

JLC Collimation System Design

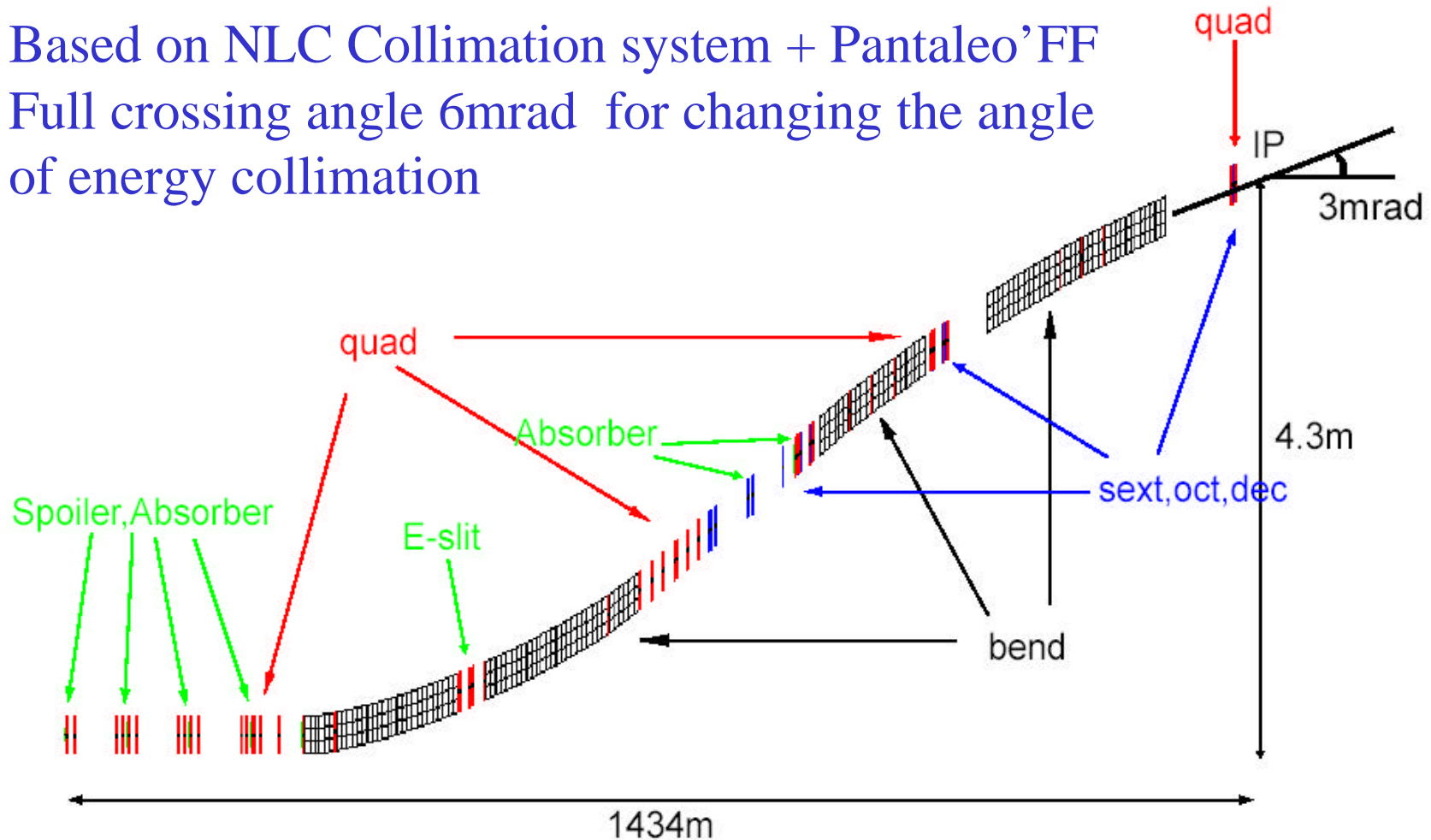
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JLC FFIR/BDSIM Collaboration

1. JLC Collimation System
2. Synchrotron Radiation, Electron Loss
3. Muon Attenuators
4. Summary

JLC Collimation and Final Focus

Based on NLC Collimation system + Pantaleo'FF
Full crossing angle 6mrad for changing the angle
of energy collimation



JLC Beam Parameters

Center of mass energy	500 GeV
Number of particle per bunch	0.75×10^{10}
Number of bunches per train	192
Repetition frequency	120 Hz
Horizontal normalized emittance	3.6×10^{-6} m rad
Vertical normalized emittance	4.0×10^{-8} m rad
Horizontal beta function in IP	8×10^{-3} m
Vertical beta function in IP	1.1×10^{-4} m
Horizontal beam size in IP	243 nm
Vertical beam size in IP	3 nm
Horizontal angle in IP	30 μ rad
Vertical angle in IP	27 μ rad

Collimation Depth & Energy Collimation

Collimation Depth Criteria:

No photon hit $R > 1\text{cm}$ at $z = 350\text{cm}$

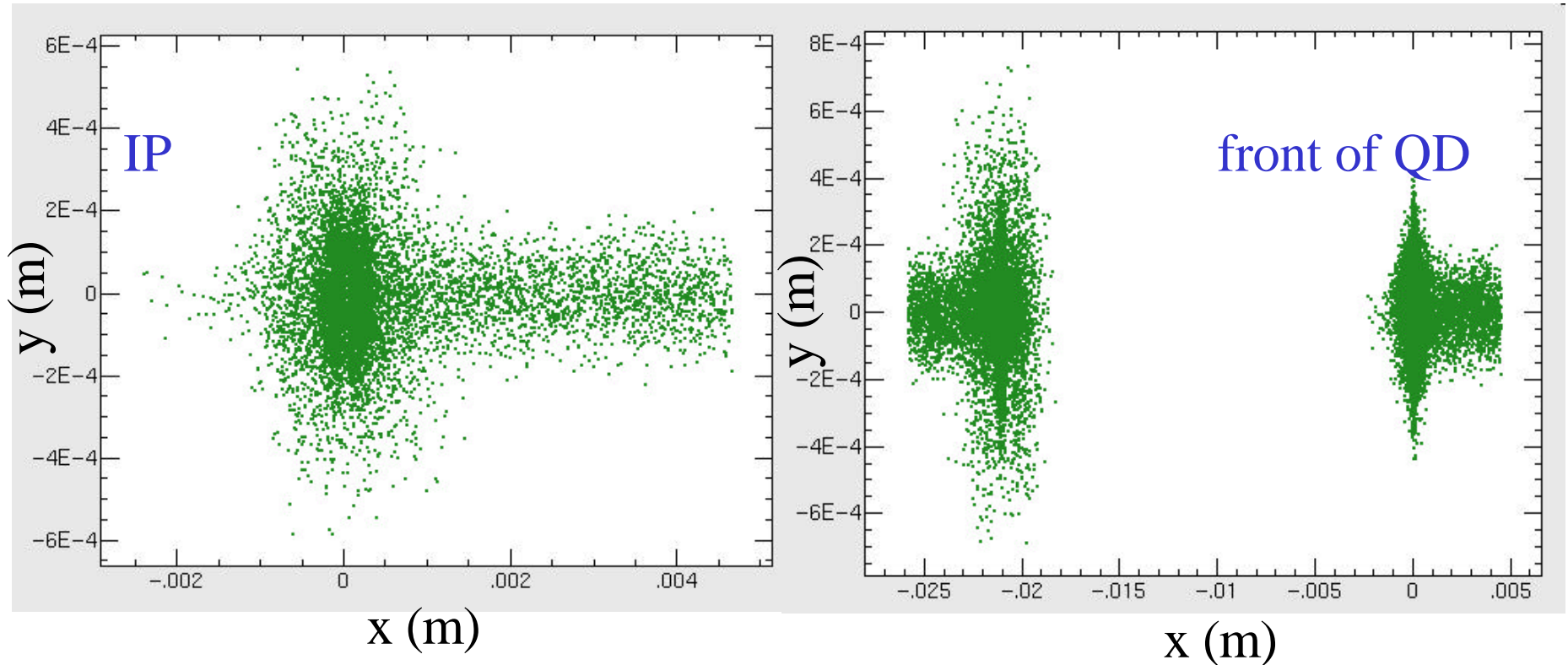
$x' < 13 \times 30.3 \mu\text{rad}$ $y' < 43 \times 27.3 \mu\text{rad}$

