



TEST REPORT

Report Number: C21T00091-EMC04-V00

Applicant	Shanghai Sunmi Technology Co.,Ltd.
Product Name	Smart POS system
Model Name	T6900
Brand Name	SUNMI
FCC ID	2AH25T6900

Industrial Internet Innovation Center (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in FCC CFR47 Part 2, FCC CFR47 Part 15C, ANSI C63.10-2013.

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Approved by 李柳凯

Issue Date 2022-01-07

Industrial Internet Innovation Center (Shanghai) Co., Ltd.

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Test Laboratory:

Industrial Internet Innovation Center (Shanghai) Co., Ltd.

Add: Building 4, No. 766 Jingang Rd, Pudong, Shanghai, China

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Revision Version

Report Number	Revision	Date	Memo
C21T00091-EMC04-V00	00	2022-01-07	Initial creation of test report

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1. Test Laboratory

1.1. Testing Location

Primary Lab:

Company Name	Industrial Internet Innovation Center (Shanghai) Co., Ltd.
Address	Building 4, No. 766 Jingang Rd, Pudong, Shanghai, China
FCC Registration No.	958356
FCC Designation No.	CN1177

Subcontracting Lab #1:

Company Name	N/A
Address	N/A

1.2. Testing Environment

Normal Temperature	15°C~35°C
Relative Humidity	30%RH~60%RH
Supply Voltage	120V/60Hz

1.3. Project Information

Project Leader	Wang Wenwen
Testing Start Date	2021-10-08
Testing End Date	2021-01-07

2. Client Information

2.1. Applicant Information

Company Name	Shanghai Sunmi Technology Co.,Ltd.
Address	Room 505, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai, China
Telephone	+86 18501703215

2.2. Manufacturer Information

Company Name	Shanghai Sunmi Technology Co.,Ltd.
Address	Room 505, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai, China
Telephone	+86 18501703215

3. Equipment under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Product Name	Smart POS system
Model name	T6900
GSM Frequency Band	GSM850/GSM900/GSM1800/GSM1900
UMTS Frequency Band	Band I /Band II /Band IV /Band V /Band VIII
LTE Frequency Band	LTE 1/2/3/4/5/7/17/28/38/41
Supported Radio Technology and Bands	BT4.2 WLAN 802.11b,g,n WLAN 802.11a,n NFC GPS
Hardware Version	B1691_MAIN_PCB_V1.1
Software Version	V1.0.2

Note: Photographs of EUT are shown in ANNEX B of this test report.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of Receipt
N07 (Main Supply)	N/A	B1691_MAIN_PCB_V1.1	V1.0.2	2021/10/08
N09 (Secondary Supply)	N/A	B1691_MAIN_PCB_V1.1	V1.0.2	2021/11/11

*EUT ID: is internally used to identify the test sample in the lab.

3.3. Internal Identification of AE used during the test

AE ID*	Description	Model	SN/Remark
CA01	Adapter	TPA-23A050200UU01	NA
UA03	USB Cable	SSM-A001A	NA
BA04	Battery	T6900	B21019104724
BB01	Battery	T6900	NA
AE1	Type A Card	N/A	N/A

*AE ID: is internally used to identify the test sample in the lab.

*The AE is provided by the lab.

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC CFR47 Part 2	Frequency allocations and radio treaty matters; general rules and regulations	2020/10/01
FCC CFR47 Part 15C	Radio Frequency Devices-Intentional Radiators	2020/10/01
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013

5. Test Summary

5.1. Summary of Test Results

Items	Test List	Standard	Verdict
1	20 dB bandwidth	2.1049	Pass
2	Frequency Stability	15.225(e)	Pass
3	Radiated Emissions	15.225 (a) (b) (c) (d) and 15.209	Pass
4	Conducted Emissions	15.207	Pass

5.2. Statements

The T6900, manufactured by Shanghai Sunmi Technology Co.,Ltd. is a variant product for testing.

Industrial Internet Innovation Center (Shanghai) Co., Ltd. only performed test cases which identified with Pass/Fail/Inc result in section 5.1.

Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 3 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 4 of this test report.

5.3. Decision of final test mode

The EUT was tested together with the above additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The test configuration modes are as the following:

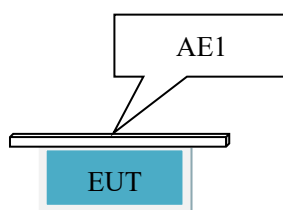
N07(Main Supply):

Test Item	Test setup and operating modes
20 dB bandwidth	Mode 1: TX mode <Figure 1>
Frequency Stability	Mode 1: TX mode <Figure 1>
Radiated Emissions	Mode 1: TX mode <Figure 1>
Conducted Emissions	Mode 2: TX mode+CA01+UA03 <Figure 2>
Remark: Enter working mode according to NFC transmission command. The EUT will transmit the NFC command continuously during the test, and will read the information from the Type A Card continuously.	

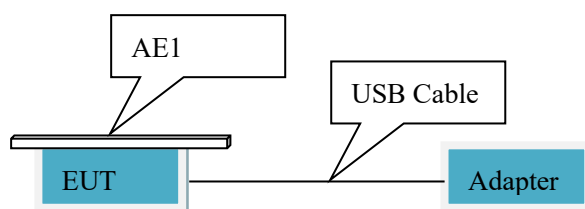
N09(Secondary Supply):

Test Item	Test setup and operating modes
20 dB bandwidth	Mode 1: TX mode <Figure 1>
Frequency Stability	Mode 1: TX mode <Figure 1>
Radiated Emissions	Mode 1: TX mode <Figure 1>
Conducted Emissions	Mode 2: TX mode+CA01+UA03 <Figure 2>
Remark: Enter working mode according to NFC transmission command. The EUT will transmit the NFC command continuously during the test, and will read the information from the Type A Card continuously.	

5.4. EUT Connection Diagram of Test System



<Figure 1> Mode 1



<Figure 2> Mode 2

6. Measurement Results

6.1 20dB Bandwidth

Reference

See Clause 6.9 of ANSI C63.10-2013

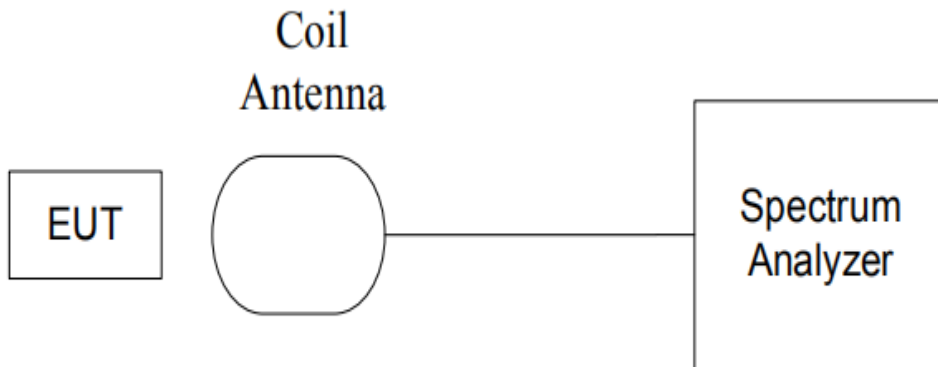
Measurement Methods

The transmitter output signal was picked up by coil antenna to the spectrum analyzer.

