FCC Test Report

FCC ID	:	**B32T650P**
Equipment	:	**Point of Sales Terminal**
Brand Name	:	**Verifone**
Model Name	:	**T650p**
Applicant/ Manufacturer	:	**Verifone, Inc. 1400 West Stanford Ranch Road, Suite 200, Rocklin CA 95765 USA**
Standard	:	**47 CFR FCC Part 15.225**

The product was received on Sep. 01, 2020, and testing was started from Sep. 04, 2020 and completed on Sep. 06, 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.

Allen Lin

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

Report No.	Version	Description	Issued Date
FR052211-08AR	01	Initial issue of report	Oct. 20, 2020

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: Yunha Liou

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information			
Frequency Range	**Ch. Frequency (MHz)**	**Channel Number**	**Field Strength (dBuV/m)**
13.553 – 13.567 MHz	13.56	1	85.12
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	
Ant. Cat.	**Ant. Type**
Integral	Loop

1.1.3 EUT Information

Operational Condition		
EUT Power Type	From AC Adapter	
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

1.2 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	23.6~24.9°C / 56~60%	06/Sep/2020
RF Conducted	TH06-HY	Alan	20.1~26.9°C/ 50~60%	04/Sep/2020
Radiated Emission	03CH02-HY	Edward	22.3~25.4°C / 52~59%	05/Sep/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
Frequency Stability	Tnom	20°C
-	Tmin	-20°C
-	Tmax	55°C
-	Vnom	120V
-	Vmin	93.5V
-	Vmax	126.5V

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	85.12

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. Adapter 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		
	☒ 1. Adapter Mode		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			
Worst Planes of EUT	V		

2.4 Accessories

Accessories Information				
AC Adapter (For US)	**Brand Name**	Verifone	**Model Name**	S010CNU0500200
	Power Rating	I/P: 100 - 240 50-60Hz Vac, 400mA O/P: 5.0Vdc, 2000mA		
Battery	**Brand Name**	Verifone	**Model Name**	SX18650-2S1P
USB Cable	**Brand Name**	Verifone	**Model Name**	NA
	Signal Line	1.45 meter, non-shielded cable, w/o ferrite core		
WWAN Module	**Brand Name**	Quectel	**Model Name**	SC20-A

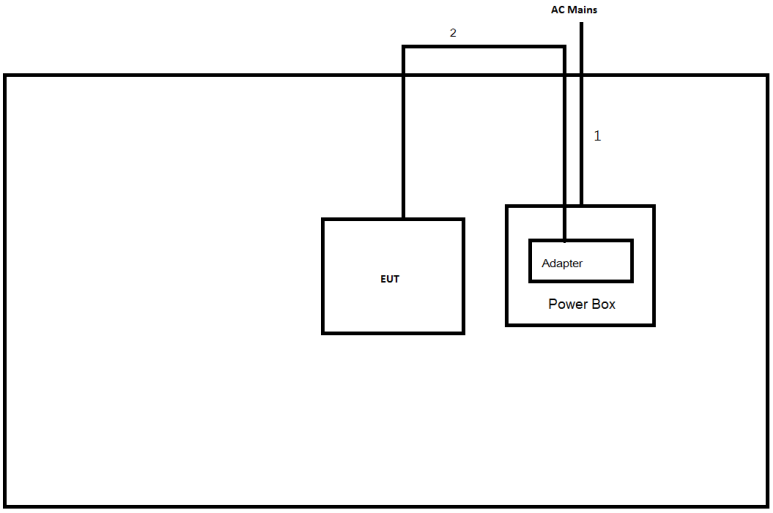
Reminder: Regarding to more detail and other information, please refer to user manual.

