



FCC Licensed Transmitter Test Report

for

**Beltpack Radio Mic
S4.4LTX-UL**

Reference Standard 47CFR Part 2, Subpart J : Oct 2005
Manufacturer BBM Electronics
For type of equipment and serial number, refer to section 3
Report Number 04-104/3088/2/06
Report Produced by: -

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2. Summary of Test Results

The Beltpack Radio Mic S4.4LTX-UL was tested for compliance to the following standard for licensed transmitters: -

47CFR Part 2, Subpart J : Oct 2005
47CFR Part 74, Subpart H : Oct 2005

Title	References	Results
1. RF Power Output.	47CFR Part 2, Subpart J	conducted: PASSED
		radiated: PASSED
2. Modulation Characteristics.	47CFR Part 2, Subpart J	frequency response: PASSED
		modulation limiting: PASSED
3. Occupied Bandwidth	47CFR Part 2, Subpart J	PASSED
4. Spurious Emissions at Antenna Terminals.	47CFR Part 2, Subpart J	PASSED
5. Field Strength of Spurious Radiation.	47CFR Part 2, Subpart J	PASSED
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: 24th-28th April 2006

Test Engineer:

Approved By:
Technical Manager.

3. Information about Equipment Under Test

Applicant BBM Electronics
Kestral House
Garth Road
Morden
Surrey
SM4 4LP

Brand name of EUT Trantec

Model Number(s) of EUTs S4.4LTX-UL

Serial Numbers of EUTs -

FCC ID (if applicable): DLAWM-S300

Date when equipment was received by
RN Electronics Limited 20th April 2006

Date of test: 24th-28th April 2006

Customer order number: Not specified.

Visual description of EUT: Small plastic enclosure with antenna and Mic input on the top. The unit has an OFF/ON switch on the front and a flip up cover revealing a battery compartment and channel switch.

Main function of the EUT: Belt or body worn microphone transmitter pack.

EUT Information specification.

Height	190mm
Width	65mm
Depth	30mm
Weight	100g
Voltage	9V DC
Current required from above voltage source	not specified

EUT Configurations for testing.

Choice of model(s) for type testing	Standard model.
Method of achieving an unmodulated carrier frequency	Mic input left at 0V and 0Hz
Audio capsule / test fixture used	Mic input socket .
Declared power level (dBm)	<250mW
Declared channel bandwidth (kHz)	<200kHz

n.b. EUT is also marketed under the brand name TOA Corporation, model # WM-S300.

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: 14 June 2006

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, Subpart H	Oct 2005	Part 74 - Experimental Radio, Auxiliary, Special Broadcast And Other Program Distributional Services.
4.1.2	47CFR Part 2, Subpart J	Oct 2005	Part 2 - Frequency Allocations And Radio Treaty Matters; General Rules And Regulations.
4.1.3	ITU Rec. SM.329	10 (02/03)	Unwanted emissions in the spurious domain

4.2 Measurement Uncertainty

Parameter	Uncertainty
RF frequency	$<\pm 1 \times 10^{-7}$
Audio Output power	$<\pm 0.5$ dB
Radiated RF power	$<\pm 6$ dB
Conducted RF power variations using a test fixture	$<\pm 0.75$ dB
Maximum frequency deviation:	
	- within 300 Hz and 6 kHz of audio frequency $<\pm 5$ %
	- within 6 kHz and 25 kHz of audio frequency $<\pm 3$ dB
Deviation limitation	$<\pm 5$ %
Radiated emission of transmitter valid up to 12.75 GHz	$<\pm 6$ dB
Radiated emission of receiver valid up to 12.75 GHz	$<\pm 6$ dB
Transmitter switch off time	$<\pm 5$ %

4.2 Tests at Extremes of Temperature and Voltage

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

Temperature Test Conditions		Voltage Test Conditions	
T amb	per ambient conditions of the laboratory	V nom	9V DC
T cold	-30°C	V min	6.8V DC
T hot	+50°C	V max	9V DC

- ☐ 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.

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:	47CFR Part 2, Subpart J, Clause §2.1046
Limits:	47CFR Part 2, Subpart J, Clause §74.861(e)(1)(ii)

5.1.1.1.1 Configuration of EUT

The EUT was placed in a temperature controlled chamber and thermal balance was achieved before testing commenced. Measurements were made at the 50 ohm coaxial transmit / receive port (EUT's antenna unscrewed and Coax soldered to connector for this test).

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: 47%

	Bottom Channel	Middle Channel	Top Channel
Power Measured	+8.34dBm	+8.00 dBm	+7.24dBm

Variation in Power observed (dB)	Max Power Observed (dBm)
1.1dB	+8.34dBm

LIMIT: 250mW (+24 dBm).

5.1.1.3 Test Equipment used

C031, C032

See Section 9 for more details

5.1.2 Radiated

5.1.2.1 Test Methods

Test Requirements	47CFR Part 2, Subpart J
Test Method:	47CFR Part 2, Subpart J, Clause §2.1046
Limits:	47CFR Part 2, Subpart J, 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.

5.1.2.2 Test results

Ambient conditions.

Temperature: 20°C

Relative humidity: 44%

Channel Name	Low
Channel Frequency	719.025MHz
O/P Power Level	Max Power

ERP Results (dBm)	+10dBm
-------------------	--------

Channel Name	Mid
Channel Frequency	730.1MHz
O/P Power Level	Max Power

ERP Results (dBm)	+11.5dBm
-------------------	----------

Channel Name	High
Channel Frequency	743.975MHz
O/P Power Level	Max Power

ERP Results (dBm)	+6.8dBm
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LIMIT: 250mW (+24 dBm).

5.1.2.3 Test Equipment used

E131, E3, TMS933, TMS814

See Section 9 for more details

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 Part 2, Subpart J, §74.861(e)(3)

5.2.1.1 Configuration of EUT

The EUT was tested on the bench / in the chamber with the door open and ambient conditions were monitored.

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.

5.2.2 Test Results

Ambient conditions.

Temperature: 21°C Relative humidity: 47%

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

LIMIT: Any form of modulation may be used. A maximum deviation of +/- 75 kHz is permitted when FM is employed.

5.2.3 Test Equipment used

TMS48, TMS55, E227

See Section 9 for more details

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:	47CFR Part 2, Subpart J, none stated

5.2.2.1 Configuration of EUT

The EUT was tested on the bench / in the chamber with the door open and ambient conditions were monitored.

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.

5.2.3 Test Results

Ambient conditions.

Temperature: 21°C Relative humidity: 47%

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

5.2.4 Test Equipment used

TMS48, TMS55, E227

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 Part 2, Subpart J, Clause §74.861(e)(6)

5.3.1.1 Configuration of EUT

The EUT was tested on the bench / in the chamber with the door open and ambient conditions were monitored.

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: 20°C

Relative humidity: 47%

Output Power	<250mW
Channel Spacing	<200kHz
Modulation	FM

	Reference to plot / results		
	Bottom Channel	Middle Channel	Top Channel
Bandwidth plot	Plot 2	Plot 3	Plot 4
Occupied bandwidth (kHz)	104	104	105
Max. observed occupied bandwidth (kHz)	105		

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

LIMIT: 200 kHz

5.3.1.4 Test Equipment used

TMS6, TMS55, TMS48, E227

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: 47CFR Part 2, Subpart J, §2.1051
ITU-R Rec. SM.329

Limits: 47CFR Part 2, Subpart J, Clause §74.861(e)(6)(iii)

5.4.1.1.1 Configuration of EUT

The EUT was tested on the bench / in the chamber with the door open and ambient conditions were monitored.

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.

5.4.1.2 Test results

Ambient conditions.

Temperature: 20°C

Relative humidity: 45%

Channel Name	High
Channel Spacing	<200kHz
Modulation Type	FM
Power Level	<250mW

Spurious Frequency (MHz)	Measured Spurious Level (dBm)
none	-
Frequency Range	Plot Number
9k-150kHz	12
150k - 30MHz	13
30-1000MHz	18
1-2GHz	19
2-2.9GHz	24
2.9-5GHz	25
5-7.5GHz	30
7.5-8.1GHz	31

Channel Name	Mid
Channel Spacing	<200kHz
Modulation Type	FM
Power Level	<250mW

Spurious Frequency (MHz)	Measured Spurious Level (dBm)
2190	-33.1
Frequency Range	Plot Number
9k-150kHz	11
150k - 30MHz	14
30-1000MHz	17
1-2GHz	20
2-2.9GHz	23
2.9-5GHz	26
5-7.5GHz	29
7.5-8.1GHz	32

Channel Name	Low
Channel Spacing	<200kHz
Modulation Type	FM
Power Level	<250mW

Spurious Frequency (MHz)	Measured Spurious Level (dBm)
2157	-30.4
Frequency Range	Plot Number
9k-150kHz	10
150k - 30MHz	15
30-1000MHz	16
1-2GHz	21
2-2.9GHz	22
2.9-5GHz	27
5-7.5GHz	28
7.5-8.1GHz	33

SPURIOUS FOUND MORE THAN 20dB BELOW THE LIMIT NOT LISTED.

LIMIT: $43 + 10\text{LOG}(\text{Po}) = -13 \text{ dBm}$

5.4.1.3 Test Equipment used

TMS48, TMS55, TMS6, E227, TMS10, TMS73

See Section 9 for more details

5.5 Field Strength of Spurious Radiation.

5.5.1 Test Methods

Test Requirements:	47CFR Part 2, Subpart J
Test Methods:	47CFR Part 2, Subpart J, §2.1053 ITU-R Rec. SM.329
Limits:	47CFR Part 2, Subpart J, 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. 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.

5.5.2 Test Results

Ambient conditions.
Temperature: 20°C Relative humidity: 49%

Channel Name	High
Channel Frequency	743.975MHz
Channel Spacing	<200kHz
Modulation Type	FM
Power Level	<250mW

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Antenna Polarisation	EUT Polarisation
NONE			

Channel Name	Mid
Channel Frequency	730.1MHz
Channel Spacing	<200kHz
Modulation Type	FM
Power Level	<250mW

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Antenna Polarisation	EUT Polarisation
NONE			

Channel Name	Low
Channel Frequency	719.025MHz
Channel Spacing	<200kHz
Modulation Type	FM
Power Level	<250mW

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Antenna Polarisation	EUT Polarisation
NONE			

NO SPURIOUS FOUND WITHIN 20dB OF THE LIMIT.

LIMIT: $43 + 10\text{LOG}(P_o) = -13 \text{ dBm}$

5.5.3 Test Equipment Used

E268, E131, E136, E3, TMS77, TMS82,

See Section 9 for more details

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 Part 2, Subpart J, 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 before testing commenced. Measurements were made at the 50 ohm coaxial transmit / receive port (EUT's antenna unscrewed and Coax soldered to connector for this test).

