

# FCC NFC REPORT

## Certification

<b>Applicant Name:</b> SAMSUNG Electronics Co., Ltd.	<b>Date of Issue:</b> June 14, 2021
<b>Address:</b> 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea	<b>Test Site/Location:</b> 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon- si, Gyeonggi-do, 17383 KOREA
	<b>Report No.:</b> HCT-RF-2106-FC019

<b>FCC ID:</b>	<b>A3LSMG990B</b>
<b>APPLICANT:</b>	<b>SAMSUNG Electronics Co., Ltd.</b>
<b>Model:</b>	SM-G990B/DS
<b>Additional Model:</b>	SM-G990B
<b>EUT Type:</b>	Mobile Phone
<b>RF Output Field Strength:</b>	17.94 dBuV/m @30 m
<b>Frequency of Operation:</b>	13.56 MHz
<b>Modulation type:</b>	ASK
<b>FCC Classification:</b>	Low Power Communication Device Transmitter (DXX)
<b>FCC Rule Part(s):</b>	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-2106-FC019

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REVIEWED BY



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Report prepared by : Woong Jin 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)

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## Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2106-FC019	June 14, 2021	- First Approval Report

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## 1. EUT DESCRIPTION

<b>Model</b>	SM-G990B/DS
<b>Additional Model</b>	SM-G990B
<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>	17.94 dBuV/m @30 m
<b>Modulation Type</b>	ASK
<b>Date(s) of Tests</b>	April 24, 2021~ June 10, 2021
<b>Serial number</b>	Radiated: 544a5f8570207ece Conducted: 524d0f145f1e7ece

## **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)	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)

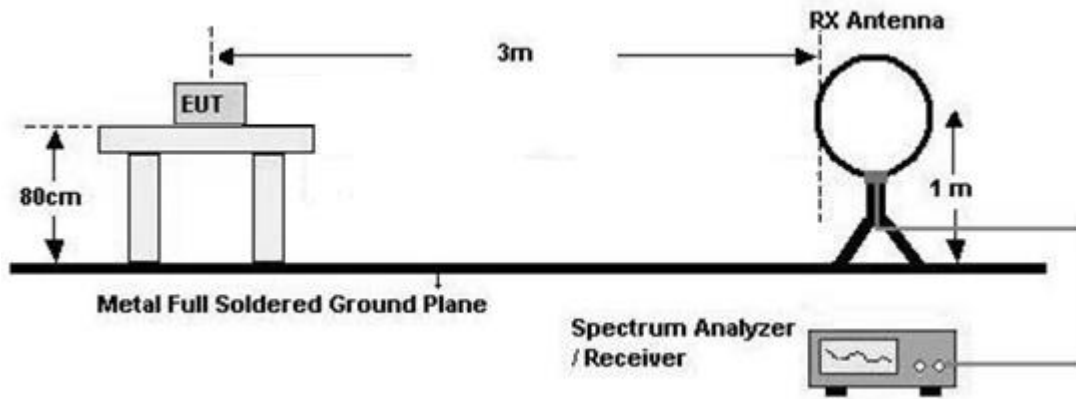
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	* 100	3
88-216	* 150	3
216-960	* 200	3
Above 960	500	3

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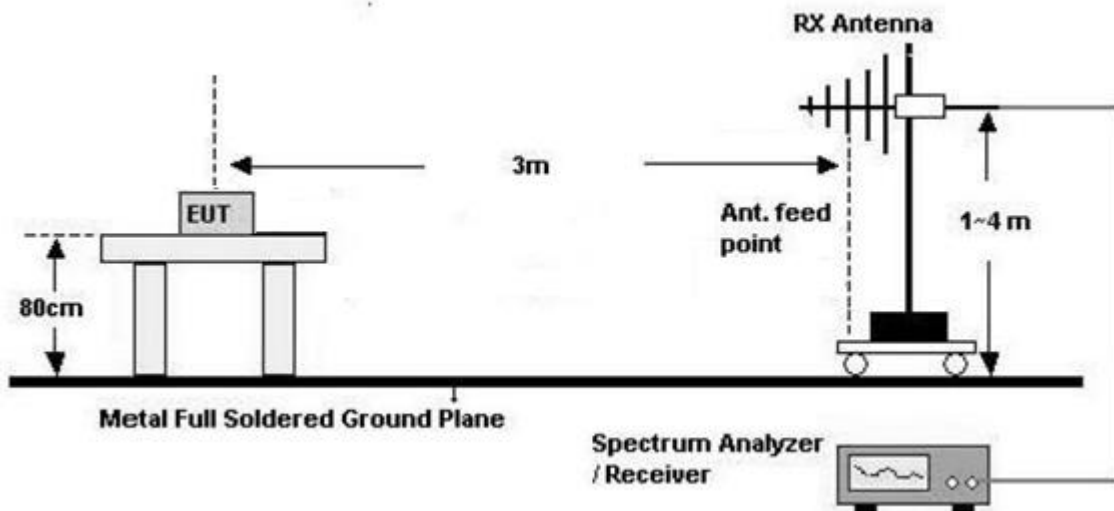
Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part,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

