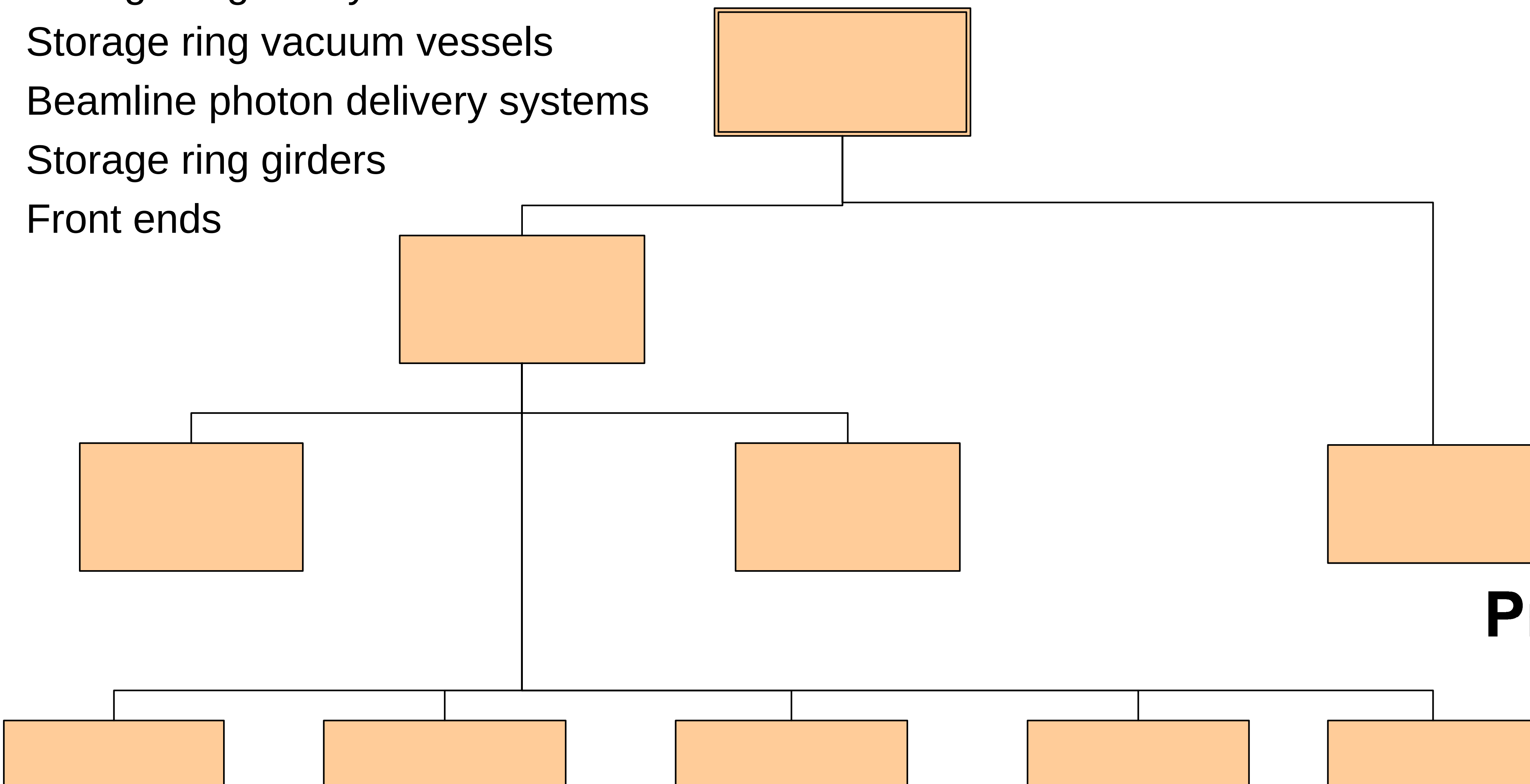
elatively small staff of 54 people.

pecialist contractors and consultants used.

esign and project management responsibility has been placed on suppliers ith turn-key contracts.

ontracts for the following systems included installation and commissioning:

- Injection system
- Storage ring RF system
- Storage ring vacuum vessels
- Beamline photon delivery systems
- Storage ring girders
- Front ends

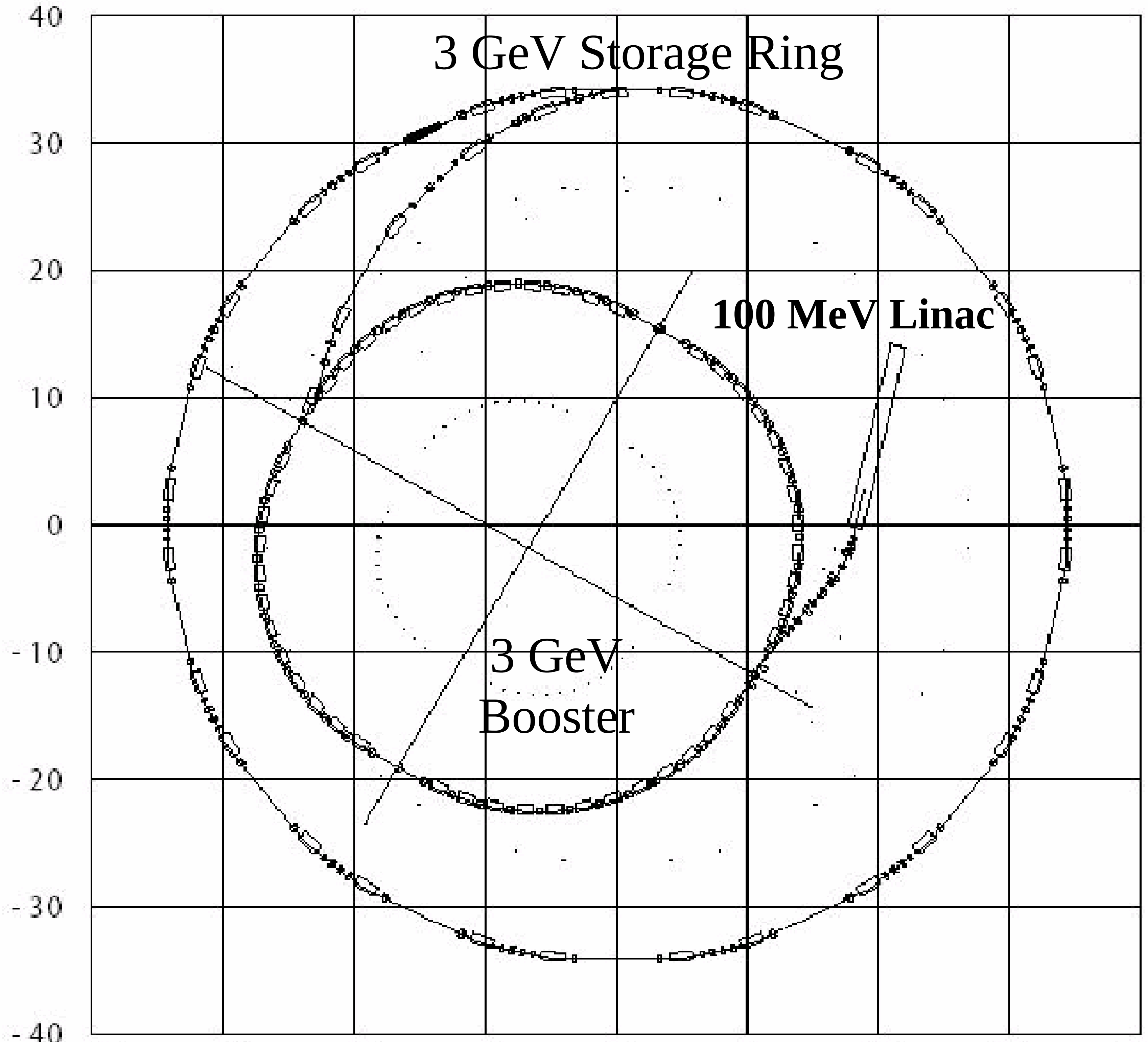


Proj

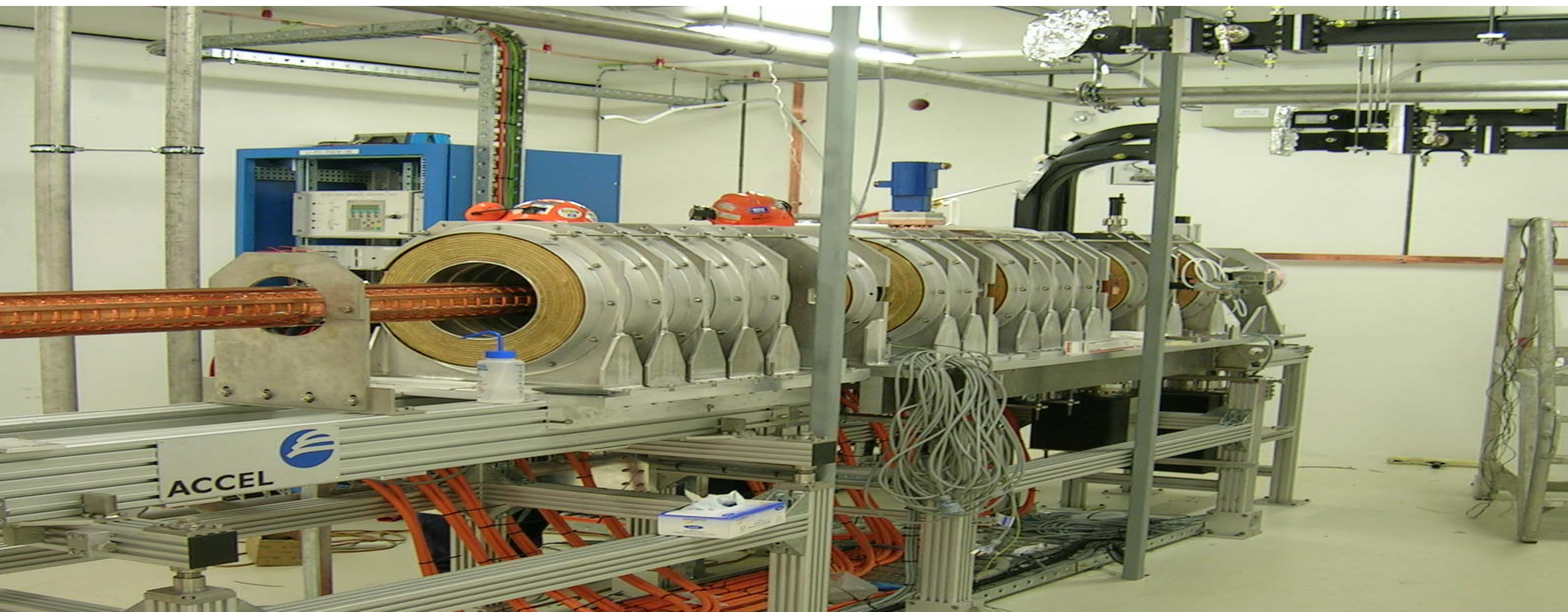

Australian Synchrotro

Schedule Milestones

esign announced	January 2003
ilding contract placed	July 2003
ilding complete	February 2005
aff move into building	March 2005
stallation begins	April 2005
ection system commissioning begins	October 2005
orage ring installation complete	May 2006
orage ring commissioning begins	June 2006
st turns in the storage ring	June 2006
amline installation begins	September 2006
amline commissioning begins	February 2007
ansition to operations	April 2007


3 GeV Storage Ring
100 MeV Linac
3 GeV
Booster
40
30
20
10
0
-10
-20
-30
-40

	Linac
on Source	90 keV thermionic
y	0.1[GeV]
equency	2997.92[MHz]
armonic Pre-buncher	499.654[MHz]
tion rate	1-5[Hz]
lised Emittance	<50π[mm·mrad]
harge (short/long)	>0.31/>3.1[nC]



Booster

Function Lattice

y	0.1 → 3.0[GeV]
nference	130.2[m]
equency	499.654[MHz]
onic Number	217
Bunch Current	>0.5[mA]
bunch Train	>5.0[mA]
on Tune (h/v)	9.2/3.25
l Chrom. (h/v)	-8.8/-11.5
y Spread (3GeV)	0.094[%]
ntal Emittance	33[nm·rad]

