

FCC Test Report

Product Name	NFC module
Model No.	NFC module, AWM-001
FCC ID	MSQ-NFCAWM001

Applicant	ADVANCED WIRELESS & ANTENNA INC.
Address	B2-F, No. 207-1, Sec. 3, Bei-Hsin Rd., Xindian Dist., New Taipei City, 231, Taiwan

Date of Receipt	Jul. 22, 2021
Issued Date	Sep. 07, 2021
Report No.	2170944R-RFUSOTHV03
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

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Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test Report

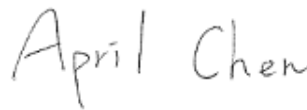
Issued Date: Sep. 07, 2021

Report No.: 2170944R-RFUSOTHV03



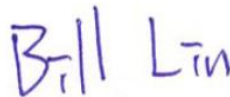
Product Name	NFC module
Applicant	ADVANCED WIRELESS & ANTENNA INC.
Address	B2-F, No. 207-1, Sec. 3, Bei-Hsin Rd., Xindian Dist., New Taipei City, 231, Taiwan
Manufacturer	ADVANCED WIRELESS & ANTENNA INC.
Model No.	NFC module, AWM-001
FCC ID.	MSQ-NFCAWM001
EUT Rated Voltage	DC 3.3V
EUT Test Voltage	AC 120 V / 60 Hz
Trade Name	awan
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :



(Senior Project Specialist / April Chen)

Tested By :



(Senior Engineer / Bill Lin)

Approved By :



(Senior Engineer / Jack Hsu)

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Revision History

Report No.	Version	Description	Issued Date
2170944R-RFUSOTHV03	V1.0	Initial issue of report.	Sep. 07, 2021

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	NFC module
Trade Name	awan
Model No.	NFC module, AWM-001
FCC ID	MSQ-NFCAWM001
Frequency Range	13.56MHz
Modulation	ASK
Antenna Type	Loop coil Antenna

Frequency of Each Channel:

Channel	Frequency
Channel 1:	13.56 MHz

Note:

1. This device is a NFC module with a built-in 13.56MHz transceiver.
2. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.225.
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
4. All models are electrically identical, different model names are for marketing purpose, The identification of test sample is NFC module.

Test Mode	Mode 1: Transmit
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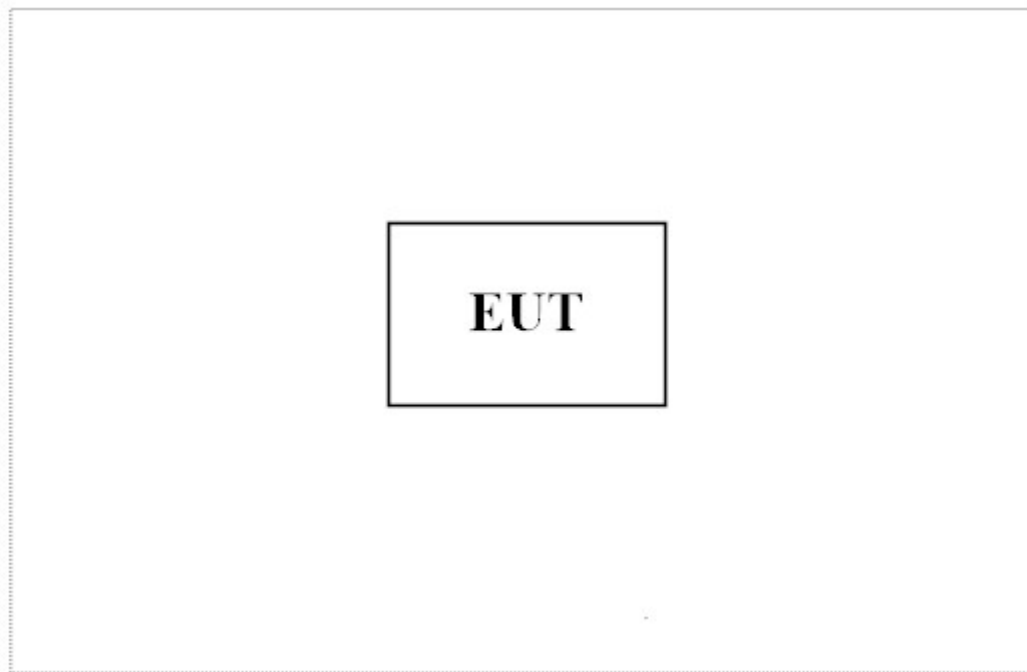
1.2. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
N/A				

Signal Cable Type	Signal cable Description
N/A	

1.3. Configuration of tested System



1.4. EUT Exercise Software

1. Setup the EUT as shown in Section 1.3.
2. Execute software "Test Tool-original-40 Version 6.1.7601" on the Notebook PC.
3. Configure the test mode, the test channel.
4. Press "OK" to start the continuous transmit.
5. Verify that the EUT works properly.

1.5. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Conducted Emission	Temperature (°C)	10~40 °C	26.2 °C
	Humidity (%RH)	10~90 %	58.2 %
Radiated Emission	Temperature (°C)	10~40 °C	23.0 °C
	Humidity (%RH)	10~90 %	59.2 %
Conductive	Temperature (°C)	10~40 °C	28.6 °C
	Humidity (%RH)	10~90 %	49 %

USA : FCC Registration Number: TW1014

Canada : IC Registration Number: 26930

Site Description : Accredited by TAF
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd
Address : No. 26, Huaya 1st Rd., Guishan Dist.,
Taoyuan City 333411, Taiwan, R.O.C.
Phone number : +886-3-275-7255
Fax number : +866-3-327-5505
Email address : info.tw@dekra.com
Website : <http://www.dekra.com.tw>

1.6. List of Test Equipment

For Conduction measurements /SH1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	EMI Test Receiver	R&S	ESR7	101601	2021.06.19	2022.06.18
X	Two-Line V-Network	R&S	ENV216	101306	2021.04.08	2022.04.07
X	Two-Line V-Network	R&S	ENV216	101307	2021.05.04	2022.05.03
X	Coaxial Cable	DEKRA	RG400_BNC	RF001	2021.05.24	2022.05.23

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : DEKRA Testing System V2.0

For Conducted measurements /SH3

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Temperature Chamber	KSON	THS-D4T-100	A0606	2021.08.24	2022.08.23
X	Spectrum Analyzer	R&S	FSV40	101149	2021.02.04	2022.02.03
X	AC Power Source	eec	6605	1570547	2020.12.23	2021.12.22

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.

For Radiated measurements /966-3

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	56736	2021.04.14	2022.04.13
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-678	2020.09.04	2021.09.03
	Horn Antenna	ETS-Lindgren	3117	00201259	2020.10.23	2021.10.22
	Horn Antenna	Com-Power	AH-840	101087	2021.06.16	2022.06.15
X	Pre-Amplifier	EMCI	EMC001330	980254	2021.01.20	2022.01.19
	Pre-Amplifier	EMCI	EMC051835SE	980312	2021.02.24	2022.02.23
	Pre-Amplifier	EMCI	EMC05820SE	980312	2021.02.24	2022.02.23
	Pre-Amplifier	EMCI	EMC184045SE	980314	2021.06.24	2022.06.23
	Filter	MICRO TRONICS	BRM50702	G251	2020.09.17	2021.09.16
	Filter	MICRO TRONICS	BRM50716	G188	2020.09.17	2021.09.16
X	EMI Test Receiver	R&S	ESR	102793	2020.12.17	2021.12.16
X	Spectrum Analyzer	R&S	FSV3044	101113	2021.02.03	2022.02.02
X	Coaxial Cable	SGH, EMCI	HA800 , SGH18	HY2103-001C	2021.03.03	2022.03.02
	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2021.06.25	2022.06.24

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : DEKRA Testing System V2.0

1.7. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.

