FCC 47CFR part 15C
Test Report
For
Cougar module type A
VL-62444

Reference Standard: FCC 47CFR part 15C
Manufacturer: Imagination Technologies
For type of equipment and serial number, refer to section 3
Report Number: 08-6899-5-13 Issue 01
Report Produced by: -

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Certificate of Test 6899-5

The unit noted below has been tested by **R.N. Electronics Limited** and, where appropriate, conforms to the relevant subpart of FCC 47CFR Part 15. This is a certificate of test only and should not be confused with an equipment authorisation. Other standards may also apply.

Equipment:	Cougar module type A
Model Number: Proposed FCC ID:	VL-62444 X280072
Unique Serial Number:	ES4B-3
Manufacturer:	Imagination Technologies Home Park Industrial Estate Kings Langley Hertfordshire WD4 8LZ
Full measurement results are detailed in Report Number:	08-6899-5-13 Issue 01
Test Standards:	FCC 47CFR Part 15.247 effective date **October 1st 2012,** Class DSS Intentional Radiator

NOTE:
Certain tests were not performed based upon manufacturer's declarations. Certain other requirements are subject to manufacturer declaration only and have not been tested/verified. For details refer to section 3 of this report.
This test report covers the Bluetooth mode of operation only. Please see RN Electronics report number: 08-6899-8-13 Issue 01, for results pertaining to the Wi-Fi modes of operation.

DEVIATIONS:
Deviations from the standards have been applied. For details refer to section 4.2 of this report.

This certificate relates only to the unit tested as identified by a unique serial number and in the condition 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. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of unit not meeting the intentions of the standard or the requirements of the Directive, particularly under different conditions to those during testing. Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Statements of compliance, where measurements were made, do not include the measurement uncertainty. 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: 25th June to 16th August, 2013

Test Engineer: Digitally signed by: Daniel Sims
DN: CN = Daniel Sims C = GB O = RN Electronics
Date: 2013.10.09 15:06:52 Z

Approved By:
Technical Director

Customer Representative:

1 Contents

2 Equipment Under Test (EUT)

2.1 Equipment Specification

Applicant	Imagination Technologies Home Park Industrial Estate Kings Langley Hertfordshire WD4 8LZ	
Manufacturer of EUT	Imagination Technologies	
Brand name of EUT	Cougar module type A	
Model Number of EUT	VL-62444	
Serial Number of EUT	ES4B-3	
Date when equipment was received by RN Electronics	24th June 2013	
Date of test:	25th June to 16th August, 2013	
Visual description of EUT:	PCB module with an RF can covering almost one entire side of the pcb. There is 1 conducted RF port and 1 pcb antenna at either end of the board (2 in total), one of these is for Bluetooth operation and one is for Wi-Fi operation. On the underside of the module there is a 2 x 22 pin connector.	
Main function of the EUT:	RF and audio module for wireless audio system.	
Height	107 mm	
Width	51 mm	
Depth	10 mm	
Weight	0.05 kg	
Voltage	8.5-23V DC for module (18V nominal)	
Current required from above voltage source	Not specified	
EUT supplied PSU:	Manufacturer	Imagination Technologies
	Model number	CPS065A180361
	Serial number	None specified
	Input voltage	100-240V AC
	Input current	1.6A
	Output	18V DC @ 3.61A

2.2 EUT Configurations for testing

General parameters	
EUT Normal use position	EUT is a module and will be fitted inside deskHigh equipment
Choice of model(s) for type tests	Single variant supplied
Antenna details	2 of inverted 'F' type
Antenna port	Internal port available
Baseband data port (yes/no)?	No
Highest signal generated in EUT	2480MHz (highest Bluetooth channel)
Lowest signal generated in EUT	12MHz (USB clock)
TX Parameters	
Alignment range – transmitter	2402MHz - 2480MHz
EUT Declared Modulation Parameters	FHSS

EUT Declared Power level	+2dBm
EUT Declared Signal Bandwidths	1MHz
EUT Declared Channel Spacing's	1MHz
Declared frequency stability	+/- 20 ppm
RX Parameters	
Alignment range – receiver	2402MHz - 2480MHz
EUT Declared RX Signal Bandwidth	1MHz
FHSS Parameters	
No. Of hop channels	79
Dwell time per hop channel	<400ms

2.3 Functional Description

Wireless RF and audio module to be placed inside an audio product to enable streaming of audio media via use of a Wi-Fi network or via Bluetooth. The media can be streamed from a smart phone, tablet or PC. Use of the Pure connect App on iOS and Android is the suggested way to use the equipment.

2.4 EUT Modes

Mode Reference	Description	Used for testing
Constant TX Low Channel	EUT constantly transmitting at 2402MHz	Yes
Constant TX Mid Channel	EUT constantly transmitting at 2441MHz	Yes
Constant TX High Channel	EUT constantly transmitting at 2480MHz	Yes
Hopping TX High Channel	EUT Hopping on 2480MHz	Yes
Hopping TX Low Channel	EUT Hopping on 2402MHz	Yes
Hopping All channels	EUT Hopping across all 79 channels	Yes
Wi-Fi modes	EUT transmitting on various Wi-Fi channels	No*

*Please see RN Electronics report number: **08-6899-8-13 Issue 01** for results pertaining to the Wi-Fi modes of operation.

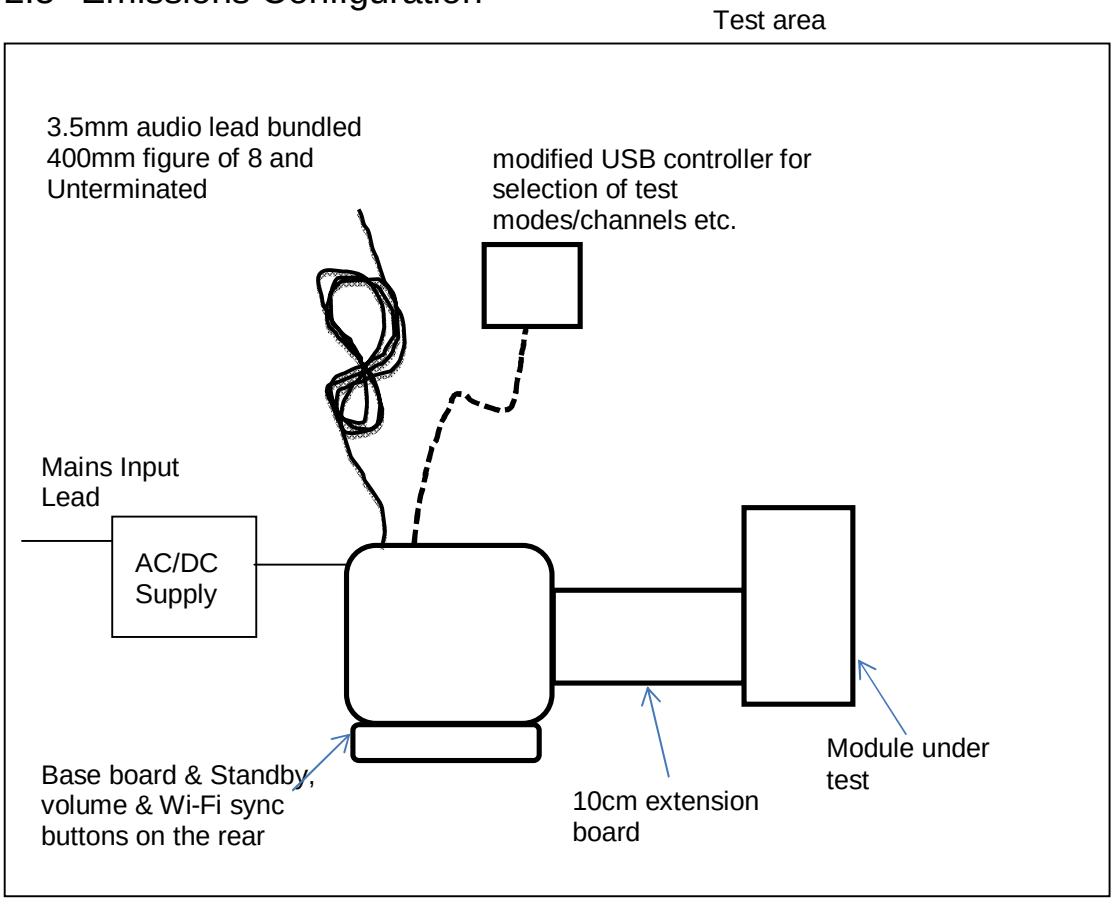
Note: Bluetooth test modes were set by placing the EUT into DUT mode and then controlling the Bluetooth device with a Bluetooth test set. See section 11 for details.

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

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

This report was printed on: 09 October 2013

2.5 Emissions Configuration



The unit was powered from the dedicated AC/DC adapter provided with the EUT. For conducted RF tests the same unit was used and tested via its provided RF port and a short uFL to SMA lead. Note: Conducted port only used to facilitate easier testing methods; unit is otherwise tested as an integral antenna unit.

The unit was configured with a Bluetooth DUT mode in an engineering menu in software. Once this mode was selected the Bluetooth module could be controlled and test modes set via a Bluetooth test set. High, middle and Low channels were set as stated within section 2.4 of this report. The transmit modes were 100% continuous with modulation (except where stated) and the power settings for each channel were left at the default maximum setting. The module was fitted to the end of a special 10cm extender PCB which in turn was connected to a controller PCB which provided a means of controlling the module and setting the various modes for test.

For radiated and conducted emissions tests the unit was populated with typical peripherals. The audio input port had a 3.5mm audio lead inserted which was connected to the audio out of an iPhone (3.5mm socket) the USB port was populated with the special USB device for control of the test modes required for tests (DUT mode etc.).
The AC/DC adapter was also placed on to the test table along with the main enclosure of the EUT.

3 Summary of test results

The **Cougar module type A, VL-62444** was tested to the following standards: -

FCC 47CFR Part 15.247 (effective date October 1st, 2012);
Class DSS Intentional Radiator

Any compliance statements are made reliant on the modes of operation as instructed to us by the Manufacturer based on their specific knowledge of the application and functionality of the equipment tested. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of equipment not meeting the intentions of the standard, particularly under different conditions to those during testing.

Title	Reference	Results
1. AC power line conducted emissions	FCC Part 15C §15.207	PASSED
2. Radiated emissions	FCC Part 15C §15.205, §15.209 and §15.247(d)	PASSED
3. Antenna power conducted emissions for receivers	FCC Part 15.111	NOT APPLICABLE[1]
4. Occupied bandwidth	FCC Part 15C §15.215(c), §15.247(a)(2)	PASSED
5. Maximum Peak conducted output power	FCC Part 15C §15.247(b) Peak Average	PASSED NOT APPLICABLE[2]
6. Effective radiated power field strength		PASSED
7. Duty cycle	FCC Part 15C §15.35(c)	NOT APPLICABLE[3]
8. Power Spectral Density	FCC Part 15C §15.247(e)	NOT APPLICABLE[4]
9. Band edge compliance	FCC Part 15C §15.205, §15.209 and §15.247	PASSED
10. FHSS parameters	FCC Part 15C §15.247(a)(1) Dwell time and Number of hopping channels Frequency separation	 PASSED PASSED
11. Frequency stability	ANSI C63.10 §6.8.	NOT APPLICABLE[5]

[1] EUT has no receive function in the range 30-960MHz.
[2] Alternative method not required as peak power measured.
[3] No limits apply, however duty cycle measurement performed to verify correction factors for average emissions.
[4] EUT uses FHSS technology and is therefore not applicable to this test.
[5] No limits apply, however the requirement to contain the designated bandwidth of the emission within the specified frequency band includes the frequency stability of the transmitter over expected variations in temperature and supply voltage

NOTE: This report covers the Bluetooth technology test requirements only. For Wi-Fi test requirements please refer to RN Electronics report: 08-6899-8-13 Issue 01.

4 Specifications

4.1 Relevant Standards

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

R.N. Electronics Ltd sites M and OATS are listed with the FCC. Registration Number 293246

Reference	Standard Number	Year	Description
4.1.1	FCC 47CFR15	2012	47CFR15
4.1.2	ANSI C63.10	2009	American National Standard for Testing Unlicensed Wireless Devices
4.1.3	ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
4.1.4	FCC DA 00-705	2000	Public Notice, released March 30, 2000 – Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

4.2 Deviations

ANSI C63-10-2009 deviations:
The reference standard ANSI C63.4-2003 was used, not the latest ANSI C63.4-2009

FCC Part 15 deviations:
None.

4.3 Tests at Extremes of Temperature & Voltage

Not Required.

4.4 Measurement Uncertainties

Parameter	Uncertainty
Transmitter Tests	
Conducted RF power	<± 1.0 dB
Occupied bandwidth	± 1.9 %
Radiated RF power	± 3.5 dB
Radiated spurious emissions	30MHz - 1000MHz ±5.1dB 1000MHz - 2000MHz ±4.5dB 1 – 18 GHz ±3.5dB 18 – 26.5 GHz ±3.9dB
AC power line conducted emissions	(For LISN) 150kHz to 30MHz ±3.6dB

5 Tests, Methods and Results

5.1 AC power line conducted emissions

5.1.1 Test Methods

Test Requirements	FCC Part 15C, Reference (15.207)
Test Method:	ANSI C63.10, Reference (6.2.)

5.1.2 Configuration of EUT

The EUT and AC/DC adapter were placed on a wooden table 0.8m above the ground plane and connected to a LISN via a 1m mains cable.

Details of the Peripheral and Ancillary Equipment connected for this test is listed in section 11.

The EUT was operated in Constant TX Low Channel and Constant TX Mid Channel and Constant TX High Channel modes.

5.1.3 Test Procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted in the 'Test Equipment' Section. Measurements were made on the live and neutral conductors using both average and quasi-peak detection.
At least 6 signals within 20dB and/or all signals within 10dB of the limit were investigated.

Tests were performed in Test Site F.

5.1.4 Test Equipment used

E150, E035, E410, E411, E412, E465

See Section 10 for more details.

5.1.5 Test results

Ambient conditions.
Temperature: 20 °C Relative humidity: 48 %

No discernible difference was noted in emissions between channels (exploratory measurements); therefore the final measurements are presented for **TX mid channel** mode only.

Analyser plots showing Peak values can be found in Section 6.1 of this report.

Table of signals measured.

Quasi-Peak and Average Live (AC_DC Adapter Input (BT))

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP - Lim1 (dB)	AV Amp (dBuV)	AV - Lim1 (dB)
1	0.166	44.0	41.1	-24.1	24.1	-31.1
2	0.414	32.1	30.2	-27.4	23.3	-24.3
3	0.431	34.1	32.3	-24.9	27.8	-19.4
4	0.433	33.5	32.3	-24.9	27.7	-19.5
5	0.468	27.5	25.6	-30.9	21.2	-25.3
6	2.546	29.7	27.1	-28.9	17.6	-28.4
7	2.583	29.8	27.7	-28.3	17.3	-28.7
8	2.637	29.7	27.4	-28.6	16.1	-29.9
9	24.577	28.3	26.7	-33.3	24.8	-25.2

Table of signals measured.

Quasi-Peak and Average Neutral (AC_DC Adapter Input (BT))

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP - Lim1 (dB)	AV Amp (dBuV)	AV - Lim1 (dB)
1	0.180	42.6	38.5	-26.0	18.0	-36.5
2	0.218	36.6	33.9	-29.0	16.8	-36.1
3	0.311	28.8	23.6	-36.3	11.4	-38.5
4	0.396	31.7	29.7	-28.2	23.3	-24.6
5	0.413	32.7	30.1	-27.5	23.2	-24.4
6	1.233	28.6	26.6	-29.4	20.6	-25.4
7	1.249	28.4	26.1	-29.9	20.4	-25.6
8	2.526	25.5	21.6	-34.4	10.2	-35.8

Plot reference tables

Frequency range	Plot reference
150kHz to 30MHz	6899-5 Cond 1 AC Live 150k-30M Average
150kHz to 30MHz	6899-5 Cond 1 AC Live 150k-30M Quasi-Peak
150kHz to 30MHz	6899-5 Cond 1 AC Neutral 150k-30M Average
150kHz to 30MHz	6899-5 Cond 1 AC Neutral 150k-30M Quasi-Peak

These results show that the **EUT** has **PASSED** this test.

5.2 Radiated emissions

5.2.1 Test Methods

Test Requirements:	FCC Part 15C, Reference (15.209)
Test Method:	ANSI C63.10, Reference (6.4 – 6.6.)

5.2.2 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The EUT was rotated in all three orthogonal planes.

The EUT was operated in Constant TX Low Channel and Constant TX Mid Channel and Constant TX High Channel modes.

5.2.3 Test Procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below.

Below 30MHz, measurements were made in a semi-anechoic chamber (pre-scan) with final measurements on an OATS without a ground plane. The antenna was placed 1m above the ground. The equipment and the antenna were rotated 360° to record the worst case emissions.

30MHz - 1GHz, measurements were made on a site listed with the FCC. The equipment was rotated 360° and the antenna scanned 1 – 4 metres in both horizontal and vertical polarisations to record the worst case emissions.

Above 1GHz, measurements were made in a semi-anechoic chamber with appropriate absorbing material for use in this range. Horn antennas were used at heights where the whole of the EUT was contained within the main beam. The EUT was rotated through 360° to record the worst case emissions.

At least 6 signals within 20dB and all signals within 10dB of the limit were investigated.

Tests were performed using Test Site M**.**

5.2.4 Test Equipment used

E268, E410, E411, E412, E429, TMS78, TMS79, TMS81**,** TMS82, TMS933, N240**.**

See Section 10 for more details

5.2.5 Test results

Ambient conditions (Radiated emissions 150kHz-30MHz)
Temperature: 18-23 °C Relative humidity: 44-57 %

Analyser plots showing Peak values can be found in Section 6.2 of this report.

Note: EUT tested in a continuous transmit mode for ease of test.

No discernible difference was noted in emissions between channel settings in the test ranges 150k-30MHz and 30-1000MHz (exploratory measurements); therefore final measurements are presented for **TX mid channel** mode only for these test ranges.

5.2.5.1 Below 30MHz.

Plot references for Low Frequency Radiated emissions measurements (150kHz to 30MHz)

Channel	Parallel Plots	Perpendicular Plots
Middle Bluetooth	6899-5 Parallel 150k-30MHz Bluetooth TX Mid channel	6899-5 Perpendicular 150k-30MHz Bluetooth TX Mid channel

5.2.5.2 30MHz - 1GHz.

Plot references for Radiated emissions measurements (30-1000MHz)

Frequency Range	Antenna Polarisation	Plot reference
30 – 300 MHz	Horizontal	6899-5 Rad 2 VHF Horiz
30 – 300 MHz	Vertical	6899-5 Rad 2 VHF Vert
300 – 1000 MHz	Horizontal	6899-5 Rad 2 UHF Horiz
300 – 1000 MHz	Vertical	6899-5 Rad 2 UHF Vert

Table of signals measured (Bluetooth Mid chan TX)

Horizontal

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP - Lim1 (dB)
1	119.998	39.9	36.2	-7.3
2	122.883	33.3	31.7	-11.8
3	138.023	23.4	16.6	-26.9
4	147.459	42.7	42.3	-1.2
5	239.997	35.8	33.5	-12.5
6	245.766	39.2	38.4	-7.6

Vertical

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP - Lim1 (dB)
1	41.986	31.6	20.7	-19.3
2	44.855	31.1	27.6	-12.4
3	48.002	36.4	30.3	-9.7
4	54.053	27.8	21.7	-18.3
5	113.586	29.8	25.0	-18.5
6	119.998	35.6	32.5	-11.0
7	122.883	30.1	27.6	-15.9
8	147.459	38.2	37.6	-5.9

5.2.5.3 Above 1GHz.

Note: Whilst Low, Mid and High channels were tested, plots are for illustrative purposes only and only **Mid channel** plots are shown in this report.

Radio Parameters 1

Band	2400-2483.5 MHz
Power level	2 dBm
Channel spacing	1 MHz
Mod scheme	FHSS
Low channel	2402 MHz

Results relating to Radio Parameters 1

Spurious Frequency (MHz)	Measured Peak Level (dBµV/m)	Difference to Peak Limit (dB)	Measured Average Level (dBµV/m)	Difference to Average Limit (dB)	Antenna Polarisation	EUT Polarisation
1997	44.6	-29.4	37.6	-16.4	Vertical	vertically sideways
1997	43.9	-30.1	37	-17	Horizontal	Vertically sideways
2532	43.7	-30.3	35.4	-18.6	Vertical	vertically sideways
2558	48.7	-25.3	42.6	-11.4	Vertical	vertically sideways
2584	46.2	-27.8	37.9	-16.1	Vertical	vertically sideways
2532	43.4	-30.6	34.8	-19.2	Horizontal	vertically sideways
2558	48.2	-25.8	42.2	-11.8	Horizontal	vertically sideways
2584	45.1	-28.9	36.3	-17.7	Horizontal	vertically sideways
2610	44.7	-29.3	34.7	-19.3	Horizontal	vertically sideways

Radio Parameters 2

Band	2400-2483.5 MHz
Power level	2 dBm
Channel spacing	1 MHz
Mod scheme	FHSS
Middle channel	2441 MHz

Results relating to Radio Parameters 2

Spurious Frequency (MHz)	Measured Peak Level (dBµV/m)	Difference to Peak Limit (dB)	Measured Average Level (dBµV/m)	Difference to Average Limit (dB)	Antenna Polarisation	EUT Polarisation
1997	44.6	-29.4	37.6	-16.4	Vertical	vertically sideways
1997	43.9	-30.1	37	-17	Horizontal	Vertically sideways
2532	43.7	-30.3	35.4	-18.6	Vertical	vertically sideways
2558	48.7	-25.3	42.6	-11.4	Vertical	vertically sideways
2584	46.2	-27.8	37.9	-16.1	Vertical	vertically sideways
2532	43.4	-30.6	34.8	-19.2	Horizontal	vertically sideways
2558	48.2	-25.8	42.2	-11.8	Horizontal	vertically sideways
2584	45.1	-28.9	36.3	-17.7	Horizontal	vertically sideways
2610	44.7	-29.3	34.7	-19.3	Horizontal	vertically sideways

Radio Parameters 3

Band	2400-2483.5 MHz
Power level	2 dBm
Channel spacing	1 MHz
Mod scheme	FHSS
High channel	2480 MHz

Results relating to Radio Parameters 3

Spurious Frequency (MHz)	Measured Peak Level (dBµV/m)	Difference to Peak Limit (dB)	Measured Average Level (dBµV/m)	Difference to Average Limit (dB)	Antenna Polarisation	EUT Polarisation
1997	44.6	-29.4	37.6	-16.4	Vertical	vertically sideways
1997	43.9	-30.1	37	-17	Horizontal	Vertically sideways
2532	43.7	-30.3	35.4	-18.6	Vertical	vertically sideways
2558	48.7	-25.3	42.6	-11.4	Vertical	vertically sideways
2584	46.2	-27.8	37.9	-16.1	Vertical	vertically sideways
2532	43.4	-30.6	34.8	-19.2	Horizontal	vertically sideways
2558	48.2	-25.8	42.2	-11.8	Horizontal	vertically sideways
2584	45.1	-28.9	36.3	-17.7	Horizontal	vertically sideways
2610	44.7	-29.3	34.7	-19.3	Horizontal	vertically sideways

Plot reference table

Frequency Range	Antenna Polarisation	Plot reference
1-2GHz	Vertical	6899-5 Vert 1-2GHz Mid chan TX
1-2GHz	Horizontal	6899-5 Horiz 1-2GHz Mid chan TX
2-2.7GHz	Vertical	6899-5 Vert 2-2.7GHz Mid chan TX
2-2.7GHz	Horizontal	6899-5 Horiz 2-2.7GHz Mid chan TX
2.7-5GHz	Vertical	6899-5 Vert 2.7-5GHz Mid chan TX
2.7-5GHz	Horizontal	6899-5 Horiz 2.7-5GHz Mid chan TX
5-6GHz	Vertical	6899-5 Vert 5-6GHz Mid chan TX
5-6GHz	Horizontal	6899-5 Horiz 5-6GHz Mid chan TX
6-7.8GHz	Vertical	6899-5 Vert 6-7.8GHz Mid chan TX
6-7.8GHz	Horizontal	6899-5 Horiz 6-7.8GHz Mid chan TX
7.8-10GHz	Vertical	6899-5 Vert 7.8-10GHz Mid chan TX
7.8-10GHz	Horizontal	6899-5 Horiz 7.8-10GHz Mid chan TX
10-12.5GHz	Vertical	6899-5 Vert 10-12.5GHz Mid chan TX
10-12.5GHz	Horizontal	6899-5 Horiz 10-12.5GHz Mid chan TX
12-15GHz	Vertical	6899-5 Vert 12-15GHz Mid chan TX
12-15GHz	Horizontal	6899-5 Horiz 12-15GHz Mid chan TX
15-18GHz	Vertical	6899-5 Vert 15-18GHz Mid chan TX
15-18GHz	Horizontal	6899-5 Horiz 15-18GHz Mid chan TX
18-21.5GHz	Vertical	6899-5 Vert 18-21.5GHz Mid chan TX
18-21.5GHz	Horizontal	6899-5 Horiz 18-21.5GHz Mid chan TX
21.5-25GHz	Vertical	6899-5 Vert 21.5-25GHz Mid chan TX
21.5-25GHz	Horizontal	6899-5 Horiz 21.5-25GHz Mid chan TX

LIMITS: 15.209 limits are applicable in the restricted bands of 15.205 with the relevant detector. 15.247(d) other emissions, outside the intentional band, must be attenuated by at least 20dB from the level of the fundamental / meet the general limits of 15.209.

N.b. the general limits of 15.209 are as drawn on the respective plots.

These show that the **EUT** has **PASSED** this test.

5.3 Antenna power conducted emissions

NOT APPLICABLE: has no receive function in the range 30-960MHz.

