FCC
Test Report
for
MasterCue V5 USB
i2TX1, i2TX2, i2TX3

Report Number 03-087/3051/6/06A
Supersedes Report Number 03-087/3051/6/06
Report Produced by: -

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1. Contents

2. Summary of Test Results

The MasterCue V5 USB, i2TX-3 was tested to the following standards: -

FCC Part 15C (effective date February 16, 2006); Class DSC Intentional Radiator

Title	Reference	Results
1. Conducted Emissions	FCC Part 15C §15.207	NOT APPLICABLE[1]
2. Radiated Emissions	FCC Part 15C §15.205, §15.209 & §15.231	PASSED
3. Modulation Bandwidth	FCC Part 15C §15.215(c), §15.231	PASSED
4. Intentional Radiator Field Strength	FCC Part 15C §15.231	PASSED
5. Frequency Tolerance	FCC Part 15C	NOT APPLICABLE[2]
6. Duty Cycle	FCC Part 15C §15.231	PASSED
7. Power Spectral Density	FCC Part 15C	NOT APPLICABLE[2]
8. Frequency separation	FCC Part 15C	NOT APPLICABLE[2]
9. No. of hopping channels	FCC Part 15C	NOT APPLICABLE[2]
10. Input power	FCC Part 15C	NOT APPLICABLE[2]
11. Sweep repetition rate	FCC Part 15C	NOT APPLICABLE[2]

[1] **E**quipment **U**nder **T**est battery powered.
[2] No particular limits specified.

Date of Test: 6th & 9th March 2006

Test Engineer: Daniel Sims — Digitally signed by Daniel Sims, DN: CN = Daniel Sims, C = GB, O = RN Electronics, Date: 2006.04.18 11:41:13 +01'00'

Approved By: Paul Darragh — Digitally signed by Paul Darragh, DN: CN = Paul Darragh, C = GB, OU = RN Electronics, Date: 2006.04.18 10:32:00 +01'00'

Customer Representative:

3. Information about Equipment Under Test

Manufacture of EUT	Hive Industries Ltd 28 High St. Arlesey Bedfordshire SG15 6RA
Full name of EUT	MasterCue V5 USB
Model Number of EUT	i2TX-1, i2TX-2, i2TX-3
Serial Number of EUT	130160000
FCC ID (if applicable):	T3Q I2TX
Date when equipment was received by RN Electronics Limited	18th January 2006
Date of test:	6th & 9th March 2006
Customer order number:	3079
A visual description of EUT is as follows:	Small Black plastic enclosure with Red, Green & Black buttons on the front and a battery compartment on the back.
The main function of the EUT is:	Cueing system to signal a person to do something by remote means or drive a pc to control power point etc.
Antenna:	Integral

Equipment Under Test Information specification:

Height	30mm
Width	65mm
Depth	95mm
Weight	0.1kg
Voltage	9V DC
Current required from above voltage source	<200mA
Highest Frequencies used / generated	434.075MHz

There are three variants with either one, two or three buttons. The three button model (i2TX-3) underwent full tests as a worst case example.

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: 18 April 2006

4. Specifications

The tests were performed by RN Electronics 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

NOT APPLICABLE. UNIT BATTERY POWERED.

5.2 Radiated Emissions

5.2.1 Test Methods

Test Requirements	FCC Part 15C, Reference (15.209, 15.231)
Test Method:	FCC Part 15C, Reference (15.209, 15.231)

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. n.b. The EUT had been modified for continuous operation for purpose of this test.

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 with final measurements for emissions below 50MHz 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.
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.**

Test Environment: M	Temperature: 17°C Humidity: 32%

Analyser plots for the Quasi-Peak / Average values as applicable and any table of signals within 20dB of the 15.209 limit line 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

E1, TMS933, E136, E3, TMS82

See Section 10 for more details

5.3 Intentional Radiator Field Strength

5.3.1 Test Methods

Test Requirements	FCC Part 15C, Reference (15.205, 15.231)
Test Method:	FCC Part 15C, Reference (15.231)

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. n.b. The EUT had been modified for continuous operation for purpose of this test.

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. A CISPR quasi-peak detector was used.

Testing was performed with a new battery.

5.3.2 Test results

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

Test Environment: M Temperature: 18°C Humidity: 44 %

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

The maximised field strength measured was **79.1dBµV/m at 3metres** distance, which is 9015µV/m {15.231 limit at 434 MHz is to 11,000µV/m at 3m distance}.

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

NOT APPLICABLE. NO SPECIFICATION REQUIREMENT.

5.5 Duty Cycle

5.5.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.231)

Test Method: FCC Part 15C, Reference (15.231)

5.5.1.1 Configuration of EUT

The EUT was placed on a bench. The EUT fundamental emissions were coupled into a test antenna in close proximity to the EUT. n.b. An unmodified EUT was used for purpose of this test.

5.5.1.2 Test Procedure

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

5.5.2 Test results

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

Temperature of test Environment: 22°C

Analyser plots for the dwell time and duty cycle can be found in Section 6.4 of this report.

Maximum Transmit On time was measured as **4.72 Seconds**. This occurred when one of the buttons was held down.

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

5.5.2.1 Test Equipment used

TMS6

See Section 10 for more details.

5.6 Maximum Spectral Power Density

NOT APPLICABLE. NO SPECIFICATION REQUIREMENT.