The transmitter output signal was picked up by coil antenna connected to the spectrum analyzer.

The bandwidth of the center frequency was measured with 140Hz RBW, 420Hz VBW and 14kHz span.

Test Setup



EUT Operating Mode and Test Conditions

The measurement of EUT is carried out under the transmit state of NFC and without modulation.

EUT had been not connected to a travel adapter.

During the measurements, the ambient temperature is in the range of 15~25°C.

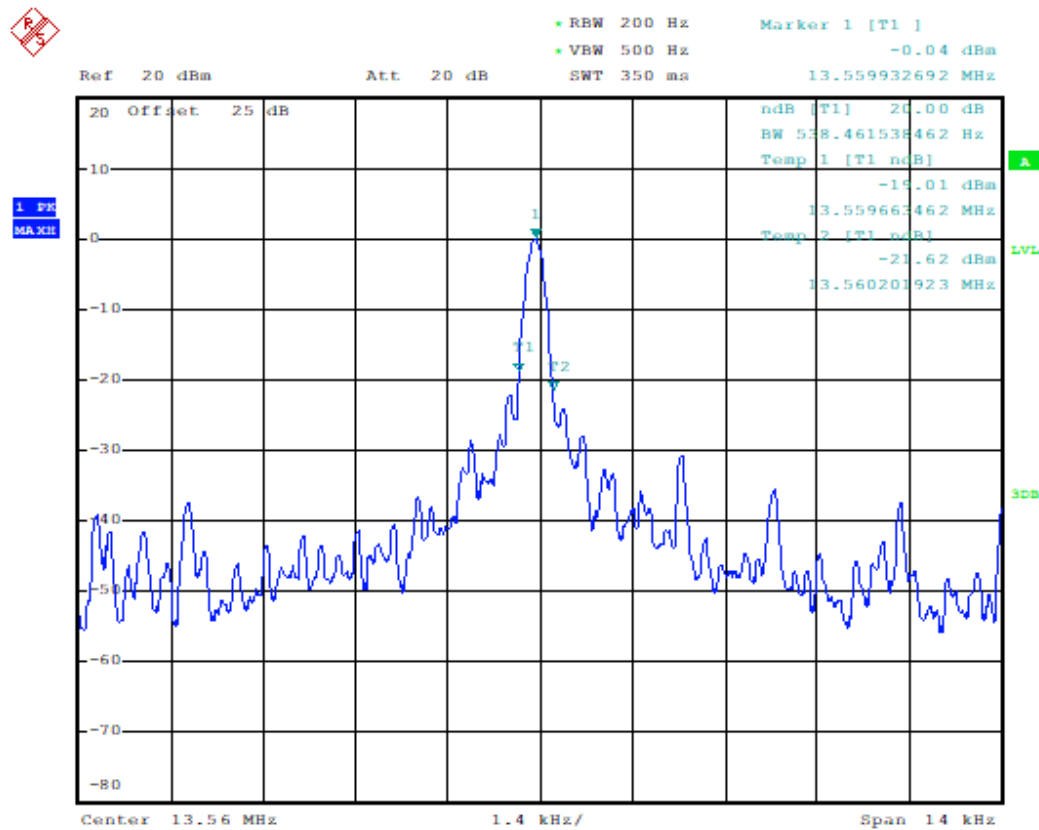
Limits

The 20dB bandwidth shall be less than 80% of the permitted frequency band. For 13.56MHz NFC, the permitted frequency band is 14kHz, so the limit is 11.2kHz.

Test Results:

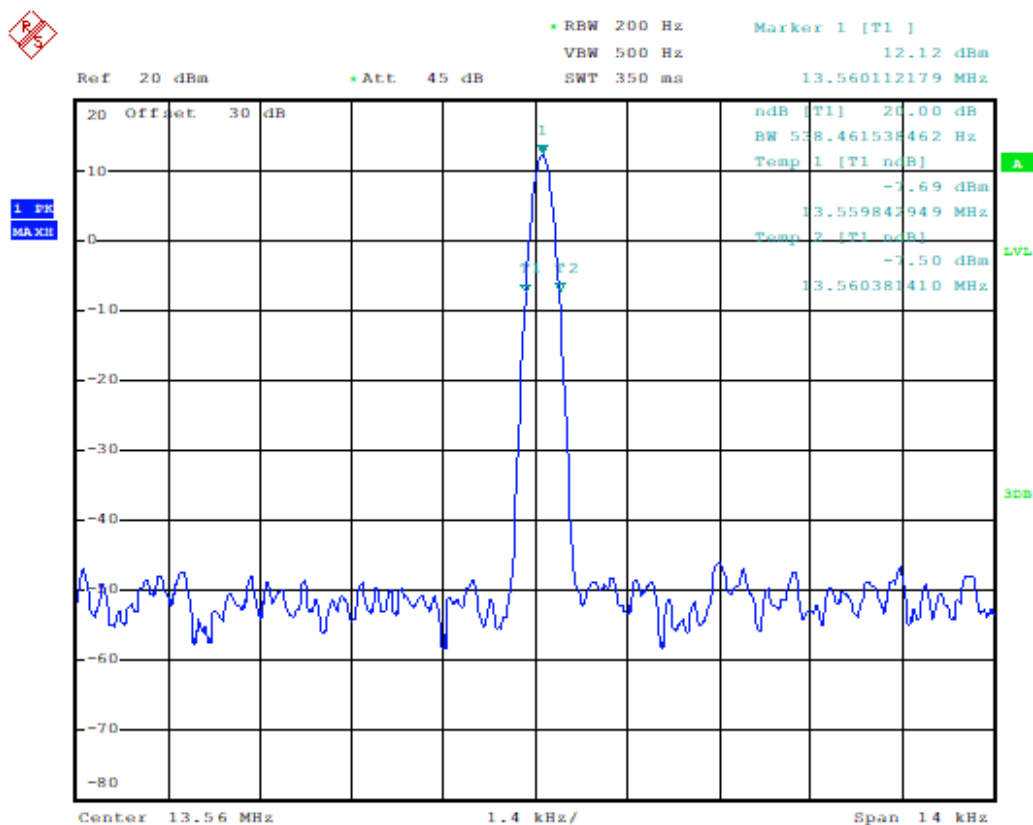
N07(Mainly Supply):

Carrier frequency (MHz)	20dB Bandwidth (kHz)	Conclusion
13.56	0.538	Pass



N09(Secondary Supply):

