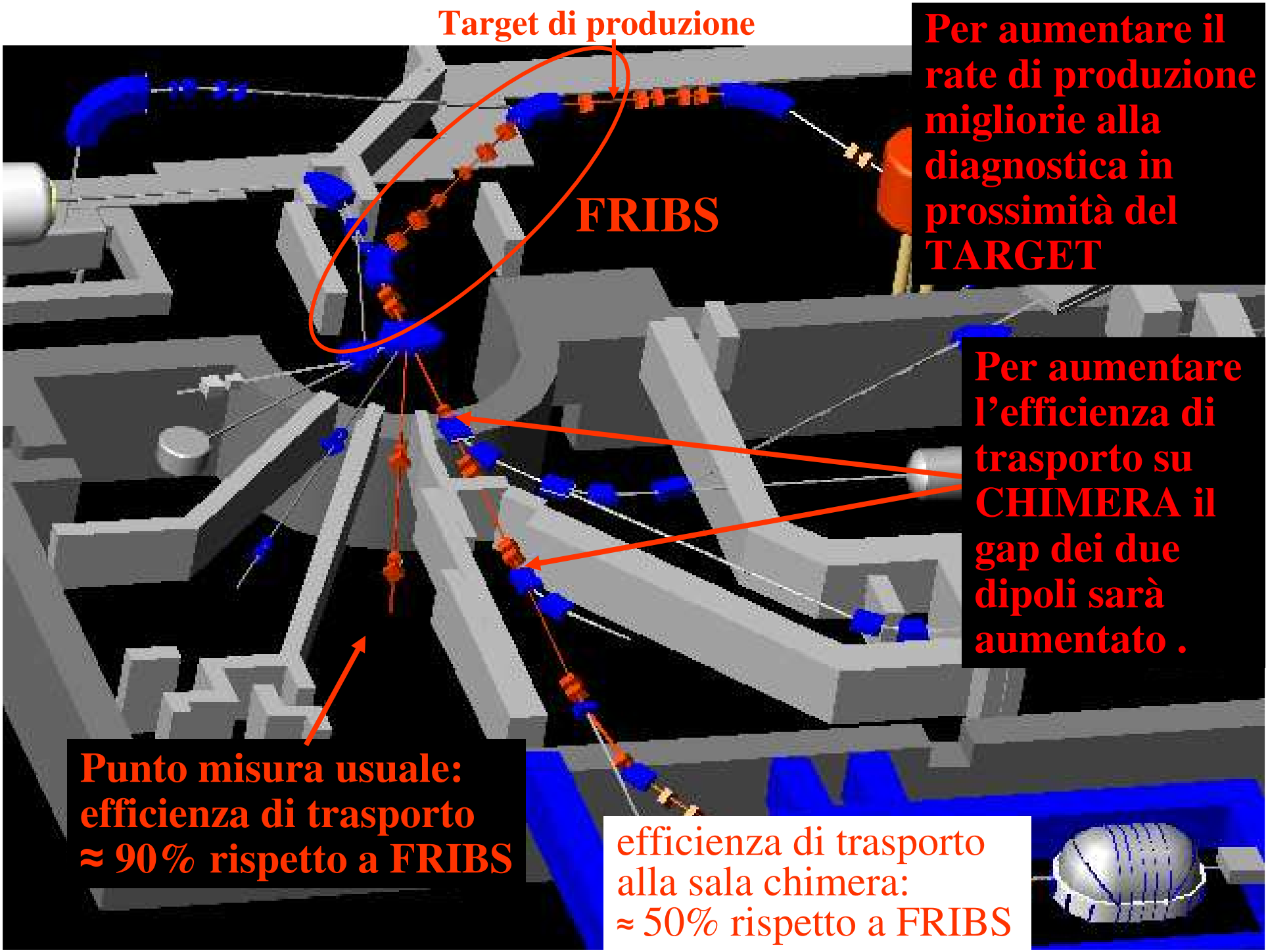
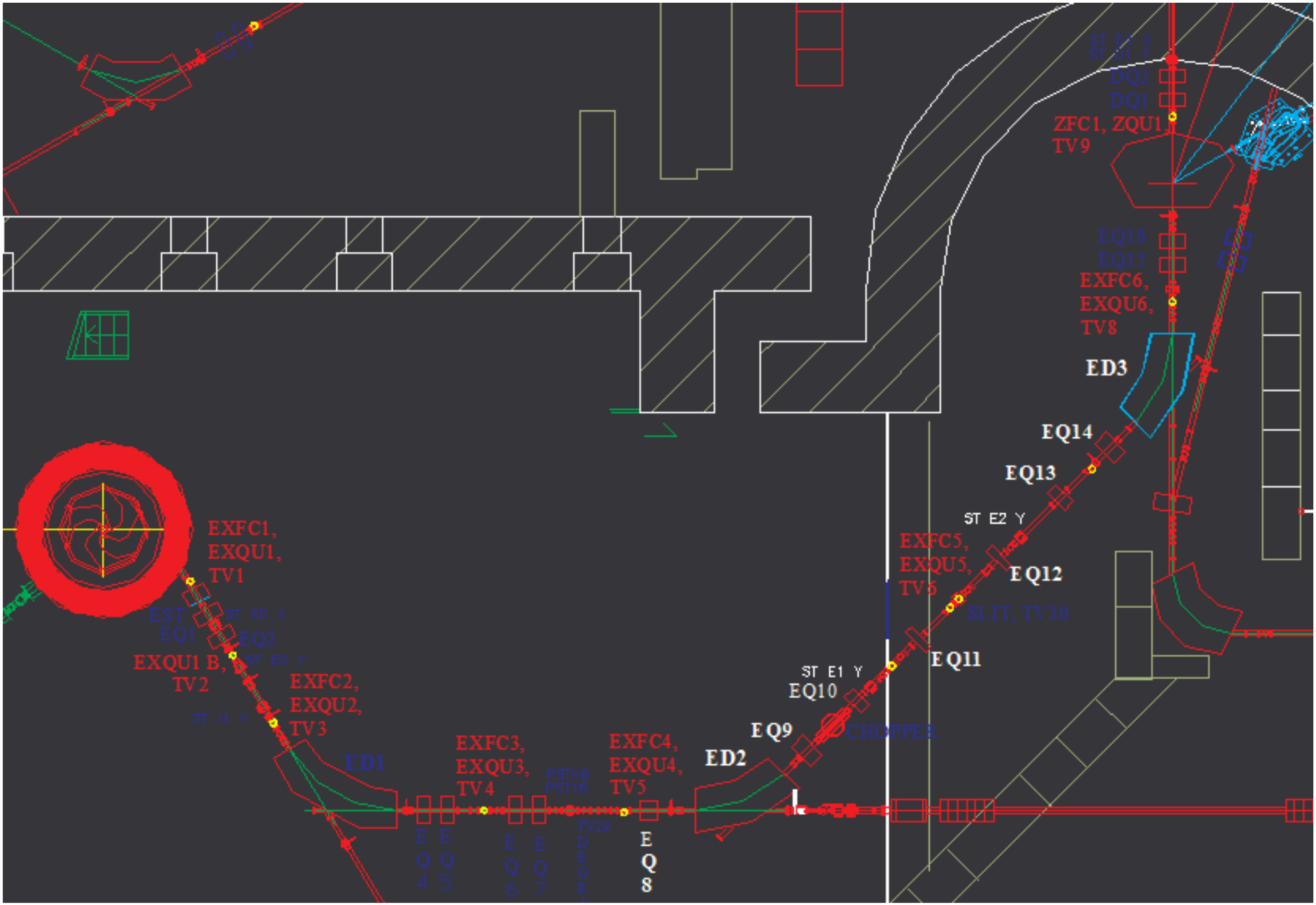

Target di produzione
FRIBS
Per aumentare il rate di produzione migliorie alla diagnostica in prossimità del TARGET
Per aumentare l'efficienza di trasporto su CHIMERA il gap dei due dipoli sarà aumentato .
Punto misura usuale: efficienza di trasporto ≈ 90% rispetto a FRIBS
efficienza di trasporto alla sala chimera: ≈ 50% rispetto a FRIBS

