

RADIO PERFORMANCE TEST REPORT (CLASS II Permissive Change)

Test Report No. : OT-227-RWD-001
Reception No. : 2109004087
Applicant : LG Electronics USA
Address : 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, 07632, United States
Manufacturer : LG Electronics Inc.
Address : 10, Magokjungang 10-ro, Gangseo-gu, Seoul, Korea, 07796
Type of Equipment : Telematics Module
FCC ID. : BEJ-TM04ANNABM0
Model Name : TM04ANNABM0
Serial number : 001, 002
Total page of Report : 38 pages (including this page)
Date of Incoming : June 08, 2022
Date of issue : July 01, 2022

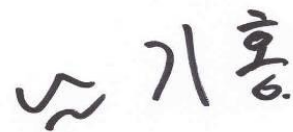
SUMMARY

The equipment complies with the regulation; **Part 2 Subpart J, Part 22 Subpart C/H, Part 24 Subpart E, Part 27 Subpart C and Part 90 Subpart S.**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.





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OTC-TRF-RF-001(0)

CONTENTS

	PAGE
1. VERIFICATION OF COMPLIANCE	5
2. TEST SUMMARY.....	6
2.1 TEST ITEMS AND RESULTS	6
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....	7
2.3 RELATED SUBMITTAL(S) / GRANT(S)	7
2.4 PURPOSE OF THE TEST	7
2.5 TEST METHODOLOGY.....	7
2.6 TEST FACILITY.....	7
3. GENERAL INFORMATION.....	8
3.1 PRODUCT DESCRIPTION.....	8
3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	10
4. EUT MODIFICATIONS.....	10
5. SYSTEM TEST CONFIGURATION	11
5.1 JUSTIFICATION.....	11
5.2 PERIPHERAL EQUIPMENT	11
5.3 MODE OF OPERATION DURING THE TEST	11
5.4 CONFIGURATION OF TEST SYSTEM.....	11
6. PRELIMINARY TEST	11
6.1 GENERAL RADIATED EMISSIONS TESTS	11
7. RF RADIATED OUTPUT POWER	12
7.1 OPERATING ENVIRONMENT	12
7.2 TEST SET-UP	12
7.3 TEST DATE	13
7.4 TEST DATA FOR ANTENNA NAME: 9825131_02 [ORIGINAL GRANT].....	14
7.5 TEST DATA FOR ANTENNA NAME: 920-631-001	15
7.6 TEST DATA FOR ANTENNA NAME: 8705921	16
7.7 TEST DATA FOR ANTENNA NAME: 920-631-002	17
8. SPURIOUS RADIATED EMISSION	18
8.1 OPERATING ENVIRONMENT	18
8.2 TEST SET-UP	18
8.3 TEST DATE	19
8.4 TEST DATA FOR ANTENNA NAME: 920-631-001	20

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OTC-TRF-RF-001(0)

8.4.1 Test data for LTE Band 71 (5 BW 1 RB size / 0 Offset)	20
8.4.2 Test data for LTE Band 26 (1.4 BW 1 RB size / 0 Offset)	21
8.4.3 Test data for LTE Band 26/5 (1.4 BW 1 RB size / 0 Offset)	22
8.4.4 Test data for LTE Band 66/4 (1.4 BW 1 RB size / 0 Offset)	23
8.4.5 Test data for LTE Band 25/2 (20 BW 1 RB size / 0 Offset)	24
8.4.6 Test data for LTE Band 41 (10 BW 1 RB size / 0 Offset)	25
8.5 TEST DATA FOR ANTENNA NAME: 8705921	26
8.5.1 Test data for LTE Band 71 (5 BW 1 RB size / 0 Offset)	26
8.5.2 Test data for LTE Band 26 (1.4 BW 1 RB size / 0 Offset)	27
8.5.3 Test data for LTE Band 26/5 (1.4 BW 1 RB size / 0 Offset)	28
8.5.4 Test data for LTE Band 66/4 (1.4 BW 1 RB size / 0 Offset)	29
8.5.5 Test data for LTE Band 25/2 (20 BW 1 RB size / 0 Offset)	30
8.5.6 Test data for LTE Band 41 (10 BW 1 RB size / 0 Offset)	31
8.6 TEST DATA FOR ANTENNA NAME: 920-631-002	32
8.6.1 Test data for LTE Band 71 (5 BW 1 RB size / 0 Offset)	32
8.6.2 Test data for LTE Band 26 (1.4 BW 1 RB size / 0 Offset)	33
8.6.3 Test data for LTE Band 26/5 (1.4 BW 1 RB size / 0 Offset)	34
8.6.4 Test data for LTE Band 66/4 (1.4 BW 1 RB size / 0 Offset)	35
8.6.5 Test data for LTE Band 25/2 (20 BW 1 RB size / 0 Offset)	36
8.6.6 Test data for LTE Band 41 (10 BW 1 RB size / 0 Offset)	37
9. LIST OF TEST EQUIPMENT	38

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-227-RWD-001	July 01, 2022	Class II Permissive Change	All

1. VERIFICATION OF COMPLIANCE

Applicant : LG Electronics USA
 Address : 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, 07632, United States
 Contact Person : Sung Soo, Kim / Director, Regulatory and Environmental Affairs
 Telephone No. : +201-266-2215
 FCC ID : BEJ-TM04ANNABM0
 Model Name : TM04ANNABM0
 Serial Number : 001, 002
 Date : July 01, 2022

EQUIPMENT CLASS	PCB-PCS Licensed Transmitter
EQUIPMENT DESCRIPTION	Telematics Module
THIS REPORT CONCERNS	Class II Permissive Change
MEASUREMENT PROCEDURES	ANSI C63.26:2015, KDB Publication 971168 D01
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	Part 2 Subpart J, Part 22 Subpart C/H, Part 24 Subpart E, Part 27 Subpart C and Part 90 Subpart S.
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
§2.1046 §22.913(a)(5) §24.232(c) §27.50(c)(10) §27.50(d)(4) §90.635(b)	E.R.P. / E.I.R.P.	Met the Limit / PASS
§2.1053 §22.917(a) §24.238(a) §27.53(c)(2) §27.53(g) §27.53(h)(1) §90.691(a)	Spurious Radiated Emission	Met the Limit / PASS
§2.1046	Conducted Output Power	Met the Limit (See Note 1)
§2.1049	Occupied Bandwidth	Met the Limit (See Note 1)
§22.913(d) §24.232(d) §27.50(d)(5)	Peak-Average Ratio	Met the Limit (See Note 1)
§2.1051 §22.917(a) §24.238(a) §27.53(c)(2) §27.53(g) §27.53(h)(1) §90.691(a)	Spurious Emission at Antenna Terminal	Met the Limit (See Note 1)
§22.917(a) §24.238(a) §27.53(c)(2) §27.53(g) §27.53(h)(1) §90.691(a)	Band Edge	Met the Limit (See Note 1)
§2.1055 §22.355 §24.235 §27.54 §90.213(a)	Frequency Stability	Met the Limit (See Note 1)

Remark: This product is a C2PC case due to the addition of antennas. So only radiation test was performed and the rules for E.R.P. / E.I.R.P. and spurious radiated emission were satisfied.

Note 1: The EUT has been already certified by FCC ID BEJ-TM04ANNABM0, so this test was not performed.

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

-. CLASS II Permissive Change:

The EUT was granted on July 14, 2020 but only following modifications and/or changed items are implemented into the device.

Addition of Antenna	1. Antenna Name: 920-631-001
	2. Antenna Name: 8705921
	3. Antenna Name: 920-631-002

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in Part 22 Subpart C/H, Part 24 Subpart E, Part 27 Subpart C and Part 90 Subpart S.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.26:2015. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The LG Electronics USA, Model TM04ANNABM0 (referred to as the EUT in this report) is a Telematics Module. Product specification information described herein was obtained from product data sheet or user’s manual.