5.4 Occupied bandwidth

5.4.1 Test Methods

Test Requirements**:** FCC Part 15C, Reference (15.215)
Test Method: ANSI C63.10, Reference (6.9)
FCC Public Notice DA 00-705

5.4.2 Configuration of EUT

The EUT was tested on a bench. Measurements were made at the RF port. The EUT was tested whilst connected to the AC power. The EUT was configured for maximum emissions. The EUT was operated in Constant TX Low Channel, Constant TX Mid Channel and Constant TX High Channel modes.

5.4.3 Test Procedure

Tests were performed using Test Site A.
Tests were made in accordance with FCC Part 15 using the measuring equipment noted below. A 10kHz RBW, 3x VBW, auto sweep time and max hold settings were used for the 20dB bandwidth.

5.4.4 Test Equipment used

E533, E534, E535, E256, TMS44

See Section 10 for more details.

5.4.5 Test results

Ambient conditions.
Temperature: 24 °C Relative humidity: 54 % Pressure: 101.7 kPa

Analyser plots for the 20dB bandwidth can be found in Section 6.3 of this report.

Radio Parameter 1

Band	2400-2483.5 MHz
Power level	2 dBm
Channel spacing	1 MHz
Mod scheme	FHSS
Low channel	2402 MHz
Mid channel	2441 MHz
High channel	2480 MHz

Results relating to Radio Parameters 1

	Low	Mid	High
99% BW (kHz)	922.96	925.96	924.46
Plot reference	J6899-5 Bluetooth Low Channel 20dB BW	J6899-5 Bluetooth Mid Channel 20dB BW	J6899-5 Bluetooth High Channel 20dB BW

LIMITS:

15.215(c) The 20dB bandwidth of the emission must be contained within the designated frequency band.
15.247(a)(1)(ii) The maximum allowed 20dB bandwidth of the hopping channel is 1MHz.

These results show that the EUT has **PASSED** this test.

5.5 Maximum Peak conducted output power

5.5.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.247)
Test Method: ANSI C63.10, Reference (6.10.2.1 a))

5.5.2 Configuration of EUT

The EUT was measured on a bench using a spectrum analyser connected to the internal RF port.

The EUT was operated in Constant TX Low Channel, Constant TX Mid Channel and Constant TX High Channel modes for this test.

The EUT was set to each mode and test signal in turn (see section 2.4) and highest power levels recorded.

5.5.3 Test Procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below.
Peak stated reading is maximum power observed using a spectrum analyser RBW > 6dB BW of the EUT.

Measurements were made on a test bench in site A.

5.5.4 Test Equipment used

E533, E534, E535, E256, TMS44

See Section 10 for more details

5.5.5 Test results

Ambient conditions.
Temperature: 24 °C Relative humidity: 54 % Pressure: 101.7 kPa

Radio Parameter 1

Band	2400-2483.5 MHz
Power level	2 dBm
Channel spacing	1 MHz
Mod scheme	FHSS
Low channel	2402 MHz
Mid channel	2441 MHz
High channel	2480 MHz

Results relating to Radio Parameters 1

Test conditions		**Carrier Power (mW)**		
		Low	**Mid**	**High**
Temp Ambient	**Volts Nominal**	1.40	1.91	1.86
Maximum TX Power observed (mW)		1.91		

LIMITS: 15.247(b)(1) For FHSS operating 2400-2483.5 MHz employing at least 75 channels 1 Watt.

These results show that the EUT has **PASSED** this test.

5.6 Maximum Average conducted output power

NOT APPLICABLE: PK Power performed instead.

5.7 Effective radiated power field strength

5.7.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.247)
Test Method: ANSI C63.10 Reference (6.3.1)

5.7.2 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was rotated in all three orthogonal planes to maximise. Final measurements were taken at 3m. The EUT was operated in Constant TX Low Channel, Constant TX Mid Channel and Constant TX High Channel modes for this test.

5.7.3 Test Procedure

Tests were made in accordance with the Test Method noted above using the measuring equipment noted in the 'Test Equipment used' section at Site M. The power stated is Peak field strength.

5.7.4 Test Equipment used

E268, E533, E534, E535, TMS82

See Section 9 for more details

5.7.5 Test results

Ambient conditions.
Temperature: 21°C Relative humidity: 56 % Pressure: 102 kPa

Any Analyser plots can be found in Section 6.5 of this report.

Radio Parameter 1

Band	2400-2483.5 MHz
Power level	2 dBm
Channel spacing	1 MHz
Mod scheme	FHSS
Low channel	2402 MHz
Mid channel	2441 MHz
High channel	2480 MHz

Results relating to Radio Parameters 1

	Low	Mid	High
Peak Level (dBµV/m)	97.2	97.2	97
Conversion to mW	1.57	1.57	1.50
Plot reference	J6899-5 PK Field strength Low channel hopping	J6899-5 PK Field strength Mid channel hopping	J6899-5 PK Field strength High channel hopping
Antenna Polarisation	Horiz	Horiz	Horiz
EUT Polarisation	Vertically sideways	Vertically sideways	Vertically sideways

LIMITS: The maximum output power in all cases is 30dBm/ 1 Watt.

These results show that the EUT has **PASSED** this test.

5.8 Duty cycle

NOT APPLICABLE: There is no limit defined in the standard. It was, however, confirmed by observation that the continuous test mode set by the test set was 100% duty. For Dwell time results please refer to section 5.11 within this report.

5.9 Maximum Power Spectral Density

NOT APPLICABLE: Test not applicable to FHSS equipment

5.10 Band Edge Compliance

5.10.1 Test Methods

Test Requirements:	FCC Part 15C, Reference (15.215 and 15.247)
Test Method:	ANSI C63.10-2009, Reference clause 6.9.3

5.10.2 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres.

The EUT was operated in Constant TX Low Channel and Constant TX High Channel and Hopping All channels modes.

5.10.3 Test Procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below. The emission from the EUT was maximised before taking the plots. The EUT was set into hopping and non-hopping modes.

Tests were performed using Test Site **B**.

5.10.4 Test Equipment used

E268, E533, E534, E535, TMS82

See Section 10 for more details.

5.10.5 Test results

Ambient conditions.
Temperature: 24 °C Relative humidity: 54 % Pressure: 101.7 kPa

Analyser plots for the Band Edge Compliance can be found in Section 6.4 of this report. These show the 20dBc requirement of 15.247(d) are met at the band edges of 2400 and 2483.5 MHz.

Restricted band edge plots are also shown in section 6.4.The following tables list the field strengths observed in the adjacent restricted bands, which are required to meet the tighter 15.209 limits:

Radio Parameter 1

Band	2400-2483.5 MHz
Power level	2 dBm
Channel spacing	1 MHz
Mod scheme	FHSS
Low channel	2402 MHz
Mid channel	2441 MHz
High channel	2480 MHz

Restricted Band Edge Results relating to Radio Parameters 1

	Low	**High**
Peak Level (dBµV/m)	33.8	36.7
Peak Plot reference	J6899-5 PK radiated Res band edge Low channel	J6899-5 PK radiated Res band edge High channel
Average Level (dBµV/m)	*N/A	*N/A
Average Plot reference	*N/A	*N/A

* As Peak results are lower than the Average limit, no average results were measured/plotted.

Band Edge Results relating to Radio Parameters 1

	Low	**High**
Plot reference	J6899-5 Bluetooth Band edge Low channel Hopping 100kRBW	J6899-5 Bluetooth Band edge High channel Hopping 100kRBW

The band edge readings were performed with a peak detector (max held plot).

Limits: AV = 54dBuV/m at band edges
PK = 74dBuV/m at band edges

The restricted band edges closest to the EUT frequency of 2400-2483.5MHz are 2390 & 2483.5MHz.

Further wider span plots have been taken to show the fact that there are no spurious emissions above the restricted limits of 15.209.

These results show that the **EUT** has **PASSED** this test.

5.11 FHSS Parameters

5.11.1 Carrier frequency separation

5.11.1.1 Test Methods

Test Requirements: FCC Part 15C, Reference (15.247)
Test Method: FCC Public Notice DA 00-705

5.11.1.2 Configuration of EUT

The EUT was tested on the bench and ambient conditions were monitored. The EUT was operated in Hopping All channels mode for this test.

5.11.1.3 Test Procedure

Tests were made using the measuring equipment noted in the 'Test Equipment' Section at Site A. With the EUT hopping, a span was set on the spectrum analyser to show two adjacent channel peaks. The analyser was set to Peak detector and a max held and the trace was allowed to stabilise.

5.11.1.4 Test Equipment used

E533, E534, E535, E256, TMS44

See Section 10 for more details

5.11.1.5 Test Results

Ambient conditions.
Temperature: 24 °C Relative humidity: 55 % Pressure: 101.8 kPa

Channel	Plot reference	Separation
78 & 79	J6899-5 Bluetooth frequency separation	986.9kHz

Analyser plots for carrier frequency separation can be found in Section 6.6 of this report.

LIMITS:
Minimum of 25kHz or 20dB Bandwidth Separation.

These results show that the EUT has **PASSED** this test.

5.11.2 Number of hopping frequencies and Channel Occupancy (Dwell time)

5.11.2.1 Test Methods

Test Requirements: FCC Part 15C, Reference (15.247)
Test Method: FCC Public Notice DA 00-705

5.11.2.2 Configuration of EUT

The EUT was tested on the bench and ambient conditions were monitored. The EUT was operated in Hopping All channels mode for this test.

5.11.2.3 Test Procedure

Tests were made using the measuring equipment noted in the 'Test Equipment' Section at Site A. With the EUT hopping, a suitable span was set on the spectrum analyser to show clearly over a range of plots the number of channels being used by the EUT. The analyser was set to Peak detector and a max held and the trace was allowed to stabilise for each plot. For time of occupancy the analyser was set to zero span mode and centred on a hopping channel with a suitable dwell time to capture one hop.

5.11.2.4 Test Equipment used

E252, E533, E534, E535

See Section 10 for more details

5.11.2.5 Test Results

Ambient conditions.
Temperature: 21 °C Relative humidity: 48 % Pressure: 101 kPa

No of hopping channels	79
Plot references for no. of channels used	J6899-5 Bluetooth Number of hopping channels part 1 J6899-5 Bluetooth Number of hopping channels part 2 J6899-5 Bluetooth Number of hopping channels part 3
Dwell time per hop	2.88ms
Dwell time plot reference	J6899-5 Bluetooth Dwell time plot 1

Bluetooth is a slotted protocol and uses up to 5 slots per transmission. Each slot = 625us. 5x6.25us = 3.125ms. Therefore the EUT is using 5 slots per transmission. Based on Bluetooth using nominally 1600 hops per second, 1600/5 = 320 hops per second. 320/79 channels is 4.05 hops per channel per second. Thus 4.05 hops multiplied by the measured dwell of 2.88ms = 11.67ms per second occupancy which equals 368.64ms per 31.6 seconds.

Analyser plots for number of hopping frequencies and dwell time can be found in Section 6.6 of this report.

LIMITS:
Average time of occupancy shall not exceed 0.4s per channel within a period of 0.4s multiplied by number of hopping channels. (79 channels) = 31.6seconds.

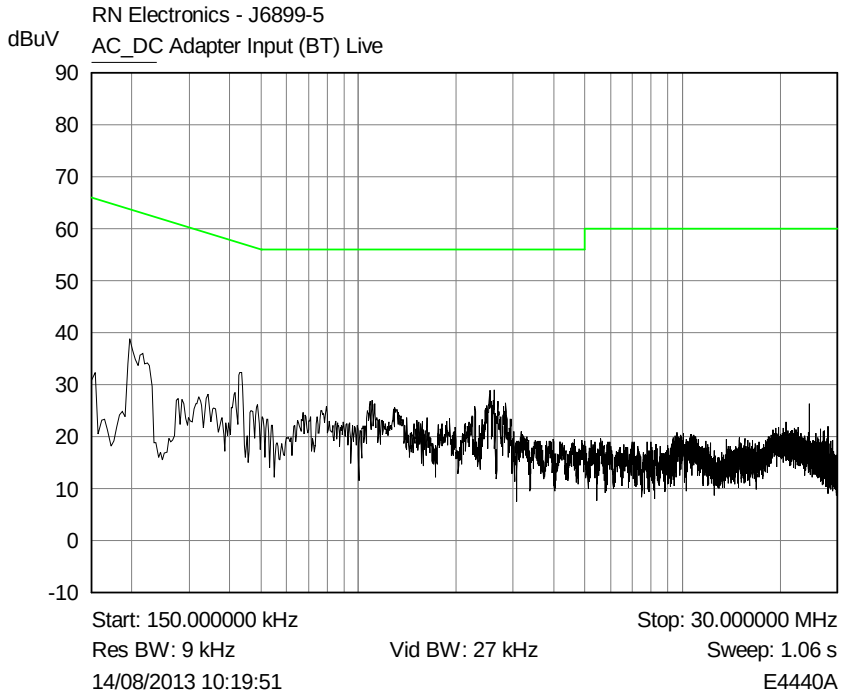
These results show that the EUT has **PASSED** this test.

5.12 Frequency stability

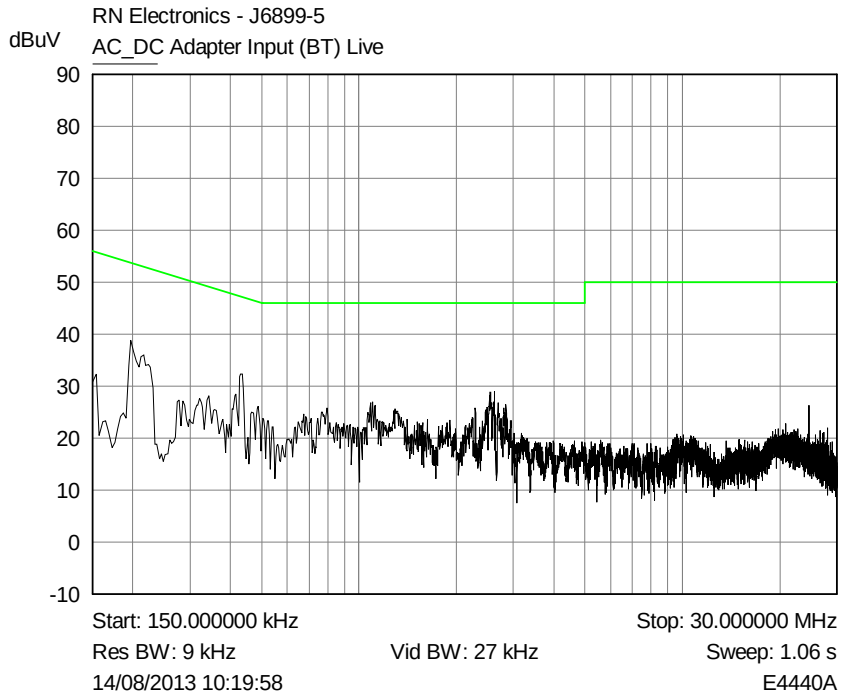
NOT APPLICABLE: No limits apply, however the requirement to contain the designated bandwidth of the emission within the specified frequency band includes the frequency stability of the transmitter over expected variations in temperature and supply voltage.

6 Plots and Results

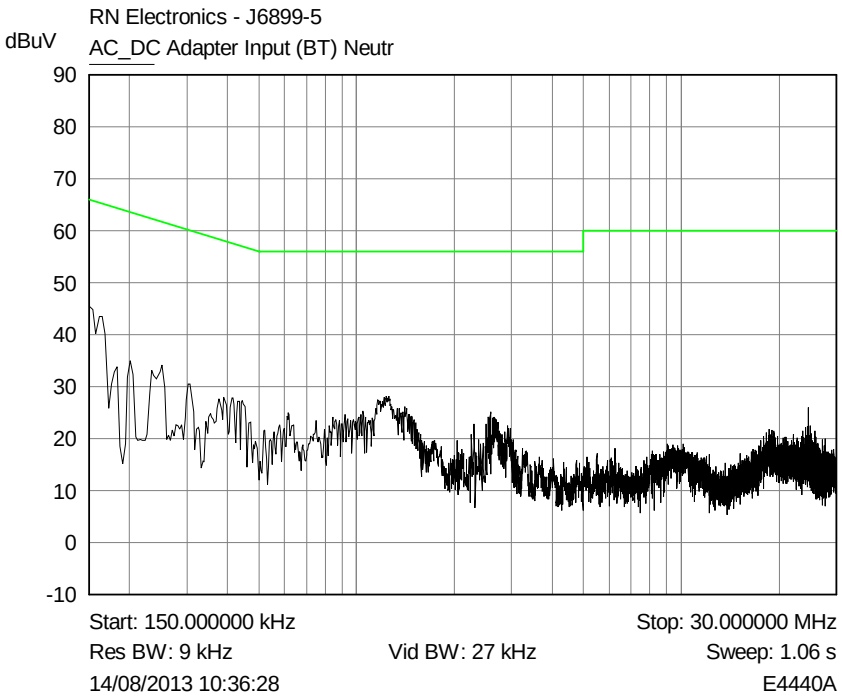
6.1 AC power line conducted emissions plots



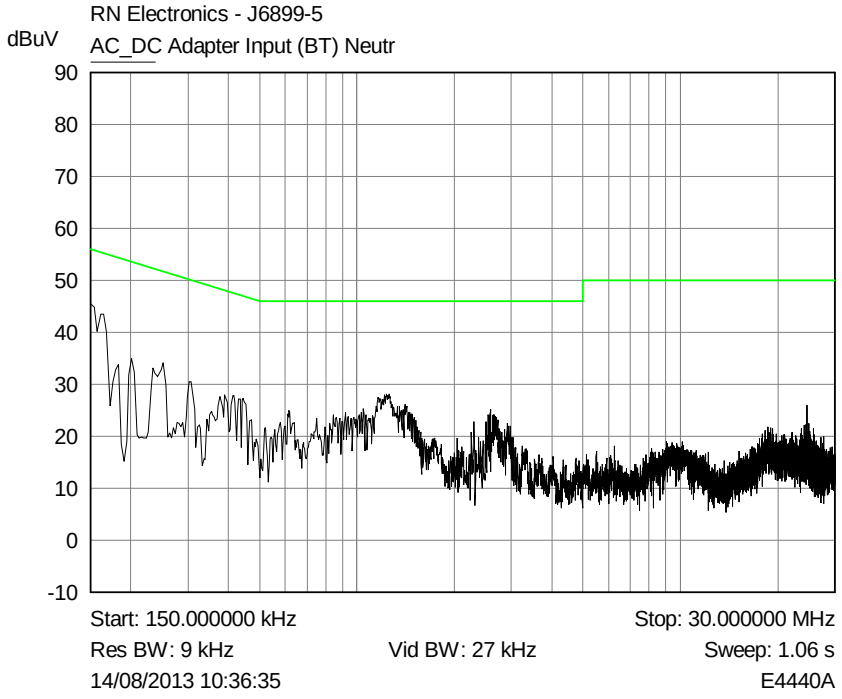
Plot of peak emissions 150kHz - 30MHz on the AC_DC Adapter Input live terminal against the quasi-peak limit line.



Plot of peak emissions 150kHz - 30MHz on the AC_DC Adapter Input live terminal against the average limit line.



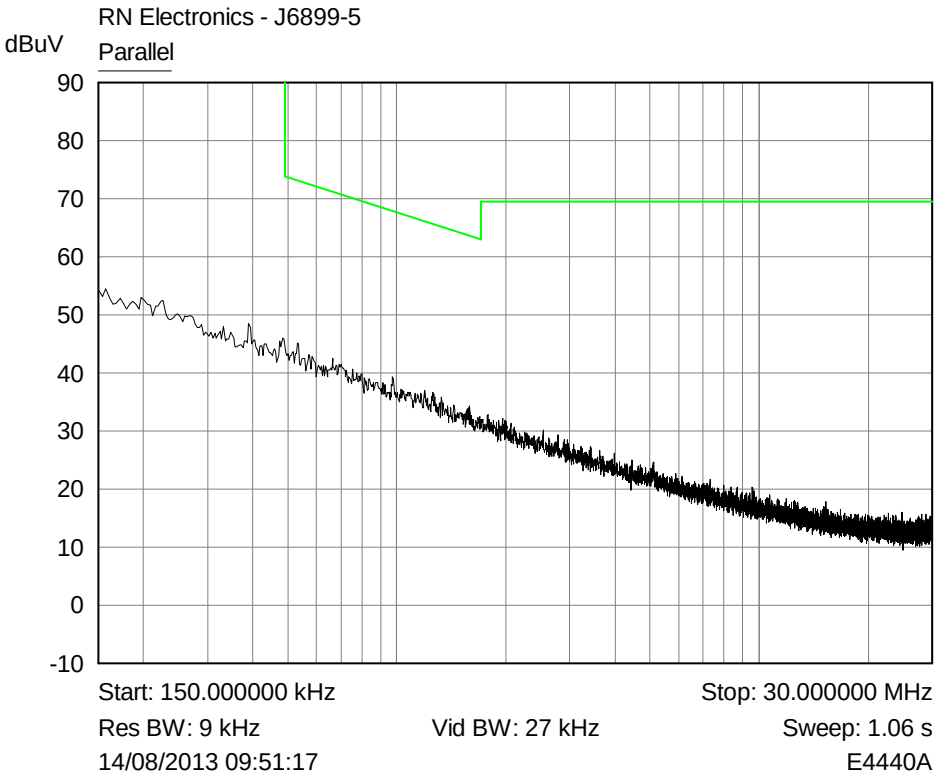
Plot of peak emissions 150kHz - 30MHz on the AC_DC Adapter Input (BT) neutral terminal against the quasi-peak limit line.



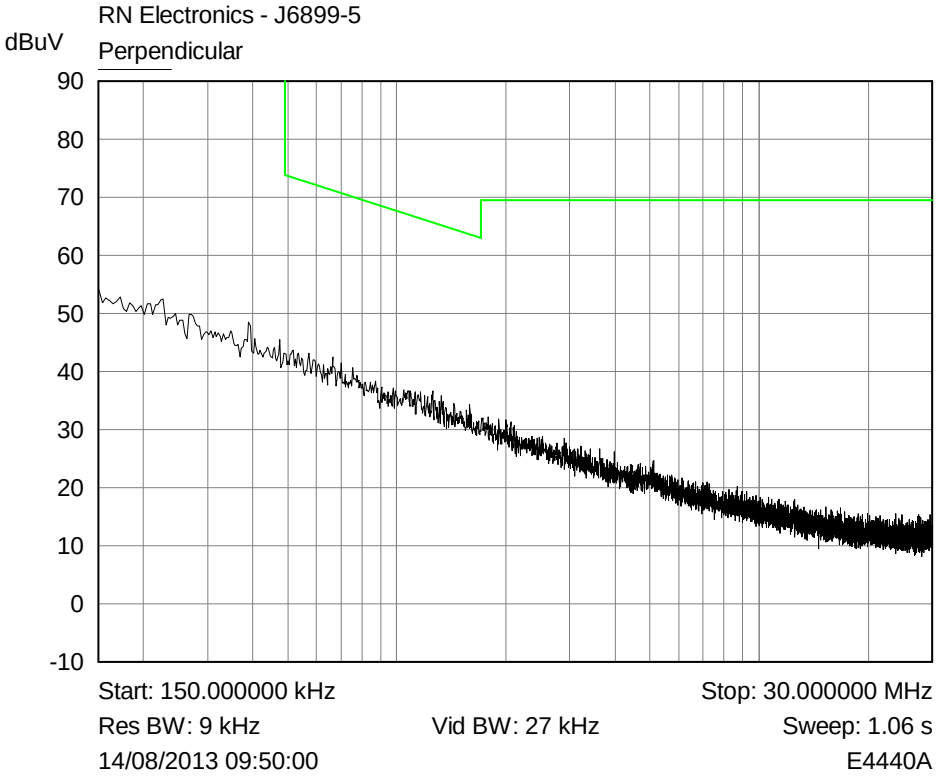
Plot of peak emissions 150kHz - 30MHz on the AC_DC Adapter Input (BT) neutral terminal against the average limit line.

