

TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Multitone Electronics Plc
RPE 503

To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
and RSS-119 Issue 9 June 2007

Test Report Serial No:
RFI/RPTE2/RP49561JD01A

Supersedes Test Report Serial No:
RFI/RPTE1/RP49561JD01A

**This Test Report Is Issued Under The Authority
Of Steve Flooks, Service Leader RPG:**



pp Brian Watson

Checked By:
Brian Watson



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Test of: **Multitone Electronics Plc**
RPE 503

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1. Client Information

Company Name:	Multitone Electronics Plc
Address:	Multitone House Shortwood Copse Lane Kempshott Basingstoke Hampshire RG23 7NL
Contact Name:	Brian Merchant

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2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Identification of Equipment Under Test (EUT)

Description:	UHF Radio Paging Transmitter
Brand Name:	Multitone
Model Name or Number:	RPE 503
Serial Number:	50300043:03
Country of Manufacture:	UK
Date of Receipt:	22 October 2007

2.2. Accessories

The following accessories were supplied with the EUT:

Description:	AC/DC Power Supply
Brand Name:	FP
Model Name or Number:	SAW36-13.8-21.00
Cable Length and Type:	1.8m twin-core
Connected to Port:	Tx DC I/P

2.3. Description of EUT

The equipment under test is a RPE 503 – 5 Watt UHF Radio Paging Transcoder (Transmitter with Integral Encoder).

2.4. Modifications Incorporated in the EUT

During the course of the testing the EUT was not modified.

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2.5. Additional Information Related to Testing

Power Supply Requirement:	DC Supply of: 13 V; 2A via 110 V, 60 Hz AC	
Intended Operating Environment:	Residential, Commercial and Light Industry	
Equipment Category:	PMR	
Type of Unit:	Base Station Transmitter	
Transmit Frequency Range:	430MHz to 470MHz	
Transmit Channels Tested:	Frequency	Channel Frequency (MHz)
	Bottom	430
	Middle	450
	Top	470
Highest Fundamental Frequency:	470MHz	

2.6. Port Identification

Interface Ports	Description	Type / Length
1	50ohm RF O/P	"N" Type RF Socket
2	Auxiliary Connector	15 Way Hi-Density "D"
3	DC Power I/P	2.1mm Jack
4	Line Connector	8 pin RJ45
5	RS232 Encoder Data I/P	9 Way "D"
6	7 Way DLC I/P	8 pin RJ45

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2.7. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	PC
Brand Name:	Dell
Model Name or Number:	Inspiron 5000
Serial Number:	000712TM-12961-067-3349
Cable Length and Type:	4m Multicore +2m Multicore-core
Connected to Port:	Tx Aux port/Transcoder RS232

Description:	DLC Test Switch PCB
Brand Name:	N/A
Cable Length and Type:	2.5m Multi-core
Connected to Port:	RPE 503 DLC Port

Description:	Audio I/P Lead
Brand Name:	N/A
Cable Length and Type:	1M Multi-core
Connected to Port:	Line Port

Description:	Line Test Encoder
Brand Name:	Multitone
Model Name or Number:	P391
Serial Number:	0039
Cable Length and Type:	3M Multi-core
Connected to Port:	Line Port

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3. Test Specification, Methods and Procedures

3.1. Test Specifications

Reference:	FCC Part 90: 2007
Title:	Code of Federal Regulations, Part 15 (47CFR290) Radio Frequency Devices.

Reference:	RSS-Gen Issue 2 June 2007
Title:	General Requirements and Information for the Certification of Radio communication Equipment

Reference:	RSS-119 Issue 9 June 2007
Title:	Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41-960 MHz.

3.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003

Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)

Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2001)

Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)

Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)

Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)

Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

3.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

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4. Deviations from the Test Specification

There were no deviations from the Test Specification.

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5. Operation of the EUT During Testing

5.1. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated:

- The Unit is a single frequency device. However, it is capable of being aligned between 430 and 470 MHz. Therefore full transmitter testing was performed at 430MHz, 450MHz and 470MHz.
- The device has two channel spacing's 12.5kHz and 25kHz and can transmit both analogue and data signals. As such, all bandwidth tests were performed to accommodate the two channel spacing's in accordance with standard requirements with both modulation schemes.
- A data pattern built into the EUT and configured for maximum deviation for each channel spacing was used to perform the data tests.
- An audio signal swept from 300Hz to 4kHz was used for the audio part.
- All testing was performed in an attempt to cover all worse case scenarios.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

- Antenna port connected to a measuring receiver or power meter as required.
- The AF port was connected to an audio generator when required.
- The serial port was connected to a laptop to enable transmitter keying.

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6. Summary of Test Results

Range of Measurements	FCC Part	RSS-Gen Clause	RSS-119 Clause	Port Type	Compliance Status
Idle Mode AC Conducted Emissions	15.107	7.2.2		AC Mains	Complied
Transmitter AC Conducted Spurious Emissions	15.207	7.2.2		AC Mains	Complied
Idle Radiated Spurious Emissions (30 MHz to 2.5 GHz)	15.109	6.0		Enclosure	Complied
Transmitter Carrier Output Power (ERP)	90.267, 2.1046		5.4	Antenna Terminals	Complied
Transmitter Audio Frequency Response (Modulation Characteristics)	2.1047		5.5	Antenna Terminals	Complied
Transmitter Occupied Bandwidth (Bandwidth Limitations)	90.209, 2.1049		5.5	Antenna Terminals	Complied
Transmitter Conducted Emissions Masks	90.210 (b) Mask B 90.210 (d) Mask D		5.5	Antenna Terminals	Complied
Transmitter Conducted Emissions (Out of Band) (9 kHz to 5 GHz)	90.210		5.8	Antenna Terminals	Complied
Transmitter Radiated Emissions (Out of Band) (30 MHz to 5 GHz)	90.210		5.8	Antenna Terminals	Complied
Transmitter Frequency Stability (Temperature & Voltage Variation)	90.213, 2.1055		5.3	Antenna Terminals	Complied
Transmitter Transient Frequency Behaviour	Part 90.214		5.9	Antenna Terminals	Complied

6.1. Location of Tests

All the measurements described in this report were performed at the premises of RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England.

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7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%.

Please refer to Section 8 for details of measurement uncertainties.

Some emissions plots report stop frequencies higher than that required by the standard. This is done for convenience of the test due to test setup hardware and does not reflect the operating frequency range of the EUT. The actual required measurement ranges were 5x470MHz for Idle mode and 10x470MHz for transmit mode. The plots more than cover this requirement.

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7.2. Test Results

7.2.1. Idle Mode AC Conducted Spurious Emissions: Section 15.107

Test Procedure as per C63.4 Clause 5.2 & 7.

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

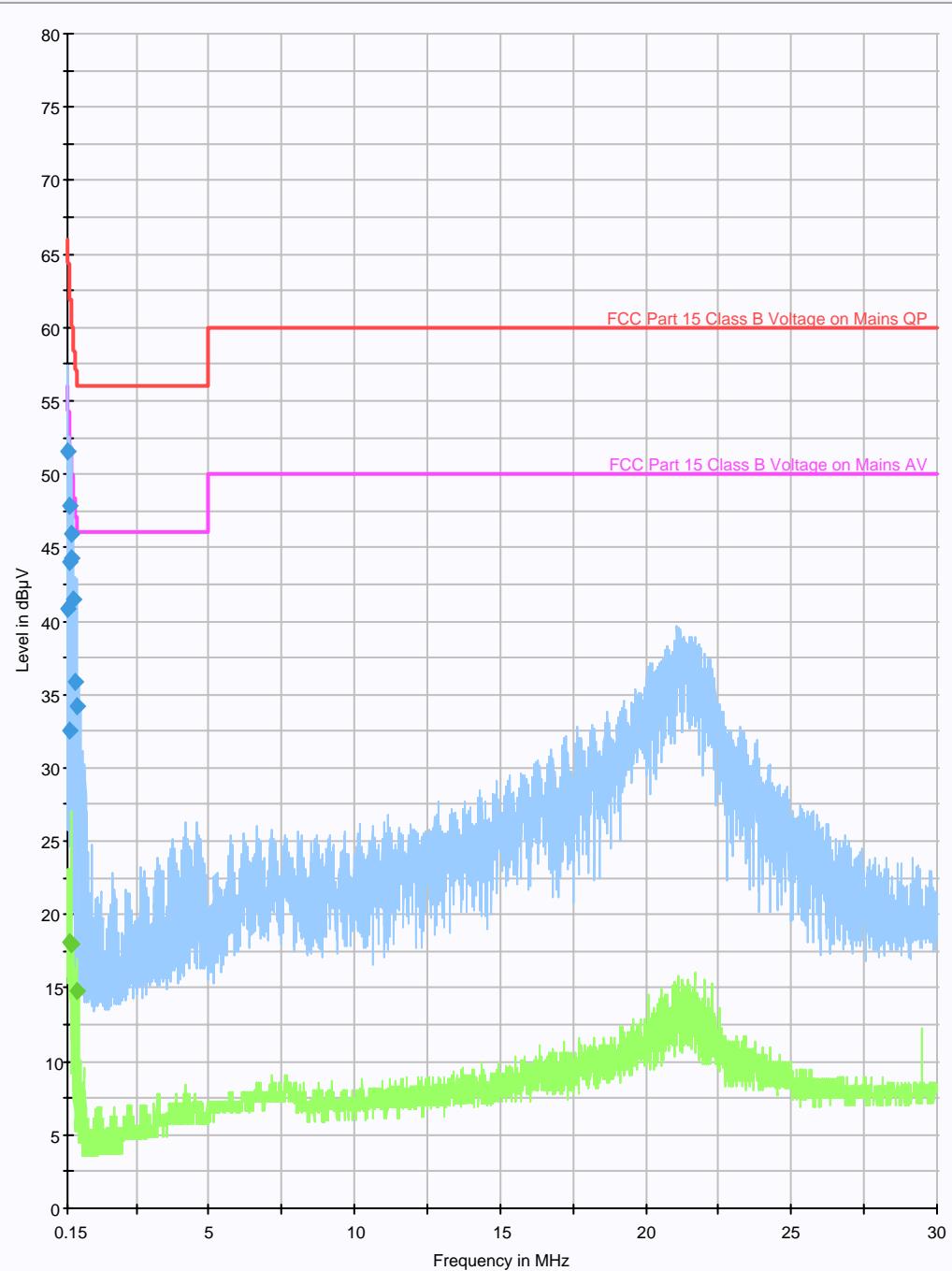
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.166000	Neutral	40.9	65.2	24.3	Complied
0.178000	Neutral	51.5	64.6	13.1	Complied
0.222000	Live	32.5	62.7	30.2	Complied
0.230000	Live	47.8	62.4	14.6	Complied
0.238000	Live	44.1	62.2	18.1	Complied
0.290000	Live	46.0	60.5	14.5	Complied
0.294000	Live	44.3	60.4	16.1	Complied
0.350000	Live	41.5	59.0	17.5	Complied
0.406000	Live	35.9	57.7	21.8	Complied
0.470000	Live	34.2	56.5	22.3	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.238000	Live	18.1	52.2	34.1	Complied
0.294000	Live	18.0	50.4	32.4	Complied
0.470000	Live	14.8	46.5	31.7	Complied

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Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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7.2.2. Transmitter AC Conducted Spurious Emissions: Section 15.207

