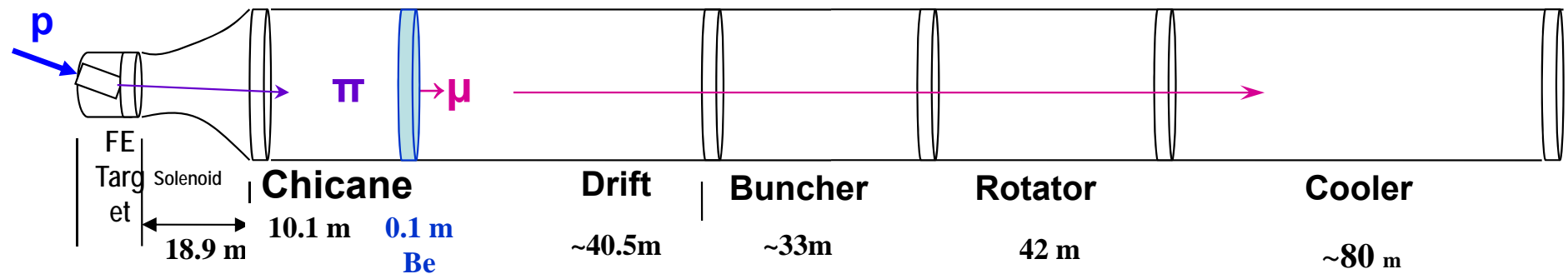


# Chicane Update

David Neuffer

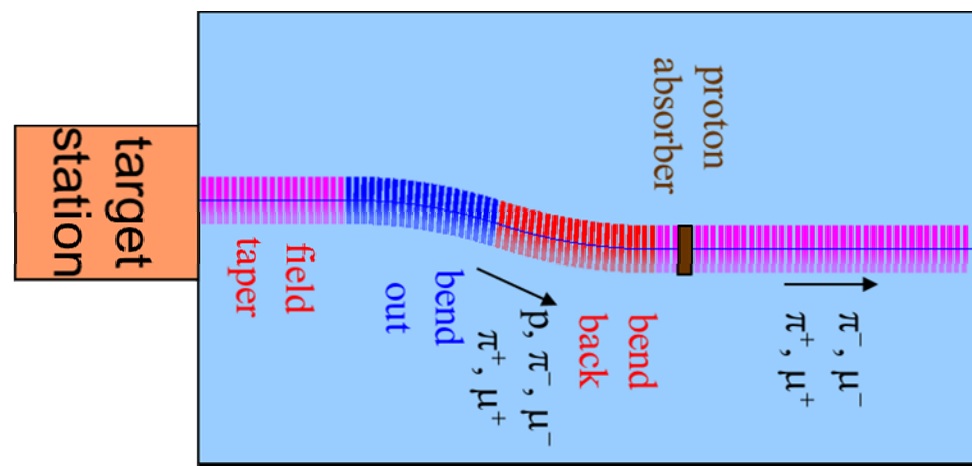
January 14, 2014



## ➤ with absorber & chicane

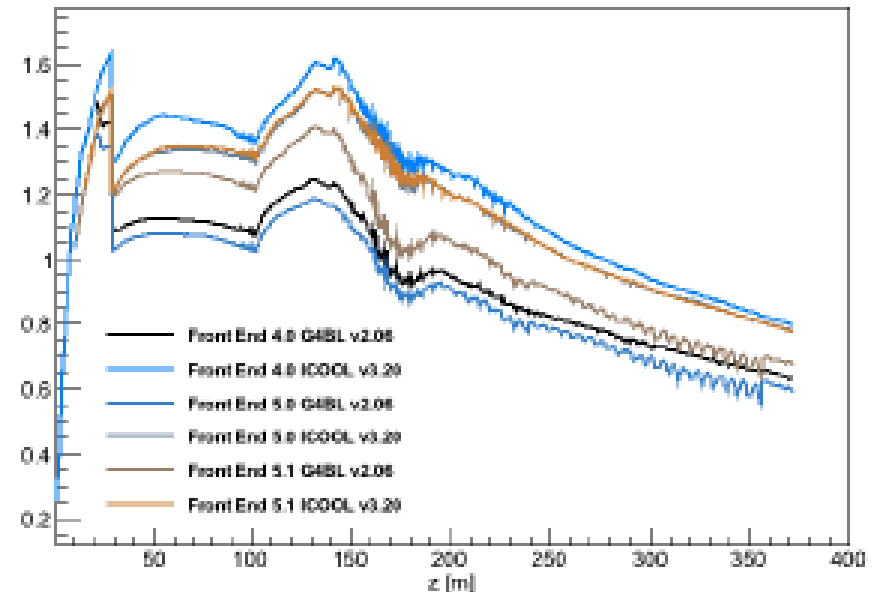
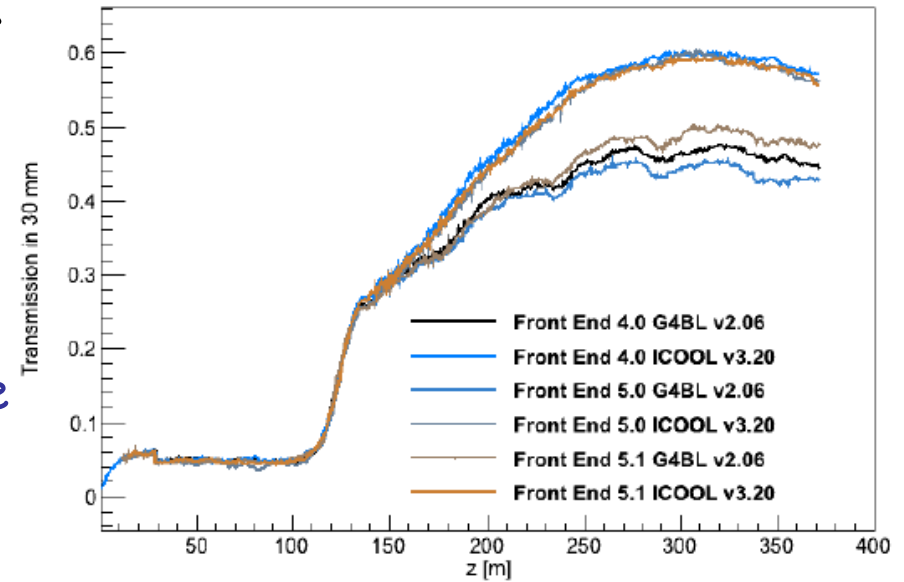
- particle 1-270 MeV/c
- particle 2-185 MeV/c
- 10m chicane (+/- 12.5°)
- absorber at 29m
  - 10cm Be
  - particle 1-237 MeV/c
  - particle 2-144 MeV/c
- Bunch N=10
- Rotate N=10.045
- Cool -201.25MHz
  - $p_{ref}=235 \text{ MeV/c}$

SREGION	!	bentsol																		
5.0	1	1e-2																		
1	0.	1.0																		
BSOL																				
1	1.5	0.0	1	0.27	0.0	0.043636	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
0.	0.																			
VAC																				
NONE																				
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

