

# FCC NFC REPORT

## Certification

**Applicant Name:**  
SAMSUNG Electronics Co., Ltd.

**Address:**  
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16677, Rep. of Korea

**Date of Issue:**  
June 17, 2022

**Test Site/Location:**  
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-  
si, Gyeonggi-do, 17383 KOREA

**Report No.:** HCT-RF-2206-FC015

**FCC ID:** A3LSMG990B2

**APPLICANT:** SAMSUNG Electronics Co., Ltd.

**Model:** SM-G990B2/DS

**Additional Model:** SM-G990B2

**EUT Type:** Mobile Phone

**RF Output Field Strength:** 18.27 dB $\mu$ V/m @30 m

**Frequency of Operation:** 13.56 MHz

**Modulation type:** ASK

**FCC Classification:** Low Power Communication Device Transmitter (DXX)

**FCC Rule Part(s):** FCC Part 15.225 Subpart C

**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 Rules under normal use and maintenance.

Report No.: HCT-RF-2206-FC015

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REVIEWED BY



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Report prepared by : Sang Hoon Lee  
Engineer of Telecommunication Testing Center

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Report approved by : Jong Seok Lee  
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)

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## Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2206-FC015	June 17, 2022	- First Approval Report

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## 1. EUT DESCRIPTION

<b>Model</b>	SM-G990B2/DS
<b>Additional Model</b>	SM-G990B2
<b>EUT Type</b>	Mobile Phone
<b>Power Supply</b>	DC 4.20 V
<b>Frequency of Operation</b>	13.56 MHz
<b>Transmit Power</b>	18.27 dB $\mu$ V/m @30 m
<b>Modulation Type</b>	ASK
<b>Date(s) of Tests</b>	May 26, 2022 ~ June 21, 2022
<b>Serial number</b>	Radiated: R3CT409L9YB

## 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.

## 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 equipment, 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).

#### 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 FCC 47 CFR §15.203:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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."

(1) The antennas of this E.U.T are permanently attached.

(2)The E.U.T Complies with the requirement of §15.203

## 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)	2.00 ( Confidence level about 95 %, $k=2$ )
Radiated Disturbance (9 kHz ~ 30 MHz)	4.40 ( Confidence level about 95 %, $k=2$ )
Radiated Disturbance (30 MHz ~ 1 GHz)	5.74 ( Confidence level about 95 %, $k=2$ )
Radiated Disturbance (1 GHz ~ 18 GHz)	5.51 ( Confidence level about 95 %, $k=2$ )
Radiated Disturbance (18 GHz ~ 40 GHz)	5.92 ( Confidence level about 95 %, $k=2$ )
Radiated Disturbance (Above 40 GHz)	5.48 ( Confidence level about 95 %, $k=2$ )



## 7. DESCRIPTION OF TESTS

### 7.1. Radiated Test

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

Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ )	Measurement Distance (m)
13.553 – 13.567	15,848	30
13.410 $\leq$ f $\leq$ 13.553 13.567 $\leq$ f $\leq$ 13.710	334	30
13.110 $\leq$ f $\leq$ 13.410 13.710 $\leq$ f $\leq$ 14.010	106	30

Note:

1. 15,848  $\mu\text{V/m}$  = 84.0dB $\mu\text{V/m}$
2. 334  $\mu\text{V/m}$  = 50.47 dB $\mu\text{V/m}$
3. 106 $\mu\text{V/m}$  = 40.51dB $\mu\text{V/m}$

