TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 22H, PART 24E
FCC PART 27

MEASUREMENT AND TEST REPORT

For

Quanzhou Tesunho Electronics Co., Ltd

2#, 5F E-19# Phase 2 Xunmei, Quanzhou, Fujian, China

FCC ID: 2AKS9TH388U

Report Type:	**Product Type:**
Original Report	IP Trunking Radio

Report Number:	RXM180516052-00B
Report Date:	2018-06-19
Reviewed By:	Jerry Zhang EMC Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		IP Trunking Radio
EUT Model:		TH-388U
Multiple Models:		TH-389U, TH-390U, TH-289U, TH-290U
FCC ID:		2AKS9TH388U
Rated Input Voltage:		DC 3.63V from battery or DC12V form adapter
Adapter Information	**Model:**	ZM-01A1210
	Input:	AC 100-240V, 50/60Hz, 0.5A, Max
	Output:	DC 12V, 1000mA
External Dimension:		6.2cm(L)*4.5cm(W)*12.7cm(H)
Serial Number:		180516052
EUT Received Date:		2018.05.16

Note: The series product, models TH-388U, TH-389U, TH-390U, TH-289U, TH-290U are electrically identical, the difference between them please refer to the declaration letter for details. For marketing purpose, we selected TH-388U for fully testing.

Objective

This report is prepared on behalf of ***Quanzhou Tesunho Electronics Co., Ltd*** in accordance with: Part 2-Subpart J, Part 22-Subpart H, and Part 24-Subpart E of the Federal Communications Commission's rules. Part 2, Part 27 of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J, as well as the following parts:

Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E - Personal Communication Services
Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA/EIA 603-D-2010

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp.(Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Unwanted Emissions, radiated	30MHz ~ 1GHz:5.85 dB 1G~26.5GHz: 5.23 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218,the FCC Designation No. : CN1220.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062D.

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to TIA/EIA-603-D 2010.

The device build in a certified module, module model number: ME3630, FCC ID: SRQ-ME3630, certified on 2017-08-28.

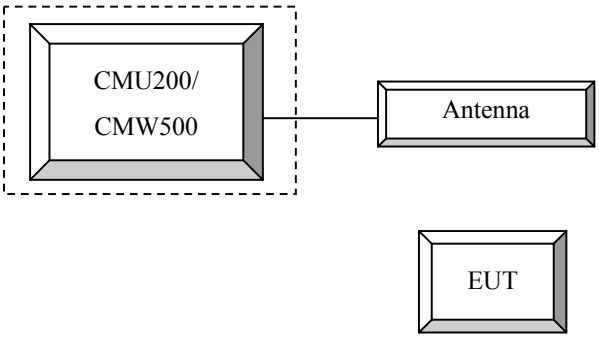
Equipment Modifications

No modification was made to the EUT.

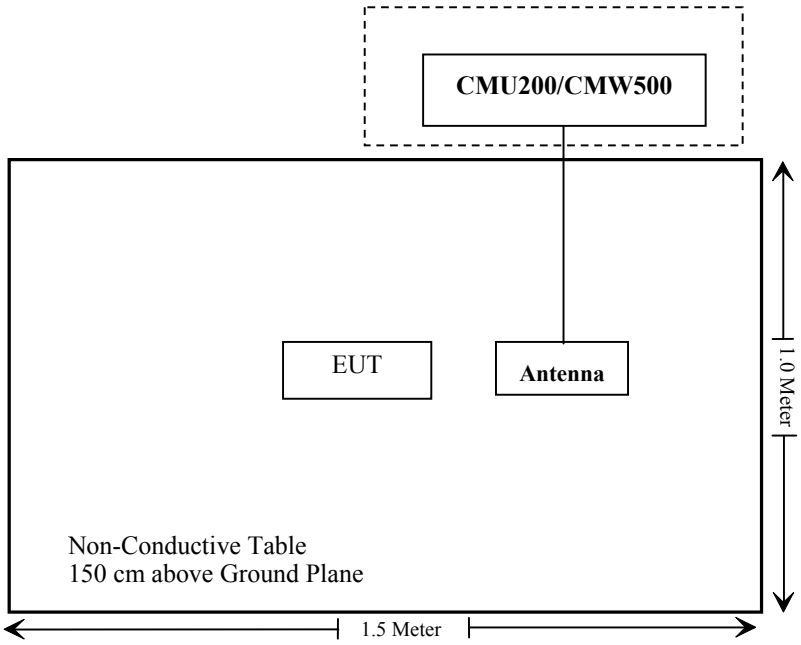
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
R&S	Universial Radio Communication Tester	CMU200	109038
R&S	Wideband Radio Communication Tester	CMW500	147473
N/A	ANTENNA	N/A	N/A

