



TEST REPORT

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1. Client ◦ Name : HOIMYUNG ICT Corporation ◦ Address : 1203, 8th Daeryungtechnotown, 96, Gamasan-ro, Geumcheon-gu, Seoul, Republic of Korea ◦ Date of Receipt : 2019-06-03			
2. Use of Report : -			
3. Name of Product and Model : Telematics mangement Terminal / DTM-02L			
4. Manufacturer and Country of Origin : HOIMYUNG ICT Corporation / Korea			
5. FCC ID : 2ARPKDTM-02L			
6. IC Certification : 24504-DTM02L			
6. Date of Test : 2019-07-03 to 2019-08-13			
7. Test Standards : FCC Part 2 / RSS-Gen FCC Part 22 subpart H / RSS-132 FCC Part 24 subpart E / RSS-133 FCC Part 27 subpart C / RSS-130 / RSS-139 / RSS-199			
8. Test Results : Refer to the test result in the test report			
Affirmation	Tested by Name : Heesu Ahn (Signature)		Technical Manager Name : Jaehyong Lee (Signature)
			2019-09-25
KCTL Inc.			
As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.			

Report revision history

Date	Revision	Page No
2019-09-18	Initial report	-
2019-09-25	Updated measurement equipment	31

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1. General information

Client : HOIMYUNG ICT Corporation
Address : 1203, 8th Daeryungtechnotown, 96, Gamasan-ro, Geumcheon-gu, Seoul, Republic of Korea
Manufacturer : HOIMYUNG ICT Corporation
Address : 1203, 8th Daeryungtechnotown, 96, Gamasan-ro, Geumcheon-gu, Seoul, Republic of Korea
Laboratory : KCTL Inc.
Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132
VCCI Registration No. : R-3327, G-198, C-3706, T-1849
Industry Canada Registration No. : 8035A
KOLAS No.: KT231

2. Device information

Equipment under test : Telematics management Terminal
Model : DTM-02L
Frequency range : 2 402 MHz ~ 2 480 MHz (Bluetooth Low Energy)
699.7 MHz ~ 715.3 MHz (LTE Band 12)
824.7 MHz ~ 848.3 MHz (LTE Band 5)
1 710.7 MHz ~ 1 754.3 MHz (LTE Band 4)
1 850.7 MHz ~ 1 909.3 MHz (LTE Band 2)
2 502.5 MHz ~ 2 567.5 MHz (LTE Band 7)
826.4 MHz ~ 846.6 MHz (WCDMA Band V)
1 852.4 MHz ~ 1 907.6 MHz (WCDMA Band II)
Modulation technique : GFSK (Bluetooth Low Energy)
QPSK, 16-QAM (LTE, WCDMA)
Number of channels : Bluetooth(BLE)_40 ch
Power source : DC 12 V, DC 24 V
Antenna specification : Chip Antenna (Bluetooth Low Energy, LTE, WCDMA)
Antenna gain : 3.50 dBi (Bluetooth Low Energy)
1.97 dBi (LTE Band 12)
1.94 dBi (LTE Band 5, WCDMA Band V)
3.03 dBi (LTE Band 4)
2.98 dBi (LTE Band 2, WCDMA Band II)
1.46 dBi (LTE Band 7)
Software version : Ver1.0.1
Hardware version : LTGHTTMS_LTE_R1.0
Operation temperature : -30 °C ~ 70 °C

2.1. Frequency/channel operations

This device contains the following capabilities:

Bluetooth(BDR/EDR/BLE), LTE Band 12, LTE Band 5, LTE Band 4, LTE Band 2, LTE Band 7
WCDMA 850, WCDMA 1900

