



Test Report No.: PSU-NQN2505120212RF05



Certificate #6613.01

FCC TEST REPORT

(PART 90)

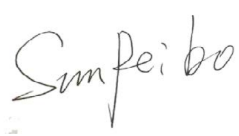
Applicant:	InHand Networks, Inc.
Address:	43671 Trade Center Place, Suite 100, Dulles, VA 20166 United States

Manufacturer or Supplier	InHand Networks, Inc.
Address	43671 Trade Center Place, Suite 100, Dulles, VA 20166 United States
Product	Industrial Cellular Router
Brand Name	inhand
Model Name	IR315-FQ38-WLAN v2, IR325-FQ38-WLAN v2, IR355-FQ38-WLAN v2
FCC ID	2BPWU-IR315
Date of tests	Apr. 28, 2025 ~May. 11, 2025

The tests have been carried out according to the requirements of the following standard:

☒ FCC Part 90, Subpart R, S ☒ ANSI/TIA/EIA-603- D
☒ FCC Part 2 ☒ ANSI/TIA/EIA-603-E ☒ ANSI C63.26-2015

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Prepared by Hanwen Xu Engineer / Mobile Department	Approved by Peibo Sun Manager / Mobile Department
 Date: May. 11, 2025	 Date: May. 11, 2025

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

TABLE OF CONTENTS

RELEASE CONTROL RECORD	4
1 SUMMARY OF TEST RESULTS	5
1.1 MEASUREMENT UNCERTAINTY	6
1.2 TEST SITE AND INSTRUMENTS	7
2 GENERAL INFORMATION.....	9
2.1 GENERAL DESCRIPTION OF EUT	9
2.2 CONFIGURATION OF SYSTEM UNDER TEST	11
2.3 DESCRIPTION OF SUPPORT UNITS	12
2.4 DESCRIPTION OF TEST MODES.....	12
2.5 GENERAL DESCRIPTION OF APPLIED STANDARDS	14
3 TEST TYPES AND RESULTS	15
3.1 OUTPUT POWER MEASUREMENT	15
3.1.1 LIMITS OF OUTPUT POWER MEASUREMENT	15
3.1.2 TEST PROCEDURES	15
3.1.3 TEST SETUP	16
3.1.4 TEST RESULTS	16
3.2 FREQUENCY STABILITY MEASUREMENT	18
3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT	18
3.2.2 TEST PROCEDURE	18
3.2.3 TEST SETUP	18
3.2.4 TEST RESULTS	18
3.3 OCCUPIED BANDWIDTH MEASUREMENT	19
3.3.1 LIMITS OF OCCUPIED BANDWIDTH MEASUREMENT	19
3.3.2 TEST SETUP	19
3.3.3 TEST PROCEDURES	19
3.3.4 TEST RESULTS	19
3.4 EMISSION MASK MEASUREMENT.....	20
3.4.1 LIMITS OF EMISSION MASK MEASUREMENT	20
3.4.2 TEST SETUP	21
3.4.3 TEST PROCEDURES	22
3.4.4 TEST RESULTS	22
3.5 CONDUCTED SPURIOUS EMISSIONS.....	23
3.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT	23
3.5.2 TEST PROCEDURE	23
3.5.3 TEST SETUP	23
3.5.4 TEST RESULTS	23
3.6 RADIATED EMISSION MEASUREMENT	24
3.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT	24
3.6.2 TEST PROCEDURES	24
3.6.3 DEVIATION FROM TEST STANDARD	24
3.6.4 TEST SETUP	25
3.6.5 TEST RESULTS	27
3.7 PEAK TO AVERAGE RATIO	28
3.7.1 LIMITS OF PEAK TO AVERAGE RATIO MEASUREMENT	28
3.7.2 TEST SETUP	28
3.7.3 TEST PROCEDURES	28
3.7.4 TEST RESULTS	28
4 INFORMATION ON THE TESTING LABORATORIES	29



Test Report No.: PSU-NQN2505120212RF05

5	MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	29
6	APPENDIX	29



Test Report No.: PSU-NQN2505120212RF05

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
PSU-NQN2505120212RF05	Original release	May. 11, 2025

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 90 & Part 2			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	TEST LAB*
§ 2.1046	Effective Radiated Power (Band14)	PASS	A
§2.1055 §90.539(e)	Frequency Stability	PASS	A
§2.1049	Occupied Bandwidth	PASS	A
§2.1051 §90.543(n)	Emission Masks	PASS	A
§2.1053 §90.543(e)(3)	Conducted Spurious Emissions	PASS	A
§2.1053 §90.543(e)(3) §90.543(f)	Radiated Spurious Emissions	PASS	A

*Test Lab Information Reference

Lab A:

Huarui 7Layers High Technology (Suzhou) Co., Ltd.

