

CM-destined Cavities

- **TB9AES009** (dressed) – **CM2#1 [VT 36 MV/m, HT 35 MV/m]** – CM ready at MP9
- **ACCEL8** (dressed) - **CM2-backup [VT 31 MV/m, HT 31 MV/m]** – CM ready at MP9
- **TB9AES010** (dressed) - **CM2#2 [VT 38 MV/m, HT >35 MV/m]** – CM ready at MP9
- **TB9AES008** (dressed) - **CM2#3 [VT 41 MV/m , HT >35 MV/m]** – CM ready at MP9

- ❖ **TB9RI018** (dressed) - **CM2-candidate#4 [VT 39 MV/m]**
 - At HTS - reached 35 MV/m (administrative limit) with 500 us (flattop) pulse, low FE, just a little FE processing; try longer pulses next; start warm up ~14.Feb; Allan&Tug will participate in cavity vacuum venting ~16.Feb.; additional cooldown cycle to check venting and re-evacuation effect on performance
- ❖ **TB9RI019** (dressed) - **CM2-candidate#5 [VT 38 MV/m]**
 - At MP9 after ANL HTS prep; expect to HTS ~week of Feb.28; eng note approved
- ❖ **TB9RI028** (dressed) - **CM2-candidate#6 [VT 39 MV/m]**
 - At MP9. Need ANL HTS prep within ~a month
- ❖ **TB9RI020** (dressed) - **CM2-candidate#7 [VT 36 MV/m]**
 - At MP9. Need ANL HTS prep
- ❖ **TB9RI027** (dressed) - **CM2-candidate#8 [VT 40 MV/m]**
 - At MP9. Need ANL HTS prep
- ❖ **TB9RI024** (dressed) - **CM2-backup [VT 40 MV/m]**
 - At MP9. Need ANL HTS prep

CM2 Cavities

Cavity ID	CM2 candidate	Vertical Test	He vessel?	Horizontal Test	cryomodule ready?
TB9AES009	1	36 MV/m	dressed	35 MV/m	yes
TB9AES010	2	38 MV/m	dressed	>35 MV/m	yes
TB9AES008	3	41 MV/m	dressed	>35 MV/m	yes
TB9RI018	4	39 MV/m	dressed	ongoing	
TB9RI019	5	38 MV/m	dressed		
TB9RI028	6	39 MV/m	dressed		
TB9RI020	7	36 MV/m			
TB9RI027	8	40 MV/m			
ACCEL8	backup	31 MV/m	dressed	31 MV/m	yes
TB9ACC013	backup	38 MV/m	dressed	FE limit(Cu)	
TB9ACC016	backup	39 MV/m	dressed	FE limit(Cu)	
TB9RI029	backup	35 MV/m	dressed	29 MV/m	
TB9AES007	backup	42 MV/m	dressed	33 MV/m(FE)	[to be kept clean]
TB9RI024	backup	36 MV/m			

R&D Dressed Cavities

- **TB9ACC013** (dressed) **CM2-backup [VT 38 MV/m]**
 - At MP9. Bad FE after arc event at HTS. After HPR and re-HT, FE still a problem. FE onset 5 MV/m, 20 MV/m max. Defect seen on copper coating of inner rim of input coupler flange. Optically inspected coupler region with Questar system, saw nothing unusual.
 - Currently in use at MP9 for procedure development, but could be moved
 - Next: [pending HGRP removal+replacement advice from Tug] HPR+VT for baseline measurement, HNO₃ rinse (ANL)+VT
- **TB9ACC016** (dressed) - **CM2-backup [VT 39 MV/m]**
 - At MP9. Bad FE seen in HT. FE onset 18 MV/m, 27 MV/m max. Copper flakes found on input coupler antenna tip. Std optical inspection with KEK/Kyoto system; no Cu blobs on irises.
 - Next: [pending HGRP removal+replacement advice from Tug] HPR+VT for baseline measurement, (if necessary) HNO₃ rinse (ANL)+VT
- **TB9AES007** (dressed) - **CM2-backup [VT 42 MV/m]**
 - Limited to 33 MV/m by field emission induced quench for ILC-style (969 us) RF pulse. Could reach higher gradient for shorter pulses. 35 MV/m achieved using 500 us pulse.
 - Next: HPR and try HT again; on hold but to be kept clean as CM2 backup
- **TB9RI029*** (dressed) - **CM2-backup [VT 35 MV/m]**
 - Reached 29 MV/m in HTS, limitation quench with no anomalous heating and low FE.
 - Currently: in use at MP9 for procedure development, but could be moved
 - Next: put aside and think of a good way to improve it
- **AES002** (dressed, helium pipe cut off)
 - VT 29.Oct.: Limited by FE-induced quench at 27.3MV/m. Improvement from previous 19.8MV/m hard quench limit, but FE much worse, and overall both low-field and high-field Q₀ worse. Field flatness measured 96.2%.
 - VT 19.Jan: 28.5MV/m (quench), no meas FE, Q drop but no 120C bake possible, then high FE after purge/pumpdown cycle.
 - Next: use for R&D as needed

