TEST REPORT

Test Report No. : UL-RPT-RP10014935JD03A V2.0

Manufacturer	:	Sony Mobile Communications AB
Type No.	:	PM-0440-BV
FCC ID	:	PY7PM-0440
Technology	:	RFID – 13.56 MHz
Test Standard(s)	:	FCC Parts 15.207, 15.209(a) & 15.225

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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 2.0 supersedes all previous versions.

Date of Issue: 23 June 2015

Checked by:

Ian Watch
Senior Engineer, Radio Laboratory

Issued by :

pp

John Newell
Quality Manager,
UL VS LTD

0644

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

Company Name:	Sony Mobile Communications AB
Address:	Nya Vattentornet Lund SE-221 88 Sweden

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.225
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Radio Frequency Devices) - Section 15.225
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
Site Registration:	209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	26 July 2013 to 30 July 2013

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.207	Transmitter AC Conducted Emissions	✓
Part 15.225(a)(b)(c)(d)	Transmitter Fundamental Field Strength	✓
Part 15.209(a), 15.225(d)	Transmitter Radiated Spurious Emissions	✓
Part 15.209(a), 15.225(c)(d)	Transmitter Band Edge Radiated Emissions	✓
Part 2.1049	Transmitter 20 dB Bandwidth	✓
Part 15.225(e)	Transmitter Frequency Stability (Temperature & Voltage Variation)	✓

Key to Results

✓ = Complied ✗ = Did not comply

2.3. Methods and Procedures

Reference:	ANSI C63.4 (2009)
Title:	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
Reference:	ANSI C63.10 (2009)
Title:	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)

Brand Name:	Sony
IMEI:	004402540812108 *(Radiated sample #1)*
Serial Number:	CB5124UN3A
Hardware Version Number:	AP2
Software Version Number:	14.1.H.0.246
FCC ID:	PY7PM-0440

Brand Name:	Sony
IMEI:	004402540811944 *(Radiated sample #2, modified with a Dummy battery)*
Serial Number:	CB5124UN43
Hardware Version Number:	AP2
Software Version Number:	14.1.H.0.246
FCC ID:	PY7PM-0440

Brand Name:	Sony
Description:	AC Charger
Model Name or Number:	EP880

Brand Name:	Sony
Description:	MHL Cable
Model Name or Number:	Not marked or stated

Brand Name:	Sony
Description:	MHL Adaptor
Model Name or Number:	IM750

Brand Name:	Sony
Description:	Magnetic Plug
Model Name or Number:	EC801

Brand Name:	Sony
Description:	USB cable
Model Name or Number:	EC21

Identification of Equipment Under Test (EUT) (continued)

Brand Name:	Sony
Description:	PHF
Model Name or Number:	MH750

3.2. Description of EUT

The equipment under test (EUT) is a model of GSM/UMTS/LTE mobile phone with integrated antenna and inbuilt Li-Polymer battery.
The EUT supports GSM 850/900/1800/1900MHz bands, WCDMA FDD bands 1/5 and LTE FDD bands 1/3. It also supports GPRS service with multi-slots class 33 and EGPRS service with multi-slots class 33 too. The HSDPA and HSUPA features are also supported. It has MP3, camera, FM radio, USB memory, GPS receiver, NFC, Mobile High-Definition Link (MHL), Bluetooth (EDR and Bluetooth 4.0), WLAN (802.11 a/b/g/n/ac) and Wi-Fi hotspot functions.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Tested Technology:	RFID	
Category of Equipment:	Transceiver	
Channel Spacing:	Single channel device	
Transmit Frequency Range:	13.56 MHz	
Receive Frequency Range:	13.56 MHz	
Power Supply Requirement:	Nominal	3.8 V
	Minimum	3.23 V
	Maximum	4.37 V
Tested Temperature Range:	Minimum	-20°C
	Maximum	50°C

3.5. Support Equipment

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

Brand Name:	Sony
IMEI:	004402540814724 *(Radiated sample)*
Serial Number:	CB5124UMV0

Description:	RFID tag
Brand Name:	Sony
Model Name or Number:	Al-1400 (salvor)
Hardware Version Number:	DP

Brand Name:	Not marked or stated
Description:	2 GB Micro SD Card
Model Name or Number:	Not marked or stated

Brand Name:	Logik
Description:	22” High Definition Television
Model Name or Number:	L22FE12A
Serial Number	1309020661

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- 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):

