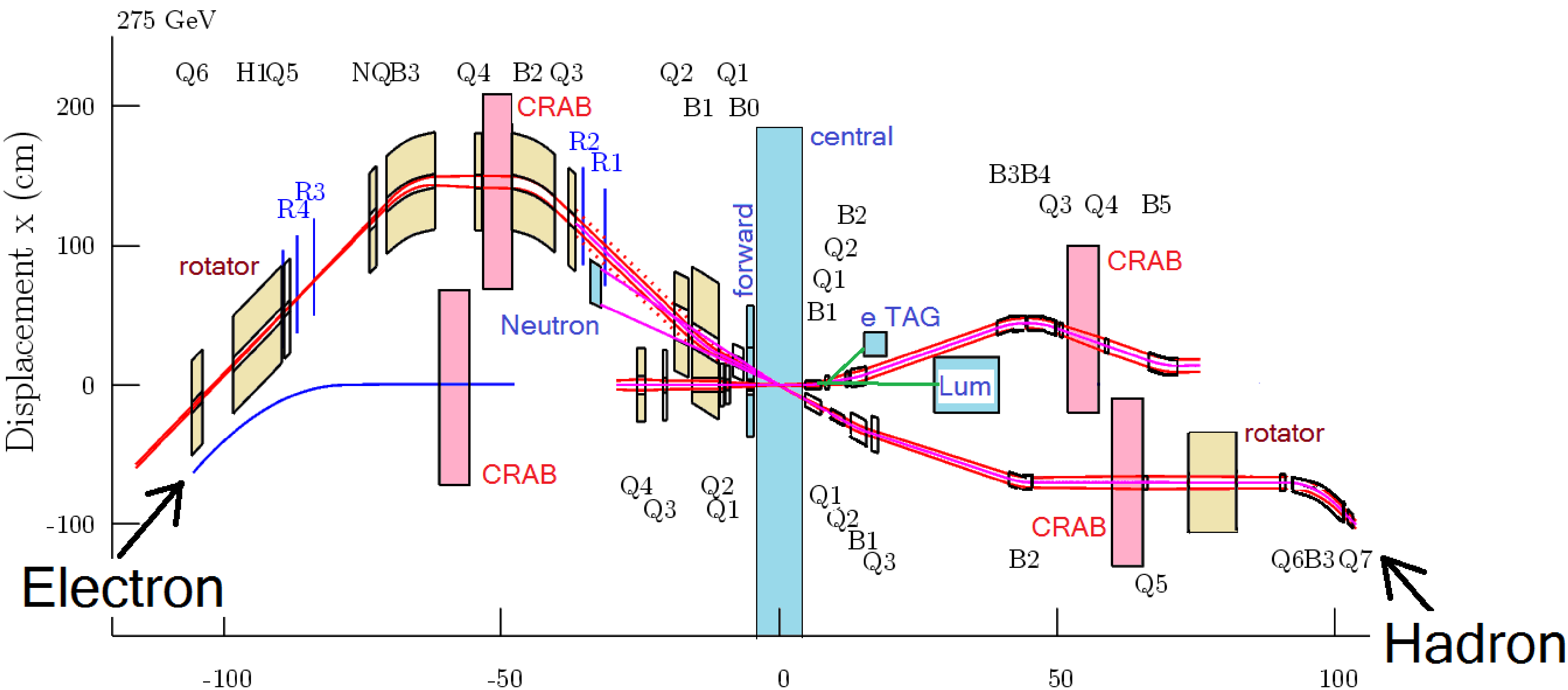
IR

3/15/2017

R. B. Palmer

Layout


275 GeV
Displacement x (cm)
200
100
0
-100
Q6 H1Q5 NQB3 Q4 B2 Q3 Q2 Q1
B1 B0
CRAB
R2
R1
R3
R4
rotator
Neutron
CRAB
central
forward
B3B4
Q3 Q4 B5
B2
Q2
Q1
B1
e TAG
CRAB
Lum
rotator
Q4
Q3
Q2
Q1
Q1
Q2
B1
Q3
CRAB
B2
Q5
Q6B3 Q7
Electron
Hadron
-100
-50
0
50
100

Parameters

		E GeV	N 10^{10}	Nb	$\epsilon_x(\epsilon_{Nx})$ nm(μm)	$\epsilon_y(\epsilon_{Ny})$ nm(μm)	β_x cm	β_y cm	σ_x μm	σ_y μm	σ'_x μrad	σ'_y μrad	ξ_x	ξ_y	ΔQ	σ_s cm	I A	SR MW	HG %	lum 10^{33}
HA	com	105.1																		
	p	275	10.6	330	16.1(4.7)	6.1(1.8)	566.2	3.9	302	15	0.05	0.40	.015	.002	.002	8.0	0.44		82	1.16
	e	10.1	30.2	330	23.1(454)	3.68(72)	397.0	6.5	303	15	0.08	0.24	.100	.032	.000	0.8	1.25	4.9		
HL	com	105.4																		
	p	275	11.1	330	16.1(4.7)	6.1(1.8)	94.4	4.2	123	16.0	131	381	.014	.005	.002	7.2	0.46		81	2.87
	e	10.1	30.5	330	24.2(478)	3.47(69)	62.5	7.4	123	16.0	197	217	.092	.083	.000	1.0	1.26	5.0		

