Full

TEST REPORT

No. I20D00079-SRD27

For

Client:	**Thales DIS AIS Deutschland GmbH**
Production:	**LTE Data-Only SMT World-Module**
Model Name:	**PLS62-W**
Brand Name:	**CINTERION**
FCC ID:	**QIPPLS62-W1**
Hardware Version:	**B2.1**
Software Version:	**02.000**
Issued date:	**2020-08-07**

NOTE

1. The test results in this test report relate only to the devices specified in this report.
2. This report shall not be reproduced except in full without the written approval of East China Institute of Telecommunications.
3. For the test results, the uncertainty of measurement is not taken into account when judging the compliance with specification, and the results of measurement or the average value of measurement results are taken as the criterion of the compliance with specification directly.

Test Laboratory:
East China Institute of Telecommunications
Add: Block No.4, No.766, Jingang Road, Pudong District, Shanghai, P. R. China
Tel: +86 21 63843300
E-Mail: welcome@ecit.org.cn

Revision Version

Report Number	Revision	Date	Memo
I20D00079-SRD27	00	2020-08-07	Initial creation of test report

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1. Test Laboratory

1.1. Testing Location

Company Name	ECIT Shanghai, East China Institute of Telecommunications
Address	1.7-8F, G Area, No. 668, Beijing East Road, Huangpu District, Shanghai, P. R. China 2.Block No.4, No.766, Jingang Road, Pudong District, Shanghai, P. R. China
Postal Code	201206
Telephone	(+86)-021-63843300
FCC registration No	CN1177

1.2. Testing Environment

Normal Temperature	15℃-35℃
Relative Humidity	25%-75%

1.3. Project data

Project Leader	Zhou Yan
Testing Start Date	2020-07-16
Testing End Date	2020-07-30

1.4. Signature

Liu Yan
(Prepared this test report)

Fan Songyan
(Reviewed this test report)

Zheng Zhongbin
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name	Thales DIS AIS Deutschland GmbH
Address	Werinherstr. 81, 81541 Munich, Germany
Telephone	/
Postcode	/

2.2. Manufacturer Information

Company Name	THALES DIS AIS Deutschland GmbH
Address	Thales DIS AIS Deutschland GmbH, Werinherstr. 81, 81541 Munich, Germany
Telephone	+ 86 10 59378342
Postcode	/

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Production	LTE Data-Only SMT World-Module
Model name	PLS62-W
LTE Frequency Band	Band 2/4/5/7/12
Extreme Temperature	-10/+55℃
Nominal Voltage	3.8V
Extreme High Voltage	4.5V
Extreme Low Voltage	3.0V

Note:

a. Photographs of EUT are shown in ANNEX A of this test report.

b. The value of the antenna gain is provided by the customer. For specific antenna information, please check the antenna specifications of the customer.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
N01	004401081899482	B2.1	02.000	2020-07-14
N02	004401081896231	B2.1	02.000	2020-07-14
N03	004401081899888	B2.1	02.000	2020-07-14

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	SN
AE1	RF cable	---

*AE ID: is used to identify the test sample in the lab internally.

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	2018-10-01
FCC Part 22	PUBLIC MOBILE SERVICES	2018-10-01
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	2018-10-01
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	2018-10-01
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI C63.26	American National Standard of Procedures for Compliance Testing of Licensed Transmitters Used in Licensed Radio	2015
KDB 971168 D01	Measurement Guidance for Certification of Licensed Digital Transmitters	v03r01

5. Test Results

5.1. Summary of Test Results

LTE Band 2

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	24.232(c)	A.1	P
2	Emission Limit	24.238(a),2.1051	A.2	P
3	Frequency Stability	24.235, 2.1055	A.3	P
4	Occupied Bandwidth	2.1049(h)(i)	A.4	P
5	Emission Bandwidth	24.238(a)	A.5	P
6	Band Edge Compliance	24.238(a)	A.6	P
7	Conducted Spurious Emission	24.238, 2.1057	A.7	P
8	Peak to Average Power Ratio	24.232 (d)	A.8	P

LTE Band 4

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	27.50(d)(4)	A.1	P
2	Emission Limit	27.53(h), 2.1051	A.2	P
3	Frequency Stability	27.54, 2.1055	A.3	P
4	Occupied Bandwidth	2.1049(h)(i)	A.4	P
5	Emission Bandwidth	27.53(h)	A.5	P
6	Band Edge Compliance	27.53(h)	A.6	P
7	Conducted Spurious Emission	27.53(h), 2.1057	A.7	P
8	Peak to Average Power Ratio	27.50(a)	A.8	P

LTE Band 5

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	2.1046(a),22.913(a)	A.1	P
2	Emission Limit	22.917, 2.1051	A.2	P
3	Frequency Stability	22.235, 2.1055	A.3	P
4	Occupied Bandwidth	2.1049(h)(i)	A.4	P
5	Emission Bandwidth	22.917(b)	A.5	P
6	Band Edge Compliance	22.917(b)	A.6	P
7	Conducted Spurious Emission	22.917, 2.1057	A.7	P

LTE Band 7

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	27.50(h)(2)	A.1	P
2	Emission Limit	27.53(m), 2.1051	A.2	P
3	Frequency Stability	27.54, 2.1055	A.3	P
4	Occupied Bandwidth	2.1049(h)(i)	A.4	P
5	Emission Bandwidth	27.53(m)	A.5	P
6	Band Edge Compliance	27.53(m)	A.6	P
7	Conducted Spurious Emission	27.53(m), 2.1057	A.7	P
8	Peak to Average Power Ratio	27.50(a)	A.8	P

