

FCC NFC REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Date of Issue:
July 09, 2020

Address:
129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do,
16677, Rep. of Korea

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

Report No.: HCT-RF-2006-FC086-R1

FCC ID:	A3LSMN980F
APPLICANT:	SAMSUNG Electronics Co., Ltd.
According to the Evaluation report, all of the data contained herein is reused from the reference FCC ID : A3LSMN981B report.	

Model: SM-N980F/DS

Additional Model SM-N980F

EUT Type: Mobile Phone

RF Output Field Strength: 15.32 dBuV/m @30 m

Frequency of Operation: 13.56 MHz

Modulation type: ASK

FCC Classification: Low Power Communication Device – Transmitter

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-2006-FC086-R1

REVIEWED BY



Report prepared by : Jung Ki Lim
Engineer of Telecommunication Testing Center



Report approved by : Kwon Jeong
Manager of Telecommunication Testing Center

This report only responds to the tested sample and may not be reproduced, except in full, without written approval of the HCT Co., Ltd.

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 KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2006-FC086	June 30, 2020	- First Approval Report
HCT-RF-2006-FC086-R1	July 09, 2020	- Revised the test plot of 20 dB BW - Added the Note for Worst case configuration (16 page) - Revised the list of equipment. - The Test date has been updated. - The calibration date has been updated. - Added the result of powerline conducted emissions

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 KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

Table of Contents

REVIEWED BY	2
1. EUT DESCRIPTION	5
2. TEST METHODOLOGY	6
EUT CONFIGURATION	6
EUT EXERCISE	6
GENERAL TEST PROCEDURES	6
DESCRIPTION OF TEST MODES	6
3. INSTRUMENT CALIBRATION.....	7
4. FACILITIES AND ACCREDITATIONS	7
FACILITIES	7
EQUIPMENT	7
5. ANTENNA REQUIREMENTS	7
6. MEASUREMENT UNCERTAINTY	8
7. DESCRIPTION OF TESTS.....	9
8. TEST SUMMARY	17
9. TEST RESULT	18
9.1. Operation within the band 13.110 MHz – 14.010 MHz	18
9.2. Radiated Emission 9 kHz – 30 MHz	21
9.3. Radiated Emission 30 MHz – 1000 MHz	22
9.4. 20 dB Bandwidth	23
9.5. Frequency Stability	24
9.6. POWERLINE CONDUCTED EMISSIONS	28
10. LIST OF TEST EQUIPMENT	36
11. ANNEX A_ TEST SETUP PHOTO	38

1. EUT DESCRIPTION

Model	SM-N981F/DS
Additional Model	SM-N981F
EUT Type	Mobile Phone
Power Supply	DC 3.88 V
Battery Information	Model: EB-BN-980ABY Type: Li-ion Battery
Travel Adapter Information	Model : EP-TA800 Manufacture: SOLUM
Data Cable Information	Model : EP-DG980BBE Manufacture: RFTech
Ear-jack Information	Model : YBD-19HS-026 Manufacture: ALMUS
Frequency of Operation	13.56 MHz
Transmit Power	Without Tag: 14.43 dBuV/m @30 m With Tag: 15.32 dBuV/m @30 m
Modulation Type	ASK
Date(s) of Tests	May 12, 2020 ~ June 23, 2020 July 03, 2020 (20 dB Bandwidth Test_rev1)

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 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).

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_{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 ($\pm$ 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)

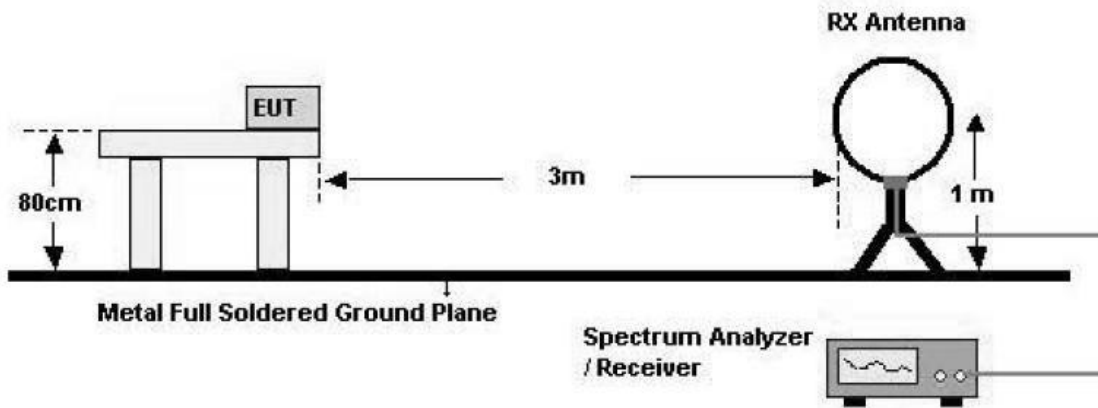
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	*100	3
88-216	*150	3
216-960	*200	3
Above 960	500	3

※.