The extraction beam line Today



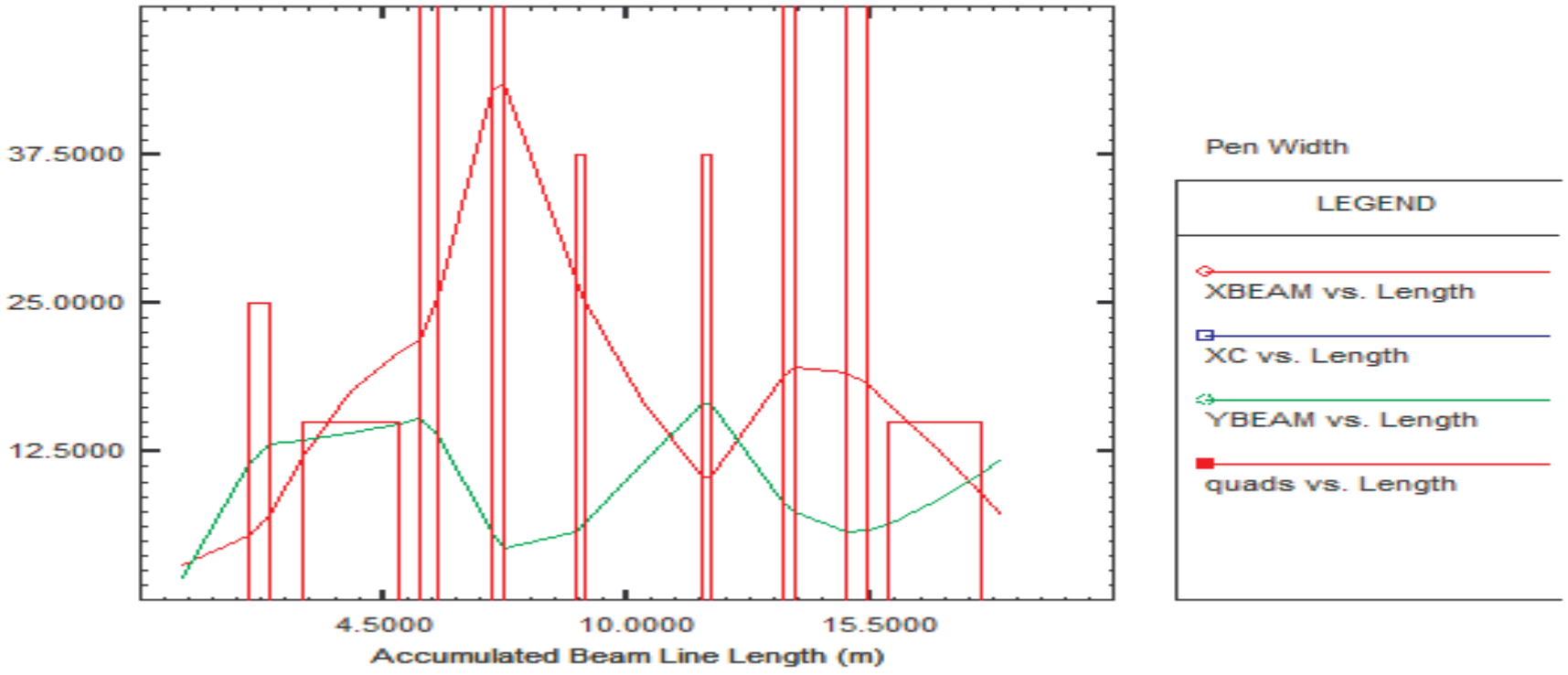
1° order beam envelope

X_i= +/-3 mm θ_i= +/- 3 mrad

Y_i= +/-2 mm ϕ_i= +/- 7.5 mrad

$\Delta P/P$= +/- 0.5%

Goal of beam line Design 20 years ago:
Achromatic or highly dispersive



Present beam line

2° order beam envelope

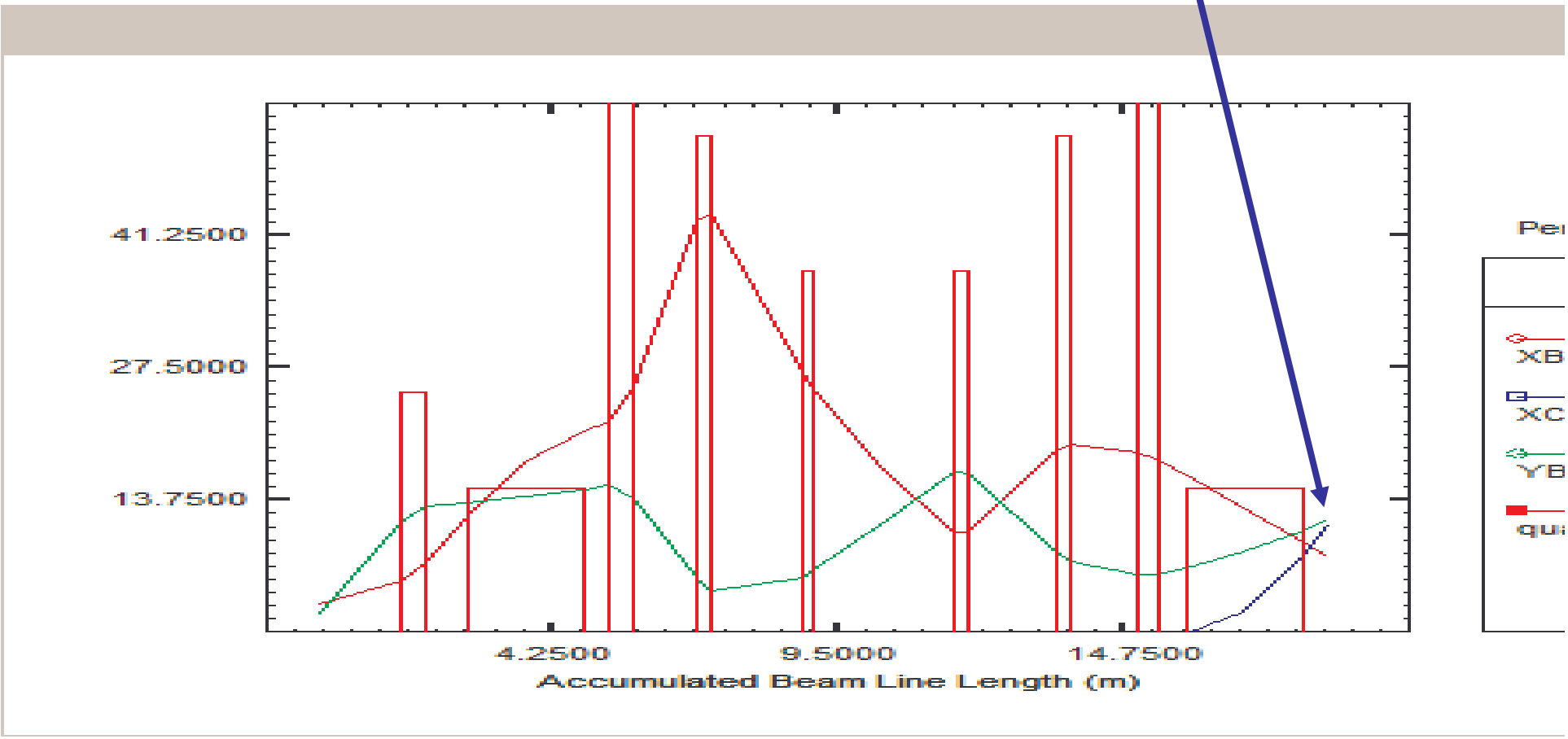
X_i= +/-3 mm θ_i= +/- 3 mrad

Y_i= +/-2 mm ϕ_i= +/- 7.5 mrad

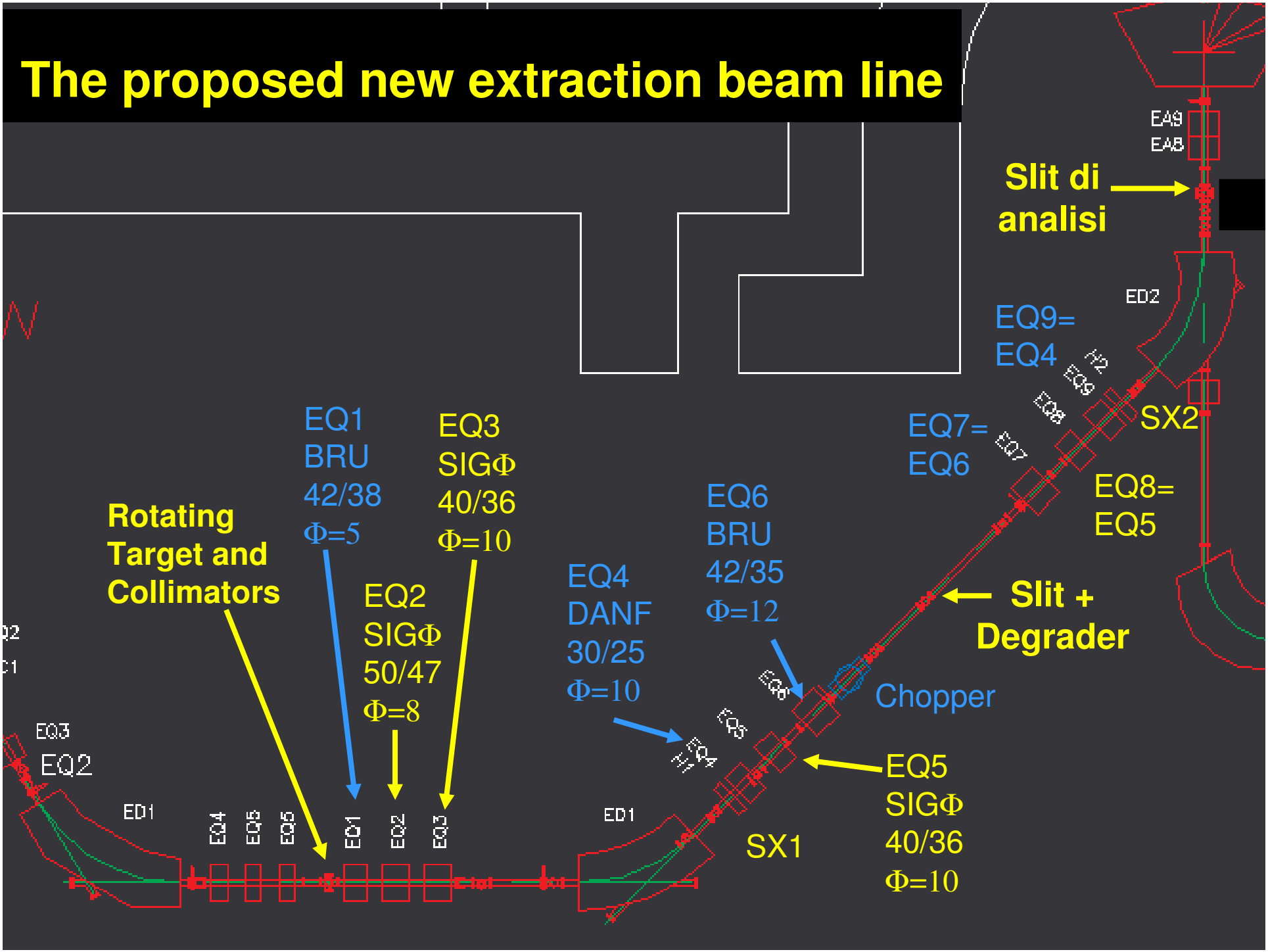
$\Delta P/P$= +/- 0.5%

The blue line shows the position shift for a particle with a **$\Delta P/P$= 1%!**

At this position the selection slits should be able to select particle with momentum difference higher than 1.5%



The proposed new extraction beam line

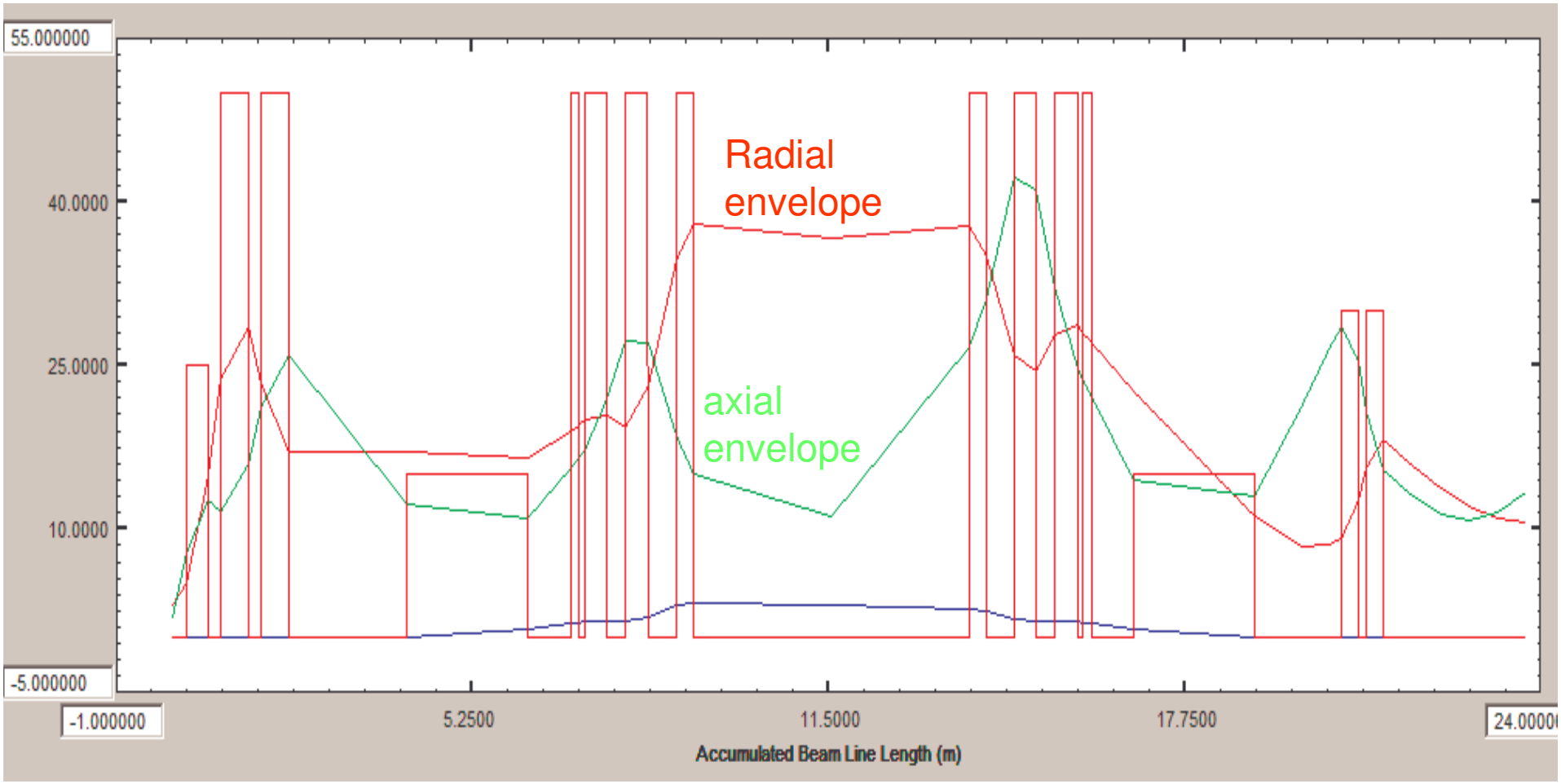


2° order beam envelope

X_i= +/-3 mm θ_i= +/- 16 mrad (+/- 1°)

Y_i= +/-2 mm ϕ_i= +/- 30 mrad (+/- 2°)

$\Delta P/P$= +/- 1%



Present Beam Line

2° order beam envelope

X_i= +/-3 mm θ_i= +/- 3 mrad (+/- 1°)

Y_i= +/-2 mm ϕ_i= +/- 7.5 mrad (+/- 2°)

$\Delta P/P$= +/- 0.5%

New Beam Line

2° order beam envelope

X_i= +/-3 mm θ_i= +/- 16 mrad (+/- 1°)

Y_i= +/-2 mm ϕ_i= +/- 30 mrad (+/- 2°)

