

FCC Test Report

FCC ID : 2AJ7M-MN1H
Equipment : Air Mini(+)
Brand Name : Molekule
Model Name : MN1H-US , MN1L-US
Applicant : Molekule Inc.
1301 Folsom St. San Francisco CA 94103 United States Of America
Manufacturer 1 : Inventec Appliances(Pudong)Corporation
NO.789 Puxing Road Shanghai N/A China
Manufacturer 2 : Scope Manufacturers (M) Sdn. Bhd.
Lot 6181, Jalan Perusahaan 2, Kawasan Perindustrian Parit Buntar, 34200 Parit Buntar, Perak Darul Ridzuan, Malaysia
Standard : 47 CFR FCC Part 15.225

The product was received on Oct. 20, 2020, and testing was started from Oct. 29, 2020 and completed on Nov. 10, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.



Approved by: Allen Lin

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

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History of this test report

[illegible]

Summary of Test Result

Report Clause	Ref. Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.207	AC Power-line Conducted Emissions	PASS	-
3.2	15.215(c)	Emission Bandwidth	PASS	-
3.3	15.225(a)~(d)	Field Strength of Fundamental Emissions and Spectrum Mask	PASS	-
3.4	15.225(d)	Transmitter Radiated Unwanted Emissions	PASS	-
3.5	15.225(e)	Frequency Stability	PASS	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and explanations:

None

Reviewed by: Sam Tsai
Report Producer: Debby Hung

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information					
Frequency Range(MHz)	Modulation Mode	Mode	Ch. Frequency (MHz)	Channel Number	Field Strength (dBuV/m)
13.553 – 13.567	ASK	NFC	13.56	1	70.17

Note :

- ♦ Field strength performed peak level at 3m.
- ♦ Uses a ASK modulation.

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector
1	-	-	Loop antenna	N/A

1.1.3 EUT Information

Operational Condition	
EUT Power Type	From Switching Power Supply
Type of EUT	
☒	Stand-alone
☐	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.:
☐	Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.:
☐	Other:

1.1.4 Test Signal Duty Cycle

Duty Cycle Operation Restriction			
The transmitter is used for		The transmitter is operated	
☒	Inductive applications	☒	Automatically triggered
☐	Duty cycle fixed mode	☒	Duty cycle random mode

1.1.5 Table for Multiple Listing

The brand/model names in the following table are all refer to the identical product.

Brand Name	Model Name	Description
Molekule	MN1H-US	All the models are identical, the difference model for difference brand served as marketing strategy.
Molekule	MN1L-US	

1.2 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2013

The following reference test guidance is not within the scope of accreditation of TAF:

- KDB 414788 D01 v01r01

1.3 Testing Location Information

Testing Location			
☒	HWA YA	ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)	
		TEL : 886-3-327-3456	FAX : 886-3-327-0973
Test site Designation No. TW1190 with FCC.			

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
AC Conduction	TH01-HY	Barry	24.1~26.5°C / 53~61%	29/Oct/2020
RF Conducted	CO04-HY	Edward	22.5~24.3°C/56~63%	04/Nov/2020
Radiated Emission	03CH02-HY	Daniel	20.7~25.4°C /54~69%	09/Nov/2020~10/Nov/2020

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	0.9 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	2.4 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.7 dB	Confidence levels of 95%
Conducted Emission	1.0 dB	Confidence levels of 95%
Temperature	0.41 °C	Confidence levels of 95%
Humidity	3.4 %	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Condition

Condition Item	Abbreviation/Remark	Remark
TnomVnom	Tnom	20°C
-	Vnom	120V
Freq. Stability	Abbreviation	Remark
-20°C	-	-
-10°C	-	-
0°C	-	-
10°C	-	-
20°C	-	-
30°C	-	-
40°C	-	-
50°C	-	-
20°C-138V	-	-
20°C-120V	-	-
20°C-102V	-	-

2.2 Test Channel Mode

Test Software Version	DoS 6.1
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Mode	Power Setting
NFC	-
13.56MHz	default

2.3 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral
Operating Mode	CTX
	Switching Power Supply mode

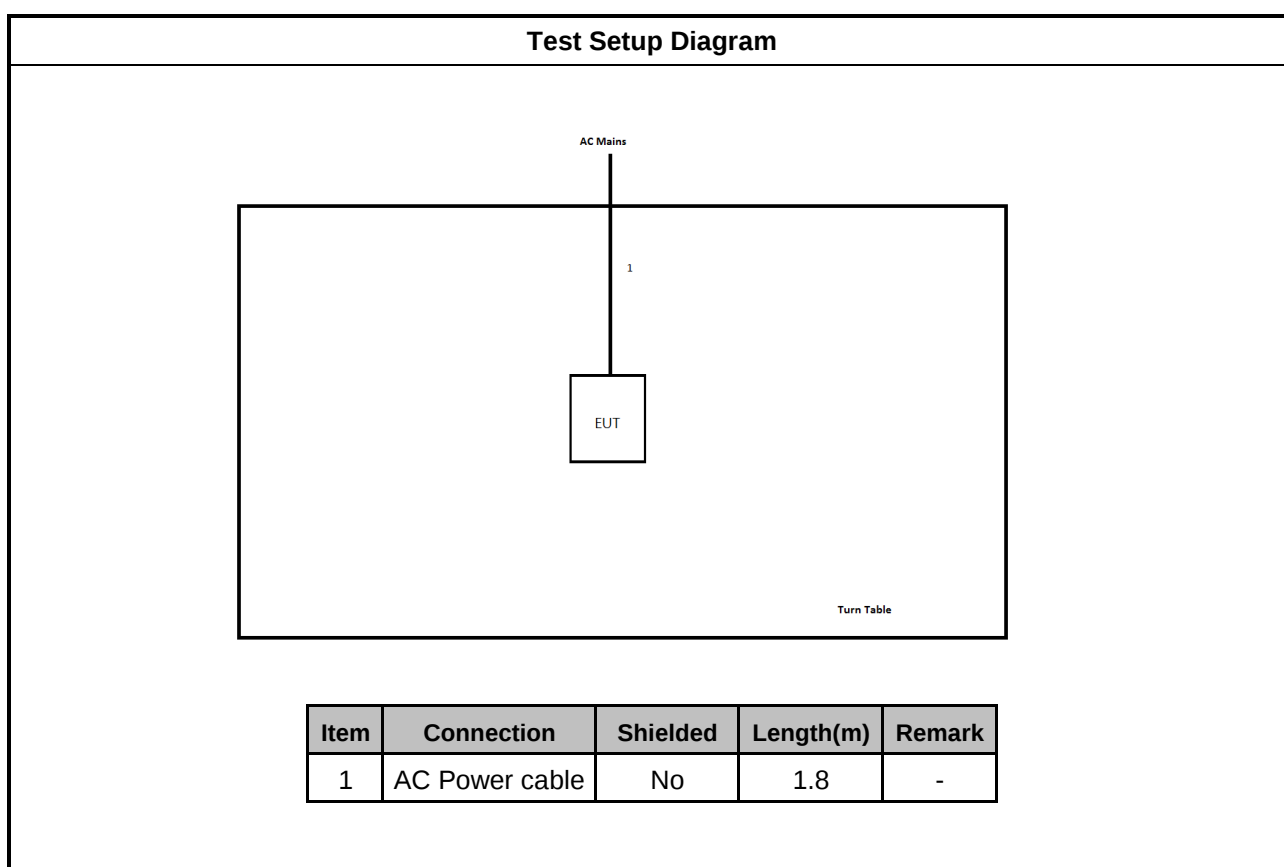
The Worst Case Mode for Following Conformance Tests	
Tests Item	Emission Bandwidth, Frequency Stability
Test Condition	Conducted measurement

