

# FCC/ISED NFC REPORT

## Certification

**Applicant Name:**  
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**Date of Issue:**  
November 13, 2020

**Test Site/Location:**  
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si, Gyeonggi-do, 17383 KOREA

**Report No.:** HCT-RF-2011-FI017-R2

<b>FCC ID:</b>	<b>A3L-EFKG991</b>
<b>IC:</b>	<b>649E-EFKG991</b>
<b>APPLICANT:</b>	<b>SAMSUNG Electronics Co., Ltd.</b>

**Model:** EF-KG991  
**EUT Type:** Smart LED cover  
**RF Output Field Strength:** 17.33 dBuV/m @30 m  
**Frequency of Operation:** 13.56 MHz  
**FCC Classification:** Low Power Communication Device – Transmitter(DXX)  
**FCC Rule Part(s):** FCC Part 15.225 Subpart C  
**ISED Rule Part(s):** RSS-210 Issue 10 (December 2019), RSS-Gen Issue 5\_Amendment 1 (March 2019)

**Engineering Statement:**

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC/ISED Rules under normal use and maintenance.

Report No.: HCT-RF-2011-FI017-R2

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REVIEWED BY



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Report prepared by : Jeong Ho Kim  
Engineer of Telecommunication Testing Center

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Report approved by : Kwon Jeong  
Manager of Telecommunication Testing Center

This test results were applied only to the test methods required by the standard.

This laboratory is not accredited for the test results marked \*.

The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

\* The report shall not be reproduced except in full(only partly) without approval of the laboratory.

## Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2011-FI017	November 10, 2020	- First Approval Report
HCT-RF-2011-FI017-R1	November 12, 2020	- Revised the page 5. (revised the Client Device) - Revised the page 14. (99% BW Procedure added) - Revised the page 21. (revised the note content) - Revised the page 28. (table of content revised)
HCT-RF-2011-FI017-R2	November 13, 2020	- Revised the page 21. (revised the note content)

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## 1. EUT DESCRIPTION

<b>Model</b>	EF-KG991
<b>Additional Model</b>	-
<b>EUT Type</b>	Smart LED cover
<b>LED COVER Test application</b>	LED BACK COVER TEST APP (beyond)
<b>Client Device</b>	- Model : SM-G991U(FCC) / SM-G991W(ISED) - Manufacturer : SAMSUNG - FCC ID : A3LSMG991U - IC : 649E-SMG991W
<b>Power Supply</b>	DC 3.88 V (Cover input Voltage : 3.0 V)
<b>Battery Information</b>	Model: EB-BG991ABY Type: Li-ion Battery
<b>Travel Adapter Information</b>	Model : EP-TA800 Manufacture: DONGYANG E&P
<b>Data Cable Information</b>	Model : EP-DN980BBE, EP-DN980BBZ Manufacture: RF-Tech
<b>Ear-jack Information</b>	Model : YBD-19HS-026 Manufacture: ALMUS
<b>Frequency of Operation</b>	13.56 MHz (NFC Power transmission)
<b>Transmit Power</b>	17.33 dBuV/m @30 m
<b>Date(s) of Tests</b>	October 26, 2020 ~ November 09, 2020
<b>PMN (Product Marketing Number)</b>	Smart LED cover
<b>HVIN (Hardware Version Identification Number)</b>	EF-KG991
<b>FVIN (Firmware Version Identification Number)</b>	V00.06
<b>HMN (Host Marketing Name)</b>	N/A

## 2. TEST METHODOLOGY

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) is used in the measurement of the test device.

### EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.225 under the FCC Rules Part 15 Subpart C. / RSS-210 Issue 10 (December 2019)

### GENERAL TEST PROCEDURES

#### Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

#### Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013).

### DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

### 3. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

### 4. FACILITIES AND ACCREDITATIONS

#### FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

For ISED, test facility was accepted dated February 14, 2019 (CAB identifier: KR0032).

#### EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### 5. ANTENNA REQUIREMENTS

#### According to RSS-GEN(Issue 5) Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested..

## 6. 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 indicate a 95 % level of confidence.

The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05



## 7. DESCRIPTION OF TESTS

### 7.1. Radiated Test

#### Limit (Operation within the band 13.110 MHz – 14.010 MHz)

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
13.553 – 13.567	15,848	30
13.410 ≤ f ≤ 13.553 13.567 ≤ f ≤ 13.710	334	30
13.110 ≤ f ≤ 13.410 13.710 ≤ f ≤ 14.010	106	30

Note:

1. 15,848 uV/m = 84.0 dBuV/m
2. 334 uV/m = 50.47 dBuV/m
3. 106 uV/m = 40.51 dBuV/m

#### Limit (Radiated Spurious Emissions)

##### **FCC**

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	* 100	3
88-216	* 150	3
216-960	* 200	3
Above 960	500	3

※:

Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

**ISED**

Frequency (MHz)	Field Strength (uA/m)	Measurement Distance (m)
0.009 – 0.490	6.37/F(kHz)	300
0.490 – 1.705	63.7/F(kHz)	30
1.705 – 30	0.08	30

