Vibration Measurements on GBT Turrent

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Description

Because of the effects of vibration on the performance of bolometer receivers, there is a desire to characterize the vibration environment on the GBT turret. An accelerometer with a low frequency spectrum analyzer was used to measure the vibration spectra on July 23. The accelerometer was a VibraMetrics Model 1136, SN 11465, with a P5000 power supply. A HP 3561A Dynamic Signal Analyzer was used to display the accelerometer output signal in the time and frequency domains. The analyzer input was AC coupled during these tests.

The accelerometer was first setup in the Jansky lab, sitting on a bench. Figure 1 shows the results with the sensor "quiet". (The analyzer was sitting on the same bench, so one expects some vibration due to the fan in the analyzer.) Figure 2 shows the result while lightly drumming fingers on the bench top, about 1 foot from the sensor. Satisfied that the system was operational, we then moved to the GBT receiver room.

The accelerometer came attached to a small lead block, which was simply set on the turret top surface. Initially, it was set on the Ku-band receiver mounting plate, near the feedhorns. The feed defrost blower which sits in the center of the turret was ON at this time. Figure 3 shows a single 400mS sweep (1kHz frequency span). The impulse-like feature visible in the time display appeared to be related to the chugging of the CTI refrigerators, probably the Model 350 in the Ku-band receiver. Figure 4 shows the average of 50 sweeps under the same conditions. Because there appears to be significant power still at 1kHz, the frequency span was then widened to 5kHz and another average taken, Figure 5.

We then turned the defrost blower off, and took another average, Figure 6. There is little difference in Figures 5 and 6. We then moved the sensor to an adjacent blank feed ring cover plate, and took averaged sweeps at spans of 5kHz and 200Hz, Figures 7 and 8. With the sensor at this location, we saw none of the large impulse-like features due to the CTI refrigerators.

In retrospect, perhaps we should have done more narrow spans to resolve the CTI rep rate (about 1.2Hz). If others feel that's important, it is not much effort to setup again.

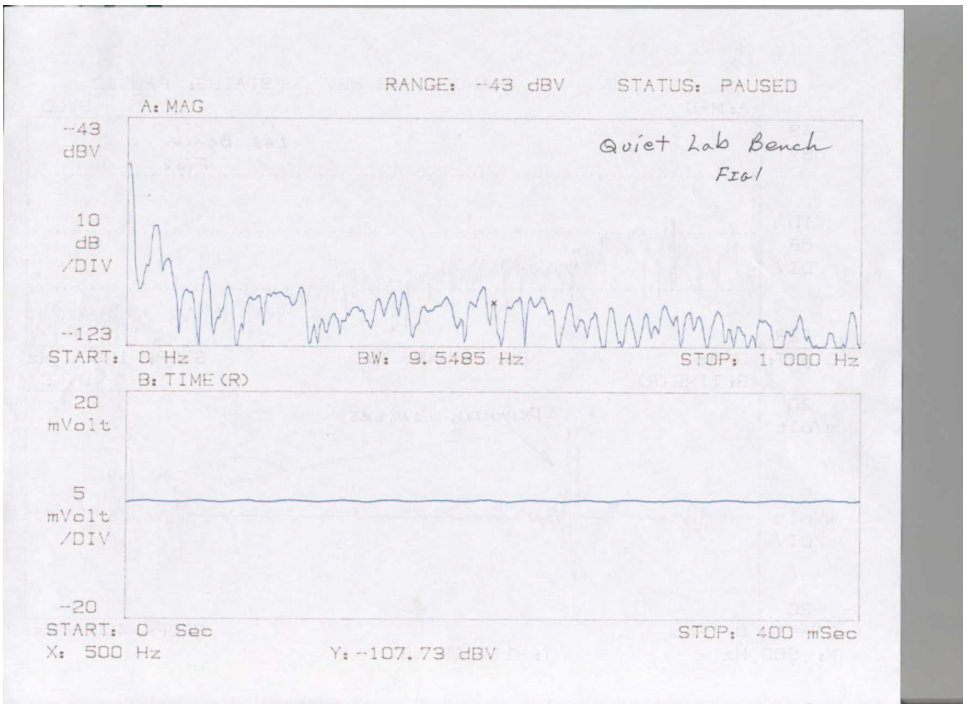

Figure 1: The accelerometer located on a benchtop in the Jansky Lab.

