STUDY 2A FRONT END

MC Collaboration Meeting
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Outline of the Talk

- Motivation for the study and its main focus

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- Description of the Front End

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- Results

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Motivation

APS divisions, DPF, DNP, DAP, DPB organized a **Join Study on the Future of Neutrino Physics:The Neutrino Matrix**

Report published late last year at *http://www.aps.org/neutrino/*

Charge to the MC-Collaboration: **Review, advance our understanding of design issues of a *Neutrino Factory* and *Beta Beam*.**

Working Group Leaders: S. Geer and M. Zisman; Editor: J Gallardo

Participants

Under this rubric, Study2a Front End was carried out by the MC-Collaboration.

Principal participants (NF): J.S. Berg, R. Fernow, J. Gallardo, S. Geer, H. Kirk, D. Neuffer, R. Palmer, K. Paul, M. Zisman.

This talk is just a summary of the work done and an introduction to a later talk by R. Palmer on *Matching: from the Cooling Section into the Acceleration Linac*

Main Focus

Update FS2 design to be more cost-effective. Based on:

- Optimized capture section

Discuss only items 1 and 2

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Main Focus

Update FS2 design to be more cost-effective. Based on:

- Optimized capture section
- Adiabatic rf bunching: Less expensive, in addition it keeps both muon signs
- Optimized acceleration scheme: combination of RLA and FFAG rings

Discuss only items 1 and 2

Front End

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- In addition muons of both signs are transported

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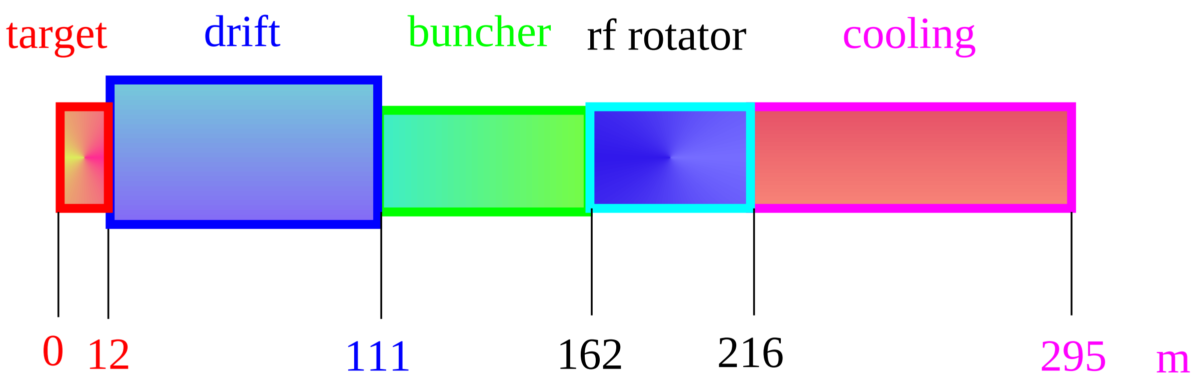
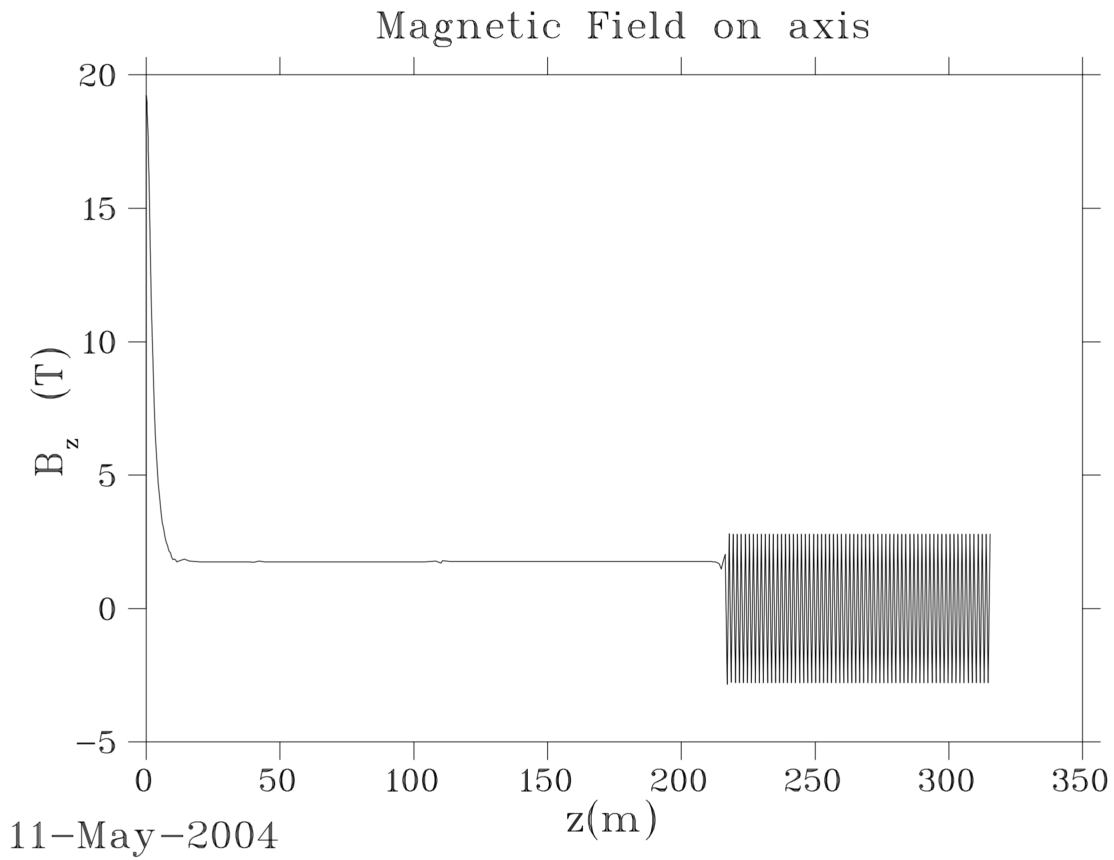
Layout of Front End