Carrier frequency (MHz)	20dB Bandwidth (kHz)	Conclusion
13.56	0.538	Pass

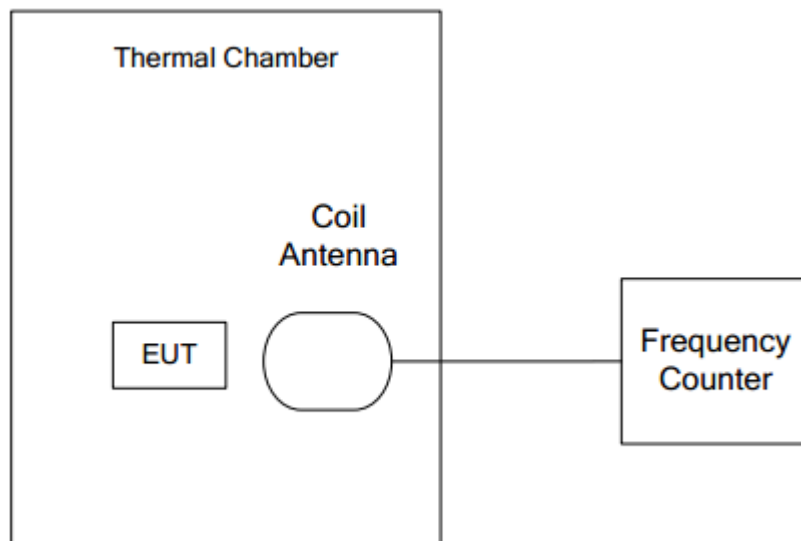


6.2 Frequency Stability

Reference

See Clause 6.8 of ANSI C63.10-2013

Measurement Methods



The transmitter output signal was picked up by coil antenna connected to the frequency counter. The center frequency was measured with 30Hz RBW and 1kHz span.

During the test, the EUT was placed in a thermal chamber until thermal balance and lasting appropriate time.

EUT Operating Mode and Test Conditions

The measurement of EUT is carried out under the transmit state of without modulation, EUT1 had been not connected to a travel adapter.

Operation Temperature: $T_{min}=-20^{\circ}\text{C}$, $T_{nom}=25^{\circ}\text{C}$, and $T_{max}=50^{\circ}\text{C}$

Operation Voltage: $V_{min}=22.8\text{V}$, $V_{max}=25.2\text{V}$, and $T_{nom}=24\text{V}$.

Limits

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency.

Test Results

N07(Mainly Supply):

Temperature	Voltage	Frequency Error (MHz)			
		Startup	2Min Later	5Min Later	10Min Later
Tmin	Vnom	13.559934	13.559933	13.559932	13.559933
Tmax	Vnom	13.559932	13.559932	13.559932	13.559932
Tnom	Vnom	13.559933	13.559933	13.559934	13.559933
Tnom	Vmin	13.559933	13.559932	13.559932	13.559932
Tnom	Vmax	13.559929	13.559930	13.559930	13.559930

Temperature	Voltage	Frequency Error (%)			
		Startup	2Min Later	5Min Later	10Min Later
Tmin	Vnom	0.000%	0.000%	-0.001%	0.000%
Tmax	Vnom	-0.001%	-0.001%	-0.001%	-0.001%
Tnom	Vnom	0.000%	0.000%	0.000%	0.000%
Tnom	Vmin	0.000%	-0.001%	-0.001%	-0.001%
Tnom	Vmax	-0.001%	-0.001%	-0.001%	-0.001%

N09(Secondary Supply):

Temperature	Voltage	Frequency Error (MHz)			
		Startup	2Min Later	5Min Later	10Min Later
Tmin	Vnom	13.560456	13.560453	13.560458	13.560455
Tmax	Vnom	13.560436	13.560439	13.560433	13.560435
Tnom	Vnom	13.560424	13.560428	13.560427	13.560428
Tnom	Vmin	13.560445	13.560445	13.560448	13.560447
Tnom	Vmax	13.560413	13.560416	13.560415	13.560416

Temperature	Voltage	Frequency Error (%)			
		Startup	2Min Later	5Min Later	10Min Later
Tmin	Vnom	0.003	0.003	0.003	0.003
Tmax	Vnom	0.003	0.003	0.003	0.003
Tnom	Vnom	0.003	0.003	0.003	0.003
Tnom	Vmin	0.003	0.003	0.003	0.003
Tnom	Vmax	0.003	0.003	0.003	0.003

6.3 Radiated Emissions

6.3.1 Electric Field Strength of Fundamental Emissions

Reference

See Clause 6.4 of ANSI C63.10-2013

Method of Measurement

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013. The transmitter carrier output levels (E-Field) from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving antenna is 1 meter above the ground. The E-field is measured with a shielded loop antenna connected to a measurement receiver. Detected E-field was maximized by rotating the EUT through 360° and adjusting the receiving antenna polarizations. Both horizontal and vertical polarizations of the antenna were set during the measurement. The maximization processes were repeated with the EUT positioned respectively in its three orthogonal axes. The measurements were performed with the peak detector and if required, the quasi-peak detector.

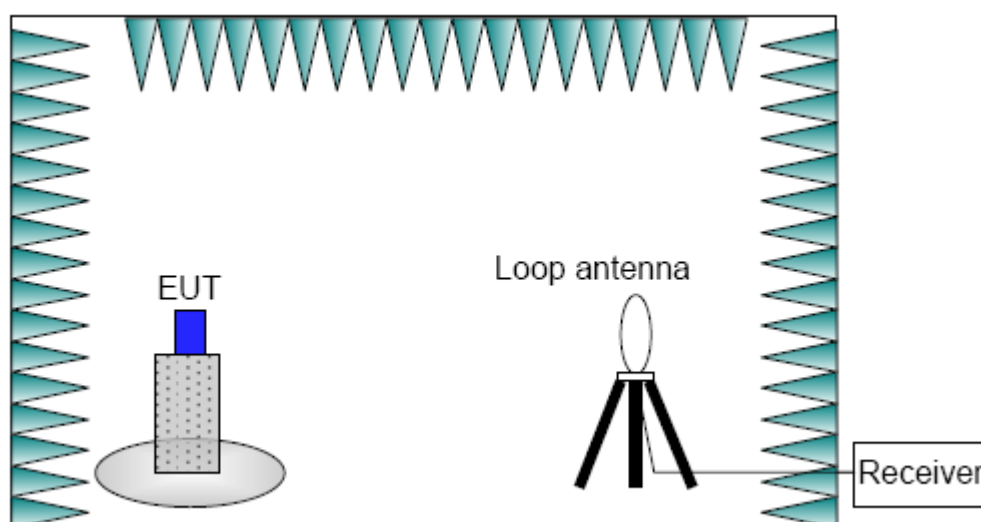
The measurement bandwidth:

Frequency (MHz)	RBW / VBW
12.56-14.56	10 / 30kHz

The E-field measured at 3m is calculated as:

$$\text{E-field (dBuV/m)} = \text{Rx (dBuV)} + \text{Cable Loss (dB)} + \text{AF@3m (dB/m)}$$

Test Setup



Limits

Clause 15.225(a) the field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

Clause 15.225(b) within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

Clause 15.225(c) within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

Frequency Range (MHz)	E-field Strength Limit @30m (uV/m)	E-field Strength Limit @3m (dBuV/m)
13.560 ± 0.007	+15,848	124
13.410 to 13.553 13.567 to 13.710	+334	90
13.110 to 13.410 13.710 to 14.010	+106	81

Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula:
 Extrapolation (dB) = $40 \log_{10}(\text{Measurement Distance} / \text{Specification Distance})$

Measurement Results

Measurement results of normal conditions see Figure 1 for different set-ups of EUT. The result displayed take into account applicable antenna factors and cable losses.

