

FCC Radio Test Report

FCC ID : C3K2029
Equipment : Portable Computing Device
Brand Name : Microsoft
Model Name : 2029
Applicant : Microsoft Corporation
One Microsoft Way Redmond, WA 98052-6399, U.S.A
Manufacturer : Microsoft Corporation
One Microsoft Way Redmond, WA 98052-6399, U.S.A
Standard : 47 CFR FCC Part 15.225

The product was received on Jan. 03, 2023, and testing was started from Mar. 01, 2023 and completed on Jun. 21, 2023. We, SPORTON INTERNATIONAL INC. Hsinhua 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. Hsinhua Laboratory, the test report shall not be reproduced except in full.


Approved by: Jackson Tsai

SPORTON INTERNATIONAL INC. Hsinhua Laboratory

No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)



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PHOTOGRAPHS OF EUT V01	

[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(e)	Frequency Stability	PASS	
3.4	15.225(a)~(d)	Field Strength of Fundamental Emissions and Spectrum Mask	PASS	-
3.5	15.225(d)	Transmitter Radiated Unwanted Emissions	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: Ben Tseng

Report Producer: Michelle Tsai

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information					
Frequency Range(MHz)	Modulation	Mode	Ch. Frequency (MHz)	Channel Number	Field Strength (dBuV/m)
13.553 – 13.567	ASK	WLC	13.56	1	45.04

Note :

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

1.1.2 Antenna Information

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

1.1.3 EUT Information

Operational Condition	
EUT Power Type	From AC Adapter / Battery
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
☐	Dutycyclefixed mode	☒	Dutycyclerandom mode
☒	Duty cycle mode - WLC		
Declare transmitter duty cycle / 1 hour =		100%	

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

Test Lab. : Sporton International Inc. Hsinhua Laboratory				
☒ Hsinhua (TAF: 3785)	ADD: No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)			
	TEL: 886-3-327-3456		FAX: 886-3-327-0973	
Test site Designation No. TW3785 with FCC.				
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
AC Conduction	CO04-HY	Wayne Chiu	21.3~22.6°C / 55~61%	06/Mar/2023
RF Conducted (CW Mode)	TH01-HY	Vivi Jiang	22.2~23.4°C / 50~52%	05/Mar/2023
RF Conducted (ASK Mode)	TH01-HY	Xie Xun	23.1~24.2°C / 55~59%	21/Jun/2023
Radiated	03CH03-HY	Edward Wang	16.6~18.3°C / 55~59%	01/Mar/2023~03/Mar/2023
☐ Wen 33rd.St. (TAF: 3785)	ADD: No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)			
	TEL: 886-3-318-0787		FAX: 886-3-318-0287	
Test site Designation No. TW0008 with FCC.				

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
AC Power-line Conducted Emissions	4.53 dB	Confidence levels of 95%
Emission Bandwidth	0.005 MHz	Confidence levels of 95%
Frequency Stability	5 ppm	Confidence levels of 95%
Field Strength of Fundamental Emissions and Spectrum Mask	2.5 dB	Confidence levels of 95%
Transmitter Radiated Unwanted Emissions	4.8 dB	Confidence levels of 95%
Receiver Radiated Unwanted Emissions	4.8 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
TminVmin	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	N/A
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Note: The EUT transmits RF signal continuously by itself.

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 Test Voltage: 120Vac / 60Hz
Operating Mode	CTX
	Adapter Mode with Stylus

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emission Bandwidth, Frequency Stability
Test Condition	Conducted measurement
Operating Mode	1. Adapter Mode with Stylus
	2. Adapter Mode without Stylus

The Worst Case Mode for Following Conformance Tests			
Tests Item	Field Strength of Fundamental Emissions and Spectrum Mask Transmitter Radiated Unwanted Emissions		
Test Condition	Radiated measurement		
Operating Mode	CTX		
	Adapter Mode with Stylus		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			
Worst Planes of EUT	V		

Note: Adapter Mode with Stylus was found to be the worst case scenario and recorded in this test report.

2.4 Accessories

Adapter 1	Brand Name	Microsoft	Model Name	1932
	Manufacturer	Chicony	SN	-
	Power Rating	I/P:100-240Vac,1.91A,O/P:15.0Vdc,8.0A,120.0W,5.0Vdc,1.5A,7.5W		
Adapter 2	Brand Name	Microsoft	Model Name	1798
	Manufacturer	Chicony	SN	-
	Power Rating	I/P:100-240Vac,1.5A,O/P:15.0Vdc,6.33A,95.0W,5.0Vdc,1.5A,7.5W		
Power Cord 1	Brand Name	Volex (Asia) Pte Ltd	Model Name	X908885
Power Cord 2	Brand Name	WELL SHIN TECHNOLOGY CO.,LTD	Model Name	X908885
Stylus	Brand Name	Microsoft	Model Name	1962
Battery 1	Brand Name	SMP	Model Name	G3HTA071H
Battery 2	Brand Name	SMP	Model Name	G3HTA072H

Reminder: Regarding to more detail and other information, please refer to user manual.

