FCC 47CFR part 15C
Test Report
For
DR1198 JN5168-001-U00 USB Dongle
DR1198 JN5168-001-U00

Reference Standard: FCC 47CFR part 15C
Manufacturer: NXP Laboratories UK Ltd
For type of equipment and serial number, refer to section 3
Report Number: 11-6535-4-12
Report Produced by: -

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Certificate of Test 6535/4

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:	DR1198 JN5168-001-U00 USB Dongle
Model Number: Proposed FCC ID:	DR1198 JN5168-001-U00 TYOJN5168U0
Unique Serial Number:	1
Manufacturer:	NXP Laboratories UK Ltd Furnival Street Sheffield S1 4QT
Customer Purchase Order Number:	GB628200059902
Full measurement results are detailed in Report Number:	11-6535-4-12
Test Standards:	FCC 47CFR Part 15.247 effective date **October 1st 2012,** Class DTS 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.

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 one or more national authorities within the EU 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:	1st Nov 2012 - 8th Nov 2012
Test Engineer:	Lee Chandler
Approved By: Technical Director	
Customer Representative:	

The contents of this report, apart from the referenced ANSI C63.4-2003, are beyond the scope of UKAS Testing Laboratory No. 2360 accreditation.

1 Contents

The contents of this report, apart from the referenced ANSI C63.4-2003, are beyond the scope of UKAS Testing Laboratory No. 2360 accreditation.

2 Summary of test results

The DR1198 JN5168-001-U00 USB Dongle was tested to the following standards: -

FCC 47CFR Part 15.247 (effective date October 1st, 2012);
Class DTS 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. Conducted emissions	FCC Part 15C §15.207	PASSED
2. Radiated emissions	FCC Part 15C §15.205, §15.209 and §15.247(d)	PASSED
3. Occupied bandwidth	FCC Part 15C §15.215(c), §15.247(a)(2)	PASSED
4. Peak conducted power	FCC Part 15C §15.247(b)	PASSED
5. Frequency tolerance	FCC Part 15C §15.215(c)	Not Applicable[1]
6. Duty cycle	FCC Part 15C §15.35(c)	Not Applicable[2]
7. Power Spectral Density	FCC Part 15C §15.247(e)	PASSED
8. Band edge compliance	FCC Part 15C §15.205, §15.209 and §15.247	PASSED
9. FHSS parameters	FCC Part 15C §15.247(a)(1)	Not Applicable[3]

[1] 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.
[2] No limits apply, however duty cycle measurement performed to verify correction factors for average emissions.
[3] EUT does not employ FHSS technology.

3 Equipment Under Test (EUT)

3.1 Equipment Specification

Applicant	NXP Laboratories UK Ltd Furnival Street Sheffield S1 4QT
Manufacturer of EUT	NXP Laboratories UK Ltd
Brand name of EUT	NXP
Model Number of EUT	DR1198 JN5168-001-U00
Proposed FCC ID	TYOJN5168U0
Serial Number of EUT	1
Date when equipment was received by RN Electronics	26th Oct 2012
Date of test:	1st Nov 2012 - 8th Nov 2012
Customer order number:	GB628200059902
Visual description of EUT:	The EUT is a small plastic transparent enclosure. There is a USB port located at the end of the EUT.
Main function of the EUT:	IEEE 802.15.4 compliant 2.4GHz wireless microcontroller USB dongle.
Height	70 mm
Width	25 mm
Depth	9 mm
Weight	0.005 kg
Voltage	4.5-5.5 Vdc
Current required from above voltage source	Not specified

3.2 EUT Configurations for testing

Frequency range	2405 – 2480 MHz
Normal use position	USB dongle
Normal test signals	Internally generated IEEE 802.15.4 compliant test packets
Declared power level	2.5dBm into printed PCB antenna
Declared channel bandwidth	1.73 MHz
Highest frequency generated / used	2480 MHz
Lowest frequency generated / used	32 MHz

3.3 Functional Description

The IEEE 802.15.4 USB Dongle provides an easy way of interfacing a host machine (such as a PC) to a wireless network based on the IEEE 802.15.4 protocol standard, where this network may additionally employ the ZigBee PRO or JenNet IP networking protocol. The dongle incorporates an FTDI FT232R USB/Serial convertor which interfaces with the JN5168 wireless microcontroller, thus allowing a direct USB connection between the host machine and the JN5168 device, which then provides the radio interface to the wireless network. Typical uses of the dongle include:

- A complete and stable hardware environment for the development of IEEE 802.15.4, ZigBee PRO and JenNet-IP applications.
- The basis of a packet sniffer for IEEE 802.15.4-based wireless communications
- A means of integrating the host machine into a wireless network, typically as the network Co-ordinator

3.4 EUT Modes

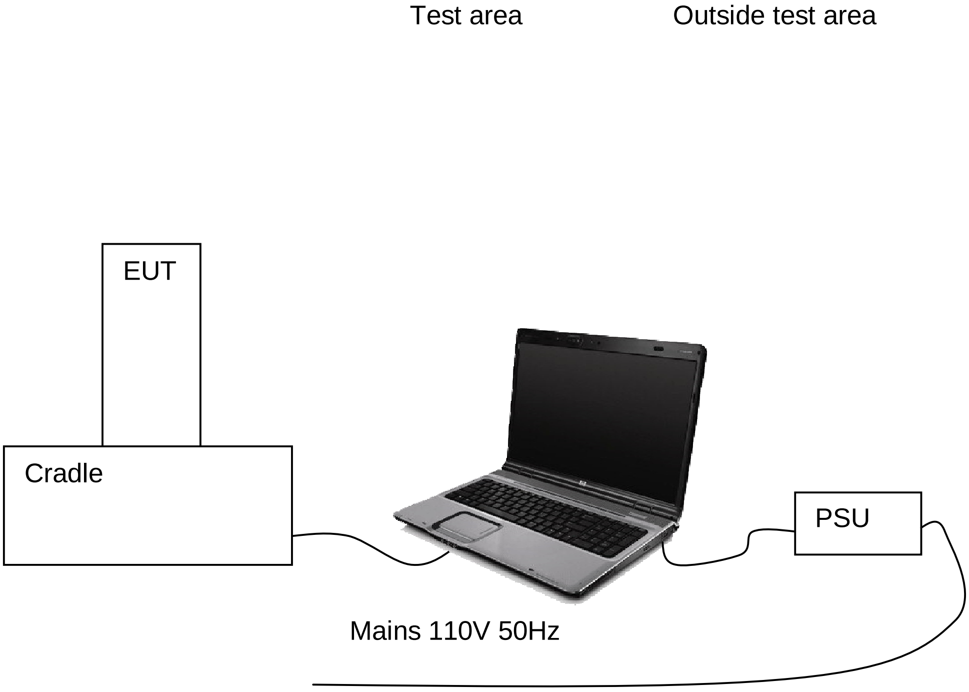
Mode	Description of mode	Used for Testing
Transmit Low	Unit constantly transmitting packets on 2405MHz	YES
Transmit Mid	Unit constantly transmitting packets on 2440MHz	YES
Transmit High	Unit constantly transmitting packets on 2480MHz	YES
Transmit Other	Unit constantly transmitting on other available channels	NO
Receive	Unit receiving packets from networked RF device	YES
Transmit 1% duty cycle	Unit transmitting system modulation 1% duty cycle	YES

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: 15 December 2012

3.5 Emissions Configuration



The laptop that supplied the EUT was supplied by 110V AC power via its ac/dc adaptor. The EUT was plugged into the USB port of the laptop via a dedicated USB lead and cradle.

4 Specifications

4.1 Relevant Standards

The tests were performed by RN Electronics Engineer Lee Chandler who set up the tests, the test equipment, and operated it in accordance with the ***R.N. Electronics Ltd*** procedures manual, ANSI C63.10-2009, FCC Part 15 and those specifications incorporated by reference into 47CFR15 (e.g. ANSI C63.4-2003).

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

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

No tests were required at extremes of temperature / voltage.

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
Conducted spurious emissions	± 2.8 dB
AC line conducted emissions	(For LISN) 150kHz to 30MHz ±3.6dB (For Voltage Probe) 150kHz to 30MHz ±4.2dB

The contents of this report, apart from the referenced ANSI C63.4-2003, are beyond the scope of UKAS Testing Laboratory No. 2360 accreditation.

5 Tests, Methods and Results

5.1 Conducted emissions

5.1.1 Test Methods

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

5.1.1.1 Configuration of EUT

The EUT was placed on a wooden table 0.8m above the ground plane and connected to a laptop via USB, the laptops ac/dc adaptor was placed a 100mm separation from it. The adaptor was connected to a LISN via a 1m mains cable.

Refer to section 8.2 for a photograph and section 8.3 for a diagram of this test set-up.

Details of the peripheral and ancillary equipment connected for this test is listed in section 10.

During the initial scan, Receiving mode (refer to section 2.2) was found to be worst case mode of operation.

5.1.1.2 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.

5.1.2 Test results

Temperature of test environment:	22°C
Relative humidity of test environment:	36%

Analyser plots for the Quasi-Peak / Average values as applicable can be found in Section 6.1 of this report.

Quasi-Peak and Average Live

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP - Lim1 (dB)	AV Amp (dBuV)	AV - Lim1 (dB)
1	0.197	51.7	48.7	-15.0	44.4	-9.3
2	0.328	43.6	41.9	-17.6	40.0	-9.5
3	0.394	41.4	40.0	-18.0	35.9	-12.1
4	0.525	39.3	38.1	-17.9	35.4	-10.6
5	0.591	39.3	37.1	-18.9	33.8	-12.2
6	0.722	36.2	34.8	-21.2	32.2	-13.8
7	0.787	37.0	34.3	-21.7	26.4	-19.6
8	0.919	37.9	36.6	-19.4	34.0	-12.0
9	0.984	37.1	35.5	-20.5	32.1	-13.9
10	1.050	37.2	35.8	-20.2	32.9	-13.1
11	1.181	37.6	36.4	-19.6	33.5	-12.5
12	1.247	38.5	37.3	-18.7	34.2	-11.8
13	1.641	38.1	37.0	-19.0	34.4	-11.6
14	1.706	38.4	36.7	-19.3	32.5	-13.5
15	1.837	37.9	36.8	-19.2	33.7	-12.3
16	2.296	38.2	36.8	-19.2	33.6	-12.4
17	3.018	37.4	36.0	-20.0	31.7	-14.3
18	4.396	37.6	36.1	-19.9	31.2	-14.8

Quasi-Peak and Average Neutral

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP - Lim1 (dB)	AV Amp (dBuV)	AV - Lim1 (dB)
1	0.197	46.3	41.4	-22.3	35.4	-18.3
2	0.263	44.3	42.2	-19.1	39.0	-12.3
3	0.329	40.5	38.5	-21.0	35.0	-14.5
4	0.592	38.1	36.5	-19.5	33.0	-13.0
5	0.789	37.5	36.2	-19.8	33.4	-12.6
6	0.986	36.6	35.7	-20.3	33.3	-12.7
7	1.249	38.1	36.6	-19.4	33.2	-12.8
8	1.445	37.6	36.6	-19.4	33.7	-12.3
9	1.709	37.5	36.3	-19.7	32.2	-13.8
10	1.906	37.9	36.7	-19.3	33.2	-12.8
11	2.103	37.7	36.4	-19.6	33.4	-12.6
12	3.417	37.4	35.8	-20.2	31.4	-14.6
13	4.141	37.2	35.8	-20.2	30.8	-15.2

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

5.1.2.1 Test Equipment used

E150, E035, E410, E411, E412, E465

See Section 10 for more details

5.2 Peak Conducted power

5.2.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.247)

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

5.2.1.1 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 set to each transmit mode and test signal in turn (see section 3.4) and highest power levels recorded.

5.2.1.2 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 in site M.

5.2.2 Test results

Test Environment: Temperature: 18°C Humidity: 35 %

Channel / scheme	EIRP (dBuV/m)	Duty cycle adjustment (dB)	Total (dBuV/m)	Result (mW)
Low	95.7	-	95.7	1.1
Mid	98.0	-	98.0	1.9
High	97.1	-	97.1	1.5

LIMITS:
15.247(b)(3)
For systems using digital modulation in the 902-928, 2400-2483.5 or 5725-5850 MHz bands 1 Watt.

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

5.2.2.1 Test Equipment used

E268, E410, E411, E412, E429, TMS82
See Section 10 for more details

5.3 Maximum Power Spectral Density

5.3.1 Test Methods

Test Requirements	FCC Part 15C, Reference (15.247)
Test Method:	FCC Part 15C, Reference (15.247) 558074 D01 DTS Meas Guidance v02; 9.1 Option 1

5.3.1.1 Configuration of EUT

The EUT was configured for maximum output power closely coupled into a test fixture. The EUT was set to each transmit mode and test signal in turn (see section 3.4) and highest power levels recorded.

5.3.1.2 Test Procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below. Span 1.5 x BW, RBW 3kHz, VBW 9kHz, auto sweep settings were used. PEP was recorded in the required bandwidth.

5.3.2 Test results

Temperature of test Environment: 20°C

Table of results

Channel/ scheme	PEP (dBuV/m @3m/3kHz)	PEP (dBm/3kHz)
2.405GHz	86.12	-9.1
2.440GHz	83.89	-11.3
2.480GHz	84.58	-10.6

LIMITS:
15.247(e) +8dBm/3kHz.

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

5.3.2.1 Test Equipment used

E492

See Section 10 for more details.

5.4 Duty cycle
5.4.1 Test Methods

Test Requirements	FCC Part 15C, Reference (15.35)
Test Method:	ANSI C63.10, Reference (7.5)

5.4.1.1 Configuration of EUT

The EUT was configured for maximum output power closely coupled into a test fixture. The EUT was operated in Transmit mode, Low.

5.4.1.2 Test Procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below. The centre frequency of the analyser was set to that of the transmitter, and the span set to zero. The sweep time was adjusted so that either the pulse width or the periodic operation could be observed.

5.4.2 Test results

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

Temperature of test Environment: 20°C

Analyser plots for the dwell time and duty cycle can be found in Section 6.4 of this report.

State	Result (ms)	Plot reference
Constant TX mode	100ms	J6535-4-005 Duty cycle 100%
1% ON	92µs	J6535-4-002 Duty cycle 1%
1% PERIOD	8.177ms	J6535-4-001 Duty cycle 1%

LIMITS:
Not applicable

These results show that the constant TX mode used for purposes of test was truly 100% and that a typical 1% duty setting of the EUT produced 1.125% duty. Duty cycle correction factor for peak to average emissions could therefore be 20log(13*0.092 / 100) = -38.4 dB, however the maximum peak to average ratio allowed is 20dB, hence correction factor of 20dB could be applied.

5.4.2.1 Test Equipment used

E492

See Section 10 for more details.

5.5 Radiated emissions

5.5.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.209)

Test Method: ANSI C63.10, Reference (6.4 – 6.6.)

5.5.1.1 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. During the initial scan, Transmit mode, low channel was found to be worst case.

5.5.1.2 Test Procedure

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

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. The EUT was raised and antenna was placed 1.5m above the ground in line with the EUT, which 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.

5.5.2 Test results

Tests were performed using Test Site M and B (above 1GHz)**.**

Test Environment:
M: Temperature: 18°C Humidity: 35%
B: Temperature: 18°C Humidity: 54%

Analyser plots for the Quasi-Peak / Average values as applicable can be found in Section 6.2 and 6.3 of this report.

Table of signals below 1GHz, Horizontal.

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP - Lim1 (dB)
1	267.038	33.5	30.8	-15.2
2	287.993	35.6	33.0	-13.0
3	400.561	35.3	33.1	-12.9
4	563.981	34.4	28.9	-17.1

Table of signals below 1GHz, Vertical.

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP - Lim1 (dB)
1	120.086	31.5	24.6	-18.9
2	131.990	34.3	26.8	-16.7
3	267.037	35.3	24.7	-21.3
4	287.993	34.4	32.3	-13.7

Table of signals above 1GHz, Horizontal,Low channel.

Signal No.	Freq (MHz)	Peak Amp (dBuV)	Peak - Lim1 (dB)	AV Amp (dBuV)	AV - Lim1 (dB)
1	2373.430	45.1	-28.9	36.3	-17.7
2	2437.074	45.9	-28.1	40.1	-13.9

Table of signals above 1GHz, Vertical,Low channel.

Signal No.	Freq (MHz)	Peak Amp (dBuV)	Peak - Lim1 (dB)	AV Amp (dBuV)	AV - Lim1 (dB)
1	2373.171	42.3	-31.7	34.2	-19.8
2	2437.144	43.7	-30.3	35.8	-18.2
3	4808.897	46.8	-27.2	36.0	-18.0

Table of signals above 1GHz, Horizontal,Mid channel.

Signal No.	Freq (MHz)	Peak Amp (dBuV)	Peak - Lim1 (dB)	AV Amp (dBuV)	AV - Lim1 (dB)
1	2407.882	44.3	-29.7	37.7	-16.3
2	2472.021	46.7	-27.3	40.9	-13.1

Table of signals above 1GHz, Vertical,Mid channel.

Signal No.	Freq (MHz)	Peak Amp (dBuV)	Peak - Lim1 (dB)	AV Amp (dBuV)	AV - Lim1 (dB)
1	2408.012	42.6	-31.4	35.7	-18.3
2	2472.114	44.5	-29.5	36.9	-17.1
3	4881.018	46.7	-27.3	35.5	-18.5

Table of signals above 1GHz, Horizontal,High channel.

Signal No.	Freq (MHz)	Peak Amp (dBuV)	Peak - Lim1 (dB)	AV Amp (dBuV)	AV - Lim1 (dB)
1	2447.533	45.2	-28.8	36.8	-17.2
2	2511.585	47.6	-26.4	40.1	-13.9

Table of signals above 1GHz, Vertical,High channel.

Signal No.	Freq (MHz)	Peak Amp (dBuV)	Peak - Lim1 (dB)	AV Amp (dBuV)	AV - Lim1 (dB)
1	2447.652	41.9	-32.1	31.6	-22.4
2	2512.348	43.6	-30.4	35.6	-18.4
3	4959.035	48.4	-25.6	37.8	-16.2

Note: EUT tested in a continuous transmit mode for ease of test. Where average limits apply, duty cycle correction may then be calculated as per FCC 15.35. TX on time in 100ms period. See section 5.4 Duty cycle within this report.

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.

5.5.2.1 Test Equipment used

E410, E411, E412, TMS933, E268, TMS78, TMS79, TMS82
See Section 10 for more details

5.6 Occupied bandwidth

5.6.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.215)

Test Method: ANSI C63.10, Reference (6.9)

5.6.1.1 Configuration of EUT

The EUT was configured for maximum output power closely coupled into a test fixture. The EUT was operated in Transmit mode, Low, Mid and High.

5.6.1.2 Test Procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below. A 100kHz RBW, 3x VBW, auto sweep time and max hold settings were used for the 6dB bandwidth.

5.6.2 Test results

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

Temperature of test Environment: 20°C

Analyser plots for the 6dB bandwidth can be found in Section 6.5 of this report.

Channel	Result	Plot reference
Bottom	1.40 MHz	J6535-4-006
Middle	1.51 MHz	J6535-4-007
Top	1.56 MHz	J6535-4-008

LIMITS:

15.215(c) The 20dB bandwidth of the emission must be contained within the designated frequency band.
15.247(a)(2) The minimum 6dB bandwidth shall be at least 500kHz.

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

5.6.2.1 Test Equipment used

E492

See Section 10 for more details.