The Worst Case Mode for Following Conformance Tests	
Tests Item	Field Strength of Fundamental Emissions Spectrum Mask, Transmitter Radiated Unwanted Emissions
Test Condition	Radiated measurement
Operating Mode	CTX
	Switching Power Supply mode
Orthogonal Planes of EUT	Z Plane
	
Worst Planes of EUT	V

2.4 Support Equipment

Support Equipment – Conducted					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
1	Notebook	DELL	E5410	-	-
2	Adapter for NB	DELL	HA65NM130	-	-
3	AC Power Source	GW	APS-9102	-	-

2.5 Test Setup Diagram



Note: The EUT transmits RF signal continuously by itself

3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

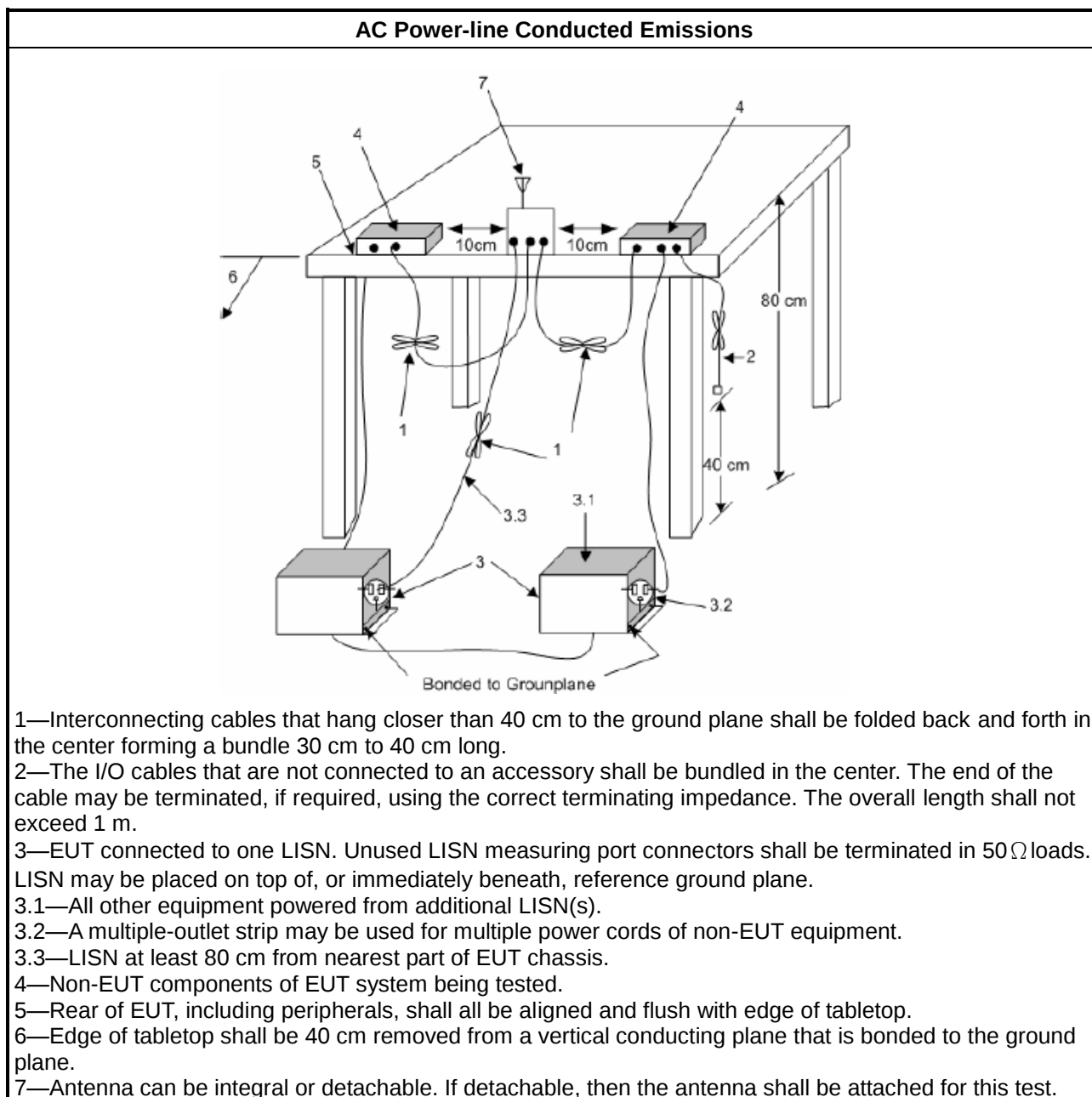
Test Method	
☒	Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.
☒	If AC conducted emissions fall in operating band, then following below test method confirm final result.
☐	Accept measurements done with a suitable dummy load replacing the antenna under the following conditions: (1) Perform the AC line conducted tests with the antenna connected to determine compliance with FCC 15.207 limits outside the transmitter's fundamental emission band; (2) Retest with a dummy load to determine compliance with FCC 15.207 limits within the transmitter's fundamental emission band.
☒	For a device with a permanent antenna operating at or below 30 MHz, accept measurements done with a suitable dummy load, in lieu of the permanent antenna under the following conditions: (1) Perform the AC line conducted tests with the permanent antenna to determine compliance with the FCC 15.207 limits outside the transmitter's fundamental emission band; (2) Retest with a dummy load in lieu of the permanent antenna to determine compliance with the FCC 15.207 limits within the transmitter's fundamental emission band.

3.1.4 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Raw(Read Level) + LISN(LISN Factor) + CL(Cable Loss) + AT(Attenuator).

3.1.5 Test Setup



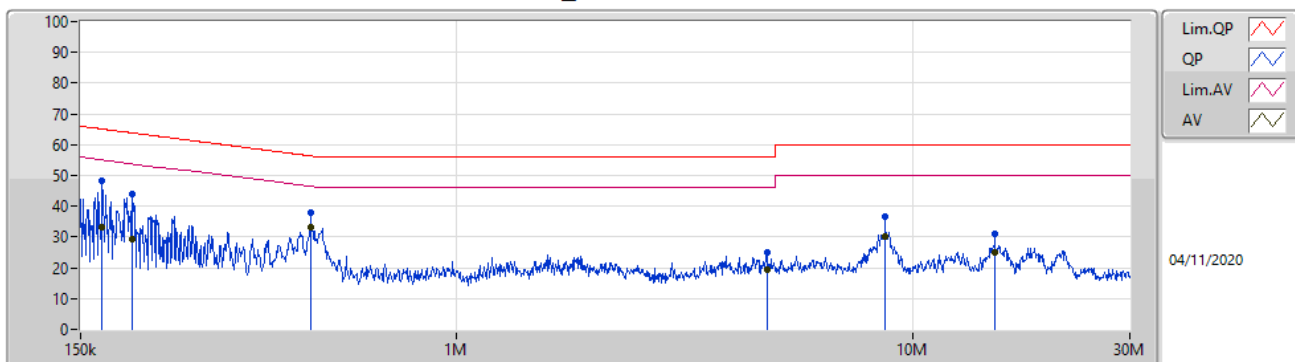
3.1.6 Test Result of AC Power-line Conducted Emissions

