

Update of 201 MHz Cavity Activities

Lixin Ge (SLAC), **Derun Li** (LBNL),
Tianhuan Luo (University of Mississippi)

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Study of MP of 201 MHz Cavity in MICE Cooling Channel

- Previous numerical simulation studies show potential MP problems in RF coupler region
 - Assuming constant B field with an angle
- Recent progress: collaboration with SLAC (Dr. Lixin GE) using ACE3P suite
 - Using real MICE field map of the cooling channel
 - Simulation model using as-built 201-MHz cavity, coupler and curved Be windows
 - MP simulations and explorations studies of RF coupler
 - Searching for possible solutions for improvements

Accelerator Modeling with Suite ACE3P

Meshing - CUBIT for building CAD models and generating finite-element meshes
<http://cubit.sandia.gov>

Modeling and Simulation – SLAC’s suite of conformal, higher-order, C++/MPI based parallel finite-element electromagnetic codes
https://slacportal.slac.stanford.edu/sites/ard_public/bpd/acd/Pages/Default.aspx

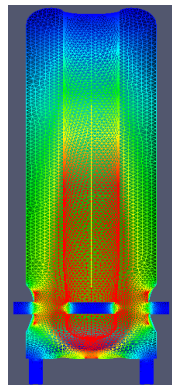
ACE3P (Advanced Computational Electromagnetics 3P)

<i><u>Frequency Domain:</u></i>	Omega3P	– Eigensolver (damping)
	S3P	– S-Parameter
<i><u>Time Domain:</u></i>	T3P	– Wakefields and Transients
<i><u>Particle Tracking:</u></i>	Track3P	– Multipacting and Dark Current
<i><u>EM Particle-in-cell:</u></i>	Pic3P	– RF guns & klystrons
<i><u>Multi-physics:</u></i>	TEM3P	– EM, Thermal & Structural effects

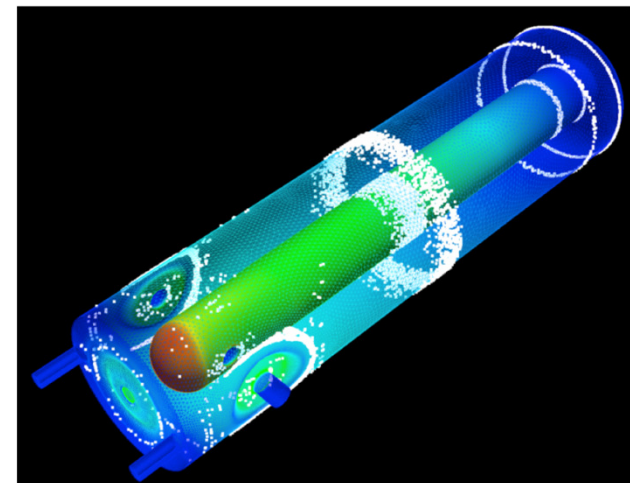
Post-processing - ParaView to visualize unstructured meshes & particle/field data
<http://www.paraview.org/>

Example: MP Analysis using Track3P

- Track3P: 3D parallel high-order finite-element particle tracking code for dark current and MP simulations
 - High Accuracy
 - High Performance
- MP simulations using Track3P have been carried out for many accelerator structures successfully
 - Benchmarked with experiments: TTFIII coupler, Tesla, ...
 - Predicted MP barriers: ICHIRO Cavity, Crab cavity, BNL SRF Gun, ...
 - Helped to improve accelerator designs: FRIB Half/Quarter Wave resonator, Muon Cooling Cavity, ...



