Update on testing of Jlab fabricated 9-cell cavities

P. Kneisel, G. Ciovati

- One fine grain prototype (SC1) and two large grain (LG1 and LG2) cavities were completed at the beginning of 2007
- All cavities received initial bcp of ~ 100 micron and hydrogen degassing at 600C for 10 hrs
- All cavities were tuned to a flat field profile,

  no attempt was made to reach 1300 MHz at 2K after final bcp
- Frequencies after flat field profile tuning:

  SC1: f = 1299.930 MHz, LG1: f = 1300.048 MHz

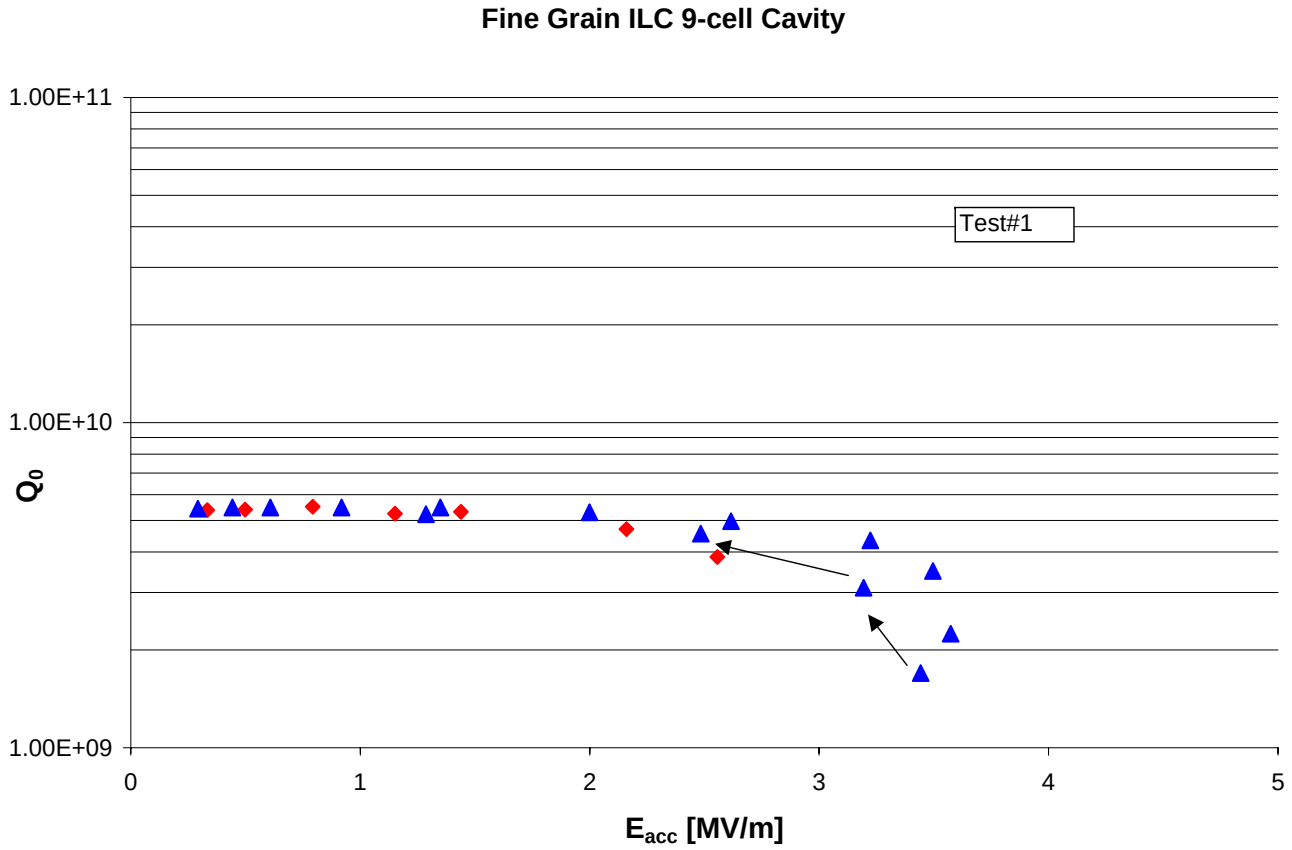
  LG2: f = 1299.887 MHz

Testing

- Testing concentrated on SC1 with bcp
- We had hoped that we could test the cavity in a shallower dewar (D3, 9 feet deep) to save capacity for the S0 effort (D7/8, 12 feet deep)
- First two test attempts showed that the helium level could not be maintained above the cavity and the cavity warmed up at low field levels