#### Limit(Radiated Spurious Emissions)

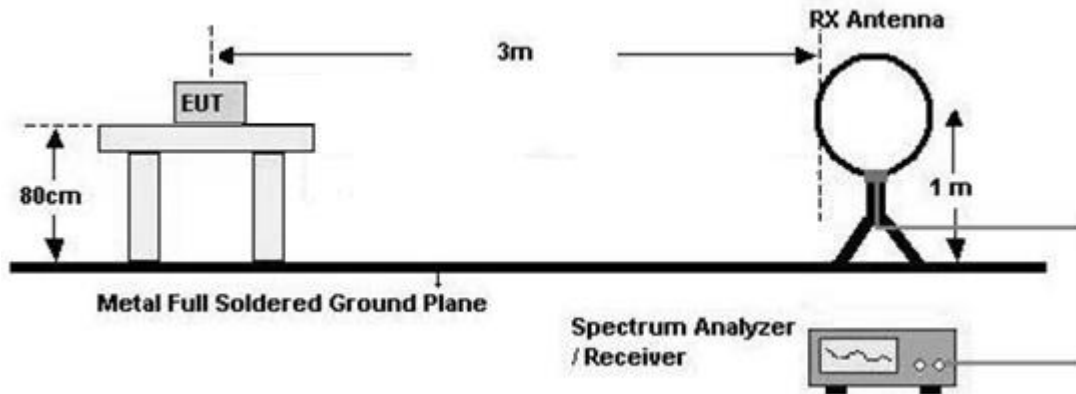
Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ )	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	* 100	3
88-216	* 150	3
216-960	* 200	3
Above 960	500	3

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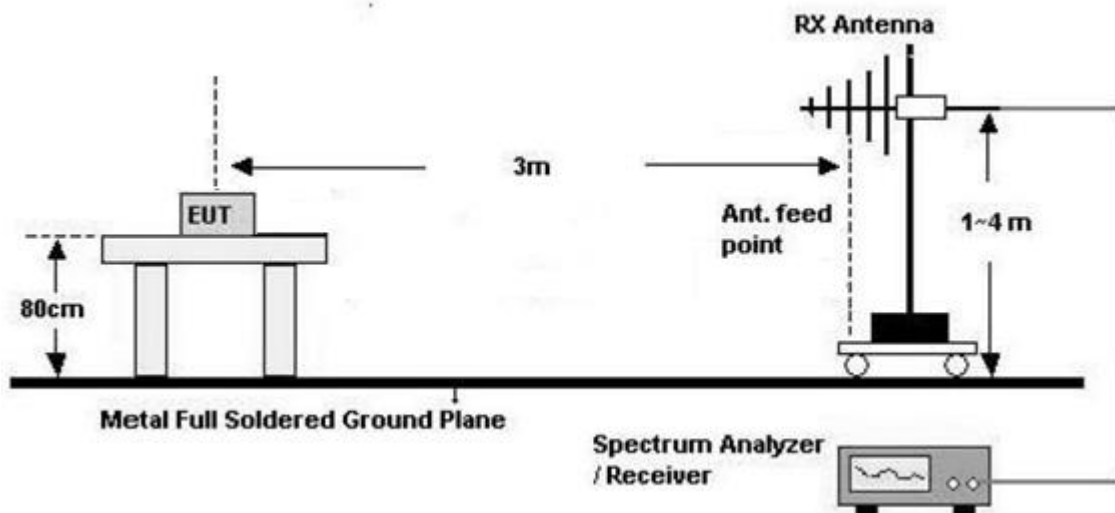
Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.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

## Test Configuration

Below 30 MHz



30 MHz - 1 GHz



## Test Procedure of in-band

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3 m 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(Below30 MHz)
7. Spectrum Setting

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

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

### **Test Procedure of Radiated spurious emissions(Below30 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 3 m 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 = Measured 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.

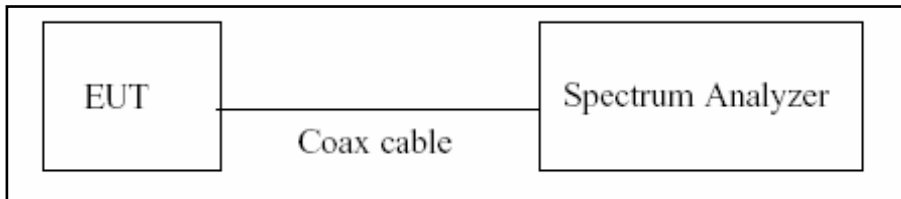
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

**Test Procedure of Radiated spurious emissions(Above30 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 3 m 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 = Measured 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

### Test Configuration



### Test Procedure

The 20 dB bandwidth was measured by using a spectrum analyzer.

