



# TEST REPORT

**Test Report No. : UL-RPT-RP82173JD01A V4.0**

**Manufacturer** : Ingenico SA  
**Model No.** : IWL252-01T1535A  
**FCC ID** : XKB-IWL2XXBCL  
**IC Certification No.** : 2586D-IWL2BCL  
**Technology** : RFID – 13.56 MHz  
**Test Standard(s)** : FCC Part 15.225: 2010 Subpart C, RSS-210 Issue 8 December 2010 & RSS-Gen Issue 3 December 2010

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2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 4.0 supersedes Test Report Serial Number RFI-RPT-RP82183JD01A V3.0. The original test report was issued under the previous company name of RFI Global Services Ltd

**Date of Issue:** 31 July 2015

**Checked by:**

Ian Watch  
Senior Engineer, Radio Laboratory

**Issued by :**

pp

John Newell  
Quality Manager,  
UL VS LTD



This laboratory is accredited by UKAS. The tests reported herein have been performed in accordance with its terms of accreditation.

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**1. Customer Information**










<b>Company Name:</b>	Ingenico SA
<b>Address:</b>	1, rue Claude Chappe – BP 346 Guilherand-Granges 7503 France

## 2. Summary of Testing

### 2.1. General Information

<b>Specification Reference:</b>	47CFR15.225
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 15 Subpart C (Radio Frequency Devices) - Section 15.225
<b>Specification Reference:</b>	47CFR15.109
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 15 Subpart B (Radio Frequency Devices) – Section 15.109
<b>Specification Reference:</b>	47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 15 Subpart C (Intentional Radiators) - Section 15.209
<b>Specification Reference:</b>	RSS-Gen Issue 3 December 2010
<b>Specification Title:</b>	General Requirements and Information for the Certification of Radio Apparatus
<b>Specification Reference:</b>	RSS-210 Issue 8 December 2010
<b>Specification Title:</b>	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment.
<b>Site Registration:</b>	FCC: 209735; Industry Canada: 3245B-2
<b>Location of Testing:</b>	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
<b>Test Dates:</b>	05 August 2011 to 18 September 2011

### 2.2. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Result
Part 15.109	-	Receiver/Idle Mode Radiated Spurious Emissions	
Part 15.207	RSS-Gen 7.2.2	Transmitter AC Conducted Emissions	
Part 15.225(a)(b)(c)(d)	RSS-Gen 4.8 RSS-210 A2.6	Transmitter Fundamental Field Strength	
Part 15.209(a)/ 15.225(d)	RSS-Gen 4.9 RSS-210 A2.6	Transmitter Radiated Emissions	
Part 15.209(a)/ 15.225(c)(d)	RSS-Gen 4.9 RSS-210 A2.6	Transmitter Band Edge Radiated Emissions	
Part 2.1049	RSS-Gen 4.6.1/4.6.3	Transmitter 20 dB Bandwidth	
Part 15.225(e)	RSS-Gen 4.7 RSS-210 A2.6	Transmitter Frequency Stability (Temperature & Voltage Variation)	
<b>Key to Results</b>			
 = Complied  = Did not comply			

**2.3. Methods and Procedures**

<b>Reference:</b>	ANSI C63.4 (2009)
<b>Title:</b>	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
<b>Reference:</b>	ANSI C63.10 (2009)
<b>Title:</b>	American National Standard for Testing Unlicensed Wireless Devices

**2.4. Deviations from the Test Specification**

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

### **3. Equipment Under Test (EUT)**

#### **3.1. Identification of Equipment Under Test (EUT)**

<b>Brand Name:</b>	Ingenico
<b>Model Name or Number:</b>	IWL252-01T1535A
<b>Serial Number:</b>	11075WL40001198
<b>Hardware Version Number:</b>	IWL252
<b>Software Version Number:</b>	Y001
<b>FCC ID:</b>	XKB-IWL2XXBCL
<b>IC Certification Number:</b>	2586D-IWL2BCL

#### **3.2. Description of EUT**

The equipment under test was a handheld point of sale terminal. It contains both *Bluetooth* and RFID technologies.

