

FCC PART 27
FCC PART 24E
TEST REPORT

For

Shenzhen CO-ME Technology Co., Ltd.

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cooperation district, Shen Zhen China

FCC ID: 2AVVZ-MSA01

Report Type: Original Report	Product Type: Mobile Assistant
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Report Date: 2020-03-19	
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TABLE OF CONTENTS

GENERAL INFORMATION	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S)	3
TEST METHODOLOGY	4
MEASUREMENT UNCERTAINTY	4
TEST FACILITY	4
SYSTEM TEST CONFIGURATION	5
DESCRIPTION OF TEST CONFIGURATION	5
EQUIPMENT MODIFICATIONS	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
BLOCK DIAGRAM OF TEST SETUP	5
SUMMARY OF TEST RESULTS	6
TEST EQUIPMENT LIST	7
FCC §1.1307(B) & §2.1093 - RF EXPOSURE INFORMATION	8
APPLICABLE STANDARD	8
TEST RESULT	8
FCC §2.1047 - MODULATION CHARACTERISTIC	9
FCC § 2.1046, § 24.232 (C); §27.50 (B) (C) (D) (H) - RF OUTPUT POWER	10
APPLICABLE STANDARD	10
TEST PROCEDURE	10
TEST DATA	10
FCC §2.1049, §24.238 & §27.53 - OCCUPIED BANDWIDTH	25
APPLICABLE STANDARD	25
TEST PROCEDURE	25
TEST DATA	25
FCC §2.1051, §24.238(A); §27.53 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS	27
APPLICABLE STANDARD	27
TEST PROCEDURE	27
TEST DATA	27
FCC § 2.1053 § 24.238 (A); §27.53 SPURIOUS RADIATED EMISSIONS	28
APPLICABLE STANDARD	28
TEST PROCEDURE	28
TEST DATA	28
FCC § 24.238 (A); §27.53 (H)(M) - BAND EDGES	30
APPLICABLE STANDARD	30
TEST PROCEDURE	30
TEST DATA	30
FCC § 2.1055; § 24.235; §27.54 - FREQUENCY STABILITY	31
APPLICABLE STANDARD	31
TEST PROCEDURE	31
TEST DATA	31

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Mobile Assistant
Tested Model	MSA 01
Frequency Range	LTE Band 2: 1850-1910 MHz(TX); 1930-1990 MHz(RX) LTE Band 4: 1710-1755 MHz(TX); 2110-2155 MHz(RX) LTE Band 12: 699-716MHz(TX); 729-746MHz(RX)
Maximum Conducted Average Output Power	LTE Band 2: 23.98dBm LTE Band 4: 23.14dBm LTE Band 12: 23.93dBm
Antenna Specification	FPC Antennas
Voltage Range	DC 3.8 V from battery
Date of Test	2020-02-18 to 2020-02-21
Sample serial number	RSZ200120813-RF-S1 (Assigned by Shenzhen BACL)
Received date	2020-01-20
Sample/EUT Status	Good condition

Objective

This test report is prepared on behalf of *Shenzhen CO-ME Technology Co., Ltd.* in accordance with Part 2-Subpart J, Part 22-Subpart H and Part 24-Subpart E and Subpart 27 of the Federal Communication Commissions rules.

The objective is to determine the compliance of the EUT with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability and band edge.

Related Submittal(s)/Grant(s)

No related submissions.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2-Subpart J as well as the following parts:

Part 24 Subpart E - Personal Communication Services
Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA/EIA 603-D.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF output power, conducted		±0.73dB
Unwanted Emission, conducted		±1.6dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±1 °C
Humidity		±6%
Supply voltages		±0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was configured for testing according to TIA/EIA-603-D.

The final qualification test was performed with the EUT operating at normal mode.

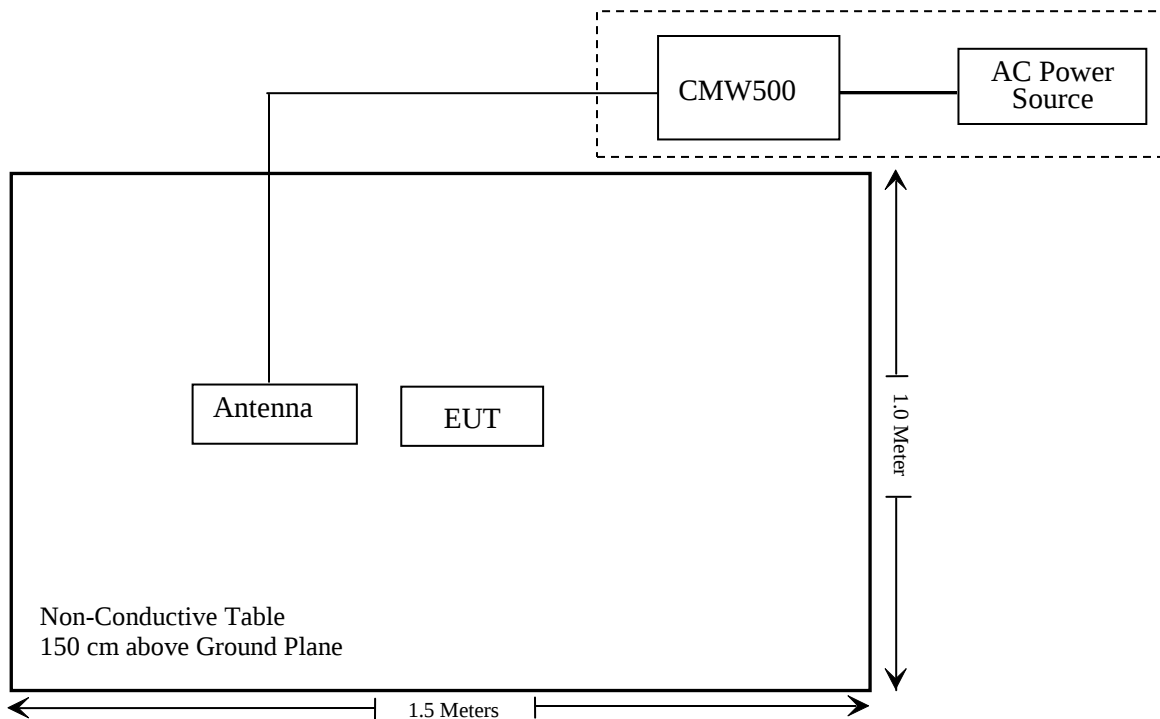
Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-116218-UY