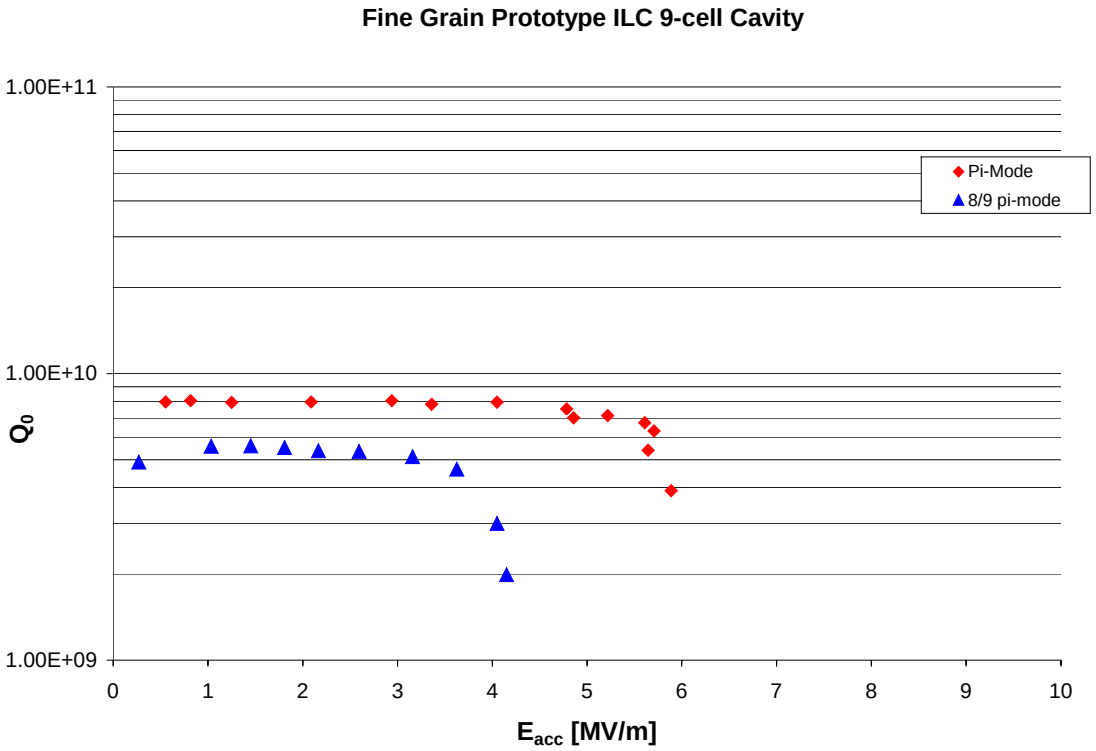
Test #1:shallow dewar

- 50 micron bcp after hydrogen degassing



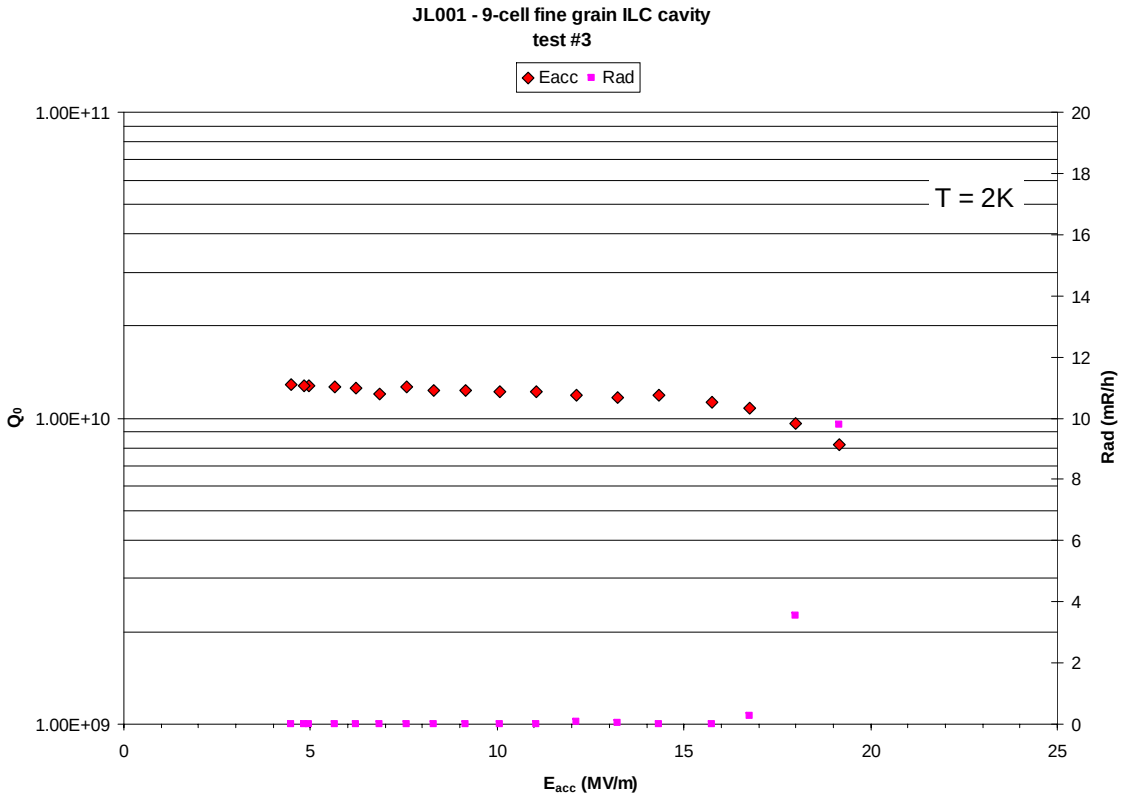
Test #2: shallow dewar

- Cavity lowered by 10” in dewar, ~ 7 micron add. bcp (intended was 20 micron)