(Procedure 6.9.2 in ANSI 63.10-2013)

- 1) RBW = 1%~5% of the OBW
- 2) VBW = approximately three times RBW
- 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 :

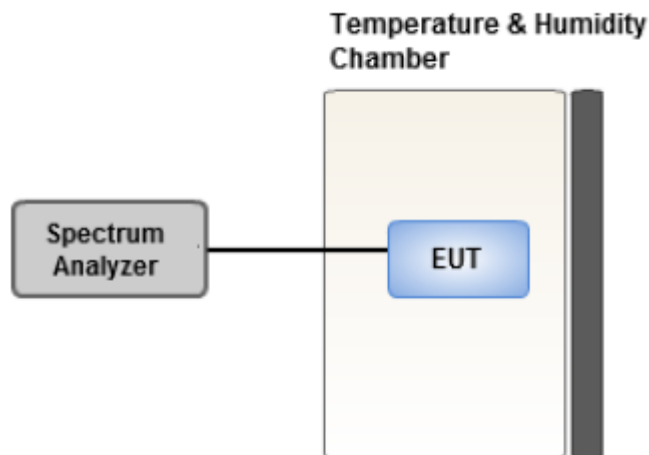
We tested Occupied Bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer.

### 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) = Measured Value + Correction Factor

## 7.5. 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, Stand alone + external accessories(Earphone, etc)
  - Worst case : Stand alone
2. EUT Axis : X
3. All type and bitrate were investigated and the worst case results are reported.
  - Worst case : Type A, 106 kbps
4. All mode of without tag and with tag were investigated and the worst case configuration results are reported.
  - Worst case : Without Tag
5. All position of loop antenna were investigated and the worst case configuration results are reported.
  - Position : Horizontal, Vertical, Parallel to the ground plane
  - Worst case : Horizontal
6. SM-G990B2/DS, SM-G990B2 were tested and the worst case results are reported.  
(Worst case : SM-G990B2/DS)

### **AC Power line Conducted Emissions**

1. All modes of operation were investigated and the worst case configuration results are reported.
  - Mode : Stand alone + Earphone + Travel Adapter, Stand alone + Travel Adapter
  - Worst case : Stand alone + Travel Adapter
2. All modes(For unterminated the Antenna, terminated the Antenna) of operation were investigated and the worst case configuration results are reported.
  - Worst case : Unterminated the Antenna
3. SM-G990B2/DS, SM-G990B2 were tested and the worst case results are reported.  
(Worst case : SM-G990B2/DS)

### **20 dB Bandwidth & Frequency Stability**

1. All type and bitrate were investigated and the worst case results are reported.
  - Worst case : Type A, 106 kbps
2. SM-G990B2/DS, SM-G990B2 were tested and the worst case results are reported.  
(Worst case : SM-G990B2/DS)



## 8. TEST SUMMARY

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

## 9. TEST RESULT

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

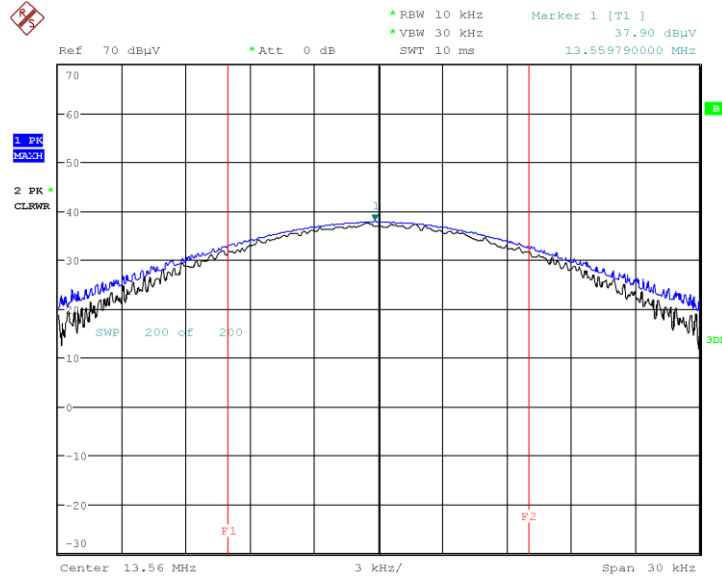
Measured Frequency Range :							
13.553 MHz-13.567 MHz							
Frequency (MHz)	Measured Value (dB $\mu$ V/m) @3 m	Ant. Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL (H/V)	Total (dB $\mu$ V/m) @30 m	Limit (dB $\mu$ V/m) @30 m	Margin (dB)
13.55979	37.90	20.37	-40.00	H	18.27	84.00	65.73
13.55966	37.64	20.37	-40.00	H	18.01	84.00	65.99

