

FCC Radio Test Report

FCC ID: HFSQTA-LI7CS

Report No. : BTL-FCCP-4-2107T083A
Equipment : Notebook Computer
Model Name : NL72LTE, NL72CT-LTE, LI7, LI7XXXXXXXXXXXX, NL7XXXXXXXXXXXX(The "X" Can be 0-9,A-Z, a-z ,- or blank for the marketing purpose)
Brand Name : Quanta, CTL
Applicant : Quanta Computer Inc.
Address : No. 188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan

Radio Function : Transmit Simultaneously

FCC Rule Part(s) : 47 CFR FCC Part15, Subpart C (15.247)
47 CFR FCC Part15, Subpart E (15.407)
47 CFR FCC Part 22 Subpart H
47 CFR FCC Part 24 Subpart E
47 CFR FCC Part 27 Subpart F
47 CFR FCC Part 27 Subpart L
47 CFR FCC Part 27 Subpart H

Measurement Procedure(s) : ANSI C63.10-2013
ANSI C63.26-2015
ANSI/TIA-603-E-2016
FCC KDB 971168 D01 Power Meas License Digital Systems v03r01

Date of Receipt : 2021/9/11
Date of Test : 2021/9/11 ~ 2021/10/4
Issued Date : 2021/11/1

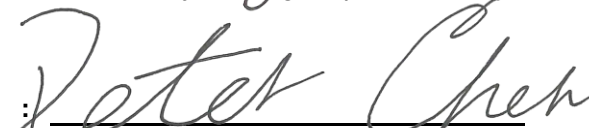
The above equipment has been tested and found in compliance with the requirement of the above standards by BTL Inc.

Prepared by


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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REVISION HISTORY

Report No.	Version	Description	Issued Date
BTL-FCCP-4-2107T083A	R00	Original Report.	2021/10/13
BTL-FCCP-4-2107T083A	R01	Added one brand name.	2021/11/1

1 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards.

Standard(s) Section	Description	Test Result	Judgement	Remark
15.205 15.209 15.247(d) 15.407(b) 2.1053 22.917(a) 24.238(a) 27.53(f) 27.53(g) 27.53(h)	Radiated Emissions	APPENDIX A	Pass	-----

NOTE:

- (1) "N/A" denotes test is not applicable in this Test Report.
- (2) The report format version is TP.1.1.1.

1.1 TEST FACILITY

The test facilities used to collect the test data in this report:

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
The test sites and facilities are covered under FCC RN: 674415 and DN: TW0659.

☐ C05 ☐ CB08 ☐ CB11 ☒ CB15 ☐ CB16

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately 95 %.

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.

A. Radiated emissions test :

Test Site	Measurement Frequency Range	U_1 (dB)
CB15	0.03 GHz ~ 0.2 GHz	4.17
	0.2 GHz ~ 1 GHz	4.72
	1 GHz ~ 6 GHz	5.21
	6 GHz ~ 18 GHz	5.51
	18 GHz ~ 26 GHz	3.69
	26 GHz ~ 40 GHz	4.23

NOTE:

Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Environment Condition	Test Voltage	Tested by
Radiated emissions	21~23 °C, 54~70 %	AC 120V	Eddie Lee

