



TESTREPORT

Applicant Name : Shenzhen Omni Intelligent Technology Co., Ltd.
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Nanwan street, Longgang District, Shenzhen, China
Report Number: SZNS221018-47756E-RF-00A
FCC ID: 2A120-M113IOT

Test Standard (s)

FCC PART 27; FCC PART 22H; FCC PART 24E

Sample Description

Product Type: IOT
Model No.: M113-IOT
Multiple Model(s) No.: N/A
Trade Mark: N/A
Date Received: 2022/10/18
Report Date: 2022/12/05

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Approved By:

Roger Ling

Candy Li

Roger Ling
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Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*" .

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Frequency Range	LTE Band 2: 1850-1910MHz(TX); 1930-1990MHz(RX) LTE Band 4: 1710-1755MHz(TX); 2110-2155MHz(RX) LTE Band 5: 824-849MHz(TX); 869-894MHz(RX) LTE Band 12: 699-716MHz(TX); 729-746MHz(RX) LTE Band 13: 777-787MHz(TX); 746-756MHz(RX)
Modulation Technique	4G: QPSK, 16QAM
Antenna Specification*	LTE Band 2: -1.25dBi LTE Band 4: -0.86dBi LTE Band 5: -1.3dBi LTE Band 12: -0.93dBi LTE Band 13: -0.81dBi (provided by the applicant)
Voltage Range	DC3.7V from battery or DC 9~90V
Sample serial number	IMLR for Radiated Emissions IMLS for RF Conducted Test (Assigned by ATC)
Sample/EUT Status	Good condition

Objective

This test report is in accordance with Part 2-Subpart J, Part 22-Subpart H, Part 24-Subpart E, and Part 27 of the Federal Communication Commission's 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.

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 22 Subpart H - Public Mobile Services
Part 24 Subpart E - Personal Communication Services
Part 27 - Miscellaneous Wireless Communications Services

ANSI C63.26-2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF Frequency		0.082×10^{-7}
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Emissions, Radiated	9kHz - 30MHz	2.66dB
	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz -26.5GHz	5.06dB
	26.5GHz -40GHz	4.72dB
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 Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. 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.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

Frequency band	Bandwidth (MHz)	Test Frequency(MHz)		
		Low	Middle	High
LTE B2	1.4	1850.7	1880	1909.3
	3	1851.5	1880	1908.5
	5	1852.5	1880	1907.5
	10	1855	1880	1905
	15	1857.5	1880	1902.5
	20	1860	1880	1900
LTE B4	1.4	1710.7	1732.5	1754.3
	3	1711.5	1732.5	1753.5
	5	1712.5	1732.5	1752.5
	10	1715	1732.5	1750
	15	1717.5	1732.5	1747.5
	20	1720	1732.5	1745
LTE B5	1.4	824.7	836.5	848.3
	3	825.5	836.5	847.5
	5	826.5	836.5	846.5
	10	829	836.5	844
LTE B12	1.4	699.7	707.5	715.3
	3	700.5	707.5	714.5
	5	701.5	707.5	713.5
	10	704.0	707.5	711
LTE B13	5	779.5	782	784.5
	10	/	782	/

Equipment Modifications

No modification was made to the EUT.

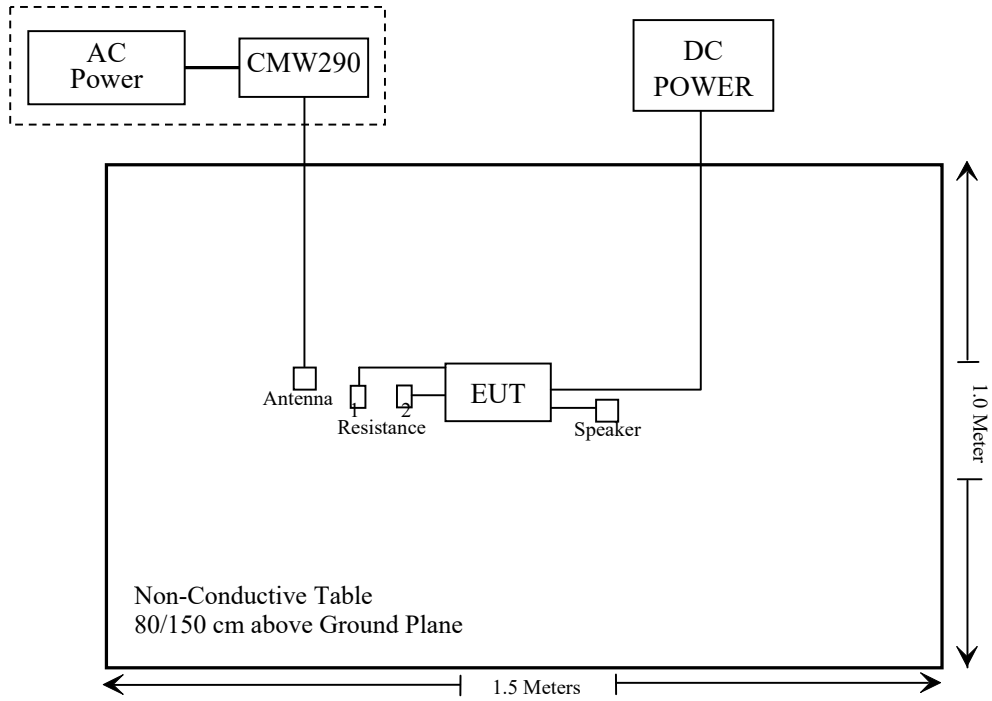
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Functional Radio Communication Tester	CMW290	154606
Manson	DC Power	KPS-6604	ATCS-205
Unknown	Speaker	Unknown	Unknown
Unknown	Resistance 1	Unknown	Unknown
Unknown	Resistance 2	Unknown	Unknown

Support Cable Description

Cable Description	Length (m)	From / Port	To
Un-shielded Detachable AC Cable	1.2	AC Power	CMW290
Un-shielding Detachable DC Cable	1.0	EUT	DC Power
Un-shielding Un-Detachable DC Cable	0.2	EUT	Speaker
Un-shielding Un-Detachable DC Cable	0.2	EUT	Resistance 1
Un-shielding Un-Detachable DC Cable	0.2	EUT	Resistance 2

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §1.1307(b) & 2.1091	MAXIMUM PERMISSIBLE EXPOSURE (MPE)	Compliant
§2.1046; § 22.913 (a)(d); § 24.232 (c)(d); §27.50(b)(c)(d);	RF Output Power	Compliant
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905; § 22.917; § 24.238; §27.53	Occupied Bandwidth	Compliant
§ 2.1051; §22.917 (a); § 24.238 (a); §27.53;	Spurious Emissions at Antenna Terminal	Compliant
§ 2.1053; § 22.917 (a); § 24.238 (a); §27.53	Field Strength of Spurious Radiation	Compliant
§ 22.917 (a); § 24.238 (a); §27.53 (g) (h) (m)	Band Edge	Compliant
§ 2.1055; § 22.355; § 24.235; §27.54;	Frequency stability	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Rohde& Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12
SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2021/11/09	2022/11/08
Quinstar	Amplifier	QLW-184055 36-J0	15964001002	2021/11/09	2022/11/08
Radiated Emission Test Software: e3 19821b (V9)					
Unknown	RF Coaxial Cable	No.10	N050	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.11	N1000	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.15	N600	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.16	N650	2021/12/14	2022/12/13
CD	High Pass Filter	HPM-1.2/18G -60	110	2021/12/14	2022/12/13
Schwarzbeck	Bilog Antenna	VULB9163	9163-194	2020/01/05	2023/01/04
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-655	2020/01/05	2023/01/04
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
PASTERNAK	Horn Antenn	PE9852/2F-20	1120 (ATC-BA-024-1)	2020/01/05	2023/01/04
PASTERNAK	Horn Antenn	PE9852/2F-20	1120 (ATC-BA-025-1)	2020/01/05	2023/01/04
Unknown	RF Coaxial Cable	No.16	N200	2021/12/14	2022/12/13
Agilent	Signal Generator	N5183A	MY51040755	2021/12/13	2022/12/12

