DCR Stability Monitoring of IF System
Project TBASErdn030114
January 14, 2003

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January 15, 2003

1 Setup

The DCR was used to record the total power from both the IF Rack and the Analog Filter Rack Sampler/Filter module detectors. The IF Rack noise source was used as the signal source. IF Rack 3000/320MHz filters were selected, as were SF module 200MHz filters. DCR $tau = 1s$, $ScanTime = 300s$, $BlankingTime = 2mS$, and switching mode Total Power with Cal were used. M&C version 3.9 was active.

2 Measurements

2.1 Odd Numbered Fiber Channels

The system was configured so that the noise source output was connected to odd numbered Optical Driver modules. The corresponding Optical Receiver outputs were then connected through two independent Converter and Sampler/Filter module paths. Data from detectors in the ODM and SF modules was recorded by the DCR.

Connections:
NS → ODM1 → OR1 → CM1 → SF1 → DCR ch9
NS → ODM1 → OR1 → CM2 → SF2 → DCR ch10
NS → ODM3 → OR3 → CM5 → SF5 → DCR ch13
NS → ODM3 → OR3 → CM6 → SF6 → DCR ch14
NS → ODM5 → OR5 → CM11 → SF3 → DCR ch11
NS → ODM5 → OR5 → CM12 → SF4 → DCR ch12
(ODM 7 was out-of-service)

Scan 1 st@ 22:13:28 → Scan 6 fi @ 22:44:10.

Discussion: Figures 1 to 4 show the total power during scans 1-6. The 1% simultaneous drift in all channels is of unknown origin. The GBT was moved from access to snowdump elevations during first few minutes, so it may be that there was a related change in air stratification in the receiver room. The 0.3% steps in total power seen in Figure 3 may also be related to antenna movement.

2.2 Even Numbered Fiber Channels

Connections were changed to even numbered fiber channels.

Connections:
NS → ODM2 → OR2 → CM1 → SF1 → DCR ch9
NS → ODM2 → OR2 → CM2 → SF2 → DCR ch10
NS → ODM6 → OR6 → CM11 → SF3 → DCR ch11
NS → ODM6 → OR6 → CM12 → SF4 → DCR ch12
NS → ODM8 → OR8 → CM15 → SF7 → DCR ch15
NS → ODM8 → OR8 → CM16 → SF8 → DCR ch16
(ODM 4 was out-of-service)

Scan 7 st @ 22:47:53 → Scan 12 fi @ 23:18:35.

Discussion: Figures 5 to 8 show the total power during scans 7-12. Note that the simultaneous drift has slowed down. The equipment room detectors all show a roughly cyclic behavior with about 18 minute period. The equipment room temperature is suspected as a cause of this behavior.

2.3 All Converter Rack A Modules

The system was reconfigured so that signals through all CM1-8 modules were recorded.

Connections:
NS → ODM2 → OR2 → CM1-4 → SF1-4 → DCR ch9-12
NS → ODM3 → OR3 → CM5-8 → SF5-8 → DCR ch13-16

Scan 13 st @ 23:24:13 → Scan 18 fi @ 23:54:55.

Discussion: Figure 9 shows the total power during scans 13-18. All the channels are well-behaved. There are small disturbances at the $0.1-0.2\%$ level.

2.4 All Converter Rack B Modules

The system was reconfigured so that signals through all CM9-16 modules were recorded.

Connections:
NS → ODM6 → OR6 → CM9-12 → SF1-4 → DCR ch9-12
NS → ODM8 → OR8 → CM13-16 → SF5-8 → DCR ch13-16

Scan 19 st @ 23:59:20 → Scan 24 fi @ 00:30:02.

Discussion: Figure 10 shows the total power during scans 19-24. All the channels are well-behaved. There are small disturbances at the $0.1-0.2\%$ level.

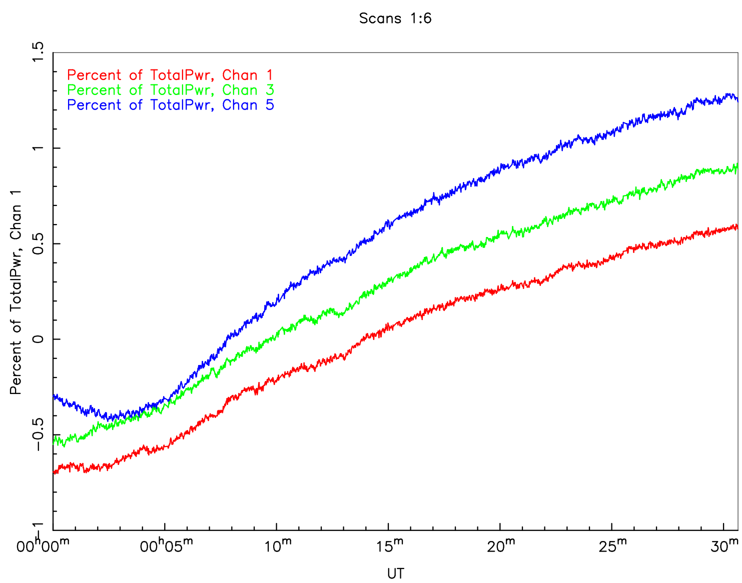

Figure 1: Total Power from scans 1-6, from the ODM 1, 3, and 5 detectors.

