FCC
Test Report
for
802.15.4/ Zigbee module
JN 5139-000-M04

Report Number 02-164A/3296/1/07
Supersedes report number 02-164/3296/1/07
Report Produced by: -

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1. Contents

2. Summary of Test Results

The 802.15.4/ Zigbee module JN 5139-000-M04 was tested to the following standards: -

FCC Part 15C (effective date February 7, 2007); Class DTS Intentional Radiator

Any compliance statements are made reliant on: (a) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT.

Title	Reference	Results
1. Conducted Emissions	FCC Part 15C §15.207	NOT APPLICABLE[1]
2. Radiated Emissions	FCC Part 15C §15.205, §15.209 & §15.247(d)	PASSED[2]
3. Modulation Bandwidth	FCC Part 15C §15.215(c), §15.247(a)(2)	PASSED
4. Intentional Radiator Field Strength	FCC Part 15C §15.247(b)	PASSED
5. Power Spectral Density	FCC Part 15C §15.247(e)	PASSED

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

Date of Test: 24th March 2007

Test Engineer: Daniel Sims — Digitally signed by Daniel Sims DN: CN = Daniel Sims, C = GB, O = RN Electronics Date: 2007.04.16 08:31:45 +01'00'

Approved By: Paul Darragh — Digitally signed by Paul Darragh DN: CN = Paul Darragh, C = GB, OU = RN Electronics Date: 2007.04.14 23:04:26 +01'00'

Customer Representative:

[1] The digital device tested is intended to be powered from 3V dc supply (battery) and intended for modular approval. Any third party device it is incorporated into with a connection to the AC power line will require demonstration of compliance with the limits. Refer to §15.207(c) "Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to AC power lines".

[2] For purposes of test the equipment was operated with the transmitter continuously on. In order to comply with the limits for radiated emissions in the restricted bands of 15.205, averaging for manufacturers declared pulse rate is required.

3. Information about Equipment Under Test

Manufacturer of EUT	Jennic Ltd Furnival Street Sheffield S1 4QT
Full name of EUT	802.15.4/ Zigbee module
Model Number of EUT	JN 5139-000-M04
Serial Number of EUT	03
FCC ID (if applicable):	TYOJN5139M4
Date when equipment was received by RN Electronics Limited	23rd February 2007
Date of test:	24th March 2007
Customer order number:	PO 004001
A visual description of EUT is as follows:	A canned IC on small PCB with an antenna port intended for dedicated antenna use only. For purposes of test mounted on a motherboard with battery / dc voltage input and RS232 communications fly lead. The unit was also positioned on a small plastic box containing an sma adapter lead for test purposes.
The main function of the EUT is:	To provide 2.4GHz Zigbee / IEEE 802.15.4 communications.
Antenna:	Dedicated antenna connected to antenna port. gigaAnt Titanis 2.4GHz swivel sma antenna (4.4dBi gain).

Equipment Under Test Information specification:

Height	10.6mm
Width	18mm
Depth	40.5mm
Weight	0.01kg
Voltage	3V dc
Current required from above voltage source	0.05A
Highest Frequencies used / generated	2480MHz

Description of ancillary equipment connected to the equipment under test, for the purpose of tests, can be found in Section 11.

Any modifications made to the **EUT**, whilst under test, can be found in Section 12.

This report was printed on: 14 April 2007

4. Specifications

The tests were performed by RN Electronics Engineer Daniel Sims who set up the tests, the test equipment, and operated it in accordance with the ***R.N. Electronics Ltd*** procedures manual and FCC Part 15.

4.1 Deviations

NONE

5. Tests, Methods and Results
5.1 Conducted Emissions

NOT APPLICABLE.
The digital device tested is intended to be powered from 3V dc supply (battery) and intended for modular approval. Any third party device it is incorporated into with a connection to the AC power line will require demonstration of compliance with the limits. Refer to §15.207(c) "Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to AC power lines"

5.2 Radiated Emissions

5.2.1 Test Methods

Test Requirements	FCC Part 15C, Reference (15.205 / 15.209)
Test Method:	FCC Part 15C, Reference (15.209)

5.2.1.1 Configuration of EUT

Radiated Emissions testing was performed with the EUT in a test jig provided by the manufacturer. The jig allowed for communications to set the frequency and power level of the device as well as provide the 3V required dc input. This set up also allowed for continuous operation of the transmitter which would normally have a duty cycle <= 1 %.

30MHz to 6.5GHz.
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. Tests were repeated with the EUT transmit frequency channel set to 2405, 2440 and 2480 MHz.
Above 6.5GHz.
The antenna was re-positioned at a distance of 1 metre.

5.2.1.2 Test Procedure

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

30MHz to 1GHz measurements were made in a semi-anechoic chamber (pre-scan) with final measurements on an OATS. Test sites ‘M’ and 'OATS' have been 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.
1GHz to 26GHz measurements were made in a semi-anechoic chamber. The equipment was rotated 360° and the antenna positioned level with the EUT in both horizontal and vertical polarisations.
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**.**

Test Environment:
Temperature: 18-20°C Humidity: 43-62 %

Analyser plots for the Quasi-Peak / Average values as applicable on the middle channel and a table of any signals within 20dB of the limit line on all three channels can be found in Section 6.2 of this report.

These show that the **EUT** has PASSED this test after averaging for pulse rate.

5.2.2.1 Test Equipment used

E3, E268, TMS79, N438, E242, E238, E235, TMS82, E1, TMS933, E320, E319
See Section 10 for more details

5.3 Intentional Radiator Field Strength

5.3.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.247(b))

Test Method: FCC Part 15C, Reference (15.247)

5.3.1.1 Configuration of EUT

A test jig was provided with an SMA 50ohm coaxial connector which was checked for maximum conducted power at the antenna port.

5.3.1.2 Test Procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below and taking due consideration of the loss of the antenna port adaptor.

5.3.2 Test results

Tests were performed using Test Site A.
Test Environment:
A Temperature: 22°C Humidity: 36 %

The conducted power from the alternative sample was as shown in the table below:

Frequency (MHz)	Power (W)
2405	0.0622
2440	0.0612
2480	0.0550

Limit 1 Watt.
These results show that the EUT has PASSED this test.

5.3.2.1 Test Equipment used

E274, E246
See Section 10 for more details

5.4 Maximum Spectral Power Density

5.4.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.247(e))

Test Method: FCC Part 15C, Reference (15.247)

5.4.1.1 Configuration of EUT

A test jig was provided with an SMA 50ohm coaxial connector which was checked for maximum conducted power at the antenna port.

5.4.1.2 Test Procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below and taking due consideration of the loss of the antenna port adaptor.

5.4.2 Test results

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

Temperature of test Environment: 22°C

The spectral power density from the alternative sample was as shown in the table below:

Frequency (MHz)	Peak Power (dBm/3kHz)
2405	-2.9
2440	-2.6
2480	-3.3

Limit +8dBm/3kHz
These results show that the **EUT** has PASSED this test.

5.4.2.1 Test Equipment used

E3, E266, E246, E274, E5
See Section 10 for more details.

5.5 6dB Bandwidth

5.5.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.247(a))

Test Method: FCC Part 15C, Reference (15.247)

5.5.1.1 Configuration of EUT

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

5.5.1.2 Test Procedure

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

Measurements were made in a semi-anechoic chamber.

5.5.2 Test results

Tests were performed using Test Site A.

Temperature of test Environment: 22°C

Analyser plots for the 6dB bandwidth can be found in Section 6.3 of this report.

Frequency (MHz)	6dB Bandwidth (MHz)	Plot Reference
2405	1.61	Plot 003
2440	1.61	Plot 002
2480	1.61	Plot 001

Limit > 500kHz.
These results show that the **EUT** has PASSED this test.

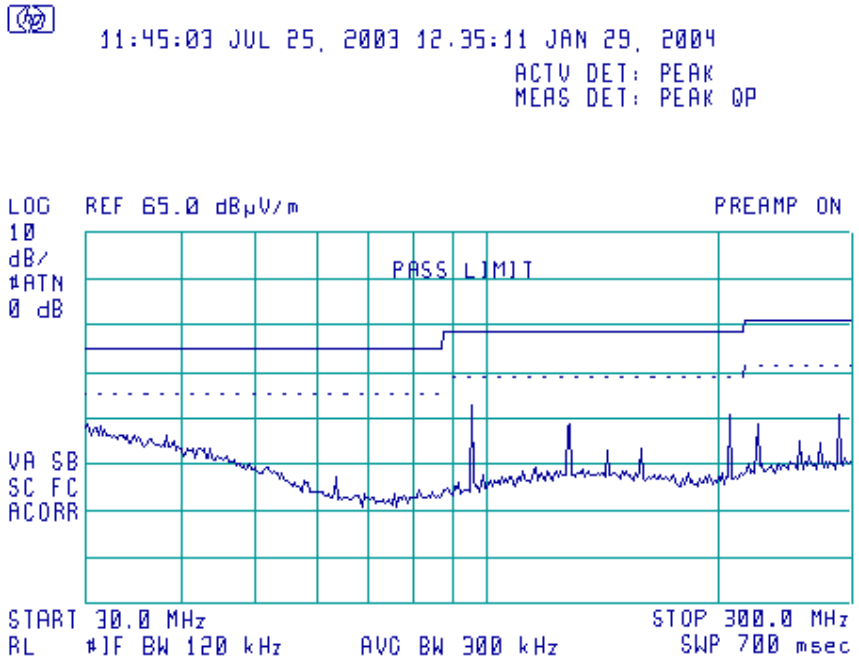
5.5.2.1 Test Equipment used

E3, TMS10, TMS73
See Section 10 for more details.

6. Plots and Results
6.1 Conducted Emissions

NONE - TEST NOT APPLICABLE

6.2 Radiated Emissions



Quasi-Peak Values of 30 MHz. to 300 MHz.

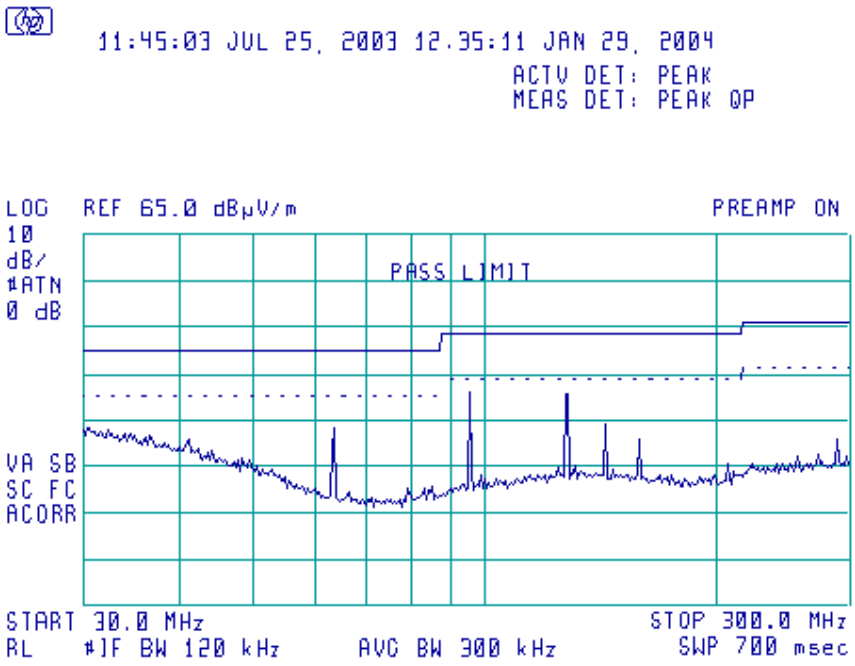
Horizontal Polarisation

The plot shows a swept response of peak values using the quasi-peak limit line

(Any peaks within 20dB of the limit line have been calculated and appear in the table on following page of this report)

Table of signals within 20dB of the limit line for Quasi-Peak Horizontal

Signal	Freq (MHz)	Peak Amp (dBuV/m)	Peak - Lim1 (dB)	QP Amp (dBuV/m)	QP - Lim1 (dB)
1	96.008100	29.01	-14.49	28.03	-15.47
2	128.000213	25.83	-17.67	23.80	-19.70
3	208.003725	27.05	-16.45	25.31	-18.19
4	287.997188	28.26	-17.74	26.60	-19.40



Quasi-Peak Values of 30 MHz. to 300 MHz.

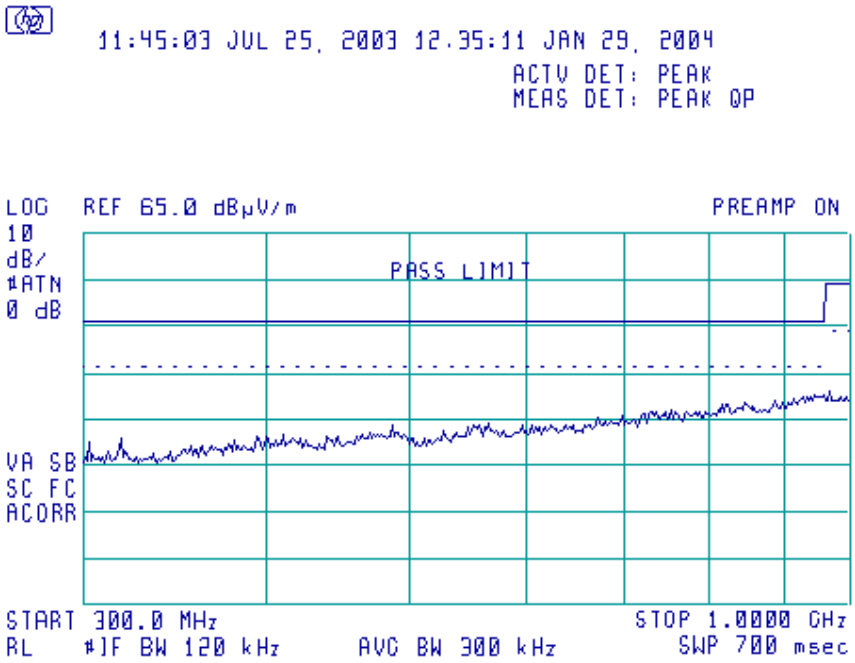
Vertical Polarisation

The plot shows a swept response of peak values using the quasi-peak limit line

(Any peaks within 20dB of the limit line have been calculated and appear in the table on following page of this report)

Table of signals within 20dB of the limit line for Quasi-peak Vertical

Signal	Freq (MHz)	Peak Amp (dBuV/m)	Peak - Lim1 (dB)	QP Amp (dBuV/m)	QP - Lim1 (dB)
1	64.000950	24.19	-15.81	23.04	-16.96
2	95.998313	31.96	-11.54	31.29	-12.21
3	127.999875	31.96	-11.54	30.99	-12.51
4	144.013088	24.68	-18.82	22.82	-20.68



Quasi-Peak Values of 300 MHz. to 1 GHz.