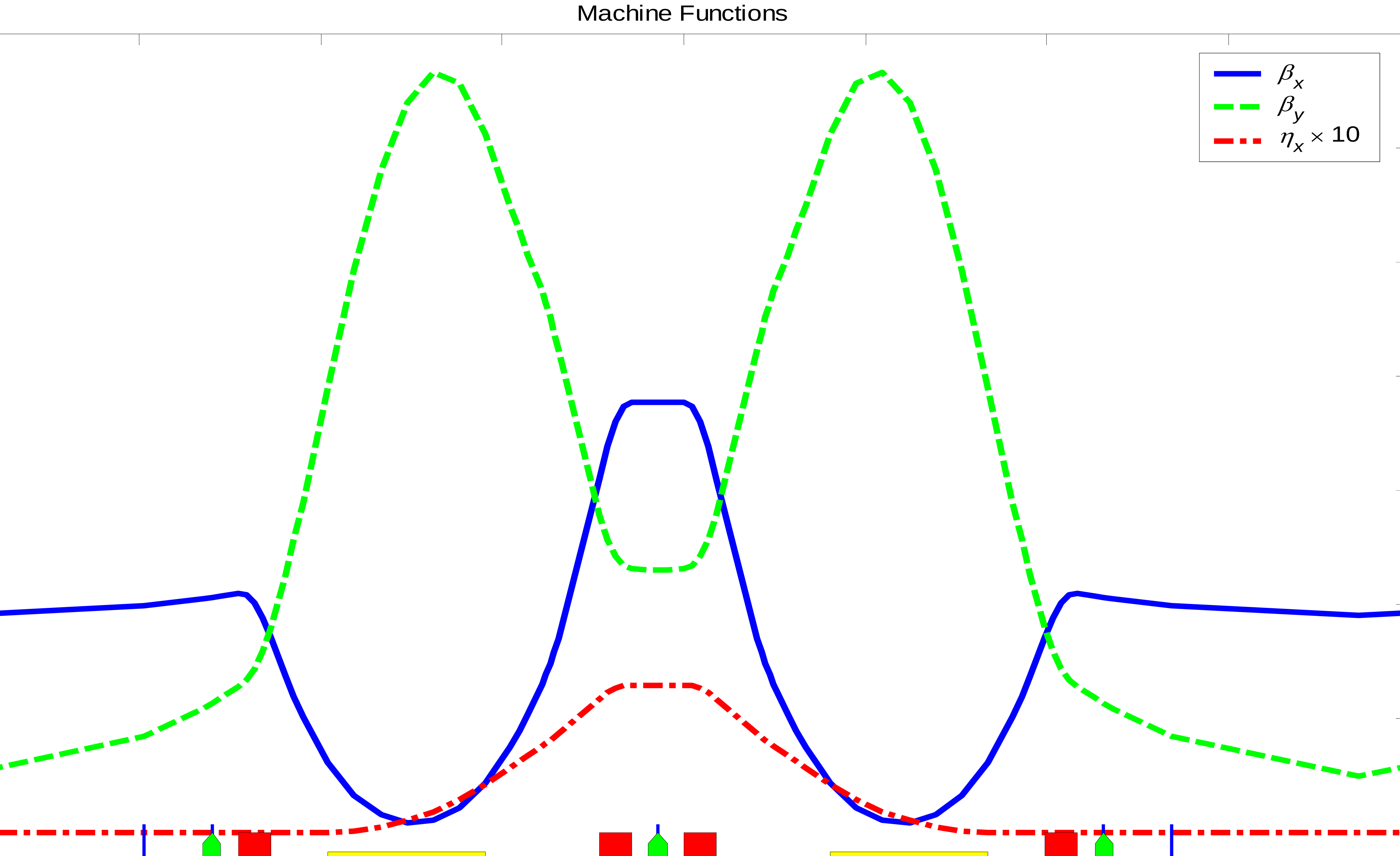
Storage Ring

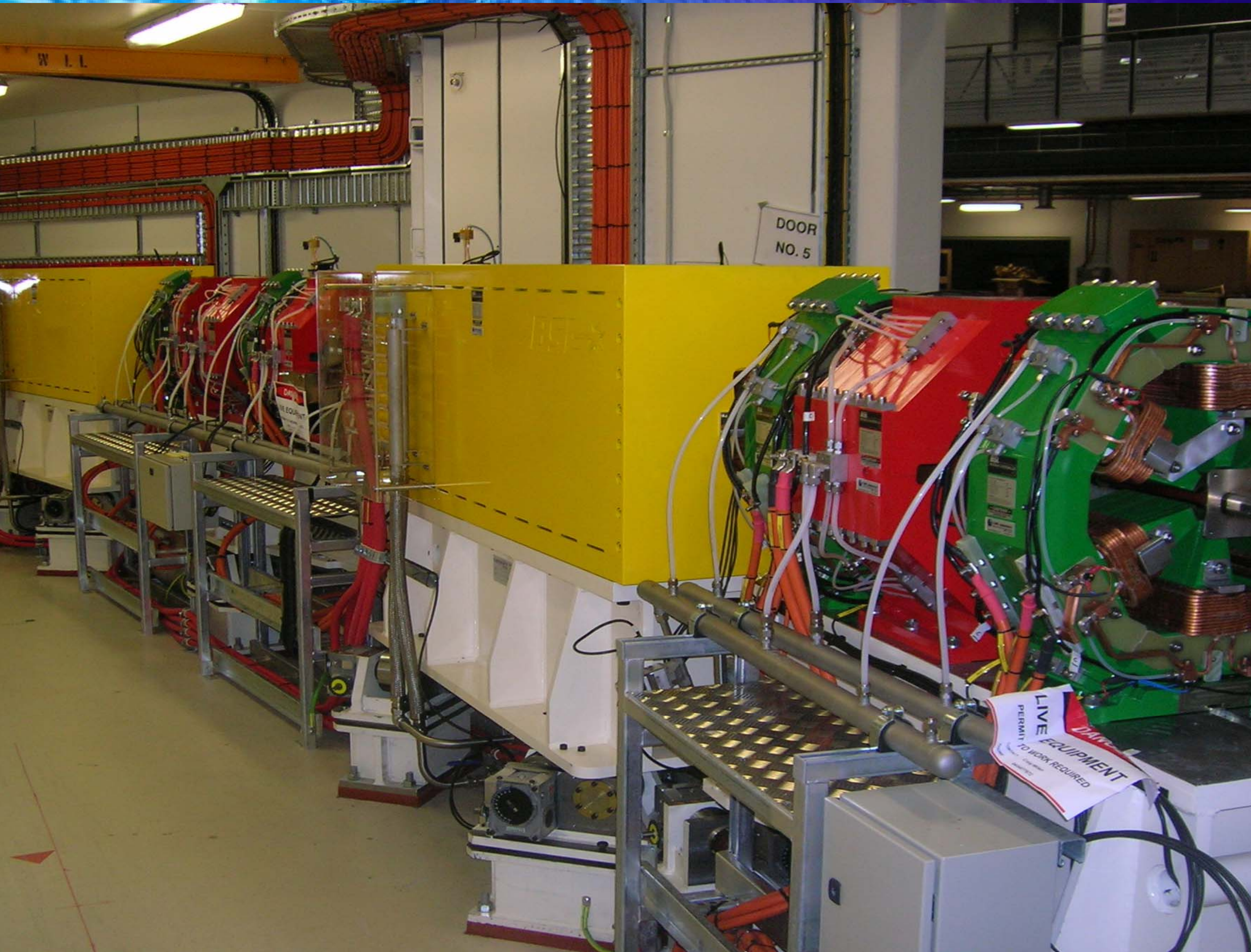
ergy	3[GeV]
rcumference	216[m]
F Frequency	499.654[MHz]
rmonic Number	360
ak RF Voltage	3.0[MV]
urrent	200[mA]
itical Photon Energy	7.8[keV]
tatron Tune (h/v)	13.3/5.2
omentum Compaction	0.002
tural Chromaticity (h/v)	-28/-27
diation Damping (h/v/l)	3/5/3[ms]
ergy Spread	0.1[%]
diation Loss Per Turn	932[keV]
orizontal Emittance	7-16[nm·rad]