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
SPECTRUM ANALYZER	Rohde & Schwarz	FSU26	200982	2022/07/04	2023/07/03
Rohde & Schwarz	Functional Radio Communication Tester	CMW290	154606	2021/12/13	2022/12/12
Mini-Circuits	Power Splitter	DC-18000MHz	SF10944151S	2021/12/14	2022/12/13
UNI-T	DC Power Supply	UTP8305B	10584	NCR	NCR
Fluke	Desktop Multi Meter	45	7664009	2021/12/14	2022/12/13
REALE	Temp. & Humid. Chamber	RHP-800BT	R20170318310	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.33	RF-03	Each time	

* Statement of Traceability: Shenzhen Accurate Technology Co., Ltd. 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) & 2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to KDB 447498 D04 Interim General RF Exposure Guidance

MPE-Based Exemption:

An alternative to the SAR-based exemption is provided in § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power. For this case, a RF source is an RF exempt device if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form in Appendix B. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2f$.
1,500-100,000	$19.2R^2$.

f = frequency in MHz;

R = minimum separation distance from the body of a nearby person (appropriate units, e.g., m);

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

Result

For worst case:

Mode	Frequency (MHz)	Tune up conducted power (dBm)	Antenna Gain		ERP		Evaluation Distance (m)	ERP Limit (W)
			(dBi)	(dBd)	(dBm)	(W)		
BLE	2402-2480	-2.0	3.0	-0.85	-1.15	0.0008	0.2	0.768
LTE Band 2	1850-1910	22.0	-1.25	-3.4	18.6	0.072	0.2	0.768
LTE Band 4	1710-1755	22.0	-0.86	-3.01	18.99	0.079	0.2	0.768
LTE Band 5	824-849	22.0	-1.3	-3.45	18.55	0.072	0.2	0.422
LTE Band 12	699-716	22.0	-0.93	-3.08	18.92	0.078	0.2	0.358
LTE Band 13	777-787	22.0	-0.81	-2.96	19.04	0.080	0.2	0.398

Note 1: The tune-up power and antenna gain was declared by the applicant.

Note 2: 0dBd=2.15dBi.

Simultaneous transmitting consideration (worst case):

The ratio= $ERP_{BLE}/limit + ERP_{LTE}/limit = 0.0008/0.768 + 0.078/0.358 = 0.219 < 1.0$

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant.

FCC§2.1047 - MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), Part 22H,24E&27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

FCC § 2.1046, § 22.913 (a)(d) & § 24.232 (c)(d); § 27.50(b) (c)(d)- RF OUTPUT POWER

Applicable Standard

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

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(b), Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

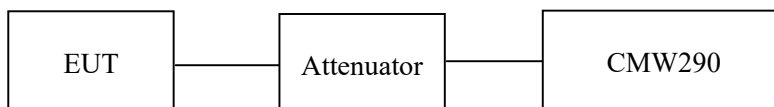
According to §27.50(c), Control and mobile stations in the 698-746 MHz band are limited to 30 watts ERP. And Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

According to §27.50(d), Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

Test Procedure

Conducted method:

The RF output of the transmitter was connected to the CMW290 through sufficient attenuation.



Note: the path loss (cable loss and attenuator) has included in result.

ANSI C63.26-2015 Section 5.5.

Test Data

Environmental Conditions

Temperature:	25.2~25.7 °C
Relative Humidity:	53~55 %
ATM Pressure:	101.0 kPa

The testing was performed by Andy Yu from 2022-11-16 to 2022-11-18.

LTE Band 2

Bandwidth (MHz)	Modulation	RB size/ RB Offset/ NB Position	Conducted Average Output Power (dBm)			EIRP(dBm)		
			Low	Mid	High	Low	Mid	High
1.4	QPSK	RB1#0#Low	20.34	20.60	20.95	19.09	19.35	19.70
		RB1#3#Low	20.25	20.50	20.88	19.00	19.25	19.63
		RB1#5#Low	20.19	20.44	20.83	18.94	19.19	19.58
		RB3#0#Low	20.10	20.39	20.77	18.85	19.14	19.52
		RB3#3#Low	20.02	20.33	20.67	18.77	19.08	19.42
		RB6#0#Low	19.92	20.25	20.59	18.67	19.00	19.34
	16QAM	RB1#0#Low	19.86	20.17	20.50	18.61	18.92	19.25
		RB1#3#Low	19.77	20.09	20.45	18.52	18.84	19.20
		RB1#5#Low	19.67	20.00	20.38	18.42	18.75	19.13
		RB3#0#Low	19.57	19.95	20.33	18.32	18.70	19.08
		RB3#3#Low	19.52	19.86	20.26	18.27	18.61	19.01
		RB5#0#Low	19.46	19.80	20.17	18.21	18.55	18.92
3.0	QPSK	RB1#0#Low	19.36	19.70	20.10	18.11	18.45	18.85
		RB1#3#Low	19.29	19.64	20.02	18.04	18.39	18.77
		RB1#5#Low	19.19	19.54	19.97	17.94	18.29	18.72
		RB3#0#Low	19.10	19.45	19.88	17.85	18.20	18.63
		RB3#3#Low	19.00	19.39	19.82	17.75	18.14	18.57
		RB6#0#Low	18.91	19.29	19.77	17.66	18.04	18.52
	16QAM	RB1#0#Low	18.84	19.22	19.71	17.59	17.97	18.46
		RB1#3#Low	18.78	19.12	19.64	17.53	17.87	18.39
		RB1#5#Low	18.69	19.05	19.54	17.44	17.80	18.29
		RB3#0#Low	18.64	18.98	19.47	17.39	17.73	18.22
		RB3#3#Low	18.54	18.91	19.38	17.29	17.66	18.13
		RB5#0#Low	18.46	18.81	19.28	17.21	17.56	18.03

Bandwidth (MHz)	Modulation	RB size/ RB Offset/ NB Position	Conducted Average Output Power (dBm)			EIRP(dBm)		
			Low	Mid	High	Low	Mid	High
5.0	QPSK	RB1#0#Low	20.99	20.97	20.13	19.74	19.72	18.88
		RB1#3#Low	20.91	20.88	20.05	19.66	19.63	18.80
		RB1#5#Low	20.81	20.79	19.99	19.56	19.54	18.74
		RB3#0#Low	20.73	20.72	19.89	19.48	19.47	18.64
		RB3#3#Low	20.63	20.62	19.79	19.38	19.37	18.54
		RB6#0#Low	20.53	20.55	19.72	19.28	19.30	18.47
	16QAM	RB1#0#Low	20.47	20.46	19.67	19.22	19.21	18.42
		RB1#3#Low	20.38	20.38	19.61	19.13	19.13	18.36
		RB1#5#Low	20.33	20.29	19.52	19.08	19.04	18.27
		RB3#0#Low	20.23	20.20	19.47	18.98	18.95	18.22
		RB3#3#Low	20.15	20.14	19.42	18.90	18.89	18.17
		RB5#0#Low	20.10	20.04	19.35	18.85	18.79	18.10
10.0	QPSK	RB1#0#Low	20.01	19.96	19.29	18.76	18.71	18.04
		RB1#3#Low	19.92	19.90	19.23	18.67	18.65	17.98
		RB1#5#Low	19.85	19.80	19.18	18.60	18.55	17.93
		RB3#0#Low	19.76	19.75	19.11	18.51	18.50	17.86
		RB3#3#Low	19.67	19.70	19.03	18.42	18.45	17.78
		RB6#0#Low	19.59	19.63	18.98	18.34	18.38	17.73
	16QAM	RB1#0#Low	19.53	19.56	18.92	18.28	18.31	17.67
		RB1#3#Low	19.46	19.47	18.83	18.21	18.22	17.58
		RB1#5#Low	19.39	19.41	18.77	18.14	18.16	17.52
		RB3#0#Low	19.29	19.36	18.68	18.04	18.11	17.43
		RB3#3#Low	19.20	19.27	18.59	17.95	18.02	17.34
		RB5#0#Low	19.13	19.19	18.52	17.88	17.94	17.27

