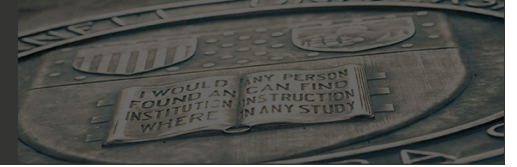


Cornell High-Q update

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TTC High-Q Working Group Meeting 23Apr2015



HTC9-4 results at Cornell

AES018 w/ high power coupler

Short history

- ❑ HTC9-3 test at Cornell, reported at the previous mtg.
- ❑ Disconnected cavity from HTC.
- ❑ installed high power coupler, but no HPR on cavity prior to installation.
- ❑ **HTC9-4 test** , slides from Dan Gonnella.

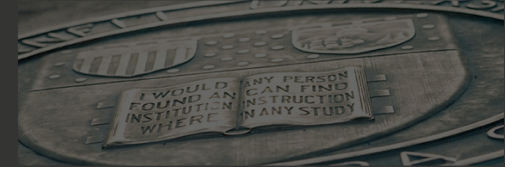


HTC9-4, AES018 w/ coupler





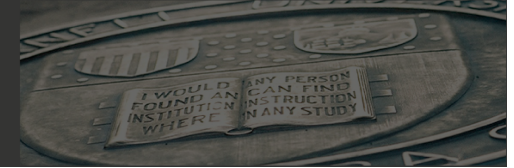
Overview



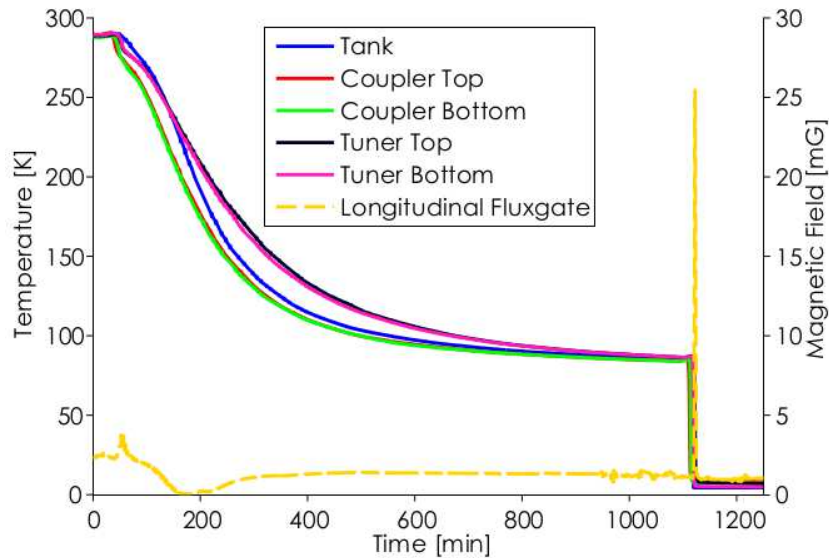
- AES018 (HTC9-3) was assembled with High Power Coupler – this is the only change between HTC9-3 and HTC9-4
- Two cool downs were completed
 - Both were very fast with $\Delta T_{\text{vertical}} \geq 60 \text{ K}$
- First cool down was used to check quench field and condition field emission
- In the second cool down the following was measured:
 - Q_0 vs E (2.0 and 1.6 K)
 - Q_0 vs Forward Power
 - Q_0 vs Q_{ext}
 - Heating and Pressure of the High Power Coupler