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
FCC§1.1310, §2.1093	RF Exposure	Compliance
FCC§2.1046; § 22.913 (a); § 24.232 (c); §27.50	RF Output Power	Compliance
FCC§ 2.1047	Modulation Characteristics	Not Applicable
FCC§ 2.1049; § 22.905 § 22.917; § 24.238; §27.53	Occupied Bandwidth	Compliance*
FCC§ 2.1051, § 22.917 (a); § 24.238 (a); §27.53	Spurious Emissions at Antenna Terminal	Compliance*
FCC§ 2.1053 § 22.917 (a); § 24.238 (a); §27.53	Field Strength of Spurious Radiation	Compliance
FCC§ 22.917 (a); § 24.238 (a); §27.53	Out of band emission, Band Edge	Compliance*
FCC§ 2.1055 § 22.355; § 24.235; §27.54	Frequency stability vs. temperature Frequency stability vs. voltage	Compliance*

Note:
Compliance*. Conducted data at antenna port, please refer to the certified LTE module (FCC ID: SRQ-ME3630) granted on 08/11/2017. The applicant (Quanzhou Tesunho Electronics Co. Ltd.) declared that the RF characteristics of LTE module was not changed or modified.

FCC §1.1310 , §2.1093 - RF EXPOSURE

Applicable Standard

FCC§1.1310 and §2.1093

Test Result

Compliant, please refer to the SAR report: RXM180516052-20.

FCC §2.1047 - MODULATION CHARACTERISTIC

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

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

Applicable Standard

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

According to FCC §2.1046 and §24.232 (C), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to §24.232 (d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. 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.

According to §27.50

(b)(10) 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.

(c) (10) Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

(d), (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

(h),(2) Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

Test Procedure

CDMA 1x RTT

Maximum output power is verified on the high, middle and low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. Steps 3 and 4 are measured using Loopback Service Option SO55 with power control bits in "All Up" condition. Step 10 is measured using TDSO/SO32 with power control bits in the "Bits Hold" condition (i.e. alternative Up/Down Bits).

Table 4.4.5.2-1. Test Parameters for Maximum RF Output Power with a Single Traffic Code Channel, Spreading Rate 1

Parameter	Units	Value
$\hat{I}_{or}$	dBm/1.23 MHz	-104
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
Traffic E	dB	-7.4

Table 4.4.5.2-2. Test Parameters for Maximum RF Output Power with Multiple Traffic Code Channels, Spreading Rate 1

Parameter	Units	Value
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

EVDO

Maximum output power is verified on the high, middle and low channels according to procedures in section 3.1.2.3.4 of 3GPP2 C.S0033-0/TIA-866 for Rev. 0, section 4.3.4 of 3GPP2 C.S0033-A for Rev. A.

Maximum output power is measured for Rev. 0 and Rev. A in Subtype 0/1 and Subtype 2 Physical Layer configurations, respectively.

WCDMA-Release 99

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification. The EUT has a nominal maximum output power of 24dBm (+1.7/-3.7).

WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc / βd	8/15

WCDMA HSDPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subset	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	βd (SF)	64			
	βc/ βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR(dB)	0	0	0.5	0.5
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs=βhs/ βc	30/15			

WCDMA HSUPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	HSUPA	HSUPA	HSUPA	HSUPA	HSUPA
	Subset	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/ βd	11/15	6/15	15/9	2/15	-
	βhs	22/15	12/15	30/15	4/15	5/15
	CM(dB)	1.0	3.0	2.0	3.0	1.0
	MPR(dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback	4ms				
	CQI Repetition Factor	2				
	Ahs=βhs/ βc	30/15				
HSUPA Specific Settings	DE-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_FCIs	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27	

HSPA+

The following tests were conducted according to the test requirements in Table C.11.1.4 of 3GPP TS 34.121-1

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	β_{ed}1: 30/15 β_{ed}2: 30/15	β_{ed}3: 24/15 β_{ed}4: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .

Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).

Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.

Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

DC-HSDPA

The following tests were conducted according to the test requirements in Table C.8.1.12 of 3GPP TS 34.121-1

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK

Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table.

Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.

LTE (FDD):

The following tests were conducted according to the test requirements in 3GPP TS36.101

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01".

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23[1]	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

Radiated method:

ANSI/TIA-603-D section 2.2.17

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
Agilent	Spectrum Analyzer	E4440A	SG43360054	2018-01-04	2019-01-04
ETS LINDGREN	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Agilent	Signal Generator	E8247C	MY43321350	2017-12-11	2018-12-11
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2016-01-05	2019-01-04
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-02	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
R&S	Universal Radio Communication Tester	CMU200	106 891	2017-12-14	2018-12-14
R&S	Wideband Radio Communication Tester	CMW500	110479	2017-12-11	2018-12-11

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	29.1°C
Relative Humidity:	31 %
ATM Pressure:	102.1kPa

** The testing was performed by Vern Shen & Blake Yang on 2018-05-25.*

ERP & EIRP

WCDMA:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
WCDMA Band 2								
1880.000	H	86.54	13.9	11.7	2.7	22.9	33.00	10.1
1880.000	V	89.86	17.4	11.7	2.7	26.4	33.00	6.6
WCDMA Band 5								
836.600	H	85.99	11.1	0.0	1	10.1	38.45	28.4
836.600	V	97.31	25.5	0.0	1	24.5	38.45	14.0

LTE Band 2 Middle Channel (1880 MHz):

Frequency (MHz)	BW (MHz)	Modulation	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
					Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
1880.000	1.4	QPSK	H	87.20	14.6	11.7	2.7	23.6	33.00	9.4
1880.000			V	90.15	17.7	11.7	2.7	26.7	33.00	6.3
1880.000	3		H	87.58	15	11.7	2.7	24.0	33.00	9.0
1880.000			V	89.66	17.2	11.7	2.7	26.2	33.00	6.8
1880.000	5		H	85.34	12.7	11.7	2.7	21.7	33.00	11.3
1880.000			V	88.12	15.7	11.7	2.7	24.7	33.00	8.3
1880.000	10		H	84.45	11.8	11.7	2.7	20.8	33.00	12.2
1880.000			V	87.17	14.7	11.7	2.7	23.7	33.00	9.3
1880.000	15		H	85.68	13.1	11.7	2.7	22.1	33.00	10.9
1880.000			V	89.10	16.6	11.7	2.7	25.6	33.00	7.4
1880.000	20		H	85.76	13.2	11.7	2.7	22.2	33.00	10.8
1880.000			V	89.35	16.9	11.7	2.7	25.9	33.00	7.1
1880.000	1.4	16QAM	H	86.85	14.2	11.7	2.7	23.2	33.00	9.8
1880.000			V	89.86	17.4	11.7	2.7	26.4	33.00	6.6
1880.000	3		H	87.32	14.7	11.7	2.7	23.7	33.00	9.3
1880.000			V	89.35	16.9	11.7	2.7	25.9	33.00	7.1
1880.000	5		H	84.98	12.4	11.7	2.7	21.4	33.00	11.6
1880.000			V	87.83	15.4	11.7	2.7	24.4	33.00	8.6
1880.000	10		H	84.08	11.5	11.7	2.7	20.5	33.00	12.5
1880.000			V	86.92	14.5	11.7	2.7	23.5	33.00	9.5
1880.000	15		H	85.24	12.6	11.7	2.7	21.6	33.00	11.4
1880.000			V	88.67	16.2	11.7	2.7	25.2	33.00	7.8
1880.000	20		H	84.58	12	11.7	2.7	21.0	33.00	12.0
1880.000			V	88.31	15.8	11.7	2.7	24.8	33.00	8.2

LTE Band 4 Middle Channel (1732.5MHz):