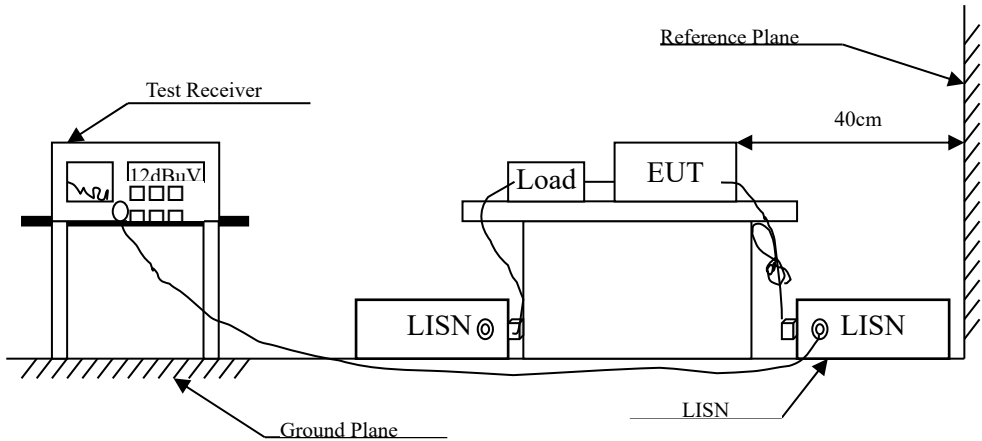
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test item	Uncertainty	
Conducted Emission	± 3.42 dB	
Radiated Emission	Under 1GHz ± 4.06 dB	Above 1GHz ± 3.73 dB
Band Edge	Under 1GHz ± 4.06 dB	Above 1GHz ± 3.73 dB
Frequency Tolerance	± 682.83 Hz	

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56 _(註)	56-46 _(註)
0.50-5.0	56	46
5.0 - 30	60	50

2.3. Test Procedure

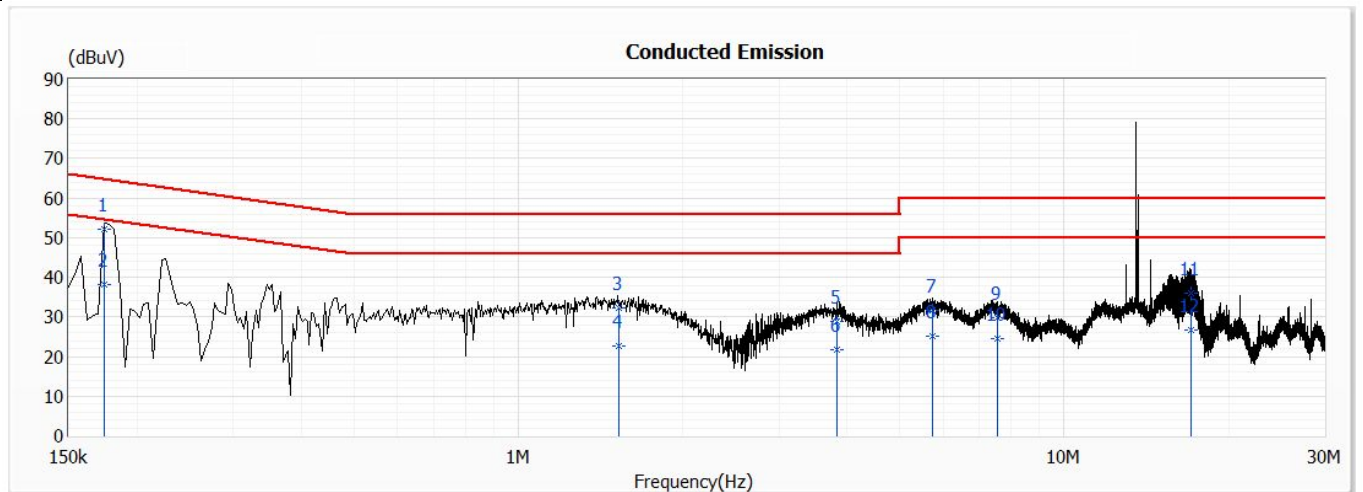
The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.4. Test Result of Conducted Emission

Model No	NFC Module	Site	SH1
Test Voltage	AC 120V/60Hz	Test Date	2021/9/3
Test Mode	Mode 1: Transmit	Engineer	Yulin Chen
Phase	L1	Temperature (°C)	26.2
Test Condition	--	Humidity (%RH)	58.2
Note	CE-TX		

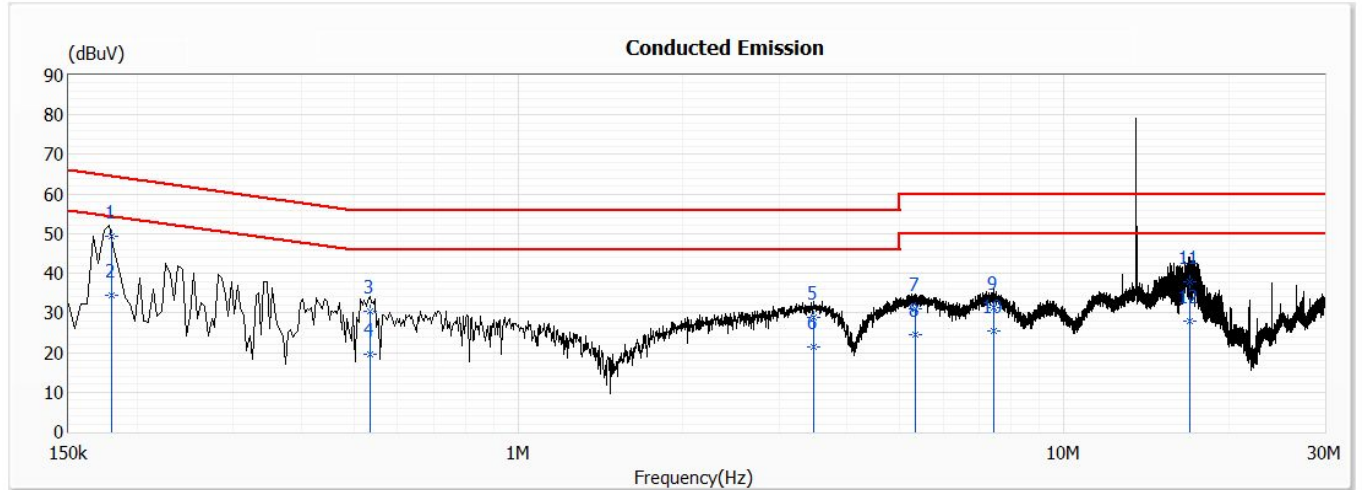


No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
*1	0.175	52.23	64.74	-12.51	42.53	9.70	QP
2	0.175	38.14	54.74	-16.60	28.44	9.70	AV
3	1.524	32.21	56.00	-23.79	22.42	9.79	QP
4	1.524	22.68	46.00	-23.32	12.89	9.79	AV
5	3.832	28.96	56.00	-27.04	18.51	10.45	QP
6	3.832	21.79	46.00	-24.21	11.34	10.45	AV
7	5.728	31.65	60.00	-28.35	20.81	10.84	QP
8	5.728	25.05	50.00	-24.95	14.21	10.84	AV
9	7.539	29.92	60.00	-30.08	19.09	10.83	QP
10	7.539	24.46	50.00	-25.54	13.63	10.83	AV
11	17.034	35.93	60.00	-24.07	25.12	10.81	QP
12	17.034	26.74	50.00	-23.26	15.93	10.81	AV

Note:

1. “*” means this data is the worst emission level.
2. Emission Level = Reading Level + Correct Factor.
3. Margin = Emission Level – Limit.
4. Correct Factor = LISN insertion loss + Cable loss.