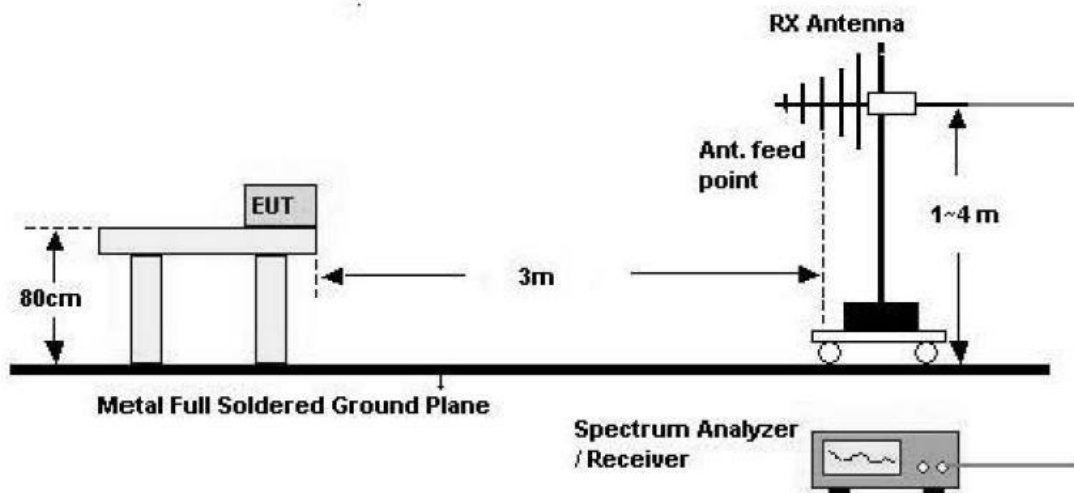
Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part,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

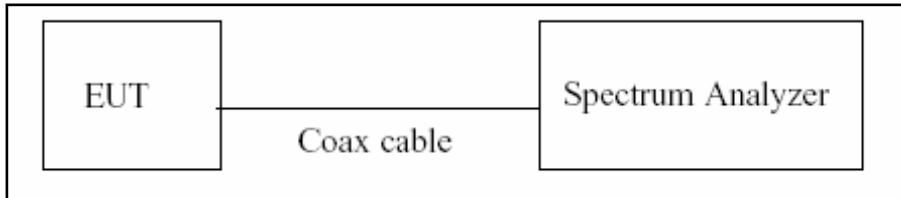
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

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 $\geq 3 \times$ 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 :

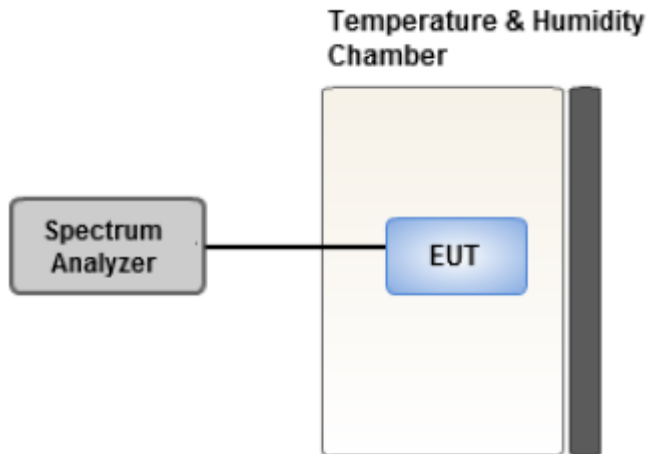
We tested Occupied Bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer.

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°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 μ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 ^(a)	56 to 46 ^(a)
0.50 to 5	56	46
5 to 30	60	50

^(a)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 : X, Z
3. All type and bitrate were investigated and the worst case results are reported.
(Worst case : Type A, 106 kbps)
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
5. SM-N981F/DS, SM-N981F were tested and the worst case results are reported.
(Worst case : SM-N981F/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-N981F/DS, SM-N981F were tested and the worst case results are reported.
(Worst case : SM-N981F/DS)

20dB 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-N981F/DS, SM-N981F were tested and the worst case results are reported.
(Worst case : SM-N981F/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)
13.5602	36.74	18.58	-40.00	H	15.32	84.00	68.68
13.5607	36.63	18.58	-40.00	V	15.21	84.00	68.79

