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FCC TEST REPORT

Manufacturer : Samsung Electronics, Co., Ltd.
Model : SM-T320NU
FCC ID : A3LSMT320
Application Type : Certification
EUT Type : Portable Tablet

UKAS TESTING
1911

Prepared By ..... Date 2015.02.23
S Park – Test Engineer

Checked By ..... Date 2015.02.23
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Authorized By ..... Date 2015.02.23
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Table of Contents:

- - - End of page - - -

§ 2.1033 General Information

APPLICANT:	SAMSUNG Electronics Co., Ltd
APPLICANT ADDRESS:	129 Samsung-ro, Yeongtong-gu, Suwon City, Gyeonggi – Do, Korea 443-742
TEST SITE:	SEQAL Korea
TEST SITE ADDRESS:	129 Samsung-ro, Yeongtong-gu, Suwon City, Gyeonggi – Do, Korea 443-742
FCC RULE PART(S):	FCC Part 15 Subpart B / ANSI C63.4-2009
TEST PROCEDURE(S):	ANSI C63.4-2009
MODEL NAME:	SM-T320NU
FCC ID:	A3LSMT320
FCC CLASSIFICATION:	FCC Class B
DATE(S) OF RECEIPT:	2015.02.05
DATE(S) OF TEST:	2015.02.06 ~ 2015.02.13
TEST DEVICE JOB NO.:	FCM-009
TEST DEVICE SERIAL NO.:	FCM-009-A

- - - End of page - - -

1.0 PRODUCT INFORMATION

1.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Tablet FCC ID:A3LSMT320.** The test data contained in this report pertains only to the emissions due to the digital circuitry of the EUT.

1.2 Device Capabilities

This device contains the following capabilities:
802.11a/b/g/n/ac WLAN (DTS/NII), Bluetooth (1x, EDR, LE), ANT+

1.3 Emission

Applied	Test type	Applied standard	Result
▣	Conducted Disturbance (Mains port)	FCC Part 15 Subpart B / ANSI C63.4-2009 (Class B)	Complied
▣	Radiated Disturbance		Complied

Table 1-1. Emission

1.4 Test Configuration

The **Samsung Portable Tablet FCC ID:A3LSMT320** was tested with a notebook PC connected via USB Interface port. The EUT was exercised during testing by means of software installed on the PC. Since the EUT is a peripheral device, the host PC was populated with another USB device and an additional peripheral device with a non-USB interface, as shown in Table 3-2, thus satisfying the minimum system requirement of two different I/O interfaces. All equipment is placed on the test table top and arranged in a typical configuration in accordance with ANSI C63.4-2009 and manipulated to obtain worst case emissions.

1.5 Test Condition

Temperature	**23.5℃**
Humidity	**53%**

1.6 Identification of Samples Tested

Date of Receipt	Identification Number:	Information of samples:
2015.02.05	FCM-009-A	-

1.7 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

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2.0 DESCRIPTION OF TEST

2.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Methods of measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment on the Range of 150KHz to 40GHz(ANSI C63.4-2009) was used in the measurement of the **Samsung Portable Tablet FCC ID:A3LSMT320.**

2.2 AC Line Conducted Emissions

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying to the EUT and/or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration / arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 4.6 and 4.7. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is TOYO EP5-CE, Version 5.4.10.

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2.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

Automated test software, TOYO EP5-RE, Version 5.5.2, was used to perform the radiated emissions testing.

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3.0 TEST EQUIPMENT CALIBRATION AND UNCERTAINTY

3.1 Measuring instrument calibration

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

TEST EQUIPMENT LIST						
Description	**Model**	**Manufacturer**	**Cal Date**	**Cal Interval**	**Cal Due**	**S/N**
PXA Signal Analyzer	N9030A	Agilent	2014-10-24	Annual	2015-10-24	MY52350977
EMI Receiver	ESU26	R&S	2014-11-10	Annual	2015-11-10	100521
PSG Analog Signal Generator	E8257D	Agilent	2014-11-07	Annual	2015-11-07	MY51501209
BILOG Antenna	CBL 6112D	TESEQ	2013-09-24	Biannual	2015-09-24	36011
HORN Antenna	3115	ETS LINDGREN	2013-05-15	Biannual	2015-05-15	143185
Pre-amplifier	SONOMA/310	SONOMA	2014-10-28	Annual	2015-10-28	332507
Turn Table	Turn Table	MATURO	-	-	-	TT1.2 SI
Band Selector	NS4900	TOYO	-	-	-	1305-061
Antenna Mast	AM 4.0	MATURO	-	-	-	-
ESG Vector Signal Generator	E4438C	Agilent	2014-05-30	Annual	2015-05-30	MY47272353
EMI Test Receiver	ESCI	R&S	2014-07-04	Annual	2015-07-04	101367/003
Two-Line V-Network	NNB 51	TESEQ	2014-06-13	Annual	2015-06-13	33297
Two-Line V-Network	NNB 51	TESEQ	2014-07-04	Annual	2015-07-04	33298
PRE-AMPLIFIER	8449B	Agilent	2014-11-25	Annual	2015-11-25	3008A02672