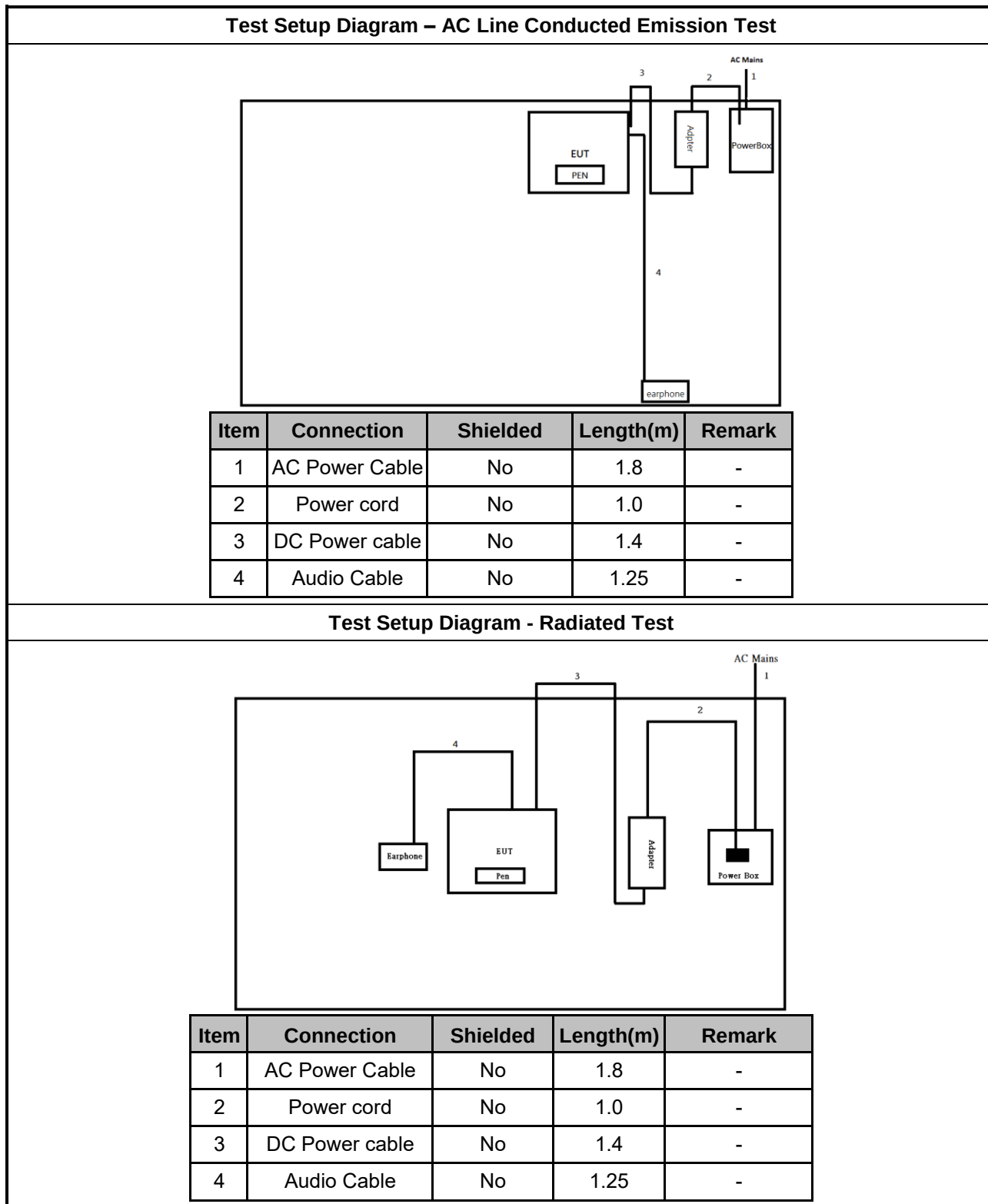
2.5 Support Equipment

Support Equipment – AC Conduction					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
1	Earphone	Apple	MD827FE/A	-	-

Support Equipment – Radiated					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
1	Earphone	Apple	MD827FE/A	-	-

Support Equipment – Conducted					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
1	AC Power Source	AC POWER	APS-9102	-	-

2.6 Test Setup Diagram



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

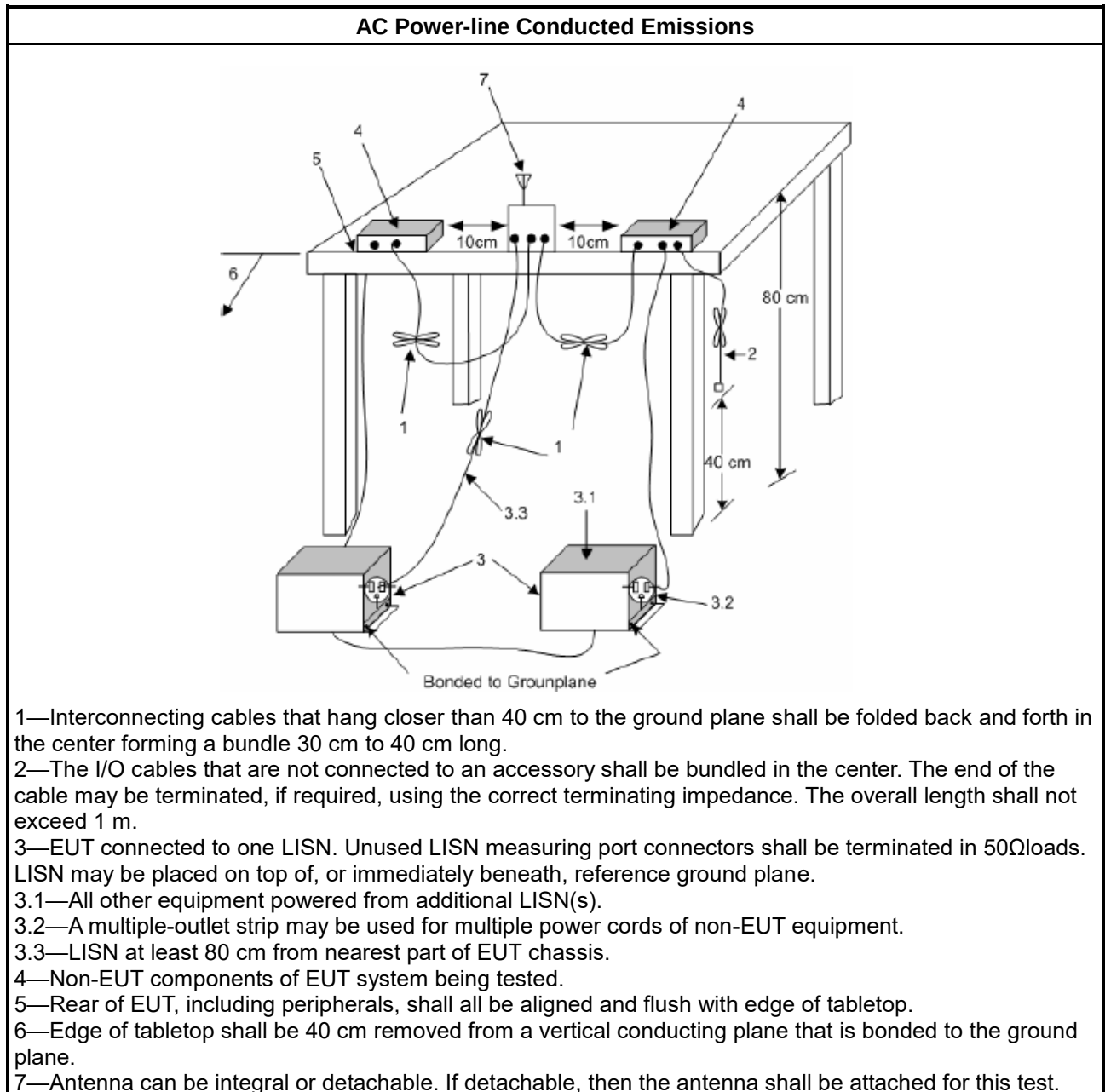
Test Method	
☒	Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.
☒	If AC conducted emissions fall in operating band, then following below test method confirm final result.
☐	Accept measurements done with a suitable dummy load replacing the antenna under the following conditions:
☐	(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

Refer as Appendix A

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).

