



TEST REPORT

Test Report No. : UL-RPT-RP11066287JD08A

Manufacturer : Flextronics International Sweden AB
Type No. : SR0020-W
FCC ID : 2AIP8I
Technology : UMTS1700 Band IV
Test Standard(s) : FCC Part 27 Subpart C

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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 1.0

Date of Issue: 16 August 2016

Checked by:

Sarah Williams
Engineer, Radio Laboratory

Company Signatory:

Steven White
Service Lead, Radio Laboratory
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

1.1. Customer Information

Company Name:	Sirin Labs AG
Address:	Muhlentalstrasse 2 8200 Schaffhausen Switzerland

1.2. Manufacturer Information






Manufacturer Name:	Flextronics International Sweden AB
Address:	Datalinjen 3A SE – 583 30 Linköping Sweden

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR27
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 27 Subpart C (Miscellaneous Wireless Communication Services)
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:	06 May 2016 to 03 June 2016

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 2.1046/27.50(d)(4)	Transmitter Output Power (EIRP)	
Part 2.1049	Transmitter Occupied Bandwidth	
Part 2.1055/27.54	Transmitter Frequency Stability (Temperature and Voltage Variation)	
Key to Results		
 = Complied  = Did not comply		

2.3. Methods and Procedures

Reference:	ANSI/TIA-603-D-2010
Title:	Land Mobile FM or PM Communications Equipment, Measurements and Performance Standards
Title:	FCC KDB 971168 D01 v02r02, October 17 2014
Reference:	Measurement Guidance for Certification of Licensed Digital Transmitters

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:	SOLARIN
Model Name or Number:	SR0020-W
Test Sample Serial Number:	0108 (<i>Conducted Sample</i>)
Test Sample IMEI:	357232070003189
Hardware Version Number:	TPI
Software Version Number:	LRC1TA.1.0.2.3
Handset Cover Material:	Technical leather with titanium coating
FCC ID:	2AIP8I

3.2. Description of EUT

The equipment under test was a Mobile device supporting Cellular, WLAN, BT, BTLE, RFID & GPS Technologies.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Technology Tested:	UMTS1700		
Type of Radio Device:	Transceiver		
Mode:	UMTS FDD IV		
Modulation Type:	QPSK / 8PSK		
Channel Spacing:	5 MHz		
Power Supply Requirement(s):	Nominal	3.9 V	
	Minimum	3.5 V	
	Maximum	4.4 V	
Maximum Output Power (EIRP):	RMC (12.2 kbps)	22.9 dBm	
	HSDPA Sub-Test 2	23.4 dBm	
	HSUPA Sub-Test 5	23.7 dBm	
Transmit Frequency Range:	1710 MHz to 1755 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1312	1712.4
	Middle	1412	1732.4
	Top	1513	1752.6

3.5. Support Equipment

No support equipment was used to exercise the EUT during testing.

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 on bottom, middle and top channels as required.
- Occupied bandwidth, EIRP and band edge tests were performed with the EUT in RMC (12.2 kbps), HSDPA (Sub-tests 1 to 4) or HSUPA (Sub-tests 1 to 5) modes.

4.2. Configuration and Peripherals

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

- Connected to a Rohde & Schwarz CMW 500 Wideband Radio Communications Tester, operating in UMTS Band IV mode.
- Testing for frequency stability and measurements at temperature and voltage extremes was performed using a conducted sample supplied by the customer. Short 4-wire DC flying leads were connected internally to the device in place of the battery, and exited through a hole in the casing. These leads were then extended to a DC power supply for testing purposes.
- For conducted cellular measurements, the RF conducted port was a temporary SMA connector provided by the customer.
- The conducted sample with IMEI 357232070003189 was used for all measurements.
- For the conducted measurements in this report antenna port 2 was used.