5.7 20dB Bandwidth

5.7.1 Test Methods

Test Requirements FCC Part 15C, Reference (15.231)

Test Method: FCC Part 15C, Reference (15.231)

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. n.b. The EUT had been modified for continuous operation for purpose of this test.

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: 18°C

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

	Channel Frequency
20dB Point fL	434.007 MHz
20dB Point fH	434.113 MHz

i.e. 20dB bandwidth = 106kHz = 0.02%.

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

5.7.2.1 Test Equipment used

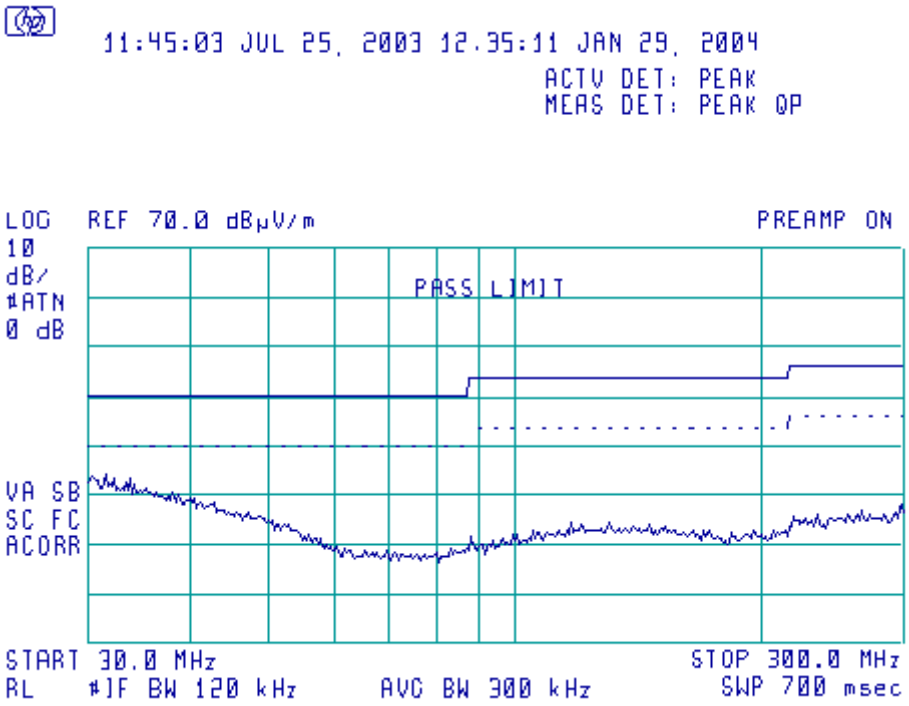
E1, TMS933

See Section 10 for more details.

6. Plots and Results
6.1 Conducted Emissions

NOT APPLICABLE. EQUIPMENT BATTERY POWERED.

6.2 Radiated Emissions



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

Horizontal Polarisation

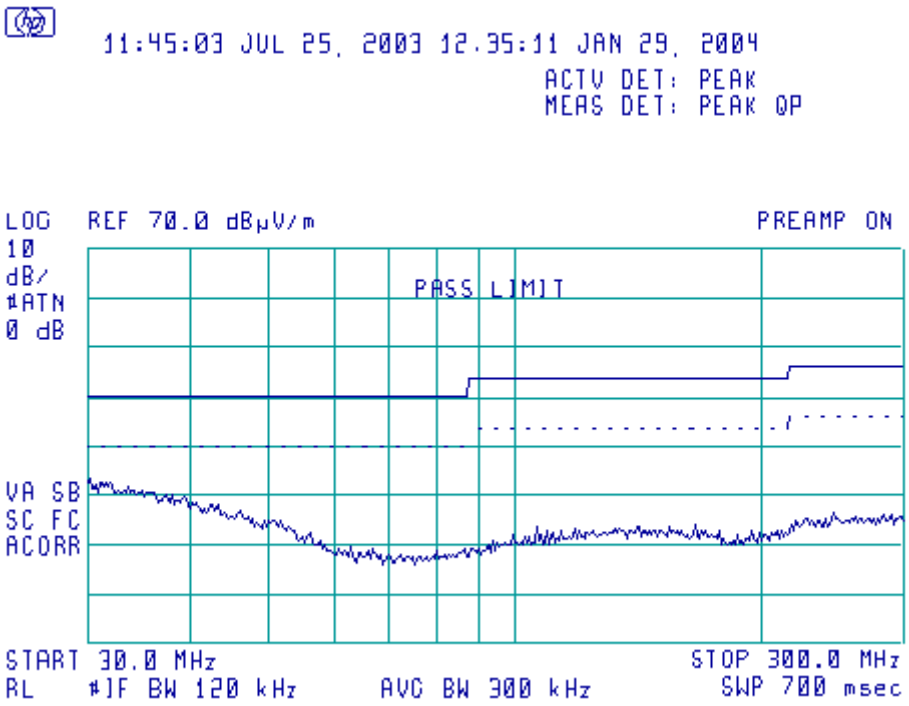
The plot shows a swept response of peak values using the quasi-peak limit line

