RadiaBeam Technologies

Future HOM dampening: EIC & beyond

NSAC Long Range Planning Process in the Accelerator Science, Applications and Broader Impacts

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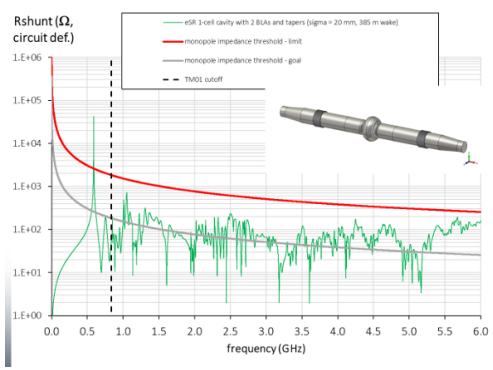
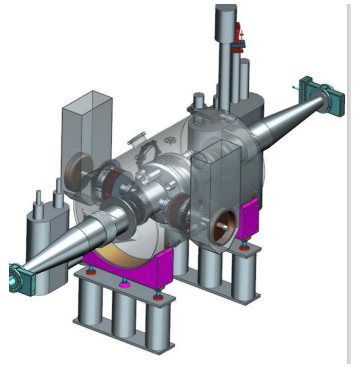
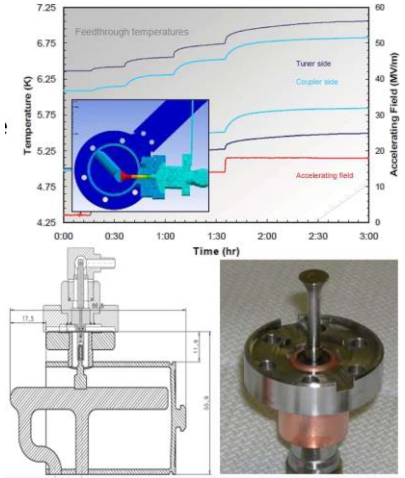
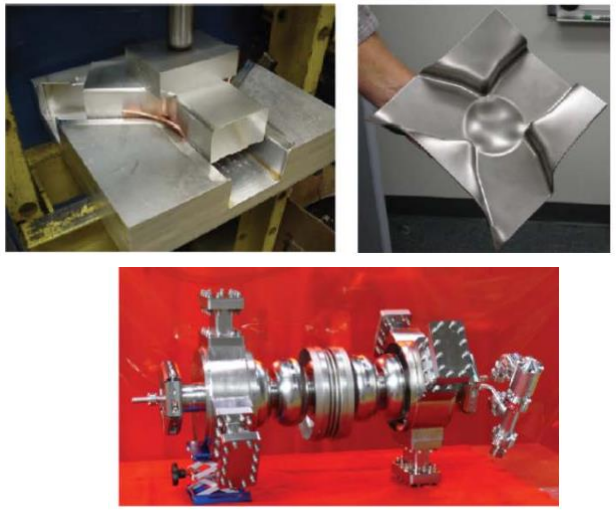
Introduction

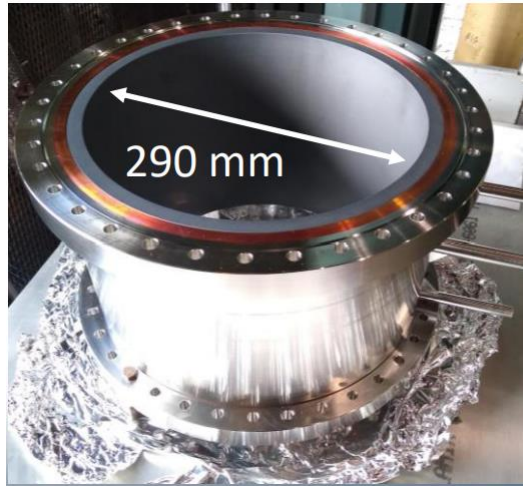
- High current or high luminosities: HOM dampers is crucial to absorb the wakefields
  - Does not harm fundamental mode
  - RF Power handling capabilities: [mW] -> [kW]
  - Thermal/mechanical/vacuum/cleanliness considerations
- Design types
  1. Coaxial dampers
  2. Waveguide dampers
  3. **Beampipe/line absorbers(BLA)**











Marhauser, "Next generation HOM-damping." *Superconductor Science and Technology* 30.6 (2017): 063002.
Kim 2016 HOM Damping in superconducting harmonic cavity for APS source upgrade

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Lab/Industry/University involvement

- Various forms of 'industry': R&D focused($$$) versus production-focused($)
  - Production-focused companies cannot tolerate design changes: quote & build to print
  - Costs: Project schedule versus budget
- Accelerators: High mix/low volume engineering and production needs
  - SBIR/STTR projects keep PhD-heavy companies engaged throughput development lifecycle: application-specific challenges
- $280B CHIPS and Science ACT will impact production-focused companies with applied physics, clean room, chemistry and vacuum expertise
  - Challenge or opportunity?