LTE Band 12

Ch.	Frequency (MHz)
23017	699.7
23095	707.5
23173	715.3

Table 2.1.1. 1.4M BW

Ch.	Frequency (MHz)
23025	700.5
23095	707.5
23165	714.5

Table 2.1.2. 3M BW

Ch.	Frequency (MHz)
23035	701.5
23095	707.5
23155	713.5

Table 2.1.3. 5M BW

Ch.	Frequency (MHz)
23060	704.0
23095	707.5
23130	711.0

Table 2.1.4. 10M BW

LTE Band 5

Ch.	Frequency (MHz)
20407	824.7
20525	836.5
20643	848.3

Table 2.1.5. 1.4M BW

Ch.	Frequency (MHz)
20415	825.5
20525	836.5
20635	847.5

Table 2.1.6. 3M BW

Ch.	Frequency (MHz)
20425	826.5
20525	836.5
20625	846.5

Table 2.1.7. 5M BW

Ch.	Frequency (MHz)
20450	829.0
20525	836.5
20600	844.0

Table 2.1.8. 10M BW

LTE Band 4

Ch.	Frequency (MHz)
19957	1 710.7
20175	1 732.5
20393	1 754.3

Table 2.1.9. 1.4M BW

Ch.	Frequency (MHz)
19965	1 711.5
20175	1 732.5
20385	1 753.5

Table 2.1.10. 3M BW

Ch.	Frequency (MHz)
19975	1 712.5
20175	1 732.5
20375	1 752.5

Table 2.1.11. 5M BW

Ch.	Frequency (MHz)
20000	1 715.0
20175	1 732.5
20350	1 750.0

Table 2.1.12. 10M BW

Ch.	Frequency (MHz)
20025	1 717.5
20175	1 732.5
20325	1 747.5

Table 2.1.13. 15M BW

Ch.	Frequency (MHz)
20050	1 720.0
20175	1 732.5
20300	1 745.0

Table 2.1.14. 20M BW

LTE Band 2

Ch.	Frequency (MHz)
18607	1 850.7
18900	1 880.0
19193	1 909.3

Table 2.1.15. 1.4M BW

Ch.	Frequency (MHz)
18615	1 851.5
18900	1 880.0
19185	1 908.5

Table 2.1.16. 3M BW

Ch.	Frequency (MHz)
18625	1 852.5
18900	1 880.0
19175	1 907.5

Table 2.1.17. 5M BW

Ch.	Frequency (MHz)
18650	1 855.0
18900	1 880.0
19150	1 905.0

Table 2.1.18. 10M BW

Ch.	Frequency (MHz)
18675	1 857.5
18900	1 880.0
19125	1 902.5

Table 2.1.19. 15M BW

Ch.	Frequency (MHz)
18700	1 860.0
18900	1 880.0
19100	1 900.0

Table 2.1.20. 20M BW

LTE Band 7

Ch.	Frequency (MHz)
20775	2 502.5
21100	2 535.0
21425	2 567.5

Table 2.1.21. 5M BW

Ch.	Frequency (MHz)
20800	2 505.0
21100	2 535.0
21400	2 565.0

Table 2.1.22. 10M BW

Ch.	Frequency (MHz)
20825	2 507.5
21100	2 535.0
21375	2 562.5

Table 2.1.23. 15M BW

Ch.	Frequency (MHz)
20850	2 510.0
21100	2 535.0
21350	2 560.0

Table 2.1.24. 20M BW

3. Maximum ERP/EIRP power

LTE Band 12

Mode	Tx frequency (MHz)	Emission designator	ERP	
			Max. power (dBm)	Max. power (W)
LTE Band 12	699.7 ~ 715.3	1M09G7D	19.08	0.081
		1M09W7D	17.59	0.057
	700.5 ~ 714.5	2M70G7D	19.08	0.081
		2M69W7D	17.93	0.062
	701.5 ~ 713.5	4M48G7D	19.45	0.088
		4M50W7D	18.52	0.071
	704.0 ~ 711.0	8M93G7D	19.39	0.087
		9M93W7D	18.46	0.070

LTE Band 5

Mode	Tx frequency (MHz)	Emission designator	ERP		EIRP	
			Max. power (dBm)	Max. power (W)	Max. power (dBm)	Max. power (W)
LTE Band 5	824.7 ~ 848.3	1M09G7D	20.80	0.120	22.95	0.197
		1M09W7D	20.62	0.115	22.77	0.189
	825.5 ~ 847.5	2M70G7D	20.62	0.115	22.77	0.189
		2M69W7D	19.41	0.087	21.56	0.143
	826.5 ~ 846.5	4M48G7D	20.70	0.117	22.85	0.193
		4M49W7D	19.62	0.092	21.77	0.150
	829.0 ~ 844.0	8M93F7D	20.83	0.121	22.98	0.199
		8M93W7D	19.66	0.092	21.81	0.152

LTE Band 4

Mode	Tx frequency (MHz)	Emission designator	EIRP	
			Max. power (dBm)	Max. power (W)
LTE Band 4	1 710.7 ~ 1 754.3	1M10G7D	20.75	0.119
		1M09W7D	19.58	0.091
	1 711.5 ~ 1 753.5	2M70G7D	22.72	0.187
		2M69W7D	21.63	0.146
	1 712.5 ~ 1 752.5	4M48G7D	22.84	0.192
		4M49W7D	21.67	0.147
	1 715.0 ~ 1 750.0	8M93G7D	23.20	0.209
		8M91W7D	21.77	0.150
	1 717.5 ~ 1 747.5	13M4G7D	22.36	0.172
		13M4W7D	21.26	0.134
	1 720.0 ~ 1 745.0	17M9G7D	21.60	0.145
		17M9W7D	20.64	0.116

LTE Band 2

Mode	Tx frequency (MHz)	Emission designator	EIRP	
			Max. power (dBm)	Max. power (W)
LTE Band 2	1 850.7 ~ 1 909.3	1M09G7D	23.38	0.218
		1M09W7D	22.27	0.169
	1 851.5 ~ 1 908.5	2M70G7D	23.16	0.207
		2M69W7D	22.04	0.160
	1 852.5 ~ 1 907.5	4M48G7D	22.69	0.186
		4M49W7D	21.75	0.150
	1 855.0 ~ 1 905.0	8M93G7D	22.83	0.192
		8M93W7D	21.65	0.146
	1 857.5 ~ 1 902.5	13M5G7D	22.66	0.185
		13M5W7D	21.83	0.152
	1 860.0 ~ 1 900.0	17M9G7D	22.85	0.193
		17M9W7D	22.10	0.162

LTE Band 7

Mode	Tx frequency (MHz)	Emission designator	EIRP	
			Max. power (dBm)	Max. power (W)
LTE Band 7	2 502.5 ~ 2 567.5	4M48G7D	22.03	0.160
		4M49W7D	20.94	0.124
	2 505.0 ~ 2 565.0	8M93G7D	22.63	0.183
		8M91W7D	21.28	0.134
	2 507.5 ~ 2 562.5	13M5G7D	22.38	0.173
		13M4W7D	21.28	0.134
	2 510.0 ~ 2 560.0	17M9G7D	23.28	0.213
		17M9W7D	22.04	0.160

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4. Summary of tests

FCC Part Section(s)	RSS Section(s)	Parameter	Test results
2.1046 22.913(a)(5) 24.232(c) 27.50(c),(d), (h)(2)	RSS-Gen(6.12) RSS-130(4.6.3) RSS-132(5.4) RSS-133(6.4) RSS-139(6.5)	Conducted Output Power	N/T ^(note1)
2.1049	RSS-Gen(6.7)	Occupied Bandwidth & 26 dB Bandwidth	N/T ^(note1)
2.1051 22.917(a) 24.238(a) 27.53(g),(h) (m)(4)	RSS-130(4.7) RSS-132(5.5) RSS-133(6.5) RSS-139(6.6)	Band Edge Emissions at Antenna Terminal	N/T ^(note1)
		Spurious Emissions at Antenna Terminal	N/T ^(note1)
24.232(d) 27.50(d)(5)	RSS-130(4.6.1) RSS-132(5.4) RSS-133(6.4) RSS-139(6.5)	Peak to Average Power Ratio	N/T ^(note1)
2.1055 22.355 24.235 27.54	RSS-130(4.5) RSS-132(5.3) RSS-133(6.3) RSS-139(6.4)	Frequency stability	N/T ^(note1)
22.913(a)(5) 24.232(c) 27.50(c),(d) (h)(2)	RSS-130(4.6.3) RSS-132(5.4) RSS-133(6.4) RSS-139(6.5)	Effective Radiated Power & Equivalent Isotropic Radiated Power	Passs
22.917(a) 24.238(a) 27.53(g),(h) (m)(4)	RSS-130(4.7) RSS-132(5.5) RSS-133(6.5) RSS-139(6.6)	Radiated Spurious Emissions	Pass

Notes: (N/T: Not Tested, N/A: Not Applicable)

- This test item was not performed by the request of manufacturer. Please refer to original test report no. HR/2019/1001601(FCC), HR/2019/1001603(IC) issued on Feb. 28, 2019 by SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch.
- All modes of operation were investigated and the worst case emissions are reported with the EUT positioning, modulations and paging service configurations in the test data.
- The test procedure(s) in this report were performed in accordance as following.
 - ANSI C63.26-2015
 - ANSI/TIA-603-E-2016
 - KDB 971168 D01 v03r01

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014.

