# TEST REPORT

**KCTL Inc.**
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
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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 : 2021-12-30

**2. Use of Report** : Certification

**3. Name of Product / Model** : Mobile Phone / SM-A235M/DS

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

**5. FCC ID** : A3LSMA235M

**6. Date of Test** : 2022-01-10 to 2022-02-14

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

**8. Test method used** : FCC Part 15 Subpart C, 15.225

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

| | | |
|---|---|---|
| Affirmation | Tested by<br>Name : Taeyoung Kim (Signature) | Technical Manager<br>Name : Seungyong Kim (Signature) |

2022-02-16

## KCTL Inc.

## REPORT REVISION HISTORY

| Date | Revision | Page No |
|---|---|---|
| 2022-02-16 | Originally issued | - |
| | | |
| | | |
| | | |
| | | |



## 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 | : | 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<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-A235M/DS |
| Derivative model | : | SM-A235M |
| Modulation technique | : | Bluetooth(BDR/EDR)_GFSK, π/4DQPSK, 8DPSK<br>Bluetooth(BLE)_GFSK<br>WIFI(802.11a/b/g/n/ac)_DSSS, OFDM<br>LTE_QPSK, 16QAM, 64QAM<br>WCDMA_QPSK<br>GSM_GMSK, 8-PSK<br>NFC_ASK |
| Number of channels | : | Bluetooth(BDR/EDR)_79 ch / Bluetooth(BLE)_40 ch<br>802.11b/g/n_HT20 : 13 ch<br>UNII-1: 4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)<br>UNII-2A: 4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)<br>UNII-2C: 12 ch (20 ㎒), 6 ch (40 ㎒), 3 ch (80 ㎒)<br>UNII-3: 5 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)<br>NFC: 1 ch |
| Power source | : | DC 3.88 Ⅴ |
| Antenna specification | : | LTE/WCDMA/GSM_MFA Antenna<br>WIFI/Bluetooth(BDR/EDR/BLE)_MFA Antenna<br>NFC_FPCB Antenna |

| | | |
|---|---|---|
| Antenna gain | : | WIFI/Bluetooth(BDR/EDR/BLE)_-4.0 dBi |
| | | UNII-1 : -4.3 dBi |
| | | UNII-2A : -4.5 dBi |
| | | UNII-2C : -4.3 dBi |
| | | UNII-3 : -3.5 dBi |
| Frequency range | : | Bluetooth(BDR/EDR/BLE)_2 402 ㎒ ~ 2 480 ㎒ |
| | | 2 412 ㎒ ~ 2 472 ㎒ (802.11b/g/n_HT20) |
| | | UNII-1: 5 180 ㎒ ~ 5 240 ㎒ (802.11a/n/ac_HT20/VHT20) |
| | | UNII-1: 5 190 ㎒ ~ 5 230 ㎒ (802.11n/ac_HT40/VHT40) |
| | | UNII-1: 5 210 ㎒ (802.11ac_VHT80) |
| | | UNII-2A: 5 260 ㎒ ~ 5 320 ㎒ (802.11a/n/ac_HT20/VHT20) |
| | | UNII-2A: 5 270 ㎒ ~ 5 310 ㎒ (802.11n/ac_HT40/VHT40) |
| | | UNII-2A: 5 290 ㎒ (802.11ac_VHT80) |
| | | UNII-2C: 5 500 ㎒ ~ 5 720 ㎒ (802.11a/n/ac_HT20/VHT20) |
| | | UNII-2C: 5 510 ㎒ ~ 5 710 ㎒ (802.11n/ac_HT40/VHT40) |
| | | UNII-2C: 5 530 ㎒ ~ 5 690 ㎒ (802.11ac_VHT80) |
| | | UNII-3: 5 745 ㎒ ~ 5 825 ㎒ (802.11a/n/ac_HT20/VHT20) |
| | | UNII-3: 5 755 ㎒ ~ 5 795 ㎒ (802.11n/ac_HT40/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 17_706.5 ㎒ ~ 713.5 ㎒ |
| | | LTE Band 13_779.5 ㎒ ~ 784.5 ㎒ |
| | | 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 ㎒ |
| | | NFC_13.56 ㎒ |
| Software version | : | A235M.001 |
| Hardware version | : | REV0.3 |
| Test device serial No. | : | Radiated(R38RC00VADR) |
| Operation temperature | : | -20 ℃ ~ 50 ℃ |

**Note.** The Product equality letter includes detailed information about the differences between basic and derivative model.

## 2.1. Frequency/channel operations

This device contains the following capabilities:
WiFi (802.11a/b/g/n/ac), Bluetooth (BDR/EDR/BLE), NFC
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, GSM 850, GSM 1900, WCDMA 850, WCDMA 1700, WCDMA 1900

| Ch. | Frequency (㎒) |
|---|---|
| 01 | 13.56 |

Table 2.1.1. NFC

## 3. Antenna requirement

Requirement of FCC part section 15.203
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

- The transmitter has permanently attached FPCB Antenna (Internal antenna) on board.

