# TEST REPORT

| Eurofins KCTL Co.,Ltd.<br>65, Sinwon-ro, Yeongtong-gu,<br>Suwon-si, Gyeonggi-do, 16677, Korea<br>TEL: 82-31-285-0894 FAX: 82-505-299-8311<br>www.kctl.co.kr | Report No.:<br>KR23-SRF0032-A<br>Page (1) of (19) | 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 90 subpart S

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

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

2023-01-20

**Eurofins KCTL Co.,Ltd.**

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 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 The report No. KR23-SRF0032 is superseded by the report No. KR23-SRF0032-A.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<br>VCCI Registration No. : R-20080, G-20078, C-20059, T-20056<br>CAB Identifier: KR0040<br>ISED Number: 8035A<br>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 | : | 814.7 ㎒ ~ 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 26**

| Ch. | Frequency (㎒) |
|---|---|
| 26697 | 814.7 |
| 26783 | 823.3 |

Table 2.1-1. 1.4M BW

| Ch. | Frequency (㎒) |
|---|---|
| 26705 | 815.5 |
| 26775 | 822.5 |

Table 2.1-2. 3M BW

| Ch. | Frequency (㎒) |
|---|---|
| 26715 | 816.5 |
| 26765 | 821.5 |

Table 2.1-3. 5M BW

| Ch. | Frequency (㎒) |
|---|---|
| 26740 | 819.0 |

Table 2.1-4. 10M BW

| Ch. | Frequency (㎒) |
|---|---|
| 26765 | 821.5 |

Table 2.1-5. 15M BW

# 3. Introduction

This report referenced from the FCC ID : A3LSMA346M PCE WWAN (FCC CFR 47 Part 90).
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 B26 | ERP | QPSK | 15 | 26790 | 824.00 | 21.26 | 20.03 | -1.15 |
| | RSE | QPSK | 15 | 26765 | 2 484.38 | -53.10 | -59.80 | -6.70 |

**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 output power

**LTE Band 26 (Part 90)**

| Mode | Tx frequency (㎒) | Emission designator | Conducted | |
|---|---|---|---|---|
| | | | Max. power (dBm) | Max. power (W) |
| LTE Band 26 | 814.7 ~ 823.3 | 1M10G7D | 23.49 | 0.223 |
| | | 1M10W7D | 22.52 | 0.179 |
| | 815.5 ~ 822.5 | 2M70G7D | 23.47 | 0.222 |
| | | 2M70W7D | 23.01 | 0.200 |
| | 816.5 ~ 821.5 | 4M51G7D | 23.64 | 0.231 |
| | | 4M51W7D | 22.43 | 0.175 |
| | 819.0 | 9M02G7D | 23.44 | 0.221 |
| | | 9M02W7D | 23.06 | 0.202 |
| | 821.5 | 13M5G7D | 23.42 | 0.220 |
| | | 13M4W7D | 23.02 | 0.200 |
| Straddle channel | 824.0 | 1M10G7D | 23.32 | 0.215 |
| | | 1M09W7D | 22.37 | 0.173 |
| | | 2M70G7D | 23.26 | 0.212 |
| | | 2M68W7D | 22.88 | 0.194 |
| | | 4M48G7D | 23.49 | 0.223 |
| | | 4M51W7D | 22.34 | 0.171 |
| | | 8M97G7D | 23.41 | 0.219 |
| | | 8M97W7D | 22.97 | 0.198 |
| | | 13M4G7D | 23.36 | 0.217 |
| | | 13M5W7D | 22.92 | 0.196 |

## 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 |
| 2.1053<br>90.691(a) | Radiated Spurious Emissions | <43 + 10Log$_{10}$(P) dB | | 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, 64QAM and 256QAM 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 | B26 (Part90) | QPSK | 15 | 1 | 0, 36, 74 |