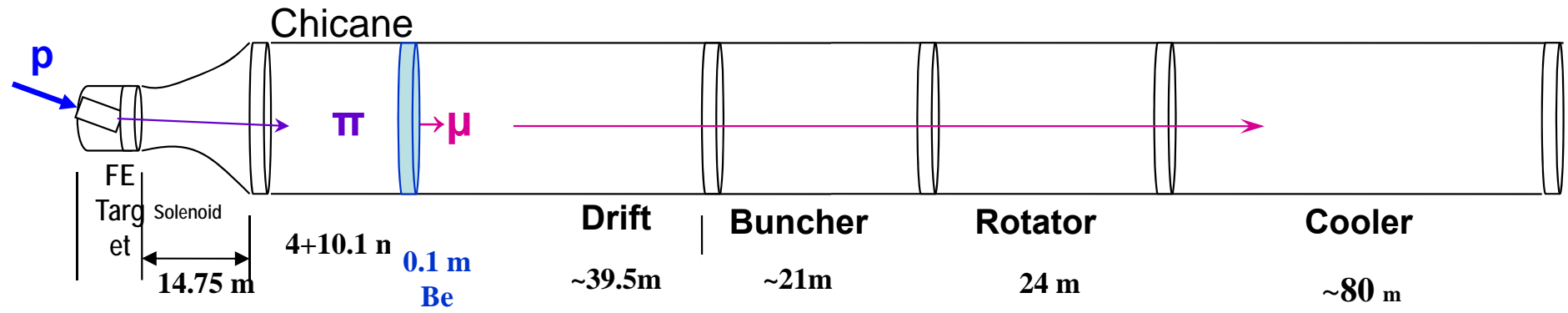


# Chicane Anomaly (Rogers)

- G4BL version does not work as well as ICOOL version
- Comparison
  - same  $\mu/p$  after rotator
  - less gain from cooling
  - more loss of beam in chicane absorber
- Design differences
  - ICOOL model idealized
    - no fringe fields
  - G4BL coils
    - smaller aperture cuts?
  - design matched within ICOOL
    - not rematched for G4bl
- scraping of larger amplitudes would give this behavior



- Anomaly is due to difference in G4BL/ICOOL in modeling  $\pi$  interactions
  - Icool is missing nuclear interactions that cause  $\pi$  loss in material
    - ICOOL adds  $\mu$ 's from  $\pi$ 's that have not decayed before absorber.
- Decay length for  $\pi$ 's is  $7.8\beta\gamma$  m
  - $\beta\gamma = \sim 2$
  - Absorber is 29m downstream
- → Place absorber further downstream
  - $\pi$  's decay before absorber



## ➤ "Muon collider" version

- $\pm 12.5^\circ$

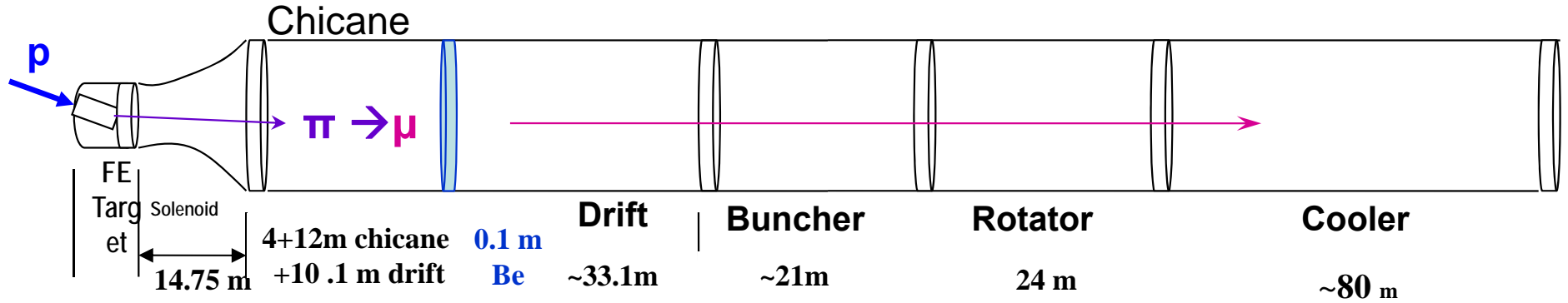
## ➤ Add chicane + absorber

- particle 1-283 MeV/c
- particle 2-194 MeV/c
- absorber at 29m
  - 10cm Be
  - particle 1-250 MeV/c
  - particle 2-154 MeV/c

- Bunch N=12  $0 \rightarrow 15$  MV/m : 496  $\rightarrow$  365 MHz
- Rotate N=12.045 - 20MV/m : 365  $\rightarrow$  326.5 MHz
- Cool -325MHz -25 MV/m
  - $p_{ref}=245$  MeV/c

SREGION	!	bentsol
5.0	1	1e-2
1	0.	1.0
BSOL		
1	2.0	0.0 1 0.283 0.0 0.043636 0.0 0.0
0.0	0.0	0.0 0.0 0.
VAC		
NONE		
0.0	0.0	0.0 0.0 0.0 0.0 0.0 0.0

# Update Chicane to reduce $\pi$ losses



## ➤ Add 10 m drift after chicane

\*6m  $\rightarrow$  +15°, -15°

## ➤ Add chicane + absorber

- particle 1-283 MeV/c
- particle 2-194 MeV/c
- absorber at 41m
  - 10cm Be
  - particle 1-250 MeV/c
  - particle 2-154 MeV/c