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Different Sections

- Capture Section: Hg jet target; AGS type proton beam. Length≈ 12m
  $20 < B_z < 1.75$ T
- Decay Drift: Length≈ 100 m $B_z = 1.75$ T
- Adiabatic Bunching: 27 cavities with 13 different $\Downarrow$ frequencies and changing $\Uparrow$ gradients. Length ≈ 50 m
  - $333 \leq f \leq 234$ MHz
    $5 \leq Grad. \leq 10$ MV/m

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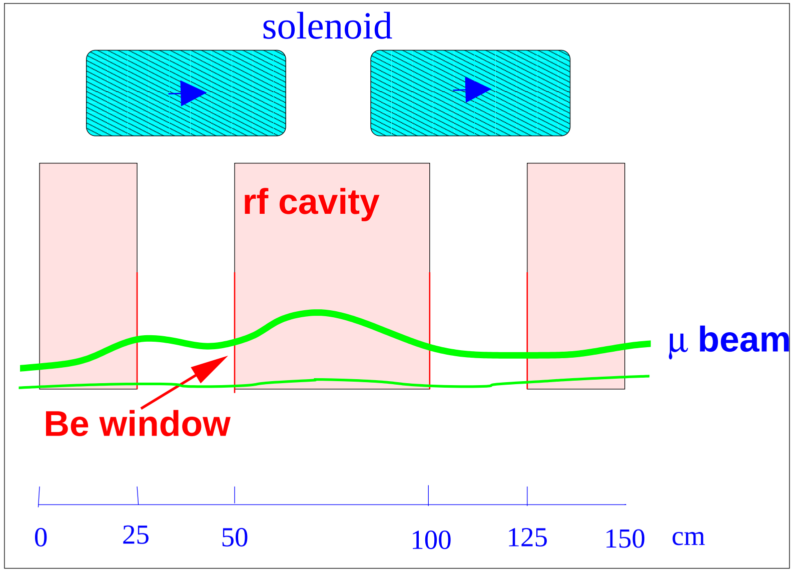
Buncher Section



Schematic of 2 cells of the buncher or rotator section

Phase Rotator Section

- Phase Rotator: 72 cavities with 15 different ⇓ frequencies; constant gradient. Length ≈ 50 m
  - $232 \leq f \leq 201$ MHz
    $Grad = 12.5$ MV/m

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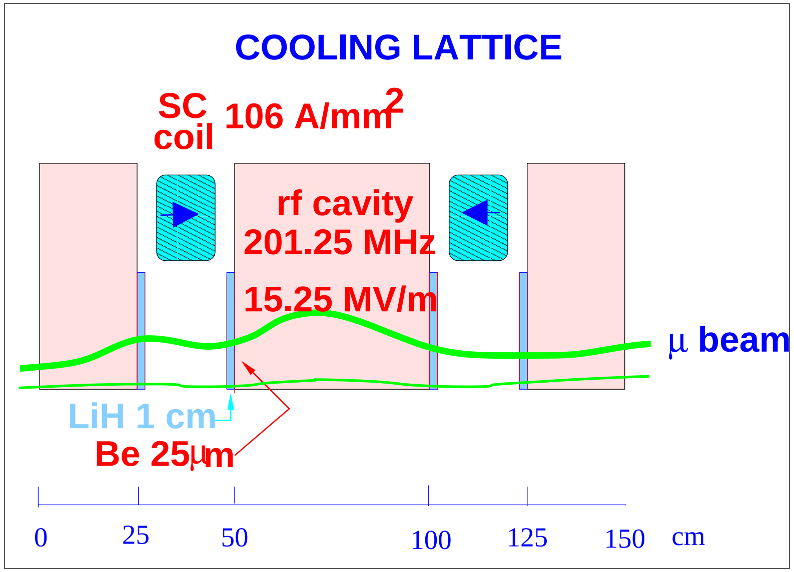
Cooling Section

Schematic of one cell of the cooling section



Beta function is constant ≈ 80 cm. Window are absorbers; they are 1 cm LiH with coating, 25μm of Be.

