SEQAL

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FCC TEST REPORT

Model : NP345XNA
Variant Model : None
FCC ID : A3LNP345XNA
Application Type : Certification
EUT Type : Notebook Computer

Prepared By ..... Date 2022.10.25.....
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1. Report Information

1.1 Revision History

No.	Revised Detailed Information
Issue 1	There is no revisions and this version is basic test report.

2. General Information

APPLICANT:	SAMSUNG Electronics Co., Ltd
APPLICANT ADDRESS:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
TEST SITE:	SEQAL Korea
TEST SITE ADDRESS:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
FCC Designation Number	KR0028
FCC RULE PART(S):	47 CFR Part 15.B
TEST PROCEDURE(S):	ANSI C63.4-2014
MODEL NAME:	NP345XNA
FCC ID:	A3LNP345XNA
DATE(S) OF RECEIPT:	2022.10.04
DATE(S) OF TEST:	2022.10.13 ~ 2022.10.18
TEST DEVICE JOB NO.:	FT-027
TEST DEVICE SERIAL NO.:	NONE

Samsung Electronics Quality Assurance Lab is accredited and designated in accordance with the provisions of Radio Wave Act and International Standard ISO/IEC 17025 by the National Radio Research Agency with designation No. KR0028. for EMC testing.

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3. PRODUCT INFORMATION

3.1 Equipment Description

The Equipment Under Test (EUT) is the NP345XNA. The test data contained in this report pertains only to the emissions due to the digital circuitry of the EUT.

3.2 Device Capabilities

This device contains the following capabilities:

Operation Band(s):
- WCDMA FDD 1/2/4/5/8
- LTE FDD 1/2/3/4/5/7/8/12/13/17/20/26/28/66, TDD 38/40/41
- 5G FR1 n1/3/5/7/8/20/28/38/40/41/66/77/78

Additional Capabilities:
- Bluetooth, Camera, Audio and Video, GNSS, Wi-Fi (802.11b/g/n/ax/a/ac), DP,

3.3 Emission

Applied	Test type	Applied standard	Result
■	Conducted Disturbance (Mains port)	47 CFR Part 15 Subpart B / ANSI C63.4-2014 (Class B)	Complied
■	Radiated Disturbance		Complied

Table 1-1. Emission

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3.4 Test Configuration and Condition

The system was configured for testing in a typical fashion that a customer would normally use. Cables were attached to each of the available I/O Ports. Where applicable, peripherals were attached to the I/O cables. All the external I/O ports are exercised, as well as internal and the external SD card, by writing and reading arbitrary data or charging with TA.

The EUT was investigated in three orientations and the worst case orientation is reported.

Cellular Rx mode conducted testing was performed with the LTE FDD 5 mode at center frequency. All licensed communication Cellular Rx mode, WCDMA/LTE test results are not significantly different.

The video and music were played on monitor through Display Out function using direct DP Cable or DP converter.

The camera of the EUT was operated continuously.

Power source for the EUT operating was supplied by CVCF made by the Digitek Power and AC Power Korea.

Test Voltage : AC 120 V, 60 Hz

3.5 EUT operating mode

To achieve compliance applied standard specification including CXX and JBC requirement, the following mode(s) were made during compliance testing:

3.5.1 Radiated Emission

No.	Operating mode
1	eUFS(Internal storage) & micso SD Card Read/Write + Display Port + Front Preview +H Pattern + MP4 Play + Charging(w/TA)

3.5.2 Conducted Emission

No.	Operating mode
1	eUFS(Internal storage) & micso SD Card Read/Write + Display Port + Front Preview +H Pattern + MP4 Play + Cellular Receiver(LTE B5 Center Frequency) + Charging(w/TA)

3.5.3 EUT Frequency

The highest Frequency	Frequency[MHz]
Wi-Fi 6E	7,115 MHz

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

3.6 Test Condition

Max Temperature	**24.5℃**
Max Humidity	**46.3%**

3.7 Identification of Samples Tested

Date of Receipt	Identification Number:	Information of samples:
2022.10.04	FT-027-1	#1
2022.10.04	FT-027-2	#2

3.8 EMI Suppression Device(s)/Modifications

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

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4. DESCRIPTION OF TEST

4.1 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--2014) was used in the measurement of NP345XNA**.**

4.2 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 ground plane. 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 6.3. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is TOYO EP5-CE, Version 5.4.40.

