

FCC Test Report

FCC ID : NYOMBECNWPC2006
Equipment : Wireless Charging System
Brand Name : MOBASE ELECTRONICS CO., LTD.
Model Name : MBECNWPC2006
Applicant : MOBASE ELECTRONICS CO., LTD.
100, Saneop-ro 156beon-gil, Gwonseon-gu,
Suwon-si, Gyeonggi-do, South Korea
Manufacturer : MOBASE ELECTRONICS CO., LTD.
100, Saneop-ro 156beon-gil, Gwonseon-gu,
Suwon-si, Gyeonggi-do, South Korea
Standard : 47 CFR FCC Part 15.225

The product was received on May 15, 2020, and testing was started from May 26, 2020 and completed on Jun. 09, 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of United States government.

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: Michelle Tsai

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information				
Frequency Range	Modulation Mode	Ch. Frequency (MHz)	Channel Number	Field Strength (dBuV/m)
13.553 – 13.567 MHz	ISO 14443-3A (ASK) ISO 14443-3B (ASK) ISO 18092 (ASK)	13.56	1	58.71
Note 1: Field strength performed peak level at 3m.				

1.1.2 Antenna Information

Antenna Category	
☐	Equipment placed on the market without antennas
☒	Integral antenna (antenna permanently attached)
☐	Temporary RF connector provided
☒	No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
☐	External antenna (dedicated antennas)

Antenna General Information		
No.	Ant. Cat.	Ant. Type
1	Integral	Loop

1.1.3 EUT Information

Operational Condition	
EUT Power Type	From DC 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
☒ Duty cycle mode - NFC-A (ISO 14443-3A)	
Declare transmitter duty cycle / 1 hour =	100%
☒ Duty cycle mode - NFC-B (ISO 14443-3B)	
Declare transmitter duty cycle / 1 hour =	100%
☒ Duty cycle mode - NFC-F (ISO 18092)	
Declare transmitter duty cycle / 1 hour =	100%
☐ Duty cycle mode - NFC-V (ISO 15693)	
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

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	CO04-HY	Edward Wang	21.1~24.3°C/56~62%	26/May/2020
RF Conducted	TH06-HY	Alan Chien	23.5~23.9°C/65~69%	01/Jun/2020~09/Jun/2020
Radiated Emission	03CH02-HY	Streak Liao	23.2~25.9°C/53~58%	02/Jun/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
TminVmin	Vnom	12V
TminVmax	Vmin	10.2V
TmaxVmin	Vmax	13.8V
TmaxVmax	Tmin	-30°C
-	Tmax	75°C

2.2 The Worst Case Configuration

Modulation Used for Conformance Testing		
Mode	Test Channel Frequencies (MHz)	Field Strength (dBuV/m at 3 m)
NFC	13.56	58.71

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
	☒ 1. DC 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
Pretest Mode	☒ 1. NFC-A (ISO 14443-3A)
	☒ 2. NFC-B (ISO 14443-3B)
	☒ 3. NFC-F (ISO 18092)
Operating Mode	CTX
	☒ 1. DC Power Supply Mode
Orthogonal Planes of EUT	Z Plane
	

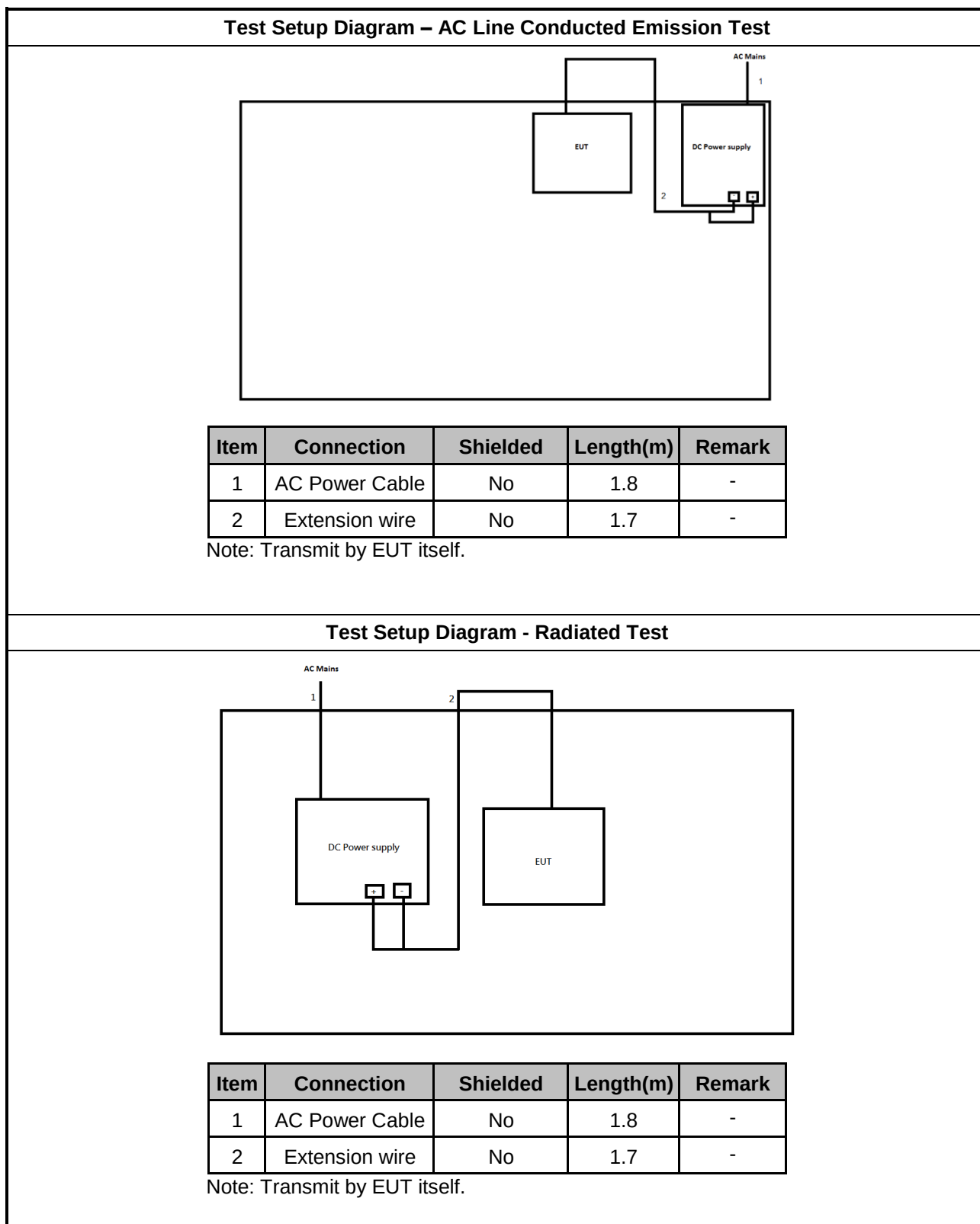
2.4 Support Equipment

Support Equipment - AC Conduction			
No.	Equipment	Brand Name	Model Name
1	DC Power Supply	GW	GPR-3510HD

Support Equipment - RF Conducted			
No.	Equipment	Brand Name	Model Name
1	DC Power Supply	GW	GPR-3510HD

Support Equipment - Radiated			
No.	Equipment	Brand Name	Model Name
1	DC Power Supply	GW	GPR-3510HD

2.5 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.