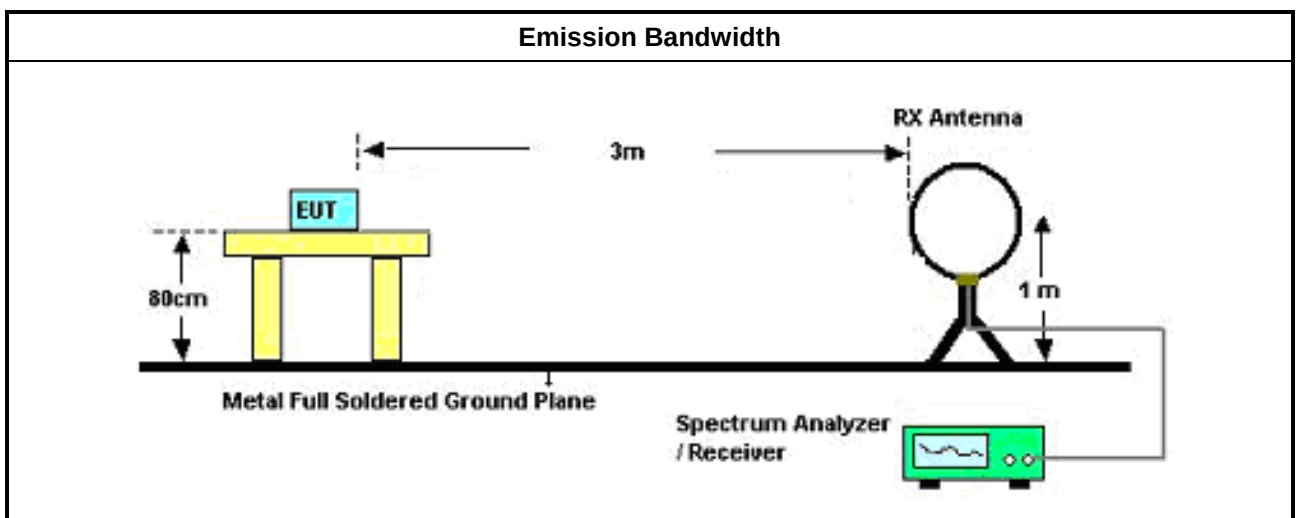
3.2.2 Measuring Instruments

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

Refer as Appendix B

3.3 Frequency Stability

3.3.1 Frequency Stability Limit

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

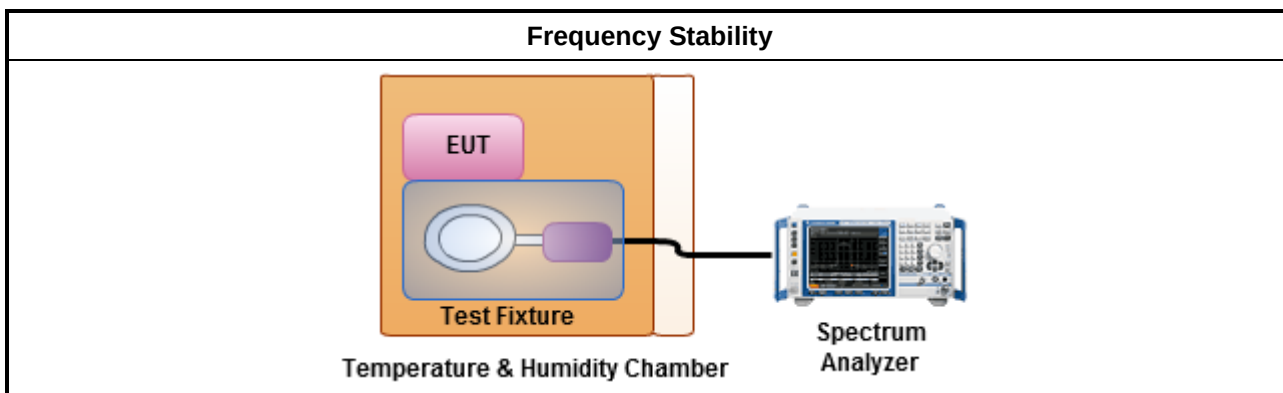
3.3.2 Measuring Instruments

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 6.8 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.

3.3.4 Test Setup



3.3.5 Test Result of Frequency Stability

Refer as Appendix C

3.4 Field Strength of Fundamental Emissions and Spectrum Mask

3.4.1 Field Strength of Fundamental Emissions and Spectrum Mask Limit

Field Strength of Fundamental Emissions and Spectrum Mask					
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					
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

3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

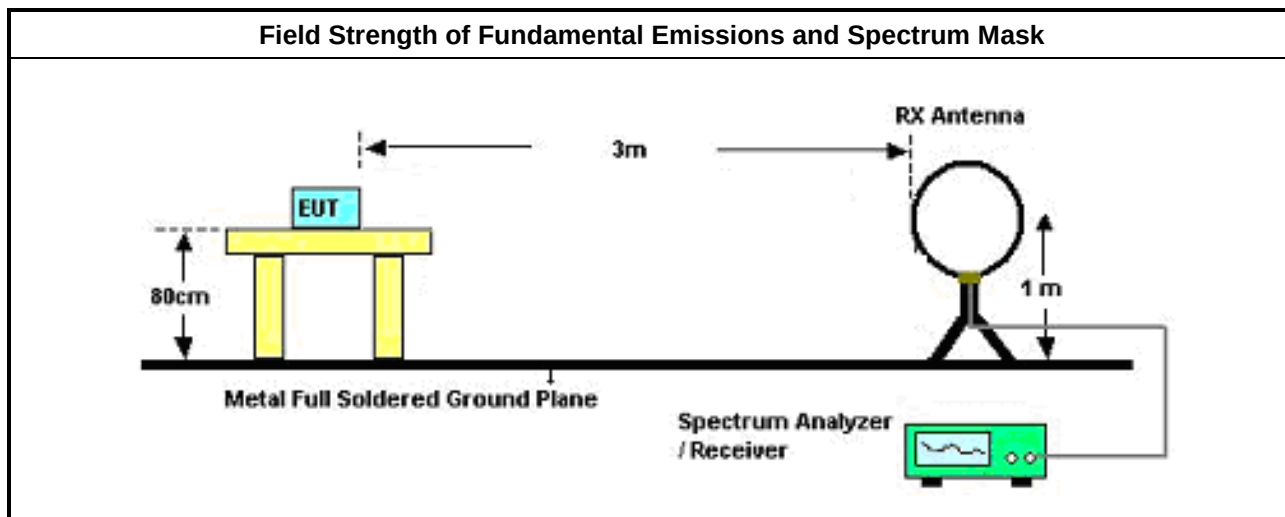
Test Method	
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.
☒	At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; however, an attempt should be made to avoid making measurements 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.
☒	Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement. The parallel orientation was found to be the worst case scenario.

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 Test Result of Field Strength of Fundamental Emissions and Spectrum Mask

Refer as Appendix D

3.5 Transmitter Radiated Unwanted Emissions

3.5.1 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.