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 Uncertainty* 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 Output Power (EIRP)

Test Summary:

Test Engineer:	David Doyle	Test Dates:	01 June 2016 & 03 June 2016
Test Sample IMEI:	357232070003189		

FCC Reference:	Parts 2.1046 & 27.50(d)(4)
Test Method Used:	FCC KDB 971168 Sections 5.1.1 and 5.2.1

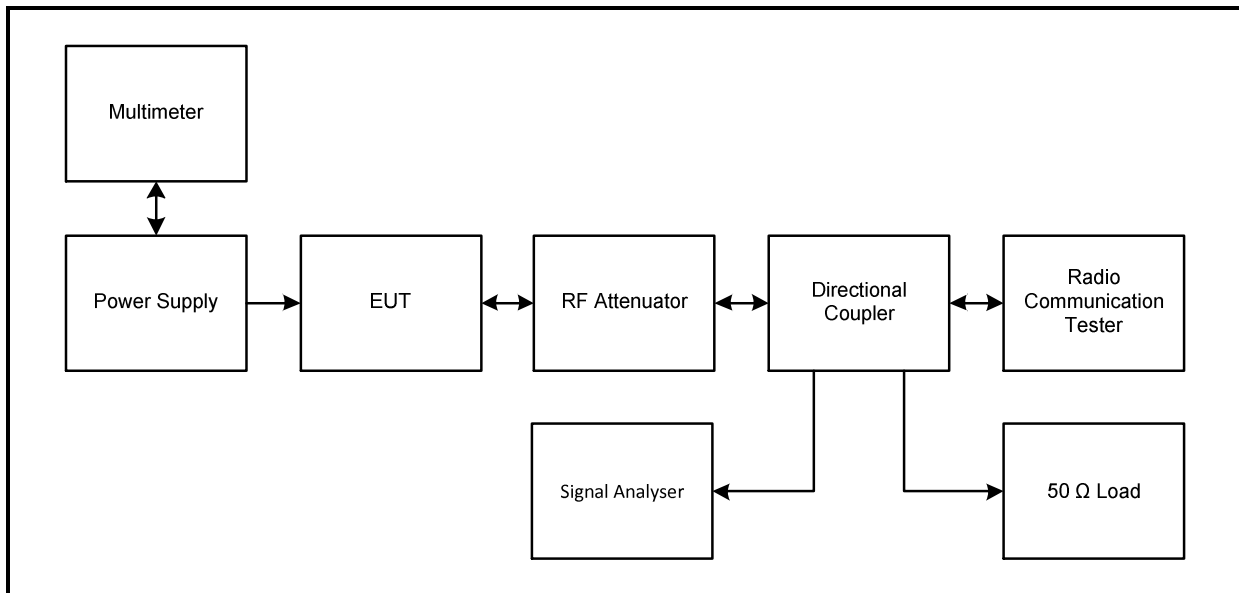
Environmental Conditions:

Temperature (°C):	23 to 24
Relative Humidity (%):	34 to 36

Note(s):

1. All modes were compared on each channel and the highest power recorded was subtracted from the limit to show the margin.
2. The signal analyser was connected to the RF port on the EUT via the coupled port on an RF directional coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.
3. The customer stated a maximum antenna gain of -1.54 dBi.
4. The antenna gain was added to the conducted output power to obtain the EIRP.

Test setup:



Transmitter Output Power (EIRP) (continued)**Results: Peak EIRP / HSDPA and RMC**

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1700	1312	21.7	22.2	22.2	22.2	22.0	30.0	7.8	Complied
	1412	22.2	23.4	23.4	22.9	22.9	30.0	6.6	Complied
	1513	21.7	23.0	23.0	23.1	22.5	30.0	6.9	Complied
β_c		2	11	15	15				
β_d		15	15	8	4				
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8				

Results: Peak EIRP / HSUPA

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1700	1312	22.5	22.3	22.6	22.0	22.5	30.0	7.4	Complied
	1412	23.5	22.4	23.7	22.0	23.7	30.0	6.3	Complied
	1513	23.2	22.3	22.3	22.0	23.2	30.0	6.8	Complied
β_c		10	6	15	2	15			
β_d		15	15	9	15	1			
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8	8			