N07(Mainly Supply):

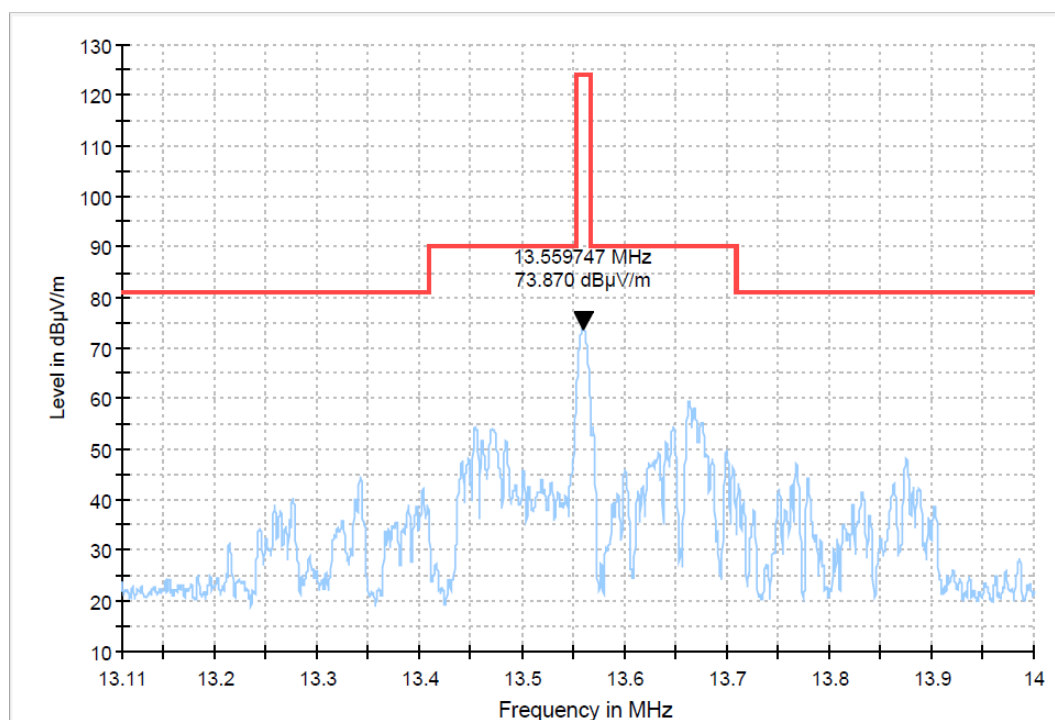


Figure 1 TX mode

N09(Secondary Supply):

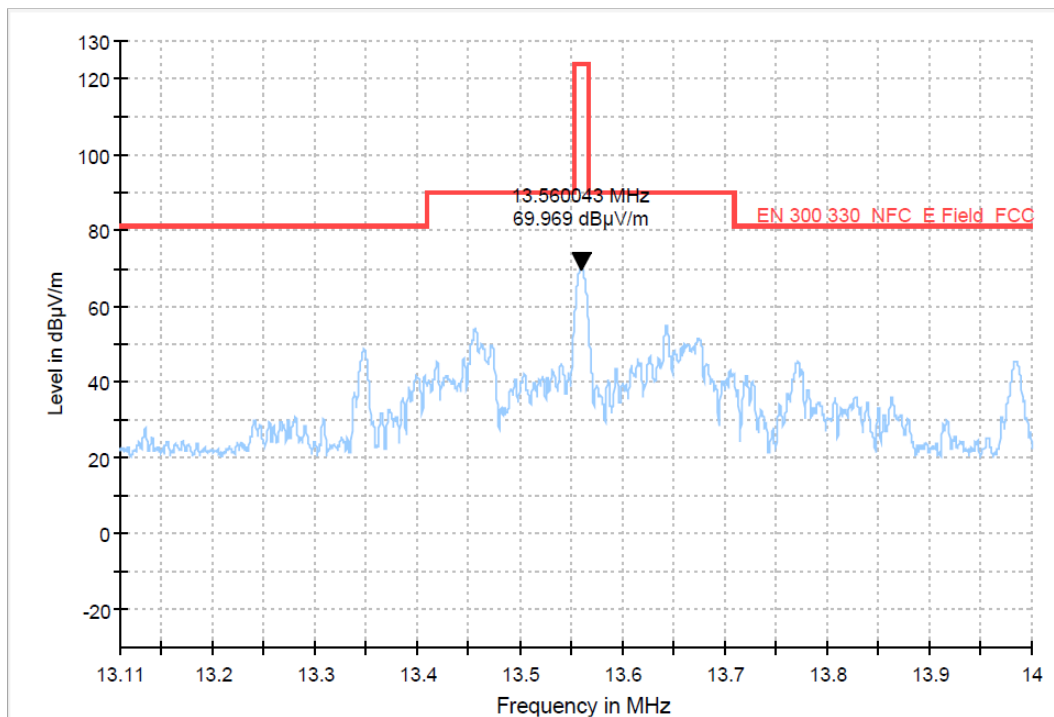


Figure 2 TX mode

6.3.2 Electric Field Radiated Emissions (Below 30MHz)

Reference

See Clause 6.4 of ANSI C63.10-2013

Method of Measurement

The electric field radiated emissions from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving antenna is 1 meter above the ground. The E-field is measured with a shielded loop antenna connected to a measurement receiver. Detected E-field was maximized by rotating the EUT through 360° and adjusting the receiving antenna polarizations. Both horizontal and vertical polarizations of the antenna were set during the measurement. The maximization processes were repeated with the EUT positioned respectively in its three orthogonal axes. The measurements were performed with the peak detector and if required, the quasi-peak detector.

