FCC
Test Report
for
Wireless Retail Shelf-Edge Zero Power LCD Display
EDK230 Issue 3
S/n EM00000112

Report Number 03-169/3312/1/07
Report Produced by: -

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1. Contents

2. Summary of Test Results

The Wireless Retail Shelf-Edge Zero Power LCD DisplayEDK230 Issue 3 was tested to the following standards: -

FCC Part 15C (effective date March 11, 2005); Class DXT Intentional Radiator

Title	Reference	Results
1. Conducted Emissions	FCC Part 15C §15.207	PASSED
2. Radiated Emissions	FCC Part 15C §15.205, §15.209 & §15.249	PASSED
3. Modulation Bandwidth	FCC Part 15C §15.215(c), §15.249	PASSED
4. Intentional Radiator Field Strength	FCC Part 15C §15.249	PASSED
5. Frequency Tolerance	FCC Part 15C §15.225, §15.229, §15.233, §15.249(b)	NOT APPLICABLE[1]
6. Duty Cycle	FCC Part 15C §15.231, §15.240	NOT APPLICABLE[1]
7. Power Spectral Density	FCC Part 15C §15.247	NOT APPLICABLE[1]
8. Frequency separation	FCC Part 15C §15.247	NOT APPLICABLE[1]
9. No. of hopping channels	FCC Part 15C §15.247	NOT APPLICABLE[1]

[1] No specification requirement for this type of equipment.

Date of Test: 22nd March 2007

Test Engineer: Daniel Sims — Digitally signed by Daniel Sims DN: CN = Daniel Sims, C = GB, O = RN Electronics Date: 2007.04.23 08:55:04 +01'00'

Approved By: Roger Ray — Digitally signed by Roger Ray DN: CN = Roger Ray, C = GB, O = RN Electronics Date: 2007.04.23 09:19:21 +01'00'

Customer Representative:

3. Information about Equipment Under Test

Manufacture of EUT	The Technology Partnership Melbourn Science Park Cambridge Road Melbourn Royston Hertfordshire SG8 6EE
Full name of EUT	Wireless Retail Shelf-Edge Zero Power LCD Display
Model Number of EUT	EDK230 Issue 3
Serial Number of EUT	EM00000112
FCC ID (if applicable):	
Date when equipment was received by RN Electronics Limited	22nd March 2007
Date of test:	22nd March 2007
Customer order number:	ET1257/ SRT
A visual description of EUT is as follows:	Small white plastic enclosure with an LCD display on one side.
The main function of the EUT is: promotional information	Shelf-Edge label to display retail price and
Antenna:	Integral

Equipment Under Test Information specification:

Height	120mm
Width	80mm
Depth	15mm
Weight	0.2kg
Voltage	3V DC (Battery)
Current required from above voltage source	0.1A
Highest Frequencies used / generated	902.5 – 927.5MHz

Modes of operation:

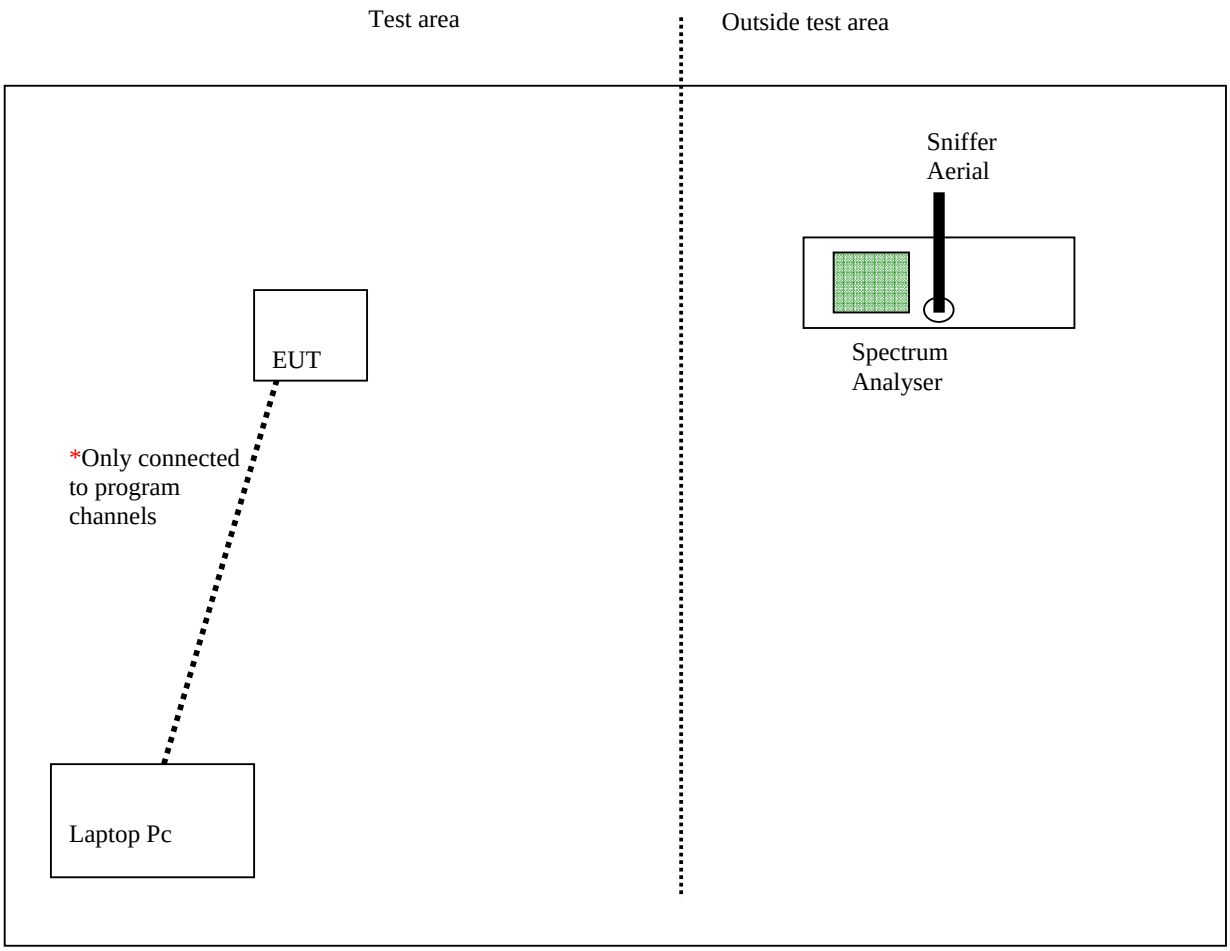
Mode	Description
TX Continuous Wave	Unmodulated continuous transmit.
TX continuous Data	Continuous Transmit with Modulation.
RX	Receive mode
Standby	Unit on and not programmed to do anything
V3 Mode	Unit operating pre-programmed data communications sequence with Bounce communicator base station

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: 23 April 2007

3.1 Configuration Diagram.



*The Shelf edge label unit was only connected via the laptop for programming of channels and modes.

The spectrum analyser was only used to ensure the correct operating channel was programmed by detecting the RF carrier signal.

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.

5. Tests, Methods and Results
5.1 Conducted Emissions

TEST NOT APPLICABLE. UNIT IS BATTERY POWERED.

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

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. Mode **TX Continuous Wave** was used for testing.

5.2.1.2 Test Procedure

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

Above 30MHz, 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.
Below 30MHz, measurements were made in a semi-anechoic chamber (pre-scan) with final measurements on an OATS without a ground plane. The antenna was placed 1m above the ground. The equipment and the antenna were rotated 360° to record the worst case emissions.
Radiated Emissions testing was performed with a new battery.
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 or OATS**.**

Test Environment:
M

Temperature: 19-20°C Humidity: 32-34%

Analyser plots for the Quasi-Peak / Average values as applicable and any table of signals within 10dB of the limit line can be found in Section 6.2 of this report.

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

5.2.2.1 Test Equipment used

E1, TMS933, E268, E3, TMS82, E242, E238, E239, N438, E219, E328

See Section 10 for more details

5.3 Intentional Radiator Field Strength

5.3.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.)

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

5.3.1.1 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The antenna was scanned 1-4m in height in both Horizontal and Vertical polarisations. The EUT was rotated in all three orthogonal planes. Mode **TX Continuous Wave** was used for testing.

5.3.1.2 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 and/ or on an OATS.

Both the equipment and the antenna were rotated 360° to record the maximised emission.

5.3.2 Test results

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

Test Environment:

Temperature: 19°C Humidity: 32 %

Any Analyser plots can be found in Section 6.3 of this report.

The highest maximised field strength measured was **91.7dBuV/m** @3metres on the top operating channel with a software power setting of **P9**.

Power setting P9 used for all channels.

Channel Frequency (MHz)	Vertical reading (dBuV/m)	Horizontal reading (dBuV/m)
Channel F11, 902.5 MHz	87.8	88.7
Channel F36, 915.0 MHz	88.9	90.3
Channel F61, 927.5 MHz	90.9	91.7

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

5.3.2.1 Test Equipment used

E1, TMS933

See Section 10 for more details

5.4 Frequency Tolerance

This test was not performed as there are no specified Limits.

5.5 Duty Cycle

This test is not applicable. Only applicable for Frequency Hopping Spread Spectrum equipment.

5.6 Maximum Spectral Power Density

This test is not applicable. Only applicable for Frequency Hopping Spread Spectrum equipment.

