FCC
Test Report
for
802.15.4/ Zigbee module
JN5139-000-M03

Report Number 03-166A/3298/1/07
Supersedes report number 03-166/3298/1/07
Report Produced by: -

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2. Summary of Test Results

The 802.15.4/ Zigbee module JN5139-000-M03 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
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: 25th March 2007

Test Engineer: Daniel Sims — Digitally signed by Daniel Sims DN: CN = Daniel Sims, C = GB, O = RN Electronics Date: 2007.04.16 08:32:07 +01'00'

Approved By: Paul Darragh — Digitally signed by Paul Darragh DN: CN = Paul Darragh, C = GB, OU = RN Electronics Date: 2007.04.14 23:04:44 +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".

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	JN5139-000-M03
Serial Number of EUT	05
FCC ID (if applicable):	TYOJN5139M3
Date when equipment was received by RN Electronics Limited	13th March 2007
Date of test:	25th March 2007
Customer order number:	PO 004039
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	3.5mm
Width	18mm
Depth	30mm
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: 19-21°C Humidity: 42-51 %

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.

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: 19-21°C Humidity: 42-51 %

The conducted power is shown in the table below:

Frequency (MHz)	Power (W)
2405	0.00177
2440	0.00189
2480	0.00189

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

5.3.2.1 Test Equipment used

C031, C032

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 is shown in the table below:

Frequency (MHz)	Peak Power (dBm/3kHz)
2405	-16.7
2440	-15.7
2480	-16.9

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

5.4.2.1 Test Equipment used

E3, E3, E266, C031, C032, E5, TMS73

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: 23°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	1.64	Plot 001
2440	1.63	Plot 003
2480	1.65	Plot 002

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

5.5.2.1 Test Equipment used

E2, TMS10, TMS73

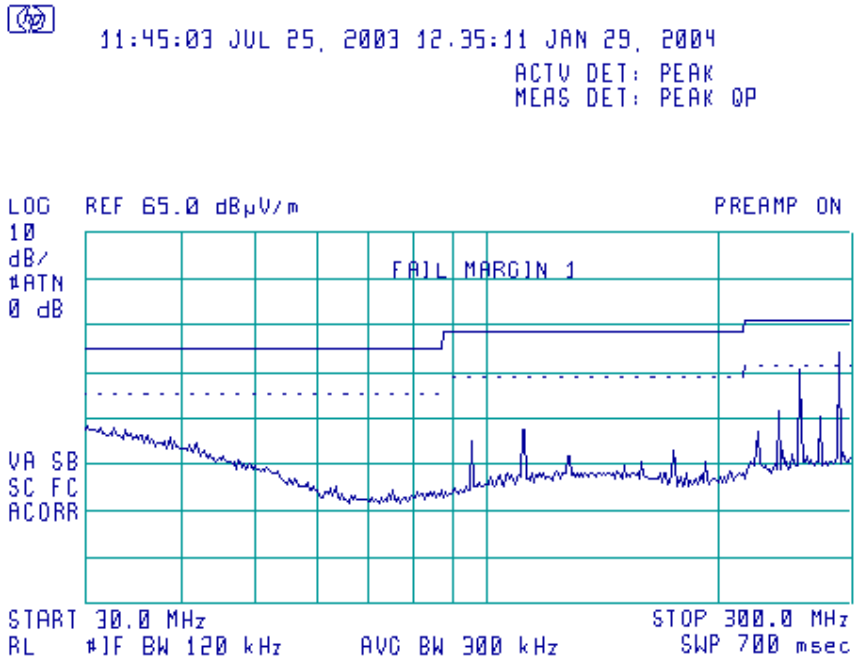
See Section 10 for more details.

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.

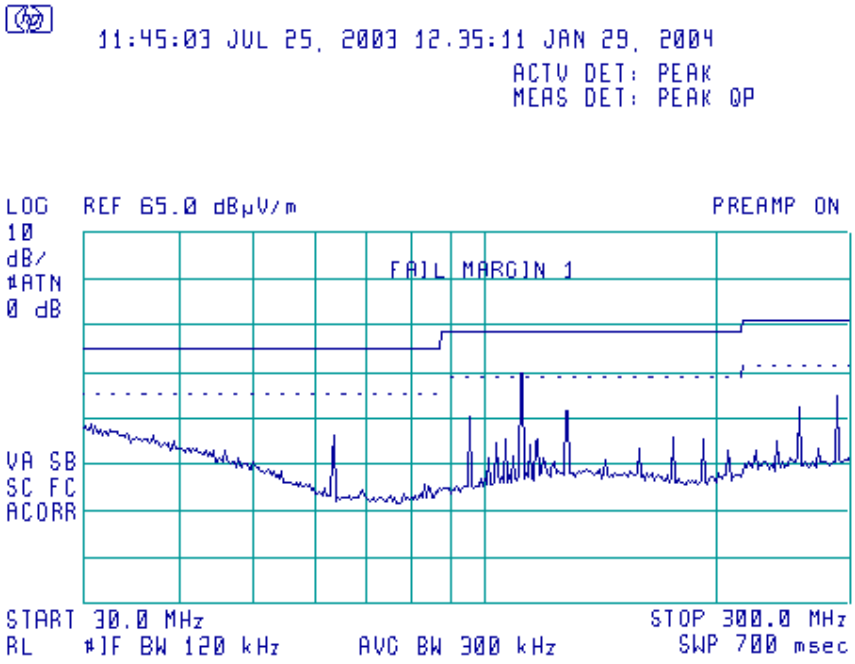
Horizontal Polarisation

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)

Signal	Freq (MHz)	Peak Amp (dBuV/m)	Peak - Lim1 (dB)	QP Amp (dBuV/m)	QP - Lim1 (dB)
1	111.994013	23.72	-19.78	21.83	-21.67
2	223.993200	24.57	-21.43	22.34	-23.66
3	239.995950	27.37	-18.63	25.60	-20.40
4	255.995813	36.93	-9.07	36.17	-9.83
5	272.007038	26.85	-19.15	24.81	-21.19
6	287.995013	40.41	-5.59	39.82	-6.18

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



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

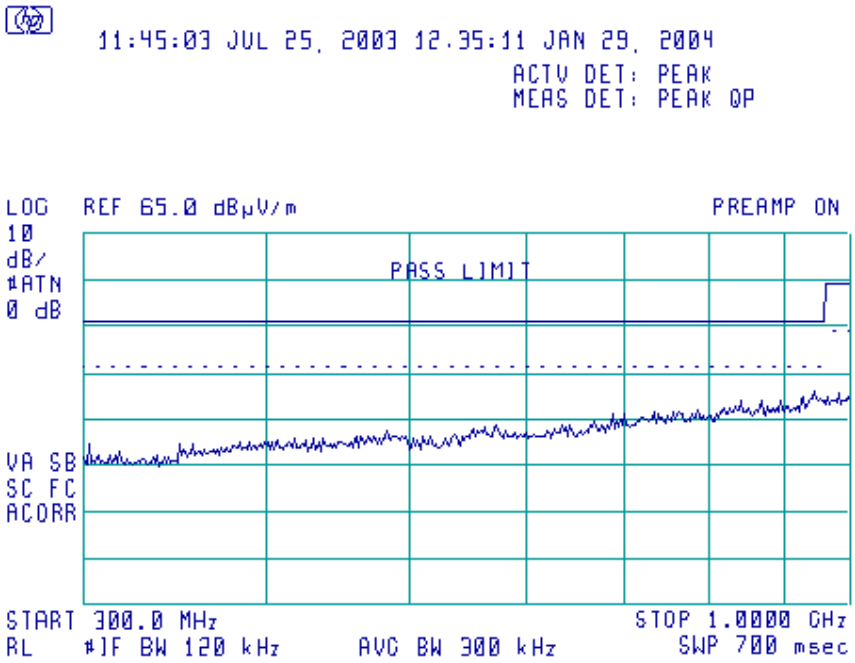
Vertical Polarisation

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)

Signal	Freq (MHz)	Peak Amp (dBuV/m)	Peak - Lim1 (dB)	QP Amp (dBuV/m)	QP - Lim1 (dB)
1	63.997088	22.27	-17.73	20.91	-19.09
2	95.998950	26.72	-16.78	25.54	-17.96
3	111.996875	35.88	-7.62	35.30	-8.20
4	127.993275	28.06	-15.44	26.58	-16.92
5	255.993275	29.05	-16.95	27.40	-18.60
6	287.995975	31.54	-14.46	29.95	-16.05

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



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

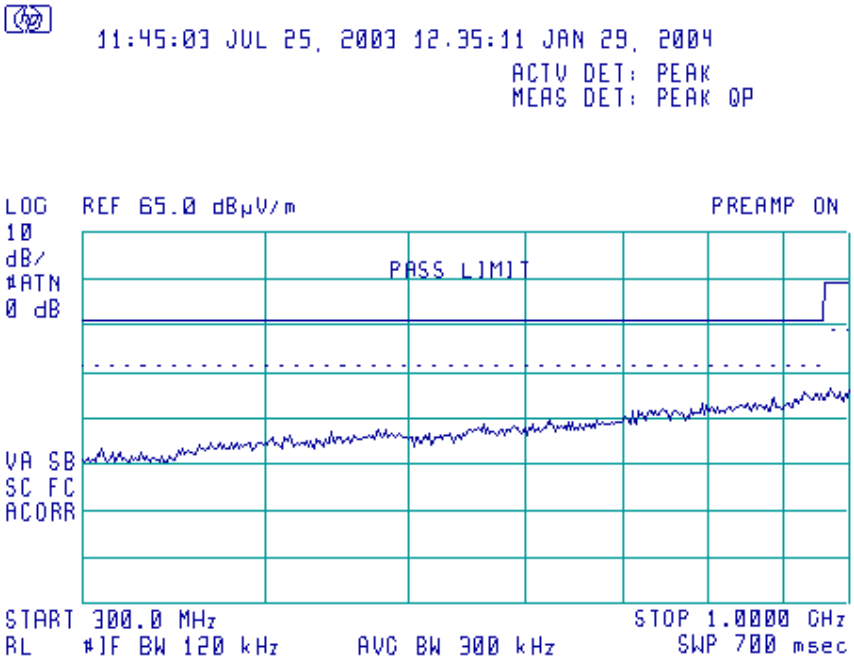
Horizontal Polarisation

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.