Model No	NFC Module	Site	SH1
Test Voltage	AC 120V/60Hz	Test Date	2021/9/3
Test Mode	Mode 1: Transmit	Engineer	Yulin Chen
Phase	N	Temperature (°C)	26.2
Test Condition	--	Humidity (%RH)	58.2
Note	CE-TX		



No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
*1	0.180	49.33	64.49	-15.16	39.62	9.71	QP
2	0.180	34.32	54.49	-20.17	24.61	9.71	AV
3	0.535	30.54	56.00	-25.46	20.83	9.71	QP
4	0.535	19.68	46.00	-26.32	9.97	9.71	AV
5	3.480	29.01	56.00	-26.99	18.67	10.34	QP
6	3.480	21.30	46.00	-24.70	10.96	10.34	AV
7	5.337	31.02	60.00	-28.98	20.16	10.86	QP
8	5.337	24.61	50.00	-25.39	13.75	10.86	AV
9	7.420	31.23	60.00	-28.77	20.38	10.85	QP
10	7.420	25.33	50.00	-24.67	14.48	10.85	AV
11	16.998	37.87	60.00	-22.13	27.00	10.87	QP
12	16.998	27.87	50.00	-22.13	17.00	10.87	AV

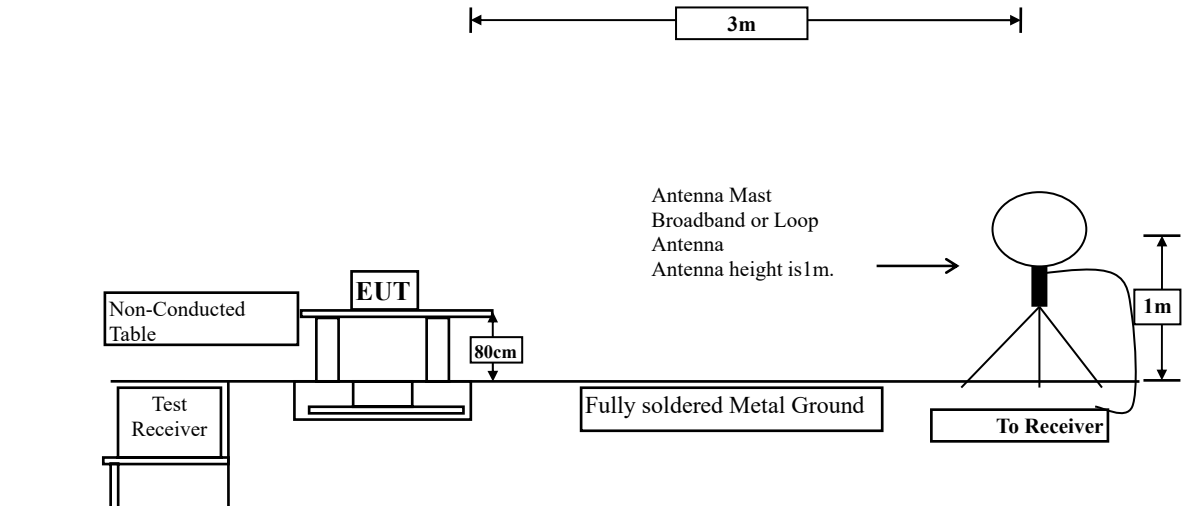
Note:

1. “*” means this data is the worst emission level.
2. Emission Level = Reading Level + Correct Factor.
3. Margin = Emission Level – Limit.
4. Correct Factor = LISN insertion loss + Cable loss.

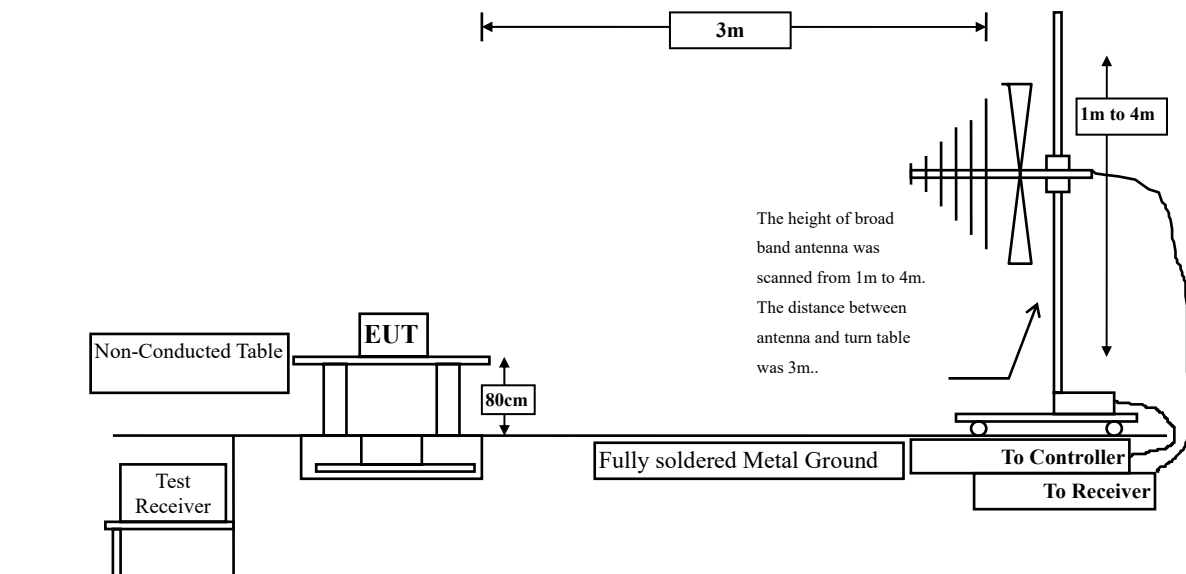
3. Radiated Emission

3.1. Test Setup

Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



3.2. Limits

➤ Fundamental electric field strength Limit

FCC Part 15 Subpart C Paragraph 15.225 Limits				
Fundamental Frequency MHz	Field strength of fundamental			
	uV/m	Distance (meter)	dBuV/m	Distance (meter)
13.553 – 13.567	15848	30	124	3
13.410 – 13.553 and 13.567 – 13.710	334	30	90.47	3
13.110 – 13.410 and 13.710 – 14.010	106	30	80.50	3
Outside of the 13.110 – 14.010	See 15.209 Limits			

Remarks :

1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
3. The emission limit in this paragraph is based on measurement instrumentation employing an quasi-peak detector.

➤ Spurious electric field strength Limit

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
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

Remarks :

1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.3. Test Procedure

Fundamental electric field strength:

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum electric field strength.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna which is 1 meter above ground. All X-axis, Y-axis and Z-axis polarization of the antenna are set on measurement.

Spurious electric field strength:

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

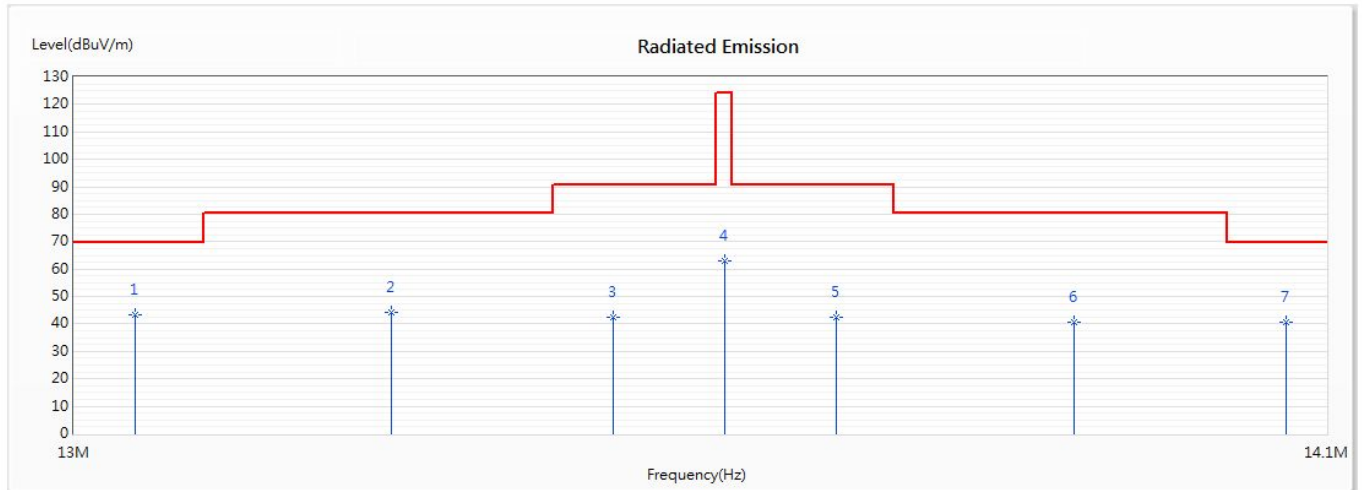
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth below 30MHz setting on the field strength meter is 9kHz and above 30MHz is 120kHz. The frequency range from 9kHz to 10th harmonics is checked.