parameters for hadrons in x

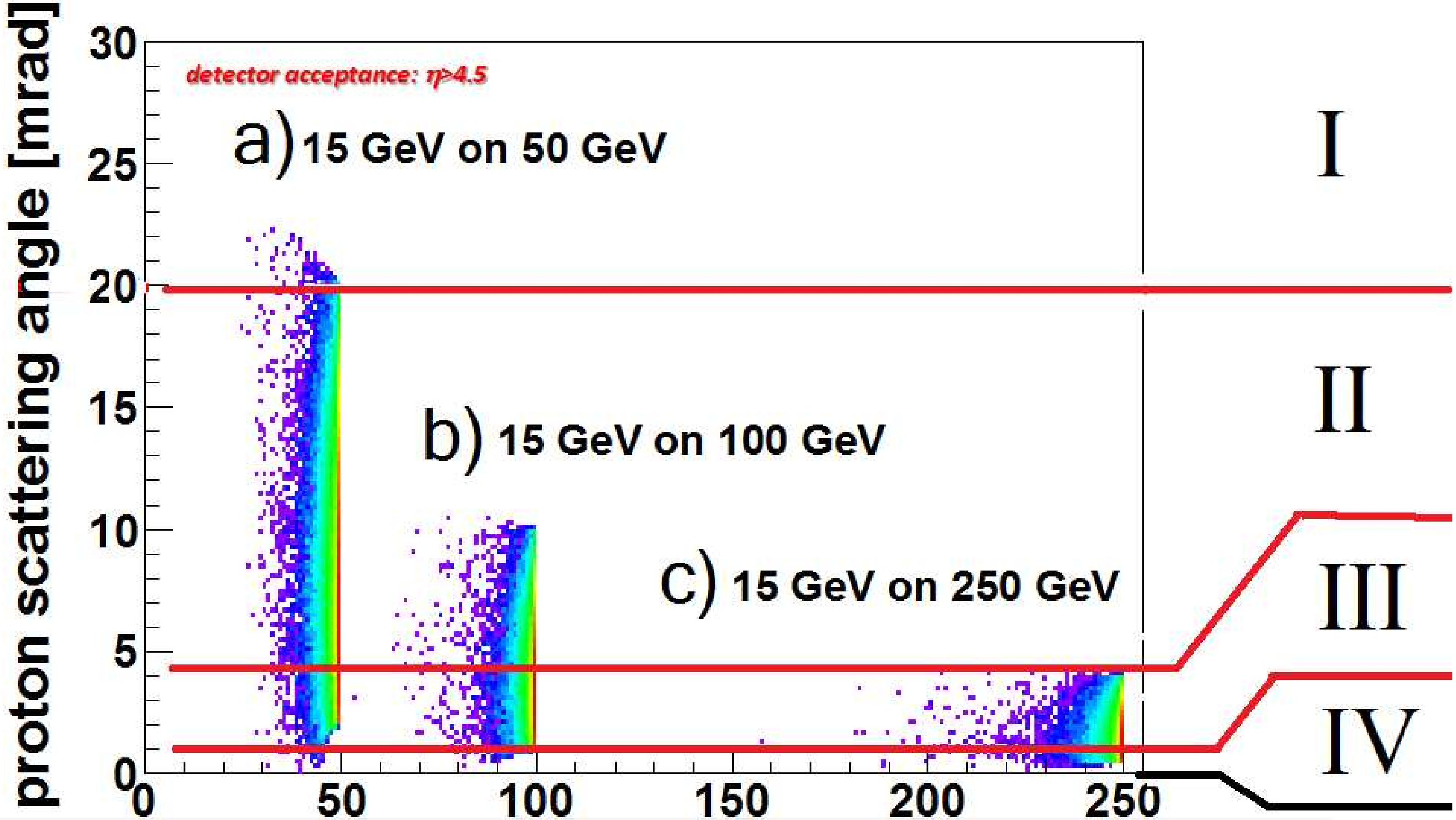
$$p_{||} = 275 \quad \text{GeV/c}$$

$$\beta^* = 5.66(HA) \;\; 0.94(HL) \quad \text{m}$$

$$\beta_{crab} = 1300 \quad \text{m}$$

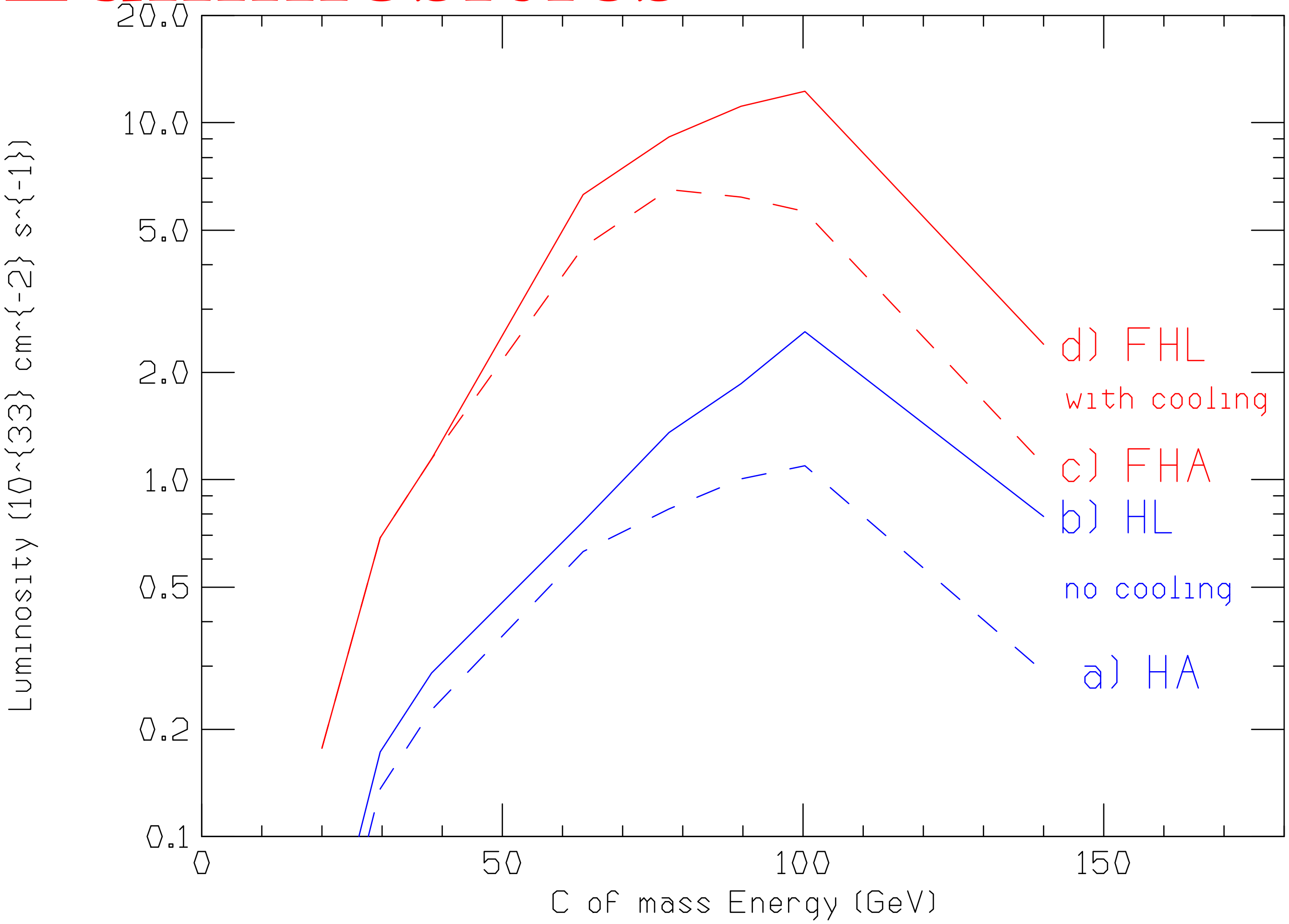
		a	b	c	d
cooling		no	no	yes	yes
		HA	HL	FHA	FHL
Luminosity	$10^{33} cm^{-2} s^{-1}$	1.1	2.6	6.2	11.1
bunches n_b		330	330	1320	1320
Divergence$_p$	μrad	56	137	56	110
E$_p$	GeV	250	250	250	250
N$_p$	10^{10}	11.1	11.1	5.6	5.6
σ_{zp}	cm	8	8	2	2
E$_e$	GeV	10.1	10.1	10.1	10.1
N$_e$	10^{10}	30.5	30.5	15.2	15.2
σ_{ze}	cm	0.8	0.8	0.8	0.8
emit$_p$ x	nm	17.7	17.7	9.7 2.6	8.9 2.4
emit$_p$ y	nm	6.6	6.6	1.9 0.5	1.9 0.5
beta$_p$ x	cm	556	94	308	70
beta$_p$ y	cm	4.2	4.2	2.5	2.5
emit$_e$ x	nm	24.2	24.2	26.6	24.2
emit$_e$ y	nm	3.86	3.86	1.06	1.06
beta$_e$ x	cm	416	69	113	25.7
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]

