



CERTIFICATION TEST REPORT

Report Number. : 12085703-E2V1

Applicant : SONY MOBILE COMMUNICATIONS INC.
4-12-3 HIGASHI-SHINAGAWA,
SHINAGAWA -KU,TOKYO, 140-0002, JAPAN

FCC ID : PY7-00718V

EUT Description : GSM/WCDMA/LTE PHONE WITH BT, DTS/UNII A/B/G/N/AC & NFC

Test Standard(s) : FCC CFR47 PART 22 SUBPART H
FCC CFR47 PART 24 SUBPART E
FCC CFR47 PART 27 SUBPART F, H, L, and M
FCC CFR47 PART 90 SUBPART S

Date Of Issue:
FEBRUARY 14, 2018

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2/13/2018	Initial Review	Dan Corona
V2	2/14/2018	Updated Section 8 by adding results	Dan Corona

1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	SONY MOBILE COMMUNICATIONS, INC. 4-12-3 HIGASHI-SHINAGAWA, SHINAGAWA -KU, TOKYO, 140-0002, JAPAN
FCC ID	PY7-00718V
EUT Description	GSM/WCDMA/LTE PHONE WITH BT, DTS/UNII A/B/G/N/AC & NFC
Serial Number	QV7000MR16, QV70001X16
Date Tested	JANUARY 02, 2018 - JANUARY 09, 2018
Applicable Standards	FCC CFR 47 PART 22H, 24E, 27F,H,L,M and 90S
	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released For
UL Verification Services Inc By:



Dan Corona
Operations Leader
UL Verification Services Inc.

Prepared By:



Kiya Kedida
Project Engineer
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.26:2015, TIA-603-E-, FCC CFR 47 Part 2, Part 22, Part 24, Part 27, Part and 90, FCC KDB 971168 D01 v03, KDB 484596 D01 v01 Referencing Test Data DR01-42712.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
<input checked="" type="checkbox"/> Chamber A (IC:2324B-1)	<input checked="" type="checkbox"/> Chamber D (IC:22541-1)
<input checked="" type="checkbox"/> Chamber B (IC:2324B-2)	<input type="checkbox"/> Chamber E (IC:22541-2)
<input type="checkbox"/> Chamber C (IC:2324B-3)	<input type="checkbox"/> Chamber F (IC:22541-3)
	<input type="checkbox"/> Chamber G (IC:22541-4)
	<input type="checkbox"/> Chamber H (IC:22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \\ &\text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Radiated Disturbance, 26000 to 40000 MHz	5.24 dB
Occupied Channel Bandwidth	±0.39 %
Temperature	±0.9 °C
Supply voltages	±0.45 %
Time	±0.02 %

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE PHONE WITH BT, DTS/UNII A/B/G/N/AC & NFC

6. REUSE OF TEST DATA

6.1. INTRODUCTION

According to the manufacturer, FCC ID: PY7-21831A and FCC ID: PY7-00718V licensed and unlicensed radios (WWAN/WLAN/BT/BLE/NFC) are electrically identical. The FCC ID: PY7-21831A test data shall remain representative of FCC ID: PY7-00718V so, FCC ID: PY7-00718V leverages test data from FCC ID: PY7-21831A.

The applicant takes full responsibility that the test data as referenced in this section represents compliance for this FCC ID.

6.2. DEVICES DIFFERENCES

Difference between PY7-21831A and PY7-00718V:

- Conducted power all same (i.e. Cellular band and WLAN)
- For cellular band, all cellular bands will change the antenna perspective which is listed as below (i.e. antenna gain, pattern, and matching circuit), Hence RSE and SAR has been tested for all bands.
 - LTE: B2/B4/B5/B7/B12/B13/B17/B26/B41/B66 (*B29 Rx only no impact)
 - UMTS: B2/B4/B5
 - GSM: 850/1900
- For WLAN only 2.4GHz/5GHz chain 1 will change from antenna gain perspective. (i.e. WLAN 2.4GHz and 5GHz WLAN chain 0, PY7-00718V is same as PY7-21831A)

Please refer to operational description for details.

6.3. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device PY7-00718V for radiated harmonic spurious. The data from the application has been verified through appropriate spot checks to demonstrate compliance for this device as shown in the summary and appendix A.

6.4. REFERENCE DETAIL

Equipment Class	Reference FCC ID	Report Title/Section
PCE (WWAN)	PY7-21831A	12073310-E1V3 FCC Report WWAN

6.5. MAXIMUM OUTPUT POWER

ERP/EIRP LIMIT

FCC: §2.1046, §22.913, §24.232, §27.50, §90.635

EIRP/ERP TEST PROCEDURE

ANSI C63.26:2015/ TIA-603-E Clause 2.2.17

KDB 971168 Section 5.6

$$\text{ERP/EIRP} = \text{PMeas} + \text{GT} - \text{LC}$$

where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);

PMeas = measured transmitter output power or PSD, in dBm or dBW;

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

The transmitter has a maximum average conducted and ERP / EIRP output powers as follows:

GSM MODES

Part 22 850MHz

Frequency range (MHz)	Modulation	Conducted (Average) (dBm)	Antenna Gain (dBi)	ERP		Limit (dBm)	Margin (dB)
				dBm	mW		
824- 849	GPRS	32.50	-9.40	20.95	124.5	38.5	-17.5
	EGPRS	27.10	-9.40	15.55	35.9	38.5	-22.9

Part 24 1900MHz

Frequency range (MHz)	Modulation	Conducted (Average) (dBm)	Antenna Gain (dBi)	EIRP		Limit (dBm)	Margin (dB)
				dBm	mW		
1850-1910	GPRS	28.20	-3.90	24.30	269.2	33.0	-8.7
	EGPRS	26.00	-3.90	22.10	162.2	33.0	-10.9

WCDMA MODE

Part 22 Band 5

Frequency range (MHz)	Modulation	Conducted (Average) (dBm)	Antenna Gain (dBi)	ERP		Limit (dBm)	Margin (dB)
				dBm	mW		
824- 849	REL 99	24.80	-9.40	13.25	21.1	38.5	-25.2
	HSDPA	23.80	-9.40	12.25	16.8	38.5	-26.2

Part 24 Band 2

Frequency range (MHz)	Modulation	Conducted (Average) (dBm)	Antenna Gain (dBi)	EIRP		Limit (dBm)	Margin (dB)
				dBm	mW		
1850-1910	REL 99	22.70	-3.90	18.80	75.9	33.0	-14.2
	HSDPA	22.00	-3.90	18.10	64.6	33.0	-14.9