$\Delta P/P$= +/- 1%

Expected acceptance increase

5x4x2 40 times

2° order beam envelope

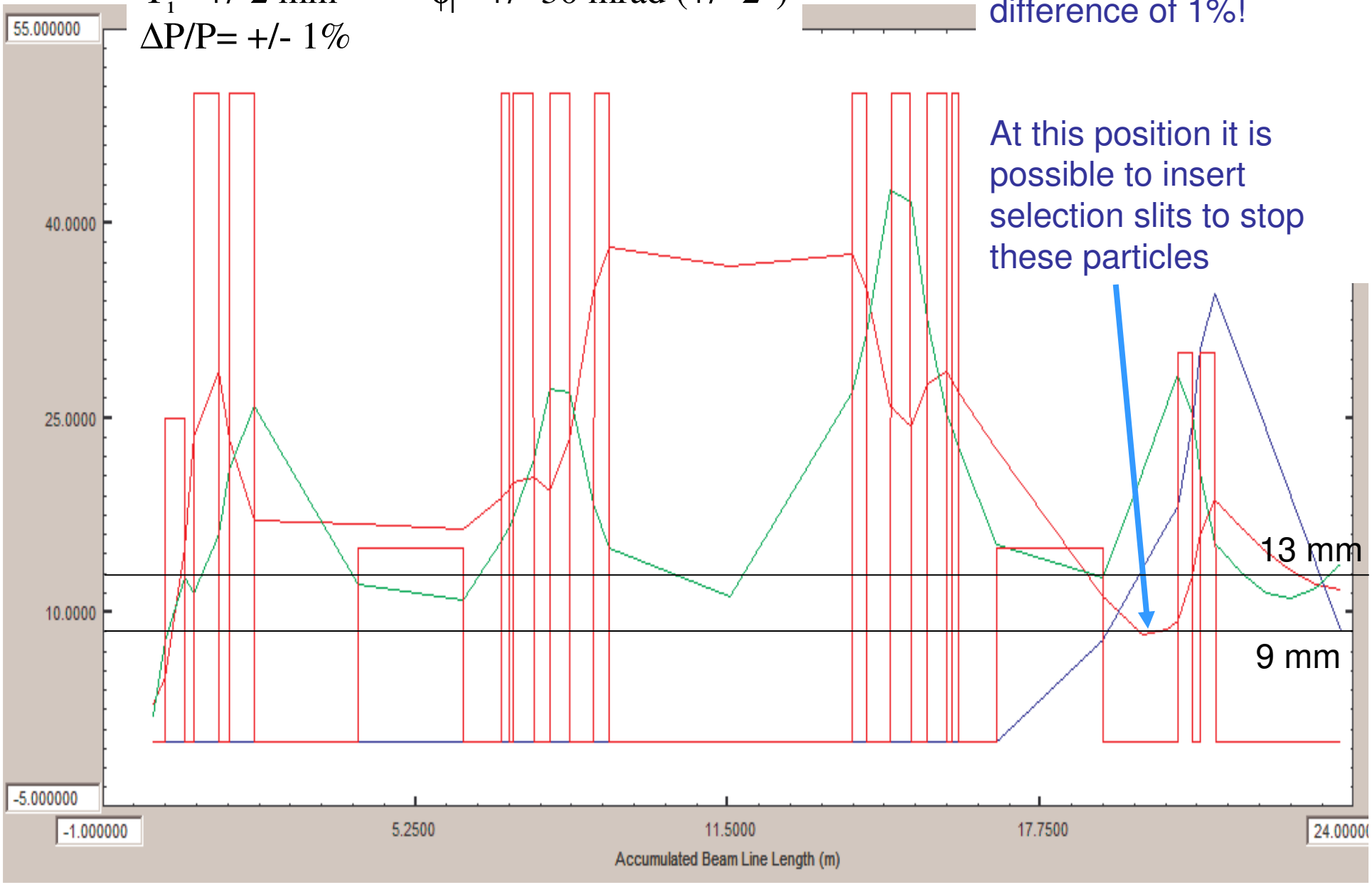
X_i= +/-3 mm θ_i= +/- 16 mrad (+/- 1°)

Y_i= +/-2 mm ϕ_i= +/- 30 mrad (+/- 2°)

$\Delta P/P$= +/- 1%

The blue line shows the position shift for particles with a momentum difference of 1%!

At this position it is possible to insert selection slits to stop these particles



2° order beam envelope

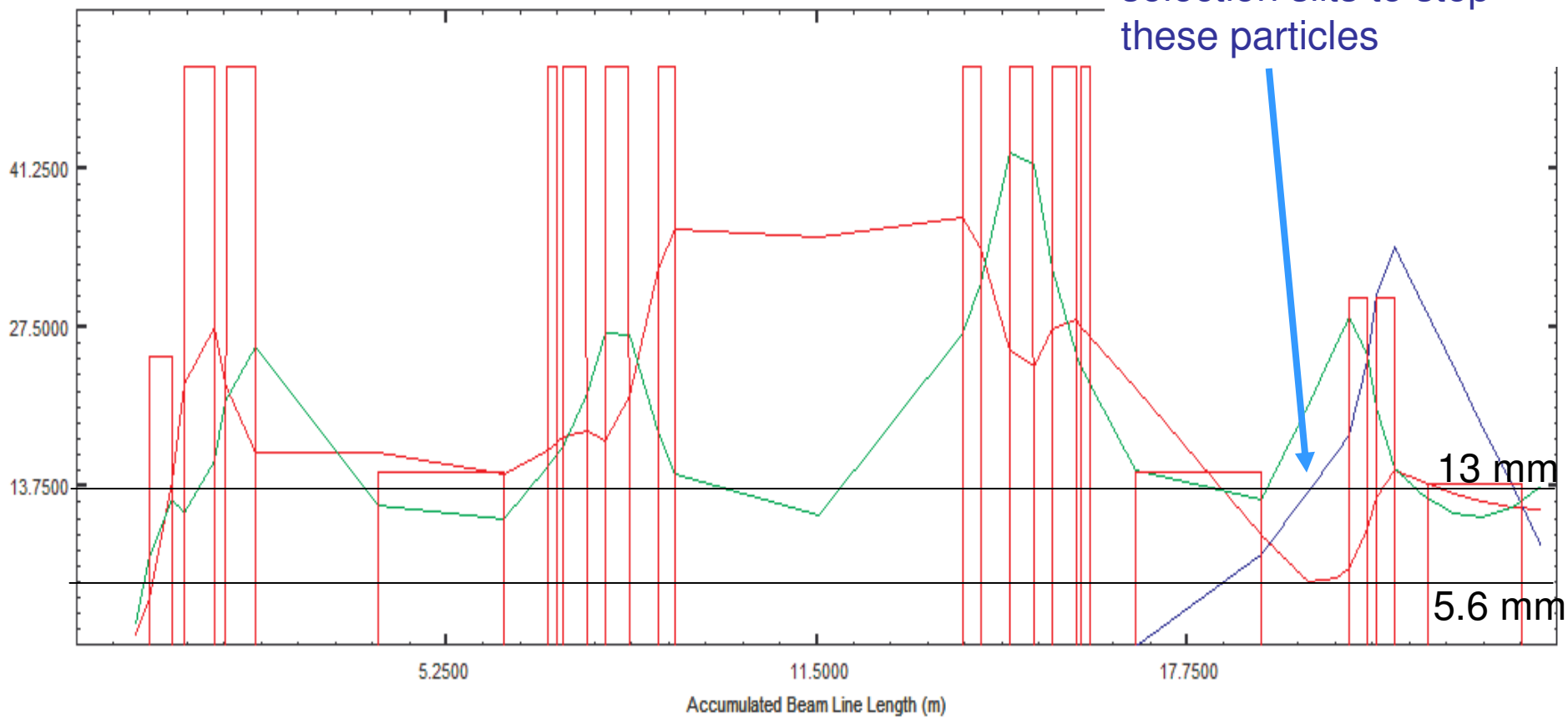
X_i= +/-1 mm θ_i= +/- 16 mrad (+/- 1°)

Y_i= +/-2 mm ϕ_i= +/- 30 mrad (+/- 2°)

$\Delta P/P$= +/- 1%

The blue line shows the position shift for a particle with a momentuum difference of 1%!

At this position it is possible to insert selection slits to stop these particles



2° order beam envelope

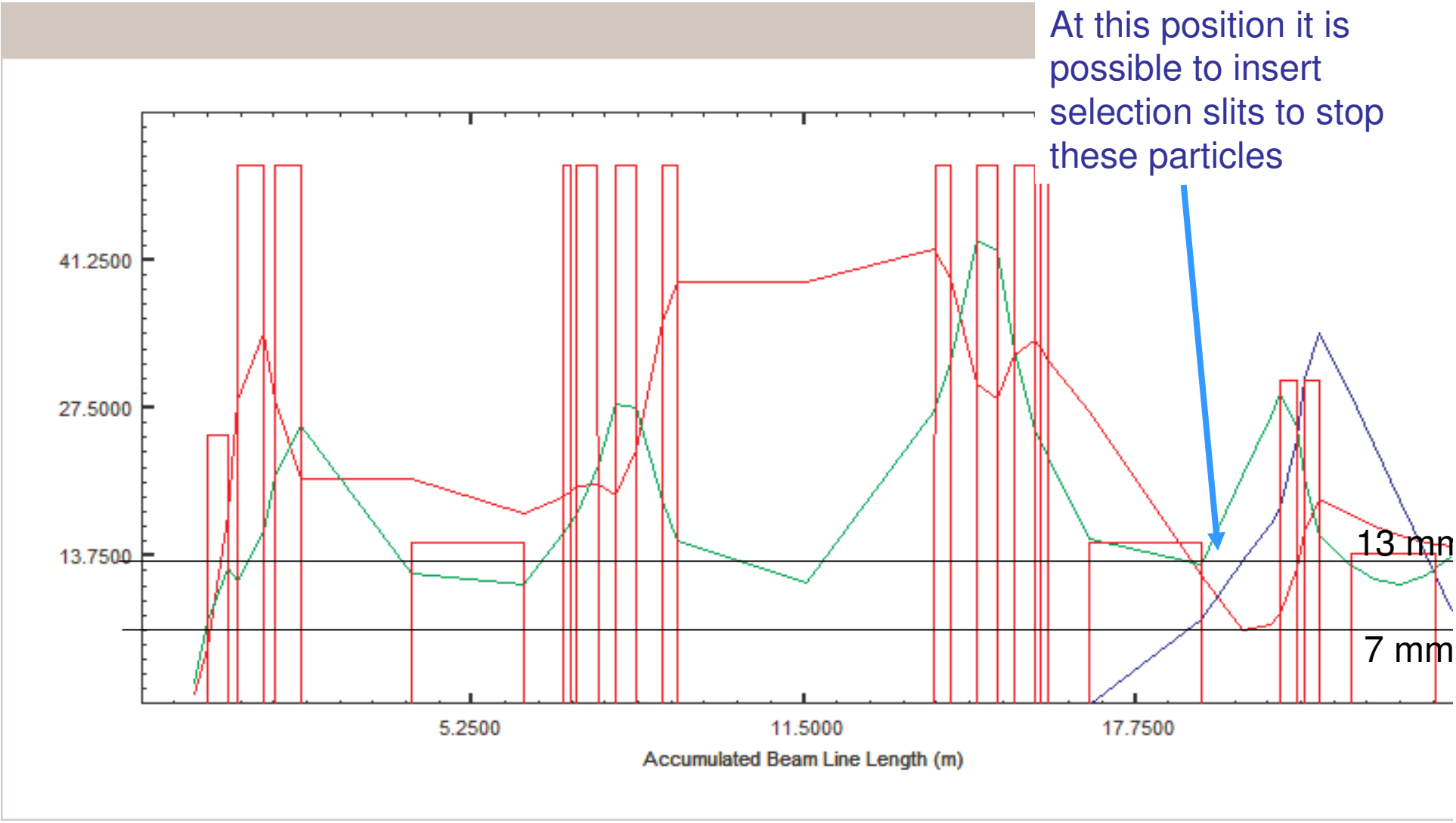
X_i= +/-1 mm θ_i= +/- 20 mrad (+/- 1°)

Y_i= +/-2 mm ϕ_i= +/- 30 mrad (+/- 2°)

$\Delta P/P$= +/- 1%

The blue line shows the position shift for a particle with a momentuum difference of 1%!