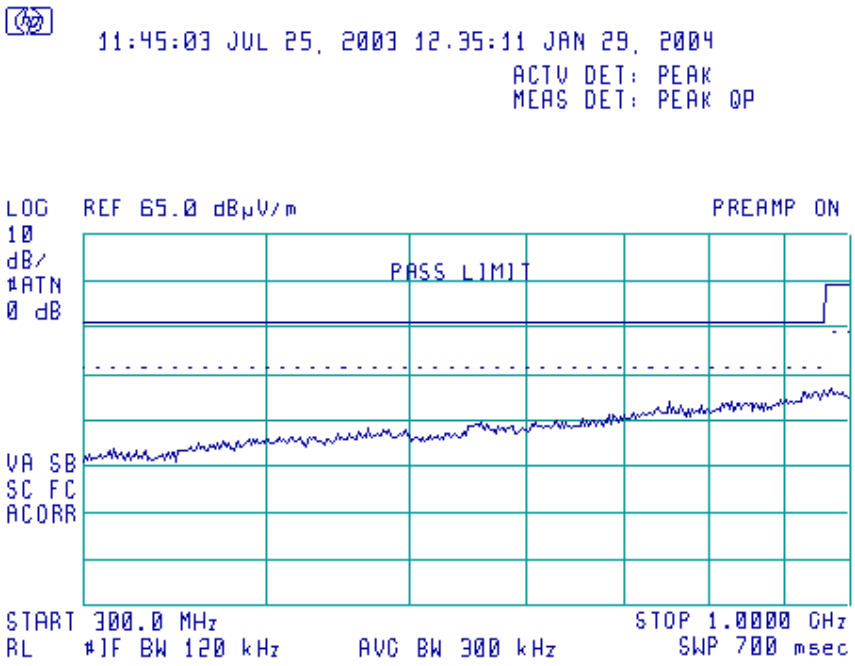
Horizontal Polarisation

The plot shows a swept response of peak values using the quasi-peak limit line

(Any peaks within 20dB of the limit line have been calculated and appear in the table on following page of this report)

NONE

Table of signals within 20dB of the limit line for Quasi-Peak Horizontal



Quasi-Peak Values of 300 MHz. to 1 GHz.

Vertical Polarisation

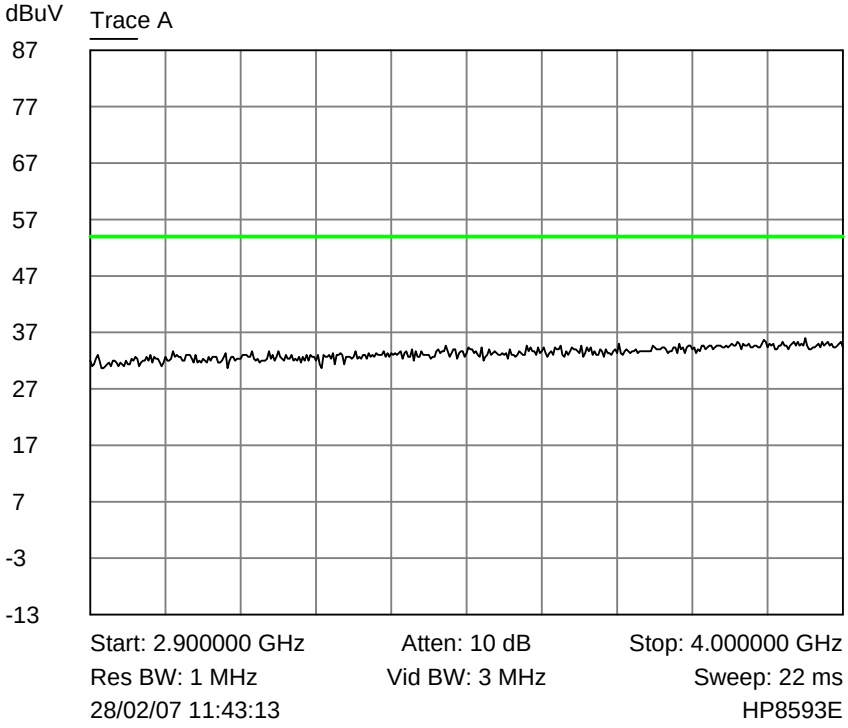
The plot shows a swept response of peak values using the quasi-peak limit line

(Any peaks within 20dB of the limit line have been calculated and appear in the table on following page of this report)

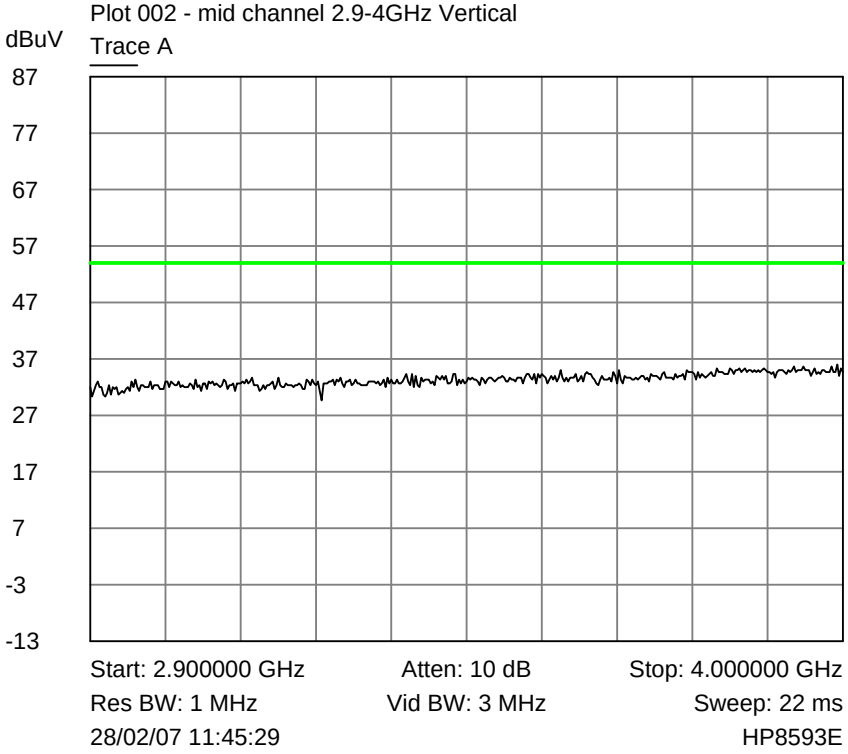
NONE

Table of signals within 20dB of the limit line for Quasi-peak Vertical

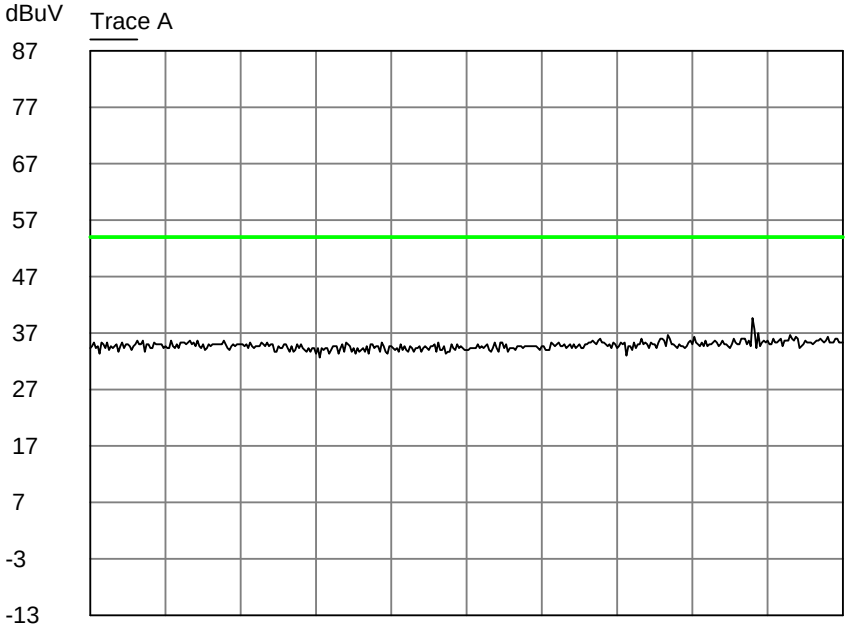
Plot 001 - mid channel 2.9-4GHz horizontal



Plot 002 - mid channel 2.9-4GHz Vertical

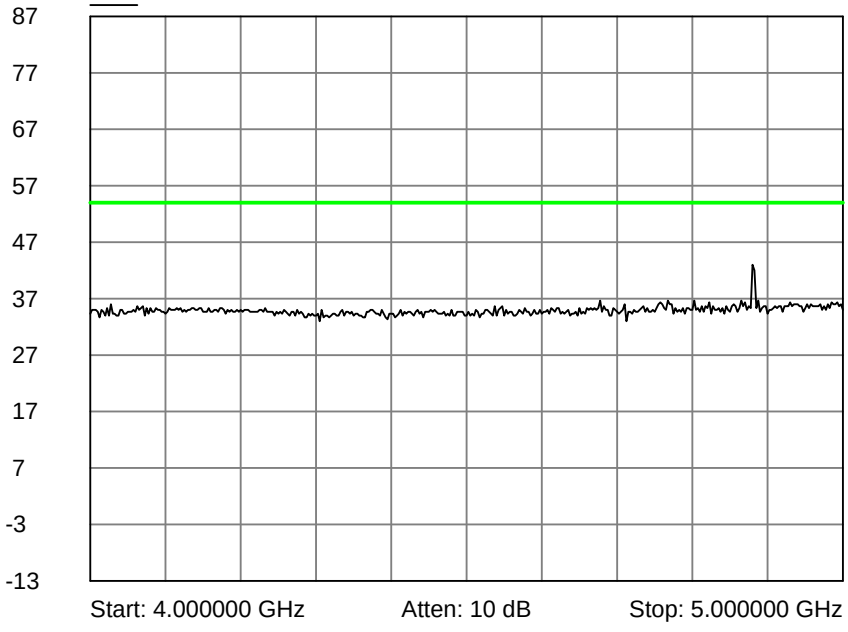


Plot 003 - mid channel 4-5GHz Vertical



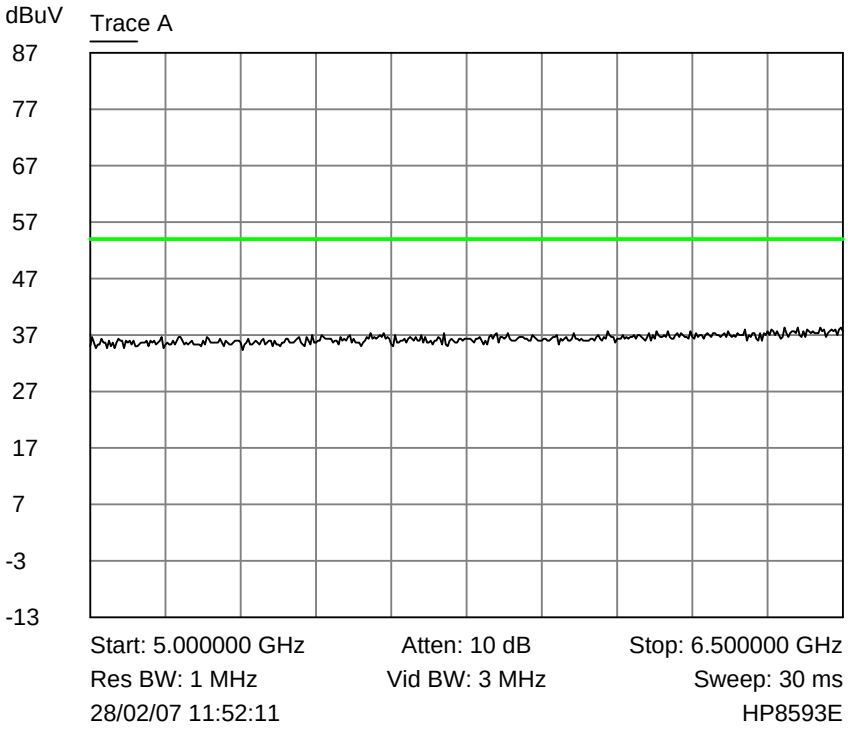
Start: 4.000000 GHz Atten: 10 dB Stop: 5.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 20 ms
28/02/07 11:46:36 HP8593E