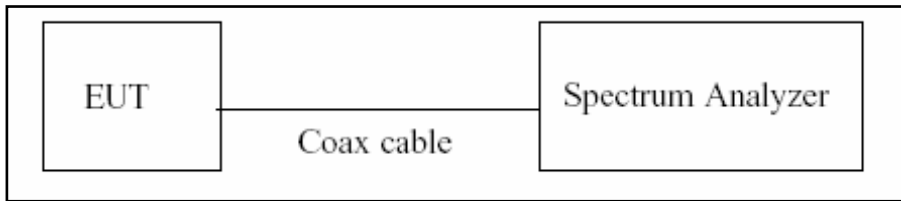
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

**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. 20dB 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 :

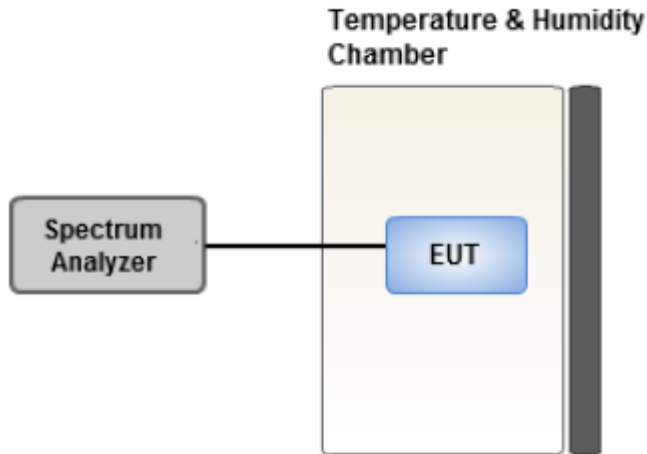
We tested Occupied Bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer.

### 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) = Reading 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)
  - Worstcase : Stand alone
2. EUT Axis : Z
3. All type and bitrate were investigated and the worst case results are reported.
  - Worstcase : Type A, 106 kbps
4. All mode of without tag and with tag were investigated and the worst case configuration results are reported.
  - Worstcase : 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
  - Worstcase : Horizontal
6. SM-G990B/DS, SM-G990B were tested and the worst case results are reported.  
(Worstcase : SM-G990B/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
  - Worstcase : 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.
  - Worstcase : Unterminated the Antenna
3. SM-G990B/DS, SM-G990B were tested and the worst case results are reported.  
(Worstcase : SM-G990B/DS)

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

1. All type and bitrate were investigated and the worst case results are reported.
  - Worstcase : Type A, 106 kbps
2. SM-G990B/DS, SM-G990B were tested and the worst case results are reported.  
(Worstcase : SM-G990B/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 ( $13.410 \leq f \leq 13.553$ , $13.567 \leq f \leq 13.710$ )	Pass
Part 15.225 (c)	Radiated Electric Field Emissions ( $13.110 \leq f \leq 13.410$ , $13.710 \leq f \leq 14.010$ )	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

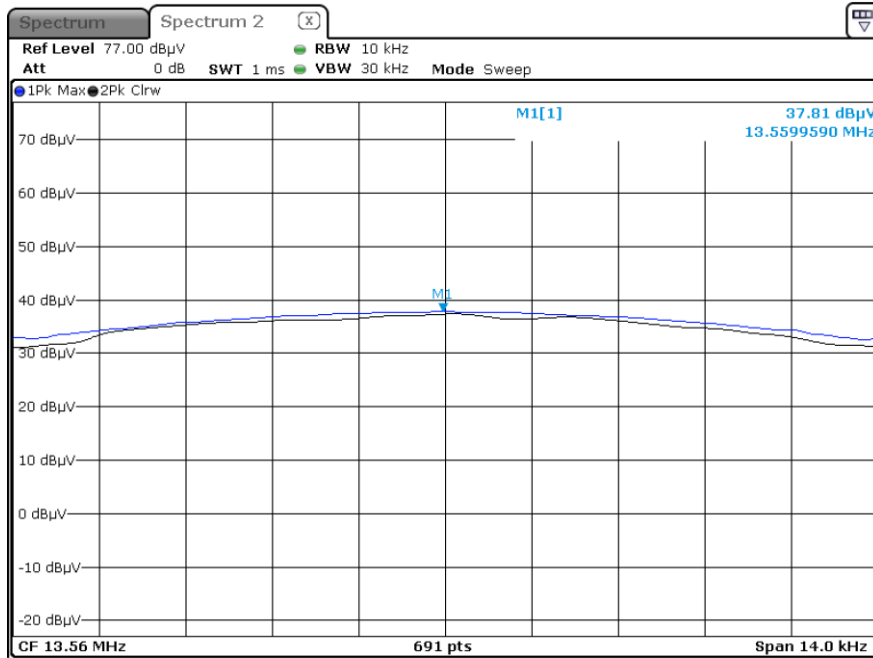
Measured Frequency Range : 13.553 MHz-13.567 MHz							
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
13.559899	37.81	20.13	-40.00	H	17.94	84.00	66.06
13.560425	32.27	20.13	-40.00	V	12.40	84.00	71.60