#### **3.3. Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

**3.4. Additional Information Related to Testing**

<b>Tested Technology:</b>	RFID	
<b>Category of Equipment:</b>	Transceiver	
<b>Channel Spacing:</b>	Single channel device	
<b>Transmit Frequency Range:</b>	13.56 MHz	
<b>Receive Frequency Range:</b>	13.56 MHz	
<b>Power Supply Requirement:</b>	Nominal	3.6 V
	Minimum	3.06 V
	Maximum	4.14 V
<b>Tested Temperature Range:</b>	Minimum	-20°C
	Maximum	50°C

**3.5. Support Equipment**

The following support equipment was used to exercise the EUT during testing:

<b>Description:</b>	Laptop PC
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	Latitude D600
<b>Serial Number:</b>	UL Asset No. PC353

<b>Description:</b>	Charging cradle
<b>Brand Name:</b>	Ingenico
<b>Model Name or Number:</b>	IWL200-01B1328A
<b>Serial Number:</b>	11055WL40001155

<b>Description:</b>	AC/DC Adapter
<b>Brand Name:</b>	Sagem
<b>Model Name or Number:</b>	FW7650L/05
<b>Serial Number:</b>	Not marked or stated



## **4. Operation and Monitoring of the EUT during Testing**

### **4.1. Operating Modes**

The EUT was tested in the following operating mode(s):

- Receiver/Idle mode
- Constantly transmitting at full power with a modulated carrier in RFID test mode.

### **4.2. Configuration and Peripherals**

The EUT was tested in the following configuration(s):

- A test mode provided by the Customer enabled the EUT to be placed into constant transmit mode for test purposes.
- During radiated emissions testing, the EUT was tested in its' standalone configuration. A sample chip card was used to terminate the card reader. SIM and memory cards were fitted in to their respective ports on the EUT. The EUT was battery powered from an internal chargeable battery. The battery was fully charged between tests.
- The battery was removed and the EUT was powered by a bench power supply during tests at voltage extremes.
- AC conducted tests were performed with the EUT located in the charging cradle. The EUT was configured to constantly transmit at maximum power. A sample chip card was used to terminate the card reader. SIM and memory cards were fitted in to their respective ports on the EUT. All unused ports on the charging cradle were terminated into a laptop PC. The laptop PC was not turned on. The charging cradle AC/DC adaptor was connected to a 120 VAC 60 Hz mains supply via a LISN.

## **5. Measurements, Examinations and Derived Results**

### **5.1. General Comments**

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6: Measurement Uncertainties* for details.

## 5.2. Test Results

### 5.2.1. Receiver/Idle Mode Radiated Spurious Emissions

#### Test Summary:

Test Engineer:	Crawford Lindsay	Test Date:	18 September 2011
Test Sample Serial No:	11075WL40001198		

FCC Part:	15.109
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3, 6.4 and 6.5 referencing ANSI C63.4
Frequency Range:	9 kHz to 1000 MHz

#### Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	37

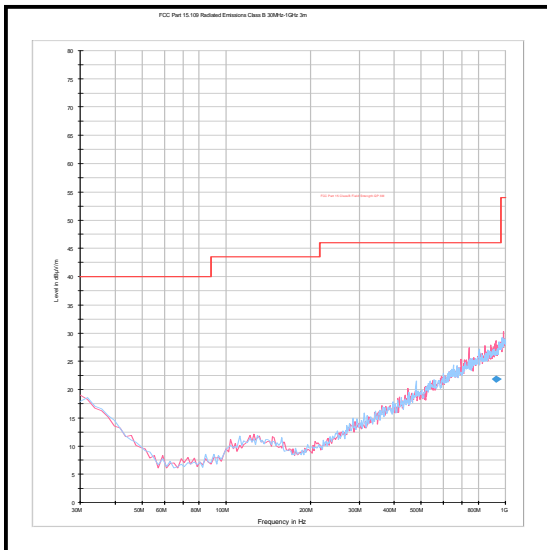
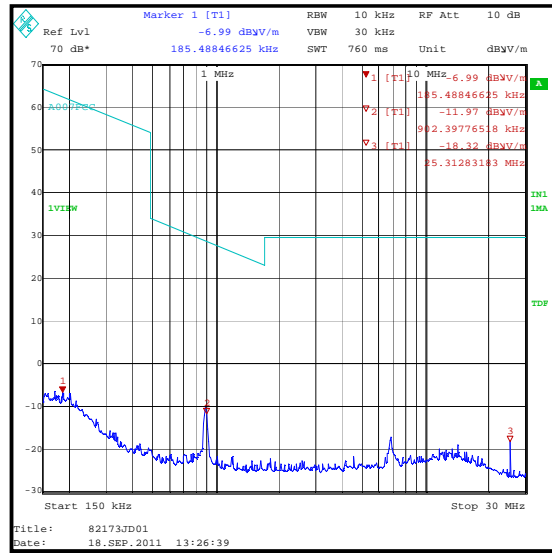
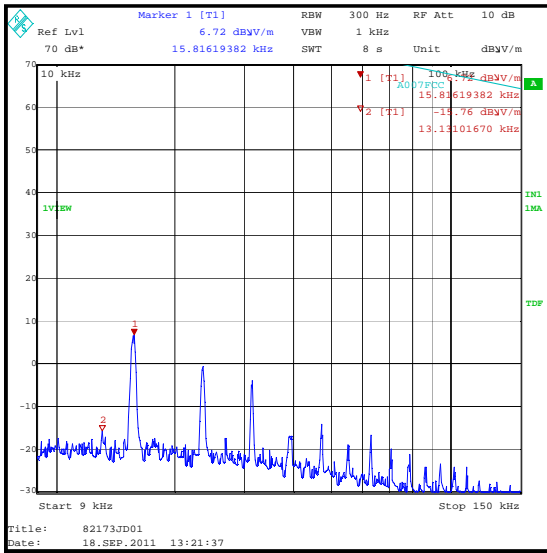
#### Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
925.963	Vertical	21.9	46.0	24.1	Complied

#### Note(s):

- Limits below 30 MHz are specified at a test distance of 30 metres, whilst below 0.49 MHz they are specified at a test distance of 300 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).
- A transducer factor on the measuring instrument was used to extrapolate the results at 3 metres to a distance of 30 metres where required. A distance extrapolation factor of 40 dB was used.
- Final measurement values include corrections for antenna factor and cable losses.
- All emissions on the 9 kHz to 150 kHz plot were investigated and found to be radiating from the test site turntable.
- All emissions on the 150 kHz to 30 MHz plot were investigated and found to be ambient.
- All other emissions shown on the pre-scan plots were investigated and found to be >20 dB below the applicable limit or below the measurement system noise floor.
- Measurements in the range 30 MHz to 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

### Receiver/Idle Mode Radiated Spurious Emissions (continued)



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying table.

**5.2.2. Transmitter AC Conducted Spurious Emissions****Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	16 September 2011
<b>Test Sample Serial No:</b>	11075WL40001198		

<b>FCC Part:</b>	15.207
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	32

**Results: Live / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.172500	Live	46.9	64.8	17.9	Complied
0.217500	Live	42.9	62.9	20.0	Complied
0.267000	Live	39.8	61.2	21.4	Complied
0.325500	Live	36.6	59.6	23.0	Complied
0.388500	Live	33.2	58.1	24.9	Complied
0.541500	Live	24.9	56.0	31.1	Complied

**Results: Live / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.150000	Live	22.3	56.0	33.7	Complied
0.208500	Live	21.5	53.3	31.8	Complied
0.235500	Live	17.0	52.3	35.3	Complied
0.361500	Live	21.7	48.7	27.0	Complied
0.420000	Live	16.4	47.4	31.0	Complied
0.604500	Live	11.6	46.0	34.4	Complied

