TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR23-SRF0031-A Page (1) of (25)	eurofins | 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 : 2022-10-17

2. Use of Report : Certification

3. Name of Product / Model : Mobile phone / SM-A346B/DSN

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

5. FCC ID : A3LSMA346B

6. Date of Test : 2022-11-09 to 2023-01-04

7. Location of Test : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

8. Test method used : FCC Part 2
FCC Part 22 Subpart H
FCC Part 24 Subpart E
FCC Part 27 Subpart C

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

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

2023-01-20

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2023-01-17	Originally issued	-
2023-01-20	Updated to TCB comment	6 ~ 7

Note. The report No. KR23-SRF0031 is superseded by the report No. KR23-SRF0031-A.

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ **Statement not required by the standard or client used for type testing**

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	:	Yen Binh Industrial Park, Dong Tien Ward, Pho Yen Town, Thai Nguyen Province, Vietnam
Laboratory	:	Eurofins KCTL Co.,Ltd.
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 CAB Identifier: KR0040 ISED Number: 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	Mobile phone		
Model	:	SM-A346B/DSN		
Modulation technique	:	QPSK, 16QAM, 64QAM		
Power source	:	DC 3.88 V		
Antenna specification	:	Main Antenna 1	:	Metal Antenna (LTE B2/4/5/12/17/26/66)
		Main Antenna 2	:	Metal Antenna (LTE B41)
Frequency range	:	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 17	:	706.5 ㎒ ~ 713.5 ㎒
		LTE Band 26	:	824.7 ㎒ ~ 848.3 ㎒
		LTE Band 41	:	2 498.5 ㎒ ~ 2 687.5 ㎒
		LTE Band 66	:	1 710.7 ㎒ ~ 1 779.3 ㎒
Bandwidth	:	LTE Band 2	:	1.4 ㎒, 3 ㎒, 5 ㎒, 10 ㎒, 15 ㎒, 20 ㎒
		LTE Band 4	:	1.4 ㎒, 3 ㎒, 5 ㎒, 10 ㎒, 15 ㎒, 20 ㎒
		LTE Band 5	:	1.4 ㎒, 3 ㎒, 5 ㎒, 10 ㎒
		LTE Band 12	:	1.4 ㎒, 3 ㎒, 5 ㎒, 10 ㎒
		LTE Band 17	:	5 ㎒, 10 ㎒
		LTE Band 26	:	1.4 ㎒, 3 ㎒, 5 ㎒, 10 ㎒, 15 ㎒
		LTE Band 41	:	5 ㎒, 10 ㎒, 15 ㎒, 20 ㎒
		LTE Band 66	:	1.4 ㎒, 3 ㎒, 5 ㎒, 10 ㎒, 15 ㎒, 20 ㎒
Software version	:	A346B.001		
Hardware version	:	REV1.0		
Test device serial No.	:	Conducted	:	R3CTA0N869H
		Radiated	:	R3CTA0N84EX
Operation temperature	:	-20 ℃ ~ 60 ℃		

2.1. Frequency/channel operations

This device contains the following capabilities:
WLAN (11a/b/g/n/ac), Bluetooth (BDR/EDR/BLE), LTE B2/4/5/12/17/26/41/66, GSM 850/1900, WCDMA 850/1700/1900, NFC

