

Noise Contribution due to 74 MHz dipoles at Cassegrain bands

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Effect of 74 MHz cross dipoles on the G/T performance at L-band were discussed in VLA Test Memo. No. 168. Due to extensive L-band observations planned in the upcoming D-array, it was decided to temporarily remove the 74 MHz dipoles from the antennas (Nos. 3, 6, 7, 11, 14, 20, 21, and 26) which had these dipoles. Since the dipoles were going to be removed, we thought that it may be interesting to see the effect of these diploes on the antenna efficiency and the system temperature at other bands, by making antenna efficiency and system temperature measurements at various bands immediately before and after removing the dipoles. But due to scheduling considerations for removing the dipoles, measurements before removing the dipoles could not be made. However we do have some measurements of the system temperature values at various cassegrain bands, made in May 1993, when all the 8 antennas (Nos. 3, 6, 7, 11, 14, 20, 21, and 26) had 74 MHz systems on them (VLA Test Memo. No. 170).

Estimates of the system temperature at various band for different antennas from the Test Memo 170 are given in Table 1. These measurements were made using Moon. At the bottom of the table we have given average values of system temperatures for antennas with and without 74 MHz dipoles for each IF at every cassegrain band. Now, if we assume that the average receiver noise performance for antennas with and without the 74 MHz dipoles is similar and that any difference in the system temperature is caused by the 74 MHz dipoles, then it suggests that average noise contribution due to the 74 MHz dipoles at:

L band is about 3.8 °K, i.e. about 11.8%

C band is about 2.9 °K, i.e. about 6.5%

X band is about 2.2 °K, i.e. about 7 %

U band is about 3.9 °K, and

K band is about 2.7 °K.

The contributions to the system temperature by 74 MHz dipoles at U and K bands are not reliable due to small contributions to the system temperature by the 74 MHz dipoles and a large spread in the values of the system temperature for various antennas at these bands.

We have tried to repeat these measurements during the last month but had only limited success. Results of the system temperature measurements, using moon on 1993Sep09 by Paul Lilie, after the 74 MHz dipoles were removed, and a comparision of these measurements with the earlier estimates for the system temperature measurements on 1993May28 are given in Table 2. The system temperature estimates on 9 September 1993 were made from measurements of total power and synchronous detecors at the backend, whereas those for the May 1993 were derived from detectors in the frontend system. Also at L band BD IFs (1365 MHz) had heavy RFI and

therefore were not used in these results. Paul again repeated these measurements on 1993Sep29, and got the results given in Table 3. These results were derived from only a couple of total power and synchronous detector data points at each setting, and therefore have limited accuracy. However all these measurements roughly agree with the estimates given above for contribution due to the 74 MHz dipoles at cassegrain bands.

TABLE System Temperature using measurements on moon

(data for 93 MAY 28)

