Front End Studies and Plans

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(October 27, 2009)

Outline

- **Front End for the Neutrino Factory/MC**
  - Shorter front end example-
    - basis for present study

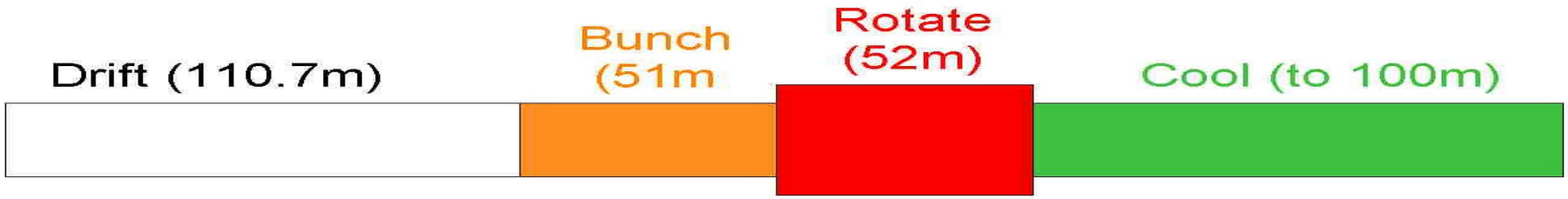
- **Need baseline design for IDS**
  - need baseline for "5-year Plan"

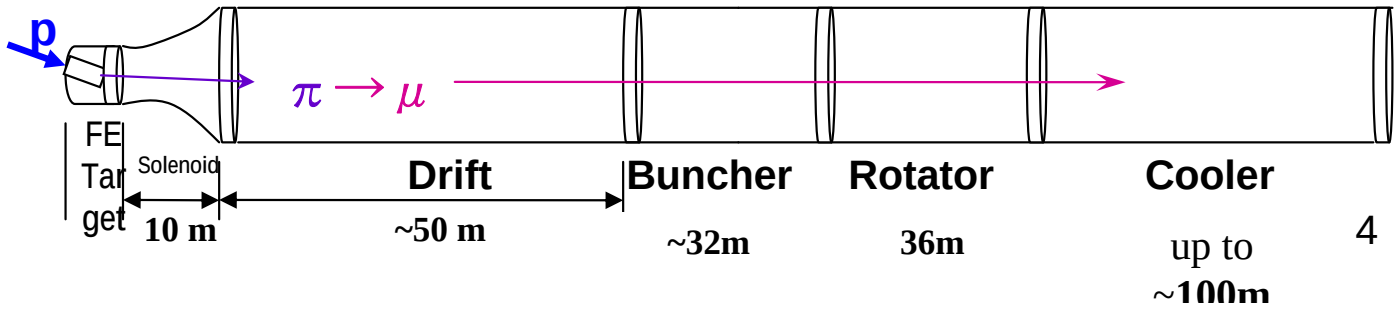
Plan for IDS

- **Need one design likely to work for V_{rf}/B-field**
  - rf studies are likely to be inconclusive
  - B=1.25T; V' = 10MV/m is very likely to work
  - B= 2T; V' = 15 MV/m should work with Be
- **Hold review to endorse a potential design for IDS**
  - - likely to be acceptable (V_{rf}/B-field)
  - April 2010 ?
- **Use reviewed design as basis for IDS engineering study**