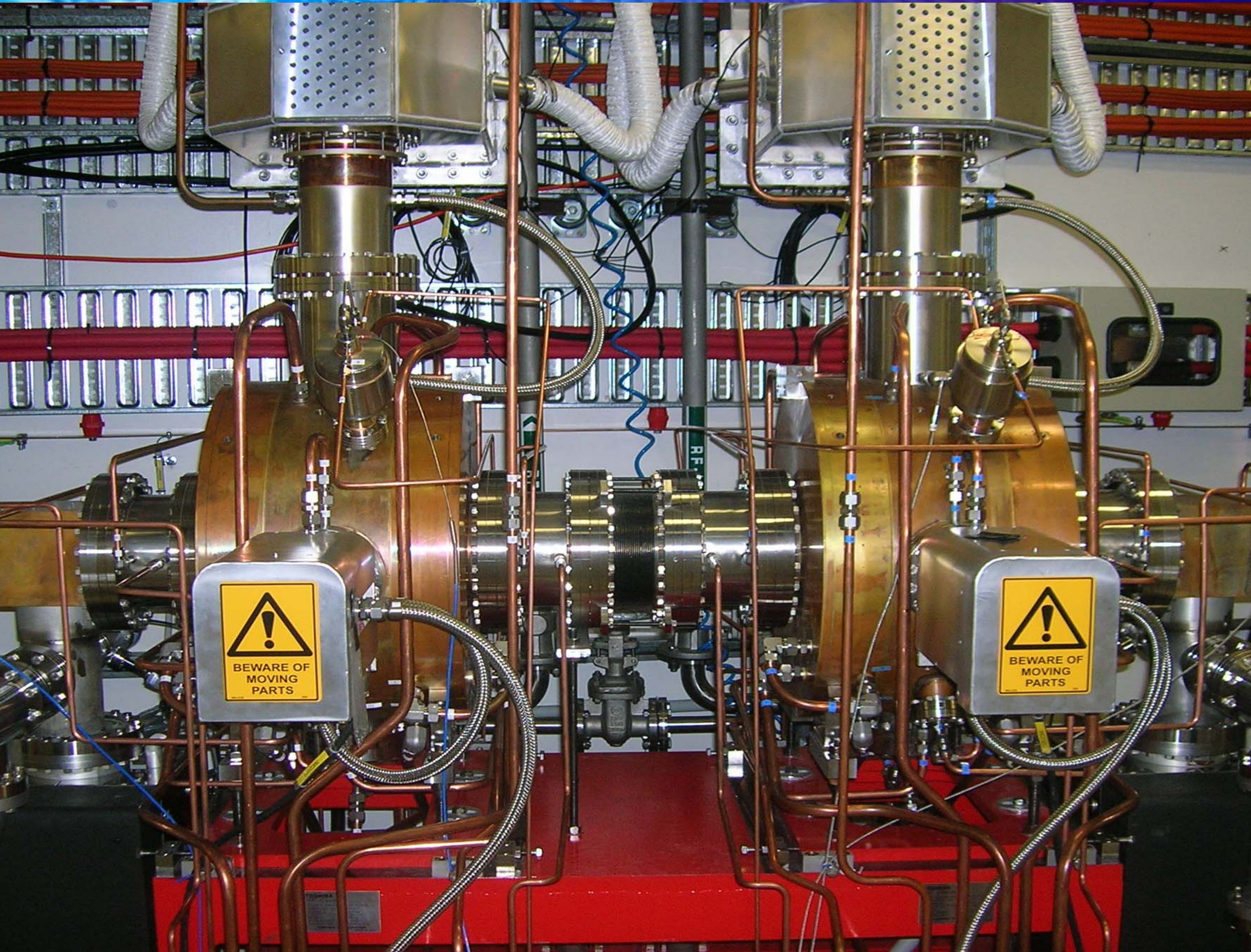
bined function dipoles

able emittance with dispersion

ector coils on sextupoles




DOOR
NO. 5
LIVE EQUIPMENT
TO WORK REQUIRED


BEWARE OF
MOVING
PARTS
BEWARE OF
MOVING
PARTS

Controls

EPICS control system

Different control systems from contractors

All EPICS compatible

Accelerator Toolbox running in the Matlab environment is used

Matlab Channel Access makes process variables available in Matlab

Matlab scripts automate measurements

Diagnostics

BPMs per sector

- First-turn, turn-by-turn, and slow acquisition simultaneously

orizontal and vertical scrapers

orizontal and vertical stripline detectors

DCCT

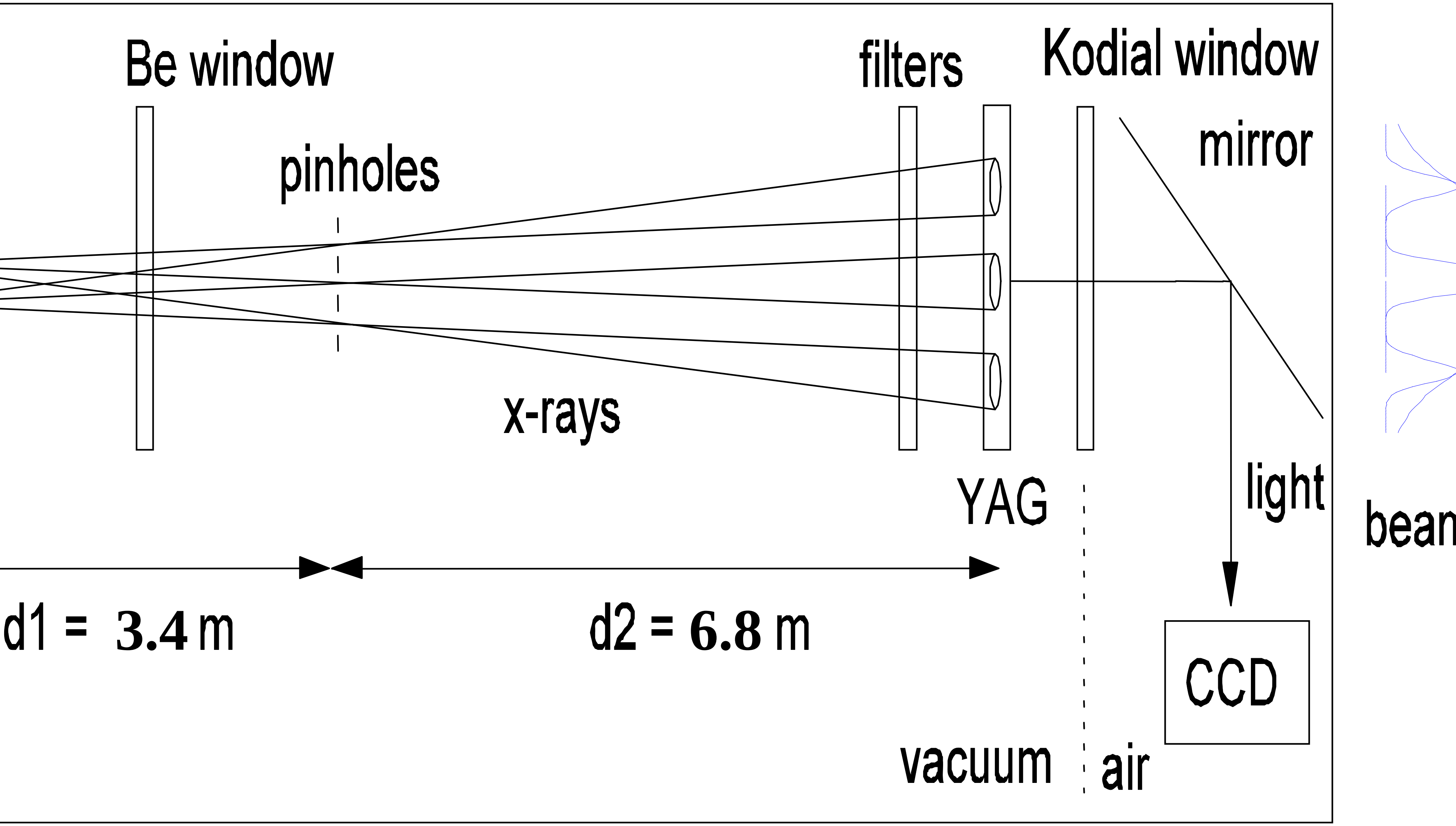
beam loss monitor system

-ray diagnostic beamline

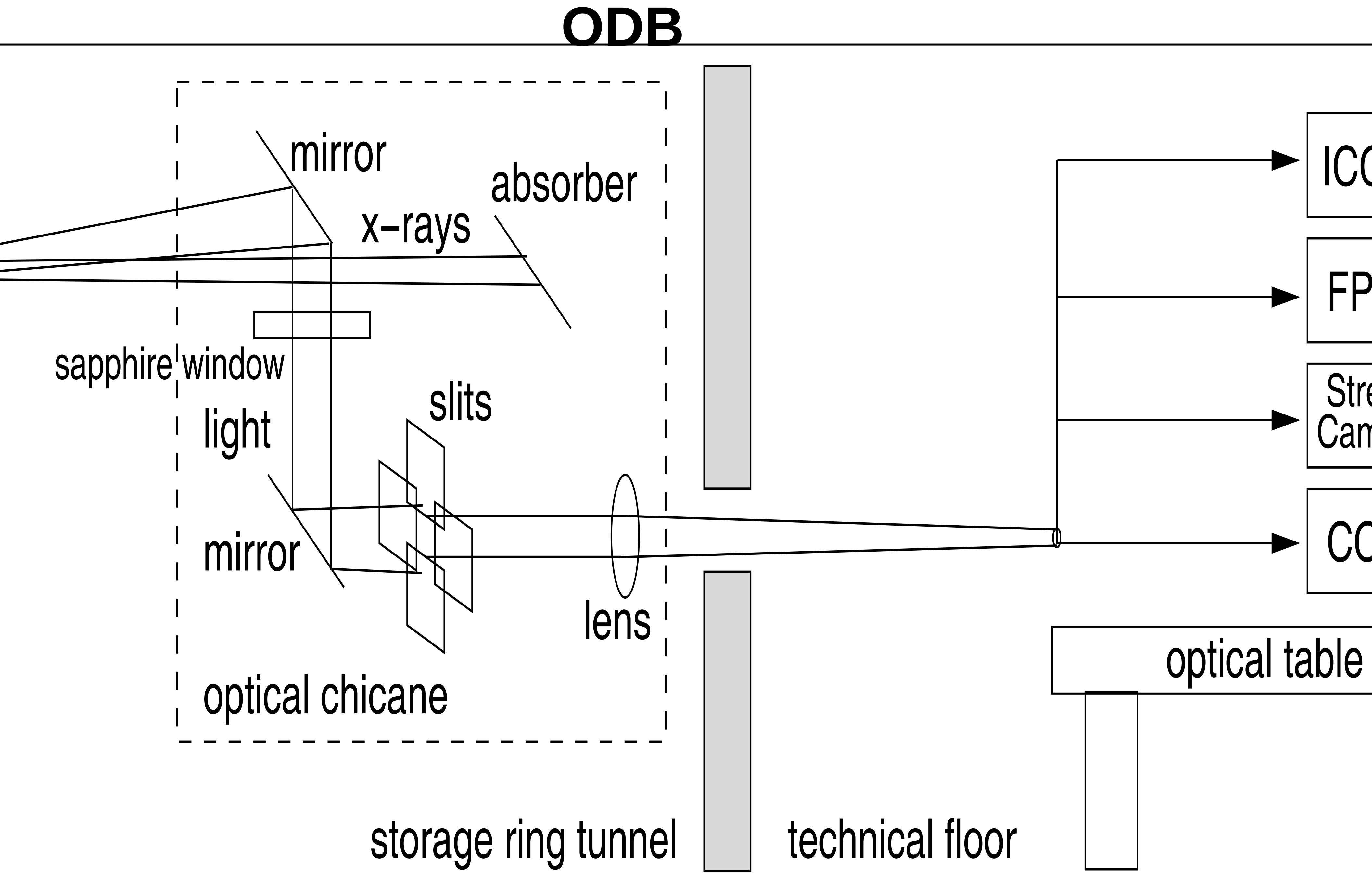
ptical diagnostic beamline

- Streak camera
- ICCD camera
- Fill pattern Monitor

XDB



hatic layout of the X-Ray Diagnostic Beamline



matic layout of the Optical Diagnostic Beamline e are nine beamlines planned

R*	Infrared Spectroscopy	Bending Magnet
3M*	Protein Crystallography 1	Bending Magnet
D	Protein Crystallography 2	In-vacuum undulator
D	Imaging & Medical Therapy	Superconducting wigg
D	Microspectroscopy	In-vacuum undulator
0BM*	Powder Diffraction	Bending Magnet
2ID*	X-ray Absorption Spectroscopy	Wiggler
3ID	Small & Wide Angle X-ray Scattering	In-vacuum undulator
4ID*	Soft X-ray Spectroscopy	APPLE II Undulator

mlines under construction

Injection System

nmissioning included in contract

P personnel actively involved

ac klystrons started in September 2005

first electrons from the gun October 2005.

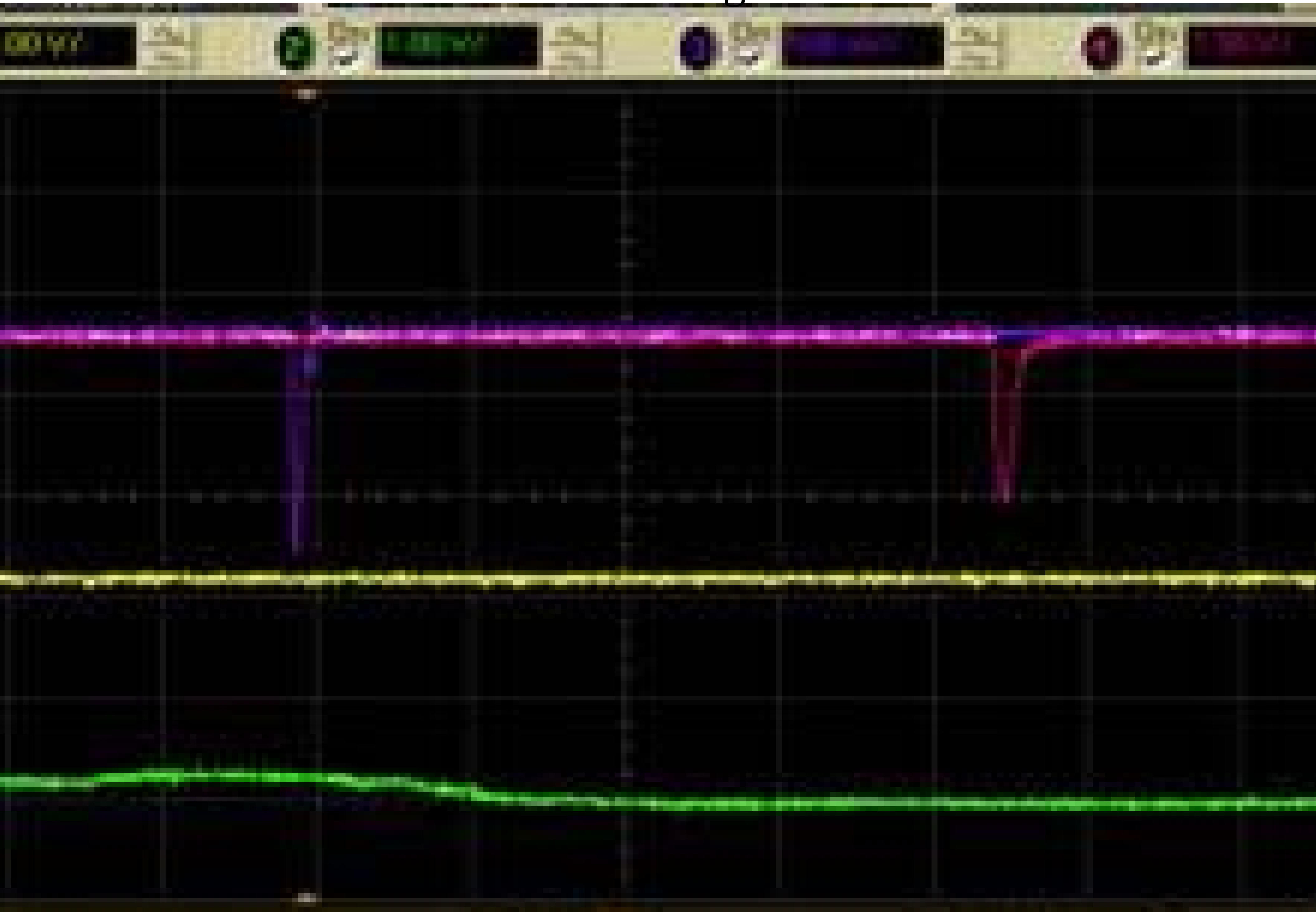
first linac beam December 2005.