Production Cavities (1/2)

- **TB9RI021*** (FNAL/ANL process):
 - 1st pass (15.Jun.10) 26.6 MV/m (power/FE) with $Q_0=4E9$
 - After re-HPR at ANL (non-optimal): 7.18 MV/m (FE)
 - After re-HPR at ANL (120C bake problematic) 8/5: 27.1 MV/m (power/Q-drop) with $Q_0=3.2E9$
 - After re-do of 120C bake and re-test 8/16, equivalent results
 - 2nd light EP /4th pass low-T high-V EP params
 - Tests 4,6,8.Oct: 28.8 MV/m (quench) limitation; low-field $Q_0 \sim 1.6E10$; no evidence of Q-disease in 100K hold test
 - Next: 20 um EP 10.Feb, then vertical test prep and vertical test
- **TB9RI022*** (FNAL/ANL process)
 - 1st pass/ 3 tests (18,22,29.Jun.10) to study FE (valve open/closed, 120C bake y/n): 27.8MV/m with $Q_0=3.4E9$ (Q-drop/power)
 - Optical inspection shows rough surface and multiple pits/features in eq5 weld
 - 2nd pass (2.Aug.10) after light EP: 34.3 MV/m (quench) with $Q_0=7E9$
 - 3rd pass (21-22.Sep.10) after light EP (low-V high-T) same performance as in previous test
 - optical inspection and field flatness measurement before following surface treatment
 - 4th pass (13.Oct.10) after HPR only: 32 MV/m (quench/FE) $Q_0= 7.5 \times 10^9$; $R_s \sim 9n\Omega$; low-field $Q_0=1.9 \times 10^{10}$
 - Next: 20 um EP, vertical test prep, vertical test

Production Cavities (2/2)

- **TB9RI025***: to ANL for light EP eventually
- **TB9RI023***: to ANL for light EP eventually
- **TB9AES011**
 - incoming inspection, preliminary tuning complete, optical inspection complete
 - next: process/test
- **TB9AES012**
 - incoming inspection, preliminary tuning complete; optical inspection complete
 - Tumbling in progress; complete week of 14.Feb.
 - Next: ultralight EP, 800C bake, tuning, ultralight EP, vertical test prep, vertical test
- **TB9AES013**
 - Incoming inspection, optical inspection complete
 - FNAL/ANL bulk EP 120 um removal complete (amount is based on time); optical inspection shows pitted surface both before and after bulk EP
 - Next: wait for incoming inspection of remaining cavities and discuss options
- **TB9AES014**
 - Incoming inspection, optical inspection complete
- **TB9AES015, TB9AES016** in QC
- Niowave-Roark remaining (4) cavities due ~March

R&D Cavities (1/3)

- **TB9ACC017** [laser remelting repair of HAZ pit]
 - 1st pass VT(27.Oct.09, 7.Dec.09) after FNAL/ANL process: 12.3 MV/m (quench), limiting pit found in HAZ cell#4
 - Laser re-melt (done), optical inspection, no replica - too risky
 - Next: moderate EP (50-60 um), vertical test prep, vertical test
- **TB9RI026** [defect repair by local grinding]
 - 1st pass VT after bulk-EP (100 um) and light-EP (26 um) at ANL: Initially reached 28.8 MV/m with several FE burn-off events; did not recover well from one FE event; final gradient limit 19.6 MV/m; R(res)~11nOhm; iris 8/9 pit molded
 - Returned from KEK 8.Feb after local grinding
 - local grinding, tuning >98% flatness, 20-30um EP, HPR, drying, and flanged in the clean room air.
 - Next: vertical test prep, vertical test
- **AES001** [defect repair by local grinding]
 - Well studied cavities with well established pit/quench location correlation; features are in cell 3 equator HAZ, last test 21.8MV/m (quench/FE) at KEK
 - Returned from KEK after local grinding 8.Feb
 - local grinding, tuning >98% flatness, 20-30um EP, HPR, drying, and flanged in the clean room air.
 - Next: vertical test prep, vertical test

R&D Cavities (2/3)

