

FCC Licensed Transmitter Test Report for

S5 series Handheld transmitter S5.5HDX

Reference Standard 47CFR Part 2, Subpart J: Oct 2007 Manufacturer: BBM Electronics Group Ltd For type of equipment and serial number, refer to section 3 Report Number 10-217A/3479/3/07 Supersedes report number 10-217/3479/3/07 Report Produced by: -

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PAGE 1 OF 48 File name BBM.217A

REPORT NUMBER 10-217A/3479/3/07

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PAGE 2 OF 48 File name BBM.217A

1. Contents

1.		CONTENTS	3
2.	S	UMMARY OF TEST RESULTS	4
3.		INFORMATION ABOUT EQUIPMENT UNDER TEST	5
4.		SPECIFICATIONS	6
	4.1	Relevant Standards	6
	4.2	Deviations Applied	6
	4.3	Measurement Uncertainty	6
	4.4	Tests at Extremes of Temperature and Voltage	6
5.	T	ESTS, METHODS AND RESULTS	7
	5.1	Carrier Power	7
	5.2	Modulation Characteristics	9
	5.3	Occupied Bandwidth	11
	5.4	Spurious Emissions at Antenna Terminals	12
	5.5	Field Strength of Spurious Radiation.	
	5.6	Frequency Error	
6.	G	GRAPHICAL RESULTS	17
	6.1	Conducted Emissions.	17
	6.2	Modulation Limiting	32
	6.3	Audio Response	34
	6.4	Channel Bandwidth.	
7.	P	HOTOGRAPHS	39
	7.1	EUT Front View	39
	7.2	EUT Antenna	40
	7.3	EUT Display / Controls	41
	7.4	EUT Internal Construction	
	7.5	Test set-up, spurious emissions	
8.		SIGNAL LEADS.	
9.	T	EST EQUIPMENT CALIBRATION LIST	46
10).	AUXILIARY EQUIPMENT	47
	10.1		
	10.2		
11		MODIFICATIONS	

2. Summary of Test Results

The S5 series Handheld transmitter S5.5HDX was tested for compliance to the following standard for licensed transmitters: -

47CFR Part 2, Subpart J: Oct 2007 47CFR Part 74, Subpart H: Oct 2007 Class TBF Intentional Radiator

Title		References		Results	
1.	RF Power Output.	47CFR Part 2, Subpart J	conducted:	PASSED	
			radiated:	PASSED	
2.	Modulation	47CFR Part 2, Subpart J	frequency	PASSED	
	Characteristics.		response:		
			modulation	PASSED	
			limiting:		
3.	Occupied Bandwidth	47CFR Part 2, Subpart J		PASSED	
4.	Spurious Emissions at	47CFR Part 2, Subpart J		PASSED	
	Antenna Terminals.				
5.	Field Strength of	47CFR Part 2, Subpart J		PASSED	
	Spurious Radiation.				
6.	Frequency Stability.	47CFR Part 2, Subpart J		PASSED	

This report relates to the equipment tested as identified by a unique serial number and at the time it was tested. It does not relate to any other similar equipment and performance of the product before or after the test cannot be guaranteed.

The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Date of Test:	12th-19th October 2007	
Test Engineer:		
Approved By:		
Customer Representative:		

File name BBM.217A PAGE 4 OF 48

3. Information about Equipment Under Test

Applicant BBM Electronics Group Ltd

subsidiary of TOA Corporation

Kestral House Garth Road Morden Surrey SM4 4LP

Brand name of EUT Trantec

Model Number(s) of EUTs S5.5HDX

Serial Numbers of EUTs Tst3

FCC ID (if applicable): F3SS5HX

Date when equipment was received by

RN Electronics Limited 11th October 2007

Date of test: 12th-19th October 2007

Customer order number: sb5series

Visual description of EUT: small metal cylindrical enclosure with Mic head on the

top. The main body slides to reveal an on/off switch, two control buttons & an LCD display. At the bottom

is a small plastic cover over the end.

Main function of the EUT: A professional handheld radio microphone

EUT Information specification.

Height	245mm long
Width	37mm main body diameter
Depth	50mm head diameter
Weight	0.35kg
Voltage	1.5V
Current required from above voltage source	<300mA
Highest Frequencies used / generated	685.9 – 758.1 MHz

EUT Configurations for testing.

Choice of model(s) for type testing	Prototype	
Method of achieving an unmodulated carrier frequency	No Audio applied to mic input	
Audio capsule / test fixture used	Mic capsule in place but disconnected and soldered to audio leads	
Declared power level (dBm)	+20dBm	
Declared channel bandwidth (kHz)	200kHz	

Description of ancillary equipment connected to the equipment under test, for the purpose of tests, can be found in Section 10.

Auxiliary Equipment.

Any modifications made to the EUT, whilst under test, can be found in Section 11. Modifications

This report was printed on: 08 January 2008

File name BBM.217A PAGE 5 OF 48

4. Specifications

The tests were performed by RN Electronics Engineer Daniel Sims who set up the tests, the test equipment, and operated it in accordance with the *R.N. Electronics Ltd* procedures manual and the relevant standards listed below.

4.1 Relevant Standards

	Standard Number	Version	Description
4.1.1	47CFR Part 74,	7CFR Part 74, Oct Part 74 - Experimental Radio, Auxi	
	Subpart H	2007	And Other Program Distributional Services.
4.1.2	47CFR Part 2,	Oct	Part 2 - Frequency Allocations And Radio Treaty Matters;
	Subpart J	2007	General Rules And Regulations.
4.1.3	ITU Rec. SM.329 10 Unwanted emissions in the spurious domain		Unwanted emissions in the spurious domain
		(02/03)	_
4.1.4	TIA-603-C 2004 Land Mobile FM or PM Communications Equipmen		Land Mobile FM or PM Communications Equipment
			Measurement and Performance Standards

4.2 Deviations Applied

None.

4.3 Measurement Uncertainty

Parameter	Uncertainty	
RF frequency	<±7 x 10-8	
Conducted RF power into 50ohms	<±0.82 dB	
Maximum frequency deviation:	<±1 %	
Occupied Bandwidth	<±2 %	
Radiated emissions (valid up to 26.5 GHz).	<±3.4 dB	

4.4 Tests at Extremes of Temperature and Voltage

The following test conditions were used to simulate testing at nominal or extremes.

