FCC 47CFR part 15C
Test Report
For
Sensia 200D Connect

Reference Standard: FCC 47CFR part 15C
Manufacturer: Imagination Technologies
For type of equipment and serial number, refer to section 3
Report Number: 03-557/4997/4/12
Report Produced by: -

R.N. Electronics Ltd.
1 Arnolds Court
Arnolds Farm Lane
Mountnessing
Essex
CM13 1UT
U.K.

www.RNelectronics.com

Telephone +44 (0) 1277 352219
Facsimile +44 (0) 1277 352968

1. Contents

2. Summary of Test Results

The Sensia 200D Connect was tested to the following standards: -

FCC 47CFR Part 15C (effective date October 1st, 2011); Class DTS Intentional Radiator

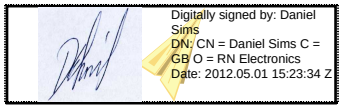
Any compliance statements are made reliant on the modes of operation as instructed to us by the Manufacturer based on their specific knowledge of the application and functionality of the equipment tested. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although 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. Modulation 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 §15.247	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. Frequency separation	FCC Part 15C §15.247	NOT APPLICABLE[2]
10. No. of hopping channels	FCC Part 15C §15.247	NOT APPLICABLE[2]

[1] No test requirement or limit specified for this type of device.
[2] EUT is not FHSS equipment.

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

Date of Test: 5th to 16th March 2012

Test Engineer: 

Approved By: 

Customer Representative:

3. Equipment Under Test (EUT)

3.1 Equipment Specification

Applicant	Imagination Technologies Home Park Estate Kings Langley Hertfordshire WD4 8DH	
Manufacturer of EUT	Pure Digital Ltd	
Brand name of EUT	Pure Digital Ltd	
Model Number of EUT	Sensia 200D Connect	
Serial Number of EUT	ES3-44	
Date when equipment was received by RN Electronics	5th March 2012	
Date of test:	5th to 16th March 2012	
Customer order number:	120535	
Visual description of EUT:	Black plastic horizontal egg shaped enclosure with a speaker on each end. The unit's front side has a colour touch screen display. The top of the unit has four push buttons, and on the rear are four ports and also a battery compartment. The unit comes supplied with a dedicated AC/DC adapter.	
Main function of the EUT:	802.11b/g (portable part) internet radio functionality and audio file streaming.	
Height	190mm	
Width	270mm	
Depth	180mm	
Weight	<2kg	
Voltage	12.9 - 15.7 V DC from supplied AC/DC adapter, 3.7V DC nominal from Internal Chargepak	
Current required from above voltage source	2A	
EUT Supplied PSU	Manufacturer	Pure Digital
	Model Number	KSAFF1430200W1UV-1
	Serial Number	not specified
	Specification	input 100-240V AC 0.8A, output 14.3V DC 2A

3.2 Functional description

The Pure Sensia 200D Connect is a fully featured wireless music system, the unit uses 802.11b/g (portable part) Wi-Fi technology to stream audio from the internet and internet radio stations.
The unit also has a DAB radio tuner, An FM radio tuner and an auxiliary input port for connection of external audio devices. The Sensia 200D Connect supports instant and timed recording of live internet and digital radio to USB memory stick. The unit delivers 30W RMS of digital sound via DSP tuned high efficiency class-D amplifiers and has a sophisticated colour touch screen.

3.3 EUT Configurations for testing

Frequency range	2.412 - 2.462 GHz
Normal use position	Tabletop / Bench
Normal test signals	802.11B, 802.11G, OFDM, DSSS/CCK
Declared Power Level	+18dBm
Declared Channel Bandwidth	22MHz
Highest Frequencies generated/used	2.462 GHz

3.4 EUT Modes

Wi-Fi RF part

Mode	Description of mode	Used for Testing
TX channel 1	Unit constantly transmitting on 2.412GHz	YES
TX channel 6	Unit constantly transmitting on 2.437GHz	YES
TX channel 11	Unit constantly transmitting on 2.462GHz	YES
RX channel 1	Unit constantly Receiving on 2.412GHz	YES
RX channel 6	Unit constantly Receiving on 2.437GHz	YES
RX channel 11	Unit constantly Receiving on 2.462GHz	YES
Normal mode	Unit communicating with wireless Router network	NO

Wi-Fi modes were provided with 100% TX duty cycle.

The Transmit modes referred to above were used in combination with the following table of modulation/ data rate schemes to fulfil the test requirements:-

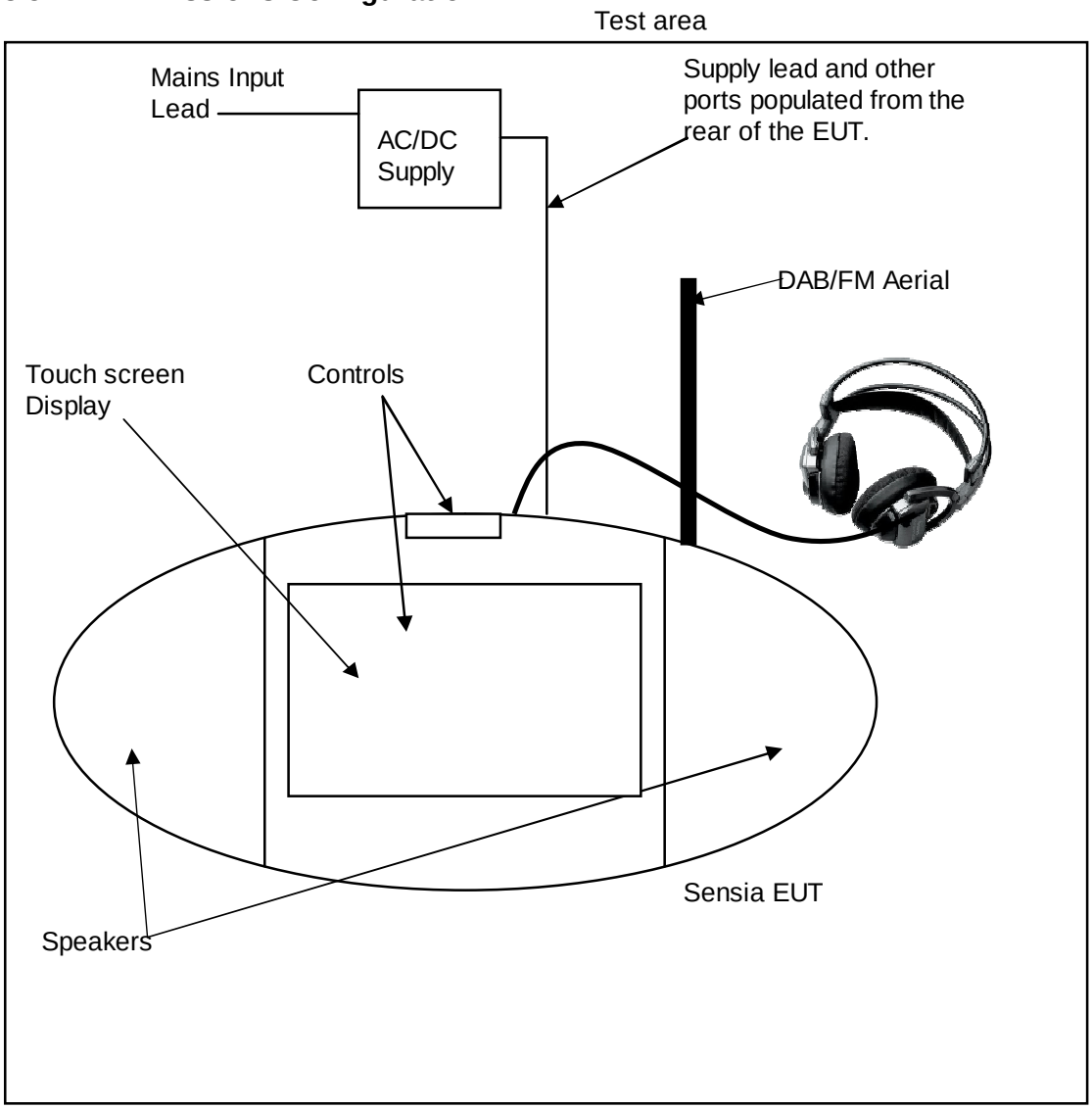
Mode	Rate
802.11B	1 Mbps
802.11B	2 Mbps
802.11B	5.5 Mbps
802.11B	11 Mbps
802.11G	6 Mbps
802.11G	9 Mbps
802.11G	12 Mbps
802.11G	18 Mbps
802.11G	24 Mbps
802.11G	36 Mbps
802.11G	48 Mbps
802.11G	54 Mbps

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: 01 May 2012

3.5 Emissions Configuration



The unit was powered from the dedicated AC/DC adapter provided with the unit (see section 3.1 for details). For conducted tests the internal antenna was unsoldered and an SMA connector fitted in its place. The unit was configured with engineering menus in software to allow permanent transmit and receive modes of the Wi-Fi device on the top, middle and bottom channels as stated within section 3.4 of this report. The Wi-Fi TX and RX modes were set using the engineering mode provided within the unit. The transmit mode was 100% continuous with modulation and the power settings for each channel were as stated below:-

Bottom Channel (2412MHz) 802.11b schemes only = level 13
Middle Channel (2437MHz) 802.11b schemes only = level 16
Top Channel (2462MHz) 802.11b schemes only = level 16

For all channels and 802.11g mod schemes the default setting of 20 was used for tests. See section 12 for modification details.
For tests performed in the “Engineering” Wi-Fi TX mode of operation software version 6 labelled “polaris_4.109.1.32.006.dfu” was loaded into the EUT.
For tests performed in the “Engineering” Wi-Fi RX only mode of operation software version 13 labelled “polaris_4.109.1.32.013.dfu” was loaded into the EUT.

For radiated and conducted emissions tests the unit was populated with typical leads, a pair of headphones and a USB stick. The AC/DC adapter was also placed on to the test table along with the main enclosure of the EUT. The same unit was used for both Radiated and Conducted tests.

4. Specifications

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

4.1 Deviations

None.

4.2 Tests at Extremes of Temperature & Voltage

☒ A permanent integral antenna RF port was used for testing.
☐ A test fixture was used for testing.
☒ A temporary internal RF connection was used for testing.
☐ The equipment external RF port was used for testing.

4.3 Measurement Uncertainties

Parameter	Uncertainty
Transmitter Tests	
RF frequency	<± 0.7 ppm
Conducted RF power	<± 1.0 dB*
Spectral power density	<± 1.5 dB
Bandwidth	<± 1.9 %
Radiated RF Power	<± 3.5 dB
Radiated Spurious Emissions	<± 3.4 dB
Receiver Tests	
Radiated Spurious Emissions	<± 3.4 dB

*Applies to average conducted power only

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 C63.4, Reference (7.)

5.1.1.1 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.

Initial scans were made in transmit, receive and normal Wi-Fi modes to determine any worst case mode for emissions. No discernible difference was noted. Therefore full tests were performed in Wi-Fi mode TX channel 6 (see section 3.3).

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: 15°C

Analyser plots for the Quasi-Peak / Average values as applicable and a table of signals within 20dB of the limit line can be found in Section 6.1 of this report.

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

5.1.2.1 Test Equipment used

E035, E010, E410, E411, E412

See Section 10 for more details.

5.2 Radiated Emissions

5.2.1 Test Methods

Test Requirements	FCC Part 15C, Reference (15.209)
Test Method:	ANSI C63.4, Reference (8.)

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.

5.2.1.2 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. The antenna was placed 1m 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.

5.2.2 Test results

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

Test Environment: M & B
Temperature: 18-21°C Humidity: 34-45%

Analyser plots for the Quasi-Peak / Average values as applicable and any table of signals within 20dB of the limit line can be found in Section 6.2 of this report. Band Edge Compliance plots can be found in section 6.6 of this report.

Plot references above 1GHz

Frequency range	Plot reference
1 – 2 GHz	1 – 2 GHz Vert / 1 – 2 GHz Horiz
2 – 2.7 GHz	2 – 2.7 GHz Vert / 2 – 2.7 GHz Horiz
2.7 – 5 GHz	2.7 – 5 GHz Vert / 2.7 – 5 GHz Horiz
5 – 6 GHz	5 – 6 GHz Vert / 5 – 6 GHz Horiz
6 – 7.8 GHz	6 – 7.8 GHz Vert / 6 – 7.8 GHz Horiz
7.8 – 10 GHz	7.8 – 10 GHz Vert / 7.8 – 10 GHz Horiz
10 – 12 GHz	10 – 12 GHz Vert / 10 – 12 GHz Horiz
12 – 14 GHz	12 – 14 GHz Vert / 12 – 14 GHz Horiz
14 – 16 GHz	14 – 16 GHz Vert / 14 – 16 GHz Horiz
16 – 18 GHz	16 – 18 GHz Vert / 16 – 18 GHz Horiz
18 – 20 GHz	18 – 20 GHz Vert / 18 – 20 GHz Horiz
20 – 22 GHz	20 – 22 GHz Vert/ 20 – 22 GHz Horiz
22 – 25 GHz	22 – 25 GHz Vert/ 22 – 25 GHz Horiz

All applicable channels were measured and signal lists for all three channels accompany the plots in Section 6.2. Only middle channel (channel 6) plots are listed/shown.

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

5.2.2.1 Test Equipment used

E410, E411, E412, TMS933, TMS78, E268, E428, E429, TMS79, TMS82, TMS81, E250, E252, E342

See Section 10 for more details

5.3 Peak Conducted Power

5.3.1 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 b))

5.3.1.1 Configuration of EUT

The EUT was measured on a bench using a power meter / spectrum analyser connected to the Internal RF port. The EUT was set to each 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.
Power meter reading stated is maximum power observed using an average power head.
Peak stated reading is maximum power observed using a spectrum analyser channel power function over the 6dB bandwidth + 1MHz using a 1MHz RBW, per ANSI C63.10.

Measurements were made on a test bench.

5.3.2 Test results

Test Environment: Temperature: 20-23°C Humidity: 37-42 %

Bottom channel (1) results

Channel / scheme	Meter reading (dBm)	Duty cycle adjustment (dB)	Total (dBm)	Result (mW)	Peak ANSI C63.10 (mW)
bot 1Mbps	13.5	N/A	13.5	22.4	61.7
bot 2Mbps	13.5	N/A	13.5	22.4	64.6
bot 5.5Mbps	13.5	N/A	13.5	22.4	69.2
bot 11Mbps	13.5	N/A	13.5	22.4	74.1
bot 6Mbps	10.4	N/A	10.4	11.0	147.9
bot 9Mbps	10.3	N/A	10.3	10.7	158.5
bot 12Mbps	10.3	N/A	10.3	10.7	134.9
bot 18Mbps	10.3	N/A	10.3	10.7	134.9
bot 24Mbps	10.4	N/A	10.4	11.0	138.0
bot 36Mbps	10.4	N/A	10.4	11.0	144.5
bot 48Mbps	10.4	N/A	10.4	11.0	95.5
bot 54Mbps	10.4	N/A	10.4	11.0	93.3

Middle channel (6) results

Channel / scheme	Meter reading (dBm)	Duty cycle adjustment (dB)	Total (dBm)	Result (mW)	Peak ANSI C63.10 (mW)
mid 1Mbps	14.7	N/A	14.7	29.5	77.6
mid 2Mbps	14.7	N/A	14.7	29.5	79.4
mid 5.5Mbps	14.7	N/A	14.7	29.5	89.1
mid 11Mbps	14.7	N/A	14.7	29.5	97.7
mid 6Mbps	11.1	N/A	11.1	12.9	134.9
mid 9Mbps	11.1	N/A	11.1	12.9	144.5
mid 12Mbps	11.1	N/A	11.1	12.9	123.0
mid 18Mbps	11.1	N/A	11.1	12.9	120.2
mid 24Mbps	11.1	N/A	11.1	12.9	125.9
mid 36Mbps	11.2	N/A	11.2	13.2	131.8
mid 48Mbps	11.2	N/A	11.2	13.2	104.7
mid 54Mbps	11.2	N/A	11.2	13.2	104.7

Top channel (11) results

Channel / scheme	Meter reading (dBm)	Duty cycle adjustment (dB)	Total (dBm)	Result (mW)	Peak ANSI C63.10 (mW)
top 1Mbps	14.0	N/A	14.0	25.1	66.1
top 2Mbps	14.0	N/A	14.0	25.1	67.6
top 5.5Mbps	14.0	N/A	14.0	25.1	74.1
top 11Mbps	14.0	N/A	14.0	25.1	81.3
top 6Mbps	10.5	N/A	10.5	11.2	114.8
top 9Mbps	10.4	N/A	10.4	11.0	123.0
top 12Mbps	10.5	N/A	10.5	11.2	107.2
top 18Mbps	10.5	N/A	10.5	11.2	104.7
top 24Mbps	10.5	N/A	10.5	11.2	107.2
top 36Mbps	10.6	N/A	10.6	11.5	112.2
top 48Mbps	10.6	N/A	10.6	11.5	74.1
top 54Mbps	10.6	N/A	10.6	11.5	72.4

Limits: 1Watt.

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

5.3.2.1 Test Equipment used

E131, E227, E290, E342, E397, E434, TMS10, P240,

See Section 10 for more details

5.4 Frequency Tolerance

Test not applicable. No test requirement nor limit given for DTS devices.

5.5 Duty Cycle

Test not applicable. However, a basic duty cycle measurement was made in order to ascertain any duty cycle corrections required to be applied to the test results.

The Transmit mode was confirmed as being 100% TX On.

5.5.1 Test Equipment used

E412

See Section 10 for more details

5.6 Maximum Spectral Power Density

5.6.1 Test Methods

Test Requirements	FCC Part 15C, Reference (15.247)
Test Method:	FCC Part 15C, Reference (15.247) KDB558074, PSD Option 1

5.6.1.1 Configuration of EUT

The EUT was tested on a bench via the Internal RF Port.

5.6.1.2 Test Procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below. PEP was recorded per KDB558074, PSD Option 1.

5.6.2 Test results

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

Temperature of test Environment: 20°C

Bottom channel (1) test results

Channel/ scheme	PEP (dBm/3kHz)	Plot reference
1MB	-9.6	J4997-4, plot 0050
2MB	-7.3	J4997-4, plot 0051
5.5MB	-10.1	J4997-4, plot 0052
11MB	-8.8	J4997-4, plot 0053
6MB	-8.7	J4997-4, plot 0054
9MB	-5.9	J4997-4, plot 0055
12MB	-5.0	J4997-4, plot 0056
18MB	-4.4	J4997-4, plot 0057
24MB	-4.3	J4997-4, plot 0058
36MB	-1.8	J4997-4, plot 0059
48MB	-1.8	J4997-4, plot 0060
54MB	-4.0	J4997-4, plot 0061

Middle channel (6) test results

Channel/ scheme	PEP (dBm/3kHz)	Plot reference
1MB	-9.0	J4997-4, plot 0085
2MB	-8.3	J4997-4, plot 0062
5.5MB	-7.9	J4997-4, plot 0063
11MB	-7.3	J4997-4, plot 0064
6MB	-7.3	J4997-4, plot 0065
9MB	-8.8	J4997-4, plot 0066
12MB	-5.1	J4997-4, plot 0067
18MB	-4.4	J4997-4, plot 0068
24MB	-4.3	J4997-4, plot 0069
36MB	-1.9	J4997-4, plot 0070
48MB	-2.1	J4997-4, plot 0071
54MB	-3.4	J4997-4, plot 0072

Top channel (11) test results

Channel/ scheme	PEP (dBm/3kHz)	Plot reference
1MB	-8.8	J4997-4, plot 0073
2MB	-6.1	J4997-4, plot 0074
5.5MB	-7.6	J4997-4, plot 0075
11MB	-7.4	J4997-4, plot 0076
6MB	-9.1	J4997-4, plot 0077
9MB	-6.8	J4997-4, plot 0078
12MB	-5.9	J4997-4, plot 0079
18MB	-5.3	J4997-4, plot 0080
24MB	-4.9	J4997-4, plot 0081
36MB	-2.7	J4997-4, plot 0082
48MB	-3.7	J4997-4, plot 0083
54MB	-4.9	J4997-4, plot 0084

Limit: +8dBm/3kHz.

Any Analyser plots can be found in Section 6.7 of this report.

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

5.6.2.1 Test Equipment used

E131, P240, E342, E434

See Section 10 for more details.

5.7 6 dB Bandwidth

5.7.1 Test Methods

Test Requirements	FCC Part 15C, Reference (15.247)
Test Method:	FCC Part 15C, Reference (15.247) KDB558074 - Bandwidth

5.7.1.1 Configuration of EUT

The EUT was tested on a bench via the Internal RF port.

5.7.1.2 Test Procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below. In accordance with KDB558074, the analyser's RBW was set to 100kHz and the span was set greater than this. Readings of 6dB bandwidth are taken directly from the analyser.

5.7.2 Test results

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

Temperature of test Environment: 22-23°C

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

Bottom channel test results

Channel 1 / Scheme	BW result (MHz)	Plot reference
1Mbps	10.10	J4997-4,0001
2Mbps	10.15	J4997-4,0002
5.5Mbps	9.60	J4997-4,0003
11Mbps	10.10	J4997-4,0004
6Mbps	15.35	J4997-4,0005
9Mbps	15.25	J4997-4,0006
12Mbps	15.30	J4997-4,0007
18Mbps	15.55	J4997-4,0008
24Mbps	15.25	J4997-4,0009
36Mbps	15.85	J4997-4,0010
48Mbps	15.45	J4997-4,0011
54Mbps	15.55	J4997-4,0012

Middle channel test results

Channel 6 / Scheme	BW result (MHz)	Plot reference
1Mbps	10.10	J4997-4,0013
2Mbps	10.10	J4997-4,0014
5.5Mbps	10.15	J4997-4,0015
11Mbps	10.15	J4997-4,0016
6Mbps	15.45	J4997-4,0017
9Mbps	15.25	J4997-4,0018
12Mbps	15.55	J4997-4,0019
18Mbps	15.60	J4997-4,0020
24Mbps	15.30	J4997-4,0021
36Mbps	15.90	J4997-4,0022
48Mbps	15.50	J4997-4,0023
54Mbps	15.50	J4997-4,0024

Top channel test results

Channel 11 / Scheme	BW result (MHz)	Plot reference
1Mbps	10.10	J4997-4,0025
2Mbps	10.15	J4997-4,0026
5.5Mbps	10.10	J4997-4,0027
11Mbps	10.10	J4997-4,0028
6Mbps	15.40	J4997-4,0029
9Mbps	15.30	J4997-4,0030
12Mbps	15.55	J4997-4,0031
18Mbps	15.55	J4997-4,0032
24Mbps	15.30	J4997-4,0033
36Mbps	15.90	J4997-4,0034
48Mbps	15.50	J4997-4,0035
54Mbps	15.30	J4997-4,0036

Limits: > 500kHz BW.

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

5.7.2.1 Test Equipment used

E342, E434, TMS10, P240

See Section 10 for more details.

5.8 Band Edge Compliance

5.8.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.215 and 15.247)

Test Method: FCC Part 15C, Reference (15.215)

5.8.1.1 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.

5.8.1.2 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.

5.8.2 Test results

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

Temperature of test Environment: 20-21°C

Restricted band edges.

Analyser plots for the Band Edge Compliance can be found in Section 6.6 of this report. The following tables list the field strengths observed in the adjacent restricted bands, which are required to meet the tighter 15.209 limits:

Bottom channel results

Channel 1 Scheme	Band edge PK reading (dBuV/m)	Band edge AV reading (dBuV/m)	Plot reference
1Mbps	61.2	53.5	J4997-4, Restricted band edge Bottom channel 1MB's Mod scheme
2Mbps	60.7	51.2	J4997-4, Restricted band edge Bottom channel 2MB's Mod scheme
5.5Mbps	60.5	50.7	J4997-4, Restricted band edge Bottom channel 5.5MB's Mod scheme
11Mbps	60.7	50.8	J4997-4, Restricted band edge Bottom channel 11MB's Mod scheme
6Mbps	67.8	52.3	J4997-4, Restricted band edge Bottom channel 6MB's Mod scheme
9Mbps	67.8	52.2	J4997-4, Restricted band edge Bottom channel 9MB's Mod scheme
12Mbps	72.0	52.0	J4997-4, Restricted band edge Bottom channel 12MB's Mod scheme
18Mbps	65.5	52.5	J4997-4, Restricted band edge Bottom channel 18MB's Mod scheme
24Mbps	65.0	51.7	J4997-4, Restricted band edge Bottom channel 24MB's Mod scheme
36Mbps	65.8	52.0	J4997-4, Restricted band edge Bottom channel 36MB's Mod scheme
48Mbps	61.8	48.2	J4997-4, Restricted band edge Bottom channel 48MB's Mod scheme
54Mbps	63.5	49.5	J4997-4, Restricted band edge Bottom channel 54MB's Mod scheme

Top channel results

Channel 11 Scheme	Band edge PK reading (dBuV/m)	Band edge AV reading (dBuV/m)	Plot reference
1Mbps	58.7	49.0	J4997-4, Restricted band edge Top channel 1MB's Mod scheme
2Mbps	58.7	47.8	J4997-4, Restricted band edge Top channel 2MB's Mod scheme
5.5Mbps	59.0	47.0	J4997-4, Restricted band edge Top channel 5.5MB's Mod scheme
11Mbps	58.3	46.8	J4997-4, Restricted band edge Top channel 11MB's Mod scheme
6Mbps	66.0	49.2	J4997-4, Restricted band edge Top channel 6MB's Mod scheme
9Mbps	68.0	49.0	J4997-4, Restricted band edge Top channel 9MB's Mod scheme
12Mbps	65.5	49.2	J4997-4, Restricted band edge Top channel 12MB's Mod scheme
18Mbps	64.8	49.3	J4997-4, Restricted band edge Top channel 18MB's Mod scheme
24Mbps	66.7	49.8	J4997-4, Restricted band edge Top channel 24MB's Mod scheme
36Mbps	64.7	48.7	J4997-4, Restricted band edge Top channel 36MB's Mod scheme
48Mbps	59.7	49.2	J4997-4, Restricted band edge Top channel 48MB's Mod scheme
54Mbps	59.5	46.3	J4997-4, Restricted band edge Top channel 54MB's Mod scheme

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

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

Non-Restricted band edges.

Analyser plots for the Band Edge Compliance can be found in Section 6.6 of this report. These show the 20dBc/30dBc requirement of 15.247(d) are met at the band edges of 2400 and 2483.5 MHz.

Bottom channel results

Channel	Scheme	Plot reference
1	1Mbps	J4997-4, band edge Bottom channel 1MB's Mod scheme
1	2Mbps	J4997-4, band edge Bottom channel 2MB's Mod scheme
1	5.5Mbps	J4997-4, band edge Bottom channel 5.5MB's Mod scheme
1	11Mbps	J4997-4, band edge Bottom channel 11MB's Mod scheme
1	6Mbps	J4997-4, band edge Bottom channel 6MB's Mod scheme
1	9Mbps	J4997-4, band edge Bottom channel 9MB's Mod scheme
1	12Mbps	J4997-4, band edge Bottom channel 12MB's Mod scheme
1	18Mbps	J4997-4, band edge Bottom channel 18MB's Mod scheme
1	24Mbps	J4997-4, band edge Bottom channel 24MB's Mod scheme
1	36Mbps	J4997-4, band edge Bottom channel 36MB's Mod scheme
1	48Mbps	J4997-4, band edge Bottom channel 48MB's Mod scheme
1	54Mbps	J4997-4, band edge Bottom channel 54MB's Mod scheme

Top channel results

Channel	Scheme	Plot reference
11	1Mbps	J4997-4, band edge Top channel 1MB's Mod scheme
11	2Mbps	J4997-4, band edge Top channel 2MB's Mod scheme
11	5.5Mbps	J4997-4, band edge Top channel 5.5MB's Mod scheme
11	11Mbps	J4997-4, band edge Top channel 11MB's Mod scheme
11	6Mbps	J4997-4, band edge Top channel 6MB's Mod scheme
11	9Mbps	J4997-4, band edge Top channel 9MB's Mod scheme
11	12Mbps	J4997-4, band edge Top channel 12MB's Mod scheme
11	18Mbps	J4997-4, band edge Top channel 18MB's Mod scheme
11	24Mbps	J4997-4, band edge Top channel 24MB's Mod scheme
11	36Mbps	J4997-4, band edge Top channel 36MB's Mod scheme
11	48Mbps	J4997-4, band edge Top channel 48MB's Mod scheme
11	54Mbps	J4997-4, band edge Top channel 54MB's Mod scheme

Limits: Average power complied with = 30dBc
Peak power complied with = 20dBc

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

5.8.2.1 Test Equipment used

E250, E252, E268, E342, TMS82

See Section 10 for more details.

5.9 Frequency Separation

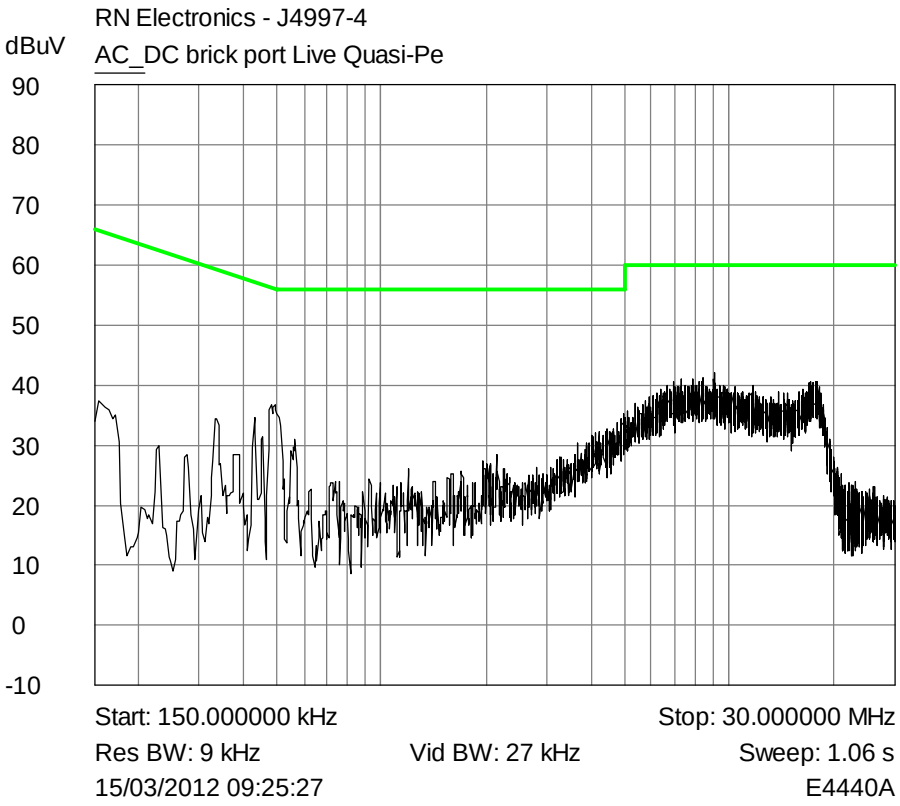
Test not applicable, EUT does not employ FHSS Technology.

5.10 Number of hopping Channels

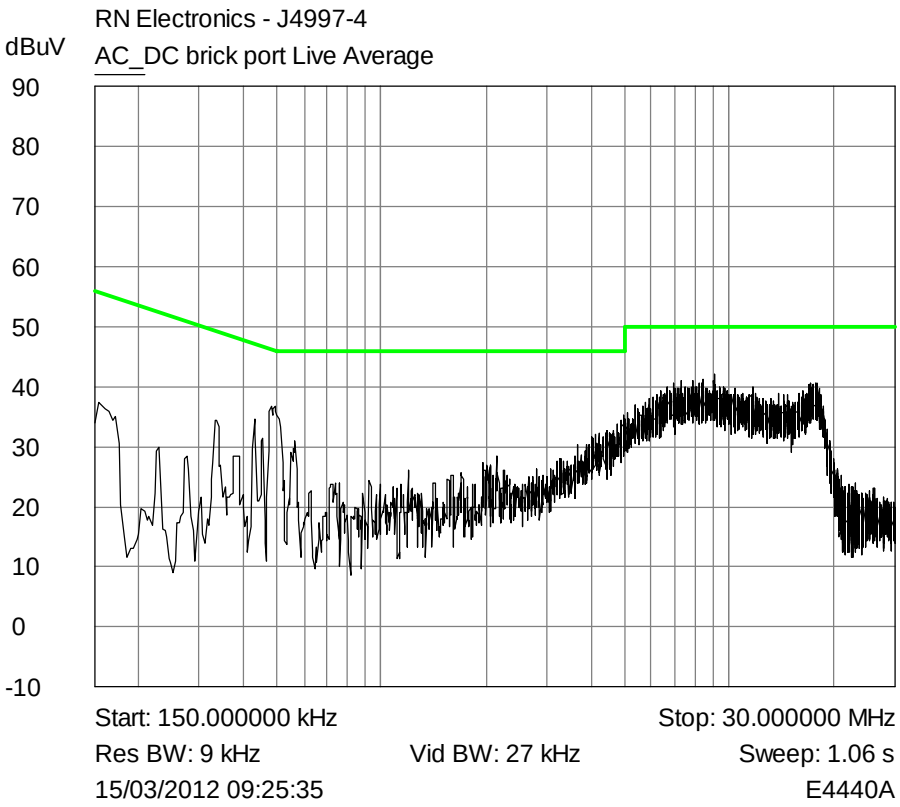
Test not applicable, EUT does not employ FHSS Technology.

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.

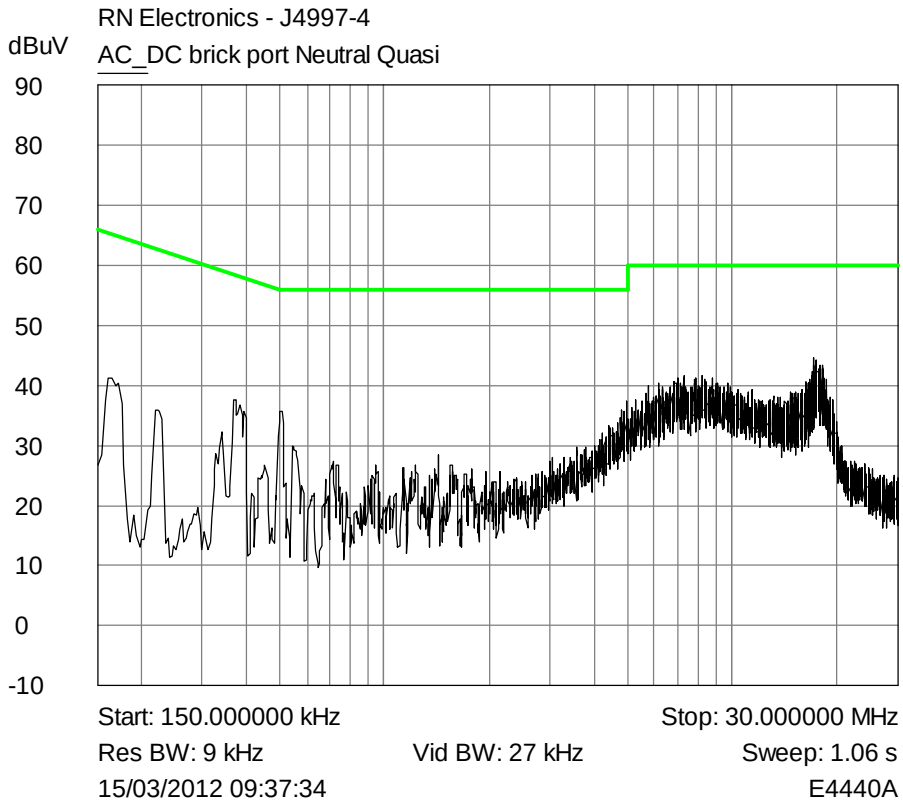


Plot of peak emissions 150kHz - 30MHz on the mains live terminal against the average limit line.

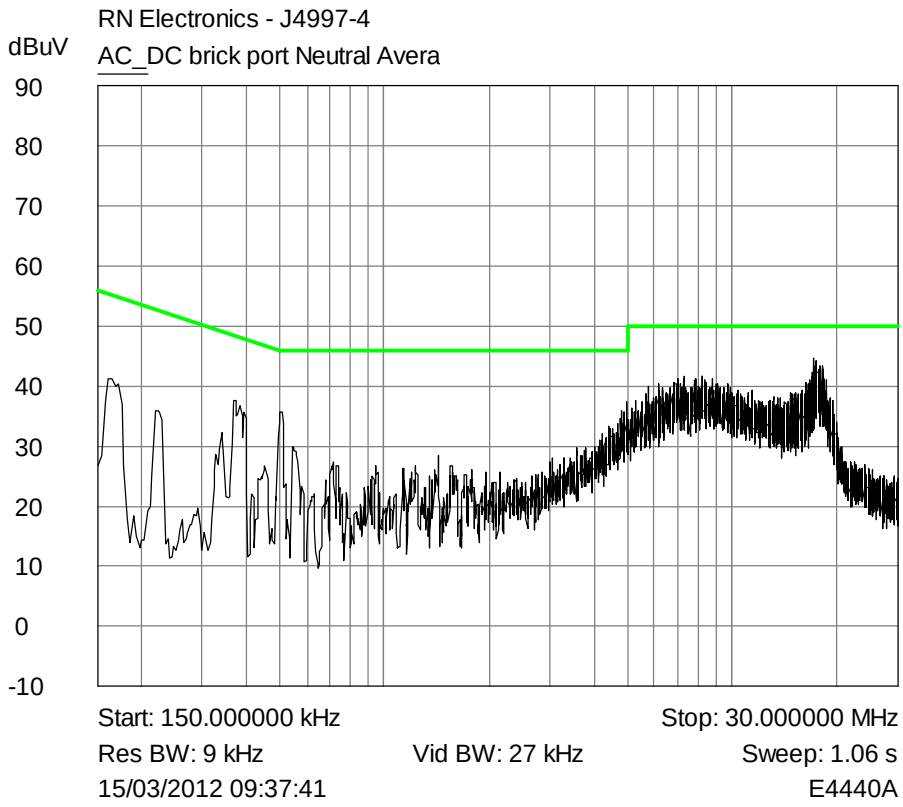
Table of signals measured.

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	0.164	42.2	38.9	-26.4	23.0	-32.3
2	0.164	41.5	38.9	-26.4	22.9	-32.4
3	0.259	35.3	26.8	-34.7	9.1	-42.4
4	0.341	35.6	32.1	-27.1	16.0	-33.2
5	0.375	37.1	32.2	-26.2	14.2	-34.2
6	0.490	37.0	33.6	-22.6	16.7	-29.5
7	7.632	42.0	37.0	-23.0	29.9	-20.1
8	8.168	40.2	37.1	-22.9	29.6	-20.4
9	8.955	39.7	36.8	-23.2	29.5	-20.5
10	9.217	42.0	36.9	-23.1	29.6	-20.4
11	10.106	39.6	36.1	-23.9	28.8	-21.2
12	17.451	40.3	37.4	-22.6	30.5	-19.5
13	17.534	40.5	37.3	-22.7	30.7	-19.3
14	17.534	40.5	37.4	-22.6	30.6	-19.4
15	17.911	40.7	37.2	-22.8	30.4	-19.6



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



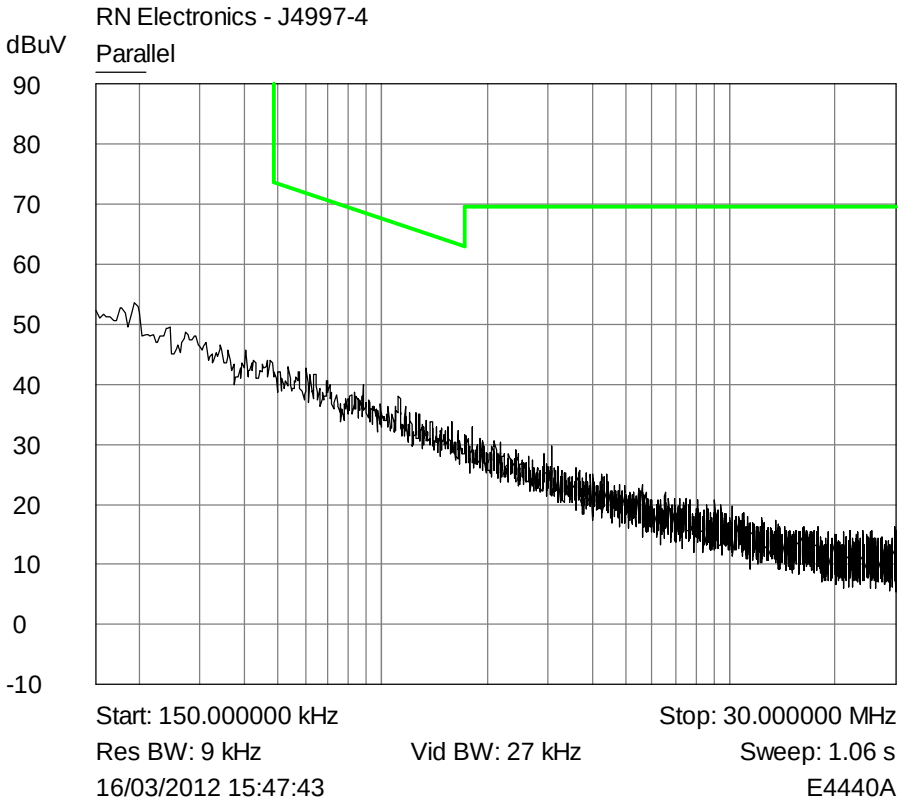
Plot of peak emissions 150kHz - 30MHz on the mains neutral terminal against the average limit line.

Table of signals measured.

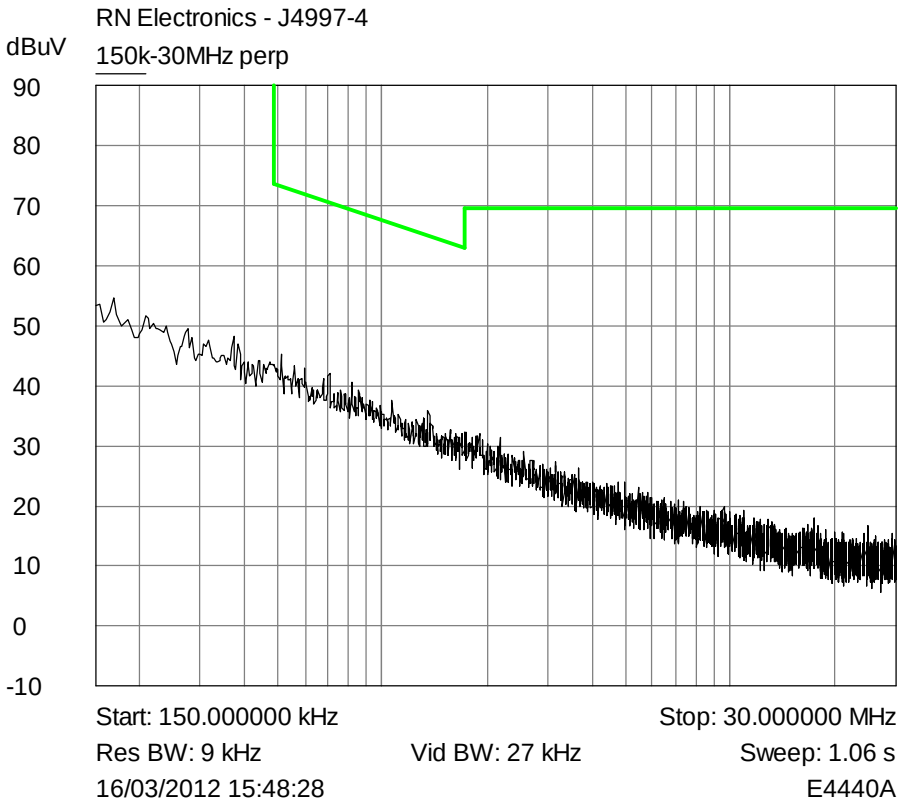
Quasi-Peak and Average Neutral

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP - Lim1 (dB)	AV Amp (dBuV)	AV - Lim1 (dB)
1	0.154	41.3	33.3	-32.5	13.4	-42.4
2	0.273	36.1	32.7	-28.3	15.9	-35.1
3	0.342	34.6	31.7	-27.5	15.0	-34.2
4	0.380	37.4	34.3	-24.0	17.8	-30.5
5	0.481	38.0	30.2	-26.1	12.7	-33.6
6	0.558	31.2	27.0	-29.0	14.8	-31.2
7	17.453	45.3	39.3	-20.7	30.3	-19.7
8	17.620	44.0	39.3	-20.7	30.8	-19.2
9	17.653	44.3	39.7	-20.3	30.8	-19.2
10	17.692	43.7	39.3	-20.7	30.8	-19.2
11	17.727	44.6	39.4	-20.6	30.8	-19.2
12	17.815	43.9	39.6	-20.4	30.9	-19.1

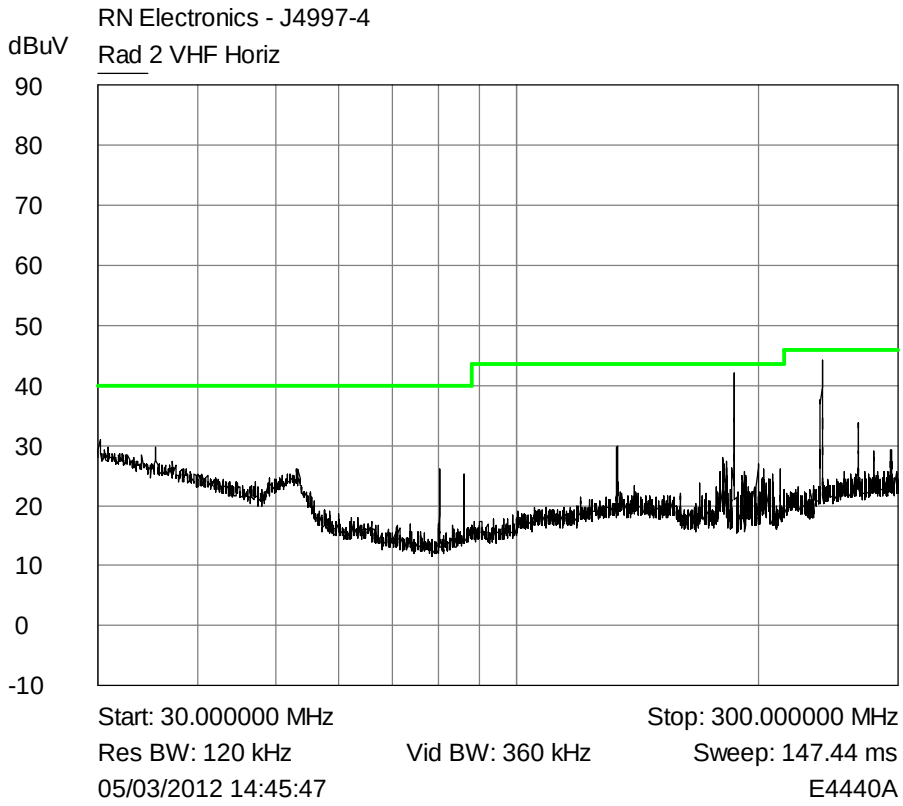
6.2 Radiated Emissions



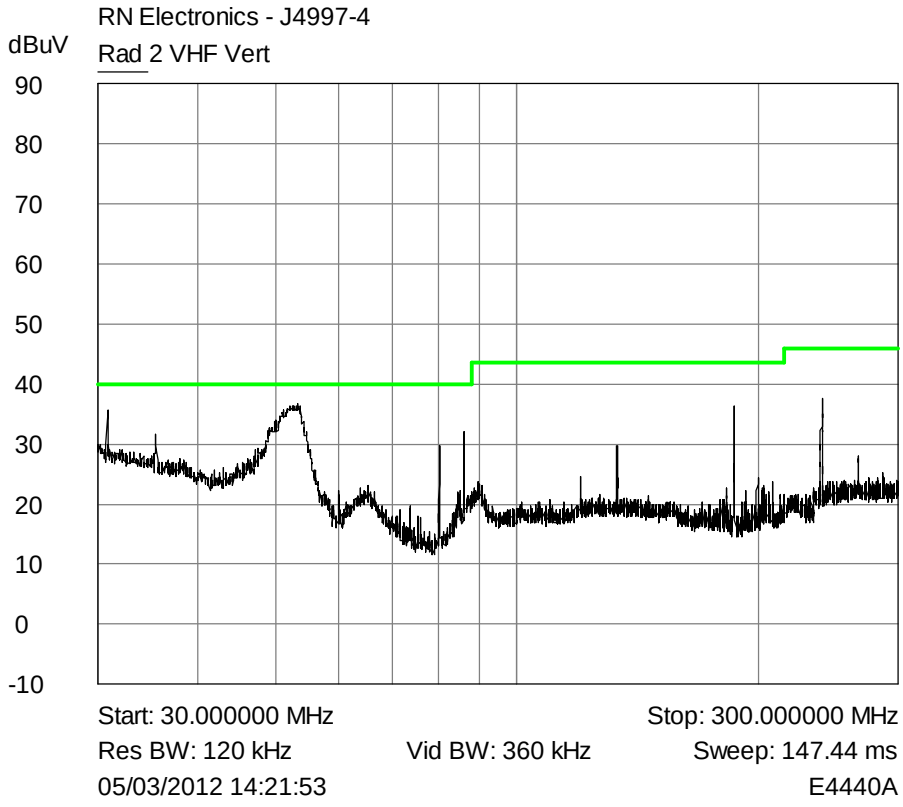
Plot of peak Parallel emissions 150kHz - 30MHz against the quasi-peak limit line.



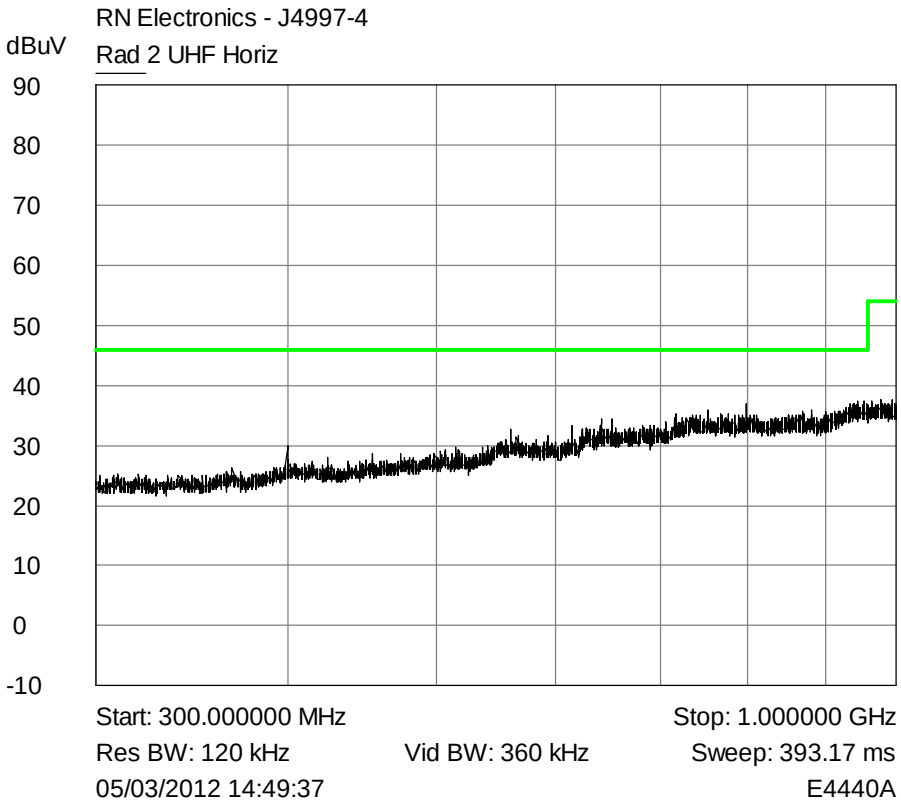
Plot of peak Perpendicular emissions 150kHz - 30MHz against the quasi-peak limit line.



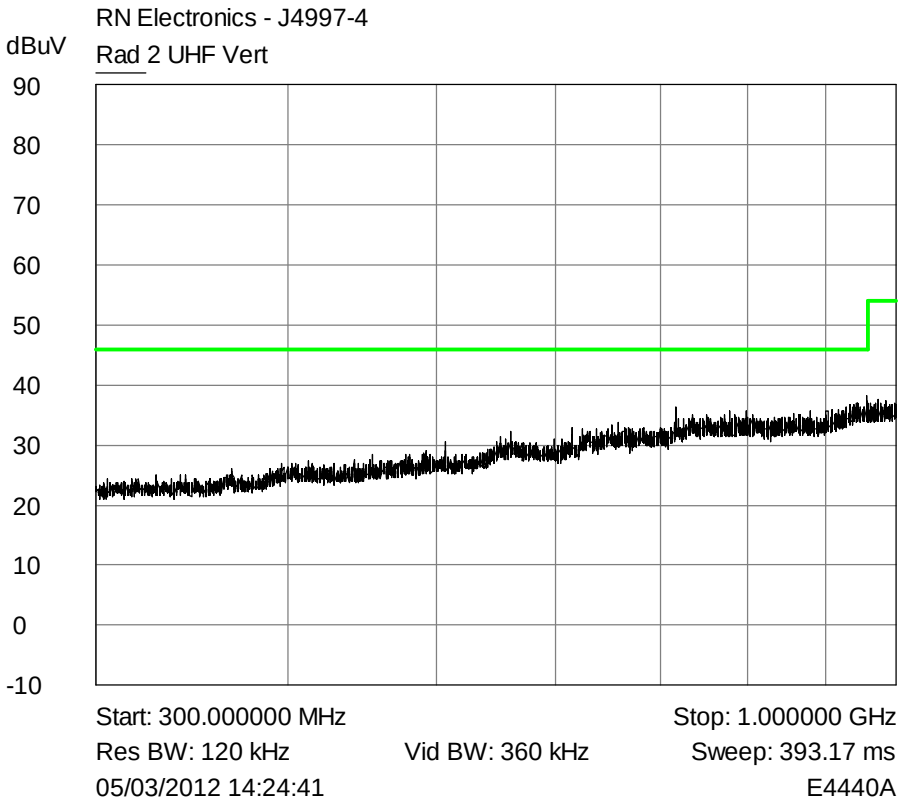
Plot of peak horizontal emissions 30MHz - 300MHz against the quasi-peak limit line.



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.

Table of signals measured below 1GHz.

Horizontal

The signal list below is common to Top, Middle & Bottom channels

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP - Lim1 (dB)
1	53.142	26.4	21.2	-18.8
2	80.183	27.6	26.4	-13.6
3	86.020	31.0	29.6	-10.4
4	133.638	31.1	29.4	-14.1
5	187.093	42.8	41.9	-1.6
6	240.550	44.3	43.2	-2.8
7	267.222	33.9	30.8	-15.2

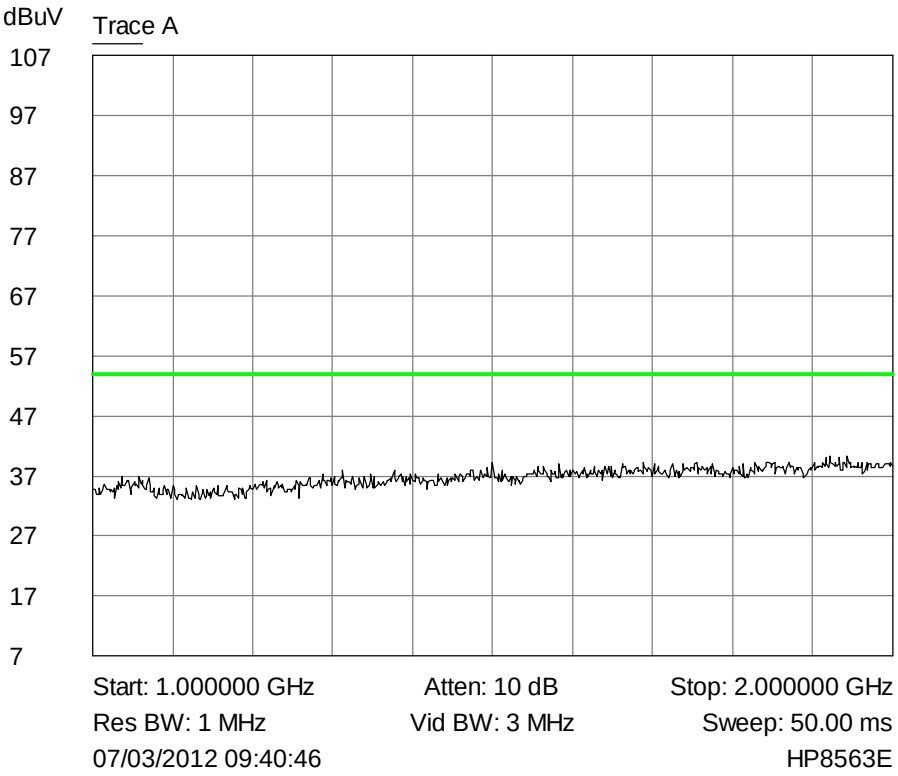
Vertical

The signal list below is common to Top, Middle & Bottom channels

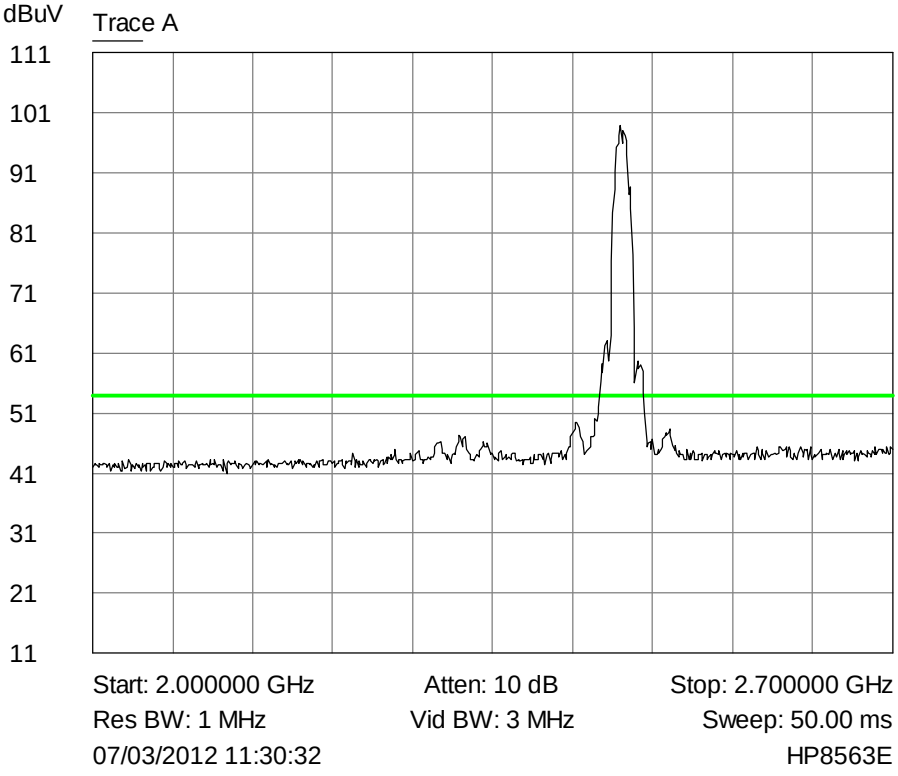
Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP - Lim1 (dB)
1	30.789	31.2	23.9	-16.1
2	35.470	33.6	29.6	-10.4
3	53.416	37.0	32.8	-7.2
4	80.183	30.5	29.6	-10.4
5	86.020	33.2	32.1	-7.9
6	133.637	26.5	23.7	-19.8
7	187.093	36.4	35.4	-8.1
8	240.544	37.7	36.4	-9.6

Plots of Peak horizontal emissions 1GHz - 25GHz against the Average limit line.

