# FCC
# Test Report
## for
## 3rd Generation wireless microcontroller
## JN5139-Z01-M04R1

Report Number 02-231/3548/1/08
Report Produced by: -

***R.N. Electronics Ltd.***
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## 1. Contents

## 2. Summary of Test Results

**The 3rd Generation wireless microcontroller JN5139-Z01-M04R1 was tested to the following standards: -**

**FCC Part 15C (effective date January 30, 2008); 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.

| 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: 14th February 2008

Test Engineer: Daniel Sims — Digitally signed by Daniel Sims DN: CN = Daniel Sims, C = GB, O = RN Electronics Date: 2008.03.06 15:33:09 Z

Approved By: Paul Darragh — Digitally signed by Paul Darragh DN: CN = Paul Darragh, C = GB, OU = RN Electronics Date: 2008.03.06 15:31:38 Z

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

| | |
|---|---|
| Applicant | Jennic Ltd<br>Furnival Street<br>Sheffield<br>S1 4QT |
| Manufacturer/Brand Name | Jennic Ltd |
| Full name of EUT | 3rd Generation wireless microcontroller |
| Model Number of EUT | JN5139-Z01-M04R1 |
| Serial Number of EUT | 0802900277 |
| FCC ID (if applicable): | TYOJN5139M4 |
| Date when equipment was received by RN Electronics Limited | 12th February 2008 |
| Date of test: | 14th February 2008 |
| Customer order number: | PO 004561/CF |
| A visual description of EUT is as follows: | A canned IC on small PCB with an UFL 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 adaptor 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 | 7mm |
| Width | 20mm |
| Depth | 35mm |
| Weight | 0.001kg |
| 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: 06 March 2008

## 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

## 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 (15.209)

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. The 3V required dc input was supplied by new batteries. 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.
Above 15GHz the antenna was re-positioned at a distance of 0.3metres.

#### 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 a listed site. 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: 12°C Humidity: 47 %

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.

Note that the results are worse than can be expected as they are performed in a continuous transmit state which is not used in the actual application.

#### 5.2.2.1 Test Equipment used

E1, TMS933, E268, E3, TMS79, TMS82, E320, E238, E239, E242, N438

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. The unit under test was powered through the test jig via 3Vdc to mains adaptor.

#### 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 M.
**Test Environment:**
**A** Temperature: 21°C Humidity: 35%

The conducted power was as shown in the table below:

| Frequency (MHz) | Power (W) |
|---|---|
| 2405 | 0.052 |
| 2440 | 0.056 |
| 2480 | 0.047 |

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

#### 5.3.2.1 Test Equipment used

E290, E291

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. The unit under test was powered through the test jig via 3Vdc to mains adaptor.

#### 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: 21°C

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

| Frequency (MHz) | Peak Power (dBm/3kHz) |
|---|---|
| 2405 | -3.0 |
| 2440 | -2.8 |
| 2480 | -3.5 |

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

#### 5.4.2.1 Test Equipment used

E3, E266, E290, E291, 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 M.

Temperature of test Environment: 20°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 | 1.60 | Plot 030 |
| 2440 | 1.60 | Plot 031 |
| 2480 | 1.61 | Plot 032 |

Limit > 500kHz.

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

#### 5.5.2.1 Test Equipment used

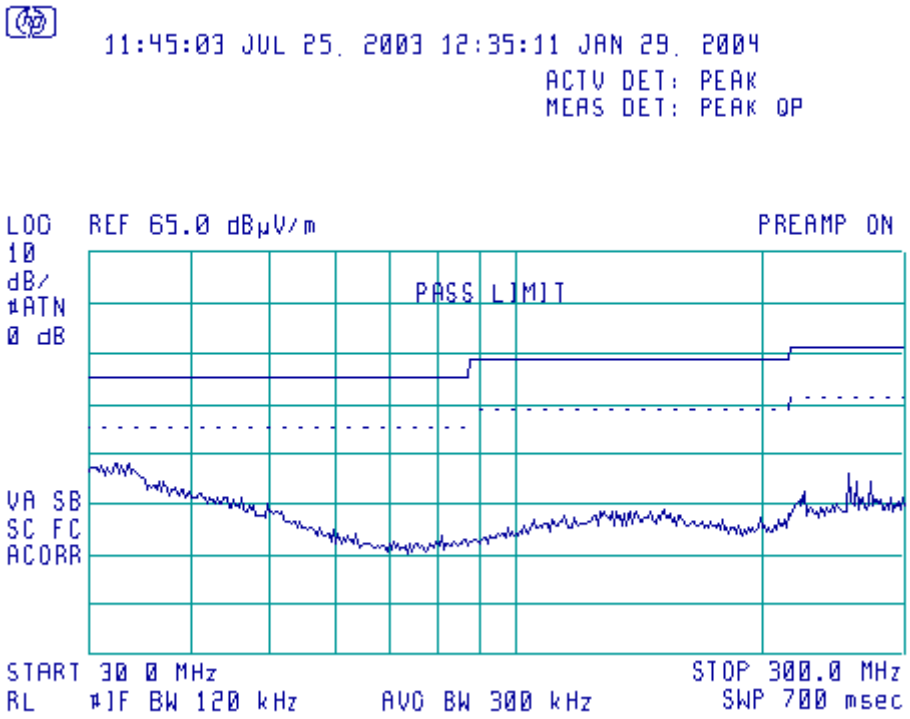
E3, TMS82, E268

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

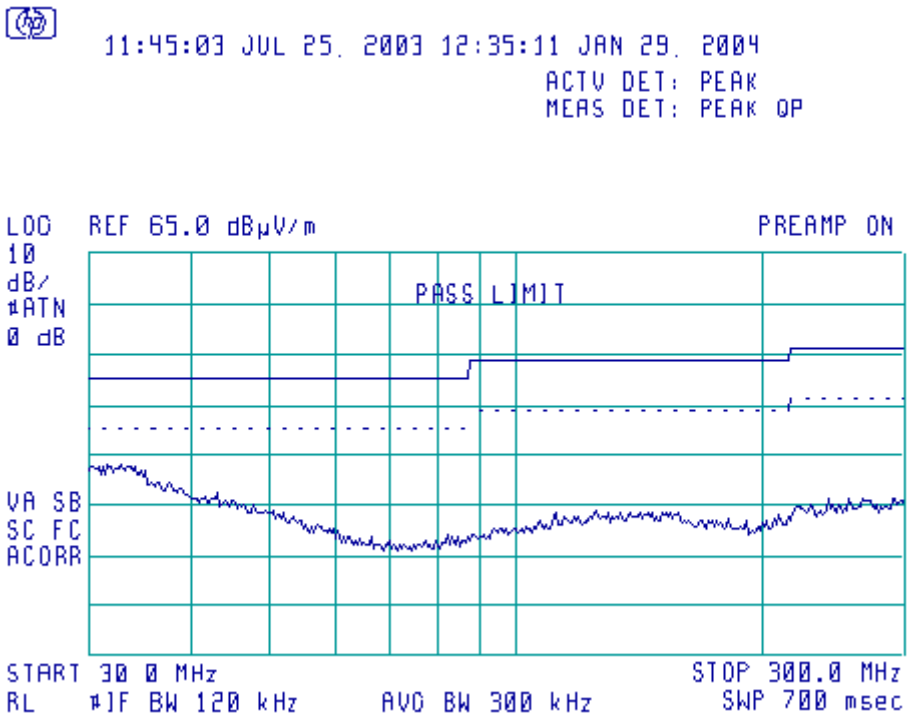
**The plot shows a swept response of peak values using the quasi-peak limit line**

(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

NONE.

**Measurement Uncertainty of ± 5.2dB Applies**




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

# Vertical Polarisation

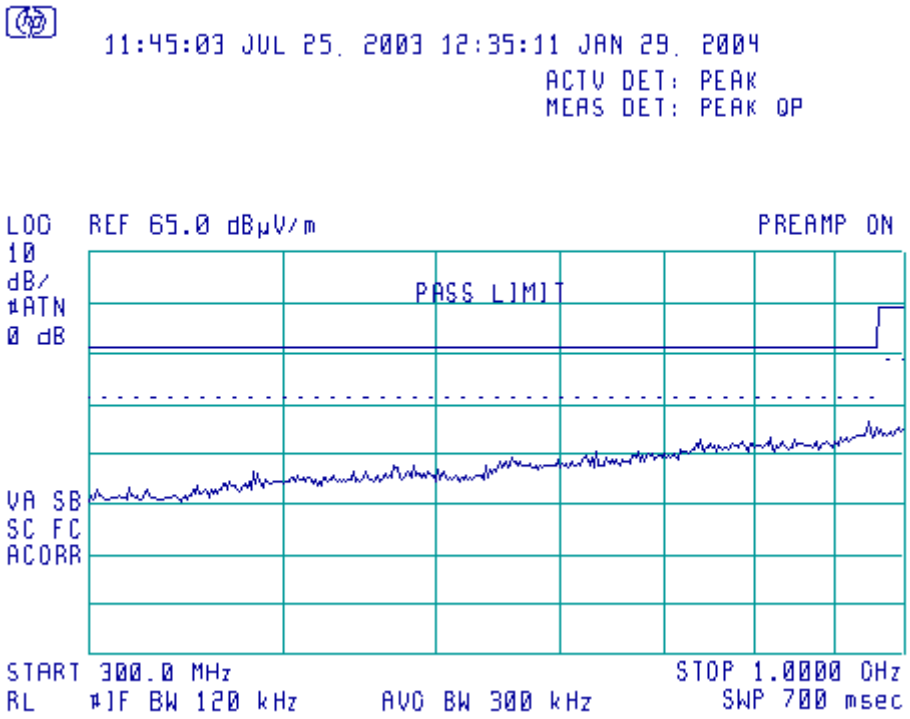
**The plot shows a swept response of peak values using the quasi-peak limit line**

(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

NONE.

**Measurement Uncertainty of ± 5.2dB Applies**




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

# Horizontal Polarisation

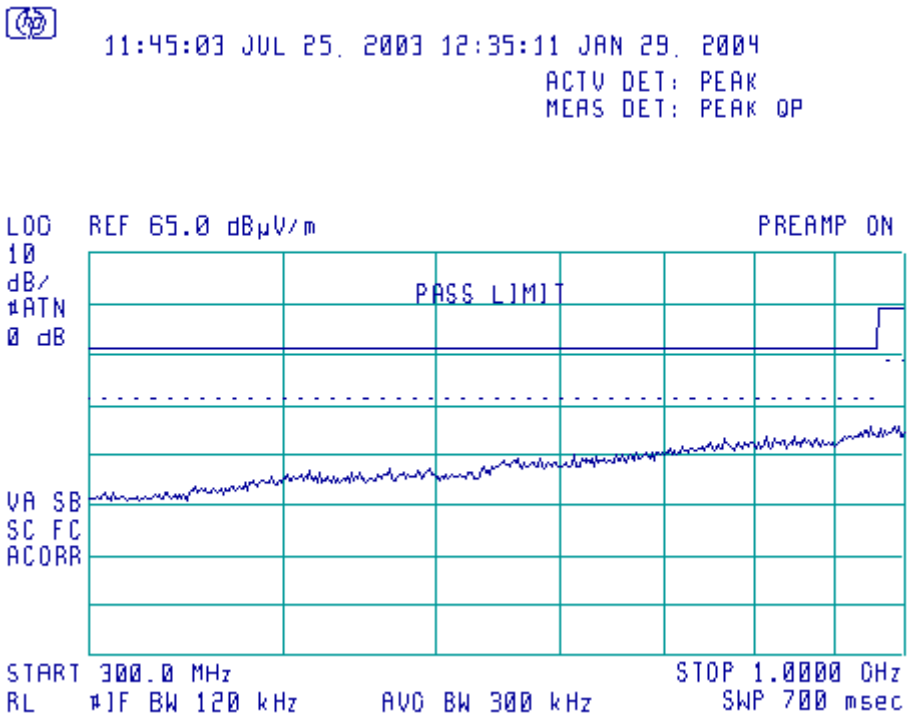
**The plot shows a swept response of peak values using the quasi-peak limit line**

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

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

NONE.