LTE Band 2

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

Table 2.1-1. 1.4M BW

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

Table 2.1-2. 3M BW

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

Table 2.1-3. 5M BW

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

Table 2.1-4. 10M BW

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

Table 2.1-5. 15M BW

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

Table 2.1-6. 20M BW

LTE Band 4

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

Table 2.1-7. 1.4M BW

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

Table 2.1-8. 3M BW

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

Table 2.1-9. 5M BW

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

Table 2.1-10. 10M BW

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

Table 2.1-11. 15M BW

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

Table 2.1-12. 20M BW

LTE Band 5

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

Table 2.1-13. 1.4M BW

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

Table 2.1-14. 3M BW

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

Table 2.1-15. 5M BW

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

Table 2.1-16. 10M BW

LTE Band 12

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

Table 2.1-17. 1.4M BW

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

Table 2.1-18. 3M BW

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

Table 2.1-19. 5M BW

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

Table 2.1-20. 10M BW

LTE Band 17

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

Table 2.1-23. 5M BW

Ch.	Frequency (㎒)
23780	709.0
23330	793.0
23800	711.0

Table 2.1-24. 10M BW

LTE Band 26

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

Table 2.1-25. 1.4M BW

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

Table 2.1-26. 3M BW

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

Table 2.1-27. 5M BW

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

Table 2.1-28. 10M BW

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

Table 2.1-29. 15M BW

LTE Band 41

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

Table 2.1-30. 5M BW

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

Table 2.1-31 10M BW

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

Table 2.1-32 15M BW

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

Table 2.1-33. 20M BW

LTE Band 66

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

Table 2.1-34. 1.4M BW

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

Table 2.1-35. 3M BW

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

Table 2.1-36. 5M BW

Ch.	Frequency (㎒)
132022	1 715.0
132322	1 745.0
132647	1 775.0

Table 2.1-37. 10M BW

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

Table 2.1-38. 15M BW

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

Table 2.1-39. 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.

3. Introduction

This report referenced from the FCC ID : A3LSMA346M PCE WWAN (FCC CFR 47 Part 22, 24, 27). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

3.1 Difference

The FCC ID: A3LSMA346B shares the same enclosure and circuit board as FCC ID: A3LSMA346M. The WIFI/BT/BLE/NFC/GSM/WCDMA/LTE antenna and surrounding circuitry and layout are identical between these two units.
As for all bands, they have been verified and the parent model test results under FCC ID: A3LSMA346M shall remain representative of FCC ID: A3LSMA346B.

Note. The difference between the parent and variant is that the RF circuit for NR/LTE Bands (13/n5/n66), ULCA Band 4 and EN-DC for Band 2/66 in the parent model A3LSMA346M is removed from the variant model A3LSMA346B.

3.2 Spot check verification data (ERP/EIRP & Spurious emission)

Test band	Test item	Test mode	Bandwidth (㎒)	Channel	Measured frequency (㎒)	SM-A346M /DSN	SM-A346B /DSN	Deviation (dB)
LTE B2	EIRP	QPSK	20	18700	1 860.00	22.15	21.76	-0.39
	RSE	QPSK	20	19100	3 781.50	-49.40	-56.40	-7.00
LTE B4	EIRP	QPSK	1.4	19957	1 710.70	19.99	20.32	0.33
	RSE	QPSK	1.4	19957	11 975.25	-43.10	-42.80	0.30
LTE B5	ERP	QPSK	1.4	20407	824.70	21.00	20.82	-0.18
	RSE	QPSK	1.4	20407	2 470.00	-49.40	-58.90	-9.50
LTE 12/17	ERP	QPSK	5	23155	713.50	18.55	18.29	-0.26
	RSE	QPSK	5	23035	2 104.80	-53.50	-60.70	-7.20
LTE B26	ERP	QPSK	15	26865	831.50	21.42	20.27	-1.15
	RSE	QPSK	15	26915	2 509.20	-54.80	-60.30	-5.50
LTE B41	EIRP	QPSK	15	41515	2 682.50	18.03	17.08	-0.95
	RSE	QPSK	15	39725	12 518.25	-46.30	-45.00	1.30
LTE B66	EIRP	QPSK	1.4	131979	1 710.70	19.99	20.45	0.46
	RSE	QPSK	1.4	131979	11 970.75	-47.60	-44.70	2.90

Notes:

1. For FCC ID: A3LSMA346B has been verified the performance as for PCE WWAN identical with the FCC ID: A3LSMA346M.
2. Comparison of two models, the variant model emissions are less than 3 ㏈ higher than the parent model, and all test results are under FCC technical limits.
3. The test procedure(s) in this report were performed in accordance as following.
   - KDB 484596 D01 v01

3.3 Reference Detail

Reference application that contains the reused reference data in the individual test reports.

Equipment Class	Reference FCC ID	Application Type	Reference Test report Number	Exhibit Type	Variant Test Report Number	Date Re-used
DTS	A3LSMA346M	Original	KR23-SRF0005 (802.11b/g/n)	Test report	KR23-SRF0027	All
			KR23-SRF0004 (Bluetooth LE)	Test report	KR23-SRF0026	All
DSS	A3LSMA346M	Original	KR23-SRF0003 (Bluetooth)	Test report	KR23-SRF0025	All
NII	A3LSMA346M	Original	KP23-SRF0006 (802.11a/n/ac)	Test report	KR23-SRF0028	All
DXX	A3LSMA346M	Original	KP23-SRF0012 (NFC)	Test report	KR23-SRF0033	All
PCE	A3LSMA346M	Original	KR23-SRF0008 (2G, 3G)	Test report	KR23-SRF0030	All
			KR23-SRF0009 (LTE)	Test report	KR23-SRF0031	Partial[1),2)]
			KR23-SRF0010 (LTE Part90)	Test report	KR23-SRF0032	All

Notes:

1. This device does not support the LTE Band 13.
2. This device does not support sub antenna for usage of ULCA (LTE B4) and EN-DC (LTE B2/66).
3. This device does not support the 5GNR Bands of n5/n66.

