

Partial FCC Test Report (PART 90S)

Report No.: RFBHDI-WTW-P21120081-11

FCC ID: 2ATM8EG25G

Test Model: EG25-G MINIPCIE

Received Date: Dec. 24, 2021

Test Date: Mar. 29 ~ Apr. 07, 2022

Issued Date: Apr. 22, 2022

Applicant: Hawkeye Tech Co., Ltd.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

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**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RFBHDI-WTW-P21120081-11	Original Release	Apr. 22, 2022

1 Certificate of Conformity

Product: LTE Module
Brand: Hawkeye Tech Co., Ltd.
Test Model: EG25-G MINIPCIE
Sample Status: Engineering Sample
Applicant: Hawkeye Tech Co., Ltd.
Test Date: Mar. 29 ~ Apr. 07, 2022
Standards: FCC Part 90, Subpart I, S
FCC Part 2

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Lena Wang , Date: Apr. 22, 2022
Lena Wang / Specialist

Approved by : Jeremy Lin , Date: Apr. 22, 2022
Jeremy Lin / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 90 & Part 2 (LTE 26)			
FCC Clause	Test Item	Result	Remarks
2.1046 90.635 (b)	Effective Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	N/A	Refer to Note
2.1055 90.213	Frequency Stability	N/A	Refer to Note
2.1049 90.209	Occupied Bandwidth	N/A	Refer to Note
90.691	Emission Masks	N/A	Refer to Note
2.1051 90.691	Conducted Spurious Emissions	N/A	Refer to Note
2.1053 90.691	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -34.84 dB at 442.25 MHz.

Note:

1. This report is a partial report. Therefore, only test item of Effective Radiated Power and Radiated Spurious Emissions tests were performed for this report. Other testing data please refer to SGS report no.: HR/2019/1001601 for module (Brand: Quectel, Model: EG25-G MINIPCIE).
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Spectrum Analyzer Agilent	N9010A	MY52220207	Jan. 06, 2022	Jan. 05, 2023
Test Receiver Agilent	N9038A	MY51210203	Sep. 22, 2021	Sep. 21, 2022
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 12, 2021	Apr. 11, 2022
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 14, 2021	Nov. 13, 2022
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Oct. 28, 2021	Oct. 27, 2022
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 13, 2021	Apr. 12, 2022
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 25, 2021	Nov. 24, 2022
Preamplifier EMCI	EMC 012645	980115	Oct. 05, 2021	Oct. 04, 2022
Preamplifier EMCI	EMC 330H	980112	Oct. 05, 2021	Oct. 04, 2022
RF Coaxial Cable EMCI	EMC104-SM-SM- 8000	171005	Oct. 05, 2021	Oct. 04, 2022
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM- 1000(140807)	Oct. 05, 2021	Oct. 04, 2022
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 05, 2021	Oct. 04, 2022
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
Radio Communication Analyzer Anritsu	MT8820C	6201010284	Dec. 24, 2021	Dec. 23, 2022

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 10.


3 General Information

3.1 General Description of EUT

Product	LTE Module		
Brand	Hawkeye Tech Co., Ltd.		
Test Model	EG25-G MINIPCIE		
Status of EUT	Engineering Sample		
Power Supply Rating	48Vdc (Adapter and PoE)		
Modulation Type	LTE	QPSK, 16QAM	
Frequency Range	LTE Band 26 (Channel Bandwidth: 1.4 MHz)	814.7 ~ 823.3 MHz	
	LTE Band 26 (Channel Bandwidth: 3 MHz)	815.5 ~ 822.5 MHz	
	LTE Band 26 (Channel Bandwidth: 5 MHz)	816.5 ~ 821.5 MHz	
	LTE Band 26 (Channel Bandwidth: 10 MHz)	819 MHz	
Max. ERP Power		QPSK	16QAM
	LTE Band 26 (Channel Bandwidth: 1.4 MHz)	134.896 mW (21.30dBm)	109.144 mW (20.38dBm)
	LTE Band 26 (Channel Bandwidth: 3 MHz)	137.404 mW (21.38dBm)	108.143 mW (20.34dBm)
	LTE Band 26 (Channel Bandwidth: 5 MHz)	140.281 mW (21.47dBm)	110.154 mW (20.42dBm)
	LTE Band 26 (Channel Bandwidth: 10 MHz)	145.546 mW (21.63dBm)	108.643 mW (20.36dBm)
Antenna Type	Dipole Antenna with 0.3 dBi gain		
Accessory Device	N/A		
Data Cable Supplied	N/A		