Frequency (MHz)	BW (MHz)	Modulation	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
					Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
1732.500	1.4	QPSK	H	87.43	13.4	10.9	2.5	21.8	30.00	8.2
1732.500			V	90.58	16.2	10.9	2.5	24.6	30.00	5.4
1732.500	3		H	86.52	12.5	10.9	2.5	20.9	30.00	9.1
1732.500			V	89.86	15.5	10.9	2.5	23.9	30.00	6.1
1732.500	5		H	85.12	11.1	10.9	2.5	19.5	30.00	10.5
1732.500			V	88.46	14.1	10.9	2.5	22.5	30.00	7.5
1732.500	10		H	84.76	10.7	10.9	2.5	19.1	30.00	10.9
1732.500			V	87.91	13.5	10.9	2.5	21.9	30.00	8.1
1732.500	15		H	83.95	9.9	10.9	2.5	18.3	30.00	11.7
1732.500			V	87.22	12.9	10.9	2.5	21.3	30.00	8.7
1732.500	20		H	84.37	10.3	10.9	2.5	18.7	30.00	11.3
1732.500			V	88.65	14.3	10.9	2.5	22.7	30.00	7.3
1732.500	1.4	16QAM	H	87.08	13	10.9	2.5	21.4	30.00	8.6
1732.500			V	90.36	16	10.9	2.5	24.4	30.00	5.6
1732.500	3		H	86.03	12	10.9	2.5	20.4	30.00	9.6
1732.500			V	89.41	15	10.9	2.5	23.4	30.00	6.6
1732.500	5		H	84.95	10.9	10.9	2.5	19.3	30.00	10.7
1732.500			V	88.13	13.8	10.9	2.5	22.2	30.00	7.8
1732.500	10		H	84.28	10.2	10.9	2.5	18.6	30.00	11.4
1732.500			V	87.73	13.4	10.9	2.5	21.8	30.00	8.2
1732.500	15		H	83.46	9.4	10.9	2.5	17.8	30.00	12.2
1732.500			V	87.02	12.7	10.9	2.5	21.1	30.00	8.9
1732.500	20		H	84.05	10	10.9	2.5	18.4	30.00	11.6
1732.500			V	87.65	13.3	10.9	2.5	21.7	30.00	8.3

LTE Band 5 Middle Channel (836.5MHz):

Frequency (MHz)	BW (MHz)	Modulation	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
					Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
836.500	1.4	QPSK	H	87.76	12.8	0.0	1	11.8	38.45	26.7
836.500			V	97.77	26	0.0	1	25.0	38.45	13.5
836.500	3		H	89.26	14.3	0.0	1	13.3	38.45	25.2
836.500			V	97.52	25.7	0.0	1	24.7	38.45	13.8
836.500	5		H	89.58	14.7	0.0	1	13.7	38.45	24.8
836.500			V	97.00	25.2	0.0	1	24.2	38.45	14.3
836.500	10		H	87.33	12.4	0.0	1	11.4	38.45	27.1
836.500			V	97.06	28.3	0.0	1	24.3	38.45	14.2
836.500	1.4	16QAM	H	87.93	13	0.0	1	12.0	38.45	26.5
836.500			V	97.32	25.5	0.0	1	24.5	38.45	14.0
836.500	3		H	89.78	14.9	0.0	1	13.9	38.45	24.6
836.500			V	96.86	25.1	0.0	1	24.1	38.45	14.4
836.500	5		H	89.14	14.2	0.0	1	13.2	38.45	25.3
836.500			V	97.07	25.3	0.0	1	24.3	38.45	14.2
836.500	10		H	88.98	14.1	0.0	1	13.1	38.45	25.4
836.500			V	97.00	25.2	0.0	1	24.2	38.45	14.3

LTE Band 12 Middle Channel (707.5MHz):