(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

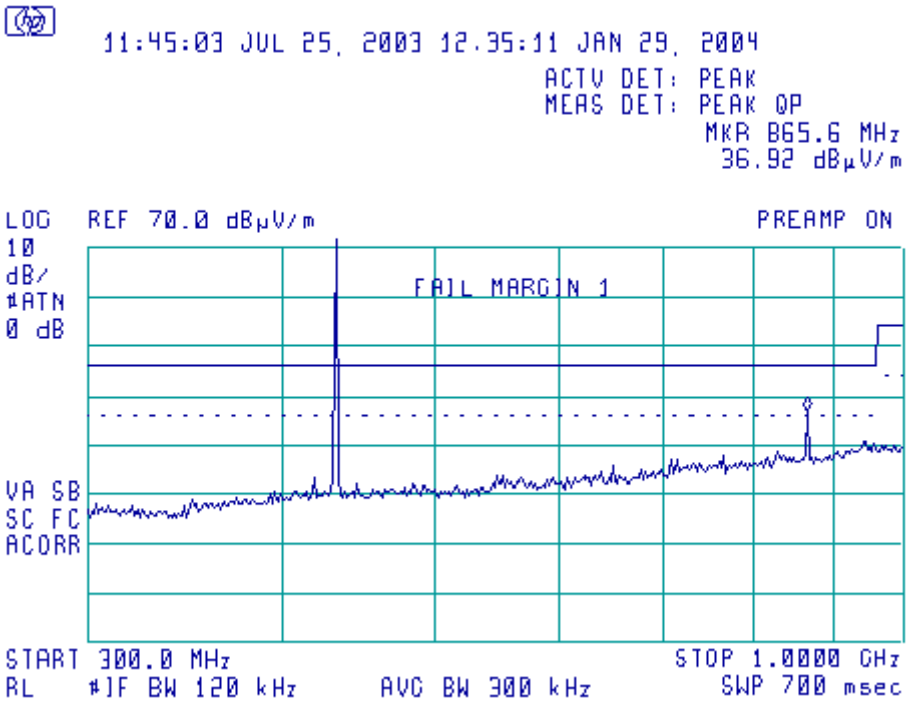
The plot shows a swept response of peak values using the quasi-peak limit line

(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

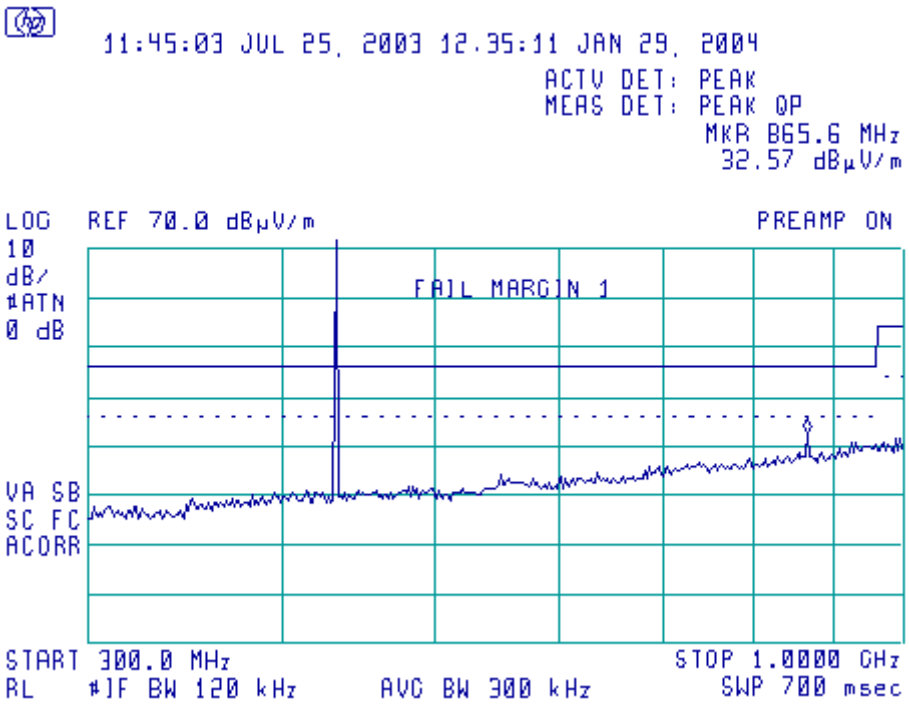
(Any peaks within 20dB of the limit line have been calculated and appear in the table on following page of this report)

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	434.084875	78.8	32.8	78.5	32.5
2	868.184631	38.33	-7.67	35.97	-10.03

Measurement Uncertainty of ± 5.2dB Applies

N.B. Signal 1 is the intended radiated emission. See Section 5.3 for final measurement results.



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

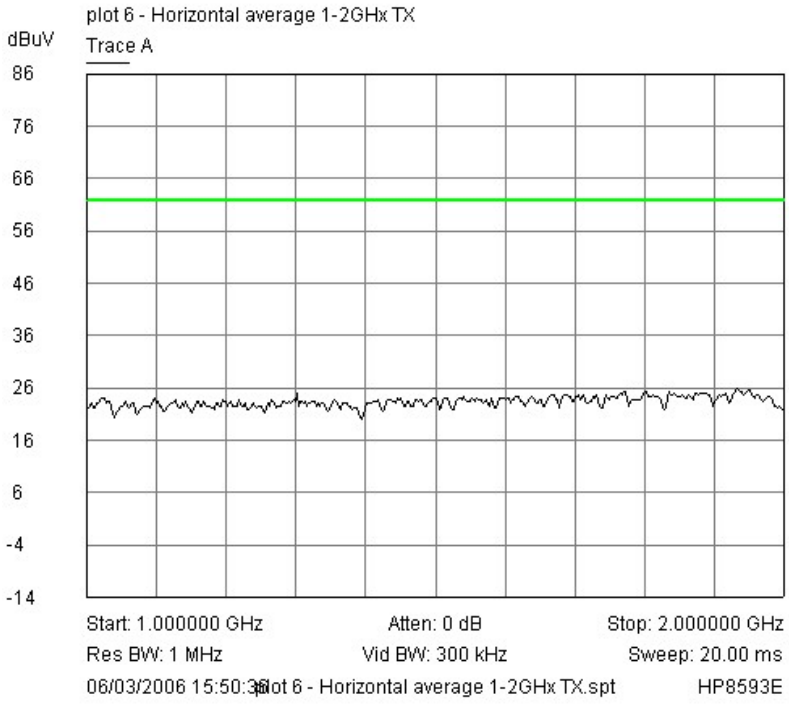
(Any peaks within 20dB of the limit line have been calculated and appear in the table on following page of this report)