Note:

- The EUT was installed in a specific End-product.

Product	Brand	Model	FCC ID
veeaHub		VHH09-4GL	2ARXKVHE09-4GL

- The End-product contains following accessory devices.

Product	Brand	Model	Description
Adapter	EDAC Power Electronics Co., Ltd.	EA1062SGR-480	I/P: 100-240 Vac, 50/60 Hz, 2.5A O/P: 48 Vdc, 1.35 A 1.2m DC cable with 1 core

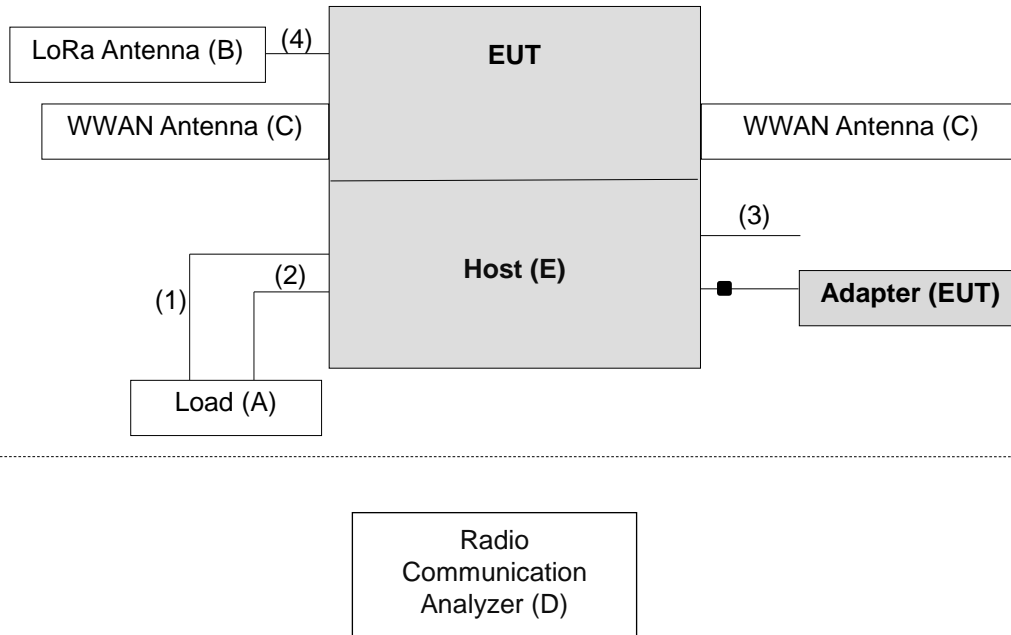
- The End-product use following devices (Support unit).

Product	Brand	Model	Description
PoE	N/A	APOE02-WM	O/P: 48 Vdc

- The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
- The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.


3.2 Configuration of System under Test

<Radiated Emission Test> & <E.R.P. Test>



3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
1.	Load	NA	NA	NA	NA	-
2.	LoRa Antenna	PCTEL	MFB9155NF	NA	NA	Provided by manufacturer
3.	WWAN Antenna	2J	2J2124W -C315N	NA	NA	Provided by manufacturer
4.	Radio Communication Analyzer	Anritsu	MT8820C	6201010284	NA	-
5.	veeaHub		VHE09XXXXX (X=A-Z, 0-9, blank or "-")	NA	2ARXKVHE09-4GL	Provided by manufacturer

Note: All power cords of the above support units are non-shielded (1.8m).

