一次および二次ビームラインの光学

KEK 野海 博之

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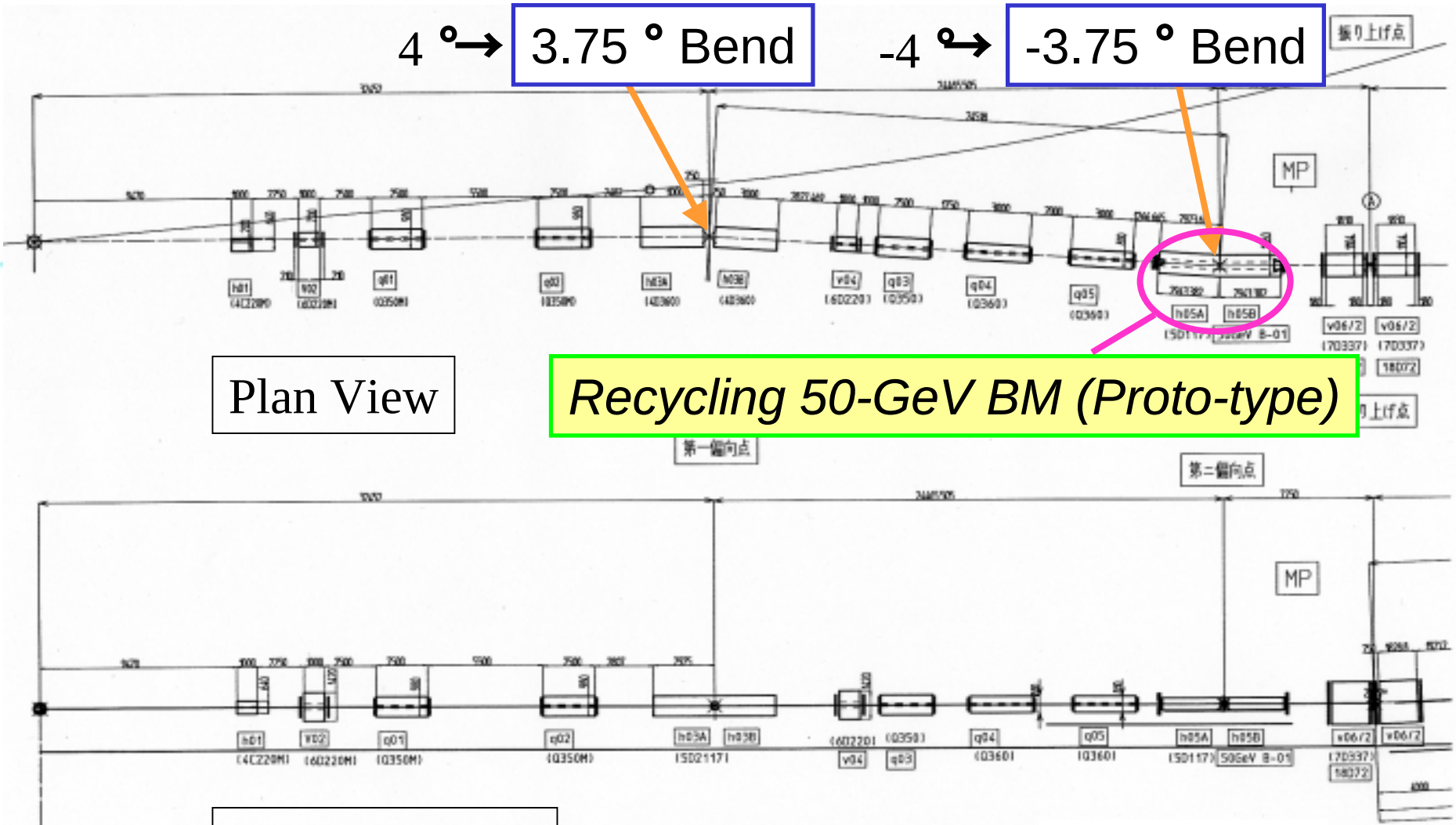