Frequency (MHz)	BW (MHz)	Modulation	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
					Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
707.500	1.4	QPSK	H	88.95	12.1	0.0	0.9	11.2	34.77	23.6
707.500			V	100.15	25.7	0.0	0.9	24.8	34.77	10.0
707.500	3		H	90.20	13.3	0.0	0.9	12.4	34.77	22.4
707.500			V	101.95	27.5	0.0	0.9	26.6	34.77	8.2
707.500	5		H	88.66	11.8	0.0	0.9	10.9	34.77	23.9
707.500			V	99.73	25.3	0.0	0.9	24.4	34.77	10.4
707.500	10		H	88.53	11.7	0.0	0.9	10.8	34.77	24.0
707.500			V	100.59	26.2	0.0	0.9	25.3	34.77	9.5
707.500	1.4	16QAM	H	88.77	11.9	0.0	0.9	11.0	34.77	23.8
707.500			V	100.54	26.1	0.0	0.9	25.2	34.77	9.6
707.500	3		H	87.67	10.8	0.0	0.9	9.9	34.77	24.9
707.500			V	100.12	25.7	0.0	0.9	24.8	34.77	10.0
707.500	5		H	87.67	10.8	0.0	0.9	9.9	34.77	24.9
707.500			V	100.28	25.9	0.0	0.9	25.0	34.77	9.8
707.500	10		H	88.50	11.6	0.0	0.9	10.7	34.77	24.1
707.500			V	100.20	25.8	0.0	0.9	24.9	34.77	9.9

LTE Band 17 Middle Channel (710MHz):

Frequency (MHz)	BW (MHz)	Modulation	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
					Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
710.000	5	QPSK	H	87.28	10.5	0.0	0.9	9.6	34.77	25.2
710.000			V	98.10	23.7	0.0	0.9	22.8	34.77	12.0
710.000	10		H	86.98	10.2	0.0	0.9	9.3	34.77	25.5
710.000			V	97.93	23.6	0.0	0.9	22.7	34.77	12.1
710.000	5	16QAM	H	89.14	12.3	0.0	0.9	11.4	34.77	23.4
710.000			V	100.29	25.9	0.0	0.9	25.0	34.77	9.8
710.000	10		H	87.00	10.2	0.0	0.9	9.3	34.77	25.5
710.000			V	98.11	23.8	0.0	0.9	22.9	34.77	11.9

Note:
1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
2) Absolute Level = Substituted Level - Cable loss + Antenna Gain
3) Margin = Limit-Absolute Level

FCC §2.1053, §22.917 & §24.238 & §27.53 - SPURIOUS RADIATED EMISSIONS

Applicable Standard

FCC § 2.1053, §22.917, § 24.238 and § 27.53.

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2018-01-04	2019-01-04
ETS LINDGREN	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Agilent	Signal Generator	E8247C	MY43321350	2017-12-11	2018-12-11
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2016-01-05	2019-01-04
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
TDK RF	Horn Antenna	HRN-0118	130 084	2016-01-05	2019-01-04
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-02 1304	2016-11-18	2019-11-18
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-02	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
R&S	Universal Radio Communication Tester	CMU200	106 891	2017-12-14	2018-12-14
R&S	Wideband Radio Communication Tester	CMW500	110479	2017-12-11	2018-12-11

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	29.1°C
Relative Humidity:	31 %
ATM Pressure:	102.1kPa

** The testing was performed by Vern Shen & Blake Yang on 2018-05-25.*

EUT Operation Mode: Transmitting

30 MHz-10 GHz:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
WCDMA Band V R99,Frequency:836.600 MHz								
1673.200	H	54.15	-60.1	10.6	0.7	-50.2	-13.0	37.2
1673.200	V	55.68	-59.1	10.6	0.7	-49.2	-13.0	36.2
2509.800	H	53.26	-59.8	13.1	1.2	-47.9	-13.0	34.9
2509.800	V	54.33	-58.7	13.1	1.2	-46.8	-13.0	33.8
3346.400	H	51.87	-58.8	13.8	1.6	-46.6	-13.0	33.6
3346.400	V	52.73	-58	13.8	1.6	-45.8	-13.0	32.8
431.510	H	48.45	-56.2	0.0	0.6	-56.8	-13.0	43.8
396.620	V	48.54	-59.7	0.0	0.6	-60.3	-13.0	47.3

30 MHz-20 GHz:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
WCDMA Band II, R99, Frequency:1880.000 MHz								
3760.000	H	53.65	-55.2	13.8	1.6	-43.0	-13.0	30.0
3760.000	V	54.25	-54.4	13.8	1.6	-42.2	-13.0	29.2
5640.000	H	52.14	-53.9	14.0	1.3	-41.2	-13.0	28.2
5640.000	V	53.58	-52.3	14.0	1.3	-39.6	-13.0	26.6
431.510	H	48.54	-56.1	0.0	0.6	-56.7	-13.0	43.7
440.000	V	44.10	-63.7	0.0	0.7	-64.4	-13.0	51.4