- **JLab-2** [tumbling]
 - Complete: tumbling, field flatness measurement (>~90%), rough HPR, 10 um light-EP, optical inspection, 800C HT (FNAL furnace), tuned
 - Ultralight-EP (10 um) done, VTS prep in progress
 - Next: arrives 10.Feb for 120C bake then VT week of 14.Feb.
- **TB9ACC015** [tumbling]
 - Complete: tumbling, limiting (19 MV/m) feature in cell 3 HAZ molded, optical inspection, field flatness measurement, molded silicone sample analyzed; optical inspection shows very mirror-like surface, 800C HT (FNAL furnace) – discoloration cured
 - Achieved 35 MV/m after ultralight-EP (10 um) +VTS prep, 120C bake and VT
 - Tuning was accidentally omitted after tumbling and before test. Field flatness 82%. Because highest field was in cell 7 during field flatness measurement, and cell 7 was the limiting cell, maximum gradient may increase after tuning.
 - Vertical test prep in progress
 - Next: vertical test - arrives at VTS 14.Feb
- **TB9ACC012** [cut/re-weld repair after EBW accident, tumbling]
 - Arrived 9.Nov.10 from AES after repair; incoming inspection and optical inspection done
 - Tumbling in progress, done ~week of 14.Feb.
 - Next: ultralight EP, 800C bake, tuning, ultralight EP, vertical test prep, vertical test
- **TB9NR002** [new vendor qualification]
 - Completed: Optical inspection, 10 um internal BCP at JLab, optical inspection, bulk-EP, optical inspection, 800C HT, optical inspection, tuning, light EP
 - 1st pass (VT 2.Nov.10): Quench limited to 28.5 MV/m with Q_0 there 1.2×10^{10} . Low-field Q_0 2.1×10^{10} , no FE. Mode meas & second sound initially indicated cell #2 as limiting cell. Add'l analysis showed a more complicated picture; optical inspection completed
 - Next: 2nd pass EP

R&D Cavities (3/3)

- @Cornell:
 - **TB9ACC010, ACCEL9, TB9AES005** (@ Cornell) – VEP+repair techniques
 - In various stages of tumbling/VEP. Used for VEP commissioning and performance improvement
 - TB9ACC010
 - Vertical test 22.Nov.: 24 MV/m Q0=1.8E10 (quench); Rs[2K]=10 nOhm
 - Next: re-test with second sound detectors. Cell 8 near equator. Nothing in optical inspection. Maybe try tumbling/VEP again.
 - NB: RG174 cables were found to be magnetic!
 - Fabricated Pt probe which can be left on during final HPR.
 - ACCEL9: to be vertically tested in January before final EP
 - TB9AES005: HPR 8-9.Jan, 120C week of Jan.10 [Despite stains-residual soap? Sealed ok]
 - Cornell to get two of the new AES cavities for VEP commissioning; preliminary tuning was requested; request is on hold for now pending schedule confirmation
- @JLab:
 - **TB9AES006** (@JLab) – repair technique
 - Limit: 22 MV/m (quench) 2 defects (300 um, 500 um) 8mm from equator weld cell#5; to be improved with e-beam; waiting for parts
 - ❖ **TB9NR001** (@JLab) – new vendor development
 - Next: Limit: 17 MV/m in JLab standard process/test path. 4 quench locations depending on mode.
 - Next: optical inspection.

9-cell Cavities - By Facility (1/2)

- Incoming inspection
 - In progress: TB9AES015, TB9AES016 [renewed urgency because of pitting found in some cavities in this batch], 4 new NR cavities ~March
- Optical Inspection
 - TB9ACC017, TB9AES015, TB9AES016 as they arrive
- Tuning/field flatness meas.
 - Tuning: TB9AES012 and TB9ACC012
 - Next for FF: TB9AES015, TB9AES016 as they arrive for incoming inspection
- Tumbling
 - In progress: TB9AES012 and TB9ACC012
 - Next: consider tumbling TB9NR002 after a 2nd pass light-EP if necessary; more cavities(!)
- Vacuum furnace:
 - TB9AES013 on hold after FNAL/ANL bulk EP

9-cell Cavities - By Facility (2/2)

- FNAL/ANL
 - (dressed – HTS prep only) TB9RI028, TB9RI020, TB9RI027, TB9RI024 (at MP9)
 - chemistry and/or vertical test prep
 - JLab-2 light EP (10 um) done + VT prep done,
 - TB9RI021* light EP (20 um)+VT prep,
 - [intervening 1-cells],
 - TB9ACC016 (dressed) VT prep,
 - TB9ACC017 moderate EP (50-60 um) after laser-remelting,
 - TB9RI022* light EP (20 um)+VT prep,
 - (VT first) HNO3 rinse TB9ACC016 ~end March
- VTS
 - Next: JLab-2, TB9ACC015, TB9RI021*, TB9ACC016 (dressed), TB9ACC017, TB9RI022*
- HTS
 - Next: TB9RI019, TB9RI028, TB9RI020, TB9RI027, TB9RI024, etc.
- MP9
 - HTS prep: TB9RI028, TB9RI020, TB9RI027, TB9RI024 (dressed), after ANL etc.
 - Next for dressing: no cavities for dressing in the queue, [rehab the glove box], eventually but not soon ACCEL6 and ACCEL7
- Cryomodule-ready: TB9AES009, ACCEL8, TB9AES010, TB9AES008