3.4. Test Result of Radiated Emission

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Nick Chen
Polarity	Horizontal	Temperature (°C)	23.0
Test Condition	13.56MHz,X axis	Humidity (%RH)	59.2

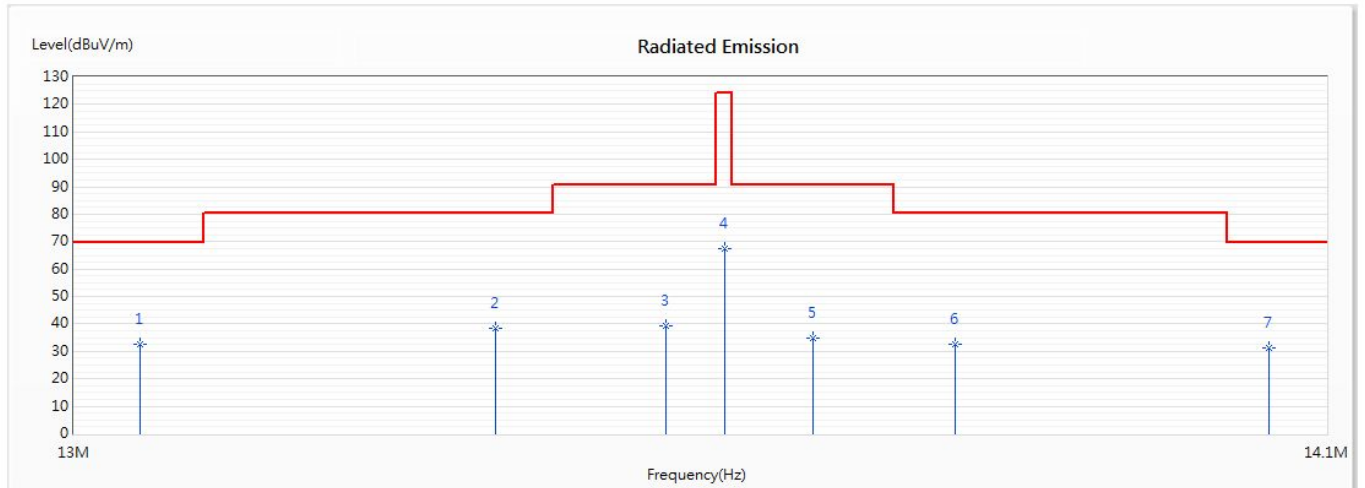


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	13.052	43.50	69.50	-26.00	23.16	20.34	QP
2	13.270	44.08	80.50	-36.42	23.83	20.25	QP
3	13.463	42.46	90.47	-48.01	22.29	20.17	QP
4	13.560	63.02	124.00	-60.98	42.88	20.14	QP
5	13.659	42.60	90.47	-47.87	22.50	20.10	QP
6	13.871	40.87	80.50	-39.63	20.86	20.01	QP
7	14.063	40.46	69.50	-29.04	20.50	19.96	QP

Remark:

1. "*" means this data is the worst emission level;
"!" means this data is over limit.
2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).
3. Margin= Emission Level- Limit.

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Nick Chen
Polarity	Vertical	Temperature (°C)	23.0
Test Condition	13.56MHz,X axis	Humidity (%RH)	59.2



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	13.056	32.72	69.50	-36.78	12.38	20.34	QP
2	13.360	38.49	80.50	-42.01	18.27	20.22	QP
3	13.509	39.39	90.47	-51.08	19.23	20.16	QP
4	13.560	67.50	124.00	-56.50	47.36	20.14	QP
5	13.638	34.74	90.47	-55.73	14.64	20.10	QP
6	13.765	32.53	80.50	-47.97	12.48	20.05	QP
7	14.047	31.16	69.50	-38.34	11.20	19.96	QP

Remark:

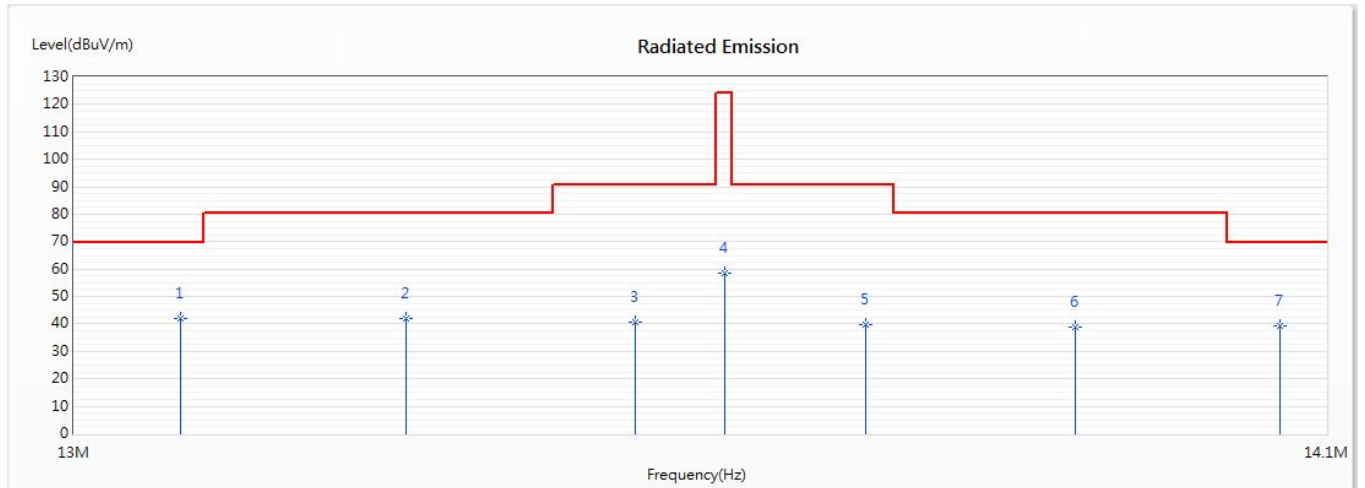
1. "*" means this data is the worst emission level;

"!" means this data is over limit.

2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).

3. Margin= Emission Level- Limit.

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Nick Chen
Polarity	Horizontal	Temperature (°C)	23.0
Test Condition	13.56MHz,Y axis	Humidity (%RH)	59.2