t beam into the booster February 2006

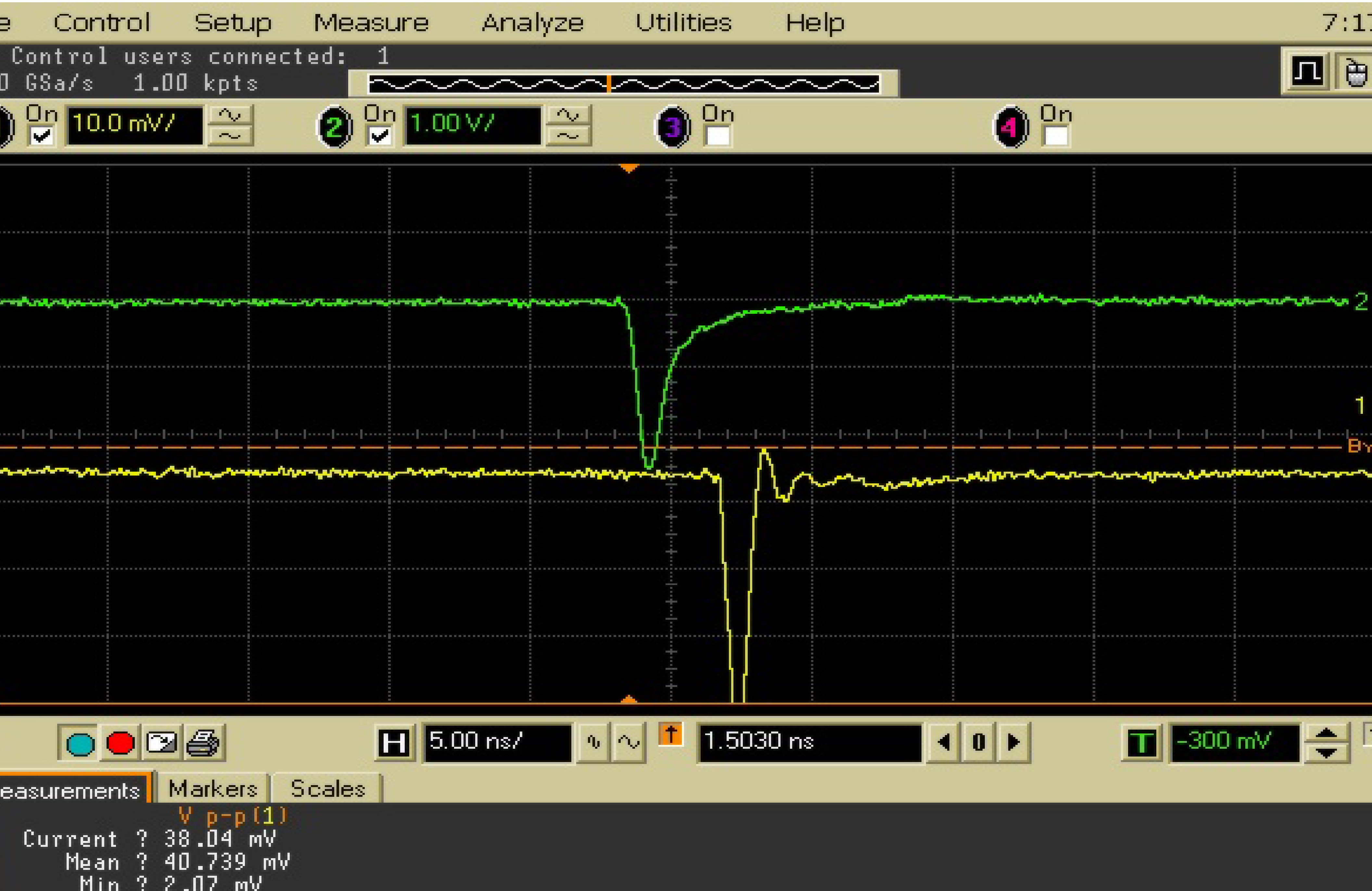
ster ramp developed during March 2006

t 3 GeV beam April 2006.

