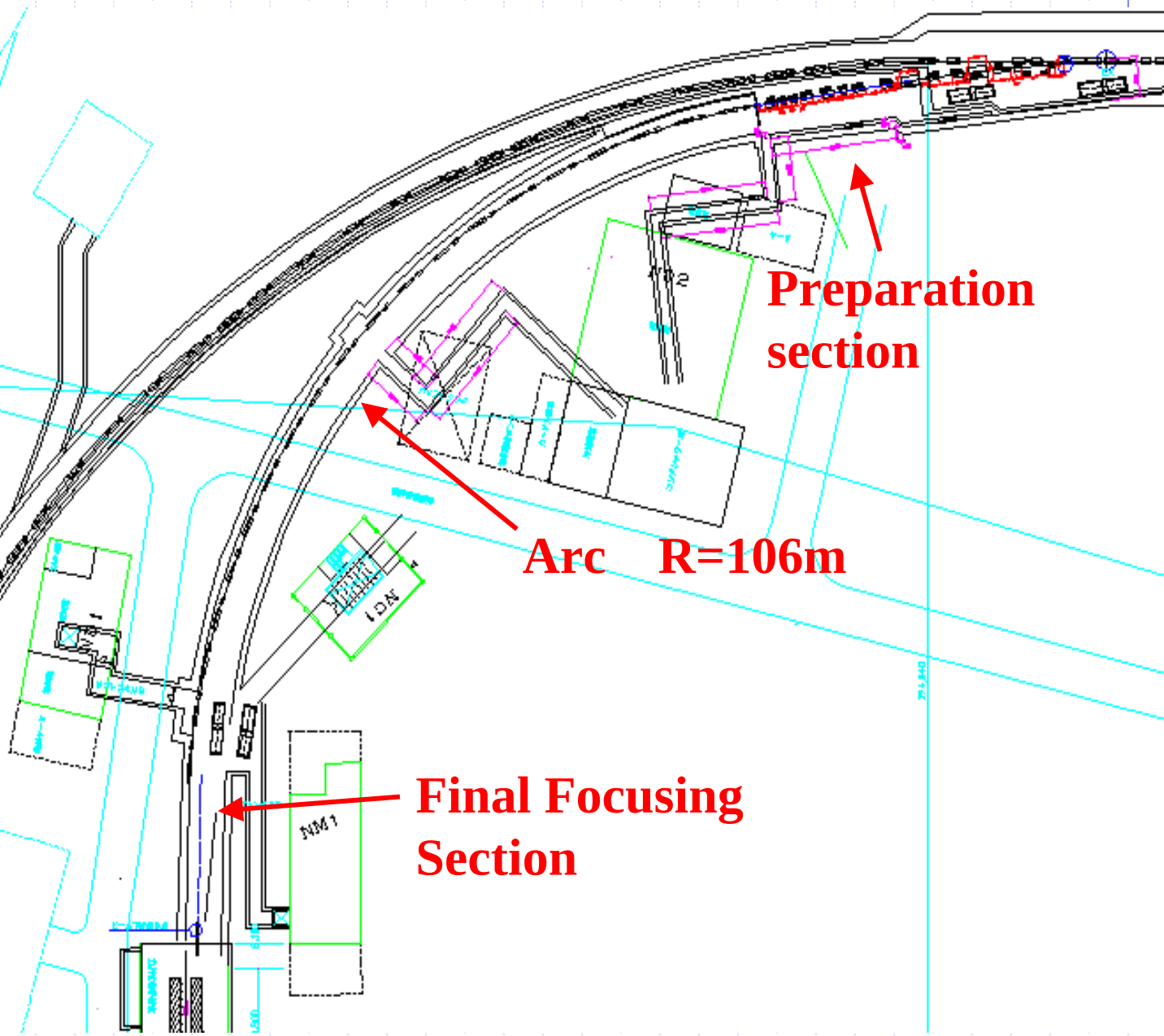
Proton Beam for JHF neutrino

A. K. Ichikawa
Kyoto University

Y. Noumi, *KEK*
J. Doornbos, *TRIUMF*

Overview
Primary proton beamline



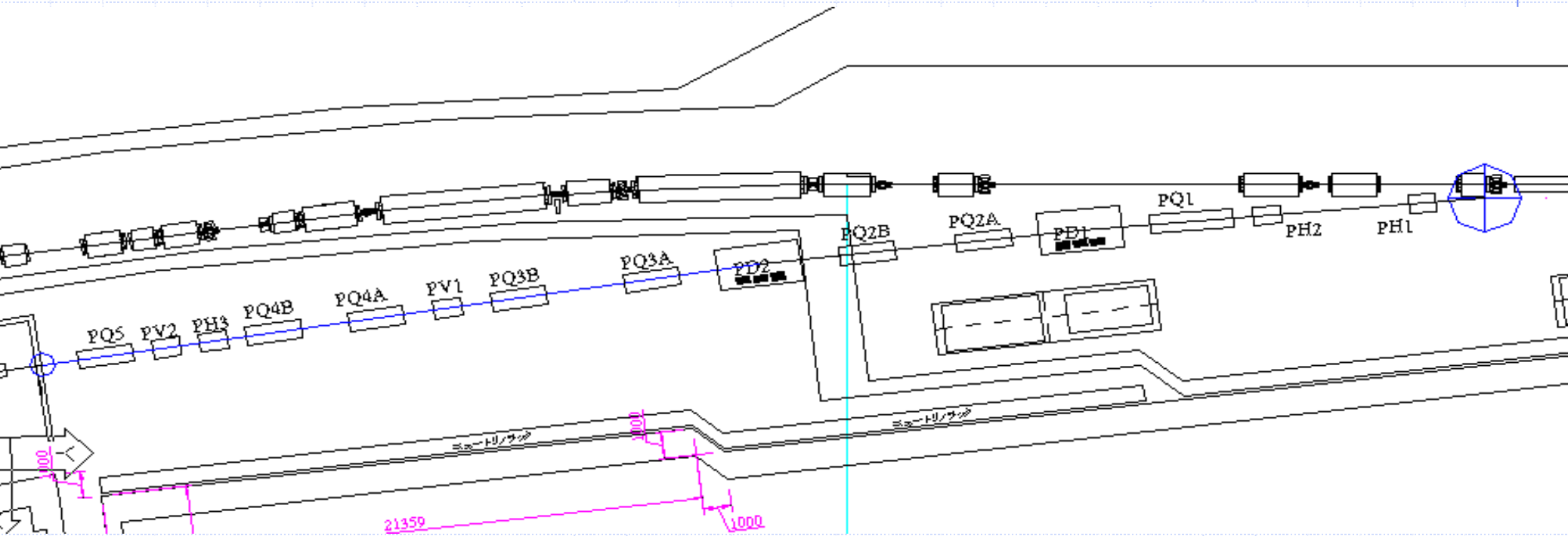
Fast extraction (0.3Hz, 5μs)

ε= 6π mm.mr

Beam power = 0.75 MW (3.3E14 ppp × 50 GeV).