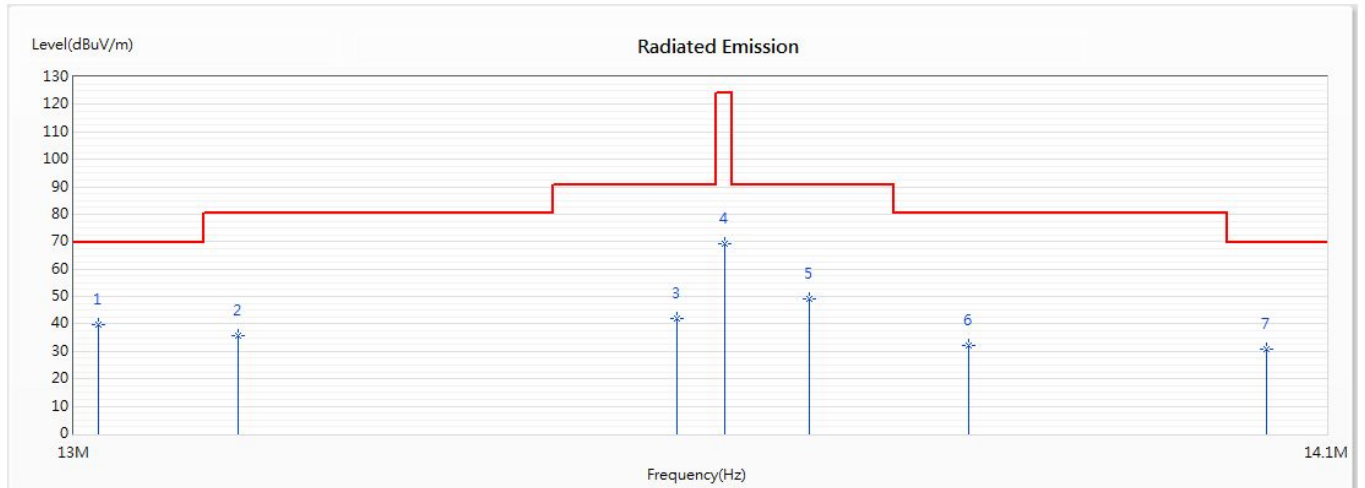


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	13.090	41.82	69.50	-27.68	21.50	20.32	QP
2	13.283	41.89	80.50	-38.61	21.64	20.25	QP
3	13.482	40.85	90.47	-49.62	20.68	20.17	QP
4	13.560	58.30	124.00	-65.70	38.16	20.14	QP
5	13.685	39.68	90.47	-50.79	19.59	20.09	QP
6	13.872	39.04	80.50	-41.46	19.03	20.01	QP
7	14.057	39.16	69.50	-30.34	19.20	19.96	QP

Remark:

1. "*" means this data is the worst emission level;
"!" means this data is over limit.
2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).
3. Margin= Emission Level- Limit.

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Nick Chen
Polarity	Vertical	Temperature (°C)	23.0
Test Condition	13.56MHz,Y axis	Humidity (%RH)	59.2

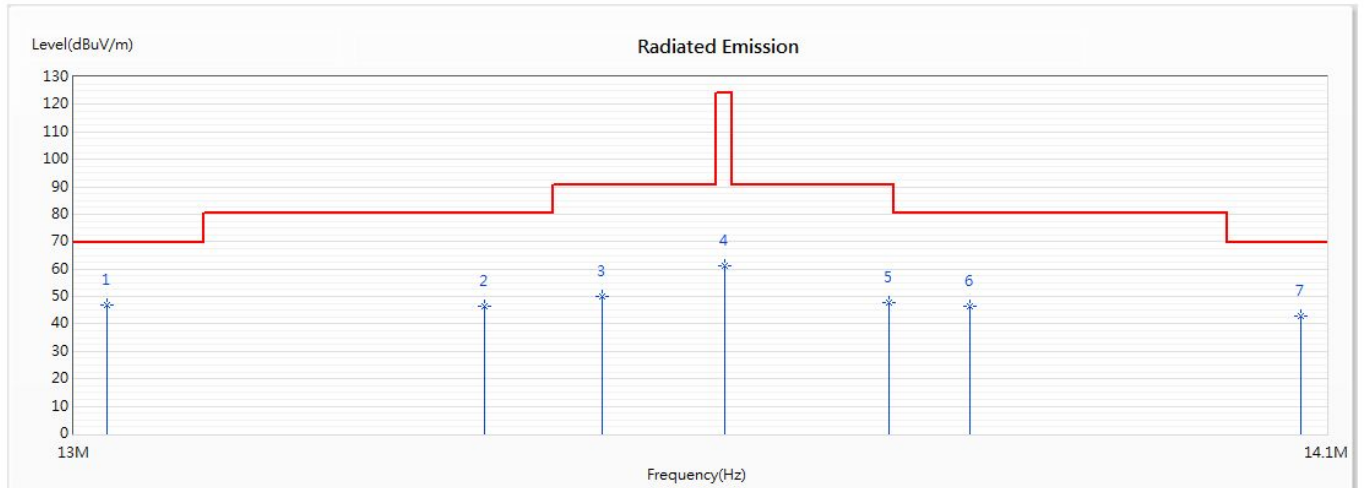


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	13.021	39.75	69.50	-29.75	19.40	20.35	QP
2	13.139	35.70	80.50	-44.80	15.40	20.30	QP
3	13.518	42.07	90.47	-48.40	21.92	20.15	QP
4	13.560	69.30	124.00	-54.70	49.16	20.14	QP
5	13.635	49.07	90.47	-41.40	28.96	20.11	QP
6	13.776	32.33	80.50	-48.17	12.28	20.05	QP
7	14.045	30.72	69.50	-38.78	10.76	19.96	QP

Remark:

1. "*" means this data is the worst emission level;
"!" means this data is over limit.
2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).
3. Margin= Emission Level- Limit.

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Cyril Chen
Polarity	Horizontal	Temperature (°C)	23.0
Test Condition	13.56MHz,Z axis	Humidity (%RH)	59.2

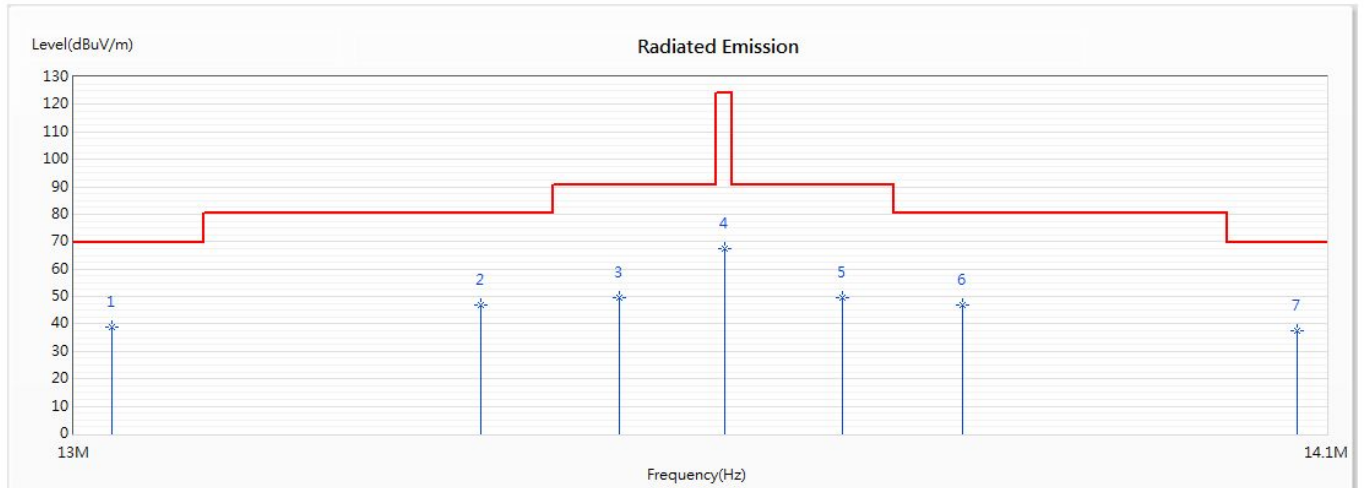


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	13.028	46.98	69.50	-22.52	26.63	20.35	QP
2	13.351	46.53	80.50	-33.97	26.31	20.22	QP
3	13.453	49.95	90.47	-40.52	29.77	20.18	QP
4	13.560	61.10	124.00	-62.90	40.96	20.14	QP
5	13.706	47.94	90.47	-42.53	27.86	20.08	QP
6	13.778	46.44	80.50	-34.06	26.39	20.05	QP
7	14.076	42.78	69.50	-26.72	22.82	19.96	QP

Remark:

1. "*" means this data is the worst emission level;
"!" means this data is over limit.
2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).
3. Margin= Emission Level- Limit.