Lab Address:

Tower N, Innovation Center, 88 Zuyi Road, High-tech District, Suzhou City, Anhui Province, China

Accredited Test Lab Cert 6613.01

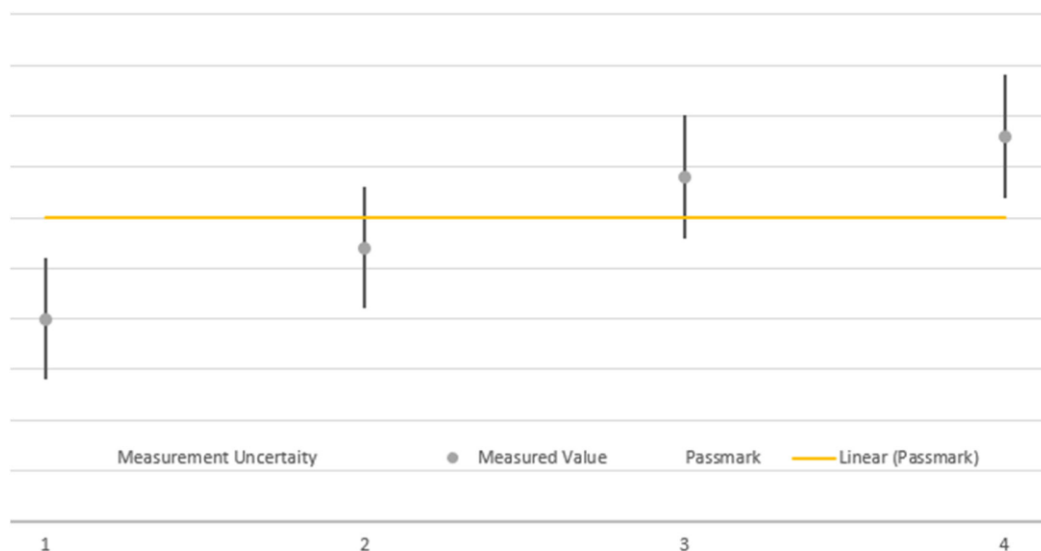
The FCC Site Registration No. is 434559; The Designation No. is CN1325.

1.1 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	UNCERTAINTY
Maximum Peak Output Power	±2.06dB
Frequency Stability	±76.97Hz
Radiated emissions (9KHz~30MHz)	±2.68dB
Radiated emissions (30MHz~1GHz)	±4.98dB
Radiated emissions (1GHz ~6GHz)	±4.70dB
Radiated emissions (6GHz ~18GHz)	±4.60dB
Radiated emissions (18GHz ~40GHz)	±4.12dB
Conducted emissions	±4.01dB
Occupied Channel Bandwidth	±43.58KHz
Band Edge Measurements	±4.70dB
Peak to average ratio	±0.76dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



The verdicts in this test report are given according the above diagram:

Case	Measured Value	Uncertainty Range	Verdict
1	below pass mark	below pass mark	Passed
2	below pass mark	within pass mark	Passed
3	above pass mark	within pass mark	Failed
4	above pass mark	above pass mark	Failed

That means, the laboratory applies, as decision rule (see ISO/IEC 17025:2017), the so-called shared risk principle.

1.2 TEST SITE AND INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Pre-Amplifier	R&S	SCU18F1	100815	Aug.30,23	Aug.29,25
Pre-Amplifier	R&S	SCU08F1	101028	Jan.22,24	Jan.21,26
Vector Signal Generator	R&S	SMBV100B	102176	Mar.29,24	Mar.28,26
Signal Generator	R&S	SMB100A	182185	Mar.29,24	Mar.28,26
3m Fully-anechoic Chamber	TDK	9m*6m*6m	HRSW-SZ-EMC-01Chamber	Nov.25,22	Nov.24,25
3m Semi-anechoic Chamber	TDK	9m*6m*6m	HRSW-SZ-EMC-02Chamber	Nov.25,22	Nov.24,25
EMI TEST Receiver	R&S	ESR26	101734	Mar.28,24	Mar.27,26
EMI TEST Receiver	R&S	ESW44	101973	Mar.28,24	Mar.27,26
Bilog Antenna	SCHWARZBECK	VULB 9163	1264	Dec.26,23	Dec.25,25
Horn Antenna	ETS-LINDGREN	3117	227836	Aug.22,23	Aug.21,25
Horn Antenna (18GHz-40GHz)	Steatite Q-par Antennas	QMS 00880	23486	Jul.15,24	Jul.14,26
Horn Antenna	Steatite Q-par Antennas	QMS 00208	23485	Aug.22,23	Aug.21,25
Loop Antenna	SCHWARZ	HFH2-Z2/Z2E	100976	Feb.23,24	Feb.22,26
Loop Antenna	SCHWARZ	HFH2-Z2/Z2E	100976	Feb.22,25	Feb.21,27
WIDEBANDRADIO COMMUNICATION TESTER	R&S	CMW500	169399	Jun.19,24	Jun.18,26
Test Software	EMC32	EMC32	N/A	N/A	N/A
6DB attenuator	Tonscend Technology Co., Ltd	N/A	23062787	N/A	N/A
Test Software	ELEKTRA	ELEKTRA4.32	N/A	N/A	N/A
Open Switch and Control Unit	R&S	OSP220	101964	N/A	N/A
DC Source	HYELEC	HY3010B	551016	Aug.31,23	Aug.30,25
Hygrothermograph	DELI	20210528	SZ014	Sep.06,23	Sep.05,25
PC	LENOVO	E14	HRSW0024	N/A	N/A
TMC-AMI18843A(CABLE)	R&S	HF290-NMNM-7.0 OM	N/A	N/A	N/A
TMC-AMI18843A(CABLE)	R&S	HF290-NMNM-4.0 OM	N/A	N/A	N/A
CABLE	R&S	W13.02	N/A	Apr.27,25	Apr.26,26
CABLE	R&S	W12.14	N/A	Apr.27,25	Apr.26,26
CABLE	R&S	J12J103539-00-1	SEP-03-20-069	Apr.27,25	Apr.26,26
CABLE	R&S	J12J103539-00-1	SEP-03-20-070	Apr.27,25	Apr.26,26
Temperature Chamber	votsch	VT4002	58566078100050	May.30,24	May.29,26



Test Report No.: PSU-NQN2505120212RF05

- NOTE:**
1. The calibration interval of the above test instruments is 12 / 24/ 36 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
 2. The test was performed in 3m Semi-anechoic Chamber and RF Oven Room.
 3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Site Registration No. is 434559; The Designation No. is CN1325.