Plot 004 - mid channel 4-5GHz Horizontal

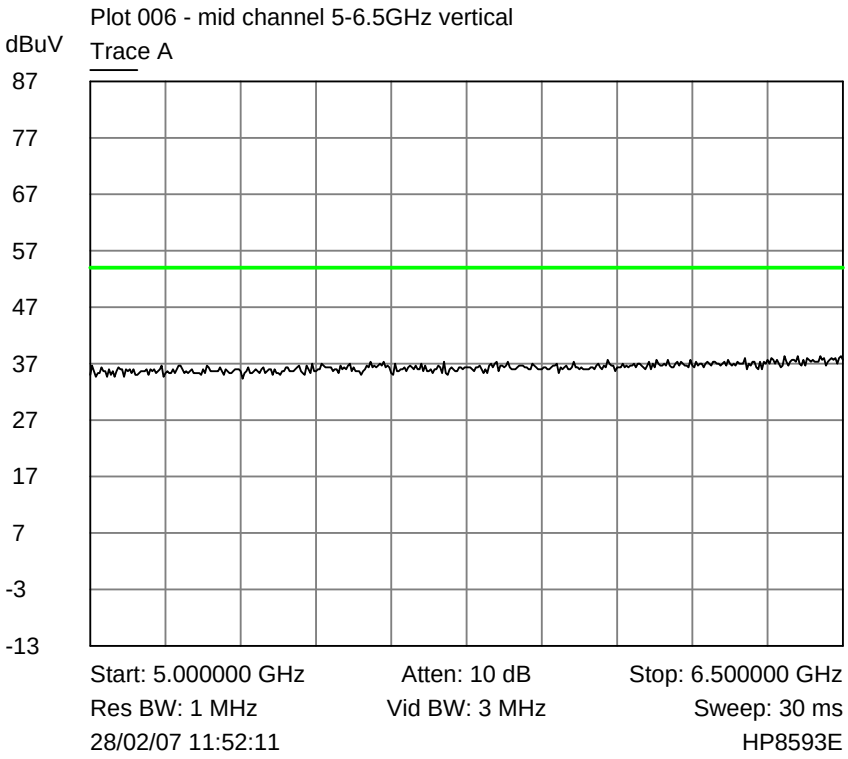


Start: 4.000000 GHz Atten: 10 dB Stop: 5.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 20 ms
28/02/07 11:48:20 HP8593E

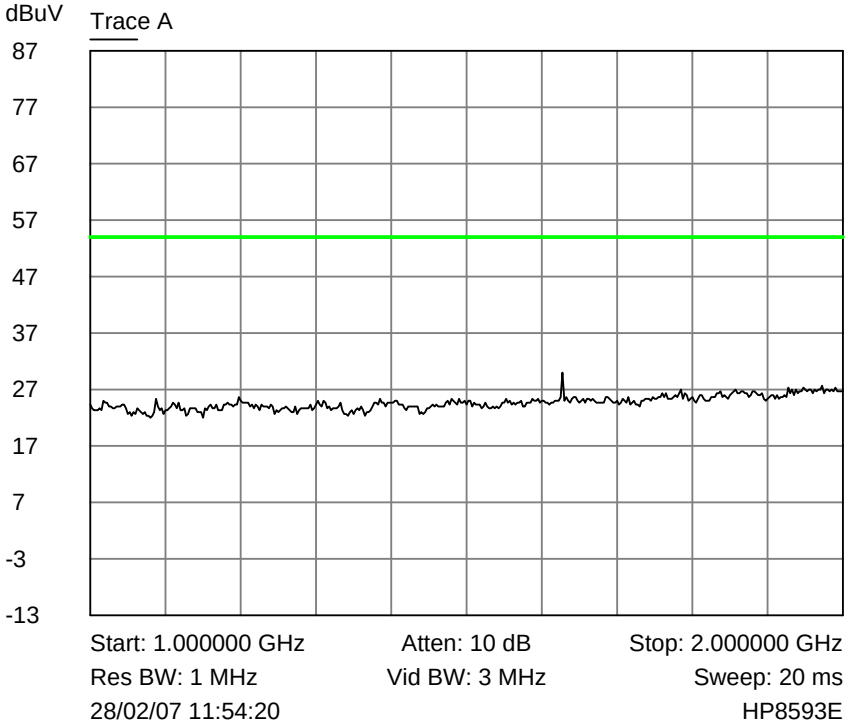
Plot 005 - mid channel 5-6.5GHz Horizontal



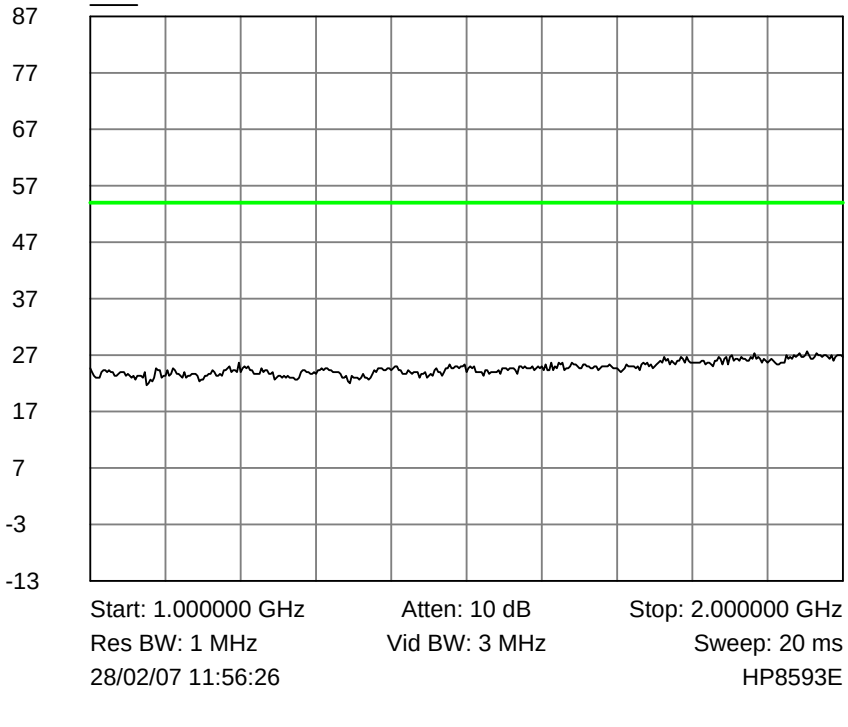
Plot 006 - mid channel 5-6.5GHz vertical



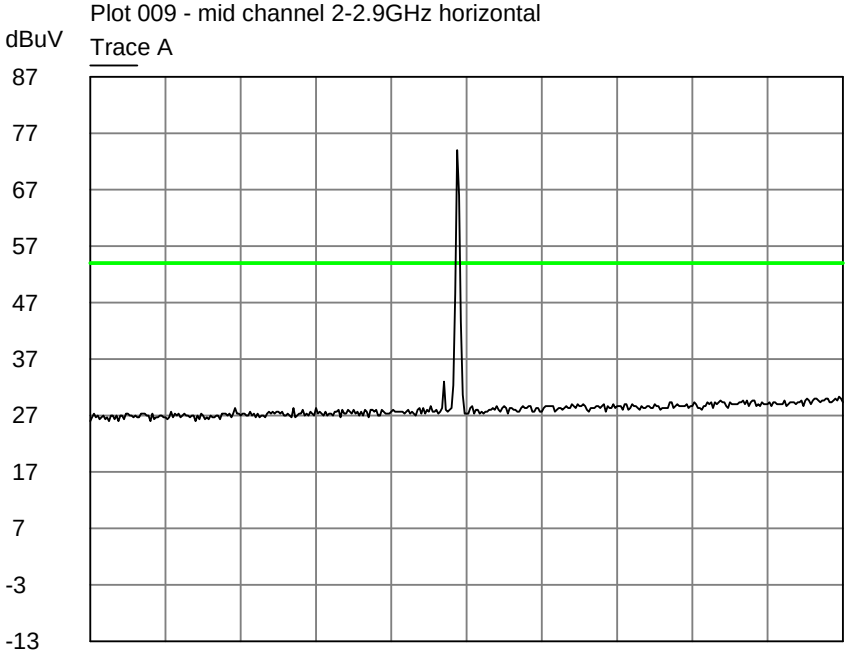
Plot 007 - mid channel 1-2GHz vertical



Plot 008 - mid channel 1-2GHz horizontal

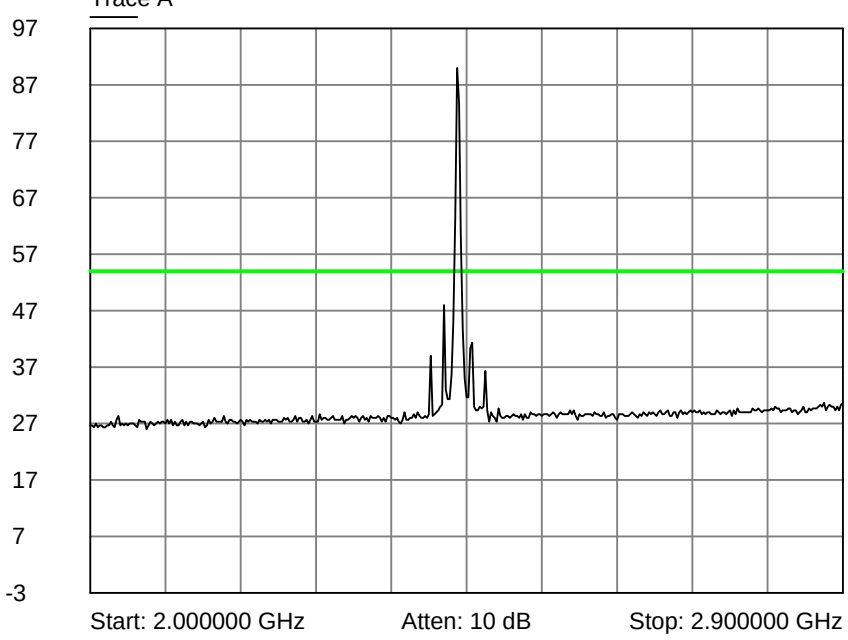


Plot 009 - mid channel 2-2.9GHz horizontal



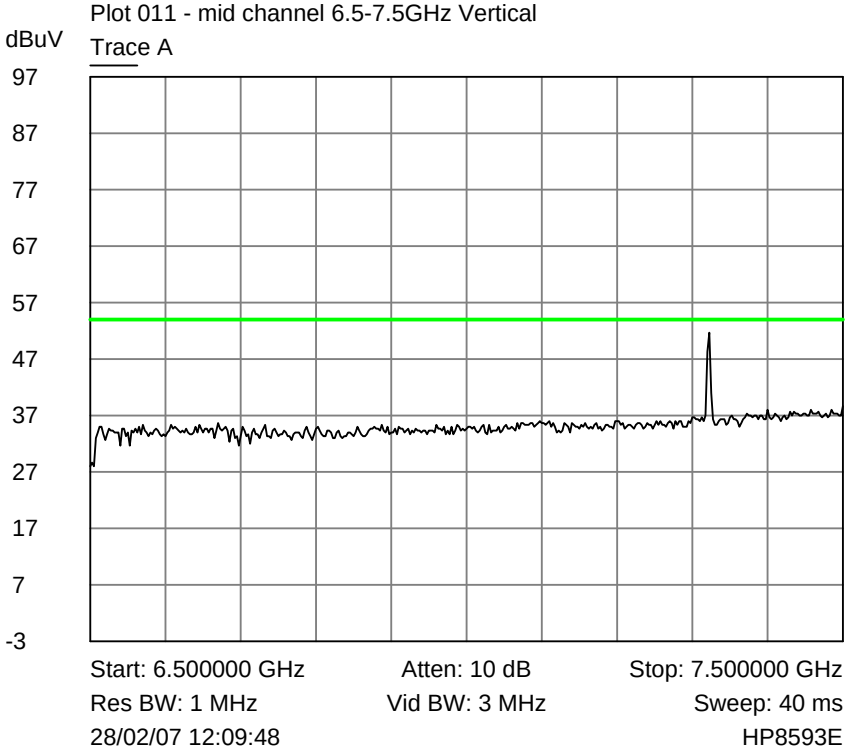
Start: 2.000000 GHz Atten: 10 dB Stop: 2.900000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 20 ms
28/02/07 11:59:24 HP8593E

Plot 010 - mid channel 2-2.9GHz Vertical

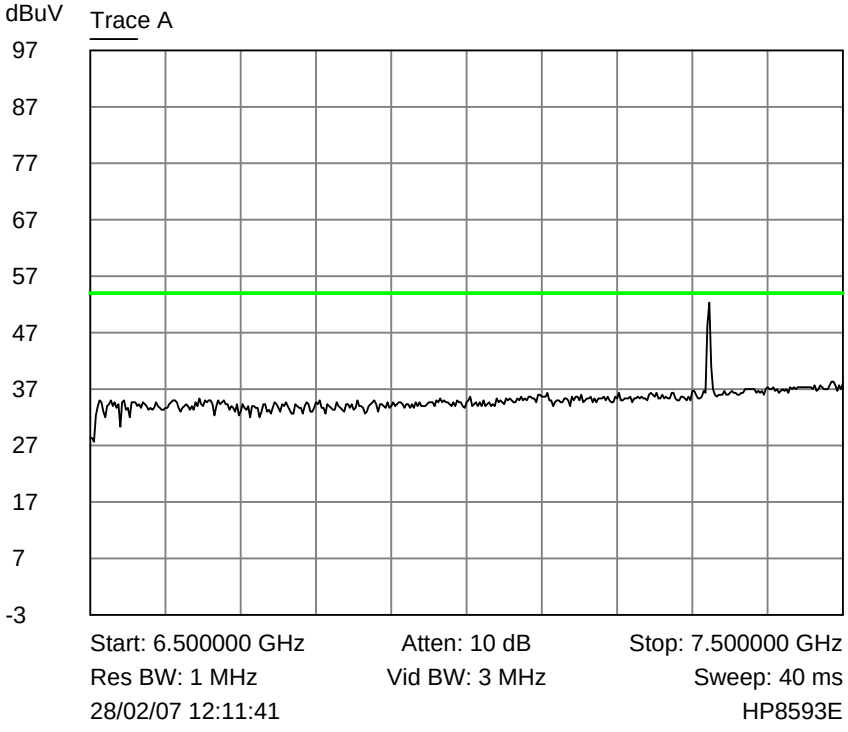


Start: 2.000000 GHz Atten: 10 dB Stop: 2.900000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 20 ms
28/02/07 12:00:58 HP8593E

