

# *Theory and Simulation*

## *Introduction and Plans*

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Fermilab

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# *Simulations and Theory Committee*

R. Raja (FNAL)	Chair
H. Kirk (BNL)	Targetry Simulation Co-ordinator
R. Fernow (BNL)	Phase Rotation Simulation Co-ordinator
R. Raja (FNAL)	Emittance Exchange/Ring Cooler Co-ordinator
S. Berg/ C. Johnstone (BNL)/(FNAL)	Acceleration Simulation Co-ordinators
A. Sessler (LBNL)	Theory Co-ordinator
M. Berz (MSU)	
E. Keil (FNAL)	
D. Neuffer (FNAL)	
R. Palmer (BNL)	

# *Charge to the Committee*

- **Charge to The Theory and Simulation Board**
- *The committee will meet periodically to review simulation and theory progress, set priorities, and make plans to further this work. Minutes should be kept to document the main conclusions from the discussion*
- **The committee will include the leaders of the simulation sub-groups covering:**
  - Target
  - Phase Rotation
  - Cooling and Emittance Exchange
  - Acceleration
  - Theory
- **These subgroup leaders plus a few other members will be chosen by the chairman of the committee in consultation with the MC Spokesperson(s).**
- *The committee should:*
  1. Assure that each Sub-group holds workshops with the appropriate frequency.
  2. Co-ordinate proposals to use collaboration funds for post docs and visitors doing simulation work. The committee chairperson will present these proposals to the Technical Board at the appropriate time each year.
  3. Advertise, interview and select Post-Docs and visitors for any open positions approved by the MC Spokesperson(s), and make a recommendation of where best they should be based and the topic(s) they should work on.
  4. Maintain a list of all people within the MC contributing to simulation and theory activities, and identify which areas they are contributing to.
  5. Consider any other activities that might further simulation and theory work.
- *December 10, 2002.*
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## Simulation Activity and personnel

<b>Production/Phase Rotation/Bunching</b>	<b>Ring Coolers</b>
Rick Fernow /BNL 20%	Rajendran Raja /FNAL 20%
Debbie Errede /UI 20%	Zafar Usubov /FNAI 100%
Kevin Paul /UI 100%	Valery Balbekov /FNAL 40%
Carol Johnstone /FNAL 15%	Steve Kahn /BNL 15%
Dave Neuffer /FNAL 50%	
	Bob Palmer /BNL 30%
<b>Acceleration</b>	Romulus Godang /U Miss 50%
Carol Johnstone /FNAL 15%	Don Summers /U Miss 10%
Scott Berg /BNL 30%	Lucien Cremaldi /U Miss 10%
Steve Kahn /BNL 15%	Steve Bracker /U Miss 5%
Dan Trebojevic 10%	Juan Gallardo /BNL 30%
	Rick Fernow /BNL 30%
<b>Linear Coolers</b>	
Carol Johnstone /FNAL 20%	Al Garren /LBNL 50%
Kyoko Makino /UI 50%	Harold Kirk /BNL 30%
Martin Berz /MSU 20%	Scott Berg /BNL 30%
<b>Targetry Simulations</b>	<b>Linear Theory</b>
Harold Kirk /BNL 20%	Andy Sessler /LBNL 10%
Nick Simos /BNL 30%	Eberhard Keil
	Dave Neuffer /FNAL 20%
	Martin Berz /MSU 10%
	Scott Berg /BNL 30%

# *Workshops*

- A very successful FFAG workshop was held at LBNL 28Oct-8 Nov, 2002. Lots of new ideas. Link at

<http://www.cap.bnl.gov/mumu/conf/ffag-021028/>

- FNAL Nov 2002 emittance exchange workshop talks can be found at

[http://www.fnal.gov/projects/muon\\_collider/eexchange/workshop02/agenda.html](http://www.fnal.gov/projects/muon_collider/eexchange/workshop02/agenda.html)