$(13\sigma_x, 43\sigma_y)$

Energy Collimation Momentum acceptance

$|\Delta p/p| < 0.015$

Synchrotron Radiation

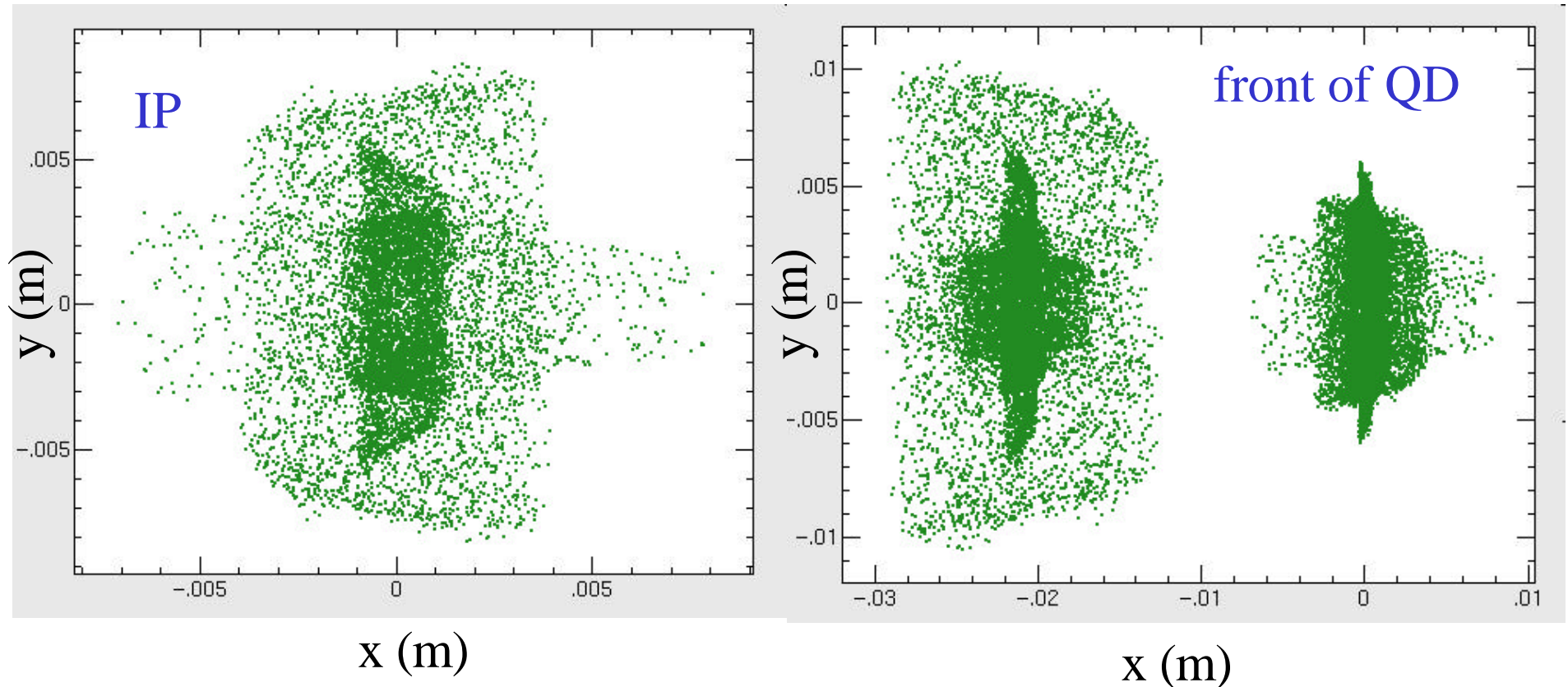


$s=0$

Core, $\Delta p/p$ 0.3%, macro 10000 (T-ratio: 1)
total number of photons 342752 (9.096 MeV) (Collimation+FF)
number of photons at IP 10890 (loss 331862)