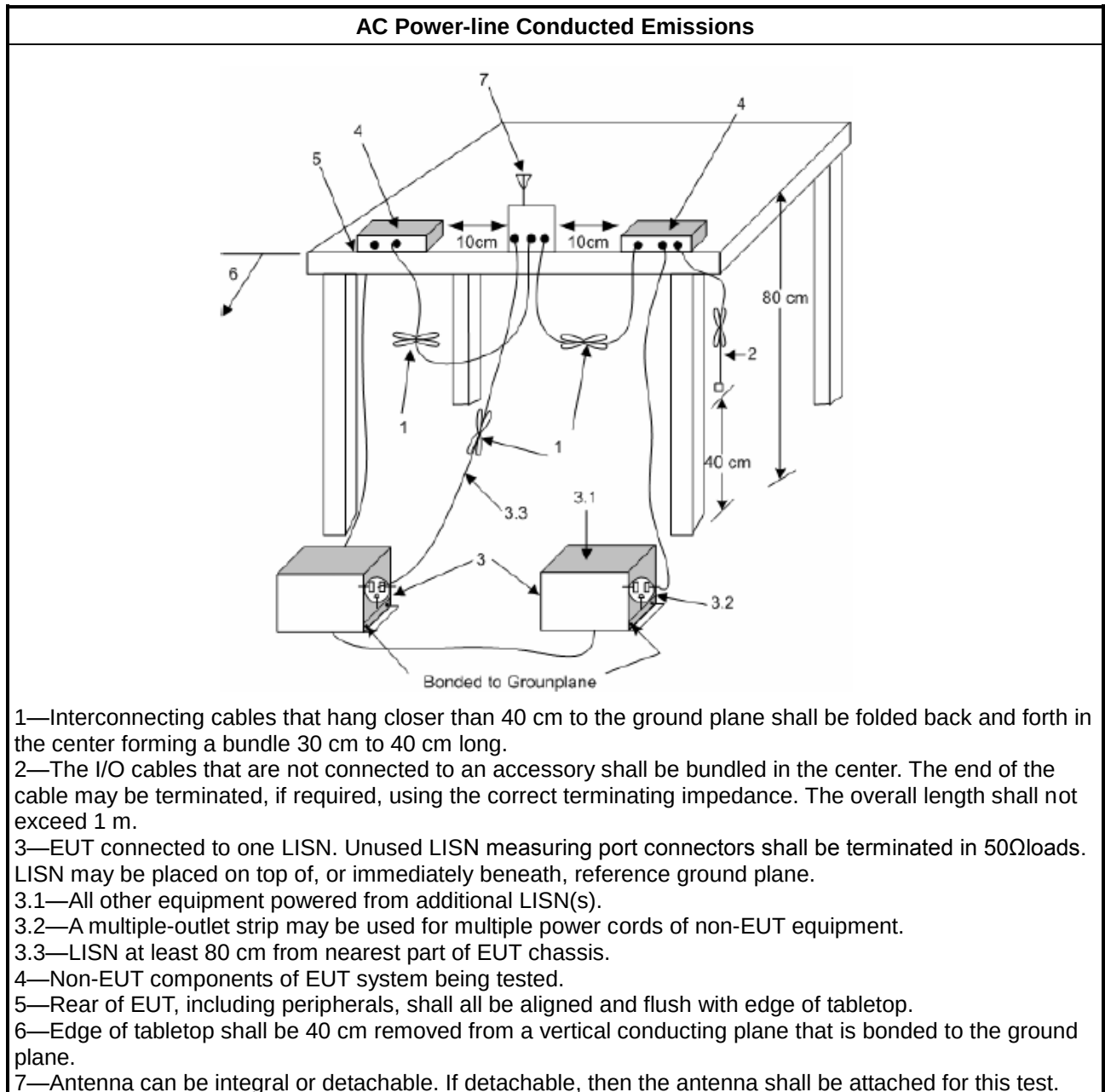
3.1.2 Measuring Instruments

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

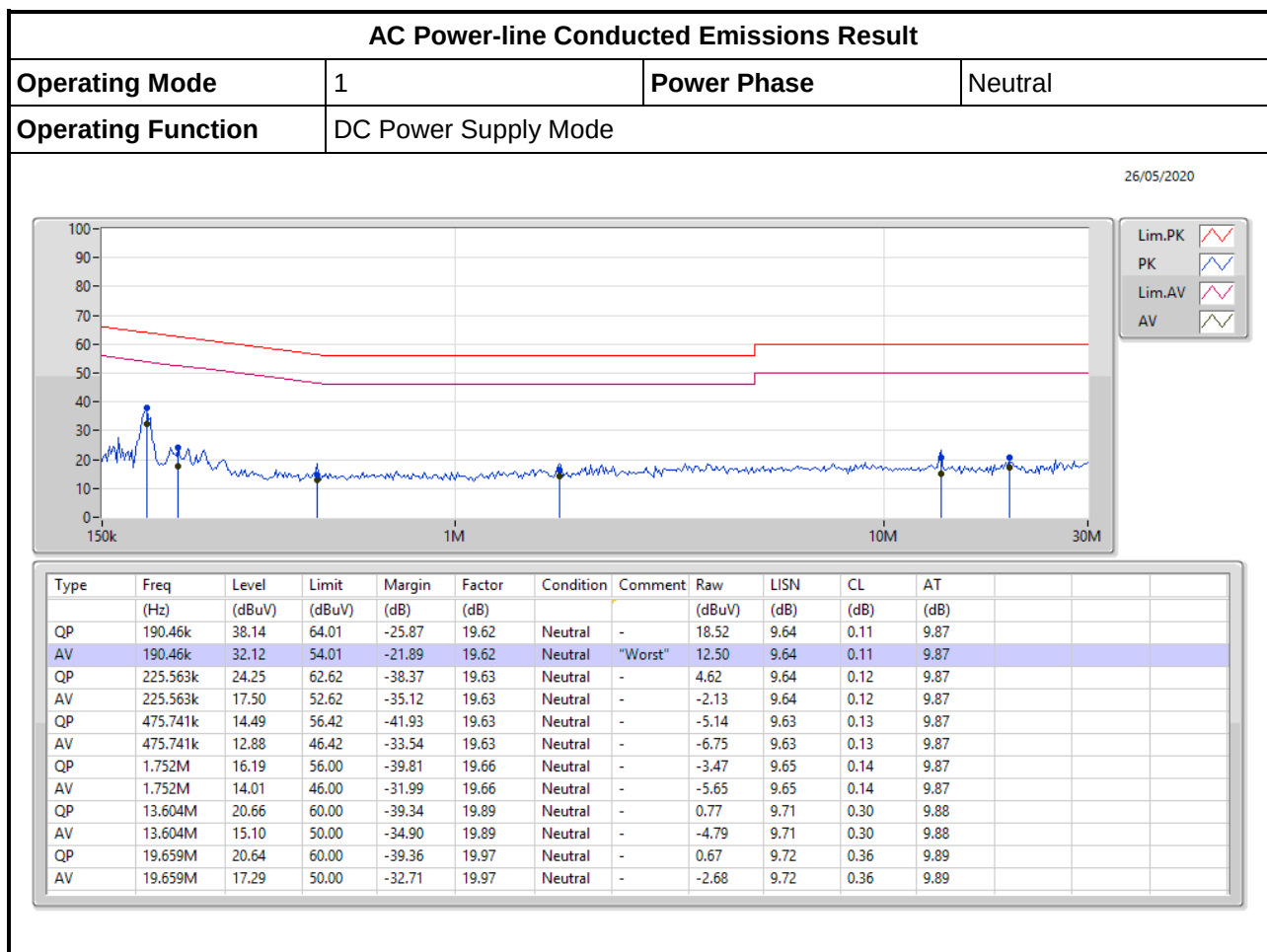
3.1.3 Test Procedures

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 Test Setup



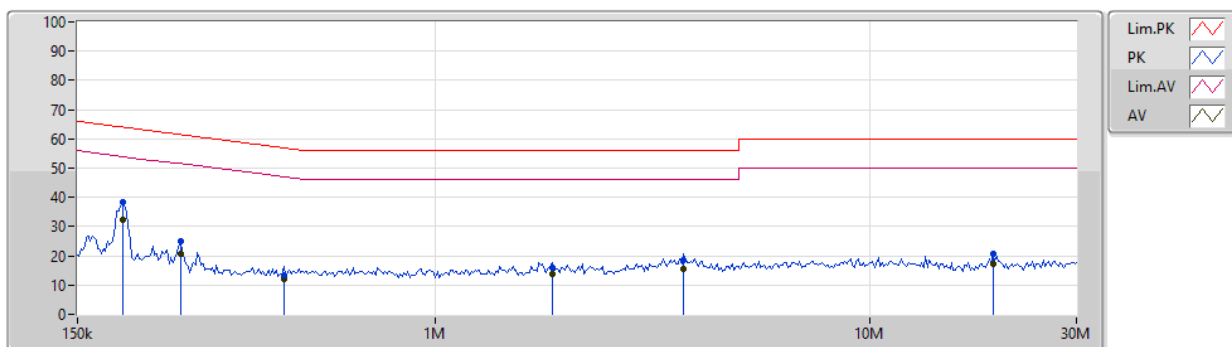
3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	DC Power Supply Mode		

26/05/2020



Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)
QP	190.46k	38.25	64.01	-25.76	19.63	Line	-	18.62	9.65	0.11	9.87
AV	190.46k	32.18	54.01	-21.83	19.63	Line	"Worst"	12.55	9.65	0.11	9.87
QP	259.279k	25.12	61.45	-36.33	19.64	Line	-	5.48	9.65	0.12	9.87
AV	259.279k	20.84	51.45	-30.61	19.64	Line	-	1.20	9.65	0.12	9.87