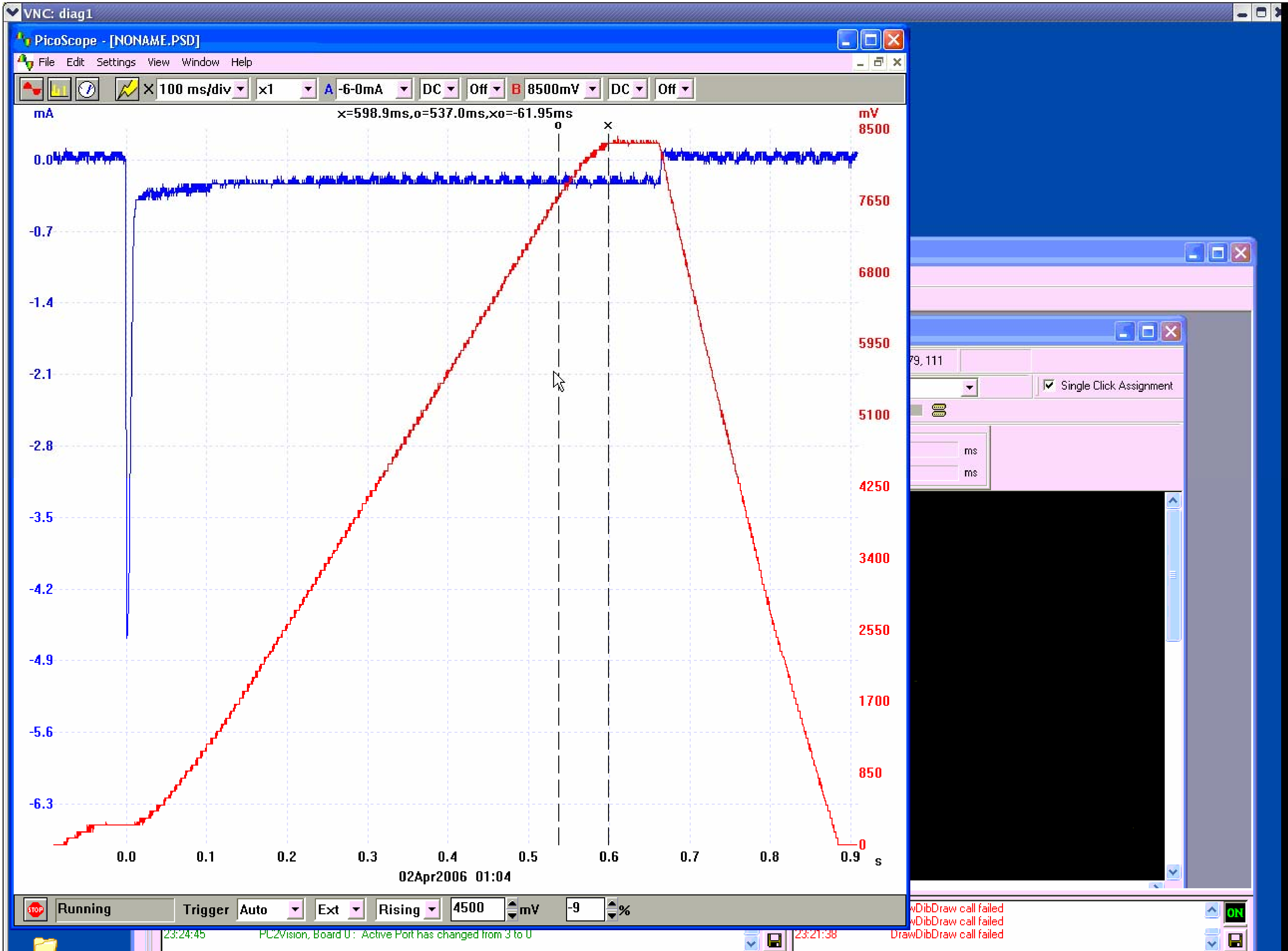
First electrons from gun



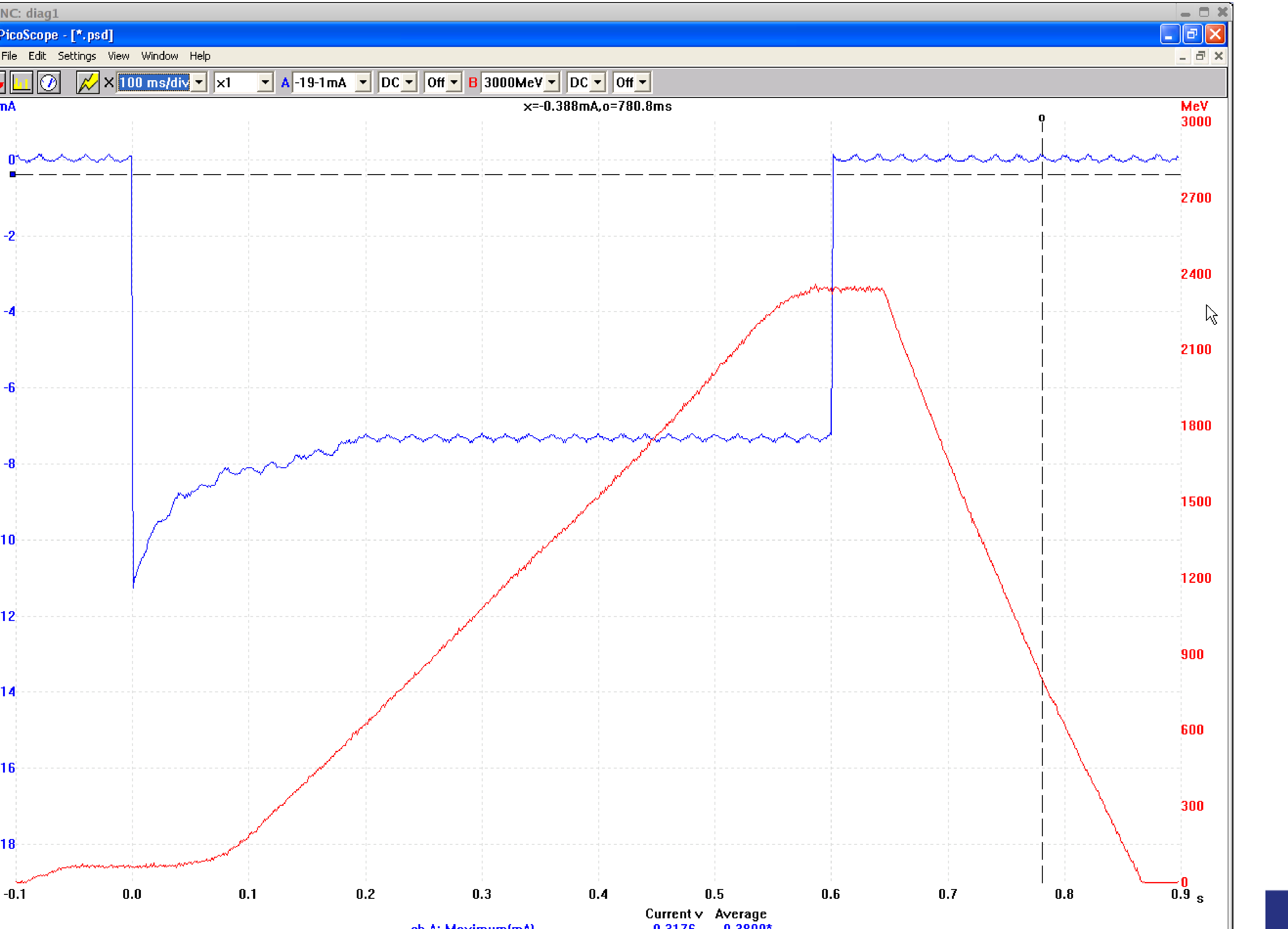
First 100 MeV beam



First 3 GeV beam

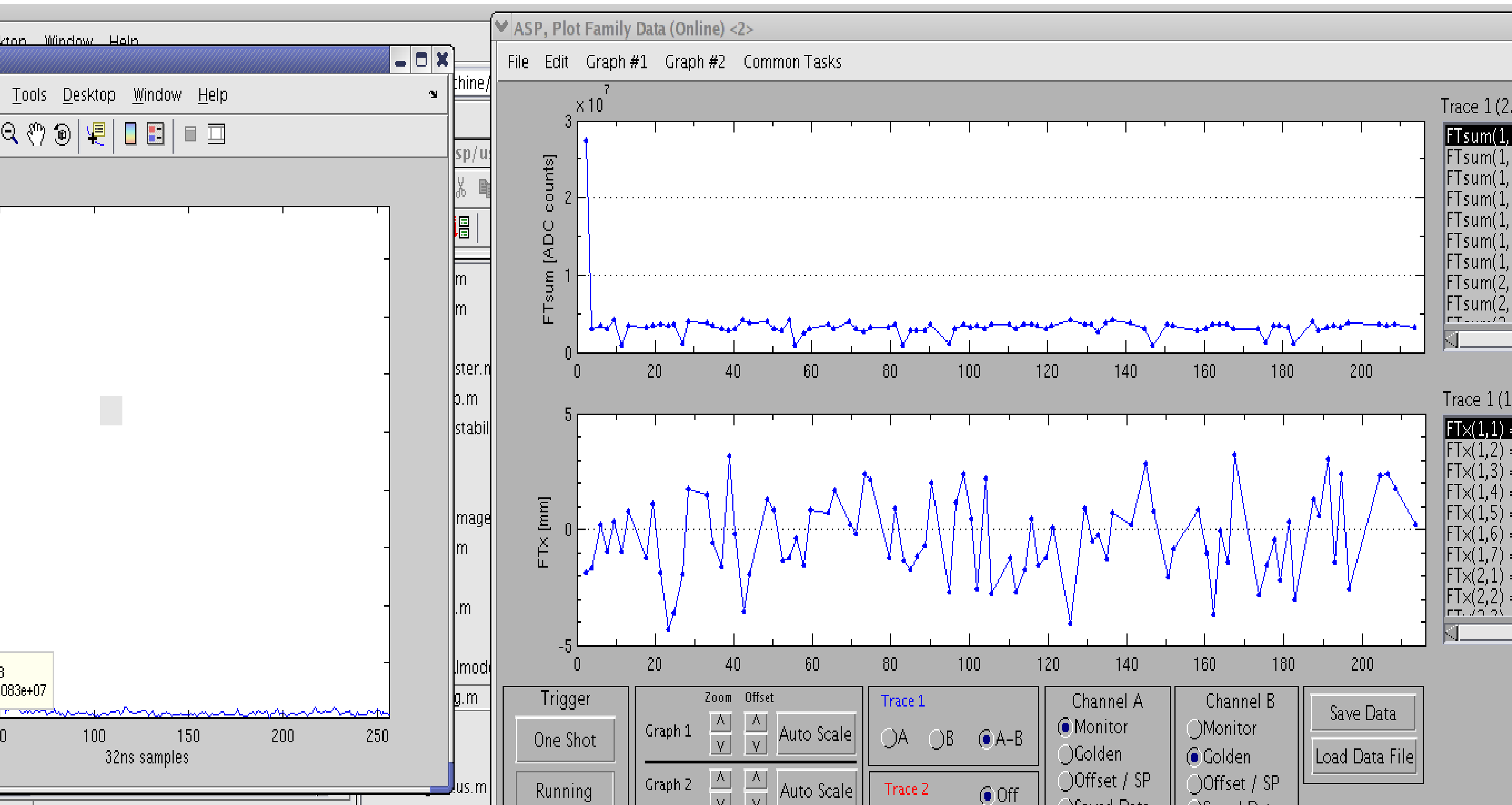


Routine operations



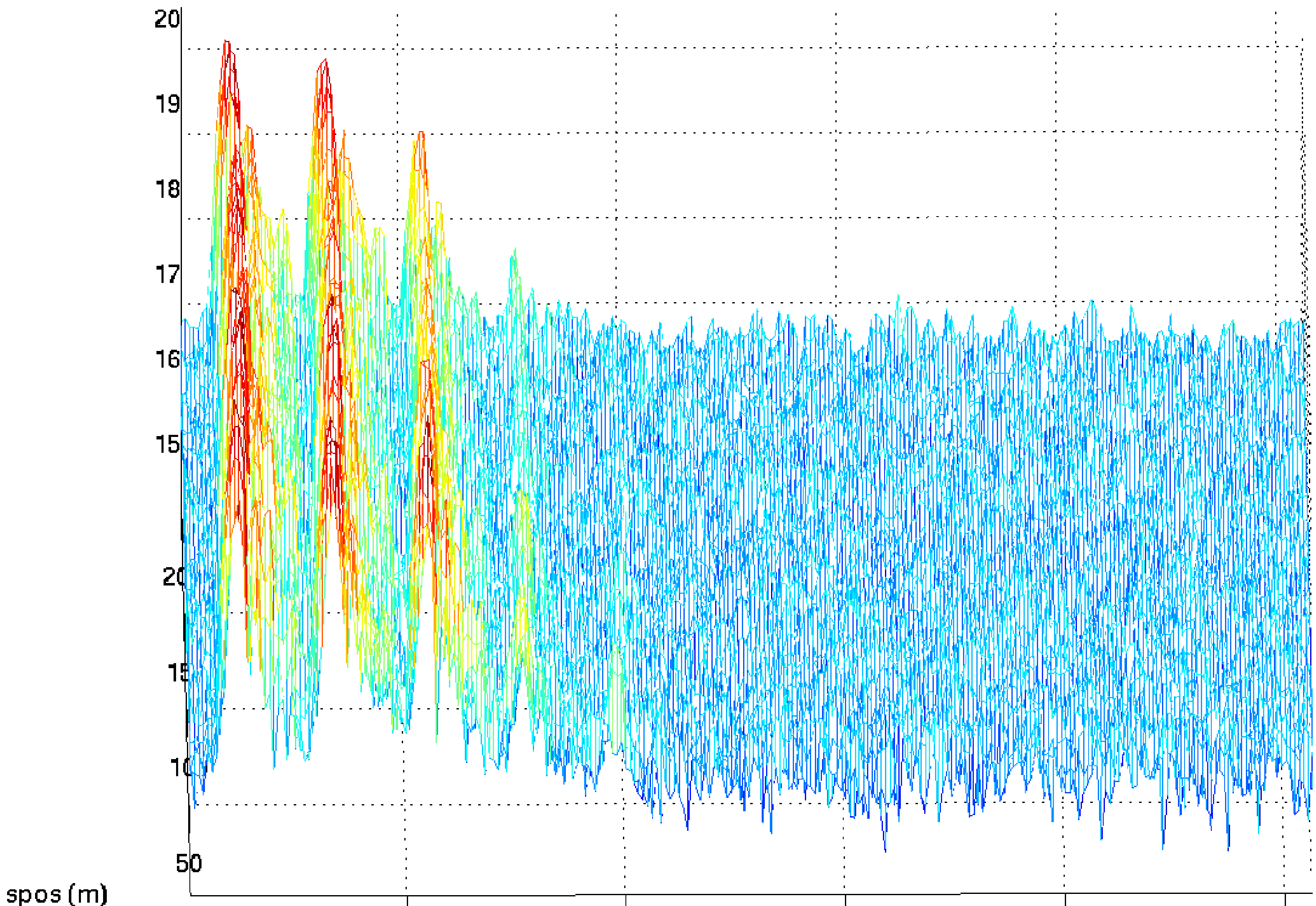
- S not included in the injection system commissioning
- st beam in BTS in the storage ring tunnel June 1 2006
- st turn in the storage ring on June 8, 2006.
- st beam was stored July 14, 2006
- rrent was immediately stacked to 1 mA
- utine injections to 10 mA in first week
- gnostic equipment commissioned and storage ring characterization began
- 0 mA has been stored with a lifetime of 6.5 hours (after the first of the insert vice chambers has been installed)
- e first insertion device is installed and has been run with the minimum gap o mm with 100 mA in the storage ring
- cond insertion device chamber installed and lifetime at 200 mA unchanged