**Measurement Uncertainty of ± 5.2dB Applies**




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

# Vertical Polarisation

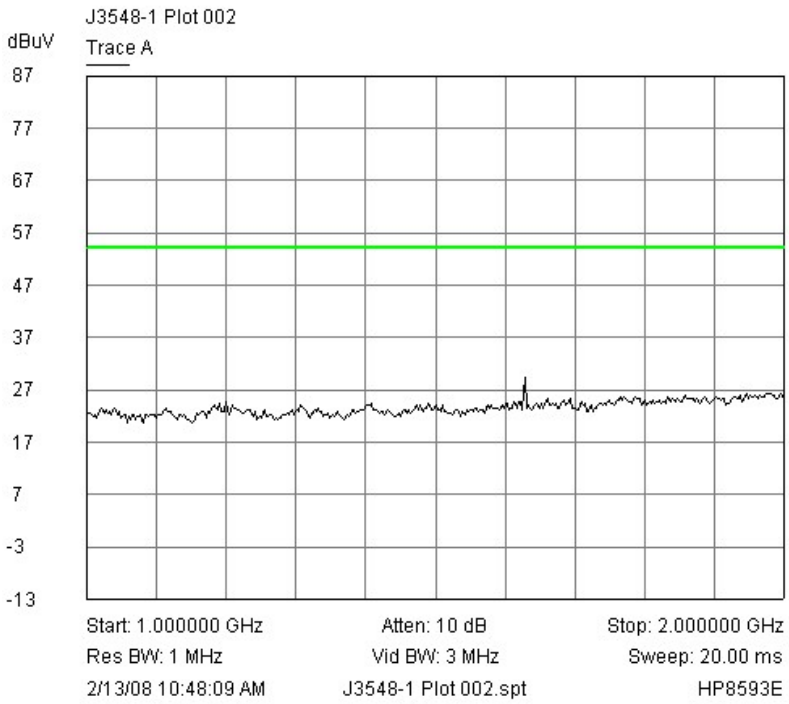
**The plot shows a swept response of peak values using the quasi-peak limit line**

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

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

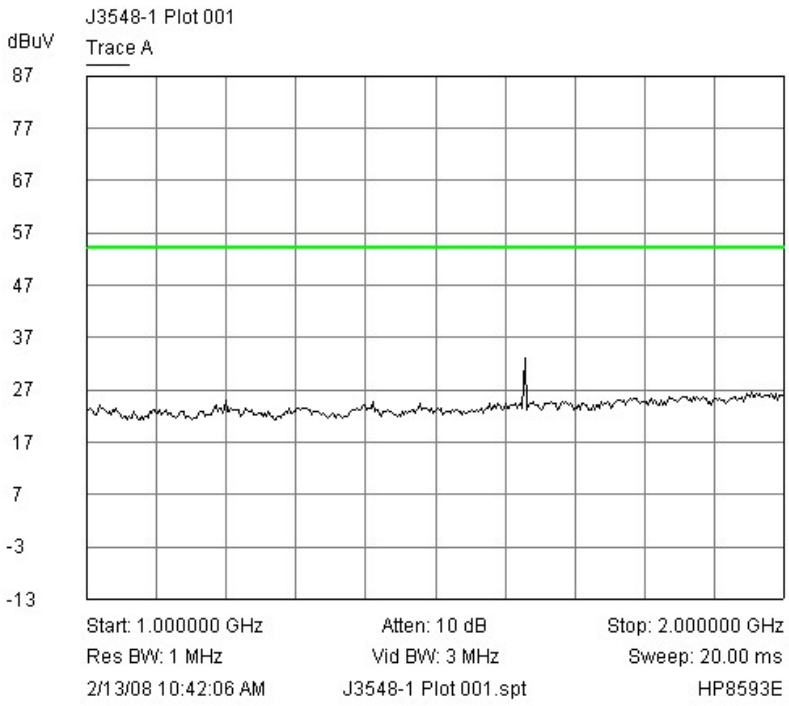
NONE.