QP	448.17k	13.19	56.92	-43.73	19.64	Line	-	-6.45	9.64	0.13	9.87
AV	448.17k	12.15	46.92	-34.77	19.64	Line	-	-7.49	9.64	0.13	9.87
QP	1.86M	16.08	56.00	-39.92	19.66	Line	-	-3.58	9.65	0.14	9.87
AV	1.86M	13.74	46.00	-32.26	19.66	Line	-	-5.92	9.65	0.14	9.87
QP	3.732M	18.51	56.00	-37.49	19.72	Line	-	-1.21	9.66	0.18	9.88
AV	3.732M	15.53	46.00	-30.47	19.72	Line	-	-4.19	9.66	0.18	9.88
QP	19.272M	20.81	60.00	-39.19	19.88	Line	-	0.93	9.64	0.35	9.89
AV	19.272M	17.13	50.00	-32.87	19.88	Line	-	-2.75	9.64	0.35	9.89

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 MHz).

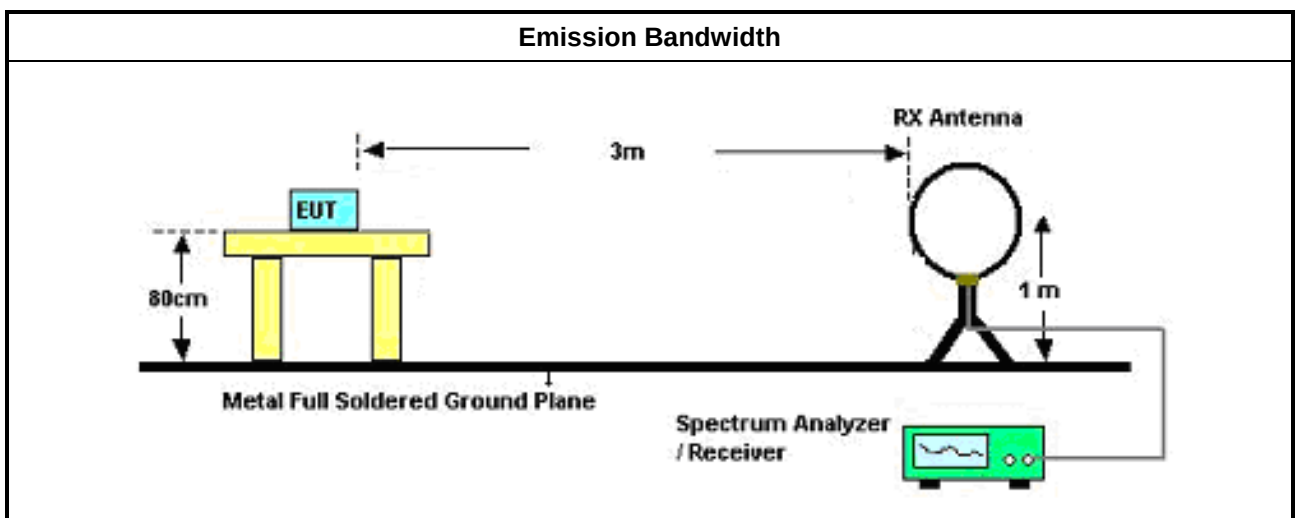
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