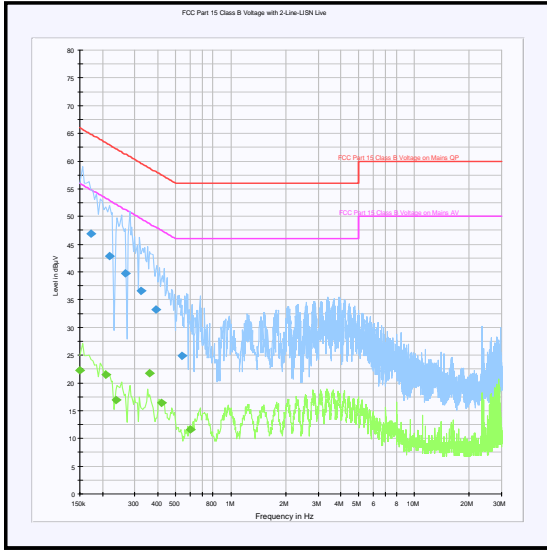
**Transmitter AC Conducted Spurious Emissions (continued)****Results: Neutral / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.150000	Neutral	48.9	66.0	17.1	Complied
0.154500	Neutral	48.2	65.8	17.6	Complied
0.163500	Neutral	48.0	65.3	17.3	Complied
0.172500	Neutral	47.2	64.8	17.6	Complied
0.177000	Neutral	46.7	64.6	17.9	Complied
0.181500	Neutral	46.0	64.4	18.4	Complied
0.190500	Neutral	45.5	64.0	18.5	Complied
0.213000	Neutral	43.5	63.1	19.6	Complied
0.231000	Neutral	42.3	62.4	20.1	Complied
0.249000	Neutral	40.8	61.8	21.0	Complied

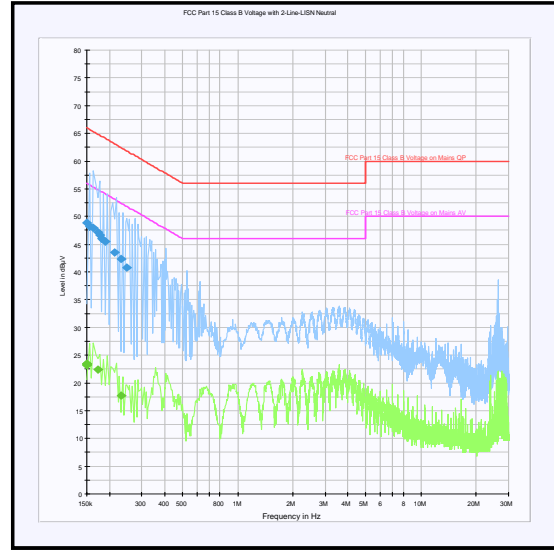
**Results: Neutral / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.150000	Neutral	23.4	56.0	32.6	Complied
0.172500	Neutral	22.4	54.8	32.4	Complied
0.231000	Neutral	17.8	52.4	34.6	Complied

### Transmitter AC Conducted Spurious Emissions (continued)



Live



Neutral

*Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

**5.2.3. Transmitter Fundamental Field Strength**

**Test Summary:**

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	18 September 2011
<b>Test Sample Serial No:</b>	11075WL40001198		

<b>FCC Part:</b>	15.225(a)(b)(c)(d)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.4

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	37

**Results: Quasi Peak**

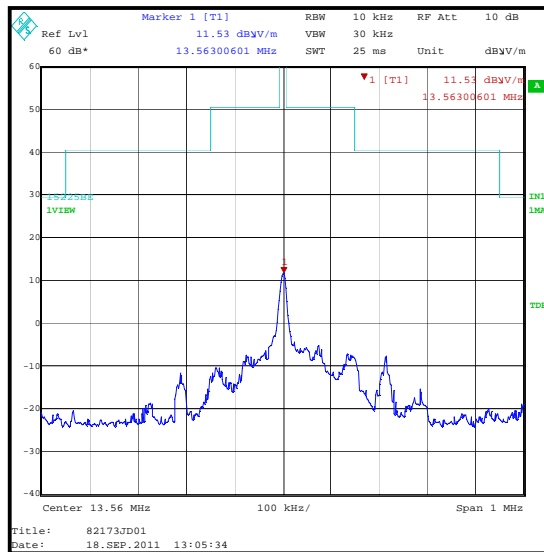
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit at 30 m (dBµV/m)	Margin (dB)	Result
13.56	90° to EUT	31.3	84.0	52.7	Complied

**Note(s):**

1. The limit is specified at a test distance of 30 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).
2. A transducer factor on the measuring instrument was used to extrapolate the results at 3 metres to a distance of 30 metres. A distance extrapolation factor of 40 dB was used.