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	434.086750	74.51	28.51	74.19	28.19
2	868.078125	34.93	-11.07	31.63	-14.37

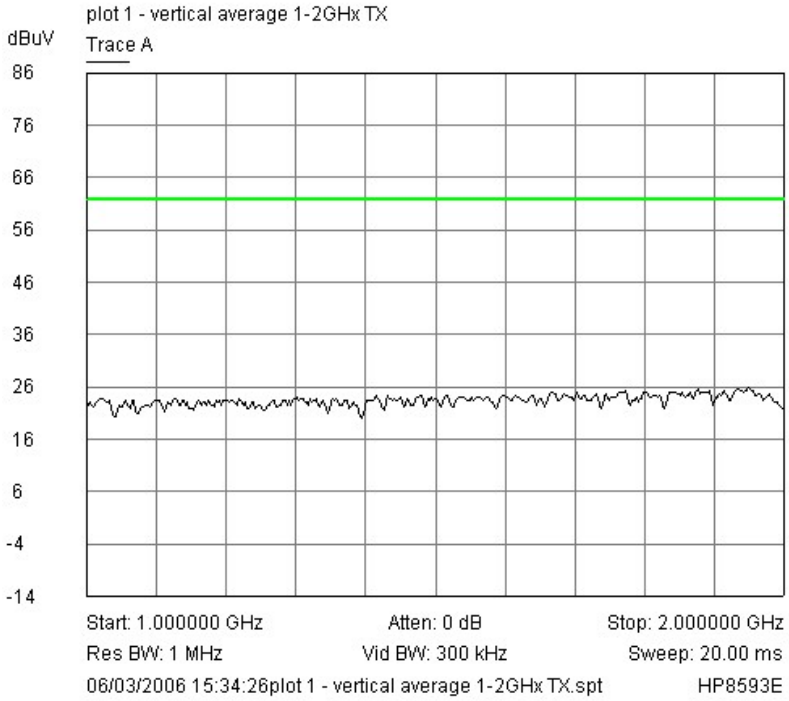
Measurement Uncertainty of ± 5.2dB Applies

N.B. Signal 1 is the intended radiated emission. See Section 5.3 for final measurement results.



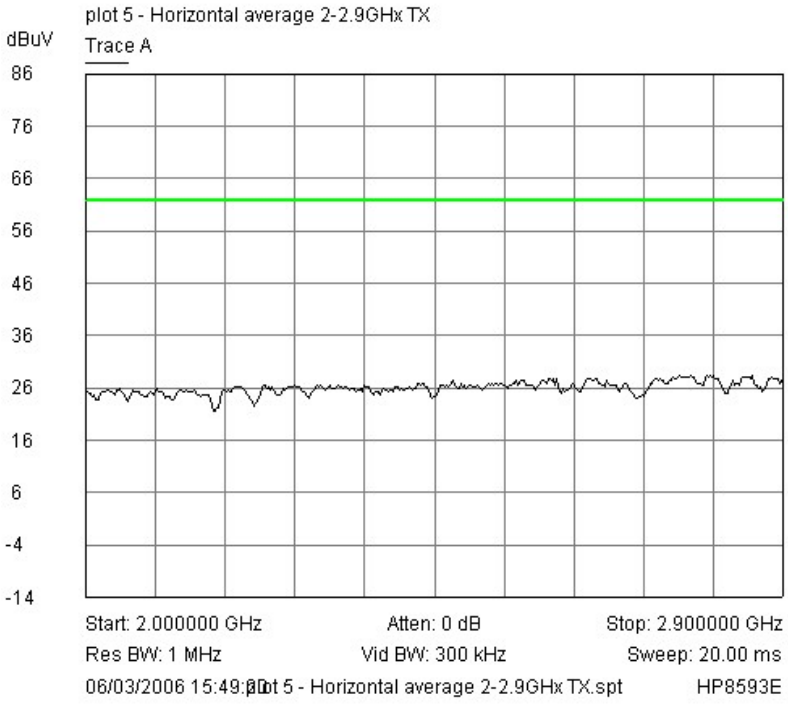
Average Values of 1 to 2GHz.

