

VLB ARRAY MEMO No. 423

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NATIONAL RADIO ASTRONOMY OBSERVATORY

Socorro, NM

RFI SURVEY FOR THE VLBA

KITT PEAK, AZ SITE

December 1984

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(1)

A survey for harmful radio interference was conducted at the proposed VLBA site at Kitt Peak, AZ from November 28, 1984 to December 14, 1984. The proposed VLBA site at Kitt Peak is located on the Southwest Ridge between the NRAO 12 Meter Radio Telescope and a KPNO operated picnic area. The RFI monitoring trailer was set up in this picnic area within 100 yards of the proposed VLBA antenna site. Power was available in the picnic area and some measure of security was provided as the picnic area was only open to the public during the day.

RFI monitoring began on November 28 and was completed on December 14. No equipment problems were encountered and power was very reliable. At the completion of this survey, the RFI trailer was left at the NRAO facilities on Kitt Peak.

As usual, this survey included all of the proposed VLBA frequency bands from 75 MHz. to 11.2 GHz. The RF environment at this location was influenced by three factors. The proximity to the major population areas of Phoenix and Tucson, activity from nearby military installations such as Davis Montham AFB, and a commercial microwave installation on Kitt Peak. These I will comment on seperatly.

1. The cities of Phoenix and Tucson provided the usual high level TV and FM signals. While these signals were no stronger than those encountered at the Los Alamos, NM site (see VLBA Memo 401) the fact that these two major metropolitan areas were so close added many more signals. Tucson is somewhat shaded by Kitt Peak but Phoenix is line of site. The most obvious problem will be with TV channel 33 from Phoenix that is very strong and lies within the 550 - 650 MHz. band. There is also a low power TV translator on channel 36 that is present.

2. The 300 - 350 MHz. band was almost completely dominated by two-way aircraft communications presumably from the local military installations. This activity continued day and night. The band from 1 - 2 GHz. did not show any strong signals but personnel from the the 12 meter facility have reported strong interfering radar signals in this band.

3. The commercial (Mountain Bell) microwave facility on Kitt Peak is of some concern. This facility consists of two microwave links from Tucson and one microwave link to Sells, AZ, located west of Kitt Peak. The links from Tucson, which are in the 6 GHz. band, do not seem to be a problem. These signals were not detected during the monitoring of the 5.9 to 6.4 GHz. band. The link to Sells, AZ however, is in the 2 GHz. band and is very evident. The two major signals are at 2.121 GHz. and 2.172 GHz.

(2)

Maps of the Kitt Peak area are included as figure 1 and figure 2. Figure 1 shows the entire mountain top while figure 2 is an expanded view of the picnic area. Locations of the proposed VLBA site and the RFI Trailer are marked.

The elevation of the horizon around the proposed VLBA site is shown in figure 3. Negative elevation angles are not plotted.

Table I lists the plots of each band included in this report. These plots are typical plots showing those items of interest. Many more plots were generated for this survey and are available if required for further study. Table II lists a few special interest plots. These are one line plots that show some detail that was not included in the normal plots. Table III is a table of harmful interference levels and measured thresholds for this survey.

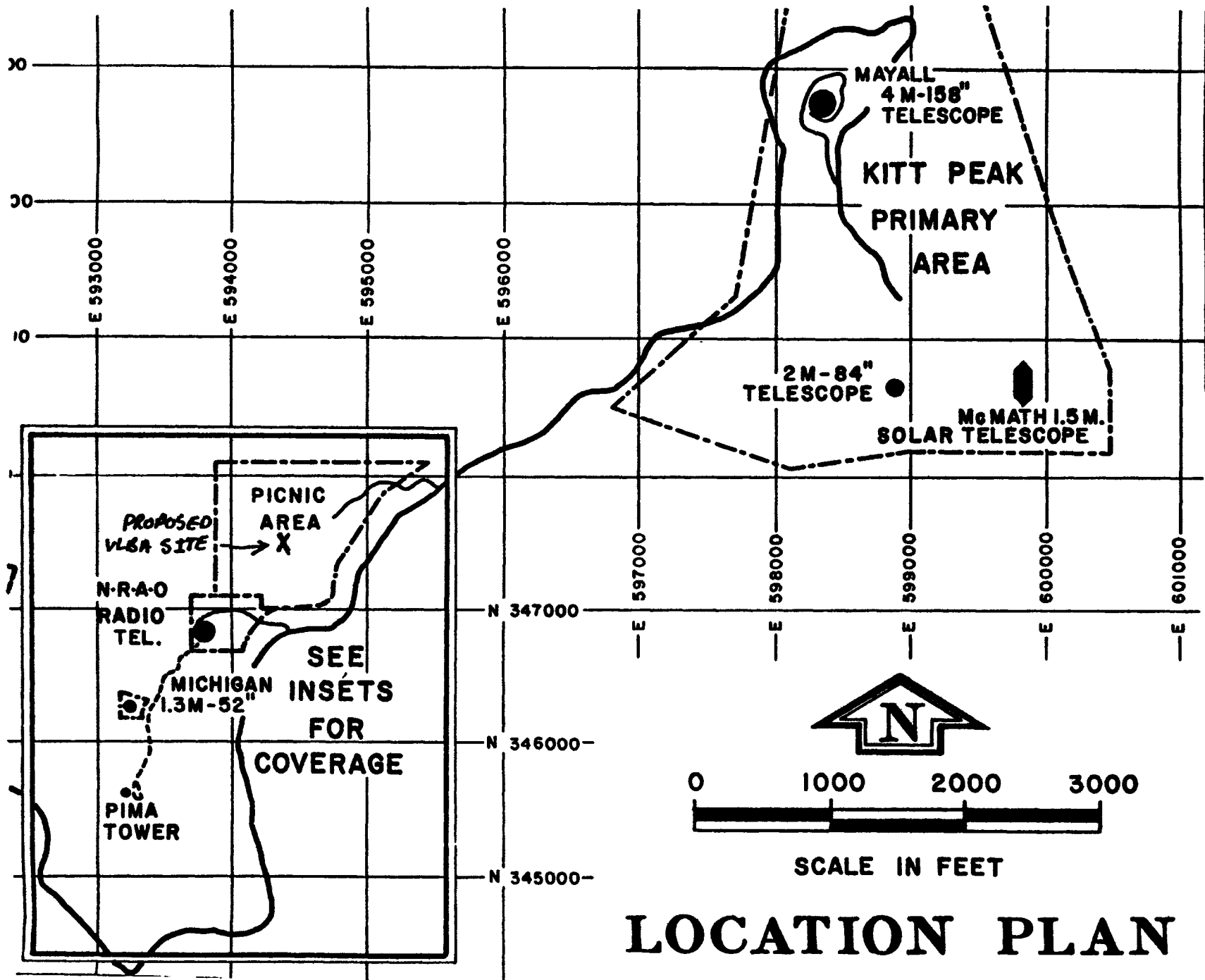


Figure 1 (3)

