



TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: ME-D350 U2

To: FCC Part 90: 2009

Test Report Serial No:
RFI/RPT4/RP75936JD01B

Supersedes Test Report Serial No:
RFI/RPT3/RP75936JD01B

This Test Report Is Issued Under The Authority Of Brian Watson, Operations Director:	
	
Checked By:	Nigel Davison
Signature:	
Date of Issue:	04 March 2010

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1. Customer Information






Company Name:	Mobile Expertise Ltd
Address:	Unit B, Woodland Works Water End Road, Potten End Berkhamsted Hertfordshire HP4 2SJ

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR90
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2009: Part 90: Public Safety Radio Pool
Site Registration:	209735
Location of Testing:	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	18 January 2010 to 29 January 2010

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Port Type	Result
Part 15.109	Receiver/Idle Mode Radiated Spurious Emissions	Enclosure	
Part 2.1046/90.205(r)	Transmitter Carrier Output Power (ERP)	Antenna Terminals	Note 1
Part 2.1047	Modulation Characteristics	Antenna Terminals	Note 1
Part 90.209/2.1049	Transmitter Occupied Bandwidth (Bandwidth Limitations)	Antenna Terminals	Note 1
Part 90.210(b)/90.210(n)/2.1051	Transmitter Conducted Emissions Masks	Antenna	Note 1
Part 90.1323/2.1051	Transmitter Conducted Emissions (Out of Band)	Antenna Terminals	
Part 90.210	Transmitter Radiated Emissions (Out of Band)	Antenna	
Part 90.213 / 2.1055	Transmitter Frequency Stability (Temperature & Voltage Variation)	Antenna Terminals	Note 1
Part 90.214	Transmitter Transient Frequency Behaviour	Antenna Terminals	Note 1
Key to Results  = Complied  = Did not comply			

Note(s):

1. Must be treated on a case by case basis as the EUT covers the frequency range 440 MHz to 480 MHz no one limit applies. Where possible, the tightest limit for the closest frequency band was used to show confidence that the device was compliant in those bands.

2.3. Methods and Procedures

Reference:	ANSI/TIA-603-C-2004
Title:	Land Mobile Communications Equipment, Measurements and performance Standards
Reference:	ANSI C63.4 (2003)
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.

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Mobile Expertise
Model Name or Number:	ME_D350 U2
Serial Number:	None Stated
Hardware Version Number:	5.0
Software Version Number:	1.9
FCC ID:	WCV-D350U2
IC Number:	3690A-D350U2

3.2. Description of EUT

The equipment under test was a RF transceiver modem.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Type of Equipment	Transceiver		
Modulation Type:	FFSK, GMSK, Voice and External Data		
Emission Designators:	FFSK - 12K5F1B, 25K0F1B GMSK - 12K5G1D, 25K0G1D Voice - 12K5F3E, 25K0F3E External Data - 12K5F1D, 25K0F1D		
Power Level:	Low (1W) and High (5W)		
Channel Spacing:	12.5 kHz and 25 kHz		
Antenna Connection Type:	External (BNC)		
Antenna Type:	Helical		
Antenna Gain:	0 dBi (stated)		
Power Supply Requirement:	Nominal	12 V DC	
	Minimum	10.2 V DC	
	Maximum	13.2 V DC	
Tested Temperature Range:	Minimum	-30°C	
	Maximum	+50°C	
Transmit Frequency Range:	440 MHz to 480 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	440.0125
	Middle	5	460.0125
	Top	9	479.9875
Receive Frequency Range:	440 MHz to 480 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	440.0125
	Middle	5	460.0125
	Top	9	479.9875

3.5. Support Equipment

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

Description:	Service Box
Brand Name:	Mobile Expertise
Model Name or Number:	None
Serial Number:	None
Cable Length and Type:	1m, Coax 1m, Serial Cable 12V DC Cable
Connected to Port:	Support Signal Generator Support Laptop Serial Port Support DC Supply

Description:	Laptop
Brand Name:	Dell
Model Name or Number:	Latitude D610
Serial Number:	None Stated
Cable Length and Type:	1m, Serial Cable
Connected to Port:	RS232

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- Transmit Mode with/without modulation as required at highest output power.
- Baud Rates were 4800 bps for 12.5kHz Channel Spacing and 9600 bps for 25kHz Channel spacing.
- Receive Mode.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- No AC conducted tests were performed as the EUT is battery powered.
- For GMSK and FFSK modulation, the EUT was connected to a laptop. A bespoke application on the laptop pc was used to configure the EUT during the testing.
- For the external data and voice modulation test, the EUT was connected to a laptop via test service box. The test service box was also connected to a signal generator which was swept over a wide audio frequency range in order to ascertain the maximum deviation/or modulation bandwidth.
- For radiated emissions testing the antenna port was terminated with antenna supplied by the customer.
- For conducted and radiated emissions out of band testing, preliminary checks were made on all four modulation schemes. The mode which exhibited the highest emissions profile with regards to amplitude (i.e. FFSK) was scanned across the required measurement frequency range. Where an emission was detected final emission measurements were performed on all four modulation schemes and two channel spacing on bottom, middle and top channel. Receiver scans were done to 5x500MHz = 2.5GHz and the Transmitter tests were performed to 10x500MHz = 5GHz
- The EUT is rated to transmit from 1Watt to 5Watts. Preliminary tests were performed for each test case in order to ascertain the worse case mode of operation regards power, emissions and bandwidth. It was found that maximum power was the worse case mode of operation on all accounts and thus this report reflects the results for maximum power mode only.

5. Measurements, Examinations and Derived Results

5.1. General Comments

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 6. Measurement Uncertainty* for details.

5.2. Test Results

5.2.1. Receiver/Idle Mode Radiated Spurious Emissions

Test Summary:

FCC Part:	FCC 15.109
Test Method:	As detailed in ANSI C63.4 Section 8 and relevant annexes
Frequency Range:	30 MHz to 1000 MHz

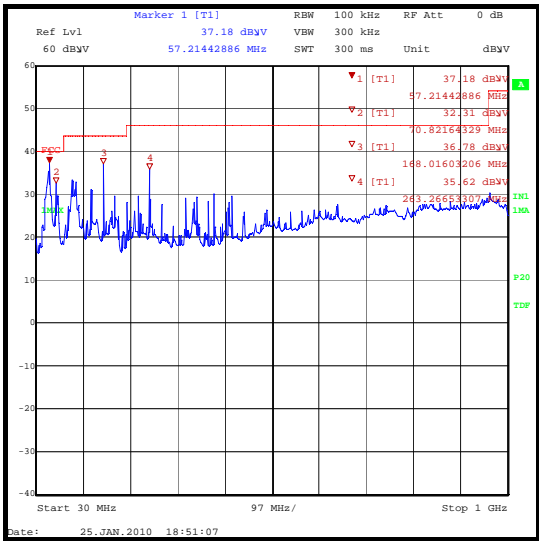
Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	29

Results:

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
56.822	Vertical	34.6	40.0	5.4	Complied
72.045	Vertical	32.1	40.0	7.9	Complied
104.926	Vertical	29.0	43.5	14.5	Complied
144.109	Vertical	31.3	43.5	12.2	Complied
186.149	Vertical	21.4	43.5	22.1	Complied
264.214	Vertical	36.1	46.0	9.9	Complied
354.311	Vertical	24.8	46.0	21.2	Complied
394.896	Vertical	31.7	46.0	14.3	Complied

Receiver/Idle Mode Radiated Spurious Emissions



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

Receiver/Idle Mode Radiated Spurious Emissions (continued)**Test Summary:**

FCC Part:	FCC 15.109
Test Method:	As detailed in ANSI C63.4 Section 8 and relevant annexes
Frequency Range:	1 GHz to 2.5 GHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	29

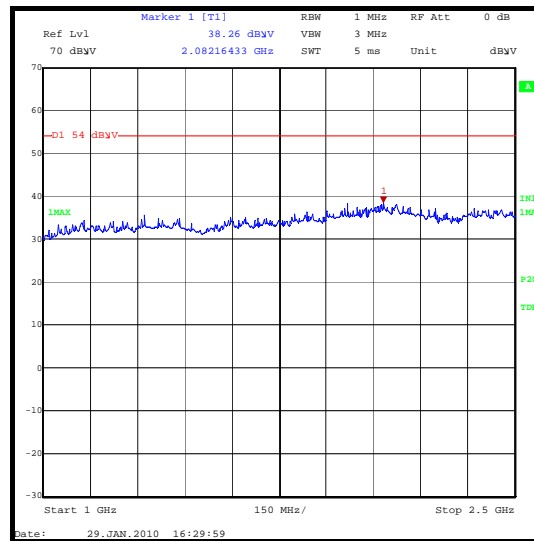
Results: Highest Peak Level

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
2.082	Vertical	37.7	0.6	38.3	54.0	15.7	Complied

Note(s):

1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above.