LTE Band 12

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	27.50(c)(10)	A.1	P
2	Emission Limit	27.53(g), 2.1051	A.2	P
3	Frequency Stability	27.54, 2.1055	A.3	P
4	Occupied Bandwidth	2.1049(h)(i)	A.4	P
5	Emission Bandwidth	27.53(g)	A.5	P
6	Band Edge Compliance	27.53(g)	A.6	P
7	Conducted Spurious Emission	27.53(g), 2.1057	A.7	P
8	Peak to Average Power Ratio	27.50(a)	A.8	P
1	Output Power	27.50(d)(4)	A.1	P
2	Emission Limit	27.53(h), 2.1051	A.2	P
3	Frequency Stability	27.54, 2.1055	A.3	P
4	Occupied Bandwidth	2.1049(h)(i)	A.4	P
5	Emission Bandwidth	27.53(h)	A.5	P
6	Band Edge Compliance	27.53(h)	A.6	P
7	Conducted Spurious Emission	27.53(h), 2.1057	A.7	P
8	Peak to Average Power Ratio	27.50(a)	A.8	P

Note: please refer to Annex C in this test report for the detailed test results.

The following terms are used in the above table.

P	Pass, the EUT complies with the essential requirements in the standard.
NM	Not measure, the test was not measured by ECIT.
NA	Not applicable, the test was not applicable.
F	Fail, the EUT does not comply with the essential requirements in the standard.

5.2. Statements

The PLS62-W is a modified model for testing.

ECIT only performed test cases which identified with P/NM/NA/F results in Annex C.

ECIT has verified that the compliance of the tested device specified in section 5 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 5 of this test report.

Note：This conduction data only tests the power and band edge of LTE B2/4/5/12, the rest of the conduction data refer to I17D00184-SD06, the radiation data refer to I20D00046-SRD06.

6. Test Equipment Utilized

Climate chamber

No.	Equipment	Model	Serial Number	Manufacturer	Cal. Date	Cal. interval
1	Climate chamber	UT333 BT	C191995461	UNI-T	2020-05-10	1 year
2	Climate chamber	SH-641	92012011	ESPEC	2016-01-07	2 years

Radiated emission test system

The test equipment and ancillaries used are as follows.

No.	Equipment	Model	Serial Number	Manufacturer	Cal. Date	Cal. interval
1	Universal Radio Communication Tester	CMW500	104178	R&S	2019-05-10 2020-05-10	1 year
2	Test Receiver	ESU40	100307	R&S	2019-05-10 2020-05-10	1 year
3	TRILOG Antenna	VULB9163	VULB9163-515	Schwarzbeck	2020-02-28	2 years
4	Double Ridged Guide Antenna	ETS-3117	135890	ETS	2020-02-28	2 years
5	2-Line V-Network	ENV216	101380	R&S	2019-05-10 2020-05-10	1 year
7	RF Signal Generator	SMF100A	102314	R&S	2019-05-10 2020-05-10	1 year
9	Amplifier	SCU08	10146	R&S	2019-05-10 2020-05-10	1 year

Conducted test system

No.	Name	Type	SN	Manufacture	Calibration date	Cal. interval
1	Vector Signal Analyser	FSQ26	101096	R&S	2017-05-11 2020-05-10	1 year
2	Wireless communication comprehensive tester	CMW500	148904	R&S	2017-05-11 2020-05-10	1 year
3	DC Power Supply	ZUP60-14	LOC-220Z006-0007	TDL-Lambda	2017-05-11 2020-05-10	1 year

7. Test Environment

Shielding Room1 (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 20%, Max. = 75 %
Shielding effectiveness	> 100 dB
Ground system resistance	< 0.5 Ω

Control room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. =25 %, Max. =75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber1 (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB,30MHz to 1GHz
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

8. Measurement Uncertainty

Measurement uncertainty for all the testing in this report are within the limit specified in ECIT documents. The detailed measurement uncertainty to see the column, k=2

Measurement Items	Range	Confidence Level	Calculated Uncertainty
Maximum Peak Output Power	30MHz-3600MHz	95%	±0.544dB
EBW and VBW	30MHz-3600MHz	95%	±62.04Hz
Transmitter Spurious Emission-Conducted	30MHz-2GHz	95%	±0.90dB
Transmitter Spurious Emission-Conducted	2GHz-3.6GHz	95%	±0.88dB
Transmitter Spurious Emission-Conducted	3.6GHz-8GHz	95%	±0.96dB
Transmitter Spurious Emission-Conducted	8GHz-20GHz	95%	±0.94dB
Transmitter Spurious Emission-Radiated	9KHz-30MHz	95%	±5.66dB
Transmitter Spurious Emission-Radiated	30MHz-1000MHz	95%	±4.98dB
Transmitter Spurious Emission-Radiated	1000MHz -18000MHz	95%	±5.06dB
Transmitter Spurious Emission-Radiated	18000MHz -40000MHz	95%	±5.20dB
Frequency stability	1MHz-16GHz	95%	±62.04Hz

ANNEX A. MEASUREMENT RESULTS

ANNEX A.1. OUTPUT POWER

A.1.1. Summary

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation.
In all cases, output power is within the specified limits.
CMW500 setting：
1: CMW500 is connected to the DUT
2; Set RX Expected PEP to 30 dbm

A.1.2. Conducted

A.1.2.1. Method of Measurements

The EUT was set up for the max output power with pseudo random data modulation.
These measurements were done at 3 frequencies (bottom, middle and top of operational frequency range) for each bandwidth.