5.7 Band Edge Compliance

5.7.1 Test Methods

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

5.7.1.1 Configuration of EUT

The EUT was configured for maximum output power closely coupled into a test fixture. The EUT was operated in Transmit mode, Low and High.
For restricted band emissions, the same configuration as for radiated power was used.

5.7.1.2 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.

5.7.2 Test results

Tests were performed using Test Site A.

Temperature of test Environment: 20°C

Analyser plots for the Band Edge Compliance can be found in Section 6.6 of this report. These show the 20dBc requirement of 15.247(d) are met at the band edges of 2400 and 2483.5 MHz.

The band edge readings were performed with a peak detector (max held plot) and with the EUT set in a constant 100% transmit state.

Restricted band edge plots are also shown in section 6.6.

LIMITS:

20dBc in 100kHz RBW, peak at band edges.

AV = 54dBuV/m in restricted bands.
PK = 74dBuV/m in restricted bands.

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.

5.7.2.1 Test Equipment used

E003, E410, E411, E412, E268

See Section 10 for more details.

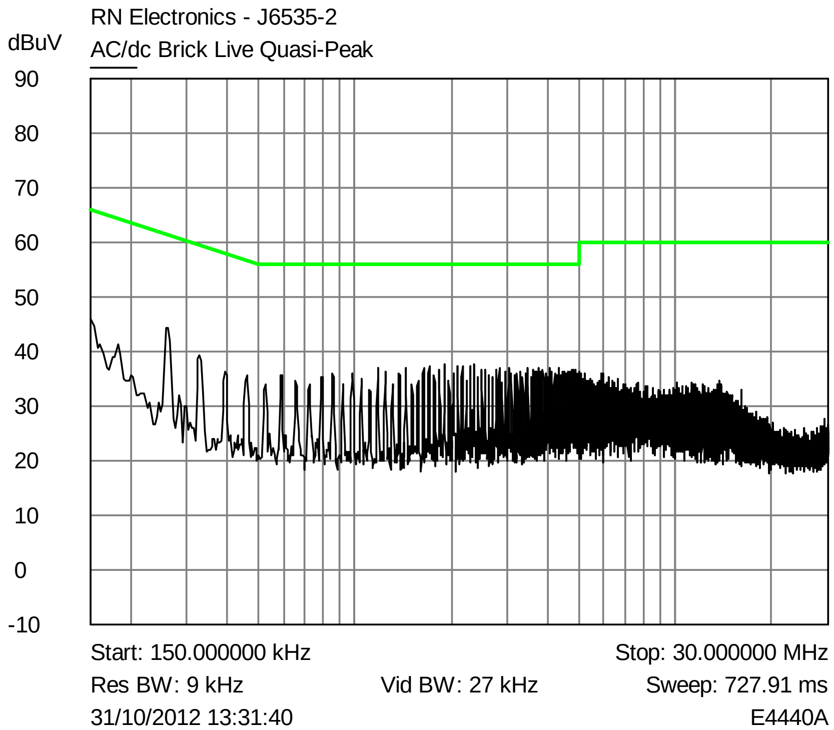
5.8 FHSS Parameters

Test following tests were not applicable as the EUT does not employ FHSS Technology.

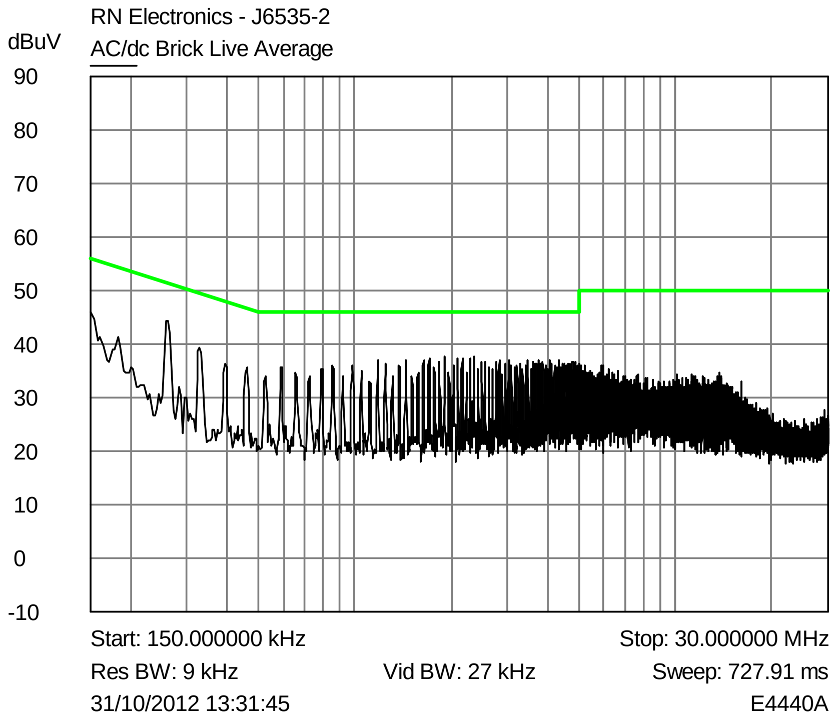
5.8.1 Frequency Separation
5.8.2 Number of hopping Channels
5.8.3 Dwell time

6 Plots and Results

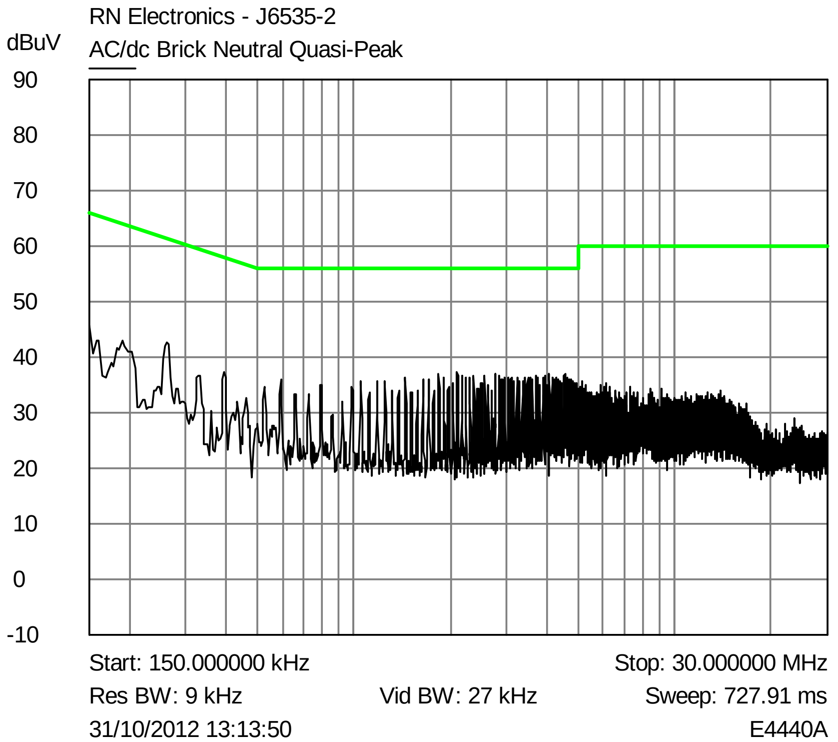
6.1 Conducted Emissions



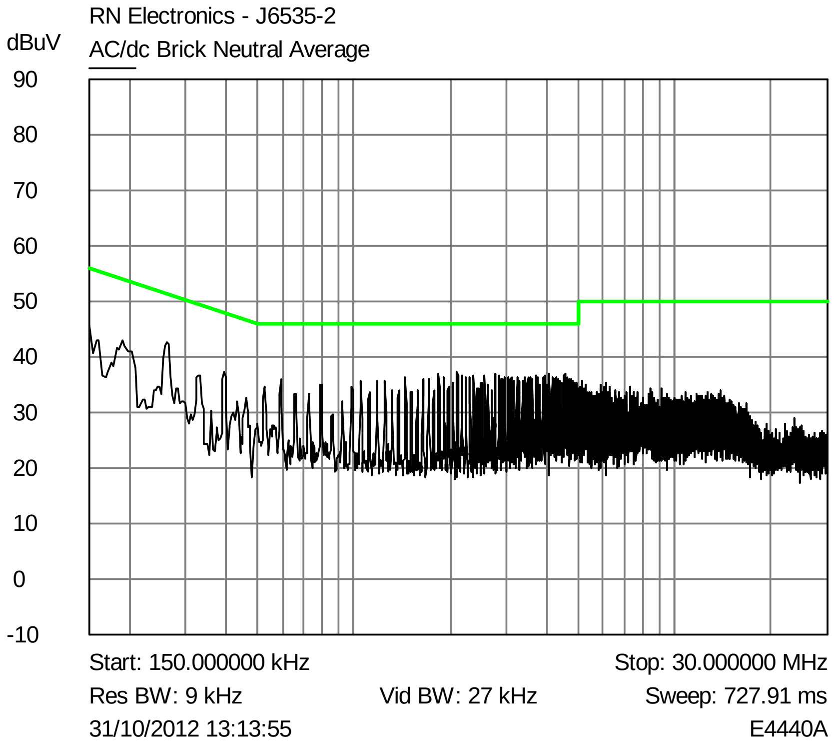
Plot of peak emissions 150kHz - 30MHz on the mains live terminal against the quasi-peak limit line.



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

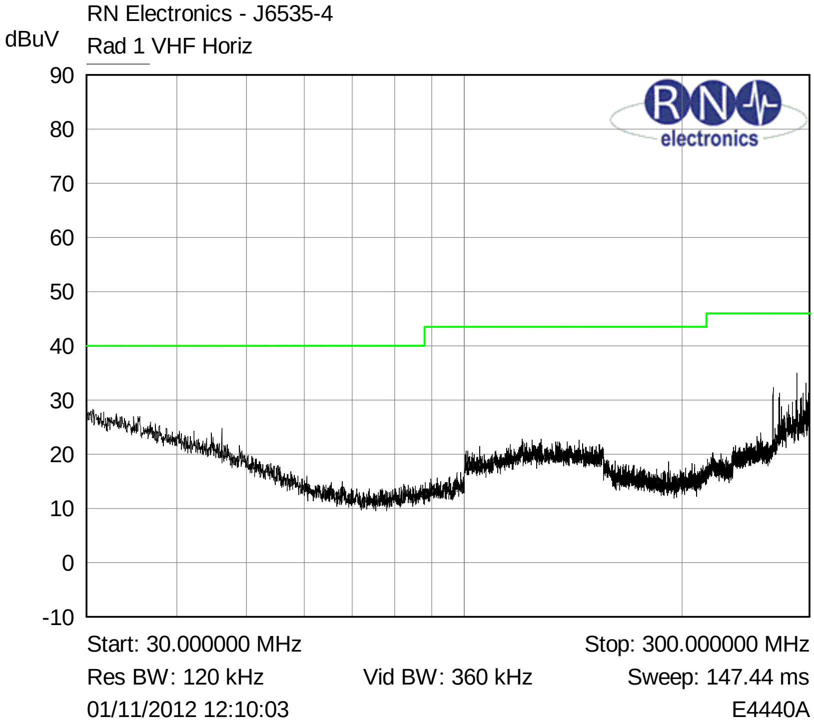


Plot of peak emissions 150kHz - 30MHz on the mains neutral terminal against the quasi-peak limit line.

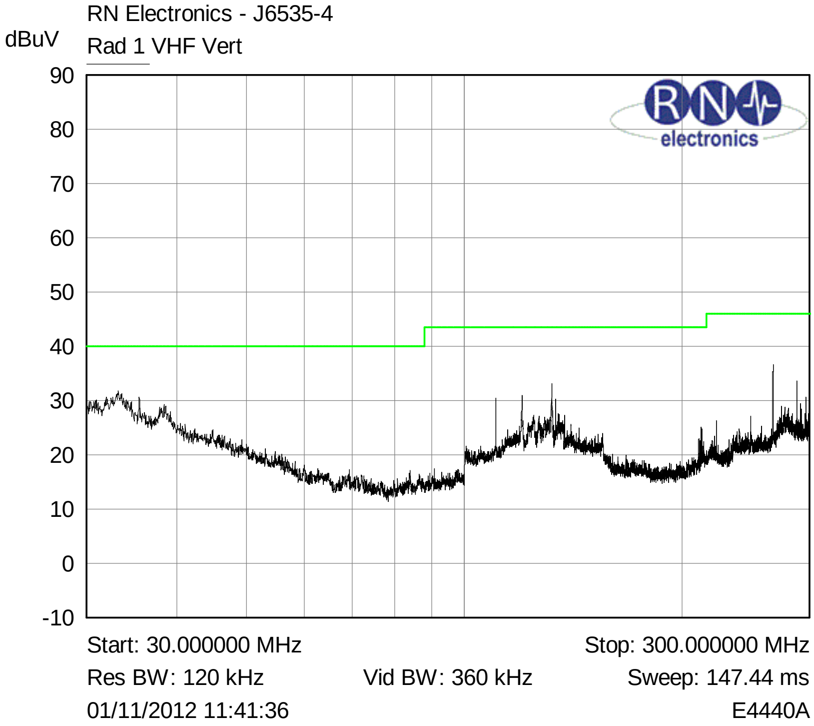


Plot of peak emissions 150kHz - 30MHz on the mains neutral terminal against the average limit line.

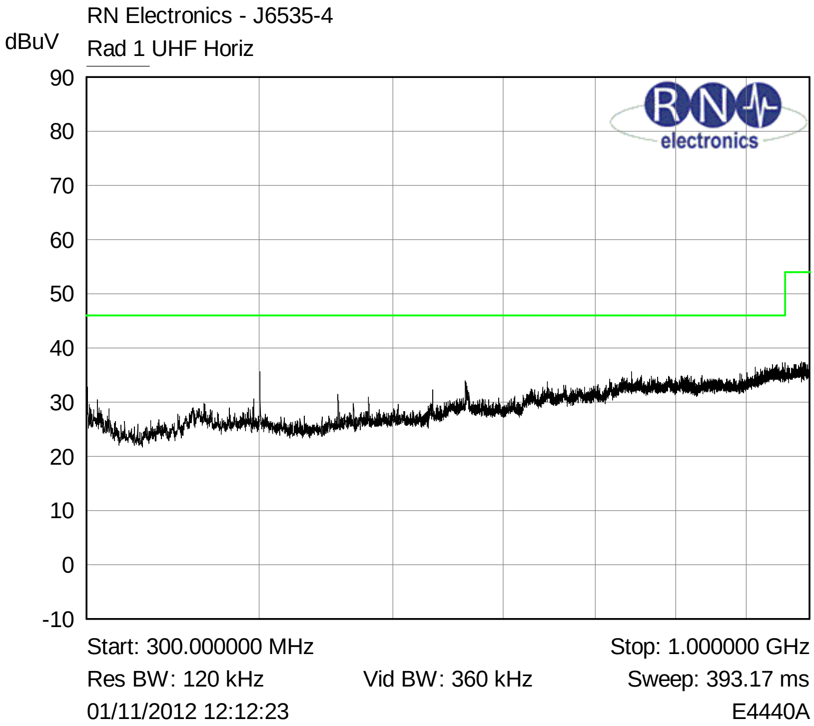
6.2 Radiated Emissions 30MHz – 1GHz



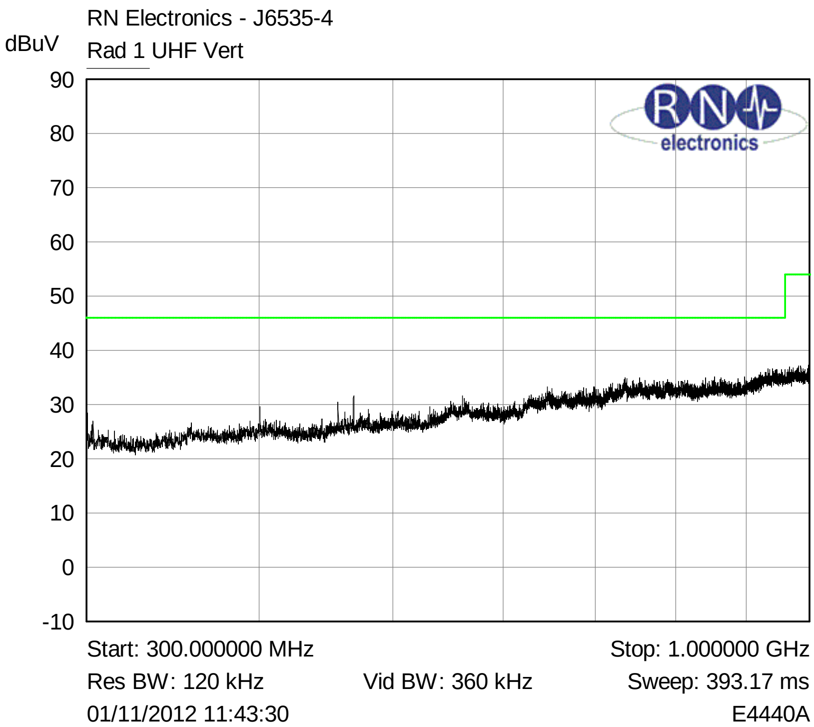
Plot of peak horizontal emissions 30MHz - 300MHz against the quasi-peak limit line.



Plot of peak vertical emissions 30MHz - 300MHz against the quasi-peak limit line.

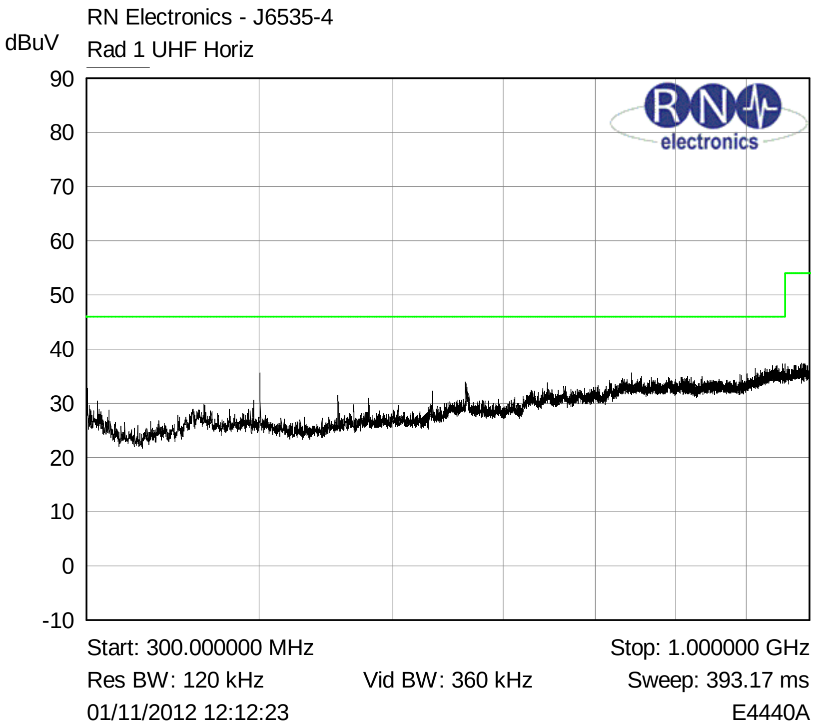


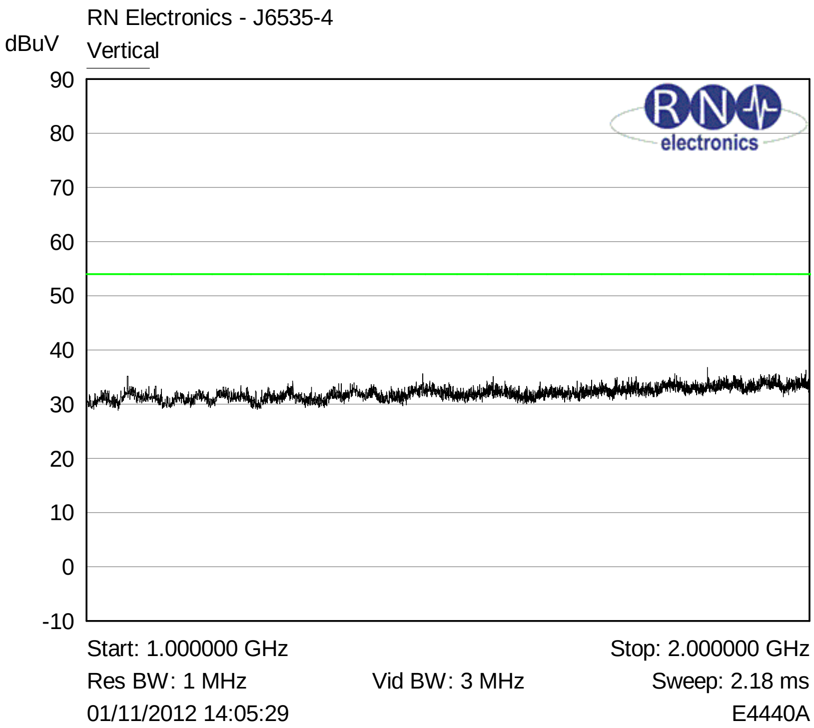
Plot of peak horizontal emissions 300MHz - 1GHz against the quasi-peak limit line.