$s=-3.51$

Synchrotron Radiation

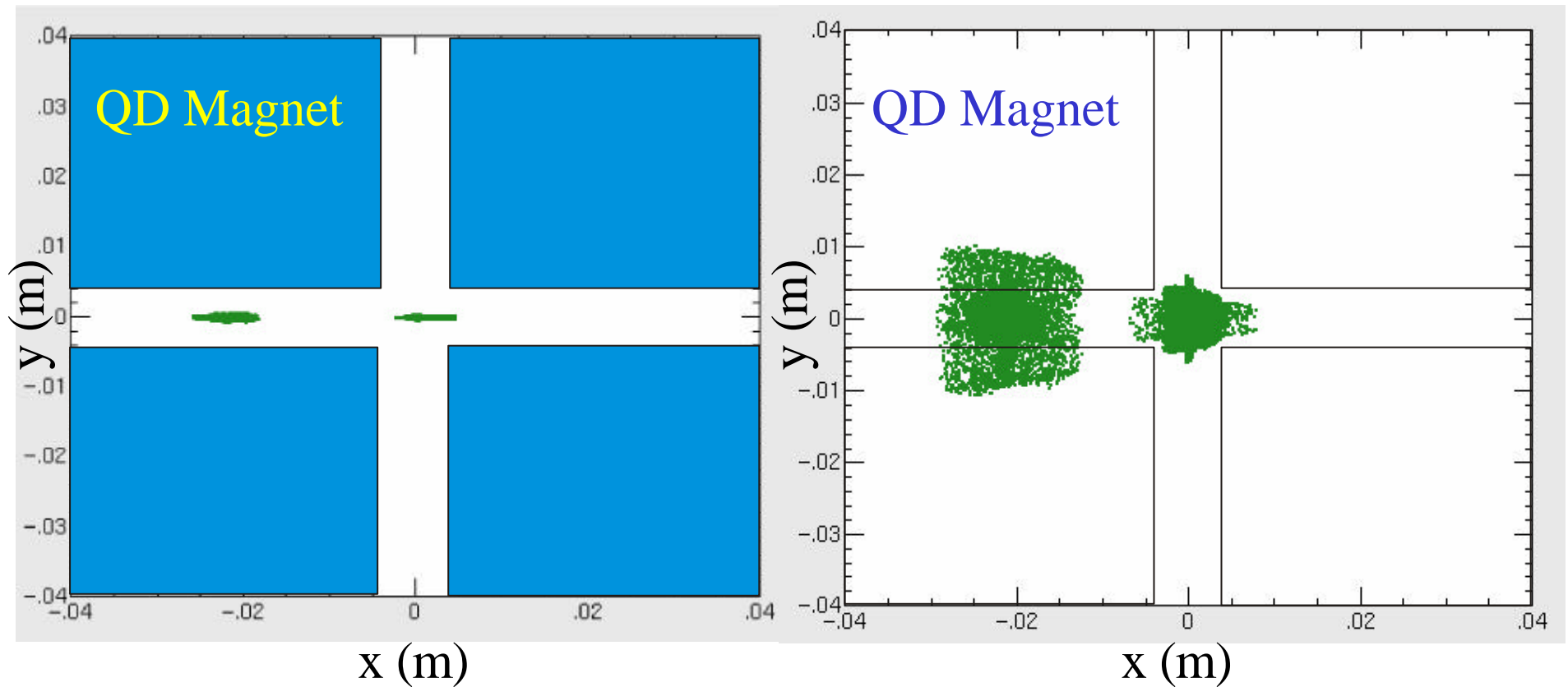


$s=0$

$s=-3.51$

Flat, $13\sigma_x$ $43\sigma_y$, $\Delta p/p$ 3%, macro 10000 (T-ratio: 0.3346)
total number of photons 217488 (19.39 MeV) (Collimation+FF)
number of photons at IP 12208 (loss 205280)

Synchrotron Radiation



Core, $\Delta p/p$ 0.3%
 $s=-3.51$

Flat, $13\sigma_x$ $43\sigma_y$, $\Delta p/p$ 3%
 $s=-3.51$

Muon backgrounds

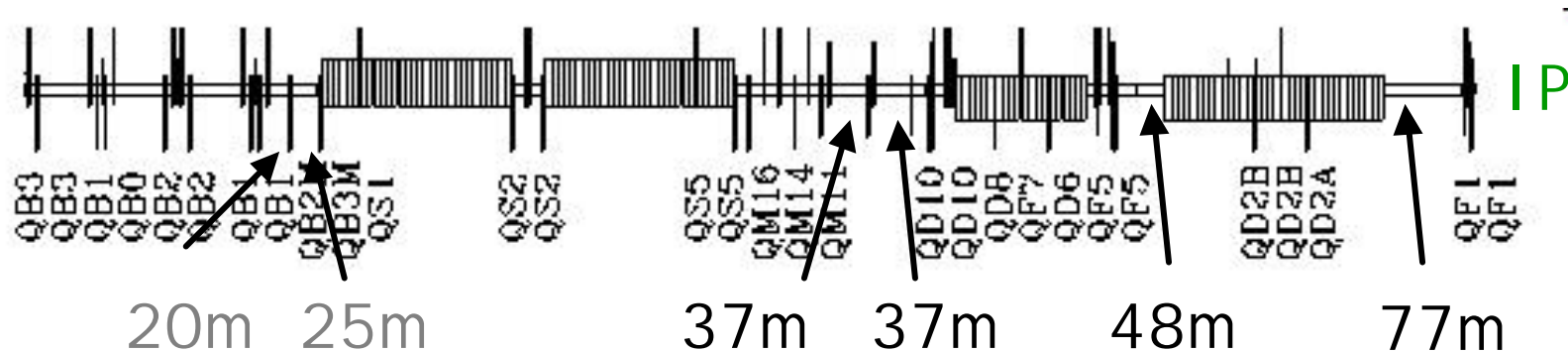
MUCARLO (Namito version)

