



Class 2 Permissive Change Certification Report for the M/A-COM MASTRII 800 MHz Base Station FCC Part 90 & RSS-119

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Prepared for: M/A-COM, Inc.
221 Jefferson Ridge Parkway
Lynchburg, Virginia
U.S.A., 24501

Author: Denis Lalonde
Radio Compliance Discipline Leader

Solectron EMS Canada Inc.
Design & Engineering Kanata (SDE)
21 Richardson Side Road
Kanata, Ontario, K2K 2C1
<http://www.solectron.com/services/prod.htm>

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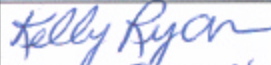
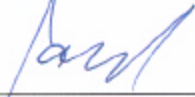
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Document Release Approval	Steve Tippet	Manager, Product Engineering and Verification	 FOR STEVE TIPPET 06-FEB-06
Author	Denis Lalonde	Radio Compliance Discipline Leader	 Feb. 6, 2006
Technical Reviewer	Jacques Rollin	EMC Advisor	 Feb. 6, 2006

Accreditations

Soletron EMS Canada test facilities are accredited by the Standards Council of Canada (SCC) in accordance with the scope of accreditation outlined at the following web site http://palcan.scc.ca/specs/pdf/95_e.pdf [1]. The SCC is a member of the APLAC [14] and ILAC [15] organizations which, through mutual recognition arrangements, provide accreditation of test facilities in the member countries.



The Soletron Design and Engineering 10-meter Ambient Free Chamber (AFC) complies with the Industry Canada (IC) requirements for Test Facilities and Test Methods [16] under reference file number 4180. Through IC MRAs, EMC measurements are accepted in the following countries: USA, Australia, Singapore, Chinese Taipei (Taiwan), and the Republic of Korea. Further information can be found at the IC Certification and Engineering Bureau web site <http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/Home> under the "conformity assessment bodies" link.

The VCCI [13] lab registration numbers associated with our test facilities are: R-1641, C-1749, C-1750, T-148, and T-149.

Soletron EMS Canada is ISO 9001:2000 and ISO-IEC 17025 certified and its processes are documented in the Soletron EMS Canada Quality Manual [2] and Lab Operations Manual [3].

Table of Contents

RELEASE CONTROL RECORD	2
APPROVALS	2
ACCREDITATIONS	2
TABLE OF CONTENTS	3
LIST OF FIGURES	4
LIST OF TABLES	5
1. EXECUTIVE SUMMARY.....	7
2. COMPLIANCE SUMMARY.....	8
3. EQUIPMENT UNDER TEST (EUT)	9
3.1 PRODUCT FUNCTIONAL DESCRIPTION	9
3.2 MANUFACTURER INFORMATION	9
3.3 TRANSMITTER SPECIFICATIONS.....	9
3.4 EQUIPMENT MODIFICATION	10
3.5 SYSTEM COMPONENTS.....	10
3.6 SUPPORT EQUIPMENT.....	10
3.7 SYSTEM SET-UP AND TEST CONFIGURATIONS.....	11
3.8 EUT INTERFACES AND CABLES	11
3.9 SYSTEM MODIFICATIONS	12
4. GENERAL TEST CONDITIONS	13
4.1 TEST FACILITY.....	13
4.2 MEASUREMENT INSTRUMENTATION	13
5. DETAILED TEST RESULTS	14
5.1 RF POWER	14
5.1.1 Test Specification.....	14
5.1.1.1 Limits.....	14
5.1.2 Test Facility Information.....	14
5.1.3 Test Procedure	14
5.1.4 Test Results	15
5.1.5 Test Conclusion.....	15
5.1.6 Test Equipment List	15
5.2 CONDUCTED SPURIOUS EMISSIONS	15
5.2.1 Test Specification.....	15
5.2.1.1 Limits.....	16
5.2.2 Test Facility Information.....	16
5.2.3 Test Procedure	16

5.2.4	Test Results	16
5.2.5	Test Conclusion.....	17
5.2.6	Test Equipment List	17
5.3	EMISSION MASK	17
5.3.1	Test Specification.....	17
5.3.1.1	Limits.....	17
5.3.2	Test Facility Information.....	18
5.3.3	Test Procedure	18
5.3.4	Test Results	19
5.3.5	Test Conclusion.....	19
5.3.6	Test Equipment List	19
5.4	FIELD STRENGTH OF SPURIOUS EMISSIONS	19
5.4.1	Test Specification.....	19
5.4.1.1	Limits.....	20
5.4.2	Test Facility Information.....	20
5.4.3	Test Procedure	20
5.4.4	Test Results	21
5.4.5	Test Conclusion.....	22
5.4.6	Test Equipment List	22
5.5	OCCUPIED BANDWIDTH.....	23
5.5.1	Test Specification.....	23
5.5.2	Test Facility Information.....	23
5.5.3	Test Procedure	23
5.5.4	Test Results	24
5.5.5	Test Equipment List	25
6.	REFERENCES	26
7.	APPENDICES	27
7.1	APPENDIX A: GLOSSARY	27
7.2	APPENDIX B: TEST SET-UP PHOTOGRAPHS	28
7.3	APPENDIX C: CONDUCTED SPURIOUS EMISSIONS PLOTS	29
7.4	APPENDIX D: EMISSION MASK PLOTS	35
7.5	APPENDIX E: FIELD STRENGTH OF SPURIOUS EMISSIONS PLOTS	38
7.6	APPENDIX F: OCCUPIED BANDWIDTH PLOTS	40

List of Figures

FIGURE 3-1	PRODUCT DESCRIPTION	9
FIGURE 3-2:	MODULE CONFIGURATION.....	11
FIGURE 3-3:	SYSTEM CONFIGURATION	11
FIGURE 7-1:	THE M/A-COM MASTRIII 800 MHZ BASE STATION RADIATED EMISSIONS SET-UP	28

FIGURE 7-2: TX AT 851.0125 MHz, 100 W POWER, 30 MHz TO 1 GHz	29
FIGURE 7-3: TX AT 851.0125 MHz, 100 W POWER, 1 GHz TO 2.75 GHz	29
FIGURE 7-4: TX AT 851.0125 MHz, 100 W POWER, 2.75 GHz TO 8.7 GHz	30
FIGURE 7-5: TX AT 851.0125 MHz, 10 W POWER, 30 MHz TO 1 GHz	30
FIGURE 7-6: TX AT 851.0125 MHz, 10 W POWER, 1 GHz TO 2.75 GHz	31
FIGURE 7-7: TX AT 851.0125 MHz, 10 W POWER, 2.75 GHz TO 8.7 GHz	31
FIGURE 7-8: TX AT 869.9875 MHz, 100 W POWER, 30 MHz TO 1 GHz	32
FIGURE 7-9: TX AT 869.9875 MHz, 100 W POWER, 1 GHz TO 2.75 GHz	32
FIGURE 7-10: TX AT 869.9875 MHz, 100 W POWER, 2.75 GHz TO 8.7 GHz	33
FIGURE 7-11: TX AT 869.9875 MHz, 10 W POWER, 30 MHz TO 1 GHz	33
FIGURE 7-12: TX AT 869.9875 MHz, 10 W POWER, 1 GHz TO 2.75 GHz	34
FIGURE 7-13: TX AT 869.9875 MHz, 10 W POWER, 2.75 GHz TO 8.7 GHz	34
FIGURE 7-14: 2500 HZ AUDIO SIGNAL	35
FIGURE 7-15: 2 LEVEL 9600 BAUD SIGNAL WITH 3 KHz DEVIATION	35
FIGURE 7-16: 2 LEVEL 9600 BAUD SIGNAL WITH 1.9 KHz DEVIATION	36
FIGURE 7-17: C4FM SIGNAL.....	36
FIGURE 7-18: NPSPAC (9600 BAUD) SIGNAL.....	37
FIGURE 7-19: NPSPAC (ANALOG) SIGNAL.....	37
FIGURE 7-20: FIELD STRENGTH WITH 100 W Tx, 30 MHz TO 1 GHz	38
FIGURE 7-21: FIELD STRENGTH WITH 100 W Tx, 1 GHz TO 9 GHz	39
FIGURE 7-22: 2500 HZ AUDIO SIGNAL	40
FIGURE 7-23: 2 LEVEL 9600 BAUD SIGNAL WITH 3 KHz DEVIATION.....	40
FIGURE 7-24: 2 LEVEL 9600 BAUD SIGNAL WITH 1.9 KHz DEVIATION.....	41
FIGURE 7-25: C4FM SIGNAL.....	41
FIGURE 7-26: NPSPAC (9600 BAUD) SIGNAL.....	42
FIGURE 7-27: NPSPAC (ANALOG) SIGNAL.....	42

List of Tables

TABLE 2-1: COMPLIANCE RESULTS SUMMARY.....	8
TABLE 3-1: TRANSMITTER SPECIFICATIONS.....	9
TABLE 3-2: MASTRIII 800 MHZ BTS COMPONENTS.....	10
TABLE 3-3: SUPPORT EQUIPMENT.....	10
TABLE 3-4: SYSTEM CABLES	12
TABLE 5-1: RF POWER REQUIREMENTS	14

TABLE 5-2: RF POWER LIMIT	14
TABLE 5-3: RF POWER LEVELS	15
TABLE 5-4: TEST EQUIPMENT USED FOR RF POWER	15
TABLE 5-5: CONDUCTED SPURIOUS EMISSIONS REQUIREMENT	15
TABLE 5-6: CONDUCTED SPURIOUS EMISSION LIMIT.....	16
TABLE 5-7: CONDUCTED SPURIOUS EMISSIONS	16
TABLE 5-8: TEST EQUIPMENT USED FOR CONDUCTED SPURIOUS EMISSIONS	17
TABLE 5-9: EMISSION MASK REQUIREMENT	17
TABLE 5-10: EMISSION MASK LIMITS.....	18
TABLE 5-11: EMISSION MASK RESULTS	19
TABLE 5-12: TEST EQUIPMENT USED FOR EMISSION MASK	19
TABLE 5-13: FIELD STRENGTH OF SPURIOUS EMISSIONS REQUIREMENT	19
TABLE 5-14: FIELD STRENGTH OF SPURIOUS EMISSIONS LIMIT	20
TABLE 5-15: FIELD STRENGTH OF SPURIOUS EMISSIONS	22
TABLE 5-16: TEST EQUIPMENT USED FOR FIELD STRENGTH OF SPURIOUS EMISSIONS	22
TABLE 5-17: OCCUPIED BANDWIDTH	23
TABLE 5-18: OCCUPIED BANDWIDTH VALUES	24
TABLE 5-19: TEST EQUIPMENT USED FOR OCCUPIED BANDWIDTH	25

1. Executive Summary

This test report documents the measurements performed on the M/A-COM MASTRIII 800 MHz Base Station as part of a Class 2 Permissive Change Equipment Certification for its FCC Part 90 and Industry Canada RSS-119 certifications. The equipment modification is the change of supplier for 2 obsolete power amplifier transistors (see Section 3.4).

On the basis of measurements performed in January 2006, the M/A-COM MASTRIII 800 MHz Base Station is verified to remain compliant with FCC Part 90 and Industry Canada RSS-119 requirements. The test data included in this report apply to the product titled above manufactured by M/A-COM, Inc.

The frequency of the band of operation is 851 to 870 MHz.

The FCCID and Industry Canada certification numbers for this equipment are the following:

- FCCID: OWDTR-0036-E
- CANADA: 3636B-0036

A detailed summary of compliance results is found in Table 2-1: Compliance Results Summary on page 8.

2. Compliance Summary

This section summarizes all the measurements performed on the M/A-COM MASTRIII 800 MHz Base Station and its compliance to FCC Part 90, and Industry Canada RSS-119.

Table 2-1: Compliance Results Summary

Product Summary					
Product Name:	the M/A-COM MASTRIII 800 MHz Base Station	Project Leader:		Denis Lalonde	
Product Code:	TR-0036	Measurements by :		Denis Lalonde	
Product Status:		Date:		January 29, 2006	
Test Cases					
Performed	Description	Specification	Test Results		Notes
			Pass	Fail	
■	RF Power	FCC Part 90.205 and 2.1046 RSS-119 sect. 5.4	■	□	
■	Conducted Spurious Emissions	FCC Part 90.210 & 2.1051 RSS-119 sect. 6.3	■	□	
■	Emission Mask	FCC Part 90.210 & 2.1049 RSS-119 sect. 6.4	■	□	
■	Field Strength of Spurious Emissions	FCC Part 90.210 & 2.1053	■	□	
□	Frequency Stability	FCC Part 90.213 and 2.1055 RSS-119 sect. 7	□	□	Note 1
□	Audio Frequency Response	FCC 2.1047	□	□	Note 1
□	Audio Low Pass Filter	FCC 2.1047 RSS-119 sect. 6.6	□	□	Note 1
□	Modulation Limiting	FCC 2.1047	□	□	Note 1
■	Occupied Bandwidth	FCC 2.202 RSP 100 sect. 7.2	■	□	
□	RF Exposure	FCC 1.1310 RSS-119 sect. 9.0	□	□	To be evaluated during licensing of equipment
□	Conducted Emissions Rx port	RSS-119 sect. 8 FCC 15.111	□	□	Note 1

Note 1: these characteristics are not affected by the design change (see Section 3.4)

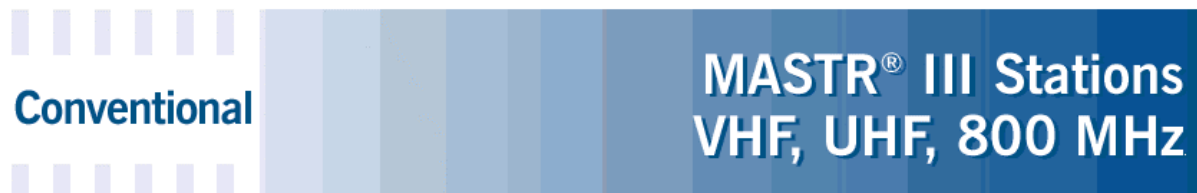
3. Equipment Under Test (EUT)

3.1 Product Functional Description

The product trade name of the unit tested is “the M/A-COM MASTRIII 800 MHz Base Station”.