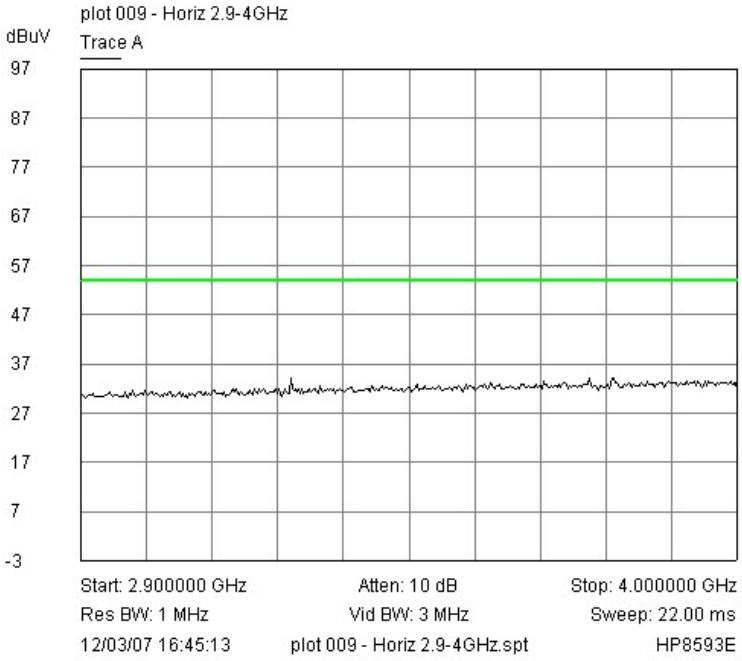
Vertical Polarisation

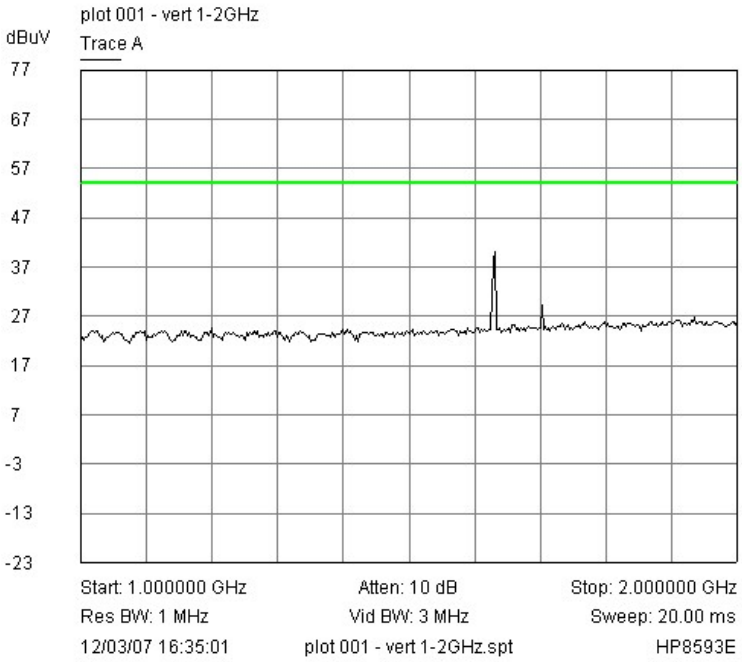
The plot shows a swept response of peak values using the quasi-peak limit line

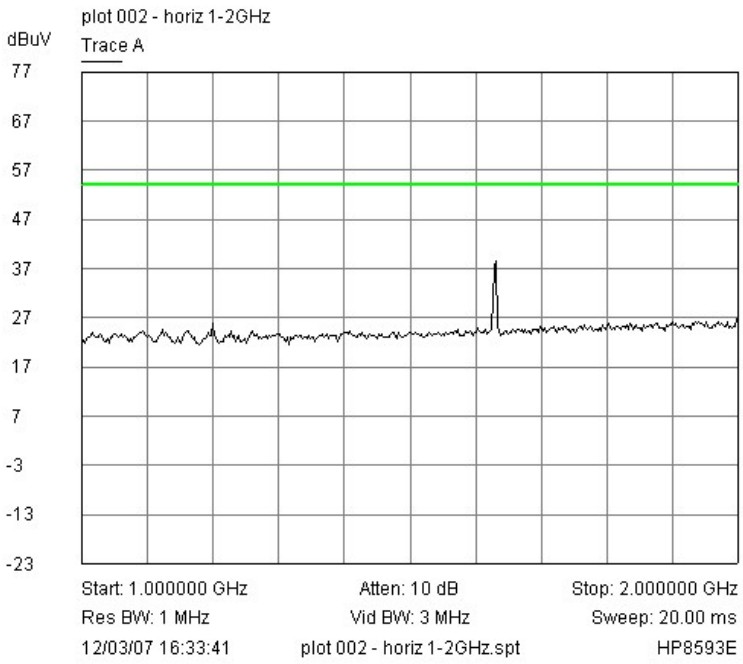
(Any peaks within 20dB of the limit line have been calculated and appear in the table on following page of this report)

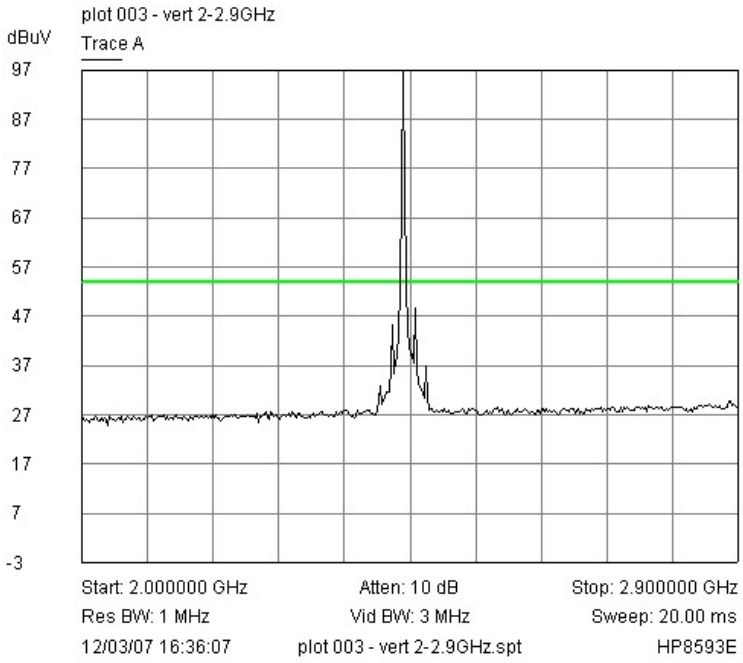
NONE

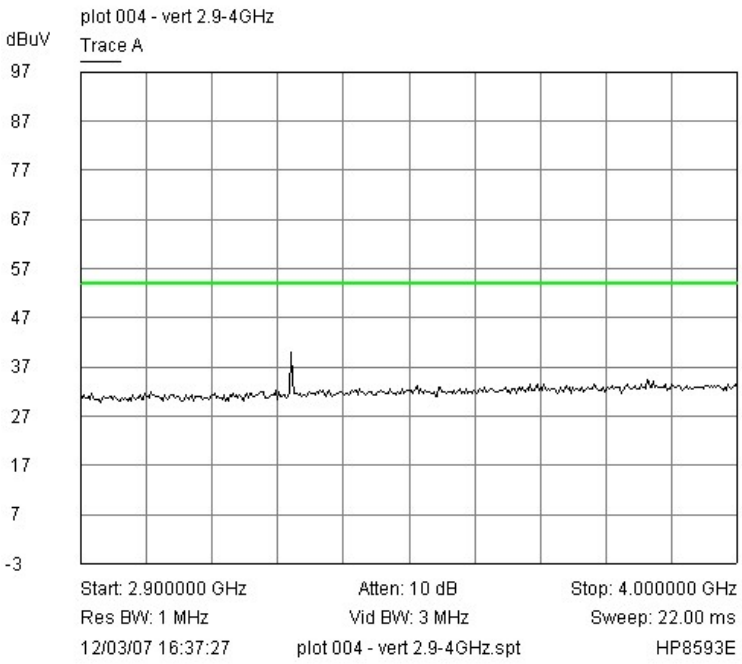
Table of signals within 20dB of the limit line for Quasi-peak Vertical