IDS candidate

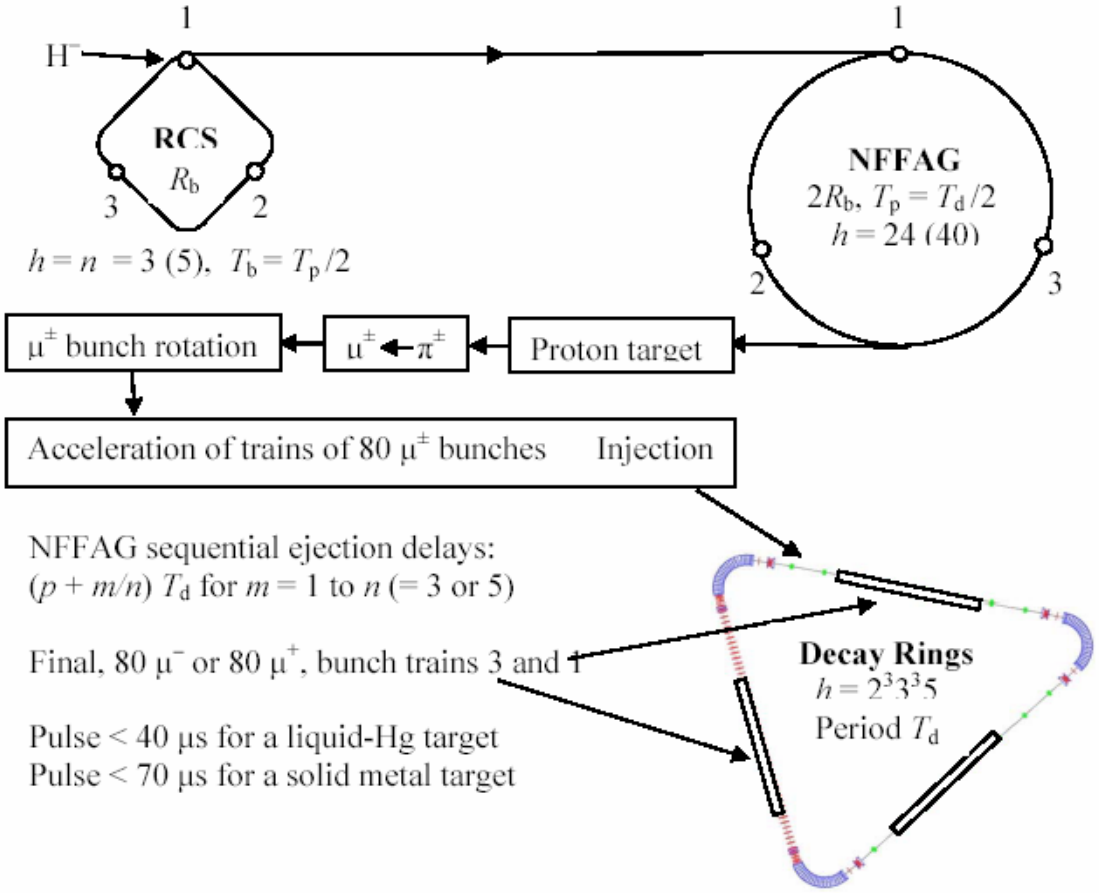
- ISS study based on n_B = 18 (280 MeV/c to 154 MeV/c)
- Reference shorter has n_B = 10 (280 MeV/c to 154 MeV/c)
  - slightly higher fields (2T, 15MV/m)
- Looking for candidate variation for IDS

