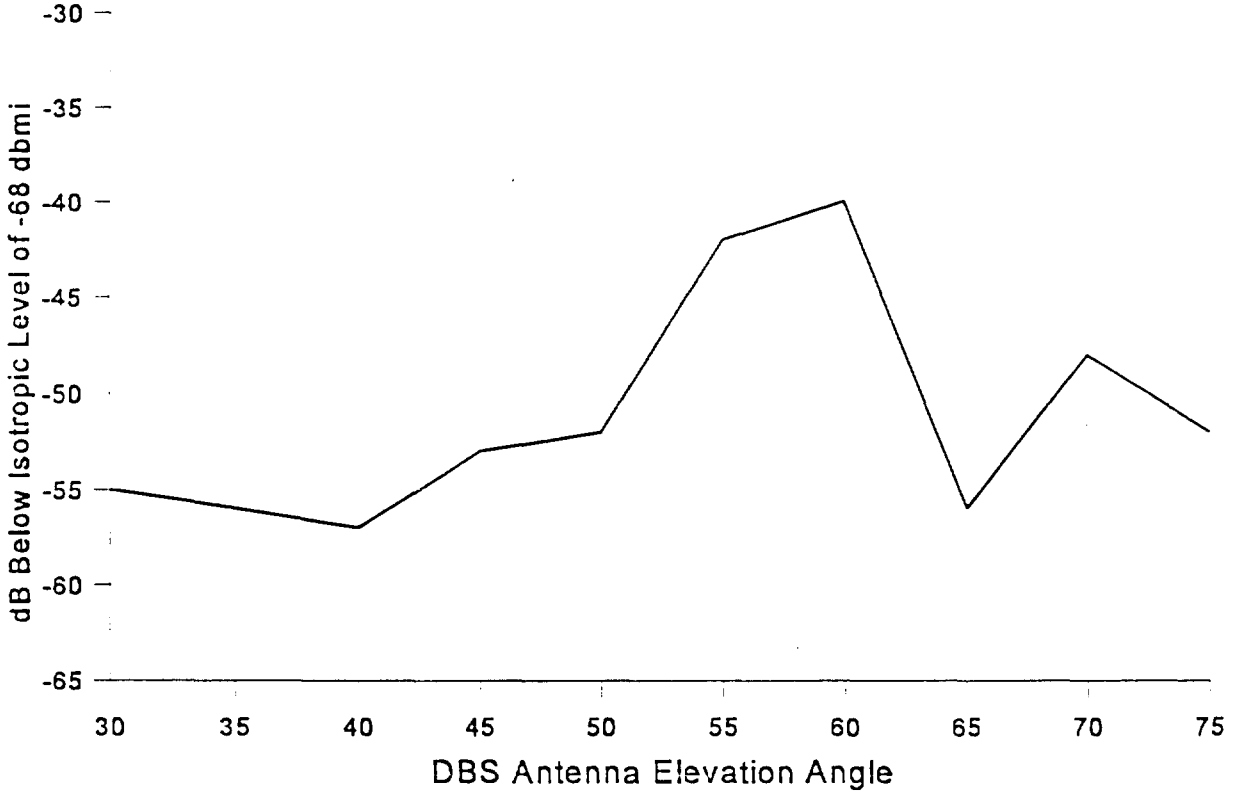
-30
-35
-40
-45
-50
-55
-60
-65
dB Below Isotropic Level of -68 dbmi
30
35
40
45
50
55
60
65
70
75
DBS Antenna Elevation Angle