2 GENERAL INFORMATION

2.1 DESCRIPTION OF EUT

Equipment	Notebook Computer		
Model Name	NL72LTE, NL72CT-LTE, LI7, LI7XXXXXXXXXX, NL7XXXXXXXXXX(The “X” Can be 0-9,A-Z, a-z ,- or blank for the marketing purpose)		
Brand Name	Quanta, CTL		
Model Difference	Brand Name	Model Name	
	Quanta	LI7, LI7XXXXXXXXXX (The “X” Can be 0-9,A-Z, a-z ,- or blank for the marketing purpose)	
	CTL	NL72LTE, NL72CT-LTE, NL7XXXXXXXXXX(The “X” Can be 0-9,A-Z, a-z ,- or blank for the marketing purpose)	
Different model distribute to different area.			
Power Source	DC voltage supplied from AC/DC Adapter.		
Power Adapter	LITEON / PA-1450-50		
Power Adapter Power Rating	I/P: 100-240V~1.3A 50/60Hz O/P: 5.0V---3.0A, 9.0V---3.0A, 12.0V---3.0A, 15.0V---3.0A, 20.0V---2.25A		
WLAN Module	Intel® Wi-Fi 6 AX201 / AX201NGW		
WWAN Module	Fibocom / NL668-AM		
Products Covered	1 * Adapter: LITEON / PA-1450-50		
Operation Frequency	WLAN: 2412 MHz ~ 2472 MHz UNII-1: 5180 MHz ~ 5250 MHz UNII-2A: 5250 MHz ~ 5320 MHz UNII-2C: 5500 MHz ~ 5700 MHz UNII-3: 5745 MHz ~ 5825 MHz		
	Band	UL Frequency (MHz)	DL Frequency (MHz)
	WCDMA V	824 ~ 849	869 ~ 894
	LTE 5	824 ~ 849	869 ~ 894
	WCDMA II	1850 ~ 1910	1930 ~ 1990
	LTE 2	1850 ~ 1910	1930 ~ 1990
	WCDMA IV	1710 ~ 1755	2110 ~ 2155
	LTE 4	1710 ~ 1755	2110 ~ 2155
	LTE 12	699 ~ 716	729 ~ 746
	LTE 13	777 ~ 787	746 ~ 756
	LTE 66	1710 ~ 1780	2110 ~ 2200
Test Model	NL72LTE		
Sample Status	Engineering Sample		
EUT Modification(s)	N/A		

NOTE:

(1) For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

(2) Channel List:

WLAN 2.4 GHz					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	06	2437	11	2462
02	2417	07	2442	12	2467
03	2422	08	2447	13	2472
04	2427	09	2452		
05	2432	10	2457		

WLAN 5 GHz					
UNII-1					
IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11ac (VHT20) IEEE 802.11ax (HEW20)		IEEE 802.11n (HT40) IEEE 802.11ac (VHT40) IEEE 802.11ax (HEW40)		IEEE 802.11ac (VHT80) IEEE 802.11ax (HEW80)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

UNII-2A					
IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11ac (VHT20) IEEE 802.11ax (HEW20)		IEEE 802.11n (HT40) IEEE 802.11ac (VHT40) IEEE 802.11ax (HEW40)		IEEE 802.11ac (VHT80) IEEE 802.11ax (HEW80)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	54	5270	58	5290
56	5280	62	5310		
60	5300				
64	5320				

UNII-2C					
IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11ac (VHT20) IEEE 802.11ax (HEW20)		IEEE 802.11n (HT40) IEEE 802.11ac (VHT40) IEEE 802.11ax (HEW40)		IEEE 802.11ac (VHT80) IEEE 802.11ax (HEW80)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	102	5510	106	5530
104	5520	110	5550	122	5610
108	5540	118	5590	138	5690
112	5560	126	5630		
116	5580	134	5670		
120	5600				
124	5620				
128	5640				
132	5660				
136	5680				
140	5700				

UNII-3					
IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11ac (VHT20) IEEE 802.11ax (HEW20)		IEEE 802.11n (HT40) IEEE 802.11ac (VHT40) IEEE 802.11ax (HEW40)		IEEE 802.11ac (VHT80) IEEE 802.11ax (HEW80)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				

802.11ac (VHT160) 802.11ax (HEW160)	
Channel	Frequency(MHz)
50	5250
114	5570

(3) Table for Filed Antenna:

WLAN 2.4 GHz and WLAN 5 GHz					
Antenna	Manufacture	Part Number	Type	Frequency Range (MHz)	Gain (dBi)
Main	WNC	DQ6615GAY00 (81EAA615.GAY)	PIFA	2400-2500	1.35
				5150-5350	2.34
				5470-5725	2.52
				5725-5850	1.69
Aux	WNC	DQ6615GAY00 (81EAA615.GAY)	PIFA	2400-2500	1.16
				5150-5350	1.58
				5470-5725	2.37
				5725-5850	2.37

WWAN					
Antenna	Manufacturer	Part Number	Type	Gain (dBi)	Note
Main	WNC	DQ6615GAU00 (81EAA615.GAU)	PIFA	0.34	WCDMA Band II LTE Band 2
				0.93	WCDMA Band IV LTE Band 4
				-1.99	WCDMA Band V LTE Band 5
				-0.10	LTE Band 12
				-0.75	LTE Band 13
				0.93	LTE Band 66
Aux	WNC	DQ6615GVU00 (81EAA615.GAV)	PIFA	-0.56	WCDMA Band II LTE Band 2
				0.23	WCDMA Band IV LTE Band 4
				-0.50	WCDMA Band V LTE Band 5
				-0.85	LTE Band 12
				0.20	LTE Band 13
				0.23	LTE Band 66