3 Summary

Total power data was recorded for thirty minute periods for several IF system configurations. A slow drift with magnitude approximately 2% that stabilized after about one hour affected all channels, and may have been due to an extreme change in GBT elevation affecting the receiver room temperature. One fiber channel (ch 3) exhibited a 0.5% step in gain that may have been related to GBT movement. All the converter modules behaved in a similar fashion during this period.

Figure 2: Total Power from scans 1-6, from ODM 1 and SF1, SF2 for comparison.

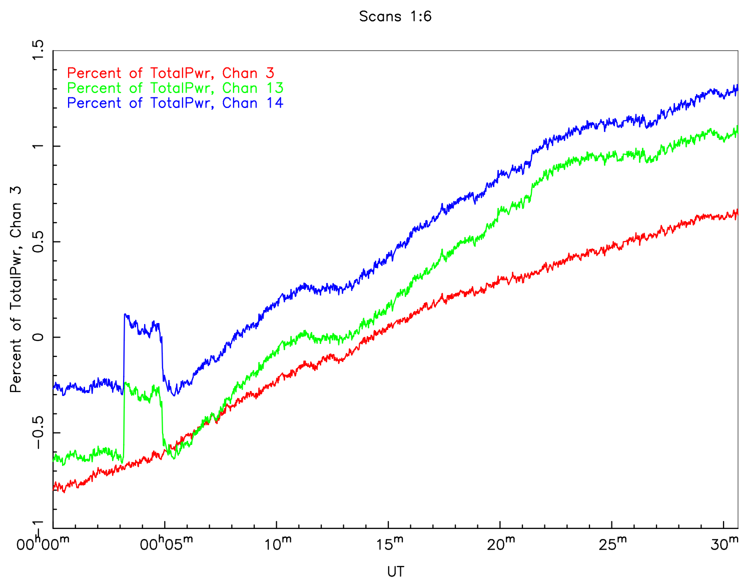

Figure 3: Total Power from scans 1-6, from ODM 3 and SF5, SF6 for comparison. The 0.3% step in the SF total powers indicats a change in the channel 3 fiber transmission. During the first part of this scan sequence, the GBT was moving from access to snow dump elevation, and rotating in azimuth. For the remainder of the IF tests, the GBT was stationary.

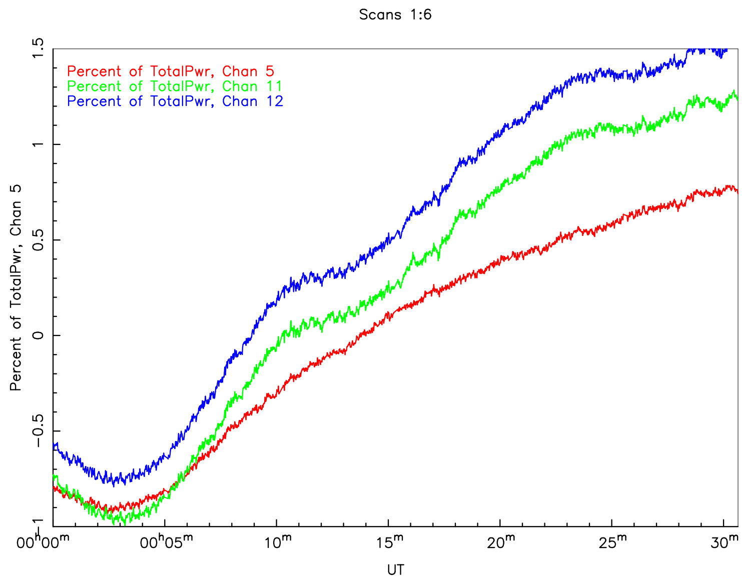

Figure 4: Total Power from scans 1-6, from ODM 5 and SF3, SF4 for comparison.