6.2 Radiated emissions plots

6.2.1 Low frequency radiated emissions plots

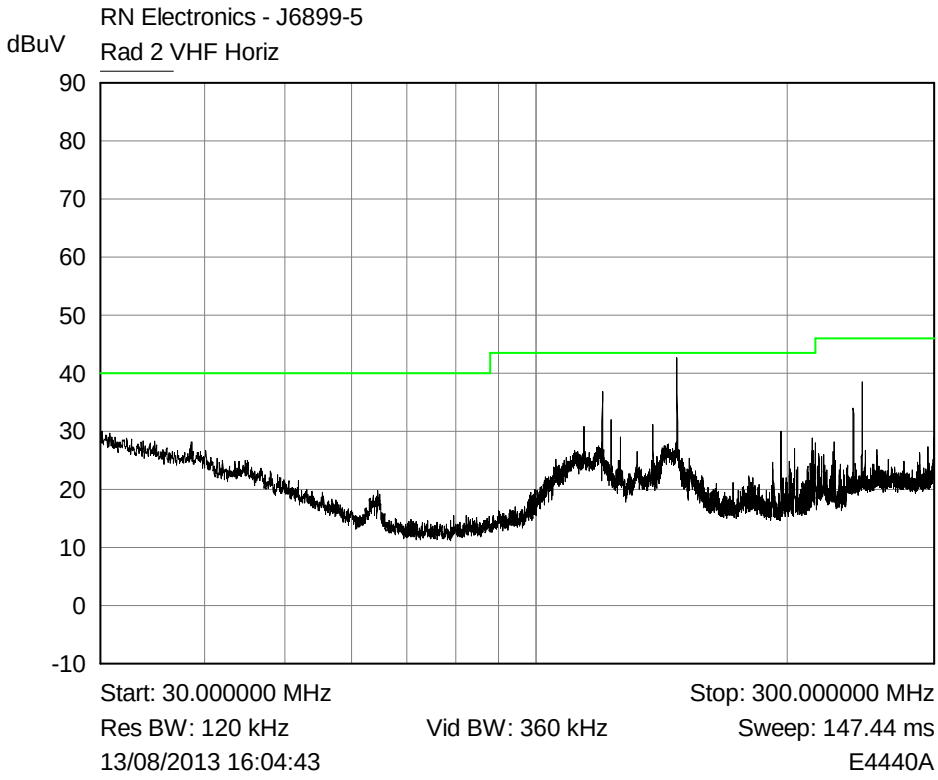


Bluetooth - Parallel Plot

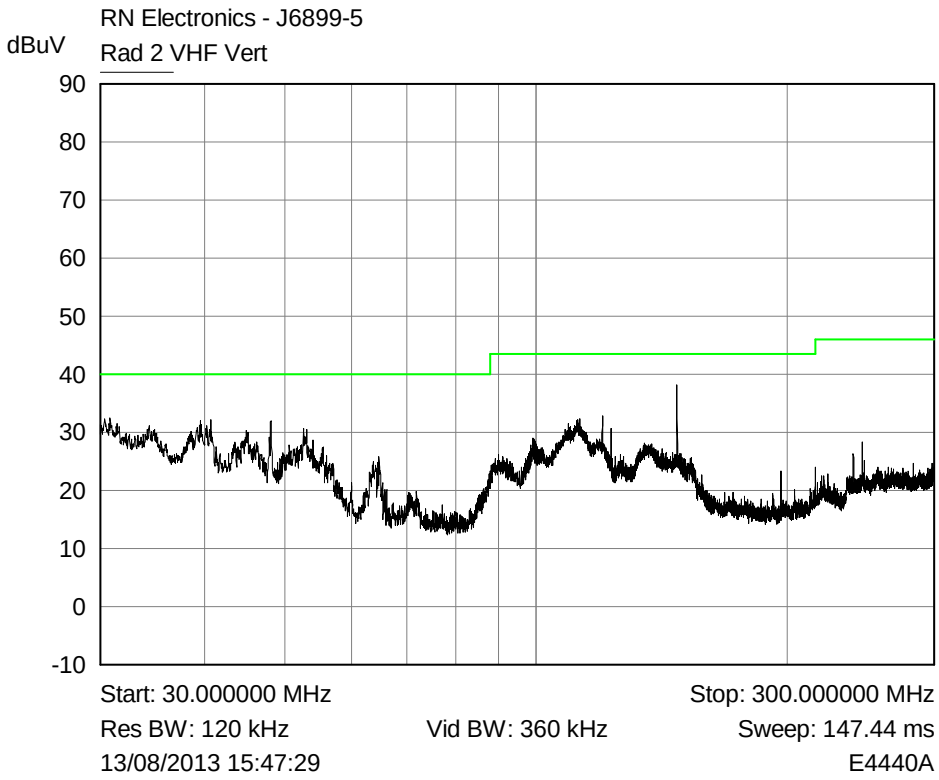


Bluetooth - Perpendicular Plot

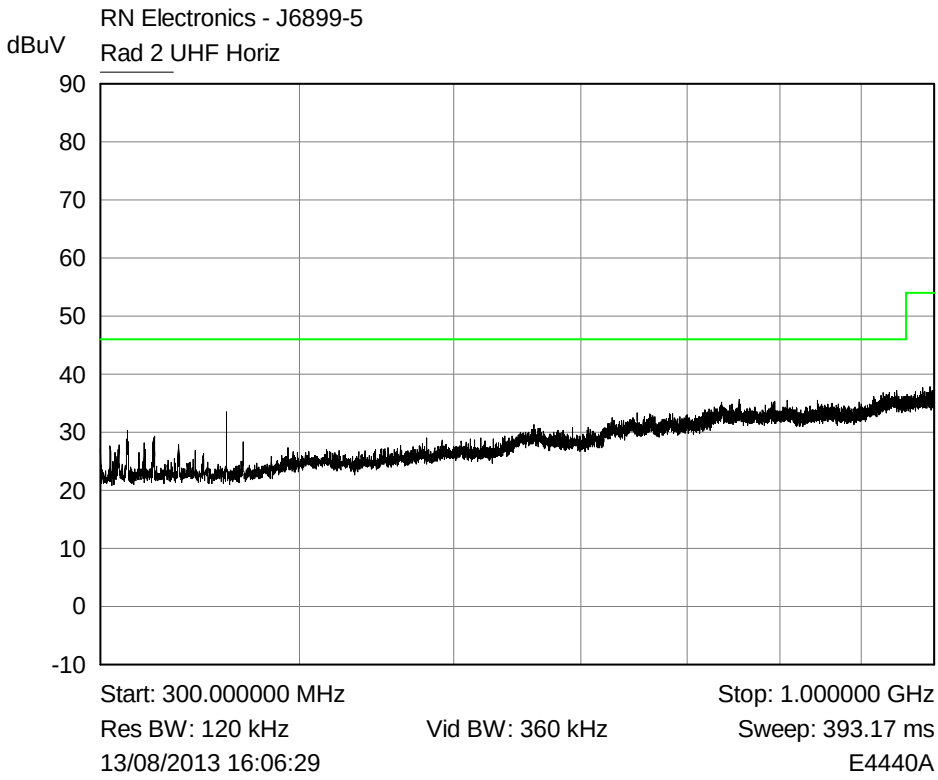
6.2.2 Radiated emissions - 30MHz - 1GHz



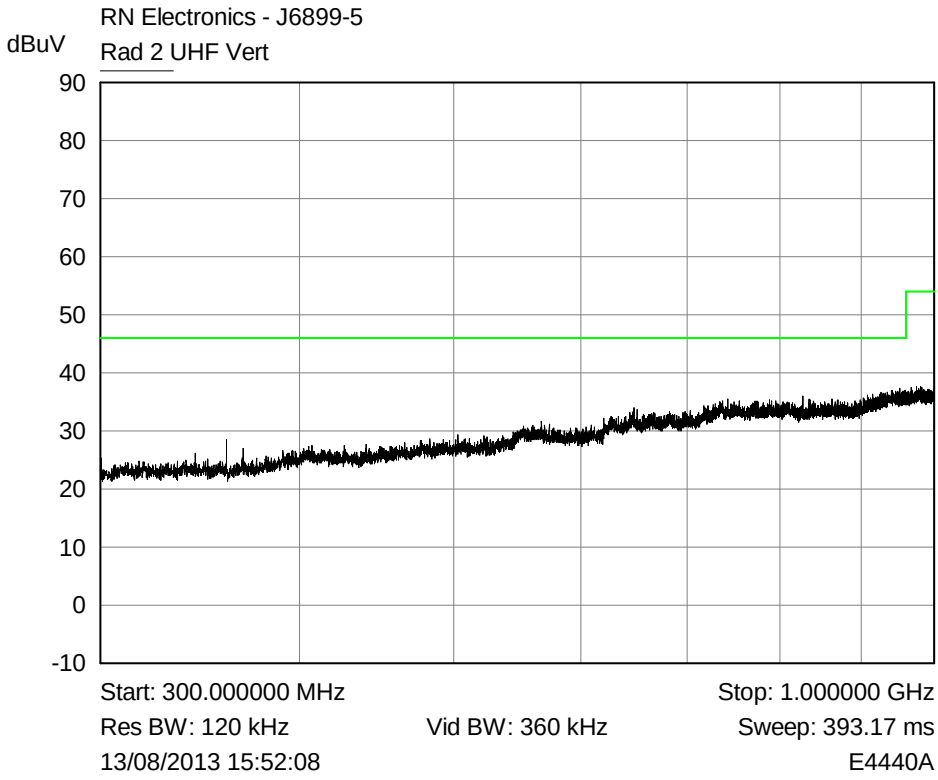
Bluetooth Mid chan TX: Plot of peak horizontal emissions 30MHz - 300MHz against the quasi-peak limit line.



Bluetooth Mid chan TX: Plot of peak vertical emissions 30MHz - 300MHz against the quasi-peak limit line.

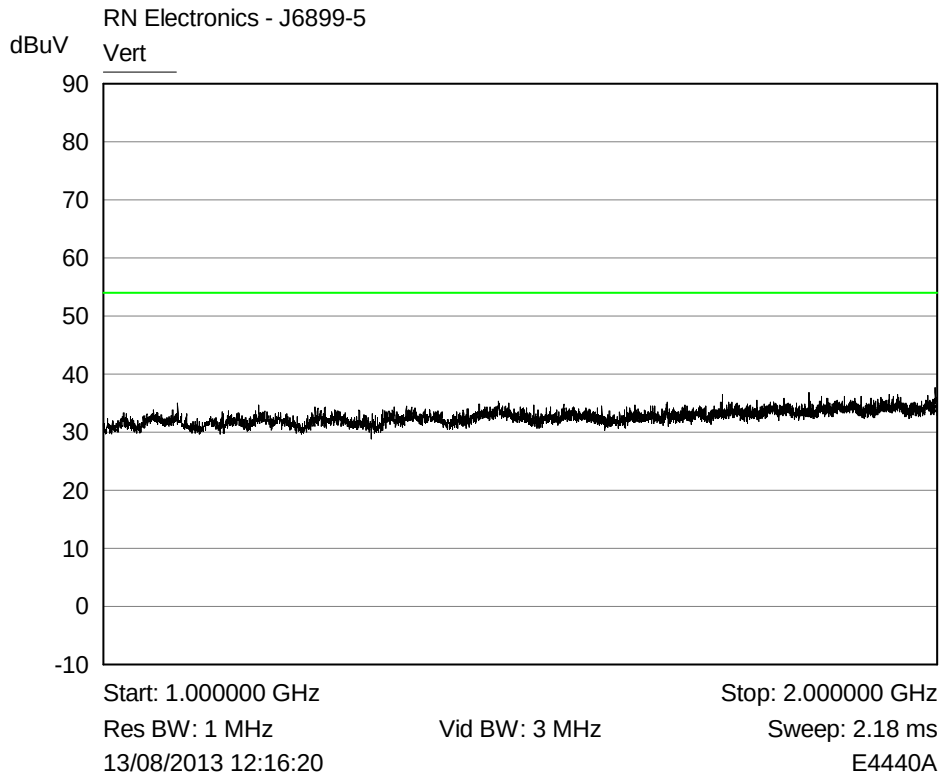


Bluetooth Mid chan TX: Plot of peak horizontal emissions 300MHz - 1GHz against the quasi-peak limit line.

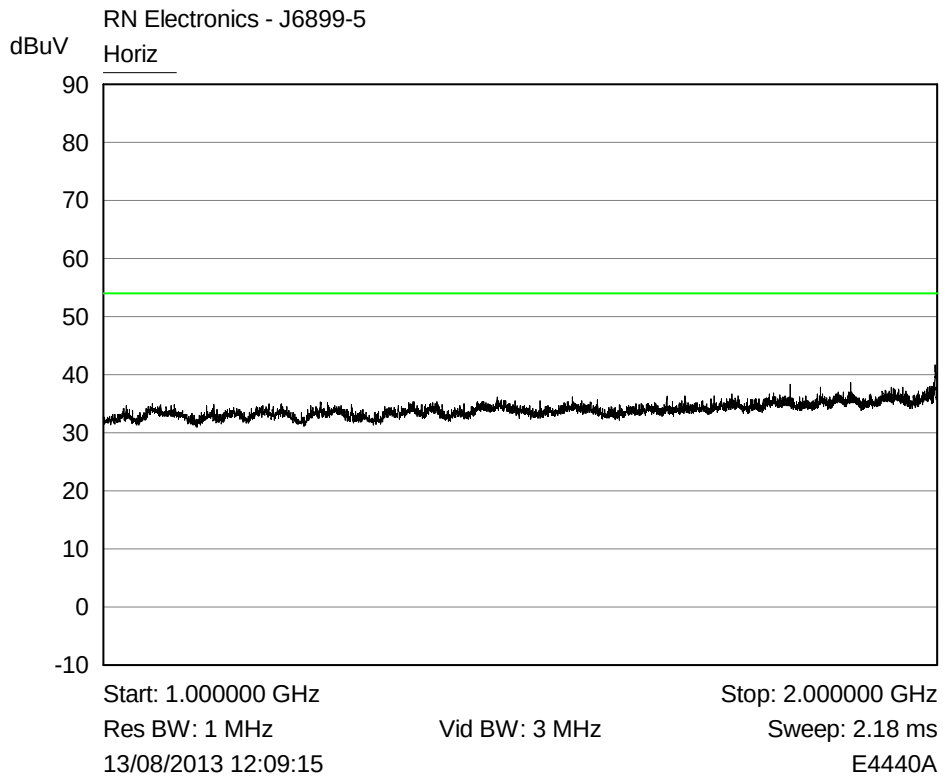


Bluetooth Mid chan TX: Plot of peak vertical emissions 300MHz - 1GHz against the quasi-peak limit line.

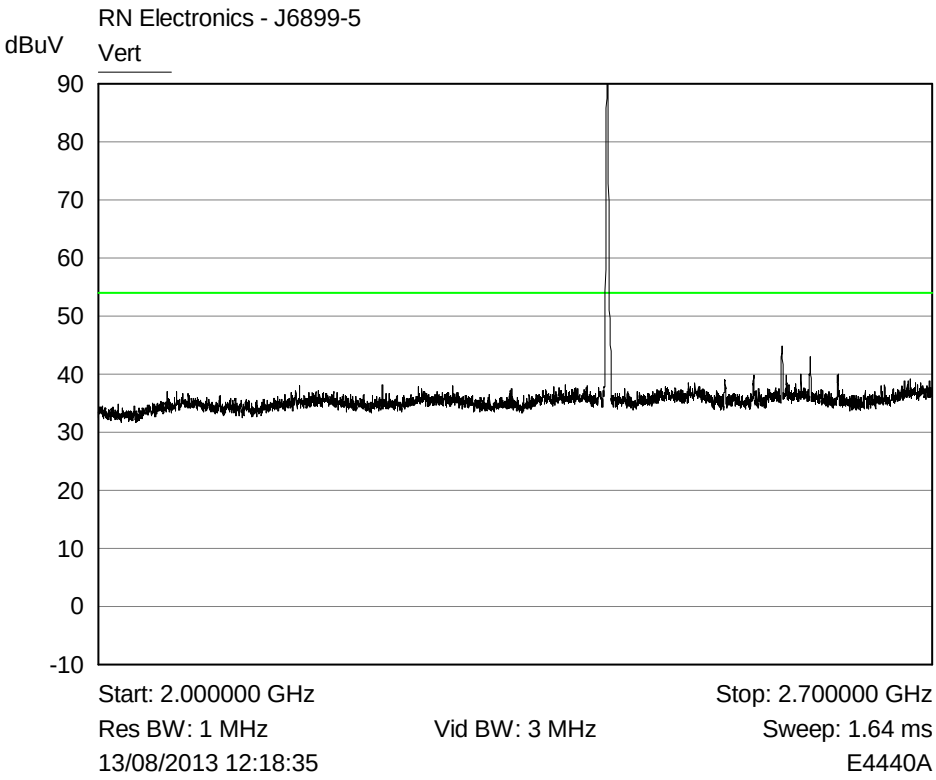
6.2.3 Radiated emissions Plots above 1GHz



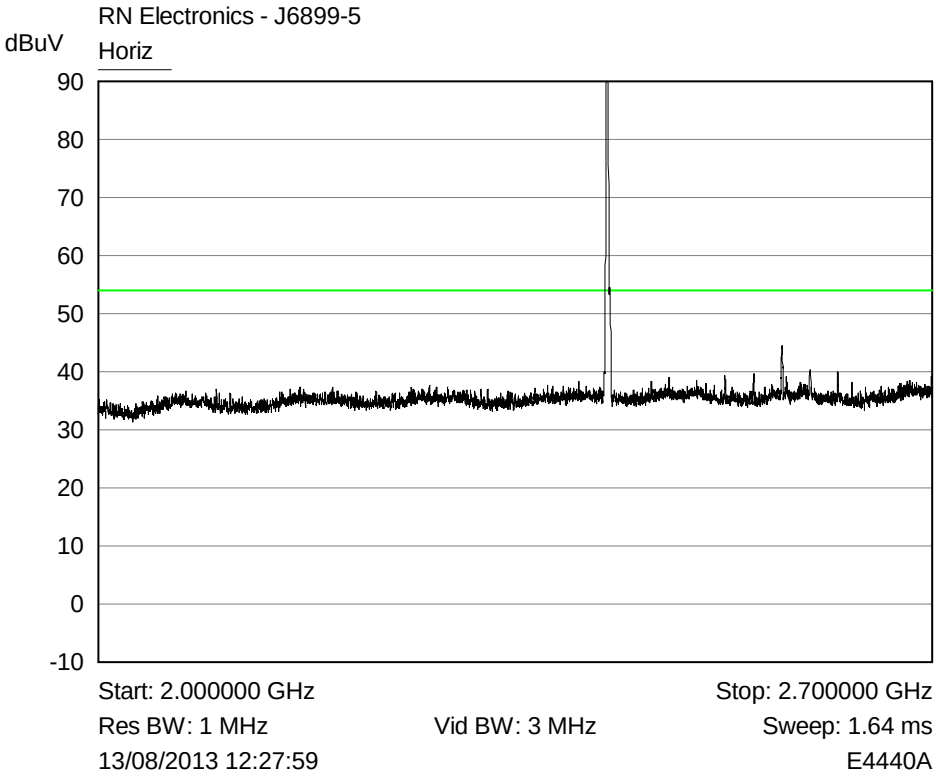
Middle channel (2441 MHz) - 1-2GHz - Vertical



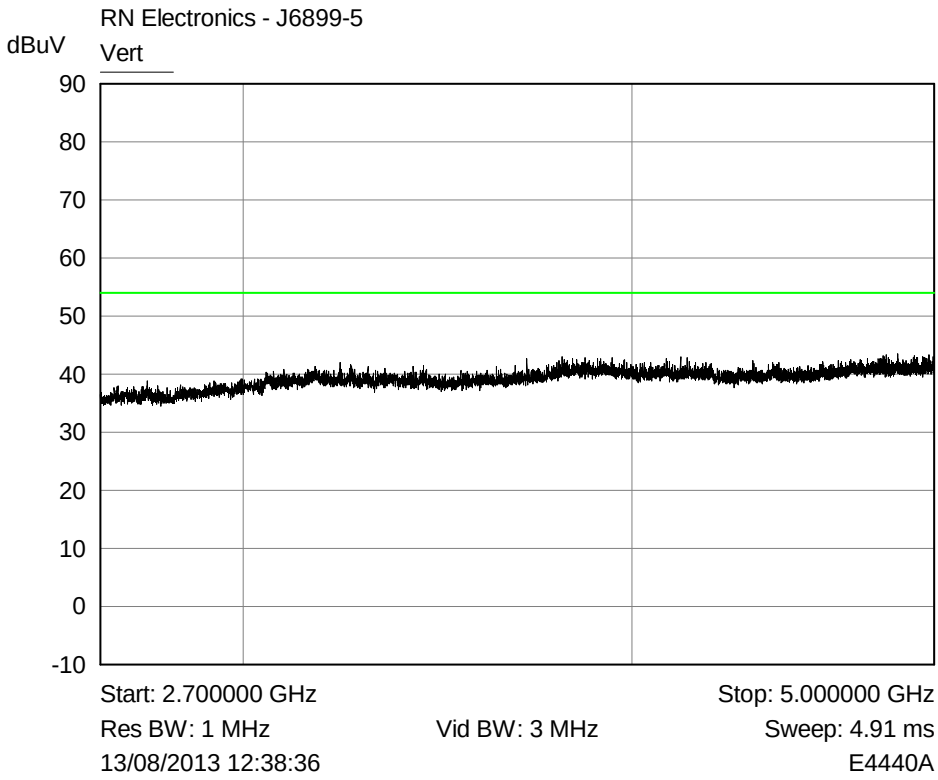
Middle channel (2441 MHz) - 1-2GHz - Horizontal



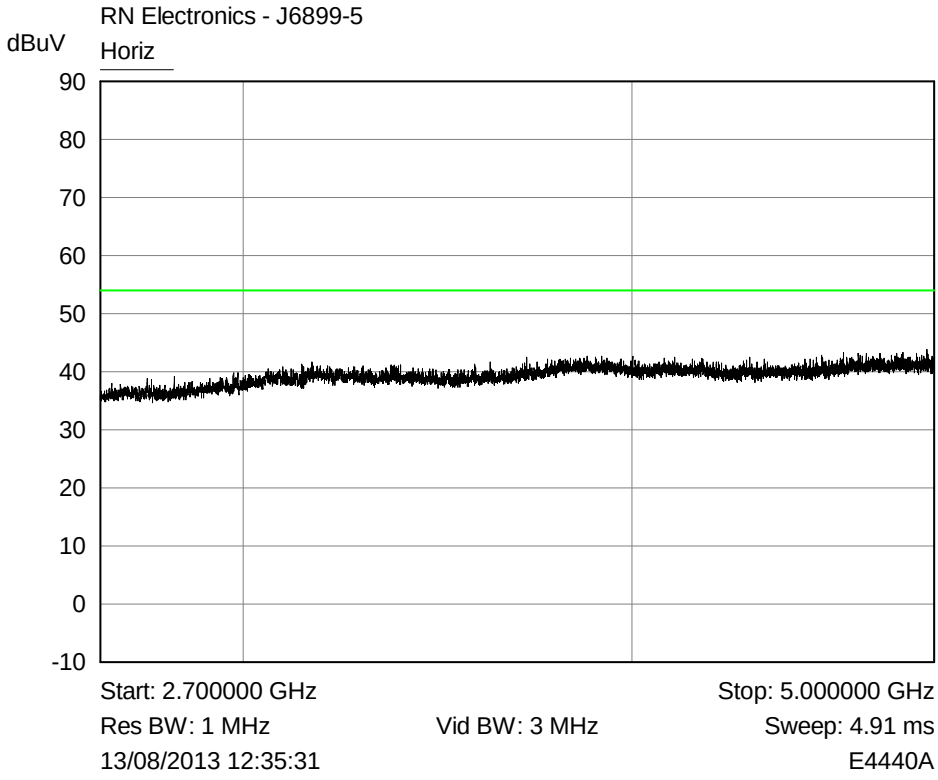
Middle channel (2441 MHz) - 2-2.7GHz - Vertical



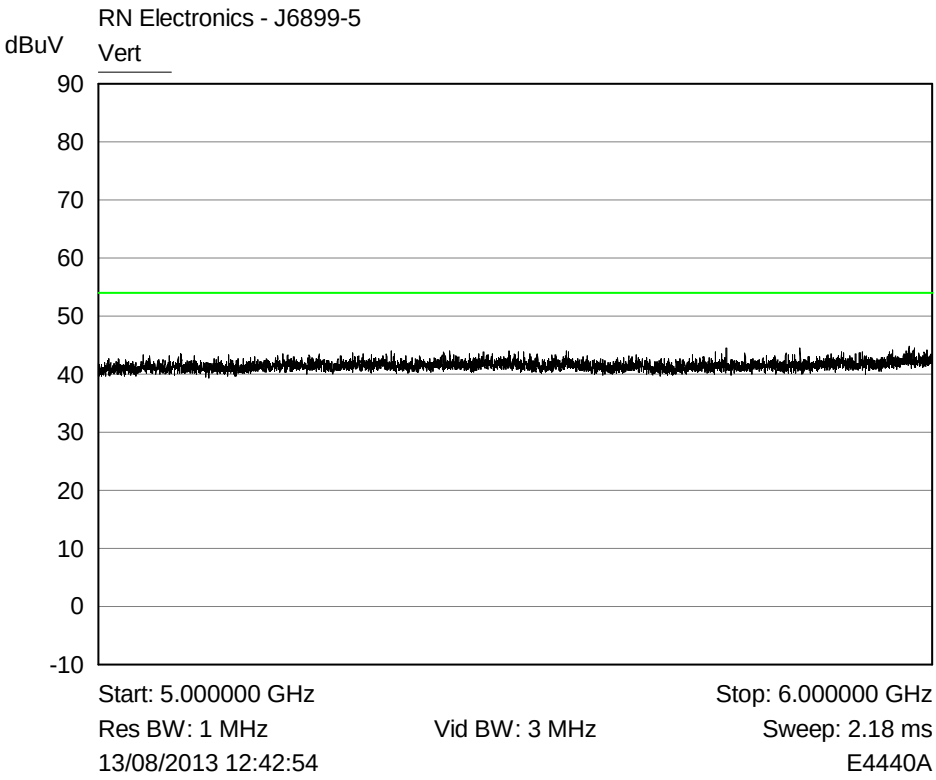
Middle channel (2441 MHz) - 2-2.7GHz - Horizontal



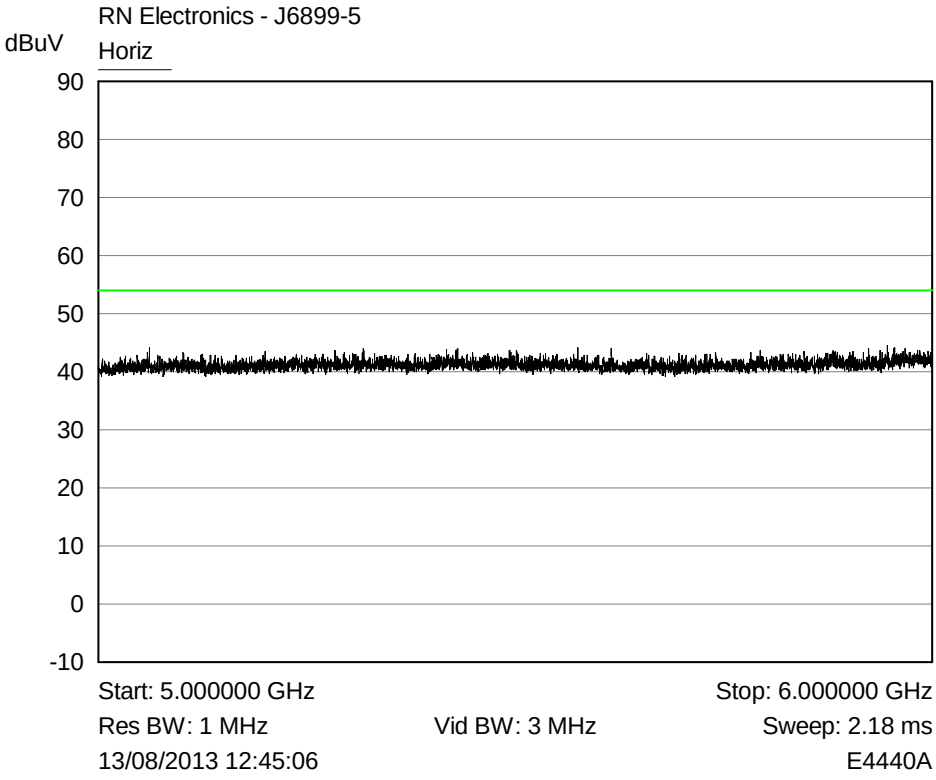
Middle channel (2441 MHz) - 2.7-5GHz - Vertical



