TEST REPORT

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Suwon-si, Gyeonggi-do, 16677, Korea
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KCTL

1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2020-09-28

2. Use of Report : Class II Permissive change

3. Name of Product / Model : Mobile phone / SM-F415F/DS

4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Vietnam

5. FCC ID : A3LSMM315F

6. Date of Test : 2020-10-06 to 2020-10-15

7. Location of Test : ■ Permanent Testing Lab □ On Site Testing (Address: Address of testing location)

8. Test method used : FCC Part 2
FCC Part 22 subpart H
FCC Part 24 subpart E
FCC Part 27 subpart L

9. Test Results : Refer to the test result in the test report

	Tested by	Technical Manager
Affirmation	Name : Kwonse Kim (Signature)	Name : Seungyong Kim (Signature)

2020-10-19

KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2020-10-16	Originally issued	-
2020-10-19	Updated	3, 9, 10

Note. The report No. KR20-SRF0268 is superseded by the report No. KR20-SRF0268-A.

General remarks for test reports

Nothing significant to report.

CONTENTS

1. General information

Client	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory	:	Samsung Electronics Vietnam Thai Nguyen Co., Ltd
Address	:	506-723 16000 Yen Phong 1 Industrial Zone, Yen Trung Commu, Yen Phong District, Bac Ninh Province, Vietnm
Factory	:	Samsung India Electronics PVT. Ltd
Address	:	B-1, Sector-8 NOIDA Uttar Pradeshe, India 201-305
Factory	:	Samsung Electronics Co., Ltd.
Address	:	94-1, Imsu-dong, Gumi-si, Gyengsangbuk-ro, 730-722, 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-20080, G-20078, C-20059, T-20056 Industry Canada Registration No. : 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	Mobile phone
Model	:	SM-F415F/DS
Modulation technique	:	Bluetooth(BDR/EDR)_ GFSK, π/4DQPSK, 8DPSK Bluetooth(BLE)_GFSK WIFI(802.11b/g/n20/n40/ac20/ac40/ac80)_DSSS, OFDM LTE_QPSK, 16QAM WCDMA_QPSK GSM_GMSK, 8-PSK
Number of channels	:	Bluetooth(BDR/EDR)_79 ch / Bluetooth(BLE)_40 ch WIFI(802.11b/g/n20)_11 ch UNII-1 : 4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒) UNII-2A : 4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒) UNII-2C : 12 ch (20 ㎒), 6 ch (40 ㎒), 3 ch (80 ㎒) UNII-3 : 5 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)
Power source	:	DC 3.85 Ⅴ
Antenna specification	:	LTE/GSM/WCDMA_LDS Antenna WIFI/Bluetooth(BDR/EDR/BLE)_LDS Antenna