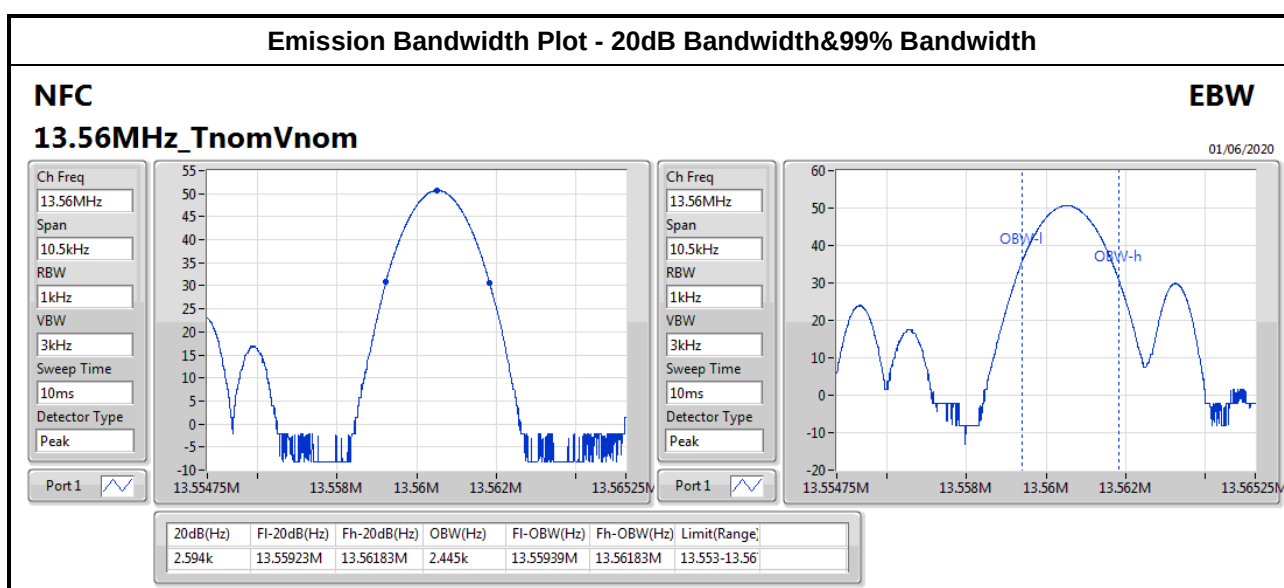
Test Method	
☒	Because the measured signal is CW or CW-like adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.
☒	For radiated measurement. Loop antenna was rotated about the horizontal and vertical 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)
NFC	13.56	2.594	2.445	13.55923	13.56183
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

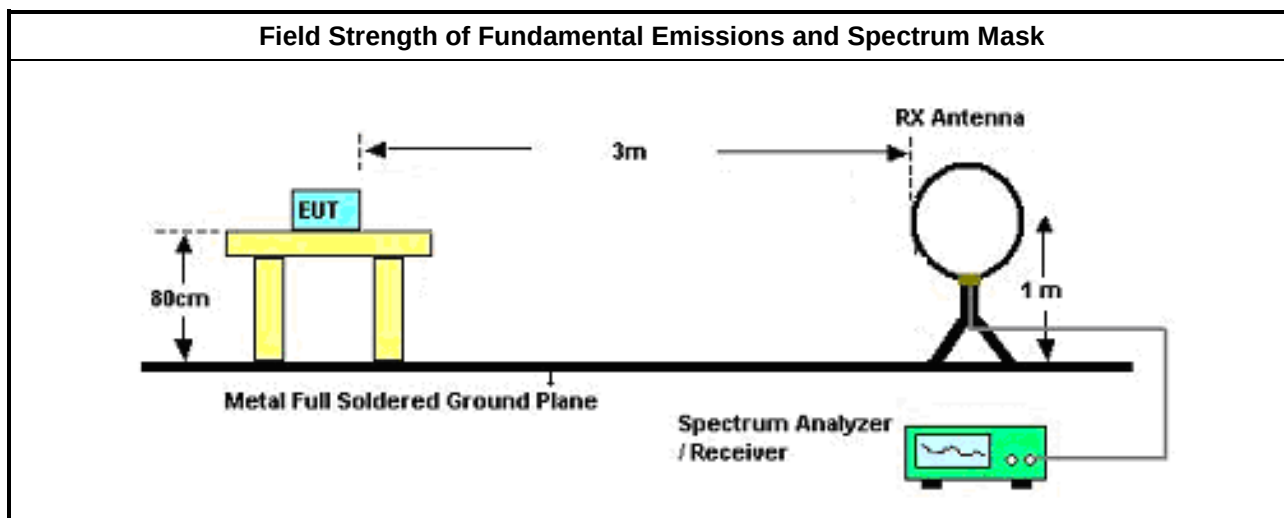
3.3.2 Measuring Instruments

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.