Receiver/Idle Mode Radiated Spurious Emissions



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

5.2.2. Transmitter Carrier Output Power (ERP)**Test Summary:**

FCC Part:	FCC 90.205(r) and 2.1046
Test Method:	As detailed in ANSI TIA-603-C-2004 Section 2.2.17.2

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	32

Results: GMSK / Middle Channel

Channel Spacing (kHz)	Conducted RF Power (dBm)	Antenna Gain (dBi)	ERP (dBm)
12.5	37.6	0.0	37.6
25.0	37.6	0.0	37.6

Results: FFSK / Middle Channel

Channel Spacing (kHz)	Conducted RF Power (dBm)	Antenna Gain (dBi)	ERP (dBm)
12.5	37.7	0.0	37.7
25.0	37.7	0.0	37.7

Results: External Data / Middle Channel

Channel Spacing (kHz)	Conducted RF Power (dBm)	Antenna Gain (dBi)	ERP (dBm)
12.5	37.7	0.0	37.7
25.0	37.7	0.0	37.7

Results: Voice / Middle Channel

Channel Spacing (kHz)	Conducted RF Power (dBm)	Antenna Gain (dBi)	ERP (dBm)
12.5	37.7	0.0	37.7
25.0	37.7	0.0	37.7

Note(s):

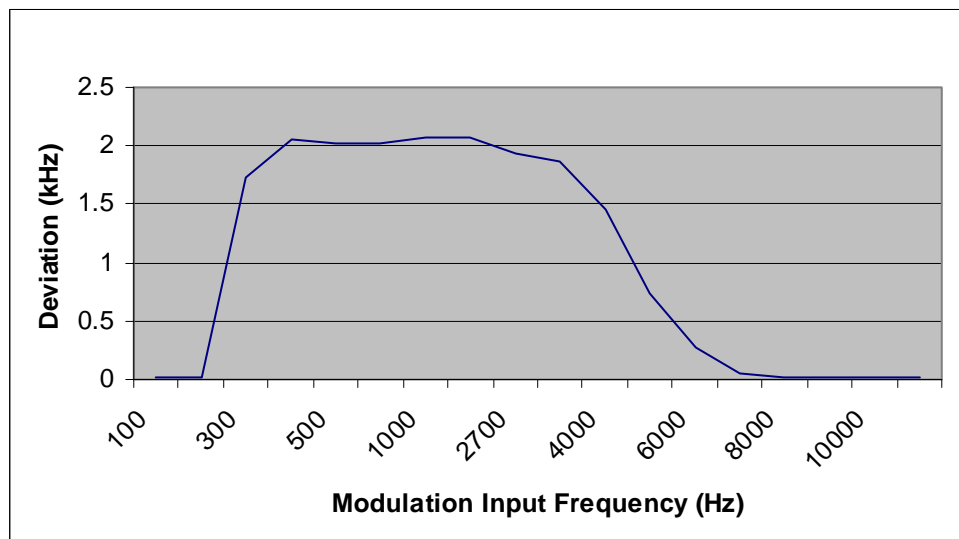
1. Preliminary testing was performed on all three channels and the worse case channel was found to be the middle channel which was thus selected for final measurements.
2. Tests were performed on all modulations scheme and channel spacing.

5.2.3. Modulation Characteristics - Audio Frequency Response**Test Summary:**

FCC Part:	FCC 2.1047(a) Part 1
Test Method:	A modulated carrier was injected into the EUT. The modulating frequency was varied between 300 Hz and 11 kHz and the deviation of the carrier recorded. A plot of deviation against modulating frequency can be seen below.

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	33

Results: Voice / Middle Channel – 12.5 kHz**Note(s):**

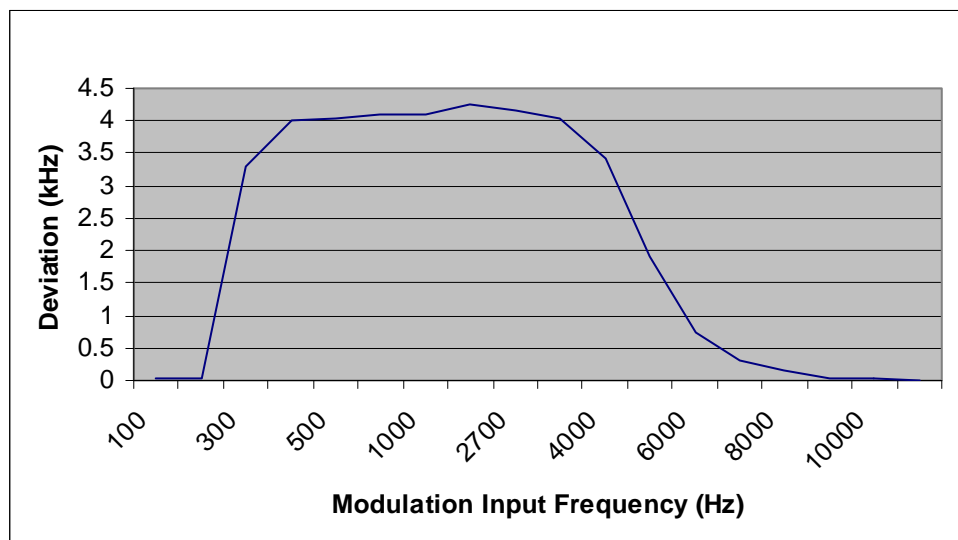
1. Preliminary testing was performed on all three channels and the worse case channel was found to be the middle channel which was thus selected for final measurements.

Transmitter Audio Frequency Response (continued)**Test Summary:**

FCC Part:	FCC 2.1047(b)
Test Method:	A modulated carrier was injected into the EUT. The modulating frequency was varied between 300 Hz and 11 kHz and the deviation of the carrier recorded. A plot of deviation against modulating frequency can be seen below.

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	33

Results: Voice / Middle Channel – 25 kHz**Note(s):**

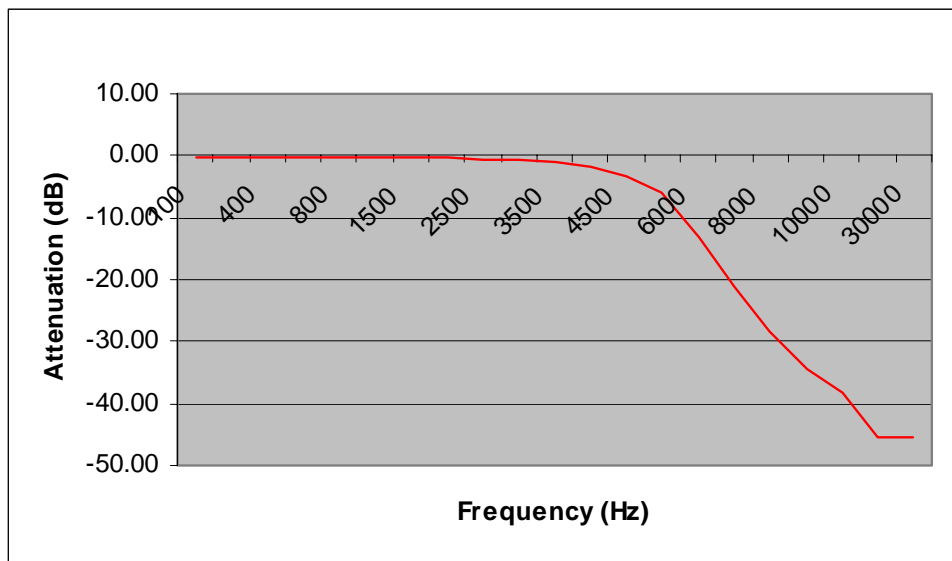
1. Preliminary testing was performed on all three channels and the worse case channel was found to be the middle channel which was thus selected for final measurements.