5.7 Modulation Bandwidth (Band Edges)

5.7.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.215)

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

5.7.1.1 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. Mode **TX Continuous Data** was used for testing.

5.7.1.2 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.

Test site 'M' has been listed with the FCC.

5.7.2 Test results

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

Temperature of test Environment: 20°C Humidity: 33 %

Analyser plots for the 20dB bandwidth can be found in Section 6.6 of this report.

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

5.7.2.1 Test Equipment used

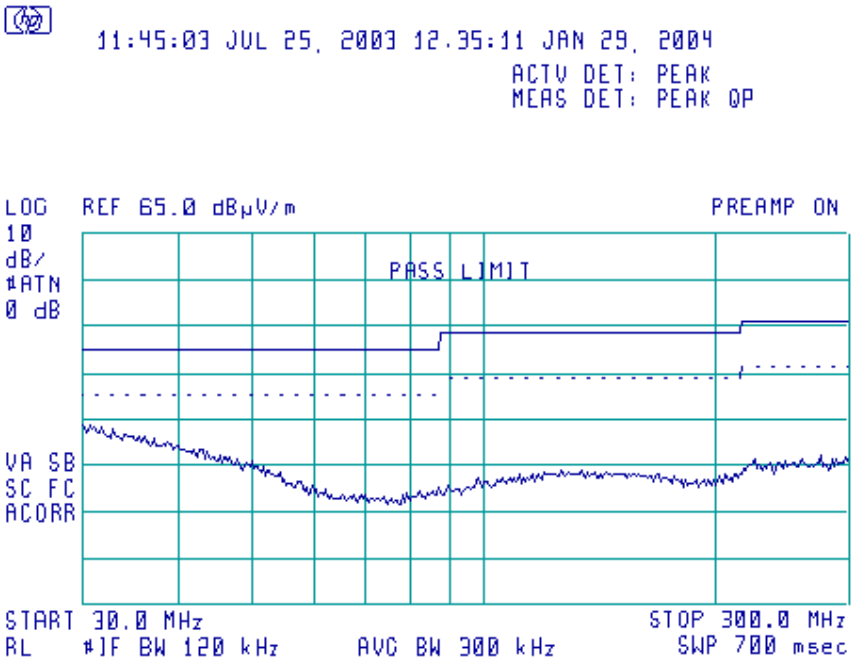
E1, TMS933, TMS907

See Section 10 for more details.

6. Plots and Results
6.1 Conducted Emissions

NOT APPLICABLE. EUT BATTERY POWERED.

6.2 Radiated Emissions



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

Horizontal Polarisation

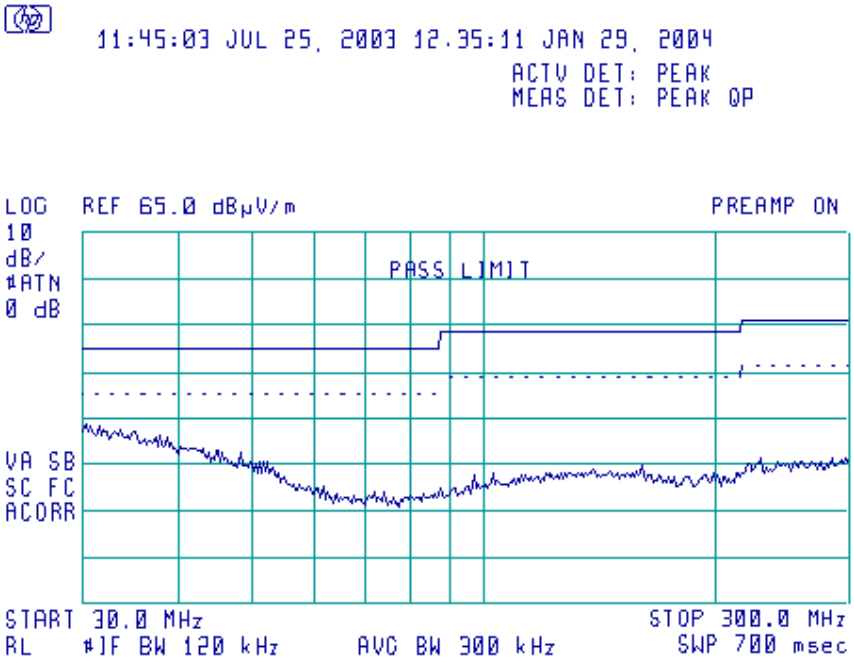
The plot shows a swept response of peak values using the quasi-peak limit line

(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

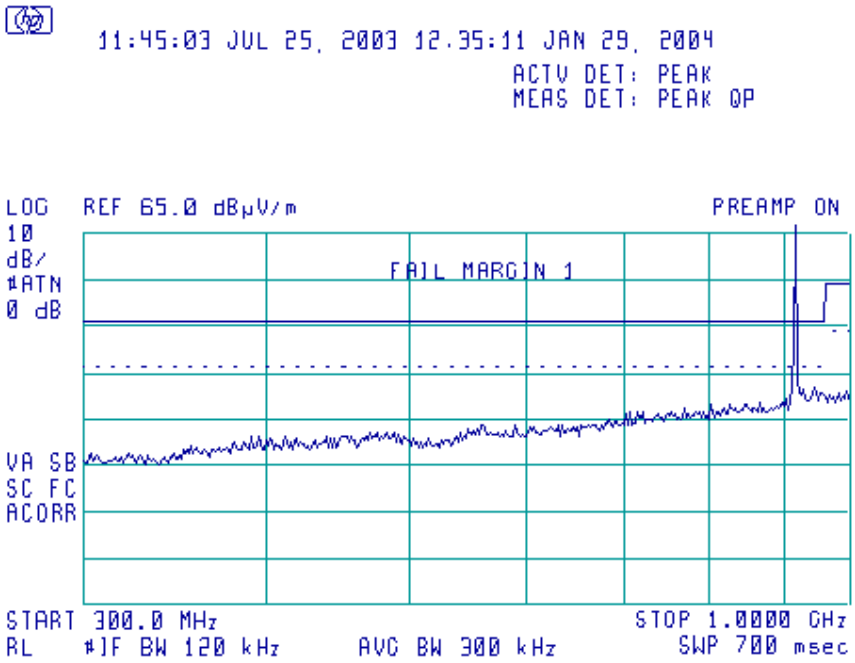
The plot shows a swept response of peak values using the quasi-peak limit line

(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

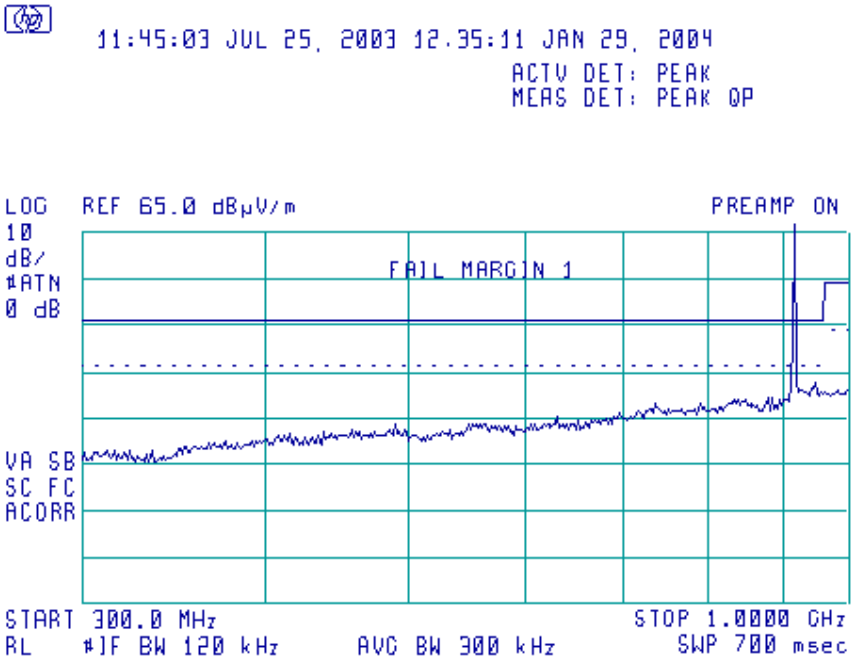
The plot shows a swept response of peak values using the quasi-peak limit line

(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

Signal	Freq (MHz)	Peak Amp (dBuV/m)	Peak - Lim1 (dB)	QP Amp (dBuV/m)	QP - Lim1 (dB)
1	914.991425	90.09	44.09	89.81	43.81