Preparation section

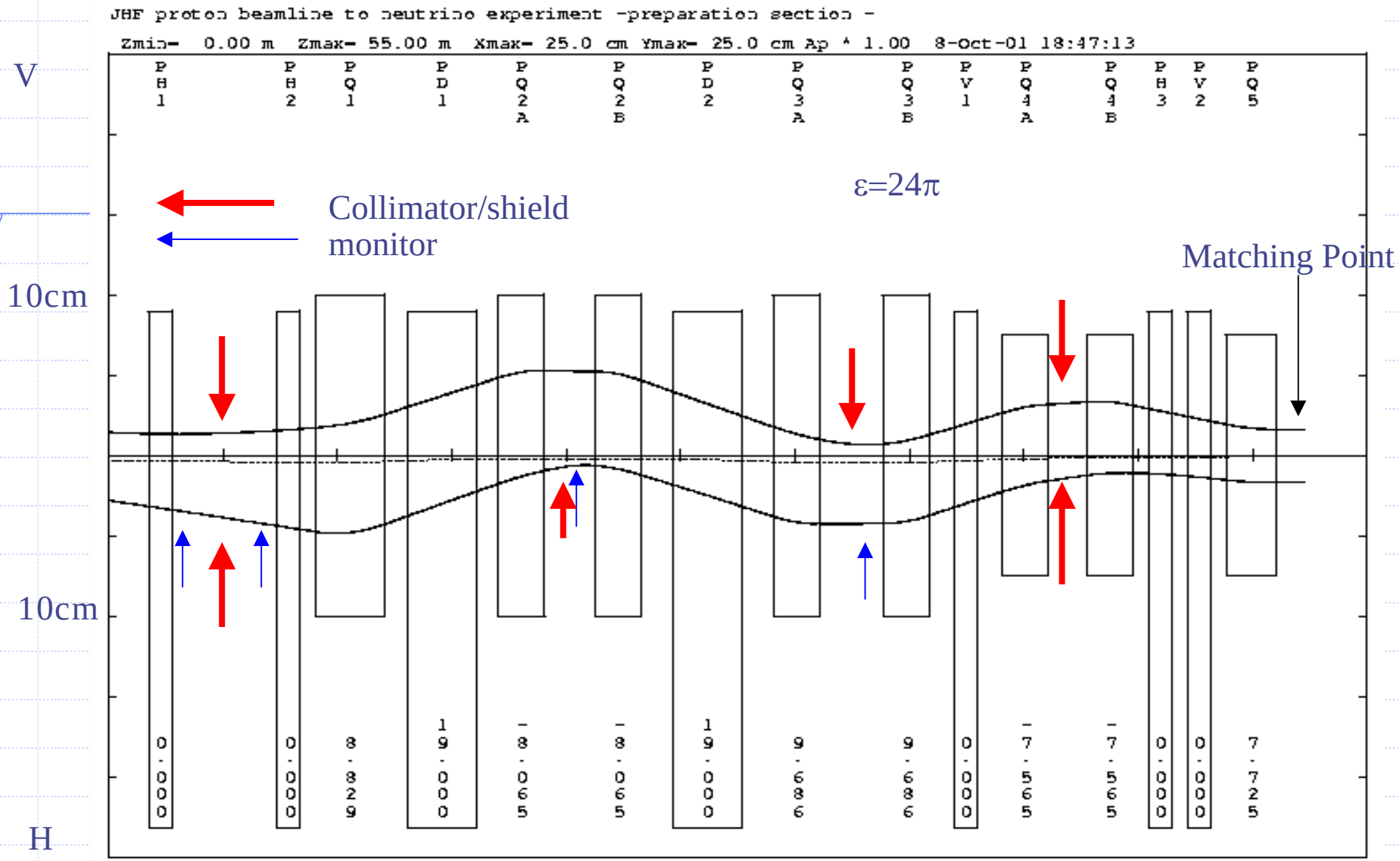
Make the matching with the Arc.