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	32.17	20.13	-40.00	H	12.30	50.47	38.17
13.5671	32.03	20.13	-40.00	H	12.16	50.47	38.31

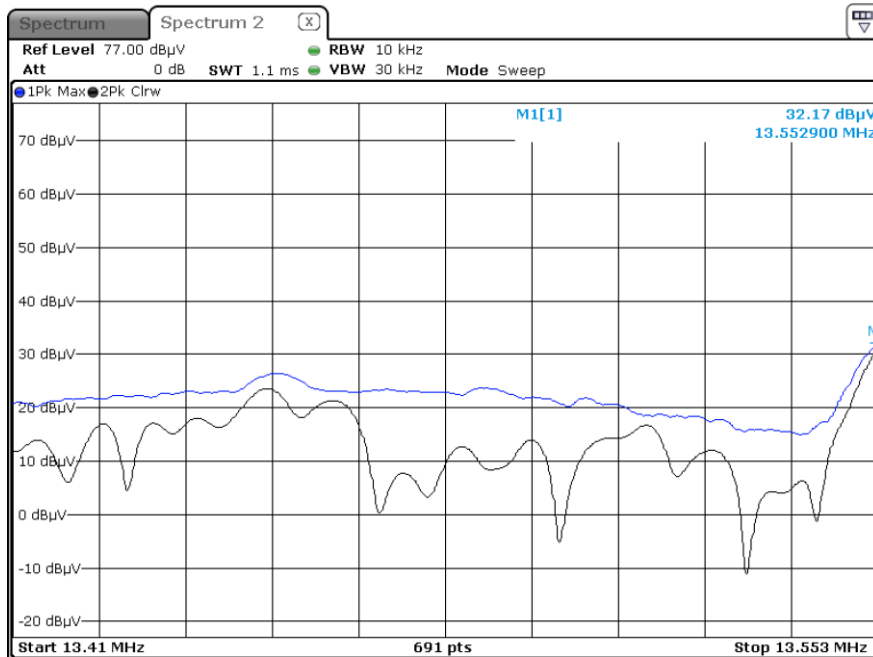
Measured Frequency Range : 13.110 MHz – 13.410 MHz and 13.710 MHz-14.010 MHz							
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
13.34791	23.70	20.13	-40.00	H	3.83	40.51	36.68
13.7716	22.92	20.13	-40.00	H	3.05	40.51	37.46

## Test Plot

13.553 MHz ~ 13.567 MHz



Worst Case (13.410 MHz-13.553 MHz)



### Note:

Plot of worst case are only reported.

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

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)
12.928	14.49	20.13	-40.00	H	-5.38	29.54	34.92
14.091	13.43	20.13	-40.00	H	-6.44	29.54	35.98
27.5065	8.71	20.63	-40.00	H	-10.66	29.54	40.20
27.3329	8.25	20.63	-40.00	V	-11.12	29.54	40.66

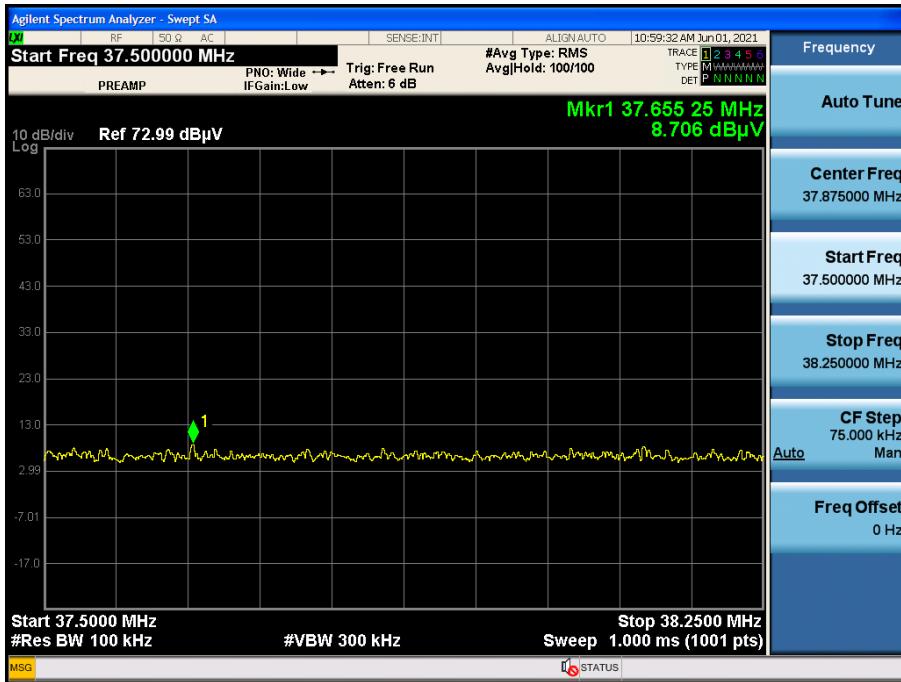
### 9.3. Radiated Emission 30 MHz – 1000 MHz