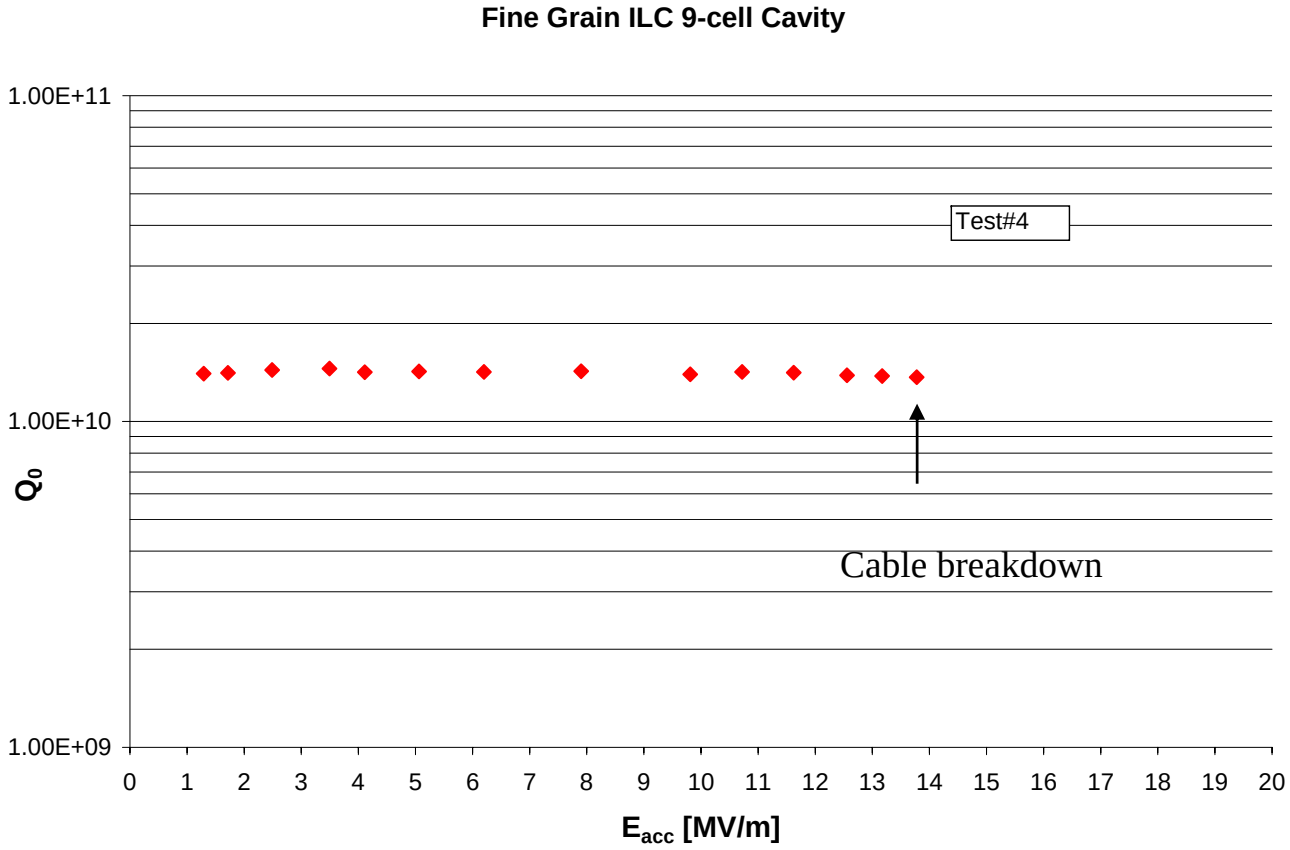
Test #3: deep dewar

- Cavity was bcp'd by ~ 11 micron; developed