



RF TEST REPORT

Applicant Micron Electronics LLC.

FCC ID ZKQ-PL4Z

Product Tracker

Brand Prime

Model AT4V

Marketing AT4V

Report No. R1802A0077-R1V2

Issue Date April 8, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2017)/ FCC CFR47 Part 27C (2017)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Jiangpeng Lan

Performed by: Jiangpeng Lan

Kai Xu

Approved by: Kai Xu

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000



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Summary of Measurement Results

Number	Test Case	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Isotropic Radiated power	27.50(d)(4)/27.50(b)(10)	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	27.53(h) /27.53(f) /27.53(c)	PASS
5	Peak-to-Average Power Ratio	27.50(d) /KDB971168 D01(5.7)	PASS
6	Frequency Stability	2.1055 / 27.54	PASS
7	Spurious Emissions at Antenna Terminals	2.1051 /27.53(h) /27.53(f) /27.53(c)	PASS
8	Radiates Spurious Emission	2.1053 /27.53(h) /27.53(f)	PASS

Date of Testing: March 7, 2018 ~ March 19, 2018

Note: PASS: The EUT complies with the essential requirements in the standard.
FAIL: The EUT does not comply with the essential requirements in the standard.



1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.



1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City: Shanghai
Post code: 201201
Country: P. R. China
Contact: Xu Kai
Telephone: +86-021-50791141/2/3
Fax: +86-021-50791141/2/3-8000
Website: <http://www.ta-shanghai.com>
E-mail: xukai@ta-shanghai.com



2 General Description of Equipment under Test

Client Information

Applicant	Micron Electronics LLC.
Applicant address	1001 Yamato Road, Suite 400, Boca Raton, Florida, United States
Manufacturer	Micron Electronics LLC.
Manufacturer address	1001 Yamato Road, Suite 400, Boca Raton, Florida, United States

General information

EUT Description					
Model	AT4V				
IMEI	866908030003104				
Hardware Version	F602_V1_PCB				
Software Version	F602V01.01B02				
Power Supply	AC adapter				
Antenna Type	Internal Antenna				
Antenna Gain	LTE Band 4: -0.61 dBi LTE Band 13: 2.68 dBi				
Test Mode(s)	LTE Band 4; LTE Band 13,				
Test Modulation	QPSK 16QAM;				
LTE Category	M1				
Maximum E.I.R.P.	LTE Band 4:	20.89dBm			
	LTE Band 13:	17.96dBm			
Rated Power Supply Voltage:	3.8V				
Extreme Voltage	Minimum: 3.45V Maximum: 4.2V				
Extreme Temperature	Lowest: -10°C Highest: +60°C				
Operating Frequency Range(s)	Mode	Tx (MHz)	Rx (MHz)		
	LTE Band 4	1710 ~ 1755	2110 ~ 2155		
	LTE Band 13	777 ~ 787	746 ~ 756		
EUT Accessory					
Adapter	Manufacturer: Shenzhen Jingrichang Electronic Technology Co., Ltd. Model: JT-M050100				
Note: 1. The information of the EUT is declared by the manufacturer.					



3 Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards

FCC CFR47 Part 2 (2017)

FCC CFR47 Part 27C (2017)

ANSI/TIA-603-E (2016)

KDB 971168 D01 Power Meas License Digital Systems v03



4 Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (X axis, horizontal polarization) and the worst case was recorded.

All mode and data rates and positions and RB size and modulations were investigated.

Subsequently, only the worst case emissions are reported.

The following testing in LTE is set based on the maximum RF Output Power.

