

# Outline



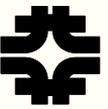
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- **Address the questions in the charge**
- **Progress/accomplishments in past two years.**
  - **Technical progress**
  - **include both infrastructure & components (cavities, CM, etc)**
- **Plan for next two to three years**
  - **Relevance of infrastructure or development to the needs of Project X and ILC.**
- **The plan for ARRA funds**
- **Collaboration with other national labs and universities**
- **Technical Milestones**
- **Conclusions**

# Charge

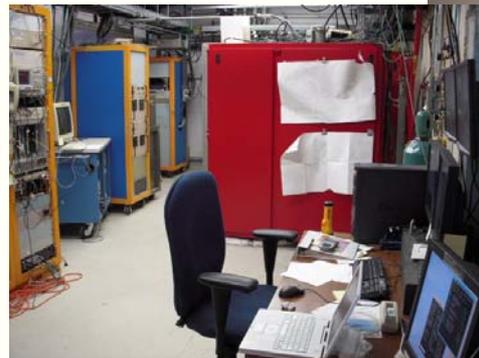
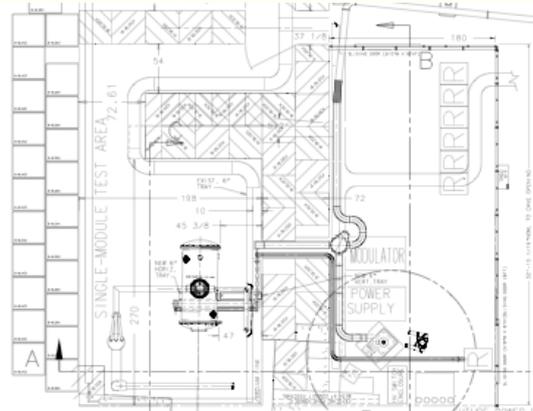
- **What are the major accomplishments in the past two years and are the already established capabilities being effectively utilized?**
- **Is the infrastructure plan for FY09 and beyond reasonable and cost effective?**
- **Are the proposed facilities sufficient to address Project-X and ILC R&D design and manufacturing questions in the three to four year time frame?**
- **Does the laboratory make effective use of collaboration with and existing SRF capabilities at other laboratories and universities?**

# What is HTS?



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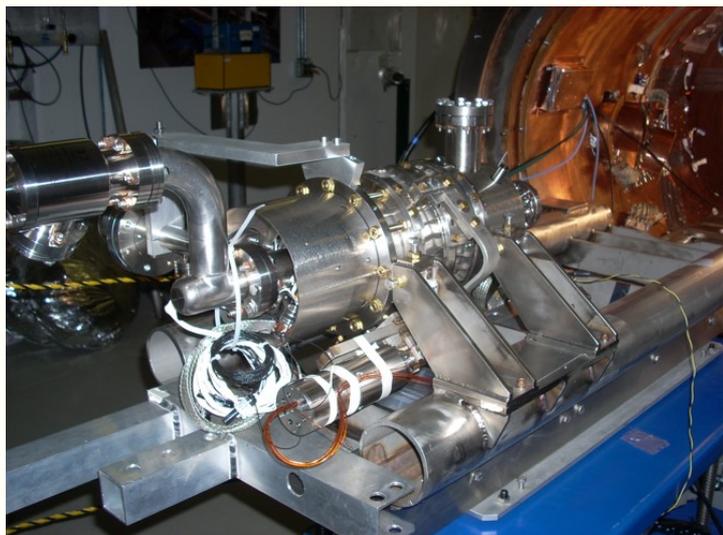
- Facility to test fully dressed single cavities
  - Shielding Cave
  - Cryo vessel
  - UHV clean vacuum systems
  - Portable clean rooms
  - RF systems
    - 1.3 GHz - 300 kW
    - 3.9 GHz - 80 kW
  - Cryo capacity
    - 1875 W (3 satellite refrigerators)
    - not just for HTS, but HINS & CC2 as well
  - 1.8K superfluid operation with vacuum pump (10 g/s Helium at 12 Torr)
  - Cavity diagnostics
    - X-ray detectors
    - Dark current detectors (Faraday cups)
    - Thermometry
  - DAQ and controls system
- Modeled after DESY CHECHIA facility