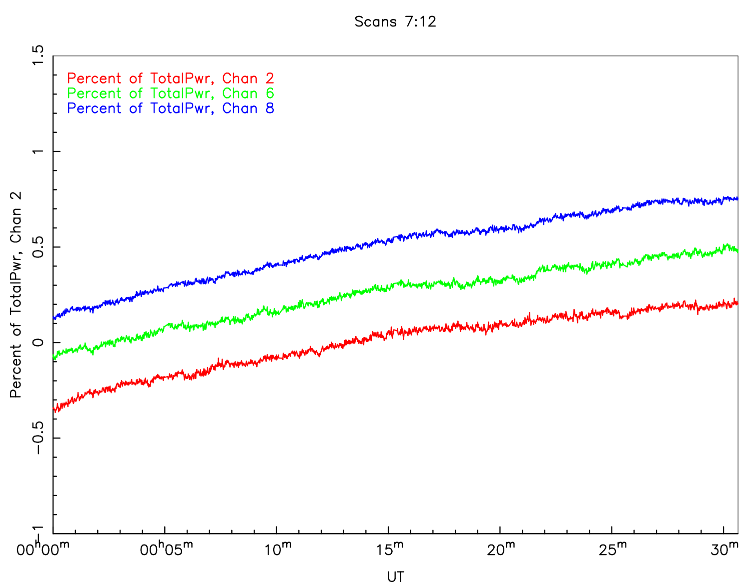

Figure 5: Total Power from scans 7-12, from the ODM 2, 6, and 8 detectors.

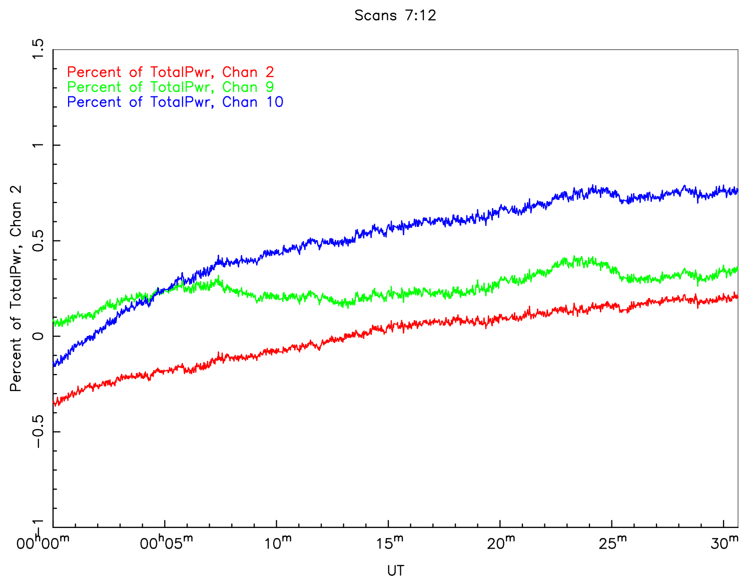

Figure 6: Total Power from scans 7-12, from ODM 2 and SF1, SF2 for comparison.

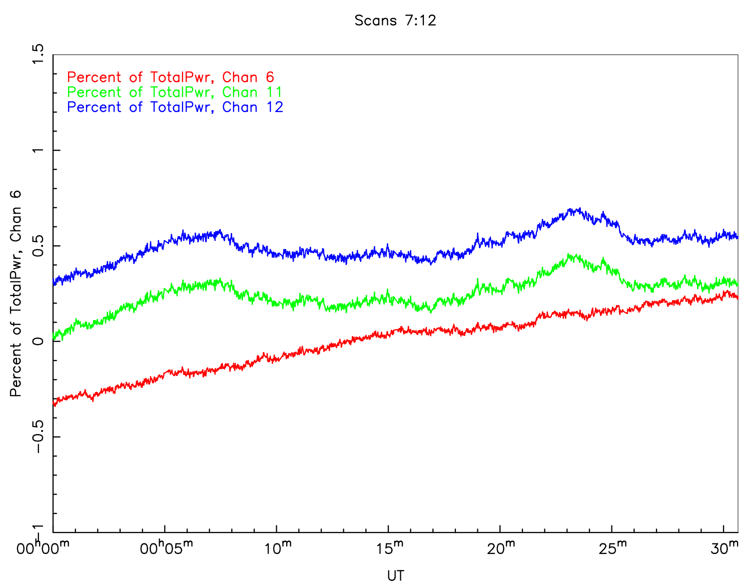

Figure 7: Total Power from scans 7-12, from ODM 6 and SF3, SF4 for comparison.