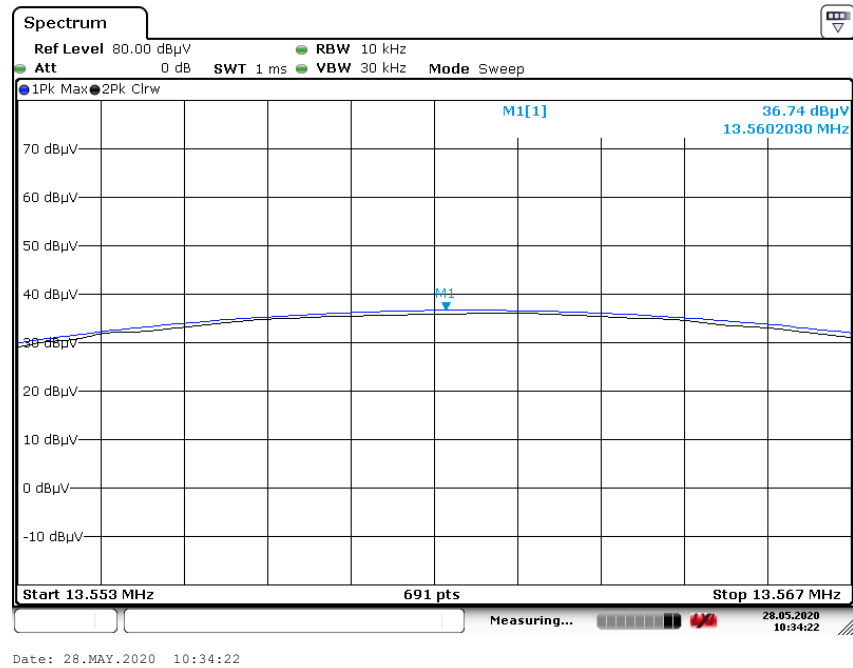
Measured Frequency Range : 13.410 MHz-13.553 MHz and 13.567 MHz-13.710 MHz							
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
13.5529	31.39	18.58	-40.00	H	9.97	50.47	40.50
13.5671	31.88	18.58	-40.00	H	10.46	50.47	40.01

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)
13.1501	20.29	18.58	-40.00	H	-1.13	40.51	41.64
13.7141	20.86	18.58	-40.00	H	-0.56	40.51	41.07

Note:

With Tag (worst case)

■ **Test Plot**



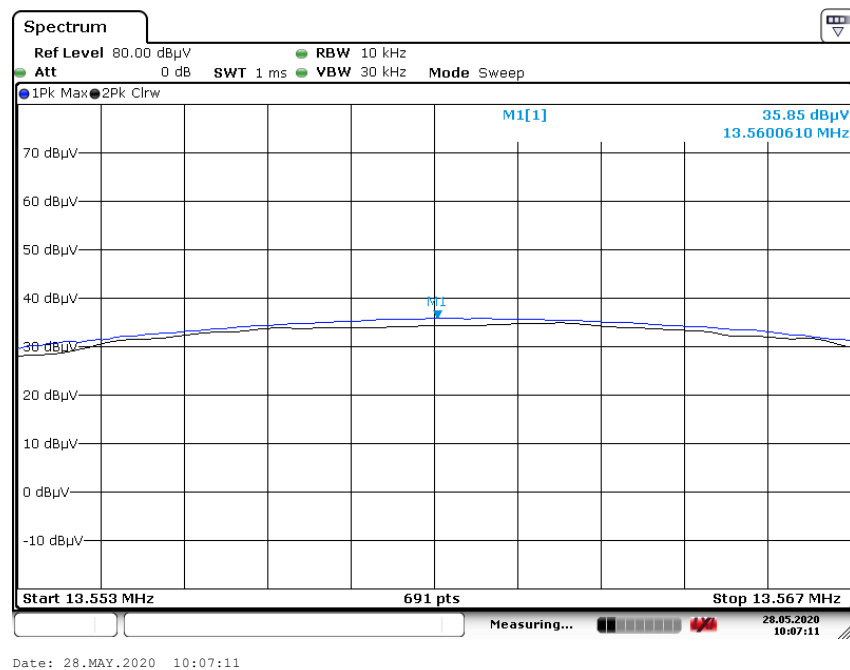
Note:

Plot of worst case are only reported.

Without Tag Mode (only fundamental)

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)
13.5600	35.85	18.58	-40	H	14.43	84.00	69.57
13.5603	35.66	18.58	-40	V	14.24	84.00	69.76

Test Plot



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)
1.109	17.826	18.58	-40.00	H	-3.59	26.71	30.30
9.084	13.122	18.58	-40.00	H	-8.30	29.54	37.84
14.618	11.619	18.58	-40.00	H	-9.80	29.54	39.34
27.128	10.077	18.98	-40.00	H	-10.94	29.54	40.48

Note:

1. With Tag (worst case)

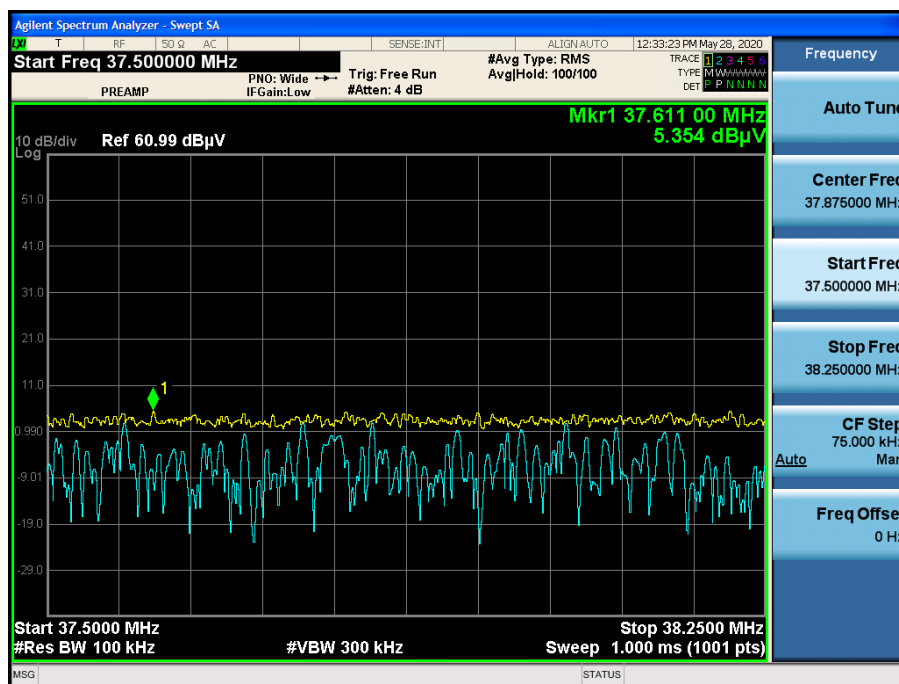
9.3. Radiated Emission 30 MHz – 1000 MHz