Horizontal Polarisation

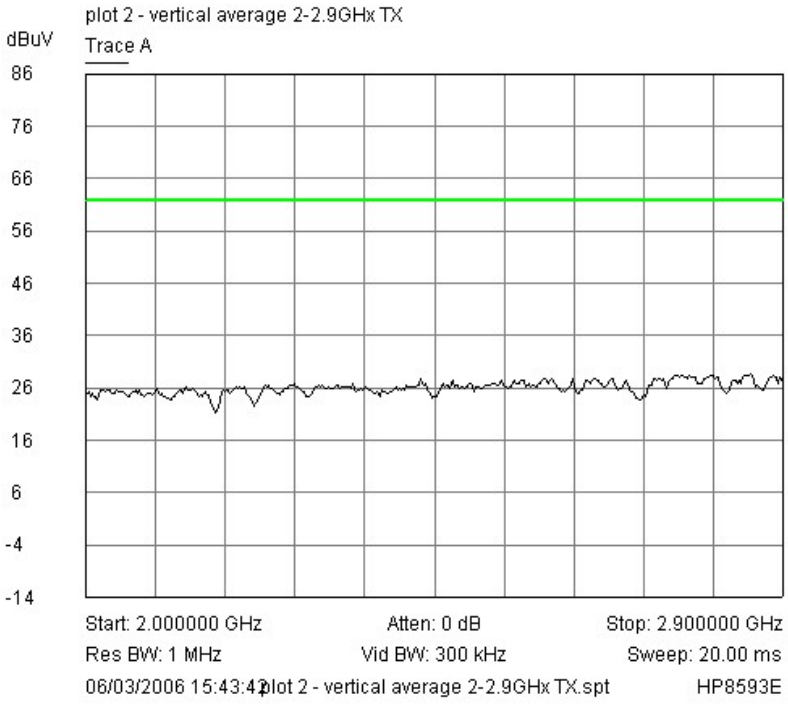


Average Values of 1 to 2GHz.

Vertical Polarisation

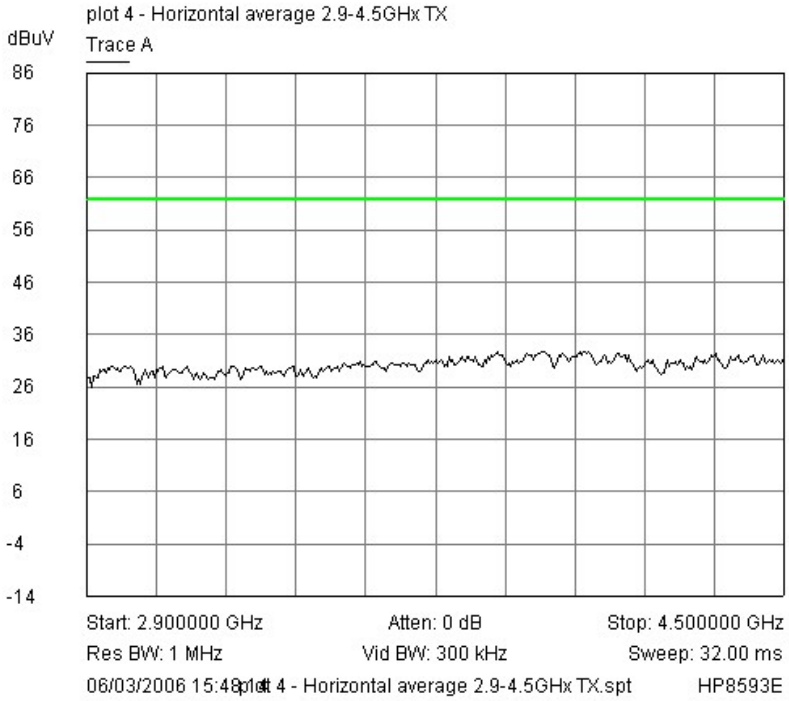


Average Values of 2 – 2.9 GHz.
Horizontal Polarisation

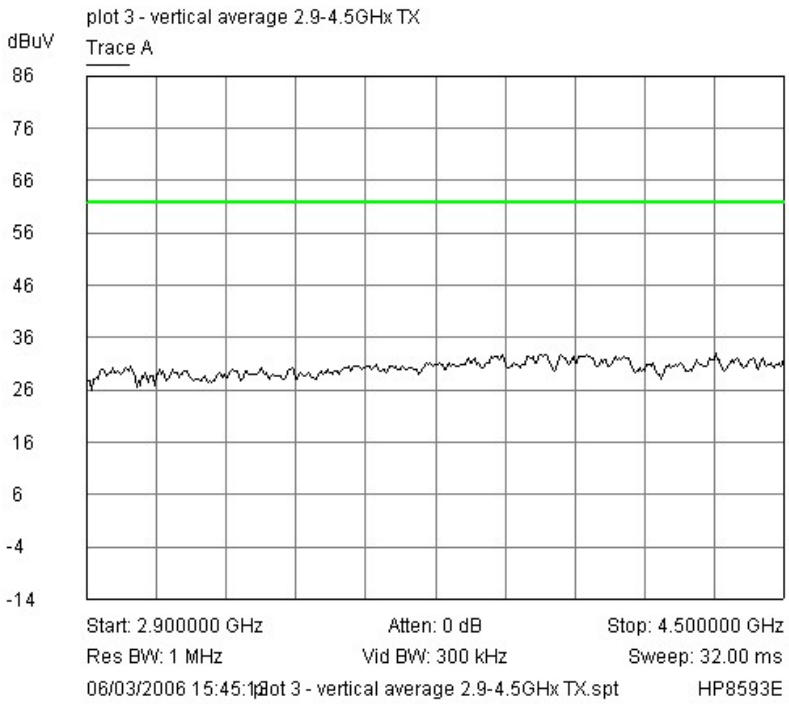


Average Values of 2 - 2.9 GHz.