Antenna gain	:	WIFI/Bluetooth(BDR/EDR/BLE) : -3.4 dBi
		UNII-1 -5.9 dBi
		UNII-2A -6.3 dBi
		UNII-2C -5.3 dBi
		UNII-3 -6.6 dBi
Frequency range	:	Bluetooth(BDR/EDR/BLE)_2 402 ㎒ ~ 2 480 ㎒
		2 412 ㎒ ~ 2 462 ㎒ (802.11b/g/n_HT20)
		UNII-1: 5 180 ㎒ ~ 5 240 ㎒ (802.11a/n_HT20/ac_VHT20)
		UNII-1: 5 190 ㎒ ~ 5 230 ㎒ (802.11n_HT40/ac_VHT40)
		UNII-1: 5 210 ㎒ (802.11ac_VHT80)
		UNII-2A: 5 260 ㎒ ~ 5 320 ㎒ (802.11a/n_HT20/ac_VHT20)
		UNII-2A: 5 270 ㎒ ~ 5 310 ㎒ (802.11n_HT40/ac_VHT40)
		UNII-2A: 5 290 ㎒ (802.11ac_VHT80)
		UNII-2C: 5 500 ㎒ ~ 5 720 ㎒ (802.11a/n_HT20/ac_VHT20)
		UNII-2C: 5 510 ㎒ ~ 5 710 ㎒ (802.11n_HT40/ac_VHT40)
		UNII-2C: 5 530 ㎒ ~ 5 690 ㎒ (802.11ac_VHT80)
		UNII-3: 5 745 ㎒ ~ 5 825 ㎒ (802.11a/n_HT20/ac_VHT20)
		UNII-3: 5 755 ㎒ ~ 5 795 ㎒ (802.11n_HT40/ac_VHT40)
		UNII-3: 5 775 ㎒ (802.11ac_VHT80)
		LTE Band 2_1 850.7 ㎒ ~ 1 909.3 ㎒
		LTE Band 4_1 710.7 ㎒ ~ 1 754.3 ㎒
		LTE Band 5_824.7 ㎒ ~ 848.3 ㎒
		LTE Band 12_699.7 ㎒ ~ 715.3 ㎒
		LTE Band 13_779.5 ㎒ ~ 784.5 ㎒
		LTE Band 17_706.5 ㎒ ~ 713.5 ㎒
		LTE Band 26_824.7 ㎒ ~ 848.3 ㎒, 814.7 ㎒ ~ 823.3 ㎒
		LTE Band 41_2 498.5 ㎒ ~ 2 687.5 ㎒
		LTE Band 66_1 710.7 ㎒ ~ 1 779.3 ㎒
		GSM 850_824.2 ㎒ ~ 848.8 ㎒
		GSM 1900_1 850.2 ㎒ ~ 1 909.8 ㎒
		WCDMA 850_826.4 ㎒ ~ 846.6 ㎒
		WCDMA 1700_1 712.4 ㎒ ~ 1 752.6 ㎒
		WCDMA 1900_1 852.4 ㎒ ~ 1 907.6 ㎒
Software version	:	M315F.001
Hardware version	:	REV1.0
Test device serial No.	:	Conducted(RZ8N122TM7N), Radiated(R38N8004GLE)
Operation temperature	:	-30 ℃ ~ 50 ℃

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
Travel Adapter	Samsung Electronics Co., Ltd.	EP-TA200	R37M4NR27T1SE3	AC 100-240V 50-60 Hz, 0.5A, 9.0V-1.67A, 5.0V-2.0A
Micro USB Data Cable	Samsung Electronics Co., Ltd.	-	-	-

2.2. Frequency/channel operations

This device contains the following capabilities:
WIFI (802.11a/b/g/n/ac), Bluetooth (BDR/EDR/BLE),
LTE Band 2, LTE Band 4, LTE Band 5, LTE Band 12, LTE Band 13, LTE Band 17, LTE Band 26, LTE Band 41, LTE Band 66, WCDMA 850, WCDMA 1700, WCDMA 1900, GSM 850, GSM 1900