Bandwidth (MHz)	Modulation	RB size/ RB Offset/ NB Position	Conducted Average Output Power (dBm)			EIRP(dBm)		
			Low	Mid	High	Low	Mid	High
15.0	QPSK	RB1#0#Low	20.91	20.25	20.73	19.66	19.00	19.48
		RB1#3#Low	20.84	20.15	20.65	19.59	18.90	19.40
		RB1#5#Low	20.78	20.05	20.56	19.53	18.80	19.31
		RB3#0#Low	20.68	19.95	20.51	19.43	18.70	19.26
		RB3#3#Low	20.62	19.86	20.46	19.37	18.61	19.21
		RB6#0#Low	20.57	19.76	20.37	19.32	18.51	19.12
	16QAM	RB1#0#Low	20.49	19.67	20.28	19.24	18.42	19.03
		RB1#3#Low	20.39	19.57	20.22	19.14	18.32	18.97
		RB1#5#Low	20.33	19.47	20.17	19.08	18.22	18.92
		RB3#0#Low	20.23	19.38	20.07	18.98	18.13	18.82
		RB3#3#Low	20.13	19.32	20.01	18.88	18.07	18.76
		RB5#0#Low	20.08	19.26	19.93	18.83	18.01	18.68
20.0	QPSK	RB1#0#Low	20.01	19.18	19.87	18.76	17.93	18.62
		RB1#3#Low	19.91	19.11	19.79	18.66	17.86	18.54
		RB1#5#Low	19.83	19.01	19.71	18.58	17.76	18.46
		RB3#0#Low	19.77	18.92	19.63	18.52	17.67	18.38
		RB3#3#Low	19.67	18.85	19.54	18.42	17.60	18.29
		RB6#0#Low	19.59	18.75	19.47	18.34	17.50	18.22
	16QAM	RB1#0#Low	19.49	18.65	19.37	18.24	17.40	18.12
		RB1#3#Low	19.43	18.57	19.30	18.18	17.32	18.05
		RB1#5#Low	19.34	18.48	19.23	18.09	17.23	17.98
		RB3#0#Low	19.25	18.40	19.18	18.00	17.15	17.93
		RB3#3#Low	19.19	18.31	19.10	17.94	17.06	17.85
		RB5#0#Low	19.09	18.24	19.02	17.84	16.99	17.77

Note: EIRP(dBm) = Conducted Power(dBm) + Antenna Gain(dBi)

For Band2: Antenna Gain = -1.25dBi

Limit: EIRP ≤ 33dBm

LTE Band 4

Bandwidth (MHz)	Modulation	RB size/ RB Offset/ NB Position	Conducted Average Output Power (dBm)			EIRP(dBm)		
			Low	Mid	High	Low	Mid	High
1.4	QPSK	RB1#0#Low	20.48	20.21	20.57	19.62	19.35	19.71
		RB1#3#Low	20.40	20.15	20.47	19.54	19.29	19.61
		RB1#5#Low	20.33	20.05	20.37	19.47	19.19	19.51
		RB3#0#Low	20.28	19.95	20.31	19.42	19.09	19.45
		RB3#3#Low	20.23	19.85	20.26	19.37	18.99	19.40
		RB6#0#Low	20.14	19.77	20.21	19.28	18.91	19.35
	16QAM	RB1#0#Low	20.08	19.69	20.12	19.22	18.83	19.26
		RB1#3#Low	19.98	19.63	20.04	19.12	18.77	19.18
		RB1#5#Low	19.91	19.54	19.95	19.05	18.68	19.09
		RB3#0#Low	19.81	19.46	19.86	18.95	18.60	19.00
		RB3#3#Low	19.74	19.39	19.80	18.88	18.53	18.94
		RB5#0#Low	19.66	19.31	19.72	18.80	18.45	18.86
3.0	QPSK	RB1#0#Low	19.59	19.25	19.67	18.73	18.39	18.81
		RB1#3#Low	19.54	19.15	19.59	18.68	18.29	18.73
		RB1#5#Low	19.44	19.05	19.49	18.58	18.19	18.63
		RB3#0#Low	19.38	18.97	19.43	18.52	18.11	18.57
		RB3#3#Low	19.29	18.88	19.35	18.43	18.02	18.49
		RB6#0#Low	19.21	18.82	19.26	18.35	17.96	18.40
	16QAM	RB1#0#Low	19.11	18.74	19.17	18.25	17.88	18.31
		RB1#3#Low	19.01	18.68	19.07	18.15	17.82	18.21
		RB1#5#Low	18.96	18.58	18.97	18.10	17.72	18.11
		RB3#0#Low	18.88	18.51	18.87	18.02	17.65	18.01
		RB3#3#Low	18.83	18.41	18.78	17.97	17.55	17.92
		RB5#0#Low	18.78	18.34	18.69	17.92	17.48	17.83

Bandwidth (MHz)	Modulation	RB size/ RB Offset/ NB Position	Conducted Average Output Power (dBm)			EIRP(dBm)		
			Low	Mid	High	Low	Mid	High
5.0	QPSK	RB1#0#Low	20.57	20.54	20.82	19.71	19.68	19.96
		RB1#3#Low	20.50	20.46	20.72	19.64	19.60	19.86
		RB1#5#Low	20.42	20.36	20.67	19.56	19.50	19.81
		RB3#0#Low	20.34	20.29	20.62	19.48	19.43	19.76
		RB3#3#Low	20.28	20.23	20.56	19.42	19.37	19.70
		RB6#0#Low	20.19	20.17	20.46	19.33	19.31	19.60
	16QAM	RB1#0#Low	20.11	20.10	20.39	19.25	19.24	19.53
		RB1#3#Low	20.04	20.03	20.34	19.18	19.17	19.48
		RB1#5#Low	19.96	19.94	20.26	19.10	19.08	19.40
		RB3#0#Low	19.87	19.87	20.21	19.01	19.01	19.35
		RB3#3#Low	19.82	19.79	20.15	18.96	18.93	19.29
		RB5#0#Low	19.77	19.71	20.06	18.91	18.85	19.20
10.0	QPSK	RB1#0#Low	19.69	19.63	20.01	18.83	18.77	19.15
		RB1#3#Low	19.60	19.55	19.96	18.74	18.69	19.10
		RB1#5#Low	19.50	19.50	19.87	18.64	18.64	19.01
		RB3#0#Low	19.43	19.43	19.81	18.57	18.57	18.95
		RB3#3#Low	19.37	19.37	19.75	18.51	18.51	18.89
		RB6#0#Low	19.29	19.30	19.65	18.43	18.44	18.79
	16QAM	RB1#0#Low	19.19	19.21	19.55	18.33	18.35	18.69
		RB1#3#Low	19.14	19.11	19.49	18.28	18.25	18.63
		RB1#5#Low	19.07	19.06	19.42	18.21	18.20	18.56
		RB3#0#Low	19.01	18.97	19.34	18.15	18.11	18.48
		RB3#3#Low	18.93	18.92	19.24	18.07	18.06	18.38
		RB5#0#Low	18.88	18.83	19.16	18.02	17.97	18.30

Bandwidth (MHz)	Modulation	RB size/ RB Offset/ NB Position	Conducted Average Output Power (dBm)			EIRP(dBm)		
			Low	Mid	High	Low	Mid	High
15.0	QPSK	RB1#0#Low	20.65	20.44	20.98	19.79	19.58	20.12
		RB1#3#Low	20.60	20.36	20.92	19.74	19.50	20.06
		RB1#5#Low	20.54	20.28	20.87	19.68	19.42	20.01
		RB3#0#Low	20.47	20.20	20.79	19.61	19.34	19.93
		RB3#3#Low	20.39	20.11	20.71	19.53	19.25	19.85
		RB6#0#Low	20.32	20.05	20.64	19.46	19.19	19.78
	16QAM	RB1#0#Low	20.26	20.00	20.55	19.40	19.14	19.69
		RB1#3#Low	20.19	19.94	20.47	19.33	19.08	19.61
		RB1#5#Low	20.09	19.88	20.42	19.23	19.02	19.56
		RB3#0#Low	20.01	19.80	20.37	19.15	18.94	19.51
		RB3#3#Low	19.96	19.70	20.32	19.10	18.84	19.46
		RB5#0#Low	19.88	19.65	20.22	19.02	18.79	19.36
20.0	QPSK	RB1#0#Low	19.78	19.60	20.17	18.92	18.74	19.31
		RB1#3#Low	19.69	19.52	20.11	18.83	18.66	19.25
		RB1#5#Low	19.63	19.46	20.02	18.77	18.60	19.16
		RB3#0#Low	19.56	19.40	19.93	18.70	18.54	19.07
		RB3#3#Low	19.51	19.30	19.84	18.65	18.44	18.98
		RB6#0#Low	19.44	19.21	19.78	18.58	18.35	18.92
	16QAM	RB1#0#Low	19.39	19.14	19.70	18.53	18.28	18.84
		RB1#3#Low	19.29	19.09	19.61	18.43	18.23	18.75
		RB1#5#Low	19.19	19.01	19.54	18.33	18.15	18.68
		RB3#0#Low	19.10	18.93	19.44	18.24	18.07	18.58
		RB3#3#Low	19.02	18.83	19.39	18.16	17.97	18.53
		RB5#0#Low	18.93	18.75	19.33	18.07	17.89	18.47