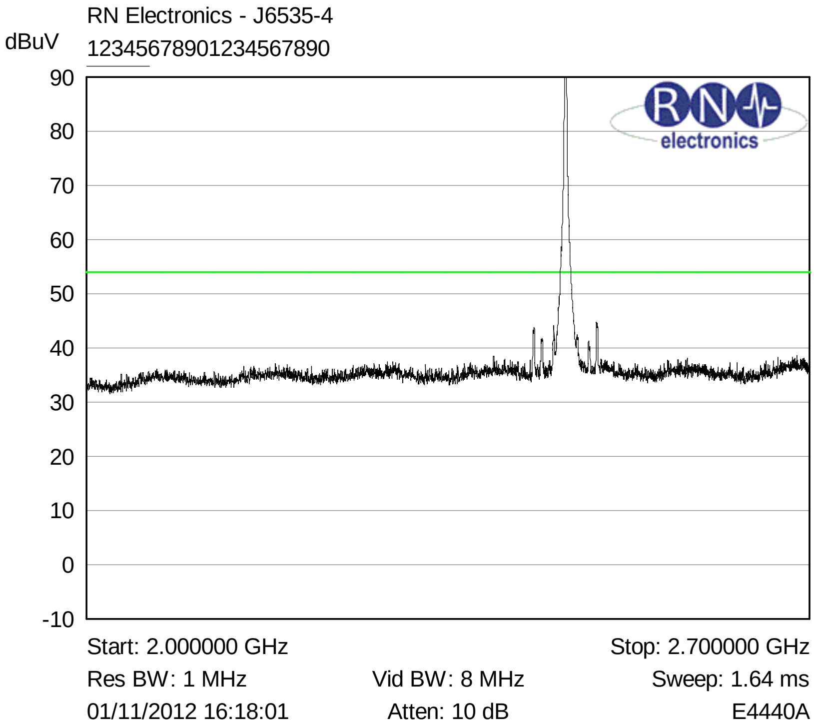


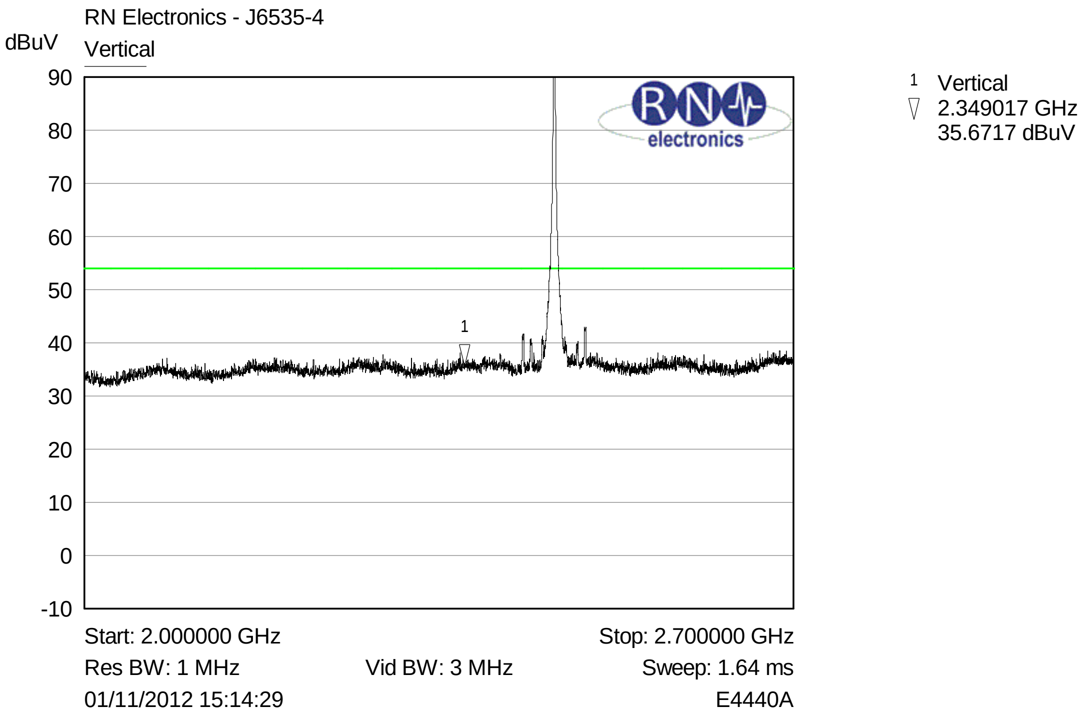
Plot of peak vertical emissions 300MHz - 1GHz against the quasi-peak limit line.

6.3 Radiated Emissions above 1GHz









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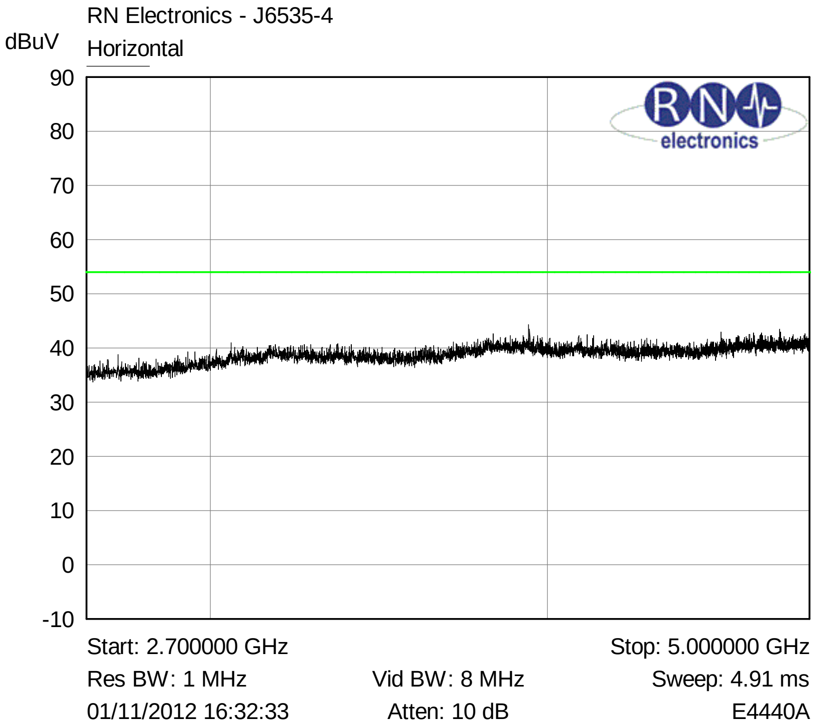
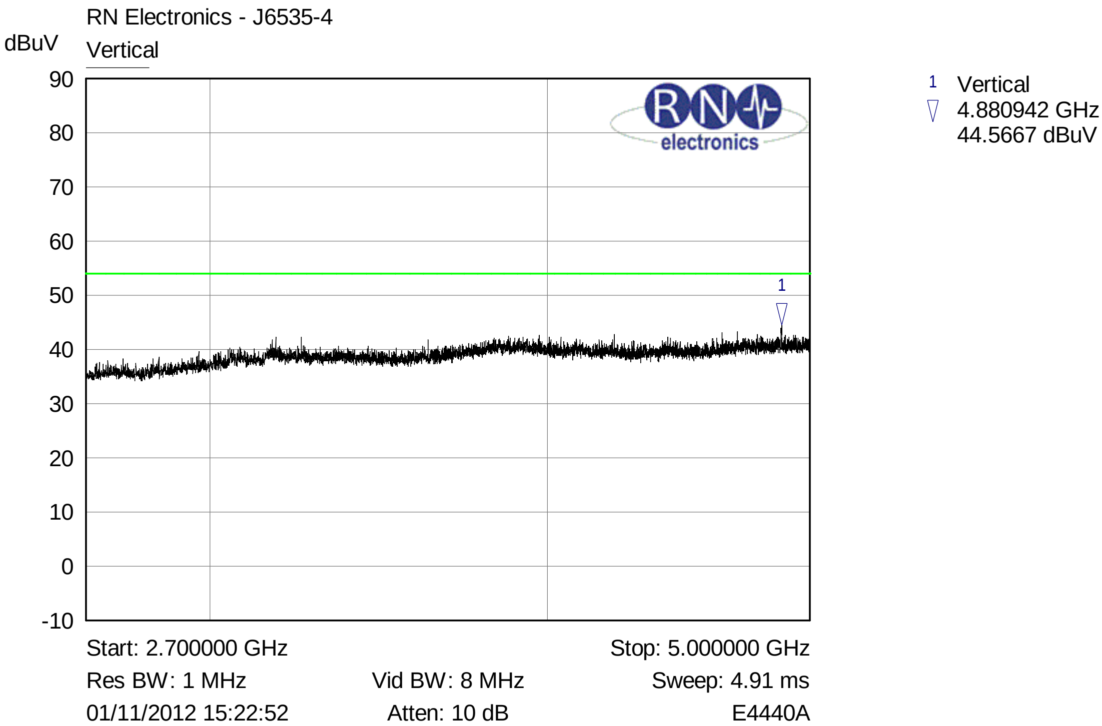
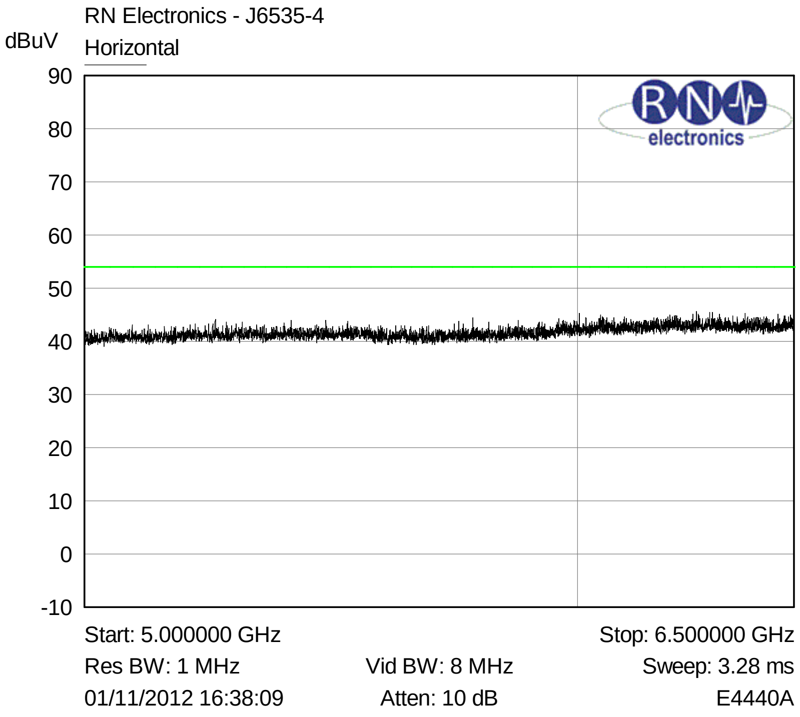
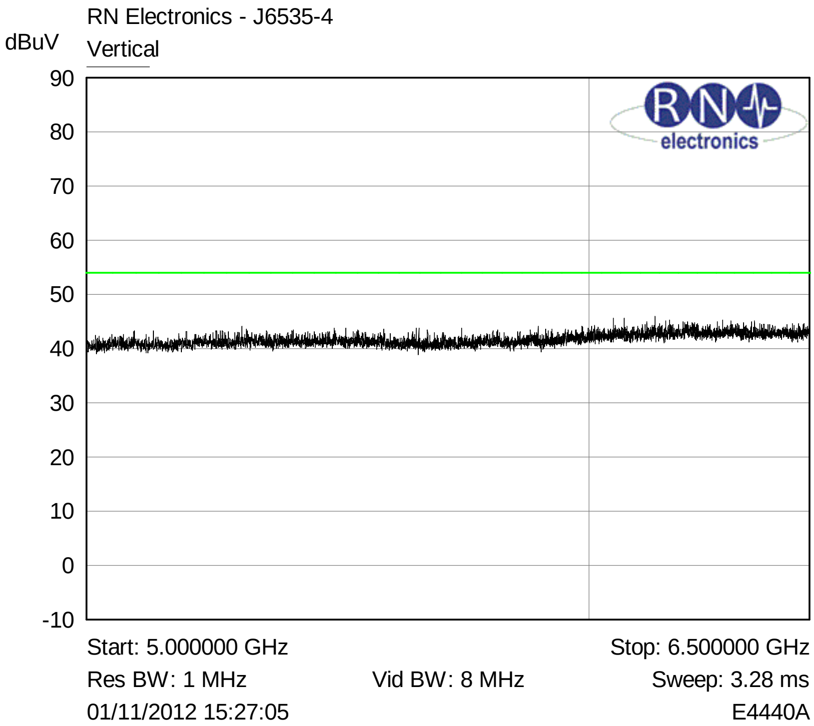
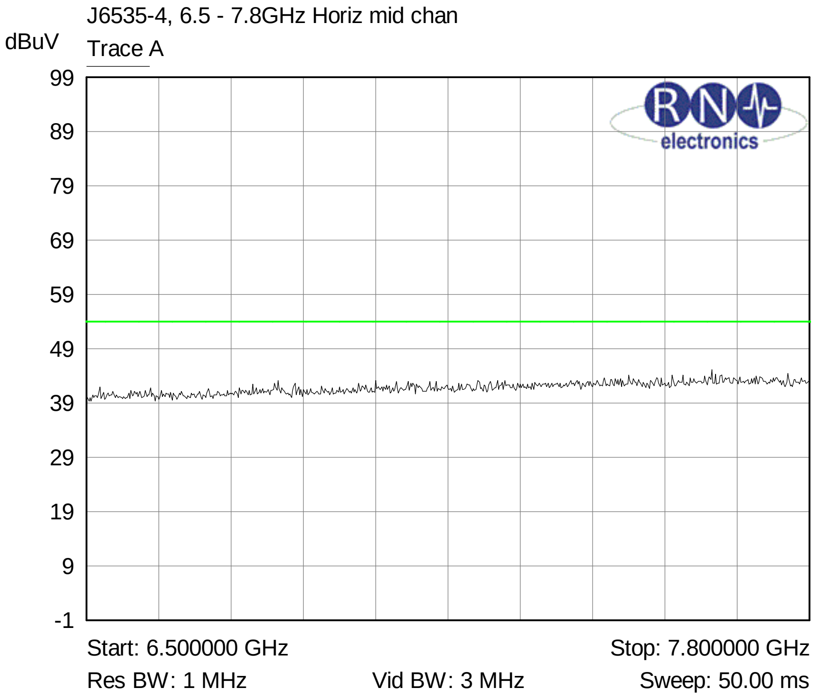
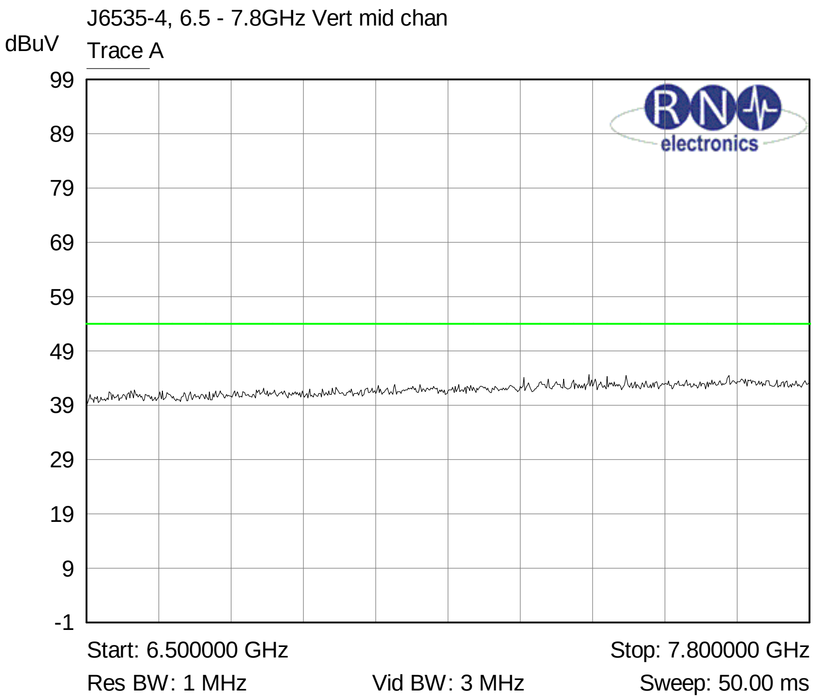

RN Electronics - J6535-4
Horizontal
dBuV
90
80
70
60
50
40
30
20
10
0
-10
Start: 2.700000 GHz
Stop: 5.000000 GHz
Res BW: 1 MHz
Vid BW: 8 MHz
Sweep: 4.91 ms
01/11/2012 16:32:33
Atten: 10 dB
E4440A