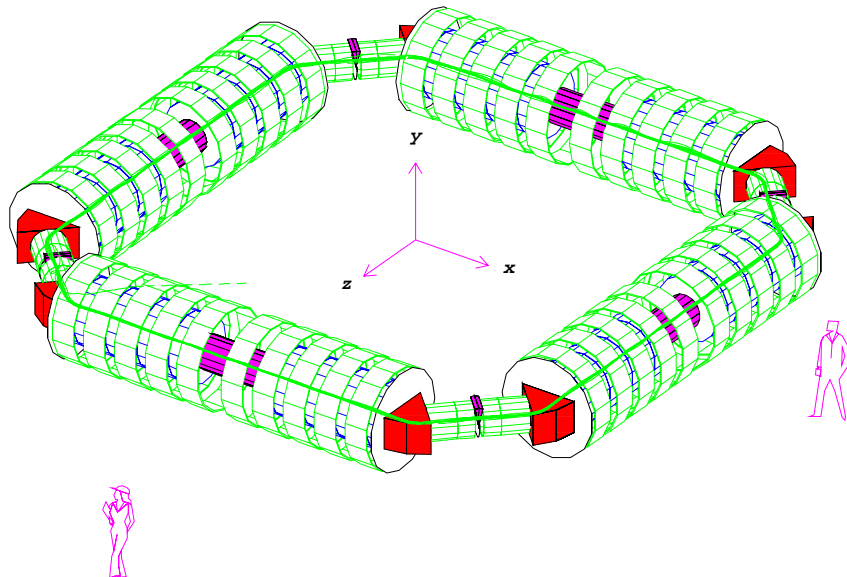
Successful workshop. No dramatic breakthroughs