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Cyril Chen
Polarity	Vertical	Temperature (°C)	23.0
Test Condition	13.56MHz,Z axis	Humidity (%RH)	59.2

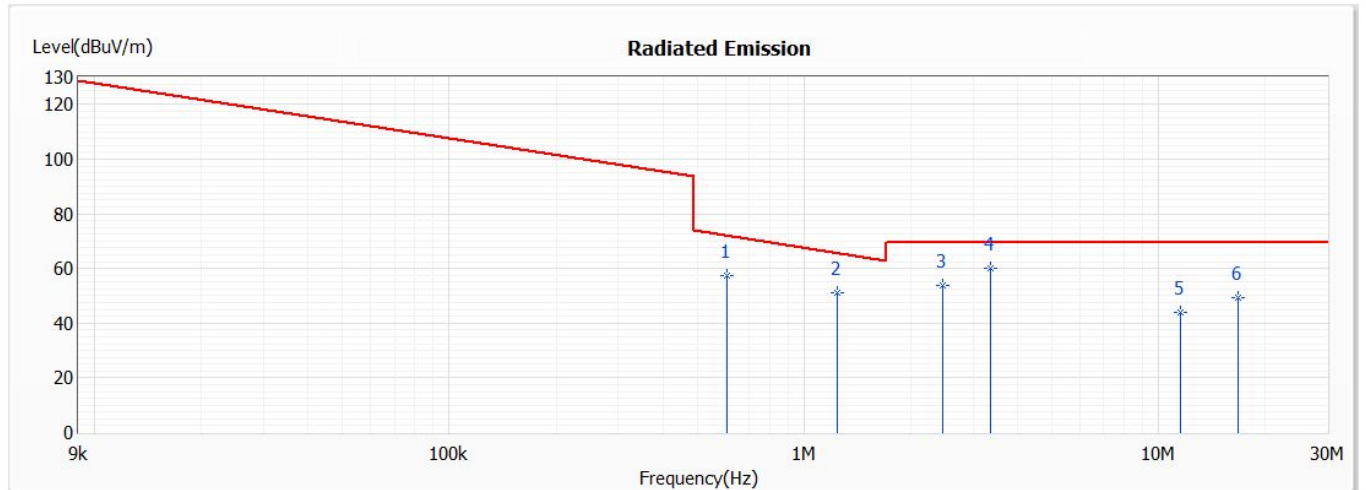


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	13.032	38.92	69.50	-30.58	18.57	20.35	QP
2	13.348	47.04	80.50	-33.46	26.82	20.22	QP
3	13.468	49.37	90.47	-41.10	29.20	20.17	QP
4	13.560	67.60	124.00	-56.40	47.46	20.14	QP
5	13.664	49.68	90.47	-40.79	29.59	20.09	QP
6	13.771	46.99	80.50	-33.51	26.94	20.05	QP
7	14.073	37.61	69.50	-31.89	17.65	19.96	QP

Remark:

1. "*" means this data is the worst emission level;
"!" means this data is over limit.
2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).
3. Margin= Emission Level- Limit.

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Cyril Chen
Polarity	Horizontal	Temperature (°C)	23.0
Test Condition	13.56MHz	Humidity (%RH)	59.2



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.609	57.47	71.92	-14.45	37.40	20.07	QP
2	1.239	51.08	65.76	-14.68	31.00	20.08	QP
3	2.468	53.87	69.54	-15.67	33.77	20.10	QP
* 4	3.368	60.24	69.54	-9.30	40.12	20.12	QP
5	11.586	43.93	69.54	-25.61	23.85	20.08	QP
6	16.744	49.46	69.54	-20.08	29.55	19.91	QP

Remark:

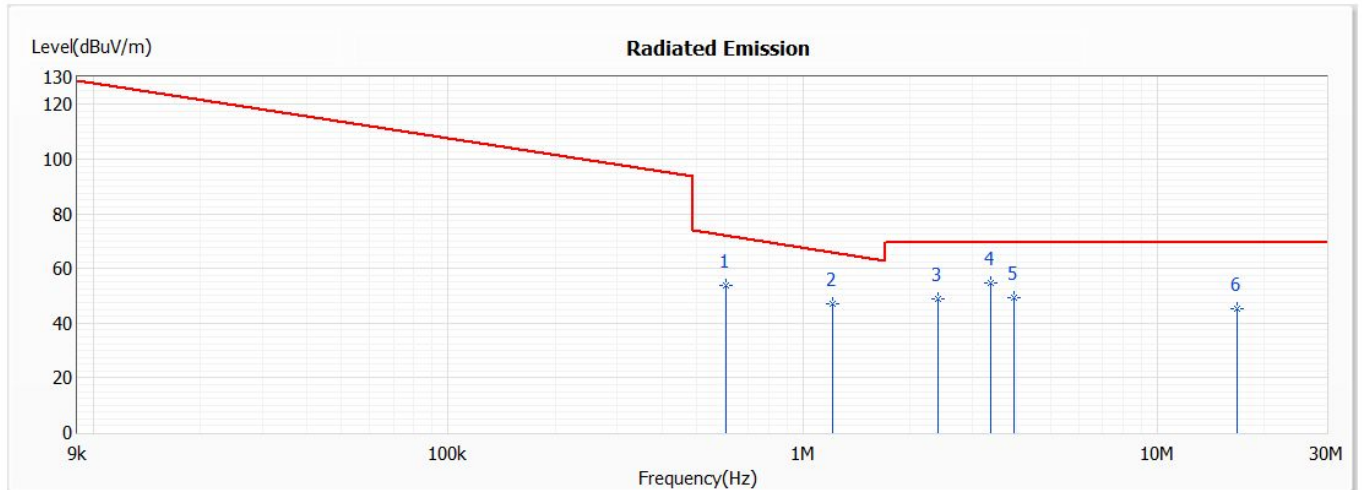
1. "*" means this data is the worst emission level;

"!" means this data is over limit.

2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).

3. Margin= Emission Level- Limit.

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Cyril Chen
Polarity	Vertical	Temperature (°C)	23.0
Test Condition	13.56MHz	Humidity (%RH)	59.2

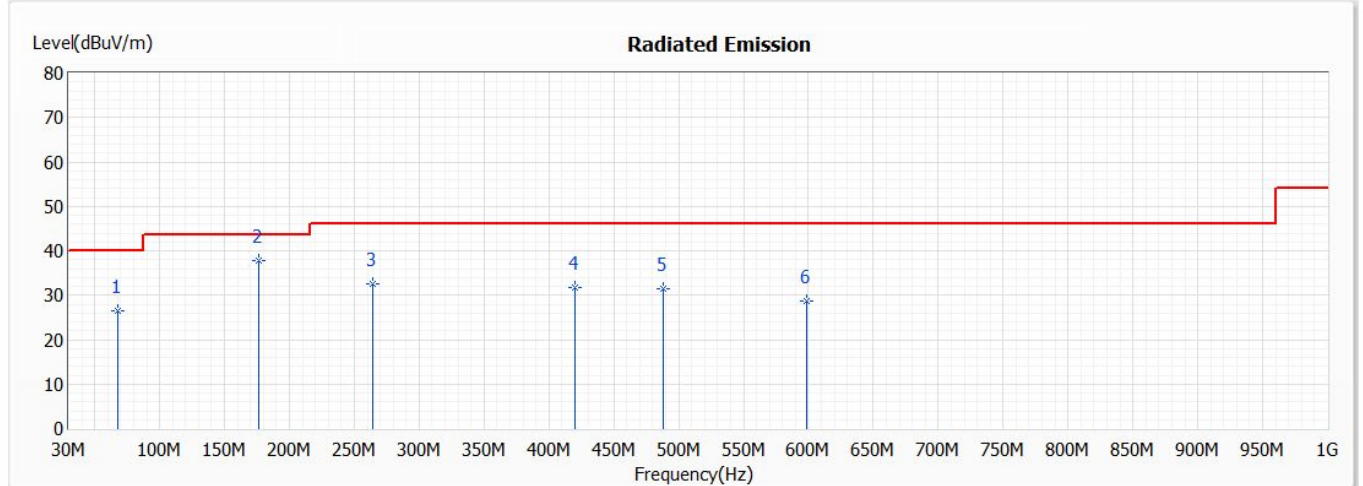


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.609	53.67	71.92	-18.25	33.60	20.07	QP
2	1.209	47.24	65.98	-18.74	27.16	20.08	QP
3	2.408	48.71	69.54	-20.83	28.61	20.10	QP
* 4	3.398	54.52	69.54	-15.02	34.39	20.13	QP
5	3.938	49.09	69.54	-20.45	28.94	20.15	QP
6	16.804	45.36	69.54	-24.18	25.45	19.91	QP

Remark:

1. "*" means this data is the worst emission level;
"!" means this data is over limit.
2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).
3. Margin= Emission Level- Limit.