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT*	Industrial Cellular Router	
BRAND NAME*	inhand	
MODEL NAME*	IR315-FQ38-WLAN v2, IR325-FQ38-WLAN v2, IR355-FQ38-WLAN v2	
NOMINAL VOLTAGE*	12.0Vdc(adapter or host equipment)	
MODULATION TECHNOLOGY*	LTE	QPSK, 16QAM
FREQUENCY RANGE	LTE Band 14 Channel Bandwidth: 5MHz	790.5MHz ~ 795.5MHz
	LTE Band 14 Channel Bandwidth: 10MHz	793MHz
MAX. EIRP POWER	LTE Band 14 Channel Bandwidth: 10MHz	178.24mW
ANTENNA TYPE*	4G sucker antenna Antenna	
ANTENNA GAIN*	1.25dBi gain for LTE B14	
HW VERSION*	V1.5	
SW VERSION*	V3.5	
I/O PORTS*	Refer to user's manual	
EXTREME TEMPERATURE*	-20°C~70 °C	
EXTREME VOLTAGE*	9 Vdc~36Vdc	

NOTE1: This product uses the module model EC25-AFXD; EC25-AFXD MINIPCI-E and supports LTE frequency bands 2/4/5/12/13/14/66/71. Therefore, for this product, we referred to the test data reported by the EC25-AFXD; EC25-AFXD MINIPCI-E module and reevaluated the spectrum of radiated emissions and EIRP.

Please Refer to Module report EC25-AFXD; EC25-AFXD MINIPCI-E
 (Report No.: R2203A0238-R4 FCC ID : XMR202008EC25AFXD)

NOTE2:

1. *Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information, Test Lab is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.
2. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
3. The EUT incorporates a SISO function. Physically, the EUT provides one completed transmitter and one receiver.

MODULATION MODE	TX FUNCTION
LTE	1TX/2RX

4. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
5. Antenna gain and EUT conducted cable loss are provided by the customer, and the laboratory will record the results based on these items that involve these two parameters.

NOTE3 DIFFERENCE DESCRIPTION:

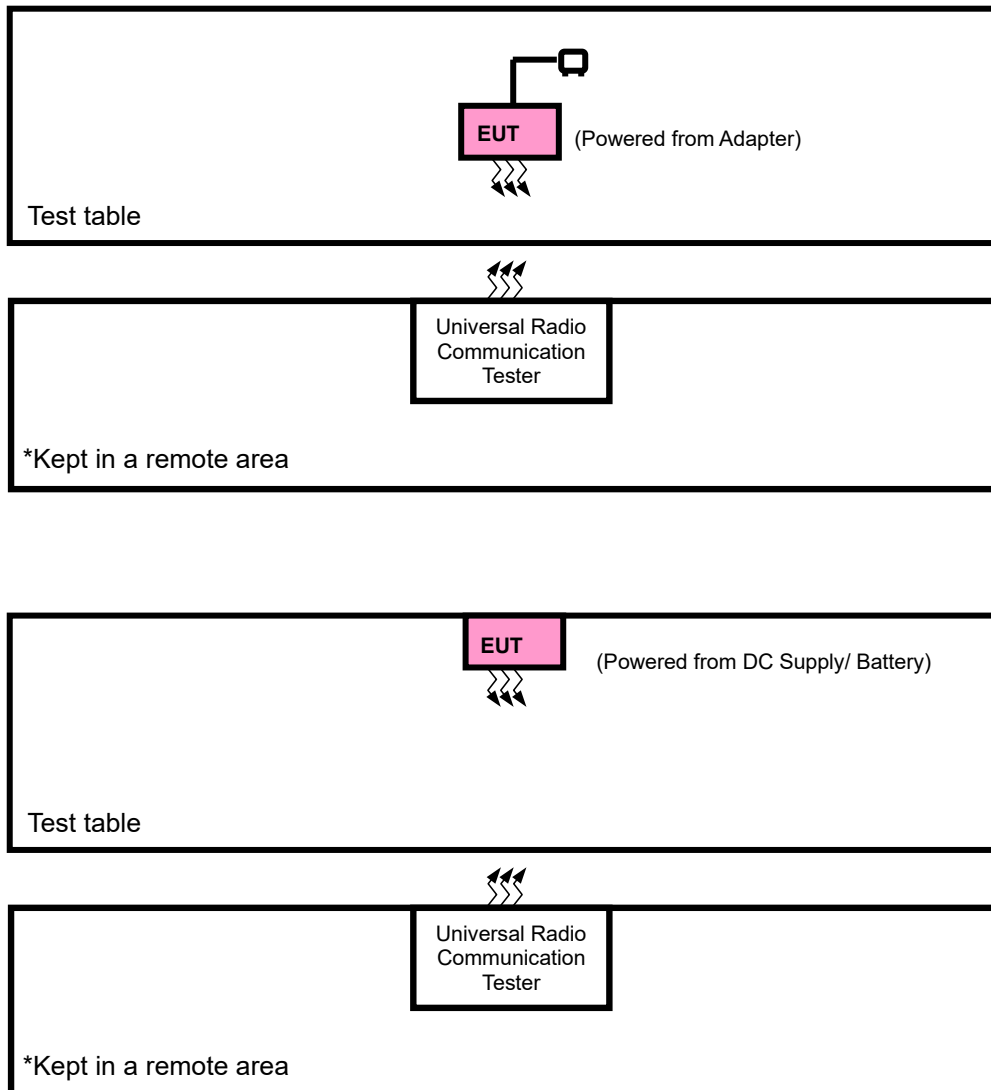
Test Model No.: IR315-FQ38-WLAN v2

Series Models NO: IR325-FQ38-WLAN v2, IR355-FQ38-WLAN v2

These three models are the same in these: appearance, PCB layout and basic software function; The only difference is that the products are used in different markets.

2.2 CONFIGURATION OF SYSTEM UNDER TEST

FOR RADIATION EMISSION TEST



2.3 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.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	DC Source	HYELEC	HY3010B	551016	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	DC Line: Unshielded, Detachable 1.8m

2.4 DESCRIPTION OF TEST MODES

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 in ERP/EIRP and radiated emission was found when positioned on X-plane for LTE. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	DESCRIPTION
A	EUT + Adapter + USB Cable with LTE link
B	EUT + DC Supply with LTE link

LTE BAND 14 MODE

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
A	ERP	23305 to 23355	23305, 23330, 23355	5MHz	QPSK,16QAM	1 RB / 0 RB Offset
		23330	23330	10MHz	QPSK,16QAM	1 RB / 0 RB Offset
B	FREQUENCY STABILITY	23330	23330	10MHz	QPSK,16QAM	50 RB / 0 RB Offset
A	OCCUPIED BANDWIDTH	23305 to 23355	23305, 23330, 23355	5MHz	QPSK,16QAM	25 RB / 0 RB Offset
		23330	23330	10MHz	QPSK,16QAM	50 RB / 0 RB Offset
A	PEAK TO AVERAGE RATIO	23330	23330	10MHz	QPSK,16QAM	1 RB / 0 RB Offset 50 RB / 0 RB Offset
A	BAND EDGE	23305 to 23355	23305	5MHz	QPSK,16QAM	1 RB / 0 RB Offset 25 RB / 0 RB Offset
			23355	5MHz	QPSK,16QAM	1 RB / 24 RB Offset 25 RB / 0 RB Offset
		23300	23330	10MHz	QPSK,16QAM	1 RB / 0 RB Offset 50 RB / 0 RB Offset 1 RB / 49 RB Offset /
A	CONDUCTED EMISSION	23305 to 23355	23305, 23330, 23355	5MHz	QPSK,16QAM	1 RB / 0 RB Offset
		23330	23330	10MHz	QPSK,16QAM	1 RB / 0 RB Offset
A	RADIATED EMISSION	23305 to 23355	23305, 23330, 23355	5MHz	QPSK	1 RB / 0 RB Offset
		23330	23330	10MHz	QPSK	1 RB / 0 RB Offset

Note: This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

TEST CONDITION:

TEST ITEM	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
EIRP(ERP)	24deg. C, 60%RH	DC12V By Adapter	Hanwen Xu
FREQUENCY STABILITY	24deg. C, 61%RH	DC 9V/12V/14V By DC Supply	Hanwen Xu
OCCUPIED BANDWIDTH	24deg. C, 61%RH	DC12V By Adapter	Hanwen Xu
BAND EDGE	24deg. C, 61%RH	DC 12V By Adapter	Hanwen Xu
CONDUCTED EMISSION	24deg. C, 61%RH	DC12V By Adapter	Hanwen Xu
RADIATED EMISSION	23deg. C, 70%RH	DC12V By Adapter	Hanwen Xu

2.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC 47 CFR Part 2

FCC 47 CFR Part 90

ANSI/TIA/EIA-603-D

ANSI/TIA/EIA-603-E

ANSI C63.26-2015

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

3 TEST TYPES AND RESULTS

3.1 OUTPUT POWER MEASUREMENT

3.1.1 LIMITS OF OUTPUT POWER MEASUREMENT

47 CFR 90.542(a)(6)

Control stations and mobile stations transmitting in the 758–768 MHz band and the 788–798 MHz band are limited to 30 watts ERP.

47 CFR 90.542(a)(7)

Portable stations (hand-held devices) transmitting in the 758–768 MHz band and the 788–798 MHz band are limited to 3 watts ERP.