Table 3-1. Annual Test Equipment Calibration Schedule

3.2 Test Support Equipment

Description	Model	Serial Number
USB Cable	ECB-DU4EWE	-
NoteBook PC	NT530U3C-K55	JGFP91CD900135F
Monitor	UP2414Qt	CN-06X55C-74445-47O-443L
HDMI Cable	-	-
Earphone	EHS64AVFWE	-
Mouse	M-B0001	-

Table 3-2. Test Support Equipment Used

3.3 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.

PARAMETER		UNCERTAINTY
Conducted Disturbance	0.15MHz to 30MHz	3.27 dB
Radiated Disturbance	30MHz to 1GHz	4.83 dB
	1GHz to 6GHz	3.98 dB

Table 3-3. Measurement Uncertainty

Uncertainty figures are valid to a confidence level of 95%.

4.0 TEST RESULTS

4.1 Summary

FCC Part 15 Section	Description	Test Result	Reference
15.107	Conducted Emissions	PASS	Section 4.6, 4.7
15.109	Radiated Emissions	PASS	Section 4.4, 4.5

Table 4-1. Summary of Test Results

4.2 EUT operating mode

To achieve compliance applied standard specification, the following mode was made during Compliance testing:

Operating Mode 1	USB Mode(Data Communication)

4.3 Clock Frequency

Kind of Clocks	Frequency[MHz]
CPU	2260

Note: Upper frequency of measurement range(MHz): 5^{th} harmonic of the highest frequency or 40GHz, whichever is lower.

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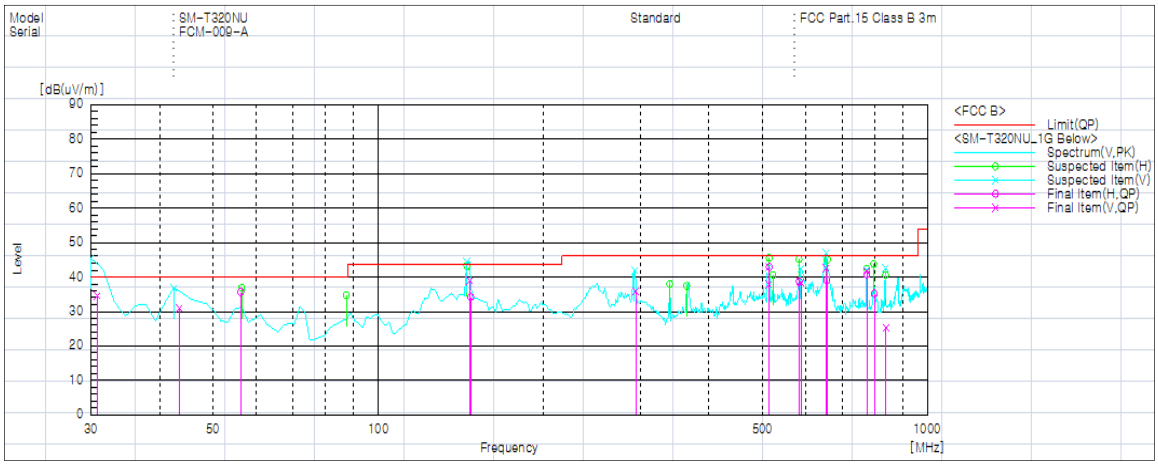
4.4 Radiated Measurement Data (30MHz-1GHz)