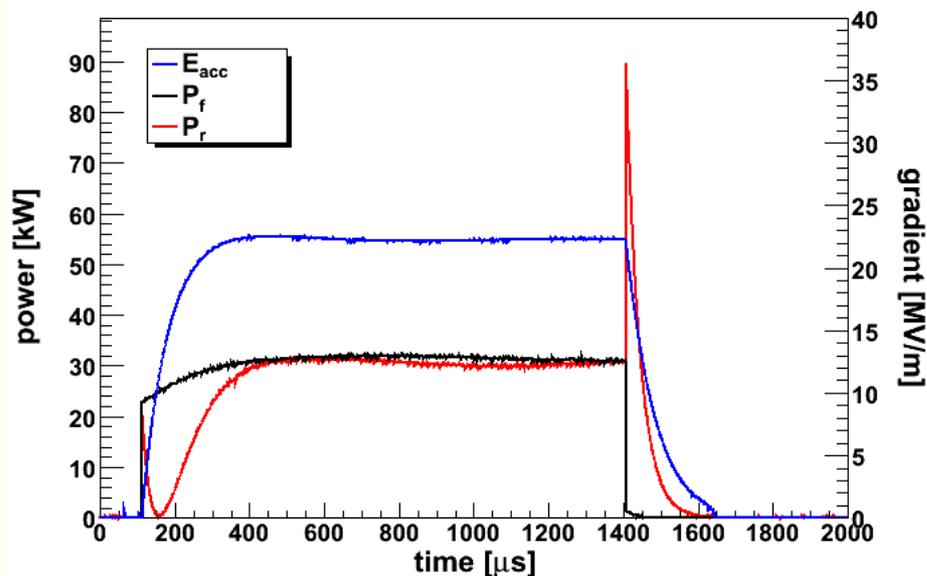
# Technical Progress

- **Accomplishments**

- C22 (1.3 GHz, commissioning): 21 May 07 to 17 January 08
- Cavity #1 (3.9 GHz RF commissioning): 20 Oct 07 to 1 Nov 07
- F3A5: 30 Jan 08 to 12 Sep 08
- F3A3: 30 Sep 08 to 13 Nov 08
- F3A7: 19 Nov 08 - 5 Dec 08
- F3A8: 15 Dec 08 - 28 Dec 08
- F3A4 evaluation: just completed



