Certification Report for M/A-COM MASTRIII VHF Base Station

FCC Part 90, Part 22, and RSS-119

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Approvals

Function	Name	Job title	Signature
Document Release Approval	Simon Richardson	Project Manager	NOV 1 2004
Author	Denis Lalonde	Radio Compliance Discipline Leader	Nov. 1, 2004
Technical Reviewer	Jacques Rollin	EMC Advisor	Nov 1, 2004

Accreditations

C-MAC Engineering 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://www.scc.ca/scopes/reg126-eng-s.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 Solectron Technical Centre 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 [12] lab registration numbers associated with our test facilities are: R-1641, C-1749, C-1750, T-148, and T-149.

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

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1. Executive Summary

This test report documents the measurements performed on the M/A-COM MASTRIII VHF Base Station as part of a Class 2 Permissive Change application for the FCC Part 90, Part 22, and Industry Canada RSS-119 certifications.

Reference: - FCCID: OWDTR-0032-E

- IC: 3636B-0017

On the basis of measurements performed in October 2004, the M/A-COM MASTRIII VHF Base Station is verified to be compliant with FCC Part 90, Part 22, and Industry Canada RSS-119 requirements. The test data included in this report applies to the product titled above manufactured by M/A-COM, Inc. 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 M/A-COM MASTRIII VHF Base Station and its compliance to FCC Part 90, Part 22, and Industry Canada RSS-119.

Table 2-1: Compliance Results Summary

Product Summary			
Product Name:	M/A-COM MASTRIII VHF Base Station	Project Manager:	Simon Richardson
Product Code:		Measurements by :	Denis Lalonde
Product Status:		Date:	October 2004

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 , 22.359, and 2.1051 RSS-119 sect. 6.3	■	□	
□	Emission Mask	FCC Part 90.210, 22.359, and 2.1049 RSS-119 sect. 6.4	□	□	
■	Field Strength of Spurious Emissions	FCC Part 90.210, 22.359, and 2.1053	■	□	
□	Frequency Stability	FCC Part 90.213, 22.355, and 2.1055 RSS-119 sect. 7	□	□	
□	Audio Frequency Response	FCC 2.1047	□	□	
□	Audio Low Pass Filter	FCC 2.1047 RSS-119 sect. 6.6	□	□	
□	Modulation Limiting	FCC 2.1047	□	□	
□	Occupied Bandwidth	FCC 2.202 RSP 100 sect. 7.2	□	□	
■	Transient Frequency Behavior	FCC 90.214 RSS-119 sect. 6.5	■	□	
□	RF Exposure	FCC 1.1310 RSS-119 sect. 9.0	□	□	To be evaluated during licensing of equipment

3. Equipment Under Test (EUT)

3.1 Product Functional Description

The product trade name of the unit tested was "M/A-COM MASTRIII VHF Base Station".

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

Figure 3-1 Product Description

3.1.1 Description of Equipment Changes

The rationale for this Class 2 Permissive Change application is the introduction of a modified power amplifier in the M/A-COM MASTRIII VHF Base Station as follows:

1. replace the now obsolete final transistor MRF184 to the SD57060
2. capacitor changes to adjust matching to the new transistor
    a. Add C115=6.2pF (new)
    b. Change C116 to 43pF (was 47pF)
    c. Change C119 to 43pF (was 47pF)
    d. Add C125=10pF (new)
    e. Change C129 to 68pF (was 56pF)
    f. Change C131 to 1.0pF (was 2.4pF)
    g. Add C127=1.8pF (new)

3. The previous PA included a 136 - 174 MHz circulator. Operation over this frequency range will now be achieved with the use of 2 power amplifiers (136 - 154 MHz, and 150 - 174 MHz). The only difference between the 2 PA's is the frequency range of the circulators; the PA's are otherwise identical. The circulator is a limited-bandwidth passive device located at the output of the PA, whose only function is to direct reflected power away from the final stage and into a dummy load. It has nothing whatsoever to do with frequency determination in the transmitter. Frequency determination is entirely performed within the synthesizer modules in the T/R Shelf of the Base Station.

3.2 Manufacturer Information

Company Name	M/A-COM, Inc.
Mailing Address	221 Jefferson Ridge Parkway, Lynchburg, Virginia, U.S.A., 24501
Product Name	M/A-COM MASTRIII VHF 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 110 W
Tx frequency	136 to 174 MHz
Channel spacing	12.5 or 25 kHz

3.4 System Components

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

Table 3-2: MASTRIII VHF BTS Components

Component	Model	Serial Number
MASTRIII shelf	SXGPNX	9861756
Tx Synthesizer module (low freq. split)	EA101685V1	SLR 0330 1352
Tx Synthesizer module (low freq. split)	EA101685V1	SLR 0330 1348
Tx Synthesizer module (high freq. Split)	EA101685V2	SLR 0330 1362
Tx Synthesizer module (high freq. Split)	EA101685V2	SLR 0330 1366
Rx Synthesizer module	EA101684V1	SLR 0330 1730
Rx Synthesizer module	EA101684V2	SLR 0330 1730
Rx Front End module	19D902782G1	CKA 0134 6979

Component		Model	Serial Number
Rx Front End module		19D902782G2	CSLR 0246 2831
IF module		EA101401V1	SLR 03150255
System module		19D902590G6	SLR 03040661
DSP module		EA101800V1	SLR 03084077
Power module		19D902589G2	CKA 01390368
12 V Battery		Dynasty Tel 12-125	
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		EA101292V11 Rev. R1A	09430360
RF Power Amplifier		EA101292V12 Rev. R1A (Note 1)	09430361

Note 1: Revision R1A power amplifiers are prototypes of revision R2A.

R: not required (SitePro shelf has a serial number)

3.5 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
DELL Optiplex	GXpro
IBM Thinkpad PC	600E

3.6 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

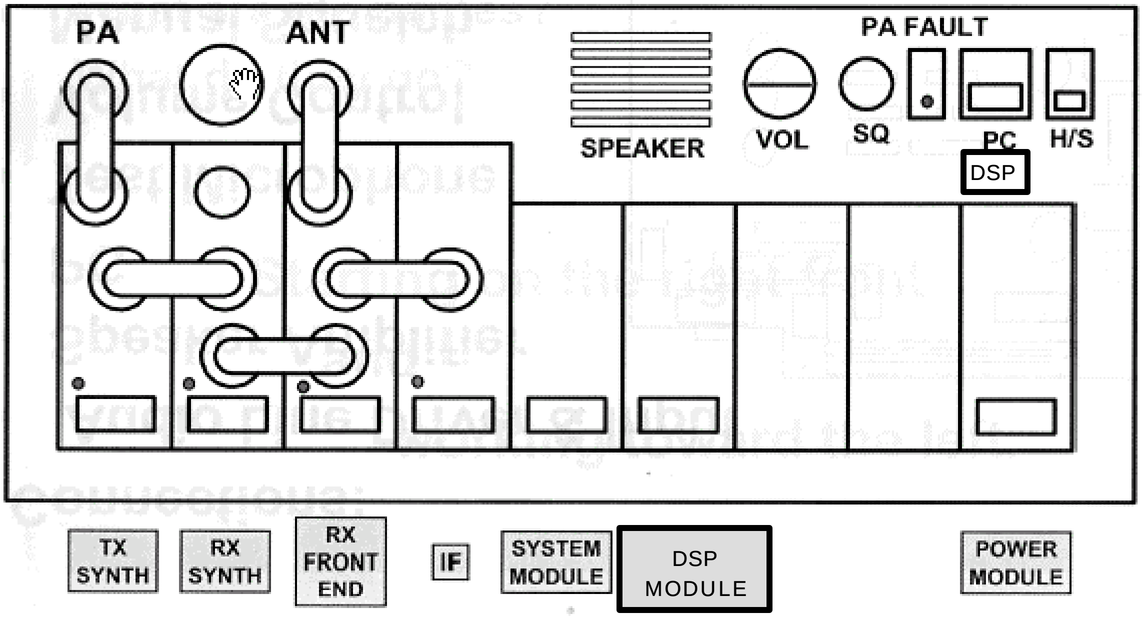
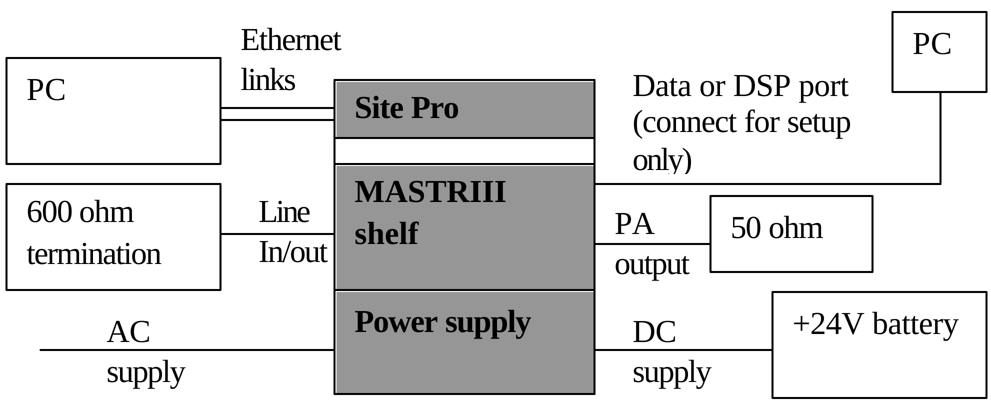


Figure 3-3: System Configuration



A photograph of the test setup used in this test report is presented in Appendix B: Test Set-up Photographs, on page 26.

3.7 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	12 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

3.8 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 110 W (40 to 50.4 dBm)

5.1.2 Test Facility Information

Location:	Solectron Technical Centre Lab 13
Date tested:	October 15, 2004
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 both extremities and in the middle of the frequency band. The lowest and highest possible power levels were evaluated. The lowest frequency signal was measured with a low frequency split Tx Synthesizer, the highest frequency signal was measured with a high frequency split Tx Synthesizer. The mid-frequency signal was measured with Tx Synthesizers of both frequency splits.

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)
136.025	40.0	50.4
153.975 (low freq. split)	40.1	50.4
153.975 (high freq. split)	40.0	50.4
173.975	40.1	50.4

5.1.5 Test Conclusion

The test results met the requirement.

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	47-6-43	6 dB, 50 W	SSG012076	22 April 2005
Attenuator	Weinschel	53-20-33	20 dB, 500 W	KW975	22 April 2005
Attenuator	Weinschel	6070-10	10 dB, 25 W	BE0846	25 Oct. 2005
Power meter	Anritsu	M2438A	Power meter	SSG012588	27 April 2005
Power sensor	Anritsu	M2424A	Power sensor	SSG012587	27 April 2005

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, 22.359, 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 1740	-19.6

The limit is calculated in section 5.3.

5.2.2 Test Facility Information

Location: Solectron Technical Centre Lab 13

Date tested: October 19, 2004

Tested by: Denis Lalonde

5.2.3 Test Procedure

Conducted spurious emissions were measured at the bottom, middle, and top of the 136 to 174 MHz frequency band. The lowest frequency signal was measured with a low frequency split Tx Synthesizer, the highest frequency signal was measured with a high frequency split Tx Synthesizer. The mid-frequency signal was measured with Tx Synthesizers of both frequency splits.

The 153.975 MHz (mid-frequency) measurements were repeated while the power amplifier was operating at 10 W and 110 W.

The signal modulation used for the measurements was a 2 level 9600 baud digital wide band signal (+/-3000 Hz deviation).