Note: An additional 20 dB has been added to attain the final value shown in the table; this is to account for a transducer factor that was not included during the original measurement.

*i.e.: 11.3 dBuV/m + 20 dB = 31.3 dBuV/m*





**5.2.4. Transmitter Radiated Spurious Emissions****Test Summary:**

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	18 September 2011
<b>Test Sample Serial No:</b>	11075WL40001198		

<b>FCC Part:</b>	15.225(d) & 15.209(a)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Sections 6.3, 6.4 and 6.5 referencing ANSI C63.4
<b>Frequency Range:</b>	9 kHz to 1000 MHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	37

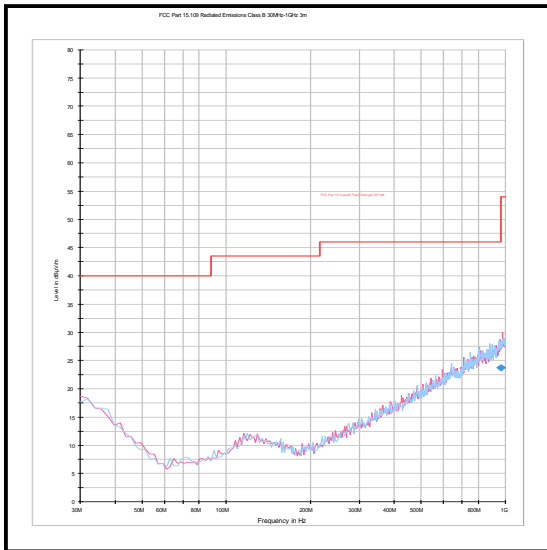
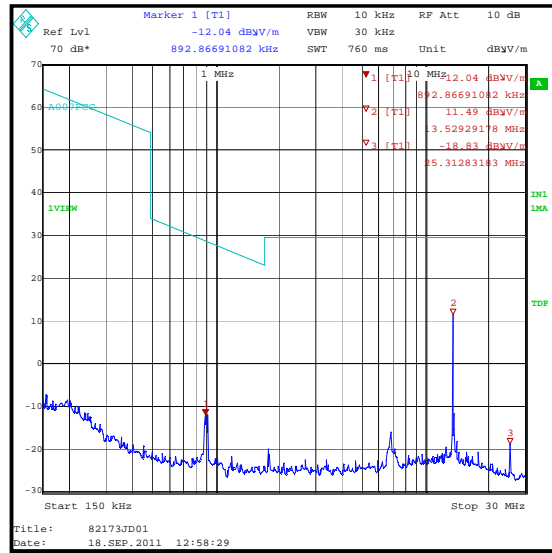
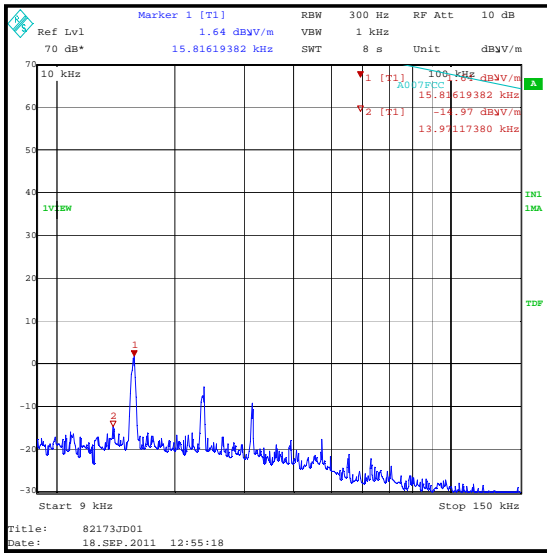
**Results: Quasi Peak**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
959.327	Vertical	23.7	46.0	22.3	Complied