4. Maximum ERP/EIRP power

LTE Band 2

Mode	Tx frequency (㎒)	Emission designator	EIRP	
			Max. power (dBm)	Max. power (W)
LTE Band 2	1 850.7 ~ 1 909.3	1M10G7D	21.90	0.155
		1M10W7D	20.74	0.119
	1 851.5 ~ 1 908.5	2M70G7D	21.86	0.153
		2M70W7D	21.01	0.126
	1 852.5 ~ 1 907.5	4M51G7D	22.01	0.159
		4M51W7D	21.07	0.128
	1 855.0 ~ 1 905.0	8M99G7D	21.88	0.154
		8M99W7D	21.04	0.127
	1 857.5 ~ 1 902.5	13M5G7D	22.01	0.159
		13M5W7D	21.01	0.126
	1 860.0 ~ 1 900.0	18M0G7D	22.15	0.164
		18M0W7D	21.20	0.132

LTE Band 4

Mode	Tx frequency (㎒)	Emission designator	EIRP	
			Max. power (dBm)	Max. power (W)
LTE Band 4	1 710.7 ~ 1 754.3	1M10G7D	19.99	0.100
		1M10W7D	18.99	0.079
	1 711.5 ~ 1 753.5	2M70G7D	19.84	0.096
		2M69W7D	18.82	0.076
	1 712.5 ~ 1 752.5	4M51G7D	19.40	0.087
		4M51W7D	18.48	0.070
	1 715.0 ~ 1 775.0	8M97G7D	19.62	0.092
		8M97W7D	18.83	0.076
	1 717.5 ~ 1 747.5	13M5G7D	19.81	0.096
		13M5W7D	18.97	0.079
	1 720.0 ~ 1 745.0	18M0G7D	19.39	0.087
		18M1W7D	18.44	0.070

LTE Band 5

Mode	Tx frequency (㎒)	Emission designator	ERP	
			Max. power (dBm)	Max. power (W)
LTE Band 5	824.7 ~ 848.3	1M10G7D	21.00	0.126
		1M10W7D	19.96	0.099
	825.5 ~ 847.5	2M70G7D	20.87	0.122
		2M69W7D	20.06	0.101
	826.5 ~ 846.5	4M51G7D	20.95	0.124
		4M52W7D	20.09	0.102
	829.0 ~ 844.0	8M99G7D	20.92	0.124
		8M99W7D	20.05	0.101

LTE Band 12/17

Mode	Tx frequency (㎒)	Emission designator	ERP	
			Max. power (dBm)	Max. power (W)
LTE Band 12	699.7 ~ 715.3	1M10G7D	17.95	0.062
		1M10W7D	17.05	0.051
	700.5 ~ 714.5	2M70G7D	18.21	0.066
		2M69W7D	17.28	0.053
LTE Band 12/17	701.5 ~ 713.5	4M52G7D	18.55	0.072
		4M51W7D	17.53	0.057
	704.0 ~ 711.0	8M99G7D	18.34	0.068
		9M02W7D	17.58	0.057

LTE Band 26

Mode	Tx frequency (㎒)	Emission designator	ERP	
			Max. power (dBm)	Max. power (W)
LTE Band 26	824.7 ~ 848.3	1M10G7D	21.07	0.128
		1M10W7D	20.09	0.102
	825.5 ~ 847.5	2M70G7D	21.03	0.127
		2M69W7D	20.09	0.102
	826.5 ~ 846.5	4M51G7D	21.02	0.126
		4M52W7D	19.91	0.098
	829.0 ~ 844.0	8M99G7D	21.18	0.131
		8M99W7D	20.52	0.113
	831.5 ~ 841.5	13M5G7D	21.42	0.139
		13M5W7D	20.30	0.107