Summary

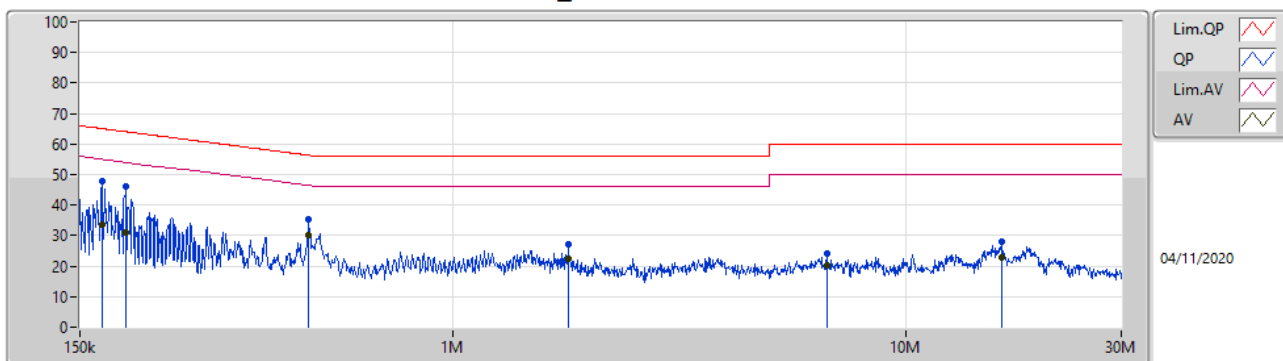
Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	AV	481.211k	33.01	46.33	-13.32	Line

Mode Configure

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition	Comments
Mode 1	Pass	QP	167.071k	48.13	65.10	-16.97	Line	-
Mode 1	Pass	AV	167.071k	33.22	55.10	-21.88	Line	-
Mode 1	Pass	QP	195.216k	43.97	63.80	-19.83	Line	-
Mode 1	Pass	AV	195.216k	29.25	53.80	-24.55	Line	-
Mode 1	Pass	QP	481.211k	37.97	56.33	-18.36	Line	-
Mode 1	Pass	AV	481.211k	33.01	46.33	-13.32	Line	"Worst"
Mode 1	Pass	QP	4.797M	25.08	56.00	-30.92	Line	-
Mode 1	Pass	AV	4.797M	19.32	46.00	-26.68	Line	-
Mode 1	Pass	QP	8.695M	36.64	60.00	-23.36	Line	-
Mode 1	Pass	AV	8.695M	30.19	50.00	-19.81	Line	-
Mode 1	Pass	QP	15.205M	30.92	60.00	-29.08	Line	-
Mode 1	Pass	AV	15.205M	25.06	50.00	-24.94	Line	-
Mode 1	Pass	QP	168.41k	47.99	65.04	-17.05	Neutral	-
Mode 1	Pass	AV	168.41k	33.50	55.04	-21.54	Neutral	-
Mode 1	Pass	QP	189.837k	46.13	64.05	-17.92	Neutral	-
Mode 1	Pass	AV	189.837k	30.84	54.05	-23.21	Neutral	-
Mode 1	Pass	QP	481.211k	35.26	56.33	-21.07	Neutral	-
Mode 1	Pass	AV	481.211k	30.16	46.33	-16.17	Neutral	"Worst"
Mode 1	Pass	QP	1.797M	27.27	56.00	-28.73	Neutral	-
Mode 1	Pass	AV	1.797M	22.55	46.00	-23.45	Neutral	-
Mode 1	Pass	QP	6.708M	24.03	60.00	-35.97	Neutral	-
Mode 1	Pass	AV	6.708M	20.17	50.00	-29.83	Neutral	-
Mode 1	Pass	QP	16.338M	27.94	60.00	-32.06	Neutral	-
Mode 1	Pass	AV	16.338M	22.66	50.00	-27.34	Neutral	-

Conducted Emissions at Powerline_Mode 1


Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)			
QP	167.071k	48.13	65.10	-16.97	19.52	Line	-	28.61	9.61	0.01	9.90			
AV	167.071k	33.22	55.10	-21.88	19.52	Line	-	13.70	9.61	0.01	9.90			
QP	195.216k	43.97	63.80	-19.83	19.51	Line	-	24.46	9.60	0.01	9.90			
AV	195.216k	29.25	53.80	-24.55	19.51	Line	-	9.74	9.60	0.01	9.90			
QP	481.211k	37.97	56.33	-18.36	19.51	Line	-	18.46	9.60	0.03	9.88			
AV	481.211k	33.01	46.33	-13.32	19.51	Line	"Worst"	13.50	9.60	0.03	9.88			
QP	4.797M	25.08	56.00	-30.92	19.69	Line	-	5.39	9.65	0.14	9.90			
AV	4.797M	19.32	46.00	-26.68	19.69	Line	-	-0.37	9.65	0.14	9.90			
QP	8.695M	36.64	60.00	-23.36	19.81	Line	-	16.83	9.71	0.20	9.90			
AV	8.695M	30.19	50.00	-19.81	19.81	Line	-	10.38	9.71	0.20	9.90			
QP	15.205M	30.92	60.00	-29.08	19.86	Line	-	11.06	9.71	0.25	9.90			
AV	15.205M	25.06	50.00	-24.94	19.86	Line	-	5.20	9.71	0.25	9.90			

Conducted Emissions at Powerline_Mode 1


Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)			
QP	168.41k	47.99	65.04	-17.05	19.52	Neutral	-	28.47	9.61	0.01	9.90			
AV	168.41k	33.50	55.04	-21.54	19.52	Neutral	-	13.98	9.61	0.01	9.90			
QP	189.837k	46.13	64.05	-17.92	19.51	Neutral	-	26.62	9.60	0.01	9.90			
AV	189.837k	30.84	54.05	-23.21	19.51	Neutral	-	11.33	9.60	0.01	9.90			
QP	481.211k	35.26	56.33	-21.07	19.51	Neutral	-	15.75	9.60	0.03	9.88			
AV	481.211k	30.16	46.33	-16.17	19.51	Neutral	"Worst"	10.65	9.60	0.03	9.88			
QP	1.797M	27.27	56.00	-28.73	19.50	Neutral	-	7.77	9.62	0.08	9.80			
AV	1.797M	22.55	46.00	-23.45	19.50	Neutral	-	3.05	9.62	0.08	9.80			
QP	6.708M	24.03	60.00	-35.97	19.78	Neutral	-	4.25	9.71	0.17	9.90			
AV	6.708M	20.17	50.00	-29.83	19.78	Neutral	-	0.39	9.71	0.17	9.90			
QP	16.338M	27.94	60.00	-32.06	19.98	Neutral	-	7.96	9.82	0.26	9.90			
AV	16.338M	22.66	50.00	-27.34	19.98	Neutral	-	2.68	9.82	0.26	9.90			

3.2 Emission Bandwidth

3.2.1 Emission Bandwidth Limit

20dB Bandwidth Limit	
☒	Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (13.553 – 13.567).