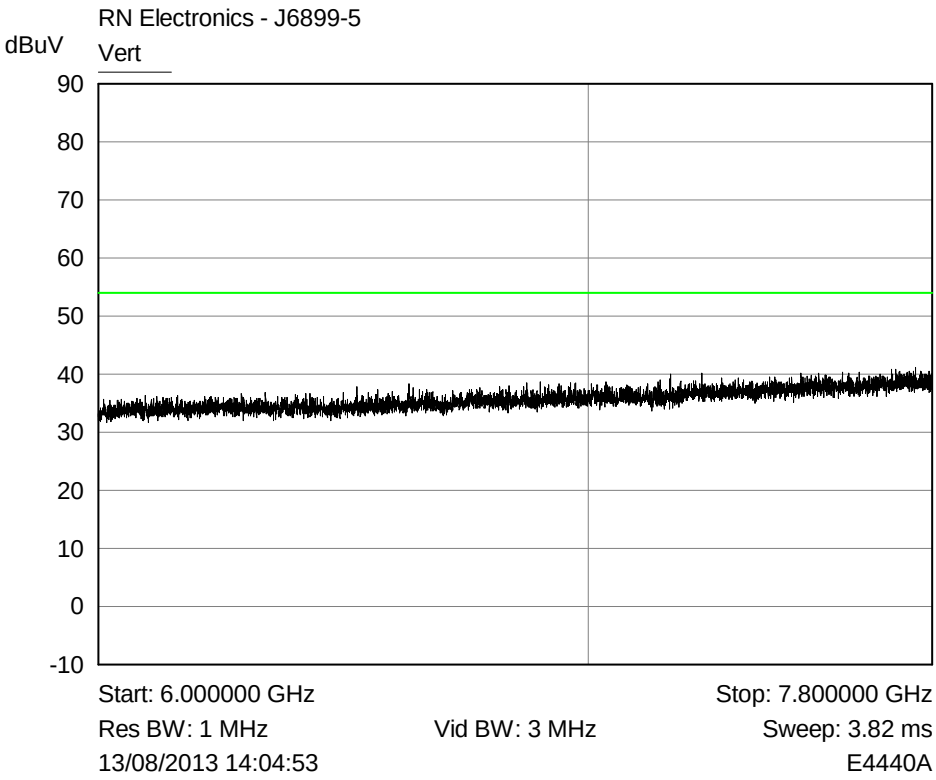
Middle channel (2441 MHz) - 2.7-5GHz - Horizontal



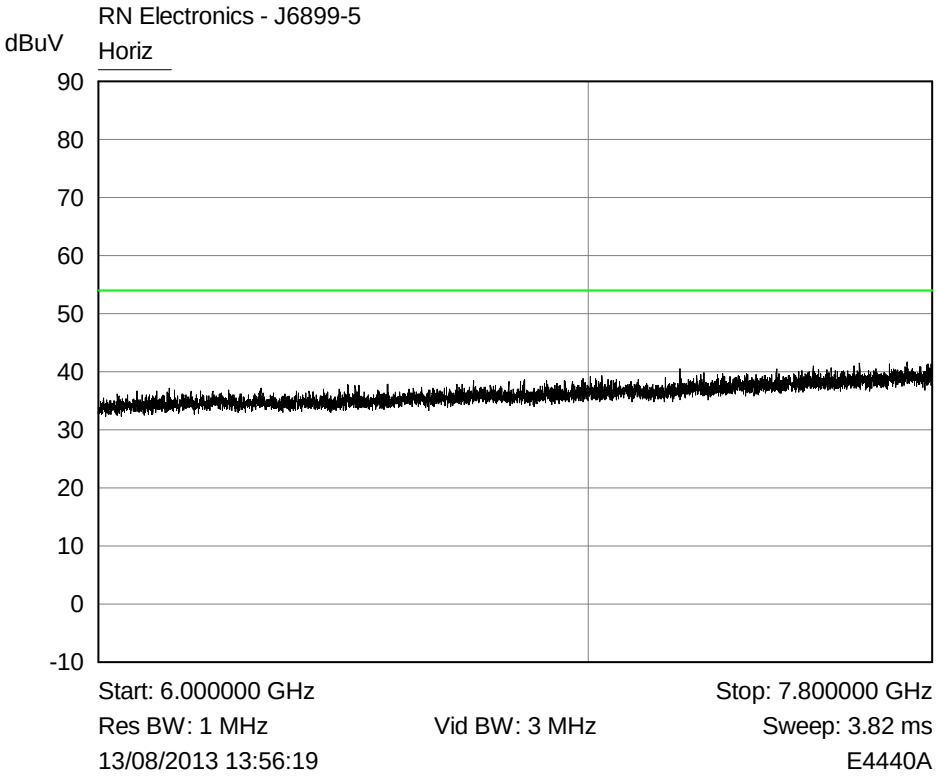
Middle channel (2441 MHz) - 5-6GHz - Vertical



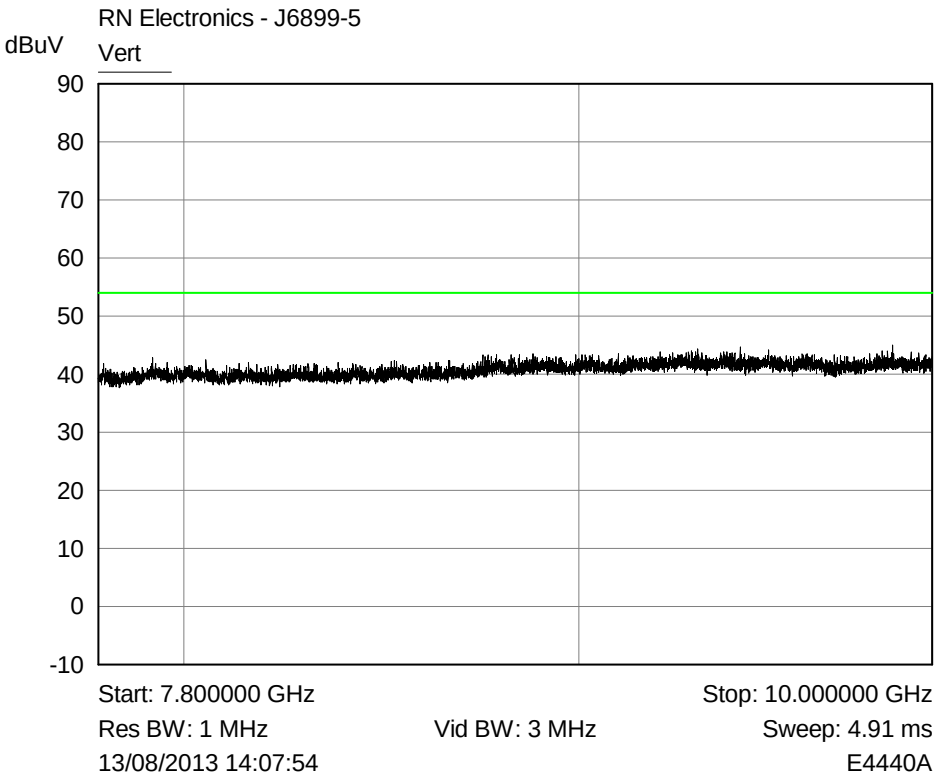
Middle channel (2441 MHz) - 5-6GHz - Horizontal



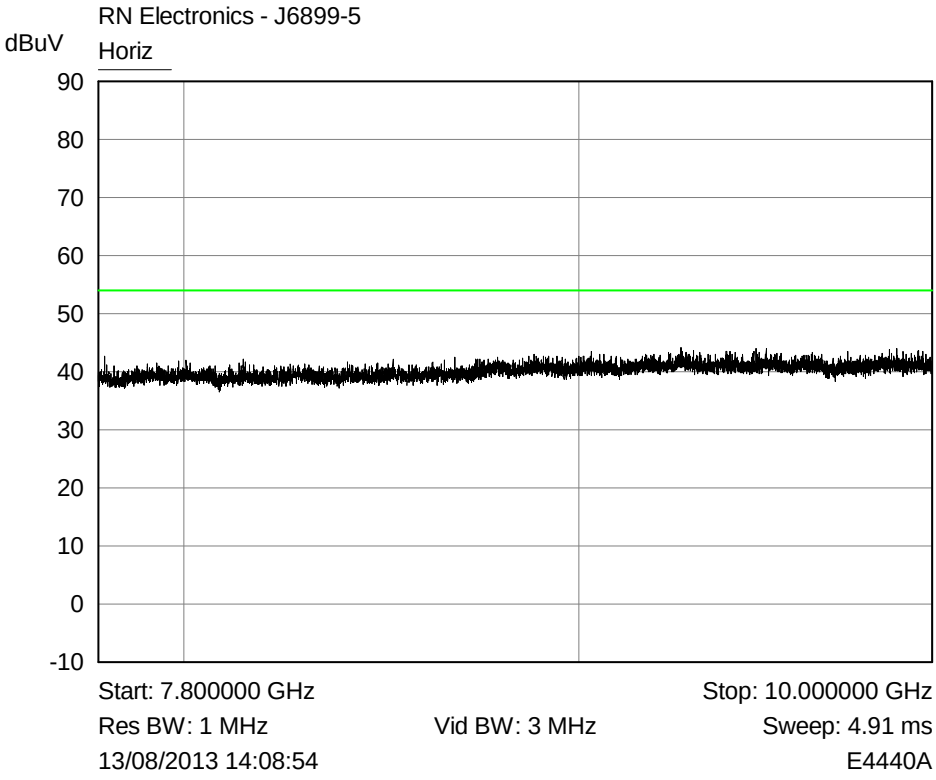
Middle channel (2441 MHz) - 6-7.8GHz - Vertical



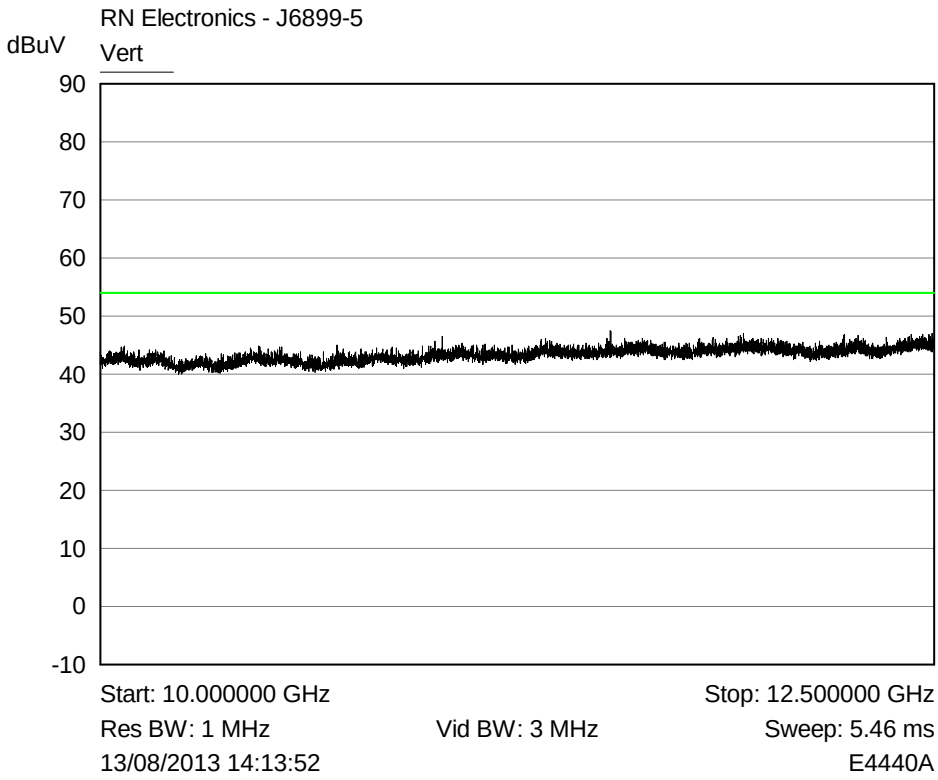
Middle channel (2441 MHz) - 6-7.8GHz - Horizontal



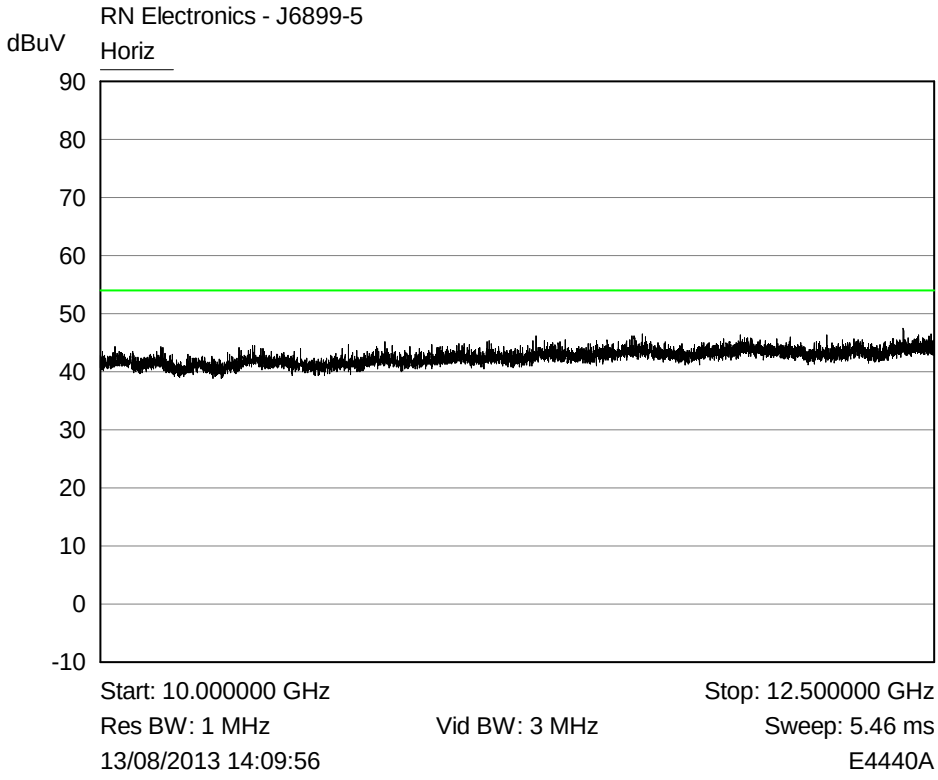
Middle channel (2441 MHz) - 7.8-10GHz - Vertical



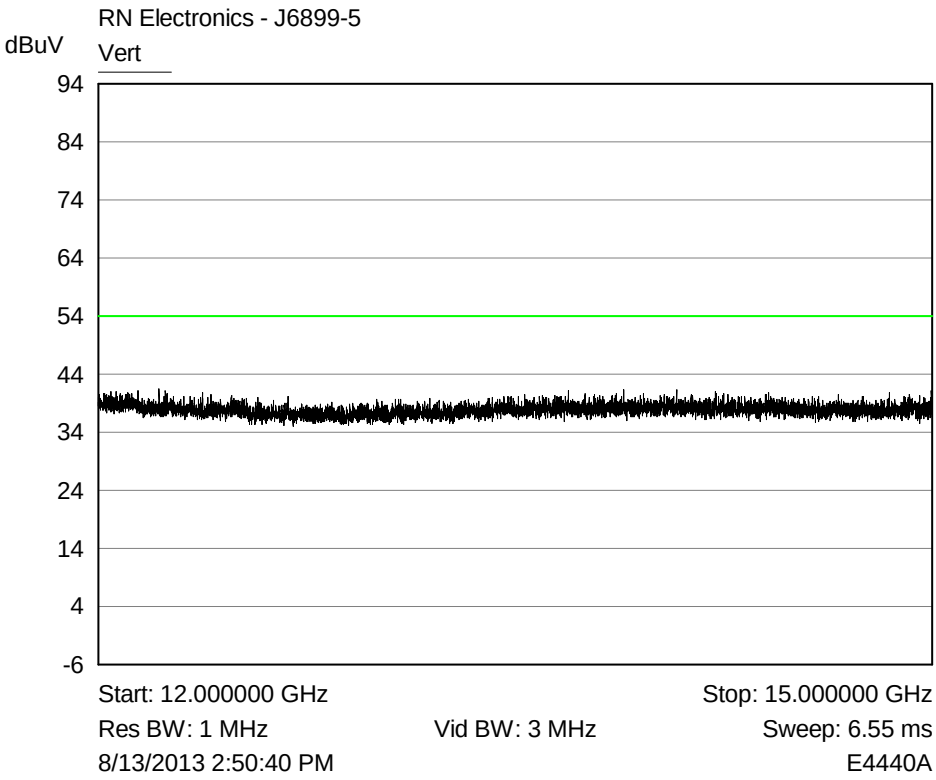
Middle channel (2441 MHz) - 7.8-10GHz - Horizontal



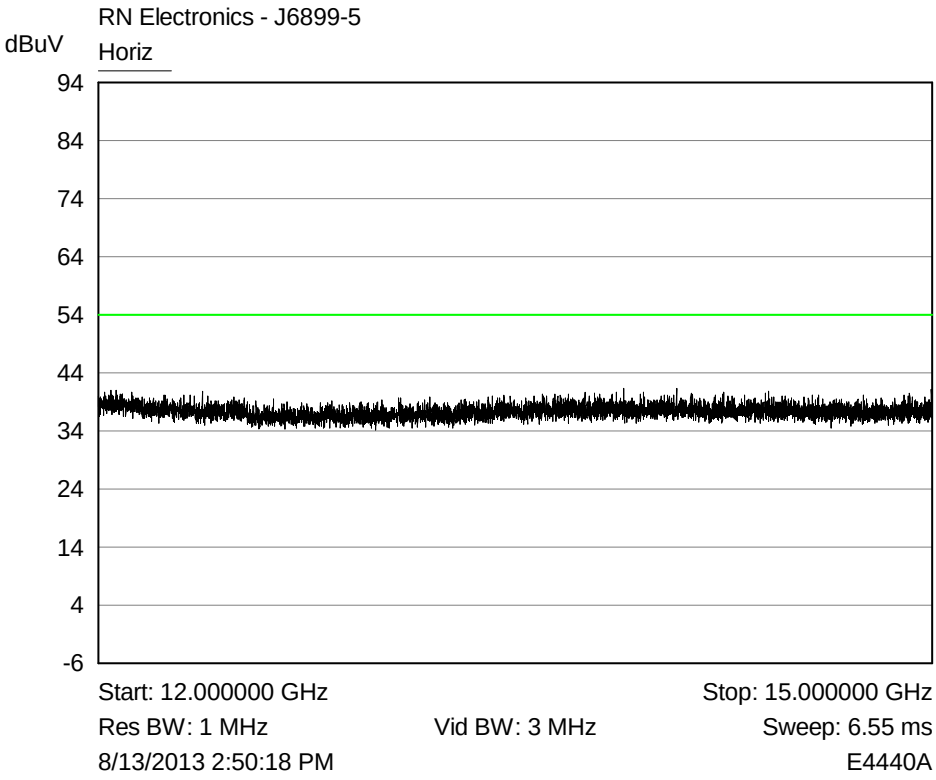
Middle channel (2441 MHz) - 10-12.5GHz - Vertical



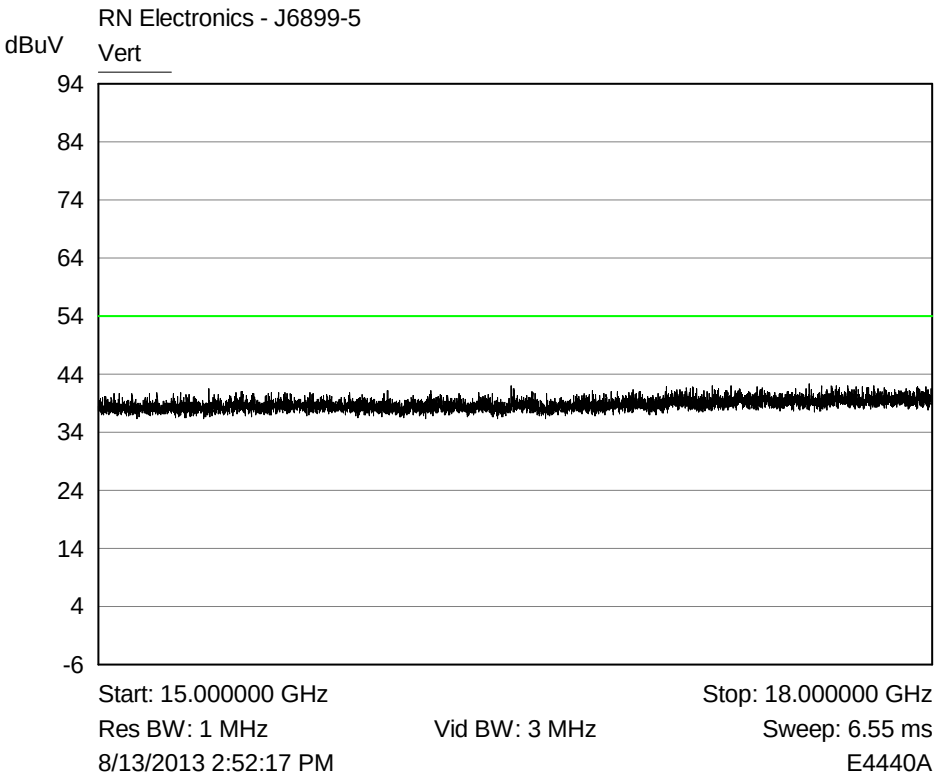
Middle channel (2441 MHz) - 10-12.5GHz - Horizontal



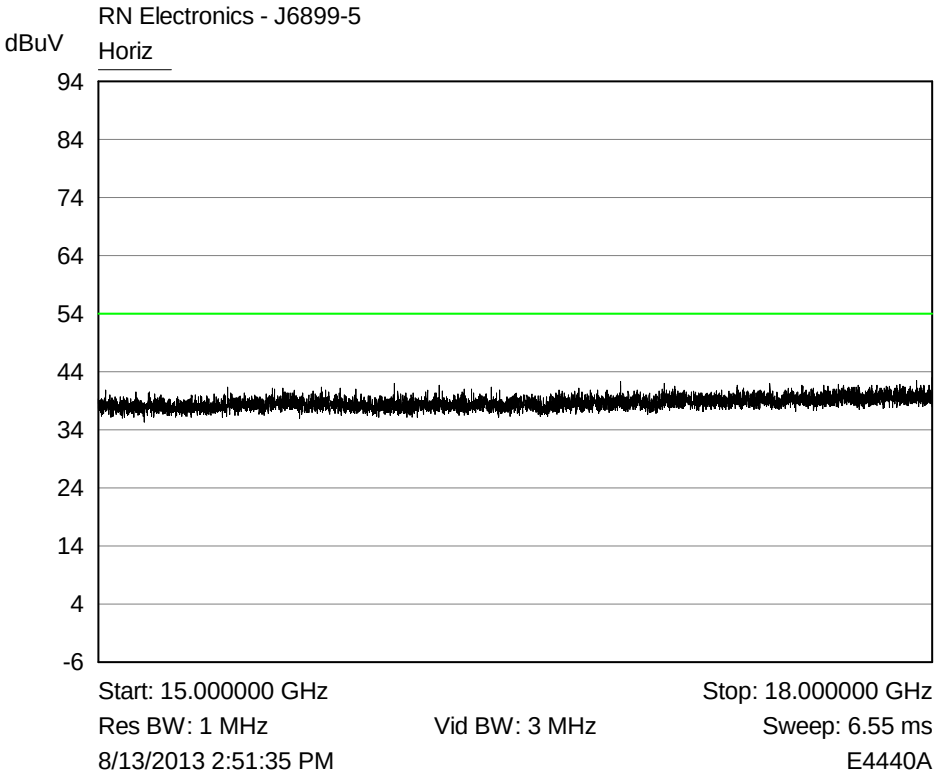
Middle channel (2441 MHz) - 12-15GHz – Vertical