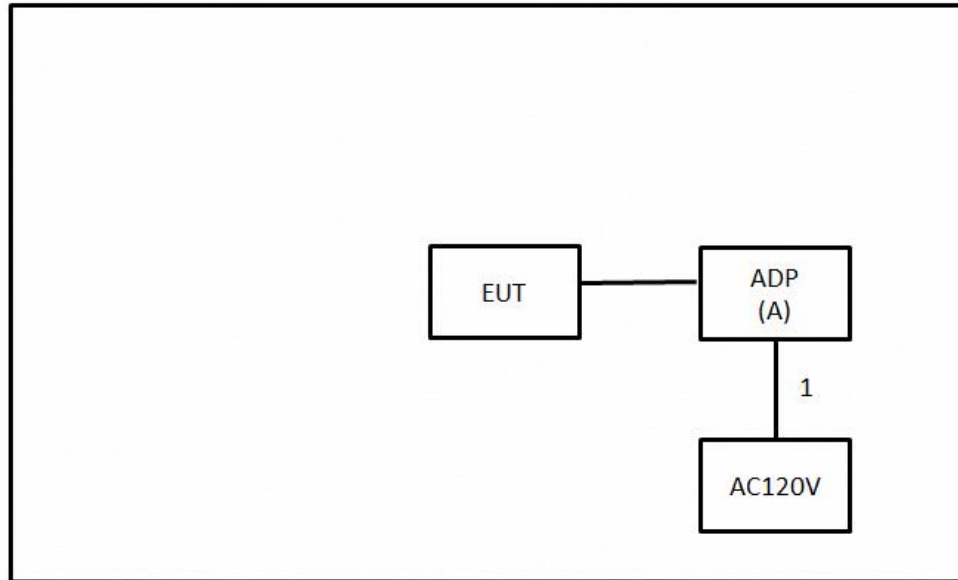
2.2 TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode as listed in below table.

Test Mode	Description
1	WLAN (2.4 GHz)_IEEE802.11b_2442MHz + WWAN (LTE Band 2)_CH18900
2	WLAN (5 GHz)_IEEE802.11a_5260 MHz + WWAN (LTE Band 2)_CH18900

2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Equipment letters and Cable numbers refer to item numbers described in the tables of clause 2.4.



2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.	Remarks
A	Adapter	LITEON	PA-1450-50	N/A	Supplied by test requester

Item	Shielded	Ferrite Core	Length	Cable Type	Remarks
1	N/A	N/A	1m	Power Cord	Supplied by test requester

3 RADIATED EMISSIONS TEST

3.1 LIMIT

For WLAN:

In case the emission fall within the restricted band specified on 15.205, then the 15.209 limit in the table below has to be followed.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

Frequency (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dBμV/m)
5150-5250	-27	68.3
5250-5350	-27	68.3
5470-5725	-27	68.3
5725-5850	-27 (NOTE 2)	68.3
	10 (NOTE 2)	105.3
	15.6 (NOTE 2)	110.9
	27 (NOTE 2)	122.3

For WWAN:

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. The emission limit equal to -13dBm.

NOTE:

- (1) The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts)}$$

- (2) According to FCC 16-24, All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

- (3) The test result calculated as following:

Measurement Value = Reading Level + Correct Factor

Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)

Margin Level = Measurement Value - Limit Value

Calculation example:

Reading Level		Correct Factor		Measurement Value
19.11	+	2.11	=	21.22

Measurement Value		Limit Value		Margin Level
21.22	-	68.3	=	-47.08

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average

Spectrum Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz~110KHz for QP detector
Start ~ Stop Frequency	110KHz~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