Voltage Test Conditions			
V nom 1.5V			
V min	1.2V		
V max	1.5V		

☐ A permanent internal RF port was used for testing.	
A test fixture was used for testing.	
A temporary RF port was created for testing.	
☐ The equipment external RF port was used for testing	·

File name BBM.217A PAGE 6 OF 48

5. Tests, Methods and Results

5.1 Carrier Power

5.1.1 Conducted

5.1.1.1 Test Methods

Test Requirements 47CFR Part 2, Subpart J
Test Method: TIA -603-C, Clause 2.2.1.
Limits: 47CFR Clause §74.861(e)(1)(ii)

5.1.1.1.1 Configuration of EUT

The EUT was tested on a test bench. Measurements were made via a soldered lead connected to the RF output point on the PCB.

5.1.1.1.2 Test Procedure

Tests were made in accordance with the Test Method noted above using the measuring equipment noted in the 'Test Equipment' Section. The power stated is the maximum power observed from an average power detector.

5.1.1.2 Test results

Ambient conditions.

Temperature: 20°C Relative humidity: 52%

	Bottom Channel	Middle Channel	Top Channel
Power measured (dBm)	+12.51	+12.41	+11.51
Converted to mW	17.8	17.4	14.2

Max power observed	Variation in power observed	
+12.51dBm	1.0dB	

Limits: 250mW (+24dBm)

5.1.1.3 Test Equipment used

E290, E291

See Section 9 for more details

File name BBM.217A PAGE 7 OF 48

5.1.2 Radiated

5.1.2.1 Test Methods

Test Requirements 47CFR Part 2, Subpart J
Test Method: TIA -603-C, Clause 2.2.17.2
Limits: 47CFR Clause §74.861(e)(1)(ii)

5.1.2.1.1 Configuration of EUT

The EUT was placed in a vertical position in a shielded anechoic chamber. New batteries were used in the EUT. It was confirmed from rotation in three orthogonal planes that a maximum was found. Measurements were made at 3m distance, then substitution was performed using a known signal generator.

5.1.2.1.2 Test Procedure

Tests were made in accordance with the Test Method noted above using the measuring equipment noted in the 'Test Equipment' Section. The power stated is the maximum power observed using a peak detector. The generator level was offset for loss in cables used. A reference dipole antenna was used, hence no antenna factors are recorded.

5.1.2.2 Test results

Ambient conditions.

Temperature: 17°C Relative humidity: 64%

	Bottom Channel	Middle Channel	Top Channel
Received level (dBm)	-28.0	-26.5	-29.3
LOSS (dB)	34.4	35.6	34.8
E.R.P. (dBm)	+6.4	+9.1	+5.5
Polarisation of	Vertical	Vertical	Vertical
measuring Antenna			

Max power observed	Variation in power observed
+9.1dBm	3.6dB

Limits: 250mW (+24dBm)

5.1.2.3 Test Equipment used

E266, TMS814, E285, E327

See Section 9 for more details

File name BBM.217A PAGE 8 OF 48

5.2 Modulation Characteristics

5.2.1 Frequency response

5.2.1.1 Test Methods

Test Requirements 47CFR Part 2, Subpart J
Test Method: 47CFR Part 2, Subpart J, §2.1047
Limits: 47CFR Clause §74.861(e)(3)

5.2.1.1 Configuration of EUT

The EUT was tested on the bench and ambient conditions were monitored. The audio input was connected to an audio analyser. The audio gain was set to maximum (level 9).

5.2.1.2 Test Procedure

Tests were made in accordance with the Test Method noted above using the measuring equipment noted in the 'Test Equipment' Section. The generated audio input was varied from 100Hz to 15kHz whilst the FM deviation was measured relative to that found at 1kHz.

5.2.2 Test Results

Ambient conditions.

Temperature: 23°C Relative humidity: 45%

Results for this test are presented graphically, please refer to section6. Graphical Results.

Limits: +/- 75kHz Max Deviation

5.2.3 Test Equipment used

TMS49, TMS55

See Section 9 for more details

File name BBM.217A PAGE 9 OF 48

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5.2.2 Modulation Limiting

5.2.2.1 Test Methods

Test Requirements 47CFR Part 2, Subpart J

Test Method: 47CFR Part 2, Subpart J, §2.1047

Limits: none stated

5.2.2.1 Configuration of EUT

The EUT was tested on the bench and ambient conditions were monitored. The audio input was connected to an audio analyser. The audio gain was set to maximum (level 9).

5.2.2.2 Test Procedure

Tests were made in accordance with the Test Method noted above using the measuring equipment noted in the 'Test Equipment' Section. For each input frequency chosen, the audio input level was varied and the FM deviation measured.

5.2.3 Test Results

Ambient conditions.

Temperature: 23°C Relative humidity: 45%

Results for this test are presented graphically, please refer to section 6. Graphical Results.

Limits: No Limits specified for this test.

5.2.4 Test Equipment used

E252, TMS49, TMS55

See Section 9 for more details

5.3 Occupied Bandwidth

5.3.1 Test Methods

Test Requirements: 47CFR Part 2, Subpart J

Test Method: 47CFR Part 2, Subpart J, §2.1049 Limits: 47CFR Clause §74.861(e)(5)

5.3.1.1 Configuration of EUT

The EUT was tested on the bench and ambient conditions were monitored. The audio input was connected to an audio analyser. The audio gain was set to maximum (level 9).

5.3.1.2 Test Procedure

Tests were made in accordance with the Test Method noted above, using the measuring equipment noted in the 'Test Equipment' section.

5.3.1.3 Test Results

Ambient conditions.

Temperature: 23°C Relative humidity: 52%

	Bottom Channel	Middle Channel	Top Channel
99% Bandwidth	92	92	93
measured (kHz)			

Results for this test are also presented graphically, please refer to section 6. Graphical Results.

Limits: 200kHz.