TABLE 1

DATE 930528 TMOON-TBG
LUNAR TRANSFER L 65.25

C 158.8
X 162.7
U 159.7
K 127

Tsys:	L-Band				C-Band				X-Band				U-Band				K-Band			
FREQ:	AC: 1465	BD: 1385	AC: 4885	BD: 4835	AC: 8415	BD: 8465	AC: 14985	BD: 15035	AC: 22485	BD: 22435										
AVG:	AC: 32.56	BD: 35.05	AC: 43.93	BD: 44.50	AC: 31.37	BD: 31.64	AC: 116.2	BD: 113.2	AC: 159.8	BD: 159.7										
ANT#	LA	LC	LB	LD	CA	CC	CB	CD	XA	XC	XB	XD	UA	UC	UB	UD	KA	KC	KB	KD
1	32.1	31.7	31.2	29.6	49.9	49.4	49.5	50.2	33.4	33.9	34.1	34.5	122	175**	122	176**	189	177	190	175
2																				
*3	37.2	33.6	36.7	36.2	44.8	38.4	44.1	39.0	29.2	32.7	29.6	33.3	113	116	117	113	150	154	150	152
4	31.1	33.4	31.3	33.1	60.0	54.1	62.3	53.1	31.9	32.2	31.8	32.5	111	114	109	115	191	186	186	192
5	27.3	26.8	28.8	27.9	42.3	57.4	43.0	60.1	26.3	26.4	26.5	26.3	115	146	114	140	135	129	137	126
*6	35.4	35.7	37.9	35.4	57.4	55.1	58.5	57.7	33.4	33.2	33.9	34.0	159**	159**	159**	161**	153	163	152	164
*7	30.8	31.3	36.7	37.0	43.3	47.2	43.1	46.9	31.2	29.6	31.1	29.4	125	105	127	106	161	151	161	152
8	28.3	26.3	29.5	28.1	43.4	43.4	42.5	43.0	29.7	30.8	29.7	31.0	99	316**	102	115	147	130	146	130
9	27.9	26.9	28.5	28.9	48.0	42.8	46.0	43.1	27.0	29.8	27.1	29.9	92	113	93	114	184	202	187	204
10	34.1	34.2	35.8	37.2	52.8	36.7	52.1	38.4	29.5	29.6	29.4	29.8	90	116	91	114	134	141	135	144
*11	33.2	38.5	38.8	44.8	41.5	37.3	42.5	38.2	30.3	29.0	31.3	29.6	149**	128	153**	126	154	178	155	183
12					52.5	43.4	54.3	44.9	35.8	33.3	35.3	32.8	102	89	103	91	129	143	128	143
13	34.9	35.4	34.8	34.1	40.0	44.2	41.9	44.8	25.7	29.2	26.0	28.9	106	166**	105	169**	142	153	144	152
*14	34.6	32.9	37.2	35.8	42.1	39.1	41.9	39.0	37.9	39.0	39.4	39.4	121	114	122	114	176	172	173	169
15	29.5	30.7	33.9	40.7	48.9	39.0	54.1	42.6	31.5	37.6	31.6	39.7	114	76	120	75	130	154	128	149
16					39.0	39.5	39.8	39.7	35.5	34.3	36.9	34.5	129	108	130	112	167	159	173	163
17	26.8	26.5	28.5	28.9	44.3	39.2	43.0	38.7	32.6	33.4	31.7	33.5	108	93	107	95	156	187	160	184
18	29.0	28.9	32.7	31.6	47.8	46.7	47.0	45.7	30.3	30.4	30.2	30.6	106	100	108	101	135	181	131	184
19	42.9	34.7	38.6	35.2	39.8	38.9	39.4	38.6	26.3	27.7	26.3	27.6	95	100	97	97	162	152	162	151
*20	36.1	35.1	45.1	45.0	48.0	37.9	48.7	37.6	35.1	33.1	35.7	33.7	100	156**	101	158**	253**	147	231**	147
*21	35.6	35.4	35.4	34.0	45.4	50.0	47.0	59.1	31.5	33.8	31.8	34.2	111	113	110	114	137	148	139	147
22	33.0	31.6	32.3	31.7	36.6	36.8	36.6	35.6	35.6	35.8	36.2	36.7	97	99	98	98	142	133	141	134
23	35.0	36.0	39.7	43.1	40.5	34.8	39.9	34.4	26.3	25.0	29.1	24.5	67	70	67	70	137	151	140	152
24	32.2	30.0	32.5	31.0	39.2	42.8	38.5	41.1	30.9	32.8	30.9	32.1	122	103	123	99	151	138	150	141
25	36.7	29.6	35.4	32.0	37.5	37.4	38.0	38.2	27.1	28.5	27.5	28.5	94	101	96	102	163	137	164	136
*26	34.2	34.3	37.2	38.6	56.2	39.8	61.9	39.3	33.1	33.5	32.9	33.5	88	97	90	98	187	176	186	177
27	25.6	24.8	29.0	27.8	43.5	31.6	41.6	31.0	34.3	33.2	34.8	33.5	103	108	105	112	161	154	161	154
28	38.1	42.2	44.1	53.1	47.6	37.0	48.7	36.6	27.1	27.7	26.6	27.8	118	144	117	141	216	196	213	196

Average for non 74 MHz Antennas:

32.0 31.2 33.3 33.8 44.9 41.8 45.2 42.1 30.4 31.3 30.6 31.3 104.7 107.3 105.6 108.4 156.4 158.1 156.6 158.4

Average for 74 MHz Antennas (Nos. 3, 6, 7, 11, 14, 20, 21, and 26):

34.6 34.6 38.1 38.4 47.3 43.1 48.5 44.6 32.7 33.0 33.2 33.4 108.7 111.5 110.7 110.8 159.3 161 159 161

Notes: * means antennas with 74 MHz system

** means these measurements not used for calculating average system temperature values

TABLE 3

$T_{\text{sys}}(930929) / T_{\text{sys}}(930528)$
 i.e., AFTER / BEFORE 4M REMOVAL

	ANTS HAVING 4m	ANTS w/o 4m	RATIO
L	.94	1.02	1.09
C	.97	1.02	1.06
X	.95	1.00	1.05
U	.95	1.00	1.06
K	.73	.74	1.01

NOT INCLUDED IN COMPARISON:

2	LCXUK	IN BARN 930528
3	C UK	WARM 930929
8	X	FE CHANGED 930815
10	L	FE CHANGED 930815
11	L	FE CHANGED 930730
12	LCXUK	IN BARN 930929
14	C UK	WARM 930929
16	L	FE CHANGED
20	K	LNA & TRANSITION CHANGED
23	L	FE CHANGED

TABLE 2

930528 - data			930909 data			930915 PR
BAND	4-BAND	NOT-4	RATIO	"4-BAND"	NOT-4	RATIO
L (1415)	43.37	38.59	1.124	31.71	32.19	0.985
C	46.05	43.67	1.054	55.56	55.25	1.006
X	33.05	30.74	1.075	44.27	43.23	1.024
U	122.2	113.6	1.076	144.85	136.85	1.059
K	138.4	132.9	1.041	160.19	171.79	0.932

NOTES:

930528 DATA FRONT-END VSO.
 930909 " BACK-END "

NOT INCLUDED:	ANT	IFS	BAND	
	2	ALL	ALL	OUT 930528
	12	ALL	ALL	OUT 930909
	25	ALL	ALL	OUT 930909
	ALL	A ≠ C	L	RFI 930909
	11	B	ALL	BAD TS (?) 930909
	24	B	ALL	"
	11	D	L	?
	16	ALL	L	?