Physics



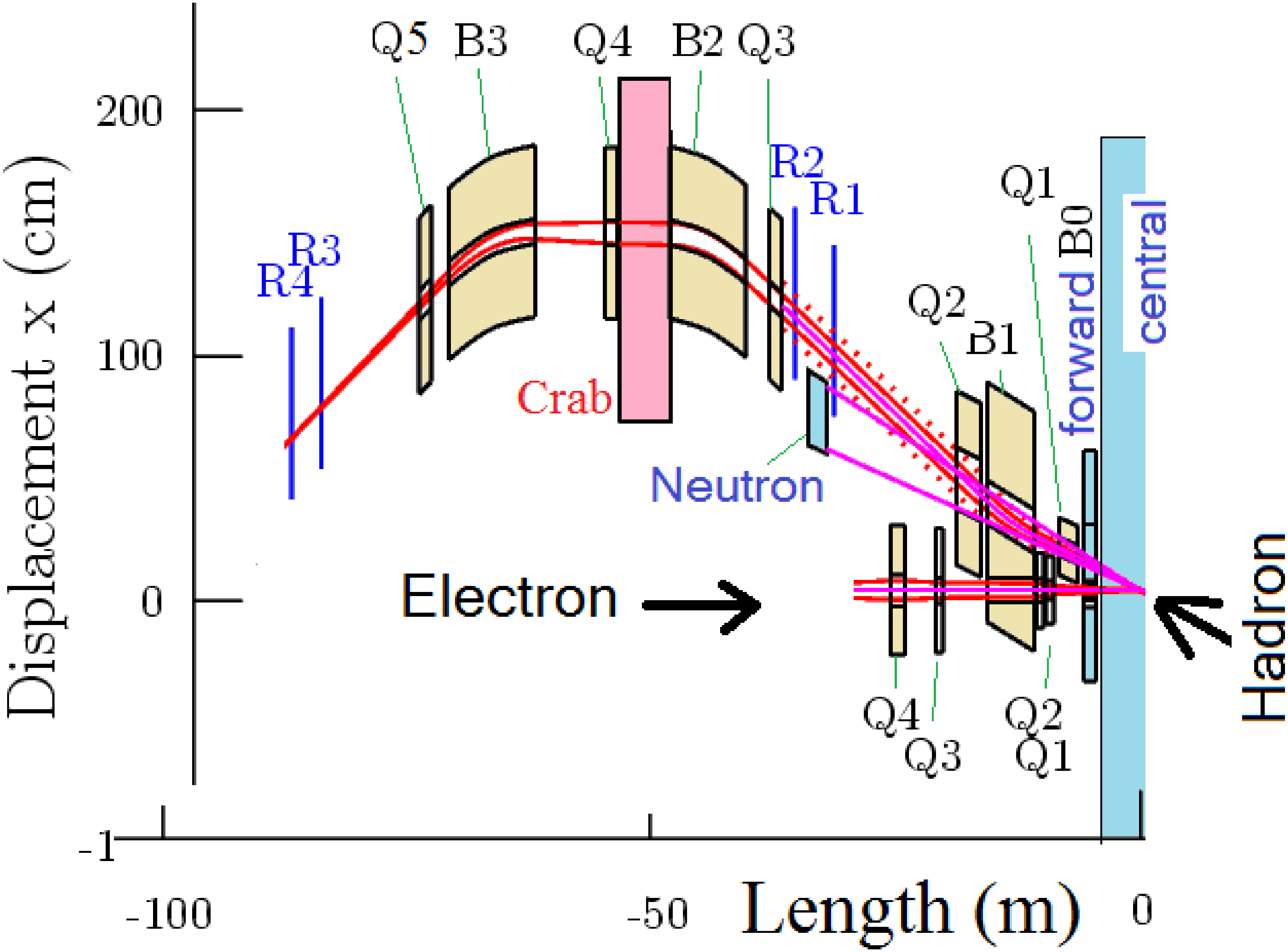
Scattering angles vs energy of diffracted protons at three energies: a) 50 GeV; b)100 GeV;c)250 GeV. Three angular regions are indicated: I, II, III, & IV.