All measurement uncertainty values are shown with a coverage factor of $k=2$ to indicated a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty(±)	
Radiated spurious emissions	9 kHz ~ 30 MHz	2.28 dB
	30 MHz ~ 1 GHz	3.68 dB
	Above 1 GHz	5.72 dB

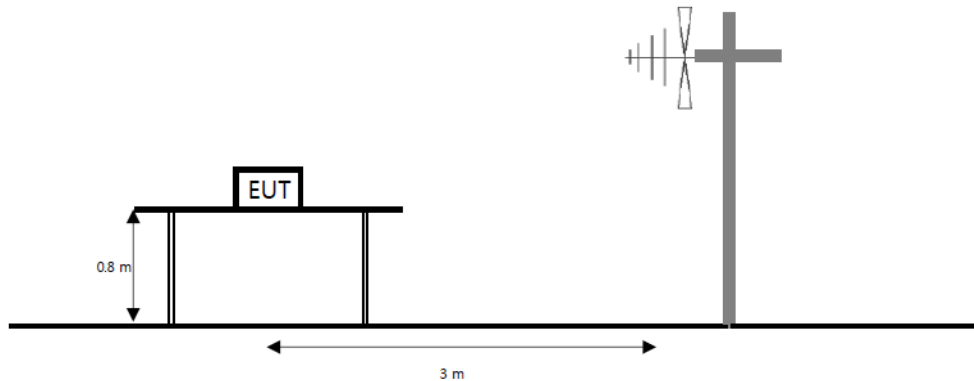
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6. Test results

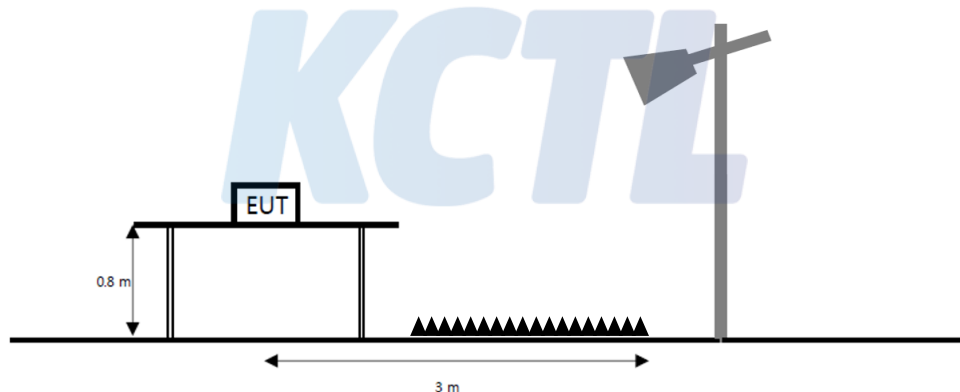
6.1. Radiated Power (ERP/EIRP)

Test setup

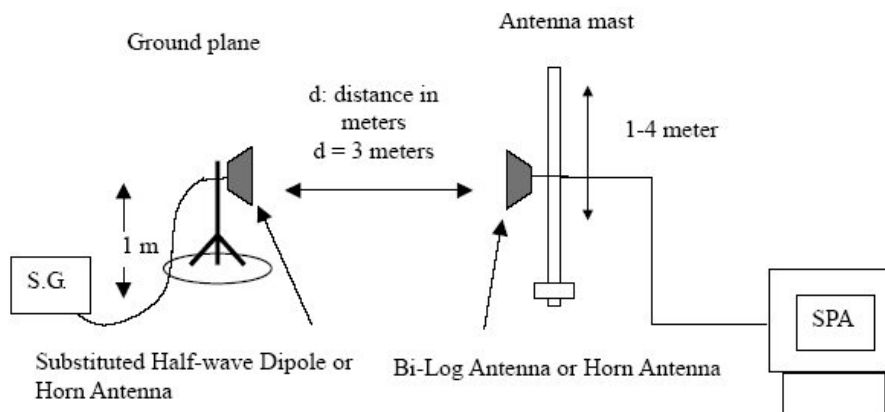
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz emissions, whichever is lower.



The diagram below shows the test setup for substituted method.



Limit

According to §22.913(a)(5), the ERP of transmitters in the cellular radiotelephone service must not exceed the limits in this section. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to RSS-132(5.4), the equivalent isotropically radiated power (e.i.r.p) for mobile equipment shall not exceed 11.5 watts. Refer to SRSP-503 for base stations e.i.r.p limits.

According to §24.232(c) and RSS-133(6.4), 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 §27.50(c)(10) and RSS-130(6.5), Portable stations (hand-held devices) in the 698 -746 MHz, 746-757MHz, 776-788MHz, and 805-806 MHz bands are limited 3 watts ERP.

According to §27.50(d)(4) and RSS-139(6.5), 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 1 watt EIRP.

According to §27.50(d)(2), Mobile and other user stations. Mobile stations are limited 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

Test procedure

971168 D01 v03r01 - Section 5.2.2

ANSI 63.26-2015 – Section 5.2.4.4.1

ANSI/TIA-603-E-2016 - Section 2.2.17

Test settings

- 1) RBW = 1 % to 5 % of the OBW.
- 2) VBW $\geq 3 \times$ RBW.
- 3) SPAN = 2 $\times$ to 3 $\times$ the OBW.
- 4) Number of measurement points in sweep $\geq 2 \times$ span / RBW.
- 5) Sweep time :
 - 1) Auto couple, or
 - 2) $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission period})]$ for single sweep (automation-compatible) measurement. Transmission period is the on and off time of the transmitter.
- 6) Detector = RMS
- 7) If the EUT can be configured to transmit continuously, then set the trigger to free run.
- 8) If the EUT cannot be configured to transmit continuously, then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Verify that the sweep time is less than or equal to the transmission burst duration. Time gating can also be used under similar constraints (i.e., configured such that measurement data is collected only during active full-power transmissions).