Part 27 Band 4

Frequency range (MHz)	Modulation	Conducted (Average) (dBm)	Antenna Gain (dBi)	EIRP		Limit (dBm)	Margin (dB)
				dBm	mW		
1710-1755	REL 99	22.60	-5.30	17.30	53.7	30.0	-12.7
	HSDPA	22.00	-5.30	16.70	46.8	30.0	-13.3

LTE BAND 2

Part 24						
EIRP Limit (dBm)		33.00				
Antenna Gain (dBi)		-3.90				
Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	EIRP Average		Margin (dB)
				dBm	mW	
1.4	1850-1910	QPSK	22.6	18.7	74.1	-14.3
		16QAM	22.5	18.6	72.4	-14.4
		64QAM	22.5	18.6	72.4	-14.4
3.0		QPSK	22.7	18.8	75.9	-14.2
		16QAM	22.6	18.7	74.1	-14.3
		64QAM	22.4	18.5	70.8	-14.5
5.0		QPSK	22.6	18.7	74.1	-14.3
		16QAM	22.6	18.7	74.1	-14.3
		64QAM	22.5	18.6	72.4	-14.4
10.0		QPSK	22.8	18.9	77.6	-14.1
		16QAM	22.7	18.8	75.9	-14.2
		64QAM	22.6	18.7	74.1	-14.3
15.0	QPSK	22.8	18.9	77.6	-14.1	
	16QAM	22.9	19.0	79.4	-14.0	
	64QAM	22.8	18.9	77.6	-14.1	
20.0	QPSK	23.0	19.1	81.3	-13.9	
	16QAM	23.0	19.1	81.3	-13.9	
	64QAM	22.9	19.0	79.4	-14.0	

LTE BAND 4

Part 27						
EIRP Limit (dBm)		30.00				
Antenna Gain (dBi)		-5.30				
Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	EIRP Average		Margin (dB)
				dBm	mW	
1.4	1710-1755	QPSK	22.4	17.1	51.3	-12.9
		16QAM	22.3	17.0	50.1	-13.0
		64QAM	22.4	17.1	51.3	-12.9
3.0		QPSK	22.5	17.2	52.5	-12.8
		16QAM	22.4	17.1	51.3	-12.9
		64QAM	22.4	17.1	51.3	-12.9
5.0		QPSK	22.4	17.1	51.3	-12.9
		16QAM	22.3	17.0	50.1	-13.0
		64QAM	22.4	17.1	51.3	-12.9
10.0		QPSK	22.5	17.2	52.5	-12.8
		16QAM	22.4	17.1	51.3	-12.9
		64QAM	22.4	17.1	51.3	-12.9
15.0	QPSK	22.6	17.3	53.7	-12.7	
	16QAM	22.6	17.3	53.7	-12.7	
	64QAM	22.1	16.8	47.9	-13.2	
20.0	QPSK	22.6	17.3	53.7	-12.7	
	16QAM	22.4	17.1	51.3	-12.9	
	64QAM	22.4	17.1	51.3	-12.9	

LTE BAND 5

Part 22						
ERP Limit (dBm)		38.45				
Antenna Gain (dBi)		-9.40				
Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	ERP Average		Margin (dB)
				dBm	mW	
1.4	824-849	QPSK	24.6	13.05	20.2	-25.4
		16QAM	23.8	12.25	16.8	-26.2
		64QAM	23.0	11.45	14.0	-27.0
3.0		QPSK	24.7	13.15	20.7	-25.3
		16QAM	23.6	12.05	16.0	-26.4
		64QAM	22.3	10.75	11.9	-27.7
5.0		QPSK	24.7	13.15	20.7	-25.3
		16QAM	23.7	12.15	16.4	-26.3
		64QAM	22.2	10.65	11.6	-27.8
10.0	QPSK	24.5	12.95	19.7	-25.5	
	16QAM	23.9	12.35	17.2	-26.1	
	64QAM	22.1	10.55	11.4	-27.9	

LTE BAND 7

EIRP Limit (dBm)		33.00				
Antenna Gain (dBi)		-2.80				
Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	EIRP Average		Margin (dB)
				dBm	mW	
5.0	2500-2570	QPSK	22.7	19.9	97.7	-13.1
		16QAM	22.8	20.0	100.0	-13.0
		64QAM	22.7	19.9	97.7	-13.1
10.0		QPSK	22.8	20.0	100.0	-13.0
		16QAM	22.6	19.8	95.5	-13.2
		64QAM	22.5	19.7	93.3	-13.3
15.0		QPSK	22.8	20.0	100.0	-13.0
		16QAM	22.7	19.9	97.7	-13.1
		64QAM	22.6	19.8	95.5	-13.2
20.0		QPSK	22.8	20.0	100.0	-13.0
		16QAM	22.7	19.9	97.7	-13.1
		64QAM	22.6	19.8	95.5	-13.2

LTE BAND 12

Part 27						
ERP Limit (dBm)		34.77				
Antenna Gain (dBi)		-13.30				
Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	ERP Average		Margin (dB)
				dBm	mW	
1.4	699-716	QPSK	24.6	9.15	8.2	-25.6
		16QAM	23.9	8.45	7.0	-26.3
		64QAM	22.8	7.35	5.4	-27.4
3.0		QPSK	24.6	9.15	8.2	-25.6
		16QAM	23.4	7.95	6.2	-26.8
		64QAM	22.1	6.65	4.6	-28.1
5.0		QPSK	24.6	9.15	8.2	-25.6
		16QAM	23.6	8.15	6.5	-26.6
		64QAM	21.8	6.35	4.3	-28.4
10.0		QPSK	24.5	9.05	8.0	-25.7
		16QAM	23.9	8.45	7.0	-26.3
		64QAM	22.1	6.65	4.6	-28.1

LTE BAND 13

Part 27							
ERP Limit (dBm)		34.77					
Antenna Gain (dBi)		-9.50					
Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	ERP Average		Margin (dB)	
				dBm	mW		
5.0	777-787	QPSK	24.9	13.25	21.1	-21.5	
		16QAM	24.0	12.35	17.2	-22.4	
		64QAM	23.0	11.35	13.6	-23.4	
10.0		QPSK	24.9	13.25	21.1	-21.5	
		16QAM	23.9	12.25	16.8	-22.5	
		64QAM	23.0	11.35	13.6	-23.4	