Transmitter Output Power (EIRP) (continued)**Results: RMS EIRP / HSDPA and RMC**

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1700	1312	18.2	17.2	17.1	17.2	19.2	30.0	10.8	Complied
	1412	18.8	18.2	17.9	17.5	19.7	30.0	10.3	Complied
	1513	18.6	18.0	17.8	17.3	19.6	30.0	10.4	Complied
β_c		2	11	15	15				
β_d		15	15	8	4				
$\Delta\text{ACK}, \Delta\text{NACK}, \Delta\text{CQI}$		8	8	8	8				

Results: RMS EIRP / HSUPA

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1700	1312	18.4	18.0	18.5	18.6	18.6	30.0	11.4	Complied
	1412	18.8	18.3	18.8	18.9	18.9	30.0	11.1	Complied
	1513	18.6	18.0	18.6	18.6	18.7	30.0	11.3	Complied
β_c		10	6	15	2	15			
β_d		15	15	9	15	1			
$\Delta\text{ACK}, \Delta\text{NACK}, \Delta\text{CQI}$		8	8	8	8	8			

Transmitter Output Power (EIRP) (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	02 Apr 2017	12
A2504	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501839	Calibrated before use	-
A2845	Attenuator	Radiall	R411.806.121	24325927	Calibrated before use	-
A2844	Attenuator	Radiall	R411.806.121	23404066	Calibrated before use	-
M1835	Signal Analyser	Rohde & Schwarz	FSV30	103050	26 Feb 2017	12
M1269	Multimeter	Fluke	179	90250210	13 May 2017	12
S0577	DC Power Supply	TTi	CPX400S	436670	Calibrated before use	-
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24
M1802	Signal Generator	Rohde & Schwarz	SMU200A	103607	16 Feb 2018	24

5.2.2. Transmitter Occupied Bandwidth

Test Summary:

Test Engineer:	David Doyle	Test Date:	03 June 2016
Test Sample IMEI:	357232070003189		

FCC Reference:	Part 2.1049
Test Method Used:	KDB 971168 Section 4.2

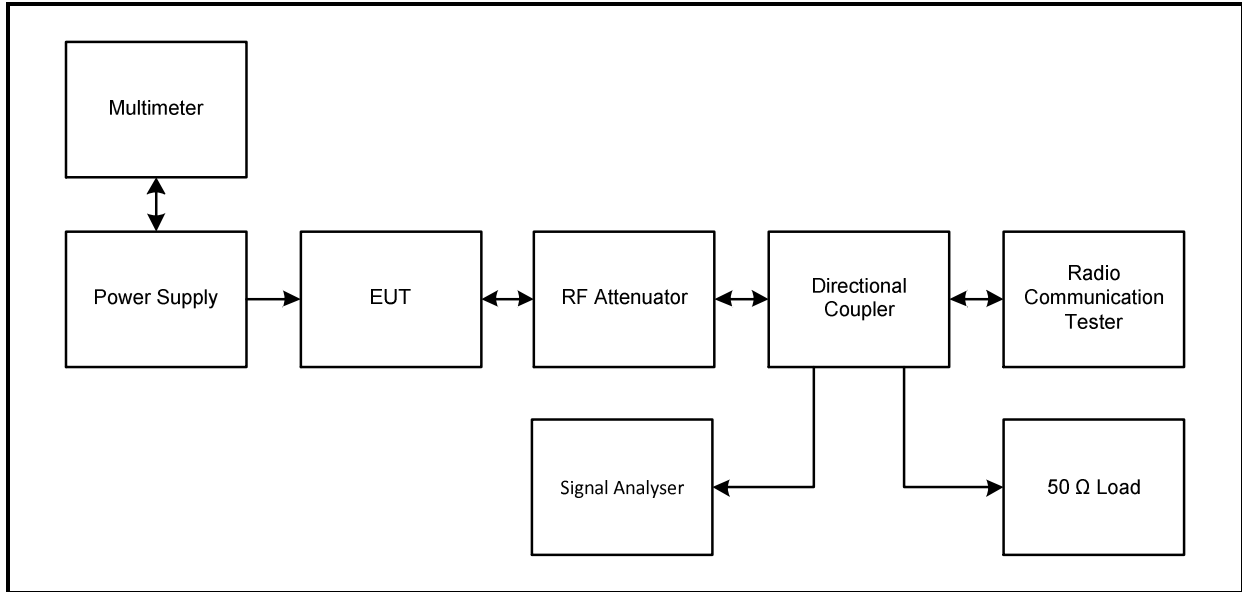
Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	34

