

**Figure 16: View of A7 TAWS Processor With Bracket Attached**

ACSS Proprietary	Use or disclosure of the information on this sheet is subject to the proprietary notice on the title page.	Page 29
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## 6 FCC COMPLIANCE TEST PLAN

### 6.1 FCC Compliance Overview

The Code of Federal Regulations, Title 47, Volume 1, Part 2, Subpart J (47CFR2.xxxx) provides procedures for radio frequency equipment to be authorized by the FCC. Certification is an equipment authorization issued by the commission, based on representations and test data submitted by the applicant. Certification attaches to all units subsequently marketed by the grantee which are identical (see section 6.1.2) to the sample tested except for permissive changes or other variations authorized by the commission.

#### 6.1.1 FCC Identifier

47CFR2.924 states that equipment, which has been authorized by the FCC, bears an FCC Identifier. Equipment, which has been authorized, may be marketed under different model/type numbers or trade names without additional authorization from the commission, provided that such devices are electrically identical and the equipment bears an FCC Identifier validated by a grant of equipment authorization.

#### 6.1.2 Changes in Certified Equipment

47CFR2.907, 8 defines Identical as either being units whose variances fall within those expected to arise as a result of quantity production techniques, or those that have been changed where the change meets the criteria of a *permissive change*.

47CFR2.1043 states that changes to the basic frequency determining and stabilizing circuitry (including clock or data rates), frequency multiplication stages, basic modulator circuit or maximum power or field strength ratings shall not be performed without application for and authorization of a new grant of certification.

Variations in electrical or mechanical construction, other than the above indicated items, are permitted provided the variations either do not affect the characteristics required to be reported to the commission or are made in compliance with other provisions in 47CFR2.1043

Two classes of permissive changes may be made in certified equipment without requiring a new application for and grant of certification. Neither class of change shall result in a change of identification.

- A Class I permissive change includes those modifications in the equipment that do not degrade the characteristics reported by the manufacturer and accepted by the commission when certification is granted (i.e., power, frequency, etc.). *No filing with the commission is required for a Class I permissive change.*
- A Class II permissive change includes those modifications that degrade the performance characteristics as reported to the commission at the time of initial certification.

## 6.2 T<sup>2</sup>CAS Units Similarity to Predecessor TCAS-2000 Unit

The T<sup>2</sup>CAS units evolved from the predecessor TCAS-2000 unit. The T<sup>2</sup>CAS units utilize the same TCAS circuit boards and TCAS circuit board software that the predecessor TCAS-2000 units utilize. These TCAS circuit boards have been previously certified with the FCC in the predecessor TCAS 2000 unit. This T<sup>2</sup>CAS model is powered exclusively from a DC power source.

## 6.3 T<sup>2</sup>CAS Model to be Subjected to FCC Compliance Testing

The T<sup>2</sup>CAS model TT-952 unit will be subjected to the full suite of FCC compliance tests with the resulting data submitted to the FCC for certification. Test results from the T<sup>2</sup>CAS model TT-952, other than Radiated Emissions, will be credited to T<sup>2</sup>CAS model TT-951 for submittal to FCC for certification. The T<sup>2</sup>CAS model TT-951 unit will be subjected to the Field Strength of Spurious Radiation tests to verify that its smaller 4MCU chassis with a fan does not alter emissions characteristics

## 6.4 All Three T<sup>2</sup>CAS Models Considered Identical

For purposes of FCC compliance testing and certification, T<sup>2</sup>CAS models (TT-951 and TT-952) are considered to meet the FCC definition of "Identical." Photographs of the T<sup>2</sup>CAS unit illustrating the assembly drawings, including markings, are shown in Figures 3 – 18. All original photographs are available for inspection. Differences exist between the two T<sup>2</sup>CAS models, however these differences fall within the definition of a Class I permissive change because the items which provide the transmit and receive functions (the TCAS circuit boards and their software) are the same in the two T<sup>2</sup>CAS models.

### 6.4.1 Conclusion

The full suite of FCC compliance tests was performed on a T<sup>2</sup>CAS model TT-952 unit. The T<sup>2</sup>CAS model TT-951 unit will be subjected to the Field Strength of Spurious Radiation tests. Test data from both TT-951 and TT-952 FCC compliance tests will be submitted to the FCC to apply for a new certification and FCC identifier for the T<sup>2</sup>CAS model TT-951 units.