## 4. Summary of tests

| FCC Part section(s) | Parameter | Test Condition | Test results |
|---|---|---|---|
| 15.225(a) | In-band Fundamental Emission | Radiated | Pass |
| 15.225(b) | In-band Spurious Emission | | Pass |
| 15.225(c) | In-band Spurious Emission | | Pass |
| 15.225(d)<br>15.209 | Out-of–band Spurious Emission | | Pass |
| 15.225(e) | Frequency Stability Tolerance | Conducted | Pass |
| 15.215(c) | 20 dB Bandwidth | | Pass |
| 15.207(a) | AC Conducted emissions | | Pass |

**Notes:**

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. These tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
3. 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
4. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
5. All the radiated tests have been performed several case.
   (Stand-alone, with accessories (TA etc.))
   Worst case: Stand-alone
6. Radiated(fundamental level and spurious emissions) tests were performed both without reading a passive tag condition[test mode] and with reading a passive tag condition
   - Worst case : Without passive tag

## 5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

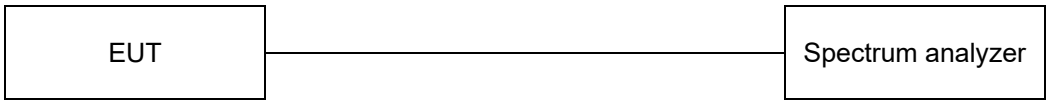
All measurement uncertainty values are shown with a coverage factor of $k$=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the $U_{CISPR}$ measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine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

| Parameter | Expanded uncertainty (±) | |
|---|---|---|
| Radiated spurious emissions | 9 ㎑ ~ 30 ㎒: | 2.4 dB |
| | 30 ㎒ ~ 1 000 ㎒ | 2.3 dB |
| Conducted emissions | 9 ㎑ ~ 150 ㎑ | 1.6 dB |
| | 150 ㎑ ~ 30 ㎒ | 1.7 dB |

# 6. Test results

## 6.1. 20 dB Bandwidth & 99% Bandwidth

**Test setup**




**Limit**

According to §15.215(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

**Test procedure**

ANSI C63.10 - Section 6.9.2

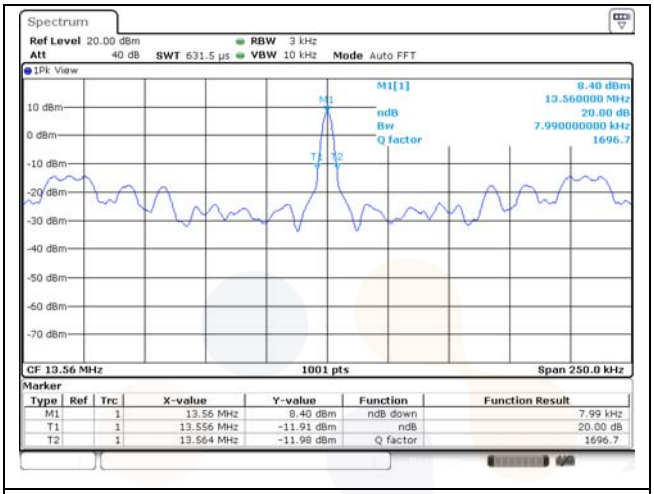
**Test settings**

The occupied bandwidth is measured as the width of the spectral envelope of the modulated signal, at an amplitude level reduced from a reference value by a specified ratio (or in decibels, a specified number of dB down from the reference value). Typical ratios, expressed in dB, are −6 dB, −20 dB, and −26 dB, corresponding to 6 dB BW, 20 dB BW, and 26 dB BW, respectively. In this subclause, the ratio is designated by "−xx dB." The reference value is either the level of the unmodulated carrier or the highest level of the spectral envelope of the modulated signal, as stated by the applicable requirement. Some requirements might specify a specific maximum or minimum value for the "−xx dB" bandwidth; other requirements might specify that the "−xx dB" bandwidth be entirely contained within the authorized or designated frequency band.

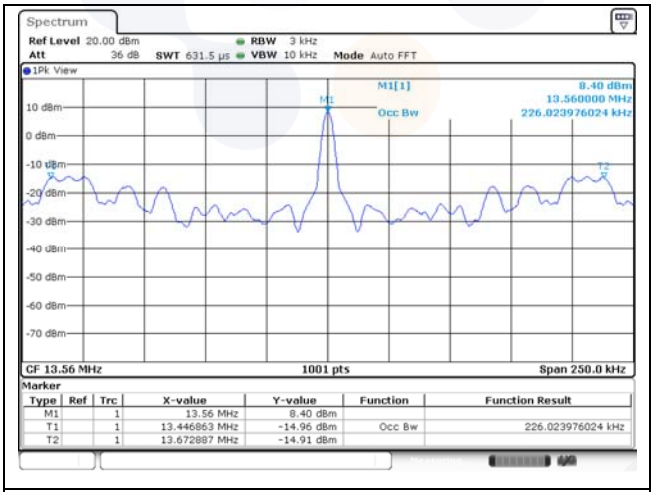
a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency.
b) Span: Two times and five times the OBW.
c) RBW = 1 % to 5 % of the OBW and VBW ≥ 3 x RBW
d) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation.
e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "−xx dB down" requirement; that is, if the requirement calls for measuring the −20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
f) Detector: peak
g) Trace mode: max hold.
h) Allow the trace to stabilize.
i) Determine the "−xx dB down amplitude" using ((reference value) − xx). Alternatively, this calculation may be made by using the marker-delta function of the instrument.
j) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).
k) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "−xx dB down amplitude" determined in step h). If a marker is below this "−xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the "−xx dB down amplitude" determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