Note(s):

1. Occupied bandwidth (99% bandwidth) was measured using a signal analyser occupied bandwidth function.
2. The signal analyser was connected to the RF port on the EUT via the coupled port on an RF directional coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.

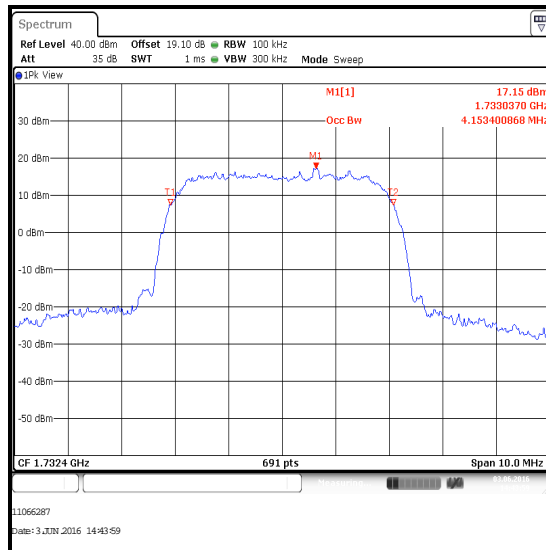
Test setup:



Transmitter Occupied Bandwidth (continued)