At this position it is possible to insert selection slits to stop these particles



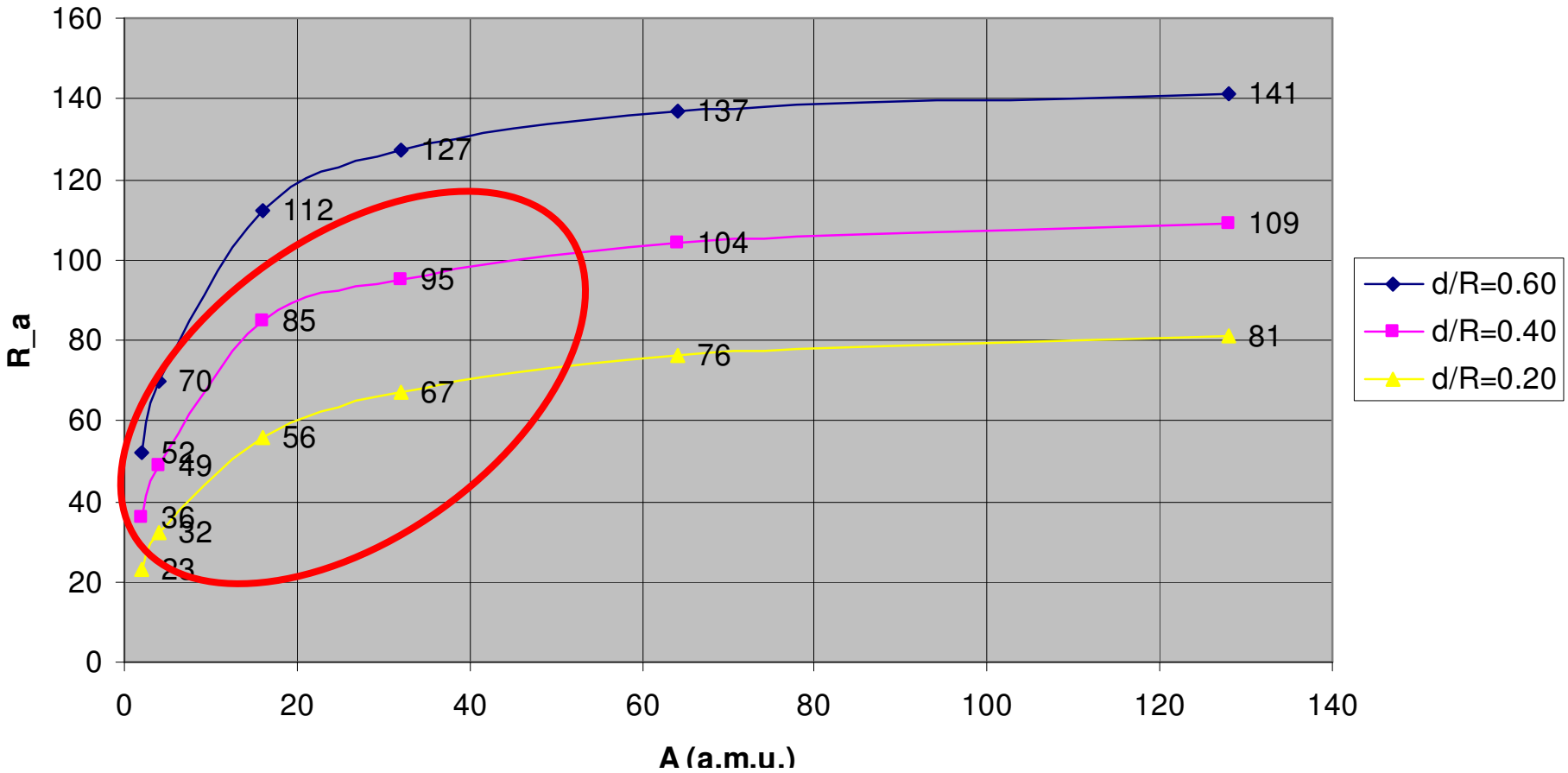
Data achieved by S. Schepounov. Beam spot on the production target

ϕ =2 mm, if ϕ =4 mm (realistic value)

the resolving power values in table have to be divide at least for 2!

But don't forget that also in a well selected mass you may have many ISOBARS!

Mass Resolution of ETNA, aluminium degrader, E=30 Mev/u

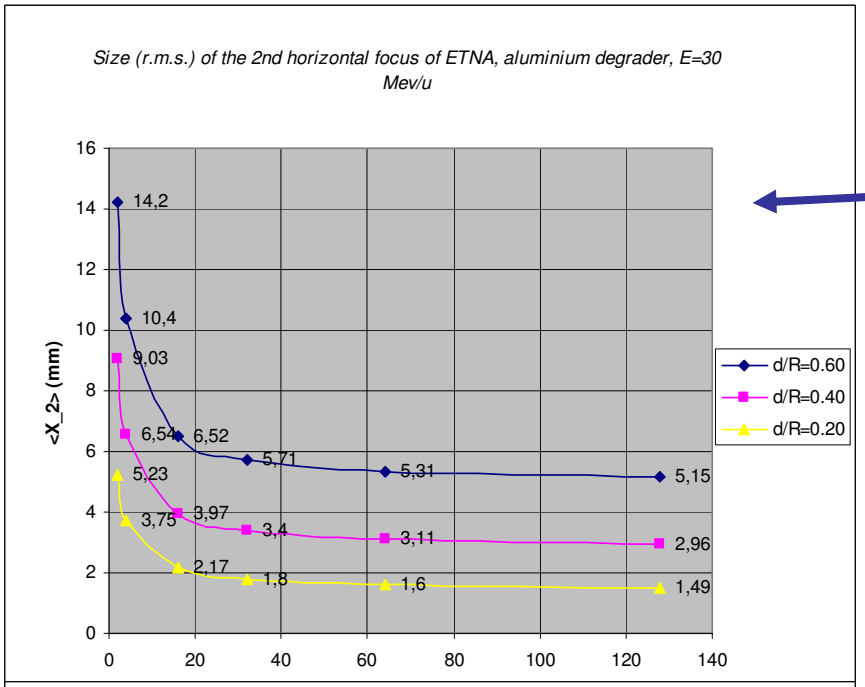


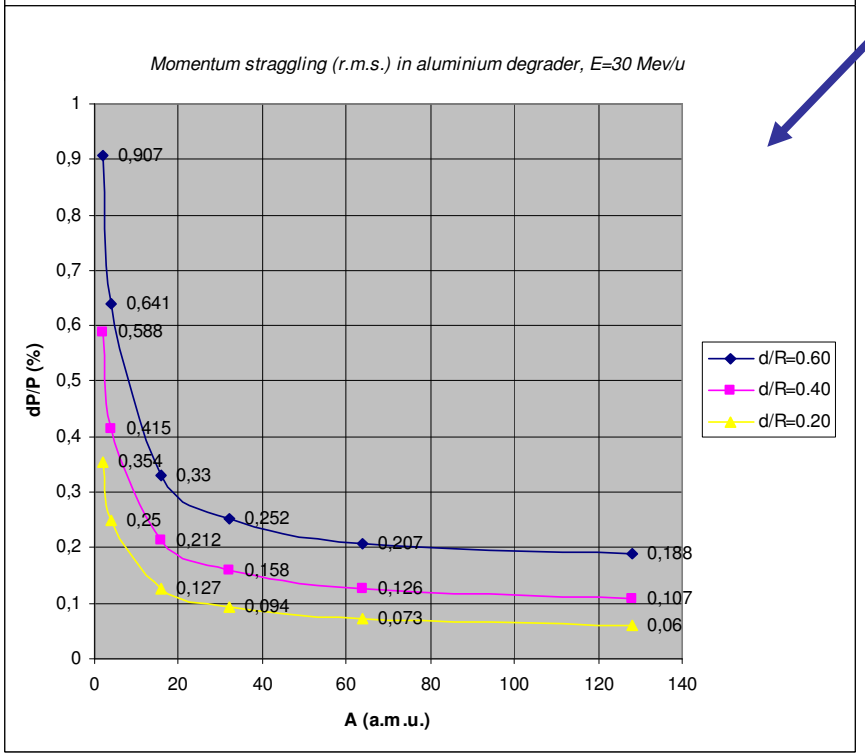
Effects of the degrader on the:

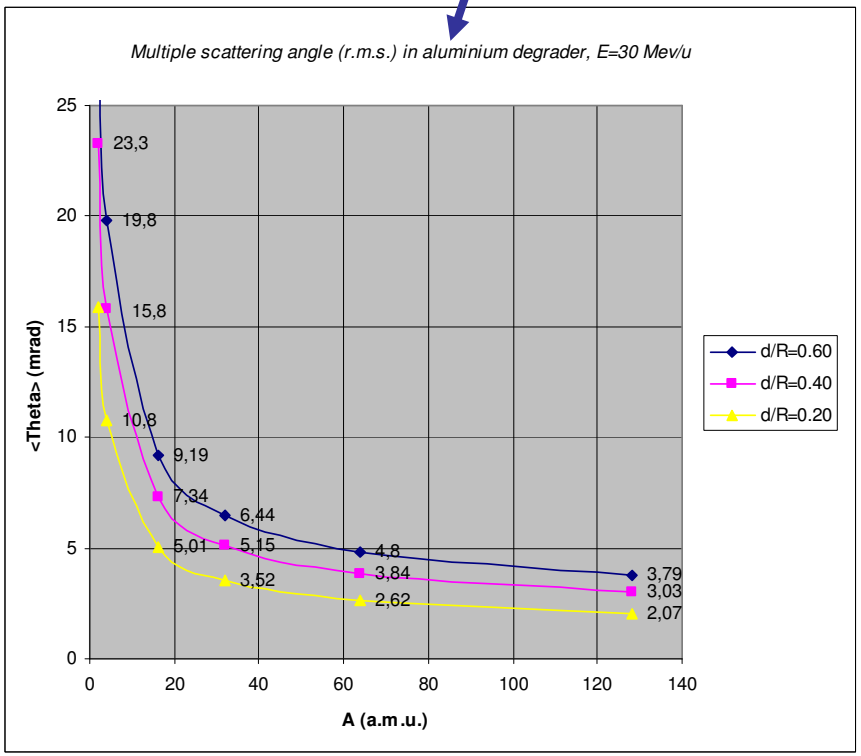
Radial size at the selection slits

Momentum spread

Angular spread







The energy lost across the degrader is proportional to Z^2

if a particle with Z=10 $\Delta E/E=10\%$ $\Delta P/P=5\%$ D/R=20%

for a particle with Z=11 $\Delta E/E12\%$ $\Delta P/P=6\%$

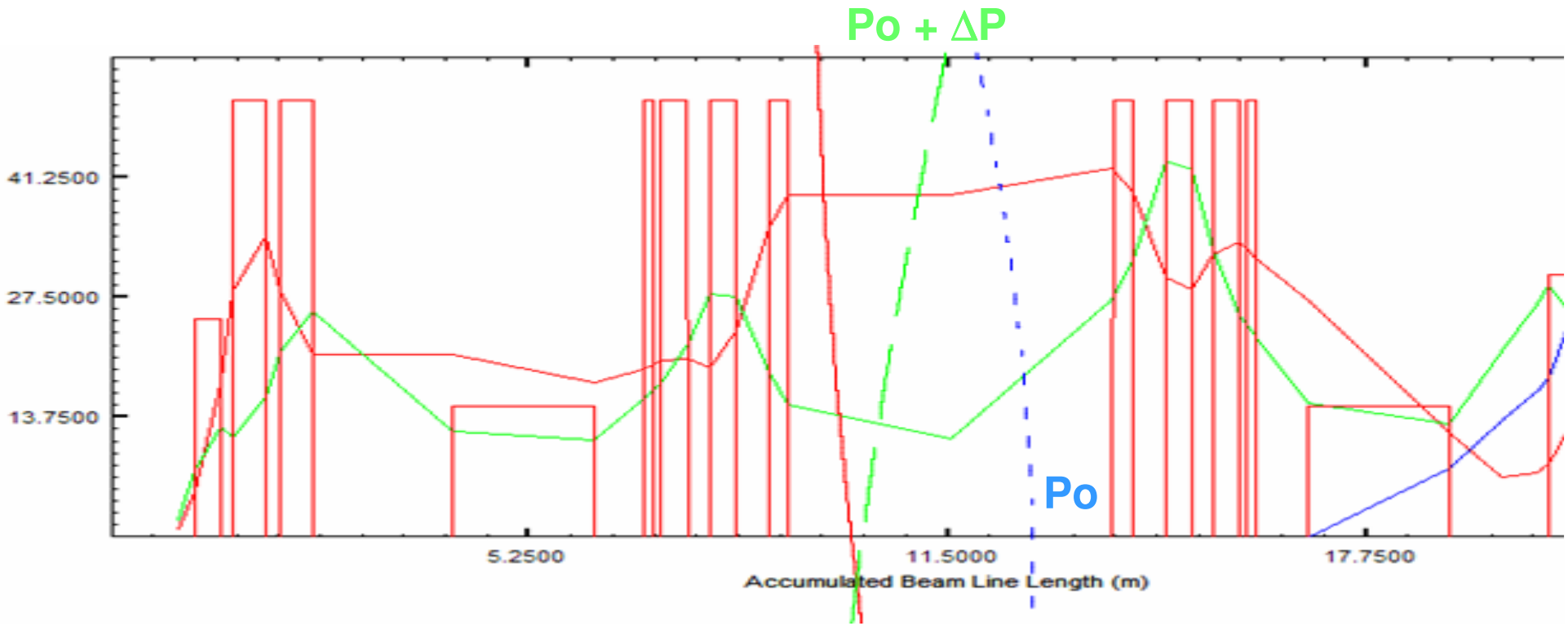
if a particle with Z=20 $\Delta E/E=20\%$ $\Delta P/P=10\%$ D/R=40%

for a particle with Z=21 $\Delta E/E=22\%$ $\Delta P/P=11\%$

E(MeV/A)	Z	Q=Z	Q=Z-1
30	30	80%	20%
35	30	94%	6%
40	30	100%	0%
30	20	100%	0%
20	20	98.3%	1.7%

Z	M	V	BR=MV/q	q=Z
20	20	10	10	
21	21	10	10	
21	20	10.5	10	
21	20	10	9.5	
30	30	10	10	
31	31	10	10	
31	30	10.33	10	
31	30	10	9.67	
29	30	10	10.33	