- The RFID transmitter test mode was enabled by running a customer specific application on the handset. The application scans until the receiver phone is placed within 30 mm of the handset under test. When the handset is in place, this enables a continuously modulated RFID mode.
- For transmitter radiated emissions above 30 MHz, an RFID tag was used to perform measurements. The application scans until an RFID tag is placed near the RFID antenna of the handset which enables a continuously modulated RFID mode.
- Transmitter radiated spurious emission tests were performed with the following configurations, employing all available accessories:
    - Configuration 1 – Handset with the AC charger, USB Cable, MHL cable (terminated in to a television), MHL adaptor and PHF
    - Configuration 2 – Handset with the AC charger, Magnetic plug and PHF

  Pre-scans below 1 GHz were performed in both configurations 1 and 2, with final measurements limited to the configuration which provided worst case results.
- Testing at voltage extremes was performed with a dummy battery fitted to the EUT, which was supplied by the customer.
- AC conducted emissions tests were performed with the EUT connected to the AC charger. The AC charger was connected to a 120 VAC 60 Hz single phase supply via a LISN.
- Radiated sample with IMEI 004402540812108 was used for AC conducted emission, fundamental field strength, radiated spurious emissions, band edge emissions and 20dB bandwidth tests.
- Radiated sample with IMEI 004402540811944 was used for Transmitter Frequency Stability test.

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.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

5.2. Test Results

5.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	30 July 2013
Test Sample IMEI:	004402540812108		

FCC Reference:	Part 15.207
Test Method Used:	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	50

Transmitter AC Conducted Spurious Emissions (continued)

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.488	Live	38.6	56.2	17.6	Complied
0.974	Live	40.4	56.0	15.6	Complied
1.239	Live	42.5	56.0	13.5	Complied
1.311	Live	41.4	56.0	14.6	Complied
13.560	Live	52.2	60.0	7.8	Complied
17.466	Live	42.5	60.0	17.5	Complied
17.804	Live	42.7	60.0	17.3	Complied
17.808	Live	42.4	60.0	17.6	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.488	Live	33.0	46.2	13.2	Complied
0.488	Live	33.0	46.2	13.2	Complied
0.524	Live	29.1	46.0	16.9	Complied
0.938	Live	32.3	46.0	13.7	Complied
1.356	Live	31.6	46.0	14.4	Complied
1.356	Live	31.6	46.0	14.4	Complied
1.356	Live	31.6	46.0	14.4	Complied
13.560	Live	46.0	50.0	4.0	Complied
17.345	Live	31.2	50.0	18.8	Complied
17.799	Live	33.6	50.0	16.4	Complied

Transmitter AC Conducted Spurious Emissions (continued)

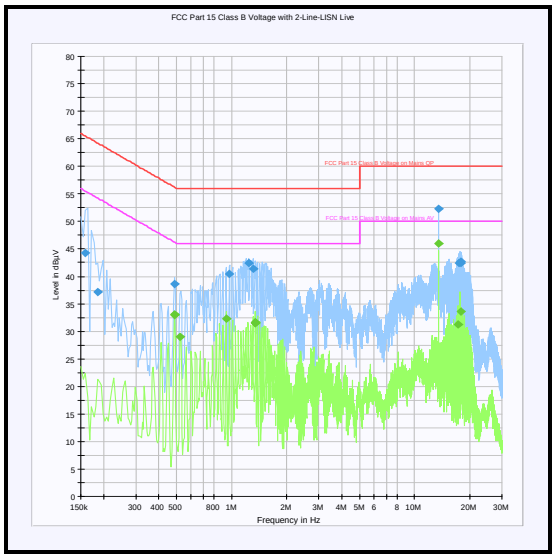
Results: Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
1.320	Neutral	35.5	56.0	20.5	Complied
13.560	Neutral	48.8	60.0	11.2	Complied
17.111	Neutral	40.3	60.0	19.7	Complied
17.462	Neutral	40.7	60.0	19.3	Complied
17.772	Neutral	40.1	60.0	19.9	Complied
17.840	Neutral	40.1	60.0	19.9	Complied