LTE BAND 17

Part 27							
ERP Limit (dBm)		34.77					
Antenna Gain (dBi)		-12.80					
Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	ERP Average		Margin (dB)	
				dBm	mW		
5.0	704-716	QPSK	24.6	9.65	9.2	-25.1	
		16QAM	23.6	8.65	7.3	-26.1	
		64QAM	21.8	6.85	4.8	-27.9	
10.0		QPSK	24.5	9.55	9.0	-25.2	
		16QAM	23.9	8.95	7.9	-25.8	
		64QAM	22.1	7.15	5.2	-27.6	

LTE BAND 26 (FCC Part 90S)

Part 90						
ERP Limit (dBm)		50.00				
Antenna Gain (dBi)		-9.60				
Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	ERP Average		Margin (dB)
				dBm	mW	
1.4	814-824	QPSK	24.0	12.25	16.8	-37.8
		16QAM	23.6	11.85	15.3	-38.2
		64QAM	22.5	10.75	11.9	-39.3
3.0		QPSK	24.0	12.25	16.8	-37.8
		16QAM	23.5	11.75	15.0	-38.3
		64QAM	22.5	10.75	11.9	-39.3
5.0		QPSK	24.0	12.25	16.8	-37.8
		16QAM	23.6	11.85	15.3	-38.2
		64QAM	22.5	10.75	11.9	-39.3
10.0	QPSK	24.0	12.25	16.8	-37.8	
	16QAM	23.5	11.75	15.0	-38.3	
	64QAM	22.4	10.65	11.6	-39.4	

LTE BAND 26 (FCC Part 22)

Part 22						
ERP Limit (dBm)		38.45				
Antenna Gain (dBi)		-9.60				
Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	ERP Average		Margin (dB)
				dBm	mW	
1.4	824-849	QPSK	24.0	12.25	16.8	-26.2
		16QAM	23.6	11.85	15.3	-26.6
		64QAM	22.5	10.75	11.9	-27.7
3.0		QPSK	24.0	12.25	16.8	-26.2
		16QAM	23.5	11.75	15.0	-26.7
		64QAM	22.5	10.75	11.9	-27.7
5.0		QPSK	24.0	12.25	16.8	-26.2
		16QAM	23.6	11.85	15.3	-26.6
		64QAM	22.5	10.75	11.9	-27.7
10.0		QPSK	24.0	12.25	16.8	-26.2
		16QAM	23.5	11.75	15.0	-26.7
		64QAM	22.4	10.65	11.6	-27.8
15.0		QPSK	24.0	12.25	16.8	-26.2
		16QAM	23.5	11.75	15.0	-26.7
		64QAM	22.3	10.55	11.4	-27.9

LTE BAND 41

Part 27							
EIRP Limit (dBm)		33.00					
Antenna Gain (dBi)		-2.50					
Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	EIRP Average		Margin (dB)	
				dBm	mW		
5.0	2496-2690	QPSK	22.5	20.0	100.0	-13.0	
		16QAM	22.1	19.6	91.2	-13.4	
		64QAM	22.1	19.6	91.2	-13.4	
10.0		QPSK	22.5	20.0	100.0	-13.0	
		16QAM	22.0	19.5	89.1	-13.5	
		64QAM	22.0	19.5	89.1	-13.5	
15.0		QPSK	22.5	20.0	100.0	-13.0	
		16QAM	22.1	19.6	91.2	-13.4	
		64QAM	22.1	19.6	91.2	-13.4	
20.0		QPSK	22.6	20.1	102.3	-12.9	
		16QAM	22.2	19.7	93.3	-13.3	
		64QAM	22.2	19.7	93.3	-13.3	

LTE BAND 66

Part 27							
EIRP Limit (dBm)		30.00					
Antenna Gain (dBi)		-5.50					
Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	EIRP Average		Margin (dB)	
				dBm	mW		
1.4	1710-1755	QPSK	22.4	16.9	49.0	-13.1	
		16QAM	22.3	16.8	47.9	-13.2	
		64QAM	22.4	16.9	49.0	-13.1	
3.0		QPSK	22.5	17.0	50.1	-13.0	
		16QAM	22.4	16.9	49.0	-13.1	
		64QAM	22.4	16.9	49.0	-13.1	
5.0		QPSK	22.4	16.9	49.0	-13.1	
		16QAM	22.3	16.8	47.9	-13.2	
		64QAM	22.4	16.9	49.0	-13.1	
10.0		QPSK	22.5	17.0	50.1	-13.0	
		16QAM	22.4	16.9	49.0	-13.1	
		64QAM	22.4	16.9	49.0	-13.1	
15.0		QPSK	22.6	17.1	51.3	-12.9	
		16QAM	22.6	17.1	51.3	-12.9	
		64QAM	22.1	16.6	45.7	-13.4	
20.0		QPSK	22.6	17.1	51.3	-12.9	
		16QAM	22.4	16.9	49.0	-13.1	
		64QAM	22.4	16.9	49.0	-13.1	

6.6. MAXIMUM ANTENNA GAIN

Please see table below:

LTE Bands	Antenna Gain (dBi)
GSM850, 824-849MHz	-9.4
GSM1900, 1850-1910MHz	-3.9
WCDMA Band 2, 1850-1910 MHz	-3.9
WCDMA Band 4, 1710-1755 MHz	-5.3
WCDMA Band 5, 824-849 MHz	-9.4
LTE Band 2, 1850 – 1910 MHz	-3.9
LTE Band 4, 1710 – 1755 MHz	-5.3
LTE Band 5, 824 – 849 MHz	-9.4
LTE Band 7, 2500 – 2570 MHz	-2.8
LTE Band 12, 699 – 716 MHz	-13.3
LTE Band 13, 777 – 787 MHz	-9.5
LTE Band 17, 704 – 716 MHz	-12.8
LTE Band 26, 814 – 849 MHz	-9.6
LTE Band 41, 2496 – 2690 MHz	-2.5
LTE Band 66, 1710 – 1780 MHz	-5.5

6.7. WORST-CASE CONFIGURATION AND MODE

The EUT supports LTE Bands of:

Band 2, Band 4, Band 5, Band 7, Band 12, Band 13, Band 17, Band 26, Band 41, and Band 66.

LTE Band 4 (1710-1755MHz, 5/10/15/20MHz bandwidth) is covered by LTE Band 66 because it is a subset of LTE band 66 and they have same output power.

LTE Band 17 (704-716MHz, 5/10MHz bandwidth) is covered by LTE Band 12 because it is a subset of LTE band 12 and they have the same output power.

The worst-case scenario for all measurements is based on the average conducted output power measurement investigation results. Output power measurements were measured on QPSK, 16QAM and 64QAM modulations. It was found that QPSK and 16QAM results were worst case. All testing was performed using QPSK and 16QAM modulations to represent the worst case.

