Americas Report

C.M. Ginsburg (FNAL)
for the FNAL/ANL, JLab, and Cornell (no report this time)
cavity teams

S0 Meeting 7.June 2011

JLab Status

RG

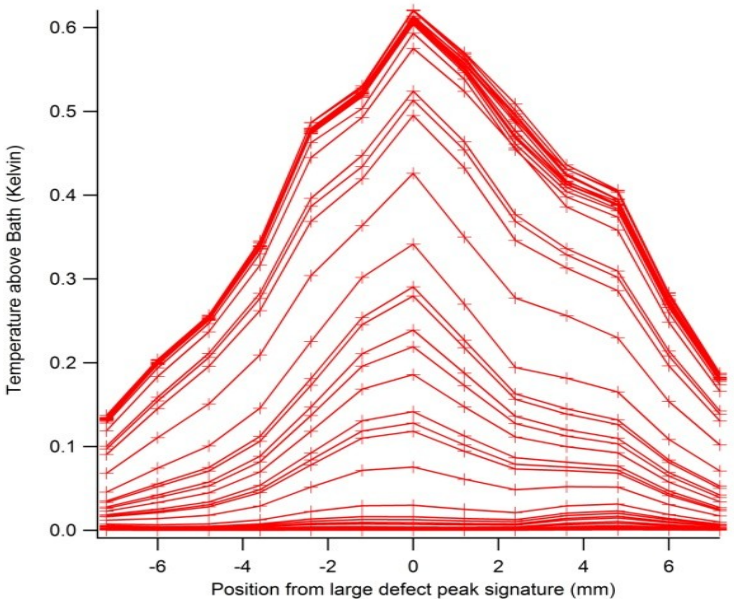
May 31, 2010

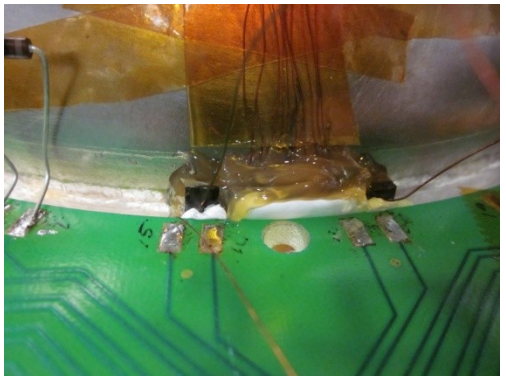
9-cell Cavities

- TB9AES011 in process of treatment and testing
- JLAB LG#1 RF test following re-HPR completed with reduced field emission
  - Cavity quench limited at 24 MV/m
  - OST data analysis and dual-mode excitation measurements to be completed
- DESY seamless 9-cell cavity RF test following light EP completed
  - Highest gradient reached 18 MV/m. OST predicted a quench location in cell#4
  - Optical inspection of quench location under way
- TB9NR001 light EP on hold due to shortage of replica material
- TB9AES006 at FNAL for mechanical polishing
- Expecting a 9-cell cavity from IHEP for vertical test

Instrumentations for Quench and Field Emission Studies

- Experiments with Hamamatsu diodes (received from KEK) placed at locations near cavity started for “at-cavity” X-ray monitoring
- High-resolution local thermometry apparatus tested with natural defects in cell #5 of TB9NR001
  - Twin defects (4mm apart) were resolved (graph and images shown)
  - Next step is to measure a controlled defect in a 1-cell cavity