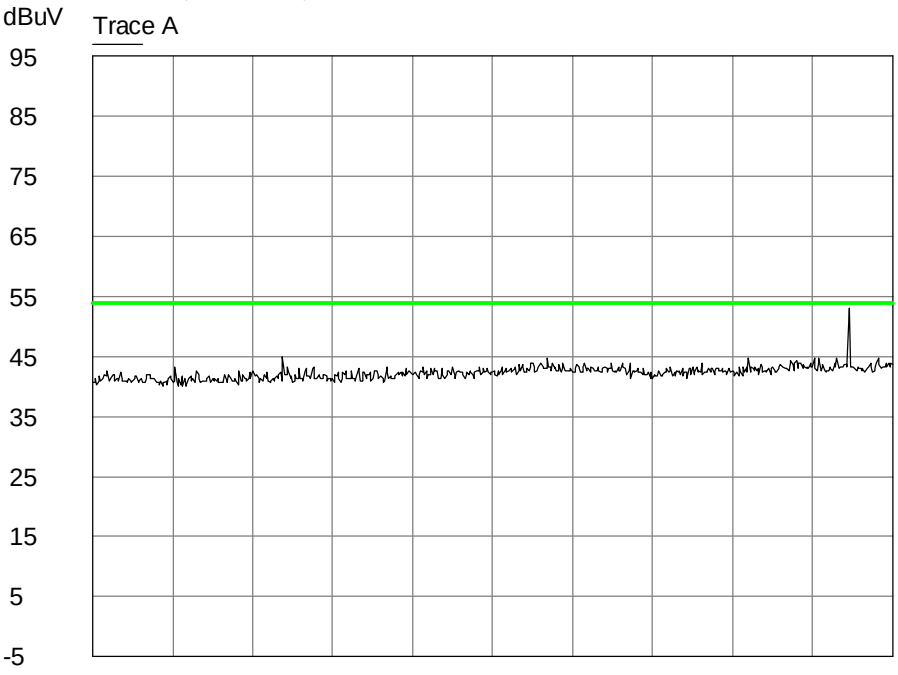
J4997-4, Plot 0002, 1-2GHz Horizontal mid channel



J4997-4, Plot 0004, 2-2.7GHz horizontal mid channel averaged

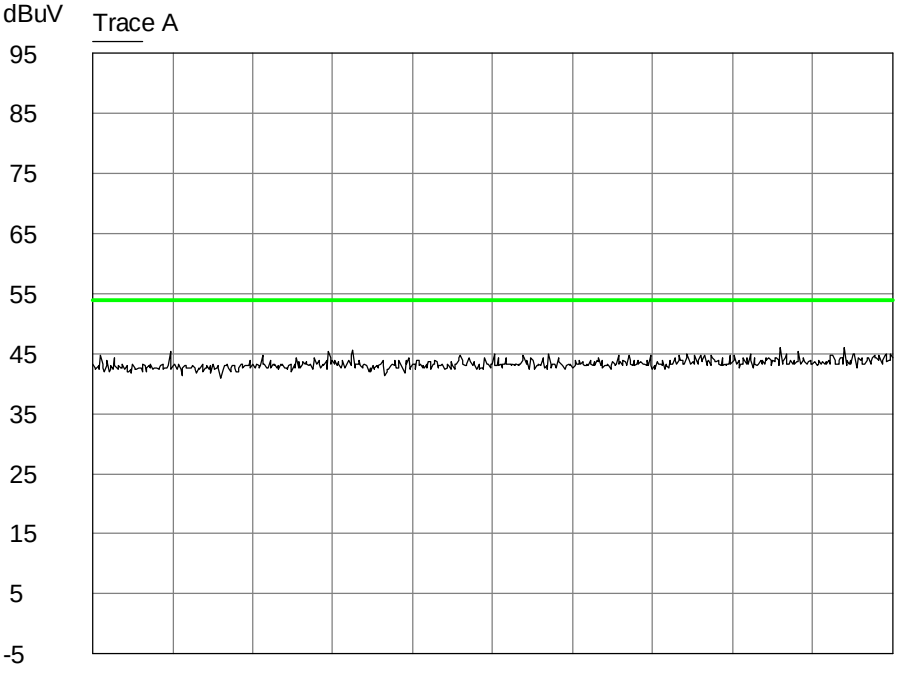


J4997-4, Plot 0005, 2.7-5GHz Horizontal mid channel



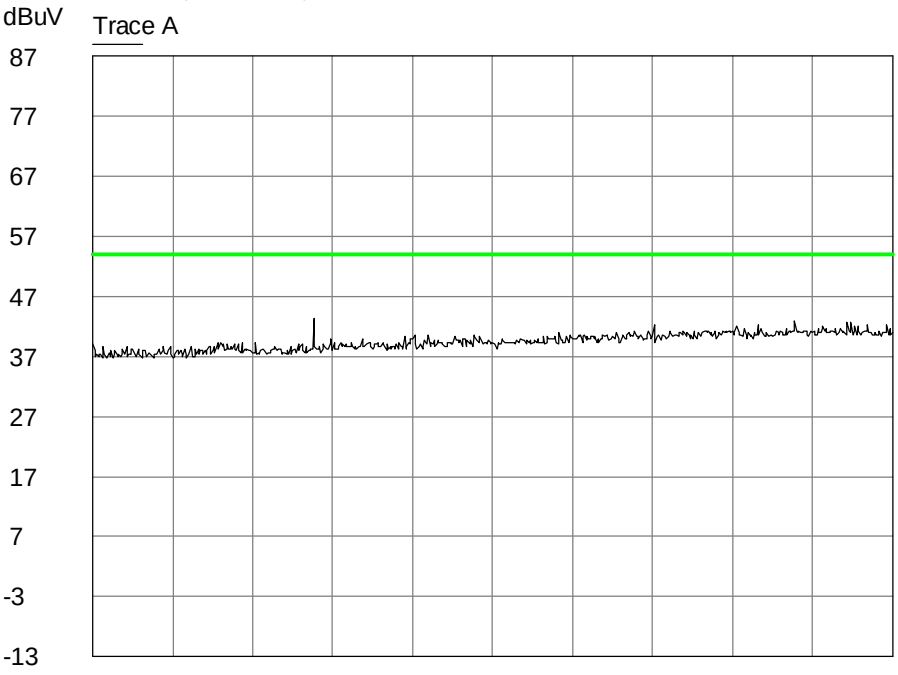
Start: 2.700000 GHz Atten: 10 dB Stop: 5.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
07/03/2012 10:20:03 HP8563E

J4997-4, Plot 0008, 5-6GHz horizontal mid channel



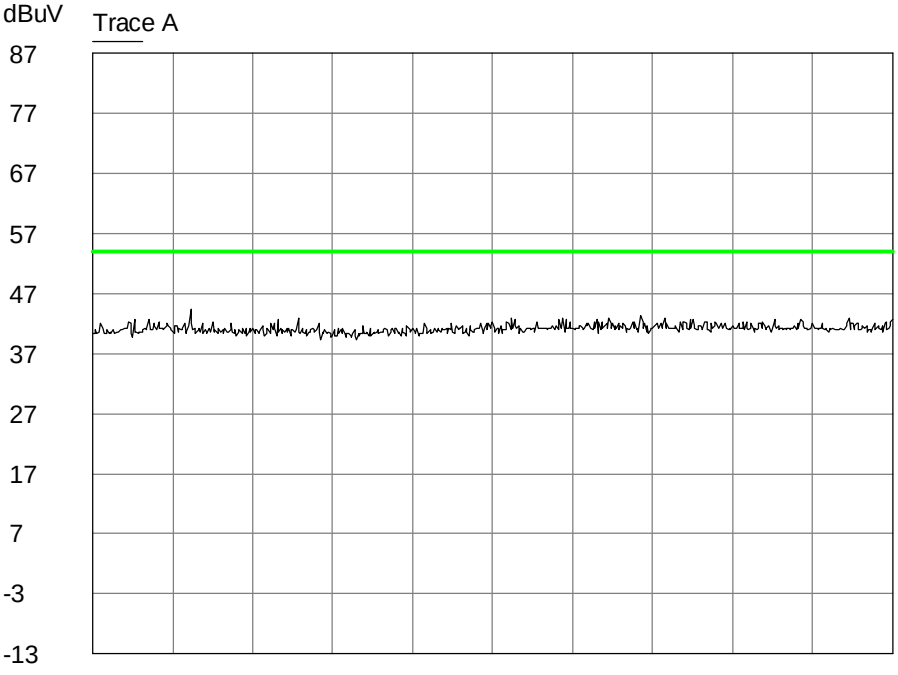
Start: 5.000000 GHz Atten: 10 dB Stop: 6.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
07/03/2012 10:44:50 HP8563E

J4997-4, Plot 0010, 6-7.8GHz horizontal mid channel



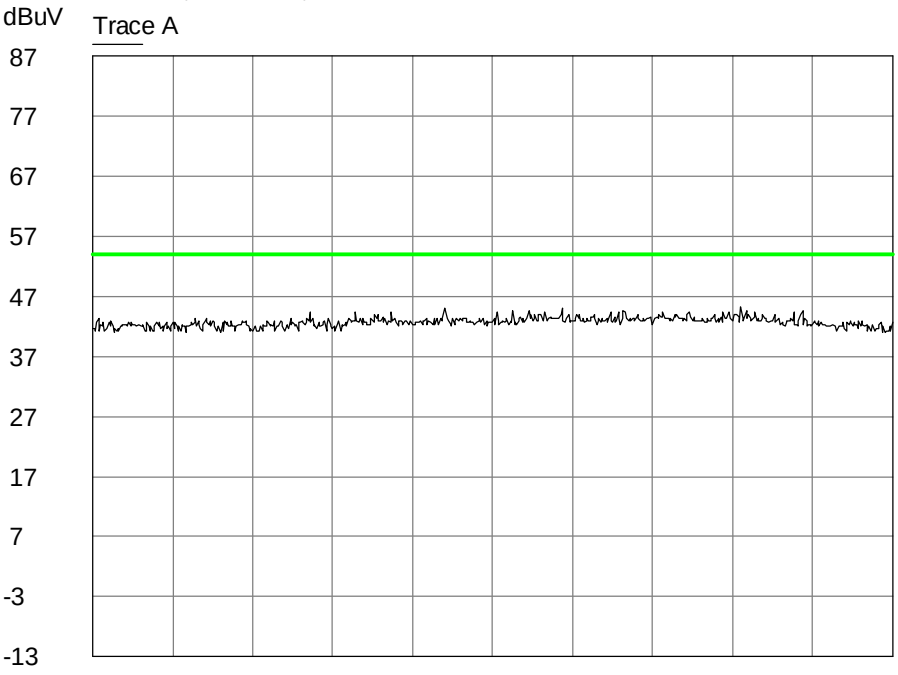
Start: 6.000000 GHz Atten: 10 dB Stop: 7.800000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
07/03/2012 15:56:03 HP8563E

J4997-4, Plot 0012, 7.8-10GHz horizontal mid channel



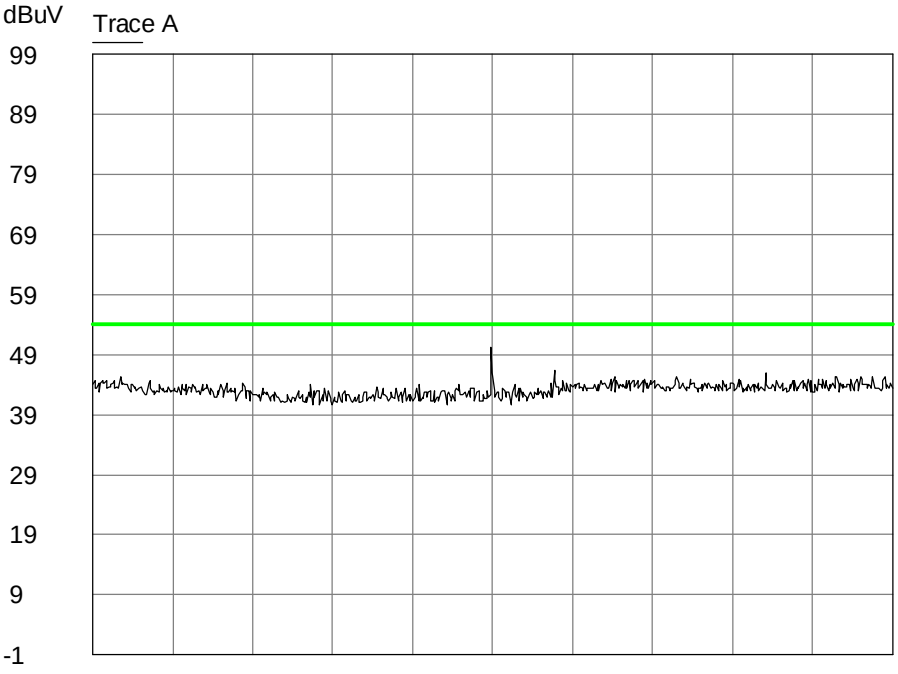
Start: 7.800000 GHz Atten: 10 dB Stop: 10.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
07/03/2012 16:44:42 HP8563E

J4997-4, Plot 0013, 10-12GHz horizontal mid channel



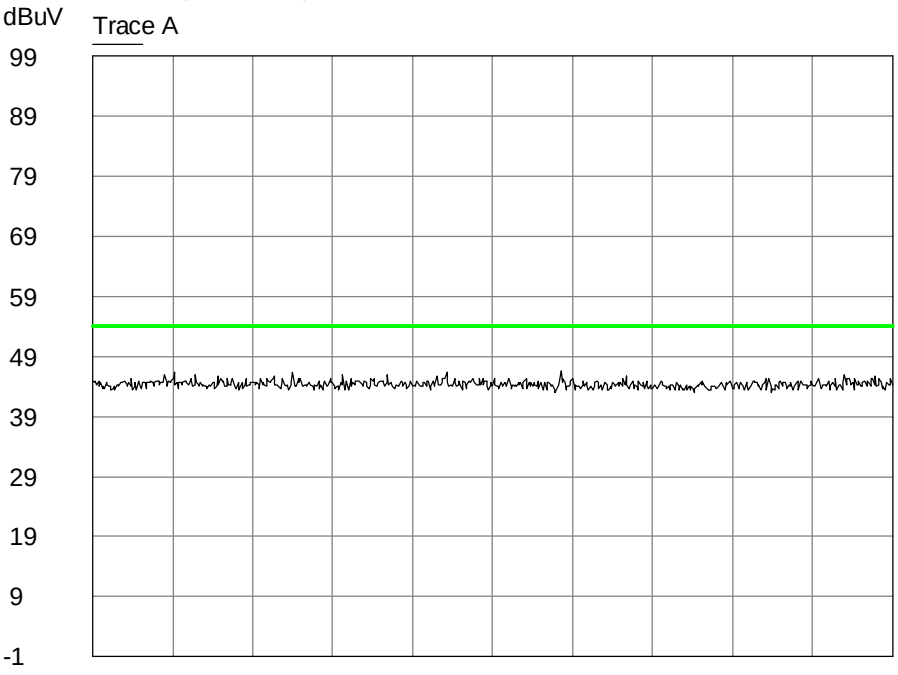
Start: 10.000000 GHz Atten: 10 dB Stop: 12.500000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
07/03/2012 16:45:55 HP8563E

J4997-4, Plot 0015, 12-14GHz horizontal mid channel



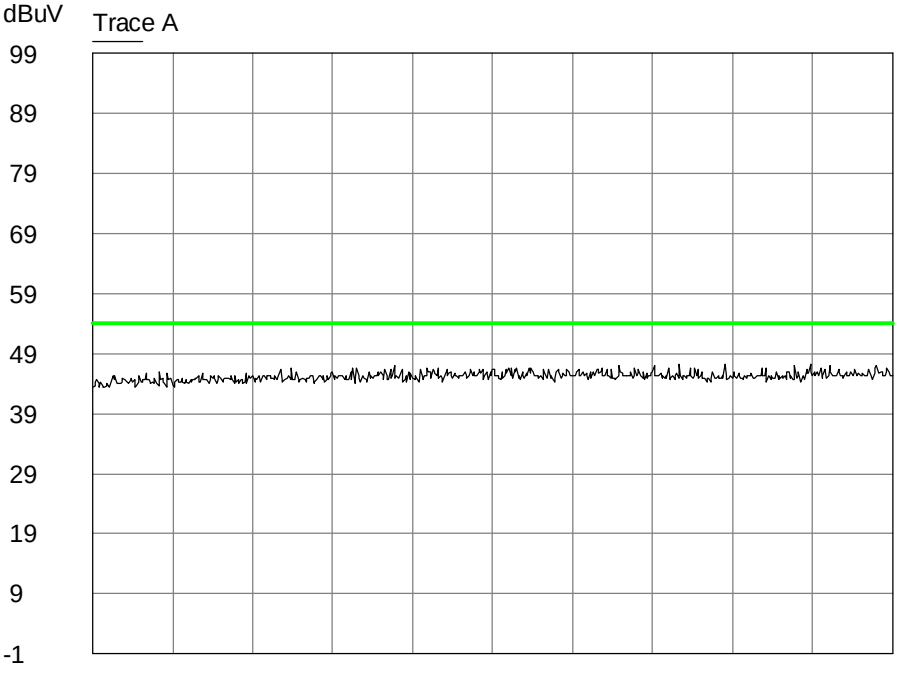
Start: 12.000000 GHz Atten: 10 dB Stop: 14.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
08/03/2012 11:57:34 HP8563E

J4997-4, Plot 0018, 14-16GHz horizontal mid channel



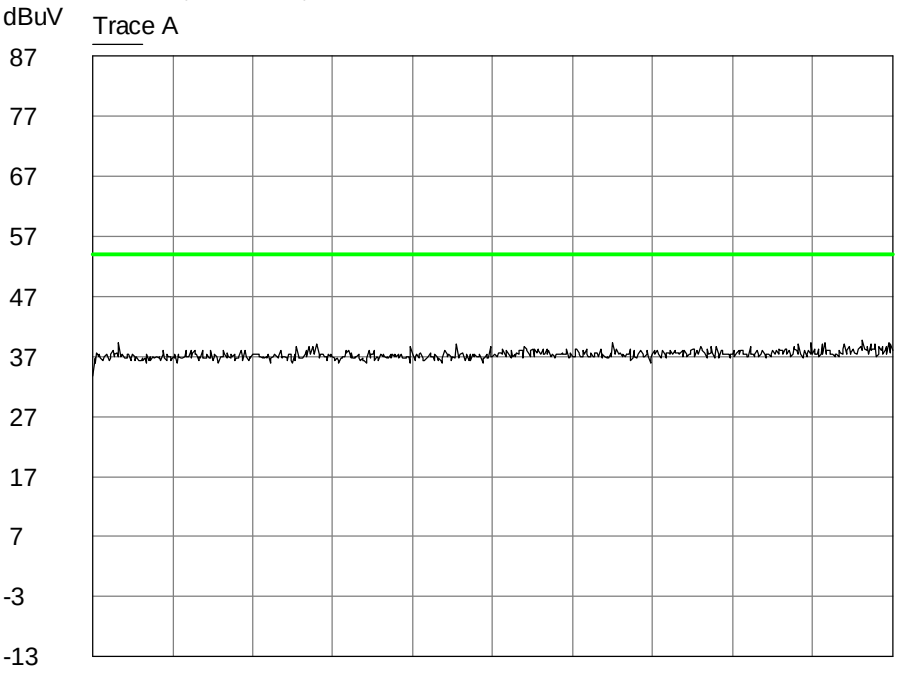
Start: 14.000000 GHz Atten: 10 dB Stop: 16.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
08/03/2012 12:01:02 HP8563E

J4997-4, Plot 0019, 16-18GHz horizontal mid channel



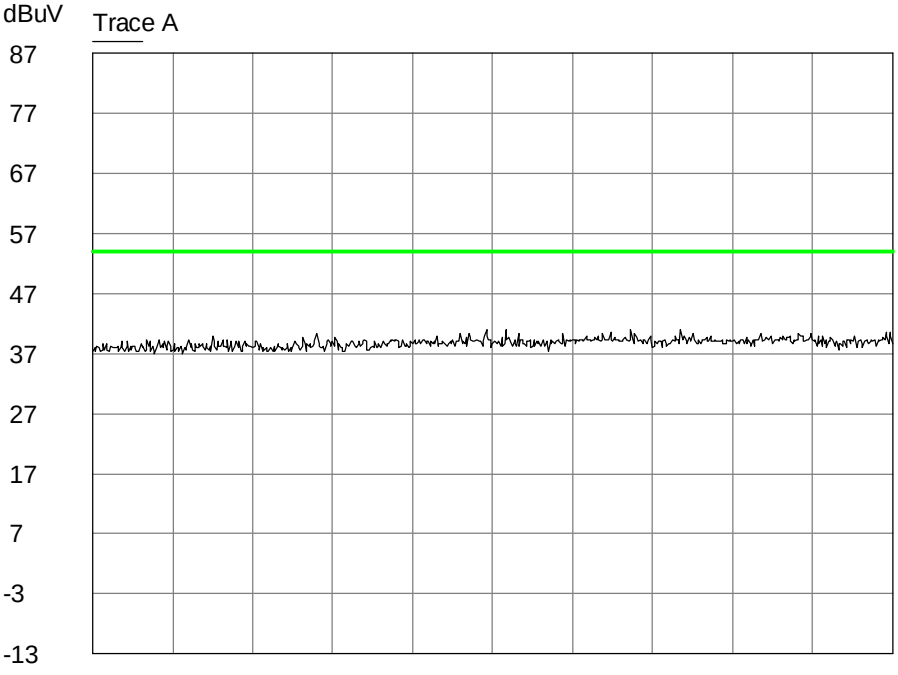
Start: 16.000000 GHz Atten: 10 dB Stop: 18.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
08/03/2012 12:01:47 HP8563E

J4997-4, Plot 0022, 18-20GHz horizontal mid channel



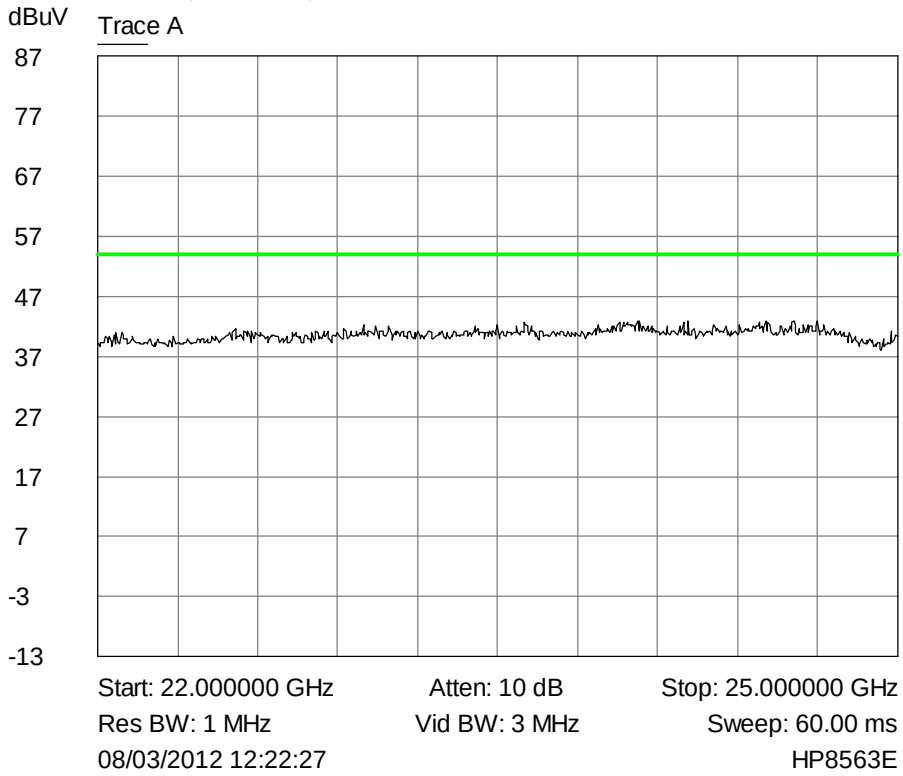
Start: 18.000000 GHz Atten: 10 dB Stop: 20.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
08/03/2012 12:17:41 HP8563E

J4997-4, Plot 0023, 20-22GHz horizontal mid channel



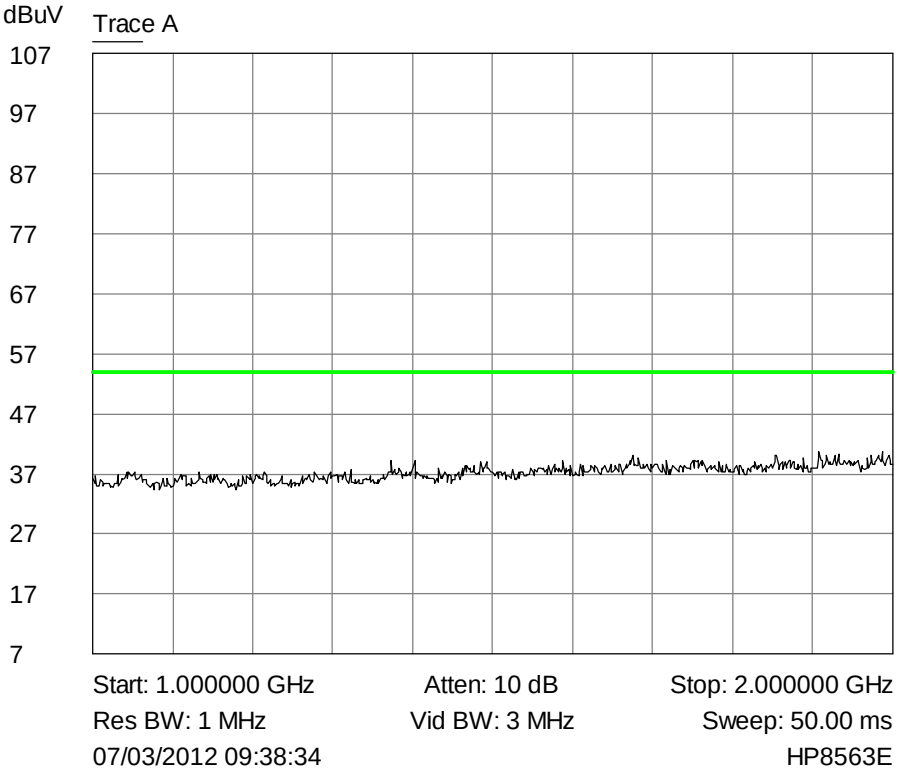
Start: 20.000000 GHz Atten: 10 dB Stop: 22.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
08/03/2012 12:18:56 HP8563E

J4997-4, Plot 0026, 22-25GHz horizontal mid channel

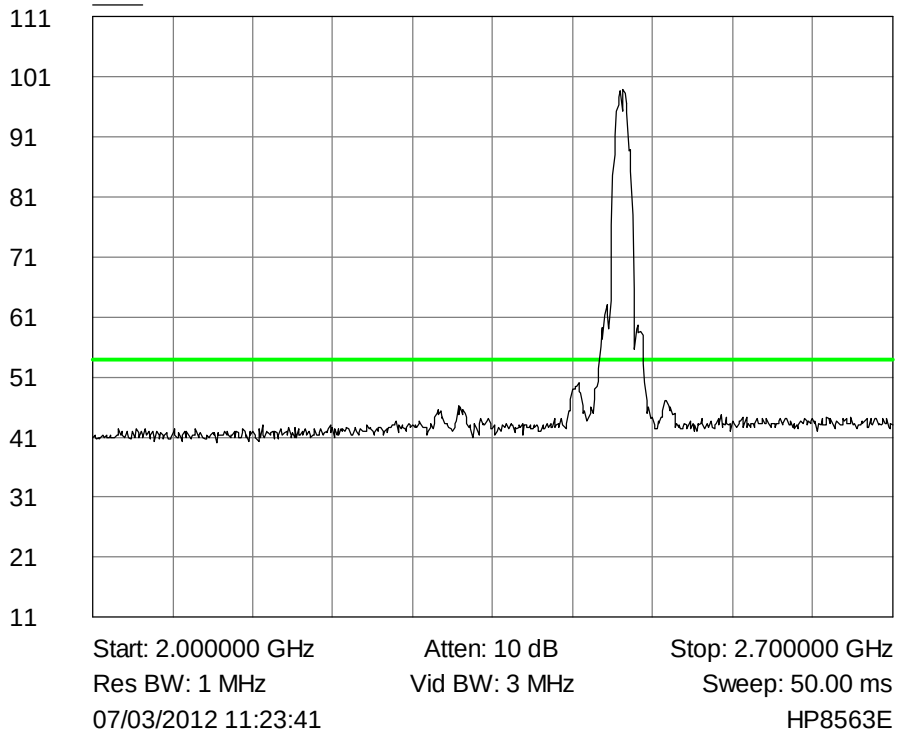


Plot of Peak Vertical emissions 1GHz - 25GHz against the Average limit line.

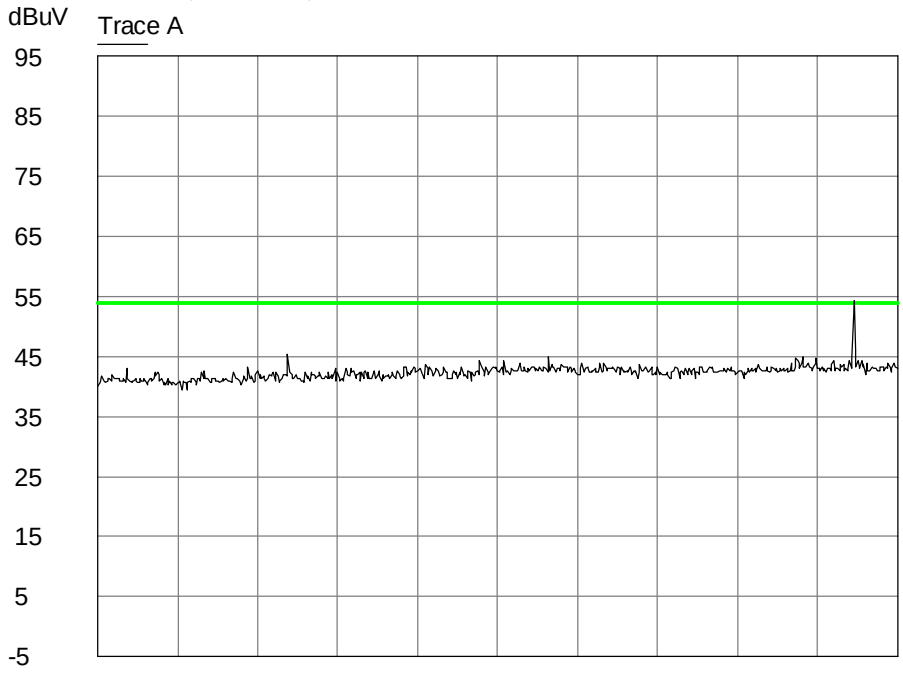
J4997-4, Plot 001, 1-2GHz Vertical mid channel



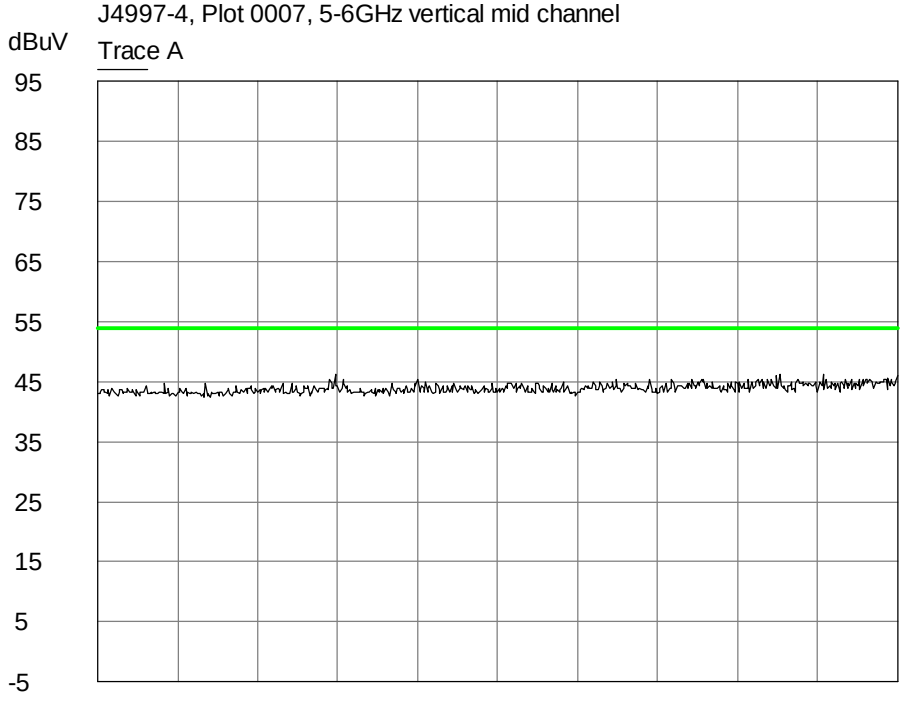
J4997-4, Plot 0003, 2-2.7GHz vertical mid channel averaged



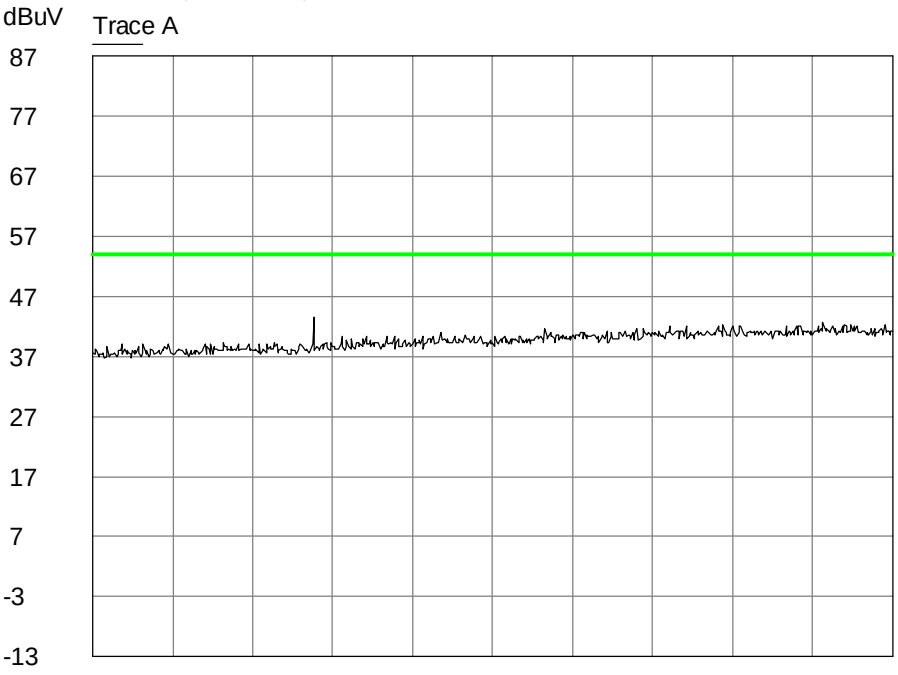
J4997-4, Plot 0006, 2.7-5GHz vertical mid channel



J4997-4, Plot 0007, 5-6GHz vertical mid channel

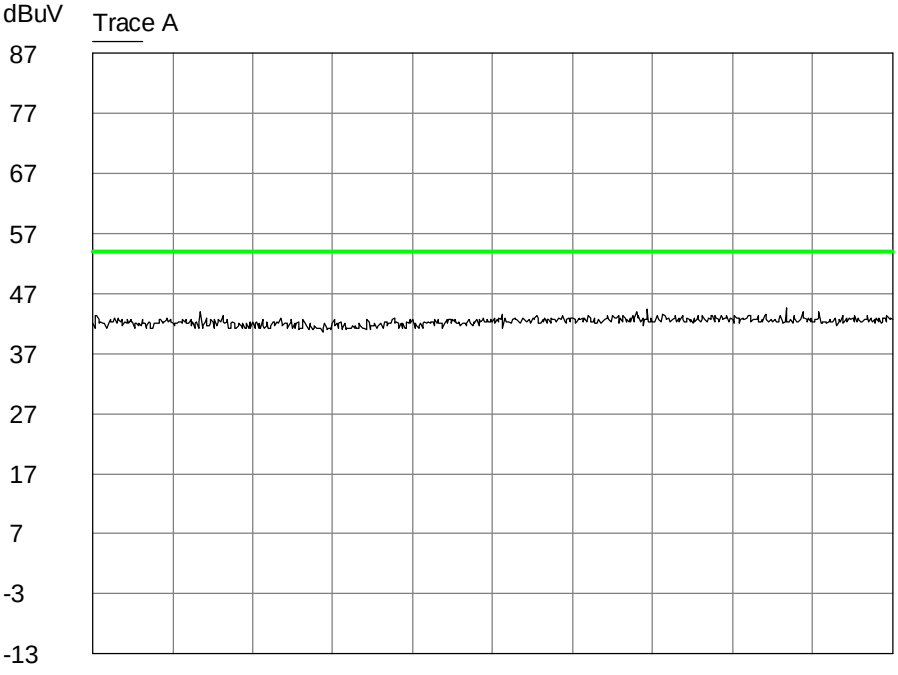


J4997-4, Plot 0009, 6-7.8GHz vertical mid channel



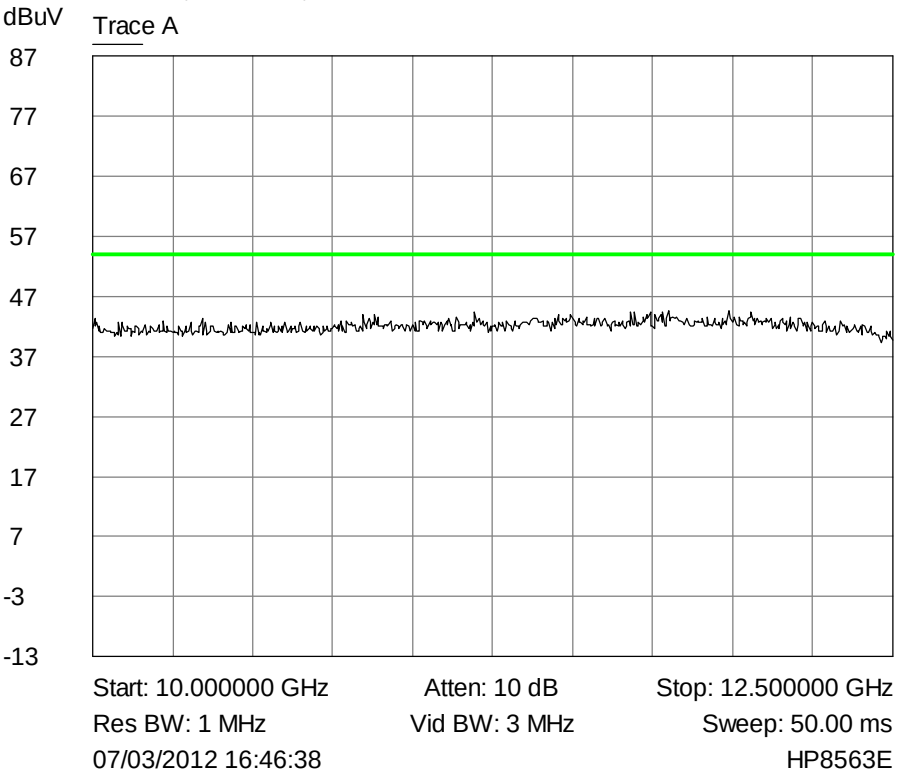
Start: 6.000000 GHz Atten: 10 dB Stop: 7.800000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
07/03/2012 15:56:45 HP8563E

J4997-4, Plot 0011, 7.8-10GHz vertical mid channel



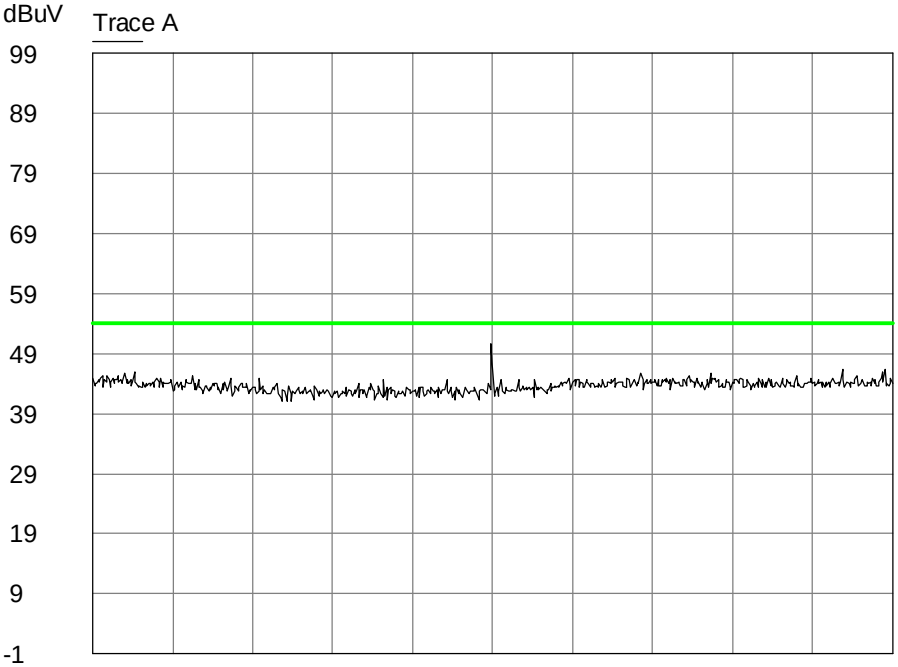
Start: 7.800000 GHz Atten: 10 dB Stop: 10.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
07/03/2012 16:44:02 HP8563E

J4997-4, Plot 0014, 10-12GHz vertical mid channel



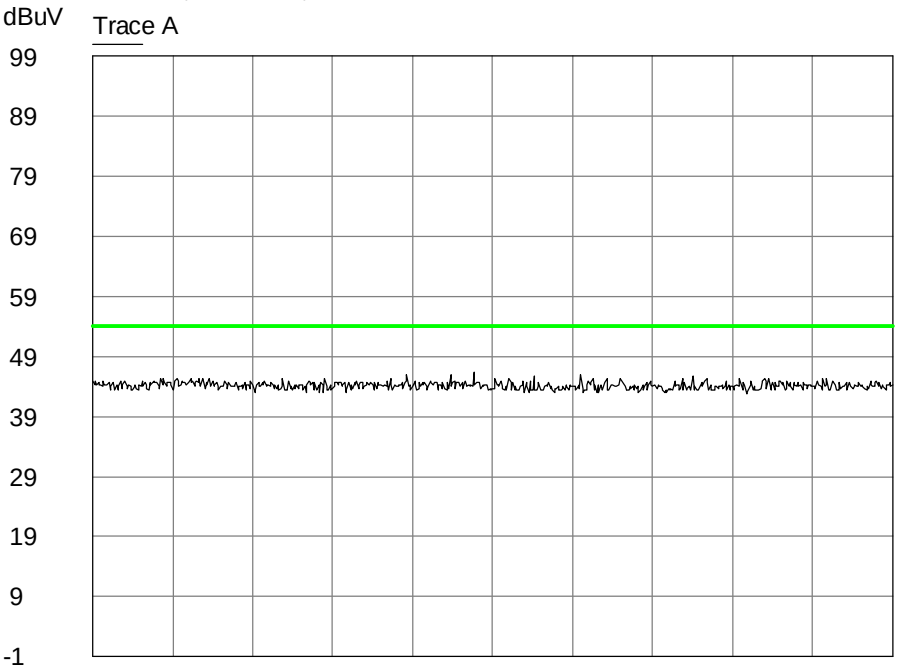
Start: 10.000000 GHz Atten: 10 dB Stop: 12.500000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
07/03/2012 16:46:38 HP8563E

J4997-4, Plot 0016, 12-14GHz vertical mid channel



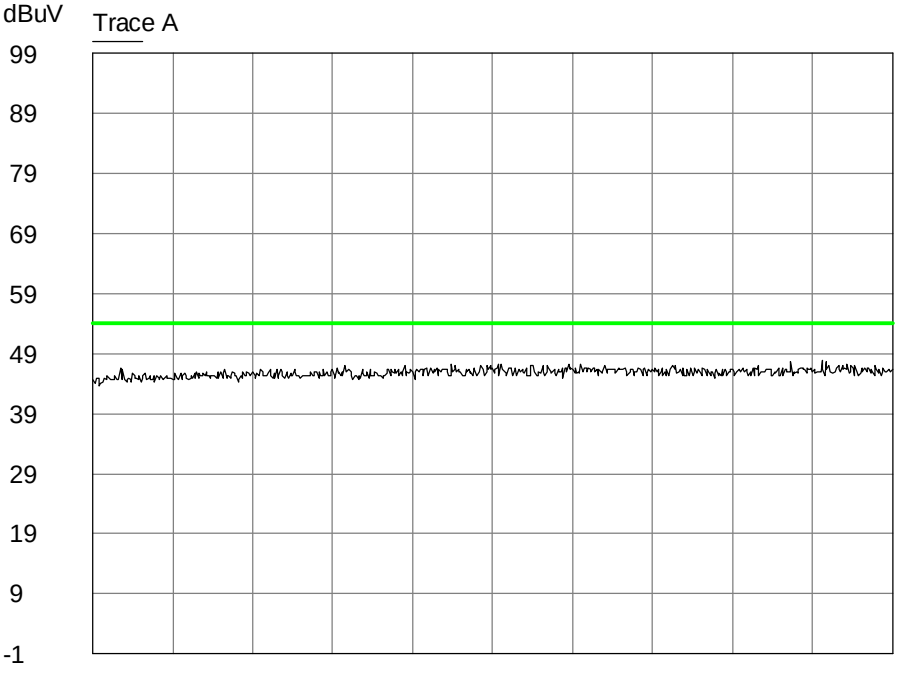
Start: 12.000000 GHz Atten: 10 dB Stop: 14.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
08/03/2012 11:59:04 HP8563E

J4997-4, Plot 0017, 14-16GHz vertical mid channel



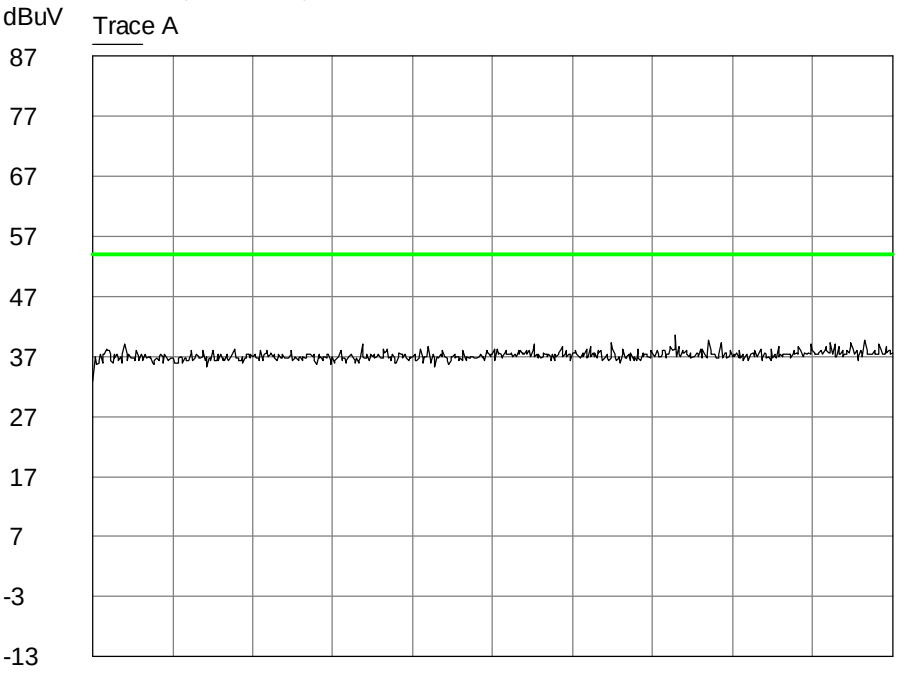
Start: 14.000000 GHz Atten: 10 dB Stop: 16.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
08/03/2012 12:00:25 HP8563E

J4997-4, Plot 0020, 16-18GHz vertical mid channel



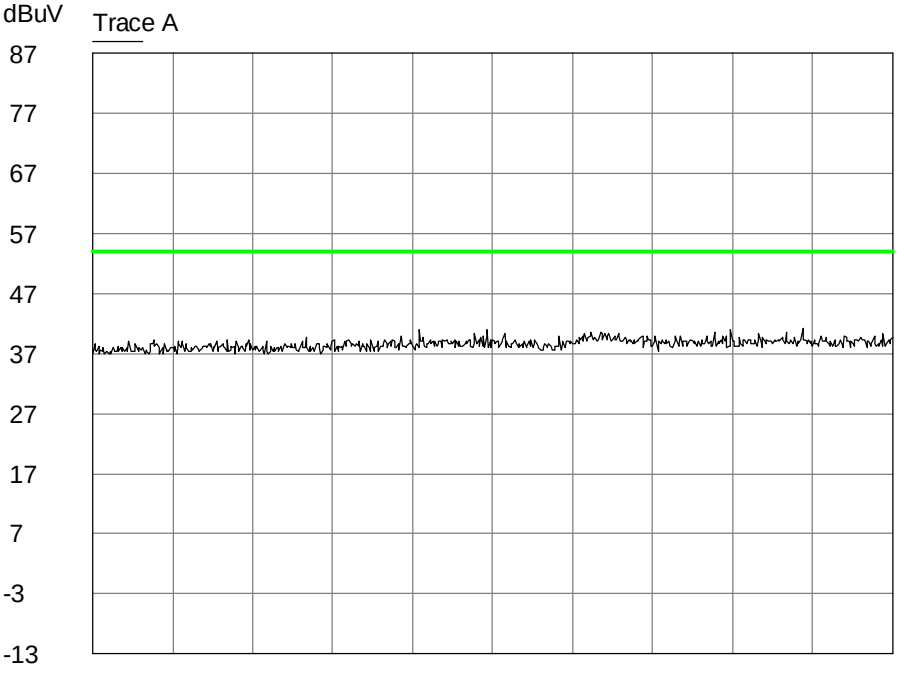
Start: 16.000000 GHz Atten: 10 dB Stop: 18.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
08/03/2012 12:02:55 HP8563E

J4997-4, Plot 0021, 18-20GHz vertical mid channel



Start: 18.000000 GHz Atten: 10 dB Stop: 20.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
08/03/2012 12:15:39 HP8563E

J4997-4, Plot 0024, 20-22GHz vertical mid channel



Start: 20.000000 GHz Atten: 10 dB Stop: 22.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 50.00 ms
08/03/2012 12:20:26 HP8563E

J4997-4, Plot 0025, 22-25GHz vertical mid channel

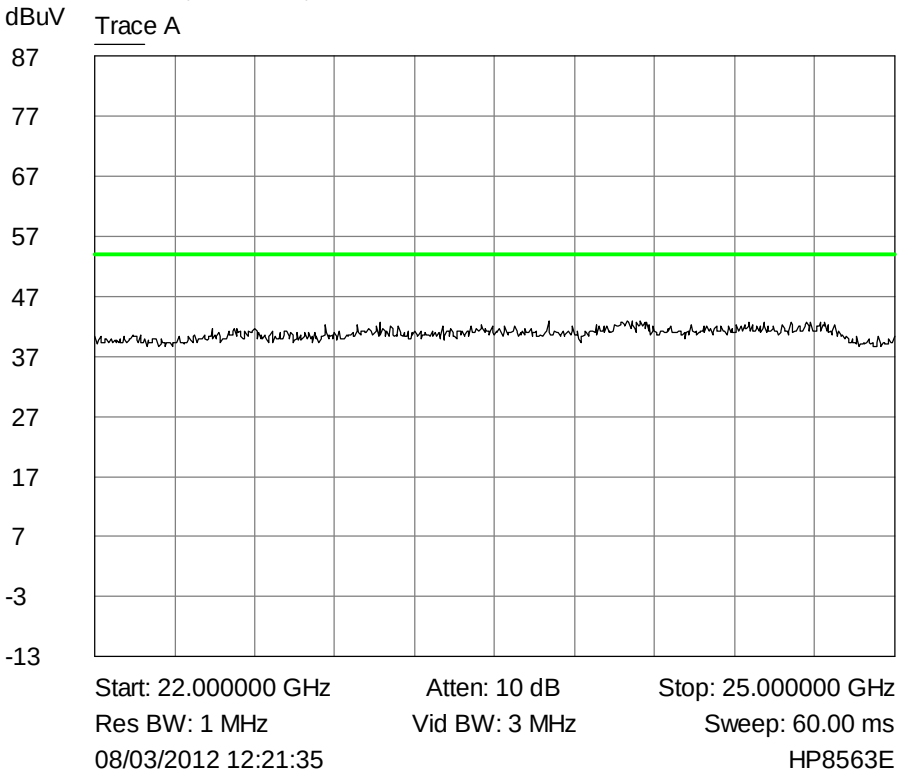


Table of signals measured within 20dB of limits above 1GHz.

Horizontal

Bottom channel TX.

Signal	Frequency (MHz)	PK measured	AV measured	AV-Lim
1	3216	42.2	36.4	-12.8
2	4824	55.6	51.6	-2.4
3	6432	47.3	41.6	-12.4
4	12864	51.3	47.5	-6.5

Middle channel TX.

Signal	Frequency (MHz)	PK measured	AV measured	AV-Lim
1	3249	40.5	36.2	-17.8
2	4884	56.2	51.9	-2.1
3	6498	47.1	41.9	-12.1
4	12997	51.2	46.3	-7.7

Top channel TX.

Signal	Frequency (MHz)	PK measured	AV measured	AV-Lim
1	3283	41.2	36.2	-17.8
2	4924	54.9	51.2	-2.8
3	6565	49.1	44.9	-9.1
4	13130	53.2	50.2	-3.8

Vertical

Bottom channel TX.

Signal	Frequency (MHz)	PK measured	AV measured	AV-Lim
1	3216	37.2	41.2	-12.8
2	4824	56.9	52.4	-1.6
3	6432	47.6	43.1	-10.9
4	12864	52.7	49.7	-14.3

Middle channel TX.

Signal	Frequency (MHz)	PK measured	AV measured	AV-Lim
1	3249	44.7	40.7	-13.3
2	4884	53.3	50.1	-3.9
3	6498	49.9	46.1	-7.9
4	12997	52.5	48.8	-5.2

Top channel TX.

Signal	Frequency (MHz)	PK measured	AV measured	AV-Lim
1	3283	45.2	39.5	-14.5
2	4924	56.7	53.4	-0.6
3	6565	48.1	41.8	-12.2
4	13130	54.3	51.8	-2.2

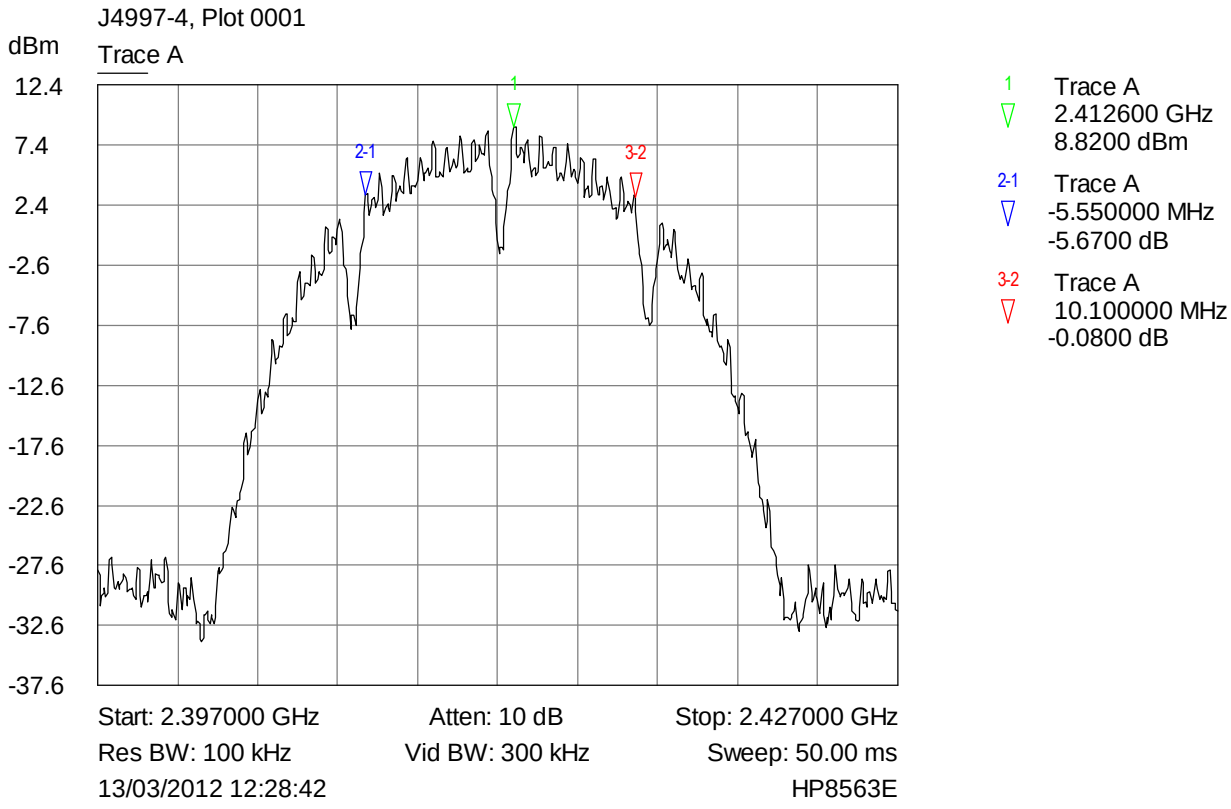
6.3 Fundamental Emissions

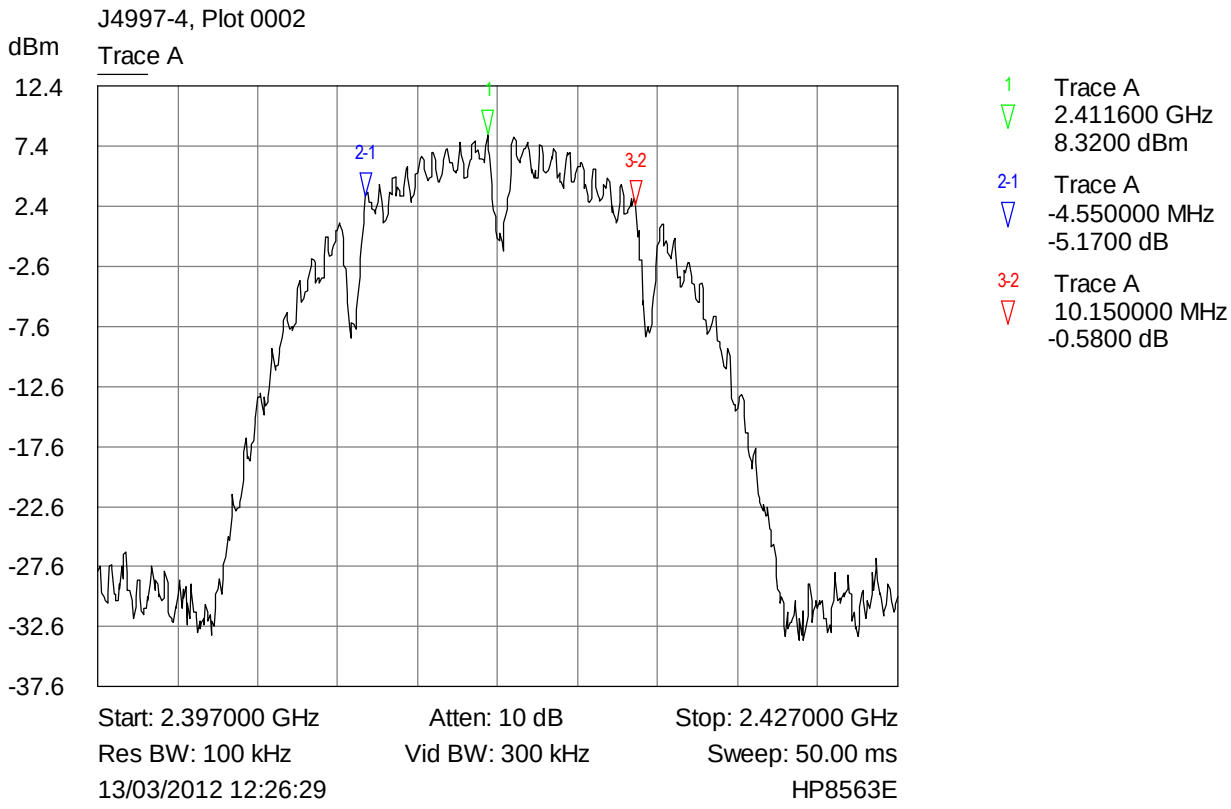
Please see Band edge plots for ERP field strength (PK)

6.4 Duty Cycle

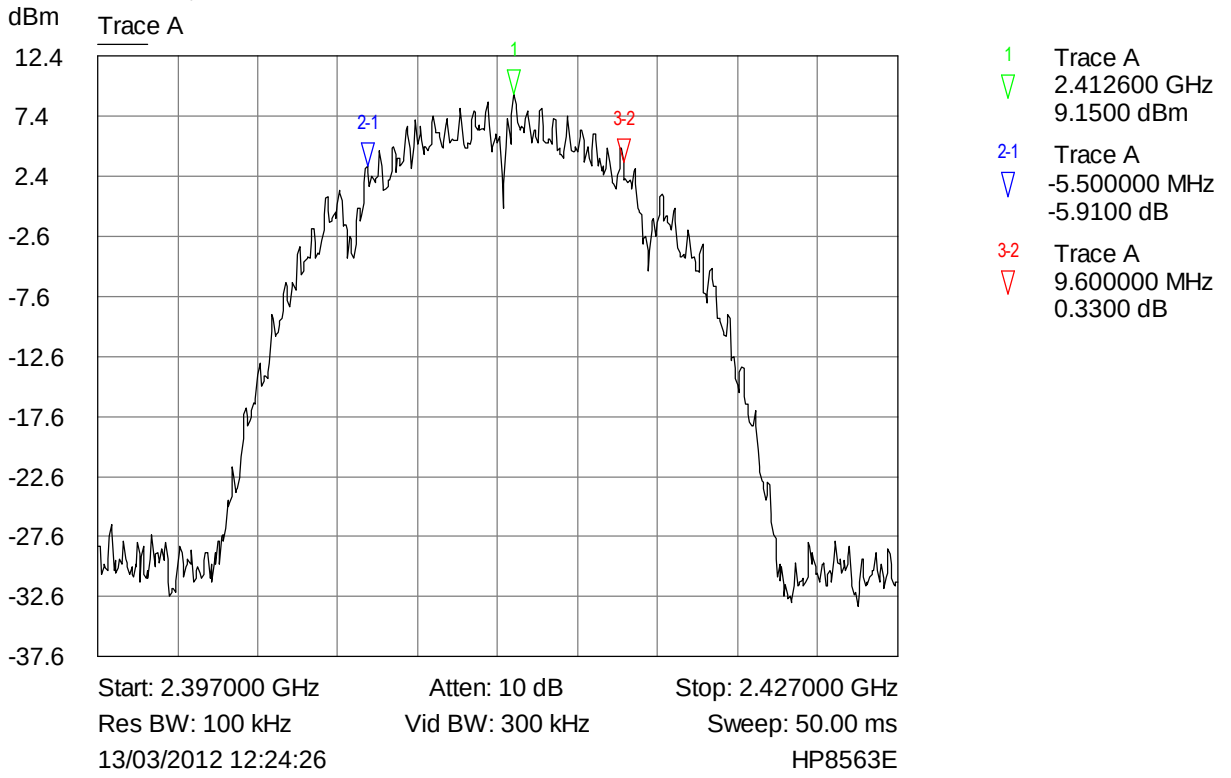
Not applicable, Tests performed with EUT in Constant 100% transmission state.