- 9) Trace mode = trace averaging (RMS) over 100 sweeps.
- 10) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
- 11) Allow trace to fully stabilize.

Notes:

1. On a test site, the EUT shall be placed at 80 cm height on a turn table, and in the position close To normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to Correspond to the fundamental frequency of the transmitter.
3. The turntable is rotated through 360°, and the receiving antenna scans in order to determine the Level of the maximized emission.
4. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
5. The maximum signal level detected by the measuring receiver shall be noted.
6. The EUT was replaced by half-wave dipole (1 GHz below) or horn antenna (1 GHz above) connected to a signal generator.

The power is calculated by the following formula;

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

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

7. The test antenna shall be raised and lowered through the specified range of height to ensure that The maximum signal is received.
8. The input signal to the substitution antenna shall be adjusted to the level that produces a level Detected by the measuring corrected for the change of input attenuator setting of the measuring Receiver.
9. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for Any change of input attenuator setting of the measuring receiver.
10. The measurement shall be repeated with the test antenna and the substitution antenna Orientated for horizontal polarization.

Test results

Test mode: LTE Band 12

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
1.4 M	QPSK	699.7	H	-0.60	3.40	23.08	19.08	0.081
		707.5	H	-0.70	3.42	22.05	17.93	0.062
		715.3	H	-0.80	3.44	20.99	16.75	0.047
	16QAM	699.7	H	-0.60	3.40	21.59	17.59	0.057
		707.5	H	-0.70	3.42	21.48	17.36	0.054
		715.3	H	-0.80	3.44	19.87	15.63	0.037
3 M	QPSK	700.5	H	-0.70	3.40	23.18	19.08	0.081
		707.5	H	-0.70	3.42	22.45	18.33	0.068
		714.5	H	-0.80	3.44	21.18	16.94	0.049
	16QAM	700.5	H	-0.70	3.40	21.98	17.88	0.061
		707.5	H	-0.70	3.42	22.05	17.93	0.062
		714.5	H	-0.80	3.44	19.95	15.71	0.037
5 M	QPSK	701.5	H	-0.70	3.40	23.55	19.45	0.088
		707.5	H	-0.70	3.42	23.14	19.02	0.080
		713.5	H	-0.80	3.44	21.78	17.54	0.057
	16QAM	701.5	H	-0.70	3.40	22.62	18.52	0.071
		707.5	H	-0.70	3.42	22.35	18.23	0.067
		713.5	H	-0.80	3.44	20.69	16.45	0.044
10 M	QPSK	704.0	H	-0.70	3.40	23.49	19.39	0.087
		707.5	H	-0.70	3.42	23.26	19.14	0.082
		711.0	H	-0.80	3.42	21.95	17.73	0.059
	16QAM	704.0	H	-0.70	3.40	22.56	18.46	0.070
		707.5	H	-0.70	3.42	22.14	18.02	0.063
		711.0	H	-0.80	3.42	20.96	16.74	0.047

Note.

1. E.R.P & E.I.R.P(dBm) = Substitute Level(dB) + Antenna gain(dBi) - C.L(Cable loss) (dB)

Test mode: LTE Band 5

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP		EIRP Note.1	
		[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]	[dBm]	[W]
1.4 M	QPSK	824.7	H	-0.60	3.69	23.25	18.96	0.079	21.11	0.129
		836.5	H	-0.50	3.72	24.53	20.31	0.107	22.46	0.176
		848.3	H	-0.50	3.74	25.04	20.80	0.120	22.95	0.197
	16QAM	824.7	H	-0.60	3.69	24.57	20.28	0.107	22.43	0.175
		836.5	H	-0.50	3.72	24.84	20.62	0.115	22.77	0.189
		848.3	H	-0.50	3.74	23.62	19.38	0.087	21.53	0.142
3 M	QPSK	825.5	H	-0.60	3.70	23.12	18.82	0.076	20.97	0.125
		836.5	H	-0.50	3.72	24.39	20.17	0.104	22.32	0.171
		847.5	H	-0.50	3.74	24.86	20.62	0.115	22.77	0.189
	16QAM	825.5	H	-0.60	3.70	22.09	17.79	0.060	19.94	0.099
		836.5	H	-0.50	3.72	23.37	19.15	0.082	21.30	0.135
		847.5	H	-0.50	3.74	23.65	19.41	0.087	21.56	0.143
5 M	QPSK	826.5	H	-0.60	3.71	23.08	18.77	0.075	20.92	0.124
		836.5	H	-0.50	3.72	24.09	19.87	0.097	22.02	0.159
		846.5	H	-0.50	3.73	24.93	20.70	0.117	22.85	0.193
	16QAM	826.5	H	-0.60	3.71	22.03	17.72	0.059	19.87	0.097
		836.5	H	-0.50	3.72	23.22	19.00	0.079	21.15	0.130
		846.5	H	-0.50	3.73	23.85	19.62	0.092	21.77	0.150
10 M	QPSK	829.0	H	-0.60	3.71	24.17	19.86	0.097	22.01	0.159
		836.5	H	-0.50	3.72	24.18	19.96	0.099	22.11	0.163
		844.0	H	-0.50	3.73	25.06	20.83	0.121	22.98	0.199
	16QAM	829.0	H	-0.60	3.71	22.18	17.87	0.061	20.02	0.100
		836.5	H	-0.50	3.72	23.32	19.10	0.081	21.25	0.133
		844.0	H	-0.50	3.73	23.89	19.66	0.092	21.81	0.152

Note.