A.1.2.2 Measurement result

LTE band 2

LTE			Output power (dBm)		
Modulation	RB	RB Offset	1.4MHz		
			18607	18900	19193
QPSK	1	Low	23.52	23.67	23.79
		Middle	23.14	23.24	23.18
		High	23.17	23.20	22.78
	50%	Low	23.47	23.60	23.56
		Middle	23.30	23.49	23.39
		High	23.19	23.43	23.10
	100%	/	22.27	22.50	22.52
16QAM	1	Low	22.85	22.72	23.07
		Middle	22.54	22.59	22.51
		High	22.36	22.51	22.06
	50%	Low	22.48	22.48	22.61
		Middle	22.42	22.48	22.63
		High	22.26	22.73	22.09
	100%	/	21.44	21.66	21.54
Modulation	RB	RB Offset	3MHz		
			18615	18900	19185
QPSK	1	Low	23.54	23.71	23.62
		Middle	23.17	23.29	23.22

		High	23.20	23.25	22.82
	50%	Low	22.57	22.72	22.69
		Middle	22.42	22.59	22.51
		High	22.29	22.54	22.20
	100%	/	22.30	22.54	22.55
16QAM	1	Low	22.88	22.74	23.10
		Middle	22.57	22.64	22.55
		High	22.38	22.55	22.09
	50%	Low	21.59	21.61	21.73
		Middle	21.53	21.61	21.75
		High	21.36	21.85	21.22
	100%	/	21.47	21.70	21.57
Modulation	RB	RB Offset	5MHz		
			18625	18900	19175
QPSK	1	Low	23.51	23.69	23.78
		Middle	23.15	23.25	23.19
		High	23.17	23.20	22.78
	50%	Low	22.54	22.67	22.65
		Middle	22.40	22.55	22.46
		High	22.27	22.52	22.16
	100%	/	22.28	22.53	22.53
16QAM	1	Low	22.85	22.70	23.07
		Middle	22.54	22.62	22.52
		High	22.35	22.53	22.05
	50%	Low	21.57	21.57	21.70
		Middle	21.50	21.56	21.71
		High	21.33	21.80	21.18
	100%	/	21.45	21.66	21.52
Modulation	RB	RB Offset	10MHz		
			18650	18900	19150
QPSK	1	Low	23.53	23.70	23.81
		Middle	23.18	23.30	23.23
		High	23.19	23.24	22.81
	50%	Low	22.57	22.72	22.69
		Middle	22.43	22.60	22.50
		High	22.29	22.56	22.21
	100%	/	22.36	22.55	22.57
16QAM	1	Low	22.87	22.73	23.09
		Middle	22.57	22.66	22.55
		High	22.38	22.55	22.08
	50%	Low	21.60	21.62	21.74
		Middle	21.52	21.60	21.74

		High	21.36	21.85	21.22
	100%	/	21.48	21.71	21.56
Modulation	RB	RB Offset	15MHz		
			18675	18900	19125
QPSK	1	Low	23.53	23.70	23.81
		Middle	23.18	23.30	23.23
		High	23.19	23.24	22.81
	50%	Low	22.57	22.72	22.69
		Middle	22.43	22.60	22.50
		High	22.29	22.56	22.21
	100%	/	22.36	22.55	22.57
16QAM	1	Low	22.87	22.73	23.09
		Middle	22.57	22.66	22.55
		High	22.38	22.55	22.08
	50%	Low	21.60	21.62	21.74
		Middle	21.52	21.60	21.74
		High	21.36	21.85	21.22
	100%	/	21.48	21.71	21.56
Modulation	RB	RB Offset	20MHz		
			18700	18900	19100
QPSK	1	Low	23.49	23.62	23.86
		Middle	23.15	23.25	23.18
		High	23.14	23.18	22.74
	50%	Low	22.52	22.63	22.62
		Middle	22.38	22.51	22.43
		High	22.23	22.48	22.13
	100%	/	22.31	22.46	22.48
16QAM	1	Low	22.80	22.67	23.02
		Middle	22.51	22.61	22.49
		High	22.33	22.48	22.03
	50%	Low	21.54	21.56	21.68
		Middle	21.46	21.53	21.67
		High	21.31	21.76	21.15
	100%	/	21.43	21.62	21.49

LTE band 4

LTE			Output power (dBm)		
Modulation	RB	RB Offset	1.4MHz		
			19957	20175	20393
QPSK	1	Low	23.22	23.30	23.67
		Middle	22.79	22.89	23.18
		High	23.00	22.88	23.05
	50%	Low	23.02	23.32	23.52
		Middle	22.87	23.30	23.38
		High	22.85	23.15	23.30
	100%	/	21.90	22.38	22.65
16QAM	1	Low	22.58	22.93	22.82
		Middle	22.06	22.58	22.39
		High	22.08	22.72	22.05
	50%	Low	22.14	22.37	22.54
		Middle	22.12	22.26	22.36
		High	22.02	22.38	22.30
	100%	/	21.08	21.55	21.69
Modulation	RB	RB Offset	3MHz		
			19965	20175	20385
QPSK	1	Low	23.24	23.34	23.70
		Middle	22.82	22.94	23.22
		High	23.03	22.93	23.09
	50%	Low	22.12	22.44	22.65
		Middle	21.99	22.40	22.50
		High	21.95	22.26	22.40
	100%	/	21.93	22.42	22.68
16QAM	1	Low	22.61	22.95	22.85
		Middle	22.09	22.63	22.43
		High	22.10	22.76	22.08
	50%	Low	21.25	21.50	21.66
		Middle	21.23	21.39	21.48
		High	21.12	21.50	21.43
	100%	/	21.11	21.59	21.72
Modulation	RB	RB Offset	5MHz		
			19975	20175	20375
QPSK	1	Low	23.21	23.32	23.66
		Middle	22.80	22.90	23.19
		High	23.00	22.88	23.05
	50%	Low	22.09	22.39	22.61
		Middle	21.97	22.36	22.45
		High	21.93	22.24	22.36