3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

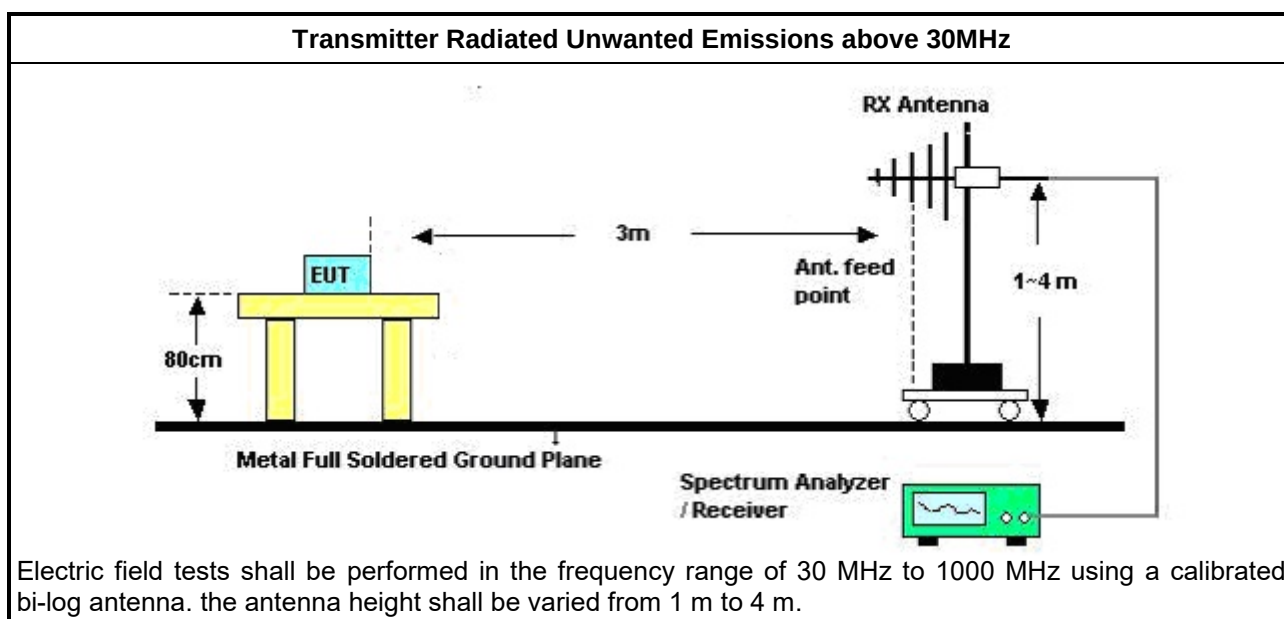
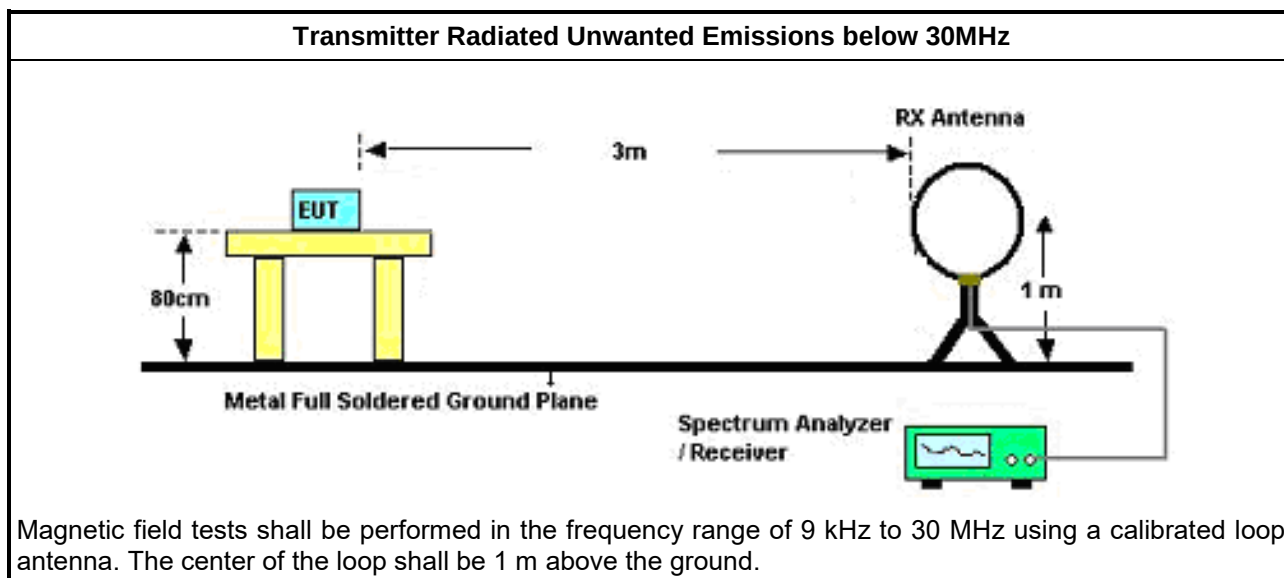
Test Method	
☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1 GHz and test distance is 3m.
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.
☒	At frequencies below 30 MHz, measurements may be performed at a distance closer than 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.
☒	Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement. The parallel orientation was found to be the worst case scenario.
☒	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.

3.5.4 Measurement Results Calculation

The measured Level is calculated using:

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

3.5.5 Test Setup



3.5.6 Transmitter Radiated Unwanted Emissions

Refer as Appendix D

4 Test Equipment and Calibration Data

Instrument for AC Conduction

Instrument	Manufacturer / Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR	102051	9kHz ~ 3.6GHz	13/May/2022	12/May/2023
Impuls Begrenzer Pulse Limiter	SCHWARZBECK	VTSD 9561-F	9561-F041	9kHz ~ 30MHz	25/Oct/2022	24/Oct/2023
Two-Line V-Network	R&S	ENV 216	100003	9kHz ~ 30MHz	16/Feb/2023	15/Feb/2024
RF Cable 5m	TITAN	TITAN	CO04-cable-01	9 kHz~200MHz	28/Feb/2023	27/Feb/2024
Software	Sporton	SENSE-EMI	V5.10.8.7	-	NCR	NCR

NCR: No Calibration Required

Instrument for Conducted Test (CW Mode)

Instrument	Manufacturer / Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV 40	101013	10Hz~40GHz	01/Apr/2022	31/Mar/2023
Programmable Temp. & Humi. Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20~100℃	26/Dec/2022	25/Dec/2023
SENSE-NFC	Sporton	V5.11.0	N/A	N/A	N/A	N/A

Instrument for Conducted Test (ASK Mode)

Instrument	Manufacturer / Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV 40	101515	10Hz~40GHz	14/Feb/2023	13/Feb/2024
Programmable Temp. & Humi. Chamber	Giant Force	GTH-225-40-CP-AR	MAA1311-008	-40~100℃	15/Jun/2023	14/Jun/2024
SENSE-NFC	Sporton	V5.11.0	N/A	N/A	N/A	N/A

**Instrument for Radiated Test**

Instrument	Manufacturer / Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	01/Aug/2022	31/Jul/2023
Signal Analyzer	R&S	FSV40	101500	10Hz~40GHz	26/Oct/2022	25/Oct/2023
Amplifier	HP	8447D	2944A08033	10kHz~1.3GHz	08/Apr/2022	07/Apr/2023
Bilog Antenna & 6dB Attenuator	SCHAFFNER / EMC	CBL6112B / N-6-05	22237 / AT-N-0603	30MHz~1GHz	16/Oct/2022	15/Oct/2023
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz~30MHz	13/Jun/2022	12/Jun/2023
RF Cable-R03m	Jye Bao	RG142	MY37335/4+CB0 21-1+CB021-2	30MHz~1GHz	22/Mar/2022	21/Mar/2023
Loop Antenna	TESEQ	HLA 6120	31244	9kHz~30MHz	18/Mar/2022	17/Mar/2023
EMI Test Receiver	R&S	ESR3	102052	9kHz~3.6GHz	30/May/2022	29/May/2023
Software	Sporton	SENSE-NFC	V5.11	-	NCR	NCR



Conducted Emissions at Powerline

Appendix A

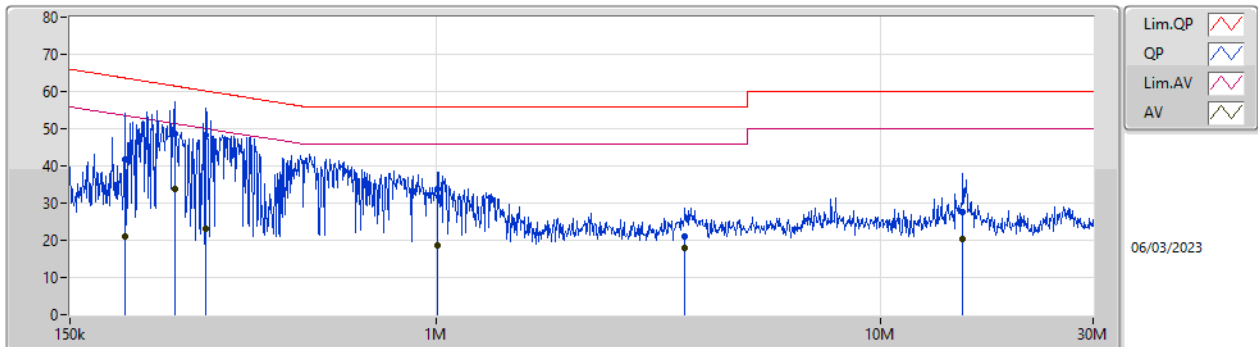
Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	QP	302.848k	48.43	60.17	-11.74	Line