Cool Downs

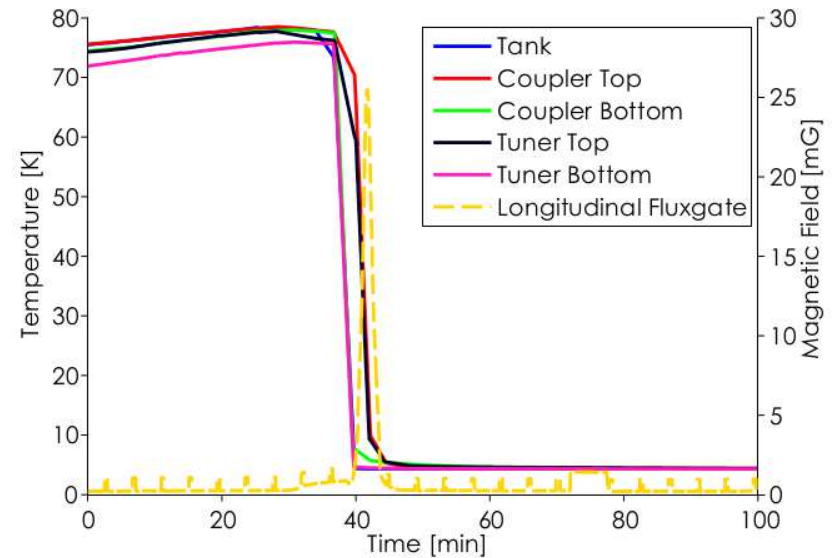


Cool Down 1



- Cool Down Rate ≈ 60 K/min
- $\Delta T_{\text{vertical}} \approx 74$ K
- $\Delta T_{\text{horizontal}} \approx 8$ K
- $B_{\text{longitudinal}}(10 \text{ K}) \approx 10$ mG
- $B_{\text{trans}}(10 \text{ K}) \approx 0.6$ mG

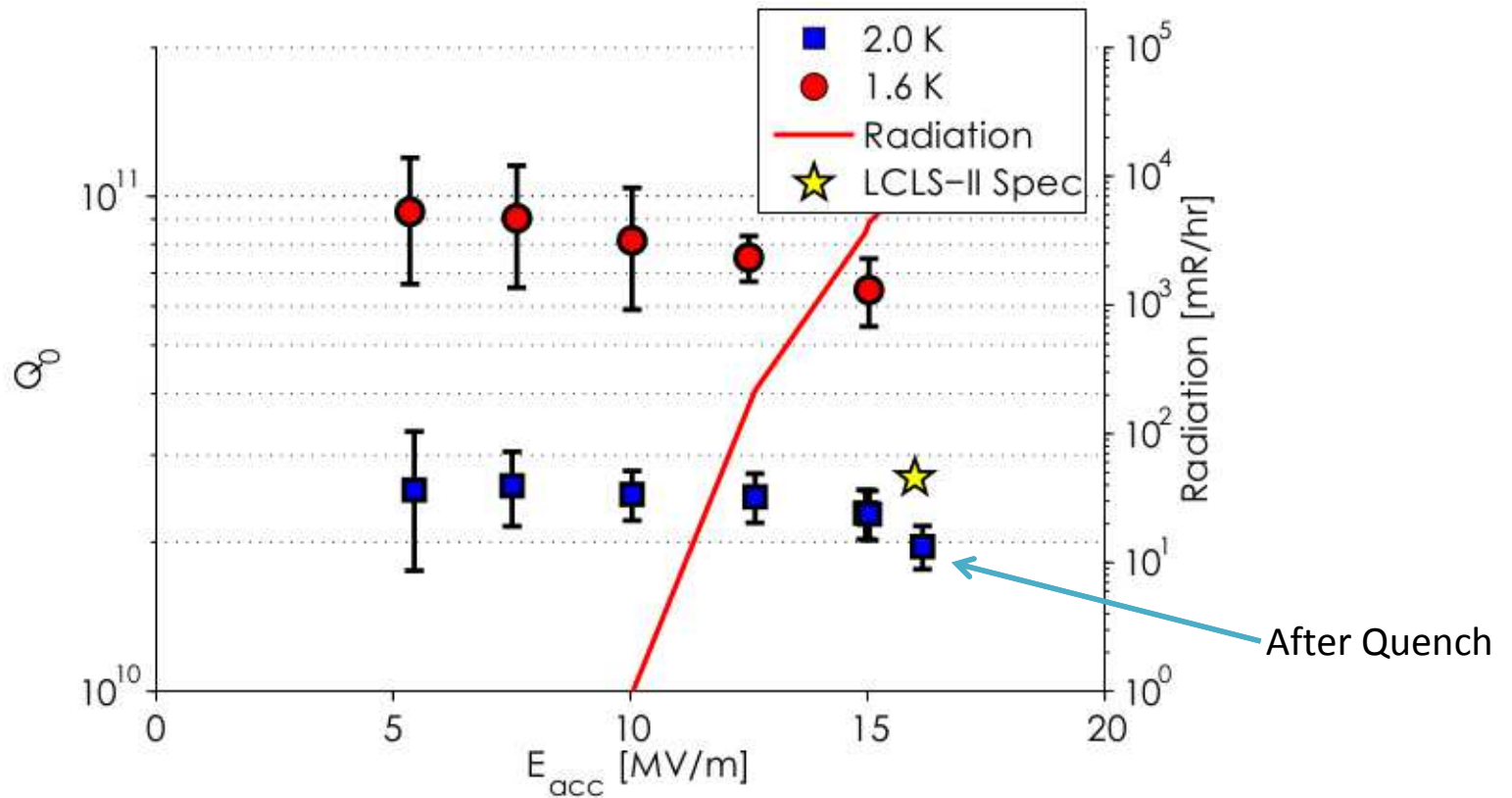
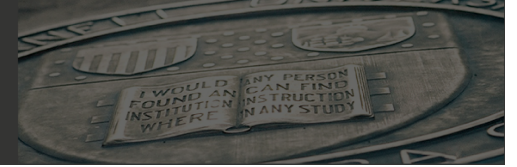
Cool Down 2