LTE Band 41

Mode	Tx frequency (㎒)	Emission designator	EIRP	
			Max. power (dBm)	Max. power (W)
LTE Band 41	2 498.5 ~ 2 687.5	4M51G7D	18.01	0.063
		4M52W7D	16.74	0.047
	2 501.0 ~ 2 685.0	8M99G7D	17.68	0.059
		9M02W7D	17.11	0.051
	2 503.5 ~ 2 682.5	13M5G7D	18.03	0.064
		13M5W7D	17.50	0.056
	2 506.0 ~ 2 680.0	18M0G7D	17.84	0.061
		18M0W7D	16.69	0.047

LTE Band 66

Mode	Tx frequency (㎒)	Emission designator	EIRP	
			Max. power (dBm)	Max. power (W)
LTE Band 66	1 710.7 ~ 1 779.3	1M10G7D	19.99	0.100
		1M10W7D	19.22	0.084
	1 711.5 ~ 1 778.5	2M70G7D	19.83	0.096
		2M69W7D	18.82	0.076
	1 712.5 ~ 1 777.5	4M51G7D	19.67	0.093
		4M51W7D	18.72	0.074
	1 715.0 ~ 1 775.0	8M99G7D	19.79	0.095
		8M97W7D	18.93	0.078
	1 717.5 ~ 1 772.5	13M5G7D	19.89	0.097
		13M5W7D	18.68	0.074
	1 720.0 ~ 1 770.0	18M0G7D	19.39	0.087
		18M0W7D	18.33	0.068

5. 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(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
2.1051 22.917(a) 24.238(a) 27.53(c)(2) 27.53(g),(h), (m)(4)	Radiated Spurious Emissions	<43 + 10Log$_{10}$(P) ㏈ for all out of band emissions, 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
   - KDB 971168 D02 v02r01
2. Conducted power has been checked and it is same as original filing.

5.1. 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. Output power measurements were measured on QPSK, 16QAM and 64QAM modulation. All tests except output power was performed with QPSK and 16QAM modulation.
3. All the radiated tests have been performed several case. (Stand-alone, with accessories (DLC Cable etc.))
   - Worst case: Stand-alone
4. EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **X** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **X** orientation.
5. Test Condition

Test condition	LTE Band	Modulation	Bandwidth (㎒)	RB size	RB offset
Radiated	B2	QPSK	20	1	0, 49, 99
	B4		1.4	1	0, 3, 5
	B5		1.4	1	0, 3, 5
	B12/17		5	1	0, 12, 24
	B26		15	1	0, 36, 74
	B41		15	1	0, 36, 74
	B66		1.4	1	0, 3, 5

6. 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.

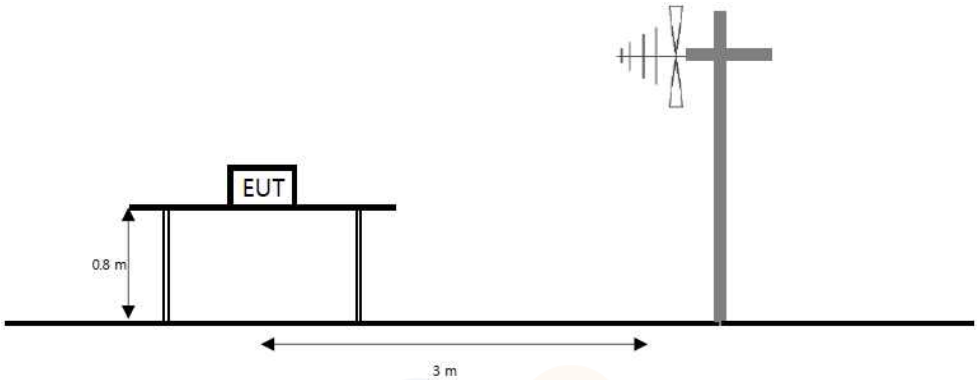
Parameter	Expanded uncertainty (±)	
Conducted RF power	0.9 dB	
Conducted spurious emissions	1.1 dB	
Radiated spurious emissions	Below 1 000 ㎒	4.3 dB
	1 000 ㎒ ~ 18 000 ㎒	3.8 dB
	Above 1 8000 ㎒	5.9 dB