**Measurement Uncertainty of ± 5.2dB Applies**



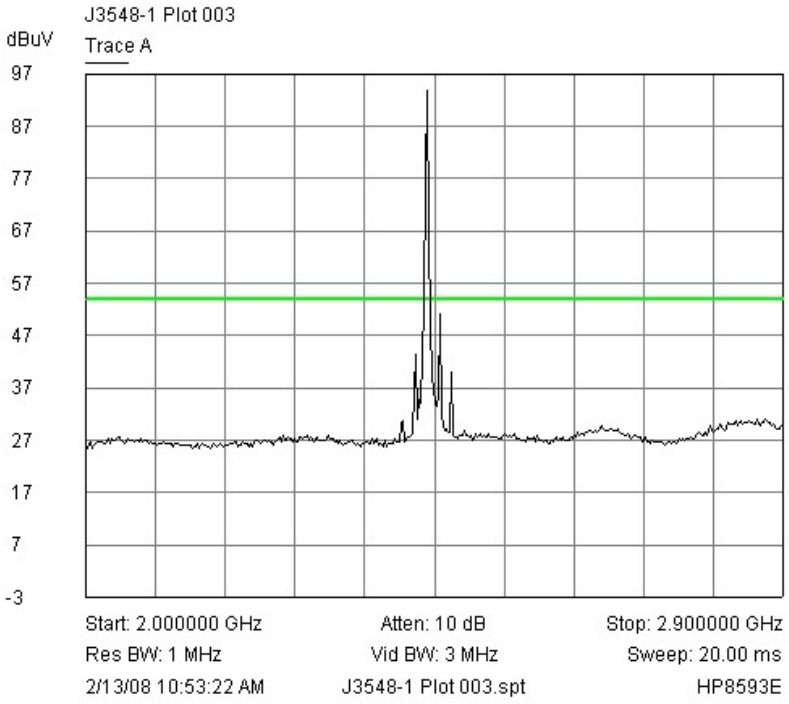

# Average Values of 1 to 2GHz.

# Horizontal Polarisation

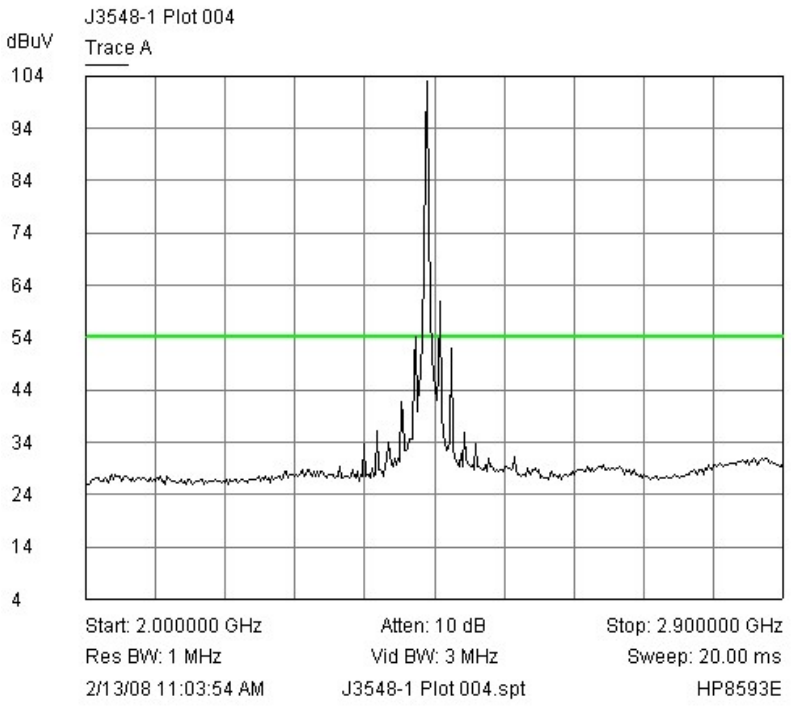



# Average Values of 1 to 2GHz.

# Vertical Polarisation

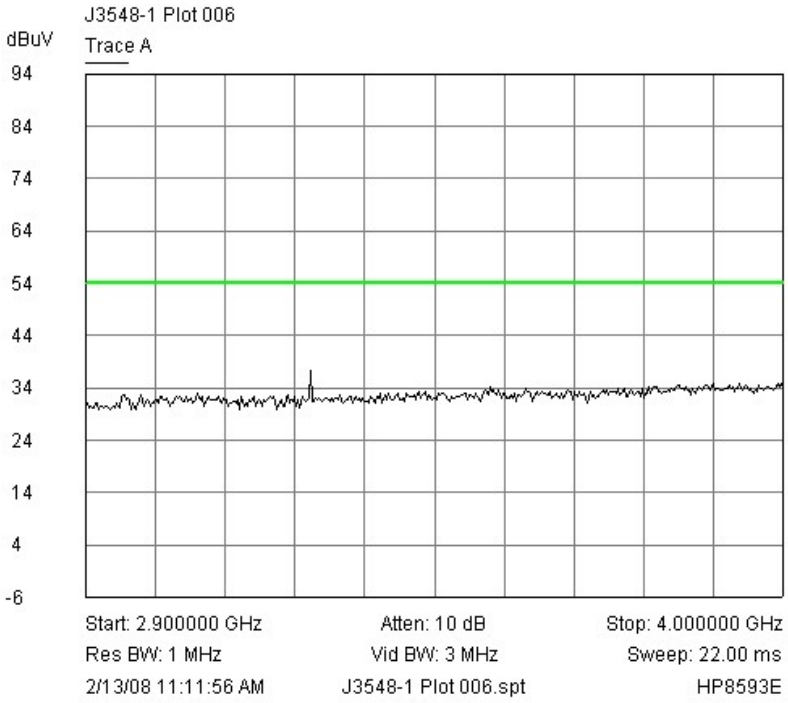



# Average Values of 2 – 2.9 GHz.
# Horizontal Polarisation

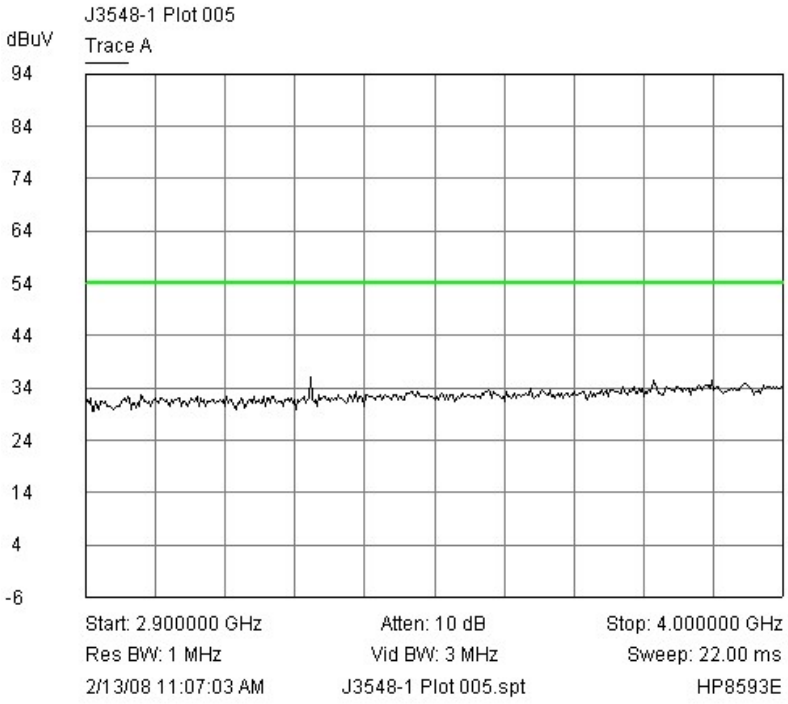



# Average Values of 2 - 2.9 GHz.

# Vertical Polarisation

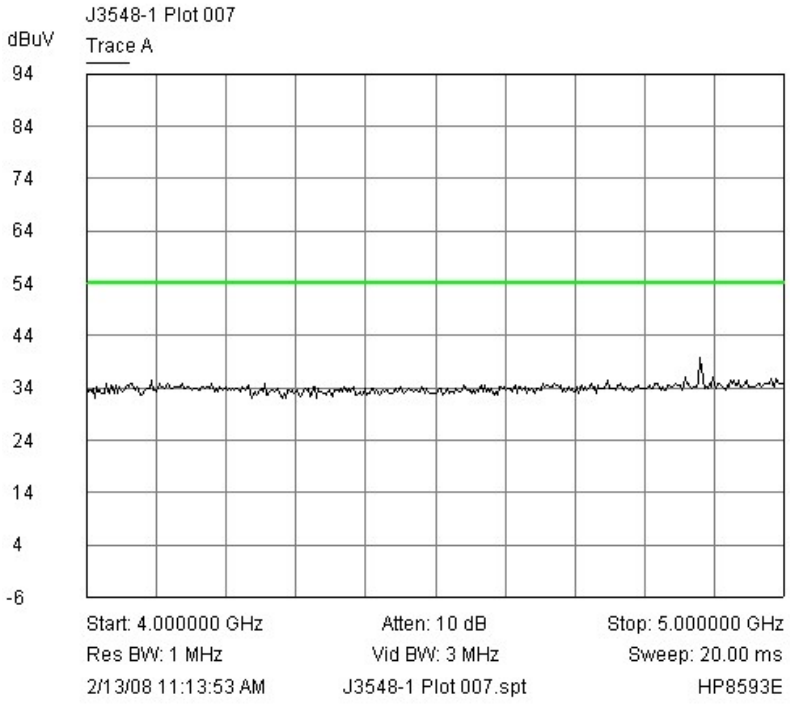



# Average Values of 2.9 to 4 GHz.
# Horizontal Polarisation



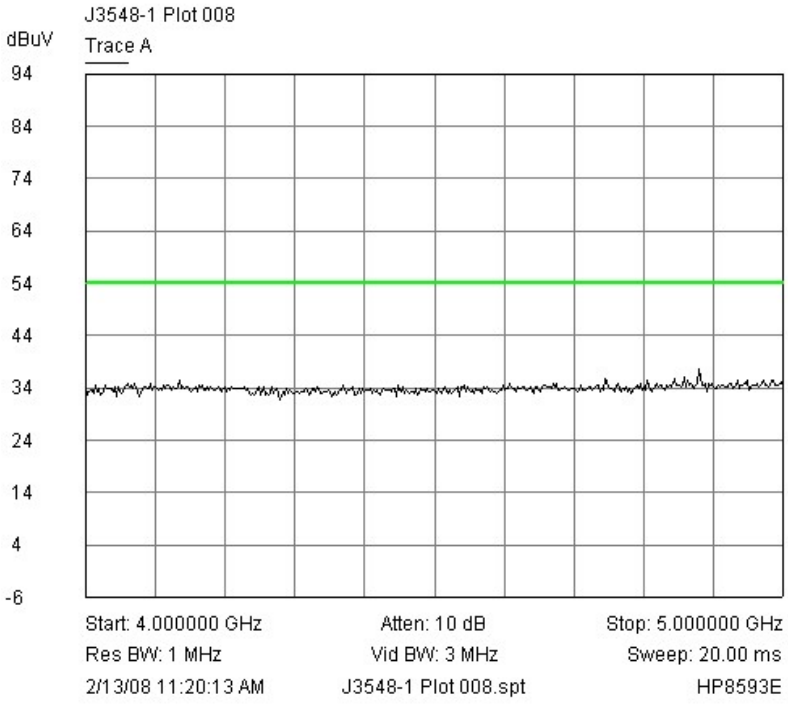

# Average Values of 2.9 to 4 GHz.

# Vertical Polarisation



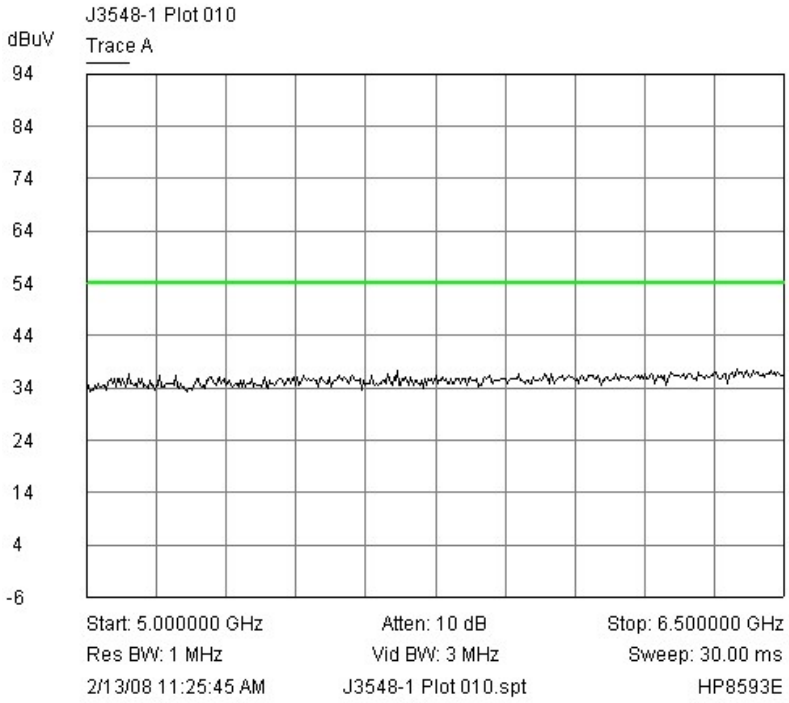

# Average Values of 4 – 5 GHz.

# Horizontal Polarisation

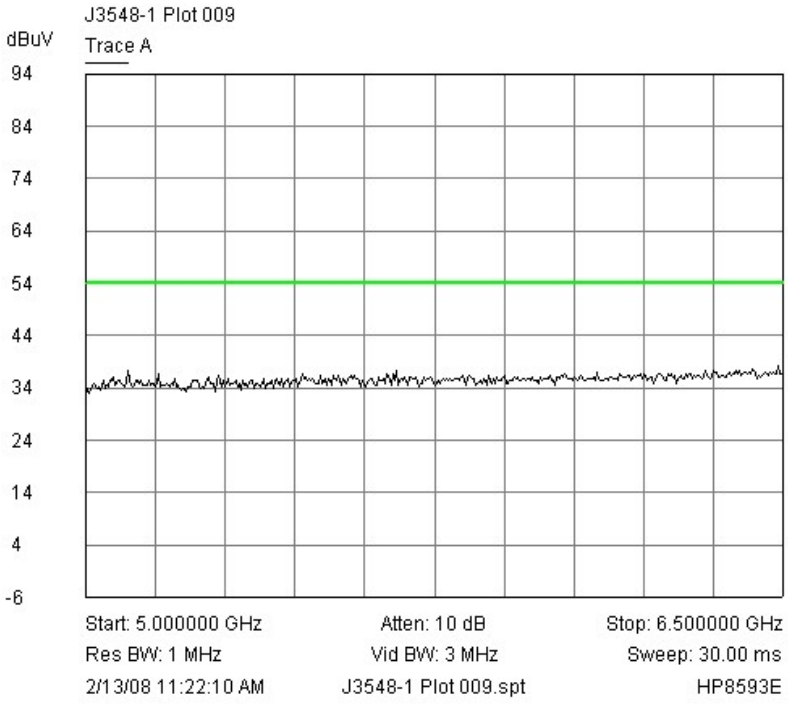



# Average Values of 4 – 5 GHz.

# Vertical Polarisation

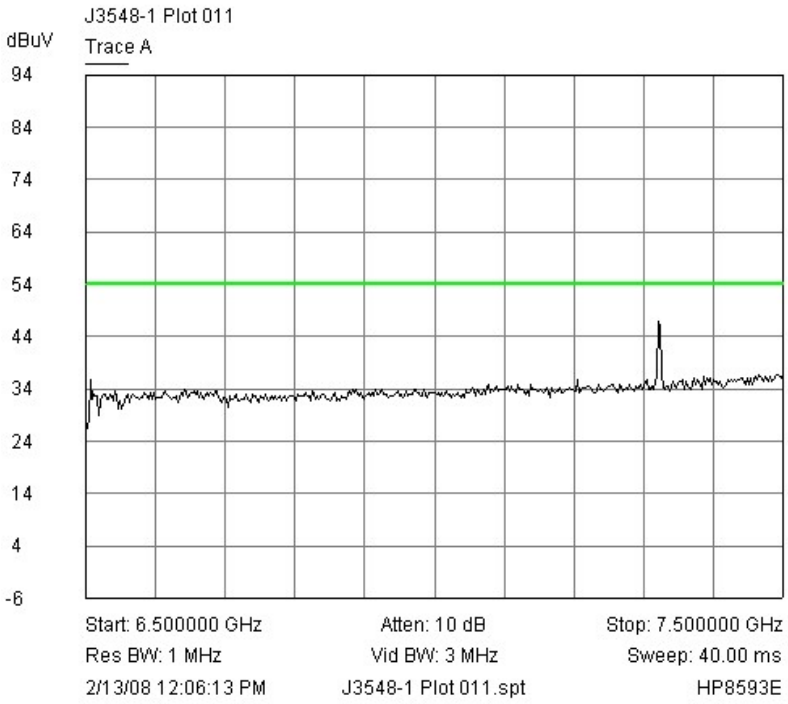



# Average Values of 5 - 6.5 GHz.
# Horizontal Polarisation

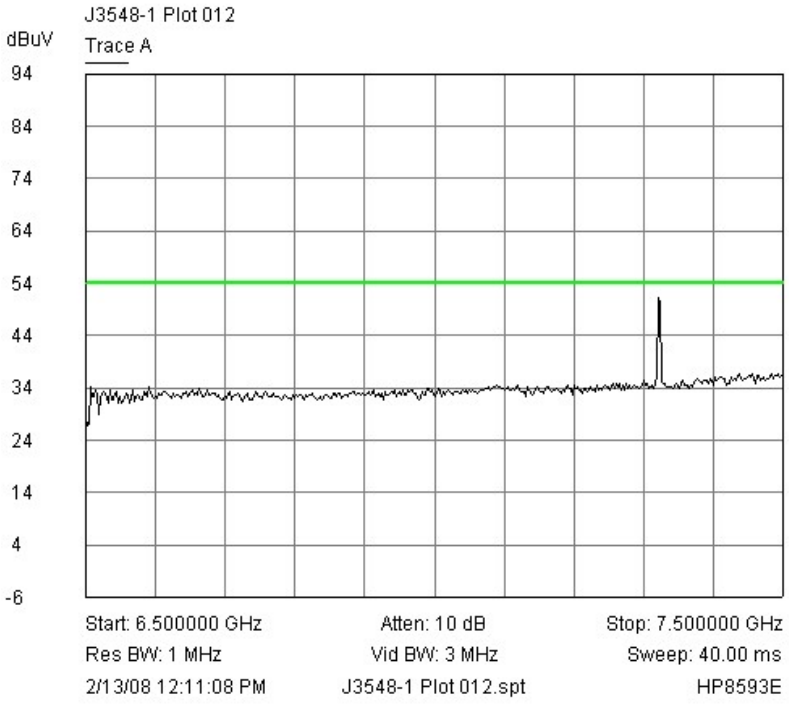



# Average Values of 5 - 6.5 GHz.

# Vertical Polarisation

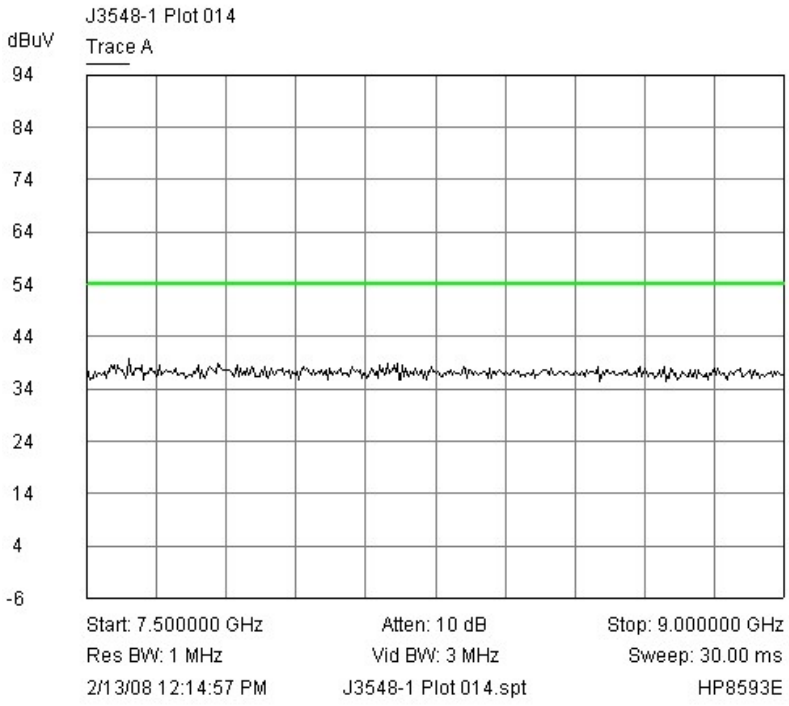



# Average Values of 6.5 – 7.5 GHz.
# Horizontal Polarisation



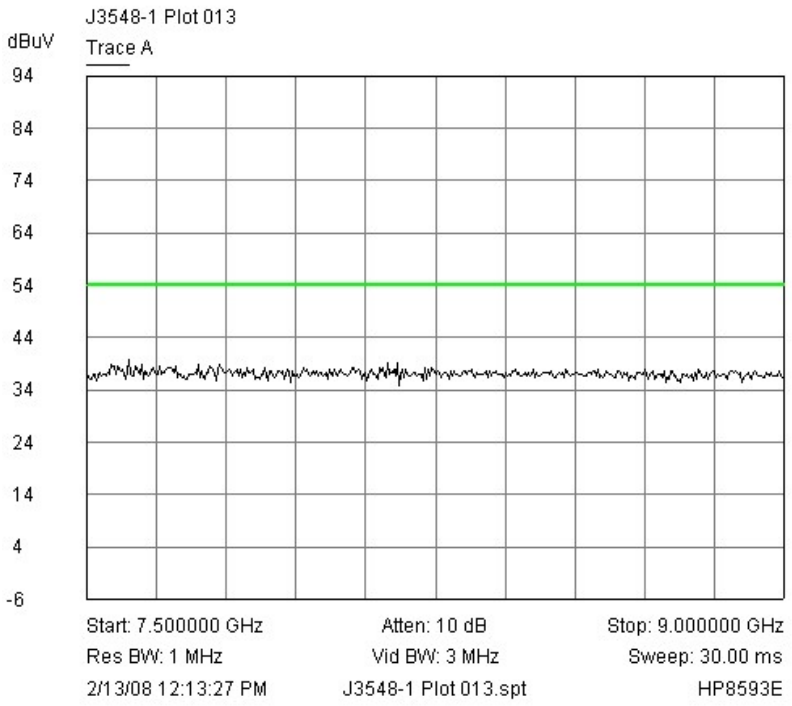

# Average Values of 6.5 – 7.5 GHz.

# Vertical Polarisation



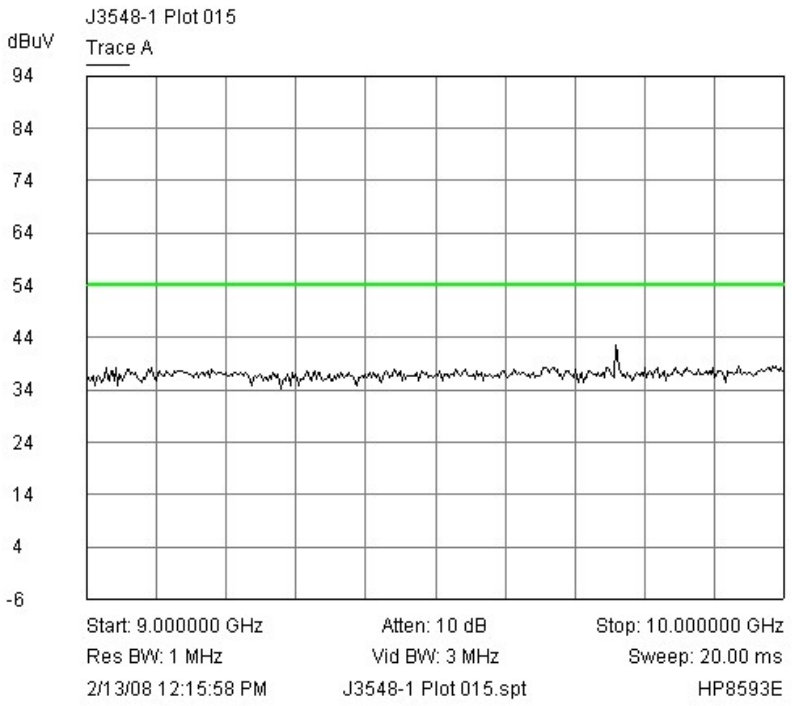

# Average Values of 7.5 – 9 GHz.

# Horizontal Polarisation



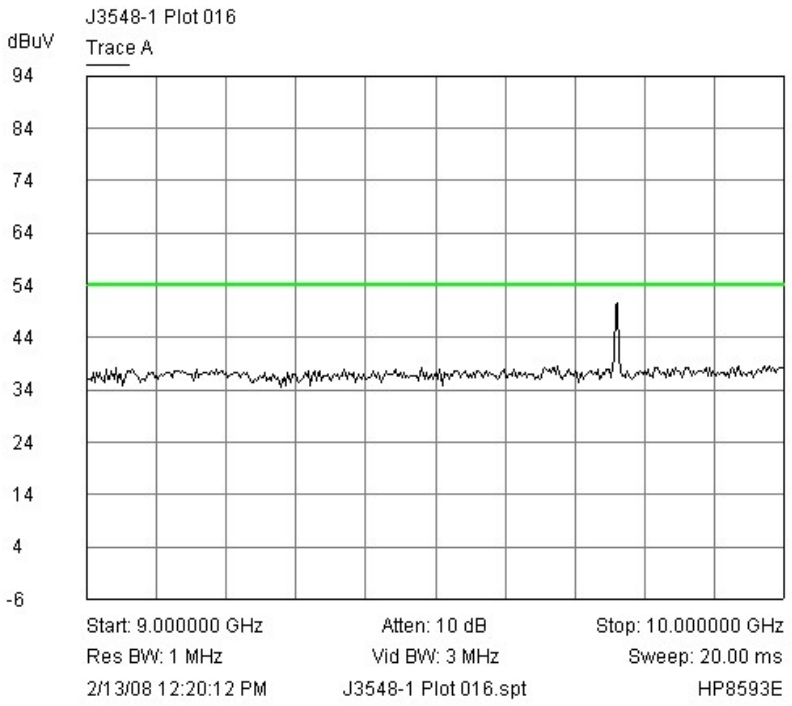