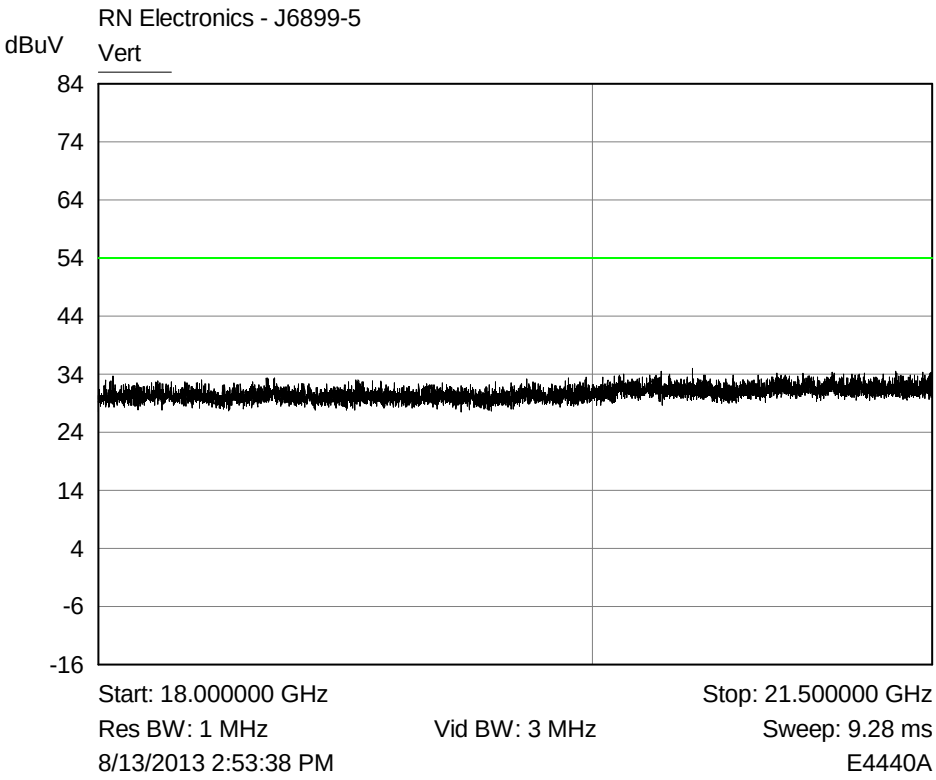
Middle channel (2441 MHz) - 12-15GHz - Horizontal



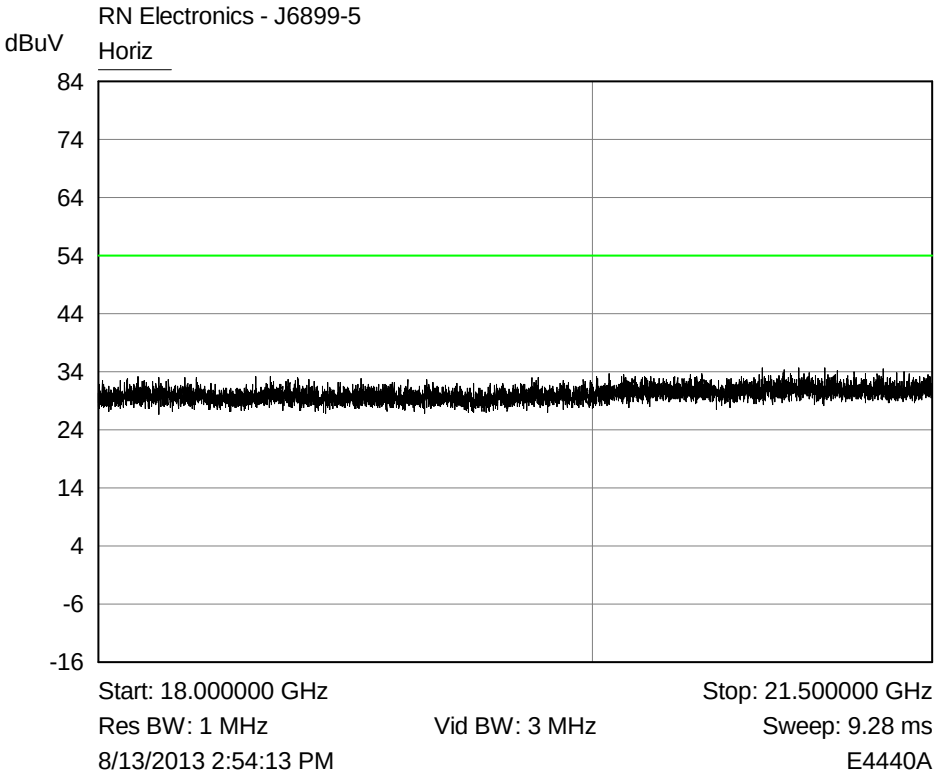
Middle channel (2441 MHz) - 15-18GHz - Vertical



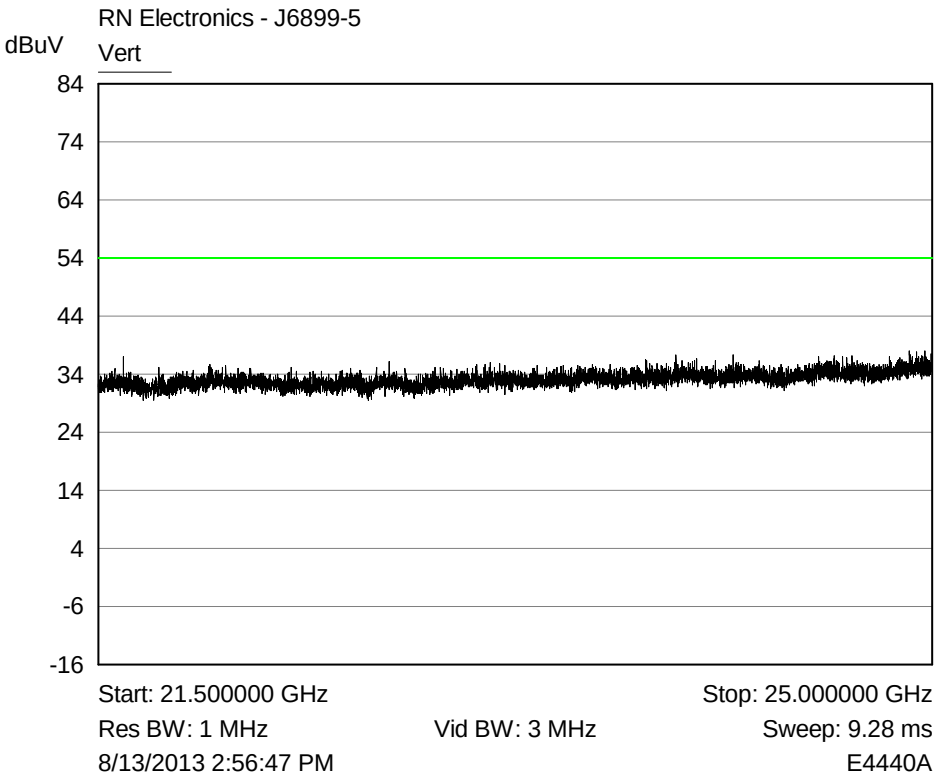
Middle channel (2441 MHz) - 15-18GHz - Horizontal



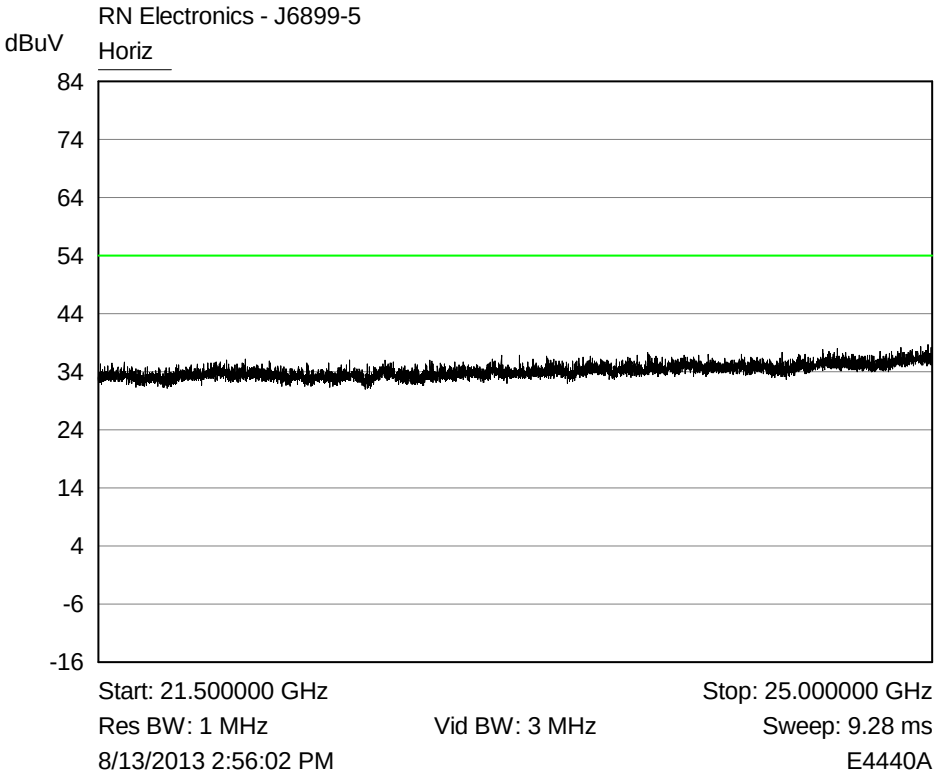
Middle channel (2441 MHz) - 18-21.5GHz - Vertical



Middle channel (2441 MHz) - 18-21.5GHz - Horizontal



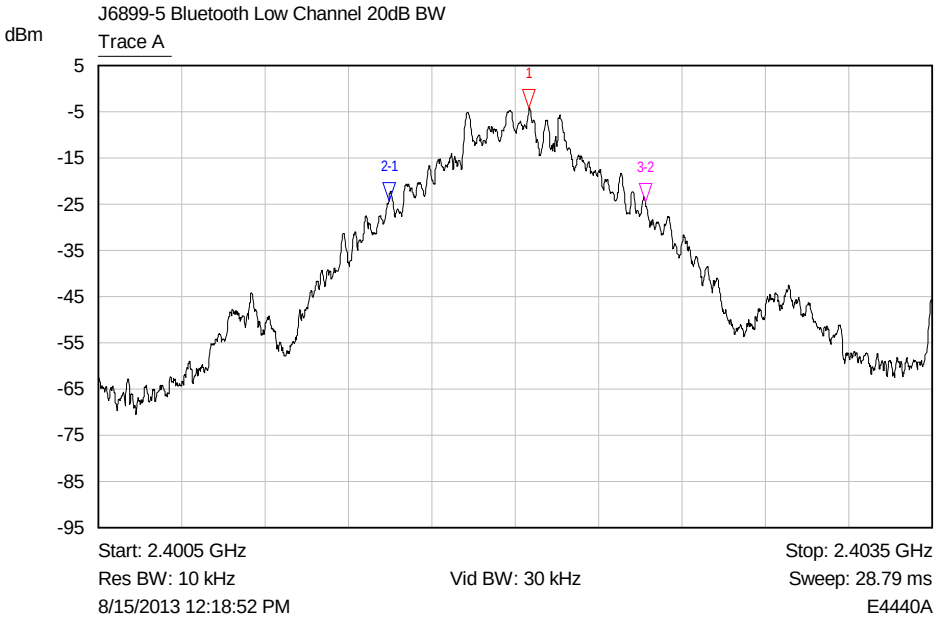
Middle channel (2441 MHz) - 21.5-25GHz - Vertical



Middle channel (2441 MHz) - 21.5-25GHz - Horizontal

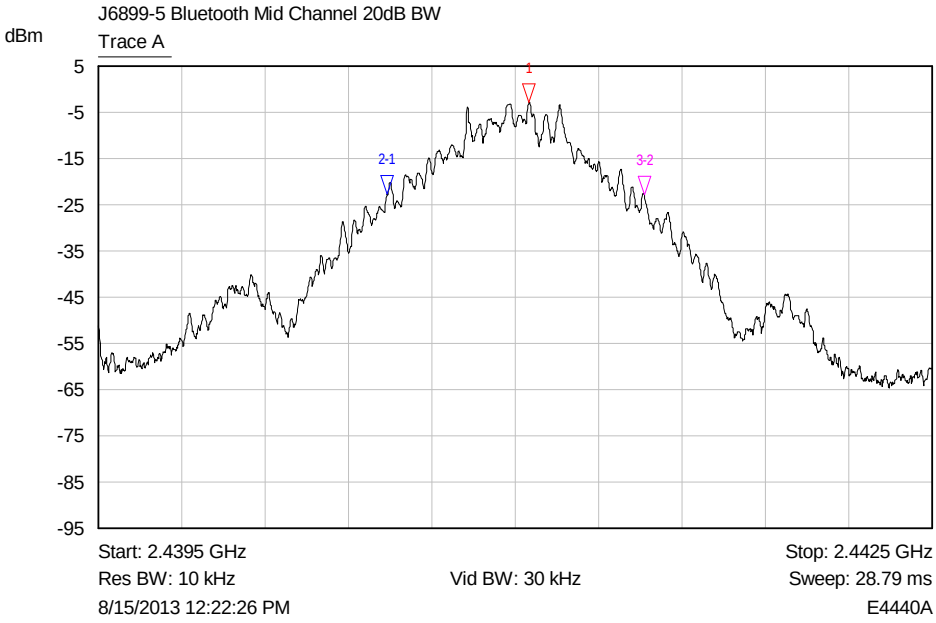
6.3 20dB bandwidth / occupied bandwidth plots

6.3.1 Plots for Band 2400-2483.5 MHz, Power 2 dBm, Spacing 1 MHz, and Modulation FHSS



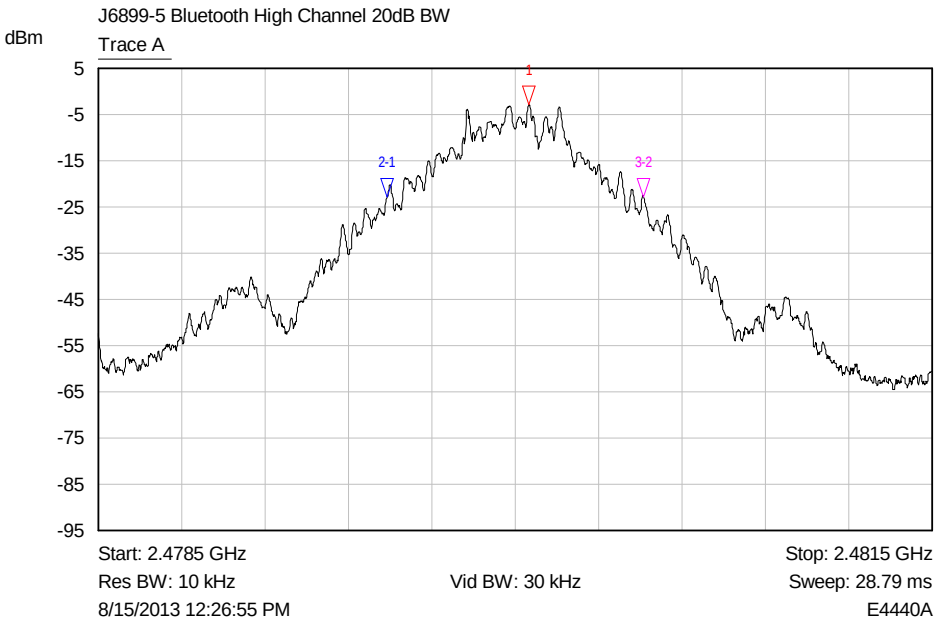
Mkr	Trace	X-Axis	Value	Notes
1	Trace A	2.4021 GHz	-4.23 dBm	
2-1	Trace A	-505.7529 kHz	-20.17 dB	
3-2	Trace A	922.9615 kHz	-0.02 dB	

Low channel



Mkr	Trace	X-Axis	Value	Notes
1	Trace A	2.4411 GHz	-2.76 dBm	
2-1	Trace A	-511.7559 kHz	-19.99 dB	
3-2	Trace A	925.9630 kHz	-0.13 dB	

Mid channel

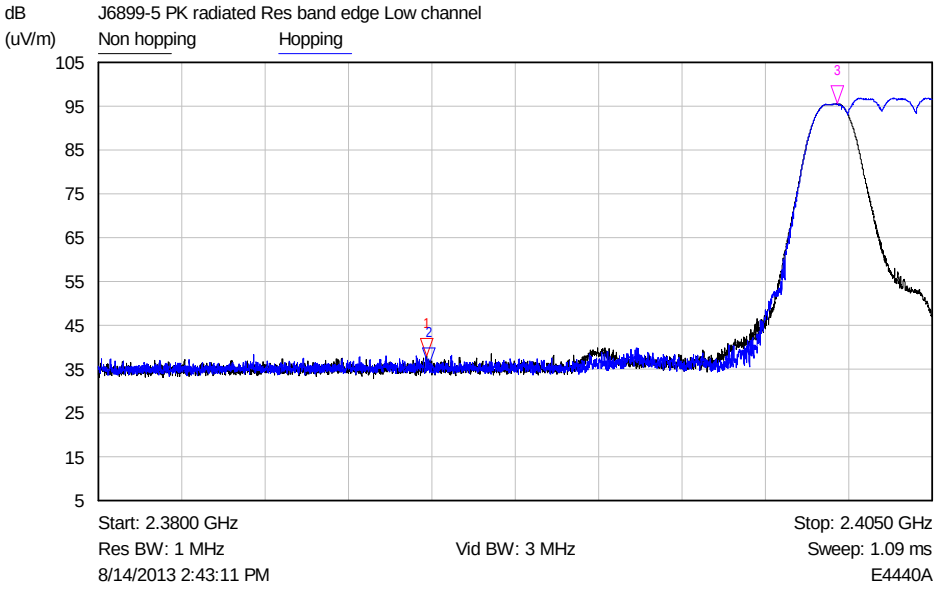


Mkr	Trace	X-Axis	Value	Notes
1	Trace A	2.4801 GHz	-2.81 dBm	
2-1	Trace A	-511.7559 kHz	-19.98 dB	
3-2	Trace A	924.4622 kHz	0.03 dB	

High channel

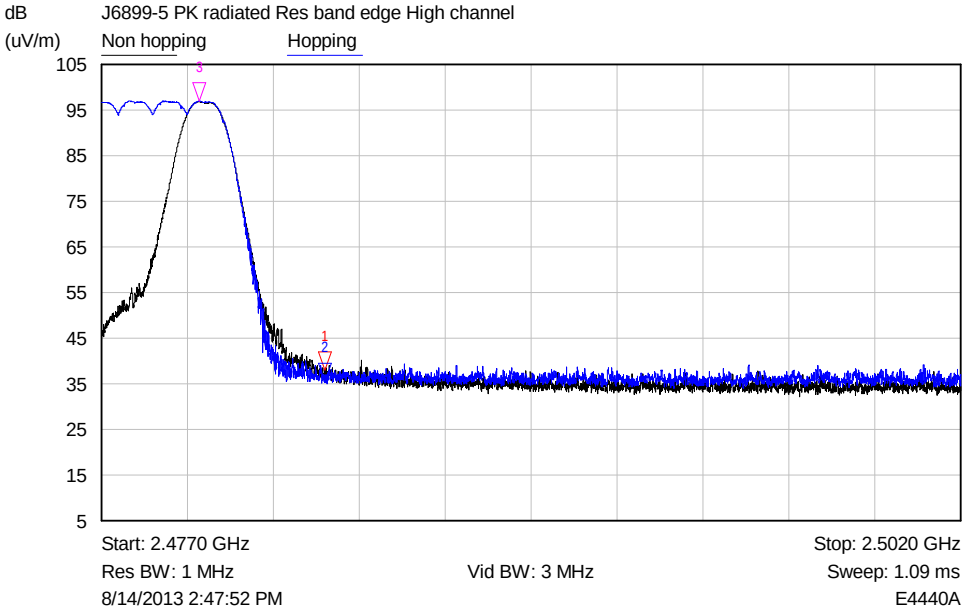
6.4 Band edge compliance plots

6.4.1 Plots for Band 2400-2483.5 MHz, Power 2 dBm, Spacing 1 MHz, and Modulation FHSS



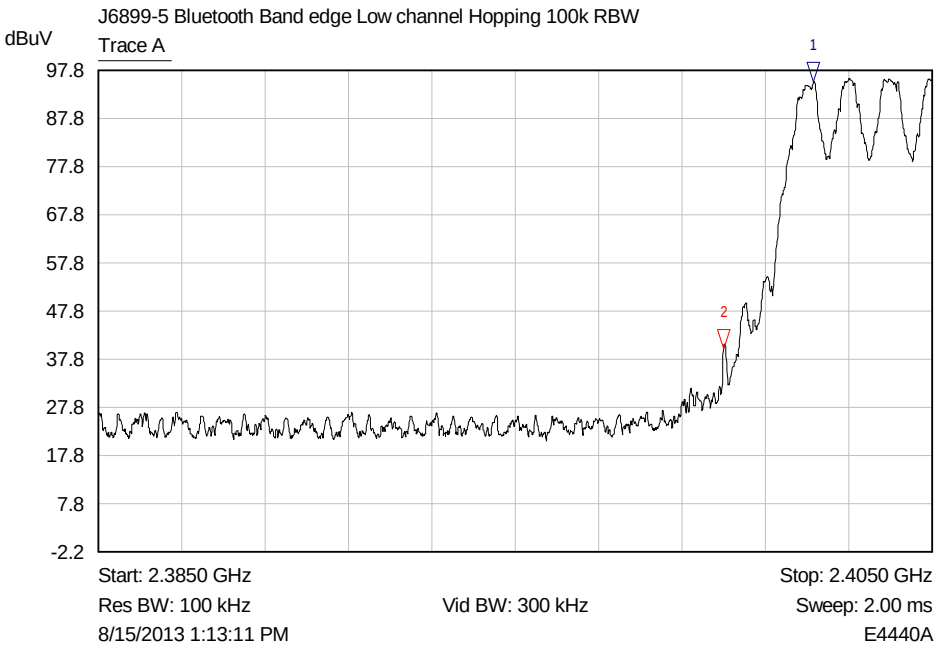
Mkr	Trace	X-Axis	Value	Notes
1	Non hopping	2.3899 GHz	38.03 dB(uV/m)	
2	Hopping	2.3899 GHz	35.89 dB(uV/m)	
3	Non hopping	2.4021 GHz	95.59 dB(uV/m)	

Restricted Band: Low channel Peak Plot



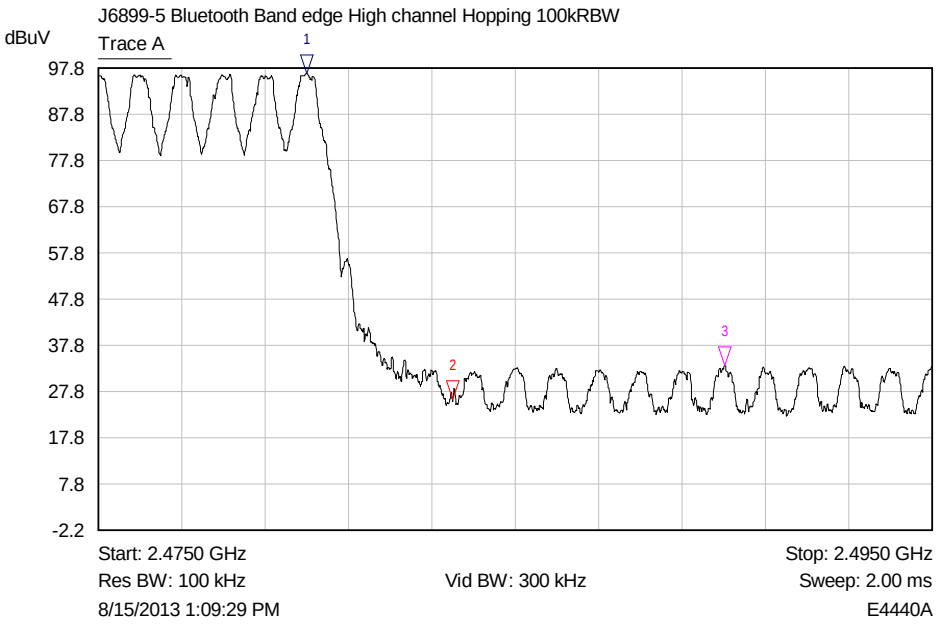
Mkr	Trace	X-Axis	Value	Notes
1	Non hopping	2.4835 GHz	38.00 dB(uV/m)	
2	Hopping	2.4835 GHz	35.53 dB(uV/m)	
3	Hopping	2.4798 GHz	97.00 dB(uV/m)	

Restricted Band: High channel Peak Plot



Mkr	Trace	X-Axis	Value	Notes
1	Trace A	2.4022 GHz	95.46 dBuV	
2	Trace A	2.4000 GHz	40.04 dBuV	

Band Edge: Low channel

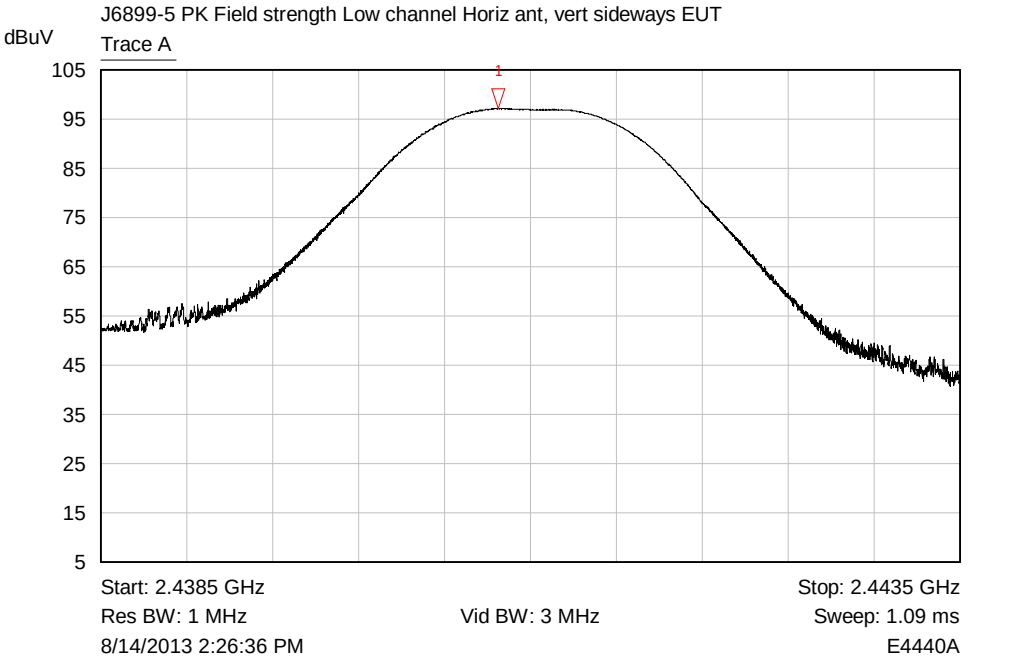


Mkr	Trace	X-Axis	Value	Notes
1	Trace A	2.4800 GHz	96.62 dBuV	
2	Trace A	2.4835 GHz	26.18 dBuV	
3	Trace A	2.4900 GHz	33.42 dBuV	