**7 TEST DATA AND FACILITIES**

<u>Paragraph</u>	<u>Description</u>
8.1	Power Output.....
8.2	Modulation Characteristics .....
8.3	Occupied Bandwidth and in Close Spurious .....
8.4.1	Spurious Emissions (Conducted) ..... 0-2000 MHz
8.4.2	Spurious Emissions (Conducted) ..... 2000 MHz - 113300 MHz
8.4.3	Spurious Emissions (Conducted) ..... L.O. Leakage 1030 MHz
8.5	Spurious Emissions (Radiated) .....
8.6.1	Frequency Stability (Temperature) .....
8.6.2	Frequency Stability (Primacy Power Variation).....

**LOCATION OF TEST FACILITIES**

All FCC testing were performed at the following facility:

National Technical Systems (NTS)  
1536 E. Valencia Drive  
Fullerton, California 92831-4797

## 8 FCC COMPLIANCE TESTS

47CFR2.1041 states that for equipment operating under parts 15 & 18, the measurement procedures are specified in the rules governing the particular device for which certification is requested. For equipment operating in the authorized radio services, measurements are required as specified in sections 2.1046 (RF Power Output), 2.1047 (Modulation Characteristics), 2.1049 (Occupied Bandwidth), 2.1051 (Spurious Emissions at Antenna Terminals), 2.1053 (Field Strength of Spurious Radiation), 2.1055 (Frequency Stability), 2.1057 (Frequency Spectrum to be Investigated).

### 8.1 RF Power Output

47CFR Reference:

2.1046, RF Power Output

87.135, Power and Emissions

#### 8.1.1 RF Power Output 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	Peak Power Analyzer	Hewlett-Packard	HP8990A	418	23/7/03
F	Spectrum Analyzer	Hewlett-Packard	HP8592L	1025	6/11/03

Table 7: RF Power Output Test Equipment Required

#### 8.1.2 RF Power Output Test Setup

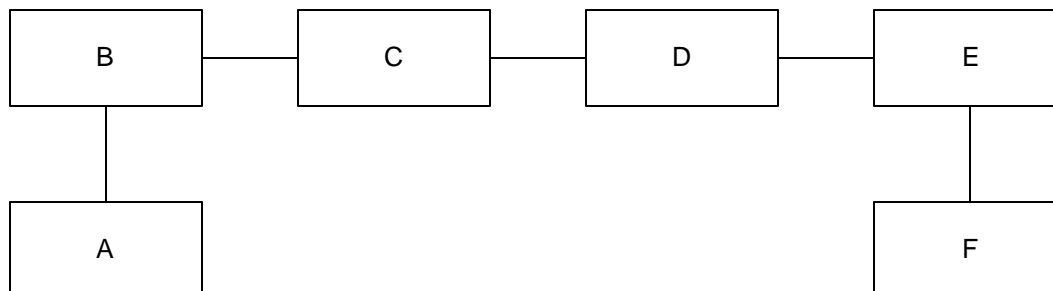


Figure 17: RF Power Output Test Setup

#### 8.1.3 RF Power Output Test Procedure

1. Connect the equipment as shown in Figure 17 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) and then

Test Mode 4 (Mode C only all-call interrogation, Test Mode Program switches on System Panel to UDUU).

- Record the measured output power and frequency as measured on the Peak Power Analyzer and Spectrum Analyzer.

#### 8.1.4 RF Power Output Test Data

Peak power output & frequency measured at top 0 degree antenna port		
Modulation Characteristic	Measured Power Output (dBm)	Measured Frequency (Ghz)
Mode S DPSK Modulation	54.98	1.029,999,800
Mode C Only All Call	55.16	1.029,998,900

Peak power output & frequency measured at bottom 0 degree antenna port		
Modulation Characteristic	Measured Power Output (dBm)	Measured Frequency (Ghz)
Mode S DPSK Modulation	54.99	1.029,999,000
Mode C Only All Call	55.08	1.029,999,200

**Table 8: Peak power output and frequency measured at bottom antenna 0 degree port**

## 8.2 Modulation Characteristics

47CFR Reference:

2.1047, Modulation Characteristics

87.141c, Modulation Requirements

### 8.2.1 Modulation Characteristics 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	Peak Power Analyzer	Hewlett-Packard	HP8990A	418	23/7/03