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)
# 37.6553	8.706	19.50	0.49	H	28.696	40.00	11.304
52.2369	7.904	20.23	0.56	H	28.694	40.00	11.306
100.9106	8.542	15.54	0.78	V	24.862	43.50	18.638
# 117.8653	8.258	17.32	0.86	H	26.438	43.50	17.062
# 135.5964	8.940	19.25	0.91	H	29.100	43.50	14.400
158.4325	7.288	20.16	0.98	V	28.428	43.50	15.072

**Note:**

- # is the result for restricted band.

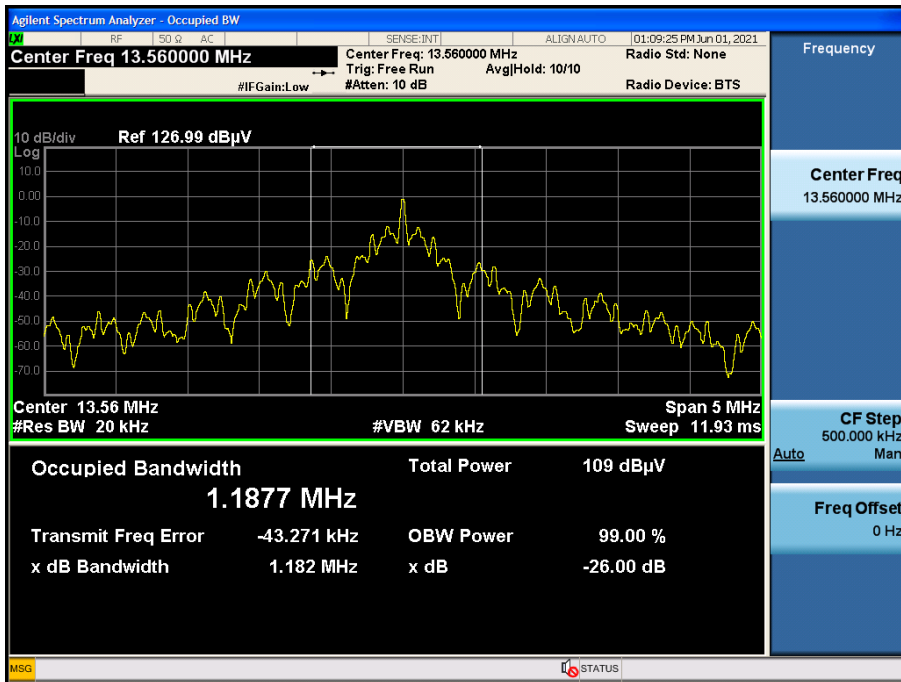
■ Test Plot



**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	13.560049	49	0.0003614
100%		-10	13.560048	48	0.0003540
100%		0	13.560045	45	0.0003319
100%		+10	13.560044	44	0.0003245
100%		+20(Ref.)	13.560037	37	0.0002729
100%		+30	13.560043	43	0.0003171
100%		+40	13.560048	48	0.0003540
100%		+50	13.560045	45	0.0003319
LOW		3.80	+20	13.560047	47
HIGH	4.40	+20	13.560052	52	0.0003835

**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	13.560051	51	0.0003761
100%		-10	13.560048	48	0.0003540
100%		0	13.560047	47	0.0003466
100%		+10	13.560046	46	0.0003392
100%		+20(Ref.)	13.560045	45	0.0003319
100%		+30	13.560046	46	0.0003392
100%		+40	13.560051	51	0.0003761
100%		+50	13.560044	44	0.0003245
LOW		3.80	+20	13.560048	48
HIGH	4.40	+20	13.560054	54	0.0003982



**5 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	13.560051	51	0.0003761
100%		-10	13.560052	52	0.0003835
100%		0	13.560047	47	0.0003466
100%		+10	13.560045	45	0.0003319
100%		+20(Ref.)	13.560043	43	0.0003171
100%		+30	13.560044	44	0.0003245
100%		+40	13.560043	43	0.0003171
100%		+50	13.560048	48	0.0003540
LOW		3.80	+20	13.560048	48
HIGH	4.40	+20	13.560055	55	0.0004056