4 Muon attenuators 37m x 2, 45m, 70m
(option 15m, 20m)

Electron beam: 250GeV

Muon generation point: Spoiler, Absorber

Drift space



JLC Muon Attenuator

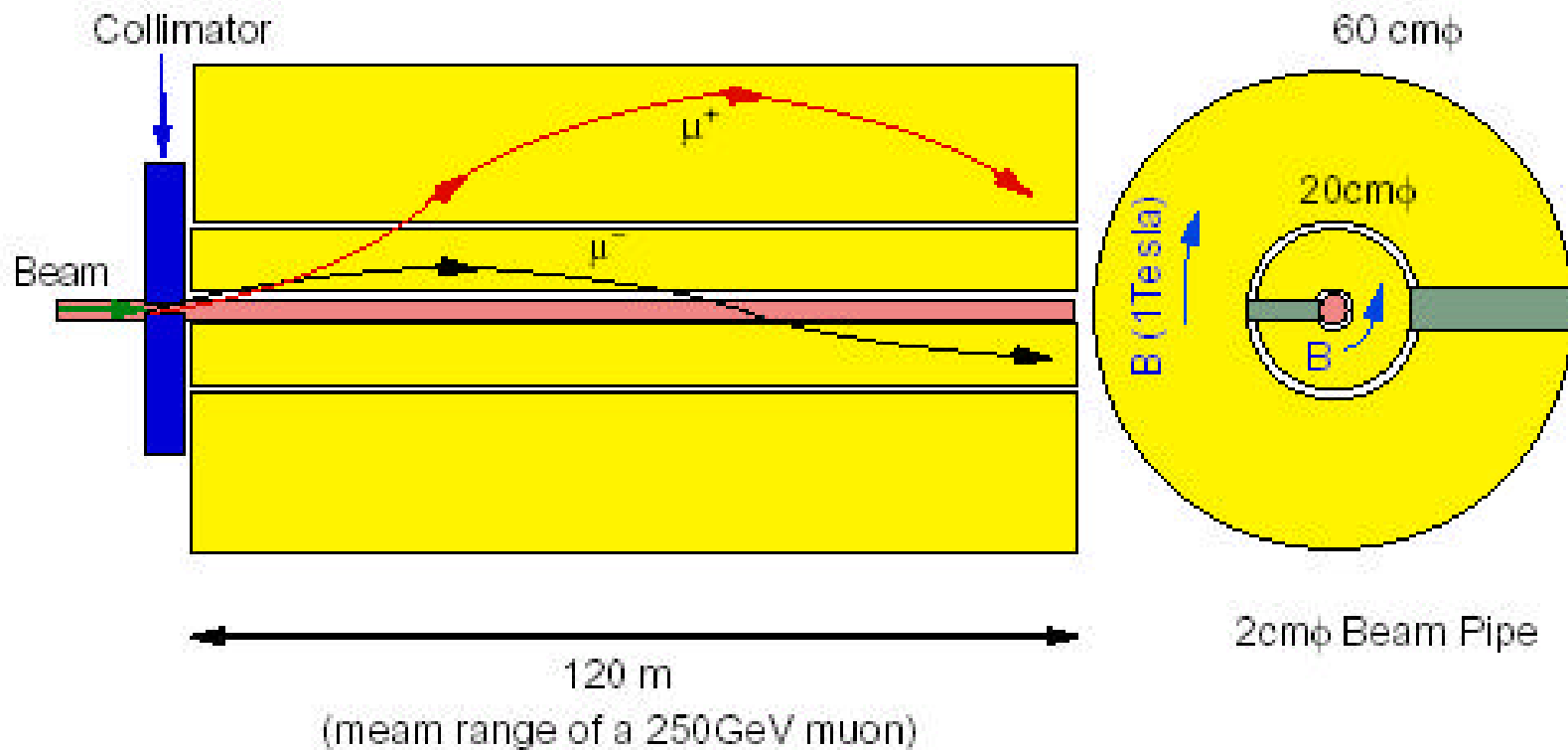
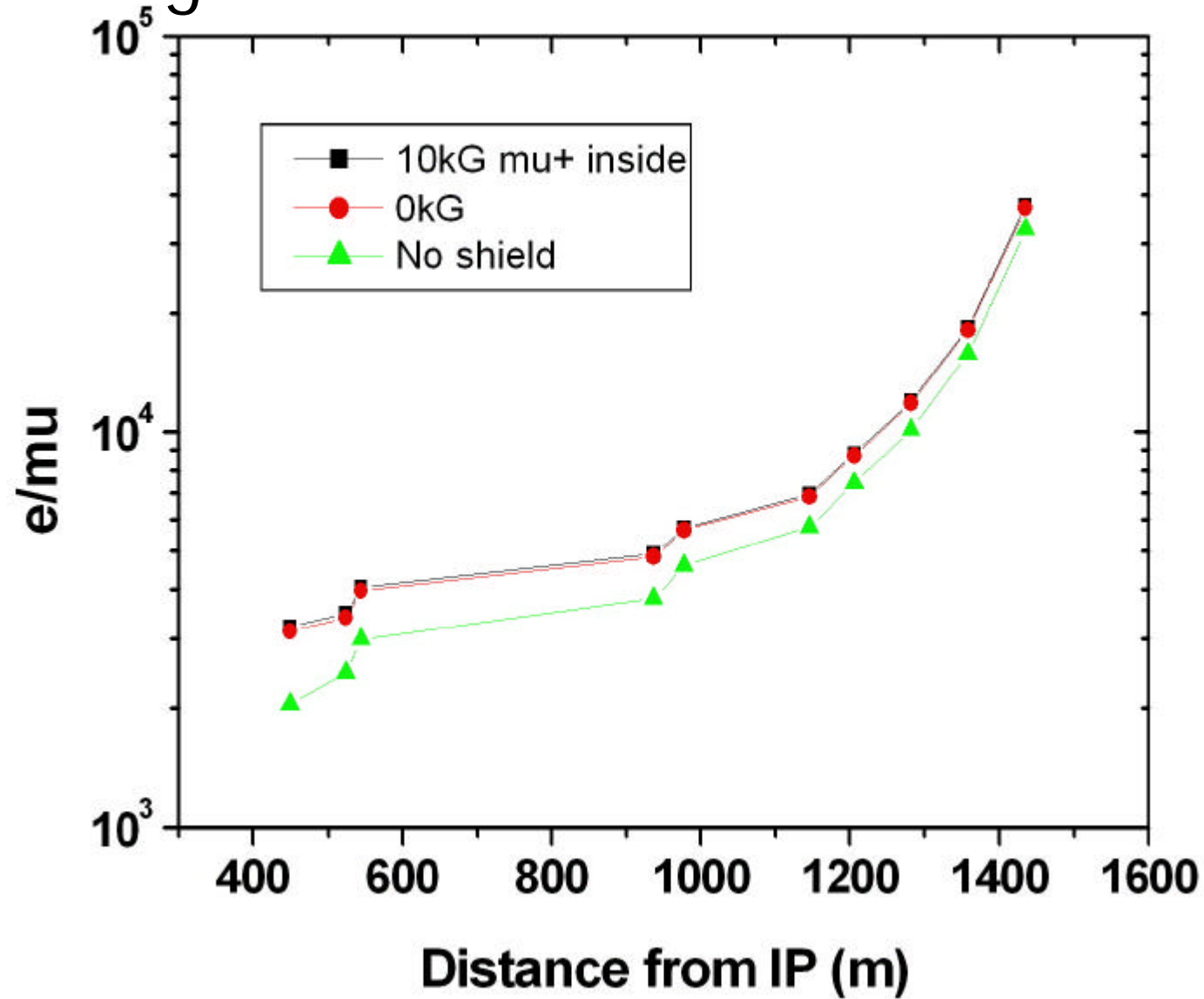
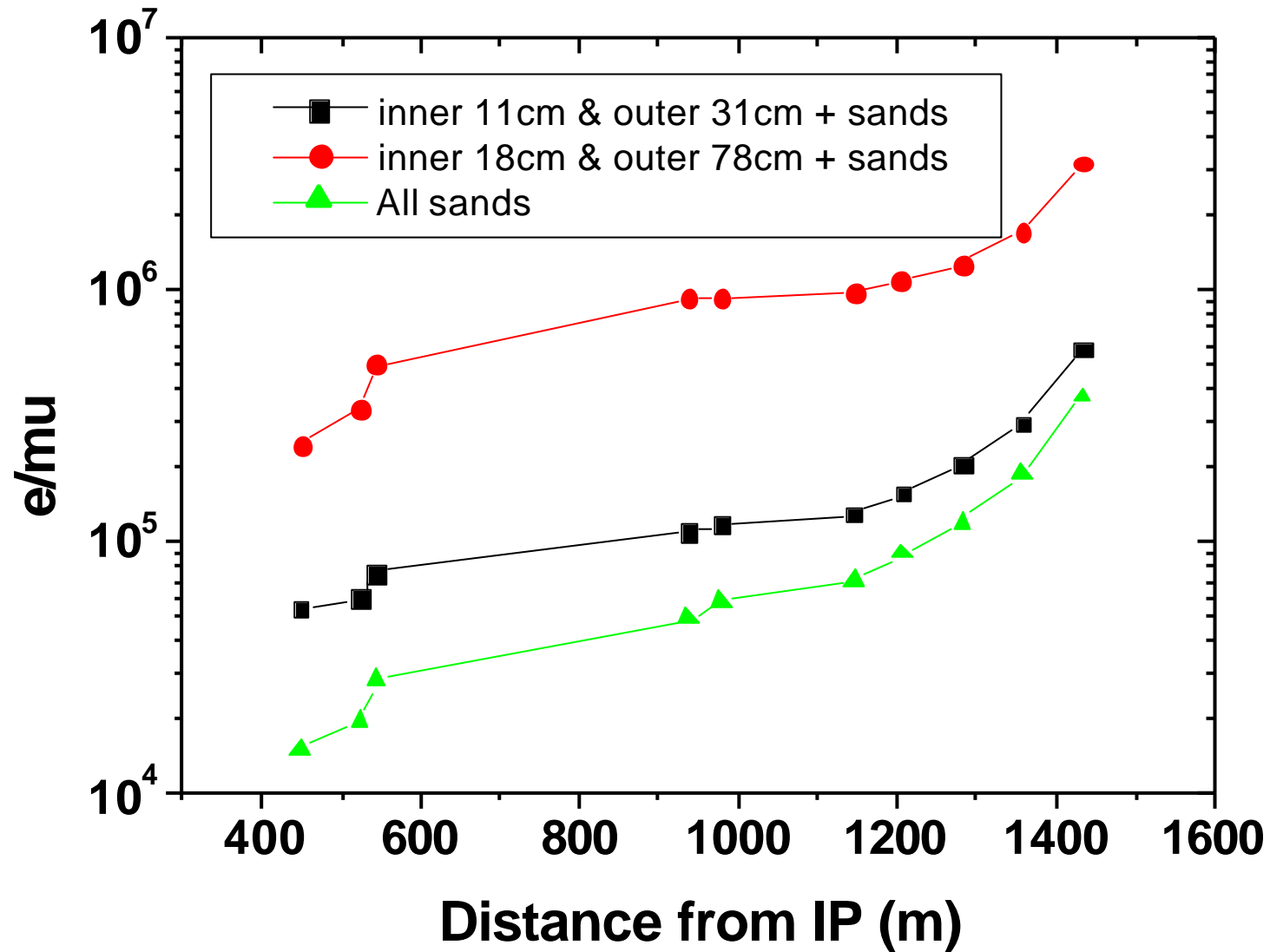