Result

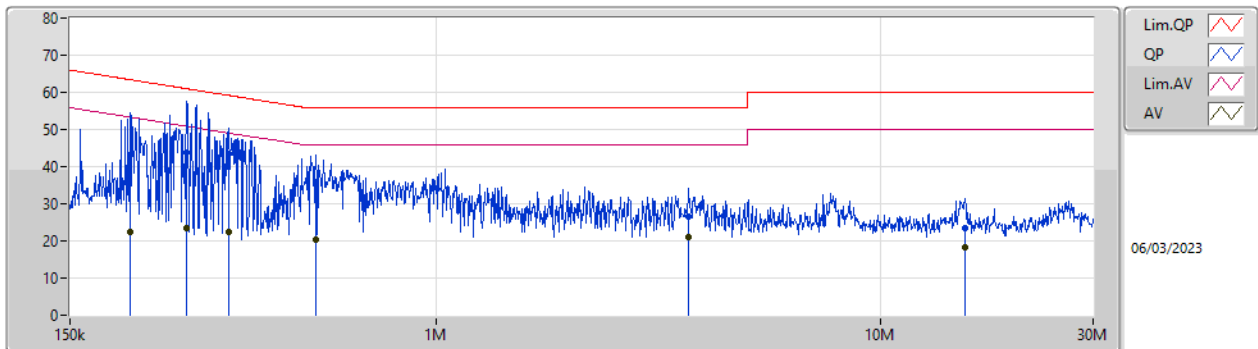
Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition	Comments
Mode 1	Pass	QP	199.949k	41.85	63.61	-21.76	Line	-
Mode 1	Pass	AV	199.949k	21.12	53.61	-32.49	Line	-
Mode 1	Pass	QP	258.152k	48.62	61.49	-12.87	Line	-
Mode 1	Pass	AV	258.152k	33.87	51.49	-17.62	Line	-
Mode 1	Pass	QP	302.848k	48.43	60.17	-11.74	Line	-
Mode 1	Pass	AV	302.848k	23.27	50.17	-26.90	Line	-
Mode 1	Pass	QP	1.007M	33.88	56.00	-22.12	Line	-
Mode 1	Pass	AV	1.007M	18.64	46.00	-27.36	Line	-
Mode 1	Pass	QP	3.627M	20.87	56.00	-35.13	Line	-
Mode 1	Pass	AV	3.627M	17.83	46.00	-28.17	Line	-
Mode 1	Pass	QP	15.266M	27.44	60.00	-32.56	Line	-
Mode 1	Pass	AV	15.266M	20.37	50.00	-29.63	Line	-
Mode 1	Pass	QP	204.796k	43.11	63.42	-20.31	Neutral	-
Mode 1	Pass	AV	204.796k	22.26	53.42	-31.16	Neutral	-
Mode 1	Pass	QP	274.083k	43.83	60.99	-17.16	Neutral	-
Mode 1	Pass	AV	274.083k	23.54	50.99	-27.45	Neutral	-
Mode 1	Pass	QP	341.378k	43.61	59.17	-15.56	Neutral	-
Mode 1	Pass	AV	341.378k	22.42	49.17	-26.75	Neutral	-
Mode 1	Pass	QP	535.976k	35.77	56.00	-20.23	Neutral	-
Mode 1	Pass	AV	535.976k	20.46	46.00	-25.54	Neutral	-
Mode 1	Pass	QP	3.701M	26.54	56.00	-29.46	Neutral	-
Mode 1	Pass	AV	3.701M	21.02	46.00	-24.98	Neutral	-
Mode 1	Pass	QP	15.45M	23.57	60.00	-36.43	Neutral	-
Mode 1	Pass	AV	15.45M	18.31	50.00	-31.69	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	199.949k	41.85	63.61	-21.76	19.61	Line	-	22.24	9.65	0.03	9.93			
AV	199.949k	21.12	53.61	-32.49	19.61	Line	-	1.51	9.65	0.03	9.93			
QP	258.152k	48.62	61.49	-12.87	19.62	Line	-	29.00	9.65	0.03	9.94			
AV	258.152k	33.87	51.49	-17.62	19.62	Line	-	14.25	9.65	0.03	9.94			
QP	302.848k	48.43	60.17	-11.74	19.63	Line	-	28.80	9.64	0.04	9.95			
AV	302.848k	23.27	50.17	-26.90	19.63	Line	-	3.64	9.64	0.04	9.95			
QP	1.007M	33.88	56.00	-22.12	19.64	Line	-	14.24	9.65	0.05	9.94			
AV	1.007M	18.64	46.00	-27.36	19.64	Line	-	-1.00	9.65	0.05	9.94			
QP	3.627M	20.87	56.00	-35.13	19.75	Line	-	1.12	9.70	0.12	9.93			
AV	3.627M	17.83	46.00	-28.17	19.75	Line	-	-1.92	9.70	0.12	9.93			
QP	15.266M	27.44	60.00	-32.56	20.00	Line	-	7.44	9.79	0.24	9.97			
AV	15.266M	20.37	50.00	-29.63	20.00	Line	-	0.37	9.79	0.24	9.97			

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	204.796k	43.11	63.42	-20.31	19.58	Neutral	-	23.53	9.62	0.03	9.93			
AV	204.796k	22.26	53.42	-31.16	19.58	Neutral	-	2.68	9.62	0.03	9.93			
QP	274.083k	43.83	60.99	-17.16	19.59	Neutral	-	24.24	9.62	0.03	9.94			
AV	274.083k	23.54	50.99	-27.45	19.59	Neutral	-	3.95	9.62	0.03	9.94			
QP	341.378k	43.61	59.17	-15.56	19.62	Neutral	-	23.99	9.63	0.04	9.95			
AV	341.378k	22.42	49.17	-26.75	19.62	Neutral	-	2.80	9.63	0.04	9.95			
QP	535.976k	35.77	56.00	-20.23	19.63	Neutral	-	16.14	9.64	0.04	9.95			
AV	535.976k	20.46	46.00	-25.54	19.63	Neutral	-	0.83	9.64	0.04	9.95			
QP	3.701M	26.54	56.00	-29.46	19.73	Neutral	-	6.81	9.68	0.12	9.93			
AV	3.701M	21.02	46.00	-24.98	19.73	Neutral	-	1.29	9.68	0.12	9.93			
QP	15.45M	23.57	60.00	-36.43	20.11	Neutral	-	3.46	9.90	0.24	9.97			
AV	15.45M	18.31	50.00	-31.69	20.11	Neutral	-	-1.80	9.90	0.24	9.97			

**Summary**

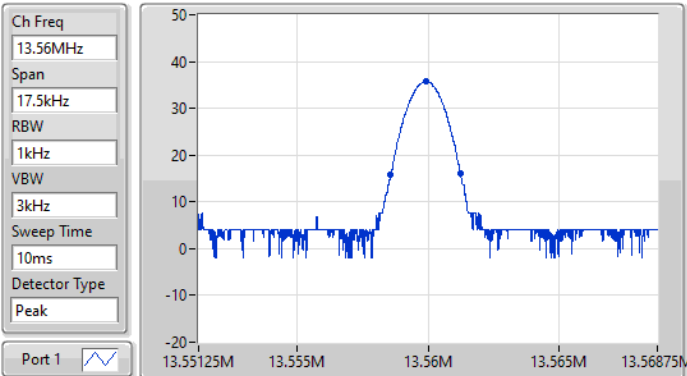
Mode	20dB (Hz)	FI-20dB (Hz)	Fh-20dB (Hz)	OBW (Hz)	Limit (Range)
13.553-13.567MHz	-	-	-	-	-
NFC	2.669k	13.55858M	13.56125M	2.51k	13.553-13.567