HOM Dev	Lab	University	Industry: R&D focus	Industry: Production
1. Conceptual Design	<80%>	<80%>	**20%**	
2. Mechanical Design	40%	20%	**40%**	
3. Prototype fabrication	30%	10%	**40%**	20%
4. Experimental Testing	***<50%>***	***<50%>***	**30%**	**20%**
5. Production	*<20%>*		***<20%>***	80%
				< %> represents shared costs

Cornell Injector

- Brazed tile delamination
- Electrostatic beam deflection

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Appendix

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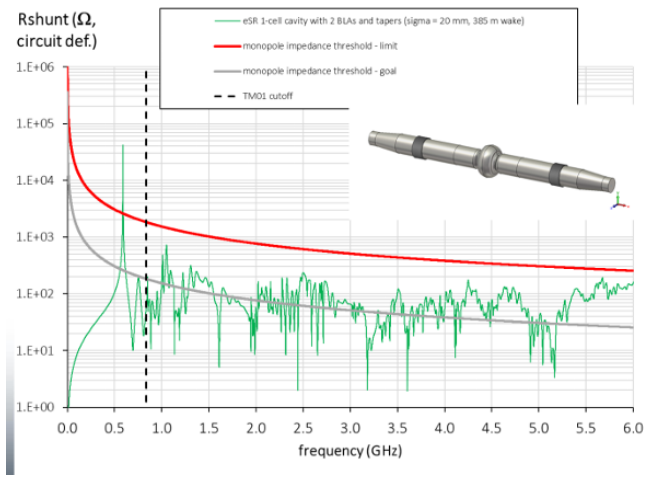
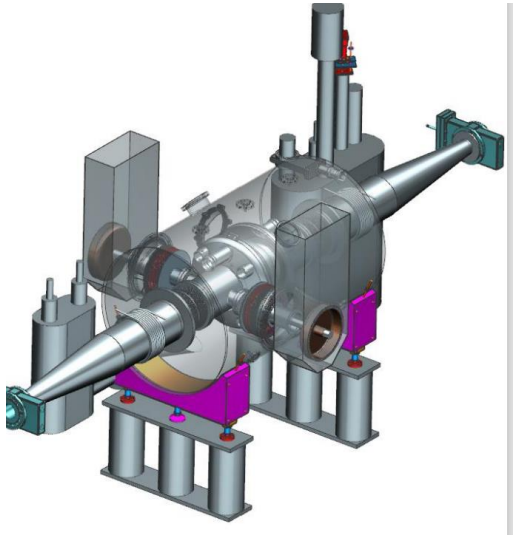
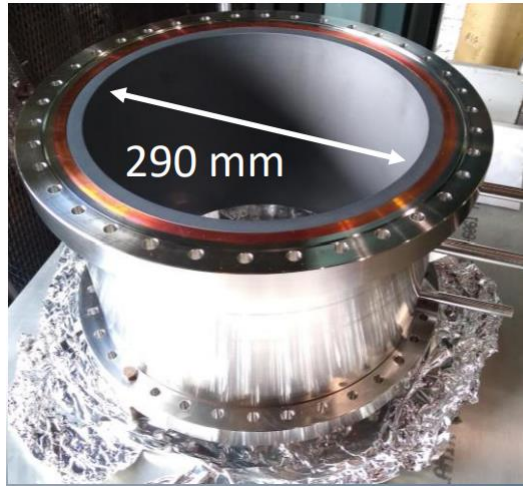
EIC Requirements

- **x17** 591MHz single cell cryomodules: 40kW HOM/cavity, >34 need
- Shrink-fit SiC beam line absorbers
  - Cornell-> APS-U -> EIC
  - Metal/ceramic joint formed mechanically: no brazing/reduced cracking
  - Coorstek Ceramic: SC-35 graphite loaded SiC: Optimized for friction/wear properties, not accelerators
- Proof of principle HOM completed: at least 34 more needed







Preble -2021 EIC SRF Systems Overview

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