LOCATION PLAN

PICNIC and RECREATION AREA

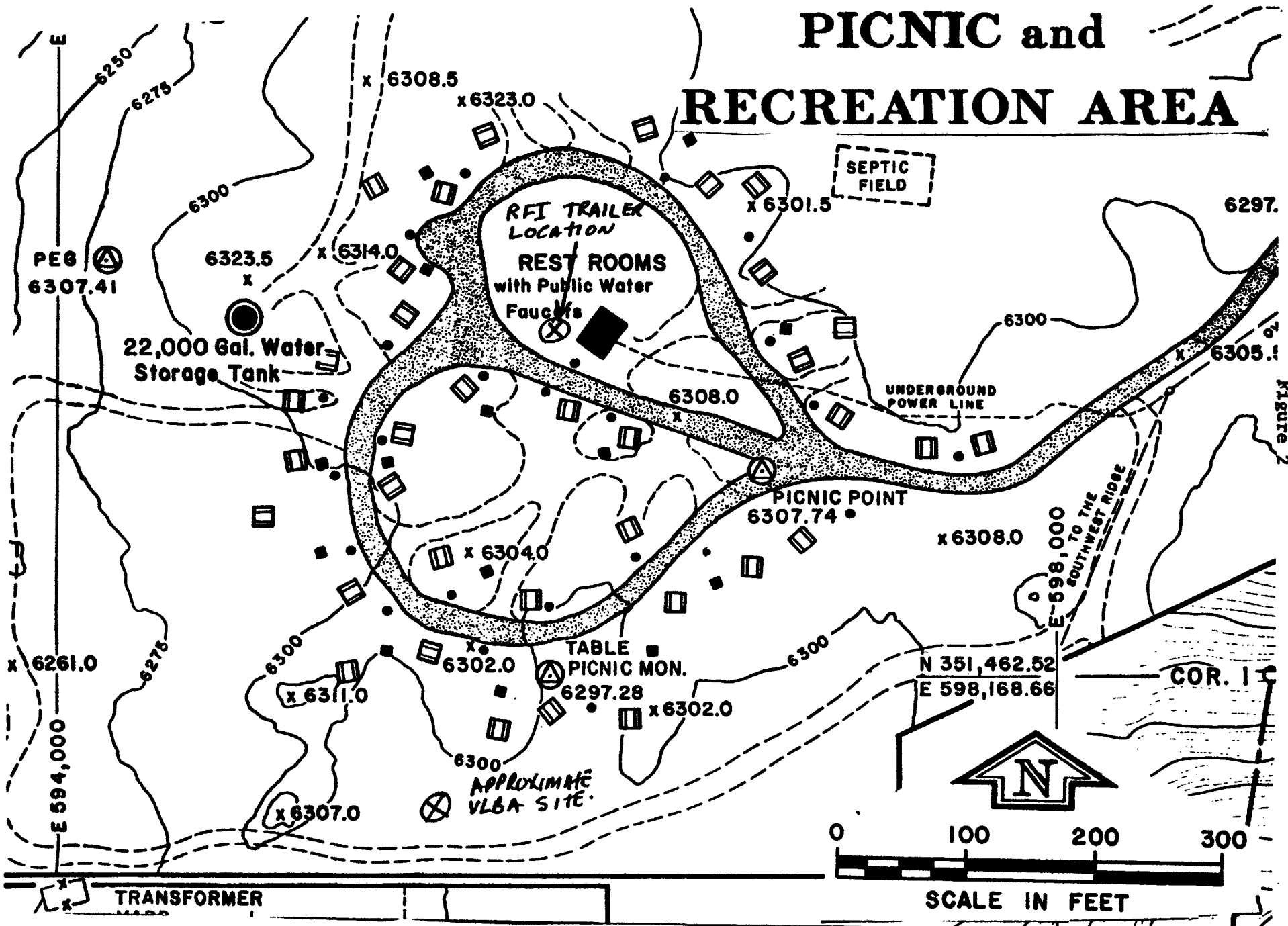
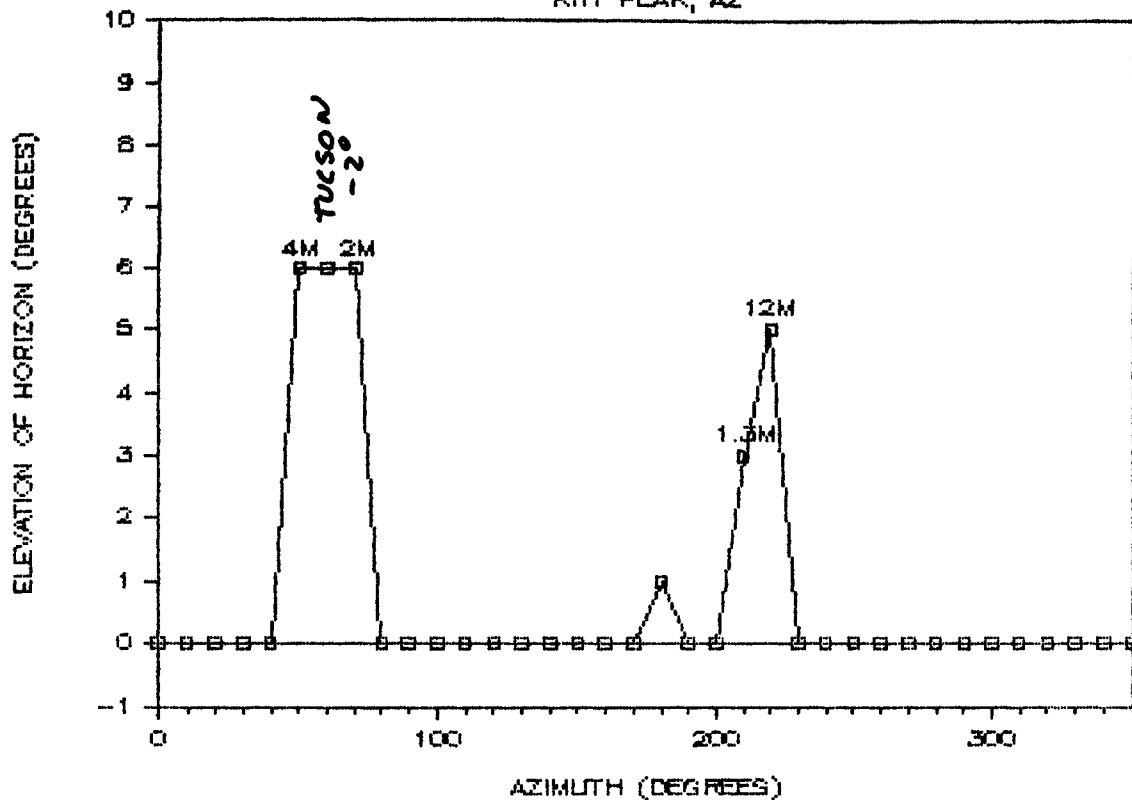


Figure 2
(4)

(5)
Figure 3

HORIZON ELEVATION

KITT PEAK, AZ



(6)
 TABLE I
 KITT PEAK, AZ

Plot #	Frequency	Filter Fc/BW	Comments
1	50 - 100 MHz	None	North
2	50 - 100 MHz	None	South.
3	300 - 350 MHz	325/50	High level signals are air/ground comm.
4	560 - 660 MHz.	600/100	Channel 33 from Phoenix. Channel 36 is low power translator.
5	1350 - 1550 MHz	1500/1000	East.
6	1550 - 1750 MHz	1500/1000	North.
7	2150 - 2350 MHz	HP2000	North.
8	2150 - 2350 MHz	HP2000	West.
9	4.2 - 4.7 GHz	HP4000	Typical plot.
10	4.7 - 5.2 GHz	HP4000	
11	5.9 - 6.4 GHz	HP4000	North. Not from Kipp Peak microwave system!
12	7.9 - 8.4 GHz.	HP6000	Typical plot.
13	8.4 - 8.9 GHz	HP6000	
14	10.2 - 10.7 GHz	HP6000	East.
15	10.7 - 11.2 GHz	HP6000	Typical plot.

(7)
TABLE II

Plot #	Frequency	Filter Fc/BW	Comments
16	74 - 76 MHz	75/5%	North. Single line plot.
17	74 - 76 MHz	75/5%	South. Single line plot.
18	1650 - 2650 MHz	HF2000	North. Local 2 GHz. microwave signals.
19	1650 - 2650 MHz	HF2000	East. Same as above.
20	1650 - 2650 MHz	HF2000	South. Same as above.
21	1650 - 2650 MHz	HF2000	West. Same as above.

(8)

TABLE III
HARMFUL INTERFERENCE LEVELS

<u>VLBA TUNNING RANGE</u>	<u>HARMFUL INTERFERENCE LEVELS (Note 1)</u>	<u>RFI MEASURED THRESHOLD (Note 2 and 3)</u>
50 - 100 MHz.	*	-155 dBW/m ²
310 - 340 MHz.	-151 dBW/m ²	-152 dBW/m ²
580 - 640 MHz.	-146 dBW/m ²	-148 dBW/m ²
1.35 - 1.75 GHz.	-135 dBW/m ²	-132 dBW/m ²
2.175 - 2.425 GHz.	*	-130 dBW/m ²
4.6 - 5.1 GHz.	-120 dBW/m ²	-127 dBW/m ²
4.99 - 5.0 GHz. (Sub-band)	-127 dBW/m ²	-127 dBW/m ²
5.9 - 6.4 GHz.	-120 dBW/m ²	-122 dBW/m ²
8.0 - 8.8 GHz.	*	-120 dBW/m ²
10.2 - 11.2 GHz.	-110 dBW/m ²	-112 dBW/m ²

Note 1: These levels, from VLB Array Memo No. 81, are increased by 10 dB since ground based RFI is likely to enter the antenna through 0 dBI sidelobes rather than the +10 dBI sidelobes assumed in Memo 81.

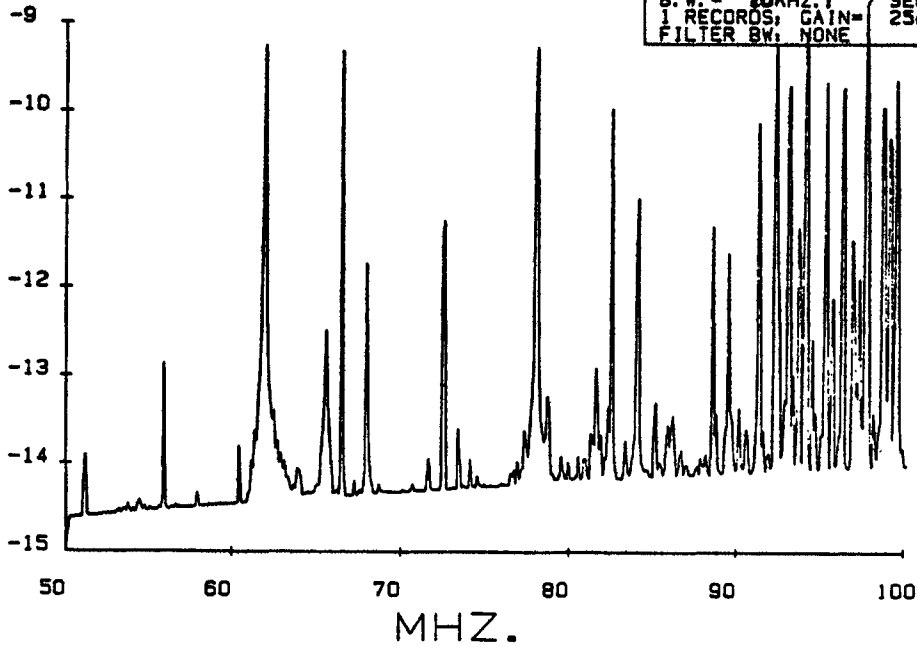
Note 2: These levels are threshold levels from Table I plots.