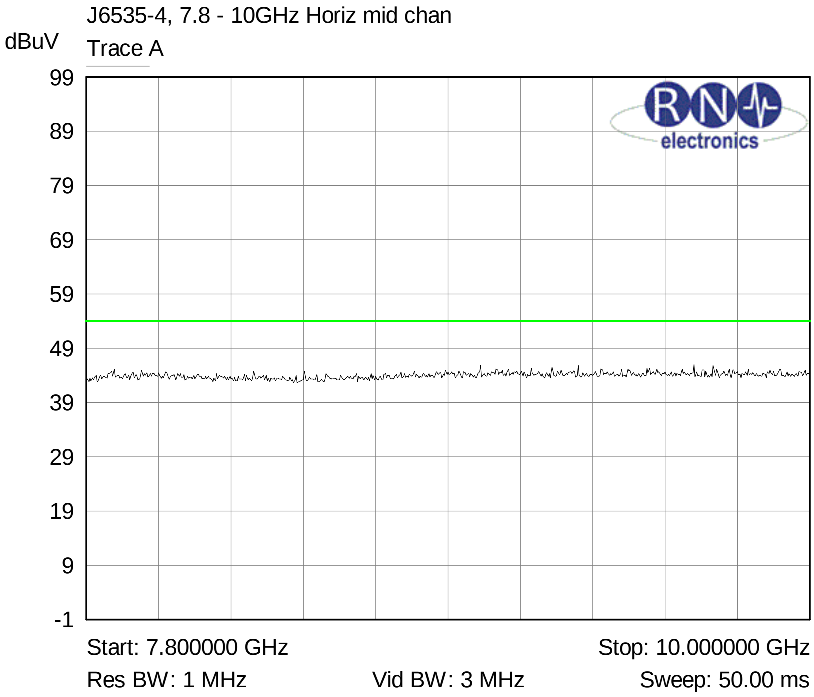

RN Electronics - J6535-4
Vertical
dBuV
90
80
70
60
50
40
30
20
10
0
-10
1
Vertical
4.880942 GHz
44.5667 dBuV
Start: 2.700000 GHz
Stop: 5.000000 GHz
Res BW: 1 MHz
Vid BW: 8 MHz
Sweep: 4.91 ms
01/11/2012 15:22:52
Atten: 10 dB
E4440A

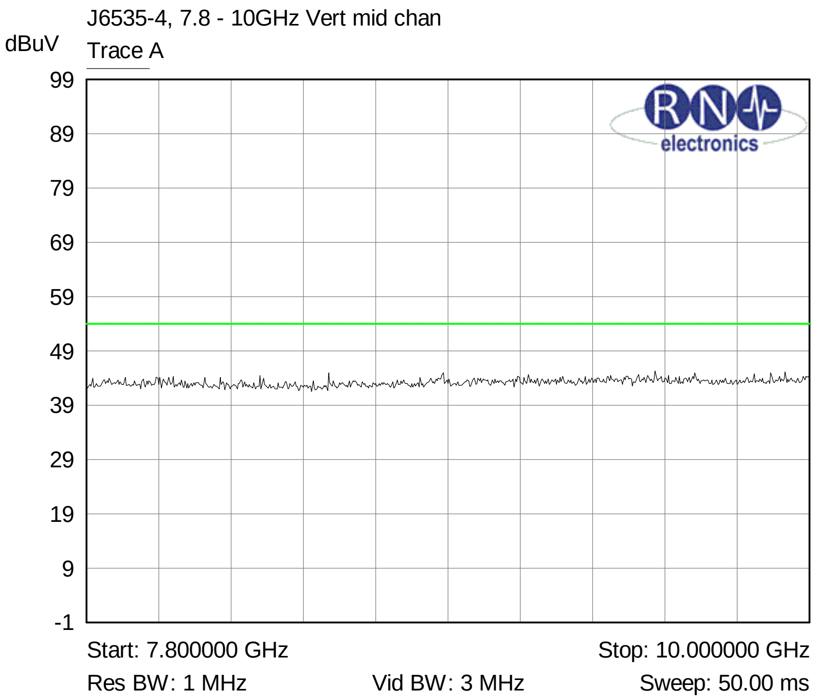

RN Electronics - J6535-4
dBuV
Horizontal
90
80
70
60
50
40
30
20
10
0
-10
RN electronics
Start: 5.000000 GHz
Stop: 6.500000 GHz
Res BW: 1 MHz
Vid BW: 8 MHz
Sweep: 3.28 ms
01/11/2012 16:38:09
Atten: 10 dB
E4440A


RN Electronics - J6535-4
dBuV
Vertical
90
80
70
60
50
40
30
20
10
0
-10
RN electronics
Start: 5.000000 GHz
Stop: 6.500000 GHz
Res BW: 1 MHz
Vid BW: 8 MHz
Sweep: 3.28 ms
01/11/2012 15:27:05
E4440A


J6535-4, 6.5 - 7.8GHz Horiz mid chan
dBuV
Trace A
99
89
79
69
59
49
39
29
19
9
-1
electronics
Start: 6.500000 GHz
Stop: 7.800000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 50.00 ms


J6535-4, 6.5 - 7.8GHz Vert mid chan
dBuV
Trace A
99
89
79
69
59
49
39
29
19
9
-1
electronics
Start: 6.500000 GHz
Stop: 7.800000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 50.00 ms





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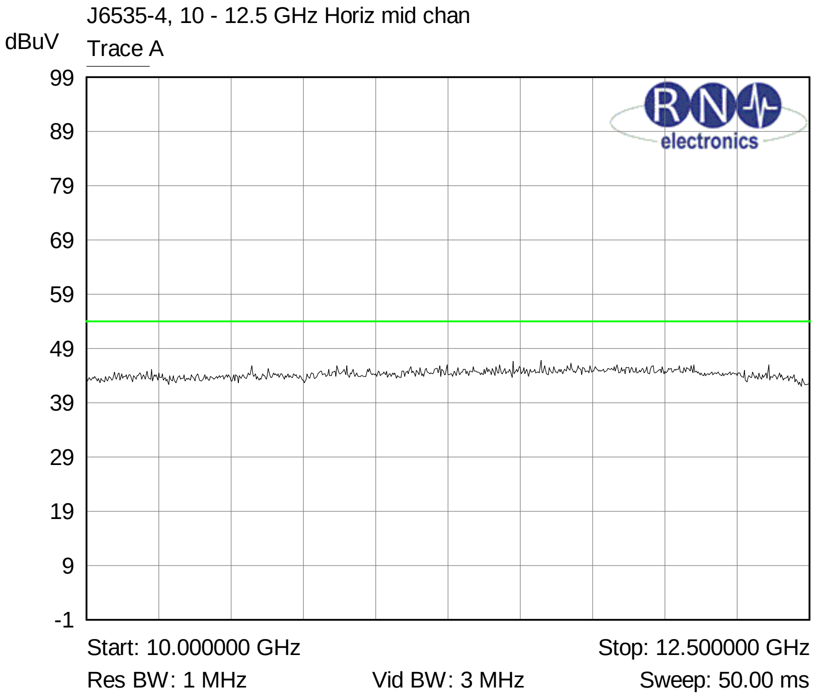
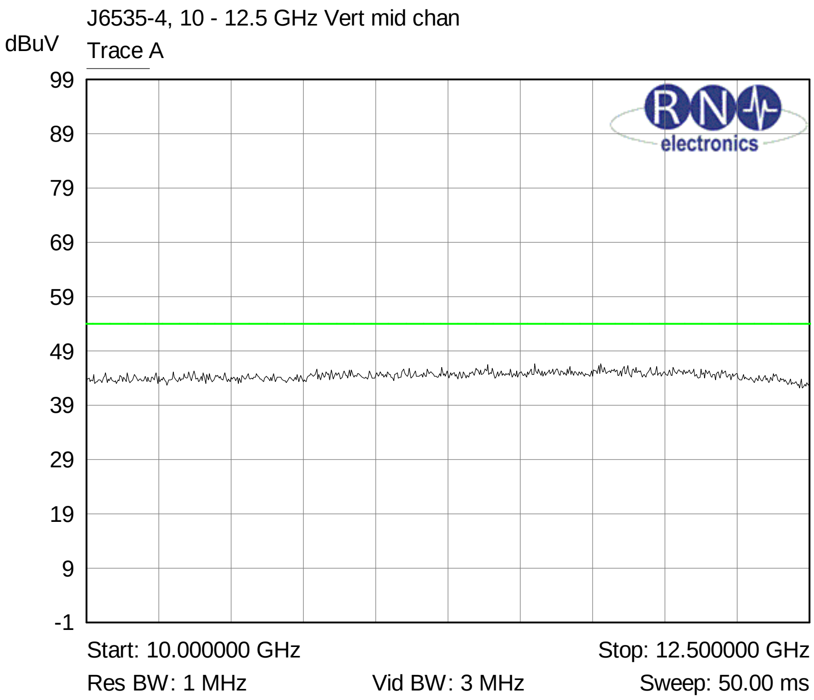
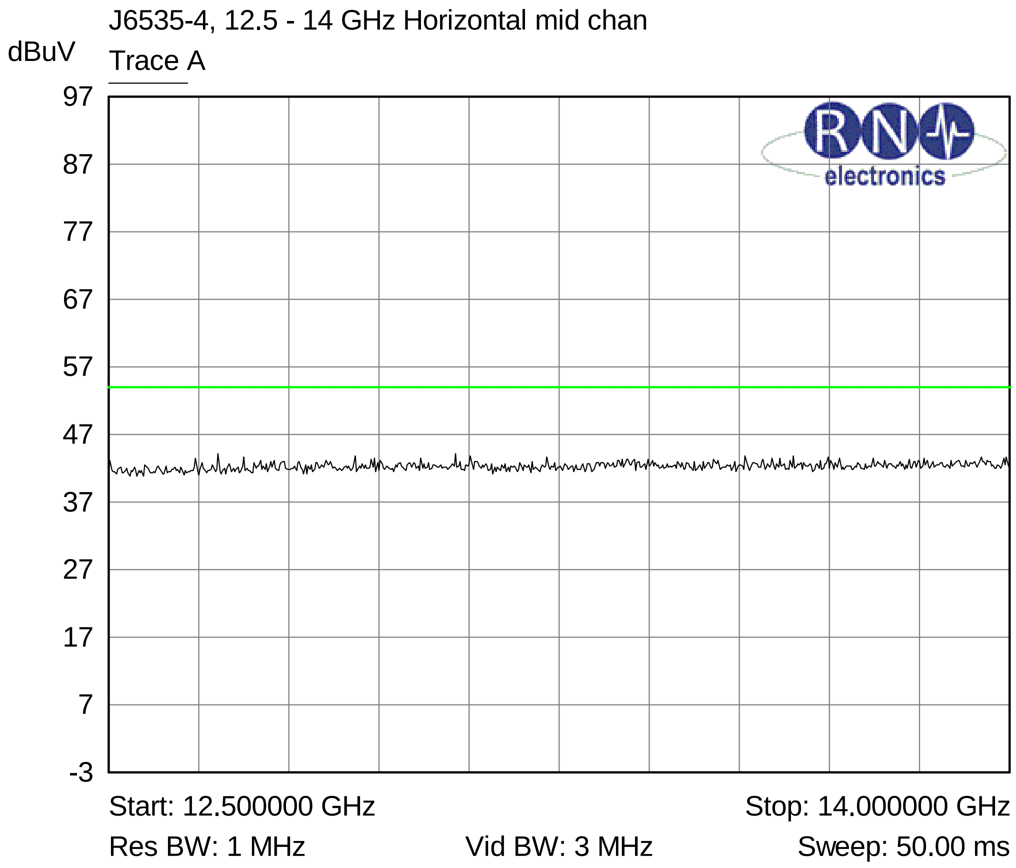
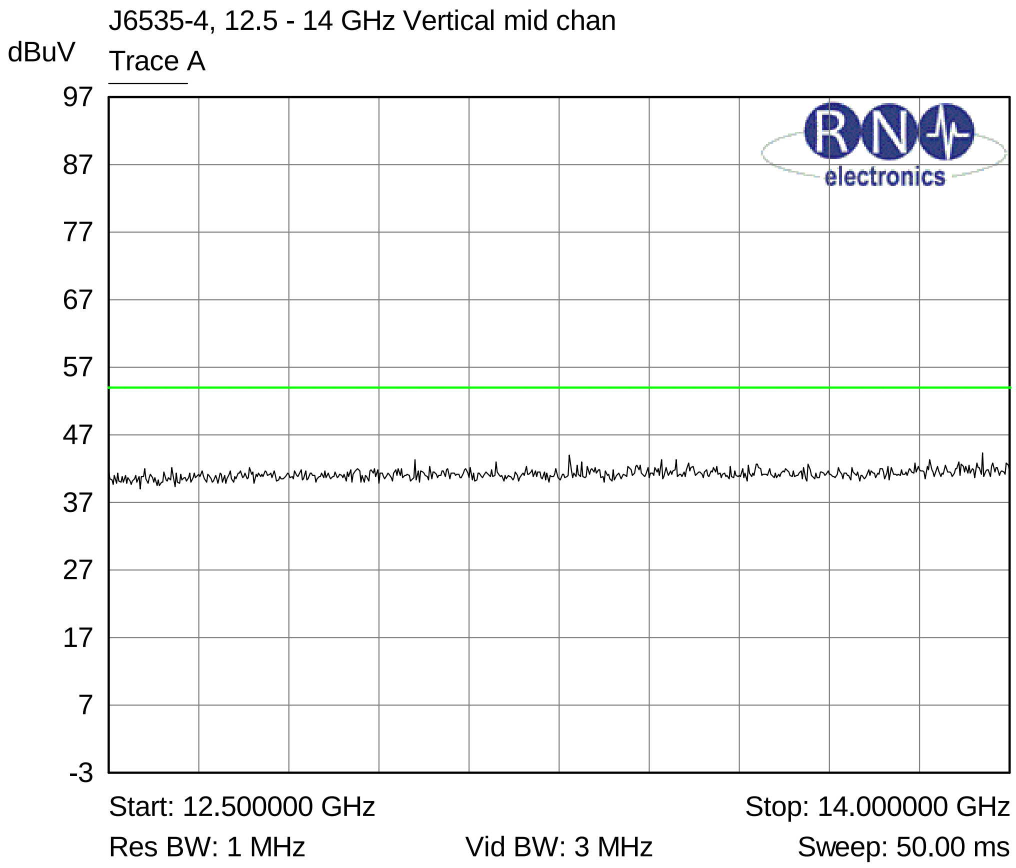
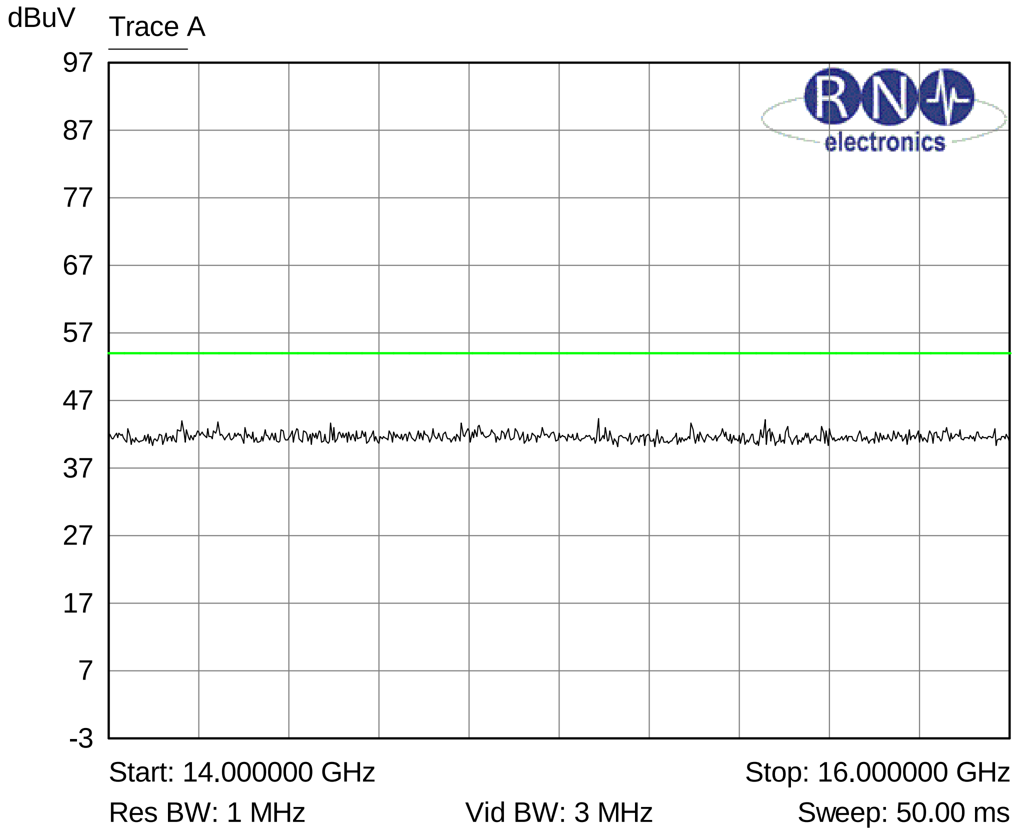

J6535-4, 10 - 12.5 GHz Horiz mid chan
dBuV
Trace A
99
89
79
69
59
49
39
29
19
9
-1
Start: 10.000000 GHz
Stop: 12.500000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 50.00 ms


J6535-4, 10 - 12.5 GHz Vert mid chan
dBuV
Trace A
99
89
79
69
59
49
39
29
19
9
-1
Start: 10.000000 GHz
Stop: 12.500000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 50.00 ms

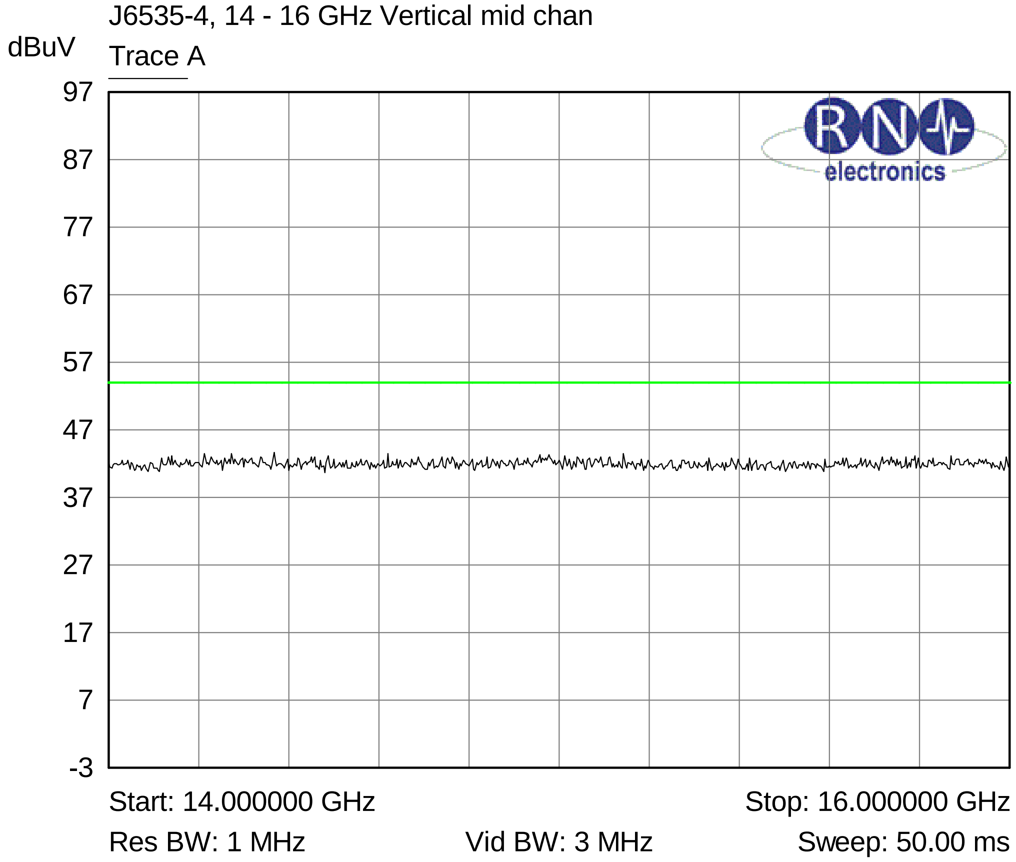

J6535-4, 12.5 - 14 GHz Horizontal mid chan
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
electronics
Start: 12.500000 GHz
Stop: 14.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 50.00 ms