- Planning more workshops- e.g. Targetry

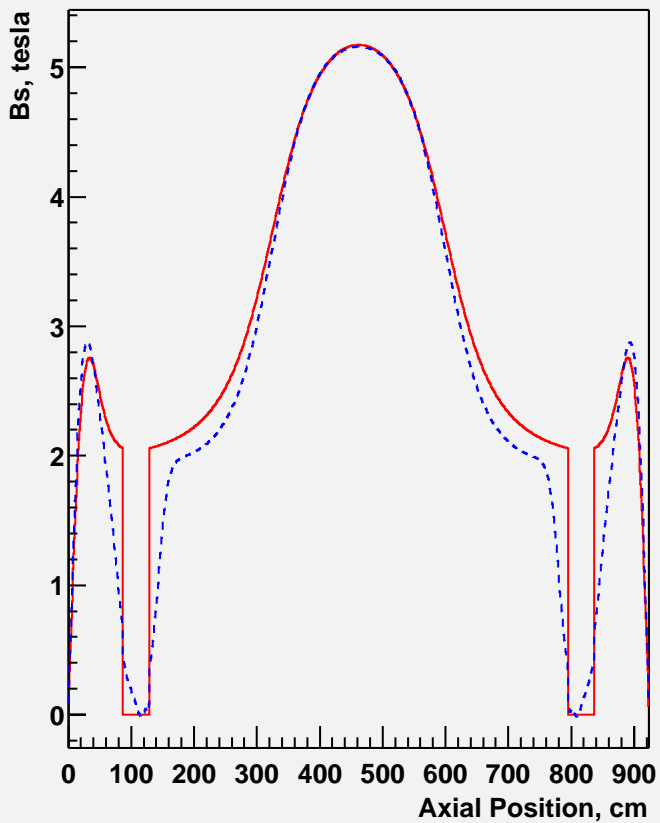
# *Ring Coolers in Geant*

- Balbekov Ring
- Palmer RFOFO ring
- Garren/Kirk Graded Dipole ring

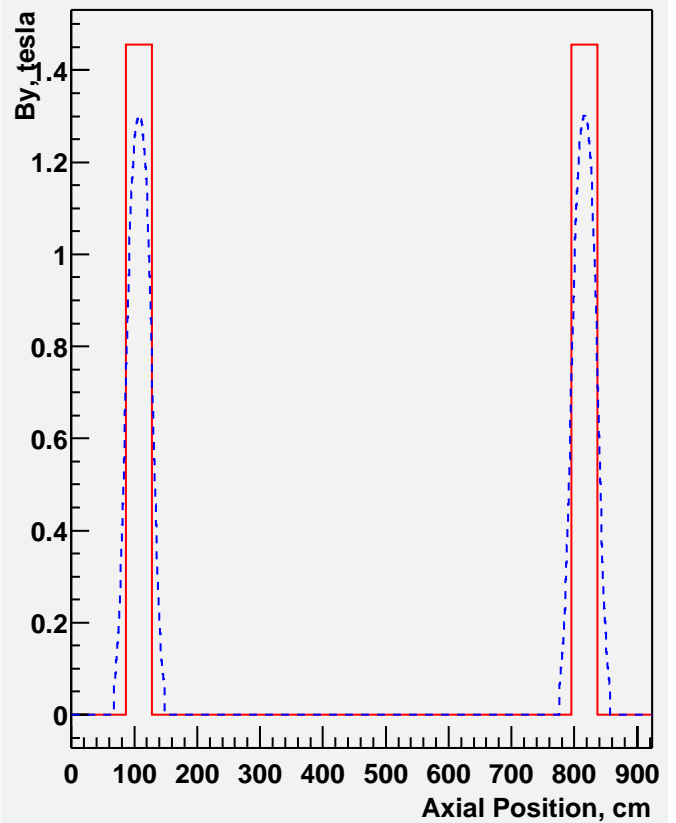
# Balbekov Ring



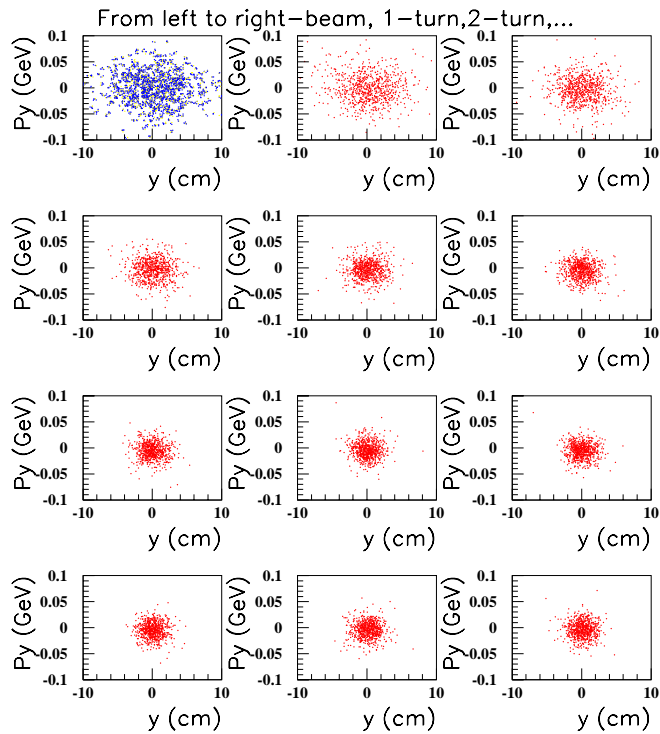
BZ in quad 1



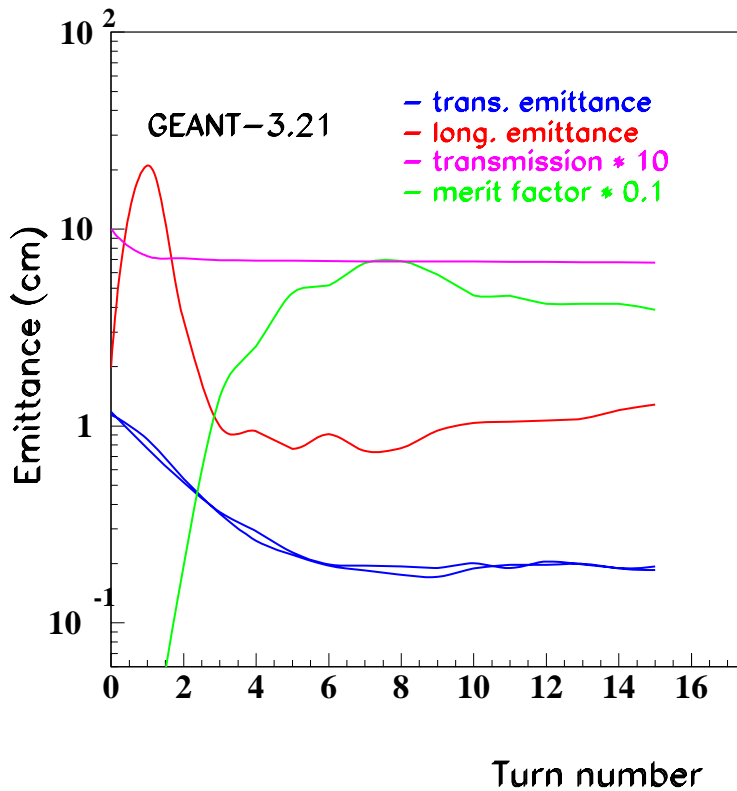