▪ Bunch (N=12) 0 $\rightarrow$ 15 MV/m :496 $\rightarrow$  365 MHz

▪ Rotate (N=12.045 )- 20MV/m : 365  $\rightarrow$  326.5 MHz

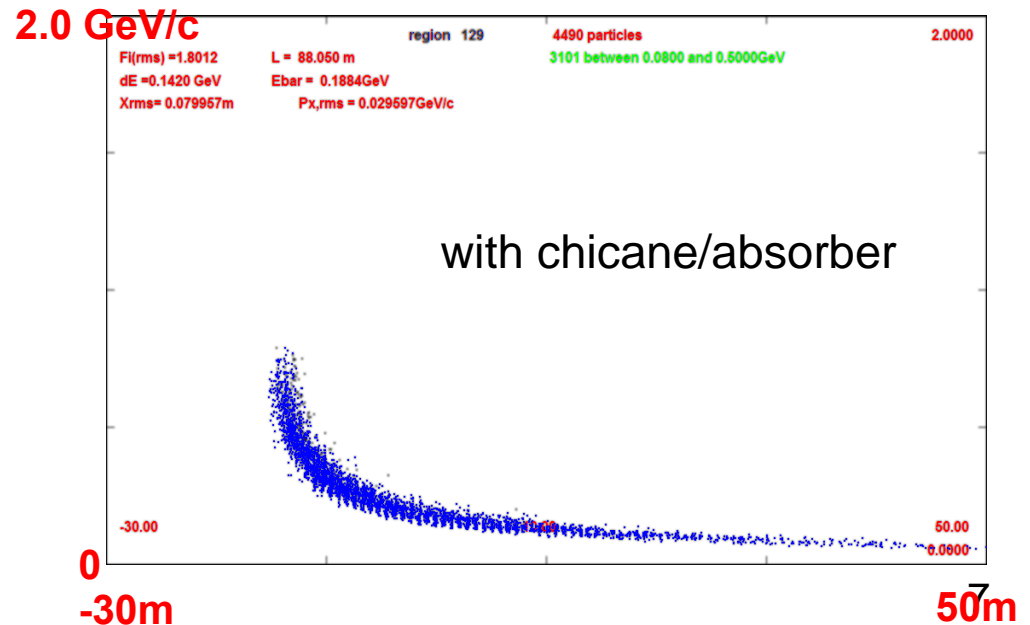
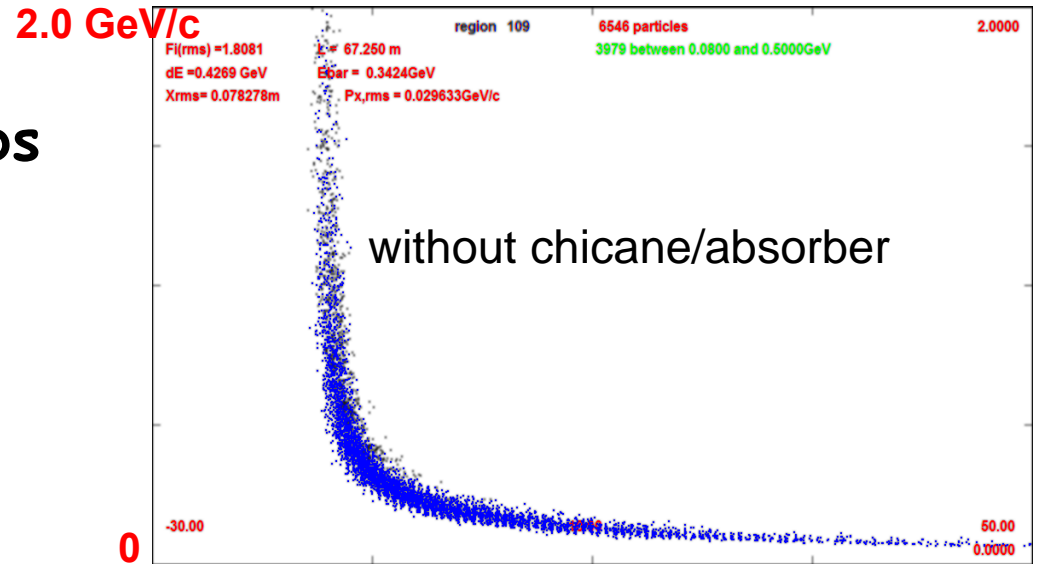
▪ Cool -325MHz -25 MV/m

