Report On

Limited FCC Testing of the
Cobra MR HH125 Handheld VHF
In accordance with FCC CFR 47 Part 15: 2006 and Part 80: 2006

FCC ID: BBOMRHH125

Document 75902016 Report 05 Issue 2 October 2007

Product Service

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REPORT ON

Limited FCC Testing of the
Cobra MR HH125 Handheld VHF
In accordance with FCC CFR 47 Part 15: 2006 and Part 80: 2006

Document 75902016 Report 05 Issue 2

October 2007

PREPARED FOR

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Illinois 60707
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PREPARED BY

J Plummer
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APPROVED BY

M Jenkins
Authorised Signatory

T J Pither
Authorised Signatory

DATED

19th October 2007

19th October 2007

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 15 and Part 80. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers;

B Airs R Blagg A Guy M Iqbal

This report has been up-issued to Issue 2 to correct typographical errors.

UKAS TESTING 0141

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SECTION 1

REPORT SUMMARY

Limited FCC Testing of the
Cobra MR HH125 Handheld VHF
In accordance with FCC CFR 47 Part 15: 2006 and Part 80: 2006

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Limited FCC Testing of the Cobra MR HH125 Handheld VHF to the requirements of FCC CFR 47 Part 15: 2006 and Part 80: 2006.

Objective	To perform Radio Approval Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Applicant	Cobra Electronics Corp
Manufacturer	TTI Tech Co., Ltd
Type Number(s)	MR HH125
Serial Number(s)	#1(EU) = _9 #1(US) = _12 #2(US) = _13
Number of Samples Tested	Three
Test Specification/Issue/Date	FCC CFR 47 Part 15: 2006 FCC CFR 47 Part 80: 2006
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	45-6467 18th August 2007
Start of Test	13th September 2007
Finish of Test	19th October 2007
Related Test Specification/Issue/Date	FCC CFR 47 Part 80: 2006
Name of Engineer(s)	B Airs R Blagg A Guy M Iqbal

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 15: 2006 and Part 80: 2006 is shown below.

FCC CFR 47 Part 15: 2006

Section	Spec Clause	Test Description	Result	Comments
2.1	15.109	Spurious Radiated Emissions	Pass	

FCC CFR 47 Part 80: 2006

Section	Spec Clause	Test Description	Result	Comments
2.2	80.209(a)	Frequency Stability Under Voltage Variations	Pass	
2.3	80.209(a)	Frequency Stability Under Temperature Variations	Pass	
2.4	80.211(f)(1)(2)	Emission Limitations (Emission Mask)	Pass	
2.5	80.205(a)	Occupied Bandwidth	Pass	
2.6	80.211(c)(f)(3)	Emission Limitations (Conducted Transmitter Spurious)	Pass	
2.7	80.211(f)(3)	Emission Limitations (Radiated Transmitter Spurious)	Pass	
2.8	80.213	Modulation Characteristics	Pass	
2.9	80.215	Transmitter Power	Pass	
2.10	80.217(b)	Suppression of Interference Aboard Ships	Pass	

1.3 APPLICATION FORM

APPLICANT'S DETAILS	
CATEGORY OF APPLICANT (please tick relevant box opposite)	(a) [ ] MANUFACTURER (b) [X] IMPORTER (c) [ ] DISTRIBUTOR (d) [ ] AGENT
If box (b), (c) or (d) is ticked complete details in box below with respect to the manufacturer	
COMPANY NAME :	Cobra Electronics Europe Limited
ADDRESS :	Dungar House Northumberland Ave Dun Laoghaire Co. Dublin, Ireland
NAME FOR CONTACT PURPOSES :	Mr. Mike Kavanagh
TELEPHONE NO : 353-1-236-7007	FAX NO : 353-1-663-9048
	TELEX NO :

MANUFACTURER'S DETAILS		
COMPANY NAME :	TTI Tech Co., Ltd	
ADDRESS :	TTI House 163-4 Poi-Dong, Kangnam-ku, Seoul, Korea, 135-260	
NAME FOR CONTACT PURPOSES : Mr W.K. You		wkyou@ttikorea.co.kr
TELEPHONE NO : +82 2 518 2417/8	FAX NO : +82 2 518 2419	
	TELEX NO :	

TYPE DESIGNATION (1)	
The type designation may be either a single alphanumeric code or an alphanumeric/code divided into two parts.	
Please fill in	
EITHER :	
TYPE DESIGNATION AS A SINGLE ALPHANUMERIC CODE	/ / / / / / / / / / / / / /
OR :	
TYPE DESIGNATION IN TWO PARTS :	
1. EQUIPMENT SERIES NO. (2) ("MODEL NUMBER")	MR HH125 / MR HH125 EU
AND	
2. EQUIPMENT SPECIFIC NO. (3) ("IDENTIFICATION NO")	/ / / / / / / / / / / / / / /

(1) This is the manufacturer's numeric or alphanumeric code or name that is specific to a particular equipment. It may contain information in coded form on the characteristics of the equipment e.g. frequency, power. The manufacturer is free to choose the form of the type designation.

(2) This is the number, code or trade name used by the manufacturer to describe a series or 'family' of equipment of substantially the same mechanical and electrical construction which will include a number of related equipments. This number is often referred to as the "model number".

(3) This is the manufacturer's identification number given to a specific equipment in the series or 'family' of equipments. It is often referred to as the "identification number".

TYPE APPROVAL TO OTHER ETS		
Has the equipment been previously type approved to other ETS?		
Yes	[ ]	ETS No.
No	[X]	
Give details of previous type approvals to the equipment:		

.

TYPE OF EQUIPMENT	
[ ]	Transmitter
[X]	Transmitter/Receiver
[ ]	Receiver
[X]	Simplex on single-frequency channels
[ ]	Simplex on two-frequency channels
[ ]	Duplex
[ ]	Separate DSC unit
[ ]	Integrated DSC units
[ ]	Integrated analogue selective calling decoder
Interfaces	
[ ]	DSC at audio level
[ ]	DSC at DC level
[ ]	Printer
[X]	External Speaker / Microphone
[ ]	DSC watchkeeping receiver antenna output
[ ]	DSC watchkeeping receiver control

DUPLEX OPERATION		
Is the equipment intended for		
Duplex operation	[ ]	Yes
	[X]	No
Is the equipment fitted with separate transmitter and receiver antenna sockets	[ ]	Yes
	[X]	No
Is the equipment fitted with a duplex filter as an integral part of the equipment with a single antenna connection socket	[ ]	Yes
	[X]	No
Is the duplex filter externally fitted and connected to the main equipment by co-axial cable(s)		
	[ ]	Yes
	[X]	No
Type and make of duplex filter		
.....		

TRANSMITTER AND RECEIVER CHARACTERISTICS
NUMBER OF CHANNELS: [X] ITU channels [X] USA channels [X] PRIVATE channels [X] WEATHER channels (Rx Only) [ ] MEMORY channels
DSC CHANNEL(S) (if provided) [ ] [ ] Other :
CHANNEL SEPARATION : 25 kHz
ITU designation of class of emission(s) : 16K0G3E ANTENNA IMPEDANCE : 50 ohm

TRANSMITTER TECHNICAL CHARACTERISTICS	
TRANSMITTER FREQUENCY	
Method of frequency generation	
[ ]	CRYSTAL
[X]	SYNTHESIZER
[ ]	OTHER
Transmitter frequency bands :	
Italy Charlie Group (C0) 155.450 MHz to 162.425 MHz Belgium Ch 96	
TRANSMITTER MODULATION	
Modulation method : Direct FM	
Occupied bandwidth : 16 kHz	
Maximum frequency deviations : +/- 5 kHz	
TRANSMITTER MODULATION INPUT CHARACTERISTICS	
Impedance :	
[ ] balanced	
[1000 ohms] unbalanced	

TRANSMITTER RF POWER CHARACTERISTICS		
RATED TRANSMITTER OUTPUT POWER (as stated by the manufacturer)		
Maximum output power :	3W	
Reduced output power :	1W	
Output power switch :	[X]	Yes
	[ ]	No

TRANSMITTER AND RECEIVER POWER SOURCE (1)			
[ ]	AC MAINS State voltage: V	[ ]	Single phase
	AC MAINS FREQUENCY	[ ]	Three phase
	DC Voltage		
	DC Maximum Current (A)		
[ ]	Other:		
BATTERY			
[ ]	Nickel Cadmium		
[ ]	Mercury		
[ ]	Alkaline		
[ ]	Lead acid (Vehicle regulated)		
[ ]	Leclanche		
[ ]	Lithium		
[X]	Other 5 AAA NiMh Cells		
Volts nominal: 6.0 V End point voltage as quoted by equipment manufacturer: 5.1 V. (Refer to Clause 4.9.2 and 4.10.3 of the Standard when completing the above)			

(1) If a transmitter and receiver use the same power source, this should be declared. In such cases only the box for the transmitter power source should be filled in.

[X] TX and RX same power source used

RECEIVER TECHNICAL CHARACTERISTICS
RECEIVER FREQUENCY
Method of frequency generation : [ ] CRYSTAL [X] SYNTHESISER [ ] OTHER : Intermediate frequencies : [X] 21.4 MHz 1st IF [X] 450 kHz 2nd IF [ ] 3rd
Receiver frequency channels : Italy Charlie Group (C0) 155.450 MHz NOAA Weather Ch 10 (W0) 163.275 MHz
Is local oscillator injection frequency higher or lower than the receiver nominal frequency? [ ] Higher [X] Lower

RECEIVER MODULATION OUTPUT CHARACTERISTICS
RATED AUDIO OUTPUT POWER (as stated by the manufacturer) Loudspeaker : 1.2 W @ 8 ohms Earphone : 0.250 W @ 16 ohms
RECEIVER MULTIPLE WATCH FACILITIES
Dual watch facilities : [X] Yes [ ] No If Yes, then : Selection of priority channel possible ? : [ ] Yes [X] No (= Ch 16)
Multiple watch facilities : [ ] Yes [X] No If Yes, then : Selection of priority channel possible ? : [ ] Yes [ ] No (= Ch 16) Number of additional channels selectable : Scan time programmable ? : [ ] Yes [X] No

RECEIVER POWER SOURCE (1)					
[ ]	AC MAINS	State voltage:	V	[ ]	Single phase
	AC MAINS FREQUENCY			[ ]	Three phase
	DC Voltage (A)				
	DC Maximum Current				
[ ]	Other				
BATTERY					
[ ]	Nickel Cadmium				
[ ]	Mercury				
[ ]	Alkaline				
[ ]	Lead acid (Vehicle regulated)				
[ ]	Leclanche				
[ ]	Lithium				
[ ]	Other				
Volts nominal: . End point voltage as quoted by equipment manufacturer V. (Refer to Clause 4.9.2 and 4.10.3 of the Standard when completing the above)					

[X] TX and RX same power source used

(1) If a transmitter and receiver use the same power source, this should be declared. In such cases only the box for the transmitter power source should be filled in.

CONSTRUCTION OF THE EQUIPMENT	
[X]	Single unit (1)
[ ]	Multiple units
If multiple units, describe each one clearly :	
TEMPERATURE RANGES over which the equipment is to be tested	
[ ]	+15ºC to +35ºC
[X]	-15ºC to +55ºC
[ ]	Other

(1) Unit means a physically separate item of the equipment.

NOTE

OTHER ITEMS SUPPLIED		
Spare batteries	[ ]	Yes
	[X]	No
Battery charging device	[X]	Yes
	[ ]	No
Special tools for dismantling equipment	[ ]	Yes
	[X]	No
Test interface box (if applicable)	[ ]	Yes
	[X]	No
Full documentation on equipment (Handbook and circuit diagrams)	[ ]	Yes
	[X]	No
Others	[X]	Yes
	[ ]	No
If Yes, please specify : **USER'S MANUAL**		

DECLARATION		
Are the equipments submitted representative production models ?	[ ]	Yes
	[X]	No
If not are the equipments pre-production models ?	[X]	Yes
	[ ]	No
If pre-production equipments are submitted will the final production equipments be identical in all respects with the equipment tested	[ ]	Yes
	[X]	No
If no supply full details: Submitted samples have marginal ACR. Samples of improved design representing production will follow for testing conformation. TUV test engineer Simon Bennett has been advised.		
Is the Test Report to be used as part of a R&TTE " Opinion"	[X]	Yes
	[ ]	No
If yes, has the product, any direct engineering predecessor, or variant ever been granted Type Approval in any EEC member country ?	[ ]	Yes
	[X]	No
If yes supply full details :		
Will labelling of the equipment comply with the requirements of ETS 300 338 ?	[ ]	Yes
	[X]	No
If no supply full details; not required by 301 178		

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signature :

Name : Charles W. Warner

Position held : Sr. Project Engineer, Cobra Electronics Corporation

Date : 13th August, 2007

TÜV Product Service formally certifies that the manufacturer's declaration as typed out in this report, is a true and accurate record of the original received from the applicant.Product Information

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Cobra MR HH125 Handheld VHF as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.

Equipment Under Test

1.4.2 Test Configurations

A 50 Ω load was connected to the antenna port of the EUT.

1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

The table below details modifications made to the EUT during the test programme. The Modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	N/A	N/A
1	Sample _9 only: An adjustment was made to the “deviation adjustment pot”	TÜV	19/09/2007

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SECTION 2

TEST DETAILS

Limited FCC Testing of the
Cobra MR HH125 Handheld VHF
In accordance with FCC CFR 47 Part 15: 2006 and Part 80: 2006

2.1 SPURIOUS RADIATED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47 Part 15: 2006 Clause 15.109

2.1.2 Equipment Under Test

MR HH125 Handheld VHF

2.1.3 Date of Test and Modification State

15th September 2007 – Modification State 0 (Below 1GHz) – Sample _13
3rd October 2007 – Modification State 0 (Above 1GHz) – Sample _11

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT. The list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector.

Emissions identified within the range 1GHz – 2GHz were then formally measured using Peak and Average Detectors, as appropriate.

