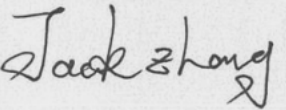




Test report No:
2210462R-RF-US-P06V01

TEST REPORT

FCC Rules&Regulations 47 CFR Chapter I - Part 15C

Product Name	Electronic Code Switch
Trademark	
Model and /or type reference	ECS-YYYY (where X, Y is a variable)
FCC ID	2A4AV-ECS-YYYY
Applicant's name / address	Curtis Technology (Suzhou) Co., Ltd. No. 7 Building, 388 Xinping Street, Suzhou Industrial Park, Suzhou, Jiangsu
Test method requested, standard	FCC CFR Title 47 Part 15 Subpart C Section 15.225
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Tim Cao/Project Engineer 
Approved by (name / position & signature)	Jack Zhang/ Supervisor 
Date of issue	2022-03-18
Report Version	V1.0
Report template No	Template_FCC 15.225-RF-V1.0

INDEX

	page
Competences and Guarantees.....	4
General conditions.....	4
Environmental conditions	4
Possible test case verdicts	5
Abbreviations.....	5
Document History	6
Remarks and Comments	6
Used Equipment	7
Uncertainty	8
1 General Information	9
1.1 General Description of the Item(s)	9
1.2. Antenna information.....	10
2 Description of Test Setup	11
2.1 Operating mode(s) used for tests	11
2.2 Support / Auxiliary equipment / unit / Test software for the EUT	11
2.3 Test Configuration / Block diagram used for tests	12
2.4 Testing process.....	13
3 Verdict summary section	14
3.1 Standards	14
3.2 Overview of results.....	14
3.3 Test Facility.....	15
4 Test Results.....	16
4.1 AC Power Line Conducted Emission	16
4.1.1 Limit	16
4.1.2 Test Setup.....	16
4.1.3 Test Procedure.....	16
4.1.4 Test Data	17
4.2 E-field Emission	18
4.2.1 Limit	18
4.2.2 Test Setup.....	18
4.2.3 Test Procedure.....	18
4.2.4 Test Data	19
4.3 Radiated Emissions.....	20
4.3.1 Limit	20

4.3.2	Test Setup.....	21
4.3.3	Test Procedure.....	22
4.3.4	Test Data	23
4.4	Emission bandwidth	41
4.4.1	Limit.....	41
4.4.2	Test Setup.....	41
4.4.3	Test Procedure.....	41
4.4.4	Test Data	42
4.5	Frequency Stability.....	43
4.5.1	Limit:	43
4.5.2	Test Setup.....	43
4.5.3	Test Procedure.....	43
4.5.4	Test Data	44
4.6	Antenna Requirement	46
4.6.1	Limit:	46
4.6.2	Antenna Connector Construction:	46
5	Test setup photo and EUT Photo	47

COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Jan. 17, 2022
Date (start test)	Jan. 18, 2022
Date (finish test)	Mar. 05, 2022

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
Tx	: Transmitter
Rx	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2210462R-RF-US-P06V01	V1.0	Initial issue of report.	2022-03-18

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with Part 15 Subpart C Paragraph 15.225.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results presented in this report relate only to the object tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1.1 General Description of the Item(s);
 - Chapter 1.2 Antenna Informaion;
 - Chapter 1.3 Channel List.

USED EQUIPMENT

AC Power Line Conducted Emission / TR-1					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100906	2021.04.28	2022.04.27
Two-Line V-Network	R&S	ENV 216	101189	2021.03.20	2022.03.19
Two-Line V-Network	R&S	ENV 216	101044	2021.03.20	2022.03.19
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	N/A	N/A
50ohm Termination	SHX	TF2	7081402	2021.09.18	2022.09.17
Temperature/Humidity Meter	RTS	RTS-8S	TR1-TH	2021.08.10	2022.08.09
Quietek EMI V3(test software)	Quietek	N/A	N/A	N/A	N/A
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

Emission in non-restricted frequency bands / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2021.08.12	2022.08.11
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2021.03.20	2022.03.19
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2021.07.11	2022.07.10
Temperature/Humidity Meter	RTS	RTS-8S	RF-08	2021.08.10	2022.08.09
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

Radiated Emission(Below 1GHz) / AC-3					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100176	2021.08.12	2022.08.11
Loop Antenna	R&S	HFH2-Z2	833799/003	2022.02.20	2023.02.19
Bilog Antenna	Teseq GmbH	CBL6112D	27613	2021.12.03	2022.12.02
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC3-C	2021.03.31	2022.03.30
Temperature/Humidity Meter	RTS	RTS-8S	AC3-TH	2021.11.23	2022.11.22
Quietek EMI V3(test software)	Quietek	N/A	N/A	N/A	N/A
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. 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%. The Uncertainties is comply with standard required as below.

Test item	Uncertainty
AC Power Line Conducted Emission	± 2.02 dB
Peak Power Output	± 1.27 dB
Radiated Emission(30MHz~1GHz)	± 3.80 dB
RF antenna conducted test	± 1.27 dB
DTS Bandwidth	± 1 kHz
Occupied Bandwidth	± 1 kHz
Power Density	± 1.27 dB
Frequency Stability	± 100 Hz

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name..... :	Electronic Code Switch
Model No. :	ECS-XXXX (where X, Y is a variable)
Trademark	
FCC ID	2A4AV-ECS-XXXX

Wireless Specification	NFC
Operating frequency range(s)..... :	13.56 MHz
Type of modulation	ASK
Number of channel..... :	1

Rated power supply	Voltage and Frequency	
	☐	AC: 220 – 240 V, 50/60 Hz
	☐	AC: 100 – 240 V, 50/60 Hz
	☐	DC: 5 V
	☒	Battery: 12-96VDC
Mounting position..... :	☐	Table top equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Hand-held equipment
	☒	Other: Vehicle-mounted equipment

1.2. Antenna information

Model No.	N/A			
Antenna manufacturer	N/A			
Antenna Delivery	☒ 1*TX+1*RX	☐ 2*TX+2*RX	☐ 3*TX+3*RX	
Antenna technology	☒ SISO			
	☐ MIMO	☐ Basic		
		☐ CDD		
		☐ Sectorized		
		☐ Beam-forming		
Antenna Type	☐ External	☐ Dipole		
		☐ Sectorized		
	☒ Internal	☐ PIFA		
		☒ PCB		
		☐ Ceramic Chip Antenna		
		☐ Coil antenna		
		☐ Type F antenna		

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

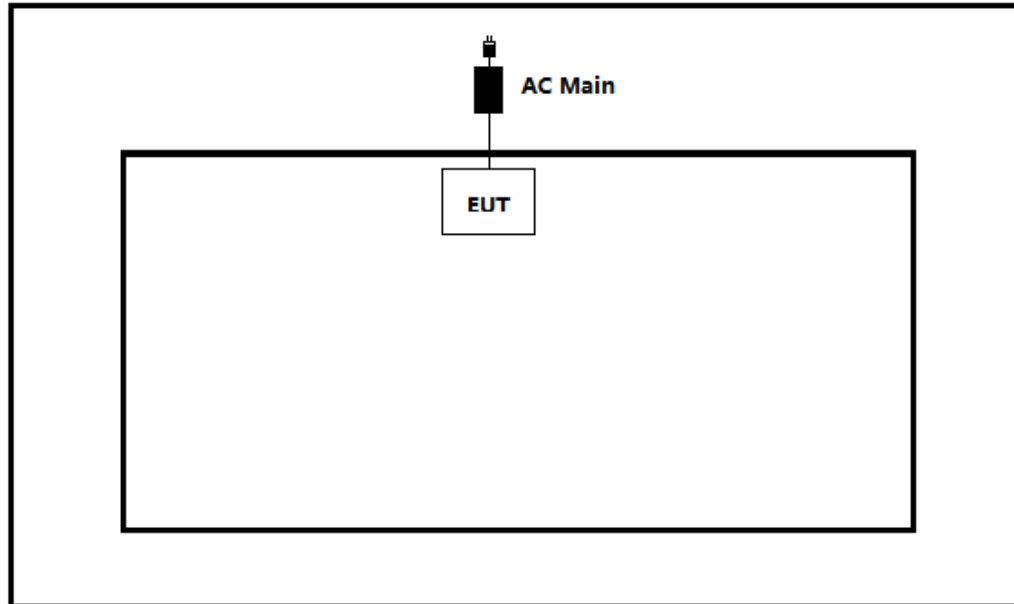
Test Mode	Mode 1: Transmit by NFC
-----------	-------------------------

2.2 Support / Auxiliary equipment / unit / Test software for the EUT

Auxiliary equipment	Type / Version	Manufacturer	Supplied by
N/A	N/A	N/A	N/A
software	Type / Version	Manufacturer	Supplied by
N/A	N/A	N/A	N/A

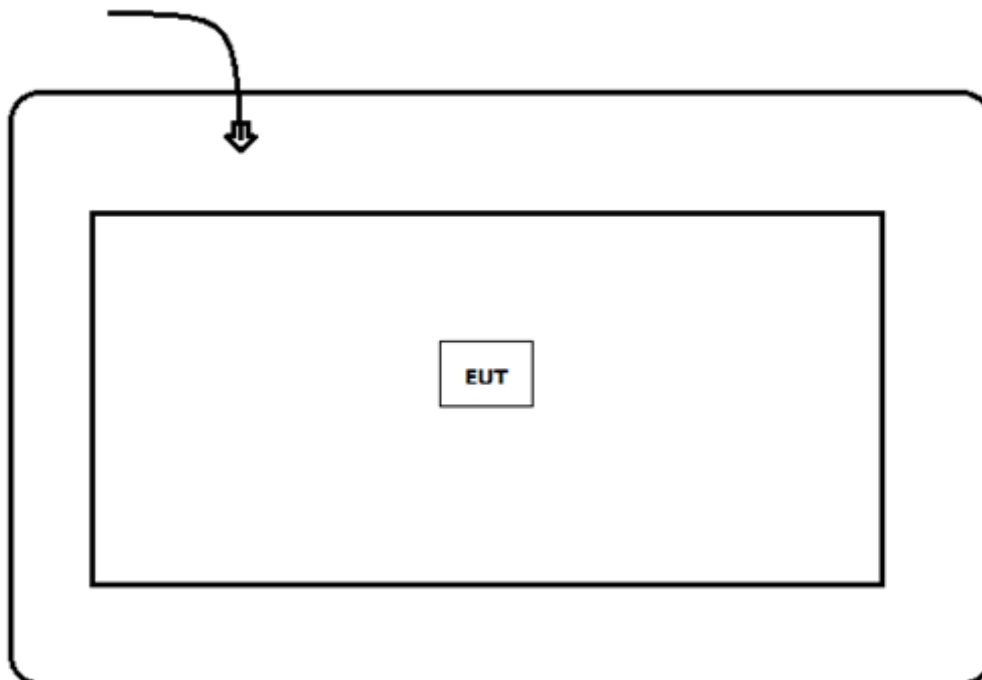
2.3 Test Configuration / Block diagram used for tests

Test setup Diagram- AC Line Conducted Emission Test



Test setup Diagram- Radiated Emission

Chamber



2.4 Testing process

1	Setup the EUT as shown in Section 2.3.
2	Execute the power on the EUT.
3	Verify that the EUT works properly.

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
FCC CFR Title 47 Part 15 Subpart C Section 15.225	2020	Operation within the band 13.110-14.010 MHz