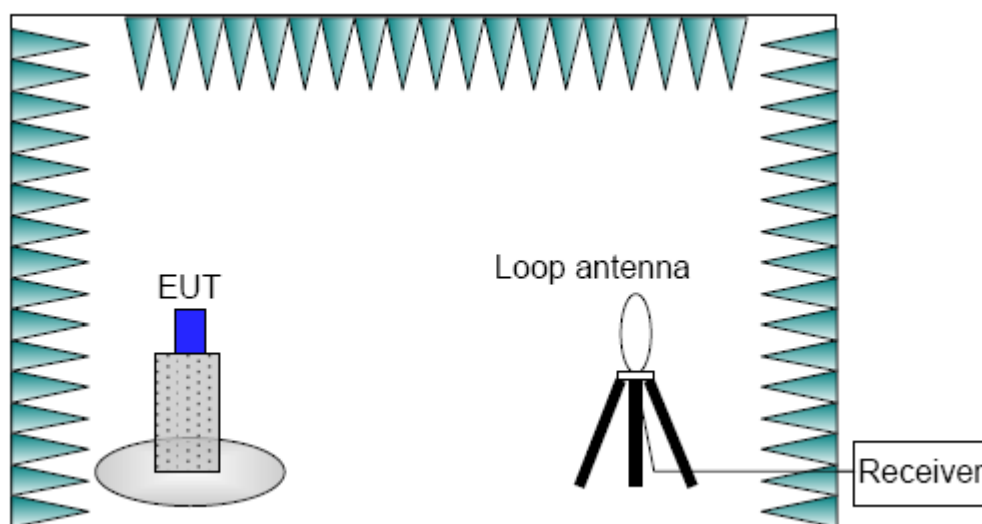
The measurement bandwidth:

Frequency (MHz)	RBW / VBW
0.009-30	10 / 30kHz

The E-field measured at 3m is calculated as:

$$\text{E-field (dBuV/m)} = \text{Rx (dBuV)} + \text{Cable Loss (dB)} + \text{AF@3m (dB/m)}$$

Test Setup



Limits

Frequency Range (MHz)	E-field Strength Limit @30m (mV/m)	E-field Strength Limit @3m (dBuV/m)
0.009-0490	2400/F (kHz)	129-94
0.490-1.705	24000/F (kHz)	74-63
1.705-30	30	70

Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula:
 Extrapolation (dB) = $40\log_{10}(\text{Measurement Distance} / \text{Specification Distance})$
 dBuA/m=dBuV/m / 120π

Measurement Results

Measurement results of normal conditions see Figure 2 for different set-ups of EUT. The result displayed take into account applicable antenna factors and cable losses

dBuV/m and dBuA/m can be converted to each other, so the test data of dBuV/m are reflected in the report

N07(Mainly Supply):

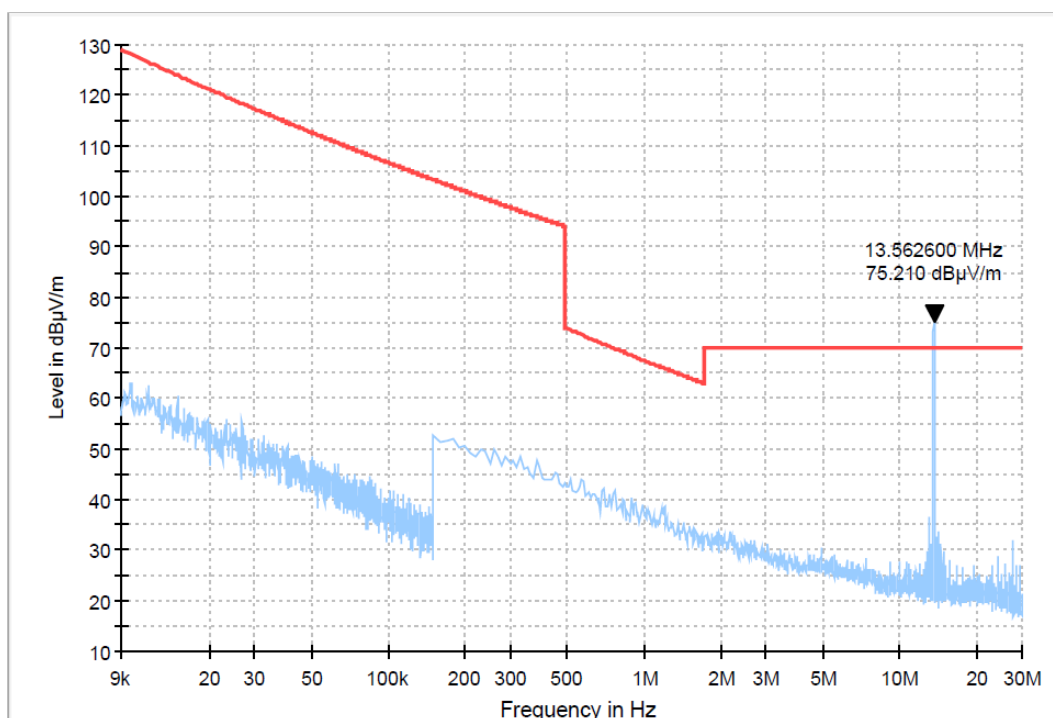


Figure 3 TX mode

N09(Secondary Supply):