Figure 3-1 provides a brief description of the tested product.

Figure 3-1 Product Description



The MASTR III, built on the tradition of the popular MASTR series of repeaters, is an industry leader in performance, flexibility, and reliability. The MASTR III provides innovations such as fully shielded and removable modules, front-mounted controls, and remote diagnostics. The MASTR III features the latest in digital signal processing technology, which provides a comprehensive array of control capabilities for system design flexibility.



3.2 Manufacturer Information

Company Name M/A-COM, Inc.
Mailing Address 221 Jefferson Ridge Parkway, Lynchburg, Virginia, U.S.A., 24501
Product Name the M/A-COM MASTRIII 800 MHz Base Station

3.3 Transmitter Specifications

Table 3-1 lists the specifications of the transmitter under test

Table 3-1: Transmitter Specifications

Circuit Pack	Fundamental Frequencies (MHz)
Tx power	10 to 100 W
Tx frequency	851 to 870 MHz
Channel spacing	851 – 866 MHz: 25 kHz 866 – 869 MHz: 12.5 kHz (NPSPAC)

3.4 Equipment Modification

The final LDMOS transistors of the power amplifier (Q1 in the Final Pallet assembly, used twice per unit) have been changed from MRF184 (Motorola) to SD57060 (ST Microelectronics). No PCB artwork have been changed and no schematic changes have been made; the parts list is updated with the new device.

3.5 System Components

The system tested consists of the following units, as shown in Table 3-2.

Table 3-2: MASTRIII 800 MHZ BTS Components

Component		Model	Serial Number
MASTRIII shelf		19D902839G2	NR
Tx Synthesizer module		EA101685V5	SLR 04111439
Rx Synthesizer module		EA101684V5	SLR 04111322
Rx Front End module		19D902782G5	SLR 03182064
IF module		EA101794V1	SLR 03190963
System module		19D902590G6	SLR 02512492
DSP module		EA101800V1	SLR 03084077
Power module		19D902589G2	CKA 01390368
12 V Battery		Dynasty TEL 12-125	NR
Switching Power supply		PS103010V120	QG12659
SitePro shelf		EA101209V1 R1B	SLR 02190892
	SSI	CB101869V1/R1A	NR
	Controller board	CB101069V2 P3A	NR
	Analog board	CB10170V1 R6A	NR
RF Power Amplifier		EA101292V1 rev PB	Prototype 2

NR: not required

3.6 Support Equipment

The support equipment used for operation and monitoring of the EUT is described in Table 3-3.

Table 3-3: Support Equipment

Description	Model Number
IBM Thinkpad PC	600E

3.7 System Set-up and Test Configurations

The system configuration used for all test cases is presented in Figure 3-2 and Figure 3-3.

Figure 3-2: Module Configuration

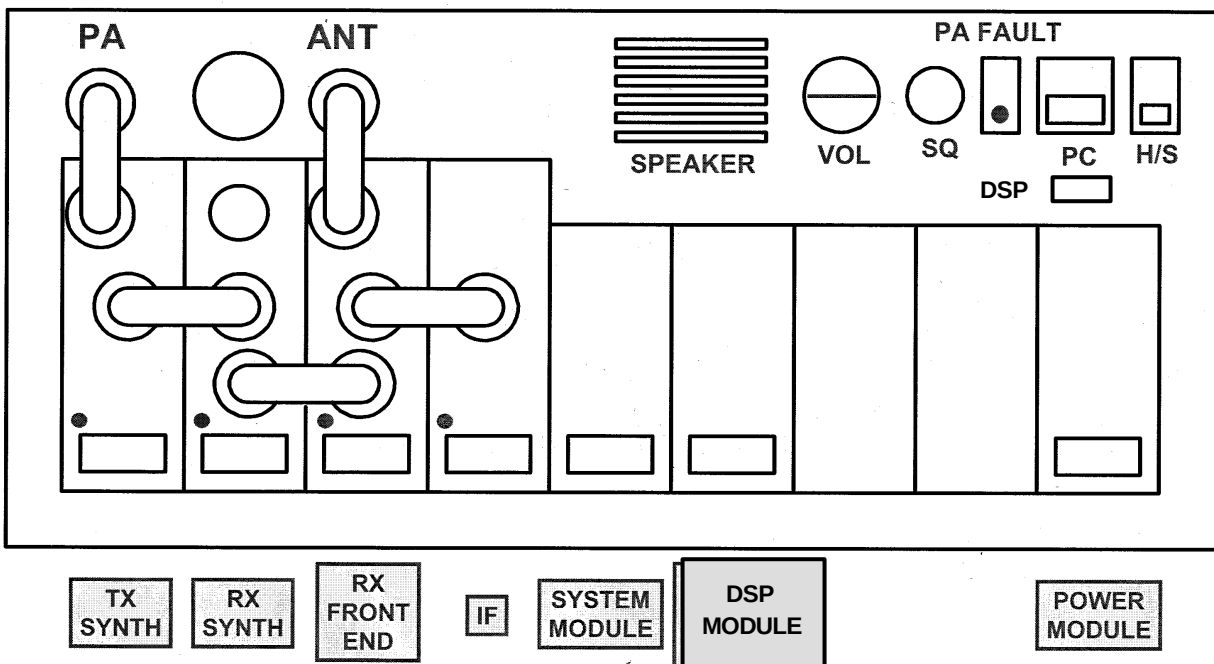
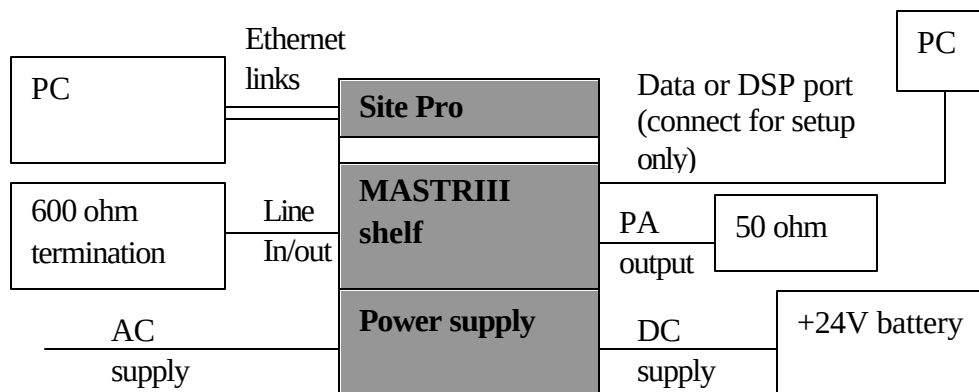


Figure 3-3: System Configuration



A photograph of the test setup used in this test report is presented in Appendix B: Test Set-up Photographs, on page 28.

3.8 EUT Interfaces and Cables

The system contains the following interfaces, as shown in Table 3-4.

Table 3-4: System Cables

Interface Type	EUT Connection	Description	Type	Length	Qty
AC Mains	AC power supply	3 wire AC cord	unshielded	6 feet	1
DC Mains (only on the new version of the supply)	Battery connector of power supply	2 wire battery cable	unshielded	6 feet	1
Ethernet link	SitePro Ethernet 0 and 1 ports	Category 5 twisted pairs	unshielded	50 feet	2
Telephone line in/out	MASTRIII shelf	2 twisted pair	unshielded	6 feet	1

3.9 System Modifications

No modifications were required to pass the requirements.

4. General Test Conditions

4.1 Test Facility

Radiated emissions testing was performed in a 10-meter Ambient Free Chamber (AFC) located at 21 Richardson Side road, Kanata, Ontario, Canada. The AFC consists of a shielded room lined with ferrite tiles and anechoic material.

These test facilities are accredited by the Standards Council of Canada (SCC) [1]. Through a Mutual Recognition Agreement (MRA) between the National Voluntary Laboratory Accreditation Program (NVLAP) and SCC, the accreditation status of the AFC facility is valid for the U.S.

4.2 Measurement Instrumentation

The measurement instrumentation conforms to ANSI C63.2 [5] and CISPR 16 [6]. Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

5. Detailed Test Results

5.1 RF Power

5.1.1 Test Specification

The system was tested to the requirements listed in Table 5-1:

Table 5-1: RF Power Requirements

Requirement	Part / Section
FCC	90.205, 2.1046
RSS-119	5.4

5.1.1.1 Limits

The system was tested to the rated power of the EUT, listed in Table 5-2.

Table 5-2: RF Power Limit

Rated power
10 to 100 W

5.1.2 Test Facility Information

Location: Soletron Design and Engineering Lab 1
Date tested: January 26, 2006
Tested by: Denis Lalonde

5.1.3 Test Procedure

The output of the power amplifier was connected to a power meter using a calibrated RF attenuator and cable.

The unmodulated RF signal was set at the bottom, middle, and top of the frequency band. The lowest and highest possible power levels were evaluated.

5.1.4 Test Results

Test results are shown in Table 5-3.

Table 5-3: RF Power Levels

Channel (MHz)	Low Power (dBm)	Hi Power (dBm)
851.0125	40.0	50.0
860.0	40.0	50.0
869.9875	40.2	50.0

5.1.5 Test Conclusion

The test results meet the requirements defined in Table 5-1: RF Power Requirements.

5.1.6 Test Equipment List

Table 5-4: Test Equipment Used for RF Power

Category	Manufacture	Model Number	Description	Serial Number	Cal. Due
Attenuator	Weinschel	53-20-33	20 dB, 500 W	SSG012589	22-Apr-2006
Attenuator	Weinschel	6070-10	10 dB, 25 W	SSG012140	23-Sep-2006
Power meter	Anritsu	M2438A	Power meter	SSG012588	19-Apr-2006
Power sensor	Anritsu	M2424A	Power sensor	SSG012587	22-Apr-2006

The measurement instrumentation conforms to ANSI C63.2[5] and CISPR 16 [6]. Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

5.2 Conducted Spurious Emissions

5.2.1 Test Specification

The system was tested to the limits of the requirements listed in Table 5-5:

Table 5-5: Conducted Spurious Emissions Requirement

Requirement	Part / Section
FCC	90.210, 2.1051
RSS-119	6.3

5.2.1.1 Limits

The following specification levels are applicable to this test:

Table 5-6: Conducted Spurious Emission Limit

Frequency Range (MHz)	Limit (dBm)
30 to 8700	-13 dBm

The limit is calculated in section 5.4.

5.2.2 Test Facility Information

Location: Soletron Design and Engineering Lab 1
Date tested: January 27, 2006
Tested by: Denis Lalonde

5.2.3 Test Procedure

Conducted spurious emissions were measured at the bottom and top of the 851 to 870 MHz frequency band. The measurement was repeated while the power amplifier was operating at 10 W and 100 W.

The signal used for measurements at 851.0125 MHz was a C4FM signal (+/-2826 Hz deviation). The signal used at 869.9875 MHz was a NPSPAC pseudo-random signal (2 level, 9600 baud with +/-2400 Hz deviation).

The measurement was separated in 3 frequency bands;

1. 30 MHz to 1 GHz: the power amplifier output is connected to the spectrum analyzer through a 10 dB and a 20 dB attenuator.
2. 1 GHz to 2.75 GHz: the power amplifier output is connected to the spectrum analyzer through a 10 dB attenuator and a notch filter.
3. 2.75 GHz to 8.7 GHz: the power amplifier output is connected to the spectrum analyzer through a 10 dB attenuator and a high-pass filter.

5.2.4 Test Results

The test result are shown in Table 5-7.

Table 5-7: Conducted Spurious Emissions

Channel (MHz)	Highest Emission Low Power Mode (dBm)	Highest Emission Hi Power Mode (dBm)	Reference
851.0125	-34.7 dBm	-24.8 dBm	Figure 7-2 to Figure 7-7
869.9875	-34.8 dBm	-25.2 dBm	Figure 7-8 to Figure 7-13

5.2.5 Test Conclusion

The test results meet the requirements defined in Table 5-5: Conducted Spurious Emissions Requirement.

5.2.6 Test Equipment List

Table 5-8: Test Equipment used for Conducted Spurious Emissions

Category	Manufacture	Model Number	Description	Serial Number	Cal. Due
Attenuator	Weinschel	53-20-33	20 dB, 500 W	SSG012589	22-Apr-2006
Attenuator	Weinschel	6070-10	10 dB, 25 W	SSG012140	23-Sep-2006
Spectrum analyzer	HP	8564A	40 GHz	SSG012069	21-Apr-2006
High Pass filter	FSY Microwave	HR2380-11XNXN	2.5 GHz high pass	002	NR
Notch filter	Wainwright Instruments	WRCAS915/960-0.2/40-6EE	Tunable notch filter	1	NR
Signal generator	Anritsu	69369A	40 GHz	SSG012138	21-Sep-2006

NR: not required, these units were calibrated using the Signal Generator and the Spectrum Analyzer

The measurement instrumentation conforms to ANSI C63.2[5] and CISPR 16 [6]. Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

5.3 Emission Mask

5.3.1 Test Specification

The system was tested to the limits of the requirements listed in Table 5-9:

Table 5-9: Emission Mask Requirement

Requirement	Part / Section
FCC	90.210, 2.1049
RSS-119	6.4

5.3.1.1 Limits

The specification levels in Table 5-10 were used.