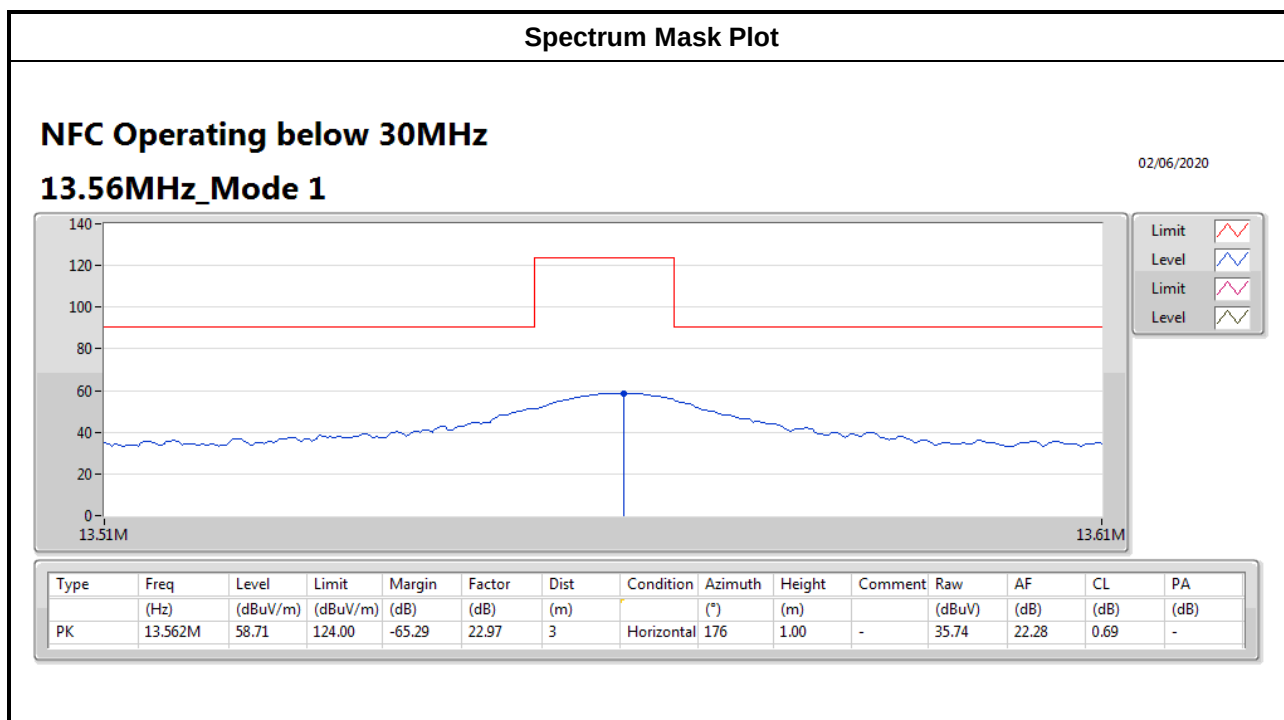
3.3.4 Test Setup



3.3.5 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
NFC	13.56	58.71	H	-65.29	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.

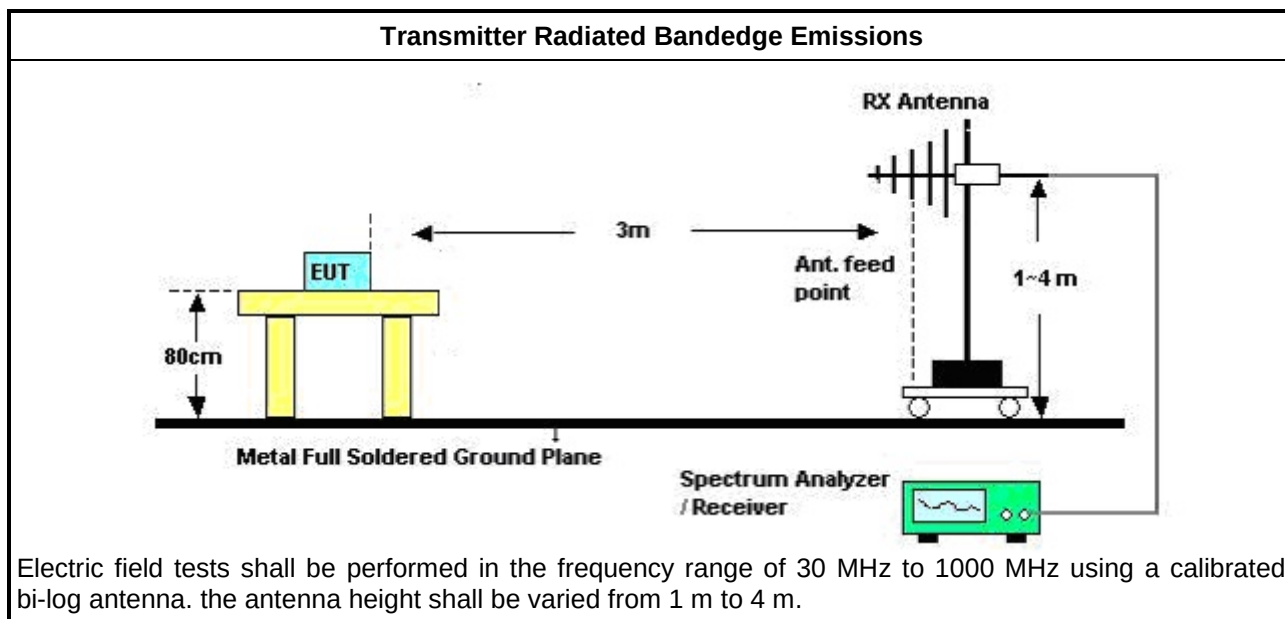
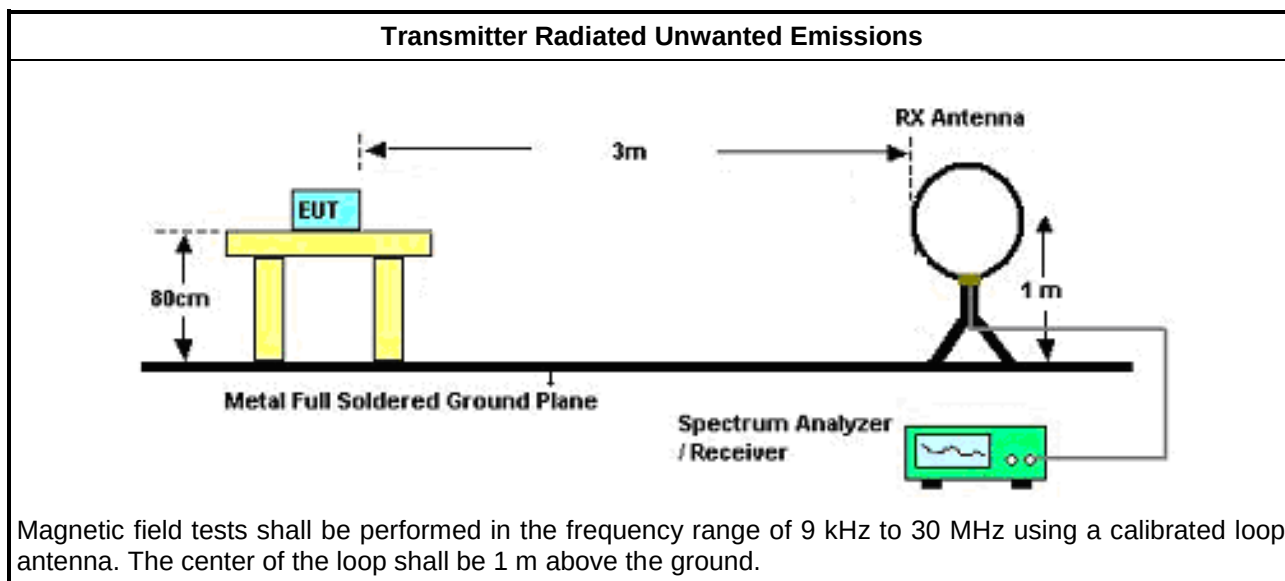
3.4.2 Measuring Instruments