Figure 3 3-1

King Ranch, Texas

Reference Level dBm_I

Azimuth: 180°

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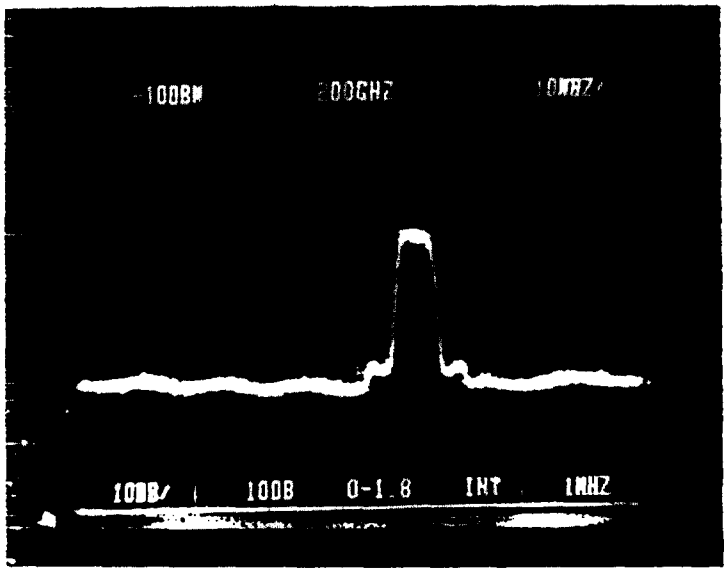
-93



Antenna Centerline: 9 Ft.

Elevation: 30 degrees

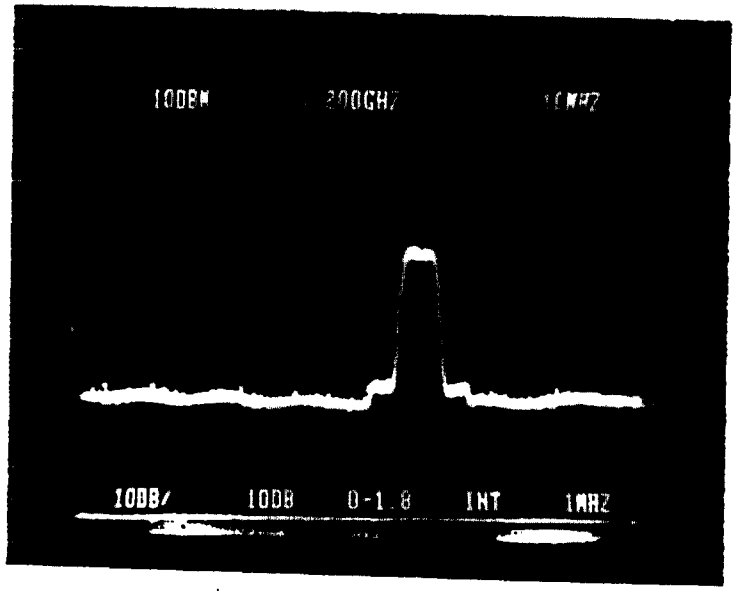
Level: -123 dBmi

(A)

Reference Level dBm_I

Azimuth: 180°

-93



Antenna Centerline: 9 Ft.

Elevation: 35 degrees

Level: -124 dBmi

(B)

Figure 3.3-2 RF Spectrum Analysis

King Ranch, Texas

Diversified Communications Engineering

Reference Level dBm

Azimuth: 180°

-93

Antenna Centerline: 9 Ft.

Elevation: 40 degrees

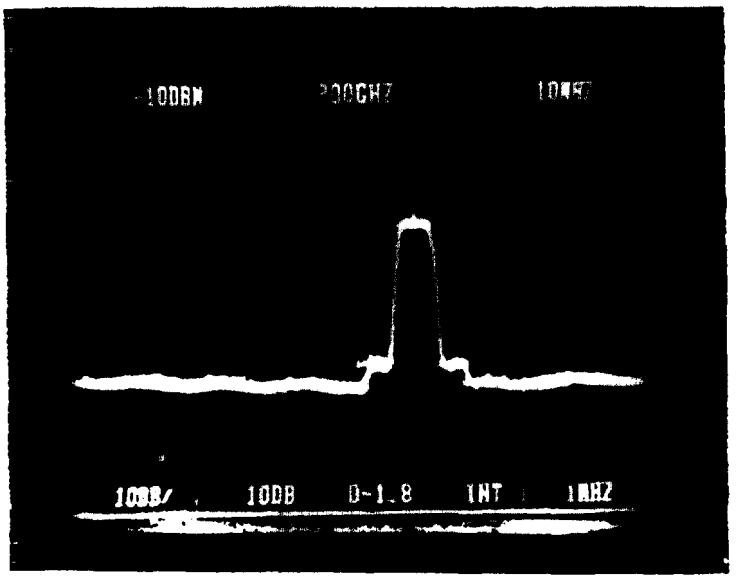
Level: -125 dBmi

(A)

Reference Level dBm

Azimuth: 180°

-93



Antenna Centerline: 9 Ft.