Note 3: These values may vary slightly from survey to survey because of minor equipment changes.

* These frequency bands not included in memo 81.

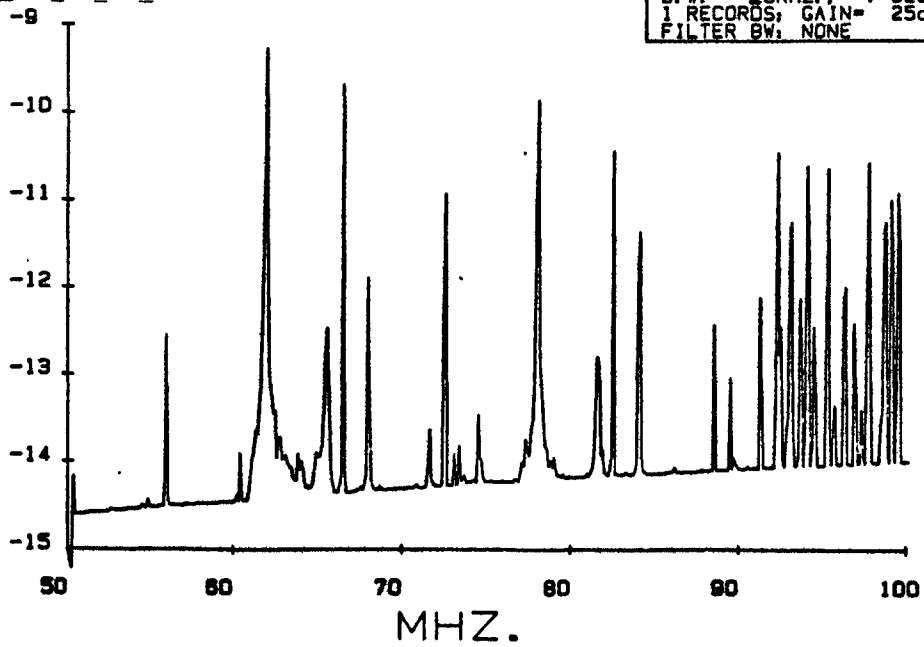
FLUX (LOG W/SQ. M)

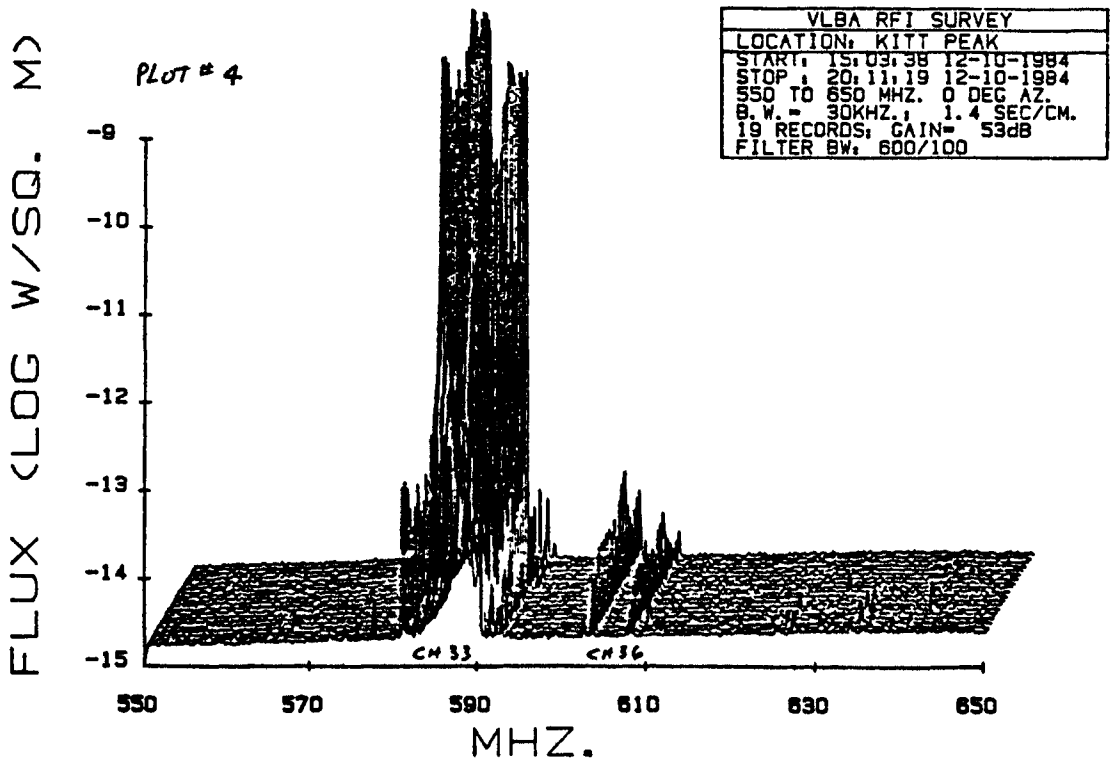
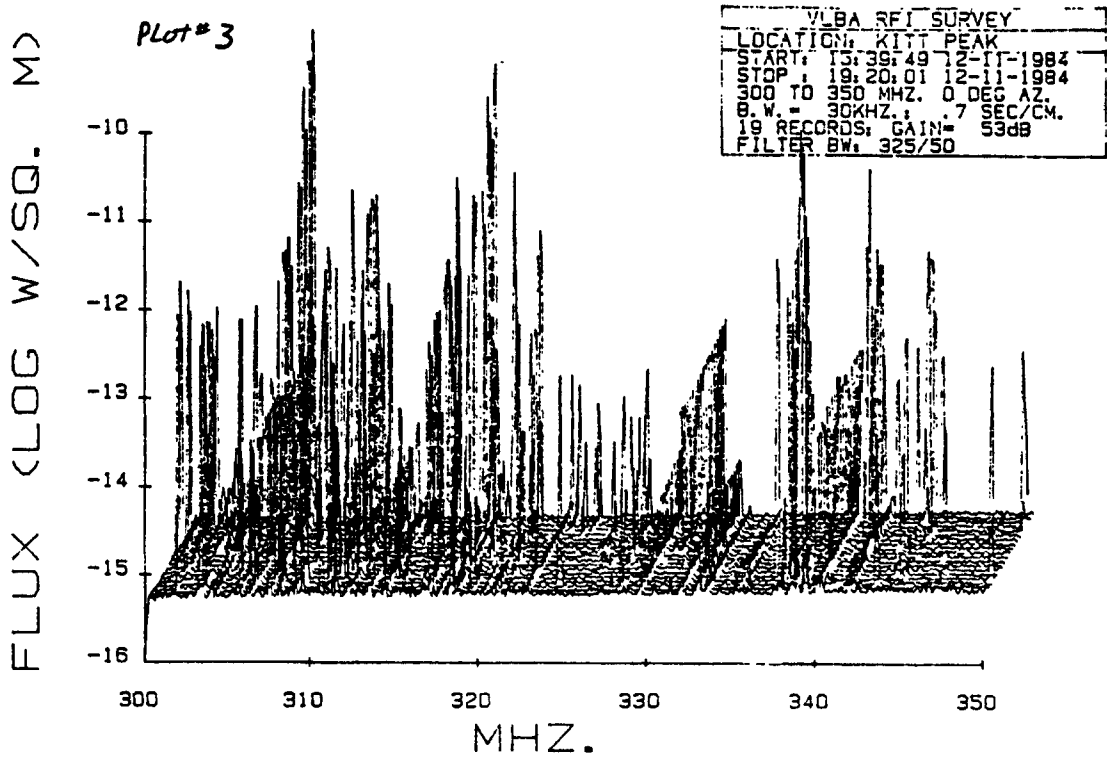
PLOT #1



FLUX (LOG W/SQ. M)