**10 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	13.560060	60	0.0004425
100%		-10	13.560061	61	0.0004499
100%		0	13.560058	58	0.0004277
100%		+10	13.560051	51	0.0003761
100%		+20(Ref.)	13.560048	48	0.0003540
100%		+30	13.560054	54	0.0003982
100%		+40	13.560055	55	0.0004056
100%		+50	13.560059	59	0.0004351
LOW		3.80	+20	13.560054	54
HIGH	4.40	+20	13.560063	63	0.0004646

## 9.6. POWERLINE CONDUCTED EMISSIONS

### Conducted Emissions (Line 1)

NFC L1 TERM

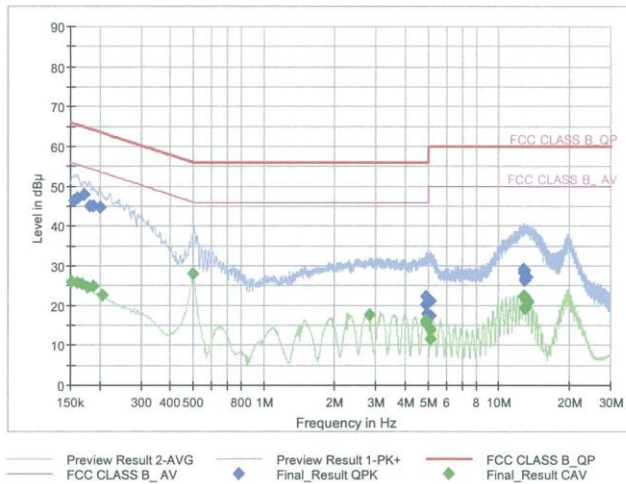
1 / 2

## Test Report

### Common Information

EUT : SM-G990B/DS  
 Manufacturer : SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions : NFC L1 TERM (25W)  
 Operator Name:  
 Comment:

Full Spectrum



### Final Result QPK

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr
0.1545	46.52	65.75	19.23	9.000	L1	OFF	9.6
0.1613	46.91	65.40	18.49	9.000	L1	OFF	9.6
0.1725	47.94	64.84	16.90	9.000	L1	OFF	9.6
0.1815	44.90	64.42	19.52	9.000	L1	OFF	9.6
0.1883	44.86	64.11	19.26	9.000	L1	OFF	9.6
0.2018	44.83	63.54	18.71	9.000	L1	OFF	9.6
4.8853	22.24	56.00	33.76	9.000	L1	OFF	9.9
4.9078	20.09	56.00	35.91	9.000	L1	OFF	9.9
4.9483	17.99	56.00	38.01	9.000	L1	OFF	9.9
5.1305	17.36	60.00	42.64	9.000	L1	OFF	9.9
5.1530	21.03	60.00	38.97	9.000	L1	OFF	9.9
5.1575	21.15	60.00	38.85	9.000	L1	OFF	9.9
12.7873	28.18	60.00	31.82	9.000	L1	OFF	10.2
12.8233	29.23	60.00	30.77	9.000	L1	OFF	10.2
12.8773	26.89	60.00	33.11	9.000	L1	OFF	10.2
12.8863	28.96	60.00	31.05	9.000	L1	OFF	10.2
12.8998	26.27	60.00	33.73	9.000	L1	OFF	10.2
13.2260	27.24	60.00	32.76	9.000	L1	OFF	10.2

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NFC L1 TERM

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**Final Result CAV**

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1523	26.10	55.88	29.78	9.000	L1	OFF	9.6
0.1613	25.72	55.40	29.68	9.000	L1	OFF	9.6
0.1680	25.37	55.06	29.69	9.000	L1	OFF	9.6
0.1770	24.57	54.63	30.05	9.000	L1	OFF	9.6
0.1883	24.71	54.11	29.40	9.000	L1	OFF	9.6
0.2063	22.43	53.36	30.92	9.000	L1	OFF	9.6
0.5000	28.04	46.00	17.96	9.000	L1	OFF	9.6
2.8355	17.52	46.00	28.48	9.000	L1	OFF	9.8
4.8830	16.14	46.00	29.86	9.000	L1	OFF	9.9
4.9078	15.55	46.00	30.45	9.000	L1	OFF	9.9
5.1058	11.43	50.00	38.57	9.000	L1	OFF	9.9
5.1530	13.87	50.00	36.13	9.000	L1	OFF	9.9
12.8233	22.34	50.00	27.66	9.000	L1	OFF	10.2
12.8773	22.34	50.00	27.66	9.000	L1	OFF	10.2
12.9695	19.45	50.00	30.55	9.000	L1	OFF	10.2
13.0753	19.46	50.00	30.54	9.000	L1	OFF	10.2
13.2260	21.28	50.00	28.72	9.000	L1	OFF	10.2
13.3273	20.64	50.00	29.36	9.000	L1	OFF	10.2

