CURRENT PROGRESS IN THE MUON COLLIDER/NEUTRINO FACTORY FRONTEND

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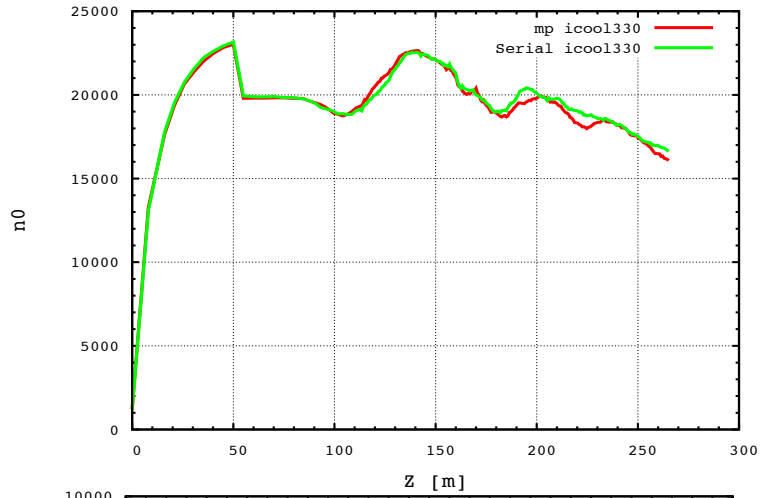
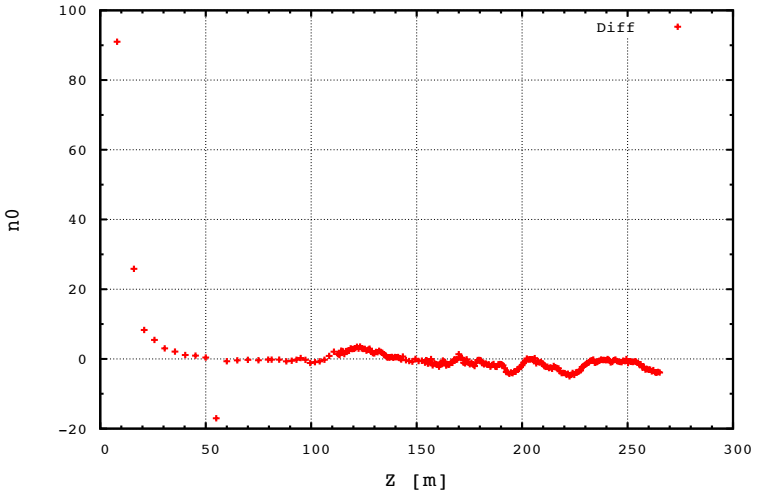
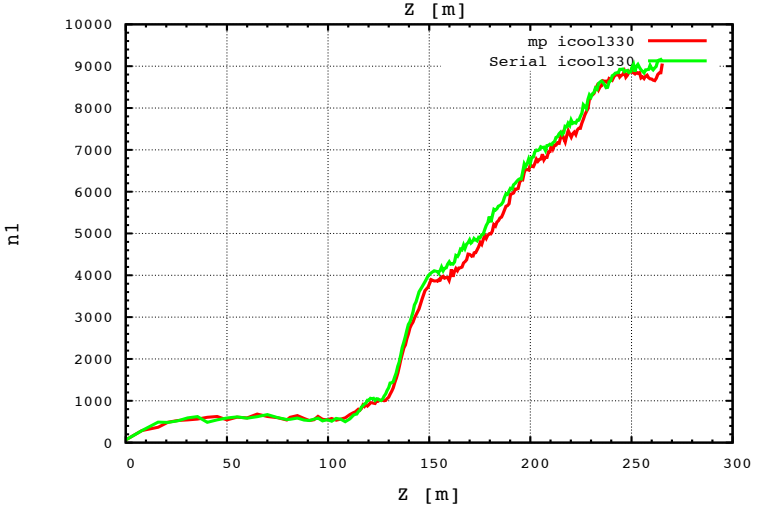
MPI-ICOOL330 ON NERSC (R. RYNE)