Consists of normal conducting magnets

Total Length : 52.3m → Tight spacing

3.84 degrees bending

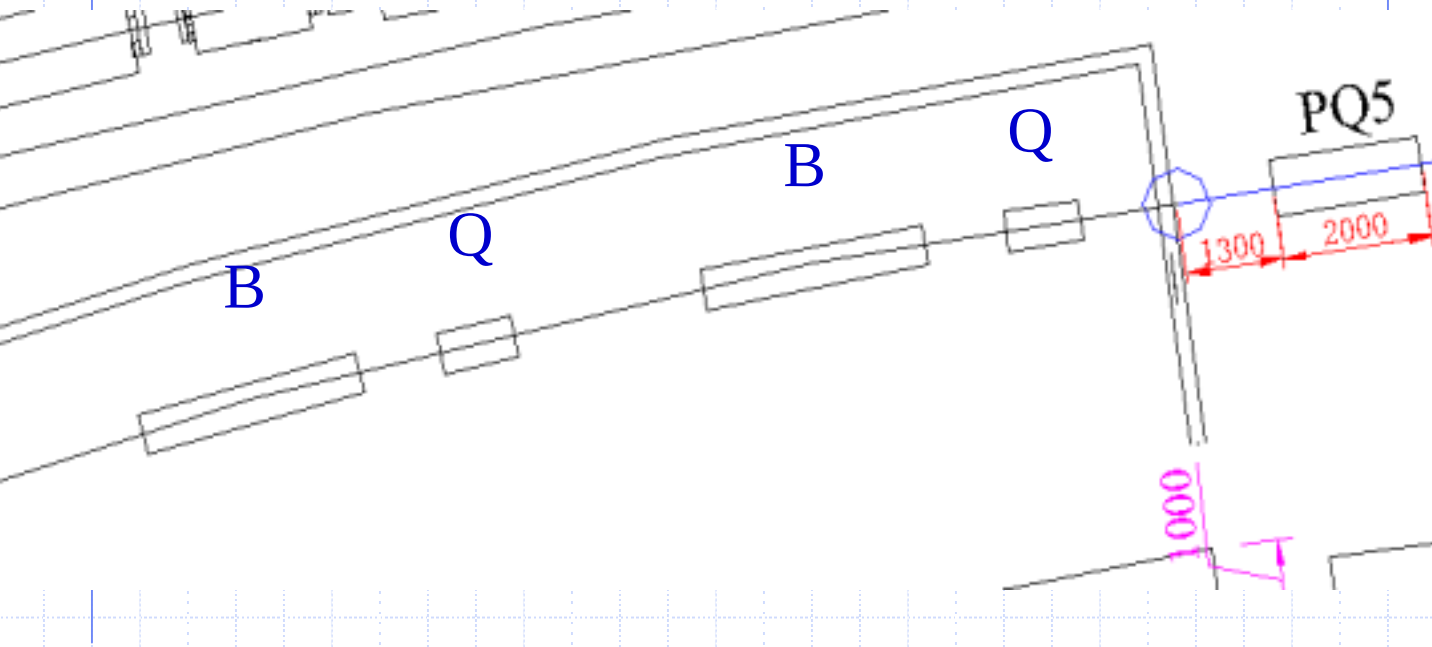


Acceptance : **60π** mm.mrad (cf Acc. design = 6π mm.mr)

Waist mode & normal mode.

Arc

FODO lattice.×10, about 80 degrees bending



Bends by **3m long 4 Tesla superconducting magnet**.

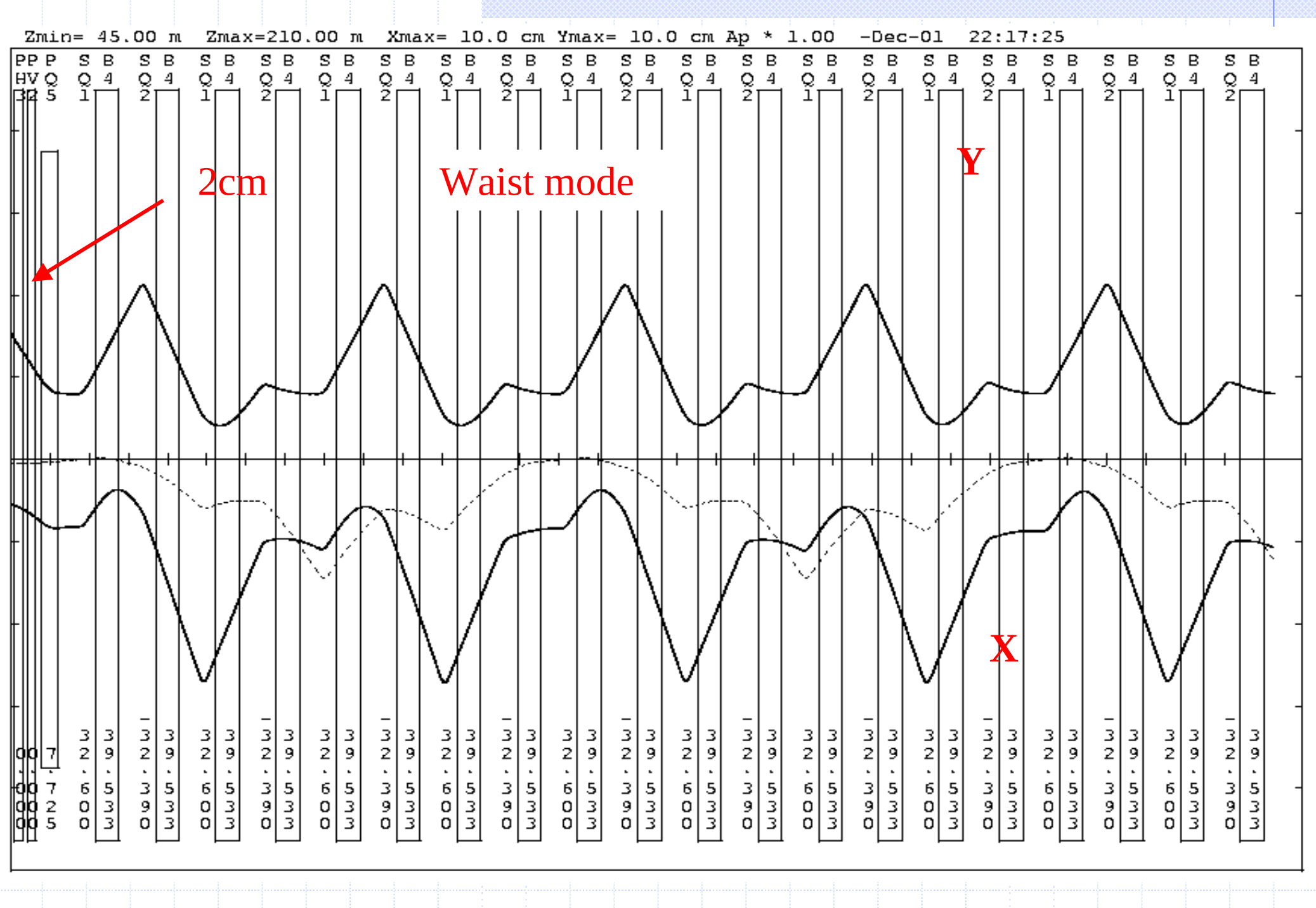
(about 4 Tesla)