Per FCC Part 90.635(a)(b)

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

3.1.2 TEST PROCEDURES

EIRP / ERP MEASUREMENT:

Per KDB 971168 D01 Power Meas License Digital Systems v03r01 or subclause 5.2.5.5 of ANSI C63.26-2015, the relevant equation for determining the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_T - L_C$$

Where:

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

(expressed in the same units as P_{Meas} , typically dBW or dBm);

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);

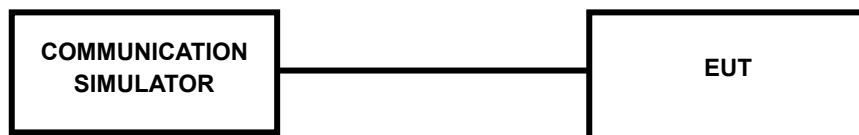
L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB

CONDUCTED POWER MEASUREMENT:

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

3.1.3 TEST SETUP

CONDUCTED POWER MEASUREMENT:



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

3.1.4 TEST RESULTS

CONDUCTED OUTPUT POWER (dBm)

Note : The gain of this product has changed, therefore Power has been revaluated test.
Please refer to the referenced module report for other test item results

B14_5MHz_EIRP

Band: 14 / Bandwidth: 5MHz / NTN								
Modulation	Frequency (MHz)	RB Allocation		Conducted Power (dBm)	Gain (dBi)	ERP (dBm)		Verdict
		Size	Offset			Result	Limit	
QPSK	790.5	1	0	24.91	1.25	24.01	<=34.77	Pass
			13	24.53	1.25	23.63	<=34.77	Pass
			24	25.01	1.25	24.11	<=34.77	Pass
		12	0	23.99	1.25	23.09	<=34.77	Pass
			6	23.95	1.25	23.05	<=34.77	Pass
			13	23.94	1.25	23.04	<=34.77	Pass
		25	0	23.96	1.25	23.06	<=34.77	Pass
	793	1	0	24.85	1.25	23.95	<=34.77	Pass
			13	24.74	1.25	23.84	<=34.77	Pass
			24	24.97	1.25	24.07	<=34.77	Pass
		12	0	23.99	1.25	23.09	<=34.77	Pass
			6	23.95	1.25	23.05	<=34.77	Pass
			13	23.94	1.25	23.04	<=34.77	Pass
		25	0	23.96	1.25	23.06	<=34.77	Pass
	795.5	1	0	24.83	1.25	23.93	<=34.77	Pass
			13	24.35	1.25	23.45	<=34.77	Pass
			24	25.31	1.25	24.41	<=34.77	Pass
		12	0	24.13	1.25	23.23	<=34.77	Pass
			6	23.96	1.25	23.06	<=34.77	Pass
			13	23.92	1.25	23.02	<=34.77	Pass
		25	0	23.98	1.25	23.08	<=34.77	Pass
16QAM	790.5	1	0	23.62	1.25	22.72	<=34.77	Pass
			13	23.55	1.25	22.65	<=34.77	Pass
			24	23.78	1.25	22.88	<=34.77	Pass
		12	0	22.81	1.25	21.91	<=34.77	Pass
			6	22.75	1.25	21.85	<=34.77	Pass
			13	22.72	1.25	21.82	<=34.77	Pass
		25	0	22.63	1.25	21.73	<=34.77	Pass
	793	1	0	23.13	1.25	22.23	<=34.77	Pass
			13	23.63	1.25	22.73	<=34.77	Pass



**BUREAU
VERITAS**

Test Report No.: PSU-NQN2505120212RF05

		12	24	23.70	1.25	22.80	<=34.77	Pass
			0	22.79	1.25	21.89	<=34.77	Pass
			6	22.78	1.25	21.88	<=34.77	Pass
			13	22.76	1.25	21.86	<=34.77	Pass
		25	0	22.87	1.25	21.97	<=34.77	Pass
	795.5	1	0	23.37	1.25	22.47	<=34.77	Pass
			13	23.41	1.25	22.51	<=34.77	Pass
			24	23.68	1.25	22.78	<=34.77	Pass
		12	0	22.88	1.25	21.98	<=34.77	Pass
			6	22.88	1.25	21.98	<=34.77	Pass
			13	22.93	1.25	22.03	<=34.77	Pass
		25	0	23.09	1.25	22.19	<=34.77	Pass

Note1: ERP=Conducted Power+Antenna Gain-2.15

B14_10MHz_EIRP

Band: 14 / Bandwidth: 10MHz / NTNV								
Modulation	Frequency (MHz)	RB Allocation		Conducted Power (dBm)	Gain (dBi)	ERP (dBm)		Verdict
		Size	Offset			Result	Limit	
QPSK	793	1	0	24.96	1.25	24.06	<=34.77	Pass
			25	24.98	1.25	24.08	<=34.77	Pass
			49	25.12	1.25	24.22	<=34.77	Pass
		25	0	23.85	1.25	22.95	<=34.77	Pass
			13	23.92	1.25	23.02	<=34.77	Pass
			25	24.02	1.25	23.12	<=34.77	Pass
		50	0	23.84	1.25	22.94	<=34.77	Pass
16QAM	793	1	0	23.78	1.25	22.88	<=34.77	Pass
			25	23.73	1.25	22.83	<=34.77	Pass
			49	22.57	1.25	21.67	<=34.77	Pass
		25	0	22.96	1.25	22.06	<=34.77	Pass
			13	22.90	1.25	22.00	<=34.77	Pass
			25	23.03	1.25	22.13	<=34.77	Pass
		50	0	22.93	1.25	22.03	<=34.77	Pass