Vertical Polarisation



Average Values of 2.9 to 4.5 GHz.
Horizontal Polarisation

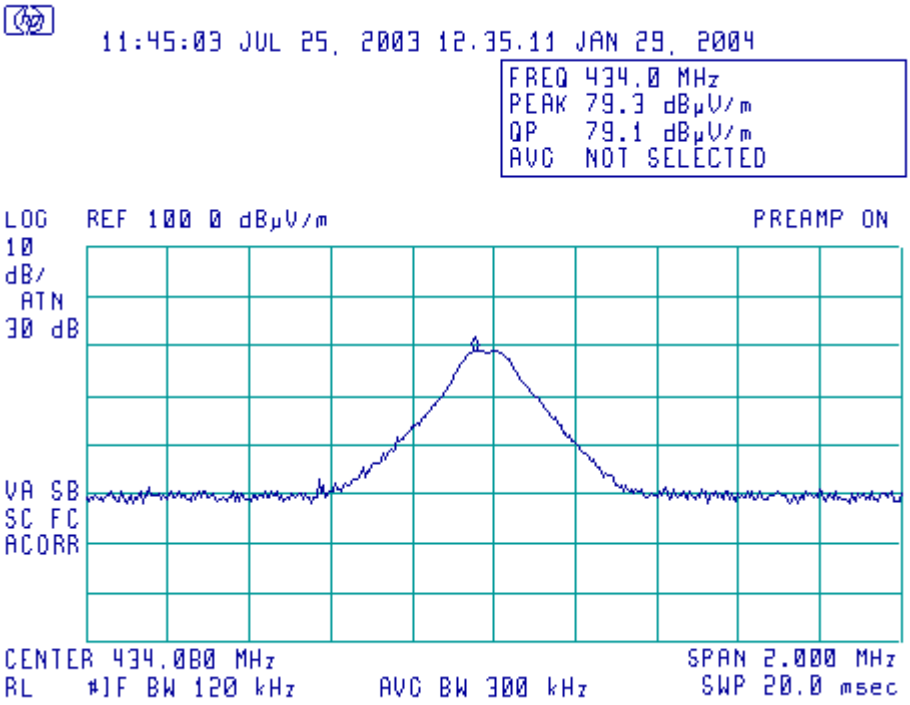


Average Values of 2.9 to 4.5 GHz.