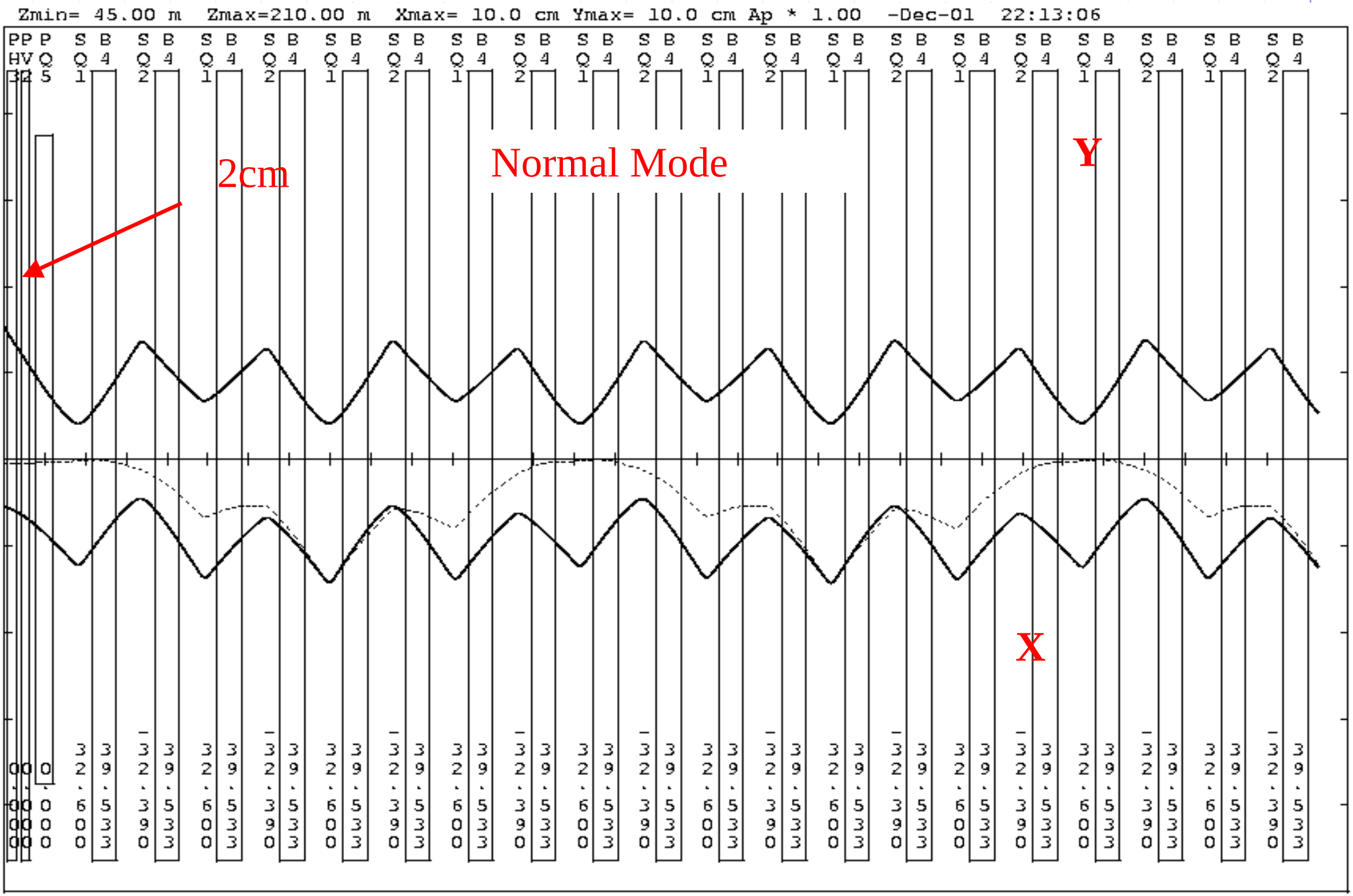
+ 1m long Quad-superconducting magnet.

Bore : 180mmϕ or 220mmϕ

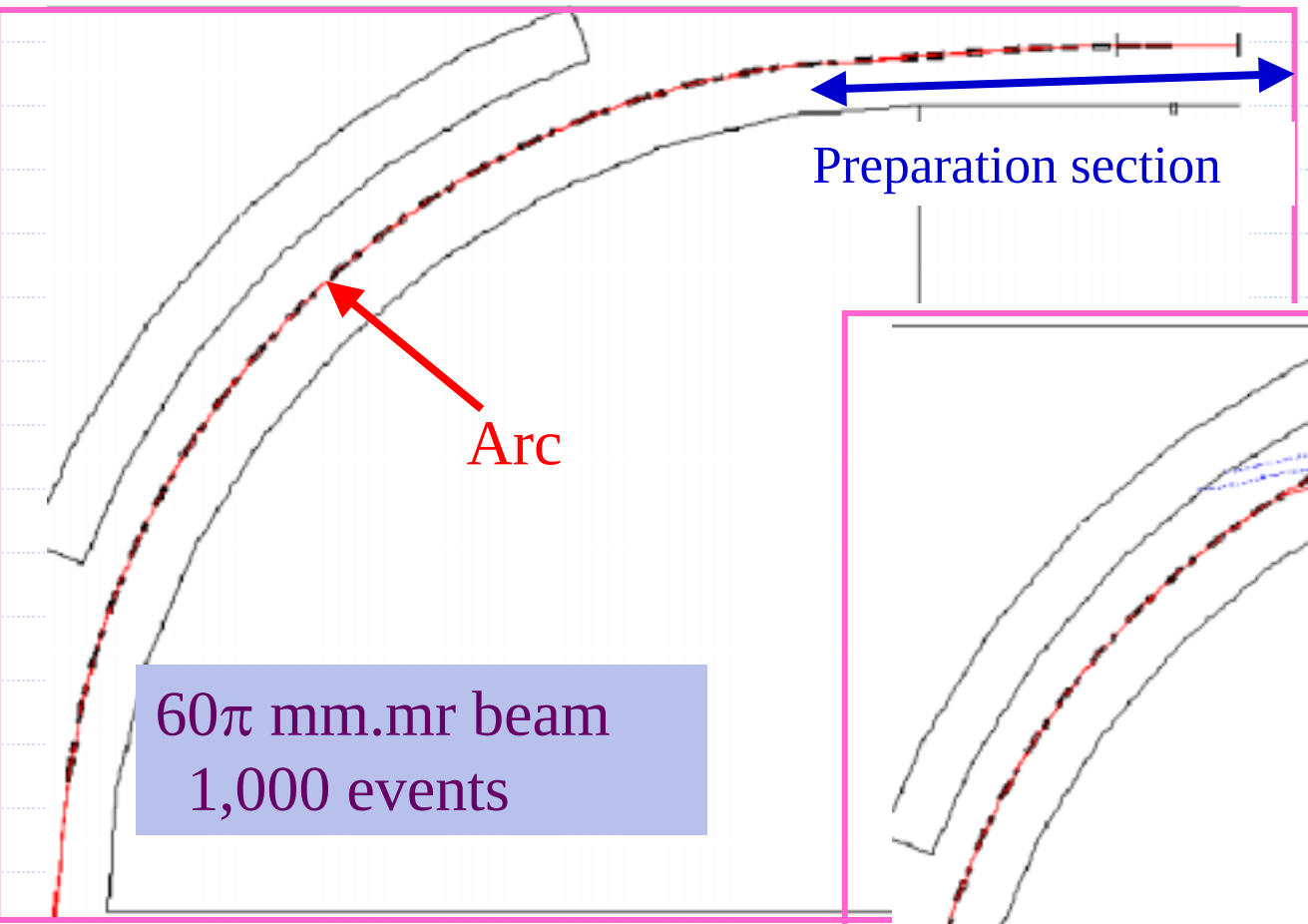
To prevent the quenching,

the beam size and halo should be small.