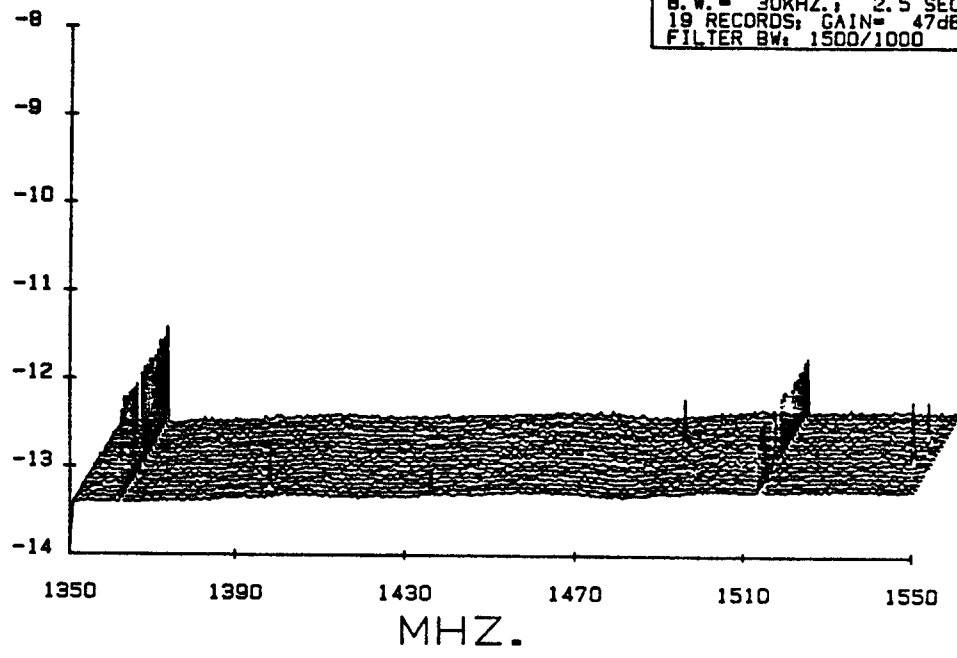
PLOT #2





FLUX (LOG W/SQ. M)

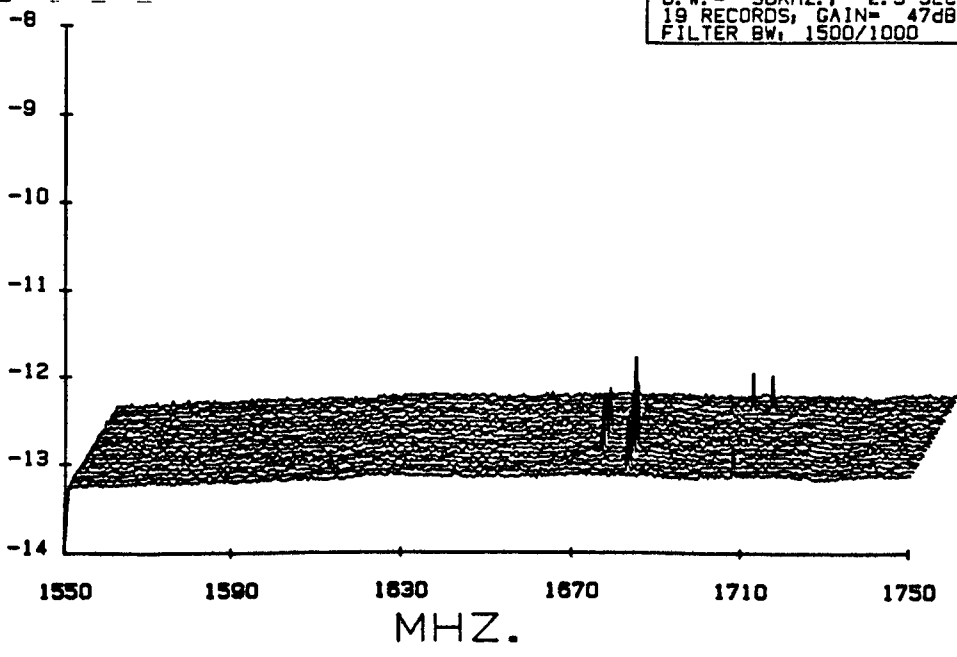
Plot #5



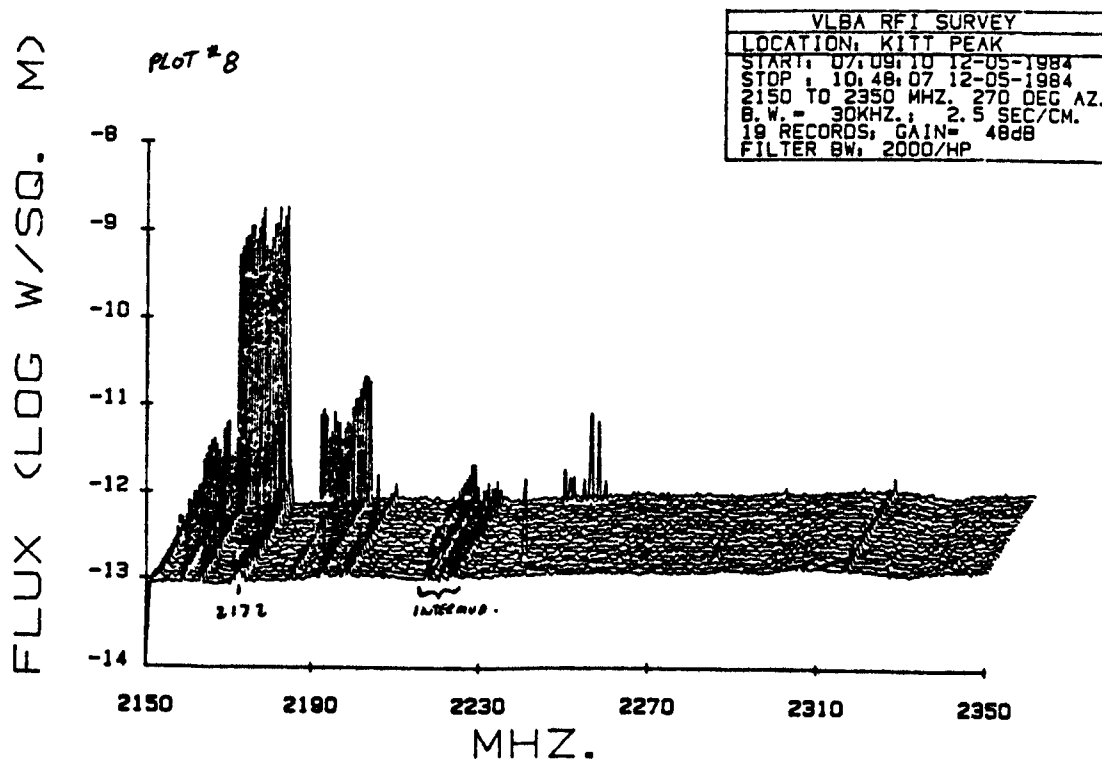
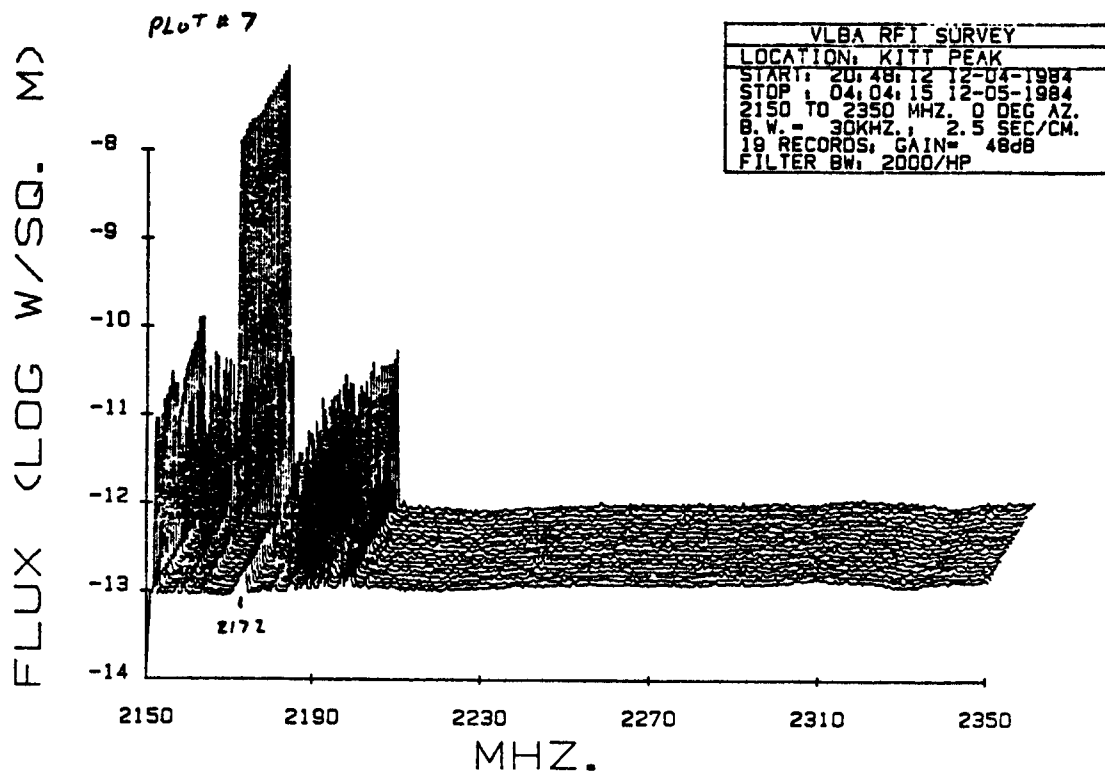
VLBA RFI SURVEY	
LOCATION: KITT PEAK	
START:	19:29:13 12-06-1984
STOP:	03:56:23 12-07-1984
1350 TO 1550 MHZ. 90 DEG AZ.	
B.W. =	30KHZ.; 2.5 SEC/CM.
19 RECORDS;	GAIN= 47dB
FILTER BW: 1500/1000	