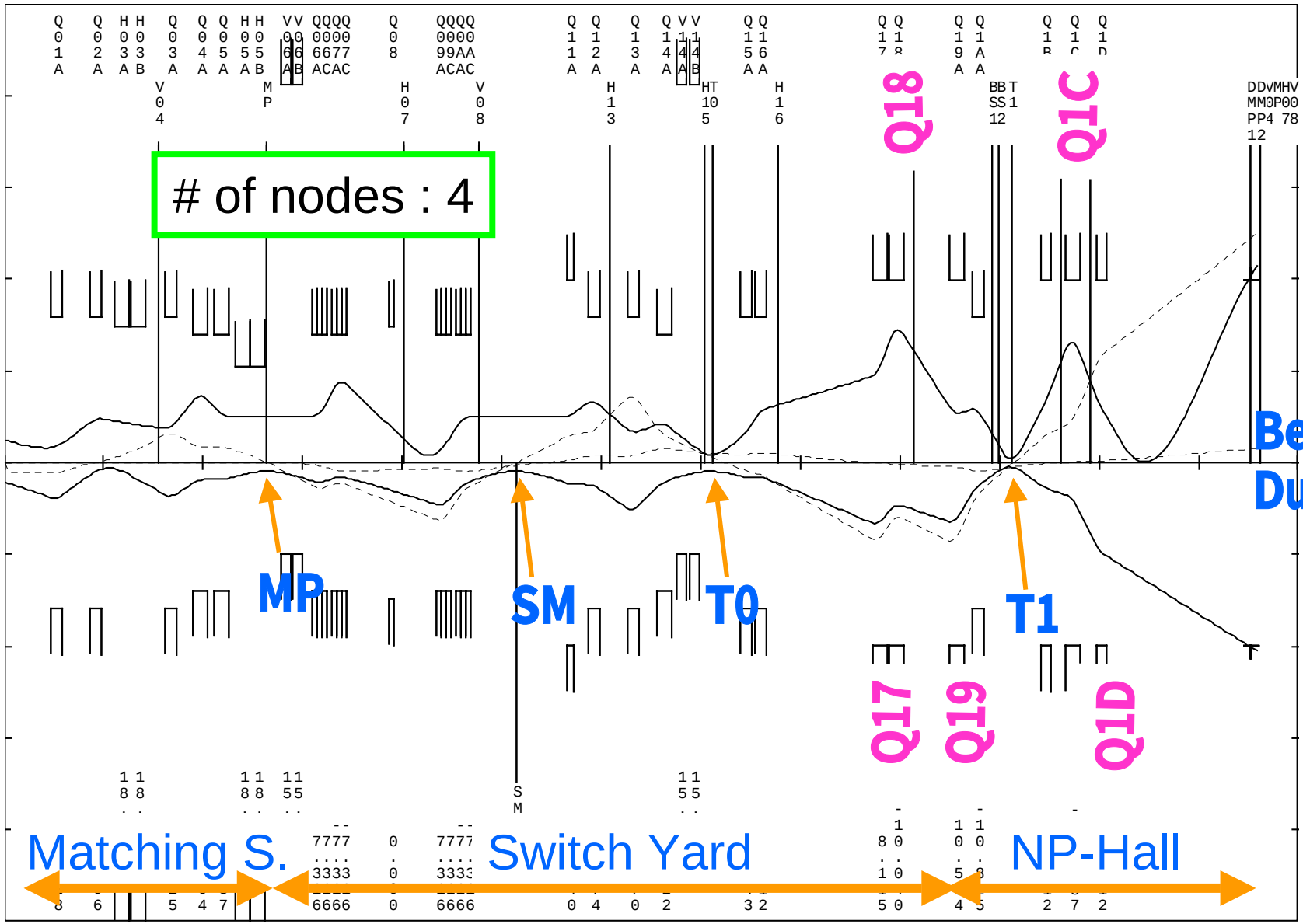
1. Summary of Recent Progress in Beam Optics