Note: EIRP(dBm) = Conducted Power(dBm) + Antenna Gain(dBi)

For Band4: Antenna Gain = -0.86dBi

Limit: EIRP ≤ 30dBm

LTE Band5

Bandwidth (MHz)	Modulation	RB size/ RB Offset/ NB Position	Conducted Average Output Power (dBm)			ERP(dBm)		
			Low	Mid	High	Low	Mid	High
1.4	QPSK	RB1#0#Low	20.96	20.81	20.18	17.51	17.36	16.73
		RB1#3#Low	20.91	20.73	20.11	17.46	17.28	16.66
		RB1#5#Low	20.84	20.68	20.03	17.39	17.23	16.58
		RB3#0#Low	20.76	20.63	19.93	17.31	17.18	16.48
		RB3#3#Low	20.69	20.56	19.86	17.24	17.11	16.41
		RB6#0#Low	20.62	20.47	19.79	17.17	17.02	16.34
	16QAM	RB1#0#Low	20.54	20.39	19.71	17.09	16.94	16.26
		RB1#3#Low	20.47	20.33	19.64	17.02	16.88	16.19
		RB1#5#Low	20.37	20.23	19.57	16.92	16.78	16.12
		RB3#0#Low	20.31	20.16	19.51	16.86	16.71	16.06
		RB3#3#Low	20.24	20.09	19.41	16.79	16.64	15.96
		RB5#0#Low	20.17	19.99	19.36	16.72	16.54	15.91
3.0	QPSK	RB1#0#Low	20.12	19.93	19.31	16.67	16.48	15.86
		RB1#3#Low	20.03	19.86	19.26	16.58	16.41	15.81
		RB1#5#Low	19.98	19.81	19.17	16.53	16.36	15.72
		RB3#0#Low	19.88	19.74	19.08	16.43	16.29	15.63
		RB3#3#Low	19.83	19.64	19.03	16.38	16.19	15.58
		RB6#0#Low	19.74	19.55	18.98	16.29	16.10	15.53
	16QAM	RB1#0#Low	19.66	19.49	18.93	16.21	16.04	15.48
		RB1#3#Low	19.59	19.43	18.83	16.14	15.98	15.38
		RB1#5#Low	19.52	19.34	18.73	16.07	15.89	15.28
		RB3#0#Low	19.45	19.28	18.66	16.00	15.83	15.21
		RB3#3#Low	19.38	19.19	18.58	15.93	15.74	15.13
		RB5#0#Low	19.33	19.14	18.51	15.88	15.69	15.06

Bandwidth (MHz)	Modulation	RB size/ RB Offset/ NB Position	Conducted Average Output Power (dBm)			ERP(dBm)		
			Low	Mid	High	Low	Mid	High
5.0	QPSK	RB1#0#Low	20.47	20.25	20.85	17.02	16.80	17.40
		RB1#3#Low	20.39	20.18	20.79	16.94	16.73	17.34
		RB1#5#Low	20.32	20.08	20.69	16.87	16.63	17.24
		RB3#0#Low	20.26	20.01	20.61	16.81	16.56	17.16
		RB3#3#Low	20.21	19.95	20.52	16.76	16.50	17.07
		RB6#0#Low	20.16	19.89	20.46	16.71	16.44	17.01
	16QAM	RB1#0#Low	20.06	19.80	20.37	16.61	16.35	16.92
		RB1#3#Low	20.00	19.73	20.27	16.55	16.28	16.82
		RB1#5#Low	19.91	19.66	20.17	16.46	16.21	16.72
		RB3#0#Low	19.81	19.61	20.07	16.36	16.16	16.62
		RB3#3#Low	19.76	19.52	20.02	16.31	16.07	16.57
		RB5#0#Low	19.68	19.42	19.95	16.23	15.97	16.50
10.0	QPSK	RB1#0#Low	19.58	19.35	19.88	16.13	15.90	16.43
		RB1#3#Low	19.53	19.27	19.80	16.08	15.82	16.35
		RB1#5#Low	19.45	19.17	19.74	16.00	15.72	16.29
		RB3#0#Low	19.38	19.10	19.69	15.93	15.65	16.24
		RB3#3#Low	19.33	19.02	19.60	15.88	15.57	16.15
		RB6#0#Low	19.28	18.94	19.53	15.83	15.49	16.08
	16QAM	RB1#0#Low	19.22	18.89	19.43	15.77	15.44	15.98
		RB1#3#Low	19.12	18.79	19.36	15.67	15.34	15.91
		RB1#5#Low	19.03	18.69	19.29	15.58	15.24	15.84
		RB3#0#Low	18.94	18.62	19.21	15.49	15.17	15.76
		RB3#3#Low	18.86	18.53	19.12	15.41	15.08	15.67
		RB5#0#Low	18.80	18.45	19.04	15.35	15.00	15.59

Note: ERP(dBm) = Conducted Power(dBm) + Antenna Gain(dBd)
For Band5: Antenna Gain = -1.3dBi = -3.45dBd (0dBd=2.15dBi)
Limit: ERP ≤ 38.45dBm

LTE Band 12

Bandwidth (MHz)	Modulation	RB size/ RB Offset/ NB Position	Conducted Average Output Power (dBm)			ERP(dBm)		
			Low	Mid	High	Low	Mid	High
1.4	QPSK	RB1#0#Low	20.33	20.32	20.60	17.25	17.24	17.52
		RB1#3#Low	20.27	20.27	20.52	17.19	17.19	17.44
		RB1#5#Low	20.17	20.18	20.43	17.09	17.10	17.35
		RB3#0#Low	20.09	20.09	20.35	17.01	17.01	17.27
		RB3#3#Low	20.04	20.02	20.26	16.96	16.94	17.18
		RB6#0#Low	19.97	19.92	20.17	16.89	16.84	17.09
	16QAM	RB1#0#Low	19.87	19.84	20.07	16.79	16.76	16.99
		RB1#3#Low	19.78	19.76	20.01	16.70	16.68	16.93
		RB1#5#Low	19.71	19.71	19.94	16.63	16.63	16.86
		RB3#0#Low	19.62	19.63	19.88	16.54	16.55	16.80
		RB3#3#Low	19.52	19.53	19.81	16.44	16.45	16.73
		RB5#0#Low	19.44	19.44	19.73	16.36	16.36	16.65
3.0	QPSK	RB1#0#Low	19.34	19.37	19.68	16.26	16.29	16.60
		RB1#3#Low	19.25	19.30	19.58	16.17	16.22	16.50
		RB1#5#Low	19.19	19.22	19.50	16.11	16.14	16.42
		RB3#0#Low	19.14	19.15	19.40	16.06	16.07	16.32
		RB3#3#Low	19.07	19.09	19.30	15.99	16.01	16.22
		RB6#0#Low	19.02	19.01	19.21	15.94	15.93	16.13
	16QAM	RB1#0#Low	18.92	18.93	19.15	15.84	15.85	16.07
		RB1#3#Low	18.87	18.86	19.08	15.79	15.78	16.00
		RB1#5#Low	18.78	18.79	18.99	15.70	15.71	15.91
		RB3#0#Low	18.68	18.69	18.91	15.60	15.61	15.83
		RB3#3#Low	18.60	18.64	18.82	15.52	15.56	15.74
		RB5#0#Low	18.53	18.58	18.74	15.45	15.50	15.66