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	LAN cable	1	0.4	N	0	RJ45, Cat5e
2.	LAN cable	1	0.4	N	0	RJ45, Cat5e
3.	RS232 cable	1	0.4	Y	0	-
4.	Coaxial cable	1	1.5	Y	0	-

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports

The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	Radiated Emission
LTE Band 26	X-axis

LTE Band 26

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	26697 to 26783	26697, 26740, 26783	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26705 to 26775	26705, 26740, 26775	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26715 to 26765	26715, 26740, 26765	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26740	26740	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Radiated Emission	26740	26740	10 MHz	QPSK	1 RB / 24 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.
2. For radiated emission above 1 GHz, select the worst radiated emission channel for final testing

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	25 deg. C, 65 % RH	120 Vac, 60 Hz	Vincent Chen
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Vincent Chen

3.4 General Description of Applied Standards and references

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 90

ANSI 63.26-2015

Note: All test items have been performed and recorded as per the above standards.

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

KDB 971168 D02 Misc Rev Approv License Devices v02r01

ANSI/TIA/EIA-603-E 2016

Note: All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw) ERP.

4.1.2 Test Procedures

Conducted Power Measurement:

- a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
- b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

Maximum EIRP / ERP

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

$$\text{EIRP} = P_{\text{Meas}} + G_{\text{T}}$$

$$\text{ERP} = P_{\text{Meas}} + G_{\text{T}} - 2.15$$

where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively

(expressed in the same units as P_{Meas} , e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_{T} gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

4.1.3 Test Setup

Conducted Power Measurement:



4.1.4 Test Results

Conducted Output Power (dBm)

LTE Band 26						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		26697	26740	26783
		Frequency (MHz)		814.7	819	823.3
1.4M	QPSK	1	0	22.90	22.97	22.88
		1	2	23.15	23.02	23.01
		1	5	23.01	23.09	23.05
		3	0	22.90	22.93	22.94
		3	1	22.91	22.98	23.06
		3	3	22.89	22.99	23.07
		6	0	21.74	21.91	21.93
	16QAM	1	0	22.05	21.95	21.97
		1	2	22.23	22.13	22.22
		1	5	22.16	22.07	22.17
		3	0	22.17	21.94	22.05
		3	1	22.21	22.08	22.16
		3	3	22.07	21.98	22.03
		6	0	20.86	20.84	20.91
BW	MCS Index	Channel		26705	26740	26775
		Frequency (MHz)		815.5	819	822.5
3M	QPSK	1	0	23.08	23.01	22.95
		1	7	23.23	23.22	23.14
		1	14	22.89	22.99	22.92
		8	0	21.84	22.04	21.91
		8	3	21.90	22.12	21.98
		8	7	21.89	22.10	21.94
		15	0	21.72	21.98	21.87
	16QAM	1	0	22.11	22.01	21.86
		1	7	22.19	22.14	22.00
		1	14	21.83	21.73	21.51
		8	0	20.81	20.81	20.66
		8	3	20.90	20.90	20.74
		8	7	20.78	20.86	20.67
		15	0	20.85	21.04	20.83