## Test results

| Frequency [㎒] | 20 ㏈ Bandwidth [㎒] | | Limit [㎒] | 20 ㏈ Bandwidth [㎒] | Occupied Bandwidth (99 % BW) [㎒] |
|---|---|---|---|---|---|
| 13.56 | Lowest Frequency | 13.556 | 13.110 | 0.008 | 0.226 |
| | Highest Frequency | 13.564 | 14.010 | | |




20 ㏈ Bandwidth

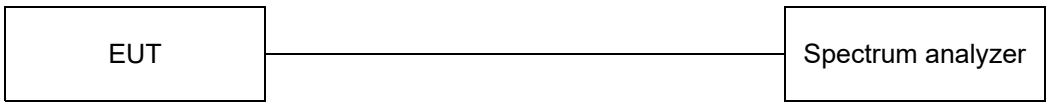



Occupied Bandwidth

**Note:**
Because the measured signal is CW/CW-like, adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW

## 6.2. Frequency tolerance

**Test setup**




**Limit**

15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±0.01 % of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

**Test procedure**

ANSI C63.10-2013 - Section 6.8.1

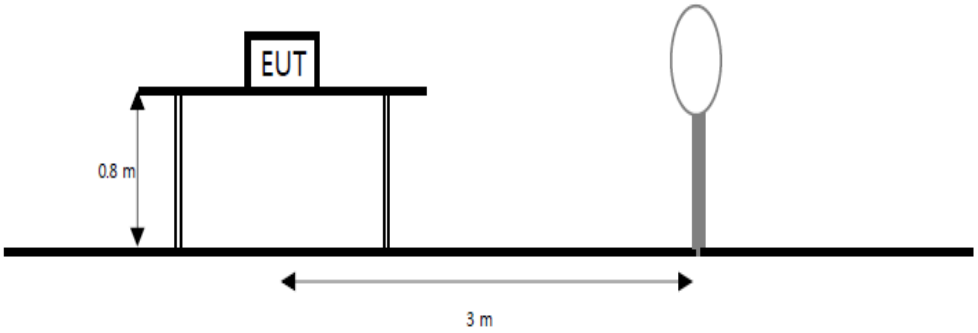
## Test results

| Voltage | Voltage | TEMP | Maintaining time | Measure frequency | Frequency deviation | Deviation |
|---|---|---|---|---|---|---|
| [%] | [V] | [℃] | | [㎐] | [㎐] | [%] |
| 100 | 3.88 | 20(Ref.) | Startup | 13 560 008 | 8.0 | 0.000 06 |
| | | | 2 minutes | 13 560 008 | 8.0 | 0.000 06 |
| | | | 5 minutes | 13 560 007 | 7.0 | 0.000 05 |
| | | | 10 minutes | 13 560 007 | 7.0 | 0.000 05 |
| | | -20 | Startup | 13 560 051 | 51.0 | 0.000 38 |
| | | | 2 minutes | 13 560 052 | 52.0 | 0.000 38 |
| | | | 5 minutes | 13 560 053 | 53.0 | 0.000 39 |
| | | | 10 minutes | 13 560 053 | 53.0 | 0.000 39 |
| | | -10 | Startup | 13 560 083 | 83.0 | 0.000 61 |
| | | | 2 minutes | 13 560 084 | 84.0 | 0.000 62 |
| | | | 5 minutes | 13 560 084 | 84.0 | 0.000 62 |
| | | | 10 minutes | 13 560 085 | 85.0 | 0.000 63 |
| | | 0 | Startup | 13 560 070 | 70.0 | 0.000 52 |
| | | | 2 minutes | 13 560 069 | 69.0 | 0.000 51 |
| | | | 5 minutes | 13 560 069 | 69.0 | 0.000 51 |
| | | | 10 minutes | 13 560 068 | 68.0 | 0.000 50 |
| | | 10 | Startup | 13 560 073 | 73.0 | 0.000 54 |
| | | | 2 minutes | 13 560 072 | 72.0 | 0.000 53 |
| | | | 5 minutes | 13 560 072 | 72.0 | 0.000 53 |
| | | | 10 minutes | 13 560 071 | 71.0 | 0.000 52 |
| | | 30 | Startup | 13 560 003 | 3.0 | 0.000 02 |
| | | | 2 minutes | 13 560 002 | 2.0 | 0.000 02 |
| | | | 5 minutes | 13 560 002 | 2.0 | 0.000 02 |
| | | | 10 minutes | 13 560 001 | 1.0 | 0.000 01 |
| | | 40 | Startup | 13 559 973 | -27.0 | -0.000 20 |
| | | | 2 minutes | 13 559 973 | -27.0 | -0.000 20 |
| | | | 5 minutes | 13 559 972 | -28.0 | -0.000 21 |
| | | | 10 minutes | 13 559 971 | -29.0 | -0.000 21 |
| | | 50 | Startup | 13 559 943 | -57.0 | -0.000 42 |
| | | | 2 minutes | 13 559 942 | -58.0 | -0.000 43 |
| | | | 5 minutes | 13 559 941 | -59.0 | -0.000 44 |
| | | | 10 minutes | 13 559 940 | -60.0 | -0.000 44 |
| End Point | 3.40 | 20 | Startup | 13 560 003 | 3.0 | 0.000 02 |
| | | | 2 minutes | 13 560 003 | 3.0 | 0.000 02 |
| | | | 5 minutes | 13 560 002 | 2.0 | 0.000 02 |
| | | | 10 minutes | 13 560 002 | 2.0 | 0.000 02 |
| 115 | 4.46 | 20 | Startup | 13 559 971 | -29.0 | -0.000 21 |
| | | | 2 minutes | 13 559 971 | -29.0 | -0.000 21 |
| | | | 5 minutes | 13 559 970 | -30.0 | -0.000 22 |
| | | | 10 minutes | 13 559 970 | -30.0 | -0.000 22 |