The measurements were performed at a 3m distance unless otherwise stated.

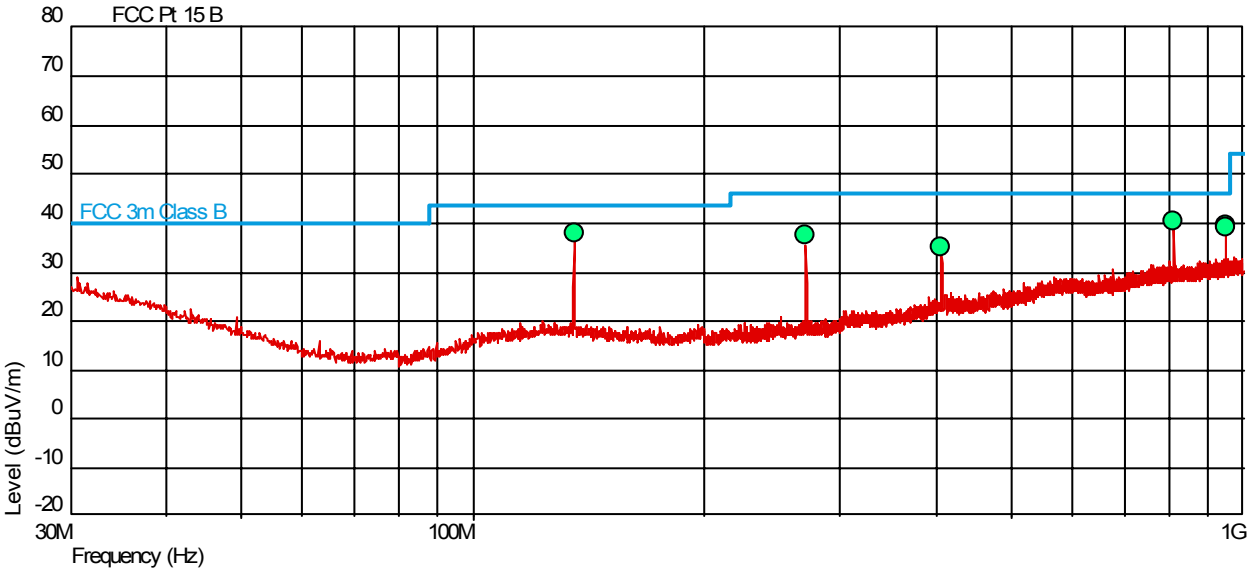
2.1.6 Environmental Conditions

	15th September	3rd October
Ambient Temperature	20.5°C	18.2
Relative Humidity	49%	46

2.1.7 Test Results

The EUT was tested with the full hands free kit.

Results below 1GHz



Final Result

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	Angle(Deg)	Height(m)	Polarity
135.388	38.1	43.5	-5.4	359.40	1.00	Vertical
270.790	37.5	46.0	-8.5	275.50	1.00	Vertical
406.194	35.3	46.0	-10.7	44.40	1.00	Vertical
812.392	40.5	46.0	-5.5	45.00	1.00	Horizontal
947.791	39.2	46.0	-6.8	314.70	1.13	Vertical
947.809	39.6	46.0	-6.4	80.60	1.00	Horizontal

Results above 1GHz

Frequency	Antenna Polarisation	Antenna Height cm	EUT Arc Degrees	Final Peak dBµV/m	Final Average dBµV/m	Peak Limit dBµV/m	Average Limit dBµV/m
1.0832	Vertical	100	0	38.71	32.22	74.0	54.0
1.7602	Vertical	100	275	43.89	33.72	74.0	54.0

2.2 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

2.2.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.209(a)

2.2.2 Equipment Under Test

MR HH125 Handheld VHF, _12

2.2.3 Date of Test and Modification State

18th September 2007 - Modification State 0

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

The EUT was set to transmit an unmodulated carrier on channel 16 at maximum power using a frequency counter, the frequency error was measured and the result recorded.

The voltage to the EUT was varied as shown in the table of results at a temperature of 20°C.

2.2.6 Environmental Conditions

Ambient Temperature	21.3°C
Relative Humidity	34.7%

2.2.7 Test Results

Channel: 1A Frequency: 156.050 MHz

DC Voltage (V)	Test Frequency (MHz)	Error (Hz)	Limit (kHz)
5.1	156.05000	0	±1.56025
6.0	156.05000	0	±1.56025

Channel: 88 Frequency: 157.425 MHz

DC Voltage (V)	Test Frequency (MHz)	Error (Hz)	Limit (kHz)
5.1	157.424875	-125	± 1.57425
6.0	157.424925	-75	± 1.57425

Limit

±1.56025 kHz / ± 1.57425 kHz or 10ppm

2.3 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

2.3.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.209(a)

2.3.2 Equipment Under Test

MR HH125 Handheld VHF, _12

2.3.3 Date of Test and Modification State

18th September 2007 - Modification State 0

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

The EUT was set to transmit an unmodulated carrier on channels 1A, 16 and 88 at maximum power. Using a frequency counter, the frequency error was measured and the result recorded. The temperature was adjusted between -20° and +50° in 10° steps.

2.3.6 Environmental Conditions

Ambient Temperature	21.3°C
Relative Humidity	34.7%

2.3.7 Test Results

Bottom Channel: 1A Frequency: 156.050 MHz

Temperature Interval ºC	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-20	5.1	156.051000	+1000	+6.408
	6.0	156.051175	+1175	+7.53
-10	5.1	156.050525	+525	+3.364
	6.0	156.050650	+650	+4.165
0	5.1	156.050425	+425	+2.723
	6.0	156.050500	+500	+3.204
+10	5.1	156.049975	-25	-0.160
	6.0	156.050025	+25	+0.610
+20	5.1	156.050000	000	000
	6.0	156.050000	000	000
+30	5.1	156.049500	-500	-3.204
	6.0	156.049550	-450	-2.884
+40	5.1	156.049450	-550	-3.525
	6.0	156.049500	-500	-3.204
+50	5.1	156.049725	-275	-1.762
	6.0	156.049700	-300	-1.922

Middle Channel: 16 Frequency: 156.800 MHz

Temperature Interval ºC	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-20	5.1	156.800825	+825	+5.261
	6.0	156.800950	+950	+6.059
-10	5.1	156.800525	+525	+3.348
	6.0	156.800450	+450	+2.870
0	5.1	156.800175	+175	+1.116
	6.0	156.800225	+225	+1.435
+10	5.1	156.799950	-50	-0.319
	6.0	156.799925	-75	-0.478
+20	5.1	156.799975	-25	-0.159
	6.0	156.799950	-50	-0.319
+30	5.1	156.799500	-500	-3.189
	6.0	156.799525	-475	-3.029
+40	5.1	156.799475	-525	-3.348
	6.0	156.799500	-500	-3.189
+50	5.1	156.799800	-200	-1.276
	6.0	156.799775	-225	-1.435

Top Channel: 88 Frequency: 157.425 MHz

Temperature Interval ºC	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-20	5.1	157.425950	+950	+6.035
	6.0	157.425900	+900	+5.717
-10	5.1	157.425900	+900	+5.717
	6.0	157.425800	+800	+5.082
0	5.1	157.425350	+350	+2.223
	6.0	157.425300	+300	+1.906
+10	5.1	157.425175	+175	+1.112
	6.0	157.425125	+125	+0.794
+20	5.1	157.424875	-125	-0.794
	6.0	157.424925	-75	-0.476
+30	5.1	157.424750	-250	-1.588
	6.0	157.424675	-325	-2.064
+40	5.1	157.424450	-550	-3.494
	6.0	157.424425	-575	-3.654
+50	5.1	157.424600	-400	-2.541
	6.0	157.424625	-375	-2.382

Limit

± 10 ppm

2.4 EMISSION LIMITATIONS (EMISSION MASK)

2.4.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.211(f)(1)(2)

2.4.2 Equipment Under Test

MR HH125 Handheld VHF, _12

2.4.3 Date of Test and Modification State

21st September 2007 - Modification State 0

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Procedure

The EUT was connected to a Spectrum Analyser via attenuators. This configuration was used to measure emissions from 9kHz to 600MHz and the emission mask (B). From 600MHz to 1600MHz, attenuators and a high pass filter was used. The emissions were measured on Bottom, Middle and Top channels up to the 10th harmonic. The path loss was measured for both the above configurations and the worst case loss was entered as a reference level offset.

All Measurements were performed with the EUT modulated in accordance with Clause 4.3(a) The EUT was initially connected to a Modulation Analyser and the EUT set to transmit. Using an Audio Analyser, an audio frequency was swept between 300Hz to 5kHz to find the frequency which produced the highest deviation.

The amplitude at this frequency was then increased to give a deviation of 2.5kHz.

The amplitude and frequency levels were 18.2mV at 3.06kHz

Then at a frequency of 2.5kHz the amplitude recorded above was increased by 16dB to provide the Final Modulated level.

The EUT transmitting on full power was then connected to a Spectrum Analyser via a 30dB Attenuator. The modulated carrier was checked (for the bottom, middle and top channels of the EUT) against the emission mask.

The Path Loss was recorded and the worst case loss was entered as a Reference Level Offset