**Table 9: Modulation Characteristics Test Equipment Required**

## 8.2.2 Modulation Characteristics Test Setup

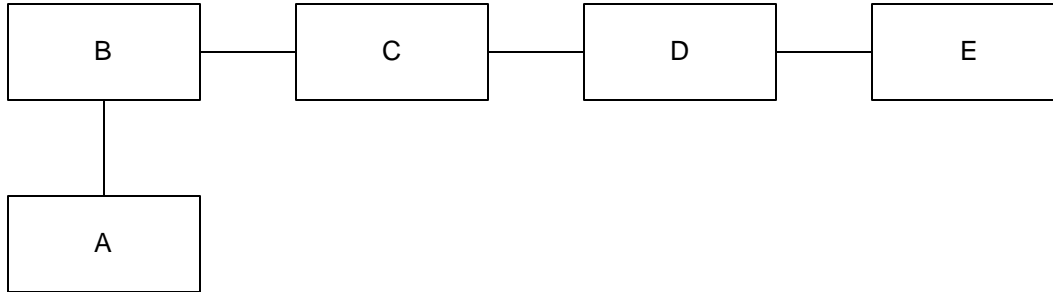


Figure 18: Modulation Characteristics Test Setup

## 8.2.3 Modulation Characteristics Test Procedure

1. Connect the equipment as shown in Figure 18 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. Record the modulation characteristics on the Peak Power Analyzer. Capture pictures of the following data to be shown in the test report:
  - Typical ATCRBS or Mode S interrogation pulse showing rise and fall times.
  - Mode S interrogation with DPSK modulation
  - Close up of Mode S interrogation preamble and sync phase reversal
  - ATCRBS Mode C interrogation

### 8.2.4 Modulation Test Data

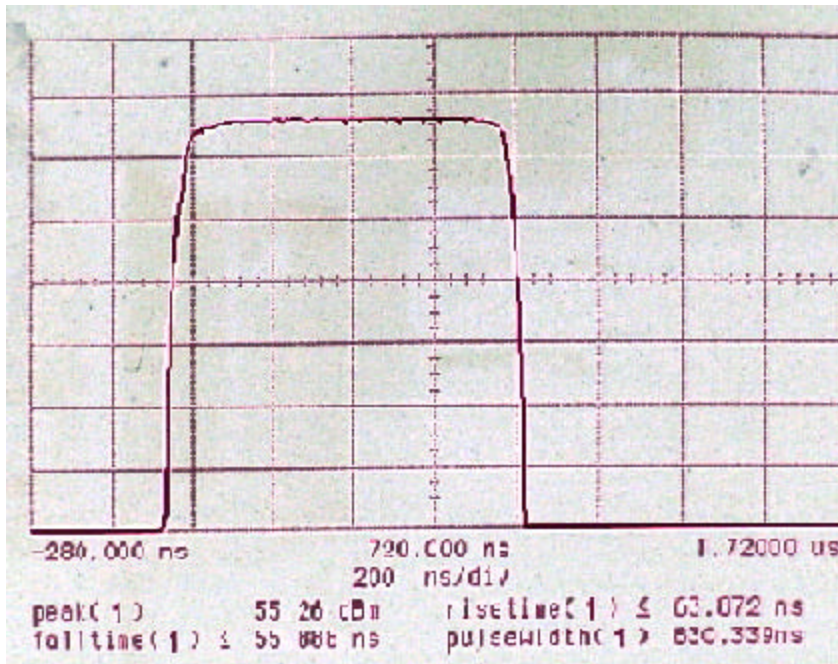


Figure 19: Typical ATCRBS or Mode S Interrogation Pulse Showing Rise and Fall Times