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 Test Setup



3.4.5 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	4.389M	41.68	69.50	-27.82	20.84	3	0	1.00	-

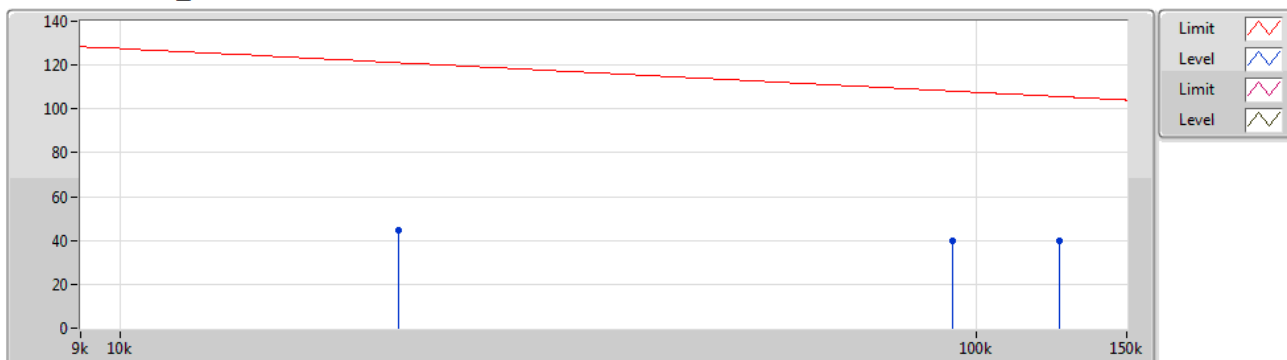
Result

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	13.562M	58.71	124.00	-65.29	22.97	3	176	1.00	-
13.56MHz_Mode 1	Pass	PK	21.126k	44.80	127.63	-82.83	20.55	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	93.882k	39.94	122.38	-82.44	20.14	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	125.184k	39.83	120.12	-80.29	20.05	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	4.389M	41.68	69.50	-27.82	20.84	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	16.388M	38.17	69.50	-31.33	23.27	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	25.224M	37.50	69.50	-32.00	23.97	3	0	1.00	-

NFC Operating below 30MHz

02/06/2020

13.56MHz_Mode 1

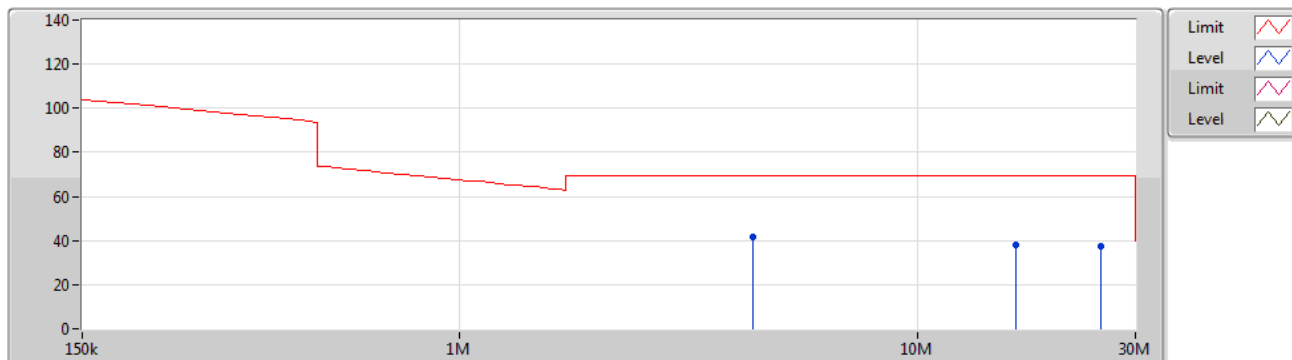


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	21.126k	44.80	127.63	-82.83	20.55	3	Horizontal	360	1.00	-	24.25	20.49	0.06	-
PK	93.882k	39.94	122.38	-82.44	20.14	3	Horizontal	360	1.00	-	19.80	20.06	0.08	-
PK	125.184k	39.83	120.12	-80.29	20.05	3	Horizontal	360	1.00	-	19.78	19.96	0.09	-

NFC Operating below 30MHz

02/06/2020

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	4.389M	41.68	69.50	-27.82	20.84	3	Horizontal	0	1.00	-	20.84	20.42	0.42	-
PK	16.388M	38.17	69.50	-31.33	23.27	3	Horizontal	0	1.00	-	14.90	22.51	0.76	-
PK	25.224M	37.50	69.50	-32.00	23.97	3	Horizontal	0	1.00	-	13.53	22.96	1.01	-

**3.4.6 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	30M	33.34	40.00	-6.66	-3.45	3	0	1.00	-

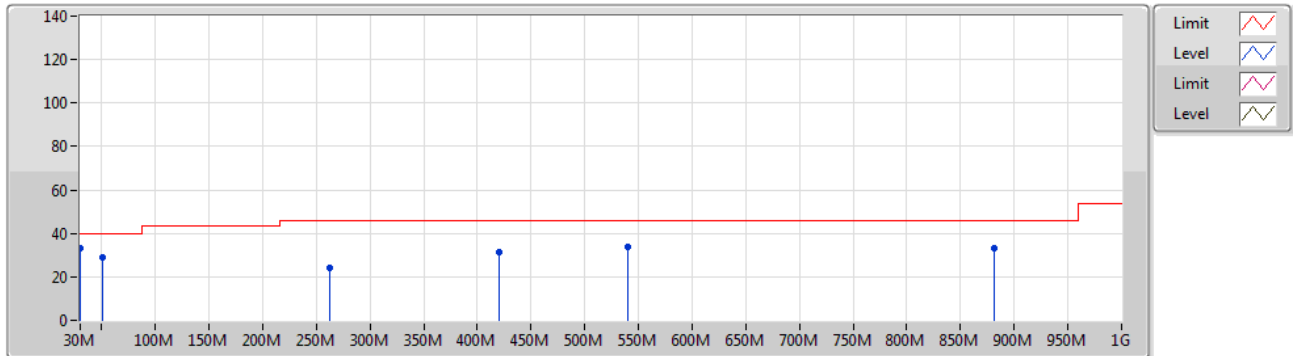
Result

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	30M	33.34	40.00	-6.66	-3.45	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	51.34M	29.25	40.00	-10.75	-13.80	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	262.8M	24.43	46.00	-21.57	-6.11	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	419.94M	31.14	46.00	-14.86	-3.06	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	540.22M	33.92	46.00	-12.08	-1.49	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	881.66M	33.21	46.00	-12.79	2.48	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	30M	31.67	40.00	-8.33	-3.45	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	210.42M	23.74	43.50	-19.76	-10.98	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	299.66M	28.62	46.00	-17.38	-6.10	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	419.94M	32.63	46.00	-13.37	-3.06	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	707.06M	31.82	46.00	-14.18	-0.07	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	986.42M	34.62	54.00	-19.38	3.99	3	360	1.00	-