The measurement was separated in 2 frequency bands;

1. 30 MHz to 250 MHz: the power amplifier output is connected to the spectrum analyzer through a 6 dB and a 20 dB attenuator.
2. 250 MHz to 2.0 GHz: the power amplifier output is connected to the spectrum analyzer through a 20 dB attenuator, and a 200 MHz 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)	Low Power (dBm)	Hi Power (dBm)	Reference Plots
136.025	Not done	<-26.4 dBm	Figure 7-2 to Figure 7-3
153.975 (low freq. split)	<-37.3 dBm	<-25.6 dBm	Figure 7-4 to Figure 7-7
153.975 (high freq. split)	<-36.3 dBm	<-26.4 dBm	Figure 7-8 to Figure 7-11
173.975	Not done	<-26.9 dBm	Figure 7-12 to Figure 7-13

5.2.5 Test Conclusion

The test results met the 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	KW975	22 April 2005
Attenuator	Weinschel	6070-10	10 dB, 25 W	BE0846	25 Oct. 2005
Spectrum analyzer	HP	8564E	40 GHz	SSG012069	28 Apr. 2005
High Pass filter	Mini Circuits	NHP-200	200 MHz high pass	19950	NA
Network Analyzer	HP	8753C	6 GHz NA	SSG012382	12 Feb. 2005

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 Field Strength of Spurious Emissions

5.3.1 Test Specification

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

Table 5-9: Field Strength of Spurious Emissions Requirement

Requirement	Part / Section
FCC	90.210, 22.359, 2.1053

5.3.1.1 Limits

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

Table 5-10: Field Strength of Spurious Emissions Limit

Frequency Range (MHz)	ERP Limit (dBm)
30 to 1740	-19.6

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

Attenuation = minimum of 50 + 10 log (P) dB or 70 dB
= minimum of 50 + 10 log (110) or 70 dB
= minimum of 70.4 dB or 70 dB
= 70 dB

ERP limit = 10 log (110 W) – 70 dB
= -19.6 dBm

5.3.2 Test Facility Information

Location: Solectron Technical Centre 10m Ambient Free Chamber

Date tested: October 18, 2004

Tested by: S. Turner, S. Cullen, and Denis Lalonde

5.3.3 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-01-04 [7]. The test was performed as per the relevant Test procedures: 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 1.8 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 1.8 GHz.
- Between 30 MHz and 1 GHz, a resolution bandwidth of 120 kHz was used.
- Above 1 GHz, a 1 MHz resolution bandwidth and 1 MHz video bandwidth were 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 110 W. A 2 level 9600 baud wideband signal at 153.975 MHz was used for this test. The test was done while using a low frequency split Tx Synthesizer (Tx1) and then repeated with a high frequency split Tx Synthesizer (Tx2). A 50 ohm load was connected to the power amplifier output.

5.3.4 Test Results

Table 5-11 lists the highest emissions measured between the low frequency split configuration (Tx1) and the high frequency split configuration (Tx2), all other emissions had more than 30 dB margin:

Table 5-11: Field Strength of Spurious Emissions

Channel (MHz)	Signal Generator Level Hi Power (dBm)	Antenna Gain (dBi)	Cable losses (dB)	ERP Low Power (dBm)	ERP Hi Power (dBm)	Margin (dB)	Reference
1077.825 (7 x Tx)	-64.3	6.5	0.9	<-63.0	-60.9	41.3	Figure 7-14 to Figure 7-21
1231.8 (8 x Tx)	-39.0	7.2	1.0	<-65.0	-35.0	15.4	Figure 7-14 to Figure 7-21
1385.775 (9 x Tx)	-66.2	7.9	1.0	<-63.0	-61.5	41.9	Figure 7-14 to Figure 7-21

5.3.5 Test Conclusion

The test results met the requirement.

5.3.6 Test Equipment List

Table 5-12: Test Equipment used for Field Strength of Spurious Emissions

Category	Manufacture	Model	Serial Number	Cal. Due
Bilog Antenna	Antenna Research	LPB 2520A	SSG012299	3/2/2005
Double Ridged Horn	Emco	3115	SSG012298	12/29/2004
Pre-Amplifier	BNR	LNA	SSG012360	2/11/2005
Quasi-Peak Adapter, HP85650A, (EMI # 2)	HP	85650A	SSG013046	10/13/2005
RF Amplifier, HP8447 # 1	Agilent	8447D	SSG013045	10/13/2005
Spec. A, RF PreSelector, HP85685A (AFC #1)	HP	85685A	SSG012010	4/29/2005
Spectrum Analyzer Display, HP 85662A	HP	85662A	SSG012433	4/29/2005
Spectrum Analyzer, HP8566B, (AFC #1)	HP	8566B	SSG012521	4/29/2005
Sucoflex Cable	Huber & Suhner	104PEA	SSG012219	10/13/2005
Sucoflex Cable, EMC Cable # 1	Huber & Suhner	106A	SSG012454	2/12/2005
Sucoflex Cable, EMC Cable # 2	Huber & Suhner	106A	SSG012453	2/12/2005
Sucoflex Cable, EMC Cable # 5	Huber & Suhner	104PEA	SSG012359	2/11/2005
Sucoflex Cable, EMC Cable # 6	Huber & Suhner	106A	SSG012456	2/12/2005
Sucoflex Cable, EMC Cable # 8	Huber & Suhner	104	SSG012302	12/29/2004
Utiflex Cable, EMC Cable # 4	Micro-Coax	UFA 147B-1-0300-70X70	SSG012309	10/13/2005

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.

5.4 Transient Frequency Behavior

5.4.1 Test Specification

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

Table 5-13: Transient Frequency Behavior Requirement

Requirement	Part / Section
FCC	90.214
RSS-119	6.5

5.4.1.1 Limits

The specification levels are listed in Table 5-14.

Table 5-14: Transient Frequency Behavior Limit

Channel Spacing (kHz)	Time interval (ms)	Maximum Frequency Difference (kHz)
25	T1 = 5	+/- 25
	T2= 20	+/12.5
	T3= 5	+/- 25
12.5	T1 = 5	+/12.5
	T2= 20	+/6.25
	T3= 5	+/12.5

Note:

T1 is the time period immediately following Txon

T2 is the time period immediately following t1.

T3 is the time period from the instant when the transmitter is turned off until Txoff.

5.4.2 Test Facility Information

Location: Solectron Technical Centre Lab 13

Date tested: October 20, 2004

Tested by: Denis Lalonde

5.4.3 Test Procedure

The test procedure of EIA/TIA-603B-2002 section 2.2.19 (modulation domain analyzer method) was used.

5.4.4 Test Results

Table 5-15 shows the transient frequency behavior measurement results. Each graph shows the transmitted signal at the center of the +/- 250 Hz frequency scale over the first and last 25 msec of transmission.

Table 5-15: Transient Frequency Behavior Test Results

Channel Spacing (kHz)	Time interval (ms)	Maximum Frequency Difference (kHz)	Δf Low frequency split Measured Frequency Difference (kHz)	Δf High frequency split Measured Frequency Difference (kHz)	Measurement Reference Plots
25	T1 = 5	+/- 25	-0.025< Δf <0.025	0.0< Δf <0.050	Figure 7-22 & Figure 7-26
	T2= 20	+/-12.5	-0.025< Δf <0.025	0.0< Δf <0.050	Figure 7-22/Figure 7-24 & Figure 7-26/Figure 7-28
	T3= 5	+/- 25	-0.025< Δf <0.025	0.0< Δf <0.050	Figure 7-24 & Figure 7-28
12.5	T1 = 5	+/-12.5	-0.025< Δf <0.025	0.0< Δf <0.050	Figure 7-23 & Figure 7-27
	T2= 20	+/-6.25	-0.025< Δf <0.025	0.0< Δf <0.050	Figure 7-23/Figure 7-25 & Figure 7-27/Figure 7-29
	T3= 5	+/-12.5	-0.025< Δf <0.025	0.0< Δf <0.050	Figure 7-25 & Figure 7-29

5.4.5 Test Conclusion

The test results met the requirement.

5.4.6 Test Equipment List

Table 5-16: Test Equipment used for Transient Frequency Behavior Measurement

Category	Manufacture	Model	Description	Serial Number	Cal. Due
Attenuator	Weinschel	47-6-43	6 dB, 50 W	SSG012076	22 April 2005
Attenuator	Weinschel	53-20-33	20 dB, 500 W	KW975	22 April 2005
Attenuator	Weinschel	6070-10	10 dB, 25 W	BE0846	25 Oct. 2005
Modulation Domain analyzer	HP	53310A		3121A01217	27 April 2005

Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

6. References

1. Standards Council of Canada Scope of Accreditation Letter SCC 1003-15/163 dated 2002-12-16 (Scope of accreditation is effective until 2005-10-05 and includes FCC Part 15 and ICES-003). This scope of accreditation is outlined at the following web site http://www.scc.ca/scopes/reg126-eng-s.pdf.
2. C-MAC Engineering Inc. Quality Manual, K0000608-QD-QM-01-04, July 2004.
3. C-MAC Engineering Inc. Lab Operations Manual KG000347-QD-LAB-01-05, June 2004.
4. ANSI C63.4-2001, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz, 17 June 2001.
5. ANSI C63.2-1996, American National Standard for Electromagnetic Noise and Field Strength Instrumentation, 10 Hz to 40 GHz – Specifications.
6. CISPR 16-1, Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods - Part 1: Radio Disturbance and Immunity Measuring Apparatus, Edition 2.0, 1999-10.
7. C C-MAC Engineering Inc., EMC General Lab Test Procedure, KP000270-LP-EMC-01-04 July 2004.
8. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations), Part 2, U.S. Federal Communications Commission.
9. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations), Part 90, U.S. Federal Communications Commission.
10. RSS-119, Issue 6, "Land Mobile and Fixed Radio, Transmitters and Receivers, 27.41 to 960 MHz" March 25, 2000.
11. ANSI/TIA-603-B-2002, "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards", November 7, 2002
12. VCCI, V-3/02.04 16th edition, April 2002.Title: AGREEMENT OF VOLUNTARY CONTROL COUNCIL FOR INTERFERENCE BY INFORMATION TECHNOLOGY EQUIPMENT
13. Chinese National Standard (CNS) 13438: 1997, "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment".
14. APLAC, Asia Pacific Laboratory Accreditation Cooperation, Website (February 10th, 2004): http://www.aplac.org.
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