- Cool Down Rate ≈ 24 K/min
- $\Delta T_{\text{vertical}} \approx 63$ K
- $\Delta T_{\text{horizontal}} \approx 8$ K
- $B_{\text{longitudinal}}(10 \text{ K}) \approx 22$ mG
- $B_{\text{trans}}(10 \text{ K}) \approx 3.4$ mG



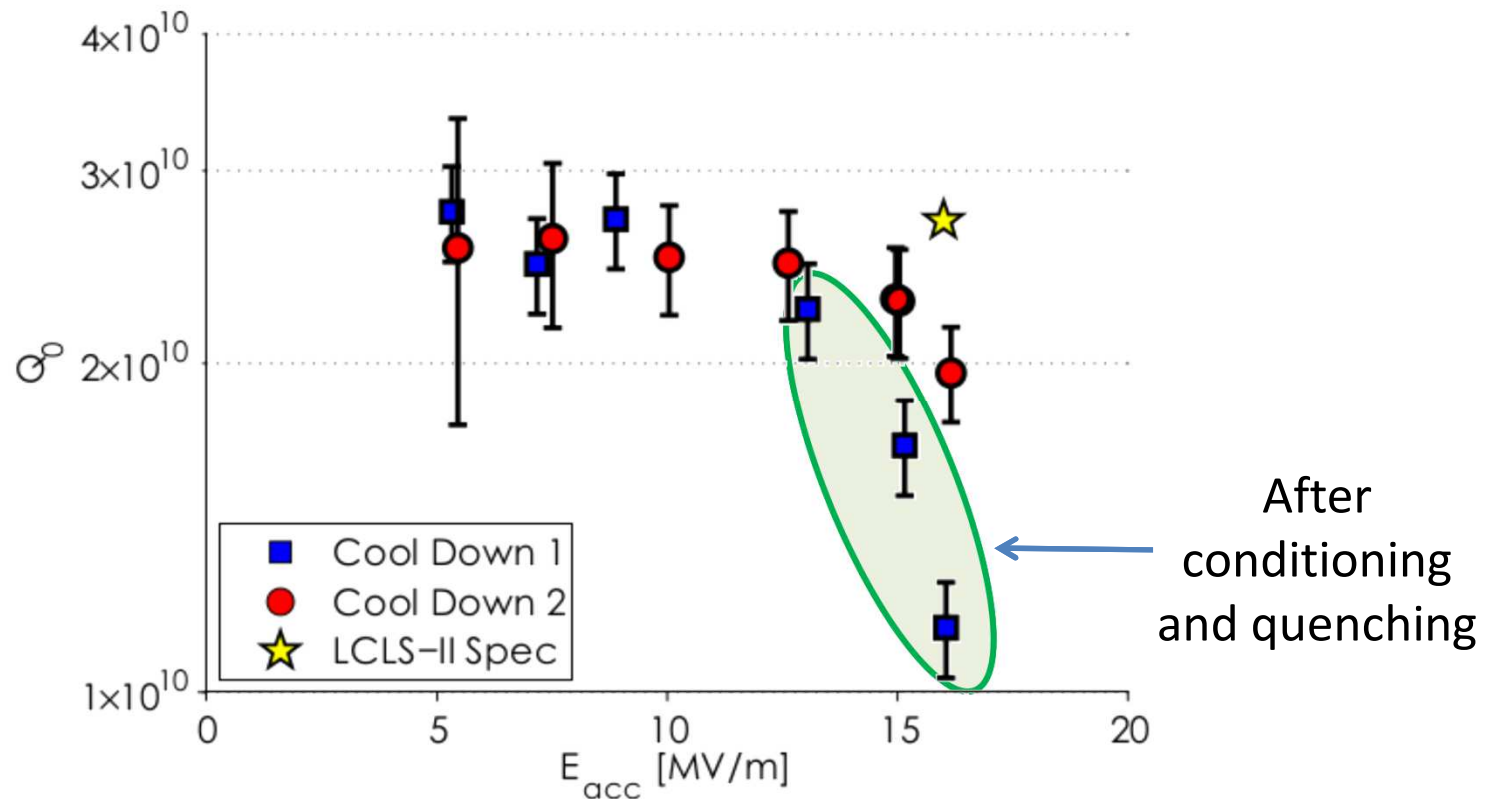
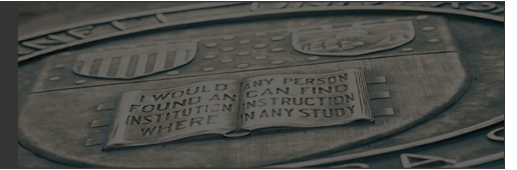
Q_0 vs E Performance