FLUX (LOG W/SQ. M)

Plot #6

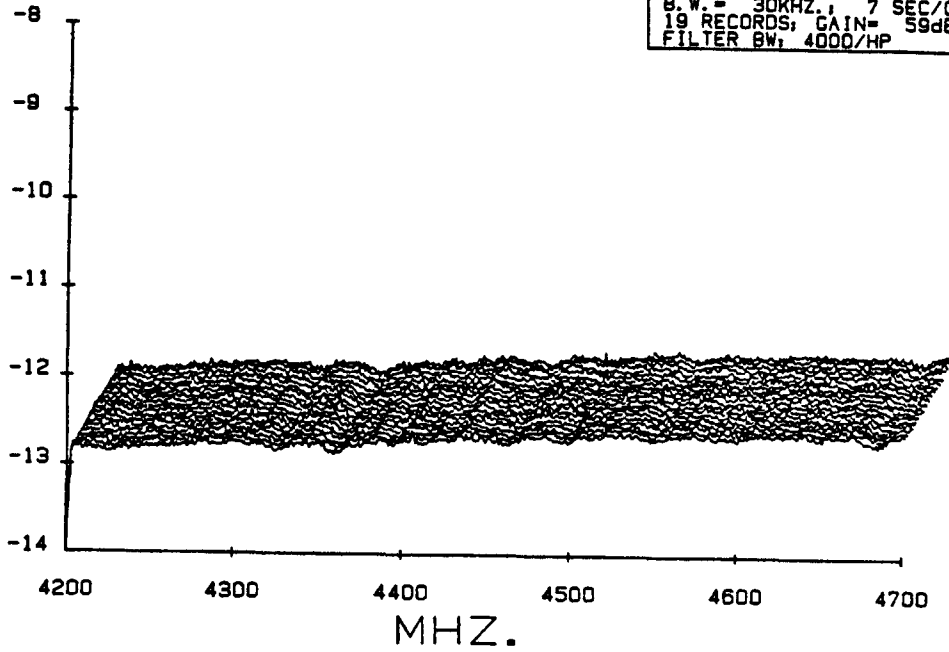


VLBA RFI SURVEY	
LOCATION: KITT PEAK	
START:	15:48:20 12-05-1984
STOP:	19:19:48 12-05-1984
1550 TO 1750 MHZ. 0 DEG AZ.	
B.W. =	30KHZ.; 2.5 SEC/CM.
19 RECORDS;	GAIN= 47dB
FILTER BW: 1500/1000	



FLUX (LOG W/SQ. M)

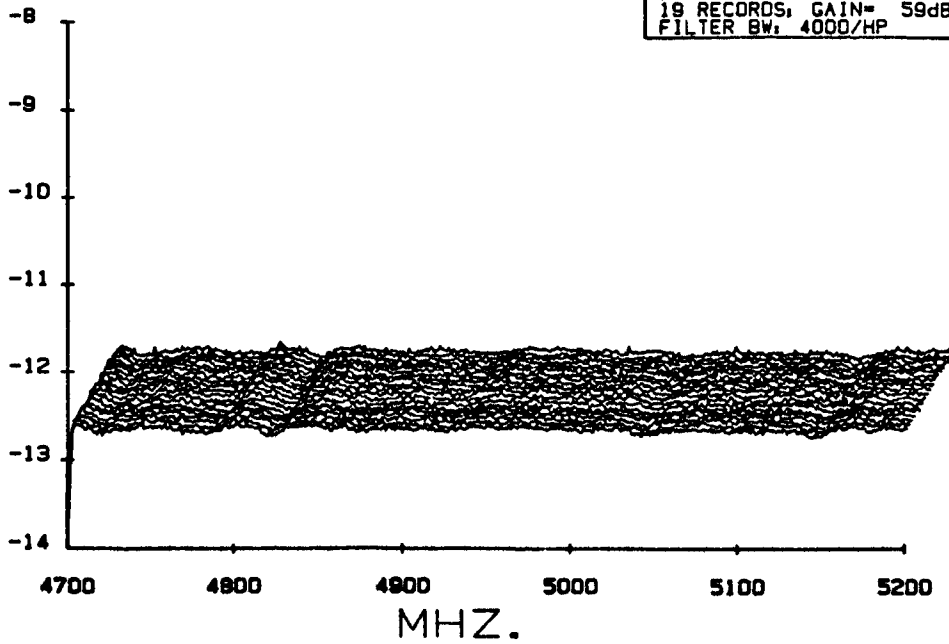
PLOT # 9



VLBA RFI SURVEY	
LOCATION: KITT PEAK	
START:	19:20:53 12-03-1984
STOP:	21:18:39 12-03-1984
4200 TO 4700 MHZ, 180 DEG AZ.	
B.W. = 30KHZ, 7 SEC/CM.	
19 RECORDS, GAIN= 59dB	
FILTER BW: 4000/HP	

FLUX (LOG W/SQ. M)

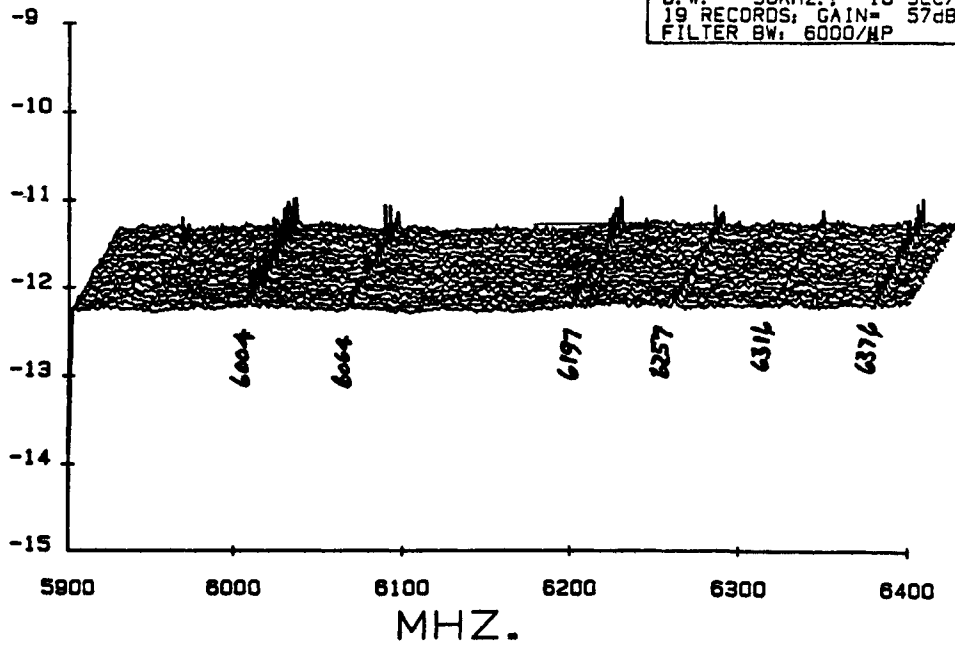
PLOT # 10



VLBA RFI SURVEY	
LOCATION: KITT PEAK	
START:	19:26:50 12-04-1984
STOP:	16:25:37 12-04-1984
4700 TO 5200 MHZ, 90 DEG AZ.	
B.W. = 30KHZ, 7 SEC/CM.	
19 RECORDS, GAIN= 59dB	
FILTER BW: 4000/HP	

FLUX (LOG W/SQ. M)

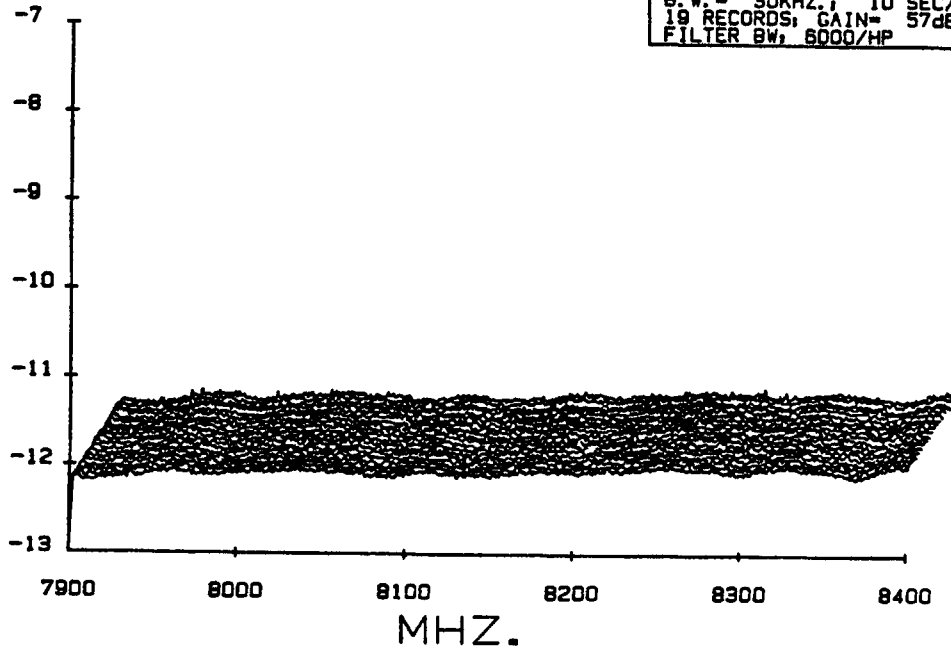
PLOT # 11



VLBA RFI SURVEY
LOCATION: KITT PEAK
START: 18:31:10 11-28-1984
STOP : 21:27:42 11-28-1984
5900 TO 6400 MHZ. 0 DEG AZ.
B.W. = 30KHZ.; 10 SEC/CM.
19 RECORDS; GAIN= 57dB
FILTER BW: 6000/HP