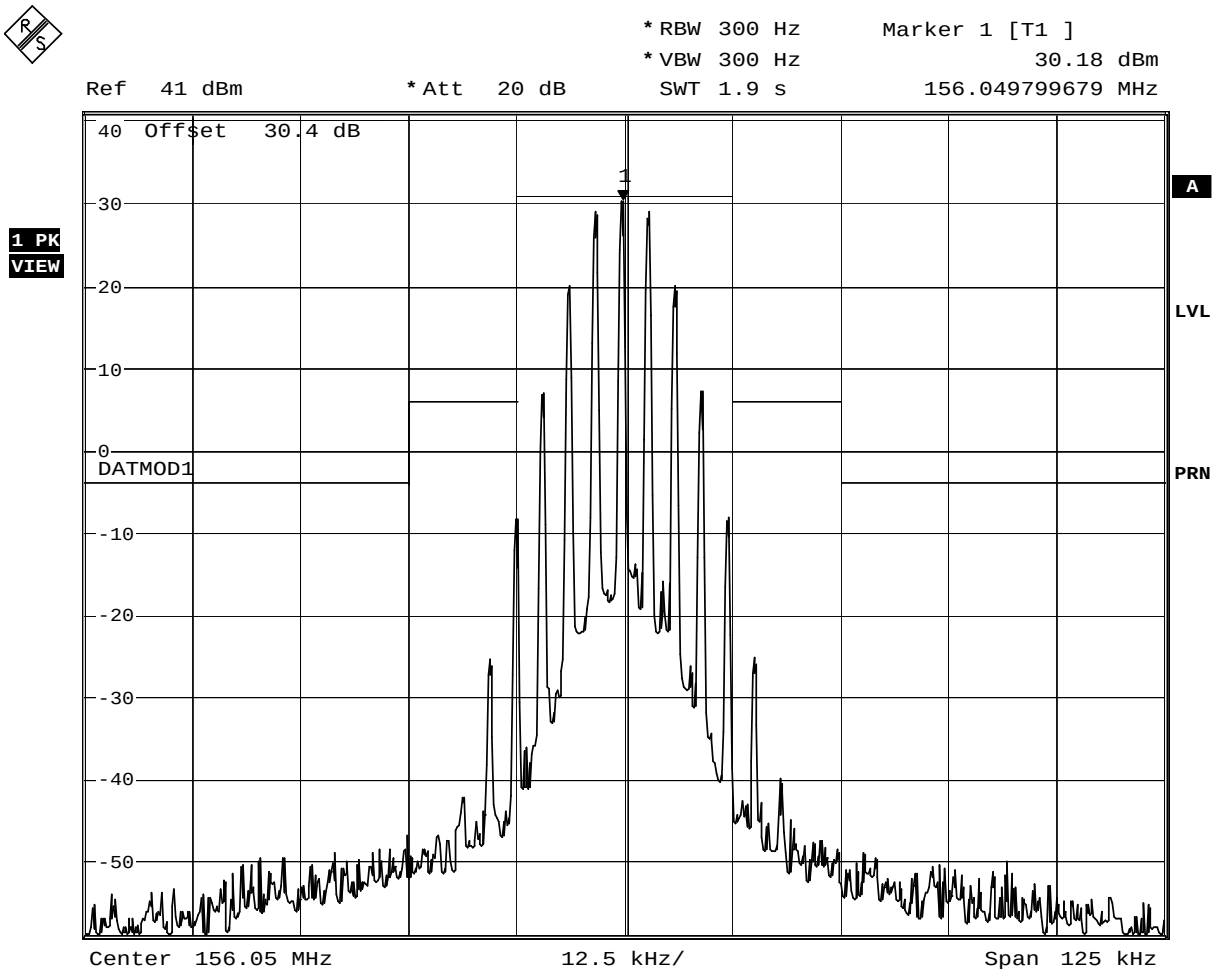
Total Path loss = 30.4

2.4.6 Environmental Conditions

Ambient Temperature	22.8°C
Relative Humidity	53%

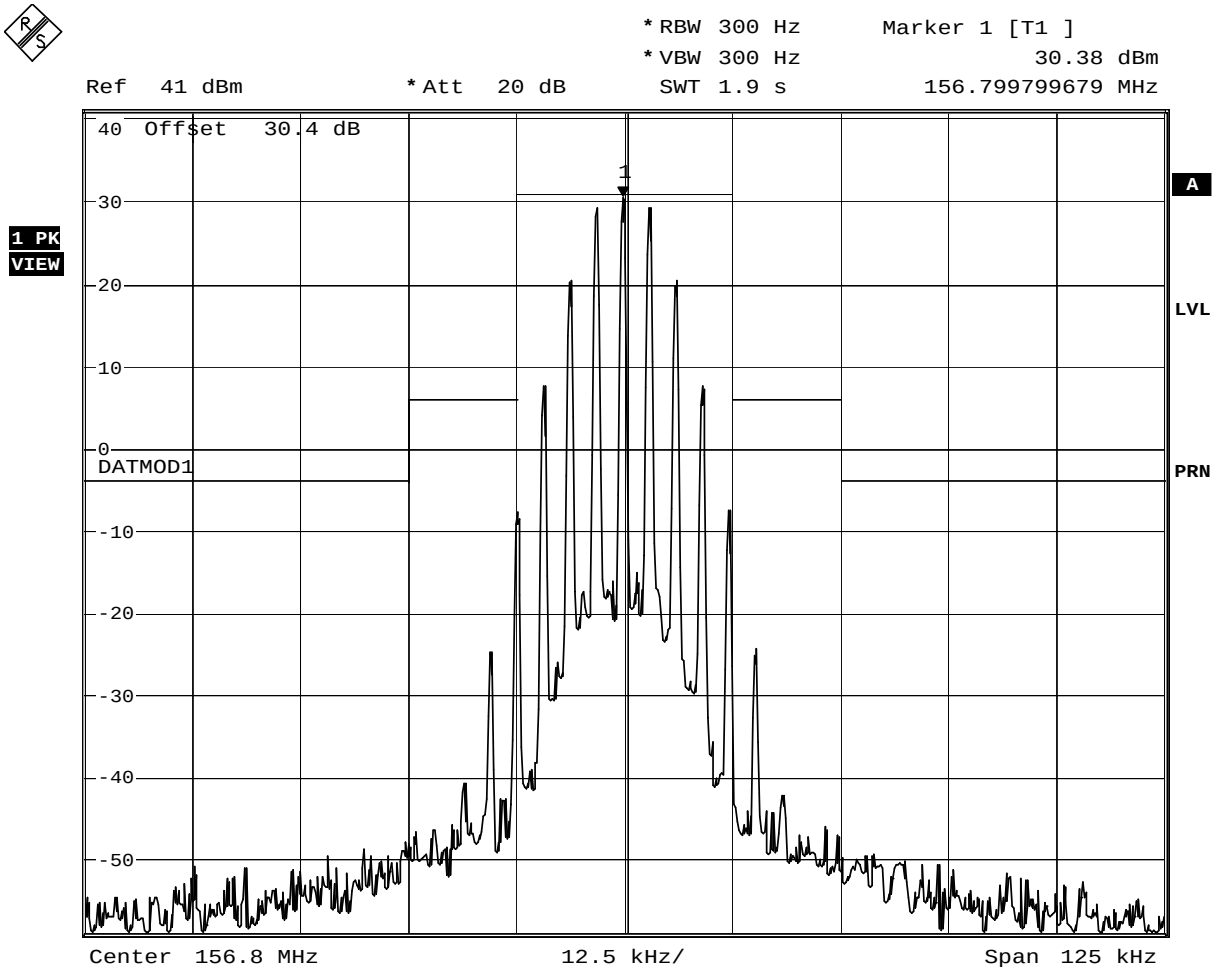
2.4.7 Test Results

Bottom Channel – 1A



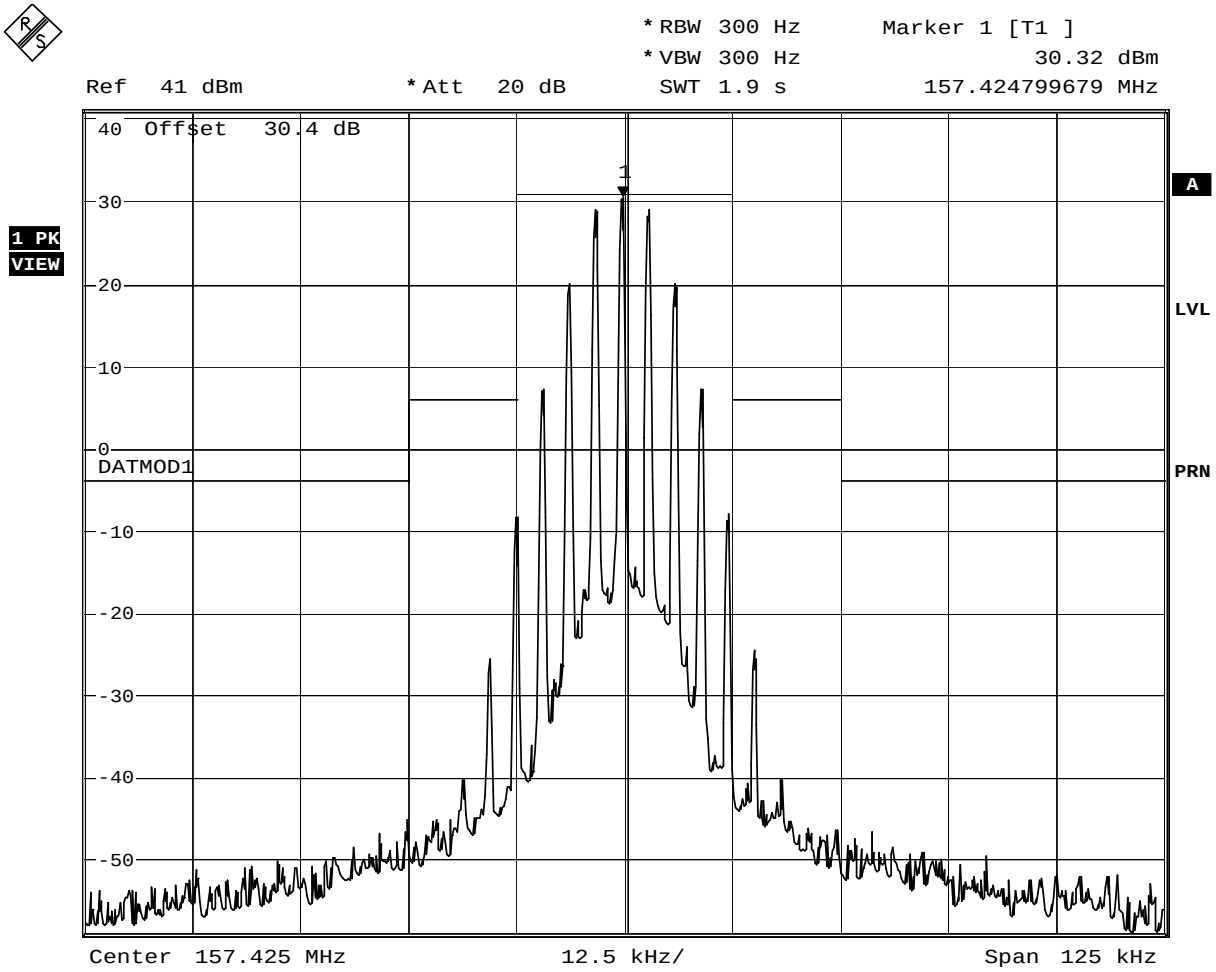
Date: 21.SEP.2007 15:14:44

Middle Channel - 16



Date: 21.SEP.2007 15:12:24

Top Channel – 88



Date: 21.SEP.2007 15:16:00

2.5 OCCUPIED BANDWIDTH

2.5.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.205(a)

2.5.2 Equipment Under Test

MR HH125 Handheld VHF, _12

2.5.3 Date of Test and Modification State

17th September 2007 - Modification State 0

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Procedure

The EUT is declared as having an emission designator of: 16K0G3E for voice application which equates to an Authorised Bandwidth of: 20kHz.

Initially, the EUT was connected via a 30dB Attenuator to a Modulation Analyser, which was set to measure the Deviation. From the results in 80.213, the audio frequency for a set input level which produces the highest level of deviation was 3.1kHz. Thus, the Audio Analyser was set to supply the EUT with an audio tone of 2.5kHz at an amplitude which produced a deviation corresponding to 50% of the maximum permissible frequency deviation, (±2.5kHz). The level was then increased on the audio analyser by 16dB.

The Modulation Analyser was then replaced with a Spectrum Analyser and the 99% Bandwidth was measured. The measurements were performed on Channel 16, bottom and top channels on maximum power levels.

2.5.6 Environmental Conditions

Ambient Temperature	24.7°C
Relative Humidity	38%

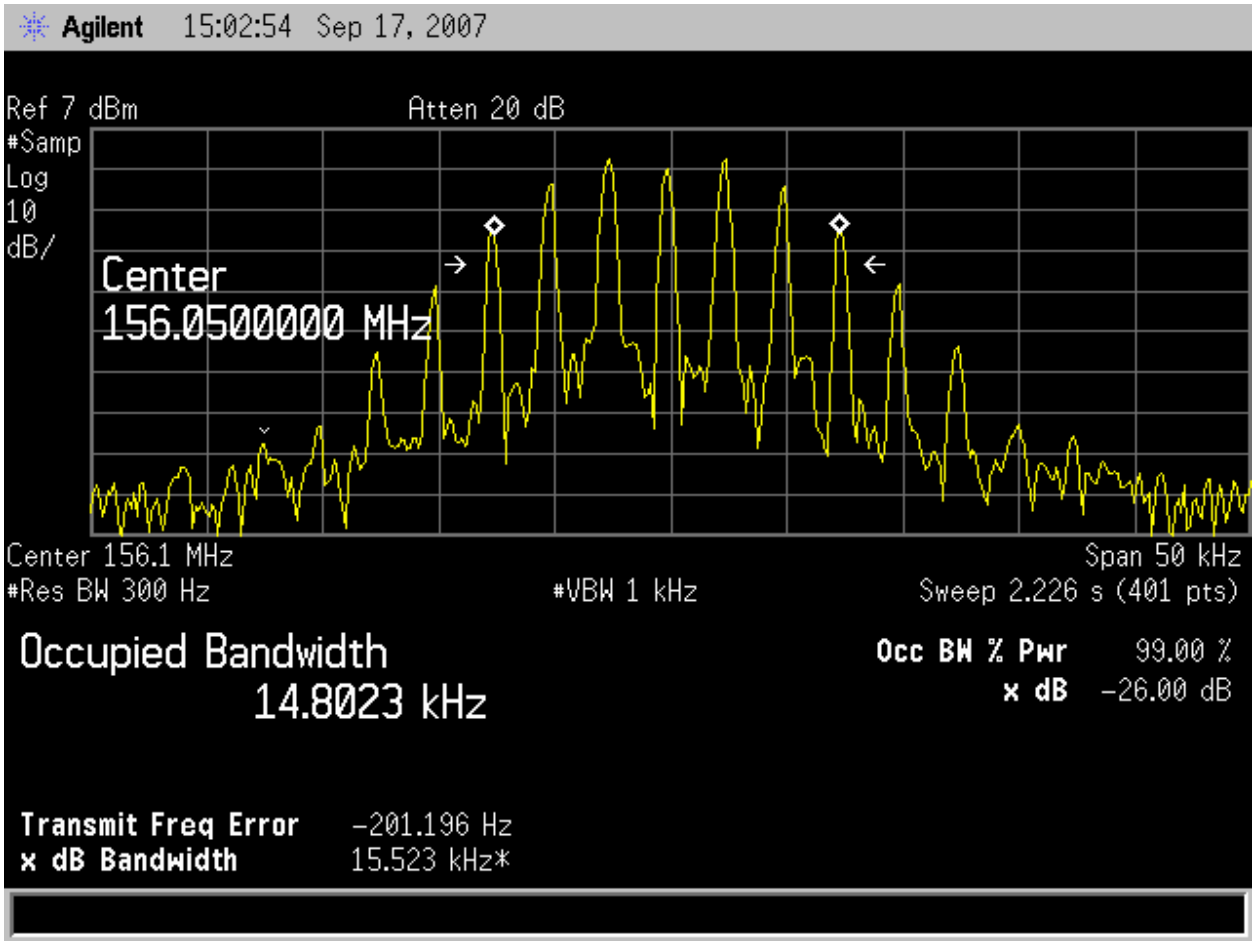
2.5.7 Test Results

Power Supply: 6V DC

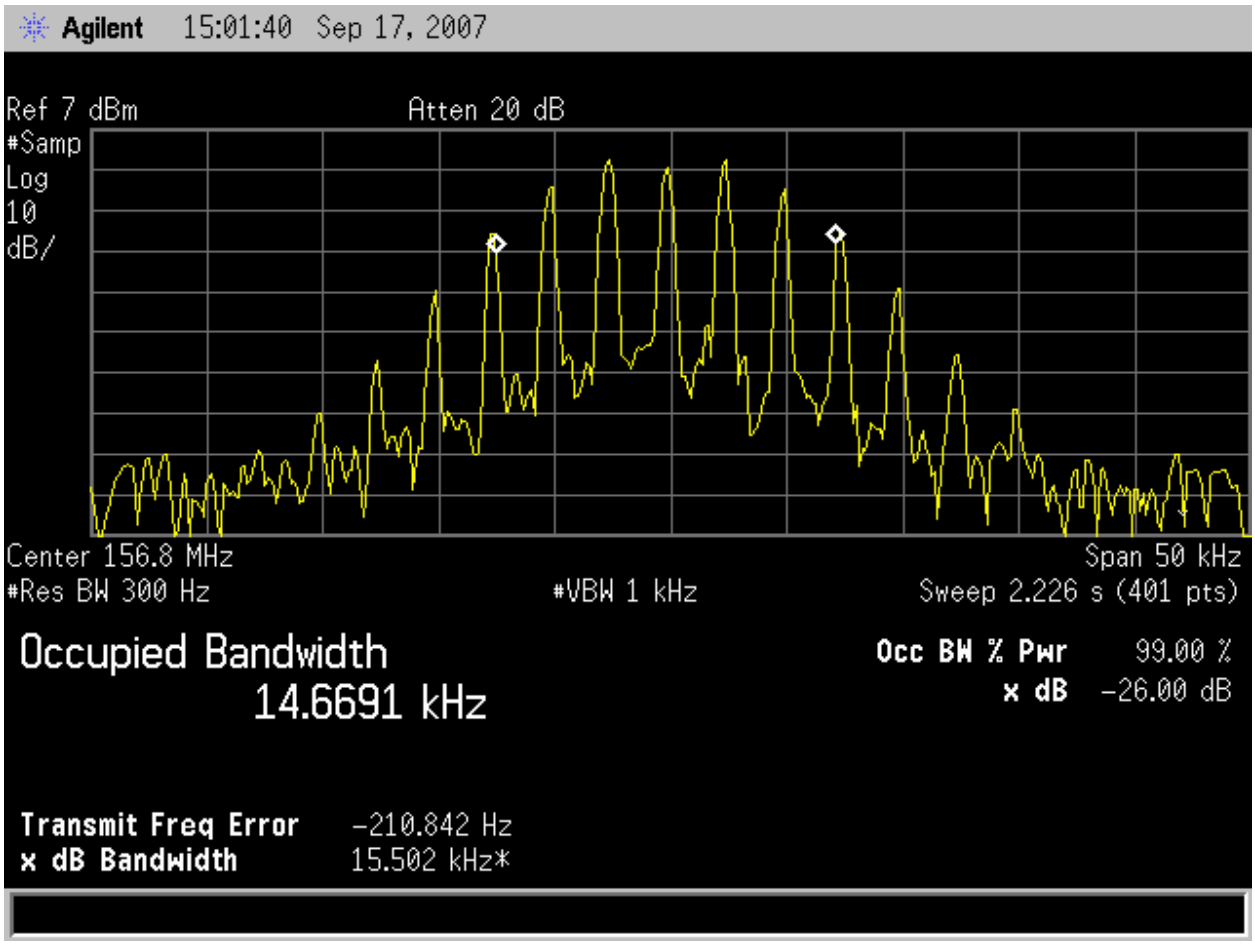
Channel Number/Frequency	Power Level (W)	Result (kHz)	Authorised Bandwidth (kHz)
1A / 156.050MHz	3	14.8023	20
16 / 156.800MHz	3	14.6691	20
88 / 157.425MHz	3	14.7572	20

The test result plots are presented below.