5.3.1.4 Test Equipment used

TMS6-2, TMS55, TMS49

See Section 9 for more details

5.4 Spurious Emissions at Antenna Terminals

5.4.1 Conducted

5.4.1.1 Test Methods

Test Requirements 47CFR Part 2, Subpart J
Test Methods: TIA -603-C, Clause 2.2.13
ITU-R Rec. SM.329

Limits: 47CFR Clause §74.861(e)(6)(iii)

5.4.1.1.1 Configuration of EUT

The EUT was tested on a test bench. Measurements were made via a soldered lead connected to the RF output point on the PCB.

5.4.1.1.2 Test Procedure

Tests were made in accordance with the Test Method noted above using the measuring equipment noted in the 'Test Equipment' Section. The power stated is the maximum power observed using a peak detector. Bandwidth settings are per FCC / ITU-R rules, not the TIA reference. Bandpass filters are used at frequencies of interest, not a notch filter as stated in the TIA reference.

5.4.1.2 Test results

Ambient conditions.

Temperature: 20°C Relative humidity: 57%

TABLE OF SPURIOUS EMISSIONS

Channel	Low Channel 685.9MHz
Channel Spacing	200kHz
Modulation Type	FM
Power Level	Max power

Spurious Frequency (MHz)	Measured Spurious Level (dBm)
NONE WITHIN 20dB of LIMIT	
Frequency Range	Plot Number
9 – 150kHz	019
150k – 30 MHz	020
30 – 500 MHz	021
500 – 1000 MHz	022
1 – 2 GHz	023
2 – 3 GHz	024
3 – 4 GHz	025
4 – 6 GHz	026
6 – 8 GHz	027

File name BBM.217A PAGE 12 OF 48

TABLE OF SPURIOUS EMISSIONS

Channel	Middle Channel 722MHz
Channel Spacing	200kHz
Modulation Type	FM
Power Level	Max power

Spurious Frequency (MHz)	Measured Spurious Level (dBm)
NONE WITHIN 20dB of LIMIT	
Frequency Range	Plot Number
9 – 150kHz	010
150k – 30 MHz	011
30 – 500 MHz	012
500 – 1000 MHz	013
1 – 2 GHz	014
2 – 3 GHz	015
3 – 4 GHz	016
4 – 6 GHz	017
6 – 8 GHz	018

TABLE OF SPURIOUS EMISSIONS

Channel	High Channel 758.1MHz
Channel Spacing	200kHz
Modulation Type	FM
Power Level	Max power

Spurious Frequency (MHz)	Measured Spurious Level (dBm)
NONE WITHIN 20dB of LIMIT	
Frequency Range	Plot Number
9 – 150kHz	001
150k – 30 MHz	002
30 – 500 MHz	003
500 – 1000 MHz	004
1 – 2 GHz	005
2 – 3 GHz	006
3 – 4 GHz	007
4 – 6 GHz	008
6 – 8 GHz	009

LIMITS: 43+10log10 (mean output power in watts) dB. I.e. -13dBm.

The plots referred to in the above table may be found in section 6. Graphical Results

5.4.1.3 Test Equipment used

TMS55, E266, TMS6-2

See Section 9 for more details

File name BBM.217A PAGE 13 OF 48

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5.5 Field Strength of Spurious Radiation.

5.5.1 Test Methods

Test Requirements: 47CFR Part 2, Subpart J
Test Methods: TIA -603-C, Clause 2.2.12
ITU-R Rec. SM.329

Limits: 47CFR Clause §74.861(e)(6)(iii)

5.5.1.1 Configuration of EUT

The EUT was placed in a vertical position in a shielded anechoic chamber. New batteries were used in the EUT. It was confirmed from rotation in three orthogonal planes that a maximum was found. Measurements were made at 3m distance, then substitution was performed using a known signal generator.

5.5.1.2 Test Procedure

Tests were made in accordance with the Test Methods noted above using the measuring equipment noted in the 'Test Equipment' Section. Bandwidth settings are per FCC / ITU-R rules, not the TIA reference.

5.5.2 Test Results

Ambient conditions.

Temperature: 17°C Relative humidity: 64%

Table of spurious emissions within 20dB of limits.

Channel Name	Low Channel
Channel Frequency	685.9 MHz
Channel Spacing	200kHz
Power Level	Max power

Spurious Frequency (MHz)	Measured Spurious	Antenna	EUT
	Level (dBm)	Polarisation	Polarisation
NONE FOUND WITHIN 20dB			

Table of spurious emissions within 20dB of limits.

Channel Name	Middle Channel
Channel Frequency	722 MHz
Channel Spacing	200kHz
Power Level	Max power

` ,	Polarisation	Polarisation
	HIN OdB	

File name BBM.217A PAGE 14 OF 48

Table of spurious emissions within 20dB of limits.

Tuble of spurious emissions within 200B of mines.				
Channel Name	High Channel			
Channel Frequency	758.1 MHz			
Channel Spacing	200kHz			
Power Level	Max power			

Spurious Frequency (MHz)	Measured Spurious	Antenna	EUT
	Level (dBm)	Polarisation	Polarisation
NONE FOUND WITHIN 20dB			

LIMITS: 43+10log10 (mean output power in watts) dB. I.e. -13dBm.

The plots referred to in the above table may be found in section 6. Graphical Results

5.5.3 Test Equipment Used

E136, E266, E268, E285, E3, E327, TMS77, TMS814, TMS82, N438, E239, E238, E320

See Section 9 for more details

File name BBM.217A PAGE 15 OF 48

5.6 Frequency Error

5.6.1 Test Methods

Test Requirements: 47CFR Part 2, Subpart J

Test Method: 47CFR Part 2, Subpart J, Clause §2.1055

Limits: 47CFR Clause §74.861(e)(4)

5.6.1.1 Configuration of EUT

The EUT was placed in a temperature controlled chamber and thermal balance was achieved at each temperature set before testing commenced.

5.6.1.2 Test Procedure

Tests were made in accordance with the Test Method noted above using the measuring equipment noted in the 'Test Equipment' Section. At each temperature extreme, the EUT was switched on in the transmit condition for one minute, after which the tests were conducted.

5.6.2 Test results

Ambient conditions.

Temperature: 20°C Relative humidity: 41%

Radio parameters.