The following testing in different Bandwidth is set to detailin the following table:

Test modes are chosen to be reported as the worst case configuration below for LTE Band 4/13:

Test items	Modes	Bandwidth (MHz)						Modulation		RB			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	50%	100%	L	M	H
RF power output	LTE 4	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	LTE 13	-	-	O	O	-	-	O	O	O	O	O	O	O	O
Effective Isotropic Radiated power	LTE 4	O	O	O	O	O	O	O	O	-	-	O	O	O	O
	LTE 13	-	-	O	O	-	-	O	O	-	-	O	O	O	O
Occupied Bandwidth	LTE 4	O	O	O	O	O	O	O	O	-	-	O	O	O	O
	LTE 13	-	-	O	O	-	-	O	O	-	-	O	O	O	O
Band Edge Compliance	LTE 4	O	O	O	O	O	O	O	O	O	-	O	O	-	O
	LTE 13	-	-	O	O	-	-	O	O	O	-	O	O	-	O
Peak-to-Average Power Ratio	LTE 4	O	O	O	O	O	O	O	O	-	-	O	O	O	O
	LTE 13	-	-	O	O	-	-	O	O	-	-	O	O	O	O
Frequency Stability	LTE 4	O	O	O	O	O	O	O	O	-	-	O	-	O	-
	LTE 13	-	-	O	O	-	-	O	O	-	-	O	-	O	-
Spurious Emissions at Antenna Terminals	LTE 4	O	O	O	O	O	O	O	-	O	-	-	O	O	O
	LTE 13	-	-	O	O	-	-	O	-	O	-	-	O	O	O
Radiates Spurious Emission	LTE 4	O	O	O	O	O	O	O	-	O	-	-	O	O	O
	LTE 13	-	-	O	O	-	-	O	-	O	-	-	O	O	O
Note	1. The mark "O" means that this configuration is chosen for testing. 2. The mark "-" means that this configuration is not testing.														

5 Test Case Results

5.1 RF Power Output

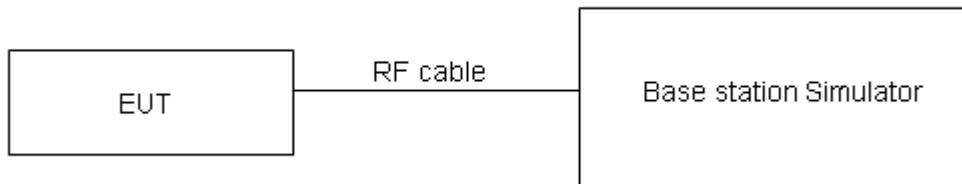
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Limits

No specific RF power output requirements in part 2.1046.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U=0.4$ dB.



Test Results

Mode	Bandwidth	Channel/ Frequency(MHz)	RB	Index	Conducted Power (dBm)	
					QPSK	16QAM
Band4	1.4MHz	19957/1710.7	1#0	0	20.62	19.27
			6#0	0	18.67	19.02
		20175/1732.5	1#0	0	20.14	19.61
			6#0	0	18.48	18.44
		20393/1754.3	1#5	0	19.49	19.16
			6#0	0	17.71	17.66
	3MHz	19965/1711.5	1#0	0	20.78	19.26
			6#0	0	18.74	19.12
		20175/1732.5	1#0	0	20.19	18.89
			6#0	0	18.32	18.37
		20385/1753.5	1#5	1	19.83	18.12
			6#0	1	17.82	18.05
Band5	5MHz	19975/1712.5	1#0	0	20.78	20.49
			6#0	0	19.75	19.15
		20175/1732.5	1#0	0	20.16	19.96
			6#0	0	19.39	18.51
		20375/1752.5	1#5	3	20.11	19.79
			6#0	3	18.97	18.01
	10MHz	20000/1715	1#0	0	20.82	20.34
			4#0	0	20.91	20.44
		20175/1732.5	1#0	0	19.81	20.61
			4#0	0	20.32	19.24
		20350/1750	1#5	7	20.02	19.49
			4#2	7	19.89	19.47
Band6	15MHz	20025/1717.5	1#0	0	20.90	20.65
			6#0	0	20.85	20.79
		20175/1732.5	1#0	0	20.03	20.51
			6#0	0	20.12	20.13
		20325/1747.5	1#5	11	19.98	19.70
			6#0	11	20.13	20.11
	20MHz	20050/1720	1#0	0	20.79	20.68
			6#0	0	20.95	21.04
		20175/1732.5	1#0	0	20.12	20.74
			6#0	0	20.18	20.39
		20300/1745	1#5	15	19.92	19.74
			6#0	15	20.06	20.02