LTE Band 2 (30MHz-20GHz):

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency:1880.000 MHz								
3760.000	H	52.18	-56.6	13.8	1.6	-44.4	-13.0	31.4
3760.000	V	54.73	-53.9	13.8	1.6	-41.7	-13.0	28.7
5640.000	H	51.66	-54.4	14.0	1.3	-41.7	-13.0	28.7
5640.000	V	52.87	-53	14.0	1.3	-40.3	-13.0	27.3
452.230	H	45.58	-58.9	0.0	0.7	-59.6	-13.0	46.6
450.980	V	38.10	-69.6	0.0	0.7	-70.3	-13.0	57.3

LTE Band 4 (30MHz-20GHz):

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency:1732.500 MHz								
3465.000	H	61.57	-48.7	13.9	1.6	-36.4	-13.0	23.4
3465.000	V	66.50	-43.8	13.9	1.6	-31.5	-13.0	18.5
5197.500	H	52.45	-54	14.0	1.5	-41.5	-13.0	28.5
5197.500	V	54.18	-52.3	14.0	1.5	-39.8	-13.0	26.8
99.840	H	40.66	-65.8	0.0	0.3	-66.1	-13.0	53.1
53.280	V	38.91	-64.4	-13.4	0.2	-78.0	-13.0	65.0

LTE Band 5 (30MHz-10GHz):

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency: 836.500 MHz								
1673.200	H	54.35	-59.9	10.6	0.7	-50.0	-13.0	37.0
1673.200	V	58.64	-56.2	10.6	0.7	-46.3	-13.0	33.3
2509.800	H	51.37	-61.6	13.1	1.2	-49.7	-13.0	36.7
2509.800	V	53.25	-59.8	13.1	1.2	-47.9	-13.0	34.9
3346.400	H	51.65	-59	13.8	1.6	-46.8	-13.0	33.8
3346.400	V	52.44	-58.3	13.8	1.6	-46.1	-13.0	33.1
200.750	H	52.54	-56.1	0.0	0.5	-56.6	-13.0	43.6
94.020	V	53.30	-59.6	0.0	0.3	-59.9	-13.0	46.9

LTE Band 12 (30MHz-10GHz)

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency:707.5MHz								
1415.000	H	53.21	-60.3	9.1	1.2	-52.4	-13.0	39.4
1415.000	V	55.64	-58.4	9.1	1.2	-50.5	-13.0	37.5
2122.500	H	51.87	-60.9	11.3	1.1	-50.7	-13.0	37.7
2122.500	V	53.66	-59.1	11.3	1.1	-48.9	-13.0	35.9
2830.000	H	51.02	-61.1	13.3	1.4	-49.2	-13.0	36.2
2830.000	V	52.48	-59.8	13.3	1.4	-47.9	-13.0	34.9
200.750	H	53.54	-55.1	0.0	0.5	-55.6	-13.0	42.6
49.400	V	43.87	-56.5	-15.5	0.2	-72.2	-13.0	59.2

LTE Band 17 (30MHz-10GHz)

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency:710.000 MHz								
1420.000	H	52.16	-61.4	9.1	1.2	-53.5	-13.0	40.5
1420.000	V	54.63	-59.5	9.1	1.2	-51.6	-13.0	38.6
2130.000	H	52.34	-60.4	11.2	1.1	-50.3	-13.0	37.3
2130.000	V	53.85	-58.9	11.2	1.1	-48.8	-13.0	35.8
2840.000	H	51.26	-60.8	13.4	1.4	-48.8	-13.0	35.8
2840.000	V	52.73	-59.6	13.4	1.4	-47.6	-13.0	34.6
738.100	H	57.64	-42.7	0.0	0.9	-43.6	-13.0	30.6
119.240	V	61.88	-48.7	0.0	0.3	-49.0	-13.0	36.0

Note:
1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
2) Absolute Level = Substituted Level - Cable loss + Antenna Gain
3) Margin = Limit-Absolute Level

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