Luminosities

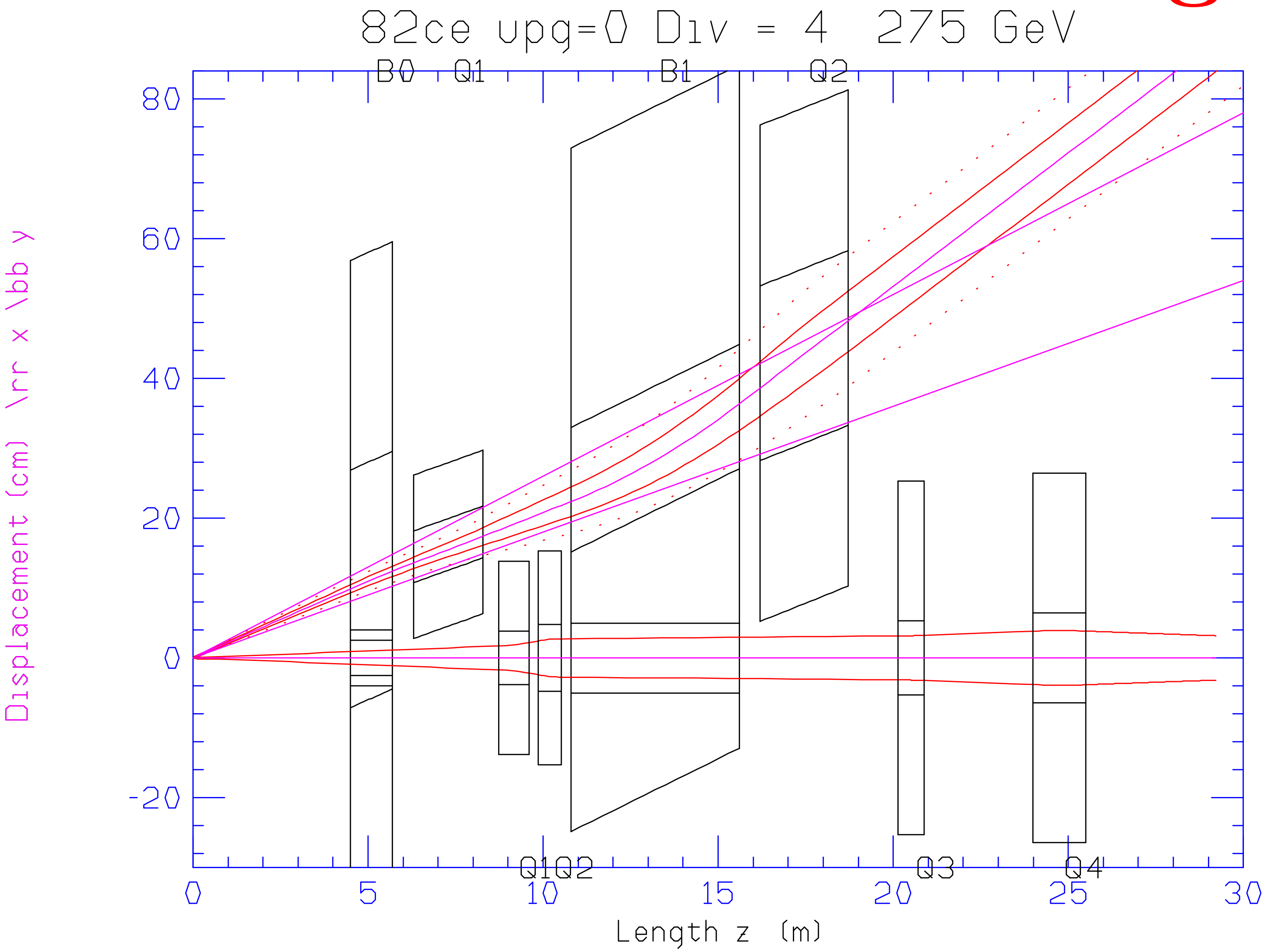


Luminosities: a) without cooling & High Acceptance (HA); b) without cooling & High Luminosity (HL); c) with cooling & High Acceptance (FHA); d) with cooling & High Luminosity (FHL).

