

8.3 Occupied Bandwidth and In Close Spurious

47CFR Reference:

2.1049, Occupied Bandwidth

87.135, Bandwidth of Emission

8.3.1 Occupied Bandwidth Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model	Asset #	Cal Date
A	T2CAS Computer	ACSS	RT-952	NA	
B	TCAS 2000 System Panel	ACSS	9000121-001	NA	
C	Attenuator	Narda	765-20	NA	
D	Attenuator	Narda	765-20	NA	
E	Spectrum Analyzer	Hewlett-Packard	HP8592L	418	6/11/03

Table 10: Occupied Bandwidth Test Equipment Required

8.3.2 Occupied Bandwidth and In Close Test Setup

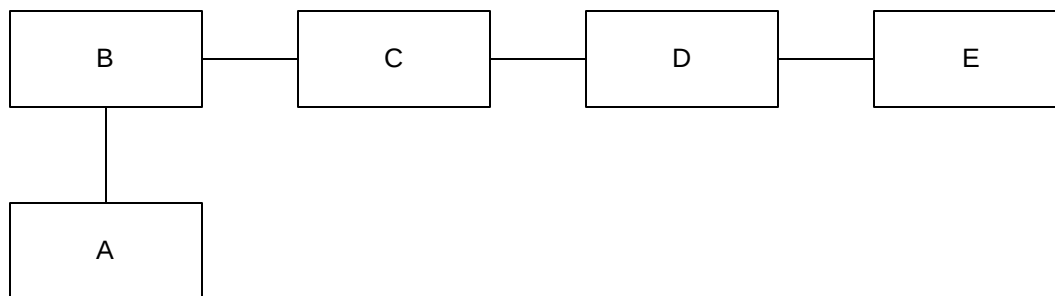


Figure 25: Occupied Bandwidth Test Setup

8.3.3 Occupied Bandwidth and In Close Test Procedure

- 1 Connect the equipment as shown in Figure 25 above.
- 2 Configure the program pins on the TCAS 2000 System Panel to invoke Test Mode 2 (Mode S, Long P6, DPSK Modulation, Test Mode Program switches on System Panel to DDUD).
- 3 Use a 300 kHz IF bandwidth on the Spectrum Analyzer and record the peak power levels at 1 MHz intervals from 1005 MHz to 1055 MHz.
- 4 Enter the data into the ACSS utility program "OCCBW.EXE" and calculate the Occupied Bandwidth.
- 5 Record the occupied bandwidth that has been calculated by the OCCBW.EXE program in the T²CAS FCC Test Report.

8.3.4 Occupied Bandwidth and In Close Spurious Test Data

FREQ OFFSET (MHZ)	LEVEL (DBC)	FREQ OFFSET (MHZ)	LEVEL (DBC)
-1.0	-8.7	+1.0	-8.7
-2.0	-8.9	+2.0	-9.0
-3.0	-9.8	+3.0	-10.9
-4.0	-19.1	+4.0	-20.6
-5.0	-20.8	+5.0	-20.6
-6.0	-25.8	+6.0	-25.6
-7.0	-30.5	+7.0	-37.2
-8.0	-37.1	+8.0	-30.6
-9.0	-39.2	+9.0	-39.3
-10.0	-49.1	+10.0	-50.0
-11.0	-45.9	+11.0	-45.9
-12.0	-47.4	+12.0	-47.7
-13.0	-46.1	+13.0	-45.9
-14.0	-40.7	+14.0	-40.9
-15.0	-48.7	+15.0	-49.0
-16.0	-32.9	+16.0	-33.7
-17.0	-44.1	+17.0	-43.9
-18.0	-40.2	+18.0	-40.6
-19.0	-19.2	+19.0	-19.1
-20.0	-25.6	+20.0	-25.7
-21.0	-52.2	+21.0	-52.4
-22.0	-53.1	+22.0	-53.2
-23.0	-58.1	+23.0	-57.8
-24.0	-56.1	+24.0	-55.5
-25.0	-9.8	+25.0	-11.1

PERCENT TOTAL ENERGY

+50.7
+64.4
+77.4
+86.8
+87.9
+88.7
+89.0
+89.1
+89.1
+89.1
+89.1
+89.1
+89.1
+89.1
+89.1
+89.2
+89.2
+89.2
+90.4
+90.7
+90.7
+90.7
+90.7
+90.7
+100.0

OCCUPIED BANDWIDTH (MHZ)

+1.0
+3.0
+5.0
+7.0
+9.0
+11.0
+13.0
+15.0
+17.0
+19.0
+21.0
+23.0
+25.0
+27.0
+29.0
+31.0
+33.0
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+37.0
+39.0
+41.0
+43.0
+45.0
+47.0
+49.0
+51.0

