

CM-1 Status

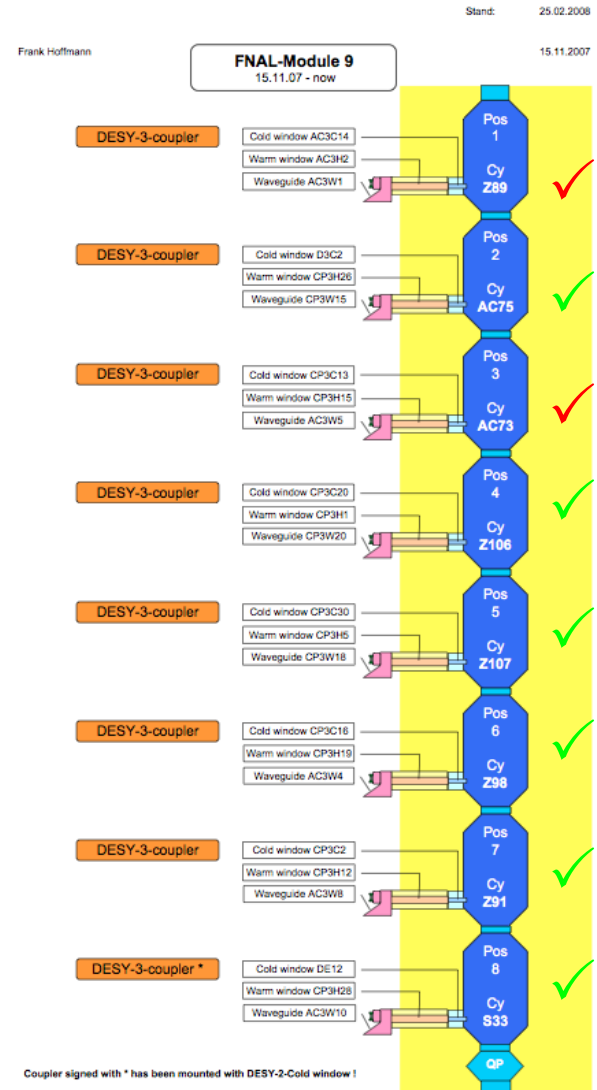
ILC Cryomodule meeting

21 June 2011

E. Harms/FNAL

Since Last Update

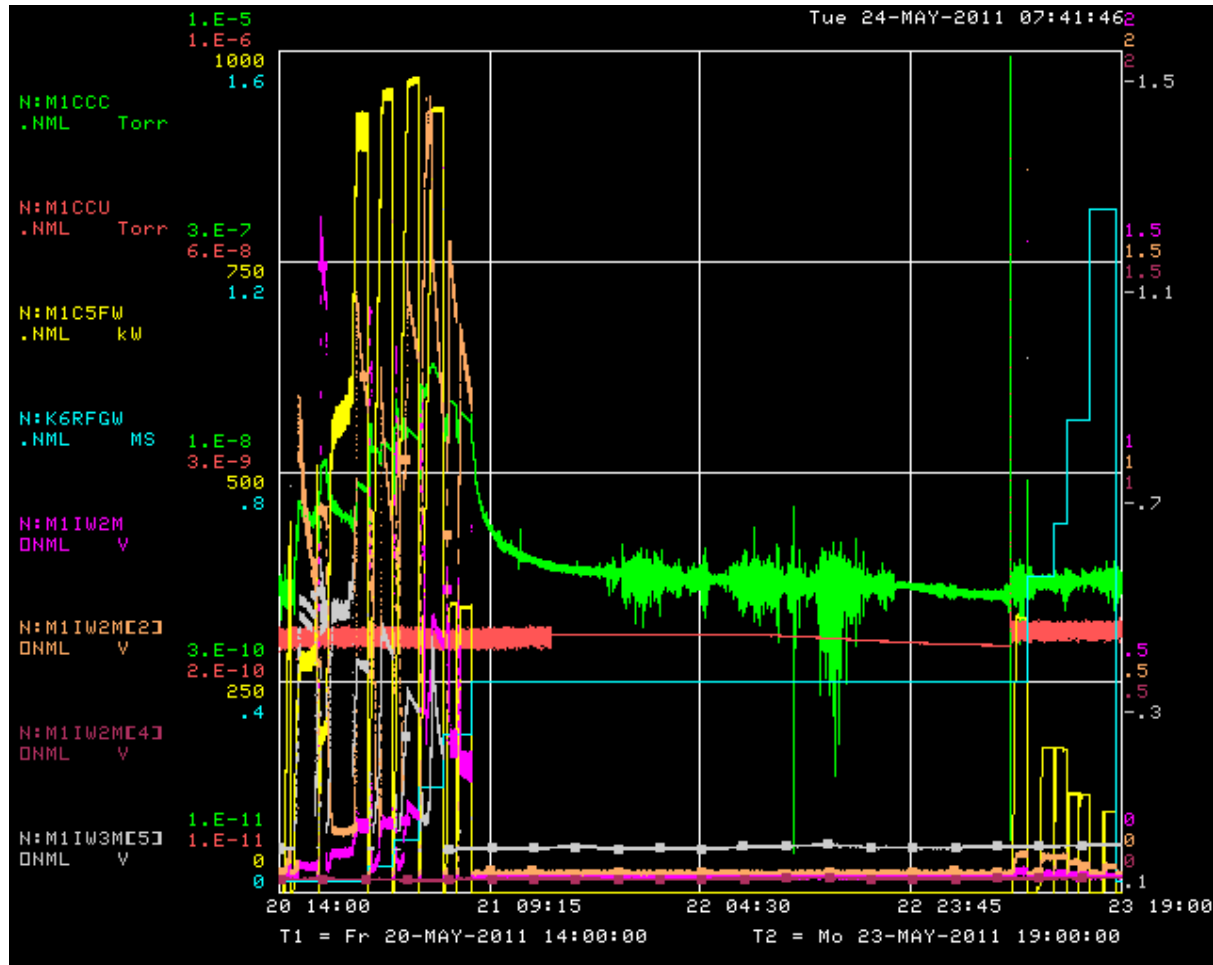
- Cavity #5/Z107 assessment complete (20-25 May)
- Cavity #6/Z98 complete (3-9 June)
- Cavity #7/Z91 complete (9-11 June)
- *All cavities have now been individually evaluated*