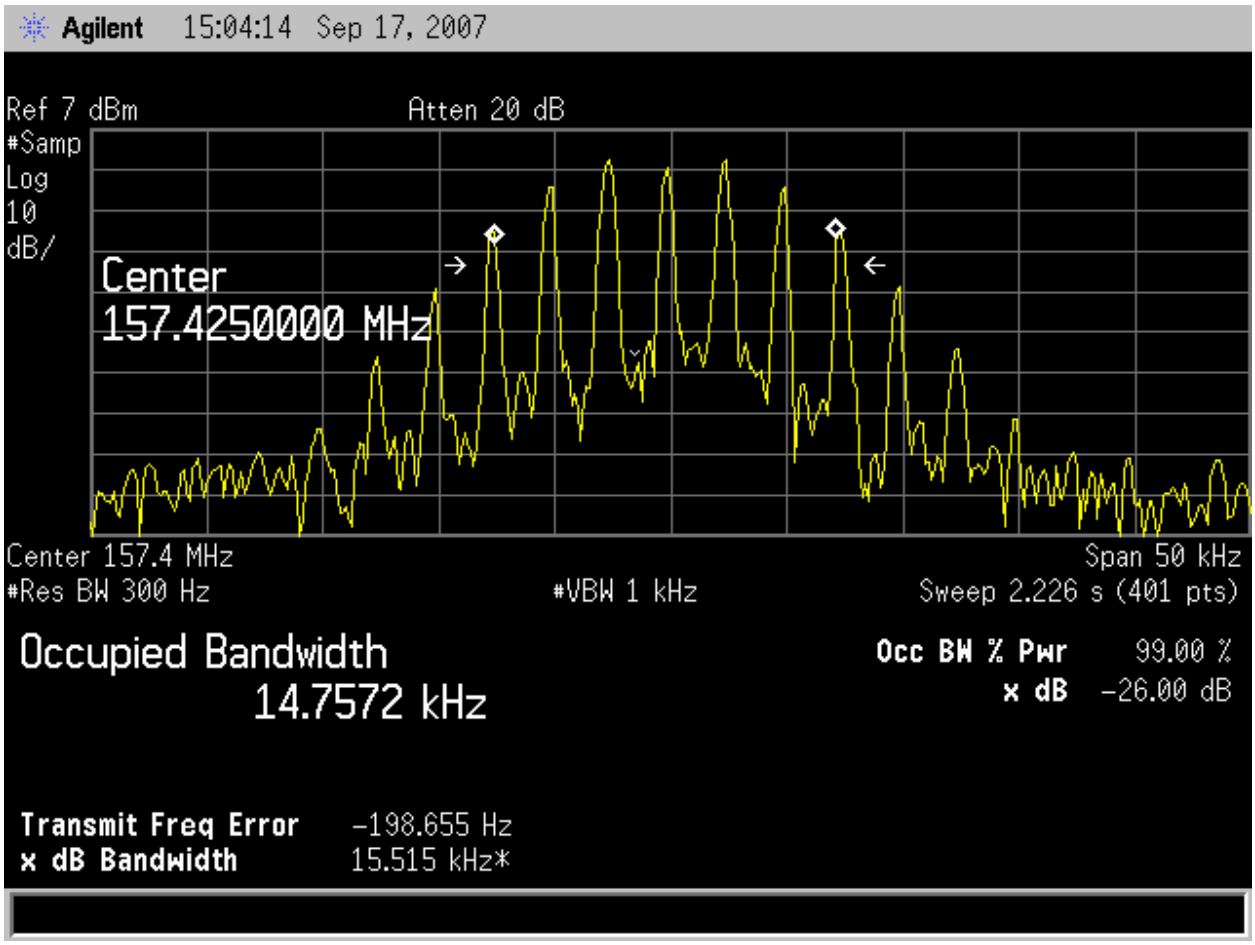
Bottom Channel – 1A



Middle Channel - 16



Top Channel – 88



2.6 EMISSION LIMITATIONS (CONDUCTED TRANSMITTER SPURIOUS)

2.6.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.211(c)(f)(3)

2.6.2 Equipment Under Test

MR HH125 Handheld VHF, _12

2.6.3 Date of Test and Modification State

21st September 2007 - Modification State 0

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Procedure

All Measurements were performed with the EUT modulated, in accordance with Clause 4.3 (a). Where the EUT was initially connected to a Modulation Analyser and the EUT set to transmit, using an Audio Analyser, an audio frequency was swept between 300Hz to 5kHz to find the frequency which produced the highest deviation.

The amplitude at this frequency was then increased to give a deviation of 2.5kHz.

The amplitude and frequency levels were 18.2mV at 3.060kHz

Then at a frequency of 2.5kHz the amplitude recorded above was increased by 16dB to provide the Final Modulated level.

The EUT transmitting on full power, was then connected to a Spectrum Analyser via 40dB of attenuation in the 9kHz - 600MHz frequency range and via a 30dB Attenuator with 600MHz High Pass Filter in the 600MHz - 1.7GHz frequency range.

The EUT was checked (for the bottom, middle and top channels of the EUT) against the specification limit for all emissions >250% removed from the assigned Frequency, between 9kHz - 1.7GHz.

The Path Loss for each frequency range was recorded and the worst case loss was entered as a Reference Level Offset.

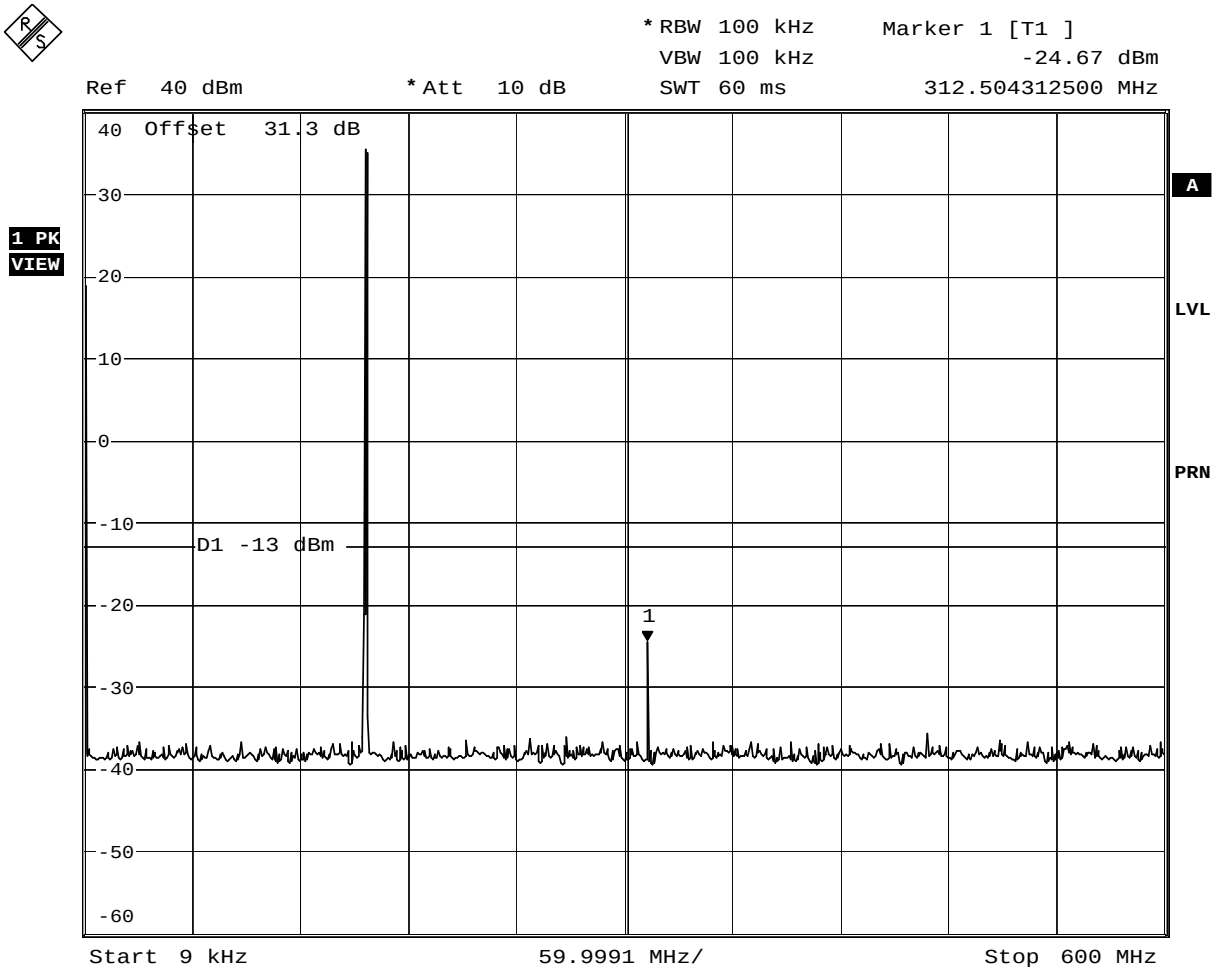
Total Path loss (9kHz - 600MHz) = 31.28dB
Total Path loss (600MHz - 1.0GHz) = 11.77dB
Total Path loss (1.0GHz - 1.7GHz) = 11.36dB