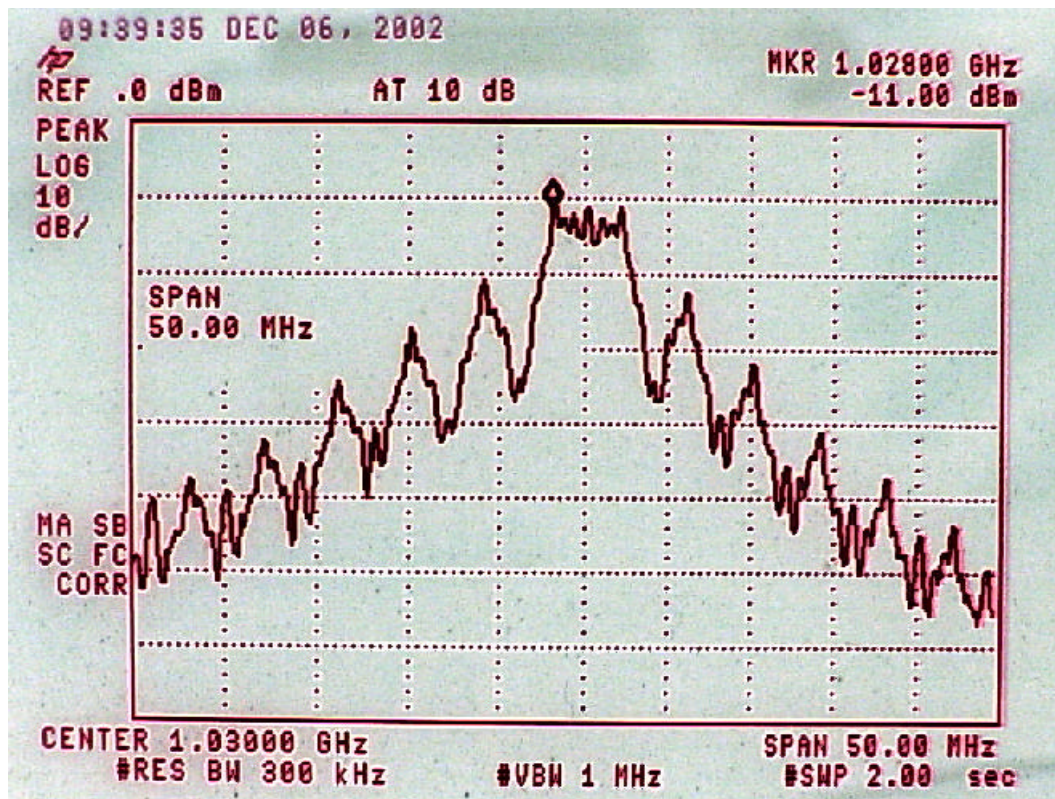


Figure 26: In Close Spurious: 5 MHz/Div

8.4 Spurious Emissions at Antenna Terminals

47CFR Reference:

2.1051, Spurious Emissions at Antenna Terminals

87.139, Emissions Limitations

47CFR2.1051 states that the radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna.

47CFR2.1051 says that curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in Sec 2.1049 (Occupied Bandwidth) as appropriate. In the Occupied Bandwidth test, the TCAS portion of the T²CAS unit was operated in Test Mode 2, and that same test mode will be used here for the Spurious Emissions at Antenna Terminals Test.

8.4.1 Spurious Emissions at Antenna Terminals (0 – 2000 MHz)

8.4.1.1 Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model	Asset #	Cal Date
A	T2CAS Computer	ACSS	RT-952	NA	
B	TCAS 2000 System Panel	ACSS	9000121-001	NA	
C	Attenuator	Narda	765-20	NA	
D	Attenuator	Narda	765-20	NA	
E	Spectrum Analyzer	Hewlett-Packard	HP8592L	418	6/11/03

Table 11: Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Equipment Required

8.4.1.2 Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Setup

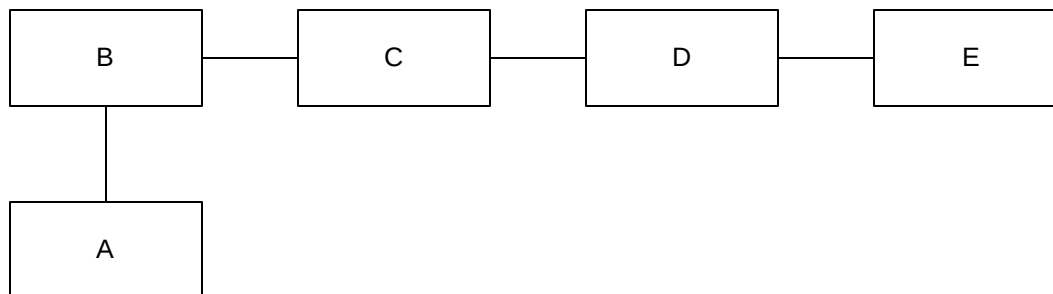


Figure 27: Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Setup

8.4.1.3 Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Procedure

1. Connect the equipment as shown in Figure 27 above.
2. Configure the TCAS 2000 System Panel to invoke Test Mode 2 (Mode S, Long P6, DPSK Modulation, Test Mode Program switches on System Panel to DDUD).
3. Measure and plot all spurious below 2000 MHz. Use a 300 kHz IF bandwidth on the Spectrum Analyzer.