6.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
AC adapter	SONY	UCH12	4016W40310044
Audio & Charging Cable	SONY	1312-8675.1B	YYWWSSPCXXXXXXXXC
Earphone	SONY	MH410c	N/A

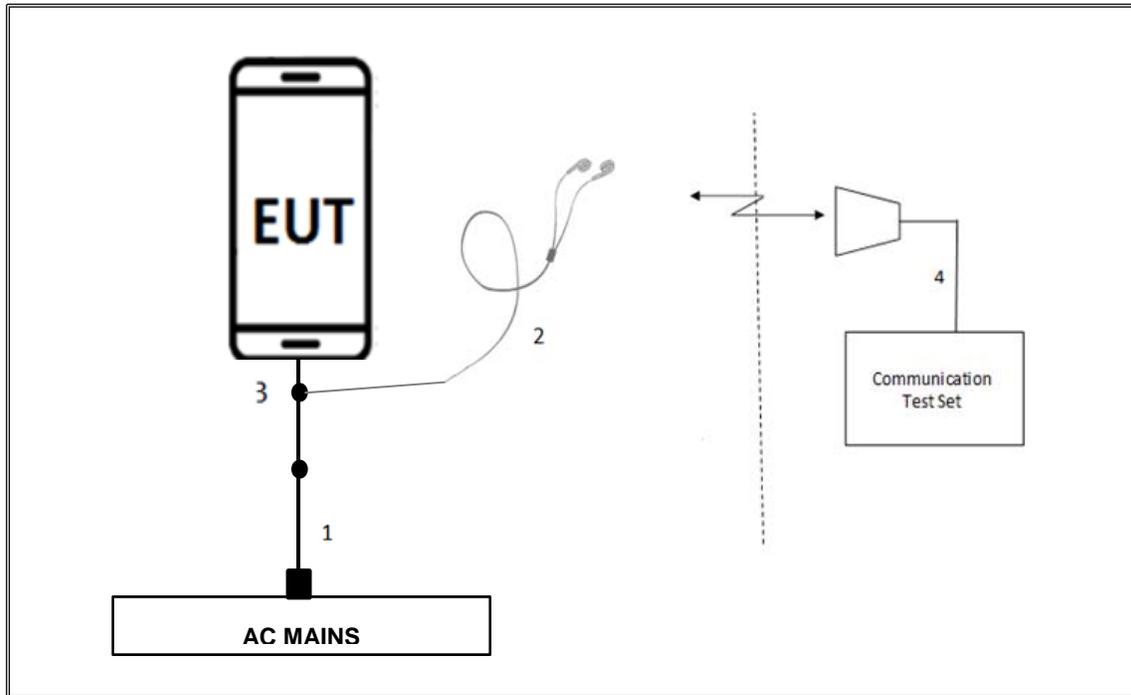
I/O CABLES (RF Radiated Test)

I/O Cable List						
Cable No	Port	# of identi	Connector Type	Cable Type	Cable Length	Remarks
1	USB	1	AC Adapter	Un-shielded	1.2m	No
2	Jack	1	Headset	Shielded	1m	No
3	USB/Headphone Jack	1	USB Type-C/Audio	Un-shielded	.2m	Audio & Charging Cable
4	RF In/out	1	Communication Test Set	Un-shielded	2m	No

TEST SETUP

The EUT is continuously communicated to the call box during the tests.

RADIATED SETUP



7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset	Cal Due
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T862	6/9/2018
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T712	01/30/18
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T863	06/09/18
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T711	01/30/18
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T1165	06/24/18
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T493	02/15/18
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T913	06/21/18
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T740	11/29/18
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1466	04/11/18
Spectrum Analyzer, PSA 3Hz to 44GHz	Keysight	E4446A	T907	01/23/18
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T905	01/11/18
Spectrum Analyzer, PSA 3Hz to 44GHz	Keysight	E4446A	T123	12/14/18
Highpass Filter, 2.7 GHz	Micro-Circuits	H2G518G6	T772	07/05/18
Highpass Filter, 1 GHz	Micro-Tronics	HPM18129	T889	02/21/18
Highpass Filter, 4GHz	Micro-Tronics	HPM13351	T1241	07/19/18
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T1210	06/30/17
Wideband Communication Test Set, Call Box	R&S	CMW500	T959	connection purpose only
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T971	connection purpose only
UL AUTOMATION SOFTWARE				
CLT Software	UL	UL RF	Ver 1.7, November 2015	
Power Measurement Software	UL	UL RF	Ver 2.2, June 2017	

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

8. RF OUTPUT POWER VERIFICATION

EUT includes different power levels for head use configuration and body use configuration and the below tables contain the highest of all configurations average conducted output powers as follows

RESULTS

Refer to report number 12073310-E1V3 FCC Report WWAN section 7.1.

9. CONDUCTED TEST RESULTS

9.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only.

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the middle channel in each band. The 99% and -26dB bandwidths was also measured and recorded.

MODES TESTED

- GSM 850
- GSM 1900
- WCDM Band 2
- WCDM Band 4
- WCDM Band 5
- LTE Band 2
- LTE Band 7
- LTE Band 12
- LTE Band 13
- LTE Band 26
- LTE Band 41
- LTE Band 66

RESULTS

Refer to report number 12073310-E1V3 FCC Report WWAN section 8.1.

9.2. BAND EDGE AND EMISSION MASK

RULE PART(S)

FCC: §2.1051, §22.917, §24.238, §27.53, §90.691

LIMITS

FCC: §22.917, §24.238, §27.53(h)

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

FCC: §90.691 Emission mask requirements for EA-based systems.

(a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \text{ Log}_{10}(f/6.1)$ decibels or $50 + 10 \text{ Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \text{ Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

FCC: §27.53 (Band 30)

(a) For operations in the 2305-2320 MHz band and the 2345-2360 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

(4) For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

(i) By a factor of not less than: $43 + 10 \log (P)$ dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than $55 + 10 \log (P)$ dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than $61 + 10 \log (P)$ dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than $67 + 10 \log (P)$ dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2300 and 2305 MHz, $55 + 10 \log (P)$ dB on all frequencies between 2296 and 2300 MHz, $61 + 10 \log (P)$ dB on all frequencies between 2292 and 2296 MHz, $67 + 10 \log (P)$ dB on all frequencies between 2288 and 2292 MHz, and $70 + 10 \log (P)$ dB below 2288 MHz;

(iii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2360 and 2365 MHz, and not less than $70 + 10 \log (P)$ dB above 2365 MHz.

FCC: §27.53 (Band 13)

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) Emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals. (-70 dBW/MHz = -40 dBm/MHz).