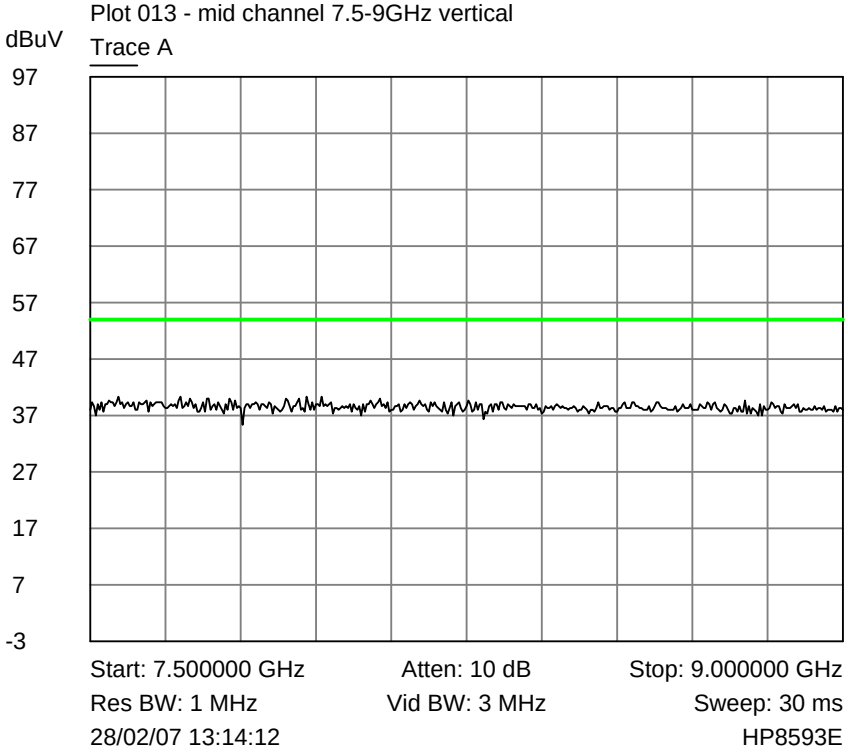
Plot 011 - mid channel 6.5-7.5GHz Vertical



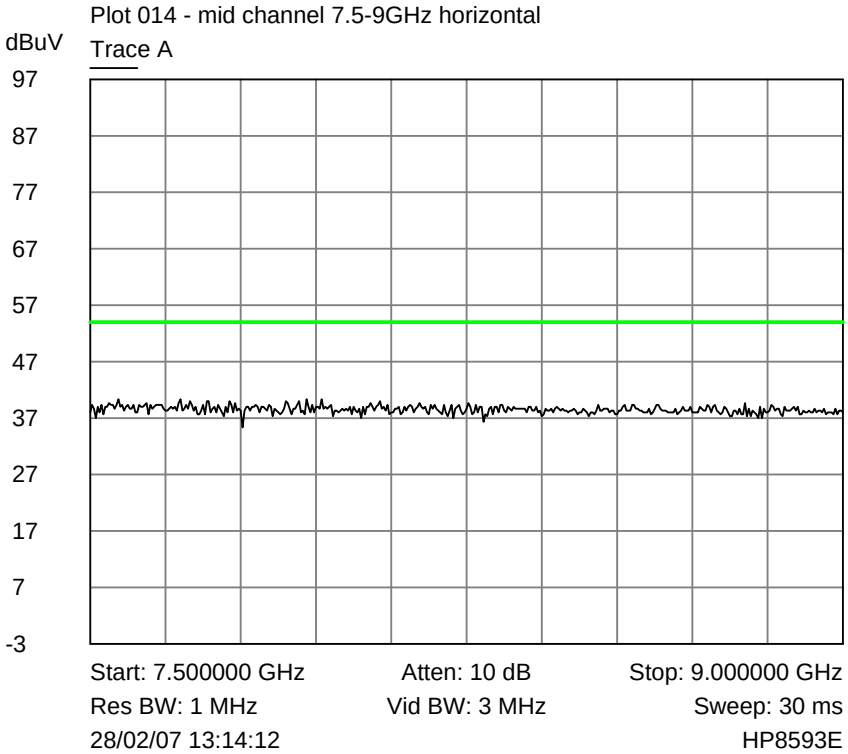
Plot 012 - mid channel 6.5-7.5GHz horizontal



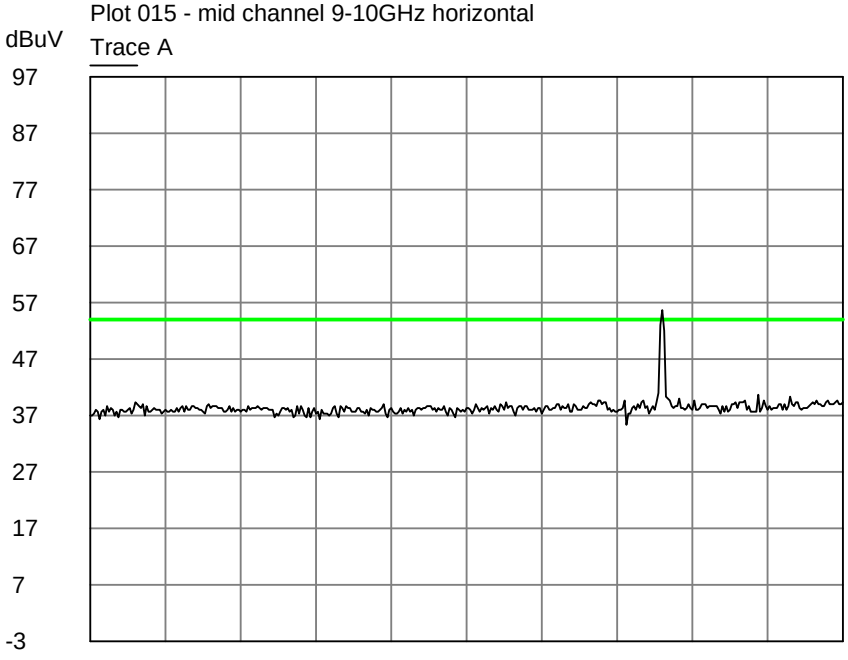
Plot 013 - mid channel 7.5-9GHz vertical



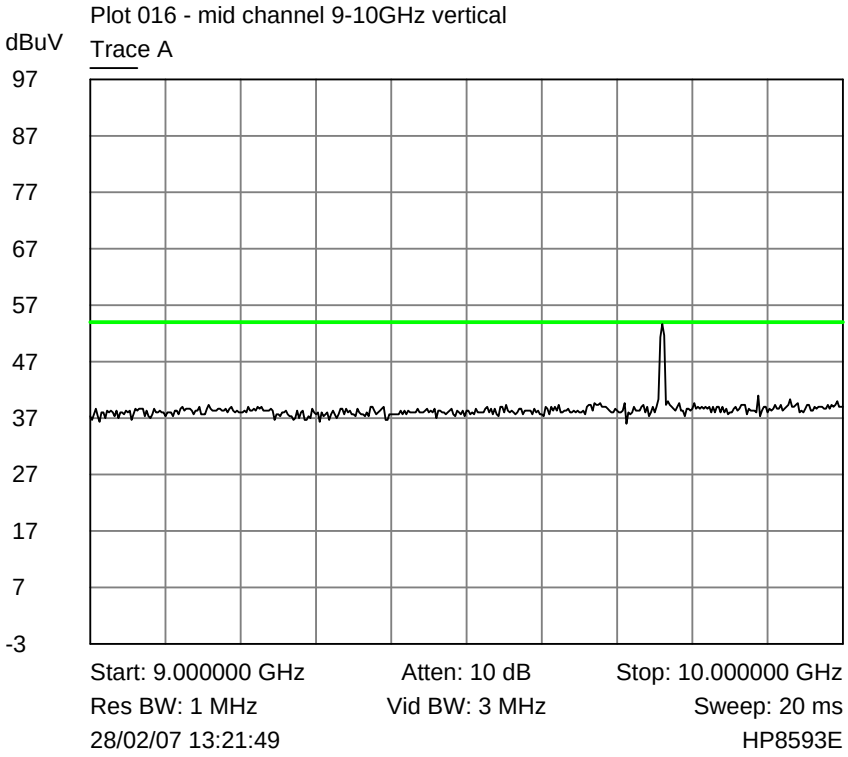
Plot 014 - mid channel 7.5-9GHz horizontal



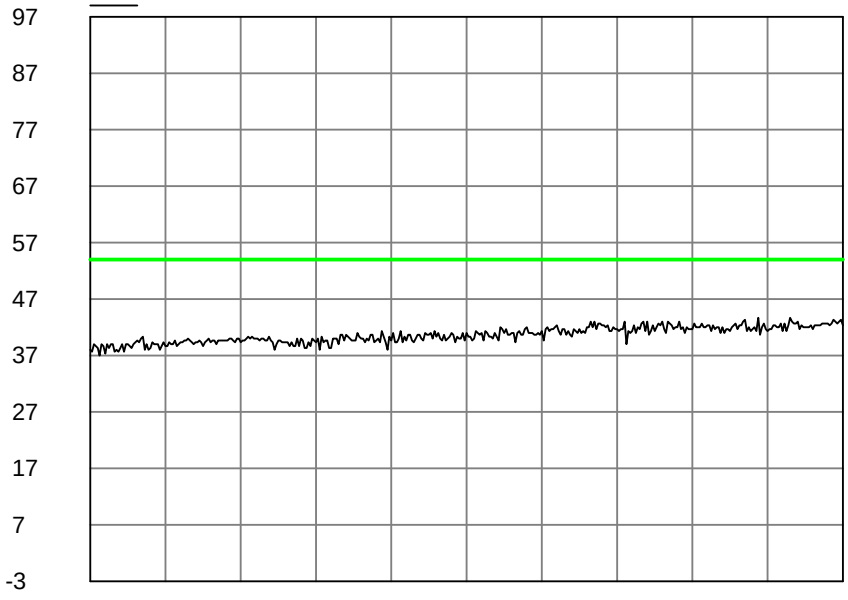
Plot 015 - mid channel 9-10GHz horizontal



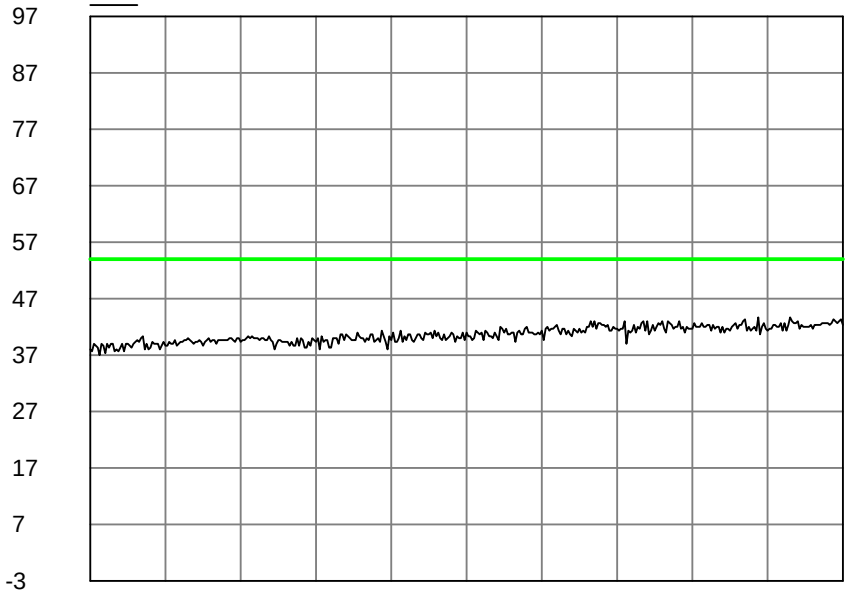
Plot 016 - mid channel 9-10GHz vertical



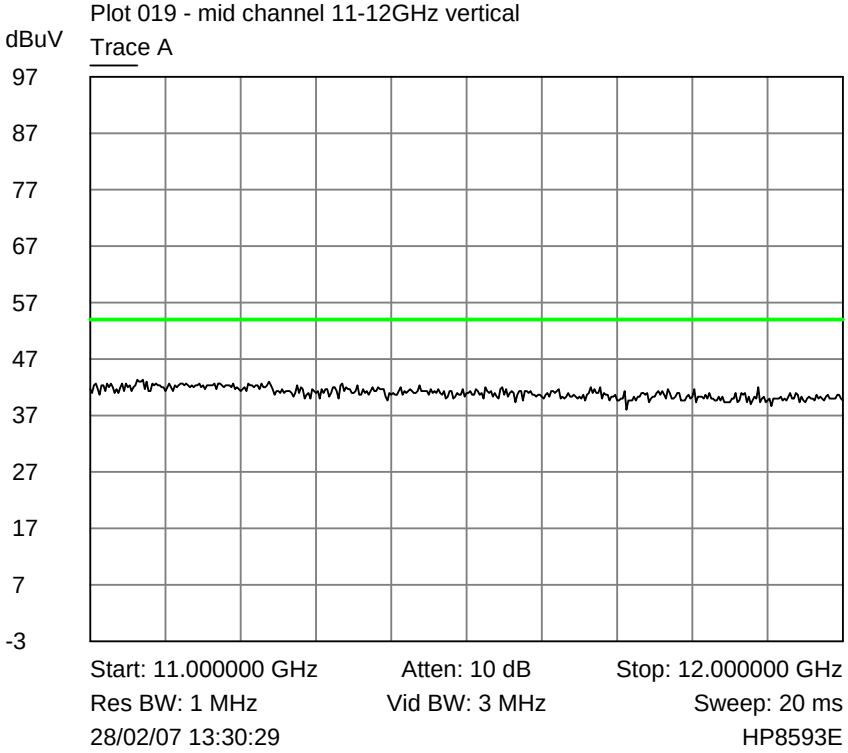
Plot 017 - mid channel 10-11GHz horizontal