1) Change of the layout in the primary matching section
2) 3rd order optics (+ ES field) for K1.8
3) Option for K1.1 Optics

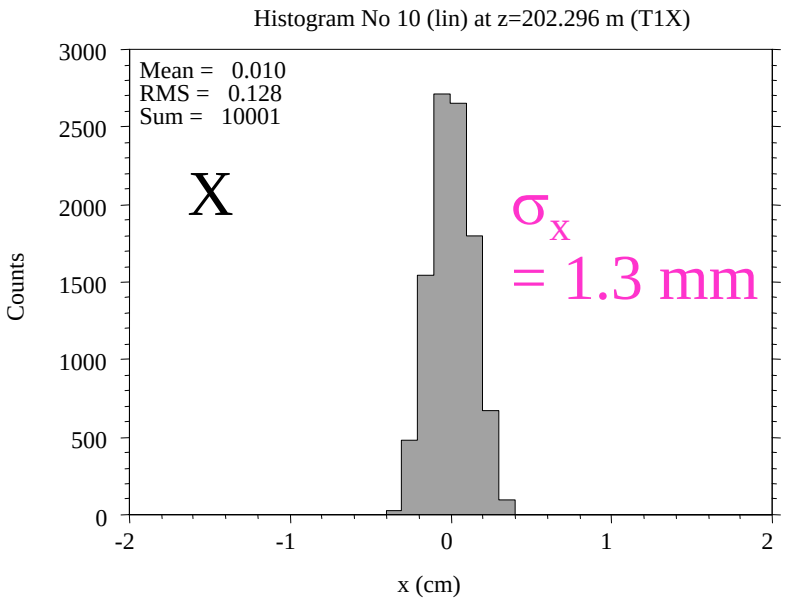
2. Minor change of Primary Beam Optics

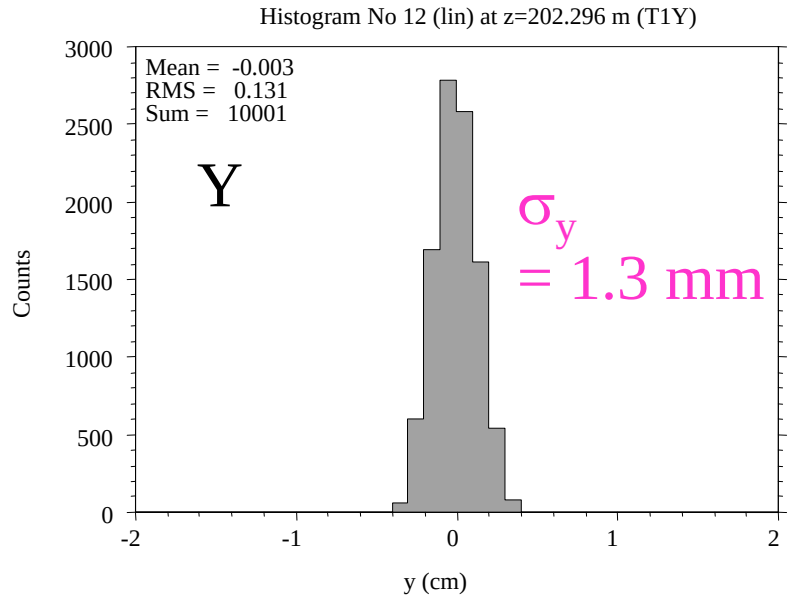


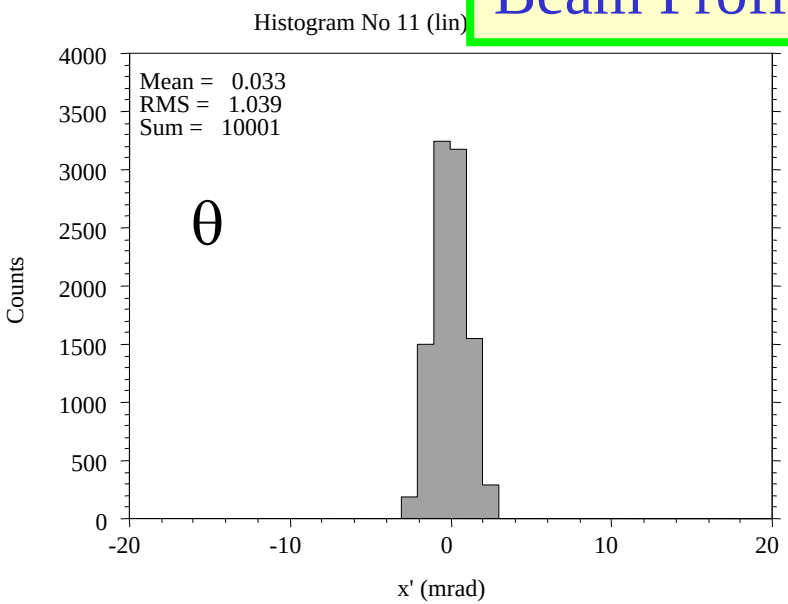
Beam Envelope (30 GeV SEB: ε_H=4.4π / ε_V=10.4π mm･mr)

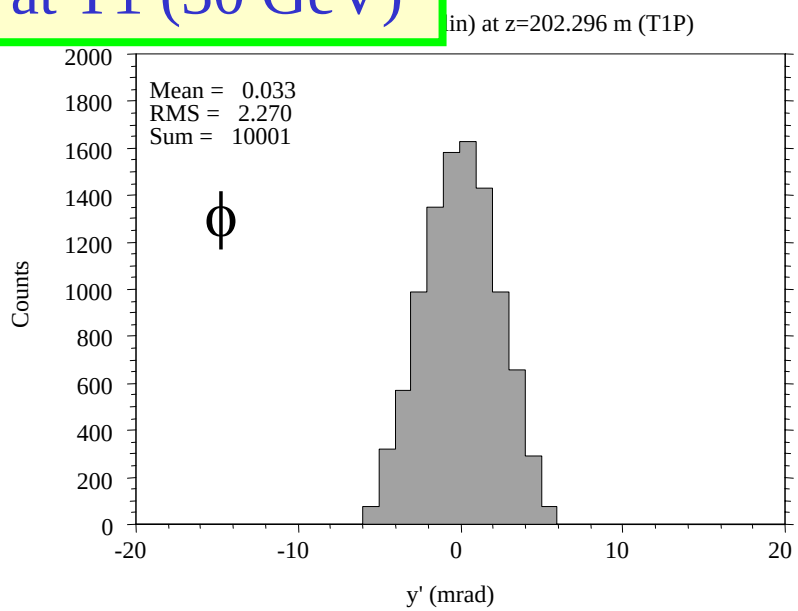


Beam Profile at T1 (30 GeV)