Mode	Bandwidth	Channel/ Frequency(MHz)	RB	Index	Conducted Power (dBm)	
					QPSK	16QAM
Band13	5MHz	23205/779.5	1#0	0	21.49	21.55
			6#0	0	20.92	19.86
		23230/782	1#0	0	21.22	21.77
			6#0	0	20.41	19.58
	10MHz	23255/784.5	1#5	3	21.26	20.61
			6#0	3	20.12	19.31
		23230/782	1#0	0	21.45	21.95
			4#0	0	21.84	20.54



5.2 Effective Isotropic Radiated Power

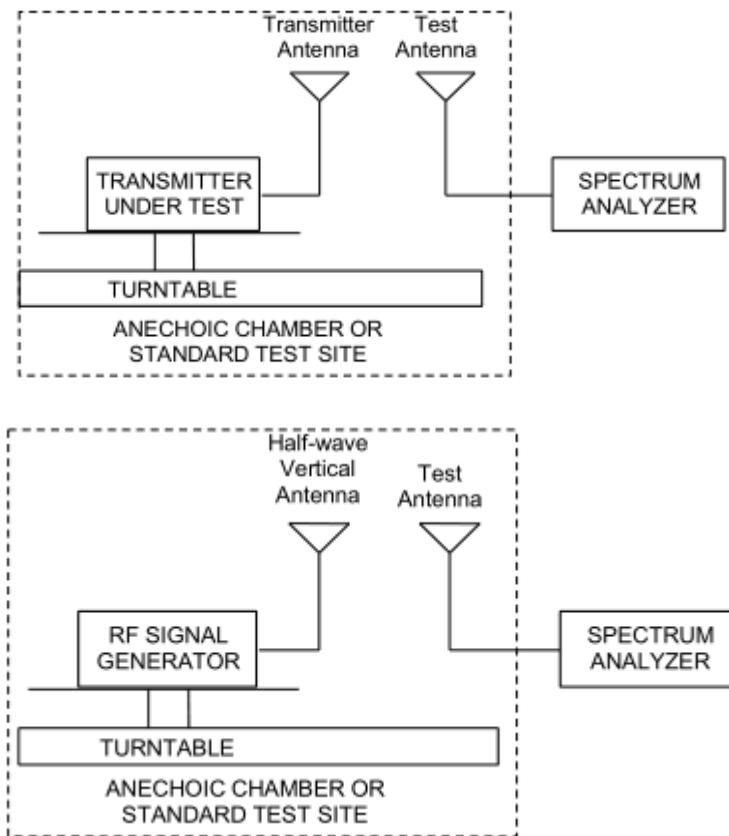
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

1. The testing follows FCC KDB 971168 D01 v03 Section 5.8 and ANSI/TIA-603-E (2016).
 - a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.
 - b) Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).
 - c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.
 - d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading.
$$\text{LOSS} = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$$
 - e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation:
$$\text{ERP (dBm)} = \text{LVL (dBm)} + \text{LOSS (dB)}$$
 - f) The maximum ERP is the maximum value determined in the preceding step.
 - g) When calculating ERP, in addition to knowing the antenna radiation and matching characteristics, it is necessary to know the loss values of all elements (e.g.transmission line attenuation, mismatches, filters, combiners) interposed between the point where transmitter output power is measured, and the point where power is applied to the antenna. ERP can then be calculated as follows:
$$\text{ERP (dBm)} = \text{Output Power (dBm)} - \text{Losses (dB)} + \text{Antenna Gain (dBd)}$$
where: dBd refers to gain relative to an ideal dipole.
- $$\text{EIRP (dBm)} = \text{ERP (dBm)} + 2.15 (\text{dB})$$

Test setup



Note: Area side:2.4mX3.6m

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.