	100%	/	21.91	22.41	22.66
16QAM	1	Low	22.58	22.91	22.82
		Middle	22.06	22.61	22.40
		High	22.07	22.74	22.04
	50%	Low	21.23	21.46	21.63
		Middle	21.20	21.34	21.44
		High	21.09	21.45	21.39
	100%	/	21.09	21.55	21.67
Modulation	RB	RB Offset	10MHz		
			20000	20175	20350
QPSK	1	Low	23.23	23.33	23.69
		Middle	22.83	22.95	23.23
		High	23.02	22.92	23.08
	50%	Low	22.12	22.44	22.65
		Middle	22.00	22.41	22.49
		High	21.95	22.28	22.41
	100%	/	21.99	22.43	22.70
16QAM	1	Low	22.60	22.94	22.84
		Middle	22.09	22.65	22.43
		High	22.10	22.76	22.07
	50%	Low	21.26	21.51	21.67
		Middle	21.22	21.38	21.47
		High	21.12	21.50	21.43
	100%	/	21.12	21.60	21.71
Modulation	RB	RB Offset	15MHz		
			20025	20175	20325
QPSK	1	Low	23.22	23.29	23.67
		Middle	22.81	22.94	23.20
		High	22.99	22.87	23.04
	50%	Low	22.10	22.40	22.62
		Middle	21.97	22.36	22.45
		High	21.92	22.25	22.37
	100%	/	21.97	22.39	22.65
16QAM	1	Low	22.55	22.92	22.82
		Middle	22.07	22.62	22.41
		High	22.07	22.72	22.04
	50%	Low	21.23	21.49	21.64
		Middle	21.19	21.33	21.43
		High	21.10	21.46	21.40
	100%	/	21.09	21.55	21.67
Modulation	RB	RB Offset	20MHz		
			20050	20175	20300

QPSK	1	Low	23.19	23.25	23.64
		Middle	22.80	22.90	23.18
		High	22.97	22.86	23.01
	50%	Low	22.07	22.35	22.58
		Middle	21.95	22.32	22.42
		High	21.89	22.20	22.33
	100%	/	21.94	22.34	22.61
16QAM	1	Low	22.53	22.88	22.77
		Middle	22.03	22.60	22.37
		High	22.05	22.69	22.02
	50%	Low	21.20	21.45	21.61
		Middle	21.16	21.31	21.40
		High	21.07	21.41	21.36
	100%	/	21.07	21.51	21.64

LTE band 5

LTE			Output power (dBm)		
Modulation	RB	RB Offset	1.4MHz		
			20407	20525	20643
QPSK	1	Low	23.19	23.16	23.09
		Middle	23.17	23.09	22.98
		High	23.05	22.94	22.77
	50%	Low	23.12	23.03	23.04
		Middle	23.04	22.89	22.99
		High	22.99	23.03	22.93
	100%	/	22.14	22.13	22.12
16QAM	1	Low	22.54	22.40	21.96
		Middle	22.49	22.32	21.91
		High	22.38	22.19	21.74
	50%	Low	22.20	22.18	22.13
		Middle	22.12	22.16	22.18
		High	22.13	22.17	21.96
	100%	/	21.26	21.21	21.20
Modulation	RB	RB Offset	3MHz		
			20415	20525	20635
QPSK	1	Low	23.21	23.20	23.12
		Middle	23.20	23.14	23.02
		High	23.08	22.99	22.81
	50%	Low	22.22	22.15	22.17
		Middle	22.16	21.99	22.11
		High	22.09	22.14	22.03
	100%	/	22.17	22.17	22.15
16QAM	1	Low	22.57	22.42	21.99

		Middle	22.52	22.37	21.95
		High	22.40	22.23	21.77
	50%	Low	21.31	21.31	21.25
		Middle	21.23	21.29	21.30
		High	21.23	21.29	21.09
	100%	/	21.29	21.25	21.23
Modulation	RB	RB Offset	5MHz		
			20425	20525	20625
QPSK	1	Low	23.19	23.15	23.09
		Middle	23.19	23.14	23.00
		High	23.04	22.93	22.76
	50%	Low	22.20	22.11	22.14
		Middle	22.14	21.95	22.06
		High	22.06	22.13	22.00
	100%	/	22.21	22.14	22.12
16QAM	1	Low	22.51	22.39	21.96
		Middle	22.50	22.36	21.93
		High	22.37	22.19	21.73
	50%	Low	21.29	21.30	21.23
		Middle	21.19	21.23	21.25
		High	21.21	21.25	21.06
	100%	/	21.27	21.21	21.18
Modulation	RB	RB Offset	10MHz		
			20450	20525	20600
QPSK	1	Low	23.16	23.11	23.06
		Middle	23.18	23.10	22.98
		High	23.02	22.92	22.73
	50%	Low	22.17	22.06	22.10
		Middle	22.12	21.91	22.03
		High	22.03	22.08	21.96
	100%	/	22.18	22.09	22.08
16QAM	1	Low	22.49	22.35	21.91
		Middle	22.46	22.34	21.89
		High	22.35	22.16	21.71
	50%	Low	21.26	21.26	21.20
		Middle	21.16	21.21	21.22
		High	21.18	21.20	21.02
	100%	/	21.25	21.17	21.15

LTE band 7

LTE			Output power (dBm)		
Modulation	RB	RB Offset	5MHz		
			20775	21100	21425
QPSK	1	Low	22.76	23.14	22.77
		Middle	21.96	22.03	21.90
		High	21.87	21.89	21.55
	50%	Low	21.75	21.48	21.38
		Middle	21.54	21.24	20.99
		High	21.14	21.11	20.80
	100%	/	21.25	21.36	21.09
16QAM	1	Low	22.44	22.15	22.11
		Middle	21.55	21.33	21.24
		High	21.42	21.32	20.94
	50%	Low	20.57	20.50	20.44
		Middle	20.38	20.41	20.22
		High	20.08	20.12	19.98
	100%	/	20.36	20.27	20.09
Modulation	RB	RB Offset	10MHz		
			20800	21100	21400
QPSK	1	Low	22.78	23.15	22.80
		Middle	21.99	22.08	21.94
		High	21.89	21.93	21.58
	50%	Low	21.78	21.53	21.42
		Middle	21.57	21.29	21.03
		High	21.16	21.15	20.85
	100%	/	21.33	21.38	21.13
16QAM	1	Low	22.46	22.18	22.13
		Middle	21.58	21.37	21.27
		High	21.45	21.34	20.97
	50%	Low	20.60	20.55	20.48
		Middle	20.40	20.45	20.25
		High	20.11	20.17	20.02
	100%	/	20.39	20.32	20.13
Modulation	RB	RB Offset	15MHz		
			20825	21100	21375
QPSK	1	Low	22.77	23.11	22.78
		Middle	21.97	22.07	21.91
		High	21.86	21.88	21.54
	50%	Low	21.76	21.49	21.39
		Middle	21.54	21.24	20.99
		High	21.13	21.12	20.81