3.2 TEST PROCEDURE

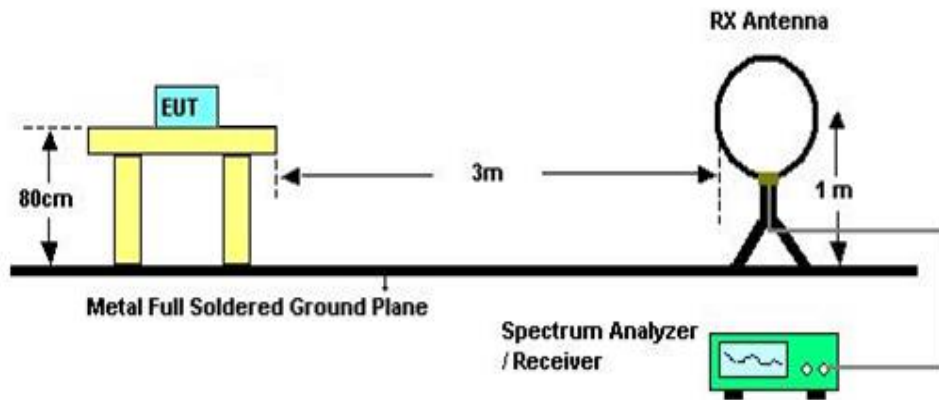
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- For the actual test configuration, please refer to the related Item – EUT TEST PHOTO.

3.3 DEVIATION FROM TEST STANDARD

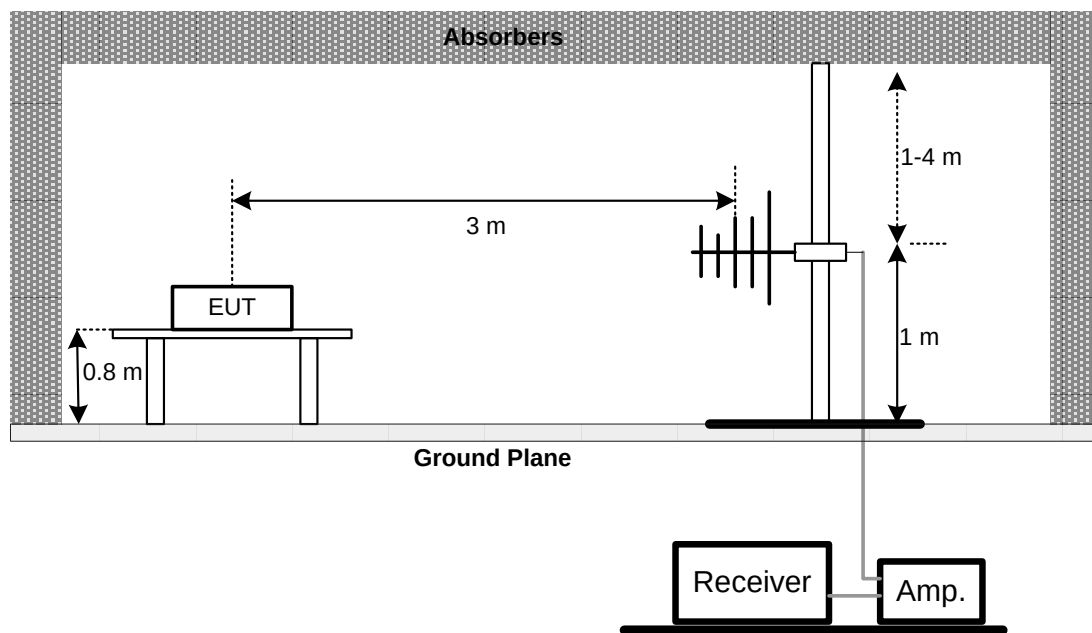
No deviation.