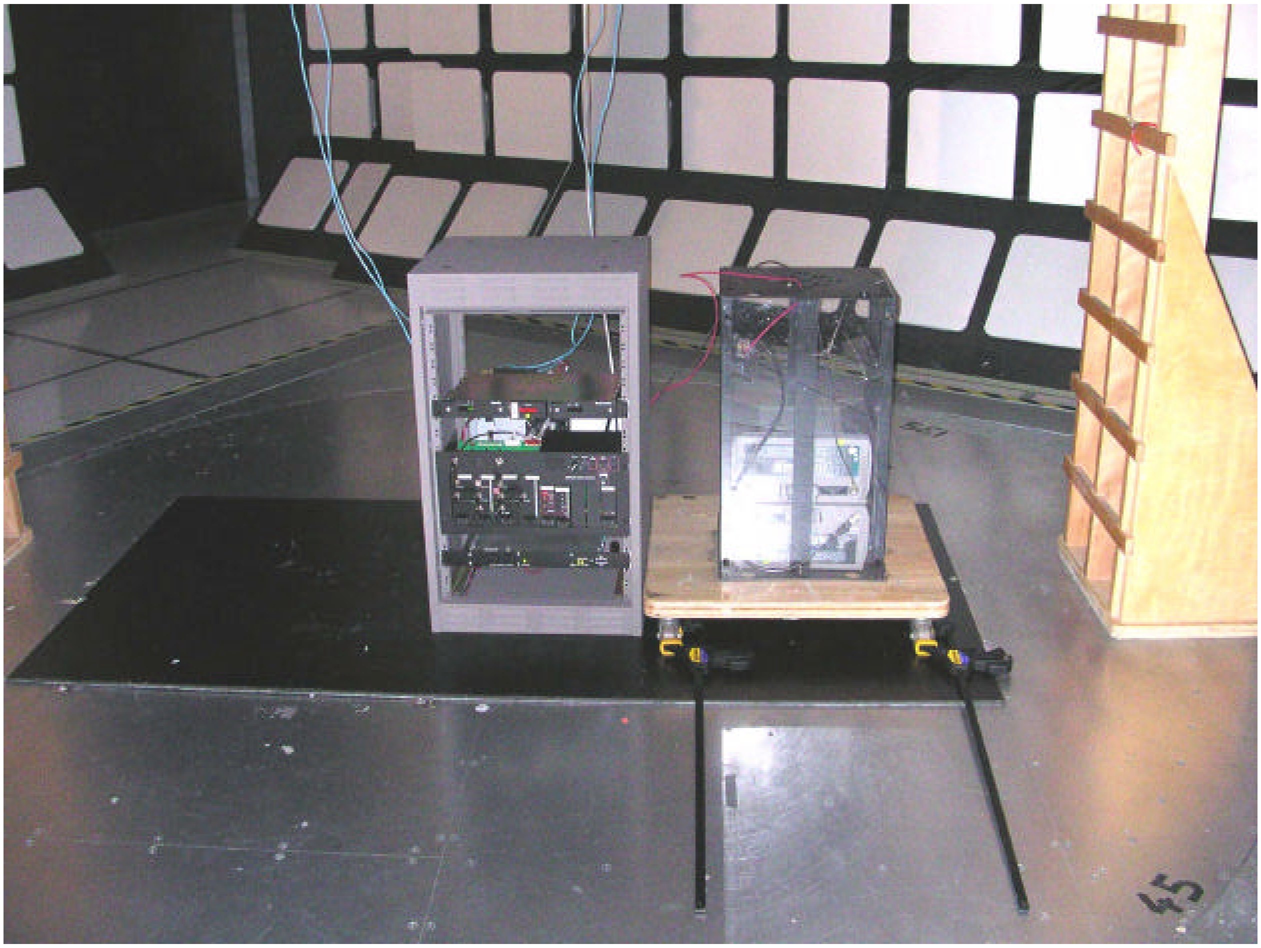
7.1 Appendix A: Glossary

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

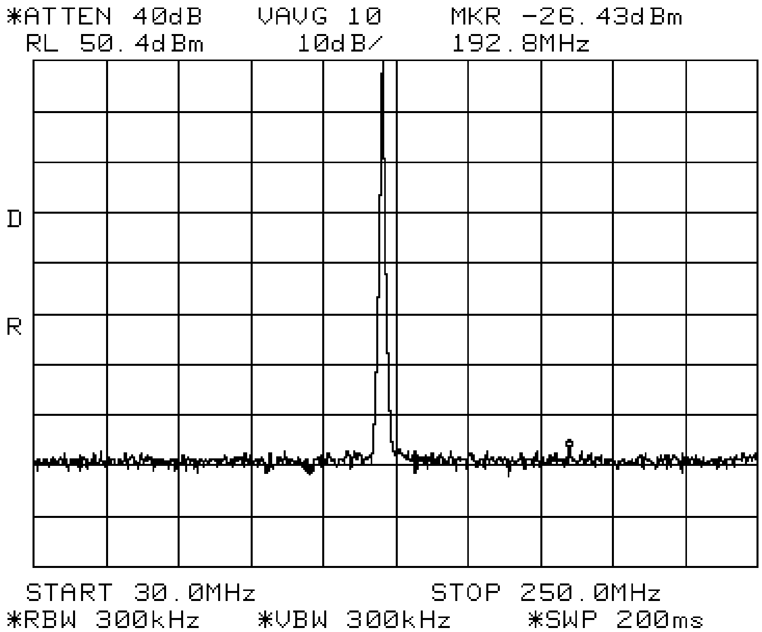
7.2 Appendix B: Test Set-up Photographs

Figure 7-1: M/A-COM MASTRIII VHF Base Station radiated emissions set-up



7.3 Appendix C: Conducted Spurious Emissions Plots

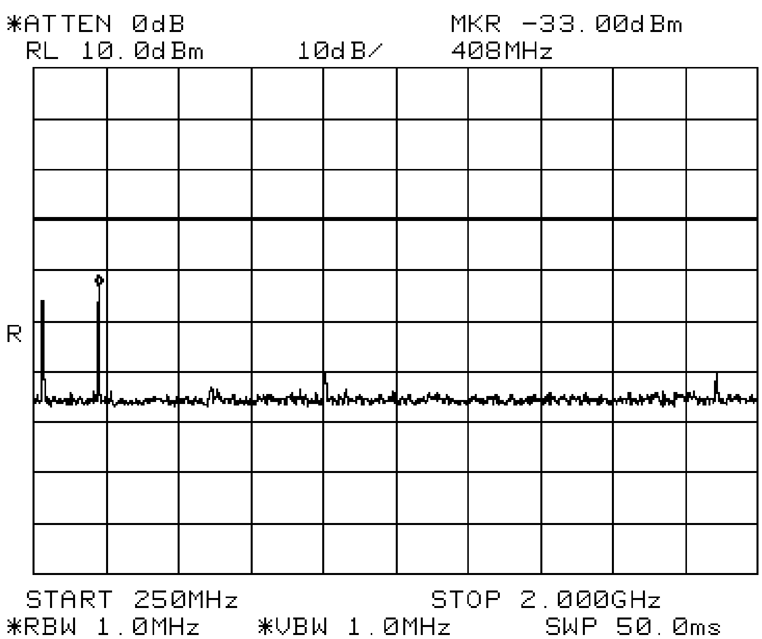
Figure 7-2: Tx at 136.025 MHz, 110 W Power, 30 MHz to 250 MHz