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)
37.611※	5.354	18.50	0.49	H	24.34	40.00	15.66
67.930	6.342	15.50	0.66	H	22.50	40.00	17.50
98.975	6.660	15.50	0.78	V	22.94	43.50	20.56
108.822※	7.004	17.00	0.83	H	24.83	43.50	18.67
138.000※	6.146	18.60	0.94	H	25.69	43.50	17.81
175.530	5.333	18.10	1.02	V	24.45	43.50	19.05

Note:

1. '※' is the result for restricted band.
2. With Tag (worst case)

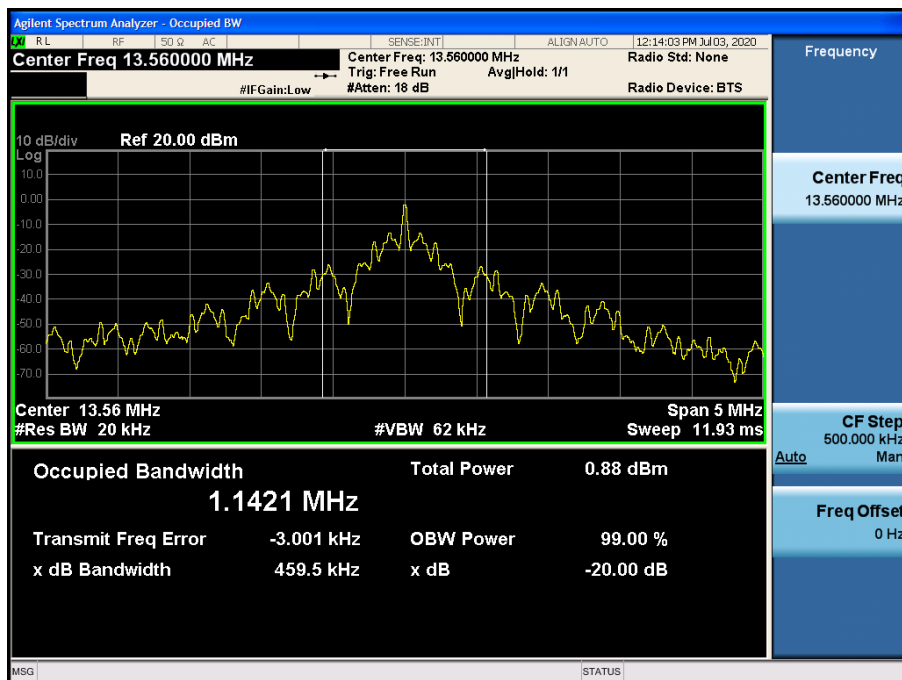
■ **Test Plot**



Note:

Plot of worst case are only reported

9.4. 20 dB Bandwidth



9.5. Frequency Stability

Startup

OPERATING FREQUENCY: 13.56 MHz
REFERENCE VOLTAGE: 3.88 VDC
DEVIATION LIMIT: $\pm 0.01\%$ = ± 1356 Hz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	3.88	-20	13.560102	102	0.0007522
100%		-10	13.560094	94	0.0006932
100%		0	13.560088	88	0.0006490
100%		+10	13.560076	76	0.0005605
100%		+20(Ref.)	13.560068	68	0.0005015
100%		+30	13.560061	61	0.0004499
100%		+40	13.560059	59	0.0004351
100%		+50	13.560055	55	0.0004056
End. Point	3.40	+20	13.560076	76	0.0005605

2 minutes

OPERATING FREQUENCY: 13.56 MHz
REFERENCE VOLTAGE: 3.88 VDC
DEVIATION LIMIT: $\pm 0.01 \% = \pm 1356 \text{ Hz}$

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	3.88	-20	13.560098	98	0.0007227
100%		-10	13.560094	94	0.0006932
100%		0	13.560085	85	0.0006268
100%		+10	13.560078	78	0.0005752
100%		+20(Ref.)	13.560075	75	0.0005531
100%		+30	13.560070	70	0.0005162
100%		+40	13.560067	67	0.0004941
100%		+50	13.560063	63	0.0004646
End. Point	3.40	+20	13.560065	65	0.0004794