Elevation: 45 degrees

Level: -121 dBmi

(B)

Figure 3.3-3 RF Spectrum Analysis

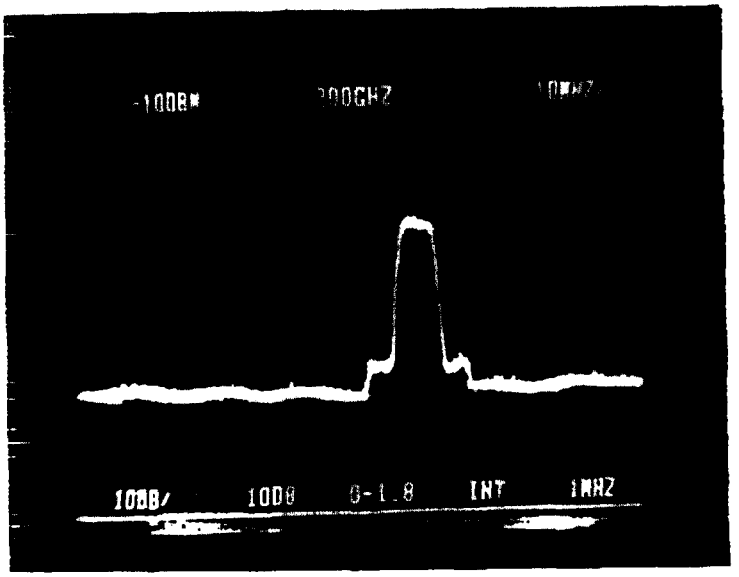
King Ranch, Texas

Diversified Communications Engineering

Reference Level dBm_i

Azimuth: 180°

-93



Antenna Centerline: 9 Ft.

Elevation: 50 degrees

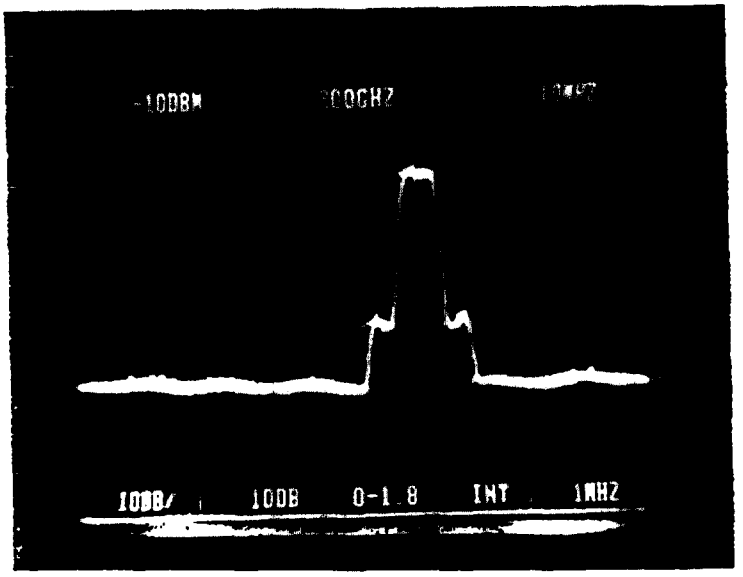
Level: -120 dBmi

(A)

Reference Level dBm_i

Azimuth: 180°

-93



Antenna Centerline: 9 Ft.