8.4.1.4 Spurious Emissions at Antenna Terminals (0-2000 MHz) Test Data

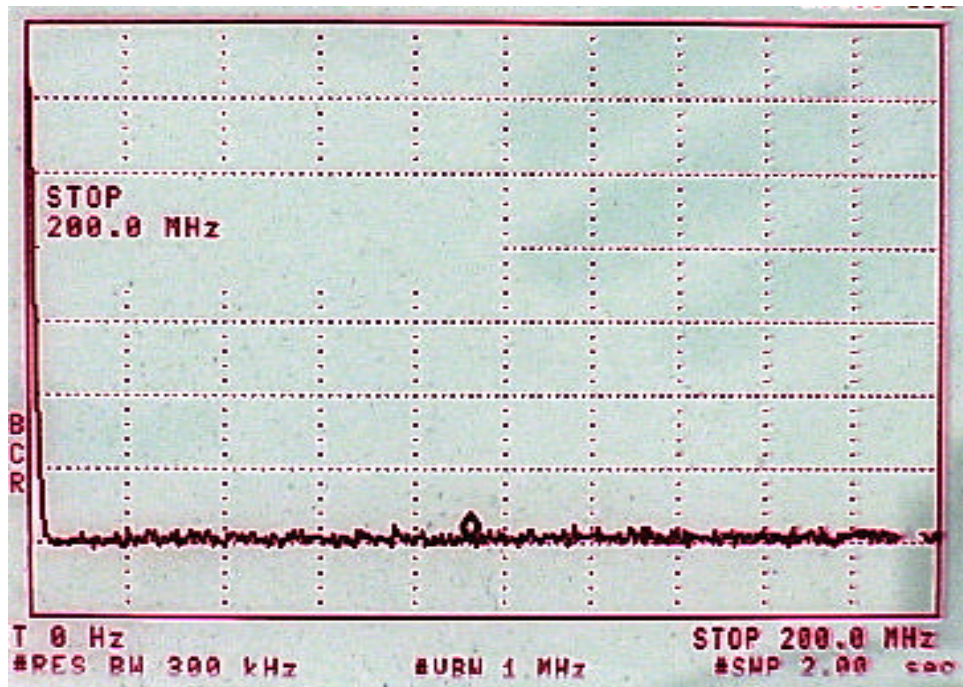


Figure 28: 0 – 200 MHz Frequency Span

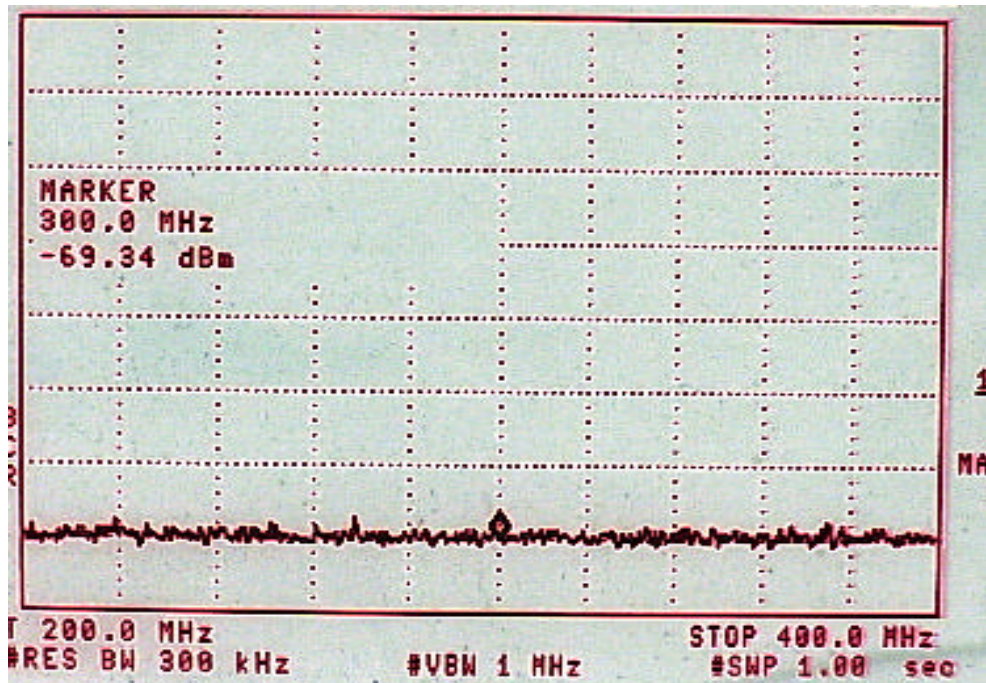


Figure 29: 200 – 400 MHz Frequency Span

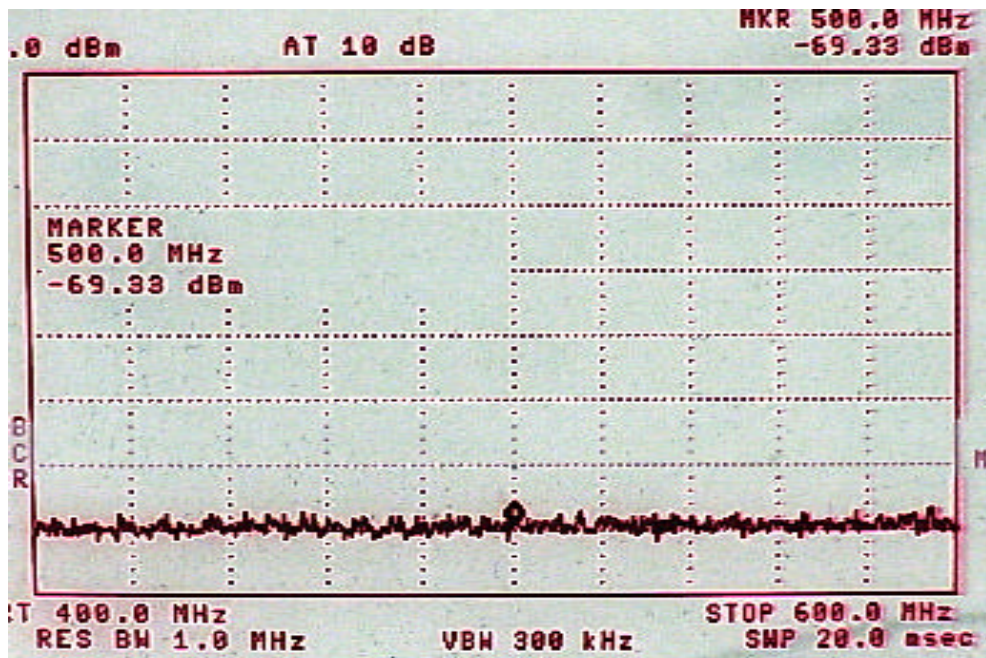


Figure 30: 400 – 600 MHz Frequency Span

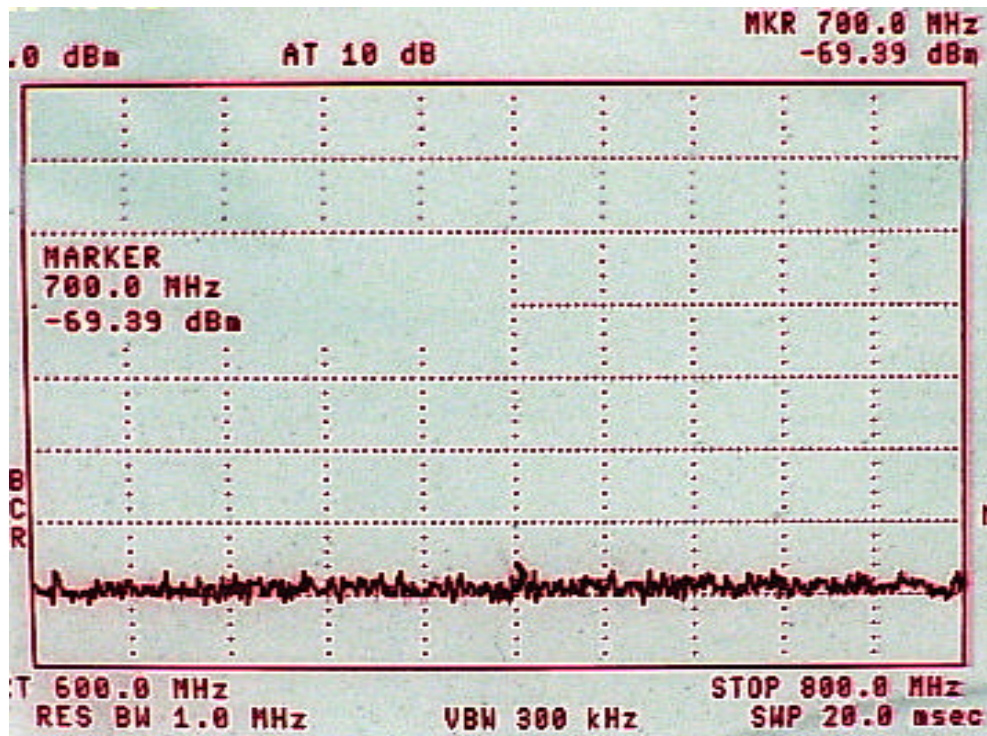


Figure 31: 600 – 800 MHz Frequency Span

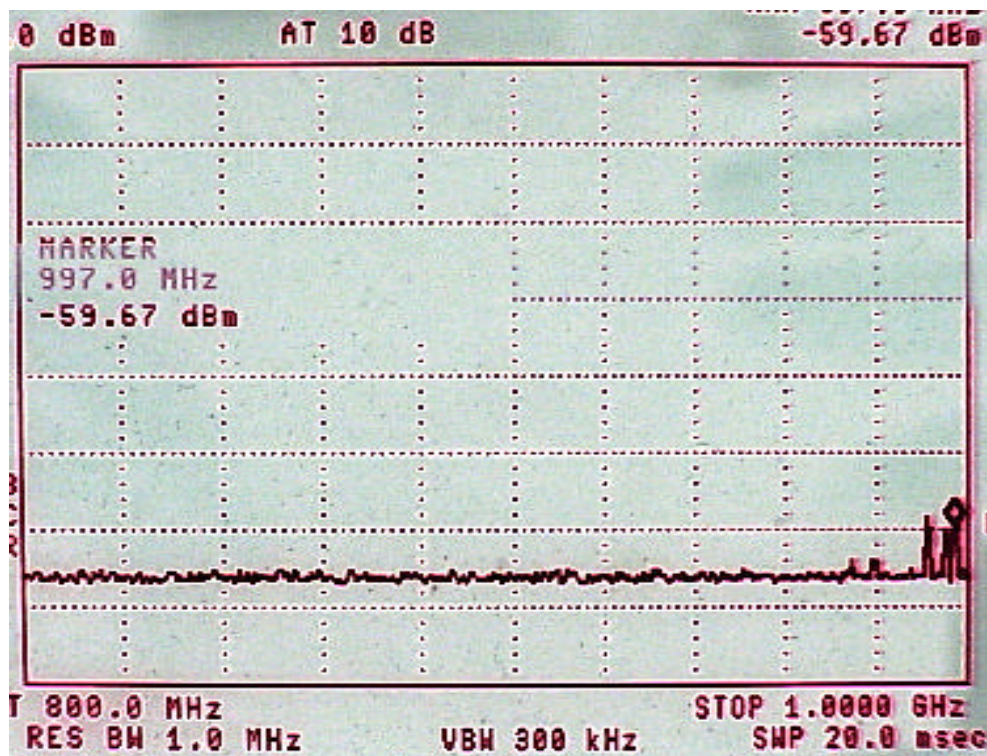