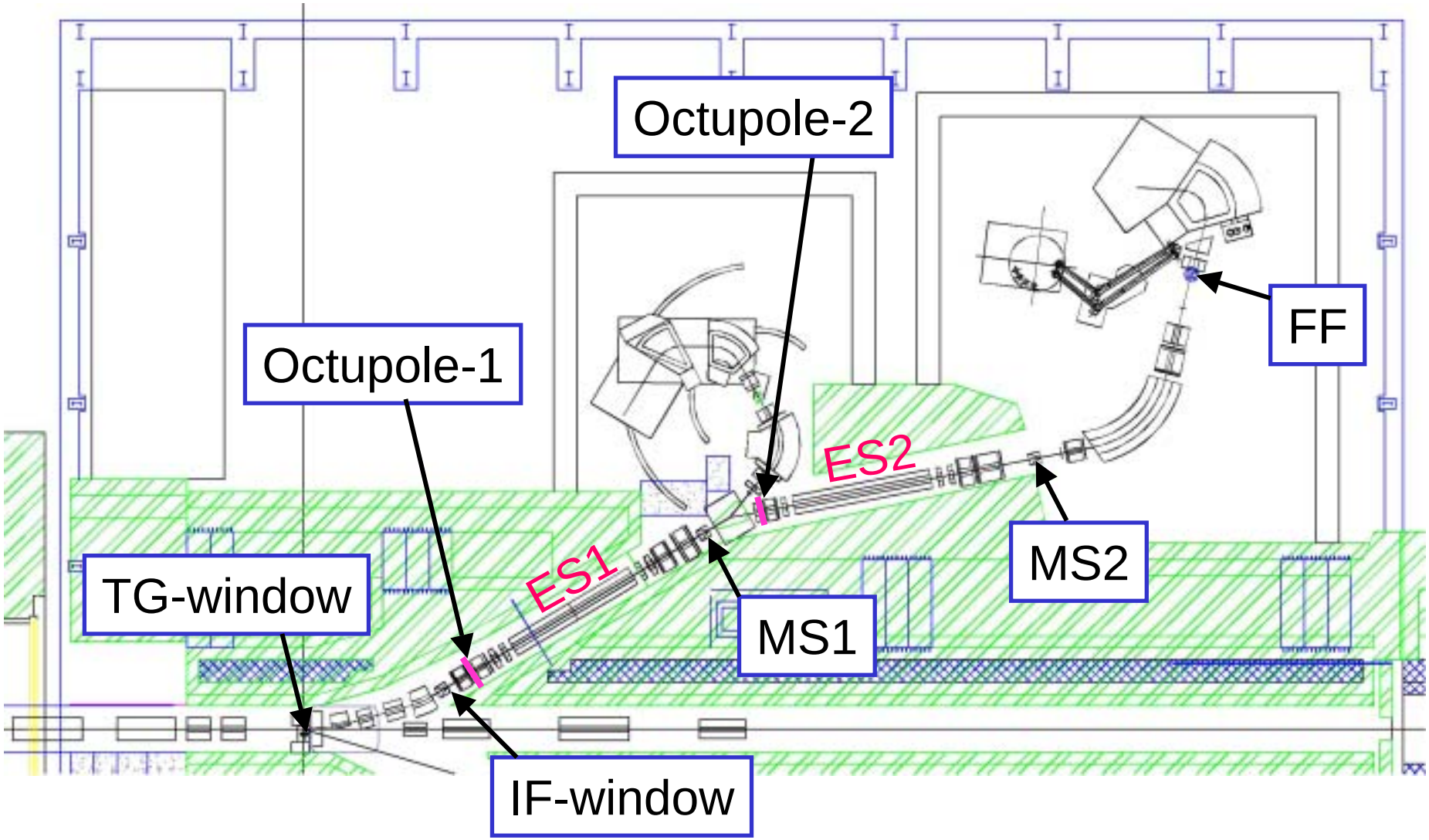






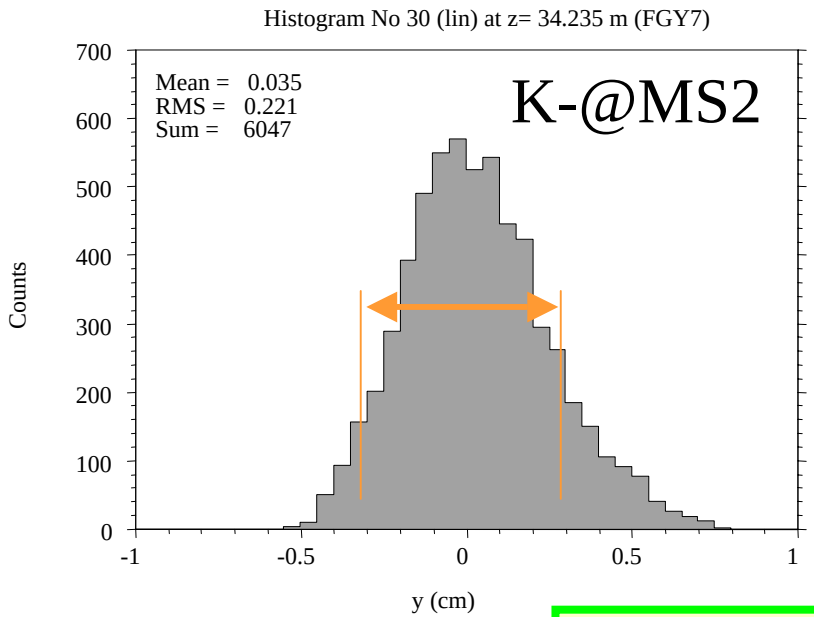


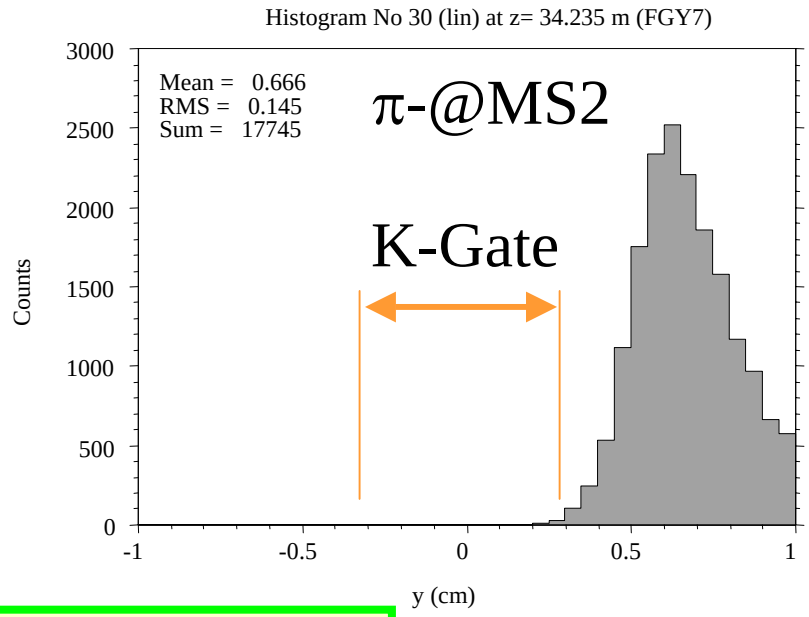
3. Progress of K1.8 Beam Optics