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Cyril Chen
Polarity	Horizontal	Temperature (°C)	23.0
Test Condition	13.56MHz	Humidity (%RH)	59.2



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	67.830	26.52	40.00	-13.48	39.47	-12.95	QP
* 2	176.470	37.82	43.50	-5.68	49.00	-11.18	QP
3	263.770	32.42	46.00	-13.58	43.44	-11.02	QP
4	419.940	31.76	46.00	-14.24	38.56	-6.80	QP
5	487.840	31.51	46.00	-14.49	36.99	-5.48	QP
6	598.420	28.81	46.00	-17.19	31.97	-3.16	QP

Remark:

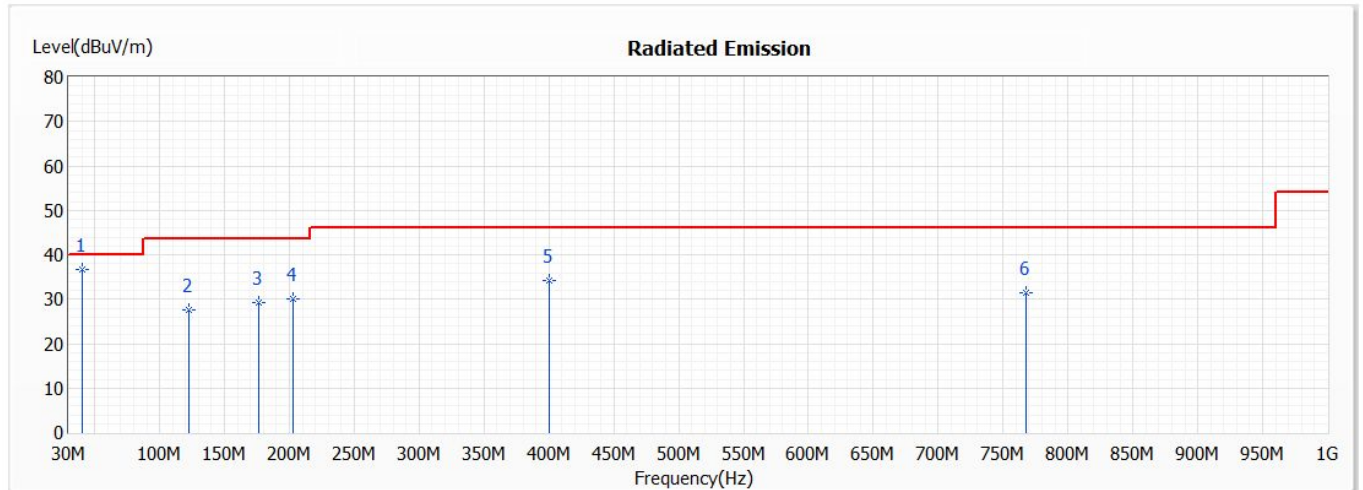
1. "*" means this data is the worst emission level;

"!" means this data is over limit.

2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).

3. Margin= Emission Level- Limit.

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Cyril Chen
Polarity	Vertical	Temperature (°C)	23.0
Test Condition	13.56MHz	Humidity (%RH)	59.2



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	40.670	36.67	40.00	-3.33	47.68	-11.01	QP
2	122.150	27.53	43.50	-15.97	40.50	-12.97	QP
3	176.470	29.16	43.50	-14.34	40.34	-11.18	QP
4	202.660	30.17	43.50	-13.33	43.58	-13.41	QP
5	400.540	34.13	46.00	-11.87	41.48	-7.35	QP
6	767.200	31.45	46.00	-14.55	32.00	-0.55	QP

Remark:

1. "*" means this data is the worst emission level;

"!" means this data is over limit.

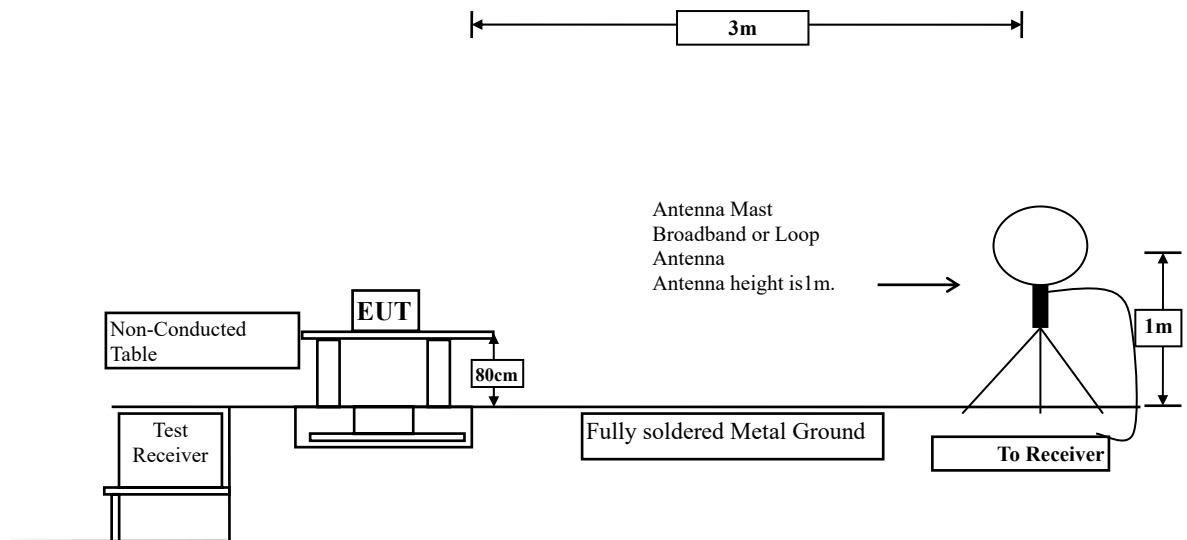
2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).

3. Margin= Emission Level- Limit.

4. Band Edge

4.1. Test Setup

Radiated Emission Under 30MHz



4.2. Limits

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in Section 15.209. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209

4.3. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

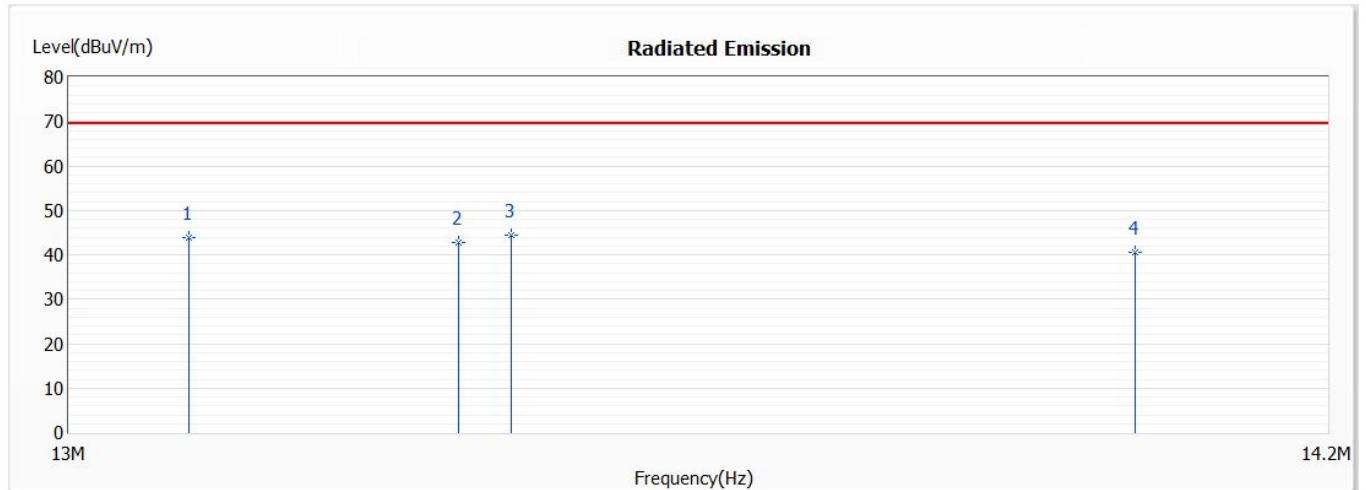
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth below 30MHz setting on the field strength meter is 9kHz and above 30MHz is 120kHz.