NFC Operating above 30MHz

02/06/2020

13.56MHz_Mode 1

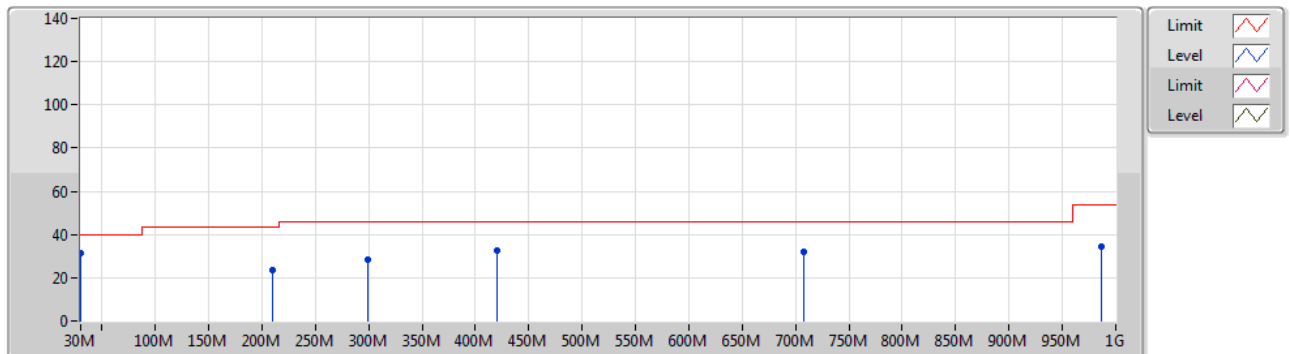


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	30M	33.34	40.00	-6.66	-3.45	3	Vertical	0	1.00	-	36.79	23.48	0.77	27.70
PK	51.34M	29.25	40.00	-10.75	-13.80	3	Vertical	0	1.00	-	43.05	12.84	1.05	27.69
PK	262.8M	24.43	46.00	-21.57	-6.11	3	Vertical	0	1.00	-	30.54	18.60	2.47	27.18
PK	419.94M	31.14	46.00	-14.86	-3.06	3	Vertical	0	1.00	-	34.20	21.83	3.16	28.05
PK	540.22M	33.92	46.00	-12.08	-1.49	3	Vertical	0	1.00	-	35.41	23.48	3.62	28.59
PK	881.66M	33.21	46.00	-12.79	2.48	3	Vertical	0	1.00	-	30.73	25.55	4.76	27.83

NFC Operating above 30MHz

02/06/2020

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	30M	31.67	40.00	-8.33	-3.45	3	Horizontal	360	1.00	-	35.12	23.48	0.77	27.70
PK	210.42M	23.74	43.50	-19.76	-10.98	3	Horizontal	360	1.00	-	34.72	14.18	2.19	27.35
PK	299.66M	28.62	46.00	-17.38	-6.10	3	Horizontal	360	1.00	-	34.72	18.41	2.66	27.17
PK	419.94M	32.63	46.00	-13.37	-3.06	3	Horizontal	360	1.00	-	35.69	21.83	3.16	28.05
PK	707.06M	31.82	46.00	-14.18	-0.07	3	Horizontal	360	1.00	-	31.89	24.08	4.22	28.37
PK	986.42M	34.62	54.00	-19.38	3.99	3	Horizontal	360	1.00	-	30.63	26.20	5.04	27.25

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).

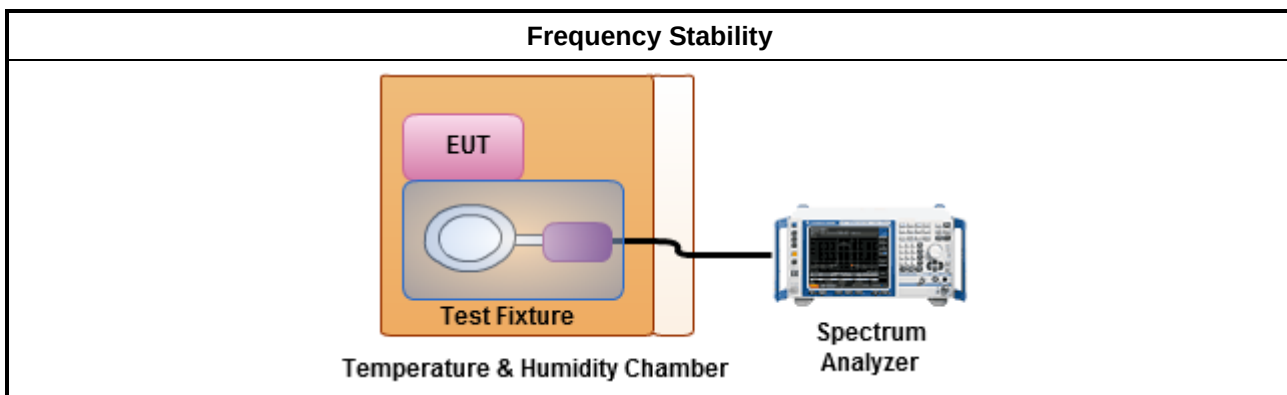
3.5.2 Measuring Instruments

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	13.561123M	82.8436	100	1	2 min