Bandwidth (MHz)	Modulation	RB size/ RB Offset/ NB Position	Conducted Average Output Power (dBm)			ERP(dBm)		
			Low	Mid	High	Low	Mid	High
5.0	QPSK	RB1#0#Low	20.76	20.45	20.61	17.68	17.37	17.53
		RB1#3#Low	20.69	20.36	20.52	17.61	17.28	17.44
		RB1#5#Low	20.60	20.29	20.47	17.52	17.21	17.39
		RB3#0#Low	20.55	20.22	20.39	17.47	17.14	17.31
		RB3#3#Low	20.46	20.15	20.32	17.38	17.07	17.24
		RB6#0#Low	20.39	20.10	20.26	17.31	17.02	17.18
	16QAM	RB1#0#Low	20.29	20.04	20.17	17.21	16.96	17.09
		RB1#3#Low	20.21	19.99	20.11	17.13	16.91	17.03
		RB1#5#Low	20.11	19.94	20.02	17.03	16.86	16.94
		RB3#0#Low	20.01	19.85	19.93	16.93	16.77	16.85
		RB3#3#Low	19.96	19.78	19.84	16.88	16.70	16.76
		RB5#0#Low	19.88	19.68	19.76	16.80	16.60	16.68
10.0	QPSK	RB1#0#Low	19.78	19.58	19.70	16.70	16.50	16.62
		RB1#3#Low	19.73	19.48	19.64	16.65	16.40	16.56
		RB1#5#Low	19.66	19.40	19.56	16.58	16.32	16.48
		RB3#0#Low	19.57	19.33	19.48	16.49	16.25	16.40
		RB3#3#Low	19.52	19.26	19.38	16.44	16.18	16.30
		RB6#0#Low	19.44	19.18	19.30	16.36	16.10	16.22
	16QAM	RB1#0#Low	19.37	19.11	19.23	16.29	16.03	16.15
		RB1#3#Low	19.30	19.05	19.15	16.22	15.97	16.07
		RB1#5#Low	19.21	18.98	19.07	16.13	15.90	15.99
		RB3#0#Low	19.11	18.92	19.02	16.03	15.84	15.94
		RB3#3#Low	19.01	18.85	18.97	15.93	15.77	15.89
		RB5#0#Low	18.91	18.76	18.91	15.83	15.68	15.83

Note: ERP(dBm) = Conducted Power(dBm) + Antenna Gain(dBd)

For Band12: Antenna Gain = -0.93dBi = -3.08dBd (0dBd=2.15dBi)

Limit: ERP ≤ 34.77dBm

LTE Band 13:

Bandwidth (MHz)	Modulation	RB size/ RB Offset/ NB Position	Conducted Average Output Power (dBm)			ERP(dBm)		
			Low	Mid	High	Low	Mid	High
5	QPSK	RB1#0#Low	20.13	20.30	20.99	17.17	17.34	18.03
		RB1#3#Low	20.08	20.20	20.90	17.12	17.24	17.94
		RB1#5#Low	20.01	20.12	20.85	17.05	17.16	17.89
		RB3#0#Low	19.95	20.02	20.78	16.99	17.06	17.82
		RB3#3#Low	19.85	19.93	20.68	16.89	16.97	17.72
		RB6#0#Low	19.76	19.86	20.58	16.80	16.90	17.62
	16QAM	RB1#0#Low	19.71	19.77	20.48	16.75	16.81	17.52
		RB1#3#Low	19.65	19.69	20.39	16.69	16.73	17.43
		RB1#5#Low	19.58	19.60	20.31	16.62	16.64	17.35
		RB3#0#Low	19.49	19.51	20.24	16.53	16.55	17.28
		RB3#3#Low	19.42	19.45	20.15	16.46	16.49	17.19
		RB5#0#Low	19.32	19.36	20.07	16.36	16.40	17.11
10	QPSK	RB1#0#Low	/	19.28	/	/	16.32	/
		RB1#3#Low	/	19.19	/	/	16.23	/
		RB1#5#Low	/	19.10	/	/	16.14	/
		RB3#0#Low	/	19.04	/	/	16.08	/
		RB3#3#Low	/	18.94	/	/	15.98	/
		RB6#0#Low	/	18.86	/	/	15.90	/
	16QAM	RB1#0#Low	/	18.81	/	/	15.85	/
		RB1#3#Low	/	18.73	/	/	15.77	/
		RB1#5#Low	/	18.66	/	/	15.70	/
		RB3#0#Low	/	18.58	/	/	15.62	/
		RB3#3#Low	/	18.51	/	/	15.55	/
		RB5#0#Low	/	18.43	/	/	15.47	/

Note: ERP(dBm) = Conducted Power(dBm) + Antenna Gain(dBd)
For Band13: Antenna Gain = -0.81dBi = -2.96dBd (0dBd=2.15dBi)
Limit: ERP ≤ 34.77dBm

Peak-to-average ratio (PAR)

Note: pre-scan all bandwidth, the worst case as below:

LTE Band 2 20MHz Bandwidth

Modulation	Low channel (dB)	Middle channel (dB)	High channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	9.23	9.97	10.93	13	Pass
QPSK (6RB Size)	9.58	10.06	10.51	13	Pass
16QAM (1RB Size)	9.90	8.21	10.90	13	Pass
16QAM (5RB Size)	10.58	10.22	8.65	13	Pass

LTE Band 4 20MHz Bandwidth

Modulation	Low channel (dB)	Middle channel (dB)	High channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	7.98	9.52	7.37	13	Pass
QPSK (6RB Size)	9.90	9.33	10.87	13	Pass
16QAM (1RB Size)	9.49	8.24	10.38	13	Pass
16QAM (5RB Size)	9.87	9.94	9.65	13	Pass

LTE Band 5 10MHz Bandwidth

Modulation	Low channel (dB)	Middle channel (dB)	High channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	8.14	9.94	8.75	13	Pass
QPSK (6RB Size)	9.46	10.00	10.64	13	Pass
16QAM (1RB Size)	9.81	9.17	10.71	13	Pass
16QAM (5RB Size)	10.38	9.84	9.65	13	Pass

LTE Band 12 10MHz Bandwidth

Modulation	Low channel (dB)	Middle channel (dB)	High channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	8.85	9.29	8.46	13	Pass
QPSK (6RB Size)	9.84	9.49	11.12	13	Pass
16QAM (1RB Size)	9.10	11.35	8.27	13	Pass
16QAM (5RB Size)	9.46	8.46	9.42	13	Pass

LTE Band 13 10MHz Bandwidth

Modulation	Low channel (dB)	Middle channel (dB)	High channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	/	7.79	/	13	Pass
QPSK (6RB Size)	/	10.38	/	13	Pass
16QAM (1RB Size)	/	9.29	/	13	Pass
16QAM (5RB Size)	/	10.45	/	13	Pass

FCC §2.1049, §22.917, §22.905 & §24.238&§27.53 - OCCUPIED BANDWIDTH

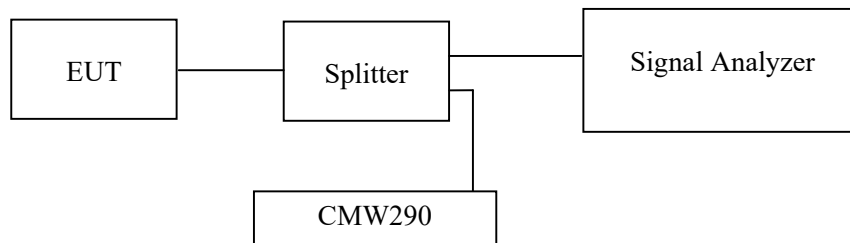
Applicable Standard

FCC 47 §2.1049, §22.917, §22.905, §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.



Note: the worst case path loss among the test frequency range has included in plot.

Test Data

Environmental Conditions

Temperature:	25.2~25.7 °C
Relative Humidity:	53~55 %
ATM Pressure:	101.0 kPa

The testing was performed by Andy Yu from 2022-11-16 to 2022-11-18.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the following tables and plots.