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 1.1307 , §2.1093	RF Exposure (SAR)	Compliance*
§2.1046; § 24.232 (c); §27.50 (b) (c) (d) (h)	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 24.238; §27.53	Occupied Bandwidth	Compliance
§ 2.1051; § 24.238 (a); §27.53	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; § 24.238 (a); §27.53	Field Strength of Spurious Radiation	Compliance
§ 24.238 (a); §27.53(h) (m)	Band Edge	Compliance
§ 2.1055; § 24.235; §27.54;	Frequency stability	Compliance

Note: * Please refer to SAR report released by BACL, report number: RSZ200120813-SAB.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2019/7/9	2020/7/8
Sonoma instrument	Pre-amplifier	310 N	186238	2019/4/20	2020/4/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
COM-POWER	Dipole Antenna	AD-100	721027	NCR	NCR
Unknown	Cable 2	RF Cable 2	F-03-EM197	2019/11/29	2020/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2019/11/29	2020/11/28
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2019/7/22	2020/07/21
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
A.H.System	Horn Antenna	SAS-200/571	135	2018/9/1	2021/8/31
Insulated Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28
Unknown	High Pass filter	1.3GHz	101120	2019/4/20	2020/4/20
Ducommun Technologies	Horn antenna	ARH-4223-02	1007726-02 1304	2017/12/6	2020/12/5
Ducommun Technologies	Horn antenna	ARH-2823-02	1007726-02 1302	2017/12/6	2020/12/5
Agilent	Signal Generator	N5183A	MY51040755	2019/12/4	2020/12/4
RF Conducted Test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2019/3/2	2020/3/1
WEINSCHTEL	3dB Attenuator	Unknown	F-03-EM121	2019/11/29	2020/11/28
Unknown	RF Cable	Unknown	2301 276	Each Time	
Unknown	RF Cable	Unknown	2301 275	Each Time	
Weinschel	Power divider	1515	RH386	2019/4/20	2020/4/20
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh	2019/7/9	2020/7/8
instek	DC Power Supply	GPS-3030DD	EM832096	NCR	NCR
ESPEC	Temperature & Humidity Chamber	EL-10KA	9107726	2020/01/05	2021/01/05
Fluke	Digital Multimeter	287	19000011	2019/04/12	2020/04/12

* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliance, please refer to the SAR report: RSZ200120813-SAB.

FCC §2.1047 - MODULATION CHARACTERISTIC

According to FCC §2.1047(d), 24E & 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

FCC § 2.1046, § 24.232 (c); §27.50 (b) (c) (d) (h) - RF OUTPUT POWER

Applicable Standard

According to FCC §2.1046 and §24.232 (C), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

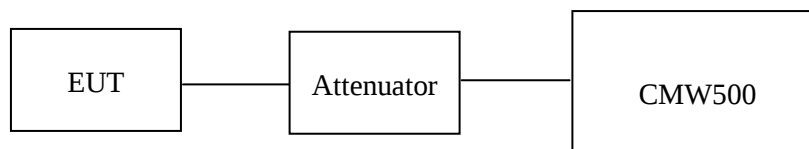
According to §27.50(c), Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

According to §27.50(d), the maximum EIRP must not exceed 1Watts (30dBm) for 1710-1755MHz.

Test Procedure

Conducted method:

The RF output of the transmitter was connected to the CMW500 through sufficient attenuation.



Radiated method:

TIA 603-D section 2.2.17

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	101.0 kPa

The testing was performed by Gavin Guo and Zero Yan from 2020-02-18 to 2020-02-19.