Zmin= 45.00 m Zmax=210.00 m Xmax= 10.0 cm Ymax= 10.0 cm Ap * 1.00 -Dec-01 22:17:25
2cm
Waist mode
Y
X


Zmin= 45.00 m Zmax=210.00 m Xmax= 10.0 cm Ymax= 10.0 cm Ap * 1.00 -Dec-01 22:13:06
2cm
Normal Mode
Y
X

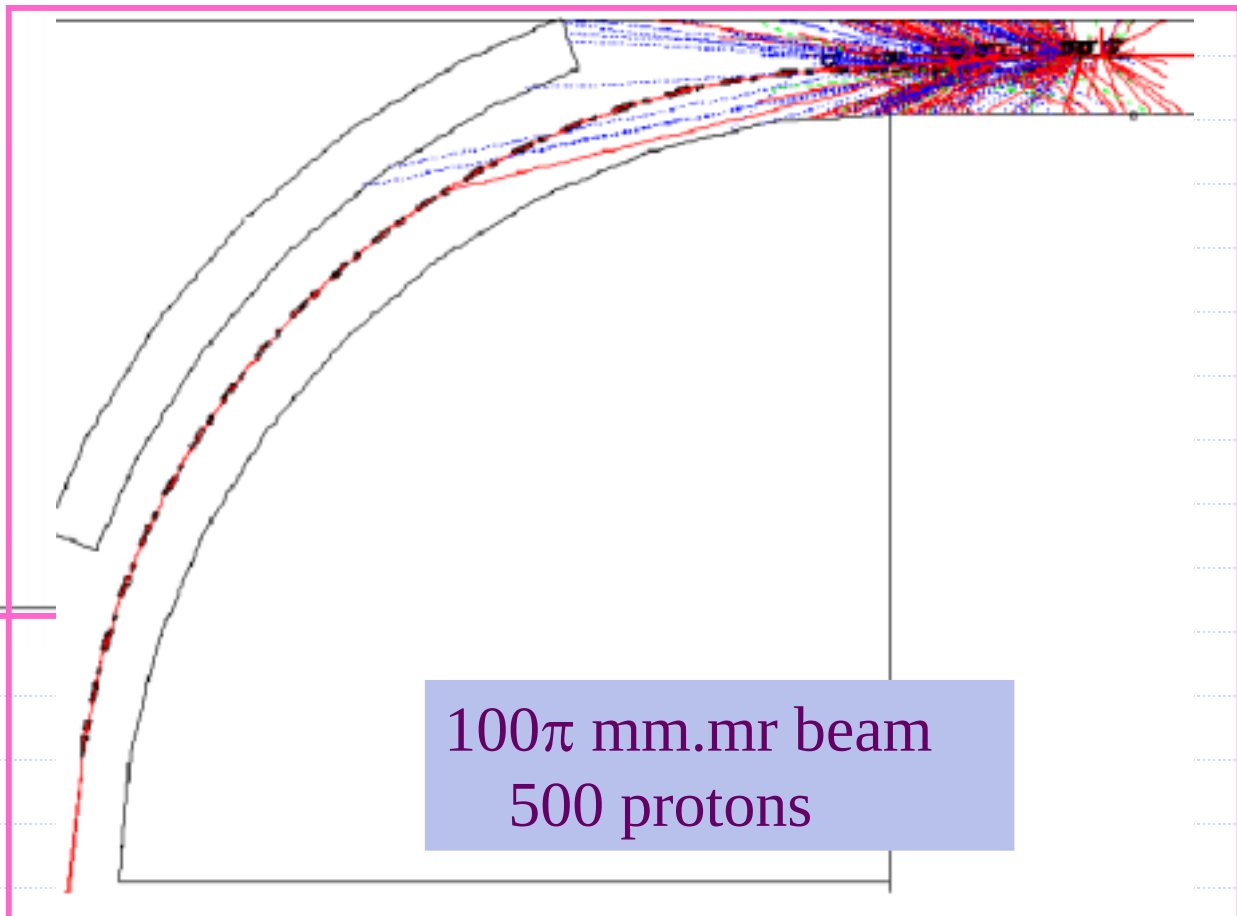
Beam halo study using Geant



Magnet geometry and field are set via data file.

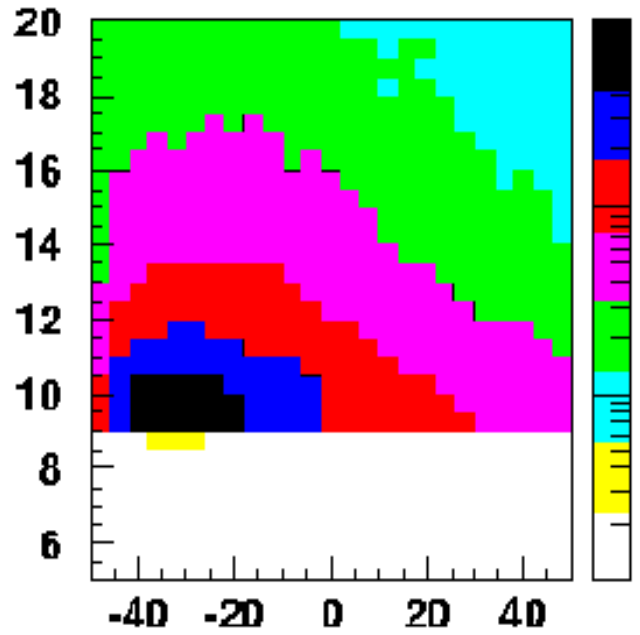
→applicable to different beamlines.