3.2 Overview of results

For FCC

Requirement – Test case	Basic standard(s)	Verdict	Remark
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C Section 15.207	N/A	---
Field Strength of Fundamental	FCC CFR Title 47 Part 15 Subpart C Section 15.225(a)(b)(c)	PASS	---
Field Strength of Spurious	FCC CFR Title 47 Part 15 Subpart C Section 15.209 & 15.225(d)	PASS	---
Frequency Tolerance	FCC CFR Title 47 Part 15 Subpart C Section 15.225(e)	PASS	---
Channel Bandwidth	FCC CFR Title 47 Part 15 Subpart C Section 15.215(c)	PASS	---
Antenna Requirement	FCC CFR Title 47 Part 15 Subpart C Section 15.203	PASS	---
<u>Supplementary information:</u>			

3.3 Test Facility

USA : FCC Designation Number: CN1199

4 TEST RESULTS

4.1 AC Power Line Conducted Emission

VERDICT: N/A

4.1.1 Limit

Standard	FCC Part 15 Subpart E Paragraph 15.207	
Frequency range [MHz]	Limit: QP [dB(μV) ¹⁾]	Limit: AV [dB(μV) ¹⁾]
0,15 - 0,50	66 - 56 ²⁾	56 - 46 ²⁾
0,50 - 5,0	56	46
5,0 - 30	60	50

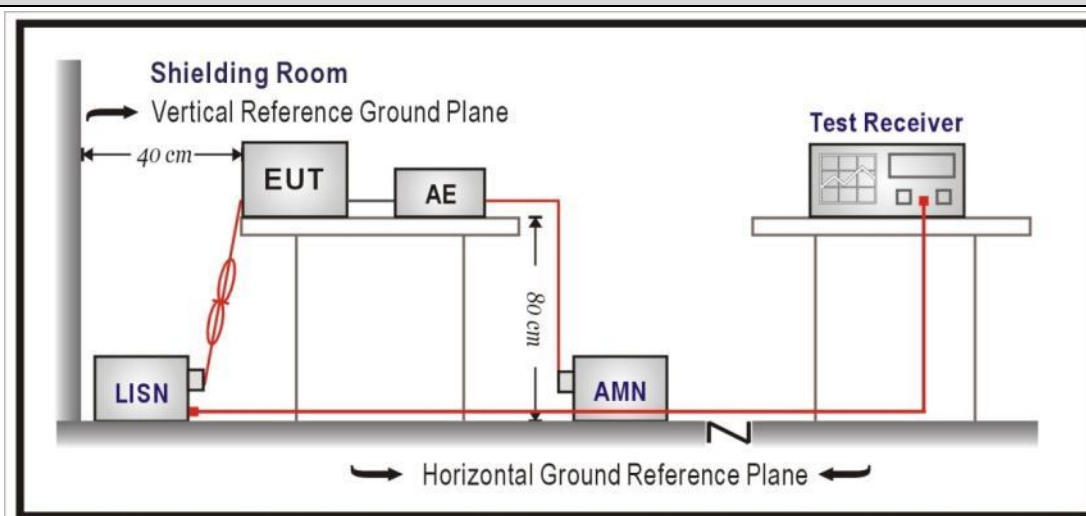
¹⁾ At the transition frequency, the lower limit applies.

²⁾ The limit decreases linearly with the logarithm of the frequency.

NOTE 1: The exclusion band for transmitters shall be considered for transmitters operating at frequencies below 30 MHz.

NOTE 2: Where the AC output port is directly connected (or via a circuit breaker) to the AC power input port of the EUT the AC power output port need not to be tested.

4.1.2 Test Setup



4.1.3 Test Procedure

	References Rule	Chapter	Item
☒	ANSI C63.10-2013	6.2	Standard test method for ac power-line conducted emissions from unlicensed wireless devices

4.1.4 Test Data

Note: The product is powered by battery, so the item is not applicable.

4.2 E-field Emission**VERDICT: PASS****4.2.1 Limit****Standard**

FCC Part 15 Subpart C Paragraph 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.

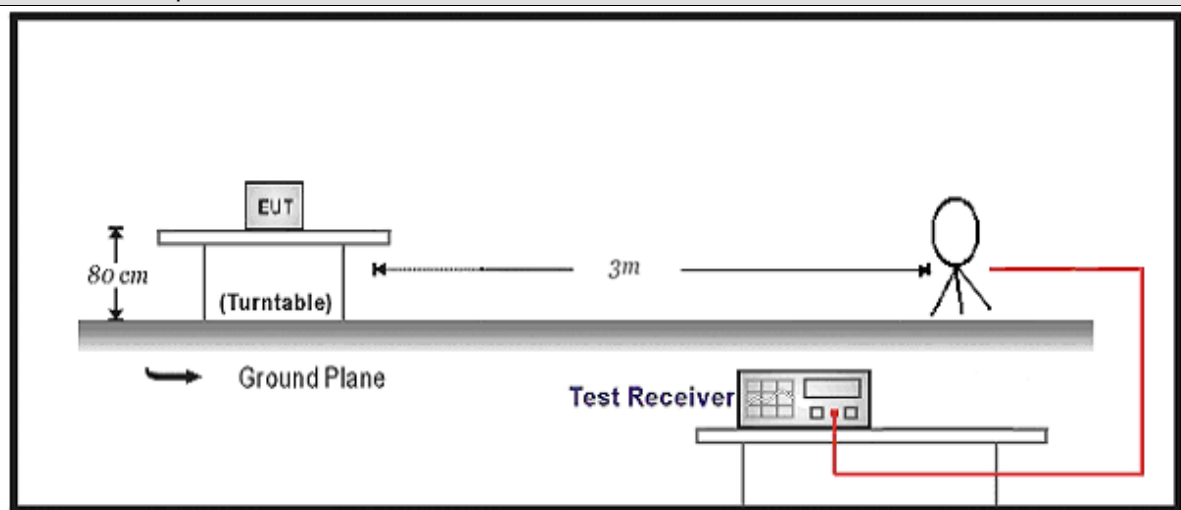
(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(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.

(d) 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 §15.209.

4.2.2 Test Setup

Below 30MHz Test Setup:

**4.2.3 Test Procedure**

	References Rule	Chapter	Description
☒	ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
☐	ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
☐	ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

4.2.4 Test Data

Frequency (MHz)	Measure Level (dBμV/m) (3m)	Loop Ant. Pol. (H/V)	Distance factor (dB)	Limit (dBμV/m) (30m)	Limit (dBμV/m) (3m)	Over Limit (dB)
13.560	66.372	H	40	84	124	-57.628
13.560	61.801	V	40	84	124	-62.199
13.372	46.548	H	40	40.5	80.5	-33.952
13.496	46.532	H	40	50.5	90.5	-43.968
13.645	45.382	H	40	50.5	90.5	-45.118
13.689	45.179	H	40	40.5	80.5	-35.321

Note1: Antenna Test Distance at 3 meters.

Note2: Measurements were performed at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)(2). Extrapolation Factor = $40 \log_{10}(30/3) = 40\text{dB}$.

4.3 Radiated Emissions**VERDICT: PASS****4.3.1 Limit****Standard**

FCC Part 15 Subpart C Paragraph 15. 209

Restricted Band Emissions Limit

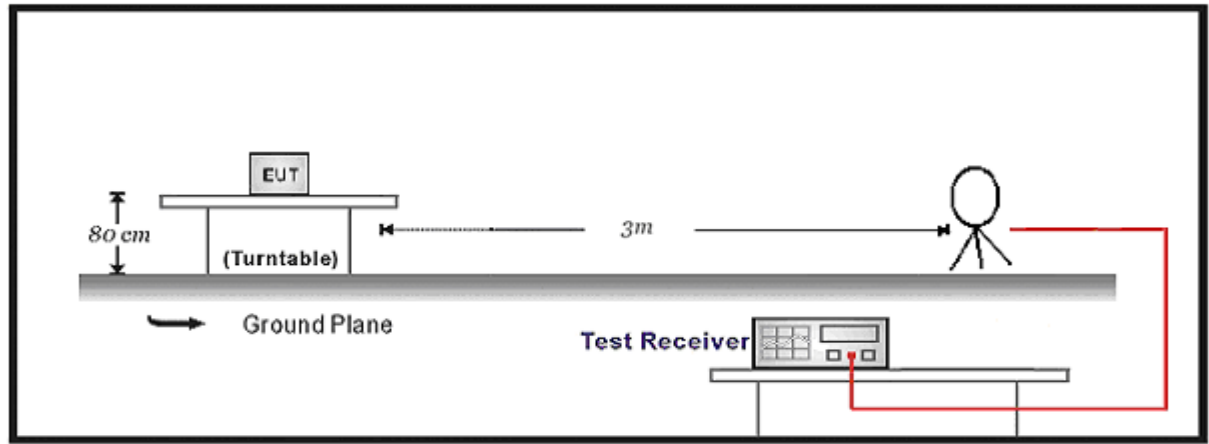
Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Field strength (dB $\mu\text{V/m}$)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 – 13.8	300 _(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30 _(Note 1)
1.705 - 30	30	29.5	30 _(Note 1)
30 - 88	100	40	3 _(Note 2)
88 - 216	150	43.5	3 _(Note 2)
216 - 960	200	46	3 _(Note 2)
Above 960	500	54	3 _(Note 2)

Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

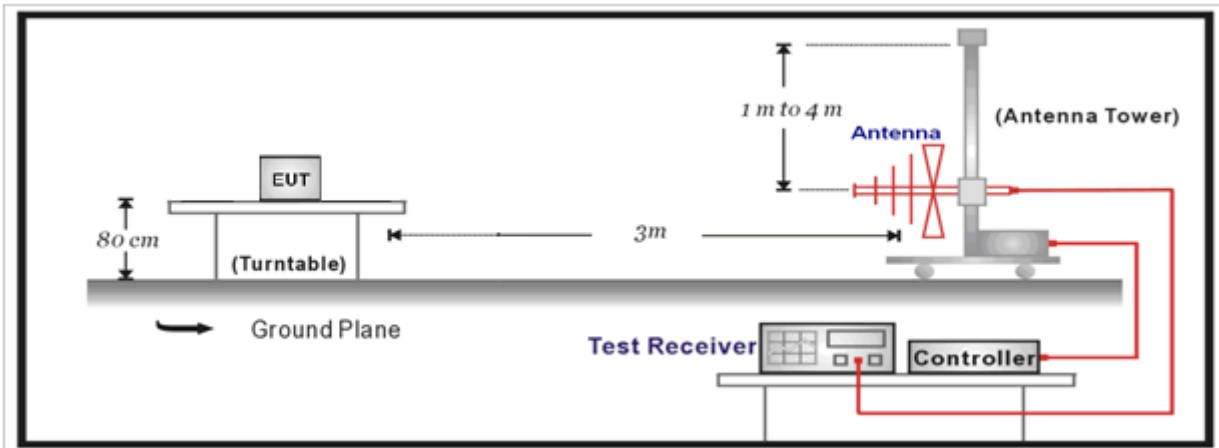
Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

4.3.2 Test Setup

Below 30MHz Test Setup:



30MHz-1GHz Test Setup:

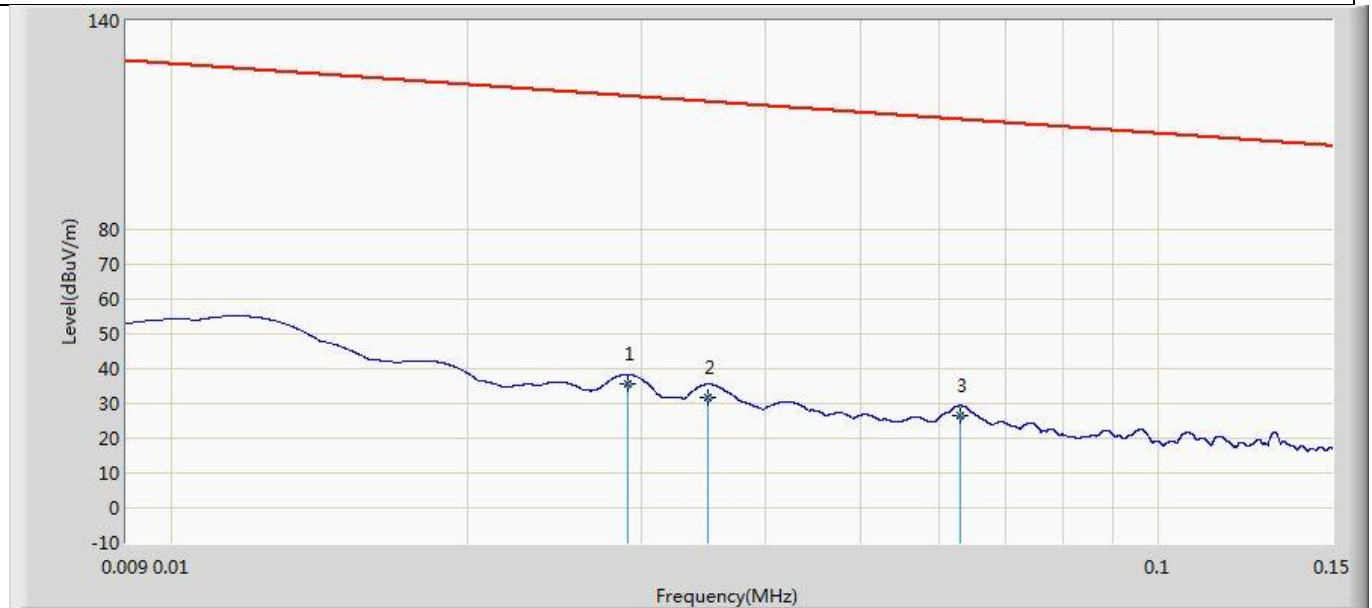


4.3.3 Test Procedure

	References Rule	Chapter	Description
	☒ ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
	☒ ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
	☐ ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

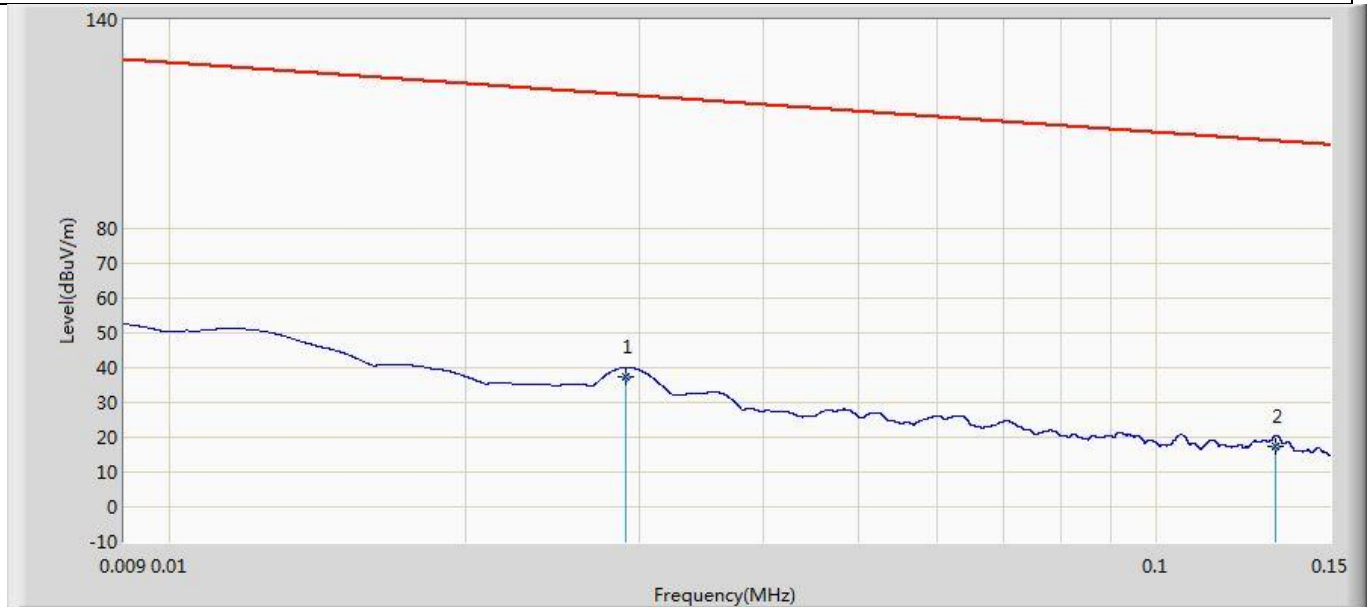
4.3.4 Test Data

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Engineer: Neil	
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Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Horizontal
EUT: ELECTRONIC CODE SWITCH	Power: DC 12V
Note: Mode 1: Transmit at 13.56MHz by NFC	



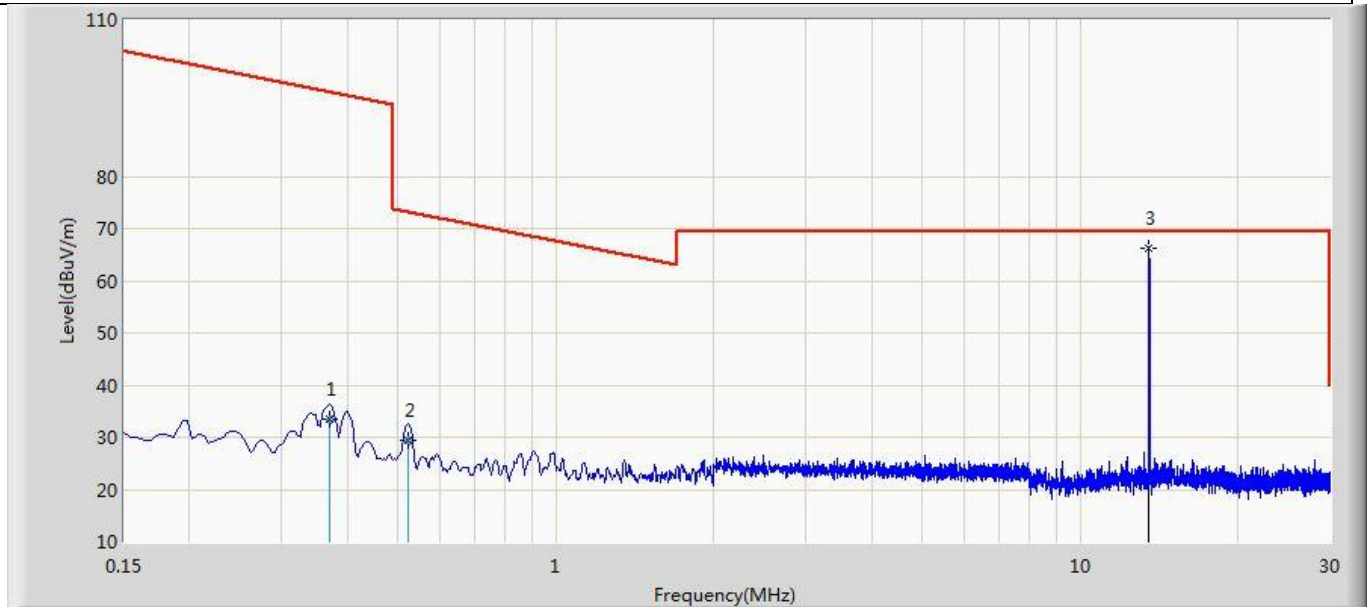
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	0.029	35.465	13.827	-82.878	118.342	21.638	QP
2		0.035	31.568	9.742	-85.142	116.710	21.826	QP
3		0.063	26.452	4.525	-85.155	111.607	21.927	QP

Profile: 2210462R	Page No.: 2
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 10:53
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Vertical
EUT: ELECTRONIC CODE SWITCH	Power: DC 12V
Note: Mode 1: Transmit at 13.56MHz by NFC	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	0.029	37.465	16.327	-80.878	118.342	21.138	QP
2		0.132	17.458	-3.892	-87.728	105.186	21.350	QP

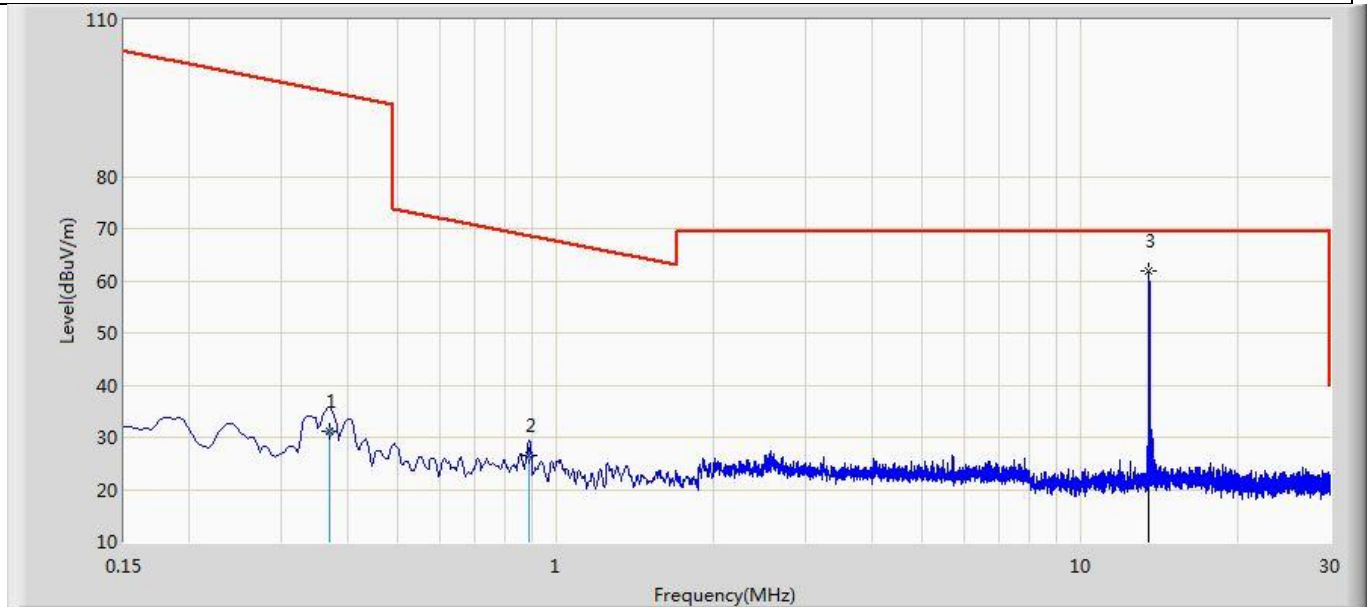
Profile: 2210462R	Page No.: 3
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 10:53
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Horizontal
EUT: ELECTRONIC CODE SWITCH	Power: DC 12V
Note: Mode 1: Transmit at 13.56MHz by NFC	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.370	33.465	11.877	-62.774	96.239	21.588	QP
2		0.523	29.356	7.975	-43.880	73.235	21.381	QP
3	*	13.560	66.372	45.278	-3.128	69.500	21.094	PK

Note: The Mark 3 is the fundamental emission.