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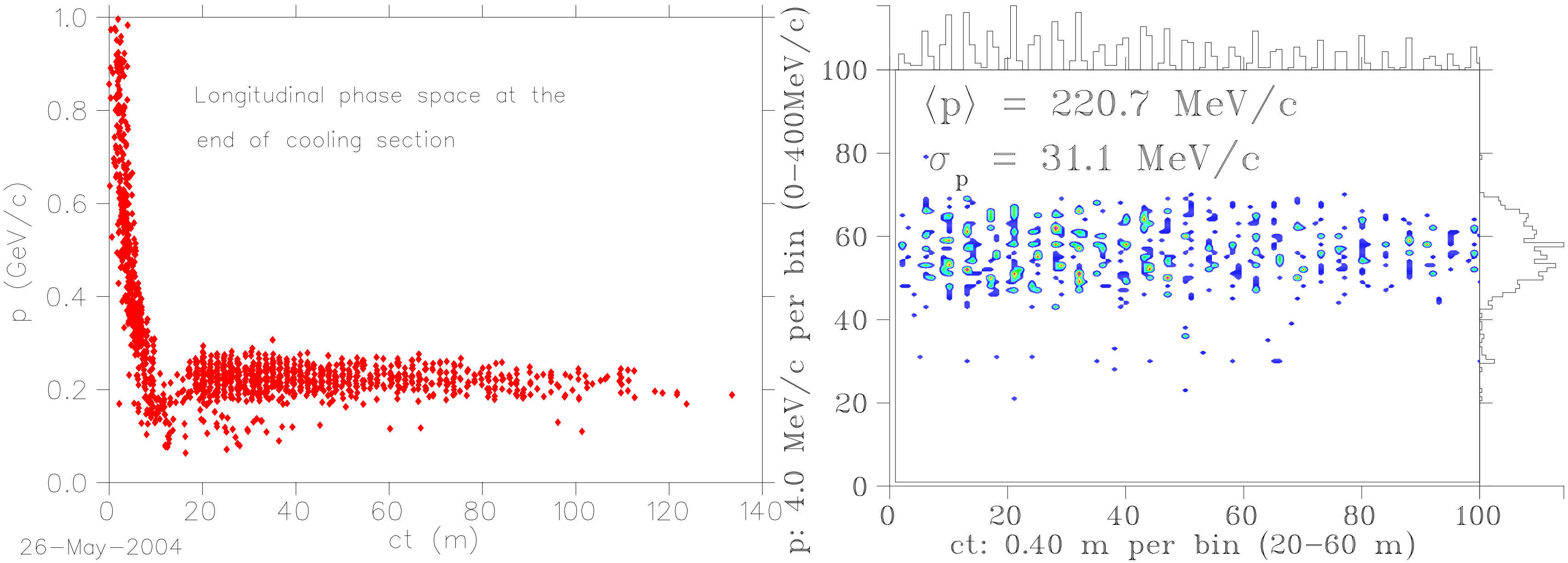
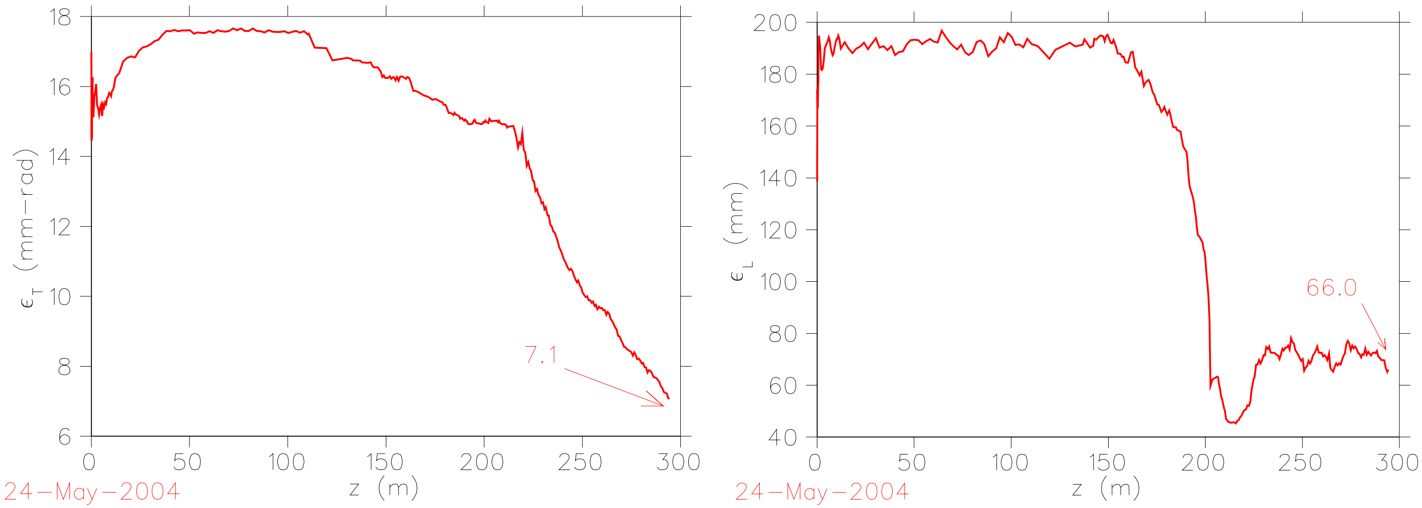
Longitudinal Phase Space