## 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.

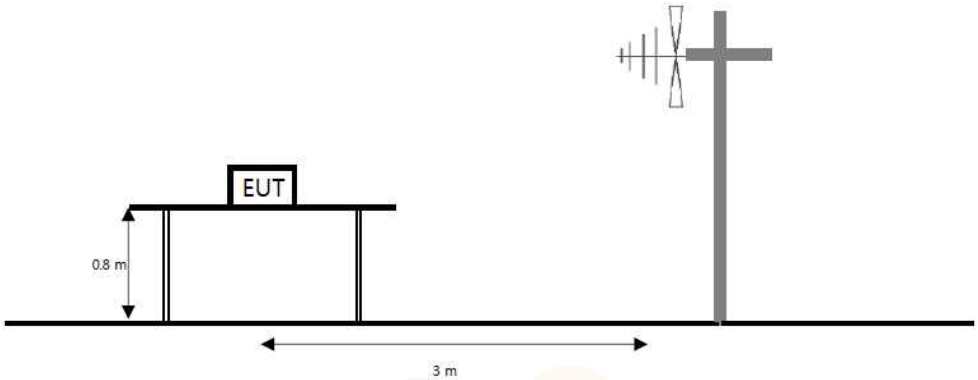
| Parameter | Expanded uncertainty (±) | |
|---|---|---|
| Conducted RF power | 0.9 dB | |
| Conducted spurious emissions | 1.1 dB | |
| Radiated spurious emissions | Below 1 000 ㎒ | 4.3 dB |
| | 1 000 ㎒ ~ 18 000 ㎒ | 3.8 dB |
| | Above 1 8000 ㎒ | 5.9 dB |

# 7. Test results

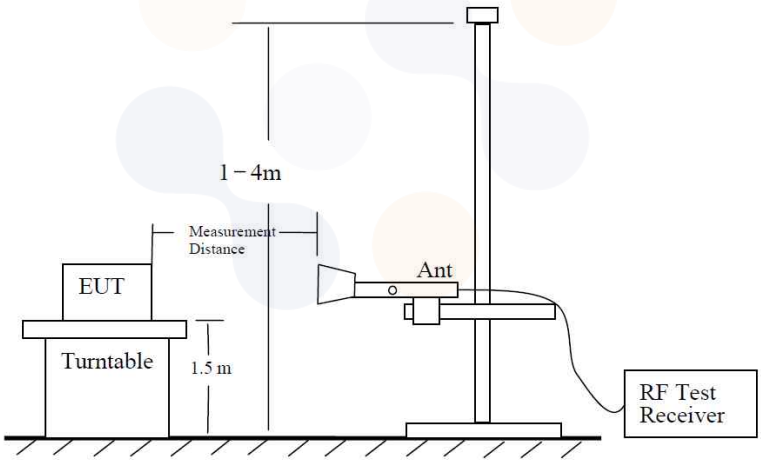
## 7.1. Radiated Power (ERP/EIRP)

**Test setup**

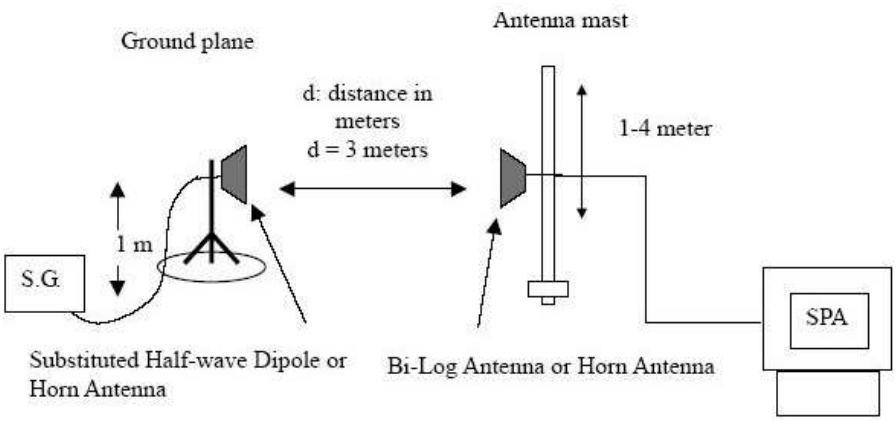
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.




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 §90.635(b), the maximum output power of the transmitter for mobile stations is 100 watts(20 dBw).