BY IN quad 1



# Balbekov Ring

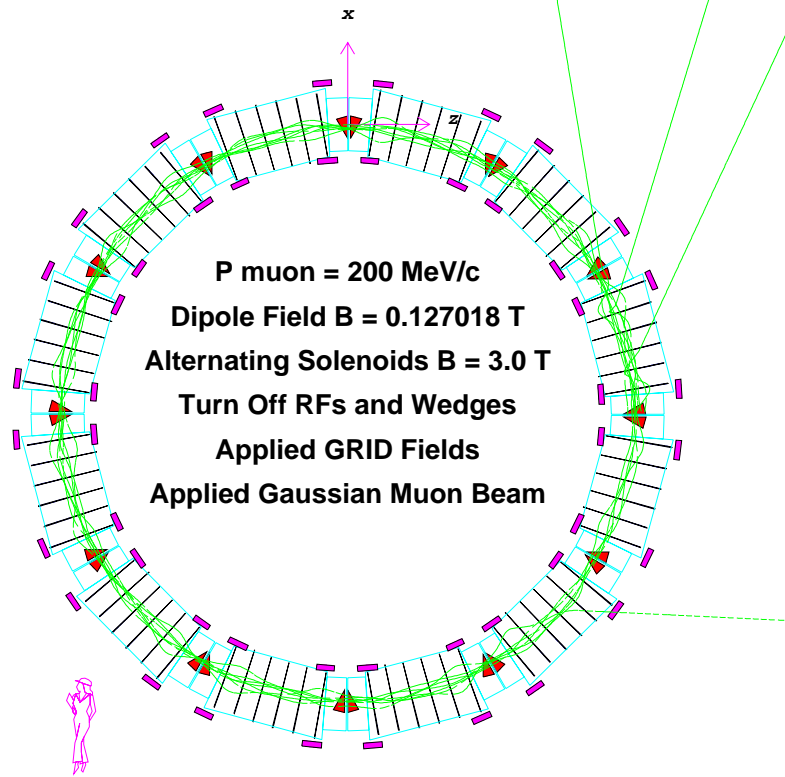


Tetra Circular Muon Cooler

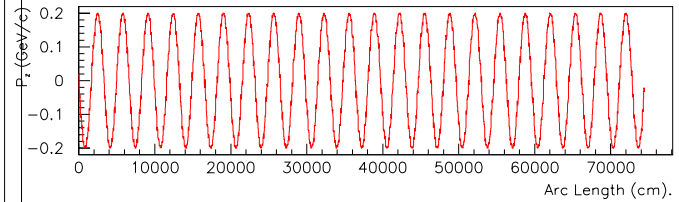
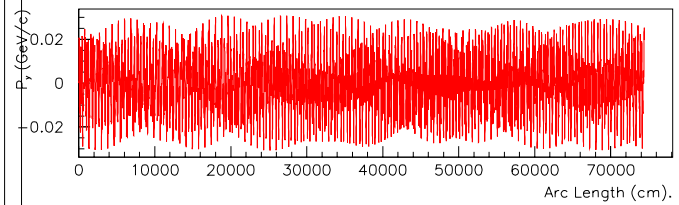
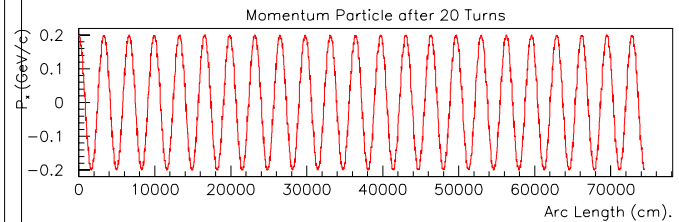
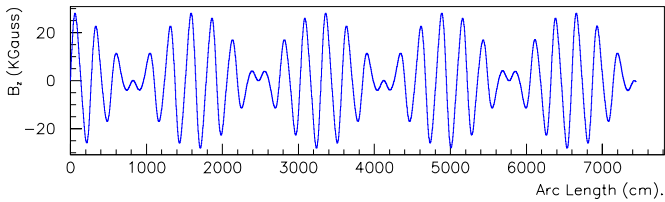
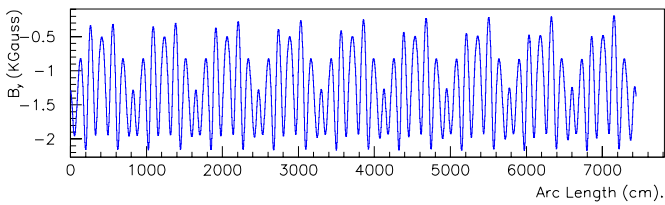
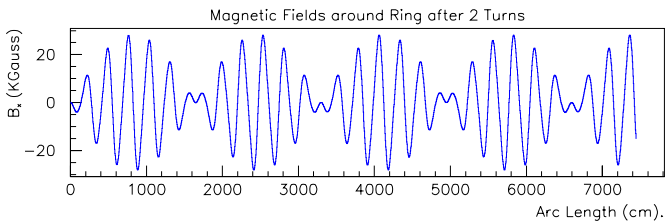