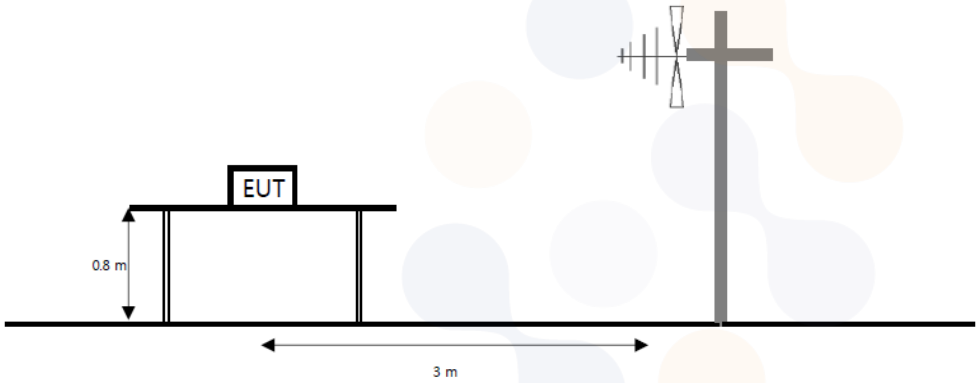
## 6.3. Radiated spurious emissions

**Test setup**

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




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




**Limit**

15.225 (a) The field strength of any emission within the band 13.553-13.567 ㎒ shall not exceed 15, 848 microvolts/meter at 30 meters.

15.225 (b) With in the bands 13.410-13.553 ㎒ and 13.567-13.710 ㎒, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

15.225 (c) With in the bands 13.110-13.410 ㎒ and 13.710-14.010 ㎒, the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

15.225 (d) The Field Strength of any emissions appearing outside of the 13.110-14.010 ㎒ band shall not exceed the general radiated emission limits in 15.209.

| Frequency (㎒) | Field Strength (㎶/m) | Measurement distance (meters) |
|---|---|---|
| 0.009-0.490 | 2400/F(㎑) | 300 |
| 0.490-1.705 | 24000/F(㎑) | 30 |
| 1.705-30.0 | 30(29.54 dB㎶/m) | 30 |
| 30.0-88.0 | 100(40 dB㎶/m) | 3 |
| 88-216 | 150(43.5 dB㎶/m) | 3 |
| 216-960 | 200 (46 dB㎶/m) | 3 |
| Above 960 | 500 (53.98 dB㎶/m) | 3 |

**Test procedure**

ANSI C63.10-2013 - Section 6.4, 6.5

**Test settings**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in table
3. VBW ≥ 3 x RBW
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

**Table. RBW as a function of frequency**

| Frequency | RBW |
|---|---|
| 9 ㎑ to 150 ㎑ | 200 ㎐ to 300 ㎐ |
| 0.15 ㎒ to 30 ㎒ | 9 ㎑ to 10 ㎑ |
| 30 ㎒ to 1 000 ㎒ | 100 ㎑ to 120 ㎑ |
| > 1 000 ㎒ | 1 ㎒ |

**Notes:**

1. *f* <30 ㎒, extrapolation factor of 40 dB/decade of distance. $F_d = 40\log(D_m/Ds)$
   *f* ≥30 ㎒, extrapolation factor of 20 dB/decade of distance. $F_d = 20\log(D_m/Ds)$
   Where:
   $F_d$= Distance factor in dB
   $D_m$= Measurement distance in meters
   $D_s$= Specification distance in meters
2. Measurements were performed at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in § 15.31(f)(2). Extrapolation Factor = 40 log10(30/3) = 40 dB.
3. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or $F_d$(dB)
4. Result = Reading + Cable loss + Amp gain + Ant. factor - Distance factor
5. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
6. All measurements were recorded using a spectrum analyzer employing a quasi-peak detector.
7. Below 30 ㎒ frequency range, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported and the worse orientations of Face-on and Face-off were set for final test.
8. Face-on = Parallel, Face-off = Perpendicular
9. [1] means restricted band