First electrons into storage ring

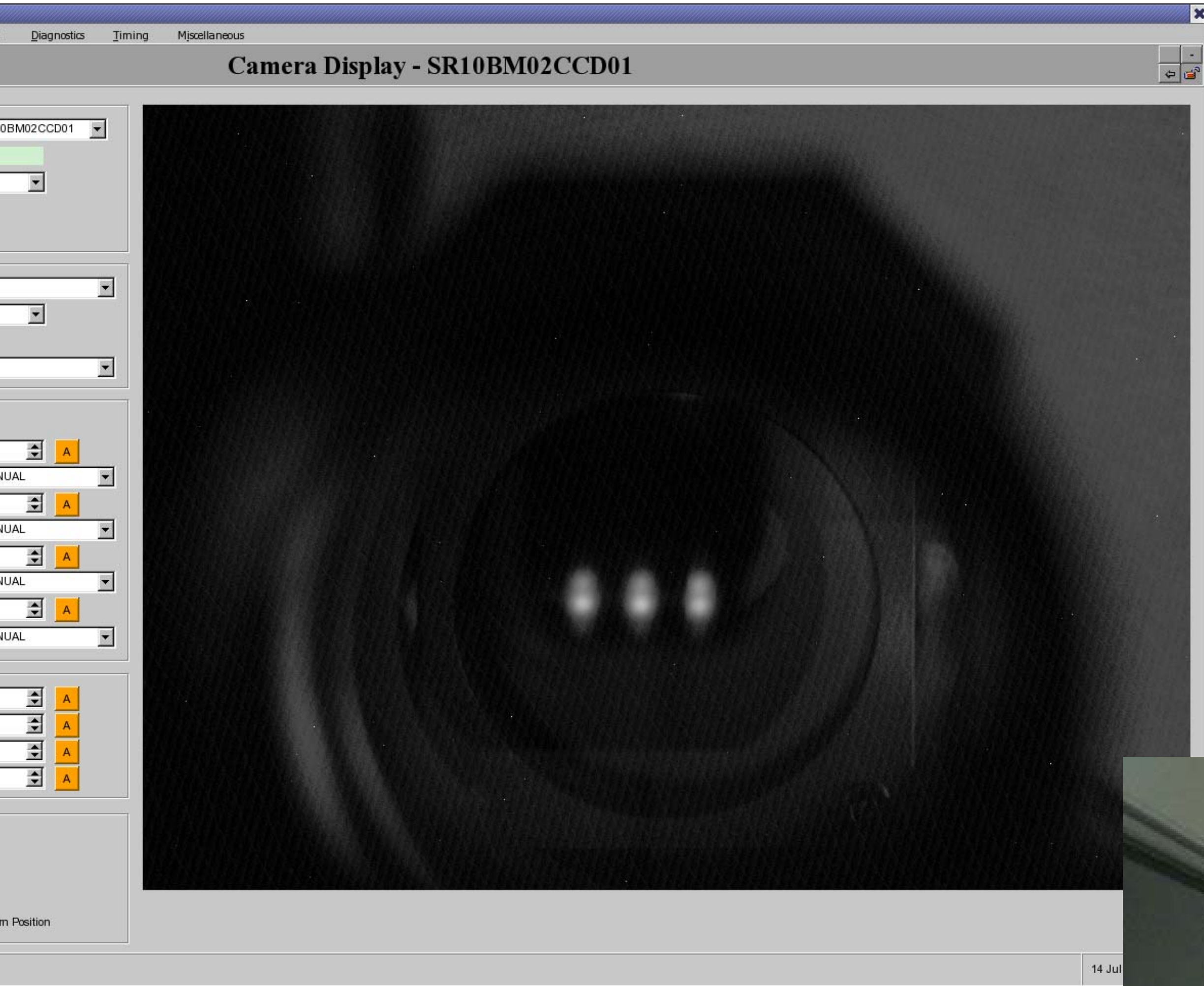


First turn in the storage ring

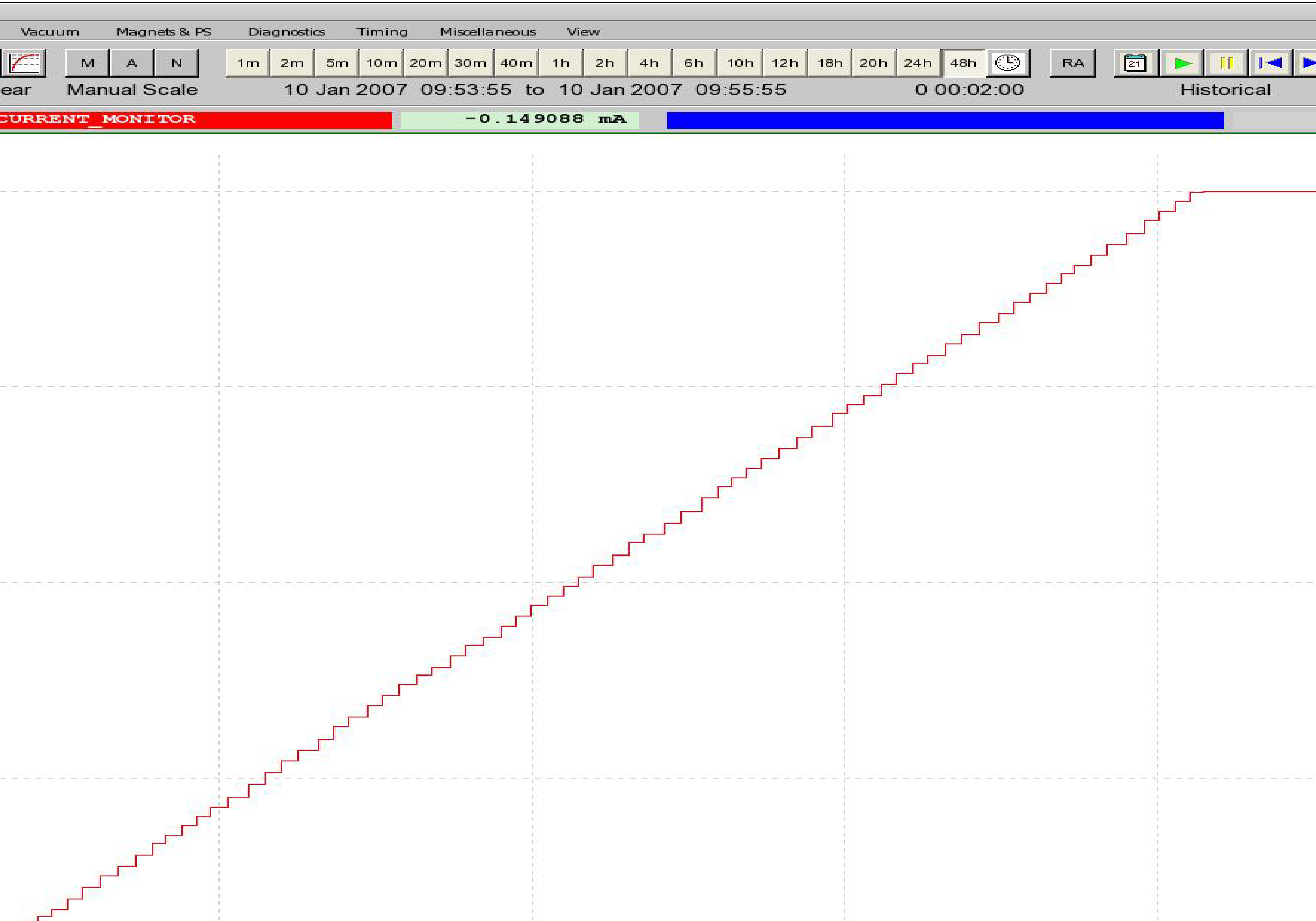
Multiple turns



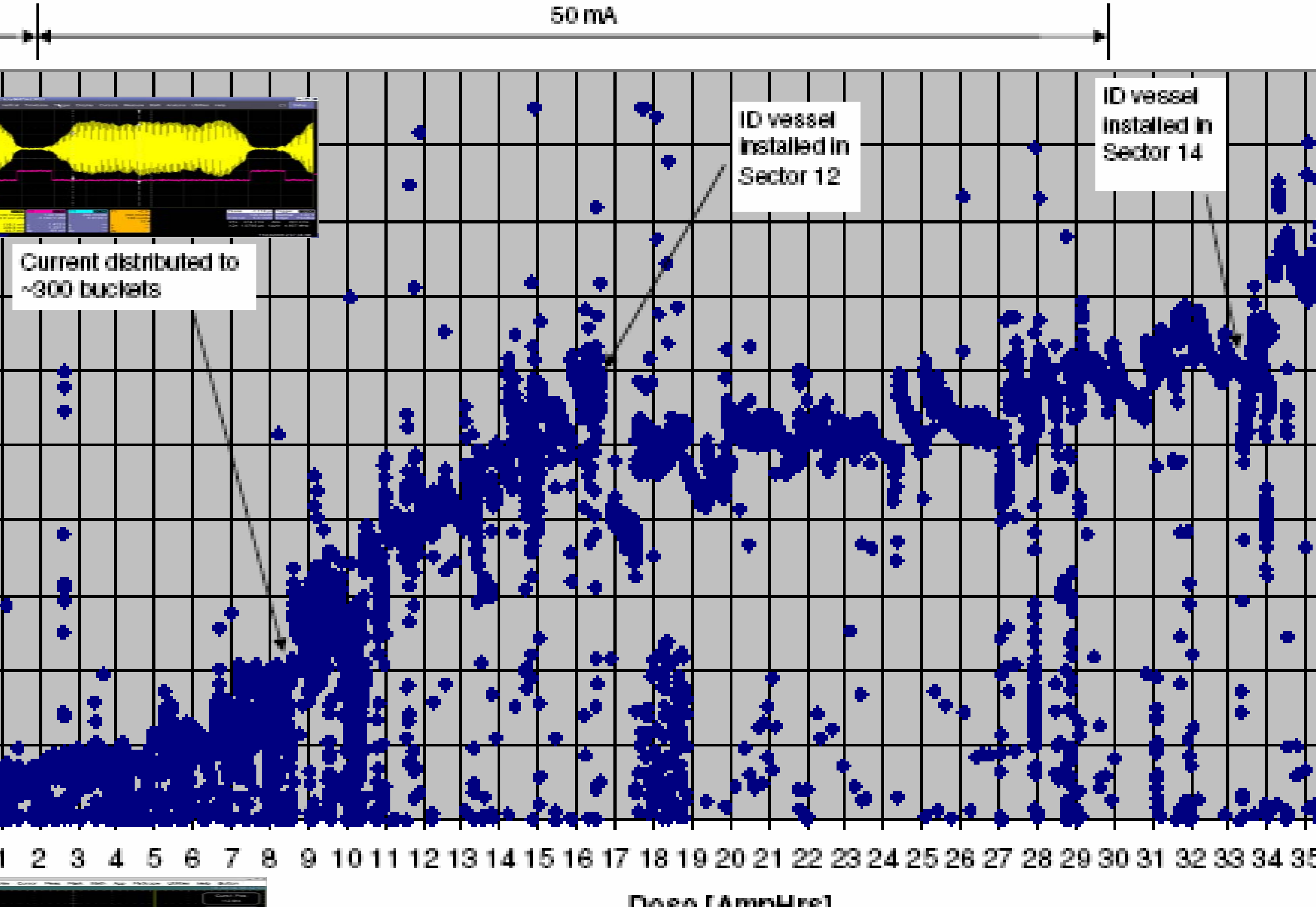
First light 03:00 July 14 2007



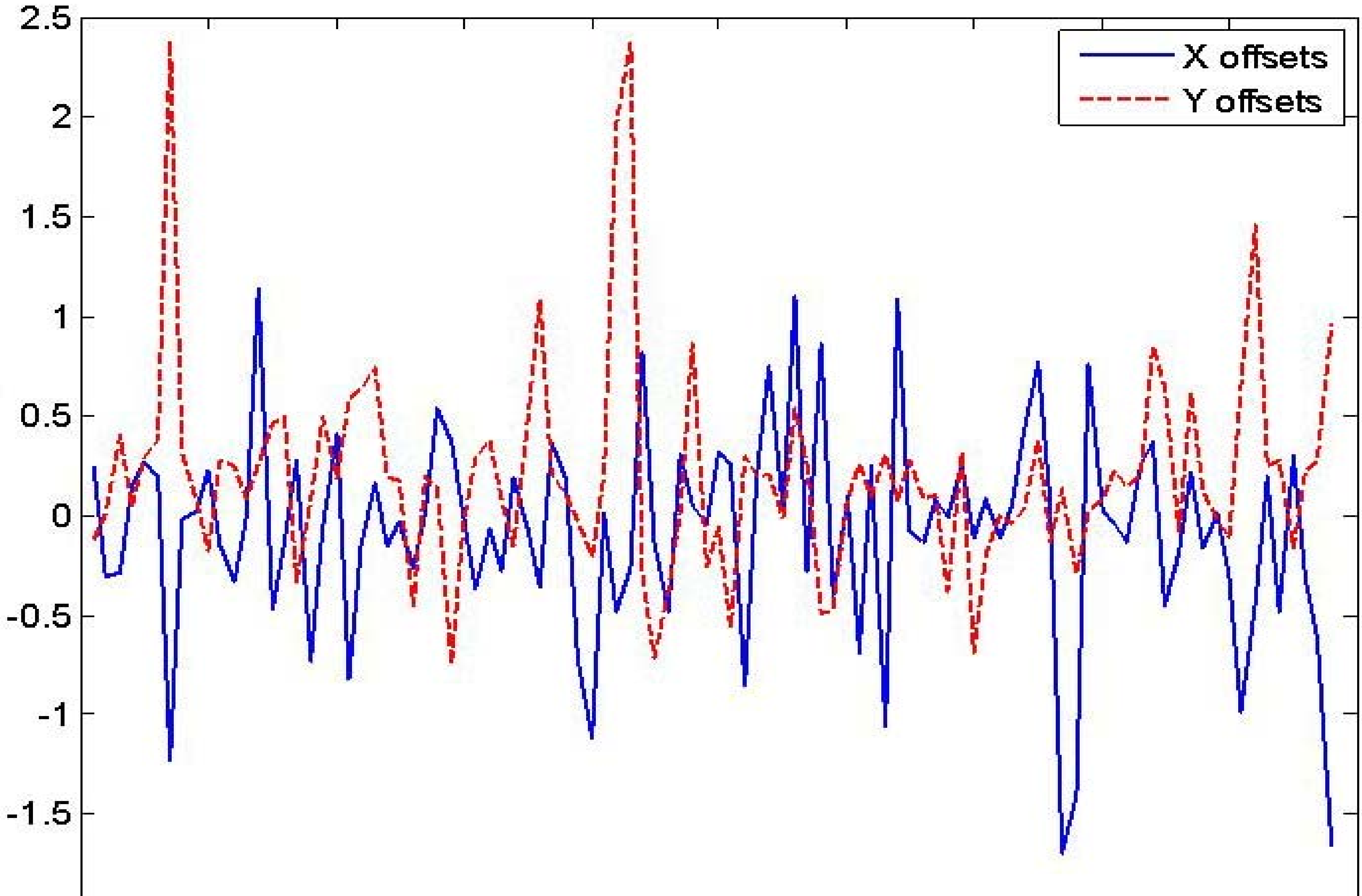
Injection


Vacuum
Magnets & PS
Diagnostics
Timing
Miscellaneous
View
M
A
N
1m
2m
5m
10m
20m
30m
40m
1h
2h
4h
6h
10h
12h
18h
20h
24h
48h
RA
Manual Scale
10 Jan 2007 09:53:55 to 10 Jan 2007 09:55:55
0 00:02:00
Historical
CURRENT_MONITOR
-0.149088 mA