Figure 32: 800 – 1000 MHz Frequency Span

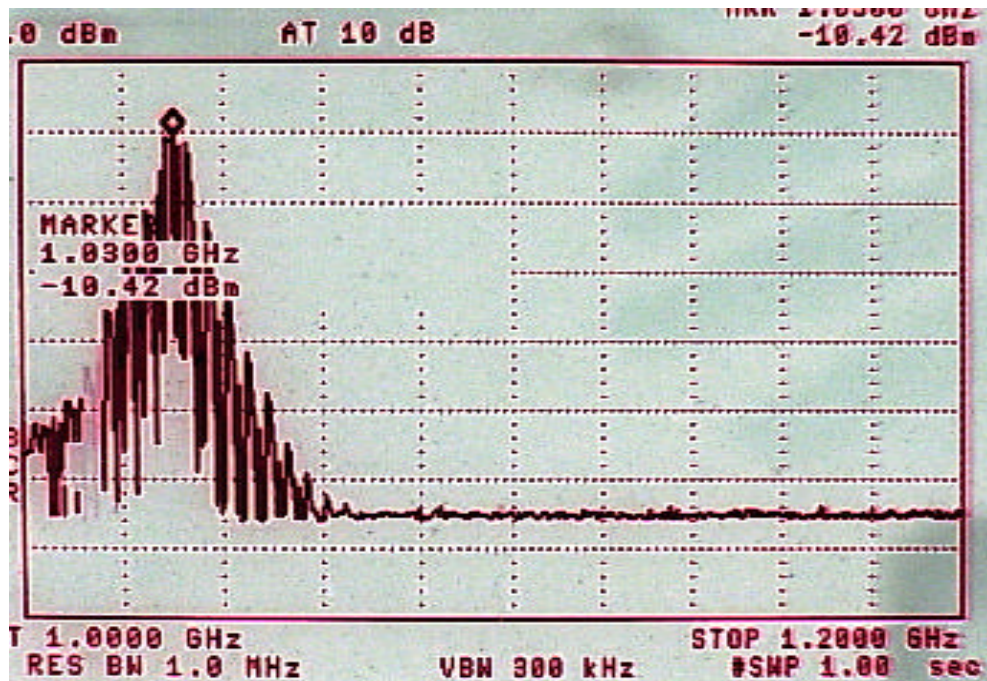


Figure 33: 1000 – 1200 MHz Frequency Span

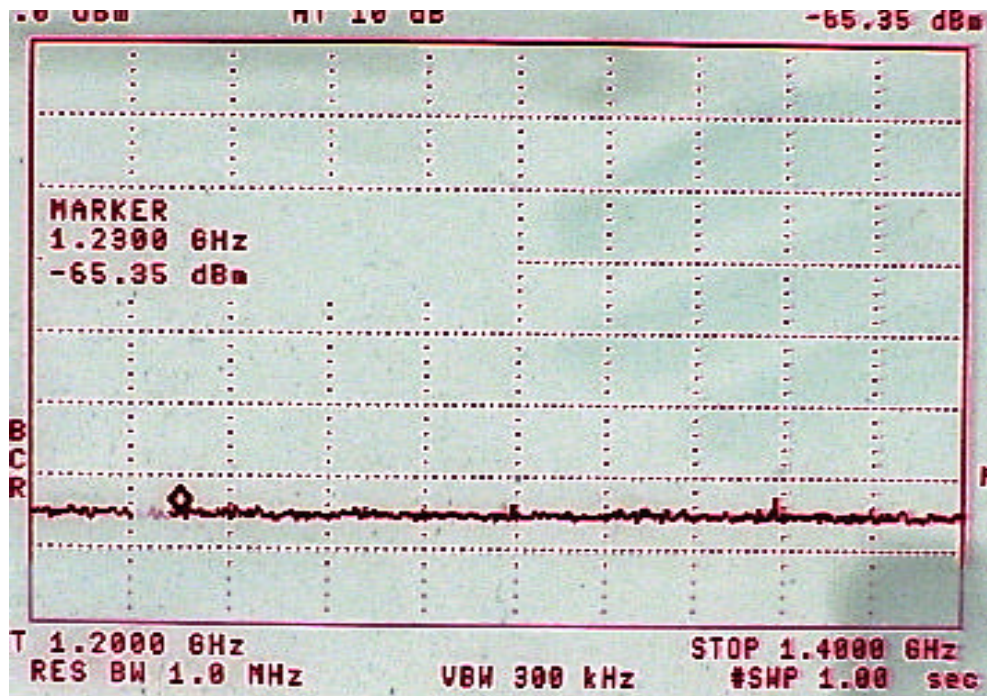


Figure 34: 1200 – 1400 MHz Frequency Span

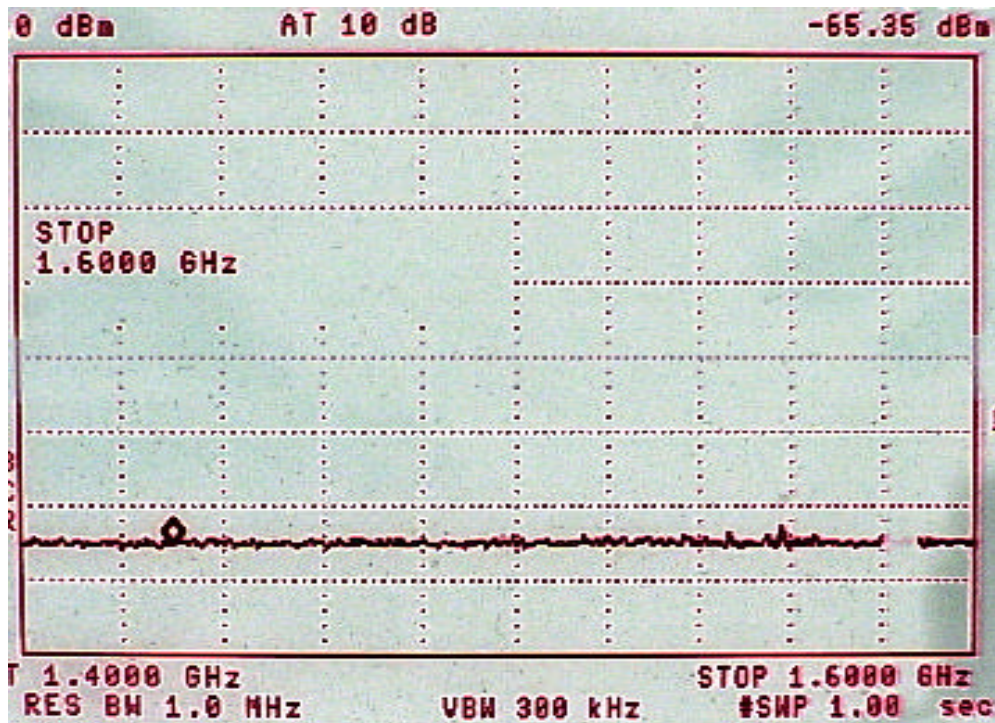


Figure 35: 1400 – 1600 MHz Frequency Span

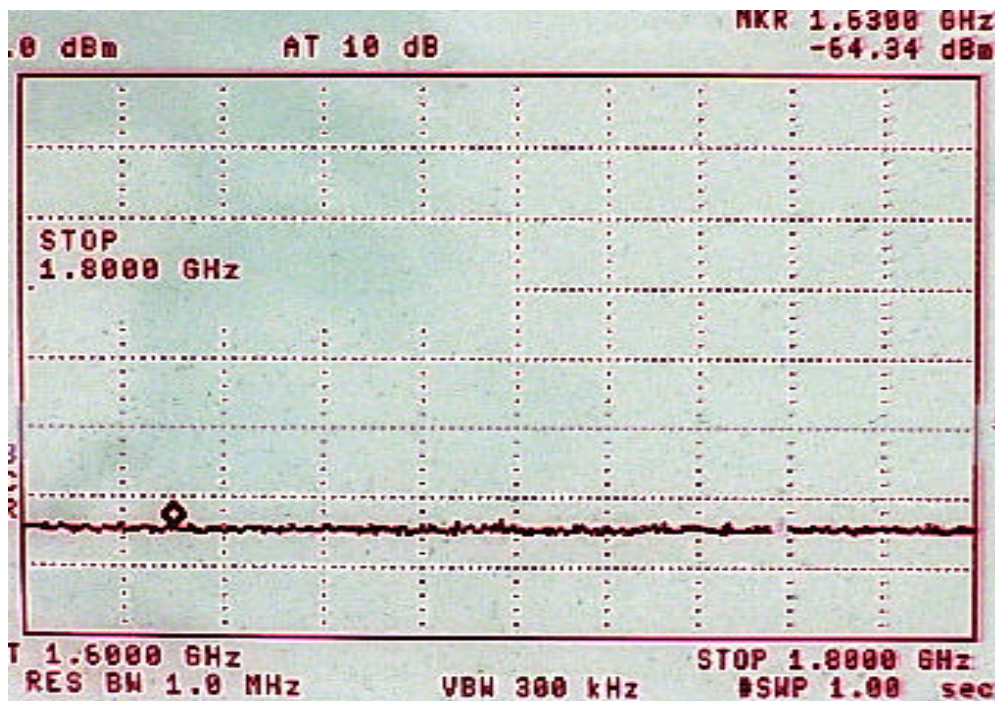


Figure 36: 1600 – 1800 MHz Frequency Span

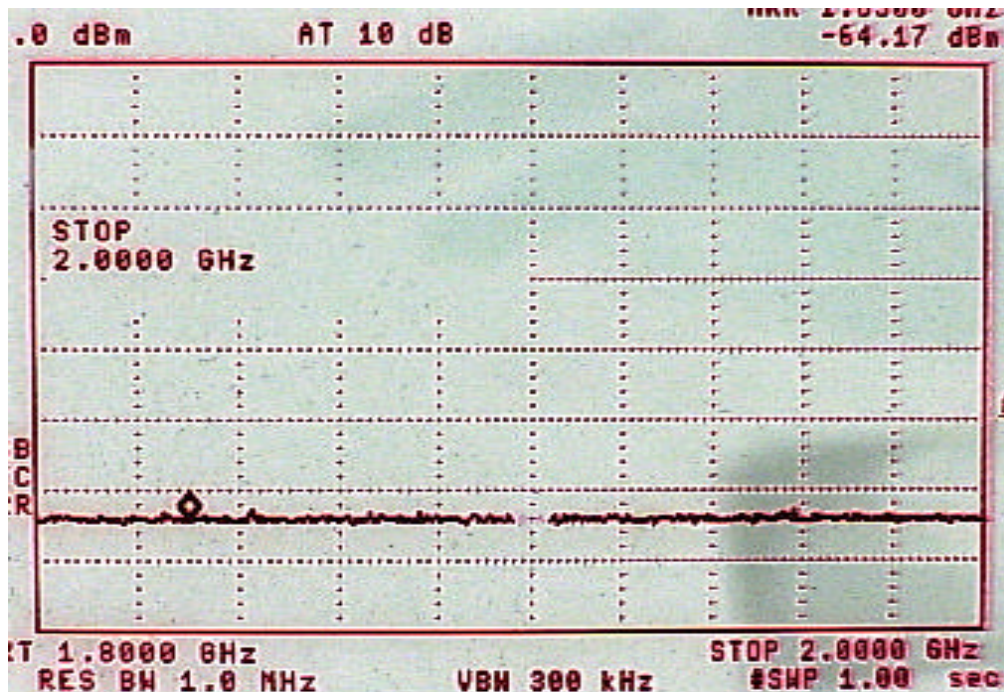


