Second-Pass Processing Results of AES6 & AES9

Rong-Li Geng
Jefferson Lab

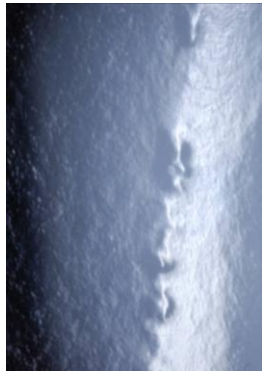October 27, 2009
17th ILC Cavity Group Meeting

AES9 Second-Pass Processing
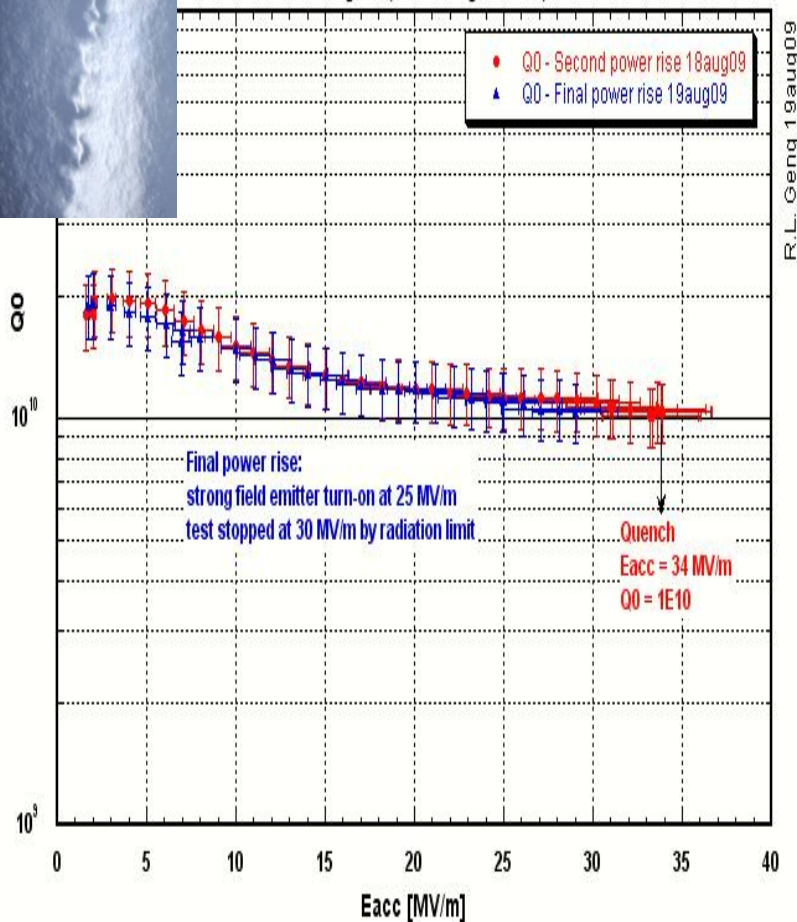