Limits

Rule Part 27.50(b) (10) specifies that “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”

Rule Part 27.50(d) (4) specifies that “Fixed, mobile and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP” ”

Part 27.50(b)(10)Limit (ERP)	$\leq 3 \text{ W}$ (34.77 dBm)
Part 27.50(d)(4)Limit (EIRP)	$\leq 1 \text{ W}$ (30 dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U= 1.19 \text{ dB}$

**Test Results**

The measurement is performed for both of horizontal and vertical antenna Polarization, and only the data of worst mode is recorded in this report.

LTE Band 4									
Bandwidth	Modulation	Channel/ Frequency (MHz)	Polarization	RB	Index	Output power (dBm)	Losses (dBm)	Ant gain (dBi)	EIRP (dBm)
1.4MHz	QPSK	19957 1710.7	H	1#0	0	-35.19	-54.30	1.44	20.55
		20175/1732.5	H	1#2	0	-35.78	-54.32	1.57	20.10
		20393/1754.3	H	1#5	0	-36.38	-54.10	1.72	19.44
	16QAM	19957 1710.7	H	1#0	0	-35.30	-54.35	1.44	20.49
		20175/1732.5	H	1#2	0	-35.90	-54.41	1.57	20.08
		20393/1754.3	H	1#5	0	-36.79	-54.52	1.72	19.45
3MHz	QPSK	19965/1711.5	H	1#0	0	-35.23	-54.33	1.44	20.54
		20175/1732.5	H	1#5	0	-35.80	-54.32	1.57	20.08
		20385/1753.5	H	1#5	1	-36.28	-54.11	1.72	19.55
	16QAM	19965/1711.5	H	1#0	0	-35.22	-54.35	1.44	20.57
		20175/1732.5	H	1#5	0	-35.86	-54.41	1.57	20.12
		20385/1753.5	H	1#5	1	-36.74	-54.48	1.72	19.46
5MHz	QPSK	19975/1712.5	H	1#0	0	-35.08	-54.34	1.44	20.70
		20175/1732.5	H	1#5	1	-35.79	-54.32	1.57	20.09
		20375/1752.5	H	1#5	3	-35.83	-54.13	1.72	20.01
	16QAM	19975/1712.5	H	1#0	0	-35.28	-54.38	1.44	20.54
		20175/1732.5	H	1#5	1	-36.00	-54.41	1.57	19.98
		20375/1752.5	H	1#5	3	-36.71	-54.47	1.72	19.48
10MHz	QPSK	20000/1715	H	4#0	0	-34.89	-54.33	1.44	20.88
		20175/1732.5	H	4#2	3	-35.60	-54.32	1.57	20.28
		20350/1750	H	4#2	7	-35.89	-54.12	1.66	19.89
	16QAM	20000/1715	H	4#0	0	-35.12	-54.32	1.44	20.64
		20175/1732.5	H	4#2	3	-35.81	-54.41	1.57	20.17
		20350/1750	H	4#2	7	-36.34	-54.52	1.66	19.84
15MHz	QPSK	20025/1717.5	H	1#0	0	-34.94	-54.35	1.49	20.89
		20175/1732.5	H	1#5	5	-35.09	-54.32	1.57	20.79
		20325/1747.5	H	1#5	11	-35.75	-54.17	1.66	20.08
	16QAM	20025/1717.5	H	1#0	0	-35.03	-54.39	1.49	20.85
		20175/1732.5	H	1#5	5	-35.28	-54.41	1.57	20.70
		20325/1747.5	H	1#5	11	-36.29	-54.51	1.66	19.88
20MHz	QPSK	20050/1720	H	6#0	0	-35.17	-54.37	1.49	20.69
		20175/1732.5	H	6#0	7	-35.85	-54.32	1.57	20.03
		20300/1745	H	6#0	15	-35.99	-54.23	1.63	19.87
	16QAM	20050/1720	H	6#0	0	-35.55	-54.44	1.49	20.38