LTE Band 26						
BW	MCS Index	Channel		26715	26740	26765
		Frequency (MHz)		816.5	819	821.5
5M	QPSK	1	0	23.02	23.08	23.03
		1	12	23.32	23.27	23.28
		1	24	23.10	23.23	23.26
		12	0	21.91	22.06	22.18
		12	6	21.87	22.11	22.14
		12	13	21.79	22.06	22.14
		25	0	21.83	22.11	22.24
	16QAM	1	0	22.13	22.07	22.15
		1	12	22.27	22.16	22.22
		1	24	21.95	21.87	22.02
		12	0	21.10	21.07	21.21
		12	6	21.21	21.23	21.33
		12	13	21.04	21.13	21.16
		25	0	20.85	21.04	21.05
BW	MCS Index	Channel		26740		
		Frequency (MHz)		819		
10M	QPSK	1	0	23.12		
		1	24	23.48		
		1	49	23.25		
		25	0	22.03		
		25	12	22.21		
		25	25	22.17		
		50	0	22.07		
	16QAM	1	0	22.01		
		1	24	22.21		
		1	49	21.85		
		25	0	21.04		
		25	12	21.10		
		25	25	21.07		
		50	0	20.99		

ERP Power (dBm)

LTE Band 26						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		26697	26740	26783
		Frequency (MHz)		814.7	819	823.3
1.4M	QPSK	1	0	21.05	21.12	21.03
		1	2	21.30	21.17	21.16
		1	5	21.16	21.24	21.20
		3	0	21.05	21.08	21.09
		3	1	21.06	21.13	21.21
		3	3	21.04	21.14	21.22
		6	0	19.89	20.06	20.08
	16QAM	1	0	20.20	20.10	20.12
		1	2	20.38	20.28	20.37
		1	5	20.31	20.22	20.32
		3	0	20.32	20.09	20.20
		3	1	20.36	20.23	20.31
		3	3	20.22	20.13	20.18
		6	0	19.01	18.99	19.06
BW	MCS Index	Channel		26705	26740	26775
		Frequency (MHz)		815.5	819	822.5
3M	QPSK	1	0	21.23	21.16	21.10
		1	7	21.38	21.37	21.29
		1	14	21.04	21.14	21.07
		8	0	19.99	20.19	20.06
		8	3	20.05	20.27	20.13
		8	7	20.04	20.25	20.09
		15	0	19.87	20.13	20.02
	16QAM	1	0	20.26	20.16	20.01
		1	7	20.34	20.29	20.15
		1	14	19.98	19.88	19.66
		8	0	18.96	18.96	18.81
		8	3	19.05	19.05	18.89
		8	7	18.93	19.01	18.82
		15	0	19.00	19.19	18.98

*ERP = Conducted + antenna gain (0.3dBi)-2.15

LTE Band 26						
BW	MCS Index	Channel		26715	26740	26765
		Frequency (MHz)		816.5	819	821.5
5M	QPSK	1	0	21.17	21.23	21.18
		1	12	21.47	21.42	21.43
		1	24	21.25	21.38	21.41
		12	0	20.06	20.21	20.33
		12	6	20.02	20.26	20.29
		12	13	19.94	20.21	20.29
		25	0	19.98	20.26	20.39
	16QAM	1	0	20.28	20.22	20.30
		1	12	20.42	20.31	20.37
		1	24	20.10	20.02	20.17
		12	0	19.25	19.22	19.36
		12	6	19.36	19.38	19.48
		12	13	19.19	19.28	19.31
		25	0	19.00	19.19	19.20
BW	MCS Index	Channel		26740		
		Frequency (MHz)		819		
10M	QPSK	1	0	21.27		
		1	24	21.63		
		1	49	21.40		
		25	0	20.18		
		25	12	20.36		
		25	25	20.32		
		50	0	20.22		
	16QAM	1	0	20.16		
		1	24	20.36		
		1	49	20.00		
		25	0	19.19		
		25	12	19.25		
		25	25	19.22		
		50	0	19.14		

*ERP = Conducted + antenna gain (0.3dBi)-2.15

4.2 Radiated Emission Measurement

4.2.1 Limits of Radiated Emission Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB. The limit of emission is equal to -13 dBm.

4.2.2 Test Procedure

- a. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. Perform a field strength measurement and record the worse read value, is the field strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor and then mathematically convert the measured field strength level to EIRP/ERP level.
- c. Following C63.26 section 5.5 and 5.2.7.
EIRP (dBm) = E (dB μ V/m) + 20log (D) - 104.8; where D is the measurement distance (in the far field region) in m.
ERP (dBm) = E (dB μ V/m) + 20log (D) - 104.8 - 2.15; where D is the measurement distance (in the far field region) in m.