O/P Power: Max Modulation: CW

TABLE OF FREQUENCY ERROR

Temperature	Voltage	Bottom Channel	Middle Channel	Top Channel
-30°C	Nominal	685.900123	722.000262	758.100363
-20°C	Nominal	685.901930	722.001825	758.101144
-10°C	Nominal	685.900062	722.000317	758.100482
0°C	Nominal	685.901100	722.001095	758.101232
+10°C	Nominal	685.901039	722.001121	758.101157
+20°C	Nominal	685.899985	722.000025	758.100066
+20°C	Minimum	685.899792	721.999842	758.099828
+20°C	Maximum	685.899985	721.000025	758.100066
+30°C	Nominal	685.899366	721.999365	758.099336
+40°C	Nominal	685.898012	721.997858	758.097942
+50°C	Nominal	685.897388	721.997227	758.097078

	Bottom Channel	Middle Channel	Top Channel
Variation in Frequency (+/-Hz)	+1930 / -2612	+1825 / -2773	+1232 / -2922
Worst case observed (%)	+0.0003 / -0.0004		

Limits: +/-0.005% (50ppm)

5.6.3 Test Equipment used

E227, E3, TMS38, TMS57, TMS73, TMS80

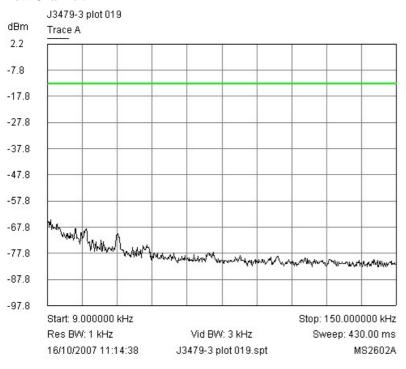
See Section 9 for more details

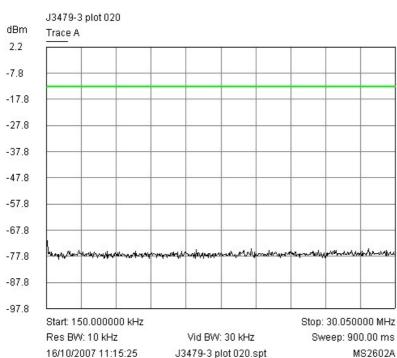
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6. **Graphical Results**

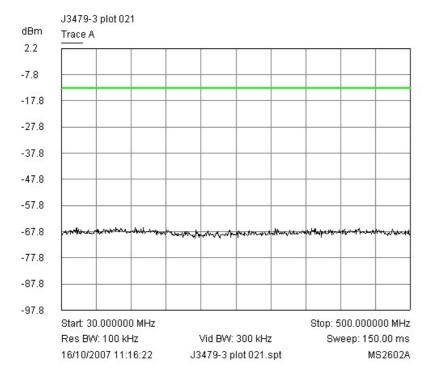
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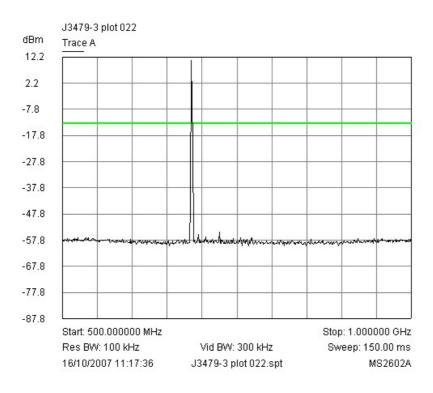
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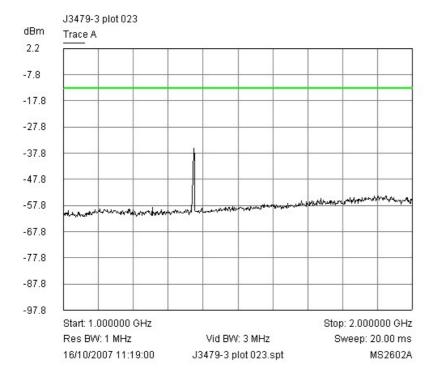


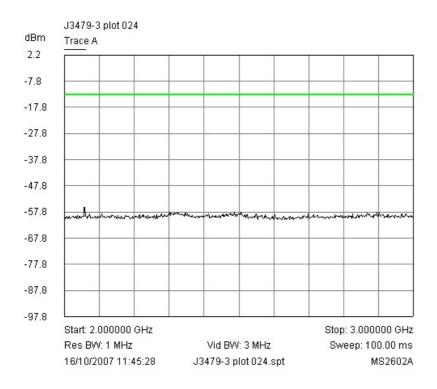
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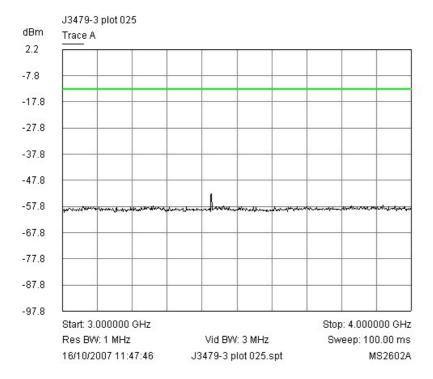


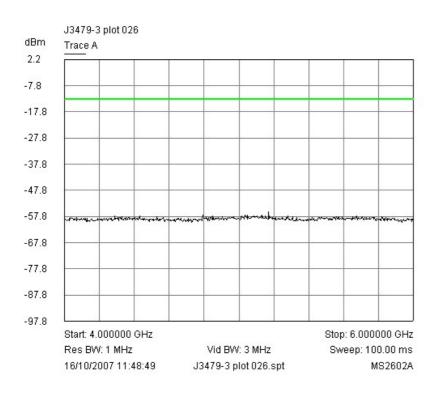
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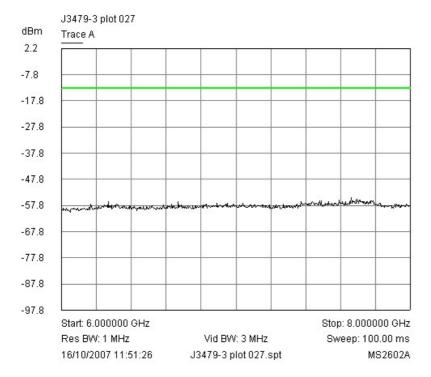