- Radiation peaked at ~ 10 R/hr at 16 MV/m after conditioning.
- Prior to quench, Q_0 was 2.2×10^{10} at 15 MV/m and 2.0 K.



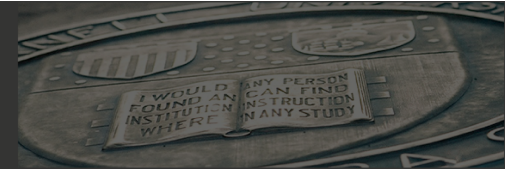
Q_0 vs E Performance



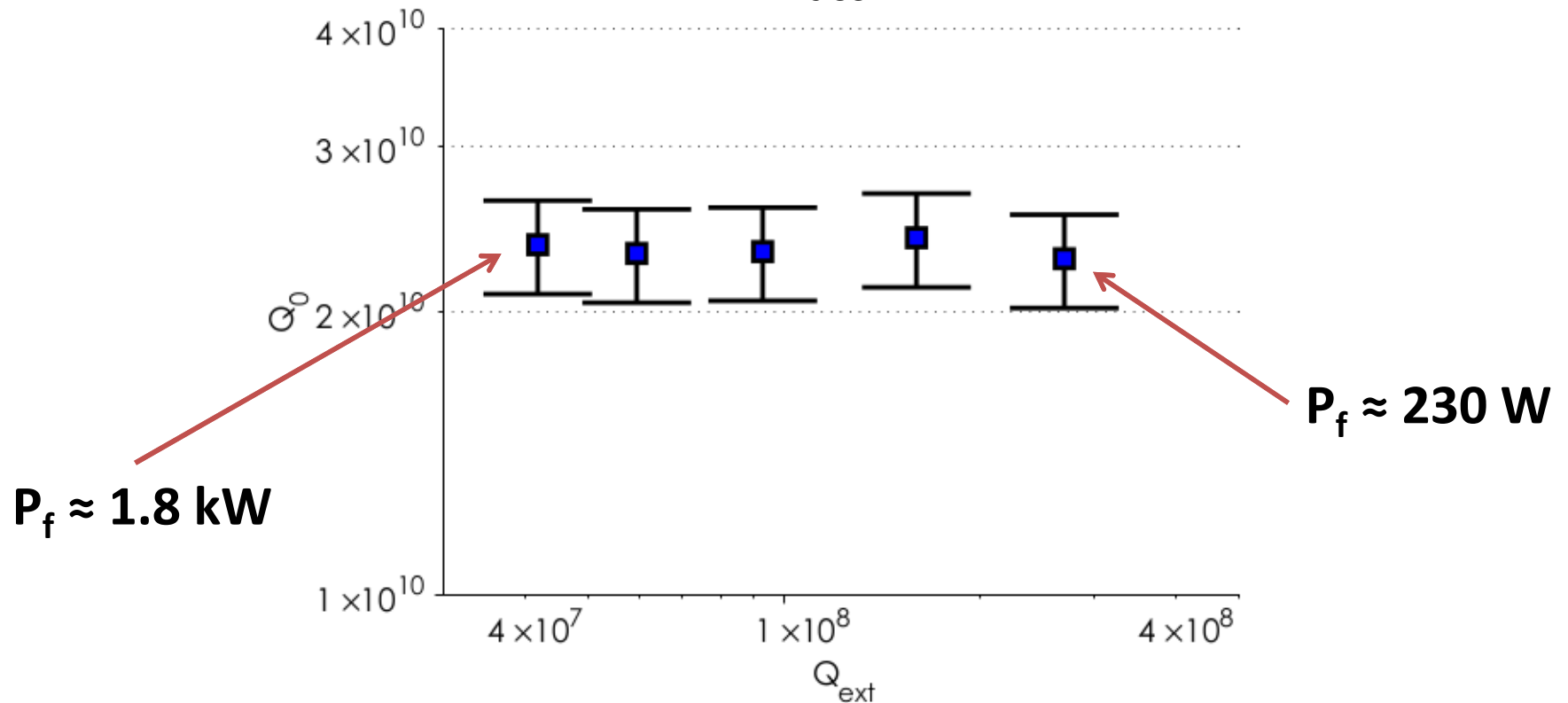
- Good Q_0 vs E agreement between the two cool downs
- Suggests that our “fast cool down” sufficiently expels magnetic field (consistent with HTC9-3 measurements)