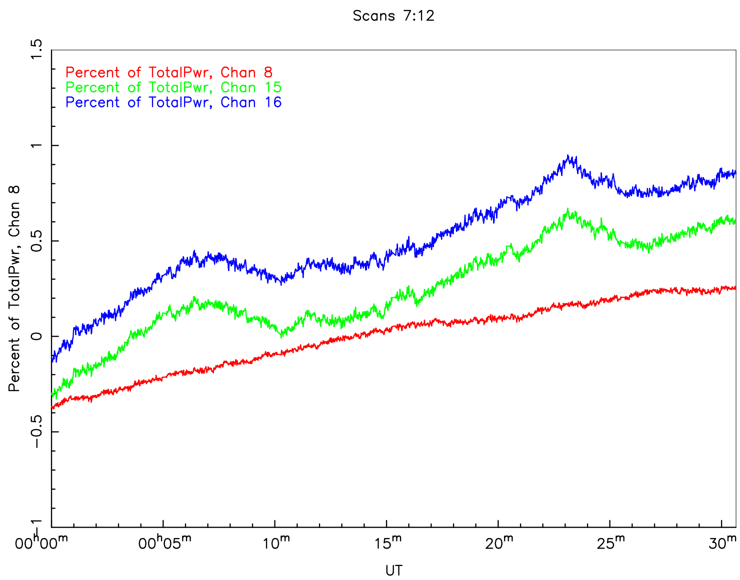

Figure 8: Total Power from scans 7-12, from ODM 8 and SF7, SF8 for comparison.

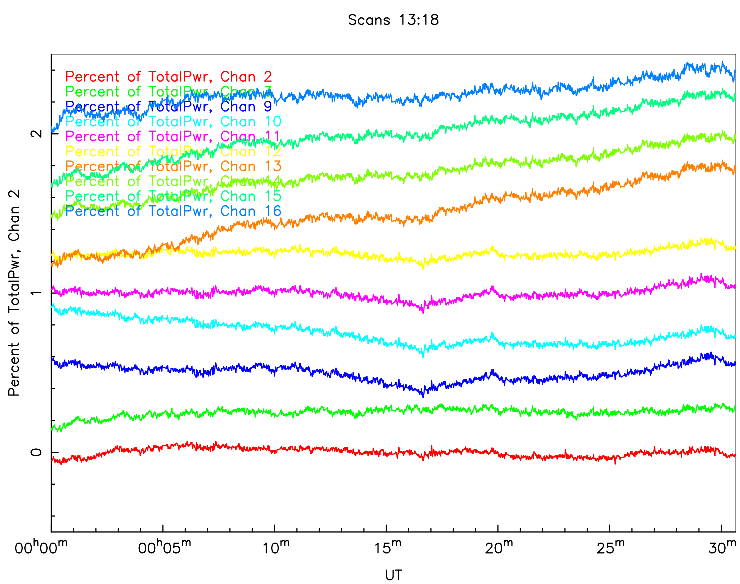

Figure 9: Total Power from scans 13-18. Traces 1 and 2 (counting from the bottom) show the total power from ODM 2 and 3. Traces 3-6 shows total power via CM 1-4, and traces 7-10 shows total power via CM 5-8.

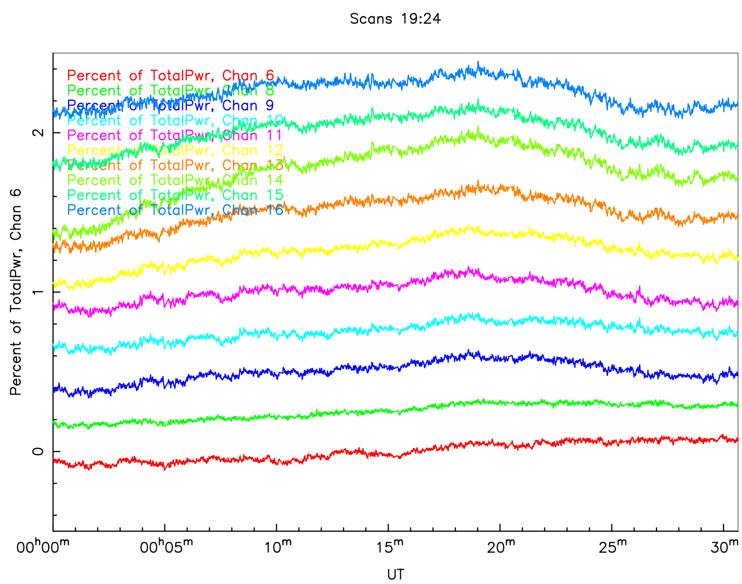

Figure 10: Total Power from scans 19-24. Traces 1 and 2 (counting from the bottom) show the total power from ODM 6 and 8. Traces 3-6 shows total power via CM 9-12, and traces 7-10 shows total power via CM 13-16.