1. The E.I.R.P conversion formula for IC : E.I.R.P result(dBm)

= E.R.P result (dBm) + 2.15 (dB)

2. E.R.P & E.I.R.P(dBm) = Substitute Level(dB) + Antenna gain(dBi) - C.L(Cable loss) (dB)

Test mode: LTE Band 4

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EIRP	
		[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
1.4 M	QPSK	1 710.7	H	4.00	5.48	20.27	18.79	0.076
		1 732.5	H	3.80	5.52	22.47	20.75	0.119
		1 754.3	H	3.90	5.55	20.68	19.03	0.080
	16QAM	1 710.7	H	4.00	5.48	19.93	18.45	0.070
		1 732.5	H	3.80	5.52	21.30	19.58	0.091
		1 754.3	H	3.90	5.55	19.35	17.70	0.059
3 M	QPSK	1 711.5	H	4.00	5.48	22.57	21.09	0.129
		1 732.5	H	3.80	5.52	24.44	22.72	0.187
		1 753.5	H	3.90	5.56	22.80	21.14	0.130
	16QAM	1 711.5	H	4.00	5.48	22.20	20.72	0.118
		1 732.5	H	3.80	5.52	23.35	21.63	0.146
		1 753.5	H	3.90	5.56	21.52	19.86	0.097
5 M	QPSK	1 712.5	H	4.00	5.49	22.52	21.03	0.127
		1 732.5	H	3.80	5.52	24.56	22.84	0.192
		1 752.5	H	3.90	5.55	23.12	21.47	0.140
	16QAM	1 712.5	H	4.00	5.49	21.72	20.23	0.105
		1 732.5	H	3.80	5.52	23.39	21.67	0.147
		1 752.5	H	3.90	5.55	21.86	20.21	0.105
10 M	QPSK	1 715.0	H	4.00	5.50	21.65	20.15	0.104
		1 732.5	H	3.80	5.52	24.92	23.20	0.209
		1 750.0	H	3.90	5.54	22.53	20.89	0.123
	16QAM	1 715.0	H	4.00	5.50	21.64	20.14	0.103
		1 732.5	H	3.80	5.52	23.49	21.77	0.150
		1 750.0	H	3.90	5.54	21.87	20.23	0.105
15 M	QPSK	1 717.5	H	4.00	5.49	22.59	21.10	0.129
		1 732.5	H	3.80	5.52	24.08	22.36	0.172
		1 747.5	H	3.90	5.54	22.06	20.42	0.110
	16QAM	1 717.5	H	4.00	5.49	22.24	20.75	0.119
		1 732.5	H	3.80	5.52	22.98	21.26	0.134
		1 747.5	H	3.90	5.54	20.12	18.48	0.070
20 M	QPSK	1 720.0	H	3.90	5.50	23.19	21.59	0.144
		1 732.5	H	3.80	5.52	23.32	21.60	0.145
		1 745.0	H	3.90	5.56	23.00	21.34	0.136
	16QAM	1 720.0	H	3.90	5.50	22.09	20.49	0.112
		1 732.5	H	3.80	5.52	22.36	20.64	0.116
		1 745.0	H	3.90	5.56	22.00	20.34	0.108

Note.

1. E.R.P & E.I.R.P(dBm) = Substitute Level(dB) + Antenna gain(dBi) - C.L(Cable loss) (dB)

Test mode: LTE Band 2

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EIRP	
		[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
1.4 M	QPSK	1 850.7	H	4.60	5.74	20.79	19.65	0.092
		1 880.0	H	4.90	5.78	24.26	23.38	0.218
		1 909.3	H	4.90	5.80	23.79	22.89	0.195
	16QAM	1 850.7	H	4.60	5.74	20.05	18.91	0.078
		1 880.0	H	4.90	5.78	23.15	22.27	0.169
		1 909.3	H	4.90	5.80	22.44	21.54	0.143
3 M	QPSK	1 851.5	H	4.60	5.74	22.55	21.41	0.138
		1 880.0	H	4.90	5.78	24.04	23.16	0.207
		1 908.5	H	4.90	5.81	23.10	22.19	0.166
	16QAM	1 851.5	H	4.60	5.74	21.09	19.95	0.099
		1 880.0	H	4.90	5.78	22.92	22.04	0.160
		1 908.5	H	4.90	5.81	22.32	21.41	0.138
5 M	QPSK	1 852.5	H	4.60	5.74	21.91	20.77	0.119
		1 880.0	H	4.90	5.78	23.57	22.69	0.186
		1 907.5	H	4.90	5.80	23.14	22.24	0.167
	16QAM	1 852.5	H	4.60	5.74	20.69	19.55	0.090
		1 880.0	H	4.90	5.78	22.63	21.75	0.150
		1 907.5	H	4.90	5.80	22.00	21.10	0.129
10 M	QPSK	1 855.0	H	4.60	5.75	22.07	20.92	0.124
		1 880.0	H	4.90	5.78	23.71	22.83	0.192
		1 905.0	H	4.90	5.79	23.67	22.78	0.190
	16QAM	1 855.0	H	4.60	5.75	20.63	19.48	0.089
		1 880.0	H	4.90	5.78	22.53	21.65	0.146
		1 905.0	H	4.90	5.79	22.07	21.18	0.131
15 M	QPSK	1 857.5	H	4.60	5.75	21.78	20.63	0.116
		1 880.0	H	4.90	5.78	23.54	22.66	0.185
		1 902.5	H	4.90	5.79	22.53	21.64	0.146
	16QAM	1 857.5	H	4.60	5.75	20.62	19.47	0.089
		1 880.0	H	4.90	5.78	22.71	21.83	0.152
		1 902.5	H	4.90	5.79	22.20	21.31	0.135
20 M	QPSK	1 860.0	H	4.60	5.75	21.50	20.35	0.108
		1 880.0	H	4.90	5.78	23.73	22.85	0.193
		1 900.0	H	4.90	5.79	22.88	21.99	0.158
	16QAM	1 860.0	H	4.60	5.75	20.48	19.33	0.086
		1 880.0	H	4.90	5.78	22.98	22.10	0.162
		1 900.0	H	4.90	5.79	22.05	21.16	0.131

Note.