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NFC L1 UNTERM

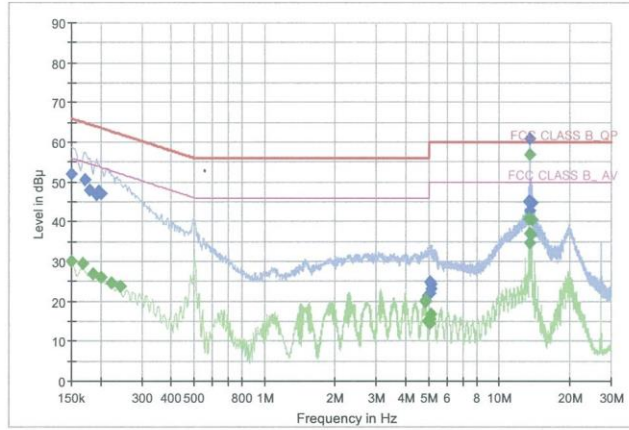
1 / 2

# Test Report

## Common Information

EUT : SM-G990B/DS  
 Manufacturer : SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions : NFC L1 UNTERM (25W)  
 Operator Name:  
 Comment:

Full Spectrum



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

## Final Result QPK

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Correction
0.1500	51.93	66.00	14.07	9.000	L1	OFF	9.7
0.1725	50.56	64.84	14.28	9.000	L1	OFF	9.6
0.1793	47.92	64.52	16.60	9.000	L1	OFF	9.6
0.1928	46.76	63.92	17.16	9.000	L1	OFF	9.6
0.1973	47.55	63.73	16.18	9.000	L1	OFF	9.6
0.2018	46.96	63.54	16.57	9.000	L1	OFF	9.6
4.9753	21.48	56.00	34.52	9.000	L1	OFF	9.9
5.0653	22.04	60.00	37.96	9.000	L1	OFF	9.9
5.0923	24.94	60.00	35.06	9.000	L1	OFF	9.9
5.1013	24.16	60.00	35.84	9.000	L1	OFF	9.9
5.1125	24.36	60.00	35.64	9.000	L1	OFF	9.9
5.1238	23.22	60.00	36.78	9.000	L1	OFF	9.9
13.3475	45.11	60.00	14.89	9.000	L1	OFF	10.2
13.4533	45.12	60.00	14.88	9.000	L1	OFF	10.2
13.4623	42.60	60.00	17.40	9.000	L1	OFF	10.2
13.5590	61.00	60.00	-1.00	9.000	L1	OFF	10.2
13.6648	44.75	60.00	15.25	9.000	L1	OFF	10.2
13.7728	44.82	60.00	15.18	9.000	L1	OFF	10.2

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오전 2:57:47

NFC L1 UNTERM

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**Final Result CAV**

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1500	30.14	56.00	25.86	9.000	L1	OFF	9.7
0.1680	29.39	55.06	25.67	9.000	L1	OFF	9.6
0.1860	26.96	54.21	27.26	9.000	L1	OFF	9.6
0.2018	25.90	53.54	27.63	9.000	L1	OFF	9.6
0.2220	24.62	52.74	28.12	9.000	L1	OFF	9.6
0.2423	23.60	52.02	28.42	9.000	L1	OFF	9.6
4.8448	20.28	46.00	25.72	9.000	L1	OFF	9.9
4.8628	19.95	46.00	26.05	9.000	L1	OFF	9.9
4.9528	15.04	46.00	30.96	9.000	L1	OFF	9.9
5.0765	14.31	50.00	35.69	9.000	L1	OFF	9.9
5.0968	15.62	50.00	34.38	9.000	L1	OFF	9.9
5.1170	16.63	50.00	33.37	9.000	L1	OFF	9.9
13.3475	40.70	50.00	9.30	9.000	L1	OFF	10.2
13.4533	36.84	50.00	13.16	9.000	L1	OFF	10.2
13.4668	34.53	50.00	15.47	9.000	L1	OFF	10.2
13.5590	56.88	50.00	-6.88	9.000	L1	OFF	10.2
13.6648	36.57	50.00	13.43	9.000	L1	OFF	10.2
13.7728	40.41	50.00	9.59	9.000	L1	OFF	10.2

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**Conducted Emissions (Line 2)**