Measured Frequency Range :							
13.410 MHz-13.553 MHz and 13.567 MHz-13.710 MHz							
Frequency (MHz)	Measured Value (dB $\mu$ V/m) @3 m	Ant. Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL (H/V)	Total (dB $\mu$ V/m) @30 m	Limit (dB $\mu$ V/m) @30 m	Margin (dB)
13.55297	32.57	20.37	-40.00	H	12.94	50.47	37.53
13.56703	32.29	20.37	-40.00	H	12.66	50.47	37.81

Measured Frequency Range :							
13.110 MHz – 13.410 MHz and 13.710 MHz-14.010 MHz							
Frequency (MHz)	Measured Value (dB $\mu$ V/m) @3 m	Ant. Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL (H/V)	Total (dB $\mu$ V/m) @30 m	Limit (dB $\mu$ V/m) @30 m	Margin (dB)
13.34901	23.24	20.37	-40.00	H	3.61	40.51	36.90
13.77122	22.61	20.37	-40.00	H	2.98	40.51	37.53

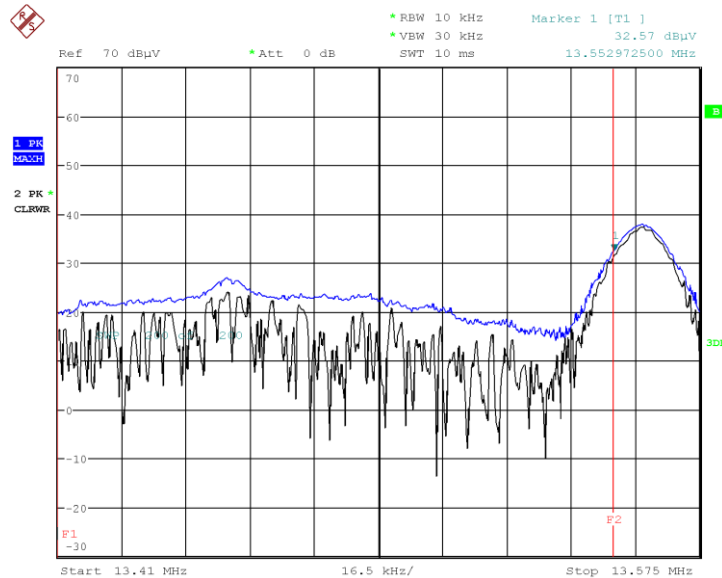
## Test Plot

13.553 MHz ~ 13.567 MHz



Date: 27.MAY.2022 13:16:55

Worst Case (13.410 MHz ~ 13.553 MHz)



Date: 27.MAY.2022 13:19:54

### Note:

Plot of worst case are only reported.

**9.2. Radiated Emission 9kHz – 30 MHz**

Measured Frequency Range : 9 kHz - 30 MHz							
Frequency (MHz)	Measured Value (dB $\mu$ V/m) @3 m	Ant. Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL (H/V)	Total (dB $\mu$ V/m) @30 m	Limit (dB $\mu$ V/m) @30 m	Margin (dB)
0.1500	29.97	20.07	-80.00	H	-29.96	24.08	54.04
14.0900	13.02	20.37	-40.00	H	-6.61	29.54	36.15
27.1345	10.72	20.47	-40.00	H	-8.81	29.54	38.35
27.1331	10.33	20.47	-40.00	V	-9.20	29.54	38.74