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4.3 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 5.9.1, was used to perform the radiated emissions testing.

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5. TEST EQUIPMENT CALIBRATION AND UNCERTAINTY

5.1 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**	**Date of next Calibration**	**S/N**
BILOG Antenna	CBL 6112D	TESEQ	2024-01-18	36010
BILOG Antenna	CBL 6112D	TESEQ	2023-10-19	36011
BILOG Antenna	CBL 6112D	TESEQ	2023-10-12	36012
6dB Attenuator	50HF-006	JFW	2023-10-19	None
HORN Antenna	HF907	R&S	2023-06-04	100492
HORN Antenna	HF907	R&S	2024-06-02	100579
Pre-amplifier (30MHz to 1GHz)	310	Sonoma	2023-07-26	304577
Pre-amplifier (1GHz to 18GHz)	SCU-18	R&S	2023-01-24	10216
Pre-amplifier (1GHz to 18GHz)	SCU-18F	R&S	2023-04-06	100944
HORN Antenna & Pre-amplifier assembly (18GHz to 26.5GHz)	HAP18-26N	Flann	2024-04-19	216249
HORN Antenna & Pre-amplifier assembly (18GHz to 26.5GHz)	HAP18-26N	Flann	2023-12-13	216251
HORN Antenna & Pre-amplifier assembly (18GHz to 26.5GHz)	HAP18-26N	Flann	2023-12-13	216252
HORN Antenna & Pre-amplifier assembly (26.5GHz to 40GHz)	HAP26-40N	Flann	2024-04-19	216253
HORN Antenna & Pre-amplifier assembly (26.5GHz to 40GHz)	HAP26-40N	Flann	2024-07-25	216250
EMI Receiver	ESU40	R&S	2023-06-30	100370
EMI Receiver	ESU	R&S	2023-01-18	100521
EMI Receiver	ESU8	R&S	2023-04-22	100474
EMI Receiver	ESCI	R&S	2023-08-24	101367/003
TWO L LINE-V-NETWORK	ENV216	R&S	2023-07-04	101053
TWO L LINE-V-NETWORK	ENV216	R&S	2023-07-04	101644
Communication Tester	CMU 500	R&S	2023-07-26	163307
Vector Signal Generator	SMBV100A	R&S	2023-09-13	260252
Test software	EP5-RE	TOYO	-	V5.9.1
Test software	EP5-CE	TOYO	-	V5.4.40

Table 5-1. Annual Test Equipment Calibration Schedule

5.2 Test Support Equipment

Description	Model	Manufacturer	Serial Number	FCC ID.
Mouse	AA-SM7PCP	Samsung	CNBA59003634ADV8J32S6837	Doc
Data Cable	EP-DW767	RF TECH	-	-
Travel Adapter	EP-TA845	DONGYANG E&P	R37T5AZ71F3DK3	-
Travel Adapter	EP-TA845	DONGYANG E&P	R37T5AZ7113DK3	-
Monitor	U2713HMt	DELL	CN-07JNY5-74445-3BT-056S	Doc
DP Cable	DM479	COMS	-	-

Table 5-2. Test Support Equipment Used

5.3 Measurement Uncertainty

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

Test Item		Measurement Uncertainty (C.L. 95%, k=2)
Conducted Disturbance	0.15MHz to 30MHz	1.46 dB
Radiated Disturbance	Below 1GHz (Horizontal)	4.16 dB
	Below 1GHz (Vertical)	4.75 dB
	Above 1GHz (Horizontal)	4.98 dB
	Above 1GHz (Vertical)	4.98 dB

Table 5-3. Measurement Uncertainty

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6. TEST RESULTS

6.1 Summary

FCC Part 15 Section	Description	Test Result
15.107	Conducted Emissions	Complied
15.109	Radiated Emissions	Complied

Table 6-1. Summary of Test Results

Note: See Appendix A. Test setup photographs for actual system test setup.