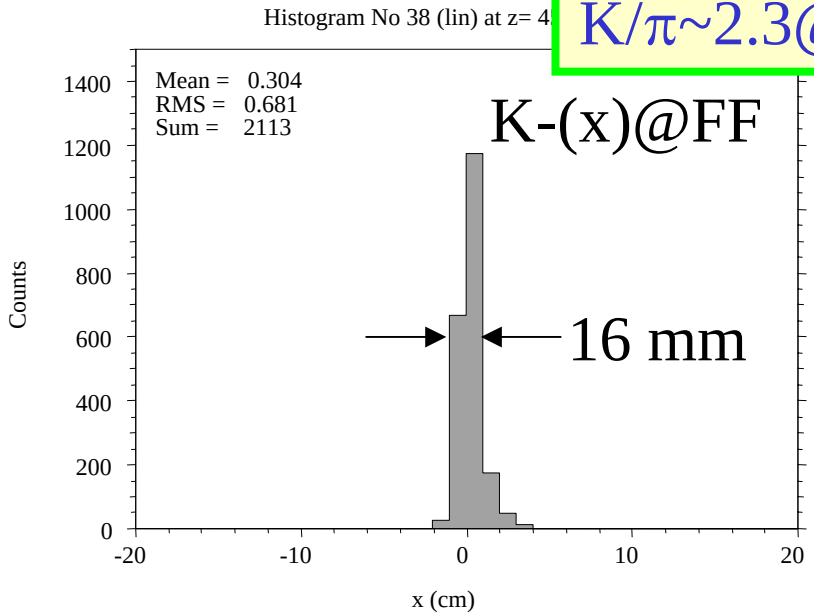
⇒ Decay TURTLE (3rd Order Optics + ES Field)

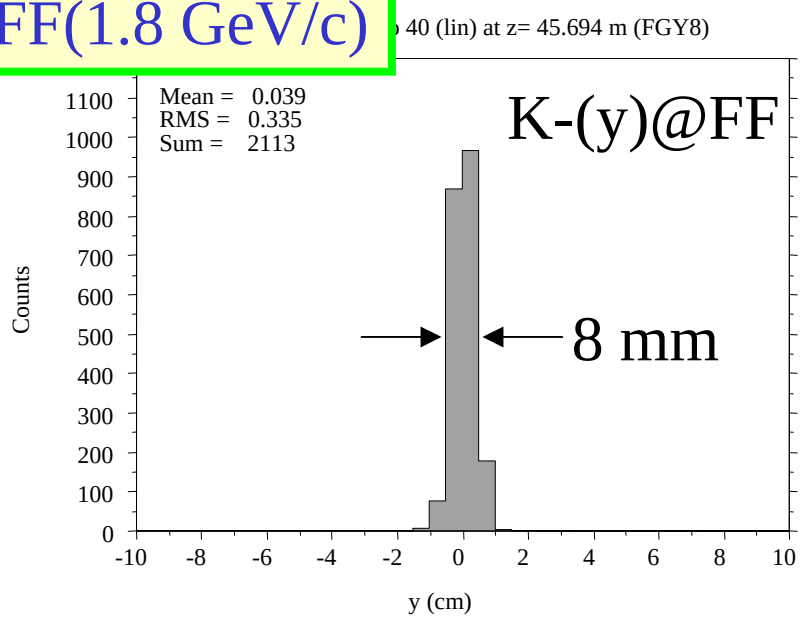
w/ TG, IF-windows (SUS-200μm,50μm) MS1 Opening: ± 2 mm