FCC: §27.53 (Band 12, 17)

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC: §27.53 (Band 7, 41)

(m)(4) For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

TEST PROCEDURE

The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each band edge measurement:

1. Set the spectrum analyzer span to include the block edge frequency.
2. Set a marker to point the corresponding band edge frequency in each test case.
3. Set display line at -13 dBm
4. Set resolution bandwidth to at least 1% of emission bandwidth.

MODES TESTED

- GSM 850
- GSM 1900
- WCDM Band 2
- WCDM Band 4
- WCDM Band 5
- LTE Band 2
- LTE Band 7
- LTE Band 12
- LTE Band 13
- LTE Band 26
- LTE Band 41
- LTE Band 66

RESULTS

Refer to report number 12073310-E1V3 FCC Report WWAN section 8.2.

9.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238, §27.53, §90.691

LIMITS

FCC: §22.917, §24.238, §27.53 (c), (g), (h), §90.691

The minimum permissible attenuation level of any spurious emissions is $43 + 10 \log (P)$ dB where transmitting power (P) in Watts.

FCC: §27.53 (a) (Band 30)

The minimum permissible attenuation level of any spurious emissions is $70 + 10 \log (P)$ dB where transmitting power (P) in Watts.

FCC: §27.53 (m) (Band 7, 41)

The minimum permissible attenuation level of any spurious emissions is $55 + 10 \log (P)$ dB where transmitting power (P) in Watts.

TEST PROCEDURE

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

- Set display line at -13 dBm, -25dBm and -40dBm according to the band Limit
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.
(NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

MODES TESTED

- GSM 850
- GSM 1900
- WCDM Band 2
- WCDM Band 4
- WCDM Band 5
- LTE Band 2
- LTE Band 7
- LTE Band 12
- LTE Band 13
- LTE Band 26
- LTE Band 41
- LTE Band 66

RESULTS

Refer to report number 12073310-E1V3 FCC Report WWAN section 8.3.

9.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235, §27.54 and §90.213

LIMITS

FCC: §22.355, §90.213

The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.

FCC: §24.235 & §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = -30°C to $+50^{\circ}\text{C}$
- Voltage = (85% - 115%)
Low voltage, 3.23VDC, Normal, 3.8VDC and High voltage, 4.37VDC.
End Voltage, 3.2VDC.

Frequency Stability vs Temperature:

The EUT is placed inside a temperature chamber. The temperature is set to 20°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until $+50^{\circ}\text{C}$ is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

MODES TESTED

- LTE Band 2
- LTE Band 7
- LTE Band 13
- LTE Band 17
- LTE Band 26
- LTE Band 41
- LTE Band 66

RESULTS

Refer to report number 12073310-E1V3 FCC Report WWAN section 8.4.

9.5. PEAK-TO-AVERAGE POWER RATIO

LIMIT

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

Full resource block (FRB) for each bandwidth was used to measure as the worst case. The results from all CCDF measurements are passed with 13dB peak-to-average power ratio criteria.

RESULTS

Refer to report number 12073310-E1V3 FCC Report WWAN section 8.5.

10. SPOT CHECK DATA

10.1. FIELD STRENGTH OF SPURIOUS RADIATION

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		SOMC							
Project #:		12085703							
Date:		1/2/2018							
Test Engineer:		39005RA							
Configuration:		EUT + Charger + Headset							
Location:		Chamber B							
Mode:		EGPRS 1900 MHz Harmonics							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1850.2MHz									
3700.40	-20.5	V	3.0	35.9	1.0	-55.4	-13.0	-42.4	
5550.60	-17.1	V	3.0	35.5	1.0	-51.5	-13.0	-38.5	
7400.80	-17.4	V	3.0	35.7	1.0	-52.1	-13.0	-39.1	
3700.40	-20.1	H	3.0	35.9	1.0	-54.9	-13.0	-41.9	
5550.60	-16.6	H	3.0	35.5	1.0	-51.0	-13.0	-38.0	
7400.80	-15.9	H	3.0	35.7	1.0	-50.6	-13.0	-37.6	
Mid Ch, 1880MHz									
3760.00	-20.2	V	3.0	35.8	1.0	-55.0	-13.0	-42.0	
5640.00	-17.4	V	3.0	35.5	1.0	-51.9	-13.0	-38.9	
7520.00	-15.9	V	3.0	35.7	1.0	-50.7	-13.0	-37.7	
3760.00	-20.3	H	3.0	35.8	1.0	-55.2	-13.0	-42.2	
5640.00	-16.7	H	3.0	35.5	1.0	-51.2	-13.0	-38.2	
7520.00	-15.9	H	3.0	35.7	1.0	-50.6	-13.0	-37.6	
High Ch, 1909.8MHz									
3819.60	-20.1	V	3.0	35.8	1.0	-54.9	-13.0	-41.9	
5729.40	-17.4	V	3.0	35.5	1.0	-51.9	-13.0	-38.9	
7639.20	-17.3	V	3.0	35.8	1.0	-52.1	-13.0	-39.1	
3819.60	-19.7	H	3.0	35.8	1.0	-54.4	-13.0	-41.4	
5729.40	-15.9	H	3.0	35.5	1.0	-50.4	-13.0	-37.4	
7639.20	-15.2	H	3.0	35.8	1.0	-49.9	-13.0	-36.9	

GSM 1900MHz EGPRS

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		SOMC							
Project #:		12085703							
Date:		1/2/2018							
Test Engineer:		39317							
Configuration:		EUT + Charger + Headset							
Location:		Chamber A							
Mode:		Rel99 Band 4 Harmonics							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1712.4MHz									
3424.80	-20.3	V	3.0	36.1	1.0	-55.4	-13.0	-42.4	
5137.20	-16.8	V	3.0	35.4	1.0	-51.3	-13.0	-38.3	
6849.60	-14.7	V	3.0	35.7	1.0	-49.4	-13.0	-36.4	
3424.80	-20.9	H	3.0	36.1	1.0	-55.9	-13.0	-42.9	
5137.20	-15.8	H	3.0	35.4	1.0	-50.2	-13.0	-37.2	
6849.60	-15.5	H	3.0	35.7	1.0	-50.2	-13.0	-37.2	
Mid Ch, 1732.6MHz									
3465.20	-20.4	V	3.0	36.0	1.0	-55.5	-13.0	-42.5	
5197.80	-16.1	V	3.0	35.4	1.0	-50.5	-13.0	-37.5	
6930.40	-14.7	V	3.0	35.7	1.0	-49.4	-13.0	-36.4	
3465.20	-20.1	H	3.0	36.0	1.0	-55.1	-13.0	-42.1	
5197.80	-13.8	H	3.0	35.4	1.0	-48.2	-13.0	-35.2	
6930.40	-15.0	H	3.0	35.7	1.0	-49.6	-13.0	-36.6	
High Ch, 1752.6MHz									
3505.20	-20.6	V	3.0	36.0	1.0	-55.6	-13.0	-42.6	
5257.80	-15.7	V	3.0	35.4	1.0	-50.1	-13.0	-37.1	
7010.40	-14.3	V	3.0	35.7	1.0	-49.0	-13.0	-36.0	
3505.20	-20.5	H	3.0	36.0	1.0	-55.5	-13.0	-42.5	
5257.80	-16.9	H	3.0	35.4	1.0	-51.4	-13.0	-38.4	
7010.40	-14.9	H	3.0	35.7	1.0	-49.6	-13.0	-36.6	