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: 22°C

Relative humidity: 45%

Output Power	<250mW
Channel Spacing	<200kHz
Modulation	FM

Temperature	Voltage	Frequency measured(MHz)		
		Bottom Channel	Middle Channel	Top Channel
-30°C	Nominal	719.018990	730.095939	743.971526
-20°C	Nominal	719.023546	730.099024	743.974307
-10°C	Nominal	719.024830	730.100057	743.975123
0°C	Nominal	719.026342	730.101738	743.976415
+10°C	Nominal	719.026482	730.101503	743.976527
+20°C	Nominal	719.025779	730.100774	743.975773
+20°C	Minimum	719.025684	730.100708	743.975737
+20°C	Maximum	719.025779	730.100774	743.975773
+30°C	Nominal	719.025136	730.100117	743.975097
+40°C	Nominal	719.024232	730.099203	743.974150
+50°C	Nominal	719.023421	730.098378	743.973334
Variation on each channel		-6010Hz/+1482Hz	-4061Hz/+1738Hz	-3474Hz/+1527Hz
Overall variation in Frequency %		-0.0008Hz / +0.0002		

LIMIT: 0.005%

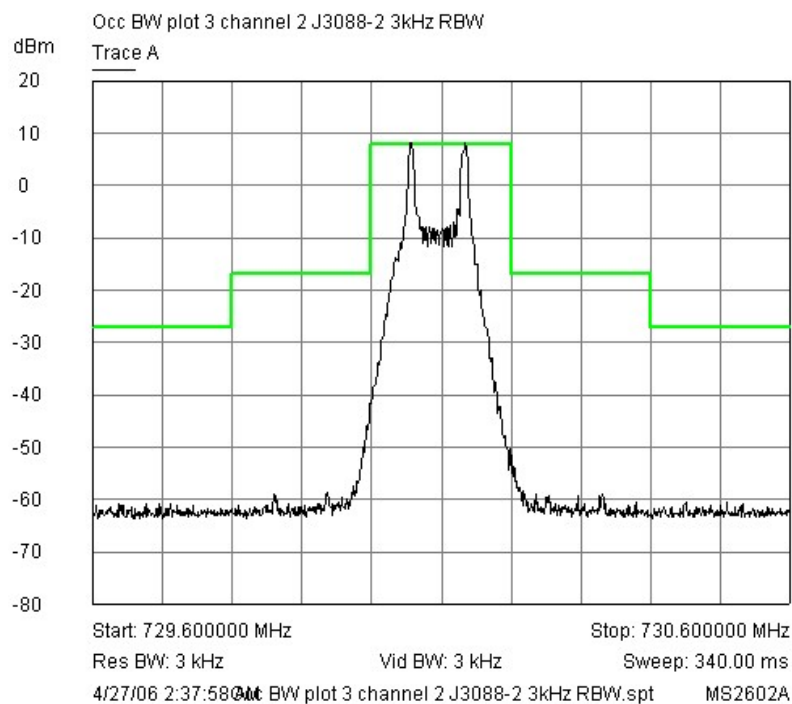
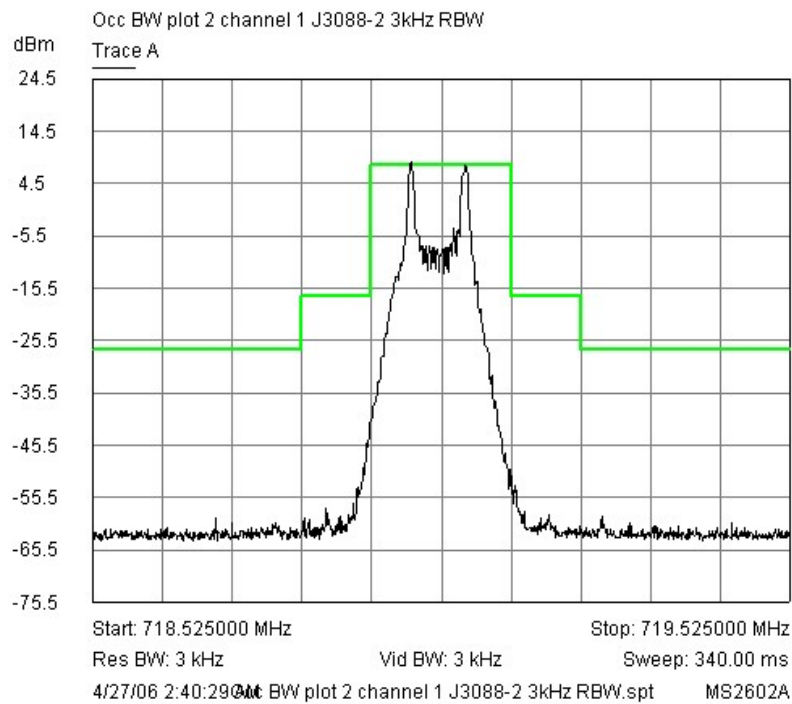
5.6.3 Test Equipment used

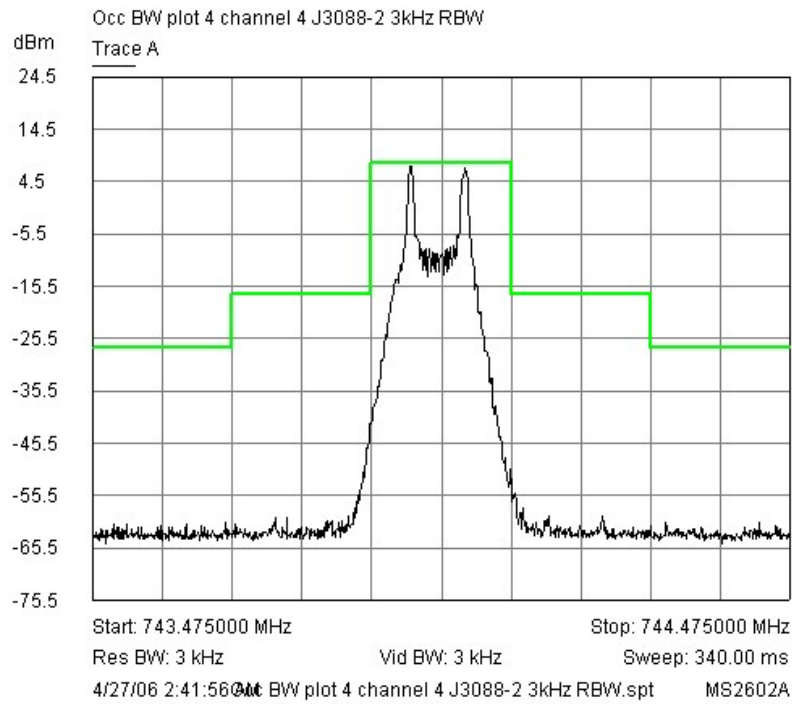
TMS6, E227, E3, TMS10, TMS38, TMS48, TMS73, TMS80

See Section 9 for more details

6. Graphical Results

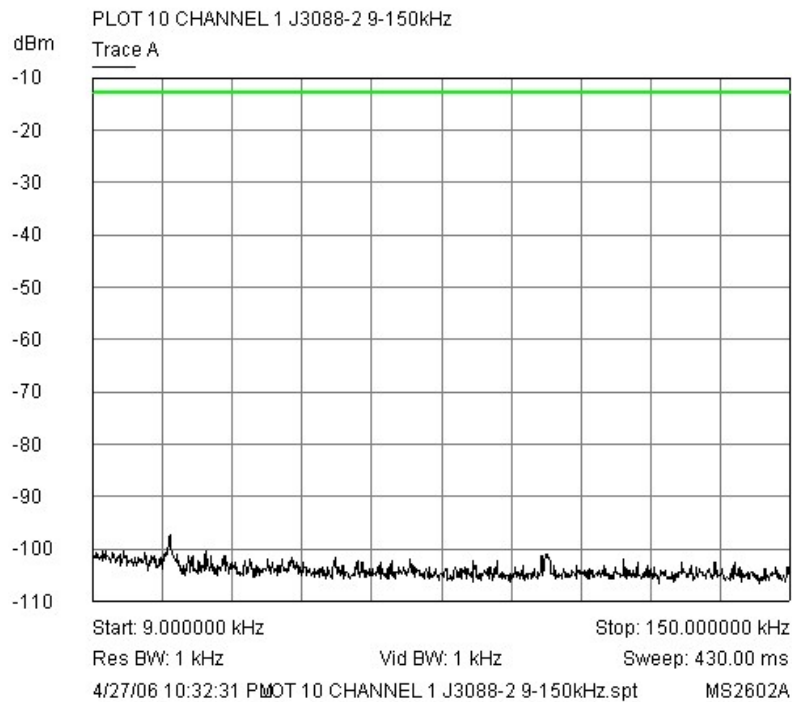
Occupied Bandwidth.

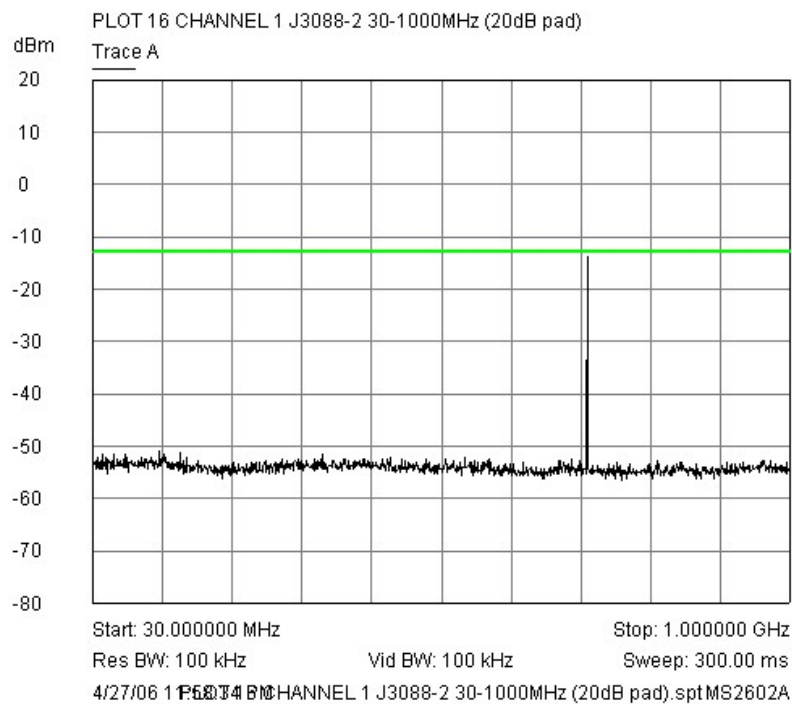
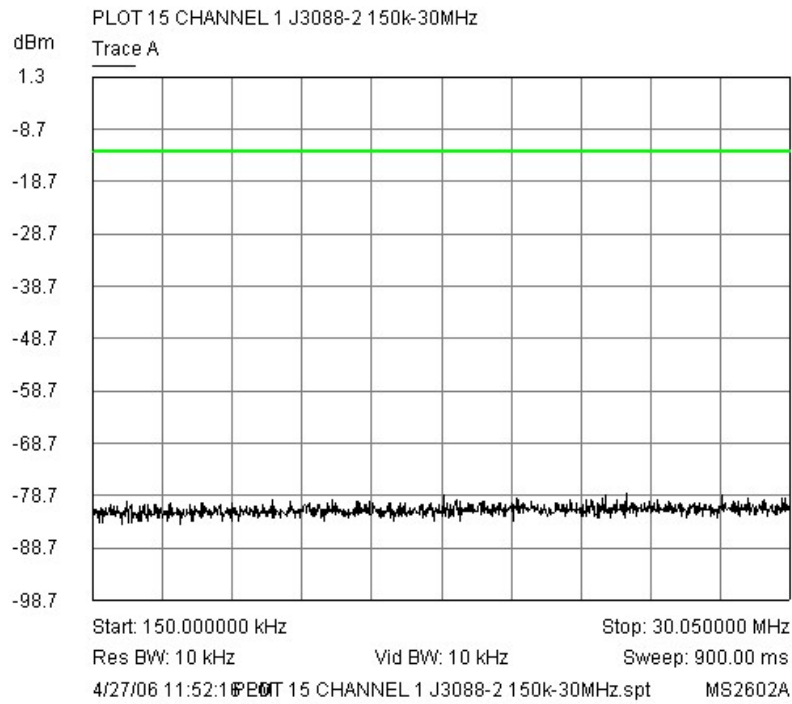