Q_0 vs Q_{ext}



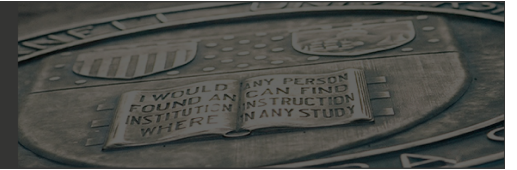
On Resonance, $E_{acc}=15$ MV/m



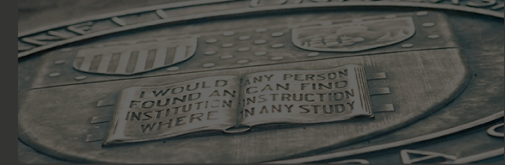
- Q_0 was **unaffected by Q_{ext}** between 4×10^7 and 3×10^8



HTC: Schedule



- AES031: receive from FNAL May 11, 2015
- Magnetic shield: receive from JLAB May 11, 2015
- HTC9-5: assembly completed May 29, 2015
- HTC9-5: installation in test area June 9, 2015
- HTC9-5: test ends June 26, 2016
- HTC9-5: remove from test area June 30, 2015

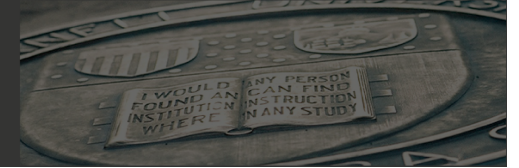