Result

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
NFC	-	-	-	-	-	-	-
13.56MHz_-30°C	Pass	13.56M	13.560523M	38.5829	100	1	0 min
13.56MHz_-30°C	Pass	13.56M	13.560538M	39.6798	100	1	2 min
13.56MHz_-30°C	Pass	13.56M	13.560518M	38.1958	100	1	5 min
13.56MHz_-30°C	Pass	13.56M	13.560522M	38.5184	100	1	10 min
13.56MHz_-20°C	Pass	13.56M	13.560614M	45.293	100	1	0 min
13.56MHz_-20°C	Pass	13.56M	13.560525M	38.712	100	1	2 min
13.56MHz_-20°C	Pass	13.56M	13.560549M	40.454	100	1	5 min
13.56MHz_-20°C	Pass	13.56M	13.560546M	40.2605	100	1	10 min
13.56MHz_-10°C	Pass	13.56M	13.560571M	42.1315	100	1	0 min
13.56MHz_-10°C	Pass	13.56M	13.560185M	13.6782	100	1	2 min
13.56MHz_-10°C	Pass	13.56M	13.559871M	9.4844	100	1	5 min
13.56MHz_-10°C	Pass	13.56M	13.560655M	48.3254	100	1	10 min
13.56MHz_0°C	Pass	13.56M	13.560658M	48.519	100	1	0 min
13.56MHz_0°C	Pass	13.56M	13.560533M	39.2927	100	1	2 min
13.56MHz_0°C	Pass	13.56M	13.560519M	38.2603	100	1	5 min
13.56MHz_0°C	Pass	13.56M	13.559966M	2.5163	100	1	10 min
13.56MHz_10°C	Pass	13.56M	13.560515M	38.0023	100	1	0 min
13.56MHz_10°C	Pass	13.56M	13.561001M	73.8108	100	1	2 min
13.56MHz_10°C	Pass	13.56M	13.560681M	50.1965	100	1	5 min
13.56MHz_10°C	Pass	13.56M	13.560515M	38.0023	100	1	10 min
13.56MHz_20°C	Pass	13.56M	13.559528M	34.7763	100	1	0 min
13.56MHz_20°C	Pass	13.56M	13.561014M	74.7786	100	1	2 min
13.56MHz_20°C	Pass	13.56M	13.560514M	37.8732	100	1	5 min
13.56MHz_20°C	Pass	13.56M	13.560512M	37.7442	100	1	10 min
13.56MHz_30°C	Pass	13.56M	13.559839M	11.8717	100	1	0 min
13.56MHz_30°C	Pass	13.56M	13.560633M	46.7124	100	1	2 min
13.56MHz_30°C	Pass	13.56M	13.560368M	27.1629	100	1	5 min
13.56MHz_30°C	Pass	13.56M	13.560539M	39.7443	100	1	10 min
13.56MHz_40°C	Pass	13.56M	13.560534M	39.3572	100	1	0 min
13.56MHz_40°C	Pass	13.56M	13.560492M	36.2602	100	1	2 min
13.56MHz_40°C	Pass	13.56M	13.560824M	60.7778	100	1	5 min
13.56MHz_40°C	Pass	13.56M	13.560941M	69.4235	100	1	10 min
13.56MHz_50°C	Pass	13.56M	13.561062M	78.3272	100	1	0 min

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
13.56MHz_50°C	Pass	13.56M	13.560502M	37.0345	100	1	2 min
13.56MHz_50°C	Pass	13.56M	13.559949M	3.7422	100	1	5 min
13.56MHz_50°C	Pass	13.56M	13.560542M	39.9379	100	1	10 min
13.56MHz_60°C	Pass	13.56M	13.560459M	33.873	100	1	0 min
13.56MHz_60°C	Pass	13.56M	13.560507M	37.3571	100	1	2 min
13.56MHz_60°C	Pass	13.56M	13.560269M	19.8076	100	1	5 min
13.56MHz_60°C	Pass	13.56M	13.560059M	4.3228	100	1	10 min
13.56MHz_70°C	Pass	13.56M	13.560466M	34.3891	100	1	0 min
13.56MHz_70°C	Pass	13.56M	13.560472M	34.8408	100	1	2 min
13.56MHz_70°C	Pass	13.56M	13.560458M	33.7439	100	1	5 min
13.56MHz_70°C	Pass	13.56M	13.560474M	34.9698	100	1	10 min
13.56MHz_75°C	Pass	13.56M	13.560286M	21.098	100	1	0 min
13.56MHz_75°C	Pass	13.56M	13.560625M	46.0673	100	1	2 min
13.56MHz_75°C	Pass	13.56M	13.560581M	42.8413	100	1	5 min
13.56MHz_75°C	Pass	13.56M	13.560527M	38.841	100	1	10 min
13.56MHz_20°C-13.8V	Pass	13.56M	13.560577M	42.5832	100	1	0 min
13.56MHz_20°C-13.8V	Pass	13.56M	13.560521M	38.4539	100	1	2 min
13.56MHz_20°C-13.8V	Pass	13.56M	13.560522M	38.5184	100	1	5 min
13.56MHz_20°C-13.8V	Pass	13.56M	13.56035M	25.808	100	1	10 min
13.56MHz_20°C-10.2V	Pass	13.56M	13.561078M	79.4886	100	1	0 min
13.56MHz_20°C-10.2V	Pass	13.56M	13.561123M	82.8436	100	1	2 min
13.56MHz_20°C-10.2V	Pass	13.56M	13.560533M	39.2927	100	1	5 min
13.56MHz_20°C-10.2V	Pass	13.56M	13.56052M	38.3249	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
EMC Receiver	R&S	ESR3	102051	9kHz ~ 3.6GHz	28/May/2019	27/May/2020
LISN	R&S	ENV216	101295	9kHz ~ 30MHz	04/Nov/2019	05/Nov/2020
RF Cable-CON	MTJ	RG142	CB002-CO	9kHz ~ 200MHz	12/Sep/2019	11/Sep/2020
AC POWER	APC	AFC-11005G	F310050055	47Hz~63Hz 5~300V	NCR	NCR
Impuls Begrenzer Pulse Limiter	SCHWARZBECK	VTSD 9561-F	9561-F041	9 kHz ~ 30 MHz	24/Sep/2019	23/Sep/2020

NCR : Non-Calibration Require

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101029	10kHz ~ 40GHz	01/Oct/2019	30/Sep/2020
Loop Antenna	TESEQ	HLA 6120	31244	9kHz ~ 30MHz	16/Mar/2020	15/Mar/2021
*TEMP & humidity Chamber	Giant Force	GTH-225-40-CP-AR	MAA1611-005	-40~100℃ 10~98%RH	09/Dec/2019	08/Dec/2020

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	29/Aug/2019	28/Aug/2020
Amplifier	Agilent	8447D	2944A11149	100kHz ~ 1.3GHz	02/Jul/2019	01/Jul/2020
Spectrum Analyzer	Rohde & Schwarz	FSP40	100593	9kHz ~ 40GHz	27/Feb/2020	26/Feb/2021
EMI Test Receiver	R&S	ESR	102052	9kHz ~ 3.6GHz	29/Apr/2020	28/Apr/2021
RF Cable-R03m	Jye Bao	RG142	CB017	9kHz ~ 1GHz	25/Mar/2020	24/Mar/2021
Bilog Antenna & 5dB Attenuator	SCHAFFNER / MTJ	CBL 6112B / MTJ6102-05	2723 / 2	30MHz ~ 1GHz	28/Feb/2020	27/Feb/2021
Loop Antenna	TESEQ	HLA 6120	31244	9k-30MHz	16/Mar/2020	15/Mar/2021