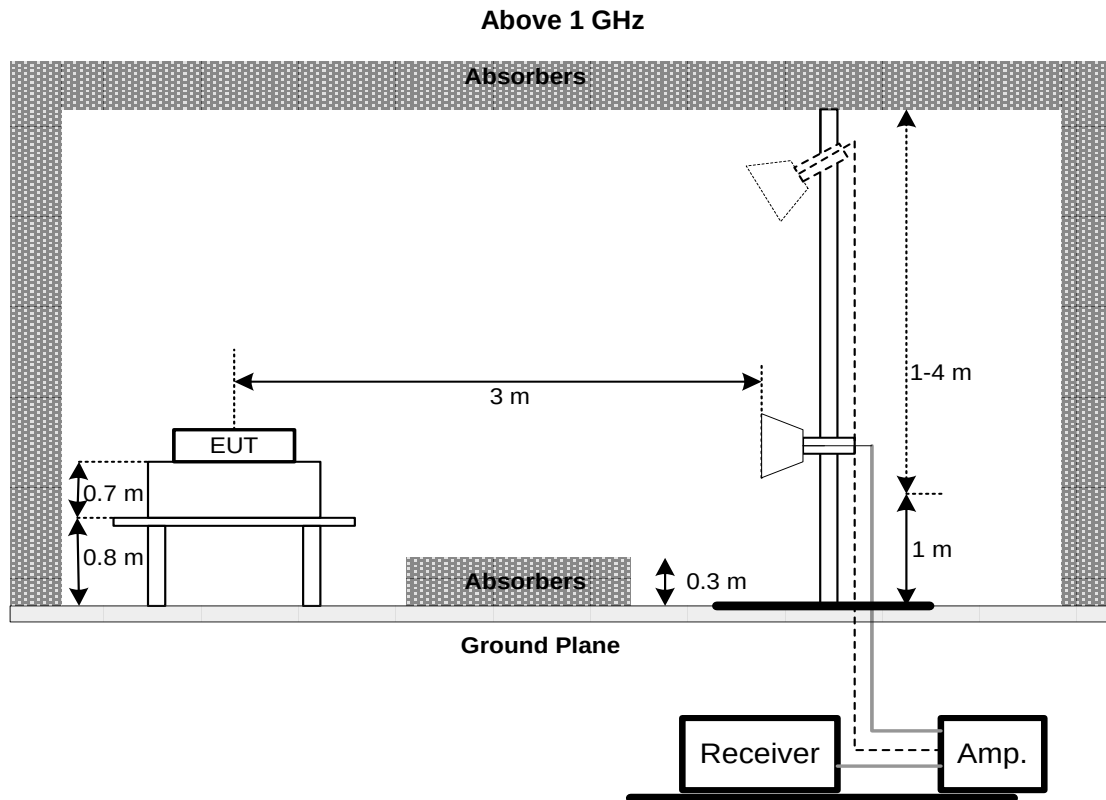
3.4 TEST SETUP

9 kHz to 30 MHz



30 MHz to 1 GHz





3.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

3.6 TEST RESULT

Please refer to the APPENDIX A.

4 LIST OF MEASURING EQUIPMENTS

Radiated Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Preamplifier	EMCI	EMC02325B	980217	2021/4/8	2022/4/7
2	Preamplifier	EMCI	EMC012645B	980267	2021/4/8	2022/4/7
3	Test Cable	EMCI	EMC-SM-SM-100 0	180809	2021/4/8	2022/4/7
4	Test Cable	EMCI	EMC104-SM-SM- 3000	151205	2021/4/8	2022/4/7
5	Test Cable	EMCI	EMC-SM-SM-700 0	180408	2021/4/8	2022/4/7
6	MXE EMI Receiver	Agilent	N9038A	MY554200087	2021/5/27	2022/5/26
7	Signal Analyzer	Agilent	N9010A	MY56480554	2021/8/25	2022/8/24
8	Horn Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	2021/6/2	2022/6/1
9	Horn Ant	Schwarzbeck	BBHA 9170	BBHA 9170340	2021/7/9	2022/7/8
10	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	VULB 9168-352	2021/8/11	2022/8/10
11	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0625	2021/8/11	2022/8/10
12	Measurement Software	EZ	EZ EMC (Version NB-03A1-01)	N/A	N/A	N/A
13	8960 Series 10 Wireless Com Test Set	Agilent	E5515C	GB47390193	2021/7/23	2022/7/22
14	Radio Communication Analyzer (LTE)	Anritsu	MT8820C	6201381608	2021/1/7	2022/1/6

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.
All calibration period of equipment list is one year.