Test Procedure as per C63.4 Clause 5.2 & 7

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

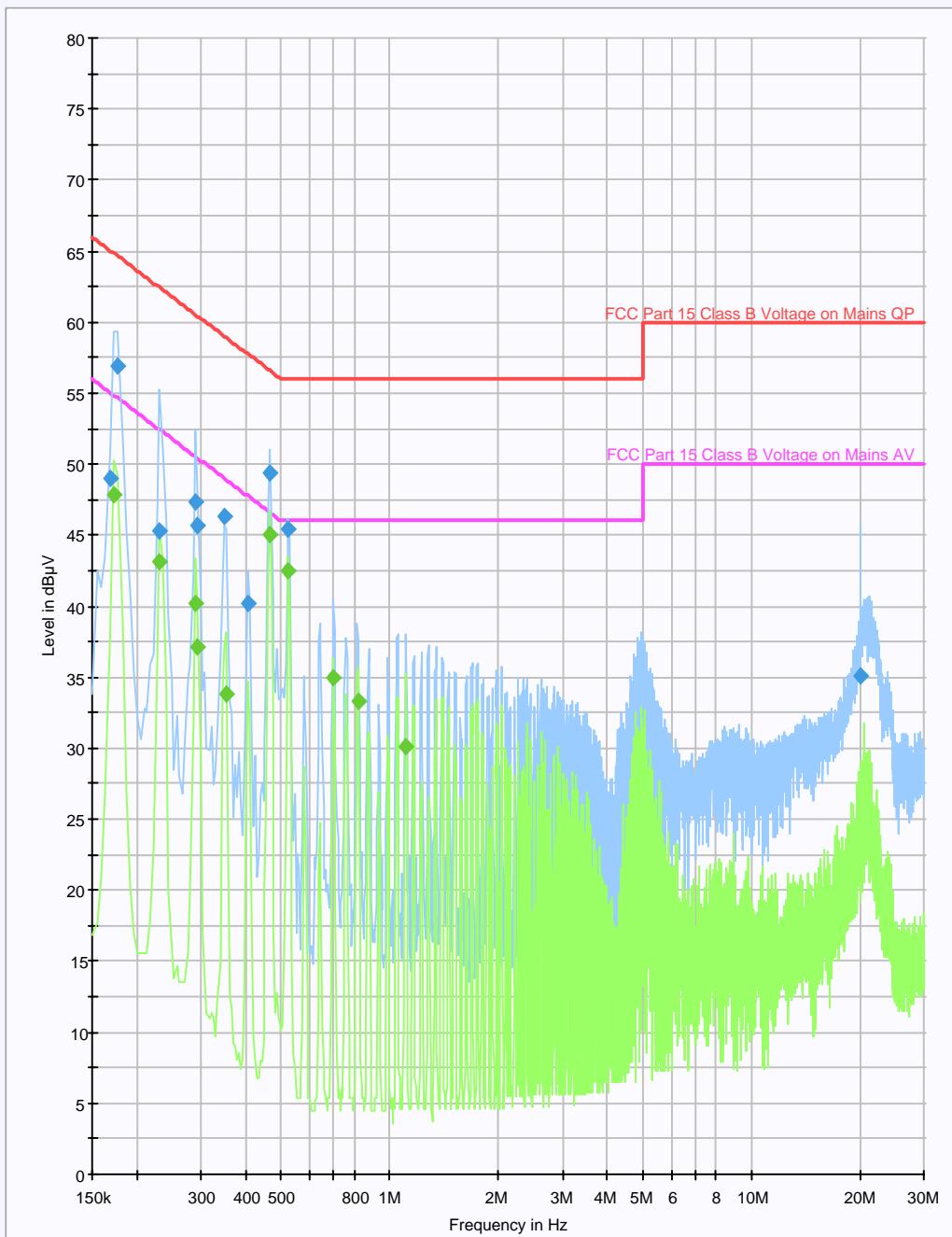
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.168000	Live	48.9	65.1	16.2	Complied
0.177000	Live	56.9	64.6	7.7	Complied
0.231000	Live	45.3	62.4	17.1	Complied
0.289500	Live	47.3	60.5	13.2	Complied
0.294000	Live	45.6	60.4	14.8	Complied
0.348000	Live	46.3	59.0	12.7	Complied
0.406500	Live	40.2	57.7	17.5	Complied
0.465000	Live	49.4	56.6	7.2	Complied
0.523500	Live	45.5	56.0	10.5	Complied
19.927500	Neutral	35.0	60.0	25.0	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.172500	Neutral	47.9	54.8	6.9	Complied
0.231000	Neutral	43.1	52.4	9.3	Complied
0.289500	Neutral	40.2	50.5	10.3	Complied
0.294000	Neutral	37.2	50.4	13.2	Complied
0.352500	Neutral	33.9	48.9	15.0	Complied
0.465000	Neutral	45.0	46.6	1.6	Complied
0.523500	Neutral	42.4	46.0	3.6	Complied
0.699000	Neutral	34.9	46.0	11.1	Complied
0.816000	Neutral	33.3	46.0	12.7	Complied
1.108500	Neutral	30.2	46.0	15.8	Complied

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Transmitter AC Conducted Spurious Emissions: Section 15.207 (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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7.2.3. Idle Mode Radiated Emissions (Out of Band) - 30MHz to 1GHz

Test procedure as per C63.4 - Clause 5.4 and 8.

Results:

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Result
49.839679	24.3	40	15.7	Complied
71.182365	30.5	40	9.5	Complied

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7.2.4. Idle Mode Radiated Emissions (Out of Band) - 1GHz to 2.5GHz

Test procedure as per C63.4 - Clause 5.5 and 8.

Results:

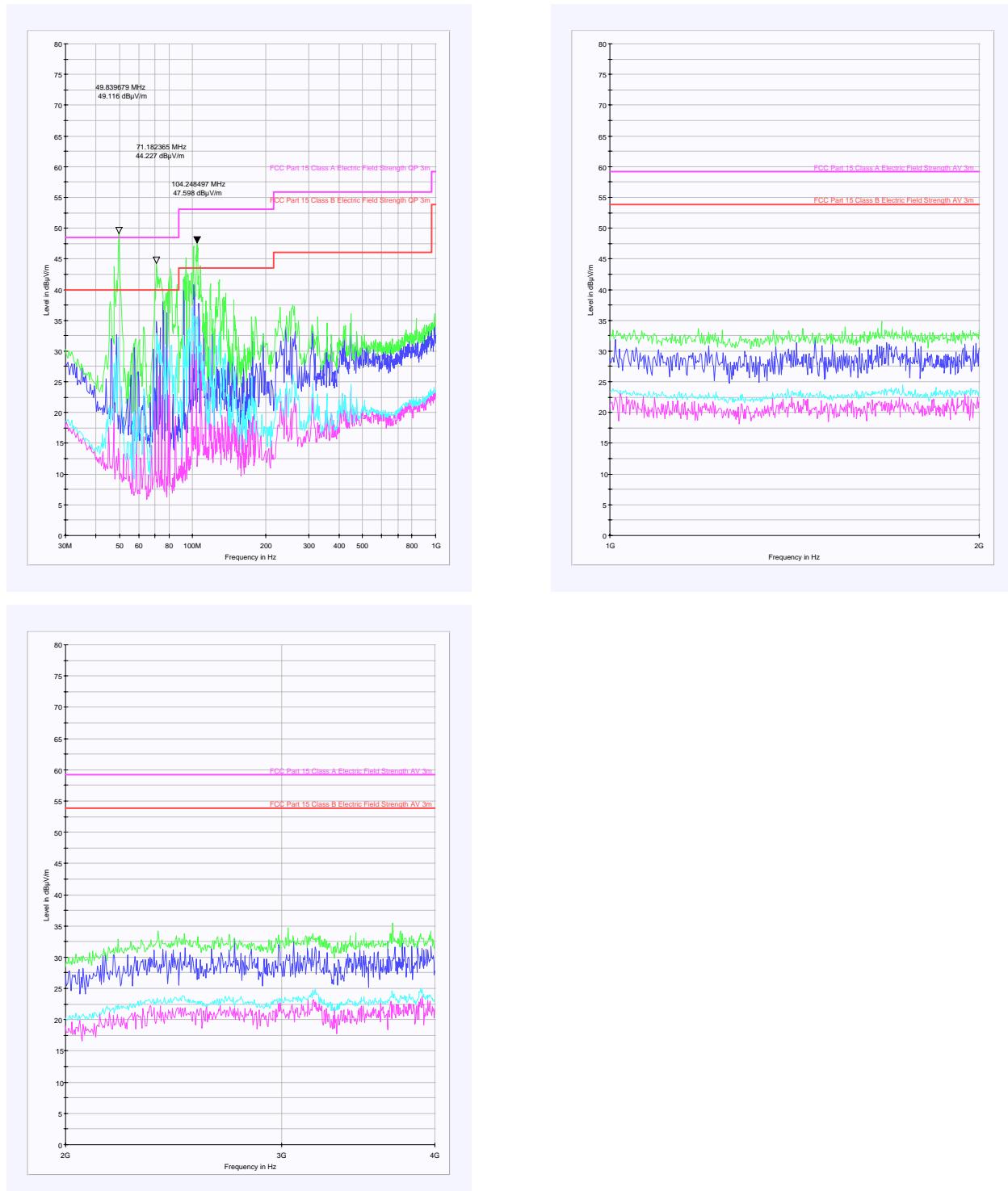
Frequency (MHz)	Detector Level (dBuV/m)	Transducer Factors (dB)	Actual Level (dBuV/m)	Limit (dBuV/m)	Margin (dBm)	Result
3750	44	-8.5	35.5	54	18.5	Complied

Note(s):

1. All emissions were below the receiver noise floor, as such the peak noise floor reading was recorded and compared to the average limit to show compliance.

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Idle Mode Radiated Emissions (Out of Band) – Plots



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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7.2.5. Transmitter Carrier Output Power (ERP)

Test procedure as per TIA-603-C 2.2.1

As the antenna gain is 0, the conducted power and radiated power are the same.

Antenna Gain: 0 dBi

Limit: 37.8 dBm

Results: Analogue/Digital Mode 25 kHz

Channel	EUT Power Setting		ERP (dBm)	Margin (dBm)	Result
	Forward Power Setting	Reverse Power Setting			
Bottom	414	9	37.0	0.8	Complied
Middle	432	11	36.9	0.9	Complied
Top	480	16	36.9	0.9	Complied

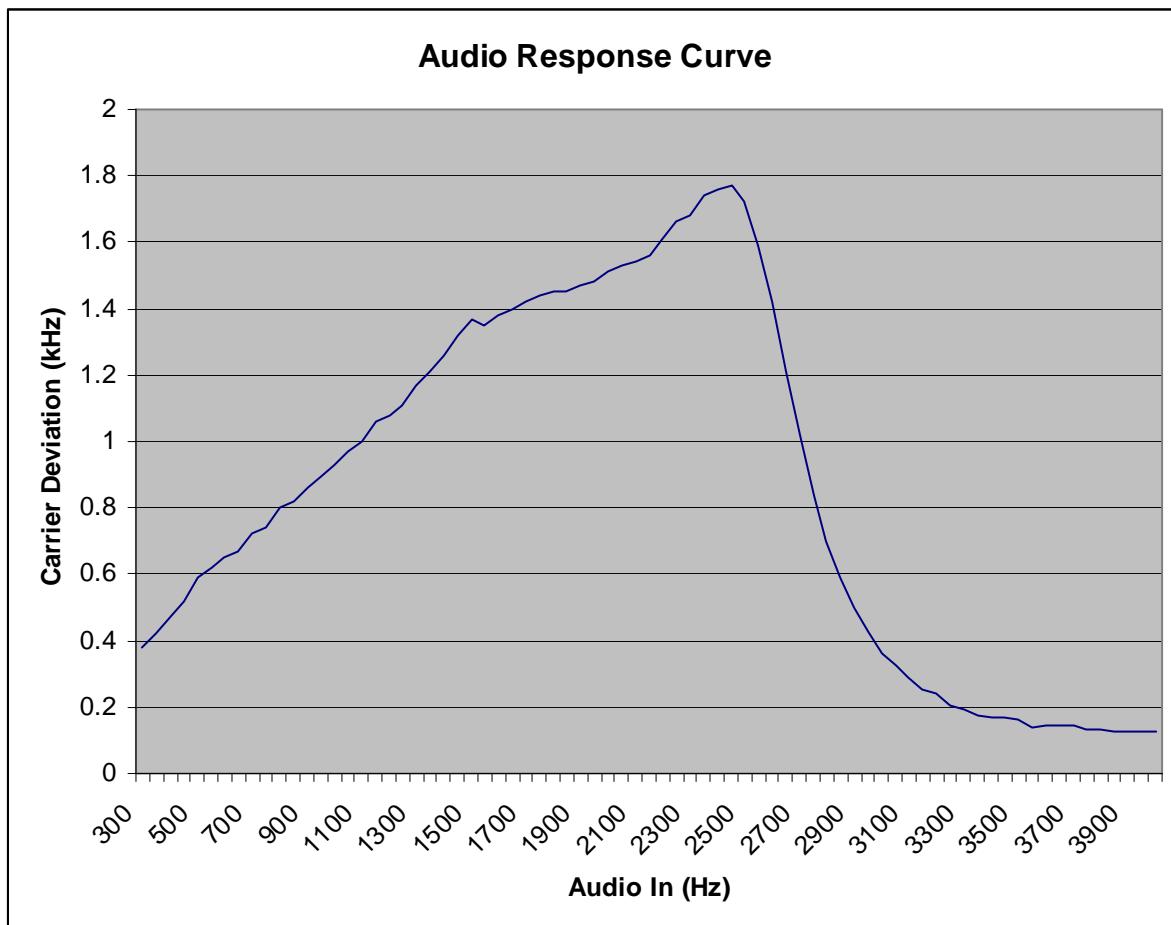
Results: Analogue/Digital Mode 12.5 kHz

Channel	EUT Power Setting		ERP (dBm)	Margin (dBm)	Result
	Forward Power Setting	Reverse Power Setting			
Bottom	434	13	37.0	0.8	Complied
Middle	467	16	37.0	0.8	Complied
Top	514	23	37.1	0.7	Complied

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Transmitter Audio Frequency Response – 12.5 kHz Mode

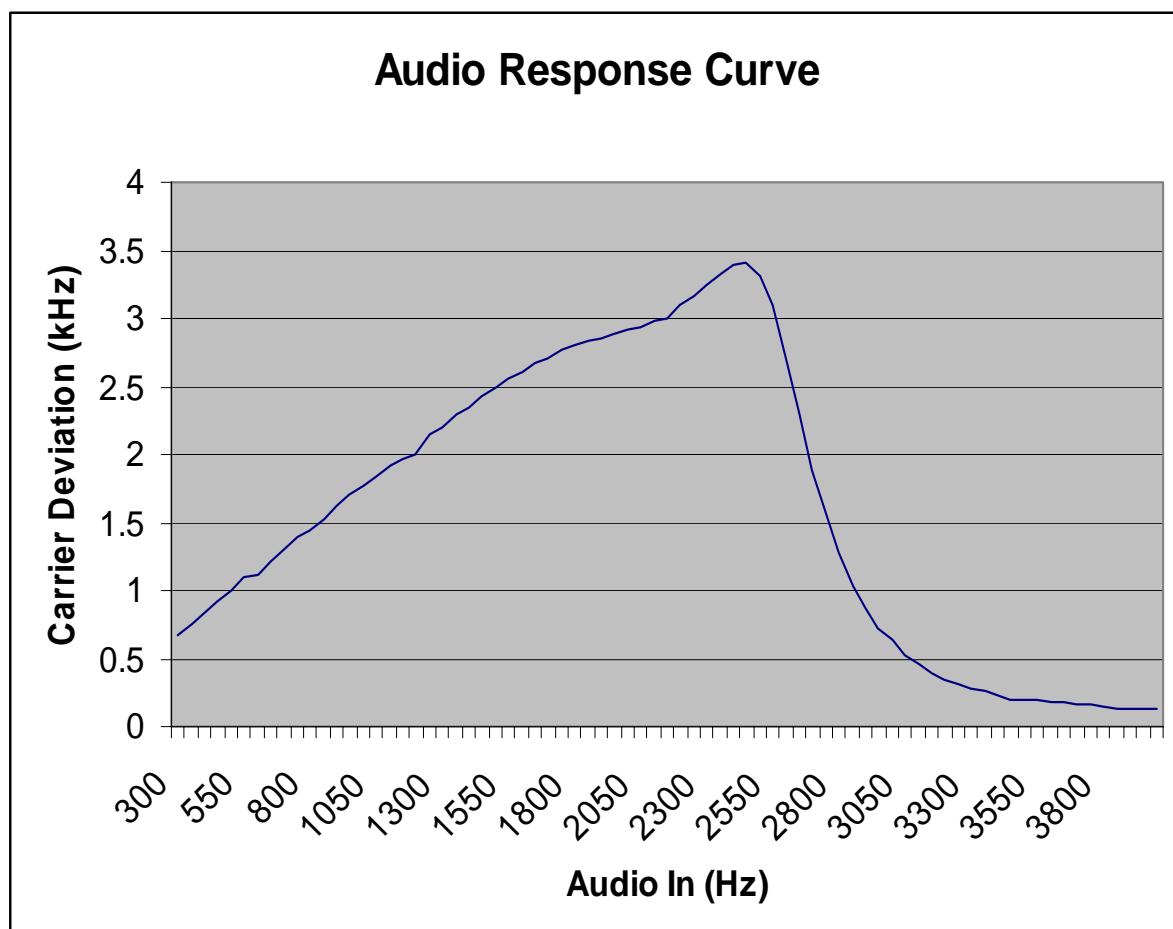
Procedure: A modulated carrier was injected into the EUT. The modulating frequency was varied between 300 Hz and 4kHz and the deviation of the carrier recorded. A plot of deviation against modulating frequency can be seen below.