NFC N TERM

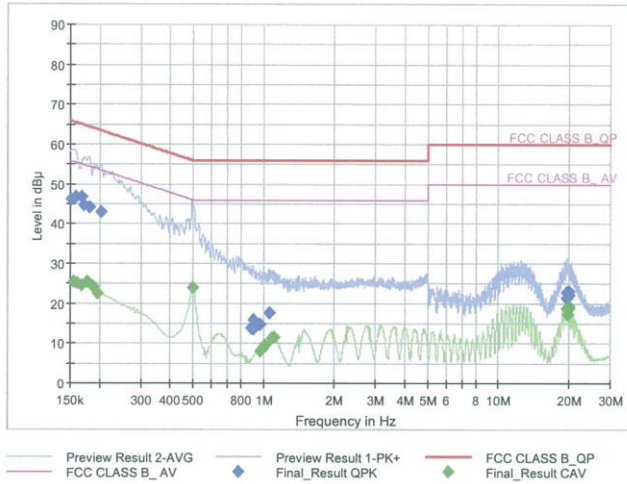
1 / 2

**Test Report**

**Common Information**

EUT : SM-G990B/DS  
 Manufacturer : SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions : NFC N TERM (25W)  
 Operator Name:  
 Comment:

Full Spectrum



**Final Result QPK**

Frequency (MHz)	QuasiPeak	Limit (dB $\mu$ V)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1523	46.22	65.88	19.66	9.000	N	OFF	9.6
0.1590	46.59	65.52	18.93	9.000	N	OFF	9.6
0.1680	46.60	65.06	18.46	9.000	N	OFF	9.6
0.1725	44.78	64.84	20.06	9.000	N	OFF	9.6
0.1815	44.18	64.42	20.24	9.000	N	OFF	9.6
0.2040	42.93	63.45	20.52	9.000	N	OFF	9.6
0.8893	13.96	56.00	42.04	9.000	N	OFF	9.6
0.9028	13.69	56.00	42.31	9.000	N	OFF	9.7
0.9095	15.73	56.00	40.27	9.000	N	OFF	9.7
0.9320	14.45	56.00	41.55	9.000	N	OFF	9.7
0.9703	14.69	56.00	41.31	9.000	N	OFF	9.7
1.0580	17.73	56.00	38.27	9.000	N	OFF	9.7
19.5035	21.38	60.00	38.62	9.000	N	OFF	10.5
19.5868	22.85	60.00	37.15	9.000	N	OFF	10.5
19.9175	21.98	60.00	38.02	9.000	N	OFF	10.5
19.9310	21.88	60.00	38.12	9.000	N	OFF	10.5
19.9670	22.32	60.00	37.68	9.000	N	OFF	10.5
19.9828	23.04	60.00	36.96	9.000	N	OFF	10.5

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NFC N TERM

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**Final Result CAV**

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1545	25.46	55.75	30.30	9.000	N	OFF	9.6
0.1613	25.21	55.40	30.19	9.000	N	OFF	9.6
0.1680	24.45	55.06	30.61	9.000	N	OFF	9.6
0.1770	25.36	54.63	29.27	9.000	N	OFF	9.6
0.1883	24.31	54.11	29.80	9.000	N	OFF	9.6
0.1973	22.56	53.73	31.16	9.000	N	OFF	9.6
0.5000	24.00	46.00	22.00	9.000	N	OFF	9.6
0.9725	8.02	46.00	37.98	9.000	N	OFF	9.7
0.9973	8.56	46.00	37.44	9.000	N	OFF	9.7
1.0175	9.48	46.00	36.52	9.000	N	OFF	9.7
1.0828	11.22	46.00	34.78	9.000	N	OFF	9.7
1.1053	11.45	46.00	34.55	9.000	N	OFF	9.7
19.4878	18.85	50.00	31.15	9.000	N	OFF	10.5
19.6790	17.41	50.00	32.59	9.000	N	OFF	10.5
19.9310	18.74	50.00	31.26	9.000	N	OFF	10.5
19.9558	19.02	50.00	30.98	9.000	N	OFF	10.5
19.9648	19.21	50.00	30.79	9.000	N	OFF	10.5
19.9828	19.33	50.00	30.67	9.000	N	OFF	10.5

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오전 2:46:10



NFC N UNTERM

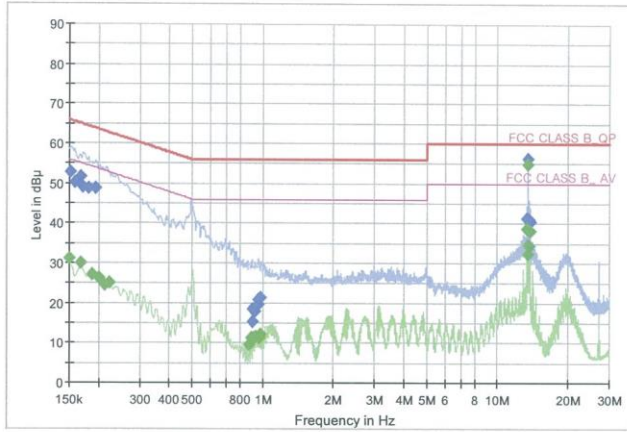
1 / 2

# Test Report

## Common Information

EUT : SM-G990B/DS  
 Manufacturer : SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions : NFC N UNTERM (25W)  
 Operator Name:  
 Comment:

Full Spectrum



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

## Final Result QPK

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr.
0.1523	52.86	65.88	13.02	9.000	N	OFF	9.6
0.1590	50.10	65.52	15.41	9.000	N	OFF	9.6
0.1680	51.61	65.06	13.45	9.000	N	OFF	9.6
0.1725	49.10	64.84	15.74	9.000	N	OFF	9.6
0.1815	48.87	64.42	15.55	9.000	N	OFF	9.6
0.1950	48.68	63.82	15.14	9.000	N	OFF	9.6
0.9028	18.54	56.00	37.46	9.000	N	OFF	9.7
0.9073	15.30	56.00	40.70	9.000	N	OFF	9.7
0.9298	17.89	56.00	38.11	9.000	N	OFF	9.7
0.9545	19.61	56.00	36.39	9.000	N	OFF	9.7
0.9635	20.74	56.00	35.26	9.000	N	OFF	9.7
0.9860	21.28	56.00	34.72	9.000	N	OFF	9.7
13.3475	41.16	60.00	18.84	9.000	N	OFF	10.3
13.4533	41.20	60.00	18.80	9.000	N	OFF	10.3
13.5590	56.35	60.00	3.65	9.000	N	OFF	10.3
13.6423	38.24	60.00	21.76	9.000	N	OFF	10.3
13.6670	40.95	60.00	19.05	9.000	N	OFF	10.3
13.7728	40.52	60.00	19.48	9.000	N	OFF	10.3

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NFC N UNTERM

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**Final Result\_CAV**

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1500	31.02	56.00	24.98	9.000	N	OFF	9.6
0.1680	29.87	55.06	25.19	9.000	N	OFF	9.6
0.1883	27.18	54.11	26.94	9.000	N	OFF	9.6
0.2018	26.19	53.54	27.35	9.000	N	OFF	9.6
0.2130	24.48	53.09	28.61	9.000	N	OFF	9.6
0.2220	25.16	52.74	27.59	9.000	N	OFF	9.6
0.8780	9.46	46.00	36.54	9.000	N	OFF	9.6
0.8983	11.12	46.00	34.88	9.000	N	OFF	9.6
0.9185	11.27	46.00	34.73	9.000	N	OFF	9.7
0.9410	11.66	46.00	34.34	9.000	N	OFF	9.7
0.9658	11.20	46.00	34.80	9.000	N	OFF	9.7
0.9860	12.15	46.00	33.85	9.000	N	OFF	9.7
13.3475	38.54	50.00	11.46	9.000	N	OFF	10.3
13.4533	34.60	50.00	15.40	9.000	N	OFF	10.3
13.4668	32.32	50.00	17.68	9.000	N	OFF	10.3
13.5590	54.71	50.00	-4.71	9.000	N	OFF	10.3
13.6648	34.40	50.00	15.60	9.000	N	OFF	10.3
13.7728	38.22	50.00	11.78	9.000	N	OFF	10.3

2021-05-15

오전 2:51:58

## 10. LIST OF TEST EQUIPMENT

### Conducted Test

<b>Manufacturer</b>	<b>Model / Equipment</b>	<b>Calibration Date</b>	<b>Calibration Interval</b>	<b>Serial No.</b>
Rohde & Schwarz	ENV216 / LISN	09/04/2020	Annual	102245
Rohde & Schwarz	ESR / EMI Test Receiver	09/16/2020	Annual	101910
ESPACE	SU-642 / Temperature Chamber	03/15/2021	Annual	0093008124
Agilent	N9030A / Signal Analyzer	01/11/2021	Annual	MY49431210
Hewlett Packard	E3632A / DC Power Supply	02/16/2021	Annual	MY50360067
Hewlett Packard	8493C / Attenuator(10 dB)	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**

<b>Manufacturer</b>	<b>Model / Equipment</b>	<b>Calibration Date</b>	<b>Calibration Interval</b>	<b>Serial No.</b>
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
Schwarzbeck	Loop Antenna	03/19/2020	Biennial	1513-333
Schwarzbeck	VULB 9168 / Hybrid Antenna	02/22/2021	Biennial	760
Schwarzbeck	BBHA 9120D / Horn Antenna	05/19/2020	Biennial	02299
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	07/28/2020	Annual	102168
Agilent	N9030A / Signal Analyzer	01/11/2021	Annual	MY49431210
Api tech.	18B-03 / Attenuator (3 dB)	02/03/2021	Annual	1
Agilent	8493C-10 / Attenuator(10 dB)	02/03/2021	Annual	08285
CERNEX	CBLU1183540 / Power Amplifier	02/03/2021	Annual	22964

**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-2106-FC019-P