6.2 Radiated disturbance

The following data lists the significant emission frequencies, measured levels, correction factors (for antenna and cables), orientation of table, polarization and height of antenna, the corrected reading, the limit, and the amount of margin.

Peak measurements were made over the changeable frequency range 30 MHz to 1 GHz at a measurement distance of 10 m for the following antenna and turntable arrangements:

Antenna Height [cm]	Antenna Polarization	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]	Turntable position [degrees]
100 ~ 400	Horizontal, Vertical	120	300	Continuous

Measurements within 6 dB of the limit were then maximized by adjusting turntable position.
Final measurements were made using quasi-peak detector.

Peak/CISPR-Average measurements were made over the changeable frequency range 1 GHz to 40 GHz or 5th harmonics of the highest frequency generated or used in the device or on which the device operate or tunes at a measurement distance of 3 m for the following antenna and turntable arrangements. The measurements above 1 GHz were performed with the bore-sighting antenna aimed at the EUT.

Antenna Height [cm]	Antenna Polarization	Resolution Bandwidth [MHz]	Video Bandwidth [MHz]	Turntable position
100 ~ 400	Horizontal, Vertical	1	3	Continuous

Measurements within 6 dB of the limit were then maximized by adjusting turntable position.
Final measurements were made using peak and CISPR-average detectors.

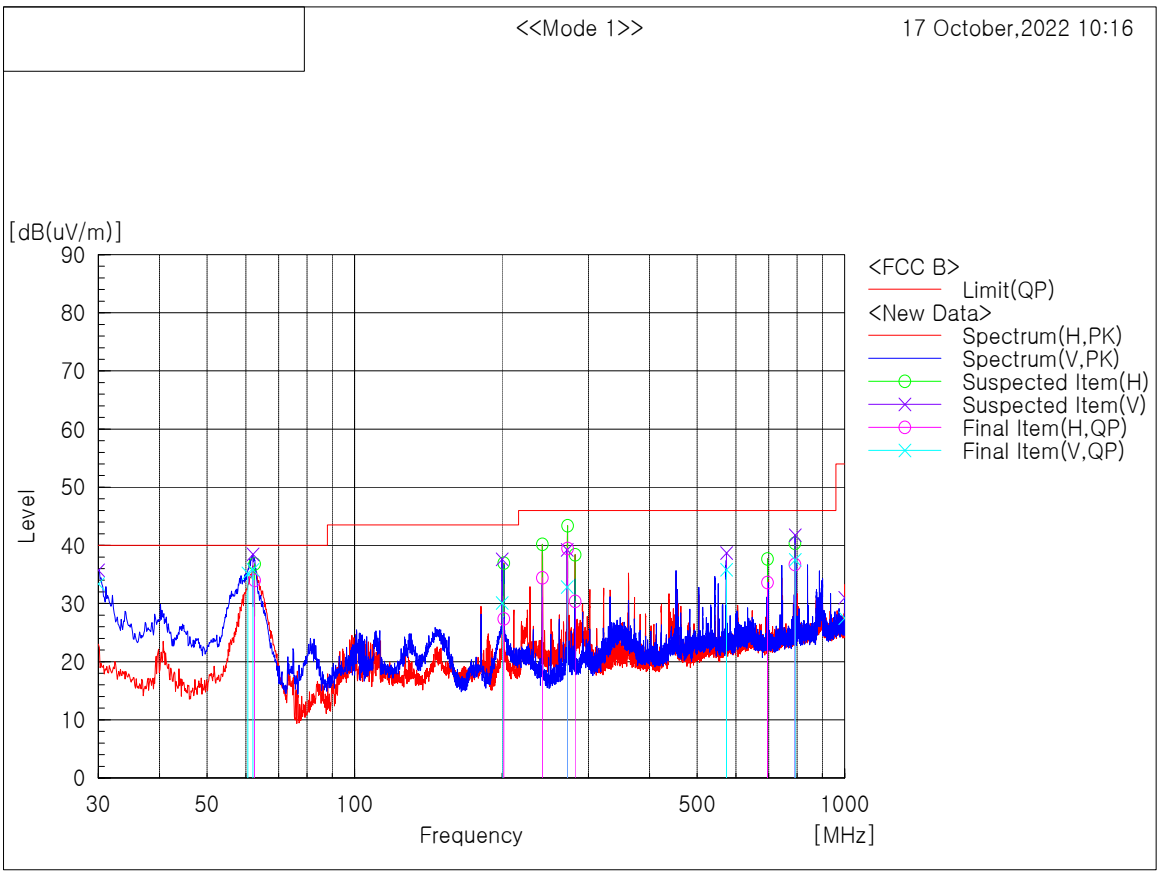
Limits for radiated disturbance of Class B ITE at a measuring distance of 3 m