6.5 6dB Bandwidth





J4997-4, Plot 0003

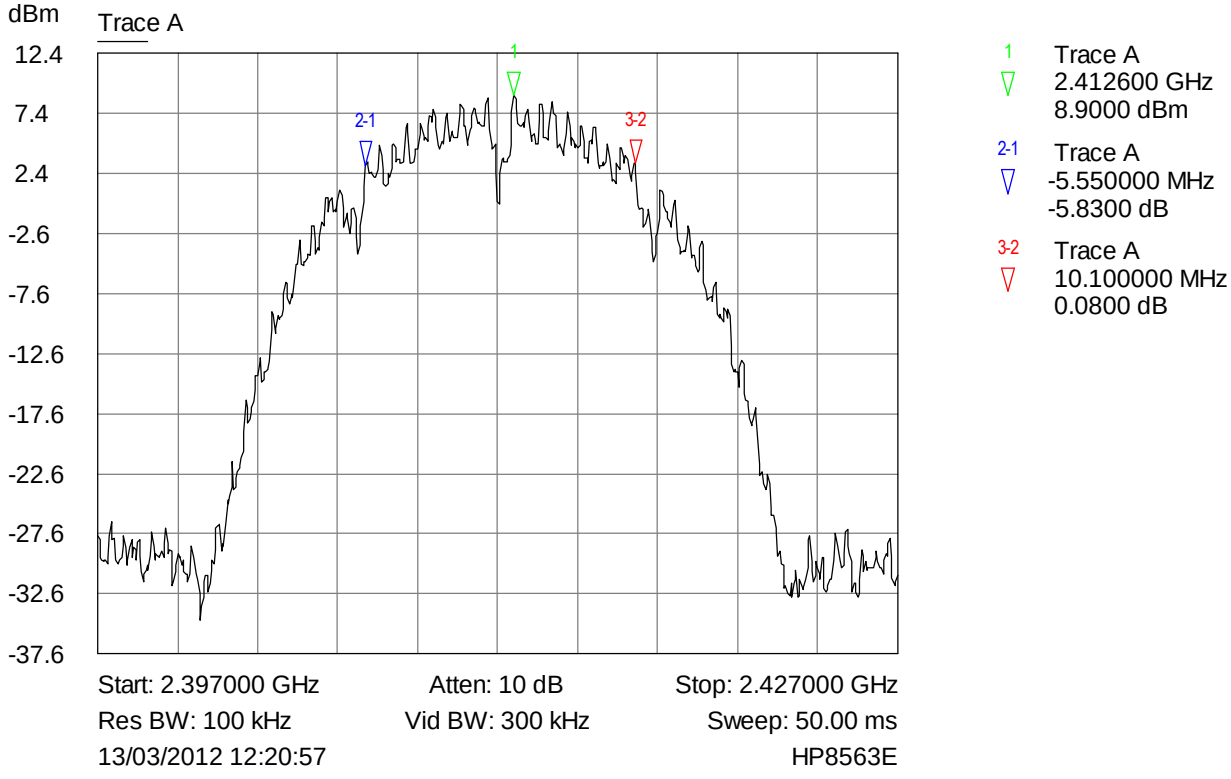


1 Trace A
2.412600 GHz
9.1500 dBm

2-1 Trace A
-5.500000 MHz
-5.9100 dB

3-2 Trace A
9.600000 MHz
0.3300 dB

J4997-4, Plot 0004

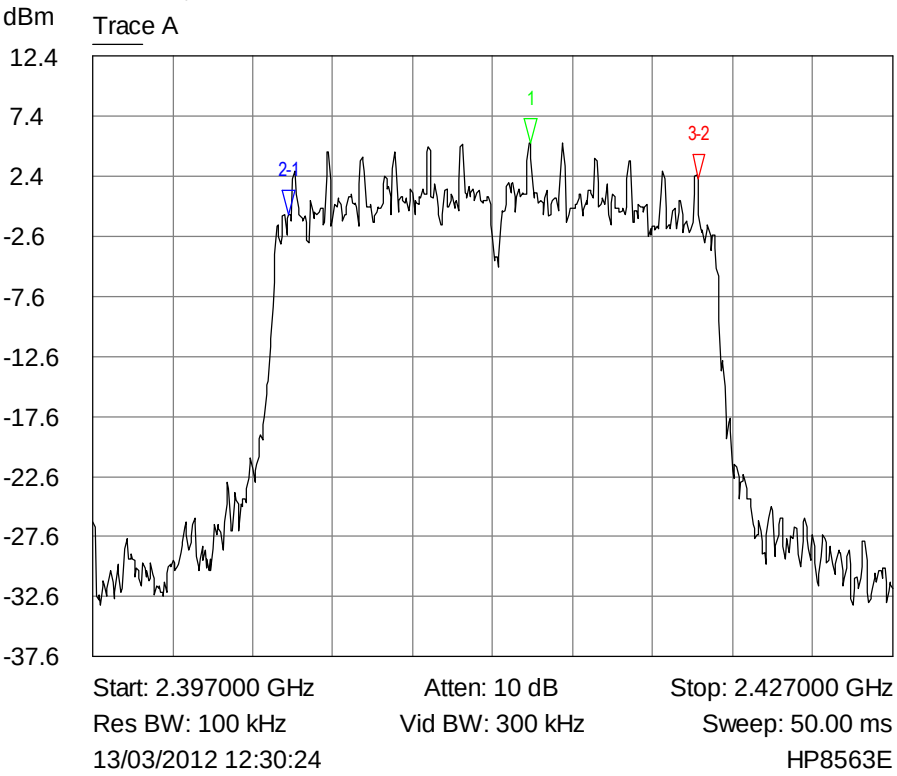


1 Trace A
2.412600 GHz
8.9000 dBm

2-1 Trace A
-5.550000 MHz
-5.8300 dB

3-2 Trace A
10.100000 MHz
0.0800 dB

J4997-4, Plot 0005



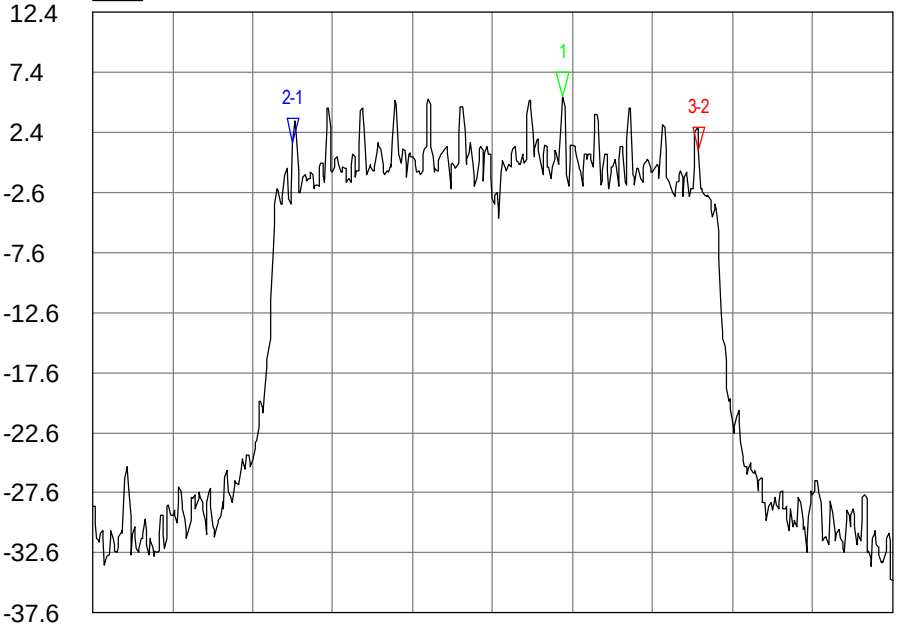
1 Trace A
2.413400 GHz
5.2400 dBm

2-1 Trace A
-9.050000 MHz
-6.0000 dB

3-2 Trace A
15.350000 MHz
3.0000 dB

Start: 2.397000 GHz | Atten: 10 dB | Stop: 2.427000 GHz
Res BW: 100 kHz | Vid BW: 300 kHz | Sweep: 50.00 ms
13/03/2012 12:30:24 | HP8563E

J4997-4, Plot 0006



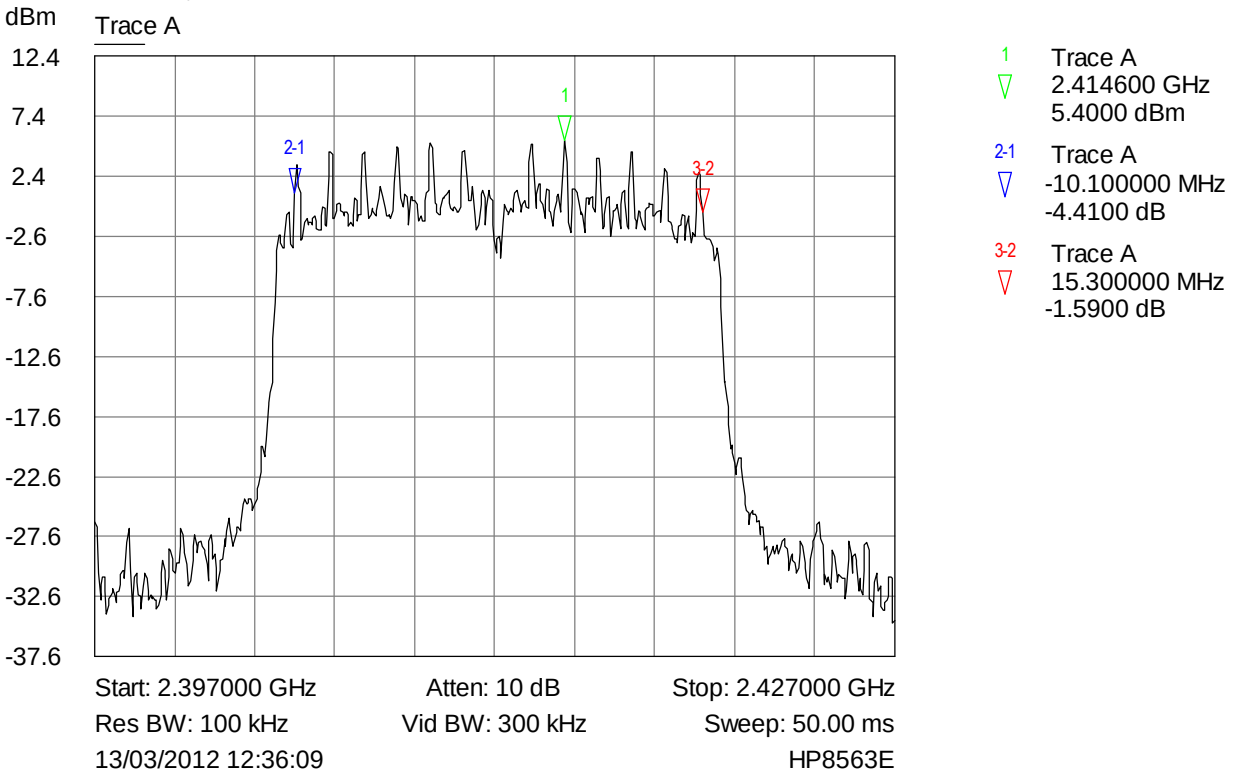
1 Trace A
2.414600 GHz
5.4000 dBm

2-1 Trace A
-10.100000 MHz
-3.8300 dB

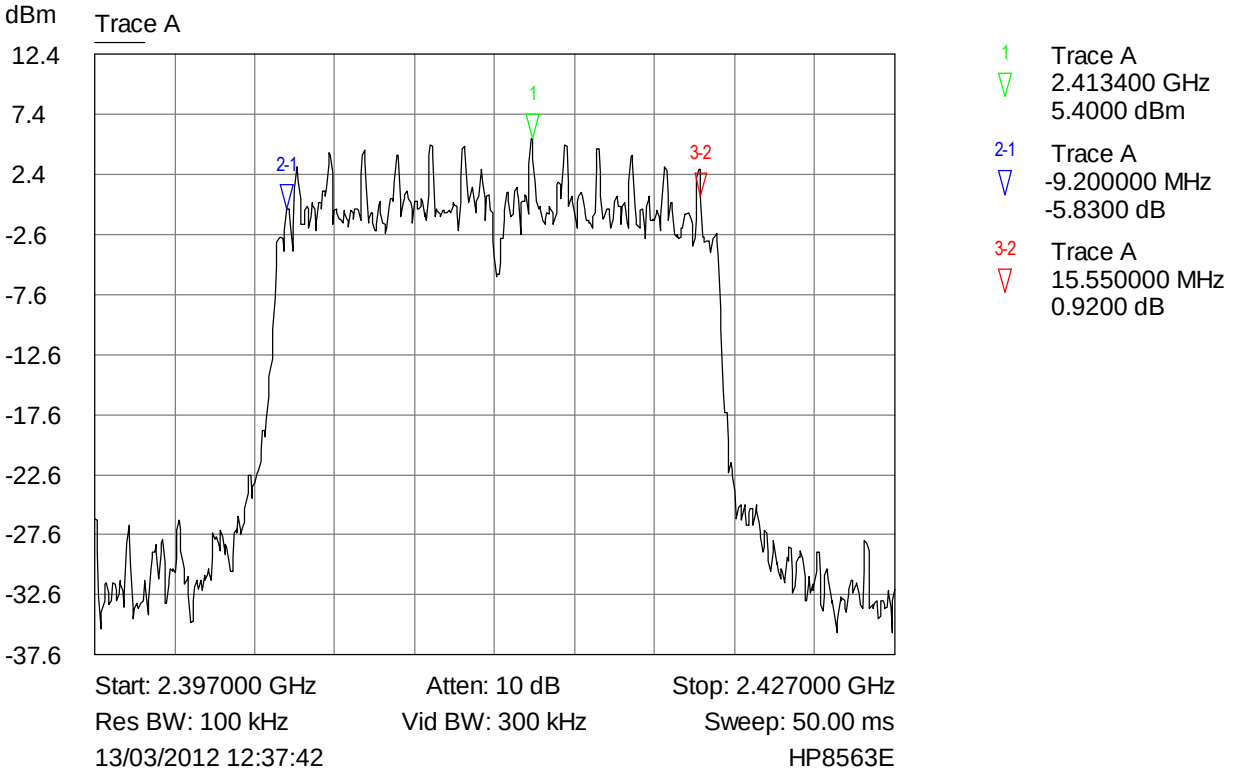
3-2 Trace A
15.250000 MHz
-0.6700 dB

Start: 2.397000 GHz | Atten: 10 dB | Stop: 2.427000 GHz
Res BW: 100 kHz | Vid BW: 300 kHz | Sweep: 50.00 ms
13/03/2012 12:32:55 | HP8563E

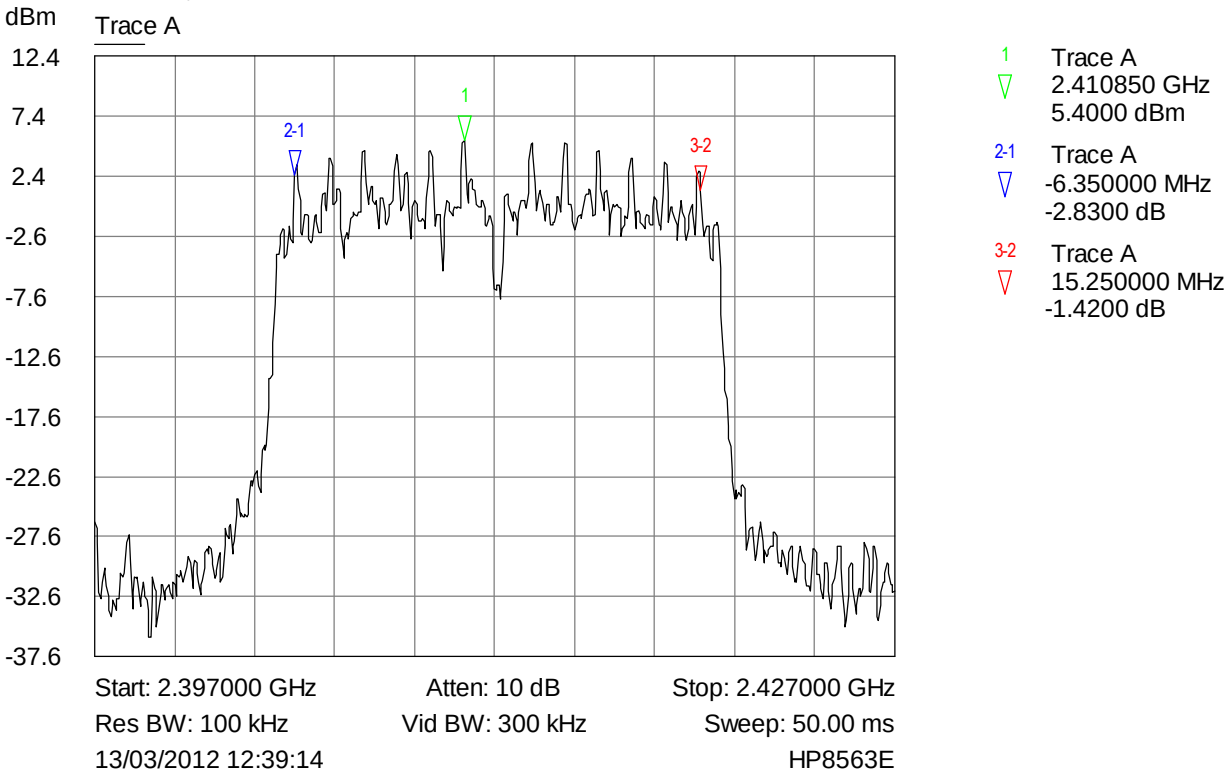
J4997-4, Plot 0007



J4997-4, Plot 0008

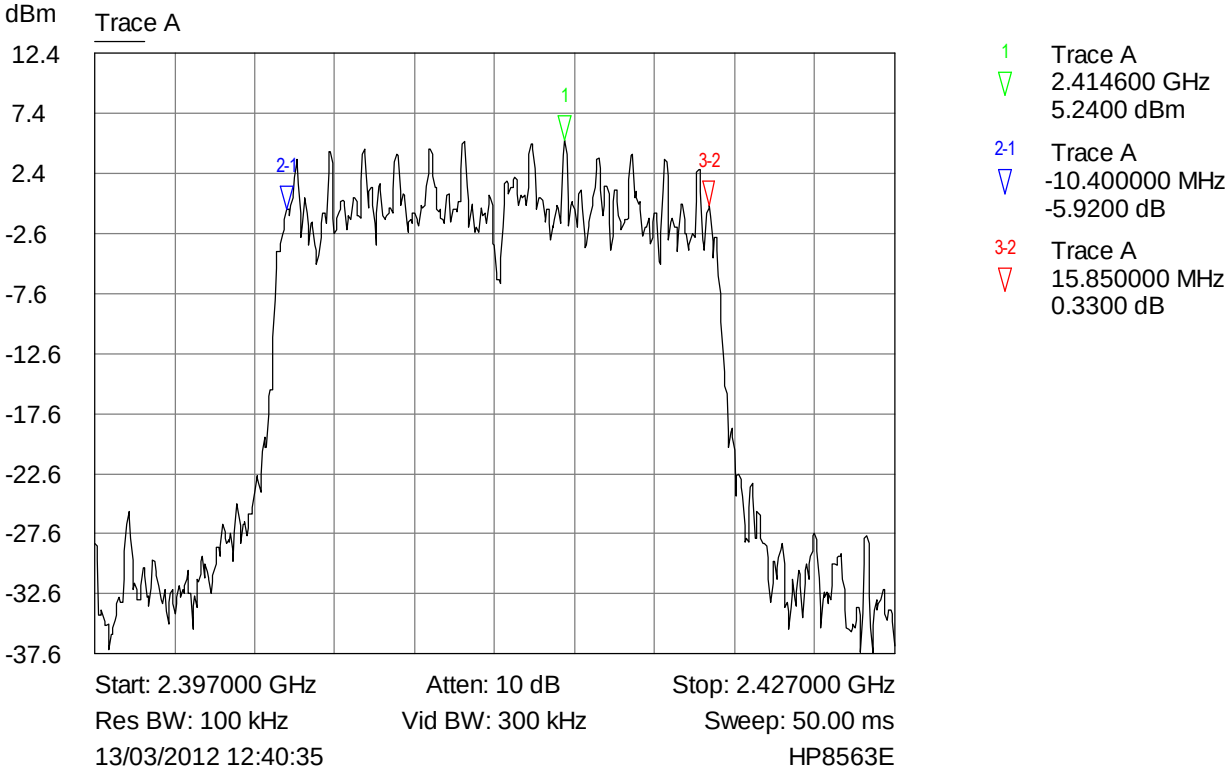


J4997-4, Plot 0009



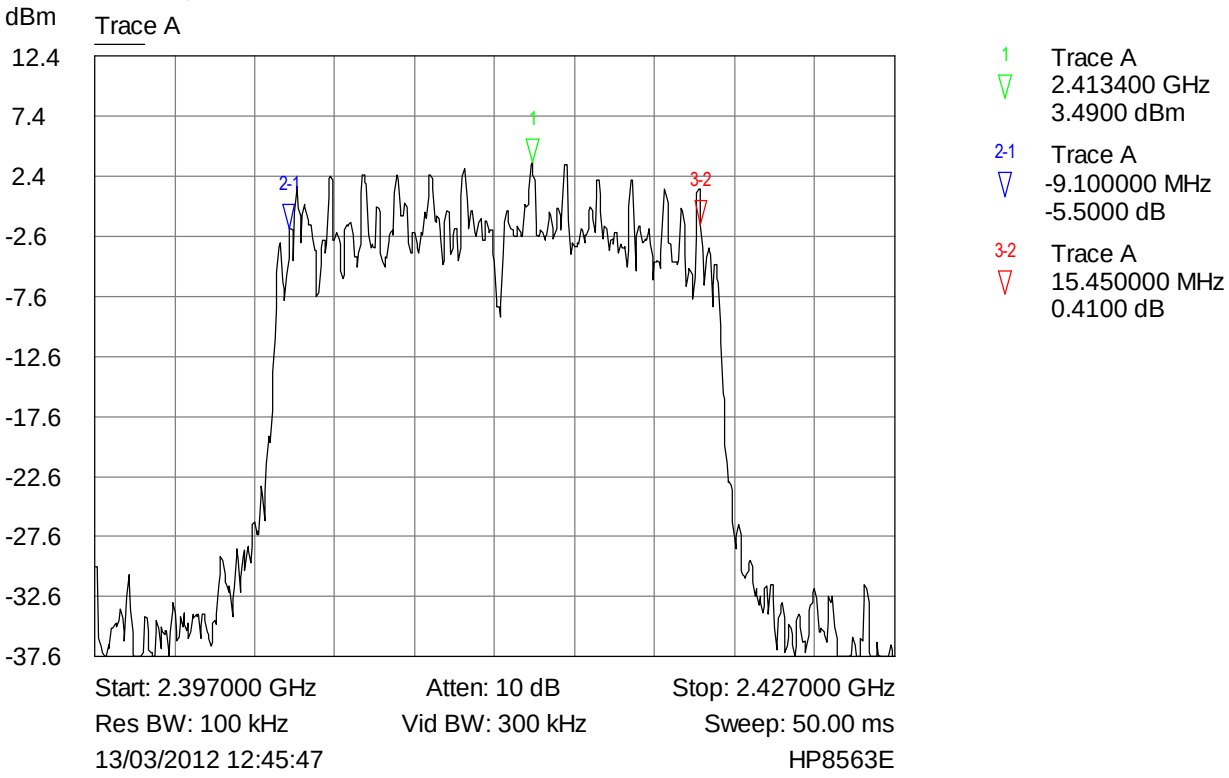
Start: 2.397000 GHz Atten: 10 dB Stop: 2.427000 GHz
Res BW: 100 kHz Vid BW: 300 kHz Sweep: 50.00 ms
13/03/2012 12:39:14 HP8563E

J4997-4, Plot 0010



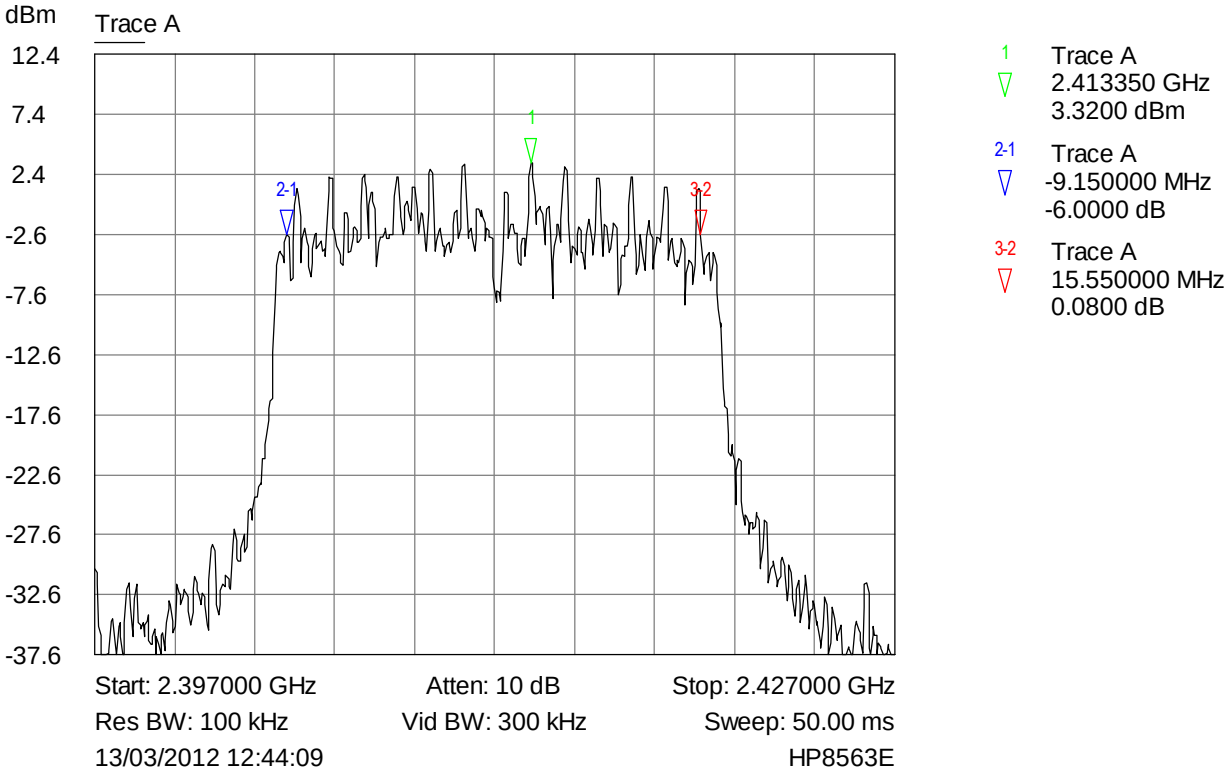
Start: 2.397000 GHz Atten: 10 dB Stop: 2.427000 GHz
Res BW: 100 kHz Vid BW: 300 kHz Sweep: 50.00 ms
13/03/2012 12:40:35 HP8563E

J4997-4, Plot 0011



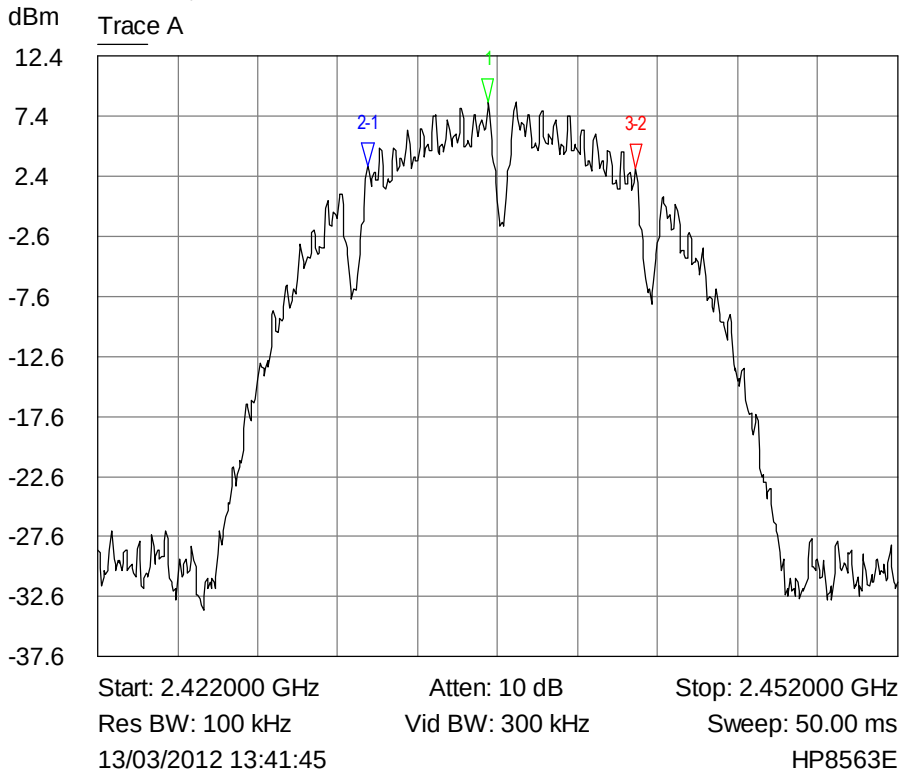
Start: 2.397000 GHz Atten: 10 dB Stop: 2.427000 GHz
Res BW: 100 kHz Vid BW: 300 kHz Sweep: 50.00 ms
13/03/2012 12:45:47 HP8563E

J4997-4, Plot 0012



Start: 2.397000 GHz Atten: 10 dB Stop: 2.427000 GHz
Res BW: 100 kHz Vid BW: 300 kHz Sweep: 50.00 ms
13/03/2012 12:44:09 HP8563E

J4997-4, Plot 0013



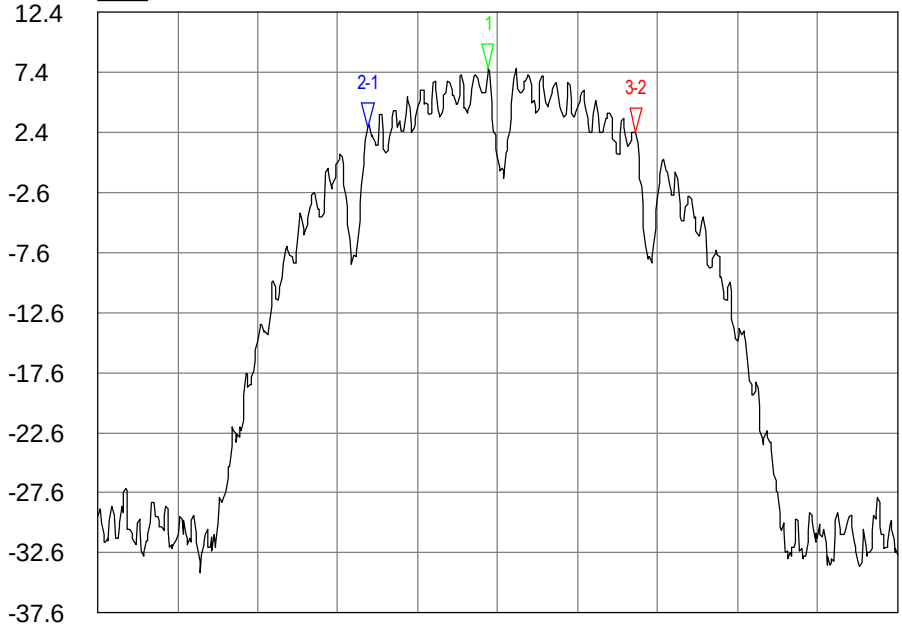
1 Trace A
2.436650 GHz
8.5700 dBm

2-1 Trace A
-4.550000 MHz
-5.4200 dB

3-2 Trace A
10.100000 MHz
-0.1600 dB

Start: 2.422000 GHz | Atten: 10 dB | Stop: 2.452000 GHz
Res BW: 100 kHz | Vid BW: 300 kHz | Sweep: 50.00 ms
13/03/2012 13:41:45 | HP8563E

J4997-4, Plot 0014



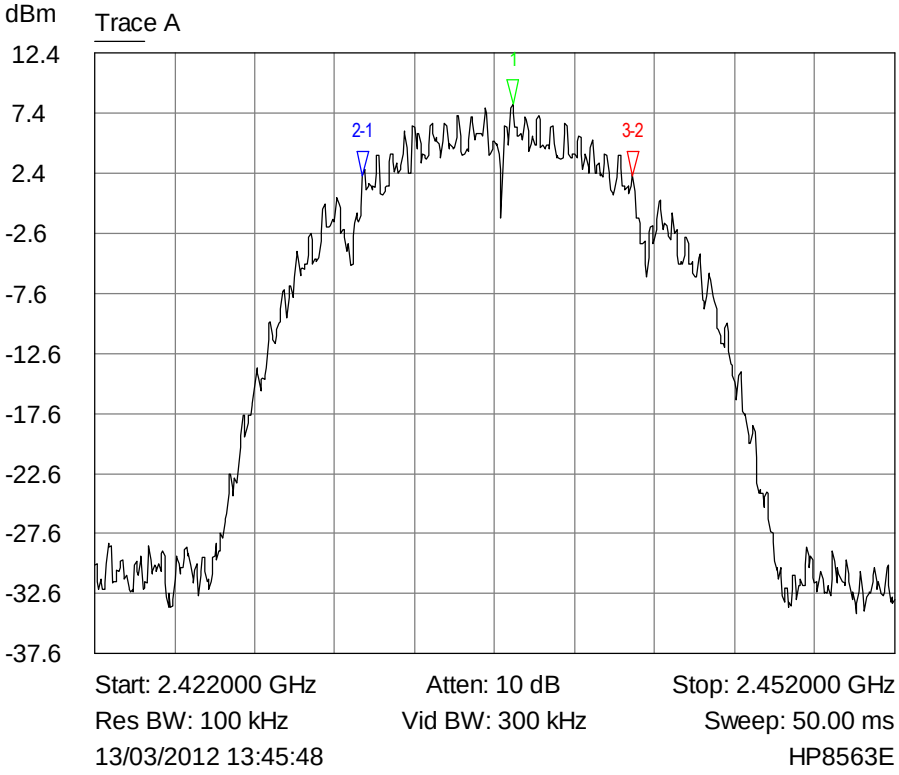
1 Trace A
2.436650 GHz
7.7400 dBm

2-1 Trace A
-4.550000 MHz
-4.9200 dB

3-2 Trace A
10.100000 MHz
-0.4200 dB

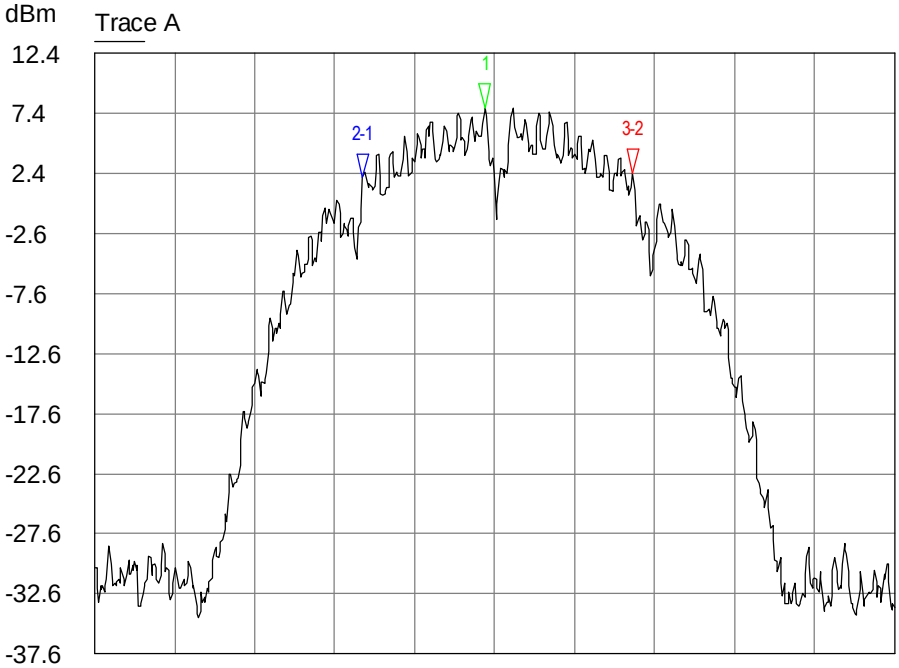
Start: 2.422000 GHz | Atten: 10 dB | Stop: 2.452000 GHz
Res BW: 100 kHz | Vid BW: 300 kHz | Sweep: 50.00 ms
13/03/2012 13:44:23 | HP8563E

J4997-4, Plot 0015



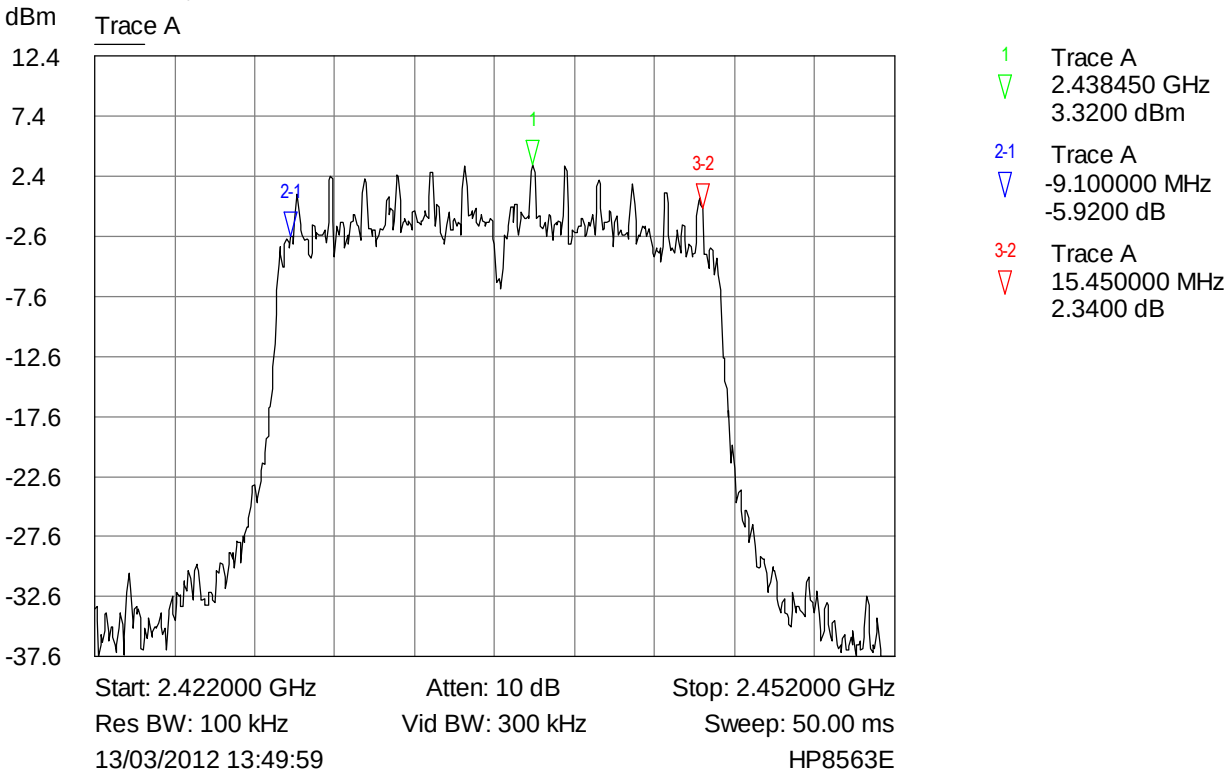
Start: 2.422000 GHz Atten: 10 dB Stop: 2.452000 GHz
Res BW: 100 kHz Vid BW: 300 kHz Sweep: 50.00 ms
13/03/2012 13:45:48 HP8563E

J4997-4, Plot 0016

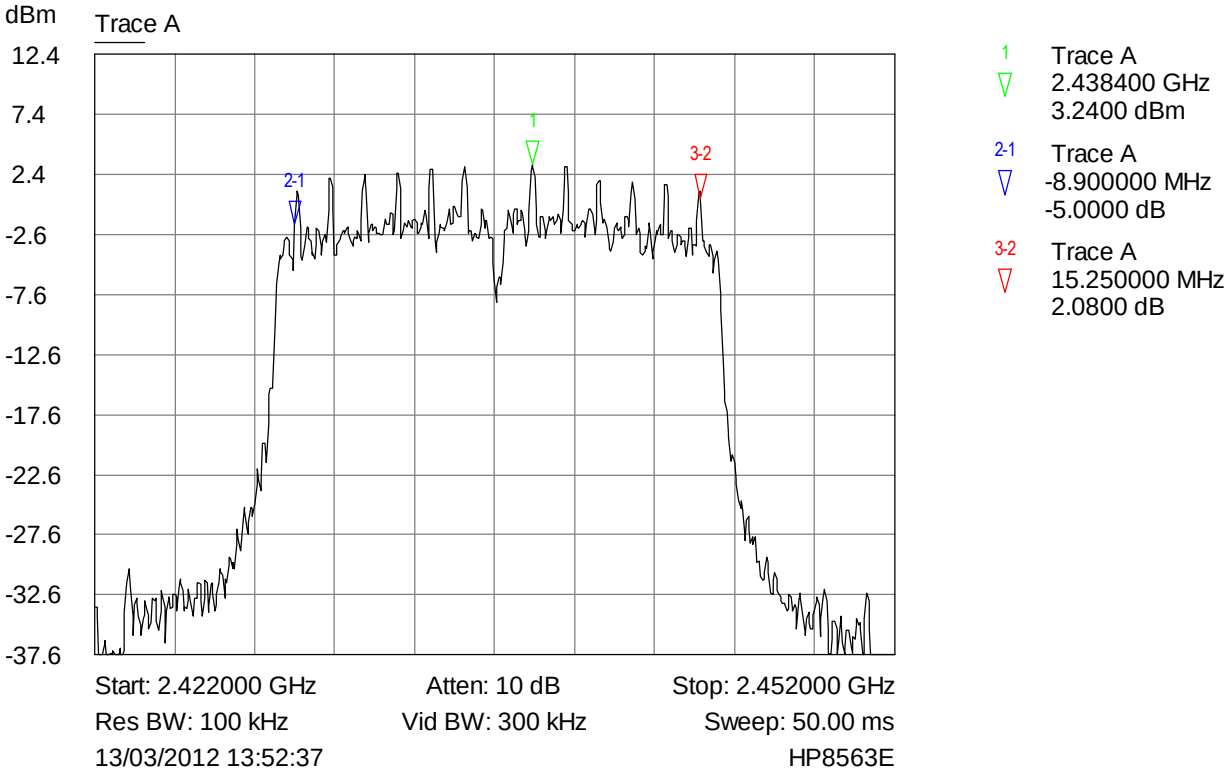


Start: 2.422000 GHz Atten: 10 dB Stop: 2.452000 GHz
Res BW: 100 kHz Vid BW: 300 kHz Sweep: 50.00 ms
13/03/2012 13:48:43 HP8563E

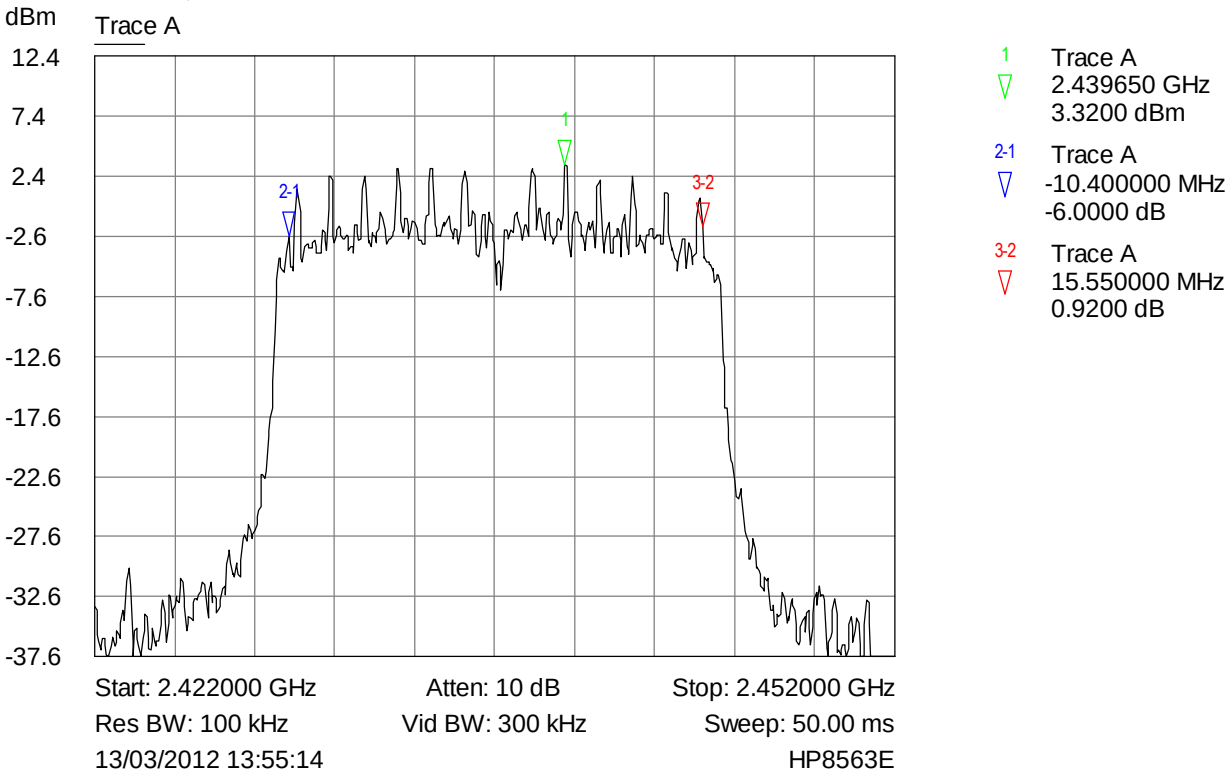
J4997-4, Plot 0017



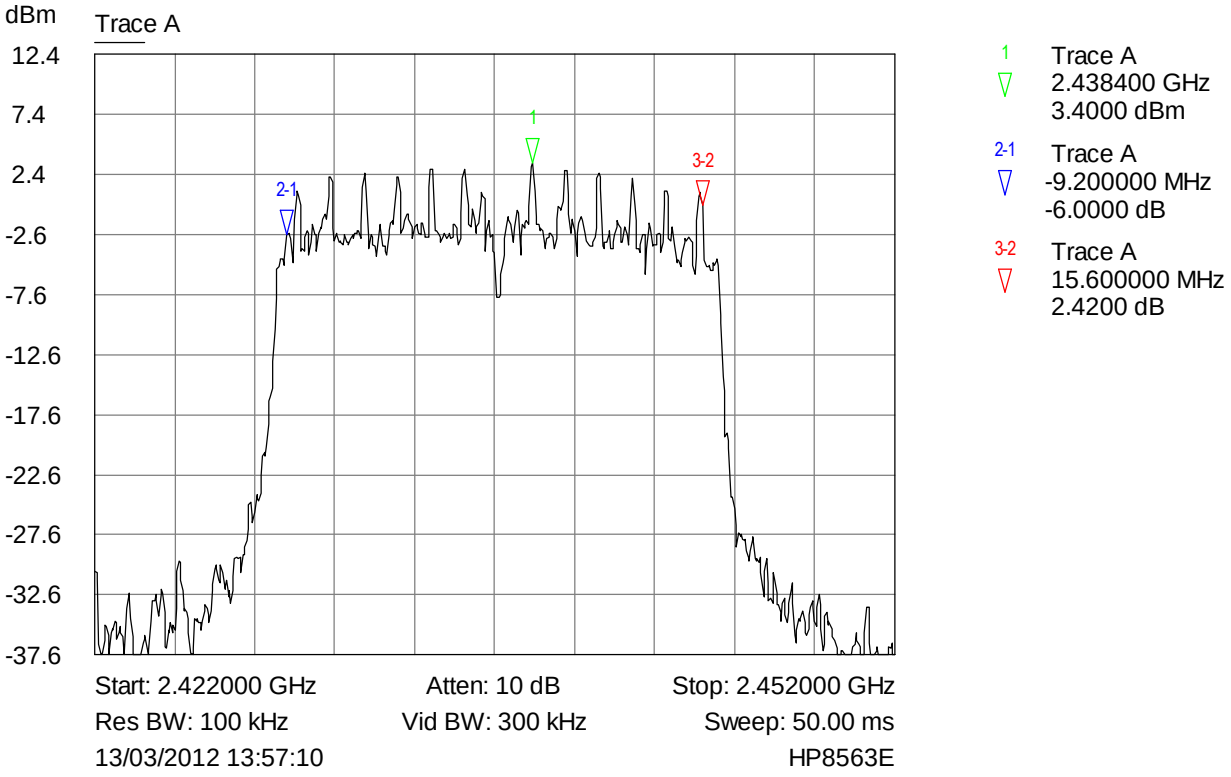
J4997-4, Plot 0018



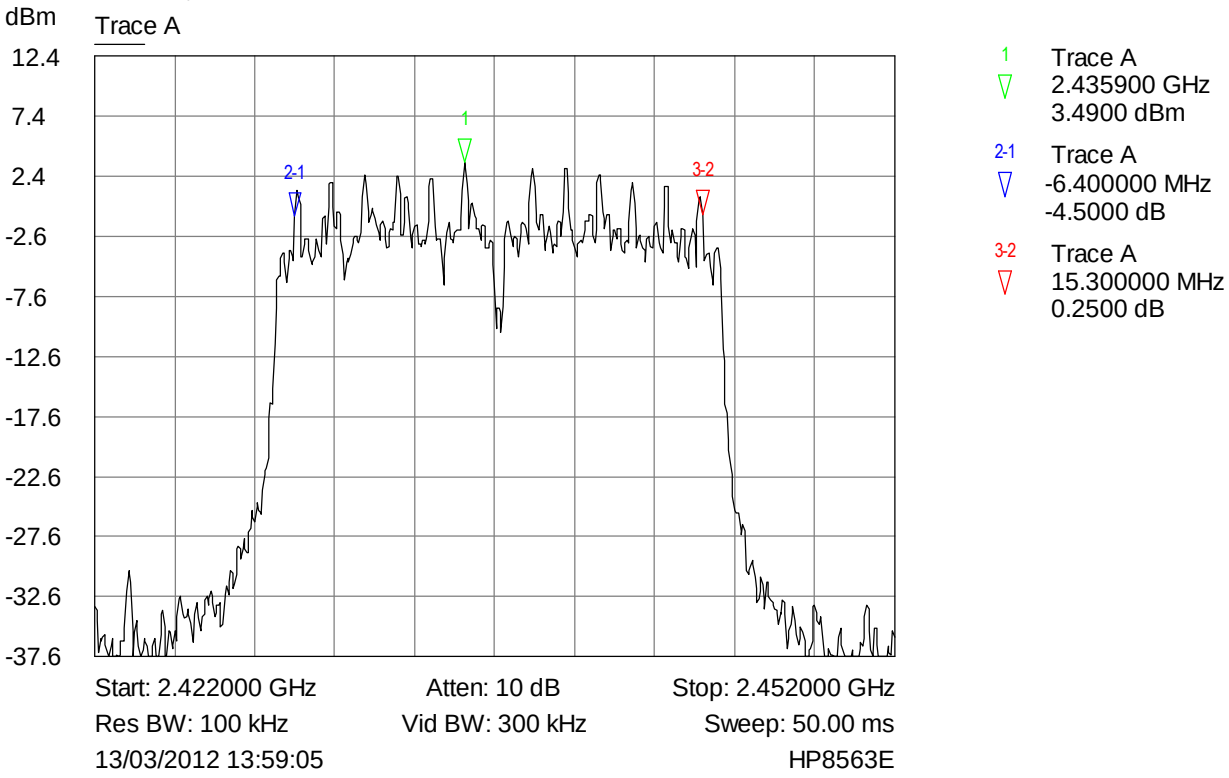
J4997-4, Plot 0019



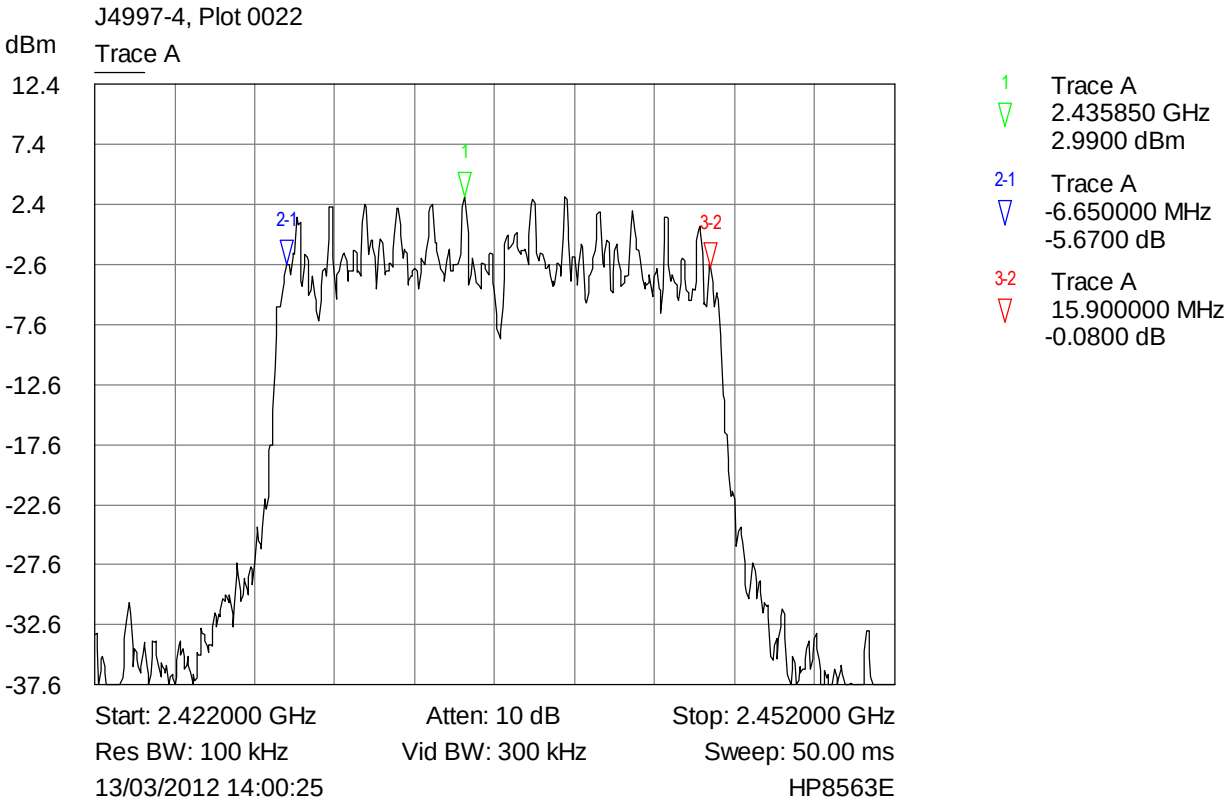
J4997-4, Plot 0020



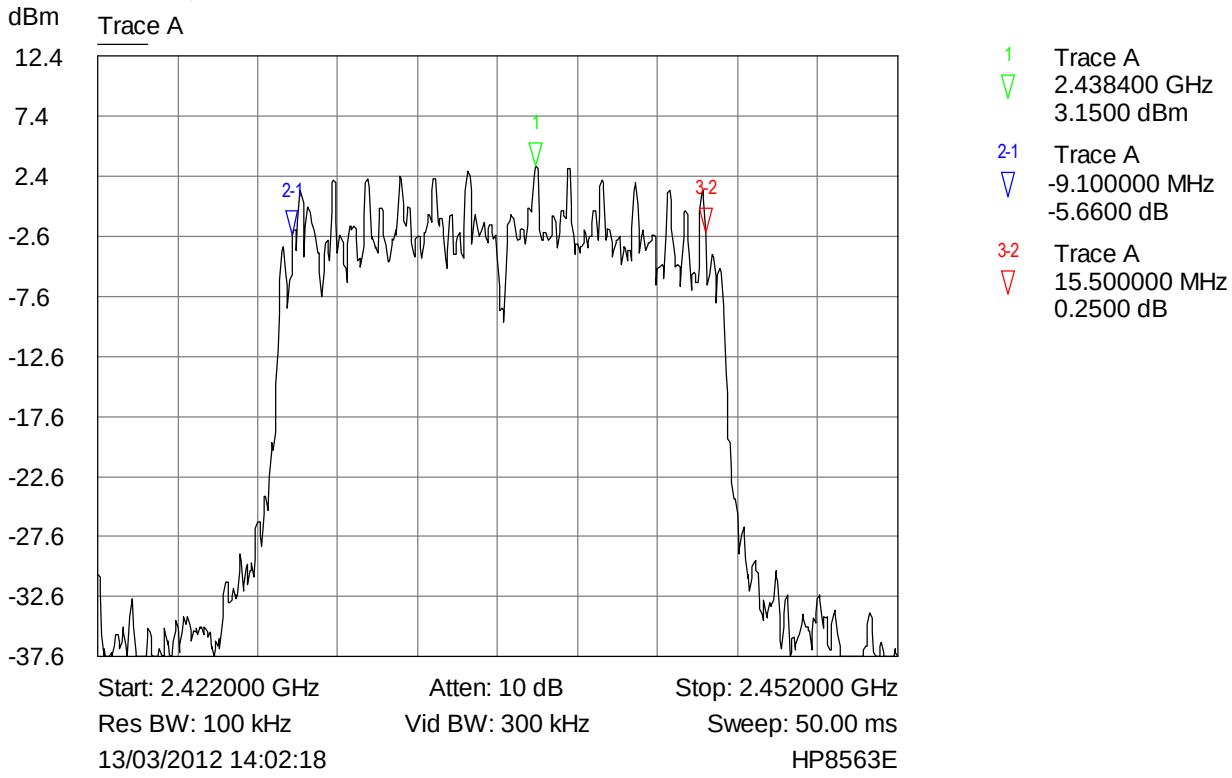
J4997-4, Plot 0021



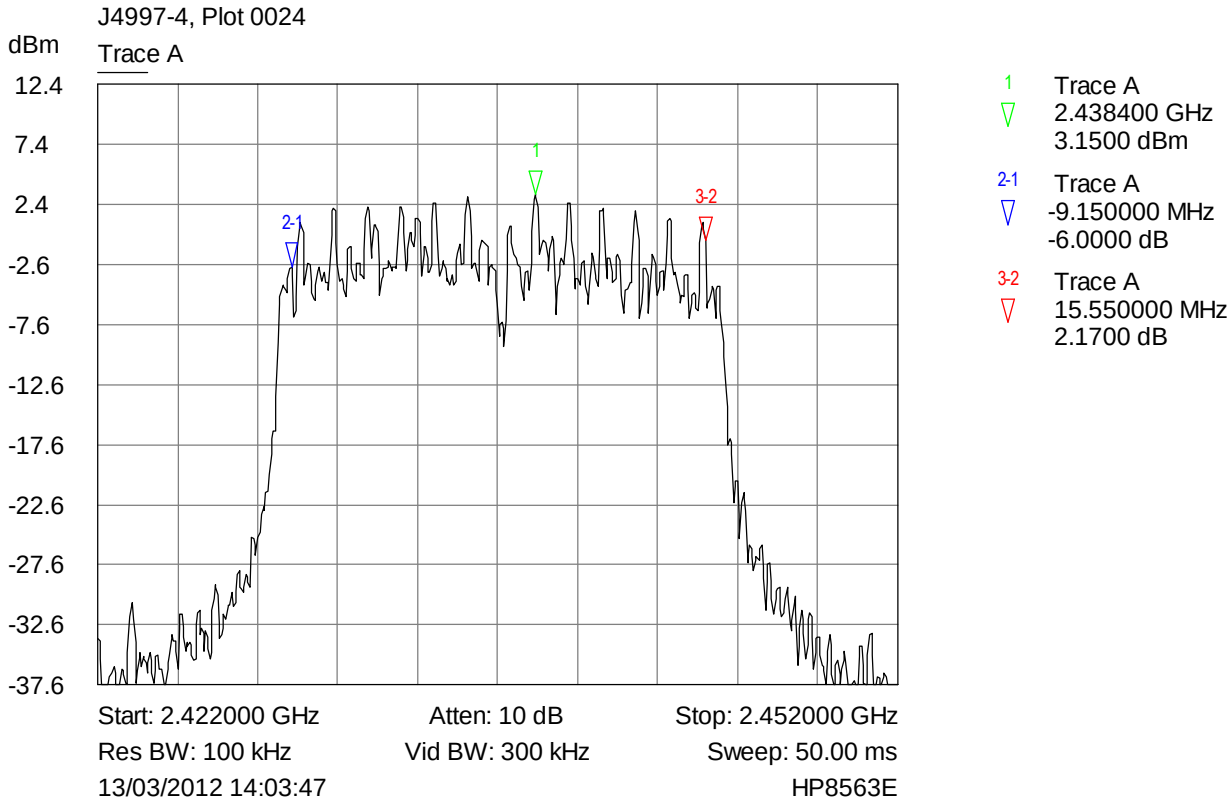
J4997-4, Plot 0022



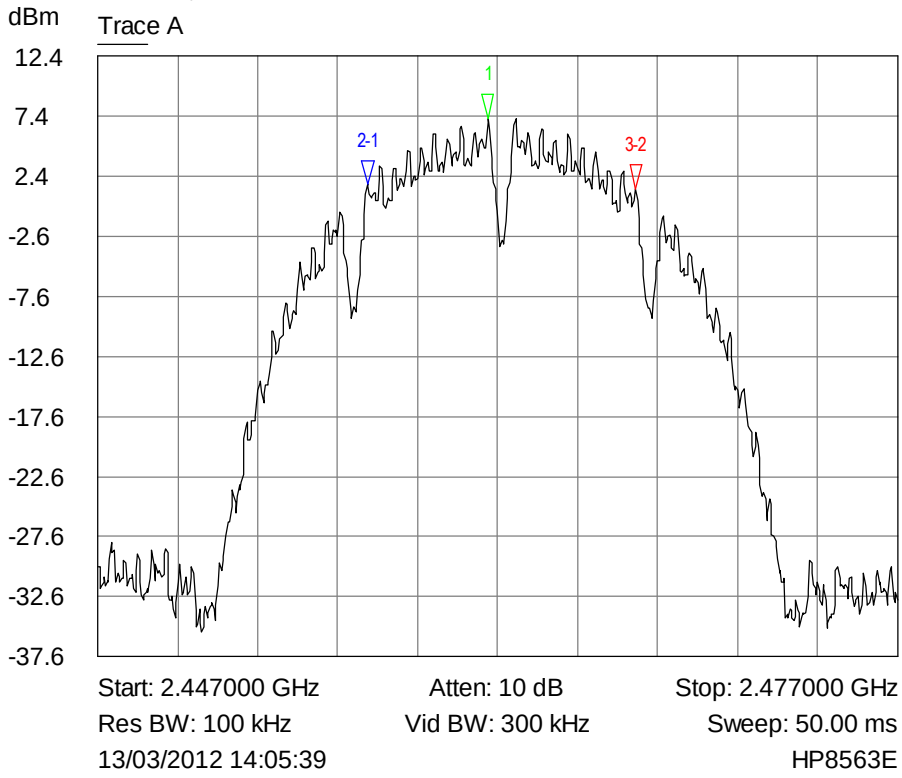
J4997-4, Plot 0023



J4997-4, Plot 0024



J4997-4, Plot 0025



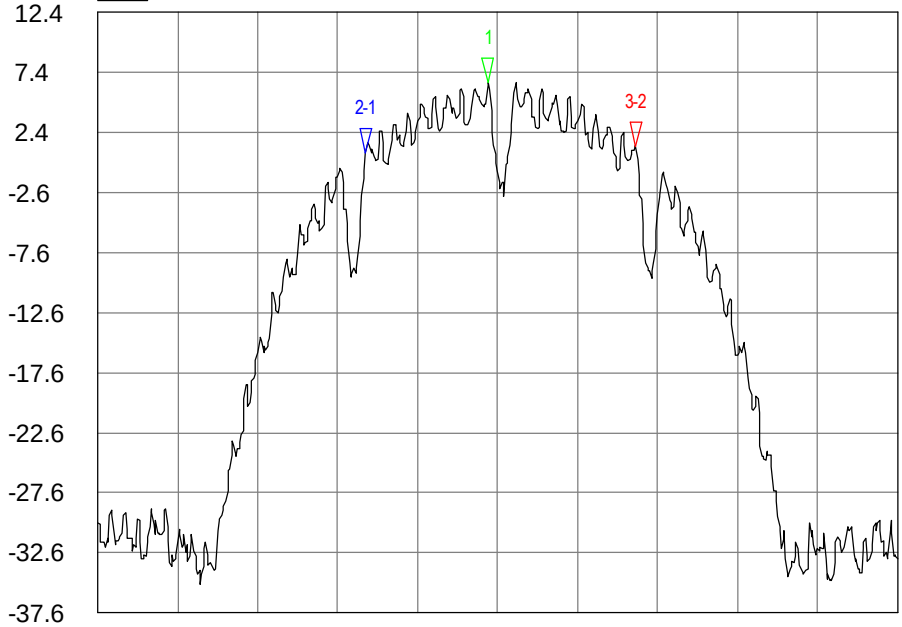
1 Trace A
2.461650 GHz
7.1500 dBm

2-1 Trace A
-4.550000 MHz
-5.4100 dB

3-2 Trace A
10.100000 MHz
-0.3400 dB

Start: 2.447000 GHz | Atten: 10 dB | Stop: 2.477000 GHz
Res BW: 100 kHz | Vid BW: 300 kHz | Sweep: 50.00 ms
13/03/2012 14:05:39 | HP8563E