Results: RMC / 12.2 kbps

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1732.4	4153.401

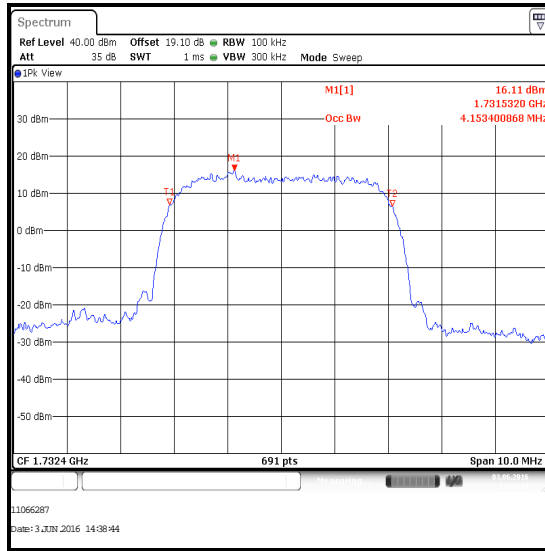


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 1

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1732.4	4153.401

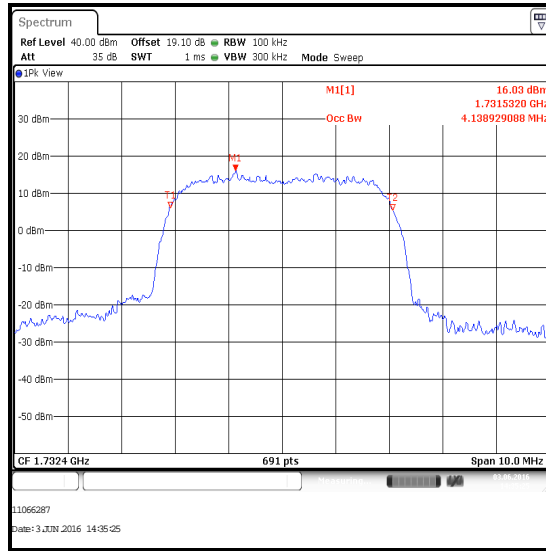


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 2

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1732.4	4138.929

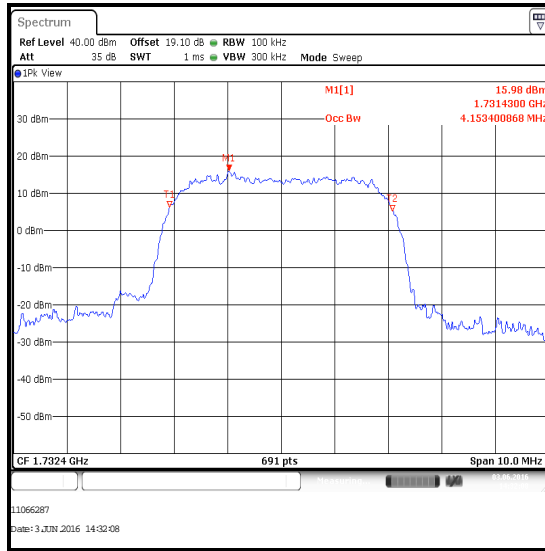


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 3

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1732.4	4153.401

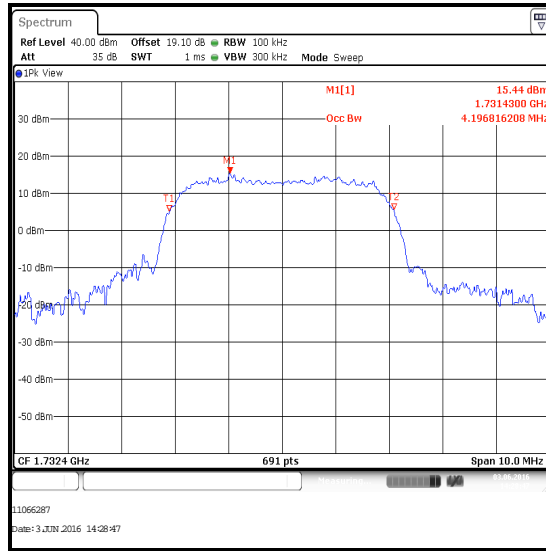


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 4

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1732.4	4196.816

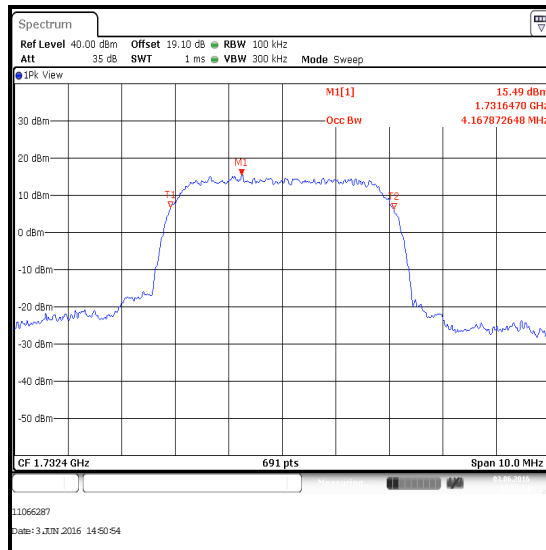


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 1

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1732.4	4167.873

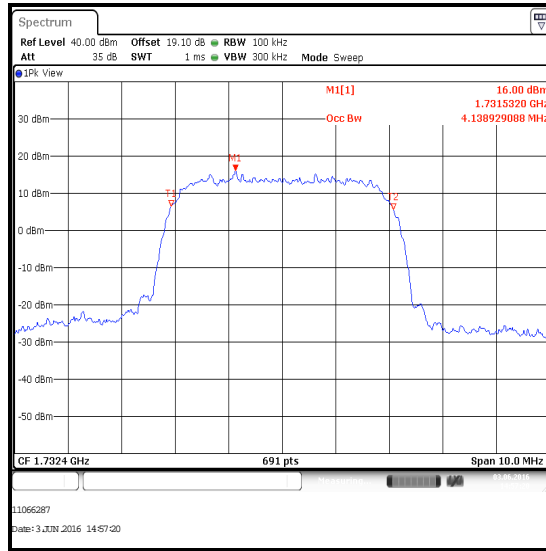


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 2

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1732.4	4138.929

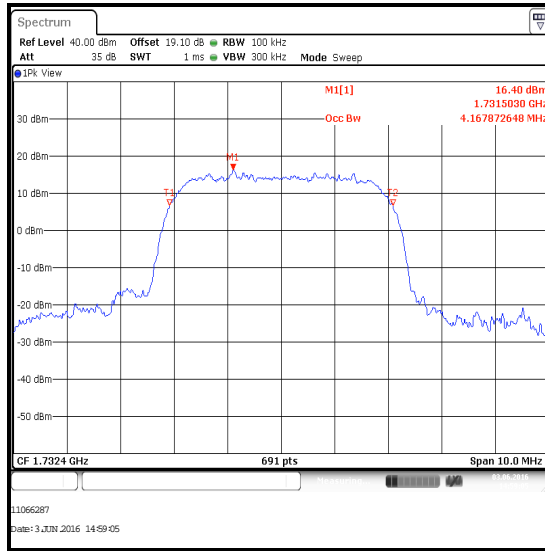