5 EUT TEST PHOTO

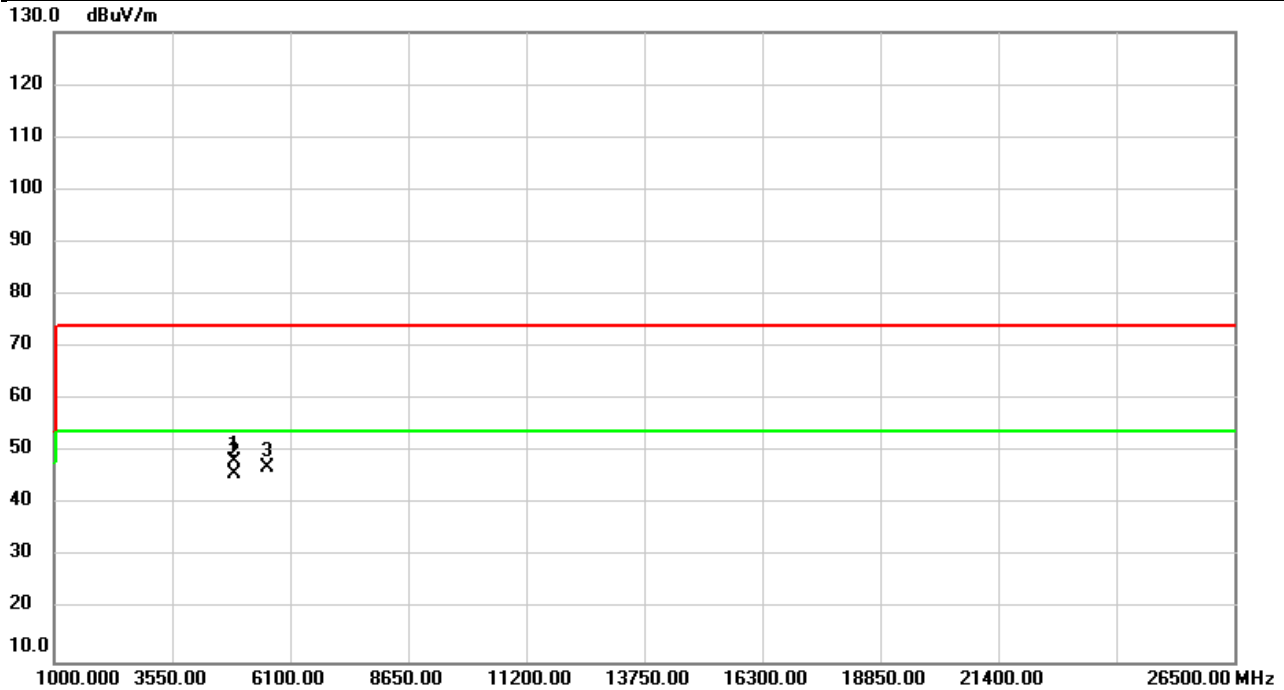
Please refer to document Appendix No.: TP-2107T083A-FCCP-1 (APPENDIX-TEST PHOTOS).

6 EUT PHOTOS

Please refer to document Appendix No.: EP-2107T083A-1 (APPENDIX-EUT PHOTOS).

APPENDIX A RADIATED EMISSIONS

Test Mode	WLAN (2.4 GHz)_IEEE802.11b+ WWAN (LTE Band 2)	Test Date	2021/9/30
Test Frequency	2442MHz+ CH18900	Polarization	Vertical
Temp	21°C	Hum.	70%