Table 5-10: Emission Mask Limits

Frequency Range (MHz)	Audio modulation	2 level/9600 baud modulation, C4FM modulation, NPSPAC modulation
851 to 866	Mask B	Mask G
866 to 869	Mask B	Mask H

5.3.2 Test Facility Information

Location: Soletron Design and Engineering Lab 1

Date tested: January 26 and 27, 2006

Tested by: Denis Lalonde

5.3.3 Test Procedure

Four emission mask measurements were performed at 860 MHz and two at 869.9875 MHz. The six different modulated signals were evaluated as follows:

1. Analog signal: the power amplifier output was modulated with a 2500 Hz signal which had a level 16 dB higher than what was required to produce a deviation of 50% of rated system deviation (5 kHz) at 1 kHz. Tested at 860 MHz.
2. Two level/9600 baud modulation: the power amplifier output was modulated with a 2 level 9600 baud pseudo-random signal which had the level required for +/- 3 kHz deviation. Tested at 860 MHz.
3. Two level/9600 baud modulation: the power amplifier output was modulated with a 2 level 9600 baud pseudo-random signal which had the level required for +/- 1.9 kHz deviation. Tested at 860 MHz.
4. C4FM modulation: the power amplifier output was modulated with a C4FM pseudo-random signal which had the level required for a maximum of +/- 2826 Hz deviation. Tested at 860 MHz.
5. NPSPAC modulation (9600 baud): the power amplifier output was modulated with a 2 level 9600 baud pseudo-random signal which had the level required for +/- 2.4 kHz deviation. Tested at 869.9875 MHz.
6. NPSPAC modulation (analog) : the power amplifier output was modulated with a 2500 Hz signal which had a level 16 dB higher than what was required to produce a deviation of 50% of rated system deviation (4 kHz) at 1 kHz. Tested at 869.9875 MHz.

For all of these measurements, the power amplifier output was connected to the spectrum analyzer through a 10 dB and a 20 dB attenuator.

5.3.4 Test Results

Table 5-11 lists the modulation modes measured:

Table 5-11: Emission Mask Results

Type of signal	Test result	Reference
2500 Hz Audio	Pass	Figure 7-14
2 level 9600 baud / 3 KHz deviation	Pass	Figure 7-15
2 level 9600 baud / 1.9 KHz deviation	Pass	Figure 7-16
C4FM	Pass	Figure 7-17
NPSPAC (9600 baud)	Pass	Figure 7-18
NPSPAC (analog)	Pass	Figure 7-19

5.3.5 Test Conclusion

The test results meet the requirements defined in Table 5-9: Emission Mask Requirement.

5.3.6 Test Equipment List

Table 5-12: Test Equipment used for Emission Mask

Category	Manufacture	Model	Description	Serial Number	Cal. Due
Attenuator	Weinschel	53-20-33	20 dB, 500 W	SSG012589	22-Apr-2006
Attenuator	Weinschel	6070-10	10 dB, 25 W	SSG012140	23-Sep-2006
Spectrum analyzer	HP	8564A	40 GHz	SSG012069	21-Apr-2006

The measurement instrumentation conforms to ANSI C63.2[5]. Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

5.4 Field Strength of Spurious Emissions

5.4.1 Test Specification

The system was tested to the limits of the following requirements:

Table 5-13: Field Strength of Spurious Emissions Requirement

Requirement	Part / Section
FCC	90.210, 2.1053

5.4.1.1 Limits

The following specification levels are worst-case limits taken from all test specifications.

Table 5-14: Field Strength of Spurious Emissions Limit

Frequency Range (MHz)	ERP Limit (dBm)
30 to 8700	-13

The ERP limit was calculated using the minimum attenuation requirement of FCC 90.210 d)3).

$$\begin{aligned}\text{Attenuation} &= 43 + 10 \log (P) \text{ dB} \\ &= 43 + 10 \log (100) \\ &= 63 \text{ dB}\end{aligned}$$

$$\begin{aligned}\text{ERP limit} &= 10 \log (100 \text{ W}) - 63 \text{ dB} \\ &= -13 \text{ dBm}\end{aligned}$$

When operating at 10 W, the ERP limit for spurious emissions is – 13 dBm.

5.4.2 Test Facility Information

Location: Soletron Design and Engineering 10m Ambient Free Chamber

Date tested: January 29, 2006

Tested by: K. Sivaratnam and D. Lalonde

5.4.3 Test Procedure

Verifications of the test equipment and AFC were performed prior to the installation of the EUT in accordance with the quality assurance procedures in KP000270-LP-EMC-01-06 [7]. The test was performed as per the relevant test procedures in ANSI C63.4 [4]:

The system was tested in the following manner:

- The EUT was placed on a turntable inside the AFC and it was configured as in normal operation. The system and its cables were separated from the ground plane by an insulating support 10 mm in height. The system was grounded in accordance with its normal installation specifications. No additional grounding connections are allowed.
- For tests between 30 MHz and 1 GHz a broadband bilog antenna was placed at a 10 m distance; a horn antenna, placed also at 10 m distance from the EUT, was used for measurements between 1 GHz and 9 GHz.
- A pre-scan was performed to find emissions (frequencies) requiring detail measurement. The pre-scan (using a peak detector) was performed by rotating the system 360 degrees while recording all emissions (frequency and amplitude). This procedure was repeated for

antenna heights of 1 to 4 meters, in steps of 1 meter, and for horizontal and vertical polarizations of the receiving antenna (for measurements above 30 MHz).

- Prescan optimization was performed based on the pre-scan data. All frequencies, having emission levels within 10 dB of the specification(s) limits, were optimized. For each such frequency, the EUT was rotated in azimuth over 360 degrees and the direction of maximum emission was noted. Antenna height was then varied from 1 to 4 meters at this azimuth to obtain maximum emissions. The procedure was repeated for both horizontal and vertical polarizations of the search antenna. Then the maximum level measured was recorded.
- The frequency range investigated was 30 MHz to 9 GHz.
- Between 30 MHz and 1 GHz, a resolution bandwidth of 120 kHz was used.
- Above 1 GHz, a 1 MHz resolution bandwidth was used.
- The highest emissions were evaluated using the substitution method. This is accomplished by replacing the EUT by a calibrated antenna, cable and signal generator. This equipment is used to transmit a signal that will generate a RF meter reading level identical to the one recorded when the EUT was present. The signal generator power level, the calibration data of the cable and antenna is then used to evaluate the Effective Radiated Power (ERP) of the EUT. The following formula is used:

ERP = Signal generator level – Cable losses + Antenna gain (dBi) – Gain of tuned dipole (dBi)

Margin = Limit – ERP

The measurement was performed while the power amplifier was operating at 10 W and 100 W. A 9600 baud 2 level digital signal at 860 MHz was used for this test. A 50 ohm load was connected to the power amplifier output.

5.4.4 Test Results

Table 5-15 lists the highest emissions measured while the transmitter was set to 100 W, all other emissions had more than 20 dB margin. The levels of measurements performed at 10 W were all lower than recorded in Table 5-15.

Table 5-15: Field Strength of Spurious Emissions

Freq. of Emission (MHz)	Signal Generator Level Hi Power (dBm)	Antenna Gain (dBi)	Cable losses (dB)	ERP Hi Power (dBm)	Margin (dB)	Reference
1720	-29.1	8.4	1.5	-24.4	11.4	Figure 7-20 to Figure 7-21
2153.53	-28.3	8.8	1.8	-23.5	10.5	Figure 7-20 to Figure 7-21
2580	-35.2	9.6	1.9	-29.7	16.7	Figure 7-20 to Figure 7-21
3440	-40	9.8	2.2	-34.6	21.6	Figure 7-20 to Figure 7-21
4300	-36.5	10.4	2.5	-30.8	17.8	Figure 7-20 to Figure 7-21
5160	-42.6	10.7	2.6	-36.7	23.7	Figure 7-20 to Figure 7-21
6020	-31	11.3	2.7	-24.6	11.6	Figure 7-20 to Figure 7-21
7740	-38	11.3	3.2	-32.1	19.1	Figure 7-20 to Figure 7-21
8600	-42.9	11.5	3.3	-36.9	23.9	Figure 7-20 to Figure 7-21

5.4.5 Test Conclusion

The test results meet the requirements defined in Table 5-13: Field Strength of Spurious Emissions Requirement.

5.4.6 Test Equipment List

Table 5-16: Test Equipment used for Field Strength of Spurious Emissions

Description	Make	Model Number	Asset Number	Cal. Due
Bilog Antenna	Antenna Research	LPB 2520A	SSG012299	1/3/2007
Spectrum Analyzer, HP8566B, (AFC #1)	HP	8566B	SSG012521	4/21/2006
Spec. A, RF PreSelector, HP85685A (AFC #1)	HP	85685A	SSG012010	4/21/2006
EMC Cable # 25, Sucotest Cable	Huber + Suhner	ST18/Nm/Nm/36	SSG012788	2/8/2006
Double Ridged Horn	Emco	3115	SSG012508	12/21/2006
Power Supply	HP	6216A	SSG013063	2/11/2007
Pre-Amplifier	BNR	LNA	SSG012360	2/10/2006
Quasi-Peak Adapter, HP85650A, (EMI # 2)	HP	85650A	SSG013046	9/22/2006
RF Amplifier, HP8447 # 2	HP	8447D	SSG012405	2/8/2006
EMC Cable # 5, Sucoflex Cable	Huber & Suhner	104PEA	SSG012359	2/10/2006
EMC Cable # 3, Sucoflex Cable	Huber & Suhner	106A	SSG012455	2/9/2006
EMC Cable # 2, Sucoflex	Huber & Suhner	106A	SSG012453	2/9/2006

Description	Make	Model Number	Asset Number	Cal. Due
Cable				
EMC Cable # 4, Utiflex Cable	Micro-Coax	UFA 147B-1-0300-70X70	SSG012309	9/22/2006
Spectrum Analyzer Display, HP 85662A	HP	85662A	SSG012433	4/21/2006

The measurement instrumentation conforms to ANSI C63.2[5] and CISPR 16 [6]. Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

5.5 Occupied Bandwidth

5.5.1 Test Specification

The system occupied bandwidth was evaluated according to the specifications listed in Table 5-17:

Table 5-17: Occupied Bandwidth

Requirement	Part / Section
FCC	2.202
RSP-100	7.2

5.5.2 Test Facility Information

Location: Soletron Design and Engineering Lab 1
Date tested: January 26 and 27, 2006
Tested by: Denis Lalonde

5.5.3 Test Procedure

Four occupied bandwidth measurements were performed at 860 MHz and two at 869.9875 MHz. The six different modulated signals were evaluated as follows:

1. Analog signal: the power amplifier output was modulated with a 2500 Hz signal which had a level 16 dB higher than what was required to produce a deviation of 50% of rated system deviation (5 kHz) at 1 kHz. Tested at 860 MHz.
2. Two level/9600 baud modulation: the power amplifier output was modulated with a 2 level 9600 baud pseudo-random signal which had the level required for +/- 3 kHz deviation. Tested at 860 MHz.

3. Two level/9600 baud modulation: the power amplifier output was modulated with a 2 level 9600 baud pseudo-random signal which had the level required for +/- 1.9 kHz deviation. Tested at 860 MHz.
4. C4FM modulation: the power amplifier output was modulated with a C4FM pseudo-random signal which had the level required for a maximum of +/- 2826 Hz deviation. Tested at 860 MHz.
5. NPSPAC modulation (9600 baud): the power amplifier output was modulated with a 2 level 9600 baud pseudo-random signal which had the level required for +/- 2.4 kHz deviation. Tested at 869.9875 MHz.
6. NPSPAC modulation (analog) : the power amplifier output was modulated with a 2500 Hz signal which had a level 16 dB higher than what was required to produce a deviation of 50% of rated system deviation (4 kHz) at 1 kHz. Tested at 869.9875 MHz.

For all of these measurements, the power amplifier output was connected to the spectrum analyzer through a 10 dB and a 20 dB attenuator.

The occupied bandwidth was measured using the 99% bandwidth measuring feature of the spectrum analyzer.

5.5.4 Test Results

The table below lists the calculated and measured occupied bandwidth.