Result

Mode	Result	20dB (Hz)	FI-20dB (Hz)	Fh-20dB (Hz)	OBW (Hz)	FI-OBW (Hz)	Fh-OBW (Hz)	Limit (Range)
NFC	-	-	-	-	-	-	-	-
13.56MHz_TnomVnom	Pass	2.669k	13.55858M	13.56125M	2.51k	13.55864M	13.56115M	13.553-13.567

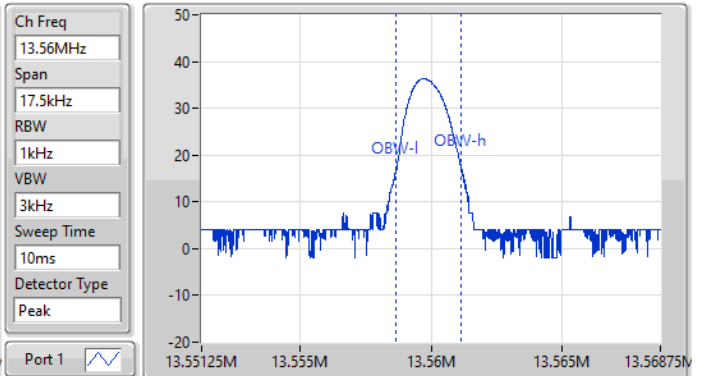
NFC

13.56MHz_TnomVnom



EBW

05/03/2023



20dB(Hz)	FI-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	FI-OBW(Hz)	Fh-OBW(Hz)	Limit(Range)
2.669k	13.55858M	13.56125M	2.51k	13.55864M	13.56115M	13.553-13.56

Note: Trace mode Max Hold.

Summary

Mode	20dB (Hz)	FI-20dB (Hz)	Fh-20dB (Hz)	OBW (Hz)	Limit (Range)
13.553-13.567MHz	-	-	-	-	-
NFC	4.025k	13.55789M	13.56192M	11.668k	13.553-13.567

Result

Mode	Result	20dB (Hz)	FI-20dB (Hz)	Fh-20dB (Hz)	OBW (Hz)	FI-OBW (Hz)	Fh-OBW (Hz)	Limit (Range)
NFC	-	-	-	-	-	-	-	-
13.56MHz_TnomVnom	Pass	4.025k	13.55789M	13.56192M	11.668k	13.55410M	13.56577M	13.553-13.567

NFC

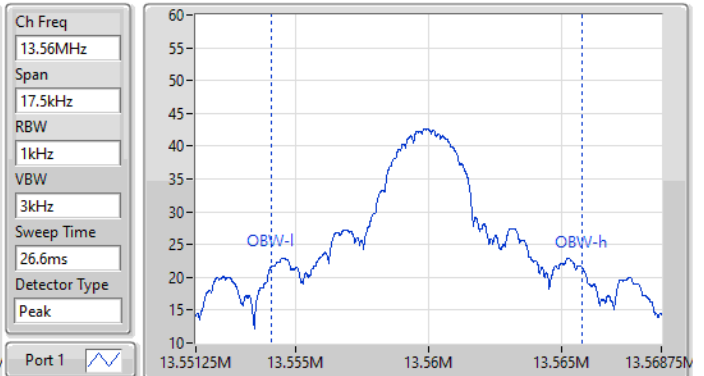
13.56MHz_TnomVnom



20dB(Hz)	FI-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	FI-OBW(Hz)	Fh-OBW(Hz)	Limit(Range)
4.025k	13.55789M	13.56192M	11.668k	13.55410M	13.56577M	13.553-13.56

EBW

21/06/2023



Note: Trace mode Max Hold.



Summary

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
13.553-13.567MHz	-	-	-	-	-	-	-
NFC	Pass	13.56M	13.559824M	12.9685	100	1	10 min

Result

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
NFC	-	-	-	-	-	-	-
13.56MHz_-20°C	Pass	13.56M	13.559912M	6.5165	100	1	0 min
13.56MHz_-20°C	Pass	13.56M	13.559937M	4.6454	100	1	2 min
13.56MHz_-20°C	Pass	13.56M	13.559941M	4.3874	100	1	5 min
13.56MHz_-20°C	Pass	13.56M	13.559894M	7.8069	100	1	10 min
13.56MHz_-10°C	Pass	13.56M	13.559852M	10.9039	100	1	0 min
13.56MHz_-10°C	Pass	13.56M	13.559895M	7.7424	100	1	2 min
13.56MHz_-10°C	Pass	13.56M	13.559901M	7.2908	100	1	5 min
13.56MHz_-10°C	Pass	13.56M	13.559958M	3.097	100	1	10 min
13.56MHz_0°C	Pass	13.56M	13.559959M	3.0324	100	1	0 min
13.56MHz_0°C	Pass	13.56M	13.559941M	4.3874	100	1	2 min
13.56MHz_0°C	Pass	13.56M	13.559894M	7.8069	100	1	5 min
13.56MHz_0°C	Pass	13.56M	13.559929M	5.2261	100	1	10 min
13.56MHz_10°C	Pass	13.56M	13.559882M	8.7102	100	1	0 min
13.56MHz_10°C	Pass	13.56M	13.559914M	6.323	100	1	2 min
13.56MHz_10°C	Pass	13.56M	13.559928M	5.2906	100	1	5 min
13.56MHz_10°C	Pass	13.56M	13.559906M	6.9682	100	1	10 min
13.56MHz_20°C	Pass	13.56M	13.559931M	5.0971	100	1	0 min
13.56MHz_20°C	Pass	13.56M	13.559906M	6.9682	100	1	2 min
13.56MHz_20°C	Pass	13.56M	13.5599M	7.3553	100	1	5 min
13.56MHz_20°C	Pass	13.56M	13.559913M	6.3875	100	1	10 min
13.56MHz_30°C	Pass	13.56M	13.559877M	9.0973	100	1	0 min
13.56MHz_30°C	Pass	13.56M	13.559916M	6.1939	100	1	2 min
13.56MHz_30°C	Pass	13.56M	13.559908M	6.7746	100	1	5 min
13.56MHz_30°C	Pass	13.56M	13.559885M	8.4521	100	1	10 min
13.56MHz_40°C	Pass	13.56M	13.5599M	7.3553	100	1	0 min
13.56MHz_40°C	Pass	13.56M	13.559911M	6.581	100	1	2 min
13.56MHz_40°C	Pass	13.56M	13.559904M	7.0972	100	1	5 min
13.56MHz_40°C	Pass	13.56M	13.559913M	6.3875	100	1	10 min
13.56MHz_50°C	Pass	13.56M	13.559938M	4.5809	100	1	0 min
13.56MHz_50°C	Pass	13.56M	13.559913M	6.3875	100	1	2 min
13.56MHz_50°C	Pass	13.56M	13.55992M	5.8713	100	1	5 min
13.56MHz_50°C	Pass	13.56M	13.559887M	8.3231	100	1	10 min
13.56MHz_20°C-138V	Pass	13.56M	13.559908M	6.7746	100	1	0 min
13.56MHz_20°C-138V	Pass	13.56M	13.559897M	7.6134	100	1	2 min
13.56MHz_20°C-138V	Pass	13.56M	13.559889M	8.194	100	1	5 min
13.56MHz_20°C-138V	Pass	13.56M	13.559824M	12.9685	100	1	10 min
13.56MHz_20°C-120V	Pass	13.56M	13.559907M	6.8391	100	1	0 min
13.56MHz_20°C-120V	Pass	13.56M	13.559914M	6.323	100	1	2 min
13.56MHz_20°C-120V	Pass	13.56M	13.559899M	7.4198	100	1	5 min
13.56MHz_20°C-120V	Pass	13.56M	13.559916M	6.1939	100	1	10 min
13.56MHz_20°C-102V	Pass	13.56M	13.559916M	6.1939	100	1	0 min
13.56MHz_20°C-102V	Pass	13.56M	13.55994M	4.4519	100	1	2 min
13.56MHz_20°C-102V	Pass	13.56M	13.559894M	7.8069	100	1	5 min