		20175/1732.5	H	6#0	7	-36.19	-54.41	1.57	19.79
		20300/1745	H	6#0	15	-36.55	-54.59	1.63	19.67

LTE Band 13

Bandwidth	Modulation	Channel/ Frequency (MHz)	Polarization	RB	Index	Output power (dBm)	Losses (dBm)	Ant gain (dBi)	ERP (dBm)
5MHz	QPSK	23205/779.5	H	1#0	0	-30.98	-47.01	1.81	17.84
		23230/782	H	1#5	1	-31.61	-47.17	1.81	17.37
		23255/784.5	H	1#5	3	-32.15	-47.59	1.83	17.27
	16QAM	23205/779.5	H	1#0	0	-30.76	-46.67	1.81	17.72
		23230/782	H	1#5	1	-31.02	-46.56	1.81	17.35
		23255/784.5	H	1#5	3	-31.44	-46.85	1.83	17.24
		23230/782	H	4#2	3	-30.60	-46.75	1.81	17.96
10MHz	QPSK	23230/782	H	4#2	3	-30.57	-46.58	1.81	17.82
Note: 1. EIRP= E.R.P+2.15									

Note: 1. EIRP= E.R.P+2.15

5.3 Occupied Bandwidth

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

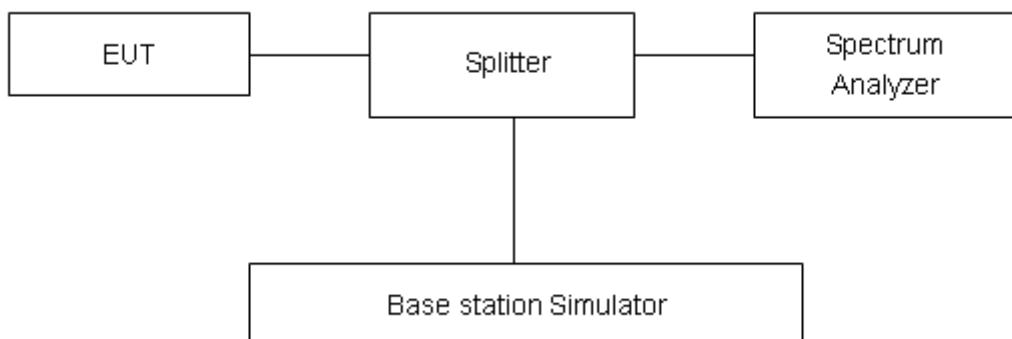
The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.

RBW is set to 51 kHz, VBW is set to 160 kHz for LTE Band 4 (1.4MHz/ 3MHz/ 5MHz/ 10MHz/ 15MHz/ 20MHz).

RBW is set to 51 kHz, VBW is set to 160 kHz for LTE Band 13 (5MHz /10MHz).

99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

No specific occupied bandwidth requirements in part 2.1049.