FLUX (LOG W/SQ. M)

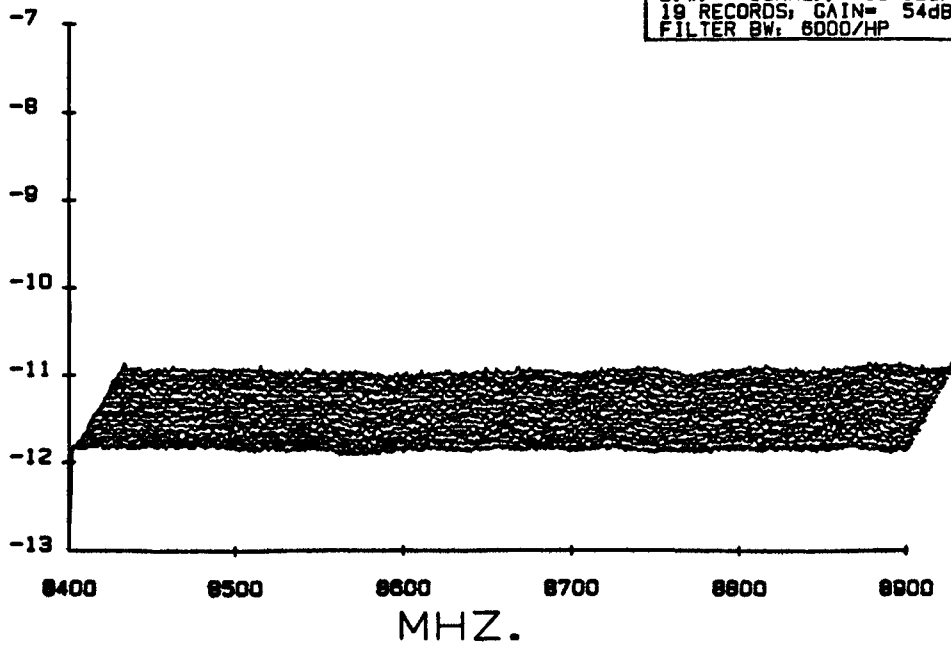
Plot # 12



VLBA RFI SURVEY	
LOCATION: KITT PEAK	
START:	11:39:13 11-29-1984
STOP:	14:32:43 11-29-1984
7900 TO 8400 MHZ. 180 DEG AZ.	
B.W. =	30KHZ., 10 SEC/CM.
19 RECORDS;	GAIN= 57dB
FILTER BW: 6000/HP	

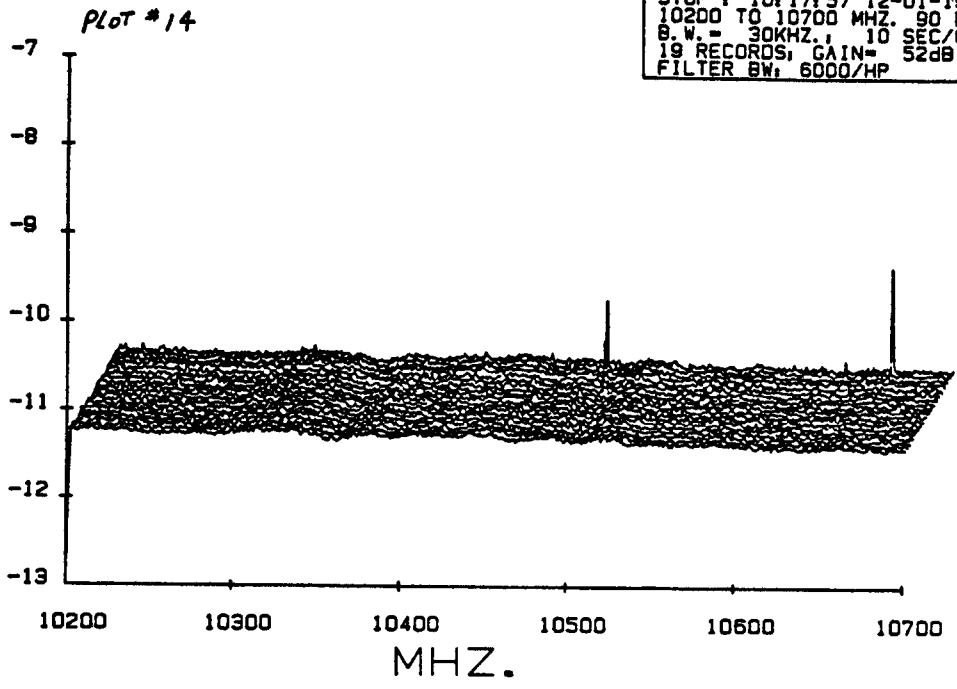
FLUX (LOG W/SQ. M)

Plot # 13



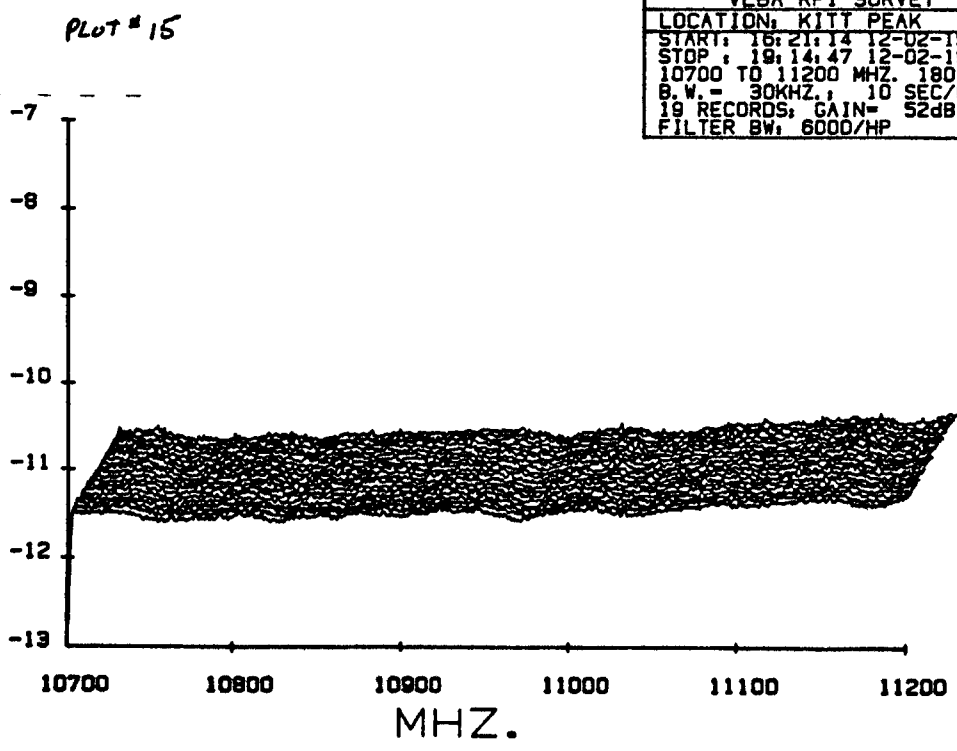
VLBA RFI SURVEY	
LOCATION: KITT PEAK	
START:	18:43:53 11-30-1984
STOP:	19:36:39 11-30-1984
8400 TO 8900 MHZ. 180 DEG AZ.	
B.W. =	30KHZ., 10 SEC/CM.
19 RECORDS;	GAIN= 54dB
FILTER BW: 6000/HP	

FLUX (LOG W/SQ. M)