## Test results for fundamental

### 15.225 (a) 13.553-13.567 ㎒

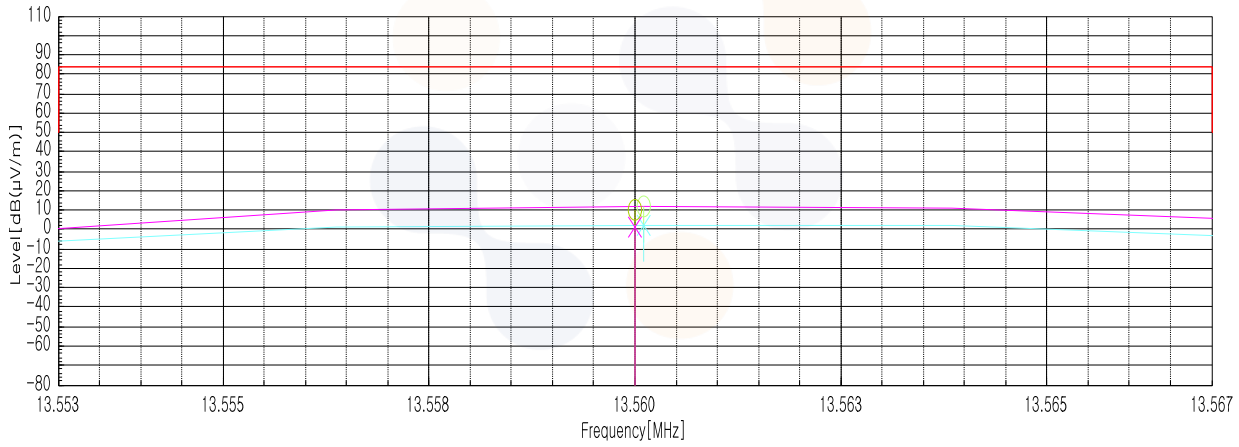
[Face-on]

| Frequency | Reading | Antenna Factor | Amp. + Cable | Distance Factor | Result | Limit | Margin |
|---|---|---|---|---|---|---|---|
| (㎒) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Quasi peak data** | | | | | | | |
| 13.56 | 52.20 | 20.20 | -31.02 | 40.00 | 1.38 | 84.00 | 82.62 |

[Face-off]

| Frequency | Reading | Antenna Factor | Amp. + Cable | Distance Factor | Result | Limit | Margin |
|---|---|---|---|---|---|---|---|
| (㎒) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Quasi peak data** | | | | | | | |
| 13.56 | 61.00 | 20.20 | -31.02 | 40.00 | 10.18 | 84.00 | 73.82 |

**Face-on/Face-off**



## Test results for in-band & out-band (9 ㎑ to 30 ㎒)

### 15.225 (b,c) 13.110-14.010 ㎒

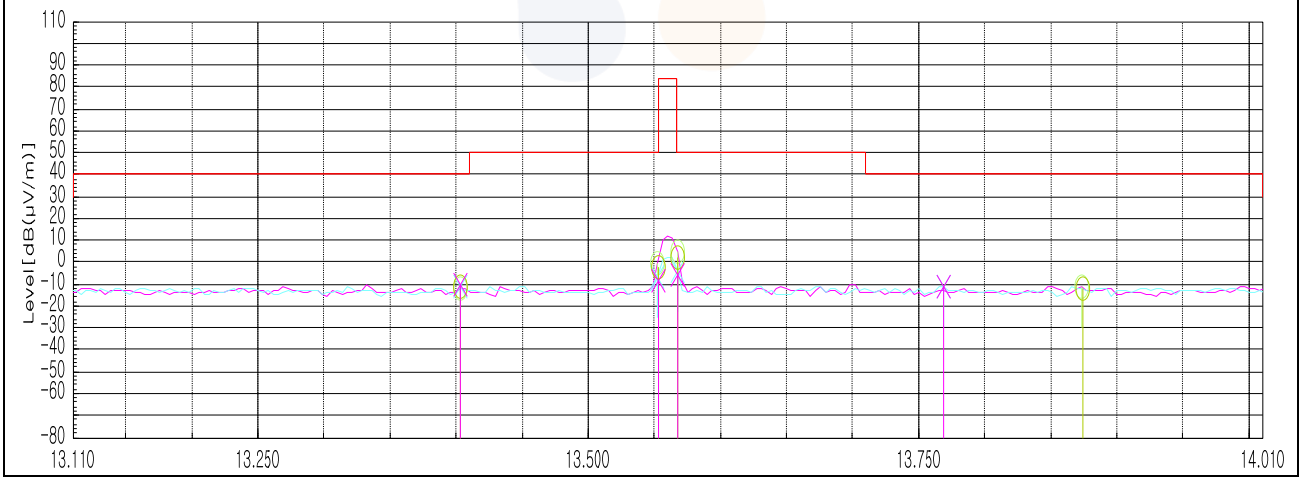
[Face-on]

| Frequency | Reading | Antenna Factor | Amp. + Cable | Distance Factor | Result | Limit | Margin |
|---|---|---|---|---|---|---|---|
| (㎒) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Quasi peak data** | | | | | | | |
| 13.40 | 39.40 | 20.20 | -31.04 | 40.00 | -11.44 | 40.50 | 51.94 |
| 13.55 | 48.30 | 20.20 | -31.02 | 40.00 | -2.52 | 50.50 | 53.02 |
| 13.57 | 52.90 | 20.20 | -31.02 | 40.00 | 2.08 | 50.50 | 48.42 |
| 13.87 | 38.40 | 20.20 | -30.97 | 40.00 | -12.37 | 40.50 | 52.87 |