**Note(s):**

- Limits below 30 MHz are specified at a test distance of 30 metres, whilst below 0.49 MHz they are specified at a test distance of 300 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).
- A transducer factor on the measuring instrument was used to extrapolate the results at 3 metres to a distance of 30 metres where required. A distance extrapolation factor of 40 dB was used.
- Final measurement values include corrections for antenna factor and cable losses.
- The emission shown at approximately 13.56 MHz is the fundamental.
- All emissions on the 9 kHz to 150 kHz plot were investigated and found to be radiating from the test site turntable.
- All emissions on the 150 kHz to 30 MHz plot were investigated and found to be ambient.
- All other emissions shown on the pre-scan plots were investigated and found to be >20 dB below the applicable limit or below the measurement system noise floor.
- Measurements in the range 30 MHz to 1 GHz were performed in a semi-anechoic chamber (UL Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

### Transmitter Radiated Spurious Emissions (continued)



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying table.

**5.2.5. Transmitter Band Edge Radiated Emissions**

**Test Summary:**

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	18 September 2011
<b>Test Sample Serial No:</b>	11075WL40001198		

<b>FCC Part:</b>	15.225(c)(d) & 15.209(a)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.9.2

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	38

**Results: Quasi Peak Lower Band Edge**

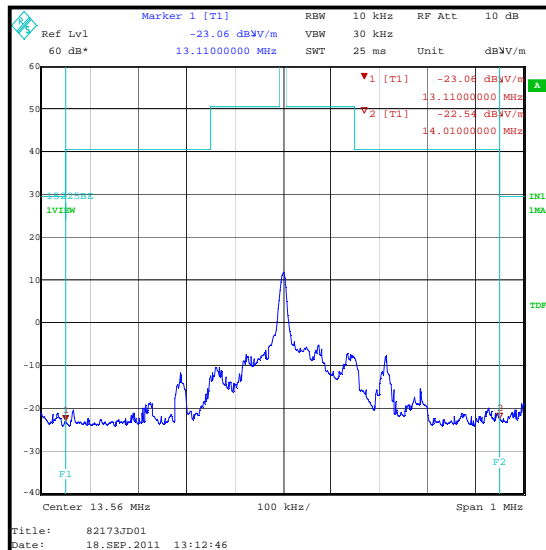
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
13.11	-3.1	29.5	32.6	Complied

**Results: Quasi Peak Upper Band Edge**

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
14.01	-2.5	29.5	32.0	Complied

**Note(s):**

1. A transducer factor on the measuring instrument was used to extrapolate the results at 3 metres to a distance of 30 metres where required. A distance extrapolation factor of 40 dB was used.
2. The band edge emission plot shown below is low by a factor of 20 dB, due to the absence of a transducer factor at the time of measurement. An additional 20 dB was subsequently added to any band edge measurements, for comparisons with the limit, when determining compliance.



**5.2.6. Transmitter 20 dB Bandwidth**

**Test Summary:**

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	05 August 2011
<b>Test Sample Serial No:</b>	11075WL40001198		

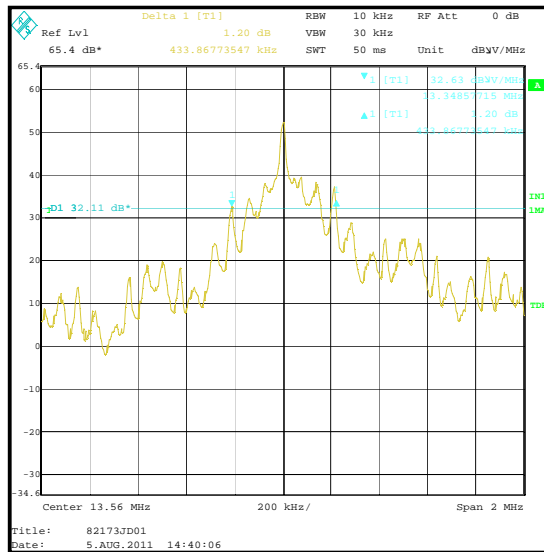
<b>FCC Part:</b>	2.1049
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.9.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	29
<b>Relative Humidity (%):</b>	33