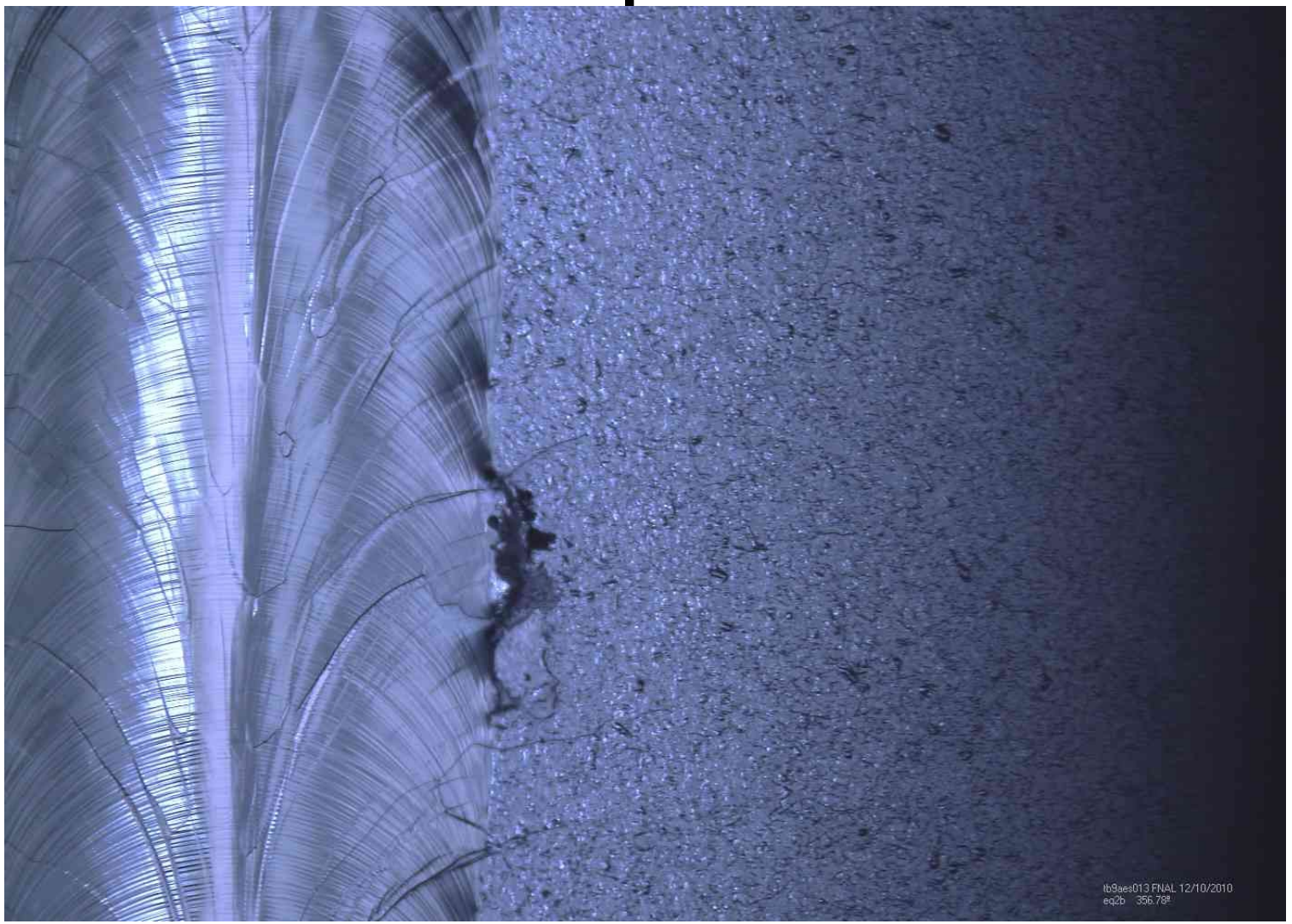




FNAL/ANL Update

- **CM1 tests ongoing**
- **Plans underway for CM2 assembly – will affect other work**
- **Horizontal test stand**
  - **Vacuum studies and remediation successful, as shown on TB9RI018**
  - **TB9RI019 was successfully tested, and TB9RI018 with two cooldowns is completing the test this week**
- **Vertical qualification**
  - **Several 1-cell tests in pursuit of general R&D and vendor qualification**
  - **First test of the new batch of AES 9-cell cavities occurred**
    - **TB9AES013 reached 17 MV/m after standard EP processing with localized quench and potential feature seen in optical inspection before final EP**
    - **These cavities had light BCP at AES and most show pitting**
    - **Two more are in process: one at JLab for standard EP/test, the other tumbled**
  - **TB9RI026 (localized grinding at KEK) – good performance**
    - **Standard EP at FNAL/ANL: initially 29 MV/m then 20 MV/m after FE event**
    - **@KEK: local grinding, tuning >98% flatness, 20-30um EP, HPR, drying, and flanged in the clean room air.**
    - **HPR, vertical test prep done at FNAL/ANL**
    - **VT 13.May: 36.6 MV/m Q0=7E9; low-field Q0~1.35E10; FE-free; quench limitation (2nd sound implicates cell 5)**
  - **AES002 (dressed) – being 120C baked at JLab after dressed-EP**
  - **TB9RI022 (6th pass, 5th light EP) was qualified**
    - **VT 24.May 2011: 37.9 MV/m with low FE Q0= 8.8E9**
  - **Next plans: TB9AES012 and TB9ACC012 (tumbled)**

TB9AES013 quench location



Shown as-received (before EP)

Scenario 1: “best performance” CM2

cavity	***status***	***needs***	***Eacc [MV/m]***	***main risk***	
TB9RI018	FE in HT after pump/purge (admin limit)	HPR, good HT	35	FE	Now
TB9AES009	HTS Good	HPR	35	FE	☺
TB9AES010	HTS Good (admin limit)	HPR	35	FE	☺
TB9AES008	HTS Good (admin limit)	HPR	35	FE	☺
TB9ACC016	VTS (dressed) good (VT gradient)	re-weld; different coupler	36.5	weld problems, coupler fails	☺
TB9RI019	in HTS (VT gradient)	good HT	38	coupler	☺
TB9RI024	prepped for HTS (VT gradient)	good HT	40	coupler	
TB9RI027	prepped for HTS (VT gradient)	good HT	40	coupler	
		***average*:**	***36.8***		