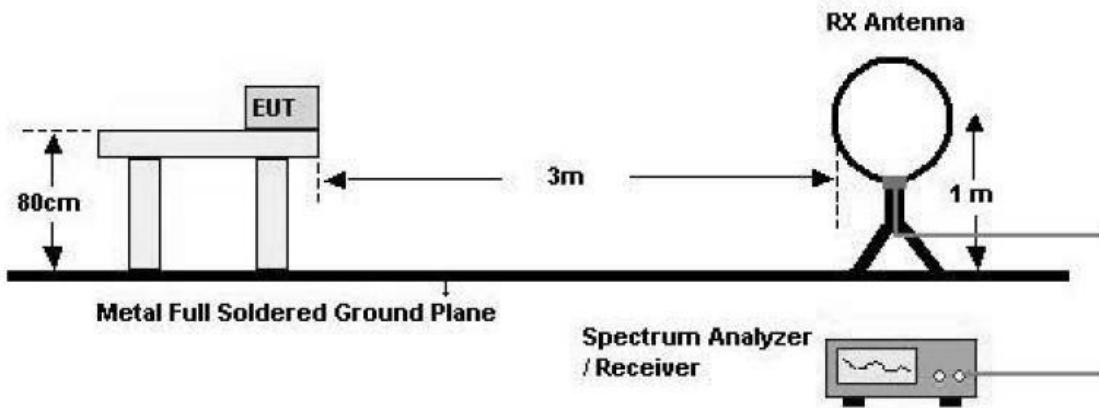
**FCC&ISED**

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

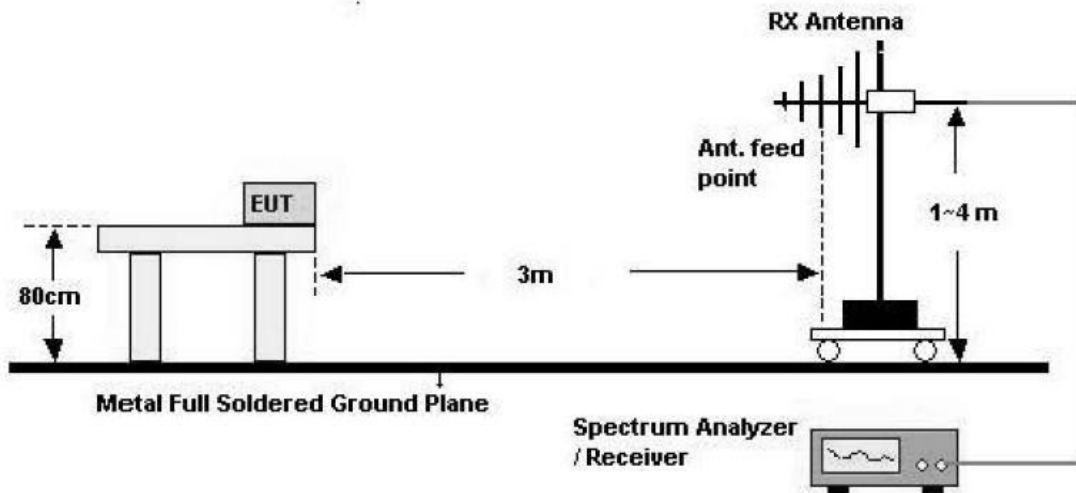
Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

### Test Configuration

Below 30 MHz



30 MHz - 1 GHz



### Test Procedure of inband

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor =  $40\log(3\text{ m}/30\text{ m}) = -40\text{ dB}$   
Measurement Distance : 3 m (Below 30 MHz)
7. Spectrum Setting

- Detector = Peak
- Trace = Maxhold
- RBW = 9 kHz
- VBW  $\geq 3 \times$  RBW

8. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

### **Test Procedure of Radiated spurious emissions(Below 30 MHz)**

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) =  $40\log(3 \text{ m}/300 \text{ m}) = - 80 \text{ dB}$   
Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) =  $40\log(3 \text{ m}/30 \text{ m}) = - 40 \text{ dB}$   
Measurement Distance : 3 m
8. Spectrum Setting
  - Frequency Range = 9 kHz ~ 30 MHz
  - Detector = Peak
  - Trace = Maxhold
  - RBW = 9 kHz
  - VBW  $\geq 3 \times$  RBW
9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

### **KDB 414788 OFS and Chamber Correlation Justification**

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

### **Test Procedure of Radiated spurious emissions(Above 30 MHz)**

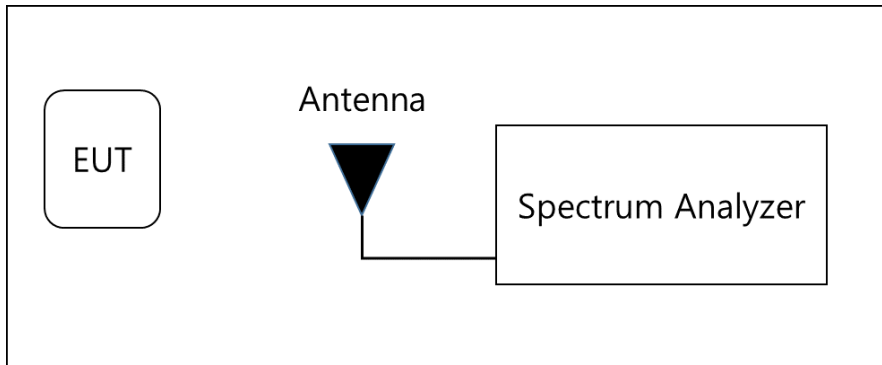
1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out

the highest emissions.

4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
  - Frequency Range = 30 MHz ~ 1 GHz
  - Detector = Peak
  - Trace = Maxhold
  - RBW = 100 kHz
  - VBW  $\geq$  3 x RBW
7. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)
8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

## 7.2. 20 dB Bandwidth & 99 % Bandwidth

### Test Configuration



### Test Procedure

The 20 dB bandwidth was measured by using a spectrum analyzer. (By connecting the measuring antenna)  
(Procedure 6.9.2 in ANSI 63.10-2013)

- 1) RBW = 1%~5% of the OBW (★10kHz)
- 2) VBW = approximately three times RBW (★30kHz)
- 3) Span = between two times and five times the OBW
- 4) Detector = Peak
- 5) Trace mode = Max hold
- 6) Allow the trace to stabilize

Note :

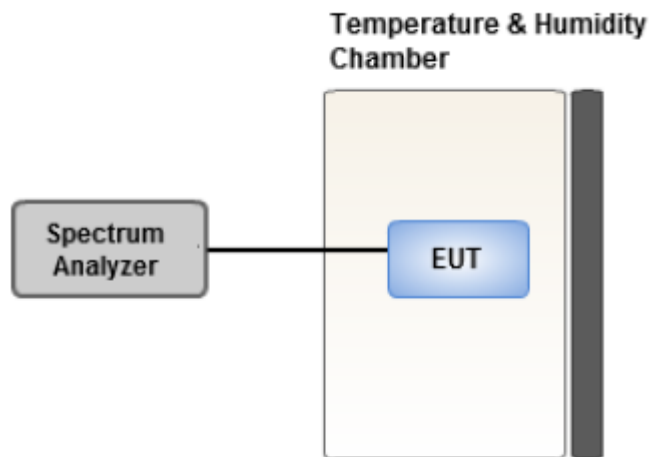
★Fundamental Signal is CW for this reason 150 kHz ~ 30 MHz RBW setting value(10kHz) apply.

### 7.3. Frequency Stability

#### Limit

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency.

#### Test Configuration



#### Test Procedure

For battery operated equipment, the equipment tests shall be performed using a new battery.

- 1) Turn the EUT OFF and place it inside the environmental temperature chamber.  
For devices that have oscillator heaters, energize only the heater circuit.
- 2) Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.
- 3) While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.
- 4) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency.

#### Note:

- 1) Temperature:  
The temperature is varied from  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  using an environmental chamber.
- 2) Primary Supply Voltage :  
The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment.  
For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

## 7.4. AC Power line Conducted Emissions

### Limit

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 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 <sup>(a)</sup>	56 to 46 <sup>(a)</sup>
0.50 to 5	56	46
5 to 30	60	50

<sup>(a)</sup>Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### Test Configuration

See test photographs attached in Annex A for the actual connections between EUT and support equipment.

### Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors : Quasi Peak and Average Detector.
5. The EUT is the device operating below 30 MHz.
  - For unterminated the Antenna, the AC line conducted tests are performed with the antenna connected
  - For terminated the Antenna, the AC line conducted tests are performed with a dummy load connected to the EUT antenna output terminal.

### Sample Calculation

Quasi-peak(Final Result) = Reading Value + Correction Factor



### 7.5. Receiver Spurious Emissions

Limit

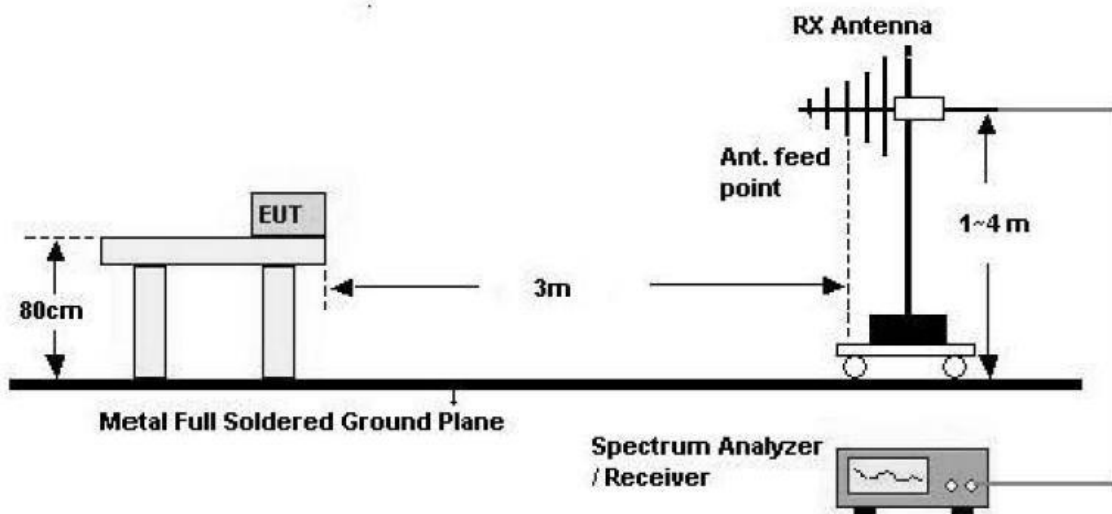
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

Measurements for compliance with the limits in table may be performed at distances other than 3 metres.

Test Configuration

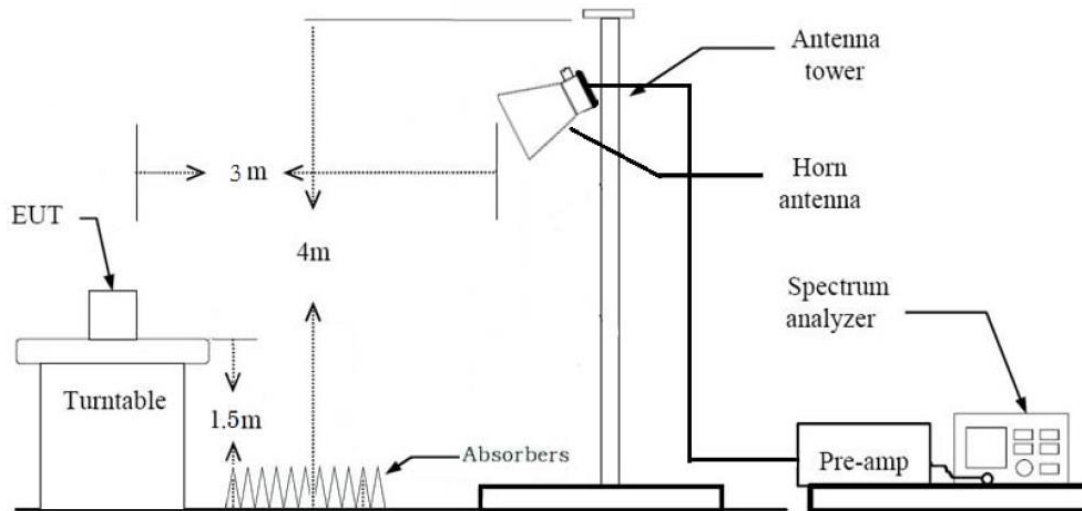
30 MHz - 1 GHz



**Test Procedure of Receiver Spurious Emissions (Below 1GHz)**

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 30 MHz – 1 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 100 kHz
    - VBW  $\geq$  3 x RBW
  - (2) Measurement Type(Quasi-peak):
    - Measured Frequency Range : 30 MHz – 1 GHz
    - Detector = Quasi-Peak
    - RBW = 120 kHz
7. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)

Above 1 GHz



#### Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting

##### (1) Measurement Type(Peak):

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW  $\geq$  3 x RBW

##### (2) Measurement Type(Average):

- We performed using a reduced video BW method was done with the analyzer in linear mode
- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz

-  $VBW \geq 1/\tau$  Hz, where  $\tau$  = pulse width in seconds

The actual setting value of  $VBW = 1$  kHz

9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

10. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

**7.6. Worst case configuration and mode**

**Radiated test**

1. All modes of operation were investigated and the worst case configuration results are reported.
  - Mode : Stand alone(with Smart LED cover),  
Stand alone(with Smart LED cover), + external accessories(Earphone, etc)
  - Worstcase : Stand alone(with Smart LED cover)
2. EUT Axis : Z
3. LED test mode App using
  - LED BACK COVER Test app On → LED BACK → RF Test mode
4. All position of loop antenna were investigated and the worst case configuration results are reported.
  - Position : Horizontal, Vertical, Parallel to the ground plane
  - Worstcase : Horizontal

**AC Power line Conducted Emissions**

1. All modes of operation were investigated and the worst case configuration results are reported.
  - Mode : Stand alone(with Smart LED cover)+Earphone+Travel Adapter,  
Stand alone(with Smart LED cover)+Travel Adapter
  - Worstcase : Stand alone(with Smart LED cover)+Travel Adapter
- 2.. LED test mode App using
  - LED BACK COVER Test app On → LED BACK → RF Test mode

**20dB Bandwidth & Frequency Stability**

1. LED test mode App using
  - LED BACK COVER Test app On → LED BACK → RF Test mode

**Note:**

1. Test by running the application with the LED cover attached.
2. Client device:

Phone(Client)	LED COVER
- Model : SM-G991U(FCC) / SM-G991W(ISED)	- Model : EF-KG991
- Manufacturer : SAMSUNG	- Manufacturer : SAMSUNG
- FCC ID : A3LSMG991U	- FCC ID: A3L-EFKG991
- IC : 649E-SMG991W	- IC: 649E-EFKG991