Measurement Uncertainty of ± 5.2dB Applies



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

Vertical Polarisation

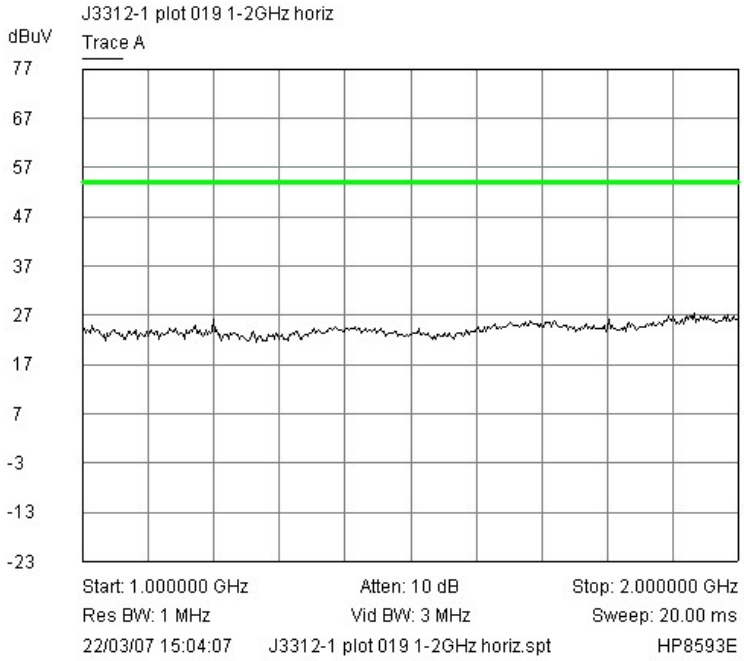
The plot shows a swept response of peak values using the quasi-peak limit line

(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

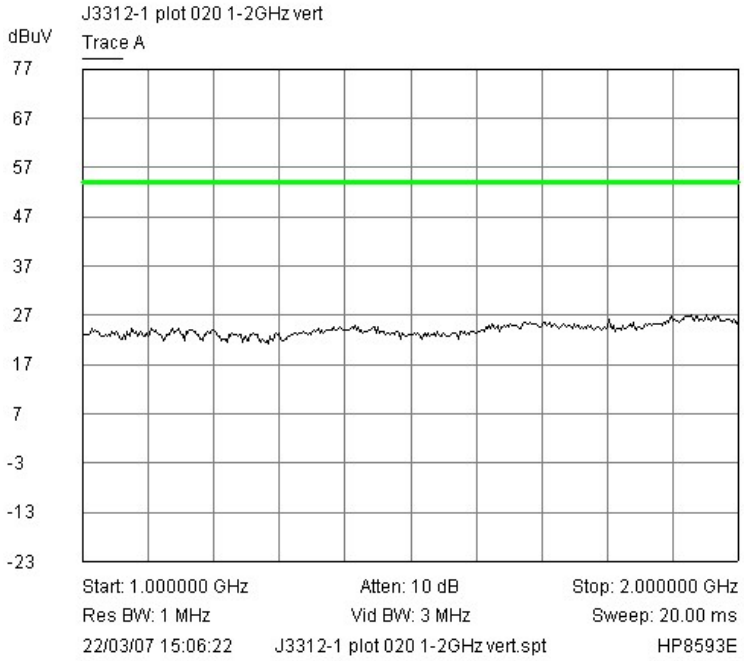
Signal	Freq (MHz)	Peak Amp (dBuV/m)	Peak - Lim1 (dB)	QP Amp (dBuV/m)	QP - Lim1 (dB)
1	914.991806	89.37	43.37	89.09	43.09

Measurement Uncertainty of ± 5.2dB Applies



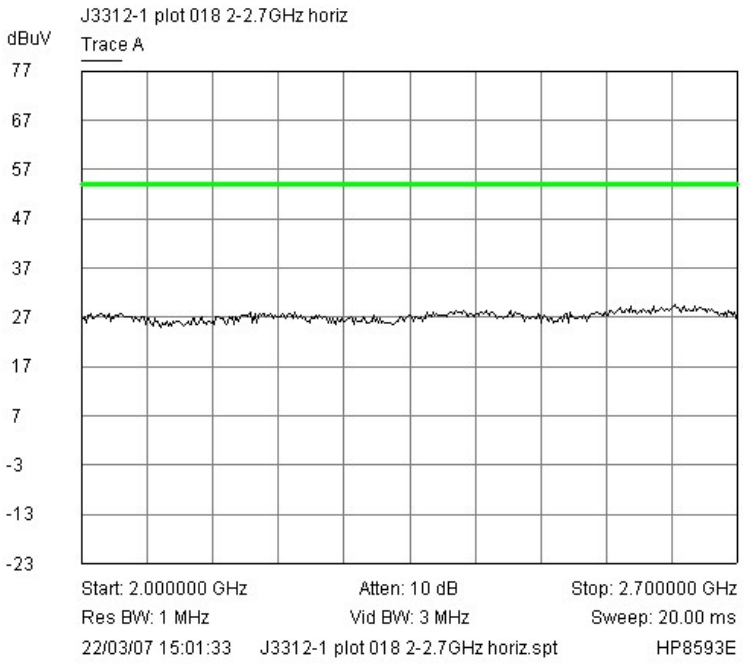
Average Values of 1 to 2GHz.

Horizontal Polarisation



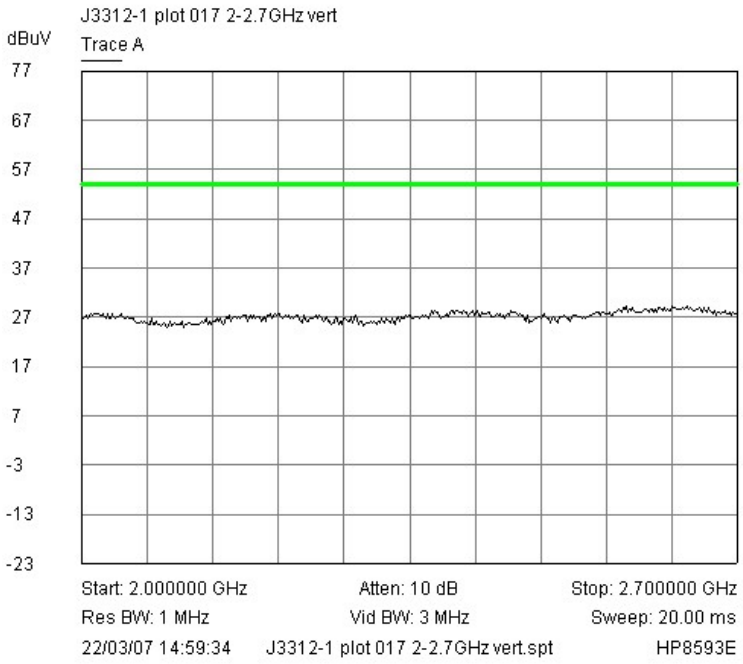
Average Values of 1 to 2GHz.

Vertical Polarisation



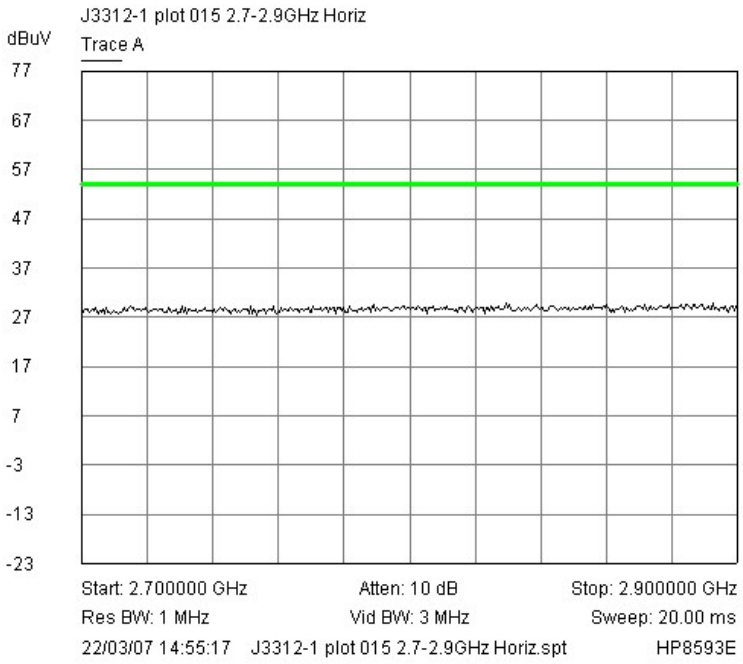
Average Values of 2 – 2.7 GHz.

Horizontal Polarisation



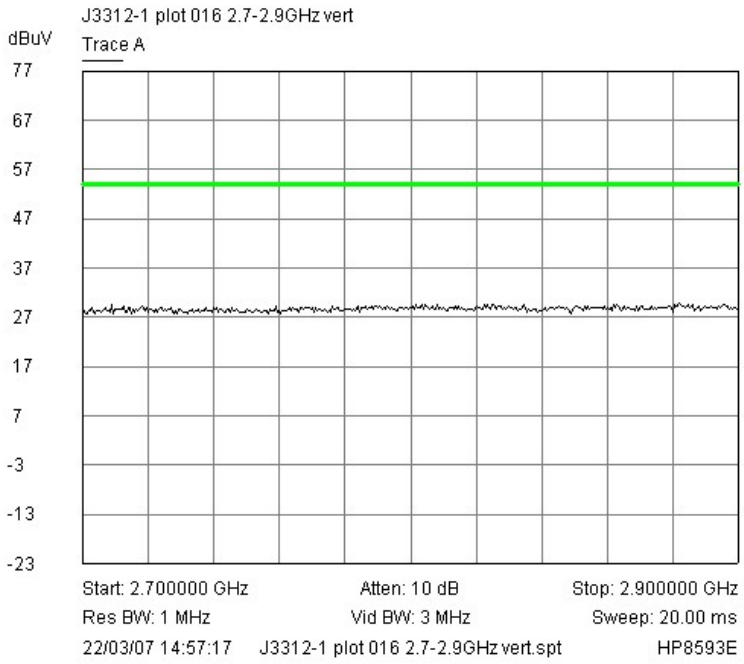
Average Values of 2 - 2.7 GHz.