2nd pass processing:
Goal: To remove surface damage created by FE during 1st-pass test
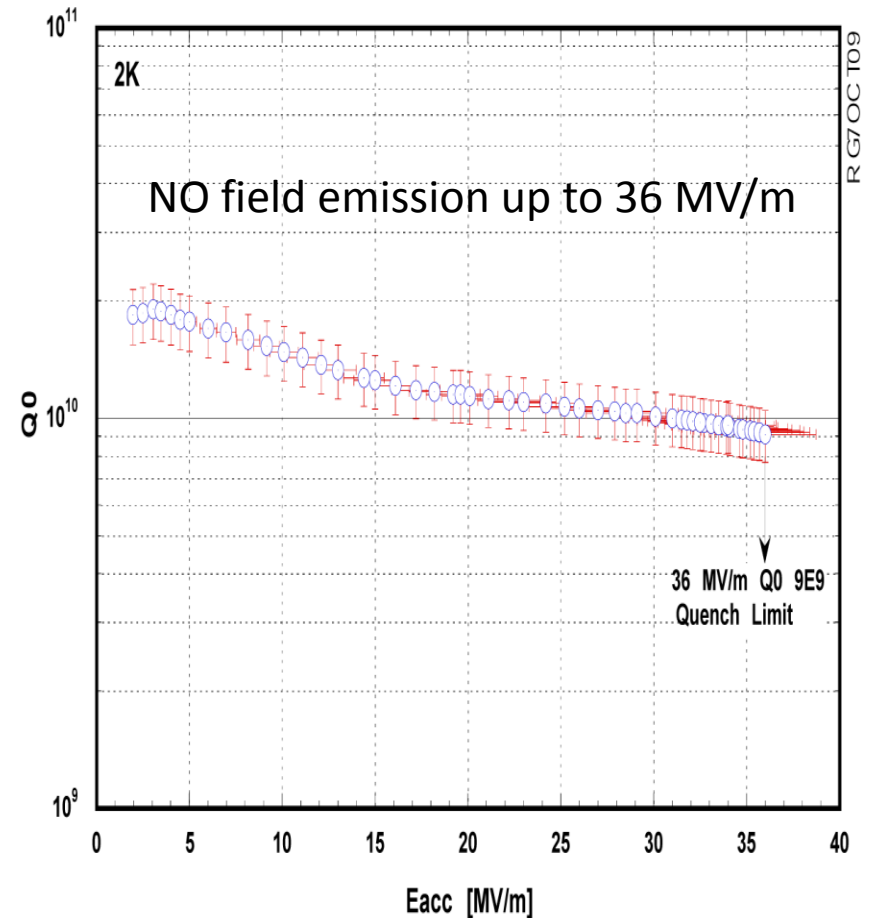Action: EP (10+10 μm) + HPR + 120cx48hr
Result: Successful FE removal and raising quench gradient to 36 MV/m