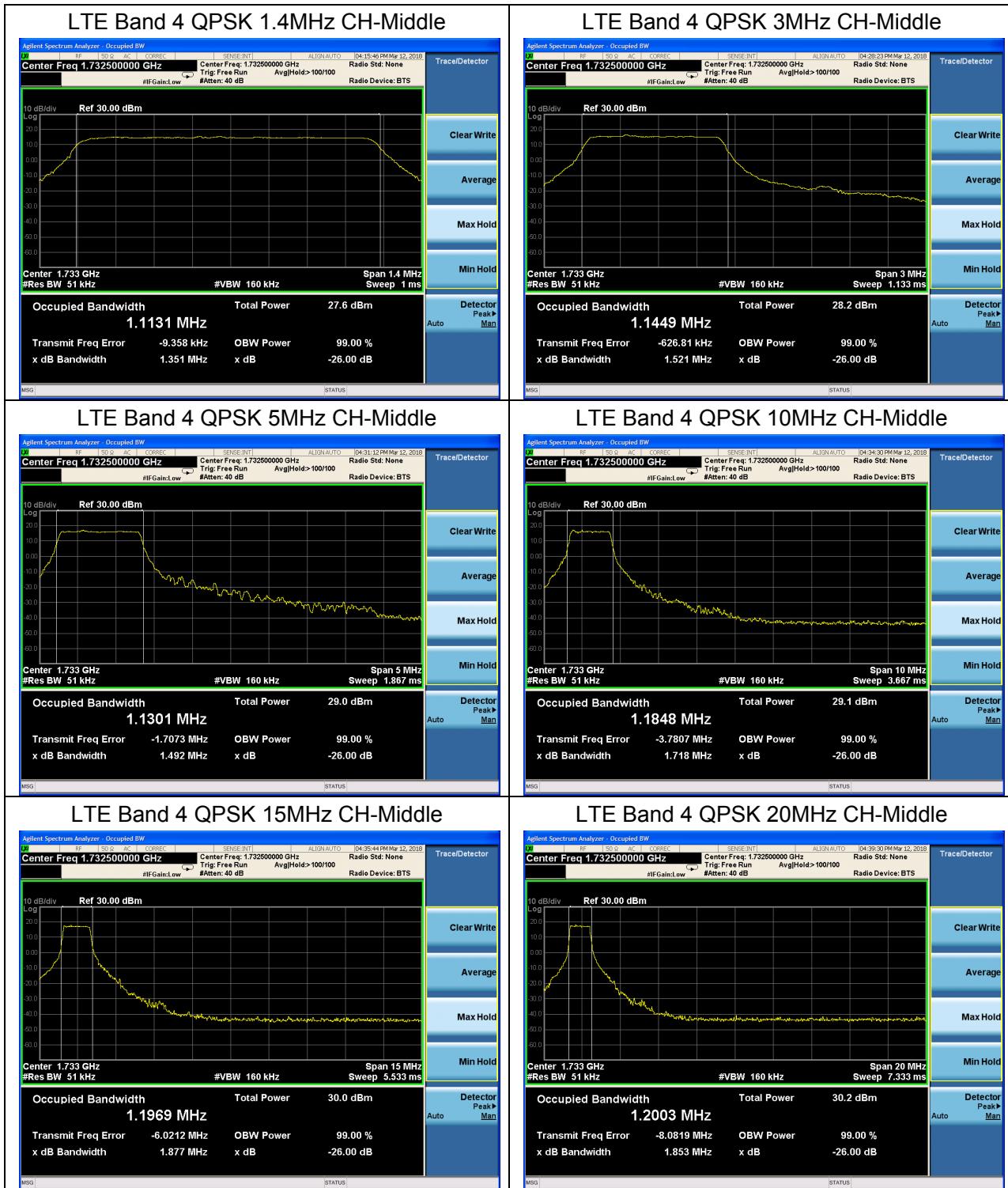
Measurement Uncertainty

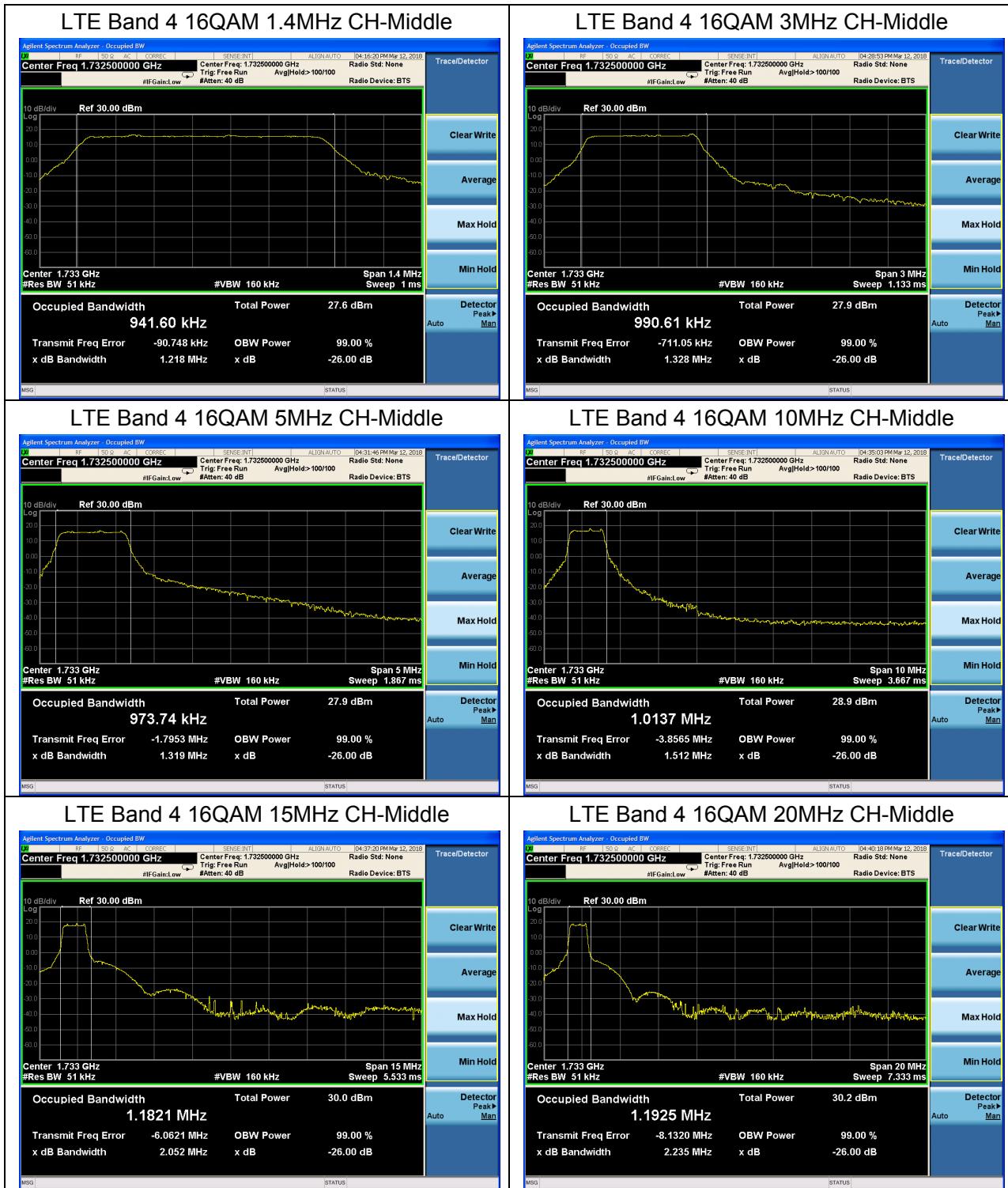
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U=624\text{Hz}$.