Longitudinal phase space end of the channel

Final Emittances

Normalized transverse emittance (left) and longitudinal emittance (right) along the front-end for a momentum cut $0.1 \leq p \leq 0.3$ GeV/c



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No. μ/p in $A_\perp$ and A_L

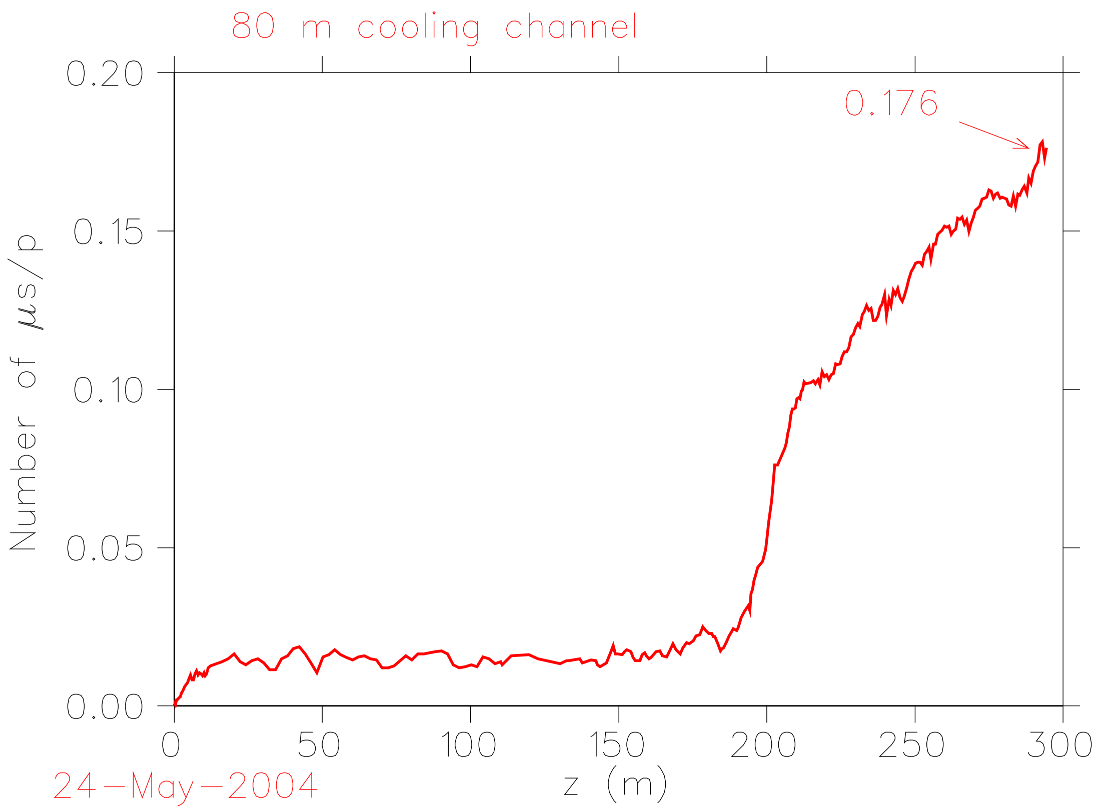

Table of Results

$< p_z >$ Mean Momentum (MeV/c)	220
rms Energy Spread (MeV)	31
$\epsilon_\perp$(mm-rad)	7.1
$\epsilon_\perp^{equil.}$(mm-rad)	5.5
ϵ_L(mm)	66
$A_\perp$ (mm-rad)	30
A_L (mm)	150
No. μ/p in $A_\perp$ and A_L	0.176

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