2.5 Support Equipment

Support Equipment - RF Conducted			
No.	**Equipment**	**Brand Name**	**Model Name**
1	AC Power Source	Verifone	S010CNU0500200

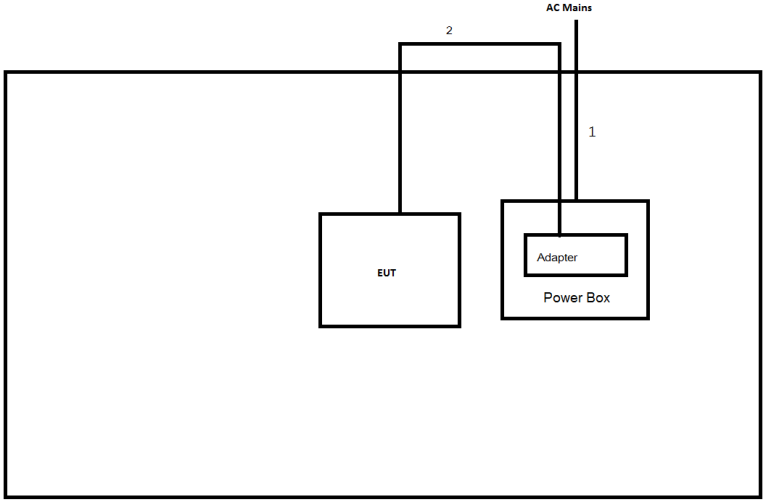
2.6 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



Item	Connection	Shielded	Length(m)	Remark
1	AC Power cable	No	1.8	-
2	USB cable	No	1.45	-

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length(m)	Remark
1	AC Power cable	No	1.8	-
2	USB cable	No	1.45	-

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

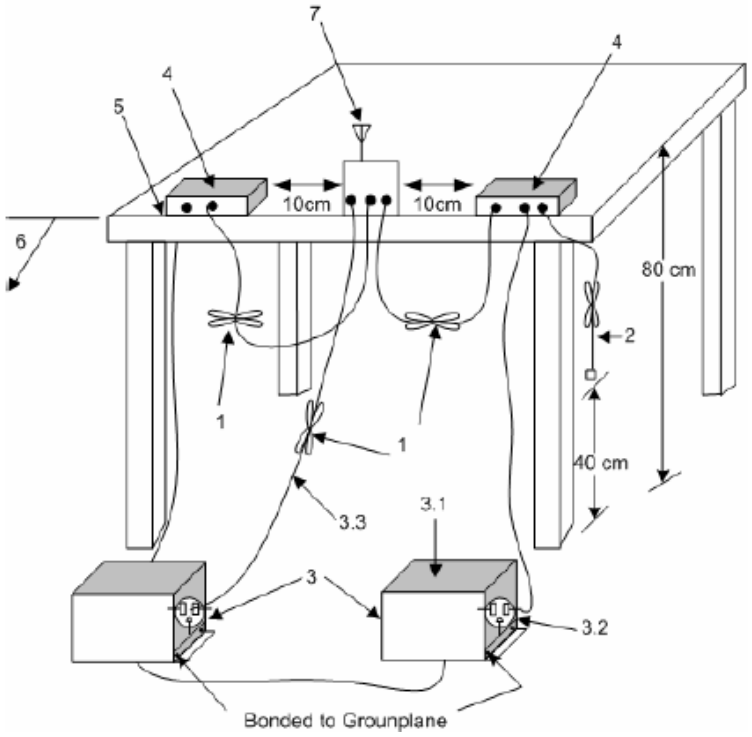
Test Method	
☒	Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.
☒	If AC conducted emissions fall in operating band, then following below test method confirm final result.
☐	Accept measurements done with a suitable dummy load replacing the antenna under the following conditions: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

AC Power-line Conducted Emissions



1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
3.1—All other equipment powered from additional LISN(s).
3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
3.3—LISN at least 80 cm from nearest part of EUT chassis.
4—Non-EUT components of EUT system being tested.
5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

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	QP	27.126M	47.05	60.00	-12.95	Neutral