Test Result

Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	RB	Index	Bandwidth(KHz)	
						99% Power	-26dBc
Band4	1.4MHz	QPSK	20175/1732.5	6#0	0	1.1131	1.351
		16QAM	20175/1732.5	6#0	0	0.9416	1.218
	3MHz	QPSK	20175/1732.5	6#0	0	1.1449	1.521
		16QAM	20175/1732.5	6#0	0	0.99061	1.328
	5MHz	QPSK	20175/1732.5	6#0	0	1.1301	1.492
		16QAM	20175/1732.5	6#0	0	0.97374	1.319
	10MHz	QPSK	20175/1732.5	6#0	0	1.1848	1.718
		16QAM	20175/1732.5	6#0	0	1.0137	1.512
	15MHz	QPSK	20175/1732.5	6#0	0	1.1969	1.877
		16QAM	20175/1732.5	6#0	0	1.1821	2.052
Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	RB	Index	Bandwidth(KHz)	
						99% Power	-26dBc
Band13	5MHz	QPSK	23230/782	6#0	0	1.1498	1.921
		16QAM	23230/782	6#0	0	1.0396	1.318
	10MHz	QPSK	23230/782	6#0	0	1.2165	1.899
		16QAM	23230/782	6#0	0	1.0760	1.539







LTE Band 13 QPSK 5MHz CH-Middle



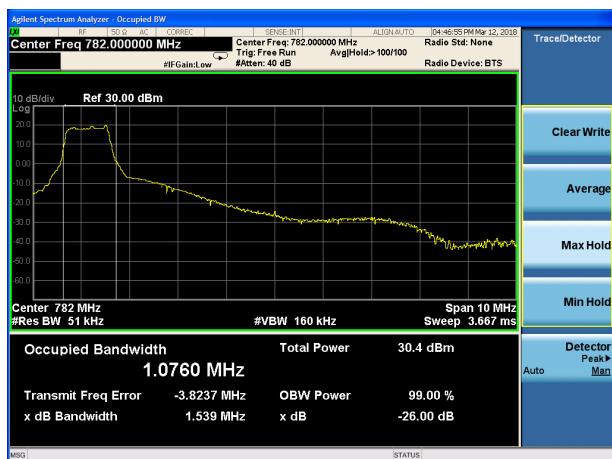
LTE Band 13 QPSK 10MHz CH-Middle



LTE Band 13 16QAM 5MHz CH-Middle



LTE Band 13 16QAM 10MHz CH-Middle



5.4 Band Edge Compliance

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured.

The testing follows KDB 971168 D01 v03 Section 6.0

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured.
3. RBW is set to 51 kHz, VBW is set to 160 kHz for LTE Band 4 (1.4MHz/ 5MHz/ 10MHz/ 15MHz/ 20MHz)

RBW is set to 10 kHz, VBW is set to 30 kHz for LTE Band 13 (763MHz~775MHz).

RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 13 (775MHz~777MHz).

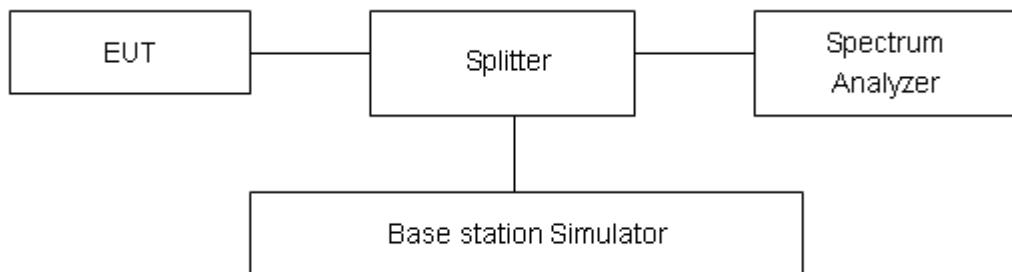
RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 13 (787MHz~793MHz).

RBW is set 10 kHz, VBW is set to 30 kHz for LTE Band 13 (793MHz~805MHz).

on spectrum analyzer.

4. Set spectrum analyzer with RMS detector.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. Checked that all the results comply with the emission limit line.

Test Setup





Limits

Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB”

Rule Part 27.53(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions 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.

Part 27.53 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, 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 any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;
- (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;
- (3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations;
- (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;
- (5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) 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 at least 30 kHz may be employed;

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U=0.684\text{dB}$.