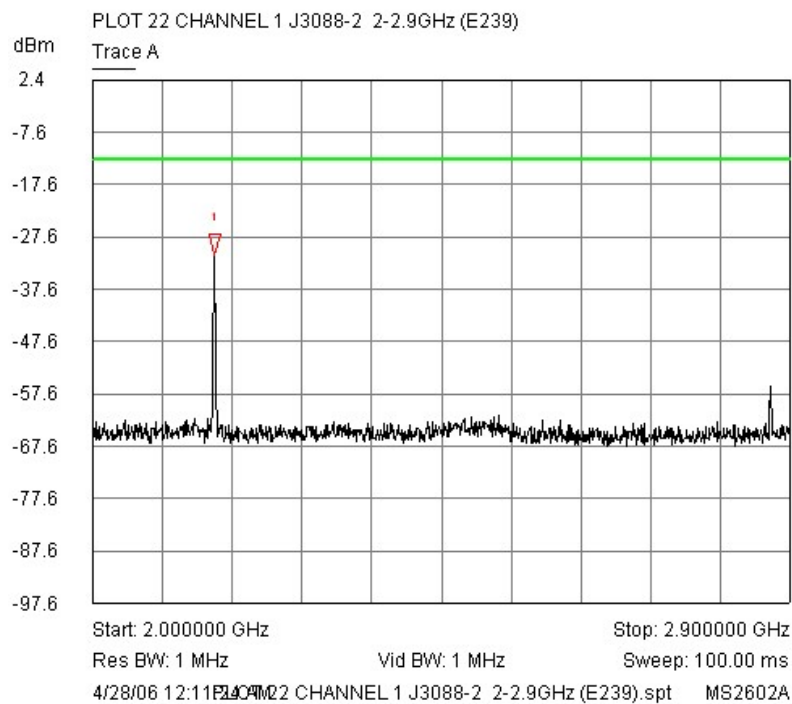
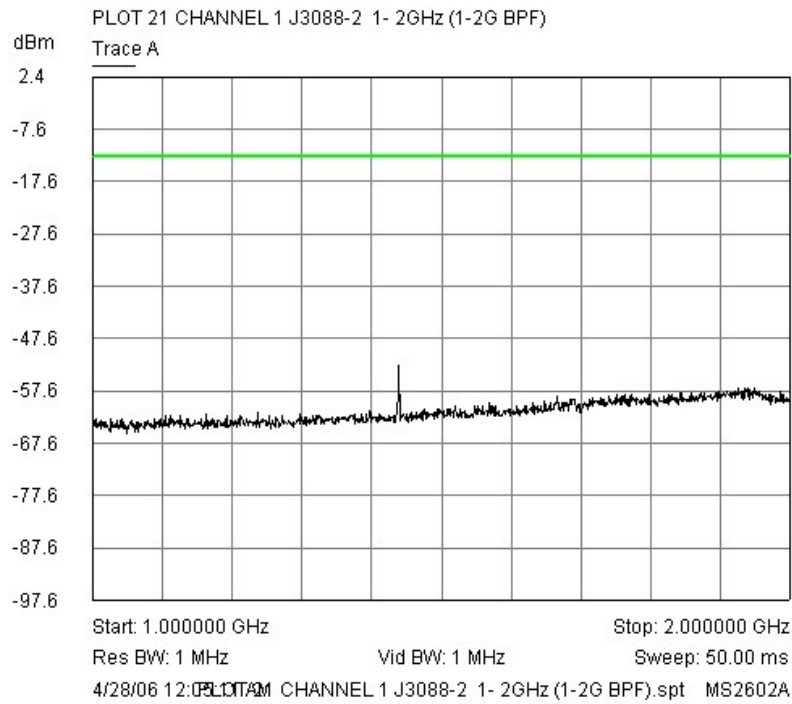


Conducted Antenna port emissions.

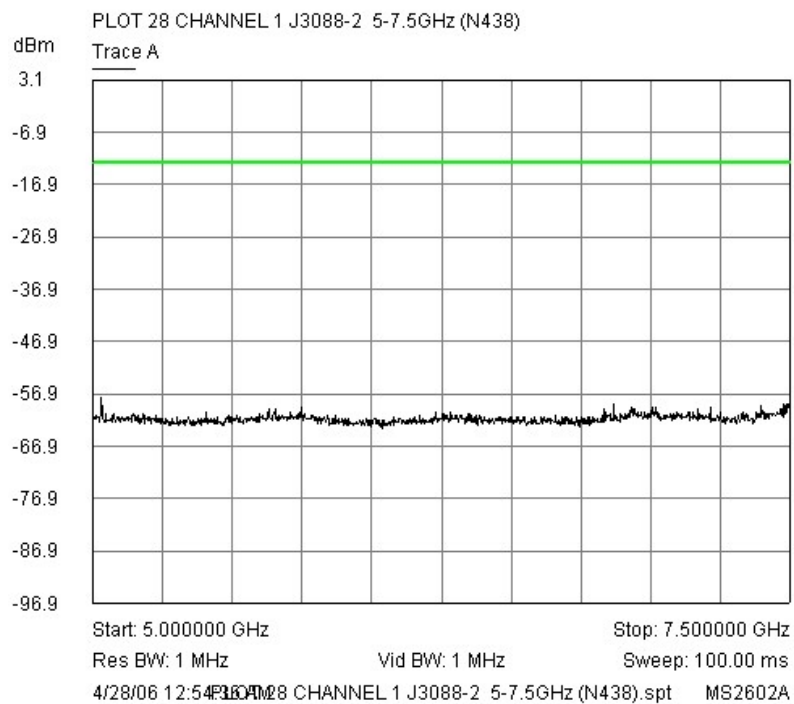
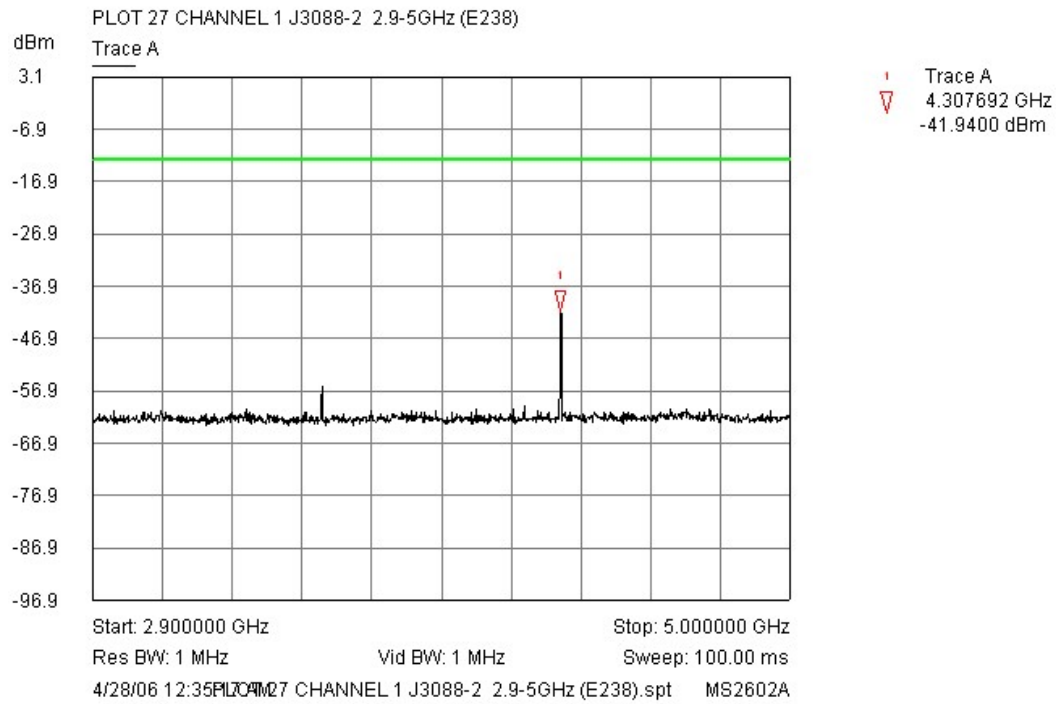
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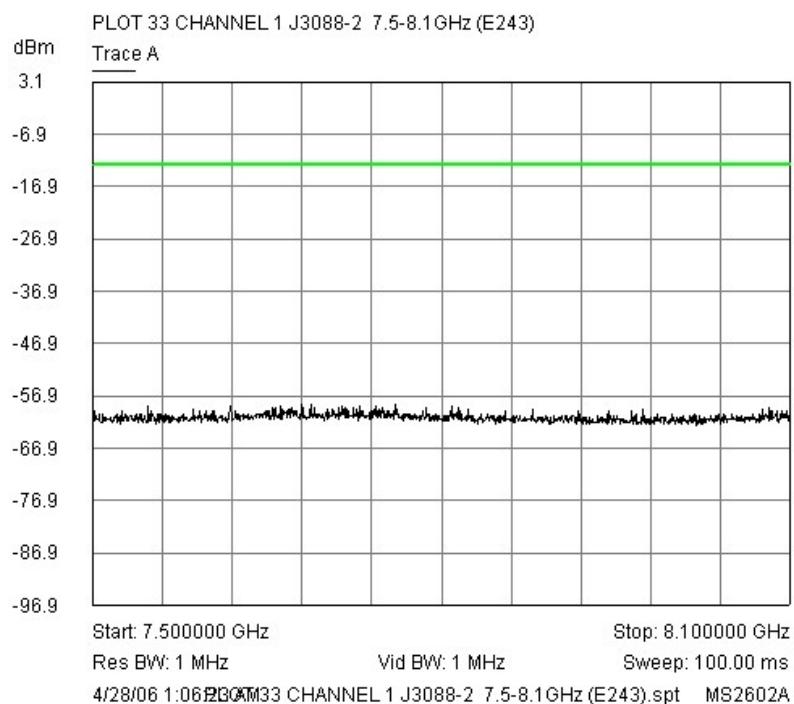