DEVICE TYPE	Telematics Module
Power Supply	DC 12.5 V
Rated Power	GSM 850: 33 dBm GSM 1900: 30 dBm WCDMA II, V: 24 dBm WCDMA IV: 24 dBm LTE Band 2, 4, 5, 12, 13, 17, 25, 26, 66, 71: 23 dBm
Frequency Range	GSM 850: 824 MHz ~ 849 MHz GSM 850: 1 850 MHz ~ 1 910 MHz WCDMA II: 1 850 MHz ~ 1 910 MHz WCDMA IV: 1 710 MHz ~ 1 755 MHz WCDMA V: 824 MHz ~ 849 MHz LTE Band 2: 1 850 MHz ~ 1 910 MHz LTE Band 4: 1 710 MHz ~ 1 755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1 850 MHz ~ 1 915 MHz LTE Band 26: 814 MHz ~ 824 MHz LTE Band 26: 824 MHz ~ 849 MHz LTE Band 66: 1 710 MHz ~ 1 780 MHz LTE Band 71: 663 MHz ~ 698 MHz

<p>Emission Designator</p>	<p>GSM 850: 241KGXW (Voice) / 246KG7W (EDGE) GSM 1900: 241KGXW (Voice) / 245KG7W (EDGE) WCDMA II: 4M15F9W WCDMA IV: 4M15F9W WCDMA V: 4M14F9W LTE Band 12/17 (1.4 MHz): 1M10G7D (QPSK) / 1M10D7D (16QAM) LTE Band 12/17 (3 MHz): 2M69G7D (QPSK) / 2M69D7D (16QAM) LTE Band 12/17 (5 MHz): 4M52G7D (QPSK) / 4M53D7D (16QAM) LTE Band 12/17 (10 MHz): 8M97G7D (QPSK) / 8M97D7D (16QAM) LTE Band 13 (5 MHz): 4M52G7D (QPSK) / 4M53D7D (16QAM) LTE Band 13 (10 MHz): 8M92G7D (QPSK) / 8M94D7D (16QAM) LTE Band 25/2 (1.4 MHz): 1M10G7D (QPSK) / 1M10D7D (16QAM) LTE Band 25/2 (3 MHz): 2M69G7D (QPSK) / 2M70D7D (16QAM) LTE Band 25/2 (5 MHz): 4M52G7D (QPSK) / 4M53D7D (16QAM) LTE Band 25/2 (10 MHz): 8M97G7D (QPSK) / 8M97D7D (16QAM) LTE Band 25/2 (15 MHz): 13M6G7D (QPSK) / 13M5D7D (16QAM) LTE Band 25/2 (20 MHz): 18M0G7D (QPSK) / 18M0D7D (16QAM) LTE Band 26/5 (1.4 MHz): 1M10G7D (QPSK) / 1M10D7D (16QAM) LTE Band 26/5 (3 MHz): 2M69G7D (QPSK) / 2M69D7D (16QAM) LTE Band 26/5 (5 MHz): 4M52G7D (QPSK) / 4M52D7D (16QAM) LTE Band 26/5 (10 MHz): 8M97G7D (QPSK) / 8M97D7D (16QAM) LTE Band 26 (15 MHz): 13M5G7D (QPSK) / 13M5D7D (16QAM) LTE Band 66/4 (1.4 MHz): 1M10G7D (QPSK) / 1M10D7D (16QAM) LTE Band 66/4 (3 MHz): 2M70G7D (QPSK) / 2M69D7D (16QAM) LTE Band 66/4 (5 MHz): 4M52G7D (QPSK) / 4M52D7D (16QAM) LTE Band 66/4 (10 MHz): 8M97G7D (QPSK) / 8M97D7D (16QAM) LTE Band 66/4 (15 MHz): 13M5G7D (QPSK) / 13M5D7D (16QAM) LTE Band 66/4 (20 MHz): 17M9G7D (QPSK) / 18M0D7D (16QAM) LTE Band 71 (5 MHz): 4M52G7D (QPSK) / 4M53D7D (16QAM) LTE Band 71 (10 MHz): 8M97G7D (QPSK) / 8M97D7D (16QAM) LTE Band 71 (15 MHz): 13M5G7D (QPSK) / 13M5D7D (16QAM) LTE Band 71 (20 MHz): 17M9G7D (QPSK) / 18M0D7D (16QAM)</p>
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Modulation Technique	QPSK, 16QAM, GMSK, 8PSK
Antenna Type	Shark antenna
Antenna gain	663 MHz ~ 698 MHz: 1.40 dBi 699 MHz ~ 716 MHz: 3.00 dBi 704 MHz ~ 716 MHz: 3.00 dBi 777 MHz ~ 787 MHz: 3.00 dBi 814 MHz ~ 849 MHz: 3.00 dBi 824 MHz ~ 849 MHz: 3.00 dBi 1 710 MHz ~ 1 755 MHz: 5.00 dBi 1 710 MHz ~ 1 780 MHz: 5.00 dBi 1 850 MHz ~ 1 910 MHz: 5.00 dBi 1 850 MHz ~ 1 915 MHz: 5.00 dBi 2 496 MHz ~ 2 690 MHz: 6.60 dBi 2 500 MHz ~ 2 570 MHz: 6.60 dBi
H/W Version	Rev.C3
S/W Version	WN22XA28

3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	N/A	N/A	N/A

5.2 Peripheral equipment

-. None

5.3 Mode of operation during the test

The EUT was received signal form signal generator and then each modulation was configured for maximum signal gain and bandwidth. The EUT was operated in a manner representative of the typical usage of the equipment. During all testing, system components were manipulated within the confines of typical usage to maximize each emission. The applicant does not supply antenna(s) with the system, so the dummy loads were connected to the RF output ports on the EUT for radiated spurious emission testing.

5.4 Configuration of Test System

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.26: 2015 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m Semi Anechoic Chamber.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