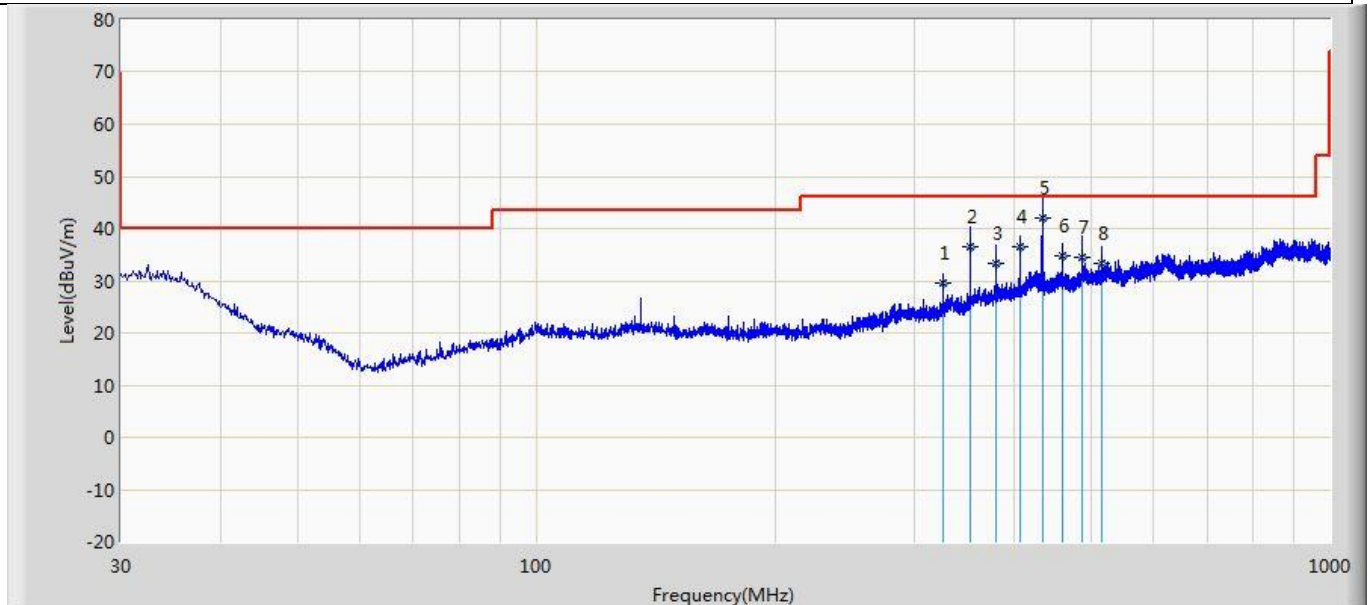
Profile: 2210462R	Page No.: 4
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 10:53
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Vertical
EUT: ELECTRONIC CODE SWITCH	Power: DC 12V
Note: Mode 1: Transmit at 13.56MHz by NFC	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.370	31.256	10.168	-64.983	96.239	21.088	QP
2		0.889	26.452	6.705	-42.188	68.640	19.747	QP
3	*	13.560	61.801	41.207	-7.699	69.500	20.594	PK

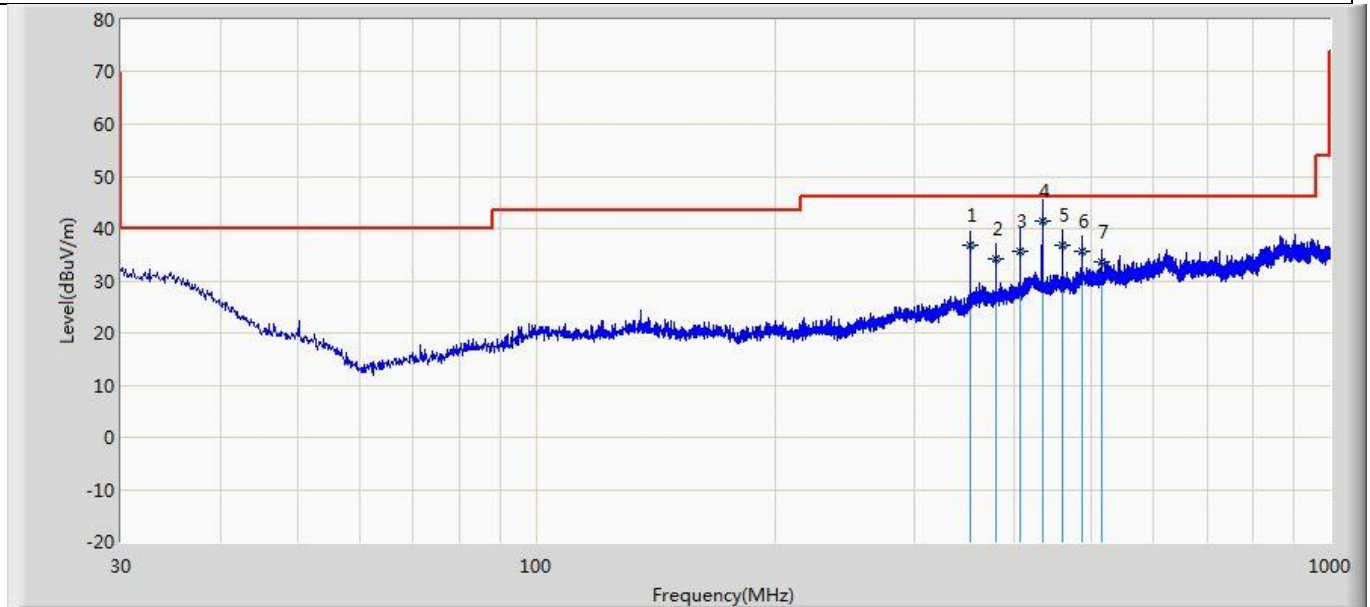
Note: The Mark 3 is the fundarmental emission.

Profile: 2210462R	Page No.: 6
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 12:55
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Horizontal
EUT: ELECTRONIC CODE SWITCH	Power: DC 12V
Note: Mode 1: Transmit at 13.56MHz by NFC	



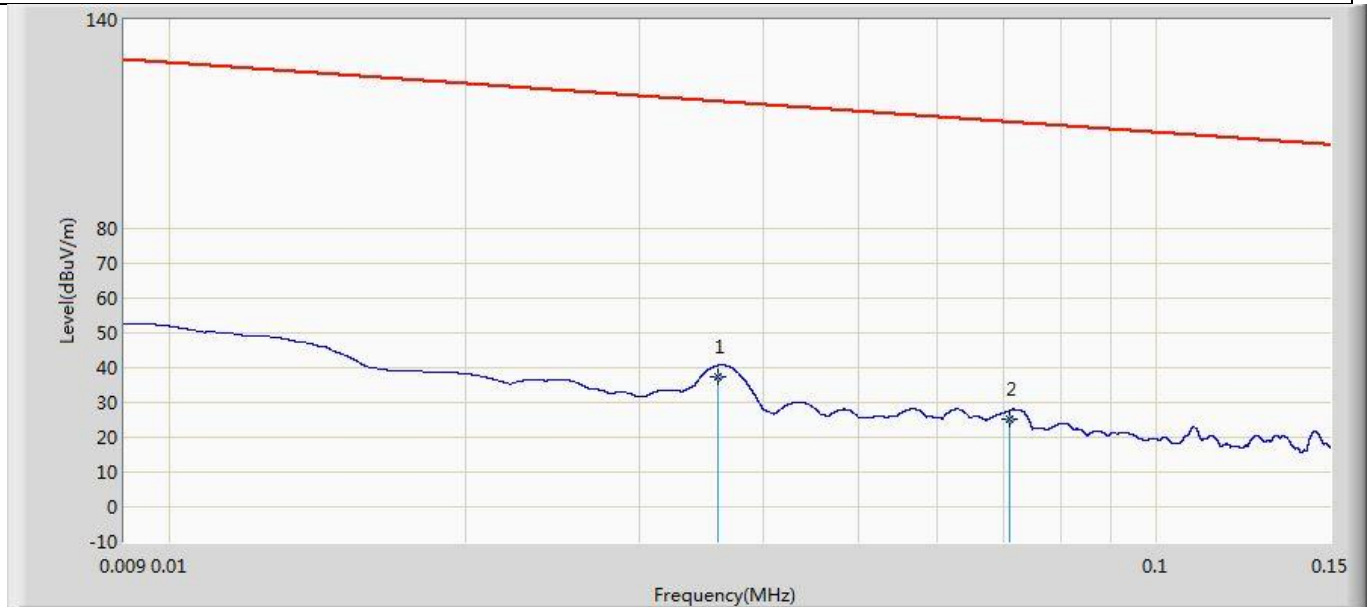
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		325.365	29.564	7.789	-16.436	46.000	21.775	QP
2		352.525	36.456	13.259	-9.544	46.000	23.197	QP
3		379.685	33.456	9.055	-12.544	46.000	24.400	QP
4		406.845	36.546	11.154	-9.454	46.000	25.392	QP
5	*	433.884	42.165	15.910	-3.835	46.000	26.254	QP
6		461.044	34.659	7.801	-11.341	46.000	26.857	QP
7		488.204	34.569	6.540	-11.431	46.000	28.029	QP
8		515.242	33.468	5.673	-12.532	46.000	27.795	QP

Profile: 2210462R	Page No.: 7
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 12:57
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Horizontal
EUT: ELECTRONIC CODE SWITCH	Power: DC 12V
Note: Mode 1: Transmit at 13.56MHz by NFC	