Recent 9-cell VT results AES030

Baseline test
as none N2 dope cavity



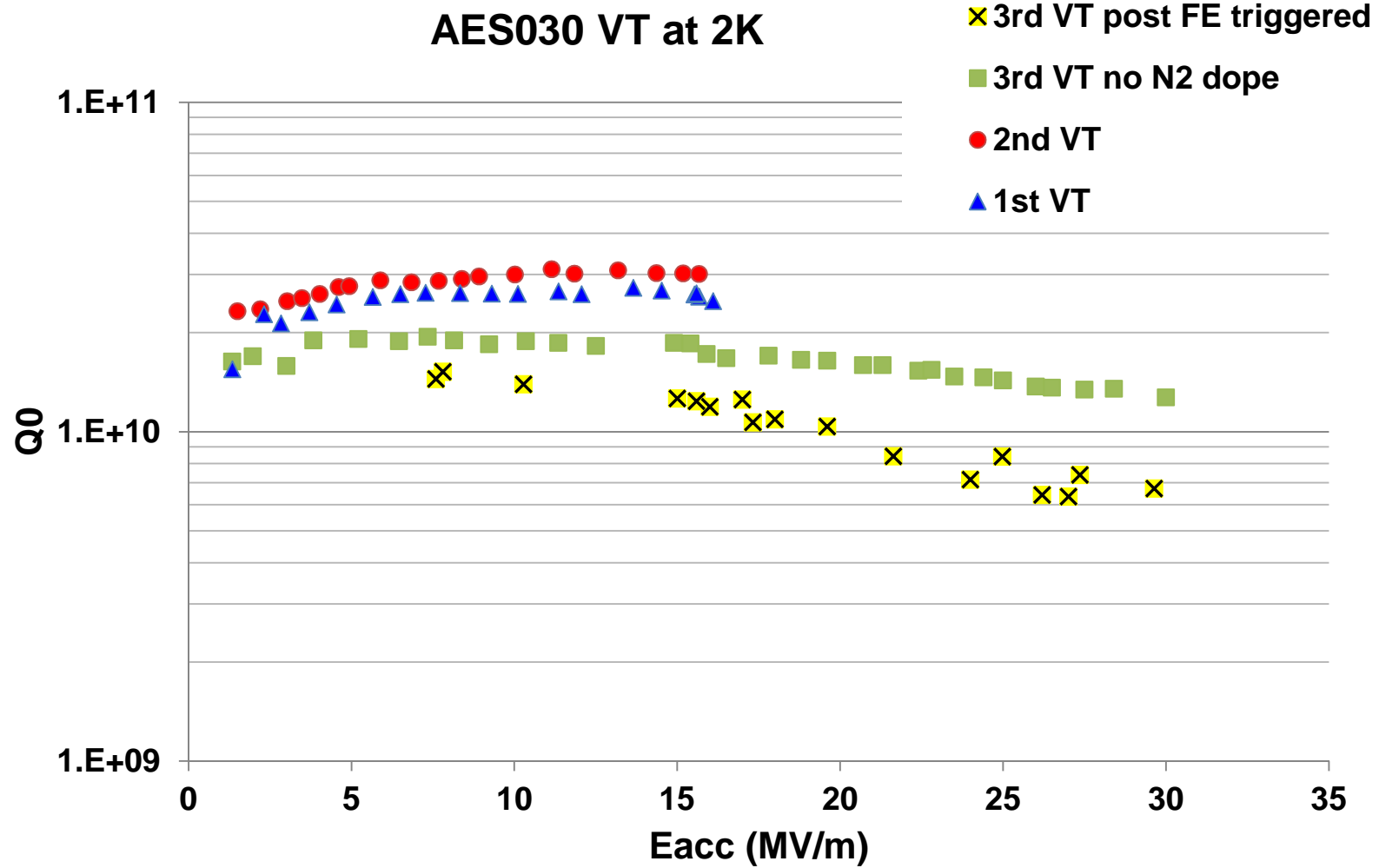
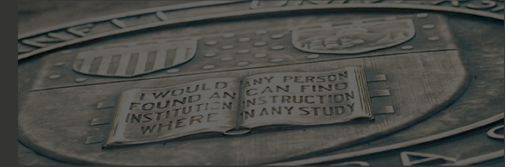
AES030, VT history



	VT1 N2 dope	VT2 Re-HPR	VT3 None dope baseline	VT4 (planned) N2 dope
Bulk VEP	120um	-	38um	-
Degas	800C*5hrs	-	-	800C*3hrs
N2 dope	20min./30min. ~40mTorr	-	-	2min./6min. ~20mTorr
Light VEP	26um	-	-	7um
USC+HPR	Yes	Yes	Yes	Yes
Qo at 16MV/m, 2K	2.5e10	3e10	1.7e10	
Quench field	17MV/m	17MV/m	30MV/m,	
Limit	Quench FE free	Quench FE free	FE triggered by quench	