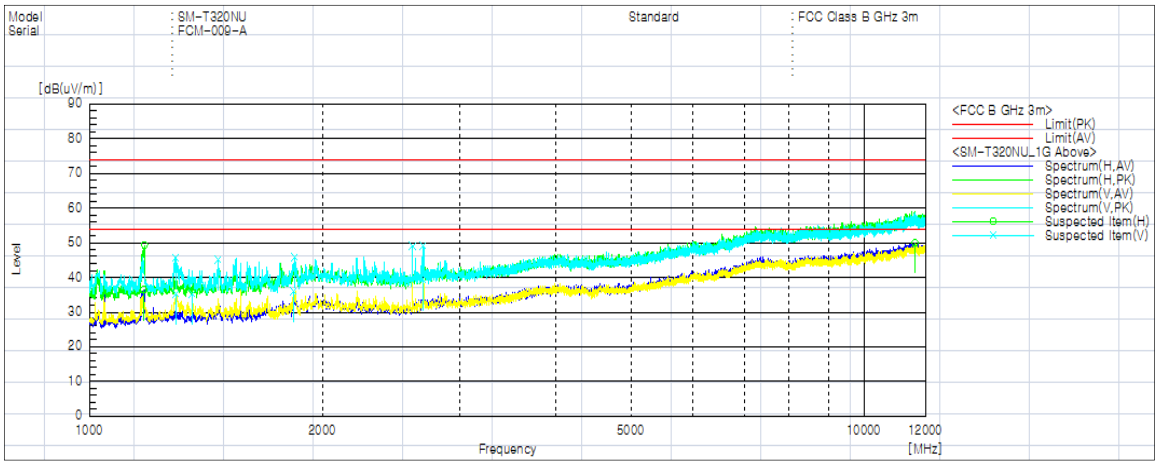
Frequency [MHz]	Level [dBm]	AFCL [dB/m]	Pol [H/V]	Height [m]	Azimuth [degrees]	Field Strength [dBµV/m]	Limit [dBµV]	Margin [dB]
515.000	49.7	-6.7	H	148.0	162.3	43.0	46.0	3.0
652.510	47.1	-4.5	V	157.0	25.1	42.6	46.0	3.4
774.848	44.9	-3.2	V	102.0	350.8	41.7	46.0	4.3
56.178	55.8	-20.2	H	399.0	329.8	35.6	40.0	4.4
146.866	53.6	-14.6	V	102.0	9.3	39.0	43.5	4.5
774.879	44.0	-3.2	H	109.0	195.1	40.8	46.0	5.2
30.754	43.2	-8.6	V	102.0	348.7	34.6	40.0	5.4
655.339	43.6	-4.5	H	110.0	151.9	39.1	46.0	6.9

Table 4-2. Radiated Measurements Data

Notes:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. Radiated emissions were measured from 30MHz – 1GHz to ensure that the provisions of 15.33(b)(1) are satisfied with respect to the upper frequency scanning range.
3. The radiated limits for unintentional radiators at a distance of 3 meters are used in the table above, as specified in 15.109(a)
4. AFCL(dB/m) = Antenna Factor(dB/m) + Cable Loss(dB)
5. Level(dBµV/m) = Analyzer Reading(dBm) + AFCL(dB/m)+107
6. Margin (dB) = Field strength(dBµV/m) – Limit(dBµV/m)
7. Measurements are made using a CISPR quasi-peak detector with a 100kHz resolution bandwidth. Above 1GHz, peak measurements are made using a peak detector with a resolution bandwidth of 1MHz and a video bandwidth of 3MHz and average measurements are made with a peak detector using a resolution bandwidth of 1MHz and a video bandwidth of 10Hz.
8. Calibrated linearly polarized broadband and horn antenna were used for measurements below and above 1GHz, respectively. For measurements made below 1GHz, the results recorded using the broadband antenna are known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy.

4.5 Radiated Measurement Data (Above 1GHz)



Frequency [MHz]	Level [dBm]	AFCL [dB/m]	Pol [H/V]	Height [m]	Azimuth [degrees]	Field Strength [dBµV/m]	Limit [dBµV]	Margin [dB]
1176.550	58.0	-8.7	H	100.0	185.8	49.3	74.0	24.7
1290.950	53.4	-7.7	V	199.0	185.4	45.7	74.0	28.3
1463.100	52.1	-7.1	V	101.0	146.1	45.0	74.0	29.0
2690.150	51.8	-2.6	V	101.0	90.5	49.2	74.0	24.8
2609.850	52.5	-3.4	V	101.0	90.5	49.1	74.0	24.9
1838.200	51.3	-5.5	V	199.0	185.4	45.8	74.0	28.2

Table 4-3. Radiated Measurement Data_Peak Detector (Above 1GHz)