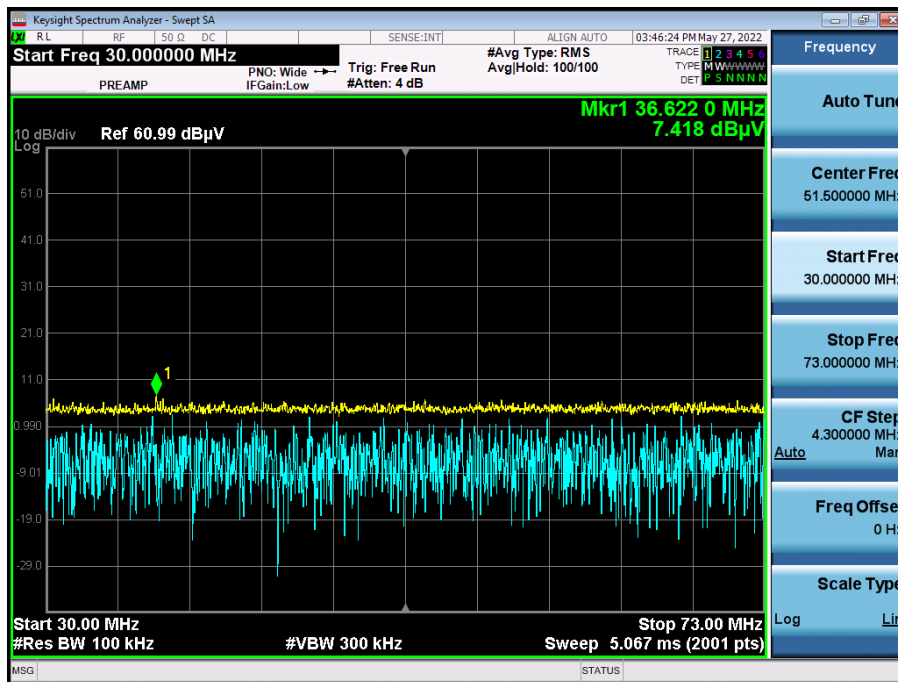
### 9.3. Radiated Emission 30MHz – 1000 MHz

Measured Frequency Range :							
30 MHz - 1000 MHz							
Frequency (MHz)	Measured Value (dBμV/m) @3 m	Ant. Factor (dB/m)	Cable Loss (dB)	Ant. Pol (H/V)	Total (dBμV/m)	Limit (dBμV/m)	Margin (dB)
36.6220	7.42	0.55	19.30	H	27.27	40.00	12.73
74.1165	6.10	0.75	16.90	V	23.75	40.00	16.25
92.3544	7.12	0.86	13.40	H	21.38	40.00	18.62
#120.0511	8.26	1.01	16.90	V	26.17	43.50	17.33
#123.3450	7.19	1.01	16.90	H	25.10	43.50	18.40
#149.9185	6.92	1.12	19.10	H	27.14	43.50	16.36

**Note:**

1. # is the result for restricted band.

**Test Plot**



**Note:**

Plot of worst case are only reported

### 9.4. 20 dB Bandwidth



## 9.5. Frequency Stability

### Startup

PERATING FREQUENCY: 13.56 MHz  
REFERENCE VOLTAGE: 4.20 VDC  
DEVIATION LIMIT: ±0.01 % = ± 1356 Hz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	4.20	-20	13.560055	55	0.0004056
100%		-10	13.560048	48	0.0003540
100%		0	13.560004	4	0.0000295
100%		+10	13.560050	50	0.0003687
100%		+20(Ref.)	13.560007	7	0.0000516
100%		+30	13.560082	82	0.0006047
100%		+40	13.560095	95	0.0007006
100%		+50	13.560053	53	0.0003909
LOW	3.80	+20	13.560048	48	0.0003540
HIGH	4.47	+20	13.560058	58	0.0004277