6. PRELIMINARY TEST

6.1 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

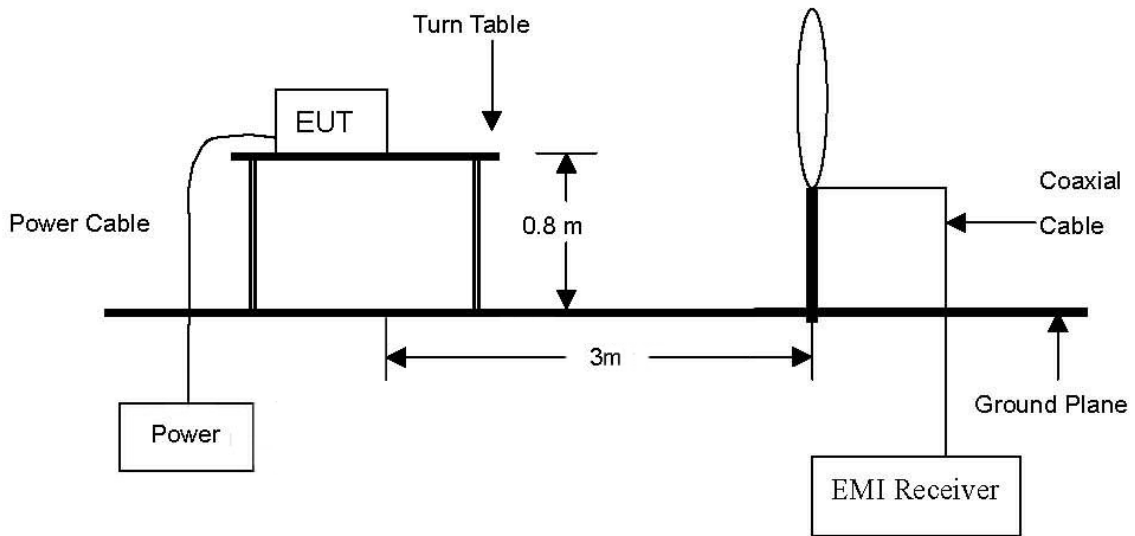
7. RF Radiated Output Power

7.1 Operating environment

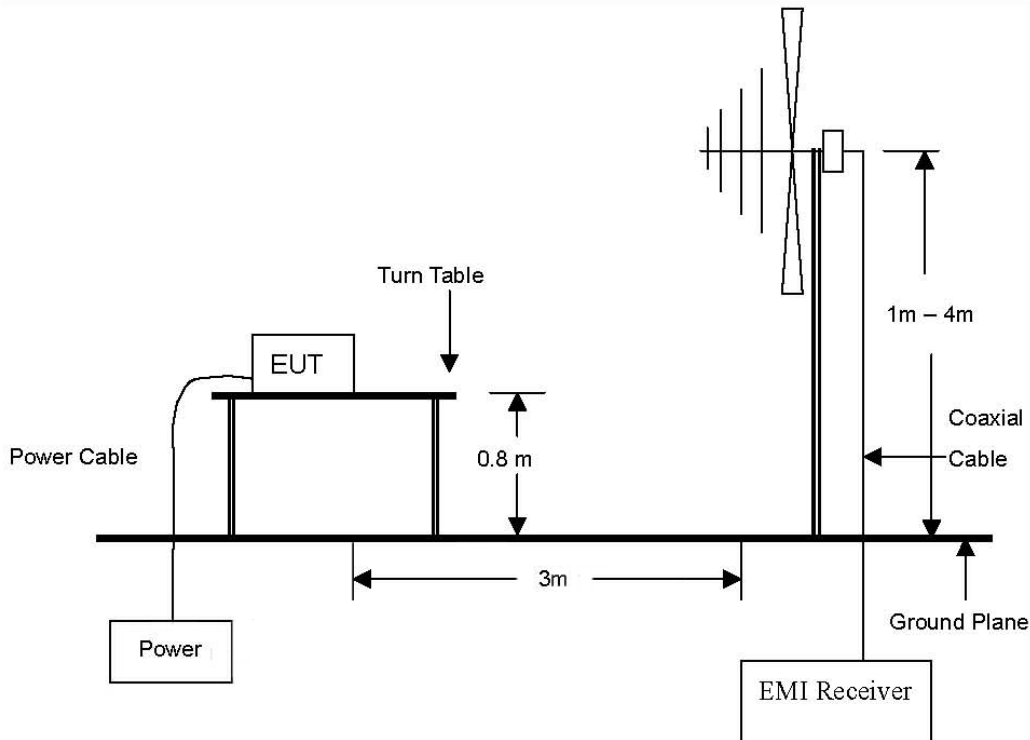
Temperature : 22 °C
 Relative humidity : 48 % R.H.

7.2 Test set-up

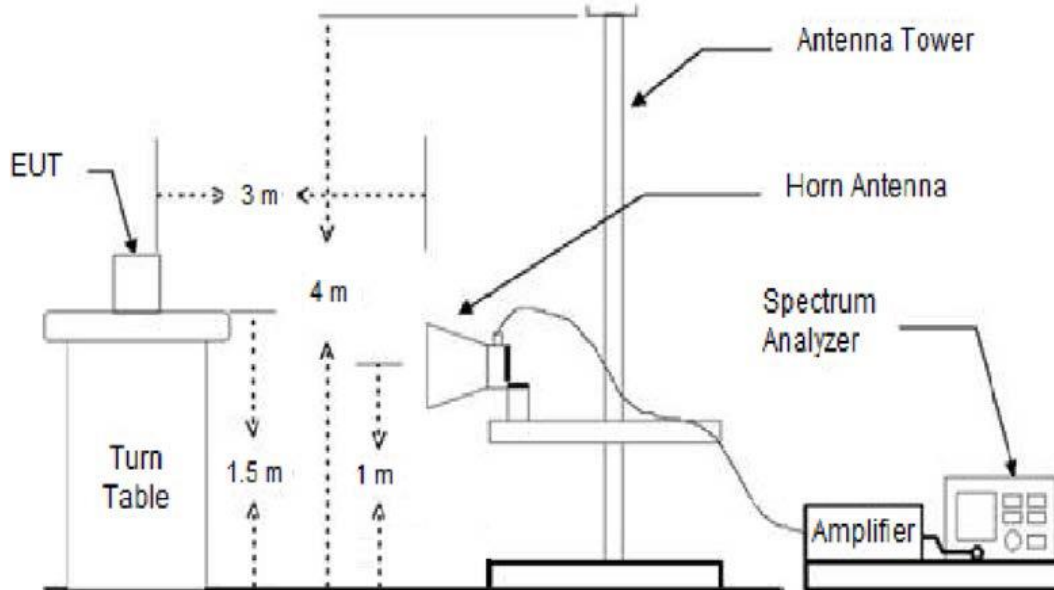
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 20 GHz.



Limits

- §22.913(a)(5), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.
- §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.
- §27.50(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.
- §27.50(d)(4), fixed, mobile, and portable (hand-held) stations operating in the 1 710-1 755 MHz band and mobile and portable stations operating in the 1 695-1 710 MHz and 1 755-1 780 MHz bands are limited to 1 watt EIRP.
- §90.635(b), the maximum output power of the transmitter for mobile stations is 100 watts (20 dBW).

7.3 Test Date

June 08, 2022 ~ June 20, 2022

7.4 Test data for Antenna Name: 9825131_02 [Original Grant]

-. Test Result : Pass

Band	Frequency (MHz)	Target Power (dBm)	Max Tune-up Tolerance (dBm)	Maximum Conducted Power (dBm)	Maximum Conducted Power (W)	Antenna Gain (dBi)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (W)	Maximum E.R.P. (dBm)	Maximum E.R.P. (W)	Output Power Limit
GSM 1 900	1 850 - 1 910	30.00	0.70	30.70	1.17	2.00	32.70	1.862	-	-	2 W E.I.R.P.
GSM 850	824 - 849	33.00	2.50	35.50	3.55	-1.90	33.60	2.291	31.45	1.40	7 W E.R.P.
WCDMA II	1 850 - 1 910	24.00	1.70	25.70	0.37	2.00	27.70	0.589	-	-	2 W E.I.R.P.
WCDMA IV	1 710 - 1 755	24.00	1.70	25.70	0.37	2.60	28.30	0.676	-	-	1 W E.I.R.P.
WCDMA V	824 - 849	24.00	1.70	25.70	0.37	-1.90	23.80	0.240	21.65	0.15	7 W E.R.P.
LTE 7	2 500 - 2 570	23.00	2.70	25.70	0.37	2.70	28.40	0.692	-	-	2 W E.I.R.P.
LTE 12/17	699 - 716	23.00	2.70	25.70	0.37	-2.10	23.60	0.229	21.45	0.14	3 W E.R.P.
LTE13	777 - 787	23.00	2.70	25.70	0.37	-0.10	25.60	0.363	23.45	0.22	3 W E.R.P.
LTE25/2	1 850 - 1 915	23.00	2.70	25.70	0.37	2.10	27.80	0.603	-	-	2 W E.I.R.P.
LTE26/5	824 - 849	23.00	2.70	25.70	0.37	-1.90	23.80	0.240	21.65	0.15	7 W E.R.P.
LTE41	2 496 - 2 690	23.00	2.70	25.70	0.37	2.70	28.40	0.692	-	-	2 W E.I.R.P.
LTE66/4	1 710 - 1 780	23.00	2.70	25.70	0.37	2.60	28.30	0.676	-	-	1 W E.I.R.P.
LTE71	663 - 698	23.00	2.70	25.70	0.37	-4.20	21.50	0.141	19.35	0.09	3 W E.R.P.
LTE 26	814 - 824	23.00	2.70	25.70	0.37	-1.10	24.60	0.288	22.45	0.18	100 W E.R.P.

Remark;

1. E.I.R.P. (dBm) = Maximum Conducted Power (dBm) + Antenna Gain (dBi)
2. E.R.P. (dBm) = E.I.R.P. (dBm) - 2.15 (dB); where E.R.P. and E.I.R.P. are expressed in consistent units.