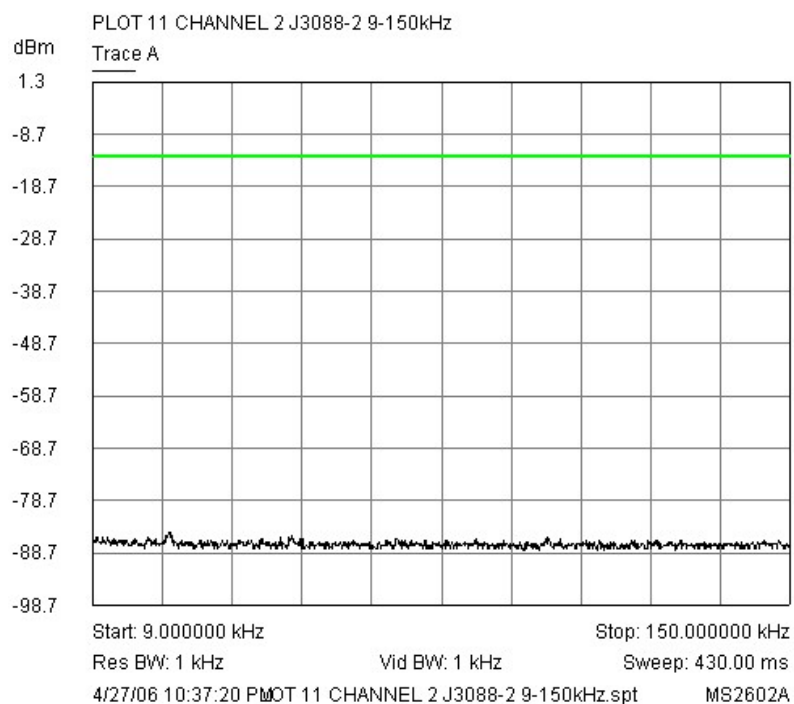


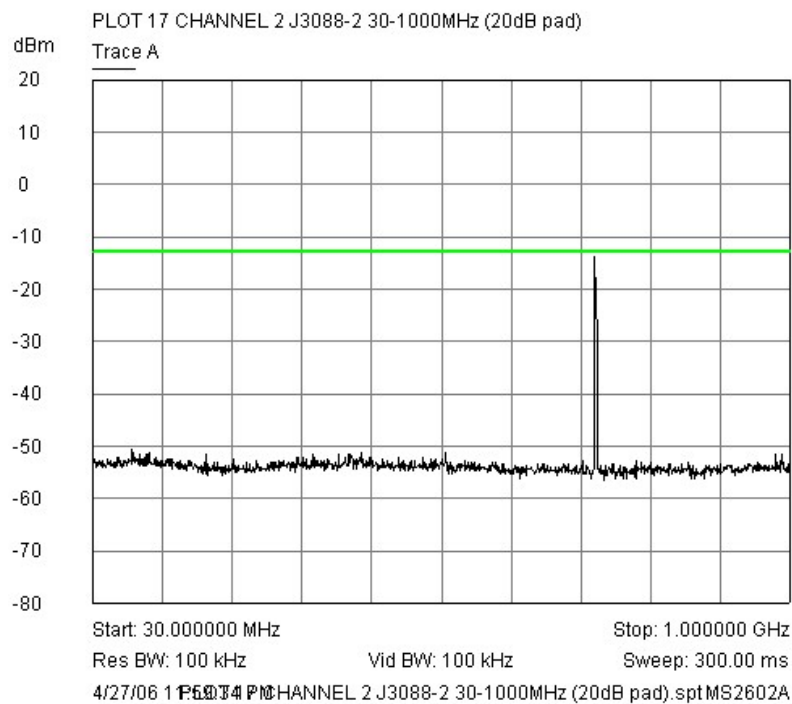
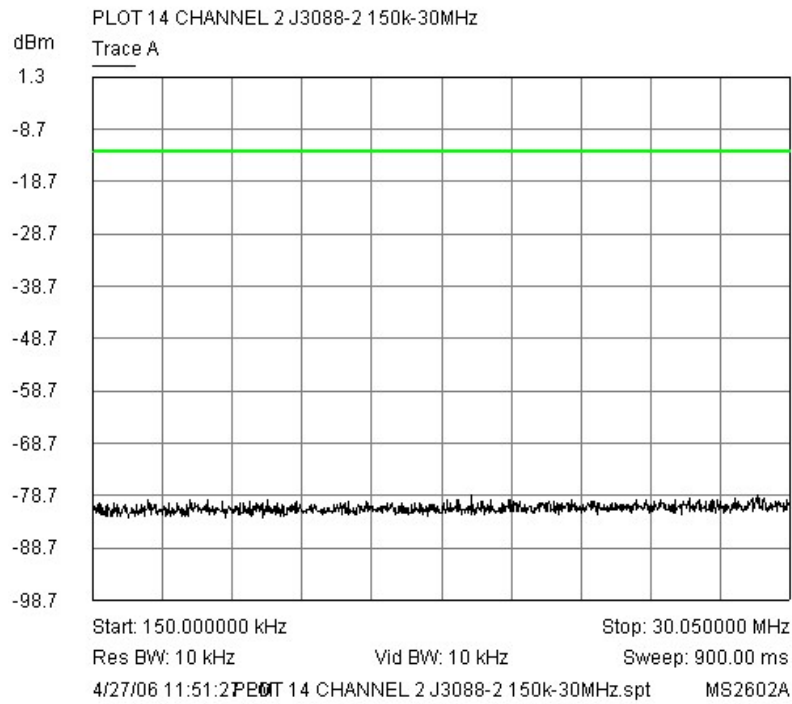
Trace A
2.157343 GHz
-31.0300 dBm

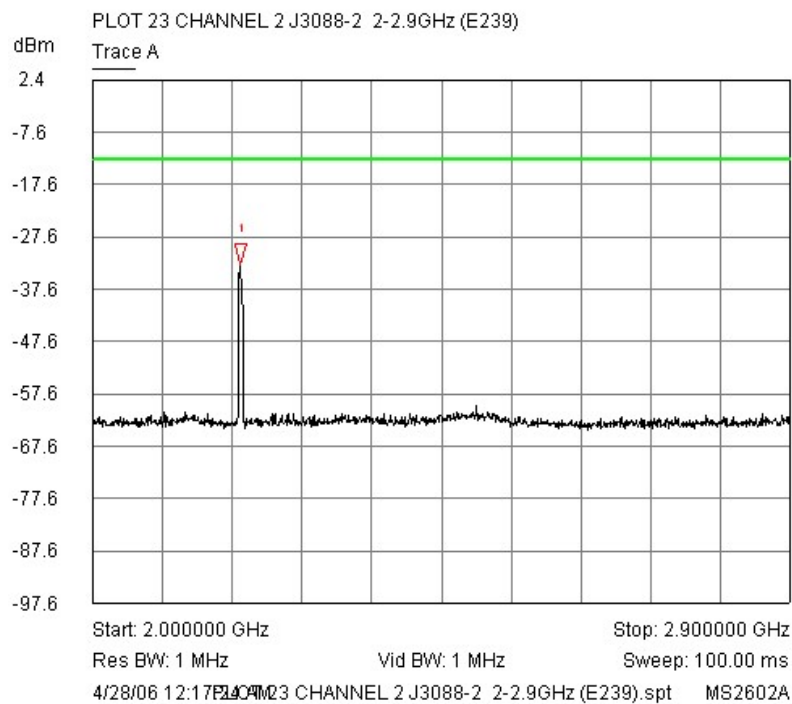
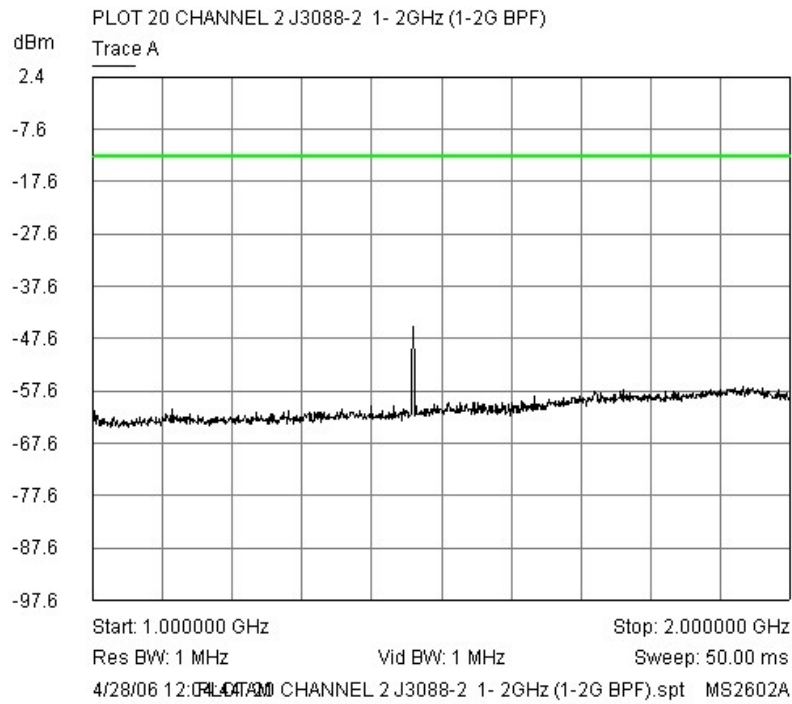