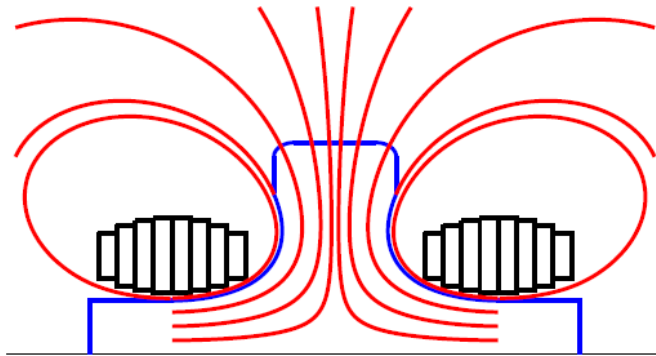
MP in FRIB
Quarter Wave
Resonator



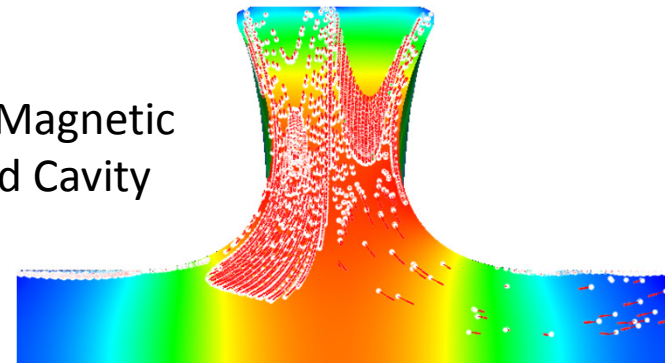
Track3P Already Has Features that can be applied for MAP MP Study

- External Magnetic Field

Magnetic insulation: design cavity surface to follow external magnetic field lines



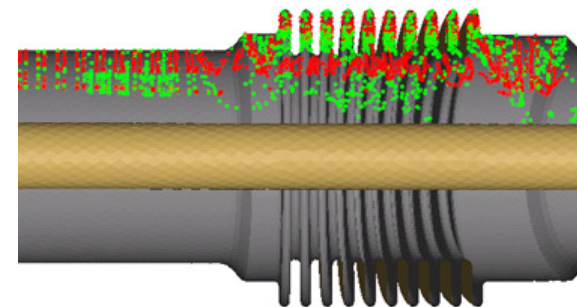
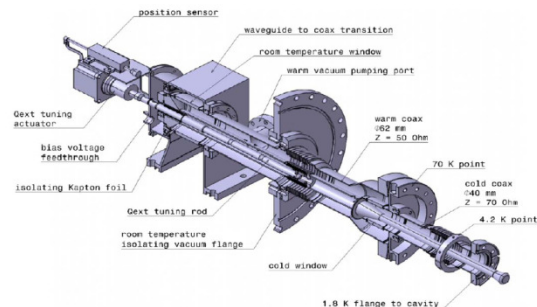
Particles moving with external magnetic field



805 MHz Magnetic Insulated Cavity

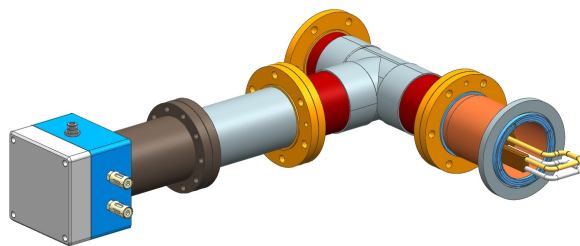
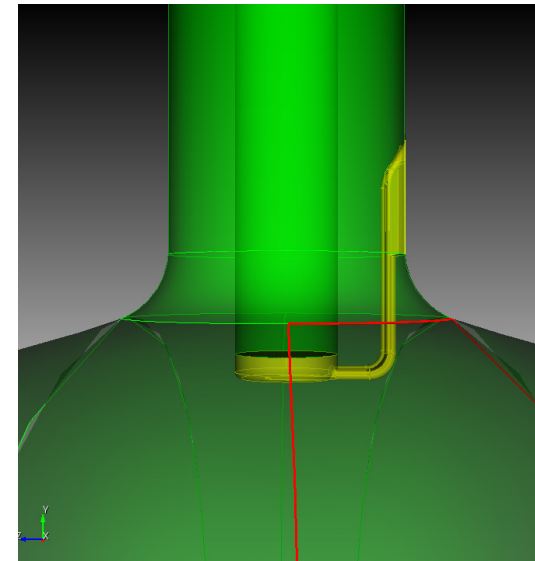
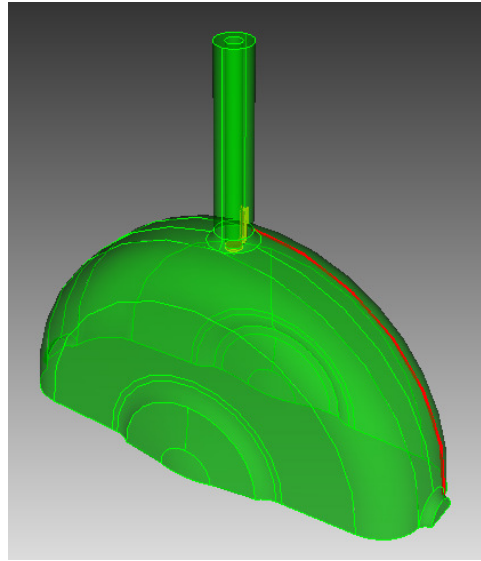
- Can apply DC BIAS voltage