Frequency range Limits [MHz]	Field Strength	
	3 m [μV/m]	3 m [dB(μV/m)]
30 to 88	100	40.0
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

Results checked manually; and points close to the limit line were re-measured.

Operating Mode 1

Frequencies below 1 GHz



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	30.000	V	40.3	-6.9	33.4	40.0	6.6	99.9	119.7	
2	60.563	V	54.1	-18.9	35.2	40.0	4.8	99.9	9.0	Manual
3	62.010	V	54.7	-18.9	35.8	40.0	4.2	99.9	321.6	
4	62.495	H	52.9	-18.9	34.0	40.0	6.0	200.3	252.2	
5	199.993	V	45.4	-15.3	30.1	43.5	13.4	99.9	334.0	
6	201.569	H	42.7	-15.3	27.4	43.5	16.1	99.8	21.5	
7	241.703	H	46.6	-12.2	34.4	46.0	11.6	99.8	320.9	
8	271.530	V	44.0	-11.1	32.9	46.0	13.1	99.9	344.2	
9	271.894	H	50.6	-11.1	39.5	46.0	6.5	99.8	303.1	
10	281.836	H	41.3	-10.9	30.4	46.0	15.6	99.8	303.1	
11	573.685	V	40.0	-4.2	35.8	46.0	10.2	99.9	167.7	
12	696.026	H	37.4	-3.8	33.6	46.0	12.4	99.8	143.7	
13	791.935	H	39.4	-2.7	36.7	46.0	9.3	200.2	8.3	
14	792.056	V	40.2	-2.7	37.5	46.0	8.5	200.3	278.5	
15	999.758	V	26.8	0.7	27.5	54.0	26.5	200.3	52.0	