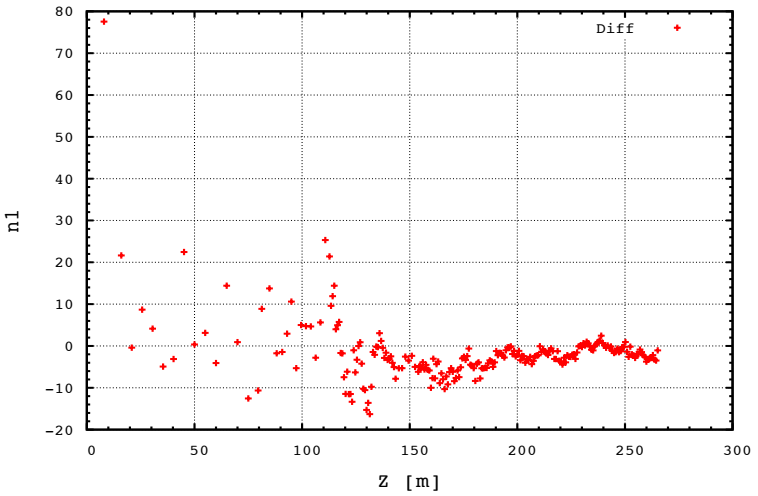
- A new tool was implemented at NERSC ICOOL-MPI by R. Ryne.
- Two test runs.

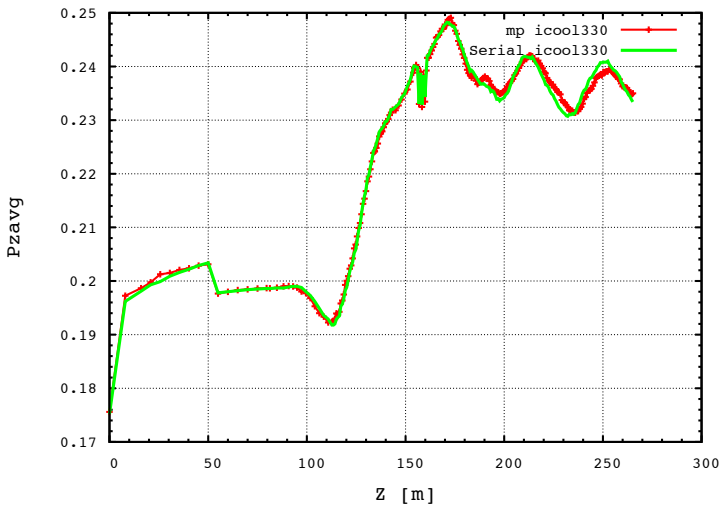
Neutrino Factory Front End Bench Mark
Nmu=45000
Icool330 runtime~ 30 mins - MPI-ICOOL330~ 2 mins with 480 cores