LTE Band 2

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

Table 2.2.1. 1.4M BW

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

Table 2.2.2. 3M BW

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

Table 2.2.3. 5M BW

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

Table 2.2.4. 10M BW

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

Table 2.2.5. 15M BW

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

Table 2.2.6. 20M BW

LTE Band 4

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

Table 2.2.7. 1.4M BW

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

Table 2.2.8. 3M BW

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

Table 2.2.9. 5M BW

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

Table 2.2.10. 10M BW

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

Table 2.2.11. 15M BW

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

Table 2.2.12. 20M BW

LTE Band 5

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

Table 2.2.13. 1.4M BW

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

Table 2.2.14. 3M BW

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

Table 2.2.15. 5M BW

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

Table 2.2.16. 10M BW

LTE Band 12

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

Table 2.2.17. 1.4M BW

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

Table 2.2.18. 3M BW

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

Table 2.2.19. 5M BW

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

Table 2.2.20. 10M BW

LTE Band 13

Ch.	Frequency (㎒)
23205	779.5
23230	782.0
23255	784.5

Table 2.2.21. 5M BW

Ch.	Frequency (㎒)
-	-
23230	782.0
-	-

Table 2.2.22. 10M BW

LTE Band 17

Ch.	Frequency (㎒)
23755	706.5
23790	710.0
23825	713.5

Table 2.2.23. 5M BW

Ch.	Frequency (㎒)
23780	709.0
23790	710.0
23800	711.0

Table 2.2.24. 10M BW

LTE Band 26

Ch.	Frequency (㎒)
26797	824.7
26915	836.5
27033	848.3

Table 2.2.25. 1.4M BW

Ch.	Frequency (㎒)
26805	825.5
26915	836.5
27025	847.5

Table 2.2.26. 3M BW

Ch.	Frequency (㎒)
26815	826.5
26915	836.5
27015	846.5

Table 2.2.27. 5M BW

Ch.	Frequency (㎒)
26840	829.0
26915	836.5
26990	844.0

Table 2.2.28. 10M BW

Ch.	Frequency (㎒)
26865	831.5
26915	836.5
26965	841.5

Table 2.2.29. 15M BW

LTE Band 41

Ch.	Frequency (㎒)
39675	2 498.5
40620	2 593.0
41565	2 687.5

Table 2.2.30. 5M BW

Ch.	Frequency (㎒)
39700	2 501.0
40620	2 593.0
41540	2 685.0

Table 2.2.31. 10M BW

Ch.	Frequency (㎒)
39725	2 503.5
40620	2 593.0
41515	2 682.5

Table 2.2.32. 15M BW

Ch.	Frequency (㎒)
39750	2 506.0
40620	2 593.0
41490	2 680.0

Table 2.2.33. 20M BW

LTE Band 66

Ch.	Frequency (㎒)
131979	1 710.7
132322	1 745.0
132665	1 779.3

Table 2.2.34. 1.4M BW

Ch.	Frequency (㎒)
131987	1 711.5
132322	1 745.0
132657	1 778.5

Table 2.2.35. 3M BW

Ch.	Frequency (㎒)
131997	1 712.5
132322	1 745.0
132647	1 777.5

Table 2.2.36. 5M BW

Ch.	Frequency (㎒)
132022	1 715.0
132322	1 745.0
132622	1 775.0

Table 2.2.37. 10M BW

Ch.	Frequency (㎒)
132047	1 717.5
132322	1 745.0
132597	1 772.5

Table 2.2.38. 15M BW

Ch.	Frequency (㎒)
132072	1 720.0
132322	1 745.0
132572	1 770.0

Table 2.2.39. 20M BW

Notes:

1. LTE Band 12(698 - 716 ㎒) overlaps the entire frequency range of LTE Band 17(704 - 716 ㎒) and they have same maximum tune-up power. Therefore, test data provided in this report covers Band 17 as well as Band 12 subpart to Part27.
2. Higher band (824 – 849 ㎒) of LTE Band 26 to cover LTE Band 5 (824 – 849 ㎒) and they have same maximum tune-up power. Therefore, test data provided in this report covers Band 5 as well as Band 26 subpart to Part22.
3. LTE Band 66(1 710 - 1 780 ㎒) overlaps the entire frequency range of LTE Band 4(1 710 - 1 755 ㎒) and they have same maximum tune-up power. Therefore, test data provided in this report covers Band 4 as well as Band 66 subpart to Part27.

3. Summary of tests

FCC Part section(s)	Parameter	Test Limit	Test Condition	Test results
22.913(a)(5)	Effective Radiated Power	< 7 Watts max. ERP	Radiated	Pass
27.50(b)(10) 27.50(c)(10)		< 3 Watts max. ERP		Pass
24.232(c) 27.50(h)(2)	Equivalent Isotropic Radiated Power	< 2 Watts max. EIRP		Pass
27.50(d)(4)		< 1 Watts max. EIRP		Pass
2.1053 22.917(a) 24.238(a) 27.53(f),(g), (h),(m)	Radiated Spurious Emissions	<43 + 10Log$_{10}$(P) dB for all out of band emissions, <-70 dBW/MHz EIRP - Wideband <-80 dBW/MHz EIRP- Narrowband, Undesirable emissions must Meet the limits detailed in 27.53(m).		Pass

Notes:

1. 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
2. This is the C2PC test report to add a variant model, SM-F415F/DS as documented in the C2PC letter. Because the change does not affect RF characteristics, therefore, only radiated spurious emission test was done against the worst case from the main model, SM-M315F/DS, documented in the original filing and approved in 02/07/2020. All rest tests documented in original filing under model SM-M315F/DS remains representative of the variant model, SM-F415F/DS.
3. The conducted power level and antenna gain are not changed and the ERP/EIRP level increased within 0.5dBm may be due to device-to-device variances and measurement uncertainty.