Frequency [MHz]	Level [dBm]	AFCL [dB/m]	Pol [H/V]	Height [m]	Azimuth [degrees]	Field Strength [dBµV/m]	Limit [dBµV]	Margin [dB]
1173.800	45.1	-8.7	H	100.0	241.3	36.4	54.0	17.6
2690.150	42.0	-2.6	V	101.0	146.1	39.4	54.0	14.6
1833.800	41.7	-5.6	V	101.0	174.3	36.1	54.0	17.9
1292.600	43.0	-7.7	V	199.0	157.3	35.3	54.0	18.7
1355.850	42.5	-7.3	V	199.0	185.4	35.2	54.0	18.8
11622.700	34.7	15.3	H	100.0	17.5	50.0	54.0	4.0

Table 4-4 Radiated Measurement Data_Average Detector (Above 1GHz)

Notes:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. Radiated emissions were measured from above 1GHz to ensure that the provisions of 15.33(b)(1) are satisfied with respect to the upper frequency scanning range.
3. The radiated limits for unintentional radiators at a distance of 3 meters are used in the table above, as specified in 15.109(a)
4. AFCL(dB/m) = Antenna Factor(dB/m) + Cable Loss(dB)
5. Level(dBµV/m) = Analyzer Reading(dBm) + AFCL(dB/m)+107
6. Margin (dB) = Field strength(dBµV/m) – Limit(dBµV/m)
7. Measurements are made using a CISPR quasi-peak detector with a 100kHz resolution bandwidth. Above 1GHz, peak measurements are made using a peak detector with a resolution bandwidth of 1MHz and a video bandwidth of 3MHz and average measurements are made with a peak detector using a resolution bandwidth of 1MHz and a video bandwidth of 10Hz.

8. Calibrated linearly polarized broadband and horn antenna were used for measurements below and above 1GHz, respectively. For measurements made below 1GHz, the results recorded using the broadband antenna are known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy.

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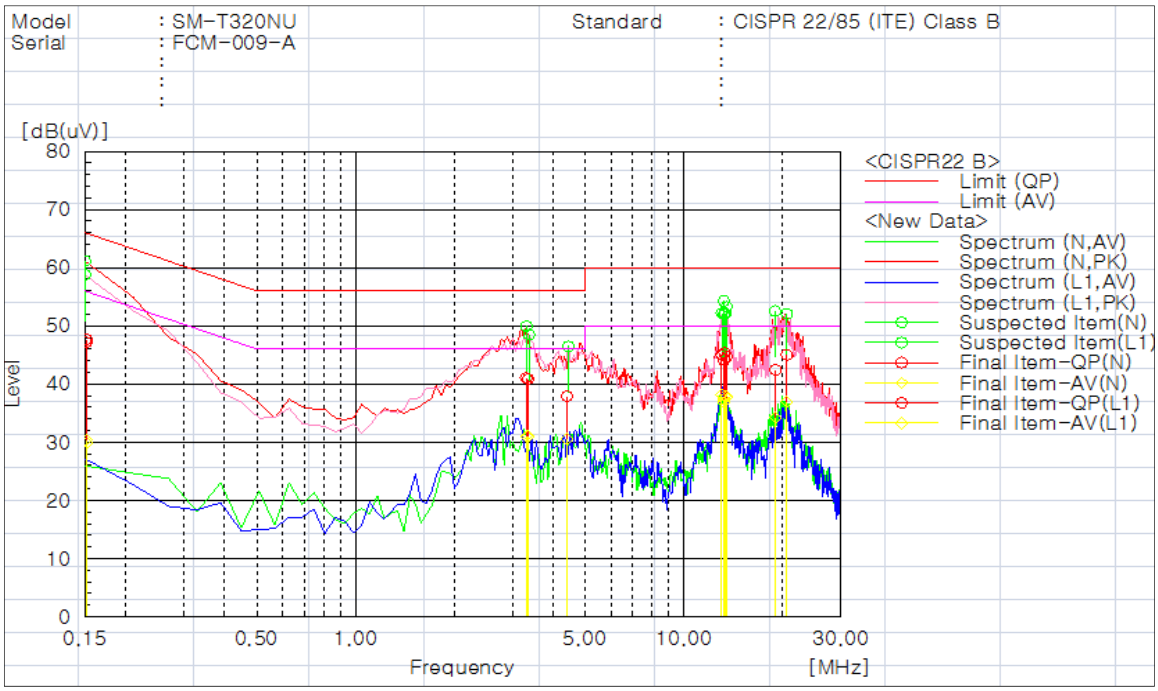
4.6 Line Conducted Measurement Data (L1)