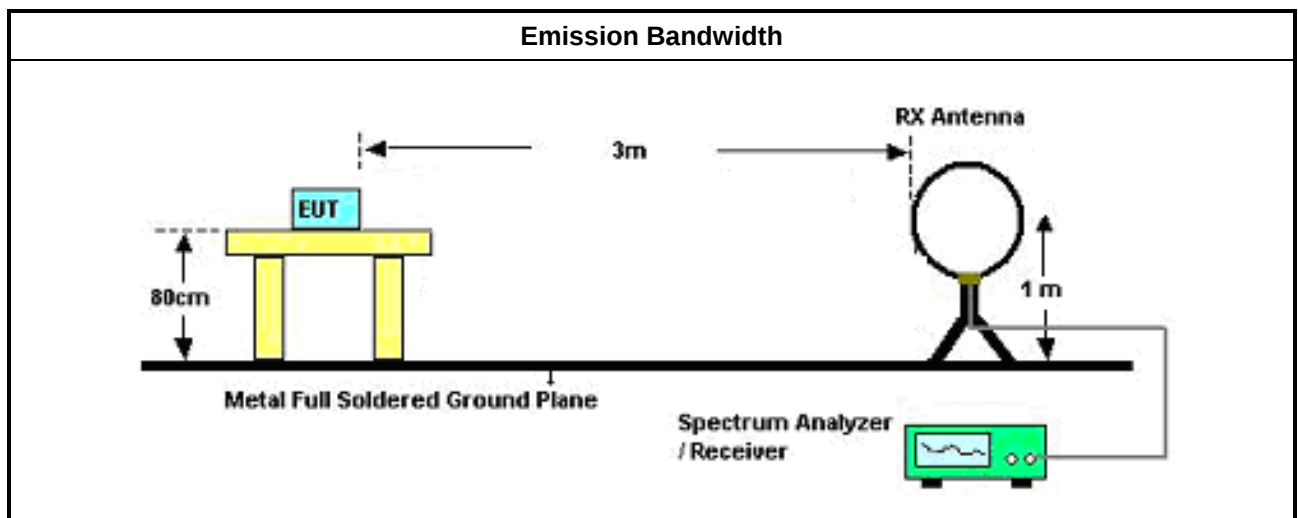
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

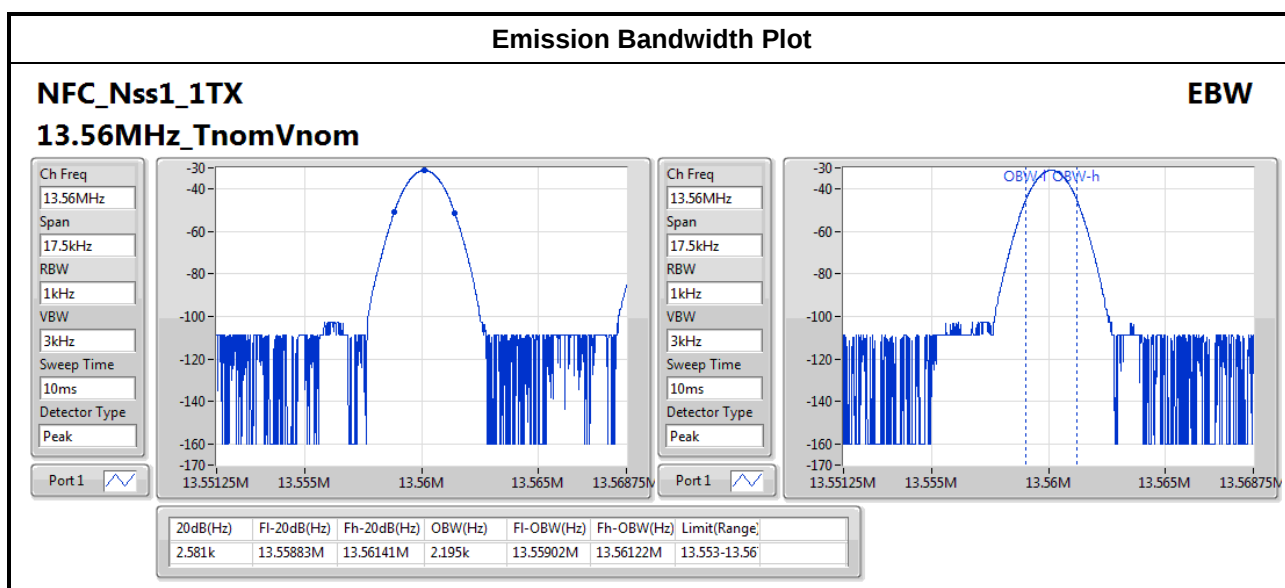
Test Method	
☒	Because the measured signal is CW or CW-like adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.
☒	For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level.

3.2.4 Test Setup



3.2.5 Test Result of Emission Bandwidth

Occupied Channel Bandwidth Result					
Modulation Mode	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)	F _L at 20dB BW (MHz)	F _H at 20dB BW (MHz)
ASK	13.56	2.581	2.195	13.55883	13.56141
Limit		N/A	N/A	13.553	13.567
Result		Complied			



3.3 Field Strength of Fundamental Emissions and Spectrum Mask

3.3.1 Field Strength of Fundamental Emissions and Spectrum Mask Limit

Field Strength of Fundamental Emissions For FCC					
Emissions	(uV/m)@30m	(dBuV/m)@30m	(dBuV/m)@10m	(dBuV/m)@3m	(dBuV/m)@1m
fundamental	15848	84.0	103.1	124.0	143.1
Quasi peak measurement of the fundamental.					

Spectrum Mask For FCC					
Freq. of Emission (MHz)	(uV/m)@30m	(dBuV/m)@30m	(dBuV/m)@10m	(dBuV/m)@3m	(dBuV/m)@1m
1.705~13.110	30	29.5	48.6	69.5	88.6
13.110~13.410	106	40.5	59.6	80.5	99.6
13.410~13.553	334	50.5	69.6	90.5	109.6
13.553~13.567	15848	84.0	103.1	124.0	143.1
13.567~13.710	334	50.5	69.6	90.5	109.6
13.710~14.010	106	40.5	59.6	80.5	99.6
14.010~30.000	30	29.5	48.6	69.5	88.6

3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

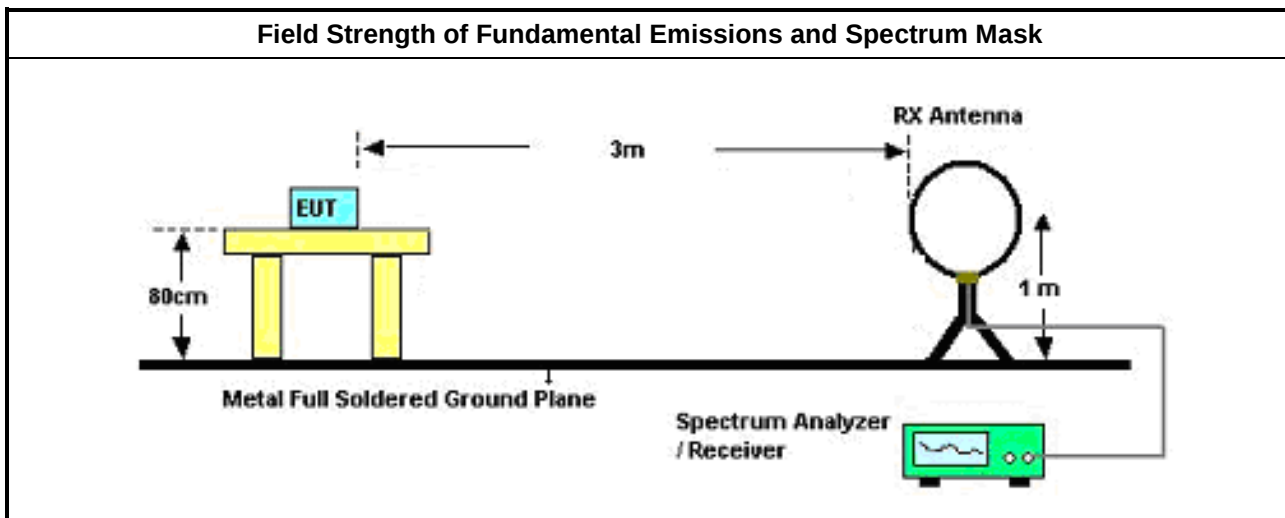
Test Method	
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.
☒	At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; however, an attempt should be made to avoid making measurements 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 following below methods.
☐	The results shall be extrapolated to the specified distance by making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor.
☒	The results shall be by using the square of an inverse linear distance extrapolation factor (40 dB/decade).
☒	For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level.