2.6.6 Environmental Conditions

Ambient Temperature	23°C
Relative Humidity	52%

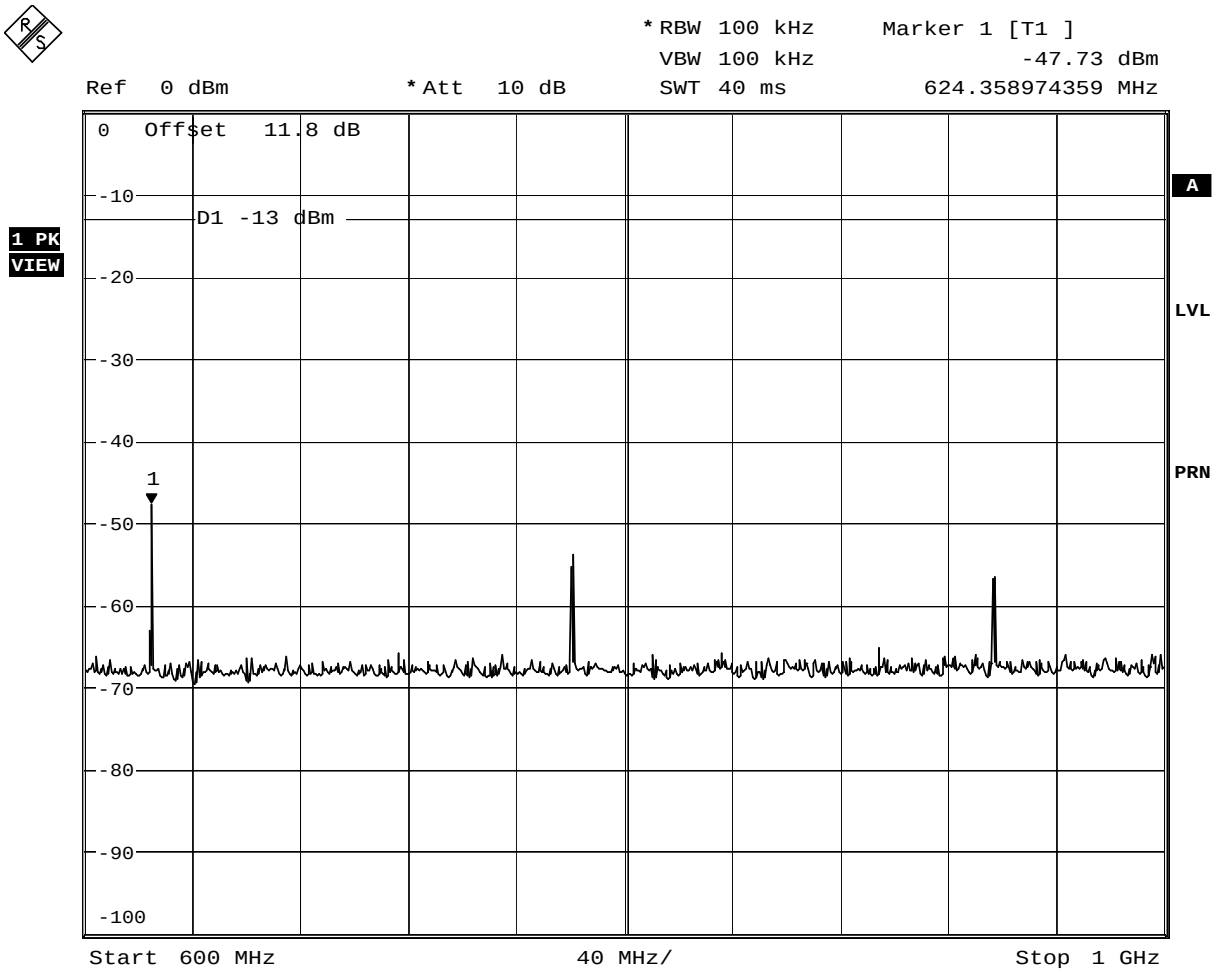
2.6.7 Test Results

Bottom Channel – 1A – 9kHz to 600MHz



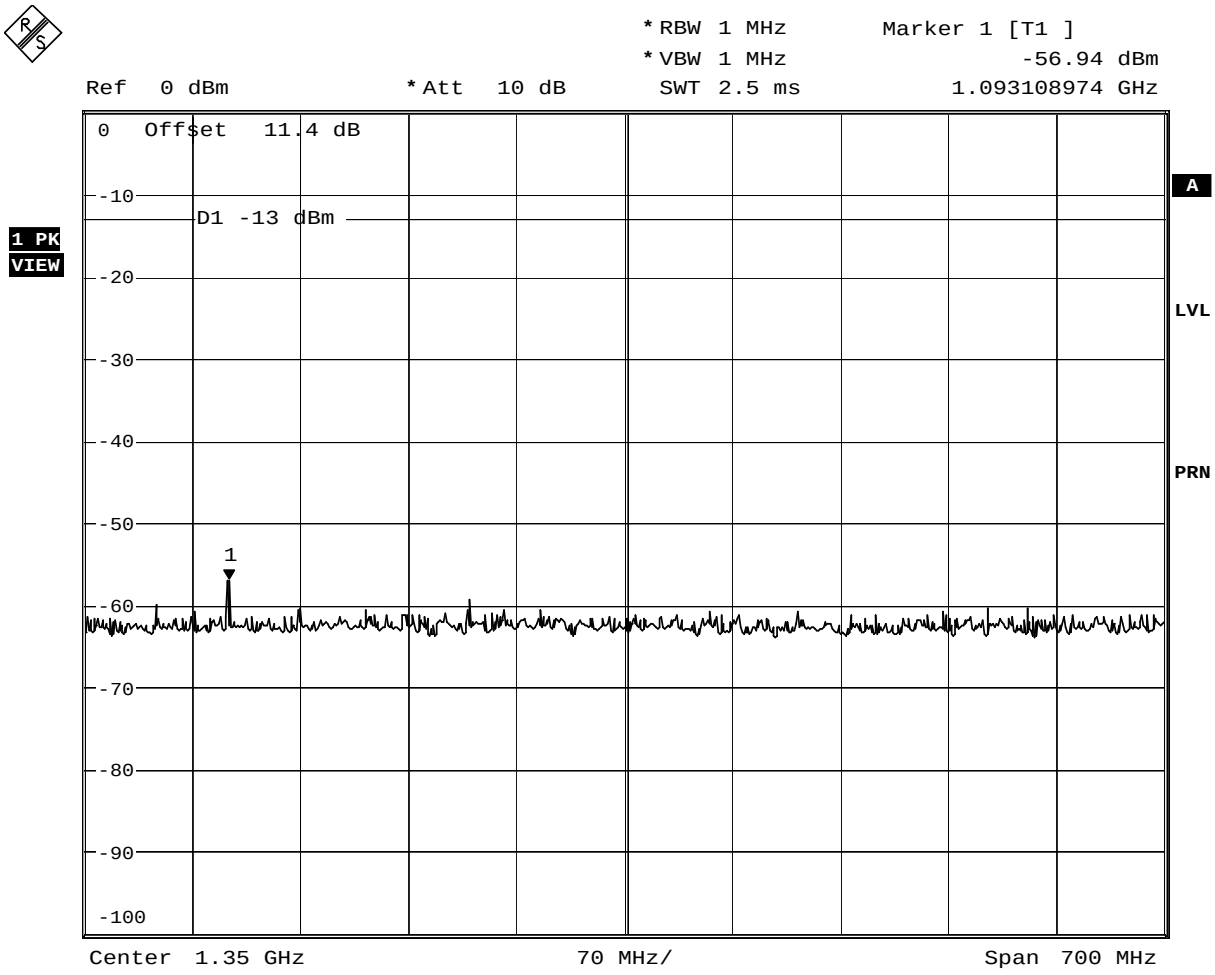
Date: 21.SEP.2007 16:33:02

Bottom Channel – 1A – 600 MHz to 1000 MHz



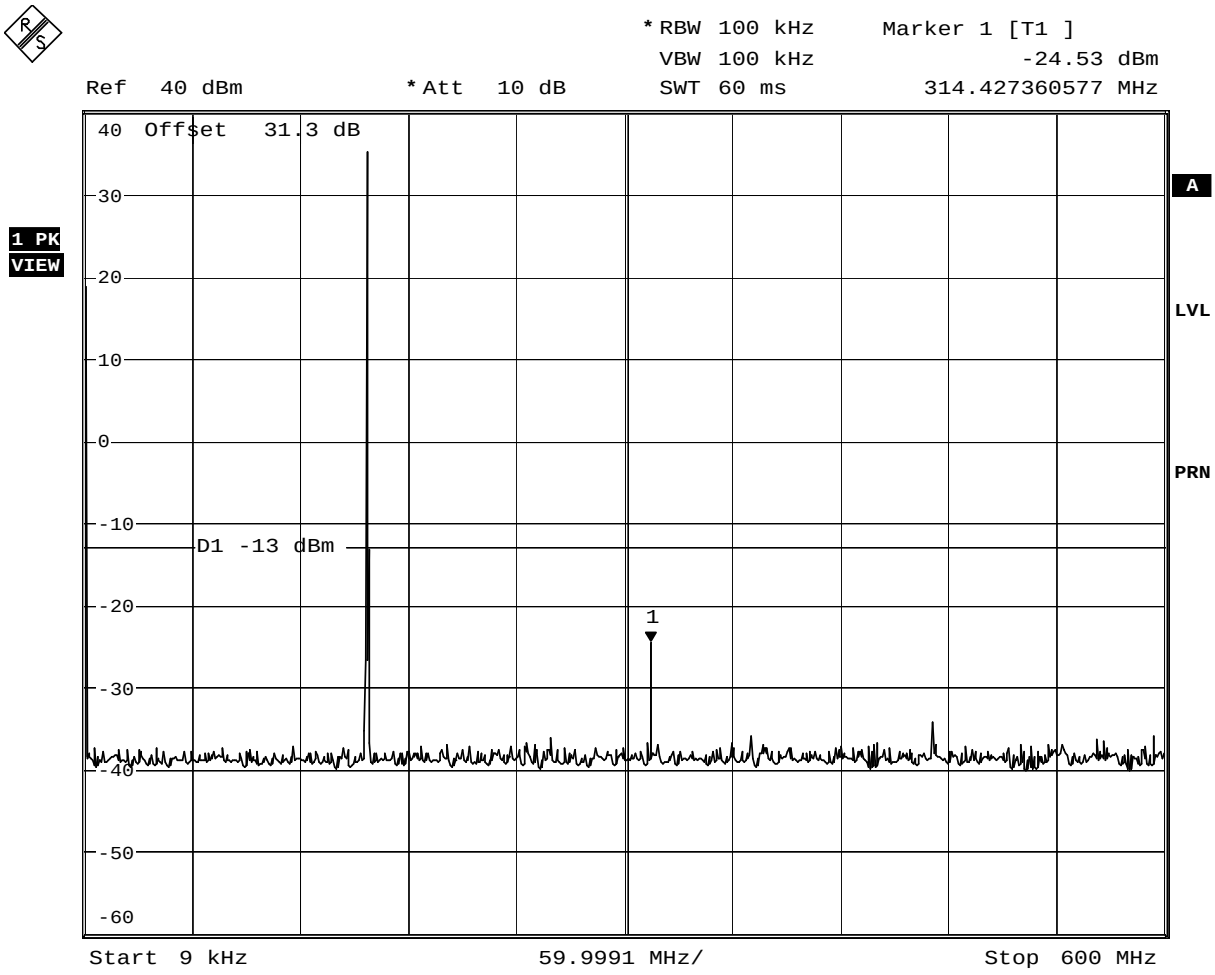
Date: 21.SEP.2007 16:14:11

Bottom Channel – 1A – 1000 MHz to 1700 MHz



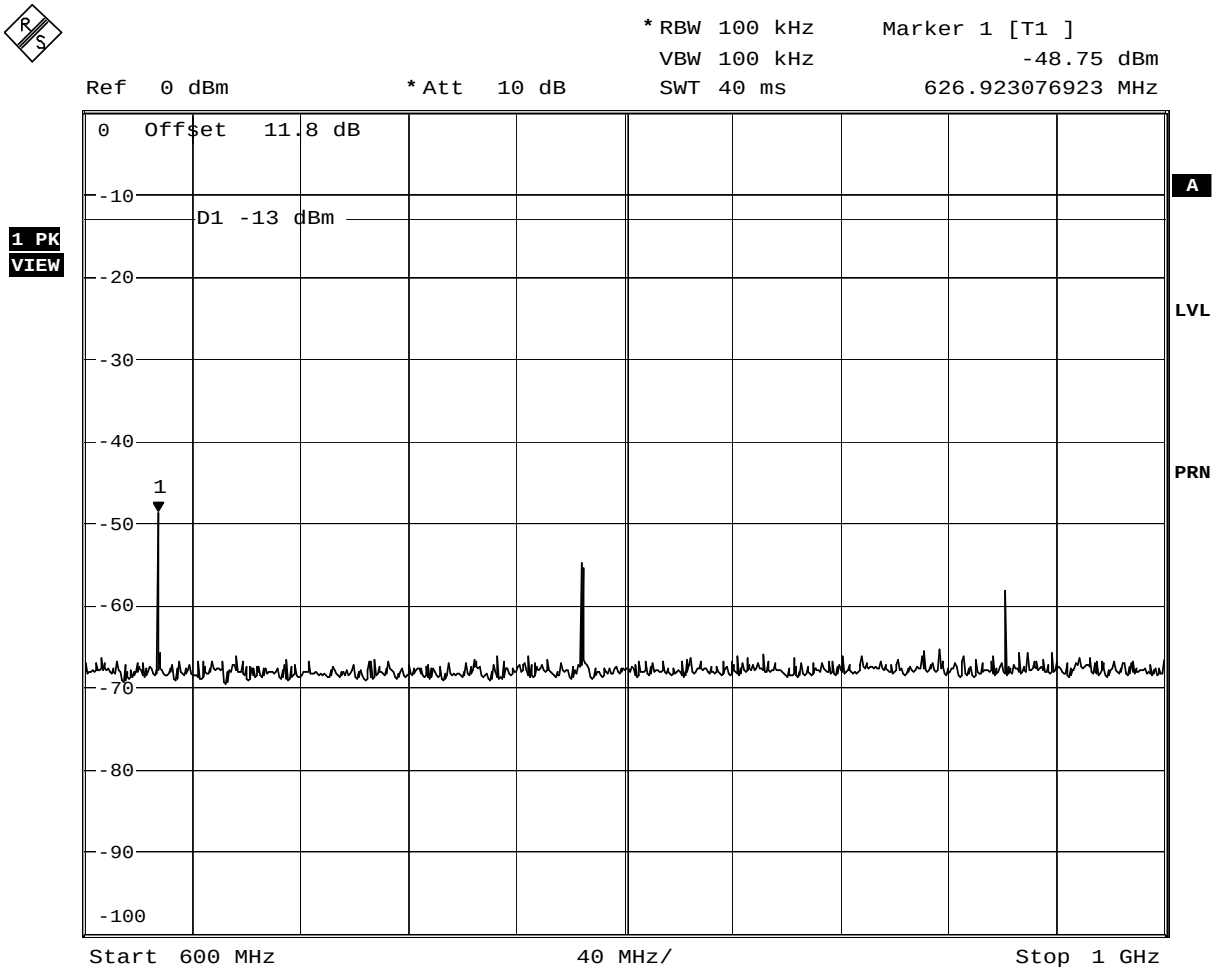
Date: 21.SEP.2007 16:02:58

Middle Channel – 16 – 9kHz to 600MHz



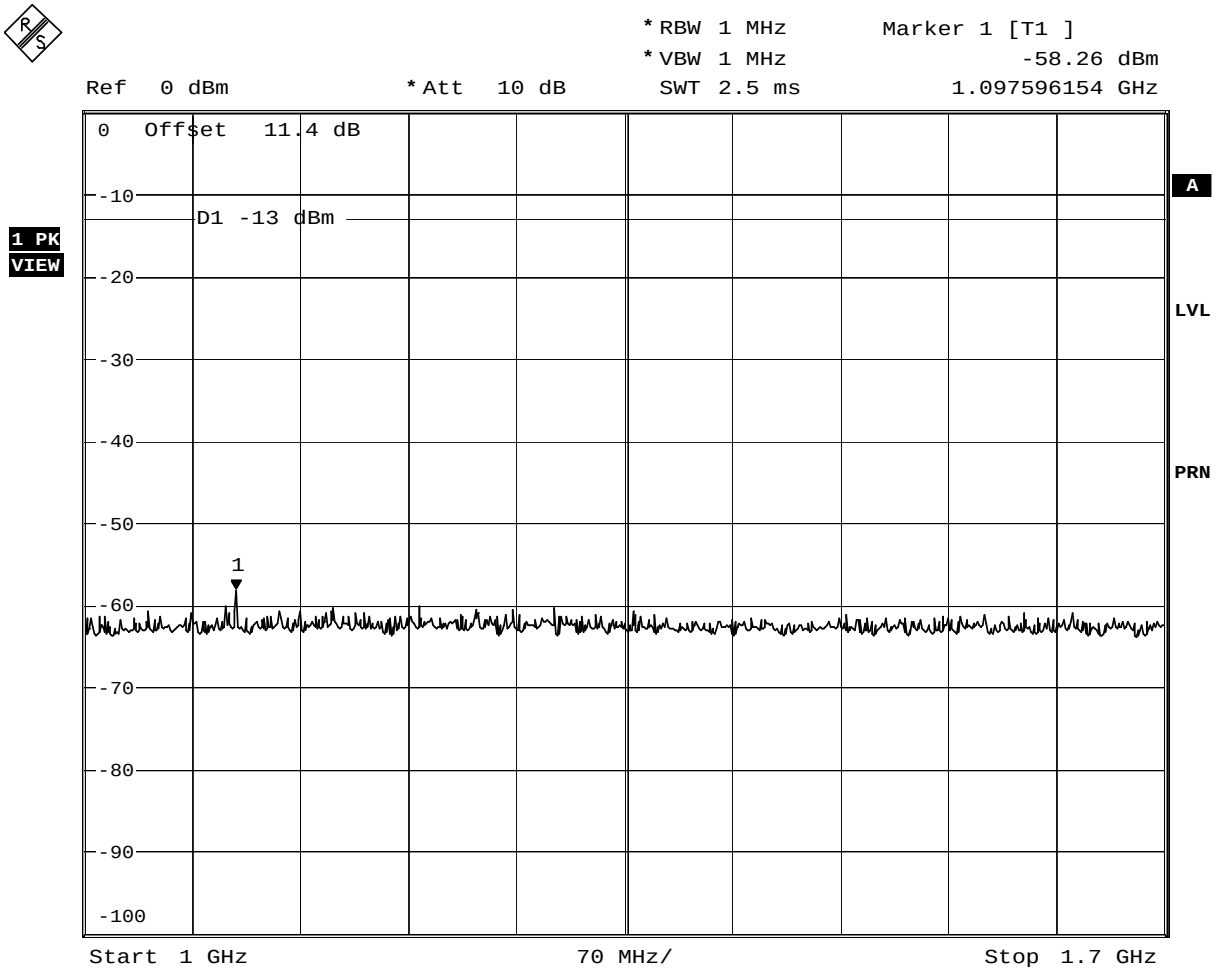
Date: 21.SEP.2007 16:22:47

Middle Channel – 16 – 600MHz to 1000MHz



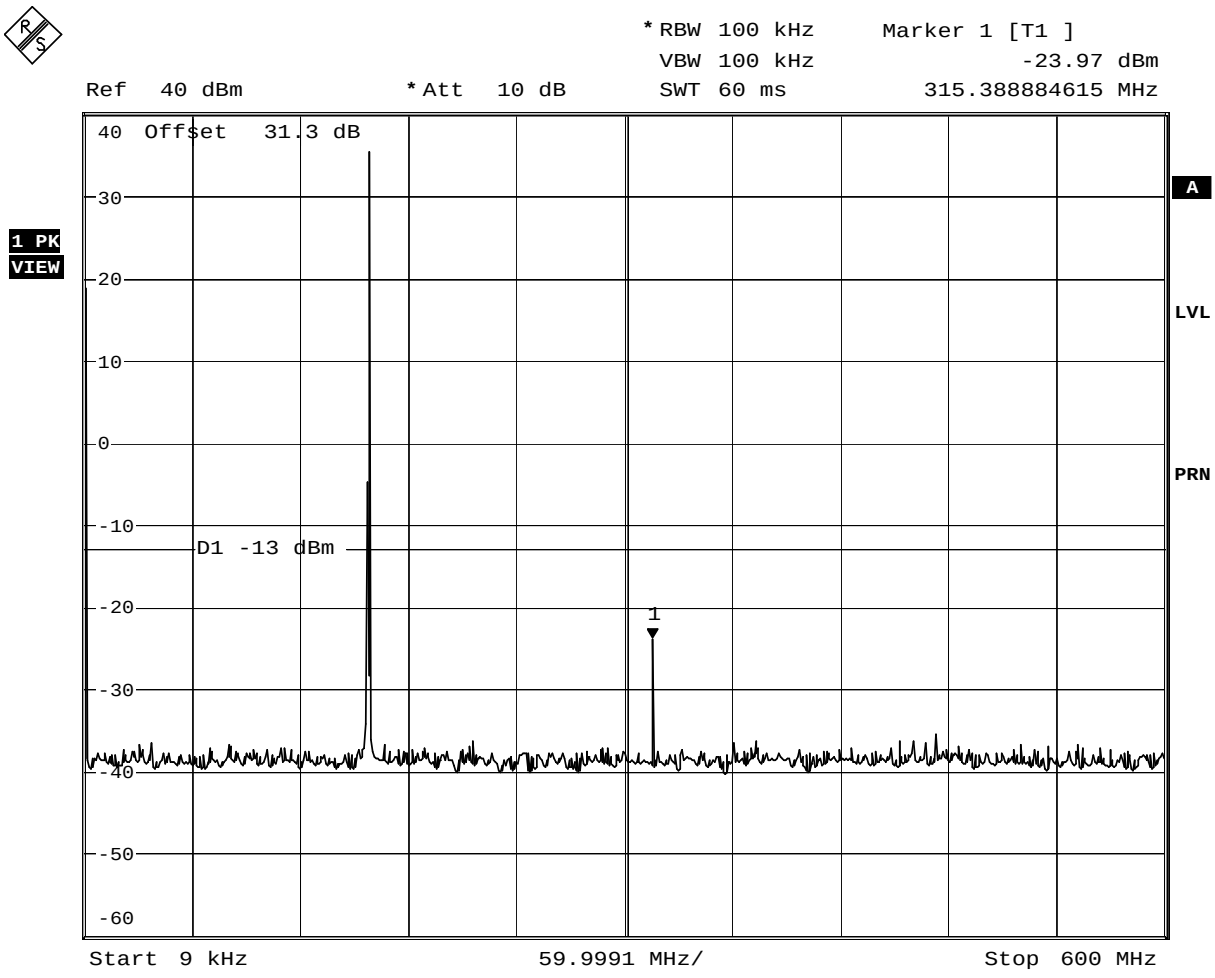
Date: 21.SEP.2007 16:15:09

Middle Channel – 16 – 1000MHz to 17000MHz