Table 5-18: Occupied bandwidth values

Type of signal	Calculation	Measurement (kHz)	Currently Used Emission Designators
Audio	Max. modulation (M) = 3 kHz Max. deviation (D) = 5 kHz $K = 1$ $B_n = 2M + 2DK$ $B_n = 16 \text{ kHz}$	10.7 kHz Figure 7-22 (measured with 2.5 kHz tone)	16K0F3E
2 level 9600 baud / 3 KHz deviation	Max. modulation (B) = 9.6 kHz Max. deviation (D) = 3 kHz $K = 1$ $B_n = B + 2DK$ $B_n = 15.6 \text{ kHz}$	11.0 kHz Figure 7-23	10K8F1D 10K8F1E
2 level 9600 baud / 1.9 KHz deviation	Max. modulation (B) = 9.6 kHz Max. deviation (D) = 1.9 kHz $K = 1$ $B_n = B + 2DK$ $B_n = 13.44 \text{ kHz}$	9.2 kHz Figure 7-24	8K2F1D 8K2F1E
C4FM	Max. modulation (B) = 4.8 kHz Max. deviation (D) = 2.826 kHz $K = 1$ $B_n = B + 2DK$ $B_n = 10.452 \text{ kHz}$	6.8 kHz Figure 7-25	7K8F1D 7K8F1D

Type of signal	Calculation	Measurement (kHz)	Currently Used Emission Designators
NPSPAC (9600 baud)	Max. modulation (B) = 9.6 kHz Max. deviation (D) = 2.4 kHz $K = 1$ $B_n = B + 2DK$ $B_n = 14.4 \text{ kHz}$	10.4 kHz Figure 7-26	10K5F1D 10K5F1E
NPSPAC (analog)	Max. modulation (M) = 3 kHz Max. deviation (D) = 4 kHz $K = 1$ $B_n = 2M + 2DK$ $B_n = 14 \text{ kHz}$	10.1 kHz Figure 7-27 (measured with 2.5 kHz tone)	14K0F3E

5.5.5 Test Equipment List

Table 5-19: Test Equipment used for Occupied bandwidth

Category	Manufacture	Model	Description	Serial Number	Cal. Due
Attenuator	Weinschel	53-20-33	20 dB, 500 W	SSG012589	22-Apr-2006
Attenuator	Weinschel	6070-10	10 dB, 25 W	SSG012140	23-Sep-2006
Spectrum analyzer	HP	8564A	40 GHz	SSG012069	21-Apr-2006

The measurement instrumentation conforms to ANSI C63.2[5]. Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

6. References

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3. Solectron EMS Canada Inc. Lab Operations Manual KG000347-QD-LAB-01-05, 2004.
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9. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations), Part 22, U.S. Federal Communications Commission.
10. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations), Part 90, U.S. Federal Communications Commission.
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15. ILAC, International Laboratory Accreditation Cooperation, Website (February 10th, 2004): <http://www.ilac.org/>
16. Industry Canada, RSS 212, Test Facilities and Test Methods for Radio Equipment, Issue 1 (Provisional), February 27, 1999.

7. Appendices

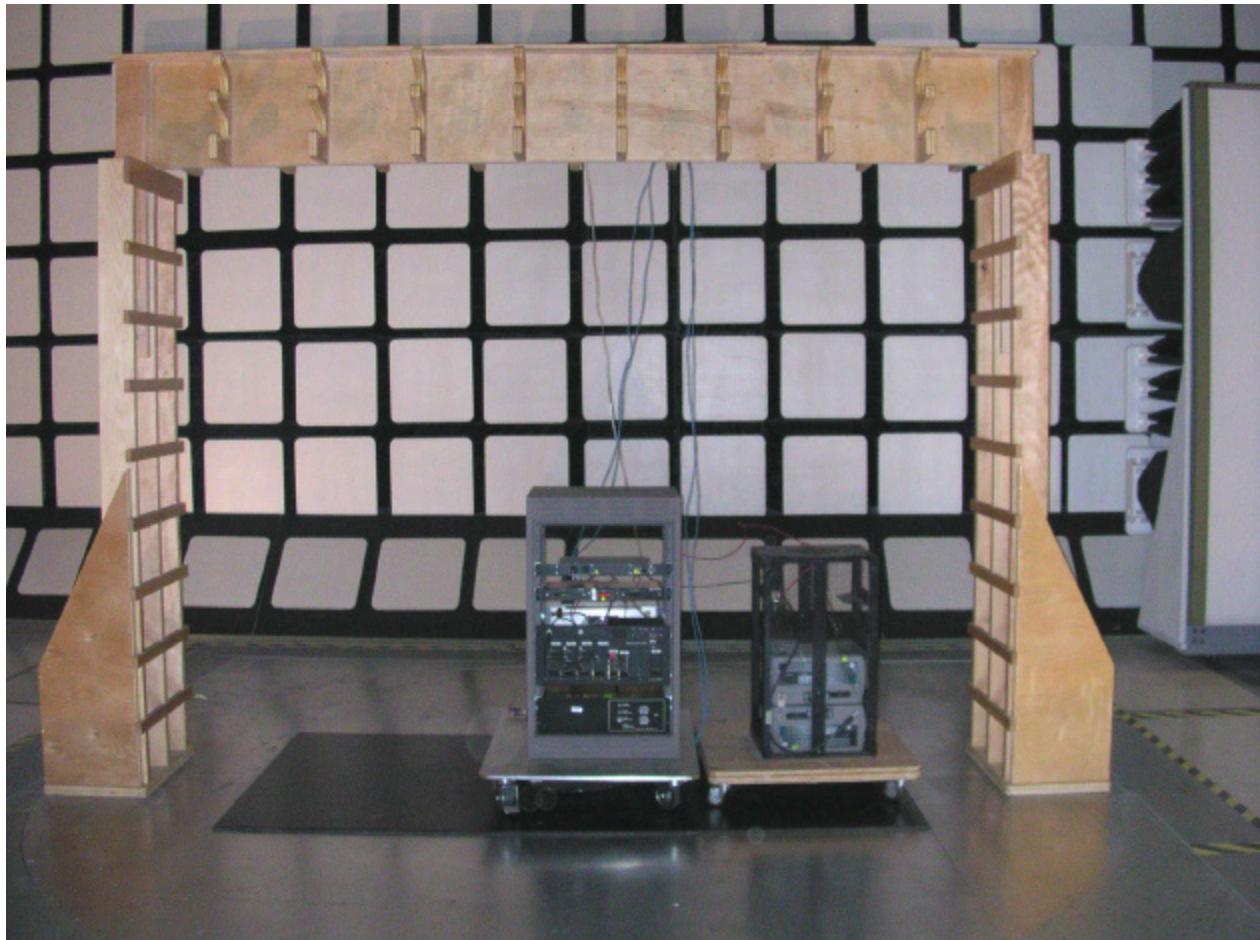
7.1 Appendix A: Glossary

Included below are definitions and abbreviations of terms used in this document.

Term	Definition
AC	Alternating Current
AFC	Ambient Free Chamber
AM	Amplitude modulation
ANSI	American National Standards Institute
AVG	Average detector
CISPR	Comité International Spécial Perturbation Radioélectrique (International Special Committee on Radio Interference)
Class A	Class A Limits for typical commercial establishments
Class B	Class B Limits for typical domestic and residential establishments
dB	Decibel
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EN	European Normative
EUT	Equipment Under Test
FCC	Federal Communications Commission, USA
GND	Ground
IC	Industry Canada
PA	Broadband Power Amplifier
RBW	Resolution Bandwidth
RF	Radio-Frequency
RFI	Radio-Frequency Interference
SCC	Standards Council of Canada