7. Test results

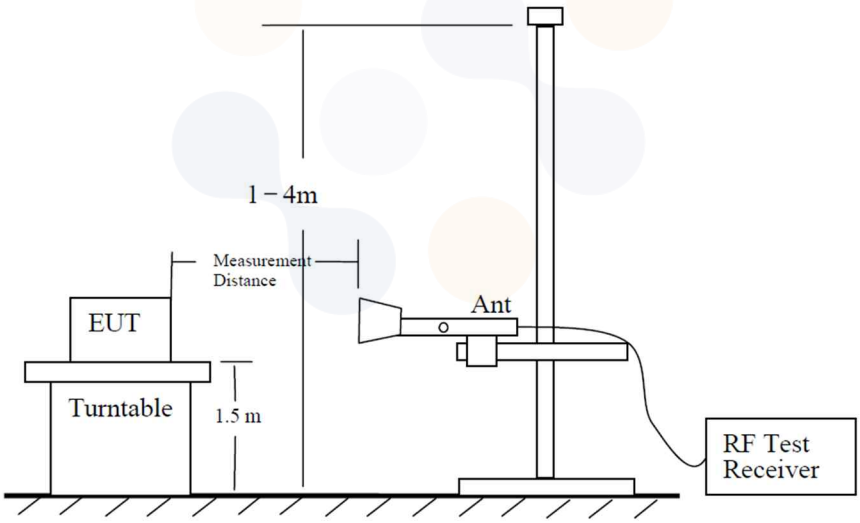
7.1 Radiated Power (ERP/EIRP)

Test setup

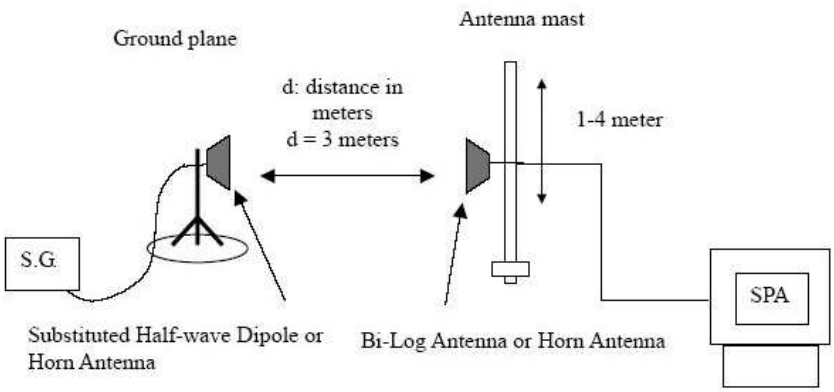
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



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

According to §27.50(d)(4), Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 ㎒ band and mobile and portable stations operating in the 1695-1710 ㎒ 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 or 1.5 m 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]
20 M	QPSK	1 860.00	H	4.99	7.19	23.96	21.76	0.150

Test mode: LTE Band 4

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EIRP	
		[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
1.4 M	QPSK	1 710.70	H	5.41	6.88	21.79	20.32	0.108

Test mode: LTE Band 5

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[㎒]	[V/H]	[dBd]	[dB]	[dBm]	[dBm]	[W]
1.4 M	QPSK	824.70	H	0.09	4.88	25.61	20.82	0.121

Test mode: LTE Band 12/17

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[㎒]	[V/H]	[dBd]	[dB]	[dBm]	[dBm]	[W]
5 M	QPSK	713.50	H	-0.48	4.50	25.09	18.29	0.067

Test mode: LTE Band 26

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[㎒]	[V/H]	[dBd]	[dB]	[dBm]	[dBm]	[W]
15 M	QPSK	831.50	H	0.08	4.92	25.69	20.27	0.106

Test mode: LTE Band 41

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EIRP	
		[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
15 M	QPSK	2 682.50	H	6.47	8.74	19.22	17.08	0.051