J6535-4, 12.5 - 14 GHz Vertical mid chan
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
electronics
Start: 12.500000 GHz
Stop: 14.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 50.00 ms

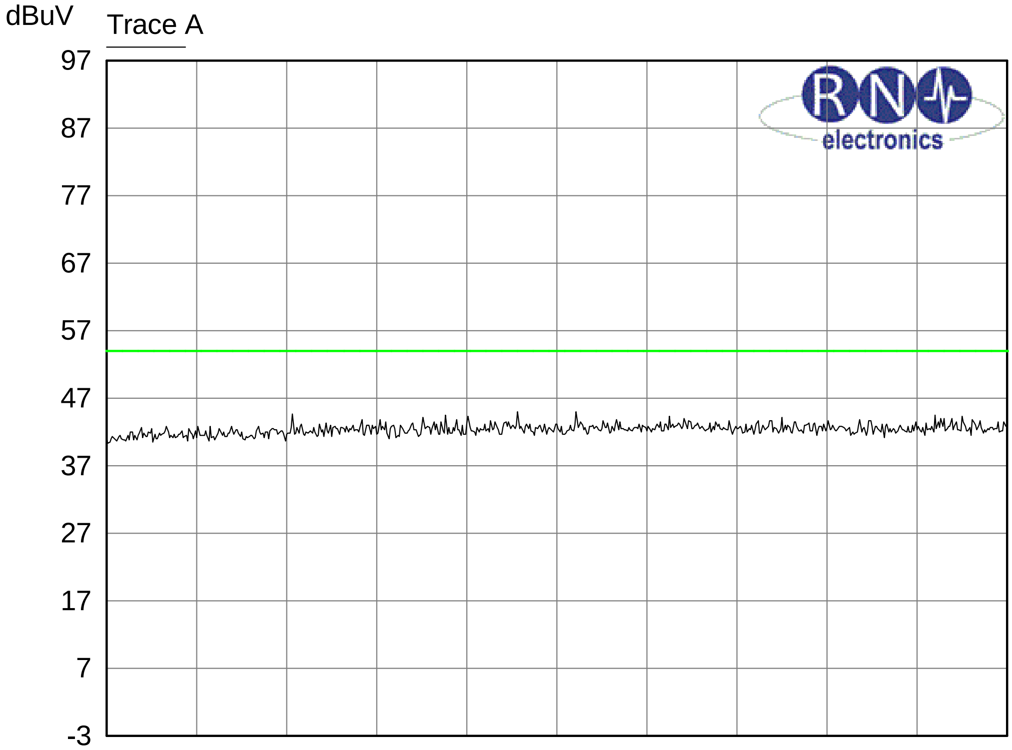
J6535-4, 14 - 16 GHz Horizontal mid chan



J6535-4, 14 - 16 GHz Vertical mid chan

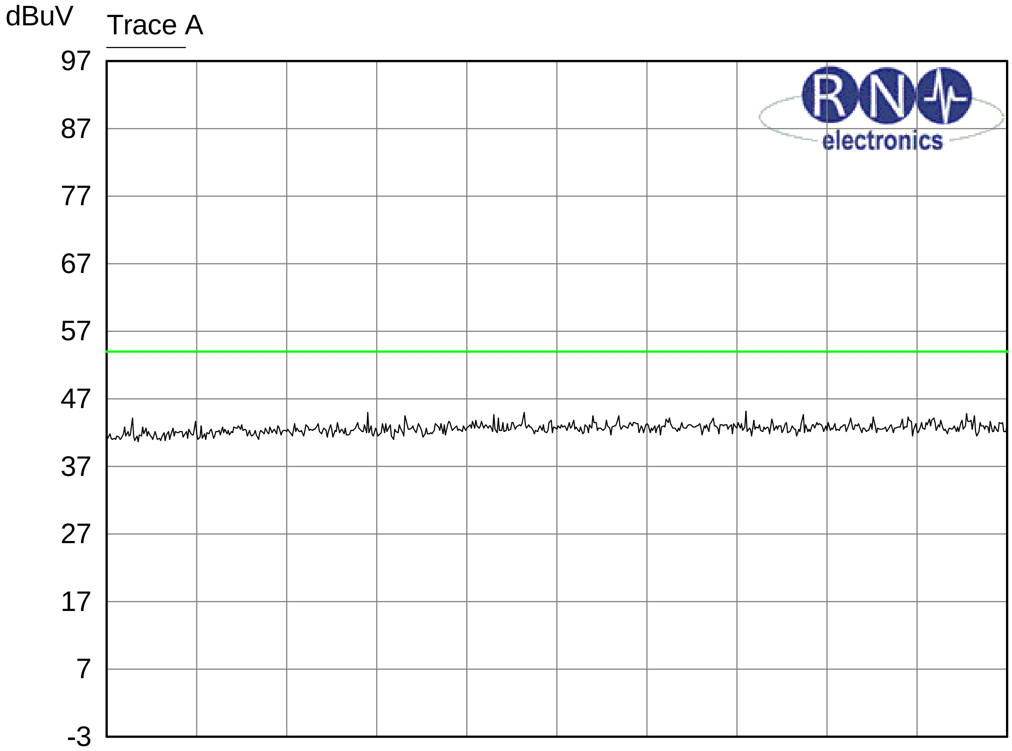


J6535-4, 16 - 18 GHz Horizontal mid chan

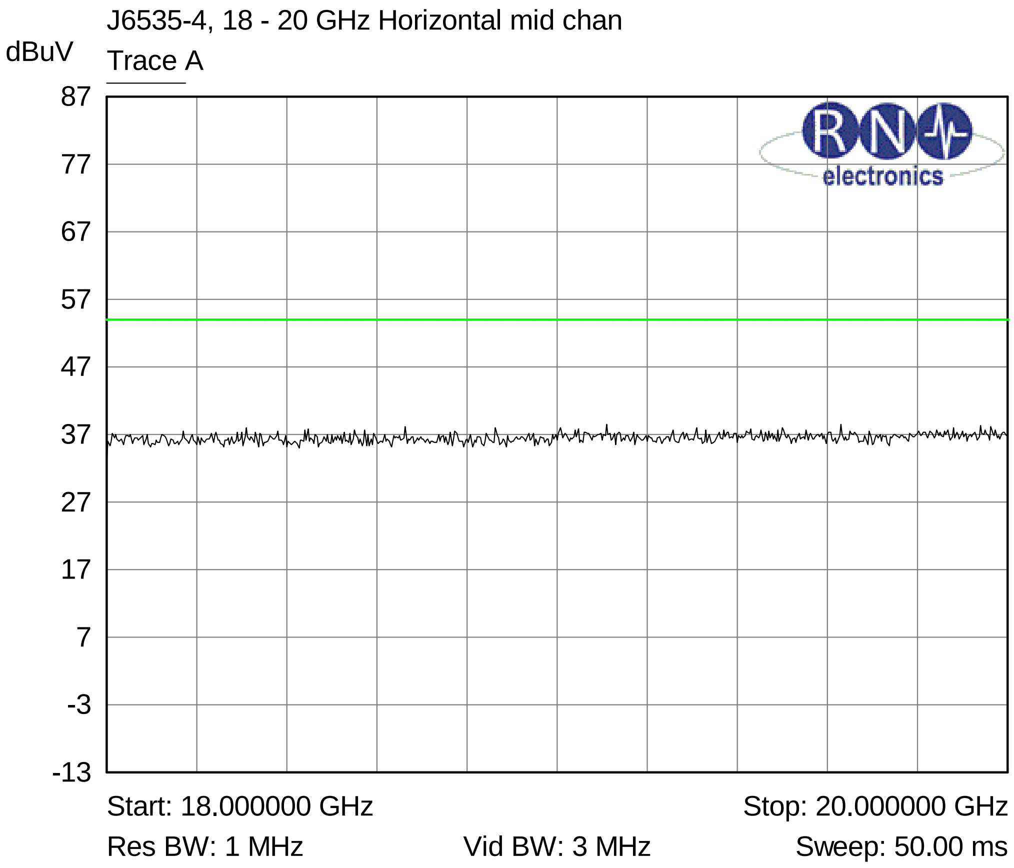


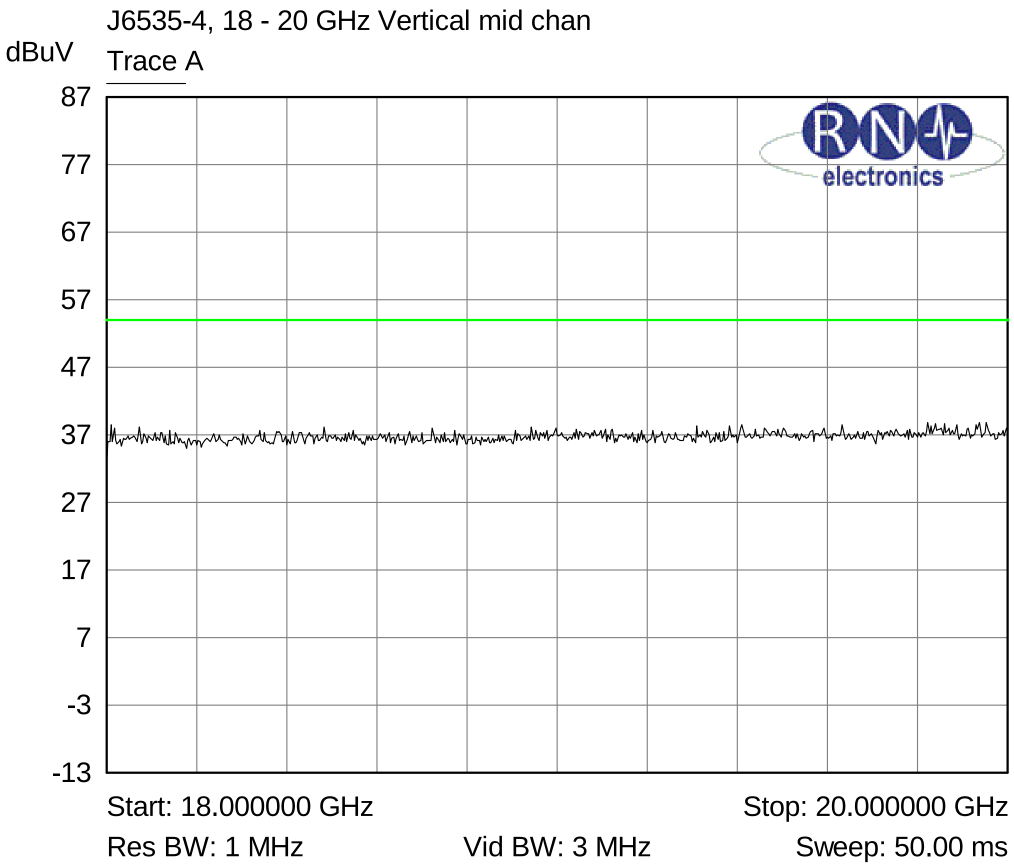
Start: 16.000000 GHz Stop: 18.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms

J6535-4, 16 - 18 GHz Vertical mid chan

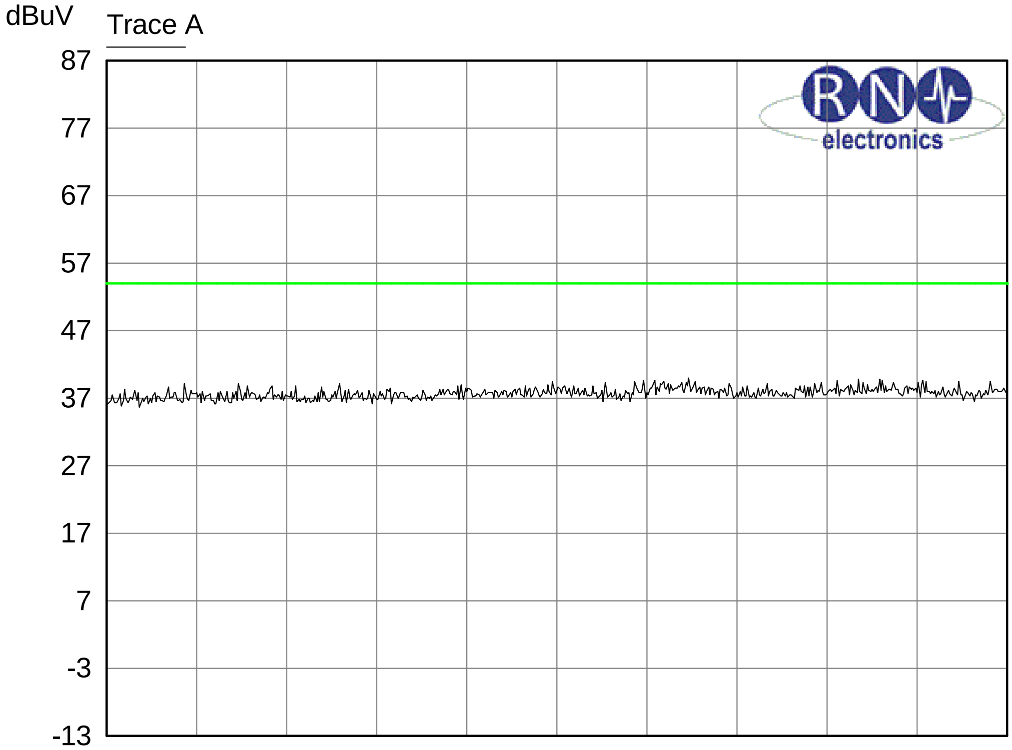


Start: 16.000000 GHz Stop: 18.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms


J6535-4, 18 - 20 GHz Horizontal mid chan
dBuV
Trace A
87
77
67
57
47
37
27
17
7
-3
-13
Start: 18.000000 GHz
Stop: 20.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 50.00 ms

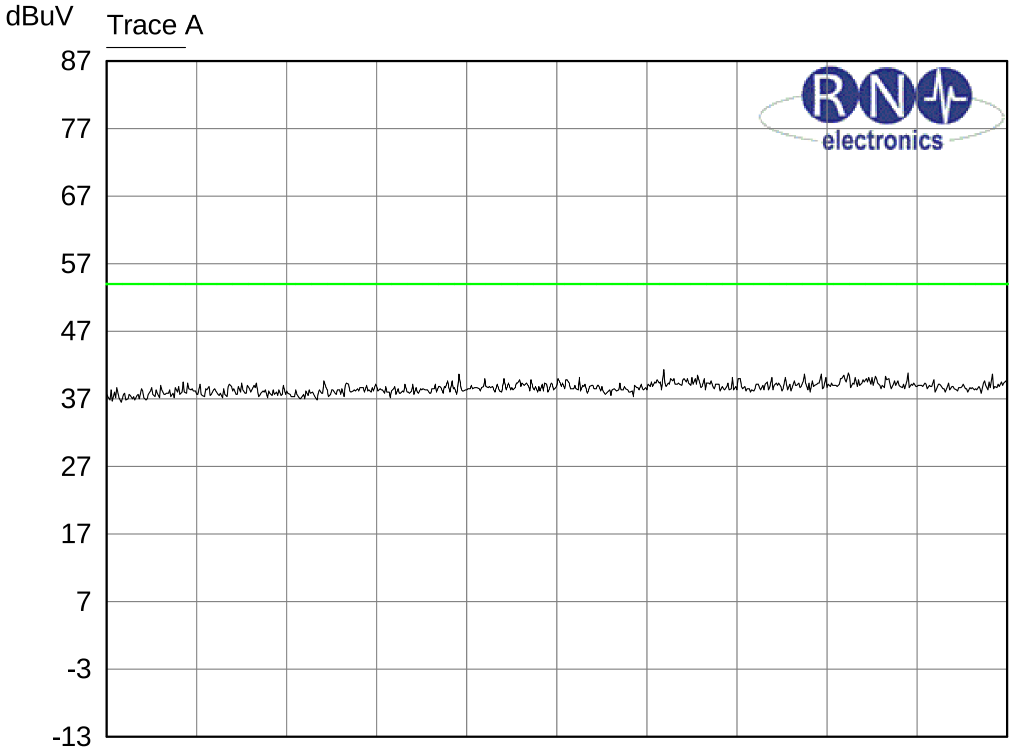

J6535-4, 18 - 20 GHz Vertical mid chan
dBuV
Trace A
87
77
67
57
47
37
27
17
7
-3
-13
Start: 18.000000 GHz
Stop: 20.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 50.00 ms

J6535-4, 20 - 22 GHz Horizontal mid chan

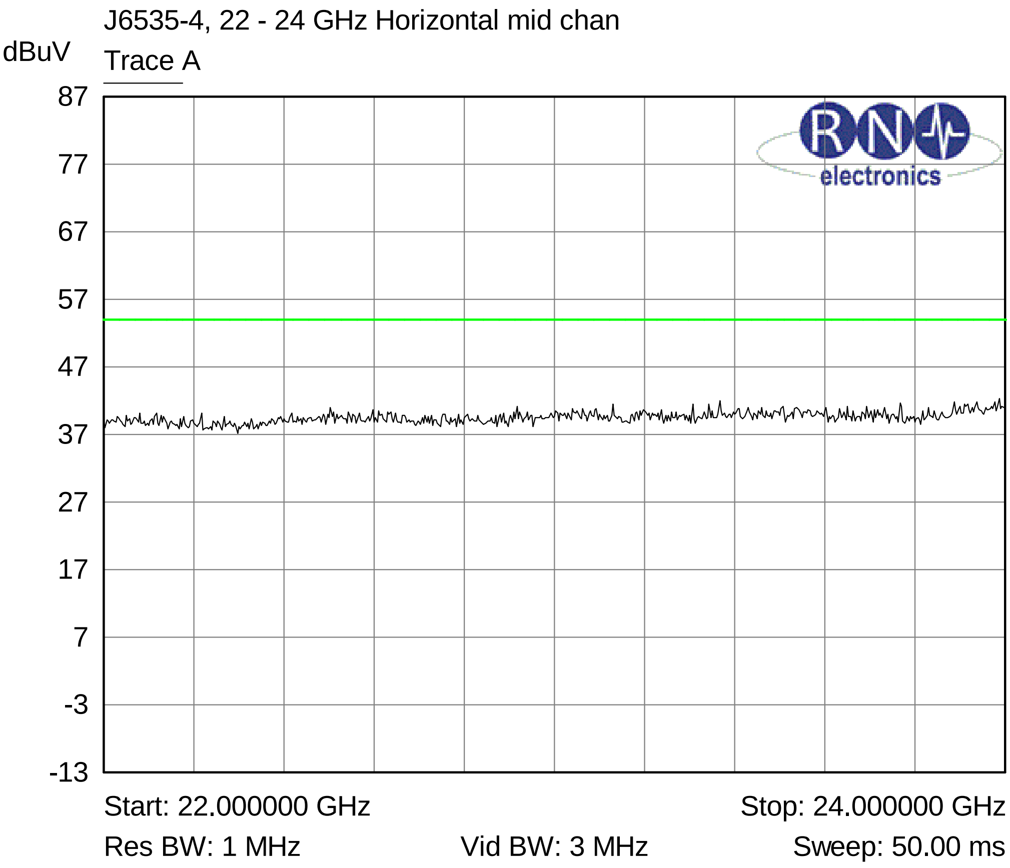


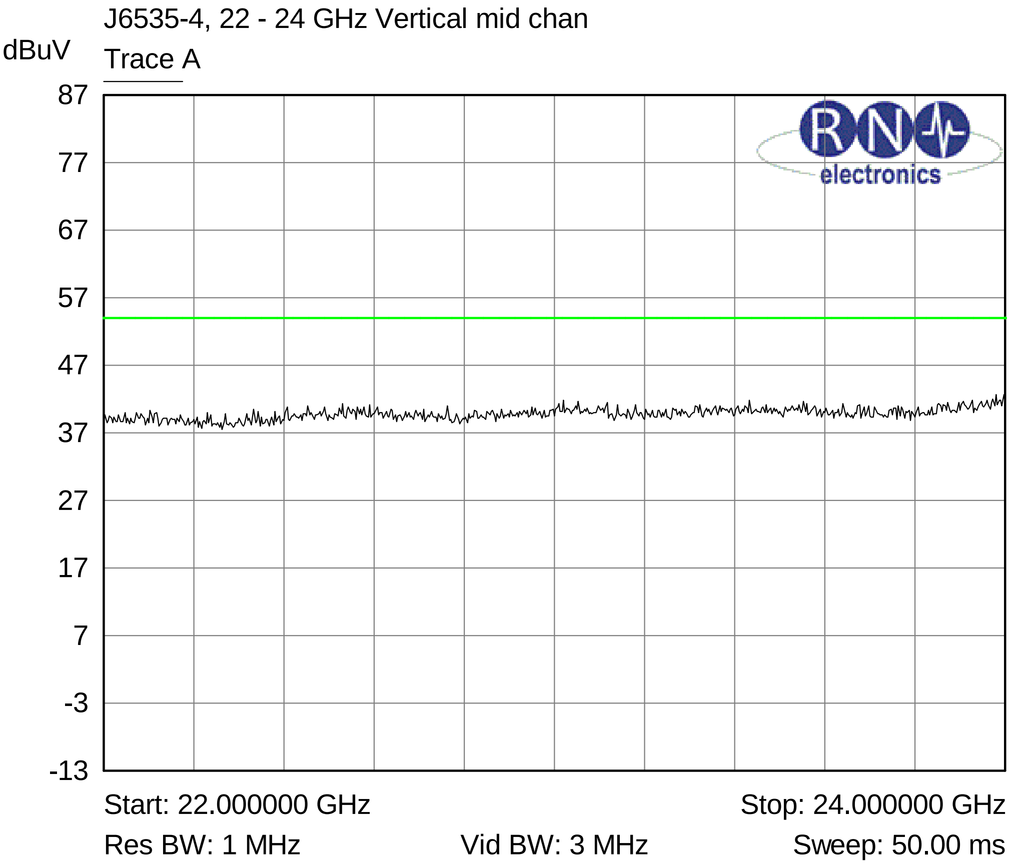
Start: 20.000000 GHz Stop: 22.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms

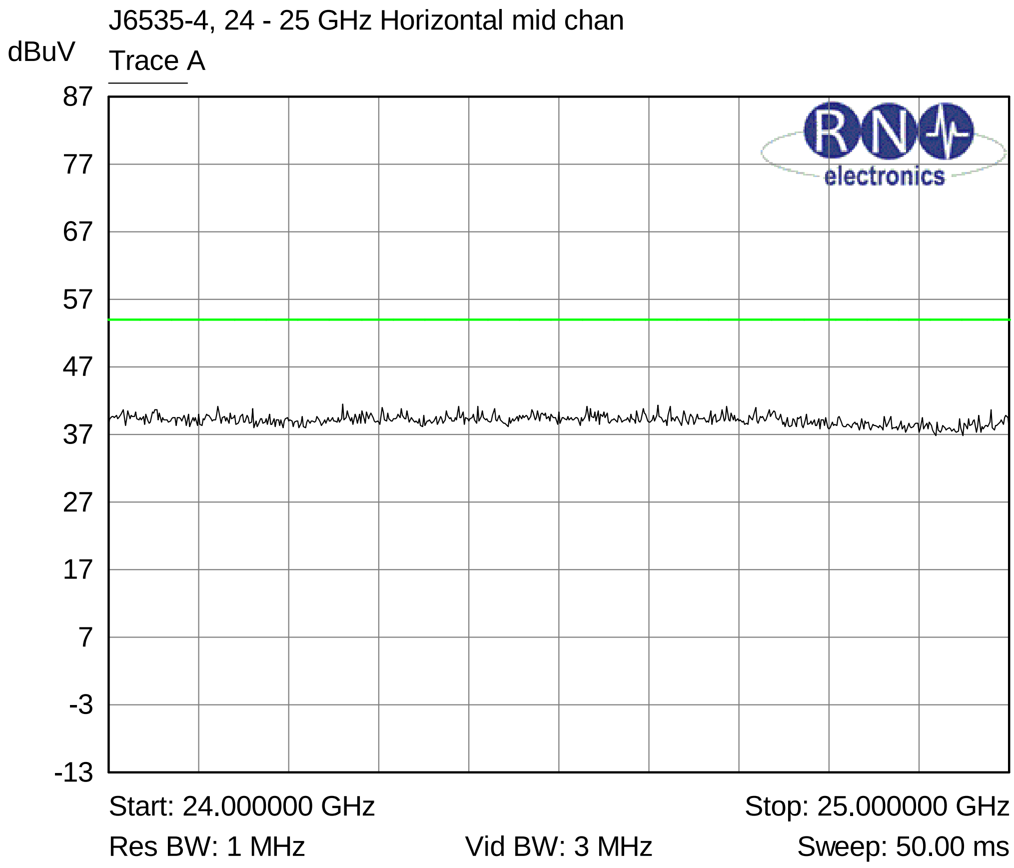
J6535-4, 20 - 22 GHz Vertical mid chan

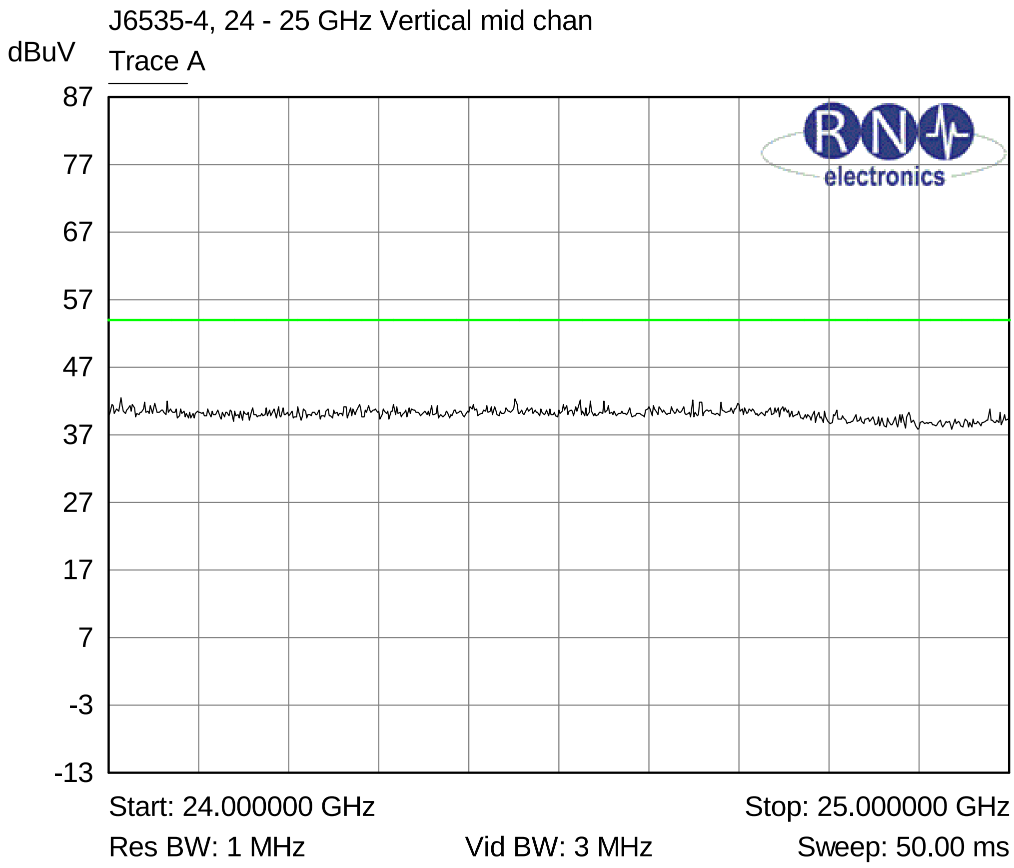


Start: 20.000000 GHz Stop: 22.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms


J6535-4, 22 - 24 GHz Horizontal mid chan
dBuV
Trace A
87
77
67
57
47
37
27
17
7
-3
-13
Start: 22.000000 GHz
Stop: 24.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 50.00 ms


J6535-4, 22 - 24 GHz Vertical mid chan
dBuV
Trace A
87
77
67
57
47
37
27
17
7
-3
-13
Start: 22.000000 GHz
Stop: 24.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 50.00 ms





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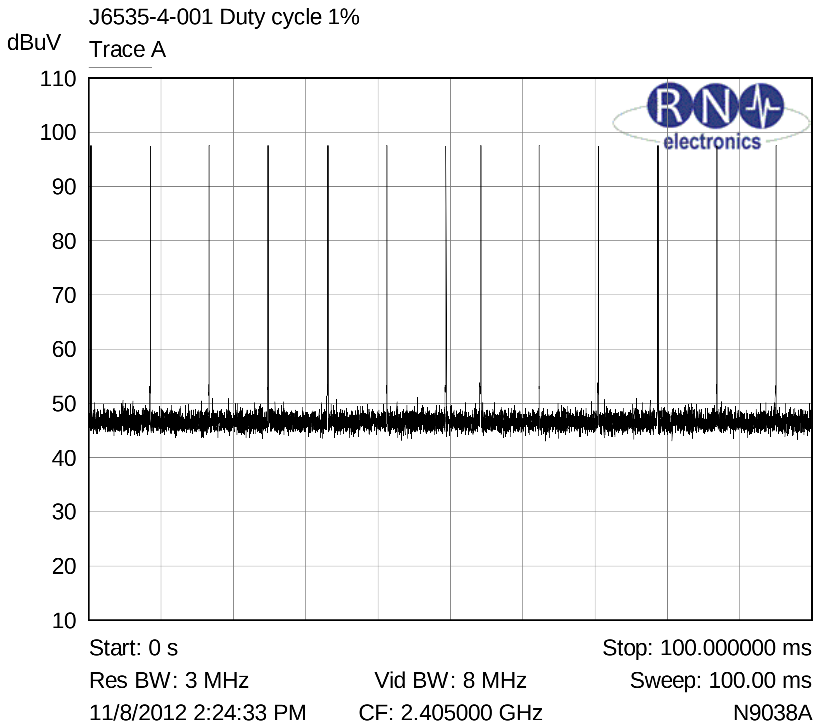
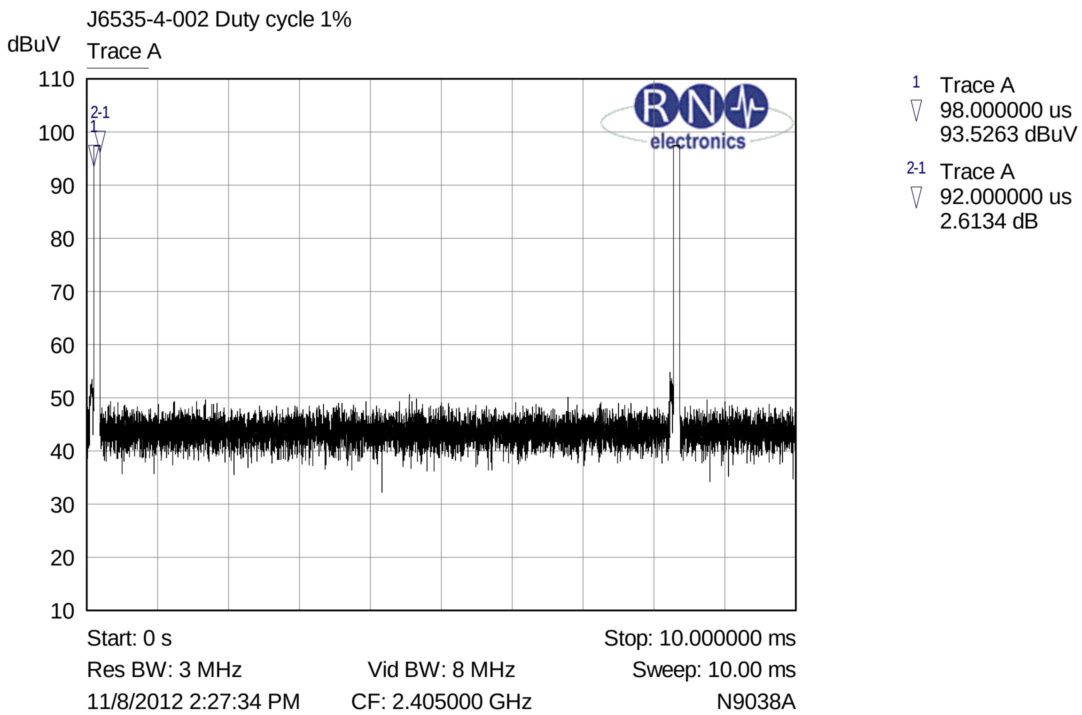
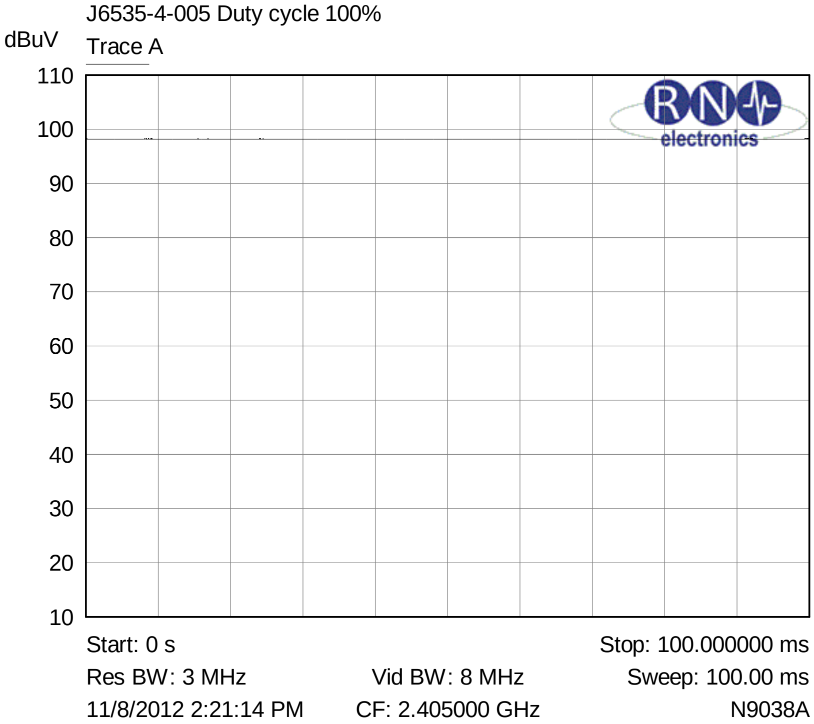
6.4 Duty cycle

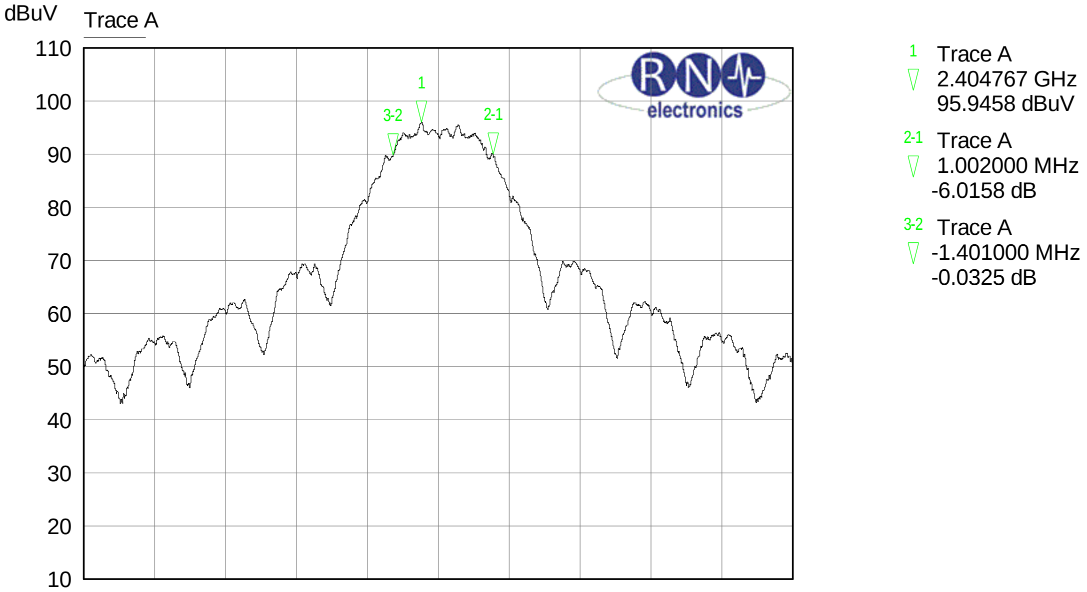





J6535-4-005 Duty cycle 100%
dBuV
Trace A
110
100
90
80
70
60
50
40
30
20
10
Start: 0 s
Stop: 100.000000 ms
Res BW: 3 MHz
Vid BW: 8 MHz
Sweep: 100.00 ms
11/8/2012 2:21:14 PM
CF: 2.405000 GHz
N9038A