- $p_{ref}=245$  MeV/c

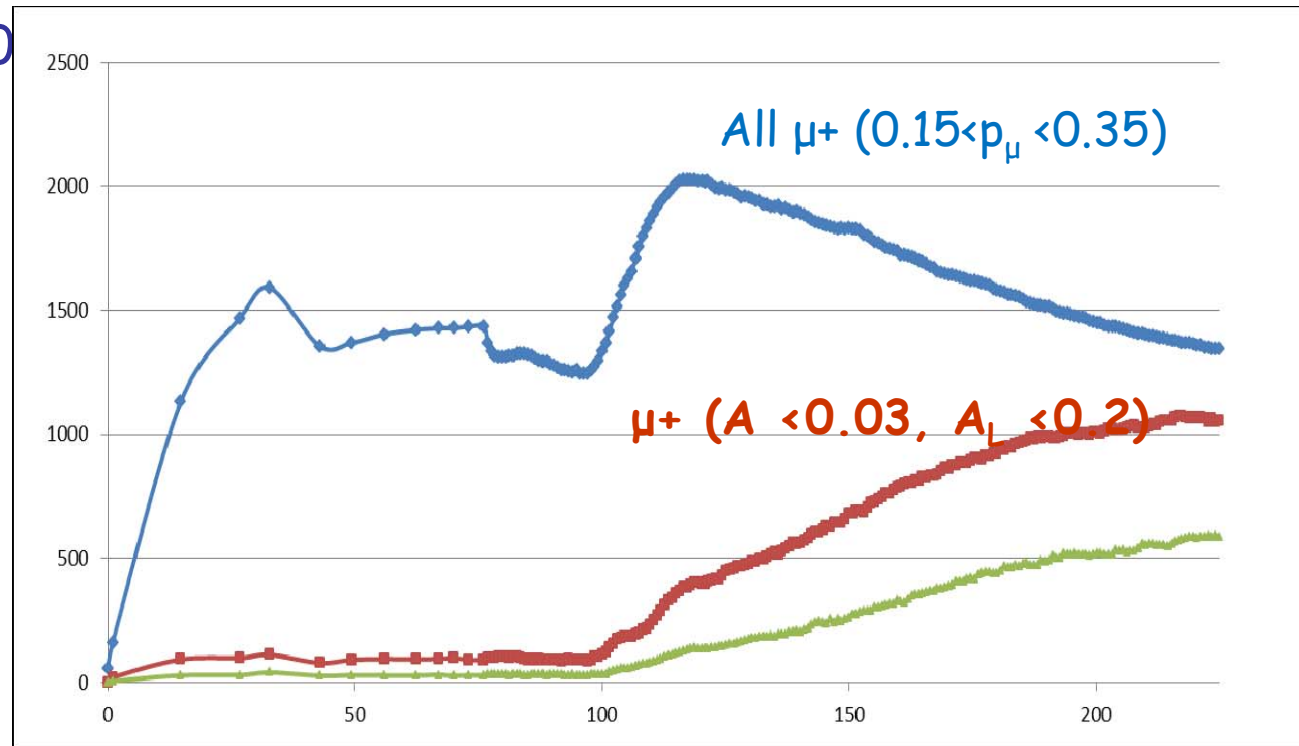
```

SREGION      ! bentsol
6.0 1 1e-2
1 0. 1.0
BSOL
1 2.0 0.0 1 0.283 0.0 0.043636 0.0 0.0
0.0 0. 0. 0. 0. 0.
VAC
NONE
0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
    
```

- Compare beam in Buncher without and with chicane/abs
  - high-energy tail removed
    - ( $> \sim 0.7 \text{ GeV}/c$ )
  - $p, \pi$  removed earlier
  