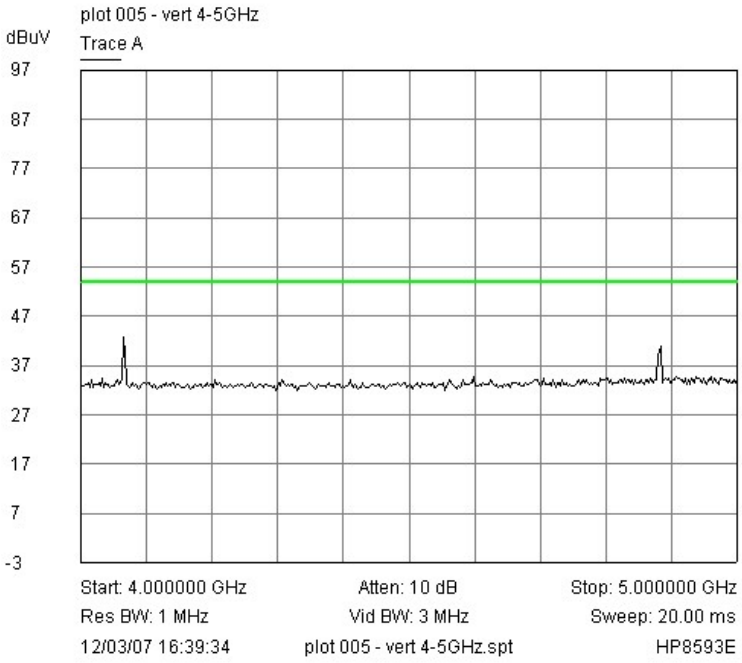


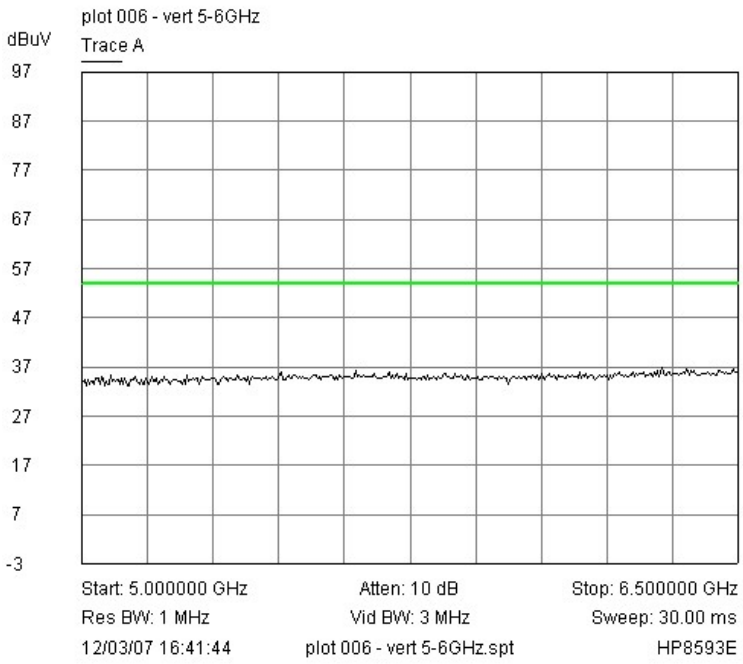


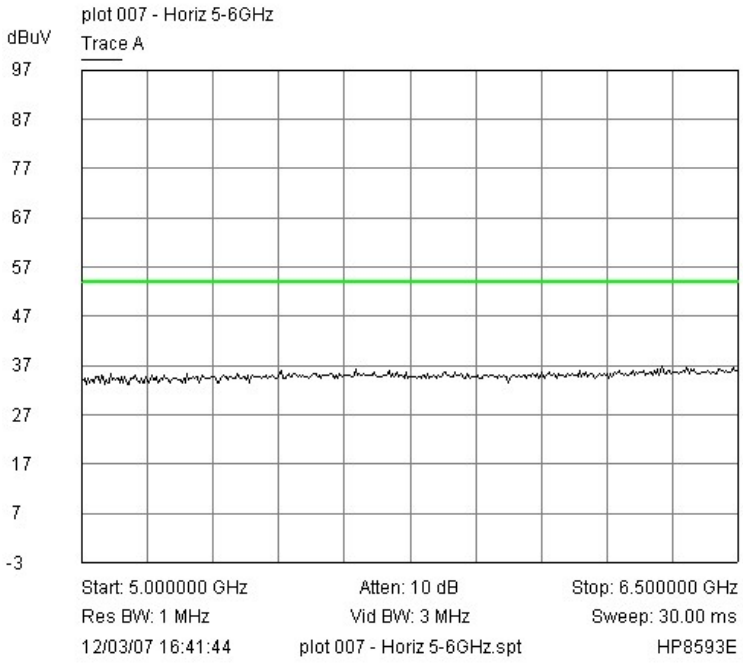

plot 002 - horiz 1-2GHz
dBuV
Trace A
77
67
57
47
37
27
17
7
-3
-13
-23
Start: 1.000000 GHz
Atten: 10 dB
Stop: 2.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 20.00 ms
12/03/07 16:33:41
plot 002 - horiz 1-2GHz.spt
HP8593E

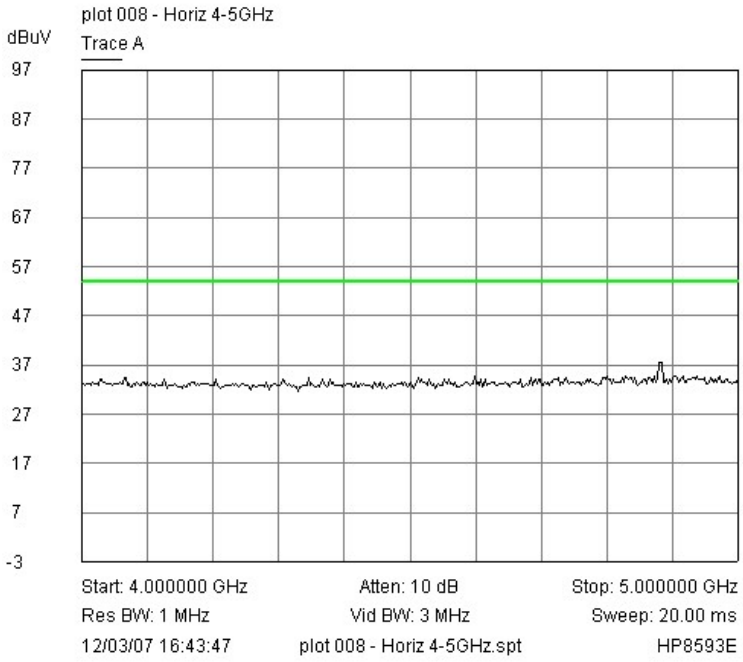

plot 003 - vert 2-2.9GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 2.000000 GHz
Atten: 10 dB
Stop: 2.900000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 20.00 ms
12/03/07 16:36:07
plot 003 - vert 2-2.9GHz.spt
HP8593E

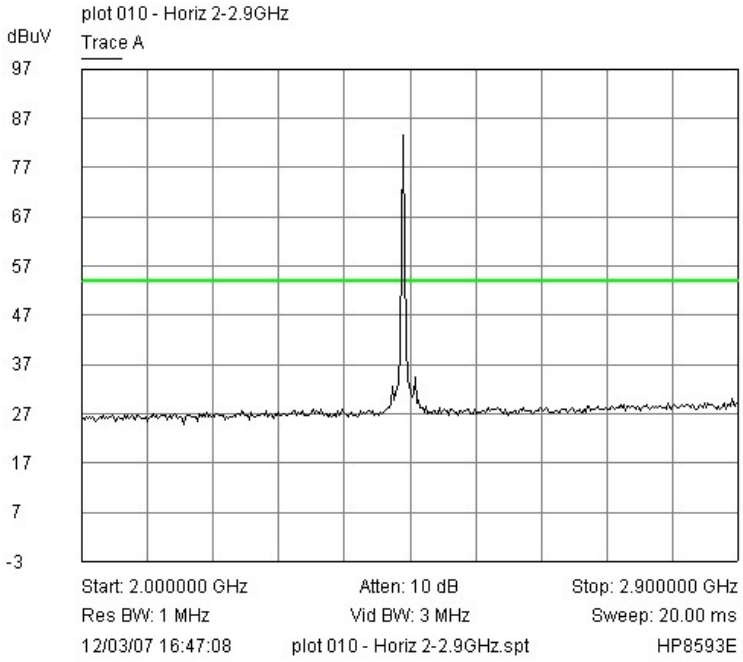

plot 004 - vert 2.9-4GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 2.900000 GHz
Atten: 10 dB
Stop: 4.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 22.00 ms
12/03/07 16:37:27
plot 004 - vert 2.9-4GHz.spt
HP8593E

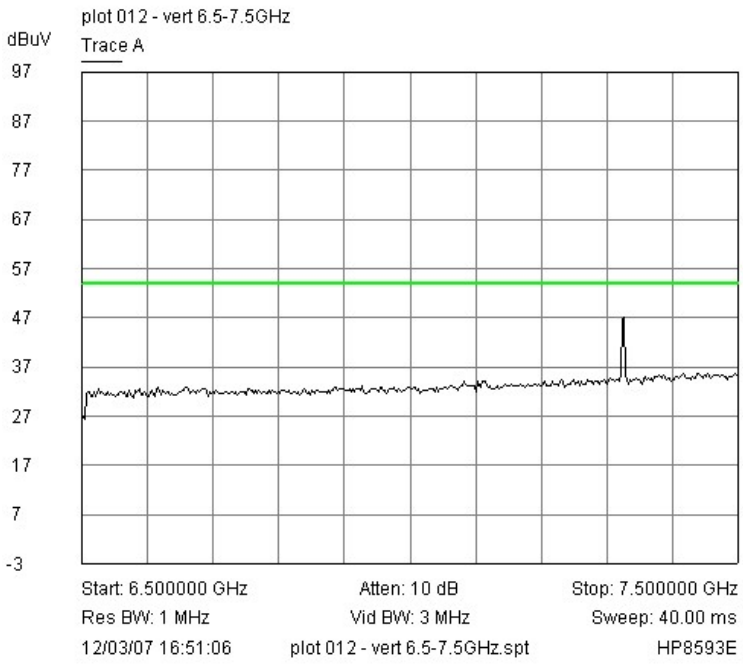

plot 005 - vert 4-5GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 4.000000 GHz
Atten: 10 dB
Stop: 5.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 20.00 ms
12/03/07 16:39:34
plot 005 - vert 4-5GHz.spt
HP8593E

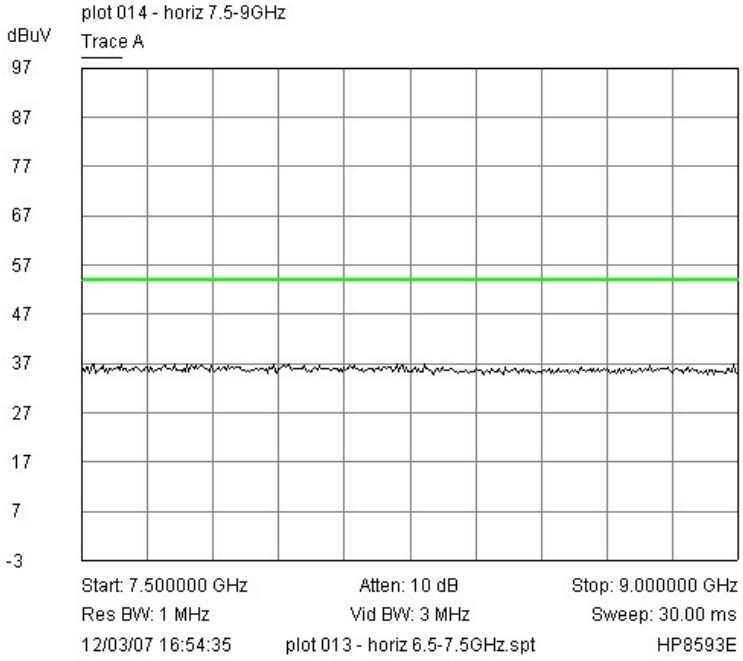

plot 006 - vert 5-6GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 5.000000 GHz
Atten: 10 dB
Stop: 6.500000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 30.00 ms
12/03/07 16:41:44
plot 006 - vert 5-6GHz.spt
HP8593E