PAGE 19 OF 48 File name BBM.217A



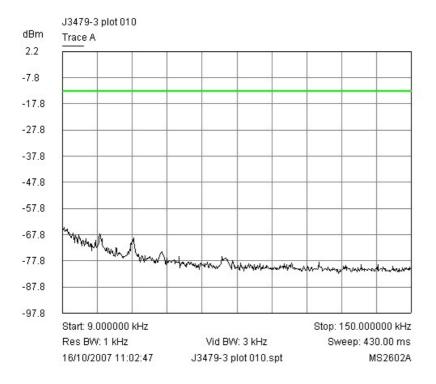


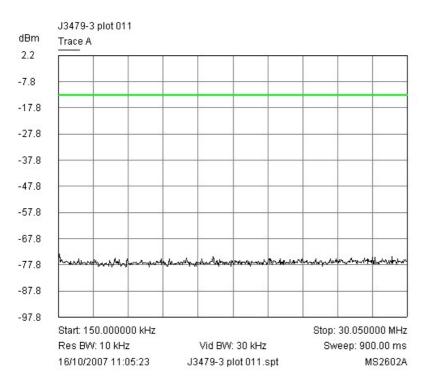
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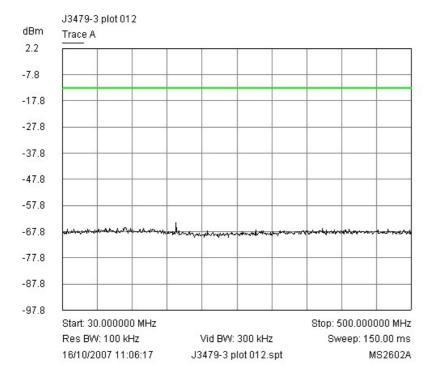
PAGE 21 OF 48 File name BBM.217A

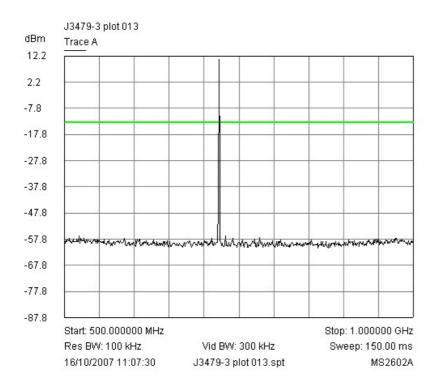
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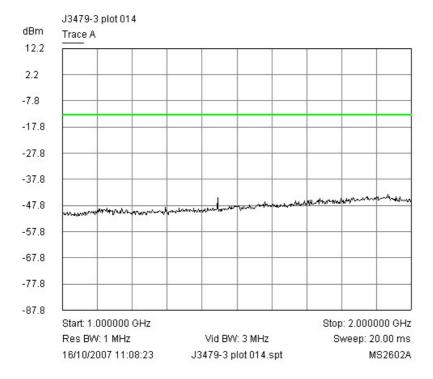


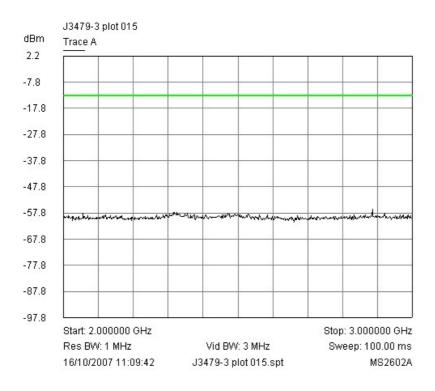
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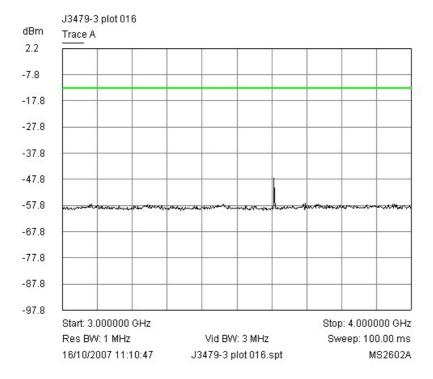


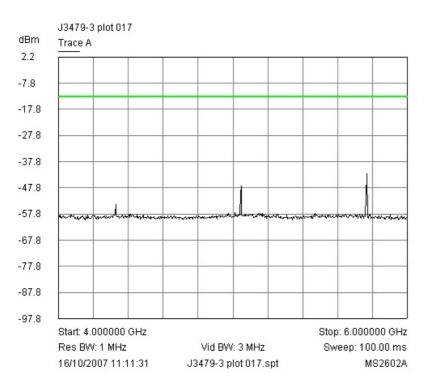
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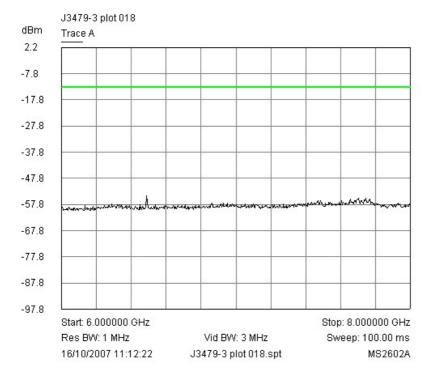


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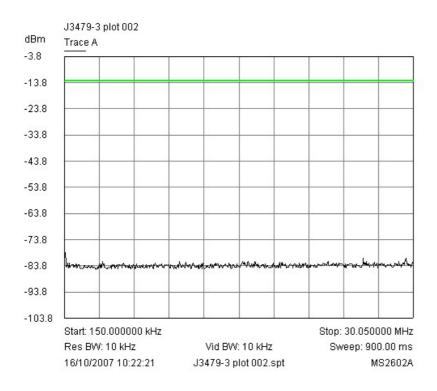
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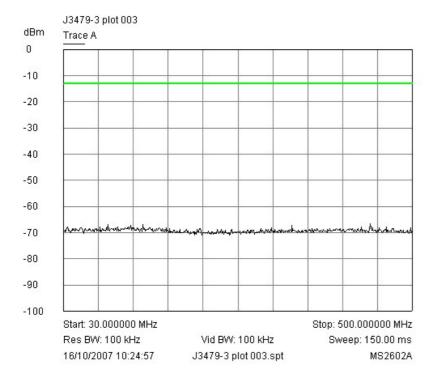
PAGE 26 OF 48 File name BBM.217A