Tx at 136.025 MHz
110 W, low freq. split

2 level digital modulation
+/- 3 kHz deviation

Figure 7-3: Tx at 136.025 MHz, 110 W Power, 250 MHz to 2 GHz



Tx at 136.025 MHz
110 W, low freq. split

2 level digital modulation
+/- 3 kHz deviation

Figure 7-4: Tx at 153.975 MHz (low split) , 10 W Power, 30 MHz to 250 MHz

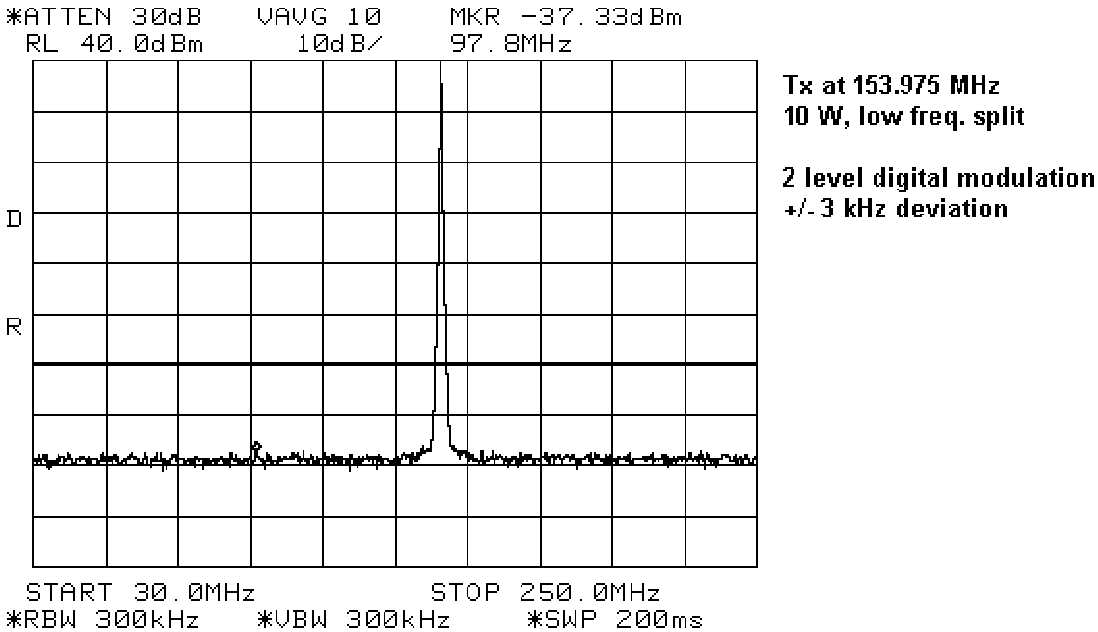


Figure 7-5: Tx at 153.975 MHz (low split), 10 W Power, 250 MHz to 2 GHz

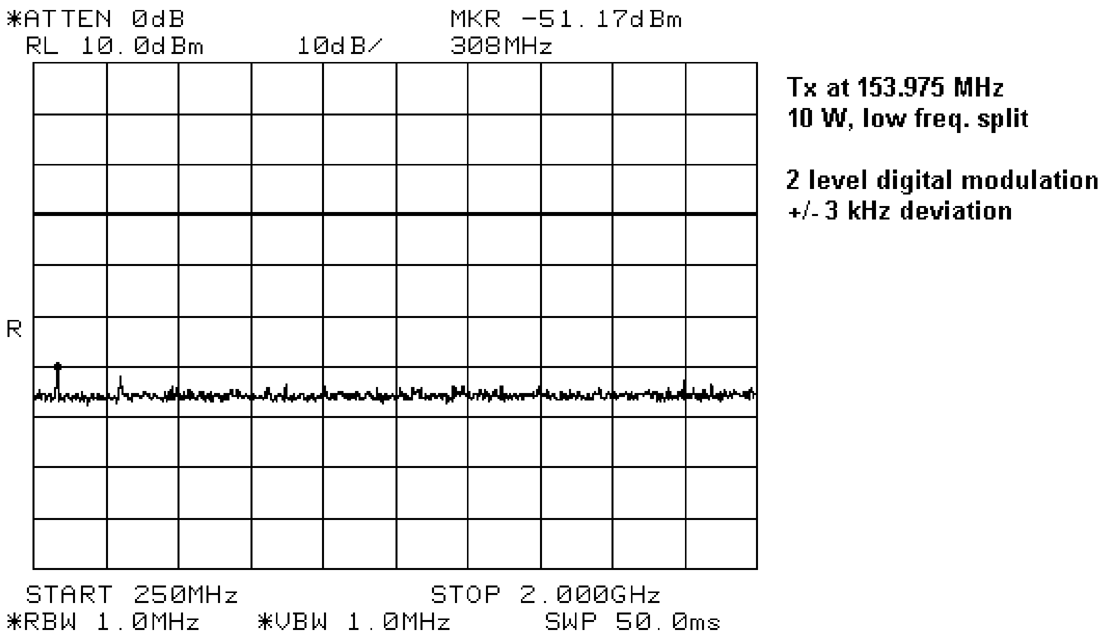


Figure 7-6: Tx at 153.975 MHz (low split), 110 W Power, 30 MHz to 250 MHz

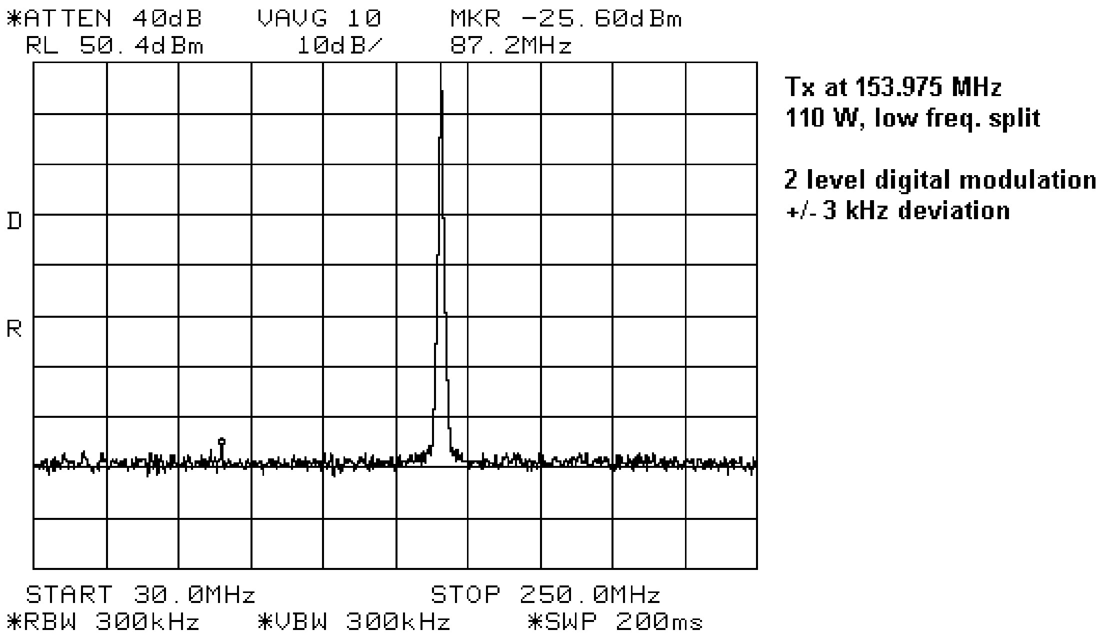


Figure 7-7: Tx at 153.975 MHz (low split), 110 W Power, 250 MHz to 2 GHz

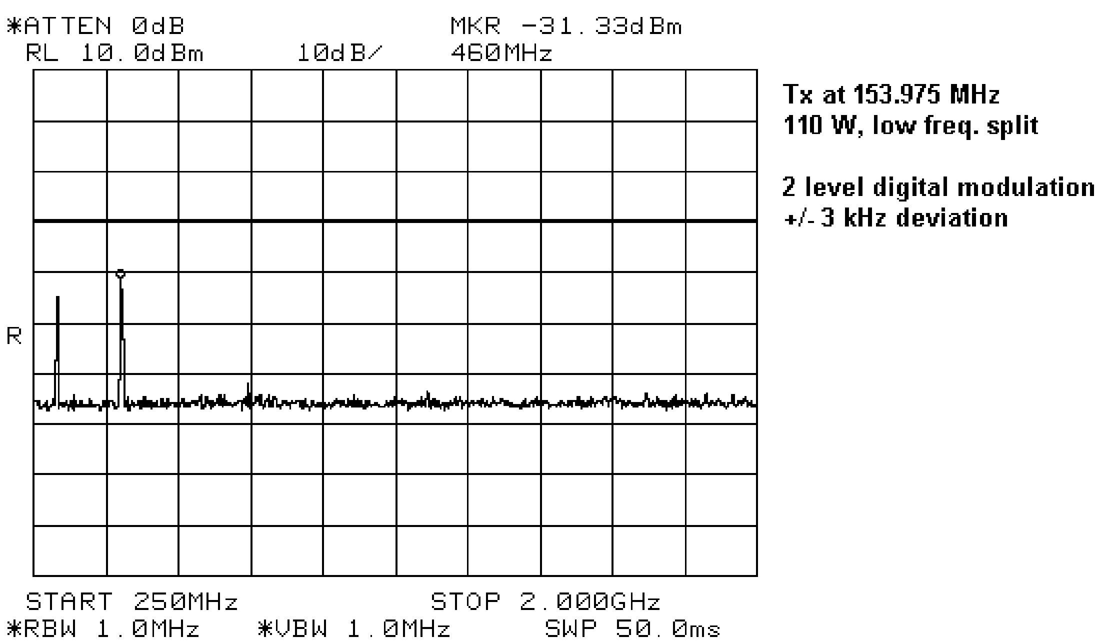


Figure 7-8: Tx at 153.975 MHz (high split), 10 W Power, 30 MHz to 250 MHz

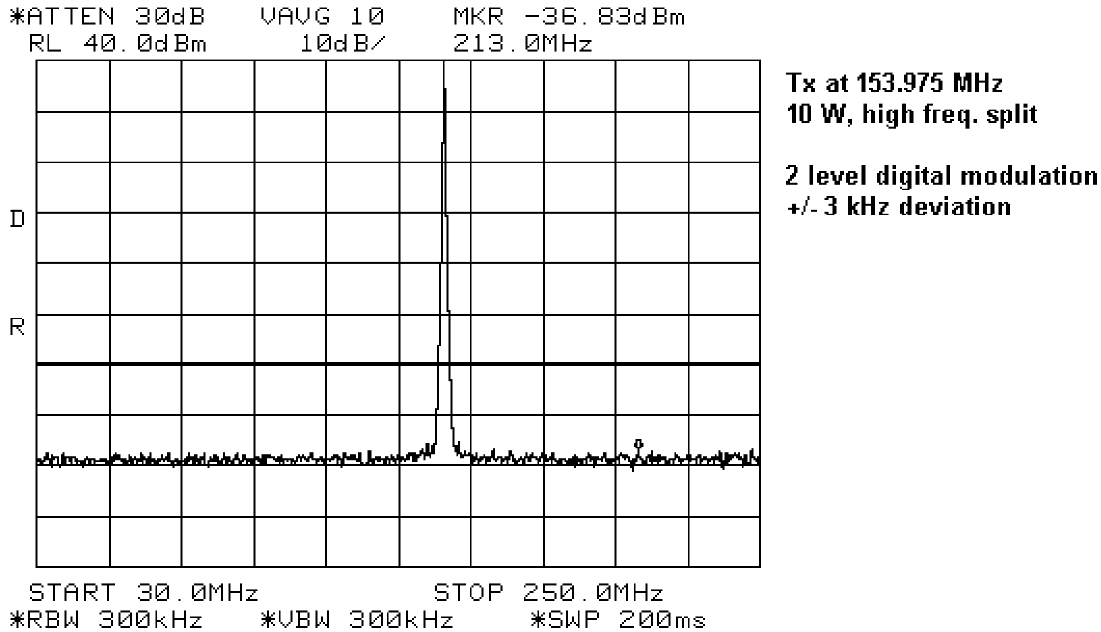


Figure 7-9: Tx at 153.975 MHz (high split), 10 W Power, 250 MHz to 2 GHz

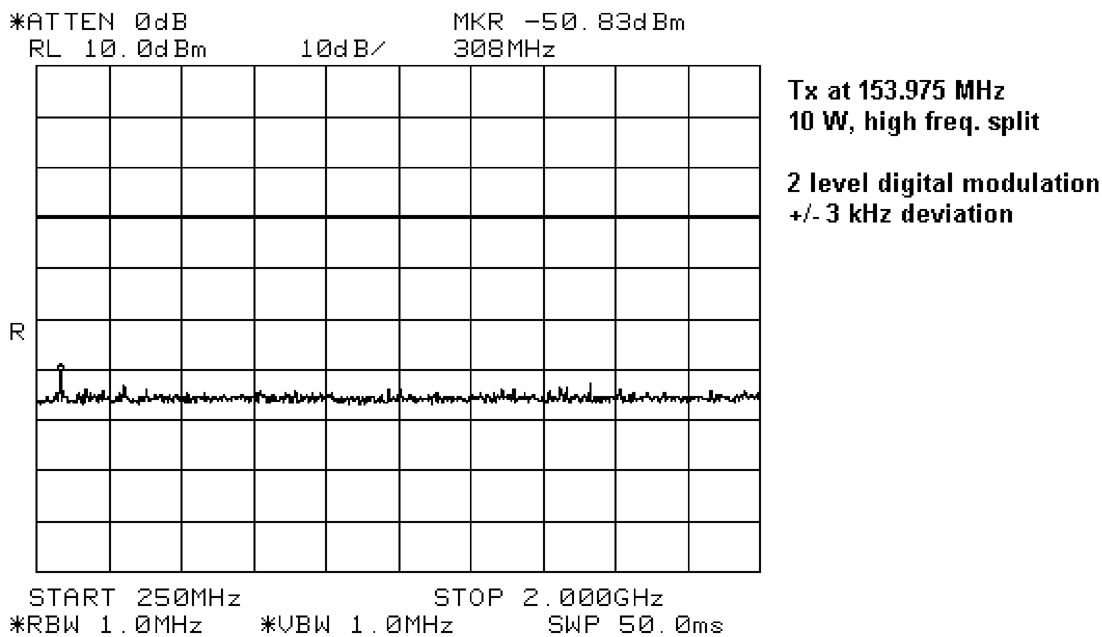


Figure 7-10: Tx at 153.975 MHz (high split), 110 W Power, 30 MHz to 250 MHz