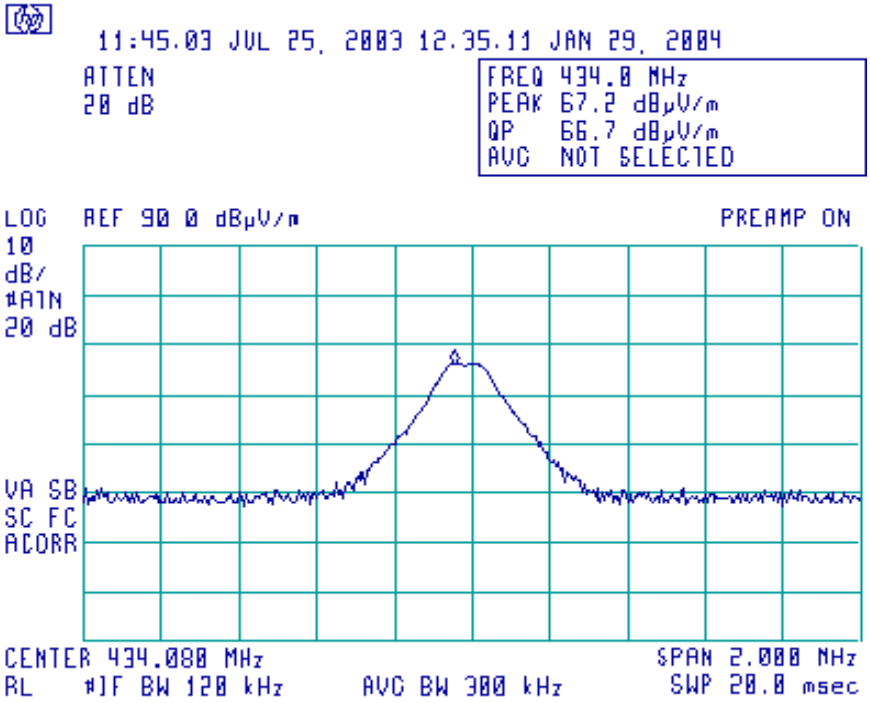
Vertical Polarisation

6.3 Fundamental Emissions

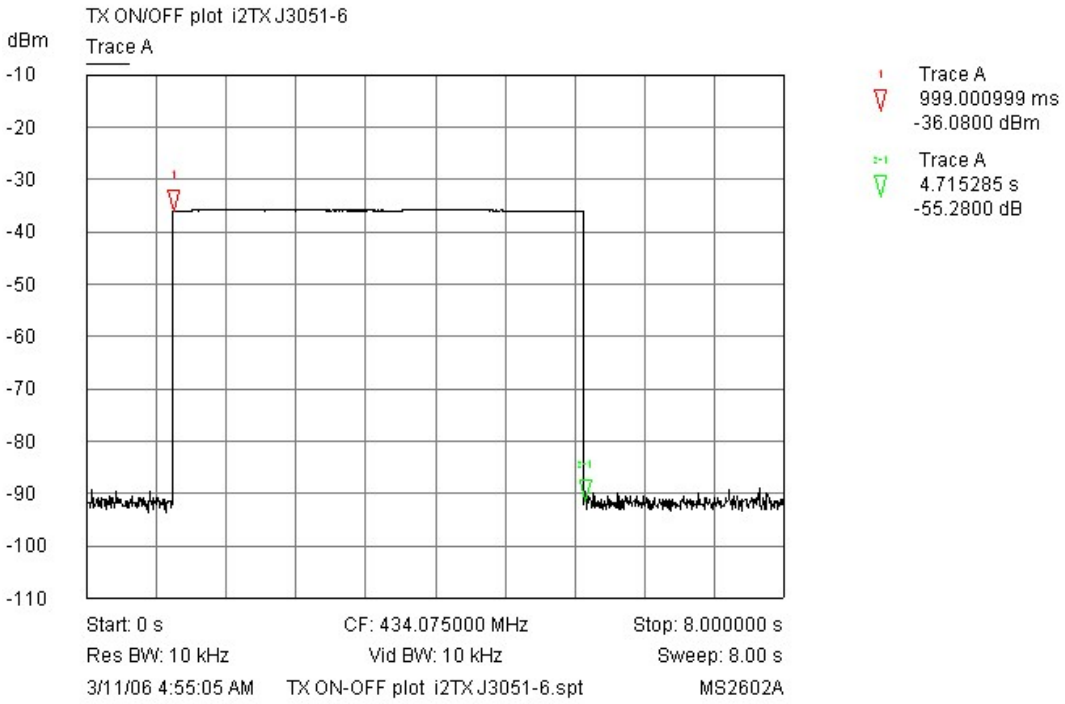
Horizontal Antenna.



Vertical Antenna.