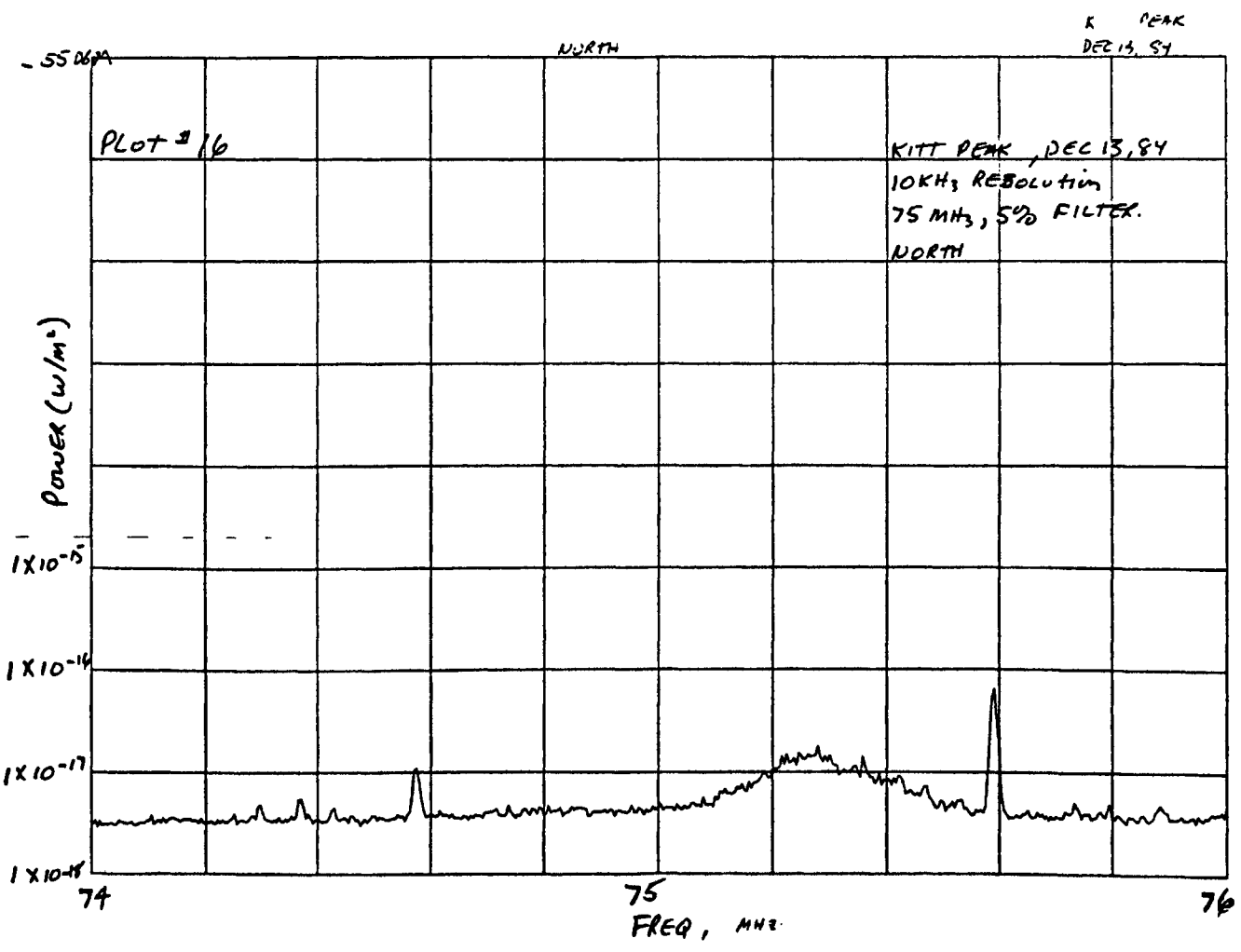


VLBA RFI SURVEY
LOCATION: KITT PEAK
START: 07:16:33 12-01-1984
STOP : 10:17:57 12-01-1984
10200 TO 10700 MHZ. 90 DEG AZ.
B.W. = 30KHZ.; 10 SEC/CM.
19 RECORDS; GAIN= 52dB
FILTER BW: 6000/HP

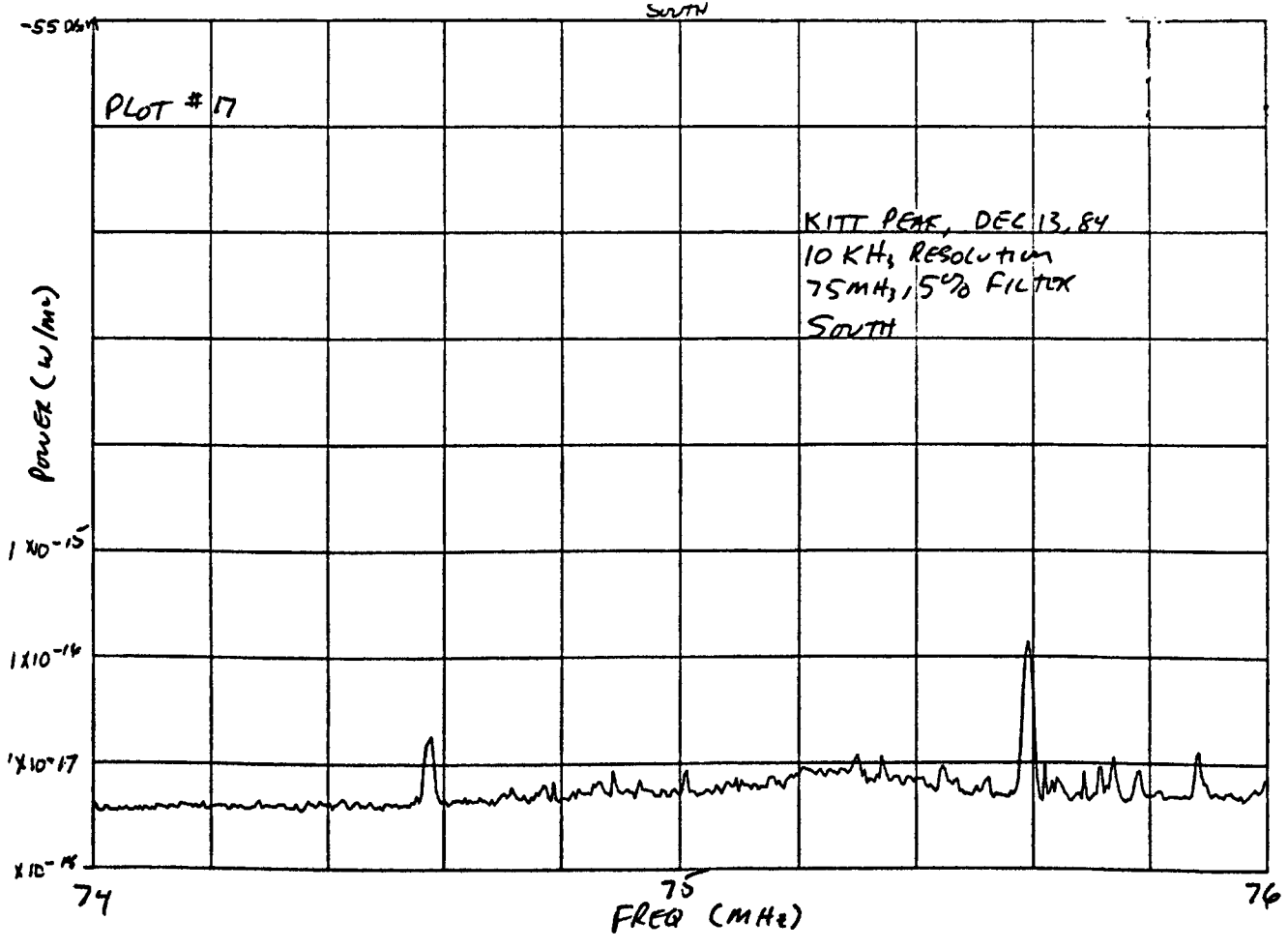
FLUX (LOG W/SQ. M)