7.5 Test data for Antenna Name: 920-631-001

- Test Result : Pass

Band	Frequency (MHz)	Target Power (dBm)	Max Tune-up Tolerance (dBm)	Maximum Conducted Power (dBm)	Maximum Conducted Power (W)	Antenna Gain (dBi)	Cable Loss (dB)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (W)	Maximum E.R.P. (dBm)	Maximum E.R.P. (W)	Output Power Limit
GSM 1900	1 850 - 1 910	30.00	0.70	30.70	1.17	2.40	3.52	29.58	0.91	-	-	2 W E.I.R.P.
GSM 850	824 - 849	33.00	2.50	35.50	3.55	1.20	2.32	34.38	2.74	32.23	1.67	7 W E.R.P.
WCDMA II	1 850 - 1 910	24.00	1.70	25.70	0.37	2.40	3.52	24.58	0.29	-	-	2 W E.I.R.P.
WCDMA IV	1 710 - 1 755	24.00	1.70	25.70	0.37	3.30	3.13	25.87	0.39	-	-	1 W E.I.R.P.
WCDMA V	824 - 849	24.00	1.70	25.70	0.37	1.20	2.32	24.58	0.29	22.43	0.17	7 W E.R.P.
LTE 7	2 500 - 2 570	23.00	2.70	25.70	0.37	6.60	4.16	28.14	0.65	-	-	2 W E.I.R.P.
LTE 12/17	699 - 716	23.00	2.70	25.70	0.37	1.40	2.12	24.98	0.31	22.83	0.19	3 W E.R.P.
LTE13	777 - 787	23.00	2.70	25.70	0.37	1.60	2.12	25.18	0.33	23.03	0.20	3 W E.R.P.
LTE25/2	1 850 - 1 915	23.00	2.70	25.70	0.37	2.40	3.52	24.58	0.29	-	-	2 W E.I.R.P.
LTE26/5	824 - 849	23.00	2.70	25.70	0.37	1.20	2.32	24.58	0.29	22.43	0.17	7 W E.R.P.
LTE41	2 496 - 2 690	23.00	2.70	25.70	0.37	6.60	4.16	28.14	0.65	-	-	2 W E.I.R.P.
LTE66/4	1 710 - 1 780	23.00	2.70	25.70	0.37	3.30	3.13	25.87	0.39	-	-	1 W E.I.R.P.
LTE71	663 - 698	23.00	2.70	25.70	0.37	1.40	2.12	24.98	0.31	22.83	0.19	3 W E.R.P.
LTE 26	814 - 824	23.00	2.70	25.70	0.37	2.10	2.32	25.48	0.35	23.33	0.22	100 W E.R.P.

Remark;

1. E.I.R.P. (dBm) = Maximum Conducted Power (dBm) + Antenna Gain (dBi)
2. E.R.P. (dBm) = E.I.R.P. (dBm) - 2.15 (dB); where E.R.P. and E.I.R.P. are expressed in consistent units.

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OTC-TRF-RF-001(0)

7.6 Test data for Antenna Name: 8705921

-. Test Result : Pass

Band	Frequency (MHz)	Target Power (dBm)	Max Tune-up Tolerance (dBm)	Maximum Conducted Power (dBm)	Maximum Conducted Power (W)	Antenna Gain (dBi)	Cable Loss (dB)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (W)	Maximum E.R.P. (dBm)	Maximum E.R.P. (W)	Output Power Limit
GSM 1 900	1 850 - 1 910	30.00	0.70	30.70	1.17	5.00	3.04	32.66	1.845	-	-	2 W E.I.R.P.
GSM 850	824 - 849	33.00	2.50	35.50	3.55	3.00	2.02	36.48	4.446	34.33	2.71	7 W E.R.P.
WCDMA II	1 850 - 1 910	24.00	1.70	25.70	0.37	5.00	3.04	27.66	0.583	-	-	2 W E.I.R.P.
WCDMA IV	1 710 - 1 755	24.00	1.70	25.70	0.37	5.00	2.70	28.00	0.631	-	-	1 W E.I.R.P.
WCDMA V	824 - 849	24.00	1.70	25.70	0.37	3.00	2.02	26.68	0.466	24.53	0.28	7 W E.R.P.
LTE 7	2 500 - 2 570	23.00	2.70	25.70	0.37	5.00	3.60	27.10	0.513	-	-	2 W E.I.R.P.
LTE 12/17	699 - 716	23.00	2.70	25.70	0.37	3.00	1.82	26.88	0.488	24.73	0.30	3 W E.R.P.
LTE13	777 - 787	23.00	2.70	25.70	0.37	3.00	1.82	26.88	0.488	24.73	0.30	3 W E.R.P.
LTE25/2	1 850 - 1 915	23.00	2.70	25.70	0.37	5.00	3.04	27.66	0.583	-	-	2 W E.I.R.P.
LTE26/5	824 - 849	23.00	2.70	25.70	0.37	3.00	2.02	26.68	0.466	24.53	0.28	7 W E.R.P.
LTE41	2 496 - 2 690	23.00	2.70	25.70	0.37	5.00	3.60	27.10	0.513	-	-	2 W E.I.R.P.
LTE66/4	1 710 - 1 780	23.00	2.70	25.70	0.37	5.00	2.70	28.00	0.631	-	-	1 W E.I.R.P.
LTE71	663 - 698	23.00	2.70	25.70	0.37	-3.00	1.82	20.88	0.122	18.73	0.07	3 W E.R.P.
LTE 26	814 - 824	23.00	2.70	25.70	0.37	3.00	2.02	26.68	0.466	24.53	0.28	100 W E.R.P.

Remark;

1. E.I.R.P. (dBm) = Maximum Conducted Power (dBm) + Antenna Gain (dBi)
2. E.R.P. (dBm) = E.I.R.P. (dBm) - 2.15 (dB); where E.R.P. and E.I.R.P. are expressed in consistent units.

7.7 Test data for Antenna Name: 920-631-002

-. Test Result : Pass

Band	Frequency (MHz)	Target Power (dBm)	Max Tune-up Tolerance (dBm)	Maximum Conducted Power (dBm)	Maximum Conducted Power (W)	Antenna Gain (dBi)	Cable Loss (dB)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (W)	Maximum E.R.P. (dBm)	Maximum E.R.P. (W)	Output Power Limit
GSM 1 900	1 850 - 1 910	30.00	0.70	30.70	1.17	2.00	3.52	29.18	0.828	-	-	2 W E.I.R.P.
GSM 850	824 - 849	33.00	2.50	35.50	3.55	1.10	2.32	34.28	2.679	32.13	1.63	7 W E.R.P.
WCDMA II	1 850 - 1 910	24.00	1.70	25.70	0.37	2.00	3.52	24.18	0.262	-	-	2 W E.I.R.P.
WCDMA IV	1 710 - 1 755	24.00	1.70	25.70	0.37	3.30	3.13	25.87	0.386	-	-	1 W E.I.R.P.
WCDMA V	824 - 849	24.00	1.70	25.70	0.37	1.10	2.32	24.48	0.281	22.33	0.17	7 W E.R.P.
LTE 7	2 500 - 2 570	23.00	2.70	25.70	0.37	6.50	4.16	28.04	0.637	-	-	2 W E.I.R.P.
LTE 12/17	699 - 716	23.00	2.70	25.70	0.37	1.70	2.12	25.28	0.337	23.13	0.21	3 W E.R.P.
LTE13	777 - 787	23.00	2.70	25.70	0.37	1.70	2.12	25.28	0.337	23.13	0.21	3 W E.R.P.
LTE25/2	1 850 - 1 915	23.00	2.70	25.70	0.37	2.00	3.52	24.18	0.262	-	-	2 W E.I.R.P.
LTE26/5	824 - 849	23.00	2.70	25.70	0.37	1.10	2.32	24.48	0.281	22.33	0.17	7 W E.R.P.
LTE41	2 496 - 2 690	23.00	2.70	25.70	0.37	6.50	4.16	28.04	0.637	-	-	2 W E.I.R.P.
LTE66/4	1 710 - 1 780	23.00	2.70	25.70	0.37	3.30	3.13	25.87	0.386	-	-	1 W E.I.R.P.
LTE71	663 - 698	23.00	2.70	25.70	0.37	1.20	2.12	24.78	0.301	22.63	0.18	3 W E.R.P.
LTE 26	814 - 824	23.00	2.70	25.70	0.37	2.30	2.32	25.68	0.370	23.53	0.23	100 W E.R.P.