Figure 14.2: Original idea of muon attenuator. Two iron pipes are magnetized axially in opposite directions for both charged muons which can be trapped, where the 120m length of the iron pipe corresponds to a mean range of 250GeV muons.

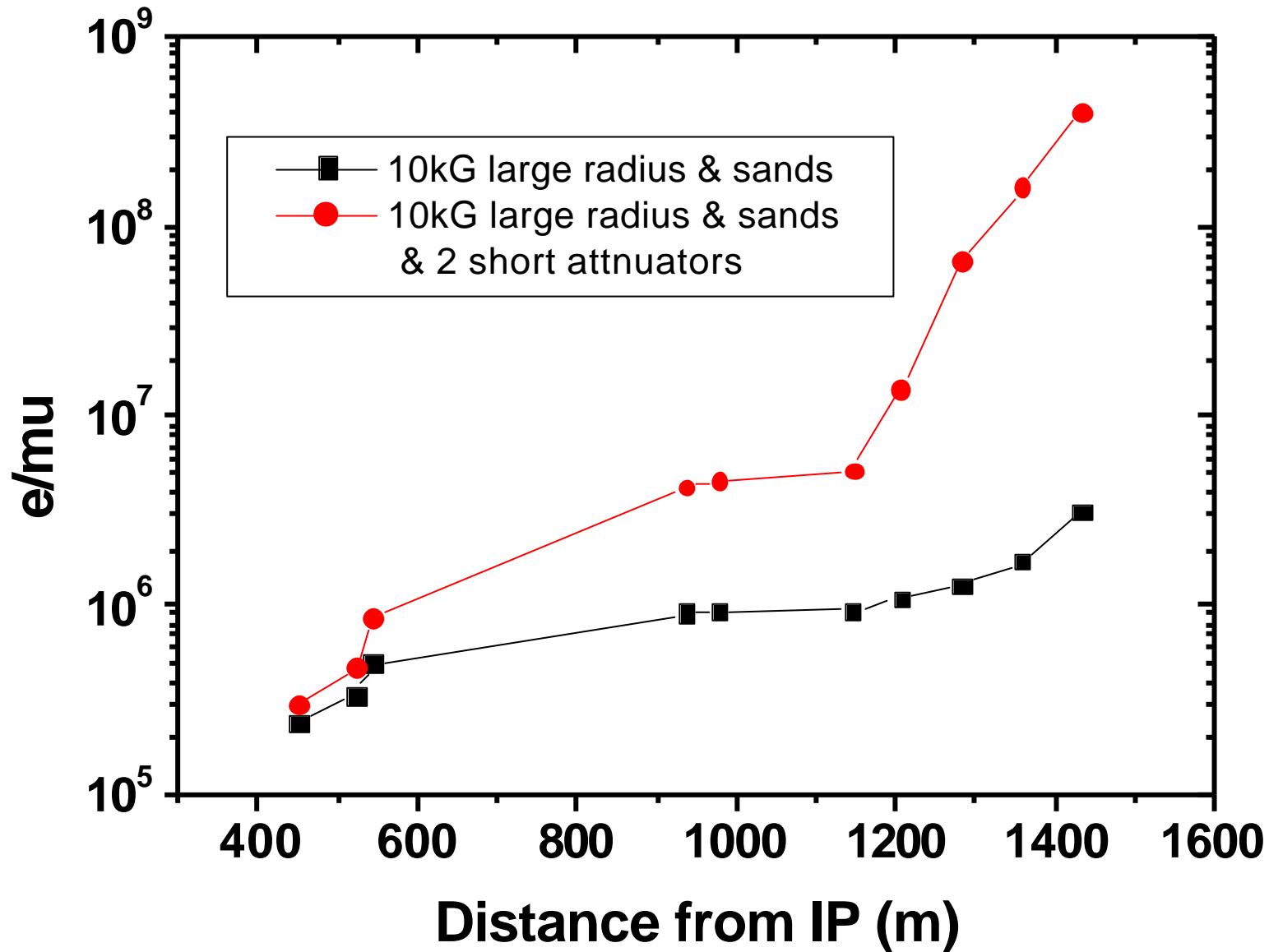
Magnetic field of muon attenuators



Radius and sands of muon attenuators

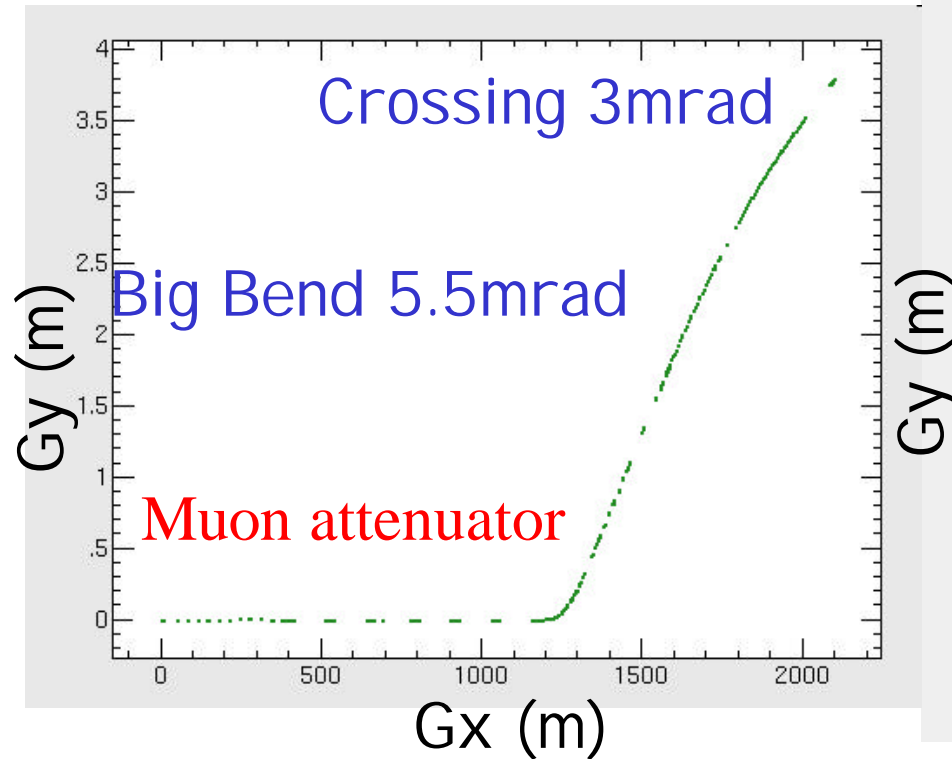


Short muon attenuators