3.1. Worst case orientation

1. All modes of operation were investigated and the worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations in the test data.
2. All final radiated testing was performed with the EUT in worst case orientation.
3. For LTE Band 12/17, LTE Band 13 and LTE Band 41 the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **Y** orientation was worst-case orientation.
   Therefore, all final radiated testing was performed with the EUT in **Y** orientation.
4. For LTE Band 2, LTE Band 26/5 and LTE Band 66/4 the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **Z** orientation was worst-case orientation.
   Therefore, all final radiated testing was performed with the EUT in **Z** orientation.

Test condition	LTE Band	Modulation	Bandwidth (㎒)	RB size	RB offset
Radiated	B2	QPSK	15	1	0
	B12/17		3	1	0
	B13		10	1	0
	B26/5		10	1	0
	B41		5	1	0
	B66/4		3	1	0

4. 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 of 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.

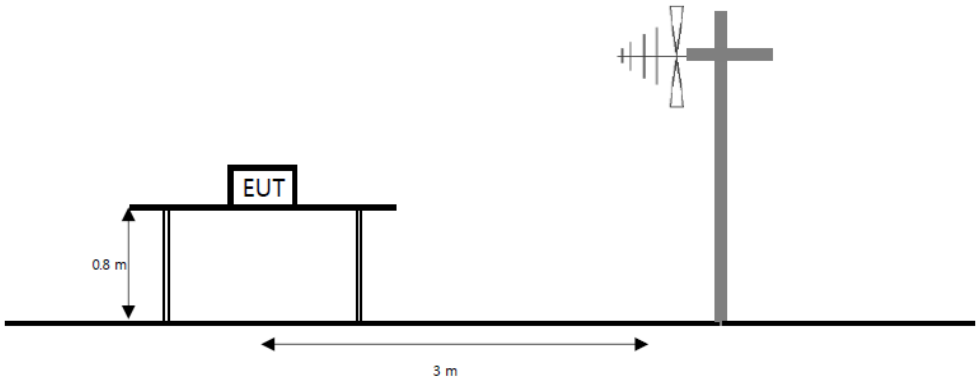
Parameter	Expanded uncertainty (±)	
Radiated spurious emissions	30 ㎒ ~ 1 ㎓	3.7 ㏈
	Above 1 ㎓	5.7 ㏈

5. Test results

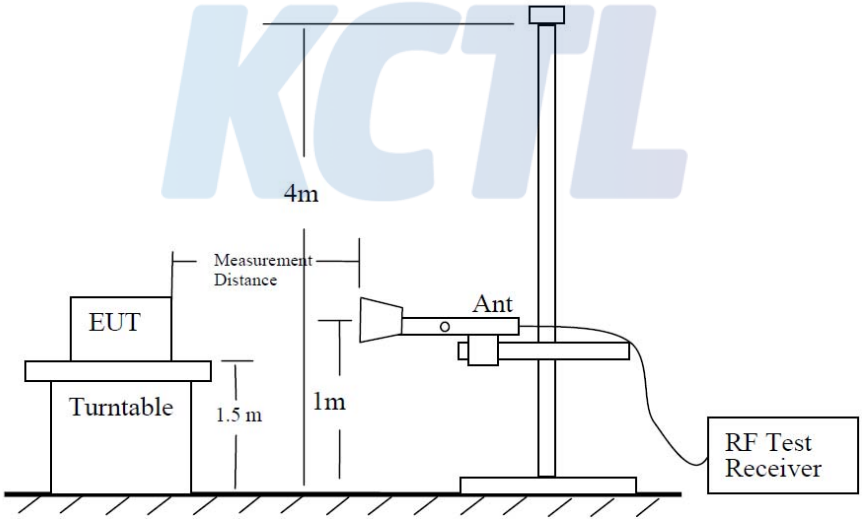
5.1. Radiated Power (ERP/EIRP)