LTE Band 2:**Maximum Output Power**

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4	QPSK	RB1#0	23.98	22.87	22.49
		RB1#3	23.68	23.11	22.74
		RB1#5	23.45	22.93	22.50
		RB3#0	23.51	22.99	22.61
		RB3#3	23.53	23.01	22.65
		RB6#0	22.46	22.05	21.68
	16QAM	RB1#0	22.39	22.11	21.61
		RB1#3	22.68	22.32	21.83
		RB1#5	22.38	22.08	21.65
		RB3#0	22.78	22.12	21.87
		RB3#3	22.77	22.14	21.84
		RB6#0	21.60	21.05	20.58
3.0	QPSK	RB1#0	23.46	22.99	22.58
		RB1#8	23.41	22.89	22.52
		RB1#14	23.37	22.87	22.51
		RB6#0	22.38	21.99	21.55
		RB6#9	22.33	21.90	21.56
		RB15#0	22.47	22.05	21.66
	16QAM	RB1#0	23.01	22.21	21.69
		RB1#8	22.92	22.17	21.67
		RB1#14	22.90	22.07	21.64
		RB6#0	21.56	21.00	20.54
		RB6#9	21.50	20.97	20.51
		RB15#0	21.62	20.97	20.70

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5.0	QPSK	RB1#0	23.35	22.83	22.45
		RB1#13	23.47	22.97	22.58
		RB1#24	23.25	22.78	22.41
		RB15#0	22.46	22.06	21.65
		RB15#10	22.44	21.99	21.66
		RB25#0	22.37	22.00	21.65
	16QAM	RB1#0	22.22	22.27	21.62
		RB1#13	22.34	22.39	21.76
		RB1#24	22.16	22.18	21.58
		RB15#0	21.61	21.05	20.69
		RB15#10	21.60	20.99	20.74
		RB25#0	21.55	21.02	20.67
10.0	QPSK	RB1#0	23.36	22.95	22.58
		RB1#25	23.48	23.03	22.67
		RB1#49	23.26	22.78	22.49
		RB25#0	22.43	22.08	21.78
		RB25#25	22.38	21.99	21.71
		RB50#0	22.39	22.06	21.78
	16QAM	RB1#0	22.94	22.22	21.70
		RB1#25	23.08	22.29	21.84
		RB1#49	22.87	22.04	21.61
		RB25#0	21.59	21.12	20.86
		RB25#25	21.57	21.07	20.80
		RB50#0	21.51	21.06	20.76

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15.0	QPSK	RB1#0	23.36	22.98	22.66
		RB1#38	23.33	22.90	22.64
		RB1#74	23.12	22.66	22.46
		RB36#0	22.48	22.10	21.86
		RB36#39	22.38	21.97	21.72
		RB75#0	22.43	22.09	21.81
	16QAM	RB1#0	22.88	22.21	22.21
		RB1#38	22.92	22.17	22.19
		RB1#74	22.70	21.93	22.02
		RB36#0	21.55	21.14	20.84
		RB36#39	21.49	20.98	20.73
		RB75#0	21.49	21.05	20.75
20.0	QPSK	RB1#0	23.22	22.90	22.38
		RB1#50	23.50	23.11	22.68
		RB1#99	22.91	22.53	22.16
		RB50#0	22.33	22.13	21.73
		RB50#50	22.21	21.92	21.62
		RB100#0	22.27	22.05	21.69
	16QAM	RB1#0	22.48	22.09	22.09
		RB1#50	22.76	22.38	22.36
		RB1#99	22.23	21.81	21.85
		RB50#0	21.44	21.14	20.79
		RB50#50	21.35	20.92	20.59
		RB100#0	21.41	21.02	20.68

Peak-to-average ratio (PAR)

Modulation	RB	Low channel (dB)	Middle channel (dB)	High channel (dB)	Limit (dB)
QPSK	RB1#0	4.62	5.32	5.29	13
	RB100#0	5.61	5.71	5.83	
16QAM	RB1#0	5.80	5.99	6.57	
	RB100#0	6.54	6.67	6.70	

QPSK:

Frequency (MHz)	Receiver Reading (dBμV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)		
Middle Channel									
1.4 MHz Bandwidth									
1880.00	85.24	316	1.9	H	15.6	1.30	9.40	23.70	33
1880.00	84.31	293	2.2	V	14.4	1.30	9.40	22.50	33
3 MHz Bandwidth									
1880.00	85.52	106	2.2	H	15.8	1.30	9.40	23.90	33
1880.00	84.70	268	1.4	V	14.8	1.30	9.40	22.90	33
5 MHz Bandwidth									
1880.00	85.64	16	2.3	H	16.0	1.30	9.40	24.10	33
1880.00	84.08	24	2.0	V	14.2	1.30	9.40	22.30	33
10 MHz Bandwidth									
1880.00	85.11	311	1.6	H	15.4	1.30	9.40	23.50	33
1880.00	84.16	317	1.5	V	14.3	1.30	9.40	22.40	33
15 MHz Bandwidth									
1880.00	85.27	291	2.2	H	15.6	1.30	9.40	23.70	33
1880.00	84.54	262	1.3	V	14.6	1.30	9.40	22.70	33
20 MHz Bandwidth									
1880.00	85.15	281	2.4	H	15.5	1.30	9.40	23.60	33
1880.00	84.64	218	2.0	V	14.7	1.30	9.40	22.80	33

16QAM:

Frequency (MHz)	Receiver Reading (dBμV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)		
Middle Channel									
1.4 MHz Bandwidth									
1880.00	85.39	47	1.5	H	15.7	1.30	9.40	23.80	33
1880.00	84.66	159	2.0	V	14.8	1.30	9.40	22.90	33
3 MHz Bandwidth									
1880.00	85.06	357	1.2	H	15.4	1.30	9.40	23.50	33
1880.00	84.39	272	1.7	V	14.5	1.30	9.40	22.60	33
5 MHz Bandwidth									
1880.00	85.16	235	1.9	H	15.5	1.30	9.40	23.60	33
1880.00	84.49	130	1.4	V	14.6	1.30	9.40	22.70	33
10 MHz Bandwidth									
1880.00	85.66	176	2.5	H	16.0	1.30	9.40	24.10	33
1880.00	84.53	45	2.5	V	14.6	1.30	9.40	22.70	33
15 MHz Bandwidth									
1880.00	85.28	317	2.0	H	15.6	1.30	9.40	23.70	33
1880.00	84.91	282	1.3	V	15.0	1.30	9.40	23.10	33
20 MHz Bandwidth									
1880.00	85.42	192	1.5	H	15.7	1.30	9.40	23.80	33
1880.00	84.97	58	1.9	V	15.1	1.30	9.40	23.20	33

LTE Band 4:**Maximum Output Power**

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4	QPSK	RB1#0	22.83	22.75	23.08
		RB1#8	22.54	22.67	23.09
		RB1#14	22.32	22.75	22.87
		RB6#0	21.48	21.69	21.97
		RB6#9	21.34	21.76	22.08
		RB15#0	21.55	21.81	21.89
	16QAM	RB1#0	21.83	21.85	21.90
		RB1#8	21.82	21.90	21.98
		RB1#14	21.82	21.78	21.92
		RB6#0	20.50	20.69	20.92
		RB6#9	20.60	20.82	20.93
		RB15#0	20.69	20.75	20.99
3.0	QPSK	RB1#0	22.72	22.63	22.88
		RB1#13	22.83	22.75	23.09
		RB1#24	22.63	22.68	22.93
		RB15#0	21.67	21.77	22.08
		RB15#10	21.74	21.90	22.05
		RB25#0	21.65	21.77	22.03
	16QAM	RB1#0	21.47	21.95	21.93
		RB1#13	21.47	22.09	22.08
		RB1#24	21.43	21.97	22.00
		RB15#0	20.68	20.72	21.02
		RB15#10	20.68	20.80	20.99
		RB25#0	20.65	20.73	20.97

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5.0	QPSK	RB1#0	22.72	22.63	22.88
		RB1#13	22.83	22.75	23.09
		RB1#24	22.63	22.68	22.93
		RB15#0	21.67	21.77	22.08
		RB15#10	21.74	21.90	22.05
		RB25#0	21.65	21.77	22.03
	16QAM	RB1#0	21.47	21.95	21.93
		RB1#13	21.47	22.09	22.08
		RB1#24	21.43	21.97	22.00
		RB15#0	20.68	20.72	21.02
		RB15#10	20.68	20.80	20.99
		RB25#0	20.65	20.73	20.97
10.0	QPSK	RB1#0	22.84	22.73	22.92
		RB1#25	22.93	22.88	23.17
		RB1#49	22.83	22.77	23.14
		RB25#0	21.73	21.82	22.00
		RB25#25	21.69	21.85	22.04
		RB50#0	21.72	21.83	21.96
	16QAM	RB1#0	22.15	21.88	21.87
		RB1#25	22.20	22.07	22.08
		RB1#49	22.08	21.94	21.97
		RB25#0	20.65	20.81	21.03
		RB25#25	20.66	20.85	21.04
		RB50#0	20.63	20.81	20.95

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15.0	QPSK	RB1#0	22.78	22.66	22.73
		RB1#38	22.77	22.75	23.01
		RB1#74	22.77	22.73	23.03
		RB36#0	21.86	21.90	22.04
		RB36#39	21.88	21.97	22.20
		RB75#0	21.89	21.96	22.18
	16QAM	RB1#0	22.10	21.80	22.07
		RB1#38	22.07	21.90	22.25
		RB1#74	22.14	21.88	22.20
		RB36#0	20.75	20.82	20.98
		RB36#39	20.84	20.94	21.06
		RB75#0	20.77	20.88	20.99
20.0	QPSK	RB1#0	22.58	22.27	22.26
		RB1#50	22.95	22.59	22.79
		RB1#99	22.22	22.29	22.55
		RB50#0	21.32	21.46	21.60
		RB50#50	21.41	21.57	21.70
		RB100#0	21.39	21.53	21.64
	16QAM	RB1#0	21.36	21.68	21.57
		RB1#50	21.66	22.17	22.04
		RB1#99	21.43	21.88	21.72
		RB50#0	20.31	20.43	20.56
		RB50#50	20.36	20.57	20.63
		RB100#0	20.37	20.47	20.62

Peak-to-average ratio (PAR)

Modulation	RB	Low channel (dB)	Middle channel (dB)	High channel (dB)	Limit (dB)
QPSK	RB1#0	3.88	4.04	3.85	13
	RB100#0	5.29	5.29	5.16	
16QAM	RB1#0	5.00	5.06	4.62	
	RB100#0	6.12	6.22	6.09	

QPSK:

Frequency (MHz)	Receiver Reading (dBμV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)		
Middle Channel									
1.4 MHz Bandwidth									
1732.5	88.36	115	2.3	H	15.0	1.30	8.90	22.60	30
1732.5	89.01	211	1.1	V	16.3	1.30	8.90	23.90	30
3 MHz Bandwidth									
1732.5	88.42	121	2.0	H	15.1	1.30	8.90	22.70	30
1732.5	88.87	177	2.5	V	16.1	1.30	8.90	23.70	30
5 MHz Bandwidth									
1732.5	88.49	86	1.1	H	15.2	1.30	8.90	22.80	30
1732.5	89.12	349	1.1	V	16.4	1.30	8.90	24.00	30
10 MHz Bandwidth									
1732.5	85.73	209	1.2	H	12.4	1.30	8.90	20.00	30
1732.5	86.93	18	2.4	V	14.2	1.30	8.90	21.80	30
15 MHz Bandwidth									
1732.5	86.84	313	2.0	H	13.5	1.30	8.90	21.10	30
1732.5	87.70	160	1.6	V	15.0	1.30	8.90	22.60	30
20 MHz Bandwidth									
1732.5	86.91	116	1.9	H	13.6	1.30	8.90	21.20	30
1732.5	87.00	169	1.4	V	14.3	1.30	8.90	21.90	30

16QAM:

Frequency (MHz)	Receiver Reading (dBμV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)		
Middle Channel									
1.4 MHz Bandwidth									
1732.50	85.72	14	1.7	H	12.4	1.30	8.90	20.00	30
1732.50	89.39	232	1.4	V	16.7	1.30	8.90	24.30	30
3 MHz Bandwidth									
1732.50	86.14	281	2.3	H	12.8	1.30	8.90	20.40	30
1732.50	88.43	314	2.1	V	15.7	1.30	8.90	23.30	30
5 MHz Bandwidth									
1732.50	86.83	324	1.8	H	13.5	1.30	8.90	21.10	30
1732.50	88.47	86	1.8	V	15.7	1.30	8.90	23.30	30
10 MHz Bandwidth									
1732.50	85.73	265	2.0	H	12.4	1.30	8.90	20.00	30
1732.50	88.51	26	2.4	V	15.8	1.30	8.90	23.40	30
15 MHz Bandwidth									
1732.50	86.46	230	1.4	H	13.1	1.30	8.90	20.70	30
1732.50	88.73	163	1.1	V	16.0	1.30	8.90	23.60	30
20 MHz Bandwidth									
1732.50	86.24	30	1.5	H	12.9	1.30	8.90	20.50	30
1732.50	88.97	353	1.2	V	16.2	1.30	8.90	23.80	30

LTE Band 12:

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4	QPSK	RB1#0	23.74	23.56	23.64
		RB1#3	23.88	23.73	23.93
		RB1#5	23.75	23.56	23.68
		RB3#0	23.40	23.51	23.35
		RB3#3	23.42	23.47	23.40
		RB6#0	22.87	22.70	22.80
	16QAM	RB1#0	22.45	22.62	22.39
		RB1#3	22.61	22.80	22.58
		RB1#5	22.45	22.62	22.45
		RB3#0	22.50	22.46	22.41
		RB3#3	22.53	22.50	22.39
		RB6#0	21.51	21.57	21.43
3.0	QPSK	RB1#0	23.83	23.60	23.70
		RB1#8	23.74	23.60	23.69
		RB1#14	23.72	23.65	23.66
		RB6#0	22.88	22.62	22.61
		RB6#9	22.77	22.62	22.72
		RB15#0	22.63	22.60	22.52
	16QAM	RB1#0	22.93	22.69	22.50
		RB1#8	22.91	22.64	22.45
		RB1#14	22.91	22.63	22.47
		RB6#0	21.58	21.51	21.44
		RB6#9	21.55	21.55	21.39
		RB15#0	21.48	21.45	21.48

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5	QPSK	RB1#0	23.63	23.49	23.52
		RB1#13	23.66	23.59	23.56
		RB1#24	23.49	23.55	23.29
		RB15#0	22.62	22.63	22.40
		RB15#10	22.66	22.59	22.53
		RB25#0	22.51	22.50	22.45
	16QAM	RB1#0	22.33	22.67	22.43
		RB1#13	22.38	22.68	22.51
		RB1#24	22.29	22.51	22.42
		RB15#0	21.44	21.50	21.48
		RB15#10	21.51	21.48	21.37
		RB25#0	21.44	21.49	21.37
10	QPSK	RB1#0	23.81	23.62	23.45
		RB1#25	23.78	23.61	23.41
		RB1#49	23.59	23.31	23.32
		RB25#0	22.44	22.54	22.11
		RB25#25	22.55	22.48	22.02
		RB50#0	22.55	22.35	22.03
	16QAM	RB1#0	22.64	22.22	22.06
		RB1#25	23.02	22.47	22.17
		RB1#49	22.77	22.22	21.99
		RB25#0	21.47	21.38	21.12
		RB25#25	21.56	21.46	21.08
		RB50#0	21.48	21.48	21.14

Peak-to-average ratio (PAR)

Modulation	RB	Low channel (dB)	Middle channel (dB)	High channel (dB)	Limit (dB)
QPSK	RB1#0	2.31	2.98	3.53	13
	RB50#0	5.03	5.03	5.16	
16QAM	RB1#0	3.33	4.04	4.46	
	RB50#0	6.03	6.03	6.06	