Vertical Polarisation



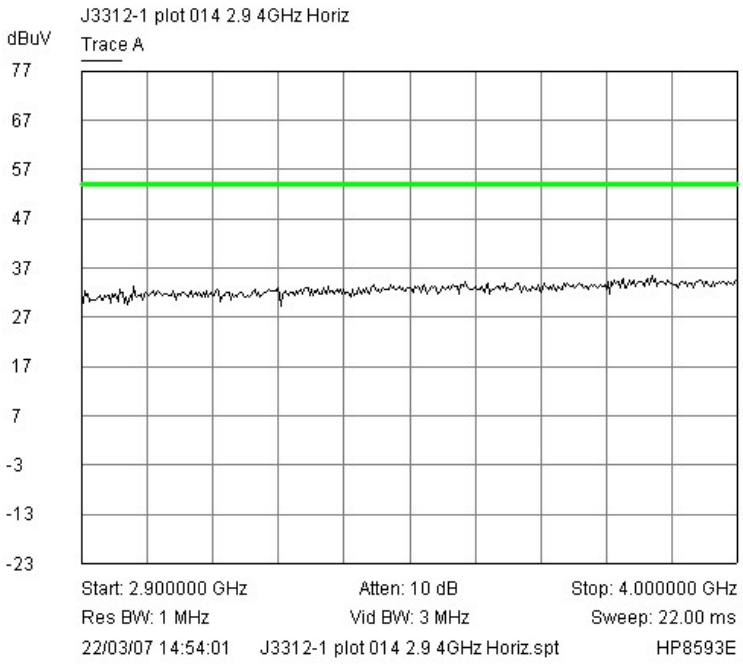
Average Values of 2.7 - 2.9 GHz.

Horizontal Polarisation

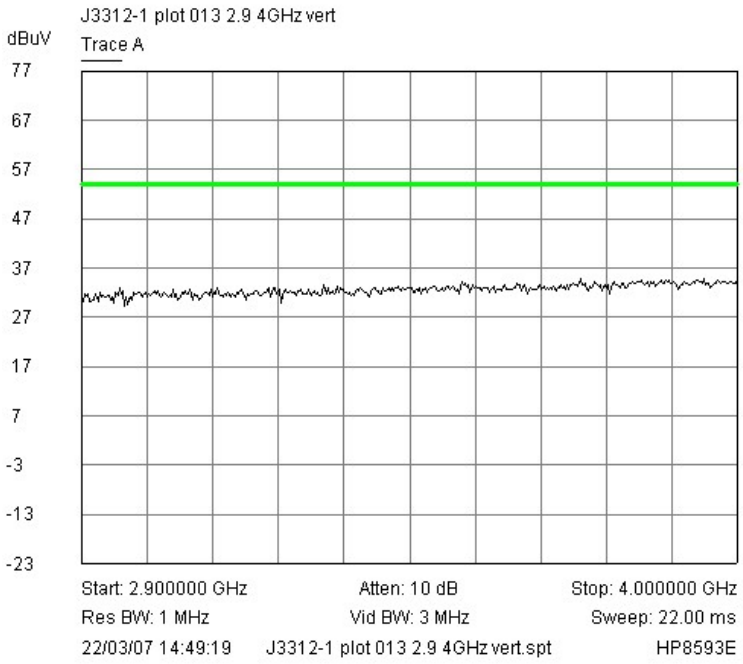


Average Values of 2.7 - 2.9 GHz.

Vertical Polarisation

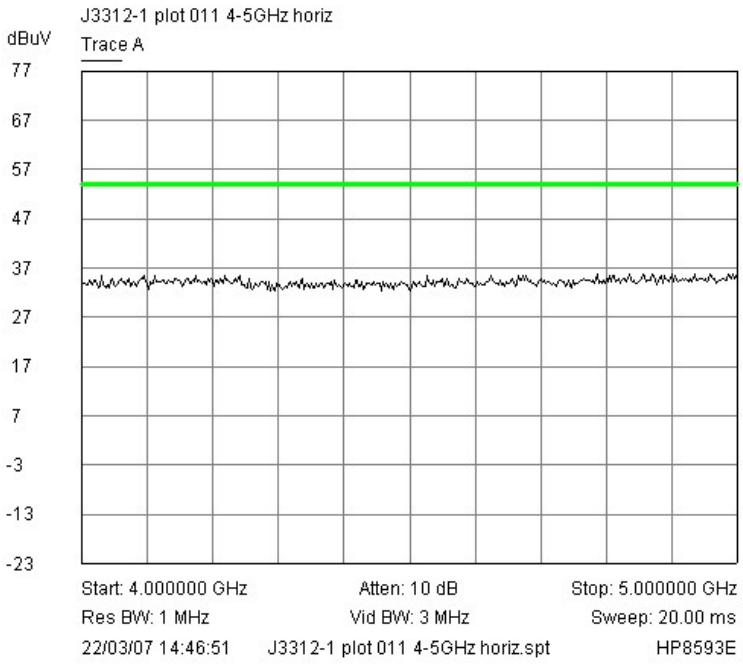


Average Values of 2.9 to 4 GHz.
Horizontal Polarisation



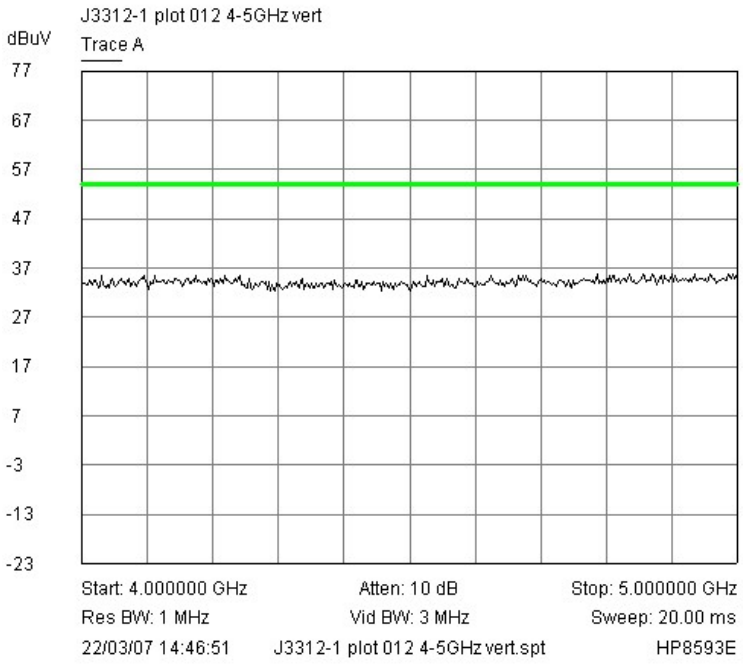
Average Values of 2.9 to 4 GHz.

Vertical Polarisation



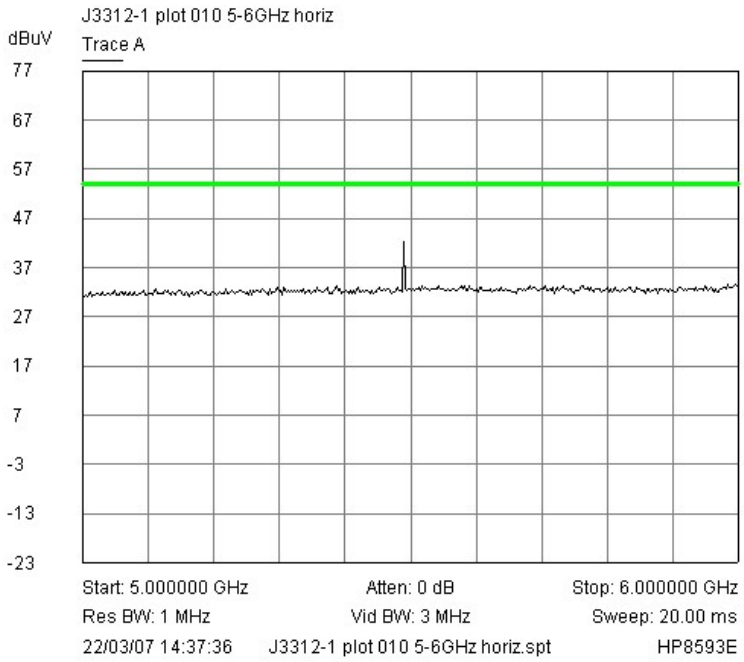
Average Values of 4 – 5 GHz.

