

Attachment A1  
Test Equipment Induced Test Failure Explanation

## **DO204 gradient test method modification and failure report to correct intermittent test failures**

### **The Symptoms:**

When performing the temperature gradient on a beacon for several hours into the program, it was found that the data collected would start to approach the limit or just exceed it at several points during the gradient.

Another problem that occurred was during the post processing of the binarydataXXX.txt. This data was collected and being processed through the TR .exe to obtain the short and medium term data. During the data conversion, the program would find "corrupt data" that it could not decode to calculate the frequencies.

Note: These problems only became apparent when these type of tests were done where the test equipment was moved near the thermal chamber and large amounts of data were being collected for frequency stability.

### **The Solutions:**

**Time base substitution:** The test setups were modified to use the 10 MHz reference output from the HP5345a counter instead of the HP8656 RF generator (see the thermal gradient figure below). This was done because it was observed the data values collected were at least 30 percent better when using the counter's time base in a rapid A/B comparison at room temperature and over an hour time frame.

**Better AC line voltage control:** The test equipment was now powered by a "line regulating" UPS instead of a standard PC type UPS that "switches in" battery generated AC during an outage. This was felt beneficial because the line voltage was found to vary from 116 to 125 VAC when the chamber compressors were cycling and there is a line voltage regulation specification for both the counter and generator that affects the oscillators stability.

**Using a higher trigger threshold and use of the 50 ohm input mode for the HP5371 time interval analyzer:** The down converted signal that went into channel A was originally set to 6 mV threshold and 1M ohm input impedance. The combination of the low threshold and high input impedance was thought that an occasional noise glitch was also seen by the analyzer and counted as a legitimate "clock cycle". The threshold was raised to 50 mV and the 50 ohm mode was used by the analyzer to improve the noise immunity this way. It has been determined that the beacon was not the cause because the same test problem was found on Sn2006 as well as sn2007. SN2006 was then sent to the Electronic Proving Grounds in Ft. Huachuca, Arizona and found to pass the frequency stability with temperature gradient test well within specification.

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