## 8. TEST SUMMARY

### FCC

Requirement	FCC Part Section(s)	Result
Radiated Electric Field Emissions (13.553MHz to 13.567MHz)	Part 15.225 (a)	Pass
Radiated Electric Field Emissions ( $13.410 \leq f \leq 13.553$ , $13.567 \leq f \leq 13.710$ )	Part 15.225 (b)	Pass
Radiated Electric Field Emissions ( $13.110 \leq f \leq 13.410$ , $13.710 \leq f \leq 14.010$ )	Part 15.225 (c)	Pass
Radiated Electric Field Emissions (9kHz to 30MHz)	Part 15.209	Pass
Radiated Electric Field Emissions (30MHz to 1GHz)	Part 15.209	Pass
Frequency Stability	Part 15.225 (e)	Pass
AC power conducted emissions (150kHz to 30MHz)	Part 15.207	Pass
20 dB Bandwidth	Part 15.215 (c)	Pass

**ISED**

Test Description	ISED Part Section(s)	Test Result
Radiated Electric Field Emissions (13.553MHz to 13.567MHz)	RSS-210, annex B.6(a)(i)	Pass
Radiated Electric Field Emissions (13.410 ≤ f ≤ 13.553, 13.567 ≤ f ≤ 13.710)	RSS-210, annex B.6(a)(ii)	Pass
Radiated Electric Field Emissions (13.110 ≤ f ≤ 13.410, 13.710 ≤ f ≤ 14.010)	RSS-210, annex B.6(a)(iii)	Pass
Radiated Electric Field Emissions (9kHz to 30MHz)	RSS-GEN, 8.9	Pass
Radiated Electric Field Emissions (30MHz to 1GHz)	RSS-GEN, 8.9	Pass
Frequency Stability	RSS-210, annex B.6(a)(iv)	Pass
AC power conducted emissions (150kHz to 30MHz)	RSS-GEN, 8.8	Pass
20 dB Bandwidth	RSS-GEN, 6.7	Pass
Receiver Spurious Emissions	RSS-GEN, 7	Pass

## 9. TEST RESULT

### 9.1. Operation within the band 13.110 MHz – 14.010 MHz

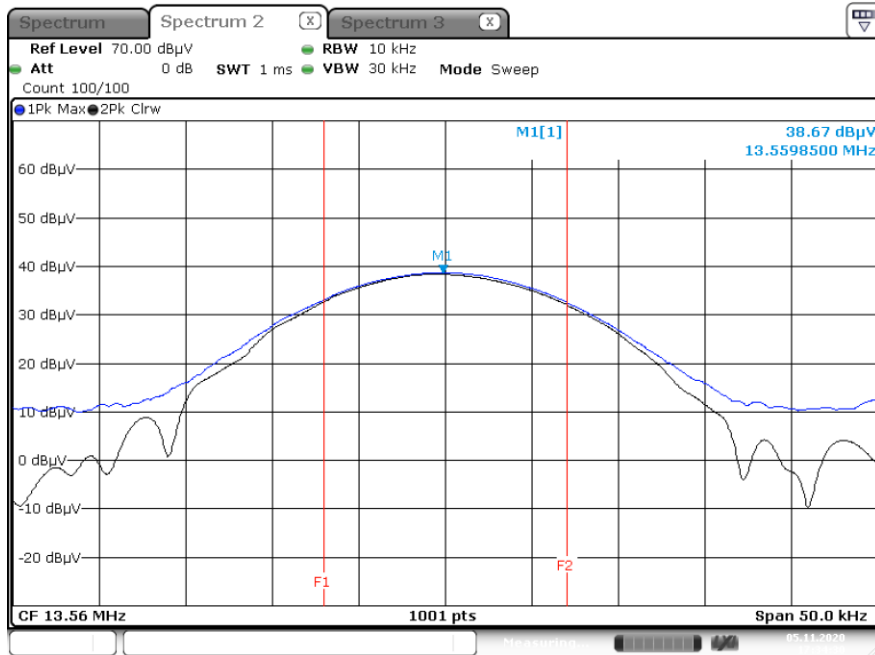
Measured Frequency Range : 13.553 MHz-13.567 MHz							
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
13.5599	38.67	18.66	-40.00	Z-H	17.33	84.00	66.67
13.5597	34.36	18.66	-40.00	Z-V	13.02	84.00	70.98

Measured Frequency Range : 13.410 MHz-13.553 MHz and 13.567 MHz-13.710 MHz							
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
13.5529	32.91	18.66	-40.00	Z-H	11.57	50.47	38.90
13.5670	32.27	18.66	-40.00	Z-H	10.93	50.47	39.54

Measured Frequency Range : 13.110 MHz – 13.410 MHz and 13.710 MHz-14.010 MHz							
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
13.2145	12.42	18.66	-40.00	Z-H	-8.92	40.51	49.43
13.7713	12.03	18.66	-40.00	Z-H	-9.31	40.51	49.82



■ **Test Plot**



**Note:**

Plot of worst case are only reported.

## 9.2. Radiated Emission 9 kHz – 30 MHz

### FCC

Measured Frequency Range :							
9 kHz - 30 MHz							
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
7.6240	17.57	18.66	-40.00	Z-H	-3.77	29.54	33.31
14.1460	12.12	18.66	-40.00	Z-H	-9.22	29.54	38.76
27.1216	11.31	19.06	-40.00	Z-H	-9.63	29.54	39.17
27.1243	11.10	19.06	-40.00	Z-V	-9.84	29.54	39.38

### ISED

Measured Frequency Range :								
9 kHz - 30 MHz								
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total		Limit (dBuA/m)@30m	Margin (dB)
					(dBuV/m)@30m	(dBuA/m)@30m		
7.6240	17.57	18.66	-40.00	Z-H	-3.77	-55.27	-21.94	33.33
14.1460	12.12	18.66	-40.00	Z-H	-9.22	-60.72	-21.94	38.78
27.1216	11.31	19.06	-40.00	Z-H	-9.63	-61.13	-21.94	39.19
27.1243	11.10	19.06	-40.00	Z-V	-9.84	-61.34	-21.94	39.40