WCDMA Band 4 Rel 99

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		SOMC							
Project #:		12085703							
Date:		12/28/2017							
Test Engineer:		43575 OS							
Configuration:		EUT + Charger + Headset							
Location:		Chamber A							
Mode:		LTE_QPSK Band 2 Harmonics, 5MHz Bandwidth							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1852.5MHz									
3705.00	-24.5	V	3.0	35.9	1.0	-59.3	-13.0	-46.3	
5557.50	-17.5	V	3.0	35.5	1.0	-52.0	-13.0	-39.0	
7410.00	-18.9	V	3.0	35.7	1.0	-53.7	-13.0	-40.7	
3705.00	-25.0	H	3.0	35.9	1.0	-59.9	-13.0	-46.9	
5557.50	-22.0	H	3.0	35.5	1.0	-56.5	-13.0	-43.5	
7410.00	-21.8	H	3.0	35.7	1.0	-56.6	-13.0	-43.6	
Mid Ch, 1880MHz									
3760.00	-23.5	V	3.0	35.8	1.0	-58.3	-13.0	-45.3	
5640.00	-22.7	V	3.0	35.5	1.0	-57.2	-13.0	-44.2	
7520.00	-21.8	V	3.0	35.7	1.0	-56.5	-13.0	-43.5	
3760.00	-23.8	H	3.0	35.8	1.0	-58.6	-13.0	-45.6	
5640.00	-21.2	H	3.0	35.5	1.0	-55.7	-13.0	-42.7	
7520.00	-21.1	H	3.0	35.7	1.0	-55.9	-13.0	-42.9	
High Ch, 1907.5MHz									
3815.00	-24.1	V	3.0	35.8	1.0	-58.9	-13.0	-45.9	
5722.50	-17.6	V	3.0	35.5	1.0	-52.1	-13.0	-39.1	
7630.00	-20.6	V	3.0	35.8	1.0	-55.4	-13.0	-42.4	
3815.00	-23.7	H	3.0	35.8	1.0	-58.5	-13.0	-45.5	
5722.50	-22.9	H	3.0	35.5	1.0	-57.4	-13.0	-44.4	
7630.00	-21.9	H	3.0	35.8	1.0	-56.7	-13.0	-43.7	
LTE B2 5MHz QPSK									

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		SOMC							
Project #:		12085703							
Date:		1/9/2018							
Test Engineer:		39005 RA							
Configuration:		EUT + Charger + Headset							
Location:		Chamber A							
Mode:		LTE_16QAM Band 5 Harmonics, 5MHz Bandwidth							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 826.5MHz									
1653.00	-28.6	V	3.0	37.0	1.0	-64.6	-13.0	-51.6	
2479.50	-23.6	V	3.0	36.4	1.0	-59.1	-13.0	-46.1	
3306.00	-21.7	V	3.0	36.1	1.0	-56.8	-13.0	-43.8	
1653.00	-28.0	H	3.0	37.0	1.0	-64.0	-13.0	-51.0	
2479.50	-23.9	H	3.0	36.4	1.0	-59.3	-13.0	-46.3	
3306.00	-22.3	H	3.0	36.1	1.0	-57.4	-13.0	-44.4	
Mid Ch, 836.5MHz									
1673.00	-27.4	V	3.0	37.0	1.0	-63.4	-13.0	-50.4	
2509.50	-23.5	V	3.0	36.4	1.0	-58.9	-13.0	-45.9	
3346.00	-21.3	V	3.0	36.1	1.0	-56.4	-13.0	-43.4	
1673.00	-27.7	H	3.0	37.0	1.0	-63.7	-13.0	-50.7	
2509.50	-23.6	H	3.0	36.4	1.0	-59.0	-13.0	-46.0	
3346.00	-22.3	H	3.0	36.1	1.0	-57.4	-13.0	-44.4	
High Ch, 846.5MHz									
1693.00	-27.4	V	3.0	37.0	1.0	-63.4	-13.0	-50.4	
2539.50	-23.3	V	3.0	36.4	1.0	-58.7	-13.0	-45.7	
3386.00	-21.3	V	3.0	36.1	1.0	-56.4	-13.0	-43.4	
1693.00	-14.0	H	3.0	37.0	1.0	-50.0	-13.0	-37.0	
2539.50	-23.3	H	3.0	36.4	1.0	-58.7	-13.0	-45.7	
3386.00	-21.4	H	3.0	36.1	1.0	-56.5	-13.0	-43.5	
LTE B5 5MHz 16QAM									

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: SOMC
 Project #: 12085703
 Date: 12/28/2017
 Test Engineer: 43575 OS
 Configuration: EUT + Charger + Headset
 Location: Chamber A
 Mode: LTE_QPSK Band 7 Harmonics, 10MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2505MHz									
5010.00	-20.2	V	3.0	35.5	1.0	-54.7	-25.0	-29.7	
7515.00	-21.2	V	3.0	35.7	1.0	-55.9	-25.0	-30.9	
10020.00	-19.5	V	3.0	36.0	1.0	-54.5	-25.0	-29.5	
5010.00	-21.3	H	3.0	35.5	1.0	-55.8	-25.0	-30.8	
7515.00	-20.6	H	3.0	35.7	1.0	-55.3	-25.0	-30.3	
10020.00	-19.2	H	3.0	36.0	1.0	-54.2	-25.0	-29.2	
Mid Ch, 2535MHz									
5070.00	-22.4	V	3.0	35.4	1.0	-56.9	-25.0	-31.9	
7605.00	-21.0	V	3.0	35.8	1.0	-55.8	-25.0	-30.8	
10140.00	-18.1	V	3.0	36.0	1.0	-53.0	-25.0	-28.0	
5070.00	-20.8	H	3.0	35.4	1.0	-55.2	-25.0	-30.2	
7605.00	-20.2	H	3.0	35.8	1.0	-55.0	-25.0	-30.0	
10140.00	-19.8	H	3.0	36.0	1.0	-54.7	-25.0	-29.7	
High Ch, 2565MHz									
5130.00	-21.5	V	3.0	35.4	1.0	-55.9	-25.0	-30.9	
7695.00	-20.6	V	3.0	35.8	1.0	-55.4	-25.0	-30.4	
10260.00	-19.5	V	3.0	35.9	1.0	-54.4	-25.0	-29.4	
5130.00	-22.4	H	3.0	35.4	1.0	-56.8	-25.0	-31.8	
7695.00	-19.8	H	3.0	35.8	1.0	-54.5	-25.0	-29.5	
10260.00	-19.2	H	3.0	35.9	1.0	-54.1	-25.0	-29.1	