J4997-4, Plot 0026



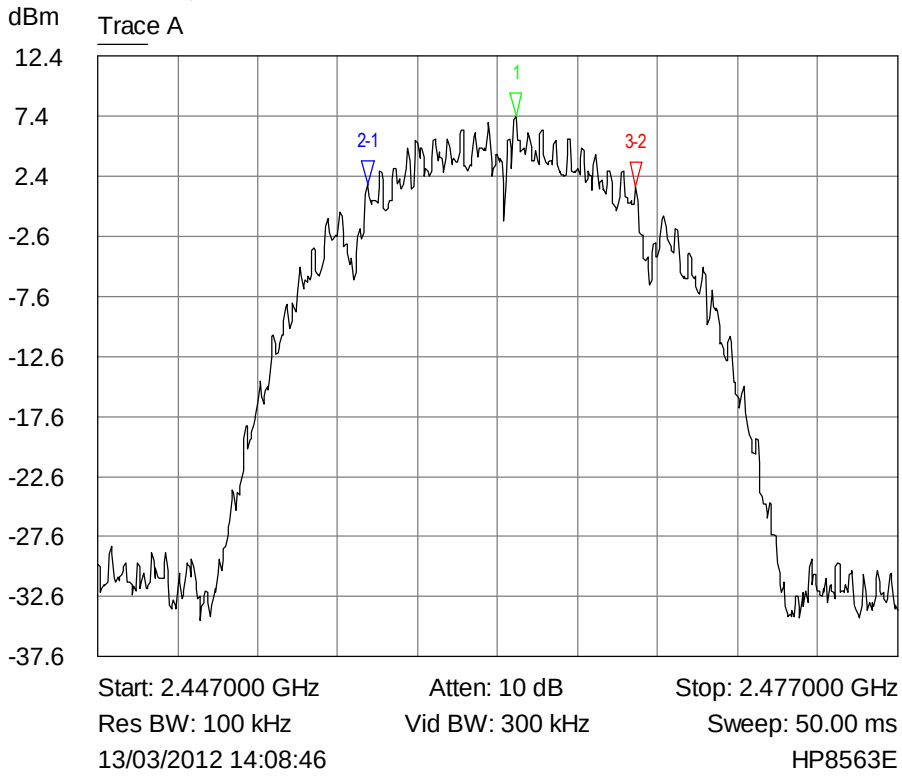
1 Trace A
2.461650 GHz
6.5700 dBm

2-1 Trace A
-4.600000 MHz
-5.9200 dB

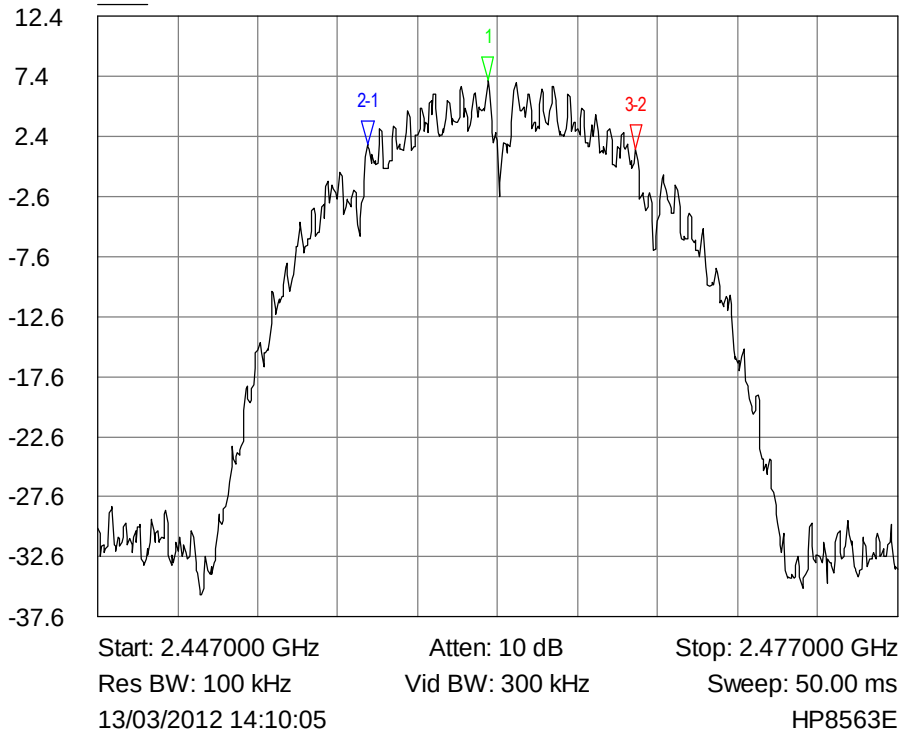
3-2 Trace A
10.150000 MHz
0.5900 dB

Start: 2.447000 GHz | Atten: 10 dB | Stop: 2.477000 GHz
Res BW: 100 kHz | Vid BW: 300 kHz | Sweep: 50.00 ms
13/03/2012 14:07:16 | HP8563E

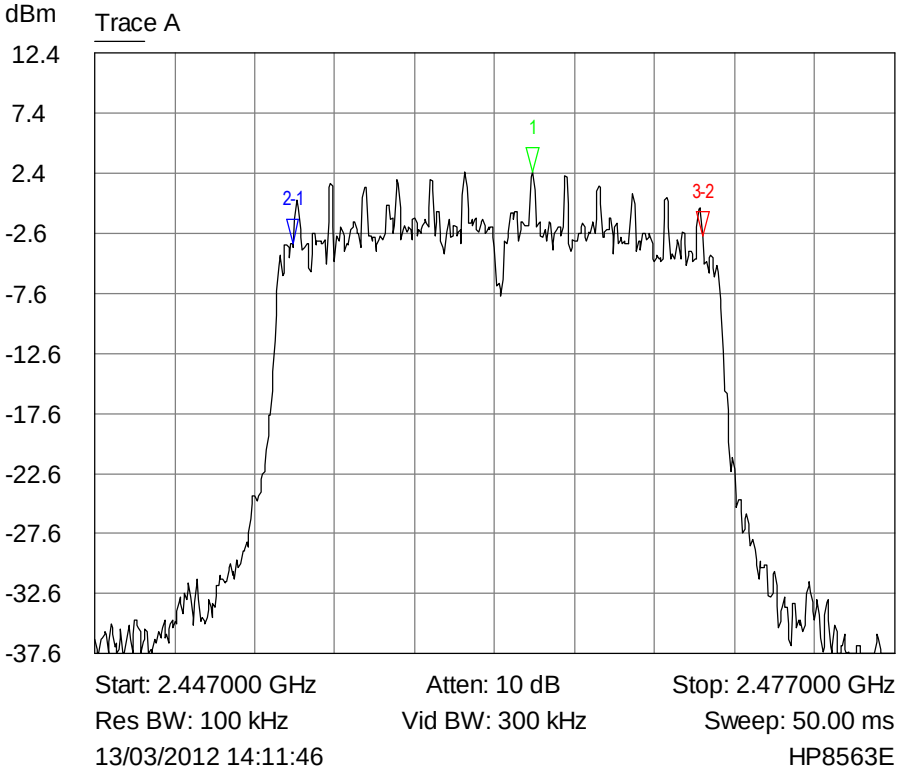
J4997-4, Plot 0027



J4997-4, Plot 0028



J4997-4, Plot 0029



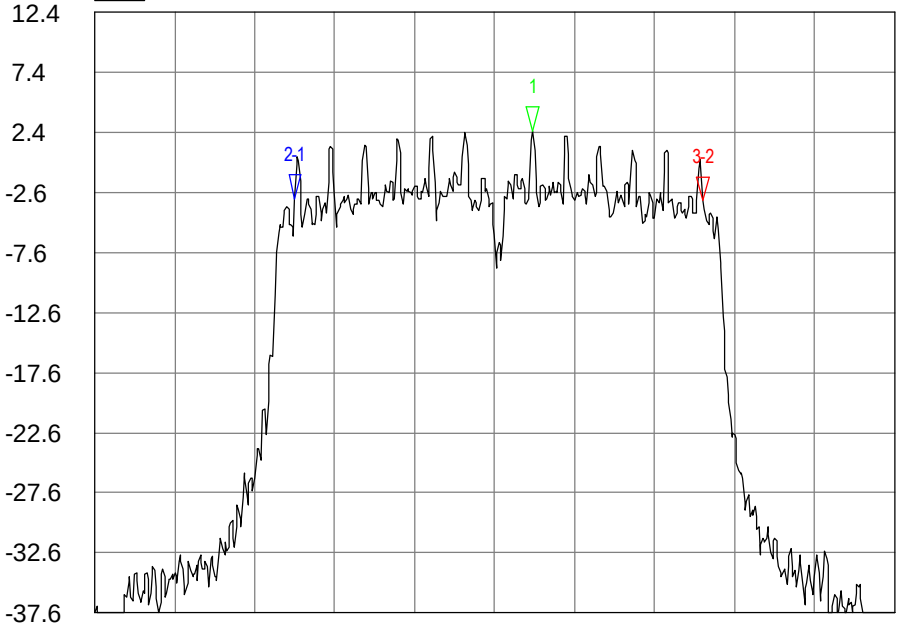
1 Trace A
2.463450 GHz
2.5700 dBm

2-1 Trace A
-9.050000 MHz
-6.0000 dB

3-2 Trace A
15.400000 MHz
0.5800 dB

Start: 2.447000 GHz | Atten: 10 dB | Stop: 2.477000 GHz
Res BW: 100 kHz | Vid BW: 300 kHz | Sweep: 50.00 ms
13/03/2012 14:11:46 | HP8563E

J4997-4, Plot 0030



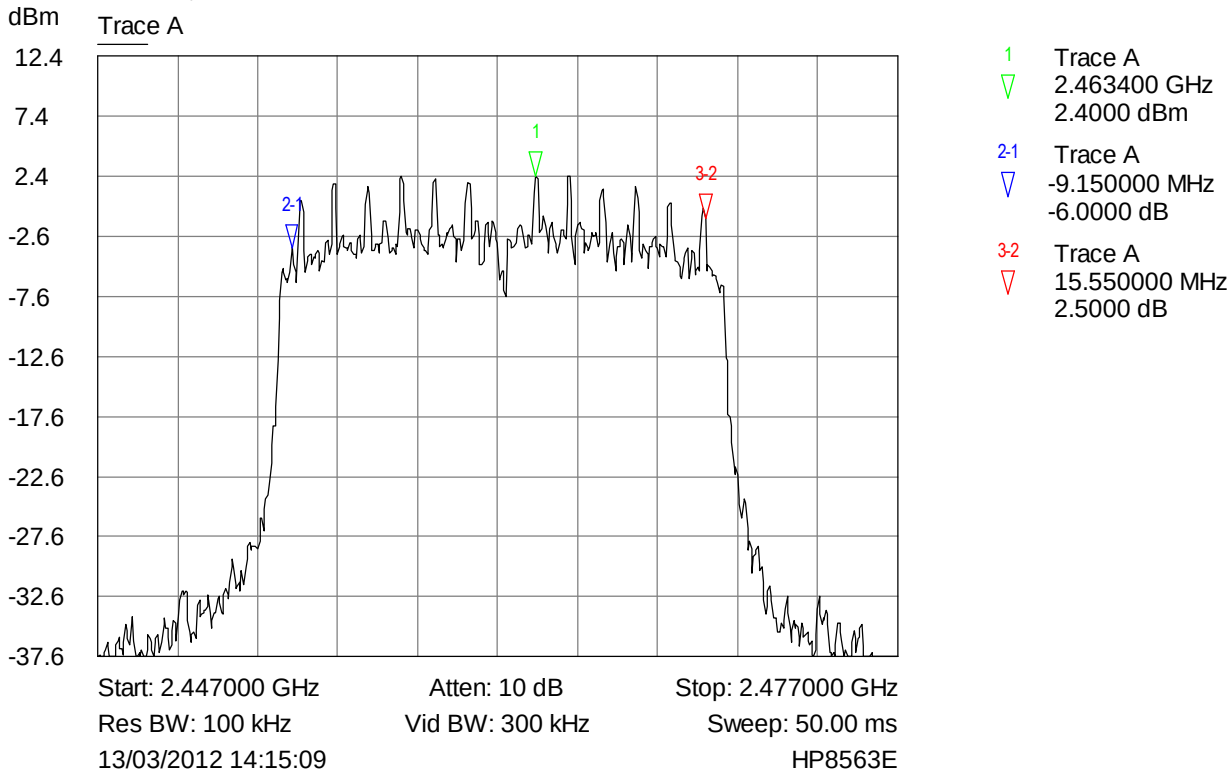
1 Trace A
2.463400 GHz
2.5700 dBm

2-1 Trace A
-8.900000 MHz
-5.6700 dB

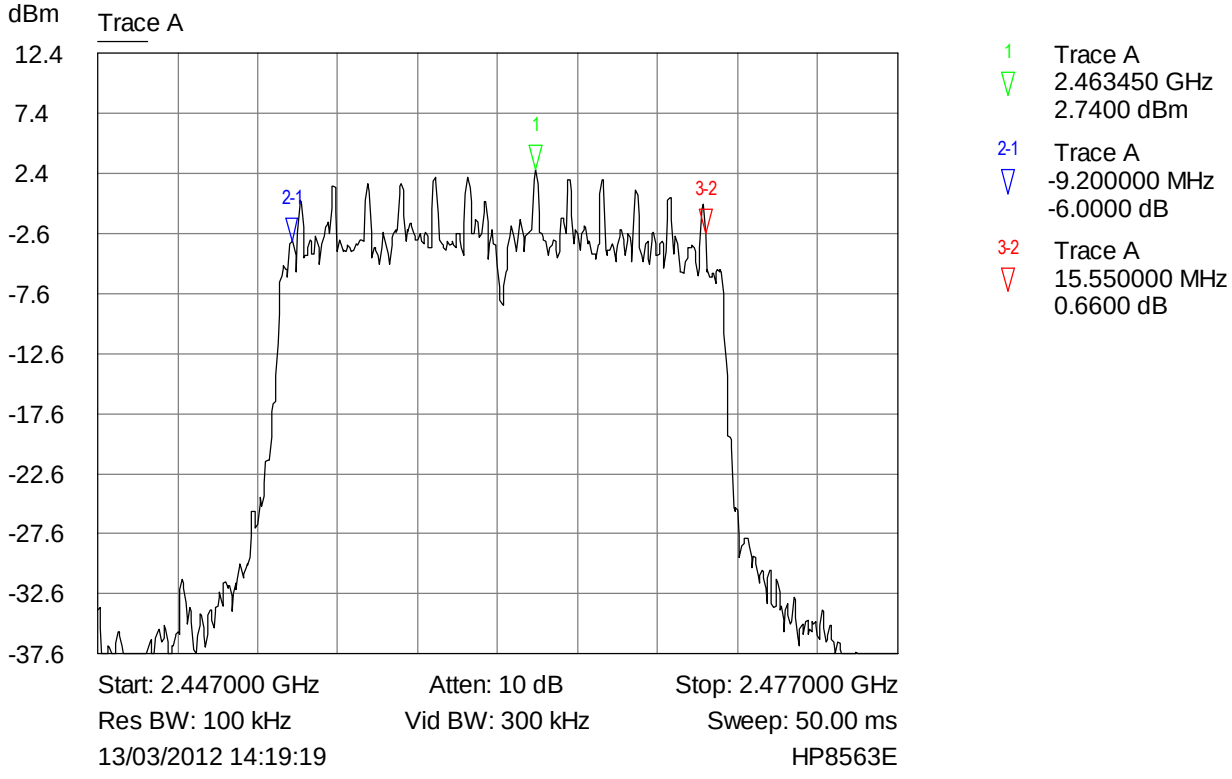
3-2 Trace A
15.300000 MHz
-0.1600 dB

Start: 2.447000 GHz | Atten: 10 dB | Stop: 2.477000 GHz
Res BW: 100 kHz | Vid BW: 300 kHz | Sweep: 50.00 ms
13/03/2012 14:13:47 | HP8563E

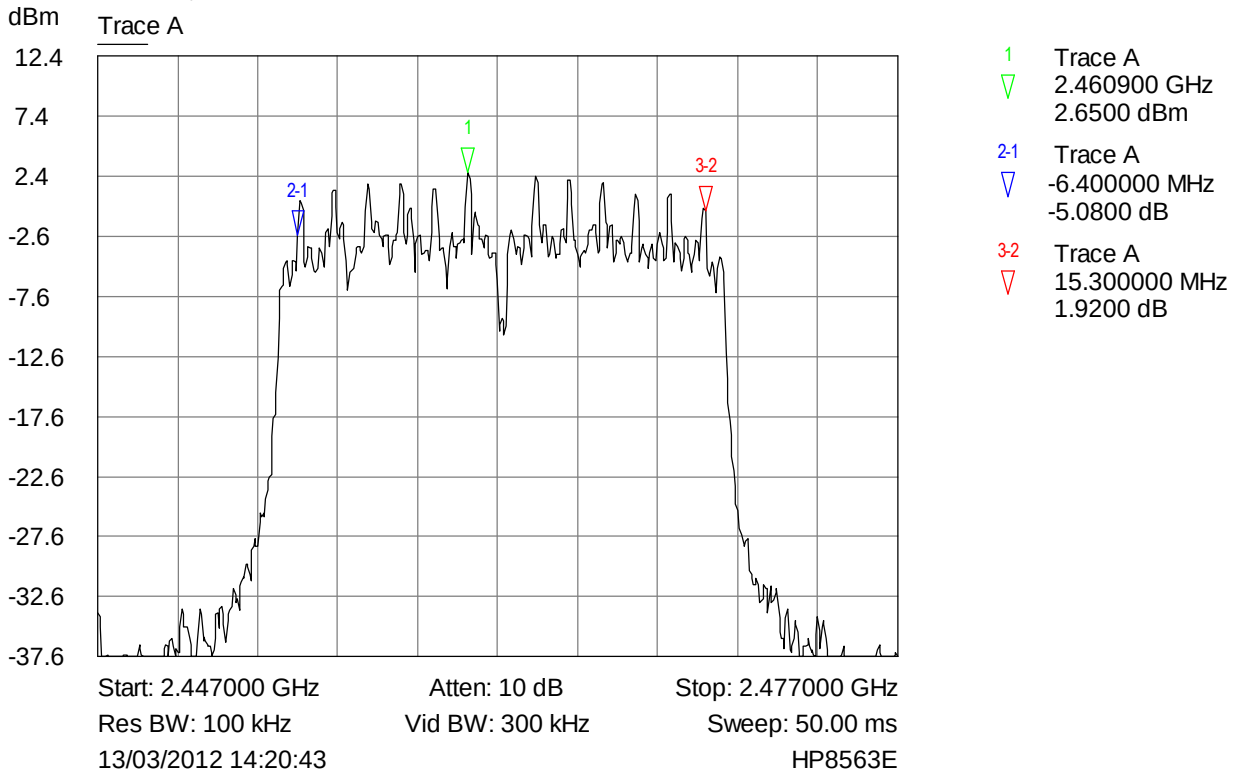
J4997-4, Plot 0031



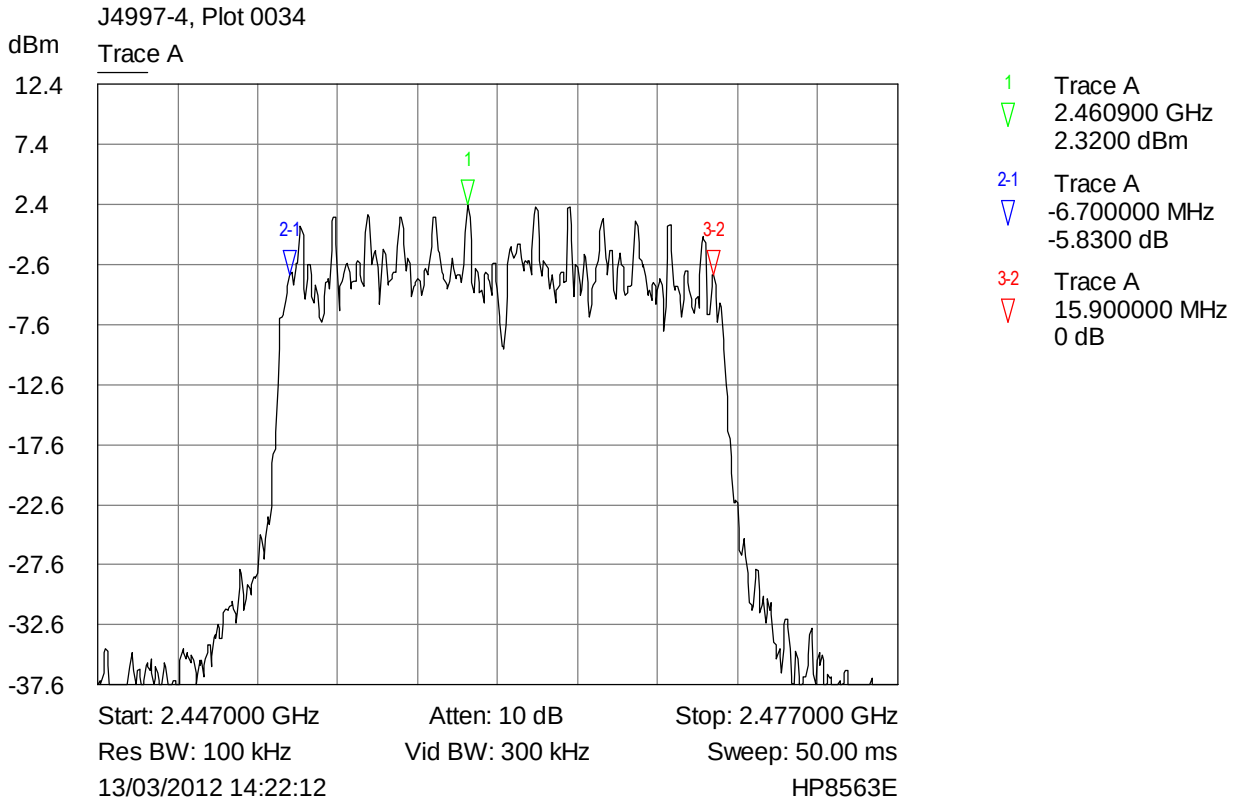
J4997-4, Plot 0032



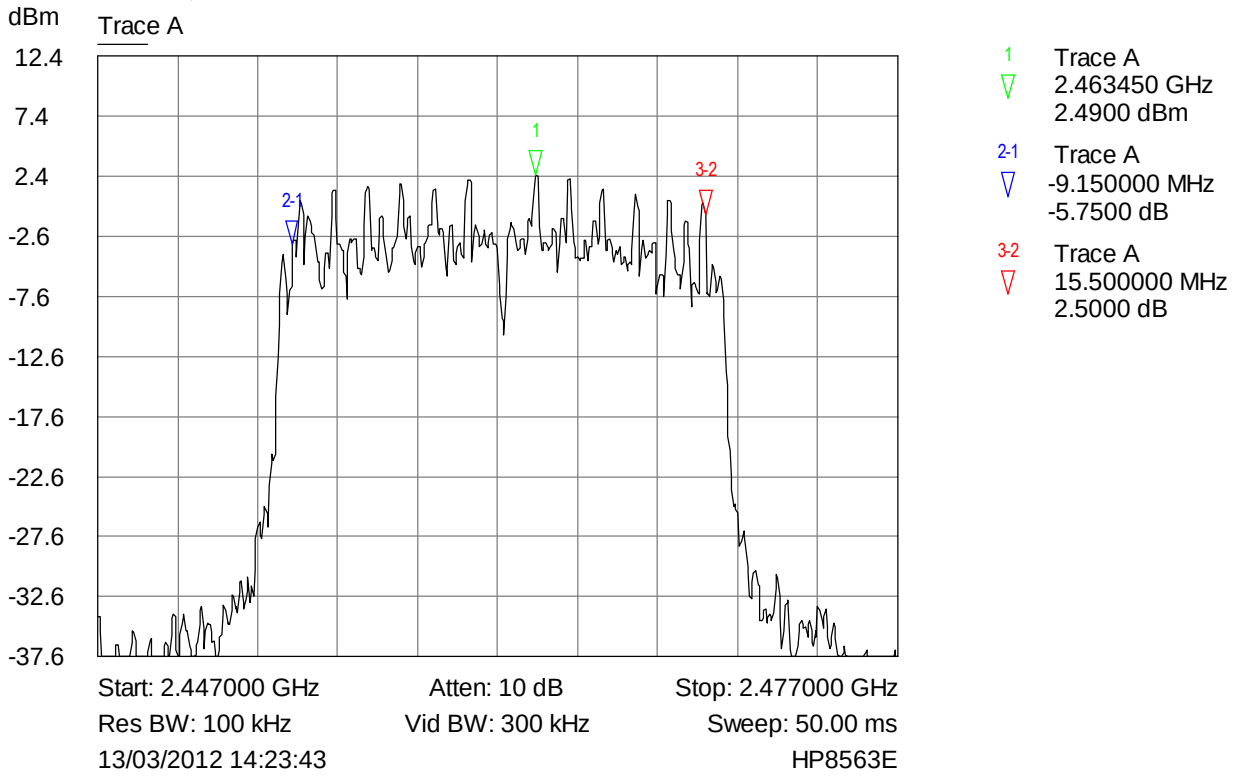
J4997-4, Plot 0033



J4997-4, Plot 0034

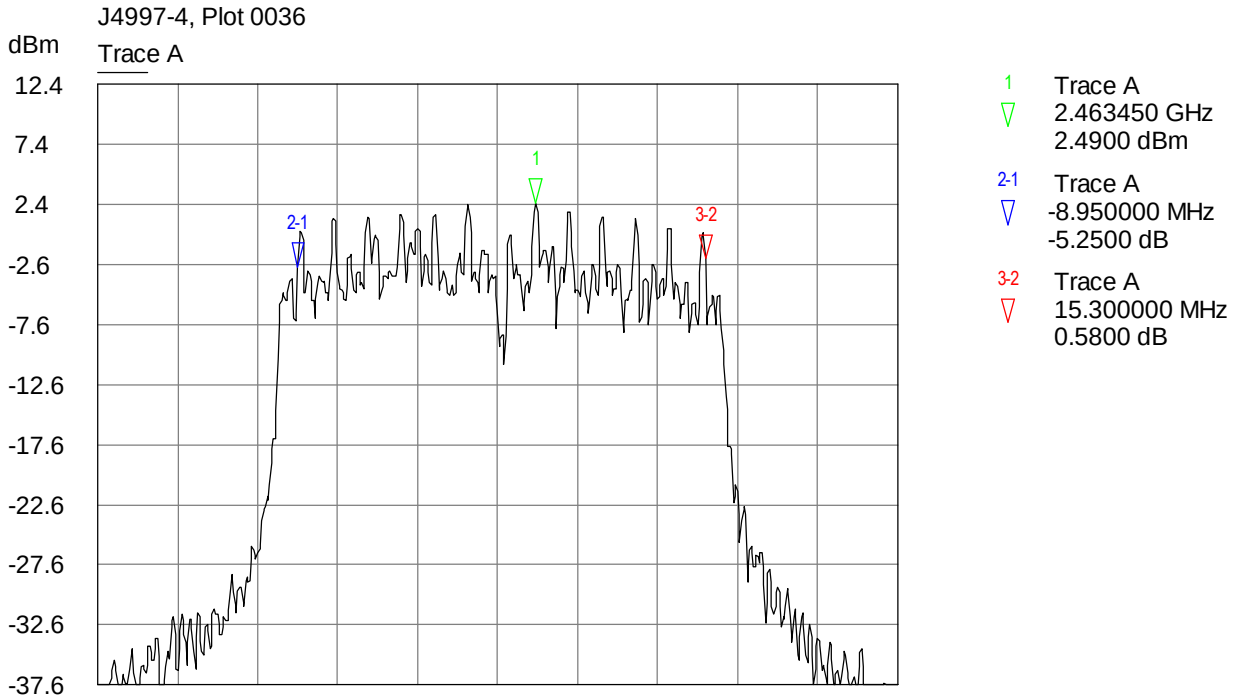


J4997-4, Plot 0035



Start: 2.447000 GHz | Atten: 10 dB | Stop: 2.477000 GHz
Res BW: 100 kHz | Vid BW: 300 kHz | Sweep: 50.00 ms
13/03/2012 14:23:43 | HP8563E

J4997-4, Plot 0036

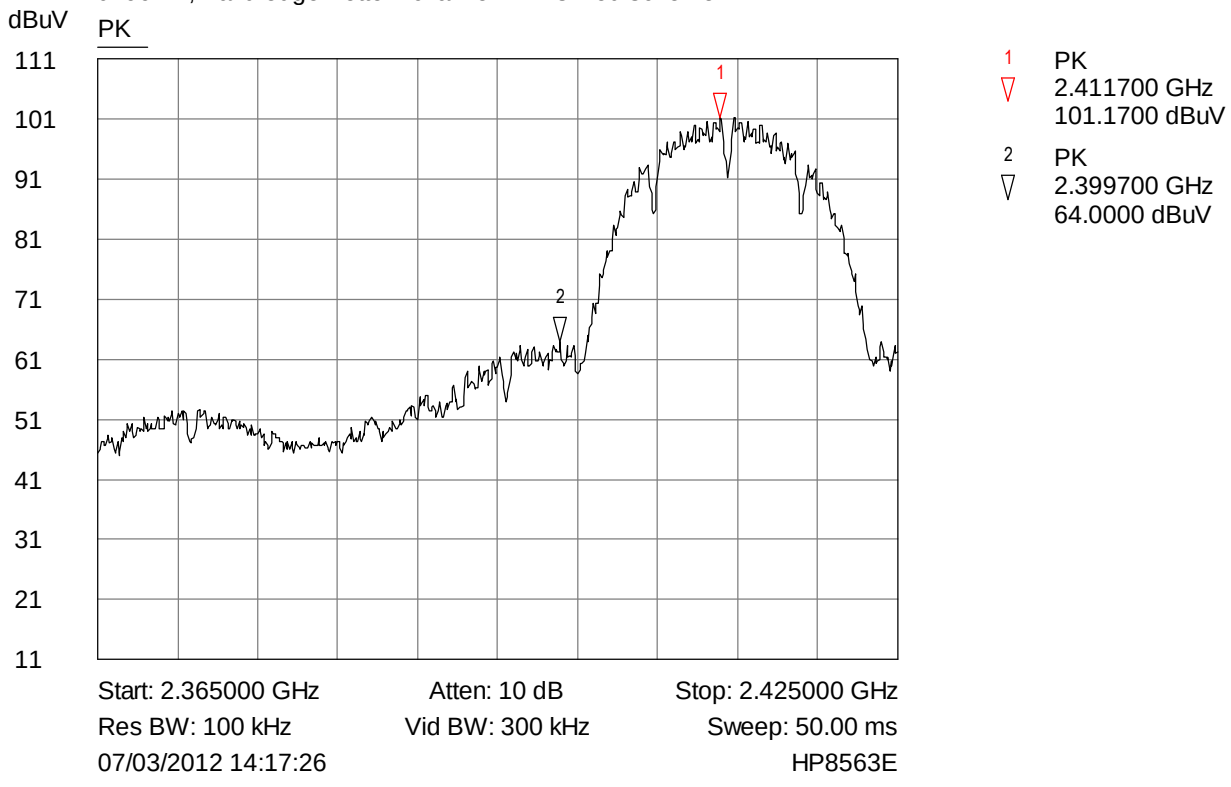


Start: 2.447000 GHz | Atten: 10 dB | Stop: 2.477000 GHz
Res BW: 100 kHz | Vid BW: 300 kHz | Sweep: 50.00 ms
13/03/2012 14:25:47 | HP8563E

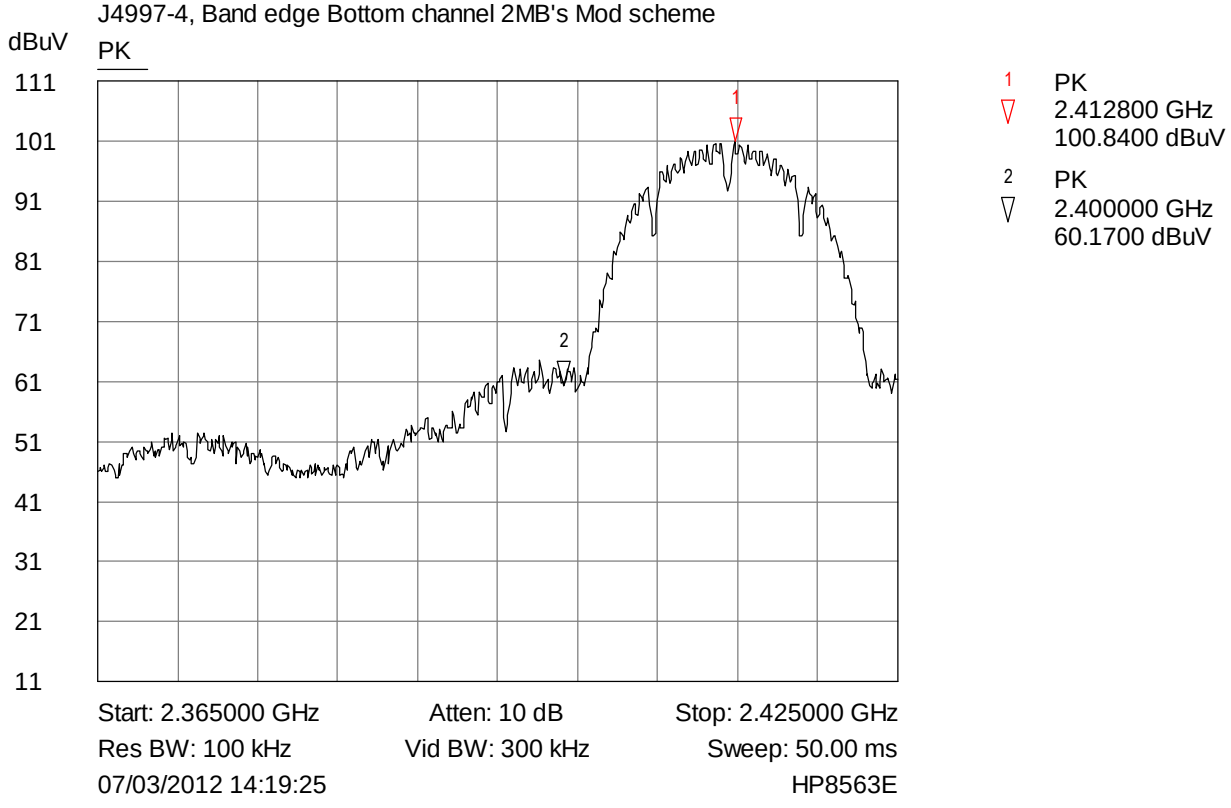
6.6 Band Edge Compliance

Band edge plots. (100kHz RBW)

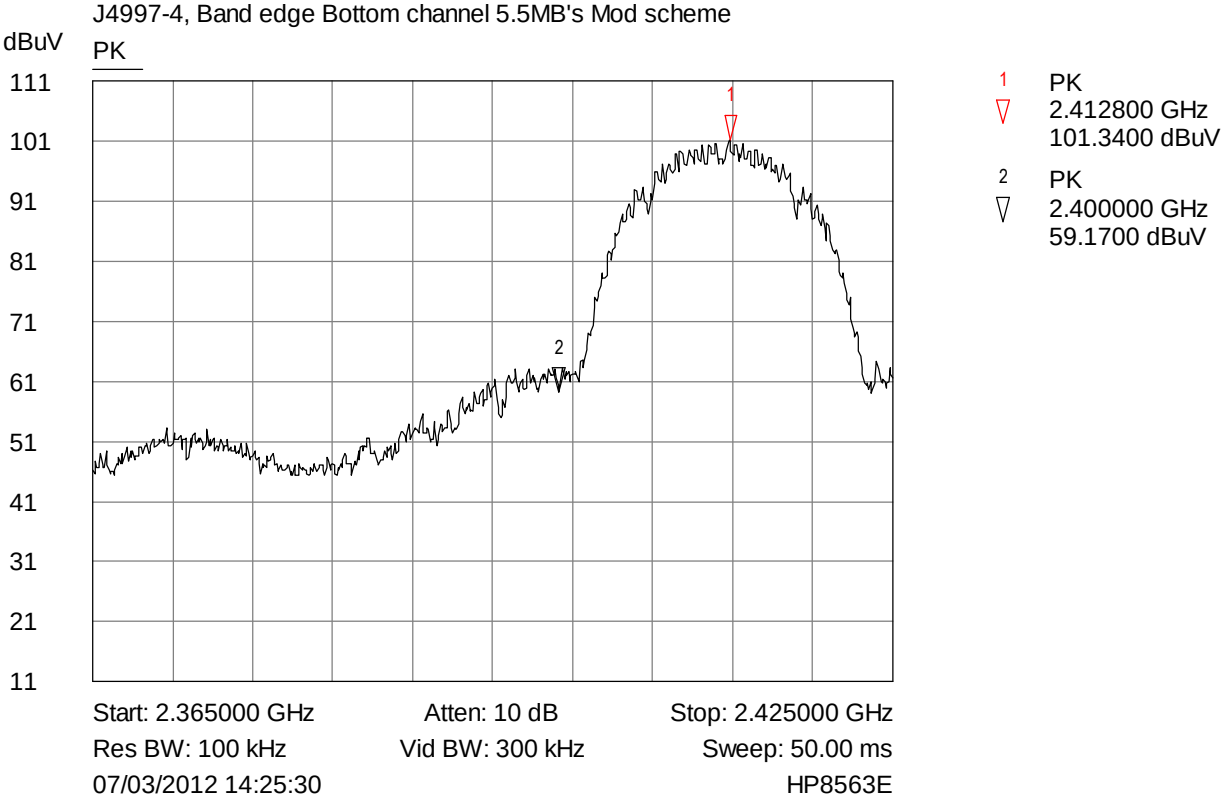
J4997-4, Band edge Bottom channel 1MB's Mod scheme



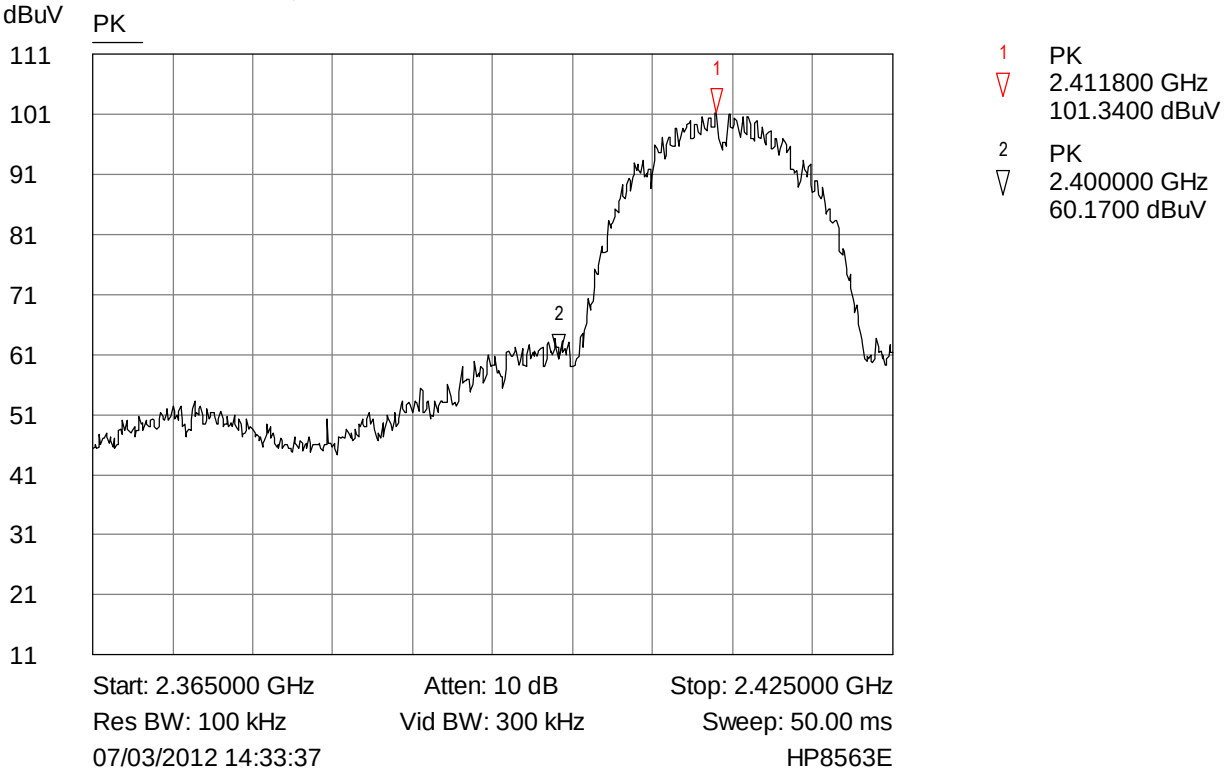
J4997-4, Band edge Bottom channel 2MB's Mod scheme



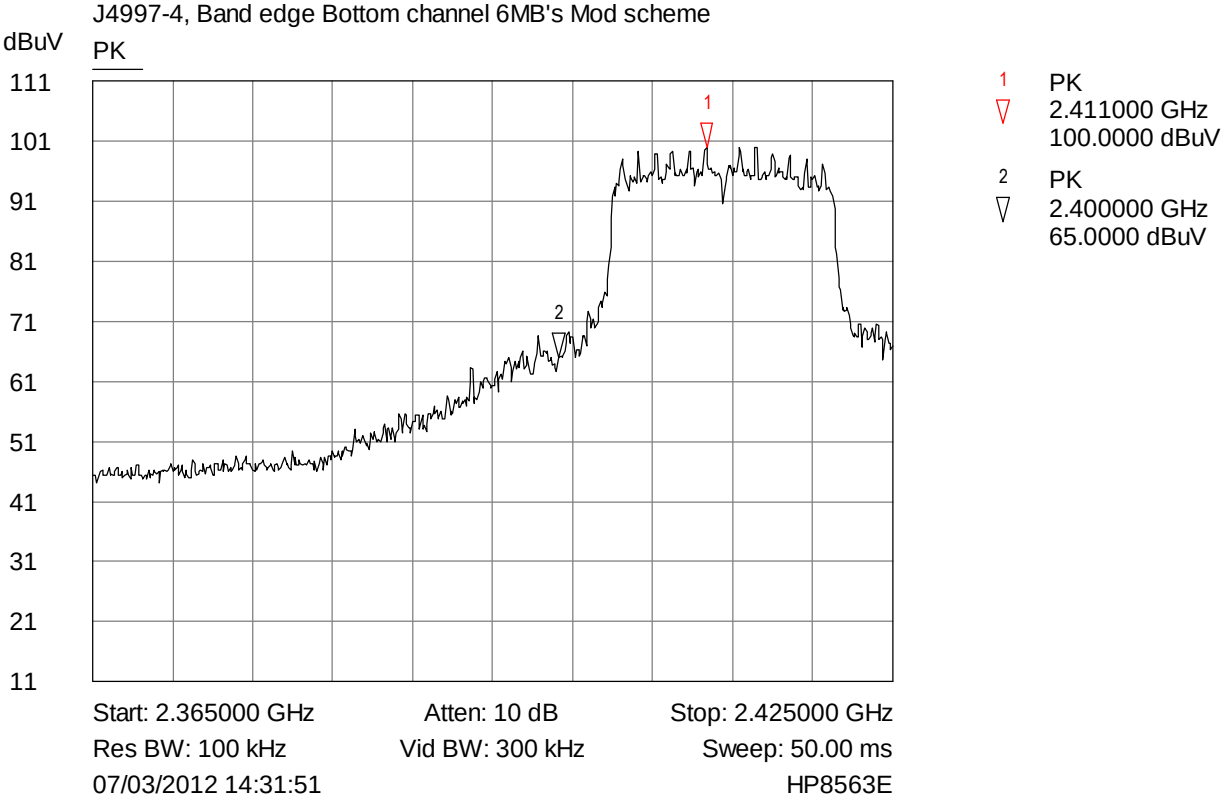
J4997-4, Band edge Bottom channel 5.5MB's Mod scheme



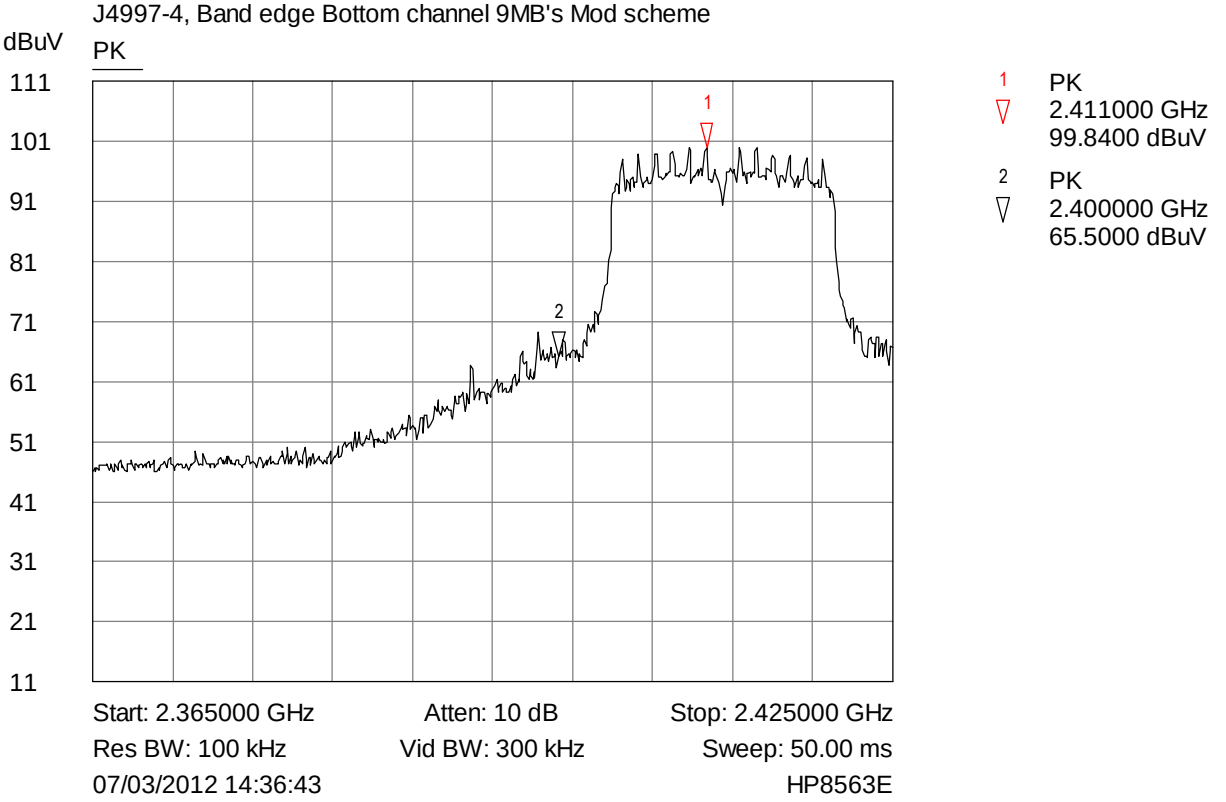
J4997-4, Band edge Bottom channel 11MB's Mod scheme



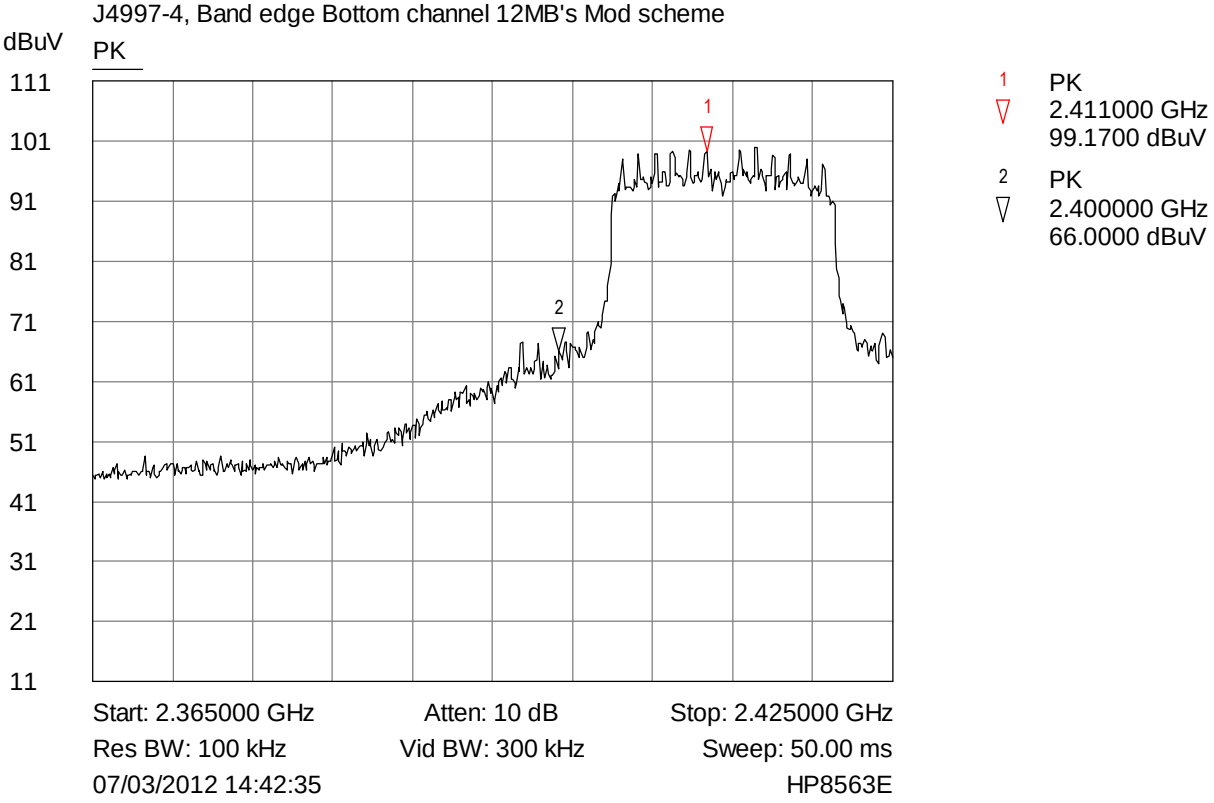
J4997-4, Band edge Bottom channel 6MB's Mod scheme



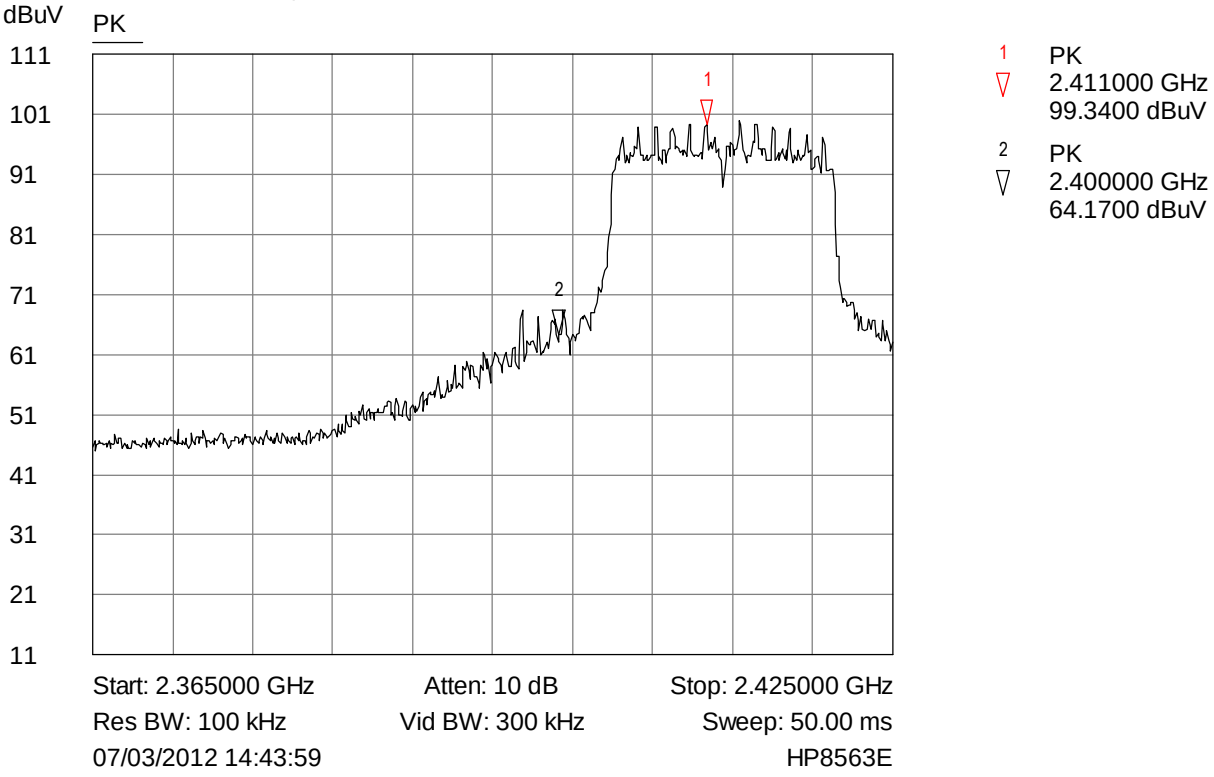
J4997-4, Band edge Bottom channel 9MB's Mod scheme