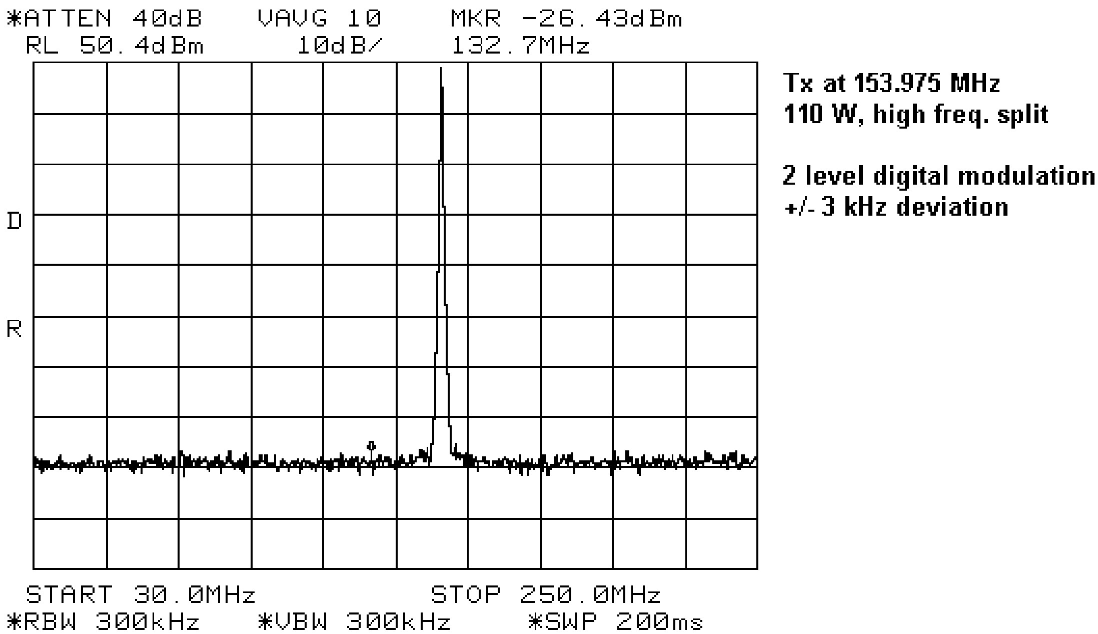


Figure 7-11: Tx at 153.975 MHz (high split), 110 W Power, 250 MHz to 2 GHz

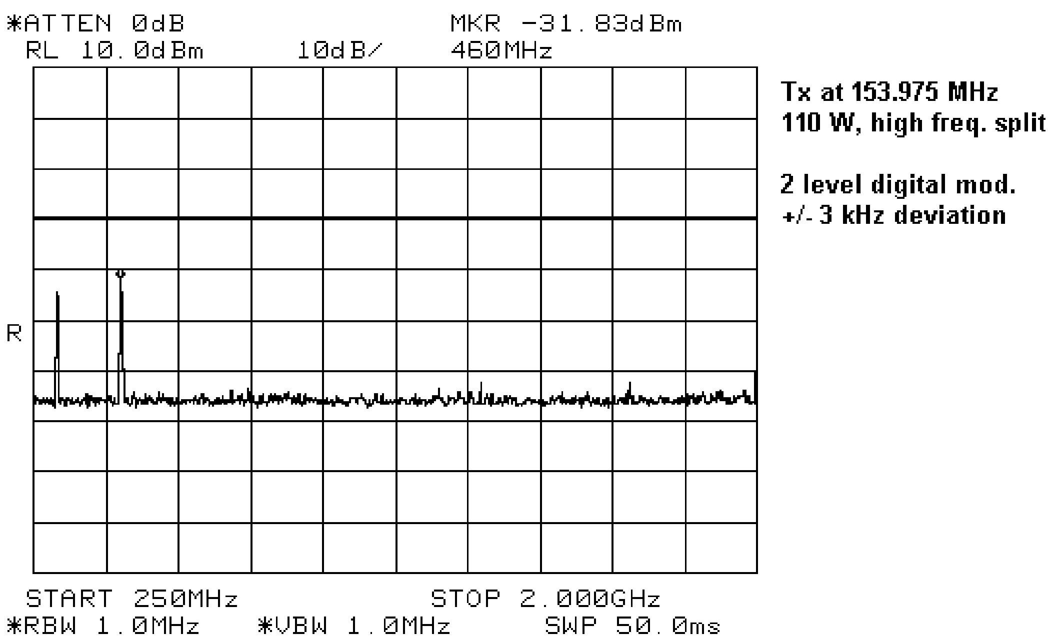


Figure 7-12: Tx at 173.975 MHz (high split), 110 W Power, 30 MHz to 250 MHz

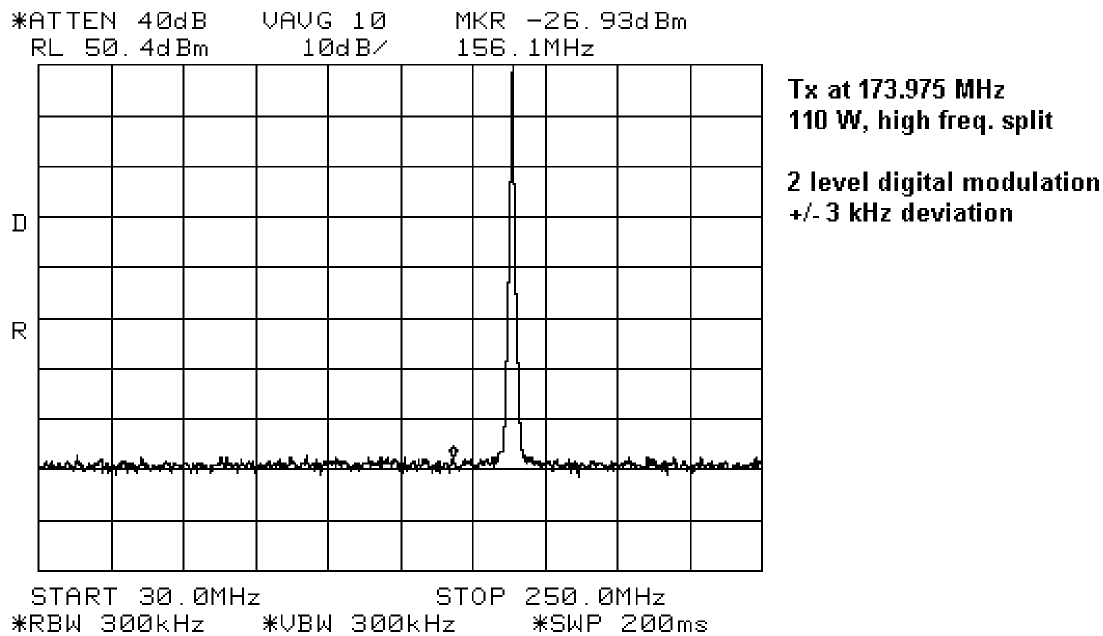
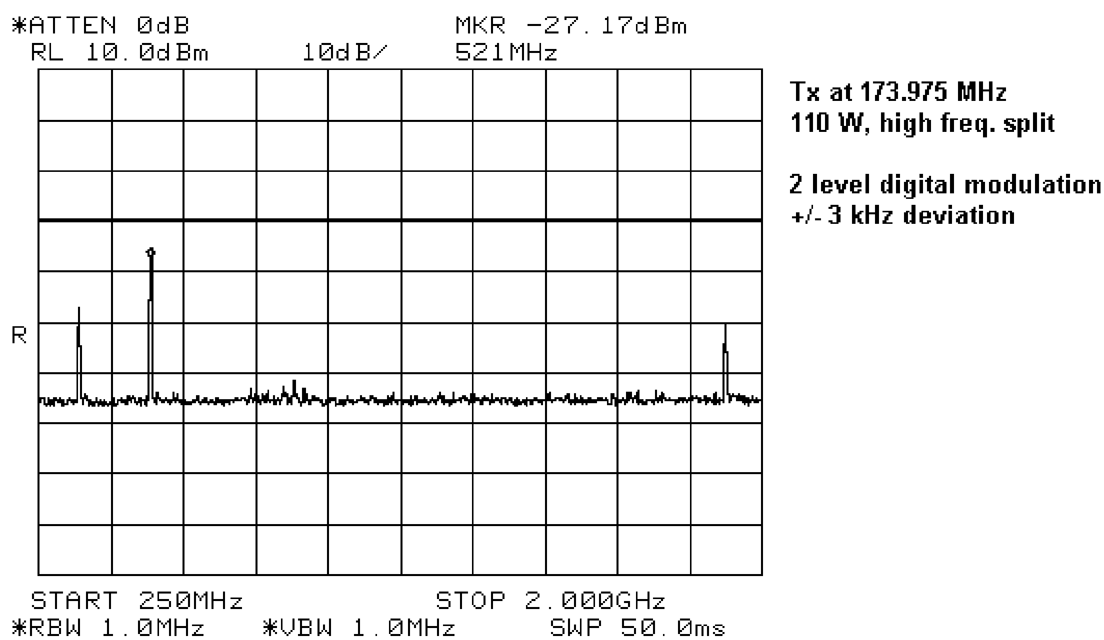


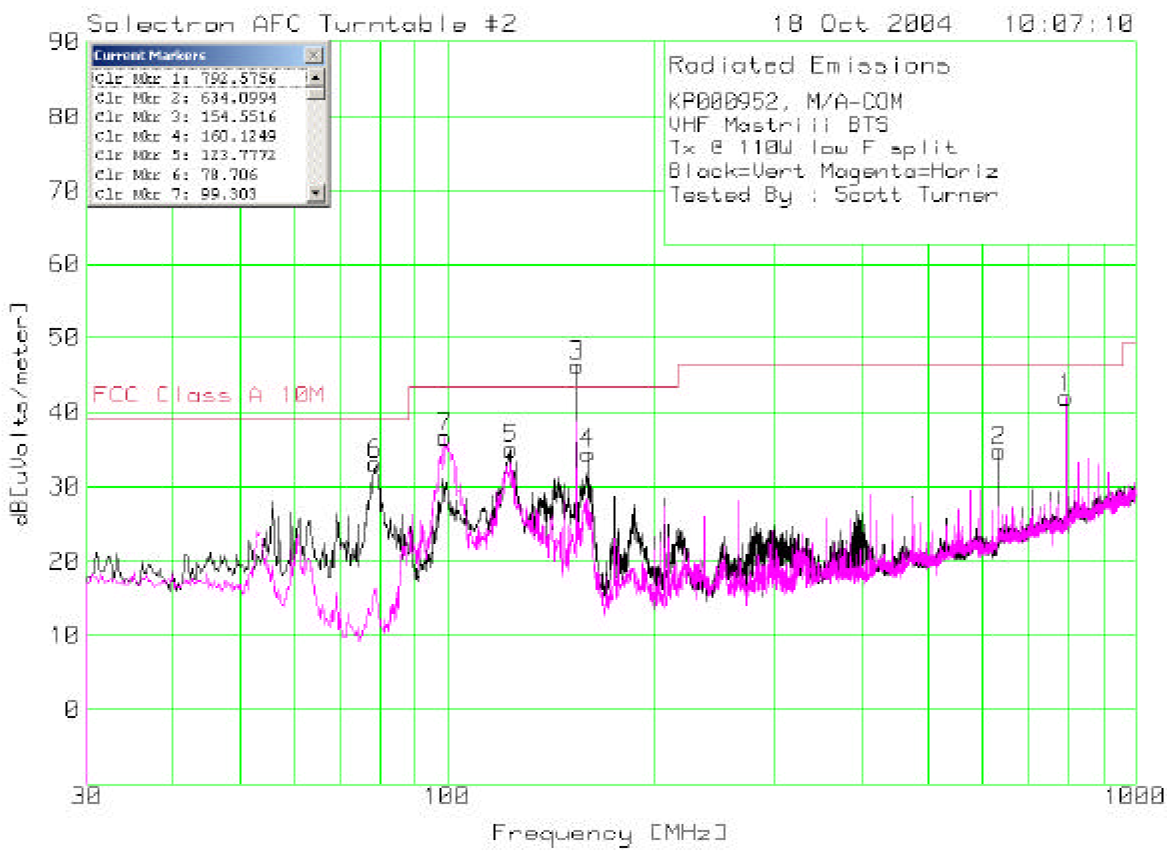
Figure 7-13: Tx at 173.975 MHz (high split), 110 W Power, 250 MHz to 2 GHz



7.4 Appendix D: Field Strength of Spurious Emissions Plots

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

Figure 7-14: Field Strength with 110 W Tx, 30 MHz to 1 GHz, Low Frequency Split



Note: the emissions at 154 MHz is leakage of the transmitted signal.

Figure 7-15: Field Strength with 110 W Tx, 1 GHz to 1.8 GHz, Low Frequency Split

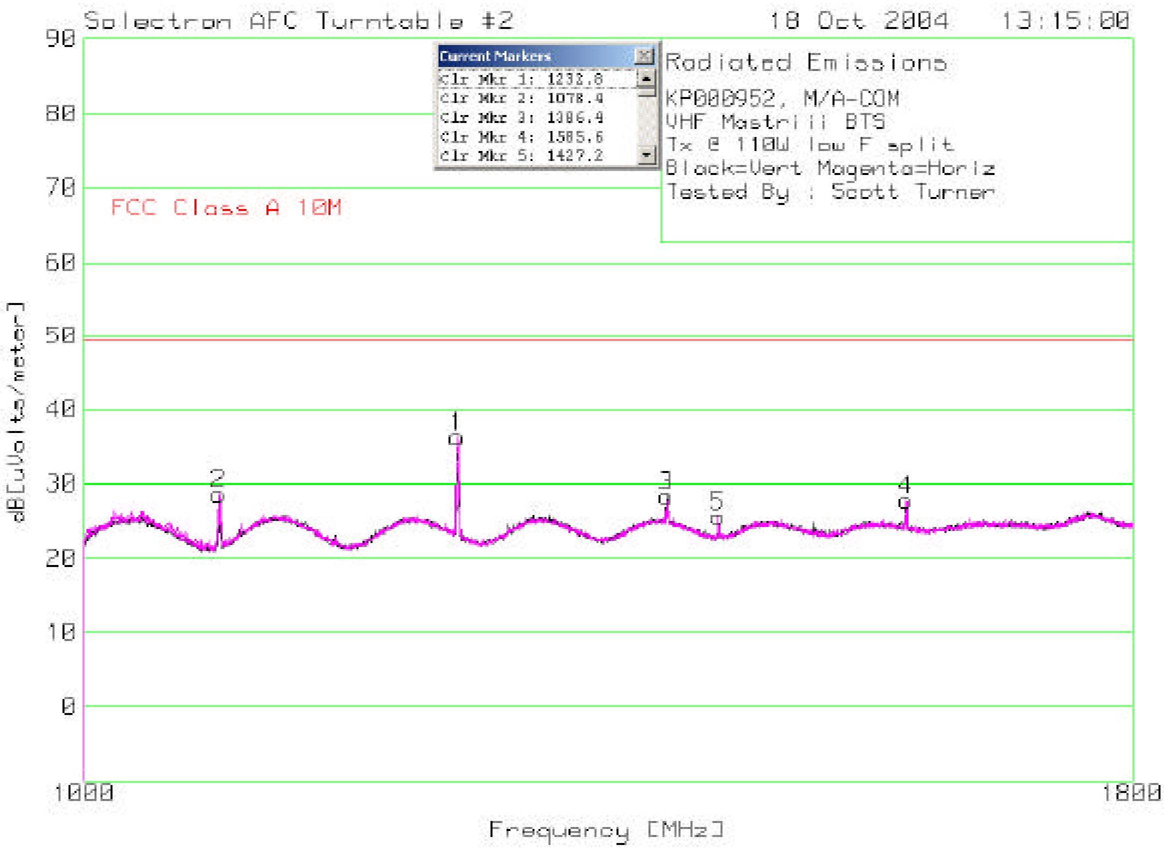
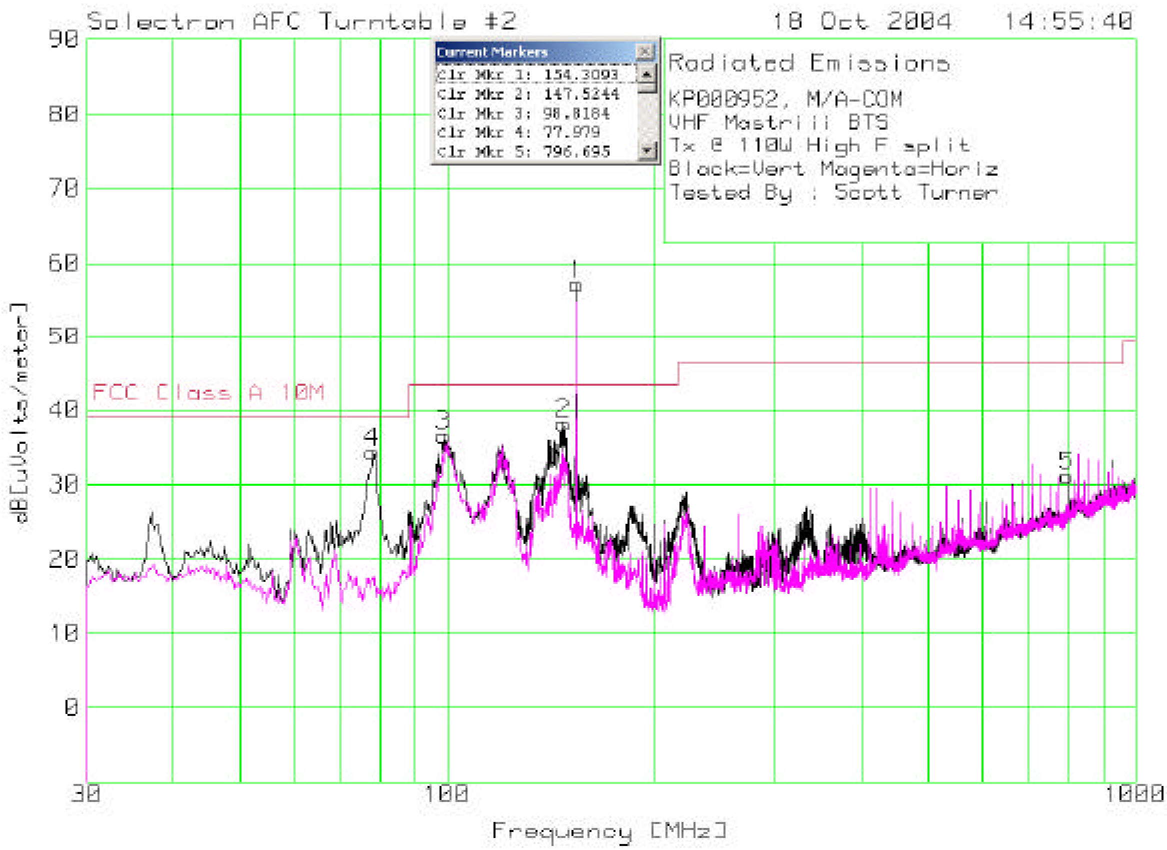


Figure 7-16: Field Strength with 110 W Tx, 30 MHz to 1 GHz, High Frequency Split



Note: the emissions at 154 MHz is leakage of the transmitted signal.