LTE B7 10MHz QPSK

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: SOMC
 Project #: 12085703
 Date: 1/2/2018
 Test Engineer: 39005RA
 Configuration: EUT + Charger + Headset
 Location: Chamber B
 Mode: LTE_16QAM Band 12 Harmonics, 1.4MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 699.7MHz									
1399.40	-30.8	V	3.0	37.4	1.0	-67.2	-13.0	-54.2	
2099.10	-23.2	V	3.0	36.6	1.0	-58.8	-13.0	-45.8	
2798.80	-22.4	V	3.0	36.4	1.0	-57.8	-13.0	-44.8	
1399.40	-29.5	H	3.0	37.4	1.0	-65.9	-13.0	-52.9	
2099.10	-23.9	H	3.0	36.6	1.0	-59.5	-13.0	-46.5	
2798.80	-24.2	H	3.0	36.4	1.0	-59.5	-13.0	-46.5	
Mid Ch, 707.5MHz									
1415.00	-30.1	V	3.0	37.4	1.0	-66.4	-13.0	-53.4	
2122.50	-22.9	V	3.0	36.6	1.0	-58.5	-13.0	-45.5	
2830.00	-21.8	V	3.0	36.4	1.0	-57.2	-13.0	-44.2	
1415.00	-29.1	H	3.0	37.4	1.0	-65.5	-13.0	-52.5	
2122.50	-23.3	H	3.0	36.6	1.0	-58.8	-13.0	-45.8	
2830.00	-22.6	H	3.0	36.4	1.0	-57.9	-13.0	-44.9	
High Ch, 715.3MHz									
1430.60	-30.0	V	3.0	37.3	1.0	-66.3	-13.0	-53.3	
2145.90	-22.8	V	3.0	36.6	1.0	-58.3	-13.0	-45.3	
2861.20	-21.9	V	3.0	36.4	1.0	-57.3	-13.0	-44.3	
1430.60	-29.3	H	3.0	37.3	1.0	-65.6	-13.0	-52.6	
2145.90	-24.0	H	3.0	36.6	1.0	-59.6	-13.0	-46.6	
2861.20	-22.3	H	3.0	36.4	1.0	-57.7	-13.0	-44.7	

LTE B12 1.4MHz 16QAM

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		SOMC							
Project #:		12085703							
Date:		12/29/2017							
Test Engineer:		43575 OS							
Configuration:		EUT + Charger + Headset							
Location:		Chamber A							
Mode:		LTE_QPSK Band 13 Harmonics, 10MHz Bandwidth							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Mid Ch, 782MHz									
1564.00	-31.1	V	3.0	37.1	1.0	-67.2	-13.0	-54.2	
2346.00	-26.1	V	3.0	36.5	1.0	-61.6	-13.0	-48.6	
3128.00	-24.8	V	3.0	36.3	1.0	-60.1	-13.0	-47.1	
1564.00	-30.9	H	3.0	37.1	1.0	-67.0	-13.0	-54.0	
2346.00	-26.7	H	3.0	36.5	1.0	-62.2	-13.0	-49.2	
3128.00	-25.0	H	3.0	36.3	1.0	-60.2	-13.0	-47.2	

LTE B13 10MHz QPSK

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		SOMC							
Project #:		12085703							
Date:		12/29/2017							
Test Engineer:		43575 OS							
Configuration:		EUT + Charger + Headset							
Location:		Chamber A							
Mode:		LTE_16QAM Band 26 Harmonics, 5MHz Bandwidth							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 816.5MHz									
1633.00	-29.6	V	3.0	37.0	1.0	-65.7	-13.0	-52.7	
2449.50	-25.9	V	3.0	36.4	1.0	-61.3	-13.0	-48.3	
3266.00	-24.0	V	3.0	36.2	1.0	-59.2	-13.0	-46.2	
1633.00	-29.6	H	3.0	37.0	1.0	-65.6	-13.0	-52.6	
2449.50	-25.2	H	3.0	36.4	1.0	-60.6	-13.0	-47.6	
3266.00	-23.8	H	3.0	36.2	1.0	-59.0	-13.0	-46.0	
Mid Ch, 831.5MHz									
1663.00	-29.5	V	3.0	37.0	1.0	-65.5	-13.0	-52.5	
2494.50	-24.2	V	3.0	36.4	1.0	-59.7	-13.0	-46.7	
3326.00	-23.9	V	3.0	36.1	1.0	-59.1	-13.0	-46.1	
1663.00	-29.6	H	3.0	37.0	1.0	-65.6	-13.0	-52.6	
2494.50	-25.3	H	3.0	36.4	1.0	-60.7	-13.0	-47.7	
3326.00	-23.7	H	3.0	36.1	1.0	-58.8	-13.0	-45.8	
High Ch, 846.5MHz									
1693.00	-29.4	V	3.0	37.0	1.0	-65.4	-13.0	-52.4	
2539.50	-25.0	V	3.0	36.4	1.0	-60.4	-13.0	-47.4	
3386.00	-24.2	V	3.0	36.1	1.0	-59.3	-13.0	-46.3	
1693.00	-29.5	H	3.0	37.0	1.0	-65.5	-13.0	-52.5	
2539.50	-25.2	H	3.0	36.4	1.0	-60.6	-13.0	-47.6	
3386.00	-24.1	H	3.0	36.1	1.0	-59.2	-13.0	-46.2	