5.2.4. Modulation Characteristics – Audio Low Pass Filter Response**Test Summary:**

FCC Part:	FCC 2.1047(a) Part 2
Test Method:	As detailed in ANSI TIA-603-C-2004 Section 2.2.15

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	25

Results:**Note(s):**

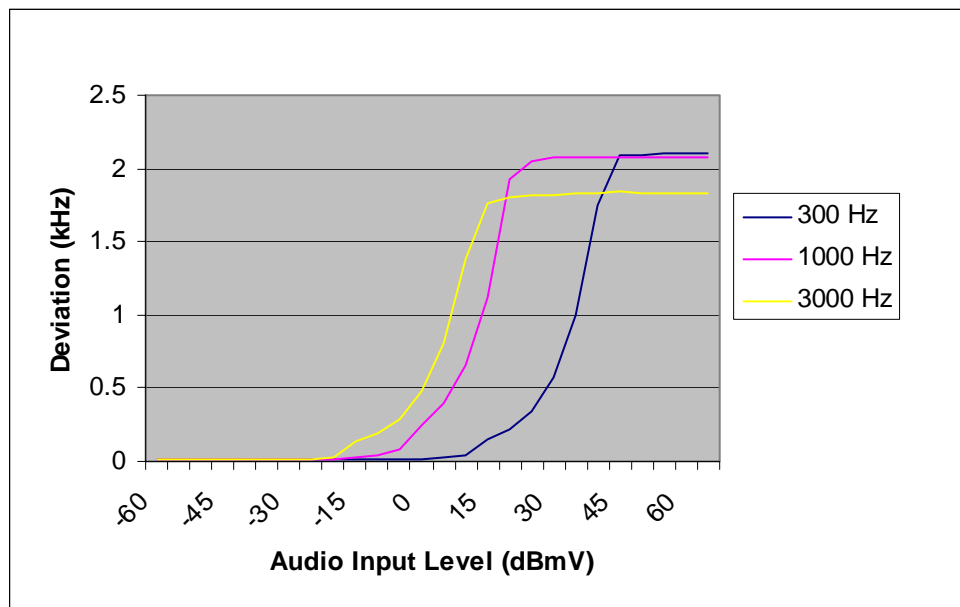
1. The audio low pass filter was measured at the actual Printed Circuit Board of the transmitter.

5.2.5. Modulation Characteristics – Modulation Limiting**Test Summary:**

FCC Part:	FCC 2.1047(b)
Test Method:	A modulated carrier was injected into the EUT. The audio input level was varied between -60 dBmV and +65 dBmV and the deviation of the carrier recorded. A plot of deviation against modulating frequency can be seen below.

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	25

Results: Voice / Middle Channel – 12.5 kHz**Note(s):**

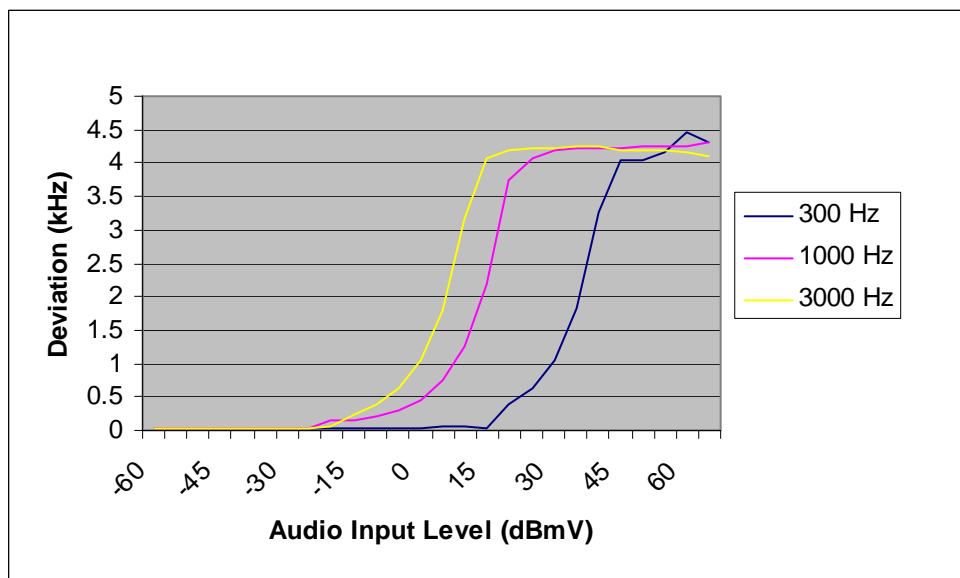
1. Preliminary testing was performed on all three channels and the worse case channel was found to be the middle channel which was thus selected for final measurements.

Modulation Characteristics – Modulation Limiting (continued)**Test Summary:**

FCC Part:	FCC 2.1047(b)
Test Method:	A modulated carrier was injected into the EUT. The audio input level was varied between -60 dBmV and +65 dBmV and the deviation of the carrier recorded. A plot of deviation against modulating frequency can be seen below.

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	25

Results: Voice / Middle Channel – 25 kHz**Note(s):**

1. Preliminary testing was performed on all three channels and the worse case channel was found to be the middle channel which was thus selected for final measurements.

5.2.6. Transmitter Occupied Bandwidth (Bandwidth Limitations)**Test Summary:**

FCC Part:	FCC 90.209 / 2.1049
Test Method:	As detailed in ANSI C63.4 Section 13.1.7 and relevant annexes referencing FCC CFR Part 2.1049 (see note below)