Band Edge: High channel

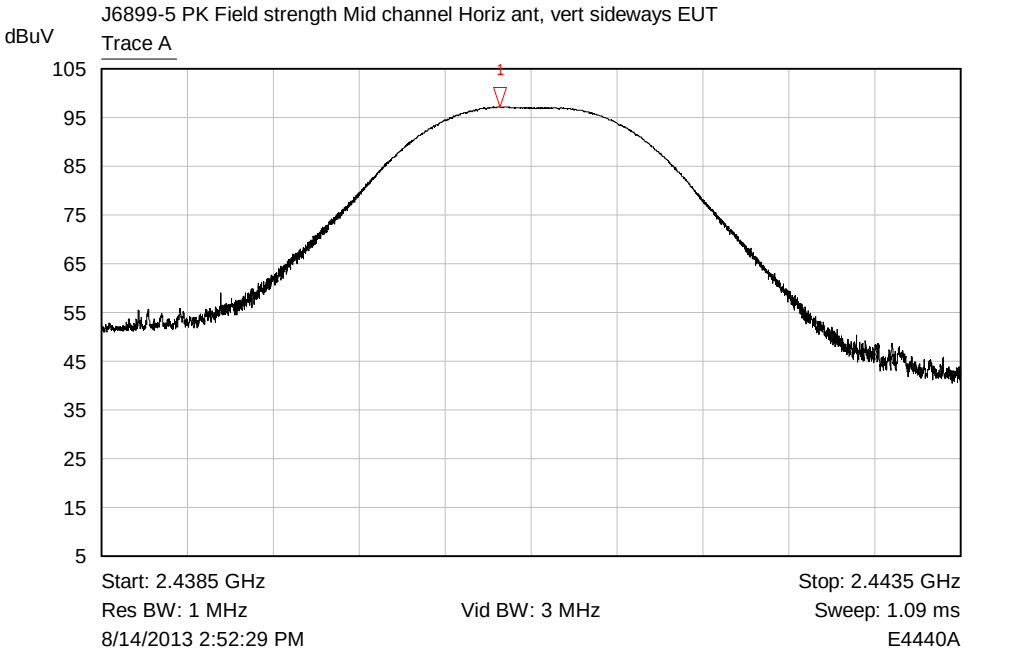
6.5 Effective radiated power field strength

6.5.1 Plots for Band 2400-2483.5 MHz, Power 2 dBm, Spacing 1 MHz, and Modulation FHSS



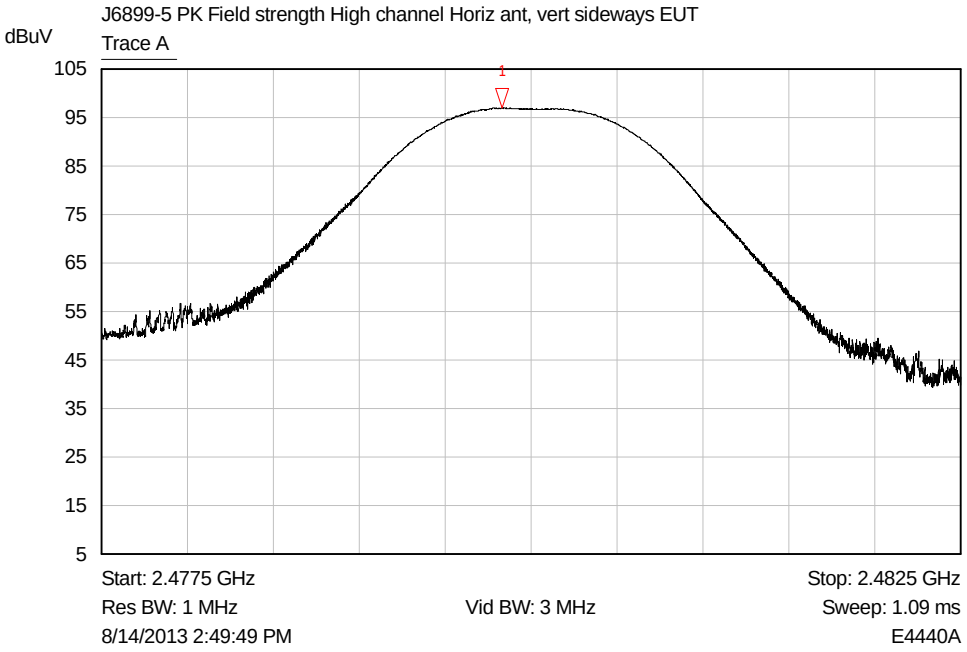
Mkr	Trace	X-Axis	Value	Notes
1 ▽	Trace A	2.4408 GHz	97.17 dBuV	

Field strength: Low channel



Mkr	Trace	X-Axis	Value	Notes
1 ▽	Trace A	2.4408 GHz	97.16 dBuV	

Field strength: Mid channel

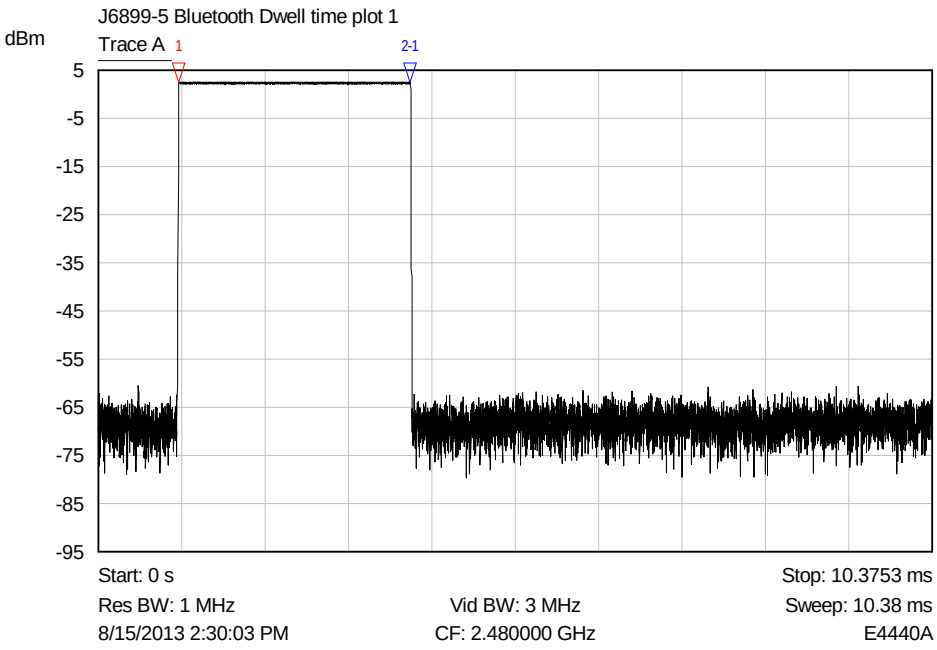


Mkr	Trace	X-Axis	Value	Notes
1 ▽	Trace A	2.4798 GHz	97.02 dBuV	

Field strength: High channel

6.6 FHSS plots

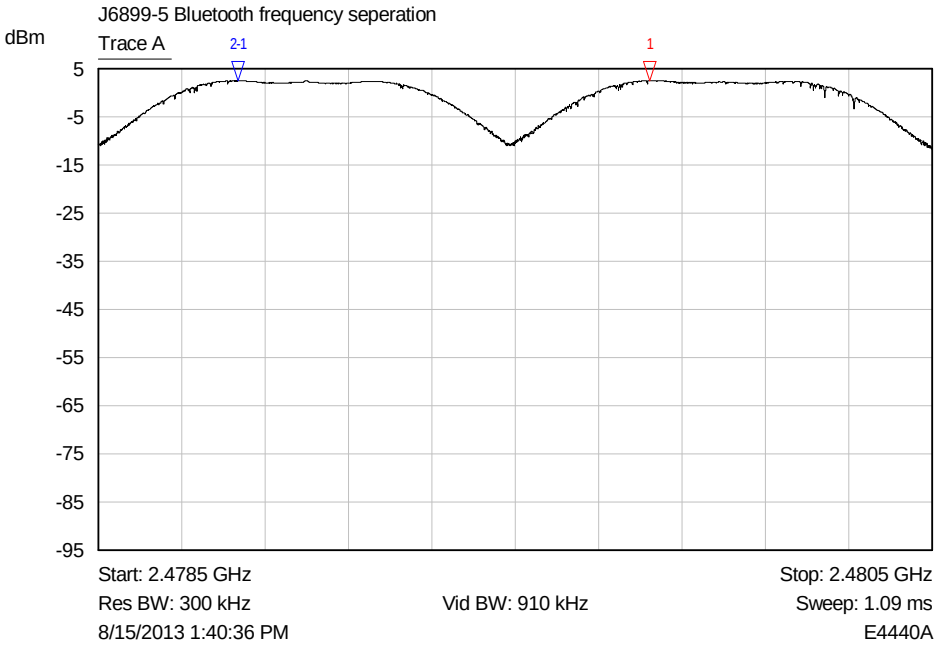
6.6.1 Dwell time plots



Mkr	Trace	X-Axis	Value	Notes
1	Trace A	1.0032 ms	2.51 dBm	
2-1	Trace A	2.8791 ms	-0.07 dB	

Dwell time plot 1

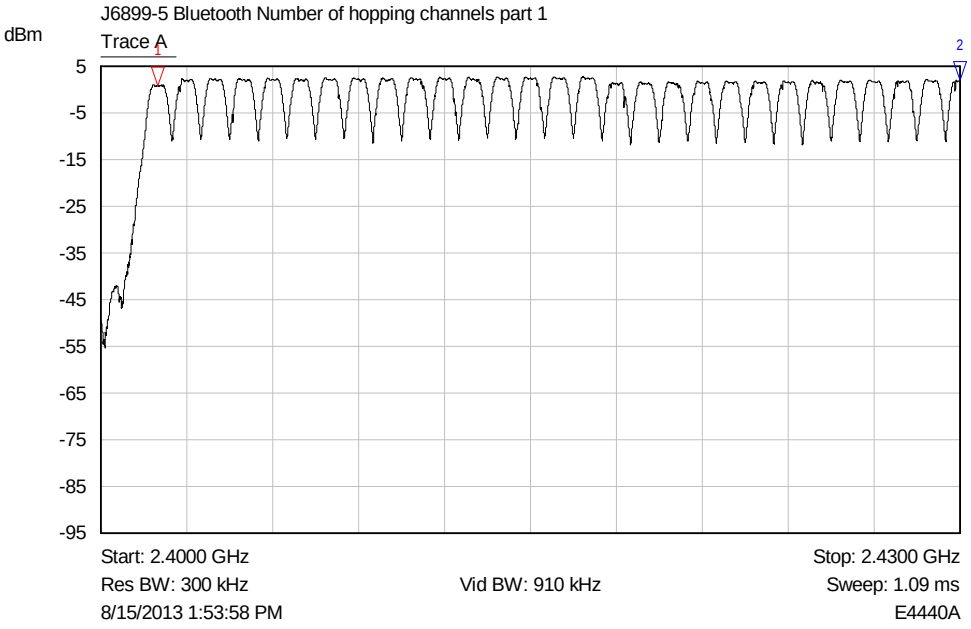
6.6.2 Frequency separation plots



Mkr	Trace	X-Axis	Value	Notes
1 ▽	Trace A	2.4798 GHz	2.56 dBm	
2-1 ▽	Trace A	-986.9369 kHz	-0.03 dB	

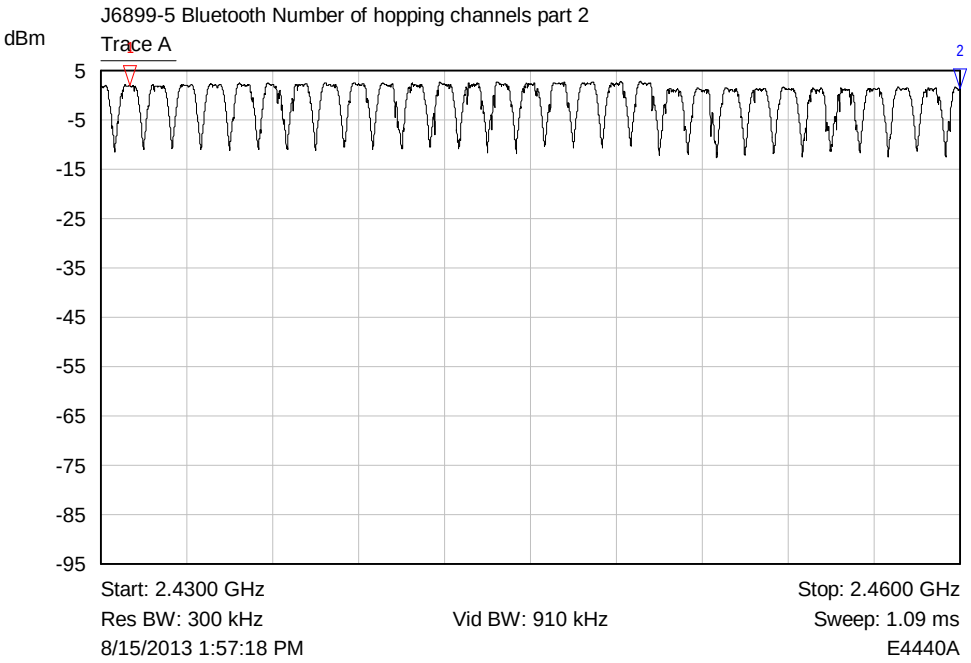
Channels 78 & 79

6.6.3 Number of hopping channels plots



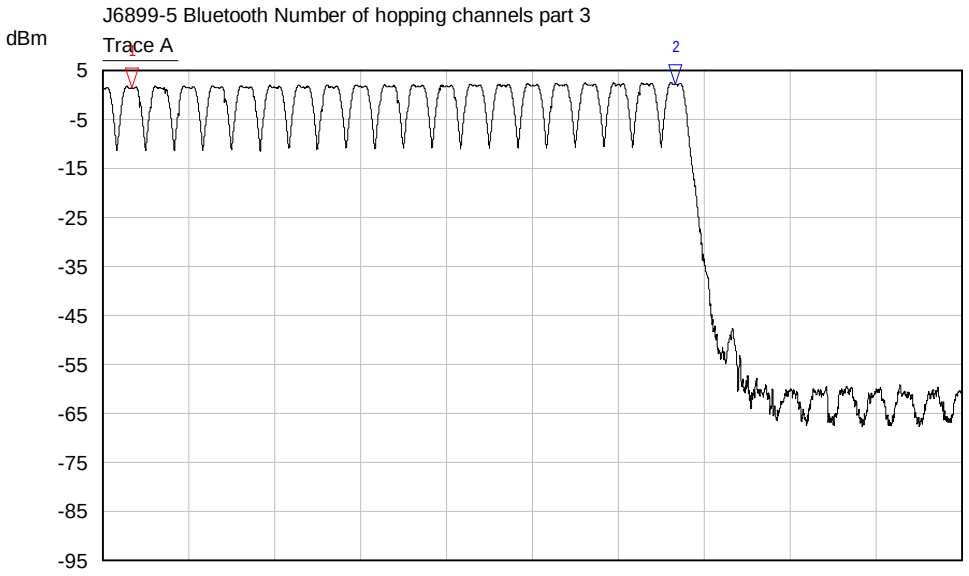
Mkr	Trace	X-Axis	Value	Notes
1 ▽	Trace A	2.4020 GHz	0.89 dBm	
2 ▽	Trace A	2.4300 GHz	1.93 dBm	

Plot 1 – lower third



Mkr	Trace	X-Axis	Value	Notes
1 ▽	Trace A	2.4310 GHz	1.93 dBm	
2 ▽	Trace A	2.4600 GHz	1.38 dBm	

Plot 2 – Middle third



Mkr	Trace	X-Axis	Value	Notes
1 ▽	Trace A	2.4610 GHz	1.48 dBm	
2 ▽	Trace A	2.4800 GHz	2.24 dBm	

Plot 3 – upper third

7 Explanatory Notes

7.1 Explanation of Table of Signals Measured

Measurements are made as required by the standard. These measurements are made and recorded using detectors, either peak, quasi peak or average dependant on the test. A table of results has been given following the relevant plots. This table looks similar to the one illustrated below dependant on the measurements required by the test: -

Signal No.	Freq (MHz)	Peak Amp (dBuV)	Pk – Lim 1 (dB)	QP Amp (dBuV)	QP - Lim1 (dB)	Av Amp (dBuV)	Av - Lim1 (dB)
1	12345	54.9	-10.5	48.0	-12.6	37.6	-14.4

Column One - Labelled Signal No. is an incremental number that the receiver has given to each signal that has been measured.

Column Two - Labelled Freq (MHz) is the approximate frequency of the signal received.

Column Three - Labelled Peak Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the peak detector.

Column Four - Labelled Pk - Lim1 (dB) is the difference in level from the peak signal given to the active limit line. If this column appears in the table the peak detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Column Five - Labelled QP Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the quasi-peak detector.

Column Six - Labelled QP - Lim1 (dB) is the difference in level from the quasi-peak signal given to the active limit line. If this column appears in the table the quasi-peak detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Column Seven - Labelled Av Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the average detector.

Column Eight - Labelled Av - Lim1 (dB) is the difference in level from the average signal given to the active limit line. If this column appears in the table the average detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Only signals highlighted in red are deemed to exceed the limit of the detector required.

7.2 Explanation of limit line calculations for radiated measurements

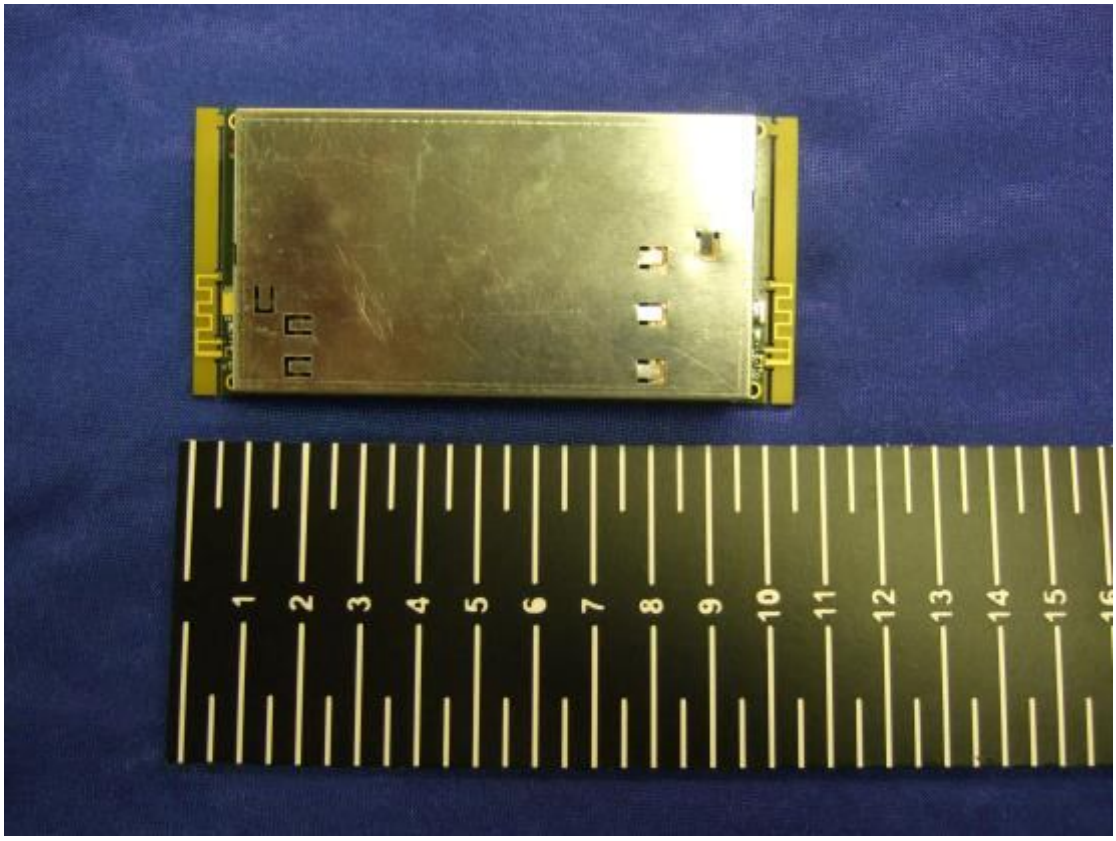
The limits given in the test standard are normally expressed as absolute values (e.g. in μV/m at a specified distance), whereas the measured values are expressed as peak, quasi peak or average values in dBμV/m referenced to the measuring instrument inputs. RN Electronics calibrate the test set-up to account for any path losses, antenna gains, etc. so that the value read at the receiver relates directly to the absolute value required, except that it is expressed in dB relative to one microVolt and may need to take account of any alternative measuring distance used. Examples:

(a) limit of 500 μV/m equates to 20.log (500) = 54 dB μV/m.
(b) limit of 300 μV/m at 10m equates to 20.log (300 . 10/3) = 60 dB μV/m at 3m

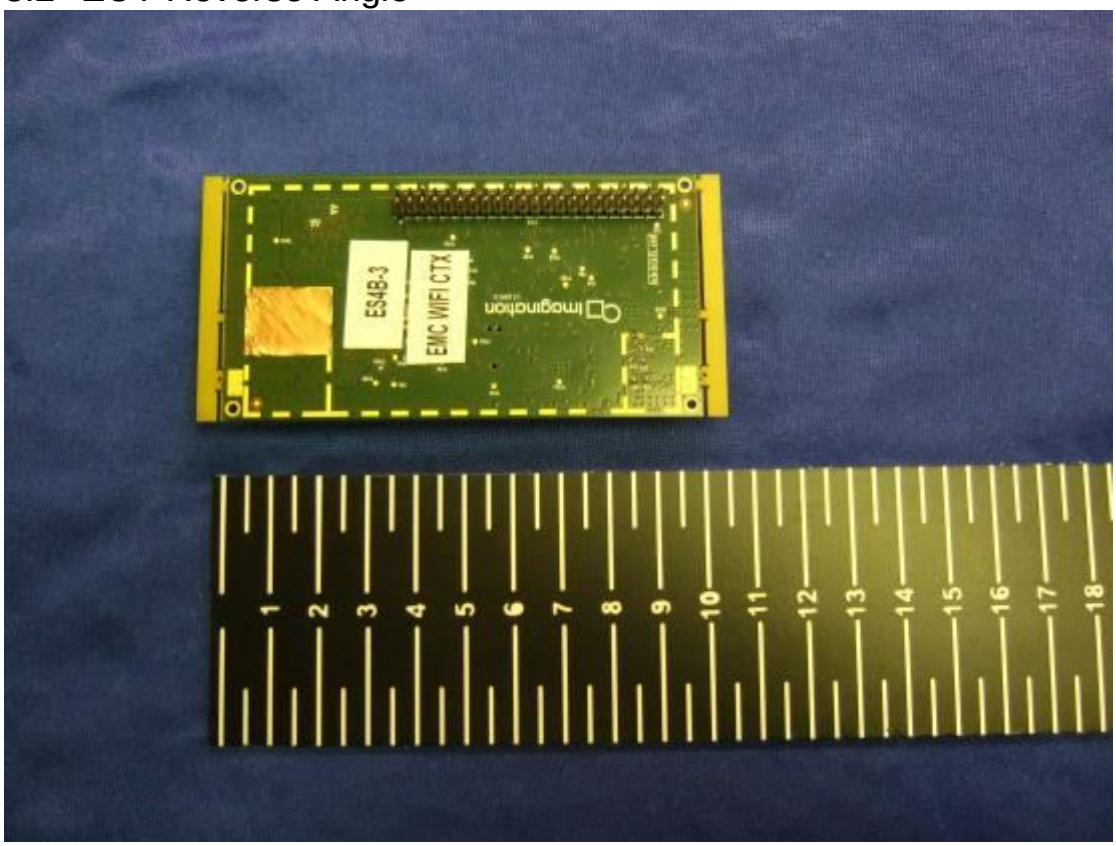
(c) limit of 30 µV/m at 30m, but below 30MHz, equates to 20.log(30) + 40.log(30/3) = 69.5 dBµV/m at 3m, as extrapolation factor below 30MHz is 40dB/decade per 15.31(f)(2).