Frequency Stability

Appendix C

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
13.56MHz_20°C-102V	Pass	13.56M	13.559928M	5.2906	100	1	10 min



Summary

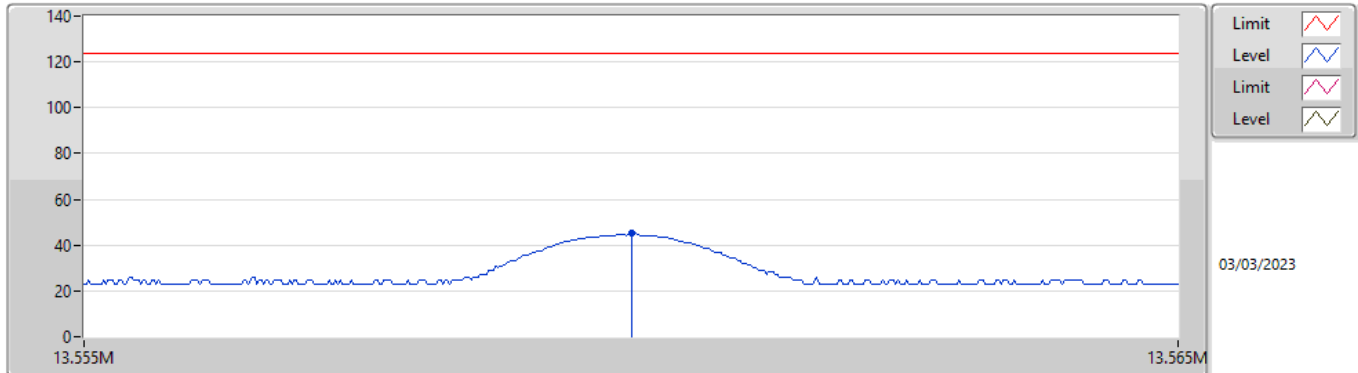
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Azimuth (°)	Height (m)
13.553-13.567MHz	-	-	-	-	-	-	-	-	-
NFC	Pass	PK	2.598M	44.66	69.50	-24.84	3	0	1.00

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Azimuth (°)	Height (m)
NFC	-	-	-	-	-	-	-	-	-
13.56MHz_Mode 1	Pass	PK	13.56M	45.04	124.00	-78.96	3	173	1.00
13.56MHz_Mode 1	Pass	PK	63.426k	40.92	111.55	-70.63	3	360	1.00
13.56MHz_Mode 1	Pass	PK	103.47k	44.90	107.29	-62.39	3	360	1.00
13.56MHz_Mode 1	Pass	PK	126.312k	44.66	105.57	-60.91	3	360	1.00
13.56MHz_Mode 1	Pass	PK	2.598M	44.66	69.50	-24.84	3	0	1.00
13.56MHz_Mode 1	Pass	PK	5.045M	39.96	69.50	-29.54	3	0	1.00
13.56MHz_Mode 1	Pass	PK	8.15M	37.16	69.50	-32.34	3	0	1.00

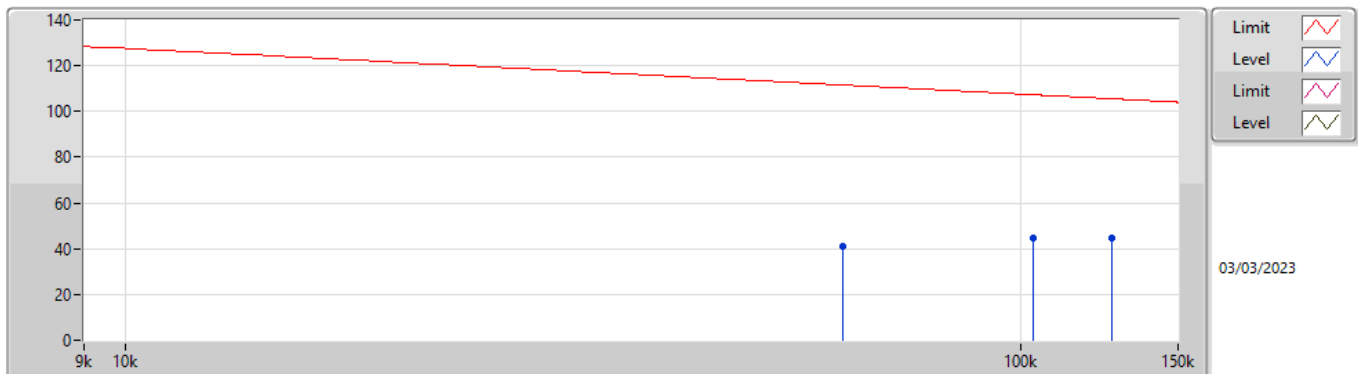
NFC

13.56MHz_Mode 1



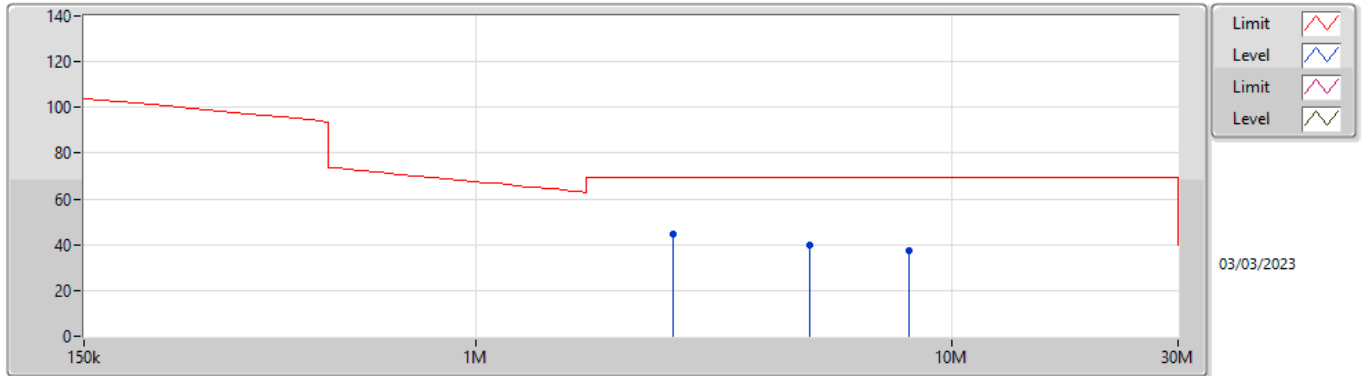
NFC

13.56MHz_Mode 1



NFC

13.56MHz_Mode 1



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)	
PK	2.598M	44.66	69.50	-24.84	19.88	3	Horizontal	0	1.00	24.78	19.69	0.19	-	
PK	5.045M	39.96	69.50	-29.54	20.60	3	Horizontal	0	1.00	19.36	20.32	0.28	-	
PK	8.15M	37.16	69.50	-32.34	21.94	3	Horizontal	0	1.00	15.22	21.57	0.37	-	