Gaussian distribution with σ=2%
and shifted of ΔP=+/-3.5%

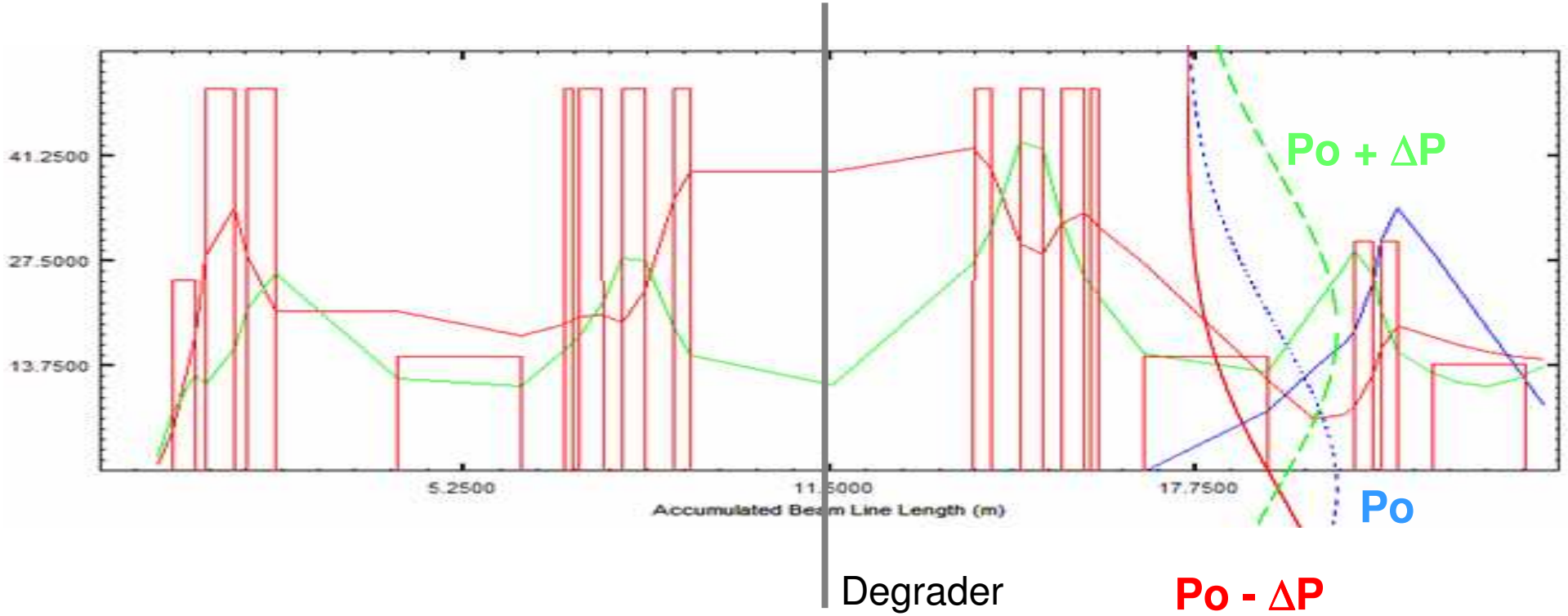


Po - ΔP

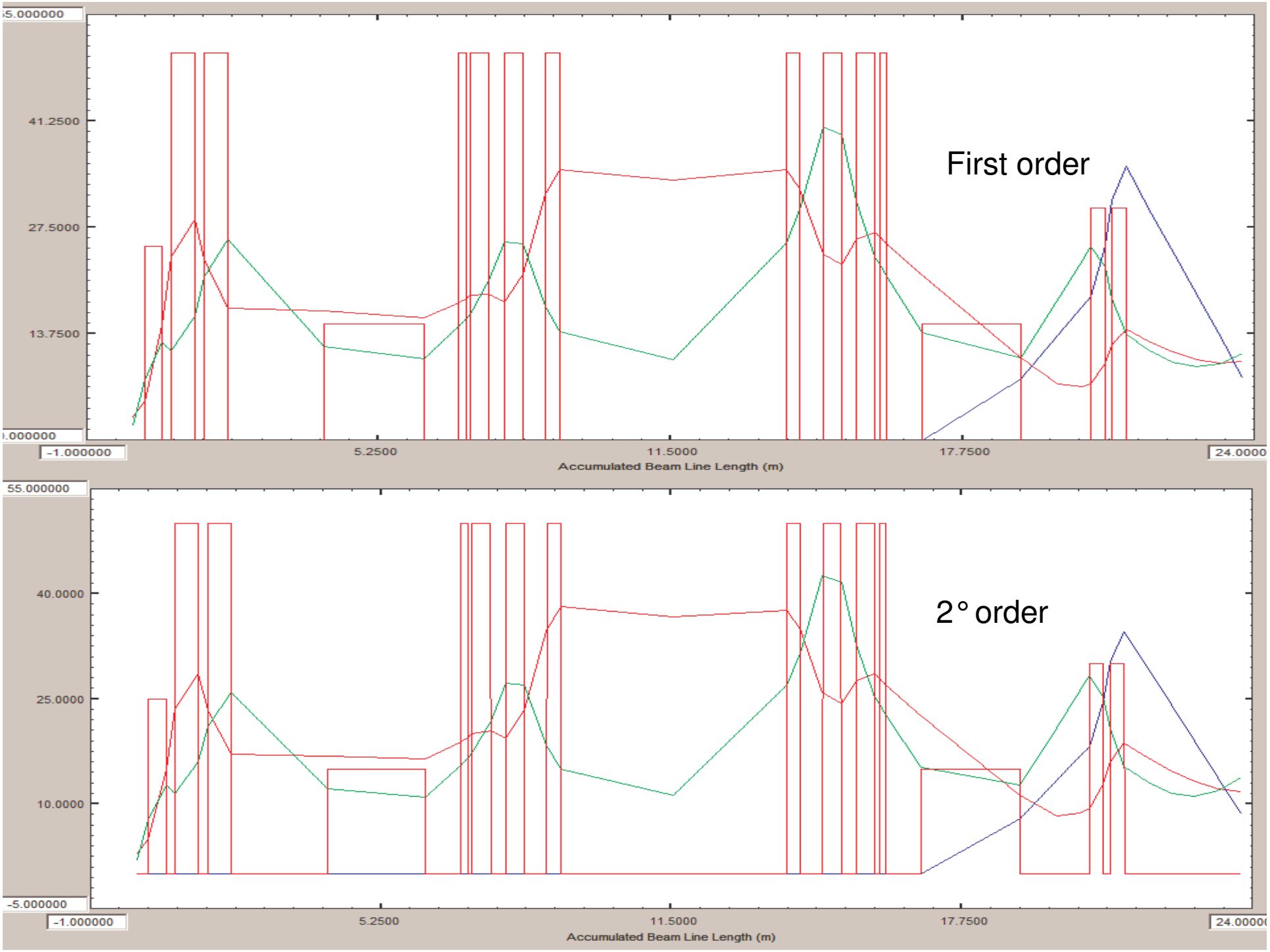
70% of central momentum +

15% Po+ΔP +15% Po-ΔP

Gaussian distribution with σ=1%
and shifted of ΔP=+/-1%



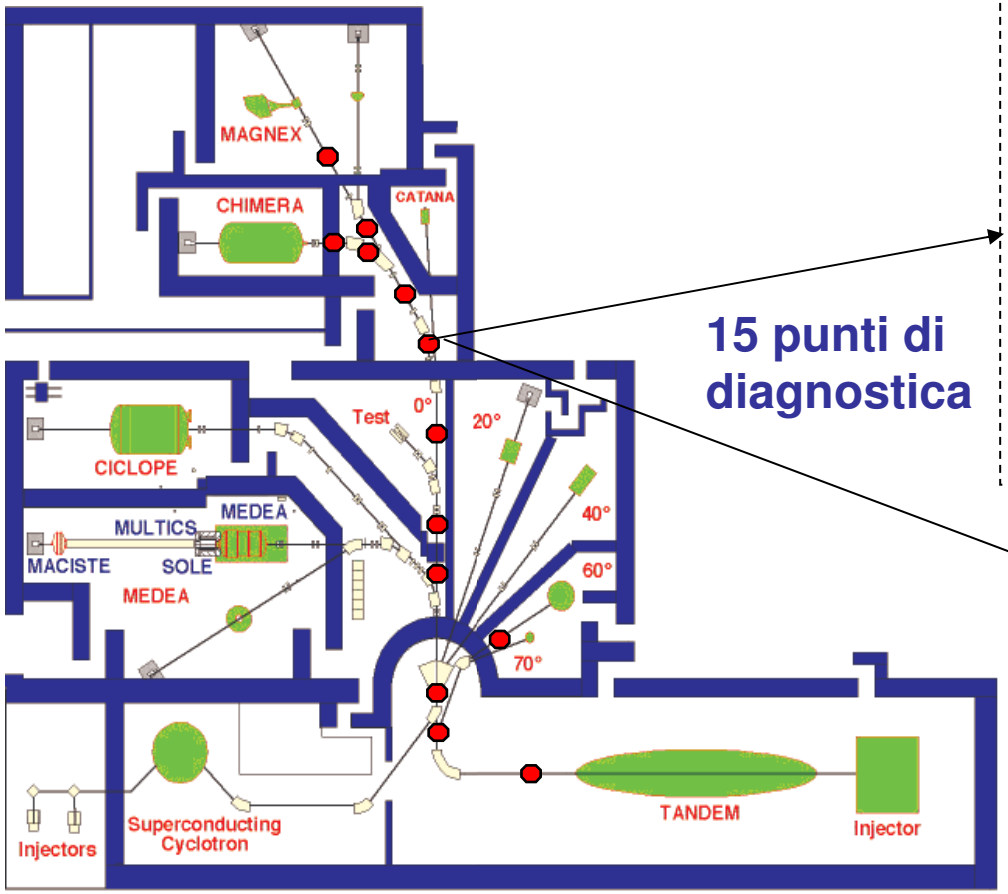
60% of central momentum +
20% Po+ΔP + 20% Po-ΔP


5.000000
41.2500
27.5000
13.7500
.000000
First order
-1.000000
5.2500
11.5000
17.7500
24.0000
Accumulated Beam Line Length (m)
55.000000
40.0000
25.0000
10.0000
-5.000000
2° order
-1.000000
5.2500
11.5000
17.7500
24.0000
Accumulated Beam Line Length (m)

Diagnostics for RIBs (Excyt)

Short term upgrading:

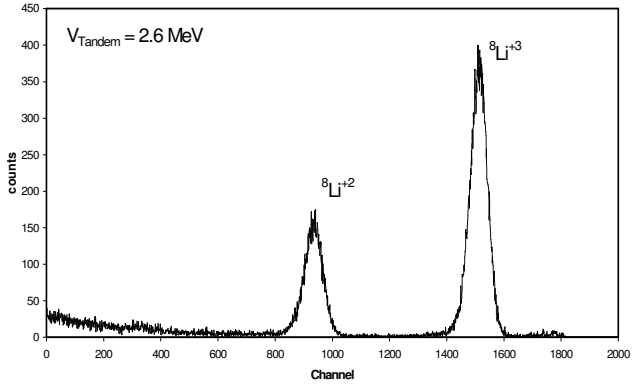
- **Provide the long beam lines (Magnex and Chimera) with low intensity diagnostics**