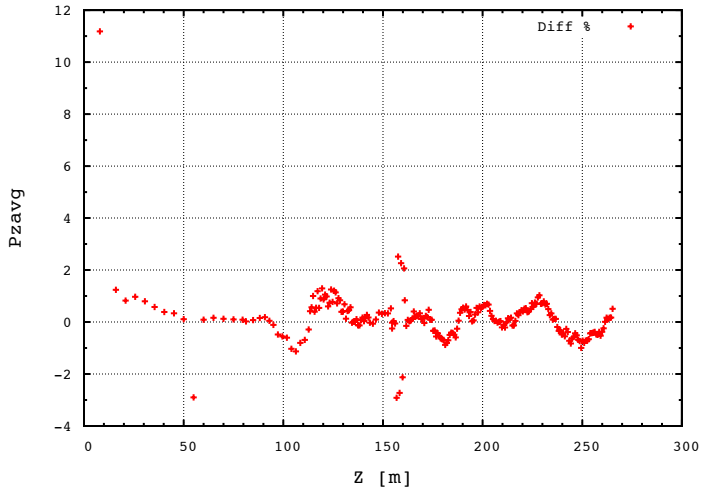


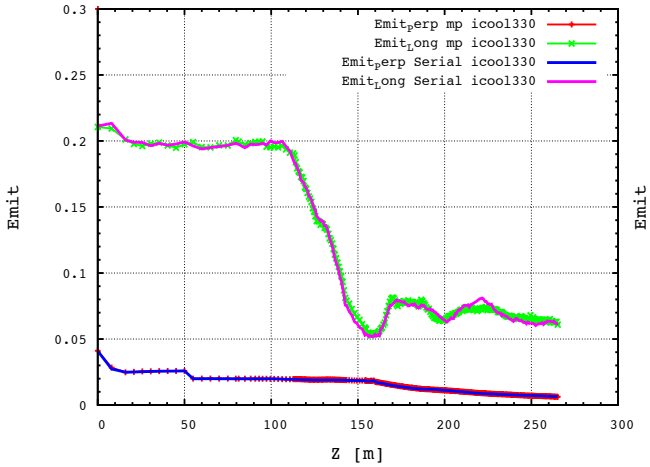


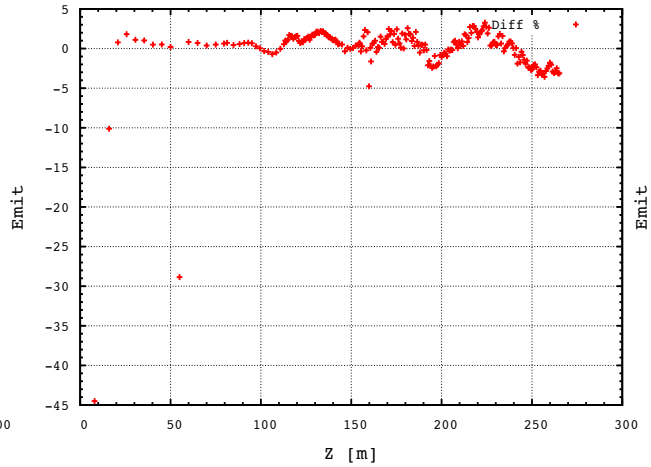




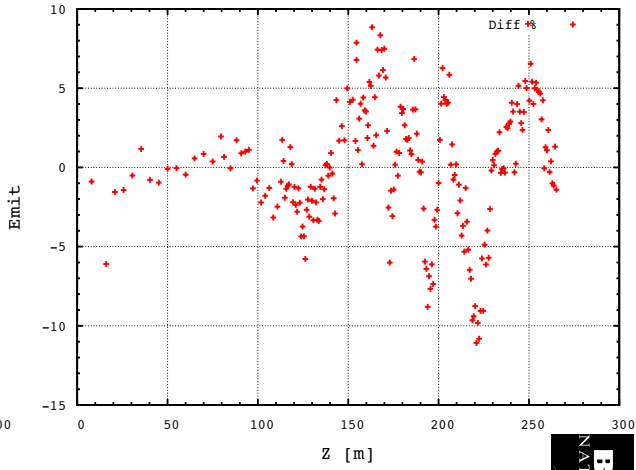








Emit_perp

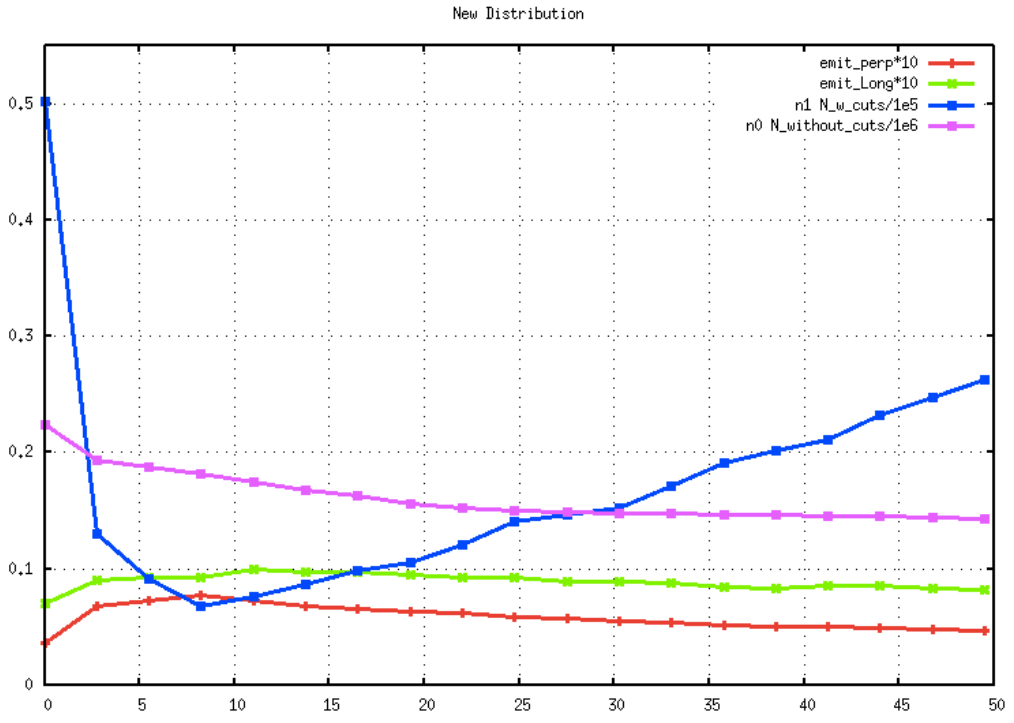


Emit_Long

MPI-ICOOL330 ON NERSC (R. RYNE)