LTE Band 2:

Bandwidth	Modulation	Low channel		Middle channel		High channel	
		OBW (MHz)	26dB EBW (MHz)	OBW (MHz)	26dB EBW (MHz)	OBW (MHz)	26dB EBW (MHz)
1.4 MHz	QPSK	1.106	1.290	1.101	1.305	1.101	1.290
	16QAM	0.942	1.173	0.942	1.383	0.942	1.161
3 MHz	QPSK	1.106	1.302	1.106	1.320	1.115	1.296
	16QAM	0.952	1.368	0.952	1.386	0.952	1.350
5 MHz	QPSK	1.090	1.340	1.122	1.340	1.106	1.340
	16QAM	0.929	1.170	0.946	1.150	0.929	1.170
10 MHz	QPSK	1.122	1.340	1.122	1.340	1.122	1.340
	16QAM	0.962	1.180	0.962	1.180	0.962	1.160
15 MHz	QPSK	1.106	1.380	1.154	1.350	1.106	1.350
	16QAM	0.962	1.170	0.962	1.230	0.962	1.200
20 MHz	QPSK	1.154	1.380	1.154	1.380	1.106	1.410
	16QAM	0.962	1.200	0.962	1.200	0.962	1.230

LTE Band 4:

Bandwidth	Modulation	Low channel		Middle channel		High channel	
		OBW (MHz)	26dB EBW (MHz)	OBW (MHz)	26dB EBW (MHz)	OBW (MHz)	26dB EBW (MHz)
1.4 MHz	QPSK	1.101	1.287	1.101	1.284	1.101	1.284
	16QAM	0.942	1.176	0.942	1.371	0.938	1.173
3 MHz	QPSK	1.115	1.302	1.106	1.296	1.106	1.320
	16QAM	0.952	1.320	0.942	1.182	0.952	1.356
5 MHz	QPSK	1.106	1.310	1.122	1.340	1.106	1.340
	16QAM	0.929	1.170	0.946	1.160	0.929	1.180
10 MHz	QPSK	1.122	1.380	1.122	1.340	1.122	1.360
	16QAM	0.962	1.180	0.962	1.160	0.962	1.220
15 MHz	QPSK	1.154	1.380	1.154	1.350	1.106	1.410
	16QAM	1.101	1.200	0.913	1.200	0.962	1.200
20 MHz	QPSK	1.154	1.380	1.106	1.320	1.106	1.380
	16QAM	0.962	1.200	0.962	1.200	0.962	1.230

LTE Band 5:

Bandwidth	Modulation	Low channel		Middle channel		High channel	
		OBW (MHz)	26dB EBW (MHz)	OBW (MHz)	26dB EBW (MHz)	OBW (MHz)	26dB EBW (MHz)
1.4 MHz	QPSK	1.101	1.287	1.106	1.287	1.101	1.290
	16QAM	0.942	1.413	0.938	1.233	0.938	1.170
3 MHz	QPSK	1.106	1.296	1.106	1.302	1.096	1.314
	16QAM	0.952	1.386	0.952	1.350	0.942	1.188
5 MHz	QPSK	1.106	1.300	1.090	1.320	1.106	1.330
	16QAM	0.946	1.160	0.946	1.160	0.946	1.160
10 MHz	QPSK	1.122	1.340	1.122	1.340	1.122	1.360
	16QAM	0.962	1.160	0.962	1.160	0.929	1.180

LTE Band 12:

Bandwidth	Modulation	Low channel		Middle channel		High channel	
		OBW (MHz)	26dB EBW (MHz)	OBW (MHz)	26dB EBW (MHz)	OBW (MHz)	26dB EBW (MHz)
1.4 MHz	QPSK	1.096	1.311	1.106	1.290	1.101	1.308
	16QAM	0.938	1.182	0.938	1.128	0.938	1.176
3 MHz	QPSK	1.106	1.302	1.106	1.302	1.106	1.314
	16QAM	0.942	1.404	0.933	1.218	0.942	1.146
5 MHz	QPSK	1.122	1.330	1.090	1.320	1.106	1.340
	16QAM	0.946	1.160	0.946	1.150	0.946	1.160
10 MHz	QPSK	1.122	1.340	1.122	1.340	1.122	1.320
	16QAM	0.962	1.160	0.962	1.180	0.962	1.160

LTE Band 13:

Bandwidth	Modulation	Low channel		Middle channel		High channel	
		OBW (MHz)	26dB EBW (MHz)	OBW (MHz)	26dB EBW (MHz)	OBW (MHz)	26dB EBW (MHz)
5 MHz	QPSK	1.122	1.330	1.090	1.320	1.106	1.300
	16QAM	0.946	1.160	0.946	1.170	0.946	1.160
10 MHz	QPSK	\	\	1.122	1.340	\	\
	16QAM	\	\	0.962	1.160	\	\

The test plots of LTE band please refer to the Appendix A.

FCC §2.1051, §22.917(a) & §24.238(a)& §27.53 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

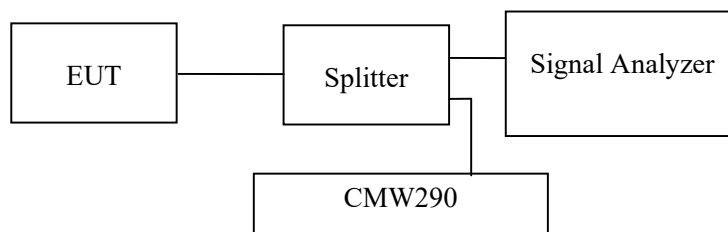
Applicable Standard

FCC §2.1051, §22.917(a) & §24.238(a)&§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.



Note: the worst case path loss among the test frequency range has included in plot.

Test Data

Environmental Conditions

Temperature:	25.2~25.7 °C
Relative Humidity:	53~55 %
ATM Pressure:	101.0 kPa

The testing was performed by Andy Yu from 2022-11-16 to 2022-11-18.

EUT operation mode: Transmitting

Test result: Pass

The test plots of LTE band please refer to the Appendix B.

FCC § 2.1053; § 22.917 (a); § 24.238 (a); §27.53 - SPURIOUS RADIATED EMISSIONS

Applicable Standard

FCC § 2.1053, §22.917(a)& § 24.238(a) & § 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:	26.5 °C
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

The testing was performed by Jeff Jiang from 2022-11-03 to 2022-11-07.

EUT operation mode: Transmitting (Scan with X-AXIS, Y-AXIS, Z-AXIS, the worst case Y-AXIS was recorded)

The worst case is as below:

LTE Bands: (pre-scan all bandwidth/modulation, the worst case as below)

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
LTE Band 2, Test frequency range: 30MHz-20GHz								
QPSK,1.4MHz,1850.7MHz								
60.00	-52.23	16	1.7	H	5.4	-46.83	-13	33.83
60.00	-35.70	9	2.2	V	-1.4	-37.10	-13	24.10
3701.4	-33.0	223	1.2	H	8.1	-24.9	-13	11.9
3701.4	-34.0	350	1.3	V	7.6	-26.4	-13	13.4
5552.1	-43.0	95	1.5	H	9.6	-33.4	-13	20.4
5552.1	-47.4	4	2.3	V	9.1	-38.3	-13	25.3
QPSK,1.4MHz,1880MHz								
60.00	-54.17	40	1.9	H	5.4	-48.77	-13	35.77
60.00	-35.65	242	2.0	V	-1.4	-37.05	-13	24.05
3760	-33.7	81	1.0	H	8.8	-24.9	-13	11.9
3760	-34.4	235	2.4	V	8	-26.4	-13	13.4
5640	-43.6	206	2.5	H	10.2	-33.4	-13	20.4
5640	-47.8	5	1.8	V	9.5	-38.3	-13	25.3
QPSK,1.4MHz,1909.3MHz								
60.00	-54.24	351	2.2	H	5.4	-48.84	-13	35.84
60.00	-36.49	16	2.0	V	-1.4	-37.89	-13	24.89
3818.6	-37.9	253	1.8	H	8.7	-29.2	-13	16.2
3818.6	-33.8	314	1.2	V	8	-25.8	-13	12.8
5727.9	-54.5	35	1.8	H	10.6	-43.9	-13	30.9
5727.9	-52.1	210	2.2	V	10.2	-41.9	-13	28.9

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
LTE Band 4, Test frequency range: 30MHz-20GHz								
QPSK, 1.4MHz, 1710.7MHz								
60.00	-52.81	116	1.6	H	5.4	-47.41	-13	34.41
60.00	-35.48	159	2.3	V	-1.4	-36.88	-13	23.88
3421.4	-52.6	167	1.9	H	6.4	-46.2	-13	33.2
3421.4	-50.3	61	2.0	V	5.7	-44.6	-13	31.6
5132.1	-57.4	184	1.4	H	11.3	-46.1	-13	33.1
5132.1	-56.2	39	1.0	V	10.8	-45.4	-13	32.4
QPSK, 1.4MHz, 1732.5MHz								
60.00	-51.95	86	2.4	H	5.4	-46.55	-13	33.55
60.00	-35.31	229	2.1	V	-1.4	-36.71	-13	23.71
3465	-52.9	288	1.1	H	7	-45.9	-13	32.9
3465	-53.0	315	2.0	V	6.2	-46.8	-13	33.8
5197.5	-55.8	8	2.3	H	10.4	-45.4	-13	32.4
5197.5	-55.3	39	1.0	V	9.8	-45.5	-13	32.5
QPSK, 1.4MHz, 1754.3MHz								
60.00	-54.29	311	2.4	H	5.4	-48.89	-13	35.89
60.00	-34.66	145	1.3	V	-1.4	-36.06	-13	23.06
3508.6	-54.5	77	1.4	H	7.8	-46.7	-13	33.7
3508.6	-53.7	211	2.3	V	6.6	-47.1	-13	34.1
5262.9	-55.1	177	1.5	H	9.5	-45.6	-13	32.6
5262.9	-54.1	40	2.5	V	8.9	-45.2	-13	32.2