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Transmitter Audio Frequency Response – 25 kHz Mode

Procedure: A modulated carrier was injected into the EUT. The modulating frequency was varied between 300 Hz and 4kHz and the deviation of the carrier recorded. A plot of deviation against modulating frequency can be seen below.



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7.2.6. Transmitter Bandwidth Limitations

Tested for 99% bandwidth with R&S FSEM Channel Power Function

Limit: 11.25 kHz

Results: Analogue Mode 12.5 kHz

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)	Margin (kHz)	Result
Bottom	430	7.257	3.993	Complied
Middle	450	7.359	3.891	Complied
Top	470	7.461	3.789	Complied

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7.2.7. Transmitter Bandwidth Limitations

Tested for 99% bandwidth with R&S FSEM Channel Power Function

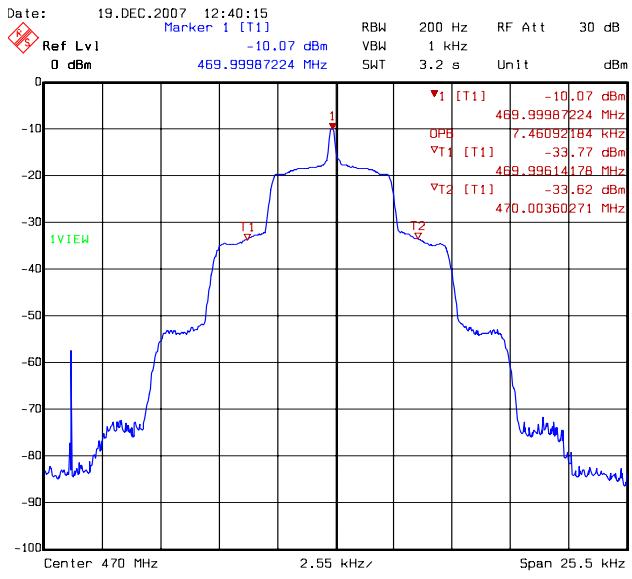
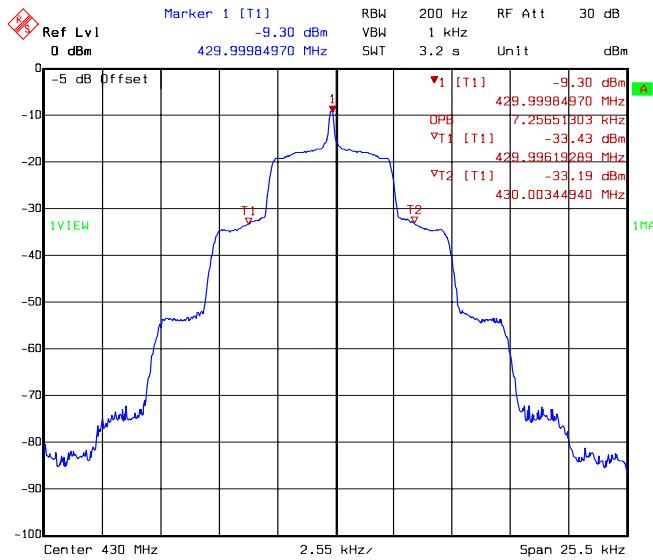
Limit: 11.25 kHz

Results: Analogue Mode 12.5 kHz

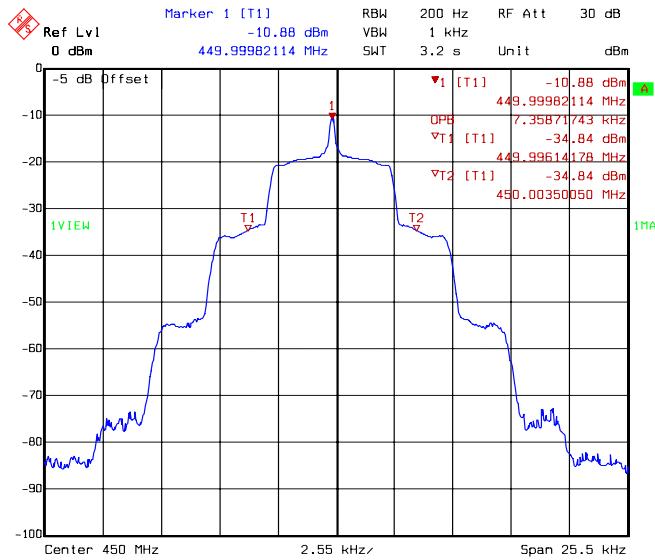
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)	Margin (kHz)	Result
Bottom	430	7.257	3.993	Complied
Middle	450	7.359	3.891	Complied
Top	470	7.461	3.789	Complied

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Transmitter Bandwidth Limitation (Continued)



Date: 18.DEC.2007 16:54:34



Date: 19.DEC.2007 12:48:36

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7.2.8. Transmitter Bandwidth Limitations

Tested for 99% bandwidth with R&S FSEM Channel Power Function

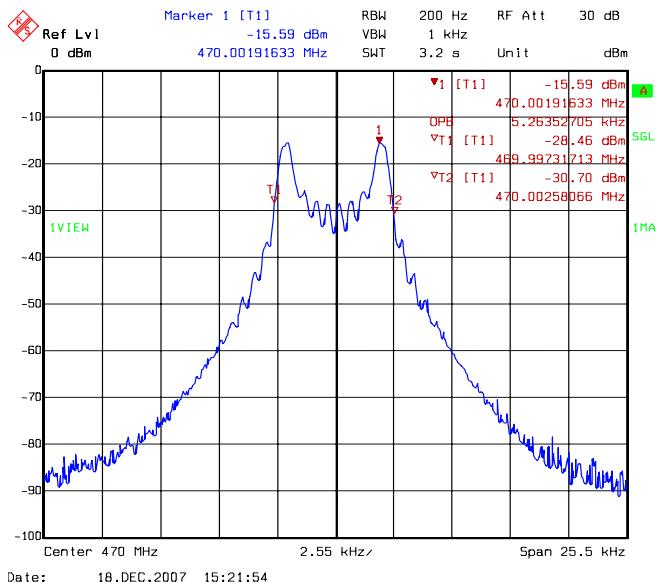
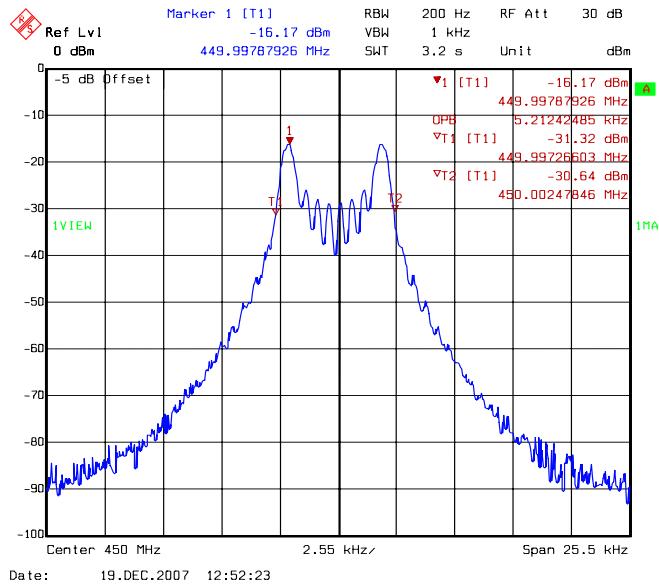
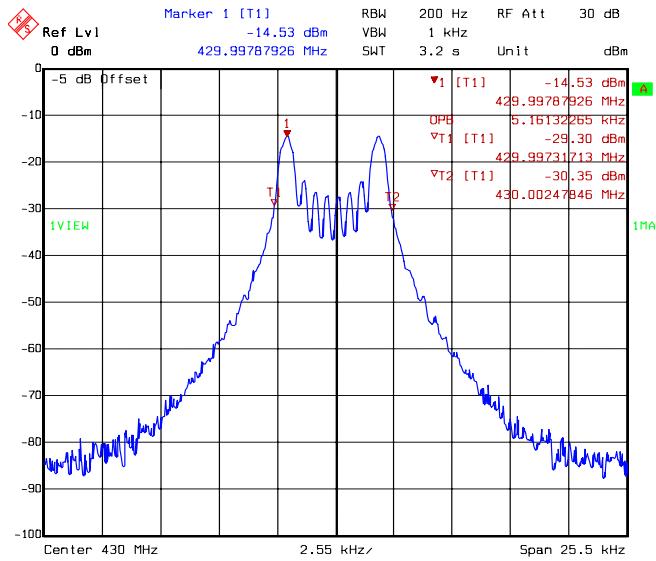
Limit: 11.25 kHz

Results: Digital Mode 12.5 kHz

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)	Margin (kHz)	Result
Bottom	430	5.161	6.089	Complied
Middle	450	5.212	6.038	Complied
Top	470	5.264	5.986	Complied

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7.2.9. Transmitter Bandwidth Limitations

The 99% Bandwidth was measured using the channel bandwidth function.

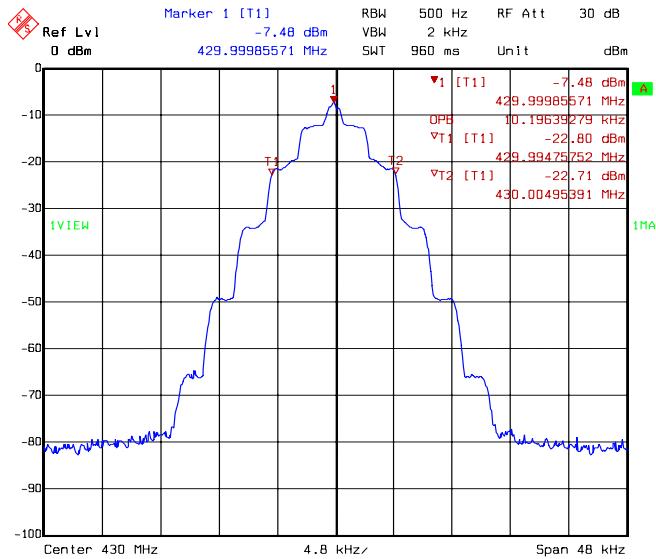
Limit: 20 kHz

Results: Analogue Mode 25 kHz

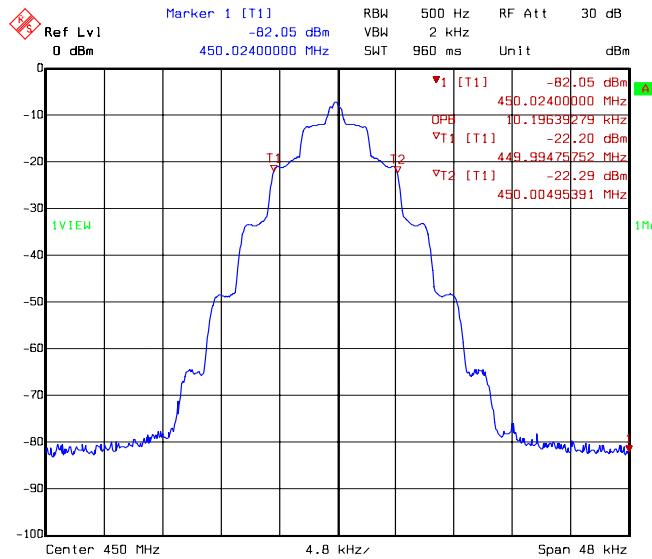
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)	Margin (kHz)	Result
Bottom	430	10.196	9.804	Complied
Middle	450	10.196	9.804	Complied
Top	470	10.292	9.708	Complied

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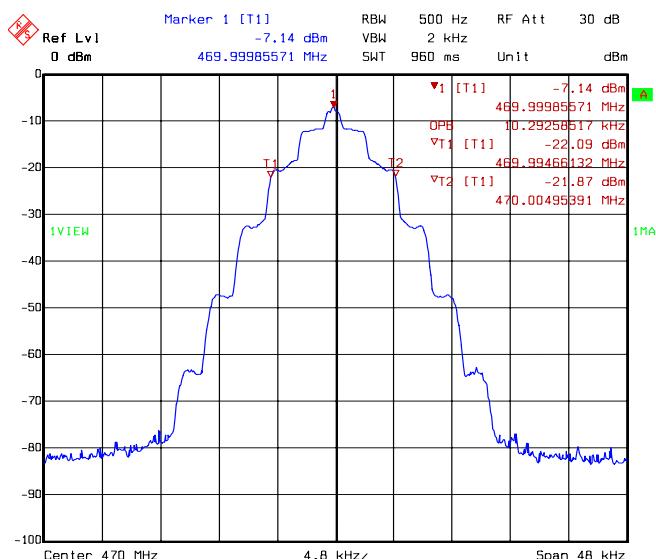
Transmitter Bandwidth Limitations (Continued)



Date: 20.DEC.2007 17:05:58



Date: 20.DEC.2007 16:28:42



Date: 20.DEC.2007 16:17:34

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7.2.10. Transmitter Bandwidth Limitations

The 99% Bandwidth was measured using the channel bandwidth function.