60π mm.mr beam
1,000 events

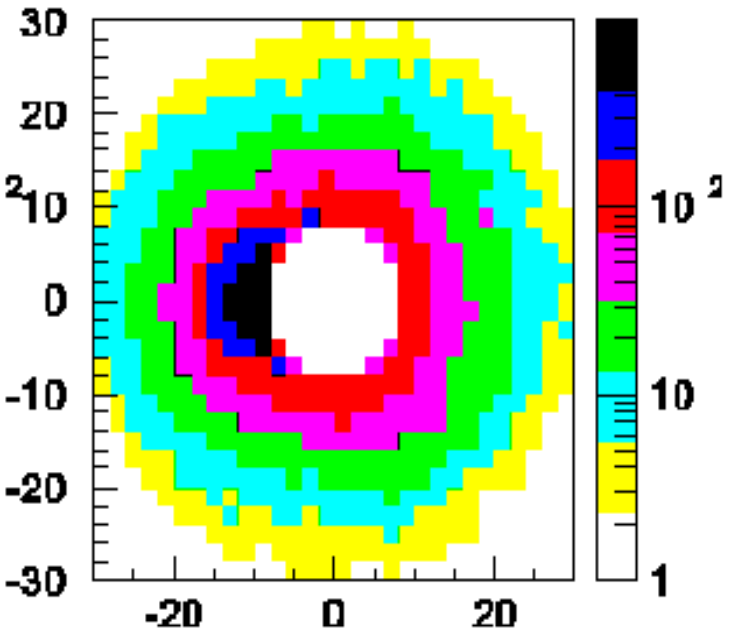


100π mm.mr beam
500 protons

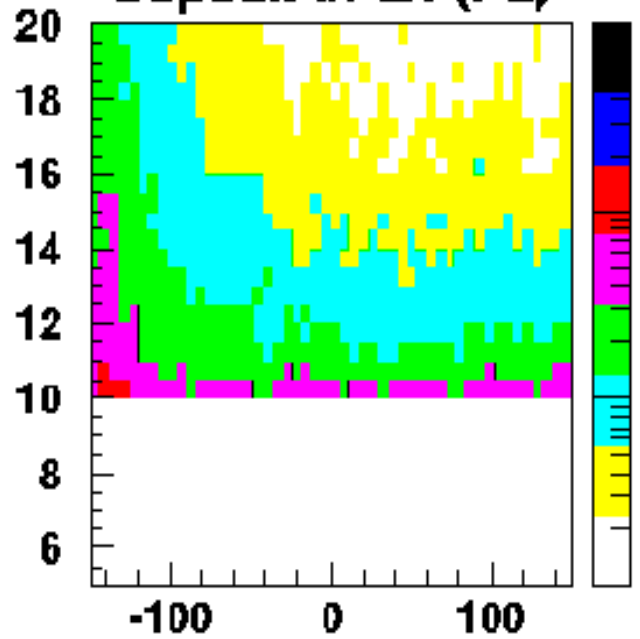
Section1



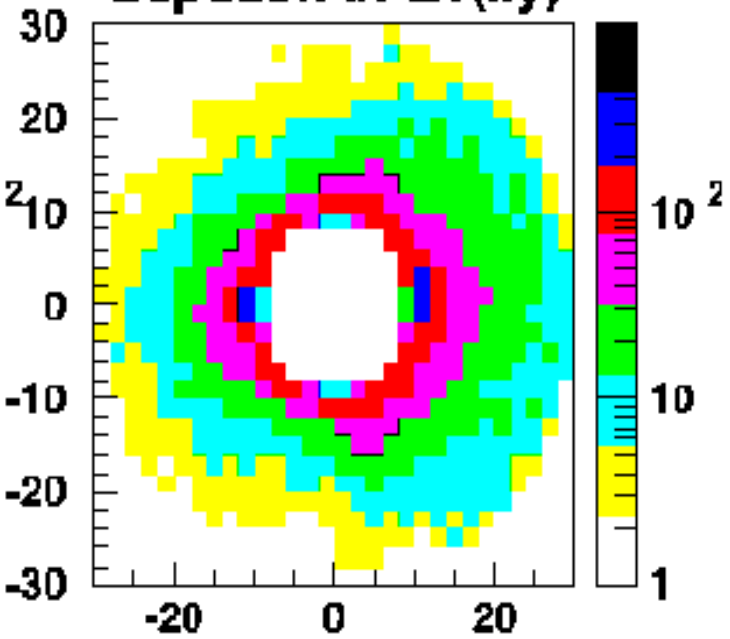
Deposit in Q1 (r-z)



Deposint in Q1(xy)

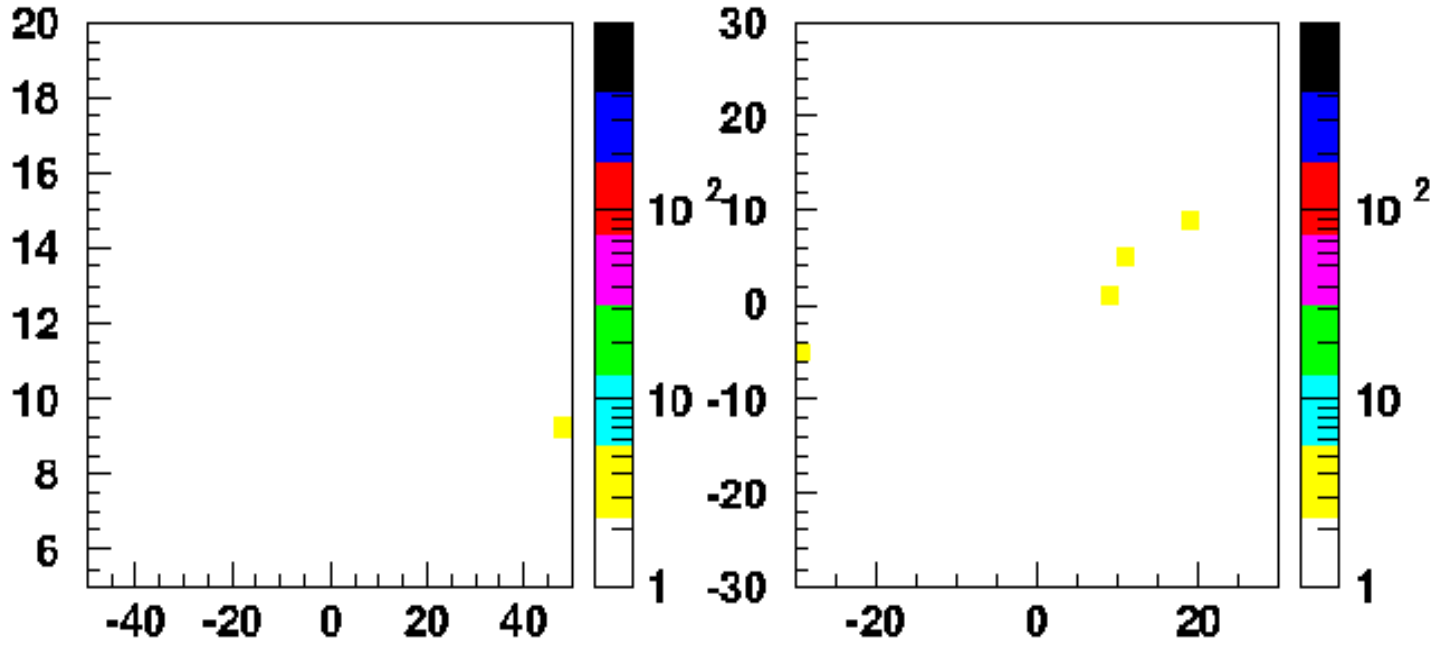


Deposit in SB (r-z)