K/π~2.3@FF(1.8 GeV/c)





3rd Order Optics → Two octupoles are to be installed.

	K1.8 (50 GeV-15μA)	(30 GeV-9μA)
Max. Mom. (GeV/c)	2	
Length (m)	45.694	
Acceptance (msr.%) &	2.03(2.00%)	
$K^-(\pi)$ Intensity (ppp)#		
1.8 GeV/c	9.3E+06	2.0E+06
1.1 GeV/c	0.67E+06	0.14E+06
Electro-static Separator	750kV/10cm 6m×2	
K^-/π^- @ 1.8 GeV/c $	2.3(0.7%)	2.6
X/Y(FWHM) size @ FF (mm)	16/8	

& MS1 opening: ±2mm, MS2 opening: -3.25mm,+2.75mm
# using Sanford-Wang formula, assuming 1pulse=3.42s (0.7s flat top)
$ cloud π not included, % values in () for no octupoles

4. Option for K1.1 Beam Optics

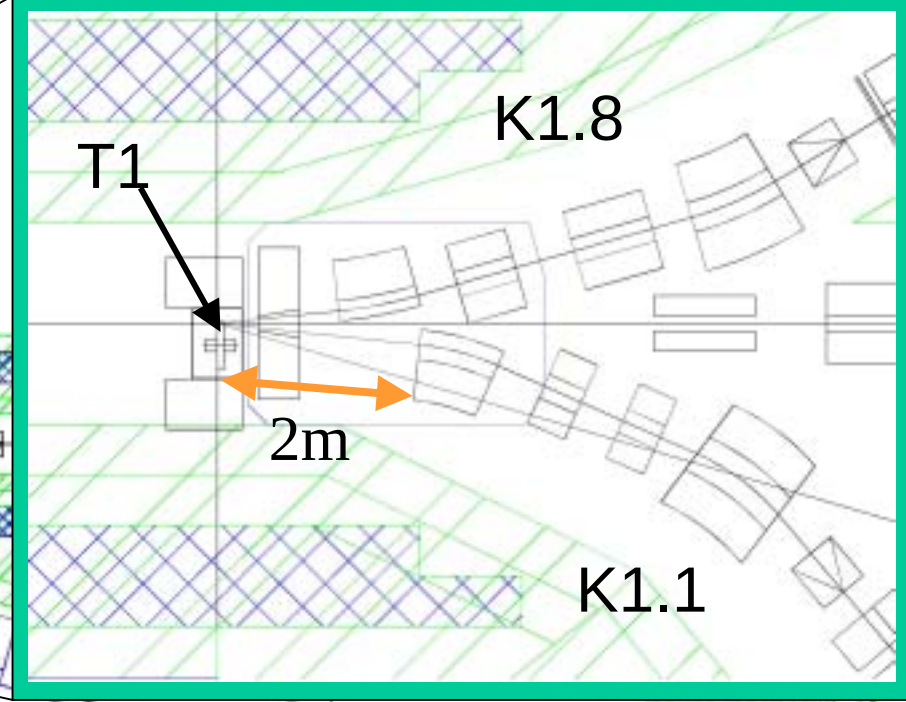
- Big Problem:
  Interference of the K1.8-D1 field with the K1.1-D1 one
  ⇒Takahashi's Talk

Need to keep those off each other

- One of Solutions (Options):
  to place the K1.1-D1 entrance 2 m from T1

…may reduces the Acceptance and Prolongs the Beam Line

K1.1 Layout Option



⇒ Decay TURTLE (3rd Order Optics)

K1.1 Beam Line 3rd Order Optics

2004.4.5

	Previous (@JPSM Sep/03)	Present (Preliminary)	
Max. Mom. (GeV/c)	1.1	1.1	
Length (m)	25.818	27.058	+1.24 m
Acceptance (msr.%)	4.4&	4.1¥	-7 %
K^- Intensity (ppp)#			
1.1 GeV/c	12E+06(2.6E+06)	9.5E+06(2.1E+06)	-20 %
0.8 GeV/c	3.1E+06(0.7E+06))	2.3E+06(0.5E+06)	-26 %
Electro-static Separator	750kV/10cm 2m×2		
K^-/π^- @ 1.1 GeV/c $	1.7	8	
Magnification@MS2	-0.44	-0.49	

& MS1&MS2 opening: ±1mm, ¥ MS1 opening: ±1mm, MS2: ±2mm

using Sanford-Wang formula, assuming 1pulse=3.42s (0.7s flat top) for 50 GeV-15μA
Values in () are in the case of 30 GeV-9μA.