#### Note:

1. dBμA/m = dBμV/m - 51.5

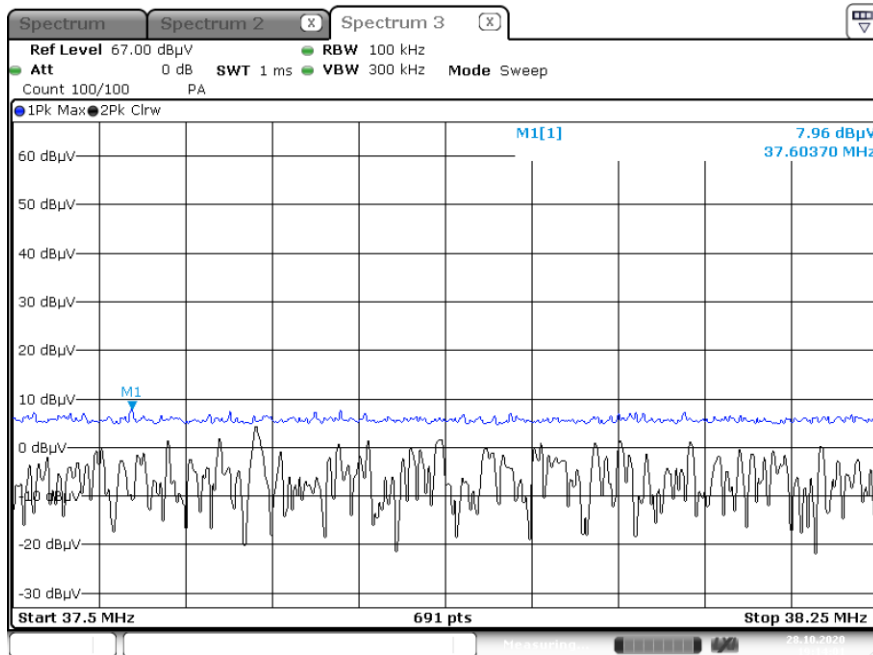
### 9.3. Radiated Emission 30 MHz – 1000 MHz

Measured Frequency Range :							
30 MHz - 1000 MHz							
Frequency (MHz)	Read Level (dBuV/m) @3m	Ant.Factor (dB/m)	Cable Loss (dB)	Ant. Pol (H/V)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)
32.7620	6.41	17.90	0.66	H	24.97	40.00	15.03
37.6037 <sup>#</sup>	7.96	18.50	0.66	H	27.12	40.00	12.88
59.7450	7.07	19.10	0.93	V	27.10	40.00	12.90
108.6960 <sup>#</sup>	7.01	16.10	1.26	H	24.37	43.50	19.13
137.4680 <sup>#</sup>	6.69	18.70	1.42	H	26.81	43.50	16.69
168.5590 <sup>#</sup>	7.87	18.70	1.54	V	28.11	43.50	15.39

**Note:**

1. “#” is the result for restricted band.

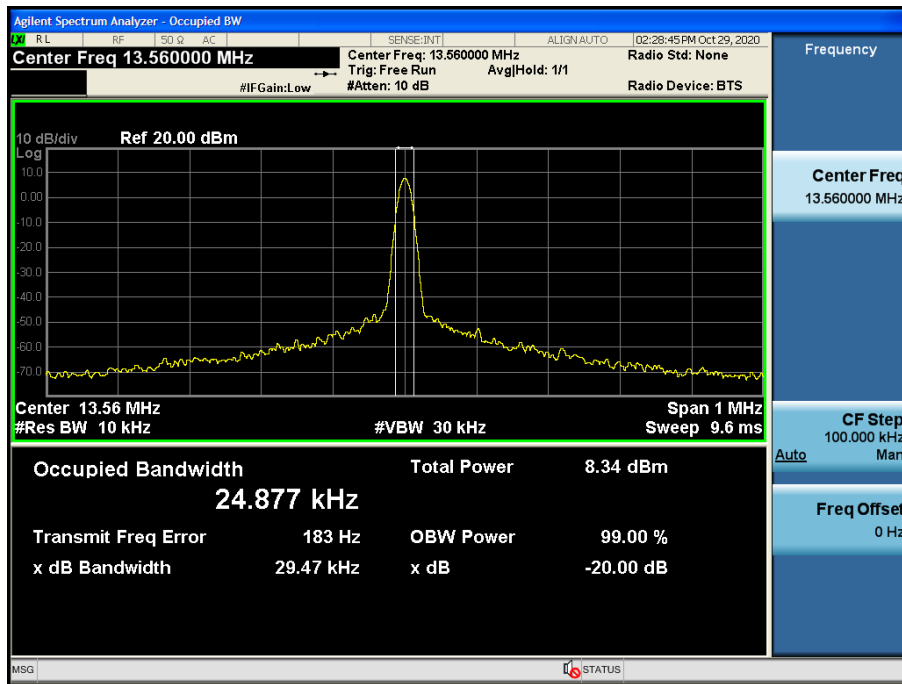
**Test Plot**



**Note:**

Plot of worst case are only reported

### 9.4. 20 dB Bandwidth & 99 % Bandwidth



**Note:**

Fundamental Signal is CW for this reason 150 kHz ~ 30 MHz RBW setting value(10kHz) apply.

## 9.5. Frequency Stability

### Startup

PERATING FREQUENCY: 13.56 MHz  
 REFERENCE VOLTAGE: 3.88 VDC  
 DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	3.88	-20	13.560092	92	0.0006782
100%		-10	13.560085	85	0.0006271
100%		0	13.560081	81	0.0005942
100%		+10	13.560077	77	0.0005704
100%		+20(Ref.)	13.560075	75	0.0005558
100%		+30	13.560078	78	0.0005728
100%		+40	13.560088	88	0.0006455
100%		+50	13.560091	91	0.0006694
End_point	3.65	+20	13.560095	95	0.0007015

**2 minutes**

PERATING FREQUENCY: 13.56 MHz  
 REFERENCE VOLTAGE: 3.88 VDC  
 DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	3.88	-20	13.560090	90	0.0006639
100%		-10	13.560083	83	0.0006131
100%		0	13.560080	80	0.0005887
100%		+10	13.560077	77	0.0005669
100%		+20(Ref.)	13.560073	73	0.0005396
100%		+30	13.560076	76	0.0005625
100%		+40	13.560085	85	0.0006278
100%		+50	13.560089	89	0.0006566
End_point	3.65	+20	13.560092	92	0.0006805

**5 minutes**

PERATING FREQUENCY: 13.56 MHz  
 REFERENCE VOLTAGE: 3.88 VDC  
 DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	3.88	-20	13.560097	97	0.0007122
100%		-10	13.560091	91	0.0006740
100%		0	13.560087	87	0.0006412
100%		+10	13.560084	84	0.0006184
100%		+20(Ref.)	13.560081	81	0.0005947
100%		+30	13.560083	83	0.0006107
100%		+40	13.560093	93	0.0006845
100%		+50	13.560098	98	0.0007193
End_point	3.65	+20	13.560099	99	0.0007295

**10 minutes**

PERATING FREQUENCY: 13.56 MHz

REFERENCE VOLTAGE: 3.88 VDC

DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	3.88	-20	13.560099	99	0.0007294
100%		-10	13.560093	93	0.0006837
100%		0	13.560089	89	0.0006549
100%		+10	13.560085	85	0.0006297
100%		+20(Ref.)	13.560082	82	0.0006074
100%		+30	13.560086	86	0.0006351
100%		+40	13.560095	95	0.0007030
100%		+50	13.560097	97	0.0007153
End_point	3.65	+20	13.560098	98	0.0007227



## 9.6 RECEIVER SPURIOUS EMISSIONS

### Frequency Range : Below 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

**Note:**

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.