8 Photographs

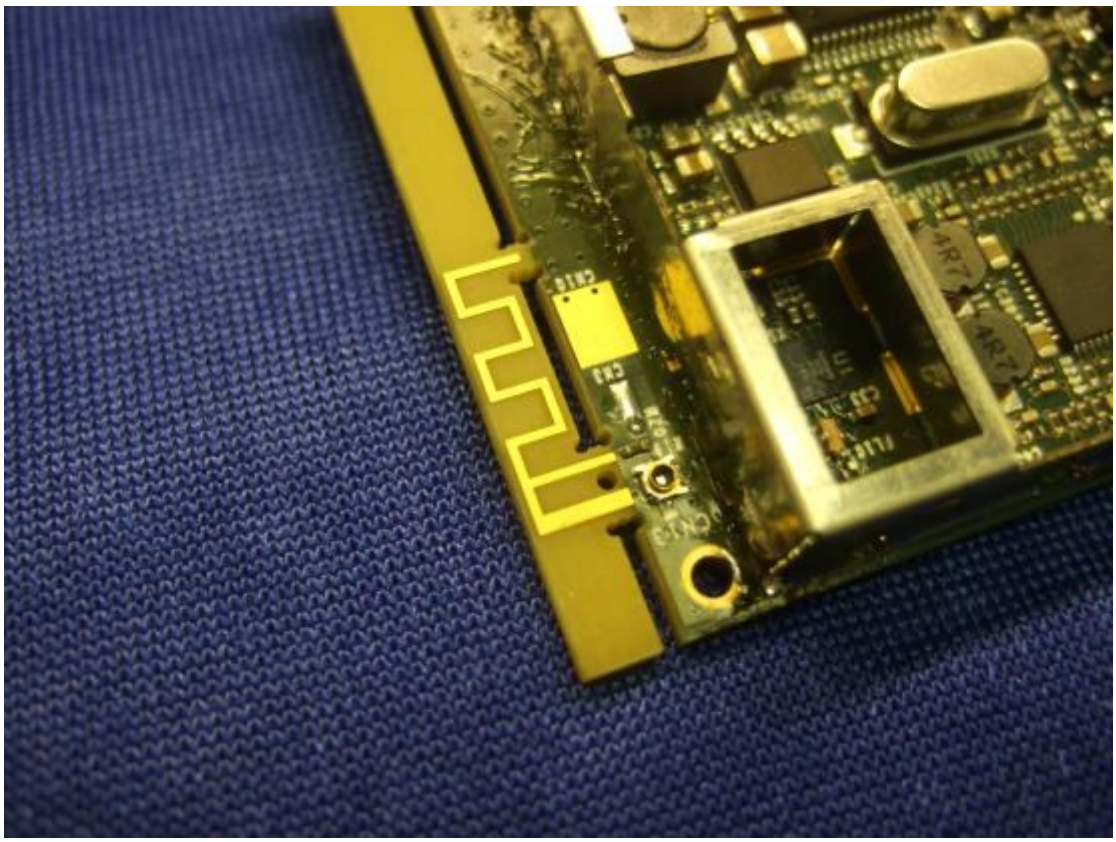
8.1 EUT Front View



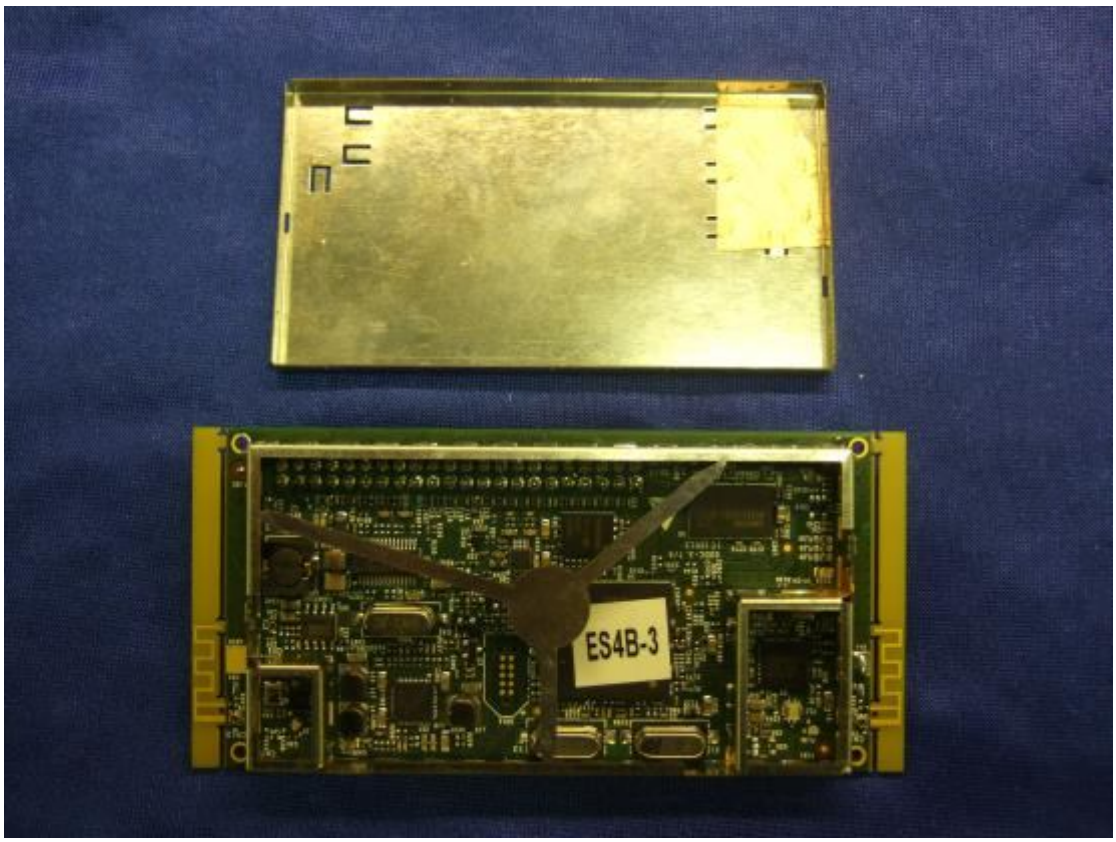
8.2 EUT Reverse Angle

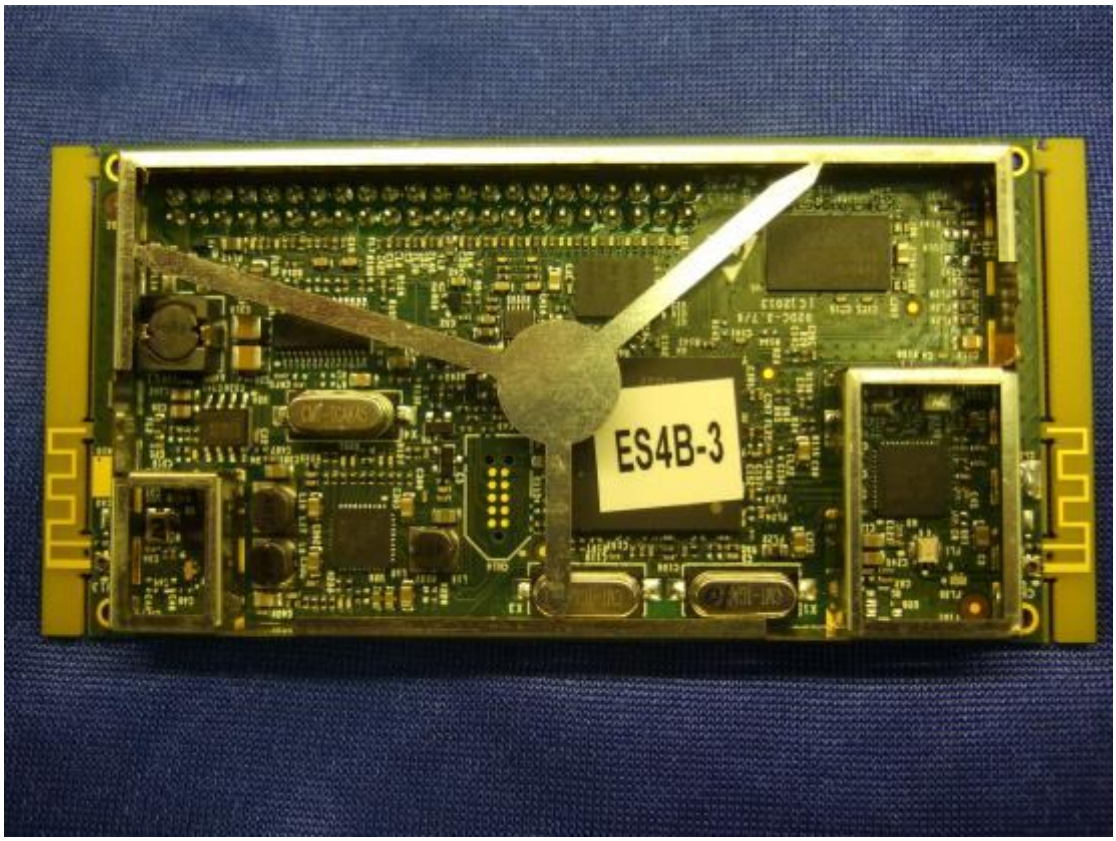


8.3 EUT Antenna & RF Connector Port

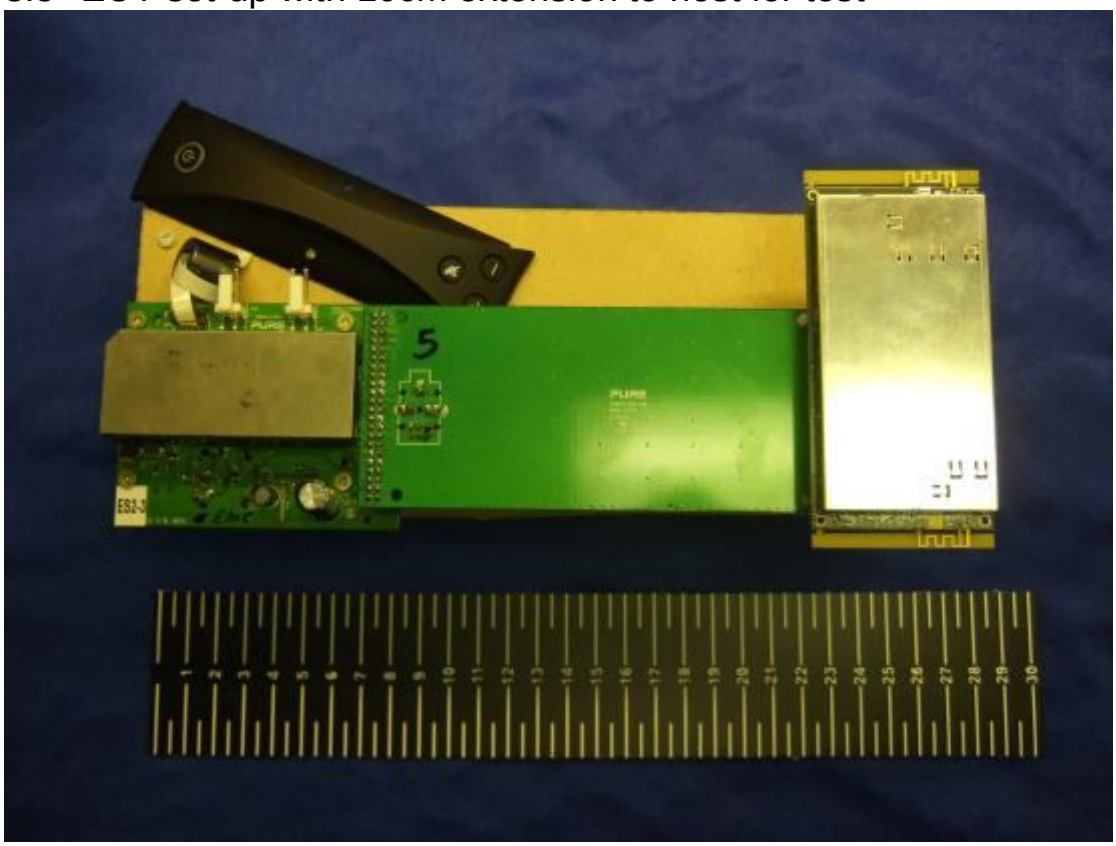


8.4 EUT Internal Construction

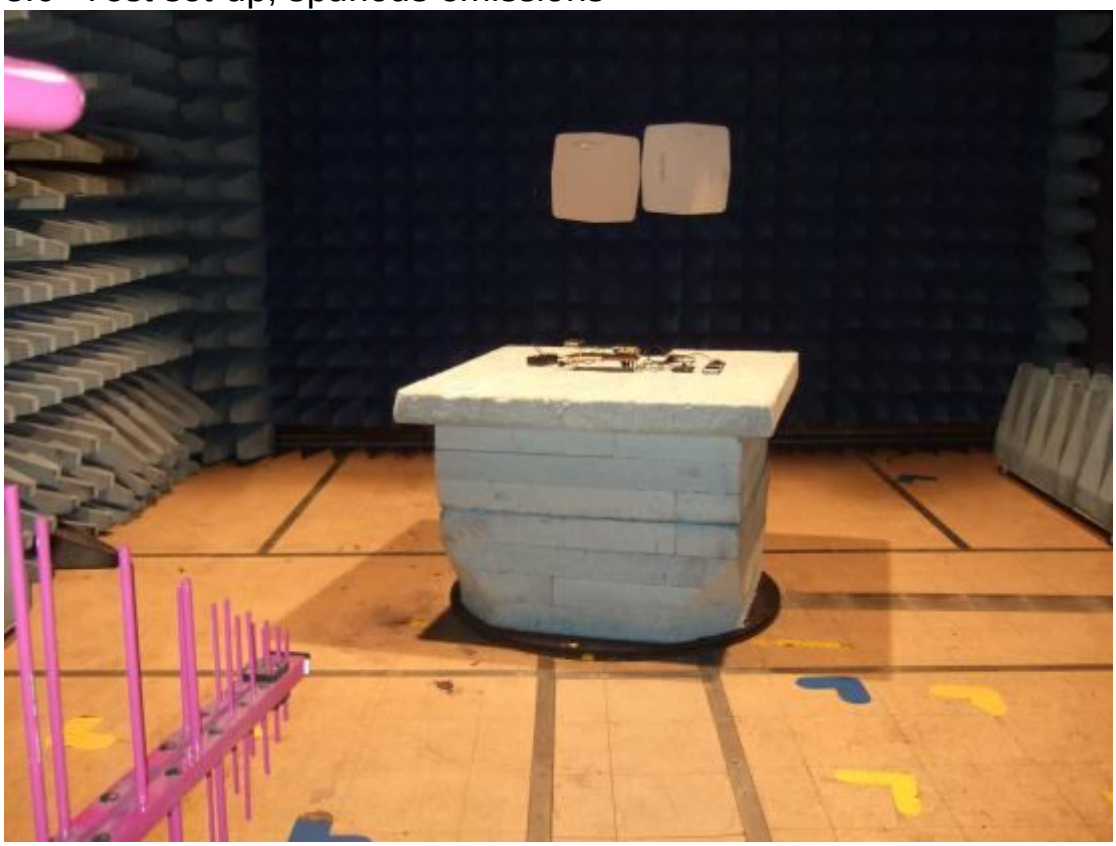


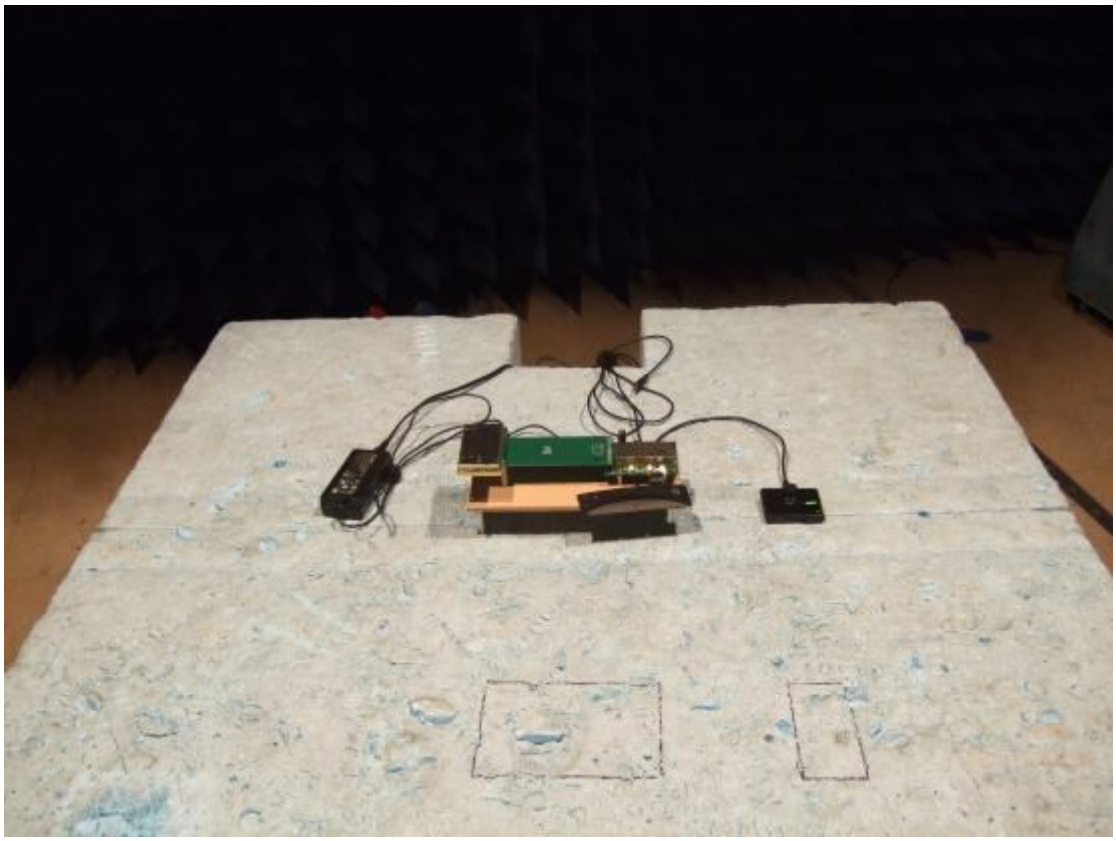


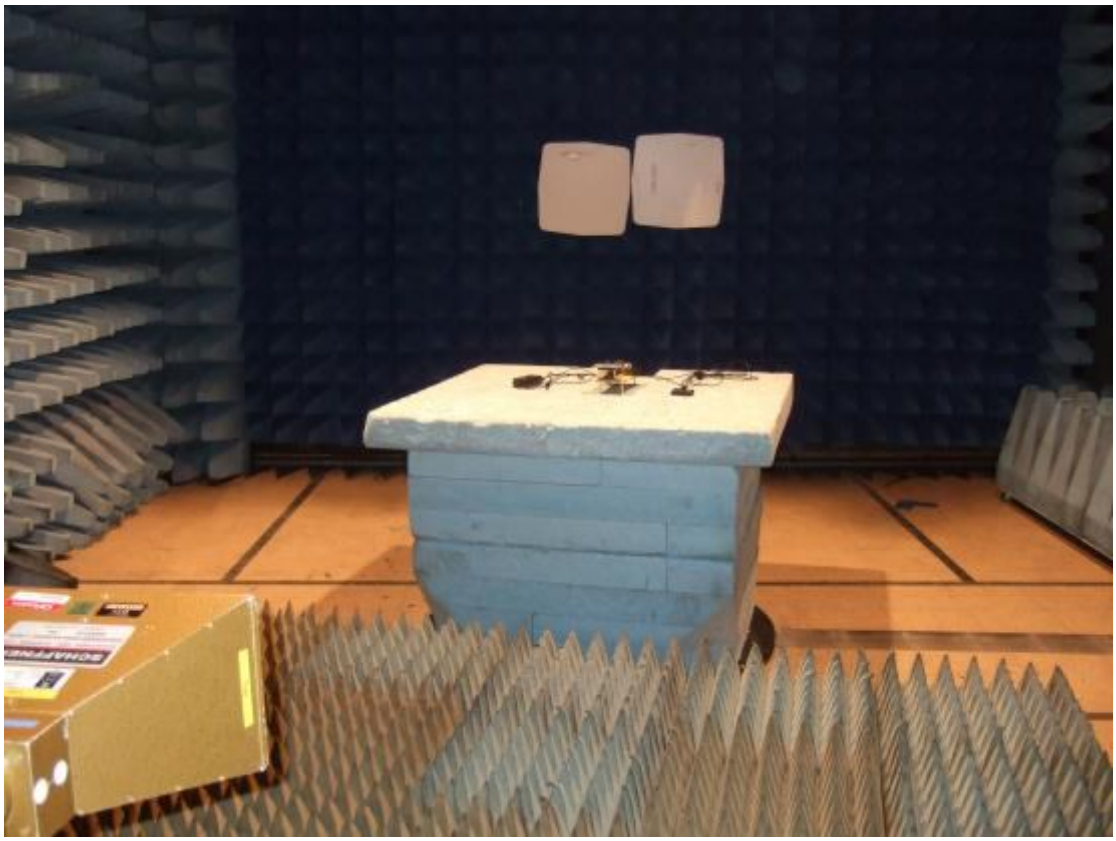
8.5 EUT set-up with 10cm extension to host for test