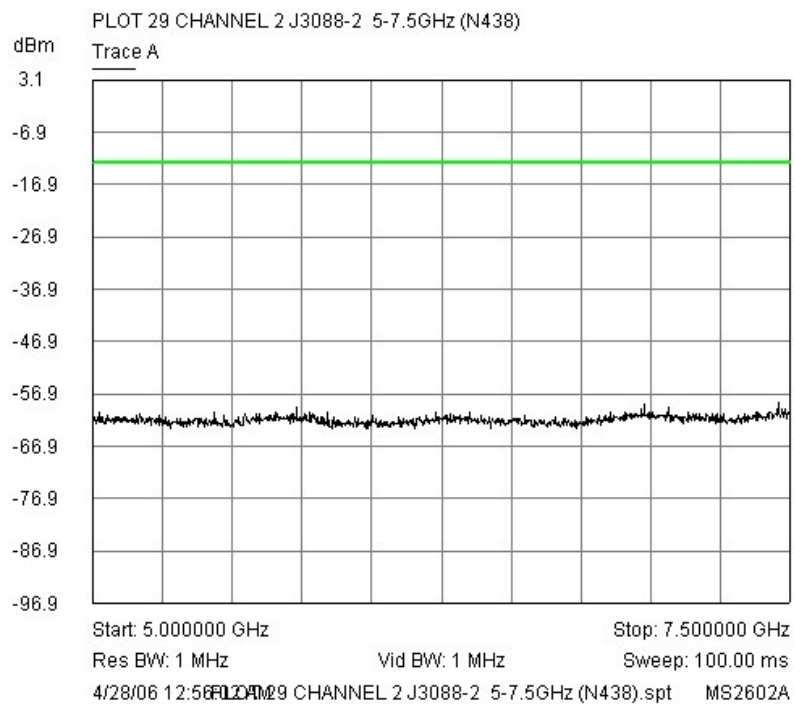
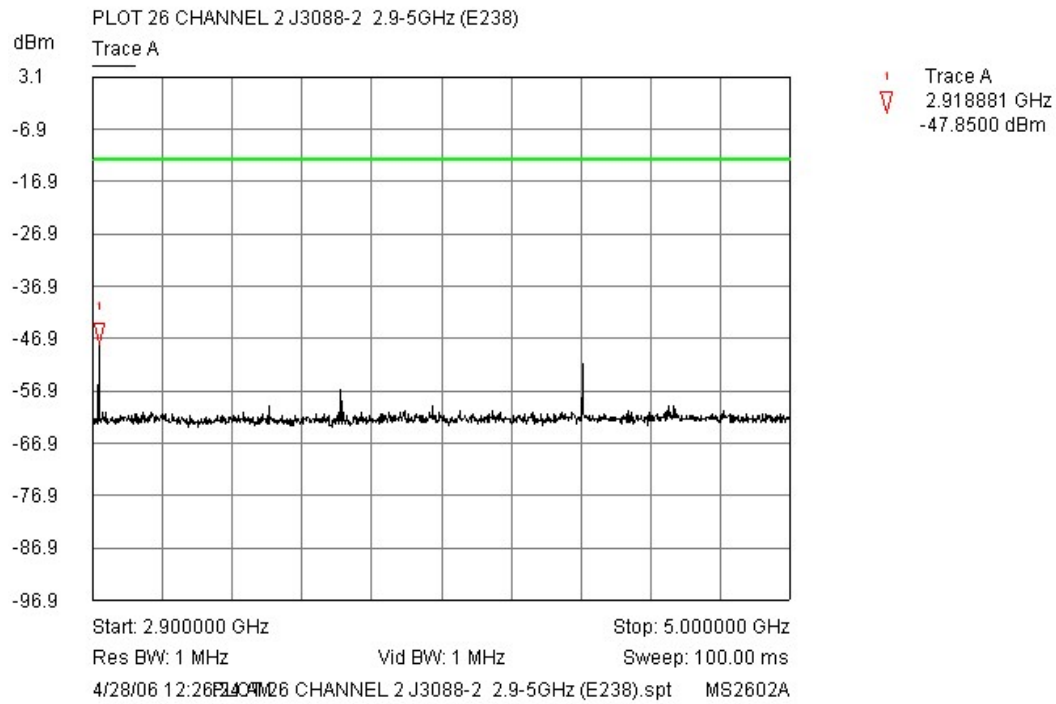
Middle Channel.

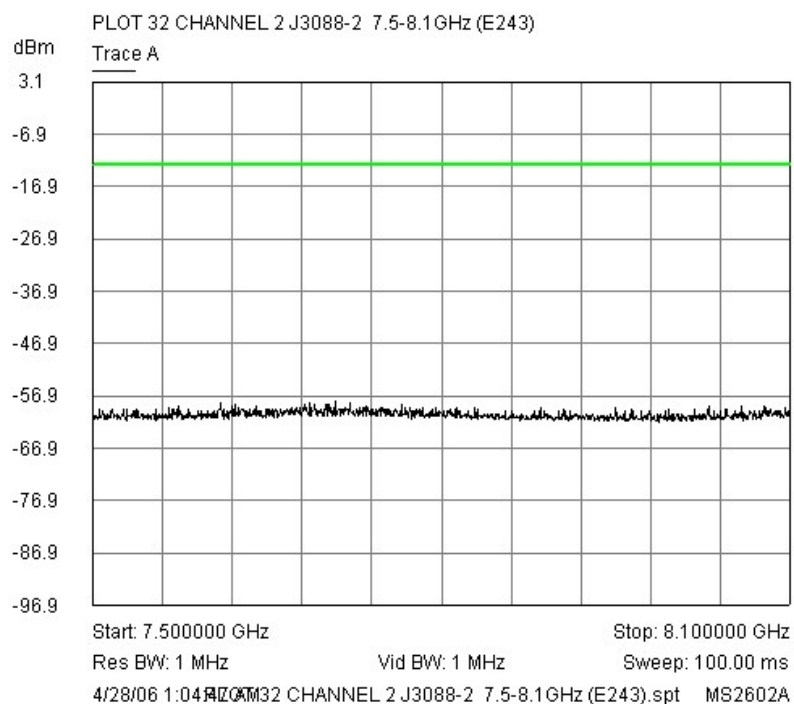




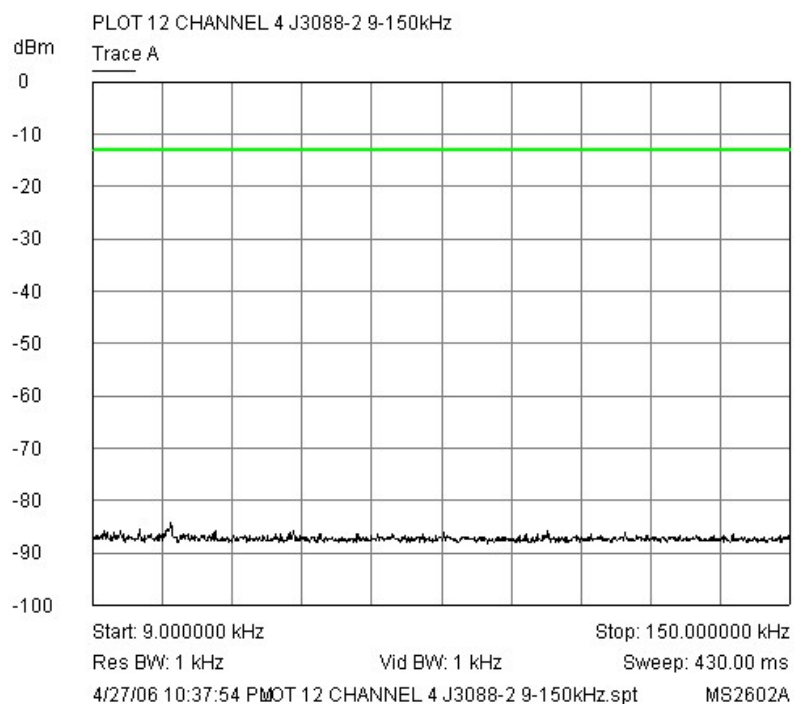


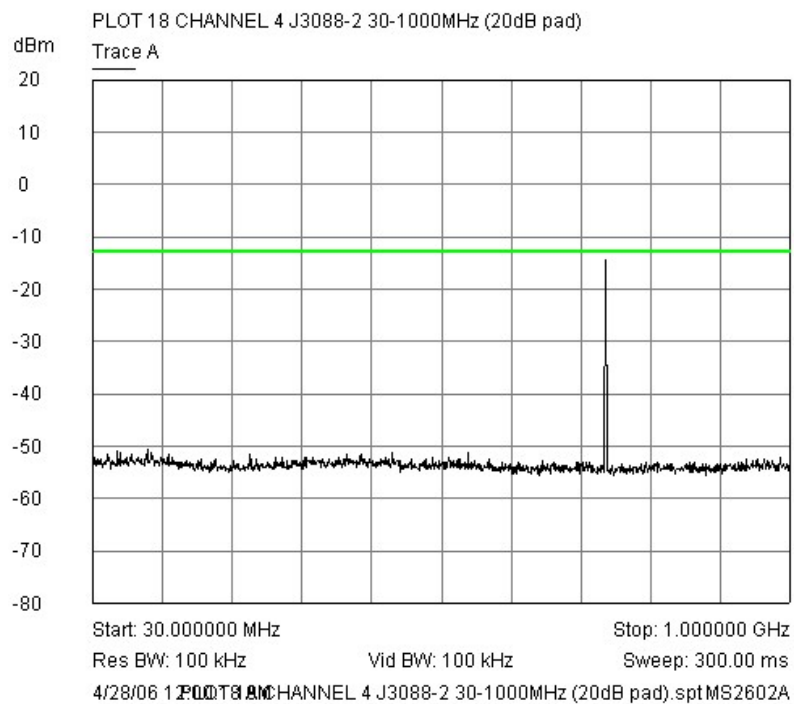
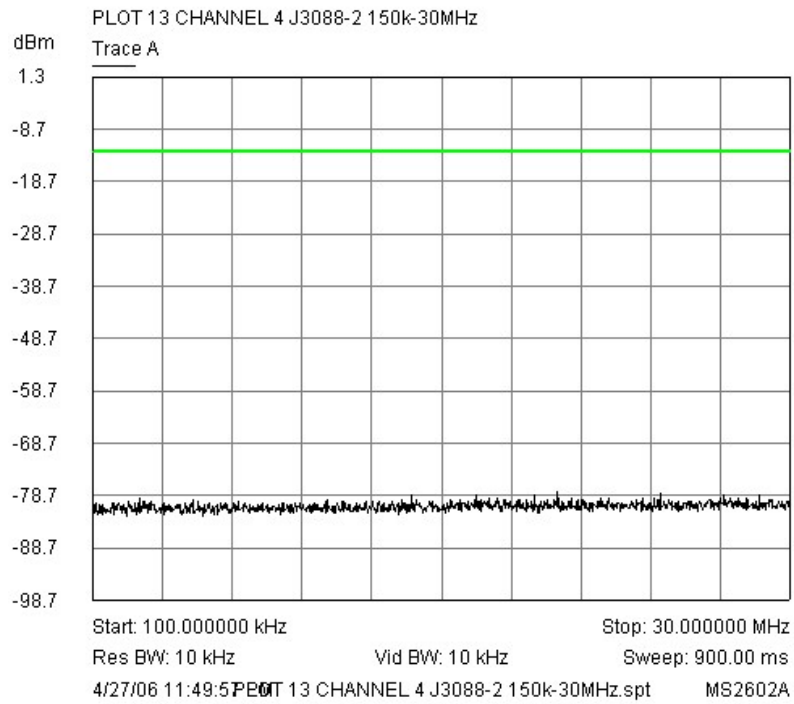
Trace A
2.190609 GHz
-32.9100 dBm