Figure 37: 1800 – 2000 MHz Frequency Span

8.4.2 Spurious Emissions at Antenna Terminals (2000 - 11330 MHz) Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model	Asset #	Cal Date
A	T2CAS Computer	ACSS	RT-952	NA	
B	TCAS 2000 System Panel	ACSS	9000121-001	NA	
C	Attenuator	Narda	765-20	NA	
D	Hi-Pass Filter	Microlab/FXR	HD-20N	NA	
E	Hi-Pass Filter	Microlab/FXR	HD-40N	NA	
F	Hi-Pass Filter	Microlab/FXR	HD-60N	NA	
G	Attenuator	Narda	765-6	NA	
H	Spectrum Analyzer	Hewlett-Packard	HP8592L	418	6/11/03

Table 12: Spurious Emissions at Antenna Terminals (2000 – 11330 MHz) Test Equipment Required

8.4.2.1 Spurious Emissions at Antenna Terminals (2000 - 11330 MHz) Test Setup

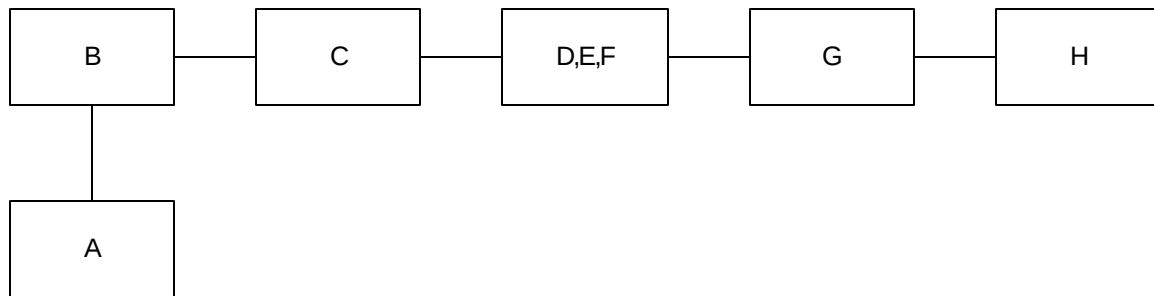


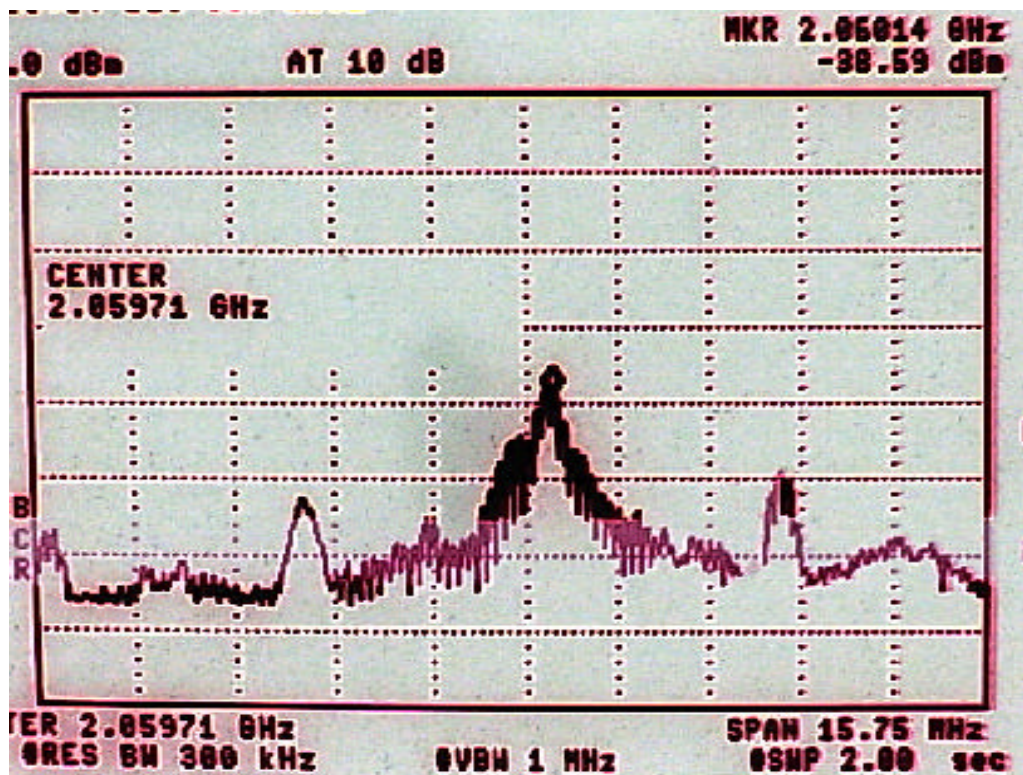
Figure 38: Spurious Emissions at Antenna Terminals (2000 - 11330 MHz) Test Setup

