

TEST note of 1.3GHz single-cell cavity TE1ACC004 1st VT in A0

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The brief history of this cavity:

1.3GHz single-cell TESLA shape cavity TE1ACC004 is manufactured by ACCEL. It had been optically inspected after arrival at FNAL, after that it was tumbled about 100~120 μ m at IB4 Fermilab, and then was shipped to ANL to do 40 μ m light EP and HPR'd and assembled for vertical test.

The purposes of this test:

The purpose of the test is to measure the Q value of this cavity. After the tumbling, the cavity didn't have any heat treatment. So this cavity could have Q-disease.

The process and result of test:

Fig 1 is the cooling curve, from 140K to 100K, it took about 20 minutes.

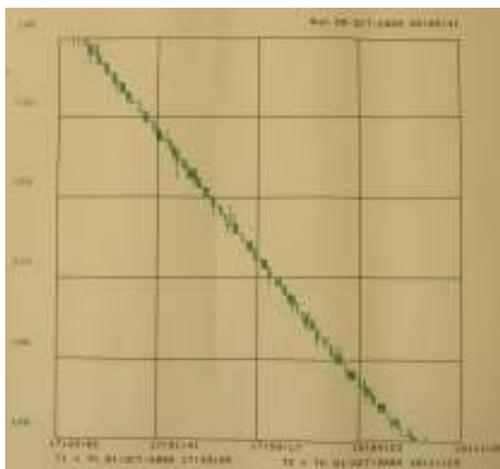


Fig1 Cooling curve from 140K to 100K

Before pumping down, the cable was calibrated, the cable loss factors are $C_f=33.89$, $C_r=35.786$, and $C_t= 5.898$. The data is closed to last 1.3GHz cavity test data. After we got the cavity frequency at 4.2K, the transmitted power was found about 40 dB lower than usual test, that because the input coupler is fixed coupler, and $Q_e=7E9$, if the cavity Q value is very low ($1E7$), it will cause mis-match between input coupler and cavity, and most forward power will be reflected back. So we added a 30dB amplifier in transmitted power line, this would allow us to measure the decay time and get the Q value. Fig 2 is the QL vs 1/T curve.

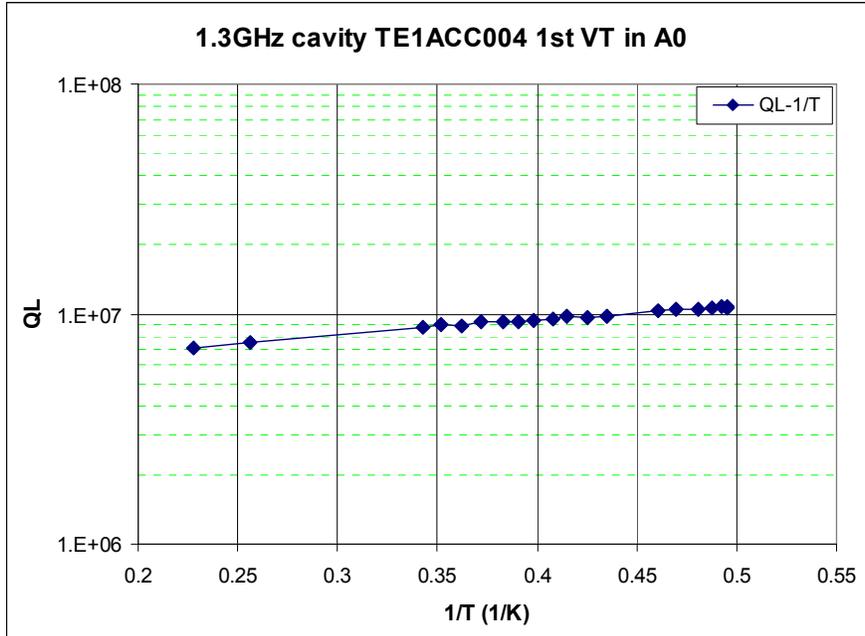


Fig 2. QL vs. 1/T curve

At 4.2K the QL was 7.09E6 and at 2K the QL is 1.06E7, which was very low.

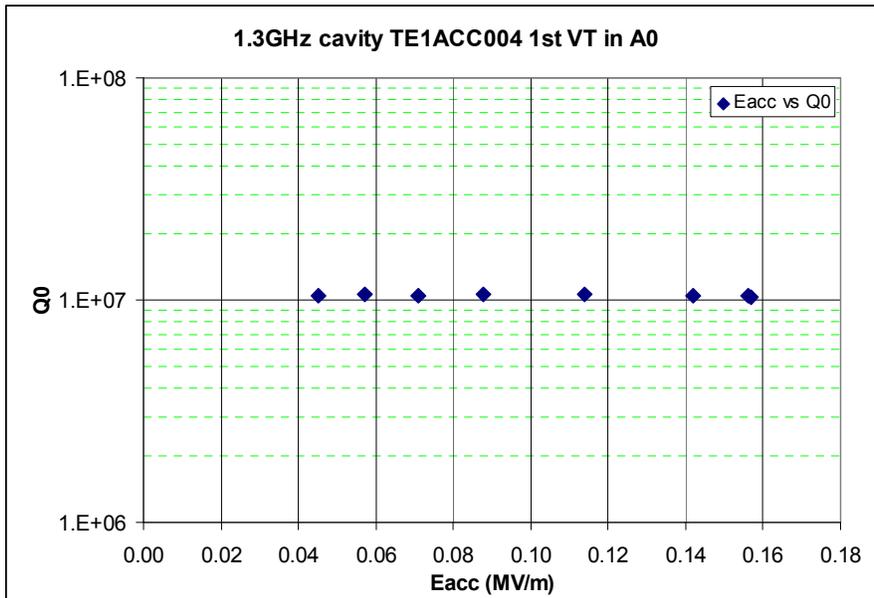


Fig 2 Eacc vs. Q0 curve

After Q-T measurement, we were trying to put more power into the cavity, most forward power was reflected back, and at 0.16MV/m, the reflected power level triggered system interlock, the test just stopped there.

Conclusion

The cavity Q value was very low, about 1E7. It is the hydrogen absorption during the tumbling causing this problem. The next step for this cavity is to do 800C baking.