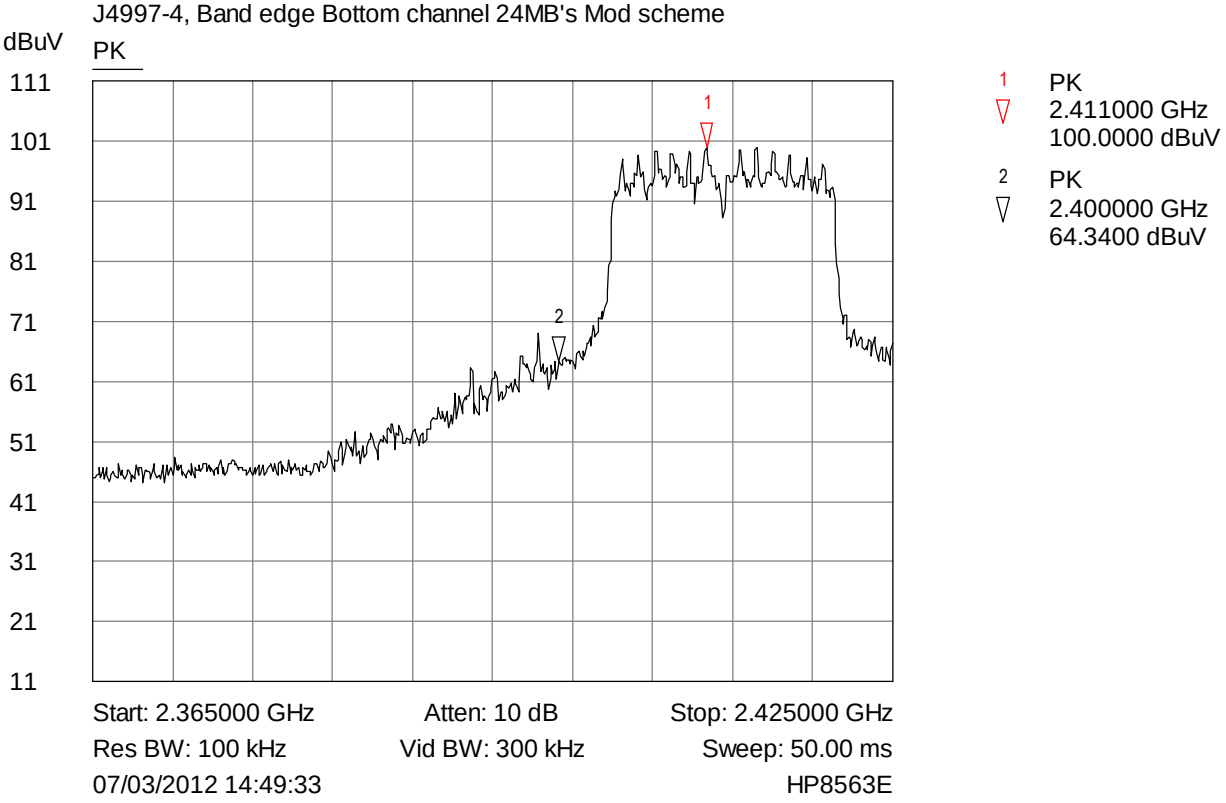
J4997-4, Band edge Bottom channel 12MB's Mod scheme



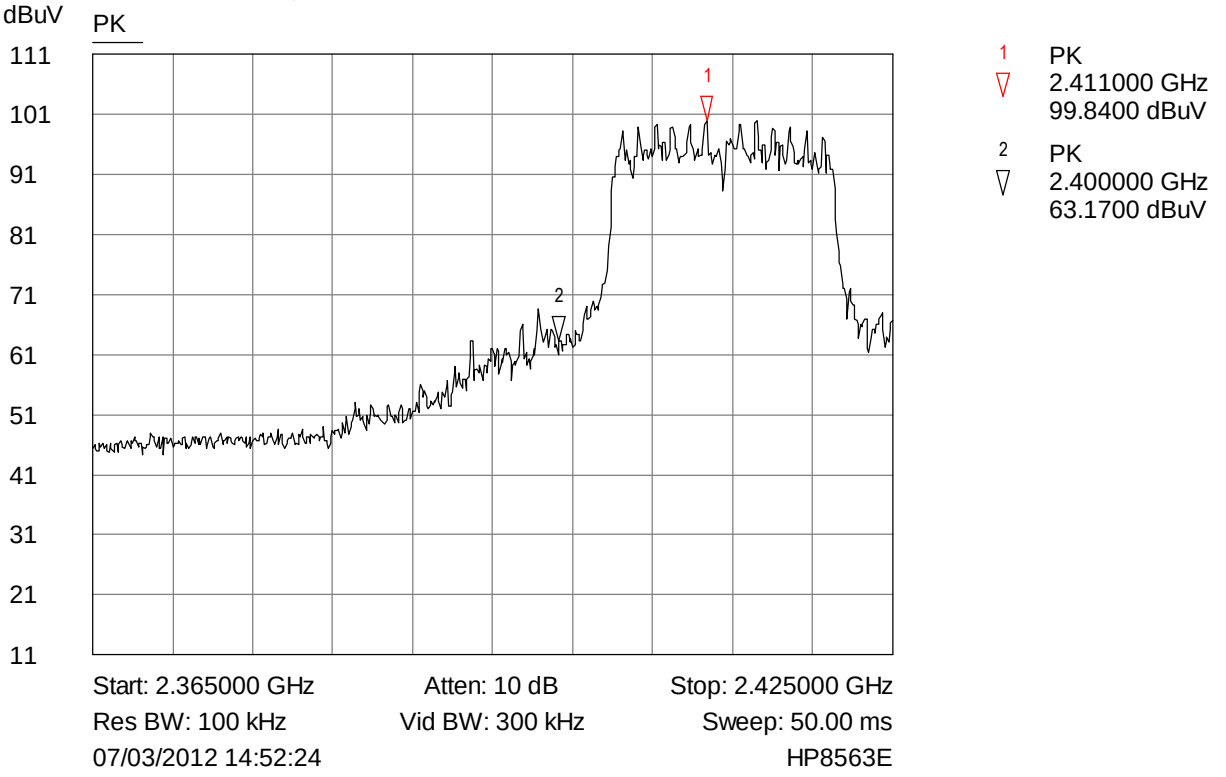
J4997-4, Band edge Bottom channel 18MB's Mod scheme



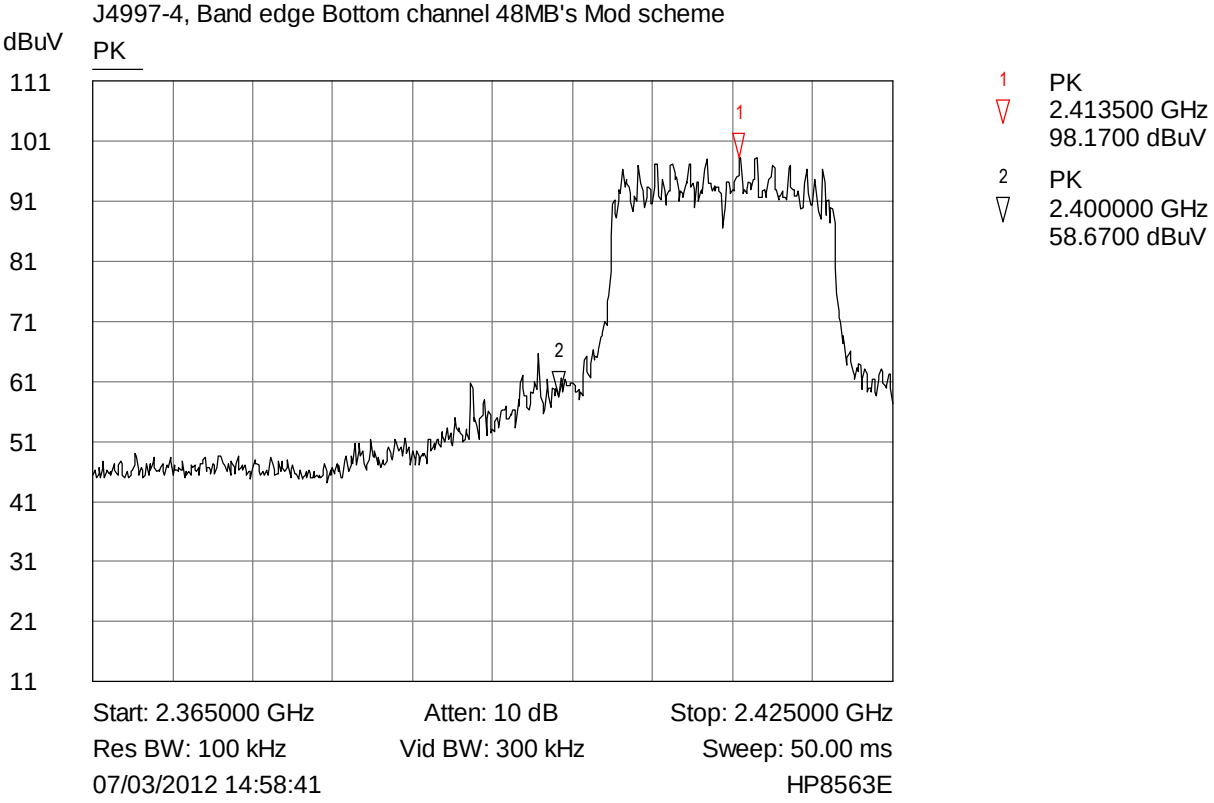
J4997-4, Band edge Bottom channel 24MB's Mod scheme



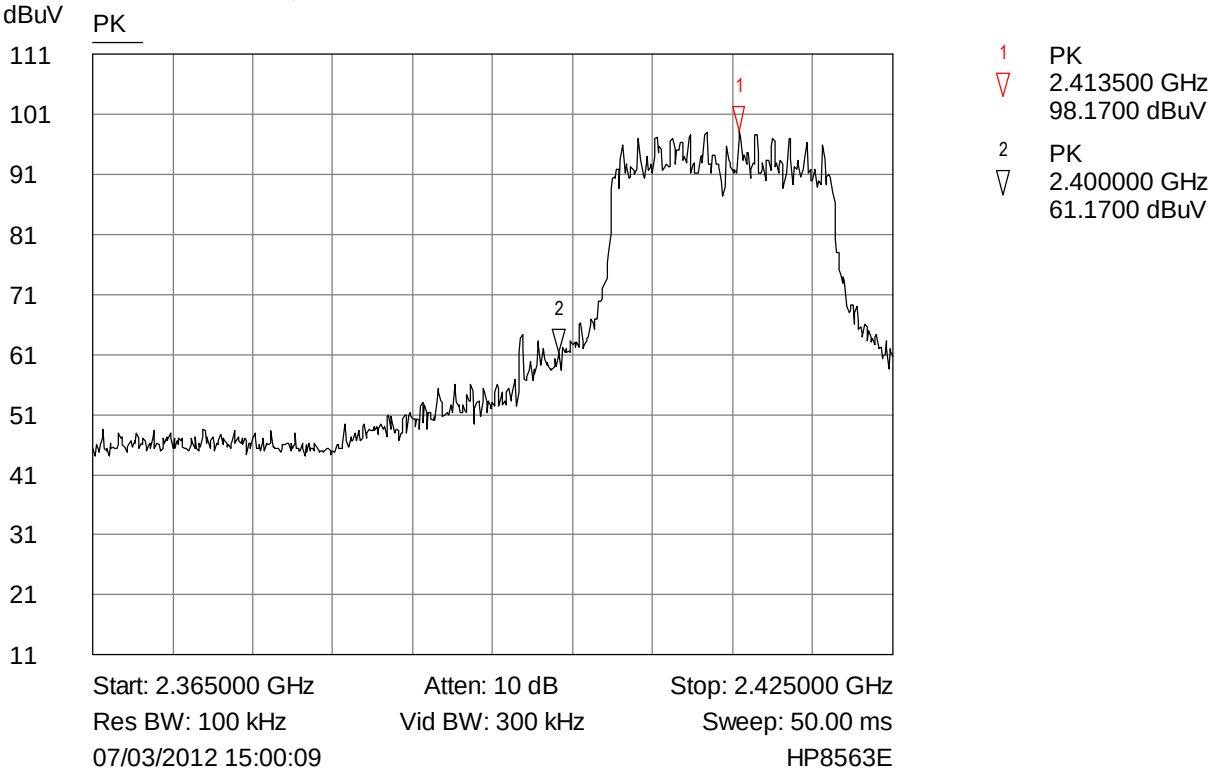
J4997-4, Band edge Bottom channel 36MB's Mod scheme



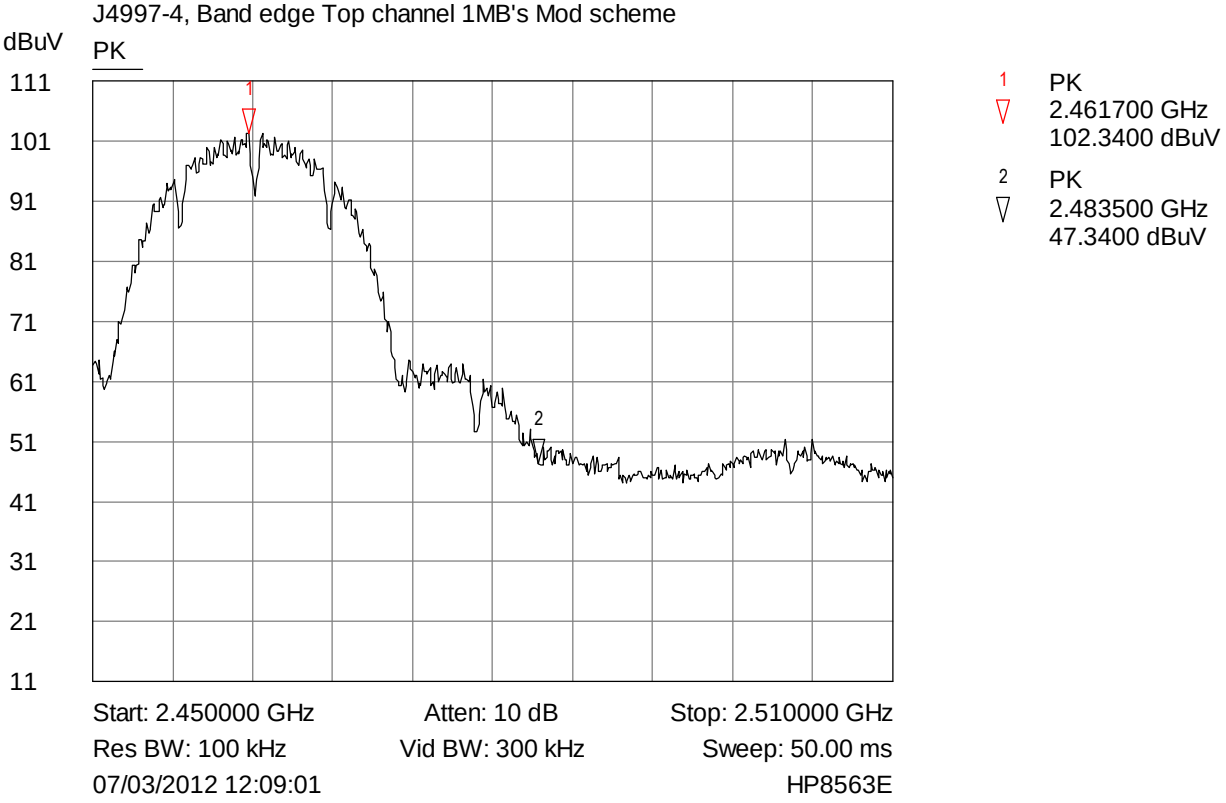
J4997-4, Band edge Bottom channel 48MB's Mod scheme



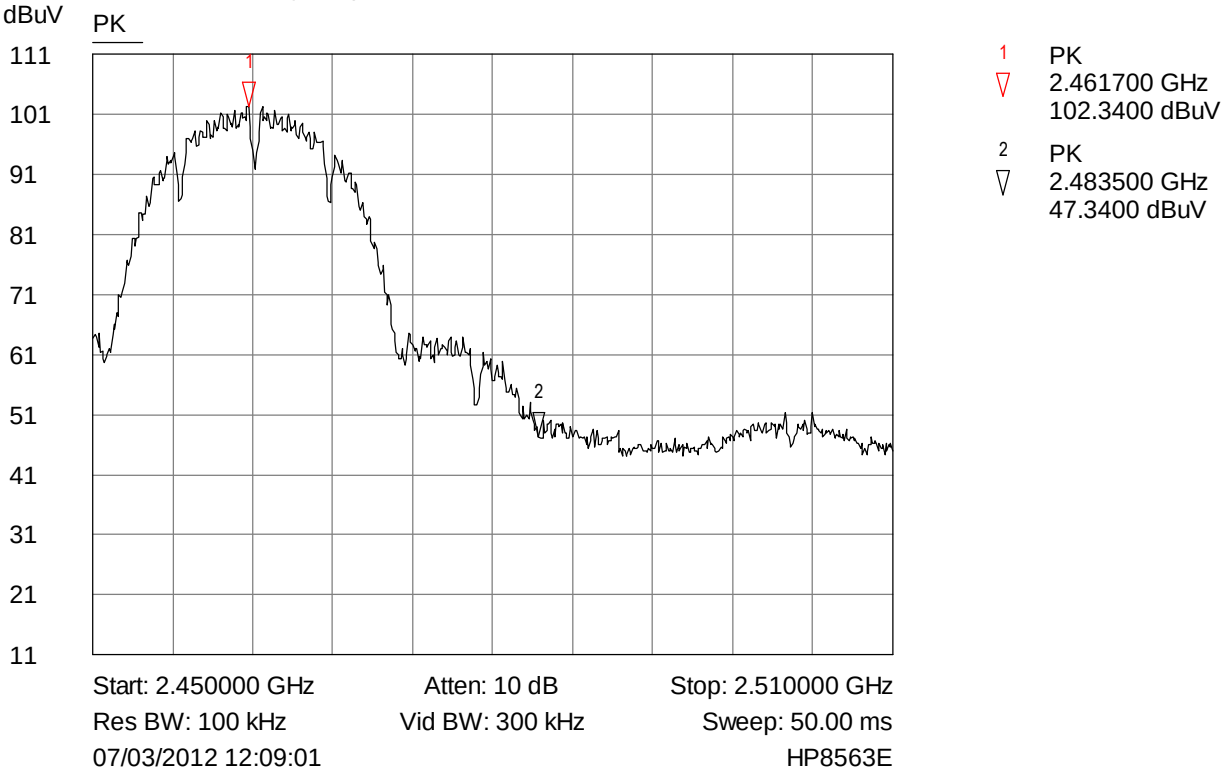
J4997-4, Band edge Bottom channel 54MB's Mod scheme



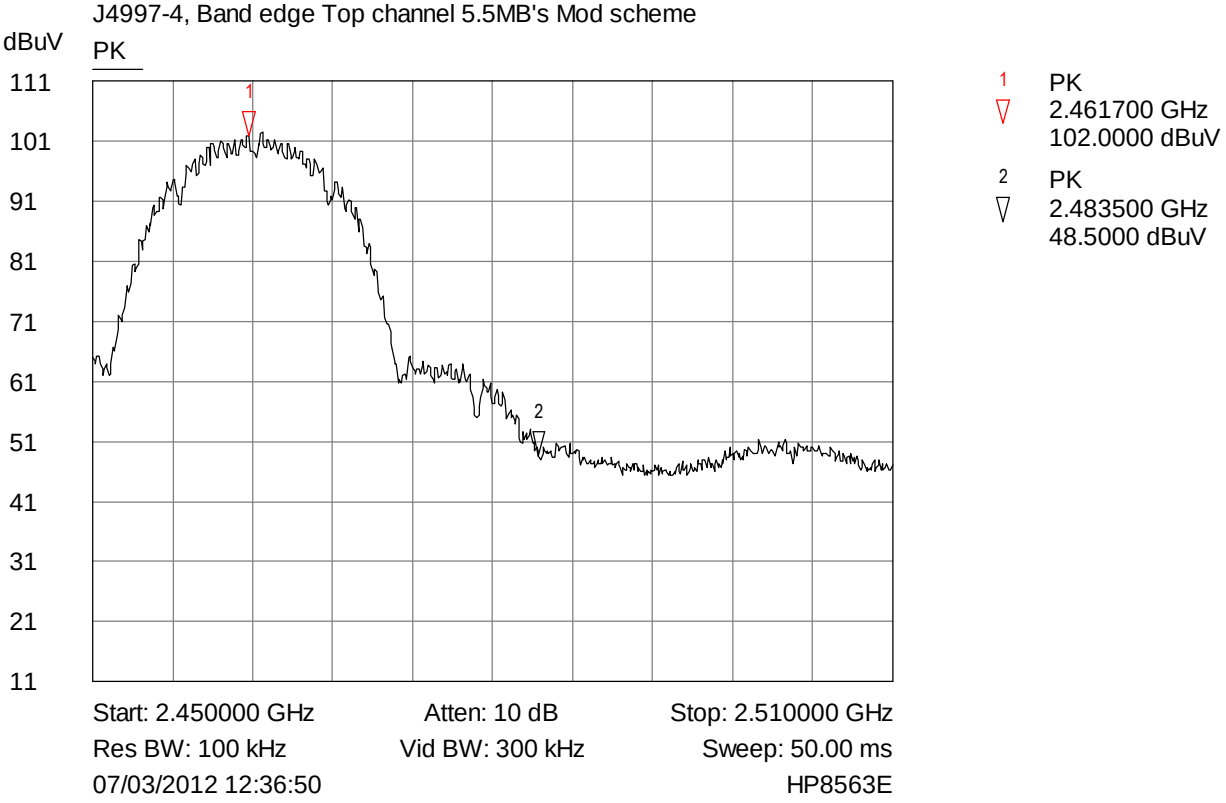
J4997-4, Band edge Top channel 1MB's Mod scheme



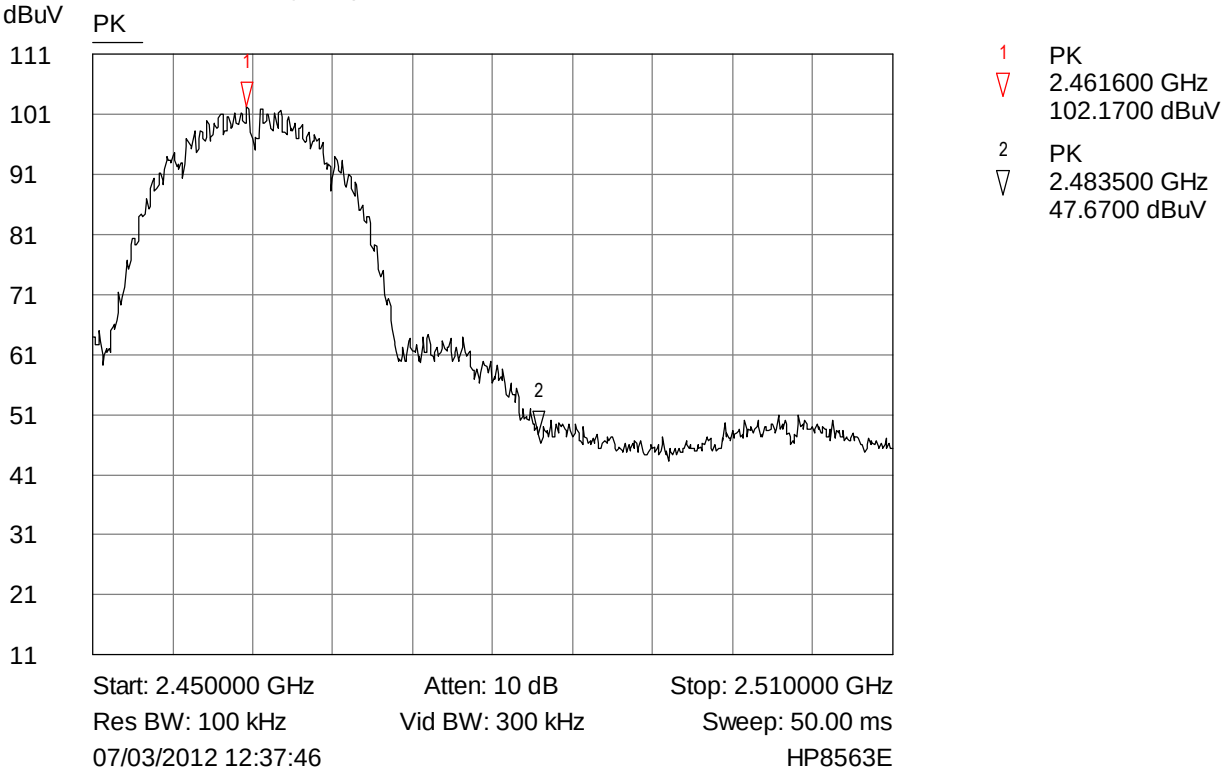
J4997-4, Band edge Top channel 2MB's Mod scheme



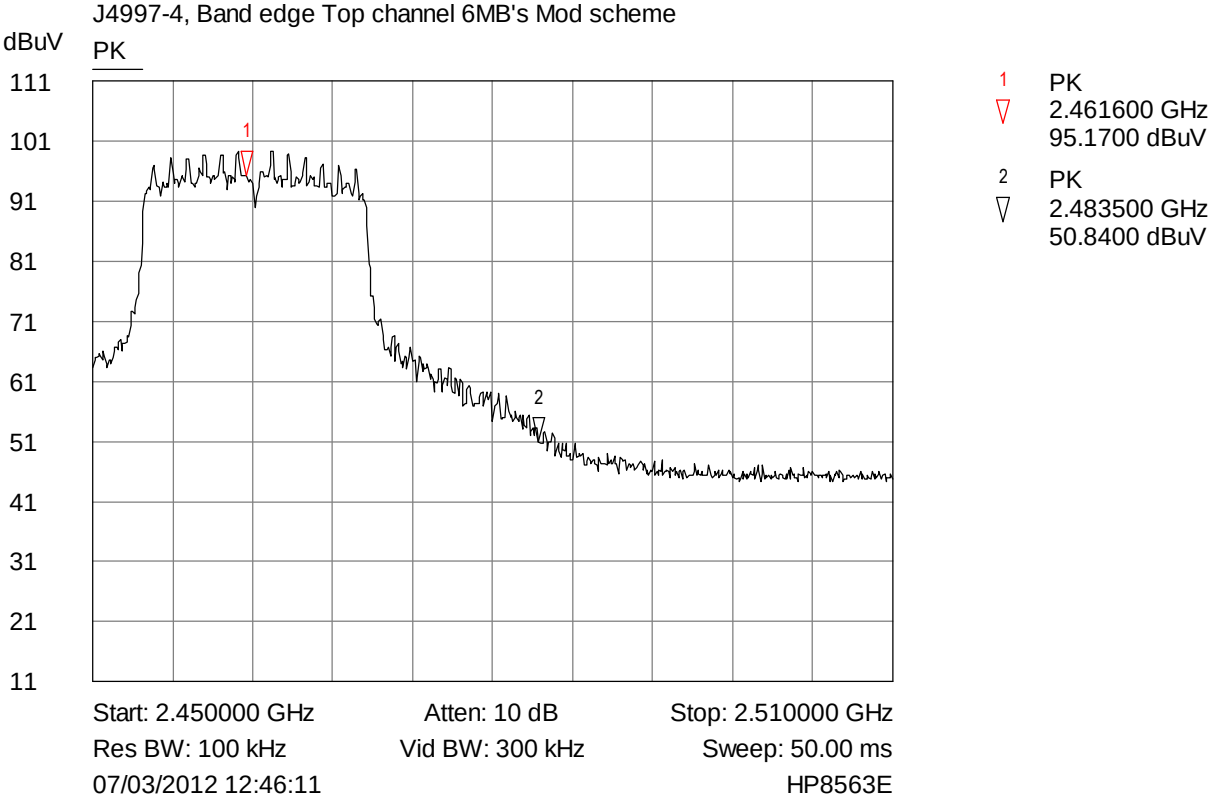
J4997-4, Band edge Top channel 5.5MB's Mod scheme



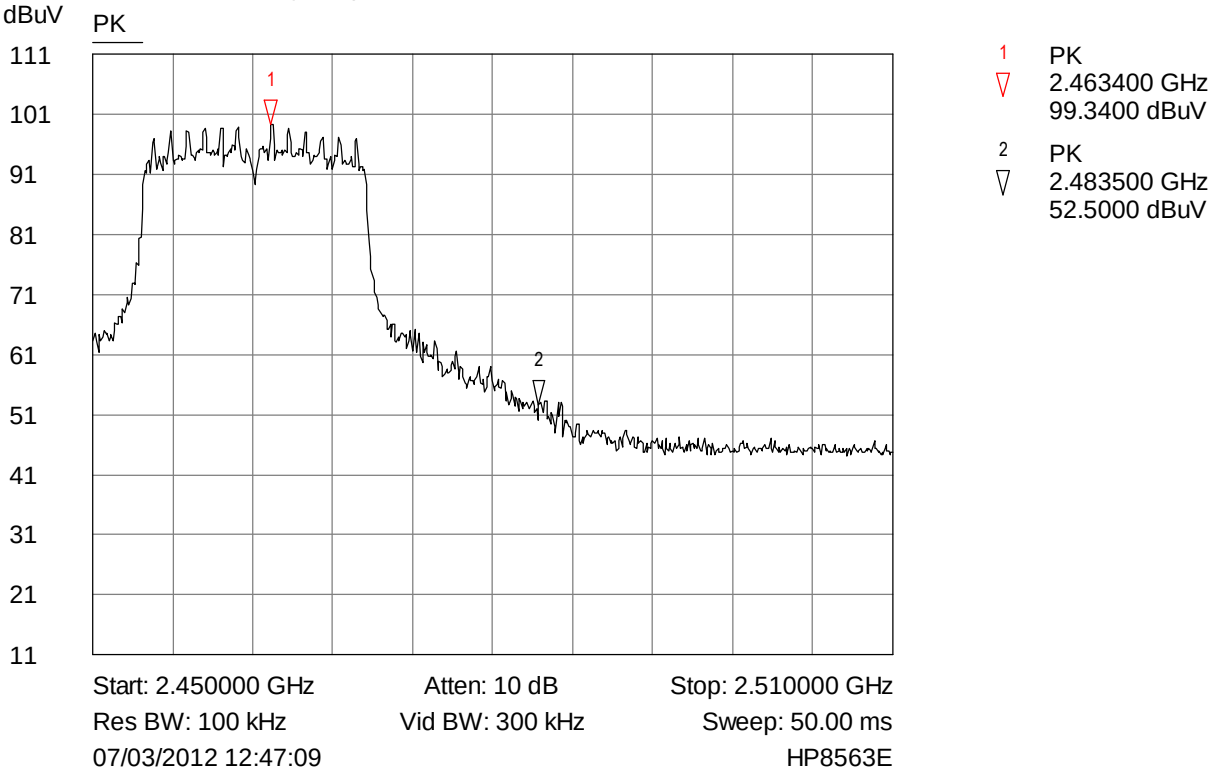
J4997-4, Band edge Top channel 11MB's Mod scheme



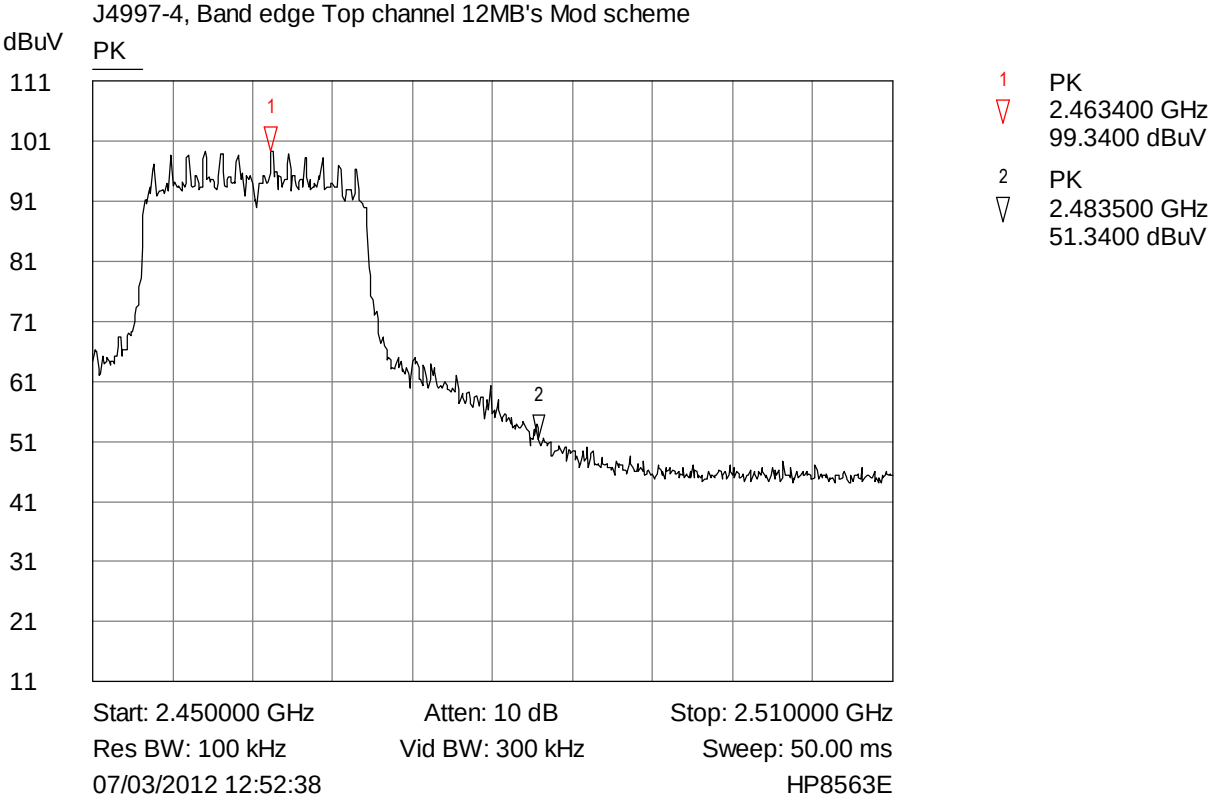
J4997-4, Band edge Top channel 6MB's Mod scheme



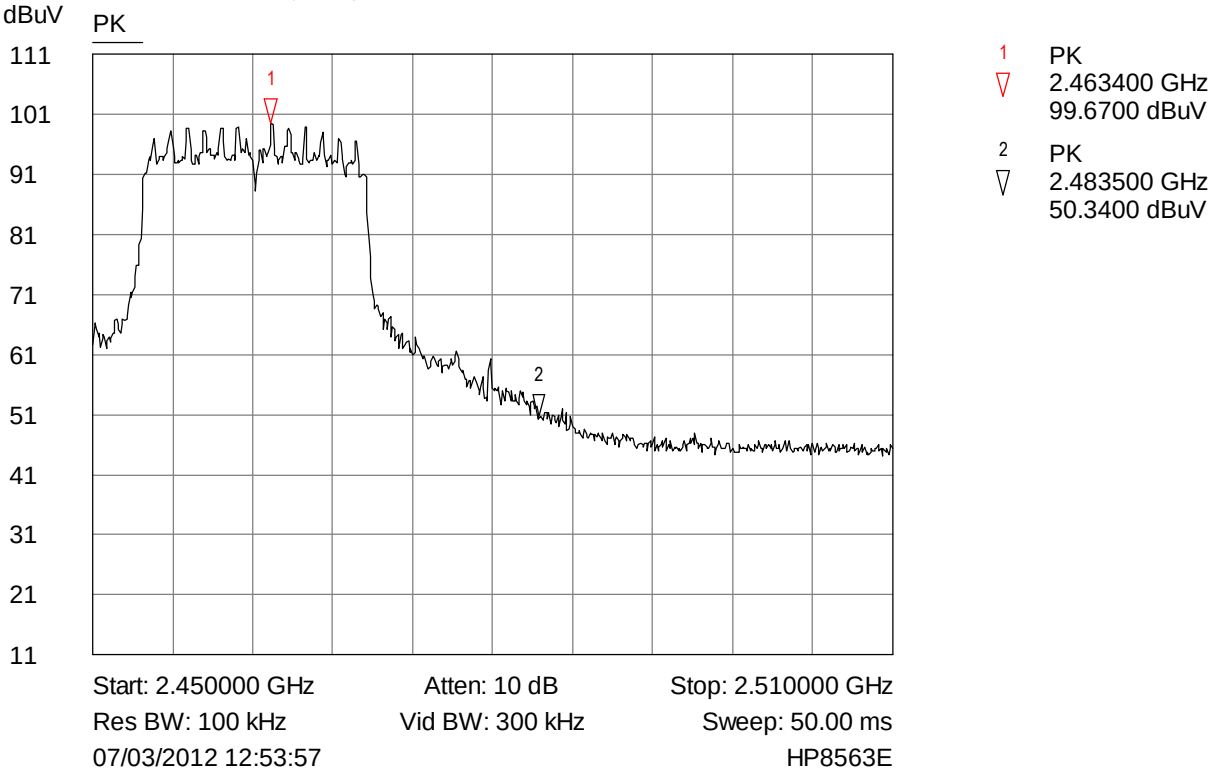
J4997-4, Band edge Top channel 9MB's Mod scheme



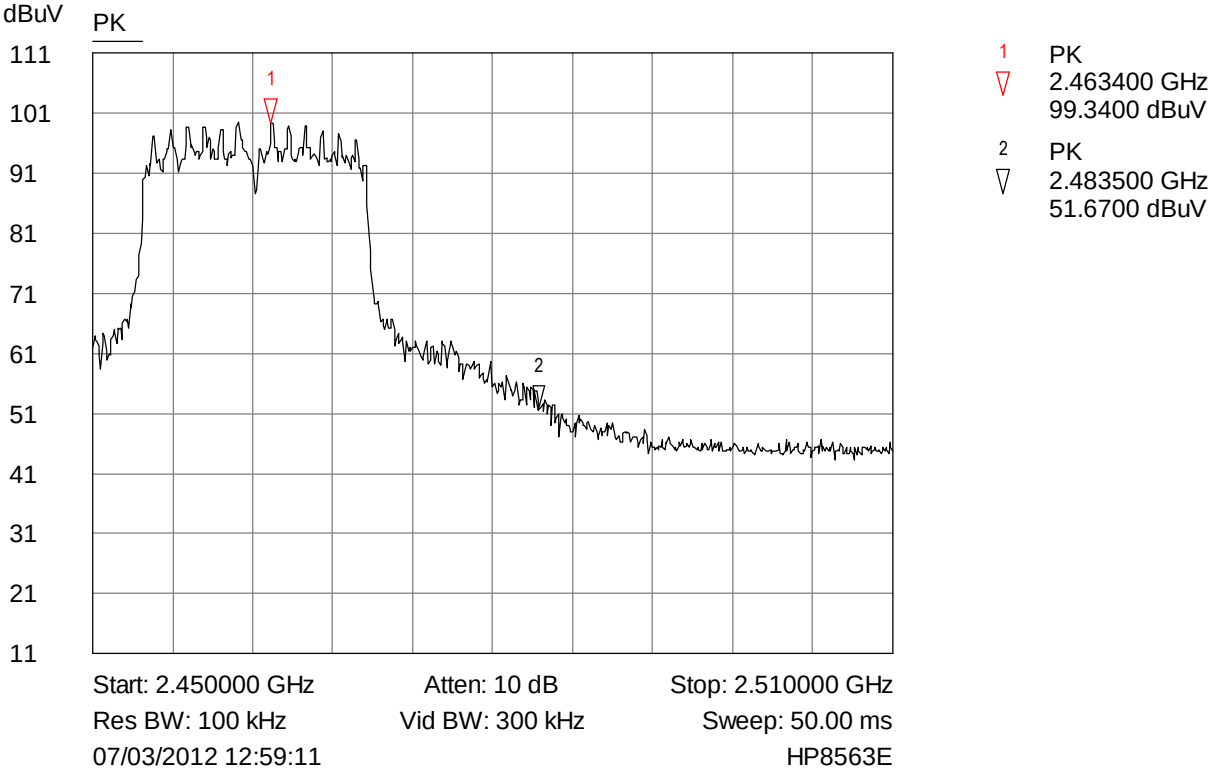
J4997-4, Band edge Top channel 12MB's Mod scheme



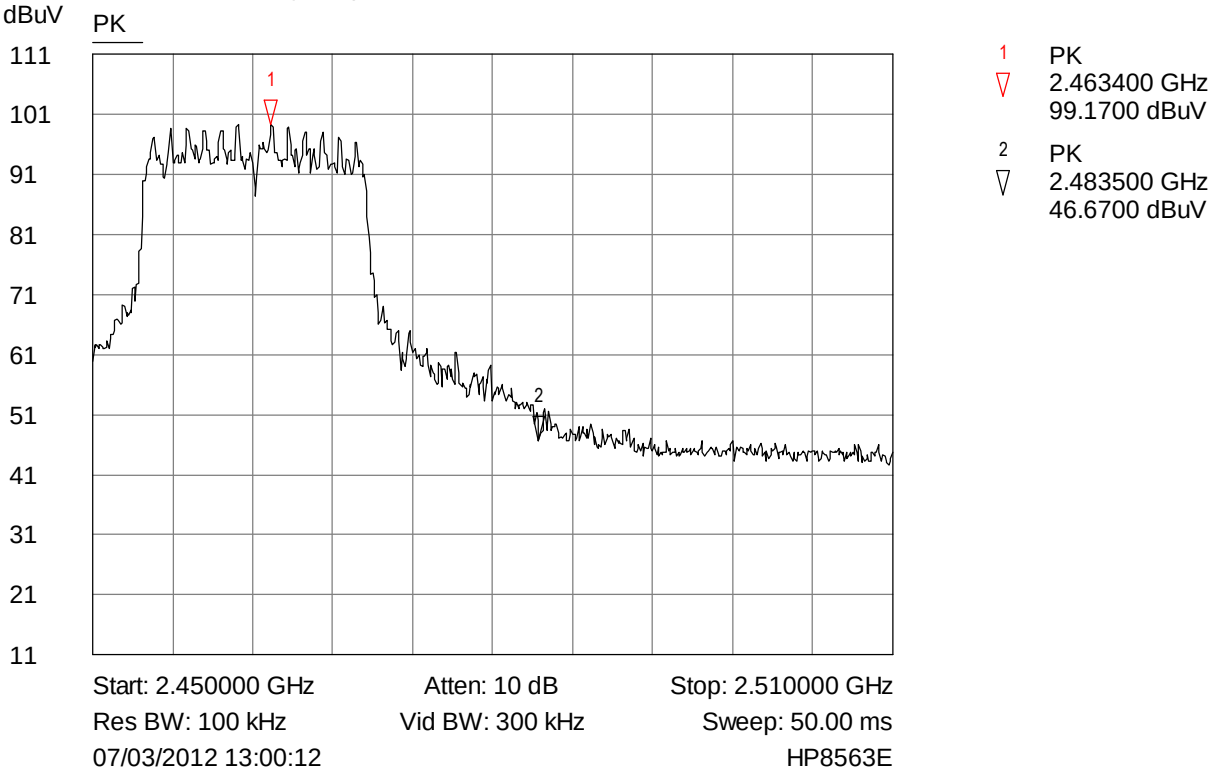
J4997-4, Band edge Top channel 18MB's Mod scheme



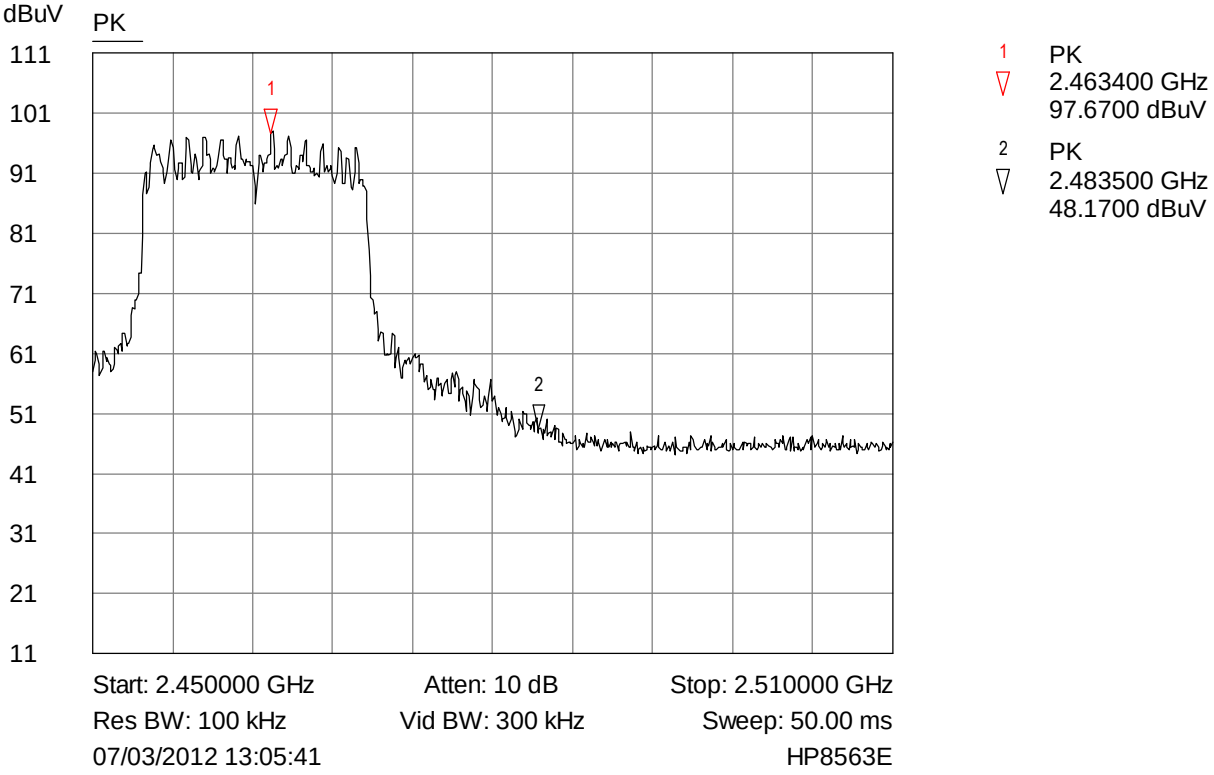
J4997-4, Band edge Top channel 24MB's Mod scheme



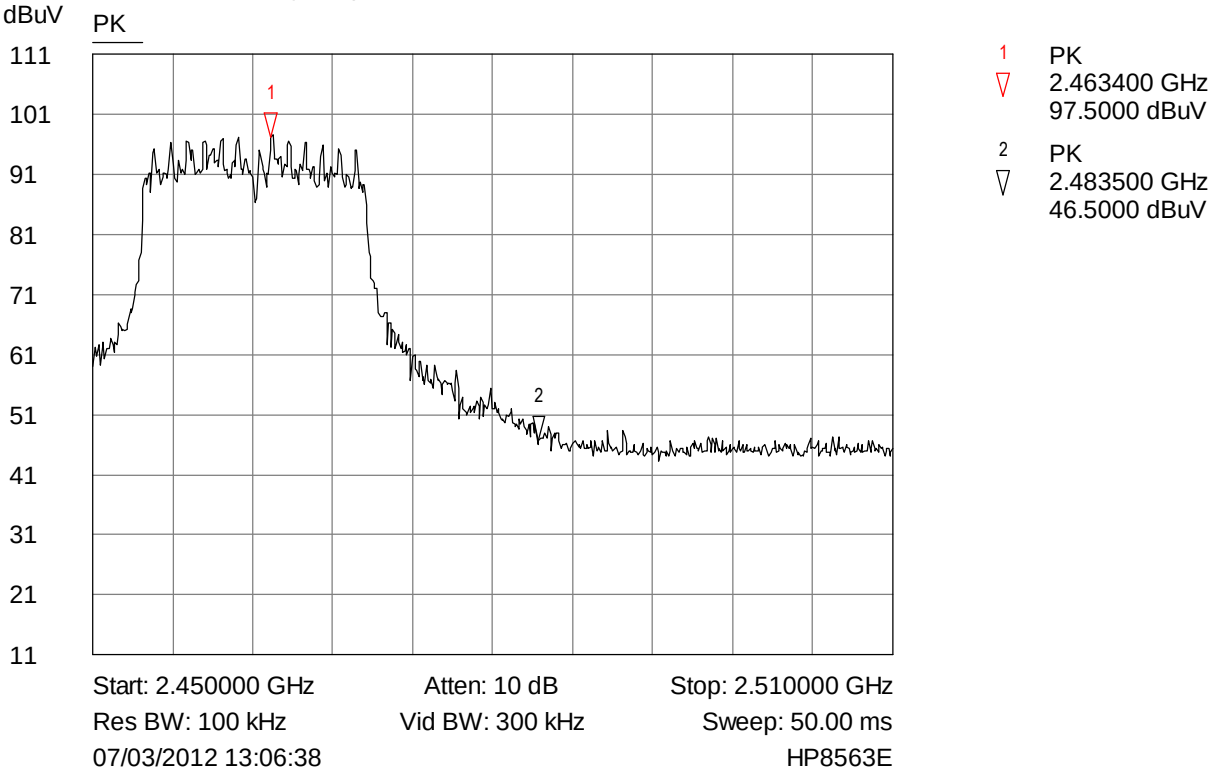
J4997-4, Band edge Top channel 36MB's Mod scheme



J4997-4, Band edge Top channel 48MB's Mod scheme

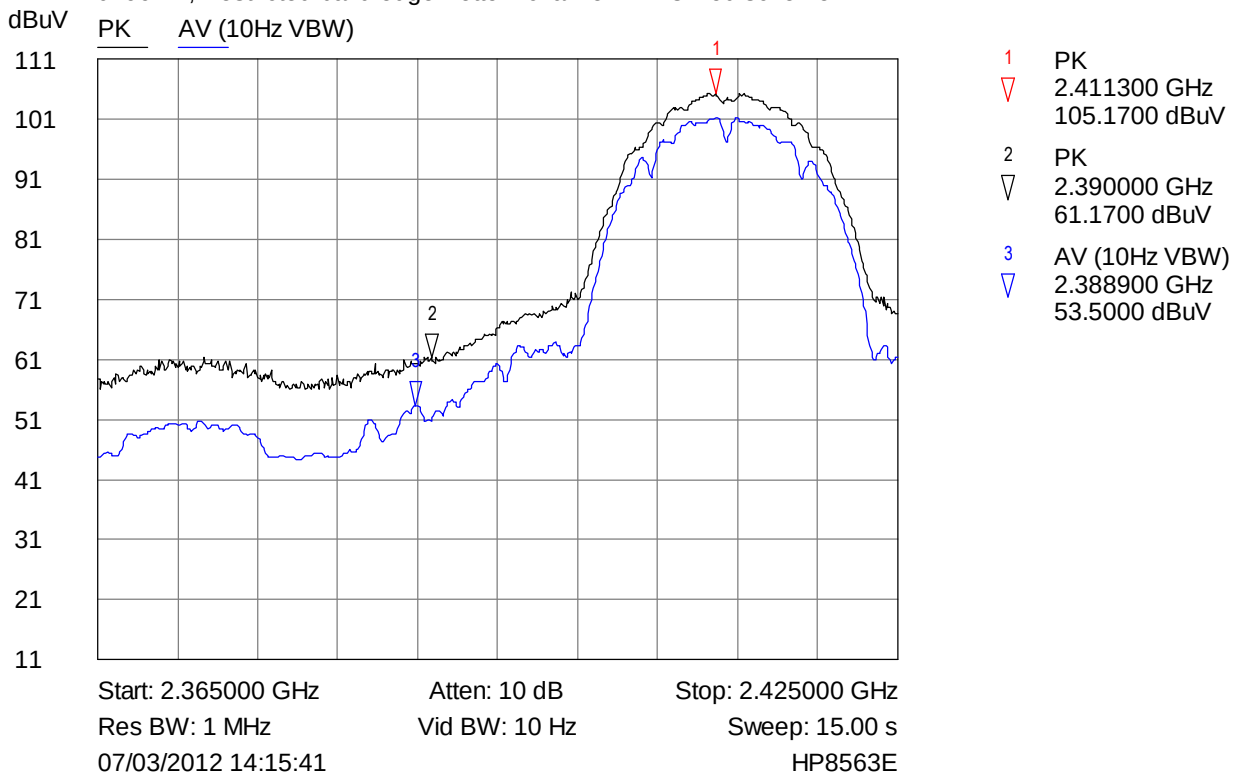


J4997-4, Band edge Top channel 54MB's Mod scheme

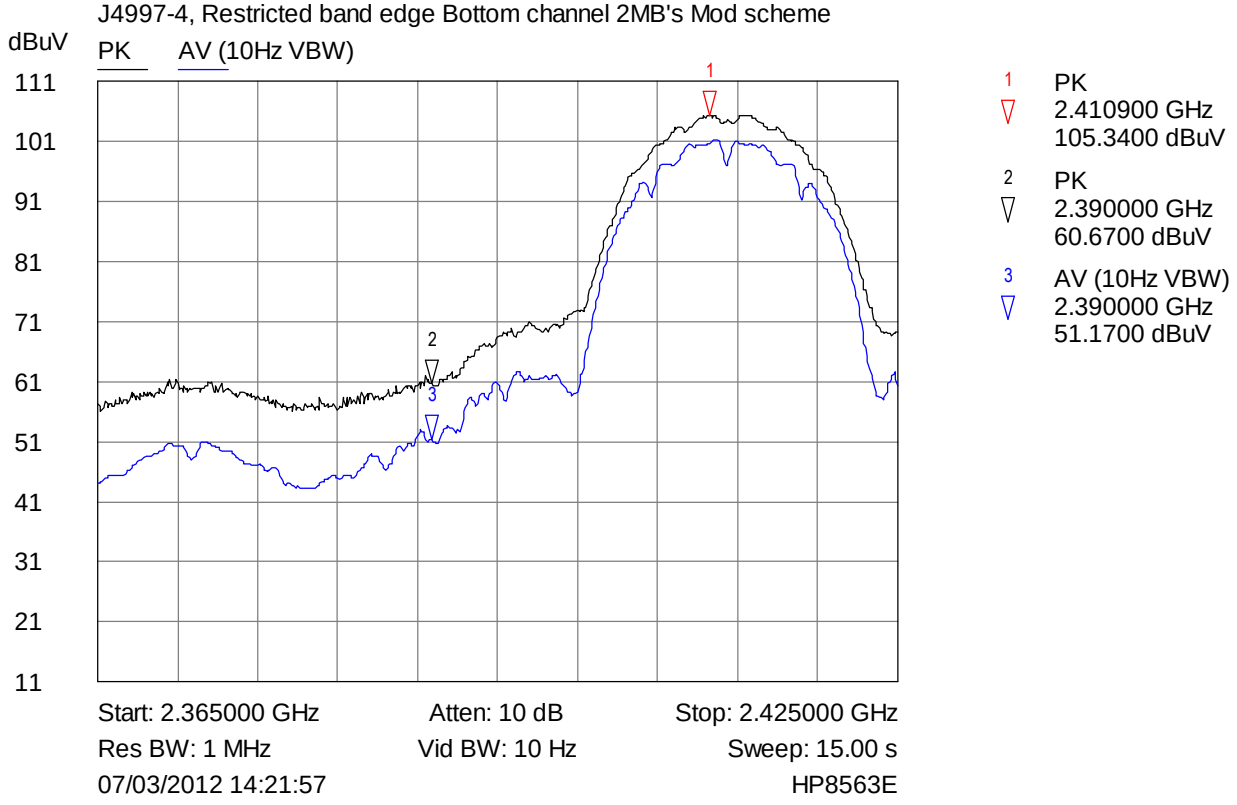


Restricted band edge. (1MHz RBW)

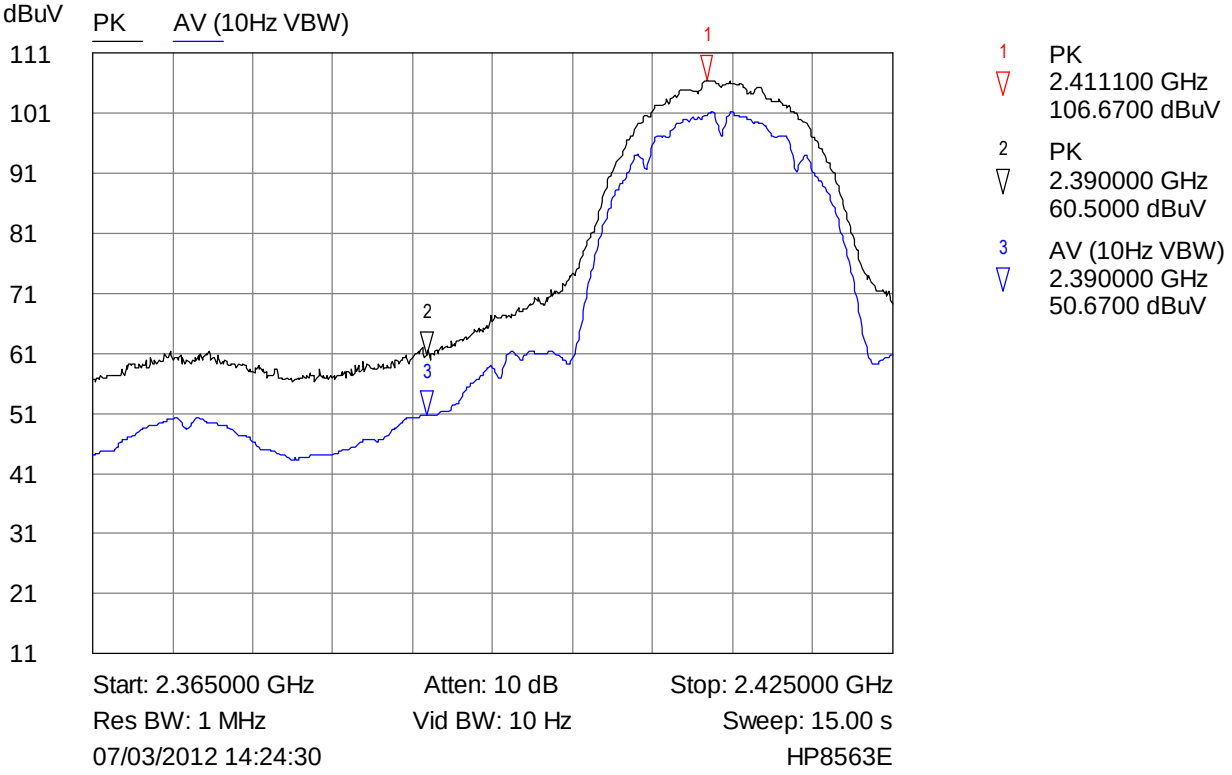
J4997-4, Restricted band edge Bottom channel 1MB's Mod scheme



J4997-4, Restricted band edge Bottom channel 2MB's Mod scheme

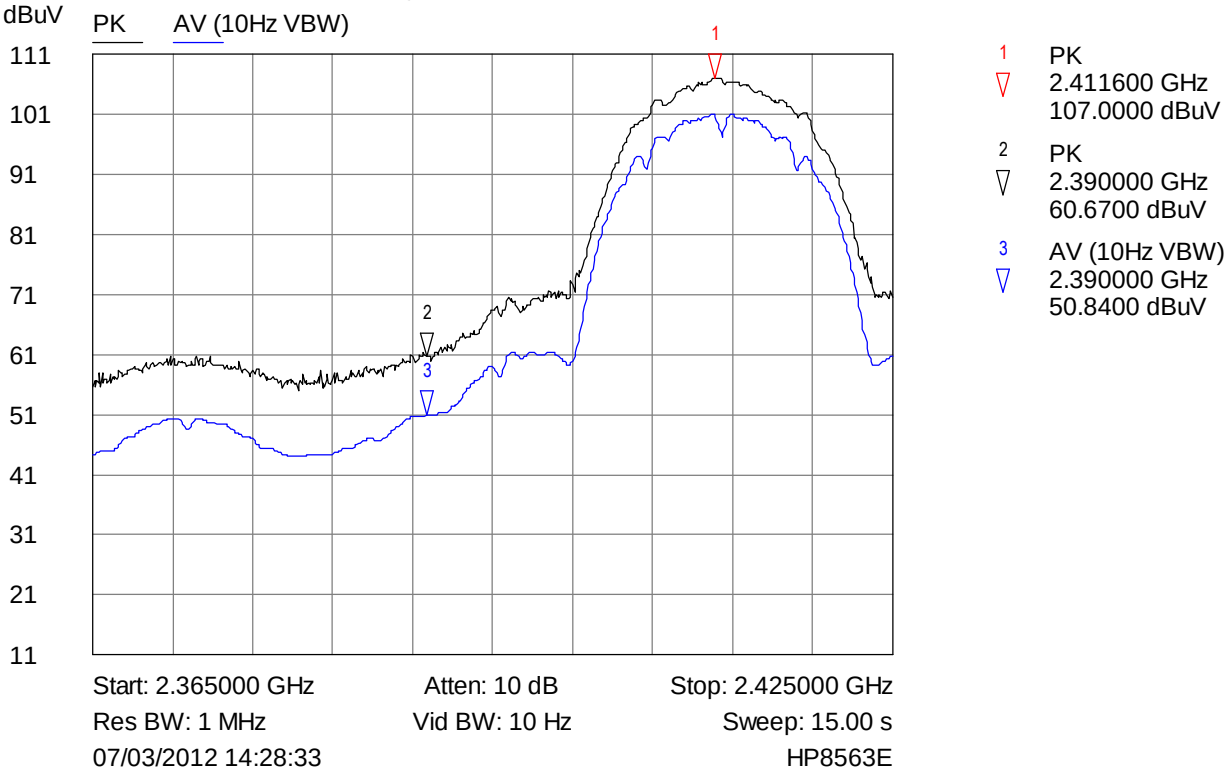


J4997-4, Restricted band edge Bottom channel 5.5MB's Mod scheme



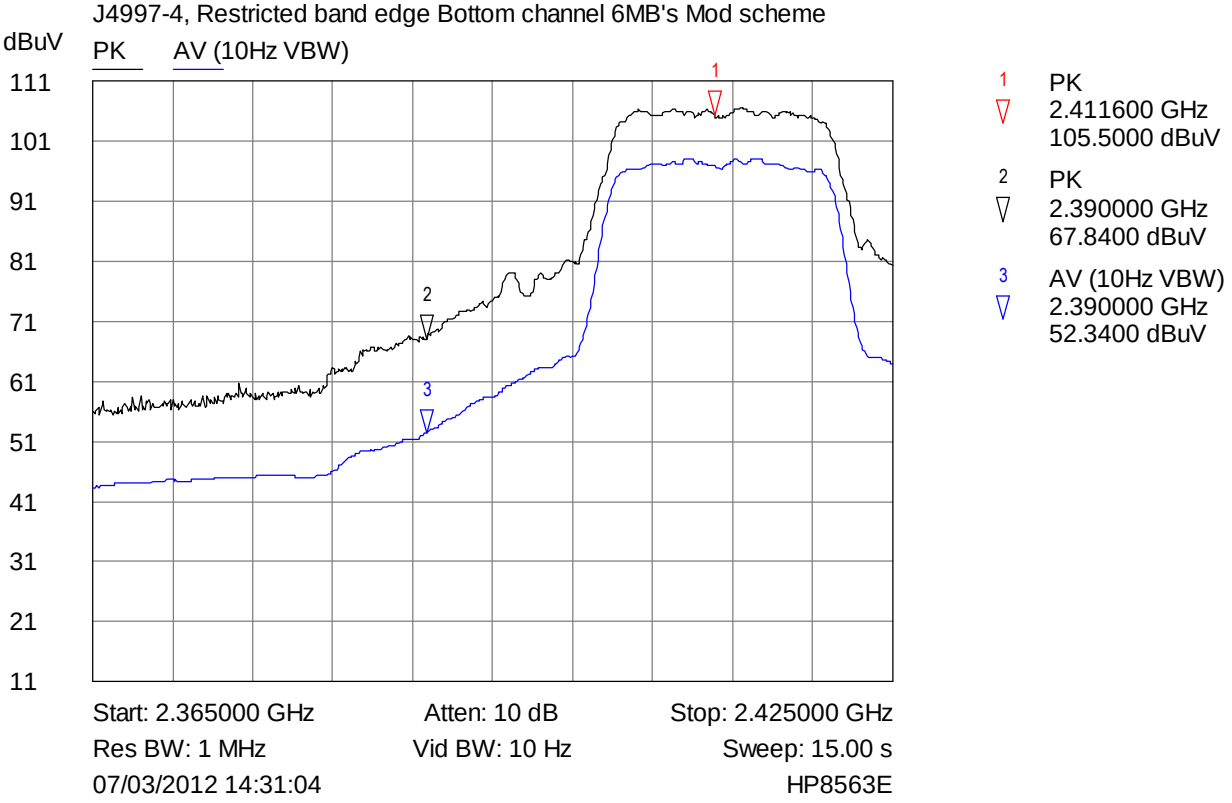
Start: 2.365000 GHz Atten: 10 dB Stop: 2.425000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 14:24:30 HP8563E