Figure 7-17: Field Strength with 110 W Tx, 1 GHz to 1.8 GHz, High Frequency Split

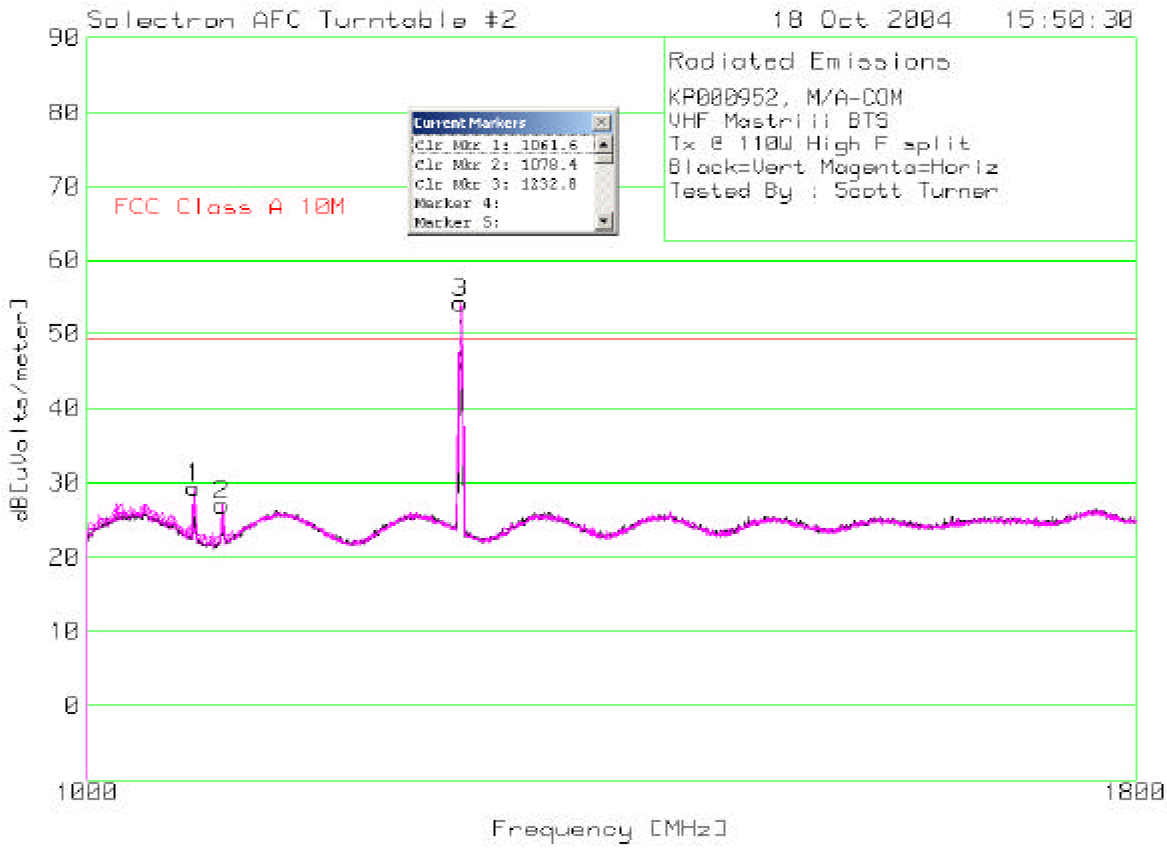
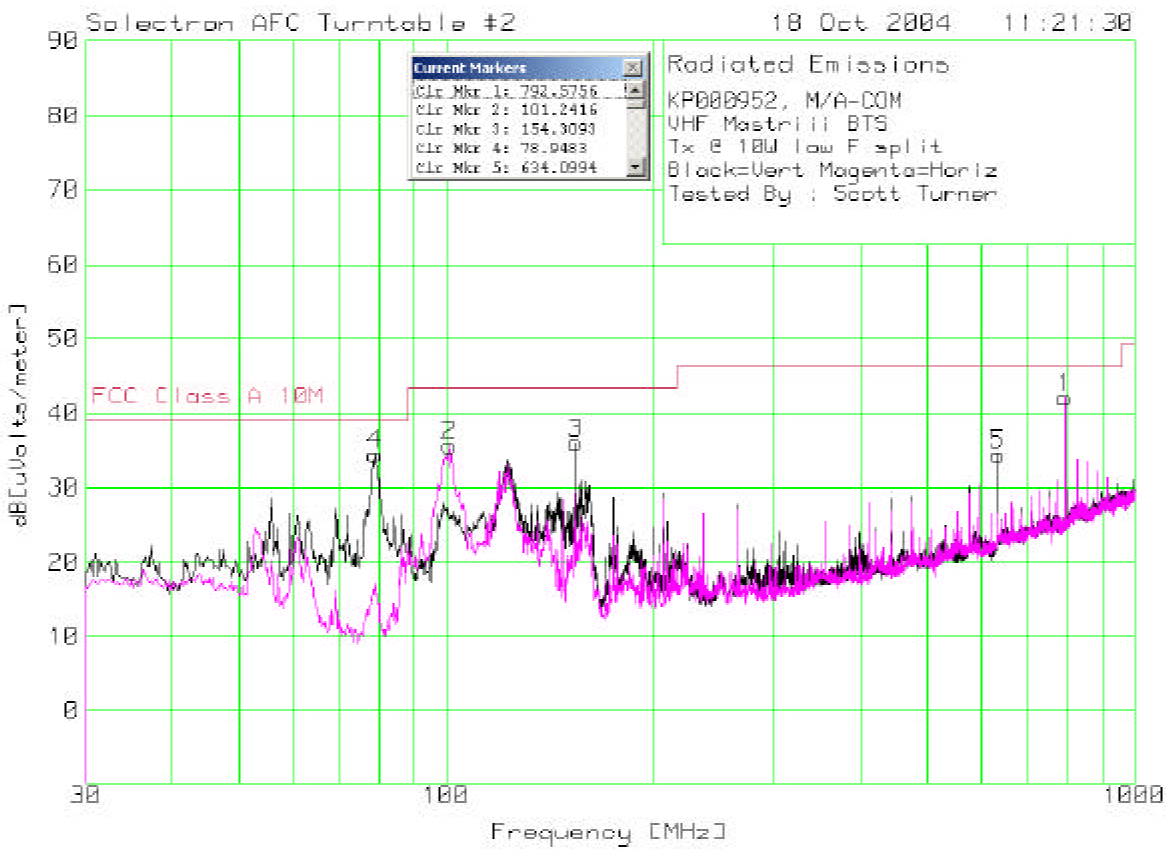


Figure 7-18: Field Strength with 10 W Tx, 30 MHz to 1 GHz, Low Frequency Split



Note: the emissions at 154 MHz is leakage of the transmitted signal

Figure 7-19: Field Strength with 10 W Tx, 1 GHz to 1.8 GHz, Low Frequency Split

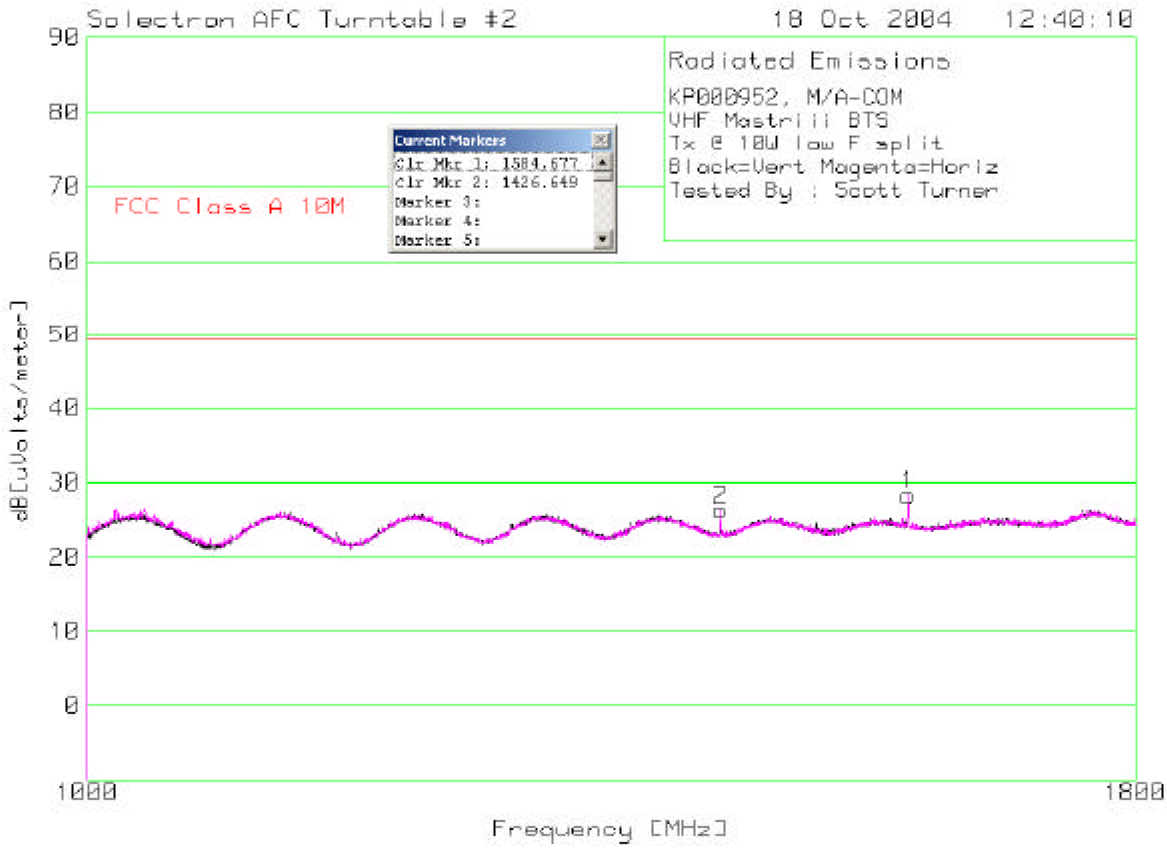
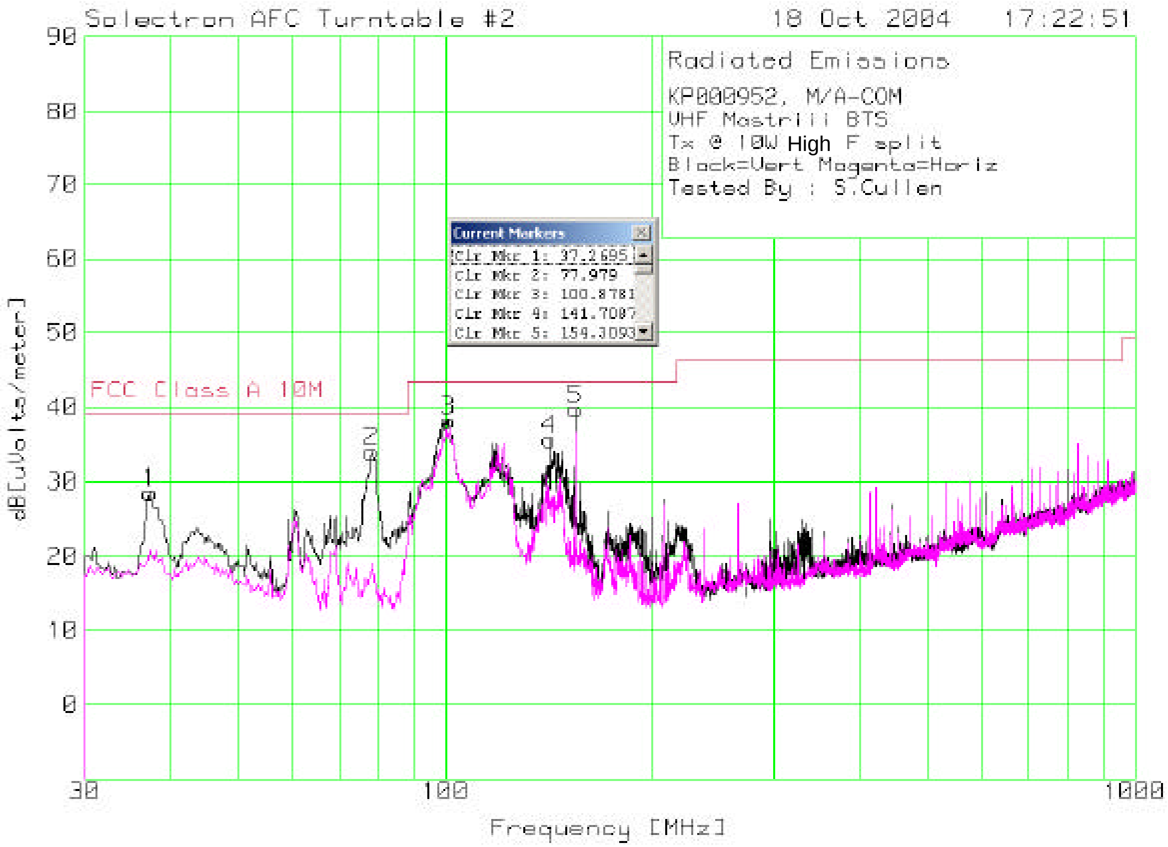
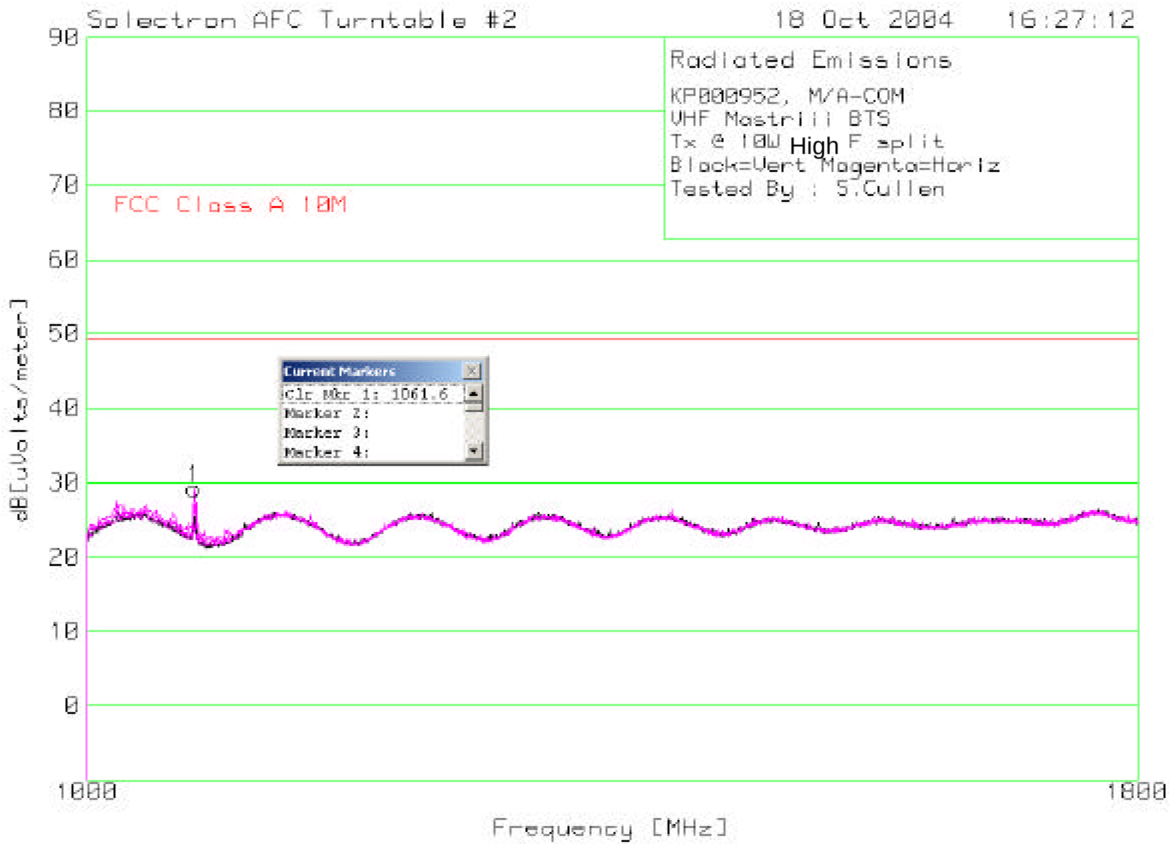