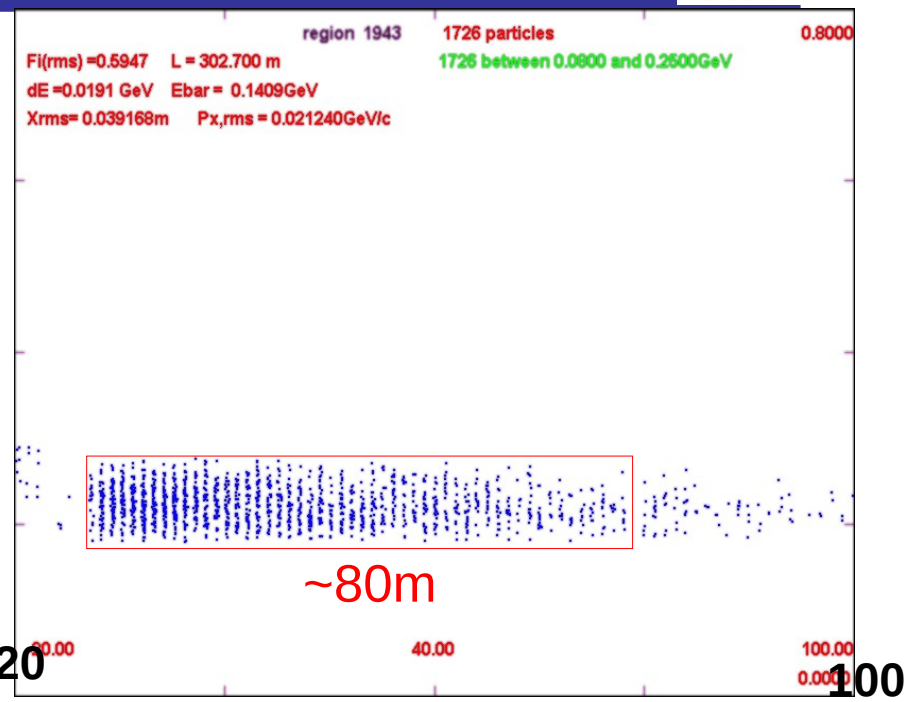


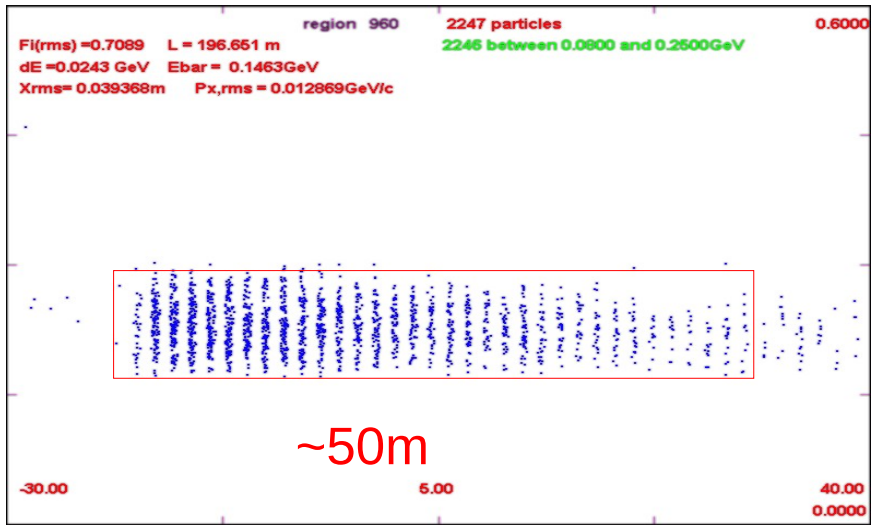


How Long a Bunch Train for IDS?

- **ISS study alotted space for 80 bunches (120m long train)**
  - 80m or 54 bunches is probably plenty

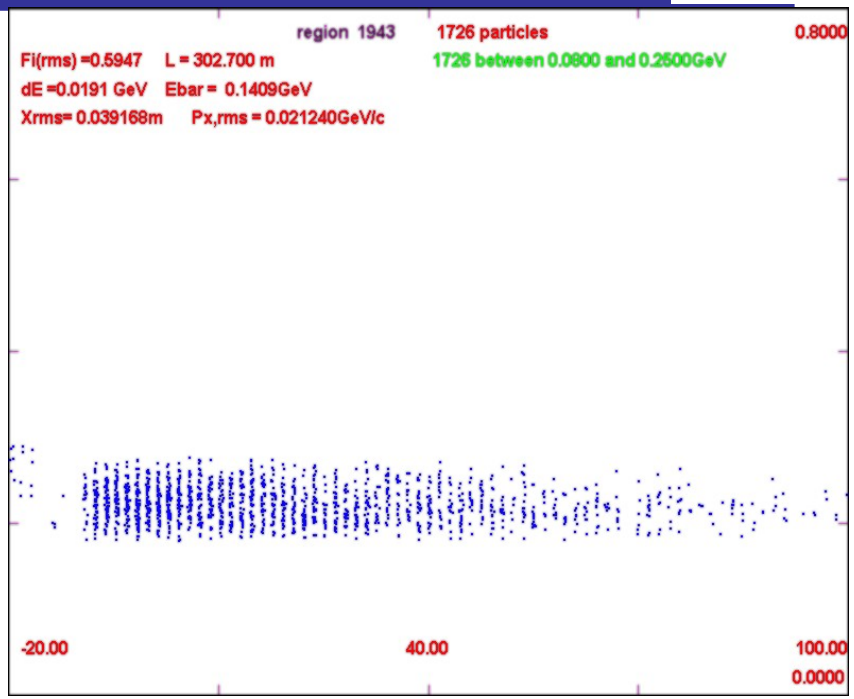


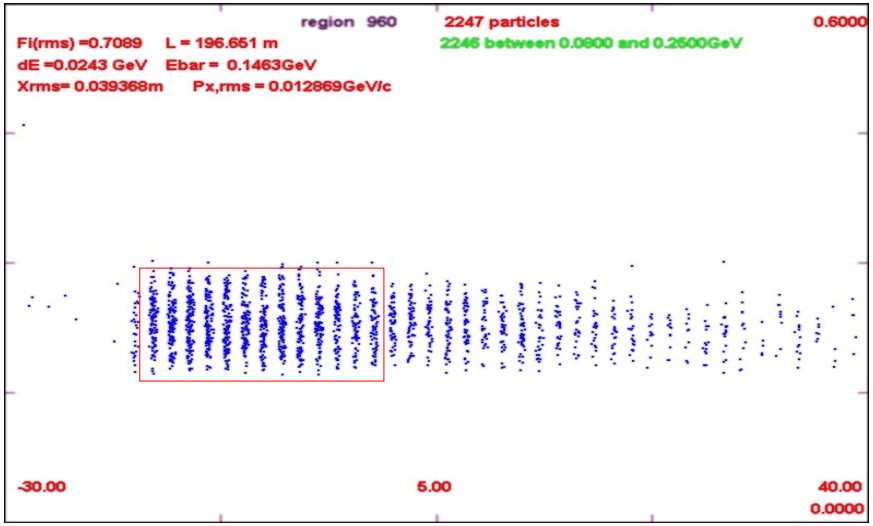




Bunch train length

- Within IDS design could reduce bunch train to ~80m (52 bunches)
  - very little mu loss
- With shorter front end, could reduce that to 50m or less
- For Collider scenario ~12 best bunches, (18m) contains ~70% of muons