- A new tool was implemented at NERSC ICOOL-MPI by R. Ryne.
- Two test runs

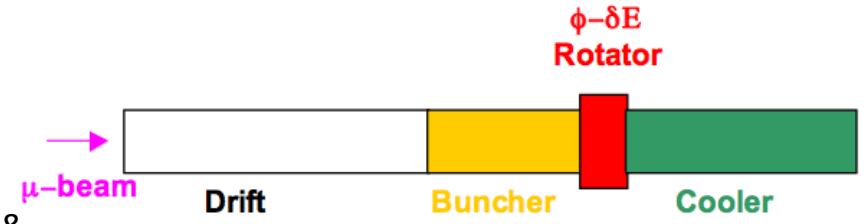
Post Merge 6D G cooling Channel (R. Fernow - Diktys version)
Nmu=225000
MPI-ICOOL330~ 2 mins with 480 cores



NEUFFER'S HIGH FREQUENCY BUNCHER & PHASE ROTATOR

D. Neuffer Scheme

Convert a muon bunch with large energy spread into a long string of bunches matched into 200 MHz rf cooling section



MOTIVATION: optimizing upstream capture-decay sections changes phase space distribution getting to buncher-rotator sections.

Ultimately: Global optimization of the Front-End utilizing NERSC & Genetic optimization algorithms (LBL R. Ryne & J. Qiang)

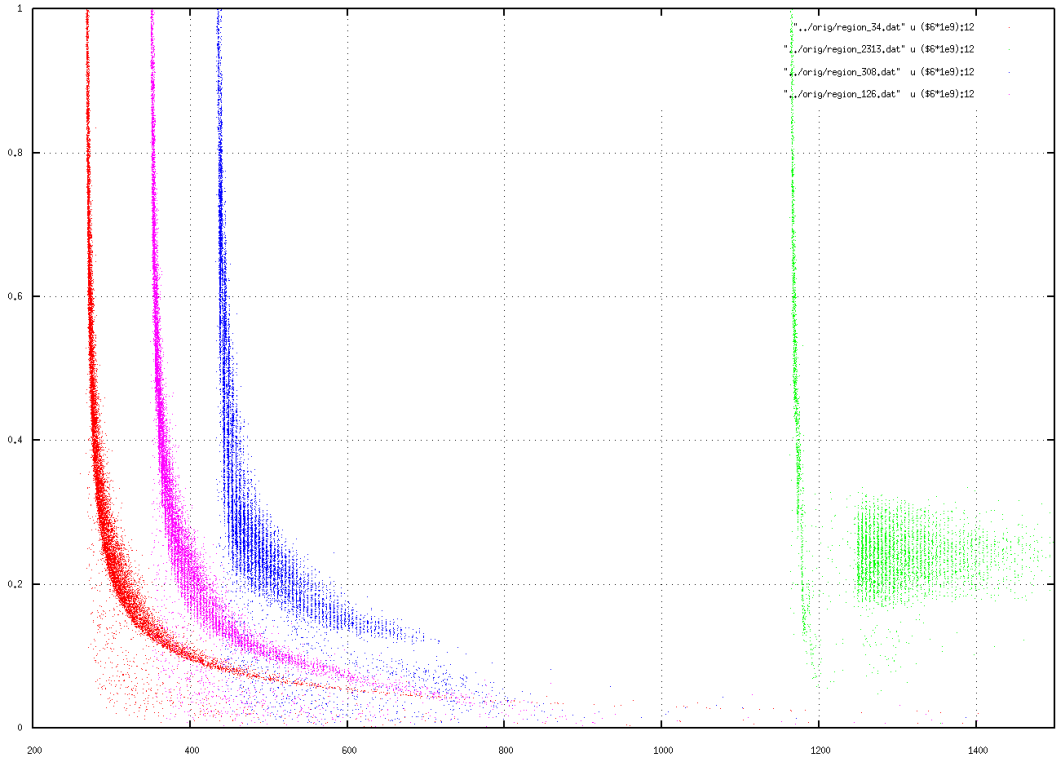
Target – Decay – Buncher – Rotator - Cooling