Hadron Leaving

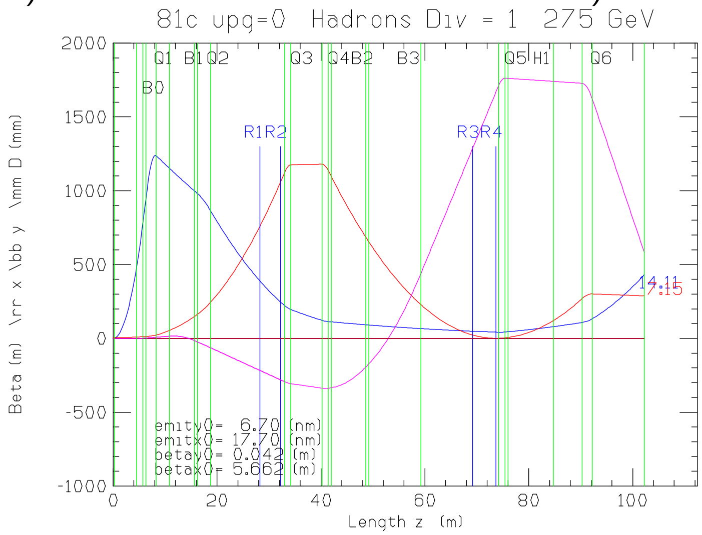


Detail of Hadron leaving

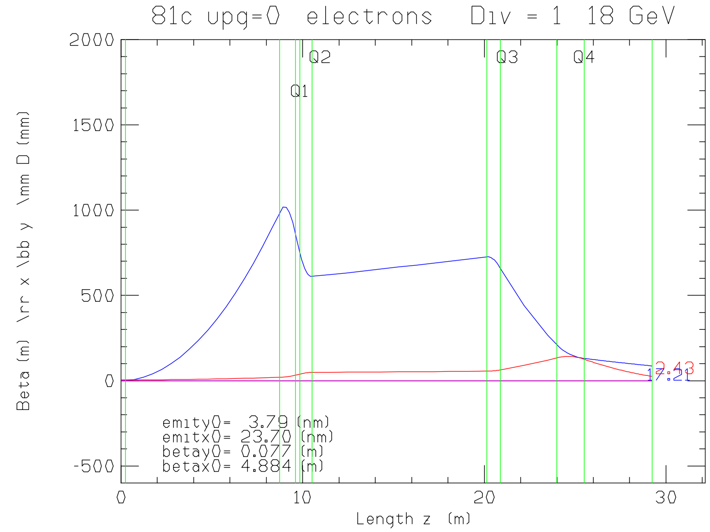


Betas

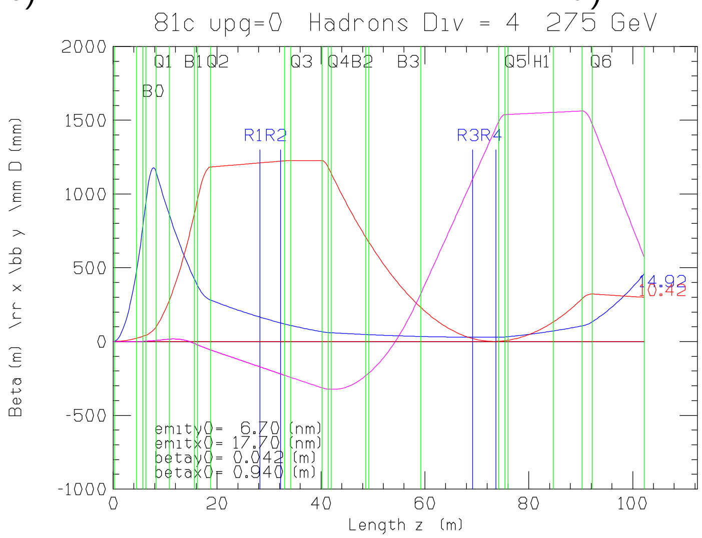
a)



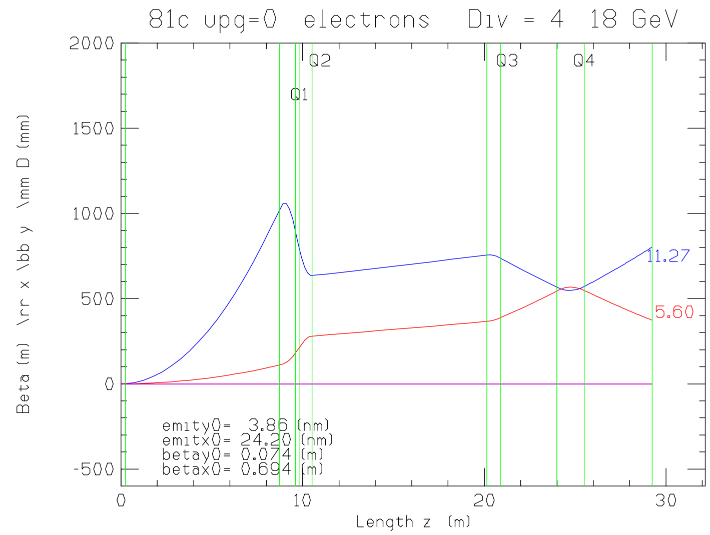
b)



c)

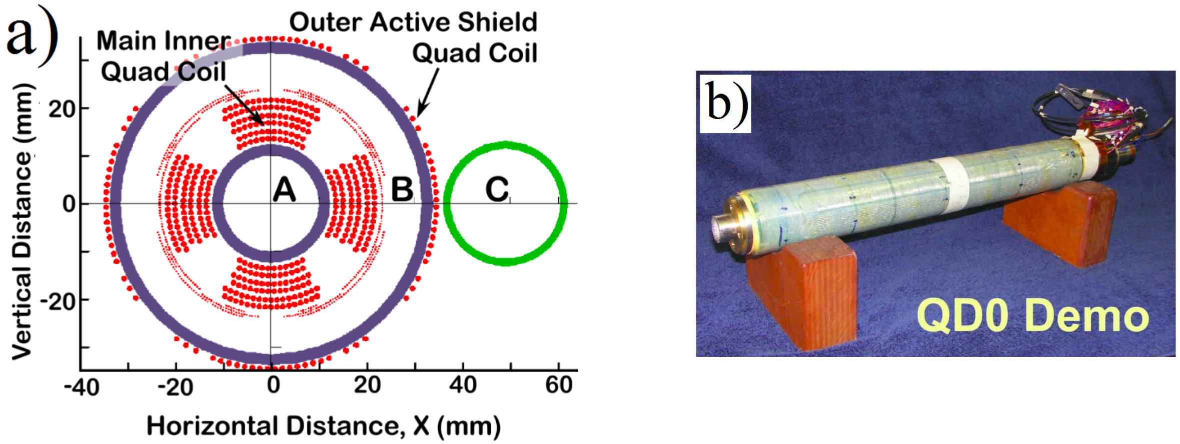


d)



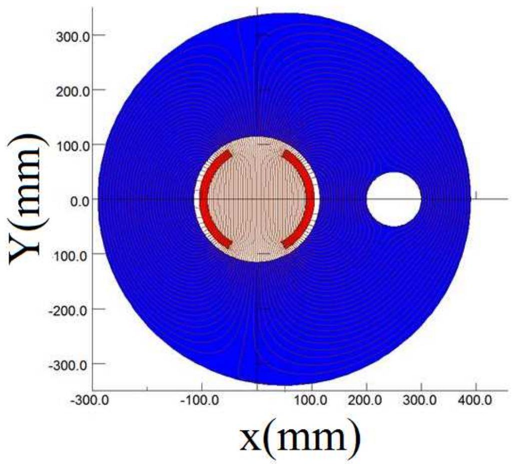
Beta functions vs.-length without cooling for the High Acceptance case; a) for protons; b) for Electrons; and High Luminosity case in c) and d) again for protons and electrons