**2 minutes**OPERATING FREQUENCY: 13.56 MHzREFERENCE VOLTAGE: 4.20 VDCDEVIATION LIMIT: ±0.01 % = ± 1356 Hz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	4.20	-20	13.560030	30	0.0002212
100%		-10	13.560090	90	0.0006637
100%		0	13.560090	90	0.0006637
100%		+10	13.560085	85	0.0006268
100%		+20(Ref.)	13.560084	84	0.0006195
100%		+30	13.560093	93	0.0006858
100%		+40	13.560080	80	0.0005900
100%		+50	13.560028	28	0.0002065
LOW		3.80	+20	13.560051	51
HIGH	4.47	+20	13.560043	43	0.0003171



**5 minutes**

PERATING FREQUENCY: 13.56 MHz  
 REFERENCE VOLTAGE: 4.20 VDC  
 DEVIATION LIMIT: ±0.01 % = ± 1356 Hz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	4.20	-20	13.560040	40	0.0002950
100%		-10	13.560084	84	0.0006195
100%		0	13.560073	73	0.0005383
100%		+10	13.560005	5	0.0000369
100%		+20(Ref.)	13.560096	96	0.0007080
100%		+30	13.560098	98	0.0007227
100%		+40	13.560023	23	0.0001696
100%		+50	13.560030	30	0.0002212
LOW		3.80	+20	13.560004	4
HIGH	4.47	+20	13.560047	47	0.0003466

**10 minutes**

PERATING FREQUENCY: 13.56 MHz  
REFERENCE VOLTAGE: 4.20 VDC  
DEVIATION LIMIT: ±0.01 % = ± 1356 Hz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	4.20	-20	13.560061	61	0.0004499
100%		-10	13.560074	74	0.0005457
100%		0	13.560004	4	0.0000295
100%		+10	13.560000	0	0.0000000
100%		+20(Ref.)	13.560099	99	0.0007301
100%		+30	13.560026	26	0.0001917
100%		+40	13.560033	33	0.0002434
100%		+50	13.560091	91	0.0006711
LOW	3.80	+20	13.560050	50	0.0003687
HIGH	4.47	+20	13.560039	39	0.0002876

## 9.6. POWERLINE CONDUCTED EMISSIONS

### Conducted Emissions (Line 1)

Test

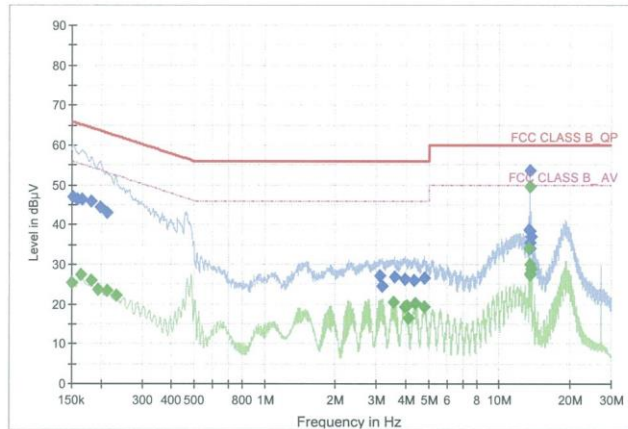
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## Test Report

### Common Information

EUT : SM-G990B2/DS  
 Manufacturer : SAMSUNG Electronics Co., Ltd.  
 Test Site: SHIELD ROOM  
 Operating Conditions : NFC\_L1 mode  
 Operator Name:  
 Comment:

Full Spectrum



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

### Final Result QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1523	47.04	65.88	18.83	9.000	L1	OFF	9.6
0.1590	46.54	65.52	18.98	9.000	L1	OFF	9.6
0.1658	46.51	65.17	18.66	9.000	L1	OFF	9.6
0.1815	45.79	64.42	18.63	9.000	L1	OFF	9.6
0.1995	44.45	63.63	19.18	9.000	L1	OFF	9.6
0.2130	42.95	63.09	20.14	9.000	L1	OFF	9.6
3.0988	27.03	56.00	28.97	9.000	L1	OFF	9.8
3.1595	24.54	56.00	31.46	9.000	L1	OFF	9.8
3.5848	26.75	56.00	29.25	9.000	L1	OFF	9.8
3.9673	26.25	56.00	29.75	9.000	L1	OFF	9.8
4.3565	25.91	56.00	30.09	9.000	L1	OFF	9.8
4.7773	26.62	56.00	29.38	9.000	L1	OFF	9.8
13.3475	38.58	60.00	21.42	9.000	L1	OFF	10.2
13.4533	38.32	60.00	21.68	9.000	L1	OFF	10.2
13.4780	35.54	60.00	24.46	9.000	L1	OFF	10.2
13.4870	34.08	60.00	25.92	9.000	L1	OFF	10.2
13.5590	53.69	60.00	6.31	9.000	L1	OFF	10.2
13.6670	36.96	60.00	23.04	9.000	L1	OFF	10.2

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Test

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**Final Result CAV**

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1500	25.49	56.00	30.51	9.000	L1	OFF	9.6
0.1635	27.45	55.28	27.84	9.000	L1	OFF	9.6
0.1815	25.86	54.42	28.55	9.000	L1	OFF	9.6
0.1950	23.62	53.82	30.20	9.000	L1	OFF	9.6
0.2130	23.23	53.09	29.86	9.000	L1	OFF	9.6
0.2333	22.32	52.33	30.02	9.000	L1	OFF	9.6
3.5218	20.44	46.00	25.56	9.000	L1	OFF	9.8
3.9718	19.37	46.00	26.63	9.000	L1	OFF	9.8
4.0280	19.68	46.00	26.32	9.000	L1	OFF	9.8
4.1023	16.32	46.00	29.68	9.000	L1	OFF	9.8
4.3655	20.24	46.00	25.76	9.000	L1	OFF	9.8
4.7795	19.45	46.00	26.55	9.000	L1	OFF	9.8
13.3475	34.09	50.00	15.91	9.000	L1	OFF	10.2
13.4533	30.03	50.00	19.97	9.000	L1	OFF	10.2
13.4668	27.60	50.00	22.40	9.000	L1	OFF	10.2
13.4735	27.39	50.00	22.61	9.000	L1	OFF	10.2
13.5590	49.48	50.00	0.52	9.000	L1	OFF	10.2
13.6648	28.99	50.00	21.01	9.000	L1	OFF	10.2

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**Conducted Emissions (Line 2)**

Test

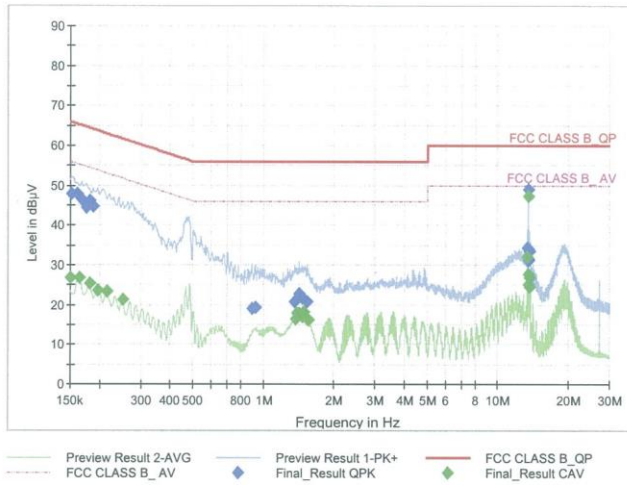
1 / 2

**Test Report**

**Common Information**

EUT : SM-G990B2/DS  
 Manufacturer : SAMSUNG Electronics Co., Ltd.  
 Test Site: SHIELD ROOM  
 Operating Conditions : NFC\_N mode  
 Operator Name:  
 Comment:

Full Spectrum



**Final Result QPK**

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1523	48.01	65.88	17.87	9.000	N	OFF	9.6
0.1613	48.01	65.40	17.39	9.000	N	OFF	9.6
0.1680	46.57	65.06	18.49	9.000	N	OFF	9.6
0.1748	44.46	64.73	20.27	9.000	N	OFF	9.6
0.1815	46.10	64.42	18.32	9.000	N	OFF	9.6
0.1883	44.66	64.11	19.46	9.000	N	OFF	9.6
0.8960	19.13	56.00	36.87	9.000	N	OFF	9.7
0.9230	19.36	56.00	36.64	9.000	N	OFF	9.7
1.3595	20.75	56.00	35.25	9.000	N	OFF	9.7
1.4203	22.79	56.00	33.21	9.000	N	OFF	9.7
1.4653	21.75	56.00	34.25	9.000	N	OFF	9.7
1.5350	20.78	56.00	35.22	9.000	N	OFF	9.7
13.3475	34.21	60.00	25.79	9.000	N	OFF	10.2
13.4465	31.46	60.00	28.54	9.000	N	OFF	10.2
13.4533	34.17	60.00	25.83	9.000	N	OFF	10.2
13.4690	31.03	60.00	28.97	9.000	N	OFF	10.2
13.5613	48.92	60.00	11.08	9.000	N	OFF	10.2
13.6648	33.39	60.00	26.61	9.000	N	OFF	10.2

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Test

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**Final Result CAV**

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1500	26.96	56.00	29.04	9.000	N	OFF	9.6
0.1635	26.91	55.28	28.37	9.000	N	OFF	9.6
0.1815	25.39	54.42	29.02	9.000	N	OFF	9.6
0.1973	23.76	53.73	29.97	9.000	N	OFF	9.6
0.2153	23.32	53.00	29.68	9.000	N	OFF	9.6
0.2513	21.48	51.72	30.23	9.000	N	OFF	9.6
1.3730	16.46	46.00	29.54	9.000	N	OFF	9.7
1.3865	17.88	46.00	28.12	9.000	N	OFF	9.7
1.4225	18.01	46.00	27.99	9.000	N	OFF	9.7
1.4788	16.90	46.00	29.10	9.000	N	OFF	9.7
1.4923	18.06	46.00	27.94	9.000	N	OFF	9.7
1.5553	16.05	46.00	29.95	9.000	N	OFF	9.7
13.3475	32.01	50.00	17.99	9.000	N	OFF	10.2
13.4420	25.00	50.00	25.00	9.000	N	OFF	10.2
13.4533	27.76	50.00	22.24	9.000	N	OFF	10.2
13.5590	47.39	50.00	2.61	9.000	N	OFF	10.2
13.6445	24.65	50.00	25.35	9.000	N	OFF	10.2
13.6648	26.92	50.00	23.08	9.000	N	OFF	10.2

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## 10. LIST OF TEST EQUIPMENT

### Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	08/23/2022	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	06/07/2023	Annual
Temperature Chamber	SU-642	ESPEC	0093008124	03/04/2023	Annual
Signal Analyzer	N9030A	Keysight	MY55410508	09/07/2022	Annual
DC Power Supply	E3646A	Agilent	MY40002937	12/14/2022	Annual
Attenuator(10 dB)(DC-26.5 GHz)	5910-N-50-010	H+S	00801	10/29/2022	Annual
Software	EMC32	Rohde & Schwarz	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**

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Controller(Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	N/A	N/A	N/A
Controller	EM2090	Emco	060520	N/A	N/A
Turn Table	N/A	Ets	N/A	N/A	N/A
Loop Antenna	FMZB 1513	Rohde & Schwarz	1513-333	03/17/2024	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	09/04/2022	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1191	11/18/2023	Biennial
Spectrum Analyzer	FSP(9 kHz ~ 30 GHz)	Rohde & Schwarz	836650/016	09/13/2022	Annual
Spectrum Analyzer	FSV40-N(9 kHz ~ 30 GHz)	Rohde & Schwarz	101068-SZ	09/15/2022	Annual
ATT(3 dB) + LNA2(6~18 GHz)	18B-03, CBL06185030	WEINSCHEL CERNEX	N/A	12/22/2022	Annual
ATT(10 dB) + LNA1(0.1~18 GHz)	56-10, CBLU1183540B-01	Api tech, CERNEX	N/A	12/22/2022	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/02/2022	Annual

**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-2206-FC015-P