1. **The Drift section:** length of the section
2. **The Buncher section:**
   - length of the section
   - Bunching voltage
   - Voltage increase (parabolic increase in voltage ($Vrf = Vrf_{rinal}\ (z/Lbuncher)^2$)
   - Distance between the reference energy particles.
3. **The ϕ-δE rotation:**
   - The length (optimum rf rotation section length should be adjusted)
   - rf voltage
   - The rf frequency is constant and set to the matched value at the end of the buncher
   - The rf wavelength and phase could be perturbed to optimize performance
   - Central reference energy could be perturbed for optimization.
4. **The cooling system:**
   - The rf wavelength readjusted to match the spacing between the reference particles

TWEAKING NEUFFER'S HIGH FREQUENCY BUNCHER & PHASE ROTATOR

RF fixed from FE standard Lattice

Drift Buncher Rotator Cooling

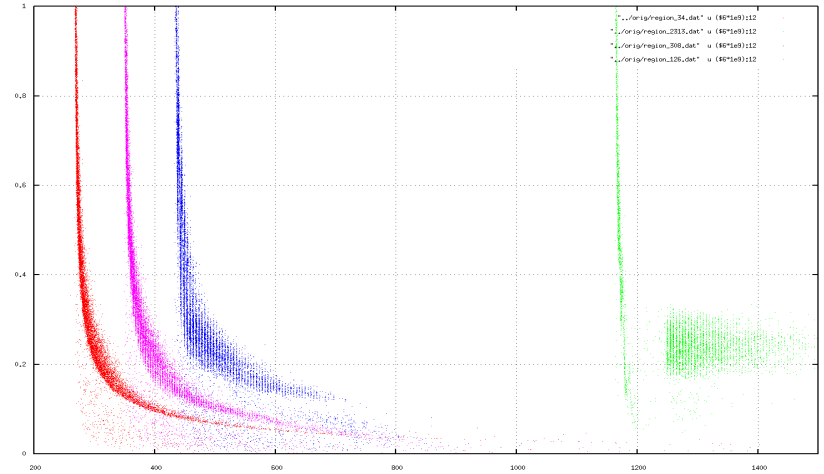


TWEAKING NEUFFER'S HIGH FREQUENCY BUNCHER & PHASE ROTATOR

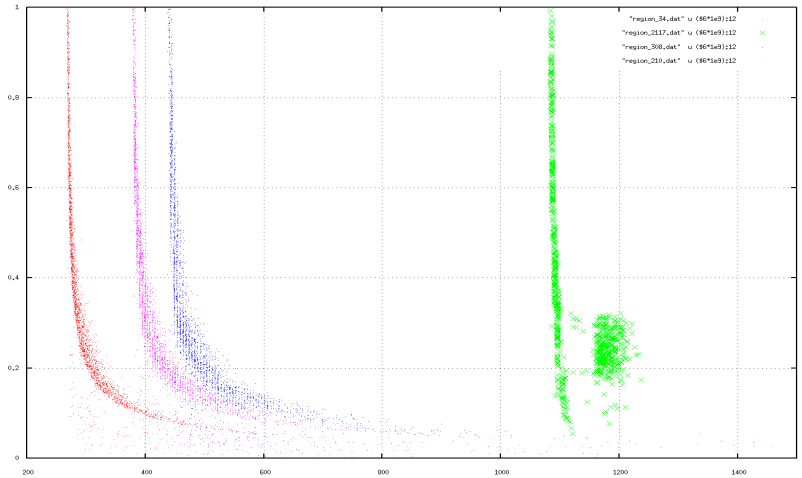
RF fixed from FE standard Lattice

RF Varied by ICOOL from FE standard Lattice

Drift Buncher Rotator Cooling



Drift Buncher Rotator Cooling



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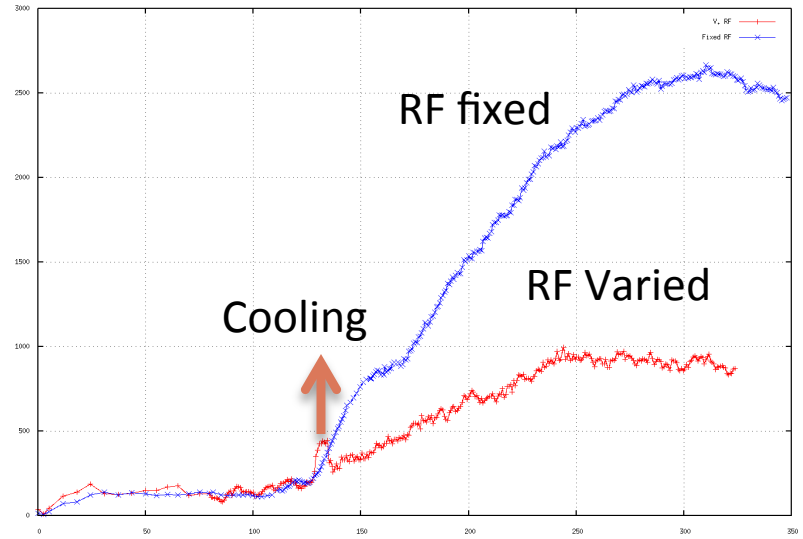
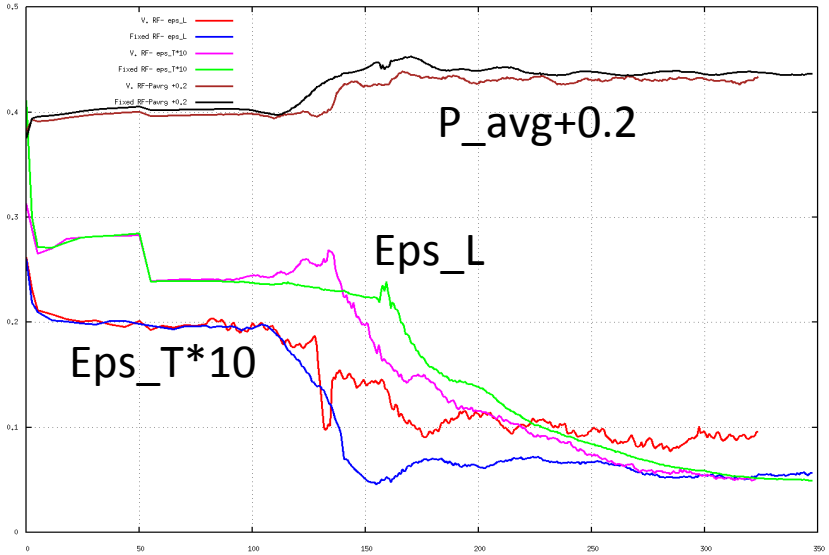
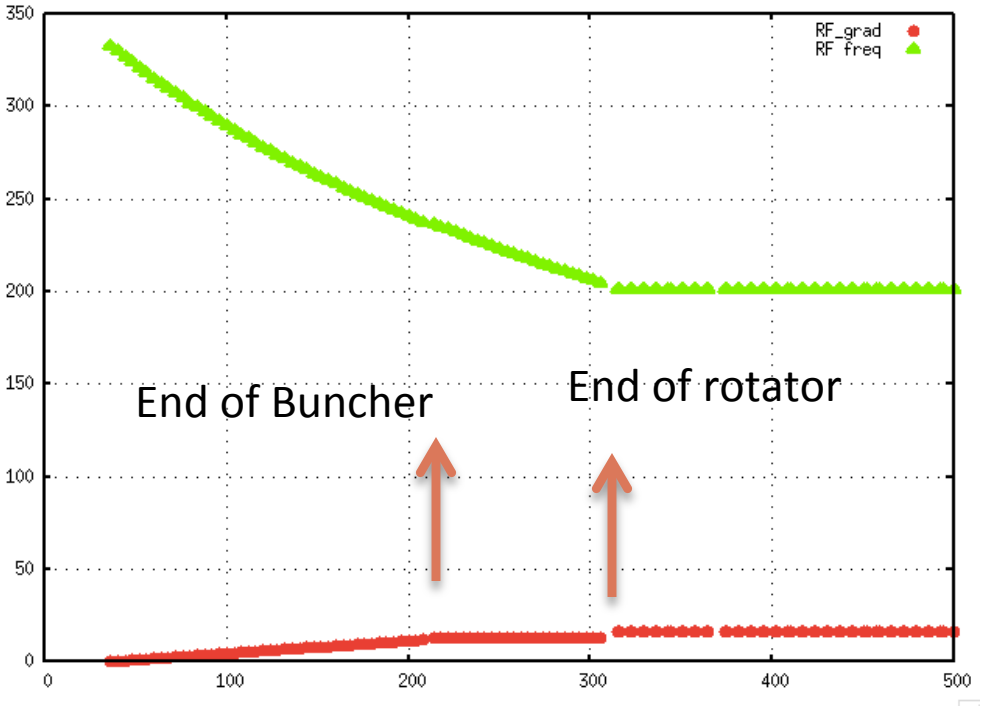