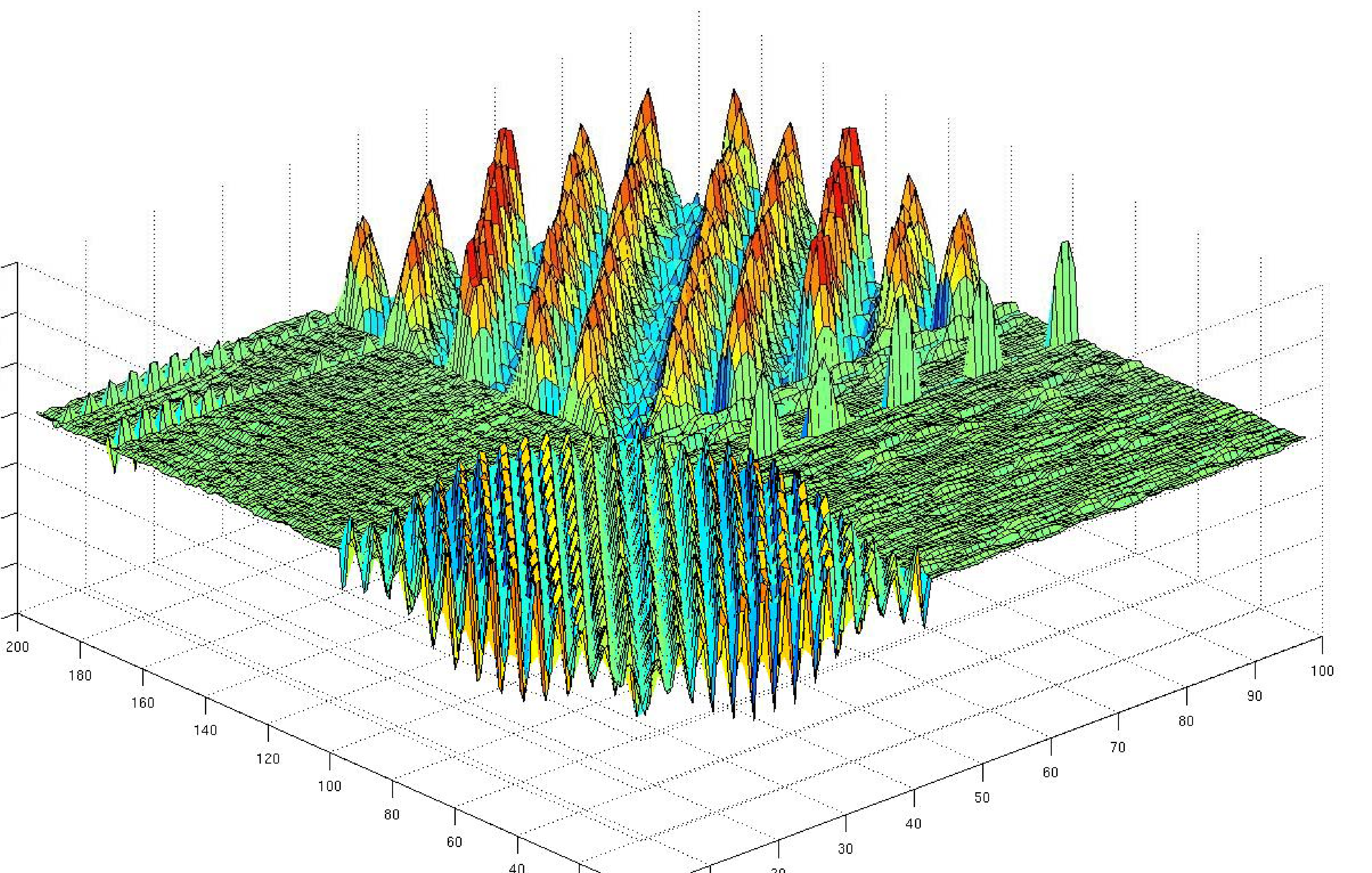
Storage Ring Lifetime Conditioning



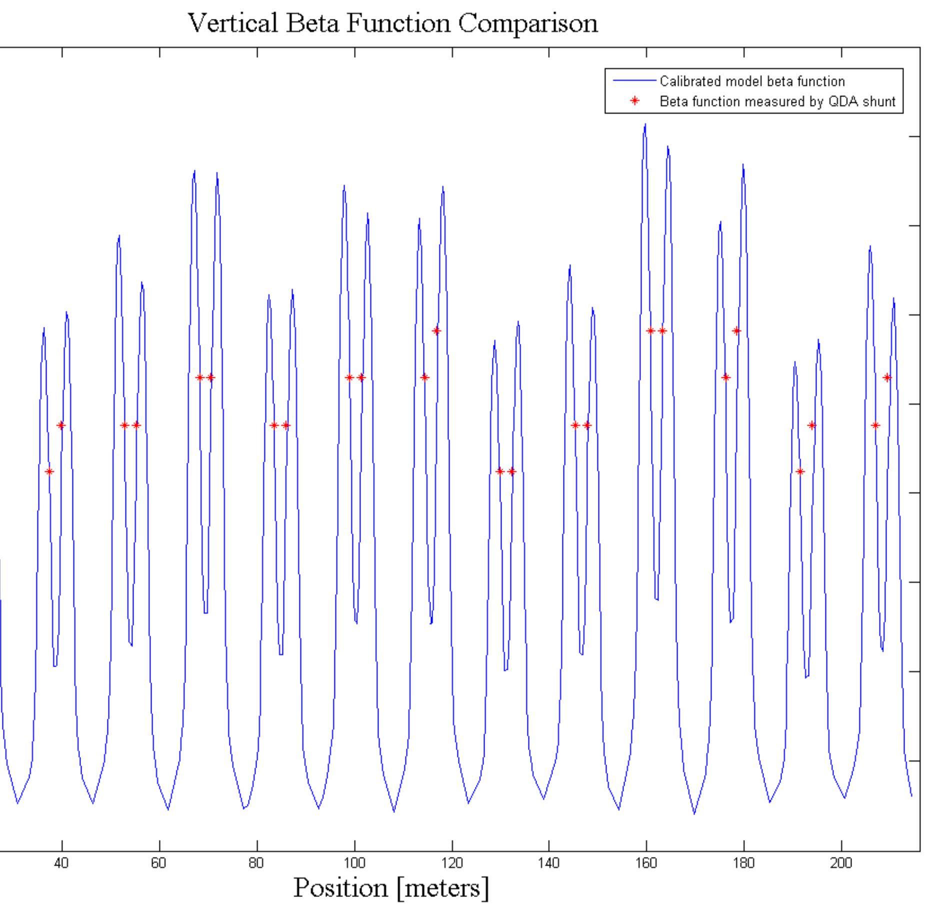
BPM Offsets

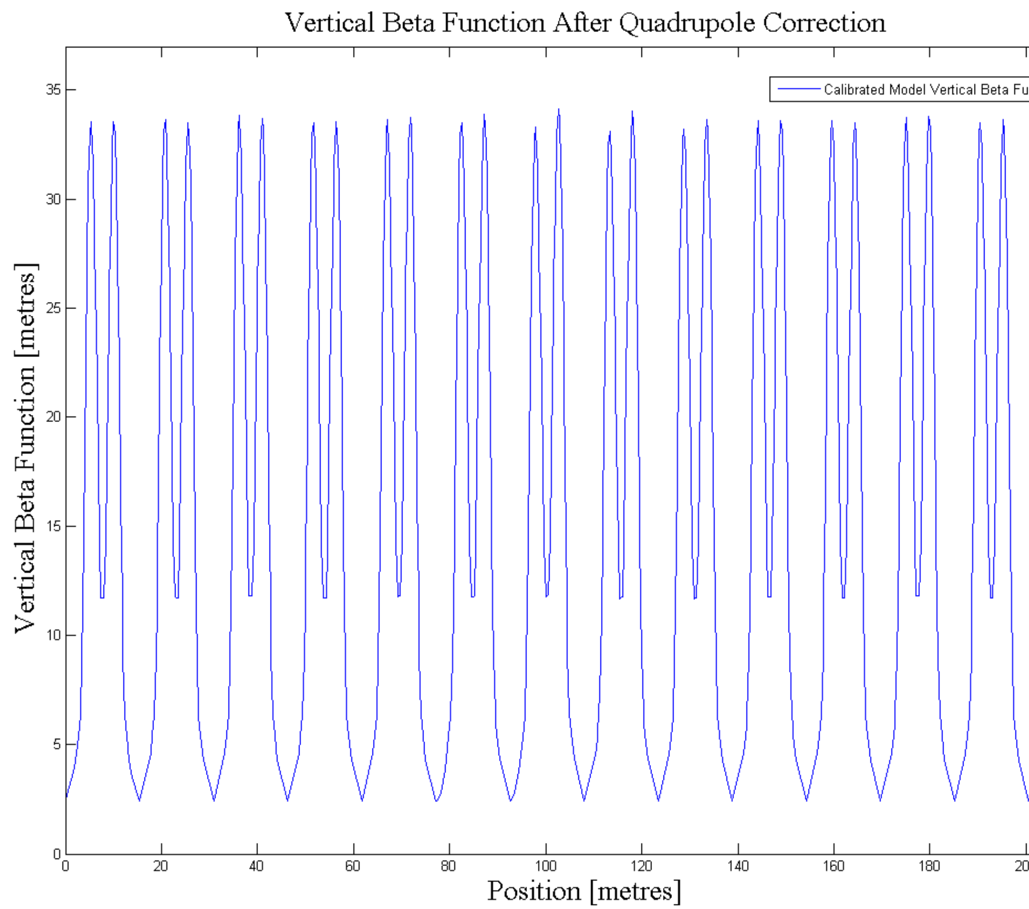


First Response Matrix

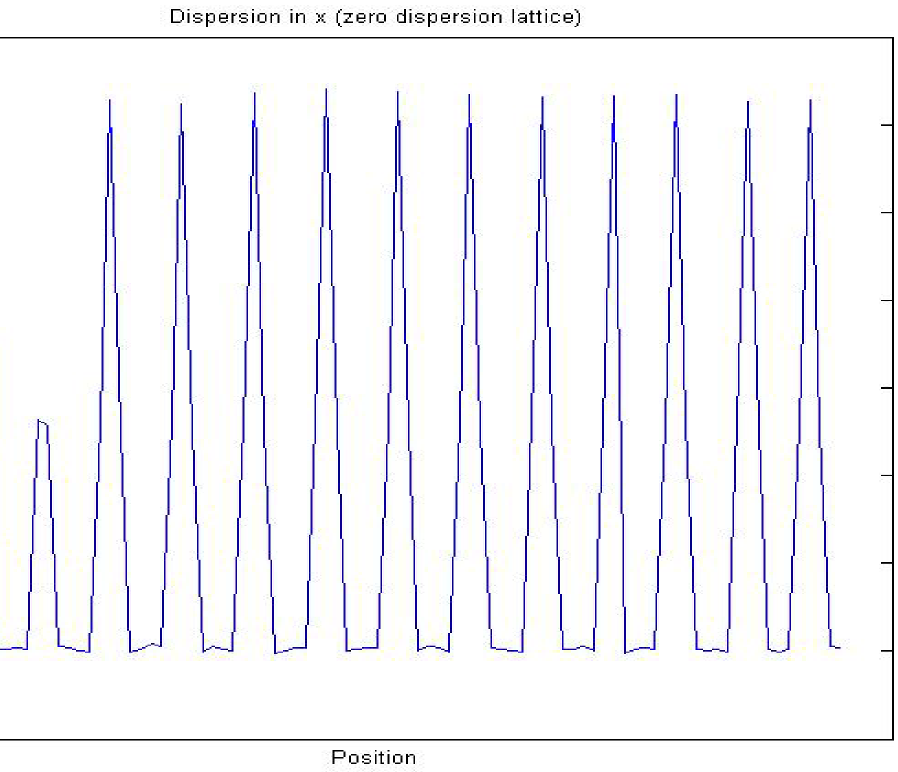


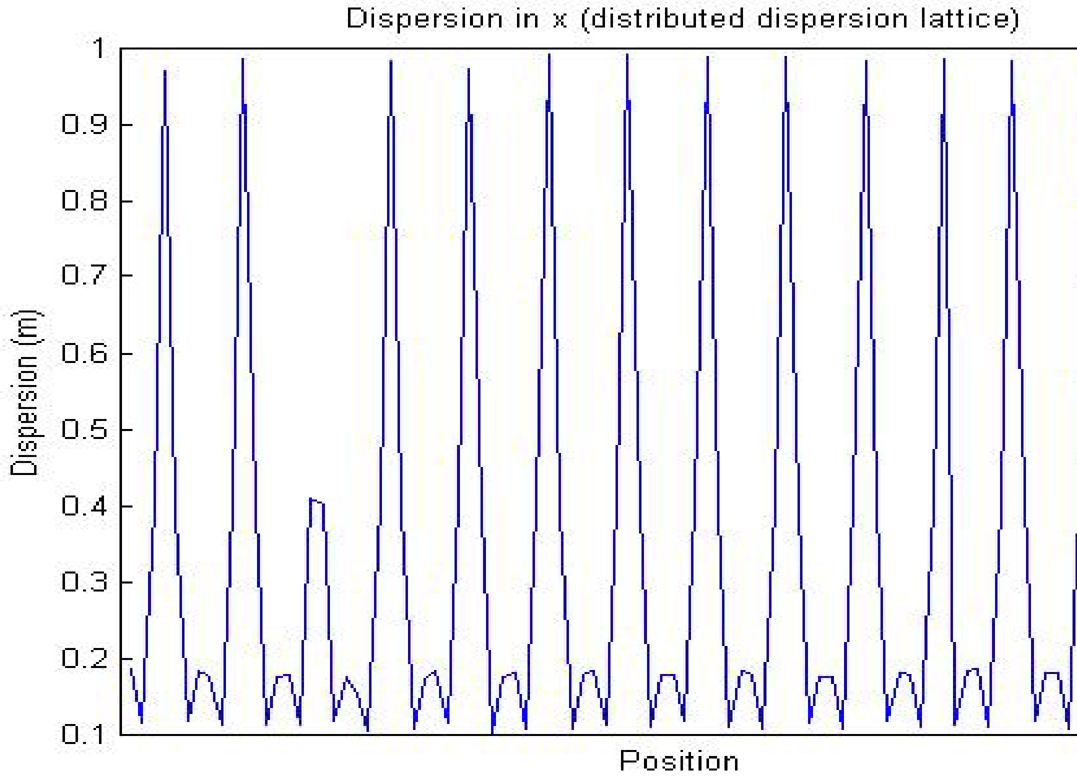
Optics Correction



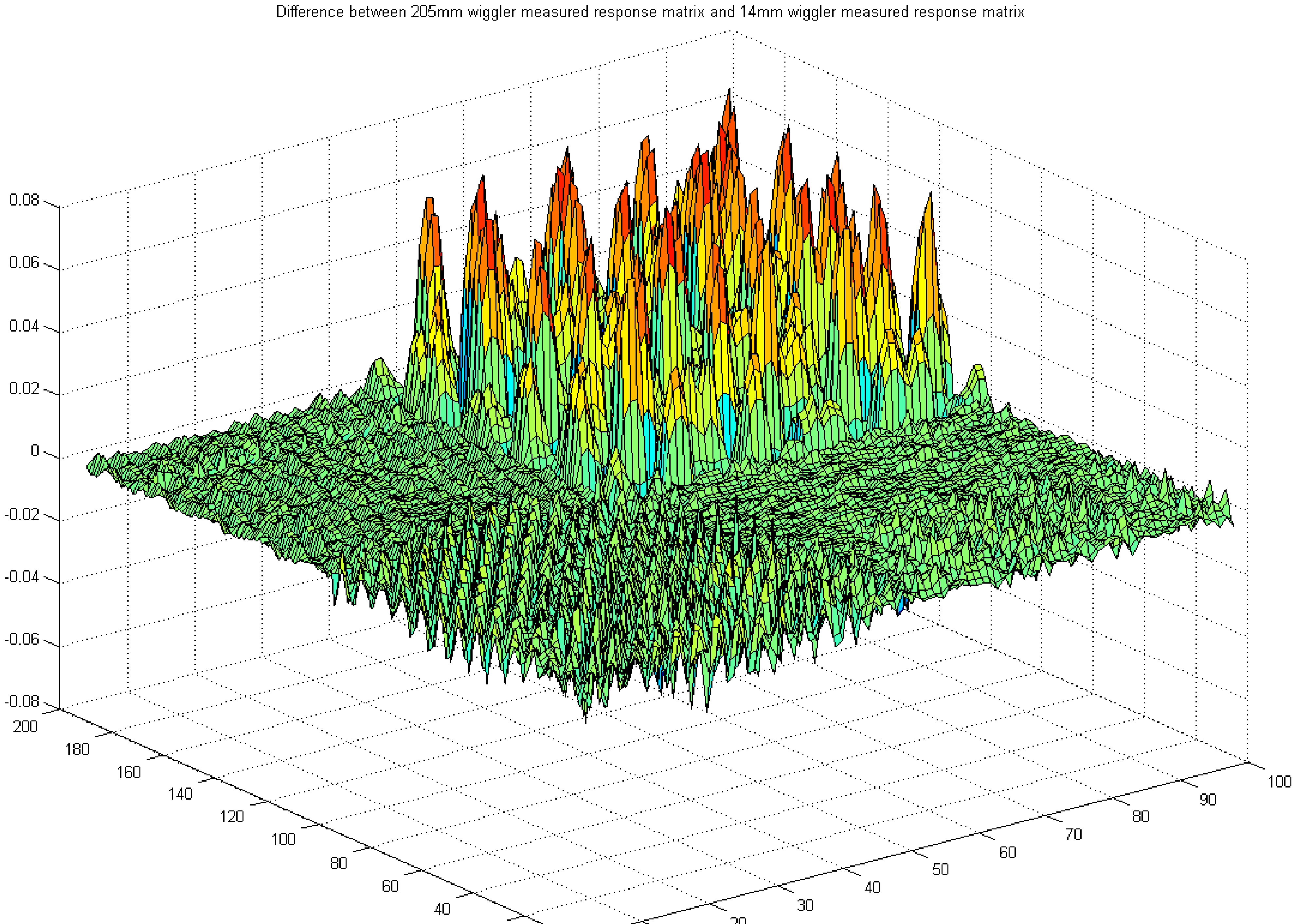


Distributed Dispersion Optics



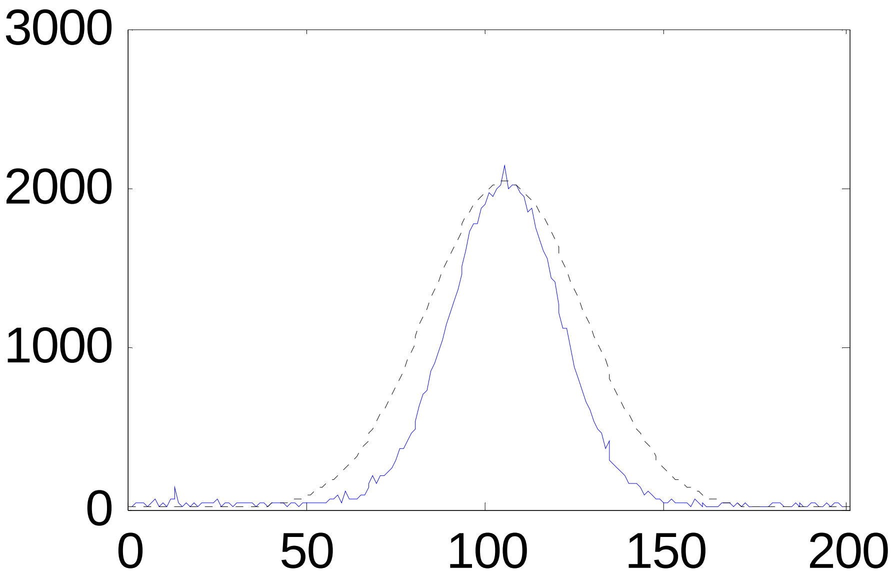


Response Matrix used to characterize wiggler



Emittance

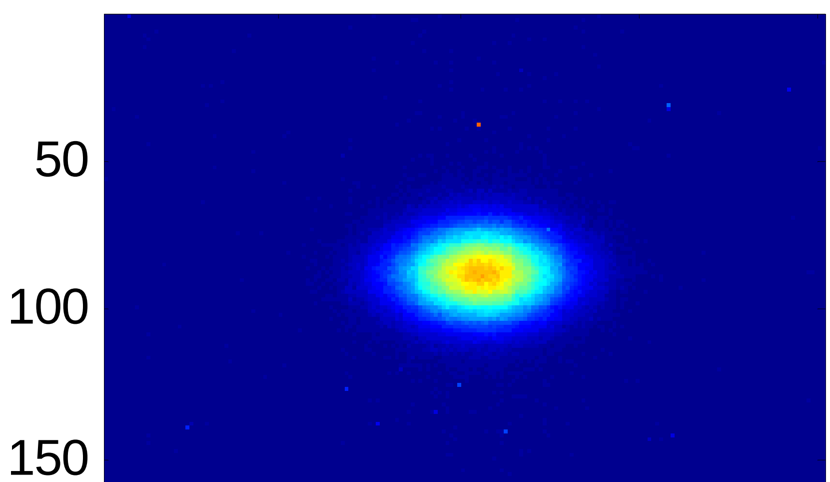
horizontal sigma = 108.32 um