1. E.R.P & E.I.R.P(dBm) = Substitute Level(dB) + Antenna gain(dBi) - C.L(Cable loss) (dB)

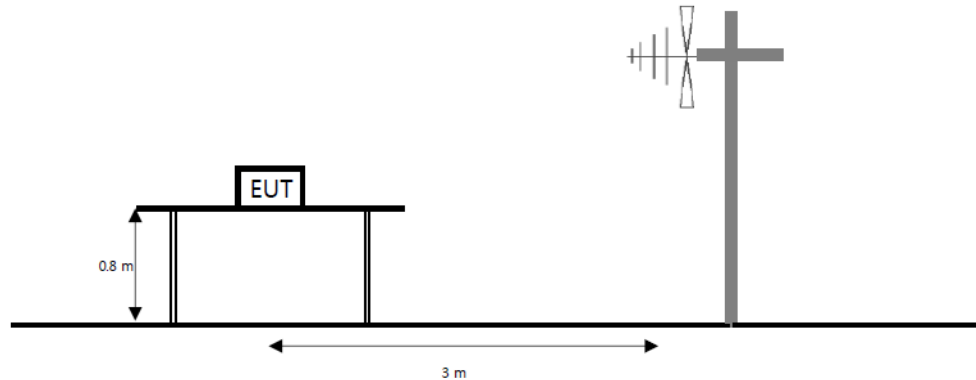
Test mode: LTE Band 7

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EIRP	
		[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
5 M	QPSK	2 502.5	H	6.30	6.62	21.36	21.04	0.127
		2 535.0	H	6.40	6.72	22.11	21.79	0.151
		2 567.5	H	6.40	6.78	22.41	22.03	0.160
	16QAM	2 502.5	H	6.30	6.62	20.18	19.86	0.097
		2 535.0	H	6.40	6.72	21.26	20.94	0.124
		2 567.5	H	6.40	6.78	21.05	20.67	0.117
10 M	QPSK	2 505.0	H	6.30	6.64	20.32	19.98	0.100
		2 535.0	H	6.40	6.72	22.28	21.96	0.157
		2 565.0	H	6.40	6.75	22.98	22.63	0.183
	16QAM	2 505.0	H	6.30	6.64	19.44	19.10	0.081
		2 535.0	H	6.40	6.72	21.04	20.72	0.118
		2 565.0	H	6.40	6.75	21.63	21.28	0.134
15 M	QPSK	2 507.5	H	6.30	6.64	20.65	20.31	0.107
		2 535.0	H	6.40	6.72	22.18	21.86	0.153
		2 562.5	H	6.40	6.74	22.72	22.38	0.173
	16QAM	2 507.5	H	6.30	6.64	19.25	18.91	0.078
		2 535.0	H	6.40	6.72	21.32	21.00	0.126
		2 562.5	H	6.40	6.74	21.62	21.28	0.134
20 M	QPSK	2 510.0	H	6.30	6.67	21.14	20.77	0.119
		2 535.0	H	6.40	6.72	22.27	21.95	0.157
		2 560.0	H	6.40	6.75	23.63	23.28	0.213
	16QAM	2 510.0	H	6.30	6.67	19.08	18.71	0.074
		2 535.0	H	6.40	6.72	21.13	20.81	0.121
		2 560.0	H	6.40	6.75	22.39	22.04	0.160

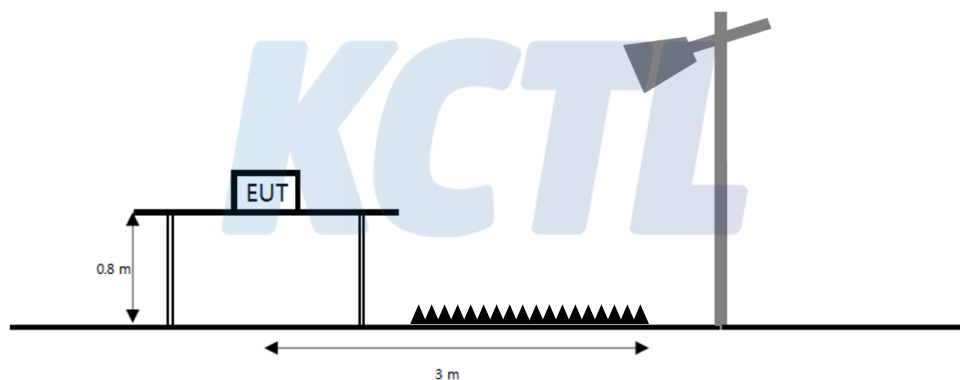
6.2. Radiated Spurious Emissions

Test setup

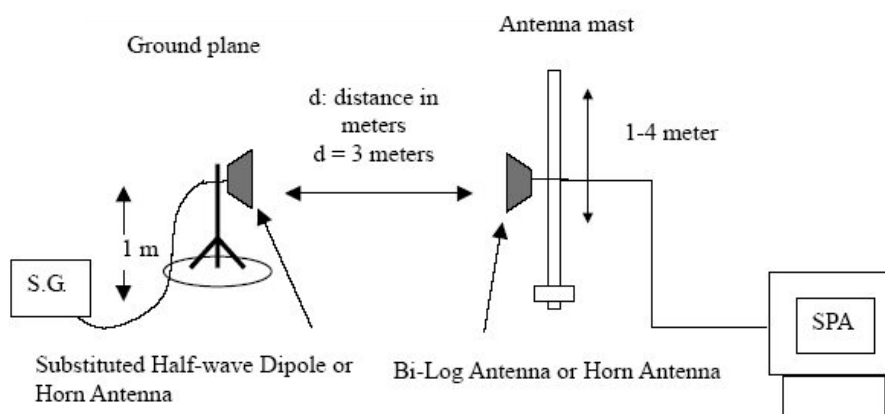
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz emissions, whichever is lower.



The diagram below shows the test setup for substituted method.



Limit

According to §22.917(a), §24.238(a) and RSS-132(5.5), RSS-133(6.5), 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 $43 + 10\log(P_{\text{[Watts]}})$ dB.

According to §27.53(g) and RSS-130(4.7), for operations in the 600 MHz band and the 698-746 MHz band, 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 $43 + 10\log(P_{\text{[Watts]}})$ dB.

According to §27.53(m)(4), the minimum permissible attenuation level of any spurious emission is $55 + 10\log(P_{\text{[Watts]}})$ dB.

According to RSS-133, the emission power per any 1 % of the emission bandwidth shall be attenuated (in dB) below the transmitter output power (P) by at least $43 + 10\log(P_{\text{[Watts]}})$ dB.