$ cloud π not included, % values in () for no octupoles

5. Summary

1. Primary beam line

   Change of the matching section layout

   ⇒realistic drawings for magnets, beam pipes, monitors…

2. K1.8 Beam Line

   3rd order optical design requires *2 octupoles*.

   ⇒ realistic layout to install those…

3. K1.1 Beam Line

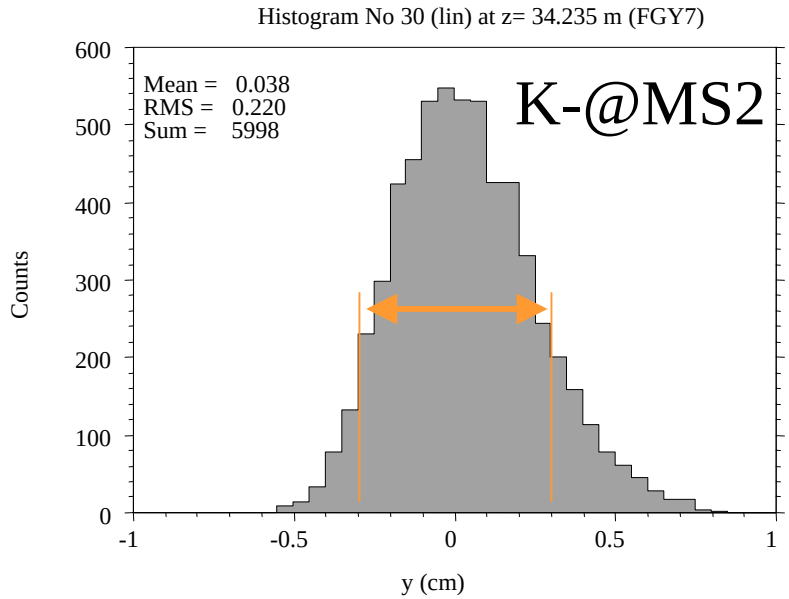
   Optical design with D1(entrance) position of 2m from T1

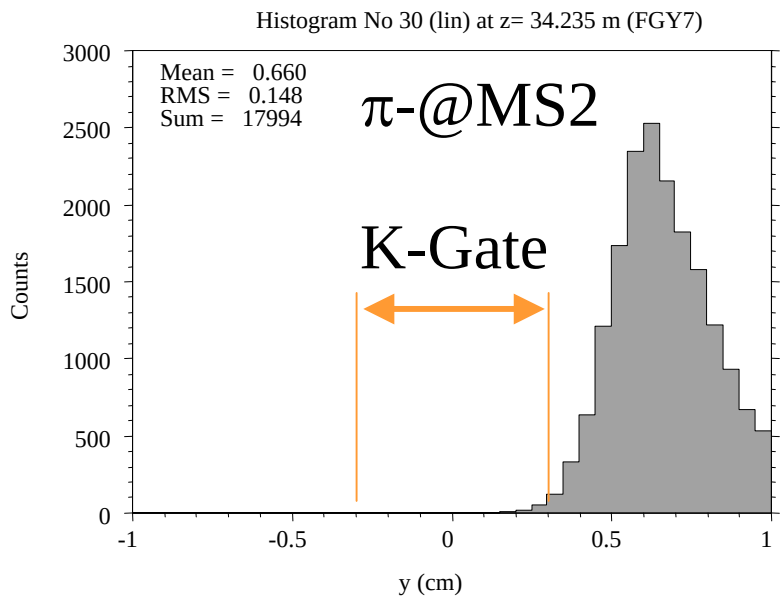
   ⇒ prolongs the BL length 1.24 m

   20 (26) % reduction of K- intensity at 1.1 (0.8) GeV/c

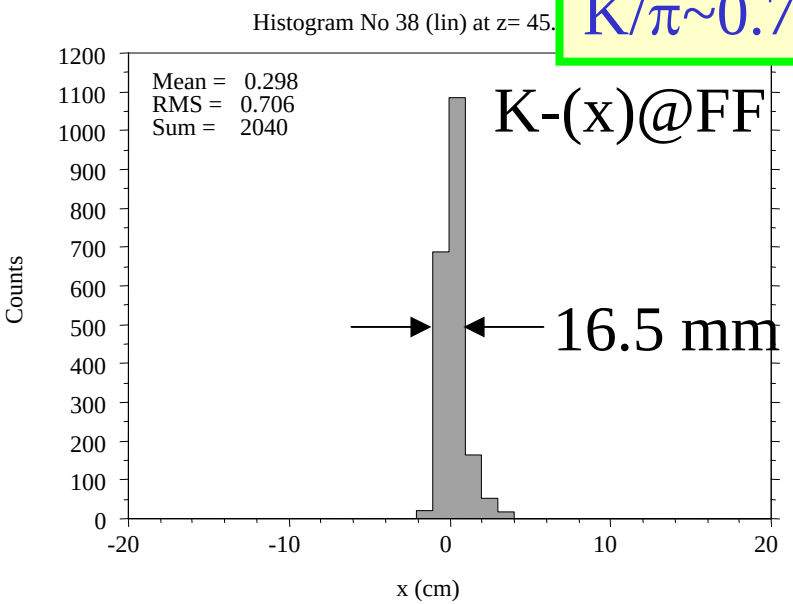
Misc.