	100%	/	21.31	21.34	21.08
16QAM	1	Low	22.41	22.16	22.11
		Middle	21.56	21.34	21.25
		High	21.42	21.30	20.94
	50%	Low	20.57	20.53	20.45
		Middle	20.37	20.40	20.21
		High	20.09	20.13	19.99
	100%	/	20.36	20.27	20.09
Modulation	RB	RB Offset	20MHz		
			20850	21100	21350
QPSK	1	Low	22.74	23.07	22.75
		Middle	21.96	22.03	21.89
		High	21.84	21.87	21.51
	50%	Low	21.73	21.44	21.35
		Middle	21.52	21.20	20.96
		High	21.10	21.07	20.77
	100%	/	21.28	21.29	21.04
16QAM	1	Low	22.39	22.12	22.06
		Middle	21.52	21.32	21.21
		High	21.40	21.27	20.92
	50%	Low	20.54	20.49	20.42
		Middle	20.34	20.38	20.18
		High	20.06	20.08	19.95
	100%	/	20.34	20.23	20.06

LTE band 12

LTE			Output power (dBm)		
Modulation	RB	RB Offset	1.4MHz		
			23017	23095	23173
QPSK	1	Low	23.09	23.22	23.18
		Middle	23.19	23.24	23.12
		High	23.20	23.23	23.22
	50%	Low	22.99	23.21	23.28
		Middle	23.07	23.35	23.28
		High	23.08	23.33	23.20
	100%	/	22.08	22.34	22.32
16QAM	1	Low	22.57	22.49	22.33
		Middle	22.57	22.48	22.24
		High	22.62	22.39	22.16
	50%	Low	22.06	22.21	22.23
		Middle	22.09	22.38	22.39
		High	22.18	22.27	22.20
	100%	/	21.23	21.34	21.35

Modulation	RB	RB Offset	3MHz		
			23025	23095	23165
QPSK	1	Low	23.11	23.26	23.21
		Middle	23.22	23.29	23.16
		High	23.23	23.28	23.26
	50%	Low	22.09	22.33	22.41
		Middle	22.19	22.45	22.40
		High	22.18	22.44	22.30
	100%	/	22.11	22.38	22.35
16QAM	1	Low	22.60	22.51	22.36
		Middle	22.60	22.53	22.28
		High	22.64	22.43	22.19
	50%	Low	21.17	21.34	21.35
		Middle	21.20	21.51	21.51
		High	21.28	21.39	21.33
	100%	/	21.26	21.38	21.38
Modulation	RB	RB Offset	5MHz		
			23035	23095	23155
QPSK	1	Low	23.09	23.21	23.18
		Middle	23.21	23.29	23.14
		High	23.19	23.22	23.21
	50%	Low	22.07	22.29	22.38
		Middle	22.17	22.41	22.35
		High	22.15	22.43	22.27
	100%	/	22.15	22.35	22.32
16QAM	1	Low	22.54	22.48	22.33
		Middle	22.58	22.52	22.26
		High	22.61	22.39	22.15
	50%	Low	21.15	21.33	21.33
		Middle	21.16	21.45	21.46
		High	21.26	21.35	21.30
	100%	/	21.24	21.34	21.33
Modulation	RB	RB Offset	10MHz		
			23060	23095	23130
QPSK	1	Low	23.06	23.17	23.15
		Middle	23.20	23.25	23.12
		High	23.17	23.21	23.18
	50%	Low	22.04	22.24	22.34
		Middle	22.15	22.37	22.32
		High	22.12	22.38	22.23
	100%	/	22.12	22.30	22.28
16QAM	1	Low	22.52	22.44	22.28

		Middle	22.54	22.50	22.22
		High	22.59	22.36	22.13
	50%	Low	21.12	21.29	21.30
		Middle	21.13	21.43	21.43
		High	21.23	21.30	21.26
	100%	/	21.22	21.30	21.30

A.1.3 Radiated

A.1.3.1 Description

This is the test for the maximum radiated power from the EUT.

Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

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

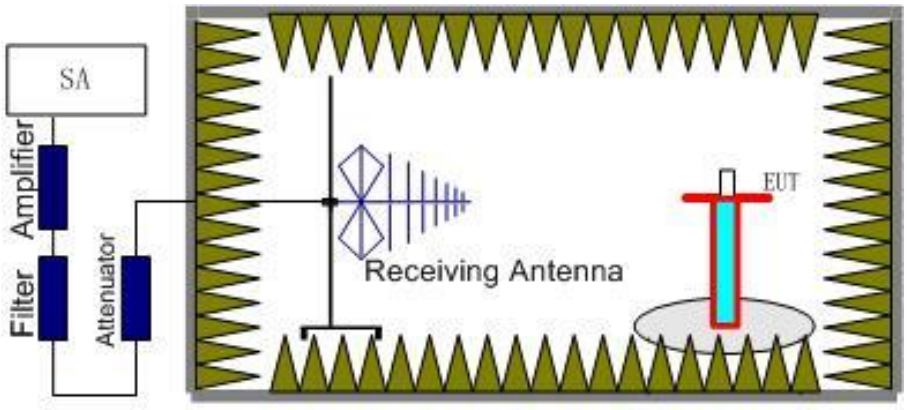
Rule Part 27.50(h)(2) specifies “Mobile stations are limited to 2.0 watts EIRP.”.