TX Radiated Emission

Appendix D.2

Summary

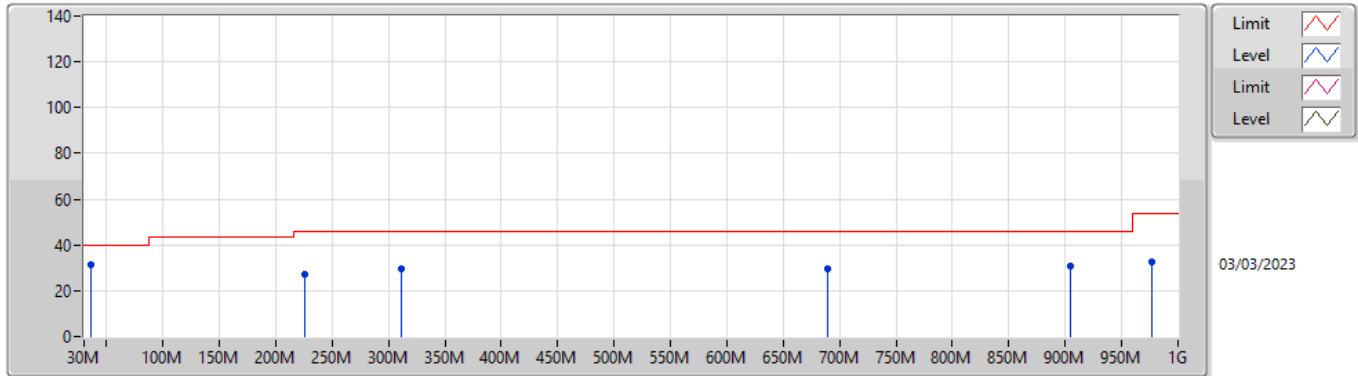
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Azimuth (°)	Height (m)
13.56M	-	-	-	-	-	-	-	-	-
NFC_Nss1_1TX	Pass	PK	30M	32.52	40.00	-7.48	3	360	1.00

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Azimuth (°)	Height (m)
NFC_Nss1_1TX	-	-	-	-	-	-	-	-	-
13.56MHz_Mode 1	Pass	PK	35.82M	31.15	40.00	-8.85	3	0	1.00
13.56MHz_Mode 1	Pass	PK	225.94M	27.04	46.00	-18.96	3	0	1.00
13.56MHz_Mode 1	Pass	PK	311.3M	29.73	46.00	-16.27	3	0	1.00
13.56MHz_Mode 1	Pass	PK	689.6M	29.40	46.00	-16.60	3	0	1.00
13.56MHz_Mode 1	Pass	PK	976.72M	32.41	54.00	-21.59	3	0	1.00
13.56MHz_Mode 1	Pass	QP	904.94M	30.85	46.00	-15.15	3	196	1.53
13.56MHz_Mode 1	Pass	PK	30M	32.52	40.00	-7.48	3	360	1.00
13.56MHz_Mode 1	Pass	PK	220.12M	29.36	46.00	-16.64	3	360	1.00
13.56MHz_Mode 1	Pass	PK	313.24M	35.66	46.00	-10.34	3	360	1.00
13.56MHz_Mode 1	Pass	PK	547.98M	29.50	46.00	-16.50	3	360	1.00
13.56MHz_Mode 1	Pass	PK	862.26M	31.64	46.00	-14.36	3	360	1.00
13.56MHz_Mode 1	Pass	PK	970.9M	32.26	54.00	-21.74	3	360	1.00

NFC_Nss1_1TX

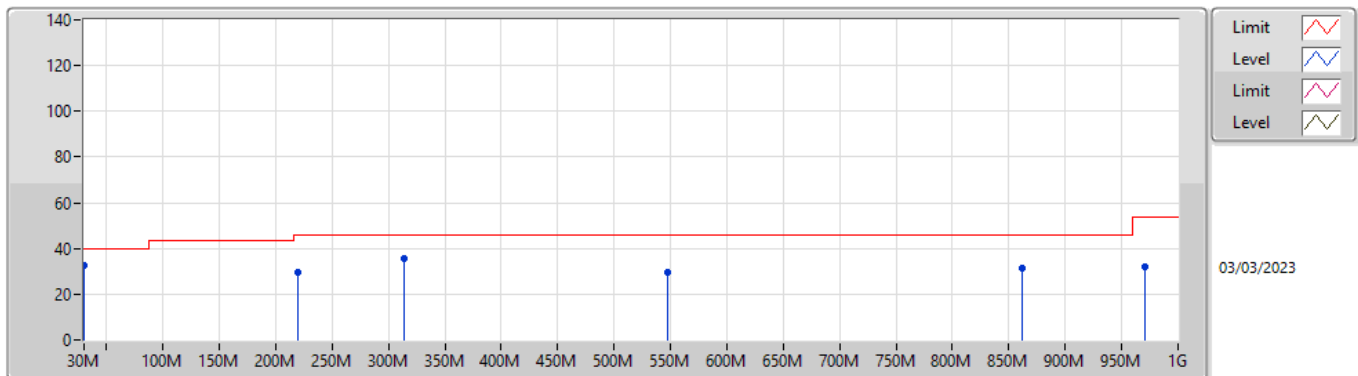
13.56MHz_Mode 1



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	35.82M	31.15	40.00	-8.85	-6.48	3	Vertical	0	1.00	37.63	20.08	0.96	27.52
PK	225.94M	27.04	46.00	-18.96	-9.40	3	Vertical	0	1.00	36.44	14.88	2.50	26.78
PK	311.3M	29.73	46.00	-16.27	-5.12	3	Vertical	0	1.00	34.85	18.58	2.97	26.67
PK	689.6M	29.40	46.00	-16.60	0.88	3	Vertical	0	1.00	28.52	24.27	4.52	27.91
PK	976.72M	32.41	54.00	-21.59	5.08	3	Vertical	0	1.00	27.33	26.74	5.56	27.22
QP	904.94M	30.85	46.00	-15.15	3.42	3	Vertical	196	1.53	27.43	25.66	5.29	27.53

NFC_Nss1_1TX

13.56MHz_Mode 1



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	30M	32.52	40.00	-7.48	-3.48	3	Horizontal	360	1.00	36.00	23.22	0.88	27.58
PK	220.12M	29.36	46.00	-16.64	-10.00	3	Horizontal	360	1.00	39.36	14.35	2.46	26.81
PK	313.24M	35.66	46.00	-10.34	-5.11	3	Horizontal	360	1.00	40.77	18.59	2.98	26.68
PK	547.98M	29.50	46.00	-16.50	0.47	3	Horizontal	360	1.00	29.03	24.49	3.96	27.98
PK	862.26M	31.64	46.00	-14.36	3.40	3	Horizontal	360	1.00	28.24	25.77	5.14	27.51
PK	970.9M	32.26	54.00	-21.74	5.13	3	Horizontal	360	1.00	27.13	26.80	5.56	27.23

—THE END—