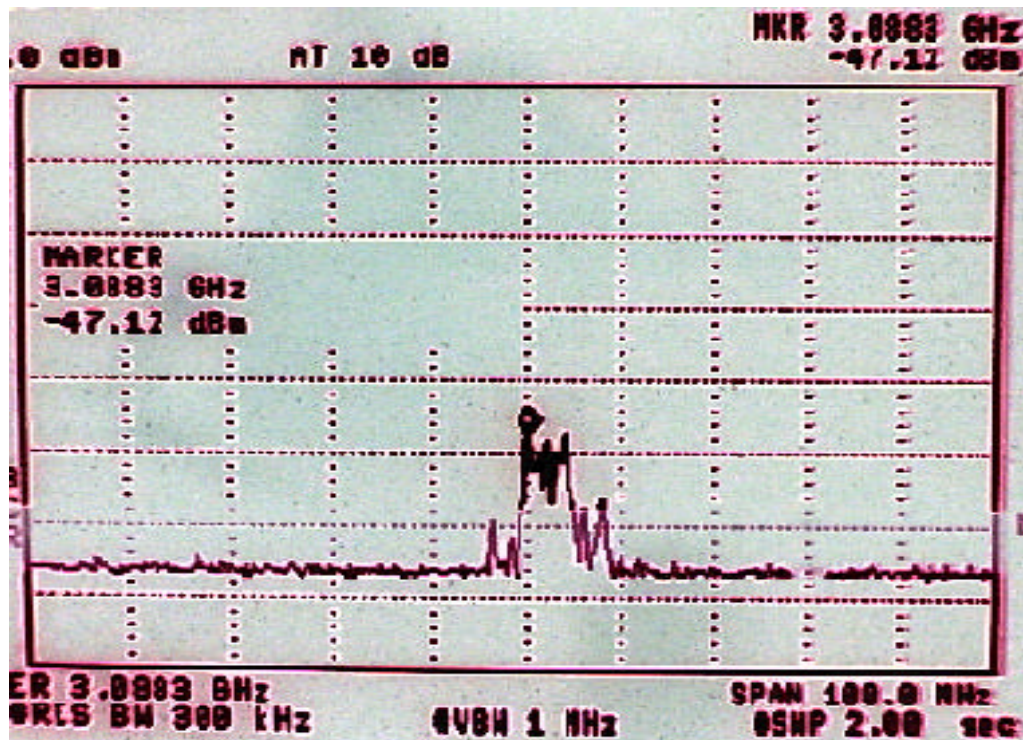
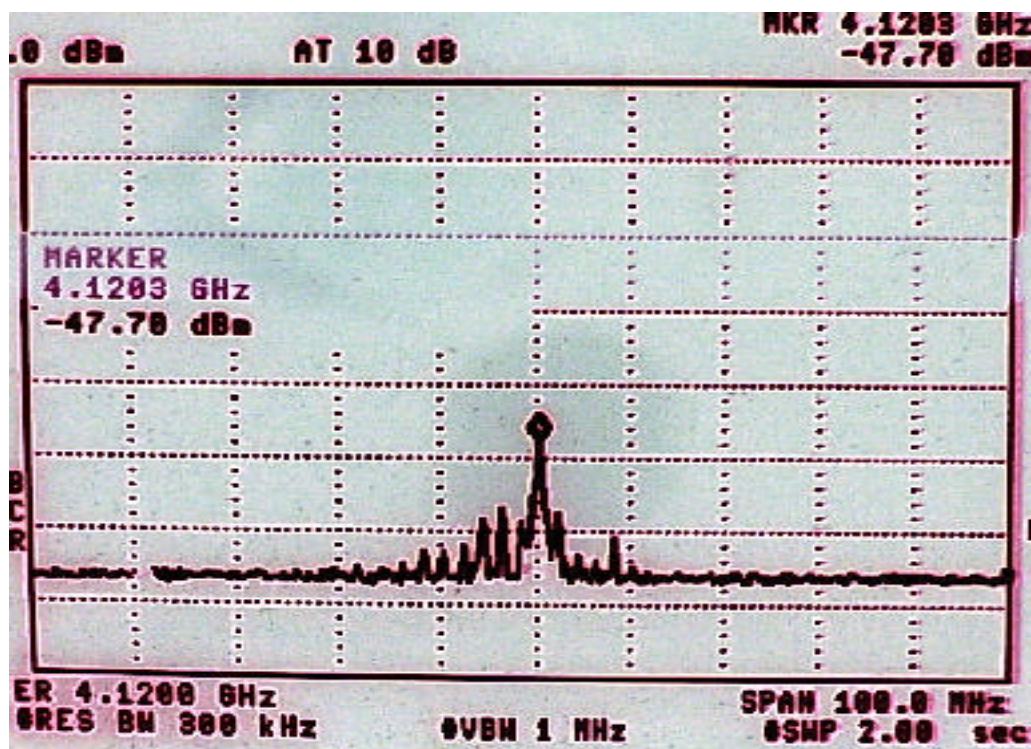
8.4.2.2 Spurious Emissions at Antenna Terminals (2000 - 11330 MHz) Test Procedure