Cavity 5/Z107 Performance

- Very quick Coupler Conditioning (24 hours)
- Tuner operation fine (no motor problems)
- No anomalous behavior seen (cryo is stable to quench limit)
- Some x-rays
- Peak performance
 - 33.8 MV/m, quench limited
 - LLRF closed loop set up
 - LFDC tuned up
 - Limited to 2.5 Hz operation with 1.2 ms pulse width by LCW temperature, flow

Cavity 5/Z107 Performance



Coupler Conditioning

E. Harms 21 June 2011

Cavity 5/Z107 Performance

33.8 MV/m

QuickTime™ and a
decompressor
are needed to see this picture.

Maximum Performance

Cavity 5/Z107 Performance

Q_L vs. Gradient

QuickTime™ and a decompressor are needed to see this picture.

QuickTime™ and a decompressor are needed to see this picture.

Quench

Cavity 6/Z98 Performance

- Rapid Coupler Conditioning (3 days)
- Tuner operation fine (no motor problems)
- No anomalous behavior seen (cryo is stable to quench limit)
- No x-rays
- Peak performance
 - 28.1 MV/m, quench limited
 - LLRF closed loop set up
 - LFDC tuned up
 - 5 Hz operation with 1.2 ms pulse width

Cavity 6/Z98 Performance

28.1 MV/m

QuickTime™ and a
decompressor
are needed to see this picture.

Cavity 6/Z98 Performance

Q_L vs. Gradient

QuickTime™ and a decompressor are needed to see this picture.

QuickTime™ and a decompressor are needed to see this picture.

Quench

Cavity 7/Z91 Performance

- Quick Turnaround and rapid Coupler Conditioning (2 days)
- Tuner operation fine (no motor problems)
- Cryo instabilities just above 21 MV/m, but prior to quenching
- QL drop with gradient
- No x-rays
- Peak performance
 - 22 MV/m, cryo and quench limited
 - LLRF closed loop set up
 - LFDC tuned up
 - 5 Hz operation with 1.2 ms pulse width

Cavity 7/Z91 Performance

Liquid Level probe

QuickTime™ and a
decompressor
are needed to see this picture.