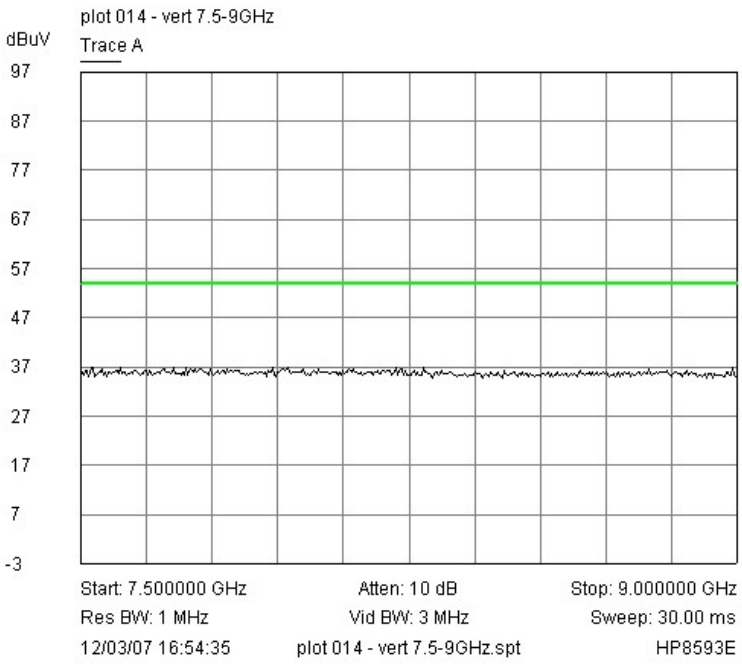

plot 007 - Horiz 5-6GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 5.000000 GHz
Atten: 10 dB
Stop: 6.500000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 30.00 ms
12/03/07 16:41:44
plot 007 - Horiz 5-6GHz.spt
HP8593E

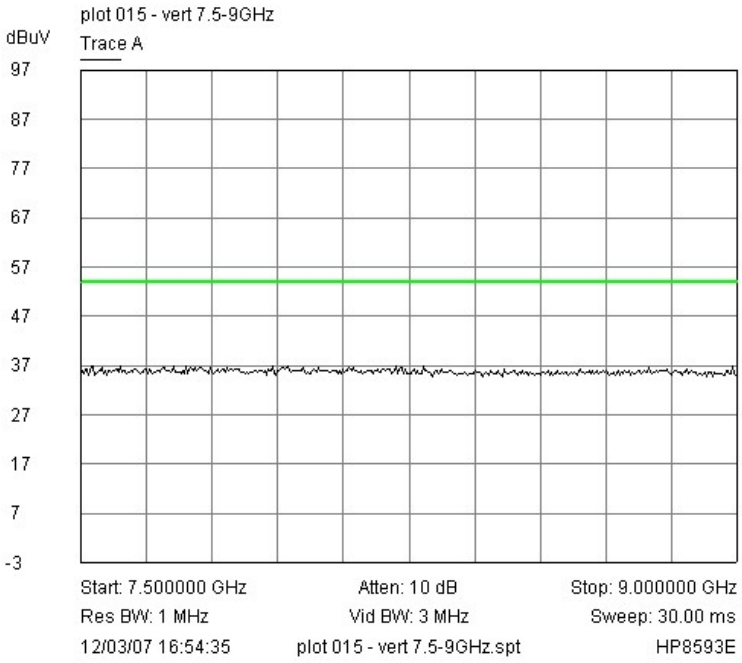

plot 008 - Horiz 4-5GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 4.000000 GHz
Atten: 10 dB
Stop: 5.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 20.00 ms
12/03/07 16:43:47
plot 008 - Horiz 4-5GHz.spt
HP8593E

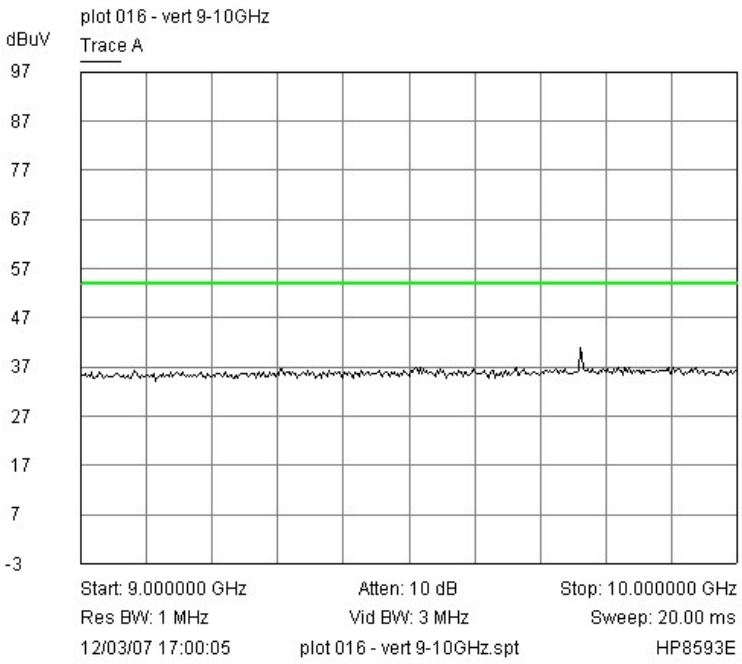

plot 010 - Horiz 2-2.9GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 2.000000 GHz
Atten: 10 dB
Stop: 2.900000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 20.00 ms
12/03/07 16:47:08
plot 010 - Horiz 2-2.9GHz.spt
HP8593E

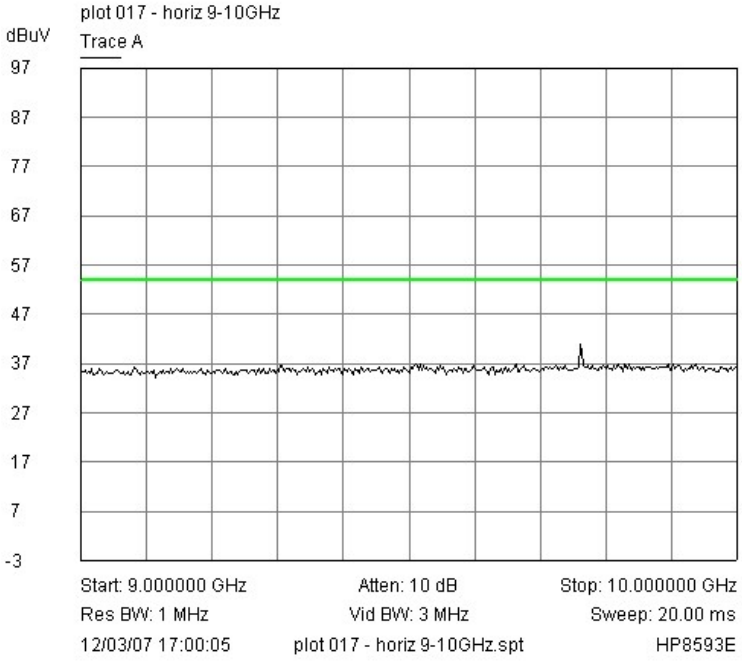

plot 012 - vert 6.5-7.5GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 6.500000 GHz
Atten: 10 dB
Stop: 7.500000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 40.00 ms
12/03/07 16:51:06
plot 012 - vert 6.5-7.5GHz.spt
HP8593E

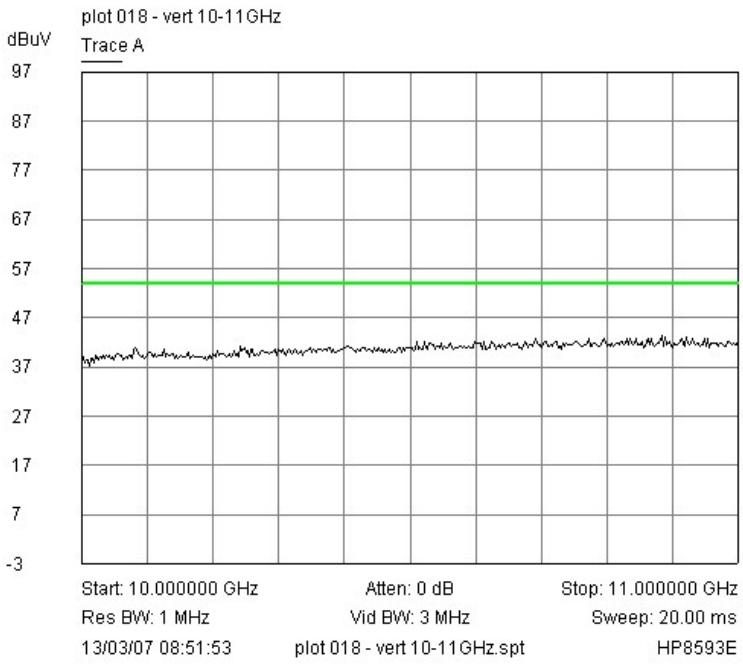

plot 014 - horiz 7.5-9GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 7.500000 GHz
Atten: 10 dB
Stop: 9.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 30.00 ms
12/03/07 16:54:35
plot 013 - horiz 6.5-7.5GHz.spt
HP8593E

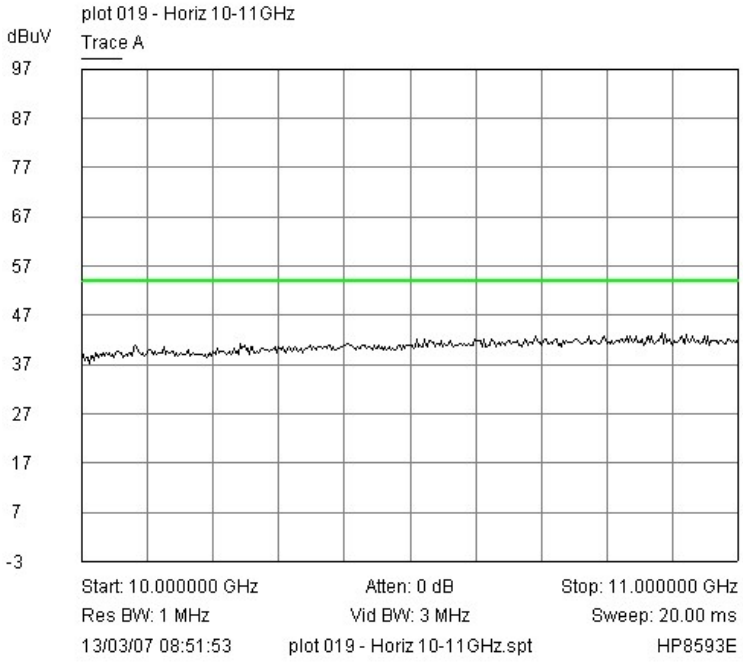

plot 014 - vert 7.5-9GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 7.500000 GHz
Atten: 10 dB
Stop: 9.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 30.00 ms
12/03/07 16:54:35
plot 014 - vert 7.5-9GHz.spt
HP8593E