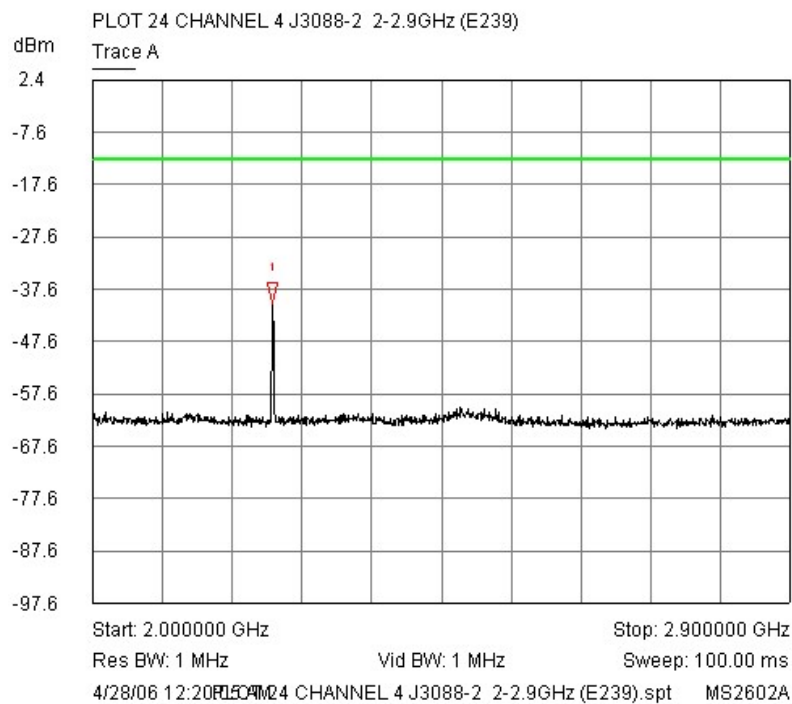
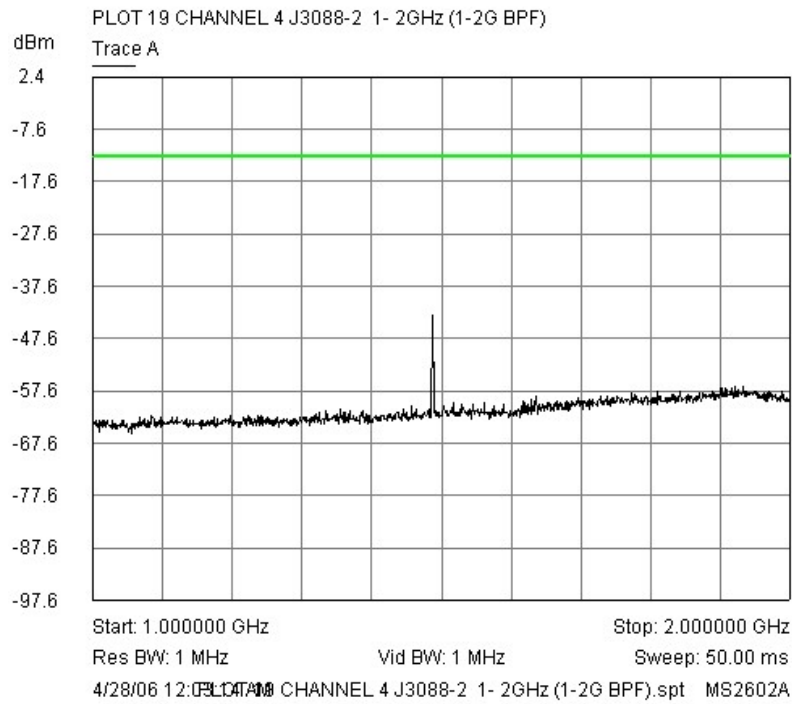




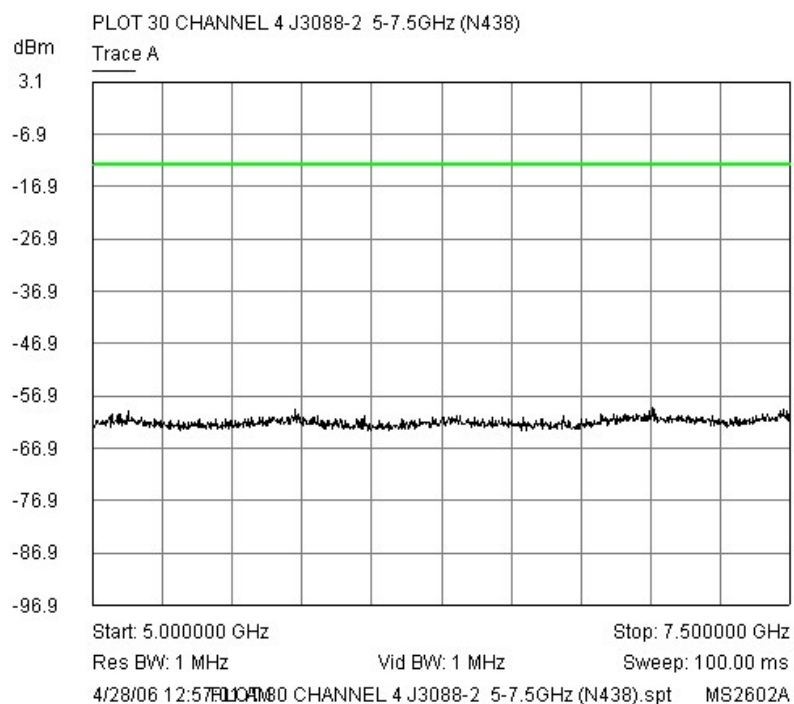
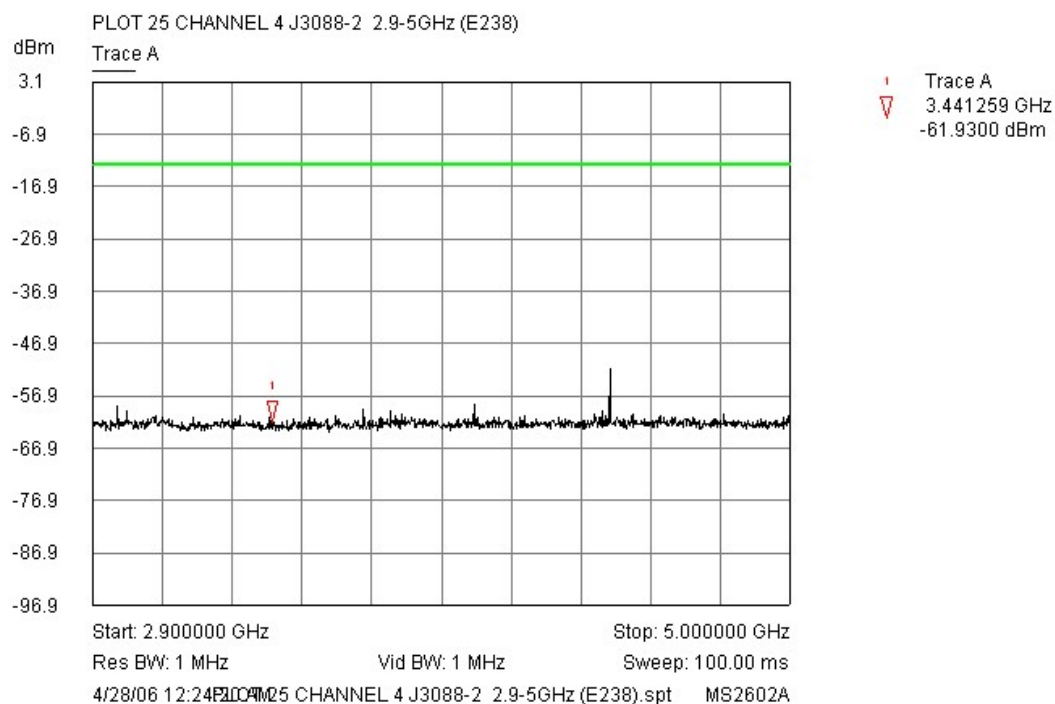
Top Channel.

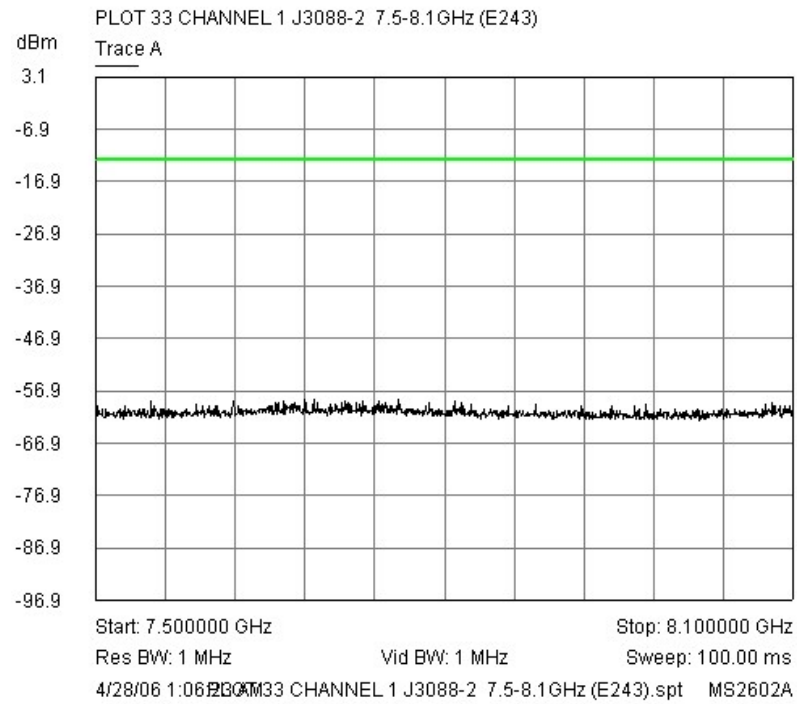






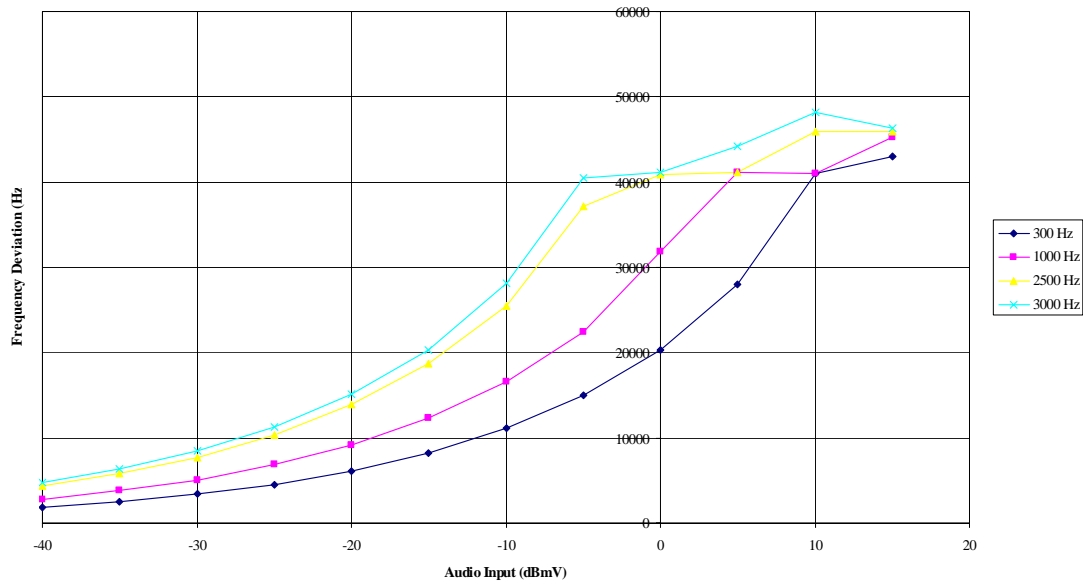
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2.231968 GHz
-40.2300 dBm