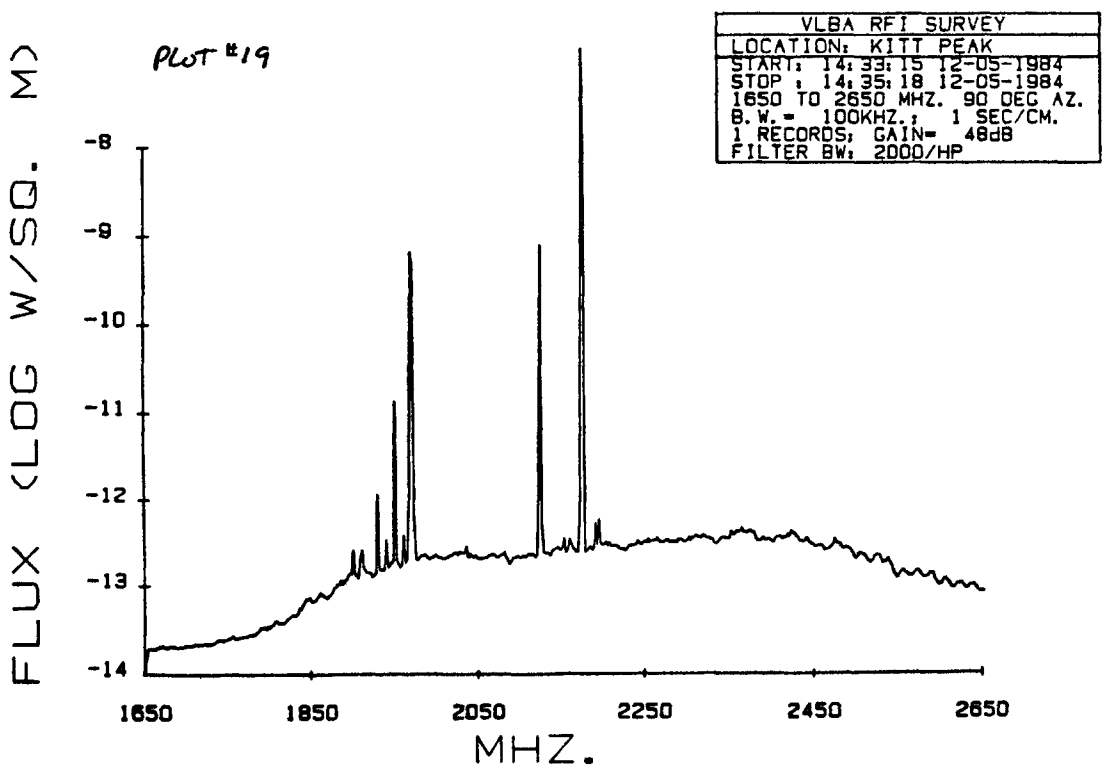
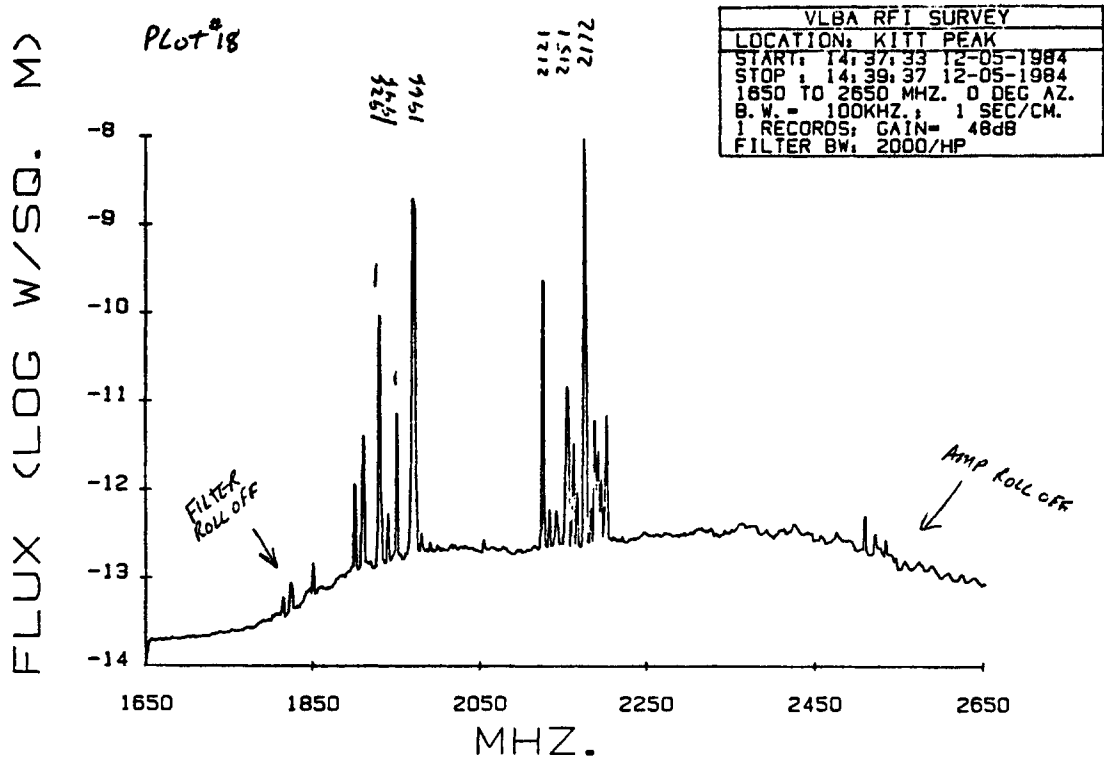


VLBA RFI SURVEY
LOCATION: KITT PEAK
START: 16:21:14 12-02-1984
STOP : 19:14:47 12-02-1984
10700 TO 11200 MHZ. 180 DEG AZ.
B.W. = 30KHZ.; 10 SEC/CM.
19 RECORDS; GAIN= 52dB
FILTER BW: 6000/HP



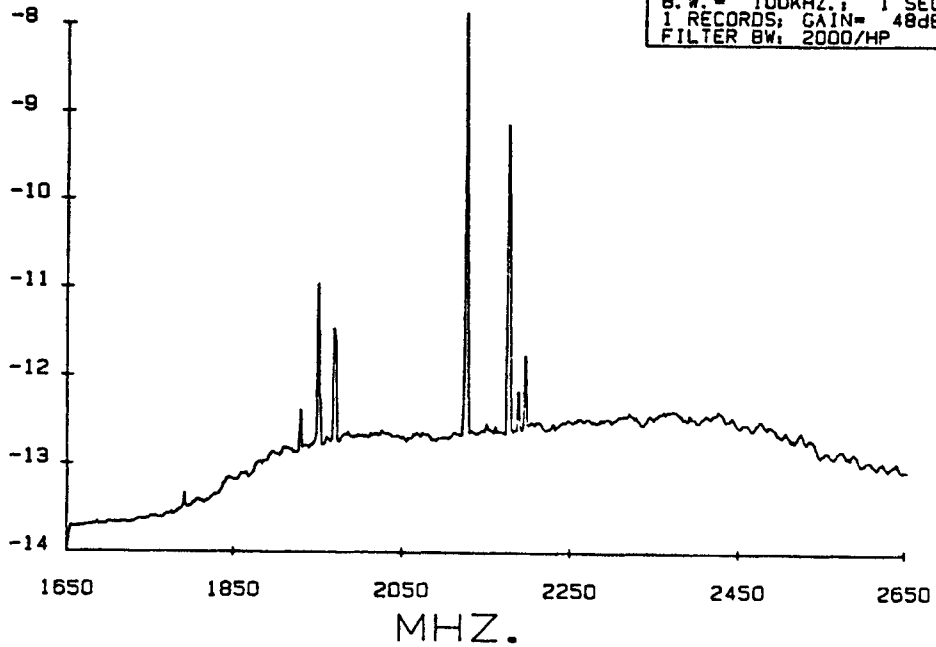
SOUTH





FLUX (LOG W/SQ. M)

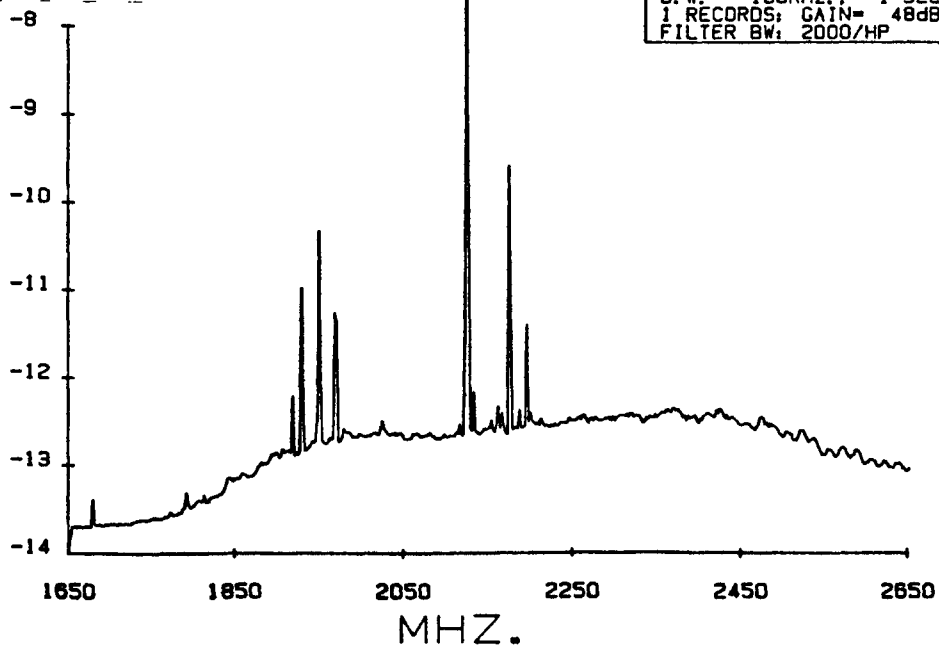
Plot # 20



VLBA RFI SURVEY	
LOCATION: KITT PEAK	
START:	14:45:59 12-05-1984
STOP:	14:48:02 12-05-1984
1650 TO 2650 MHZ. 180 DEG AZ.	
B.W. = 100KHZ.; 1 SEC/CM.	
1 RECORDS; GAIN= 48dB	
FILTER BW: 2000/HP	

FLUX (LOG W/SQ. M)

Plot # 21



LOCATION: KITT PEAK	
START:	14:41:48 12-05-1984
STOP:	14:43:51 12-05-1984
1650 TO 2650 MHZ. 270 DEG AZ.	
B.W. = 100KHZ.; 1 SEC/CM.	
1 RECORDS; GAIN= 48dB	
FILTER BW: 2000/HP	