VLA TEST MEMORANDUM NO. 133

OBSERVATIONS OF THE UBIQUITOUS 1400 MHz BIRDIE

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Previous studies of the 1400 MHz birdie reported by A.R. Thompson (7 May 1980, 2 September 1981 Test/Operations Coordination Meetings) have been based upon observations at the North Celestial Pole. The birdie results from signals leaking from the B rack to the A rack in the vertex room of each antenna and should be visible regardless of antenna orientation.

To supplement the earlier observations of the birdie, I have used test time in the D array on 2 October 1981 to survey the strength of the birdie at 24 positions at declinations between -20° and 60° and hour angles between $\pm 4^h$. A bandwidth of 781 kHz centered on the 1400 MHz birdie was used providing 256 channels for 6 antennas for a channel separation of 3 kHz. Six antennas near the center of the array were used, providing baselines between 40m and 215m.

The results are summarized in Table 1. No simple dependence upon baseline length or telescope orientation was apparent but particular antennas were obviously much worse than others. The most likely causes of the observed variations are differences in shielding of modules, tightness of connectors, and flexing of cables from antenna to antenna.

I made further observations using a hybrid A and C array on 29 January, 1982. The observing procedure was the same as in October 1981, except that I retained only the center 15 channels. This allowed the use of 17 antennas providing baselines between 0.1 and 20.0 kilometers. The ampscalar average and maximum amplitude seen during two scans at h $\sim 2^h$ and $\delta \sim 65^\circ$, are summarized in Table 2 as a function of baseline length. The two scans were taken approximately 1.5° apart and showed variations of a factor of 2 in the strongest features. As expected, because of the lobe rotation, the amplitude decreases inversely with baseline length and the phases vary randomly.

Interference at such levels represents a serious problem for hydrogen-line observations near 1400 MHz (cz ~4300 km sec^{-1}). For observations with a bandwidth of 12.5 MHz and 32 channels, the maximum and average amplitude I observed correspond to 15 and 2.6 Jy. For the observed dynamic range of 20 dB in VLA spectra such signals will cause problems at a level of ~100 mJy outside the birdie itself. Because of the growing interest in hydrogen-line observations - including frequencies near 1400 MHz - all possible steps should be taken to minimize the known sources of L band interference.

Table 1.

DISTRIBUTION OF AMPLITUDES OF THE 1400 MHz BIRDIE

‘	12.8 Jy	1
12.8 -	25.6	8
25.6 -	51.2	31
51.2 -	102.4	74
102.4 -	204.8	72
204.8 -	409.6	63
409.6 -	819.2	77
819.2 -	1638.4	33
’	1638.4	1
	Total	360

Maximum	1920 Jy
Average	334±342 Jy

Table 2.

DISTRIBUTION OF AMPLITUDE WITH BASELINE LENGTH

Baseline Length	Average	Maximum
‹0.34 km	127.0 ± 135.0 Jy	387.5 ± 14.8 Jy
0.34 - 0.68	64.7 91.1	250.1 6.1
0.68 - 1.35	26.3 37.3	167.0 4.3
1.35 - 2.70	11.0 13.6	57.1 8.0
2.70 - 5.40	10.0 12.3	46.9 19.1
5.40 - 10.80	4.1 3.0	12.6 5.9
›10.80	4.2 2.6	11.4 2.9