Active mag shielding



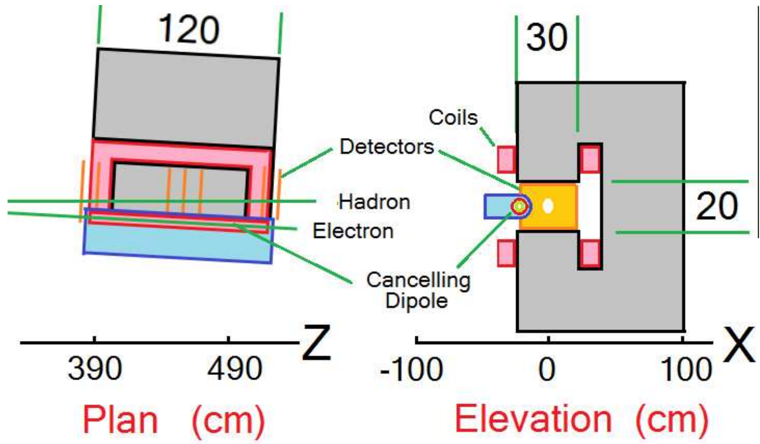
Actively shielded quadrupole Q2:a) Cross section;b) Tested prototype of such a magnet built for the ILC

Later shielding

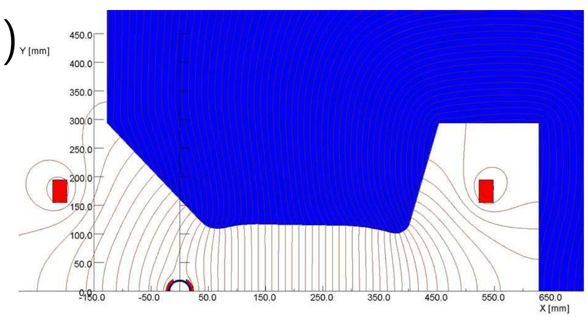


Proposed shielding of B1, and possibly Q2, where the iron yoke size is increased and a hole made where the electrons will pass.

a)

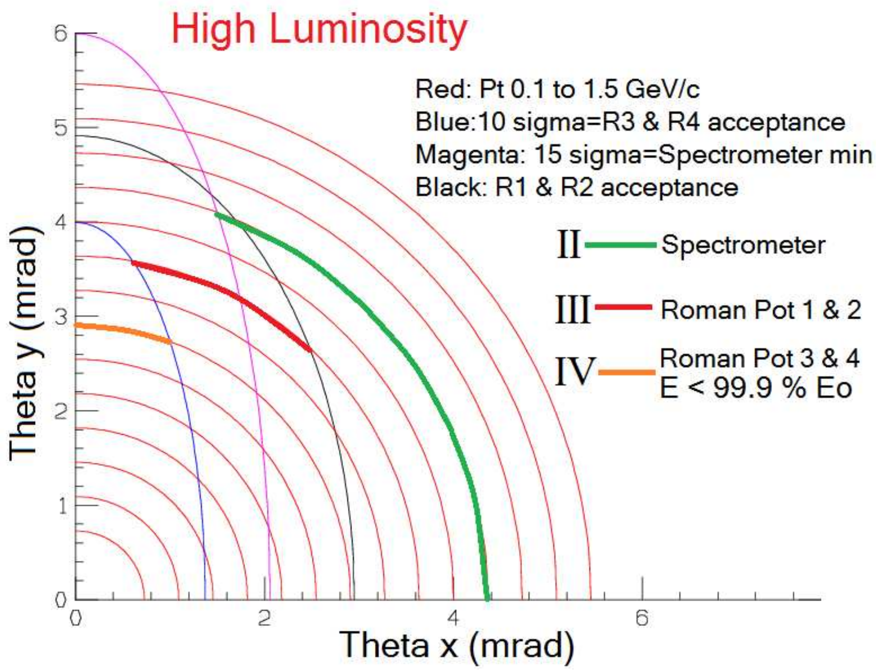


b)



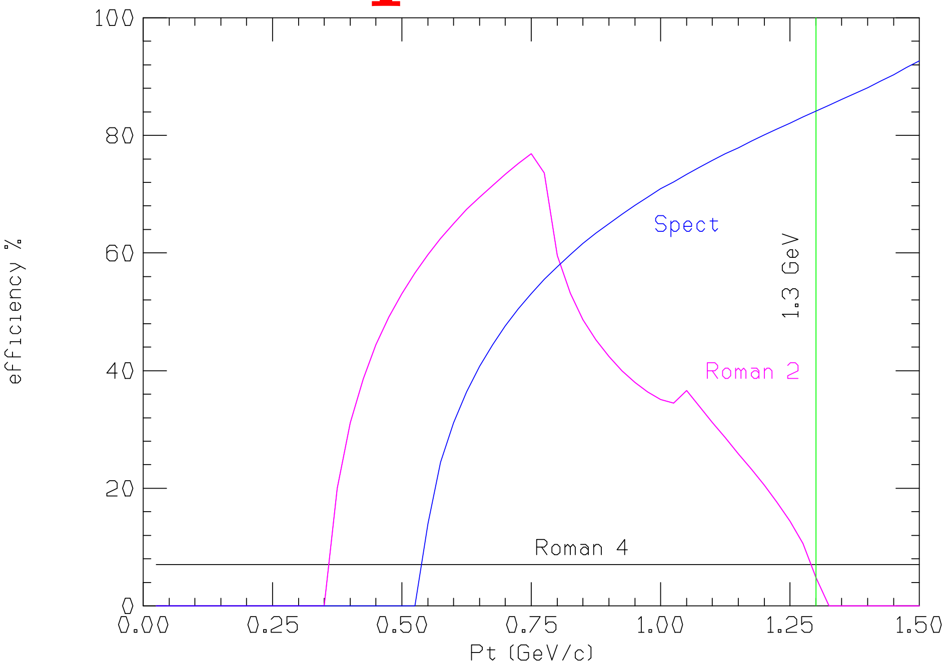
Super-ferric forward spectrometer with direct wound cancelling dipole over the electron beam; a) sketch of concept; b) First pass cross section.