Plot 018 - mid channel 10-11GHz vertical

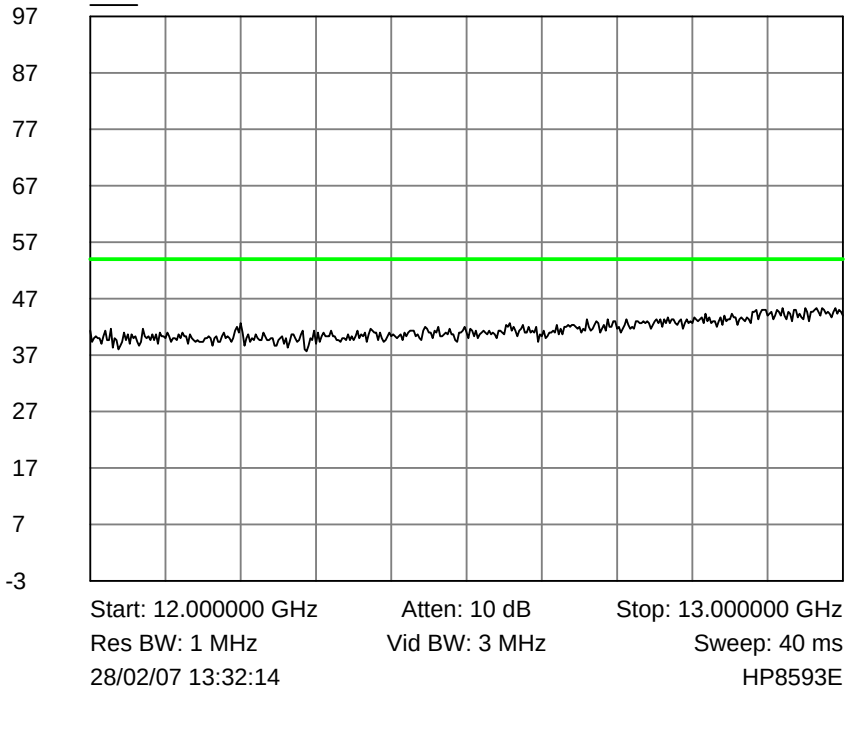


Plot 019 - mid channel 11-12GHz vertical



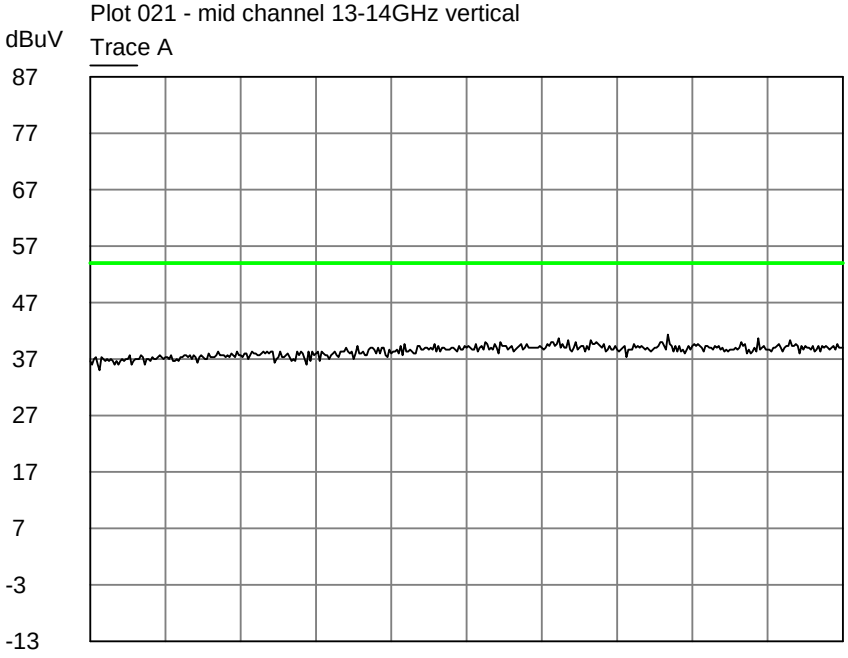
Start: 11.000000 GHz Atten: 10 dB Stop: 12.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 20 ms
28/02/07 13:30:29 HP8593E

Plot 020 - mid channel 12-13GHz vertical

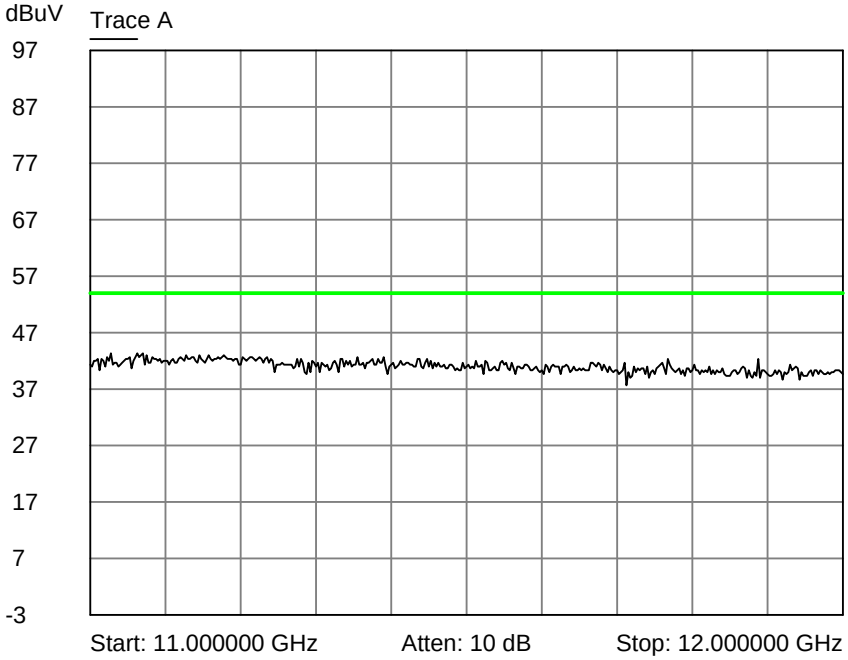


Start: 12.000000 GHz Atten: 10 dB Stop: 13.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 40 ms
28/02/07 13:32:14 HP8593E

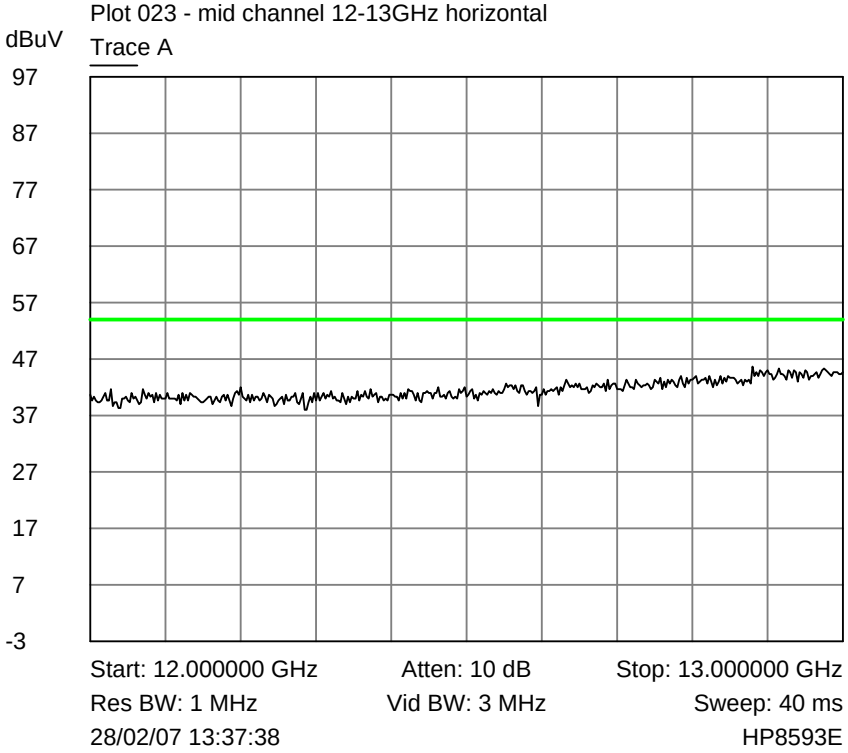
Plot 021 - mid channel 13-14GHz vertical



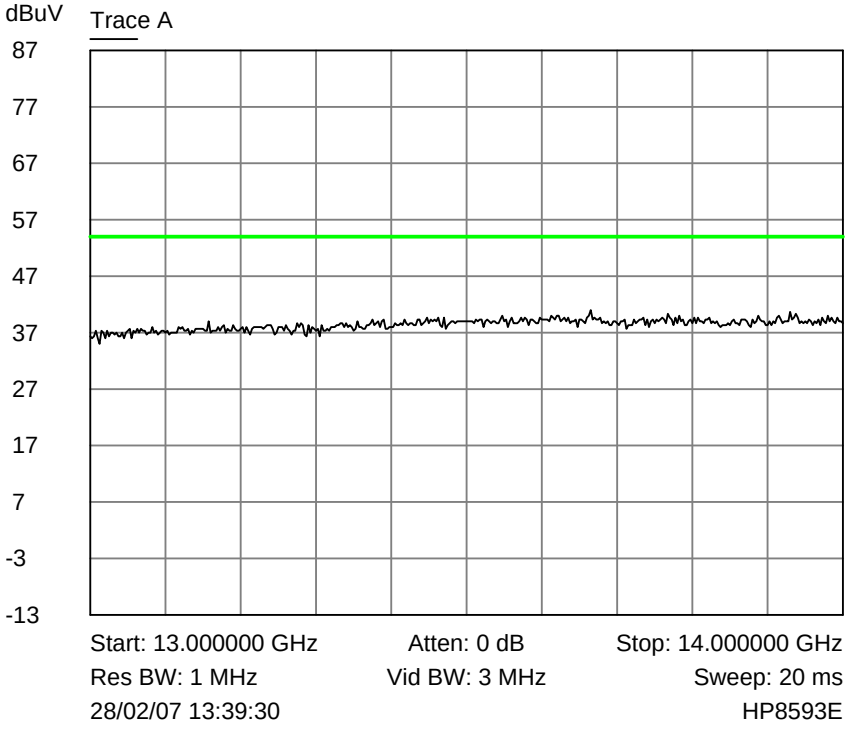
Plot 022 - mid channel 11-12GHz horizontal



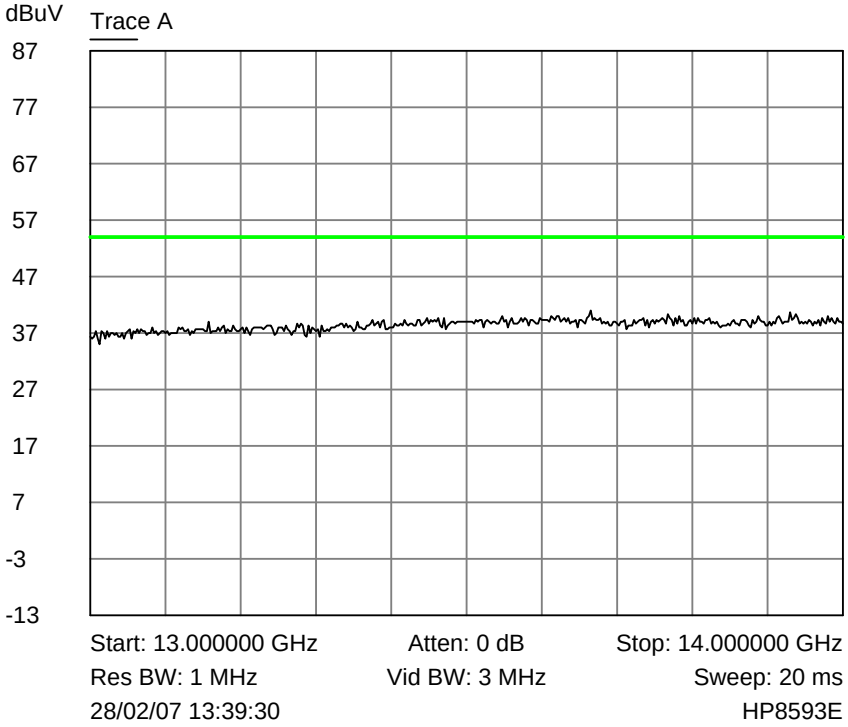
Plot 023 - mid channel 12-13GHz horizontal



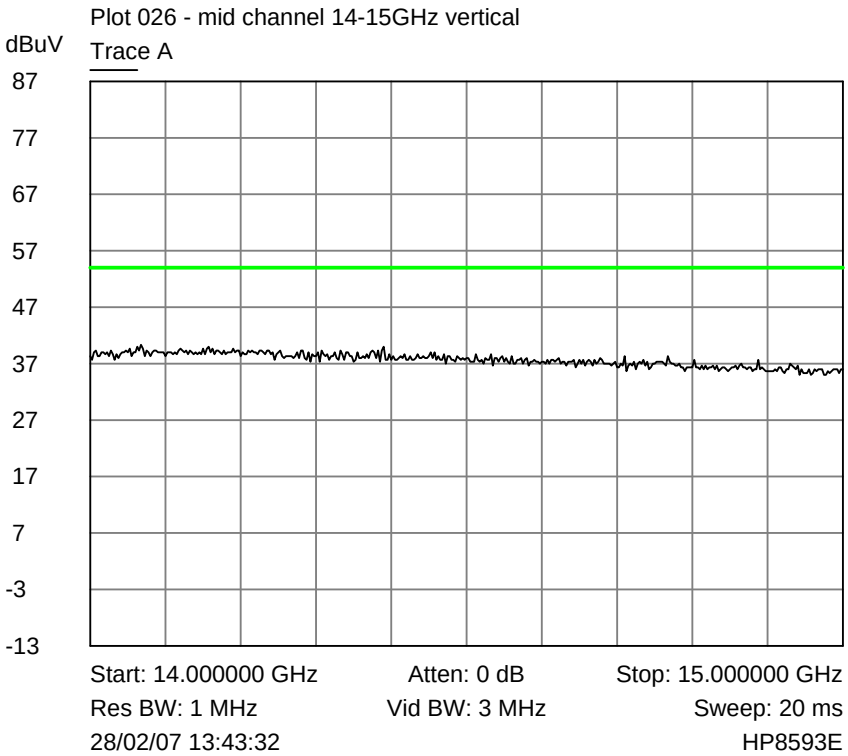
Plot 024 - mid channel 13-14GHz horizontal