Rule Part 27.50(c) specifies “Portable stations (hand-held de-vices) are limited to 3 watts ERP.”.

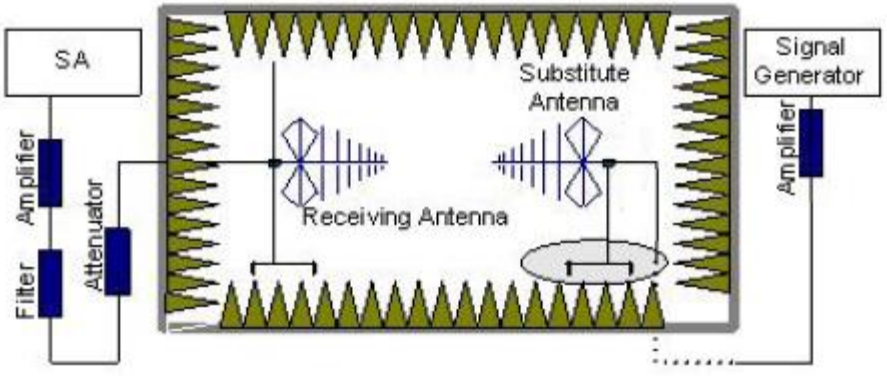
A.1.3.2 Method of Measurement

The measurements procedures in TIA-603E-2016 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. An amplifier should be connected to the Signal Source output port. And the cable should be connected between the amplifier and the substitution antenna.
   The cable loss (P_{cl}), the substitution antenna Gain (G_a) and the amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   Power (EIRP) = $P_{Mea} + P_{Ag} - P_{cl} + G_a$
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.

A.1.3.3 Measurement result

LTE Band 2- EIRP 24. 232(b) Limits: ≤33dBm (2W)

Bandwidth	Modulation	Channel	EIRP (dBm)	Limit (dBm)	Polarization
1.4MHz	QPSK	18607	20.92	33.00	H
		18900	21.07	33.00	H
		19193	21.19	33.00	H
	16QAM	18607	20.25	33.00	H
		18900	20.12	33.00	H
		19193	20.47	33.00	H
3MHz	QPSK	18615	20.94	33.00	H
		18900	21.11	33.00	H
		19185	21.02	33.00	H
	16QAM	18615	20.28	33.00	H
		18900	20.14	33.00	H
		19185	20.50	33.00	H
5MHz	QPSK	18625	20.91	33.00	H
		18900	21.09	33.00	H
		19175	21.18	33.00	H
	16QAM	18625	20.25	33.00	H
		18900	20.10	33.00	H
		19175	20.47	33.00	H
10MHz	QPSK	18650	20.93	33.00	H
		18900	21.10	33.00	H

		19150	21.21	33.00	H
	16QAM	18650	20.27	33.00	H
		18900	20.13	33.00	H
		19150	20.49	33.00	H
15MHz	QPSK	18675	20.93	33.00	H
		18900	21.10	33.00	H
		19125	21.21	33.00	H
	16QAM	18675	20.27	33.00	H
		18900	20.13	33.00	H
		19125	20.49	33.00	H
20MHz	QPSK	18700	20.89	33.00	H
		18900	21.02	33.00	H
		19100	21.26	33.00	H
	16QAM	18700	20.20	33.00	H
		18900	20.07	33.00	H
		19100	20.42	33.00	H

LTE Band 4- EIRP 27.50(d) Limits: ≤30dBm (1W)

Bandwidth	Modulation	Channel	EIRP (dBm)	Limit (dBm)	Polarization
1.4MHz	QPSK	19957	20.62	30.00	H
		20175	20.70	30.00	H
		20393	21.07	30.00	H
	16QAM	19957	19.98	30.00	H
		20175	20.33	30.00	H
		20393	20.22	30.00	H
3MHz	QPSK	19965	20.64	30.00	H
		20175	20.74	30.00	H
		20385	21.10	30.00	H
	16QAM	19965	20.01	30.00	H
		20175	20.35	30.00	H
		20385	20.25	30.00	H
5MHz	QPSK	19975	20.61	30.00	H
		20175	20.72	30.00	H
		20375	21.06	30.00	H
	16QAM	19975	19.98	30.00	H
		20175	20.31	30.00	H
		20375	20.22	30.00	H
10MHz	QPSK	20000	20.63	30.00	H
		20175	20.73	30.00	H
		20350	21.09	30.00	H

	16QAM	20000	20.00	30.00	H
		20175	20.34	30.00	H
		20350	20.24	30.00	H
15MHz	QPSK	20025	20.62	30.00	H
		20175	20.69	30.00	H
		20325	21.07	30.00	H
	16QAM	20025	19.95	30.00	H
		20175	20.32	30.00	H
		20325	20.22	30.00	H
20MHz	QPSK	20050	20.59	30.00	H
		20175	20.65	30.00	H
		20300	21.04	30.00	H
	16QAM	20050	19.93	30.00	H
		20175	20.28	30.00	H
		20300	20.17	30.00	H

LTE Band 5- ERP 22.913(a) Limits: ≤38.45dBm (7W)

Bandwidth	Modulation	Channel	ERP (dBm)	Limit (dBm)	Polarization
1.4MHz	QPSK	20407	21.39	38.45	H
		20525	21.36	38.45	H
		20643	21.29	38.45	H
	16QAM	20407	20.74	38.45	H
		20525	20.60	38.45	H
		20643	20.16	38.45	H
3MHz	QPSK	20415	21.41	38.45	H
		20525	21.40	38.45	H
		20635	21.32	38.45	H
	16QAM	20415	20.77	38.45	H
		20525	20.62	38.45	H
		20635	20.19	38.45	H
5MHz	QPSK	20425	21.39	38.45	H
		20525	21.35	38.45	H
		20625	21.29	38.45	H
	16QAM	20425	20.71	38.45	H
		20525	20.59	38.45	H
		20625	20.16	38.45	H
10MHz	QPSK	20450	21.36	38.45	H
		20525	21.31	38.45	H
		20600	21.26	38.45	H
	16QAM	20450	20.69	38.45	H