3.3.4 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Raw(Read Level) + AF(Antenna Factor) + CL(Cable Loss) - PA(Preamplifier Factor).

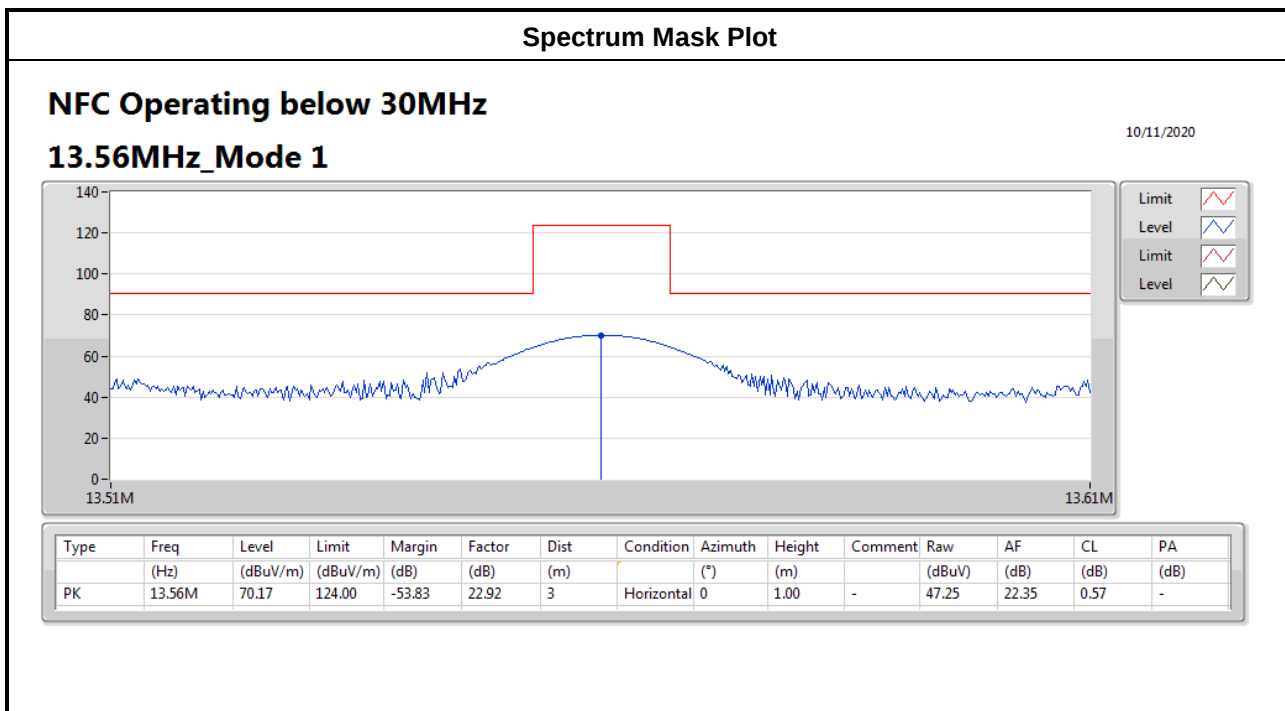
3.3.5 Test Setup



3.3.6 Test Result of Field Strength of Fundamental Emissions and Spectrum Mask

Field Strength of Fundamental Emissions Result					
Modulation Mode	Frequency (MHz)	Fundamental (dBuV/m)@3m	Polarization	Margin (dB)	Limit (dBuV/m)@3m
ASK	13.56	70.17	H	53.83	124.00
Result		Complied			

Note 1: Measurement worst emissions of receive antenna polarization: H(Horizontal).



3.4 Transmitter Radiated Unwanted Emissions

3.4.1 Transmitter Radiated Unwanted Emissions Limit

Transmitter Radiated Unwanted Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. 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 of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more 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). The test report shall specify the extrapolation method used to determine compliance of the EUT.

3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

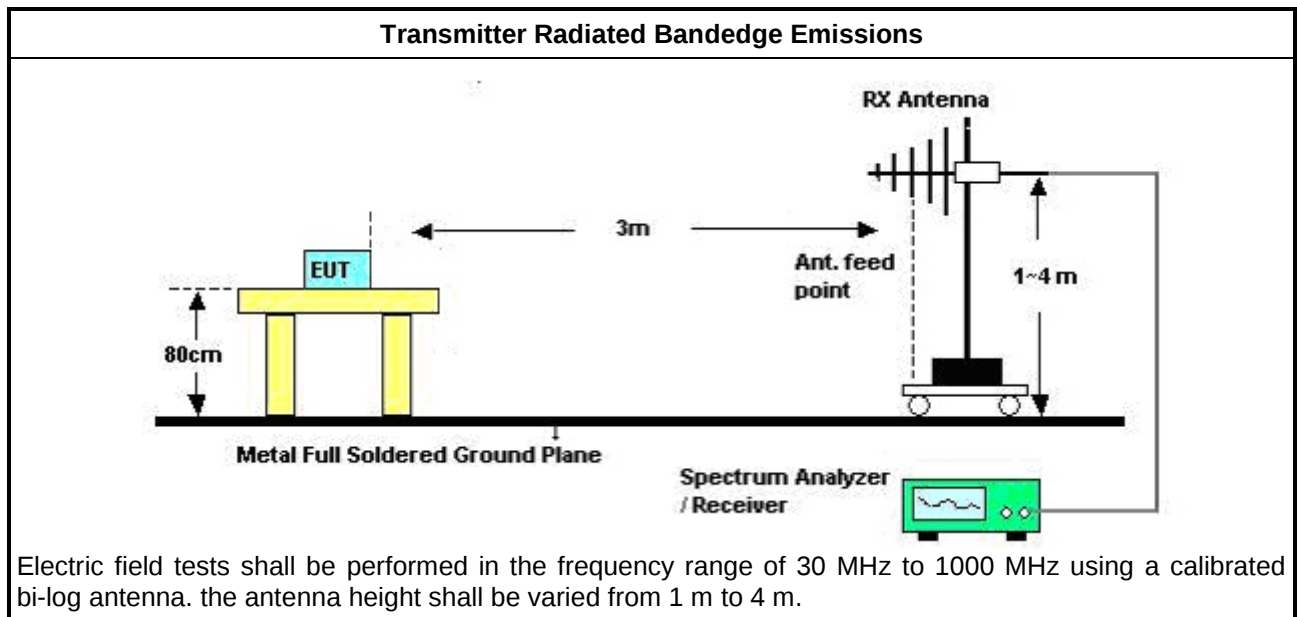
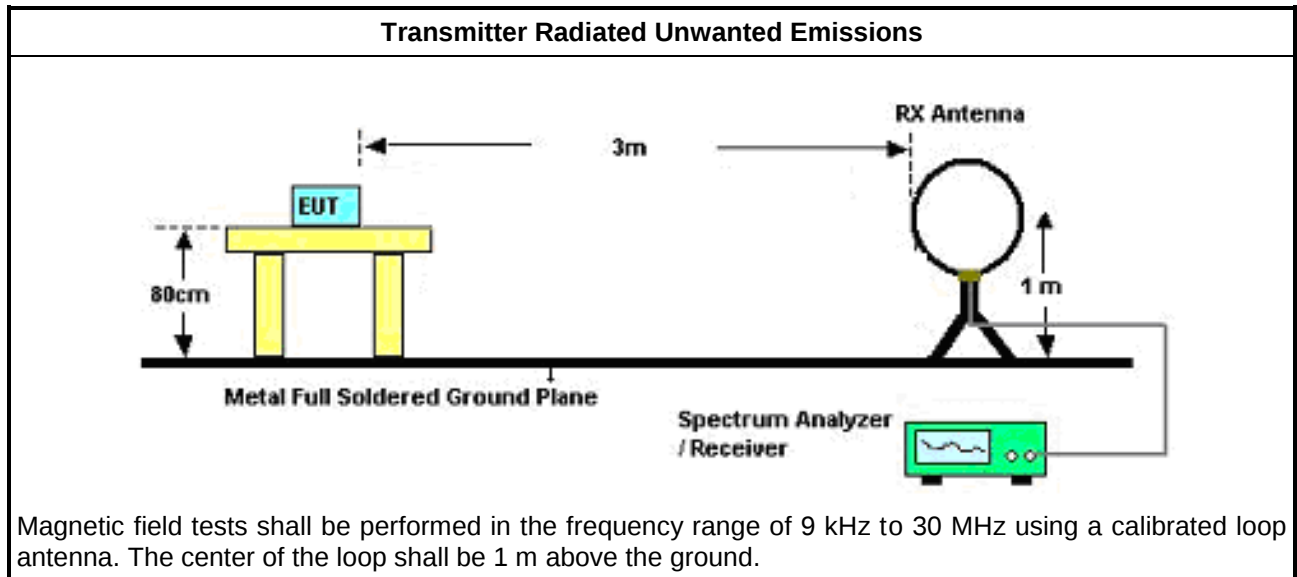
Test Method	
☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1 GHz and test distance is 3m.
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.
☒	At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; 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 following below methods.
☐	The results shall be extrapolated to the specified distance by making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor.
☒	The results shall be by using the square of an inverse linear distance extrapolation factor (40 dB/decade).
☒	For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level.
☒	The any unwanted emissions level shall not exceed the fundamental emission level.
☒	All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.
☒	KDB 414788 D01 v01r01 Open-Field Test Sites and Chamber Correlation Justification.
☐	Based on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in regulations; however, an attempt should be made to avoid making measurements in the near field.
☐	Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