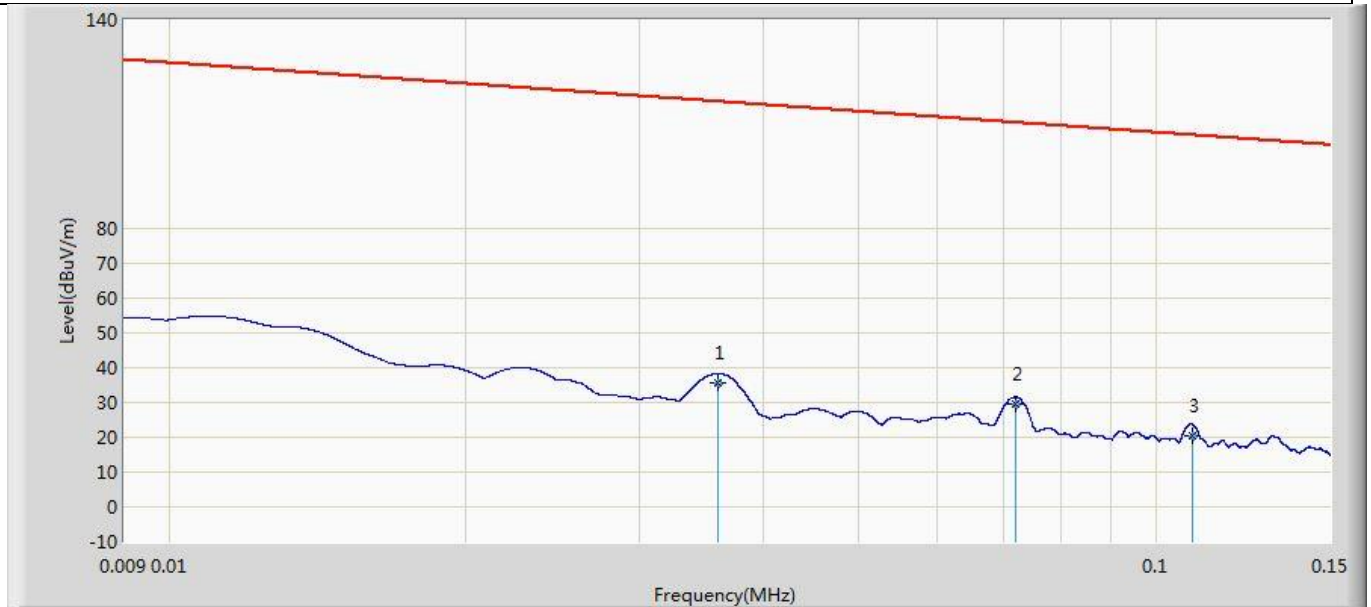
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		352.525	36.956	13.759	-9.044	46.000	23.197	QP
2		379.685	34.165	9.764	-11.835	46.000	24.400	QP
3		406.845	35.658	10.266	-10.342	46.000	25.392	QP
4	*	433.884	41.569	15.314	-4.431	46.000	26.254	QP
5		461.044	36.956	10.098	-9.044	46.000	26.857	QP
6		488.204	35.645	7.616	-10.355	46.000	28.029	QP
7		515.242	33.654	5.859	-12.346	46.000	27.795	QP

Profile: 2210462R	Page No.: 1
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 10:53
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Horizontal
EUT: ELECTRONIC CODE SWITCH	Power: DC 48V
Note: Mode 1: Transmit at 13.56MHz by NFC	



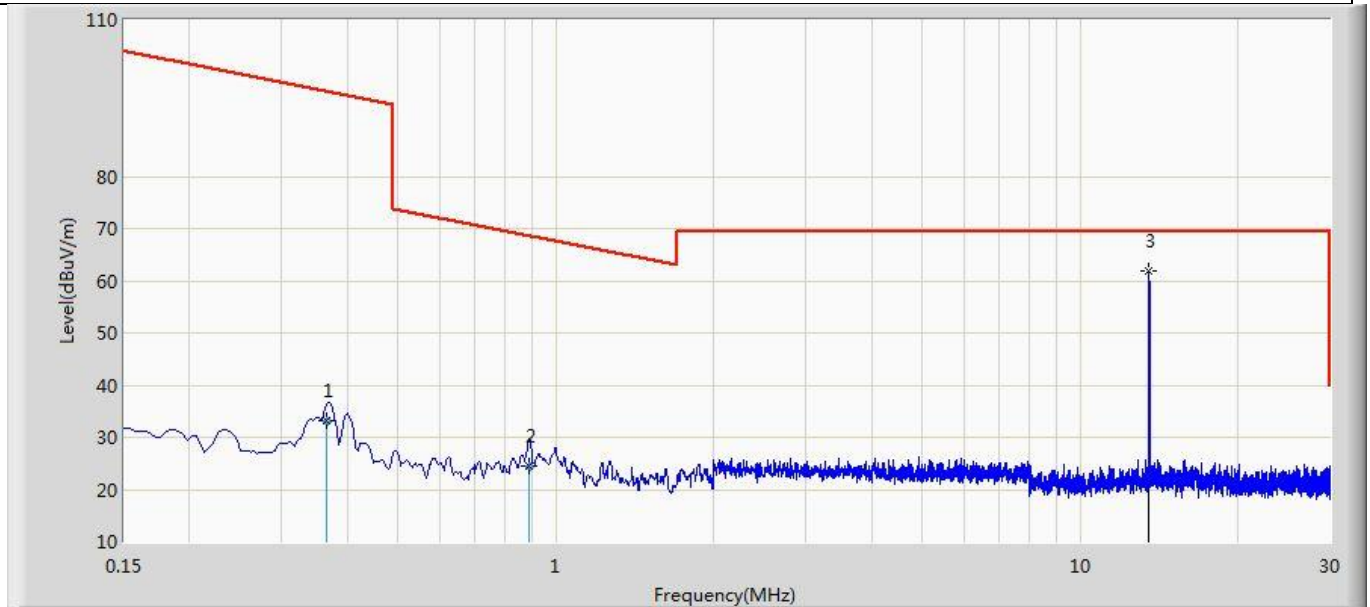
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	0.036	37.456	15.599	-79.009	116.465	21.857	QP
2		0.071	25.364	3.446	-85.205	110.570	21.918	QP

Profile: 2210462R	Page No.: 2
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 10:53
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Vertical
EUT: ELECTRONIC CODE SWITCH	Power: DC 48V
Note: Mode 1: Transmit at 13.56MHz by NFC	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.036	35.465	14.108	-81.000	116.465	21.357	QP
2	*	0.072	29.456	8.039	-80.992	110.448	21.417	QP
3		0.109	20.465	-0.907	-86.383	106.848	21.372	QP

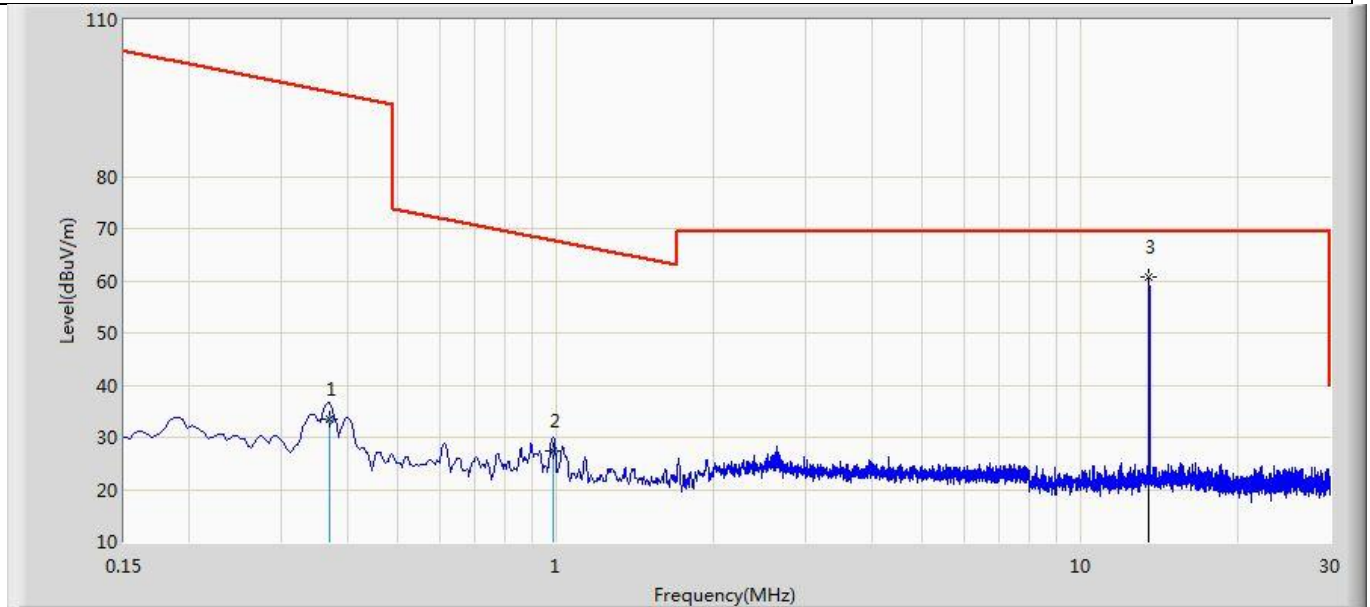
Profile: 2210462R	Page No.: 3
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 10:53
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Horizontal
EUT: ELECTRONIC CODE SWITCH	Power: DC 48V
Note: Mode 1: Transmit at 13.56MHz by NFC	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.366	33.165	11.572	-63.168	96.333	21.593	QP
2		0.889	24.569	4.322	-44.071	68.640	20.247	QP
3	*	13.560	61.795	40.701	-7.705	69.500	21.094	QP

Note: The Mark 3 is the fundamental emission.

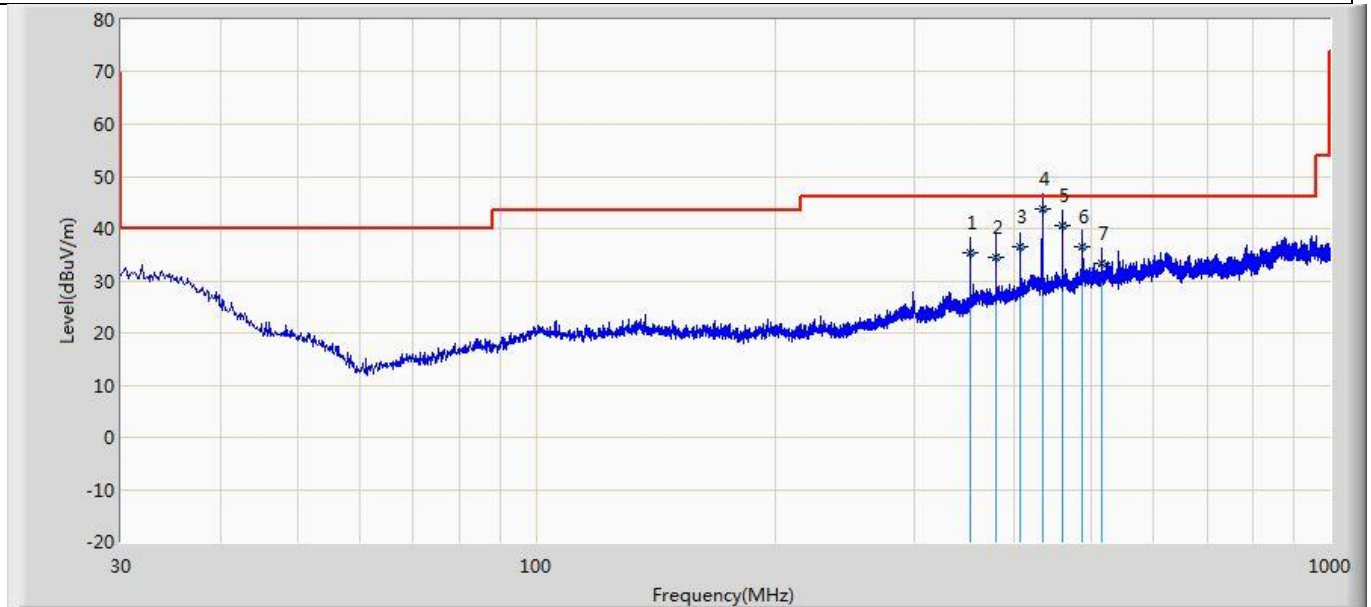
Profile: 2210462R	Page No.: 4
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 10:53
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Vertical
EUT: ELECTRONIC CODE SWITCH	Power: DC 48V
Note: Mode 1: Transmit at 13.56MHz by NFC	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.370	33.456	12.368	-62.783	96.239	21.088	QP
2		0.990	27.465	8.032	-40.243	67.708	19.433	QP
3	*	13.560	60.820	40.226	-8.680	69.500	20.594	QP