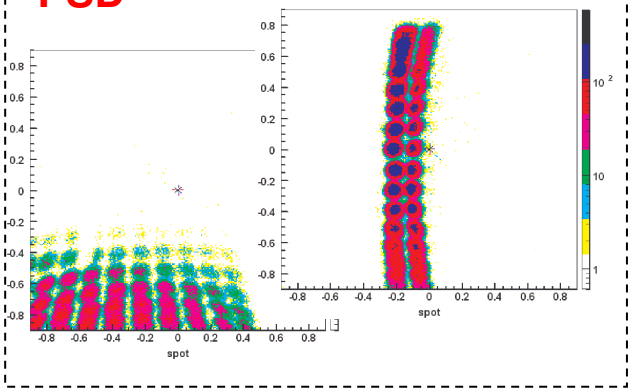
15 punti di diagnostica

PMT + plastic scintillator

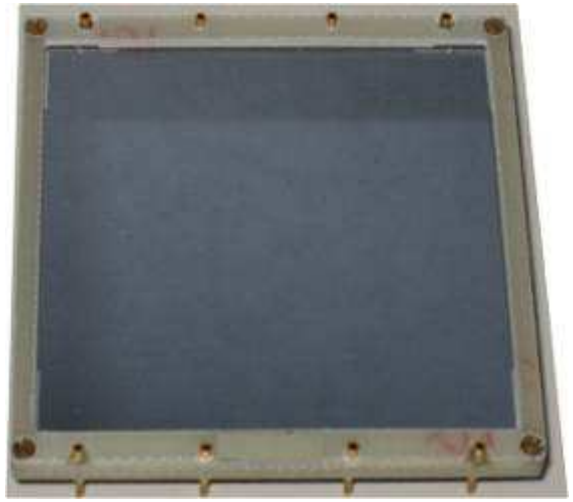
- *counting rate*



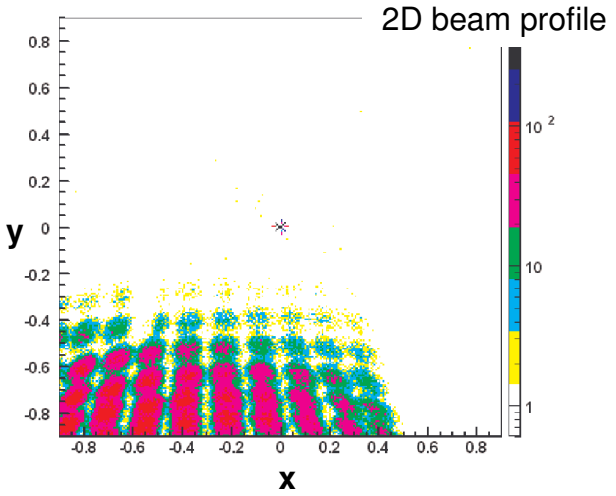
PSD

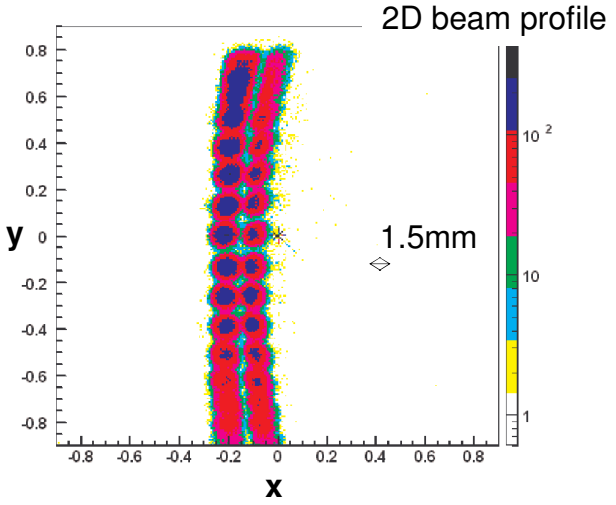


- 2D beam profile monitor
- ΔE – E identification with telescope



size: 50 x 50 mm^2



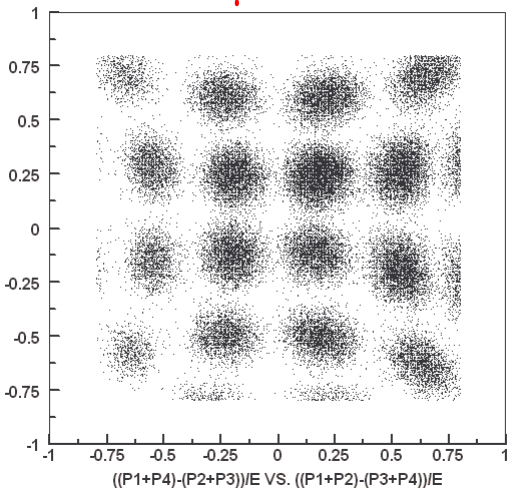


^{8}Li beam – 28MeV – 1kHz

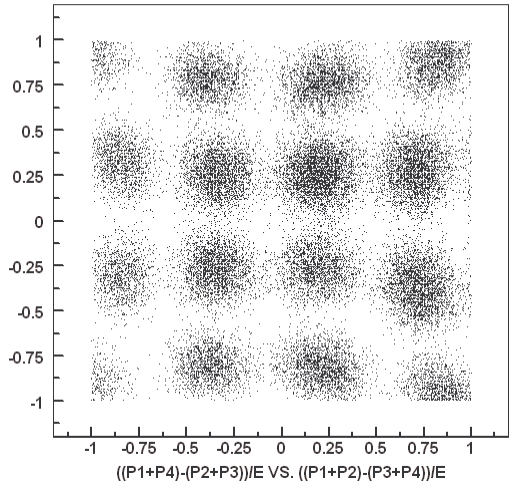
- Real time visualization
- User friendly interface