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 3

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1732.4	4167.873

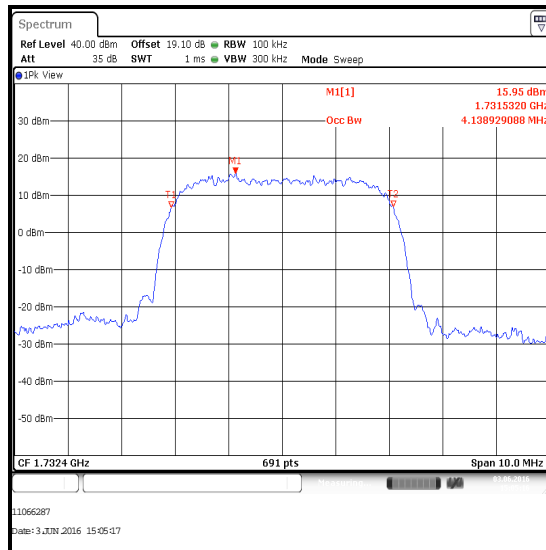


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 4

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1732.4	4138.929

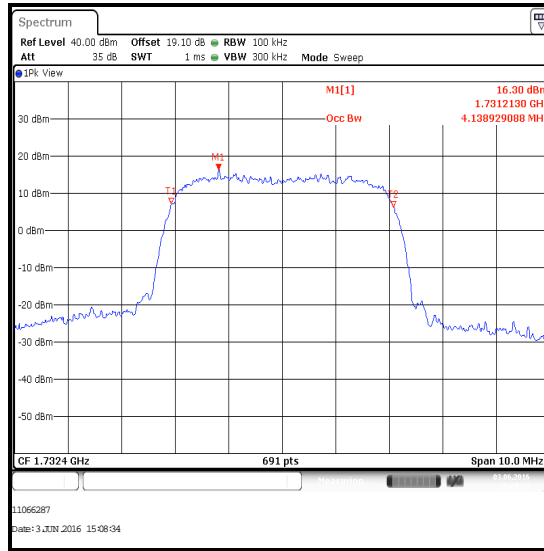


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 5

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1732.4	4138.929



Middle Channel

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohyrometer	Testo	608-H1	45041825	02 Apr 2017	12
A2504	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501839	Calibrated before use	-
A2845	Attenuator	Radiall	R411.806.121	24325927	Calibrated before use	-
A2844	Attenuator	Radiall	R411.806.121	23404066	Calibrated before use	-
M1835	Signal Analyser	Rohde & Schwarz	FSV30	103050	26 Feb 2017	12
M1269	Multimeter	Fluke	179	90250210	13 May 2017	12
S0577	DC Power Supply	TTi	CPX400S	436670	Calibrated before use	-
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24
M1802	Signal Generator	Rohde & Schwarz	SMU200A	103607	16 Feb 2018	24