J4997-4, Restricted band edge Bottom channel 11MB's Mod scheme



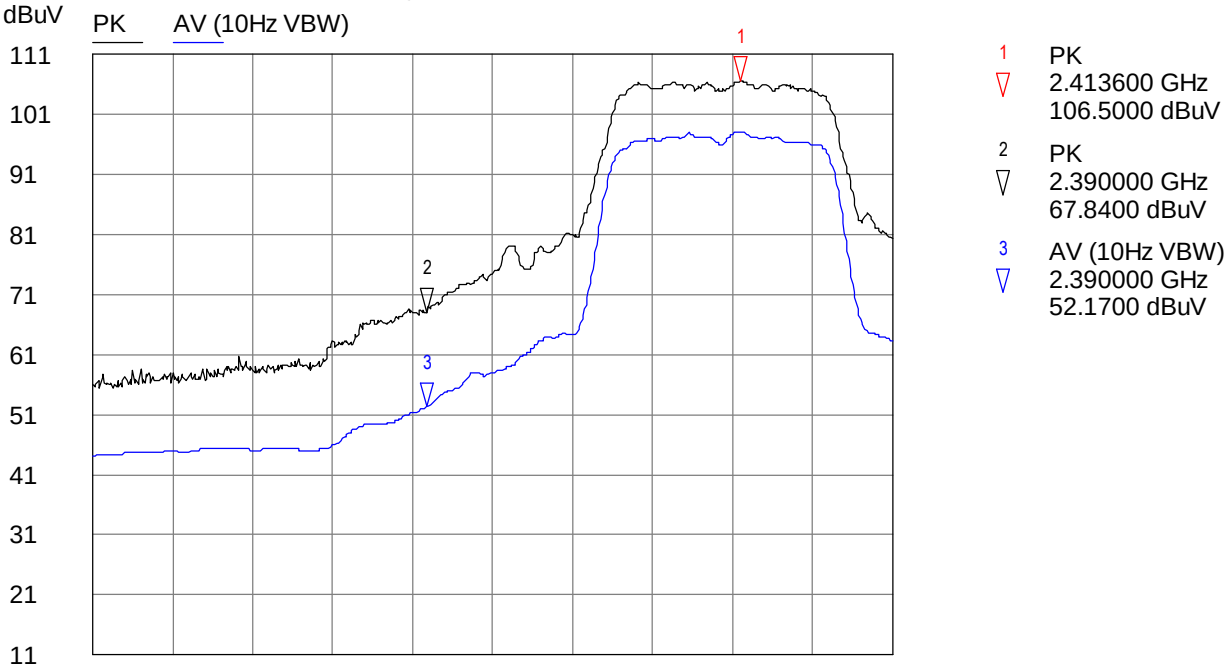
Start: 2.365000 GHz Atten: 10 dB Stop: 2.425000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 14:28:33 HP8563E

J4997-4, Restricted band edge Bottom channel 6MB's Mod scheme



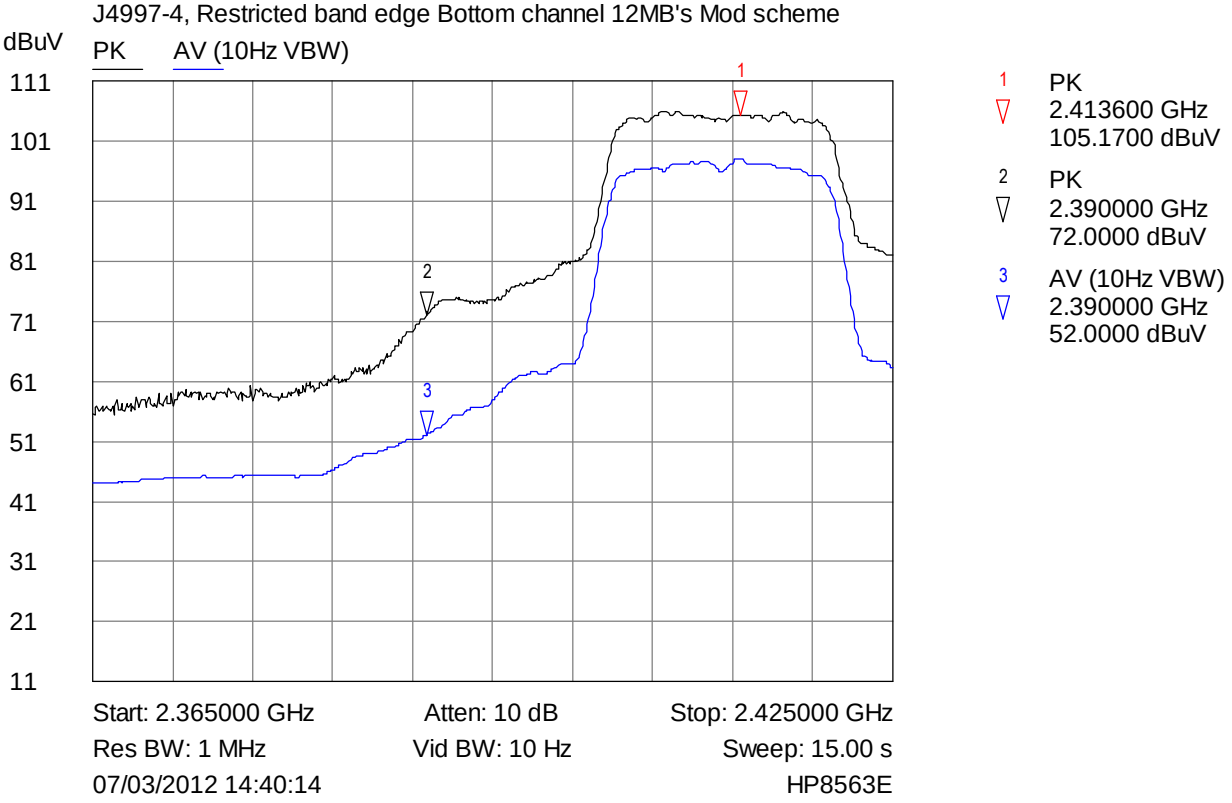
Start: 2.365000 GHz Atten: 10 dB Stop: 2.425000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 14:31:04 HP8563E

J4997-4, Restricted band edge Bottom channel 9MB's Mod scheme



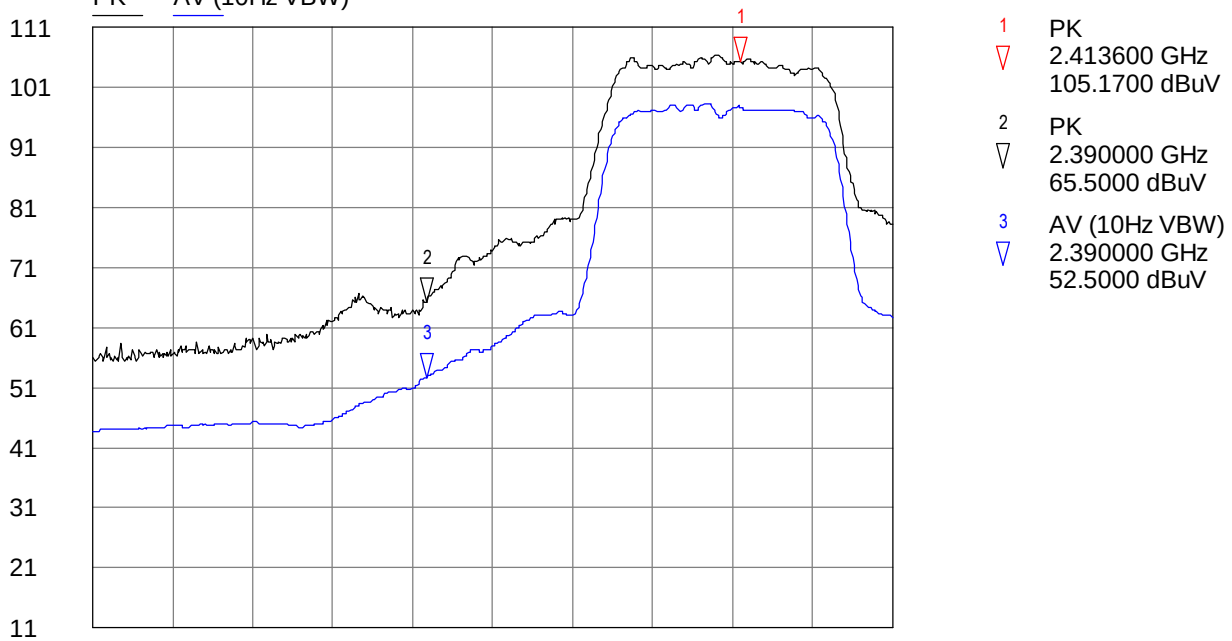
Start: 2.365000 GHz Atten: 10 dB Stop: 2.425000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 14:38:08 HP8563E

J4997-4, Restricted band edge Bottom channel 12MB's Mod scheme



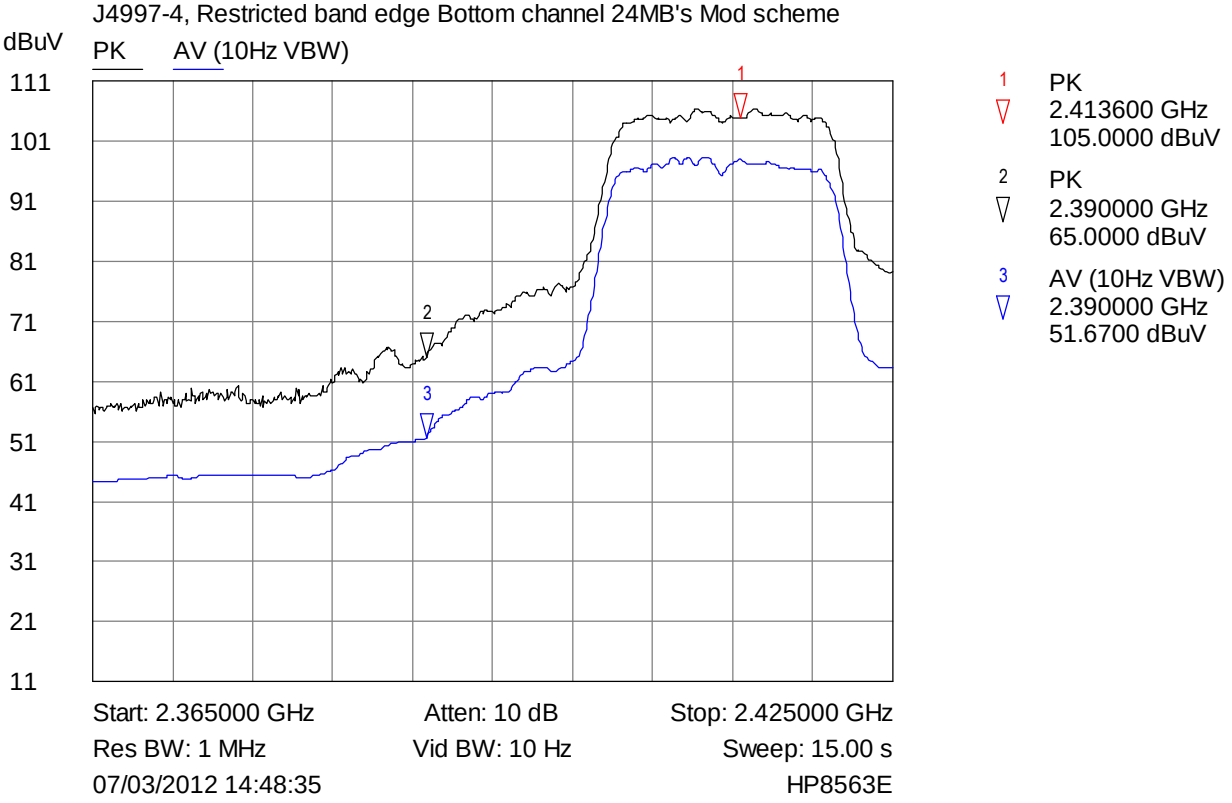
Start: 2.365000 GHz Atten: 10 dB Stop: 2.425000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 14:40:14 HP8563E

J4997-4, Restricted band edge Bottom channel 18MB's Mod scheme

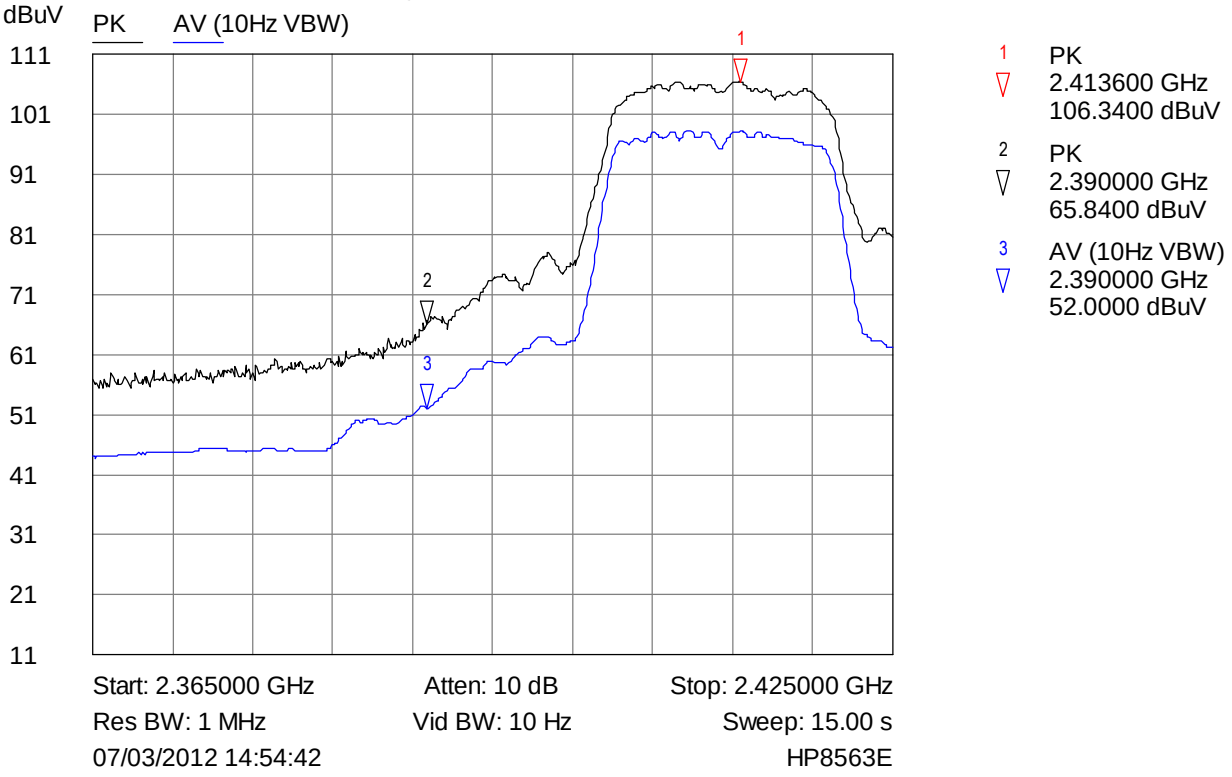


Start: 2.365000 GHz Atten: 10 dB Stop: 2.425000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 14:45:44 HP8563E

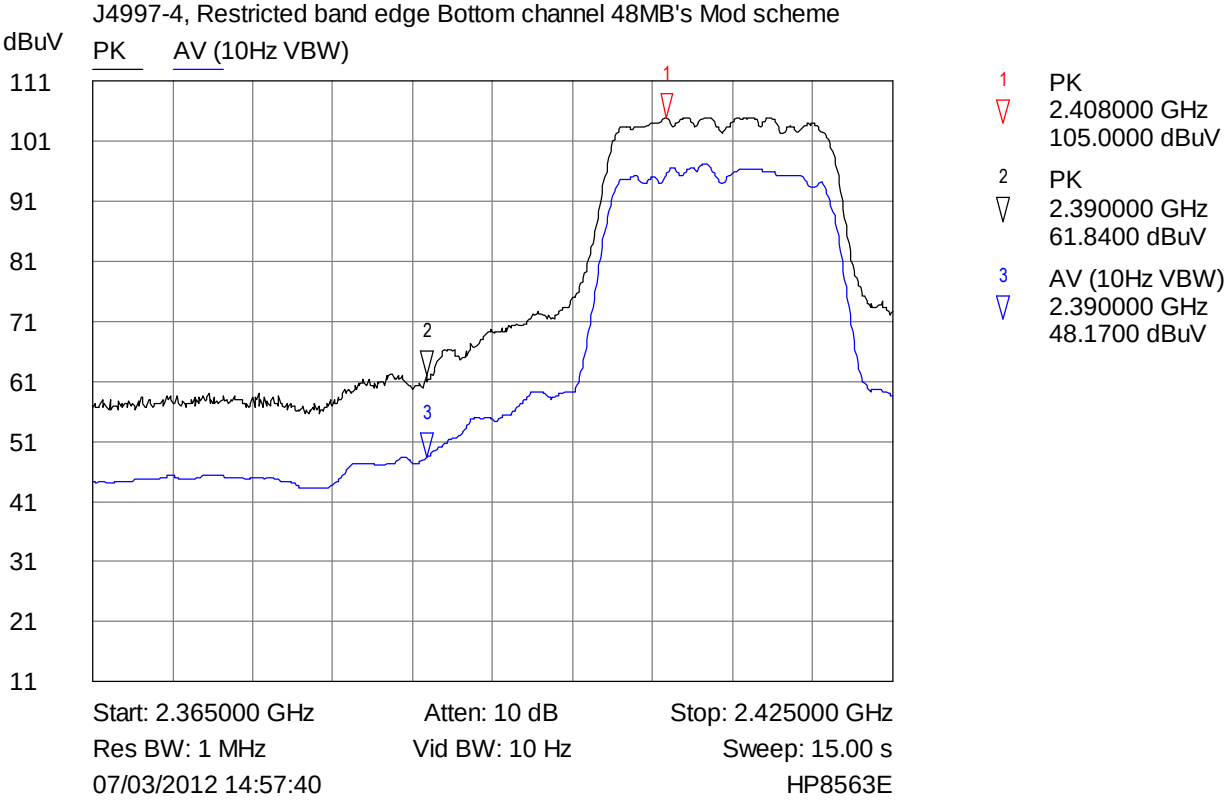
J4997-4, Restricted band edge Bottom channel 24MB's Mod scheme



J4997-4, Restricted band edge Bottom channel 36MB's Mod scheme

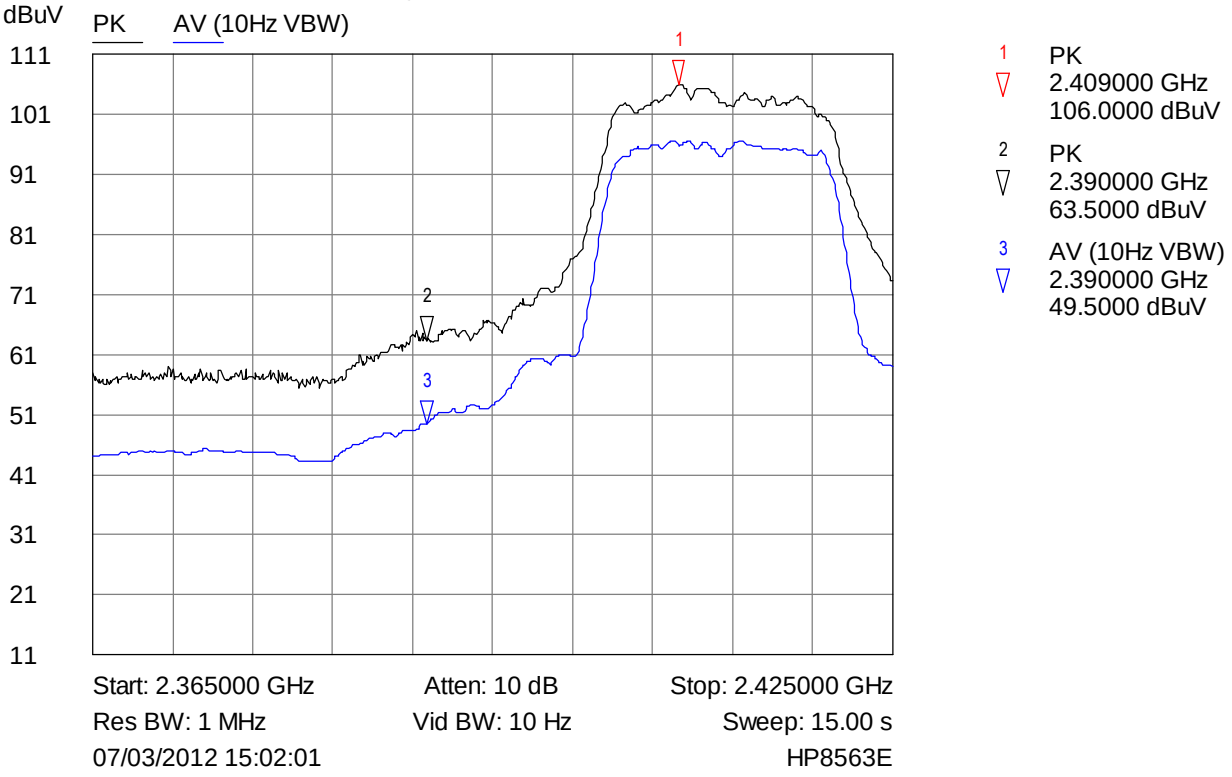


J4997-4, Restricted band edge Bottom channel 48MB's Mod scheme



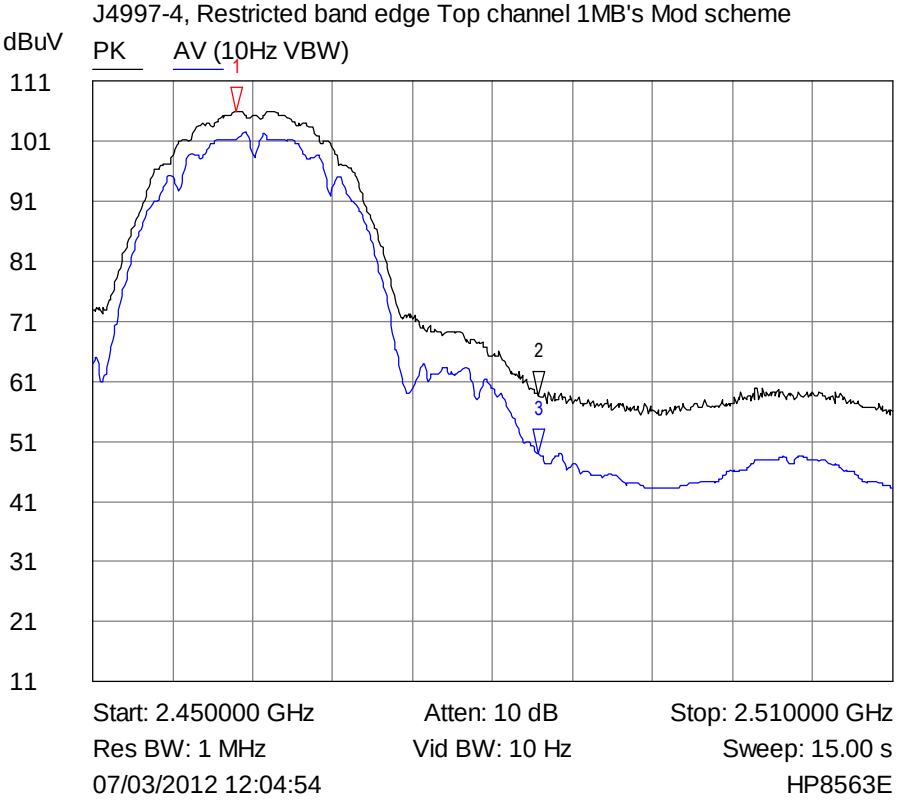
Start: 2.365000 GHz Atten: 10 dB Stop: 2.425000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 14:57:40 HP8563E

J4997-4, Restricted band edge Bottom channel 54MB's Mod scheme



Start: 2.365000 GHz Atten: 10 dB Stop: 2.425000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 15:02:01 HP8563E

J4997-4, Restricted band edge Top channel 1MB's Mod scheme



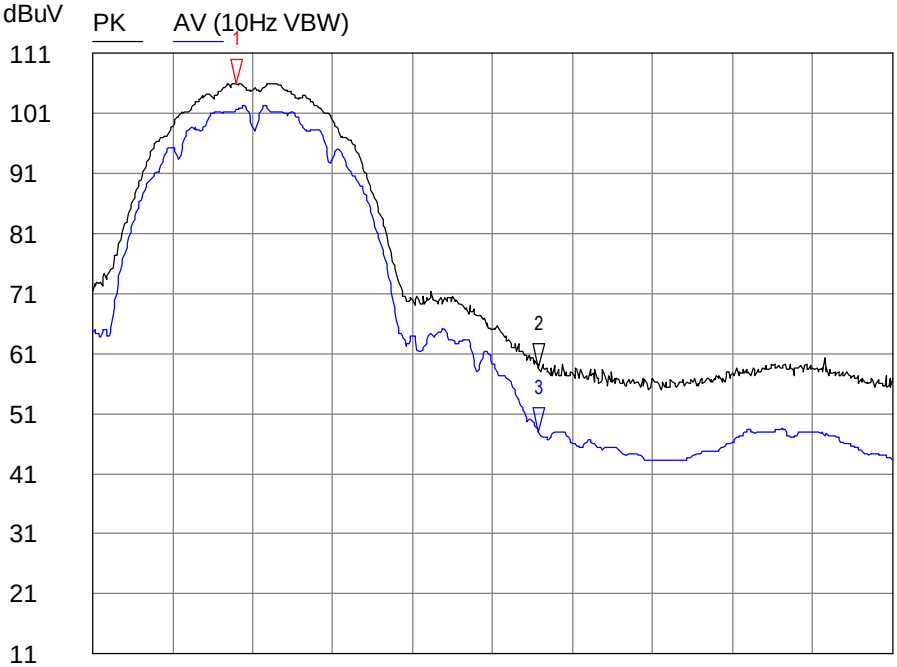
1 PK
2.460800 GHz
106.0000 dBuV

2 PK
2.483500 GHz
58.6700 dBuV

3 AV (10Hz VBW)
2.483500 GHz
49.0000 dBuV

Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 12:04:54 HP8563E

J4997-4, Restricted band edge Top channel 2MB's Mod scheme



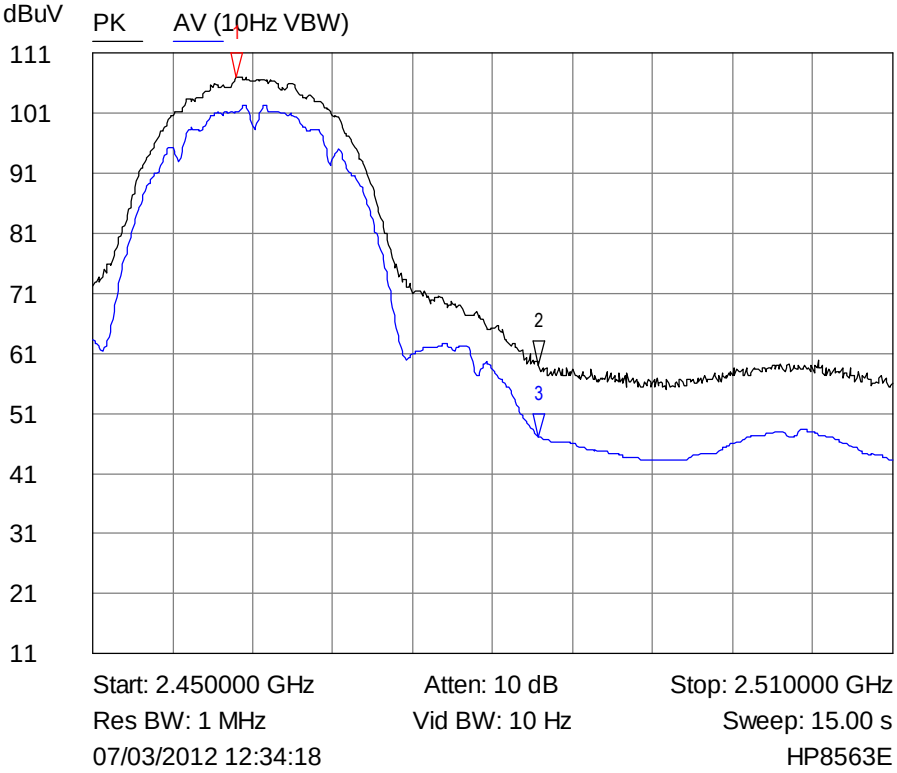
1 PK
2.460800 GHz
105.8400 dBuV

2 PK
2.483500 GHz
58.6700 dBuV

3 AV (10Hz VBW)
2.483500 GHz
47.8400 dBuV

Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 12:31:44 HP8563E

J4997-4, Restricted band edge Top channel 5.5MB's Mod scheme



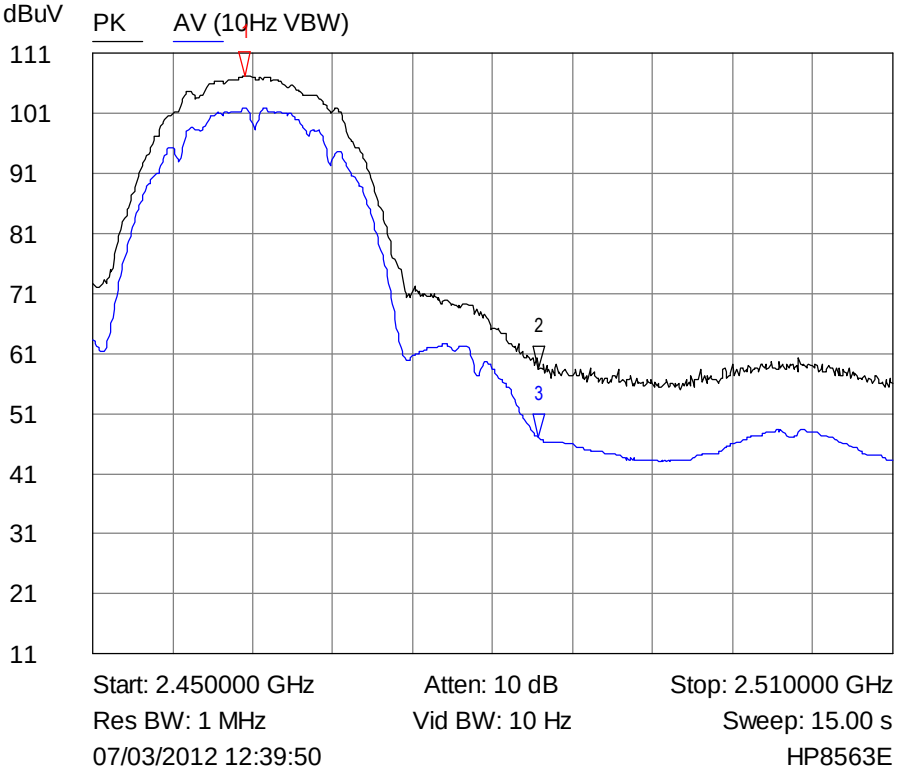
1 PK
2.460800 GHz
106.8400 dBuV

2 PK
2.483500 GHz
59.0000 dBuV

3 AV (10Hz VBW)
2.483500 GHz
47.0000 dBuV

Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 12:34:18 HP8563E

J4997-4, Restricted band edge Top channel 11MB's Mod scheme



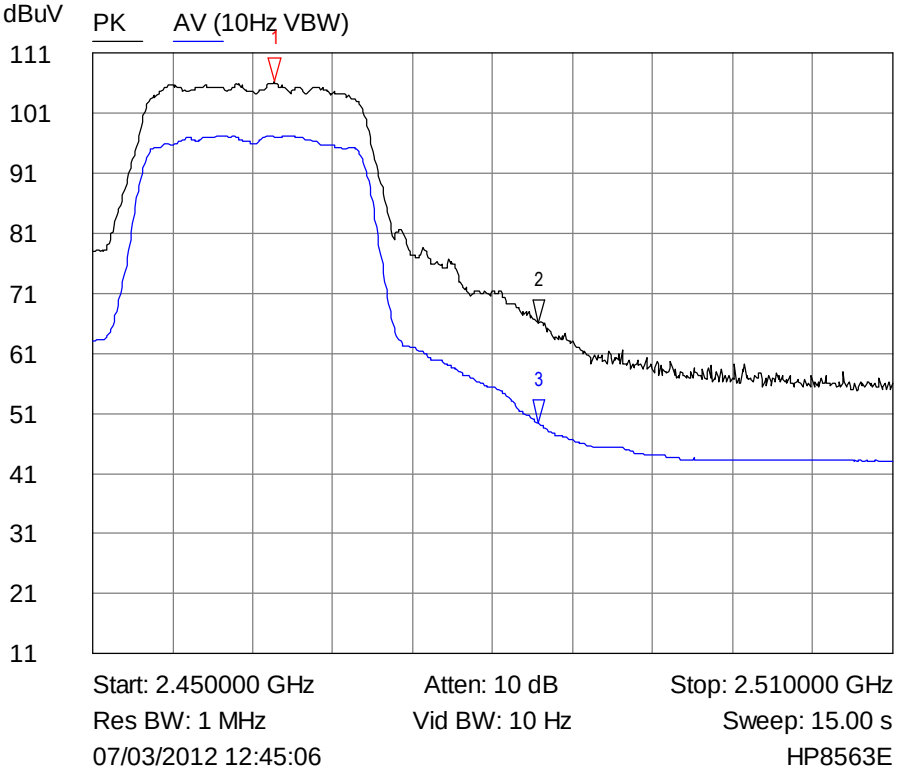
1 PK
2.461400 GHz
107.3400 dBuV

2 PK
2.483500 GHz
58.3400 dBuV

3 AV (10Hz VBW)
2.483500 GHz
46.8400 dBuV

Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 12:39:50 HP8563E

J4997-4, Restricted band edge Top channel 6MB's Mod scheme



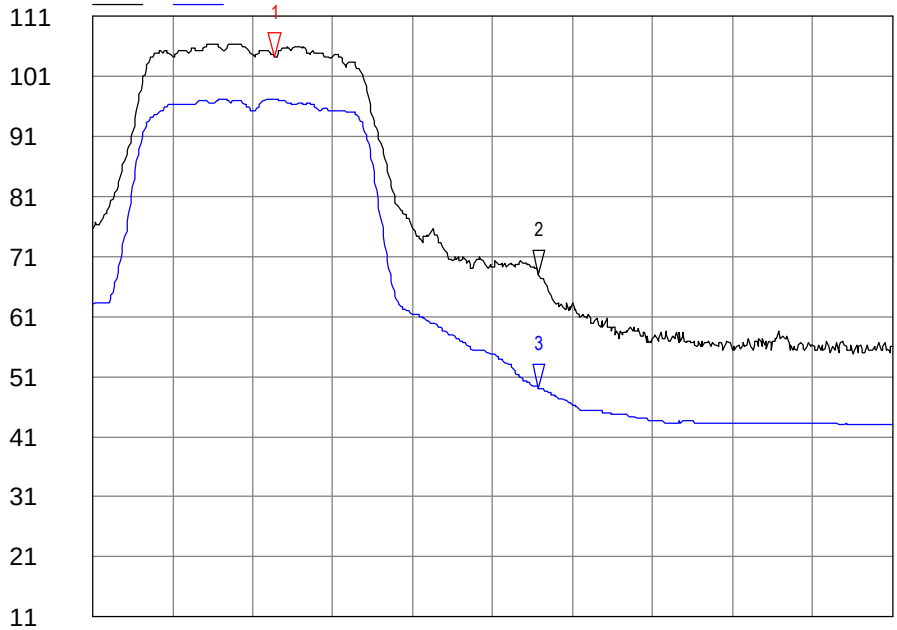
1 PK
2.463600 GHz
106.1700 dBuV

2 PK
2.483500 GHz
66.0000 dBuV

3 AV (10Hz VBW)
2.483500 GHz
49.1700 dBuV

Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 12:45:06 HP8563E

J4997-4, Restricted band edge Top channel 9MB's Mod scheme



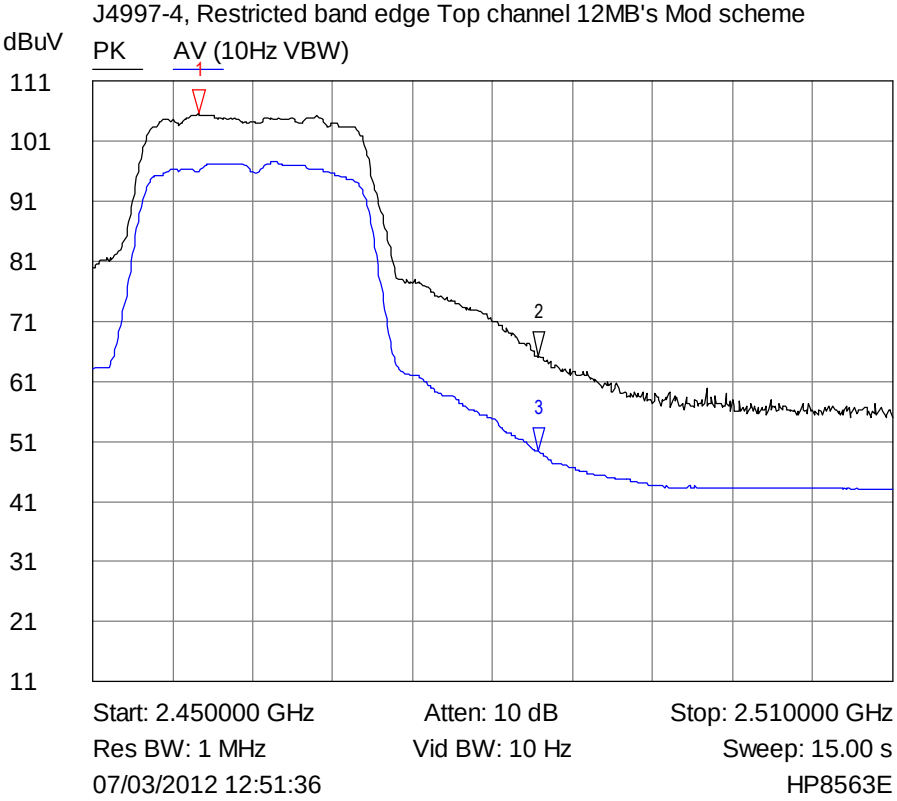
1 PK
2.463600 GHz
104.3400 dBuV

2 PK
2.483500 GHz
68.0000 dBuV

3 AV (10Hz VBW)
2.483500 GHz
49.0000 dBuV

Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 12:49:20 HP8563E

J4997-4, Restricted band edge Top channel 12MB's Mod scheme



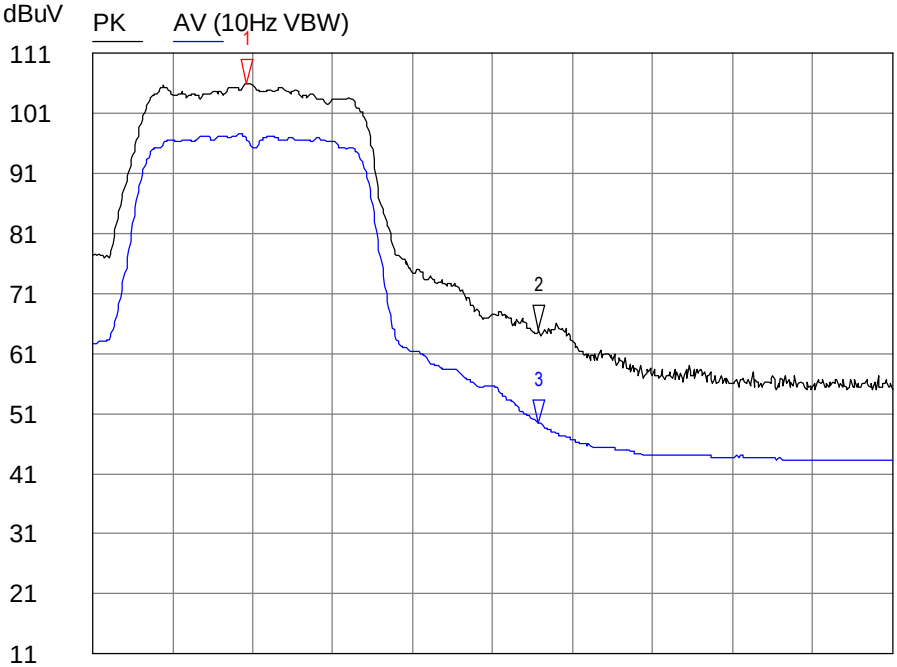
1 PK
2.457900 GHz
105.6700 dBuV

2 PK
2.483500 GHz
65.5000 dBuV

3 AV (10Hz VBW)
2.483500 GHz
49.1700 dBuV

Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 12:51:36 HP8563E

J4997-4, Restricted band edge Top channel 18MB's Mod scheme



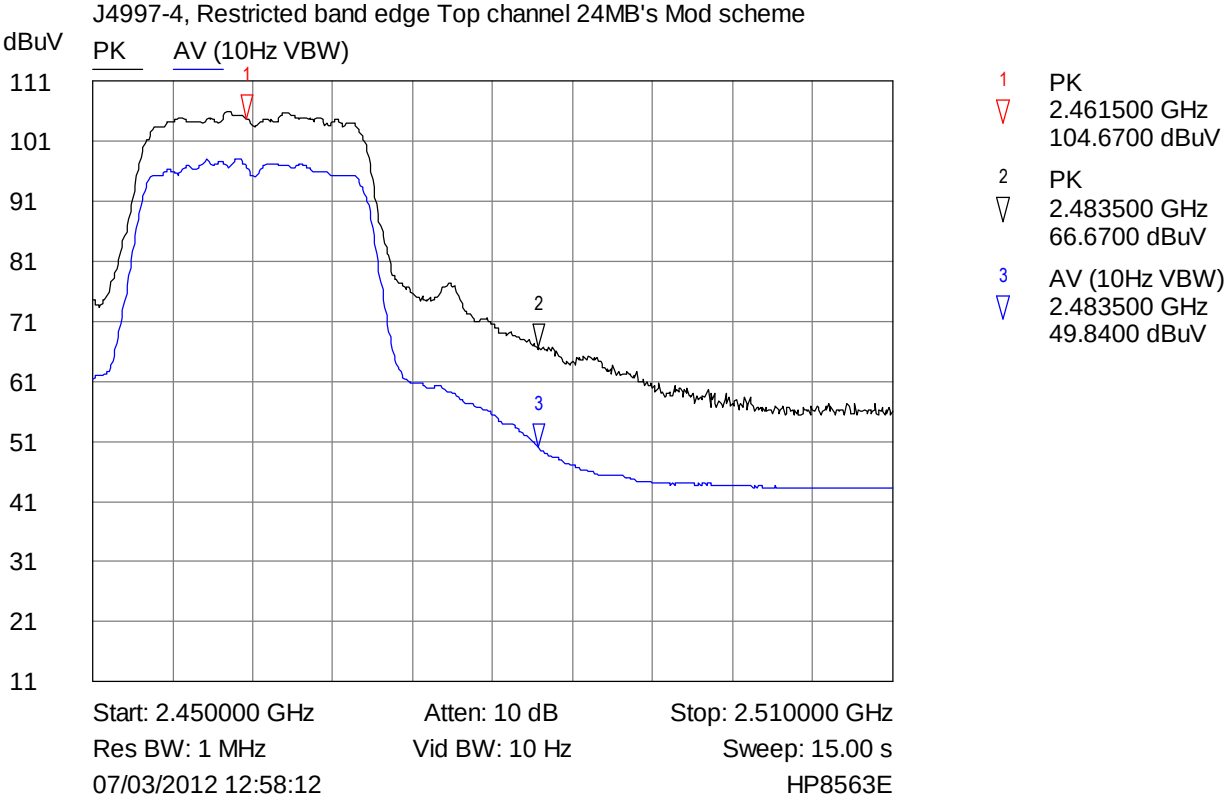
1 PK
2.461500 GHz
106.0000 dBuV

2 PK
2.483500 GHz
64.8400 dBuV

3 AV (10Hz VBW)
2.483500 GHz
49.3400 dBuV

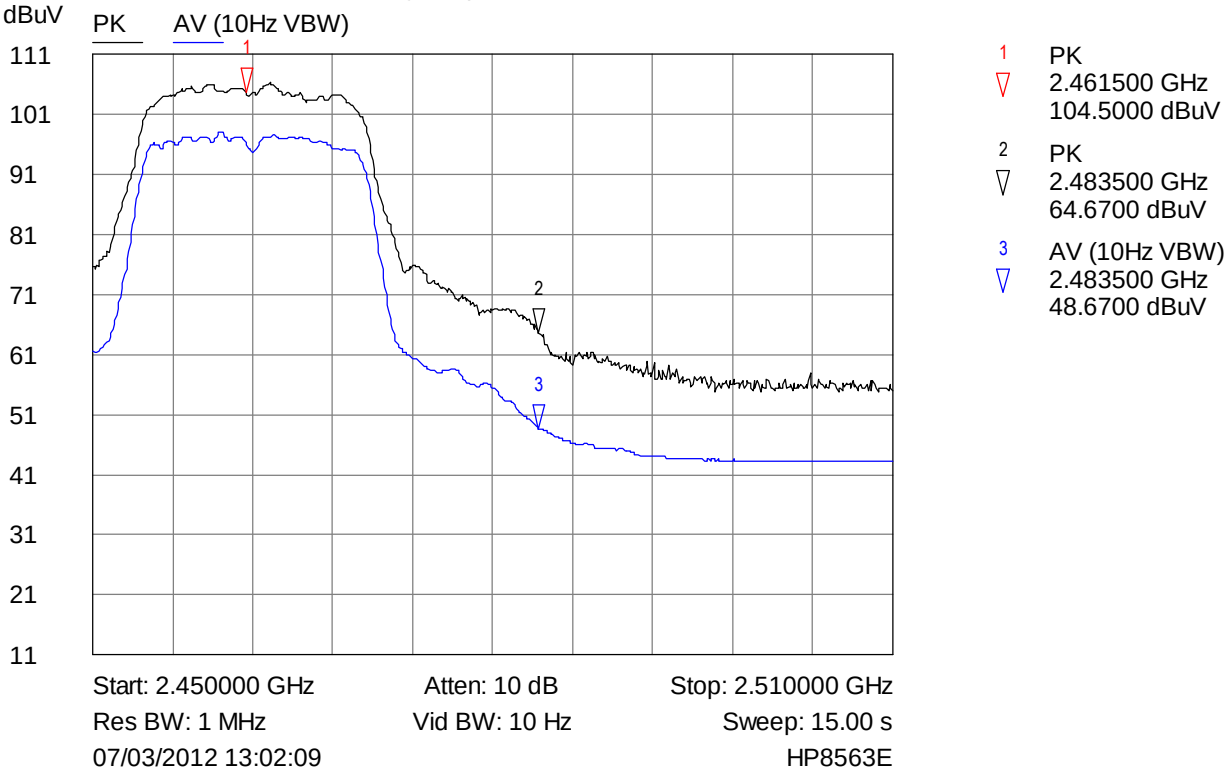
Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 12:56:08 HP8563E

J4997-4, Restricted band edge Top channel 24MB's Mod scheme



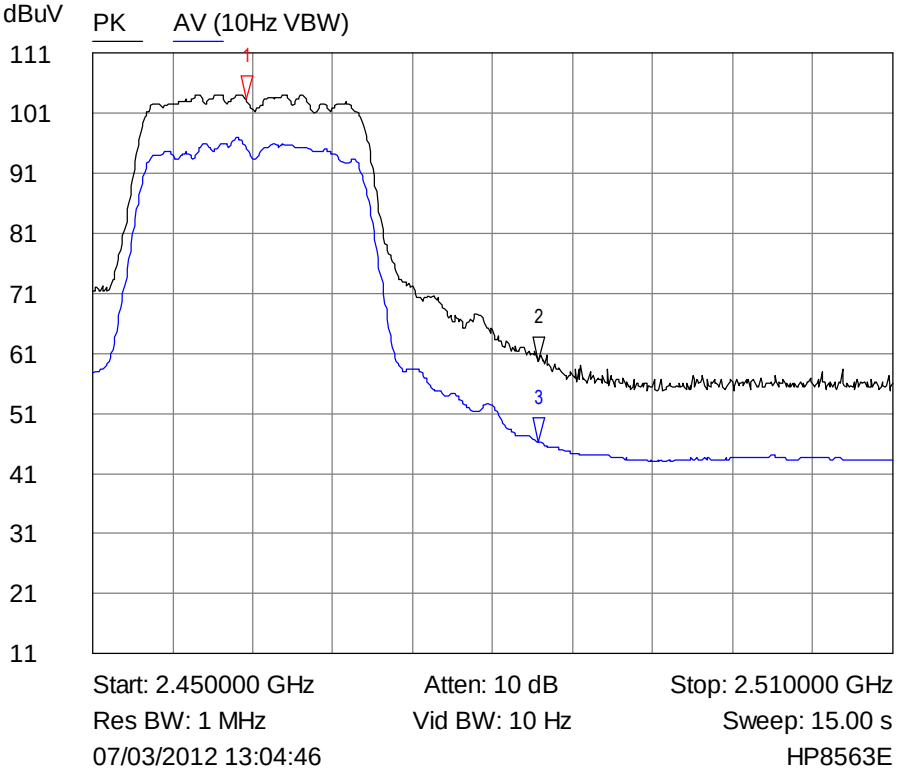
Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 12:58:12 HP8563E

J4997-4, Restricted band edge Top channel 36MB's Mod scheme



Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 13:02:09 HP8563E

J4997-4, Restricted band edge Top channel 48MB's Mod scheme



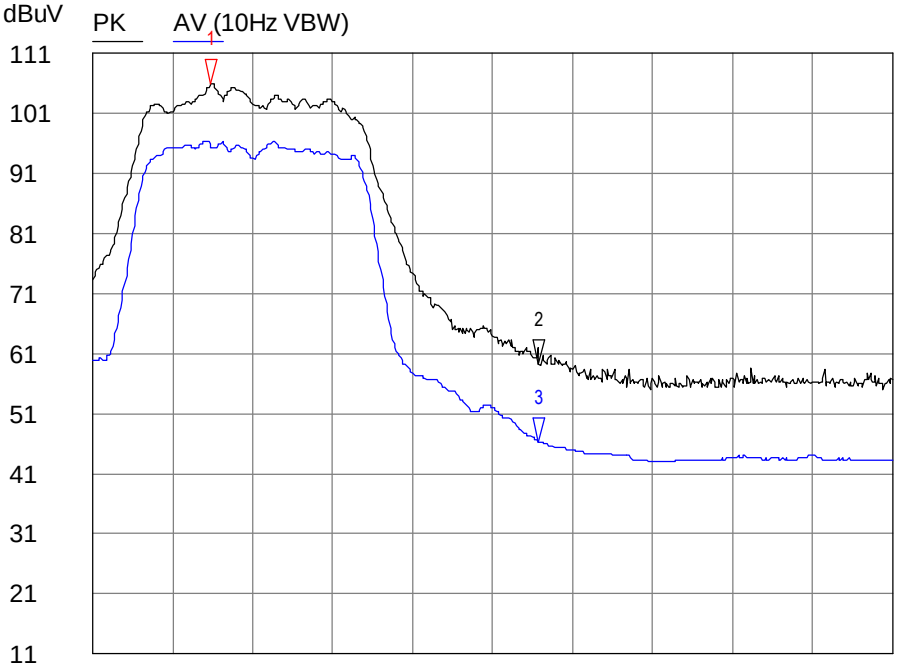
1 PK
2.461500 GHz
103.3400 dBuV

2 PK
2.483500 GHz
59.6700 dBuV

3 AV (10Hz VBW)
2.483500 GHz
46.1700 dBuV

Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 13:04:46 HP8563E

J4997-4, Restricted band edge Top channel 54MB's Mod scheme



1 PK
2.458900 GHz
105.8400 dBuV

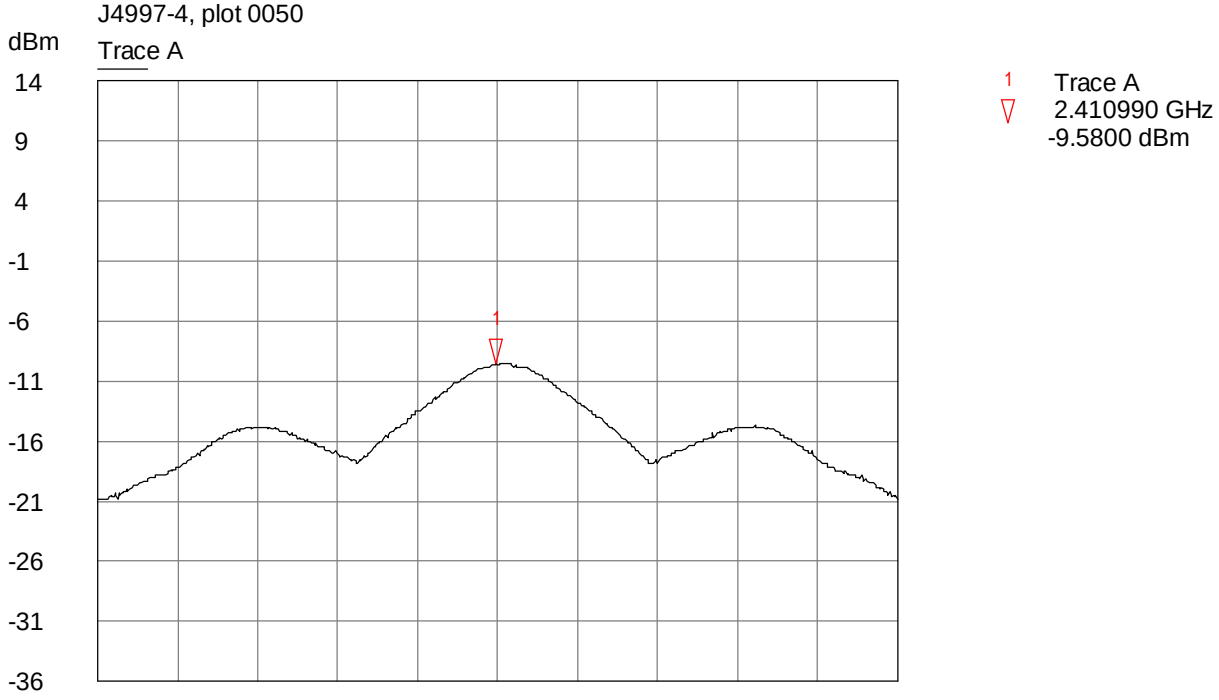
2 PK
2.483500 GHz
59.5000 dBuV

3 AV (10Hz VBW)
2.483500 GHz
46.3400 dBuV

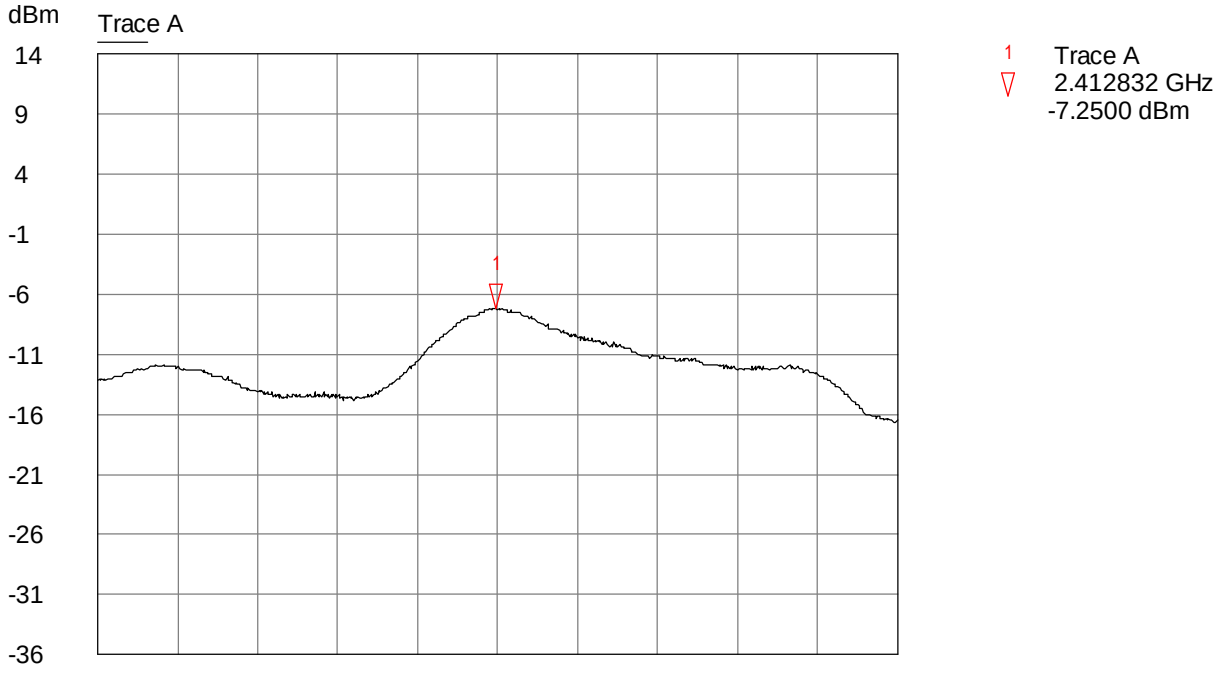
Start: 2.450000 GHz Atten: 10 dB Stop: 2.510000 GHz
Res BW: 1 MHz Vid BW: 10 Hz Sweep: 15.00 s
07/03/2012 13:08:31 HP8563E