Horizontal Polarisation

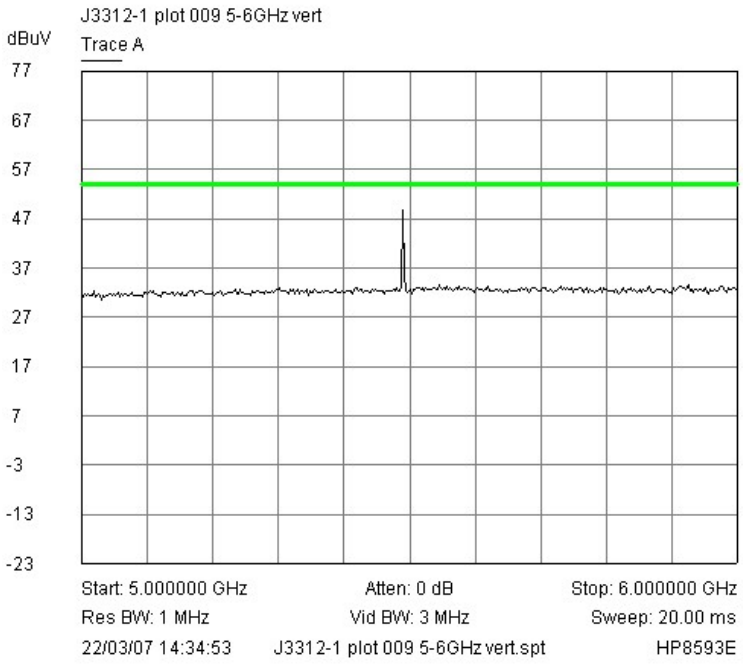


Average Values of 4 – 5 GHz.

Vertical Polarisation

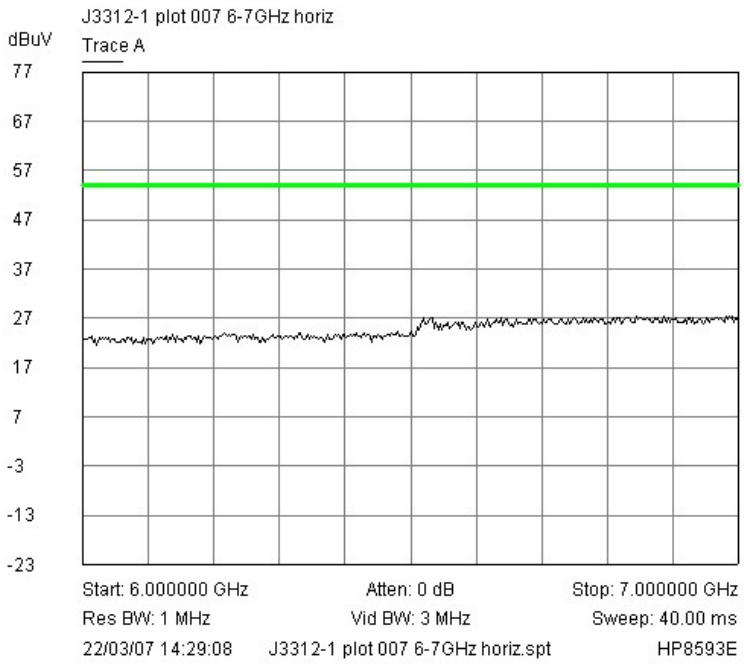


Average Values of 5 - 6 GHz.
Horizontal Polarisation

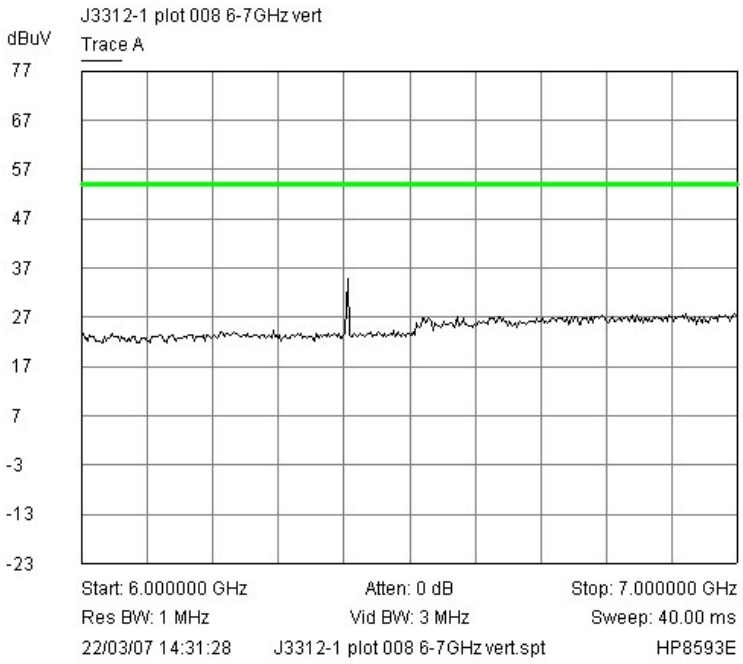


Average Values of 5 - 6 GHz.

Vertical Polarisation

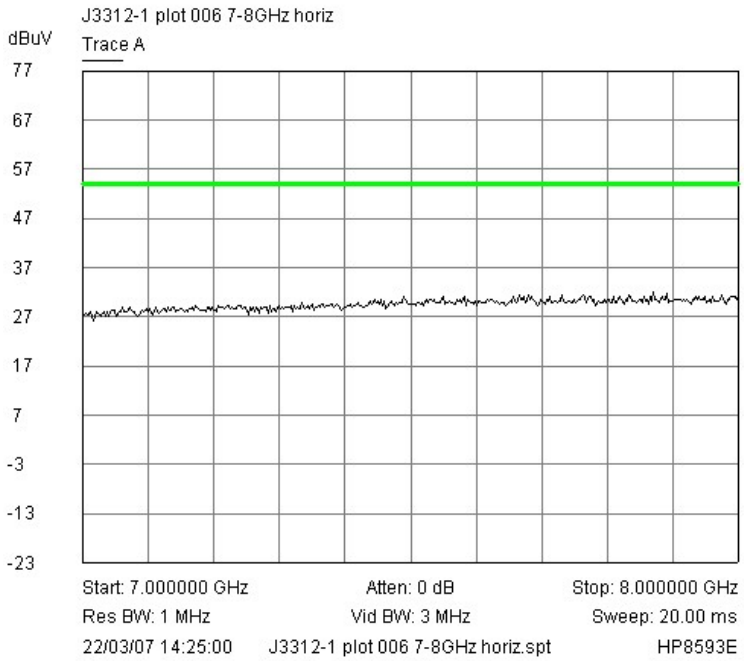


Average Values of 6 – 7 GHz.
Horizontal Polarisation



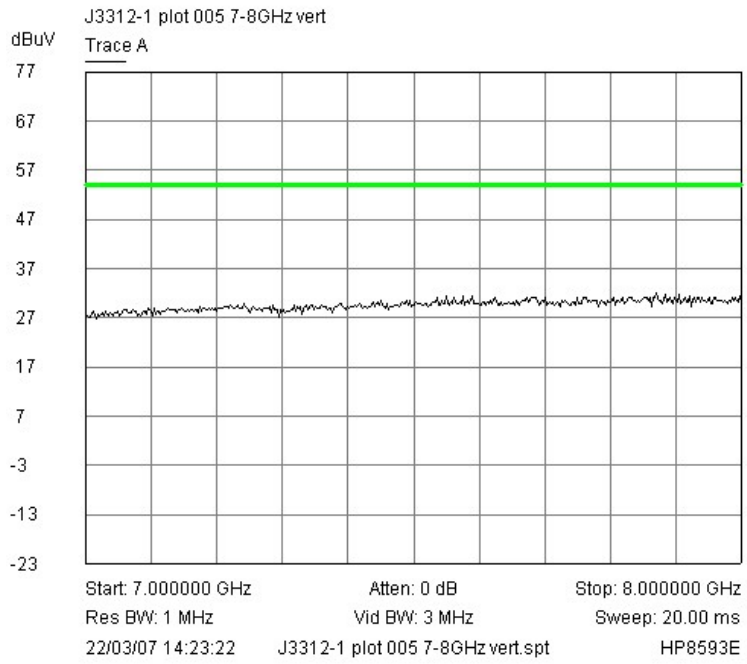
Average Values of 6 – 7 GHz.

Vertical Polarisation



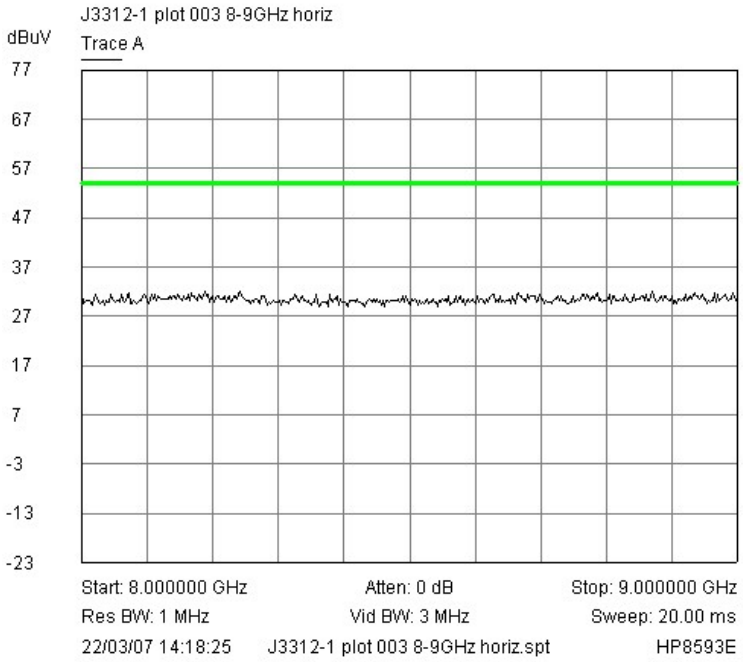
Average Values of 7 – 8 GHz.