Note:

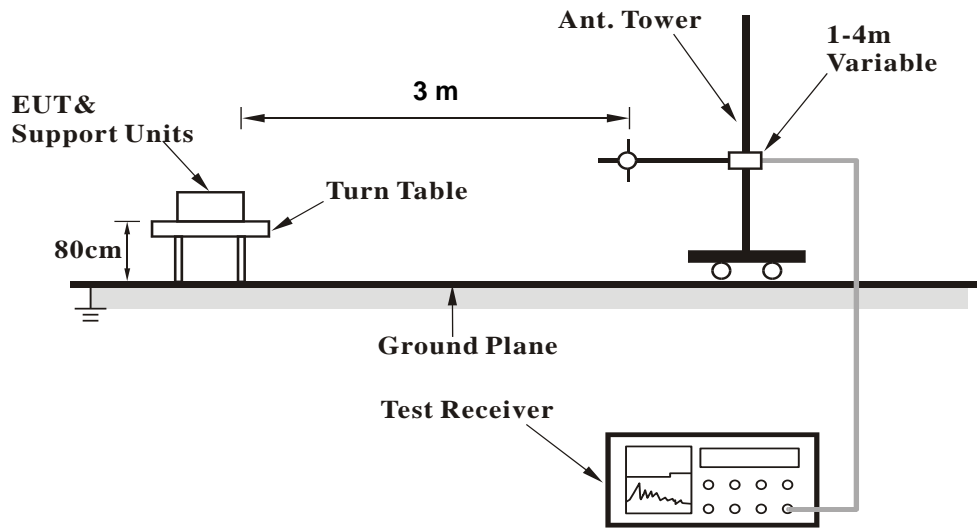
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.
2. 9 kHz ~ 30 MHz Data:
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.2.3 Deviation from Test Standard

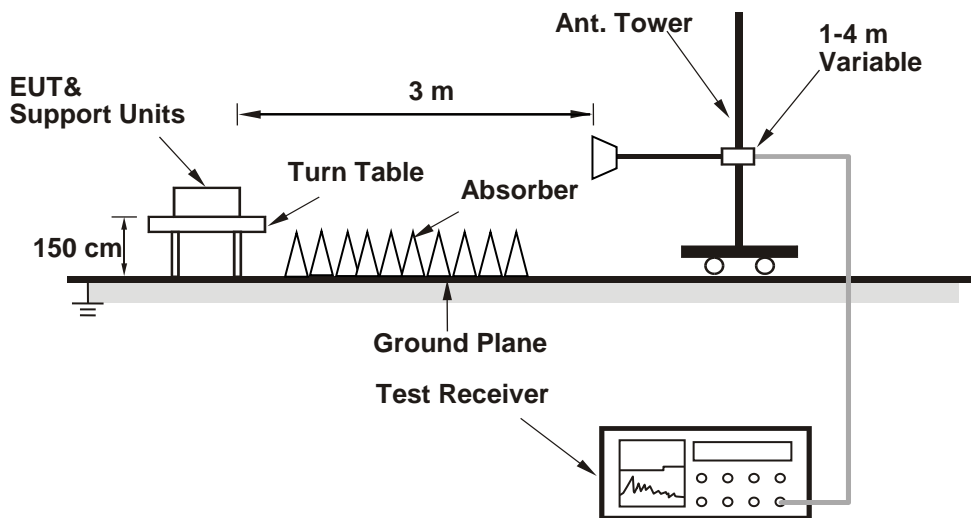
No deviation.