7.2 Appendix B: Test Set-up Photographs

Figure 7-1: the M/A-COM MASTRIII 800 MHz Base Station Radiated Emissions Set-up



7.3 Appendix C: Conducted Spurious Emissions Plots

Figure 7-2: Tx at 851.0125 MHz, 100 W Power, 30 MHz to 1 GHz

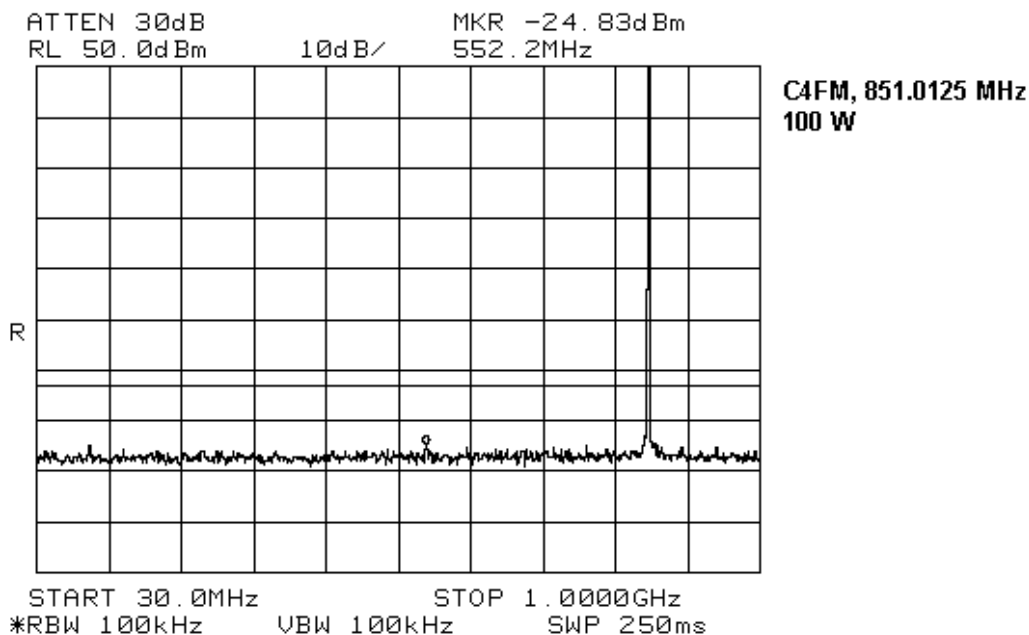


Figure 7-3: Tx at 851.0125 MHz, 100 W Power, 1 GHz to 2.75 GHz

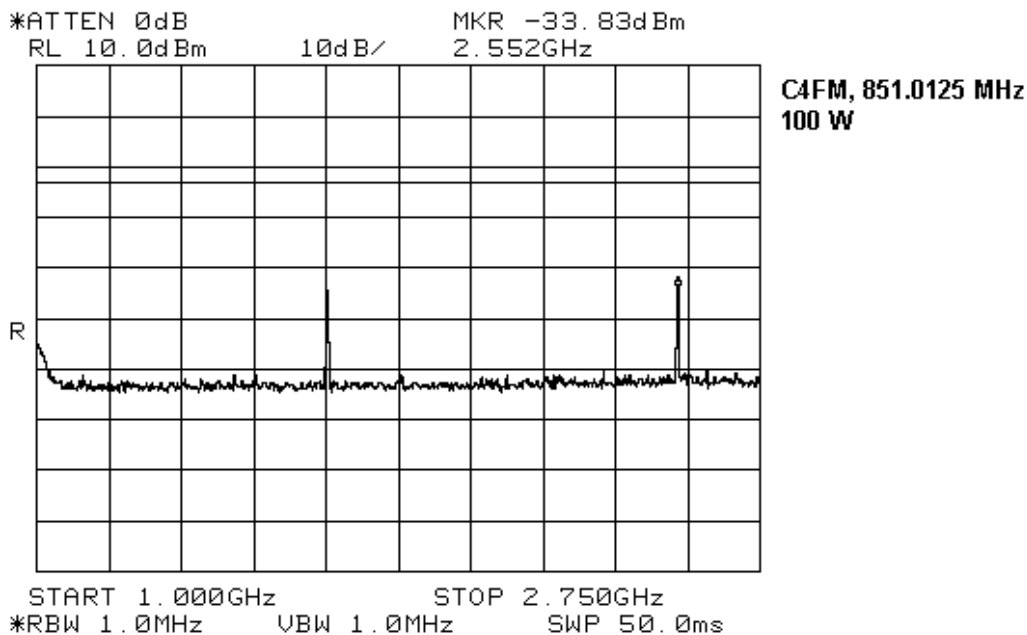


Figure 7-4: Tx at 851.0125 MHz, 100 W Power, 2.75 GHz to 8.7 GHz

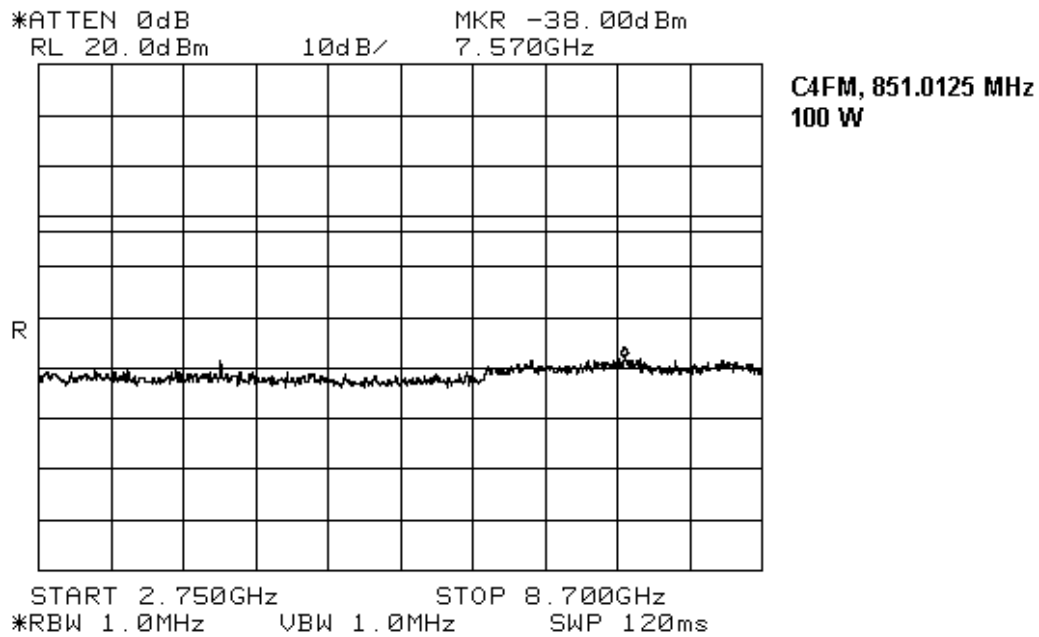


Figure 7-5: Tx at 851.0125 MHz, 10 W Power, 30 MHz to 1 GHz

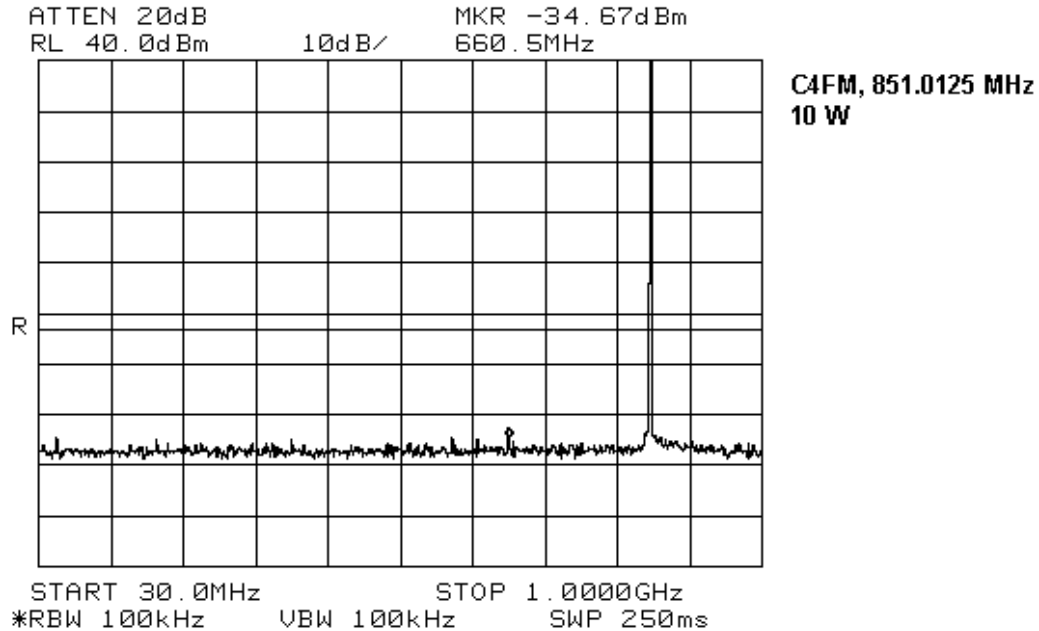


Figure 7-6: Tx at 851.0125 MHz, 10 W Power, 1 GHz to 2.75 GHz

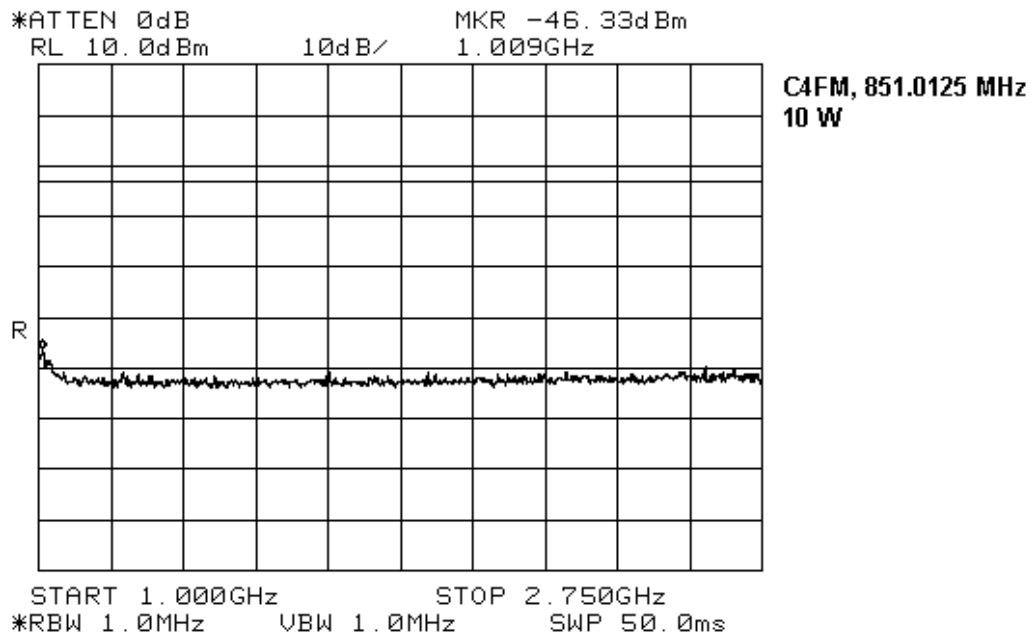


Figure 7-7: Tx at 851.0125 MHz, 10 W Power, 2.75 GHz to 8.7 GHz