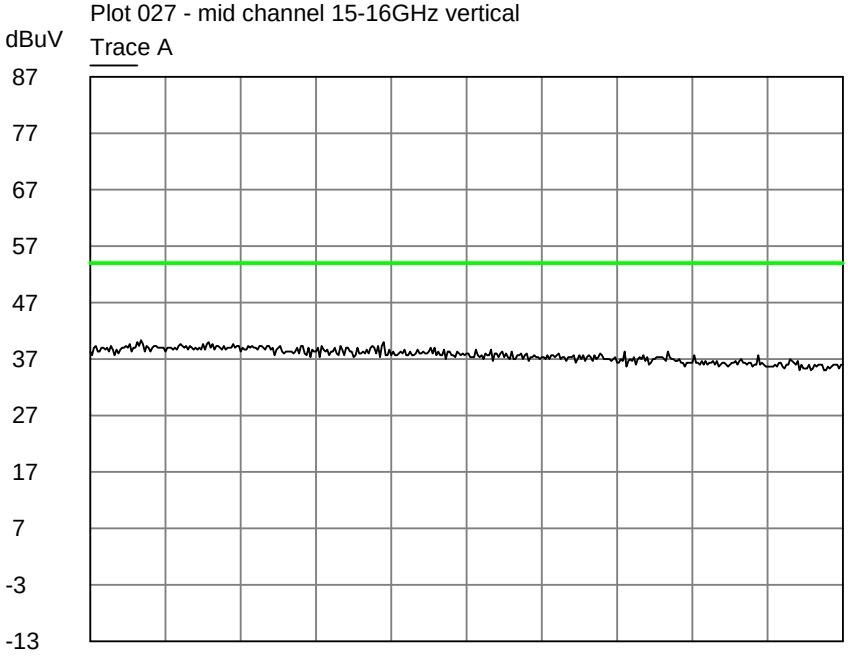
Plot 025 - mid channel 14-15GHz horizontal



Plot 026 - mid channel 14-15GHz vertical

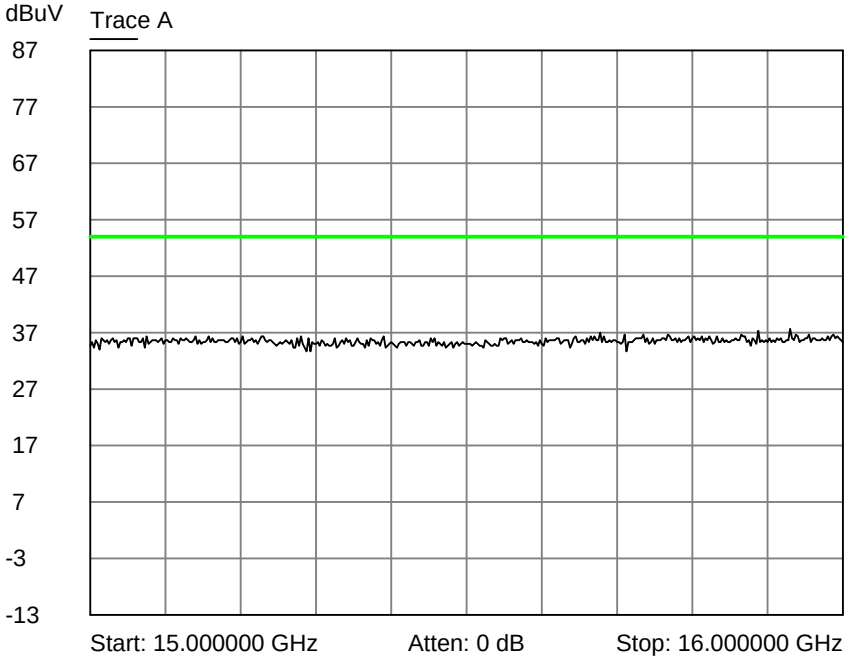


Plot 027 - mid channel 15-16GHz vertical



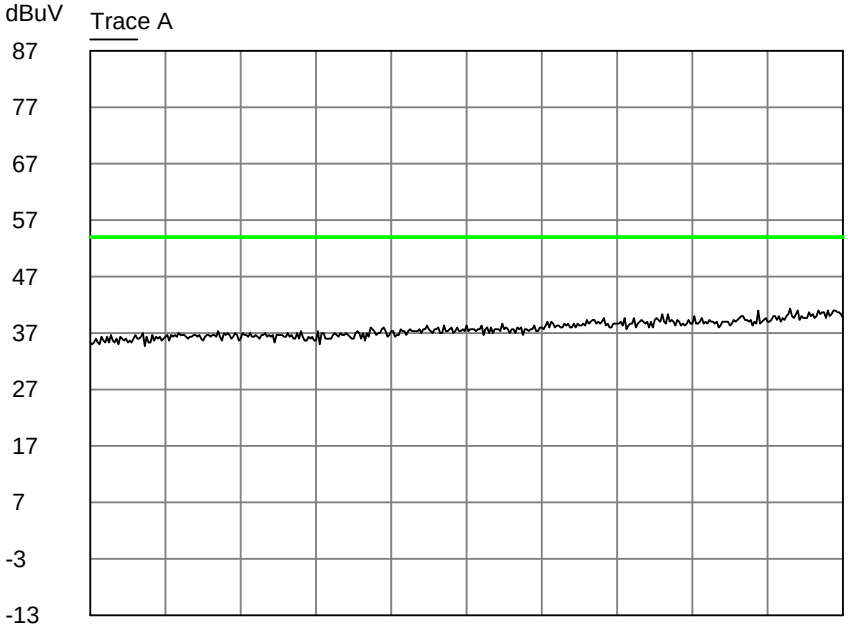
Start: 14.000000 GHz Atten: 0 dB Stop: 15.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 20 ms
28/02/07 13:43:32 HP8593E

Plot 028 - mid channel 15-16GHz horizontal



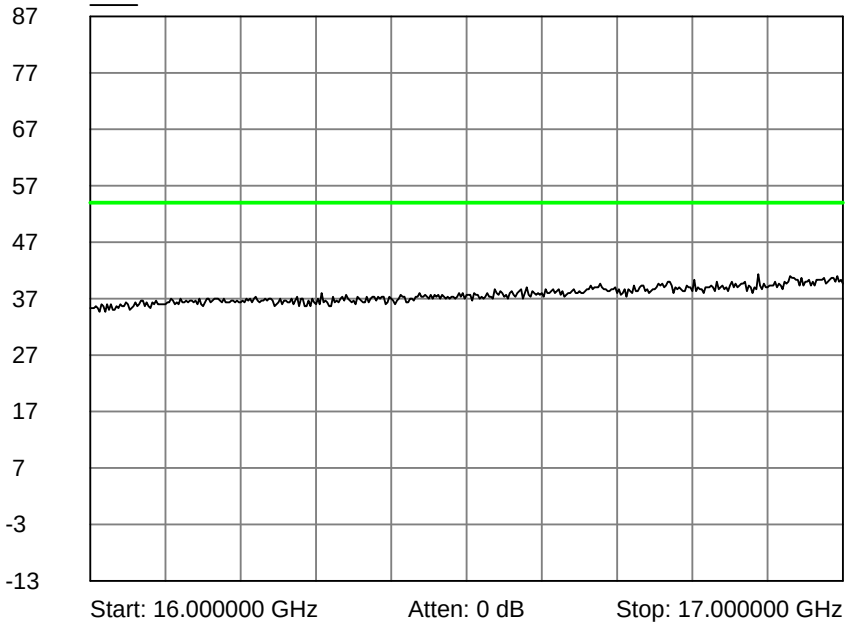
Start: 15.000000 GHz Atten: 0 dB Stop: 16.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 20 ms
28/02/07 13:46:58 HP8593E

Plot 029 - mid channel 16-17GHz horizontal



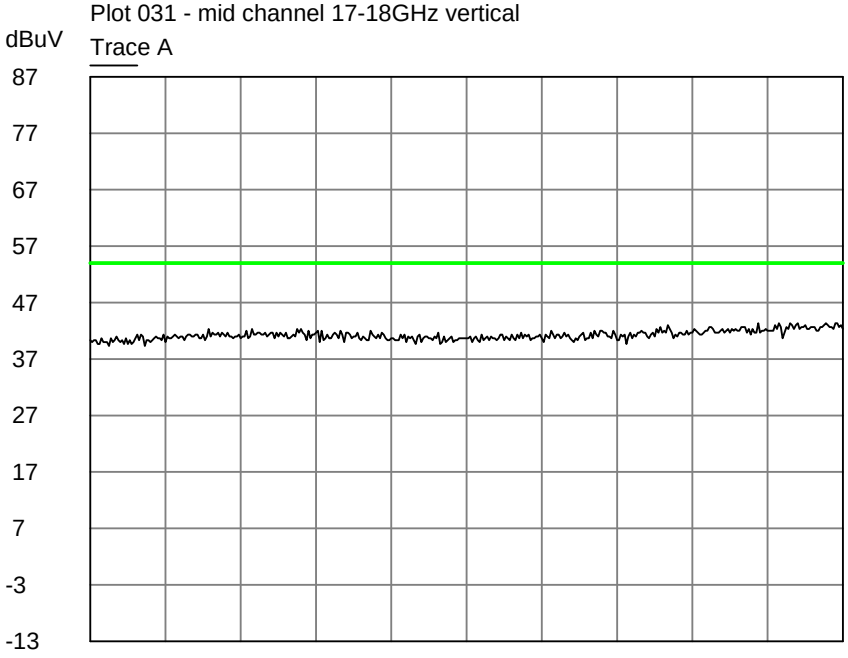
Start: 16.000000 GHz Atten: 0 dB Stop: 17.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 20 ms
28/02/07 13:48:25 HP8593E

Plot 030 - mid channel 16-17GHz vertical



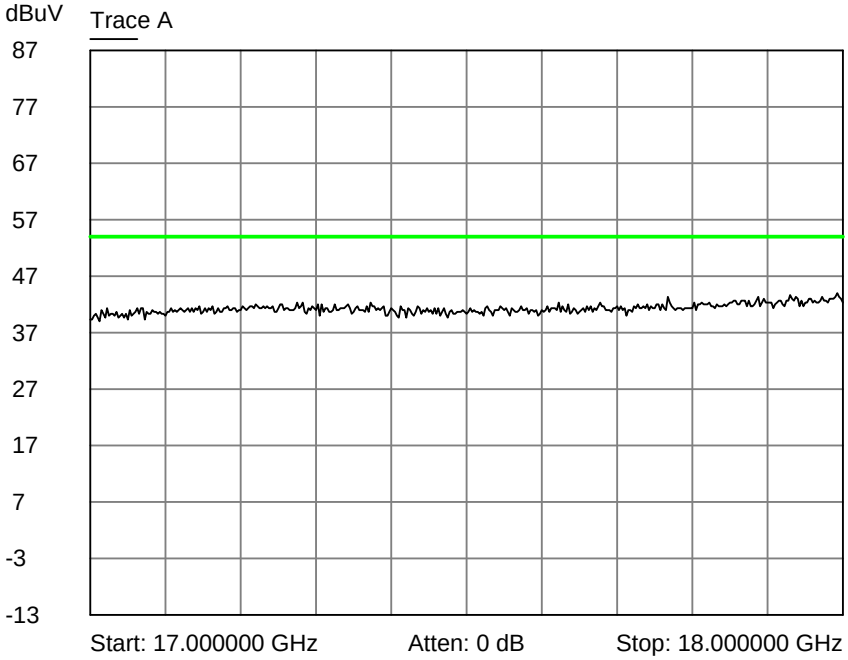
Start: 16.000000 GHz Atten: 0 dB Stop: 17.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 20 ms
28/02/07 14:15:46 HP8593E

Plot 031 - mid channel 17-18GHz vertical



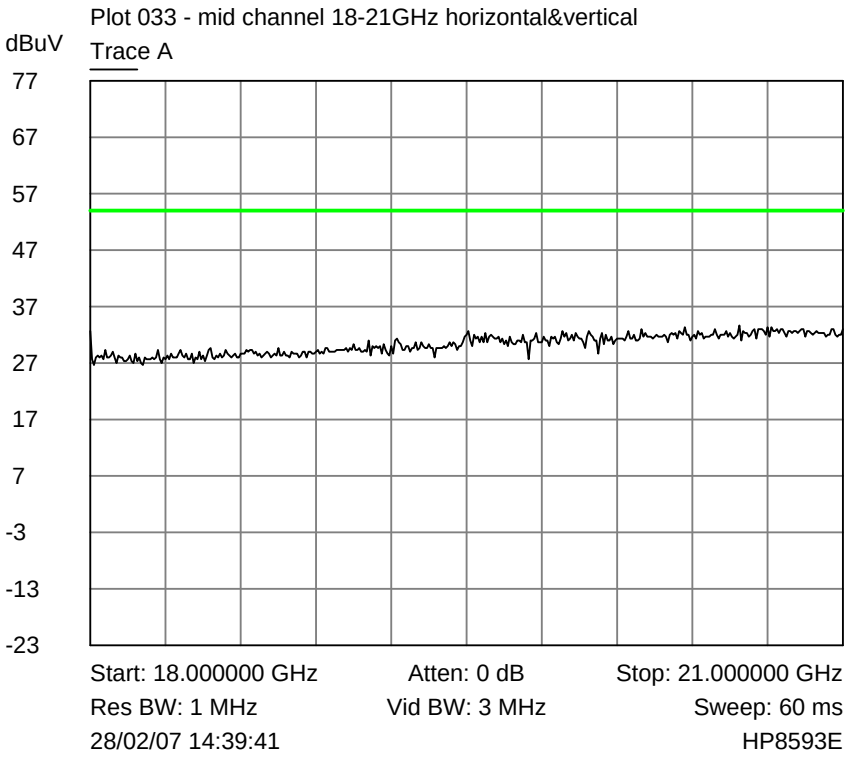
Start: 17.000000 GHz Atten: 0 dB Stop: 18.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 20 ms
28/02/07 13:51:21 HP8593E