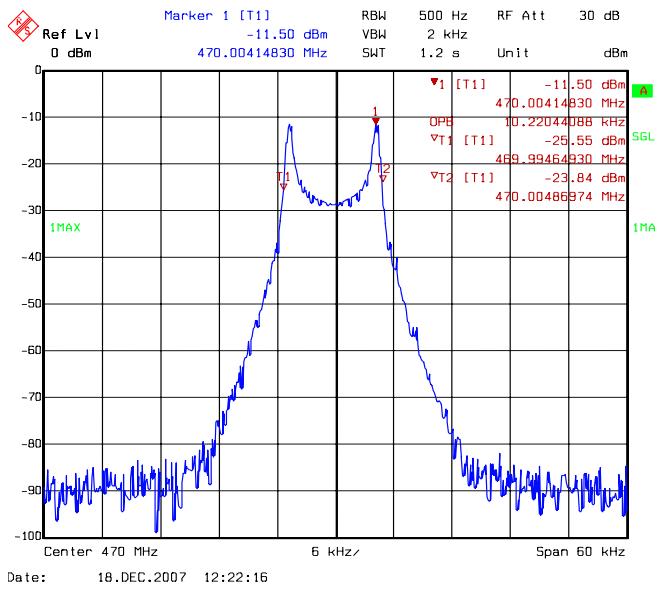
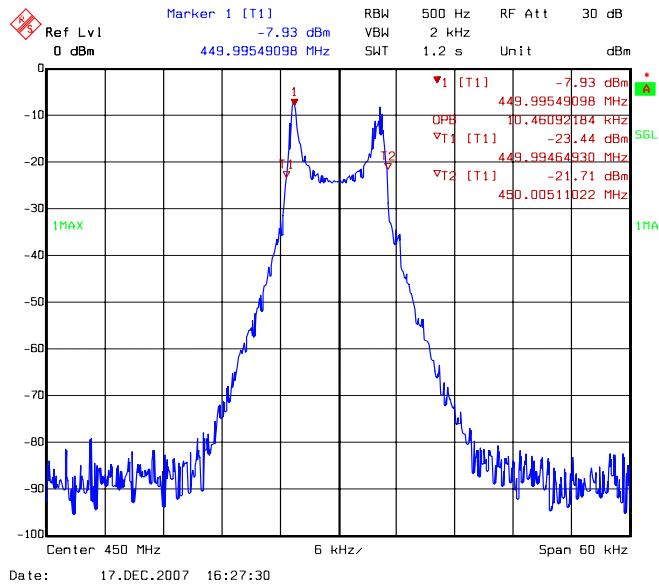
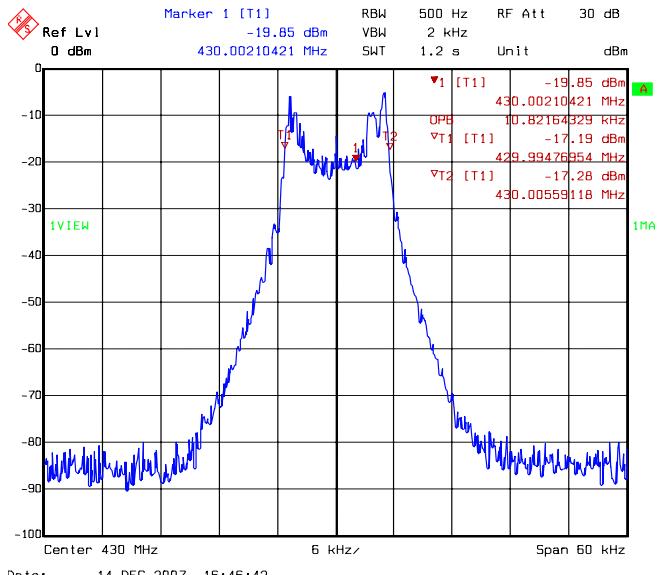
Limit: 20 kHz

Results: Digital Mode 25 kHz

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)	Margin (kHz)	Result
Bottom	430	10.822	9.178	Complied
Middle	450	10.461	9.539	Complied
Top	470	10.220	9.780	Complied

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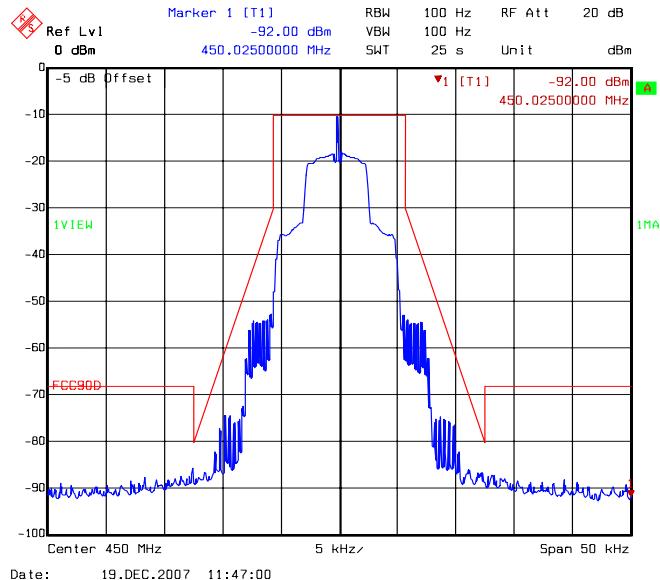
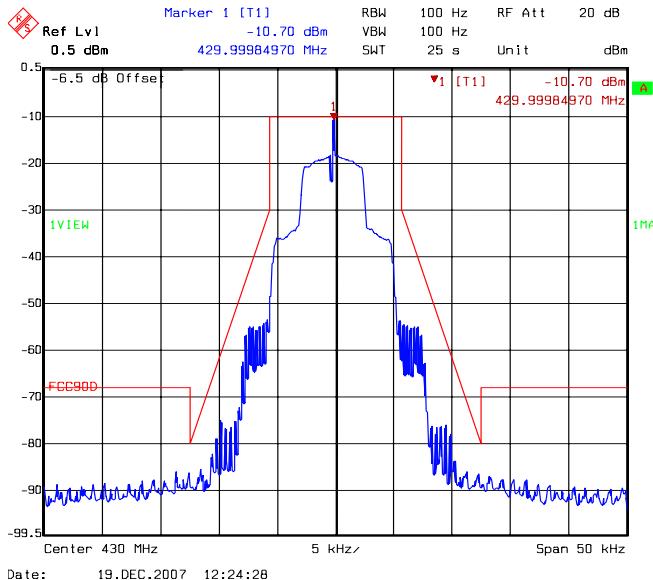
7.2.11. Transmitter Conducted Emissions Masks

Test procedure as per TIA-603-B Section 2.2.13

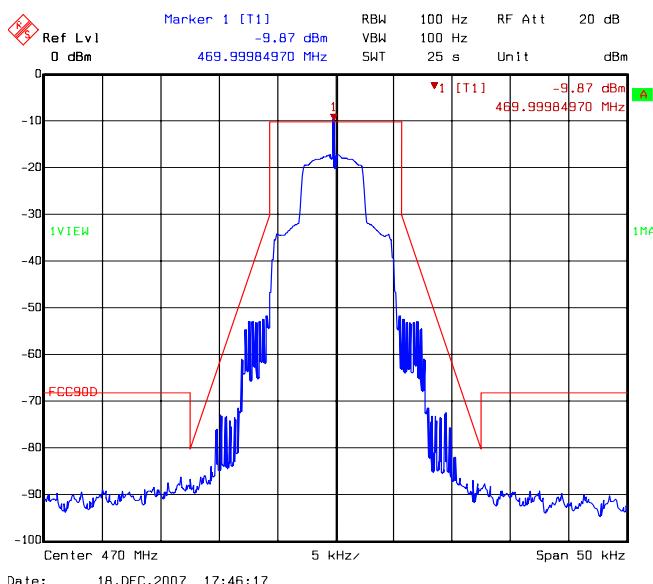
Mask: Part 90.210 D

AF tuned over = 300 Hz to 4 kHz for maximum occupancy

Results: Analogue Mode 12.5 kHz



Bottom Channel



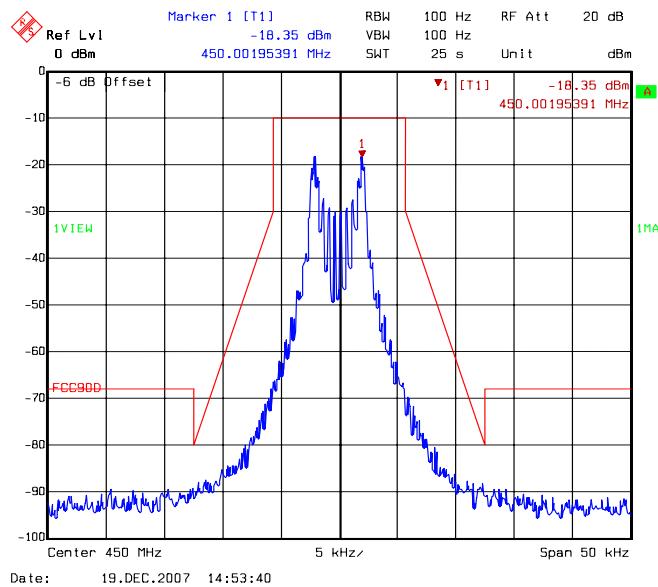
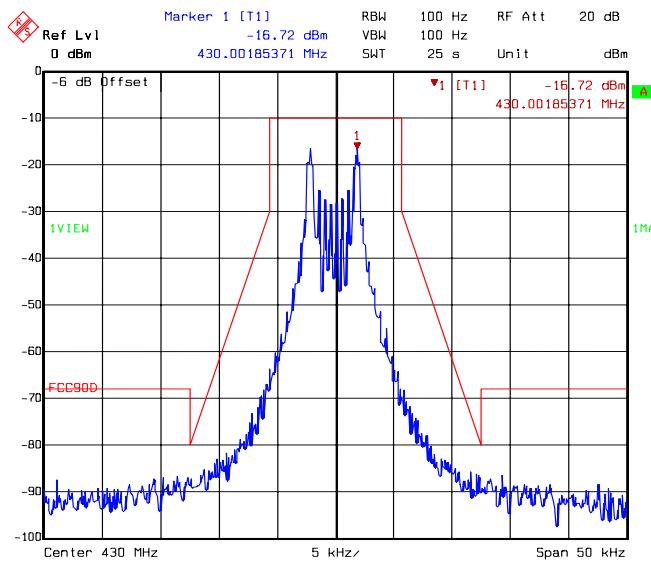
Middle Channel

Top Channel

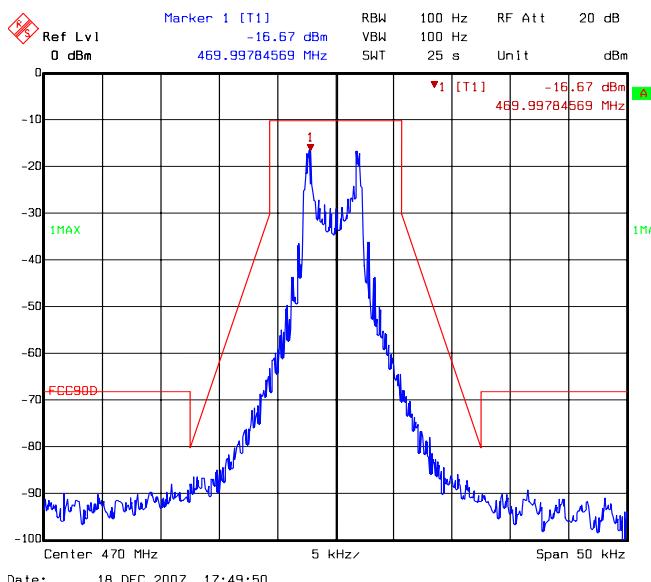
Test of: Multitone Electronics Plc
RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

Transmitter Conducted Emissions Masks (Continued)

Results: Digital Mode 12.5 kHz



Bottom Channel



Middle Channel

Top Channel

Test of: Multitone Electronics Plc
RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
and RSS-119 Issue 9 June 2007