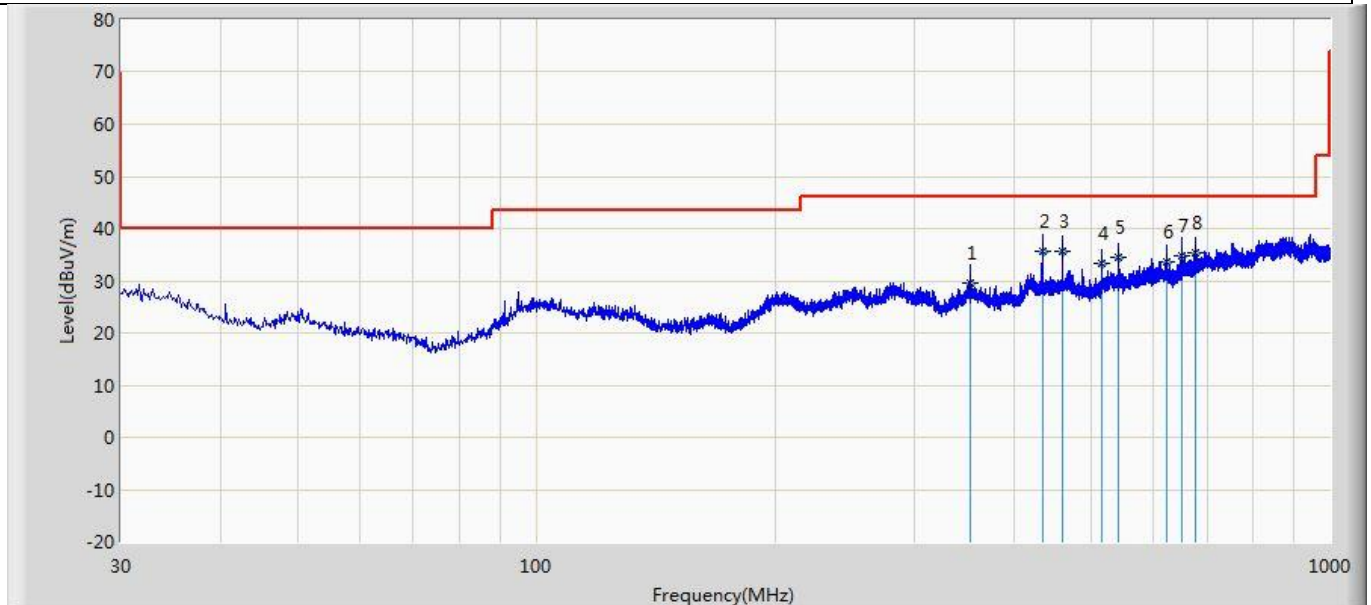
Note: The Mark 3 is the fundamental emission.

Profile: 2210462R	Page No.: 6
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 13:23
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Horizontal
EUT: ELECTRONIC CODE SWITCH	Power: DC 48V
Note: Mode 1: Transmit at 13.56MHz by NFC	



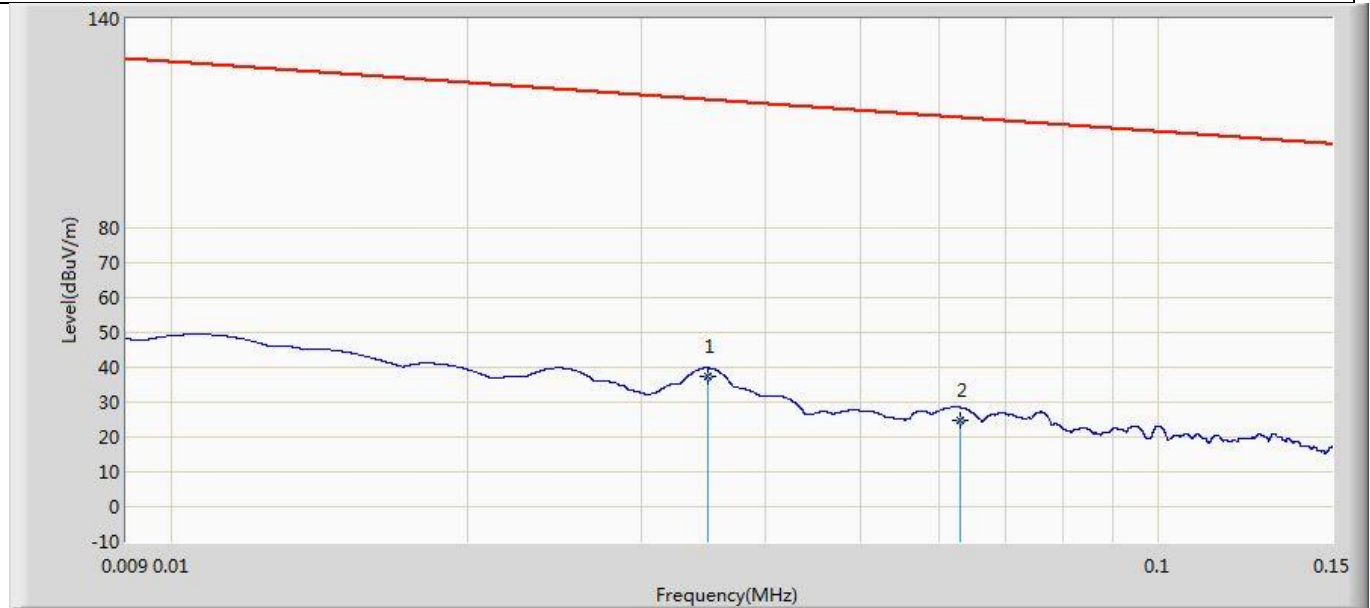
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		352.525	35.465	12.268	-10.535	46.000	23.197	QP
2		379.685	34.365	9.964	-11.635	46.000	24.400	QP
3		406.845	36.569	11.177	-9.431	46.000	25.392	QP
4	*	433.884	43.685	17.430	-2.315	46.000	26.254	QP
5		461.044	40.645	13.787	-5.355	46.000	26.857	QP
6		488.204	36.596	8.567	-9.404	46.000	28.029	QP
7		515.364	33.465	5.656	-12.535	46.000	27.809	QP

Profile: 2210462R	Page No.: 7
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 13:26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Vertical
EUT: ELECTRONIC CODE SWITCH	Power: DC 48V
Note: Mode 1: Transmit at 13.56MHz by NFC	



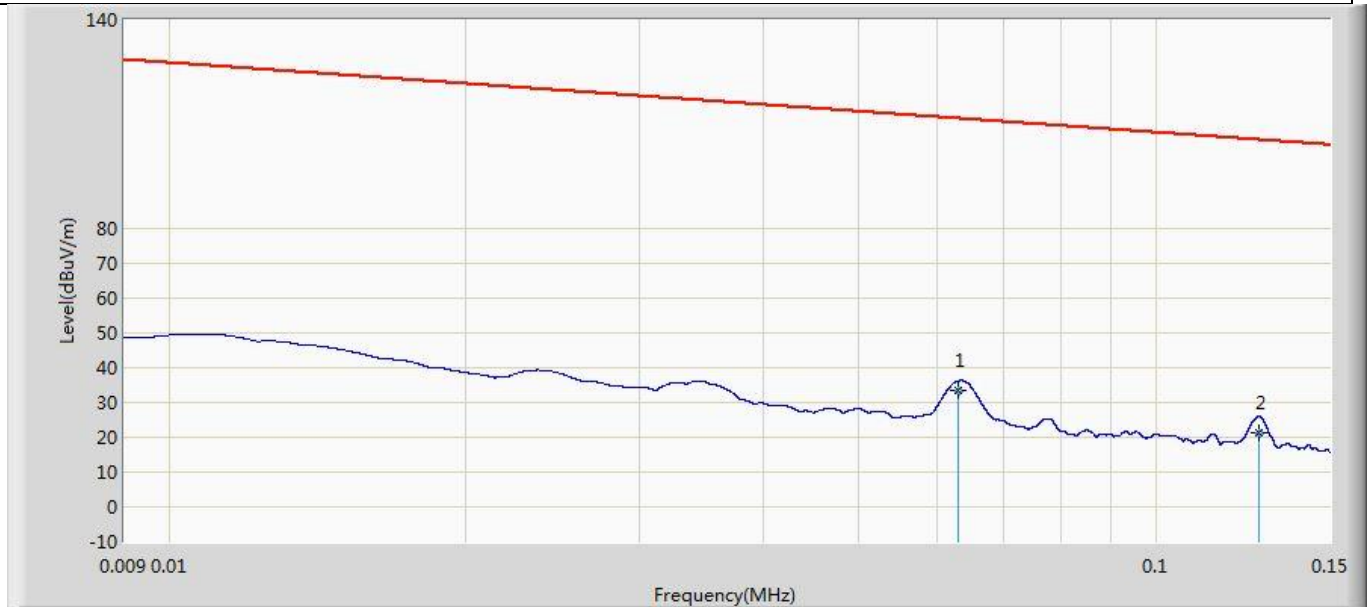
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		352.525	29.569	4.568	-16.431	46.000	25.001	QP
2		433.884	35.646	9.592	-10.354	46.000	26.053	QP
3	*	461.044	35.684	9.359	-10.316	46.000	26.324	QP
4		515.242	33.466	7.347	-12.534	46.000	26.119	QP
5		542.403	34.485	7.671	-11.515	46.000	26.814	QP
6		623.761	33.485	5.720	-12.515	46.000	27.765	QP
7		650.921	34.654	5.819	-11.346	46.000	28.834	QP
8		677.960	35.465	5.804	-10.535	46.000	29.661	QP

Profile: 2210462R	Page No.: 3
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 10:53
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Horizontal
EUT: ELECTRONIC CODE SWITCH	Power: DC 96V
Note: Mode 1: Transmit at 13.56MHz by NFC	