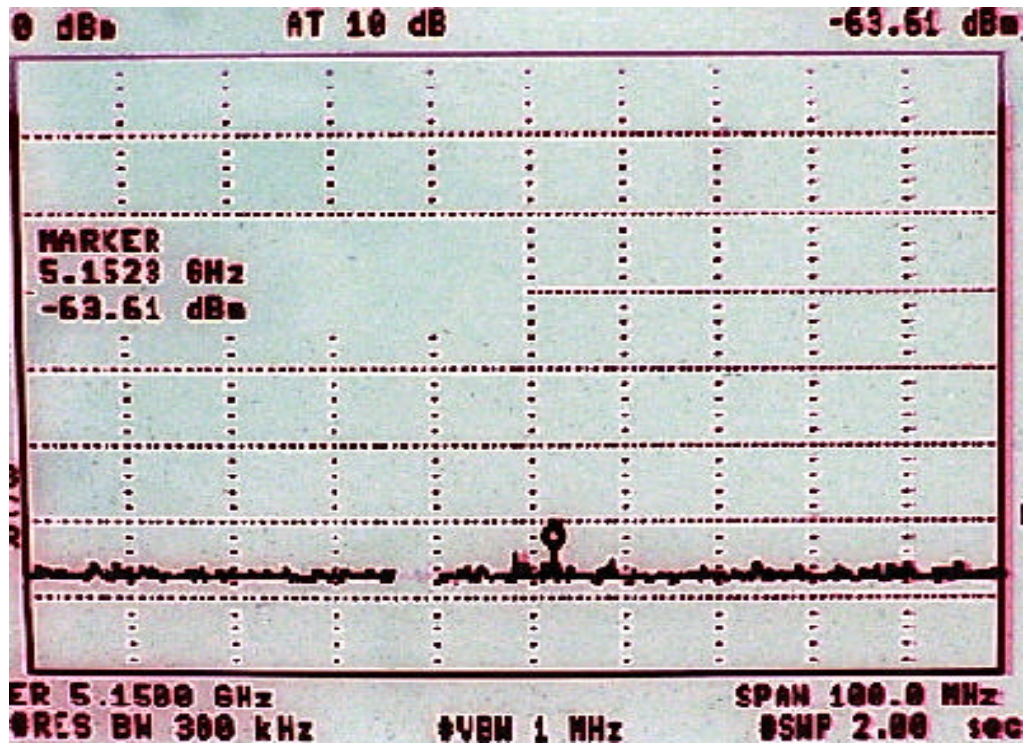
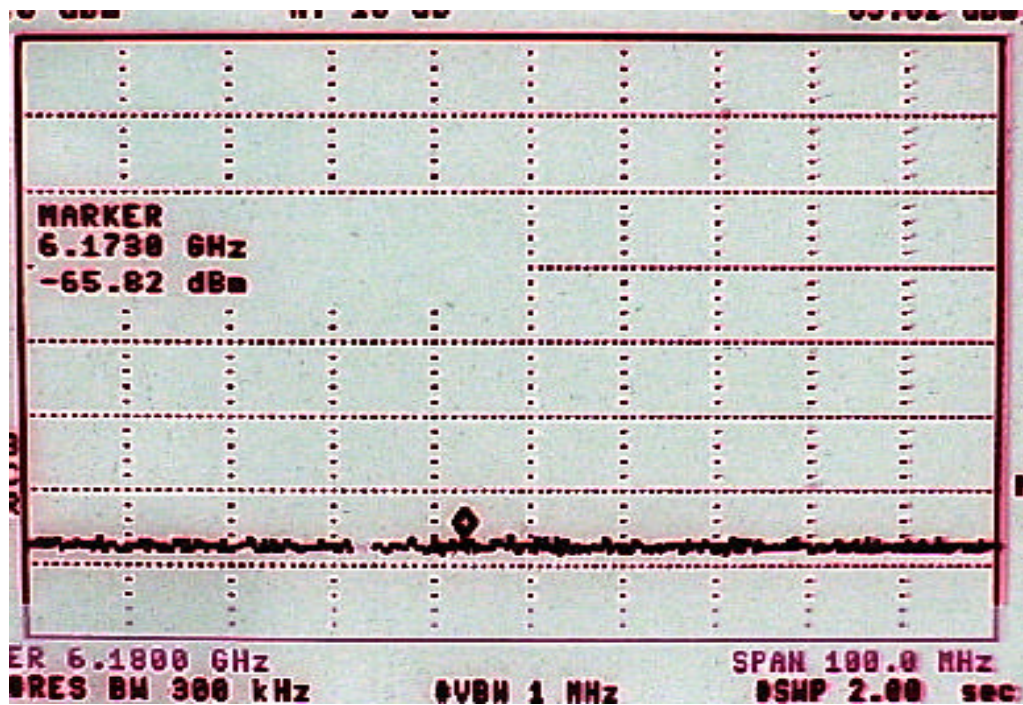
1. Connect the equipment as shown in Figure 38 above.
2. Configure the TCAS 2000 System Panel to invoke Test Mode 2 (Mode S, Long P6, DPSK Modulation, Test Mode Program switches on System Panel to DDUD).
3. Adjust the Spectrum Analyzer so that no signal exceeds the dynamic range of the analyzer. Set the resolution bandwidth to 3 MHz.
4. Measure and record all spurious emissions between 2 Ghz and 4 Ghz using the 2 Ghz high pass filter.
5. Measure and record all spurious emissions between 4 Ghz and 8 Ghz using the 4 Ghz high pass filter.
6. Measure and record all spurious emissions between 8 Ghz and 12 Ghz using the 6 Ghz high pass filter.
7. Measure and record Attenuator/filter/cable calibration factor for each harmonic.

8.4.2.3 Spurious Emissions at Antenna Terminals (2000 - 11330 MHz) Test Data

FREQUENCY (MHz)	CALIBRATION FACTOR (dB)	TOP ANTENNA SPURIOUS LEVEL (dB)	BOTTOM ANTENNA SPURIOUS LEVEL (dB)	TOP ANTENNA SPURIOUS LEVEL CORRECTED (dB)	BOTTOM ANTENNA SPURIOUS LEVEL CORRECTED (dB)	SPURIOUS OUTPUT LIMIT
2060	17.86	-37.78	-39.19	-19.92	-21.33	12.5 dBm
3090	18.32	-47.18	-46.64	-28.86	-28.32	12.5 dBm
4120	18.52	-47.70	-48.66	-29.18	-30.14	12.5 dBm
5150	19.20	-64.93	-65.16	-45.73	-45.96	12.5 dBm
6180	20.87	-65.82	-65.20	-44.95	-44.33	12.5 dBm
7210	20.68	-60.88	-60.56	-40.20	-39.88	12.5 dBm
8240	22.06	-60.45	-60.65	-38.39	-38.59	12.5 dBm
9270	22.29	-61.66	-61.28	-39.37	-38.99	12.5 dBm
10300	23.18	-59.76	-59.89	-36.58	-36.71	12.5 dBm
11330	28.42	-58.65	-58.49	-30.23	-30.07	12.5 dBm

Figure 39: 2nd Harmonic

Figure 40: 3rd HarmonicFigure 41: 4th Harmonic

Figure 42: 5th HarmonicFigure 43: 6th Harmonic