3.4.4 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Raw(Read Level) + AF(Antenna Factor) + CL(Cable Loss) - PA(Preamplifier Factor)

3.4.5 Test Setup



**3.4.6 Transmitter Radiated Unwanted Emissions (Below 30MHz)****Summary**

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Azimuth (°)	Height (m)	Comments
13.553-13.567MHz	-	-	-	-	-	-	-	-	-	-	-
NFC	Pass	PK	2.12M	51.02	69.50	-18.48	20.20	3	0	1.00	-

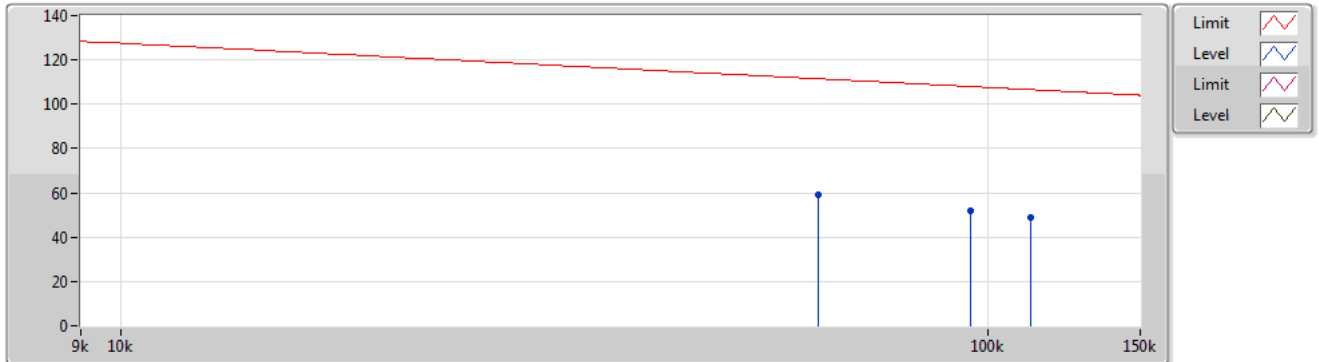
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Azimuth (°)	Height (m)	Comments
NFC	-	-	-	-	-	-	-	-	-	-	-
13.56MHz_Mode 1	Pass	PK	63.708k	59.08	111.51	-52.43	20.80	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	95.574k	52.11	107.99	-55.88	20.04	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	112.212k	48.99	106.59	-57.60	20.00	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	2.12M	51.02	69.50	-18.48	20.20	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	388.8k	51.09	95.80	-44.71	20.54	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	209.7k	45.48	101.16	-55.68	20.31	3	0	1.00	-

NFC Operating below 30MHz

09/11/2020

13.56MHz_Mode 1

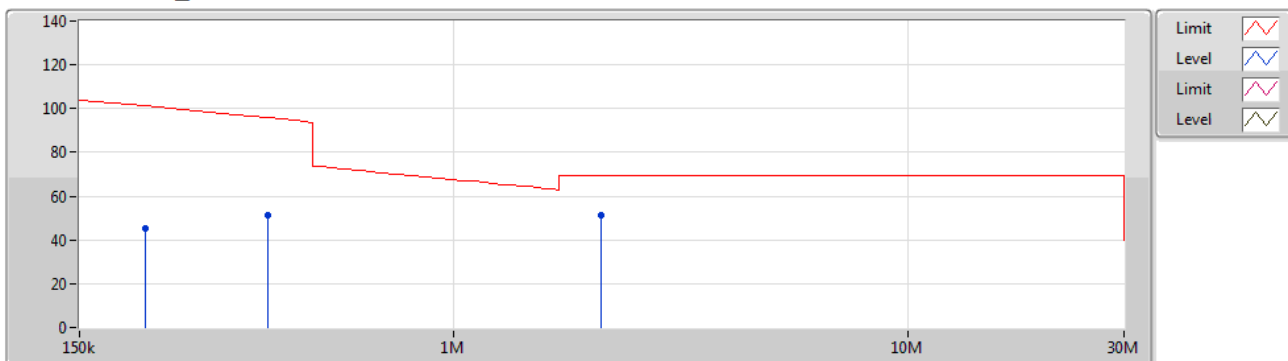


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	63.708k	59.08	111.51	-52.43	20.80	3	Horizontal	360	1.00	-	38.28	20.75	0.05	-
PK	95.574k	52.11	107.99	-55.88	20.04	3	Horizontal	360	1.00	-	32.07	19.99	0.05	-
PK	112.212k	48.99	106.59	-57.60	20.00	3	Horizontal	360	1.00	-	28.99	19.95	0.05	-