Suppressing electron MP on TTF III coupler by DC Bias has been studied by Track3P

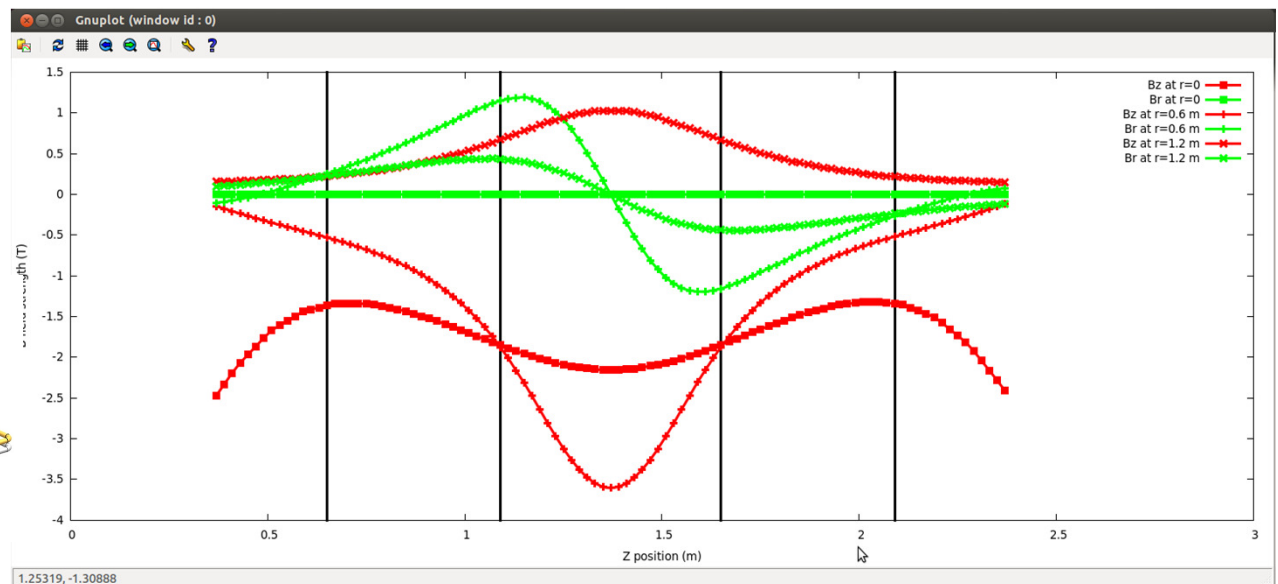


ACE3P Simulation Model

- Field map of MICE cooling channel
- 201 MHz RF cavity and coaxial loop coupler
- Different B field at each cavity and coupler
- Exploration of coupler design