Five HPR and HT preps

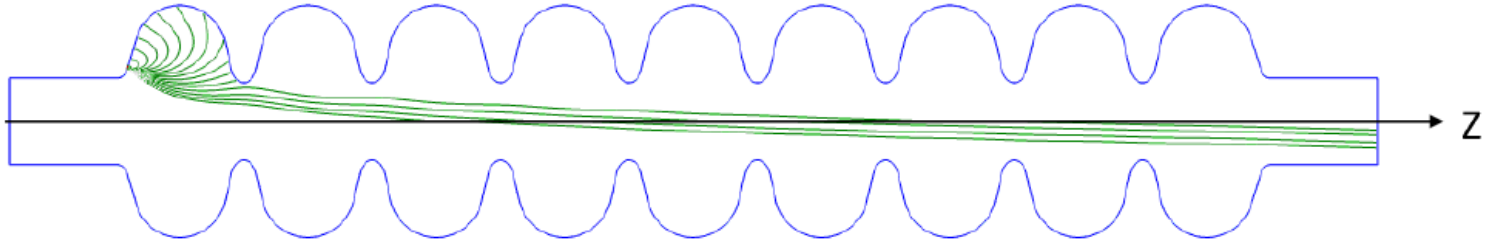
- ✓ TB9RI018
- ✓ TB9AES009
- ✓ TB9AES010
- ✓ TB9AES008
- ✓ TB9ACC016

Four more good horizontal tests

- ✓ TB9RI019
- ○ TB9RI018
- ○ TB9RI024
- ○ TB9RI027

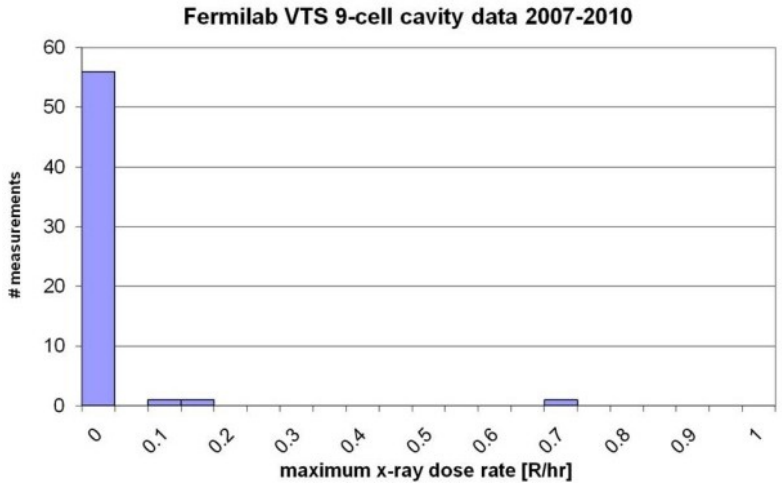
ACCEL8(31 MV/m) and TB9AES007(33 MV/m) will also be HPR’d as backup

FNAL field emission studies



Simulations made for radiation safety of vertical test stand (VTS1)

- Fishpact for field emission model
- MARS (GEANT) for particle transport through material
- According to the described model, the predicted dose rate under the external shielding is < 0.250 R/hr 90% of the time.
- The measurements are well within this value, to within the limited statistics.



Rakhno et al.
SATIF-10 (June 2010) http://lss.fnal.gov/archive/2010/conf/fermilab-conf-10-246-apc-td.pdf
IPAC10 (May 2010) http://www-spires.fnal.gov/spires/find/hep/www?j=CONFP,C100523,WEPEC056

FNAL field emission studies

Requirements to X-ray instrumentation

- What to measure
  - X-ray map - location of "hot" X-ray radiation spots on the outer surface of a cavity or cryostat
  - Intensity of radiation
  - Energy spectrum of X-ray photons
  - Angular distribution
  - Timing (ex: intensity, energy vs RF pulse timing)
  - Use all this information to figure out what is going on inside the cavity

- Mobile and flexible system which can be moved to different test areas (VTS, HTS or even CM tests)

Several detectors under study:

- "Slow"
  - High rate flux measurement
  - Sensor can be in LHe
  - Readout electronics ~30ft away, "warm"
- "Fast"
  - Single photon detection
  - Potentially measure photon energy
  - Preamp near sensor … "cold"

Primary issue: reliability and reproducibility

Sukhanov, Mukherjee