diameter 1.5mm
step 2mm

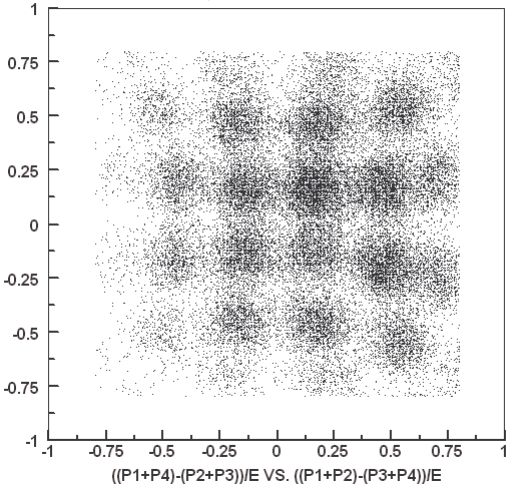
sh. time 0.2µs



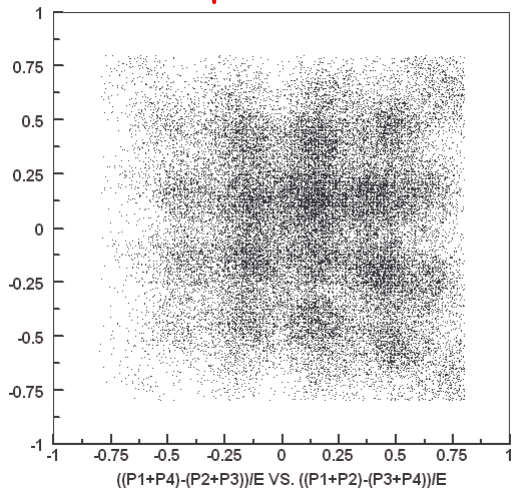
sh. time 1µs

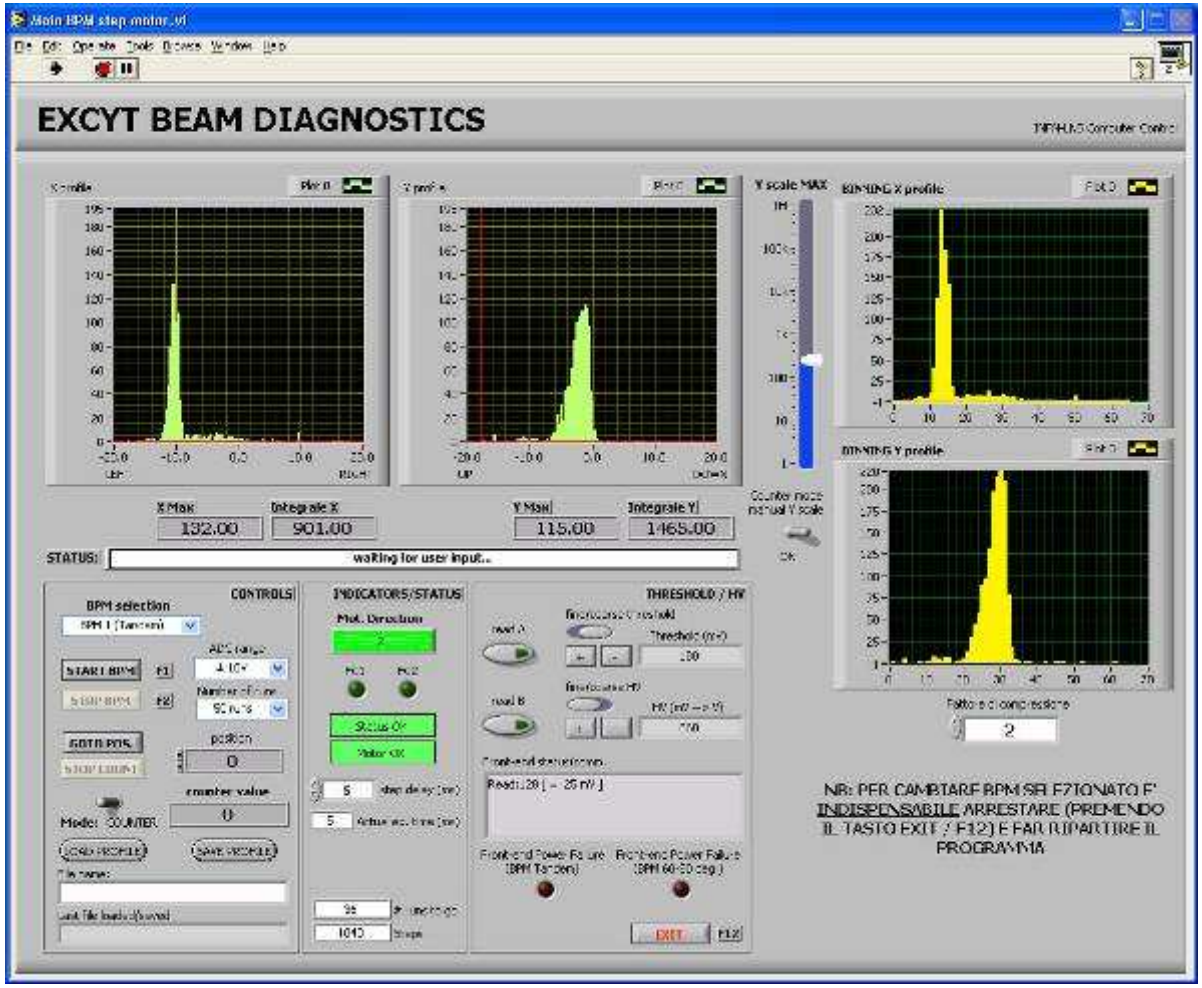


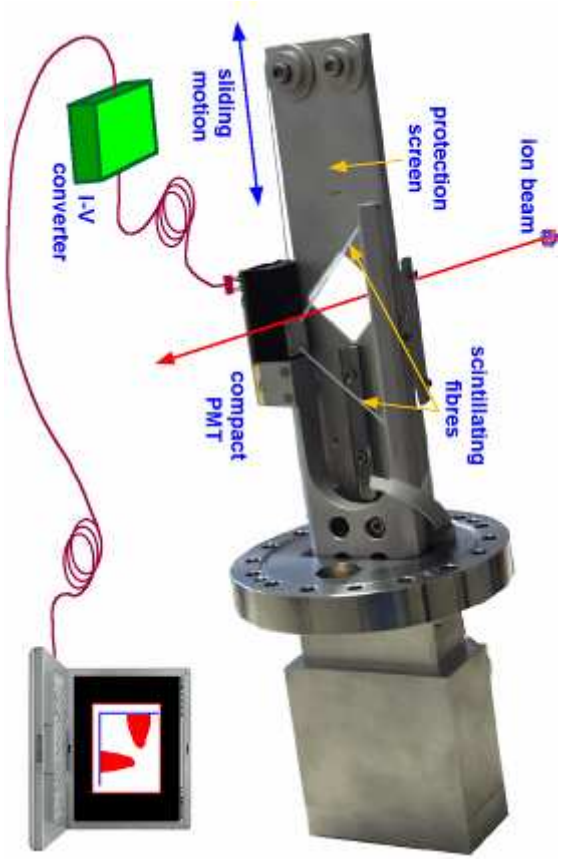
sh. time 2µs



sh. time 3µs





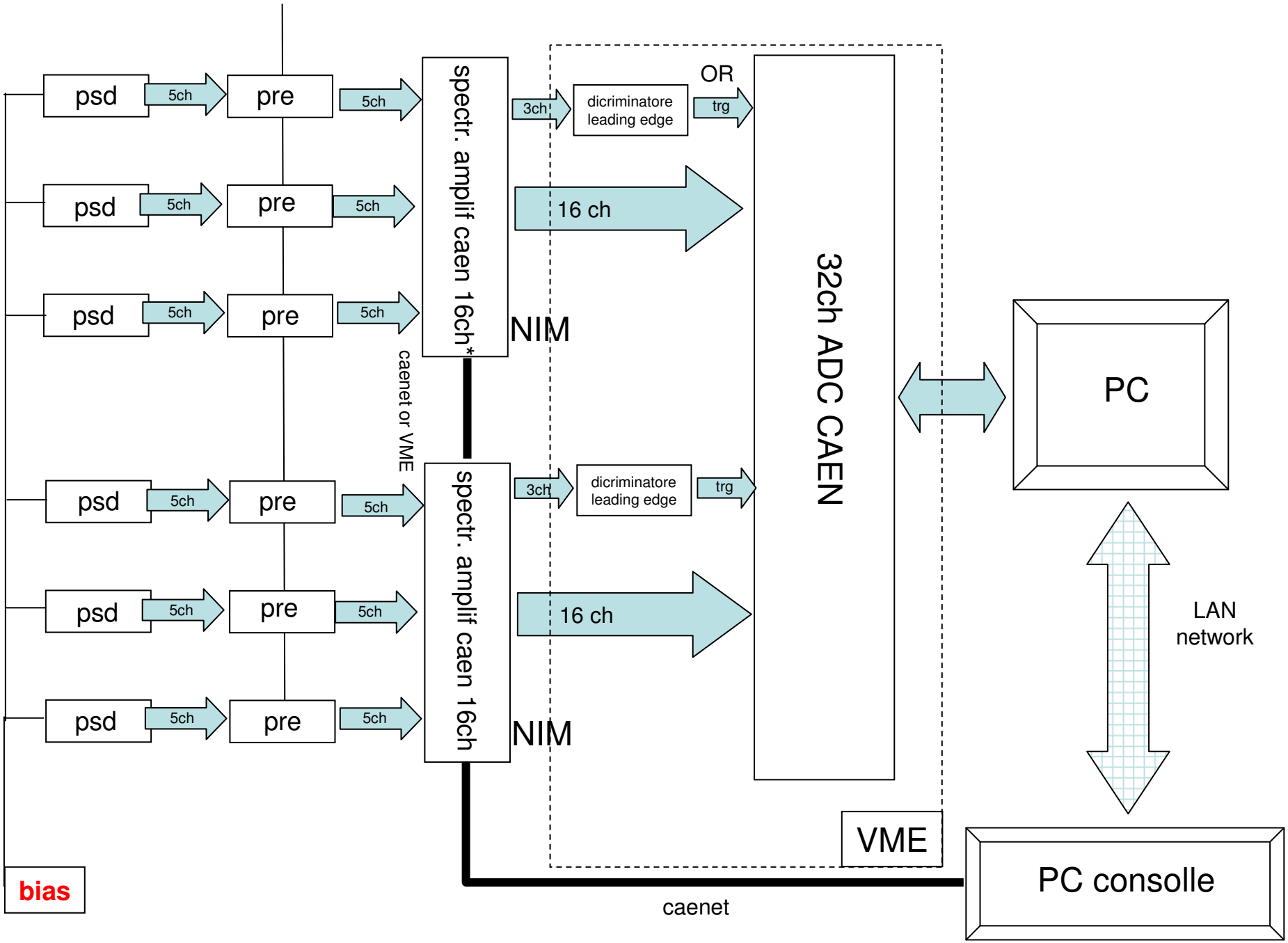


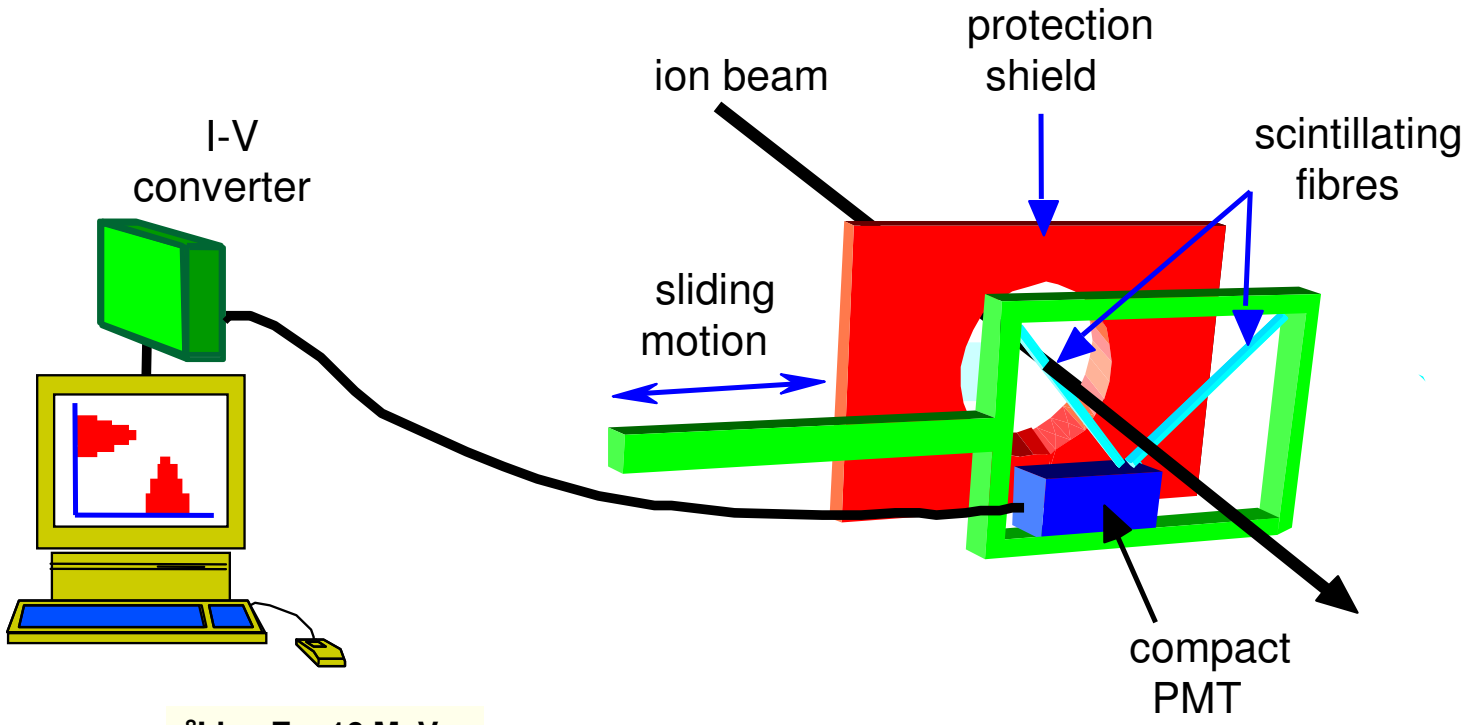
Fibres diameter: 300 ÷ 500 µm

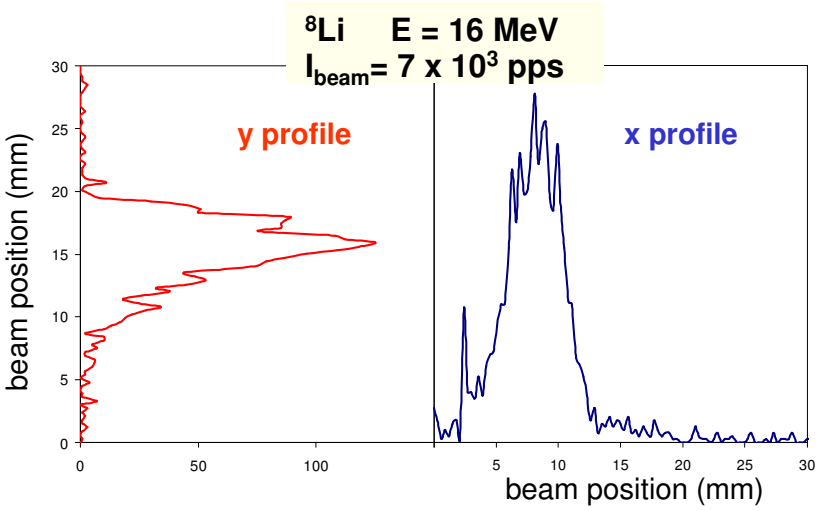
Glass fibres for intensity over 10^5 pps

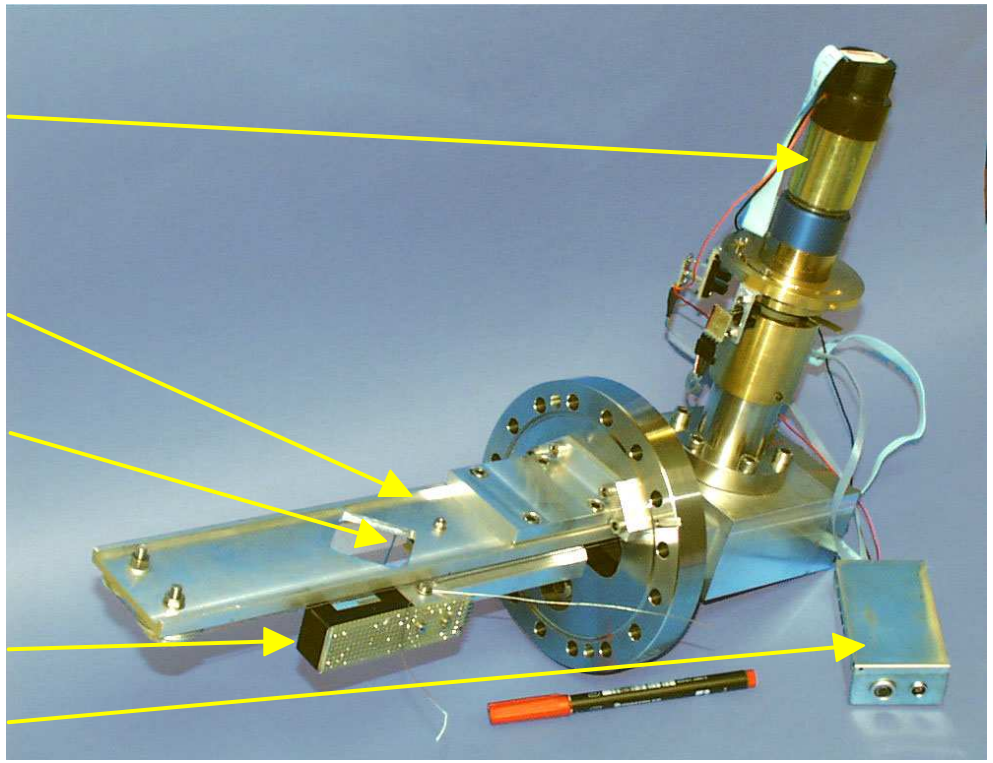
Plastic fibres for lower intensity

- Avviate procedure di acquisto delle parti meccaniche e dell'elettronica
- Entro l'estate completata l'installazione di otto punti di diagnostica (PMT e Silici)
- Settembre / ottobre i sistemi saranno pronti


psd
5ch
pre
5ch
spectr. amplif caen 16ch*
3ch
dicriminatore leading edge
OR
trg
16 ch
32ch ADC CAEN
NIM
caenet or VME
PC
psd
5ch
pre
5ch
spectr. amplif caen 16ch
3ch
dicriminatore leading edge
trg
16 ch
NIM
LAN network
VME
bias
caenet
PC consolle


protection
shield
ion beam
scintillating
fibres
I-V
converter
sliding
motion
compact
PMT


^{8}Li E = 16 MeV
I_{beam}= 7 x 10^{3} pps
y profile
x profile
beam position (mm)
beam position (mm)
0
5
10
15
20
25
30
0
50
100
5
10
15
20
25
30



Glass fibres

good sensitivity

better radiation hardness (Tb-doped glass)

4 ms decay time: single particle counting not possible

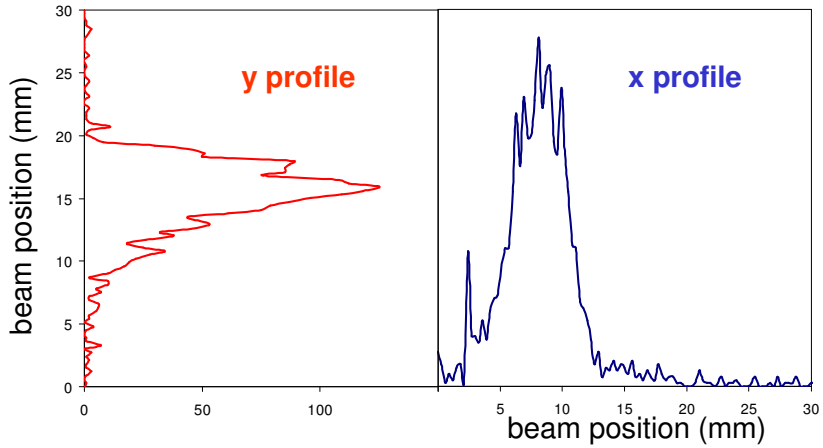
Plastic fibres

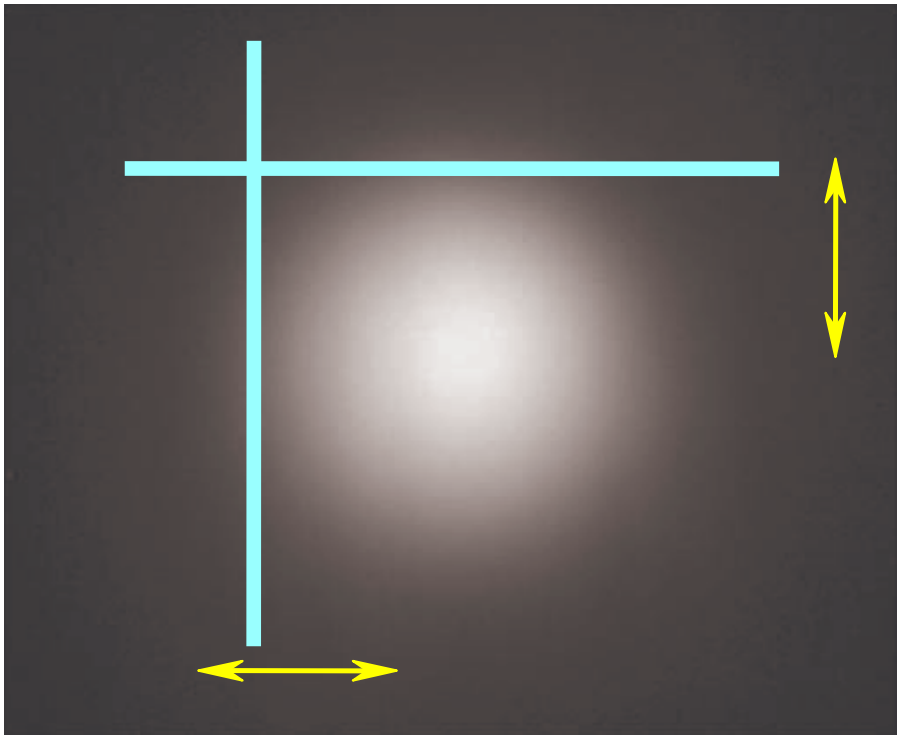
good sensitivity

limited by low radiation hardness of plastic

Pulse counting

This technique consists of scanning a beam with 1D sensors, in order to produce the 1D intensity distribution





Using ‘scintillating’ wires improves the S/N ratio !