leak at 2K limiting performance to ~ 19 MV/m



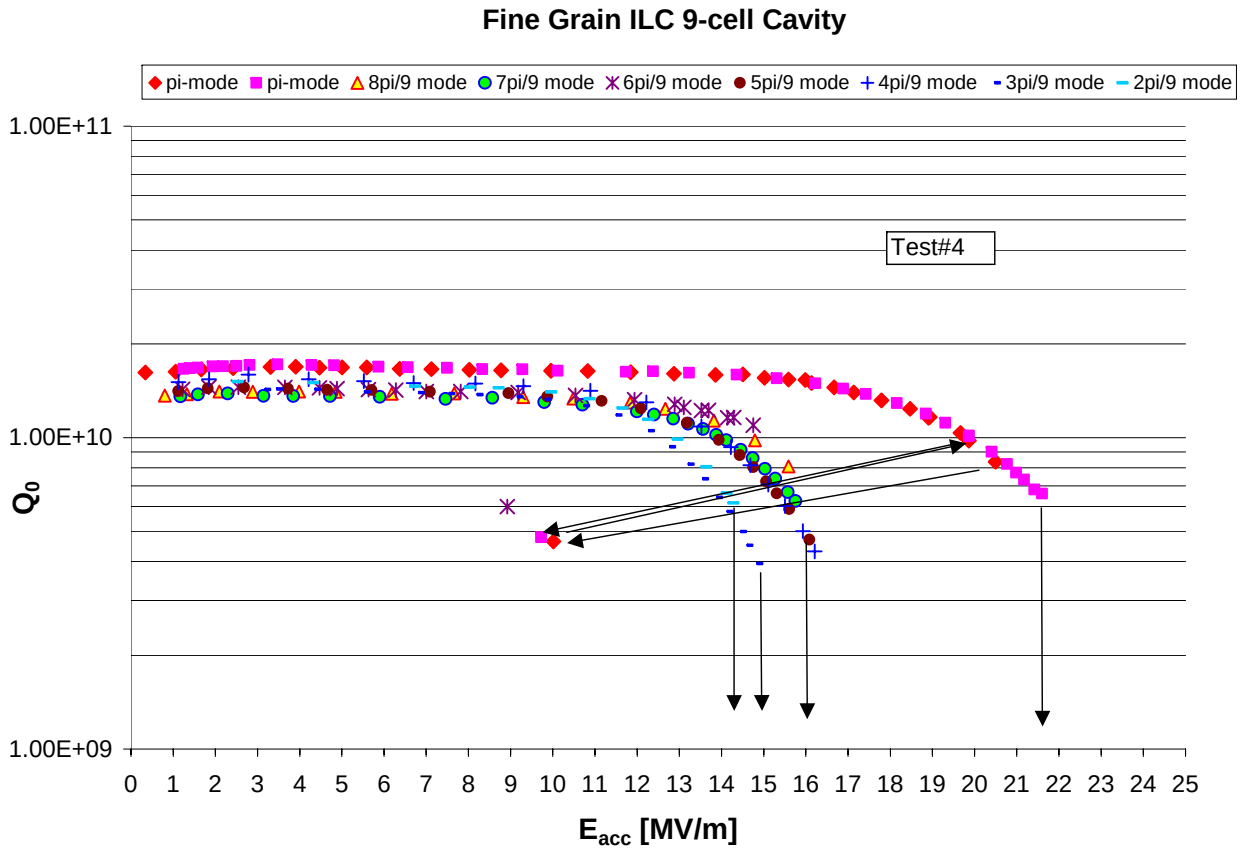
Test #4:

- Input probe removed, HPR; heliax-cable breakdown, app. 1 ft below connector,TDR trace showed discontinuity

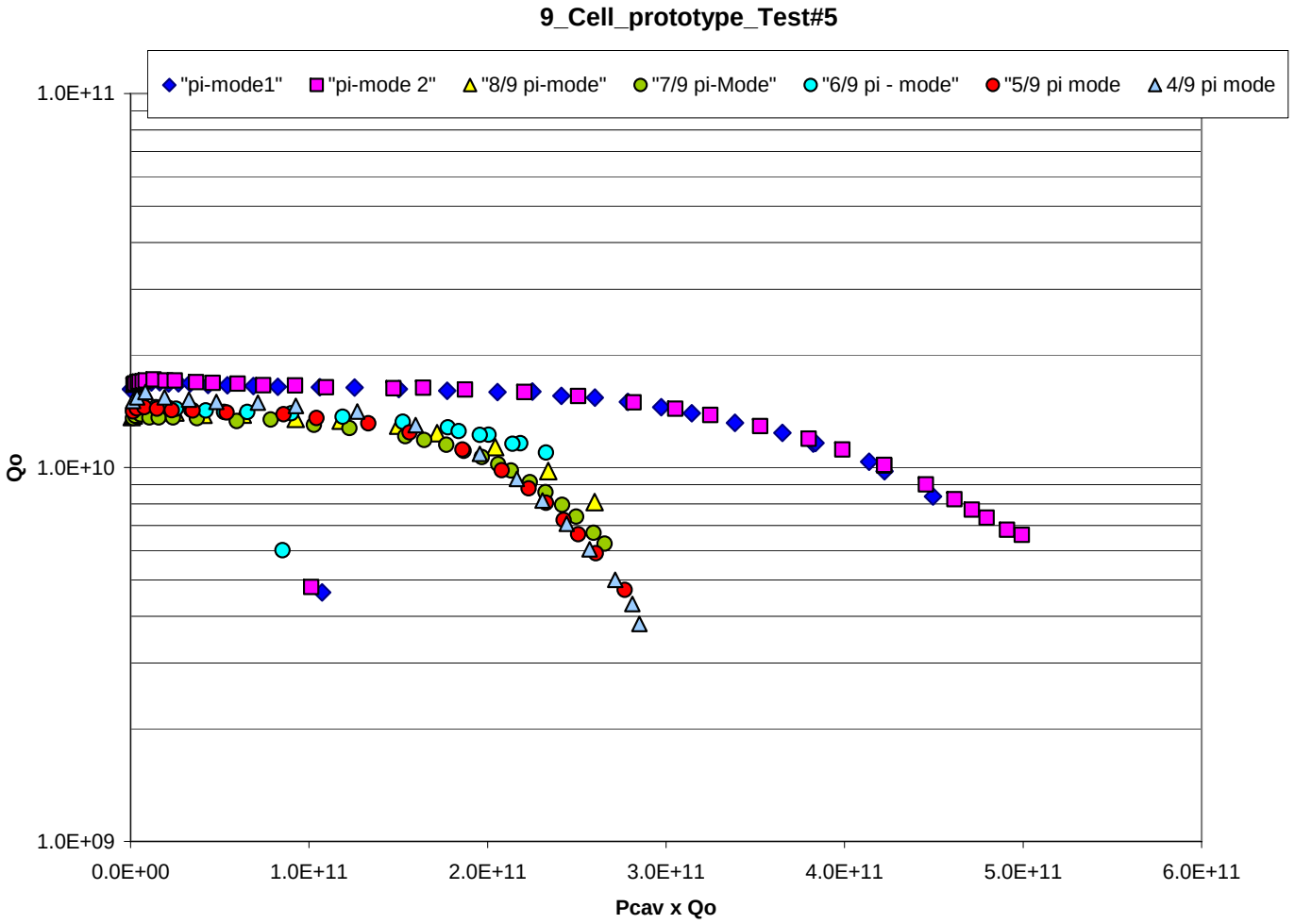


Test #5

- Disassembly of field probe and input probe, HPR, re-assembly; input probe dia increased to 0.25”