NFC Operating below 30MHz

09/11/2020

13.56MHz_Mode 1



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	2.12M	51.02	69.50	-18.48	20.20	3	Horizontal	0	1.00	-	30.82	19.99	0.21	-
PK	388.8k	51.09	95.80	-44.71	20.54	3	Horizontal	0	1.00	-	30.55	20.45	0.09	-
PK	209.7k	45.48	101.16	-55.68	20.31	3	Horizontal	0	1.00	-	25.17	20.24	0.07	-

3.4.7 Transmitter Radiated Unwanted Emissions (Above 30MHz)

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Azimuth (°)	Height (m)	Comments
13.553-13.567MHz	-	-	-	-	-	-	-	-	-	-	-
NFC	Pass	PK	747.8M	42.54	46.00	-3.46	1.19	3	0	1.00	-

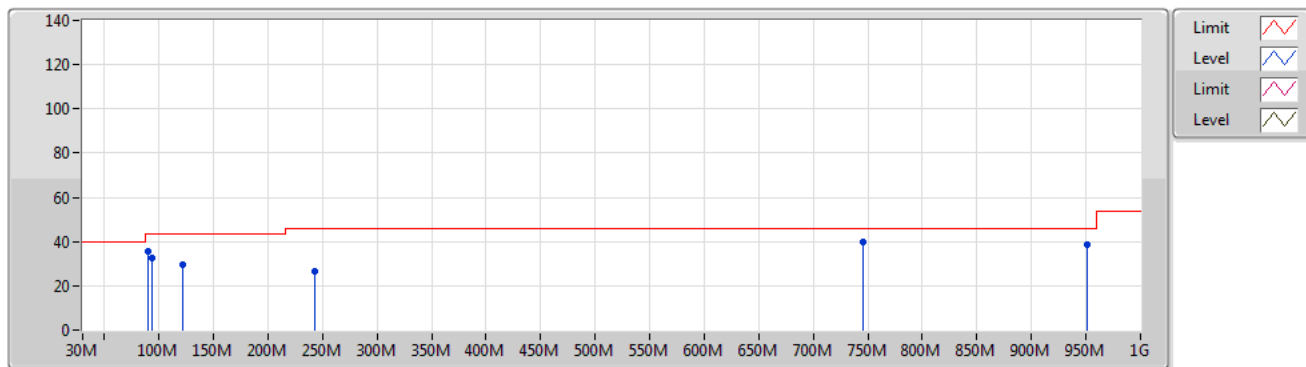
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Azimuth (°)	Height (m)	Comments
NFC	-	-	-	-	-	-	-	-	-	-	-
13.56MHz_Mode 1	Pass	PK	90.14M	35.78	43.50	-7.72	-12.32	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	94.02M	32.34	43.50	-11.16	-11.43	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	121.18M	29.56	43.50	-13.94	-8.66	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	243.4M	26.42	46.00	-19.58	-7.89	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	745.86M	39.73	46.00	-6.27	1.18	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	951.5M	38.76	46.00	-7.24	3.69	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	57.16M	25.80	40.00	-14.20	-14.91	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	90.14M	32.64	43.50	-10.86	-12.32	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	371.44M	27.15	46.00	-18.85	-4.58	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	732.28M	38.00	46.00	-8.00	0.92	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	747.8M	42.54	46.00	-3.46	1.19	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	953.44M	37.88	46.00	-8.12	3.72	3	0	1.00	-

NFC Operating above 30MHz

09/11/2020

13.56MHz_Mode 1

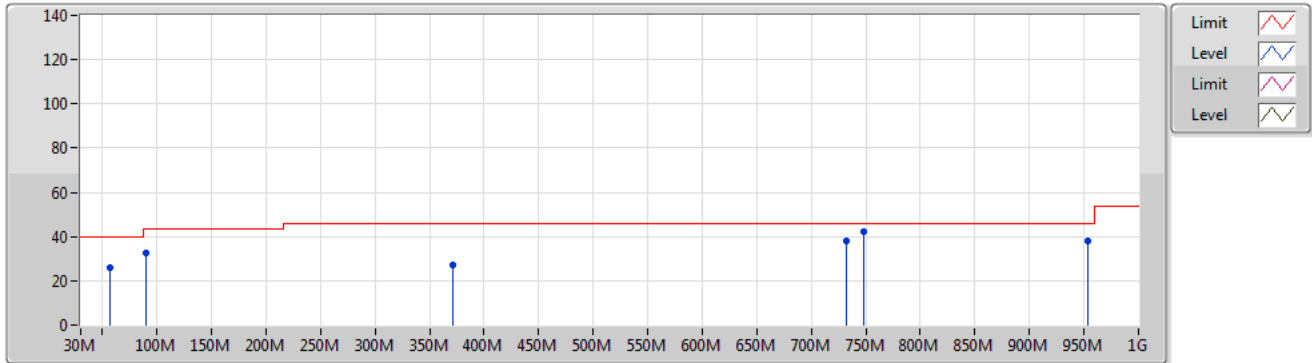


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	90.14M	35.78	43.50	-7.72	-12.32	3	Vertical	360	1.00	-	48.10	14.08	1.40	27.80
PK	94.02M	32.34	43.50	-11.16	-11.43	3	Vertical	360	1.00	-	43.77	14.96	1.40	27.79
PK	121.18M	29.56	43.50	-13.94	-8.66	3	Vertical	360	1.00	-	38.22	17.43	1.61	27.70
PK	243.4M	26.42	46.00	-19.58	-7.89	3	Vertical	360	1.00	-	34.31	16.83	2.36	27.08
PK	745.86M	39.73	46.00	-6.27	1.18	3	Vertical	360	1.00	-	38.55	24.90	4.29	28.01
PK	951.5M	38.76	46.00	-7.24	3.69	3	Vertical	360	1.00	-	35.07	26.03	4.90	27.24

NFC Operating above 30MHz

09/11/2020

13.56MHz_Mode 1



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	57.16M	25.80	40.00	-14.20	-14.91	3	Horizontal	0	1.00	-	40.71	11.84	1.04	27.79
PK	90.14M	32.64	43.50	-10.86	-12.32	3	Horizontal	0	1.00	-	44.96	14.08	1.40	27.80
PK	371.44M	27.15	46.00	-18.85	-4.58	3	Horizontal	0	1.00	-	31.73	20.03	2.89	27.50
PK	732.28M	38.00	46.00	-8.00	0.92	3	Horizontal	0	1.00	-	37.08	24.70	4.26	28.04
PK	747.8M	42.54	46.00	-3.46	1.19	3	Horizontal	0	1.00	-	41.35	24.89	4.30	28.00
PK	953.44M	37.88	46.00	-8.12	3.72	3	Horizontal	0	1.00	-	34.16	26.05	4.91	27.24

3.5 Frequency Stability

3.5.1 Frequency Stability Limit

Frequency Stability Limit	
☒	Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

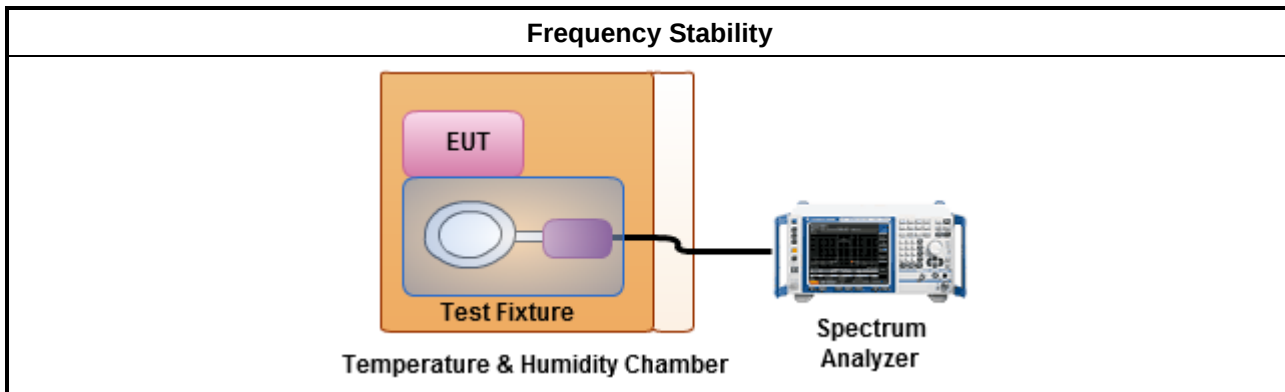
3.5.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 6.8 for frequency stability tests
☒	Frequency stability with respect to ambient temperature
☒	Frequency stability when varying supply voltage
☐	For conducted measurement.
☒	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.