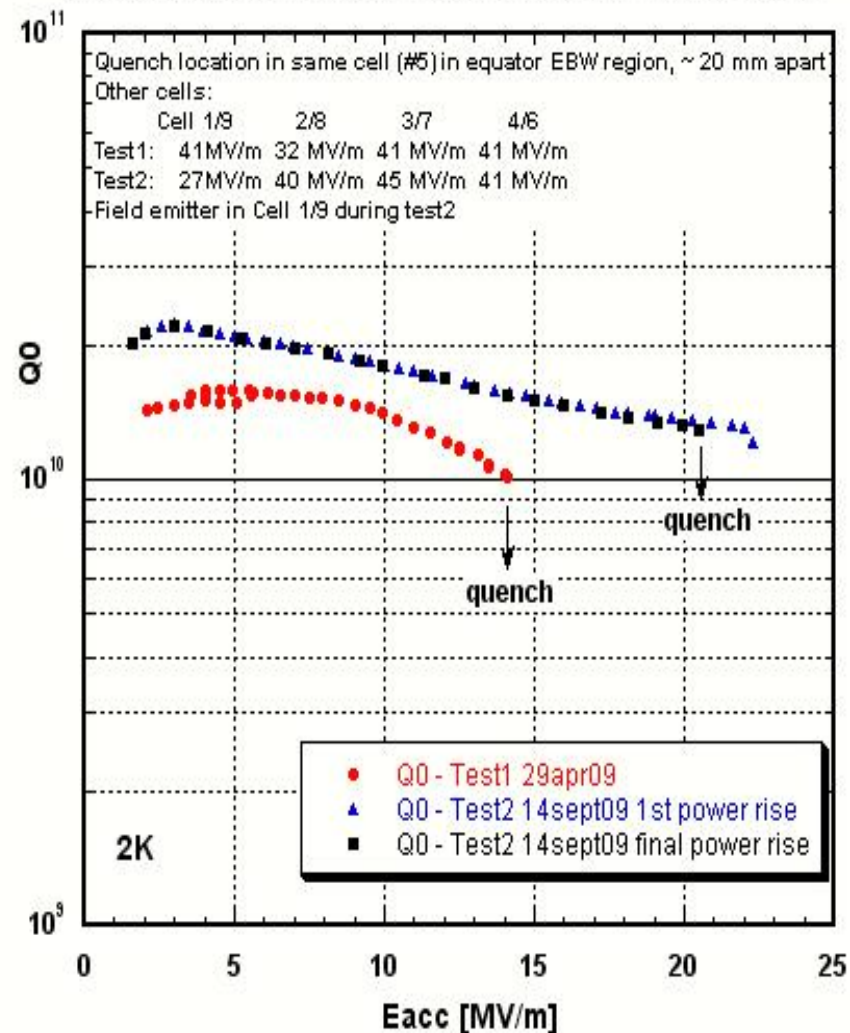

AES9 after first light EP, RF test August 18-19, 2009

R.L. Geng 19aug09

- Q0 - Second power rise 18aug09
- Q0 - Final power rise 19aug09

Final power rise:
strong field emitter turn-on at 25 MV/m
test stopped at 30 MV/m by radiation limit

Quench
Eacc = 34 MV/m
Q0 = 1E10

Q0

Eacc [MV/m]

AES9 2nd-pass Qualification Performance

R G7 OC T09

2K

NO field emission up to 36 MV/m

Q0

36 MV/m Q0 9E9
Quench Limit

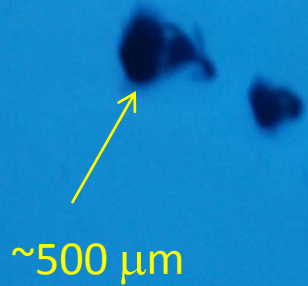Eacc [MV/m]

AES6 Second-Pass Processing

- 1st-pass test 14 MV/m.

- Quench limit.

- One defect in cell#5 (outside equator EBW).

- 2nd-pass processing:
  - Goal: check 800Cx2hr effect.
  - Action: 800Cx2hr + EP 25 um + 120Cx48hr.
  - Result: quench limit raised to 20-22 MV/m.
  - Quench limit still in cell#5, but moved to a new location, 20 mm from previous quench location and in EBW (photo later).

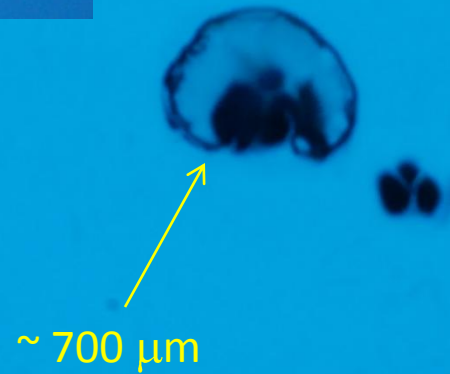AES6 1st test after standard processing and 2nd test after + 800Cx2hr + EP 25 um + 120cx48hr

Quench location in same cell (#5) in equator EBW region, ~ 20 mm apart
Other cells:

	Cell 1/9	2/8	3/7	4/6
Test1:	41MV/m	32 MV/m	41 MV/m	41 MV/m
Test2:	27MV/m	40 MV/m	45 MV/m	41 MV/m

Field emitter in Cell 1/9 during test2

- Q0 - Test1 29apr09
- Q0 - Test2 14sept09 1st power rise
- Q0 - Test2 14sept09 final power rise