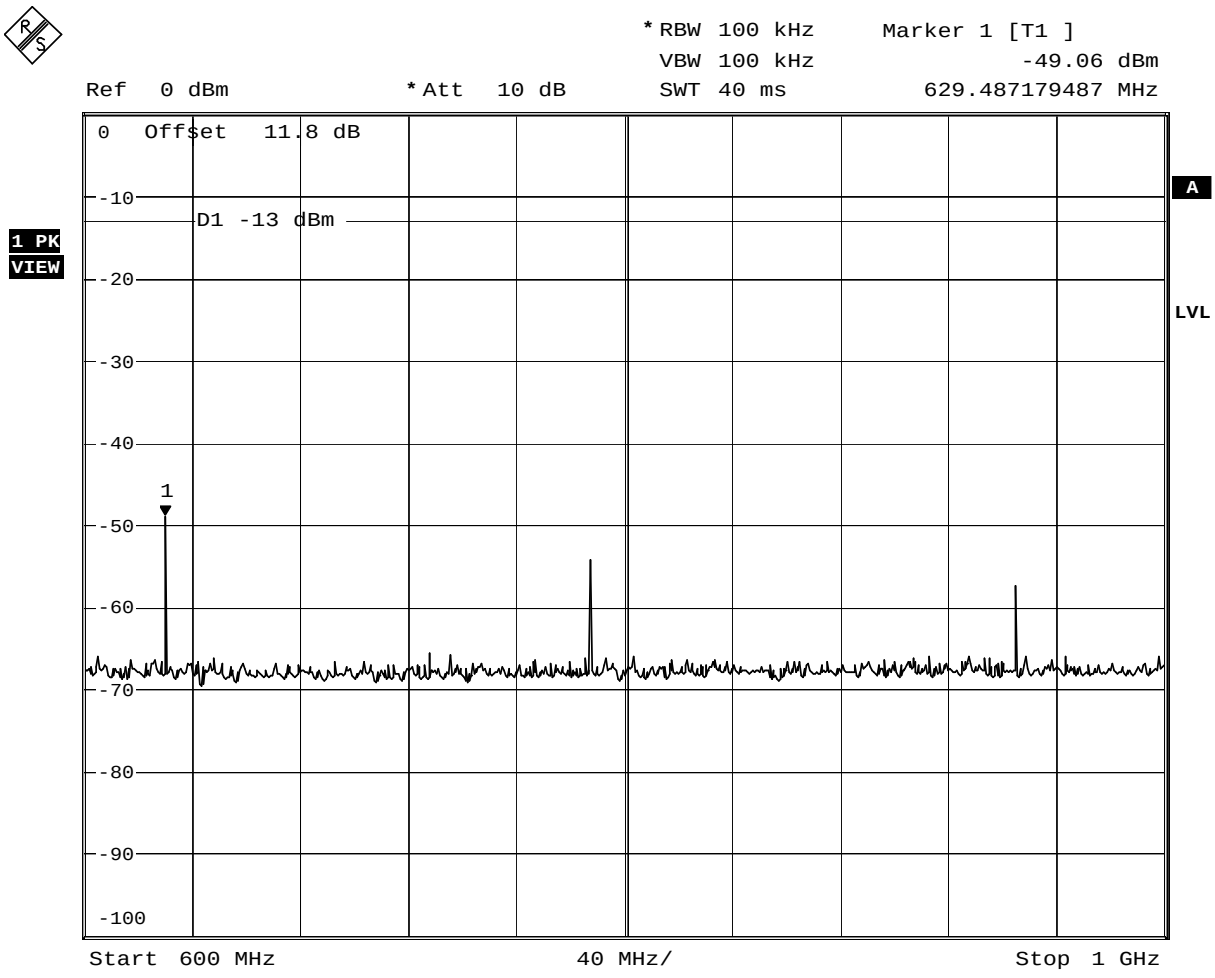
Date: 21.SEP.2007 16:01:09

Top Channel – 88 – 9kHz to 600MHz



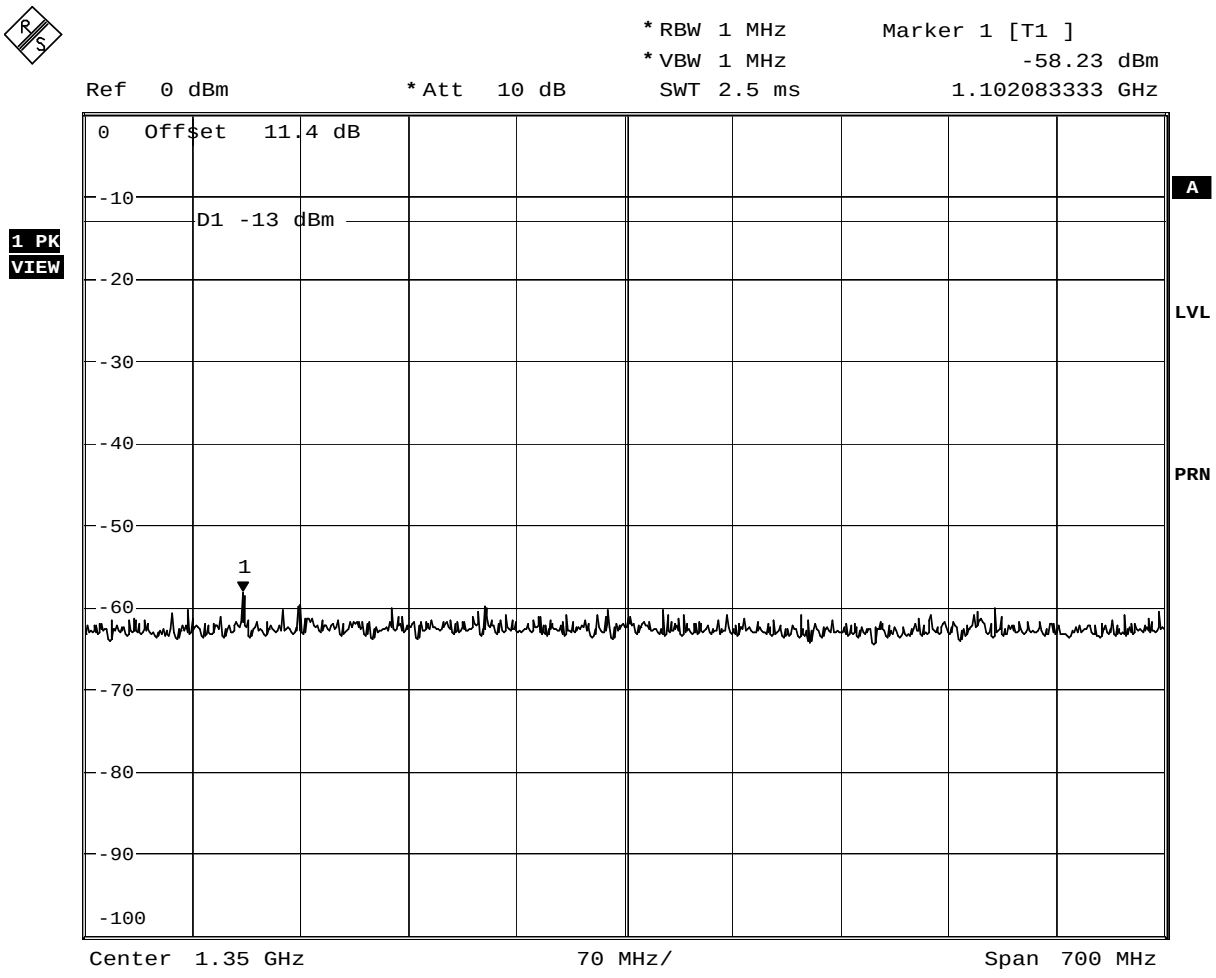
Date: 21.SEP.2007 16:34:10

Top Channel –88 – 600MHz to 1000MHz



Date: 21.SEP.2007 16:06:38

Top Channel –88 – 1000MHz to 1700MHz



Date: 21.SEP.2007 16:03:49

2.7 EMISSION LIMITATIONS (RADIATED TRANSMITTER SPURIOUS)

2.7.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.211(f)(3)

2.7.2 Equipment Under Test

MR HH125 Handheld VHF, _12

2.7.3 Date of Test and Modification State

13th September 2007 - Modification State 0

2.7.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT. The list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector.