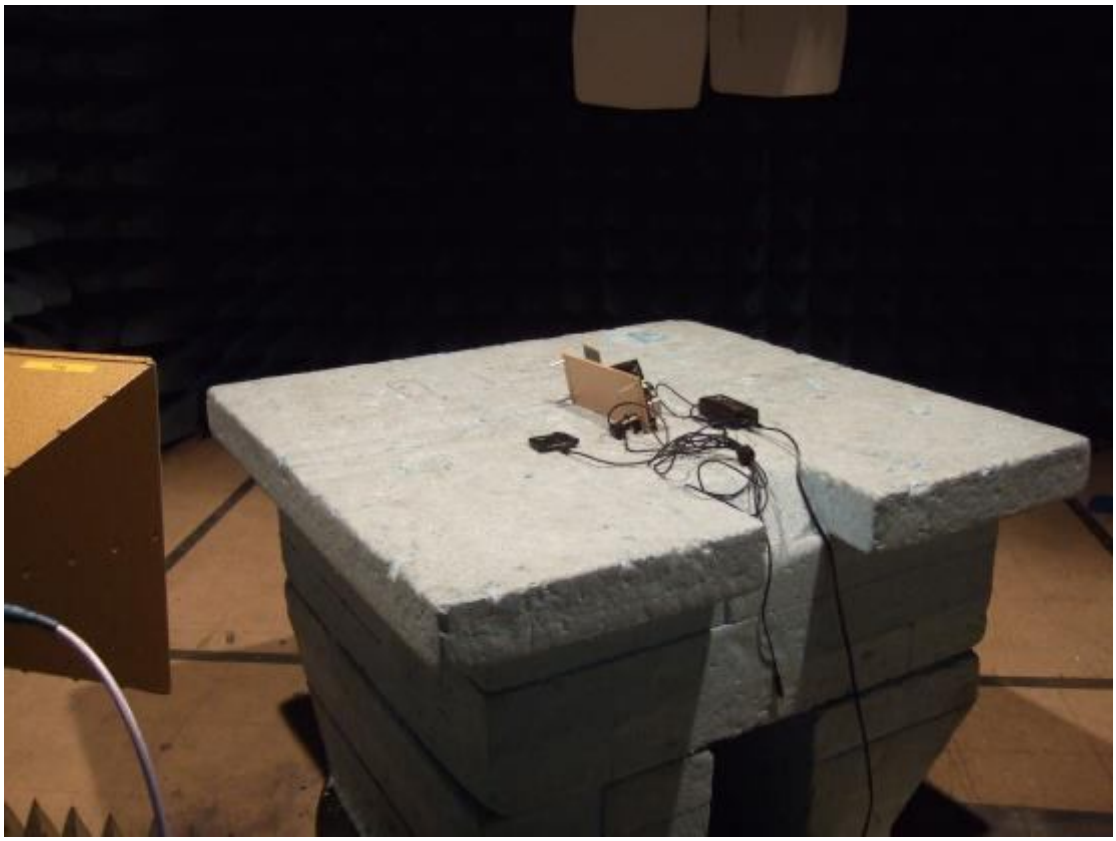


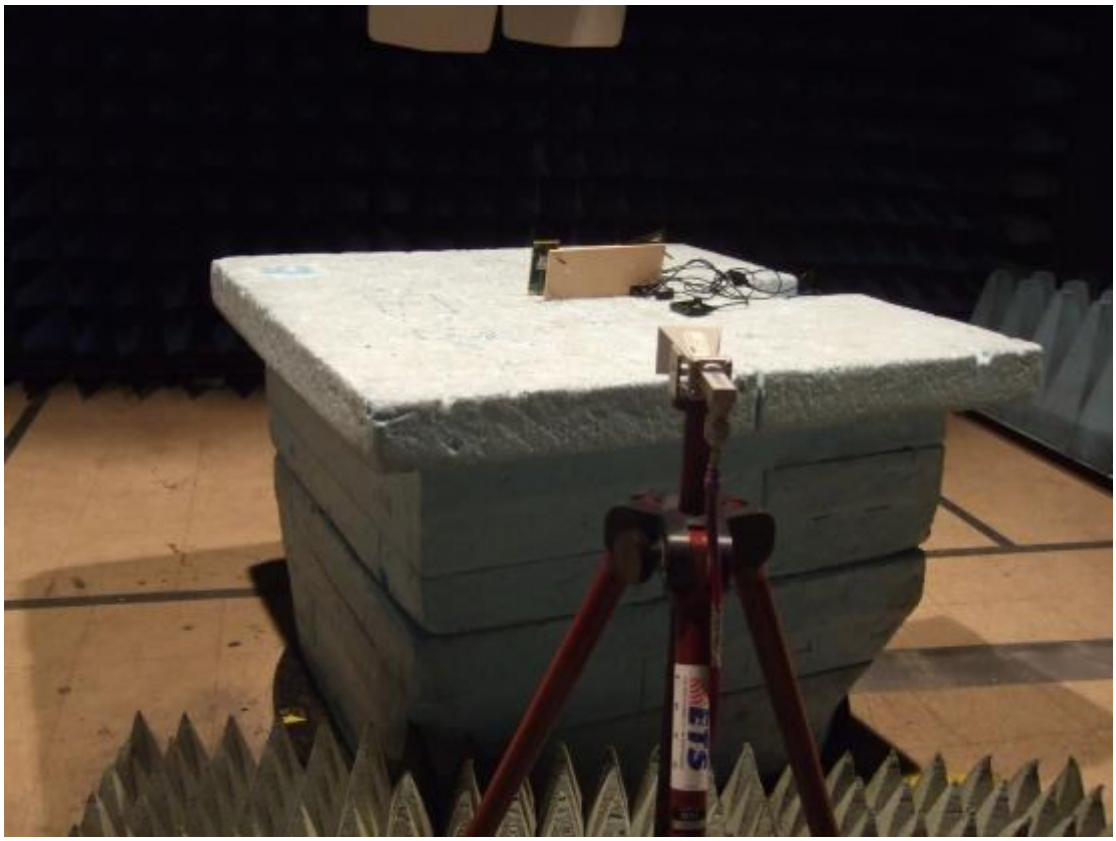
8.6 Test set-up, spurious emissions

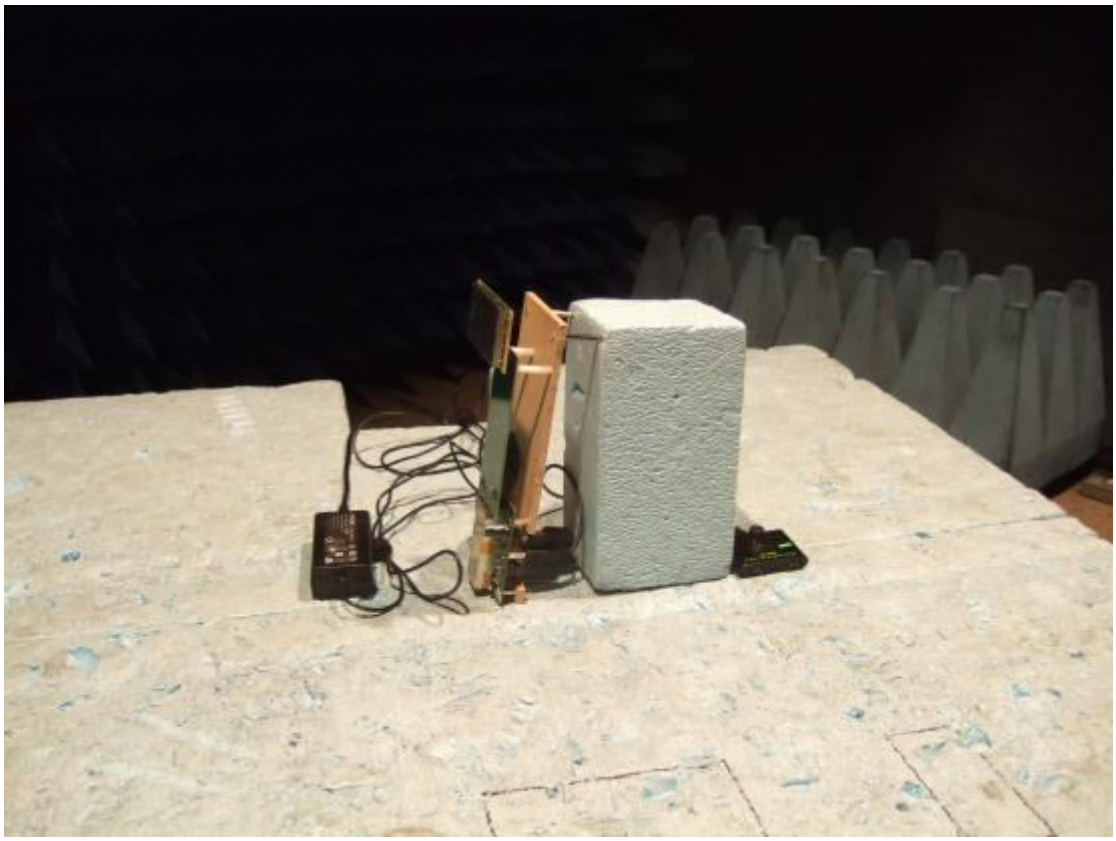


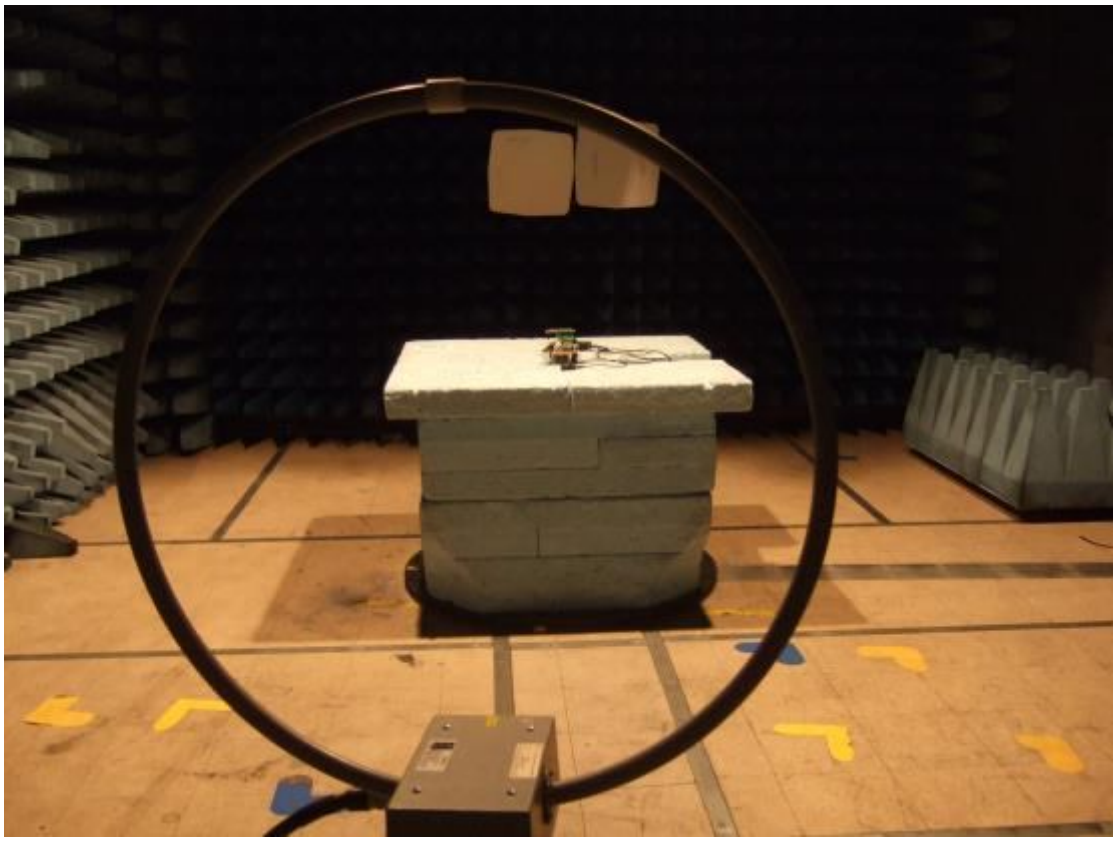




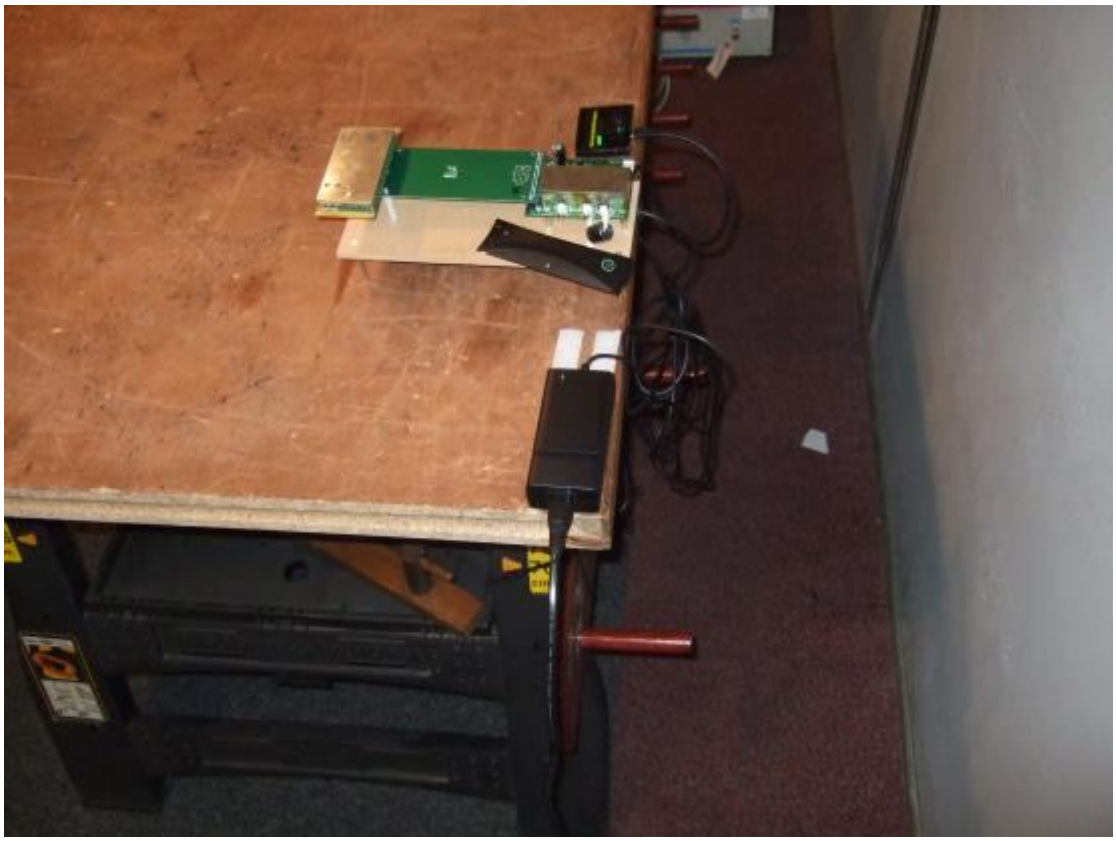








8.7 Test set-up, AC power line conducted emissions



8.8 Test set-up diagrams

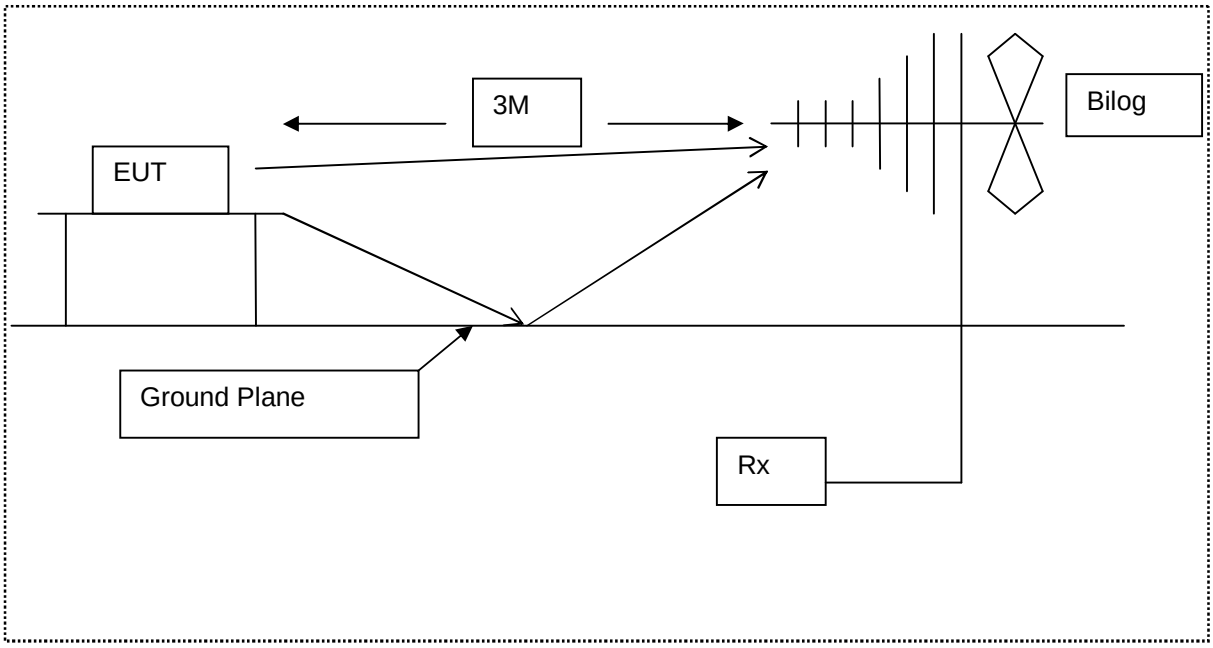


Diagram of the radiated emissions test setup.

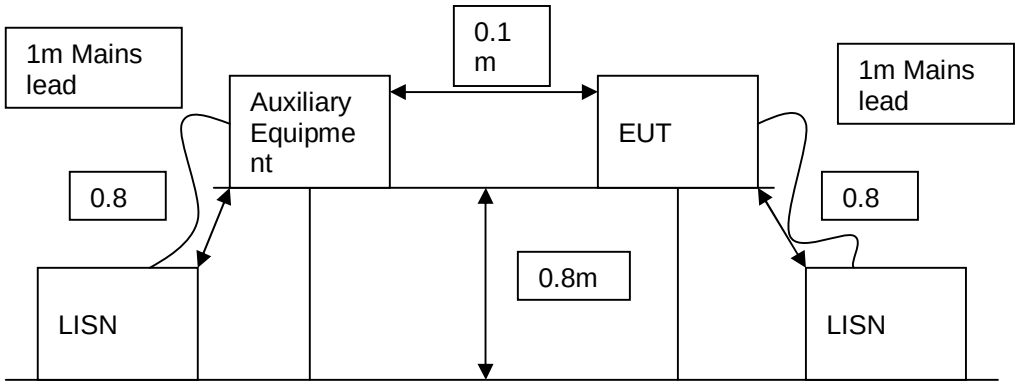


Diagram of the AC power line conducted emissions test setup.

9 Signal Leads

Port Name	Cable Type	Connected
AC/DC adapter (on host)	AC plug adapter to 2core DC lead	Yes
USB (on host)	Standard USB screened	Yes
Audio port (on host)	3.5mm jack audio lead	Yes

10 Test Equipment Calibration list

The following table lists the test equipment used, last calibration date and calibration interval. All test equipment used has been maintained within the calibration requirements of ***R.N. Electronics Ltd.*** test facility quality system. Calibration intervals are regularly reviewed dependent on equipment manufacturer's recommendations and actual usage of the equipment.

RN No.	Model	Description	Manufacturer	Calibration date	Cal period
E035	HP11947A	Transient Limiter + 10dB Atten.	Hewlett Packard	19-Aug-13	6 months
E150	MN2050	LISN 13A	Chase	02-Oct-12	12 months
E252	6810.19.A	10 dB Attenuator	Suhner	09-May-13	12 months
E256	44	10 dB Attenuator	Weinschel Engineering	01-Nov-12	12 months
E268	BHA 9118	1-18 GHz Horn Antenna	Schaffner	14-Apr-13	24 months
E410	N5181A	3 GHz MXG Signal Generator	Agilent Technologies	26-Oct-11	36 months
E411	N9039A	9 kHz - 1 GHz RF Filter Section	Agilent Technologies	18-Oct-12	12 months
E412	E4440A	3 Hz - 26.5 GHz PSA	Agilent Technologies	18-Oct-12	12 months
E429	-	5 Switch Filter Box 0.91 GHz - 16.3 GHz	RN Electronics	20-Nov-12	12 months
E465	PCR2000LA	AC Power Supply	KIKUSUI	09-May-13	12 months
E533	N5182A	6 GHz MXG Signal Generator	Agilent Technologies	26-Feb-13	36 months
E534	E4440A	3 Hz - 26.5 GHz PSA	Agilent Technologies	22-Feb-13	36 months
E535	N9039A	9 kHz - 1 GHz RF Filter Section	Agilent Technologies	22-Feb-13	36 months
N240	CRT700/3/2C	100v Transformer	N/A	N/A	N/A
TMS44	777D	Dual Directional Coupler	Hewlett Packard	28-Aug-13	12 months
TMS78	3160-08	Std Gain Horn Antenna 12.4-18 GHz	ETS Systems	07-Jun-13	24 months
TMS79	3160-09	Std Gain Horn Antenna 18-26.5 GHz	ETS Systems	07-Jun-13	24 months
TMS81	6502	Active Loop Antenna	EMCO	24-Oct-12	24 months
TMS82	8449B	Pre Amplifier 1 - 26 GHz	Agilent	19-Nov-12	12 months
TMS933	CBL6141A	Bilog Antenna 30MHz - 2GHz	York EMC	09-Sep-10	36 months

11 Auxiliary equipment

11.1 Customer supplied Equipment

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

Item No.	Model No.	Description	Manufacturer	Serial No.
1	Highway 300Di	Modified USB controller	Pure	V01.10
2	02DV-3.7/1	10cm Cougar module Extension board	Pure	5
3	02DI-3.5/2	Chilli Cougar carrier PCB	Pure	ES2-3

11.2 Supplied by RN Electronics Limited

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

Item No.	Model No.	Description	Manufacturer	Serial No.
1		Bluetooth test set	Anritsu	N/A

12 Modifications

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

12.1 Modifications before test

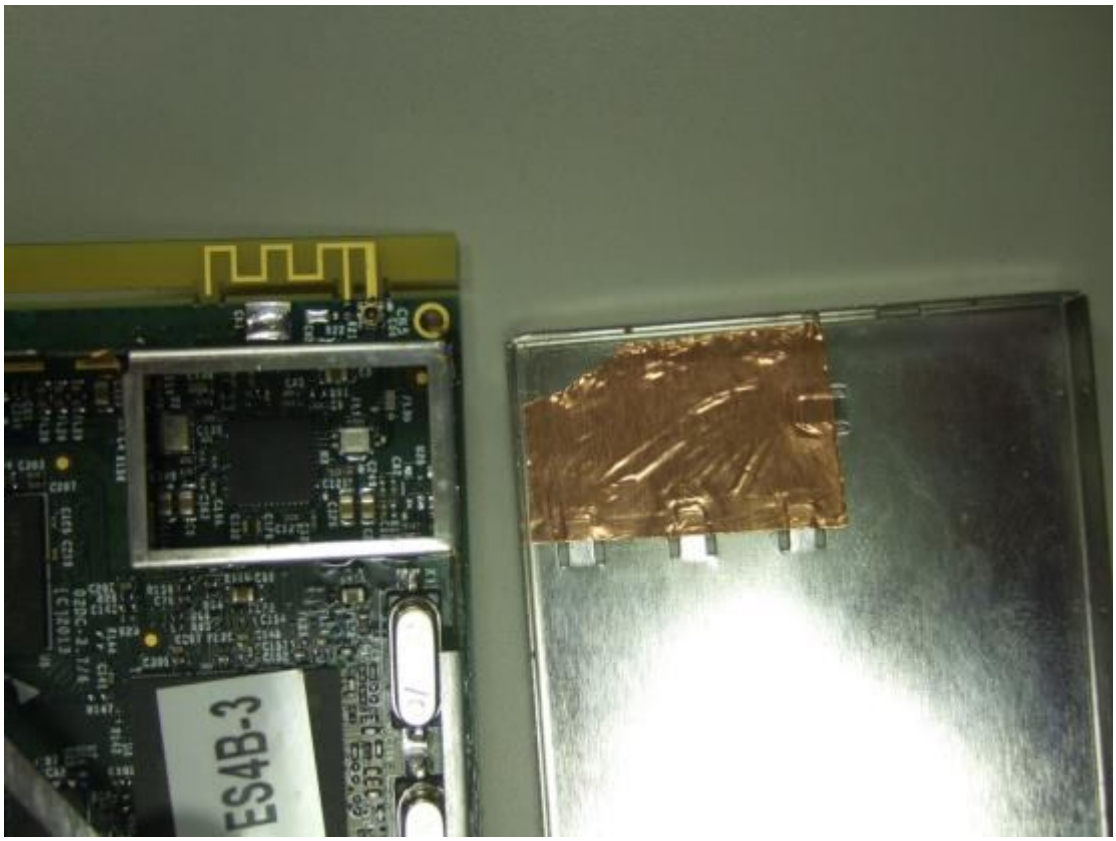
The following modifications were performed before tests.

12.2 Table of modifications

Modification	Time of modification	Photo Reference
Copper tape fitted over internal Max2830 RF can section to help RF can seal.	Before testing	MOD1
Small square of copper tape fitted over back of PCB under max2380 location and attached to ground fill plane, to mimic the burying of tracks to an internal layer.	Before testing	MOD2
Small piece of copper tape placed over corner gap in RF can to help RF seal.	Before testing	MOD3

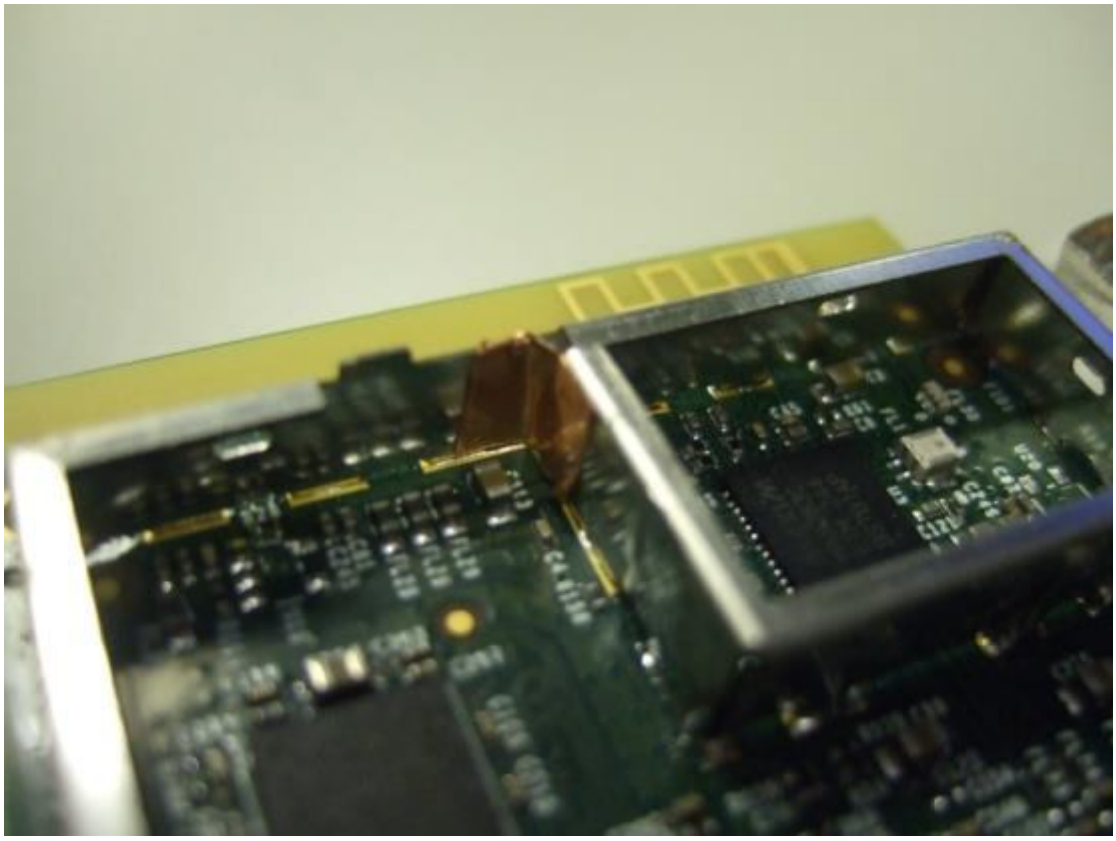
12.3 Modification photos

Mod 1



Mod 2

Mod 3



12.4 Modifications during test

No modifications were made during test by RN Electronics Ltd.

13 Compliance information

Products subject to the Declaration of Conformity procedure are required to be supplied with a compliance information statement. A copy of this statement may be included here:

Certified equipment - DoC not required.

N.b. the EUT USB port does not connect to a PC, hence it is not a PC peripheral either

14 Description of Test Sites

Site A	Radio / Calibration Laboratory and anechoic chamber
Site B	Semi-anechoic chamber
Site B1	Control Room for Site B
Site C	Transient Laboratory
Site D	Screened Room (Conducted Immunity)
Site E	Screened Room (Control Room for Site D)
Site F	Screened Room (AC power line conducted Emissions) VCCI Registration No. C-2823
Site G	Screened Room (Control Room for Site H)
Site H	3m Semi-anechoic chamber (indoor OATS)
Site J	Screened Room
Site K	Screened Room (Control Room for Site M)
Site M	3m Semi-anechoic chamber (indoor OATS) FCC Registration No. 293246
Site Q	Fully-anechoic chamber
Site OATS	3m and 10m Open Area Test Site FCC Registration No. 293246 IC Registration No. 5612A-1 VCCI Registration No. R-2580
Site R	Screened Room (Conducted Immunity)
Site S	Safety Laboratory
Site T	Transient Laboratory

15 Abbreviations and Units

%	Percent
µV	microVolts
µW	microWatts
AC	Alternating Current
ALSE	Absorber Lined Screened Enclosure
AM	Amplitude Modulation
Amb	Ambient
ANSI	American National Standards Institute
ºC	Degrees Celsius
CFR	Code of Federal Regulations
CS	Channel Spacing
CW	Continuous Wave
dB	deciBels
dBµV	deciBels relative to 1µV
dBc	deciBels relative to Carrier
dBm	deciBels relative to 1mW
DC	Direct Current
EIRP	Equivalent Isotropic Radiated Power
ERP	Effective Radiated Power
EUT	Equipment Under Test
FCC	Federal Communications Commission
FM	Frequency Modulation
FSK	Frequency Shift Keying
g	Grams
GHz	GigaHertz
Hz	Hertz
IF	Intermediate Frequency
kHz	kiloHertz
LO	Local Oscillator
mA	milliAmps
max	maximum
kPa	milliBars
MHz	MegaHertz
min	minimum
mm	milliMetres
ms	milliSeconds
mW	milliWatts
NA	Not Applicable
nom	Nominal
nW	nanoWatt
OATS	Open Area Test Site
OFDM	Orthogonal Frequency Division Multiplexing
PCB	Printed Circuit Board
ppm	Parts per million
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
Ref	Reference
RF	Radio Frequency
RTP	Room Temperature and Pressure
s	Seconds
Tx	Transmitter
V	Volts