5 minutes

OPERATING FREQUENCY: 13.56 MHz
REFERENCE VOLTAGE: 3.88 VDC
DEVIATION LIMIT: $\pm 0.01 \% = \pm 1356 \text{ Hz}$

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	3.88	-20	13.560094	94	0.0006932
100%		-10	13.560089	89	0.0006563
100%		0	13.560084	84	0.0006195
100%		+10	13.560072	72	0.0005310
100%		+20(Ref.)	13.560070	70	0.0005162
100%		+30	13.560064	64	0.0004720
100%		+40	13.560061	61	0.0004499
100%		+50	13.560060	60	0.0004425
End. Point	3.40	+20	13.560073	73	0.0005383

10 minutes

OPERATING FREQUENCY: 13.56 MHz
REFERENCE VOLTAGE: 3.88 VDC
DEVIATION LIMIT: $\pm 0.01 \% = \pm 1356 \text{ Hz}$

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (MHz)	Frequency Dev. (Hz)	Frequency Dev (%)
100%	3.88	-20	13.560084	84	0.0006195
100%		-10	13.560079	79	0.0005826
100%		0	13.560065	65	0.0004794
100%		+10	13.560061	61	0.0004499
100%		+20(Ref.)	13.560060	60	0.0004425
100%		+30	13.560055	55	0.0004056
100%		+40	13.560051	51	0.0003761
100%		+50	13.560049	49	0.0003614
End. Point	3.40	+20	13.560061	61	0.0004499

9.6. POWERLINE CONDUCTED EMISSIONS

Conducted Emissions (Line 1)

NFC MODE_L1

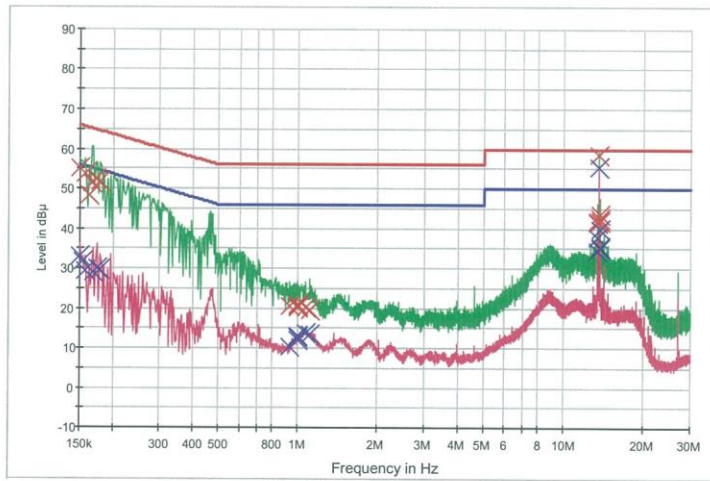
1 / 2

HCT TEST Report

Common Information

EUT: SM-N981B/DS
Manufacturer: SAMSUNG
Test Site: SHIELD ROOM
Operating Conditions: NFC MODE_L1

FCC CLASS B_Exten Cable



— FCC CLASS B_OP — 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)
0.150000	55.2	9.000	Off	L1	9.8	10.8	66.0
0.158000	53.7	9.000	Off	L1	9.8	11.9	65.6
0.162000	48.4	9.000	Off	L1	9.8	17.0	65.4
0.166000	51.4	9.000	Off	L1	9.8	13.8	65.2
0.172000	52.5	9.000	Off	L1	9.8	12.3	64.9
0.178000	51.8	9.000	Off	L1	9.8	12.8	64.6
0.928000	20.5	9.000	Off	L1	9.8	35.5	56.0
0.992000	20.1	9.000	Off	L1	9.8	35.9	56.0
0.996000	20.5	9.000	Off	L1	9.8	35.5	56.0
1.000000	20.7	9.000	Off	L1	9.8	35.3	56.0
1.068000	20.3	9.000	Off	L1	9.8	35.7	56.0
1.110000	19.5	9.000	Off	L1	9.8	36.5	56.0
13.348000	41.7	9.000	Off	L1	10.3	18.3	60.0
13.454000	41.9	9.000	Off	L1	10.3	18.1	60.0
13.562000	58.4	9.000	Off	L1	10.3	1.6	60.0
13.664000	41.7	9.000	Off	L1	10.3	18.3	60.0
13.668000	42.5	9.000	Off	L1	10.3	17.5	60.0
13.772000	43.6	9.000	Off	L1	10.3	16.4	60.0