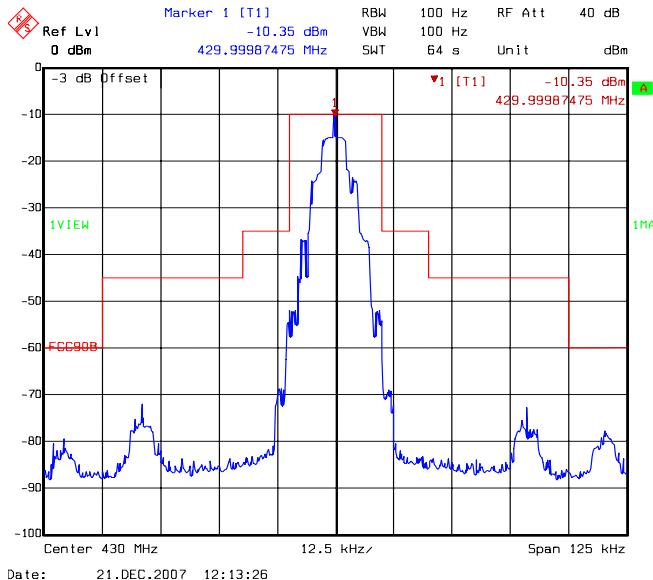
7.2.12. Transmitter Conducted Emissions Masks (Continued)

Test procedure as per TIA-603-B Section 2.2.13

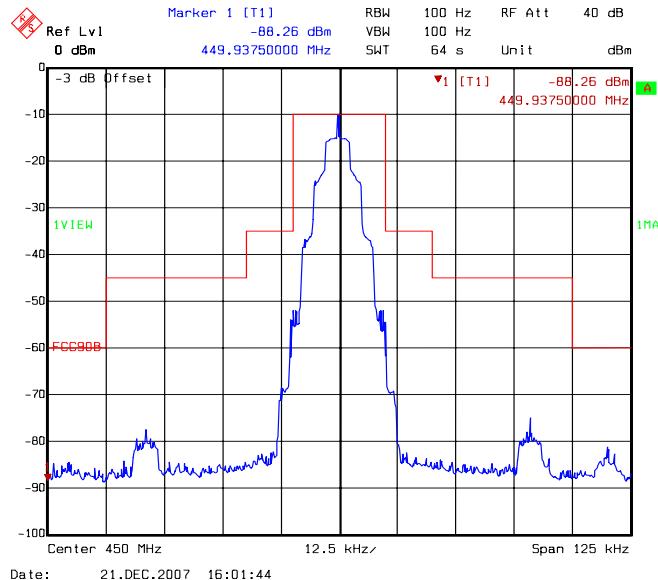
Mask: Part 90.210 B

AF tuned over = 300 Hz to 4 kHz for maximum occupancy

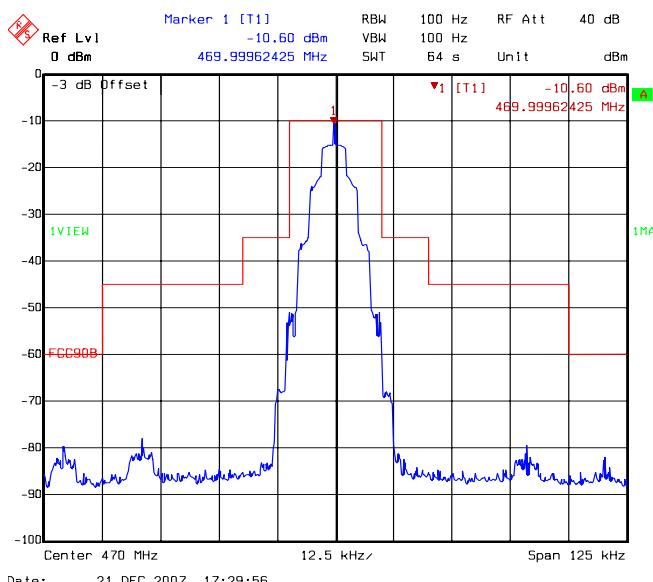
Results: Analogue Mode 25 kHz



Bottom Channel



Middle Channel



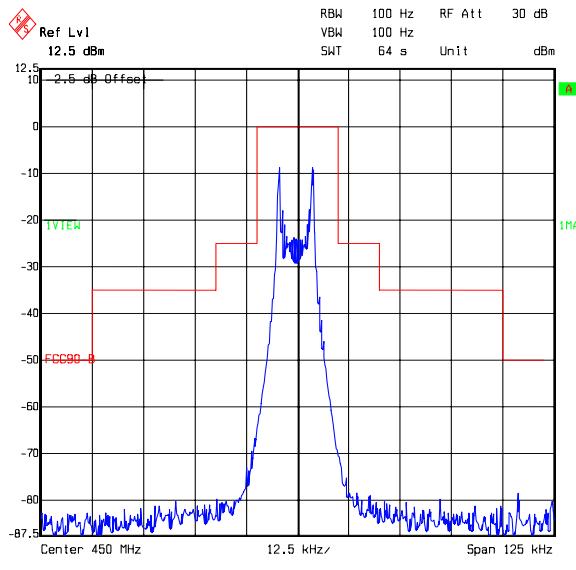
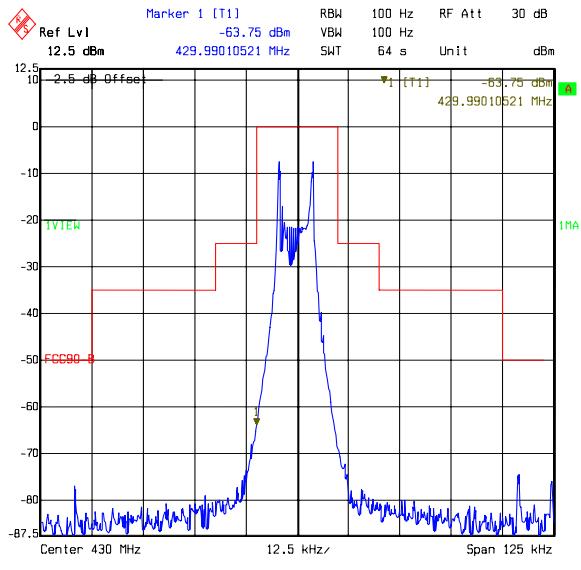
Top Channel

Test of: Multitone Electronics Plc
RPE 503

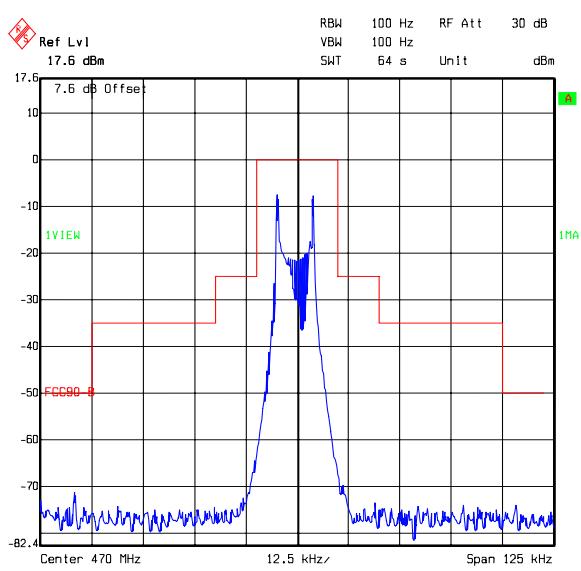
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
and RSS-119 Issue 9 June 2007

Transmitter Conducted Emissions Masks (Continued)

Results: Digital Mode 25 kHz



Bottom Channel



Middle Channel

Top Channel

Test of: Multitone Electronics Plc
 RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

7.2.13. Transmitter Conducted Emissions (Out of Band)

Test procedure as per TIA-603-B Section 2.2.13

Results:

Bottom Channel

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dBm)	Result
376.012	-35.9	-20	15.9	Complied
860.040	-28.8	-20	8.8	Complied
3677.355	-29.7	-20	9.7	Complied

Middle Channel

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dBm)	Result
0.009	-31.9	-20	11.9	Complied
0.041	-37.9	-20	17.9	Complied
0.150	-37.0	-20	17.0	Complied
393.507	-38.0	-20	18.0	Complied
506.252	-40.2	-20	20.2	Complied
900.862	-27.0	-20	7.0	Complied

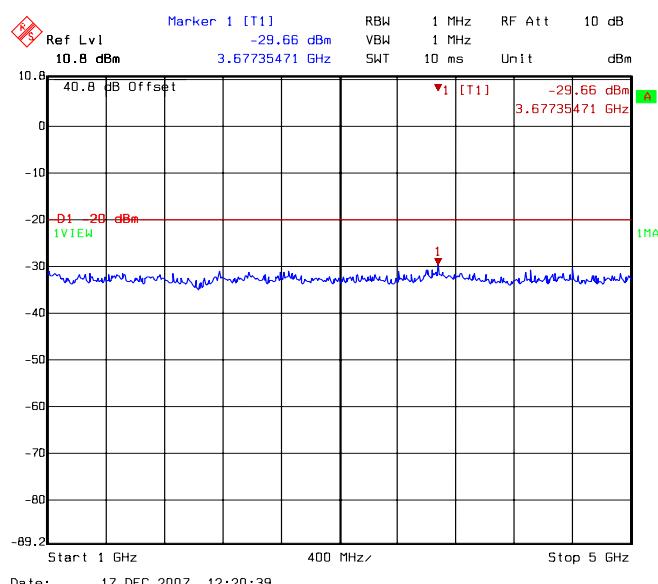
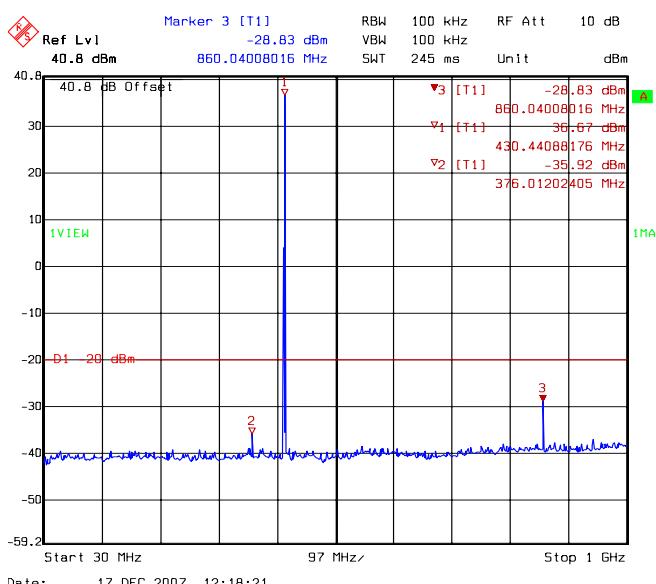
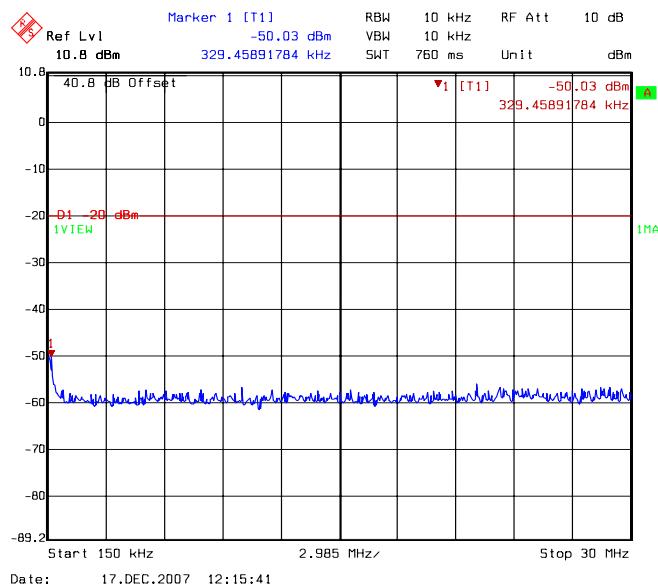
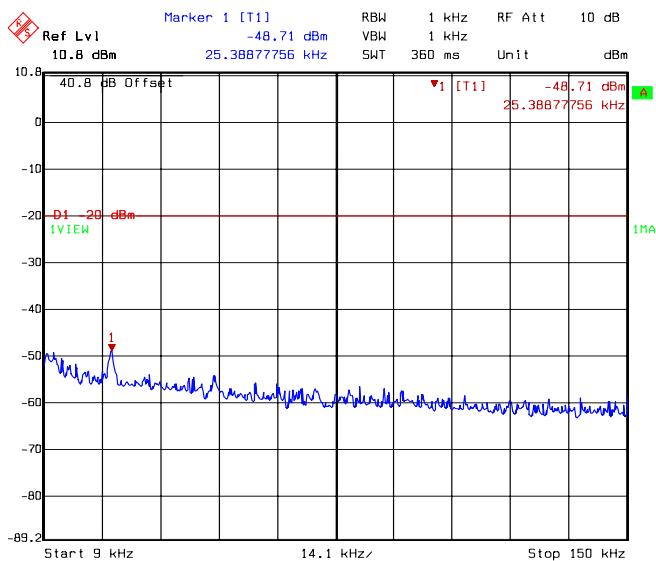
Top Channel

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dBm)	Result
411.002	-35.1	-20	15.1	Complied
941.683	-35.3	-20	15.3	Complied
2819.639	-30.2	-20	10.2	Complied

Test of: Multitone Electronics Plc
RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

Transmitter Conducted Emissions (Out of Band) (Continued)