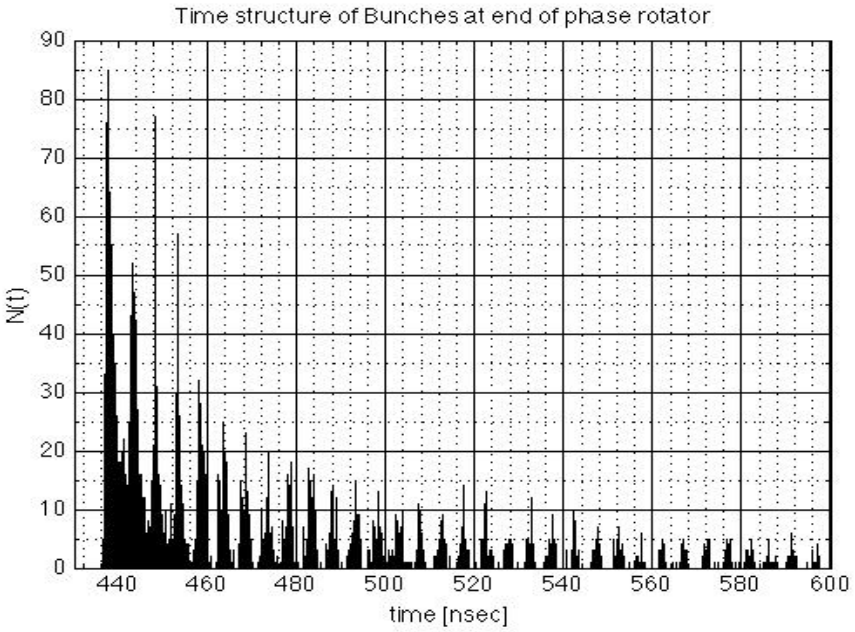


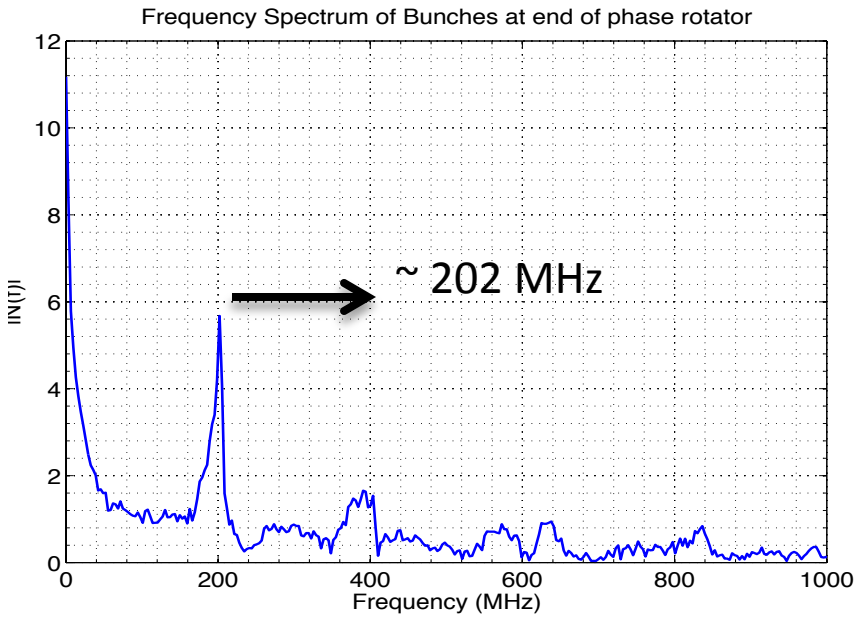
RF Frequency



FE Section	Region #	Z [m]
End of decay channel	34	79.6
End of Buncher	210	112.6
End of Phase Rotator	308	130.6
End of Cooling	2117	323.726

FOURIER ANALYSIS OF BUNCH STRUCTURE AT END OF PHASE ROTATOR





CONCLUSION