5.2.3. Transmitter Frequency Stability (Temperature Variation)

Test Summary:

Test Engineer:	Stefan Ho	Test Date:	09 May 2016
Test Sample IMEI:	357232070003189		

FCC Reference:	Parts 2.1055 & 27.54
Test Method Used:	KDB 971168 Section 9.0, ANSI TIA-603-D Section 2.2.2 and FCC Part 2.1055
Test Mode:	RMC

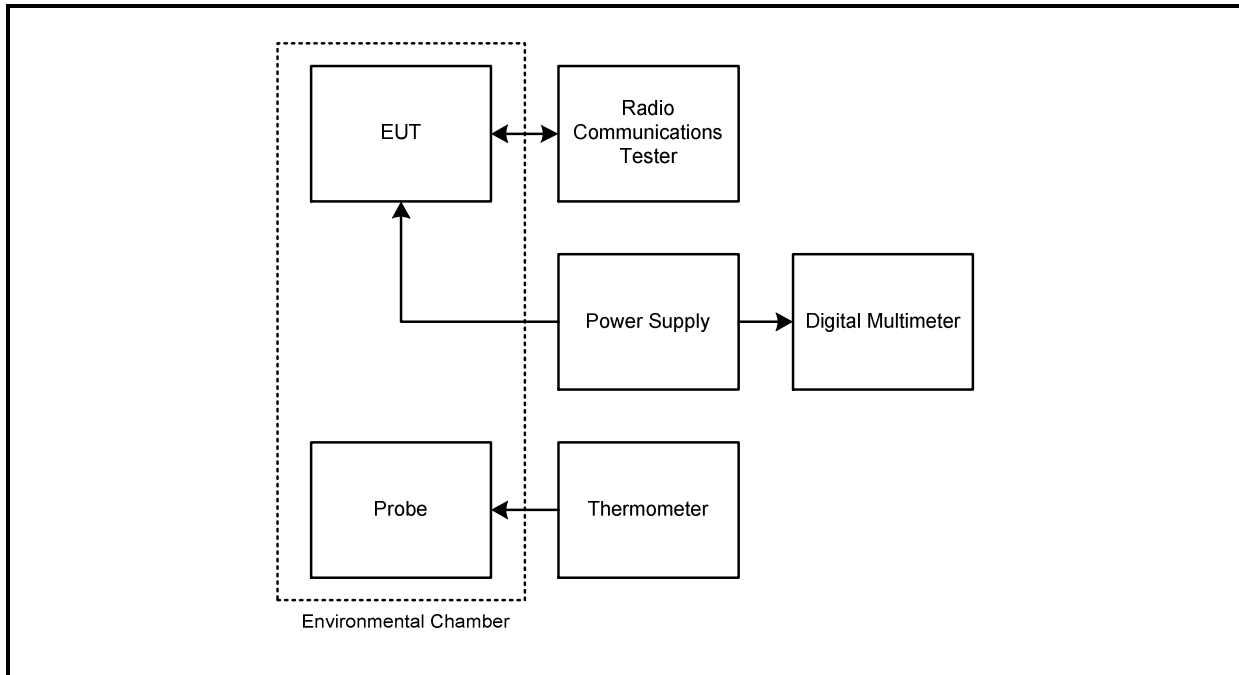
Environmental Conditions:

Ambient Temperature (°C):	24
Ambient Relative Humidity (%):	35

Note(s):

1. A dummy battery was placed on the EUT and the dummy battery cables connected to a bench power supply set to the nominal voltage of 3.9 V.
2. Frequency error was measured using a calibrated Rohde & Schwarz CMW 500 Universal Radio Communications Tester in accordance with current Rohde & Schwarz application notes. The EUT was connected by suitable RF cables to the CMW 500. A bi-directional communications link was established between the EUT and CMW 500. The frequency meter value was recorded.
3. Temperature was monitored throughout the test with a calibrated digital thermometer.