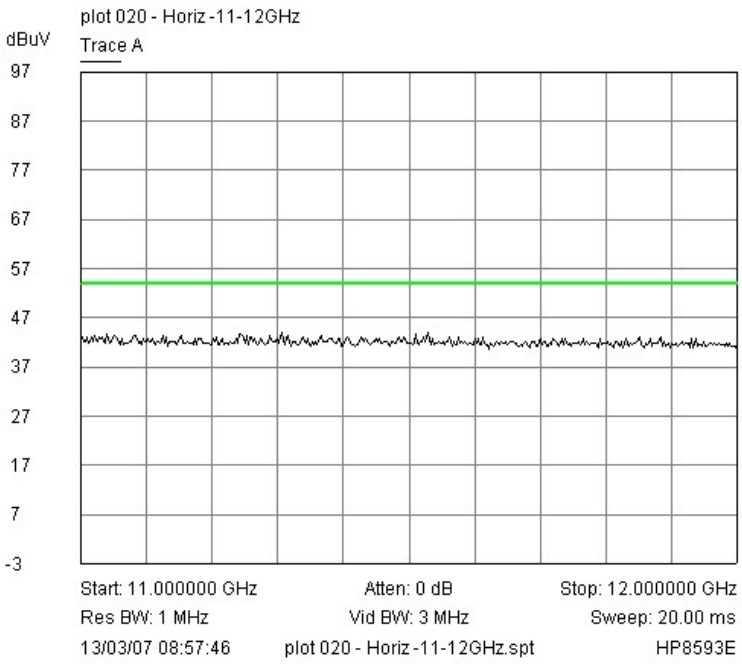

plot 015 - vert 7.5-9GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 7.500000 GHz
Atten: 10 dB
Stop: 9.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 30.00 ms
12/03/07 16:54:35
plot 015 - vert 7.5-9GHz.spt
HP8593E

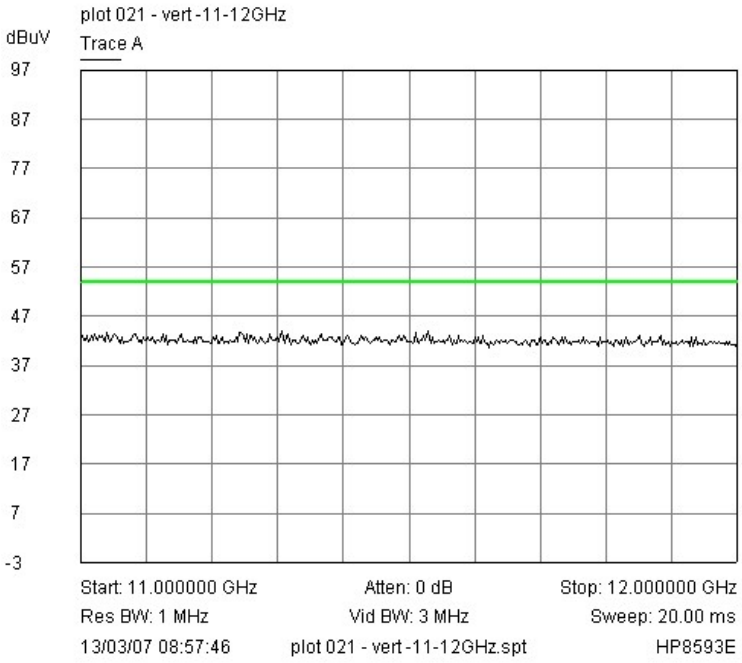

plot 016 - vert 9-10GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 9.000000 GHz
Atten: 10 dB
Stop: 10.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 20.00 ms
12/03/07 17:00:05
plot 016 - vert 9-10GHz.spt
HP8593E

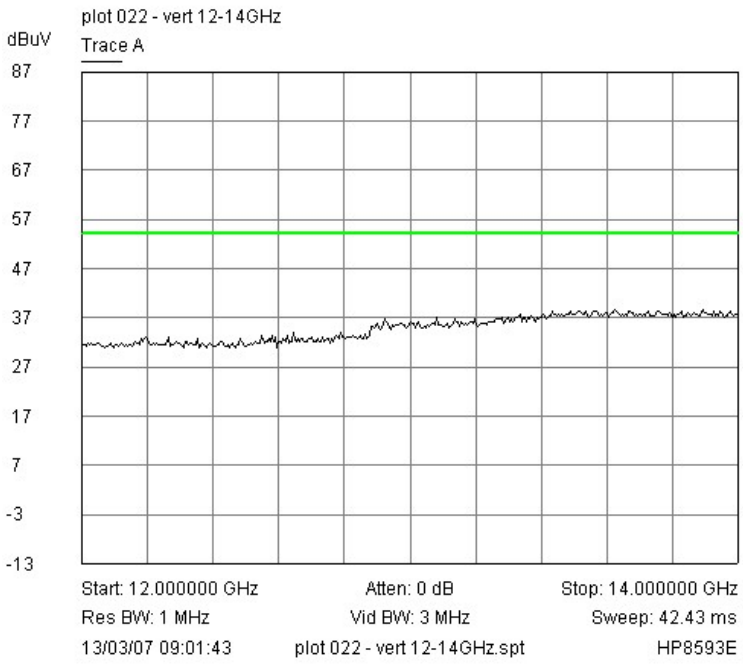

plot 017 - horiz 9-10GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 9.000000 GHz
Atten: 10 dB
Stop: 10.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 20.00 ms
12/03/07 17:00:05
plot 017 - horiz 9-10GHz.spt
HP8593E

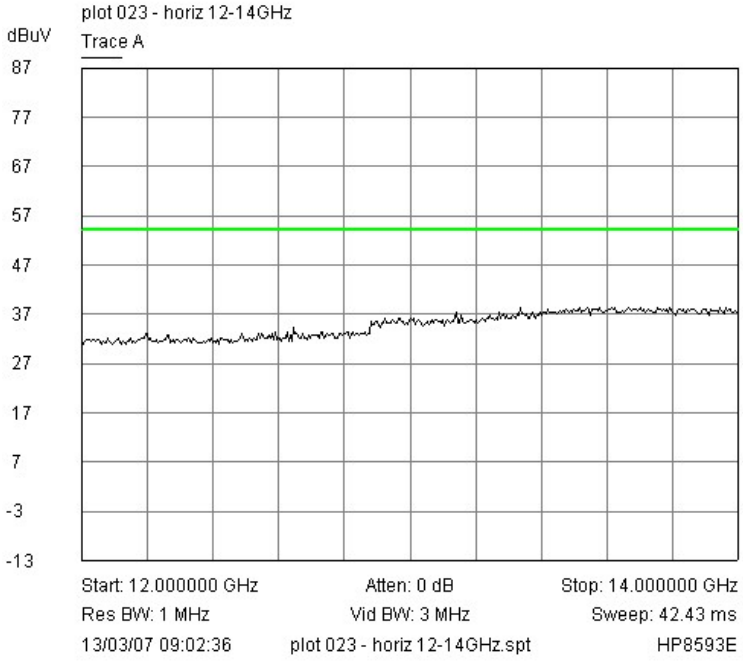

plot 018 - vert 10-11GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 10.000000 GHz
Atten: 0 dB
Stop: 11.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 20.00 ms
13/03/07 08:51:53
plot 018 - vert 10-11GHz.spt
HP8593E

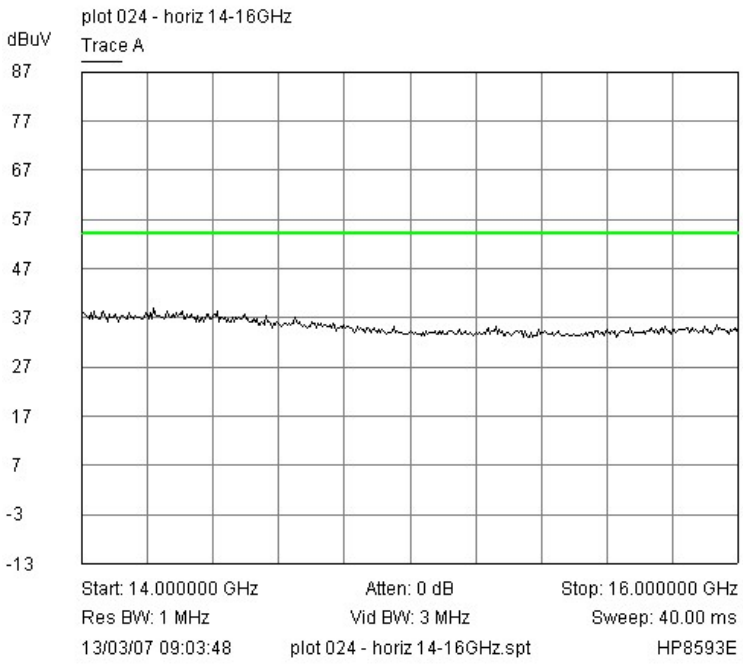

plot 019 - Horiz 10-11GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 10.000000 GHz
Atten: 0 dB
Stop: 11.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 20.00 ms
13/03/07 08:51:53
plot 019 - Horiz 10-11GHz.spt
HP8593E