6.7 Power Spectral Density plots

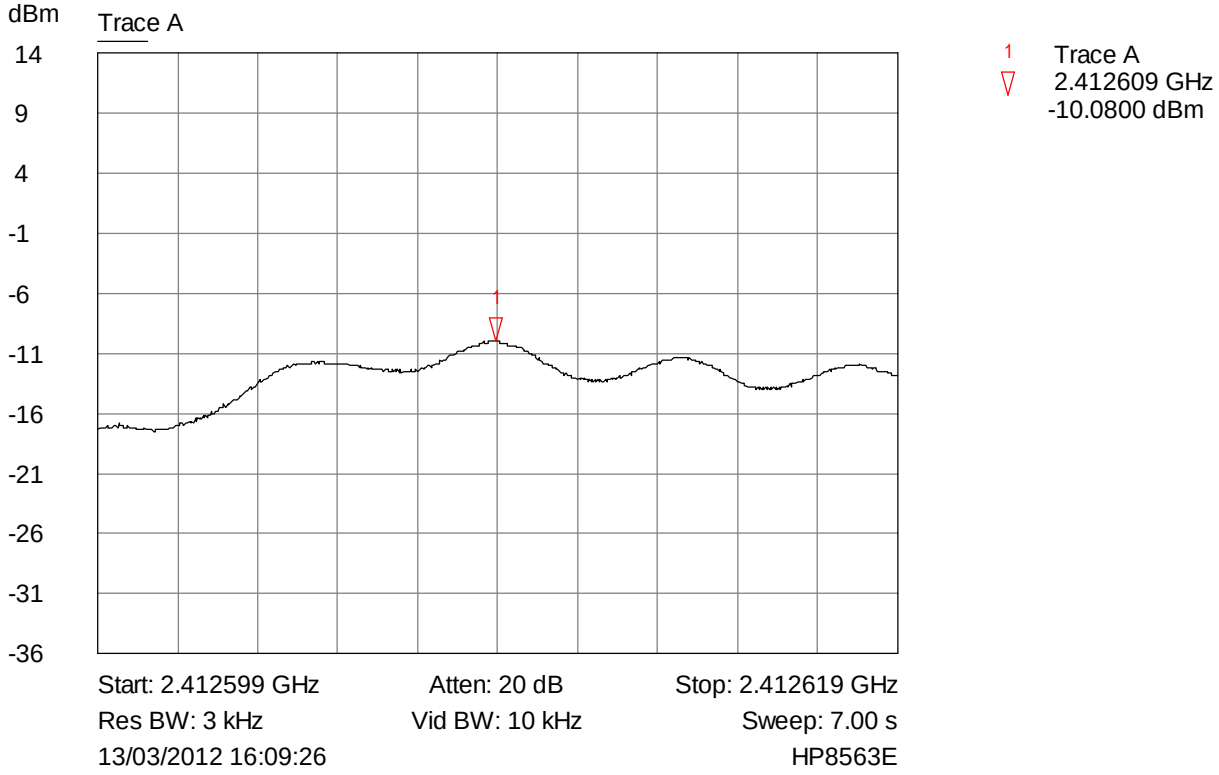
J4997-4, plot 0050



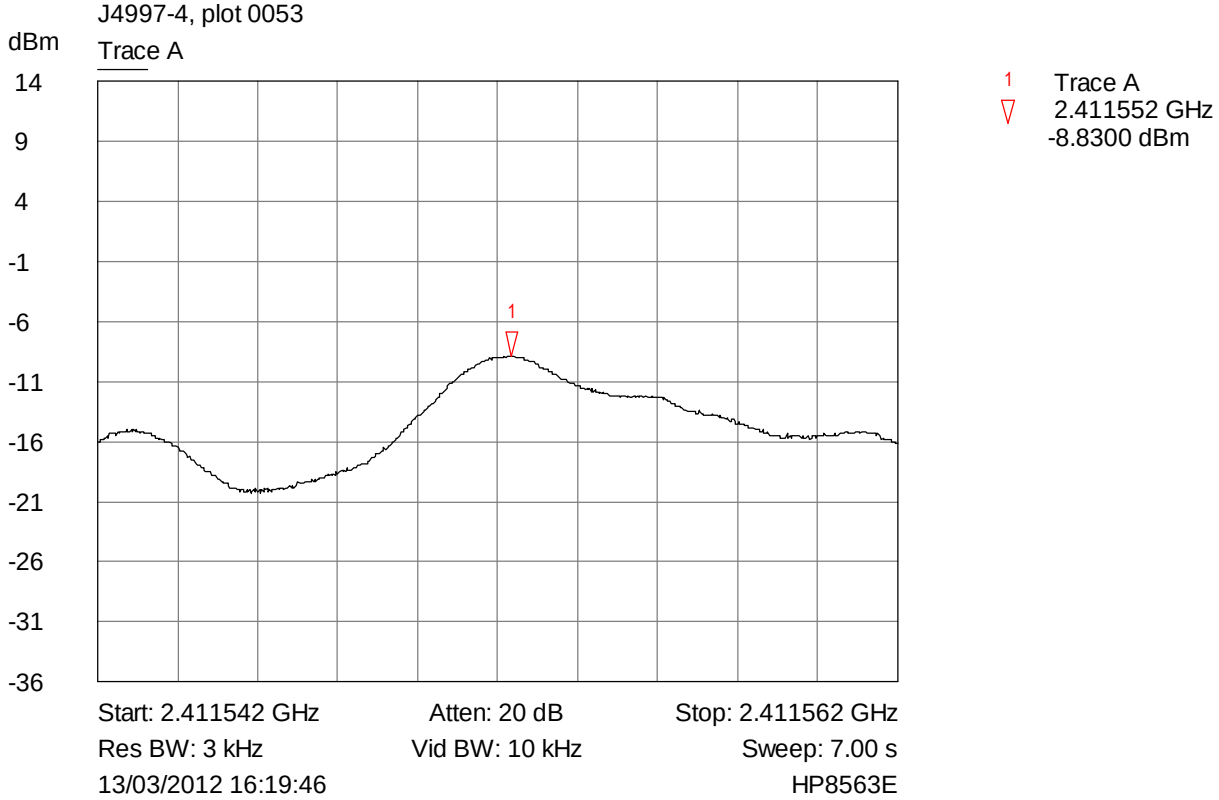
J4997-4, plot 0051



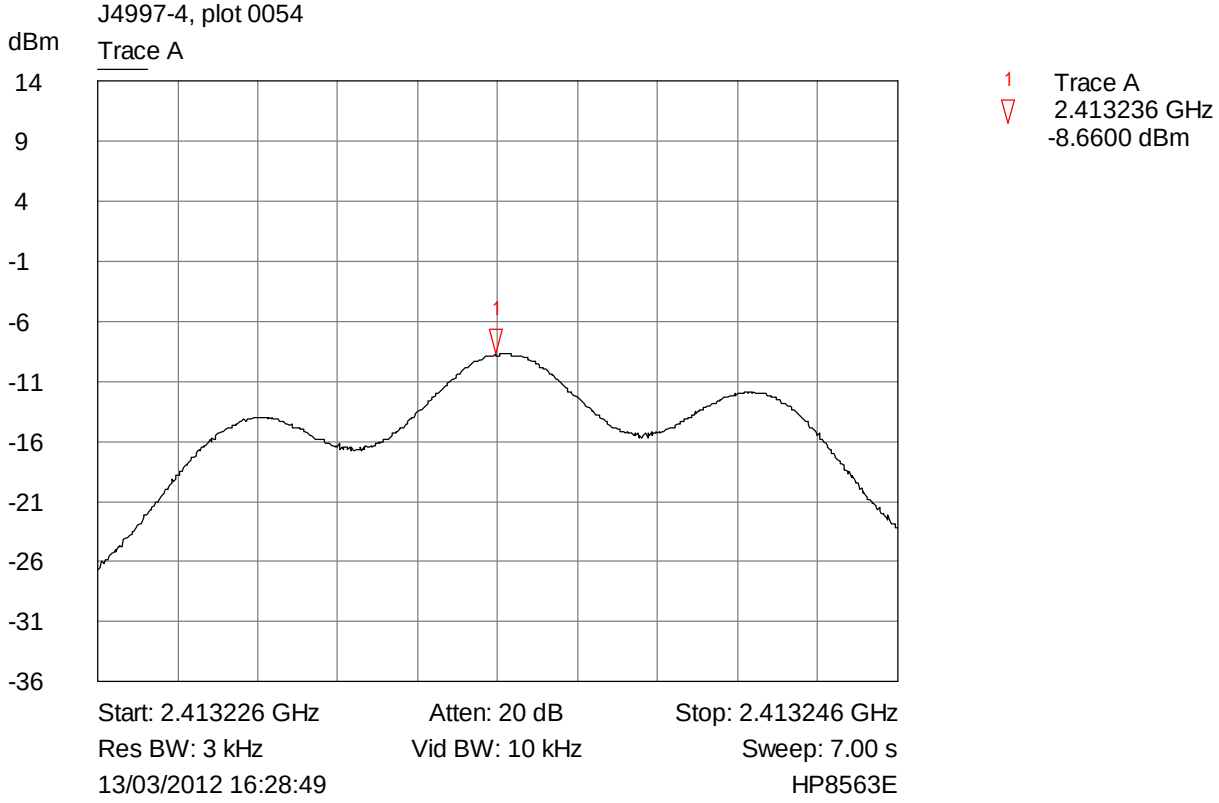
J4997-4, plot 0052



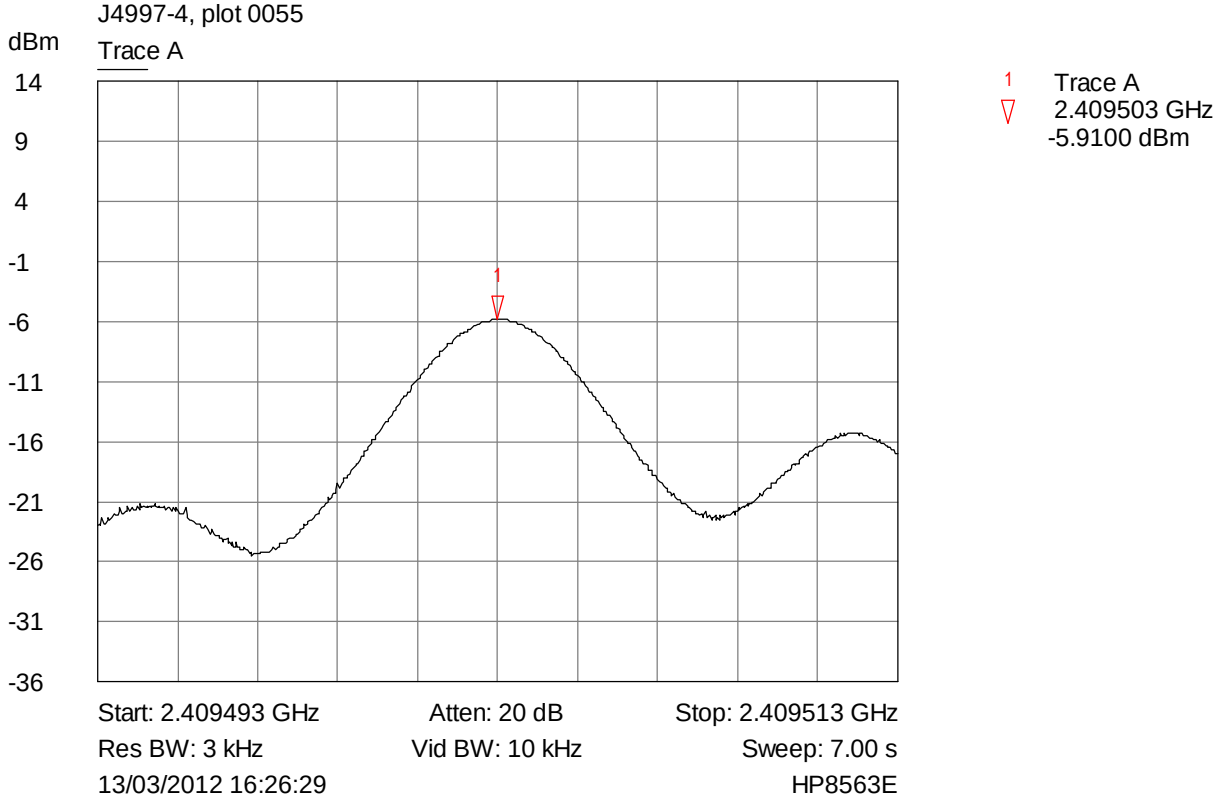
J4997-4, plot 0053



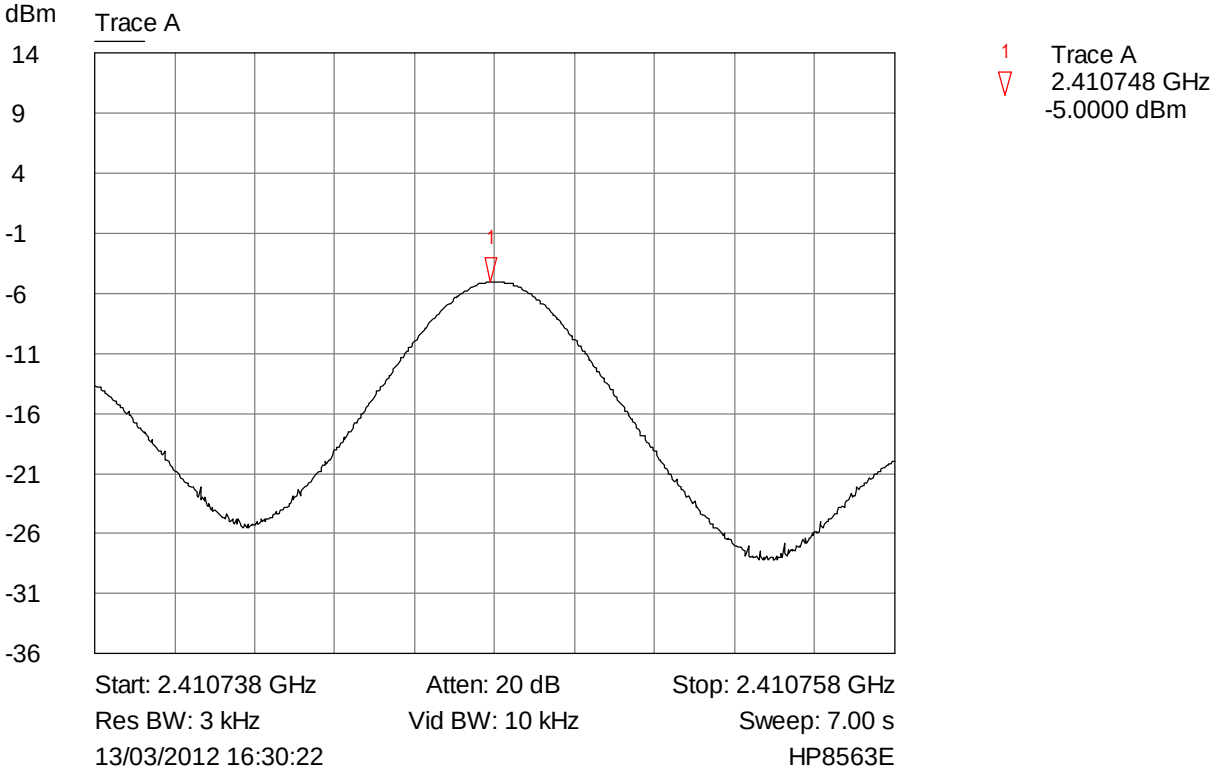
J4997-4, plot 0054



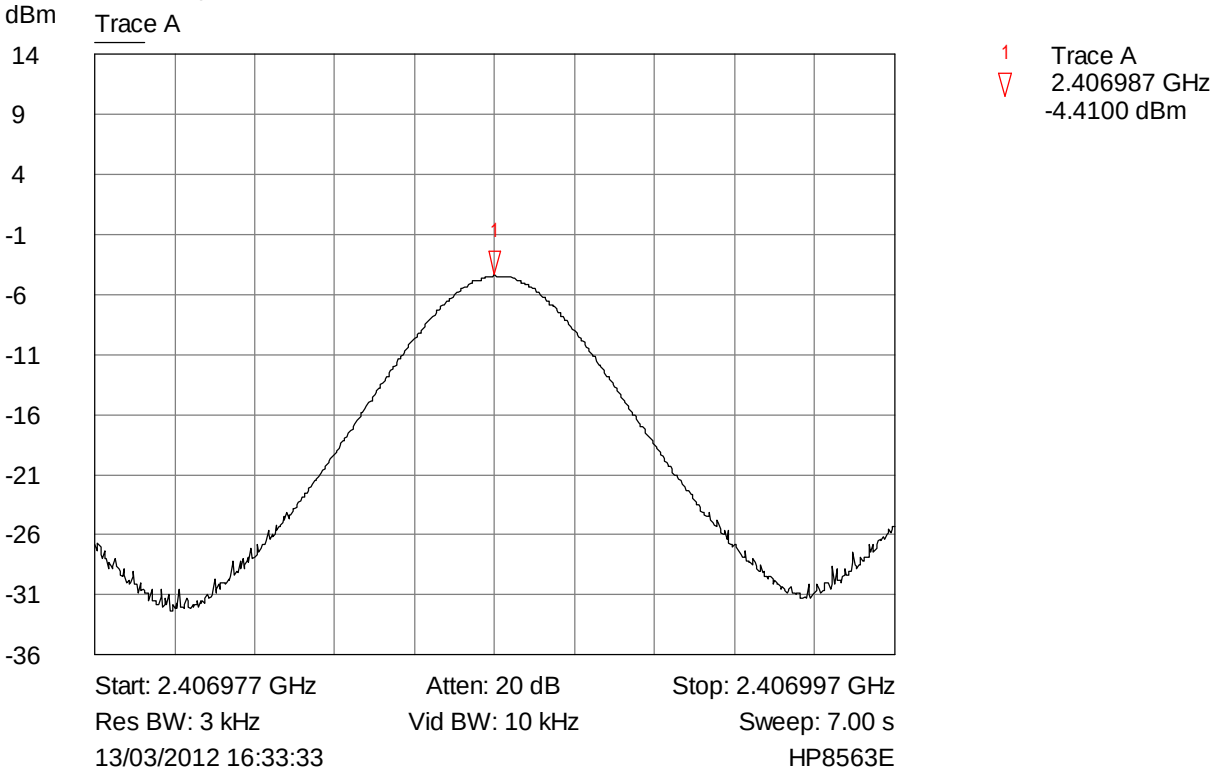
J4997-4, plot 0055



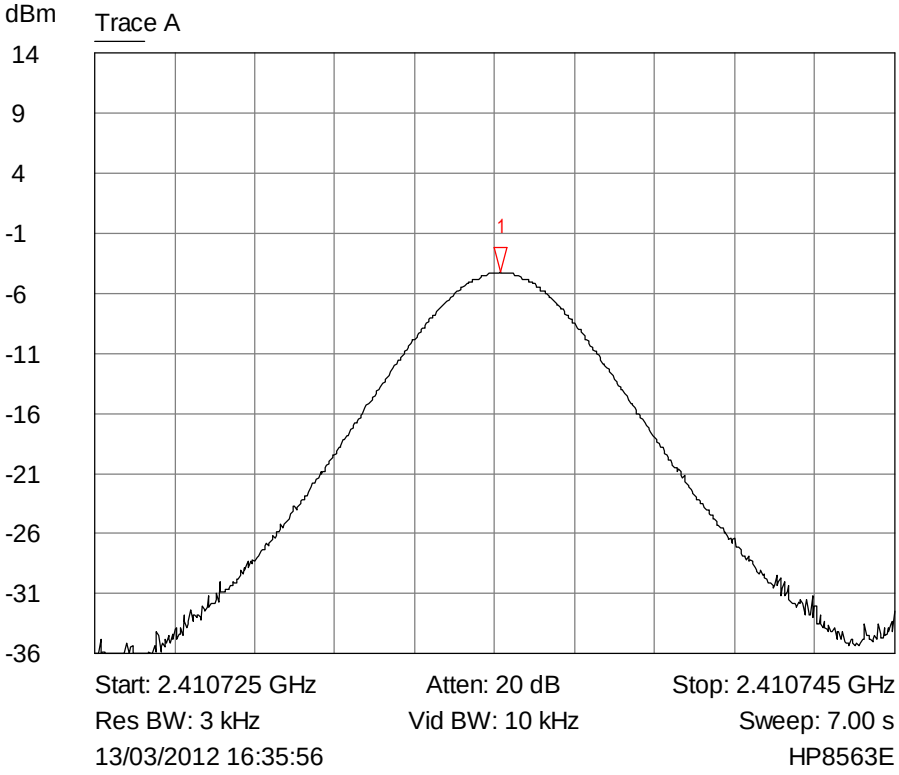
J4997-4, plot 0056



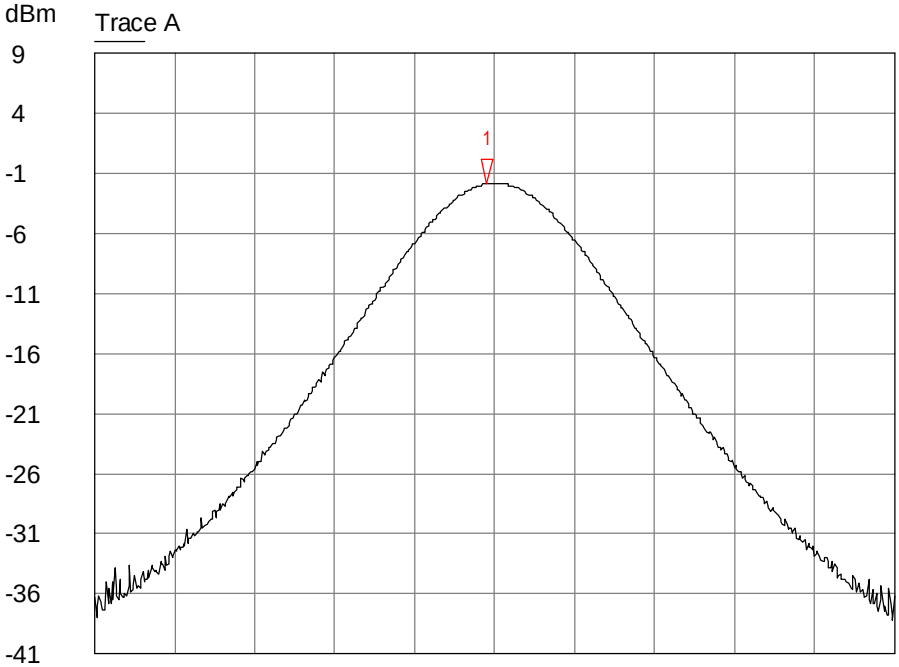
J4997-4, plot 0057



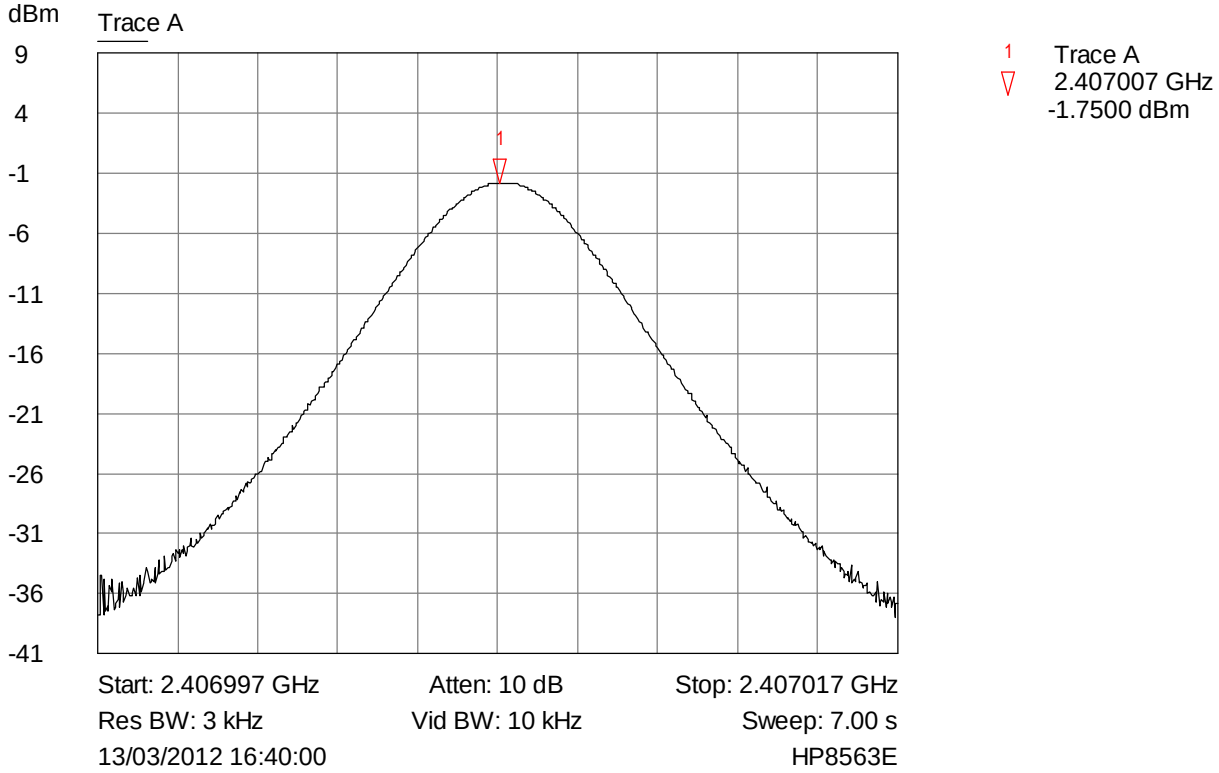
J4997-4, plot 0058



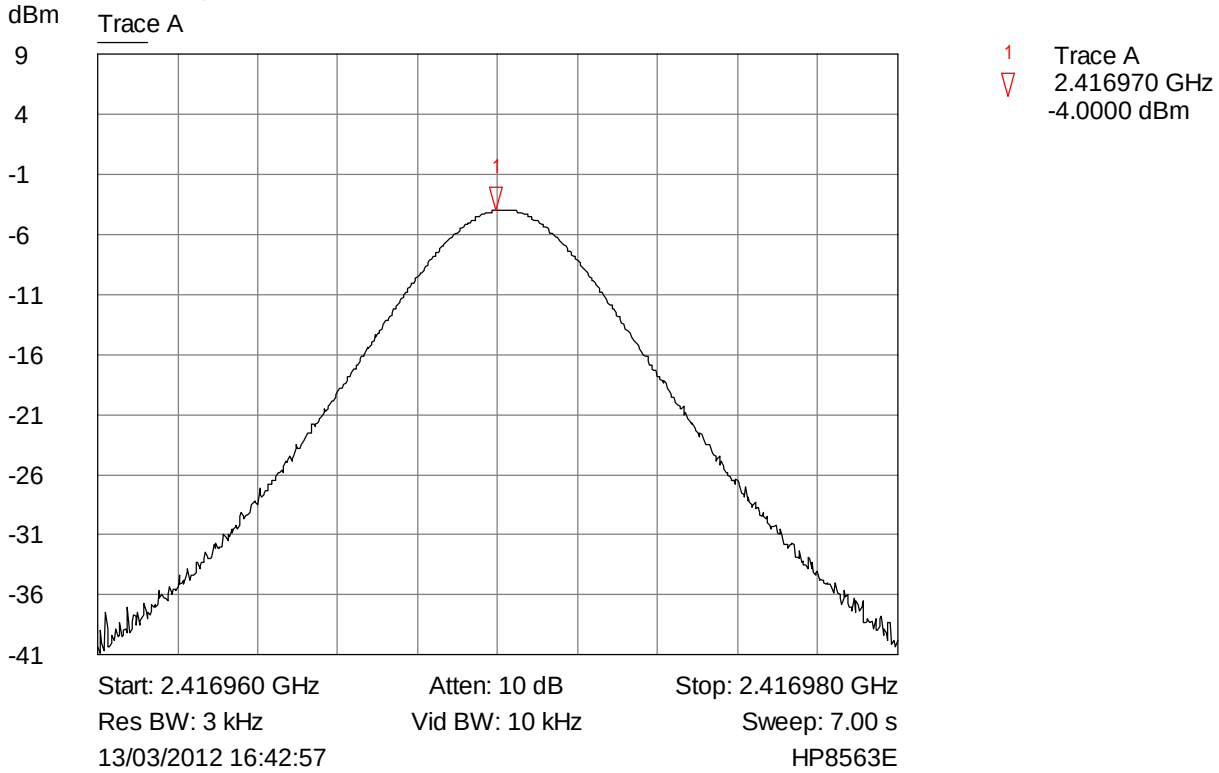
J4997-4, plot 0059



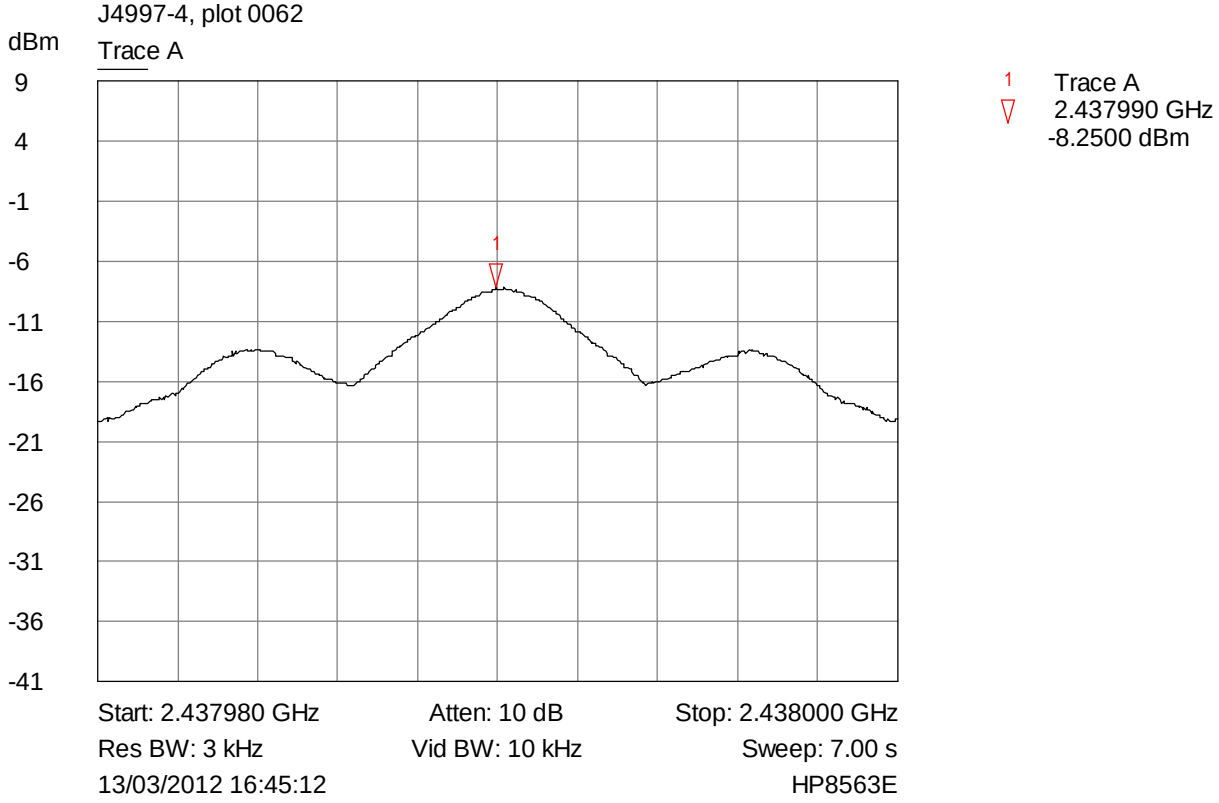
J4997-4, plot 0060



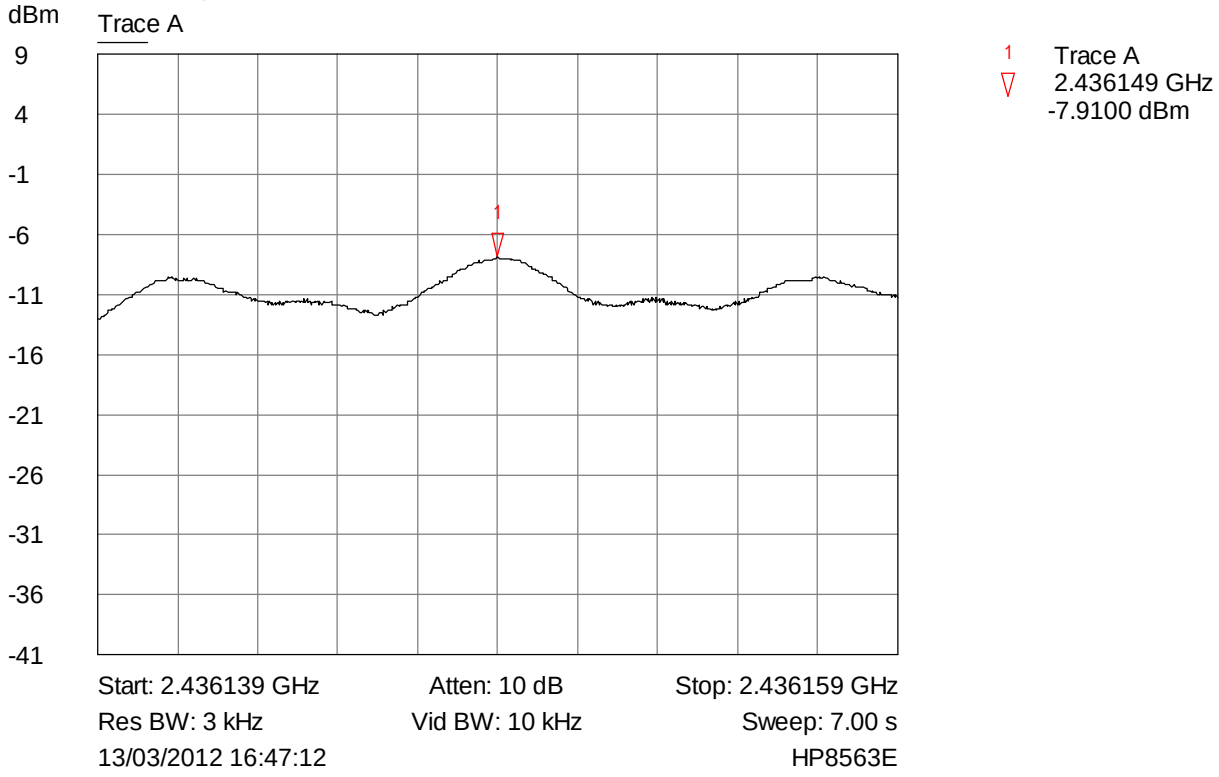
J4997-4, plot 0061



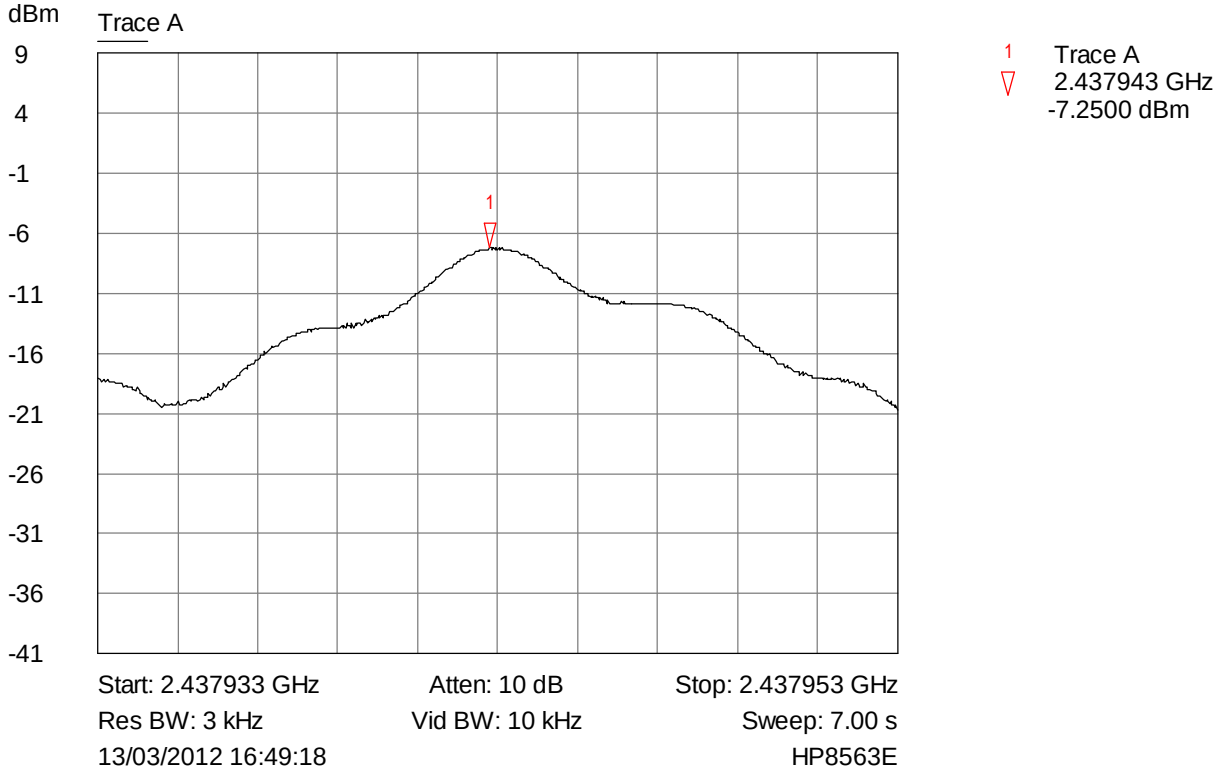
J4997-4, plot 0062



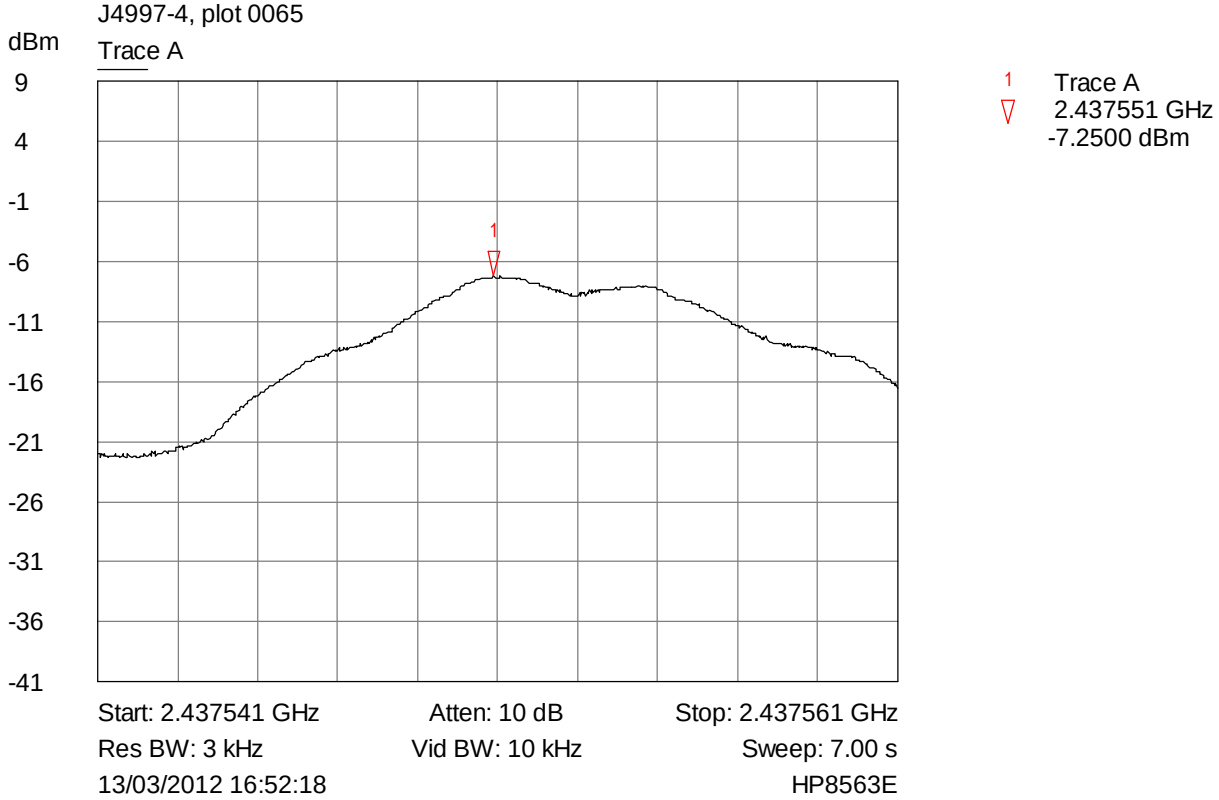
J4997-4, plot 0063



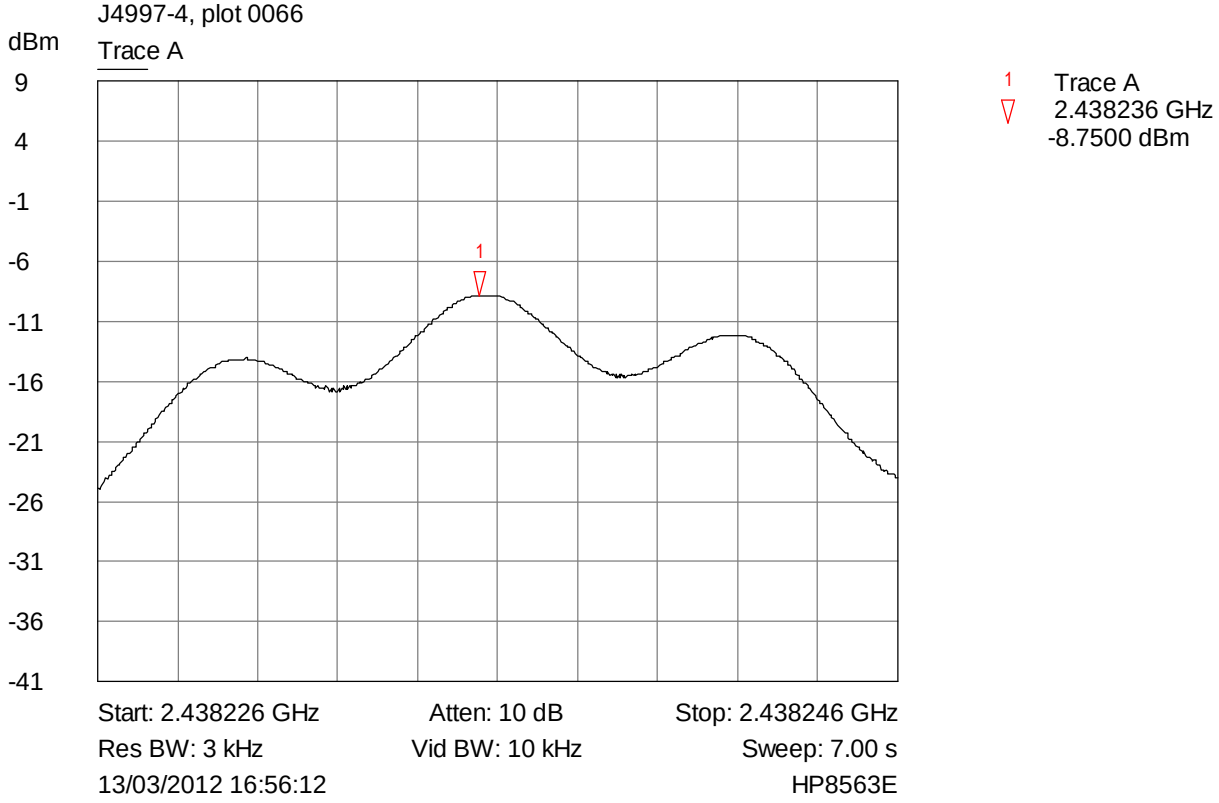
J4997-4, plot 0064



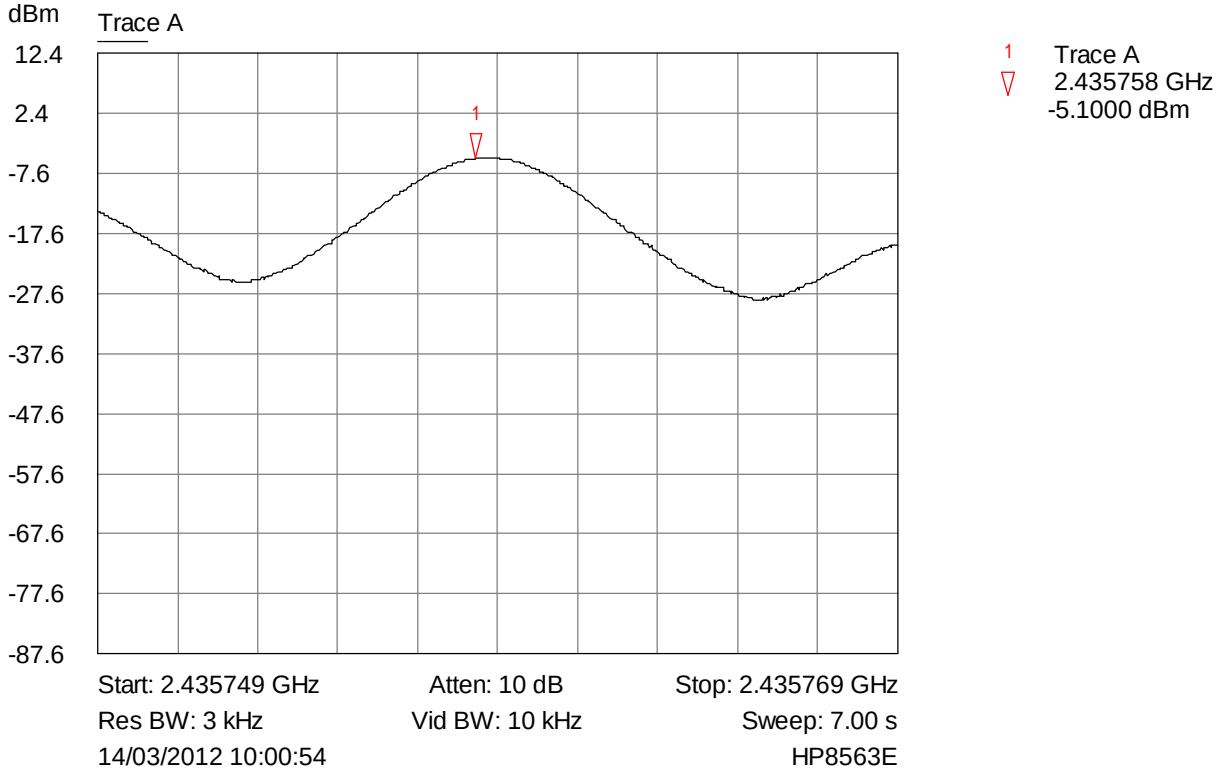
J4997-4, plot 0065



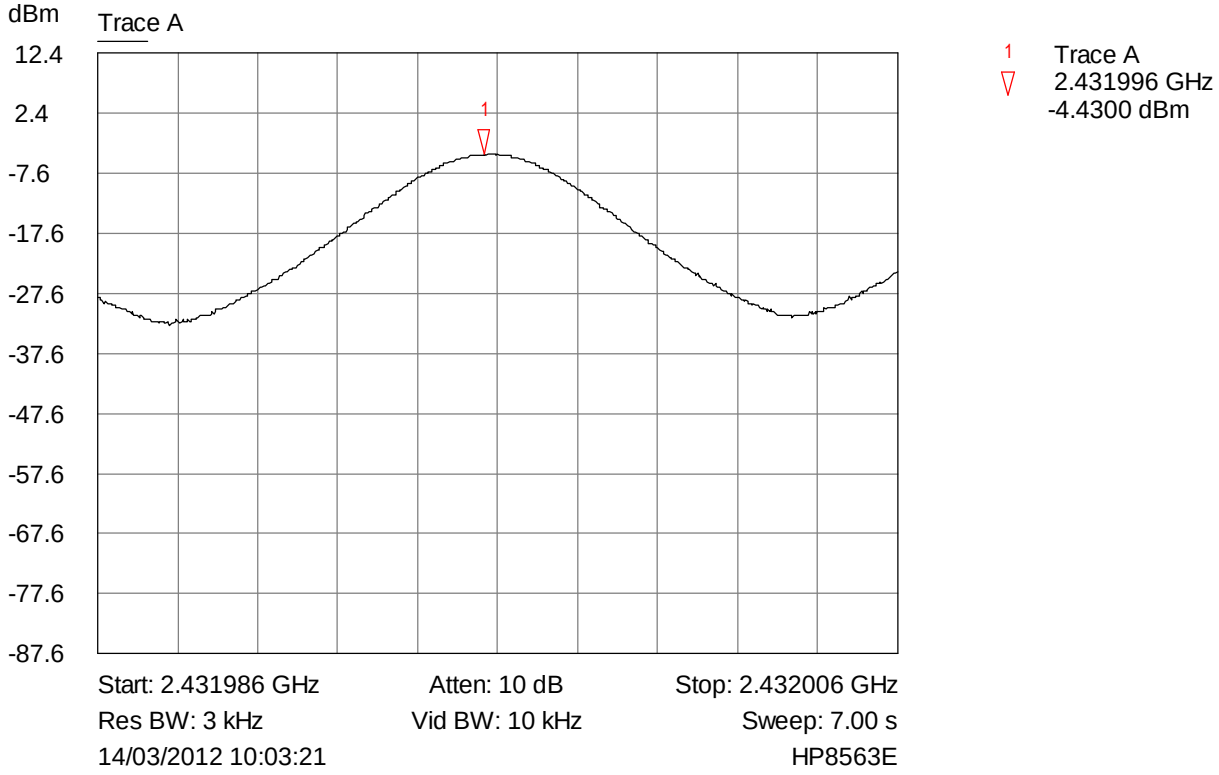
J4997-4, plot 0066



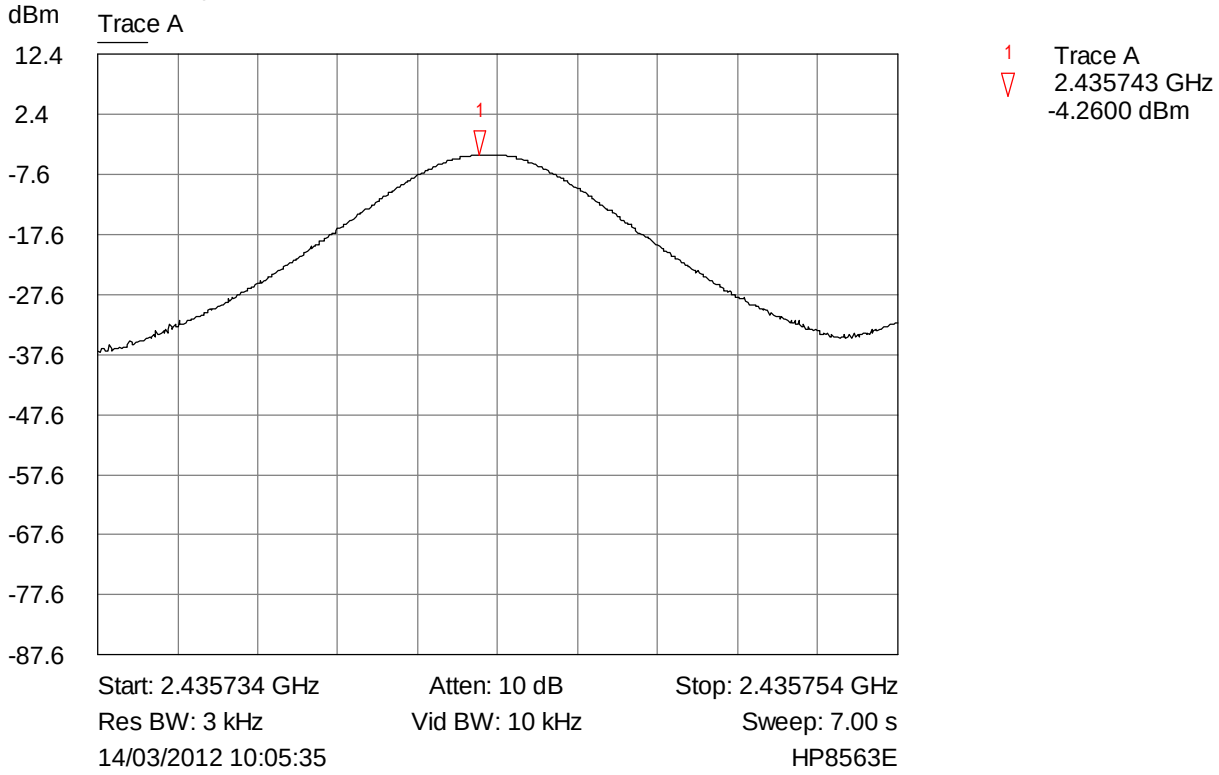
J4997-4, plot 0067



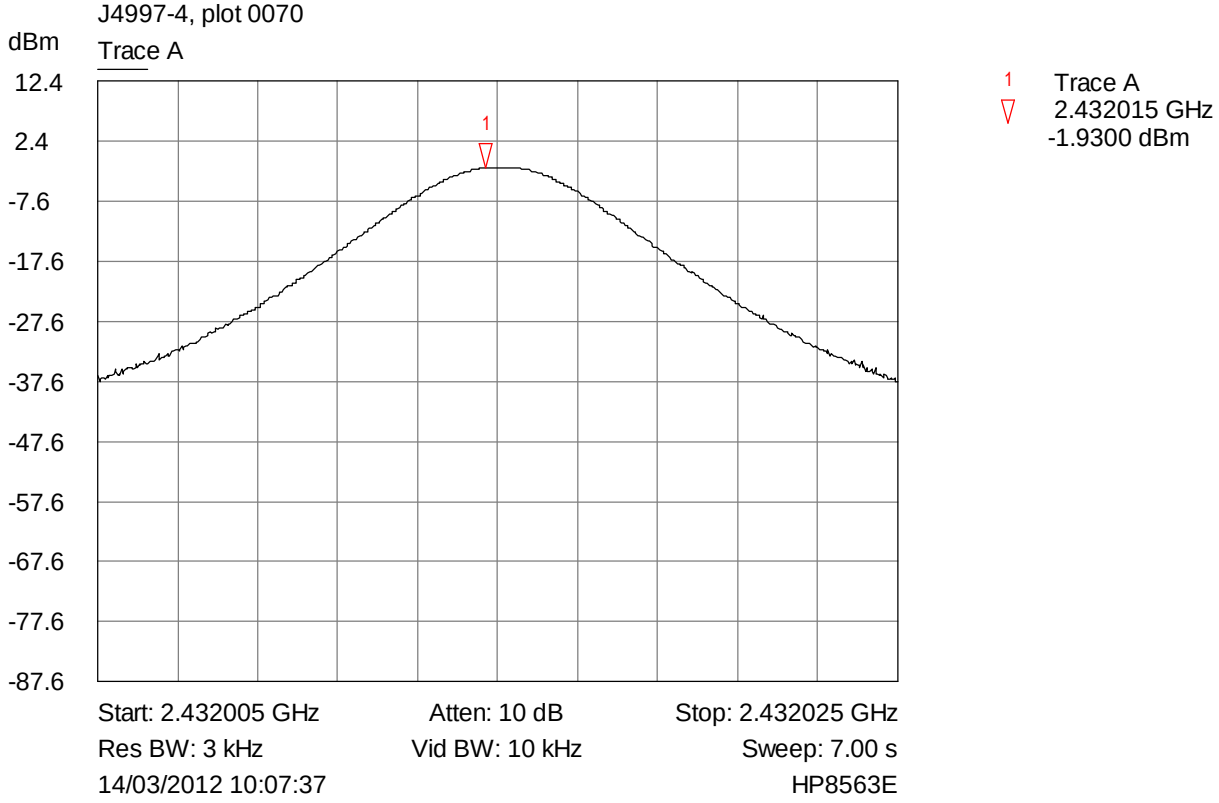
J4997-4, plot 0068



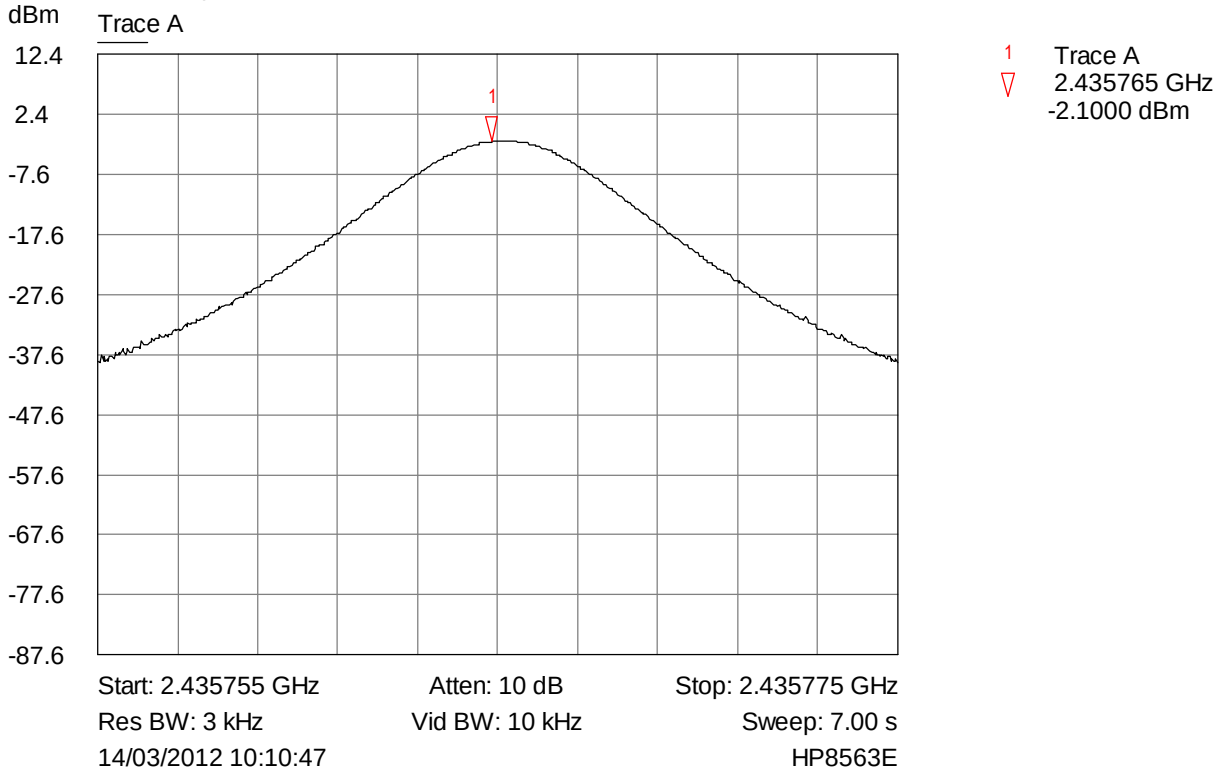
J4997-4, plot 0069



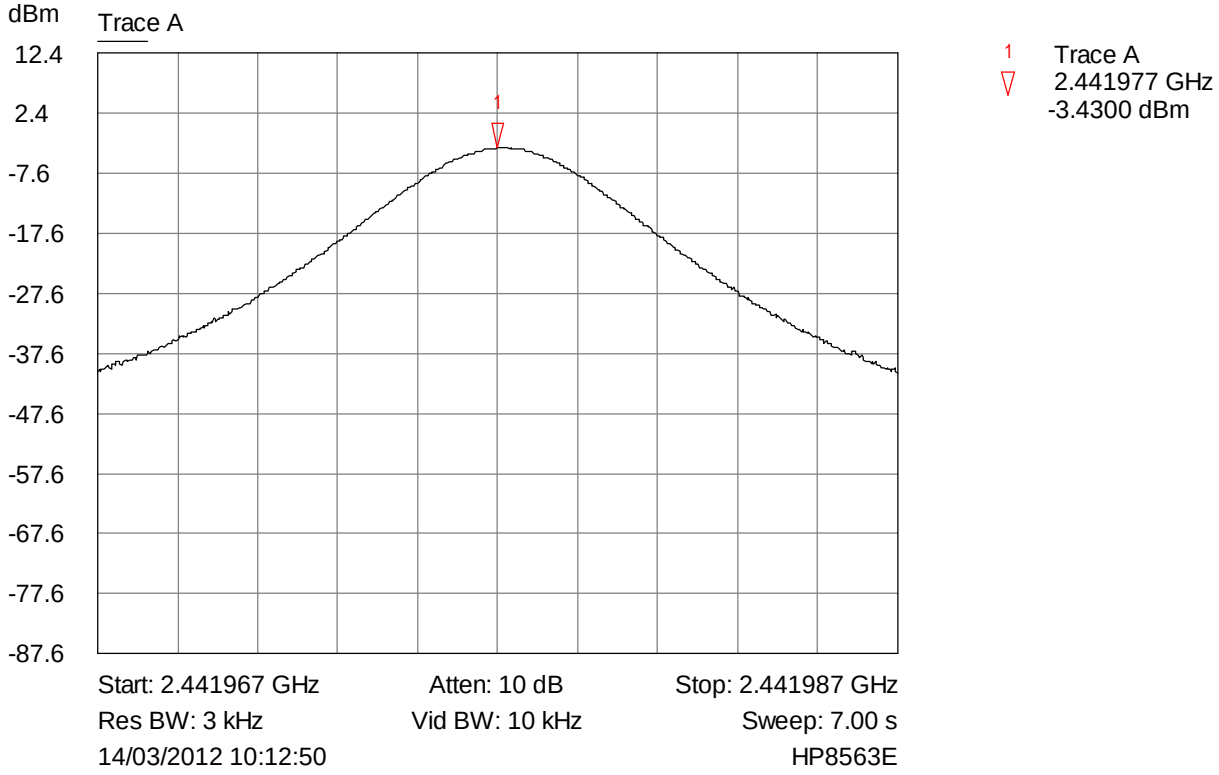
J4997-4, plot 0070



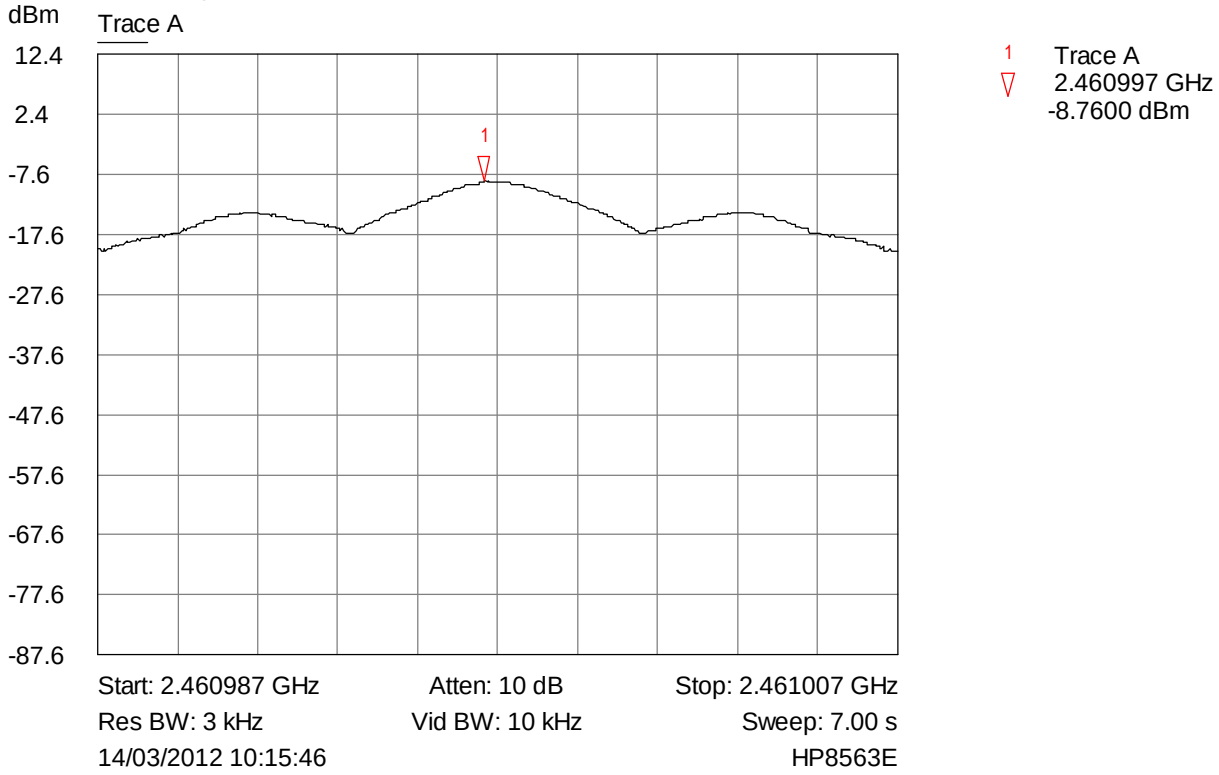
J4997-4, plot 0071



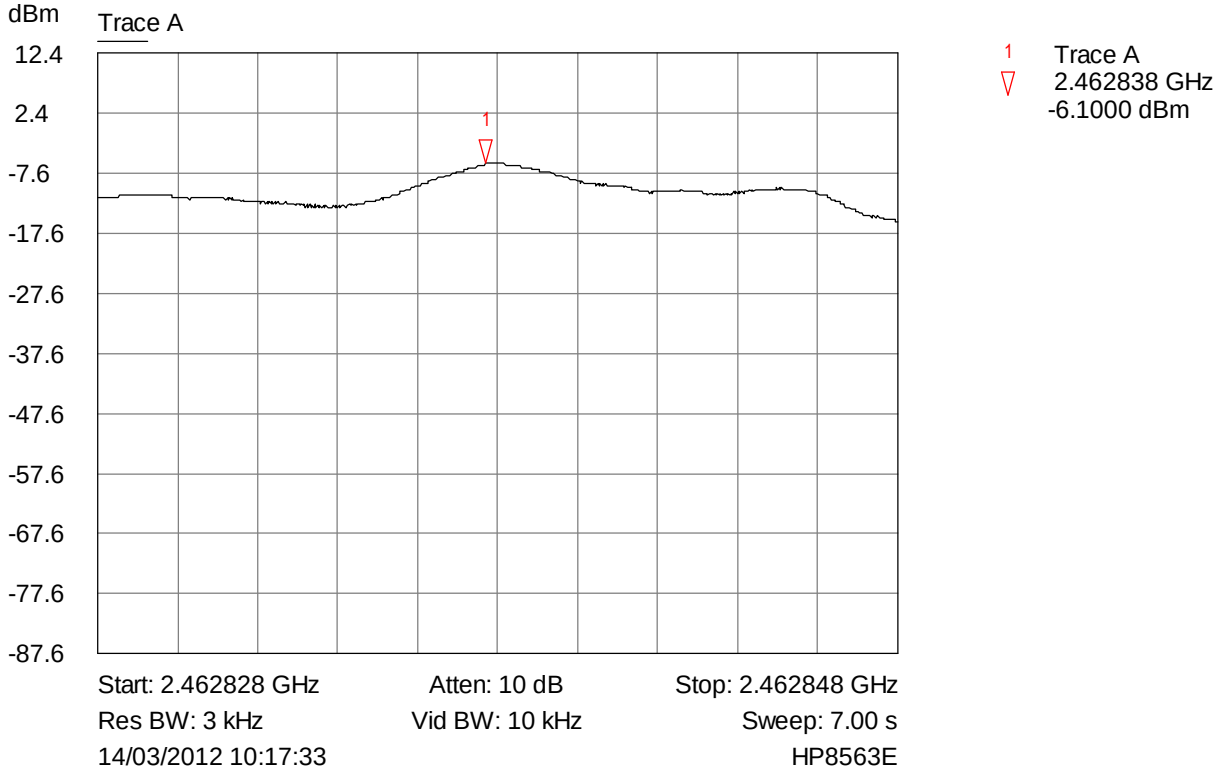
J4997-4, plot 0072



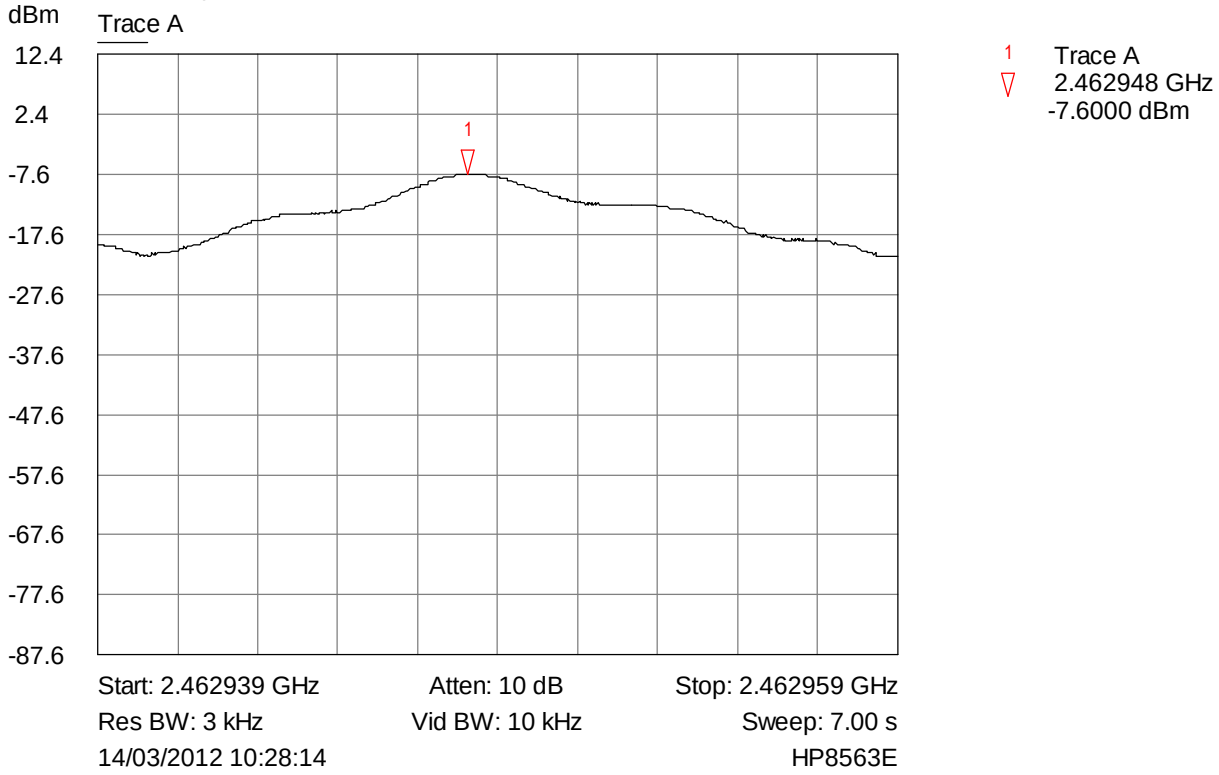
J4997-4, plot 0073



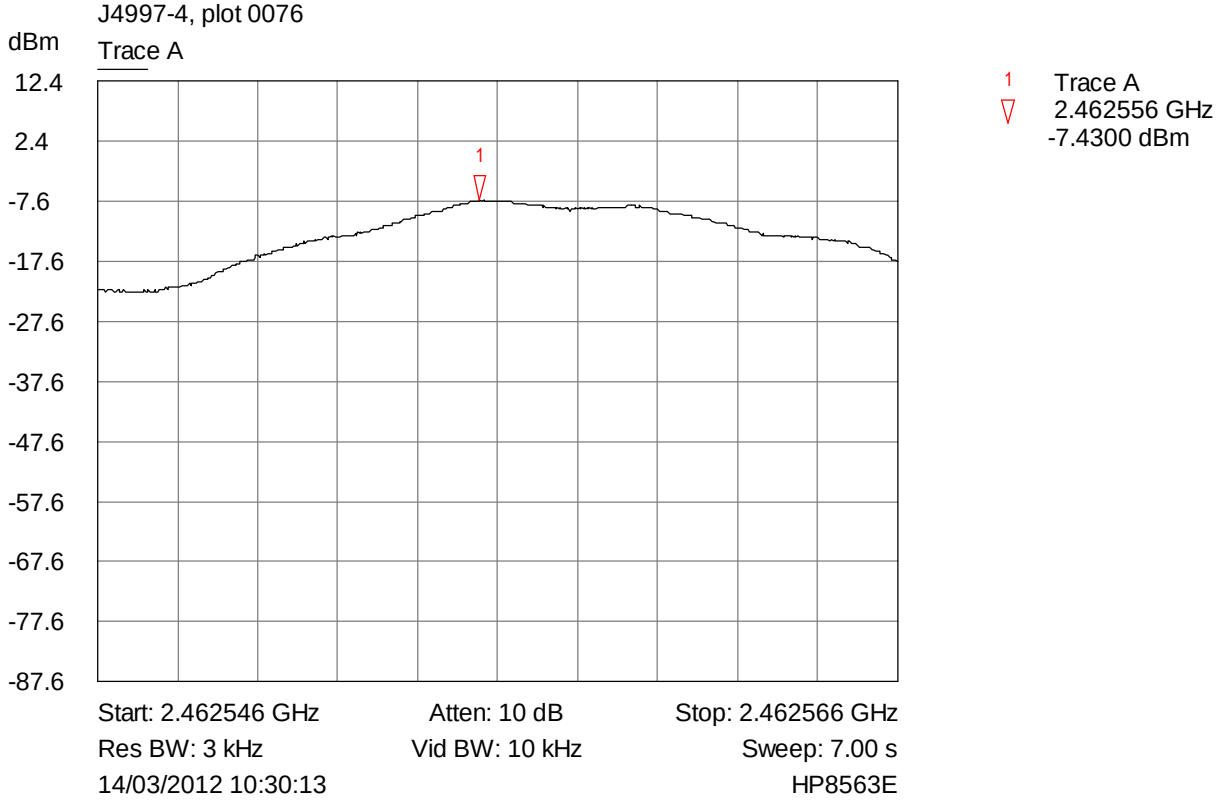
J4997-4, plot 0074



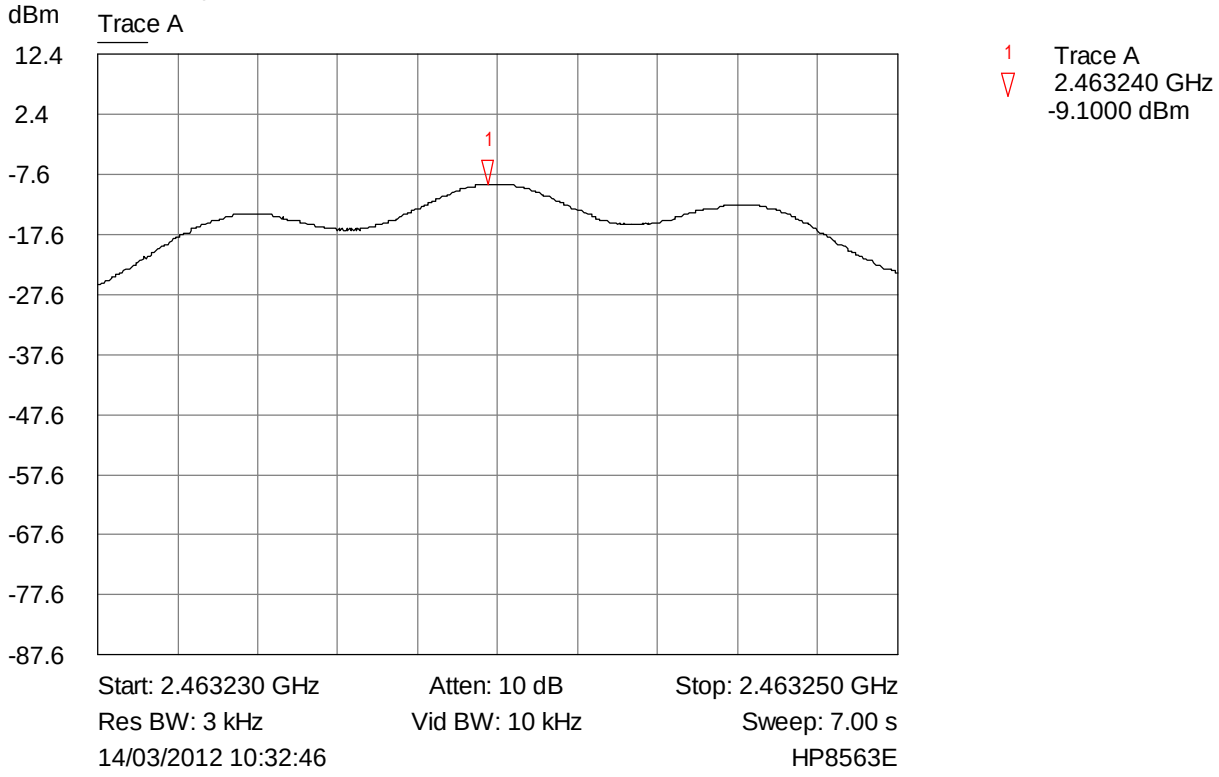
J4997-4, plot 0075



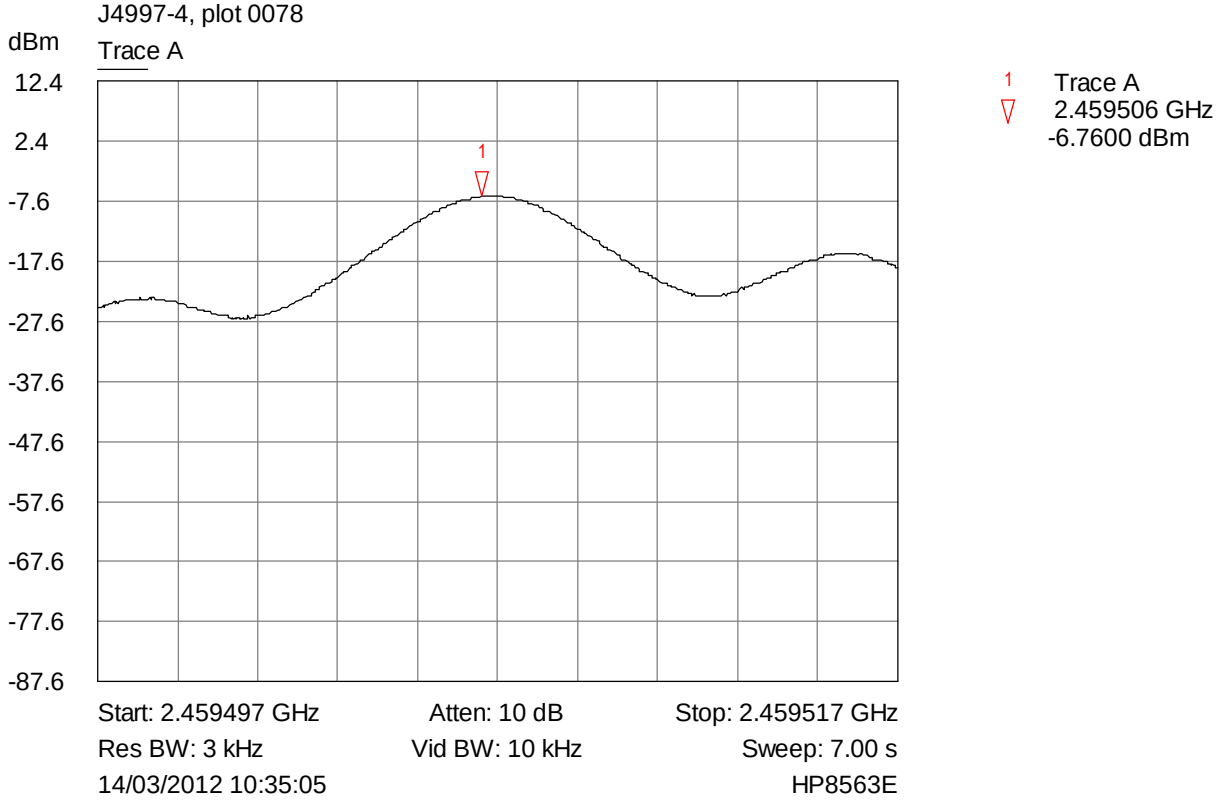
J4997-4, plot 0076



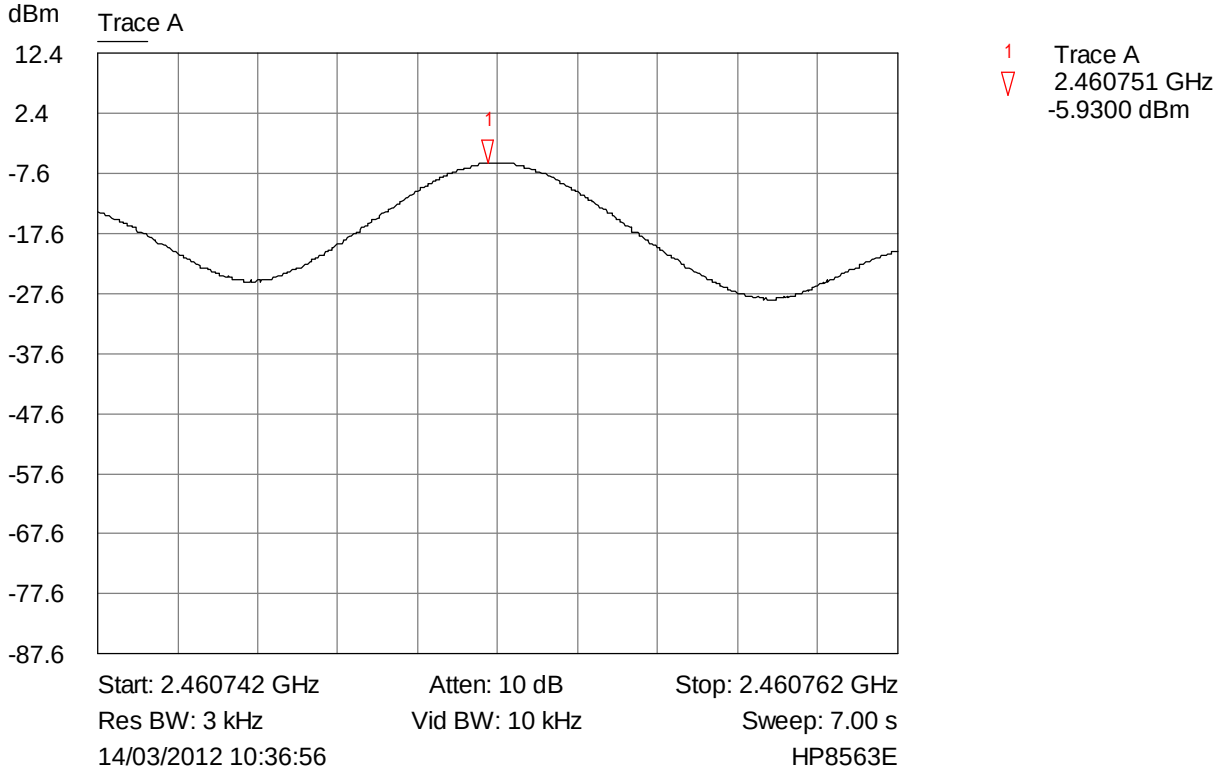
J4997-4, plot 0077



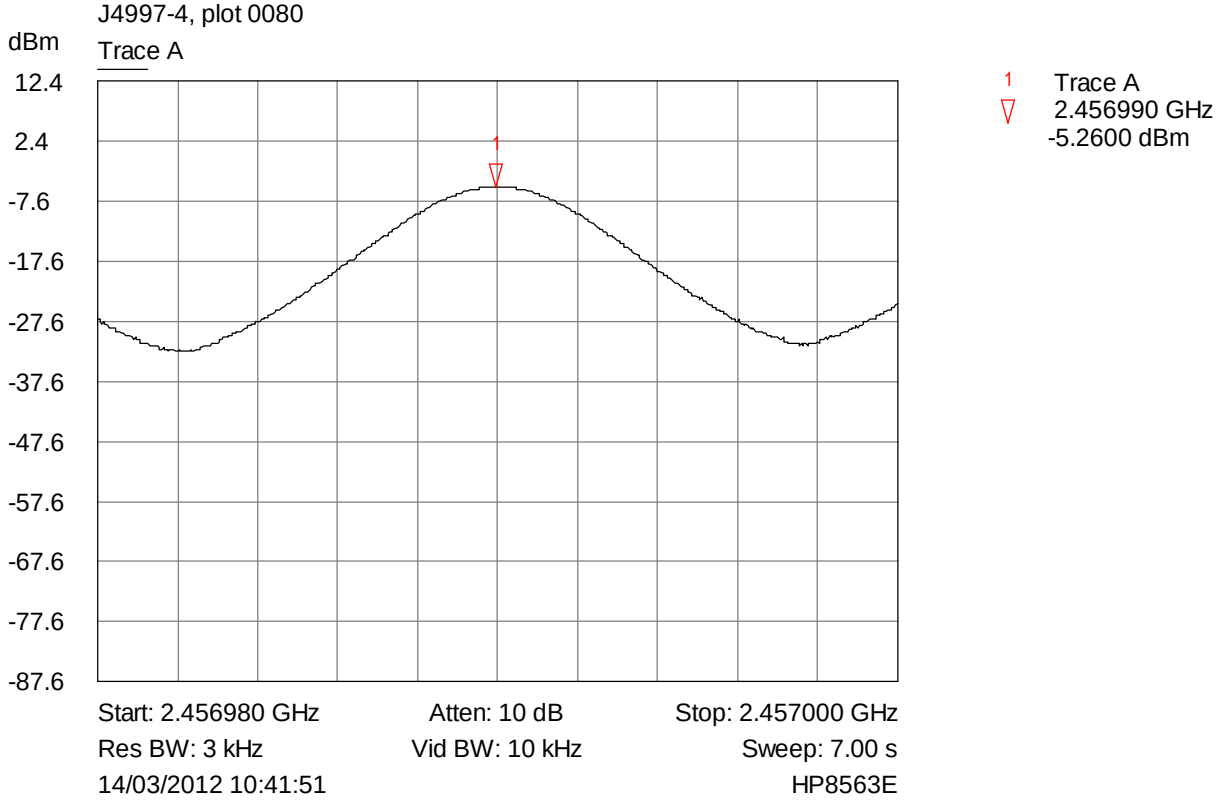
J4997-4, plot 0078



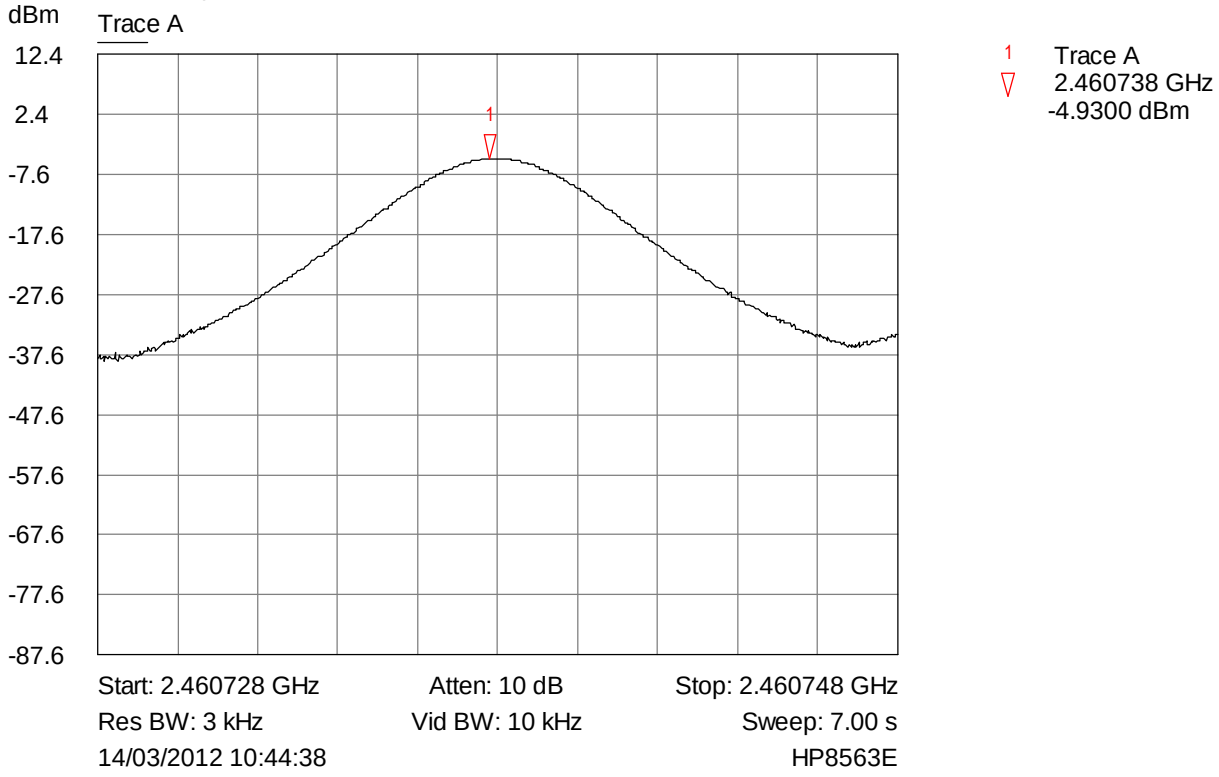
J4997-4, plot 0079



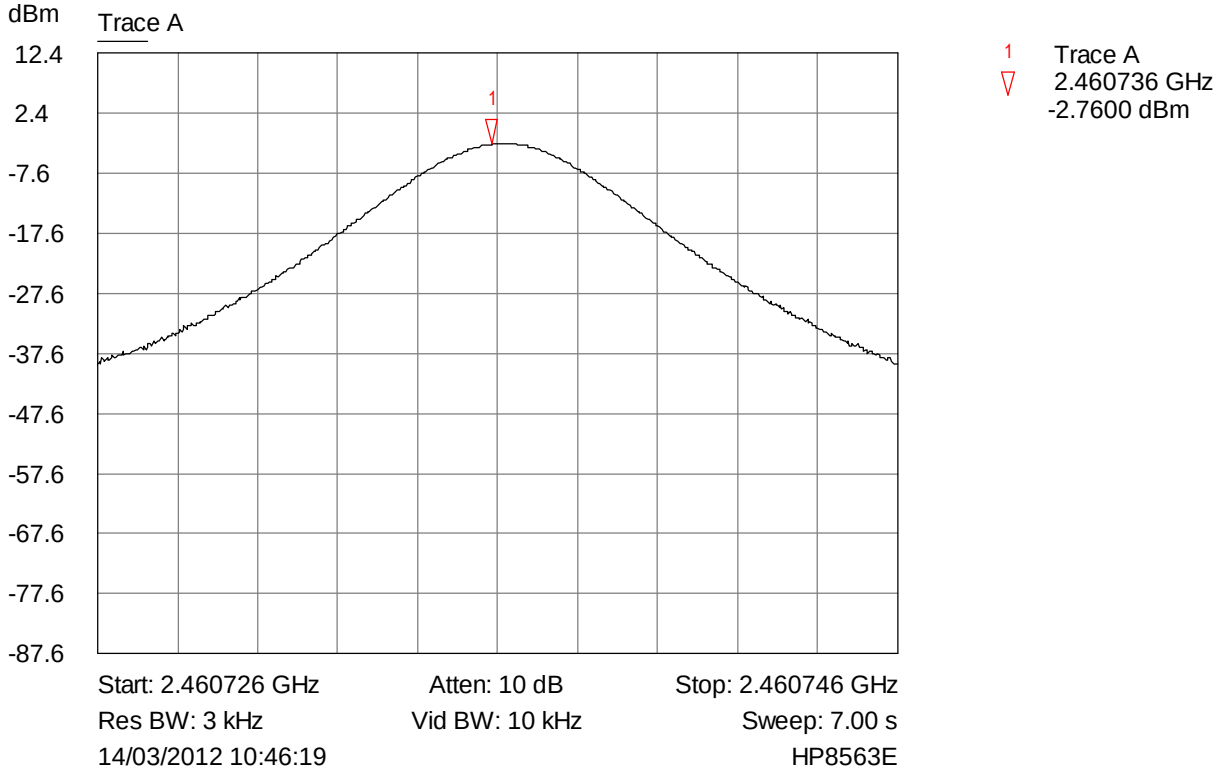
J4997-4, plot 0080



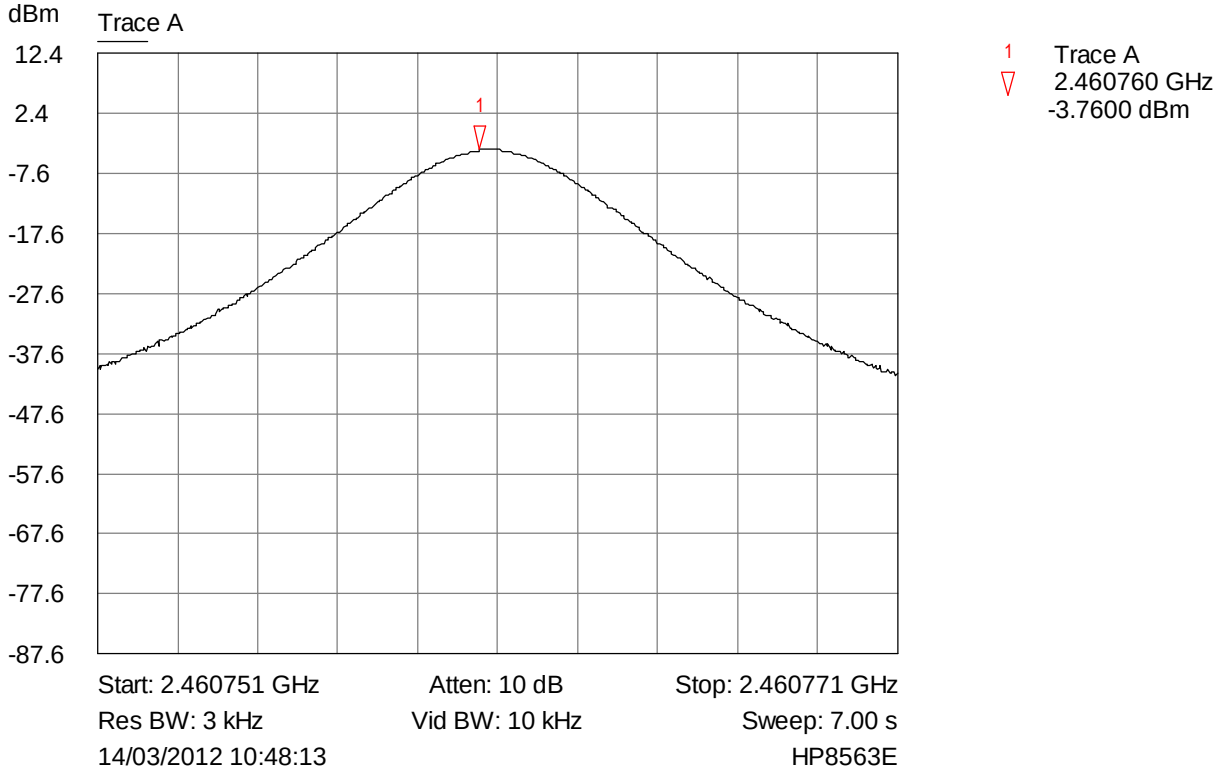
J4997-4, plot 0081



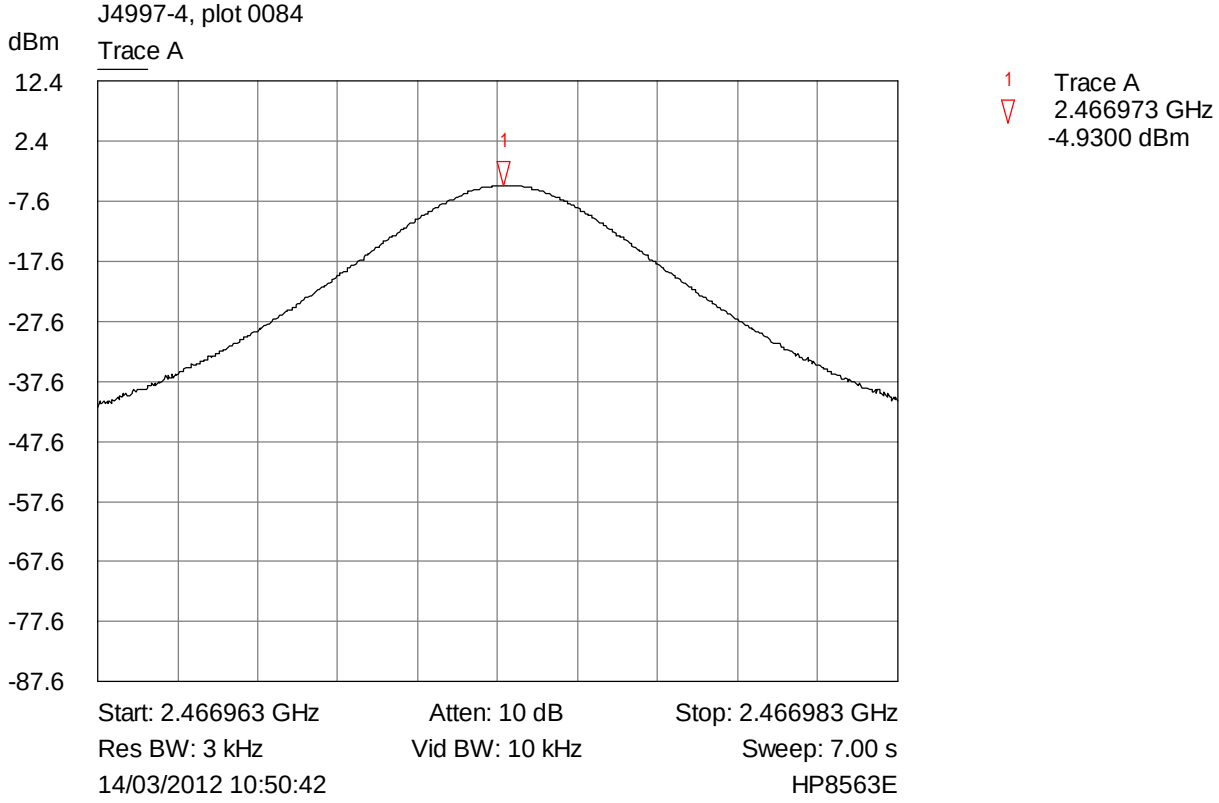
J4997-4, plot 0082



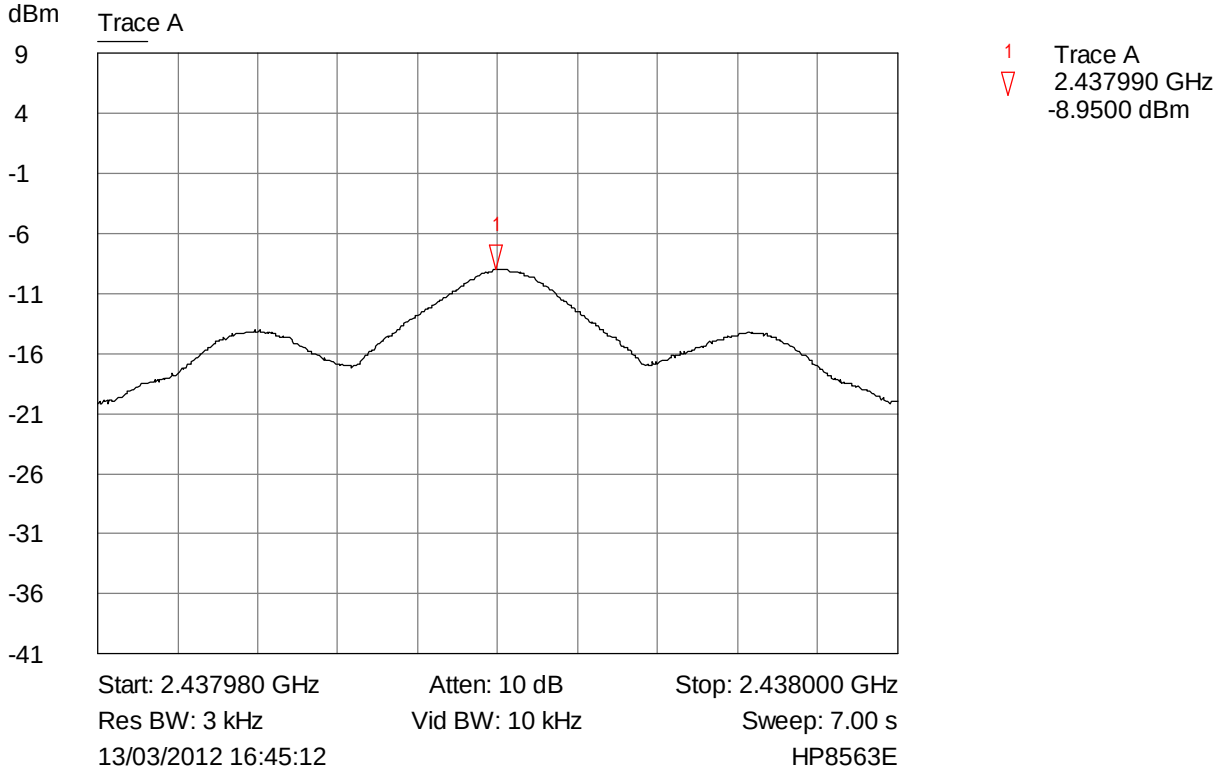
J4997-4, plot 0083



J4997-4, plot 0084



J4997-4, plot 0085



7 Explanatory Notes

7.1 Explanation of FAIL LIMIT 1 Statement

The **FAIL MARGIN 1** statement(s) may appear on the graphical plots when the receiver used to measure your equipment detects a signal that exceeds the dashed line. This does not mean that the **EUT** has failed the test, only that the 10 dB calculation margin set, has been exceeded on a peak measurement.

Following the indication that the margin has been exceeded, measurements are made at the frequency (ies) of the peaks. These peaks have been calculated to either Quasi Peak or Average Peak dependant on the test. A table of results has been printed on the reverse of the page. This table looks similar to the one illustrated below: -

Signal Number	Frequency (MHz)	Peak (dBμV)	PK Delta L 1 (dB)	Avg (dBμV)	Av Delta L 1 (dB)
1	12345.0000	12.9	-2.5	10.2	-5.2

The First column, labelled Signal Number, is a number that the receiver has given to each signal, which has been calculated.

Column Two, labelled Frequency (MHz), is the frequency of the signal received.

Column Three, labelled Peak (dBμV), (can also be labelled, in the case of Quasi Peak, Peak dBμV/m) is the Level that was received at peak amount in dB above 1μV.

Column Four, labelled PK Delta L1 (dB), is the same level as Column three but is given in a level relative to the limit line required.

Column Five, labelled AVG (dBμV), (can also be labelled, in the case of Quasi Peak, QP dBμV/m) when undertaking a Quasi peak test, This is the Average or Quasi peak calculation results given in dBμV or dBμV/m above 1μV.

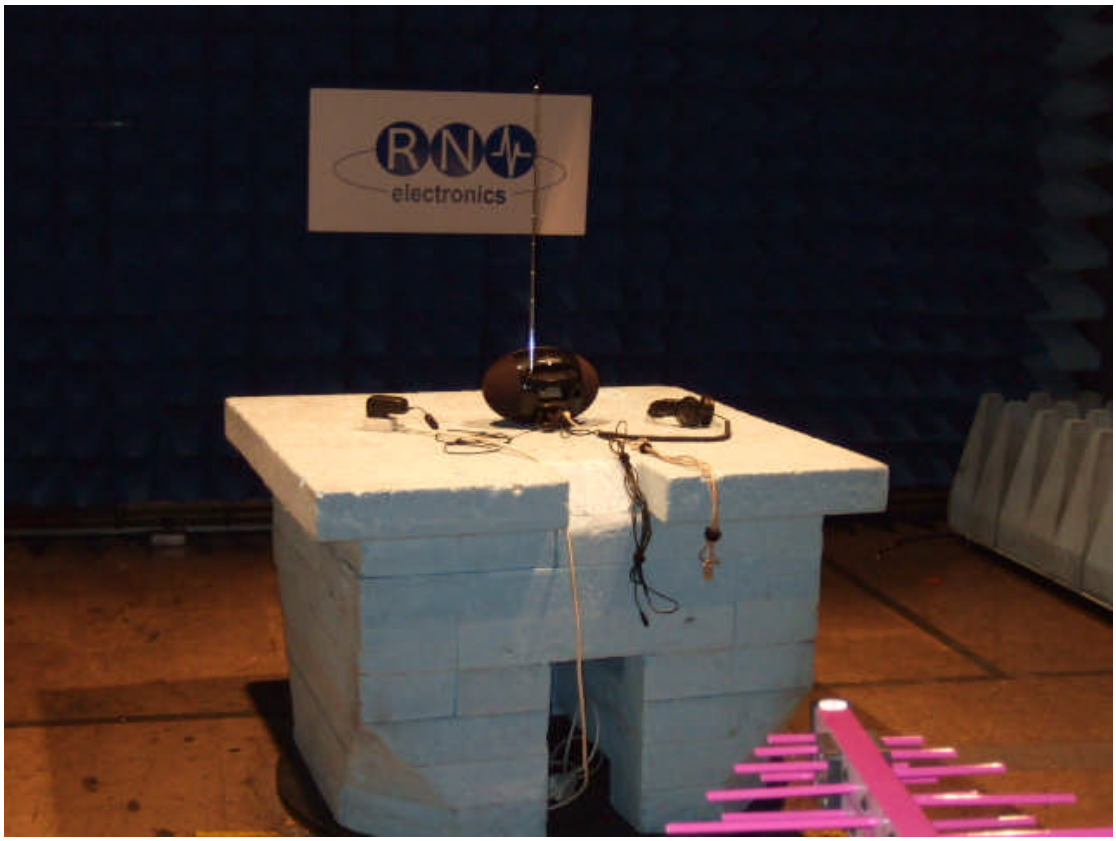
Column Six, labelled AV Delta L 1 (dB), (can also be labelled, in the case of Quasi Peak, QP Delta L 1 (dB)) is the Average or Quasi Peak calculation relevant to the limit line. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

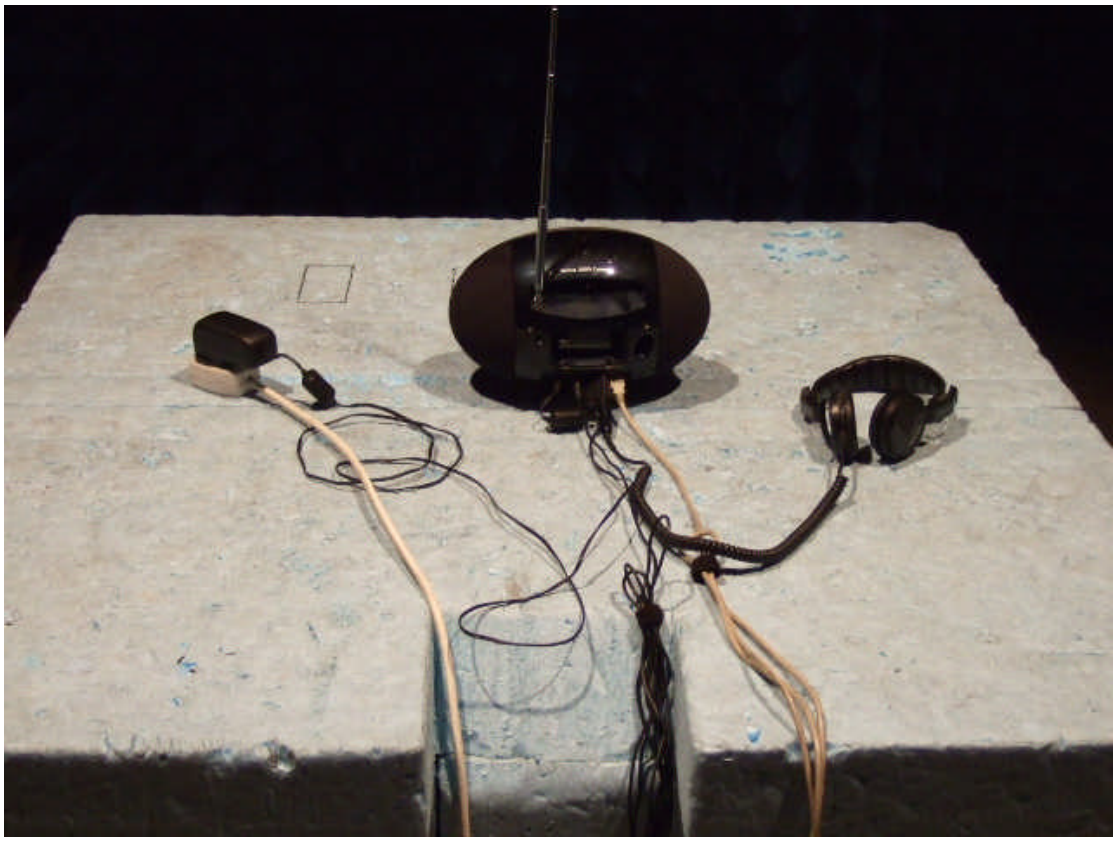
7.2 Explanation of limit line calculations for radiated measurements

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. Account of any alternative measuring distance used is included as a gain/loss. Examples:

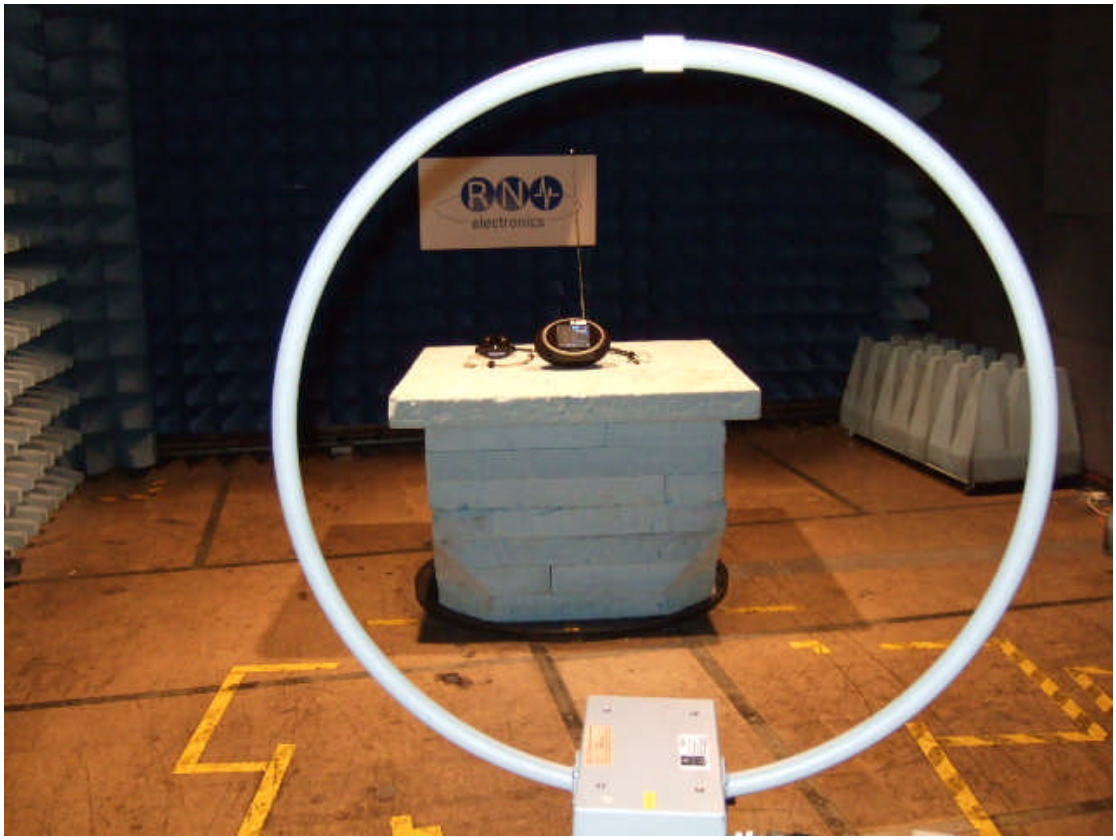
(a) limit of 500 μV/m equates to 20.log (500) = 54 dB μV/m.

8. Photographs





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



cont. photographs of the EUT as viewed from in front of the antenna.

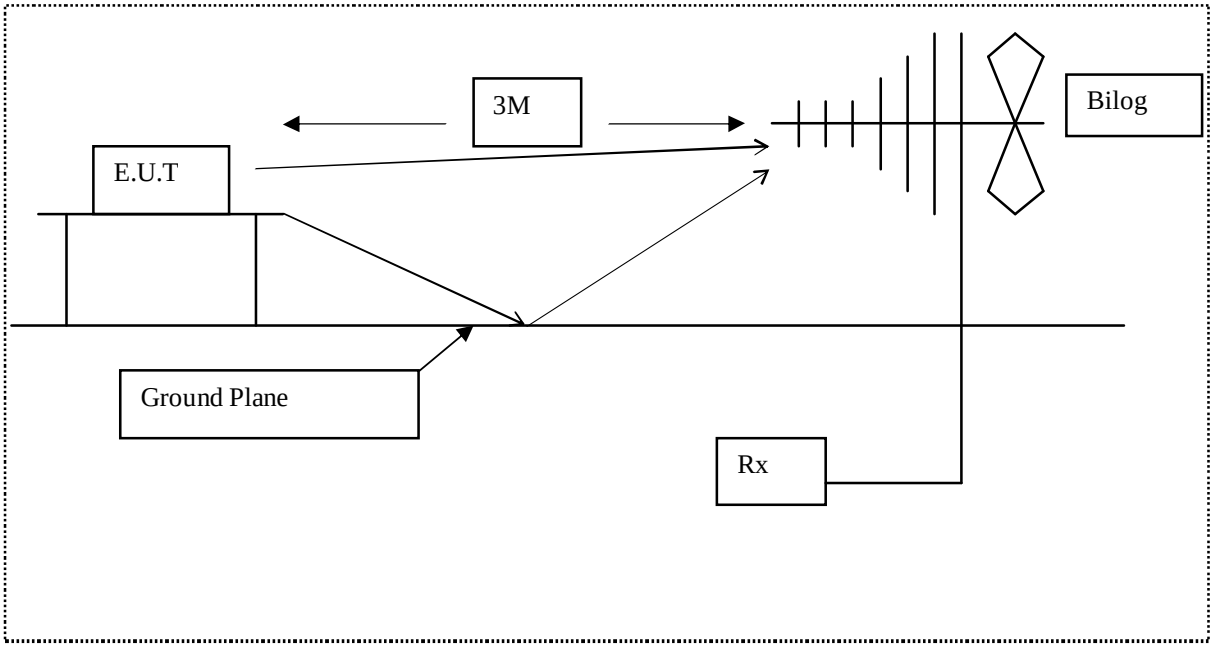


Diagram of the radiated emissions test setup.

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

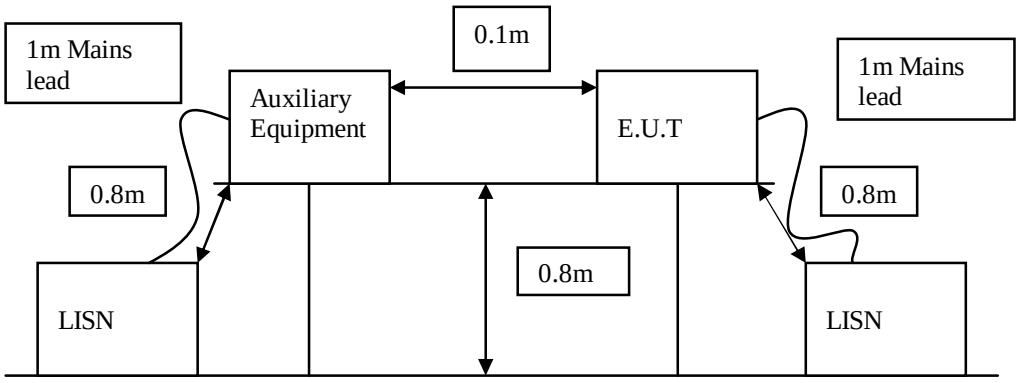


Diagram of the conducted emissions test setup.

Identifying Photograph of the EUT

9. Signal Leads

Port Name	Cable Type
AC/DC brick	AC plug to 2 core DC
Headphones	2.5mm audio screened
Auxiliary Input	2.5mm audio screened
USB	USB screened

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.

RNNo	Model	Description	Manufacturer	Date Calib	Period
E010	MN2050	LISN 13A	Chase	12-Oct-11	12
E035	HP11947A	Transient Limiter + 10dB Atten.	Hewlett Packard	01-Mar-12	6
E131	ESG-3000A	Signal Generator	Hewlett Packard	09-Nov-10	24