Elevation: 55 degrees

Level: -110 dBmi

(B)

Figure 3.3-4 RF Spectrum Analysis

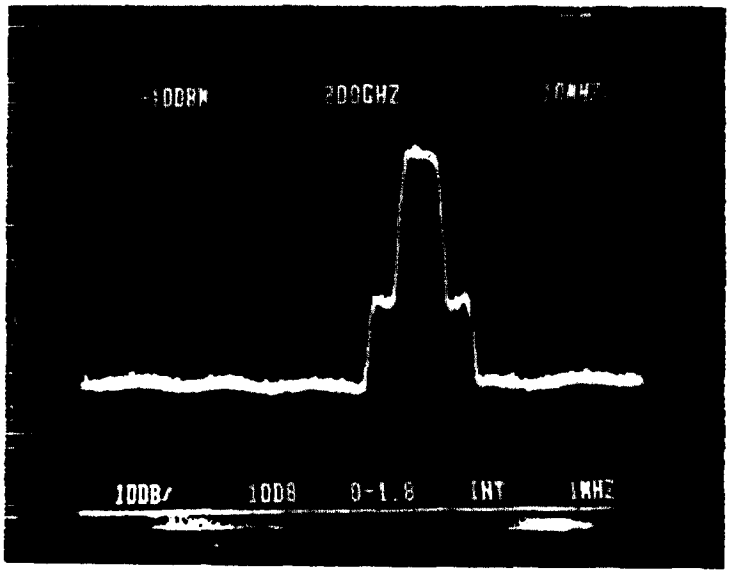
King Ranch, Texas

Reference Level dBm_i

Azimuth: 180°

Diversified Communications Engineering

-93



Antenna Centerline: 9 Ft.

Elevation: 60 degrees

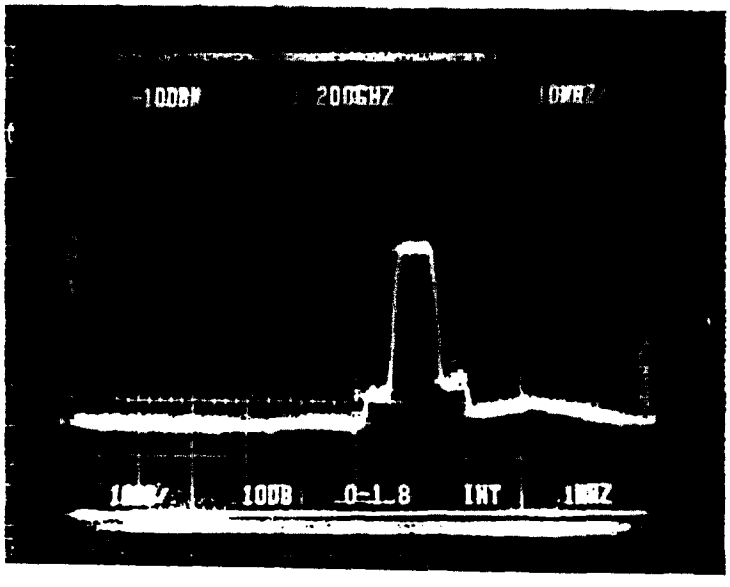
Level: -108 dBmi

(A)

Reference Level dBm_i

Azimuth: 180°

-93



Antenna Centerline: 9 Ft.

Elevation: 65 degrees

Level: -124 dBmi

(B)