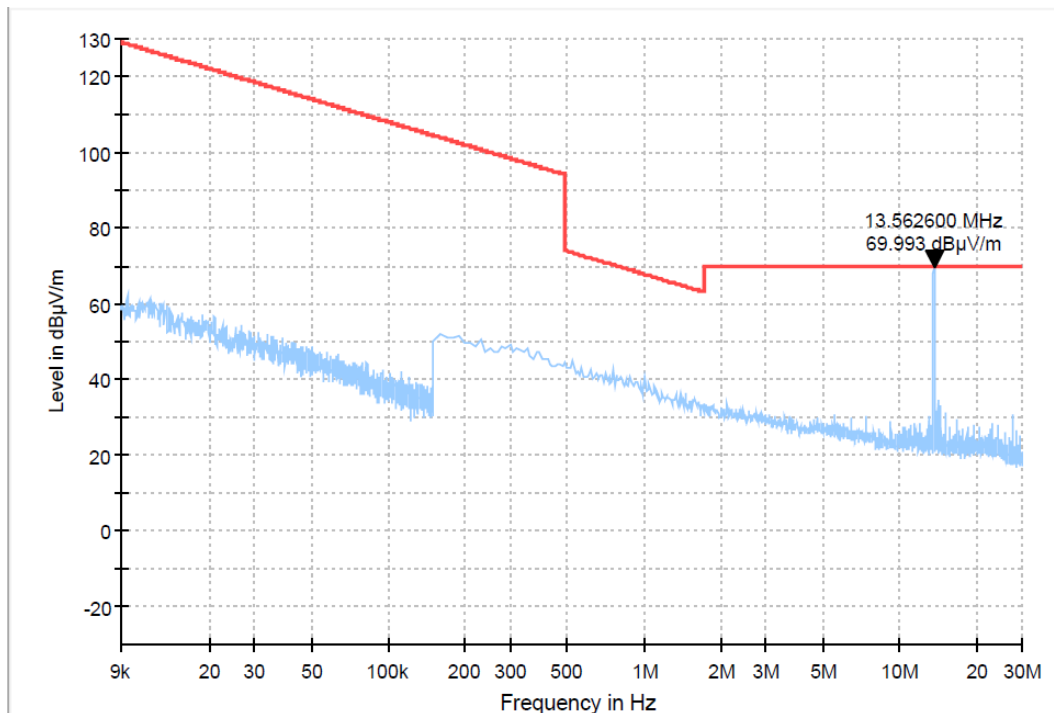


Figure 4 TX mode

6.3.3 Electric Field Radiated Emissions (Above 30MHz)

Reference

See Clause 6.5 of ANSI C63.10-2013

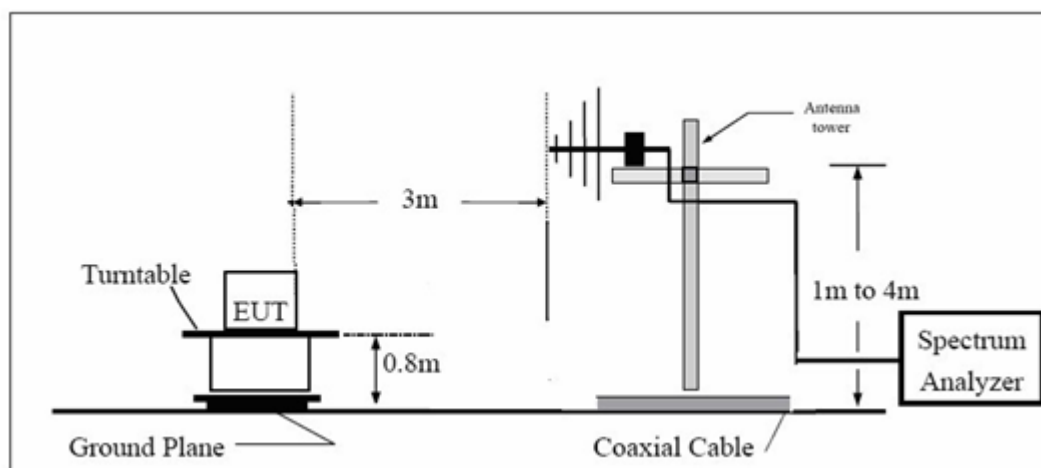
Method of Measurement

The electric field radiated emissions from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The table was rotated 360 degree and the received antenna mounted on a variable-height antenna tower was varied from 1m to 4m to find the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna were set during the measurement. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. The measurements were performed with the peak detector and if required, the quasi-peak detector.

The measurement bandwidth:

Frequency (MHz)	RBW / VBW
30-1000	120 kHz / 300kHz

Test Setup



Limits

Frequency Range (MHz)	E-field Strength Limit @3m (mV/m)	E-field Strength Limit @3m (dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
960-1000	500	54

Measurement Results

Measurement results of normal conditions see Figure 3 for different set-ups of EUT. The result displayed take into account applicable antenna factors and cable losses

QP detection is used in radiated emissions test, and the Duty Cycle of NFC main frequency signal is 100%.

N07(Mainly Supply):

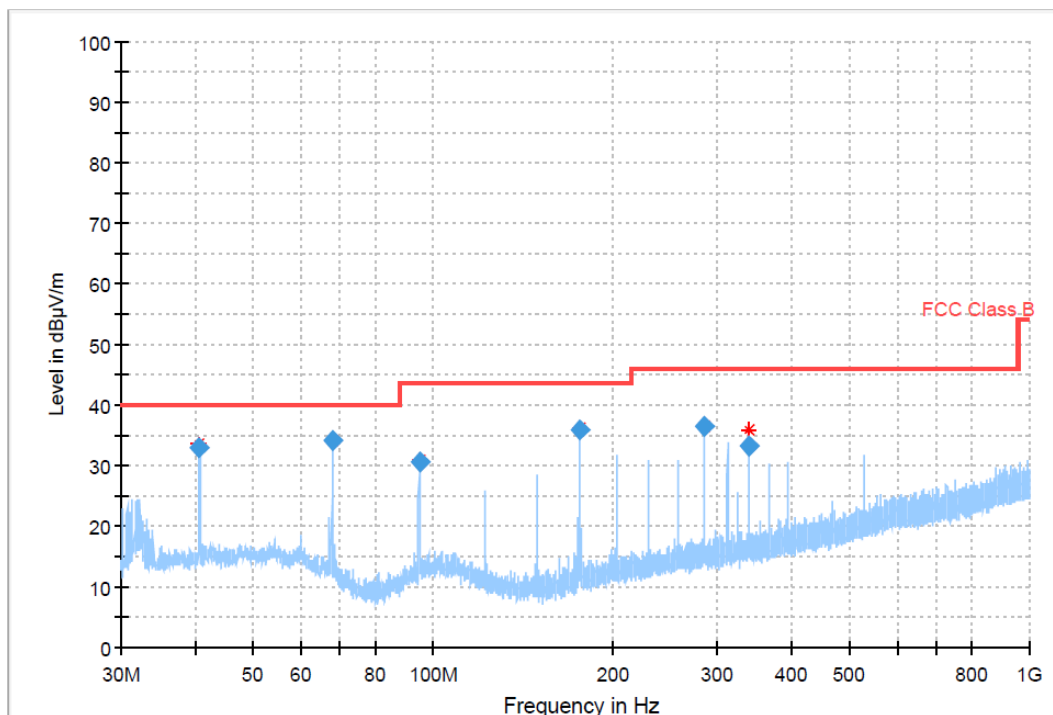


Figure 5 TX mode (30MHz-1000MHz)

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.679456	32.99	40.00	7.01	1000.0	120.000	180.0	H	261.0	-12.8
67.802051	34.15	40.00	5.85	1000.0	120.000	225.0	H	204.0	-15.2
94.914936	30.59	43.50	12.91	1000.0	120.000	180.0	H	30.0	-14.3
176.283056	35.87	43.50	7.63	1000.0	120.000	104.0	H	139.0	-15.2
284.766893	36.40	46.00	9.60	1000.0	120.000	100.0	H	289.0	-11.3
338.999477	33.37	46.00	12.63	1000.0	120.000	100.0	H	240.0	-9.8

N09(Secondary Supply):

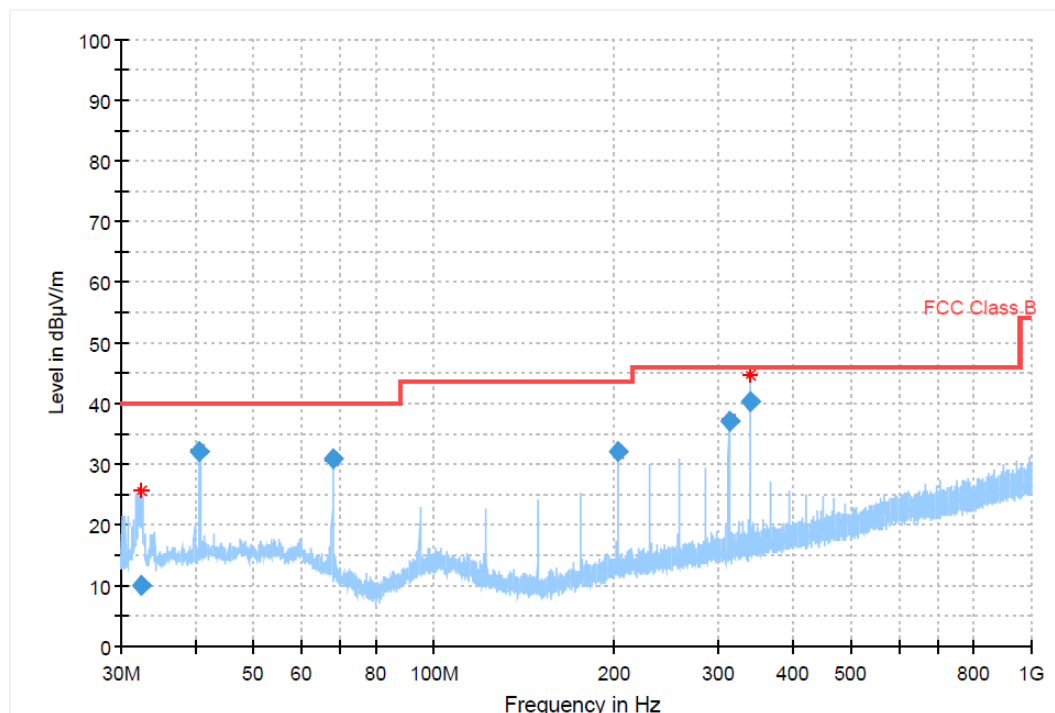


Figure 6 TX mode (30MHz-1000MHz)