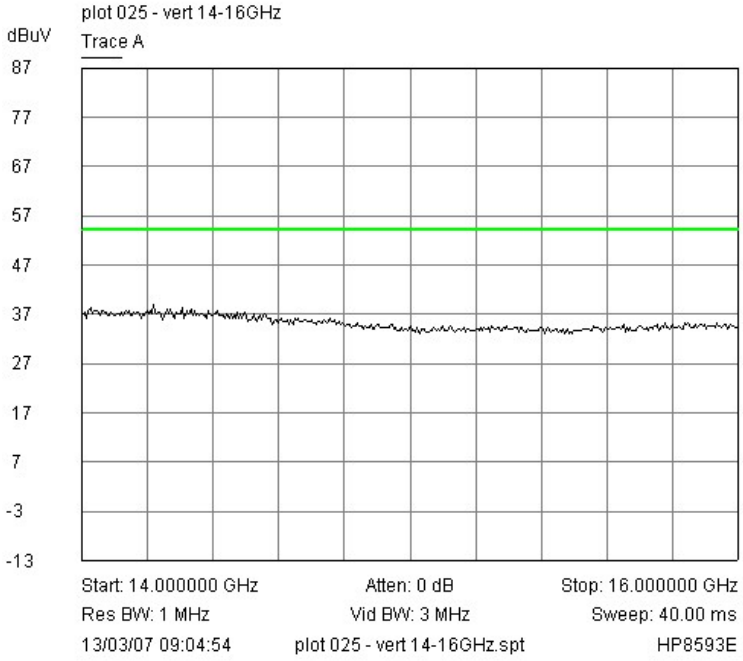

plot 020 - Horiz -11-12GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 11.000000 GHz
Atten: 0 dB
Stop: 12.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 20.00 ms
13/03/07 08:57:46
plot 020 - Horiz -11-12GHz.spt
HP8593E

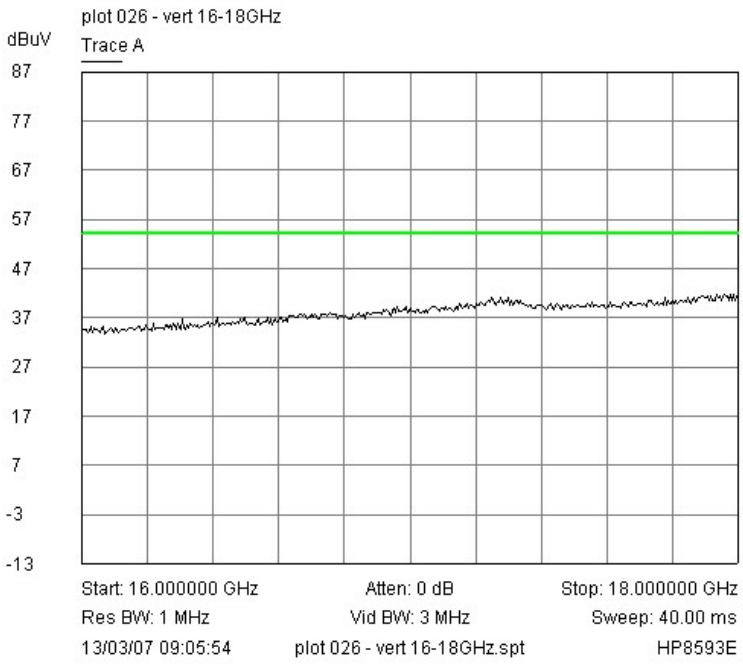

plot 021 - vert -11-12GHz
dBuV
Trace A
97
87
77
67
57
47
37
27
17
7
-3
Start: 11.000000 GHz
Atten: 0 dB
Stop: 12.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 20.00 ms
13/03/07 08:57:46
plot 021 - vert -11-12GHz.spt
HP8593E

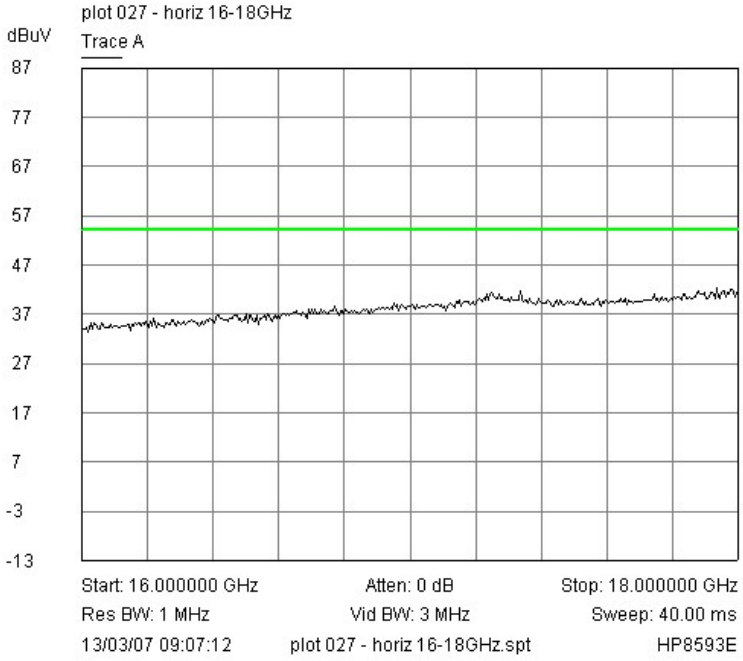

plot 022 - vert 12-14GHz
dBuV
Trace A
87
77
67
57
47
37
27
17
7
-3
-13
Start: 12.000000 GHz
Atten: 0 dB
Stop: 14.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 42.43 ms
13/03/07 09:01:43
plot 022 - vert 12-14GHz.spt
HP8593E

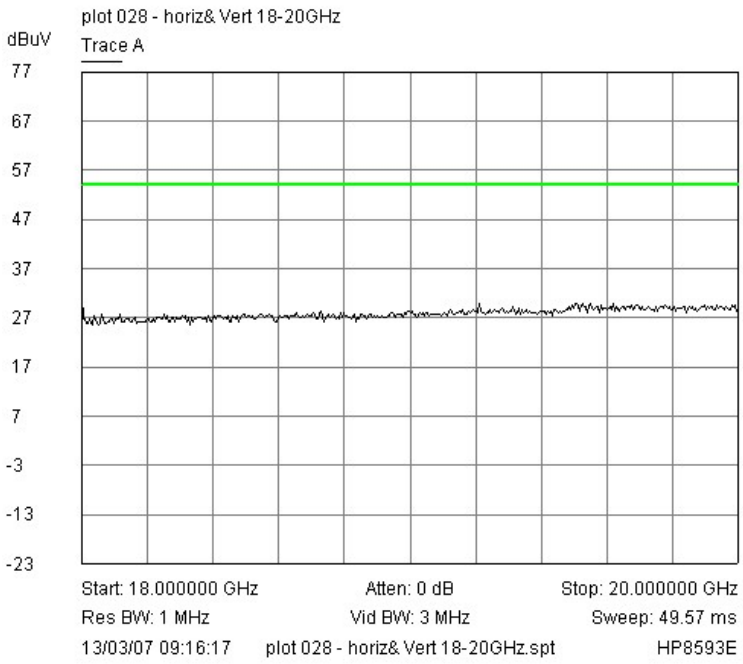

plot 023 - horiz 12-14GHz
dBuV
Trace A
87
77
67
57
47
37
27
17
7
-3
-13
Start: 12.000000 GHz
Atten: 0 dB
Stop: 14.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 42.43 ms
13/03/07 09:02:36
plot 023 - horiz 12-14GHz.spt
HP8593E

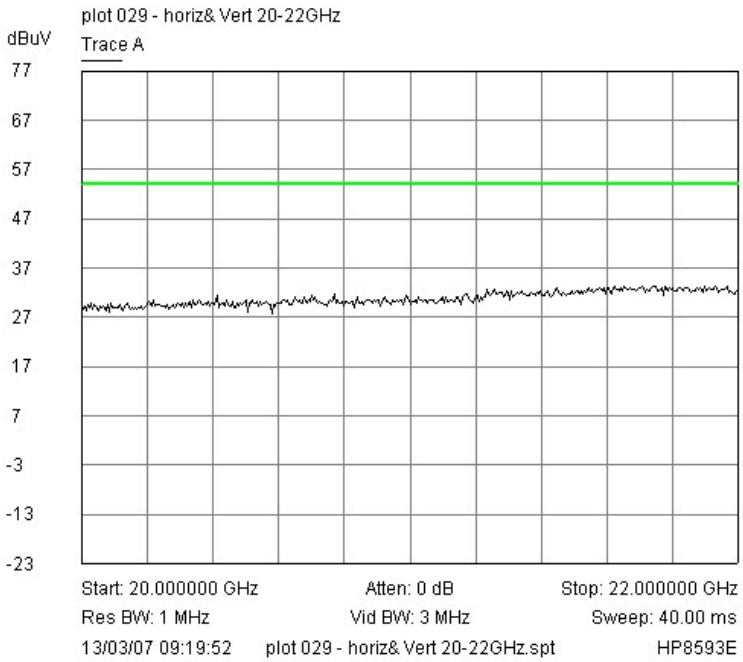

plot 024 - horiz 14-16GHz
dBuV
Trace A
87
77
67
57
47
37
27
17
7
-3
-13
Start: 14.000000 GHz
Atten: 0 dB
Stop: 16.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 40.00 ms
13/03/07 09:03:48
plot 024 - horiz 14-16GHz.spt
HP8593E

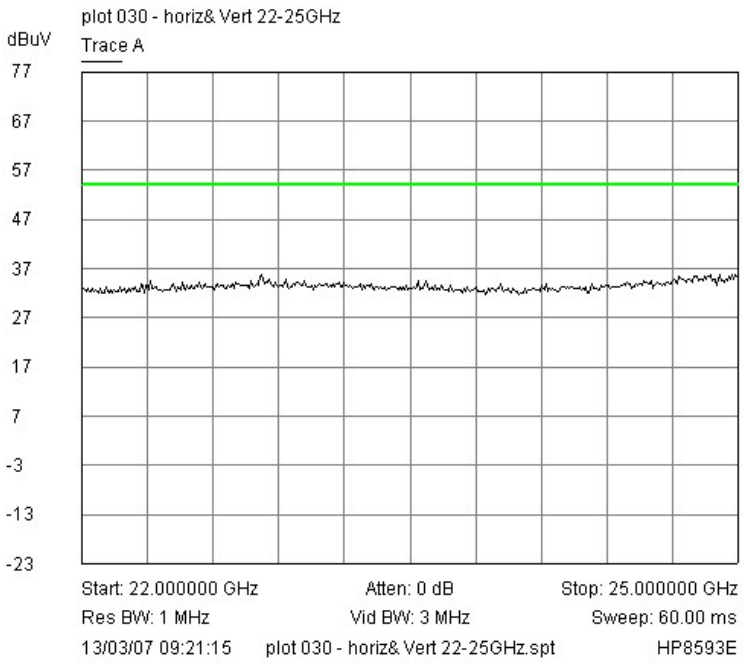

plot 025 - vert 14-16GHz
dBuV
Trace A
87
77
67
57
47
37
27
17
7
-3
-13
Start: 14.000000 GHz
Atten: 0 dB
Stop: 16.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 40.00 ms
13/03/07 09:04:54
plot 025 - vert 14-16GHz.spt
HP8593E