F3A5, 2.0 K, 5 Hz



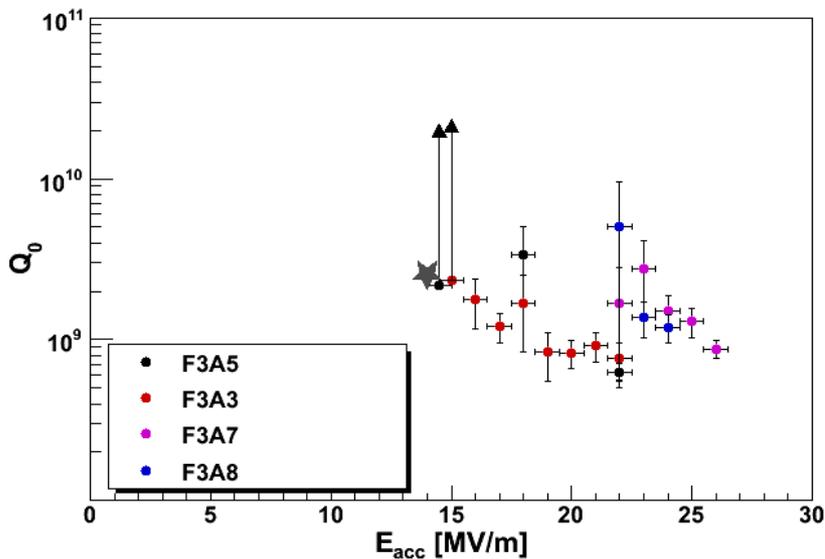
# Technical Progress



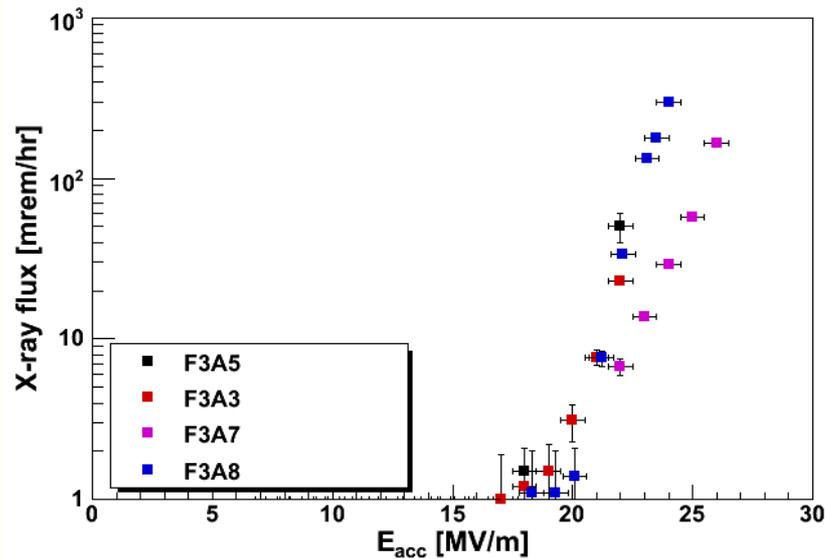
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- **3.9 GHz Cavity testing was the priority in 2008**
  - Commissioning all systems including LLRF
  - 4 cavities tested
    - First four achieve 22 MV/m or greater
  - Frontrunner/Role Model at Fermilab for
    - SRF Engineering notes, related activities and documentation
    - Shielding reviews, etc.
    - Operational Approvals
- **3.9 GHz module now at DESY**

Horizontal tests of ACC39 cavities (5 Hz, 2.0 K)

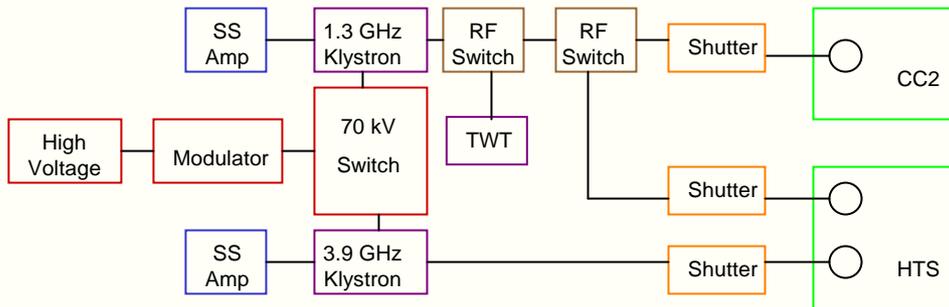
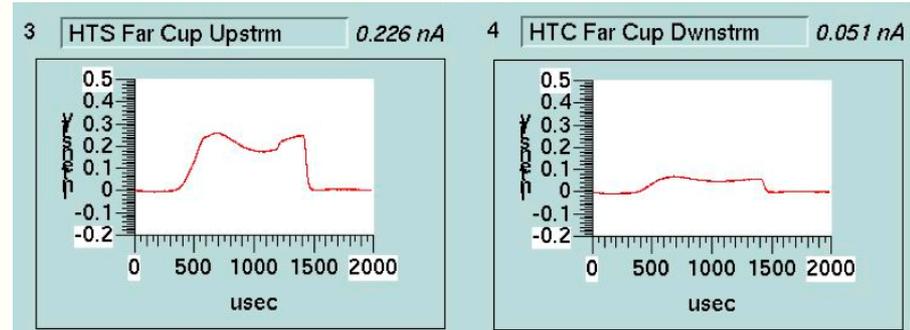


Horizontal tests of ACC39 cavities (5 Hz, 2.0 K)