2020-05-12

오후 8:56:57

NFC MODE_L1

2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	33.1	9.000	Off	L1	9.8	22.9	56.0
0.154000	31.8	9.000	Off	L1	9.8	24.0	55.8
0.158000	29.3	9.000	Off	L1	9.8	26.3	55.6
0.168000	28.9	9.000	Off	L1	9.8	26.1	55.1
0.174000	30.0	9.000	Off	L1	9.8	24.7	54.8
0.178000	29.7	9.000	Off	L1	9.8	24.9	54.6
0.928000	10.3	9.000	Off	L1	9.8	35.7	46.0
0.992000	12.2	9.000	Off	L1	9.8	33.8	46.0
0.996000	12.7	9.000	Off	L1	9.8	33.3	46.0
1.000000	13.1	9.000	Off	L1	9.8	32.9	46.0
1.068000	13.8	9.000	Off	L1	9.8	32.2	46.0
1.110000	13.4	9.000	Off	L1	9.8	32.6	46.0
13.348000	37.7	9.000	Off	L1	10.3	12.3	50.0
13.456000	34.5	9.000	Off	L1	10.3	15.5	50.0
13.560000	55.3	9.000	Off	L1	10.3	-5.3	50.0
13.664000	34.9	9.000	Off	L1	10.3	15.1	50.0
13.668000	35.3	9.000	Off	L1	10.3	14.7	50.0
13.772000	39.7	9.000	Off	L1	10.3	10.3	50.0

2020-05-12

오후 8:56:57

NFC_L1_Terminated

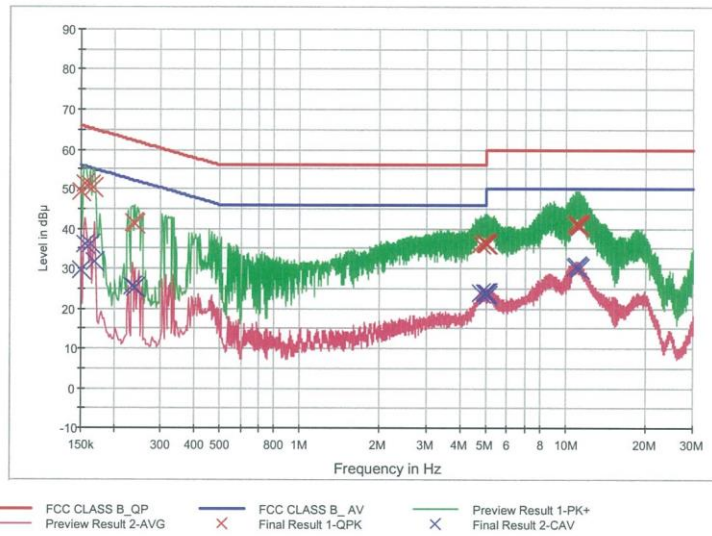
1 / 2

HCT TEST Report

Common Information

EUT: SM-N981B/DS
Manufacturer: SAMSUNG
Test Site: SHIELD ROOM
Operating Conditions: NFC_L1_Terminated

FCC CLASS B_Exten Cable



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	49.2	9.000	Off	L1	9.8	16.8	66.0
0.156000	51.5	9.000	Off	L1	9.8	14.2	65.7
0.162000	50.9	9.000	Off	L1	9.8	14.4	65.4
0.166000	50.4	9.000	Off	L1	9.8	14.8	65.2
0.236000	41.5	9.000	Off	L1	9.8	20.7	62.2
0.240000	41.3	9.000	Off	L1	9.8	20.8	62.1
4.794000	36.1	9.000	Off	L1	10.0	19.9	56.0
4.946000	36.3	9.000	Off	L1	10.0	19.7	56.0
5.018000	36.4	9.000	Off	L1	10.0	23.6	60.0
5.038000	36.2	9.000	Off	L1	10.0	23.8	60.0
5.062000	36.1	9.000	Off	L1	10.0	23.9	60.0
5.094000	36.2	9.000	Off	L1	10.0	23.8	60.0
10.878000	41.3	9.000	Off	L1	10.2	18.7	60.0
10.950000	40.7	9.000	Off	L1	10.2	19.3	60.0
11.058000	40.9	9.000	Off	L1	10.3	19.1	60.0
11.116000	41.1	9.000	Off	L1	10.3	18.9	60.0
11.226000	40.8	9.000	Off	L1	10.3	19.2	60.0
11.252000	40.4	9.000	Off	L1	10.3	19.6	60.0

2020-05-13

오전 8:59:34

NFC_L1_Terminated

2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	29.7	9.000	Off	L1	9.8	26.3	56.0
0.156000	36.1	9.000	Off	L1	9.8	19.6	55.7
0.162000	36.0	9.000	Off	L1	9.8	19.4	55.4
0.168000	31.7	9.000	Off	L1	9.8	23.4	55.1
0.234000	25.4	9.000	Off	L1	9.8	26.9	52.3
0.240000	25.1	9.000	Off	L1	9.8	27.0	52.1
4.794000	23.8	9.000	Off	L1	10.0	22.2	46.0
4.946000	24.0	9.000	Off	L1	10.0	22.0	46.0
5.018000	24.0	9.000	Off	L1	10.0	26.0	50.0
5.038000	23.8	9.000	Off	L1	10.0	26.2	50.0
5.064000	23.1	9.000	Off	L1	10.0	26.9	50.0
5.094000	23.8	9.000	Off	L1	10.0	26.2	50.0
10.812000	30.3	9.000	Off	L1	10.2	19.7	50.0
10.878000	30.4	9.000	Off	L1	10.2	19.6	50.0
10.914000	30.6	9.000	Off	L1	10.2	19.4	50.0
10.950000	30.5	9.000	Off	L1	10.2	19.5	50.0
11.058000	30.5	9.000	Off	L1	10.3	19.5	50.0
11.252000	29.9	9.000	Off	L1	10.3	20.1	50.0