[Face-off]

| Frequency | Reading | Antenna Factor | Amp. + Cable | Distance Factor | Result | Limit | Margin |
|---|---|---|---|---|---|---|---|
| (㎒) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Quasi peak data** | | | | | | | |
| 13.40 | 40.30 | 20.20 | -31.04 | 40.00 | -10.54 | 40.50 | 51.04 |
| 13.55 | 41.90 | 20.20 | -31.02 | 40.00 | -8.92 | 50.50 | 59.42 |
| 13.57 | 44.40 | 20.20 | -31.02 | 40.00 | -6.42 | 50.50 | 56.92 |
| 13.77 | 39.10 | 20.20 | -30.99 | 40.00 | -11.69 | 40.50 | 52.19 |

**Face-on/Face-off**



## Test results (9 ㎑ to 30 ㎒)

### 15.225 (d) 0.009-30 ㎒

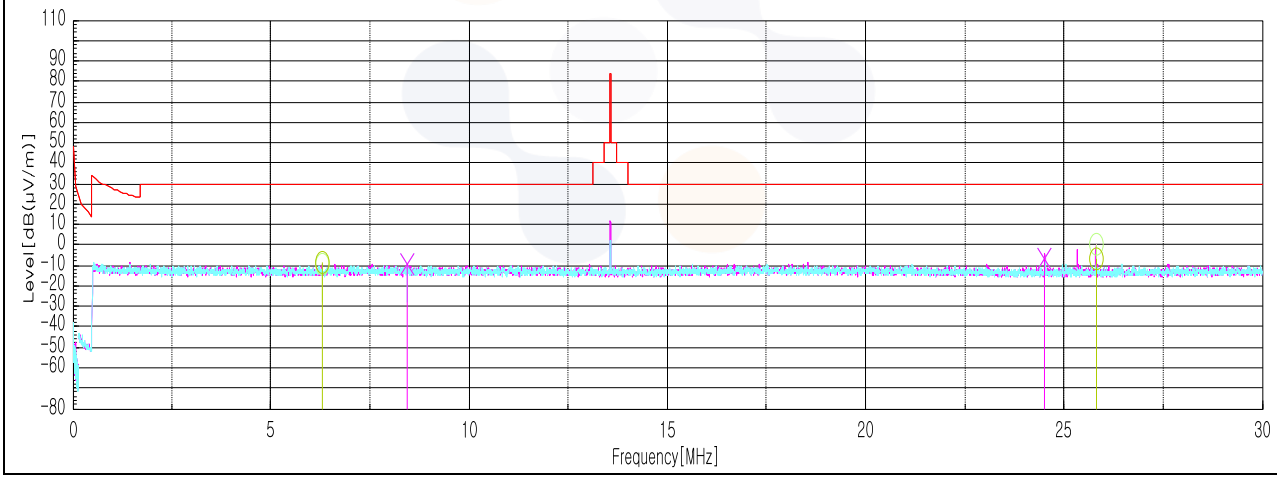
[Face-on]

| Frequency | Reading | Antenna Factor | Amp. + Cable | Distance Factor | Result | Limit | Margin |
|---|---|---|---|---|---|---|---|
| (㎒) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Quasi peak data** | | | | | | | |
| 6.307 | 42.50 | 20.13 | -31.52 | 40.00 | -8.89 | 29.50 | 38.39 |
| 25.810 | 43.10 | 20.69 | -30.52 | 40.00 | -6.73 | 29.50 | 36.23 |

[Face-off]

| Frequency | Reading | Antenna Factor | Amp. + Cable | Distance Factor | Result | Limit | Margin |
|---|---|---|---|---|---|---|---|
| (㎒) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Quasi peak data** | | | | | | | |
| 8.441 | 42.10 | 20.17 | -31.48 | 40.00 | -9.21 | 29.50 | 38.71 |
| 24.515 | 42.60 | 20.78 | -30.61 | 40.00 | -7.23 | 29.50 | 36.73 |