Azimuthal Acceptance

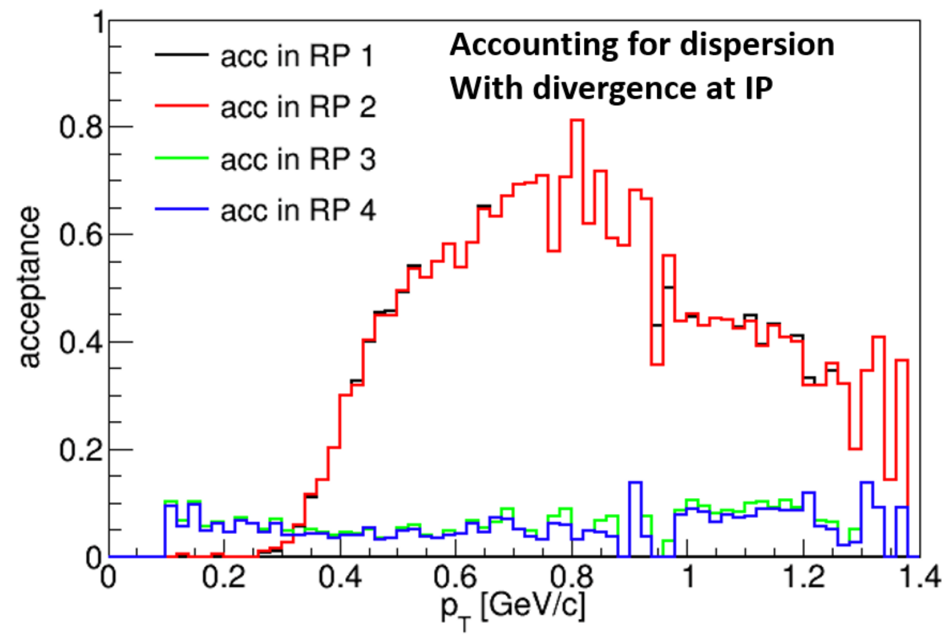


Azimuthal acceptances for regions II, IiI, and IV for the High Luminosity case.