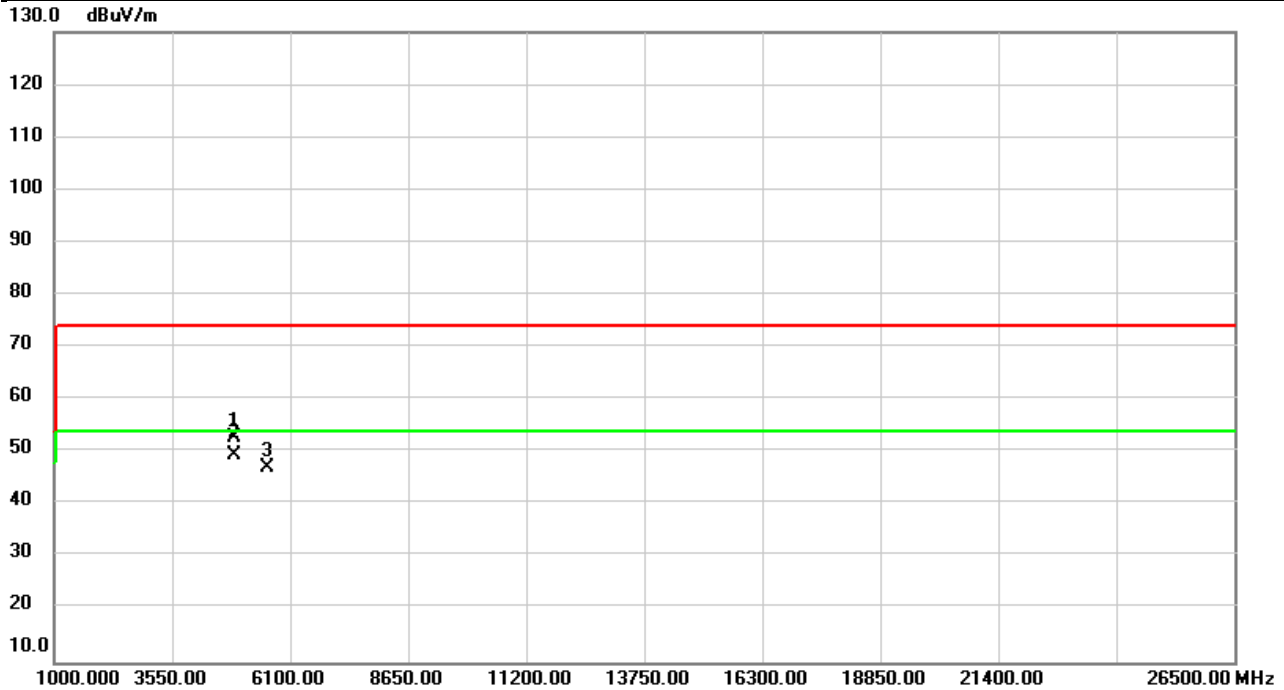


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4884.000	58.13	-9.76	48.37	74.00	-25.63	peak	
2	*	4884.000	55.66	-9.76	45.90	54.00	-8.10	AVG	
3		5613.200	56.01	-8.83	47.18	74.00	-26.82	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	WLAN (2.4 GHz)_IEEE802.11b+ WWAN (LTE Band 2)	Test Date	2021/9/30
Test Frequency	2442MHz+ CH18900	Polarization	Horizontal
Temp	22°C	Hum.	65%