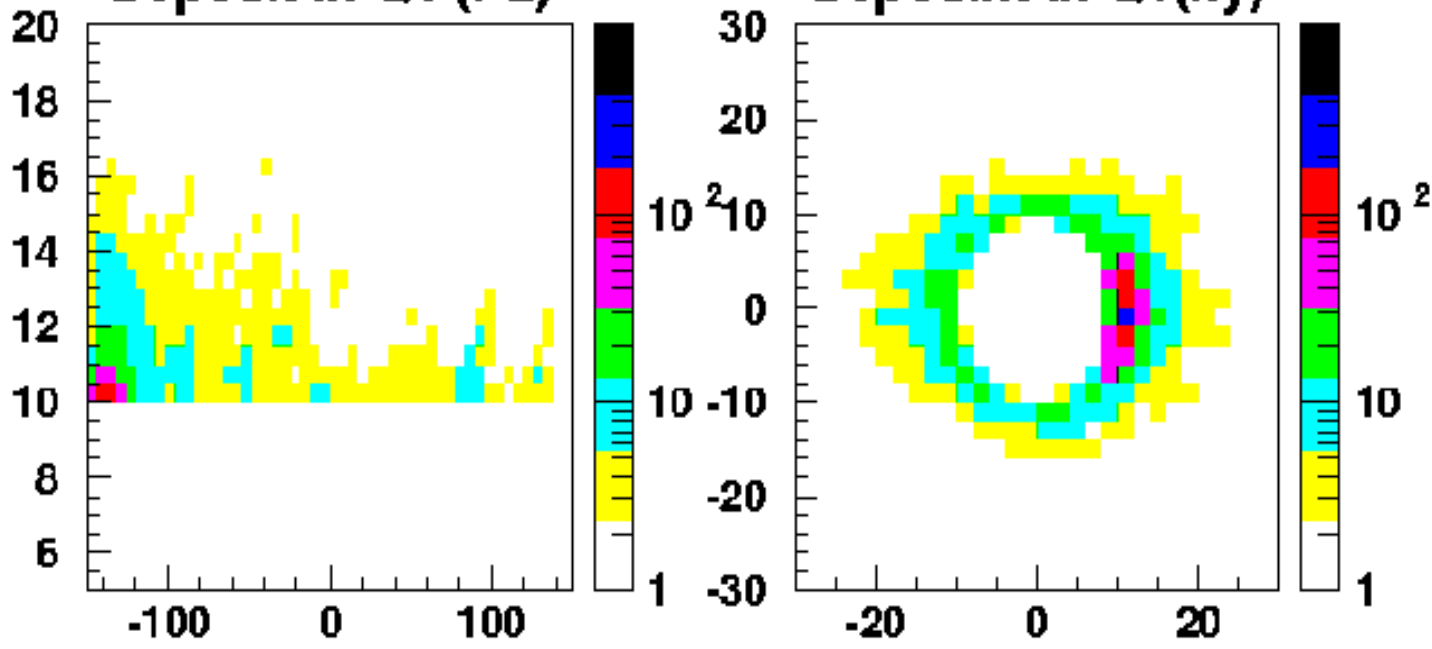
Deposint in SB (xy)

Section10



Deposit in Q1 (r-z)

Deposint in Q1(xy)



Deposit in SB (r-z)

Deposint in SB (xy)