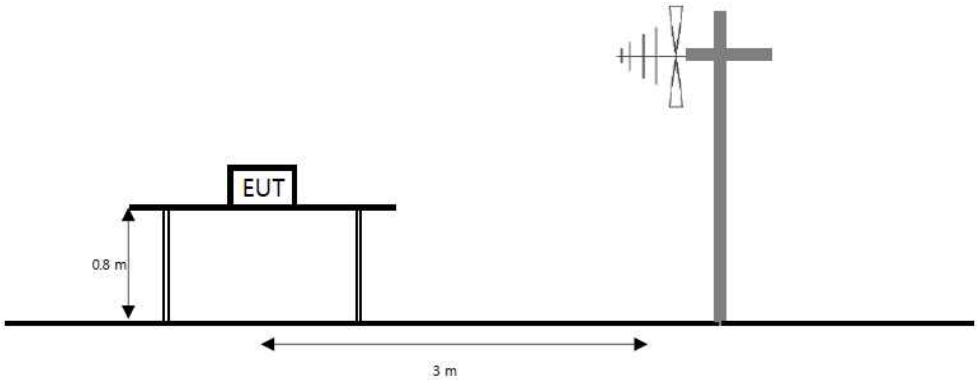
Test mode: LTE Band 66

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EIRP	
		[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
1.4 M	QPSK	1 710.70	H	5.41	6.88	21.62	20.45	0.111

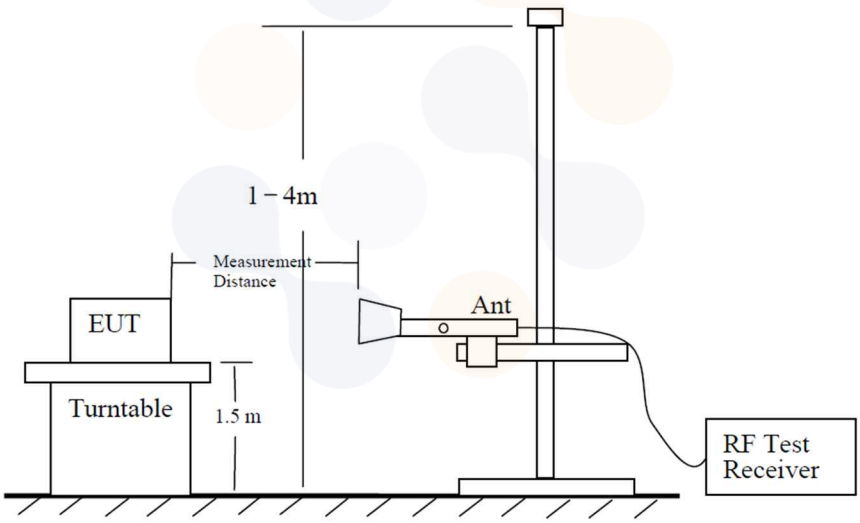
7.2 Radiated Spurious Emissions

Test setup

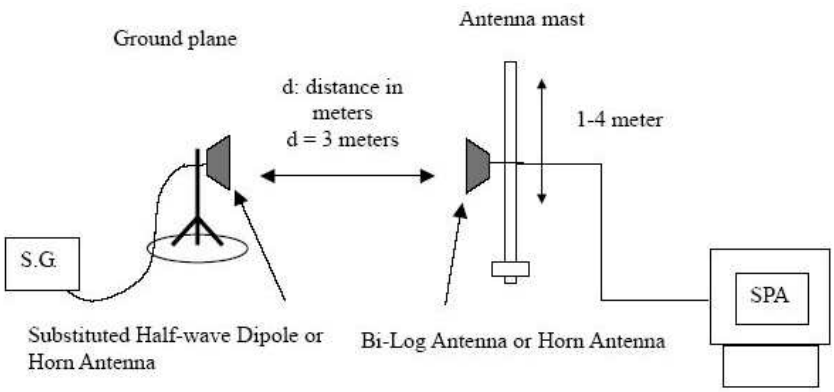
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



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(c)(2), on any frequency outside the 776-788 ㎒ band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log ($P_{[Watts]}$) ㏈.

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 cm or 1.5 m 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(㎒) : 1 900
Channel : 19100
Bandwidth(㎒) : 20

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	3 781.50	H	8.55	10.88	-54.07	-56.40	-13.00	3 781.50
	5 667.00	V	10.37	13.57	-54.80	-58.00	-13.00	5 667.00
	7 556.25	V	11.79	15.87	-51.42	-55.50	-13.00	7 556.25
	9 455.25	V	12.99	17.64	-43.15	-47.80	-13.00	9 455.25

Test mode : LTE Band 4
Frequency(㎒) : 1 710.7
Channel : 19957
Bandwidth(㎒) : 1.4

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	3 421.50	H	7.94	10.39	-54.25	-56.70	-13.00	43.70
	5 133.75	V	9.93	13.10	-56.23	-59.40	-13.00	46.40
	6 843.00	V	11.44	15.26	-53.28	-57.10	-13.00	44.10
	8 553.75	V	12.90	16.90	-48.60	-52.60	-13.00	39.60
	11 975.25	V	13.00	20.13	-35.67	-42.80	-13.00	29.80