Horizontal Polarisation



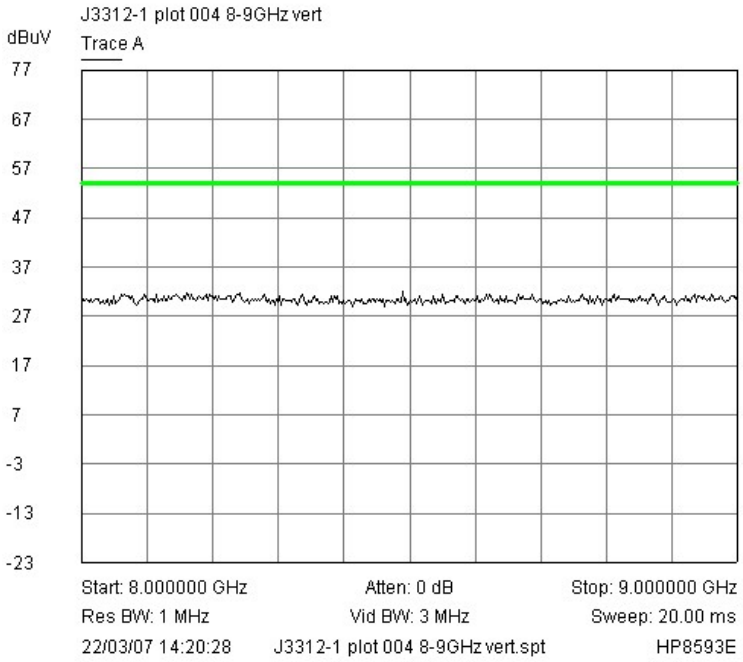
Average Values of 7 – 8 GHz.

Vertical Polarisation



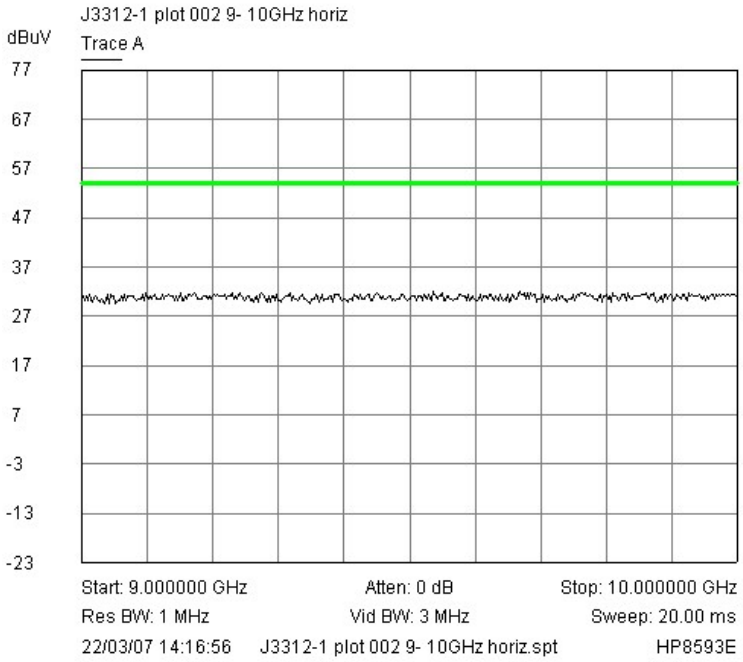
Average Values of 8 – 9 GHz.

Horizontal Polarisation



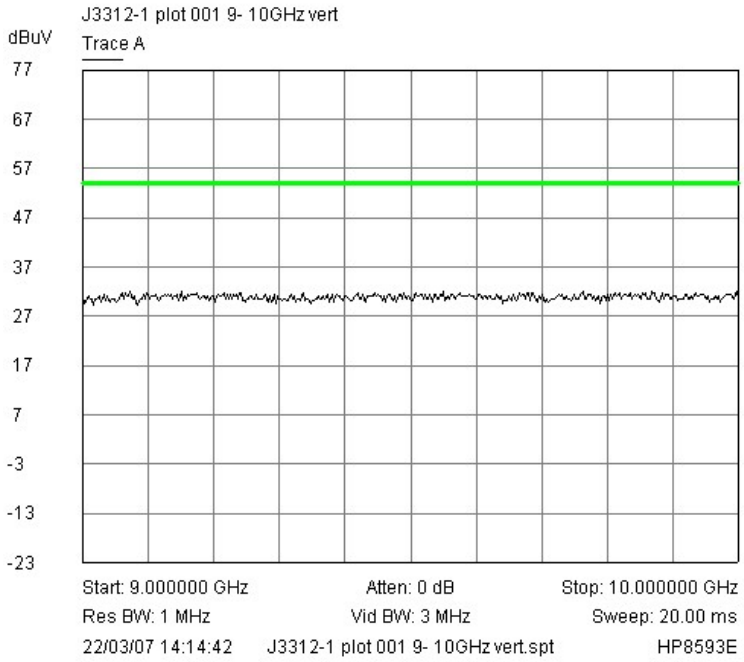
Average Values of 8 – 9 GHz.

Vertical Polarisation



Average Values of 9 – 10 GHz.

Horizontal Polarisation



Average Values of 9 – 10 GHz.

Vertical Polarisation

Signal Lists.

Bottom Channel (902.5MHz)

Signal	Frequency MHz	Average Measured	Average –Limit line	Antenna Polarization
1	5415	45	-9.0	Vertical
2	5415	53.5	-0.5	Horizontal

Middle Channel (915MHz)

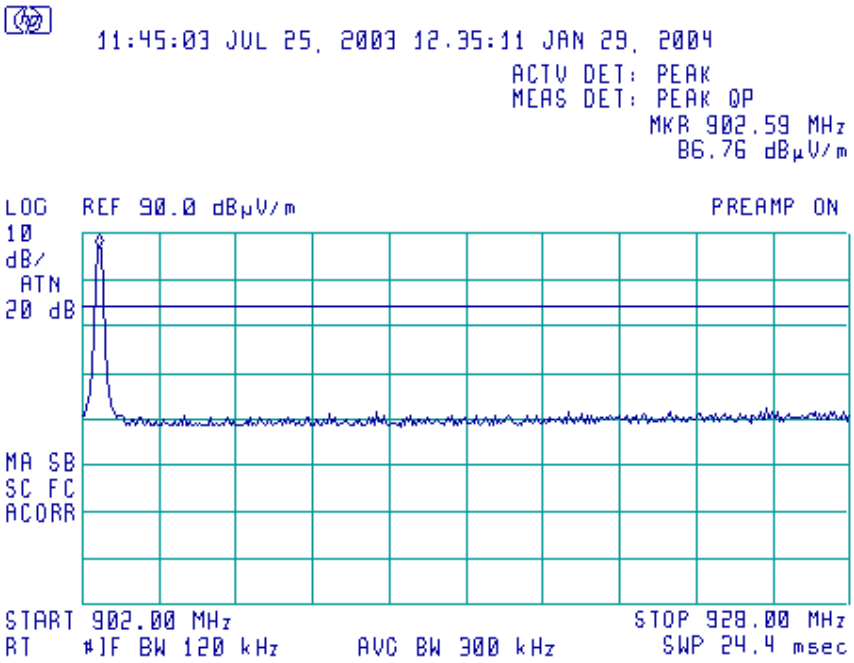
Signal	Frequency MHz	Average Measured	Average –Limit line	Antenna Polarization
1	5490	53.3	-0.7	Vertical
2	5490	50.1	-3.9	Horizontal
3	6405	43	-11.0	Vertical

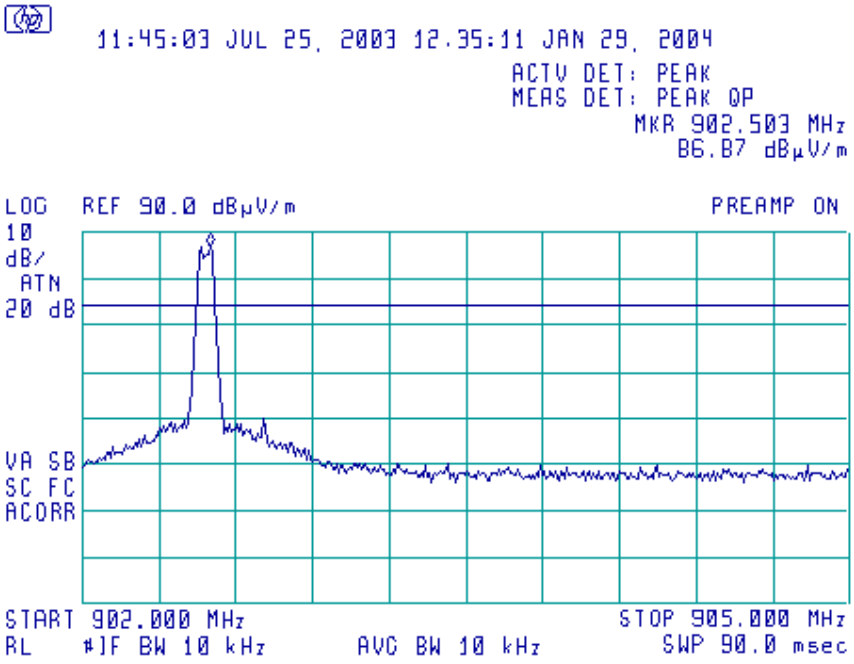
Top Channel (927.5MHz)