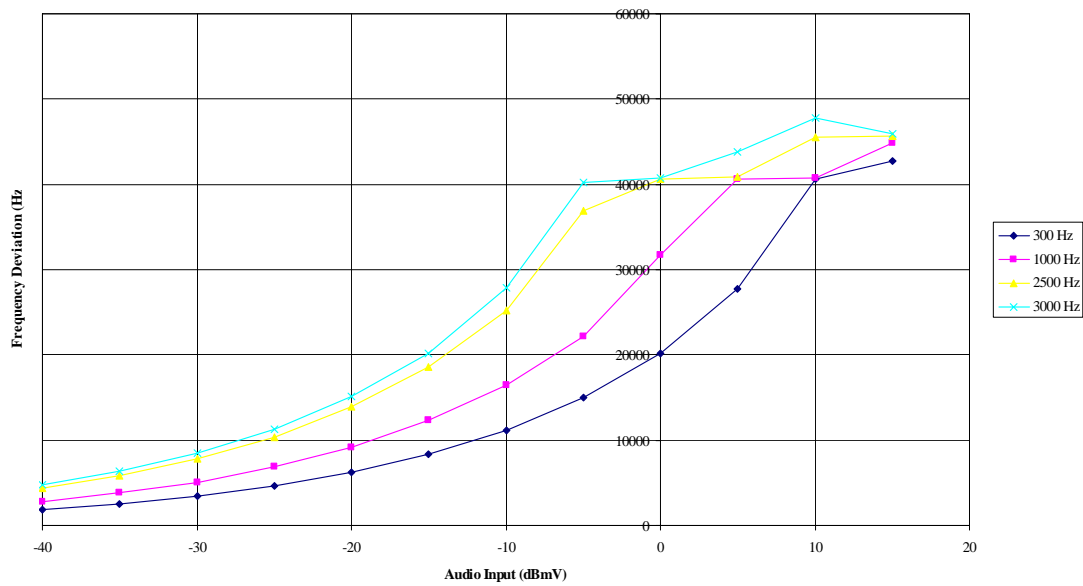


Modulation Limiting.

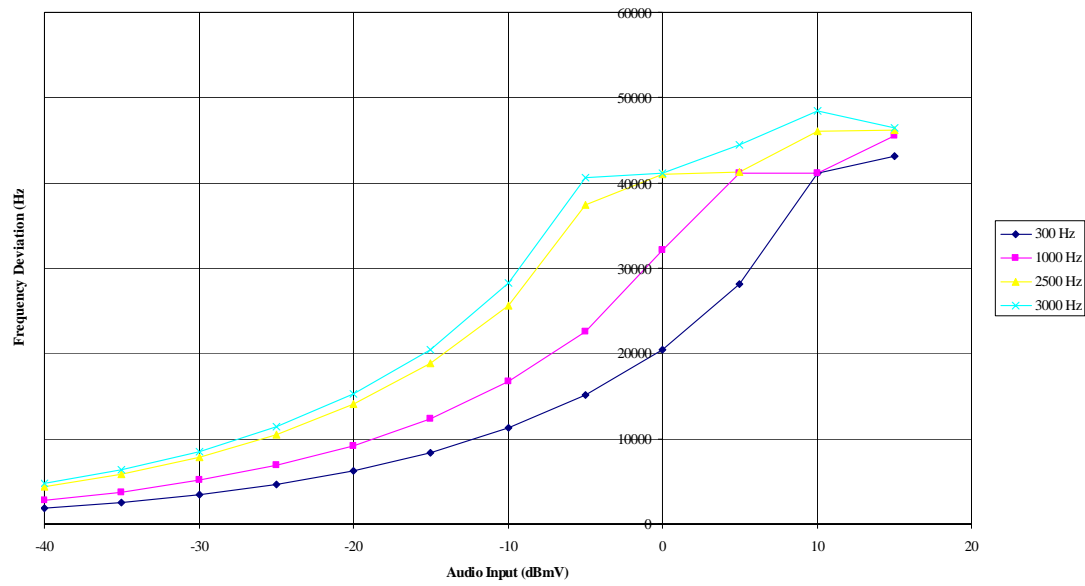
Modulation Limiting Bottom Channel (1)



Modulation Limiting Middle Channel (2)

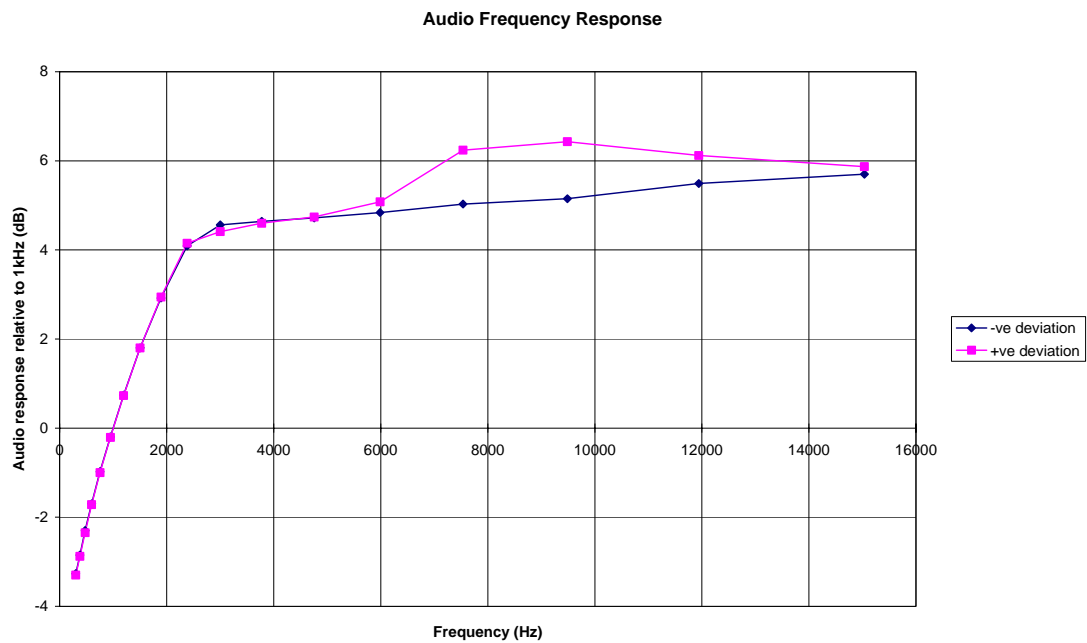


Modulation Limiting Top Channel (4)

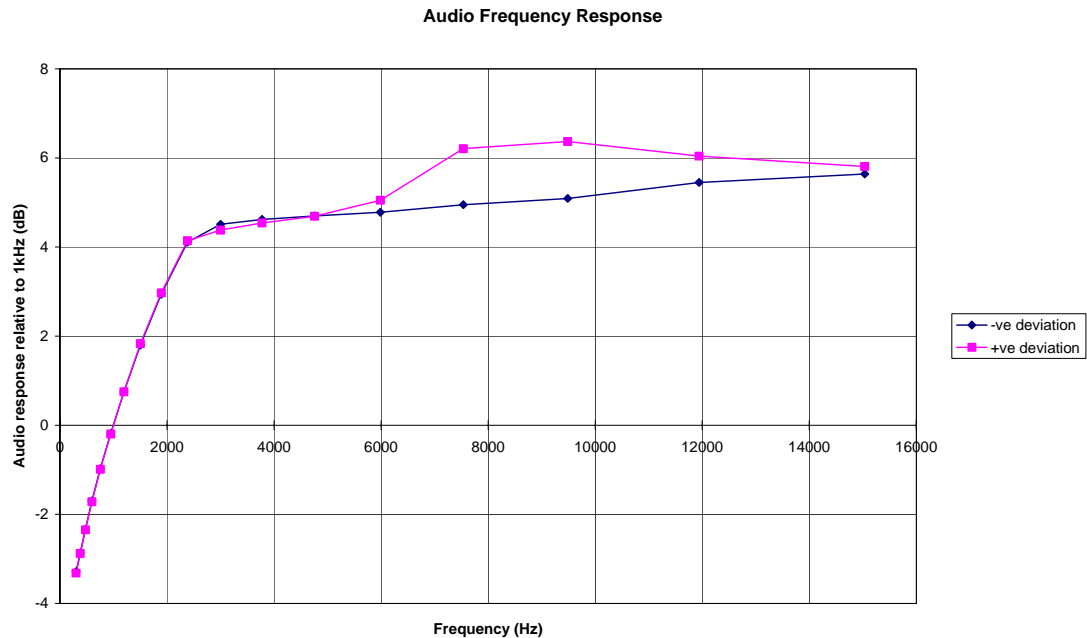


Audio Response.

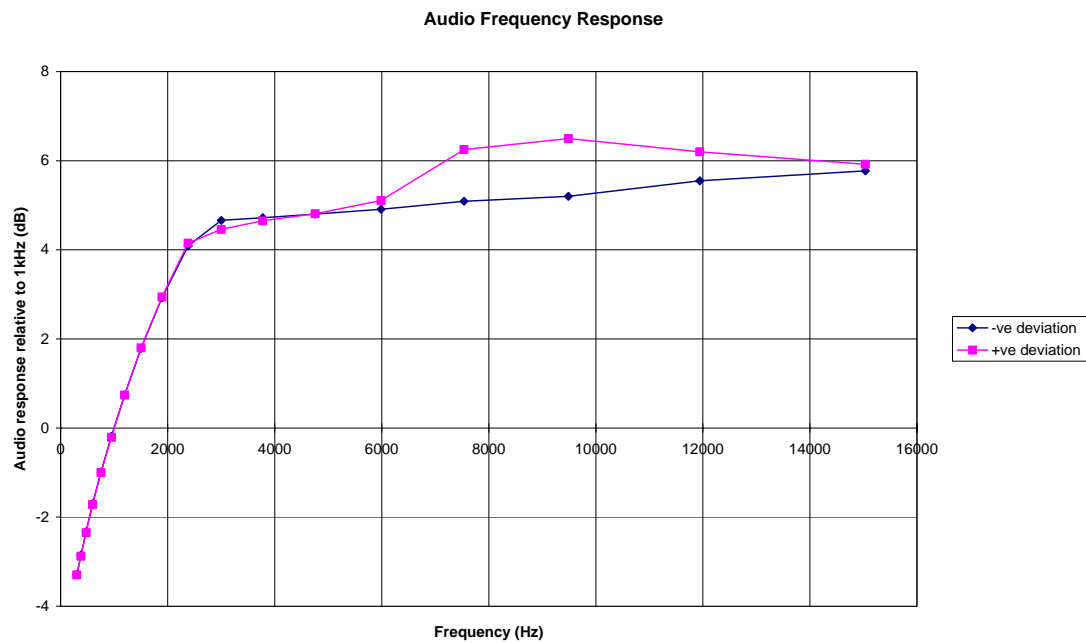
Channel 1 - Bottom Channel (719.025MHz)