Test mode : LTE Band 5
Frequency(㎒) : 824.7
Channel : 20407
Bandwidth(㎒) : 1.4

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 648.80	H	5.58	6.76	-60.42	-61.60	-13.00	48.60
	2 470.00	V	6.01	8.33	-56.58	-58.90	-13.00	45.90
	3 297.20	H	7.69	10.11	-55.18	-57.60	-13.00	44.60
	4 119.20	V	8.97	11.60	-56.77	-59.40	-13.00	46.40

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

Test mode : LTE Band 12/17
Frequency(㎒) : 701.5
Channel : 23035
Bandwidth(㎒) : 5

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 403.60	V	5.38	6.18	-64.10	-64.90	-13.00	51.90
	2 104.80	H	4.91	7.66	-57.95	-60.70	-13.00	47.70
	2 805.20	V	6.71	9.02	-59.39	-61.70	-13.00	48.70
	3 507.60	V	8.11	10.58	-57.13	-59.60	-13.00	46.60

Test mode : LTE Band 26
Frequency(㎒) : 836.5
Channel : 26915
Bandwidth(㎒) : 15

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 673.60	V	5.51	6.73	-62.28	-63.50	-13.00	50.50
	2 509.20	V	6.12	8.37	-58.05	-60.30	-13.00	47.30
	3 344.80	V	7.79	10.22	-56.77	-59.20	-13.00	46.20
	4 182.40	V	9.01	11.43	-57.88	-60.30	-13.00	47.30

Test mode : LTE Band 41
Frequency(㎒) : 2 503.5
Channel : 39725
Bandwidth(㎒) : 15

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	5 004.75	V	9.80	12.82	-56.08	-59.10	-25.00	34.10
	7 510.50	H	11.72	15.82	-51.20	-55.30	-25.00	30.30
	10 014.00	V	12.90	18.14	-40.06	-45.30	-25.00	20.30
	12 518.25	V	13.10	20.66	-37.44	-45.00	-25.00	20.00

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

Test mode : LTE Band 66
Frequency(㎒) : 1 710.7
Channel : 131979
Bandwidth(㎒) : 1.4

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	3 420.00	H	7.94	10.39	-54.15	-56.60	-13.00	43.60
	5 128.50	V	9.93	13.09	-56.74	-59.90	-13.00	46.90
	6 840.00	H	11.44	15.26	-53.58	-57.40	-13.00	44.40
	8 550.75	V	12.90	16.90	-49.70	-53.70	-13.00	40.70
	11 970.75	V	13.01	20.13	-37.58	-44.70	-13.00	31.70

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

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	AGILENT	N9040B	MY57010132	23.10.14
Wideband Radio Communication Tester	R&S	CMW500	141780	23.03.28
Signal Generator	R&S	SMB100A	176206	23.01.19
Bilog Antenna	Teseq GmbH	CBL 6143A	35039	23.05.12
Bilog Antenna	ETS.LINDGREN	3143B	00228420	23.09.28
Horn Antenna	ETS.LINDGREN	3117	161225	23.05.04
Horn Antenna	ETS.LINDGREN	3117	00227509	23.09.20
Horn Antenna	ETS.lindgren	3116	00086632	23.01.25
Horn Antenna	Steatite Antennas	QMS-00225	17790	23.07.14
Horn Antenna	Steatite Antennas	QMS-00238	17791	23.07.14
High Pass Filter	Wainwright Instruments GmbH	WHKX10-900-1000-15000-40SS	11	23.08.10
High Pass Filter	Wainwright Instruments GmbH	WHKX12-2805-3000-18000-40SS	32	23.08.10
Broadband Amplifier	SONOMA INSTRUMENT	315	300314	23.01.19
Low Noise Amplifier	TESTEK	TK-PA18H	220123-L	23.12.02*
Amplifier	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000996	23.01.21
Antenna Stand	innco systems GmbH	AS1500-EP-10kg	-	-
Antenna Stand	innco systems GmbH	AS1500-EP-10kg	-	-
Compact Table	innco systems GmbH	CT1000	-	-

*Tests related to this equipment were progressed after the calibration was completed.

End of test report