Test setup

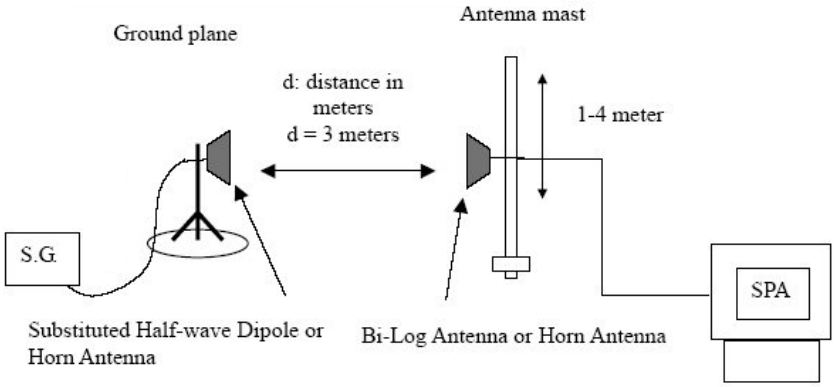
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to the tenth harmonic of the highest fundamental frequency or to 40 ㎓ 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 §24.232(c), Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

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

According to §27.50(d)(4), Fixed, mobile and portable (hand-held) stations operating in the 1710-1755 ㎒ and 1755-1780 ㎒ bands are limited to 1 watt EIRP.

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

Test procedure

971168 D01 v03r01 - Section 5.2 and 5.8, 412172 D01 v01r01
ANSI 63.26-2015 – Section 5.2
ANSI/TIA-603-E-2016 - Section 2.2.17

Test settings

1) RBW = 1 % to 5 % of the OBW.
2) VBW ≥ 3 × RBW.
3) SPAN = 2 × to 3 × the OBW.
4) Number of measurement points in sweep ≥ 2 × span / RBW.
5) Sweep time :
   1) Auto couple, or
   2) ≥ [10 × (number of points in sweep) × (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 ㎓ below) or horn antenna (1 ㎓ above) connected to a signal generator.
   The power is calculated by the following formula;
   Pd(㏈m) = Pg(㏈m) – Cable loss (㏈) + Antenna gain (㏈)
   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 ㏈m, 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 2

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EIRP	
		[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
15 M	QPSK	1 902.5	V	5.33	5.75	21.90	21.48	0.141

Test mode: LTE Band 12/17

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
3 M	QPSK	714.5	V	-0.30	3.47	21.37	17.60	0.058

Test mode: LTE Band 13

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
10 M	QPSK	782.0	V	0.60	3.65	19.84	16.79	0.048

Test mode: LTE Band 26/5

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
10 M	QPSK	829.0	V	0.70	3.76	22.68	19.62	0.092

Test mode: LTE Band 41

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EIRP	
		[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
5 M	QPSK	2 593.0	H	6.33	6.61	21.30	21.02	0.126

Test mode: LTE Band 66/4

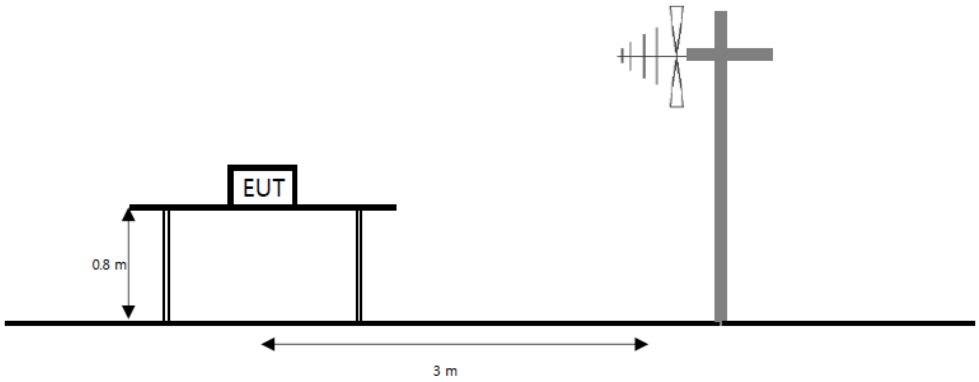
Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EIRP	
		[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
3 M	QPSK	1 711.5	V	5.79	5.36	21.24	21.67	0.147