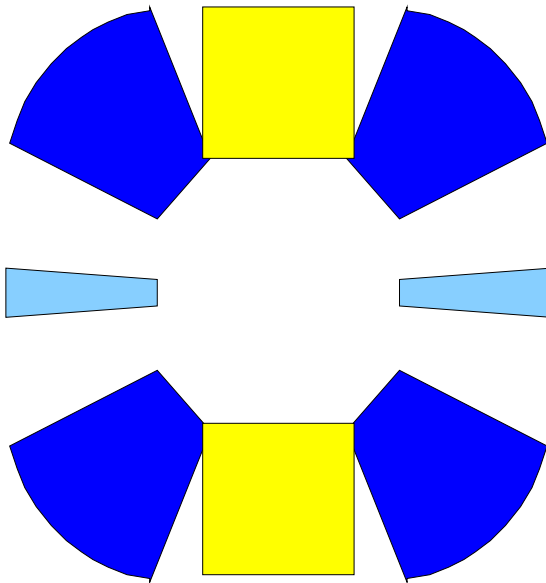
# Palmer RFOFO Ring



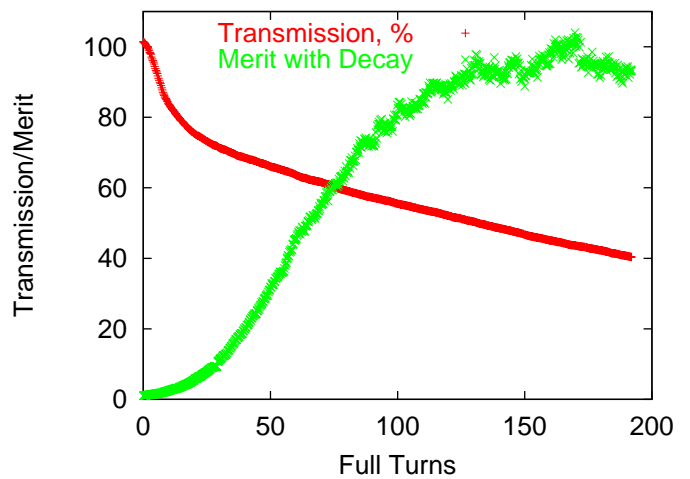
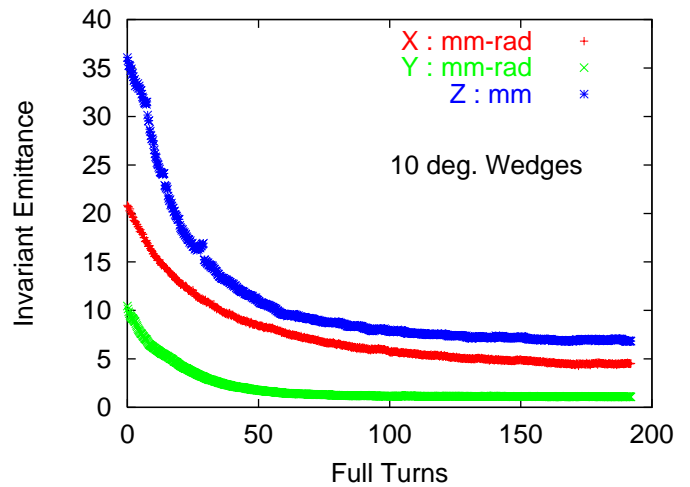
## RFOFO Ring in GEANT



# Garren/Kirk Graded Dipole ring



Edge Focusing Lattice:  $10^\circ$  Wedges  
Performance at 500 MeV/c



# *Future Plans*

- Design and Simulate a detailed Injection/Extraction scheme into ring coolers. Geant with its general fields would fit in well here.
- Design a coherent acceleration scheme.
- A complete overall beginning to end simulation for a Neutrino Factory
- A complete overall beginning to end simulation for a Muon Collider.
- Need more Muon Collider/Neutrino Factory Fellows and Postdocs.