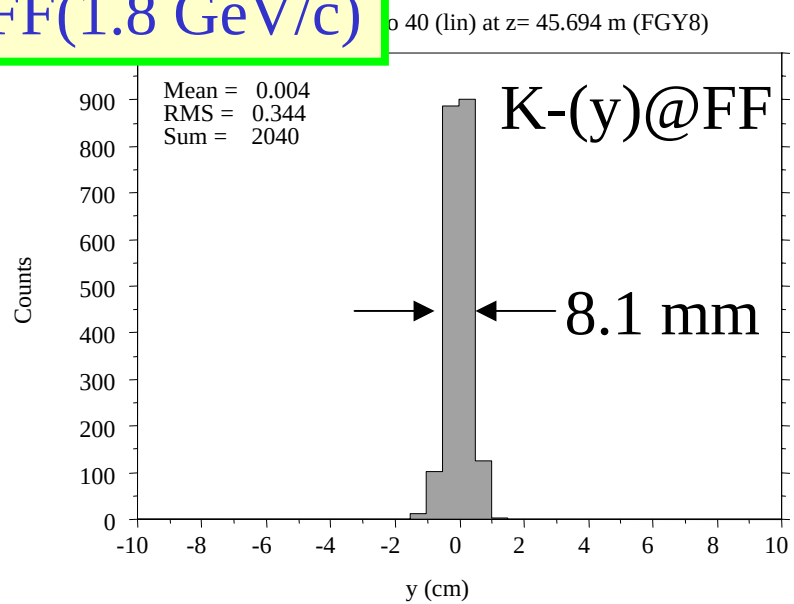
TG, IF-windows (SUS-200μm,50μm)+He Gas in the Central Chamber





K/π~0.7@FF(1.8 GeV/c)





Optical Design with Decay TURTLE/TRANSPORT %

2003.9.10

	K1.8	K1.1BR	K1.1	HR
Max. Mom. (GeV/c)	2	1.2	1.1	1.2
Length (m)	45.694	26.973	25.82	48.21
Acceptance (msr.%)	2.9	4.8	4.4	4
$K^-(\pi)$ Intensity (ppp)#				
1.8 GeV/c	13E+06			
1.1 GeV/c	0.75E+06	11E+06	12E+06	4100E+06
0.8 GeV/c		2.1E+06	3.1E+06	
Electro-static Separator	750kV/10cm 6m×2	500kV/10cm 6m×1	750kV/10cm 2m×2	500kV/10cm 6m×1
K^-/π^- $	Inf.&	Inf.*	1.7*	-
Mom. Resol.(% in σ)	0.03	0.02	-	<0.01
Xrms/Yrms size @ FF (mm)	6.0/2.7	14.5/2.6	6.0/1.6	

% taking 2nd order into account but for K1.1(3rd order)

using Sanford-Wang formula, assuming 1pulse=3.42s (0.7s flat top), 50GeV-15μA p Beam

$ cloud π not included, & at 1.8 GeV/c, * at 1.1 GeV/c

Optical Design with Decay TURTLE/TRANSPORT %

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Max. Mom. (GeV/c)	2	1.2	1.1	1.2
Length (m)	45.694	26.973	25.82	48.21
Acceptance (msr.%)	2.9	4.8	4.4	4
$K^-(\pi)$ Intensity (ppp)#				
1.8 GeV/c	3.1E+06			
1.1 GeV/c	0.18E+06	2.7E+06	2.9E+06	1331E+06
0.8 GeV/c		0.5E+06	0.75E+06	
Electro-static Separator	750kV/10cm 6m×2	500kV/10cm 6m×1	750kV/10cm 2m×2	500kV/10cm 6m×1
K^-/π^- $	Inf.&	Inf.*	1.7*	-
Mom. Resol.(% in σ)	0.03	0.02	-	<0.01
Xrms/Yrms size @ FF (mm)	6.0/2.7	14.5/2.6	6.0/1.6	

% taking 2nd order into account but for K1.1(3rd order)

assuming 1pulse=3.42s (0.7s flat top), 30GeV-9μA p Beam

$ cloud π not included, & at 1.8 GeV/c, * at 1.1 GeV/c