**Face-on/Face-off**

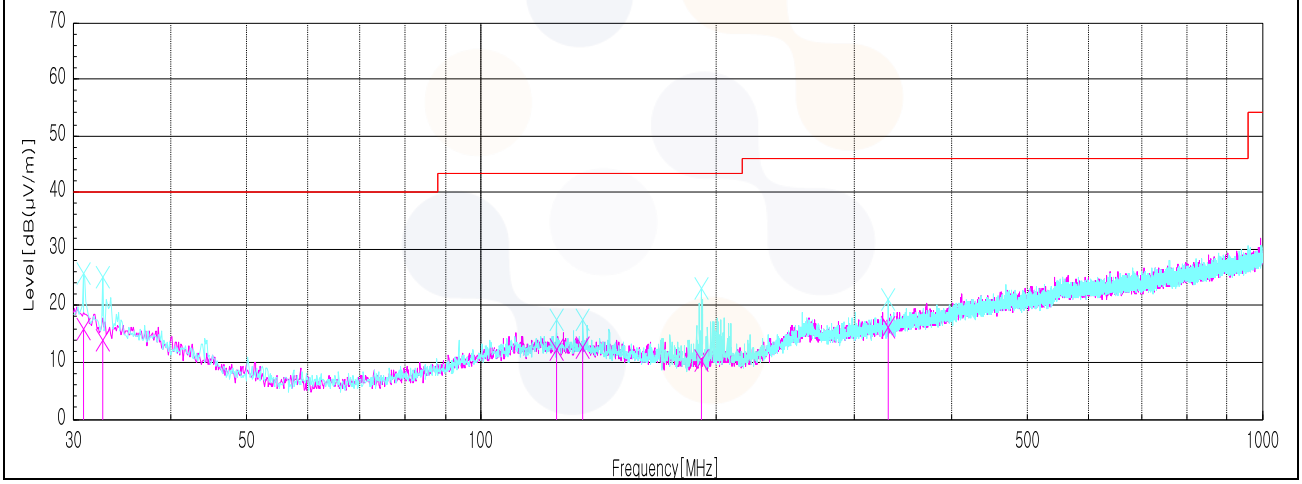


## Test results (Below 1 000 ㎒)

### 15.225 (d) 30-1000 ㎒

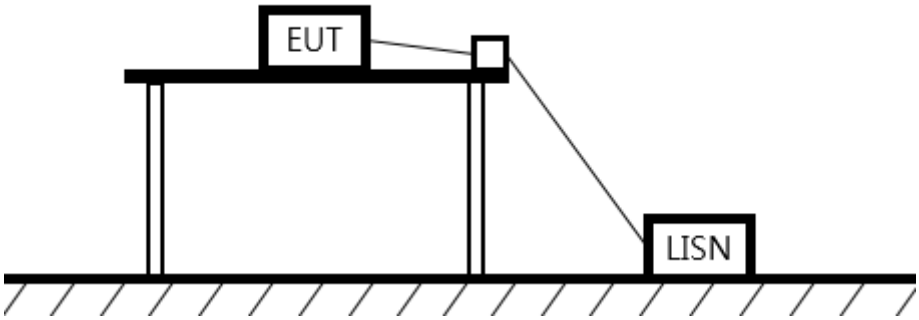
| Frequency | Pol. | Reading | Antenna Factor | Amp. + Cable | Distance Factor | Result | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| (㎒) | (V/H) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Quasi peak data** | | | | | | | | |
| 30.97 | V | 21.60 | 24.61 | -30.35 | - | 15.86 | 40.00 | 24.14 |
| 32.79 | V | 21.20 | 23.15 | -30.38 | - | 13.97 | 40.00 | 26.03 |
| 124.70 | V | 22.50 | 18.00 | -28.27 | - | 12.23 | 43.50 | 31.27 |
| 134.88 | V | 23.10 | 17.61 | -28.11 | - | 12.60 | 43.50 | 30.90 |
| 191.26 | V | 22.70 | 14.83 | -27.27 | - | 10.26 | 43.50 | 33.24 |
| 332.03 | V | 21.90 | 19.64 | -25.43 | - | 16.11 | 46.00 | 29.89 |

**Horizontal/Vertical**



## 6.4. AC Conducted emission

**Test setup**




**Limit**

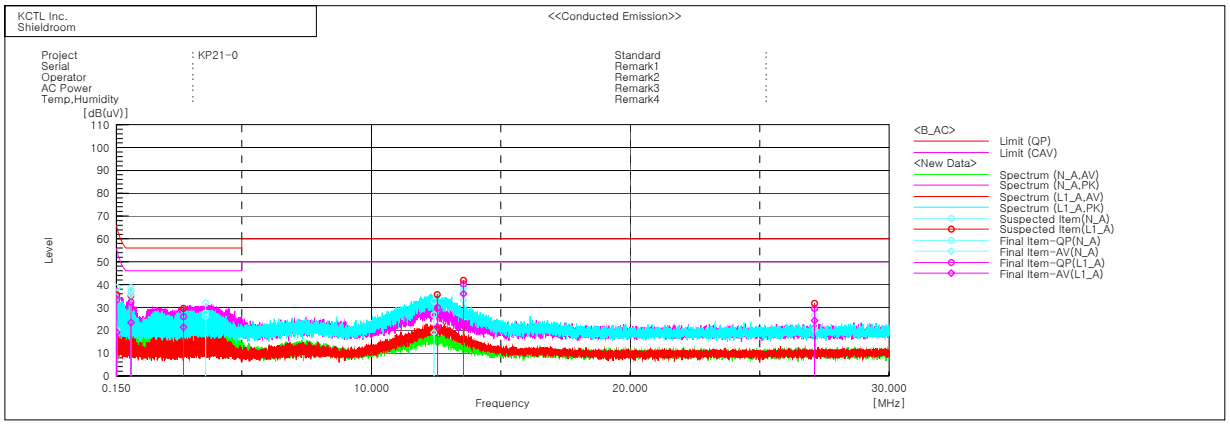
According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

| Frequency of Emission (㎒) | Conducted limit (dB㎶/m) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 – 0.50 | 66 - 56* | 56 - 46* |
| 0.50 – 5.00 | 56 | 46 |
| 5.00 – 30.0 | 60 | 50 |