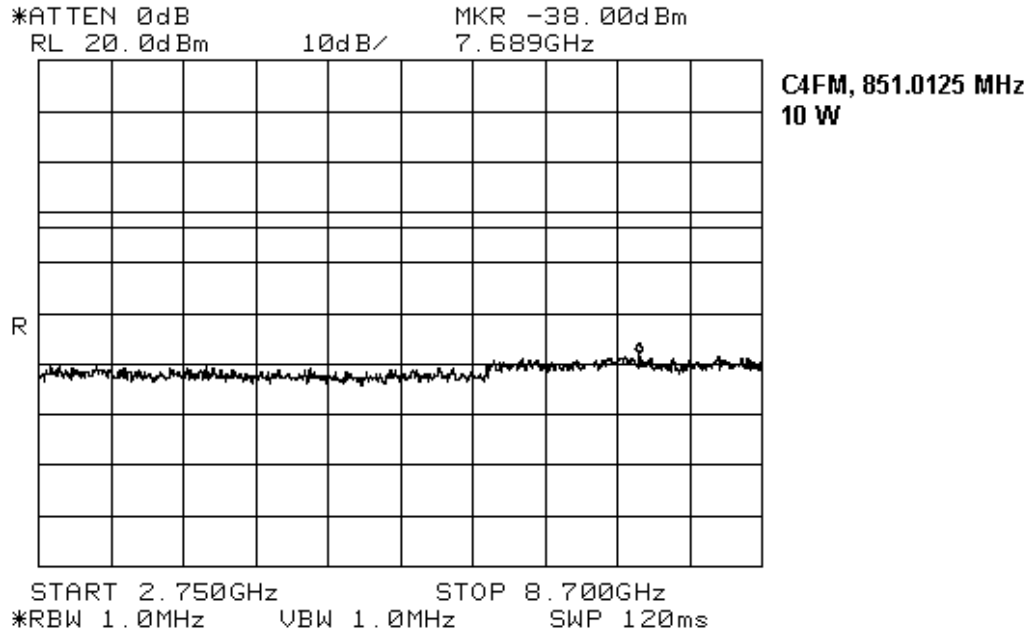


Figure 7-8: Tx at 869.9875 MHz, 100 W Power, 30 MHz to 1 GHz

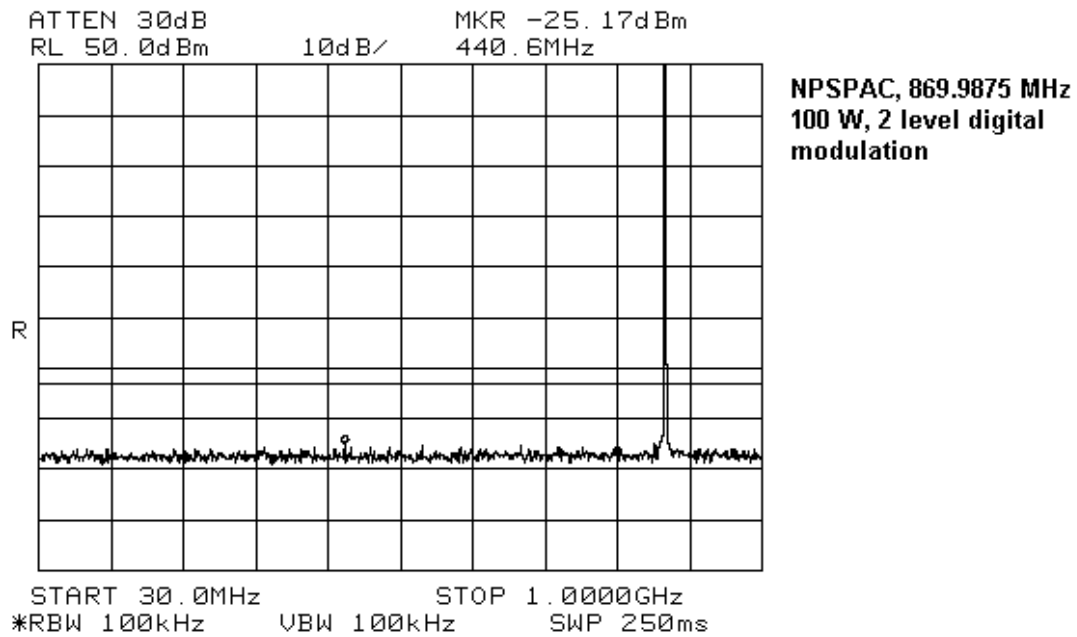


Figure 7-9: Tx at 869.9875 MHz, 100 W Power, 1 GHz to 2.75 GHz

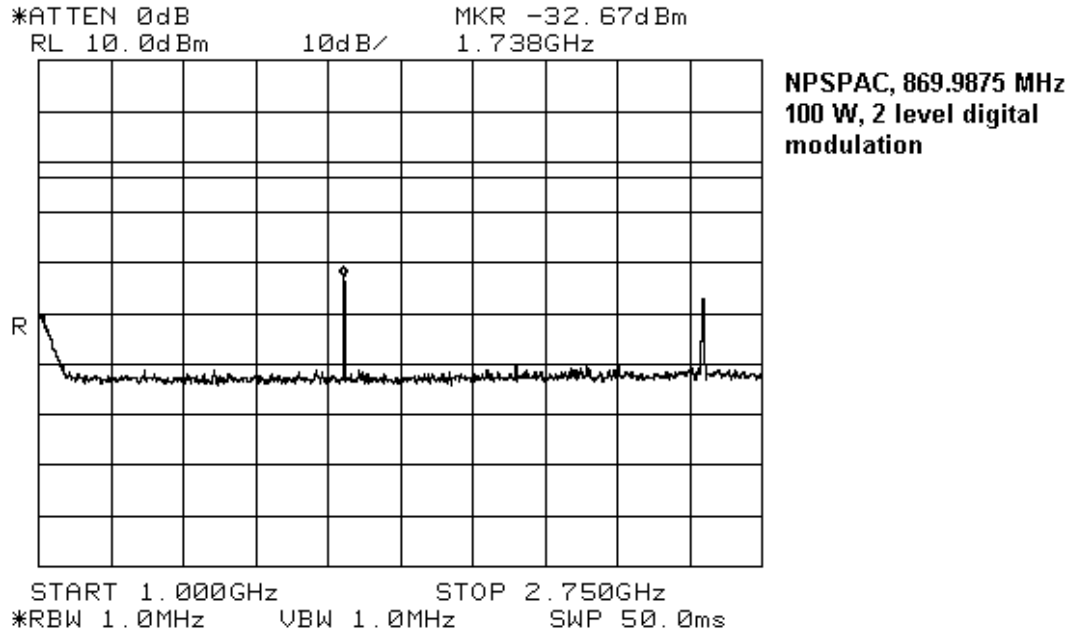


Figure 7-10: Tx at 869.9875 MHz, 100 W Power, 2.75 GHz to 8.7 GHz

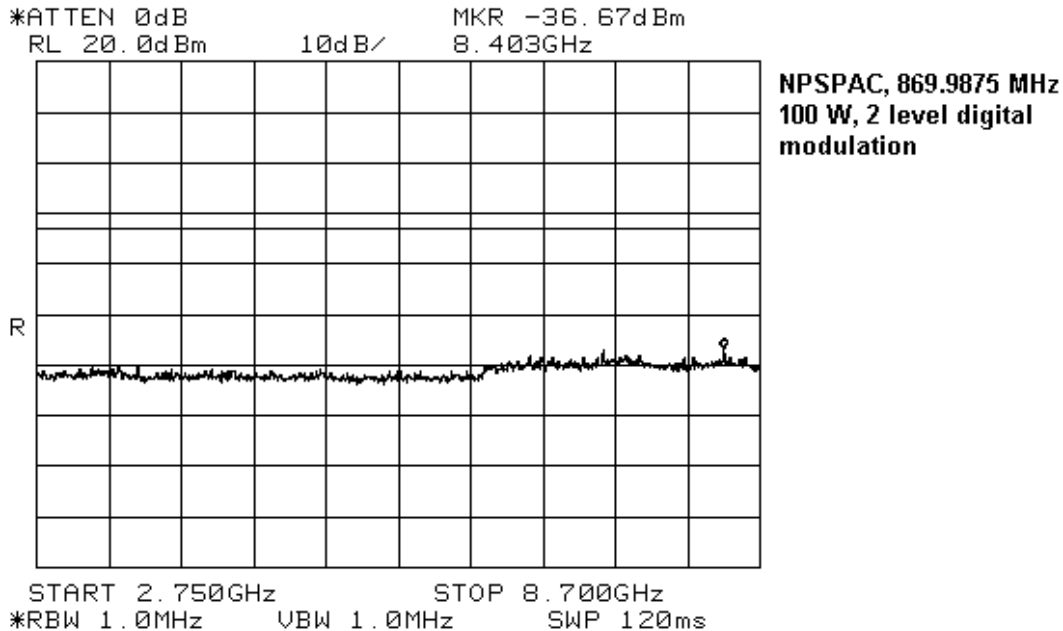


Figure 7-11: Tx at 869.9875 MHz, 10 W Power, 30 MHz to 1 GHz

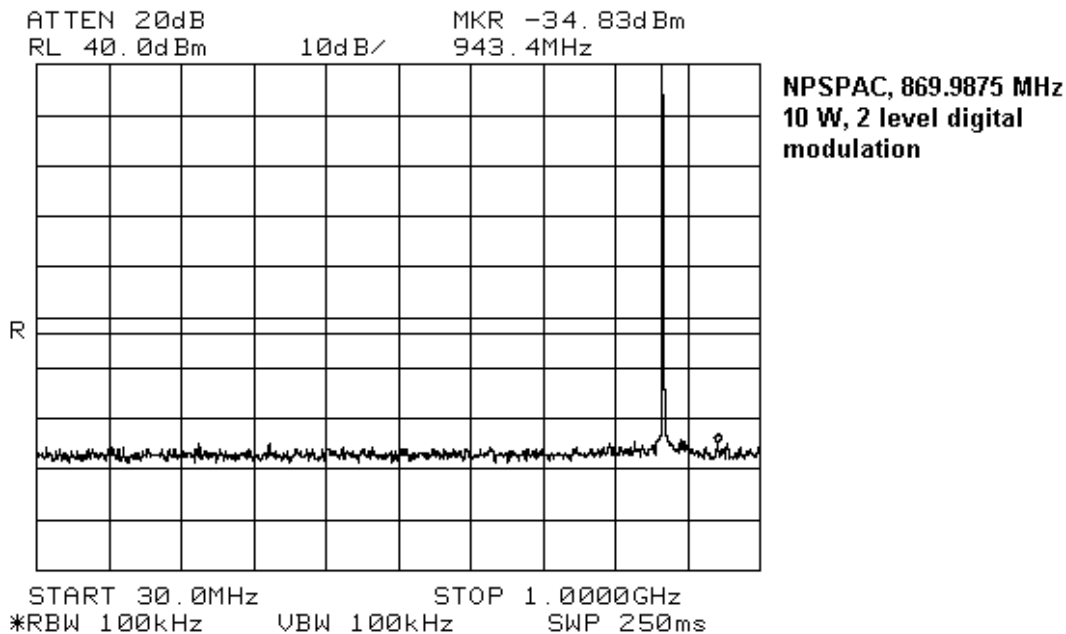


Figure 7-12: Tx at 869.9875 MHz, 10 W Power, 1 GHz to 2.75 GHz

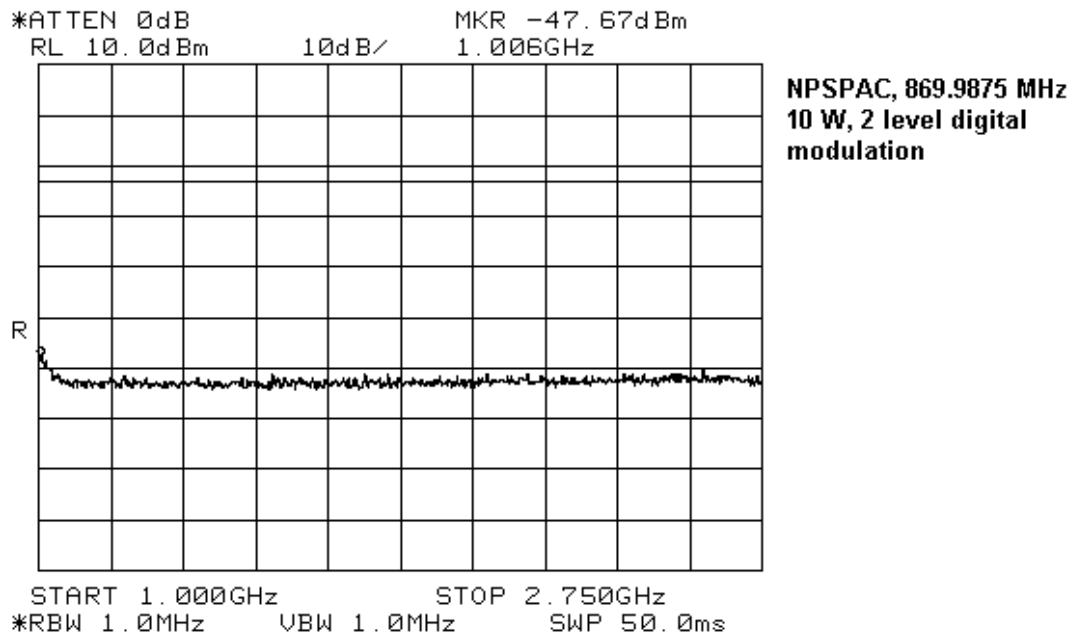
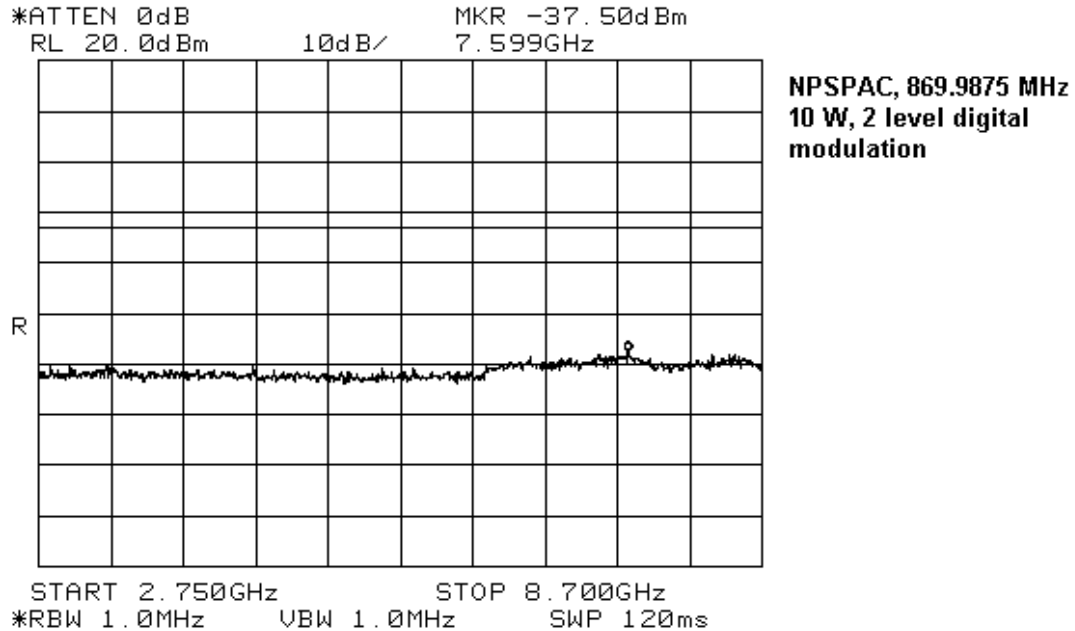


Figure 7-13: Tx at 869.9875 MHz, 10 W Power, 2.75 GHz to 8.7 GHz



7.4 Appendix D: Emission Mask Plots

This appendix presents all emission mask plots for the test cases measured.