EAcc

Pressure

Mass flow

Cryo Response ~ 20 MV/m

Cavity 7/Z91 Performance

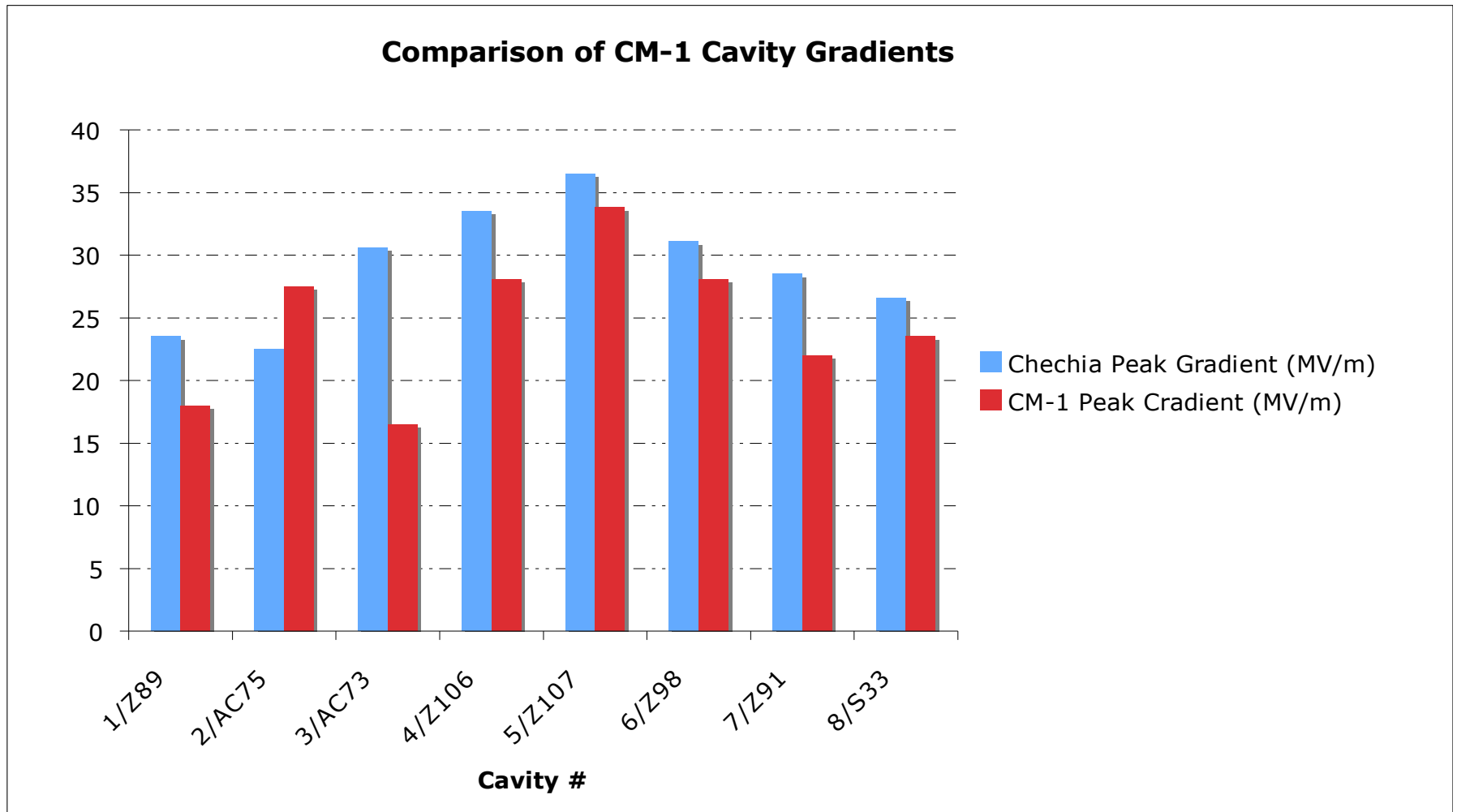
Q_L vs. Gradient

QuickTime™ and a
decompressor
are needed to see this picture.