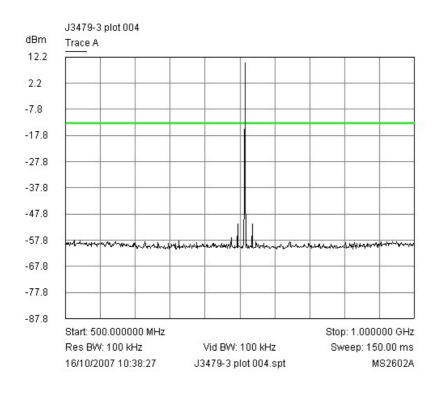
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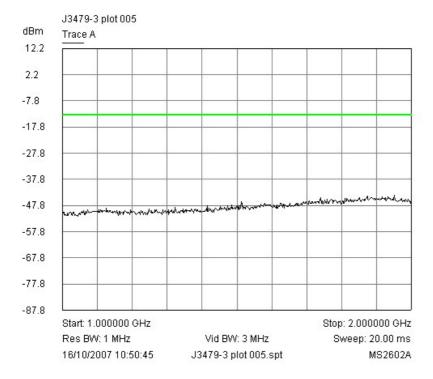


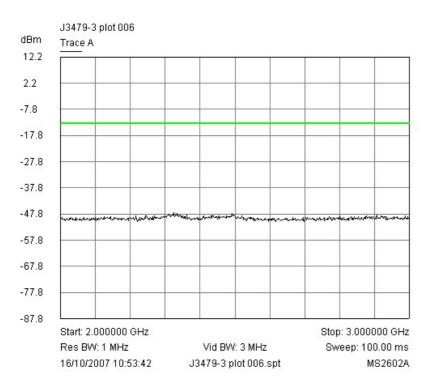
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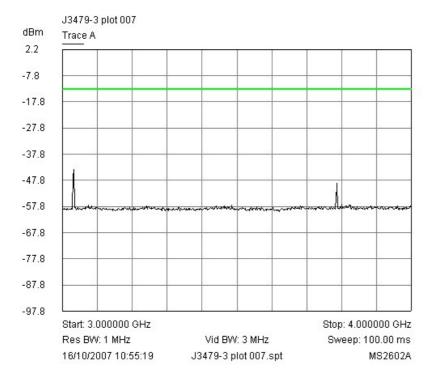


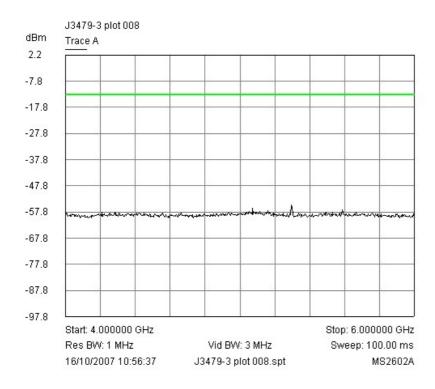
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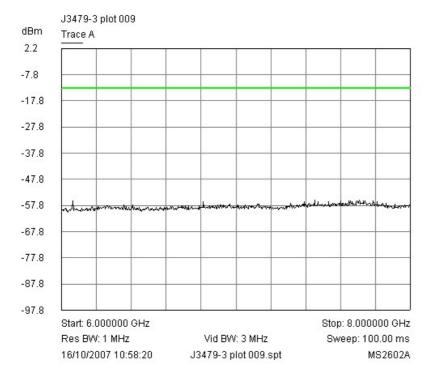