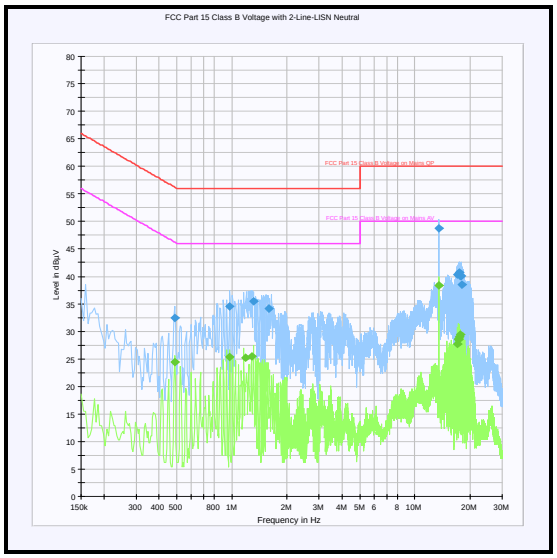
Results: Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.974	Neutral	25.4	46.0	20.6	Complied
1.185	Neutral	25.2	46.0	20.8	Complied
1.289	Neutral	25.5	46.0	20.5	Complied
13.560	Neutral	38.4	50.0	11.6	Complied
17.421	Neutral	29.0	50.0	21.0	Complied
17.768	Neutral	29.4	50.0	20.6	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.

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A004	LISN	Rohde & Schwarz	ESH3-Z5	890604/027	30 Oct 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	19 Feb 2014	12
M1263	Test Receiver	Rohde & Schwarz	ESIB 7	100265	09 Aug 2013	12
M1625	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	None stated	29 Jan 2014	12

5.2.2. Transmitter Fundamental Field Strength

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	26 July 2013
Test Sample IMEI:	004402540812108		

FCC Reference:	Part 15.225(a)(b)(c)(d)
Test Method Used:	ANSI C63.10 Section 6.4

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	44

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.
3. Pre-scans were performed with a peak detector. Final measurements were performed with a quasi-peak detector.

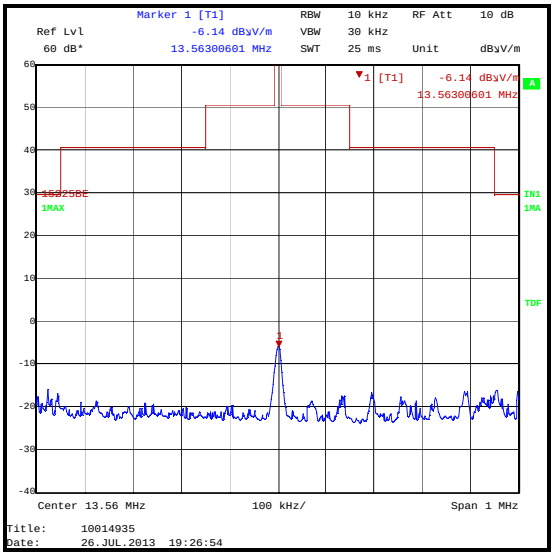
   Note: An additional 20 dB has been added to attain the final value shown in the table; this is to account for a transducer factor that was not included during the original measurement.

   i.e.: -6.9 dBuV/m + 20 dB = 13.1 dBuV/m

Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit at 30 m (dBµV/m)	Margin (dB)	Result
13.56	45° to EUT	13.1	84.0	70.9	Complied

Transmitter Fundamental Field Strength (continued)



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	07 Feb 2014	12
M1568	Magnetic Loop Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	12 Feb 2014	12
M1622	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	Not stated	24 May 2014	12

5.2.3. Transmitter Radiated Spurious Emissions

Test Summary:

Test Engineers:	Andrew Edwards	**Test Dates:**	26 July 2013 & 30 July 2013
Test Sample IMEI:	004402540812108		

FCC Reference:	Parts 15.225(d) & 15.209(a)
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):	21 to 24
Relative Humidity (%):	45 to 48

Note(s):

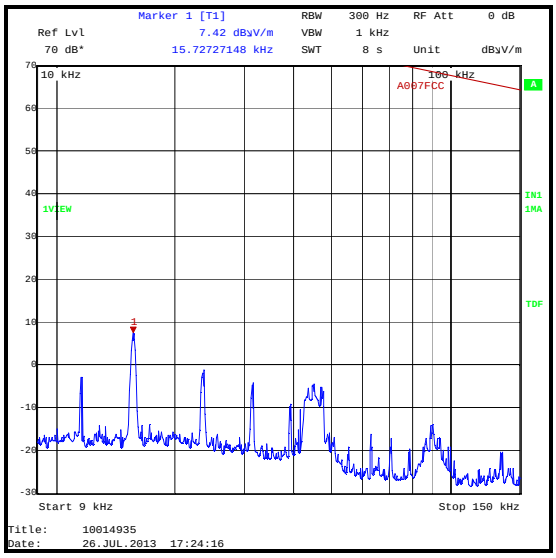
1. Limits below 30 MHz are specified at a test distance of 30 metres, whilst below 0.49 MHz they are specified at a test distance of 300 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).
2. 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.
3. Final measurement values include corrections for antenna factor and cable losses.
4. The emission shown at approximately 13.56 MHz is the fundamental.
5. All emissions on the 9 kHz to 150 kHz plot were investigated and found to be radiating from the test site turntable.
6. 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.
7. Measurements in the range 30 MHz to 1 GHz were performed in a semi-anechoic chamber (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.