Plot 032 - mid channel 17-18GHz horizontal

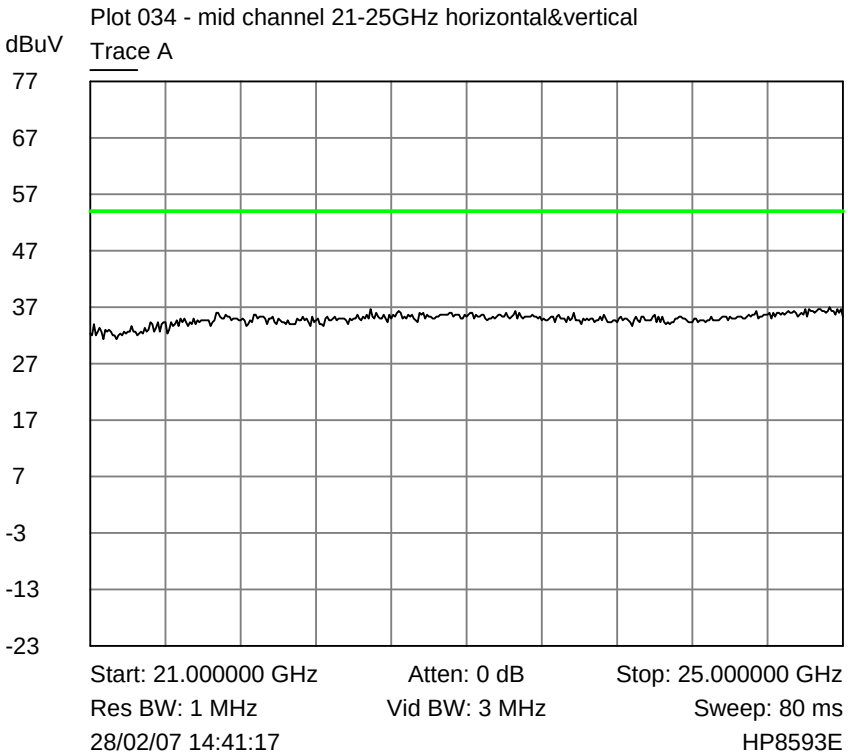


Start: 17.000000 GHz Atten: 0 dB Stop: 18.000000 GHz
Res BW: 1 MHz Vid BW: 3 MHz Sweep: 20 ms
28/02/07 13:52:24 HP8593E

Plot 033 - mid channel 18-21GHz horizontal&vertical



Plot 034 - mid channel 21-25GHz horizontal&vertical



Tables of signals within 20dB of the limit line for 1GHz - 25GHz

EUT Transmitting on Low Channel

Signal	Freq (MHz)	Polarisation	Avg Amp (dBuV/m)	Avg -Limit[1] (dBuV/m)	Comments
1	1600	V	38.4	-15.6	
2	4810	V	43.0	-11.0	
3	4810	H	50.7	-3.3	
8	12025	V	35	-19.0	
9	12025	H	45	-9.0	

Signal	Freq (MHz)	Polarisation	Avg Amp (dBuV/m)	Avg -Limit[2] (dBuV/m)	Comments
4	7215	V	51	-29.4	
5	7215	H	52	-28.4	
6	9620	V	59.0	-21.4	
7	9620	H	54.8	-25.6	

EUT Transmitting on Middle Channel

Signal	Freq (MHz)	Polarisation	Avg Amp (dBuV/m)	Avg -Limit[1] (dBuV/m)	Comments
1	1625	V	38.8	-15.2	
2	4880	V	35	-19.0	
3	4880	H	44.4	-9.6	
4	7320	V	51	-3.0	
5	7320	H	56	+2.0	See below.
8	12200	V	38.5	-15.5	
9	12200	H	36	-18.0	

Signal	Freq (MHz)	Polarisation	Avg Amp (dBuV/m)	Avg -Limit[2] (dBuV/m)	Comments
6	9760	V	60	-21.3	
7	9760	H	55.2	-26.1	

High channel

Signal	Freq (MHz)	Polarisation	Avg Amp (dBuV/m)	Avg -Limit[1] (dBuV/m)	Comments
1	1650	V	38	-16.0	
2	4960	V	41	-13.0	
3	4960	H	47	-7.0	
4	7440	V	46	-8.0	
5	7440	H	54	0.0	See below.
8	12400	V	37	-17.0	

Signal	Freq (MHz)	Polarisation	Avg Amp (dBuV/m)	Avg -Limit[2] (dBuV/m)	Comments
6	9920	V	57	-23.7	
7	9920	H	45.7	-35	

In all the above measurements the fundamental signal was continuously on, and in no case were the peak emissions more than 3dB above the average.

[1] Limit for emissions within the restricted bands of 15.205 comes from 15.209 = 54dBuV/m at 3m.
[2] Limit for emissions outside the restricted bands of 15.205 comes from 15.247(d) = -20dB from highest in-band emission measured in 100kHz.

Highest in-band emissions measured in 100kHz bandwidth, per 15.209(d):

Channel	Frequency (MHz)	Field (dBuV/m)
Low	2405	100.4
Middle	2440	101.3
High	2480	100.9

Continuous emissions observed in excess of the limit:

According to 15.35(b): the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

As peak emissions were no more than 3dB above the average emissions measured and the worst case average emission measured is 2.0 dB above the permitted average emission limit then the condition for peak emissions is met.

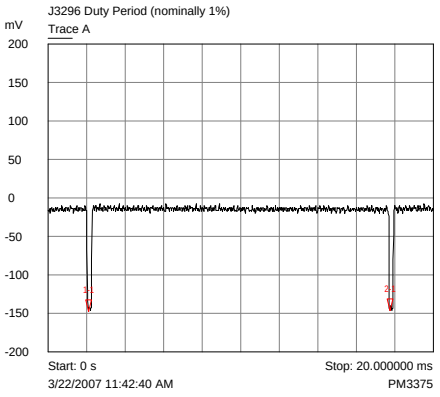
According to 15.35(c): when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

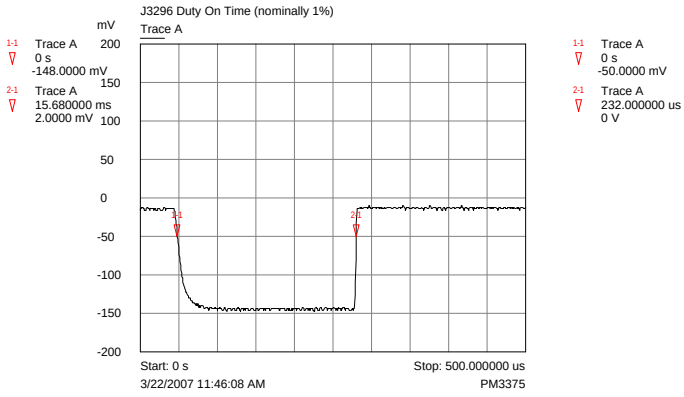
For purposes of test the equipment was operated with the transmitter continuously on. For a 1% duty cycle, the power measured would be reduced by 20 log (0.01) = 40dB. For a 10% duty cycle, the power measured would be reduced by 20 log (0.10) = 20dB. According to the declared duty cycle, therefore, the emissions observed are below the limit after averaging for pulse rate.

Duty Cycle
In normal operation the equipment employs pulsing at a variable rate, depending on the application. The manufacturer has declared a duty cycle of 1% and quotes IEEE 802.15.4: "The specifications of IEEE Std 802.15.4-2003 are tailored for applications with low power and low data rates (a maximum of 250 kb/s and down to 20 kb/s). Typical applications for IEEE 802.15.4 devices are anticipated to run with low duty cycles (under 1%). This will make IEEE 802.15.4 devices less likely to cause interference to other standards".
IEEE 802.15.4 also quotes a nominal packet length of 0.01472ms (40 data bytes) and for <10% duty cycle restrictions up to 6 packets per 100ms.

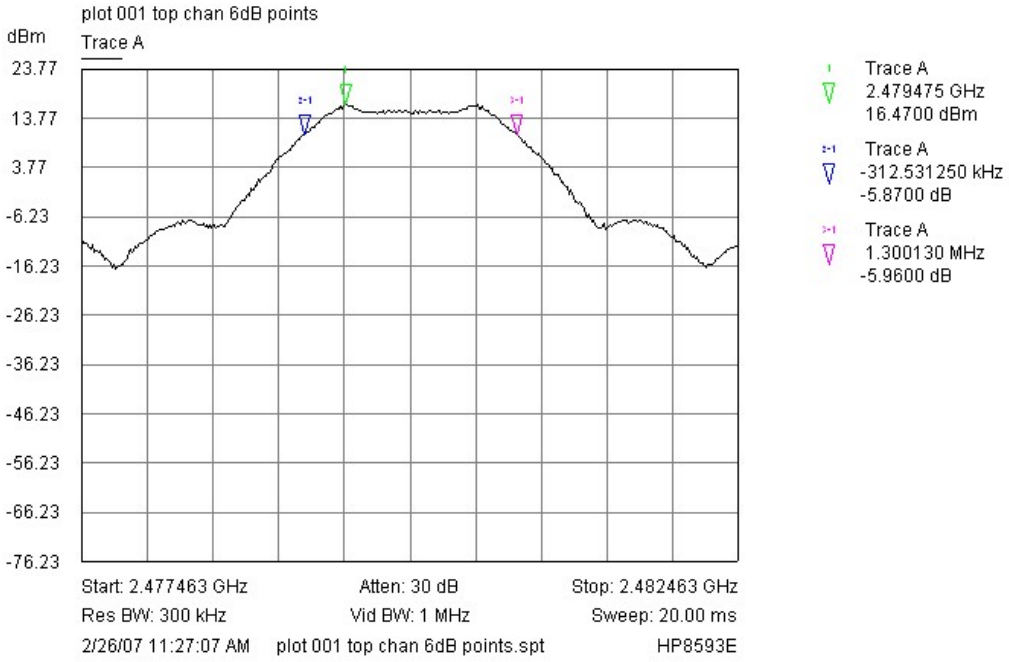
A measurement of the EUT operating at the nominal 1% rate is shown below.

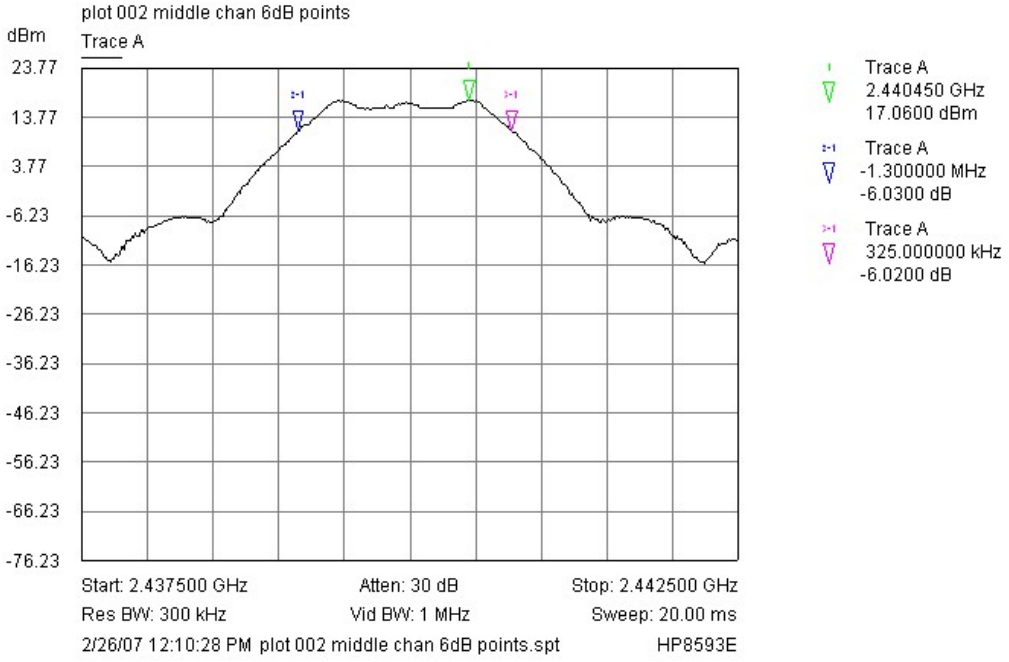
Plot of duty cycle period and pulse width (nominally 1%):

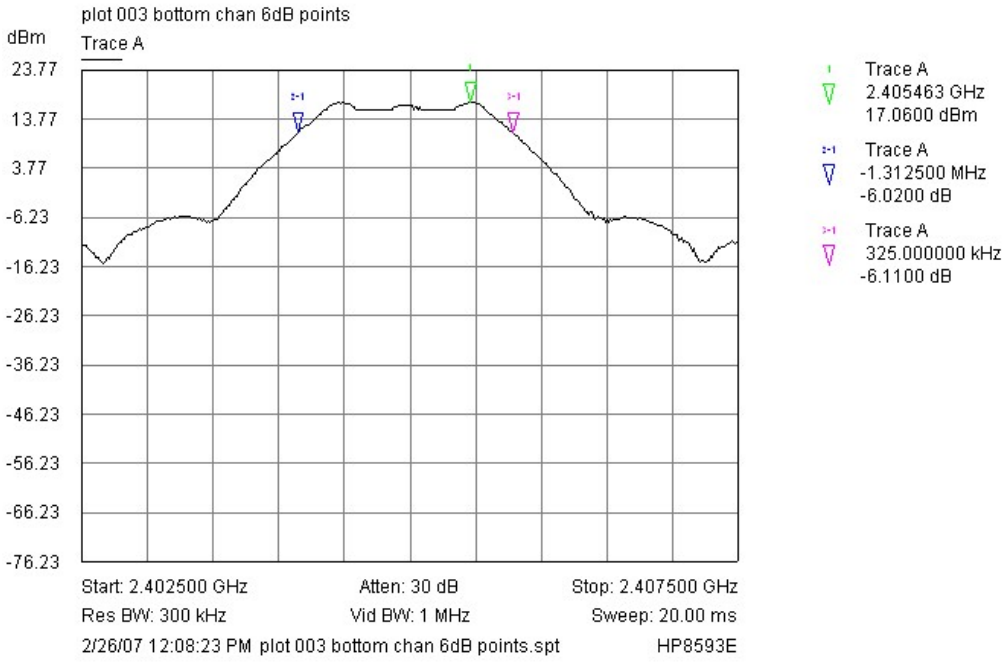




6.3 6dB Bandwidth






plot 003 bottom chan 6dB points
dBm
Trace A
23.77
13.77
3.77
-6.23
-16.23
-26.23
-36.23
-46.23
-56.23
-66.23
-76.23
Trace A
2.405463 GHz
17.0600 dBm
Trace A
-1.312500 MHz
-6.0200 dB
Trace A
325.000000 kHz
-6.1100 dB
Start: 2.402500 GHz
Atten: 30 dB
Stop: 2.407500 GHz
Res BW: 300 kHz
Vid BW: 1 MHz
Sweep: 20.00 ms
2/26/07 12:08:23 PM plot 003 bottom chan 6dB points.spt
HP8593E

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.