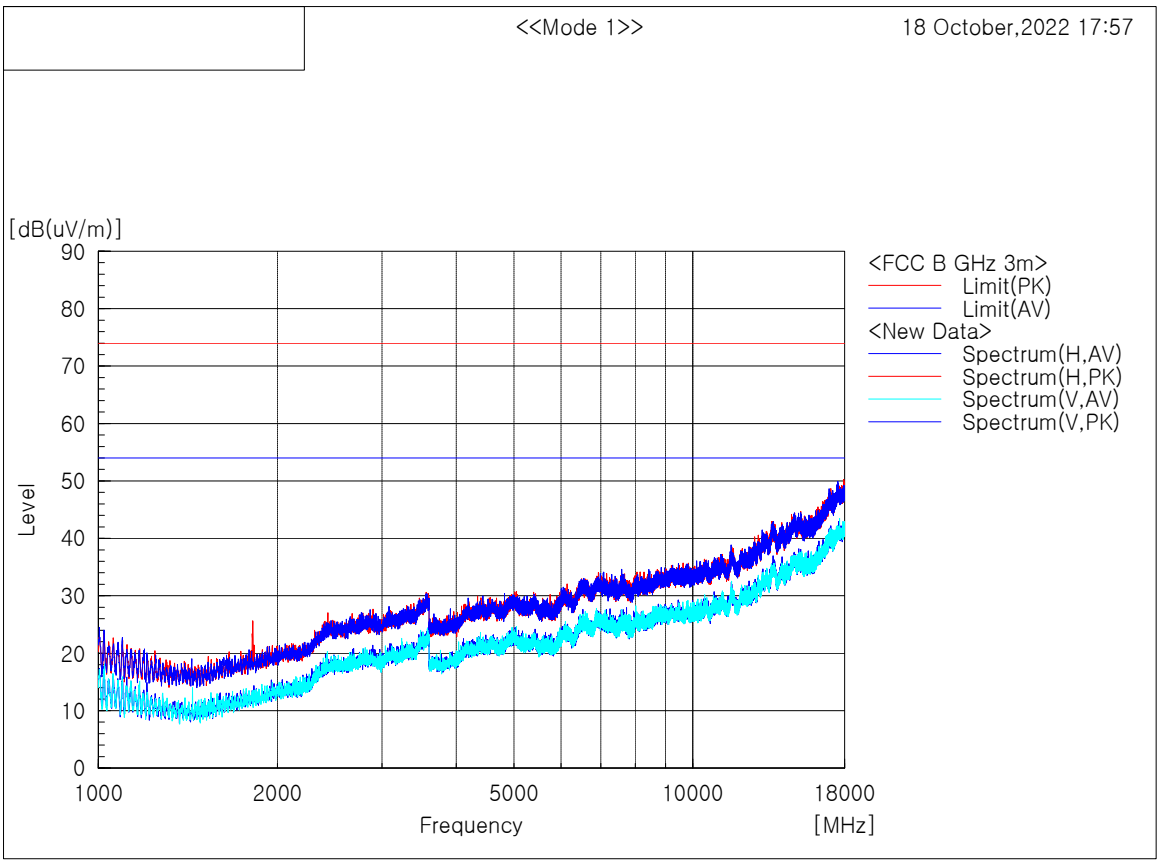
Note1) Receiving antenna polarization : Horizontal, Vertical
Test Distance : 3 m, Antenna Height : 1 to 4 meters
Result (QP) = Reading (QP) + c.f (Antenna Factor + Cable Loss - Amp. Gain)
Margin (QP) = Limit – Level (QP)
QP = Quasi-Peak, c.f = Correction Factor

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. 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.
5. 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.

Operating Mode 1

Frequencies above 1 GHz



Note 1) We have also tested from 18GHz to 40GHz and found no emissions

Note 2) Receiving antenna polarization : Horizontal, Vertical

Test Distance : 3 m, Antenna Height : 1 to 4 meters

Level (PK and/or CAV) = Reading (PK and/or CAV) + Corr. (Antenna Factor + Cable Loss - Amp. Gain)

Margin (PK and/or CAV) = Limit – Level (PK and/or CAV)

PK = Peak, CAV = CISPR-Average, Corr. = Correction Factor

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. 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.
5. 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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6.3 Conducted disturbance