2K

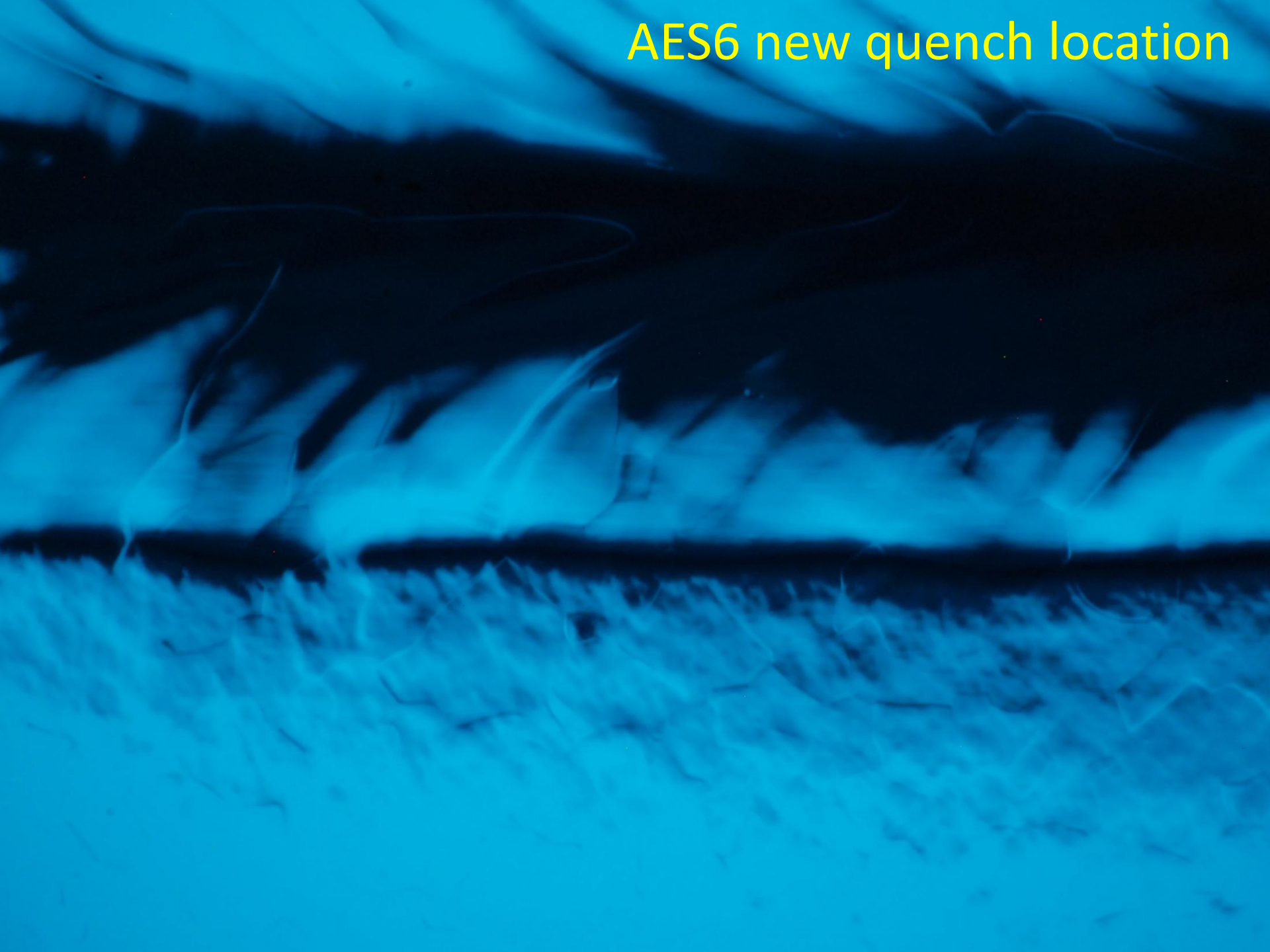Eacc [MV/m]

Before

Quench limit 14 MV/m

~500 μm

After

+800Cx2hr+EP 25 μm
Not quenching up to 22 MV/m

~ 700 μm

AES6 new quench location

Summary

- Effectiveness of data-driven 2-pass processing further validated.
- A new example of 9-cell cavity reaching > 35 MV/m without field emission.
- 2nd-pass processing of AES6 by 800Cx2hr seems to support the ideas of
  - Quench delay by improved thermal property.
  - Local suppression of RF critical field may be an operating mechanism and Magnetic field enhancement alone is not enough to explain all observed facts.
  - Independent new result of a local re-melted 1-cell cavity.