Figure 3.3-5 RF Spectrum Analysis

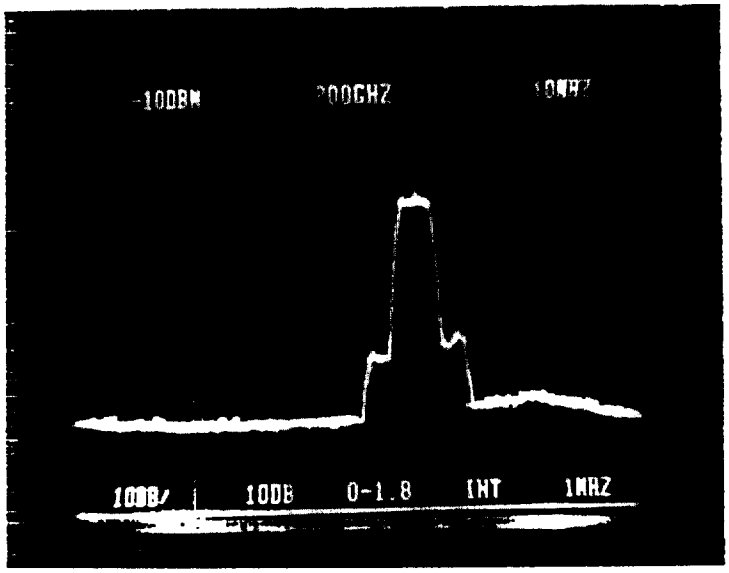
King Ranch, Texas

Diversified Communications Engineering

Reference Level dBm_1

Azimuth: 180°

-93



Antenna Centerline: 9 Ft

Elevation: 70 degrees

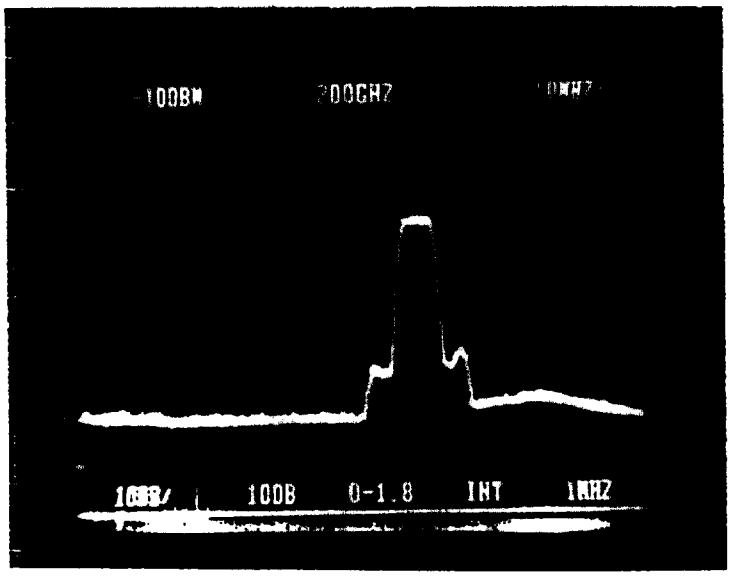
Level: -116 dBmi

(A)

Reference Level dBm_1

Azimuth: 180°

-93



Antenna Centerline: 9 Ft

Elevation: 75 degrees

Level: -120 dBmi

(B)

Figure 3.3-6 RF Spectrum Analysis

SECTION 4

SUMMARY OF RESULTS

4.1 C/I Discussion Based on Observed Levels During Testing

Once the 12 GHz isotropic level at a given measurement site was verified with the Comsearch test set, an L-band isotropic reference could be established on the spectrum analyzer (Section 3 data).

The DBS antenna was aligned on either the DIRECTV or ECHOSTAR satellite and the signal peaked for maximum satellite signal strength utilizing both the spectrum analyzer and the DBS system. The interference could then be observed (when present) along with the DBS signal.

The observed levels of two digital signals had to be corrected based upon bandwidth (all spectrum analyzer readings were at 1 MHz resolution bandwidth). The transmitter bandwidth used was 8 MHz (correction factor of 9 DB). A satellite bandwidth of 24 MHz was used (correction factor of 13.8 DB).

The transmitter power was then reduced until interference was no longer observed in the DBS system. Table 4.1-1 shows the transmit power required to achieve acceptable reception on the DBS system for each of the test sites as shown in Figure 2.6-1

Although the reduced isotropic level at 12 GHz was know based on the previous full power verification, the L-Band interference isotropic level could not be determined when masked by the satellite signal since exact DBS antenna characteristics were not known.

The following method for establishing a working C/I value was used:

It was observed that when the interference (as seen at L-band) approached the satellite signal level the interference would cease. Once the interference ceased the DBS antenna was slightly detuned, first in azimuth, then again in elevation; each time the interference level at L-band was recorded as it appeared just above the transponder level (see Figures 3.1-3 and 3.1-13). In this manner the value of about 5 dB for the C/I needed to eliminate interference was determined.