plot 026 - vert 16-18GHz
dBuV
Trace A
87
77
67
57
47
37
27
17
7
-3
-13
Start: 16.000000 GHz
Atten: 0 dB
Stop: 18.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 40.00 ms
13/03/07 09:05:54
plot 026 - vert 16-18GHz.spt
HP8593E


plot 027 - horiz 16-18GHz
dBuV
Trace A
87
77
67
57
47
37
27
17
7
-3
-13
Start: 16.000000 GHz
Atten: 0 dB
Stop: 18.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 40.00 ms
13/03/07 09:07:12
plot 027 - horiz 16-18GHz.spt
HP8593E


plot 028 - horiz& Vert 18-20GHz
dBuV
Trace A
77
67
57
47
37
27
17
7
-3
-13
-23
Start: 18.000000 GHz
Atten: 0 dB
Stop: 20.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 49.57 ms
13/03/07 09:16:17
plot 028 - horiz& Vert 18-20GHz.spt
HP8593E


plot 029 - horiz& Vert 20-22GHz
dBuV
Trace A
77
67
57
47
37
27
17
7
-3
-13
-23
Start: 20.000000 GHz
Atten: 0 dB
Stop: 22.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 40.00 ms
13/03/07 09:19:52
plot 029 - horiz& Vert 20-22GHz.spt
HP8593E


plot 030 - horiz& Vert 22-25GHz
dBuV
Trace A
77
67
57
47
37
27
17
7
-3
-13
-23
Start: 22.000000 GHz
Atten: 0 dB
Stop: 25.000000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 60.00 ms
13/03/07 09:21:15
plot 030 - horiz& Vert 22-25GHz.spt
HP8593E

Tables of signals within 20dB of the limit line for 1GHz - 26GHz

Low Channel

Signal	Freq (MHz)	Polaris-ation	Avg Amp (dBuV/m)	Avg-Limit[1] (dBuV/m)	Comments
1	1600	V	39	-15	
2	3200	H	35	-19	
3	3200	V	45	-9	
4	4810	V	46.2	-7.8	harmonic
5	4810	H	36.5	-17.5	harmonic

Signal	Freq (MHz)	Polaris-ation	Avg Amp (dBuV/m)	Avg-Limit[2] (dBuV/m)	Comments
6	2405	V	97.9	-	fundamental
7	7215	V	47	-30.9	harmonic
8	7215	H	45.8	-32.1	harmonic
9	9620	V	46.8	-31.1	harmonic
10	9620	H	46	-31.9	harmonic

Middle Channel

Signal	Freq (MHz)	Polaris-ation	Avg Amp (dBuV/m)	Avg-Limit[1] (dBuV/m)	Comments
1	1625	V	43.5	-10.5	
2	1625	H	41	-13	
3	3250	V	52	-2	
4	3250	H	40.1	-13.9	
5	4060	V	41	-13	
6	4880	V	38	-16	harmonic
7	4880	H	34	-20	harmonic
8	7320	V	47.6	-6.4	harmonic
9	7320	H	45.8	-8.2	harmonic

Signal	Freq (MHz)	Polaris-ation	Avg Amp (dBuV/m)	Avg-Limit[2] (dBuV/m)	Comments
10	2440	V	96	-	fundamental
11	9760	V	43	-33	harmonic
12	9760	H	49	-27	harmonic

[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.

High channel

Signal	Freq (MHz)	Polaris-ation	Avg Amp (dBuV/m)	Avg-Limit[1] (dBuV/m)	Comments
1	3300	V	46.1	-7.9	
2	3300	H	34	-20	
3	4960	V	41.1	-12.9	harmonic
4	4960	H	37	-17	harmonic
5	7440	V	45	-9	harmonic
6	7440	H	42	-12	harmonic

Signal	Freq (MHz)	Polaris-ation	Avg Amp (dBuV/m)	Avg-Limit[2] (dBuV/m)	Comments
7	2480	V	96.4	-	fundamental
8	9920	V	43	-33.4	harmonic
9	9920	H	43.5	-32.9	harmonic

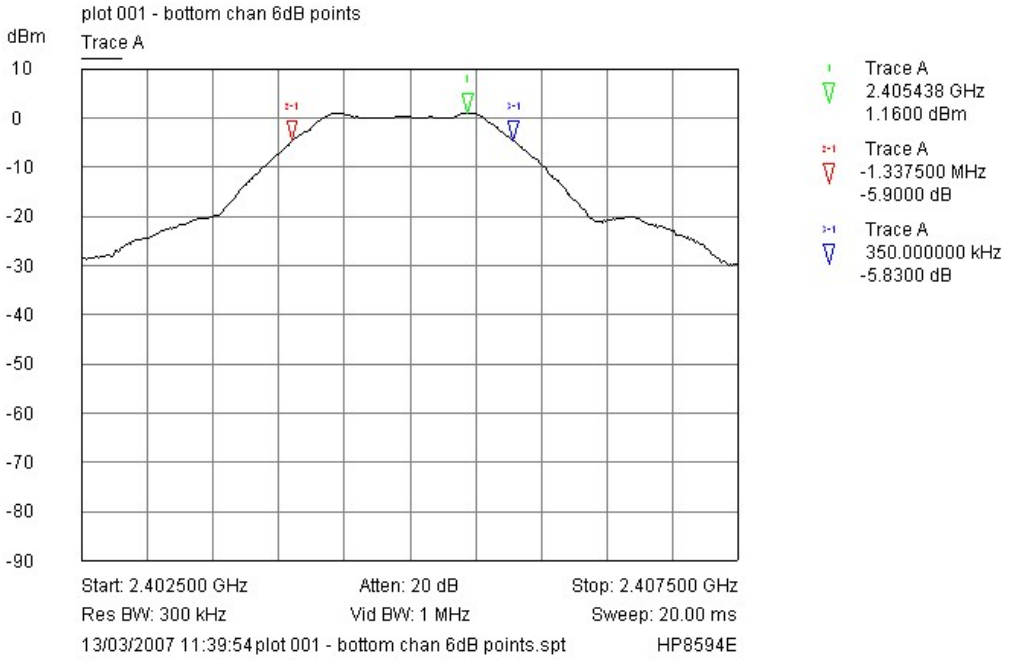
In all the above measurements the fundamental signal was continuously on, and in no case were the peak emissions more than 3dB above the average.

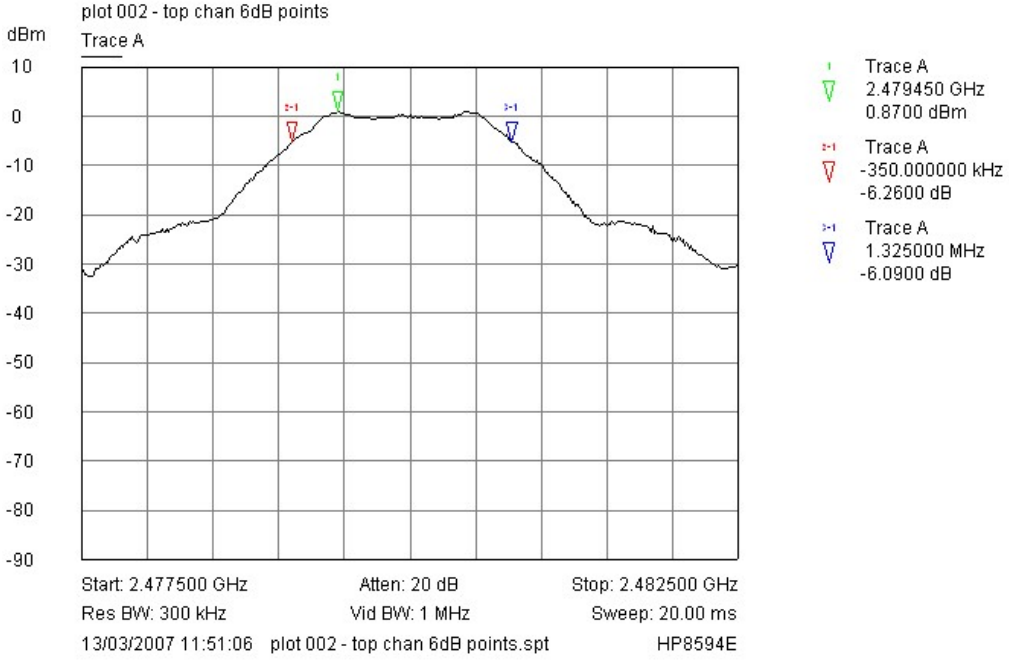
Highest in-band emissions measured in 100kHz bandwidth, per 15.209(d):

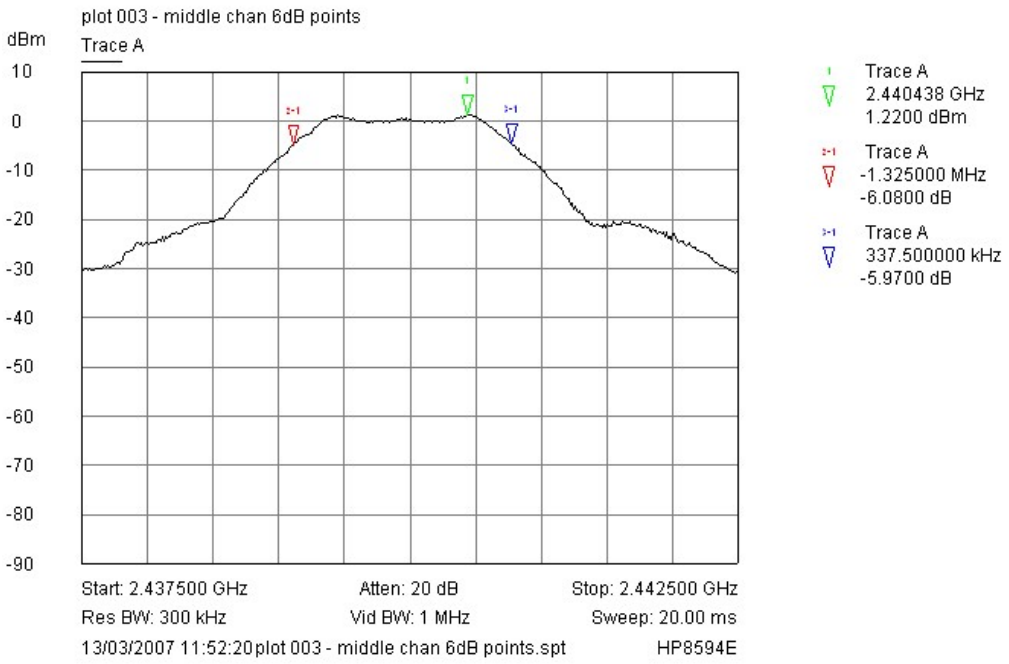
Channel	Frequency (MHz)	Field (dBuV/m)
Low	2405	97.9
Middle	2440	96.0
High	2480	96.4

[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.