Figure 7-20: Field Strength with 10 W Tx, 30 MHz to 1 GHz, High Frequency Split



Note: the emissions at 154 MHz is leakage of the transmitted signal

Figure 7-21: Field Strength with 10 W Tx, 1 GHz to 1.8 GHz, High Frequency Split



7.5 Appendix E: Transient Frequency Behavior Plots

This appendix presents all the transient frequency behavior plots for the test cases measured.

Figure 7-22 Transient Frequency Behavior, Wideband, Transmitter on (Low Frequency Split)

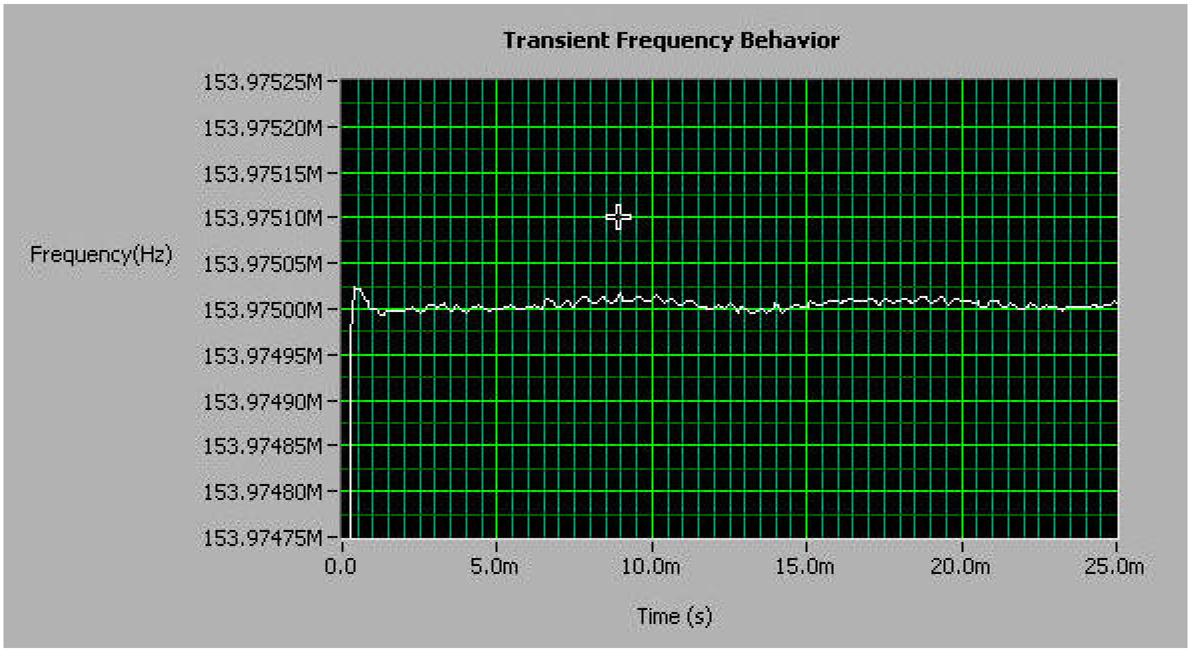


Figure 7-23 Transient Frequency Behavior, Narrowband, Transmitter on (Low Frequency Split)

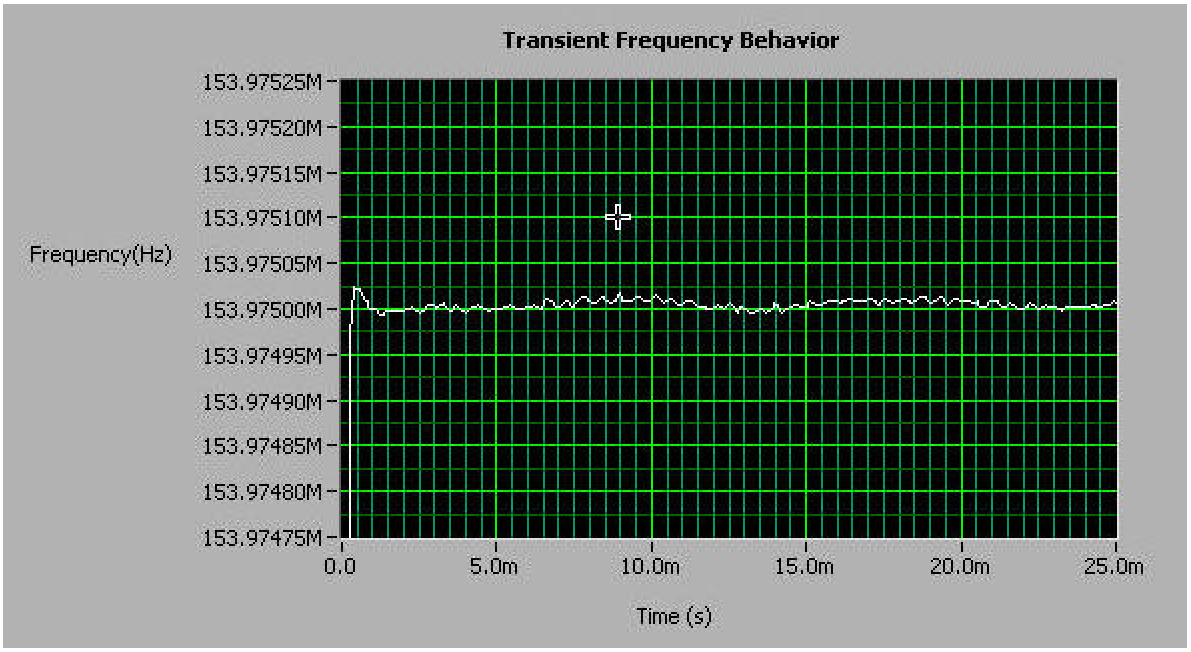


Figure 7-24 Transient Frequency Behavior, Wideband, Transmitter off (Low Frequency Split)

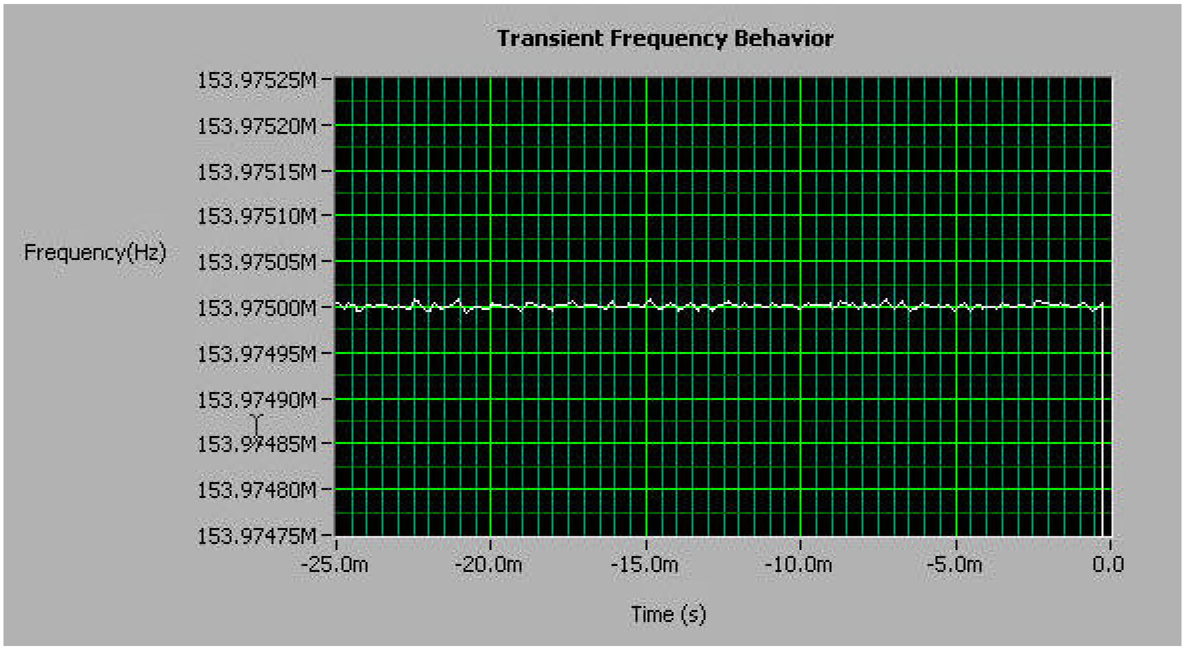


Figure 7-25 Transient Frequency Behavior, Narrowband, Transmitter off (Low Frequency Split)