		20525	20.55	38.45	H
		20600	20.11	38.45	H

LTE Band 7- EIRP 27.50(h)(2) Limits: ≤33 dBm (2W)

Bandwidth	Modulation	Channel	EIRP (dBm)	Limit (dBm)	Polarization
5MHz	QPSK	20775	20.16	33.00	H
		21100	20.54	33.00	H
		21425	20.17	33.00	H
	16QAM	20775	19.84	33.00	H
		21100	19.55	33.00	H
		21425	19.51	33.00	H
10MHz	QPSK	20800	20.18	33.00	H
		21100	20.55	33.00	H
		21400	20.20	33.00	H
	16QAM	20800	19.86	33.00	H
		21100	19.58	33.00	H
		21400	19.53	33.00	H
15MHz	QPSK	20825	20.17	33.00	H
		21100	20.51	33.00	H
		21375	20.18	33.00	H
	16QAM	20825	19.81	33.00	H
		21100	19.56	33.00	H
		21375	19.51	33.00	H
20MHz	QPSK	20850	20.14	33.00	H
		21100	20.47	33.00	H
		21350	20.15	33.00	H
	16QAM	20850	19.79	33.00	H
		21100	19.52	33.00	H
		21350	19.46	33.00	H

LTE Band 12 - ERP 27.50(c)(10) Limits: ≤34.77dBm (3W)

Bandwidth	Modulation	Channel	ERP (dBm)	Limit (dBm)	Polarization
1.4MHz	QPSK	23017	21.29	34.77	H
		23095	21.42	34.77	H
		23173	21.38	34.77	H
	16QAM	23017	20.77	34.77	H
		23095	20.69	34.77	H
		23173	20.53	34.77	H
3MHz	QPSK	23025	21.31	34.77	H
		23095	21.46	34.77	H
		23165	21.41	34.77	H
	16QAM	23025	20.80	34.77	H
		23095	20.71	34.77	H
		23165	20.56	34.77	H
5MHz	QPSK	23035	21.29	34.77	H
		23095	21.41	34.77	H
		23155	21.38	34.77	H
	16QAM	23035	20.74	34.77	H
		23095	20.68	34.77	H
		23155	20.53	34.77	H
10MHz	QPSK	23060	21.26	34.77	H
		23095	21.37	34.77	H
		23130	21.35	34.77	H
	16QAM	23060	20.72	34.77	H
		23095	20.64	34.77	H
		23130	20.48	34.77	H

ANALYZER SETTINGS:

RBW = VBW = 8MHz for occupied bandwdiths equal to or less than 5MHz.

RBW = VBW = 20MHz for occupied bandwidths equal to or greater than 10MHz.

ANNEX A.2. EMISSION LIMT

Reference

FCC: CFR 2.1051, 22.917,24.238(a), 27.53(g), 27.53(h) , 27.53(m).

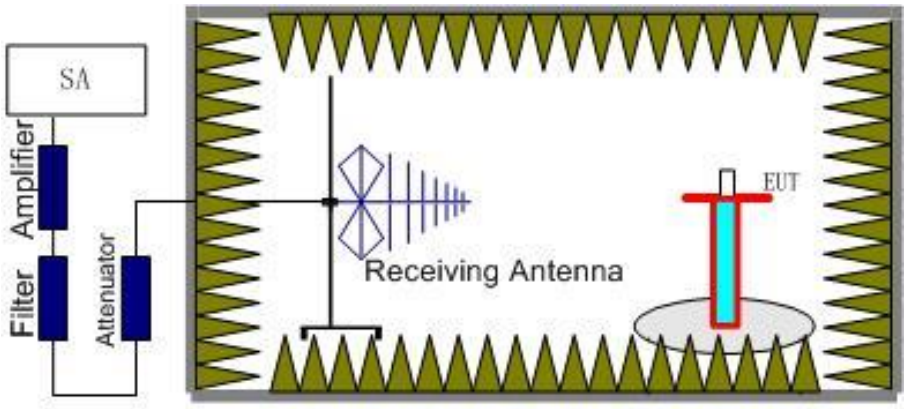
A.2.1 Measurement Method

The measurements procedures in TIA-603E-2016 are used. This measurement is carried out in fully-anechoic chamber FAC-3.

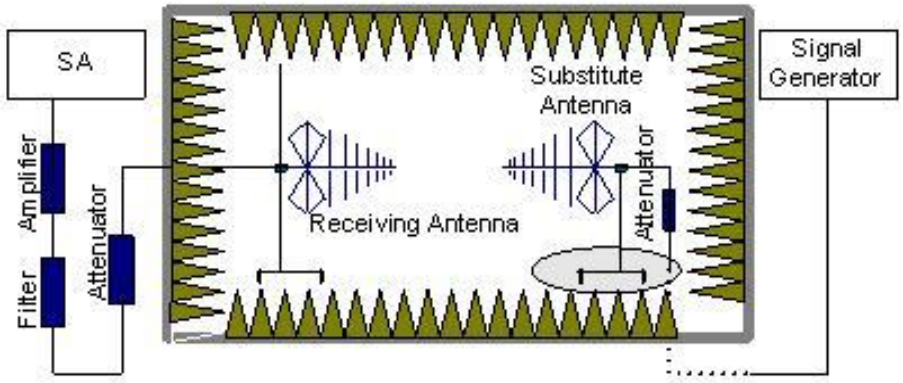
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz as outlined in Part 22.917, Part 24.238(a), Part 27.53(g), Part 27.53(h), Part 27.53(m). The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Bands 2,4,5,7,12.