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	32

Results: Middle Channel / 12.5 kHz Channel Spacing

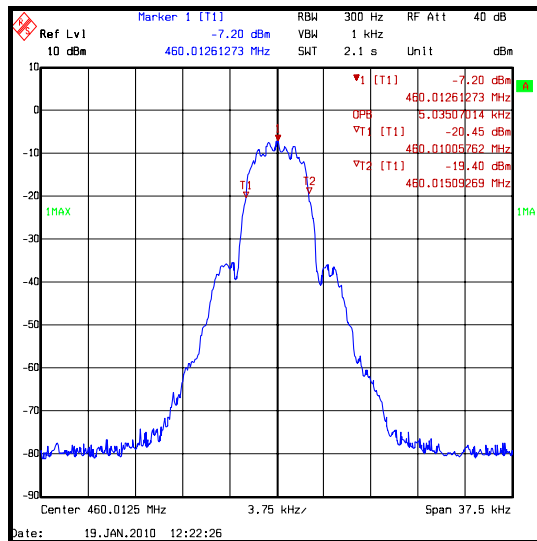
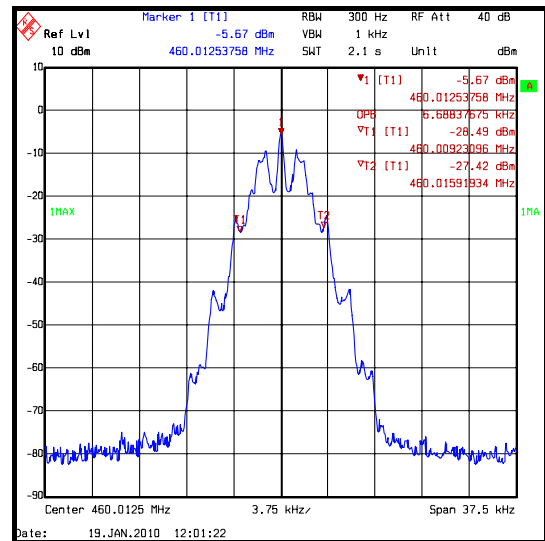
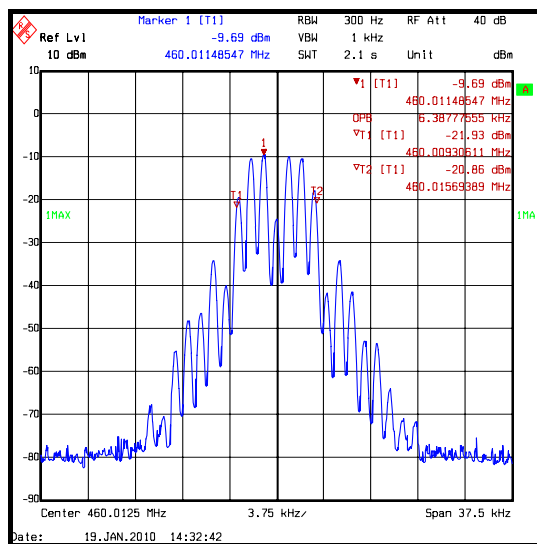
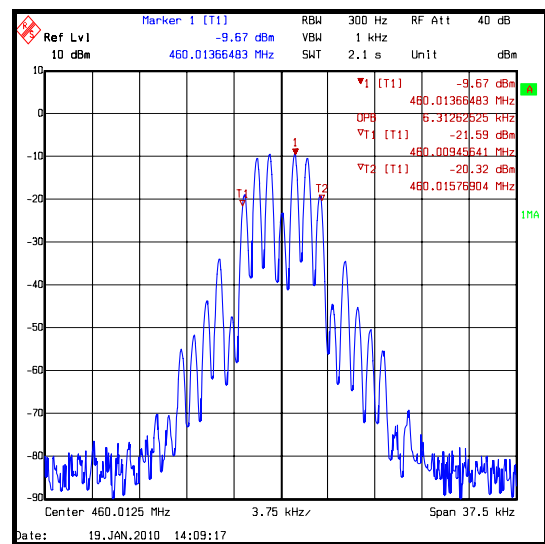
Modulation	RBW (kHz)	VBW (kHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
GMSK	0.3	1	5.035	11.250	6.215	Complied
FFSK	0.3	1	6.688	11.250	4.562	Complied
External	0.3	1	6.388	11.250	4.862	Complied
Voice	0.3	1	6.313	11.250	4.937	Complied

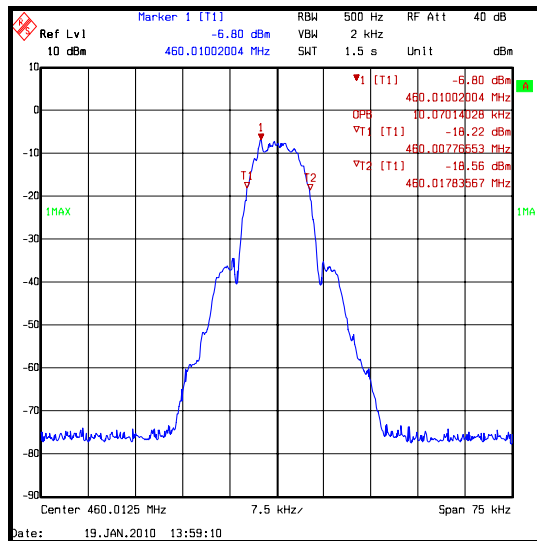
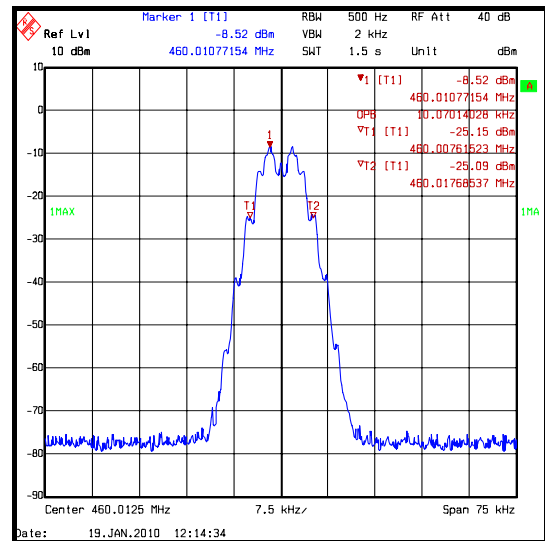
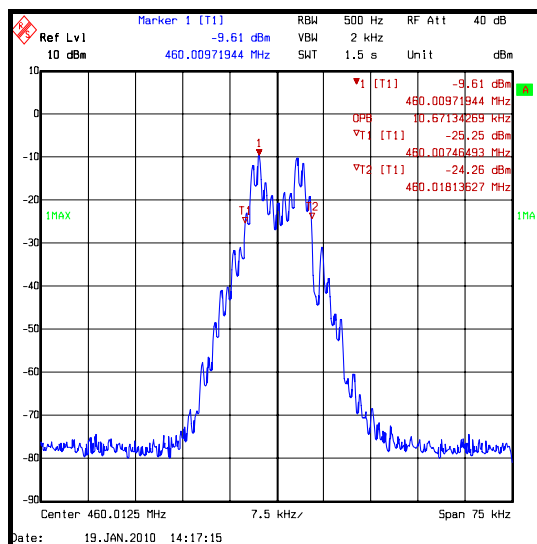
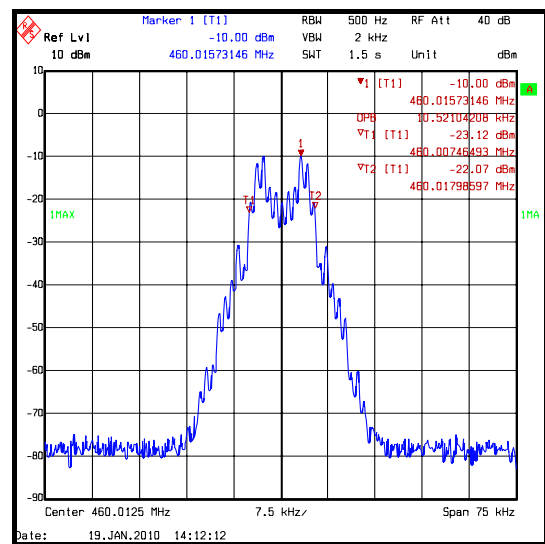
Results: Middle Channel / 25 kHz Channel Spacing

Modulation	RBW (kHz)	VBW (kHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
GMSK	0.5	2	10.070	20.000	9.930	Complied
FFSK	0.5	2	10.070	20.000	9.930	Complied
External	0.5	2	10.671	20.000	9.329	Complied
Voice	0.5	2	10.521	20.000	9.479	Complied

Note(s):

1. In lieu of the test method detailed in ANSI C63.4 Section 13.1.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the spectrum analyser.
2. Preliminary testing was performed on all three channels and the worse case channel was found to be the middle channel which was thus selected for final measurements.

Transmitter Occupied Bandwidth (Bandwidth Limitations) (continued)**12.5 kHz Channel Spacing – GMSK****12.5 kHz Channel Spacing – FFSK****12.5 kHz Channel Spacing – External Data****12.5 kHz Channel Spacing – Voice**

Transmitter Occupied Bandwidth (Bandwidth Limitations) (continued)**25 kHz Channel Spacing – GMSK****25 kHz Channel Spacing – FFSK****25 kHz Channel Spacing – External Data****25 kHz Channel Spacing – Voice**

5.2.7. Transmitter Conducted Emissions Mask

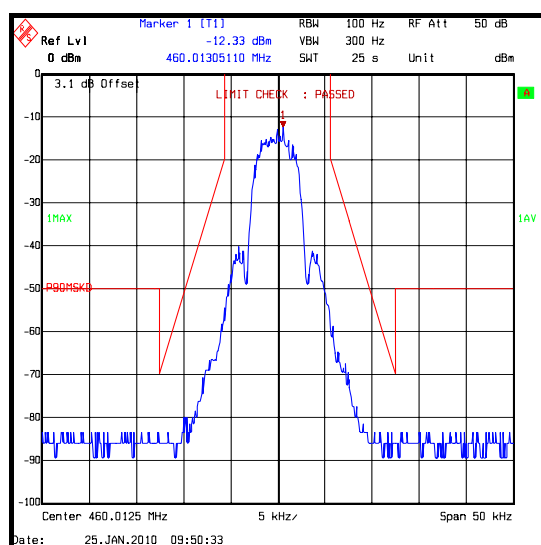
Test Summary:

FCC Part:	FCC 90.210(b)/ FCC 90.210(c)/ 90.210(d)/2.1051
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.13 referencing FCC Part 2.1051

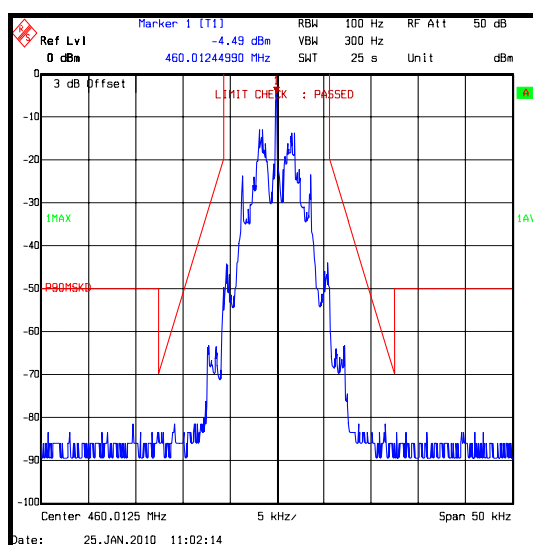
Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	33

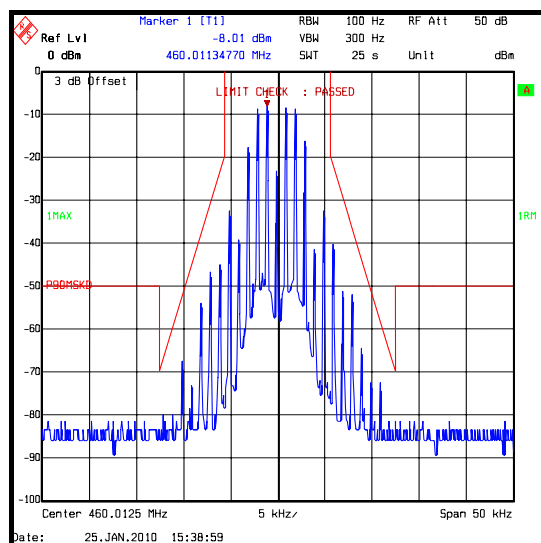
Results: 12.5 kHz Channel Bandwidth / Middle Channel



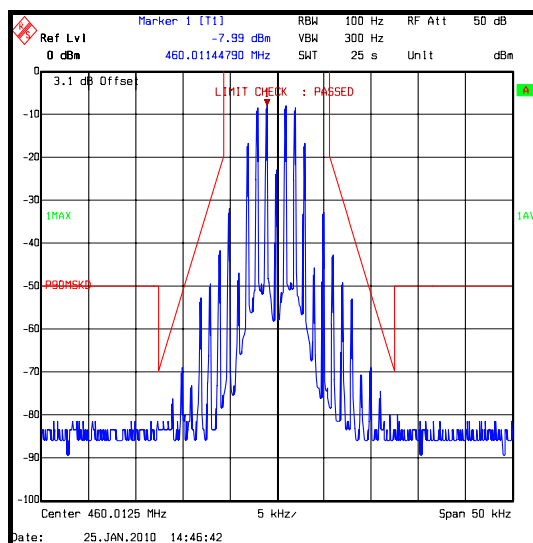
GMSK



FFSK



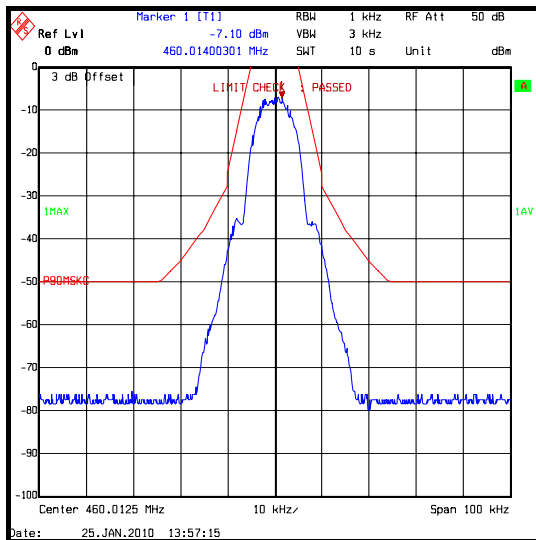
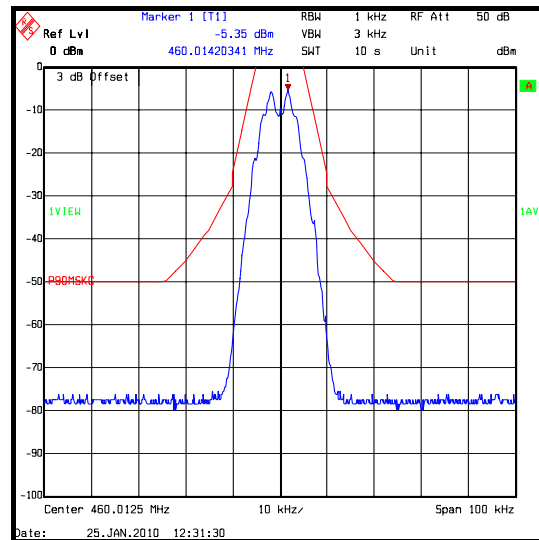
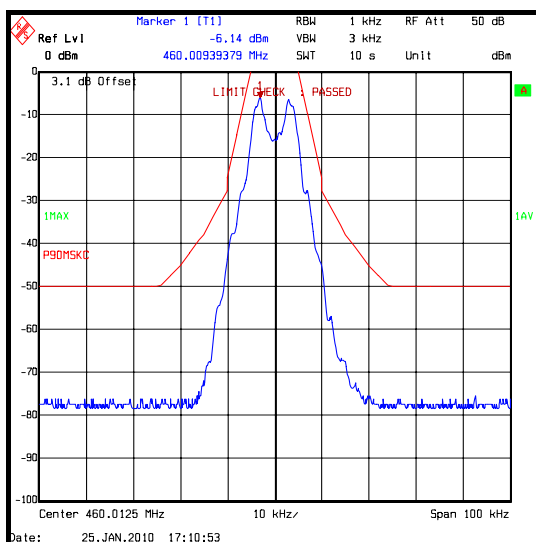
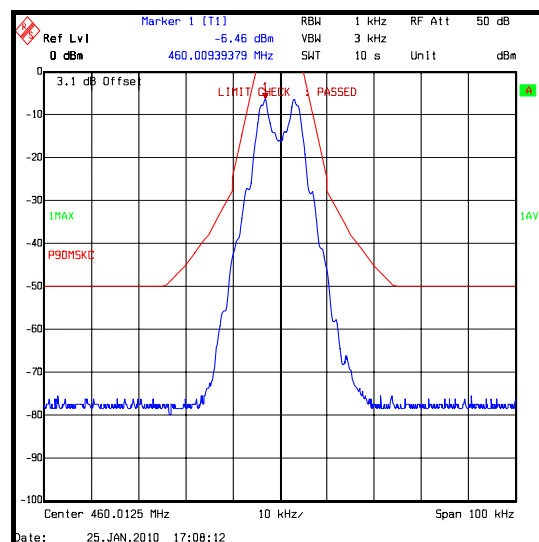
External Data



Voice

Transmitter Conducted Emissions Mask (continued)**Note(s):**

1. The emissions mask was performed relative to the maximum unmodulated carrier power.
2. Preliminary testing was performed on all three channels and the worse case channel was found to be the middle channel which was thus selected for final measurements.