Other Items

- **EP candidates:**
 - **TB9AES013:** light-EP (20 um) or maybe tumbling
 - **TB9RI021*** (133 um bulk@RI, 25 um w/ANL2 10.Jun.10, ~20-25 um light-EP w/ANL3 29.Sep.10)
 - Suspect would improve with additional material removal (20 um)
 - **TB9RI022*** (153 um bulk@RI, 22 um w/ANL2 17.Jun.10, 40 um w/ANL2 22.Jul.10, ~20-25 um w/ANL3 15.Sep.10)
 - suspect would improve with additional material removal (20um)
 - **TB9RI023*** fresh from vendor after bulk-EP: from our experience with the others, let's remove more than your typical light-EP (40 um)
 - **TB9NR002:** 2nd pass light-EP (40um)
 - **TB9RI025*** fresh from vendor after bulk-EP: from our experience with the others, let's remove more than your typical light-EP (40 um)
- **HF rinse:**
 - 1-cells
 - can currently be HF rinsed at ANL
 - 9-cells
 - need approval and a few parts which are readily available
 - this would be the same approval for very light (10 um) HF, HNO3 or BCP
 - plan to get 9-cell approval by end of March

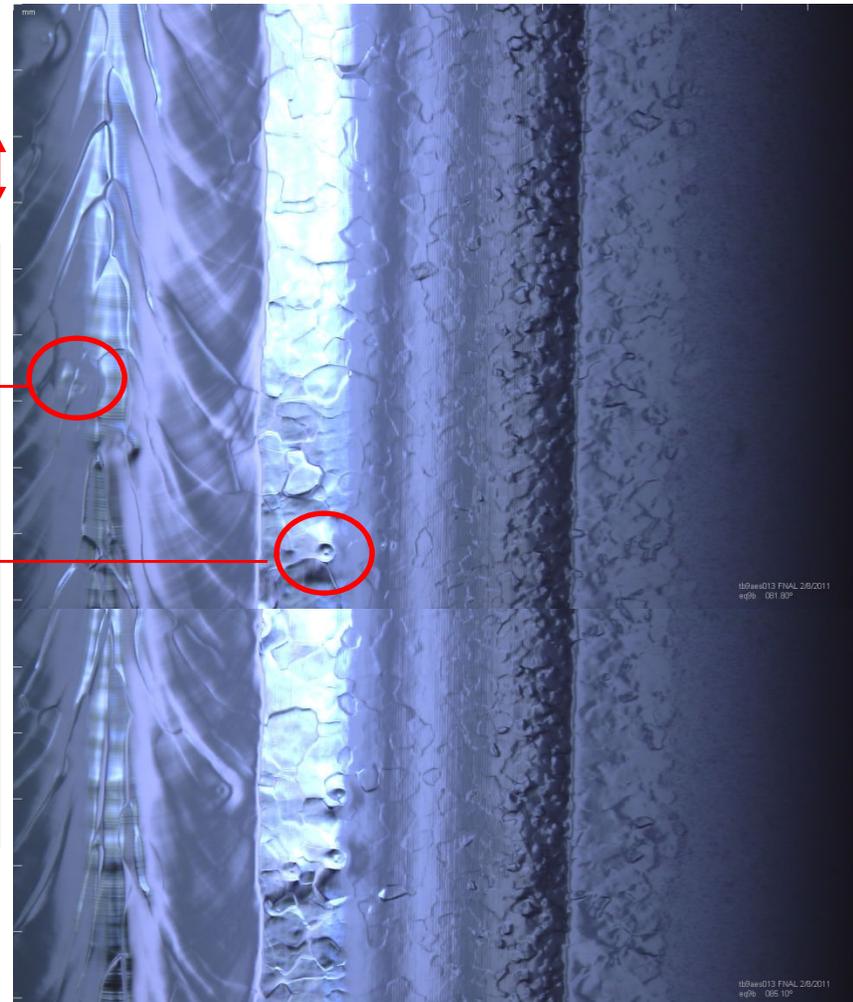
Features seen on TB9AES013

Cavity was light BCP'd (25 um) at AES

1mm



before bulk EP at ANL



after bulk EP at ANL