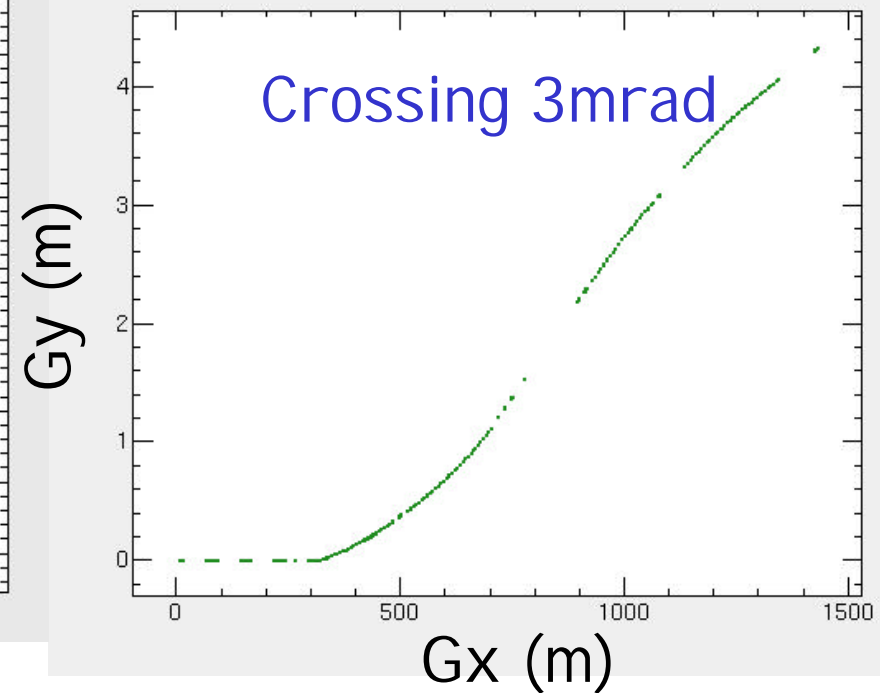
JLC Collimation + Final Focus

JLC Collimation + FF



Beam Line: 2099m

Kuroda's Collimation + FF



Beam Line: 1434m

Summary

- Based on NLC collimation system + Pantaleo'FF, we have studied JLC collimation system by SAD code.
- We have estimated the performance of muon attenuators in this collimation system by MUCARLO.
- Plan to make new collimation and final focus for JLC