# Average Values of 7.5 – 9 GHz.

# Vertical Polarisation



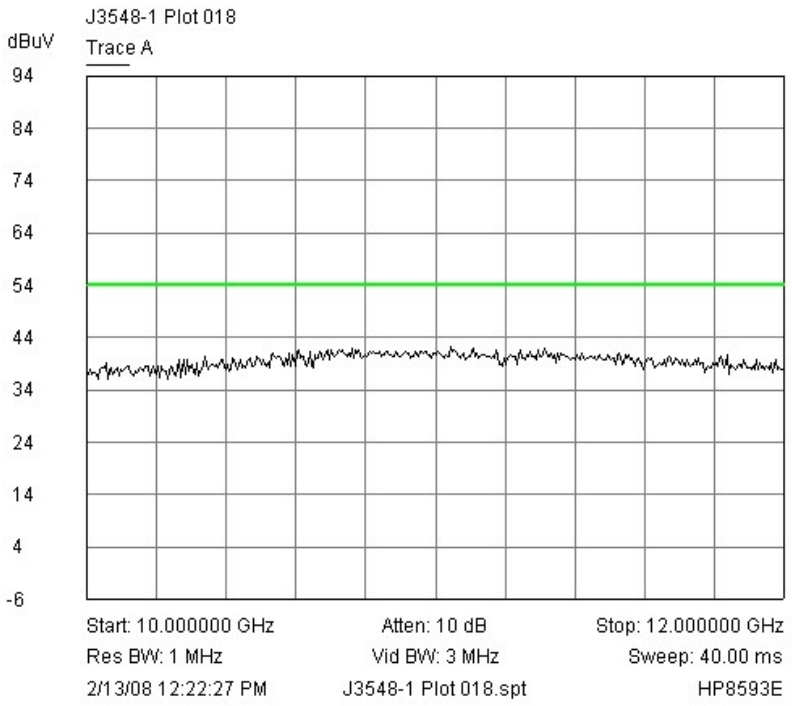

# Average Values of 9 – 10 GHz.

# Horizontal Polarisation



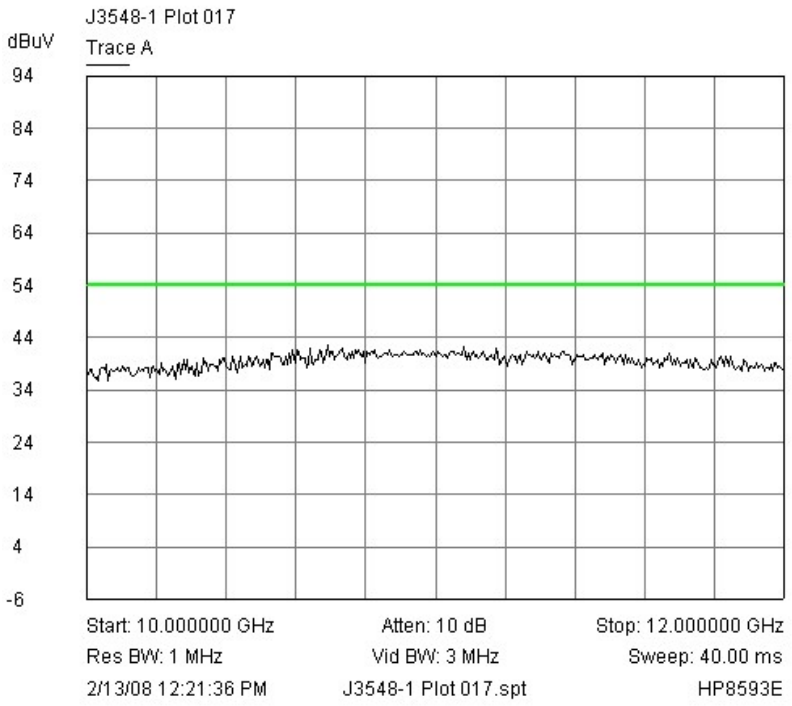

# Average Values of 9 – 10 GHz.

# Vertical Polarisation



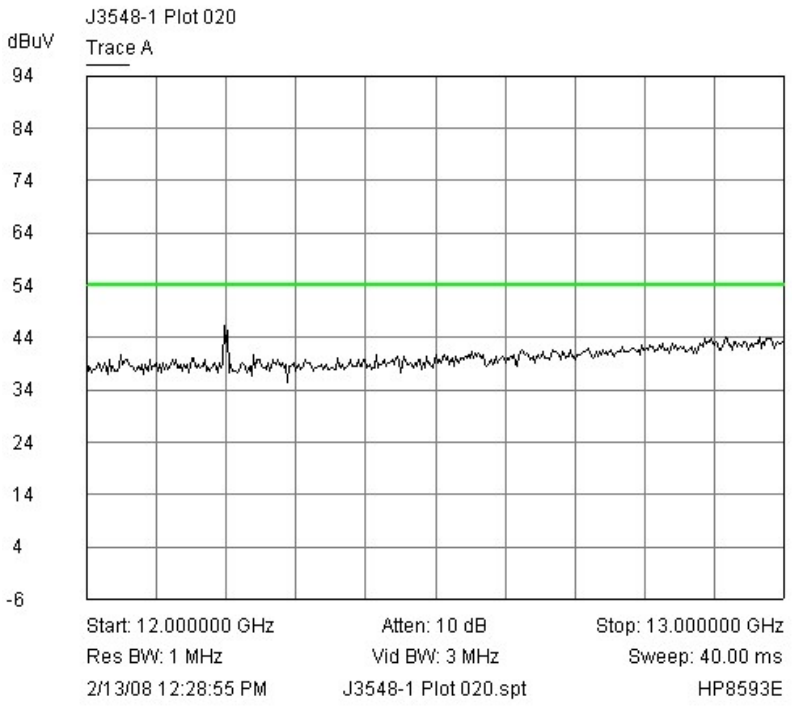

# Average Values of 10 – 12 GHz.

# Horizontal Polarisation



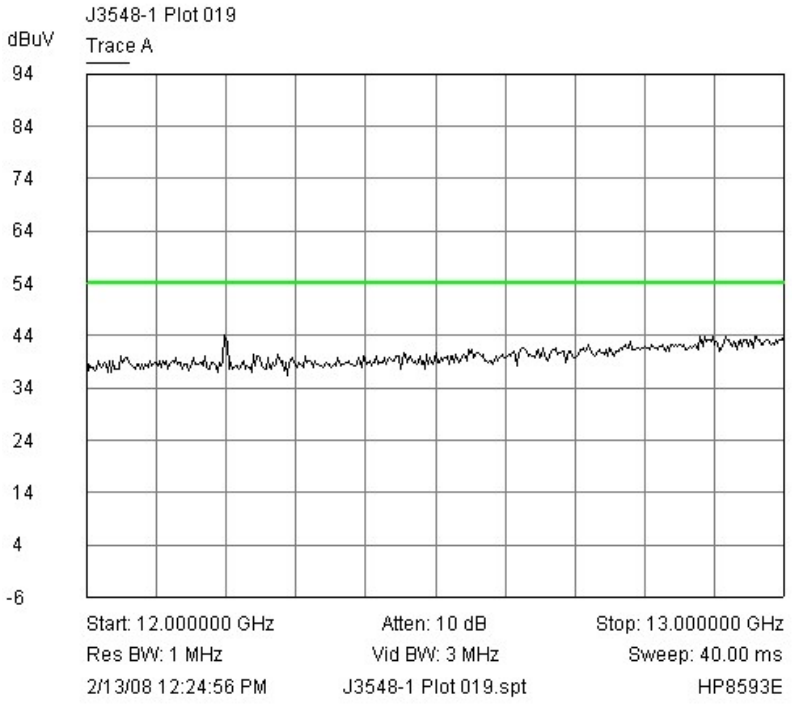

# Average Values of 10 – 12 GHz.

# Vertical Polarisation



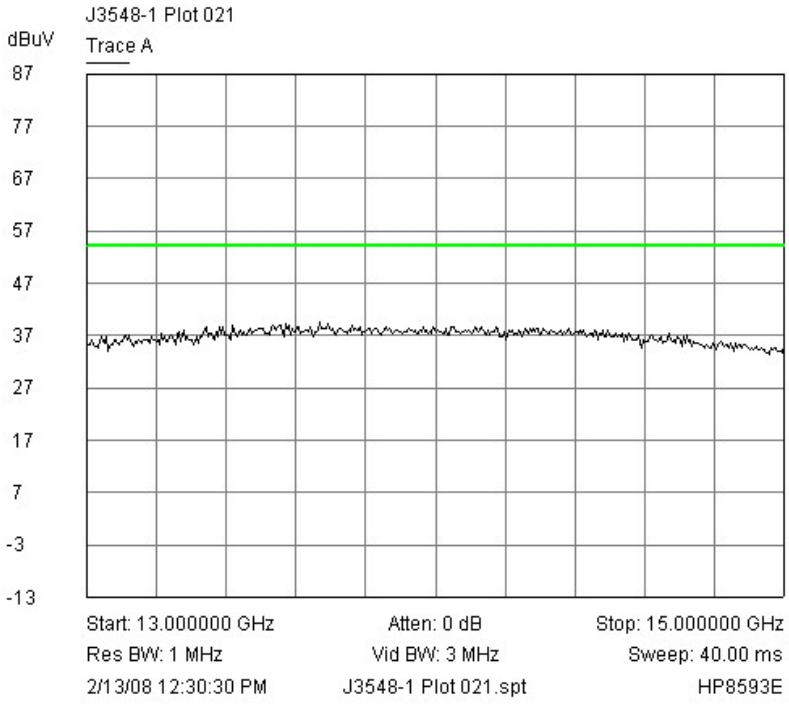

# Average Values of 12 – 13 GHz.

# Horizontal Polarisation



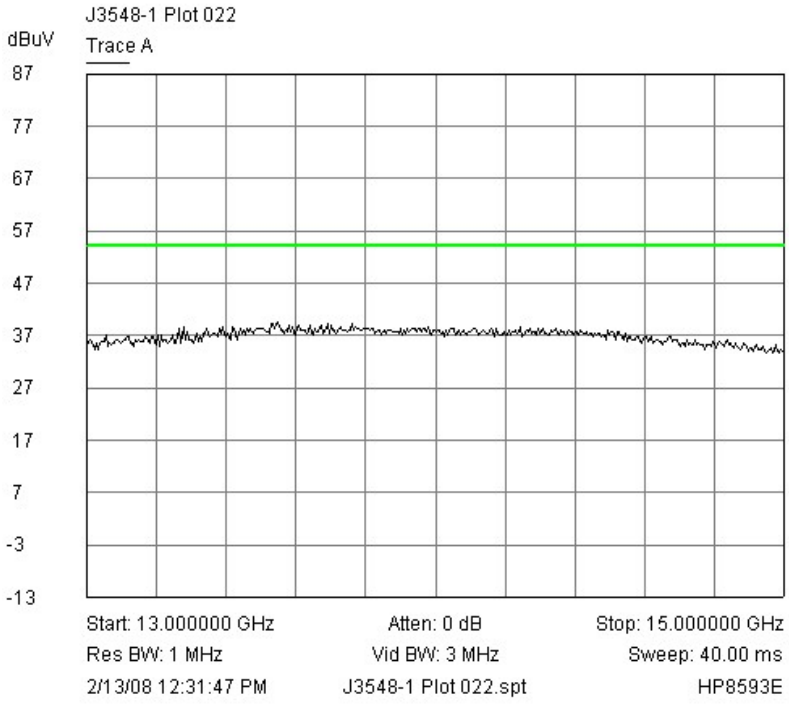

# Average Values of 12 – 13 GHz.

# Vertical Polarisation



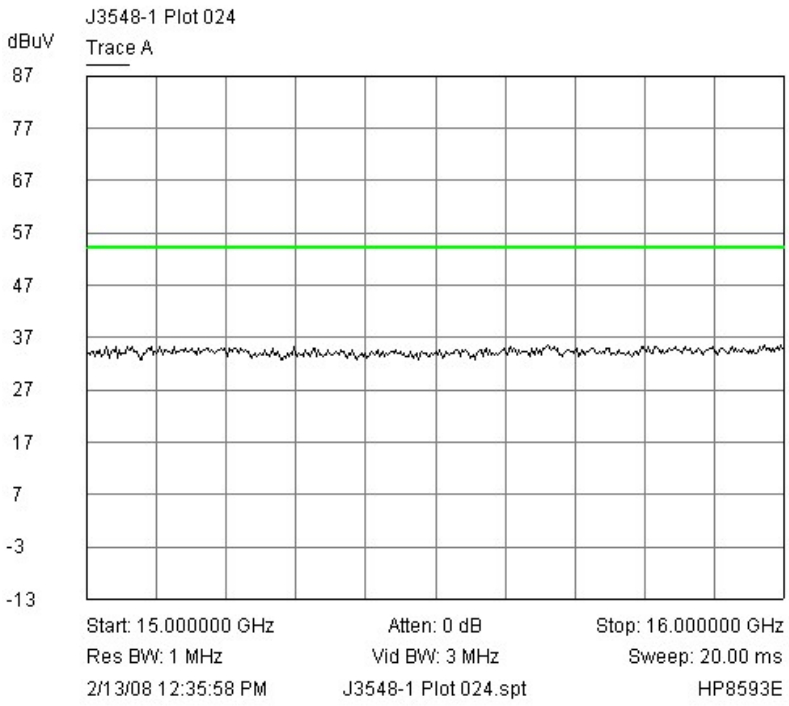

# Average Values of 13 – 15 GHz.

# Horizontal Polarisation



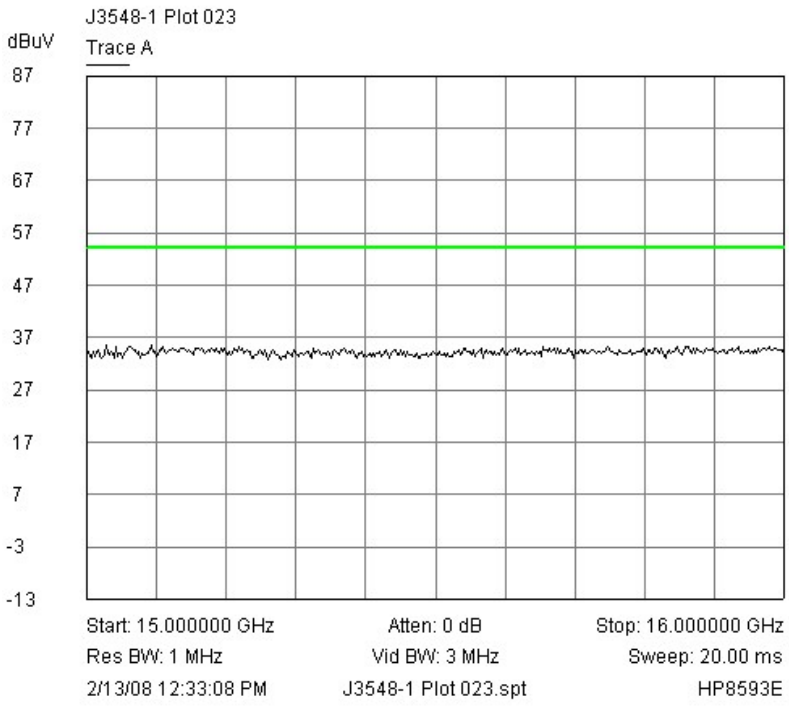

# Average Values of 13 – 15 GHz.

# Vertical Polarisation



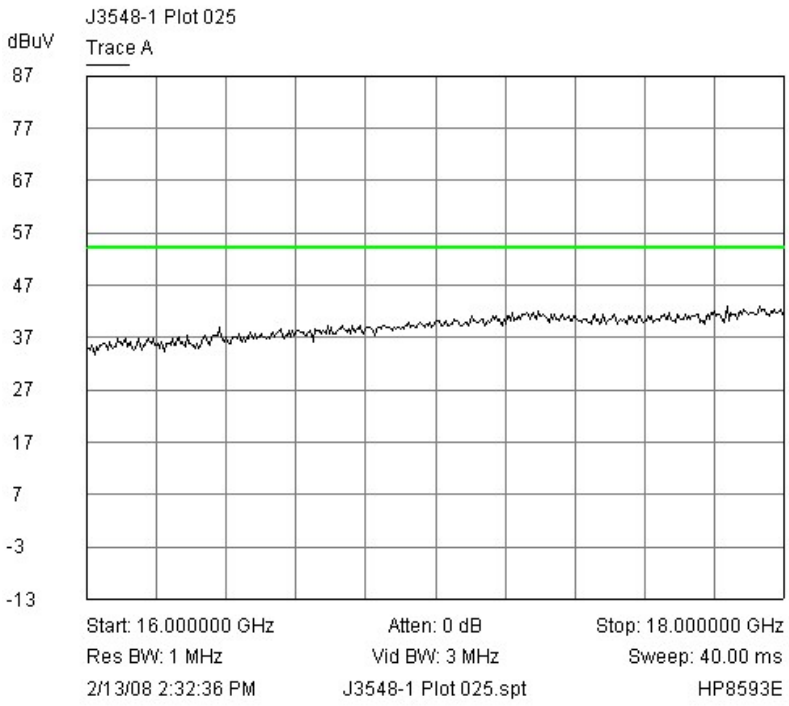

# Average Values of 15 – 16 GHz.

# Horizontal Polarisation



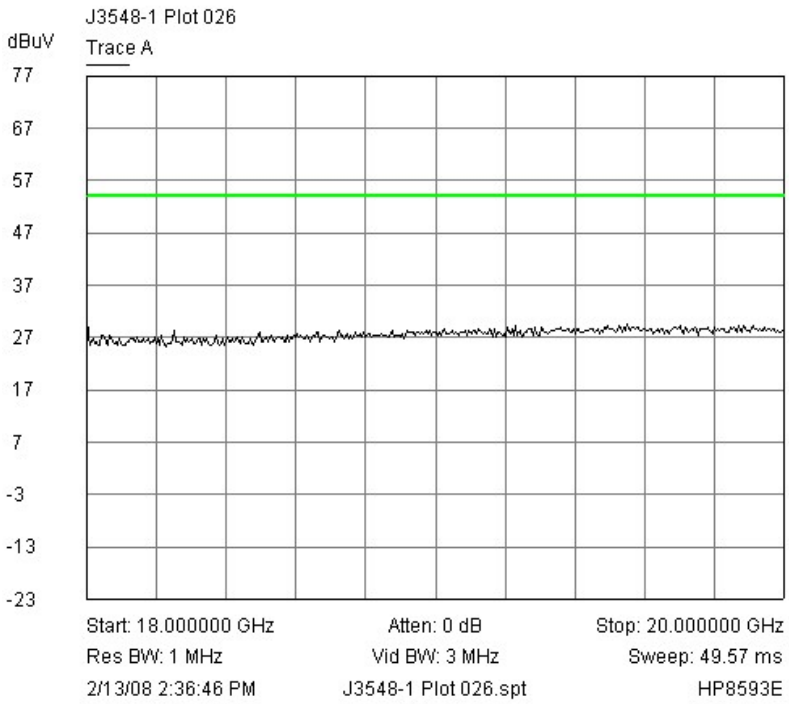

# Average Values of 15 – 16 GHz.

# Vertical Polarisation

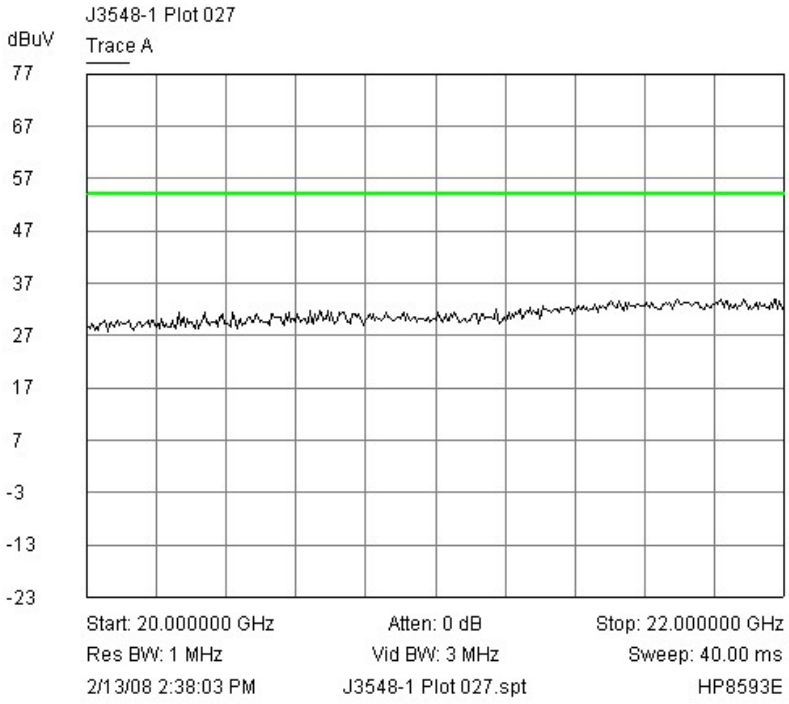



# Average Values of 16 – 18 GHz.

# Horizontal & Vertical Polarisation

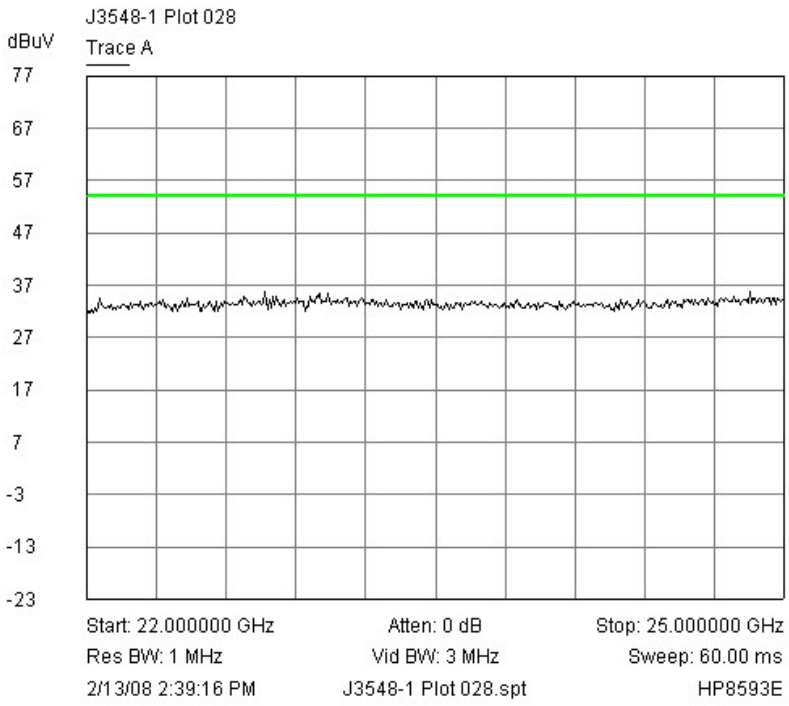



# Average Values of 18 – 20 GHz.
# Horizontal & Vertical Polarisation




# Average Values of 20 – 22 GHz.

# Horizontal & Vertical Polarisation




# Average Values of 22 – 25 GHz.

# Horizontal & Vertical Polarisation

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