PAGE 29 OF 48 File name BBM.217A



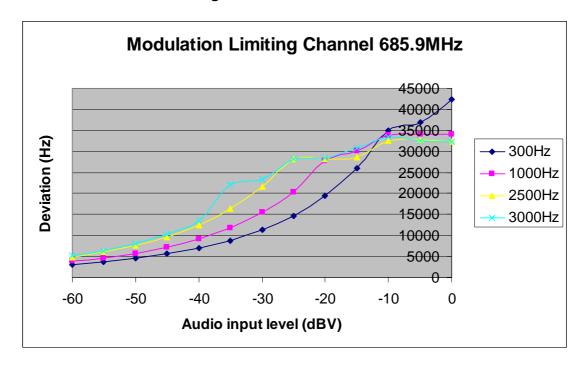


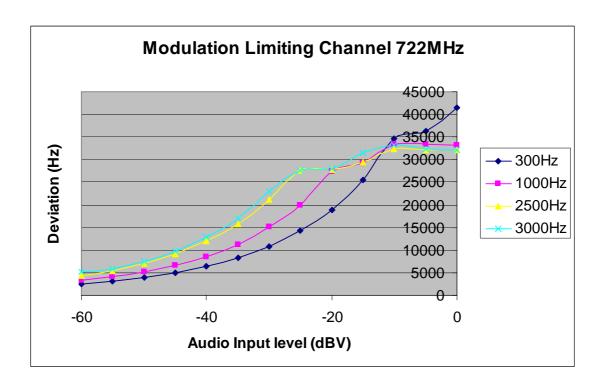
File name BBM.217A PAGE 30 OF 48



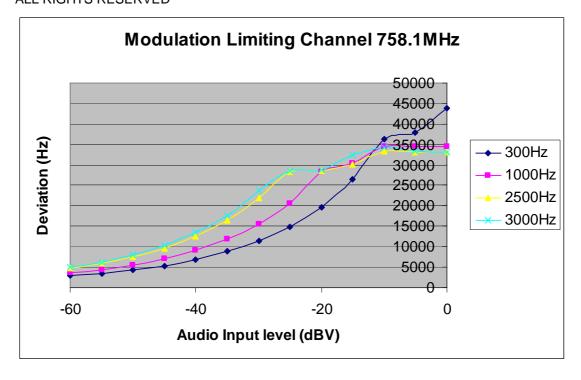
File name BBM.217A PAGE 31 OF 48

6.2 **Modulation Limiting.**



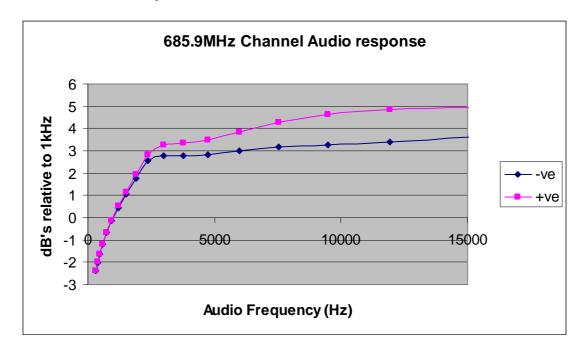


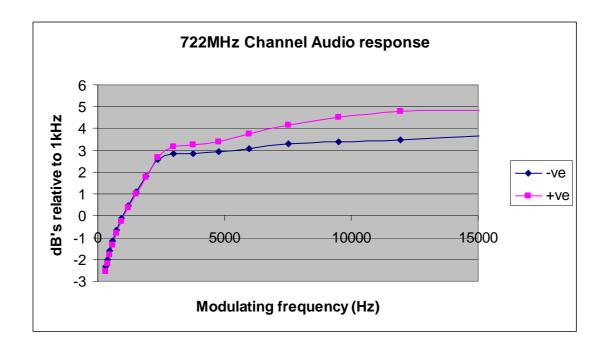
PAGE 32 OF 48 File name BBM.217A



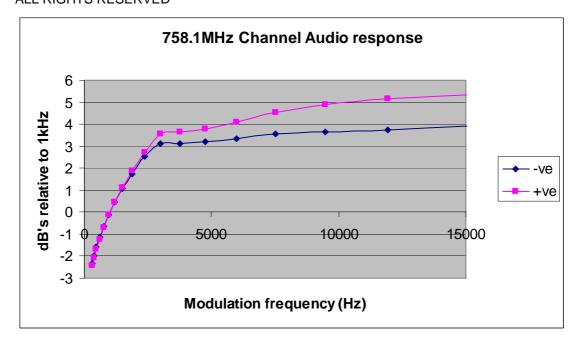
PAGE 33 OF 48 File name BBM.217A

6.3 Audio Response.



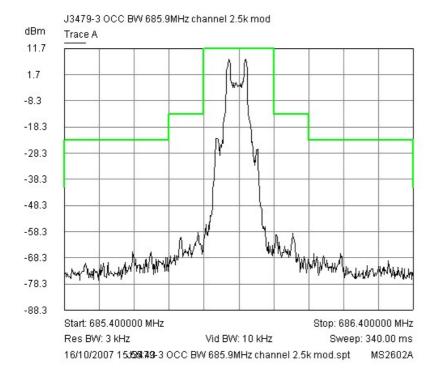


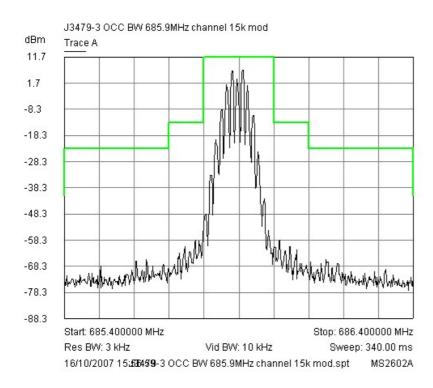
PAGE 34 OF 48 File name BBM.217A



File name BBM.217A PAGE 35 OF 48

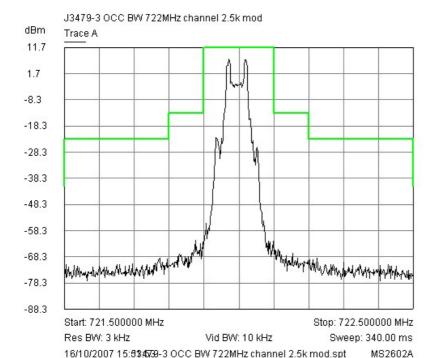
6.4 Channel Bandwidth.

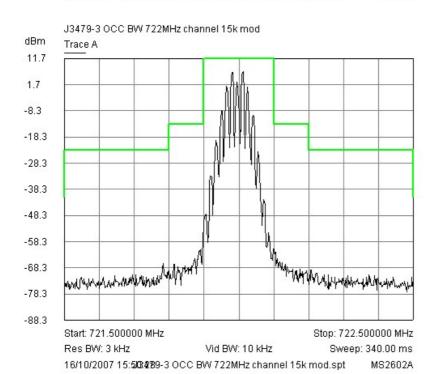




File name BBM.217A PAGE 36 OF 48

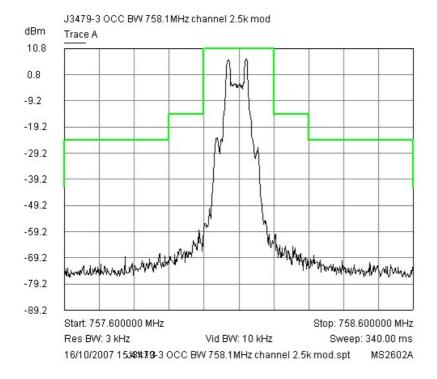
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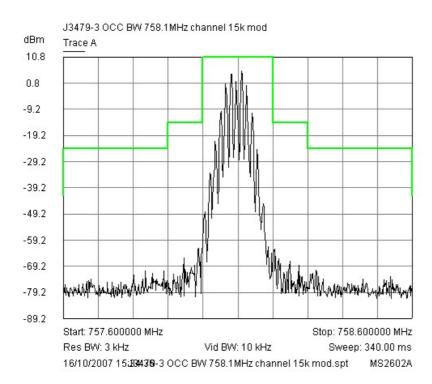




PAGE 37 OF 48 File name BBM.217A

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File name BBM.217A PAGE 38 OF 48