Bottom Channel

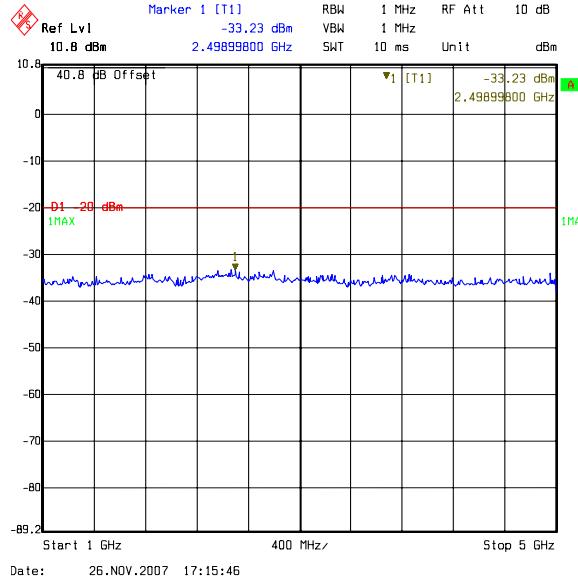
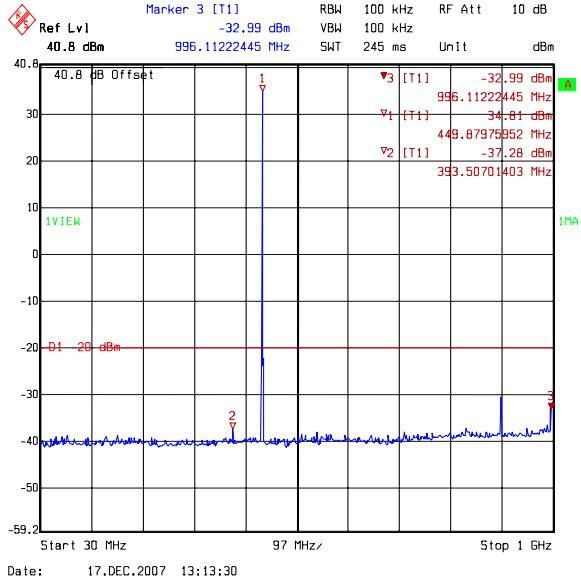
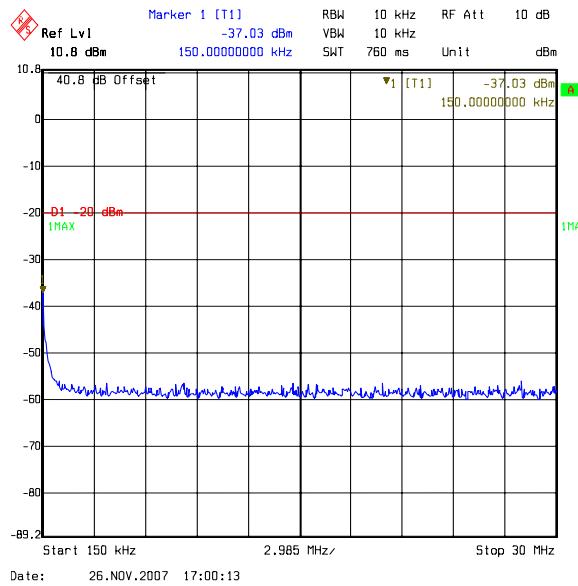
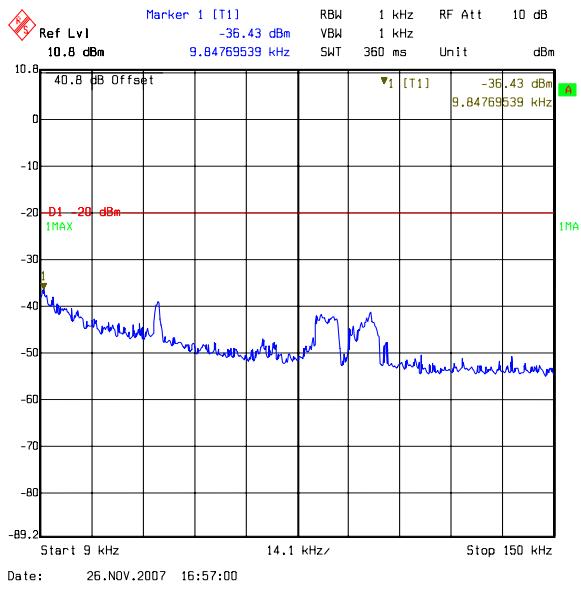


Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Test of: Multitone Electronics Plc
RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

Transmitter Conducted Emissions (Out of Band) (Continued)

Middle Channel

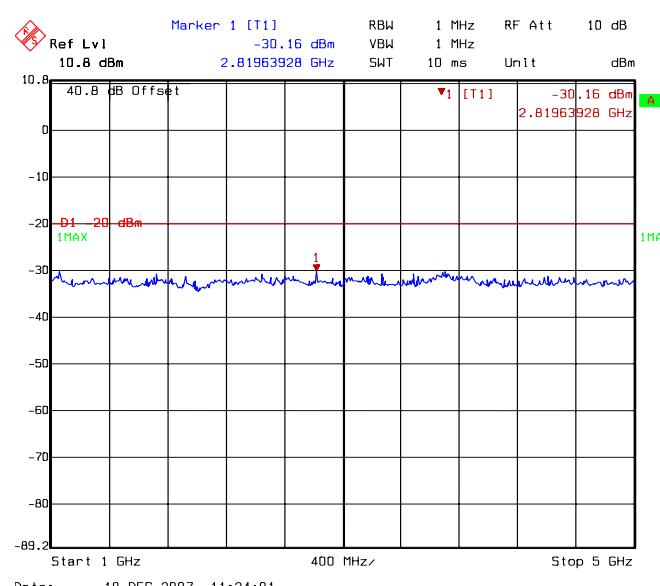
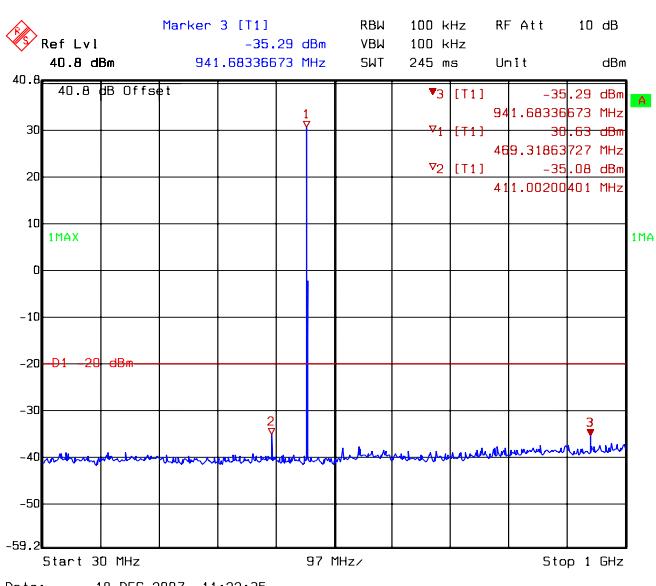
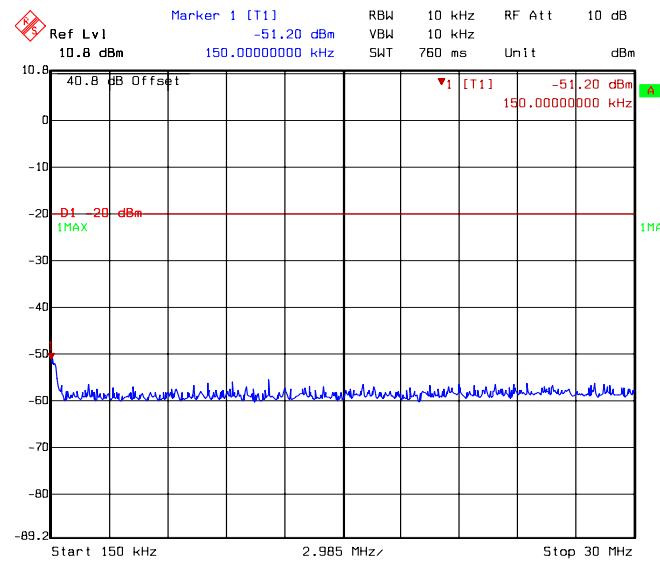
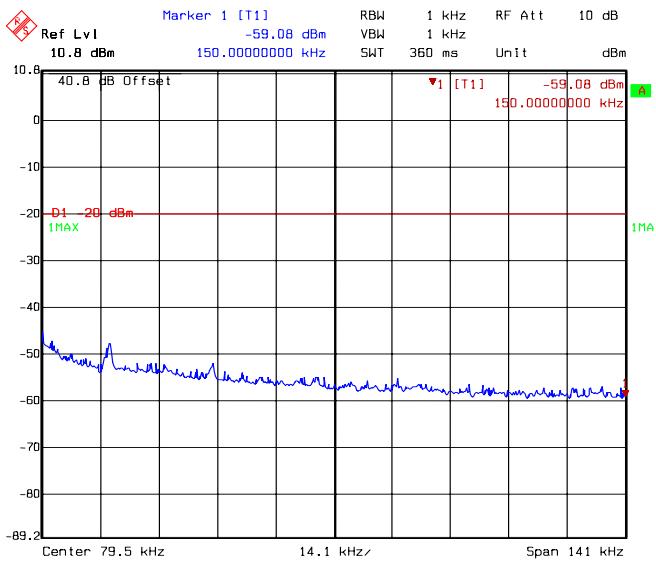


Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Test of: Multitone Electronics Plc
RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

Transmitter Conducted Emissions (Out of Band) (Continued)

Top Channel



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

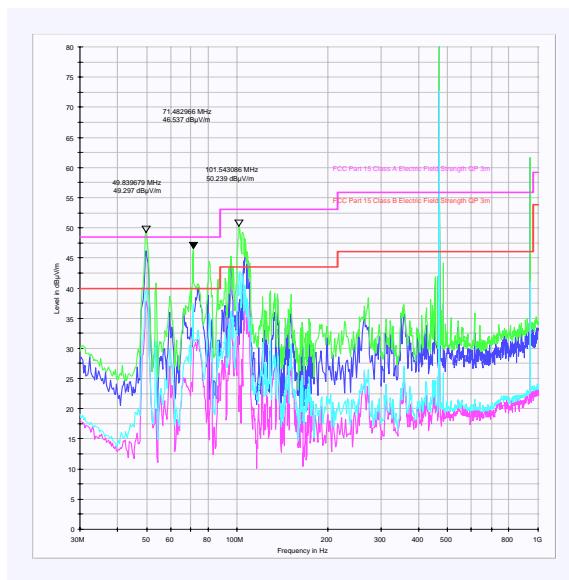
Test of: Multitone Electronics Plc
 RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

7.2.14. Transmitter Radiated Emissions (Out of Band) - 30MHz to 1GHz

Test procedure as per TIA-603-B Section 2.2.12

Results:

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
49.839679	-73.1	-20	53.1	Complied
71.182365	-66.9	-20	46.9	Complied



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Test of: Multitone Electronics Plc
 RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

7.2.15. Transmitter Radiated Emissions (Out of Band) - 1GHz to 5GHz

Test procedure as per TIA-603-B Section 2.2.12

Results:

Bottom Channel

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1290.02405	-27.2	-20	7.2	Complied
1719.97595	-34.5	-20	14.5	Complied
3009.97595	-36.9	-20	16.9	Complied
3440.07214	-33.2	-20	13.2	Complied

Middle Channel

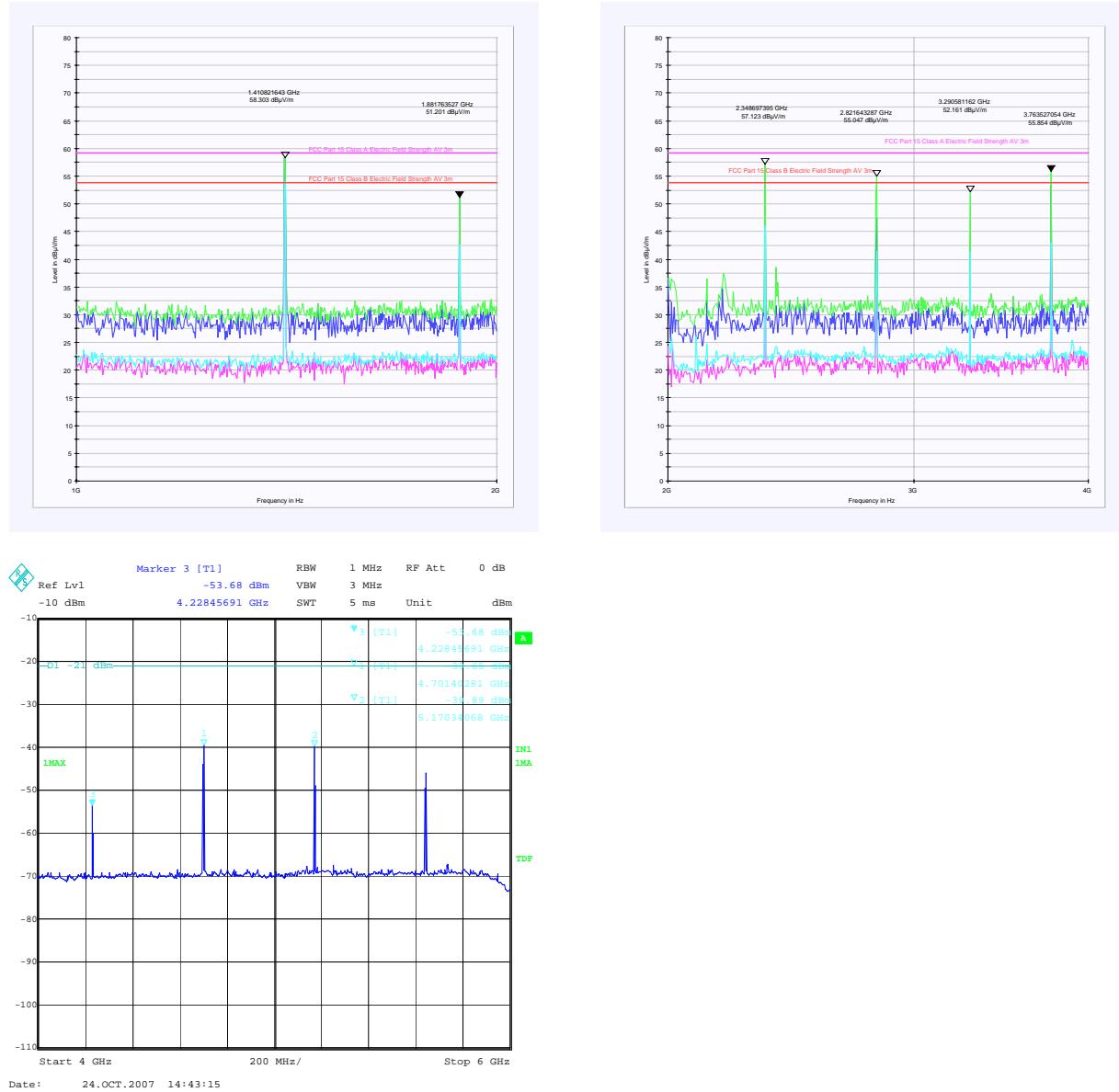
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1349.99248	-26.5	-20	6.5	Complied
1800.06263	-31.3	-20	11.3	Complied
3149.99374	-38.2	-20	18.2	Complied
3600.11899	-39.4	-20	19.4	Complied