EUT Transmitting on Low Channel

| Signal | Freq (MHz) | Polaris-ation | Avg Amp (dBuV/m) | Avg -Limit[1] (dBuV/m) | Comments |
|---|---|---|---|---|---|
| 1 | 1603 | V | 38.3 | -15.7 | |
| 2 | 1603 | H | 40.4 | -13.6 | |
| 3 | 3206 | V | 45.8 | -8.2 | |
| 4 | 3206 | H | 40.9 | -13.1 | |
| 5 | 4810 | V | 53.0 | -1.0 | See below |
| 6 | 4810 | H | 51.0 | -3.0 | |
| 7 | 12025 | V | 48.0 | -6.0 | |
| 8 | 12025 | H | 47.6 | -6.4 | |

| Signal | Freq (MHz) | Polaris-ation | Avg Amp (dBuV/m) | Avg -Limit[2] (dBuV/m) | Comments |
|---|---|---|---|---|---|
| 9 | 7215 | V | 45 | -41.7 | |
| 10 | 7215 | H | 49.5 | -37.2 | |
| 11 | 9620 | V | 52.0 | -34.7 | |
| 12 | 9620 | H | 50.6 | -36.1 | |

EUT Transmitting on Middle Channel

| Signal | Freq (MHz) | Polaris-ation | Avg Amp (dBuV/m) | Avg -Limit[1] (dBuV/m) | Comments |
|---|---|---|---|---|---|
| 1 | 1626 | V | 37.0 | -17.0 | |
| 2 | 1626 | H | 29.0 | -25.0 | |
| 3 | 3253 | V | 45.3 | -8.7 | |
| 4 | 3253 | H | 38.0 | -16.0 | |
| 5 | 4880 | V | 37.0 | -17.0 | |
| 6 | 4880 | H | 38.0 | -16.0 | |
| 7 | 7320 | V | 53.2 | -0.8 | See below |
| 8 | 7320 | H | 51.4 | -2.6 | See below |
| 9 | 12200 | V | 49.0 | -5.0 | |
| 10 | 12200 | H | 47.0 | -7.0 | |

| Signal | Freq (MHz) | Polaris-ation | Avg Amp (dBuV/m) | Avg -Limit[2] (dBuV/m) | Comments |
|---|---|---|---|---|---|
| 11 | 9760 | V | 52.1 | -36.1 | |
| 12 | 9760 | H | 48.2 | -40.0 | |

EUT Transmitting on High channel