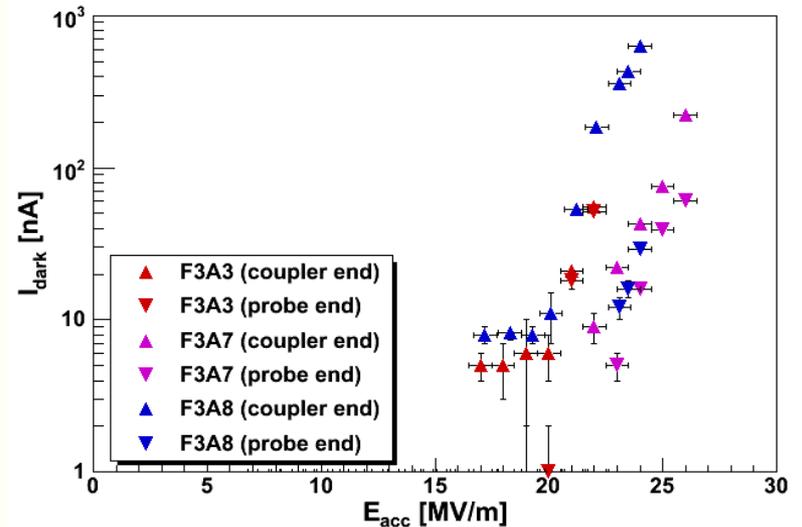


# Technical Progress

- **Unique facility**
  - only facility of its type capable of measuring single cavity dark current
  - flexibility of RF distribution



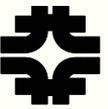
Horizontal tests of ACC39 cavities (5 Hz, 2.0 K)



# Collaborations

- **DESY/INFN and Jefferson Lab were invaluable resources in design and commissioning of HTS**
- **Illinois Institute of Technology played a role in developing spatial X-ray detection schemes**
- **More players are welcomed for R&D ideas**
- **Other international partners looking to us for HTS design input**
- **Indian collaboration in progress for HTS-2**

# Plan for next 2-3 yrs



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- **Focus on 1.3 GHz cavity testing**
  - CM-2
  - Project X
  - Other cavities, related projects as needed
- **Complete Design & Construction of HTS-2**
  - At best, HTS throughput is 24 cavities/year
  - To meet demands of Project-X = 72/year, more capacity is needed or choose not to test every cavity.
  - Up to half of the 1.3 GHz cavities for Project-X are to be tested at HTS
- **What components will be built?**
  - Completely new stand capable to independently or in tandem test 2 1.3 GHz cavities
    - Cryo vessel
    - RF
    - Cryo
    - Controls
    - Vacuum
    - a shielded cave
- **How do ARRA funds help?**
  - Funds allocated for RF system (John Reid's talk in Breakout #2)
  - Provide space, infrastructure for HTS-2 near NML
- **Collaborations in place and planned?**
  - Indians to build HTS-2 cryostat: vessel and feed can

# Plan for next 2-3 yrs

## HTS-2 design and build

- Provide detailed specs in late 2010
- Design Reviews in 2011
- Fabrication and Delivery beginning in 2011
- Ready to Operate in 2012

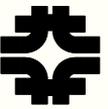
New SRF Infrastructure Construction (with ARRA)

U.S. Calendar Year	2008	2009	2010	2011	2012	2013
Nb Scan/Dress Cavity Upgrades		Design	Procure & Install			
Add Px CM Ass'y Capacity					Design	Procure & Install
VTS 2 & 3 Upgrade ARRA	OMNIBUS DELAY	Design	Procure	install VTS2	VTS3	Operate VTS 1-3
HTS 2 Upgrade (ARRA)				Design	Procure & Install	Operate
NML Beam line ARRA	OMNIBUS DELAY	Design	Procure	install	Beam Available	
NML Refrigerator ARRA	OMNIBUS DELAY	Design	Procure		install	Operate
CM Test Stand			Design	Proc end cap(India), Fab RF(FNAL)	install	Operate
ANL & JLAB EP upgrades ARRA	OMNIBUS DELAY	ANL EP	Des	Procure	Operate	

# Milestones

- **Technical milestones for the next few years**
  - **HTS improvements**
    - **Cryo upgrade w/ HINS - in progress, complete ~June 15**
    - **Replace 4K shield w/ trace line - if time permits**
    - **Controls/diagnostics/LLRF evolving**
  - **Complete 3.9 GHz testing - 2nd half of 2009**
  - **Initiate 1.3 GHz tests - 2009**
  - **Ramp up to 24 cavities/year - 2010**
  - **HTS-2 (see previous slide) - 2012**

# Conclusions



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- HTS has been commissioned and is operational
- Installation/cooldown/test time has been reduced to 12 working days (from 3 months)
- HTS has proven to be an key piece of the developing SRF infrastructure at Fermilab
- HTS is an important test bed for R&D:
  - Plenty of ideas on the table for ways to address cavity tuning, microphonics, Lorentz force detuning, high power RF processing...
  - HTS serves as a bench where these ideas can be tested
- HTS-2 is necessary to meet the aggressive test schedules envisioned for CM-2, Project-X, and other SRF efforts.