The procedure of radiated spurious emissions is as follows:

1. Below 1 GHz, EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. Above 1 GHz, EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss (P_{pl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (G_a) should be recorded after test.
   An amplifier should be connected in for the test.
   The Path loss (P_{pl}) is the summation of the cable loss and the gain of the amplifier.
   The measurement results are obtained as described below:
   Power (EIRP) =P_{Mea}- P_{pl} + G_a
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP - 2.15dBi.

A.2.2 Measurement Limit

Part 22.917, Part 24.238(a), Part 27.53(g), Part 27.53(h), Part 27.53(m) all specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A.2.3 Measurement Results

7. Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Bands 2,4,5,7,12. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the LTE Bands 2,4,5,7,12. Into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this. The evaluated frequency range is from 30MHz to 26GHz.

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Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit（dBm）	Polarization
5057.6	-45.55	7.8	9.0	-44.35	-13	V
7510.8	-43.44	9.7	14.6	-38.54	-13	V
10006.4	-45.34	11.2	17.6	-38.94	-13	H
12711.5	-37.05	12.7	19.2	-30.55	-13	V
15250.8	-38.11	14.5	25.1	-27.51	-13	V
16974.5	-26.18	16.0	20.8	-21.38	-13	V

RSE-LTE7-M-N01

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit（dBm）	Polarization
5065.6	-45.77	7.8	9.0	-44.57	-13	H
7602.4	-44.44	9.7	14.6	-39.54	-13	V
10141.6	-43.05	11.3	17.4	-36.95	-13	H
12669.5	-39.18	12.7	19.2	-32.68	-13	V
15294.5	-38.1	14.4	25.1	-27.4	-13	H
16829.2	-25.5	15.8	20.0	-21.3	-13	V

RSE-LTE7-H-N01

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit （dBm）	Polarization
5100.4	-44.95	7.9	9.0	-43.85	-13	H
7699.2	-42.22	9.8	15.3	-36.72	-13	V
10270.0	-43.27	11.4	17.4	-37.27	-13	H
12814.8	-39.14	12.5	19.2	-32.44	-13	H
15410.0	-37.9	14.4	24.2	-28.1	-13	V
17979.0	-26.68	16.4	22.5	-20.58	-13	H

Note: the EUT was displayed in several different direction, the worst cases were shown.

ANNEX A.3. FREQUENCY STABILITY

Reference

FCC: CFR Part 2.1055, 22.235, 24.235, 27.54.

A.3.1 Method of Measurement

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -10℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel for LTE band 2/4/5/7/12. Measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -10℃ to +55℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +55℃.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 ℃ decrements from +55℃ to -10℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

A.3.2 Measurement Limit

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d) (2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.6VDC and 4.4VDC, with a nominal voltage of 3.8VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. For the purposes of measuring frequency stability these voltage limits are to be used.

A.3.3 Measurement results

LTE Band 2, 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.60	11.03	10.59	0.001	0.007
3.80	7.81	8.3	0.001	0.008
4.40	-7.24	11.34	0.000	0.007

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
55	8.9	7.91	0.002	0.007
50	11.24	-11.87	0.002	0.008
40	11.1	-9.03	0.002	0.007
30	-10.46	-8.6	0.001	0.006
20	-10.16	12.12	0.001	0.008
10	7.91	6.48	0.002	0.008
0	7.11	7.7	0.001	0.009
-10	9.6	5.71	0.005	0.008

LTE Band 4, 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.60	11.26	17.31	0.001	0.011
3.80	-10.47	18.57	0.002	0.012
4.40	-9.06	19.38	0.003	0.010

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
55	-7.93	12.66	0.001	0.012
50	-5.99	18.81	0.001	0.009
40	-11.72	16.45	0.001	0.012
30	-12.13	19.81	0.001	0.012
20	10.3	20.87	0.000	0.011
10	-7.81	25.01	0.001	0.011
0	-8.13	16.85	0.001	0.010
-10	-8.57	15.84	0.002	0.010

LTE Band 5, 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.60	6.08	-9.33	0.002	0.010
3.80	4.95	-8.84	0.001	0.011
4.40	-4.38	-8.87	0.000	0.008

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
55	6.05	-11.47	0.000	0.010
50	5.19	-10.73	0.001	0.010
40	4.63	-10.53	0.003	0.008
30	-4.65	-10.8	0.000	0.011
20	4.88	-9.44	0.002	0.009
10	4.81	-10.34	0.002	0.011
0	-4.72	-12.53	0.001	0.010
-10	4.05	-10.73	0.002	0.012

LTE Band 7, 5MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.60	22.95	20.67	0.001	0.004
3.80	17.18	22.49	0.001	0.004
4.40	20.16	19	0.002	0.002

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
55	15.79	21.8	0.003	0.002
50	-10.46	19.38	0.000	0.004
40	-16.41	19.67	0.000	0.003
30	11.03	25.01	0.002	0.001
20	-16.26	29.14	0.000	0.000
10	-12.59	22.86	0.001	0.004
0	-16.06	22.07	0.003	0.002
-10	-13.09	-19.08	0.002	0.003

LTE Band 12, 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.60	6.48	-9.2	0.002	0.025
3.80	7.81	-12.22	0.003	0.026
4.40	-5.62	-11.89	0.001	0.025

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
55	6.95	-9.46	0.002	0.027
50	-4.21	-10.7	0.003	0.026
40	6.85	-11.29	0.001	0.026
30	4.76	-11.17	0.001	0.028
20	-5.61	-9.3	0.001	0.027
10	-3.73	-11.57	0.002	0.025
0	3.36	-10.37	0.002	0.026
-10	3.93	-10.06	0.002	0.025