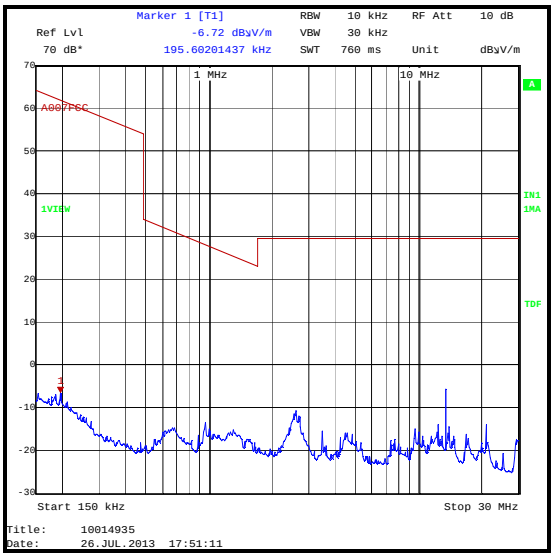
Transmitter Radiated Spurious Emissions (continued)

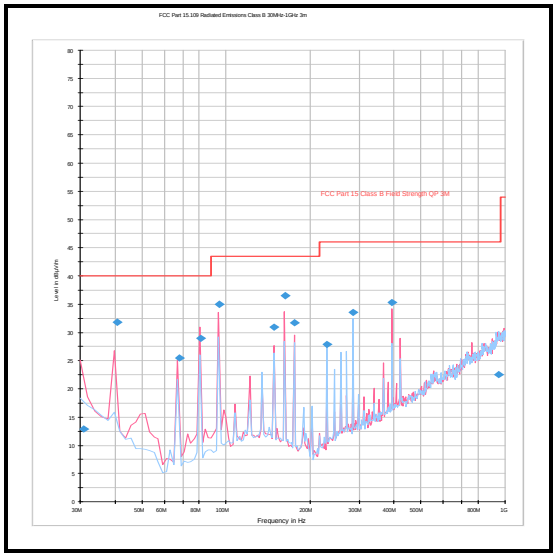
Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
40.686	Vertical	31.8	40.0	8.2	Complied
67.804	Vertical	25.4	40.0	14.6	Complied
81.354	Vertical	28.9	40.0	11.1	Complied
94.913	Vertical	34.9	43.5	8.6	Complied
149.159	Vertical	30.9	43.5	12.6	Complied
162.718	Vertical	36.5	43.5	7.0	Complied
176.277	Horizontal	31.7	43.5	11.8	Complied
230.514	Horizontal	27.9	46.0	18.1	Complied
284.760	Horizontal	33.6	46.0	12.4	Complied
393.233	Vertical	35.3	46.0	10.7	Complied

Transmitter Radiated Spurious Emissions (continued)







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

Transmitter Radiated Spurious Emissions (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A490	Antenna	Chase	CBL6111A	1590	18 Apr 2014	12
A1834	Attenuator	Hewlett Packard	8491B	10444	27 Jan 2014	12
G0543	Pre-Amplifier	Sonoma	310N	230801	04 Jul 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	07 Feb 2014	12
M1568	Magnetic Loop Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	12 Feb 2014	12
M1622	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	Not stated	24 May 2014	12

5.2.4. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	26 July 2013
Test Sample IMEI:	004402540812108		

FCC Reference:	Parts 15.225(c)(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.2

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	44

Note(s):