Note1: ERP=Conducted Power+Antenna Gain-2.15

3.2 FREQUENCY STABILITY MEASUREMENT

3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

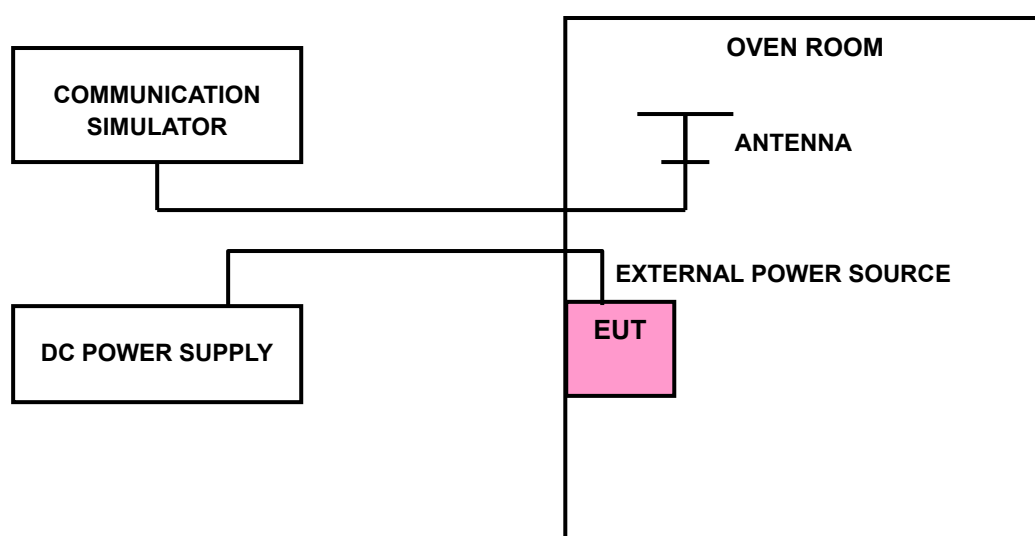
The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked

3.2.2 TEST PROCEDURE

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the $\pm 0.5^{\circ}\text{C}$ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

NOTE: The frequency error was recorded frequency error from the communication simulator.

3.2.3 TEST SETUP



3.2.4 TEST RESULTS

Please Refer to module EC25-AFXD; EC25-AFXD MINIPCIE report.

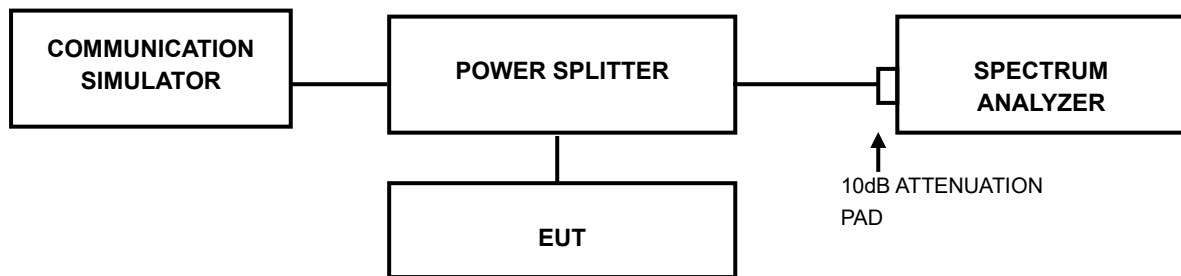
(Report No.: R2203A0238-R4 FCC ID : XMR202008EC25AFXD)

3.3 OCCUPIED BANDWIDTH MEASUREMENT

3.3.1 LIMITS OF OCCUPIED BANDWIDTH MEASUREMENT

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

3.3.2 TEST SETUP



3.3.3 TEST PROCEDURES

- The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

3.3.4 TEST RESULTS

Please Refer to module EC25-AFXD; EC25-AFXD MINIPCIE report.

(Report No.: R2203A0238-R4 FCC ID : XMR202008EC25AFXD)

3.4 EMISSION MASK MEASUREMENT

3.4.1 LIMITS OF EMISSION MASK MEASUREMENT

LTE Band14:

According to FCC part 90.543(e) shall be tested the emission mask.

(e) For operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

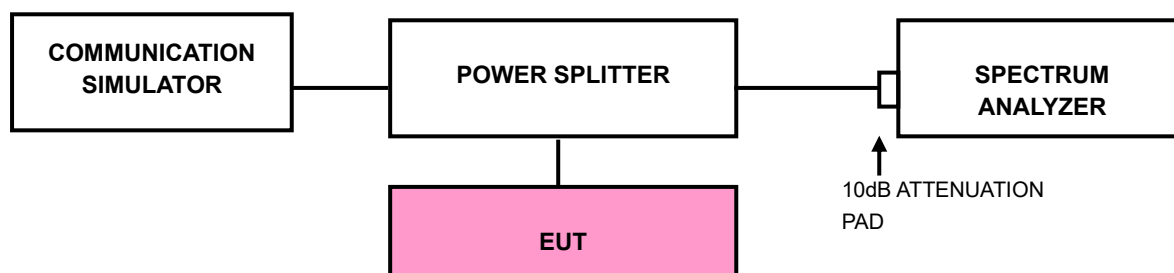
- (1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations.
- (2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.
- (3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB.
- (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.
- (5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

LTE Band26:

According to FCC part 90.691 shall be tested the emission mask. For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10}(f/6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

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

3.4.2 TEST SETUP



3.4.3 TEST PROCEDURES

- a) Connect the transmitter to the spectrum analyzer via coaxial cable while ensuring proper impedance matching.
- b) Tune the analyzer to the nominal center frequency of the emission bandwidth (EBW).
- c) Set the resolution bandwidth (RBW) $\geq 1\%$ EBW in the 1MHz band immediately outside and adjacent to the band edge.
- d) Beyond the 1MHz band from the band edge, RBW=1MHz was used.
- e) Set the video bandwidth (VBW) to $\geq 3 \times$ RBW.
- f) Select the average power (RMS) display detector.
- g) Set the number of measurement points to ≥ 1001 .
- h) Use auto-coupled sweep time.
- i) Perform the measurement over an interval of time when the transmission is continuous and at its maximum power level.
- j) The RF fundamental frequency should be excluded against the limit line in the operating frequency band and use RBW is 10KHz or 100KHz.
- k) Record the max trace plot into the test report.