Top Channel

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1410.03006	-30.9	-20	10.9	Complied
2350.05010	-35.8	-20	15.8	Complied
2819.82966	-38.2	-20	18.2	Complied
3290.05010	-37.2	-20	17.2	Complied
3760.01002	-37.3	-20	17.3	Complied

Test of: Multitone Electronics Plc
RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

Transmitter Radiated Emissions (Out of Band) - 1GHz to 5GHz (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Test of: Multitone Electronics Plc
 RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

7.2.16. Transmitter Frequency Stability (Temperature Variation)

Test Procedure as per TIA-603-C 3.2.2

Nominal Frequency: 430 MHz

Limit: 1.5 ppm*

*Worse case limit used

Results:

Bottom Channel

Temperature (°C)	Frequency (Hz)	Error (ppm)	Result
-30	430.00040	0.930	Complied
-20	430.00036	0.837	Complied
-10	430.00039	0.907	Complied
0	430.00026	0.605	Complied
10	430.00003	0.070	Complied
20	429.99994	-0.140	Complied
30	429.99990	-0.233	Complied
40	429.99985	-0.349	Complied
50	429.99978	-0.512	Complied

Test of: **Multitone Electronics Plc**
RPE 503
To: **FCC Part 90: 2007, RSS-Gen Issue 2 June 2007**
and RSS-119 Issue 9 June 2007

7.2.17. Transmitter Frequency Stability (Temperature Variation)

Test Procedure as per TIA-603-C 3.2.2

Nominal Frequency: 450 MHz

Limit: 1.5 ppm *

*Worse case limit used

Results:

Middle Channel

Temperature (°C)	Frequency (Hz)	Error (ppm)	Result
-30	450.00052	1.156	Complied
-20	450.00037	0.822	Complied
-10	450.00038	0.844	Complied
0	450.00035	0.778	Complied
10	450.00005	0.111	Complied
20	449.99996	-0.089	Complied
30	449.99981	-0.422	Complied
40	449.99975	-0.556	Complied
50	449.99972	-0.622	Complied

Test of: Multitone Electronics Plc
 RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

7.2.18. Transmitter Frequency Stability (Temperature Variation)

Test Procedure as per TIA-603-C 3.2.2

Nominal Frequency: 470 MHz

Limit: 1.5 ppm*

*Worse case limit used

Results:

Top Channel

Temperature (°C)	Frequency (Hz)	Error (ppm)	Result
-30	470.00050	1.064	Complied
-20	470.00039	0.830	Complied
-10	470.00041	0.872	Complied
0	470.00035	0.745	Complied
10	470.00004	0.085	Complied
20	469.99996	-0.085	Complied
30	469.99989	-0.234	Complied
40	469.99973	-0.574	Complied
50	469.99971	-0.617	Complied

Test of: Multitone Electronics Plc
 RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

7.2.19. Transmitter Frequency Stability (Voltage Variation)

Test Procedure as per TIA-603-C 3.2.2

Bottom Channel: 430 MHz
 Middle Channel: 450 MHz
 Top Channel: 470 MHz

Limit: 1.5 ppm*

*Worse case limit used

Bottom Channel

Voltage (V)	Frequency (Hz)	Error (ppm)	Result
93.5	430.00006	0.140	Complied
110	430.00005	0.116	Complied
126.5	430.00005	0.116	Complied

Middle Channel

Voltage (V)	Frequency (Hz)	Error (ppm)	Result
93.5	450.00006	0.133	Complied
110	450.00006	0.133	Complied
126.5	450.00006	0.133	Complied

Top Channel

Voltage (V)	Frequency (Hz)	Error (ppm)	Result
93.5	470.00003	0.064	Complied
110	470.00003	0.064	Complied
126.5	470.00003	0.064	Complied

Test of: Multitone Electronics Plc
 RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

7.2.20. Transmitter Transient Frequency Behaviour

Test Procedure as per TIA-603-C 3.2.19

Channel Spacing: 12.5 kHz

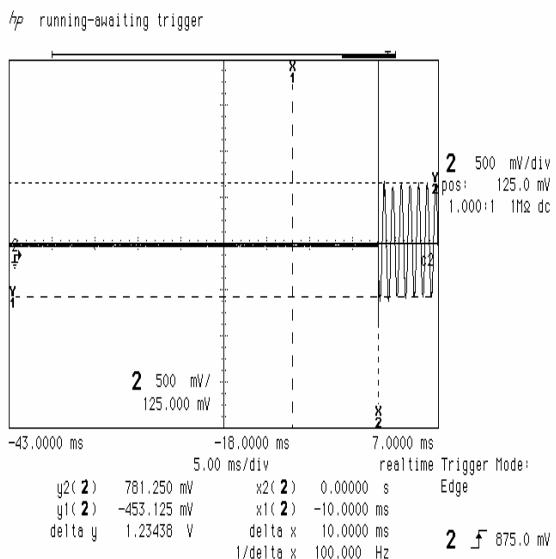
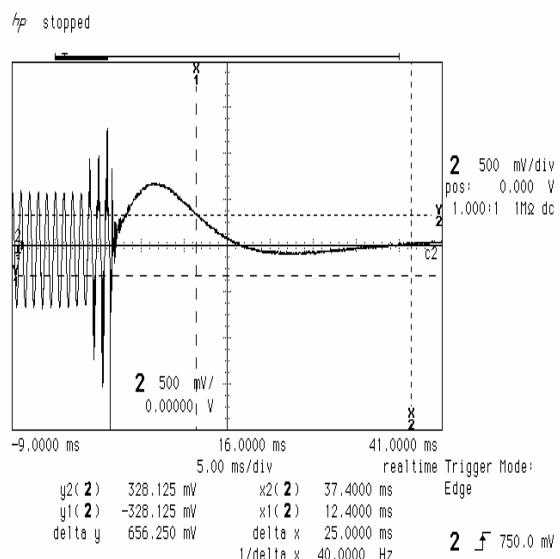
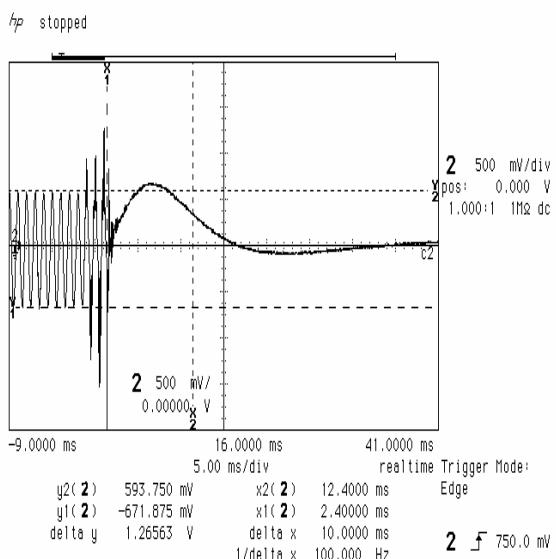
Results:

Time Intervals	Maximum Frequency Difference (kHz)			
	Bottom Channel	Middle Channel	Top Channel	Status
t1	13.5	11.0	11.3	Complied
t2	6.3	4.1	4.4	Complied
t3	0.3	1.1	0.3	Complied

Limits		
Time Intervals	Maximum Frequency Difference (±kHz)	Period (ms)
t1	12.5	10
t2	6.25	25
t3	12.5	10

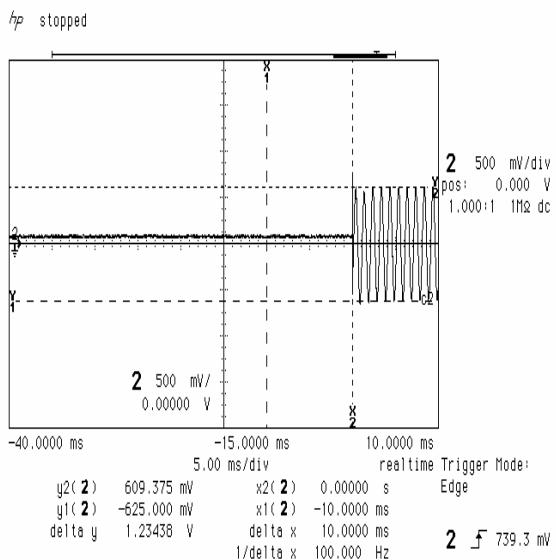
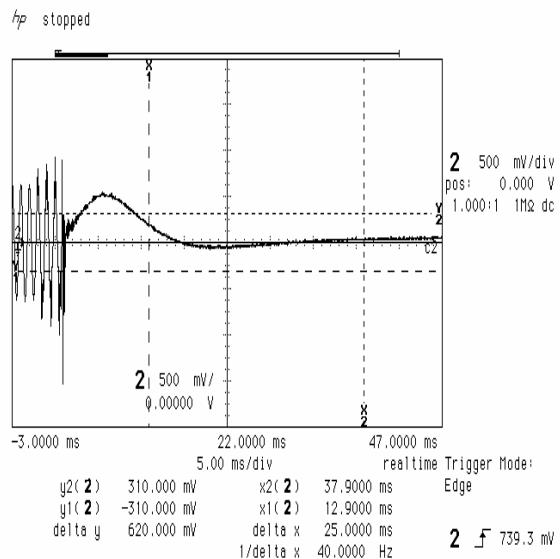
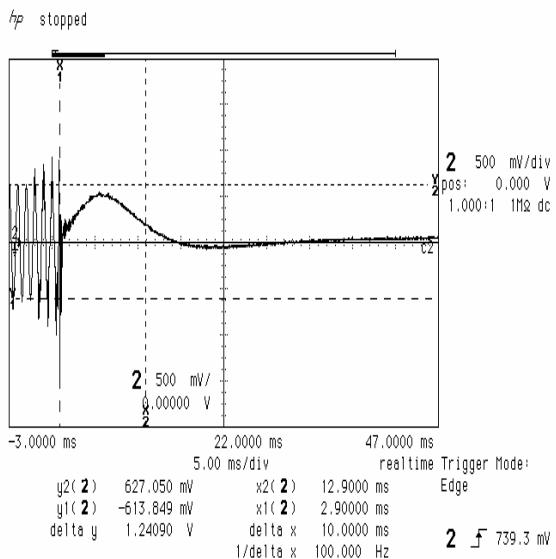
Test of: Multitone Electronics Plc
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Transmitter Frequency Transients - Bottom Channel



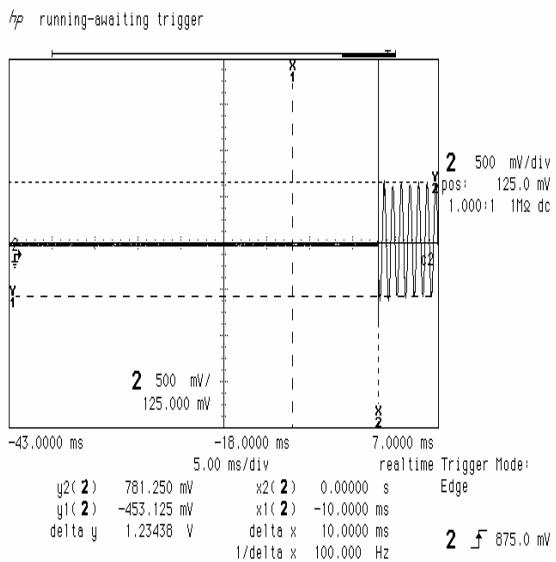
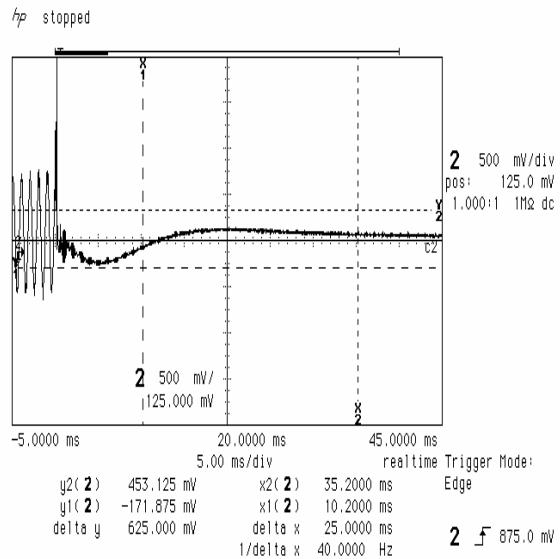
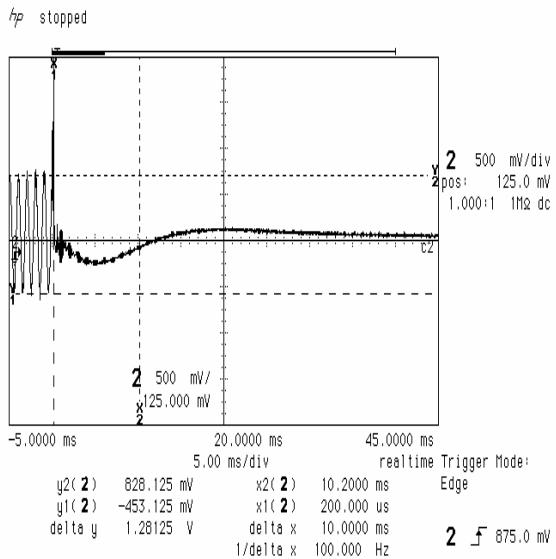
Test of: Multitone Electronics Plc
RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
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Transmitter Frequency Transients - Middle Channel