position = 105.48



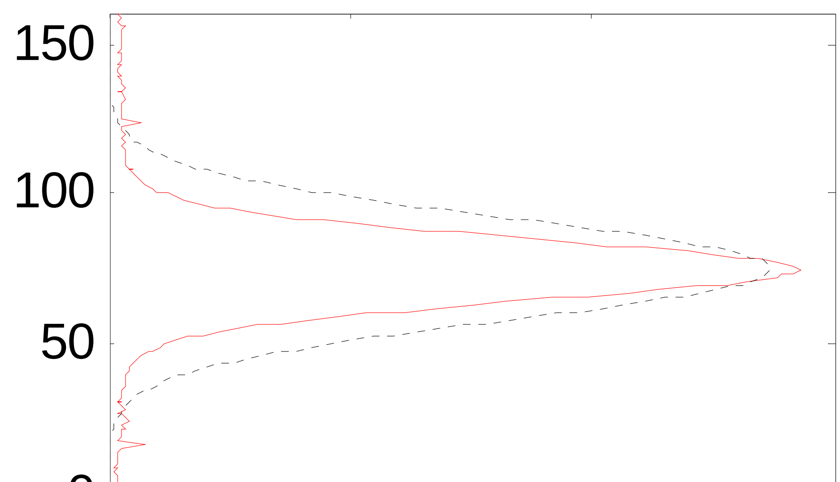
σ_x = 108.32 um
σ_y = 84.28 um

ε_x = 17.52 nm
ε_y = 0.22 nm

ccd image



vertical sigma = 84.28 um
position = 87.00



he Australian Synchrotron Project has been very successful.

here is still work to be done before becoming an operational facility

 small team of dedicated staff have done an excellent job

- writing the specifications for the contracts
- working with the contractors
- integrating all of the systems

has led to a smooth commissioning according to the project schedule.