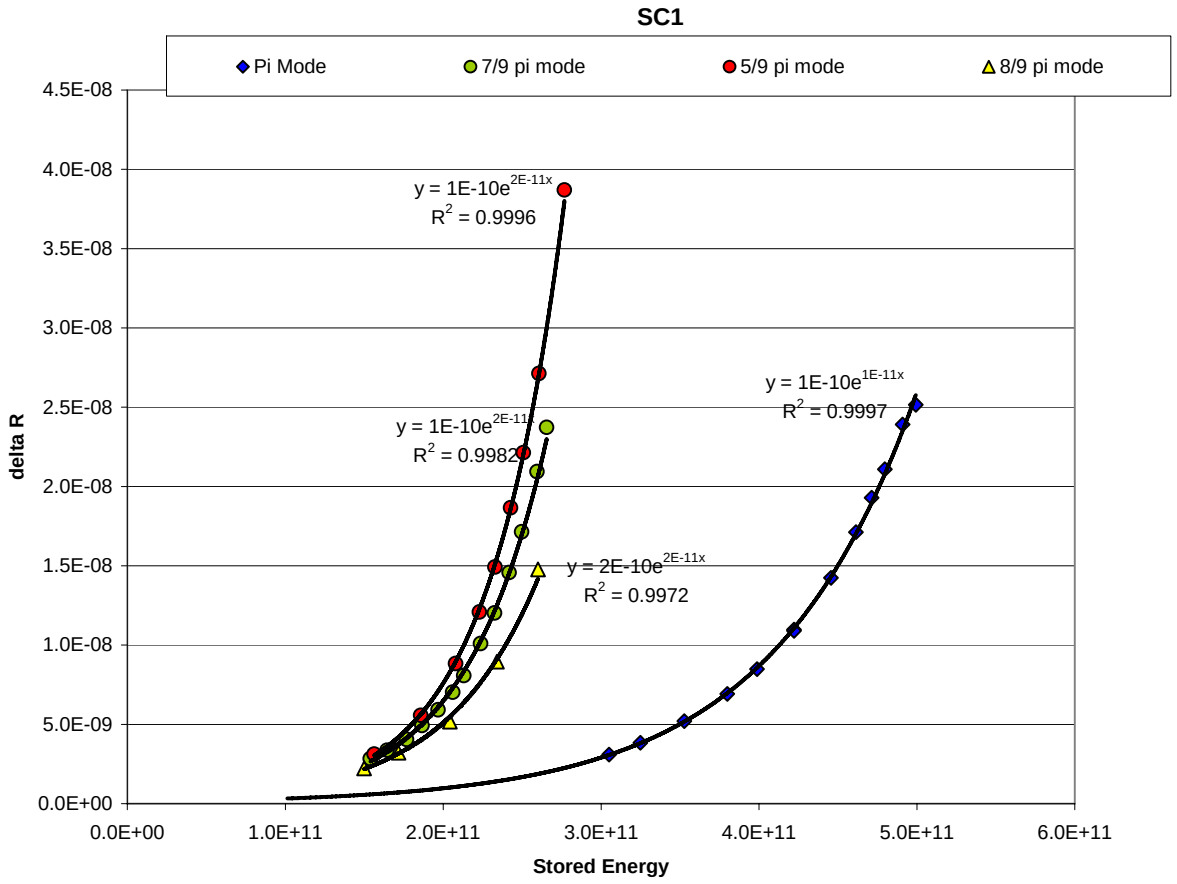


Stored Energies in pass-band modes



Test #5,cont'd

- Add. Resistance: exponential growth



Pass – band mode analysis

- Normalized stored energies(based on mode calculations by J.Sekutowicz)