Transmitter Conducted Emissions Mask (continued)**Results: 25 kHz Channel Bandwidth / Middle Channel****GMSK****FFSK****External Data****Voice****Note(s):**

1. The emissions mask was performed relative to the maximum unmodulated carrier power.
2. For voice modulation, the plot above is showing *Emission Mask C* instead of *Emission Mask B*. This is because the limit for *Emission Mask C* is more stringent to *Emission Mask B*.
3. Preliminary testing was performed on all three channels and the worse case channel was found to be the middle channel which was thus selected for final measurements.

5.2.8. Transmitter Conducted Emissions**Test Summary:**

FCC Part:	FCC 90.1323/2.1051
Test Method:	As detailed in ANSI TIA-603-C-2004 Section 2.2.13 referencing FCC Part 2.1051
Frequency Range:	9 kHz to 5 GHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	29

Results: 12.5 kHz Channel Spacing / Bottom Channel

Frequency (MHz)	Modulation	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
880.000	FFSK	-29.2	-13.0	16.2	Complied
880.000	GMSK	-38.5	-13.0	25.5	Complied
880.004	External Data	-28.6	-13.0	15.6	Complied
880.004	Voice	-28.4	-13.0	15.4	Complied
1319.993	FFSK	-29.7	-13.0	16.7	Complied
1320.017	GMSK	-40.3	-13.0	27.3	Complied
1320.018	External Data	-30.0	-13.0	17.0	Complied
1319.971	Voice	-30.0	-13.0	17.0	Complied

Results: 12.5 kHz Channel Spacing / Middle Channel

Frequency (MHz)	Modulation	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
919.998	FFSK	-33.3	-13.0	20.3	Complied
919.957	GMSK	-36.9	-13.0	23.9	Complied
920.001	External Data	-33.6	-13.0	20.6	Complied
920.008	Voice	-32.7	-13.0	19.1	Complied
1380.001	FFSK	-40.8	-13.0	27.8	Complied
1380.027	GMSK	-32.6	-13.0	19.6	Complied
1379.966	External Data	-40.5	-13.0	27.5	Complied
1379.881	Voice	-40.4	-13.0	27.4	Complied

Transmitter Conducted Emissions (continued)**Results: 12.5 kHz Channel Spacing / Top Channel**

Frequency (MHz)	Modulation	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
959.953	FFSK	-33.7	-13.0	20.7	Complied
959.957	GMSK	-39.6	-13.0	26.6	Complied
959.948	External Data	-33.7	-13.0	20.7	Complied
959.954	Voice	-33.3	-13.0	20.3	Complied
1439.869	FFSK	-42.1	-13.0	29.1	Complied
1439.951	GMSK	-40.4	-13.0	27.4	Complied
1439.772	External Data	-42.5	-13.0	29.5	Complied
1439.967	Voice	-42.3	-13.0	29.3	Complied

Results: 25 kHz Channel Spacing / Bottom Channel

Frequency (MHz)	Modulation	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
880.000	FFSK	-28.7	-13.0	15.7	Complied
880.000	GMSK	-38.5	-13.0	25.5	Complied
880.004	External Data	-28.4	-13.0	15.4	Complied
880.004	Voice	-28.3	-13.0	15.4	Complied
1319.993	FFSK	-29.9	-13.0	16.9	Complied
1320.017	GMSK	-40.3	-13.0	27.3	Complied
1320.018	External Data	-30.2	-13.0	17.2	Complied
1319.971	Voice	-29.9	-13.0	16.9	Complied

Results: 25 kHz Channel Spacing / Middle Channel

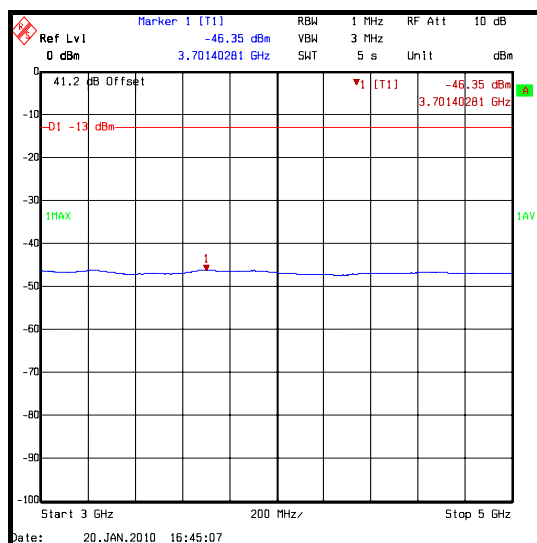
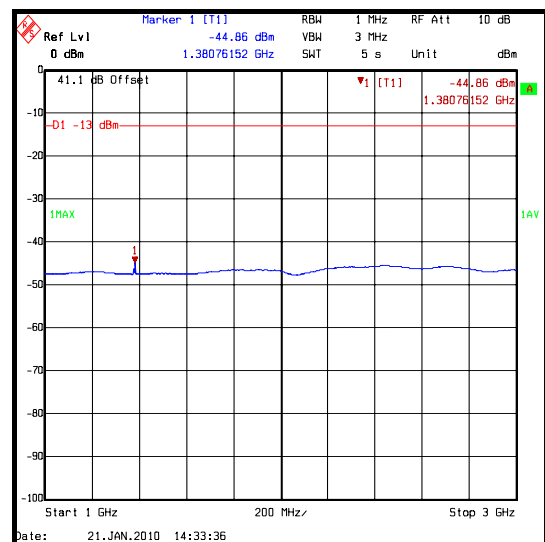
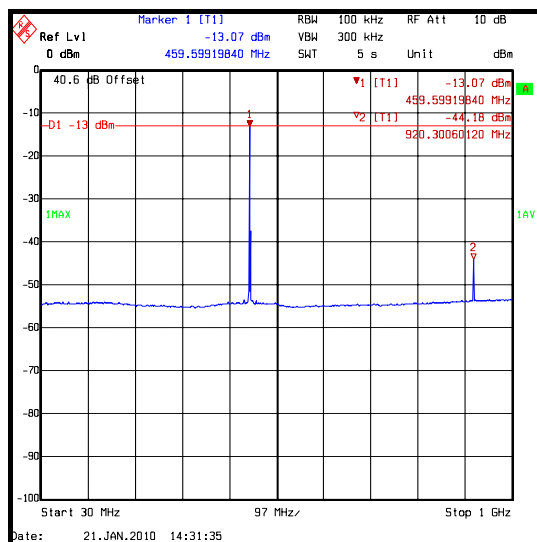
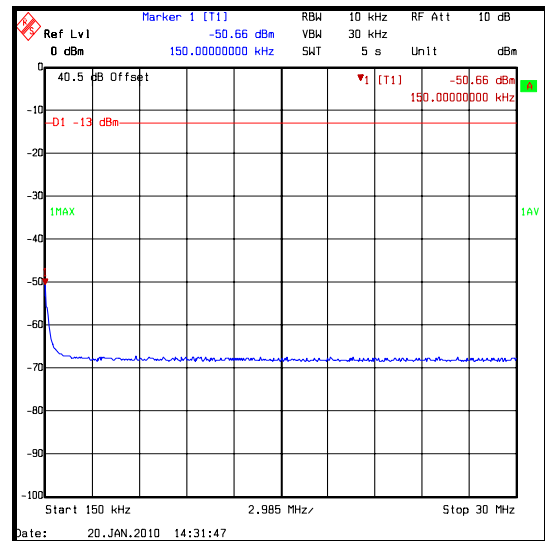
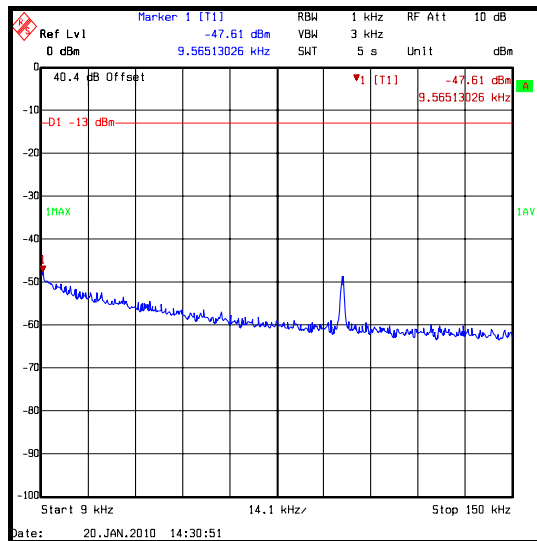
Frequency (MHz)	Modulation	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
919.998	FFSK	-33.1	-13.0	20.1	Complied
919.957	GMSK	-37.1	-13.0	24.1	Complied
920.001	External Data	-33.9	-13.0	20.9	Complied
920.008	Voice	-33.4	-13.0	20.4	Complied
1380.001	FFSK	-40.2	-13.0	27.2	Complied
1380.027	GMSK	-33.8	-13.0	20.8	Complied
1379.966	External Data	-41.1	-13.0	28.1	Complied
1379.881	Voice	-40.7	-13.0	27.7	Complied