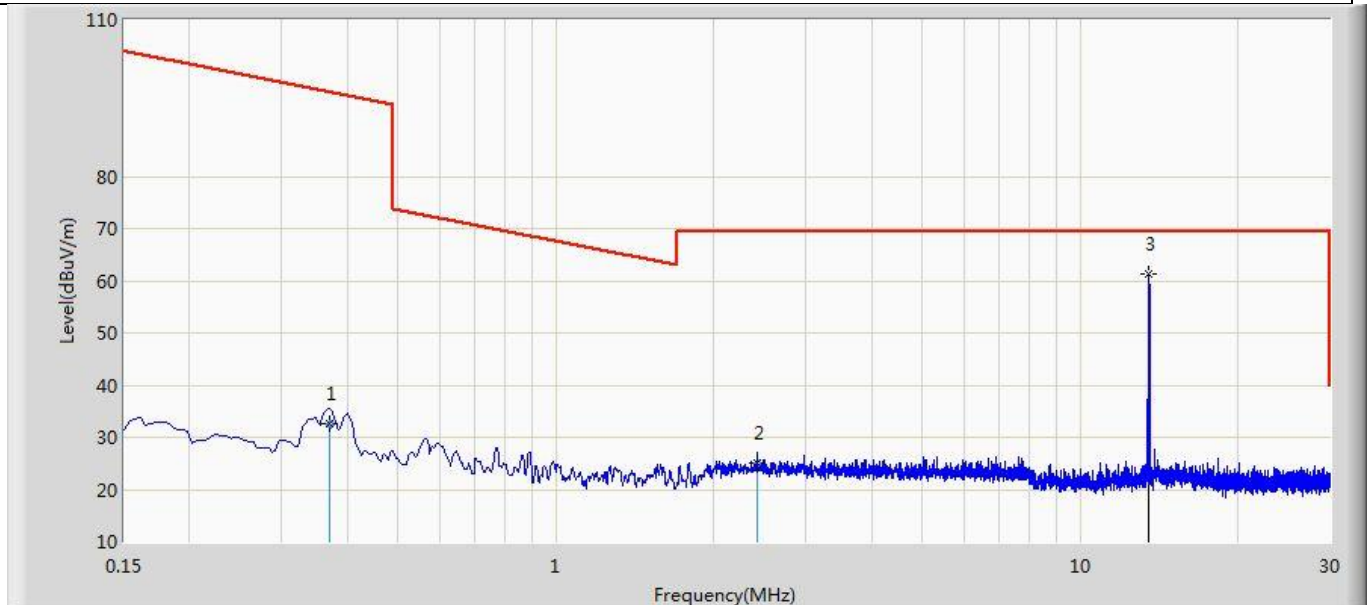
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	0.035	37.485	15.659	-79.225	116.710	21.826	QP
2		0.063	24.968	3.041	-86.639	111.607	21.927	QP

Profile: 2210462R	Page No.: 4
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 10:53
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Vertical
EUT: ELECTRONIC CODE SWITCH	Power: DC 96V
Note: Mode 1: Transmit at 13.56MHz by NFC	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	0.063	33.485	12.058	-78.122	111.607	21.427	QP
2		0.127	21.468	0.113	-84.054	105.521	21.355	QP

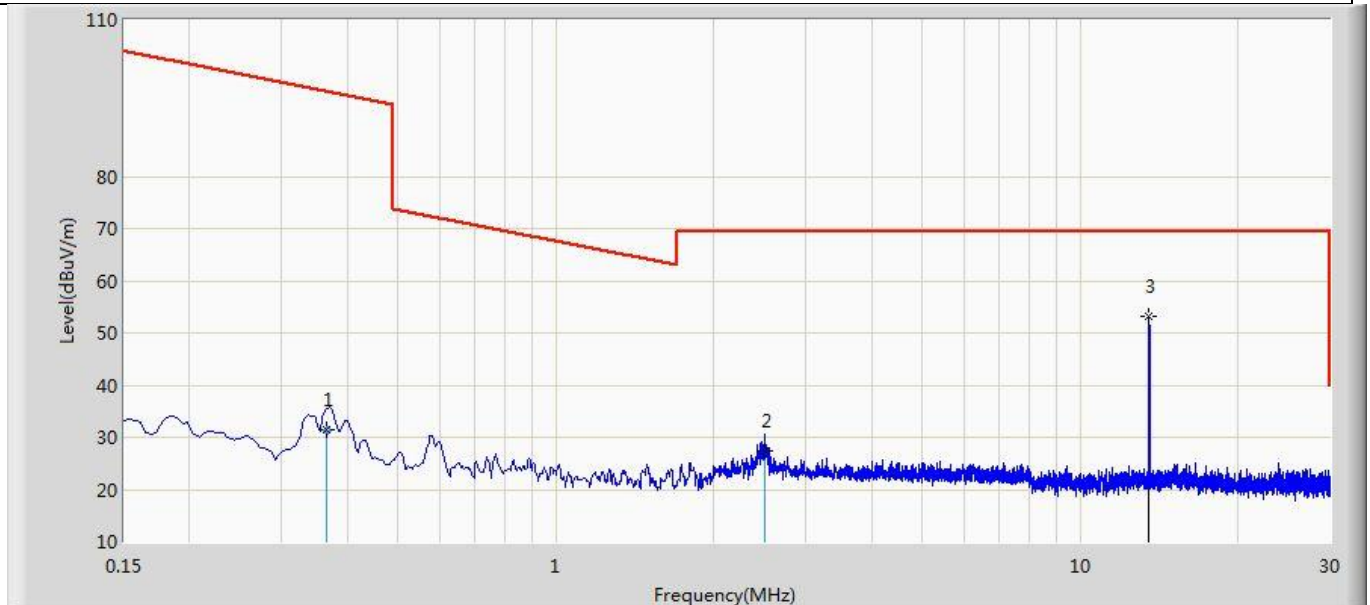
Profile: 2210462R	Page No.: 5
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 10:53
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Horizontal
EUT: ELECTRONIC CODE SWITCH	Power: DC 96V
Note: Mode 1: Transmit at 13.56MHz by NFC	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.370	32.468	10.880	-63.771	96.239	21.588	QP
2		2.422	24.987	4.138	-44.513	69.500	20.849	QP
3	*	13.564	61.235	40.141	-8.265	69.500	21.094	QP

Note: The Mark 3 is the fundamental emission.

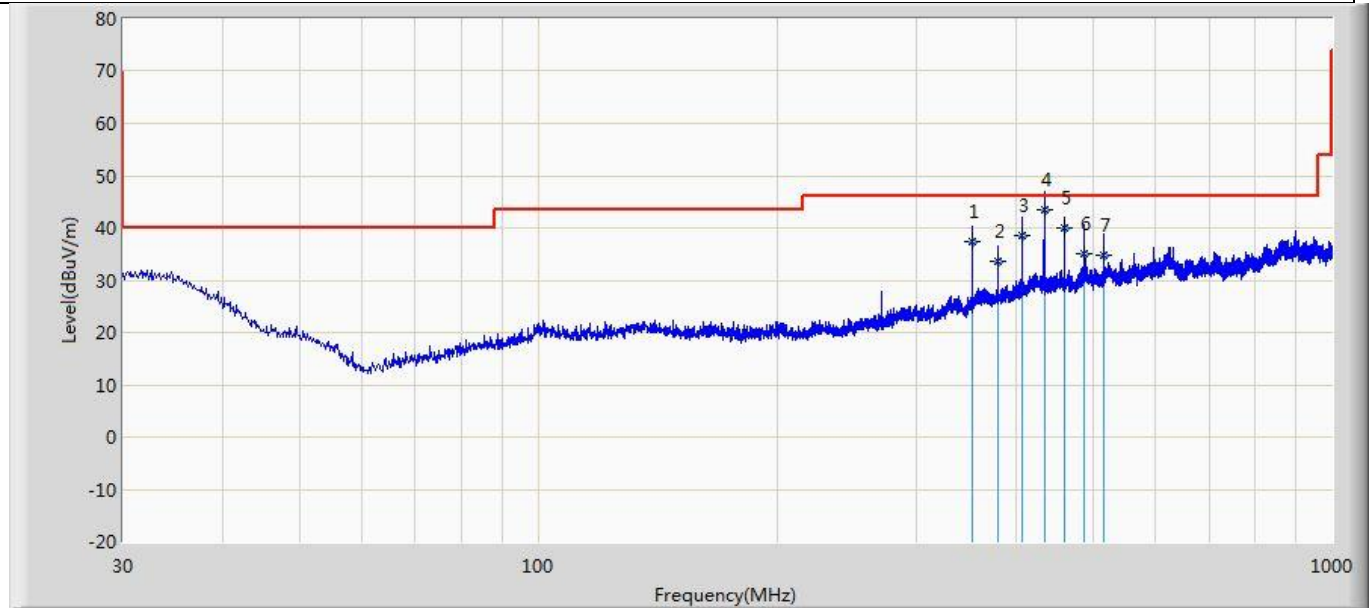
Profile: 2210462R	Page No.: 6
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 10:53
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: RF(0.009-30MHz)	Polarity: Vertical
EUT: ELECTRONIC CODE SWITCH	Power: DC 96V
Note: Mode 1: Transmit at 13.56MHz by NFC	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.366	31.466	10.373	-64.867	96.333	21.093	QP
2		2.497	27.465	7.124	-42.035	69.500	20.341	QP
3	*	13.560	53.221	32.627	-16.279	69.500	20.594	QP

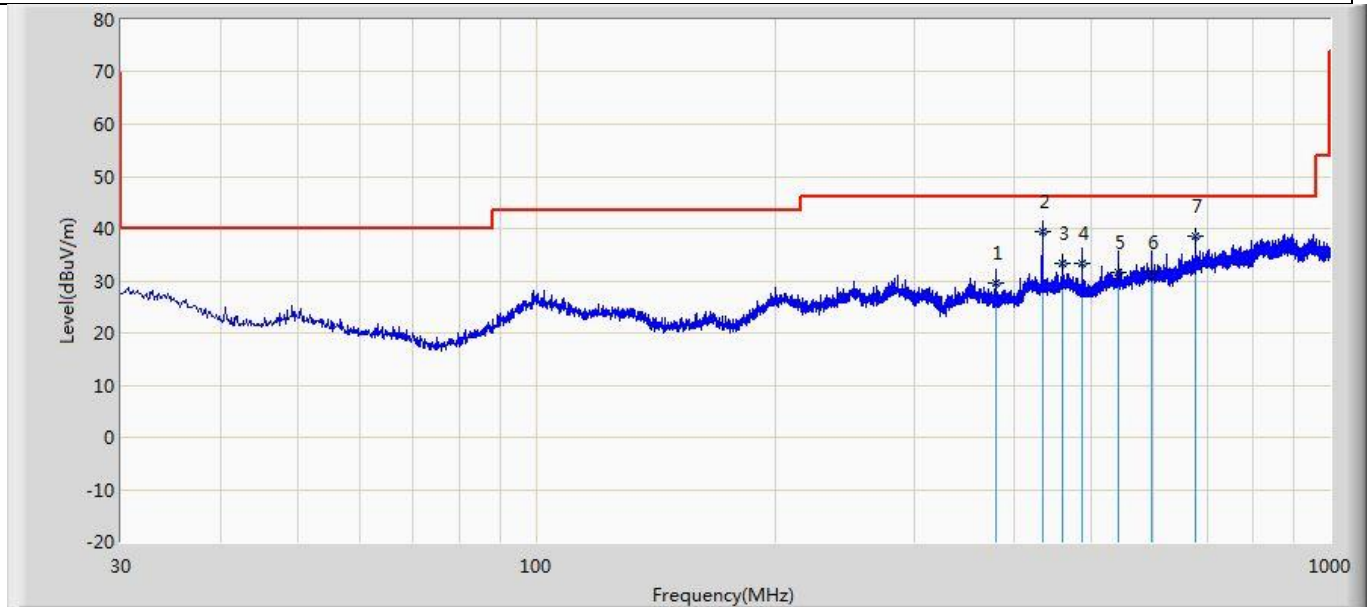
Note: The Mark 3 is the fundarmental emission.