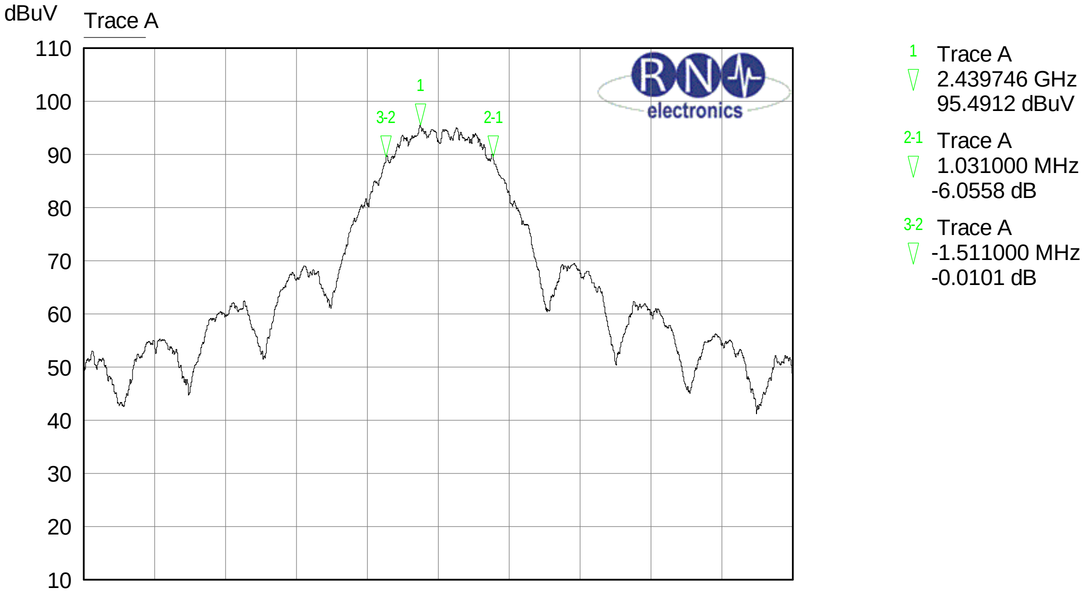
6.5 6dB Bandwidth

J6535-4-006 6dB BW

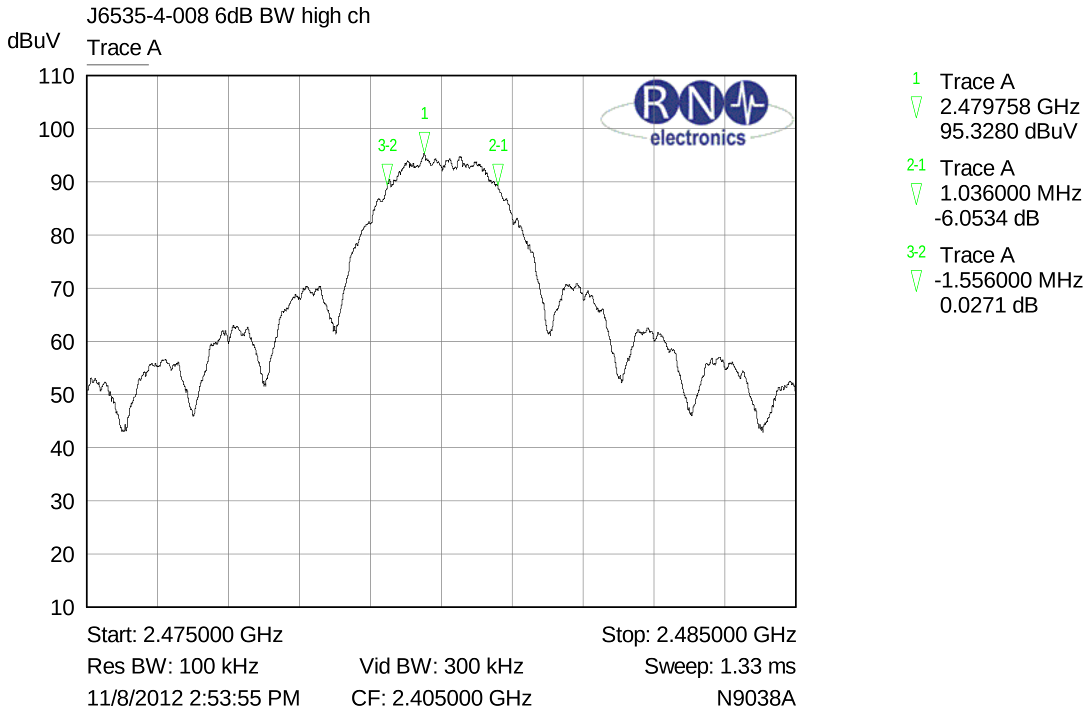


Start: 2.400000 GHz Stop: 2.410000 GHz
Res BW: 100 kHz Vid BW: 300 kHz Sweep: 1.33 ms
11/8/2012 2:37:57 PM CF: 2.405000 GHz N9038A

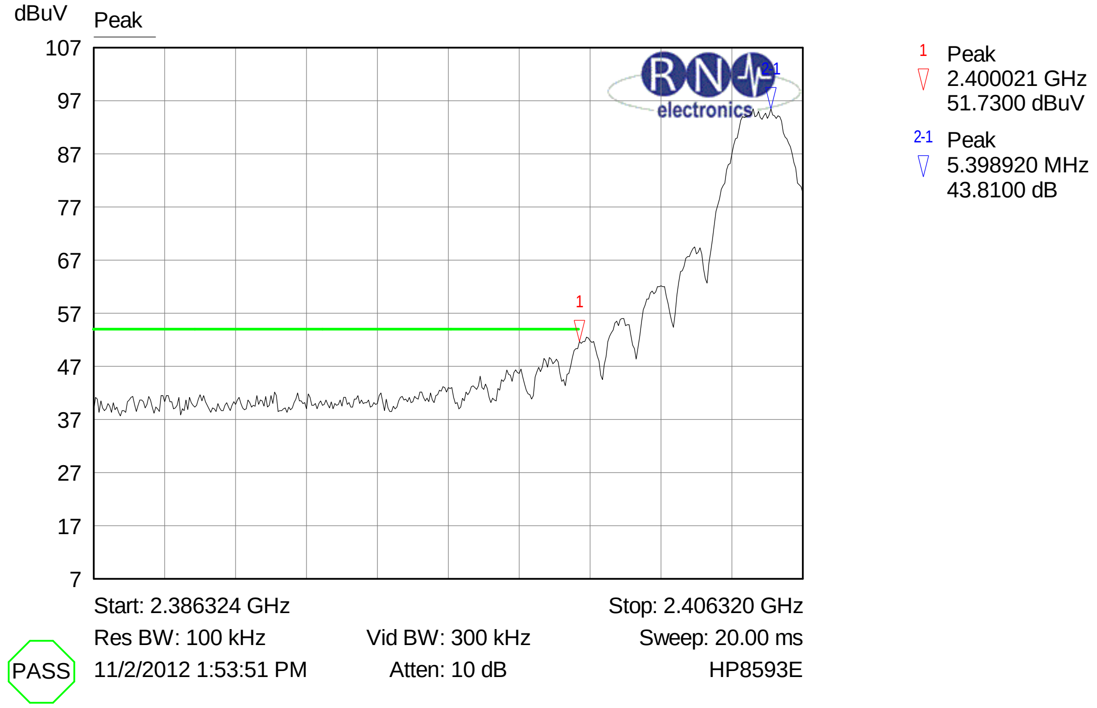
J6535-4-007 6dB BW mid ch



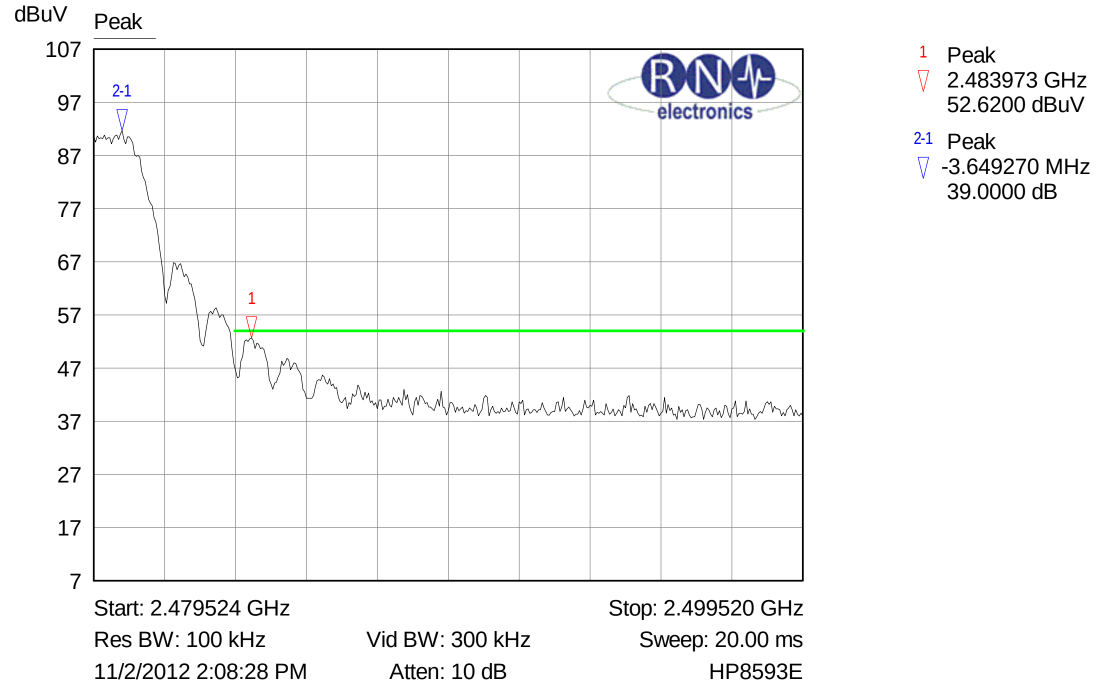
Start: 2.435000 GHz Stop: 2.445000 GHz
Res BW: 100 kHz Vid BW: 300 kHz Sweep: 1.33 ms
11/8/2012 2:47:43 PM CF: 2.440000 GHz N9038A


J6535-4-008 6dB BW high ch
dBuV
Trace A
110
100
90
80
70
60
50
40
30
20
10
1
3-2
2-1
electronics
Start: 2.475000 GHz
Stop: 2.485000 GHz
Res BW: 100 kHz
Vid BW: 300 kHz
Sweep: 1.33 ms
11/8/2012 2:53:55 PM
CF: 2.405000 GHz
N9038A
1 Trace A
2.479758 GHz
95.3280 dBuV
2-1 Trace A
1.036000 MHz
-6.0534 dB
3-2 Trace A
-1.556000 MHz
0.0271 dB

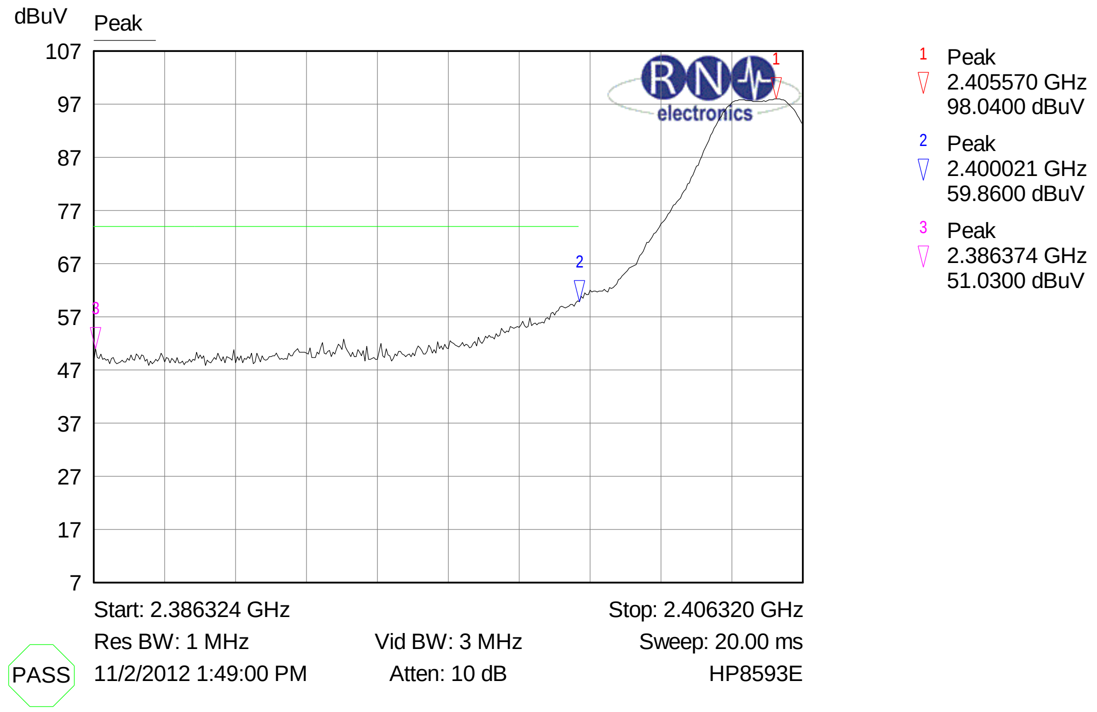
6.6 Band Edge Compliance



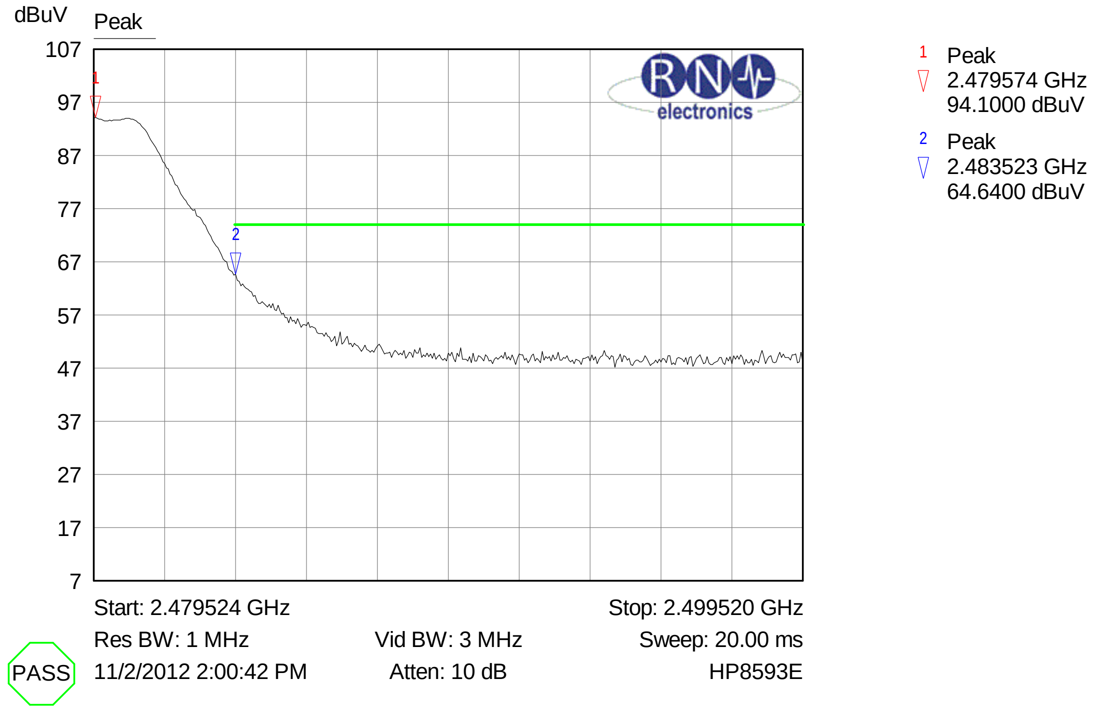
Above plot shows compliance with limit at 2400MHz band edge (20dBc).



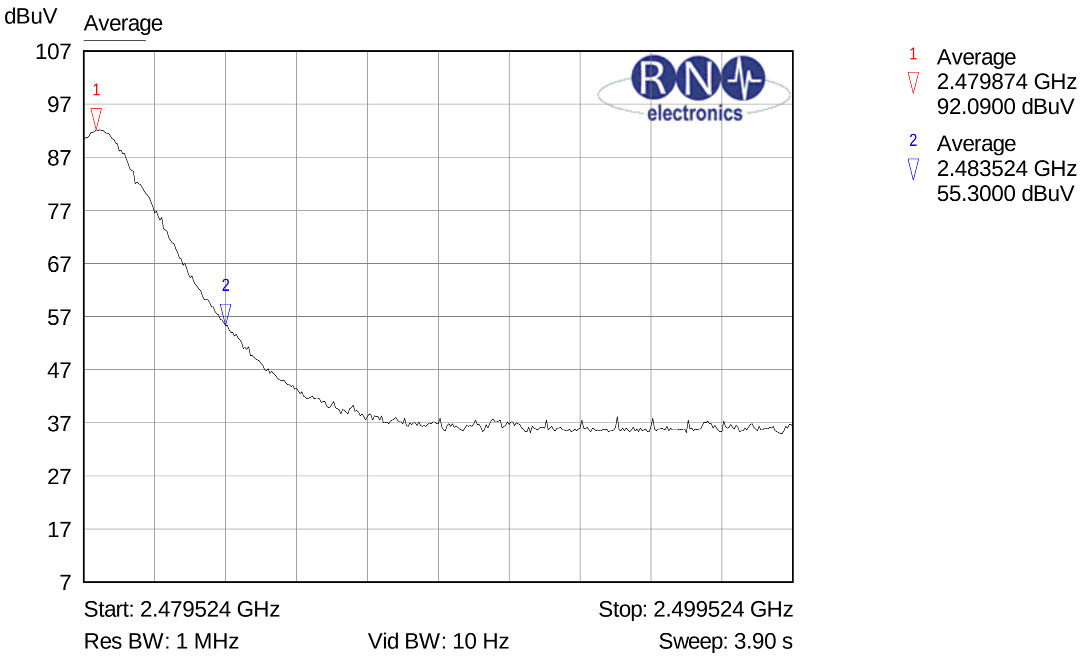
Above plot shows compliance with limit at 2483.5MHz band edge (20dBc).



Above plot shows compliance with peak limit at 2400MHz band edge and compliance with average limit at 2390MHz restricted band edge.



Above plot shows compliance with peak limit at 2483.5MHz band edge / restricted band.



The above plot shows the peak of the average envelope.

The above plot shows the delta marker in 100kHz RBW.

92.09 – 39.00 = 53.09 dBuV/m which is less than the 54dBuV/m average limit.

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).

The contents of this report, apart from the referenced ANSI C63.4-2003, are beyond the scope of UKAS Testing Laboratory No. 2360 accreditation.

7.3 Explanation of transmitter power conversions

The transmitter output power limit may be given in watts rather than field strength and yet there may not be means to measure the power at an antenna port. In these cases, the following formula is used to convert field strength measured to transmitter power:

$$TP = (FS * D)^2 / (30 * G)$$

where FS is field strength in V/m, D is the distance in metres between the two antennas and G is the antenna numerical gain referenced to isotropic gain.

e.g. 95.2 dBuV/m measured at 3m is $(0.0575 * 3)^2 / 30$, assuming isotropic radiation = 1mW.

8 Photographs

Photograph of the EUT as viewed from in front of the antenna, site M.