Transmitter Conducted Emissions - Continued**Results: 25 kHz Channel Spacing / Top Channel**

Frequency (MHz)	Modulation	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
959.953	FFSK	-33.7	-13.0	20.7	Complied
959.957	GMSK	-40.1	-13.0	27.1	Complied
959.948	External Data	-33.8	-13.0	20.8	Complied
959.954	Voice	-33.7	-13.0	20.7	Complied
1439.869	FFSK	-42.5	-13.0	29.5	Complied
1439.951	GMSK	-41.3	-13.0	28.3	Complied
1439.772	External Data	-42.7	-13.0	29.7	Complied
1439.967	Voice	-42.7	-13.0	29.7	Complied

Note(s):

1. Pre-scans were performed on middle channel with FFSK modulation and 12.5 kHz channel spacing, as this presented the highest emissions profile with regards to amplitude; Pre-scans were performed to 10 times the highest intentionally generated frequency for the device.
2. Final measurements were performed on supported modulation and channel spacing on bottom, middle and top channel.
3. All other emissions were investigated and found to be at least 20 dB below the specified limit.
4. The emission shown at approximately 459.599 MHz on the 30 MHz to 1 GHz plot is the carrier.

Transmitter Conducted Emissions (continued)

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

5.2.9. Transmitter Radiated Emissions (Out of Band)**Test Summary:**

FCC Part:	FCC 90.210
Test Method:	As detailed in ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC Part 2.1051
Frequency Range:	30 MHz to 5 GHz

Environmental Conditions:

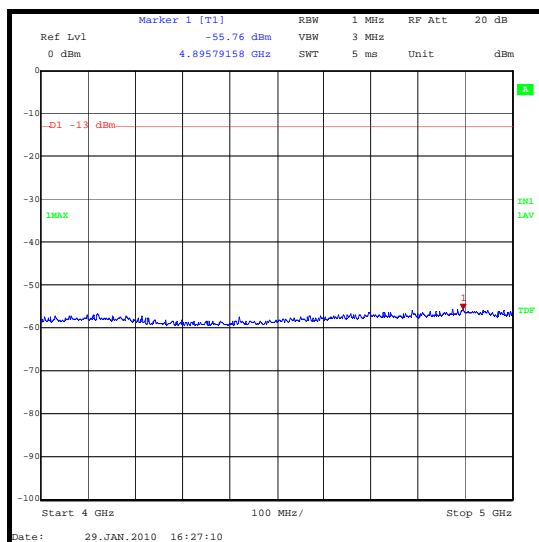
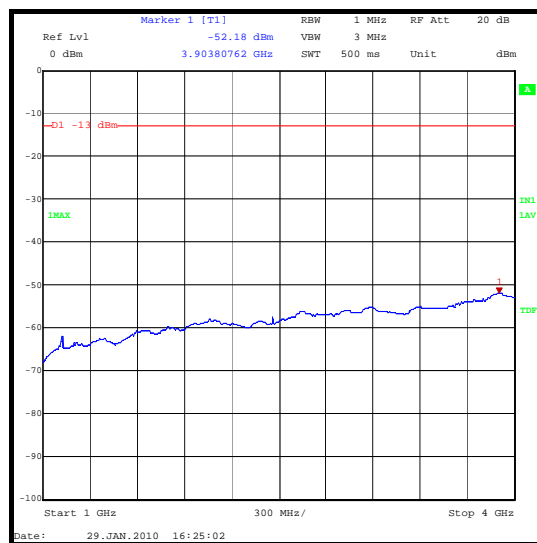
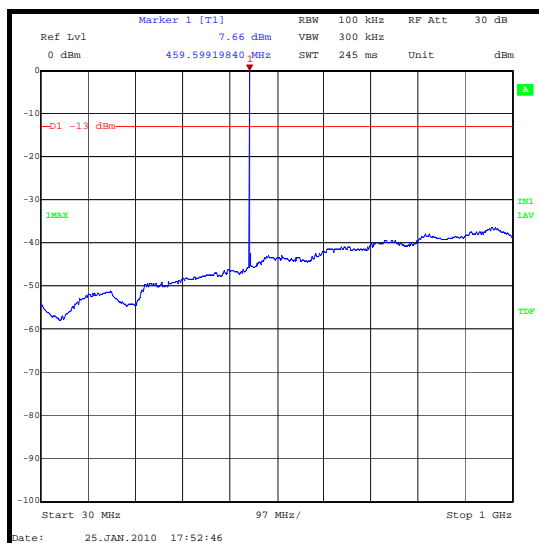
Temperature (°C):	23
Relative Humidity (%):	29

Results:

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
Note 1				

Note(s):

1. There were no emissions within 20 dB of the limit.
2. The emissions shown at approximately 459.599 MHz on the 30 MHz to 1 GHz plot is the carrier.
3. Pre-scans were performed on middle channel with FFSK modulation and 12.5 kHz channel spacing, as this presented the highest emissions profile with regards to amplitude; Pre-scans were performed to 10 times the highest intentionally generated frequency for the device.

Transmitter Radiated Emissions (Out of Band) (continued)

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

5.2.10. Transmitter Frequency Stability (Temperature Variation)**Test Summary:**

FCC Part:	FCC 90.213/2.1055(a)(1)
Test Method:	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC Part 2.1055

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	25

Results: Middle Channel 460.0125 MHz / 12.5 kHz Channel Spacing

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)
-30	460.012237	263	0.6
-20	460.012512	12	0.0
-10	460.012647	147	0.3
0	460.012699	199	0.4
10	460.012502	2	0.0
20	460.012574	74	0.2
30	460.012440	60	0.1
40	460.012200	300	0.7
50	460.012076	424	0.9

Results: Middle Channel 460.0125 MHz / 25 kHz Channel Spacing

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)
-30	460.012426	74	0.2
-20	460.012479	21	0.1
-10	460.012615	115	0.3
0	460.012673	173	0.4
10	460.012437	63	0.1
20	460.012460	40	0.1
30	460.012324	176	0.4
40	460.012091	409	0.9
50	460.012129	371	0.8

5.2.11. Transmitter Frequency Stability (Voltage Variation)**Test Summary:**

FCC Part:	FCC 90.213/2.1055
Test Method:	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC Part 2.1055

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	25

Results: Middle Channel 460.0125 MHz / 12.5 kHz Channel Spacing

Supply Voltage (V)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)
10.2	460.012347	153	0.3
12.0	460.012392	108	0.2
13.8	460.012358	142	0.3

Results: Middle Channel 460.0125 MHz / 25 kHz Channel Spacing

Supply Voltage (V)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)
10.2	460.012267	233	0.5
12.0	460.012278	222	0.5
13.8	460.012280	220	0.5

5.2.12. Transmitter Transient Frequency Behaviour**Test Summary:**

FCC Part:	FCC 90.214
Test Method:	Tested in accordance with EIA/TIA-603-C Clause 2.2.19 and 3.2.19

