

Summary of RTCH3 Conditioning

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Status

As of Aug 27, 2008, RTCH3 was fully conditioned to operate at 12.8 kW with a 3.5ms pulse length at 2Hz. This 12.8 kW is slightly larger than 120% of the nominal. The cavity was operated at this level for 8 hours. During this time, the vacuum pressure (with ion pump only) was always less than 7E-08 torr. By the end of the 8 hour period, the pressure was down to 3.3E-08 torr. The cavity was able to run for this time without tripping.

Settings

- During conditioning, the cavity water temperature feedback loop was active, with a set point of 5.75.
- The position of the tuner (based on the motor controller) was 371. The full range is -1618 to +8174.
- During conditioning with 12.8kW, 3.5ms, 2Hz, tuner at 371, and temperature feedback active, the cavity resonant frequency was 324.963. This was based on varying the drive frequency to minimize reflected power.

Details

- 8/20: Cavity was conditioned to approximately 7kW, 3.5ms, 0.5 Hz. We observed some multipactoring, but this always conditioned away fairly quickly (on the order of 15 minutes). We observed what we believed to be sparking at around 9kW.
- 8/21, 8/25: Various schemes to condition away the alleged sparking (see Figure 1) did not appear to improve the situation. We had tried higher power levels (up to 12kW) at shorter pulse width, lower power levels at longer pulse width, and fixing a permanent magnet to the cavity coupler. Note that we did not observe much vacuum activity. The pressure was almost always less than 5E-08 torr.
- 8/26: We disconnected the flexible line and directional coupler from the cavity coupler. There was a split ring (a piece from a 1⁵/₈" bullet) inside the coax line on the upstream end of the cavity coupler. There were pit marks (indicating sparking) on the directional coupler center conductor. It also appeared that this center conductor was reversed (upstream end switched with downstream; it is not symmetric). The ring was removed and the center conductor was attached with the correct orientation. We reconnected the RF and observed no further problems. We gradually increased power and pulse width again. In about an hour, we were able to run the cavity at 12.5kW, 3.5ms, 2Hz with no sparking or multipactoring. We operated the cavity with these parameters for one hour.
- 8/27: We operated the cavity at 12.8 kW, 3.5ms, 2Hz for 7 hours without any tripping, sparking or multipactoring (see Figure 2). We did see one glitch in reflected power during this time, but no tripping. Note that during this time, interlocks were set so that if the reflected power from the cavity exceeded 3.7kW, the system would trip.
- Further details may be found at <http://www-hins-crl.fnal.gov/hins/Index.jsp>