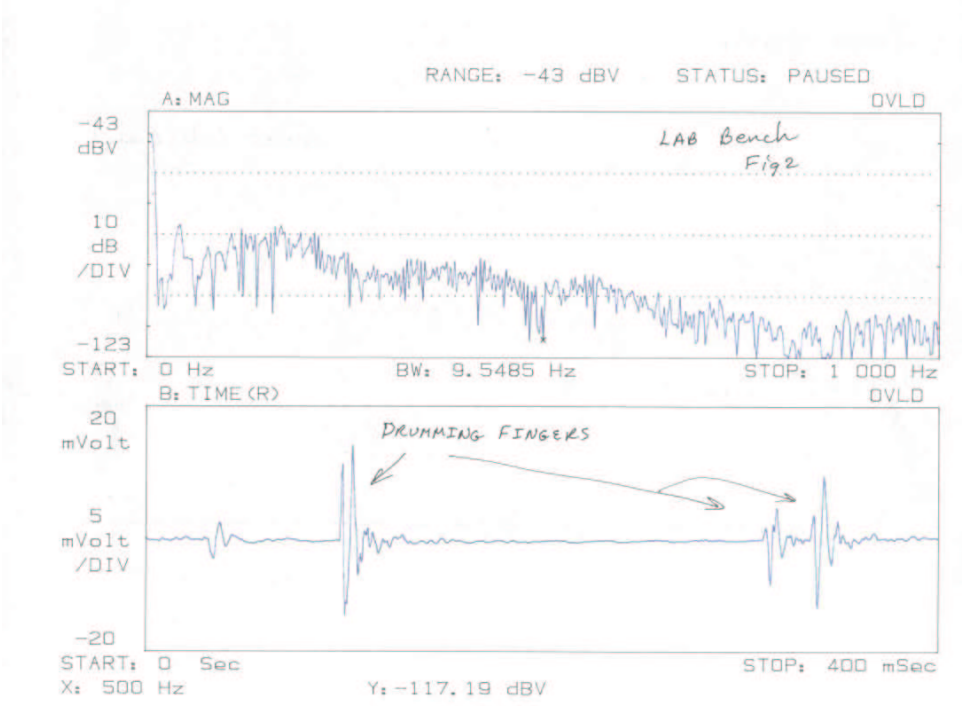

Figure 2: Light tapping on the benchtop near the accelerometer.

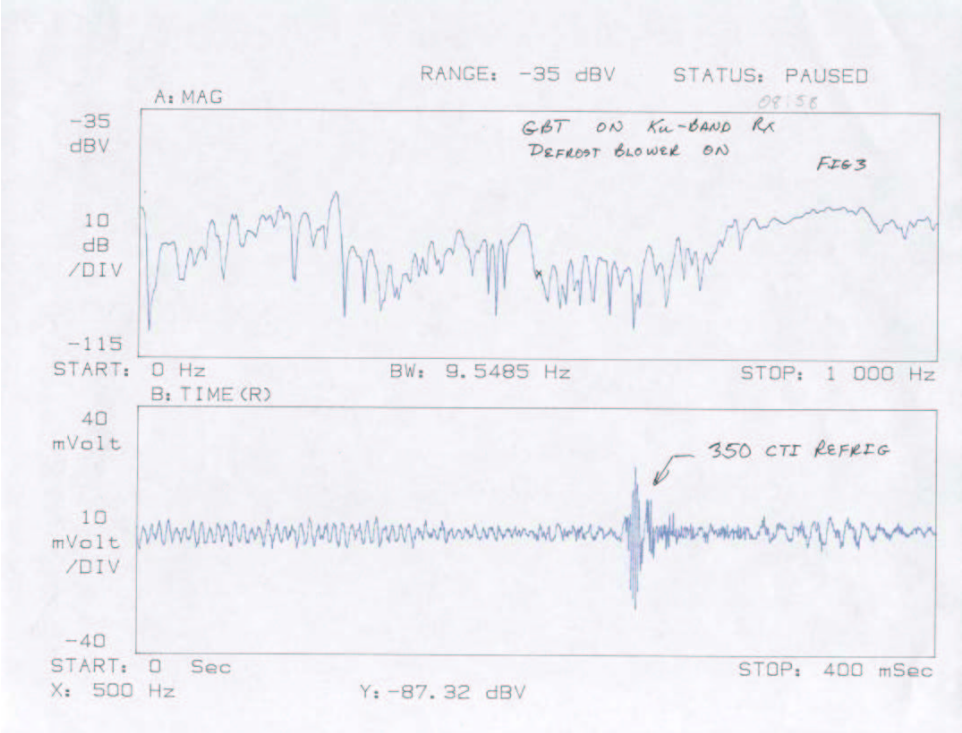

Figure 3: On the GBT Ku-band plate, with blower on. Span 1kHz, single sweep.