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	28

Results: Middle Channel / 12.5 kHz Channel Spacing

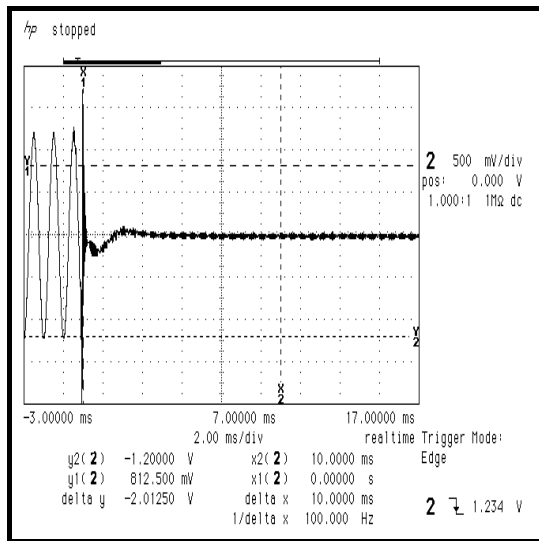
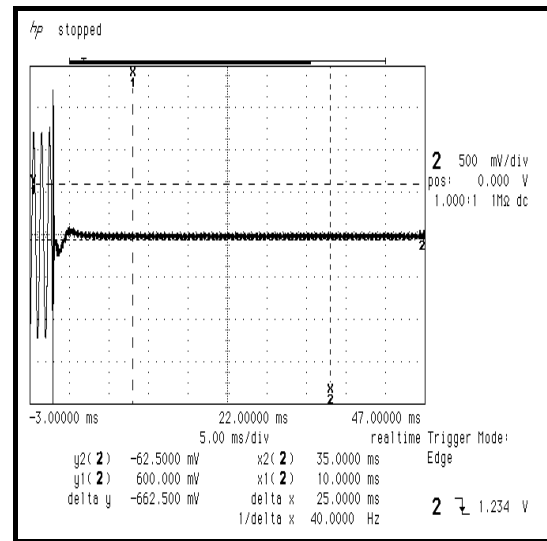
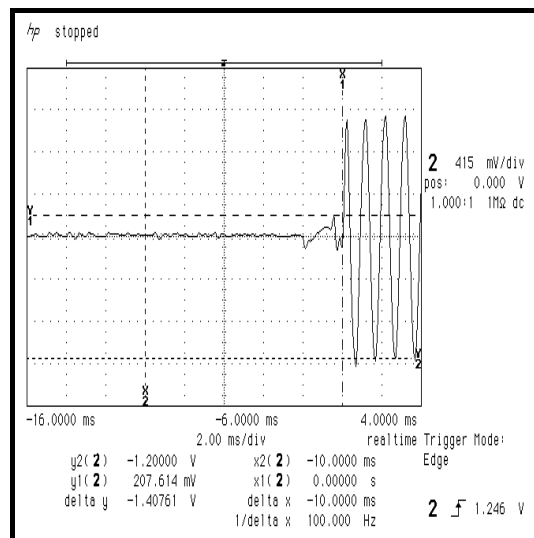
Time Intervals	FREQUENCY DIFFERENCE (kHz)
	Single Channel
t1	8.5
t2	1.3
t3	4.3

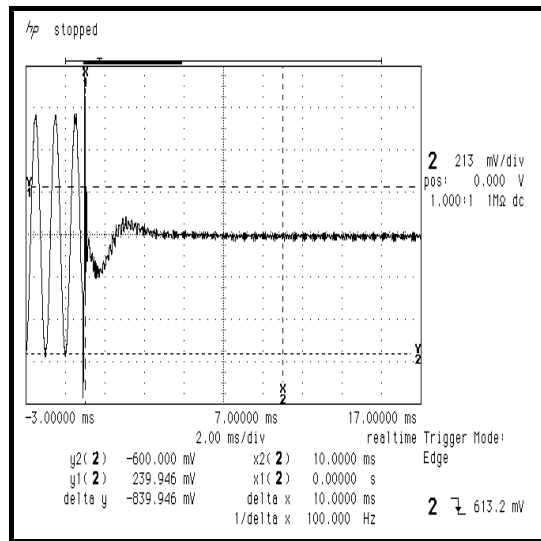
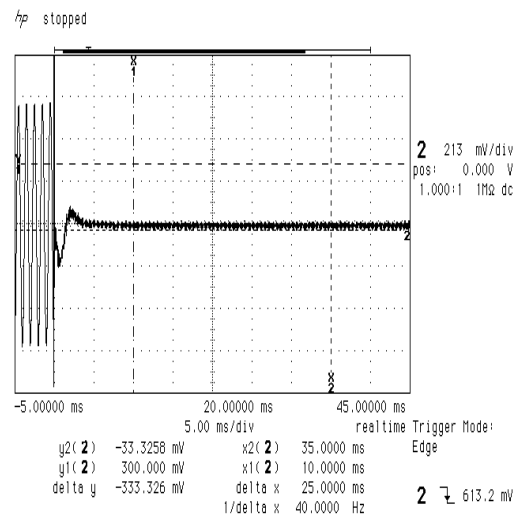
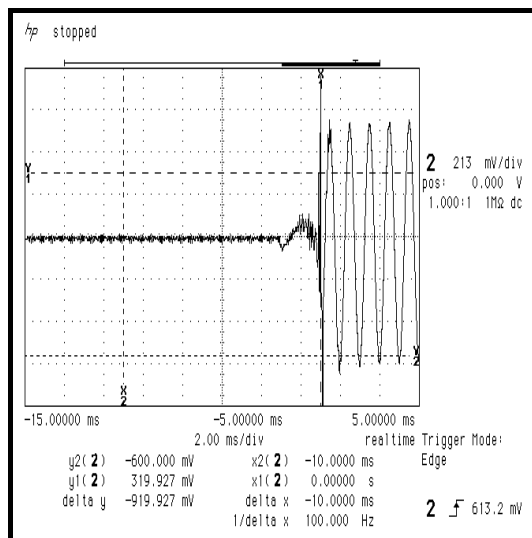
Results: Middle Channel / 25 kHz Channel Spacing

Time Intervals	FREQUENCY DIFFERENCE (kHz)
	Single Channel
t1	5.0
t2	0.7
t3	6.7

Note(s):

1. Preliminary testing was performed on all three channels and the worse case channel was found to be the middle channel which was thus selected for final measurements.

Transmitter Transient Frequency Behaviour (continued)**12.5 kHz Channels:****T1****T2****T3**

Transmitter Transient Frequency Behaviour (continued)**25 kHz Channels:****T1****T2****T3**

6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±5.26 dB
Radiated Spurious Emissions	1 GHz to 5 GHz	95%	±2.94 dB
Maximum Output Power	30 MHz to 1 GHz	95%	±0.27 dB
Occupied Bandwidth	Not applicable	95%	±0.92 ppm
Conducted Emissions	9 kHz to 5 GHz	95%	±2.62 dB
Frequency Stability	Not applicable	95%	±0.92 ppm
Transient Frequency Behaviour	Not applicable	95%	±0.32% (Amplitude) ±3.53nS (Time)

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.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A046	High Pass Filter	Aerial Facilities	HP-250-5N	4014B	Calibrated before use	-
A047	High Pass Filter	Aerial Facilities	HP-470-5N	4015B	Calibrated before use	-
A1396	Attenuator	Huber + Suhner	757987	6810.17.B	Calibrated before use	-
A1490	Attenuator	Weinschel	23-30-34	BH9156	Calibrated before use	-
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A288	Antenna	Chase	CBL6111A	1589	13 Mar 2009	12
A1818	Antenna	EMCO	3115	00075692	27 Nov 2009	12
G040	Signal Generator	Rohde & Schwarz	SMY 02	841 070/004	04 Jun 2009	24
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	01 Sep 2009	12
M015	Radiocomms Analyser	Rohde & Schwarz	CMTA	883 574/003	Calibrated before use	-
M1068	Thermometer	Iso-Tech	RS55	93102884	01 Oct 2009	12
M1223	Environmental Chamber	Votsch	VT4002	58566072720 010	Calibrated before use	-
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	14 May 2009	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	10 Jul 2009	12
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	09 Mar 2009	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	14 May 2009	12
M1269	Multimeter	Fluke	179	90250210	23 Jun 2009	12
S0537	Dual Power Supply	TTI	EL302D	249928	Calibrated before use	-

NB In accordance with UKAS requirements all the measurement equipment is on a calibration schedule.