EIRP:**QPSK:**

Frequency (MHz)	Receiver Reading (dBμV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)		
Middle Channel									
1.4 MHz Bandwidth									
707.50	81.57	328	2.0	H	13.8	1.56	0.0	12.24	34.77
707.50	87.33	275	1.7	V	21.0	1.56	0.0	19.44	34.77
3 MHz Bandwidth									
707.50	80.78	178	2.1	H	13.0	1.56	0.0	11.44	34.77
707.50	86.83	237	1.7	V	20.5	1.56	0.0	18.94	34.77
5 MHz Bandwidth									
707.50	80.12	338	1.3	H	12.3	1.56	0.0	10.74	34.77
707.50	86.71	81	2.1	V	20.4	1.56	0.0	18.84	34.77
10 MHz Bandwidth									
707.50	79.35	322	2.4	H	11.6	1.56	0.0	10.04	34.77
707.50	86.57	203	2.1	V	20.2	1.56	0.0	18.64	34.77

16QAM:

Frequency (MHz)	Receiver Reading (dBμV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)		
Middle Channel									
1.4 MHz Bandwidth									
707.50	81.29	176	1.9	H	13.5	1.56	0.0	11.94	34.77
707.50	87.17	341	1.5	V	20.8	1.56	0.0	19.24	34.77
3 MHz Bandwidth									
707.50	81.47	283	1.7	H	13.7	1.56	0.0	12.14	34.77
707.50	86.94	64	2.0	V	20.6	1.56	0.0	19.04	34.77
5 MHz Bandwidth									
707.50	80.65	207	1.1	H	12.9	1.56	0.0	11.34	34.77
707.50	86.39	274	1.6	V	20.1	1.56	0.0	18.54	34.77
10 MHz Bandwidth									
707.50	79.96	272	1.7	H	12.2	1.56	0.0	10.64	34.77
707.50	87.01	198	1.9	V	20.7	1.56	0.0	19.14	34.77

Note:

All above data were tested with no amplifier

Absolute Level = Substituted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

FCC §2.1049, §24.238 & §27.53 - OCCUPIED BANDWIDTH

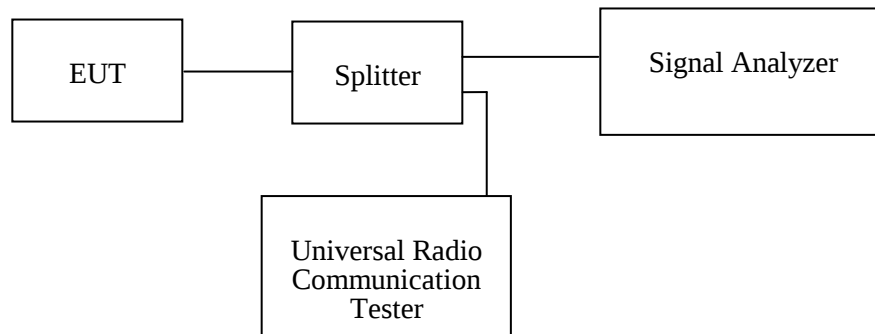
Applicable Standard

FCC 47 §2.1049, §24.238 and §27.53.

Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 1% to 5% of the anticipated emission bandwidth and the 26 dB & 99% bandwidth was recorded.



Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Gavin Guo on 2020-02-18.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the appendix A.

Part 24E_Band 2 (1850-1910 MHz)

Bandwidth	Modulation	99% occupied bandwidth (MHz)	26 dB bandwidth (MHz)
1.4 MHz	QPSK	1.110	1.326
	16QAM	1.098	1.302
3 MHz	QPSK	2.688	2.880
	16QAM	2.688	2.892
5 MHz	QPSK	4.560	5.200
	16QAM	4.520	5.180
10 MHz	QPSK	9.000	10.040
	16QAM	8.960	9.840
15 MHz	QPSK	13.560	15.180
	16QAM	13.560	15.240
20 MHz	QPSK	18.000	19.600
	16QAM	18.080	19.760

Part 27_Band 4 (1710-1755 MHz)

Bandwidth	Modulation	99% occupied bandwidth (MHz)	26 dB bandwidth (MHz)
1.4 MHz	QPSK	1.110	1.308
	16QAM	1.104	1.320
3 MHz	QPSK	2.688	2.880
	16QAM	2.688	2.880
5 MHz	QPSK	4.540	5.220
	16QAM	4.520	5.160
10 MHz	QPSK	8.960	10.080
	16QAM	8.960	9.760
15 MHz	QPSK	13.560	15.240
	16QAM	13.560	15.240
20 MHz	QPSK	18.000	19.600
	16QAM	18.000	20.240

Part 27_Band 12 (699-716 MHz)

Bandwidth	Modulation	99% occupied bandwidth (MHz)	26 dB bandwidth (MHz)
1.4 MHz	QPSK	1.104	1.320
	16QAM	1.110	1.314
3 MHz	QPSK	2.688	2.868
	16QAM	2.688	2.880
5 MHz	QPSK	4.560	5.200
	16QAM	4.540	5.160
10 MHz	QPSK	9.000	10.120
	16QAM	8.960	9.760

FCC §2.1051, §24.238(a); §27.53 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

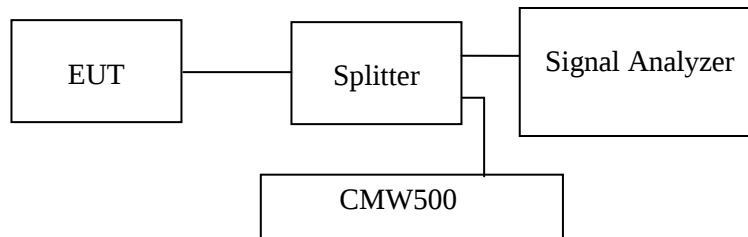
Applicable Standard

FCC §2.1051, §24.238(a) and §27.53.