3.5.4 Test Setup



3.5.5 Test Result of Frequency Stability

Summary

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
13.553-13.567MHz	-	-	-	-	-	-	-
NFC	Pass	13.56M	13.559556M	32.7761	100	1	0 min

Result

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
NFC	-	-	-	-	-	-	-
13.56MHz_-20°C	Pass	13.56M	13.560116M	8.5812	100	1	0 min
13.56MHz_-20°C	Pass	13.56M	13.560115M	8.5166	100	1	2 min
13.56MHz_-20°C	Pass	13.56M	13.560116M	8.5812	100	1	5 min
13.56MHz_-20°C	Pass	13.56M	13.560115M	8.5166	100	1	10 min
13.56MHz_-10°C	Pass	13.56M	13.56015M	11.0974	100	1	0 min
13.56MHz_-10°C	Pass	13.56M	13.56015M	11.0974	100	1	2 min
13.56MHz_-10°C	Pass	13.56M	13.56015M	11.0974	100	1	5 min
13.56MHz_-10°C	Pass	13.56M	13.560151M	11.162	100	1	10 min
13.56MHz_0°C	Pass	13.56M	13.560154M	11.3555	100	1	0 min
13.56MHz_0°C	Pass	13.56M	13.560164M	12.0652	100	1	2 min
13.56MHz_0°C	Pass	13.56M	13.560154M	11.3555	100	1	5 min
13.56MHz_0°C	Pass	13.56M	13.560154M	11.3555	100	1	10 min
13.56MHz_10°C	Pass	13.56M	13.560153M	11.291	100	1	0 min
13.56MHz_10°C	Pass	13.56M	13.560154M	11.3555	100	1	2 min
13.56MHz_10°C	Pass	13.56M	13.560153M	11.291	100	1	5 min
13.56MHz_10°C	Pass	13.56M	13.560153M	11.291	100	1	10 min
13.56MHz_20°C	Pass	13.56M	13.560122M	9.0328	100	1	0 min
13.56MHz_20°C	Pass	13.56M	13.560122M	9.0328	100	1	2 min
13.56MHz_20°C	Pass	13.56M	13.560122M	9.0328	100	1	5 min
13.56MHz_20°C	Pass	13.56M	13.560123M	9.0973	100	1	10 min
13.56MHz_30°C	Pass	13.56M	13.560098M	7.2262	100	1	0 min
13.56MHz_30°C	Pass	13.56M	13.560098M	7.2262	100	1	2 min
13.56MHz_30°C	Pass	13.56M	13.560098M	7.2262	100	1	5 min
13.56MHz_30°C	Pass	13.56M	13.560098M	7.2262	100	1	10 min
13.56MHz_40°C	Pass	13.56M	13.560098M	7.2262	100	1	0 min
13.56MHz_40°C	Pass	13.56M	13.560098M	7.2262	100	1	2 min
13.56MHz_40°C	Pass	13.56M	13.560098M	7.2262	100	1	5 min
13.56MHz_40°C	Pass	13.56M	13.559883M	8.6457	100	1	10 min
13.56MHz_50°C	Pass	13.56M	13.560098M	7.2262	100	1	0 min
13.56MHz_50°C	Pass	13.56M	13.560098M	7.2262	100	1	2 min
13.56MHz_50°C	Pass	13.56M	13.560098M	7.2262	100	1	5 min
13.56MHz_50°C	Pass	13.56M	13.560098M	7.2262	100	1	10 min
13.56MHz_20°C-138V	Pass	13.56M	13.559556M	32.7761	100	1	0 min
13.56MHz_20°C-138V	Pass	13.56M	13.560122M	9.0328	100	1	2 min
13.56MHz_20°C-138V	Pass	13.56M	13.560192M	14.1944	100	1	5 min
13.56MHz_20°C-138V	Pass	13.56M	13.560122M	9.0328	100	1	10 min
13.56MHz_20°C-120V	Pass	13.56M	13.560122M	9.0328	100	1	0 min
13.56MHz_20°C-120V	Pass	13.56M	13.560202M	14.9041	100	1	2 min
13.56MHz_20°C-120V	Pass	13.56M	13.560122M	9.0328	100	1	5 min
13.56MHz_20°C-120V	Pass	13.56M	13.560122M	9.0328	100	1	10 min



Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
13.56MHz_20°C-102V	Pass	13.56M	13.560122M	9.0328	100	1	0 min
13.56MHz_20°C-102V	Pass	13.56M	13.560122M	9.0328	100	1	2 min
13.56MHz_20°C-102V	Pass	13.56M	13.560122M	9.0328	100	1	5 min
13.56MHz_20°C-102V	Pass	13.56M	13.560122M	9.0328	100	1	10 min

4 Test Equipment and Calibration Data

Instrument for AC Conduction

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR3	102051	9kHz ~ 3.6GHz	29/May/2020	28/May/2021
LISN	R&S	ENV216	100003	9kHz ~ 30MHz	23/Sep/2020	22/Sep/2021
RF Cable-CON	MTJ	RG142	CB002-CO	9kHz ~ 200MHz	31/Aug/2020	30/Aug/2021
Impuls Begrenzer Pulse Limiter	SCHWARZBECK	VTSD 9561-F	9561-F041	9kHz ~ 30MHz	21/Sep/2020	20/Sep/2021

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV 40	101013	10Hz~40GHz	19/Mar/2020	18/Mar/2021
Programmable Temp. & Humi. Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20~100℃	15/May/2020	14/May/2021

Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz~1GHz 3m	04/Aug/2020	03/Aug/2021
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	1GHz~18GHz 3m	02/Aug/2020	01/Aug/2021
Signal Analyzer	R&S	FSP40	100593	9kHz~40GHz	27/Feb/2020	26/Feb/2021
Amplifier	Agilent	8447D	2944A11149	100kHz~1.3GHz	30/Jun/2020	29/Jun/2021
Bilog Antenna & 5dB Attenuator	SCHAFFNER / MTJ	CBL 6112B / MTJ6102-05	2723 / 2	30MHz~1GHz	06/Sep/2020	05/Sep/2021
RF Cable-R03m	Jye Bao	RG142	CB017	9kHz~30MHz	20/Jun/2020	19/Jun/2021
RF Cable-R03m	Jye Bao	RG142	CB017	30MHz~1GHz	25/Mar/2020	24/Mar/2021
Loop Antenna	TESEQ	HLA 6120	31244	9kHz~30MHz	16/Mar/2020	15/Mar/2021
EMI Test Receiver	R&S	ESR3	102051	9kHz~3.6GHz	29/May/2020	28/May/2021