3.4.4 TEST RESULTS

Please Refer to module EC25-AFXD; EC25-AFXD MINIPCIE report.

(Report No.: R2203A0238-R4 FCC ID : XMR202008EC25AFXD)

3.5 CONDUCTED SPURIOUS EMISSIONS

3.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

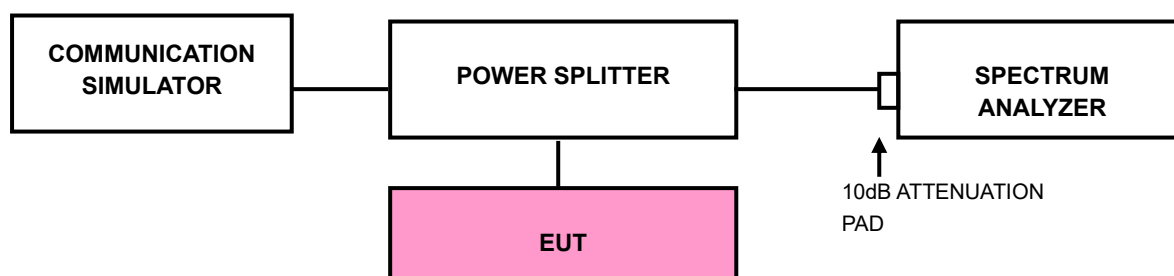
(1) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB. The limit of emission equal to -13dBm

(2) For operations in the 763–775 MHz and 793–805 MHz bands, all emissions including harmonics in the band 1559– 1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

3.5.2 TEST PROCEDURE

- a. The EUT makes a phone call to the communication simulator. All measurements were done at middle operational frequency range.
- b. Measuring frequency range is from 9kHz up to a frequency including its 10th harmonic. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

3.5.3 TEST SETUP



3.5.4 TEST RESULTS

Please Refer to module EC25-AFXD; EC25-AFXD MINIPCIE report.

(Report No.: R2203A0238-R4 FCC ID : XMR202008EC25AFXD)

3.6 RADIATED EMISSION MEASUREMENT

3.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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

(2) For operations in the 763–775 MHz and 793–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

3.6.2 TEST PROCEDURES

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m 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 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
- b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step a. Record the power level of S.G
- c. $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $\text{E.R.P power} = \text{E.I.P.R power} - 2.15\text{dBi}.$

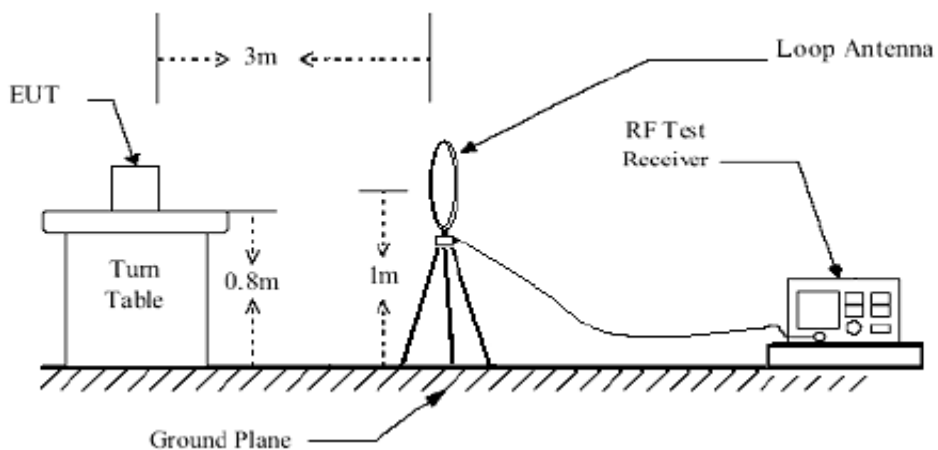
NOTE: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