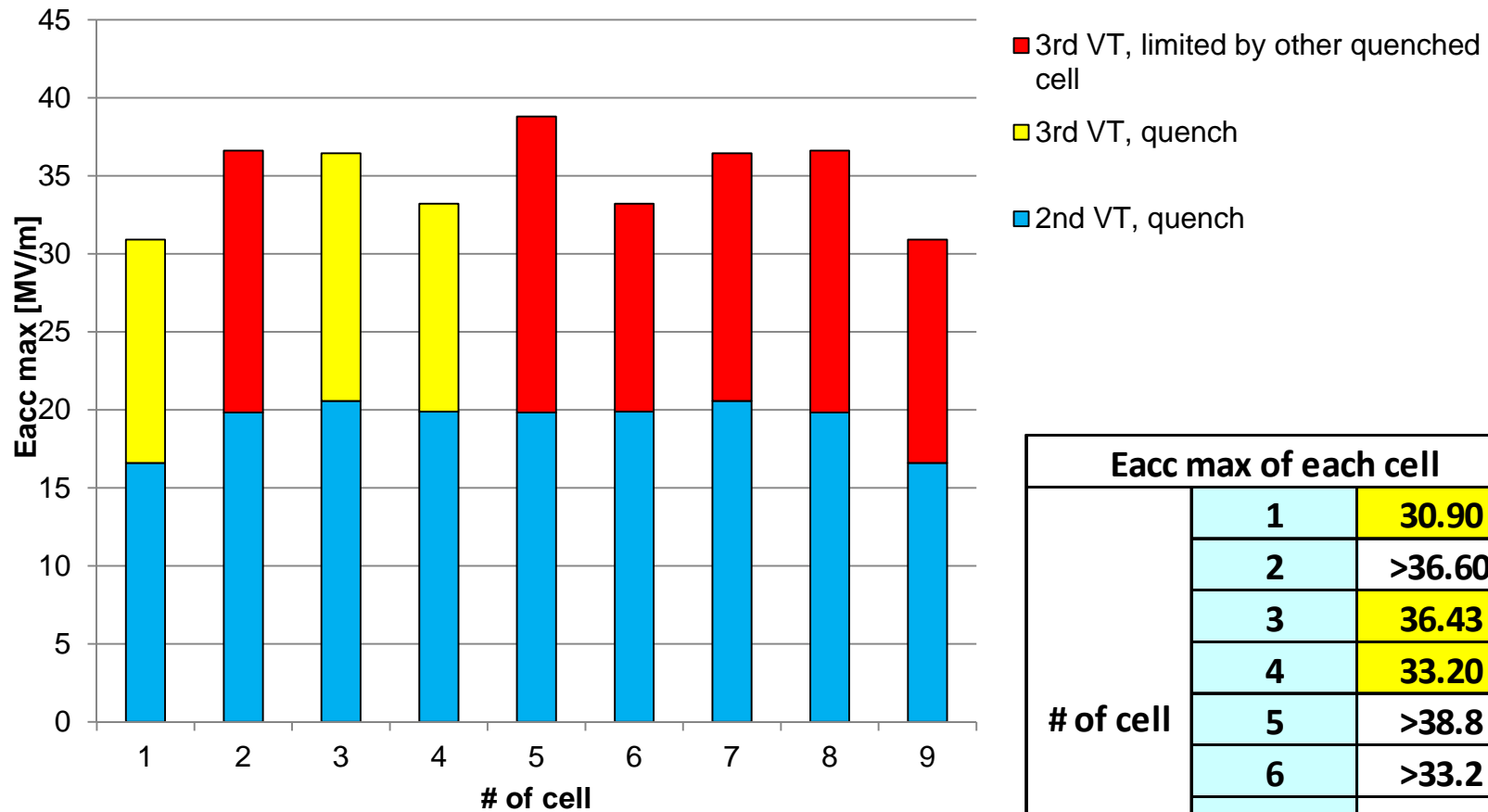


AES030, VT results, 2K





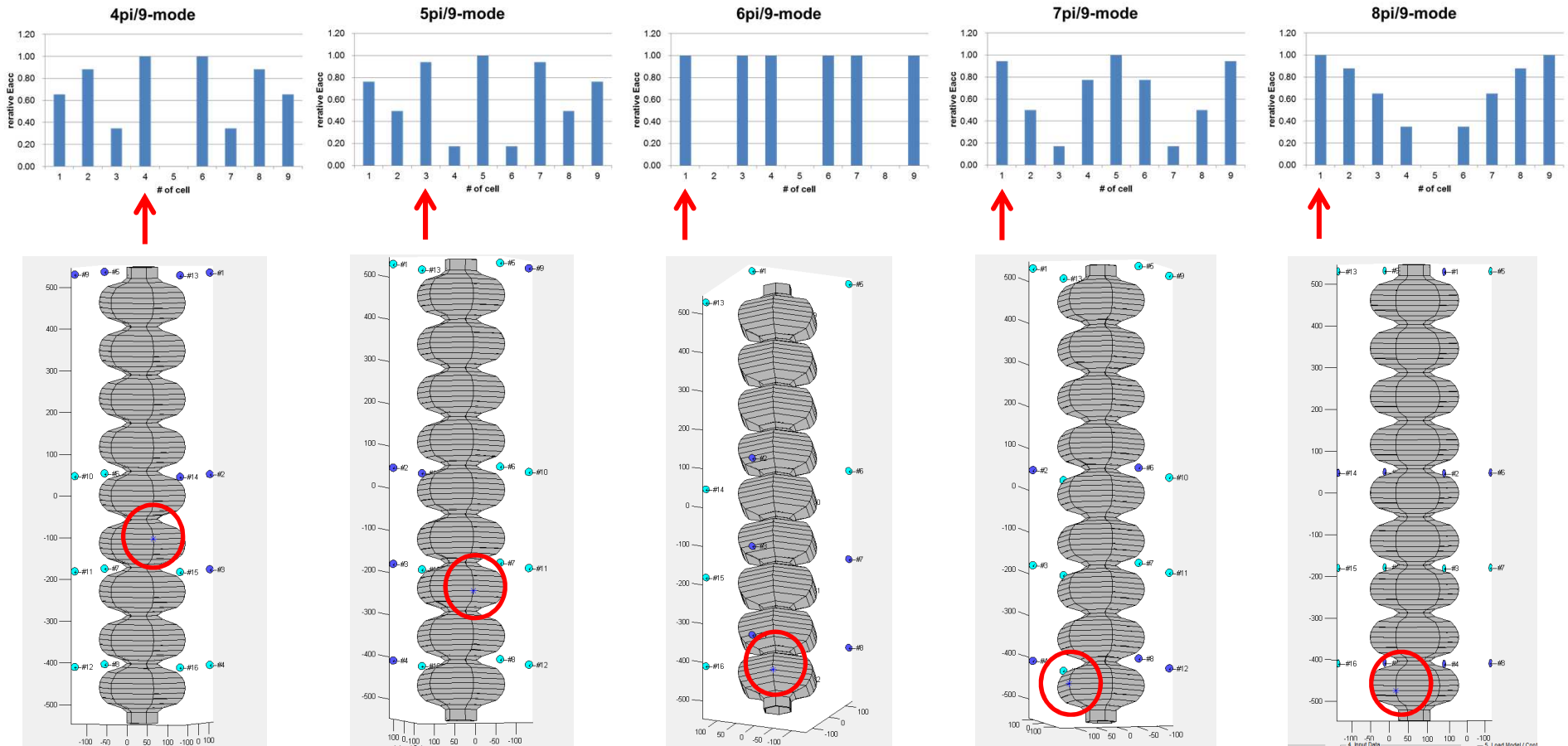
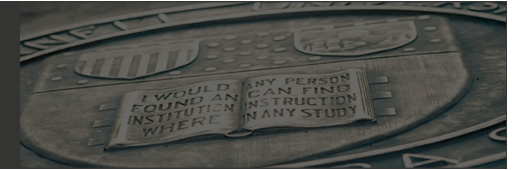
AES030, 3rd VT Pass-band analysis



Eacc max of each cell			
# of cell	1	30.90	quench
	2	>36.60	
	3	36.43	quench
	4	33.20	quench
	5	>38.8	
	6	>33.2	
	7	>36.43	
	8	>36.60	
	9	>30.9	



OST analysis on pass-band



Red arrow and circle indicate quenched cell and location predicted by OST.



Optical inspection images at quench location

$4\pi/9$; 4th cell



$5\pi/9$; 3rd cell



$6\pi/9$; 1st cell



$7\pi/9$; 1st cell



$8\pi/9$; 1st cell



No specific features at
quench location
predicted by OST