- Figures show  $\mu^+$  only
  - $P, c\tau$  coordinates



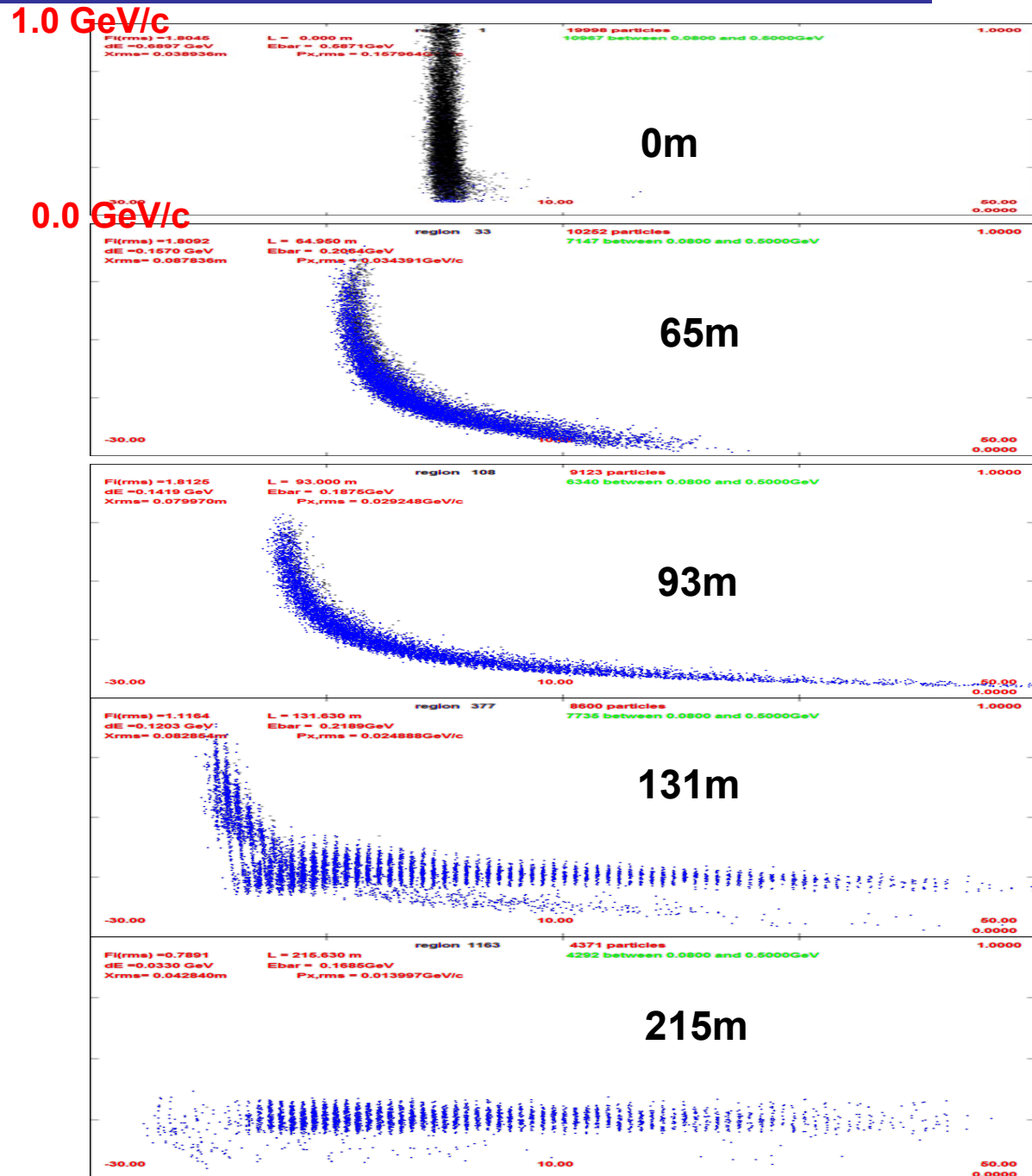
- Increased added drift
- Added drifts of 10, 20, 30m before absorber
  - similar ICOOL results to + 0
  - z=+ 10 slightly better
  - small drop for z=20, 30
    - ~5%



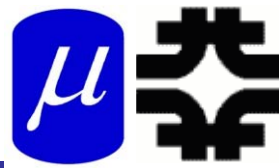


# Simulation through system

- Not a large difference in beam dynamics
  - for +30 case absorber is ~64m
  - ~21.8m more to start of buncher
- Prepulse not completely eliminated



# Current Status



Dilbert.com DilbertCartoonist@gmail.com



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