pi/9	2pi/9	3pi/9	4pi/9	5pi/9	6pi/9	7pi/9	8pi/9	pi
0.008	0.030	0.063	0.101	0.140	0.178	0.210	0.233	0.126
0.056	0.164	0.214	0.160	0.058	0.006	0.054	0.155	0.108
0.130	0.212	0.058	0.031	0.184	0.157	0.010	0.086	0.108
0.195	0.092	0.057	0.205	0.014	0.156	0.124	0.025	0.108
0.221	0.003	0.214	0.007	0.208	0.006	0.207	0.001	0.108
0.196	0.091	0.058	0.204	0.013	0.158	0.122	0.026	0.107
0.130	0.212	0.057	0.032	0.185	0.156	0.010	0.088	0.107
0.056	0.165	0.214	0.158	0.056	0.006	0.056	0.157	0.107
0.008	0.031	0.064	0.102	0.140	0.177	0.208	0.229	0.121

Pass-band mode analysis,cont'd

- Test #5: suspect are cells 4/6; 5,1/9

stored energy in each cell/each mode at quench									
pi/9	**2pi/9**	**3pi/9**	**4pi/9**	**5pi/9**	**6pi/9**	**7pi/9**	**8pi/9**	**pi**	**cell #**
	0.8	1.8	3.6	4.8	4.7	**6.8**	**7.4**	**7.7**	**1**
	4.5	6.3	5.7	2.0	0.2	1.8	4.9	6.6	**2**
	5.8	1.7	1.1	6.3	4.1	0.3	2.7	6.6	**3**
	2.5	1.7	**7.2**	0.5	4.1	4.0	0.8	6.6	**4**
	0.1	6.3	0.3	**7.1**	0.2	6.7	0.0	6.6	**5**
	2.5	1.7	**7.2**	0.5	4.1	4.0	0.8	6.6	**6**
	5.8	1.7	1.1	6.3	4.1	0.3	2.8	6.5	**7**
	4.5	6.3	5.6	1.9	0.2	1.8	5.0	6.5	**8**
	0.8	1.9	3.6	4.8	4.6	**6.8**	**7.3**	**7.4**	**9**

Next steps

- Post-purify cavity at 1250 C at Jlab
- Remove suffcient material (~ 60 micron) prior to re-testing
- Have results – hopefully – available for discussion on “Fate” of AES cavities (Aug. 28)
- Meanwhile continue with large grain cavity LG 1

Proposal for T-mapping system

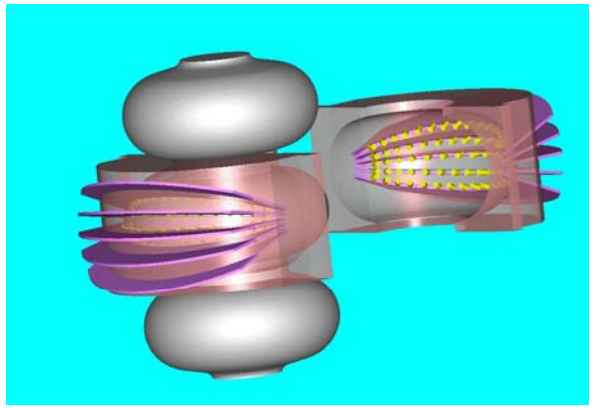
Proposal for 2-cell thermometry system for ILC 9-cell cavities

G. Ciovati, P. Kneisel

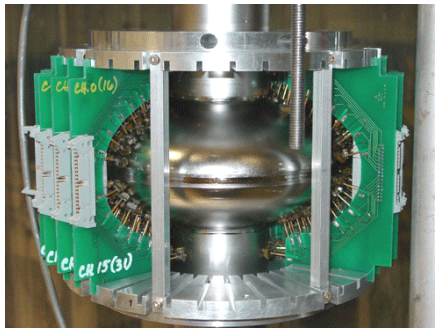
- Use existing T-mapping system at Jlab based on 16 Allen-Bradley 100 Ohm resistors per card
- Place thermometers around equator region on two cells, which have been identified by mode analysis in a previous test
- On each cell 160 thermometers are placed in 5 rows
- The azimuthal spacing is app. 22 mm and ~ 15 mm along the meridian (in superfluid helium the spatial distribution of the heat is app. 10 mm)

T – mapping , cont'd

2-cell proposal



single cell system



a)

b)

Cost and schedule

- Procurements: k$ 7.5
- Labor (loaded) k$ 31
- Schedule:

  possibly the system could be built in 3 months with sufficient priority