4.2.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.5 Test Results

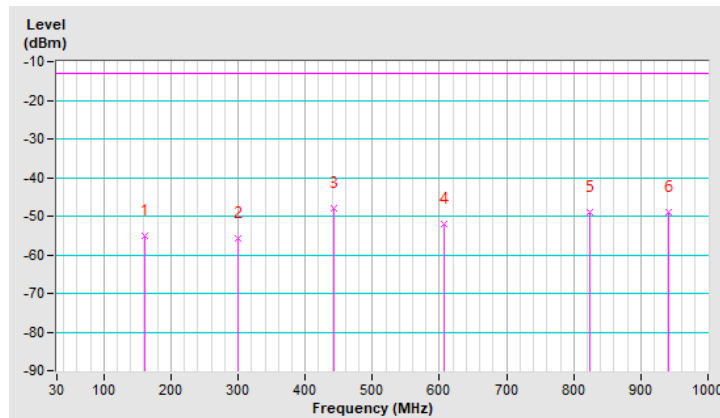
Below 1GHz

RF Mode	TX LTE Band XXVI-10MHz	Channel	CH 26740 : 819 MHz
Frequency Range	30MHz ~ 1GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	160.95	-55.12	-13.00	-42.12	1.64 H	259	54.80	-109.92
2	299.66	-55.86	-13.00	-42.86	2.69 H	238	53.68	-109.54
3	442.25	-47.84	-13.00	-34.84	2.27 H	244	57.01	-104.85
4	606.18	-52.02	-13.00	-39.02	1.52 H	235	48.77	-100.79
5	824.43	-49.02	-13.00	-36.02	1.03 H	348	47.54	-96.56
6	940.83	-48.91	-13.00	-35.91	3.37 H	18	45.94	-94.85

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

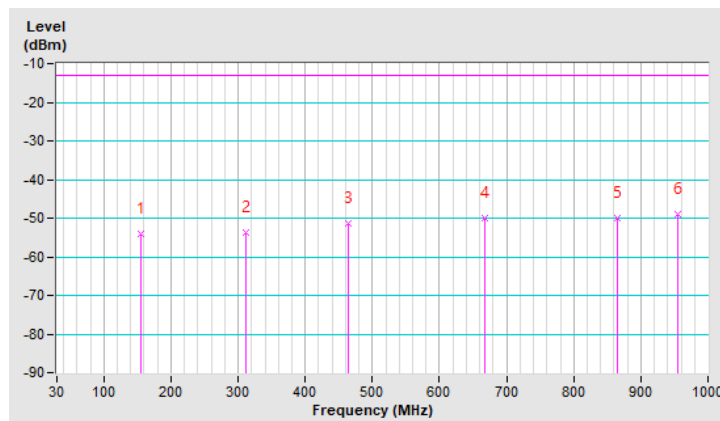


RF Mode	TX LTE Band XXVI-10MHz	Channel	CH 26740 : 819 MHz
Frequency Range	30MHz ~ 1GHz		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	155.13	-53.94	-13.00	-40.94	1.26 V	251	55.67	-109.61
2	311.30	-53.63	-13.00	-40.63	2.87 V	230	55.32	-108.95
3	464.56	-51.49	-13.00	-38.49	3.35 V	18	52.98	-104.47
4	668.26	-50.08	-13.00	-37.08	1.64 V	293	49.53	-99.61
5	864.20	-50.08	-13.00	-37.08	1.30 V	187	46.21	-96.29
6	955.38	-48.88	-13.00	-35.88	1.87 V	100	45.77	-94.65

Remarks:

1. $ERP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8 - 2.15$
3. $Margin\ value = ERP - Limit\ value$
4. The other ERP levels were very low against the limit.



Above 1GHz

RF Mode	TX LTE Band XXVI-10MHz	Channel	CH 26740 : 819 MHz
Frequency Range	1GMHz ~ 20GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1638.00	-60.76	-13.00	-47.76	2.31 H	184	61.45	-122.21
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1638.00	-61.98	-13.00	-48.98	1.78 V	236	60.23	-122.21

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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