Acceptances

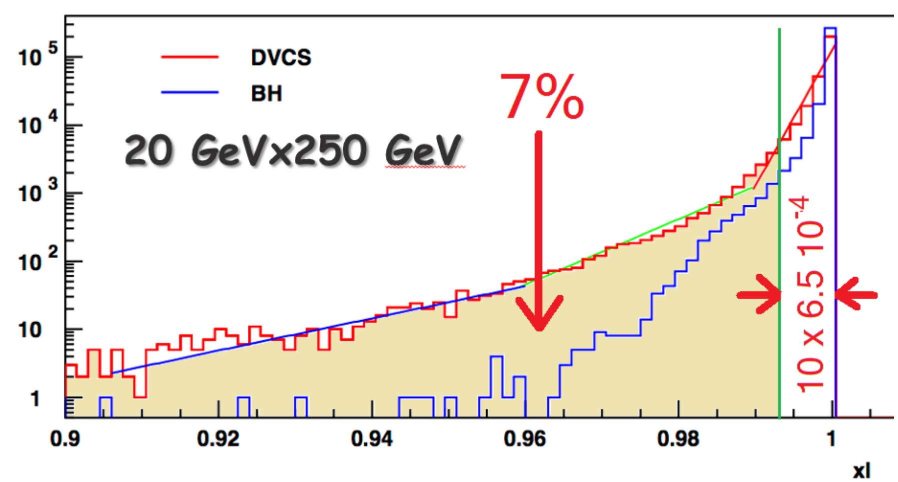


Simple Calculation

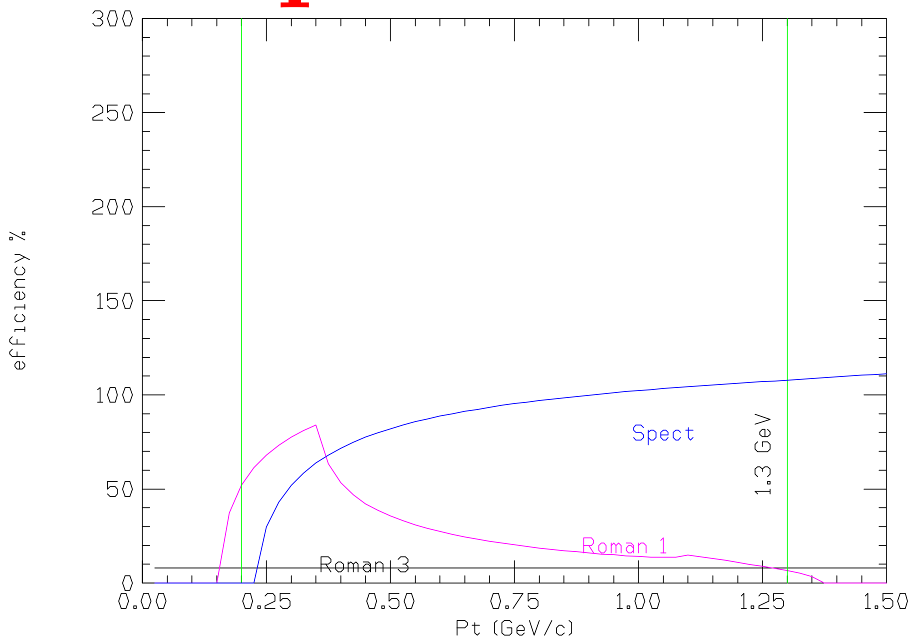


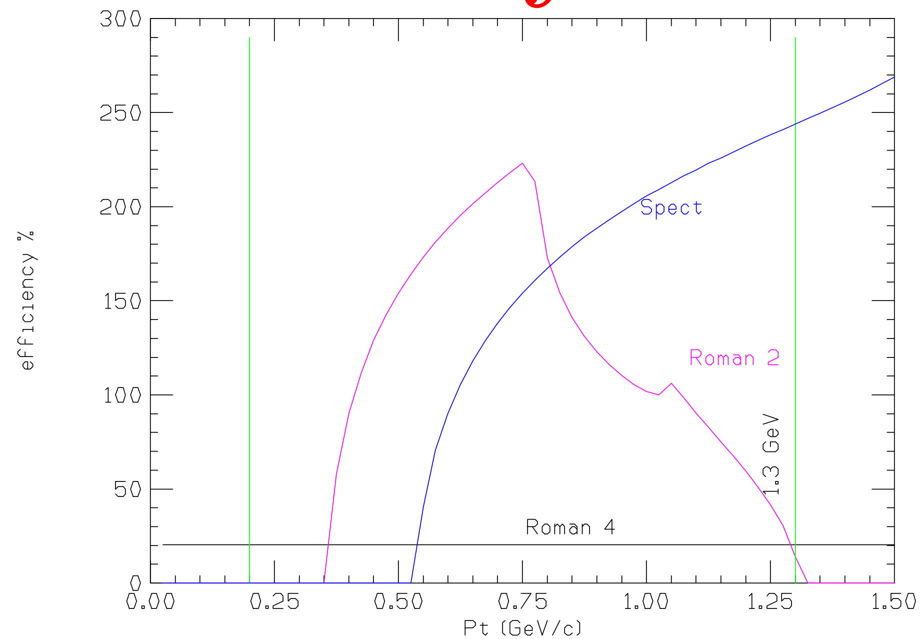
GEANT Simulation

Efficiency with cut at
$dp/p = 10 \times 6.5\ 10^{-4}$



Acceptances × Luminosity





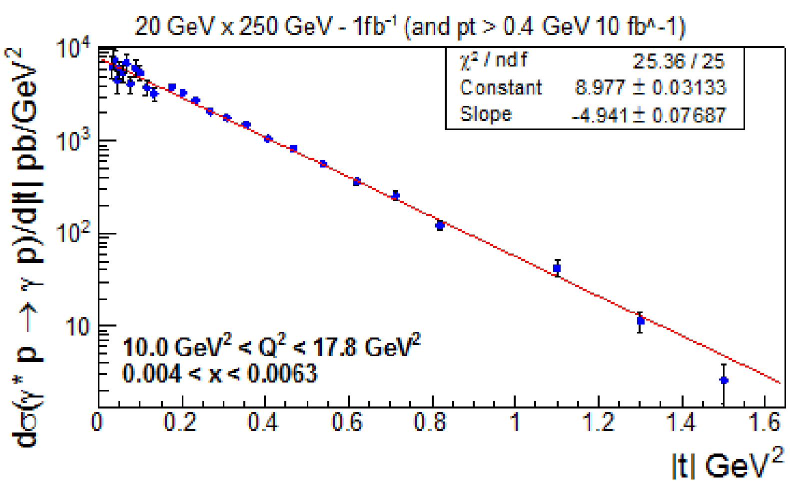
High Acceptance dir High Luminosity

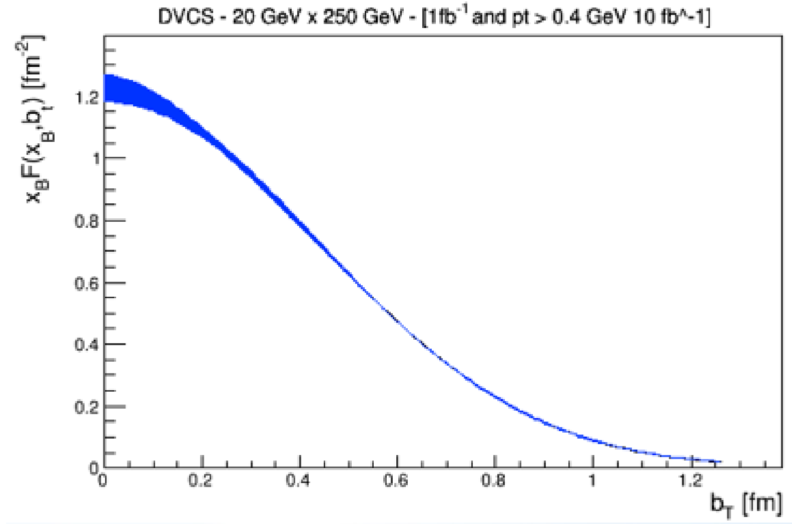
Efficiency × Luminosity:

HL	$<$ 400 MeV/c 20	$>$ 400 MeV/c 200	1:10
HA	$<$ 400 MeV/c 55	$>$ 400 MeV/c 50	1:10

HA not obviously better

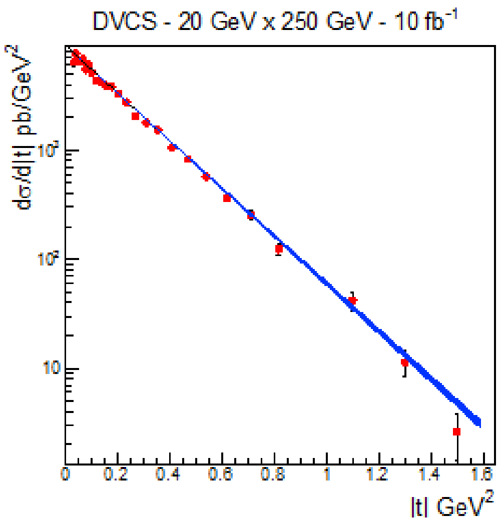
How Bad is this?

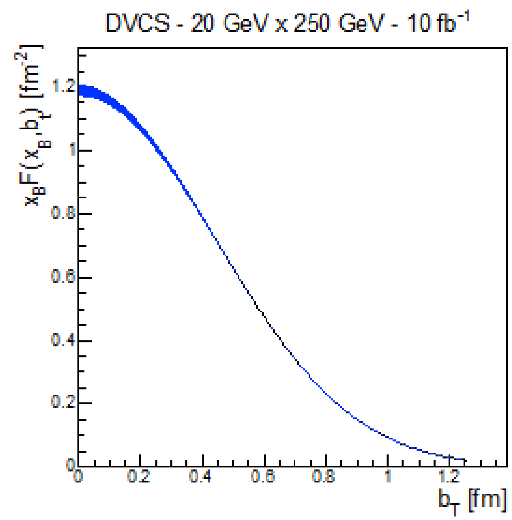




10 fb above
400 MeV/c

1 fb below
400 MeV/c





10 fb for all

Not obviously so bad, because cross sections are much higher at low pt