LTE B26 5MHz 16QAM

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		SOMC							
Project #:		12085703							
Date:		12/29/2017							
Test Engineer:		39317							
Configuration:		EUT + Charger + Headset							
Location:		Chamber A							
Mode:		LTE_QPSK Band 41 Harmonics, 5MHz Bandwidth							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2498.5MHz									
4997.00	-16.4	V	3.0	35.5	1.0	-50.9	-25.0	-25.9	
7495.50	-15.5	V	3.0	35.7	1.0	-50.2	-25.0	-25.2	
9994.00	-11.4	V	3.0	36.0	1.0	-46.4	-25.0	-21.4	
4997.00	-15.4	H	3.0	35.5	1.0	-49.9	-25.0	-24.9	
7495.50	-14.1	H	3.0	35.7	1.0	-48.8	-25.0	-23.8	
9994.00	-10.6	H	3.0	36.0	1.0	-45.6	-25.0	-20.6	
Mid Ch, 2593MHz									
5186.00	-16.3	V	3.0	35.4	1.0	-50.8	-25.0	-25.8	
7779.00	-13.9	V	3.0	35.8	1.0	-48.6	-25.0	-23.6	
10372.00	-11.2	V	3.0	35.8	1.0	-46.1	-25.0	-21.1	
5186.00	-15.3	H	3.0	35.4	1.0	-49.7	-25.0	-24.7	
7779.00	-13.9	H	3.0	35.8	1.0	-48.7	-25.0	-23.7	
10372.00	-9.8	H	3.0	35.8	1.0	-44.6	-25.0	-19.6	
High Ch, 2687.5MHz									
5375.00	-16.7	V	3.0	35.4	1.0	-51.1	-25.0	-26.1	
8062.50	-13.1	V	3.0	35.8	1.0	-47.9	-25.0	-22.9	
10750.00	-10.7	V	3.0	35.7	1.0	-45.4	-25.0	-20.4	
5375.00	-16.7	H	3.0	35.4	1.0	-51.2	-25.0	-26.2	
8062.50	-13.0	H	3.0	35.8	1.0	-47.8	-25.0	-22.8	
10750.00	-9.6	H	3.0	35.7	1.0	-44.2	-25.0	-19.2	
LTE B41 5MHz QPSK									

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		SOMC							
Project #:		12085703							
Date:		12/28/2017							
Test Engineer:		43575 OS							
Configuration:		EUT + Charger + Headset							
Location:		Chamber A							
Mode:		LTE_QPSK Band 66 Harmonics, 5MHz Bandwidth							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1712.5MHz									
3425.00	-24.2	V	3.0	36.1	1.0	-59.3	-13.0	-46.3	
5137.50	-22.9	V	3.0	35.4	1.0	-57.4	-13.0	-44.4	
6850.00	-22.6	V	3.0	35.7	1.0	-57.2	-13.0	-44.2	
3425.00	-23.6	H	3.0	36.1	1.0	-58.6	-13.0	-45.6	
5137.50	-22.9	H	3.0	35.4	1.0	-57.3	-13.0	-44.3	
6850.00	-22.2	H	3.0	35.7	1.0	-56.8	-13.0	-43.8	
Mid Ch, 1745MHz									
3490.00	-24.2	V	3.0	36.0	1.0	-59.3	-13.0	-46.3	
5235.00	-22.6	V	3.0	35.4	1.0	-57.0	-13.0	-44.0	
6980.00	-21.0	V	3.0	35.7	1.0	-55.7	-13.0	-42.7	
3490.00	-23.7	H	3.0	36.0	1.0	-58.7	-13.0	-45.7	
5235.00	-22.7	H	3.0	35.4	1.0	-57.2	-13.0	-44.2	
6980.00	-22.2	H	3.0	35.7	1.0	-56.9	-13.0	-43.9	
High Ch, 1777.5MHz									
3555.00	-23.6	V	3.0	36.0	1.0	-58.5	-13.0	-45.5	
5332.50	-21.6	V	3.0	35.4	1.0	-56.0	-13.0	-43.0	
7110.00	-21.3	V	3.0	35.7	1.0	-56.0	-13.0	-43.0	
3555.00	-23.6	H	3.0	36.0	1.0	-58.5	-13.0	-45.5	
5332.50	-21.8	H	3.0	35.4	1.0	-56.2	-13.0	-43.2	
7110.00	-21.6	H	3.0	35.7	1.0	-56.3	-13.0	-43.3	
LTE B66 5MHz QPSK									

APPENDIX A

PY7-00718V SPOT CHECK RESULTS						
Technology	Test Item	Channel / Frequency (MHz)	Measured Frequency	PY7-21831A	PY7-00718V	Delta (dB)
				EIRP	EIRP	
GSM1900	RSE	Mid Ch 1880	7520.00MHz	-46.3	-50.6	-4.3
Note: GSM 1900 EGPRS is the worst mode						
Technology	Test Item	Channel / Frequency (MHz)	Measured Frequency	PY7-21831A	PY7-00718V	Delta (dB)
				EIRP	EIRP	
WCDMA	RSE	Low Ch 1712.4	6849.60MHz	-42.8	-50.2	-7.4
Note: Band 4 Rel 99 is the worst mode						
Technology	Test Item	Channel / Frequency (MHz)	Measured Frequency	PY7-21831A	PY7-00718V	Delta (dB)
				EIRP	EIRP	
LTE B2	RSE	Low Ch 1852.5	7410.00MHz	-39.7	-53.7	-14.0
LTE B4	RSE	LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to similar frequency range, same maximum tune-up limit and same channel bandwidth.				
LTE B5	RSE	Low Ch 826.5	1653.00MHz	-40.2	-64.0	-23.8
LTE B7	RSE	Low Ch 2505	7515.00MHz	-51.3	-55.9	-4.6
LTE B12	RSE	Low Ch 699.7	2099.10MHz	-50.5	-58.8	-8.3
LTE B13	RSE	Mid Ch 782	3128.00MHz	-57.0	-60.1	-3.1
LTE B17	RSE	LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to similar frequency range, same maximum tune-up limit and same channel bandwidth (5 & 10 MHz).				
LTE B26	RSE	Low Ch 816.5	1633.00MHz	-40.2	-65.6	-25.4
LTE B41	RSE	Mid Ch 2593	10372.00MHz	-46.4	-44.6	1.8
LTE B66	RSE	High Ch 1777.5	7110.00MHz	-32.9	-56.3	-23.4
Note: Worst case mode: LTE B2 5MHz QPSK / LTE B5 5MHz 16QAM / LTE B7 10MHz QPSK / LTE 12 1.4MHz 16QAM / LTE B13 10MHz QPSK / LTE B26 5MHz 16QAM / LTE B41 5MHz QPSK / LTE B66 5MHz QPSK.						