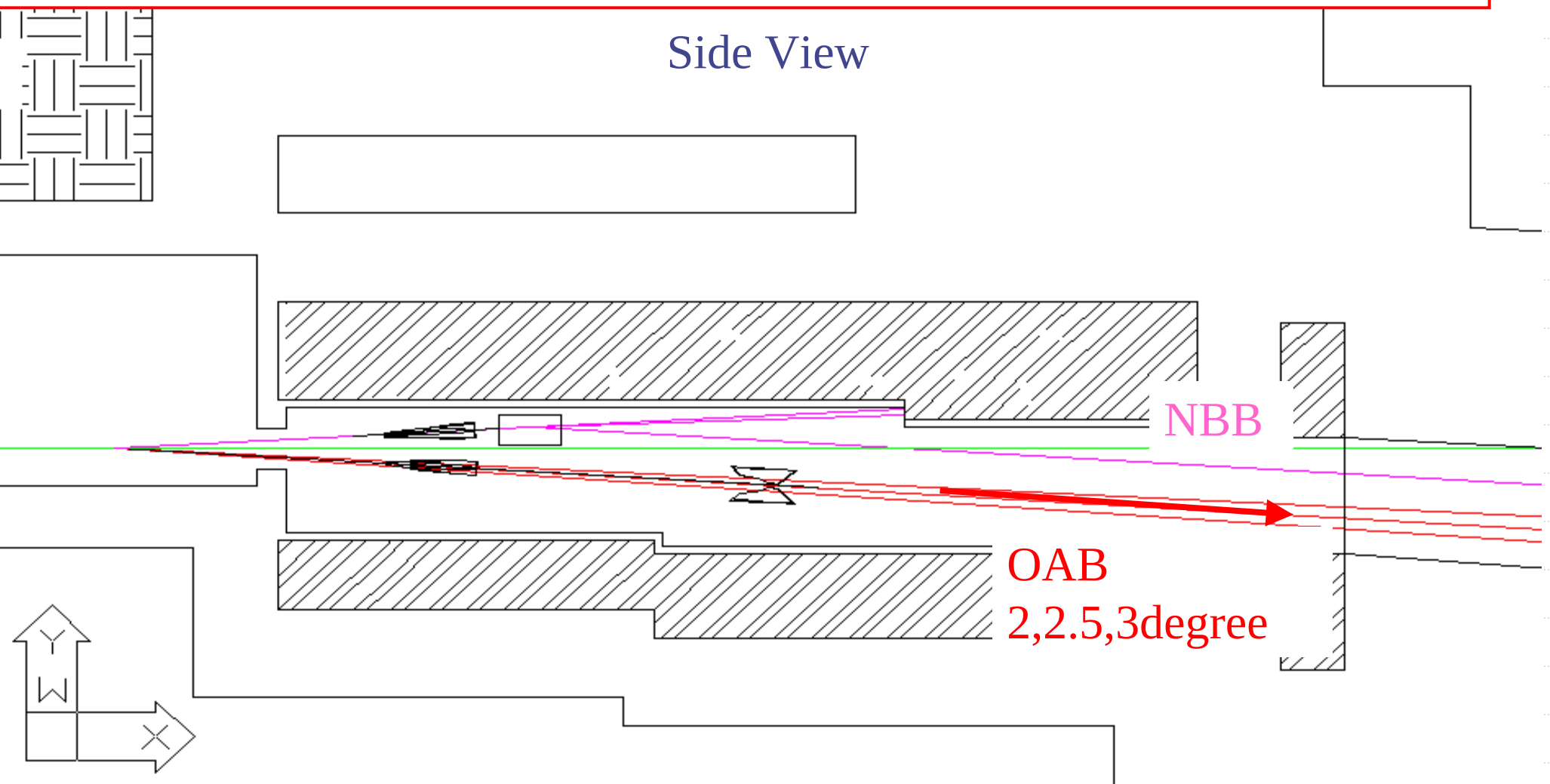
Target Station

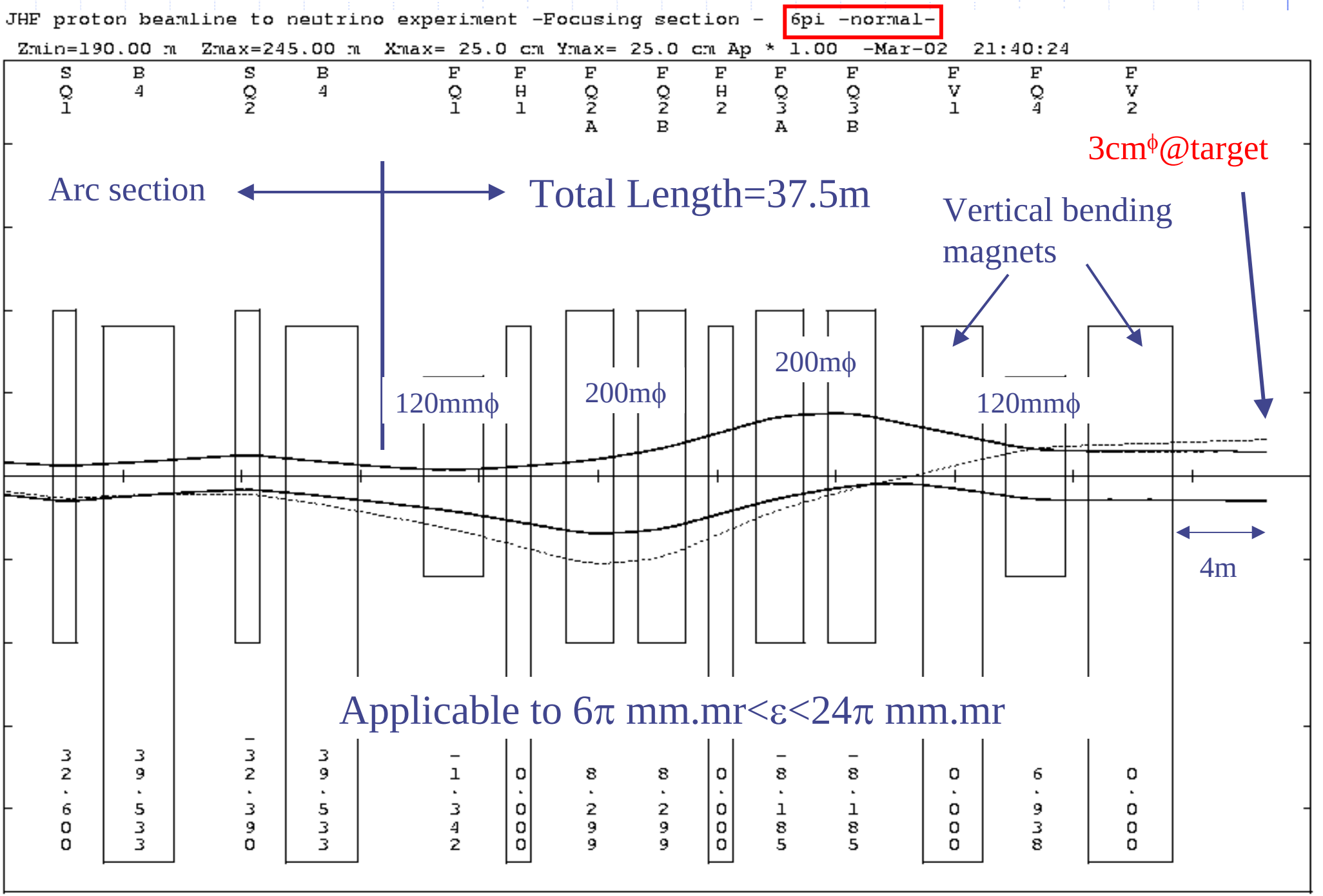
Off Axis Beam

Plan to change the axis by moving horns or w/ dipole after horns.

NBB for ν-interaction study : 6 degrees momentum selection

Side View




JHF proton beamline to neutrino experiment -Focusing section - 6pi -normal-
Zmin=190.00 m Zmax=245.00 m Xmax= 25.0 cm Ymax= 25.0 cm Ap * 1.00 -Mar-02 21:40:24
SQ1 B4 SQ2 B4 FQ1 FH1 FQ2A FQ2B FH2 FQ3A FQ3B FV1 FQ4 FV2
3cmϕ@target
Arc section
Total Length=37.5m
Vertical bending magnets
120mmϕ
200mϕ
200mϕ
120mmϕ
4m
Applicable to 6π mm.mr<ε<24π mm.mr

Summary

JHF will produce
about 0.75 MW 50 GeV proton beam.

Primary proton beam will be bent 80 degrees and transported to the target through super-conducting magnets.

Optics design was done to get
the beam size as small as possible.

Preparation & Arc :
Start MC study to scrape halo w/ collimators.

Focusing section & Target station

Changeable OAB & Limited NBB

3cmϕ at the target.