According to §27.53(h) and RSS-139(6.6), the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\log(P_{\text{[Watts]}})$ dB.

Test procedure

971168 D01 v03r01 - Section 5.8

ANSI 63.26-2015 – Section 5.5

ANSI/TIA-603-E-2016 - Section 2.2.12

Test settings

- 1) RBW = 1 kHz for below 1 GHz and 1 MHz for above 1 GHz.
- 2) VBW $\geq 3 \times$ RBW.
- 3) Detector = RMS
- 4) Trace mode = Max hold
- 5) Sweep time = Auto couple
- 6) Number of sweep points $\geq 2 \times$ span / RBW
- 7) Allow trace to fully stabilize.

Notes:

1. On a test site, the EUT shall be placed at 80 cm height on a turn table, and in the position close To normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to Correspond to the fundamental frequency of the transmitter.
3. The turntable is rotated through 360°, and the receiving antenna scans in order to determine the Level of the maximized emission.
4. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
5. The maximum signal level detected by the measuring receiver shall be noted.
6. The EUT was replaced by half-wave dipole (1 GHz below) or horn antenna (1 GHz above) connected to a signal generator.
7. The test antenna shall be raised and lowered through the specified range of height to ensure that The maximum signal is received.

8. The input signal to the substitution antenna shall be adjusted to the level that produces a level Detected by the measuring corrected for the change of input attenuator setting of the measuring Receiver.
9. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for Any change of input attenuator setting of the measuring receiver.
10. The measurement shall be repeated with the test antenna and the substitution antenna Orientated for horizontal polarization.

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Test results (Above 1 000 MHz)

Test mode : LTE Band 12
 Frequency(MHz) : 701.5
 Channel : 23035
 Bandwidth(MHz) : 5

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 403.02	H	4.93	4.94	-48.89	-48.90	-13.00	35.90
	2 806.10	V	6.73	7.06	-53.87	-54.20	-13.00	41.20
	3 507.14	V	8.01	7.92	-51.59	-51.50	-13.00	38.50
	4 209.18	V	8.88	8.67	-53.11	-52.90	-13.00	39.90
	4 910.22	V	9.48	9.52	-52.16	-52.20	-13.00	39.20

Test mode : LTE Band 12
 Frequency(MHz) : 707.5
 Channel : 23095
 Bandwidth(MHz) : 5

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 410.52	H	4.99	4.95	-42.94	-42.90	-13.00	29.90
	2 116.06	H	5.76	6.1	-49.26	-49.60	-13.00	36.60
	2 821.10	H	6.75	7.08	-54.77	-55.10	-13.00	42.10
	3 526.64	V	8.03	7.94	-53.69	-53.60	-13.00	40.60
	4 232.18	V	8.92	8.69	-47.33	-47.10	-13.00	34.10
	4 937.22	V	9.49	9.54	-48.65	-48.70	-13.00	35.70

Note.

1. Limit Calculation(dBm)= 43 + 10log(P_[Watts])

Test mode : LTE Band 12

Frequency(MHz) : 713.5

Channel : 23155

Bandwidth(MHz) : 5

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 422.52	H	5.10	4.97	-42.83	-42.70	-13.00	29.70
	2 133.56	H	5.79	6.13	-51.86	-52.20	-13.00	39.20
	2 845.10	H	6.78	7.11	-52.17	-52.50	-13.00	39.50
	3 556.14	V	8.06	7.95	-53.71	-53.60	-13.00	40.60
	4 268.68	V	8.98	8.75	-48.13	-47.90	-13.00	34.90
	4 979.22	V	9.50	9.50	-49.5	-49.50	-13.00	36.50

Note.

1. Limit Calculation(dBm)= 43 + 10log(P_[Watts])



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Test mode : LTE Band 5

Frequency(MHz) : 829.0

Channel : 20450

Bandwidth(MHz) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 649.04	H	5.74	5.36	-37.88	-37.50	-13.00	24.50
	2 473.58	H	6.26	6.63	-50.73	-51.10	-13.00	38.10
	3 298.13	V	7.60	7.66	-50.24	-50.30	-13.00	37.30
	4 122.67	V	8.72	8.59	-45.63	-45.50	-13.00	32.50
	4 947.72	V	9.49	9.55	-42.74	-42.80	-13.00	29.80

Test mode : LTE Band 5

Frequency(MHz) : 836.5

Channel : 20525

Bandwidth(MHz) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 673.04	H	5.73	5.40	-43.73	-43.40	-13.00	30.40
	2 509.58	H	6.31	6.64	-49.47	-49.80	-13.00	36.80
	3 345.63	H	7.69	7.72	-52.17	-52.20	-13.00	39.20
	4 181.68	V	8.83	8.65	-51.28	-51.10	-13.00	38.10
	5 018.22	V	9.53	9.62	-46.31	-46.40	-13.00	33.40

Note.

1. Limit Calculation(dBm)= 43 + 10log(P[Watts])

Test mode : LTE Band 5

Frequency(MHz) : 844.0

Channel : 20600

Bandwidth(MHz) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 688.04	V	5.72	5.43	-41.09	-40.80	-13.00	27.80
	2 531.59	H	6.34	6.70	-43.44	-43.80	-13.00	30.80
	3 375.63	V	7.75	7.76	-44.69	-44.70	-13.00	31.70
	4 219.68	V	8.90	8.68	-39.72	-39.50	-13.00	26.50
	5 063.73	V	9.61	9.66	-42.45	-42.50	-13.00	29.50

Note.