Figure 7-14: 2500 Hz Audio Signal

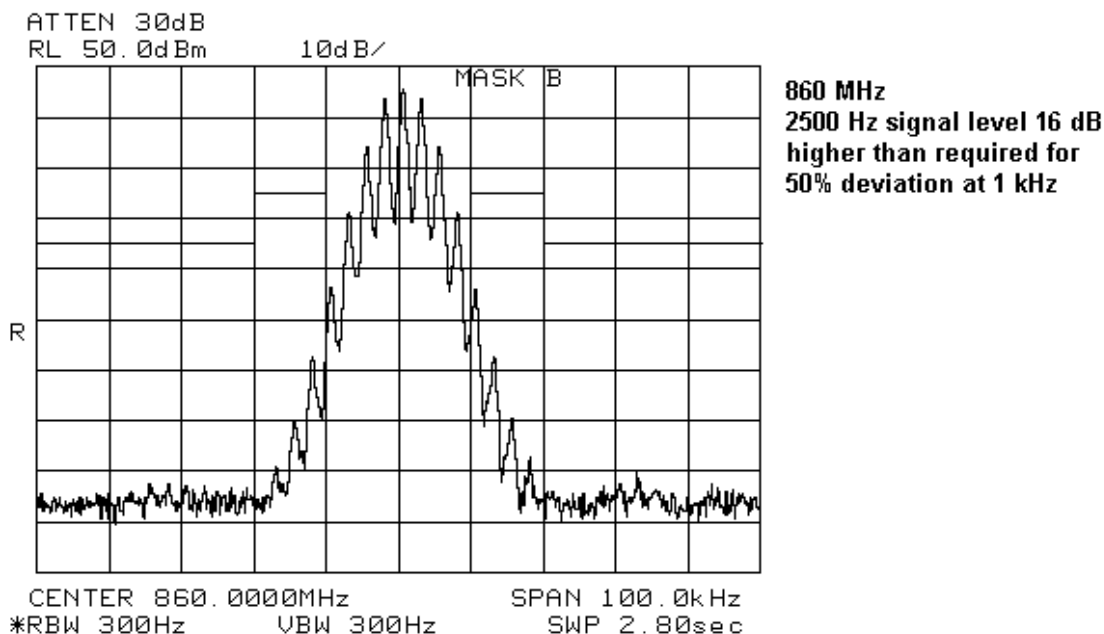


Figure 7-15: 2 level 9600 baud Signal With 3 kHz Deviation

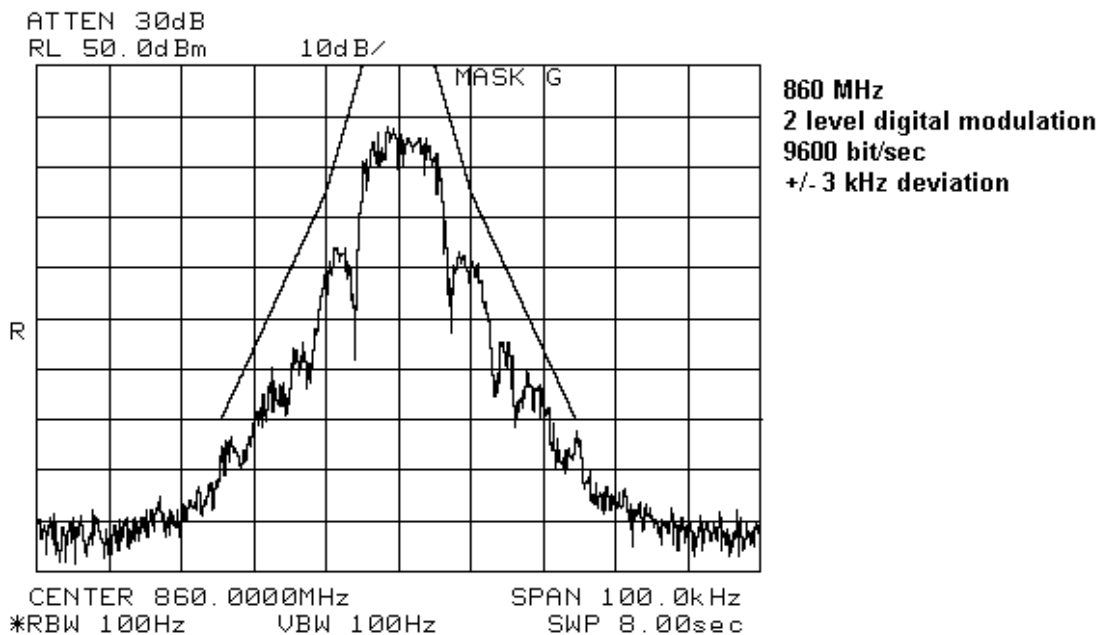


Figure 7-16: 2 level 9600 baud Signal With 1.9 kHz Deviation

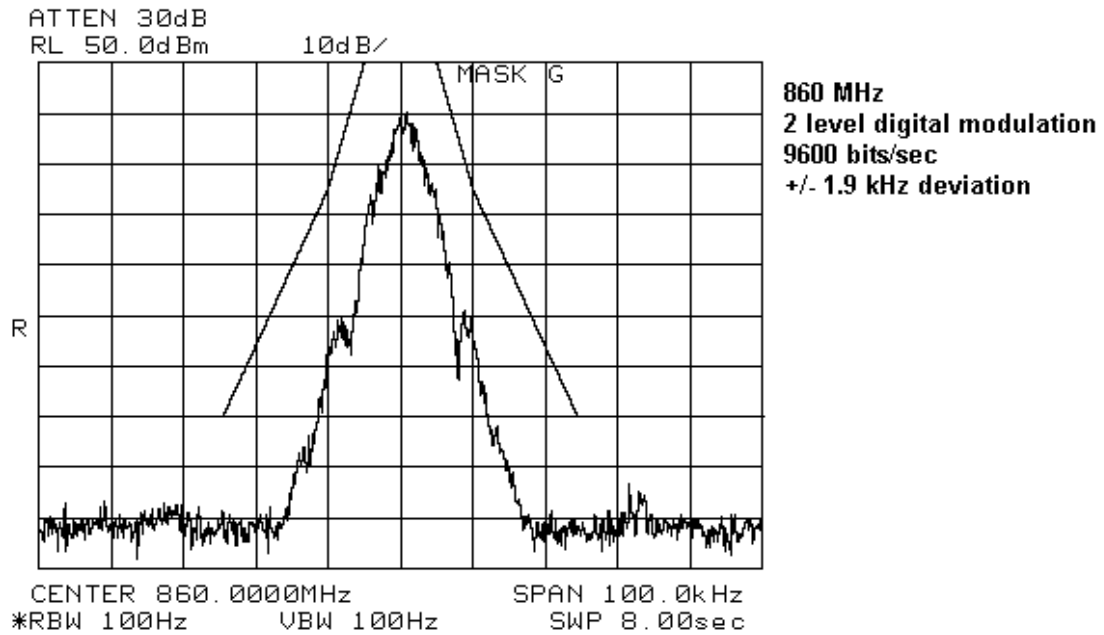


Figure 7-17: C4FM Signal

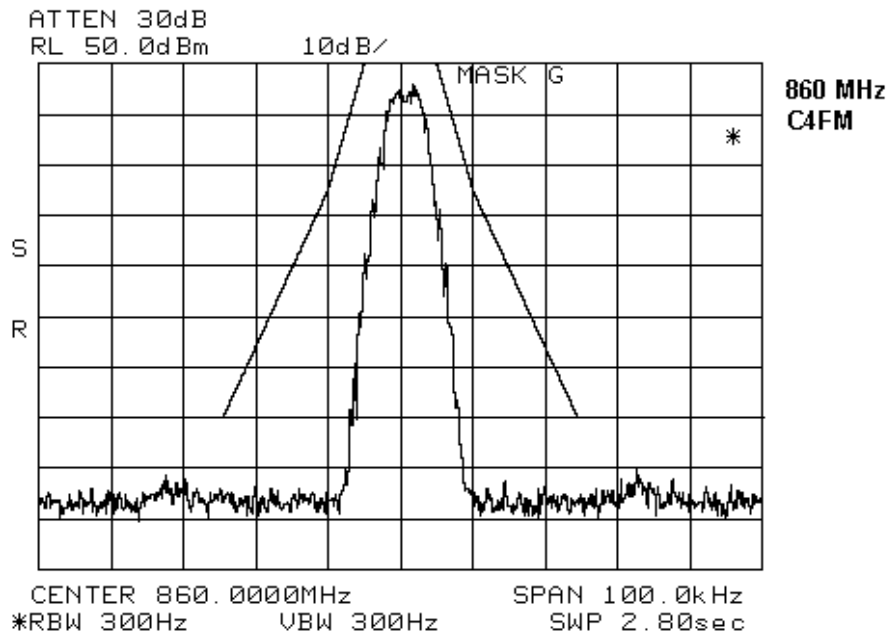


Figure 7-18: NPSPAC (9600 baud) Signal

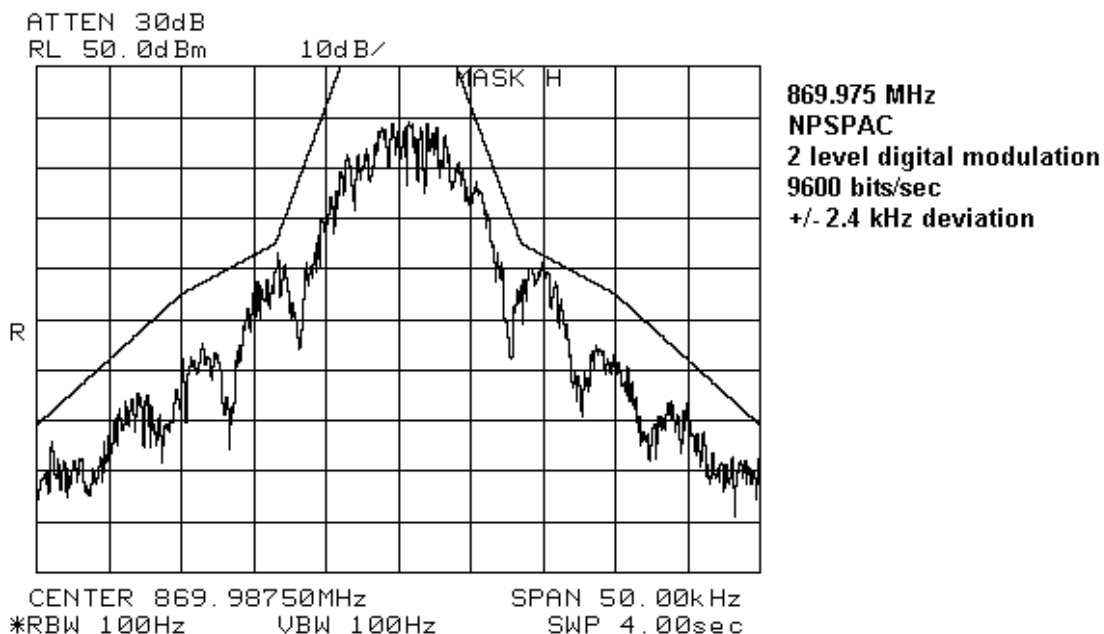
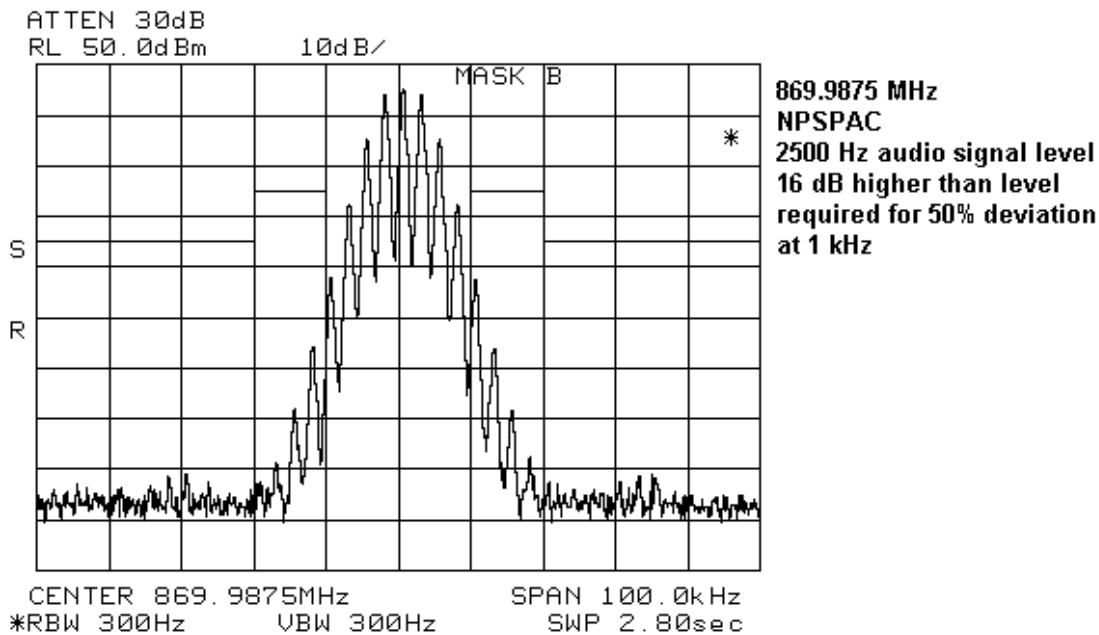


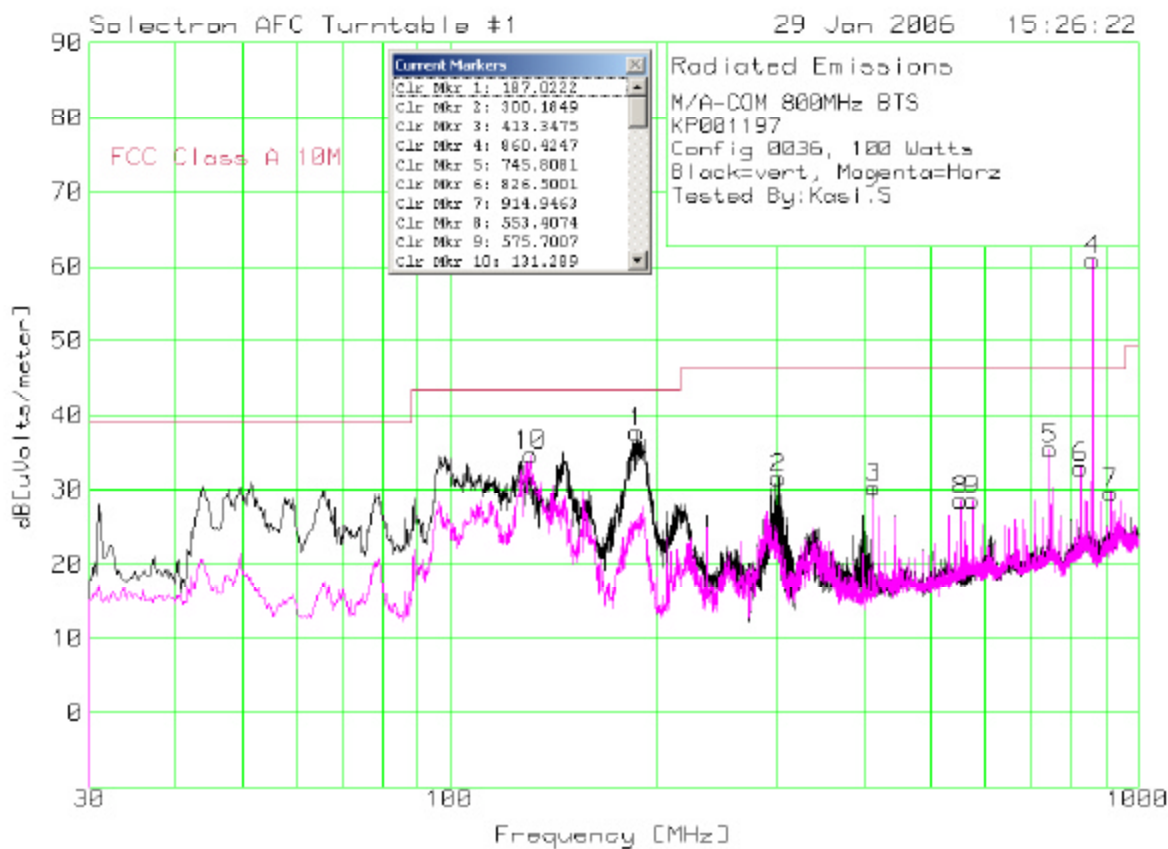
Figure 7-19: NPSPAC (Analog) signal



7.5 Appendix E: Field Strength of Spurious Emissions Plots

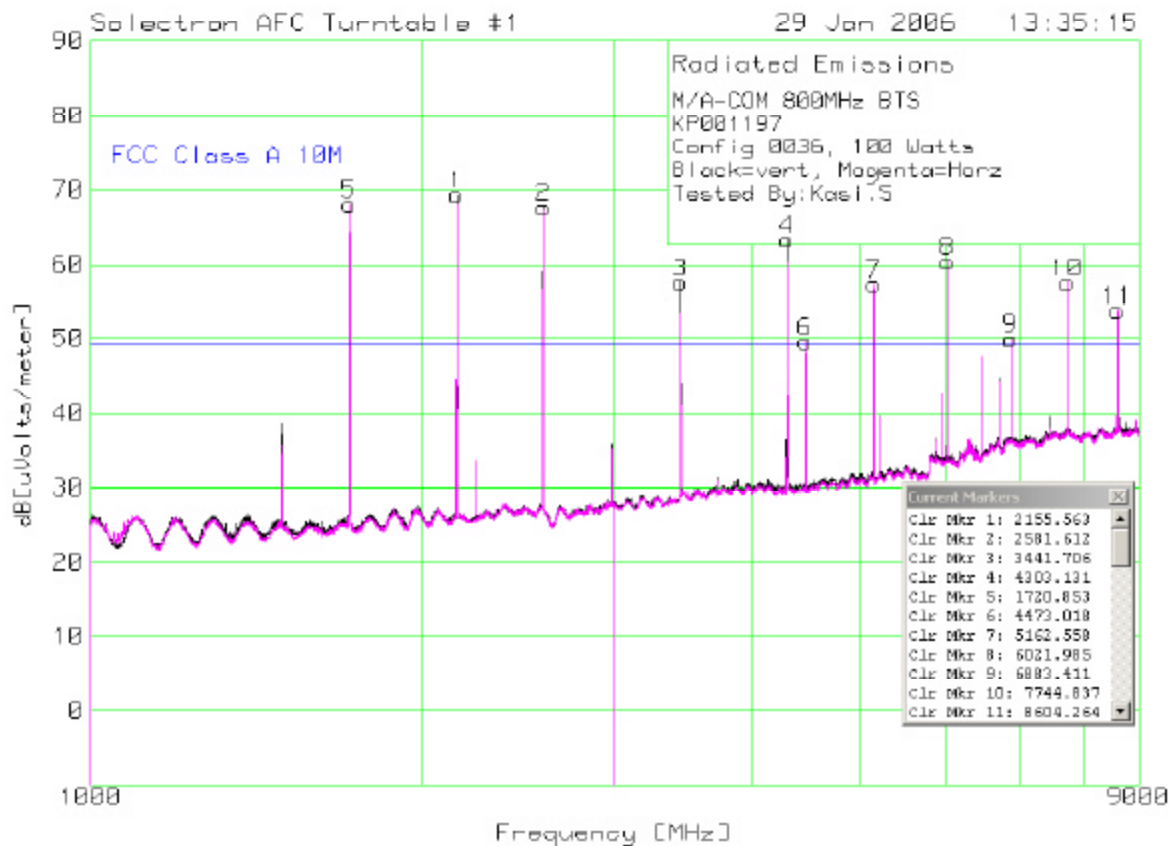
This appendix presents all field strength plots for the test cases measured.