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
LTE Band 5, Test frequency range: 30MHz-10GHz								
QPSK, 1.4MHz,824.7MHz								
60.00	-53.72	21	1.3	H	5.4	-48.32	-13	35.32
60.00	-34.44	165	1.6	V	-1.4	-35.84	-13	22.84
1649.4	-57.4	353	1.2	H	3.5	-53.9	-13	40.9
1649.4	-57.5	302	1.6	V	3.1	-54.4	-13	41.4
2474.1	-58.8	285	1.9	H	6.6	-52.2	-13	39.2
2474.1	-57.5	108	1.2	V	5.8	-51.7	-13	38.7
3298.8	-53.8	276	1.8	H	6.4	-47.4	-13	34.4
3298.8	-53.2	136	2.2	V	5.7	-47.5	-13	34.5
QPSK, 1.4MHz,836.5Hz								
60.00	-52.49	191	1.6	H	5.4	-47.09	-13	34.09
60.00	-34.58	251	2.5	V	-1.4	-35.98	-13	22.98
1673	-57.3	109	2.2	H	3.8	-53.5	-13	40.5
1673	-56.1	275	1.3	V	3.1	-53.0	-13	40.0
2509.5	-46.3	301	1.4	H	6.2	-40.1	-13	27.1
2509.5	-45.5	126	1.2	V	5.5	-40.0	-13	27.0
3346	-53.1	235	2.0	H	6.6	-46.5	-13	33.5
3346	-52.0	320	2.3	V	5.4	-46.6	-13	33.6
QPSK, 1.4MHz,848.3Hz								
60.00	-52.02	43	1.9	H	5.4	-46.62	-13	33.62
60.00	-34.47	225	2.0	V	-1.4	-35.87	-13	22.87
1696.6	-58.6	318	1.7	H	4.1	-54.5	-13	41.5
1696.6	-57.1	5	1.9	V	3.1	-54	-13	41.0
2544.9	-45.0	60	1.4	H	6.1	-38.9	-13	25.9
2544.9	-44.5	179	1.1	V	5.8	-38.7	-13	25.7
3393.2	-51.1	80	1.1	H	6.2	-44.9	-13	31.9
3393.2	-50.6	129	2.1	V	5.4	-45.2	-13	32.2

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
LTE Band 12, Test frequency range: 30MHz-10GHz								
QPSK, 1.4MHz, 699.7MHz								
60.00	-51.91	344	1.9	H	5.4	-46.51	-13	33.51
60.00	-35.93	57	2.4	V	-1.4	-37.33	-13	24.33
1399.4	-56.4	137	1.3	H	6.3	-50.1	-13	37.1
1399.4	-60.8	187	1.8	V	5.7	-55.1	-13	42.1
2099.1	-52.3	75	1.7	H	4.9	-47.4	-13	34.4
2099.1	-51.6	252	1.3	V	3.9	-47.7	-13	34.7
2798.8	-57.8	80	2.2	H	6.6	-51.2	-13	38.2
2798.8	-57.6	76	1.5	V	6	-51.6	-13	38.6
QPSK, 1.4MHz, 707.5MHz								
60.00	-51.51	350	2.3	H	5.4	-46.11	-13	33.11
60.00	-34.17	126	2.0	V	-1.4	-35.57	-13	22.57
1415	-55.6	111	1.7	H	5.9	-49.7	-13	36.7
1415	-59.6	349	1.8	V	5.9	-53.7	-13	40.7
2122.5	-54.5	228	1.7	H	6.3	-48.2	-13	35.2
2122.5	-52.7	65	1.4	V	5.1	-47.6	-13	34.6
2830	-57.7	55	1.2	H	6.7	-51.0	-13	38.0
2830	-57.8	28	1.8	V	6.7	-51.1	-13	38.1
QPSK, 1.4MHz, 715.3MHz								
60.00	-54.28	285	2.5	H	5.4	-48.88	-13	35.88
60.00	-34.72	227	1.3	V	-1.4	-36.12	-13	23.12
1430.6	-54.8	14	2.2	H	5.9	-48.9	-13	35.9
1430.6	-58.7	193	2.3	V	5.9	-52.8	-13	39.8
2145.9	-54.2	236	1.5	H	6.3	-47.9	-13	34.9
2145.9	-52.6	99	2.3	V	5.1	-47.5	-13	34.5
2861.2	-58.2	45	2.4	H	6.7	-51.5	-13	38.5
2861.2	-58.7	88	1.0	V	6.7	-52.0	-13	39.0

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
LTE Band 13, Test frequency range: 30MHz-10GHz								
QPSK, 5MHz, 779.5MHz								
60.00	-51.50	229	2.5	H	5.4	-46.10	-13	33.10
60.00	-36.20	70	1.2	V	-1.4	-37.60	-13	24.60
1559	-55.8	90	1.7	H	4.2	-51.6	-40	11.6
1559	-56.5	53	1.8	V	3.3	-53.2	-40	13.2
2338.5	-59.1	341	2.1	H	7.3	-51.8	-13	38.8
2338.5	-58.4	265	2.0	V	6.5	-51.9	-13	38.9
3118	-55.7	141	2.4	H	7.3	-48.4	-13	35.4
3118	-55.1	100	1.9	V	6.5	-48.6	-13	35.6
QPSK, 5MHz, 782MHz								
60.00	-51.67	185	1.6	H	5.4	-46.27	-13	33.27
60.00	-36.26	8	1.5	V	-1.4	-37.66	-13	24.66
1564	-57.2	61	1.5	H	4.2	-53	-40	13.0
1564	-57.0	183	1.1	V	3.3	-53.7	-40	13.7
2346	-57.7	56	1.1	H	7.3	-50.4	-13	37.4
2346	-57.5	294	1.8	V	6.4	-51.1	-13	38.1
3128	-54.9	0	2.0	H	7.3	-47.6	-13	34.6
3128	-59.6	265	1.2	V	6.6	-53	-13	40.0
QPSK, 5MHz, 784.5MHz								
60.00	-52.33	348	1.3	H	5.4	-46.93	-13	33.93
60.00	-36.38	357	2.2	V	-1.4	-37.78	-13	24.78
1569	-57.8	291	2.1	H	4.2	-53.6	-40	13.6
1569	-57.3	197	2.2	V	3.3	-54.0	-40	14.0
2353.5	-58.2	241	1.2	H	7.3	-50.9	-13	37.9
2353.5	-57.0	51	1.9	V	6.4	-50.6	-13	37.6
3138	-55.2	358	1.1	H	7.4	-47.8	-13	34.8
3138	-54.7	64	1.2	V	6.6	-48.1	-13	35.1

Note:

Absolute Level = Reading Level + Substituted Factor

Substituted Factor contains: SG Level - Cable loss+ Antenna Gain

Margin = Absolute Level - Limit

FCC§ 22.917 (a);§ 24.238 (a); §27.53(c)(g)(h) - BAND EDGES

Applicable Standard

According to § 22.917(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.

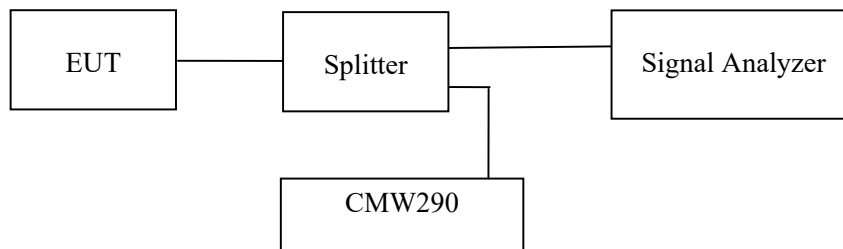
According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

According to FCC §27.53 (c)(g)(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.

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



Note: the worst case path loss among the test frequency range has included in plot.

Test Data

Environmental Conditions

Temperature:	25.2~25.7 °C
Relative Humidity:	53~55 %
ATM Pressure:	101.0 kPa

The testing was performed by Andy Yu from 2022-11-16 to 2022-12-05.