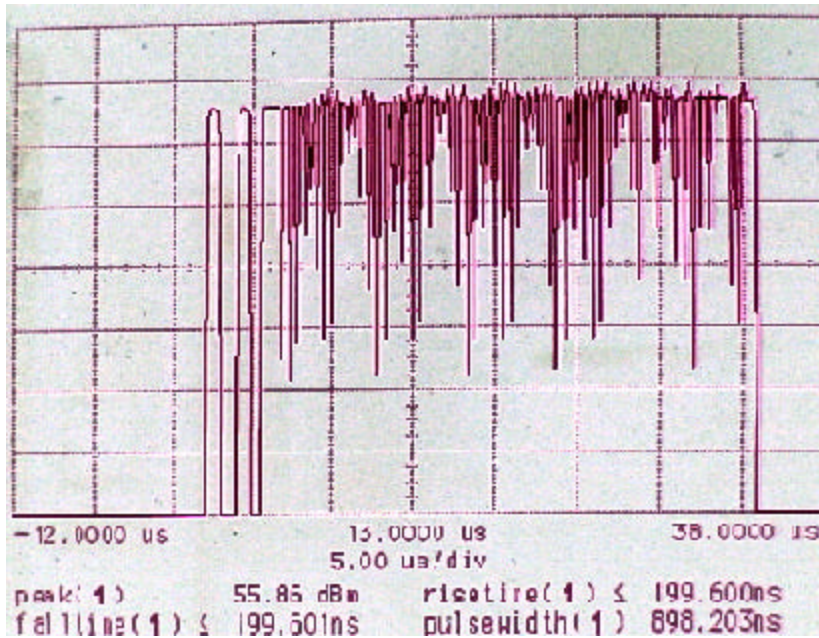


Figure 20: Mode S Interrogation With DPSK Modulation



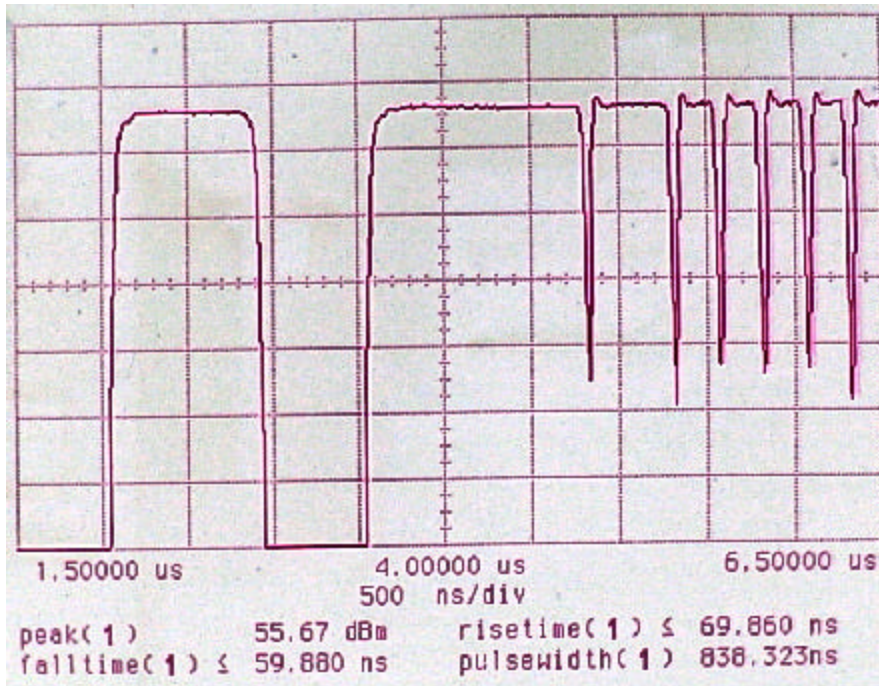


Figure 21: Close Up of Mode S Interrogation Preamble and Sync Phase Reversal

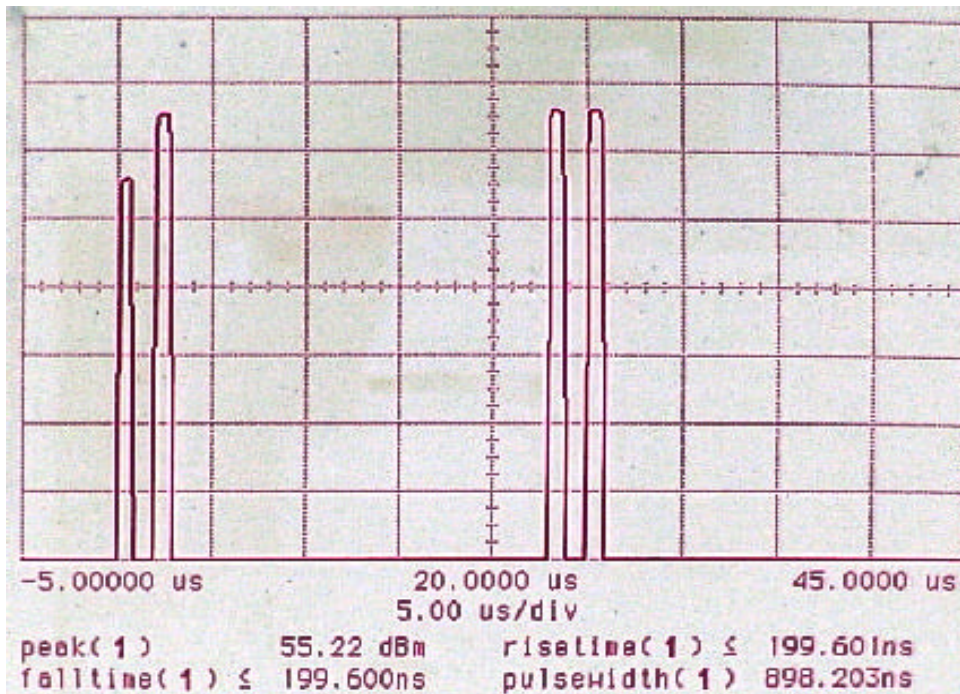


Figure 22: ATCRBS Mode C Interrogation

### 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

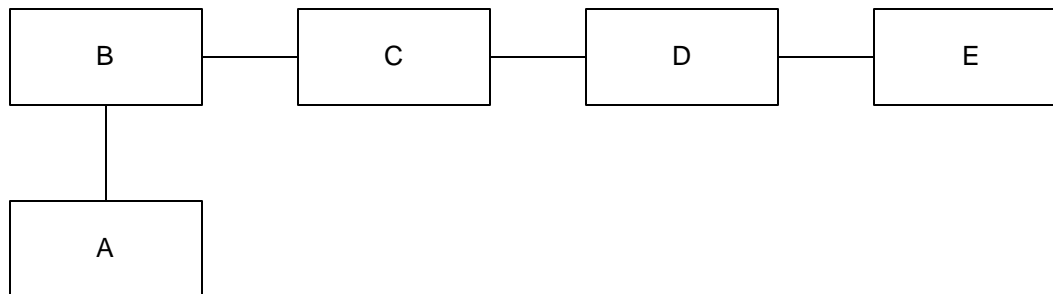


Figure 23: Occupied Bandwidth Test Setup

#### 8.3.3 Occupied Bandwidth and In Close Test Procedure

- 1 Connect the equipment as shown in Figure 23 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 T<sup>2</sup>CAS 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  
+89.1  
+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  
+35.0  
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+43.0  
+45.0  
+47.0  
+49.0  
+51.0