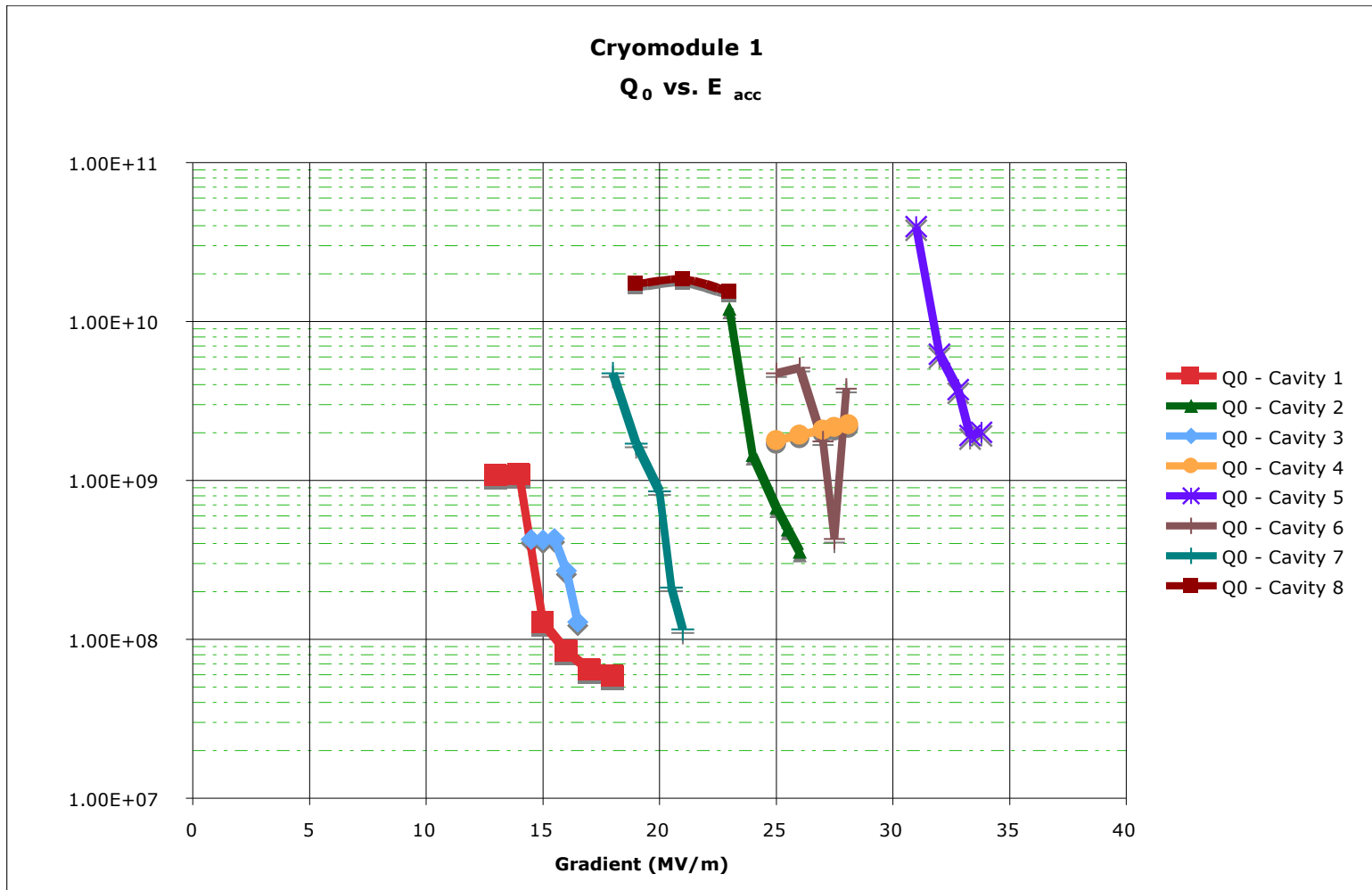
QuickTime™ and a
decompressor
are needed to see this picture.

Quench

CM-1 Comparative Gradients



CM-1 Q_0 vs E



Present Situation

- No operation for 2 weeks (last week and this week)
 - Install Low Conductivity Water system
 - Reliability issues recently; performance limitation
 - Install and start tuning Waveguide Distribution system
 - Other tasks

Next

- Follow-up testing on selected cavities
 - More DHL on cavity 7
- Begin Module testing thereafter

Module Test Plan

- 1) Signal calibrations verified (1/2 day) 0.5
- 2) Waveguide distribution system assembled to all cavities (2 weeks) 10.0
- 3) Adjust Variable Tap Off's (VTO's) based on cavity maximum gradient data (2 days) 2.0
- 4) Adjust phase shifters – minimize field emission, dark current?
- 5) Verify power to cavities as seen on directional couplers (1/2 day) 0.5
- 6) Set $Q_L = 3 \text{ E}6$ for all cavities (1/2 day)
 - a. LLRF system should be ready for real time Q_L measurements 0.5
- 7) Set cavities to as close to the same resonant frequency as possible (except #8) (1/2 day) 0.5
 - a. LLRF should be ready for real time df measurements
- 8) Determine maximum achievable E_{ACC} (1 day) 1.0
- 9) Verify system LFDC/piezo system (6 months/3 weeks) 15 (parasitic)
- 10) Investigate Microphonics (parasitic)

Module Test Plan - 2

- 11) Determine LLRF regulation limits (3 days) 3
 - a. Assess any potential issue with 8/9 pi modes (7-8 of them)
 - b. Adjustable gain in LLRF controller to control 7 or 8 cavities
 - c. FF operation
 - d. Test phase and amplitude calibration scheme
 - e. FB operation
 - f. Test real time measurements (QI, detuning, control error, system noise)
 - g. Evaluate controller performance and regulation limits
- 12) Measure dark current/x-rays levels and source(s) (mostly parasitic)
- 13) HOM signal investigation (mostly parasitic)
- 14) Investigate possible cross-talk between cavities: de-tune one cavity at a time to investigate response (2 days) 2
- 15) Cryo heat load (should be parasitic)
- 16) Life test – investigate stability over 100? Hours 5
 - a. Stability / drift analysis (→ requires waveform DAQ storage system)
- 17) 9mA related studies (Carwardine et al, meeting next week) (tbd) 5
- 18) higher Q (1E7) /P-X studies resonance control 3

*48 days/5 = 9+ weeks

Longer Term

- Complete CM-1 late this summer/early Autumn
- CM-2 assembly complete ~1 October
- Begin Cryomodule swap thereafter