6.4 Duty Cycle



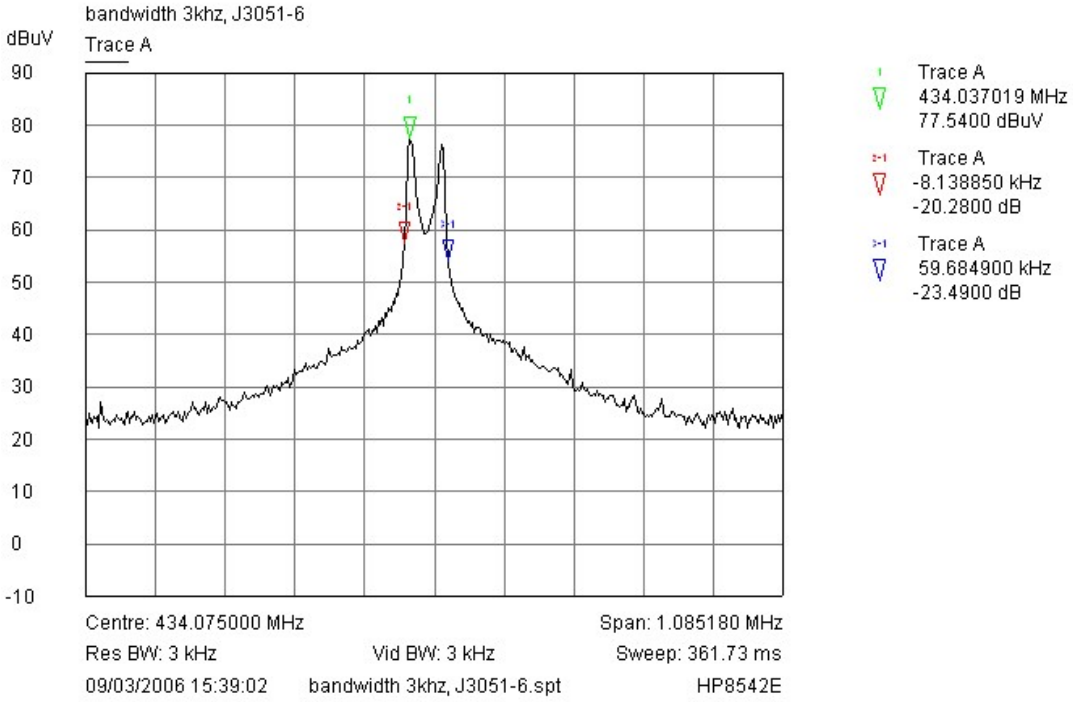
Marker 2-1 referenced to Marker 1

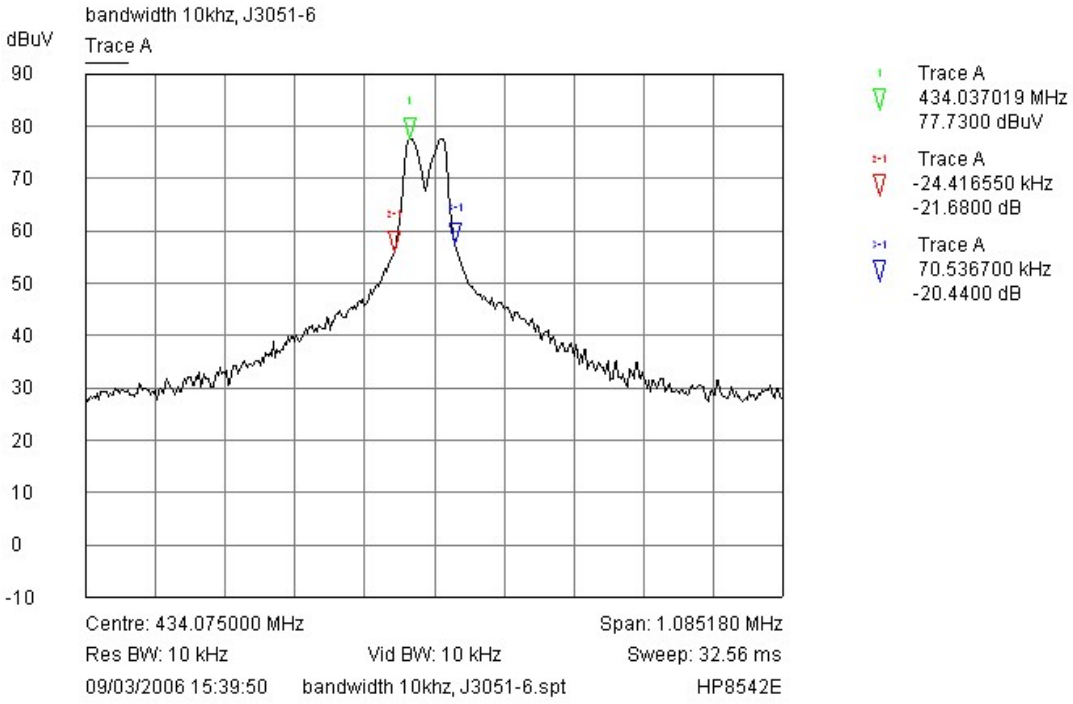
6.5 Maximum Spectral Power Density

NOT APPLICABLE.

6.6 Modulation Bandwidth

0.25% of centre frequency shown as span of plot. (1.0852MHz).





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.

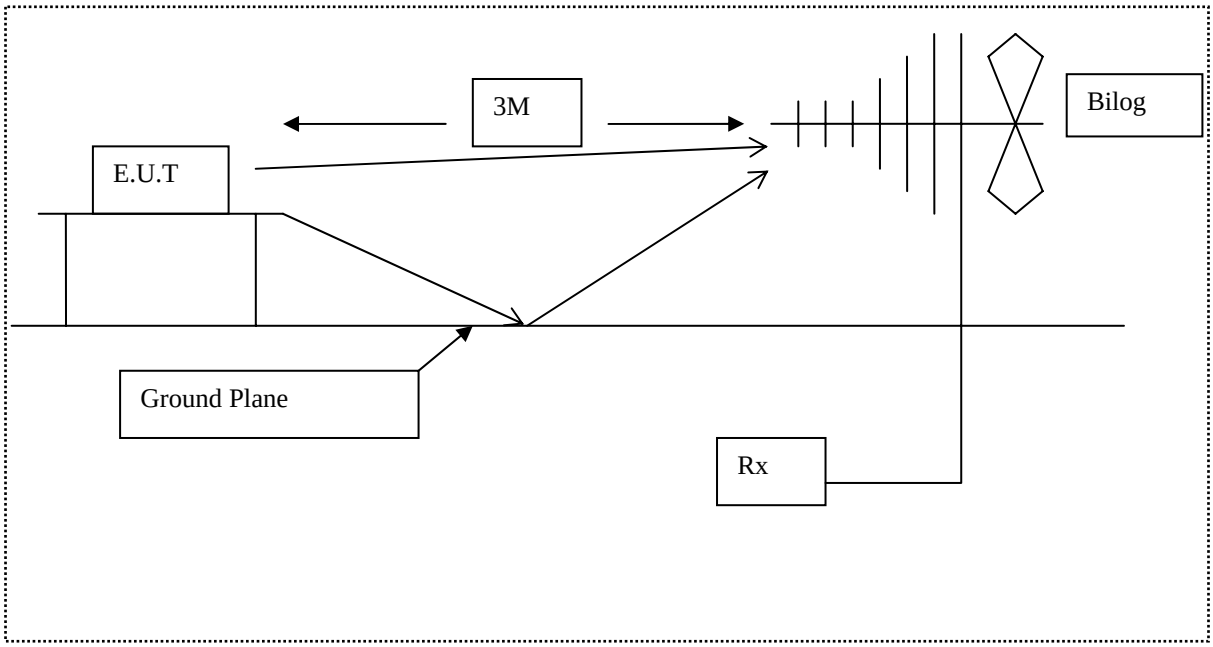


Diagram of the radiated emissions test setup.

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
E136	3105	Horn Antenna	EMCO
E3	HP8593E	Spectrum Analyser	Hewlett Packard
TMS6	MS2602A	Spectrum Analyser 100 Hz - 8.5 GHz	Anritsu Electric Co Ltd
TMS82	8449B	Pre Amplifier 1 - 26 GHz	Agilent
TMS933	CBL6141A	Bilog Antenna 30MHz - 2GHz	York EMC

11. Auxiliary equipment

11.1 Auxiliary equipment supplied by Hive Industries

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

NONE.

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.

With respect to **Intentional radiator field strength** within this report, section 5.3:-

1) 0Ω link removed in series with loop antenna feed & and replaced with 100Ω resistor to reduce field strength level within specification limits.

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
FCC ID T3Q I2TX

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:	MasterCue V5 USB
Model Number(s):	i2TX-1, i2TX-2, i2TX-3
Unique Serial Number(s):	130160000
Manufacturer:	Hive Industries Ltd
Customer Purchase Order Number:	3079
R.N. Electronics Limited Report Number:	03-087/3051/6/06A
Test Standards:	FCC Part 15C: effective date February 16th 2006 Class DSC Intentional Radiator
Date:	6th & 9th March 2006

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: 2006.04.18 10:31:47 +01'00'

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