Frequency [MHz]	Line	Corr. [dB]	Quasi Peak [dBµV]	Limit [dBµV]	Margin [dB]	Average [dBµV]	Limit [dBµV]	Margin [dB]
0.1513	L1	10.0	47.2	65.9	18.7	30.4	55.9	25.5
3.3556	L1	10.2	40.9	56.0	15.1	31.1	46.0	14.9
4.400	L1	10.2	37.9	56.0	18.1	30.5	46.0	15.5
13.0152	L1	10.9	45.0	60.0	15.0	38.2	50.0	11.8
13.2267	L1	10.9	44.2	60.0	15.8	37.3	50.0	12.7
13.4987	L1	10.9	44.7	60.0	15.3	37.7	50.0	12.3

Table 4-5. Line Conducted Data (L1)

Notes:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Factor (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Factor (dB)
5. Margin (dB) = QP/AV Limit (dBµV) – QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

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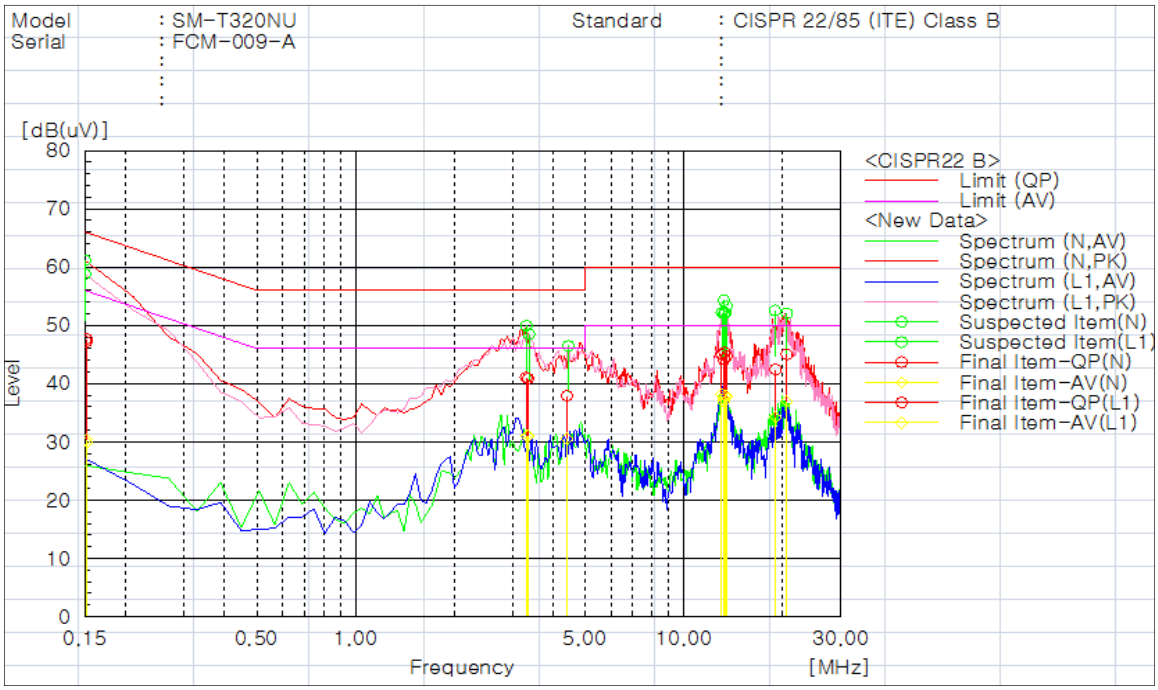
4.7 Line Conducted Measurement Data (N)



Frequency [MHz]	Line	Corr. [dB]	Quasi Peak [dBµV]	Limit [dBµV]	Margin [dB]	Average [dBµV]	Limit [dBµV]	Margin [dB]
0.1518	N	10.0	47.7	65.9	18.2	29.9	55.9	26.0
3.3067	N	10.2	41.0	56.0	15.0	31.0	46.0	15.0
13.2245	N	10.9	44.1	60.0	15.9	37.0	50.0	13.0
13.3049	N	10.9	45.3	60.0	14.7	37.9	50.0	12.1
19.0009	N	11.5	42.4	60.0	17.6	34.2	50.0	15.8
20.5754	N	11.7	45.0	60.0	15.0	36.9	50.0	13.1

Table 4-6. Line Conducted Data (N)

Notes:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Factor (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Factor (dB)
5. Margin (dB) = QP/AV Limit (dBµV) – QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

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5.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Samsung Portable Tablet FCC ID:A3LSMT320** has been tested to comply with the requirements specified in §15.107 and §15.109 of the FCC Rules.

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