### Frequency Range : Above 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

## 9.7. POWERLINE CONDUCTE EMISSIONS

[LED Test Mode : ON] Conducted Emissions (Line 1)

Note : 13.56MHz is Fundamental Signal. Final result is PASS, refer to LED Test mode Off test result

Test

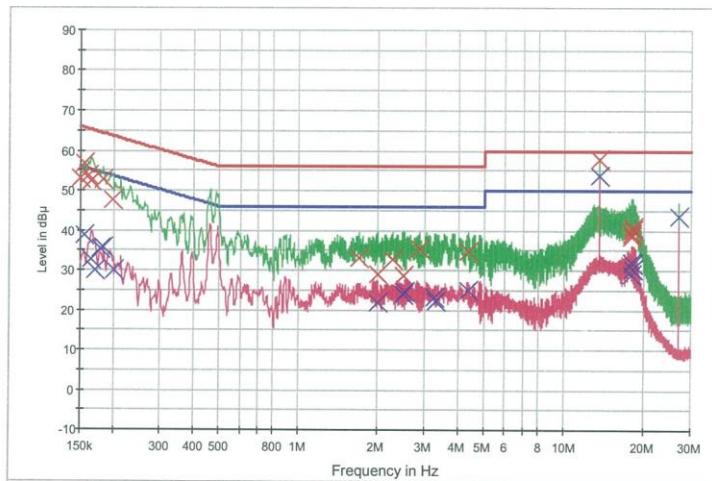
1 / 2

### HCT TEST Report

#### Common Information

EUT: SM-G991U (with EF-KG991)  
 Manufacturer: SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions: NFC LED TEST MODE\_L1

FCC CLASS B\_Exten Cable



— FCC CLASS B\_OP      — FCC CLASS B\_AV      — Preview Result 1-PK+  
— Preview Result 2-AVG      x Final Result 1-QPK      x Final Result 2-CAV

#### Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	53.2	9.000	Off	L1	9.8	12.8	66.0
0.156000	56.7	9.000	Off	L1	9.8	9.0	65.7
0.160000	53.7	9.000	Off	L1	9.8	11.8	65.5
0.164000	52.4	9.000	Off	L1	9.8	12.9	65.3
0.184000	52.6	9.000	Off	L1	9.8	11.7	64.3
0.198000	47.5	9.000	Off	L1	9.8	16.2	63.7
1.692000	33.2	9.000	Off	L1	9.8	22.8	56.0
1.992000	29.0	9.000	Off	L1	9.9	27.0	56.0
2.268000	32.8	9.000	Off	L1	9.9	23.2	56.0
2.486000	28.8	9.000	Off	L1	9.9	27.2	56.0
2.868000	35.4	9.000	Off	L1	9.9	20.6	56.0
4.350000	34.9	9.000	Off	L1	10.0	21.1	56.0
13.560000	57.6	9.000	Off	L1	10.3	2.4	60.0
17.958000	39.2	9.000	Off	L1	10.5	20.8	60.0
18.016000	38.3	9.000	Off	L1	10.5	21.7	60.0
18.164000	40.1	9.000	Off	L1	10.5	19.9	60.0
18.218000	40.2	9.000	Off	L1	10.5	19.8	60.0
18.246000	40.8	9.000	Off	L1	10.5	19.2	60.0

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Test

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**Final Result 2**

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.156000	38.7	9.000	Off	L1	9.8	17.0	55.7
0.164000	32.7	9.000	Off	L1	9.8	22.5	55.3
0.170000	29.9	9.000	Off	L1	9.8	25.1	55.0
0.178000	35.5	9.000	Off	L1	9.8	19.1	54.6
0.184000	35.6	9.000	Off	L1	9.8	18.7	54.3
0.200000	30.1	9.000	Off	L1	9.8	23.5	53.6
1.992000	21.9	9.000	Off	L1	9.9	24.1	46.0
2.490000	23.8	9.000	Off	L1	9.9	22.2	46.0
2.524000	24.6	9.000	Off	L1	9.9	21.4	46.0
3.248000	23.3	9.000	Off	L1	9.9	22.7	46.0
3.292000	22.1	9.000	Off	L1	9.9	23.9	46.0
4.350000	24.9	9.000	Off	L1	10.0	21.1	46.0
13.560000	53.8	9.000	Off	L1	10.3	-3.8	50.0
17.928000	32.0	9.000	Off	L1	10.5	18.0	50.0
17.984000	28.9	9.000	Off	L1	10.5	21.1	50.0
18.130000	30.4	9.000	Off	L1	10.5	19.6	50.0
18.218000	31.8	9.000	Off	L1	10.5	18.2	50.0
27.120000	43.7	9.000	Off	L1	10.7	6.3	50.0

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**[LED Test Mode : ON] Conducted Emissions (Line 2)**

**Note : 13.56MHz is Fundamental Signal. Final result is PASS, refer to LED Test mode Off test result**

Test

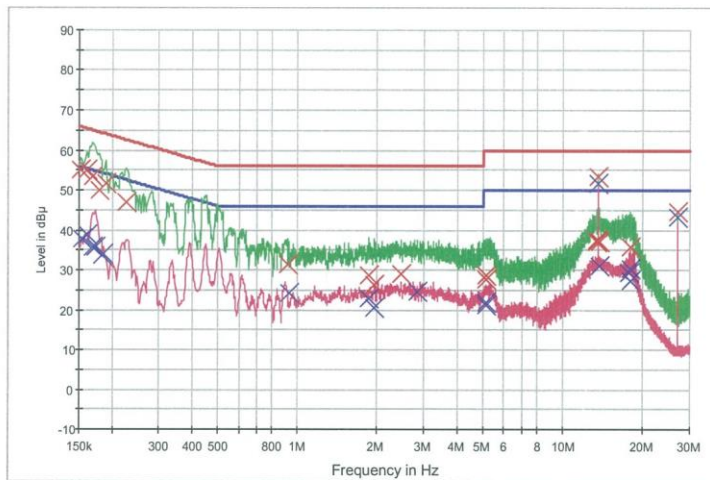
1 / 2

**HCT TEST Report**

**Common Information**

EUT: SM-G991U (with EF-KG991)  
 Manufacturer: SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions: NFC LED TEST MODE\_N