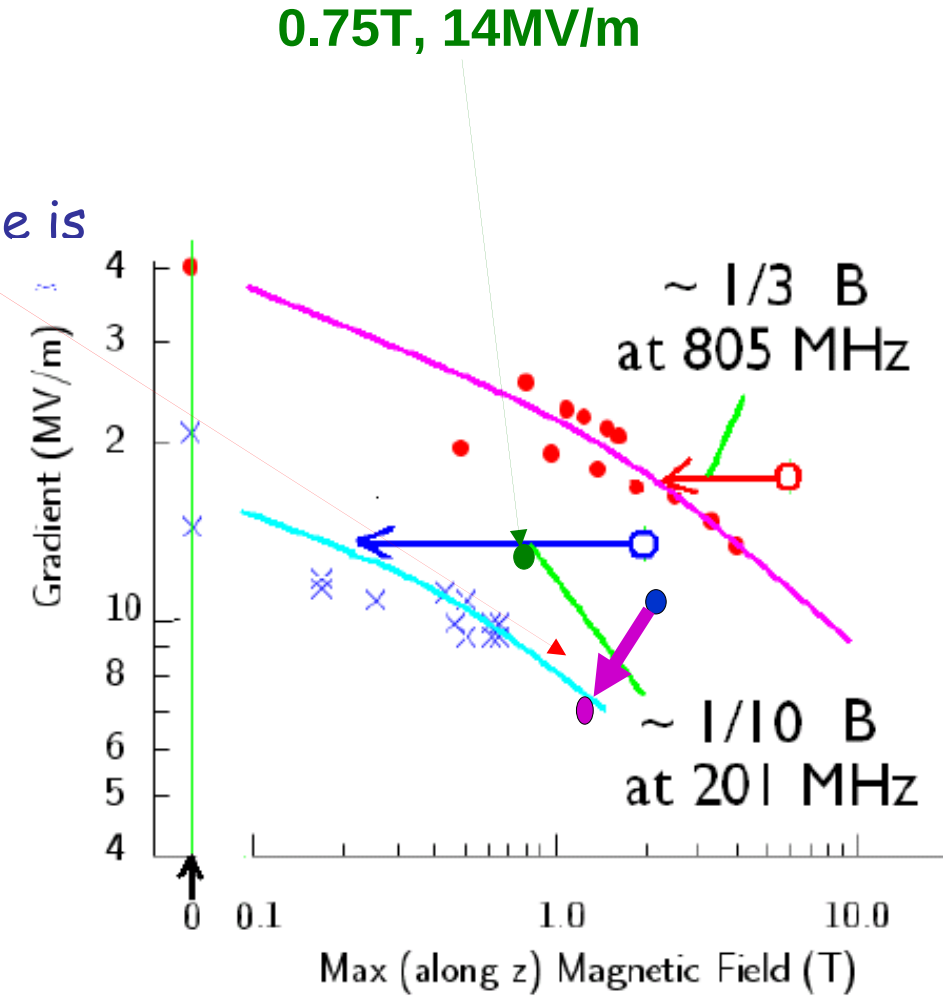
Recent Studies on Lower Fields

- Adequate acceptance can be obtained by reducing magnetic fields and gradients

- B -> 1.25T, V' -> 10 MV/m ??
  - (10MV/m is 7MV/m real estate gradient; could use 7MV/m if space is filled.)

- Reduced B, V' are relatively certain to work.

- Cost optimum?
  - B=1.5T ?, 12MV/m



Tried changing B

- B= 1.25 T (~Study 2)
- match into alternating solenoid
  - Use old R. Palmer match
- Varied Cooling Gradients
  - Less gradient => less capture
- 1.25T only slightly worse than 2.0T
- Change reference to 1.5T

B_0 =2.0T-> 1.5T Results

- Muons per 10 8-GeV protons

Cooler/ Rotator	10	12	14	15	17	18 MV/m
10	0.35 (0.63)	0.55 (0.67)	0.66	0.73		
12		0.57 (0.72)	0.754	0.77		0.80
14			0.776	0.80 0.82	0.84	
15				0.81	0.85 0.88	0.84
	(0.65cm)	(0.8cm)				

B=1.5T

Variation is not strong; more rf still means more muons

Front end Optimization

- **Change reference B-field to 1.5T**
  - constant B to end of rotator
  - As good as 2.0T case
- **Redoing n_B ="12" example**
  - A bit longer than n_B = 10
  - optimize with lower fields
- **Will see if I get "better" optimum**