**Measurement procedure**

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 ㎝ in which is located 40 ㎝ away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH LISN, which is an input transducer to a spectrum analyzer or an EMI/Field Intensity ㅡ Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 ㎒ to 30 ㎒.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 ㎑ or to quasi-peak and average within a bandwidth of 9 ㎑. The EUT was in transmitting mode during the measurements.

## Test results




Final Result

--- N_A Phase ---

| No. | Frequency [MHz] | Reading QP [dB(uV)] | Reading CAV [dB(uV)] | c.f [dB] | Result QP [dB(uV)] | Result CAV [dB(uV)] | Limit QP [dB(uV)] | Limit AV [dB(uV)] | Margin QP [dB] | Margin CAV [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.16855 | 23.3 | 10.1 | 10.1 | 33.4 | 20.2 | 65.0 | 55.0 | 31.6 | 34.8 |
| 2 | 0.70773 | 27.3 | 25.5 | 9.9 | 37.2 | 35.4 | 56.0 | 46.0 | 18.8 | 10.6 |
| 3 | 3.59114 | 17.8 | 16.1 | 9.8 | 27.6 | 25.9 | 56.0 | 46.0 | 28.4 | 20.1 |
| 4 | 12.41769 | 16.4 | 8.7 | 10.3 | 26.7 | 19.0 | 60.0 | 50.0 | 33.3 | 31.0 |
| 5 | 13.5601 | 26.6 | 22.7 | 10.4 | 37.0 | 33.1 | 60.0 | 50.0 | 23.0 | 16.9 |
| 6 | 27.11958 | 15.5 | 9.3 | 10.9 | 26.4 | 20.2 | 60.0 | 50.0 | 33.6 | 29.8 |

--- L1_A Phase ---

| No. | Frequency [MHz] | Reading QP [dB(uV)] | Reading CAV [dB(uV)] | c.f [dB] | Result QP [dB(uV)] | Result CAV [dB(uV)] | Limit QP [dB(uV)] | Limit AV [dB(uV)] | Margin QP [dB] | Margin CAV [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.16903 | 23.4 | 8.8 | 10.1 | 33.5 | 18.9 | 65.0 | 55.0 | 31.5 | 36.1 |
| 2 | 0.70722 | 22.6 | 13.6 | 9.8 | 32.4 | 23.4 | 56.0 | 46.0 | 23.6 | 22.6 |
| 3 | 2.74628 | 16.2 | 11.5 | 9.8 | 26.0 | 21.3 | 56.0 | 46.0 | 30.0 | 24.7 |
| 4 | 12.55148 | 19.5 | 11.1 | 10.4 | 29.9 | 21.5 | 60.0 | 50.0 | 30.1 | 28.5 |
| 5 | 13.56057 | 29.8 | 25.4 | 10.5 | 40.3 | 35.9 | 60.0 | 50.0 | 19.7 | 14.1 |
| 6 | 27.12019 | 18.6 | 13.4 | 10.9 | 29.5 | 24.3 | 60.0 | 50.0 | 30.5 | 25.7 |

## 7. Measurement equipment

| Equipment Name | Manufacturer | Model No. | Serial No. | Next Cal. Date |
|---|---|---|---|---|
| EMI TEST RECEIVER | R&S | ESCI7 | 100732 | 23.01.19* |
| Bi-Log Antenna | TESEQ | CBL 6112D | 55545 | 23.01.14 |
| Amplifier | SONOMA INSTRUMENT | 310N | 284608 | 22.08.19 |
| ATTENUATOR | KEYSIGHT | 8491B-6dB | MY39271060 | 23.01.14* |
| LOOP Antenna | R&S | HFH2-Z2 | 100355 | 22.08.21 |
| Antenna Mast | Innco Systems | MA4640-XP-ET | - | - |
| Turn Table | Innco Systems | CO3000 | 1175/45850319/P | - |
| TWO-LINE V - NETWORK | R&S | ENV216 | 101358 | 22.09.29 |
| EMI TEST RECEIVER | R&S | ESCI3 | 100001 | 22.08.19 |
| Cable Assembly | RadiAll | 2301761768000PJ | 1724.659 | - |
| Cable Assembly | HUER+SUHNER | SUCOFLEX 104 | MY4342/4 | - |
| Spectrum Analyzer | R&S | FSV30 | 100914 | 22.09.17 |
| Signal Generator | R&S | SMB100A | 176206 | 23.01.19* |
| Vector Signal Generator | R&S | SMBV100A | 257566 | 22.07.09 |
| Temp & Humid Chamber | ESPEC CORP. | SH-661 | 92004048 | 22.12.21 |

**End of test report**