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

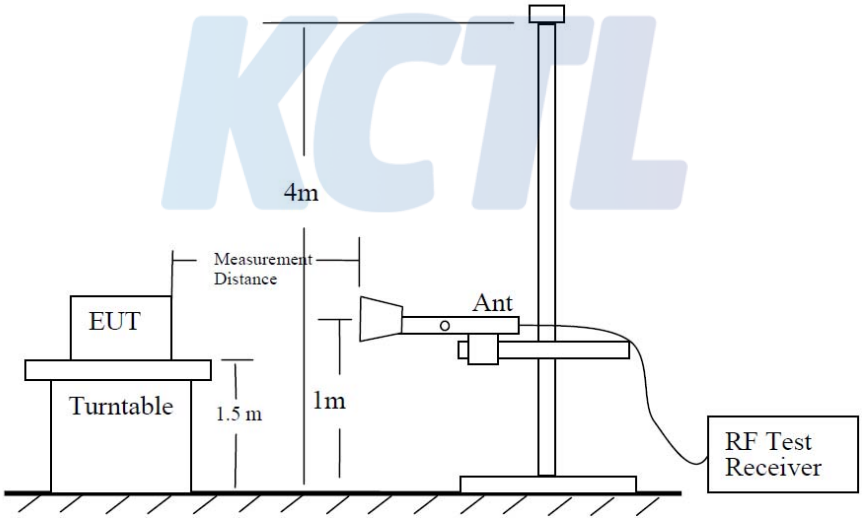
5.2. Radiated Spurious Emissions

Test setup

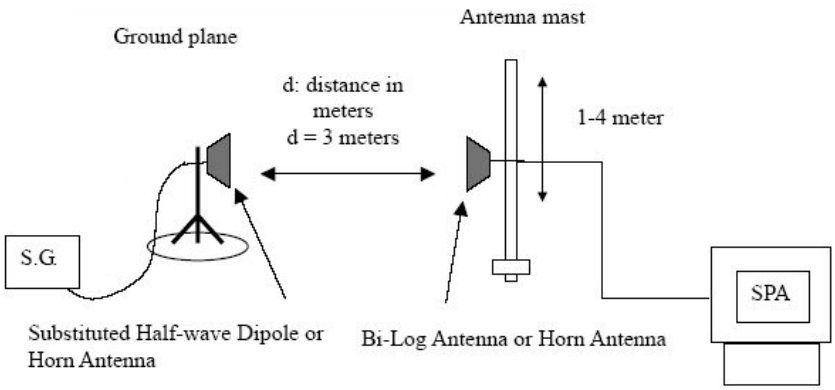
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



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



The diagram below shows the test setup for substituted method.



Limit

According to §22.917(a), §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 + 10log($P_{[Watts]}$) ㏈.

According to §27.53(f), for operations in the 746-758 ㎒, 775-788 ㎒, and 805-806 ㎒ bands, emissions in the band 1559-1610 ㎒ shall be limited to -70 ㏈W/㎒ equivalent isotropically radiated power (EIRP) for wideband signals, and -80 ㏈W EIRP for discrete emissions of less than 700 ㎐ bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

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

According to §27.53(h), 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 + 10log($P_{[Watts]}$) ㏈.

According to §27.53(m)(4), the minimum permissible attenuation level of any spurious emission is 53 + 10log($P_{[Watts]}$) ㏈.

Test procedure

971168 D01 v03r01 - Section 6.2
ANSI 63.26-2015 – Section 5.5
ANSI/TIA-603-E-2016 - Section 2.2.12

Test settings

1) RBW = 100 ㎑ for below 1 ㎓ and 1 ㎒ for above 1 ㎓.
2) VBW ≥ 3 × RBW.
3) Detector = RMS
4) Trace mode = Max hold
5) Sweep time = Auto couple
6) Number of sweep points ≥ 2 × span / RBW
7) Allow trace to fully stabilize.

Notes:

1. On a test site, the EUT shall be placed at 80 ㎝ 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 ㎓ below) or horn antenna (1 ㎓ 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 ㏈m, 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 (Above 1 000 ㎒)

Test mode : LTE Band 2
Frequency(㎒) : 1 902.5
Channel : 19125
Bandwidth(㎒) : 15

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	3 818.25	V	8.68	9.36	-55.02	-55.70	-13.00	42.70
	5 729.25	V	10.55	12.23	-54.92	-56.60	-13.00	43.60
	7 641.75	V	12.21	13.84	-52.67	-54.30	-13.00	41.30
	9 552.00	V	13.19	15.11	-49.78	-51.70	-13.00	38.70