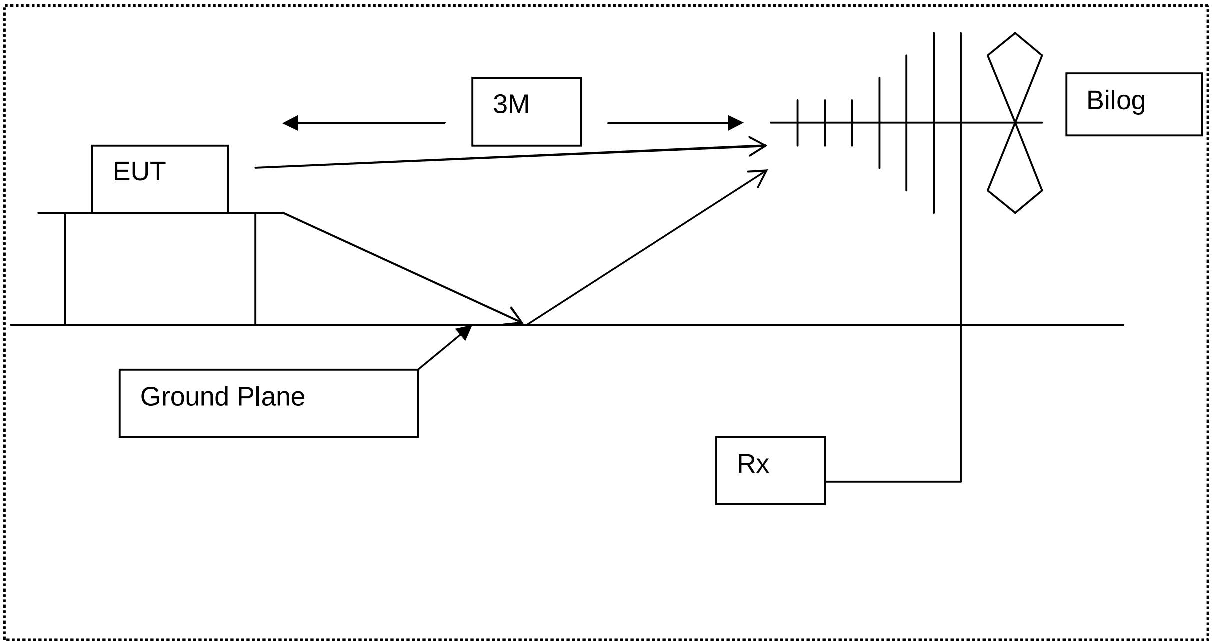
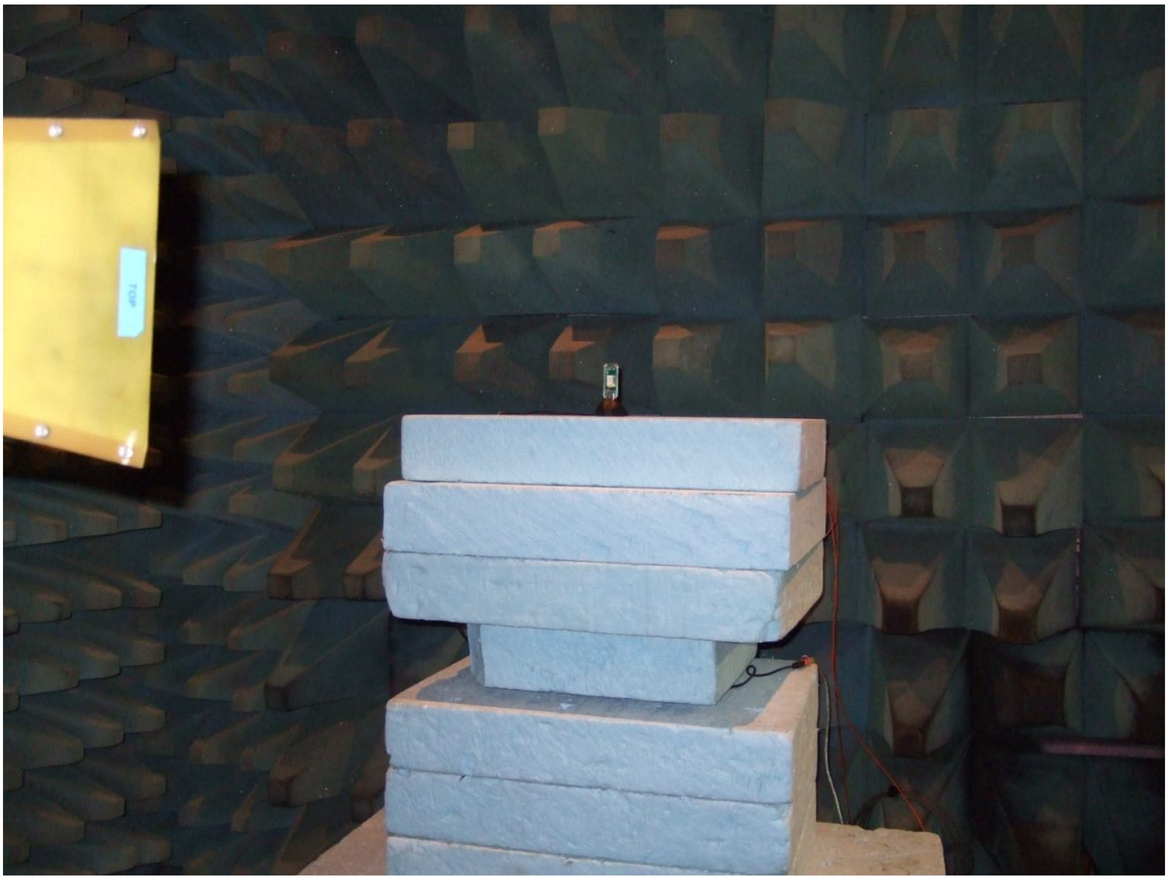
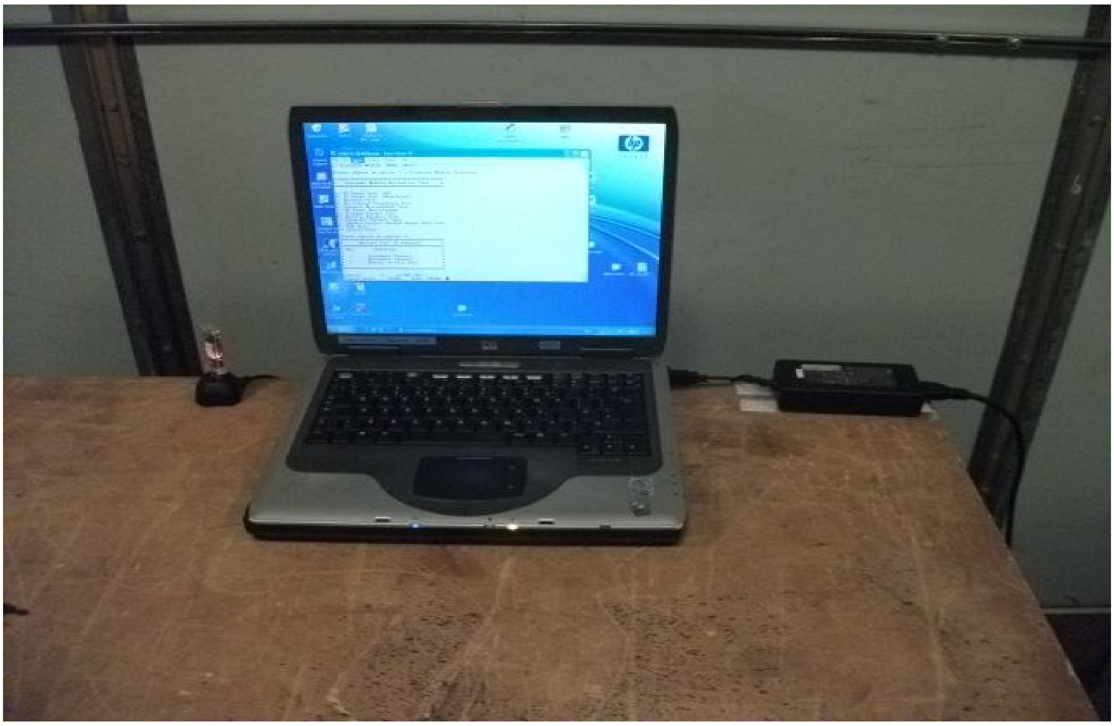


Diagram of the radiated emissions test setup.



Photograph of the EUT as viewed from in front of the antenna, site B.



Photograph of the EUT as viewed from screened room (conducted emissions)

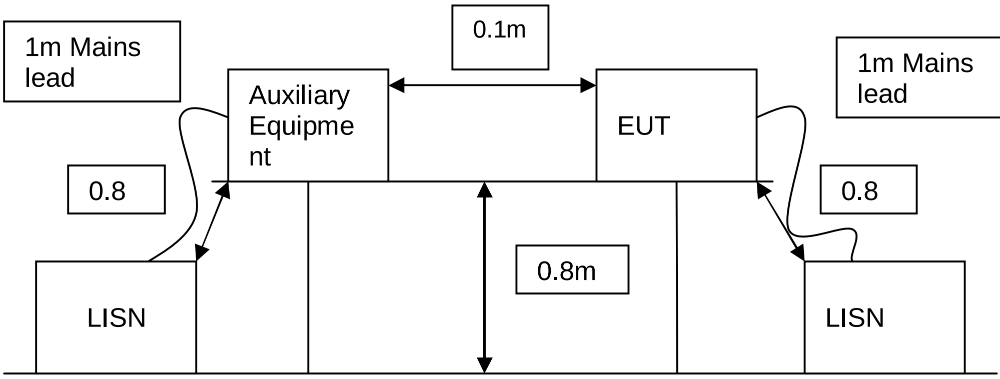
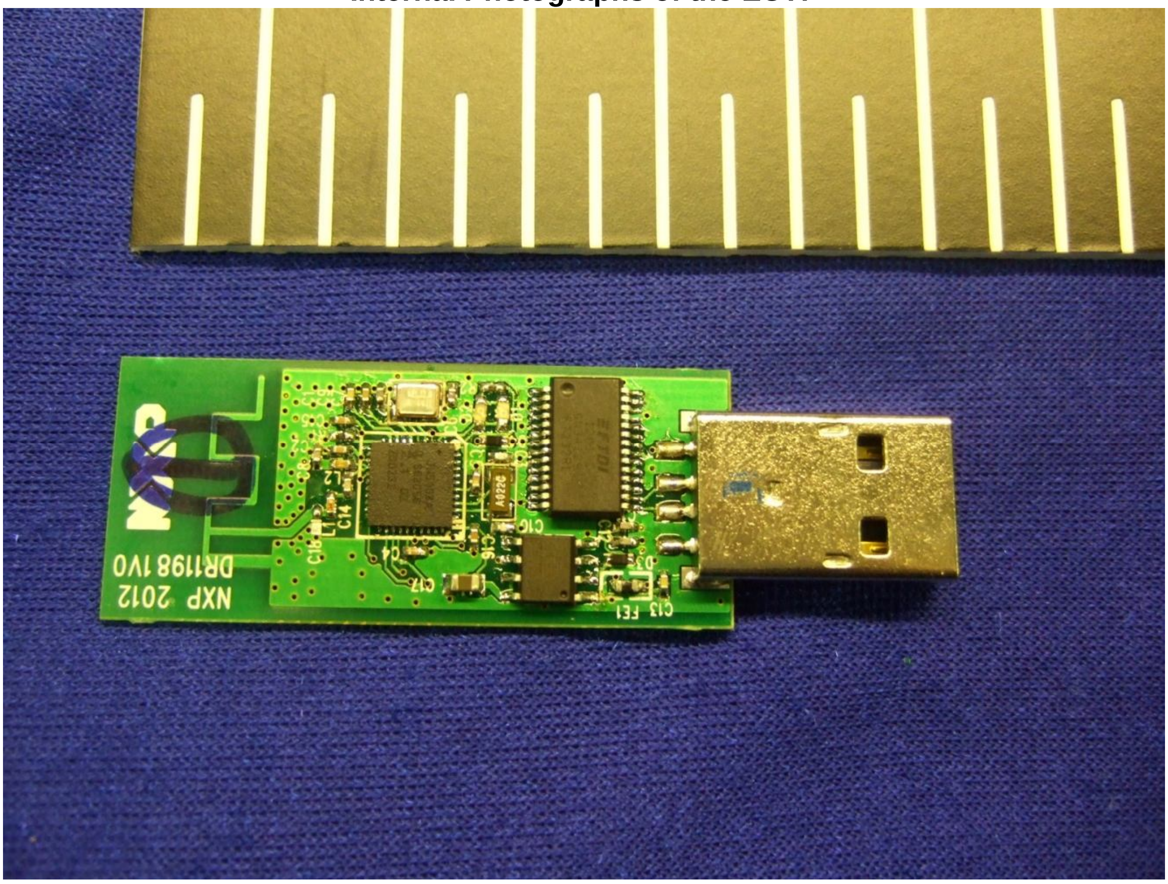
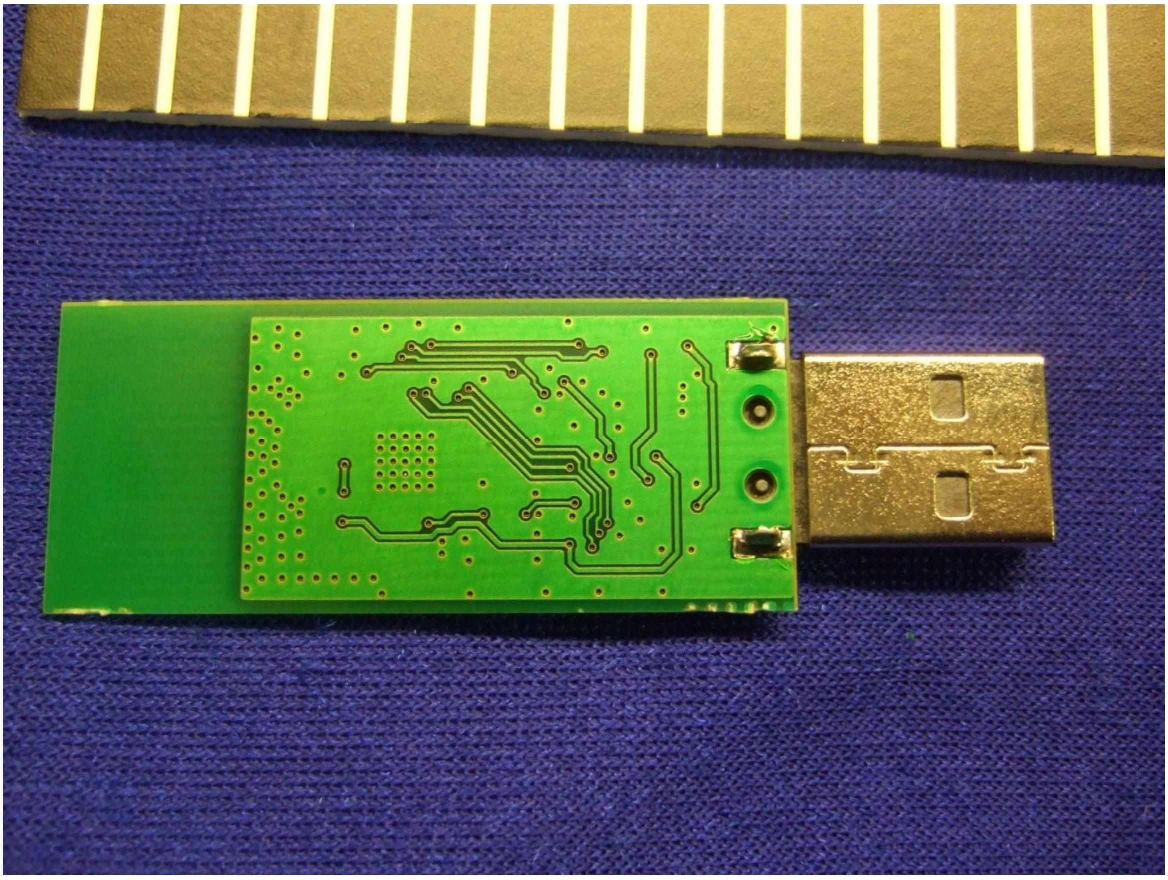


Diagram of the conducted emissions test setup.

Identifying Photograph of the EUT:

Internal Photographs of the EUT:





9 Signal Leads

Port Name	Cable Type	Connected
USB	USB Standard A	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	Period	Last Cal
E003	HP8593E	Hewlett Packard	Spectrum Analyser	24	21-Nov-12
E035	HP11947A	Hewlett Packard	Transient Limiter + 10dB Atten.	6	08-Aug-12
E150	MN2050	Chase	LISN 13A	12	02-Oct-12
E268	BHA 9118	Schaffner	1-18 GHz Horn Antenna	24	14-Apr-11
E410	N5181A	Agilent Technologies	3 GHz MXG Signal Generator	12	18-Oct-12
E411	N9039A	Agilent Technologies	9 kHz - 1 GHz RF Filter Section	12	18-Oct-12
E412	E4440A	Agilent Technologies	3 Hz - 26.5 GHz PSA	12	18-Oct-12
E465	PCR2000LA	KIKUSUI	AC Power Supply	12	17-Apr-12
E492	N9038A	Agilent Technologies	20Hz - 8.4GHz MXE EMI Receiver	12	06-Feb-12
TMS78	3160-08	ETS Systems	Std Gain Horn Antenna 12.4-18 GHz	24	03-Nov-12
TMS79	3160-09	ETS Systems	Std Gain Horn Antenna 18-26.5 GHz	24	03-Nov-12
TMS82	8449B	Agilent	Pre Amplifier 1 - 26 GHz	12	19-Nov-11
TMS933	CBL6141A	York EMC	Bilog Antenna 30MHz - 2GHz	24	09-Sep-12

11 Auxiliary equipment

11.1 Auxiliary equipment supplied by NXP Laboratories UK Ltd

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	-	USB extension lead / cradle	-	-
2	PP21L	Laptop Inspiron 13000	Dell	00045-633-785-363

11.2 Auxiliary equipment supplied by RN Electronics Limited

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

None.

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

There were no modifications made by R.N. Electronics Ltd before testing commenced.

12.2 Modifications during test

There were no modifications made by R.N. Electronics Ltd during testing.

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:

FCC COMPLIANCE INFORMATION STATEMENT
DECLARATION OF CONFORMITY

NXP LABORATORIES (UK) LTD
FURNIVAL STREET
SHEFFIELD
S1 4QT
UNITED KINGDOM

TELEPHONE: +44 (0) 114 281 2655
FACSIMILE: +44 (0) 114 281 2951
E MAIL: info@jennic.com
WEB: www.jennic.com

Manufacturer:	NXP Semiconductors Netherlands B.V
Responsible Party in the USA:	Niel P Smith NXP Semiconductors 411 E. Plumeria Drive San Jose CA 95134 USA Tel 001 408-518 5302
Product:	DR1198 JN5168-001-U00 USB Dongle
Authorisation Procedure:	Declaration of Conformity

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

We, NXP Laboratories (UK) Ltd, have determined that the above named equipment has been shown to comply with the applicable technical standards. Furthermore, we warrant that each unit of equipment marketed is identical to the unit tested and found acceptable with the standards. The records maintained continue to reflect the equipment being produced within the variation that can be expected due to quantity production and testing on a statistical basis.

NXP Semiconductors BV
DR1198 JN5168-001-U00
USB Dongle

Sheffield, December 4th, 2012

CONRAD FARLOW, SENIOR RF HARDWARE ENGINEER, NXP LABORATORIES LTD

The contents of this report, apart from the referenced ANSI C63.4-2003, are beyond the scope of UKAS Testing Laboratory No. 2360 accreditation.

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 (Conducted Emissions) VCCI Registration No. C-2823
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	Hz	Hertz
µV	microVolts	IF	Intermediate Frequency
µW	microWatts	kHz	kiloHertz
AC	Alternating Current	LO	Local Oscillator
ALSE	Absorber Lined Screened Enclosure	mA	milliAmps
		max	maximum
AM	Amplitude Modulation	mbar	milliBars
Amb	Ambient	MHz	MegaHertz
ANSI	American National Standards Institute	min	minimum
		mm	milliMetres
ºC	Degrees Celsius	ms	milliSeconds
CFR	Code of Federal Regulations	mW	milliWatts
		NA	Not Applicable
CS	Channel Spacing	nom	Nominal
CW	Continuous Wave	nW	nanoWatt
dB	deciBels	OATS	Open Area Test Site
dBµV	deciBels relative to 1µV	OFDM	Orthogonal Frequency Division Multiplexing
dBc	deciBels relative to Carrier		
dBm	deciBels relative to 1mW	ppm	Parts per million
DC	Direct Current	QAM	Quadrature Amplitude Modulation
EIRP	Equivalent Isotropic Radiated Power	QPSK	Quadrature Phase Shift Keying
ERP	Effective Radiated Power		
EUT	Equipment Under Test	Ref	Reference
FCC	Federal Communications Commission	RF	Radio Frequency
		RTP	Room Temperature and Pressure
FM	Frequency Modulation		
FSK	Frequency Shift Keying	s	Seconds
g	Grams	Tx	Transmitter
GHz	GigaHertz	V	Volts