Test of: Multitone Electronics Plc
RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

Transmitter Frequency Transients - Top Channel



Test of: Multitone Electronics Plc
 RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
 and RSS-119 Issue 9 June 2007

7.2.21. Transmitter Transient Frequency Behaviour

Test Procedure as per TIA-603-C 3.2.19

Channel Spacing: 25 kHz

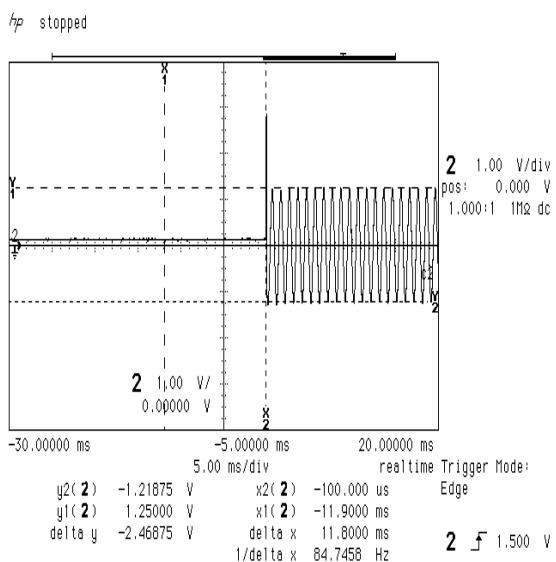
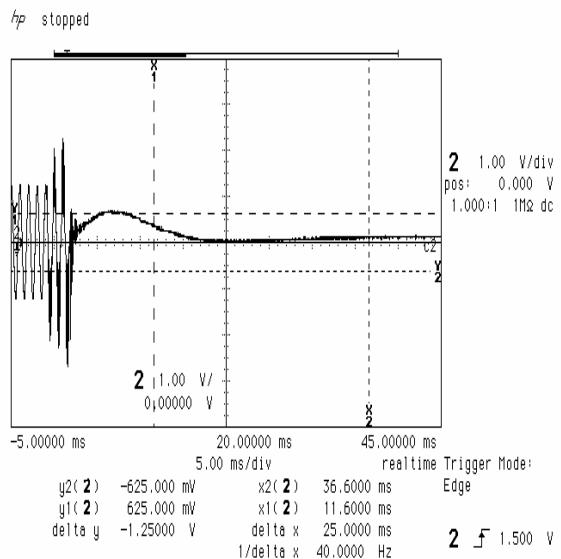
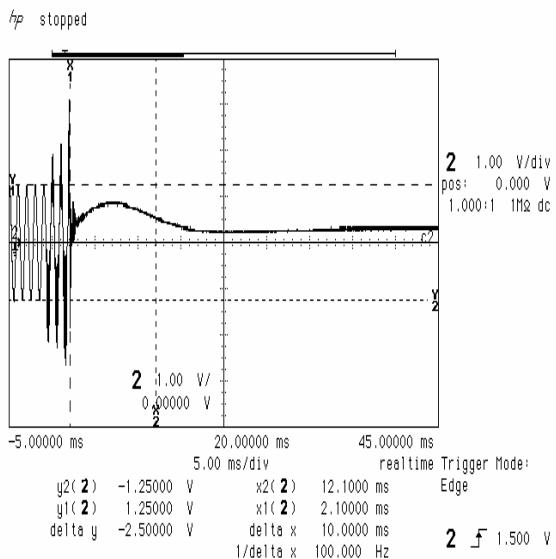
Results:

Time Intervals	Maximum Frequency Difference (kHz)			
	Bottom Channel	Middle Channel	Top Channel	Status
t1	14.4	12.8	10.2	Complied
t2	6.9	7.7	4.7	Complied
t3	0.8	0.6	0.6	Complied

Limits		
Time Intervals	Maximum Frequency Difference (±kHz)	Period (ms)
t1	25	10
t2	12.5	25
t3	25	10

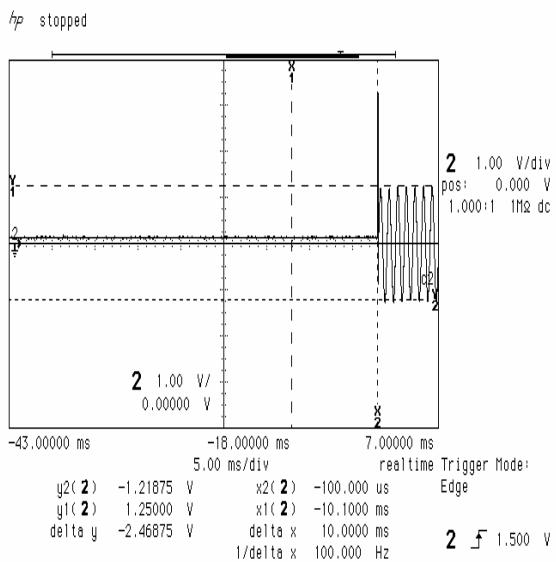
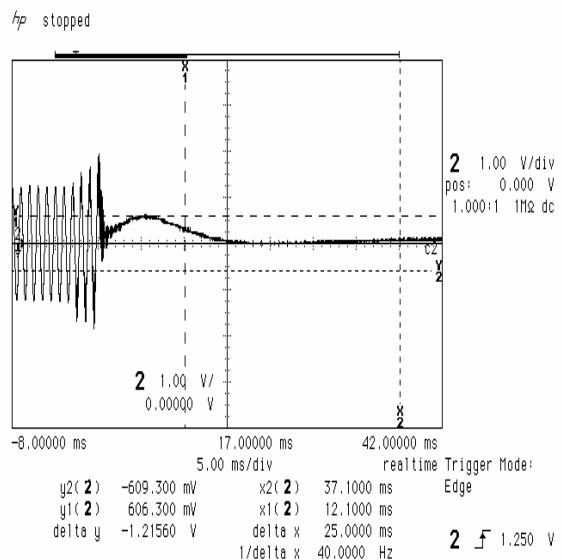
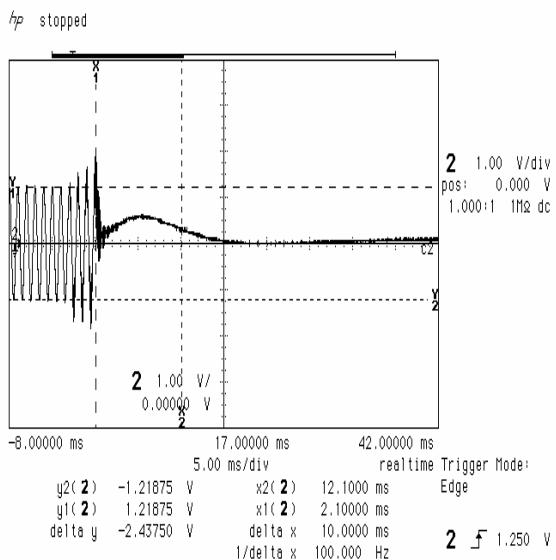
Test of: Multitone Electronics Plc
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Transmitter Frequency Transients - Bottom Channel 25 kHz



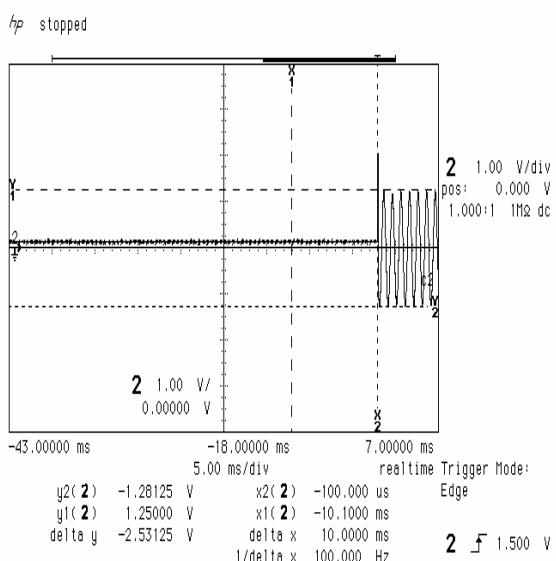
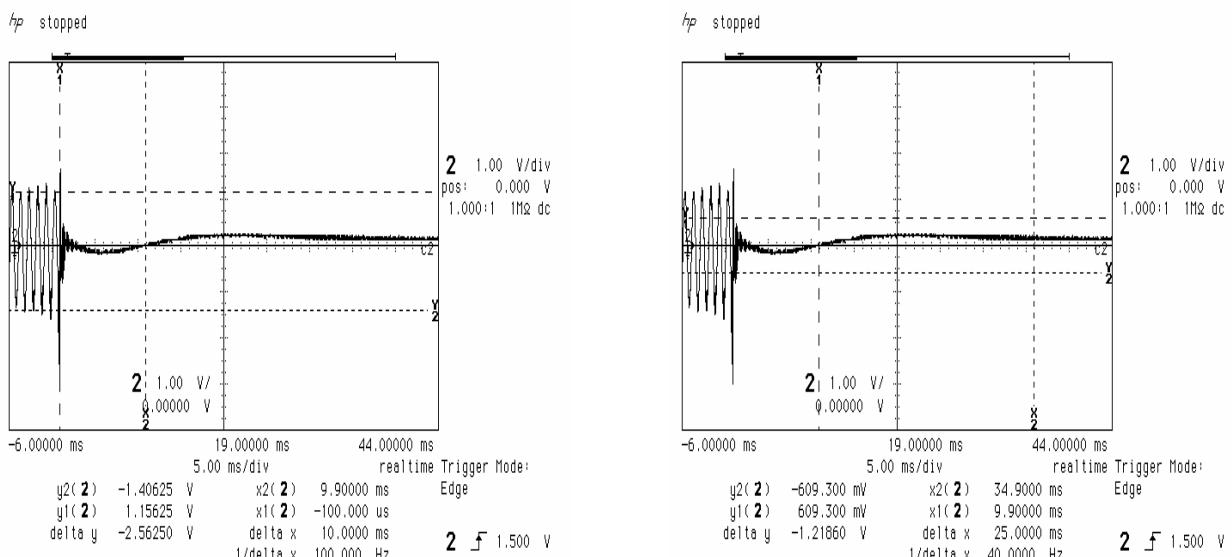
Test of: Multitone Electronics Plc
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Transmitter Frequency Transients - Middle Channel 25 kHz



Test of: Multitone Electronics Plc
 RPE 503
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Transmitter Frequency Transients - Top Channel 25 kHz



Test of: Multitone Electronics Plc
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8. Measurement Uncertainty

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30.0 MHz	95%	+/- 3.25 dB
Idle Mode Spurious Emissions	9 kHz to 30 MHz	95%	+/- 3.53 dB
Idle Mode Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Idle Mode Spurious Emissions	1 GHz to 18 GHz	95%	+/- 2.9 dB
Conducted Carrier Output Power	9 kHz to 26 GHz	95%	+/- 1.2 dB
Carrier Output Power (ERP)	30 MHz to 1000 MHz	95%	+/- 1.78 dB
Occupied Bandwidth	N/A	95%	+/- 0.12%
Conducted Emissions Antenna Port	9 kHz to 26 GHz	95%	+/- 1.2 dB
Frequency Stability	Not applicable	95%	+/- 20 Hz
Transient Frequency Behaviour	Not applicable	95%	+/- 10%

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

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 RPE 503
To: FCC Part 90: 2007, RSS-Gen Issue 2 June 2007
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Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A028	Antenna	Eaton	91888-2	304	08 Jun 2006	36
A031	Antenna	Eaton	91889-2	557	08 Jun 2006	36
A1069	Single Phase LISN	Rohde & Schwarz	ESH3-Z5	837469/012	09 Feb 2007	12
A1330	Attenuator	Midwest Microwave	ATT-0216-03-NNN-02	N/A	Calibrated before use	-
A1393	Attenuator	HUBER + SUHNER AG	757456	6820.17.B	Calibrated before use	-
A1398	Attenuator	Weinschel Associates	WA46-20	A129	Calibrated before use	-
A227	Power Divider	Suhner Electronics Ltd	4901/01/A	none	Calibrated before use	-
C1072	Cable	Rosenberger	FA210a103 0M5050	Not Stated	Calibrated before use	-
C1268	Cable	Rosenberger	FA210A00 75008080	49356-1	Calibrated before use	-
C151	Cable	Rosenberger	UFA210A-1-1181-70x70	None	Calibrated before use	-
C160	Cable	Rosenberger	UFA210A-1-1181-70x70	None	Calibrated before use	-
C348	Cable	Rosenberger	UFA210A-1-1181-70x70	2993	Calibrated before use	-
C363	Cable	Rosenberger	RG142	None	Calibrated before use	-
E013	Environmental Chamber	Sanyo	ATMOS chamber	None	Calibrated before use	-
G013	Signal Generator	Rohde & Schwarz	SMHU	894 055/003	04 Sep 2007	12
M015	Radio communications Analyser	Rohde & Schwarz	CMTA	883 574/003	23 Feb 2007	12
M1242	Spectrum Analyser	Rohde & Schwarz, Inc.	FSEM30	845986/022	29 Nov 2007	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	25 Jan 2007	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	19 Mar 2007	12