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Gavin Guo on 2020-02-19.

Test result: Compliance.

EUT operation mode: transmitting

Test Result: Compliance. Please refer to the appendix B.

FCC § 2.1053 § 24.238 (a); §27.53 SPURIOUS RADIATED EMISSIONS

Applicable Standard

FCC § 2.1053 § 24.238(a) and § 27.53

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the receiving antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Charlie Cha and Zero Yan from 2020-02-18 to 2020-02-21.

EUT operation mode: Transmitting

Pre-scan with Low, Middle and High channel, the worst case as below:

LTE Band: (Pre-scan with all the bandwidth, and worse case as below)

Frequency	Receiver	Turntable	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
(MHz)	Reading (dBμV)	Angle Degree	Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)			
Band 2 (1.4 MHz, Middle Channel)										
Test frequency range:30 MHz ~ 20 GHz										
960.51	38.18	12	1.6	H	-62.4	1.37	0.0	-63.77	-13	50.77
960.51	37.85	217	1.3	V	-61.5	1.37	0.0	-62.87	-13	49.87
3760.00	61.68	118	1.7	H	-40.4	1.50	11.80	-30.10	-13	17.10
3760.00	58.02	307	1.8	V	-43.6	1.50	11.80	-33.30	-13	20.30
Band 4(1.4 MHz, Middle Channel)										
Test frequency range:30 MHz ~ 20 GHz										
961.36	38.38	194	2.5	H	-62.2	1.37	0.0	-63.57	-13	50.57
961.36	36.98	205	2.1	V	-62.4	1.37	0.0	-63.77	-13	50.77
3465.00	51.95	4	2.2	H	-48.8	1.50	12.00	-38.30	-13	25.30
3465.00	52.61	83	2.0	V	-48.9	1.50	12.00	-38.40	-13	25.40
Band 12 (5 MHz, Middle Channel)										
Test frequency range: 30 MHz ~ 10GHz										
957.53	38.32	95	1.8	H	-62.3	1.37	0.0	-63.67	-13	50.67
957.53	37.53	127	1.1	V	-61.8	1.37	0.0	-63.17	-13	50.17
1415.00	54.20	196	1.8	H	-54.0	1.60	7.90	-47.70	-13	34.70
1415.00	48.98	2	2.3	V	-59.5	1.60	7.90	-53.20	-13	40.20

Note:

Absolute Level = Substituted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

dBd is for the ERP, dBi is for EIRP.

FCC § 24.238 (a); §27.53 (h)(m) - BAND EDGES

Applicable Standard

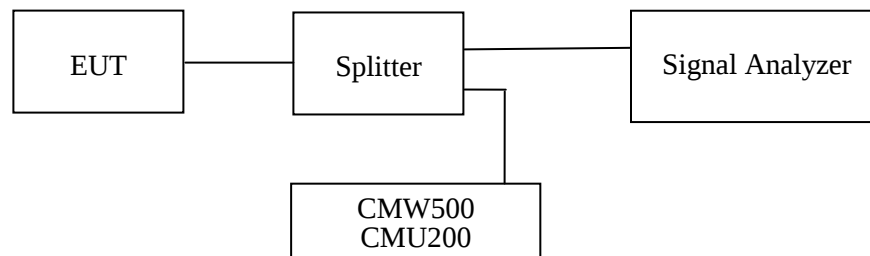
According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

According to FCC §27.53 (h)(m), 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.

Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency



Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Gavin Guo on 2020-02-19.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the appendix C.

FCC §2.1055; §24.235; §27.54 - FREQUENCY STABILITY

Applicable Standard

FCC §2.1055, §24.235 and §27.54.

According to FCC §2.1055, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

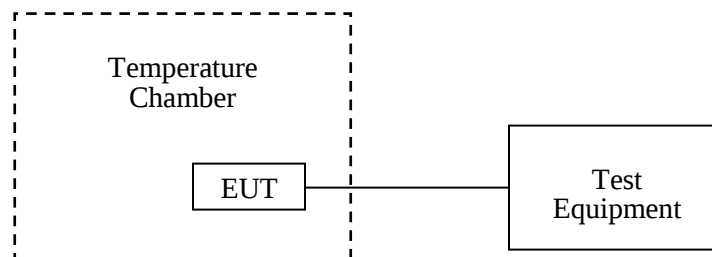
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



Test Data

Environmental Conditions

Temperature:	24~25 °C
Relative Humidity:	50~52 %
ATM Pressure:	100.9~101.0 kPa

The testing was performed by Gavin Guo on 2020-02-19.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following tables.