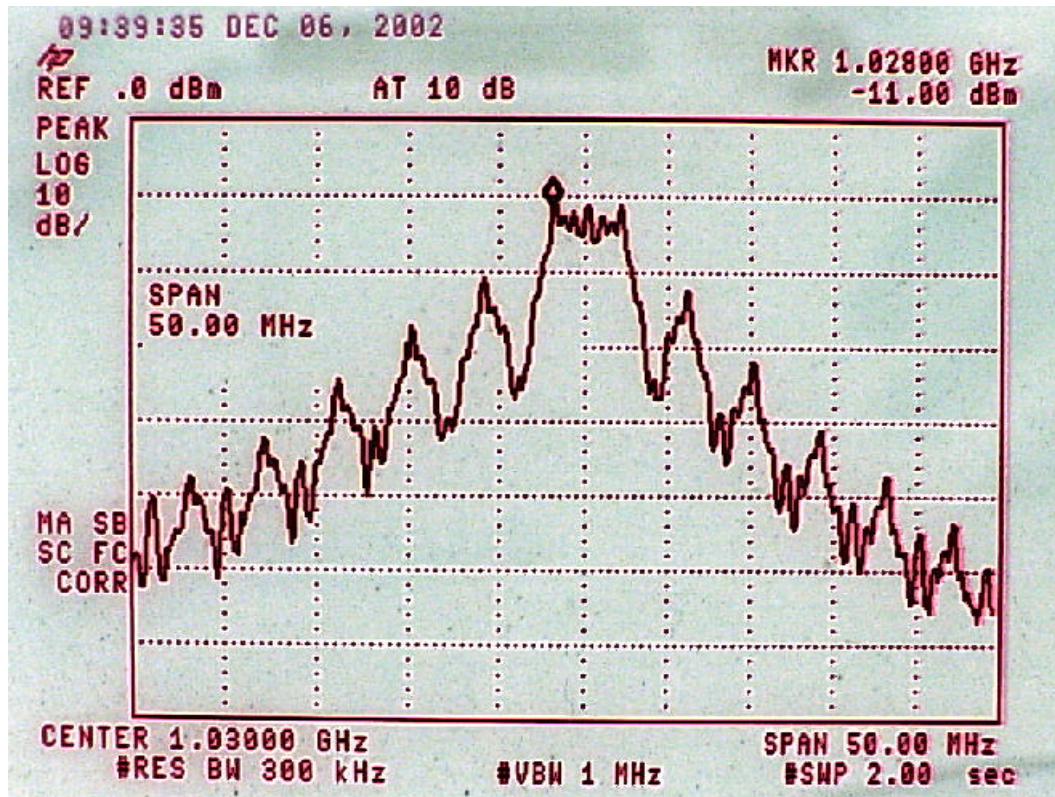


Figure 24: In Close Spurious: 5 MHz/Div

#### 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 T<sup>2</sup>CAS 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

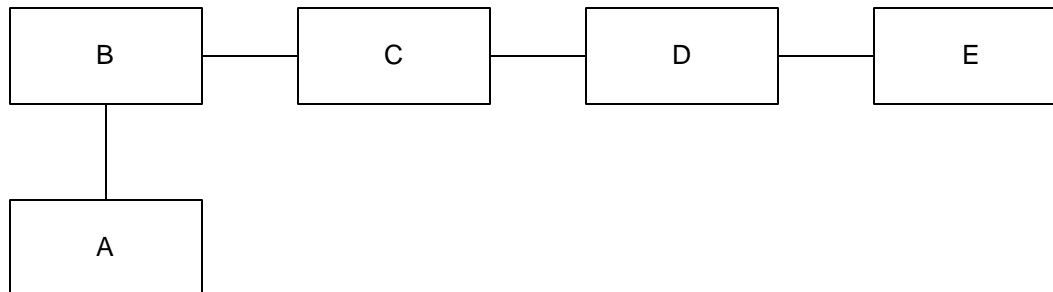


Figure 25: Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Setup

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

1. Connect the equipment as shown in Figure 25 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

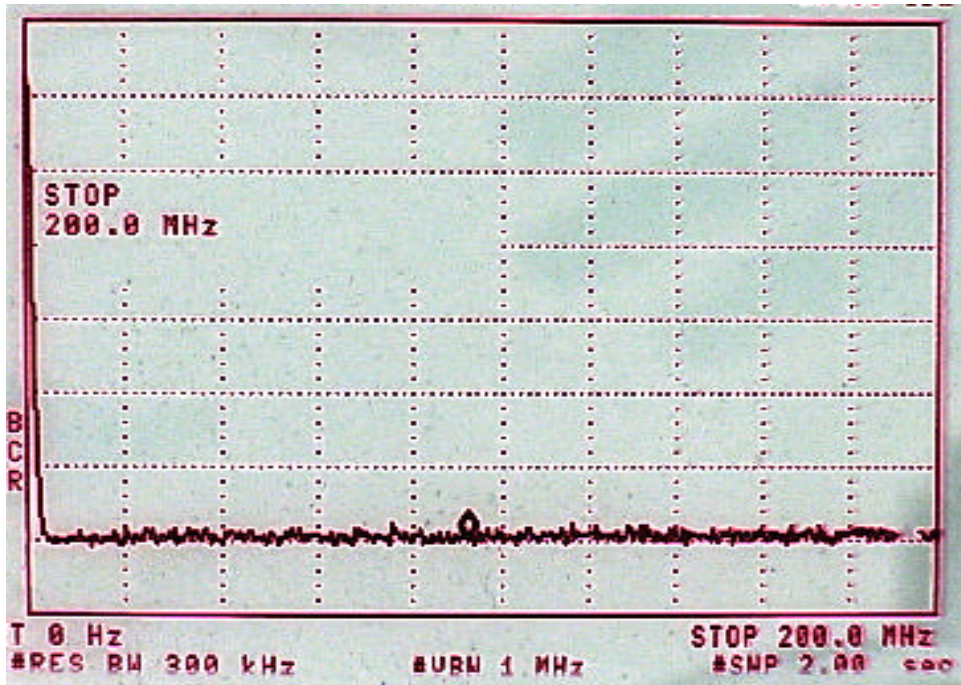


Figure 26: 0 – 200 MHz Frequency Span