**Results:**

<b>20 dB Bandwidth (kHz)</b>
433.868



**5.2.7. Transmitter Frequency Stability (Temperature & Voltage Variation)****Test Summary:**

<b>Test Engineer:</b>	Crawford Lindsay	<b>Test Date:</b>	11 August 2011
<b>Test Sample Serial No:</b>	11075WL40001198		

<b>FCC Part:</b>	15.225(e)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.8.1 and 6.8.2

**Environmental Conditions:**

<b>Ambient Temperature (°C):</b>	24
<b>Ambient Relative Humidity (%):</b>	49

**Results: Maximum frequency error of the EUT with variations in ambient temperature**

Temperature (°C)	Time after Start-up			
	0 minutes	2 minutes	5 minutes	10 minutes
-20	13.559564 MHz	13.559564 MHz	13.559574 MHz	13.559564 MHz
20	13.559524 MHz	13.559534 MHz	13.559525 MHz	13.559514 MHz
50	13.559424 MHz	13.559414 MHz	13.559403 MHz	13.559524 MHz

Frequency with Worst Case Deviation (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Margin (%)	Result
13.559403	597	0.004403	0.01	0.005597	Complied

**Results: Maximum frequency error of the EUT with variations in nominal operating voltage at an ambient temperature of 20°C**

Supply Voltage (V)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Margin (%)	Result
3.06 V	13.56	13.559541	459	0.003385	0.01	0.006615	Complied
3.6 V	13.56	13.559524	476	0.003510	0.01	0.006490	Complied
4.14 V	13.56	13.559514	486	0.003584	0.01	0.006416	Complied

## **6. Measurement Uncertainty**

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

<b>Measurement Type</b>	<b>Range</b>	<b>Confidence Level (%)</b>	<b>Calculated Uncertainty</b>
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.25 dB
20 dB Bandwidth	13 MHz to 14 MHz	95%	±0.92 ppm
Frequency Stability	13 MHz to 14 MHz	95%	±0.92 ppm
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	±3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±2.94 dB
Transmitter Fundamental Field Strength	13 MHz to 14 MHz	95%	±3.53 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

## **7. Report Revision History**

<b>Version Number</b>	<b>Revision Details</b>		
	<b>Page No(s)</b>	<b>Clause</b>	<b>Details</b>
3.0	-	-	Previous Version
4.0	16 & 19	-	Corrected previously reported emissions levels by +20 dB

## **Appendix 1. Test Equipment Used**

<b>UL No.</b>	<b>Instrument</b>	<b>Manufacturer</b>	<b>Type No.</b>	<b>Serial No.</b>	<b>Date Calibration Due</b>	<b>Cal. Interval Months</b>
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002	02 Jun 2012	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	05 Mar 2012	12
A1834	Attenuator	Hewlett Packard	8491B	10444	26 Jul 2012	12
A553	Antenna	Chase	CBL6111 A	1593	26 Mar 2012	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	29 May 2012	12
M1068	Thermometer	Iso-Tech	RS55	93102884	10 Nov 2011	12
M1223	Environmental Chamber	Votsch	VT4002	58566072720010	Calibrated before use	-
M1229	Digital Multimeter	Fluke	179	87640015	21 Jun 2012	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	15 Sep 2011	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	13 Jul 2012	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	04 Feb 2012	12
M1568	Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	27 Jan 2012	12
S0520	DC Power Supply Unit	GW instek	GPC-3030	E835141	Calibrated before use	-

**NB** In accordance with UKAS requirements all the measurement equipment is on a calibration schedule.

Please Note: All test equipment listed in the above table was within the calibration period on the date of testing.

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