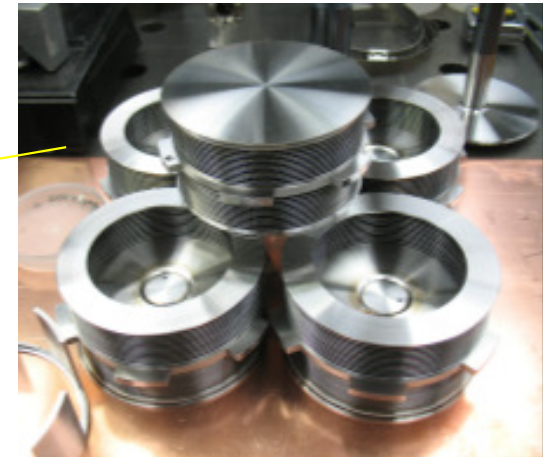
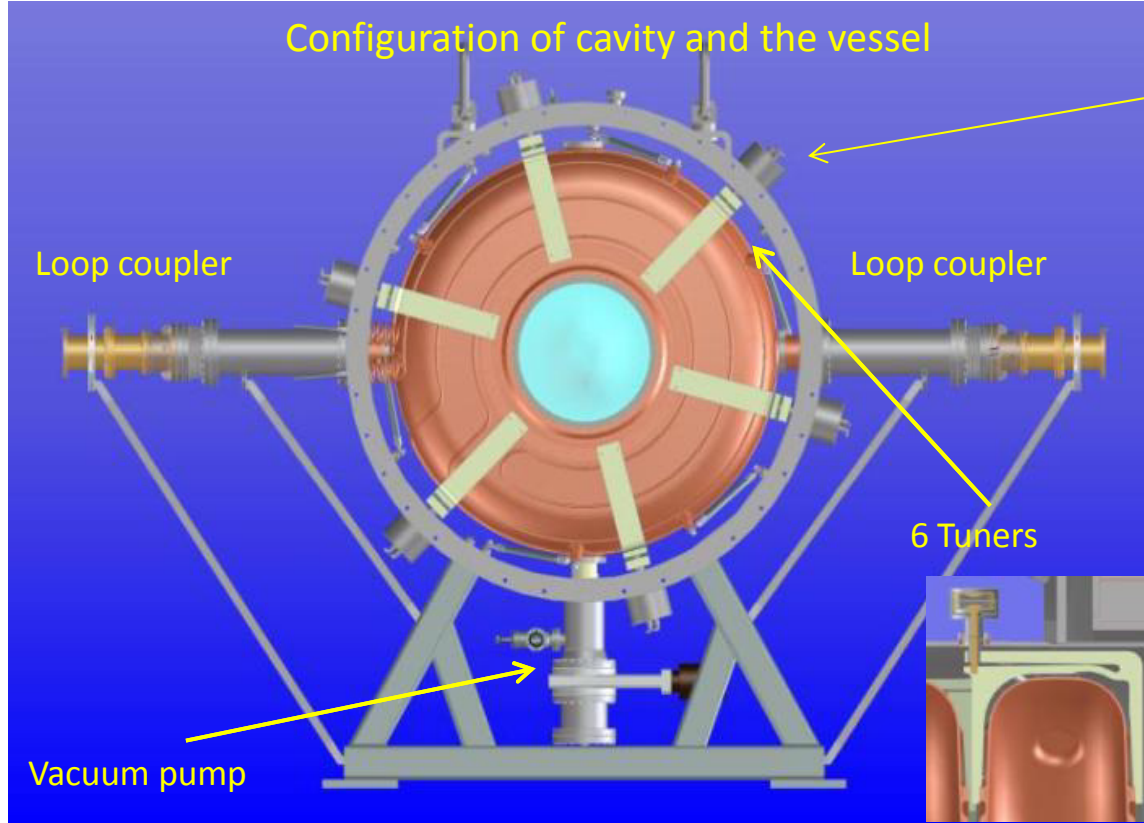


PXIE RFQ coupler



Preparation for the 201 MHz Cavity Testing at MTA, Fermilab

- Using the single cavity vacuum vessel



Fabrication of tuner actuator at LBNL



Cryostat Fabrication

- Materials ordered and arrived LBNL
- New Water Jet machine ready for fabrication
 - Machining starts end of March
- New AI welder
 - Certification ready by end of March
 - Welding starts early April 2013
- Cryostat drawings will be updated as-built
- Cryostat to be finished by July 2013

Coupling Coil Cold Mass Support Bracket Fabrication

- Current status:
 - 4 base plates finished
 - 4 of 8 cold end ears complete
- 4 side plates need to be fabricated
 - 80 hours of work left
 - E-beam welding: \$725 /ea