2020-05-13

오전 8:59:34

Conducted Emissions (Line 2)

NFC MODE_N

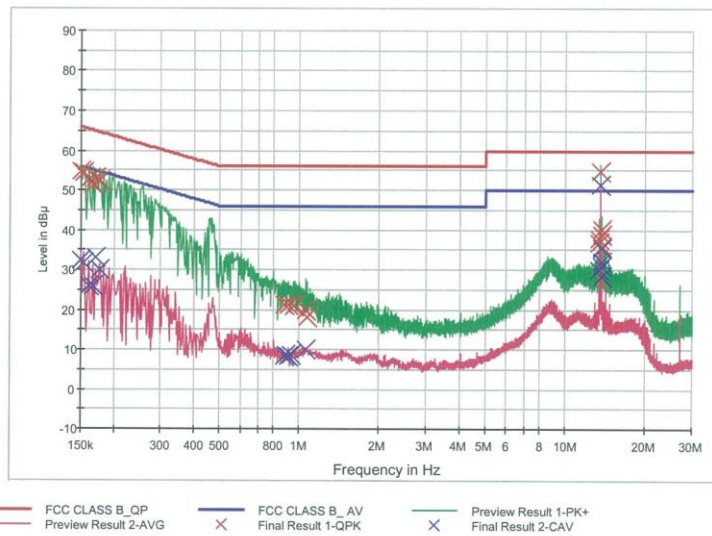
1 / 2

HCT TEST Report

Common Information

EUT: SM-N981B/DS
Manufacturer: SAMSUNG
Test Site: SHIELD ROOM
Operating Conditions: NFC MODE_N

FCC CLASS B_Exten Cable



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	54.7	9.000	Off	N	9.8	11.3	66.0
0.154000	54.2	9.000	Off	N	9.8	11.5	65.8
0.160000	52.7	9.000	Off	N	9.8	12.8	65.5
0.166000	51.4	9.000	Off	N	9.8	13.8	65.2
0.170000	53.0	9.000	Off	N	9.8	12.0	65.0
0.176000	52.5	9.000	Off	N	9.8	12.2	64.7
0.878000	21.1	9.000	Off	N	9.8	34.9	56.0
0.882000	21.1	9.000	Off	N	9.8	34.9	56.0
0.910000	21.1	9.000	Off	N	9.8	34.9	56.0
0.948000	20.8	9.000	Off	N	9.8	35.2	56.0
1.054000	19.7	9.000	Off	N	9.8	36.3	56.0
1.064000	18.3	9.000	Off	N	9.8	37.7	56.0
13.452000	36.8	9.000	Off	N	10.4	23.2	60.0
13.456000	37.6	9.000	Off	N	10.4	22.4	60.0
13.562000	54.9	9.000	Off	N	10.4	5.1	60.0
13.646000	35.6	9.000	Off	N	10.4	24.4	60.0
13.666000	38.9	9.000	Off	N	10.4	21.1	60.0
13.772000	40.0	9.000	Off	N	10.4	20.0	60.0

2020-05-12

오후 9:05:18

NFC MODE_N

2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	32.5	9.000	Off	N	9.8	23.5	56.0
0.154000	31.7	9.000	Off	N	9.8	24.1	55.8
0.160000	25.9	9.000	Off	N	9.8	29.5	55.5
0.166000	25.8	9.000	Off	N	9.8	29.4	55.2
0.170000	33.1	9.000	Off	N	9.8	21.9	55.0
0.176000	30.0	9.000	Off	N	9.8	24.7	54.7
0.878000	8.5	9.000	Off	N	9.8	37.5	46.0
0.884000	8.7	9.000	Off	N	9.8	37.3	46.0
0.892000	8.5	9.000	Off	N	9.8	37.5	46.0
0.910000	8.3	9.000	Off	N	9.8	37.7	46.0
0.932000	8.6	9.000	Off	N	9.8	37.4	46.0
1.054000	10.0	9.000	Off	N	9.8	36.0	46.0
13.458000	30.1	9.000	Off	N	10.4	19.9	50.0
13.562000	51.2	9.000	Off	N	10.4	-1.2	50.0
13.640000	28.5	9.000	Off	N	10.4	21.5	50.0
13.666000	31.9	9.000	Off	N	10.4	18.1	50.0
13.670000	30.9	9.000	Off	N	10.4	19.1	50.0
13.774000	35.5	9.000	Off	N	10.4	14.5	50.0