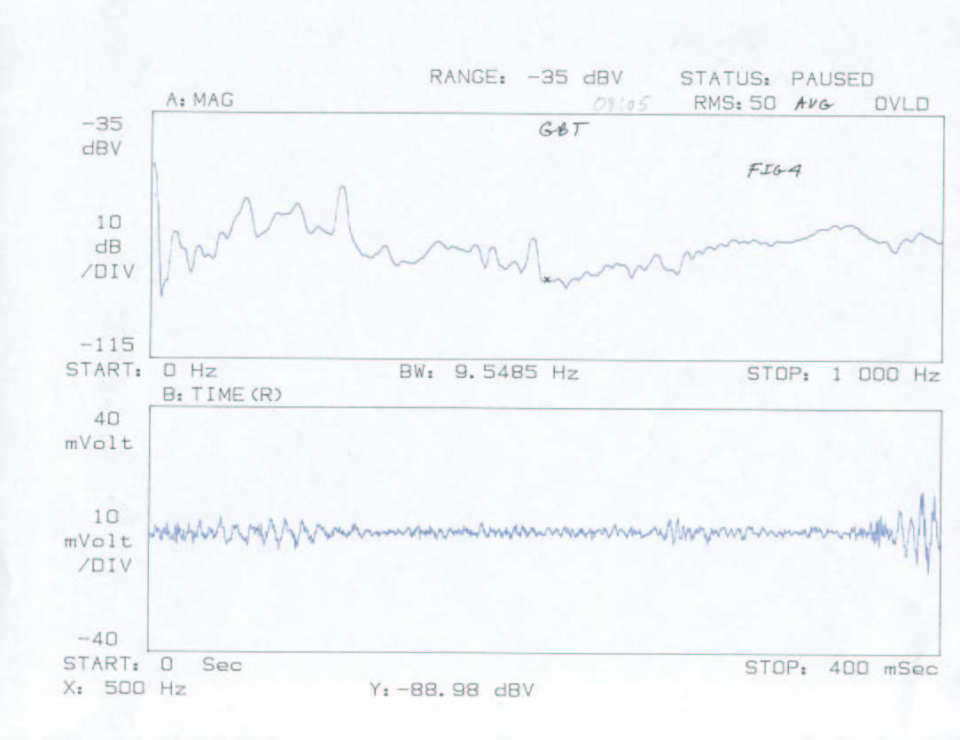

Figure 4: Same as Figure 3, but average of 50 sweeps.