**Test procedure**

971168 D01 v03r01 - Section 5.2 and 5.8
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 26

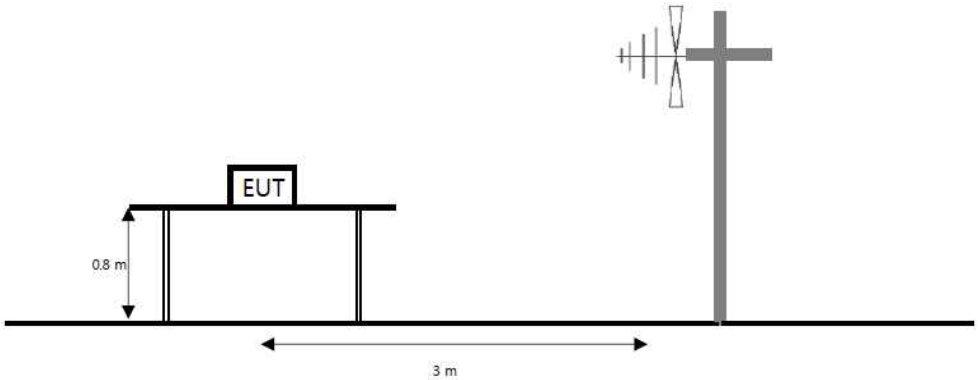
| Bandwidth | Modulation | Frequency | Pol. | Antenna Gain | C.L | Substitute Level | ERP | |
|---|---|---|---|---|---|---|---|---|
| | | [㎒] | [V/H] | [dBd] | [dB] | [dBm] | [dBm] | [W] |
| 15 M | QPSK | 824.0 | H | 0.08 | 4.88 | 23.65 | 20.03 | 0.101 |

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

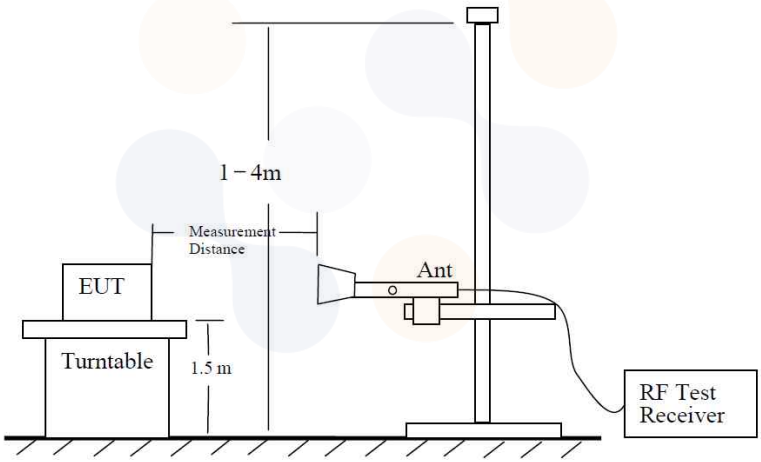
## 7.2 Radiated Spurious Emissions

**Test setup**

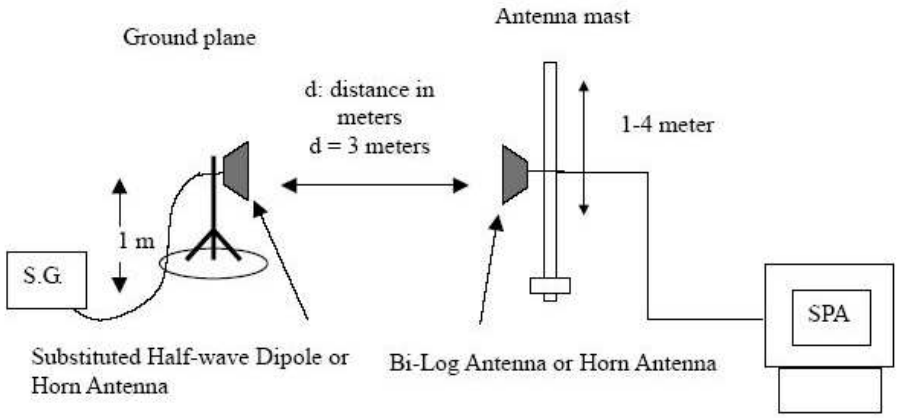
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.




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

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

(2) For any frequency removed from the EA licensee’s frequency block greater than 37.5 ㎑, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + $10Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 ㎑.

**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 = 1 ㎑ 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 26
Frequency(㎒) : 821.5
Channel : 26765
Bandwidth(㎒) : 15

| Mode | Frequency | Pol. | Antenna Gain | Cable loss | Substitute Level | Level | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| | [㎒] | [V/H] | [dBi] | [dB] | [dBm] | [dBm] | [dBm] | [dB] |
| QPSK | 1 656.40 | H | 5.56 | 6.68 | -59.78 | -60.90 | -13.00 | 47.90 |
| | 2 490.40 | V | 6.07 | 8.37 | -57.50 | -59.80 | -13.00 | 46.80 |
| | 3 314.40 | H | 7.73 | 10.15 | -57.48 | -59.90 | -13.00 | 46.90 |
| | 4 144.40 | V | 8.99 | 11.66 | -57.73 | -60.40 | -13.00 | 47.40 |

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

## 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**