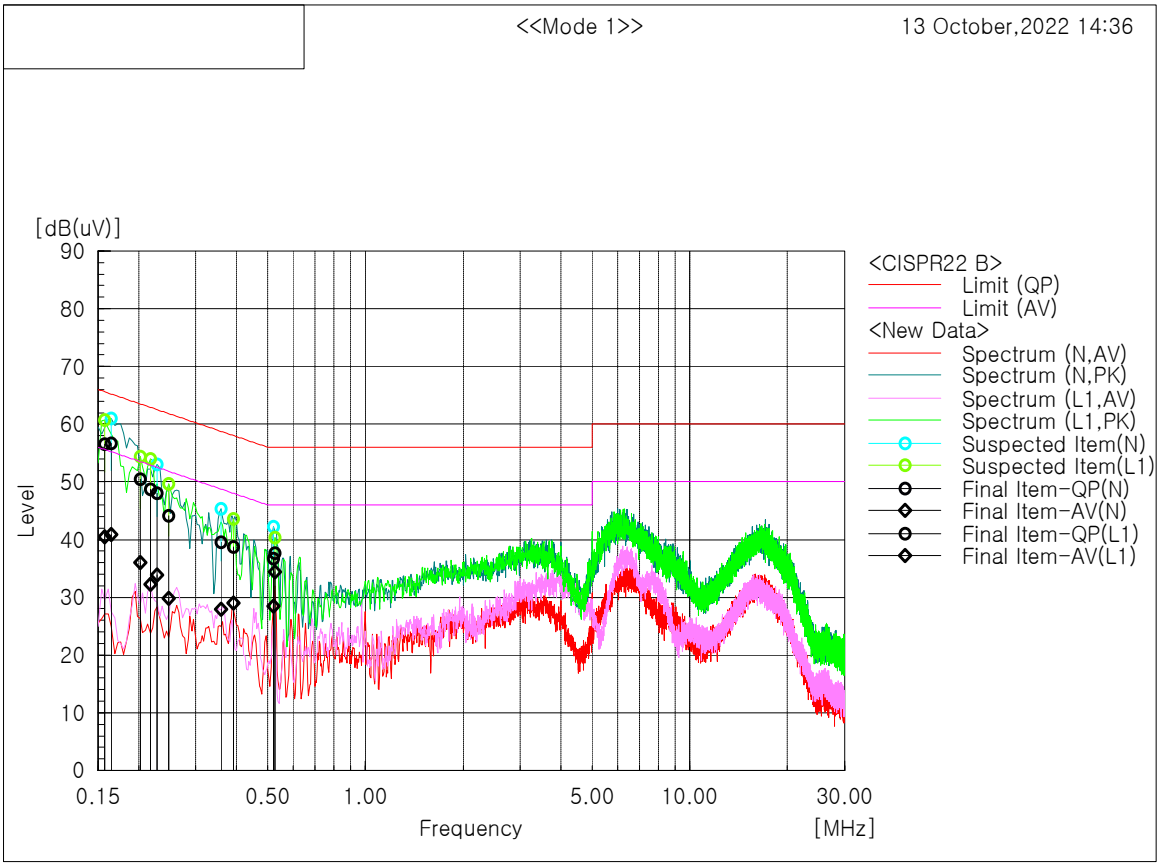
The EUT was connected to the Desk-Top Computer which was powered from one LISN for the measurements. The support equipment power cables were connected to a second LISN.

Both conducted lines are measured in Quasi-Peak and CISPR-Average mode, including the worst-case data points for each tested configuration. The EUT measured in accordance with the methods described in standards.

Limits for conducted disturbance at the mains ports of Class B ITE

Frequency range Limits [MHz]	Resolution Bandwidth [kHz]	Limits [dB(μV)]	
		Quasi-peak	Average
0,15 to 0,50	9	66 to 56	56 to 46
0,50 to 5	9	56	46
5 to 30	9	60	50
NOTE 1 The lower limit shall apply at the transition frequency. NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.			

Operating Mode 1



Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.16493	46.5	30.7	10.2	56.7	40.9	65.2	55.2	8.5	14.3
2	0.22836	38.1	23.9	9.9	48.0	33.8	62.5	52.5	14.5	18.7
3	0.35895	29.6	17.9	10.0	39.6	27.9	58.8	48.8	19.2	20.9
4	0.51939	26.6	18.4	10.1	36.7	28.5	56.0	46.0	19.3	17.5

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.15746	46.5	30.5	10.0	56.5	40.5	65.6	55.6	9.1	15.1
2	0.20224	40.5	26.0	10.0	50.5	36.0	63.5	53.5	13.0	17.5
3	0.21716	38.8	22.4	9.9	48.7	32.3	62.9	52.9	14.2	20.6
4	0.24701	34.3	20.0	9.8	44.1	29.8	61.9	51.9	17.8	22.1
5	0.39253	28.7	19.0	10.0	38.7	29.0	58.0	48.0	19.3	19.0
6	0.52686	27.7	24.4	10.0	37.7	34.4	56.0	46.0	18.3	11.6

Note 1) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph
Note 2) Level (QP and/or CAV) = Meter Reading (QP and/or CAV) + Corr. (LISN Insertion Loss + Cable Loss)
Margin (QP and/or CAV) = Limit – Level (QP and/or CAV)
QP = Quasi-Peak, CAV = CISPR-Average, Corr. = Correction Factor.

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. Traces shown in plot are made using a peak detector.
4. Deviations to the Specifications: None.

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7. CONCLUSION

The data collected relate only the item(s) tested and show that the **NP345XNA** has been tested to comply with the requirements specified in §15.107 and §15.109 of the FCC Rules.

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