The fact that the C/I of 4.8 dB is reached when both signals appear at the same level on the screen is due to the difference in the digital correction factors for the two different bandwidths.

Satellite transponder	24 MHz/13.8 dB correction
interference	8 MHz/ 9 dB correction
C/I value needed	= 4.8 dB difference
for no interference	

Consistently, at all sites, when the interference level was equal to or below the satellite level as seen on the analyzer screen at L-band, no interference to the DBS signal was observed. This represented a C/I value of about 5 dB or less.

Table 4.1-1

Test Site	Distance from Transmitter	Transmitter Power in dBm (29 dBm full power)	
		DIRECTV	ECHOSTAR
#2	1800' behind transmitter	29	29
#3	1320'	11	9
#4	6330'	29	29
#5	7400'	20	29
#6	8975'	N/A	N/A
#7	5280'	29	20
#8	1320'	N/A	5
#9	600'	9	9
#10	610' behind transmitter	29	29
#11	1400' behind transmitter	29	29
#12	1100' behind transmitter	29	29
#13	9.9 miles	29	N/A

The power levels stated above represent the highest transmit power measured while maintaining acceptable television reception on the DBS satellite system. This process involved monitoring of a television set connected to the DBS satellite receiver. Unacceptable reception was determined by a loss of audio along with the video image freezing on the screen. Where N/A is used no measurements were taken of the DBS system.

4.2 DBS Antenna Azimuth Test

The DBS antenna was pointed in the direction of the interference source at an elevation angle of 32 degrees. The interference source was one mile from the receive location.

The predicted receive level at the DBS site for the 29 dBm output power, the 2 dB of waveguide losses, an antenna gain of 10 dBi and a free space loss of 118.5 dB is -81.5 dBm. The measured receive level was -89 dBm or 7.5 dB below the predicted line-of-sight level.

For the measurement data tabulated in Section 3.2, the received levels vary from -131 dBm to -149 dBm from 0 to plus or minus 180 degrees or from 42 to 60 dB below the actual signal level at the measurement point.

The pattern seems to have peaks at 135 degrees and at 225 degrees at +/- 45 degrees from the interference source. Table 4.2-1 presents the antenna gain relative to the level measured at the 180 degree point.

Table 4.2-1

	Azimuth	Signal Level (dB)	Relative Level
	180	-145	0
165	(+15)	-140	5
195	(-15)	-141	4
150	(+30)	-139	6
210	(-30)	-136	9
135	(+45)	-135	10
225	(-45)	-131	14
120	(+60)	-147	-2
240	(-60)	-141	4
105	(+75)	-147	-2
255	(-75)	-144	1
90	(+90)	-145	0
270	(-90)	-146	-1
75	(+105)	-149	-4
285	(-105)	-146	-1
60	(+120)	-145	0
300	(-120)	-141	4
45	(+135)	-144	1
315	(-135)	-141	4
30	(+150)	-148	-3
330	(-150)	-141	4
15	(+165)	-146	-1
345	(-165)	-146	-1
360	(+/-180)	-143	2

There are no conclusions made based on this data.

4.3 DBS Antenna Elevation Test

The DBS satellite receive antenna was pointed away from the interfering source and measurements were made where the antenna elevation was varied from 30 to 75 degrees in elevation. The receive signal level at the satellite locations was predicted to be -69.5 dBm based on the 1320 foot distance from the interference source. The measured level was -68 dBm which is within 1.5 dB of the predicted.

Elevation angle	Signal Level (dBm)	Level below 68 dBm
30	-123	55
35	-124	56
40	-125	57
45	-121	53
50	-120	52
55	-110	42
60	-108	40
65	-124	56
70	-116	48
75	-120	52

CERTIFICATE OF SERVICE

I, Sally L. Linzau, a secretary with the law firm of Cole, Raywid & Braverman, L.L.P., do hereby certify that a copy of the foregoing was sent this 15th day of January 1998, via first class mail, postage prepaid, United States mail, to the following:

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*Via Hand Delivery

January 15, 1998

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