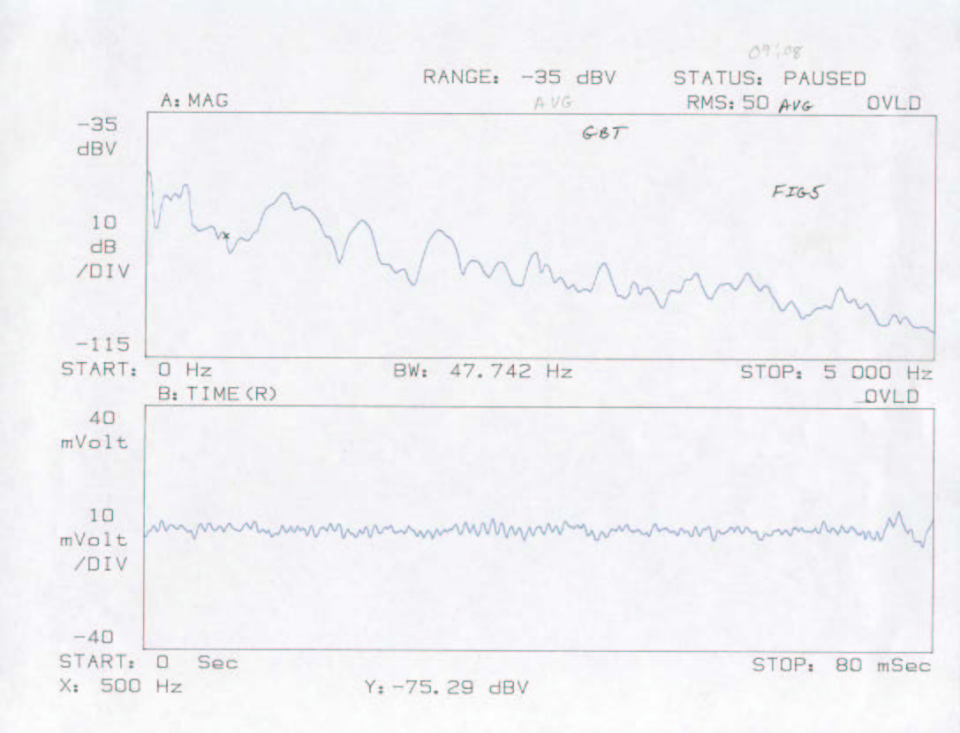

Figure 5: Same conditions as Figure 4, but with span widened to 5kHz.

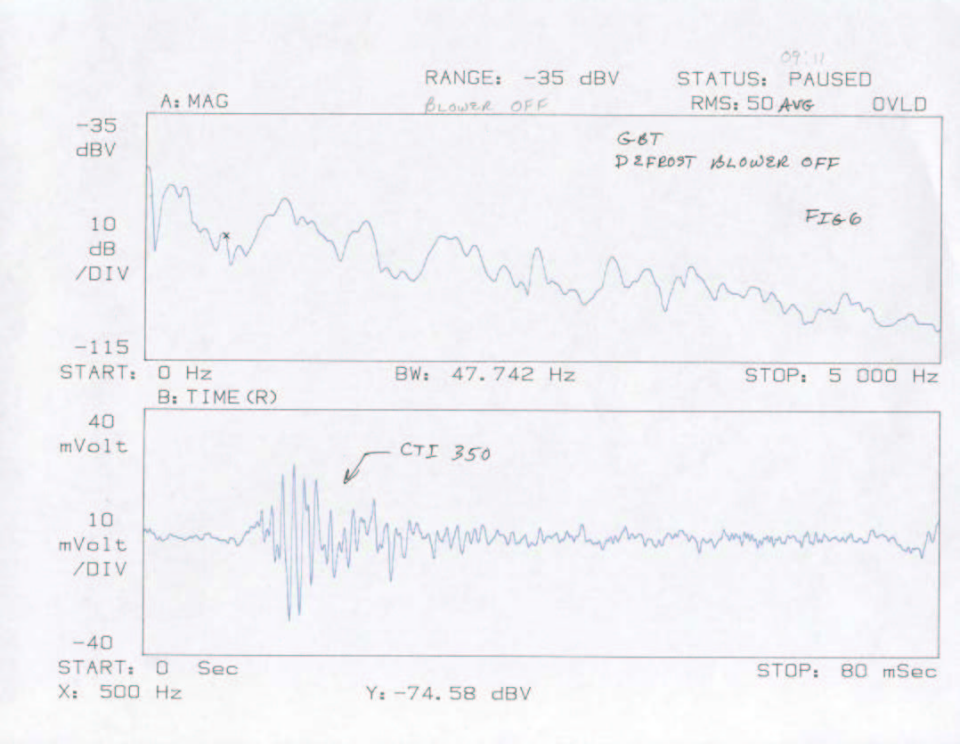

Figure 6: Same as Figure 5, but defrost blower turned off.