Test setup:



Transmitter Frequency Stability (Temperature Variation) (continued)**Results: Bottom Channel (1712.4 MHz)**

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	31	1712.400031	1710	2.400031	Complied
-20	8	1712.400008	1710	2.400008	Complied
-10	14	1712.399986	1710	2.399986	Complied
0	19	1712.399981	1710	2.399981	Complied
10	17	1712.399983	1710	2.399983	Complied
20	11	1712.399989	1710	2.399989	Complied
30	7	1712.400007	1710	2.400007	Complied
40	16	1712.400016	1710	2.400016	Complied
50	25	1712.400025	1710	2.400025	Complied

Results: Top Channel (1752.6 MHz)

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	49	1752.599951	1755	2.400049	Complied
-20	5	1752.600005	1755	2.399995	Complied
-10	20	1752.600020	1755	2.399980	Complied
0	25	1752.600025	1755	2.399975	Complied
10	23	1752.600023	1755	2.399977	Complied
20	14	1752.600014	1755	2.399986	Complied
30	6	1752.600006	1755	2.399994	Complied
40	11	1752.599989	1755	2.400011	Complied
50	19	1752.599981	1755	2.400019	Complied

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	02 Apr 2017	12
M1859	Wideband Radio Comms Tester	Rohde & Schwarz	CMW500	145920	12 Jun 2016	12
M1674	Environmental Chamber	Espec Corporation	SU-241	92013139	Calibrated before use	-
M1249	Thermometer	Fluke	52II	88800049	27 May 2016	12
S021	DC power supply	TTI	CPX200	061034	Calibrated before use	-
M1229	Multimeter	Fluke	179	87640015	21 Apr 2017	12

5.2.4. Transmitter Frequency Stability (Voltage Variation)**Test Summary:**

Test Engineer:	Stefan Ho	Test Date:	06 May 2016
Test Sample IMEI:	357232070003189		

FCC Reference:	Parts 2.1055 & 27.54
Test Method Used:	KDB 971168 Section 9.0, ANSI TIA-603-D Section 2.2.2 and FCC Part 2.1055
Test Mode:	RMC

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	33

Note(s):

1. A dummy battery was placed on the EUT and the dummy battery cables connected to a bench power supply.
2. Frequency error was measured using a calibrated Rohde & Schwarz CMW 500 Universal Radio Communications Tester in accordance with current Rohde & Schwarz application notes. The EUT was connected by suitable RF cables to the CMW 500. A bi-directional communications link was established between the EUT and CMW 500. The frequency meter value was recorded.
3. Voltage was monitored throughout the test with a calibrated digital voltmeter.

Results: Bottom Channel (1712.4 MHz)

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.5	4	1712.400004	1710	2.400004	Complied
4.4	5	1712.400005	1710	2.400005	Complied

Results: Top Channel (1752.6 MHz)

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
3.5	9	1752.600009	1755	2.399991	Complied
4.4	8	1752.600008	1755	2.399992	Complied

Transmitter Frequency Stability (Voltage Variation) (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	02 Apr 2017	12
M1859	Wideband Radio Comms Tester	Rohde & Schwarz	CMW500	145920	12 Jun 2016	12
S021	DC power supply	TTI	CPX200	061034	Calibrated before use	-
M1251	Multimeter	Fluke	175	89170179	26 May 2016	12

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
Conducted Output Power	1710 to 1755 MHz	95%	±1.13 dB
Occupied Bandwidth	1710 to 1755 MHz	95%	±3.92 %
Frequency Stability	1710 to 1755 MHz	95%	±23 Hz

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

--- END OF REPORT ----