1497 MHz Cavity Tests

July 21, 2014

**Summary**

Mark Wissman tested both 1497 MHz chopper cavities in the TED-1519 Klystron lab to determine maximum reasonable operating power. He tested “Black” cavity on July 9-11 and “Copper” cavity on July 14-15. The cavities were tested with LCW flowing (est. < 2GPM) through their cooling jacket with inlet and outlet temperature 32-33C independent of cavity conditions (power ON or OFF). The only frequency regulation performed were occasional manual adjustments to the mechanical tuners to minimize reflected power. RF conditioning was performed first, typically to 100W and than larger, to desorb gas. Then an ~hour long run was made with maximum forward power (>200 W) to determine equilibrium conditions.

Table 1. Summarizes equilibrium conditions:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Cavity* | *Port* | *Initial Vacuum (Torr)* | *Soak Time (min)* | *Final Vacuum (Torr)* | *Forward Power*  *(W)* | *Reflected Power (W)* | *Input Coupler (deg-C)* |
| Black | n/a | 6.7E-9 | n/a | | | | |
| Black | 1 | n/a | 50 | 5.2E-7 | 225 | 0.02 | 69 |
| Black | 2 | n/a | 70 | 8.4E-7 | 223 | 0.19 | 72 |
|  | | | | | | | |
| Copper | n/a | 1.7E-8 | n/a | | | | |
| Copper | 1 | n/a | 55 | 1.0E-6 | 218 | 0.02 | 78 |
| Copper | 2 | n/a | Not tested | | | | |

**Conclusions**

* Both cavities will make 200W, able to deflect 350keV electrons 10mrad
* Vacuum <2E-8 w/ RF OFF and elevated <1E-6 w/ RF at 200W
* Field emission not detected, but likely not detectable through cavity walls
* Input coupler very warm at 200W

**Recommendations**

* Fabricate cooling fixtures for FP feed-thru
* Modify FP feed-thru for higher power
* Reduce RP coupling (presently ~1%)
* Bake cavities to improve vacuum, provide isolation to gun
* Need four >200 W amplifiers
* Need elevated LCW regulation system