6.3 6dB Bandwidth






plot 003 - middle chan 6dB points
dBm
Trace A
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Trace A
2.440438 GHz
1.2200 dBm
Trace A
-1.325000 MHz
-6.0800 dB
Trace A
337.500000 kHz
-5.9700 dB
Start: 2.437500 GHz
Atten: 20 dB
Stop: 2.442500 GHz
Res BW: 300 kHz
Vid BW: 1 MHz
Sweep: 20.00 ms
13/03/2007 11:52:20 plot 003 - middle chan 6dB points.spt
HP8594E

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:

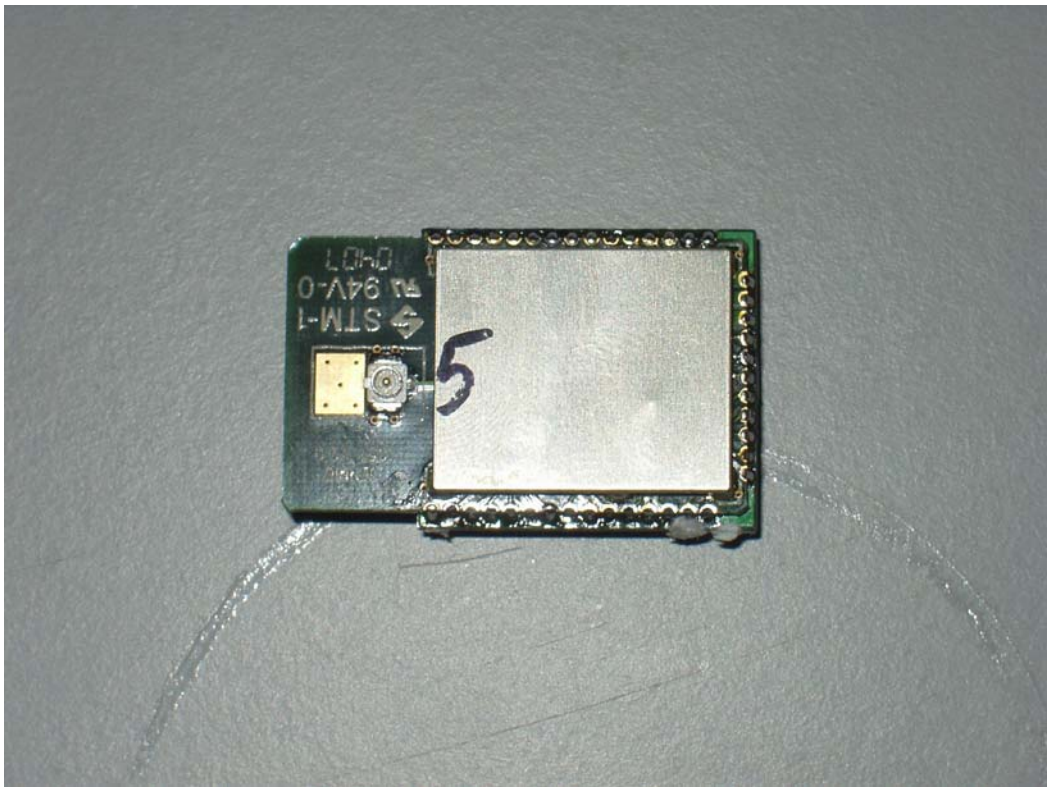
(a) limit of 500 µV/m equates to 20.log (500) = 54 dB µV/m.
(b) limit of 300 µV/m at 10m equates to 20.log (300 . 10/3) = 60 dB µV/m at 3m

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.

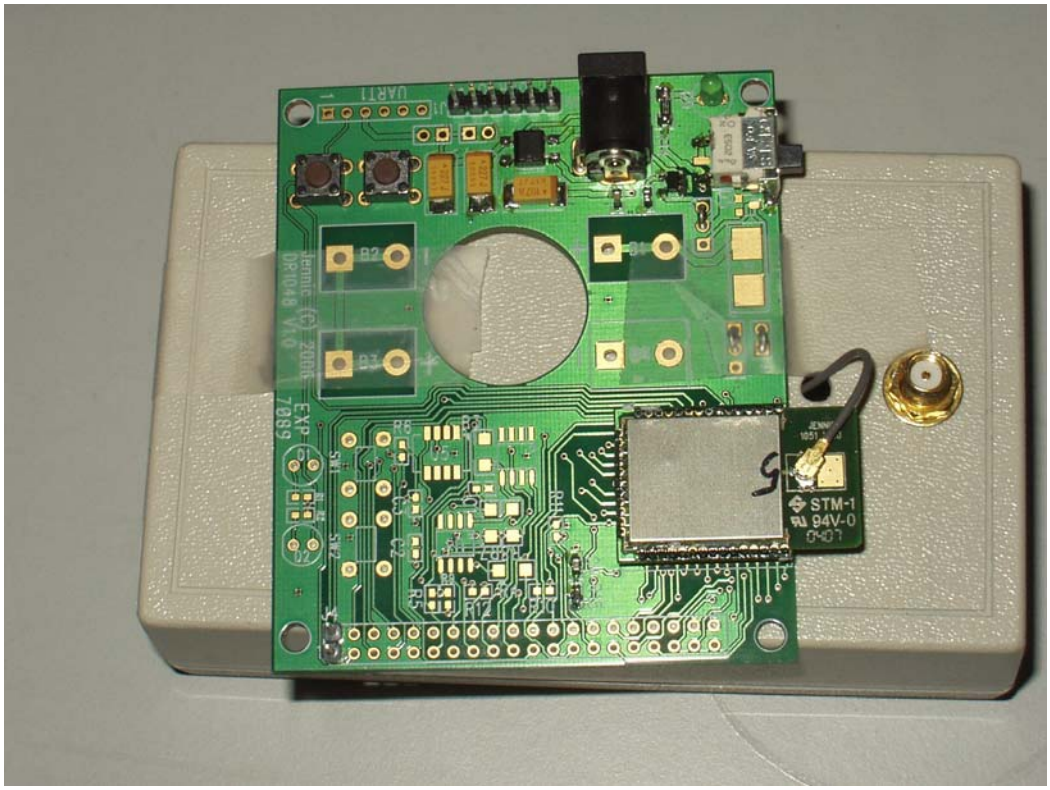
8. Photographs
8.1 Radiated emissions

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



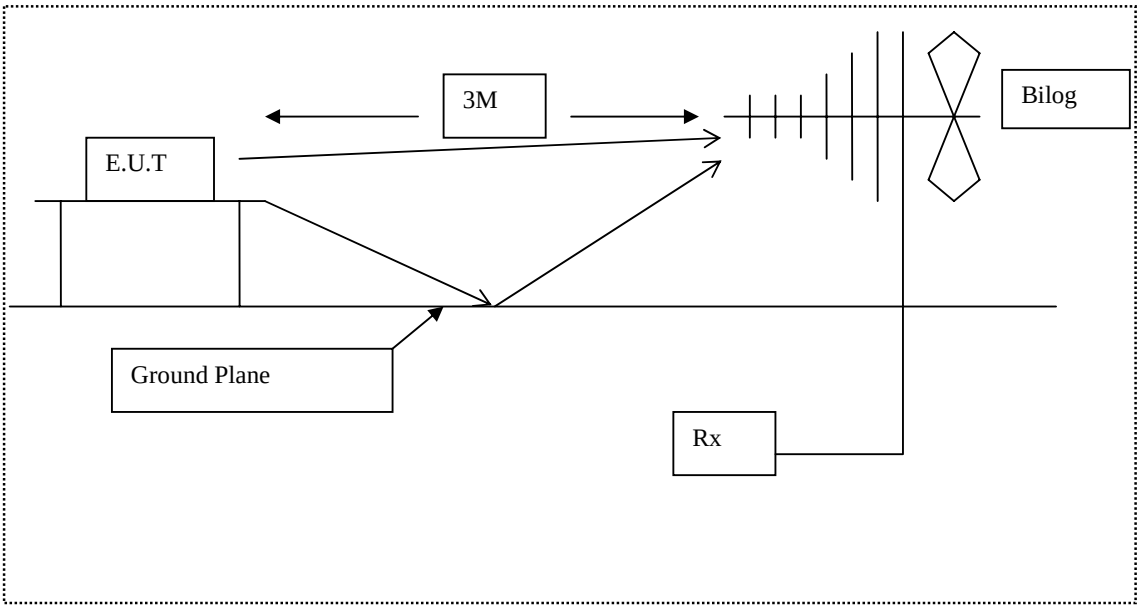


Diagram of the radiated emissions test setup.

9. Signal Leads

Port Name	Cable Type	Location
Test jig antenna port	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
C031	437B	Power Meter	Hewlett Packard	Sep-19-06	12 mths
C032	8482A	Power Sensor	Hewlett Packard	Sep-22-06	12 mths
E1	HP8542E	EMI Receiver & RF Filter	Hewlett Packard	Oct-31-06	12 mths
E2	HP8594E	Spectrum Analyser + EMC S/ware	Hewlett Packard	Mar-12-07	12 mths
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
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
E3	HP8593E	Spectrum Analyser	Hewlett Packard	Sep-20-06	24 mths
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
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

RN Number	Manufacturer	Description	Model Number	Serial Number
I003	DELL	Laptop	Latitude	191-744-573-95

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):	JN5139-000-M03
Unique Serial Number(s):	05
Manufacturer:	Jennic Ltd
Customer Purchase Order Number:	PO 004039
R.N. Electronics Limited Report Number:	03-166A/3298/1/07
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:

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