Profile: 2210462R	Page No.: 8
Engineer: Neil	
Site: AC2	Time: 2022/02/22 - 13:23
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Horizontal
EUT: ELECTRONIC CODE SWITCH #5	Power: DC 96V
Note: Mode 1: Transmit at 13.56MHz by NFC	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		352.525	37.465	14.268	-8.535	46.000	23.197	QP
2		379.685	33.745	9.344	-12.255	46.000	24.400	QP
3		406.724	38.465	13.083	-7.535	46.000	25.382	QP
4	*	433.884	43.453	17.198	-2.547	46.000	26.254	QP
5		461.044	39.856	12.998	-6.144	46.000	26.857	QP
6		488.204	35.164	7.135	-10.836	46.000	28.029	QP
7		515.242	34.687	6.892	-11.313	46.000	27.795	QP

Profile: 2210462R	Page No.: 9
Engineer:	
Site: AC2	Time: 2022/02/22 - 13:26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Vertical
EUT: ELECTRONIC CODE SWITCH #5	Power: DC 96V
Note: Mode 1: Transmit at 13.56MHz by NFC	

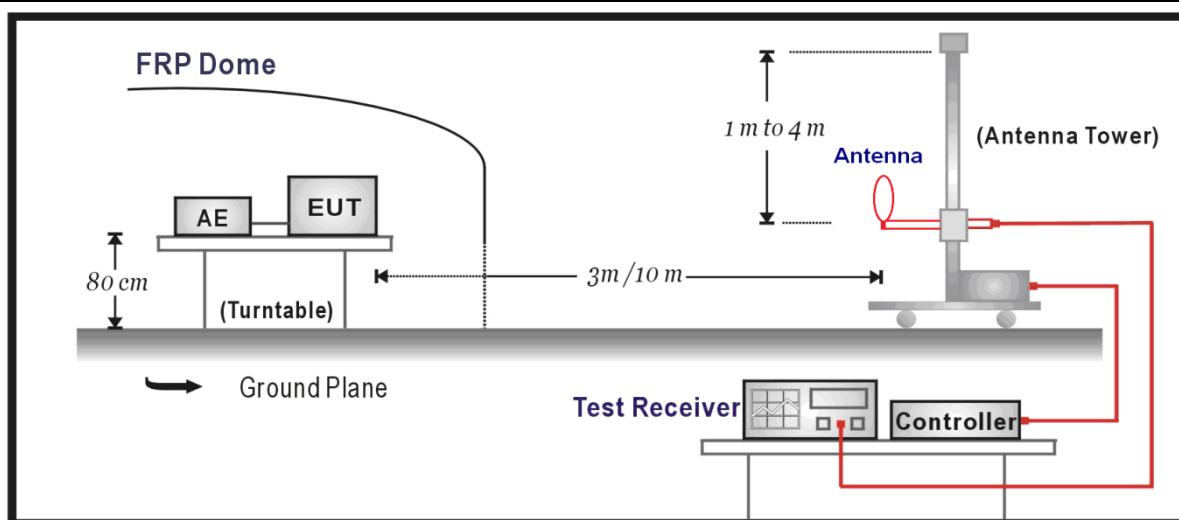


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		379.685	29.468	6.167	-16.532	46.000	23.301	QP
2	*	433.884	39.452	13.398	-6.548	46.000	26.053	QP
3		461.044	33.468	7.143	-12.532	46.000	26.324	QP
4		488.204	33.468	8.153	-12.532	46.000	25.315	QP
5		542.403	31.458	4.644	-14.542	46.000	26.814	QP
6		596.601	31.456	3.946	-14.544	46.000	27.510	QP
7		677.960	38.505	8.844	-7.495	46.000	29.661	QP

4.4 Emission bandwidth**VERDICT: PASS****4.4.1 Limit****Standard**

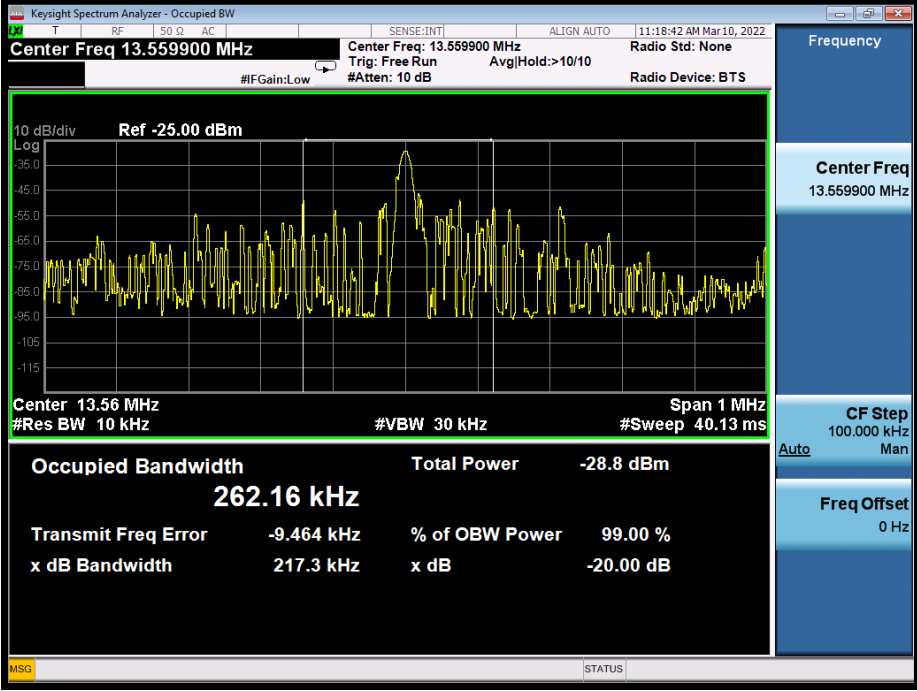
FCC Part 15 Subpart C Paragraph 15.215

Within the band.

4.4.2 Test Setup**4.4.3 Test Procedure**

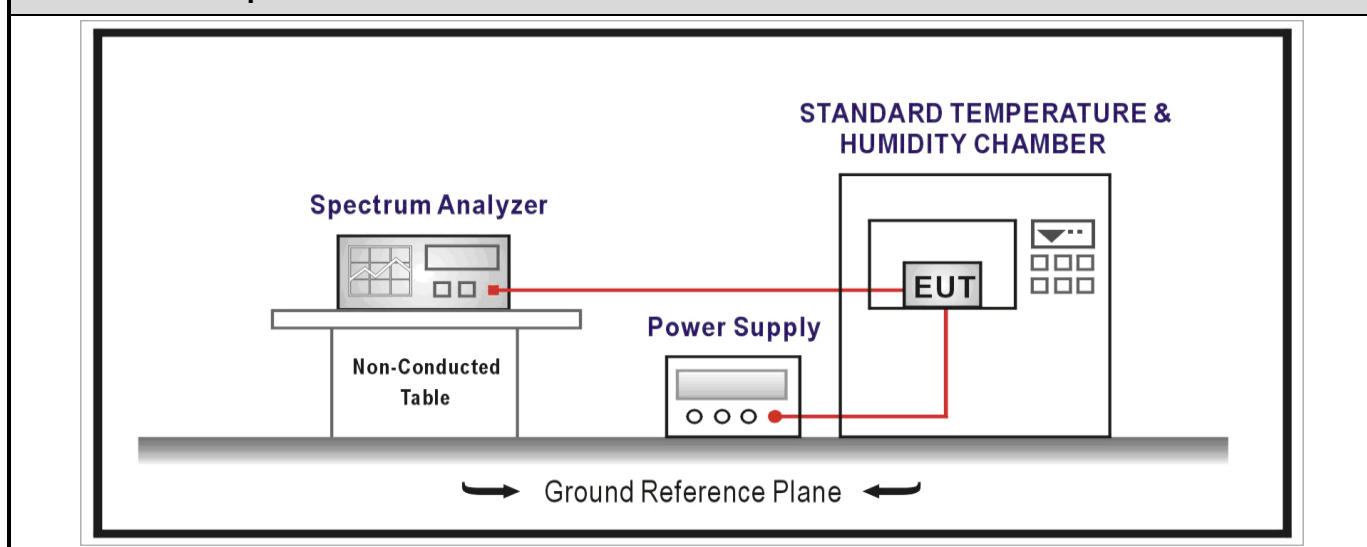
	Reference Rule	Chapter	Description
☒	ANSI C63.10	6.9.2	Occupied bandwidth—relative measurement procedure

4.4.4 Test Data

Frequency (MHz)	Frequency Range Limit (MHz)	Result
13.56	13.553 ~ 13.567	Pass
		

4.5 Frequency Stability**VERDICT: PASS****4.5.1 Limit:**

Standard	FCC Part 15 Subpart C Paragraph 15.225(e)
☒	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.

4.5.2 Test Setup**4.5.3 Test Procedure**

	References Rule	Chapter	Description
☒	ANSI C63.10	6.8	Frequency stability tests
☒	ANSI C63.10	6.8.1	Frequency stability with respect to ambient temperature
☒	ANSI C63.10	6.8.2	Frequency stability when varying supply voltage

4.5.4 Test Data**Frequency Stability under Temperature at 0min**

Temperature Interval (°C)	Test Frequency (MHz)	Deviation (Hz)	Limit (ppm)
0	13.56	0	±100
10	13.56	0	±100
20	13.56	0	±100
30	13.56	0	±100
35	13.56	0	±100

Frequency Stability under Temperature at 2min

Temperature Interval (°C)	Test Frequency (MHz)	Deviation (Hz)	Limit (ppm)
0	13.56	0	±100
10	13.56	0	±100
20	13.56	0	±100
30	13.56	0	±100
35	13.56	0	±100

Frequency Stability under Temperature at 5min

Temperature Interval (°C)	Test Frequency (MHz)	Deviation (Hz)	Limit (ppm)
0	13.56	0	±100
10	13.56	0	±100
20	13.56	0	±100
30	13.56	0	±100
35	13.56	0	±100

Frequency Stability under Temperature at 10min

Temperature Interval (°C)	Test Frequency (MHz)	Deviation (Hz)	Limit (ppm)
0	13.56	0	±100
10	13.56	0	±100
20	13.56	0	±100
30	13.56	0	±100
35	13.56	0	±100

Frequency Stability under Voltage			
DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Limit (ppm)
2.55	13.56	0	±100
3.00	13.56	0	±100
3.45	13.56	0	±100

4.6 Antenna Requirement**VERDICT: PASS****4.6.1 Limit:**

Standard	FCC Part 15 Subpart E Paragraph 15.203
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	

4.6.2 Antenna Connector Construction:

- | | |
|-------------------------------------|--|
| ☒ | The use of a permanently attached antenna |
| ☐ | The antenna use of a unique coupling to the intentional radiator |
| ☐ | The use of a nonstandard antenna jack or electrical connector |

Please refer to the attached document "Internal Photograph" to show the antenna connector.



5 TEST SETUP PHOTO AND EUT PHOTO	VERDICT: PASS
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Remark: The test setup photo and EUT Photo please see appendix.

_____ The End _____