Channel 3 - Middle Channel (730.100MHz)



Channel 4 - Top Channel (743.975MHz)



7. Photographs

7.1 **EUT Front View**



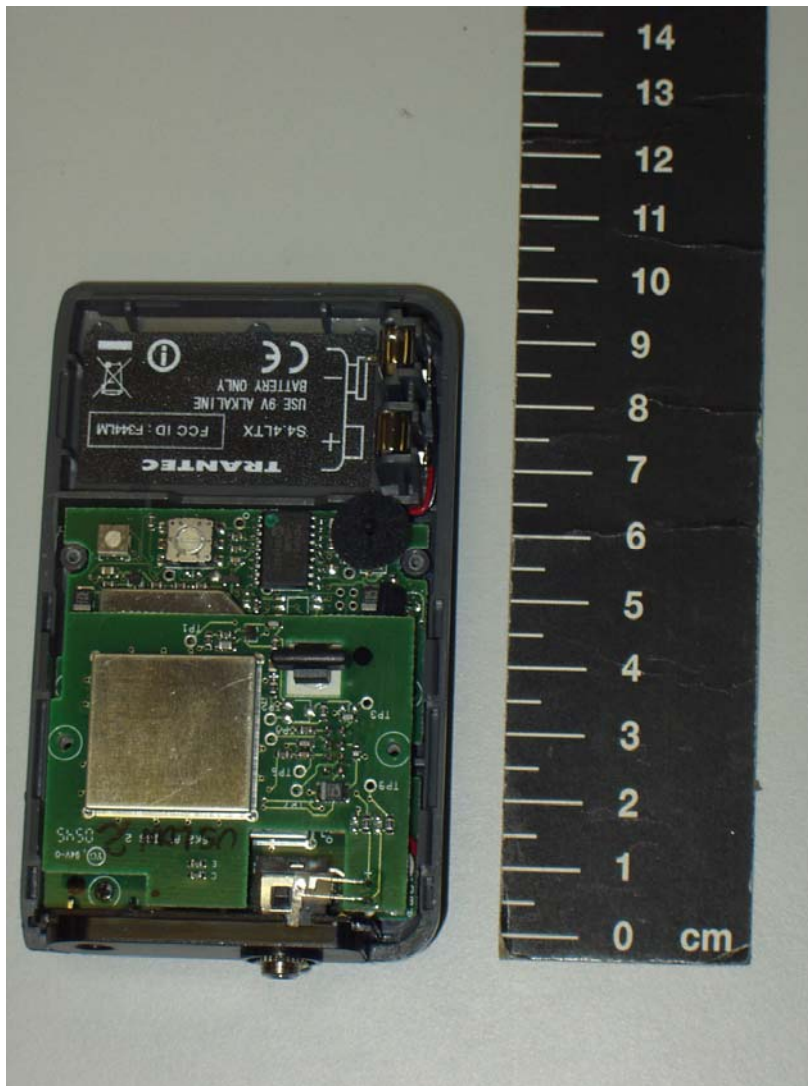
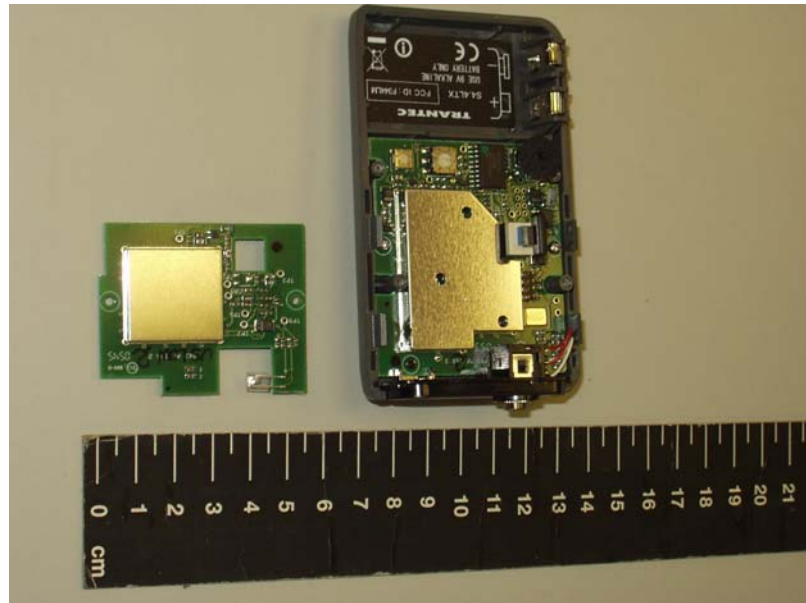
7.2 EUT Antenna Connector Port



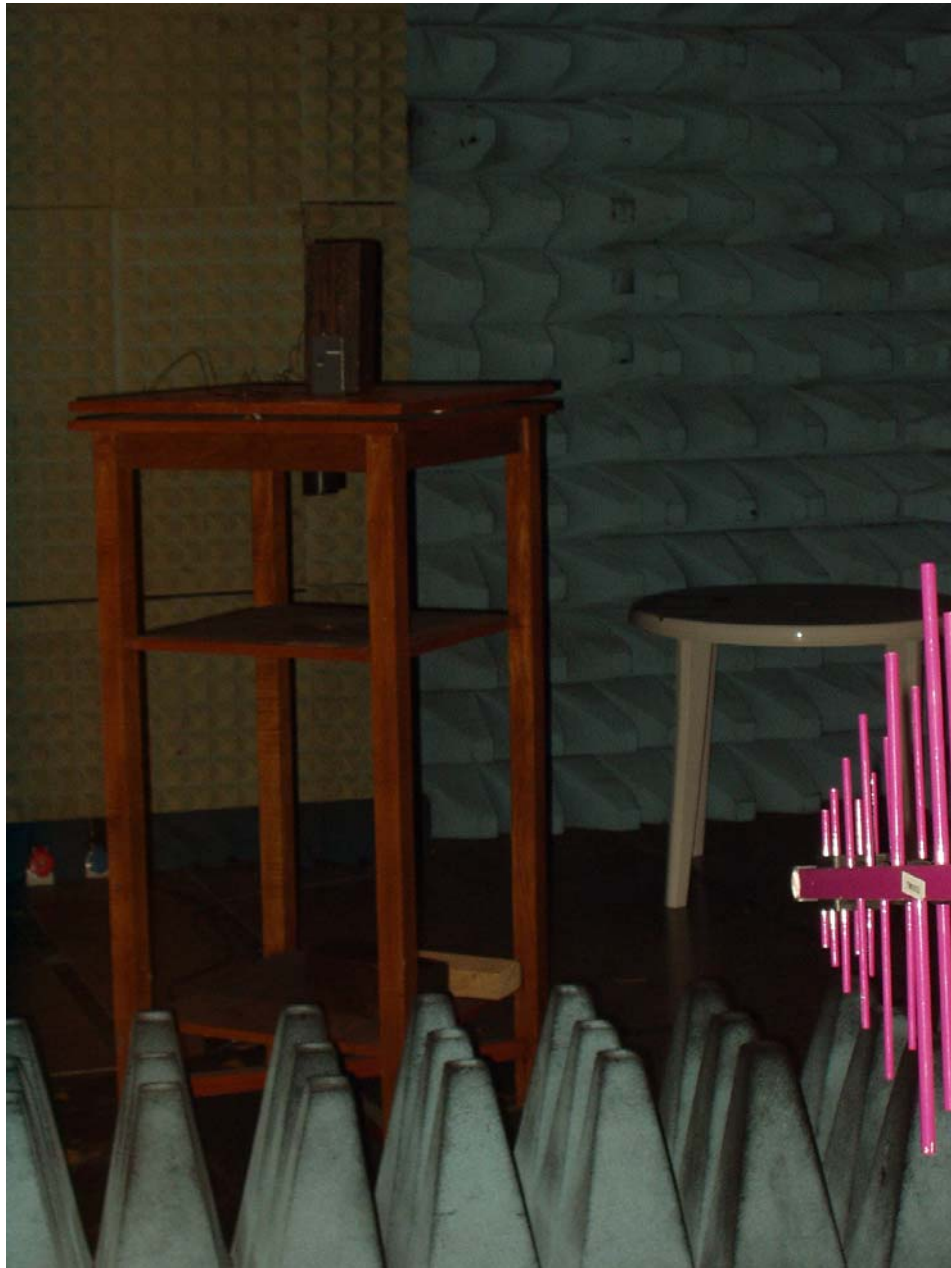
7.3 EUT Display / Controls



7.4 EUT Internal Construction



7.5 Test set-up, spurious emissions



8. Signal Leads

Port Name	Cable Type
Mic	coax

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 procedures, to meet the requirements of ISO 9001, the equipment used will be within calibration for the period during which testing was carried out.

RNNo	Model	Description	Manufacturer
C031	437B	Power Meter	Hewlett Packard
C032	8482A	Power Sensor	Hewlett Packard
E131	ESG-3000A	Signal Generator	Hewlett Packard
E136	3105	Horn Antenna	EMCO
E227	6632A	System DC Power Supply	Hewlett Packard
E268	BHA 9118	1-18 GHz Horn Antenna	Schaffner
E3	HP8593E	Spectrum Analyser	Hewlett Packard
TMS10	TH200	ThermoHygrometer	RS Components
TMS38	VMT04/140	Environmental Oven	Heraeus Votsch
TMS48	8901B	Modulation Analyser	Hewlett Packard
TMS55	8903B	Audio Analyser	Hewlett Packard
TMS6	MS2602A	Spectrum Analyser 100 Hz - 8.5 GHz	Anritsu Electric Co Ltd
TMS73	0.083333333	Off Air Standard	Quartzlock
TMS77	8673B	Synthesised Signal Generator	Hewlett Packard
TMS80	206-3722	Digital Thermometer & K Probe	RS Components Ltd
TMS814	MP627A	Doublet Antenna 200-1700 MHz	Anritsu Electric Co Ltd
TMS82	8449B	Pre Amplifier 1 - 26 GHz	Agilent
TMS933	CBL6141A	Bilog Antenna 30MHz - 2GHz	York EMC

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.

11. Modifications

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

NONE.



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:	Beltpack Radio Mic S4.4LTX-UL
FCC ID (if applicable):	DLAWM-S300
Manufacturer:	BBM Electronics
Customer Purchase Order Number:	Not specified
R.N. Electronics Limited Report Number:	04-104/3088/2/06
Test Standards:	CFR 47 FCC Part 74 subpart H: Oct 2005
Date:	24th-28th April 2006

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:



Technical Manager

QMF21J - 3; FCC CFR 47 PART 2 J OCT 2004; ISSUE 01 OCT 05