E227	6632A	System DC Power Supply	Hewlett Packard	26-Jan-12	12
E250	6806.19.A	6dB Attenuator	Hewlett Packard	15-Nov-11	12
E252	6810.19.A	10 dB Attenuator	Suhner	29-Oct-11	12
E268	BHA 9118	1-18 GHz Horn Antenna	Schaffner	14-Apr-11	60
E290	6914	Power Sensor	Marconi Instruments	23-Aug-11	24
E342	8563E	Spectrum Analyser 26.5 GHz	HP	29-Mar-11	24
E397	6960B	RF Power Meter	Marconi Instruments	16-Jul-11	24
E410	N5181A	3 GHz MXG Signal Generator	Agilent Technologies	26-Oct-11	12
E411	N9039A	9 kHz - 1 GHz RF Filter Section	Agilent Technologies	26-Oct-11	12
E412	E4440A	3 Hz - 26.5 GHz PSA	Agilent Technologies	26-Oct-11	12
E428	HF906	1-18 GHz Horn Antenna	Rhode & Schwarz	23-Oct-09	36
E434	G3RUH	10 MHz GPS Oscillator	James Miller	N/A	N/A
P240	A110-26711-0005	10dB Attn	Avantek/Midwest Microwave	N/A	N/A
TMS10	TH200	ThermoHygrometer	RS Components	07-Sep-10	24
TMS78	3160-08	Std Gain Horn Antenna 12.4-18 GHz	ETS Systems	03-Nov-10	24
TMS79	3160-09	Std Gain Horn Antenna 18-26.5 GHz	ETS Systems	03-Nov-10	24
TMS81	6502	Active Loop Antenna	EMCO	13-Apr-10	24
TMS82	8449B	Pre Amplifier 1 - 26 GHz	Agilent	14-Nov-11	12
TMS933	CBL6141A	Bilog Antenna 30MHz - 2GHz	York EMC	09-Sep-10	36

11. Auxiliary equipment

11.1 Auxiliary equipment supplied by Imagination Technologies

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

No Auxiliary equipment was provided.

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

RN Numb	Manufacturer	Description	Model Number	Serial Number
N474	Realistic	Stereo Headphones	PRO-V	-

12. Modifications

12.1 Modifications before test

Before testing commenced the correct software versions were installed for the mode under test.

For tests performed in the “Engineering” Wi-Fi TX mode of operation software version 6 labelled “polaris_4.109.1.32.006.dfu” was loaded into the EUT.

For tests performed in the “Engineering” Wi-Fi RX only mode of operation software version 13 labelled “polaris_4.109.1.32.013.dfu” was loaded into the EUT.

12.2 Modifications during test

In order for the EUT to comply with the radiated emissions limits within this report the following modification was implemented:-

- The bottom channel power setting was reduced to a level of 13 in the engineering software mode for all 802.11b schemes.
- The middle channel power setting was reduced to a level of 16 in the engineering software mode for all 802.11b schemes.
- The top channel power setting was reduced to a level of 16 in the engineering software mode for all 802.11b schemes.

The Default power level (setting of 20) was left as programmed and used for all tested channels when using the 802.11g modulation/data rate schemes.

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:

This device is subject to the Certification authorisation procedure and as such, does not require a DoC (**D**eclaration **o**f **C**onformity) to be included here.

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

15 Abbreviations and Units

%	Percent
µA/m	microAmps per metre
µV	microVolts
µW	microWatts
AC	Alternating Current
ALSE	Absorber Lined Screened Enclosure
AM	Amplitude Modulation
Amb	Ambient
ATPC	Automatic Transmit Power Control
BER	Bit Error Rate
ºC	Degrees Celsius
C/I	Carrier / Interferer
CEPT	European Conference of Postal and Telecommunications Administrations
COFDM	Coherent OFDM
CS	Channel Spacing
CW	Continuous Wave
dB	deciBels
dBµA/m	deciBels relative to 1µA/m
dBµV	deciBels relative to 1µV
dBc	deciBels relative to Carrier
dBm	deciBels relative to 1mW
DC	Direct Current
DTA	Digital Transmission Analyser
EIRP	Equivalent Isotropic Radiated Power
ERP	Effective Radiated Power
EU	European Union
EUT	Equipment Under Test
FM	Frequency Modulation
FSK	Frequency Shift Keying
g	Grams
GHz	GigaHertz
Hz	Hertz
IF	Intermediate Frequency
kHz	kiloHertz
LBT	Listen Before Talk
LO	Local Oscillator
mA	milliAmps
max	maximum
mbar	milliBars
Mbit/s	MegaBits per second
MHz	MegaHertz
mic	Microphone
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
ppm	Parts per million
PRBS	Pseudo Random Bit Sequence
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
R&TTE	Radio and Telecommunication Terminal Equipment
Ref	Reference
RF	Radio Frequency
RFC	Remote Frequency Control
RSL	Received Signal Level
RTP	Room Temperature and Pressure
RTPC	Remote Transmit Power Control
Rx	Receiver
s	Seconds
SINAD	Signal to Noise And Distortion
Tx	Transmitter
V	Volts

Certificate of Test 4997/4

The unit noted below has been tested by ***R.N. Electronics Limited*** and conforms with the relevant subpart of FCC 47CFR part 15, subject to deviations as detailed in this report.

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

Equipment:	Sensia 200D Connect
Model Number(s):	Sensia 200D Connect
Unique Serial Number(s):	ES3-44
Manufacturer:	Imagination Technologies Home Park Estate Kings Langley Hertfordshire WD4 8DH
Customer Purchase Order Number:	120535
R.N. Electronics Limited Report Number:	03-557/4997/4/12
Test Standards:	FCC 47CFR Part 15C: effective date **October 1st 2011,** Class **DTS** Intentional Radiator
Date:	5th to 16th March 2012
For and on behalf of R.N. Electronics Limited	
Signature:	
Notes:	

RN Electronics Ltd www.RNelectronics.com
Arnolds Court, Arnolds Farm Lane, Mountnessing, Brentwood, Essex CM13 1UT
Tel: +44 1277 352219 E-mail: sales@RNelectronics.com Fax: +44 1277 352968