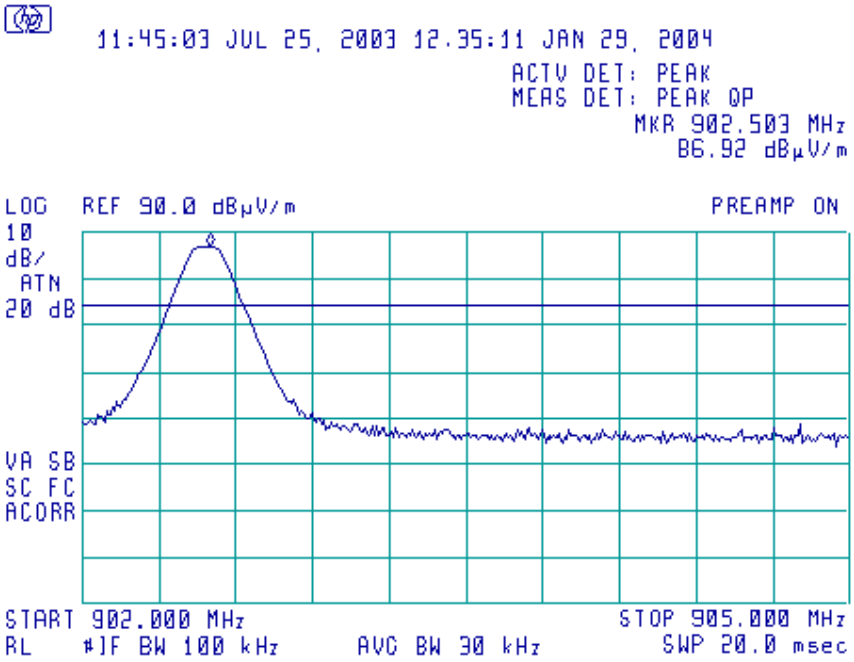
Signal	Frequency MHz	Average Measured	Average –Limit line	Antenna Polarization
1	5565	53.4	-0.6	Vertical
2	5565	48.6	-5.4	Horizontal
3	6492	53.1	-0.9	Vertical

6.3 Modulation Bandwidth

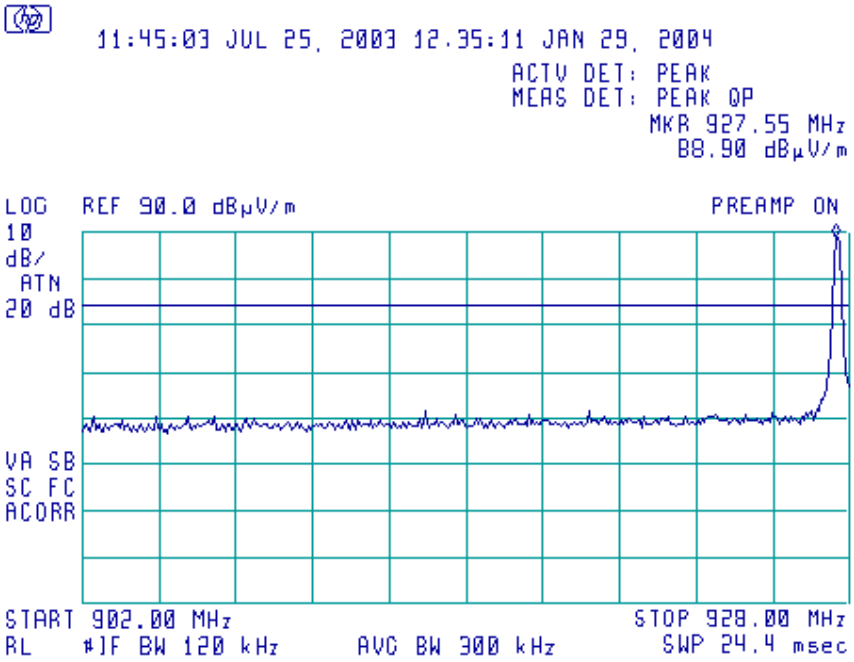
Band Edges.
Bottom Channel.

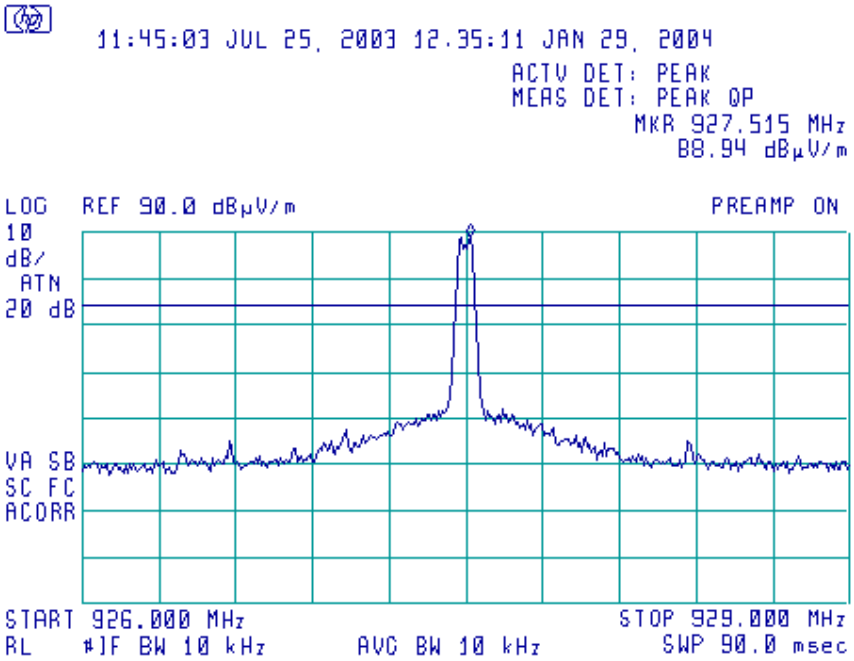


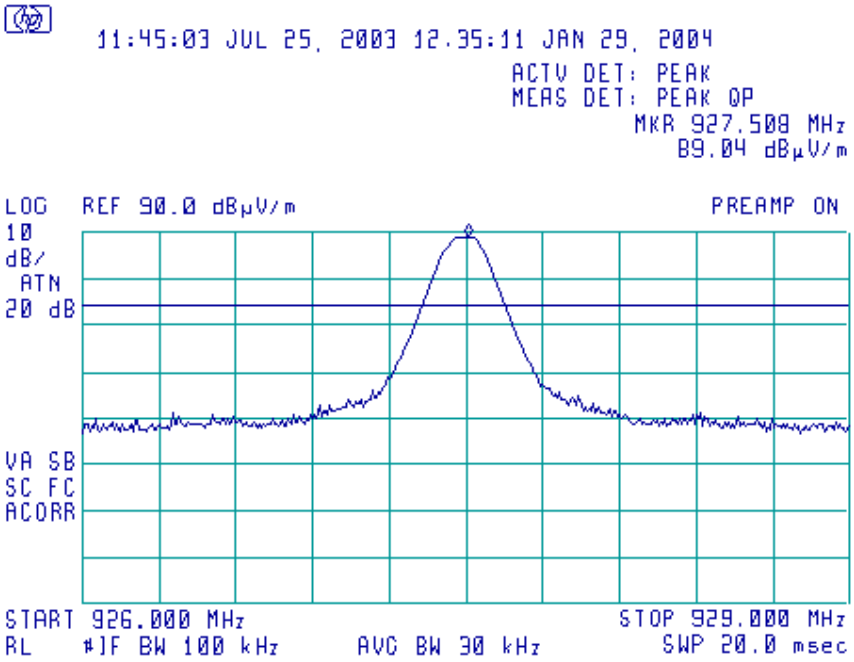



11:45:03 JUL 25, 2003 12.35:11 JAN 29, 2004
ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 902.503 MHz
86.92 dBµV/m
LOG REF 90.0 dBµV/m
PREAMP ON
10
dB/
ATN
20 dB
VA SB
SC FC
ACORR
START 902.000 MHz
STOP 905.000 MHz
RL #IF BW 100 kHz
AVG BW 30 kHz
SWP 20.0 msec

Top Channel.


11:45:03 JUL 25, 2003 12.35:11 JAN 29, 2004
ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 927.55 MHz
88.90 dBµV/m
LOG REF 90.0 dBµV/m
PREAMP ON
10 dB/
ATN 20 dB
VA SB
SC FC
ACORR
START 902.00 MHz
STOP 928.00 MHz
RL #IF BW 120 kHz
AVG BW 300 kHz
SWP 24.4 msec


11:45:03 JUL 25, 2003 12.35:11 JAN 29, 2004
ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 927.515 MHz
88.94 dBµV/m
LOG REF 90.0 dBµV/m
PREAMP ON
10 dB/
ATN 20 dB
VA SB
SC FC
ACORR
START 926.000 MHz
STOP 929.000 MHz
RL #IF BW 10 kHz
AVG BW 10 kHz
SWP 90.0 msec


11:45:03 JUL 25, 2003 12.35:11 JAN 29, 2004
ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 927.508 MHz
89.04 dBµV/m
LOG REF 90.0 dBµV/m
PREAMP ON
10
dB/
ATN
20 dB
VA SB
SC FC
ACORR
START 926.000 MHz
STOP 929.000 MHz
RL #IF BW 100 kHz
AVG BW 30 kHz
SWP 20.0 msec

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.