Test mode : LTE Band 12/17
Frequency(㎒) : 714.5
Channel : 23165
Bandwidth(㎒) : 3

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 431.55	H	5.85	4.89	-61.26	-60.30	-13.00	47.30
	2 147.05	H	5.42	6.04	-55.78	-56.40	-13.00	43.40
	2 864.80	H	6.71	7.20	-57.31	-57.80	-13.00	44.80
	3 581.20	H	8.40	7.94	-55.46	-55.00	-13.00	42.00

Test mode : LTE Band 13
Frequency(㎒) : 782.0
Channel : 23230
Bandwidth(㎒) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 555.75	H	6.17	5.08	-61.59	-60.50	-13.00	47.50
	2 332.90	H	5.83	6.31	-56.12	-56.60	-13.00	43.60
	3 106.90	H	7.20	7.85	-55.95	-56.60	-13.00	43.60
	3 885.85	V	8.76	9.42	-55.54	-56.20	-13.00	43.20

Test mode : LTE Band 26/5
Frequency(㎒) : 829.0
Channel : 26840
Bandwidth(㎒) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 668.70	H	5.90	5.24	-59.46	-58.80	-13.00	45.80
	2 500.30	H	6.20	6.49	-56.01	-56.30	-13.00	43.30
	3 335.95	V	7.84	8.47	-54.87	-55.50	-13.00	42.50
	4 176.55	V	8.79	9.77	-56.12	-57.10	-13.00	44.10

Test mode : LTE Band 41
Frequency(㎒) : 2 593.0
Channel : 40620
Bandwidth(㎒) : 5

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	5 183.25	H	10.25	11.38	-49.07	-50.20	-25.00	25.20
	7 774.50	H	12.32	13.92	-46.50	-48.10	-25.00	23.10
	10 366.50	V	13.10	15.55	-42.15	-44.60	-25.00	19.60
	12 958.50	H	13.48	17.75	-37.63	-41.90	-25.00	16.90

Test mode : LTE Band 66/4
Frequency(㎒) : 1 711.5
Channel : 131987
Bandwidth(㎒) : 3

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	3 420.00	V	8.08	8.69	-55.39	-56.00	-13.00	43.00
	5 130.75	V	10.20	11.32	-55.78	-56.90	-13.00	43.90
	6 840.00	V	11.21	13.20	-50.81	-52.80	-13.00	39.80
	8 547.00	H	13.02	14.52	-51.40	-52.90	-13.00	39.90

6. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	100807	21.07.29
Spectrum Analyzer	AGILENT	N9040B	MY57010132	21.07.29
Vector Signal Generator	R&S	SMBV100A	257566	21.07.13
Signal Generator	R&S	SMR40	100007	21.04.08
Signal Generator	R&S	SMB100A	176206	21.01.21
Wideband Radio Communication Tester	R&S	CMW500	141780	21.04.16
Wideband Radio Communication Tester	R&S	CMW500	132423	21.03.12
Biconical VHF-UHF Broadband Antenna	SCHWARZBECK	VUBA9117	275	22.04.09
Bilog Antenna	Teseq GmbH	CBL 6143A	35039	21.05.21
Horn Antenna	ETS.lindgren	3117	00227509	21.09.23
Horn Antenna	ETS.lindgren	3117	161225	21.05.12
Horn Antenna	ETS.lindgren	3116	00086632	21.02.17
Horn Antenna	ETS.lindgren	3116	00086635	21.05.12
High pass Filter	Wainwright Instruments GmbH	WHKX3.0/18G-12SS	44	21.01.21
High pass Filter	Wainwright Instruments GmbH	WHKX1.0/1.5S-10SS	14	21.01.21
Attenuator	Weinschel ENGINEERING	10	AJ1239	21.05.15
Amplifier	SONOMA INSTRUMENT	310N	186280	21.01.21
Amplifier	L-3 Narda-MITEQ	AFS5-00101800-25-S-5	2054570	21.05.22
Amplifier	L-3 Narda-MITEQ	JS44-18004000-33-9P	2000996	21.01.22
Antenna Mast	MATURO	EAS 1.5	042/8941211	N/A
Antenna Mast	MATURO	EAS 1.5	043/8941211	N/A
Turn Table	MATURO	TT 0.8 PF	041/8941211	N/A

End of test report