Figure 7-20: Field Strength With 100 W Tx, 30 MHz to 1 GHz



Note: the emissions at 860 MHz is leakage of the transmitted signal

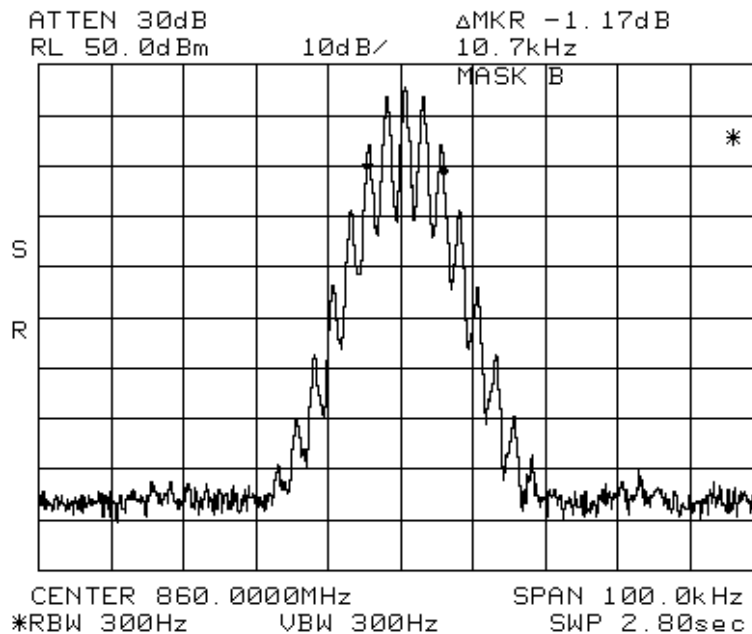
Figure 7-21: Field Strength With 100 W Tx, 1 GHz to 9 GHz



7.6 Appendix F: Occupied Bandwidth Plots

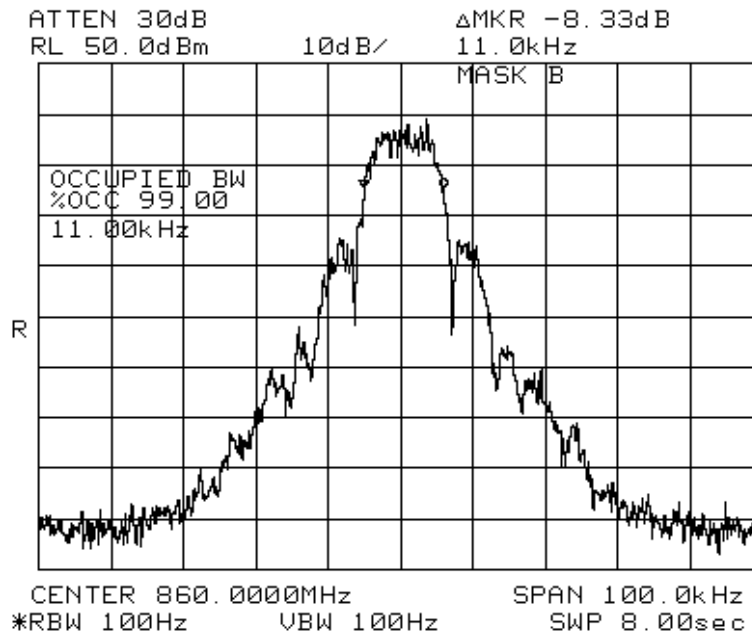
This appendix presents all the occupied bandwidth plots for the test cases measured.

Figure 7-22: 2500 Hz Audio Signal



860 MHz
2500 Hz signal level 16 dB
higher than level required
for 50% deviation at 1 KHz

Figure 7-23: 2 Level 9600 baud Signal With 3 kHz Deviation



860 MHz
2 level modulation
9600 bits/sec
+/- 3 kHz deviation

Figure 7-24: 2 Level 9600 baud Signal With 1.9 kHz Deviation

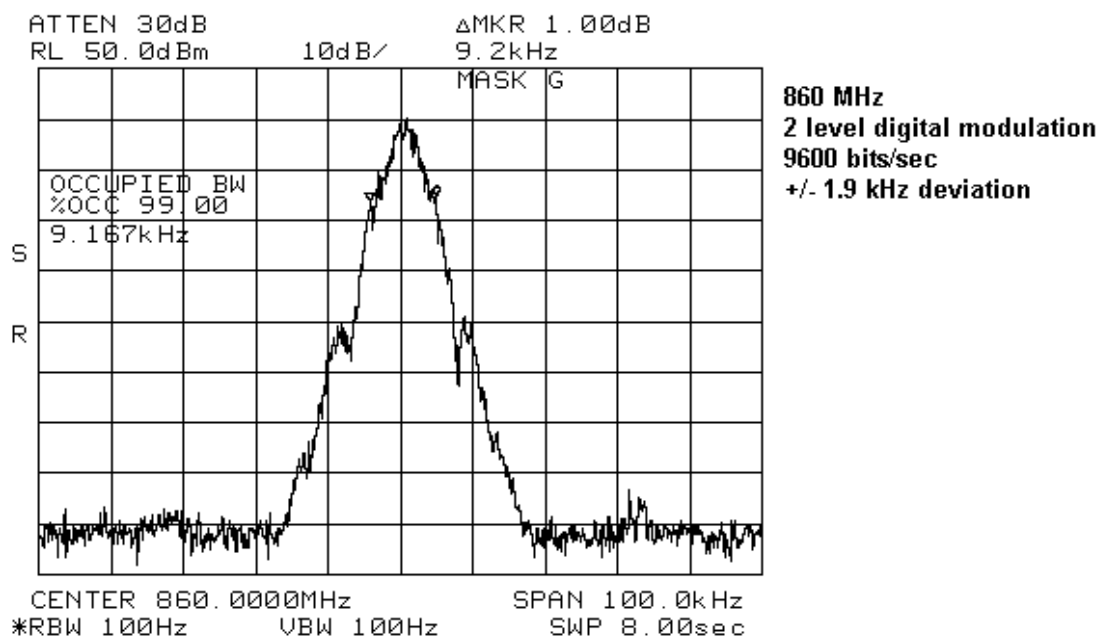


Figure 7-25: C4FM Signal

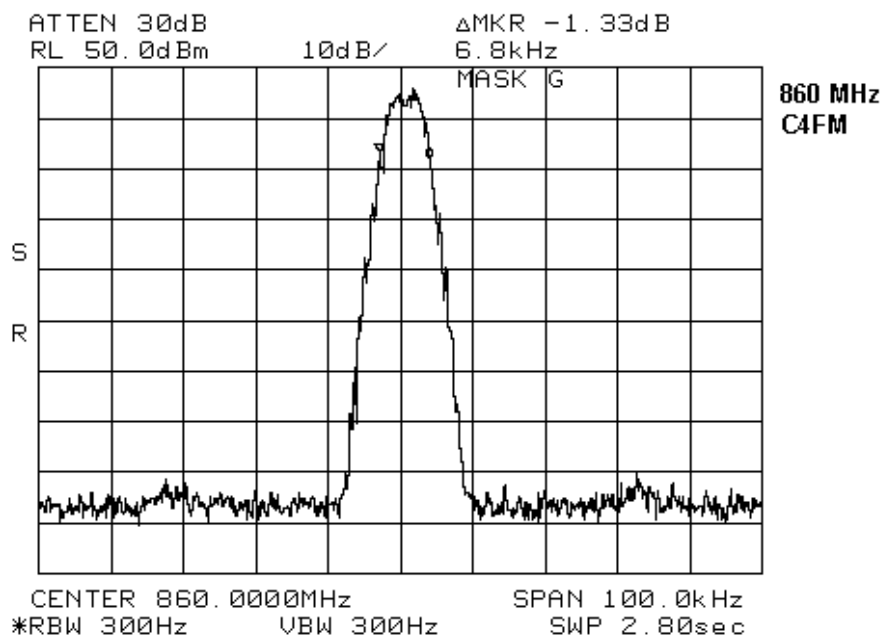


Figure 7-26: NPSPAC (9600 baud) Signal

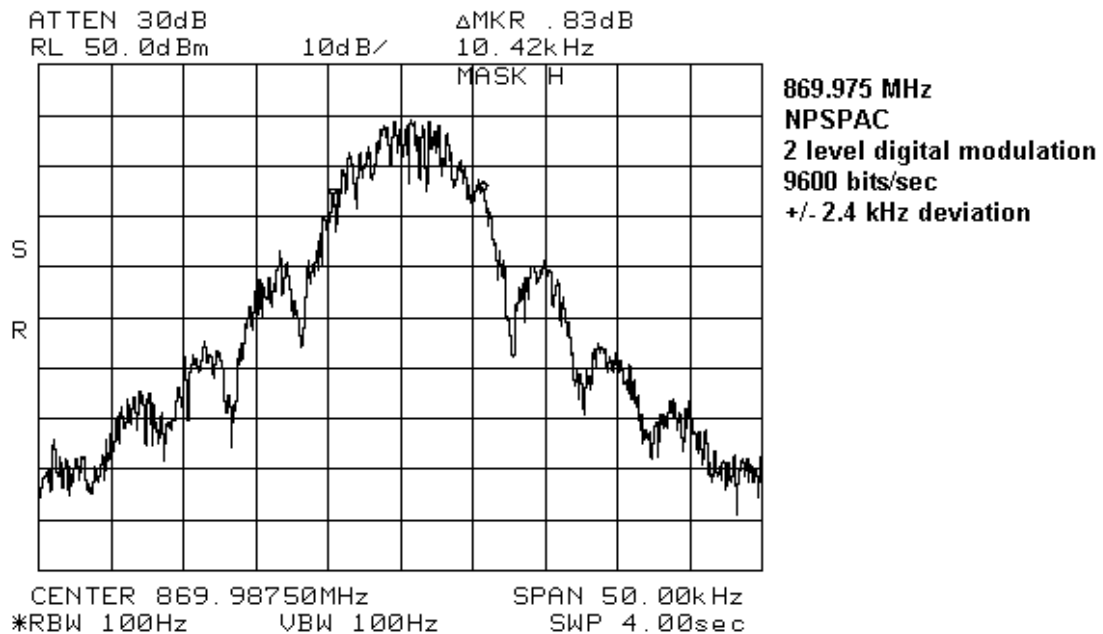
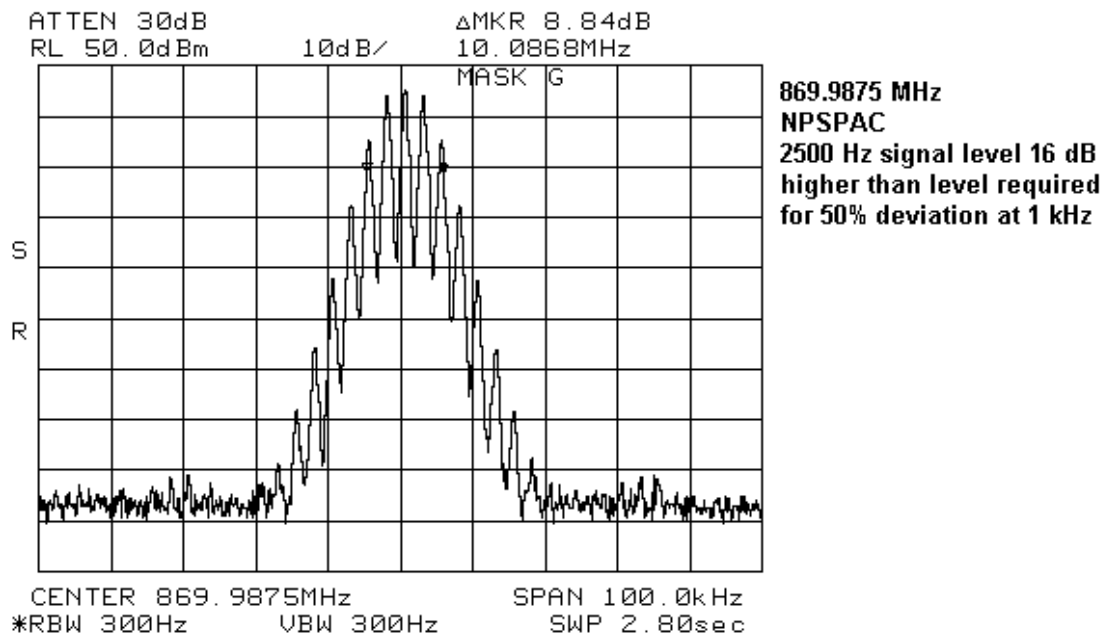


Figure 7-27: NPSPAC (Analog) Signal



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Solelectron EMS Canada Inc. Design and Engineering

Class 2 Permissive Change Certification Report for the M/A-COM MASTRIII 800 MHz Base Station FCC Part 90 & RSS-119

End of Document

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