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.539128	10.03	40.00	29.97	1000.0	120.000	225.0	H	313.0	-14.3
40.679064	31.93	40.00	8.07	1000.0	120.000	175.0	H	193.0	-12.8
67.794749	30.79	40.00	9.21	1000.0	120.000	225.0	H	223.0	-15.2
203.401267	31.98	43.50	11.52	1000.0	120.000	121.0	H	151.0	-13.7
311.881168	36.95	46.00	9.05	1000.0	120.000	100.0	H	201.0	-10.4
338.960139	40.23	46.00	5.77	1000.0	120.000	100.0	H	176.0	-9.8

6.4 Conducted Emissions

Reference

See Clause 6.2 of ANSI C63.10-2013

Methods of Measurement

The conducted emissions from the AC port of the EUT are measured in a shielding room. The EUT is connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection was performed. The measurements were performed with a quasi-peak detector and if required, an average detector. Tested in accordance with the procedures of ANSI C63.10-2013

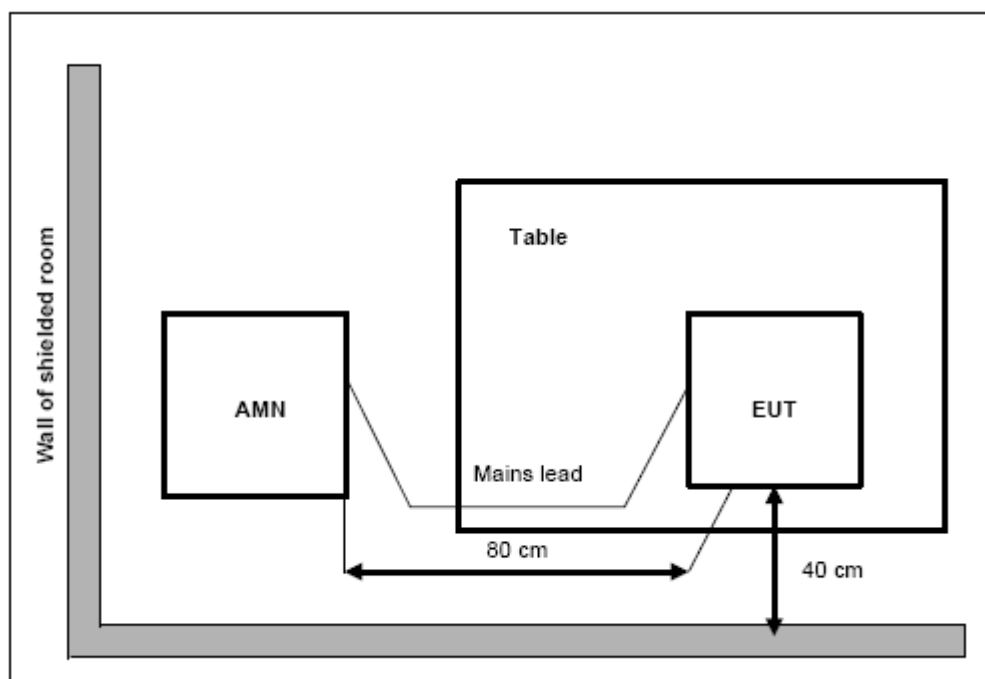
The conducted emission measurements were made with the following detector of the test receiver Quasi-Peak / Average Detector.

Test Setup

The measurement bandwidth and Test Condition

Frequency (MHz)	RBW	Sweep Time (s)	Test Voltage
0.15-30	9 kHz	Auto	120V/60Hz

Test Setup



Limits

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency		

Measurement Results

N07(Mainly Supply):

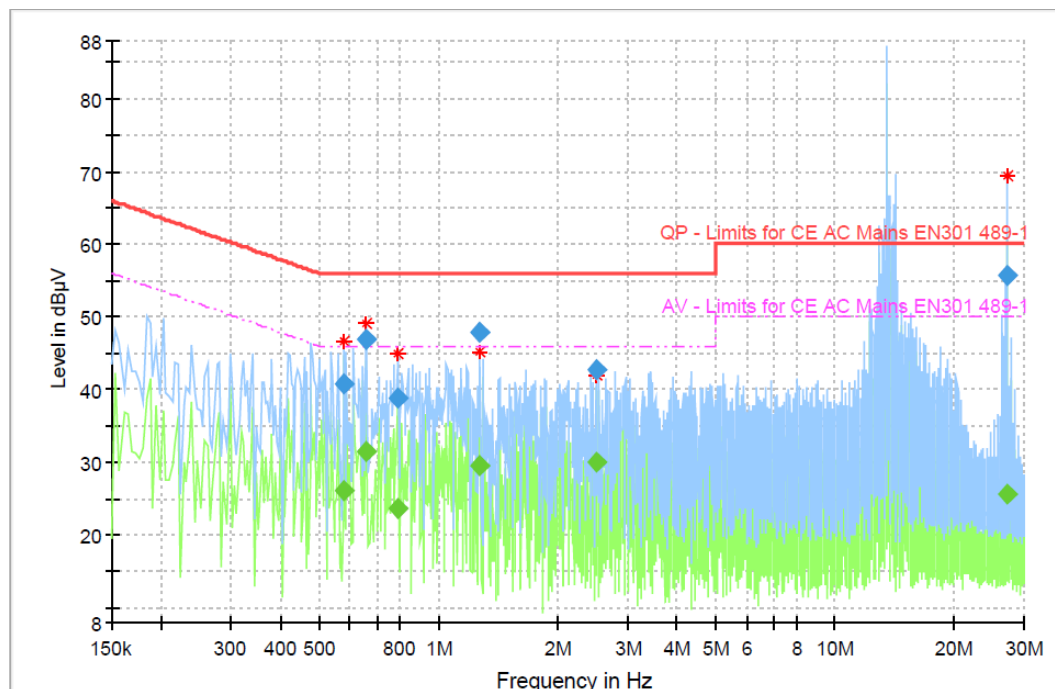


Figure 7 TX mode (150kHz-30MHz)