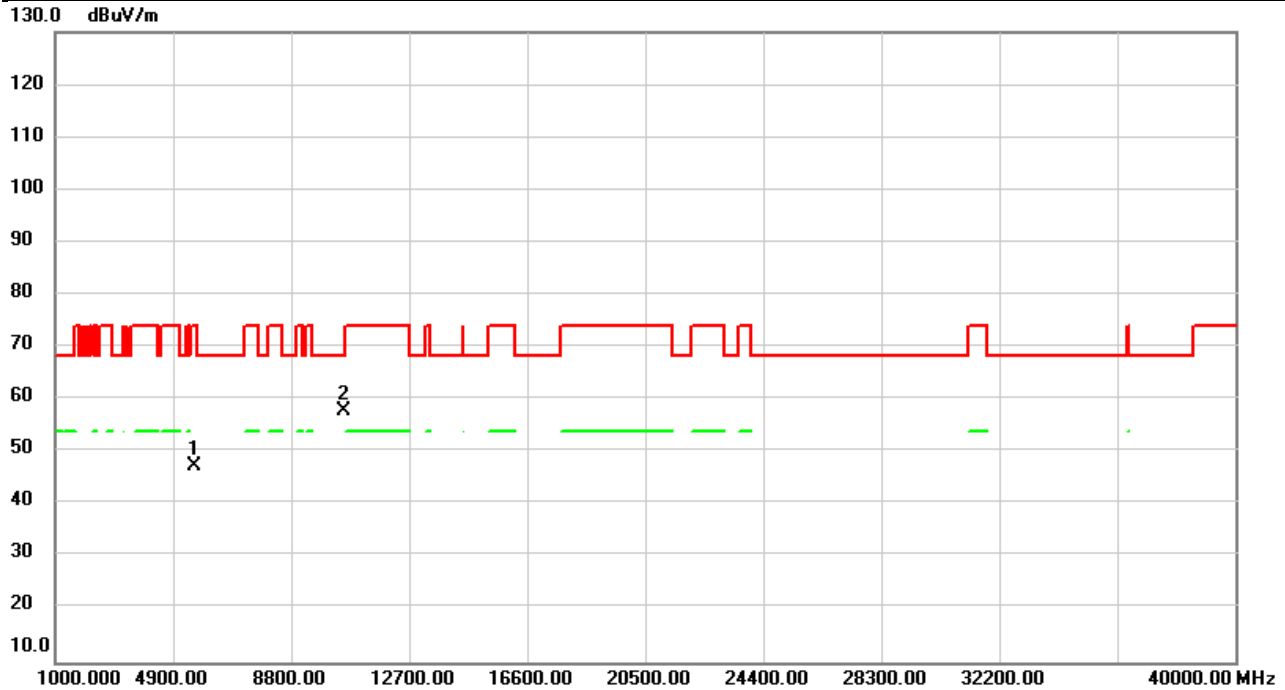


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4884.000	62.49	-9.76	52.73	74.00	-21.27	peak	
2	*	4884.000	59.35	-9.76	49.59	54.00	-4.41	AVG	
3		5613.200	55.97	-8.83	47.14	74.00	-26.86	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	WLAN (5 GHz)_IEEE802.11a+ WWAN (LTE Band 2)	Test Date	2021/10/1
Test Frequency	5260 MHz+ CH18900	Polarization	Vertical
Temp	23°C	Hum.	54%

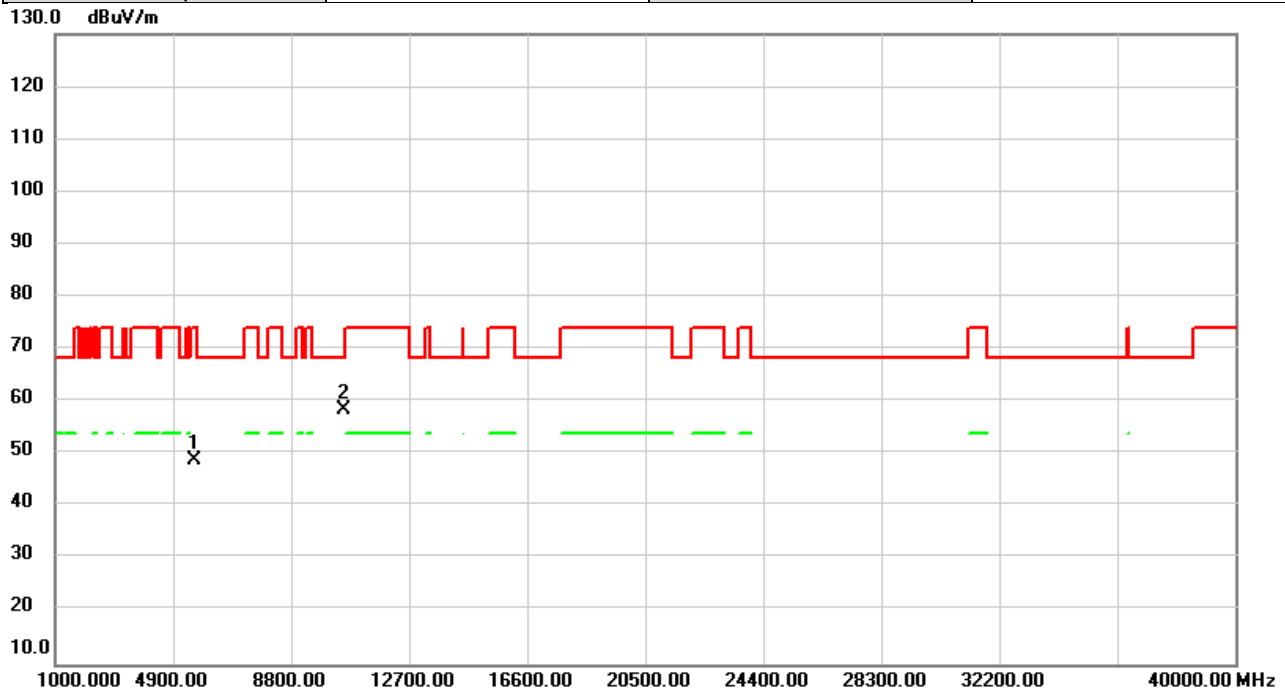


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		5613.200	56.32	-8.83	47.49	74.00	-26.51	peak	
2	*	10520.00	53.09	4.86	57.95	68.20	-10.25	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode	WLAN (5 GHz)_IEEE802.11a+ WWAN (LTE Band 2)	Test Date	2021/10/1
Test Frequency	5260 MHz+ CH18900	Polarization	Horizontal
Temp	23°C	Hum.	54%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		5613.200	57.67	-8.83	48.84	74.00	-25.16	peak	
2	*	10520.00	53.45	4.86	58.31	68.20	-9.89	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

End of Test Report