4.4. Test Result of Band Edge

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Cyril Chen
Polarity	Horizontal	Temperature (°C)	23.0
Test Condition	13.56MHz	Humidity (%RH)	59.2



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	13.110	43.81	69.54	-25.73	23.49	20.32	QP
2	13.360	42.73	69.54	-26.81	22.51	20.22	QP
* 3	13.410	44.30	69.54	-25.24	24.10	20.20	QP
4	14.010	40.58	69.54	-28.96	20.62	19.96	QP

Remark:

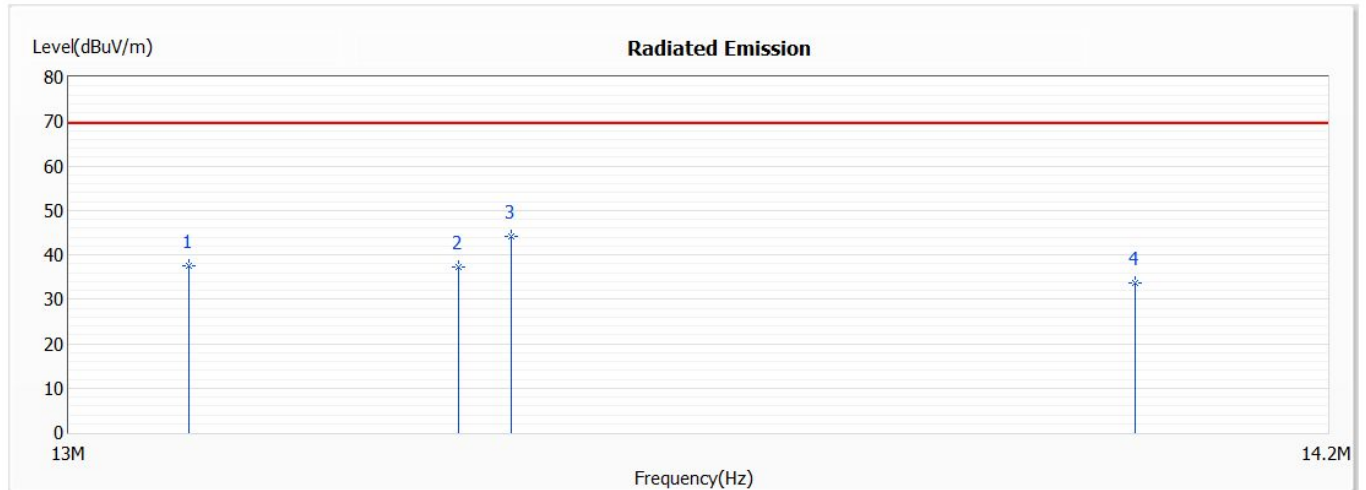
1. "*" means this data is the worst emission level;

"!" means this data is over limit.

2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).

3. Margin= Emission Level- Limit.

Model No	NFC Module	Site	966-3
Test Voltage	DC 5V by USB	Test Date	2021/7/29
Test Mode	Mode 1: Transmit	Engineer	Cyril Chen
Polarity	Vertical	Temperature (°C)	23.0
Test Condition	13.56MHz	Humidity (%RH)	59.2



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	13.110	37.42	69.54	-32.12	17.10	20.32	QP
2	13.360	37.36	69.54	-32.18	17.14	20.22	QP
* 3	13.410	44.04	69.54	-25.50	23.84	20.20	QP
4	14.010	33.55	69.54	-35.99	13.59	19.96	QP

Remark:

1. "*" means this data is the worst emission level;

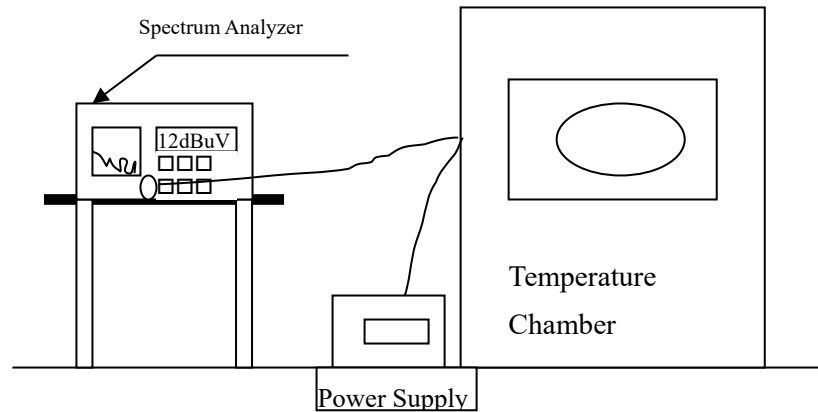
"!" means this data is over limit.

2. Emission Level=Reading Level + Correct Factor(Correct Factor=Ant Factor+ Cable Loss- Pre Amp).

3. Margin= Emission Level- Limit.

5. Frequency Tolerance

5.1. Test Setup



5.2. Limits

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

5.3. Test Procedure

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.4. Test Result of Frequency Stability

Product : NFC module
 Test Item : Frequency Tolerance
 Test Mode : Mode 1: Transmit
 Test date : 2021/08/26

Temperature (°C)	Voltage (V)	Observe Time	Declared Frequency (MHz)	Read Frequency (MHz)	Tolerance (%)	Limit (%)
20	3.3	start	13.56	13.56071	0.005236	±0.01 %
		2mins	13.56	13.56072	0.005310	
		5mins	13.56	13.56074	0.005457	
		10mins	13.56	13.56072	0.005310	
20	3.8	start	13.56	13.56072	0.005310	±0.01 %
		2mins	13.56	13.56072	0.005310	
		5mins	13.56	13.56072	0.005310	
		10mins	13.56	13.56071	0.005236	
20	2.8	start	13.56	13.56072	0.005310	±0.01 %
		2mins	13.56	13.56071	0.005236	
		5mins	13.56	13.56072	0.005310	
		10mins	13.56	13.56071	0.005236	
50	3.3	start	13.56	13.56074	0.005457	±0.01 %
		2mins	13.56	13.56074	0.005457	
		5mins	13.56	13.56072	0.005310	
		10mins	13.56	13.56072	0.005310	
40	3.3	start	13.56	13.56072	0.005310	±0.01 %
		2mins	13.56	13.56072	0.005310	
		5mins	13.56	13.56072	0.005310	
		10mins	13.56	13.56072	0.005310	
30	3.3	start	13.56	13.56075	0.005531	±0.01 %
		2mins	13.56	13.56072	0.005310	
		5mins	13.56	13.56072	0.005310	
		10mins	13.56	13.56072	0.005310	

10	3.3	start	13.56	13.56071	0.005236	±0.01 %
		2mins	13.56	13.56072	0.005310	
		5mins	13.56	13.56072	0.005310	
		10mins	13.56	13.56071	0.005236	
0	3.3	start	13.56	13.56072	0.005310	±0.01 %
		2mins	13.56	13.56072	0.005310	
		5mins	13.56	13.56072	0.005310	
		10mins	13.56	13.56072	0.005310	
-10	3.3	start	13.56	13.56072	0.005310	±0.01 %
		2mins	13.56	13.56073	0.005383	
		5mins	13.56	13.56072	0.005310	
		10mins	13.56	13.56075	0.005531	
-20	3.3	start	13.56	13.56072	0.005310	±0.01 %
		2mins	13.56	13.56075	0.005531	
		5mins	13.56	13.56072	0.005310	
		10mins	13.56	13.56077	0.005678	

6. EMI Reduction Method During Compliance Testing

No modification was made during testing.