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.579094	40.76	---	56.00	15.24	15000.	9.000	N	ON	10.0
0.579094	---	25.99	46.00	20.01	15000.	9.000	N	ON	10.0
0.657450	---	31.53	46.00	14.47	15000.	9.000	N	ON	10.0
0.657450	46.86	---	56.00	9.14	15000.	9.000	N	ON	10.0
0.791775	38.78	---	56.00	17.22	15000.	9.000	L1	ON	10.3
0.791775	---	23.55	46.00	22.45	15000.	9.000	L1	ON	10.3
1.273106	---	29.45	46.00	16.55	15000.	9.000	L1	ON	10.4
1.273106	47.94	---	56.00	8.06	15000.	9.000	L1	ON	10.4
2.500688	42.81	---	56.00	13.19	15000.	9.000	L1	ON	10.5
2.500688	---	30.08	46.00	15.92	15000.	9.000	L1	ON	10.5
27.130669	---	25.60	50.00	24.40	15000.	9.000	N	ON	13.4
27.130669	55.80	---	60.00	4.20	15000.	9.000	N	ON	13.4

Note:

1. Emission level(quasi-peak or Average peak)=Raw value by receiver + Corr(Insertion loss+ cable loss)
2. The raw value is used to calculate by software which is not shown in the sheet.
3. Margin=limit value – emission level.
4. L1 and N line is all have been tested , the result of them is synthesized in the above data diagram.
5. The frequency over the limits is the NFC main signal frequency.

N09(Secondary Supply):

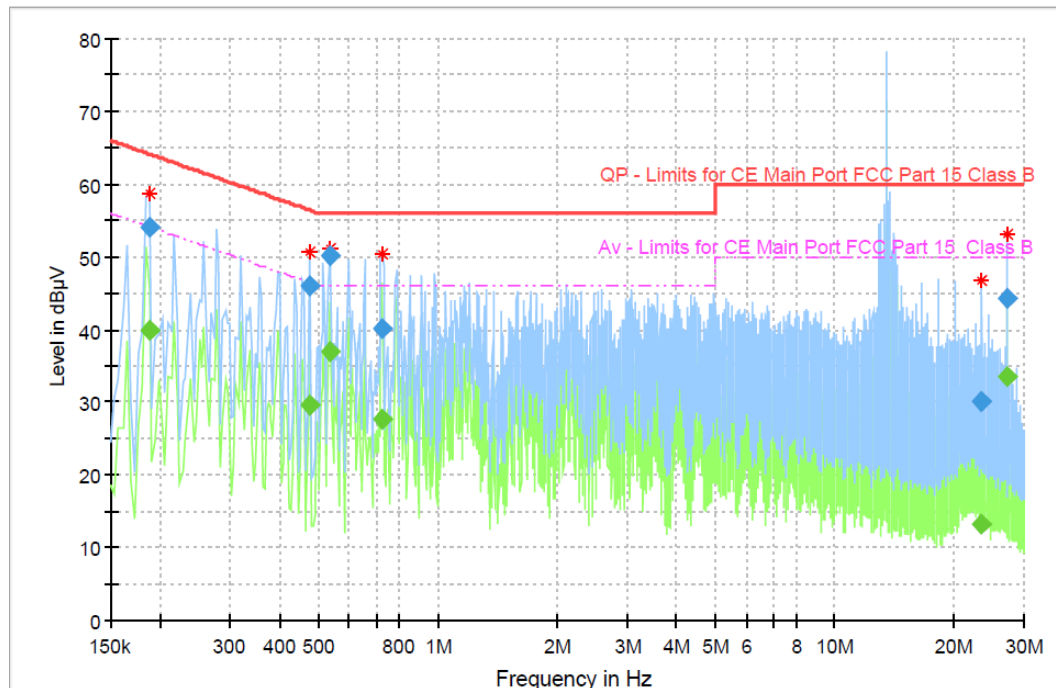


Figure 7 TX mode (150kHz-30MHz)

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.187313	---	39.90	54.16	14.26	15000.	9.000	N	ON	9.6
0.187313	54.10	---	64.16	10.06	15000.	9.000	N	ON	9.6
0.474619	46.09	---	56.43	10.34	15000.	9.000	N	ON	9.6
0.474619	---	29.57	46.43	16.86	15000.	9.000	N	ON	9.6
0.538050	---	36.91	46.00	9.09	15000.	9.000	N	ON	9.6
0.538050	50.12	---	56.00	5.88	15000.	9.000	N	ON	9.6
0.728344	---	27.65	46.00	18.35	15000.	9.000	N	ON	9.6
0.728344	40.03	---	56.00	15.97	15000.	9.000	N	ON	9.6
23.530013	30.15	---	60.00	29.85	15000.	9.000	L1	ON	10.3
23.530013	---	13.28	50.00	36.72	15000.	9.000	L1	ON	10.3
27.123206	---	33.49	50.00	16.51	15000.	9.000	N	ON	10.3
27.123206	44.34	---	60.00	15.66	15000.	9.000	N	ON	10.3

Note:

1. Emission level(quasi-peak or Average peak)=Raw value by receiver + Corr(Insertion loss+ cable loss)
2. The raw value is used to calculate by software which is not shown in the sheet.
3. Margin=limit value – emission level.
4. L1 and N line is all have been tested , the result of them is synthesized in the above data diagram.
5. The frequency over the limits is the NFC main signal frequency.

7. Test Equipment List

Item	Equipment Name	Type	Serial Number	Manufacturer	Cal. Date	Cal. interval
1	Test Receiver	ESU40	100307	R&S	2021-03-03	1 year
2	Trilog Antenna	VULB9163	VULB9163-515	Schwarzbeck	2021-02-03	2 years
3	Loop Antenna	AL-130R	121083	COM-POWER	2019-12-26	3 years
4	EMI Test Software	EMC32 V9.15	NA	R&S	N/A	N/A
5	Test Receiver	ESCI	101235	R&S	2021-05-10	1 year
6	2-Line V-Network	ENV216	101380	R&S	2021-03-20	1 year
7	EMI Test Software	EMC32 V10.35.02	NA	R&S	N/A	N/A
8	Vector Signal Analyser	FSQ26	101096	R&S	2021-05-10	1 year
9	Climate chamber	B-TF-107C	201804107	Boyi	2021-05-10	1 year

Annex A: Measurement Uncertain

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Case	Uncertainty
20 dB bandwidth	60.8 Hz
Frequency Stability	60.8 Hz
Electric Field Strength of Fundamental Emissions	5.66 dB
Electric Field Radiated Emissions (Below 30MHz)	5.66 dB
Electric Field Radiated Emissions (Above 30MHz)	4.98 dB
Conducted Emissions	3.66 dB

Annex B: Accreditation Certificate



Accredited Laboratory

A2LA has accredited

INDUSTRIAL INTERNET INNOVATION CENTER (SHANGHAI) CO., LTD.

Shanghai, People's Republic of China

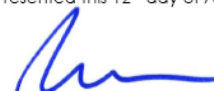
for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 12th day of April 2021.



Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3682.01
Valid to February 28, 2023

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

*****END OF REPORT*****