Man Power to dismount/mount the beam line

- Maugeri e Seminara per 7-8 mesi:
- Reparti alimentatori, Controlli, Vuoto, Progettazione,… 2 mesi;
- Saldatura ed Officina 2 mesi;

- external manpower 3 persone x 6 mesi di cui 1 meccanico e 2 elettrici (2600 h costo medio 22 €/h+IVA 70 k€ or 48k€ + 22 k€)
- N° 1 new vacuum chamber with cooling and shields 14 k€
- New Collimators and Diagnostic Box 15 k€
- N° 4 PS per Quadrupoles 26 kW 45 k€
- Supports and Stands for Quads 15 k€
- Materiale e componenti vari non considerati 15 k€
- Rotating and cooled target, neutron shielding 30 k€

Full Cost 165 k€ + 30 k€

Previous Quotation for Vacuum chamber 22.5° Dipoles

LNS- INFN
Via S. Sofia N° 62
I-95123 Catania
ITALY
Att. Director of LNS

13 October 2006
HH/jj

Vacuum chambers
Danfysik ref. ITA 16800

Dear Prof. E. Migneco,

we are pleased to send the price for the requested vacuum chambers:

2 (two)	**Vacuum chambers** similar to the vacuum chamber on drawing 63608A from ITA670, 1989. However, the internal height of these particular chambers has been increased from 21 mm to 27 mm.	
	Total budget price	**EUR 8,200**

The price is on a DDU (Delivered Duty Unpaid) Catania basis, and the estimated delivery time will be 2 months after receipt of order.

We hope this price will be of interest, and look forward to hearing from you. If you need any further information or clarification, please do not hesitate to contact us again.

Sincerely yours,
DANFYSIK A/S

Henrik Hansen
Sales Manager
e-mail: hh@danfysik.dk

Expected cost for the 1 45° vacuum chamber with sliding cover wall, to remove the beam activation: 14 k€

POWER SUPPLY SPECIFICATIONS (2007)

Dipole data:

1 Cabinet:

2 x Power Supply: Voltage/Current 50V/230A

1 Cabinet:

1 x Power Supply: Voltage/Current 100V/300A

1 x Power Supply: Voltage/Current 35V/225A

Quadrupole data:

1 Cabinet:

2 x Power Supply: Voltage/Current 30V/250A

1 Cabinet:

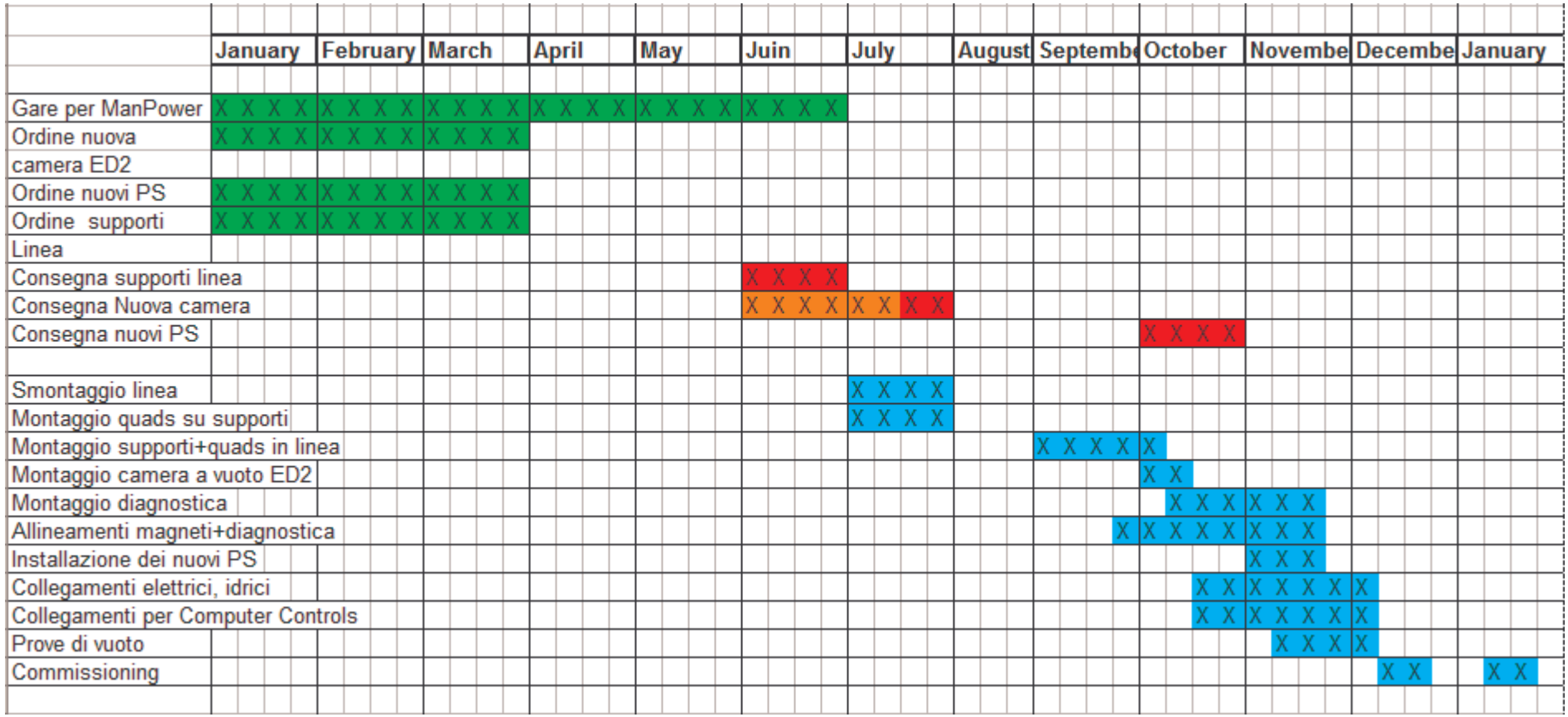
4 x Power Supply: Voltage/Current 30V/115°

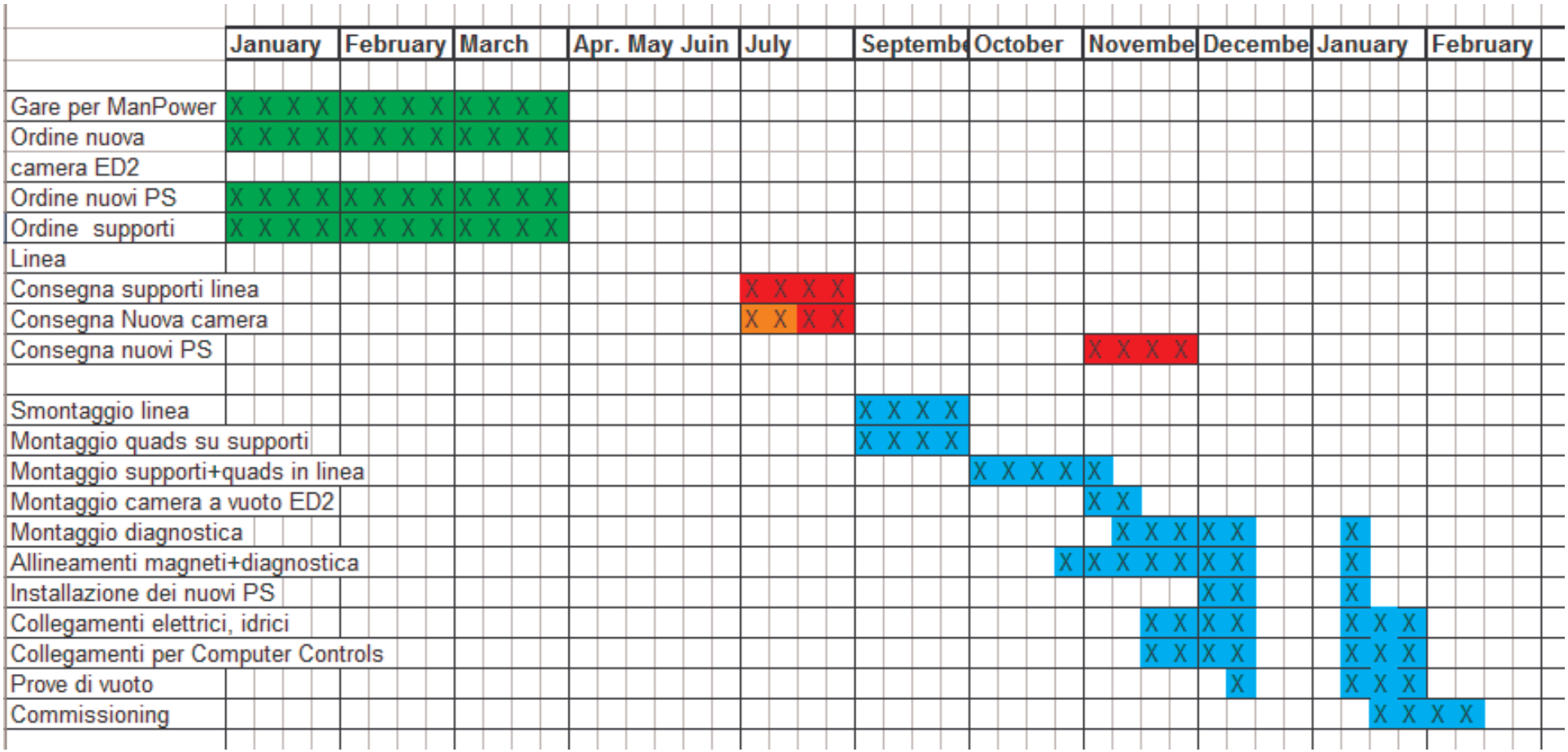
1. 10 power supplies according to the modified specifications in your email dated May 4, 2007		€ 124.715,--
2. B-MCx remote control unit to operate all 10 units with interfaces RS232 and CANbus		€ 2.295,--
3. Shipping/packing/insurance FOB Catania	estimated	€ 3.000,--

We need new PS for the new 4 Quads and 2 Sextupoles:

4 PS 30V/215 A 26 kW 44.5 k€

2 PS 9V/14° 300 W 2 k€


January
February
March
April
May
Juin
July
August
Septembe
October
Novembe
Decembe
January
Gare per ManPower
Ordine nuova
camera ED2
Ordine nuovi PS
Ordine supporti
Linea
Consegna supporti linea
Consegna Nuova camera
Consegna nuovi PS
Smontaggio linea
Montaggio quads su supporti
Montaggio supporti+quads in linea
Montaggio camera a vuoto ED2
Montaggio diagnostica
Allineamenti magneti+diagnostica
Installazione dei nuovi PS
Collegamenti elettrici, idrici
Collegamenti per Computer Controls
Prove di vuoto
Commissioning


January
February
March
Apr. May Juin
July
Septembe
October
Novembe
Decembe
January
February
Gare per ManPower
Ordine nuova
camera ED2
Ordine nuovi PS
Ordine supporti
Linea
Consegna supporti linea
Consegna Nuova camera
Consegna nuovi PS
Smontaggio linea
Montaggio quads su supporti
Montaggio supporti+quads in linea
Montaggio camera a vuoto ED2
Montaggio diagnostica
Allineamenti magneti+diagnostica
Installazione dei nuovi PS
Collegamenti elettrici, idrici
Collegamenti per Computer Controls
Prove di vuoto
Commissioning