FCC CLASS B\_Exten Cable



— FCC CLASS B\_QP      — FCC CLASS B\_AV      — Preview Result 1-PK+  
 — Preview Result 2-AVG      × Final Result 1-QPK      × Final Result 2-CAV

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.152000	55.1	9.000	Off	N	9.8	10.8	65.9
0.160000	54.9	9.000	Off	N	9.8	10.5	65.5
0.168000	53.5	9.000	Off	N	9.8	11.6	65.1
0.178000	49.9	9.000	Off	N	9.8	14.7	64.6
0.190000	51.8	9.000	Off	N	9.8	12.2	64.0
0.226000	47.1	9.000	Off	N	9.8	15.5	62.6
0.914000	31.3	9.000	Off	N	9.8	24.7	56.0
1.848000	28.7	9.000	Off	N	9.8	27.3	56.0
1.952000	26.1	9.000	Off	N	9.8	29.9	56.0
2.452000	29.0	9.000	Off	N	9.9	27.0	56.0
5.108000	27.5	9.000	Off	N	10.0	32.5	60.0
5.138000	28.8	9.000	Off	N	10.0	31.2	60.0
13.382000	37.2	9.000	Off	N	10.4	22.8	60.0
13.386000	37.4	9.000	Off	N	10.4	22.6	60.0
13.560000	53.3	9.000	Off	N	10.4	6.7	60.0
13.638000	37.1	9.000	Off	N	10.4	22.9	60.0
17.848000	35.7	9.000	Off	N	10.6	24.3	60.0
27.120000	44.7	9.000	Off	N	10.9	15.3	60.0

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Test

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**Final Result 2**

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	37.7	9.000	Off	N	9.8	18.0	55.8
0.160000	38.7	9.000	Off	N	9.8	16.8	55.5
0.168000	35.7	9.000	Off	N	9.8	19.3	55.1
0.172000	35.7	9.000	Off	N	9.8	19.1	54.9
0.182000	33.8	9.000	Off	N	9.8	20.6	54.4
0.186000	34.1	9.000	Off	N	9.8	20.2	54.2
0.926000	24.2	9.000	Off	N	9.8	21.8	46.0
1.848000	22.8	9.000	Off	N	9.8	23.2	46.0
1.952000	20.6	9.000	Off	N	9.8	25.4	46.0
2.820000	24.5	9.000	Off	N	9.9	21.5	46.0
5.136000	21.9	9.000	Off	N	10.0	28.1	50.0
5.140000	21.2	9.000	Off	N	10.0	28.8	50.0
13.560000	51.8	9.000	Off	N	10.4	-1.8	50.0
13.638000	30.9	9.000	Off	N	10.4	19.1	50.0
17.628000	29.2	9.000	Off	N	10.6	20.8	50.0
17.976000	30.2	9.000	Off	N	10.6	19.8	50.0
18.020000	27.1	9.000	Off	N	10.6	22.9	50.0
27.120000	43.3	9.000	Off	N	10.9	6.7	50.0

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오전 9:08:05

[LED Test Mode : OFF] Conducted Emissions (Line 1)

Test

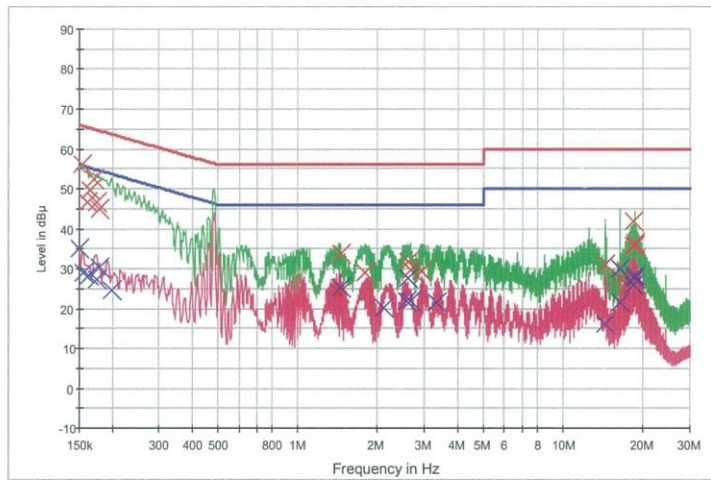
1 / 2

**HCT TEST Report**

**Common Information**

EUT: SM-G991U (with EF-KG991)  
 Manufacturer: SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions: NFC LED TEST MODE OFF\_L1

FCC CLASS B\_Exten Cable



— FCC CLASS B\_QP      —×— FCC CLASS B\_AV      —×— Preview Result 1-PK+  
 — Preview Result 2-AVG      × Final Result 1-QPK      × Final Result 2-CAV

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	56.2	9.000	Off	L1	9.8	9.6	65.8
0.160000	46.5	9.000	Off	L1	9.8	19.0	65.5
0.164000	49.6	9.000	Off	L1	9.8	15.6	65.3
0.170000	52.3	9.000	Off	L1	9.8	12.7	65.0
0.174000	46.5	9.000	Off	L1	9.8	18.3	64.8
0.178000	44.9	9.000	Off	L1	9.8	19.6	64.6
1.426000	24.0	9.000	Off	L1	9.8	32.0	56.0
1.454000	33.7	9.000	Off	L1	9.8	22.3	56.0
1.800000	28.9	9.000	Off	L1	9.9	27.1	56.0
2.594000	31.6	9.000	Off	L1	9.9	24.4	56.0
2.654000	29.7	9.000	Off	L1	9.9	26.3	56.0
2.938000	29.3	9.000	Off	L1	9.9	26.7	56.0
14.440000	31.2	9.000	Off	L1	10.3	28.8	60.0
16.380000	27.5	9.000	Off	L1	10.4	32.5	60.0
18.334000	41.8	9.000	Off	L1	10.5	18.2	60.0
18.438000	35.8	9.000	Off	L1	10.5	24.2	60.0
18.584000	35.8	9.000	Off	L1	10.5	24.2	60.0
18.594000	36.3	9.000	Off	L1	10.5	23.7	60.0