EUT operation mode: Transmitting (Worst case)

Test Result: Pass

The test plots of LTE bands please refer to the Appendix C.

FCC § 2.1055; § 22.355; § 24.235; §27.54 - FREQUENCY STABILITY

Applicable Standard

FCC § 2.1055, §22.355, §24.235&§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 §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Base, fixed (ppm)	Mobile ≤ 3 watts (ppm)	Mobile > 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

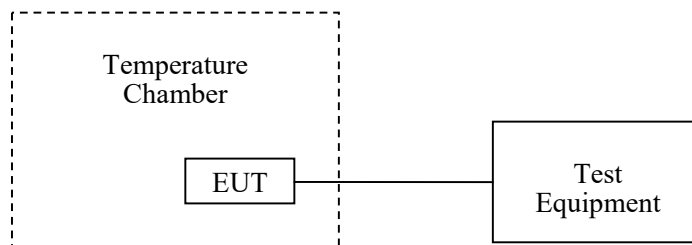
According to §24.235&§27.54, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to a DC power source 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:	25.2~25.7 °C
Relative Humidity:	53~55 %
ATM Pressure:	101.0 kPa

The testing was performed by Andy Yu from 2022-11-16 to 2022-11-18.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the following tables.

LTE:

QPSK:

Band 2:

10 MHz Bandwidth					
Temperature (°C)	Power Supplied (V _{DC})	F _L (MHz)	F _H (MHz)	F _L Limit (MHz)	F _H Limit (MHz)
-30	3.7	1850.0839	1909.9030	1850	1910
-20		1850.1042	1909.9098	1850	1910
-10		1850.0617	1909.8768	1850	1910
0		1850.0815	1909.9249	1850	1910
10		1850.0573	1909.9346	1850	1910
20		1850.1004	1909.8737	1850	1910
30		1850.0838	1909.9412	1850	1910
40		1850.1014	1909.9047	1850	1910
50		1850.1044	1909.9048	1850	1910
20	3.4	1850.1056	1909.9123	1850	1910
	4.2	1850.0875	1909.9152	1850	1910

Band 4:

10 MHz Bandwidth					
Temperature (°C)	Power Supplied (V _{DC})	F _L (MHz)	F _H (MHz)	F _L Limit (MHz)	F _H Limit (MHz)
-30	3.7	1710.1007	1754.8913	1710	1755
-20		1710.1041	1754.8923	1710	1755
-10		1710.0989	1754.8950	1710	1755
0		1710.0978	1754.8896	1710	1755
10		1710.0995	1754.8910	1710	1755
20		1710.1021	1754.8930	1710	1755
30		1710.1039	1754.8916	1710	1755
40		1710.1004	1754.8907	1710	1755
50		1710.1019	1754.8957	1710	1755
20		3.4	1710.0977	1754.8895	1710
	4.2	1710.1033	1754.8954	1710	1755

Band 5:

10.0 MHz Middle Channel, f ₀ = 836.5MHz				
Temperature (°C)	Voltage Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.7	24.65	0.0295	2.5
-20		20.67	0.0247	2.5
-10		14.51	0.0173	2.5
0		13.40	0.0160	2.5
10		10.67	0.0127	2.5
20		5.03	0.0060	2.5
30		7.36	0.0088	2.5
40		10.38	0.0124	2.5
50		7.51	0.0090	2.5
20		3.4	7.64	0.0091
	4.2	8.18	0.0098	2.5

Band 12:

10 MHz Bandwidth					
Temperature (°C)	Power Supplied (V _{DC})	F _L (MHz)	F _H (MHz)	F _L Limit (MHz)	F _H Limit (MHz)
-30	3.7	699.0561	715.9666	699	716
-20		699.0579	715.9607	699	716
-10		699.0512	715.9625	699	716
0		699.0516	715.9615	699	716
10		699.054	715.9633	699	716
20		699.0549	715.9659	699	716
30		699.0538	715.9682	699	716
40		699.0579	715.9631	699	716
50		699.0574	715.9681	699	716
20		3.4	699.0540	715.9612	699
	4.2	699.0587	715.9679	699	716

Band 13

10 MHz Bandwidth					
Temperature (°C)	Power Supplied (V _{DC})	F _L (MHz)	F _H (MHz)	F _L Limit (MHz)	F _H Limit (MHz)
-30	3.7	777.0253	786.9869	777	787
-20		777.0255	786.9807	777	787
-10		777.0350	786.9893	777	787
0		777.0327	786.9865	777	787
10		777.0319	786.9823	777	787
20		777.0368	786.9841	777	787
30		777.0368	786.9828	777	787
40		777.0303	786.9864	777	787
50		777.0317	786.9788	777	787
20		3.4	777.0248	786.9862	777
	4.2	777.0234	786.9782	777	787

16QAM:**Band 2:**

10 MHz Bandwidth					
Temperature (°C)	Power Supplied (V _{DC})	F _L (MHz)	F _H (MHz)	F _L Limit (MHz)	F _H Limit (MHz)
-30	3.7	1850.0875	1909.8870	1850	1910
-20		1850.0914	1909.9361	1850	1910
-10		1850.0868	1909.8668	1850	1910
0		1850.0782	1909.9185	1850	1910
10		1850.0935	1909.9418	1850	1910
20		1850.0660	1909.9034	1850	1910
30		1850.1216	1909.9065	1850	1910
40		1850.1193	1909.8988	1850	1910
50		1850.0694	1909.8949	1850	1910
20		3.4	1850.1103	1909.8751	1850
	4.2	1850.1140	1909.9176	1850	1910

Band 4:

10 MHz Bandwidth					
Temperature (°C)	Power Supplied (V _{DC})	F _L (MHz)	F _H (MHz)	F _L Limit (MHz)	F _H Limit (MHz)
-30	3.7	1710.0512	1754.9518	1710	1755
-20		1710.0526	1754.9486	1710	1755
-10		1710.0506	1754.9491	1710	1755
0		1710.0507	1754.9535	1710	1755
10		1710.0489	1754.9488	1710	1755
20		1710.0531	1754.9473	1710	1755
30		1710.0505	1754.9470	1710	1755
40		1710.0517	1754.9511	1710	1755
50		1710.0517	1754.9478	1710	1755
20		3.4	1710.0531	1754.9522	1710
	4.2	1710.0499	1754.9488	1710	1755

Band 5:

10.0 MHz Middle Channel, $f_o=836.5\text{MHz}$				
Temperature (°C)	Voltage Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.7	13.16	0.0157	2.5
-20		3.68	0.0044	2.5
-10		-6.30	-0.0075	2.5
0		-6.41	-0.0077	2.5
10		-2.96	-0.0035	2.5
20		-6.94	-0.0083	2.5
30		-6.62	-0.0079	2.5
40		1.00	0.0012	2.5
50		-2.45	-0.0029	2.5
20		3.4	-2.01	-0.0024
	4.2	-1.30	-0.0016	2.5

Band 12:

10 MHz Bandwidth					
Temperature (°C)	Power Supplied (V _{DC})	F _L (MHz)	F _H (MHz)	F _L Limit (MHz)	F _H Limit (MHz)
-30	3.7	699.0641	715.9756	699	716
-20		699.0578	715.9755	699	716
-10		699.0618	715.9730	699	716
0		699.0640	715.9689	699	716
10		699.0605	715.9711	699	716
20		699.0655	715.9757	699	716
30		699.0614	715.9700	699	716
40		699.0580	715.9718	699	716
50		699.0631	715.9757	699	716
20		3.4	699.0590	715.9739	699
	4.2	699.0606	715.9706	699	716

Band 13

10 MHz Bandwidth					
Temperature (°C)	Power Supplied (V _{DC})	F _L (MHz)	F _H (MHz)	F _L Limit (MHz)	F _H Limit (MHz)
-30	3.7	777.0366	786.9735	777	787
-20		777.0426	786.9768	777	787
-10		777.0280	786.9782	777	787
0		777.0430	786.9877	777	787
10		777.0301	786.9780	777	787
20		777.0261	786.9872	777	787
30		777.0247	786.9857	777	787
40		777.0377	786.9865	777	787
50		777.0400	786.9842	777	787
20		3.4	777.0381	786.9896	777
	4.2	777.0270	786.9794	777	787

Note: the extreme voltage was provided by applicant.

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