Remark;

1. E.I.R.P. (dBm) = Maximum Conducted Power (dBm) + Antenna Gain (dBi)
2. E.R.P. (dBm) = E.I.R.P. (dBm) - 2.15 (dB); where E.R.P. and E.I.R.P. are expressed in consistent units.

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OTC-TRF-RF-001(0)

8. Spurious Radiated Emission

8.1 Operating environment

Temperature : 22 °C
 Relative humidity : 48 % R.H.

8.2 Test set-up

Radiated emission measurements are performed in the Semi-Anechoic chamber. The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI C63.26 (2015) Section 5.5.3. The turntable is rotated through 360°, and the receiving antenna scans in order to determine the level of the maximized emission. The level and position of the maximized emission is recorded with the spectrum analyzer using RMS detector.

A vertically polarized half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The power is calculated by the following formula;

$$Pd(\text{dBm}) = Pg(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

Where: Pd is the dipole equivalent power and Pg is the generator output power into the substitution antenna.

The maximum EIRP is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

Limits

§22.917(a), 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.

§24.238(a), 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.

§27.53(c)(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.

§27.53(g), the power of any emission outside a 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, by at least $43 + 10 \log (P)$ dB.

§27.53(h)(1), for operations in the 1 695-1 710 MHz, 1 710-1 755 MHz, 1 755-1 780 MHz, 1 915-1 920 MHz, 1 995-2 000 MHz, 2 000-2 020 MHz, 2 110-2 155 MHz, 2 155-2 180 MHz, and 2 180-2 200 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.

§90.691(a), out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

- (1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \text{ Log}_{10} (f / 6.1)$ decibels or $50 + 10 \text{ Log}_{10} (P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
- (2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \text{ Log}_{10} (P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

Radiated spurious emissions

- 1. Frequency Range : 9 kHz ~ 10th Harmonics of highest channel fundamental frequency.
 - 2. The EUT was setup to maximum output power. The 100 kHz RBW was used to scan from 30 MHz to 1 GHz.
- Also, the 1 MHz RBW was used to scan from 1 GHz to 20 GHz. The high, low and a middle channel were tested for out of band measurements.

WORST CASE SELECTION

The worst-case scenarios have been chosen based on these Margin of Radiated Spurious Emission.

Frequency Range UL (MHz)	Band	RSE Margin [Original Grant]			* RSE Worst Case
		GSM	WCDMA	LTE	
663 - 698	LTE B71	-	-	29.58 dB	<u>B71</u>
699 - 716	LTE B12 B17	-	-	50.46 dB	
777 - 787	LTE B13	-	-	47.58 dB	
814 - 849	B26	-	-	-	<u>B26</u>
824 - 849	WCDMA V, LTE B5, GSM 850	34.41 dB	-	B26	
1710 - 1755	WCDMA IV, LTE B4	-	37.90 dB	B66	<u>B66</u>
1710 - 1780	LTE B66	-	-	20.05 dB	
1850- 1910	WCDMA II, GSM 1900, LTE B2	-	20.47 dB	B25	<u>B25</u>
1850 - 1915	LTE B25	-	-	3.08 dB	
2496 - 2690	LTE B41	-	-	3.07 dB	<u>B41</u>
2500 - 2570	LTE B7	-	-	4.80 dB	

8.3 Test Date

June 08, 2022 ~ June 20, 2022

8.4 Test data for Antenna Name: 920-631-001

8.4.1 Test data for LTE Band 71 (5 BW 1 RB size / 0 Offset)

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (665.5 MHz)							
1 331.00	-52.17	H	0.89	6.9	-46.16	-13	33.16
1 996.50	-55.21	V	1.07	10.4	-45.88	-13	32.88
2 662.00	-63.49	V	1.23	11.1	-53.62	-13	40.62
3 327.50	-65.14	H	1.38	12.3	-54.22	-13	41.22
3 993.00	-64.61	V	1.45	12.7	-53.36	-13	40.36
Test Data for Middle Channel (680.5 MHz)							
1 361.00	-52.88	H	0.91	7.1	-46.69	-13	33.69
2 041.50	-54.64	V	1.14	10.5	-45.28	-13	32.28
2 722.00	-66.30	V	1.23	11.2	-56.33	-13	43.33
3 402.50	-65.51	H	1.47	12.8	-54.18	-13	41.18
4 083.00	-65.86	V	1.46	12.7	-54.62	-13	41.62
Test Data for High Channel (695.5 MHz)							
1 391.00	-53.02	H	0.9	7.4	-46.52	-13	33.52
2 086.50	-55.07	V	1.14	10.5	-45.71	-13	32.71
2 782.00	-65.34	V	1.23	11.2	-55.37	-13	42.37
3 477.50	-65.81	V	1.47	12.6	-54.68	-13	41.68
4 173.00	-65.27	V	1.48	12.9	-53.85	-13	40.85

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation.

“H”: Horizontal, “V”: Vertical

8.4.2 Test data for LTE Band 26 (1.4 BW 1 RB size / 0 Offset)

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (814.7 MHz)							
1 629.40	-56.86	H	0.96	9.2	-48.62	-13	35.62
2 444.10	-61.23	H	1.18	10.6	-51.81	-13	38.81
3 258.80	-56.00	V	1.32	11.7	-45.62	-13	32.62
4 073.50	-63.67	V	1.46	12.8	-52.33	-13	39.33
4 888.20	-62.71	V	1.61	12.8	-51.52	-13	38.52
Test Data for Middle Channel (823.3 MHz)							
1 646.60	-57.62	H	0.96	9.7	-48.88	-13	35.88
2 469.90	-60.83	V	1.18	10.6	-51.41	-13	38.41
3 293.20	-54.36	H	1.32	12	-43.68	-13	30.68
4 116.50	-63.71	V	1.48	12.9	-52.29	-13	39.29
4 939.80	-61.94	V	1.62	12.9	-50.66	-13	37.66

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.4.3 Test data for LTE Band 26/5 (1.4 BW 1 RB size / 0 Offset)

- . Detector : RMS
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (824.7 MHz)							
1 649.40	-55.59	H	0.96	9.7	-46.85	-13	33.85
2 474.10	-60.98	V	1.18	10.6	-51.56	-13	38.56
3 298.80	-57.23	V	1.32	11.7	-46.85	-13	33.85
4 123.50	-61.04	V	1.48	12.9	-49.62	-13	36.62
4 948.20	-62.50	H	1.62	12.9	-51.22	-13	38.22
Test Data for Middle Channel (836.5 MHz)							
1 673.00	-55.62	H	0.96	9.7	-46.88	-13	33.88
2 509.50	-59.83	V	1.19	10.9	-50.12	-13	37.12
3 346.00	-58.17	H	1.38	12.6	-46.95	-13	33.95
4 182.50	-58.94	H	1.48	12.9	-47.52	-13	34.52
5 019.00	-61.19	V	1.64	12.7	-50.13	-13	37.13
Test Data for High Channel (848.3 MHz)							
1 696.60	-56.46	H	0.96	9.9	-47.52	-13	34.52
2 544.90	-59.97	V	1.19	11	-50.16	-13	37.16
3 393.20	-58.75	V	1.38	12.8	-47.33	-13	34.33
4 241.50	-59.94	V	1.48	12.9	-48.52	-13	35.52
5 089.80	-60.92	H	1.64	12.4	-50.16	-13	37.16

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.4.4 Test data for LTE Band 66/4 (1.4 BW 1 RB size / 0 Offset)