Emissions identified within the range 1GHz – 2GHz were then formally measured using Peak and Average Detectors, as appropriate.

The measurements were performed at a 3m distance unless otherwise stated.

2.7.6 Environmental Conditions

Ambient Temperature	18.2°C
Relative Humidity	46%

2.7.7 Test Results

Bottom Channel – A1 – 30MHz to 2GHz

Frequency MHz	Antenna Polarisation	Antenna Height	Antenna Azimuth	Result (dBm)	Limit (dBm)	Margin (dBm)
469.31	Vertical	100	120	-20.7	-13.0	-7.7

All other emissions measured were greater then 15dB below the specification limit.

Middle Channel – 16 – 30MHz to 2GHz

Frequency MHz	Antenna Polarisation	Antenna Height	Antenna Azimuth	Result (dBm)	Limit (dBm)	Margin (dBm)
470.34	Vertical;	100	122	-20.4	-13.0	-7.4

All other emissions measured were greater then 15dB below the specification limit.

Top Channel – 88 – 30MHz to 2GHz

Frequency MHz	Antenna Polarisation	Antenna Height	Antenna Azimuth	Result (dBm)	Limit (dBm)	Margin (dBm)
473.20	Vertical	100	130	-20.9	-13.0	-7.9

All other emissions measured were greater then 15dB below the specification limit.

2.8 MODULATION CHARACTERISTICS

2.8.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.213

2.8.2 Equipment Under Test

MR HH125 Handheld VHF, _9

2.8.3 Date of Test and Modification State

19th September 2007 - Modification State 1

2.8.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.5 Test Procedure

In each of the test modes listed in the table below, the maximum frequency deviation was checked to ensure that the deviation remained within ±5kHz as defined in 3.4.

The frequency deviation remains within ±5kHz as the amplitude is fixed for the B and Y states, it is not possible for the deviation to exceed ±5kHz. The table shows that the EUT meets the requirements of the specification.

A curve has been produced displaying the frequency response of the audio modulating circuit over a range of 100Hz to 5kHz. The plot shows the data for all of the circuitry installed between the microphone input and the modulated stage.

The EUT was connected to a Modulation Analyser via a 30dB Attenuator. An Audio Analyser was connected to the microphone input at a set voltage level and the frequency varied between 100Hz and 5kHz. The demodulated audio was measured and plotted as a graph, which is shown below.

2.8.6 Environmental Conditions

Ambient Temperature	24°C
Relative Humidity	46%

2.8.7 Test Results

MODULATION FREQUENCY (Hz)	MAXIMUM DEVIATION (kHz)	
	CH 16	CH16 Amplitude Increased By 16dB
100	-0.220	+0.640
200	-0.440	-2.220
300	-0.746	+3.362
400	-1.071	+3.447
500	-1.396	+3.488
1000	-2.998	+4.120
2000	+3.785	+3.90
3000	+4.500	+4.57
4000	+1.848	+1.938
5000	+0.608	+0.631
Maximum Deviation (kHz)	+4.50	+4.570
Measurement uncertainty (Hz)	± 85	

2.9 TRANSMITTER POWER

2.9.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.215

2.9.2 Equipment Under Test

MR HH125 Handheld VHF, _12

2.9.3 Date of Test and Modification State

17th September 2007 - Modification State 0

2.9.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.9.5 Test Procedure

The EUT was connected via a 30dB attenuator to a power meter and sensor. The path loss between the EUT and the power sensor was measured and recorded. The power meter reading and adjusted by the path loss value.

The emissions designator for the EUT is declared as G3E. The measurement of G3E designations is defined as being Carrier Power.

The carrier power was measured on the top, middle and bottom channels of the operating frequency band at maximum and minimum power levels.

The carrier power was measured in two ways, modulated and unmodulated. The emissions designator is G3E and as such, this measurement is defined as carrier power.

2.9.6 Environmental Conditions

Ambient Temperature	24.1°C
Relative Humidity	25.8%

2.9.7 Test Results

Maximum Power – 3W Modulated

Test Mode	Output Power (Uncorrected) (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
(Bottom) Channel 1A	+4.04	30.2	34.24	2.655
Channel 16	+4.157	30.2	34.357	2.727
(Top) Channel 88	+4.16	30.2	34.36	2.729

Minimum Power - 1W Modulated

Frequency (MHz)	Output Power (Uncorrected) (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
(Bottom) Channel 1A	-1.95	30.2	28.25	0.668
Channel 16	-2.56	30.2	27.64	0.581
(Top) Channel 88	-279	30.2	27.41	0.551

Maximum Power – 3W Unmodulated

Test Mode	Output Power (Uncorrected) (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
(Bottom) Channel 1A	+14.25	19.57	33.82	2.41
Channel 16	+14.10	19.54	33.64	2.31
(Top) Channel 88	+14.12	19.54	33.66	2.32

Minimum Power - 1W Unmodulated

Frequency (MHz)	Output Power (Uncorrected) (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
(Bottom) Channel 1A	+4.63	19.57	24.20	0.263
Channel 16	+4.84	19.54	24.38	0.274
(Top) Channel 88	+4.71	19.54	24.25	0.266

Limit

≤ 25W or <+43.98 dBm and ≤ 1W or <+30.00 dBm

2.10 SUPPRESSION OF INTERFERENCE ABOARD SHIPS

2.10.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.217 (b)

2.10.2 Equipment Under Test

MR HH125 Handheld VHF, _12

2.10.3 Date of Test and Modification State

24th September 2007 - Modification State 0

2.10.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.10.5 Test Procedure

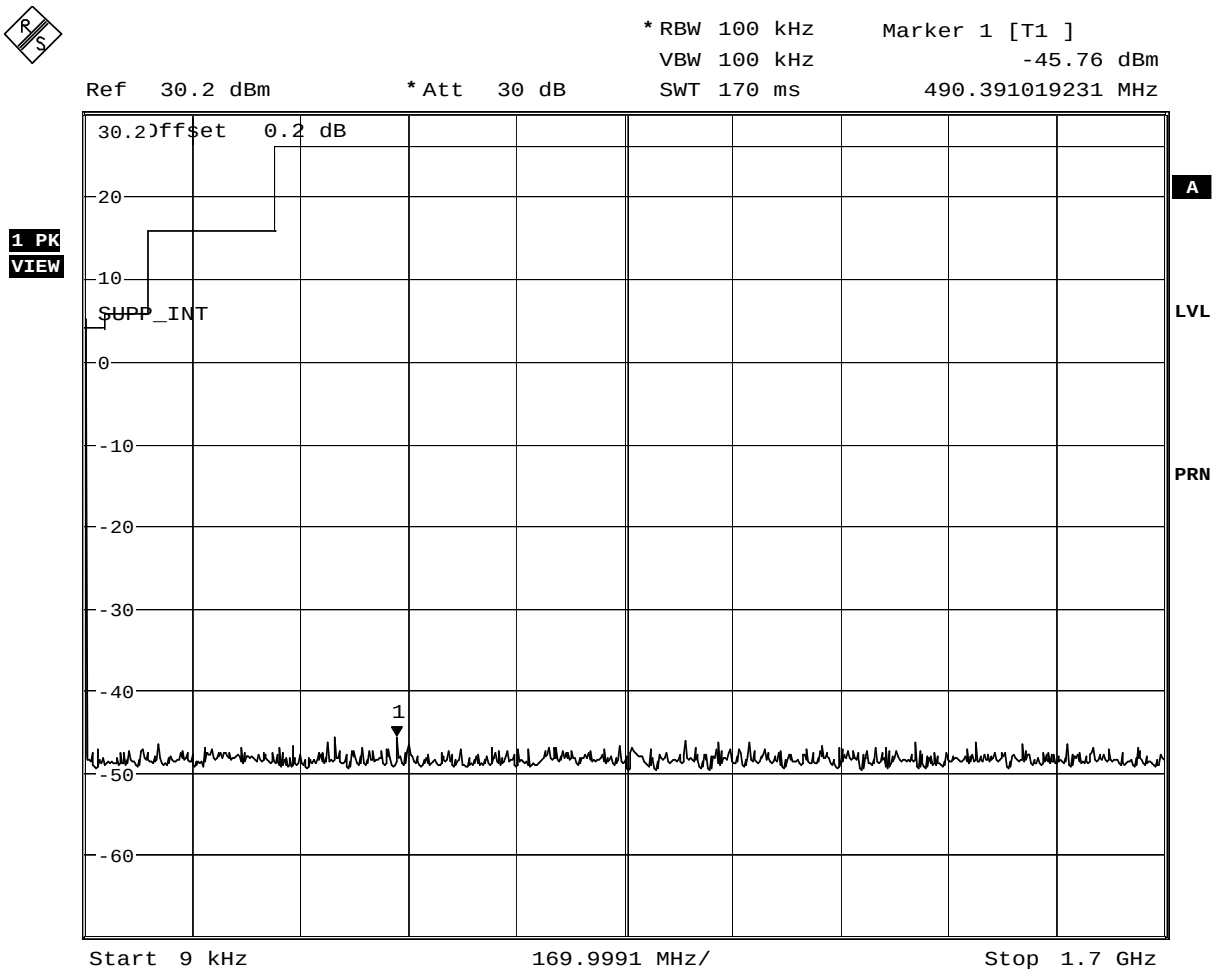
The EUT was connected to a spectrum Analyser via a cable. The EUT was set to its receive mode. The cable worst case cable loss was entered into the spectrum analyser as a reference level offset. The emissions were measured over the frequency range 9kHz to 1.7GHz with the Spectrum Analyser trace set to Max Hold.