1. Limit Calculation(dBm)= 43 + 10log(P[Watts])



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Test mode : LTE Band 4

Frequency(MHz) : 1 715.0

Channel : 20000

Bandwidth(MHz) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	3 421.03	H	7.84	7.81	-51.23	-51.20	-13.00	38.20
	5 132.14	H	9.74	9.67	-44.97	-44.90	-13.00	31.90
	6 842.26	H	10.66	11.28	-47.38	-48.00	-13.00	35.00
	8 553.37	H	12.98	12.61	-44.97	-44.60	-13.00	31.60

Test mode : LTE Band 4

Frequency(MHz) : 1 732.5

Channel : 20175

Bandwidth(MHz) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	3 465.03	H	7.93	7.86	-52.47	-52.40	-13.00	36.30
	5 197.15	H	9.85	9.73	-51.92	-51.80	-13.00	27.00
	6 930.26	H	10.63	11.40	-48.53	-49.30	-13.00	36.30
	15 591.84	V	13.76	17.08	-36.68	-40.00	-13.00	27.00

Test mode : LTE Band 4

Frequency(MHz) : 1 750.0

Channel : 20350

Bandwidth(MHz) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	3 509.03	H	8.01	7.92	-49.89	-49.80	-13.00	36.80
	5 263.15	H	9.97	9.69	-44.88	-44.60	-13.00	31.60
	7 017.27	H	10.65	11.34	-40.11	-40.80	-13.00	27.80
	8 772.38	H	12.89	12.9	-41.89	-41.90	-13.00	28.90
	15 789.85	V	13.68	17.38	-35.6	-39.30	-13.00	26.30

Note.

1. Limit Calculation(dBm)= 43 + 10log(P[Watts])

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Test mode : LTE Band 2

Frequency(MHz) : 1 850.7

Channel : 18607

Bandwidth(MHz) : 1.4

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	5 552.17	H	10.42	10.05	-51.17	-50.80	-13.00	37.80
	7 402.29	H	11.73	11.62	-45.81	-45.70	-13.00	32.70
	9 253.42	V	12.85	13.13	-45.42	-45.70	-13.00	32.70
	11 103.54	V	13.00	14.42	-39.68	-41.10	-13.00	28.10

Test mode : LTE Band 2

Frequency(MHz) : 1 880.0

Channel : 18900

Bandwidth(MHz) : 1.4

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	3 760.05	V	8.26	8.24	-52.02	-52.00	-13.00	39.00
	5 640.18	H	10.46	10.18	-43.98	-43.70	-13.00	30.70
	7 519.30	H	12.02	11.82	-40.70	-40.50	-13.00	27.50
	9 399.43	H	12.88	13.31	-41.67	-42.10	-13.00	29.10
	11 279.55	V	13.00	14.49	-39.61	-41.10	-13.00	28.10
	15 038.80	V	13.89	16.81	-36.58	-39.50	-13.00	26.50

Note.

1. Limit Calculation(dBm)= 43 + 10log(P[Watts])

Test mode : LTE Band 2

Frequency(MHz) : 1 909.3

Channel : 19193

Bandwidth(MHz) : 1.4

Mode	Frequency [MHz]	Pol. [V/H]	Antenna Gain [dBi]	Cable loss [dB]	Substitute Level [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]
QPSK	3 818.06	V	8.32	8.21	-52.71	-52.60	-13.00	39.60
	5 727.18	H	10.49	10.45	-46.54	-46.50	-13.00	33.50
	7 636.31	H	12.14	11.92	-38.72	-38.50	-13.00	25.50
	9 546.44	H	12.86	13.32	-40.14	-40.60	-13.00	27.60
	15 273.82	V	13.85	17.04	-35.91	-39.10	-13.00	26.10

Note.

1. Limit Calculation(dBm)= 43 + 10log(P[Watts])



Test mode : LTE Band 7

Frequency(MHz) : 2 510.0

Channel : 20850

Bandwidth(MHz) : 20

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	5 038.14	H	9.57	9.63	-46.04	-46.10	-25.00	21.10
	7 556.30	H	12.06	11.85	-50.61	-50.40	-25.00	25.40
	10 076.47	H	12.56	13.74	-38.02	-39.20	-25.00	14.20

Test mode : LTE Band 7

Frequency(MHz) : 2 535.0

Channel : 21100

Bandwidth(MHz) : 20

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	5 070.14	H	9.63	9.66	-45.17	-45.20	-25.00	20.20
	7 604.31	H	12.1	11.89	-49.31	-49.10	-25.00	24.10
	10 139.48	H	12.61	13.76	-40.05	-41.20	-25.00	16.20

Test mode : LTE Band 7

Frequency(MHz) : 2 560.0

Channel : 21350

Bandwidth(MHz) : 20

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	5 120.14	V	9.72	9.66	-39.46	-39.40	-25.00	14.40
	7 679.31	V	12.18	11.96	-48.82	-48.60	-25.00	23.60
	10 239.48	V	12.69	13.82	-37.37	-38.50	-25.00	13.50

Note.

1. Limit Calculation(dBm)= 55 + 10log(P[Watts])

7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal Generator	R&S	SMB100A	176206	19.01.25	20.01.25
High pass Filter	Wainwright Instruments GmbH	WHKX3.0/18G-12SS	44	19.01.25	20.01.25
High pass Filter	Wainwright Instruments GmbH	WHKX1.0/1.5S-10SS	14	19.01.25	20.01.25
Attenuator	Weinschel ENGINEERING	10	AJ1239	19.05.14	20.05.14
Attenuator	API Inmet	40AH2W-10	12	19.05.15	20.05.15
Spectrum Analyzer	AGILENT	N9040B	MY57010132	19.07.31	20.07.31
Amplifier	SONOMA INSTRUMENT	317	321041	19.01.04	20.01.04
Amplifier	L-3 Narda-MITEQ	AMF-7D-01001800-22-10P	2031196	19.02.21	20.02.21
Amplifier	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000997	19.08.01	20.08.01
Bilog Antenna	Teseq GmbH	CBL 6143A	35039	20.05.21	21.05.21
Biconical VHF-UHF Broadband Antenna	SCHWARZBECK	VUBA9117	275	19.04.13	20.04.13
Horn Antenna	ETS.lindgren	3117	161225	19.05.22	20.05.22
Horn Antenna	ETS.lindgren	3117-PA	00161083	18.09.19	19.09.19
Horn Antenna	ETS.lindgren	3116	00086635	19.05.09	20.05.09
Horn Antenna	ETS.lindgren	3116	00086632	19.05.09	20.05.09
Antenna Mast	MATURO	EAS 1.5	042/8941211	N/A	N/A
Antenna Mast	MATURO	EAS 1.5	043/8941211	N/A	N/A
Turn Table	MATURO	TT 0.8 PF	041/8941211	N/A	N/A
Cable Assembly	Radiall	R286303620	1649.241	N/A	N/A
Cable Assembly	Radiall	TESTPRO 3	-	N/A	N/A

End of test report