- . Detector : RMS
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (1 710.7 MHz)							
3 421.40	-63.65	V	1.47	12.8	-52.32	-13	39.32
5 132.10	-54.32	H	1.64	12.4	-43.56	-13	30.56
6 842.80	-60.24	V	1.92	12.6	-49.56	-13	36.56
8 553.50	-50.93	H	2.12	12	-41.05	-13	28.05
10 264.20	-56.43	H	2.43	11.2	-47.66	-13	34.66
Test Data for Middle Channel (1 745 MHz)							
3 490.00	-62.08	H	1.47	12.4	-51.15	-13	38.15
5 235.00	-53.90	H	1.68	13.3	-42.28	-13	29.28
6 980.00	-59.05	V	1.92	11.9	-49.07	-13	36.07
8 725.00	-49.97	H	2.15	11.6	-40.52	-13	27.52
10 470.00	-56.29	V	2.47	10.8	-47.96	-13	34.96
Test Data for High Channel (1 779.3 MHz)							
3 558.60	-62.64	V	1.5	12.3	-51.84	-13	38.84
5 337.90	-58.22	H	1.71	13.4	-46.53	-13	33.53
7 117.20	-58.59	V	1.92	11.4	-49.11	-13	36.11
8 896.50	-46.03	H	2.18	11.7	-36.51	-13	23.51
10 675.80	-55.95	V	2.47	10.8	-47.62	-13	34.62

- Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst case was found in QPSK modulation
- “H”: Horizontal, “V”: Vertical

8.4.5 Test data for LTE Band 25/2 (20 BW 1 RB size / 0 Offset)

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (1 860 MHz)							
3 720.00	-57.52	H	1.4	12.4	-46.52	-13	33.52
5 580.00	-54.96	V	1.7	13.5	-43.16	-13	30.16
7 440.00	-51.43	H	1.98	11.3	-42.11	-13	29.11
9 300.00	-23.85	H	2.21	10.9	-15.16	-13	2.16
11 160.00	-42.40	H	2.49	11.3	-33.59	-13	20.59
Test Data for Middle Channel (1 882.5 MHz)							
3 765.00	-57.16	V	1.4	12.4	-46.16	-13	33.16
5 647.50	-52.12	V	1.7	13.6	-40.22	-13	27.22
7 530.00	-50.48	H	1.98	11.3	-41.16	-13	28.16
9 412.50	-30.45	H	2.21	11	-21.66	-13	8.66
11 295.00	-47.63	H	2.49	11.6	-38.52	-13	25.52
Test Data for High Channel (1 905 MHz)							
3 810.00	-57.29	V	1.4	12.5	-46.19	-13	33.19
5 715.00	-55.44	V	1.71	13.6	-43.55	-13	30.55
7 620.00	-49.75	H	2.01	11.6	-40.16	-13	27.16
9 525.00	-29.16	H	2.29	11.3	-20.15	-13	7.15
11 430.00	-43.34	V	2.68	11.4	-34.62	-13	21.62

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.4.6 Test data for LTE Band 41 (10 BW 1 RB size / 0 Offset)

- . Detector : RMS
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (2 501 MHz)							
5 002.00	-48.17	H	1.64	12.7	-37.11	-25	12.11
7 503.00	-47.34	V	2.01	11.3	-38.05	-25	13.05
10 004.00	-45.78	V	2.43	11.1	-37.11	-25	12.11
12 505.00	-56.91	H	2.82	13.7	-46.03	-25	21.03
15 006.00	-55.50	H	2.56	12.7	-45.36	-25	20.36
17 507.00	-43.42	V	3.59	12.1	-34.91	-25	9.91
Test Data for Middle Channel (2 593 MHz)							
5 186.00	-48.80	H	1.68	12.9	-37.58	-25	12.58
7 779.00	-42.30	H	2.11	11.9	-32.51	-25	7.51
10 372.00	-55.28	V	2.43	11	-46.71	-25	21.71
12 965.00	-51.39	V	2.89	13.3	-40.98	-25	15.98
15 558.00	-57.82	H	2.39	16	-44.21	-25	19.21
18 151.00	-55.00	V	3.16	17	-41.16	-25	16.16
Test Data for High Channel (2 685 MHz)							
5 370.00	-48.32	H	1.69	13.5	-36.51	-25	11.51
8 055.00	-49.78	H	2.18	11.4	-40.56	-25	15.56
10 740.00	-54.85	V	2.47	10.8	-46.52	-25	21.52
13 425.00	-55.59	V	2.49	12.9	-45.18	-25	20.18
16 110.00	-58.31	V	2.35	16.5	-44.16	-25	19.16
18 795.00	-43.26	V	3.55	17.3	-29.51	-25	4.51

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.5 Test data for Antenna Name: 8705921

8.5.1 Test data for LTE Band 71 (5 BW 1 RB size / 0 Offset)

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (665.5 MHz)							
1 331.00	-52.27	H	0.89	6.9	-46.26	-13	33.26
1 996.50	-55.04	H	1.07	10.4	-45.71	-13	32.71
2 662.00	-61.42	V	1.23	11.1	-51.55	-13	38.55
3 327.50	-62.28	V	1.38	12.3	-51.36	-13	38.36
3 993.00	-64.00	V	1.45	12.7	-52.75	-13	39.75
Test Data for Middle Channel (680.5 MHz)							
1 361.00	-51.31	H	0.91	7.1	-45.12	-13	32.12
2 041.50	-57.52	H	1.14	10.5	-48.16	-13	35.16
2 722.00	-61.34	V	1.23	11.2	-51.37	-13	38.37
3 402.50	-66.95	H	1.47	12.8	-55.62	-13	42.62
4 083.00	-66.33	V	1.46	12.7	-55.09	-13	42.09
Test Data for High Channel (695.5 MHz)							
1 391.00	-50.72	H	0.9	7.4	-44.22	-13	31.22
2 086.50	-53.34	H	1.14	10.5	-43.98	-13	30.98
2 782.00	-64.34	V	1.23	11.2	-54.37	-13	41.37
3 477.50	-63.99	H	1.47	12.6	-52.86	-13	39.86
4 173.00	-63.60	V	1.48	12.9	-52.18	-13	39.18

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.5.2 Test data for LTE Band 26 (1.4 BW 1 RB size / 0 Offset)

- . Detector : RMS
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (814.7 MHz)							
1 629.40	-57.82	V	0.96	9.2	-49.58	-13	36.58
2 444.10	-62.03	V	1.18	10.6	-52.61	-13	39.61
3 258.80	-53.53	H	1.32	11.7	-43.15	-13	30.15
4 073.50	-60.89	H	1.46	12.8	-49.55	-13	36.55
4 888.20	-59.80	H	1.61	12.8	-48.61	-13	35.61
Test Data for Middle Channel (823.3 MHz)							
1 646.60	-56.56	H	0.96	9.7	-47.82	-13	34.82
2 469.90	-60.07	V	1.18	10.6	-50.65	-13	37.65
3 293.20	-52.60	H	1.32	12	-41.92	-13	28.92
4 116.50	-61.57	V	1.48	12.9	-50.15	-13	37.15
4 939.80	-62.26	V	1.62	12.9	-50.98	-13	37.98

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.5.3 Test data for LTE Band 26/5 (1.4 BW 1 RB size / 0 Offset)

- . Detector : RMS
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (824.7 MHz)							
1 649.40	-53.09	V	0.96	9.7	-44.35	-13	31.35
2 474.10	-55.74	V	1.18	10.6	-46.32	-13	33.32
3 298.80	-58.90	V	1.32	11.7	-48.52	-13	35.52
4 123.50	-62.78	H	1.48	12.9	-51.36	-13	38.36
4 948.20	-62.24	H	1.62	12.9	-50.96	-13	37.96
Test Data for Middle Channel (836.5 MHz)							
1 673.00	-56.36	V	0.96	9.7	-47.62	-13	34.62
2 509.50	-54.07	V	1.19	10.9	-44.36	-13	31.36
3 346.00	-56.90	V	1.38	12.6	-45.68	-13	32.68
4 182.50	-58.61	H	1.48	12.9	-47.19	-13	34.19
5 019.00	-60.42	H	1.64	12.7	-49.36	-13	36.36
Test Data for High Channel (848.3 MHz)							
1 696.60	-57.10	V	0.96	9.9	-48.16	-13	35.16
2 544.90	-55.19	V	1.19	11	-45.38	-13	32.38
3 393.20	-56.03	V	1.38	12.8	-44.61	-13	31.61
4 241.50	-60.67	H	1.48	12.9	-49.25	-13	36.25
5 089.80	-58.41	V	1.64	12.4	-47.65	-13	34.65

- Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst case was found in QPSK modulation
- “H”: Horizontal, “V”: Vertical

8.5.4 Test data for LTE Band 66/4 (1.4 BW 1 RB size / 0 Offset)

- . Detector : RMS
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (1 710.7 MHz)							
3 421.40	-61.49	V	1.47	12.8	-50.16	-13	37.16
5 132.10	-52.34	V	1.64	12.4	-41.58	-13	28.58
6 842.80	-59.60	V	1.92	12.6	-48.92	-13	35.92
8 553.50	-52.09	H	2.12	12	-42.21	-13	29.21
10 264.20	-54.62	V	2.43	11.2	-45.85	-13	32.85
Test Data for Middle Channel (1 745 MHz)							
3 490.00	-60.08	V	1.47	12.4	-49.15	-13	36.15
5 235.00	-51.90	H	1.68	13.3	-40.28	-13	27.28
6 980.00	-58.57	V	1.92	11.9	-48.59	-13	35.59
8 725.00	-48.70	H	2.15	11.6	-39.25	-13	26.25
10 470.00	-53.99	V	2.47	10.8	-45.66	-13	32.66
Test Data for High Channel (1 779.3 MHz)							
3 558.60	-60.36	V	1.5	12.3	-49.56	-13	36.56
5 337.90	-57.61	H	1.71	13.4	-45.92	-13	32.92
7 117.20	-58.04	V	1.92	11.4	-48.56	-13	35.56
8 896.50	-44.94	H	2.18	11.7	-35.42	-13	22.42
10 675.80	-52.61	V	2.47	10.8	-44.28	-13	31.28

- Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.
 2. The worst case was found in QPSK modulation
 “H”: Horizontal, “V”: Vertical

8.5.5 Test data for LTE Band 25/2 (20 BW 1 RB size / 0 Offset)

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (1 860 MHz)							
3 720.00	-56.82	V	1.4	12.4	-45.82	-13	32.82
5 580.00	-52.42	V	1.7	13.5	-40.62	-13	27.62
7 440.00	-54.63	V	1.98	11.3	-45.31	-13	32.31
9 300.00	-25.44	H	2.21	10.9	-16.75	-13	3.75
11 160.00	-43.02	H	2.49	11.3	-34.21	-13	21.21
Test Data for Middle Channel (1 882.5 MHz)							
3 765.00	-58.51	V	1.4	12.4	-47.51	-13	34.51
5 647.50	-53.26	V	1.7	13.6	-41.36	-13	28.36
7 530.00	-49.54	H	1.98	11.3	-40.22	-13	27.22
9 412.50	-29.34	H	2.21	11	-20.55	-13	7.55
11 295.00	-45.42	H	2.49	11.6	-36.31	-13	23.31
Test Data for High Channel (1 905 MHz)							
3 810.00	-57.68	V	1.4	12.5	-46.58	-13	33.58
5 715.00	-53.14	V	1.71	13.6	-41.25	-13	28.25
7 620.00	-49.16	H	2.01	11.6	-39.57	-13	26.57
9 525.00	-28.39	H	2.29	11.3	-19.38	-13	6.38
11 430.00	-41.37	H	2.68	11.4	-32.65	-13	19.65

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.5.6 Test data for LTE Band 41 (10 BW 1 RB size / 0 Offset)

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (2 501 MHz)							
5 002.00	-49.58	V	1.64	12.7	-38.52	-25	13.52
7 503.00	-46.85	V	2.01	11.3	-37.56	-25	12.56
10 004.00	-46.59	V	2.43	11.1	-37.92	-25	12.92
12 505.00	-56.44	H	2.82	13.7	-45.56	-25	20.56
15 006.00	-53.41	V	2.56	12.7	-43.27	-25	18.27
17 507.00	-45.02	H	3.59	12.1	-36.51	-25	11.51
Test Data for Middle Channel (2 593 MHz)							
5 186.00	-48.04	V	1.68	12.9	-36.82	-25	11.82
7 779.00	-41.35	H	2.11	11.9	-31.56	-25	6.56
10 372.00	-54.42	V	2.43	11	-45.85	-25	20.85
12 965.00	-50.91	H	2.89	13.3	-40.5	-25	15.50
15 558.00	-56.89	H	2.39	16	-43.28	-25	18.28
18 151.00	-53.93	H	3.16	17	-40.09	-25	15.09
Test Data for High Channel (2 685 MHz)							
5 370.00	-47.79	H	1.69	13.5	-35.98	-25	10.98
8 055.00	-50.48	H	2.18	11.4	-41.26	-25	16.26
10 740.00	-53.84	V	2.47	10.8	-45.51	-25	20.51
13 425.00	-54.59	H	2.49	12.9	-44.18	-25	19.18
16 110.00	-59.36	V	2.35	16.5	-45.21	-25	20.21
18 795.00	-44.37	H	3.55	17.3	-30.62	-25	5.62

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.6 Test data for Antenna Name: 920-631-002

8.6.1 Test data for LTE Band 71 (5 BW 1 RB size / 0 Offset)

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (665.5 MHz)							
1 331.00	-53.53	H	0.89	6.9	-47.52	-13	34.52
1 996.50	-56.21	V	1.07	10.4	-46.88	-13	33.88
2 662.00	-61.42	V	1.23	11.1	-51.55	-13	38.55
3 327.50	-63.61	V	1.38	12.3	-52.69	-13	39.69
3 993.00	-62.57	V	1.45	12.7	-51.32	-13	38.32
Test Data for Middle Channel (680.5 MHz)							
1 361.00	-51.70	H	0.91	7.1	-45.51	-13	32.51
2 041.50	-51.74	H	1.14	10.5	-42.38	-13	29.38
2 722.00	-63.30	V	1.23	11.2	-53.33	-13	40.33
3 402.50	-62.96	H	1.47	12.8	-51.63	-13	38.63
4 083.00	-61.47	V	1.46	12.7	-50.23	-13	37.23
Test Data for High Channel (695.5 MHz)							
1 391.00	-51.82	H	0.9	7.4	-45.32	-13	32.32
2 086.50	-51.94	H	1.14	10.5	-42.58	-13	29.58
2 782.00	-63.35	V	1.23	11.2	-53.38	-13	40.38
3 477.50	-63.75	H	1.47	12.6	-52.62	-13	39.62
4 173.00	-64.31	V	1.48	12.9	-52.89	-13	39.89

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.6.2 Test data for LTE Band 26 (1.4 BW 1 RB size / 0 Offset)

- . Detector : RMS
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (814.7 MHz)							
1 629.40	-55.83	H	0.96	9.2	-47.59	-13	34.59
2 444.10	-60.30	V	1.18	10.6	-50.88	-13	37.88
3 258.80	-56.53	V	1.32	11.7	-46.15	-13	33.15
4 073.50	-63.02	H	1.46	12.8	-51.68	-13	38.68
4 888.20	-61.70	H	1.61	12.8	-50.51	-13	37.51
Test Data for Middle Channel (823.3 MHz)							
1 646.60	-56.26	V	0.96	9.7	-47.52	-13	34.52
2 469.90	-60.11	H	1.18	10.6	-50.69	-13	37.69
3 293.20	-53.60	V	1.32	12	-42.92	-13	29.92
4 116.50	-62.70	H	1.48	12.9	-51.28	-13	38.28
4 939.80	-61.60	V	1.62	12.9	-50.32	-13	37.32

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.6.3 Test data for LTE Band 26/5 (1.4 BW 1 RB size / 0 Offset)