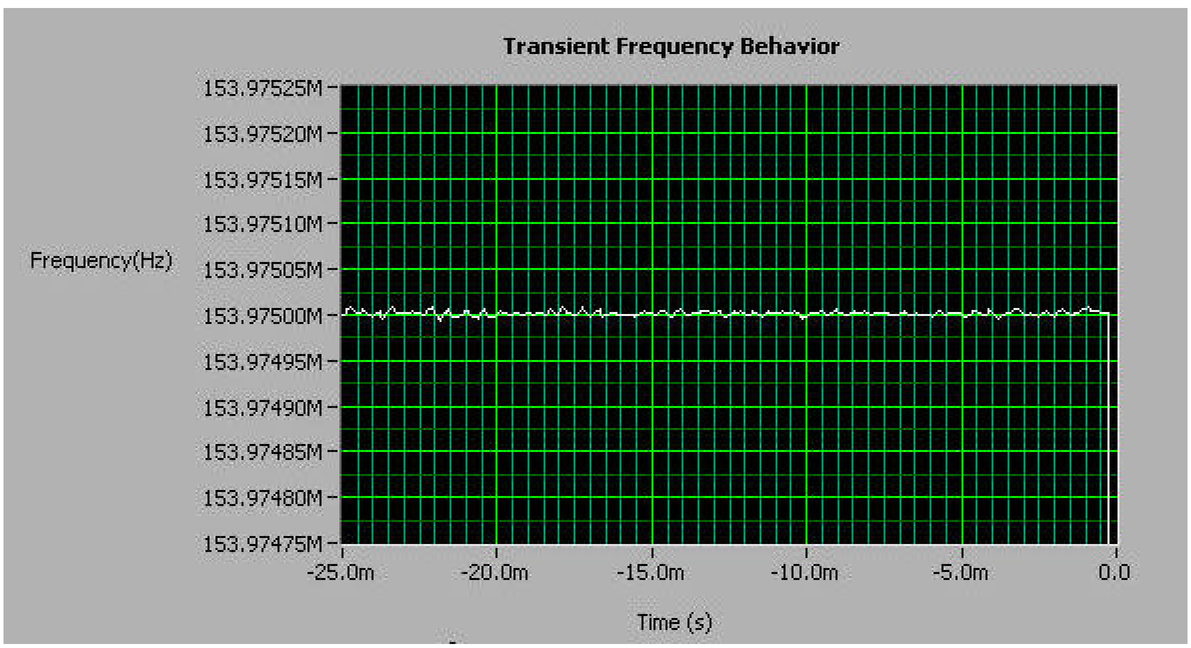


Figure 7-26 Transient Frequency Behavior, Wideband, Transmitter on (High Frequency Split)

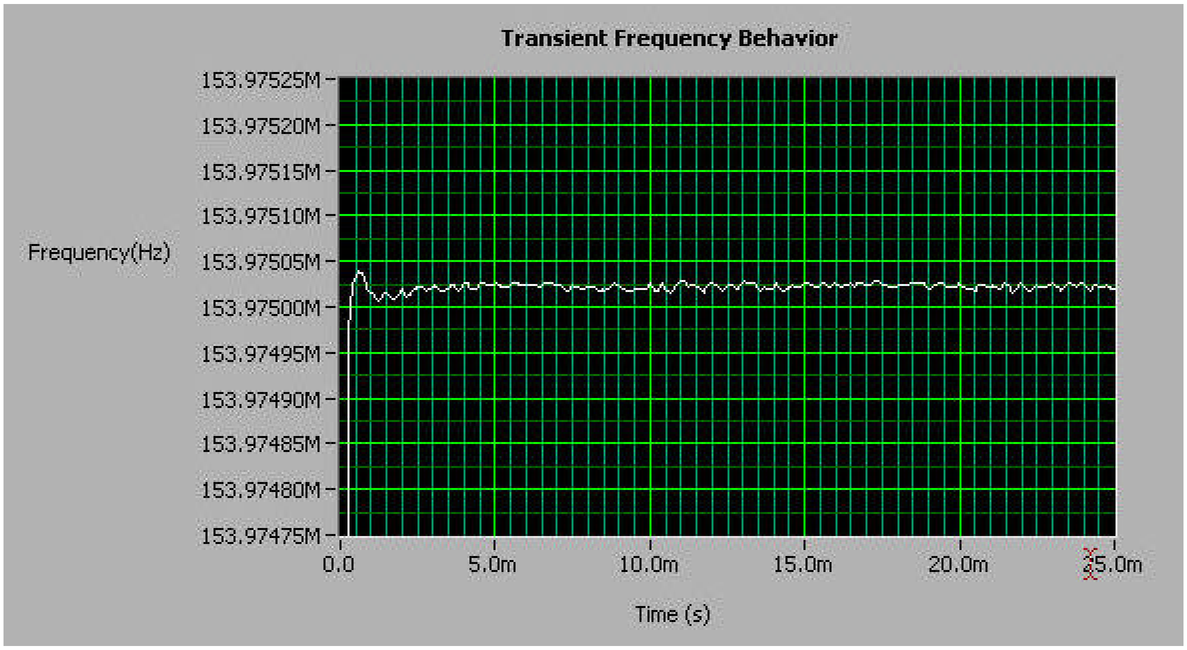


Figure 7-27 Transient Frequency Behavior, Narrowband, Transmitter on (High Frequency Split)

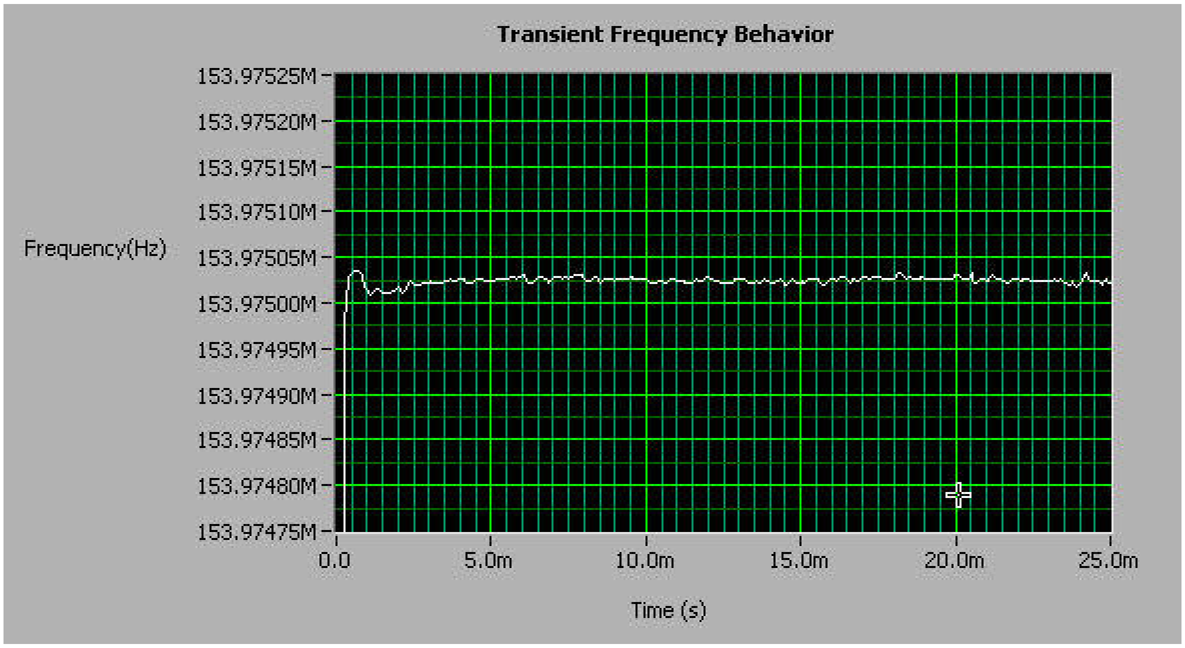


Figure 7-28 Transient Frequency Behavior, Wideband, Transmitter off (High Frequency Split)

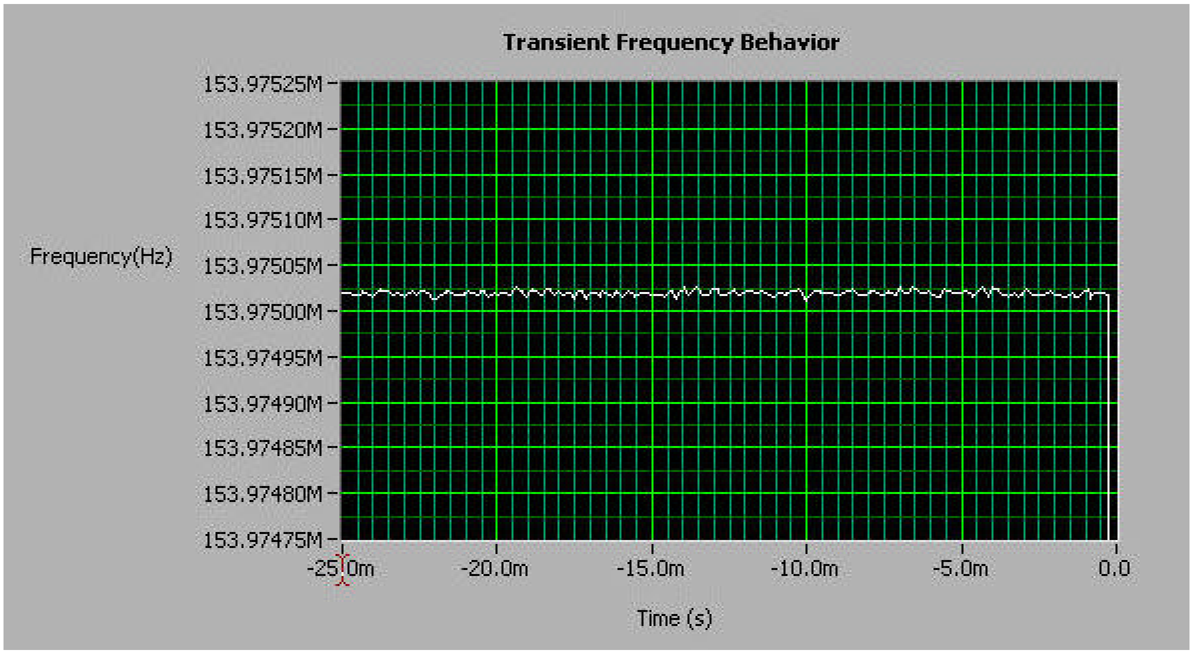
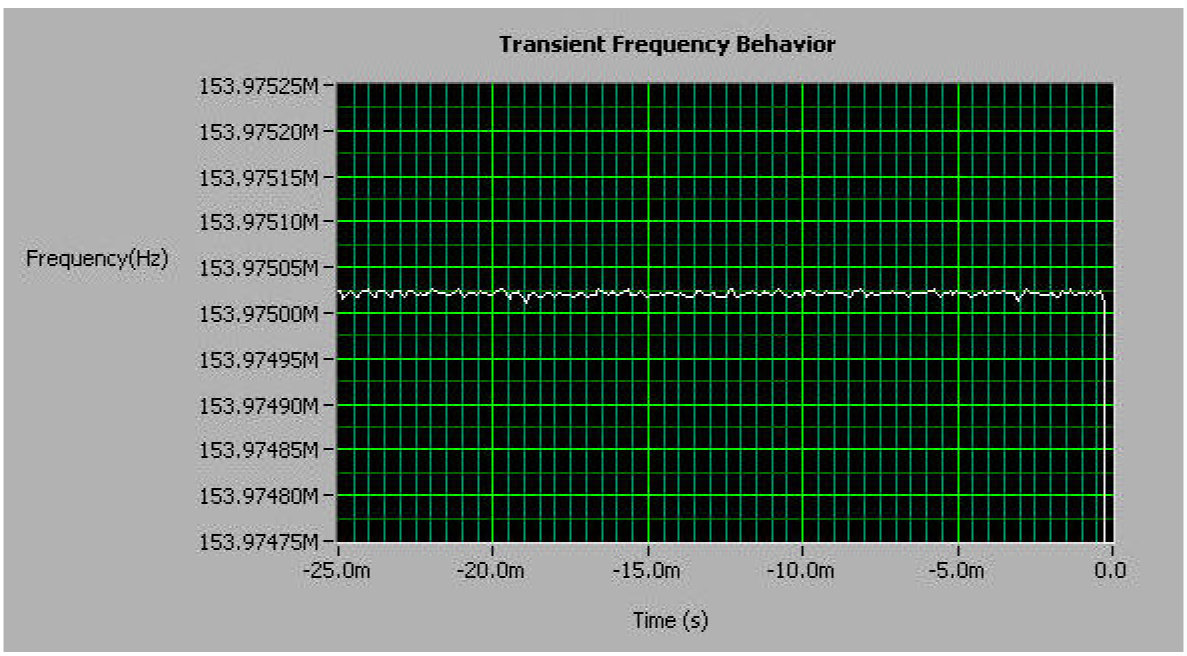


Figure 7-29 Transient Frequency Behavior, Narrowband, Transmitter off (High Frequency Split)



C-MAC ENGINEERING INC.

A Solectron Company

Certification Report for M/A-COM MASTRIII VHF Base Station

FCC Part 90, Part 22, and RSS-119