| Signal | Freq (MHz) | Polaris-ation | Avg Amp (dBuV/m) | Avg -Limit[1] (dBuV/m) | Comments |
|---|---|---|---|---|---|
| 1 | 1653 | V | 41.6 | -12.3 | |
| 2 | 1653 | H | 39.4 | -14.6 | |
| 3 | 3306 | V | 48.7 | -5.3 | |
| 4 | 3306 | H | 43.4 | -10.6 | |
| 5 | 4960 | V | 46.5 | -7.5 | |
| 6 | 4960 | H | 49.8 | -4.2 | |
| 7 | 7440 | V | 48.1 | -5.9 | |
| 8 | 7440 | H | 45.8 | -8.2 | |
| 9 | 12400 | V | 46.4 | -7.6 | |
| 10 | 12400 | H | 40.0 | -14.0 | |

| Signal | Freq (MHz) | Polaris-ation | Avg Amp (dBuV/m) | Avg -Limit[2] (dBuV/m) | Comments |
|---|---|---|---|---|---|
| 11 | 9920 | V | 54.1 | -34.8 | |

[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.

| | | | | | |
|---|---|---|---|---|---|
| 12 | 9920 | H | 52.1 | -36.8 | |

In all the above measurements the fundamental signal was continuously on, and in no case were the peak emissions more than 10dB above the average.

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

| Channel | Frequency (MHz) | Field (dBuV/m) |
|---|---|---|
| Low | 2405 | 106.7 |
| Middle | 2440 | 108.2 |
| High | 2480 | 108.9 |

**Continuous emissions observed comparable to 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.

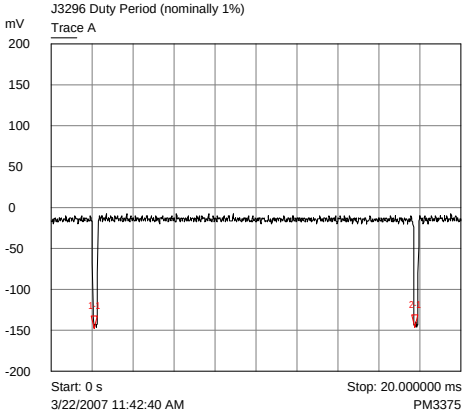
As peak emissions were no more than 10dB above the average emissions measured and the worst case average emission measured is 0.8 dB below the permitted average emission limit then the condition for peak emissions is met.