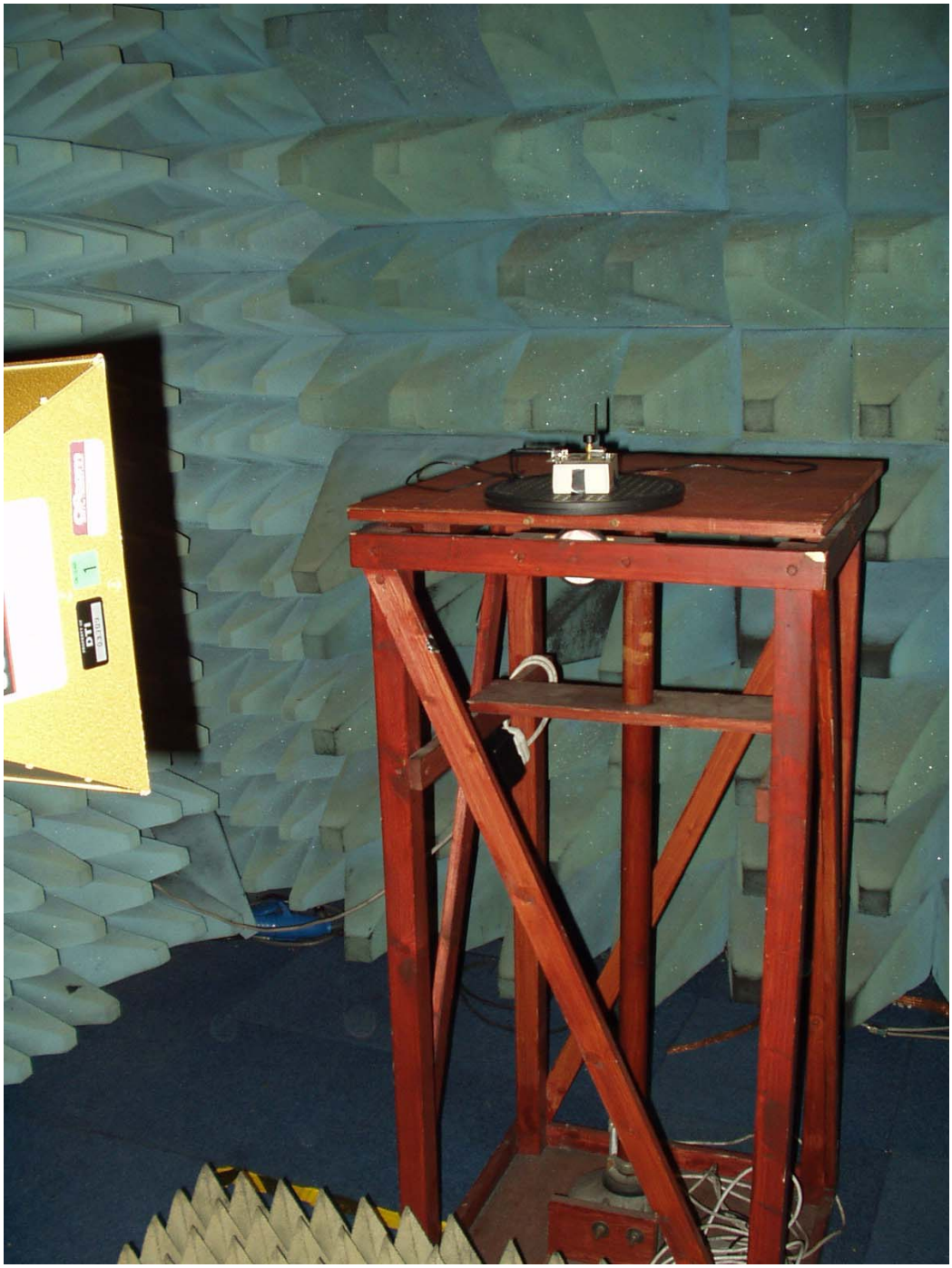
7.2 Explanation of limit line calculations for radiated measurements

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 and may need to take account of any alternative measuring distance used. Examples:

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

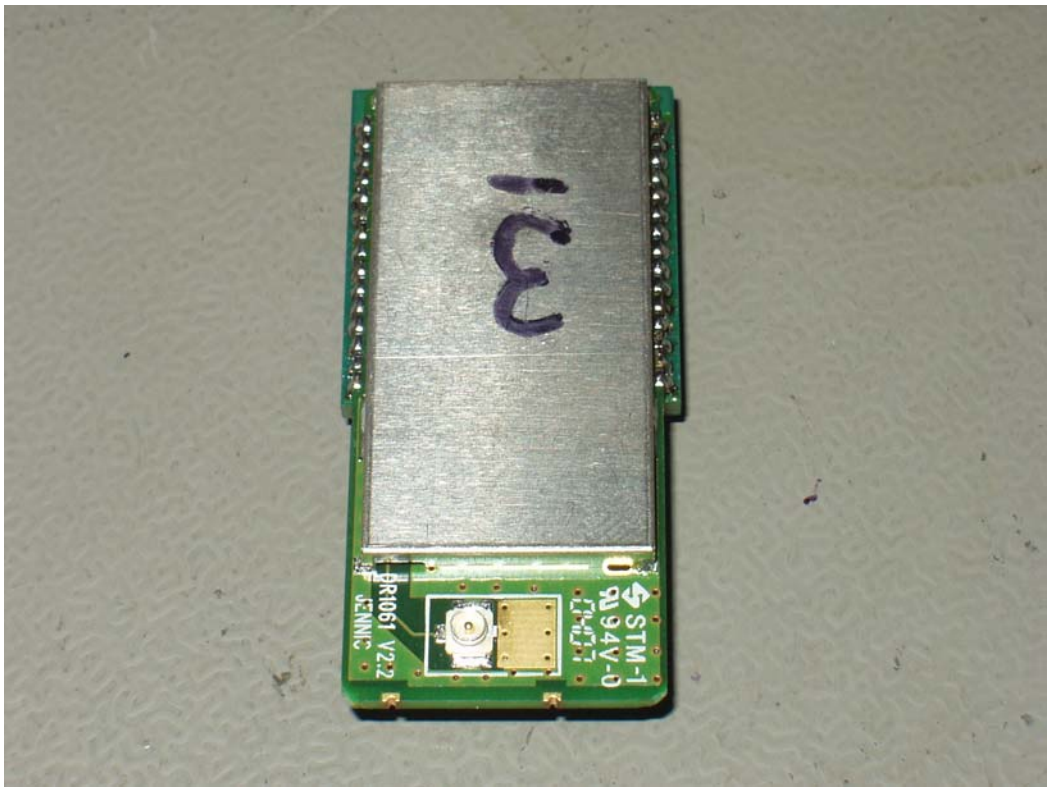
N.B. The limit lines drawn are the general limits of 15.209, not the specific limits of 15.247 which are less stringent outside of the restricted bands of 15.205.

8. Photographs
8.1 Radiated emissions



Photograph of the EUT as viewed from in front of the antenna, site M. EUT is mounted on a test jig on a turntable with test jig power adaptor to rear.

8.2 EUT



8.3 EUT in Test Jig

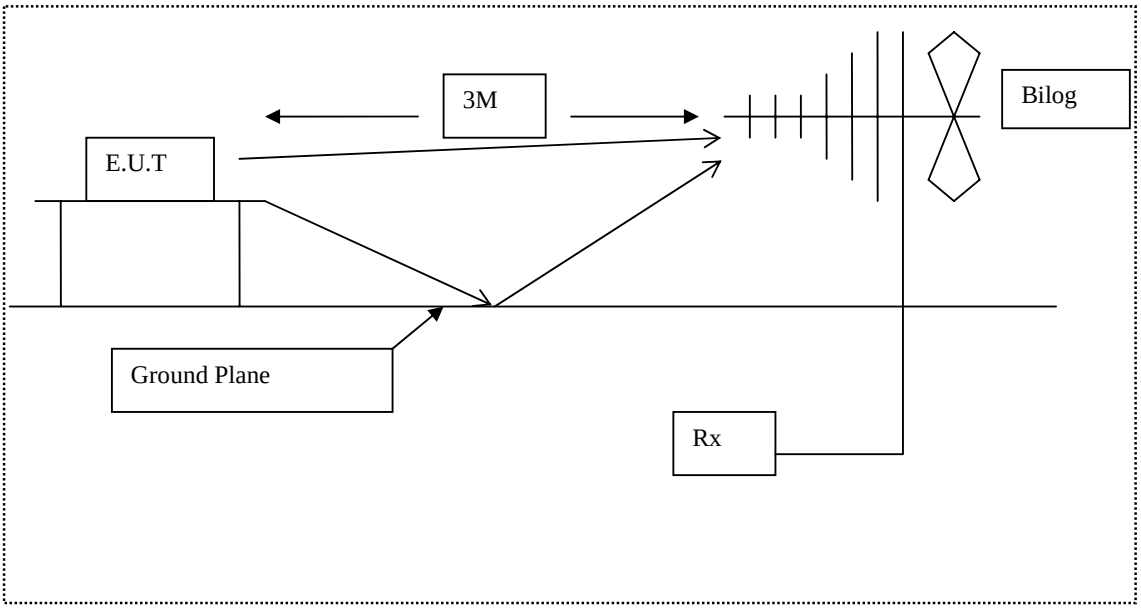


Diagram of the radiated emissions test setup.

9. Signal Leads

Port Name	Cable Type	Location
Test jig antenna port	UFL to SMA coax connector	On test jig
Antenna port	UFL coax connector.	On EUT
Serial Comms	RS232 (USB) fly lead	On test jig.
DC input	7V dc fed from ac/dc adaptor to jack	On test jig.
Battery	3V battery clip input (2 of 1.5V AAA)	On test jig / direct to pins of module.

10. Test Equipment Calibration list

The following table lists the test equipment used, last calibration date, and calibration interval. All equipment used has been maintained within the calibration requirements of R.N. Electronics Ltd. quality system.

RNNo	Model	Description	Manufacturer	Last Cal	Interval
E1	HP8542E	EMI Receiver & RF Filter	Hewlett Packard	Oct-31-06	12 mths
E235	J2 7FV-15000/X6000	12-18 GHz BPF	K&L Microwave Inc.	n/a	n/a
E238	FC5343A	2.7 - 5.0 GHz BPF	IFR	n/a	n/a
E242	22102	Bandpass filter 7.8 - 16 GHz	Merimec	n/a	n/a
E246	8482B	Power Sensor	Hewlett Packard	Nov-07-06	12 mths
E266	2032	5.4GHz Signal Generator	Marconi Instruments	Feb-14-06	24 mths
E268	BHA 9118	1-18 GHz Horn Antenna	Schaffner	May-26-06	60 mths
E274	437B	Power Meter	Hewlett Packard	Nov-07-06	12 mths
E3	HP8593E	Spectrum Analyser	Hewlett Packard	Sep-20-06	24 mths
E319	H-34-2720-01	Transmit Filter 1.5-2.0 GHz	Marconi Company Ltd	n/a	n/a
E320	8430A	Bandpass Filter 800 MHz - 2.0 GHz	HP	n/a	n/a
E5	HP8447F	Pre-Amplifier	Hewlett Packard	Aug-15-06	12 mths
N438	3513 172 1208	3.9 - 7.5 GHz BPF	MEL	n/a	n/a
TMS10	TH200	ThermoHygrometer	RS Components	May-18-06	24 mths
TMS73	0.083333333	Off Air Standard	Quartzlock	n/a	n/a
TMS79	460451	Std Gain Horn Antenna 18-26.5 GHz	ETS Systems	Oct-17-06	12 mths
TMS82	8449B	Pre Amplifier 1 - 26 GHz	Agilent	Oct-17-06	12 mths
TMS933	CBL6141A	Bilog Antenna 30MHz - 2GHz	York EMC	Aug-17-06	36 mths

11. Auxiliary equipment

11.1 Auxiliary equipment supplied by Jennic Ltd

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

Manufacturer	Description	Model Number	Serial Number
FRIWO	ac/dc adaptor set to 7.5V	EP 2	805
Jennic	Jig for RS232 comms / dc supply	DR1048 v1.0	-
Jennic	Jig for adapting UFL connector to SMA for testing	-	-

11.2 Auxiliary equipment supplied by RN Electronics Limited

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

NONE

12. Modifications

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

NONE

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:

NOT APPLICABLE - Device to be Certified.

RN Electronics
EMC & RADIO TEST SERVICES

Certificate of Test

The equipment noted below has been tested by ***R.N. Electronics Limited*** and conforms with the relevant subpart of FCC part 15.

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

Equipment:	802.15.4/ Zigbee module
Model Number(s):	JN 5139-000-M04
Unique Serial Number(s):	03
Manufacturer:	Jennic Ltd
Customer Purchase Order Number:	PO 004001
R.N. Electronics Limited Report Number:	02-164A/3296/1/07
Test Standards:	FCC Part 15C: effective date February 7th 2007 Class DTS Intentional Radiator
Date tested:	24th March 2007

For and on behalf of
R.N. Electronics Limited

Signature:

RN Electronics Ltd www.rnelectronics.com
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