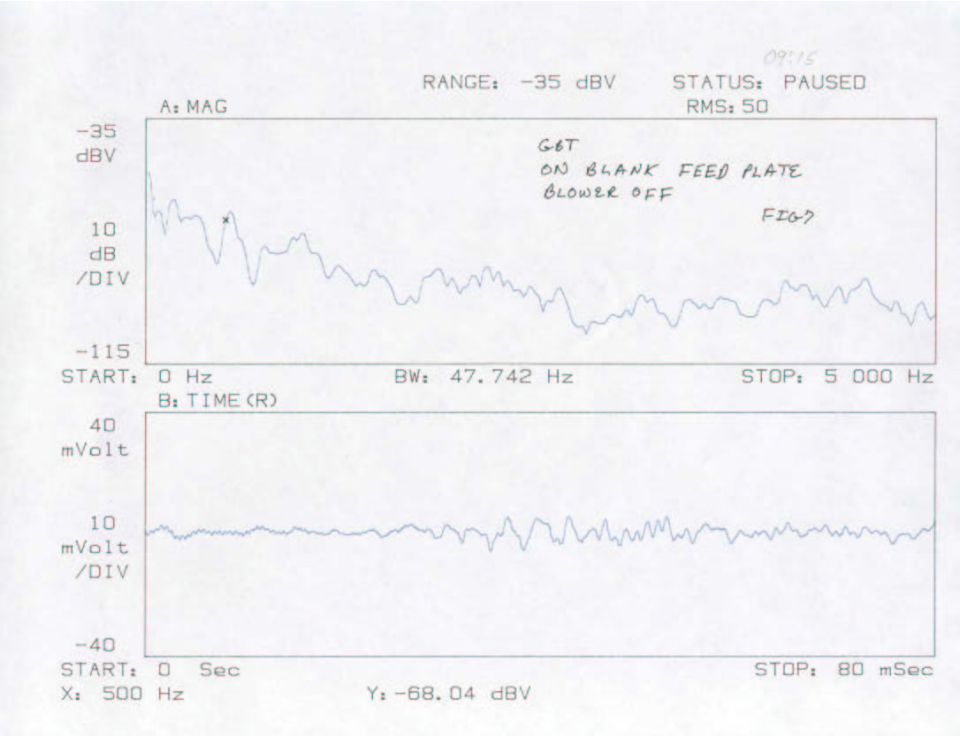

Figure 7: The accelerometer moved to a blank feedring cover plate, with the blower still off.

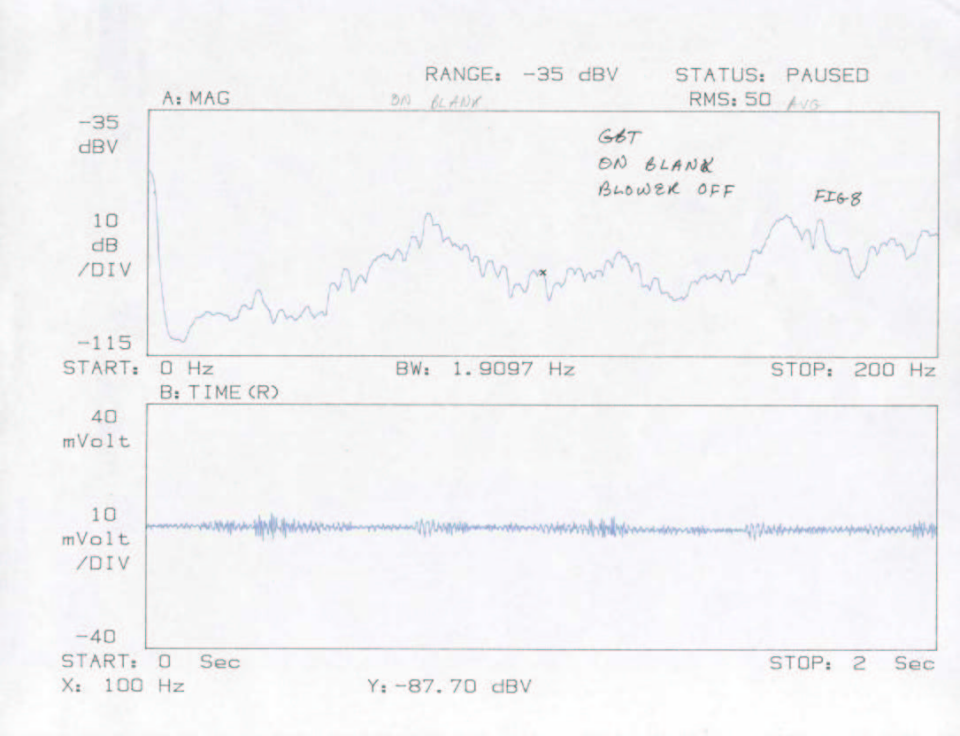

Figure 8: Same as Figure 7, but span narrowed to 200Hz.