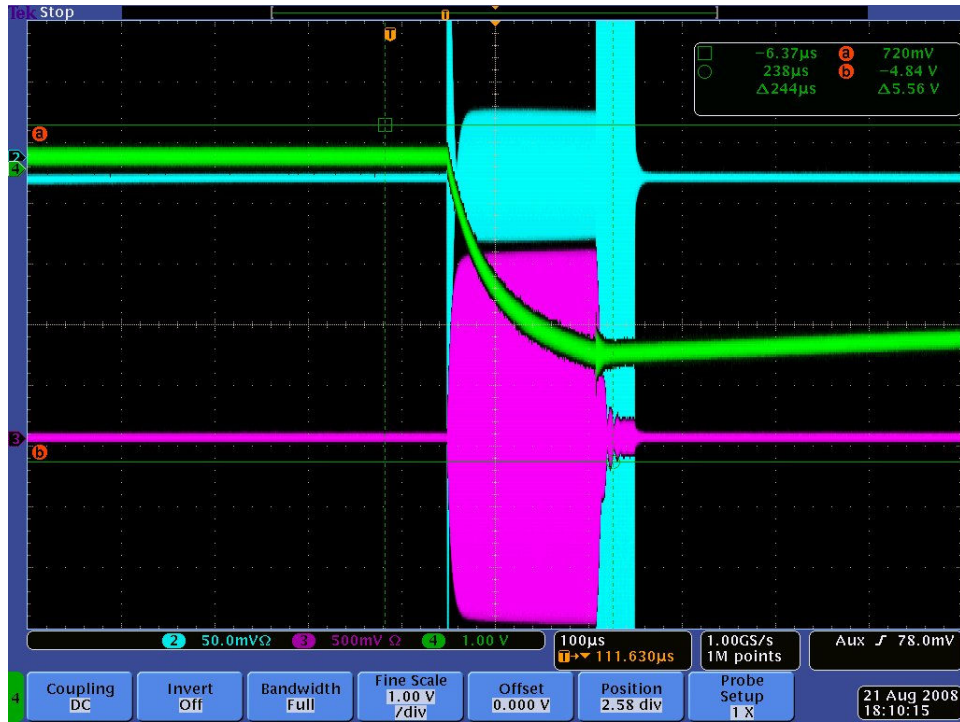


Figure 1: Ch 2 = REV25 - the spark is visible at the end of the pulse; Ch3 = cavity gap monitor; Ch4 = cavity coupler

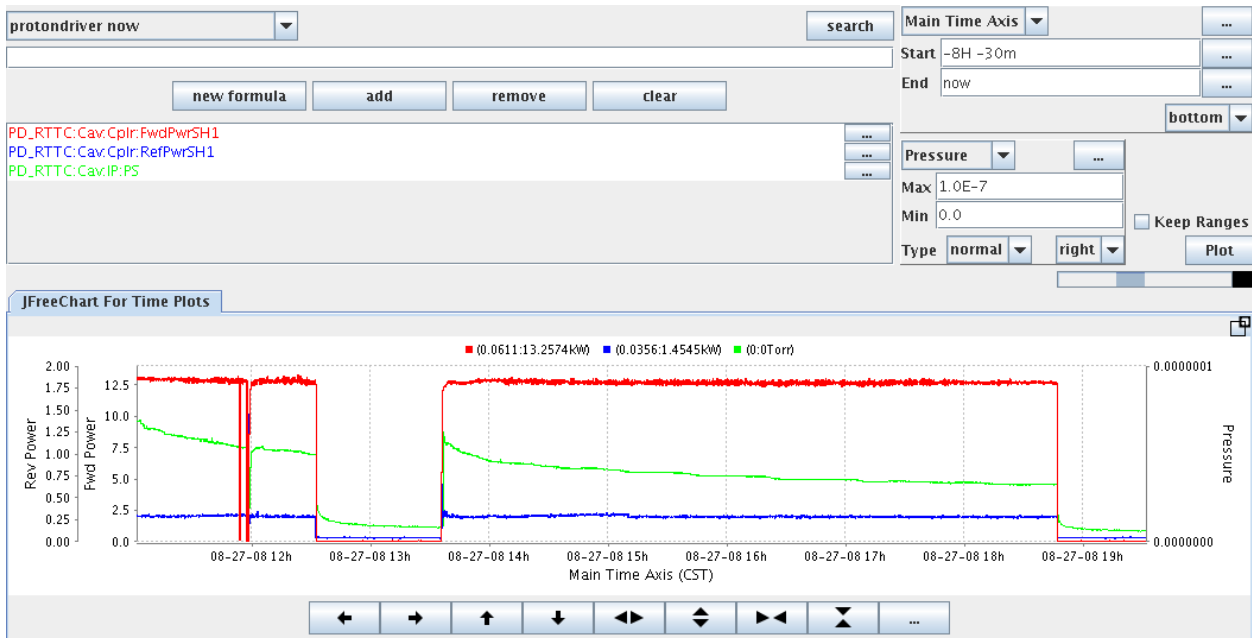


Figure 2: Forward and reverse power, and pressure during the final 7 hours of conditioning. A trip is observed when cables on the interlock modules were inadvertently touched (i.e. this does not indicate a problem with the cavity).