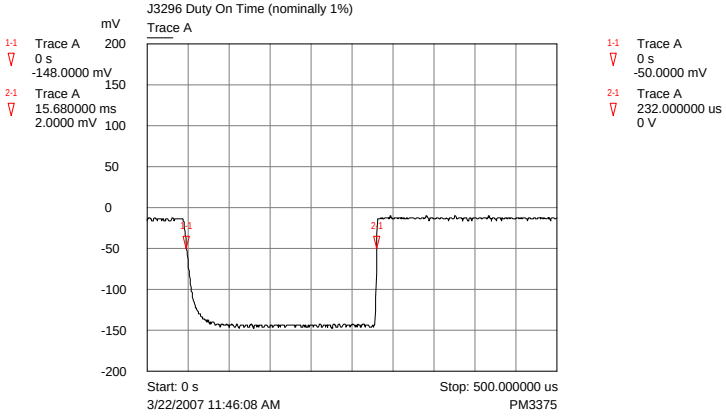
According to 15.35(c): when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train 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 well 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.

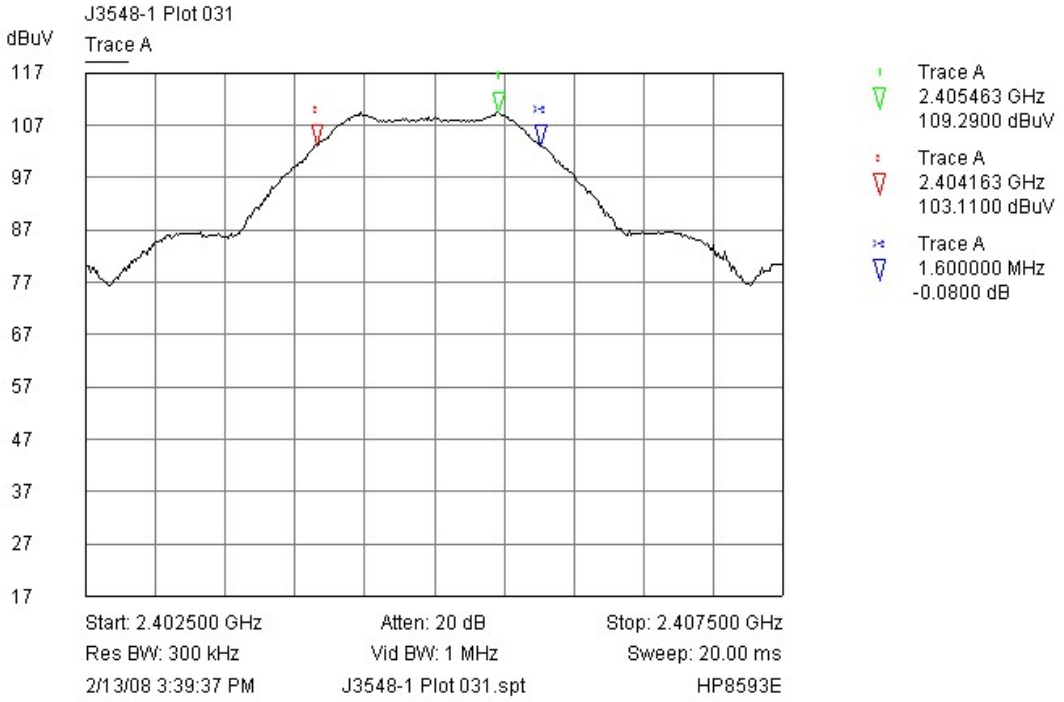
**Plot of duty cycle period and pulse width (nominally 1%):**



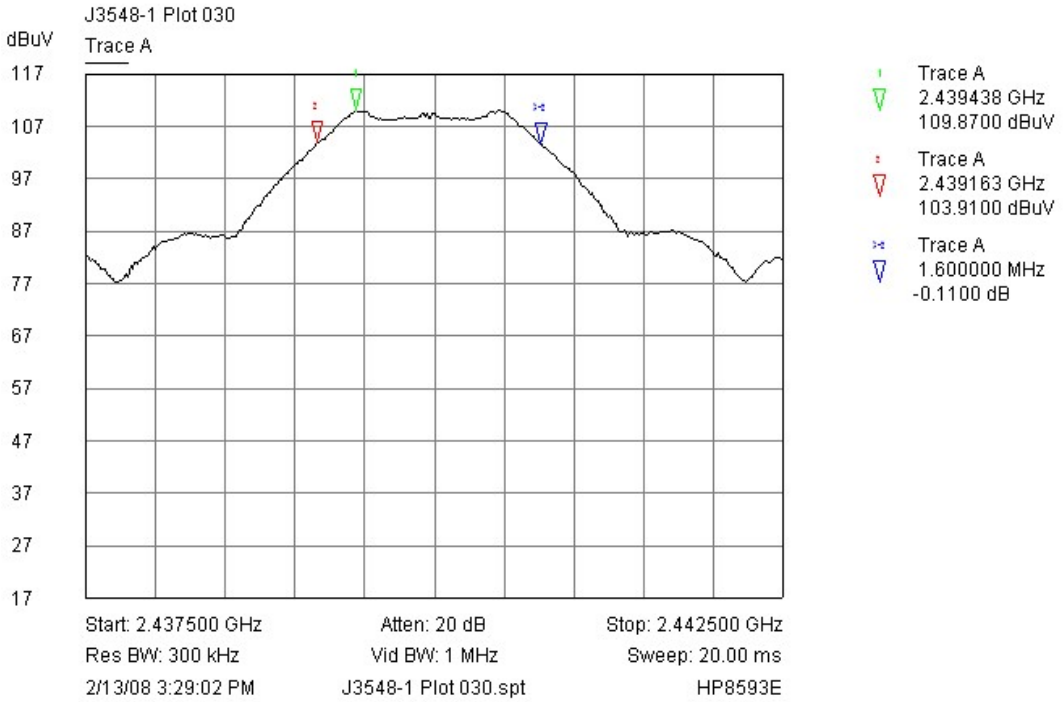



## 6.3 6dB Bandwidth

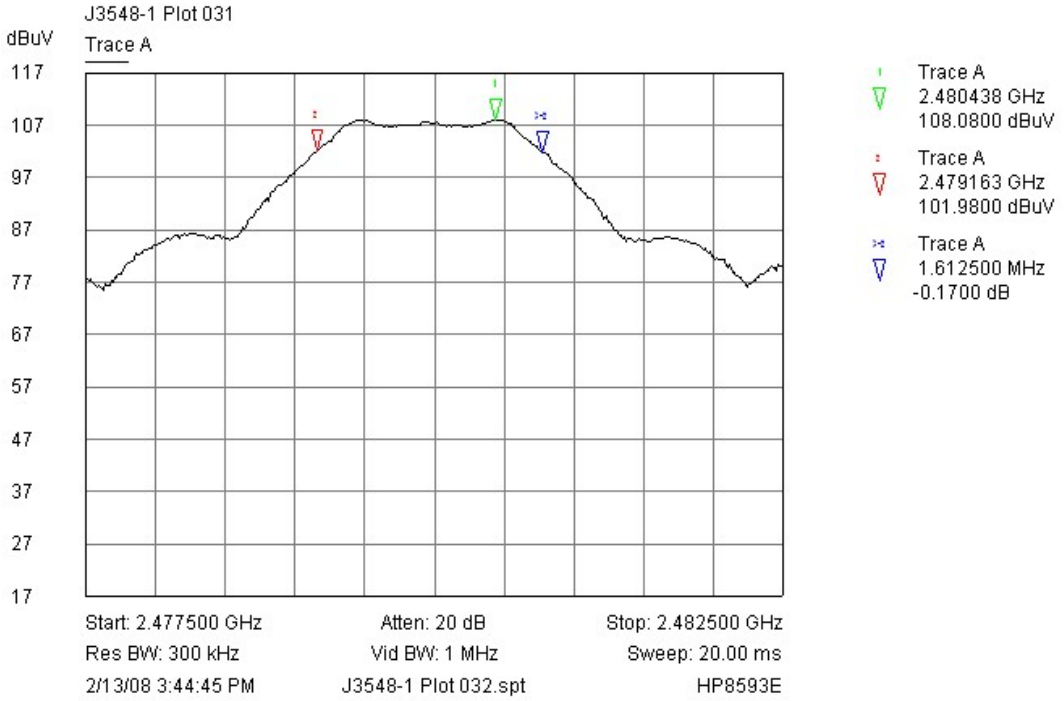
Low Channel.




Middle Channel.



High Channel.



# 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

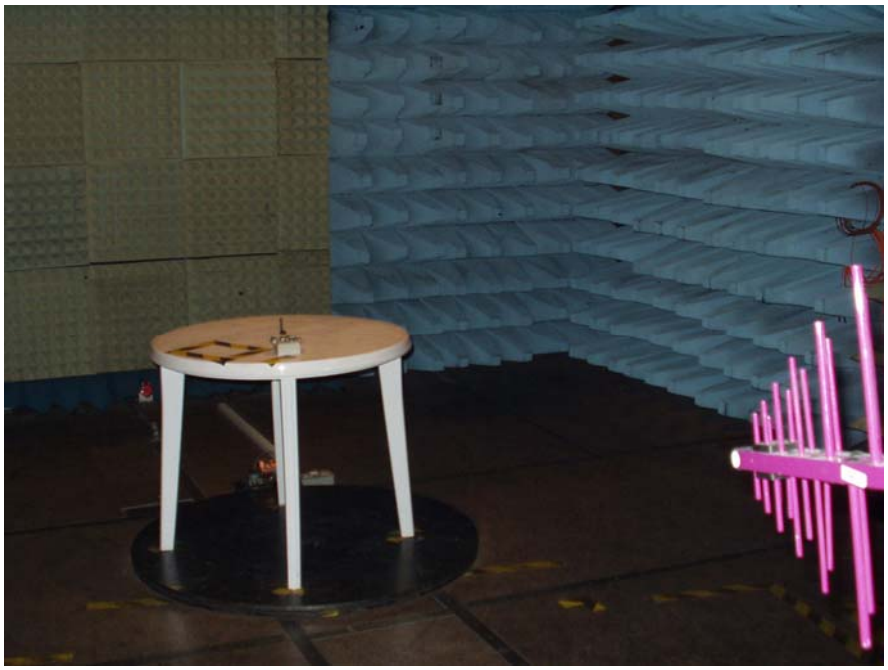
The limits given in the test standard are normally expressed as absolute values (e.g. in µV/m at a specified distance), whereas the measured values are expressed as peak, quasi peak or average values in dBµV/m referenced to the measuring instrument inputs. RN Electronics calibrate the test set-up to 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:

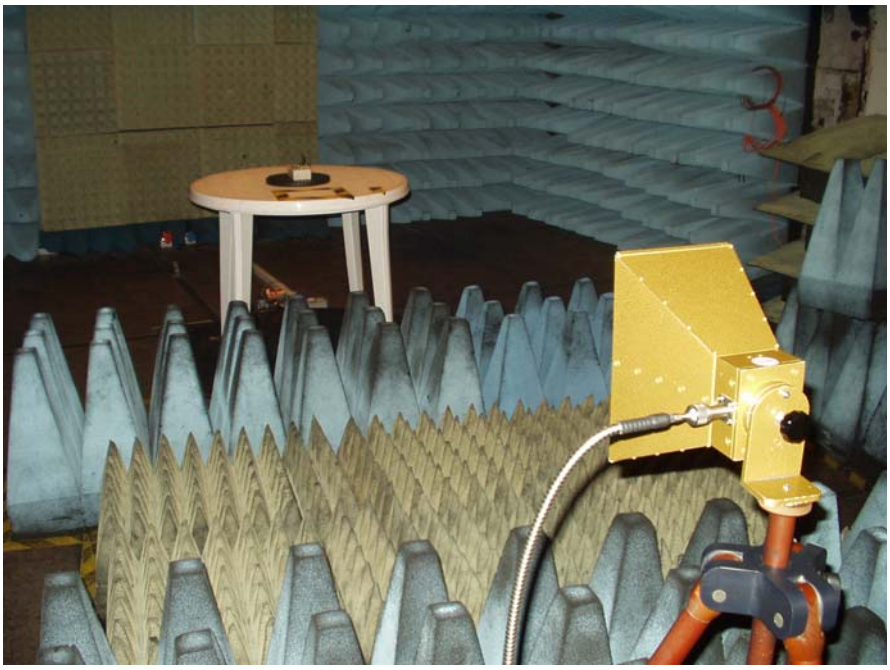
(a) limit of 500 µV/m equates to 20.log (500) = 54 dB µV/m.