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (824.7 MHz)							
1 649.40	-54.12	V	0.96	9.7	-45.38	-13	32.38
2 474.10	-59.97	H	1.18	10.6	-50.55	-13	37.55
3 298.80	-56.34	V	1.32	11.7	-45.96	-13	32.96
4 123.50	-61.80	V	1.48	12.9	-50.38	-13	37.38
4 948.20	-62.96	H	1.62	12.9	-51.68	-13	38.68
Test Data for Middle Channel (836.5 MHz)							
1 673.00	-55.95	V	0.96	9.7	-47.21	-13	34.21
2 509.50	-59.79	H	1.19	10.9	-50.08	-13	37.08
3 346.00	-57.07	V	1.38	12.6	-45.85	-13	32.85
4 182.50	-58.34	H	1.48	12.9	-46.92	-13	33.92
5 019.00	-62.14	V	1.64	12.7	-51.08	-13	38.08
Test Data for High Channel (848.3 MHz)							
1 696.60	-55.46	H	0.96	9.9	-46.52	-13	33.52
2 544.90	-59.02	V	1.19	11	-49.21	-13	36.21
3 393.20	-57.10	H	1.38	12.8	-45.68	-13	32.68
4 241.50	-61.34	V	1.48	12.9	-49.92	-13	36.92
5 089.80	-59.94	V	1.64	12.4	-49.18	-13	36.18

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.6.4 Test data for LTE Band 66/4 (1.4 BW 1 RB size / 0 Offset)

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (1 710.7 MHz)							
3 421.40	-62.71	V	1.47	12.8	-51.38	-13	38.38
5 132.10	-53.91	H	1.64	12.4	-43.15	-13	30.15
6 842.80	-59.84	V	1.92	12.6	-49.16	-13	36.16
8 553.50	-50.47	H	2.12	12	-40.59	-13	27.59
10 264.20	-56.05	V	2.43	11.2	-47.28	-13	34.28
Test Data for Middle Channel (1 745 MHz)							
3 490.00	-62.55	V	1.47	12.4	-51.62	-13	38.62
5 235.00	-55.31	H	1.68	13.3	-43.69	-13	30.69
6 980.00	-61.19	V	1.92	11.9	-51.21	-13	38.21
8 725.00	-51.03	H	2.15	11.6	-41.58	-13	28.58
10 470.00	-56.95	V	2.47	10.8	-48.62	-13	35.62
Test Data for High Channel (1 779.3 MHz)							
3 558.60	-64.42	V	1.5	12.3	-53.62	-13	40.62
5 337.90	-61.22	H	1.71	13.4	-49.53	-13	36.53
7 117.20	-60.66	V	1.92	11.4	-51.18	-13	38.18
8 896.50	-49.04	H	2.18	11.7	-39.52	-13	26.52
10 675.80	-57.66	V	2.47	10.8	-49.33	-13	36.33

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.6.5 Test data for LTE Band 25/2 (20 BW 1 RB size / 0 Offset)

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (1 860 MHz)							
3 720.00	-58.15	V	1.4	12.4	-47.15	-13	34.15
5 580.00	-56.01	V	1.7	13.5	-44.21	-13	31.21
7 440.00	-50.47	H	1.98	11.3	-41.15	-13	28.15
9 300.00	-25.21	H	2.21	10.9	-16.52	-13	3.52
11 160.00	-42.99	V	2.49	11.3	-34.18	-13	21.18
Test Data for Middle Channel (1 882.5 MHz)							
3 765.00	-57.38	V	1.4	12.4	-46.38	-13	33.38
5 647.50	-53.01	V	1.7	13.6	-41.11	-13	28.11
7 530.00	-50.30	H	1.98	11.3	-40.98	-13	27.98
9 412.50	-31.17	H	2.21	11	-22.38	-13	9.38
11 295.00	-46.63	V	2.49	11.6	-37.52	-13	24.52
Test Data for High Channel (1 905 MHz)							
3 810.00	-57.18	V	1.4	12.5	-46.08	-13	33.08
5 715.00	-54.80	H	1.71	13.6	-42.91	-13	29.91
7 620.00	-49.54	H	2.01	11.6	-39.95	-13	26.95
9 525.00	-30.39	H	2.29	11.3	-21.38	-13	8.38
11 430.00	-41.99	H	2.68	11.4	-33.27	-13	20.27

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

8.6.6 Test data for LTE Band 41 (10 BW 1 RB size / 0 Offset)

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Substituted Level (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Ant Gain (dBi)	Corrected Reading (dBm)	Limits (dBm)	Margin (dB)
Test Data for Low Channel (2 501 MHz)							
5 002.00	-49.27	H	1.64	12.7	-38.21	-25	13.21
7 503.00	-47.41	H	2.01	11.3	-38.12	-25	13.12
10 004.00	-47.29	V	2.43	11.1	-38.62	-25	13.62
12 505.00	-57.80	V	2.82	13.7	-46.92	-25	21.92
15 006.00	-57.12	H	2.56	12.7	-46.98	-25	21.98
17 507.00	-44.73	H	3.59	12.1	-36.22	-25	11.22
Test Data for Middle Channel (2 593 MHz)							
5 186.00	-48.17	V	1.68	12.9	-36.95	-25	11.95
7 779.00	-43.00	H	2.11	11.9	-33.21	-25	8.21
10 372.00	-58.08	V	2.43	11	-49.51	-25	24.51
12 965.00	-48.92	H	2.89	13.3	-38.51	-25	13.51
15 558.00	-57.76	V	2.39	16	-44.15	-25	19.15
18 151.00	-54.80	H	3.16	17	-40.96	-25	15.96
Test Data for High Channel (2 685 MHz)							
5 370.00	-48.96	H	1.69	13.5	-37.15	-25	12.15
8 055.00	-48.78	V	2.18	11.4	-39.56	-25	14.56
10 740.00	-53.54	V	2.47	10.8	-45.21	-25	20.21
13 425.00	-55.36	V	2.49	12.9	-44.95	-25	19.95
16 110.00	-57.40	V	2.35	16.5	-43.25	-25	18.25
18 795.00	-44.36	H	3.55	17.3	-30.61	-25	5.61

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

“H”: Horizontal, “V”: Vertical

9. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV30	Rohde & Schwarz	Signal Analyzer	101372	Jul. 14, 2021 (1Y)
MT8821C	ANRITSU	Radio Communication Analyzer	6261849029	Jul. 14, 2021 (1Y)
GP-4303D	LG Precision Co.,Ltd	DC Power Supply	5071069	Jan. 03, 2022(1Y)
ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 18, 2021 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 15, 2022(1Y)
SCU18	Rohde & Schwarz	Pre-Amplifier	102266	Jul. 14, 2021 (1Y)
SCU40A	Rohde & Schwarz	Pre-Amplifier	100436	Jan. 18, 2022(1Y)
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 24, 2022 (2Y)
VULB9163	Schwarzbeck	TRILOG Broadband Antenna	777	Apr. 06, 2022 (2Y)
HLP-2008	TDK	Hybrid Antenna	131313	Feb. 21, 2022 (1Y)
BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1349	Jul. 26, 2021 (1Y)
AH-118	Com-Power	Horn Antenna	10050061	Oct. 15, 2021 (1Y)
BBHA9170178	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 06, 2022 (1Y)
BBHA9170179	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 21, 2022 (1Y)
WRCGV12-821-832-862-873-80ST	Wainwright Instruments GmbH	Band Reject Filter	N/A	Jul. 14, 2021(1Y)
WRCGV14-1690-1710-1785-1805-80ST	Wainwright Instruments GmbH	Band Reject Filter	N/A	Jul. 14, 2021(1Y)
WRCJV16-2480-2500-2570-2590-80ST	Wainwright Instruments GmbH	Band Reject Filter	N/A	Jul. 14, 2021(1Y)
MA-4640-XPET	Innco Systems GmbH	Antenna Master	MA4640/652	N/A
DT2000-2t	Innco Systems GmbH	Turn Table	N/A	N/A