7. Photographs

7.1 EUT Front View



File name BBM.217A PAGE 39 OF 48

7.2 **EUT Antenna**



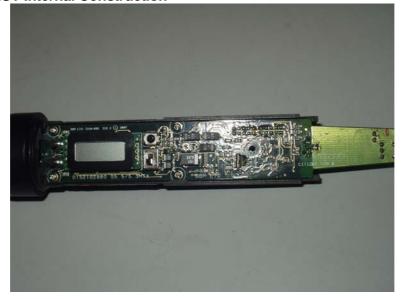
PAGE 40 OF 48 File name BBM.217A

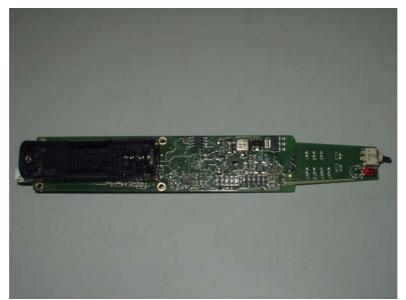
EUT Display / Controls 7.3

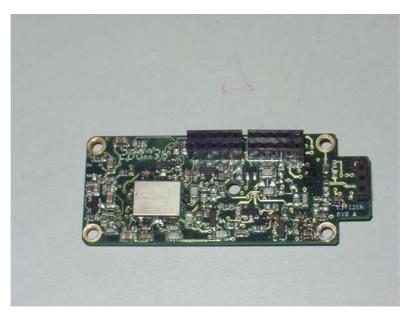


PAGE 41 OF 48 File name BBM.217A

7.4 EUT Internal Construction







File name BBM.217A PAGE 42 OF 48 QMF21J – 3; FCC CFR 47 PART 2 J OCT 2004; RNE ISSUE 02 NOV 07



File name BBM.217A PAGE 43 OF 48

7.5 Test set-up, spurious emissions





File name BBM.217A PAGE 44 OF 48

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REPORT NUMBER 10-217A/3479/3/07

8. Signal Leads

NONE.

File name BBM.217A PAGE 45 OF 48

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9. Test Equipment Calibration list

The Following is a list of the test equipment currently in use at **R.N. Electronics Ltd.** EMC test facility. In line with our quality procedures, the equipment used will be within calibration for the period during which testing was carried out.

RNNo	Model	Description	Manufacturer	Date Calibrated	Period
E136	3105	Horn Antenna	EMCO	N/A	N/A
E227	6632A	System DC Power Supply	Hewlett Packard	07-Nov-07	12
E238	FC5343A	2.7 - 5.0 GHz BPF	IFR	N/A	N/A
E239	H-34-2720-01	2.0 - 2.9 GHz BPF	Marconi	N/A	N/A
E252	6810.19.A	10 dB Attenuator	Suhner	03-Oct-07	12
E266	2032	5.4GHz Signal Generator	Marconi Instruments	14-Feb-06	24
E266	2032	5.4GHz Signal Generator	Marconi Instruments	14-Feb-06	24
E268	BHA 9118	1-18 GHz Horn Antenna	Schaffner	26-May-06	60
E285	8546A	EMI Receiver	Hewlett Packard	07-Sep-07	12
E285	8546A	EMI Receiver	Hewlett Packard	07-Sep-07	12
E290	6914	Power Sensor	Marconi Instruments	08-Nov-06	24
E291	6960A	RF Power Meter	Marconi Instruments	08-Nov-06	24
E3	HP8593E	Spectrum Analyser	Hewlett Packard	20-Sep-06	24
E320	8430A	Bandpass Filter 800 MHz - 2.0 GHz	HP	N/A	N/A
E327	CBL6141A	Bi-log Antenna	Schaffner	22-Oct-07	24
N438	3513 172 1208	3.9 - 7.5 GHz BPF	MEL	N/A	N/A
TMS38	VMT04/140	Environmental Oven	Heraeus Votsch	N/A	N/A
TMS49	8901B	Modulation Analyser	Hewlett Packard	24-Mar-06	24
TMS55	8903B	Audio Analyser	Hewlett Packard	07-Nov-06	24
TMS57	2534	Digital Multimeter	Philips	14-Dec-05	24
TMS6-2	MS2602A	Spectrum Analyser	Anritsu	17-Mar-07	12
TMS73	0.083333333	Off Air Standard	Quartzlock	N/A	N/A
TMS77	8673B	Synthesised Signal Generator	Hewlett Packard	14-Nov-05	24
TMS80	206-3722	Digital Thermometer & K Probe	RS Components Ltd	12-May-07	12
TMS814	MP627A	Doublet Antenna 200-1700 MHz	Anritsu Electric Co Ltd	08-Feb-05	36
TMS82	8449B	Pre Amplifier 1 - 26 GHz	Agilent	26-Oct-07	12
TMS903	CBL6111A	Bilog Antenna 30MHz - 1GHz	Chase	14-Mar-07	36

File name BBM.217A PAGE 46 OF 48

10. Auxiliary Equipment

10.1 Supplied by BBM Electronics

Auxiliary equipment used for the purpose of test supplied by the above has been listed below NONE.

10.2 Supplied by RN Electronics Limited

Auxiliary equipment used for the purpose of test supplied by the above has been listed below

NONE.

File name BBM.217A PAGE 47 OF 48

11. Modifications

In order for the EUT to produce the results shown within this report the following modifications, if any, were implemented.

NONE.

File name BBM.217A PAGE 48 OF 48



Certificate of Test

The equipment noted below has been tested by **R.N. Electronics Limited** and conforms with the relevant subpart of chapter 47 of the Code of Federal Regulations tested per 47CFR2 subpart J.

This certificate relates to the equipment, as identified by unique serial number(s) and further detailed in the referenced report, in the condition(s) at the time it was tested. It does not relate to any other similar equipment and performance of the product before or after the test cannot be guaranteed. Furthermore, this is a certificate of test only and should not be confused with an equipment authorisation.

Equipment:	Trantec S5 series Handheld transmitter S5.5HDX			
FCC ID (if applicable):	F3SS5HX			
Manufacturer:	BBM Electronics Group Ltd			
Customer Purchase Order Number:	sb5series			
R.N. Electronics Limited Report Number:	10-217A/3479/3/07			
Test Standards:	47CFR Part 2, Subpart J: Oct 2007			
Date:	12th-19th October 2007			
The measurement uncertainty gives a 95% confidence that the equipment meets the limits specified in the standards				
For and on behalf of R.N. Electronics Limited				
Signature:	Tachnical Managar			
	Technical Manager			

QMF21J - 3; FCC CFR 47 PART 2 J OCT 2004; RNE ISSUE 02 NOV 07