2020-05-12

오후 9:05:18

NFC_N_Terminated

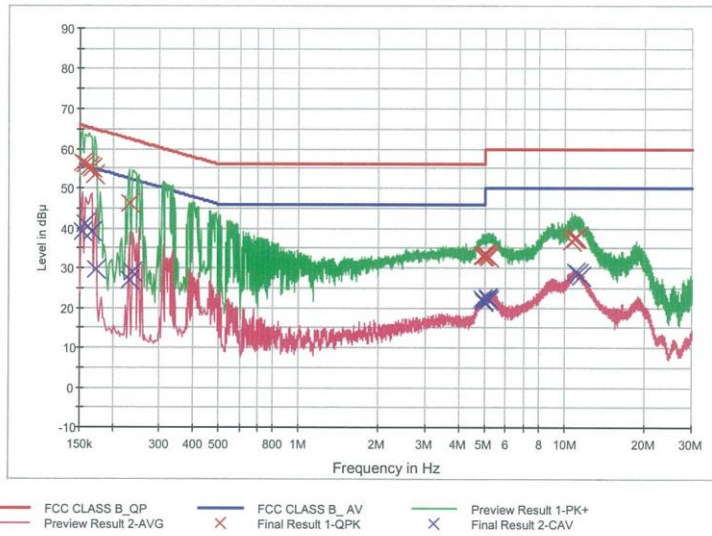
1 / 2

HCT TEST Report

Common Information

EUT: SM-N981B/DS
Manufacturer: SAMSUNG
Test Site: SHIELD ROOM
Operating Conditions: NFC_N_Terminated

FCC CLASS B_Exten Cable



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	54.8	9.000	Off	N	9.8	11.0	65.8
0.158000	54.4	9.000	Off	N	9.8	11.1	65.6
0.162000	53.9	9.000	Off	N	9.8	11.5	65.4
0.166000	53.4	9.000	Off	N	9.8	11.8	65.2
0.170000	53.3	9.000	Off	N	9.8	11.6	65.0
0.230000	46.1	9.000	Off	N	9.8	16.3	62.4
4.894000	33.0	9.000	Off	N	10.0	23.0	56.0
4.946000	32.9	9.000	Off	N	10.0	23.1	56.0
4.996000	33.3	9.000	Off	N	10.0	22.7	56.0
5.052000	33.3	9.000	Off	N	10.0	26.7	60.0
5.124000	33.0	9.000	Off	N	10.0	27.0	60.0
5.170000	32.8	9.000	Off	N	10.0	27.2	60.0
10.594000	36.8	9.000	Off	N	10.3	23.2	60.0
10.844000	37.3	9.000	Off	N	10.3	22.7	60.0
10.856000	37.4	9.000	Off	N	10.3	22.6	60.0
10.870000	37.4	9.000	Off	N	10.3	22.6	60.0
10.980000	37.7	9.000	Off	N	10.3	22.3	60.0
11.008000	37.5	9.000	Off	N	10.3	22.5	60.0

2020-05-13

오전 8:49:50

NFC_N_Terminated

2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	39.0	9.000	Off	N	9.8	16.8	55.8
0.158000	41.1	9.000	Off	N	9.8	14.5	55.6
0.166000	39.1	9.000	Off	N	9.8	16.0	55.2
0.172000	29.6	9.000	Off	N	9.8	25.3	54.9
0.230000	26.8	9.000	Off	N	9.8	25.6	52.4
0.238000	28.8	9.000	Off	N	9.8	23.3	52.2
4.894000	22.2	9.000	Off	N	10.0	23.8	46.0
4.932000	21.6	9.000	Off	N	10.0	24.4	46.0
4.946000	21.9	9.000	Off	N	10.0	24.1	46.0
5.124000	22.1	9.000	Off	N	10.0	27.9	50.0
5.134000	22.5	9.000	Off	N	10.0	27.5	50.0
5.170000	21.7	9.000	Off	N	10.0	28.3	50.0
10.948000	28.8	9.000	Off	N	10.3	21.2	50.0
10.980000	29.1	9.000	Off	N	10.3	20.9	50.0
10.992000	29.1	9.000	Off	N	10.3	20.9	50.0
11.034000	29.0	9.000	Off	N	10.3	21.0	50.0
11.208000	28.7	9.000	Off	N	10.3	21.3	50.0
11.460000	28.1	9.000	Off	N	10.3	21.9	50.0

2020-05-13

오전 8:49:50

10. LIST OF TEST EQUIPMENT

Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	09/11/2019	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/05/2020	Annual	100033
ESPAC	SU-642 / Temperature Chamber	03/18/2020	Annual	0093008124
Agilent	N9020A / Signal Analyzer	05/11/2020	Annual	MY51110085
Agilent	N9020A / Signal Analyzer	05/25/2020	Annual	MY52090906
Agilent	N9030A / Signal Analyzer	01/13/2020	Annual	MY49431210
Hewlett Packard	E3632A / DC Power Supply	06/12/2020	Annual	KR75303960
Agilent	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

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	04/26/2019	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	03/22/2019	Biennial	760
Schwarzbeck	VULB 9160 / TRILOG Antenna	08/09/2018	Biennial	9160-3368
Rohde & Schwarz	FSP(9 kHz ~ 30 GHz) / Spectrum Analyzer	04/27/2020	Annual	100854
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/26/2019	Annual	101068-SZ
Agilent	N9020A / Signal Analyzer	05/11/2020	Annual	MY51110085
Api tech.	18B-03 / Attenuator (3 dB)	03/02/2020	Annual	1
Agilent	8493C-10 / Attenuator(10 dB)	03/02/2020	Annual	08285
CERNEX	CBLU1183540 / Power Amplifier	03/02/2020	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-2006-FC086-P