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Test

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**Final Result 2**

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	35.2	9.000	Off	L1	9.8	20.8	56.0
0.156000	29.0	9.000	Off	L1	9.8	26.7	55.7
0.162000	28.2	9.000	Off	L1	9.8	27.1	55.4
0.174000	27.2	9.000	Off	L1	9.8	27.6	54.8
0.178000	30.3	9.000	Off	L1	9.8	24.3	54.6
0.198000	24.6	9.000	Off	L1	9.8	29.1	53.7
1.450000	25.1	9.000	Off	L1	9.8	20.9	46.0
2.110000	20.2	9.000	Off	L1	9.9	25.8	46.0
2.578000	21.7	9.000	Off	L1	9.9	24.3	46.0
2.610000	27.7	9.000	Off	L1	9.9	18.3	46.0
2.654000	21.9	9.000	Off	L1	9.9	24.1	46.0
3.342000	21.6	9.000	Off	L1	9.9	24.4	46.0
14.440000	15.9	9.000	Off	L1	10.3	34.1	50.0
16.378000	21.6	9.000	Off	L1	10.4	28.4	50.0
16.410000	30.1	9.000	Off	L1	10.4	19.9	50.0
18.334000	25.8	9.000	Off	L1	10.5	24.2	50.0
18.584000	27.6	9.000	Off	L1	10.5	22.4	50.0
18.594000	28.5	9.000	Off	L1	10.5	21.5	50.0

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오전 9:35:58

[LED Test Mode : OFF] Conducted Emissions (Line 2)

Test

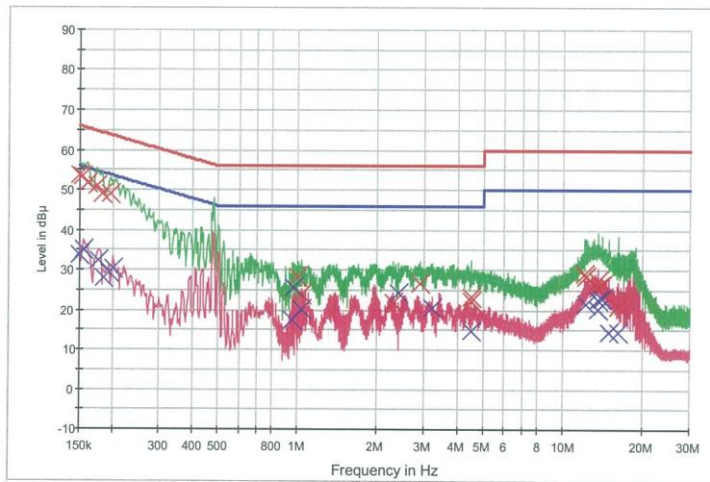
1 / 2

**HCT TEST Report**

**Common Information**

EUT: SM-G991U (with EF-KG991)  
 Manufacturer: SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions: NFC LED TEST MODE OFF\_N

FCC CLASS B\_Exten Cable



— FCC CLASS B\_QP      — FCC CLASS B\_AV      — Preview Result 1-PK+  
— Preview Result 2-AVG      x Final Result 1-QPK      x Final Result 2-CAV

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	53.9	9.000	Off	N	9.8	12.1	66.0
0.154000	53.3	9.000	Off	N	9.8	12.5	65.8
0.160000	51.7	9.000	Off	N	9.8	13.8	65.5
0.174000	50.9	9.000	Off	N	9.8	13.9	64.8
0.184000	48.8	9.000	Off	N	9.8	15.5	64.3
0.196000	49.0	9.000	Off	N	9.8	14.8	63.8
1.002000	28.3	9.000	Off	N	9.8	27.7	56.0
1.030000	23.8	9.000	Off	N	9.8	32.2	56.0
2.296000	21.8	9.000	Off	N	9.9	34.2	56.0
2.882000	26.7	9.000	Off	N	9.9	29.3	56.0
4.496000	23.4	9.000	Off	N	10.0	32.6	56.0
4.502000	22.1	9.000	Off	N	10.0	33.9	56.0
12.116000	28.8	9.000	Off	N	10.3	31.2	60.0
12.130000	28.4	9.000	Off	N	10.3	31.6	60.0
13.548000	25.5	9.000	Off	N	10.4	34.5	60.0
13.552000	27.2	9.000	Off	N	10.4	32.8	60.0
14.012000	26.2	9.000	Off	N	10.4	33.8	60.0
16.136000	20.9	9.000	Off	N	10.5	39.1	60.0

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**Final Result 2**

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	33.6	9.000	Off	N	9.8	22.4	56.0
0.156000	35.0	9.000	Off	N	9.8	20.6	55.7
0.176000	32.4	9.000	Off	N	9.8	22.3	54.7
0.186000	28.1	9.000	Off	N	9.8	26.1	54.2
0.194000	29.4	9.000	Off	N	9.8	24.4	53.9
0.200000	30.4	9.000	Off	N	9.8	23.2	53.6
0.950000	17.5	9.000	Off	N	9.8	28.5	46.0
0.958000	25.8	9.000	Off	N	9.8	20.2	46.0
1.028000	20.0	9.000	Off	N	9.8	26.0	46.0
2.394000	24.2	9.000	Off	N	9.9	21.8	46.0
3.210000	20.5	9.000	Off	N	9.9	25.5	46.0
4.504000	14.9	9.000	Off	N	10.0	31.1	46.0
12.130000	21.4	9.000	Off	N	10.3	28.6	50.0
13.548000	20.1	9.000	Off	N	10.4	29.9	50.0
13.552000	22.4	9.000	Off	N	10.4	27.6	50.0
14.012000	22.7	9.000	Off	N	10.4	27.3	50.0
14.866000	14.3	9.000	Off	N	10.5	35.7	50.0
16.136000	14.4	9.000	Off	N	10.5	35.6	50.0

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## 10. LIST OF TEST EQUIPMENT

### Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	09/04/2020	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/10/2020	Annual	100584
ESPEC	SU-642 /Temperature Chamber	07/30/2020	Annual	0093000718
Agilent	N9020A / Signal Analyzer	05/11/2020	Annual	MY51110085
Agilent	N9030A / Signal Analyzer	03/23/2020	Annual	MY49432108
HP	E3632A / DC Power Supply	09/16/2020	Annual	MY40004427
HP	8493C / Attenuator(10 dB)(DC-26.5 GHz)	06/26/2020	Annual	07560
Rohde & Schwarz	EMC32 / Software	N/A	N/A	N/A

### Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

**Radiated Test**

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Audix	Turn Table	N/A	N/A	N/A
Rohde & Schwarz	Loop Antenna	05/18/2020	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	08/02/2019	Biennial	01039
Schwarzbeck	BBHA 9120D / Horn Antenna	06/28/2019	Biennial	1300
Rohde & Schwarz	FSP(10 Hz ~ 40 GHz) / Spectrum Analyzer	05/13/2020	Annual	101055
Weinschel	2-3 / Attenuator (3 dB)	10/07/2020	Annual	BR0617
H+S	5910-N-50-010 / Attenuator(10 dB)	10/28/2020	Annual	None
CERNEX	CBL18265035 / Power Amplifier	12/26/2019	Annual	22966

**Note:**

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
3. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5(Version : 2017).

## 11. ANNEX A\_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2011-FI017-P