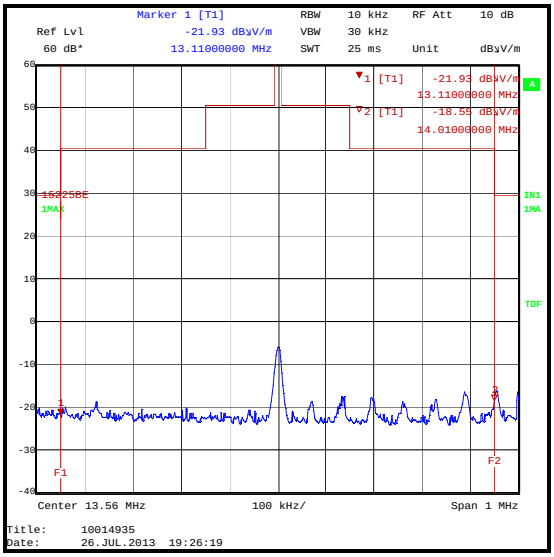
1. A transducer factor on the measuring instrument was used to extrapolate the results at 3 metres to a distance of 30 metres where required. A distance extrapolation factor of 40 dB was used.
2. The band edge emission plot shown below is low by a factor of 20 dB, due to the absence of a transducer factor 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.

Results: Quasi Peak Lower Band Edge

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
13.11	-8.8	29.5	38.3	Complied

Results: Quasi Peak Upper Band Edge

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
14.01	-6.2	29.5	35.7	Complied



Transmitter Band Edge Radiated Emissions (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	07 Feb 2014	12
M1568	Magnetic Loop Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	12 Feb 2014	12
M1622	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	Not stated	24 May 2014	12

5.2.5. Transmitter 20 dB Bandwidth

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	26 July 2013
Test Sample IMEI:	004402540812108		

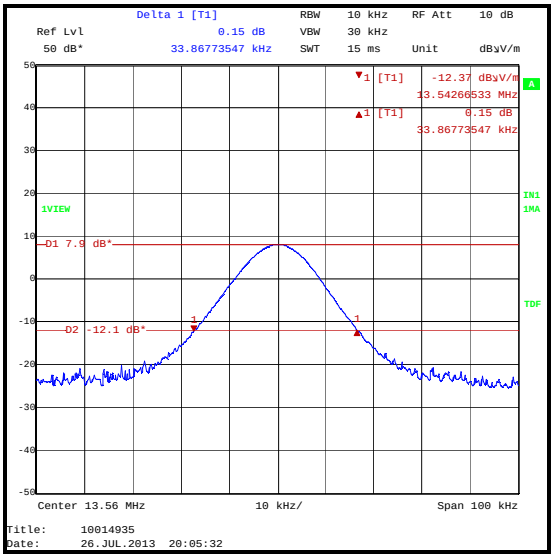
FCC Reference:	Part 2.1049
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.1

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	46

Results:

20 dB Bandwidth (kHz)
33.868



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	07 Feb 2014	12
M1568	Magnetic Loop Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	12 Feb 2014	12
M1622	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	Not stated	24 May 2014	12

5.2.6. Transmitter Frequency Stability (Temperature & Voltage Variation)

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	27 July 2013
Test Sample IMEI:	004402540811944		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	45

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

Temperature (ºC)	Time after Start-up			
	0 minutes	**2 minutes**	**5 minutes**	**10 minutes**
-20	13.560085 MHz	13.560095 MHz	13.560092 MHz	13.560092 MHz
20	13.560065 MHz	13.560064 MHz	13.560064 MHz	13.560065 MHz
50	13.560008 MHz	13.560007 MHz	13.560008 MHz	13.560007 MHz

Frequency with Worst Case Deviation (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Margin (%)	Result
13.560095 MHz	95	0.000701	0.01	0.009299	Complied

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

Supply Voltage (V)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Margin (%)	Result
3.23	13.56	13.560050	50	0.000369	0.01	0.009631	Complied
3.7	13.56	13.560065	65	0.000479	0.01	0.009521	Complied
4.37	13.56	13.560054	54	0.000398	0.01	0.009602	Complied

Transmitter Frequency Stability (Temperature & Voltage Variation) (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
E0513	Environmental Chamber	TAS	LT600 Series 3	23900506	Calibrated before use	-
M1269	Multimeter	Fluke	179	90250210	30 Jul 2013	12
M1643	Thermometer	Fluke	52II	18890136	19 Mar 2014	12
M1659	Thermometer / Hygrometer station	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
S0557	DC Power Supply	TTI	EL303R	395819	Calibrated before use	-
E0513	Environmental Chamber	TAS	LT600 Series 3	23900506	Calibrated before use	-

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”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±4.69 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%	±3.73 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±5.65 dB
Transmitter Fundamental Field Strength	13 MHz to 14 MHz	95%	±3.73 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

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	15 & 21	-	Corrected previously reported emissions levels by +20 dB

--- END OF REPORT ---