LTE:**Band 2:**

Modulation	Test condition	Channel	Frequency (MHz)	Frequency error (Hz)	Frequency error (ppm)
QPSK	-30°C/3.8V	Middle	1880	-12.92	-0.0069
	-20°C/3.8V	Middle	1880	-9.97	-0.0053
	-10°C/3.8V	Middle	1880	-6.13	-0.0033
	0°C/3.8V	Middle	1880	6.17	0.0033
	10°C/3.8V	Middle	1880	7.92	0.0042
	20°C/3.8V	Middle	1880	6.46	0.0034
	30°C/3.8V	Middle	1880	-6.52	-0.0035
	40°C/3.8V	Middle	1880	7.18	0.0038
	50°C/3.8V	Middle	1880	-9.69	-0.0052
	20°C/3.4V	Middle	1880	-8.17	-0.0043
	20°C/4.2V	Middle	1880	-7.05	-0.0038
16QAM	-30°C/3.8V	Middle	1880	-8.51	-0.0045
	-20°C/3.8V	Middle	1880	-6.68	-0.0036
	-10°C/3.8V	Middle	1880	9.77	0.0052
	0°C/3.8V	Middle	1880	-7.62	-0.0041
	10°C/3.8V	Middle	1880	-9.91	-0.0053
	20°C/3.8V	Middle	1880	-9.82	-0.0052
	30°C/3.8V	Middle	1880	-6.68	-0.0036
	40°C/3.8V	Middle	1880	-8.85	-0.0047
	50°C/3.8V	Middle	1880	5.67	0.003
	20°C/3.4V	Middle	1880	6.05	0.0032
	20°C/4.2V	Middle	1880	7.52	0.004

Band 4:

Modulation	Test condition	Channel	FL (MHz)	FH (MHz)	FL Limit (MHz)	FH limit (MHz)
QPSK	-30°C/3.8V	Middle	1710.0433	1754.9577	1710	1755
	-20°C/3.8V	Middle	1710.0474	1754.9534	1710	1755
	-10°C/3.8V	Middle	1710.0507	1754.9565	1710	1755
	0°C/3.8V	Middle	1710.0500	1754.9532	1710	1755
	10°C/3.8V	Middle	1710.0460	1754.9540	1710	1755
	20°C/3.8V	Middle	1710.0458	1754.9514	1710	1755
	30°C/3.8V	Middle	1710.0436	1754.9584	1710	1755
	40°C/3.8V	Middle	1710.0487	1754.9513	1710	1755
	50°C/3.8V	Middle	1710.0468	1754.9561	1710	1755
	20°C/3.4V	Middle	1710.0430	1754.9567	1710	1755
	20°C/4.2V	Middle	1710.0454	1754.9535	1710	1755
	20°C/4.2V	Middle	1710.0454	1754.9535	1710	1755
16QAM	-30°C/3.8V	Middle	1710.0458	1754.9514	1710	1755
	-20°C/3.8V	Middle	1710.0507	1754.9567	1710	1755
	-10°C/3.8V	Middle	1710.0486	1754.9532	1710	1755
	0°C/3.8V	Middle	1710.0498	1754.9521	1710	1755
	10°C/3.8V	Middle	1710.0461	1754.9567	1710	1755
	20°C/3.8V	Middle	1710.0469	1754.9580	1710	1755
	30°C/3.8V	Middle	1710.0509	1754.9575	1710	1755
	40°C/3.8V	Middle	1710.0459	1754.9566	1710	1755
	50°C/3.8V	Middle	1710.0496	1754.9580	1710	1755
	20°C/3.4V	Middle	1710.0498	1754.9542	1710	1755
	20°C/4.2V	Middle	1710.0495	1754.9538	1710	1755
	20°C/4.2V	Middle	1710.0495	1754.9538	1710	1755

Band 12:

Modulation	Test condition	Channel	FL (MHz)	FH (MHz)	FL Limit (MHz)	FH limit (MHz)
QPSK	-30°C/3.8V	Middle	699.0478	715.9527	699	716
	-20°C/3.8V	Middle	699.0494	715.9577	699	716
	-10°C/3.8V	Middle	699.0457	715.9537	699	716
	0°C/3.8V	Middle	699.0454	715.9565	699	716
	10°C/3.8V	Middle	699.0463	715.9538	699	716
	20°C/3.8V	Middle	699.0474	715.9509	699	716
	30°C/3.8V	Middle	699.0503	715.9518	699	716
	40°C/3.8V	Middle	699.0435	715.9542	699	716
	50°C/3.8V	Middle	699.0484	715.9528	699	716
	20°C/3.4V	Middle	699.0462	715.9518	699	716
	20°C/4.2V	Middle	699.0511	715.9572	699	716
	20°C/4.2V	Middle	699.0511	715.9572	699	716
16QAM	-30°C/3.8V	Middle	699.0452	715.9540	699	716
	-20°C/3.8V	Middle	699.0437	715.9586	699	716
	-10°C/3.8V	Middle	699.0472	715.9552	699	716
	0°C/3.8V	Middle	699.0511	715.9542	699	716
	10°C/3.8V	Middle	699.0504	715.9511	699	716
	20°C/3.8V	Middle	699.0448	715.9567	699	716
	30°C/3.8V	Middle	699.0433	715.9570	699	716
	40°C/3.8V	Middle	699.0455	715.9554	699	716
	50°C/3.8V	Middle	699.0510	715.9531	699	716
	20°C/3.4V	Middle	699.0460	715.9516	699	716
	20°C/4.2V	Middle	699.0493	715.9587	699	716
	20°C/4.2V	Middle	699.0493	715.9587	699	716

***** END OF REPORT *****