2.10.6 Environmental Conditions

Ambient Temperature	21°C
Relative Humidity	42%

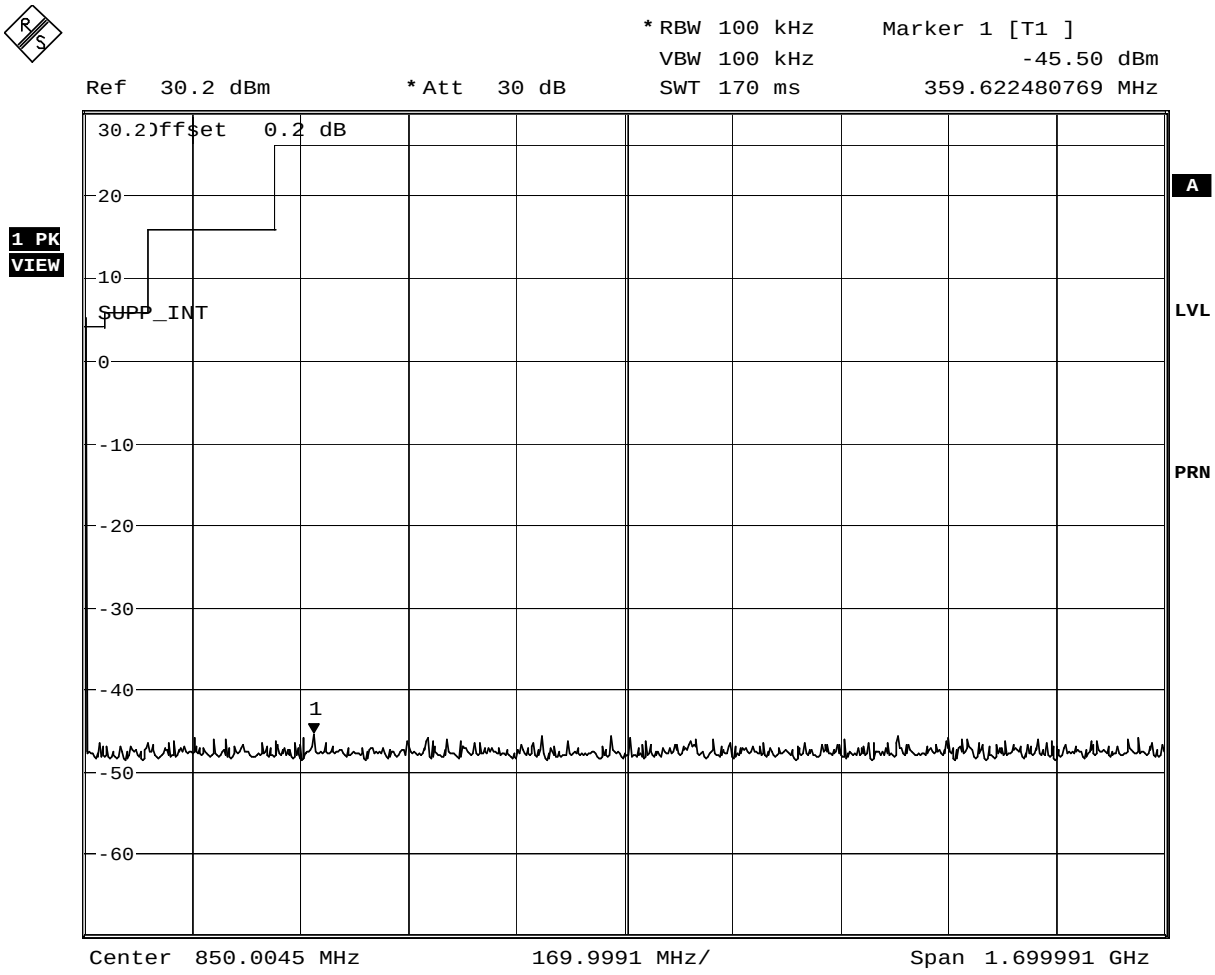
2.10.7 Test Results

Bottom Channel - 1A



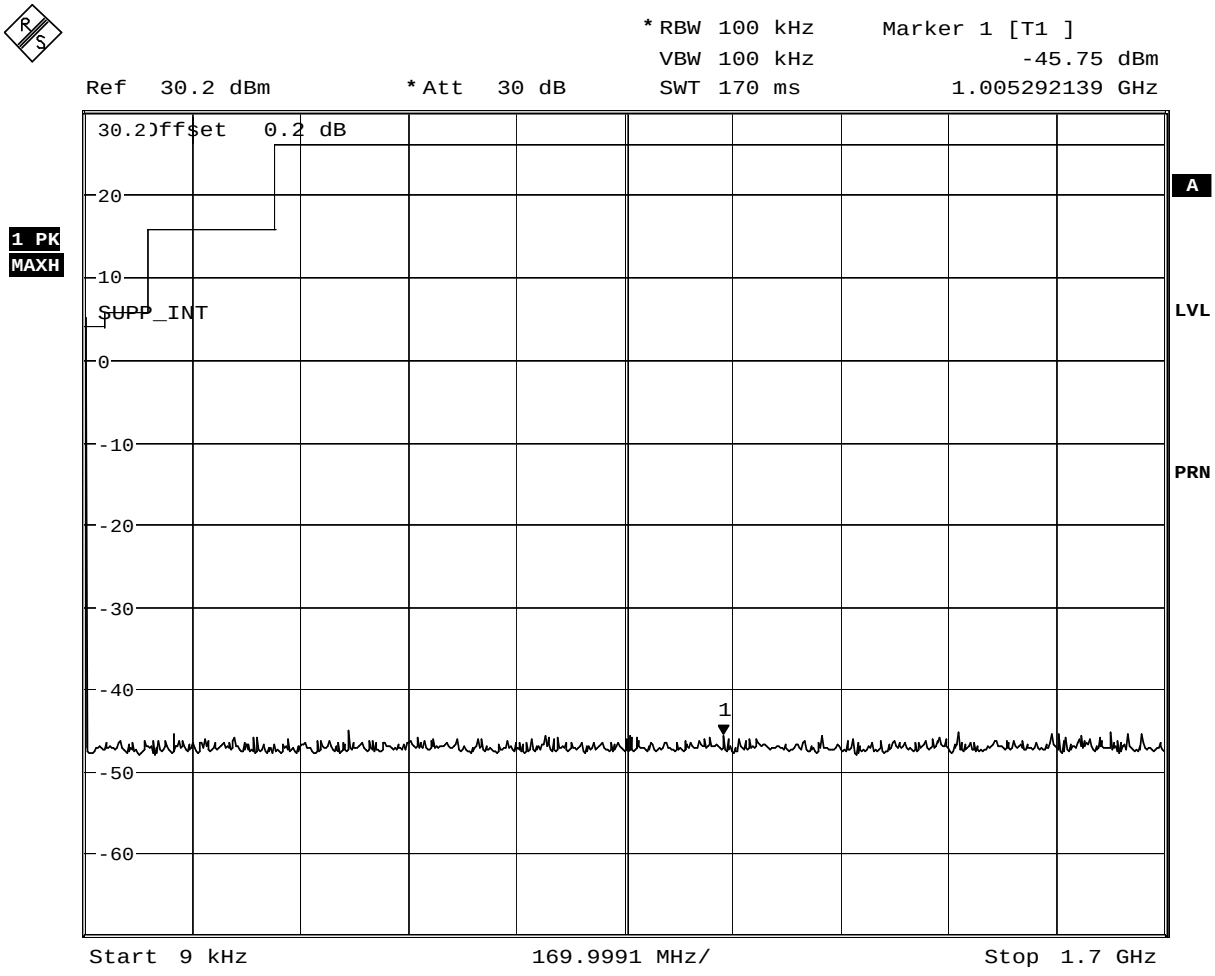
Date: 24.SEP.2007 15:19:41

Middle Channel - 16



Date: 24.SEP.2007 15:25:41

Top Channel - 88



Date: 24.SEP.2007 15:22:43

Product Service

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Sections 2.1 and 2.7 EMC - Radiated Emissions				
Spectrum Analyser	Hewlett Packard	8542E	18	9-Feb-2008
Antenna (Bilog)	Schaffner	CBL6143	287	13-Jan-2008
Modulation Analyser	Hewlett Packard	8901B	557	31-Oct-2007
Audio Analyser	Hewlett Packard	8903B	1350	12-Jul-2008
Screened Room (5)	Rainford	Rainford	1545	1-Mar-2008
Mast Controller	Inn-Co GmbH	CO 1000	1606	TU
Turntable/Mast Controller	EMCO	2090	1607	TU
Signal Generator	Marconi	2031	2015	18-Nov-2007
EMI Test Receiver	Rohde & Schwarz	ESIB26	2028	25-Jun-2008
Antenna (Bilog)	Chase	CBL6143	2904	10-Nov-2007
Section 2.10 Radio (Rx) - Suppression of Interference Aboard Ships				
DC Power Supply Unit	Hewlett Packard	6267B	294	O/P Mon
Hygromer	Rotronic	A1	2138	25-Apr-2008
Multimeter	Fluke	70 III	2277	15-Nov-2007
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	24-Jul-2008
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	11-Jul-2008

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.6 Radio (Tx) - Conducted Spurious Emissions				
DC Power Supply Unit	Hewlett Packard	6267B	294	O/P Mon
High Pass Filter	Mini-Circuits	NHP-300	1640	16-Aug-2008
Hygromer	Rotronic	A1	2138	25-Apr-2008
Multimeter	Fluke	70 III	2277	15-Nov-2007
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	24-Jul-2008
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	29-May-2008
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	11-Jul-2008
Tunable Notch Filter	Wainwright	WRCD 130.0/170.0-0.05/50-5EEK	3412	TU
Section 2.4 Radio (Tx) - Emission Mask				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
DC Power Supply Unit	Hewlett Packard	6267B	294	O/P Mon
Audio Analyser	Hewlett Packard	8903B	576	19-May-2008
Hygromer	Rotronic	A1	2138	25-Apr-2008
Multimeter	Fluke	70 III	2277	15-Nov-2007
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	24-Jul-2008
Sensor	Hewlett Packard	11722A	2787	21-Aug-2008
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	11-Jul-2008

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.2 and 2.3 Radio (Tx) - Frequency Characteristics				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Dual Power Supply Unit	Hewlett Packard	6253A	84	O/P Mon
Climatic Chamber	Votsch	VT4002	161	20-Feb-2008
DC Power Supply Unit	Hewlett Packard	6267B	294	O/P Mon
Digital Temperature Indicator	Fluke	51	1385	16-Aug-2008
Hygromer	Rotronic	A1	2138	25-Apr-2008
Multimeter	Fluke	70 III	2277	15-Nov-2007
Sensor	Hewlett Packard	11722A	2787	21-Aug-2008
Thermocouple Thermometer	Fluke	51	3174	18-Jun-2008
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	16-Apr-2008
Section 2.8 Radio (Tx) - Modulation Characteristics				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
DC Power Supply Unit	Hewlett Packard	6267B	294	O/P Mon
Audio Analyser	Hewlett Packard	8903B	576	19-May-2008
Hygromer	Rotronic	A1	2138	25-Apr-2008
Multimeter	Fluke	70 III	2277	15-Nov-2007
Sensor	Hewlett Packard	11722A	2787	21-Aug-2008

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.5 Radio (Tx) - Occupied Bandwidth				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Signal Generator	Rohde & Schwarz	SMY01	49	26-Jun-2008
Dual Power Supply Unit	Hewlett Packard	6253A	84	O/P Mon
Audio Analyser	Hewlett Packard	8903B	576	19-May-2008
Hygromer	Rotronic	A1	2138	25-Apr-2008
Multimeter	Fluke	70 III	2277	15-Nov-2007
Sensor	Hewlett Packard	11722A	2787	21-Aug-2008
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	16-Apr-2008
Section 2.9 Radio (Tx) - Power Characteristics				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Climatic Chamber	Votsch	VT4002	161	20-Feb-2008
DC Power Supply Unit	Hewlett Packard	6267B	294	O/P Mon
Digital Temperature Indicator	Fluke	51	1385	16-Aug-2008
Hygromer	Rotronic	A1	2138	25-Apr-2008
Multimeter	Fluke	70 III	2277	15-Nov-2007
Sensor	Hewlett Packard	11722A	2787	21-Aug-2008

TU – Traceability Unscheduled
OP MON – Output Monitored with Calibrated Equipment

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter	MU
Frequency Stability Under Voltage Variations		± 47Hz
Frequency Stability Under Temperature Variations		± 47Hz
Emission Limitations (Emission Mask)		± 1.11dB
Occupied Bandwidth		± 360Hz
Emission Limitations (Conducted Transmitter Spurious)		± 2.41dB
Emission Limitations (Radiated Transmitter / Receiver Spurious)	30MHz to 1GHz Amplitude	± 5.1dB
	1GHz to 40GHz Amplitude	6.3dB*
Modulation Characteristics		± 1.73%
Transmitter Power		± 0.7dB
Suppression of Interference Aboard Ships		± 2.41dB

Worst case error for both Time and Frequency measurement 12 parts in 10^6.

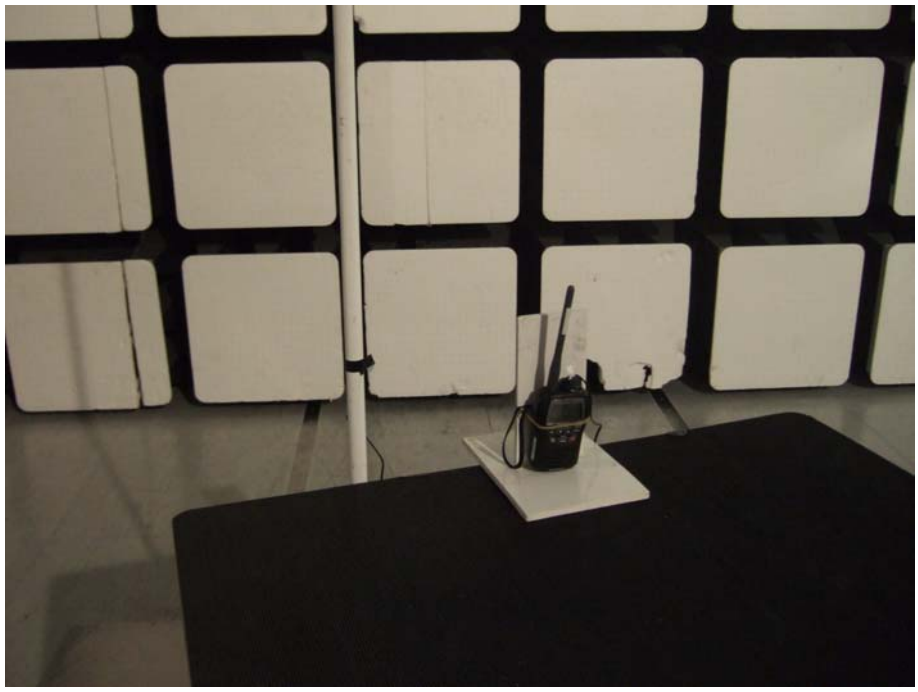
*In accordance with CISPR 16-4
†In accordance with UKAS Lab 34

Product Service

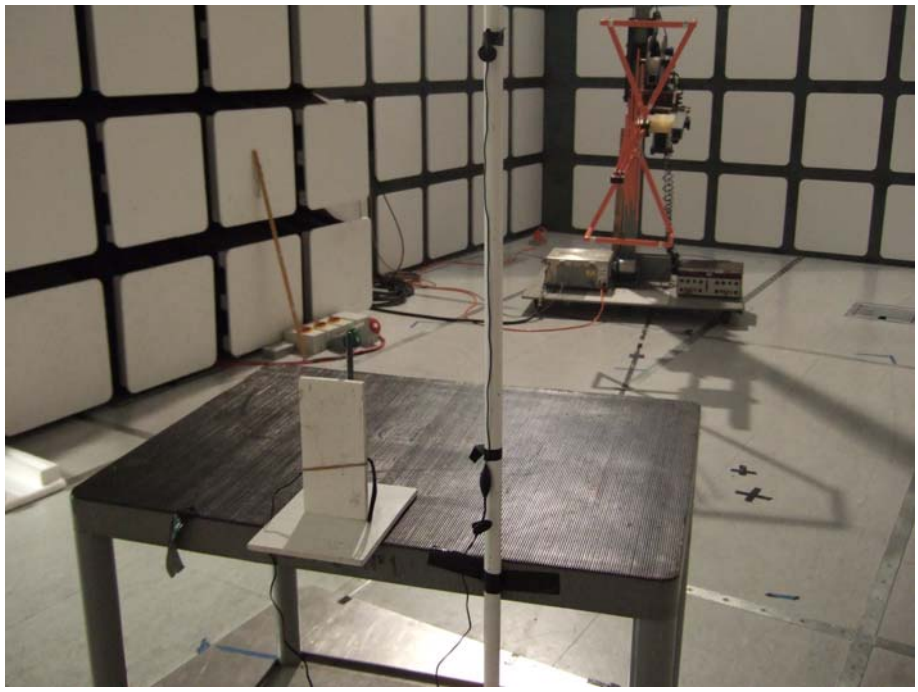
SECTION 4

PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EUT



Radiated Emissions Test Set up



Radiated Emissions Test Set up

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).