3.6.3 DEVIATION FROM TEST STANDARD

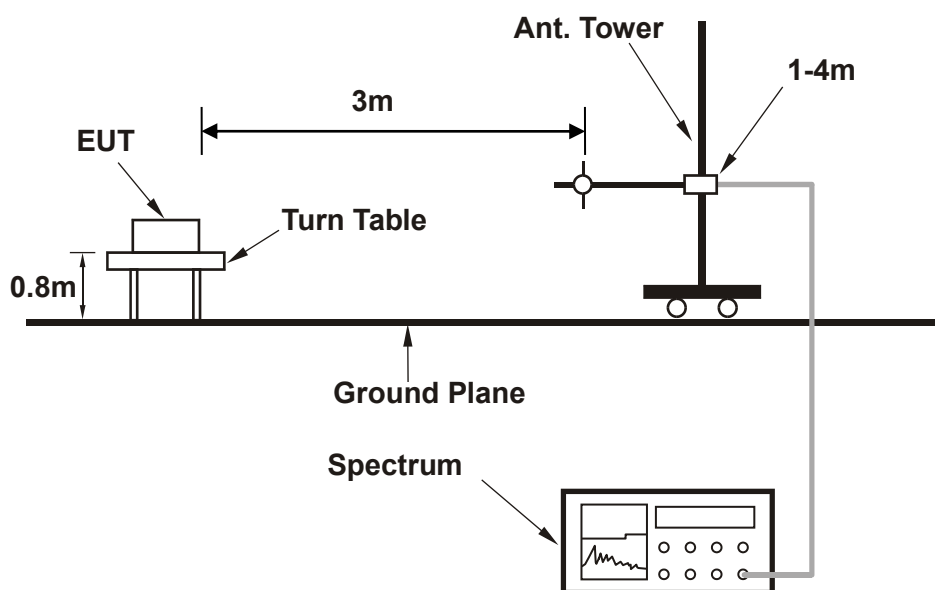
No deviation

3.6.4 TEST SETUP

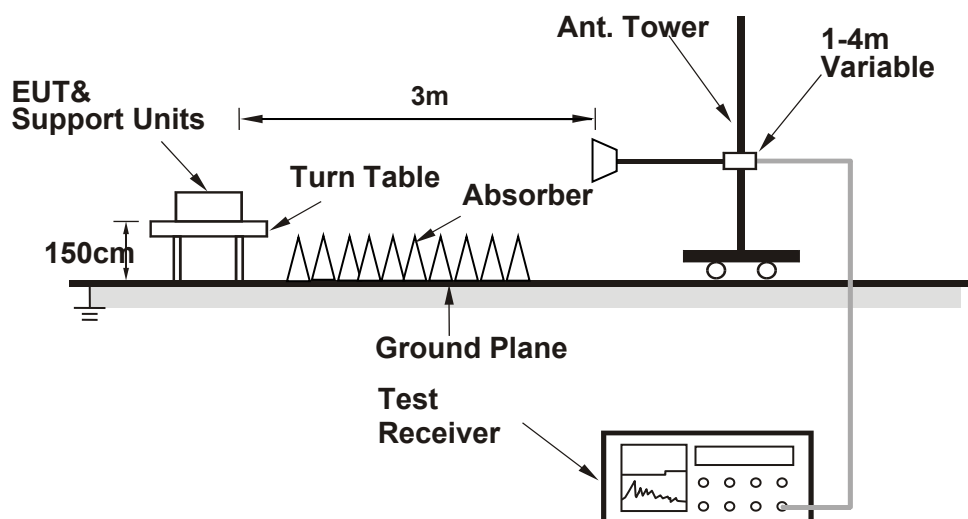
<Below 30MHz>



< Frequency Range 30MHz~1GHz >



< Frequency Range above 1GHz >



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

3.6.5 TEST RESULTS

NOTE1 : The 9K~30MHz amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

NOTE2 : The measurement range is 30M to the tenth harmonic of the highest fundamental frequency, For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report

LTE band 14

Test result:

ANT0 Channel : 23330

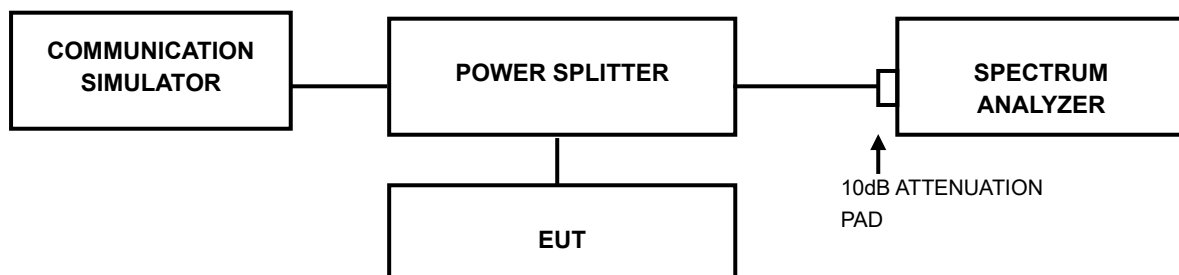
Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1247.80	-80.75	-13.00	Vertical
1743.40	-75.30	-13.00	Vertical
2407.43	-75.35	-13.00	Vertical
3075.00	-83.21	-13.00	Vertical
3519.00	-81.04	-13.00	Vertical
4641.00	-87.85	-13.00	Vertical

3.7 PEAK TO AVERAGE RATIO

3.7.1 LIMITS OF PEAK TO AVERAGE RATIO MEASUREMENT

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

3.7.2 TEST SETUP



3.7.3 TEST PROCEDURES

1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

3.7.4 TEST RESULTS

Please Refer to module EC25-AFXD; EC25-AFXD MINIPCIE report.

(Report No.: R2203A0238-R4 FCC ID : XMR202008EC25AFXD)



Test Report No.: PSU-NQN2505120212RF05

4 INFORMATION ON THE TESTING LABORATORIES

We, Huarui 7layers High Technology (Suzhou) Co., Ltd. ,were founded in 2020 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

Huarui 7Layers High Technology (Suzhou) Co., Ltd.

Lab Address:

Tower N, Innovation Center, 88 Zuyi Road, High-tech District, Suzhou City, Anhui Province, China

Accredited Test Lab Cert 6613.01

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

Suzhou EMC/RF Lab:

Tel: +86 (0557) 368 1008

5 MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No modifications were made to the EUT by the lab during the test.

6 APPENDIX

Please Refer to module EC25-AFXD; EC25-AFXD MINIPCIE report.

---END---