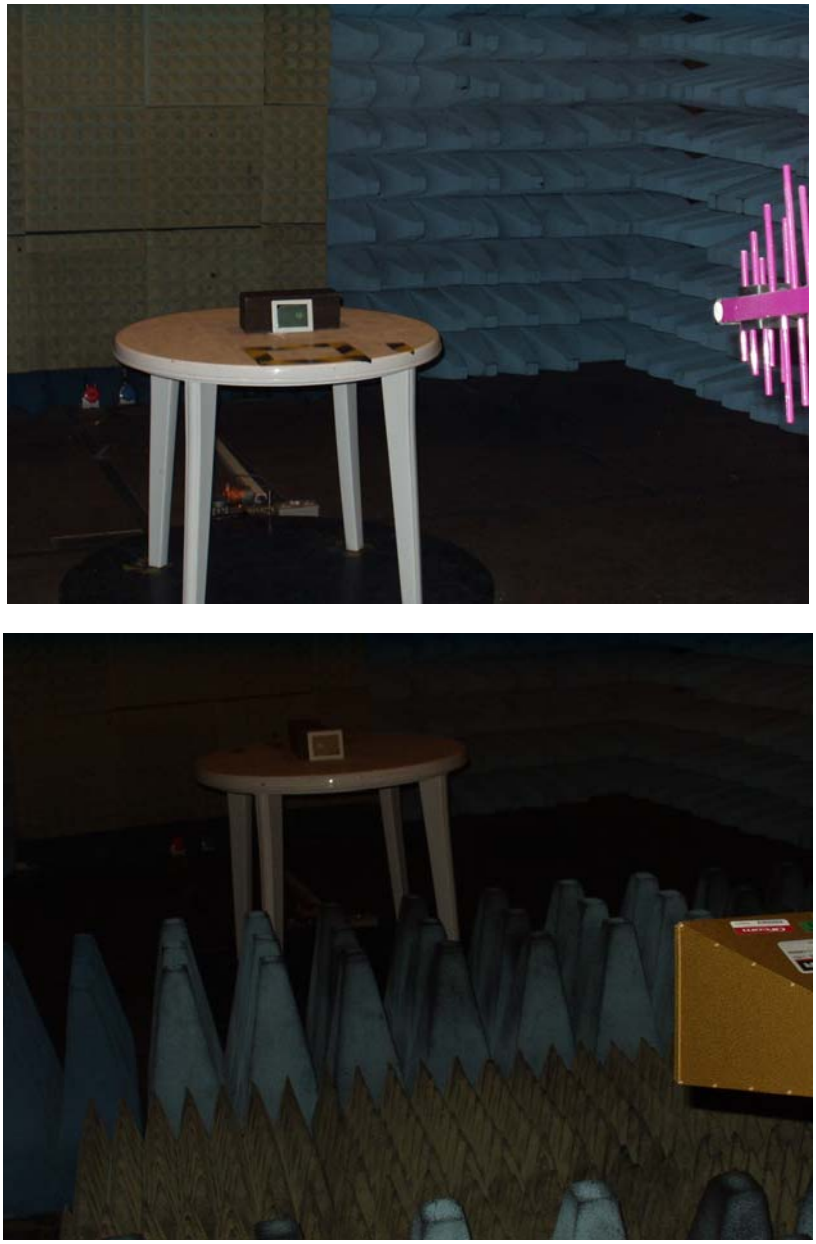
Column Six, labelled AV Delta L 1 (dB), (can also be labelled, in the case of Quasi Peak, QP Delta L 1 (dB)) is the Average or Quasi Peak calculation relevant to the limit line. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate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

8. Photographs



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

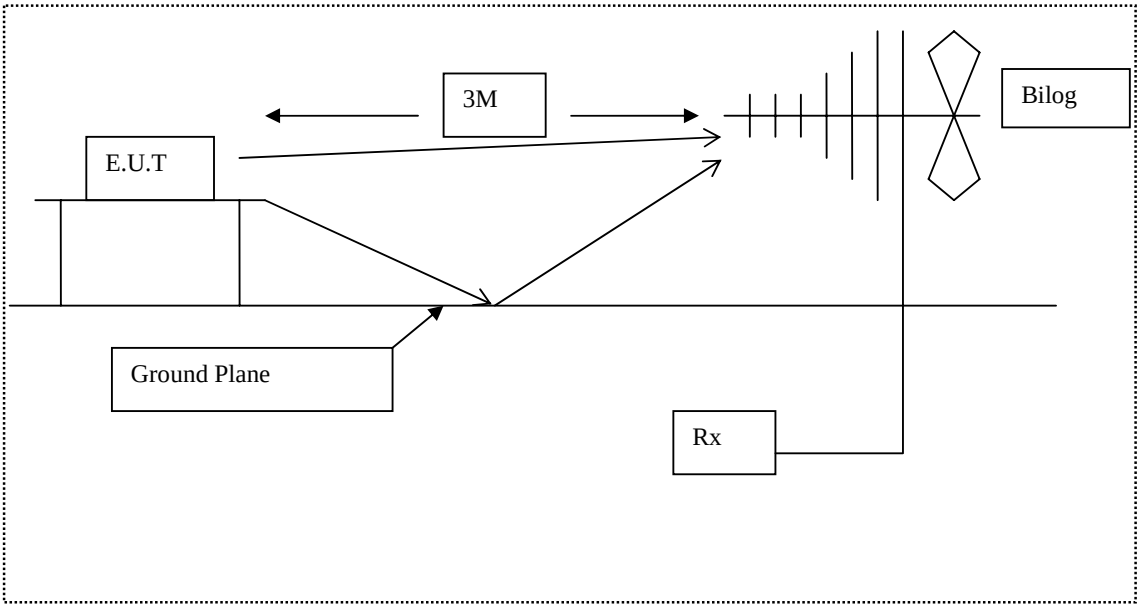


Diagram of the radiated emissions test setup.

NOT APPLICABLE.

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

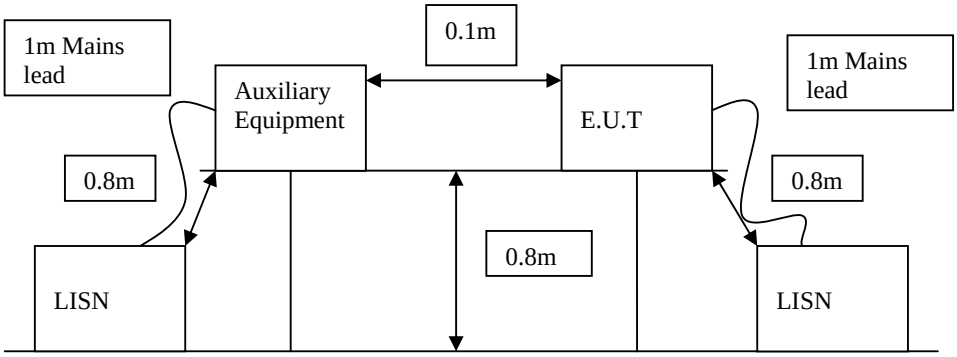


Diagram of the conducted emissions test setup.

Front view of the EUT

Back view of the EUT

9. Signal Leads

NONE.

10. Test Equipment Calibration list

The Following is a list of the test equipment currently in use at ***R.N. Electronics Ltd.*** EMC test facility. In line with our procedures, to meet the requirements of ISO 9001, the equipment used will be within calibration for the period during which testing was carried out.

RNNo	Model	Description	Manufacturer
E1	HP8542E	EMI Receiver & RF Filter	Hewlett Packard
E238	FC5343A	2.7 - 5.0 GHz BPF	IFR
E239	H-34-2720-01	2.0 - 2.9 GHz BPF	Marconi
E242	22102	Bandpass filter 7.8 - 16 GHz	Merimec
E268	BHA 9118	1-18 GHz Horn Antenna	Schaffner
E3	HP8593E	Spectrum Analyser	Hewlett Packard
E319	H-34-2720-01	Transmit Filter 1.5-2.0 GHz	The Marconi Company Ltd
N438	3513 172 1208	3.9 - 7.5 GHz BPF	MEL
TMS82	8449B	Pre Amplifier 1 - 26 GHz	Agilent
TMS907	TH200	ThermoHygrometer	RS Components
TMS933	CBL6141A	Bilog Antenna 30MHz - 2GHz	York EMC

11. Auxiliary equipment

11.1 Auxiliary equipment supplied by The Technology Partnership

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

Manufacturer	Description	Model Number	Serial Number
Dell	laptop pc	-	-
Hewlett Packard	Spectrum analyser	HP859x series	-

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:

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, 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:	Wireless Retail Shelf-Edge Zero Power LCD Display
Model Number(s):	EDK230 Issue 3
Unique Serial Number(s):	EM00000112
Manufacturer:	ZBD Displays Ltd
Customer Purchase Order Number:	ET1257/ SRT
R.N. Electronics Limited Report Number:	03-169/3312/1/07
Test Standards:	FCC Part 15C: effective date March 11th 2005 Class DXT Intentional Radiator
Date:	22nd March 2007

For and on behalf of
R.N. Electronics Limited

Signature:

Roger Ray

Digitally signed by Roger Ray
DN: CN = Roger Ray, C = GB, O = RN Electronics
Date: 2007.04.23 09:19:39 +01'00'

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