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To: Millimeter-wave VLBI Group

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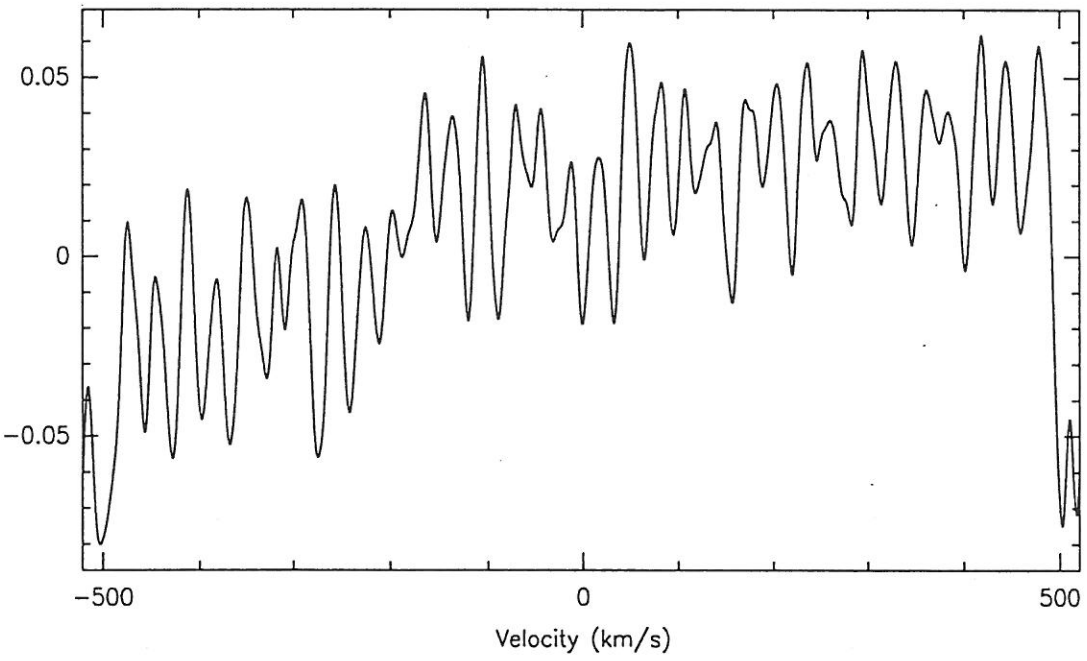
Subject: Radome reflection multipath

The radome reflection multipath was first observed as corrupting ripples in the Ku-band (12 GHz) holography. Now the multipath has been measured at 86 GHz using the new hybrid spectrometer mode (280 MHz bandwidth) and frequency switching. The typical ripple present in Double-Dicke (position switched by 127 millideg in azimuth and frequency switched by ± 2.2 MHz) scans is about 30 mK peak-to-peak with a dry radome. The frequency switching used doubles the ripple, compared to the Double-Beam mode (position switched by 127 millideg and beam switched at 5 Hz rate). Therefore, we should expect about 15 mK peak-to-peak at 86 GHz. Since the feed gain at the edge of the subreflector is about 6 dB lower at 115 GHz than at 86 GHz only about 4 mK ripple is expected at 115 GHz. At this level it is hard to observe and I in fact, so far, have not been able to see the ripple at 115.

Figure 1 shows the ripple - both in the spectrum and in the auto-correlation. The ripple period is 8.7 ± 0.2 MHz or $56.6 \pm 1'$ one-way which is very close to the $56'$ distance from the SIS mixer (where most of the reflection is likely to occur) to the radome panels just past the edge of the subreflector. Scans taken with only 5 millideg difference in azimuth show an almost identical ripple pattern while those 100 mdeg apart show a phase shift in the ripple pattern of about 90 degrees and a substantially different pattern. In these first attempts to directly observe the radome effects the angular correlation scale for spectral baseline ripple appears to be about 100 mdeg.

54; 1 AZEL SIO 2-1 V=1 HAYSTACK 120 O: 16-DEC-1993 R: 16-DEC-199
RA: 14:20:55.107 DEC: -12:52:11.96 (1950.0) Offs: 0.0 0.0 Eq
Unknown Tau: 0. Tsys: 284.4 Time: 16.00 El: 30.00 , Az 90.11
N: 7680 I0: 3841. V0: 0. Dv: 0.1358 LSR
F0: 86243.2800 Df: -3.9062E-02 Fi: 0.



54; 1 AZEL SIO 2-1 V=1 HAYSTACK 120 O: 16-DEC-1993 R: 16-DEC-199
RA: 14:20:55.107 DEC: -12:52:11.96 (1950.0) Offs: 0.0 0.0 Eq
Unknown Tau: 0. Tsys: 284.4 Time: 16.00 El: 30.00 Az = 90.11
N: 119 I0: 60.02 V0: 0. Dv: 8.690 LSR
F0: 86243.2800 Df: -2.500 Fi: 0.

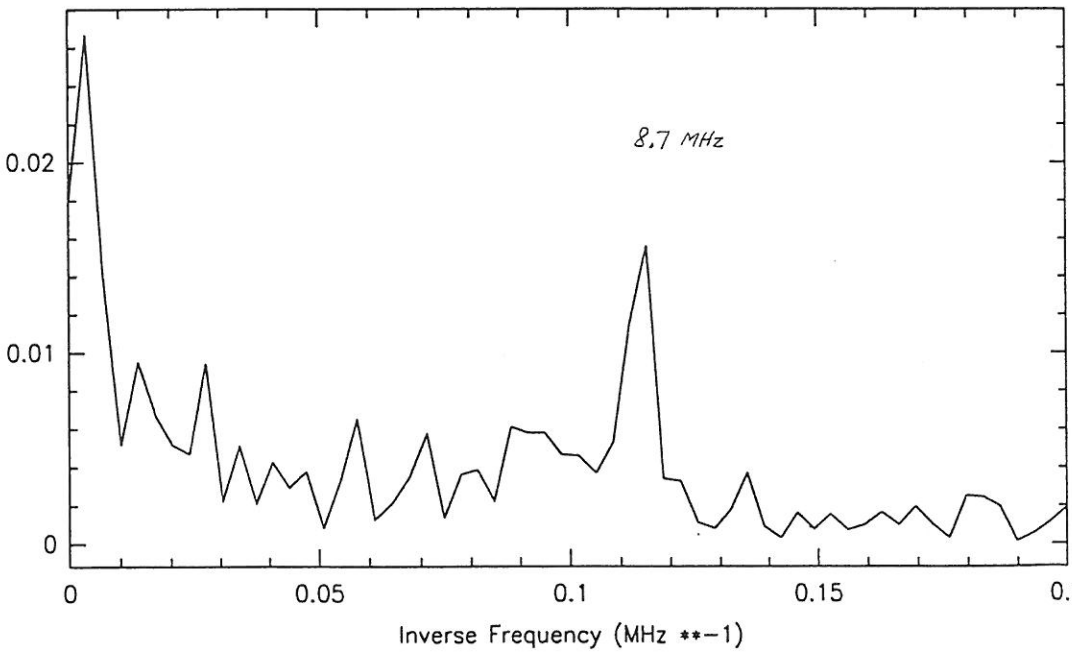


Figure 1.