(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.

## 8.2 EUT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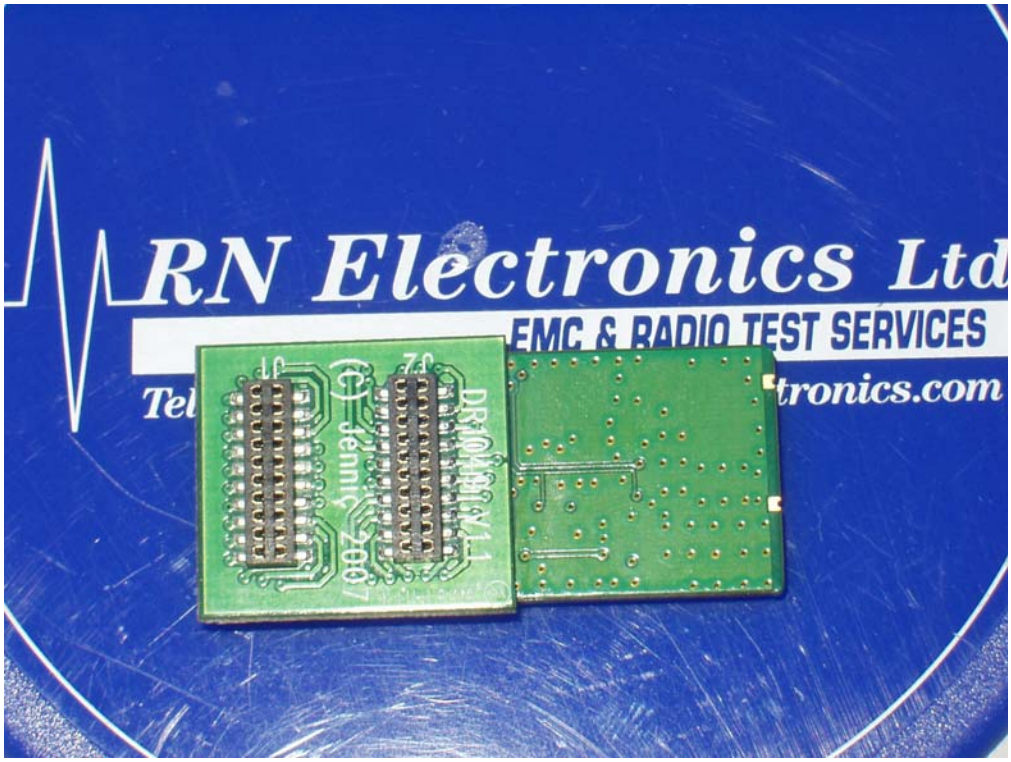
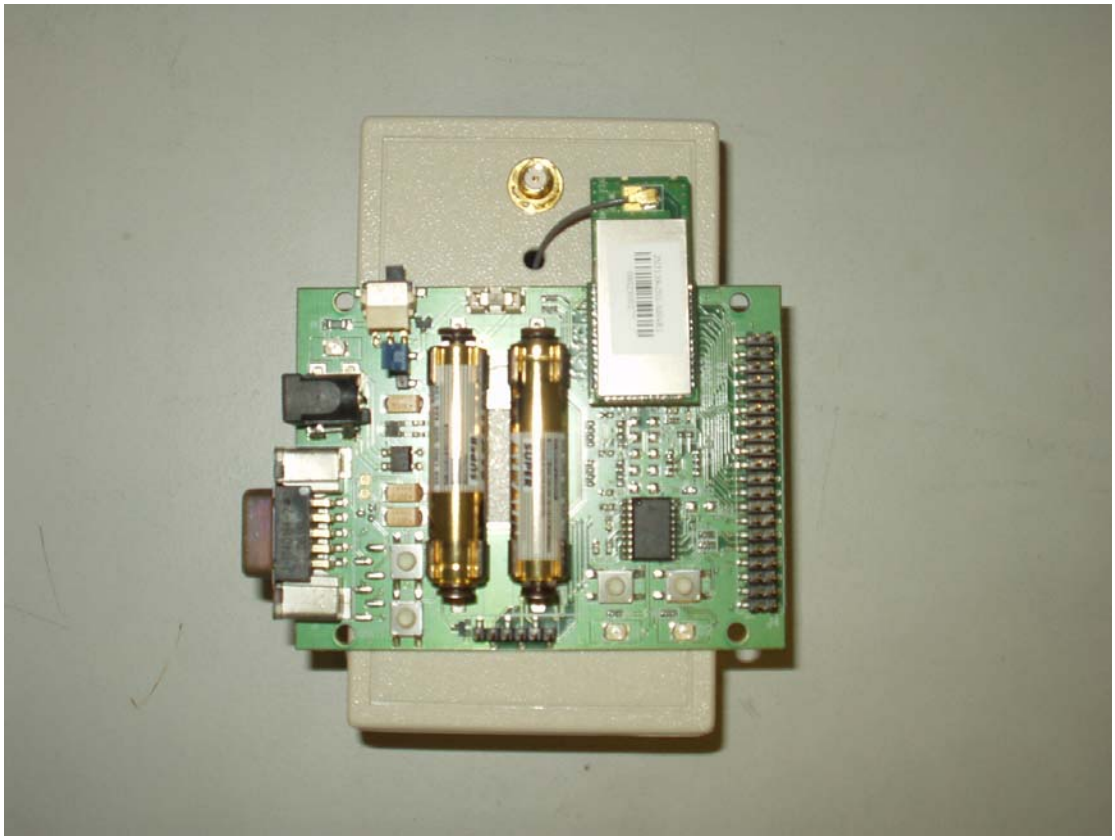
JN5139-Z01-M04R1
0802900277


RN Electronics Ltd
EMC & RADIO TEST SERVICES

## 8.3 EUT in Test Jig



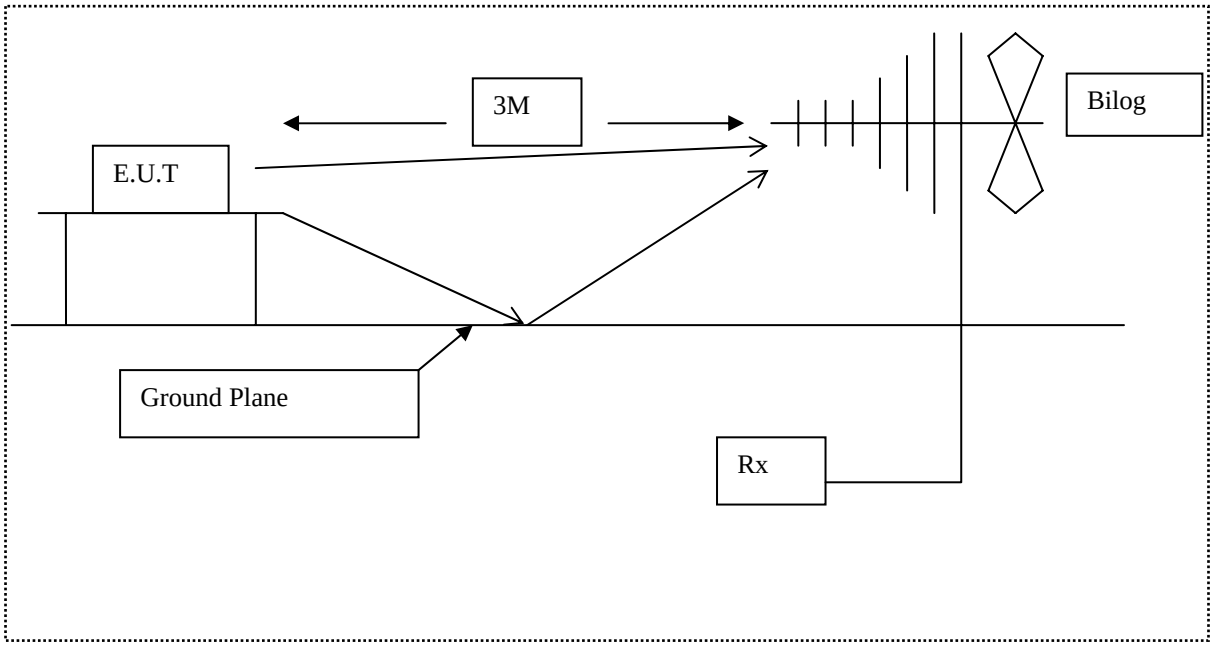



Diagram of the radiated emissions test setup.

## 9. Signal Leads

None. EUT Battery powered.

n.b. Test jig included UFL to SMA coax connector to which the dedicated antenna was attached.

## 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 Calibrated | Period |
|---|---|---|---|---|---|
| E1 | HP8542E | EMI Receiver & RF Filter | Hewlett Packard | 13-Nov-07 | 12 |
| E238 | FC5343A | 2.7 - 5.0 GHz BPF | IFR | N/A | N/A |
| E239 | H-34-2720-01 | 2.0 - 2.9 GHz BPF | Marconi | 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 | 14-Feb-06 | 24 |
| E268 | BHA 9118 | 1-18 GHz Horn Antenna | Schaffner | 26-May-06 | 60 |
| E290 | 6914 | Power Sensor | Marconi Instruments | 08-Nov-06 | 24 |
| E291 | 6960A | RF Power Meter | Marconi Instruments | 08-Nov-06 | 24 |
| E3 | HP8593E | Spectrum Analyser | Hewlett Packard | 20-Sep-06 | 24 |
| E320 | 8430A | Bandpass Filter 800 MHz - 2.0 GHz | HP | N/A | N/A |
| E5 | HP8447F | Pre-Amplifier | Hewlett Packard | 02-Oct-07 | 12 |
| 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 | 26-Oct-07 | 12 |
| TMS82 | 8449B | Pre Amplifier 1 - 26 GHz | Agilent | 26-Oct-07 | 12 |
| TMS933 | CBL6141A | Bilog Antenna 30MHz - 2GHz | York EMC | 10-Sep-07 | 36 |

# 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 |
|---|---|---|---|
| Jennic Ltd | jig for adapting UFL connector to SMA for testing | TTL-232R-3V3 | - |
| Jennic Ltd | PCB test board | DR1080 v1.0 | - |
| gigaAnt | Swivel SMA antenna | Titanis 2.4GHz | - |

## 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

| Manufacturer | Description | Model Number | Serial Number |
|---|---|---|---|
| Hewlett-Packard | DC power supply | 6632A | 2851A01971 |

## 12. Modifications

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

NONE.

n.b. The settings of the device - continuous transmit, power level, frequency were set by test software not normally available to the user.

## 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.

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# *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, subject to deviations as detailed in this report.

*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: | 3rd Generation wireless microcontroller |
| Model Number(s): | JN5139-Z01-M04R1 |
| Unique Serial Number(s): | 0802900277 |
| Manufacturer: | Jennic Ltd |
| Customer Purchase Order Number: | PO 004561/CF |
| R.N. Electronics Limited Report Number: | 02-231/3548/1/08 |
| Test Standards: | FCC Part 15C: effective date January 30th 2008 Class DTS Intentional Radiator |
| Date: | 14th February 2008 |

For and on behalf of
R.N. Electronics Limited

Signature: Paul Darragh

Digitally signed by Paul Darragh
DN: CN = Paul Darragh, C = GB, OU = RN Electronics
Date: 2008.03.06 15:31:24 Z



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