Mode Configure

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition	Comments
Mode 1	Pass	QP	168.41k	40.77	65.04	-24.27	Line	-
Mode 1	Pass	AV	168.41k	27.91	55.04	-27.13	Line	-
Mode 1	Pass	QP	304.059k	27.18	60.13	-32.95	Line	-
Mode 1	Pass	AV	304.059k	21.15	50.13	-28.98	Line	-
Mode 1	Pass	QP	573.613k	36.35	56.00	-19.65	Line	-
Mode 1	Pass	AV	573.613k	30.17	46.00	-15.83	Line	-
Mode 1	Pass	QP	2.091M	30.52	56.00	-25.48	Line	-
Mode 1	Pass	AV	2.091M	23.12	46.00	-22.88	Line	-
Mode 1	Pass	QP	13.597M	40.54	60.00	-19.46	Line	-
Mode 1	Pass	AV	13.597M	27.50	50.00	-22.50	Line	-
Mode 1	Pass	QP	27.126M	46.06	60.00	-13.94	Line	“Worst”
Mode 1	Pass	AV	27.126M	33.31	50.00	-16.69	Line	-
Mode 1	Pass	QP	174.571k	30.04	64.74	-34.70	Neutral	-
Mode 1	Pass	AV	174.571k	19.88	54.74	-34.86	Neutral	-
Mode 1	Pass	QP	286.387k	25.99	60.63	-34.64	Neutral	-
Mode 1	Pass	AV	286.387k	18.21	50.63	-32.42	Neutral	-
Mode 1	Pass	QP	594.596k	36.37	56.00	-19.63	Neutral	-
Mode 1	Pass	AV	594.596k	26.83	46.00	-19.17	Neutral	-
Mode 1	Pass	QP	4.138M	28.67	56.00	-27.33	Neutral	-
Mode 1	Pass	AV	4.138M	20.16	46.00	-25.84	Neutral	-
Mode 1	Pass	QP	14.151M	41.28	60.00	-18.72	Neutral	-
Mode 1	Pass	AV	14.151M	27.55	50.00	-22.45	Neutral	-
Mode 1	Pass	QP	27.126M	47.05	60.00	-12.95	Neutral	“Worst”
Mode 1	Pass	AV	27.126M	36.11	50.00	-13.89	Neutral	-

Conducted Emissions at Powerline_Mode 1

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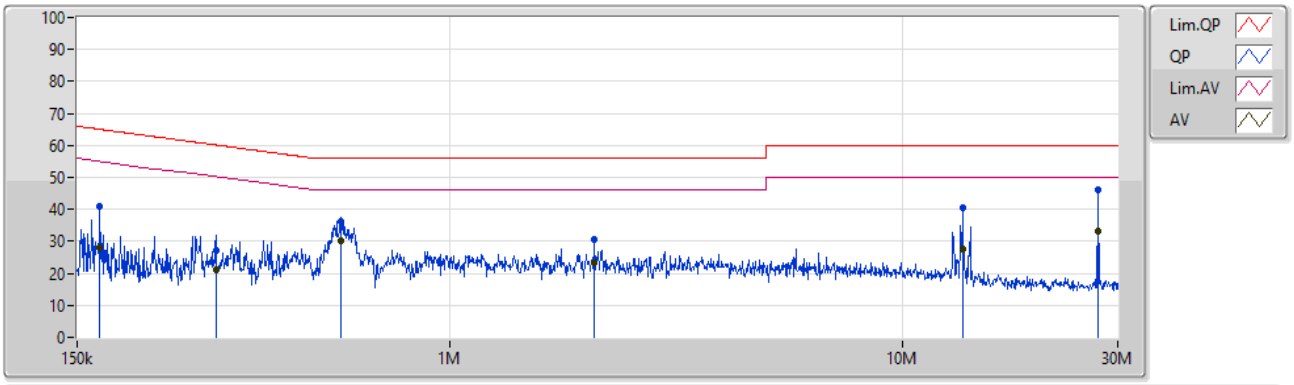
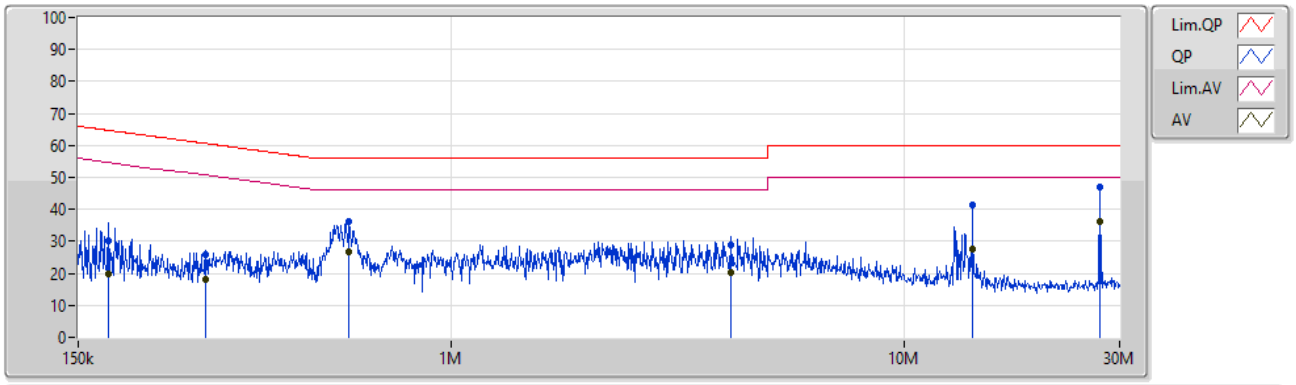


Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	168.41k	40.77	65.04	-24.27	19.54	Line	-	21.23	9.66	0.01	9.87
AV	168.41k	27.91	55.04	-27.13	19.54	Line	-	8.37	9.66	0.01	9.87
QP	304.059k	27.18	60.13	-32.95	19.53	Line	-	7.65	9.64	0.02	9.87
AV	304.059k	21.15	50.13	-28.98	19.53	Line	-	1.62	9.64	0.02	9.87
QP	573.613k	36.35	56.00	-19.65	19.54	Line	-	16.81	9.64	0.03	9.87
AV	573.613k	30.17	46.00	-15.83	19.54	Line	-	10.63	9.64	0.03	9.87
QP	2.091M	30.52	56.00	-25.48	19.60	Line	-	10.92	9.65	0.08	9.87
AV	2.091M	23.12	46.00	-22.88	19.60	Line	-	3.52	9.65	0.08	9.87
QP	13.597M	40.54	60.00	-19.46	19.79	Line	-	20.75	9.67	0.24	9.88
AV	13.597M	27.50	50.00	-22.50	19.79	Line	-	7.71	9.67	0.24	9.88
QP	27.126M	46.06	60.00	-13.94	19.78	Line	"Worst"	26.28	9.54	0.36	9.88
AV	27.126M	33.31	50.00	-16.69	19.78	Line	-	13.53	9.54	0.36	9.88

Conducted Emissions at Powerline_Mode 1

06/09/2020



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	174.571k	30.04	64.74	-34.70	19.52	Neutral	-	10.52	9.64	0.01	9.87
AV	174.571k	19.88	54.74	-34.86	19.52	Neutral	-	0.36	9.64	0.01	9.87
QP	286.387k	25.99	60.63	-34.64	19.52	Neutral	-	6.47	9.63	0.02	9.87
AV	286.387k	18.21	50.63	-32.42	19.52	Neutral	-	-1.31	9.63	0.02	9.87
QP	594.596k	36.37	56.00	-19.63	19.53	Neutral	-	16.84	9.63	0.03	9.87
AV	594.596k	26.83	46.00	-19.17	19.53	Neutral	-	7.30	9.63	0.03	9.87
QP	4.138M	28.67	56.00	-27.33	19.66	Neutral	-	9.01	9.66	0.12	9.88
AV	4.138M	20.16	46.00	-25.84	19.66	Neutral	-	0.50	9.66	0.12	9.88
QP	14.151M	41.28	60.00	-18.72	19.83	Neutral	-	21.45	9.71	0.24	9.88
AV	14.151M	27.55	50.00	-22.45	19.83	Neutral	-	7.72	9.71	0.24	9.88
QP	27.126M	47.05	60.00	-12.95	19.92	Neutral	"Worst"	27.13	9.68	0.36	9.88
AV	27.126M	36.11	50.00	-13.89	19.92	Neutral	-	16.19	9.68	0.36	9.88

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

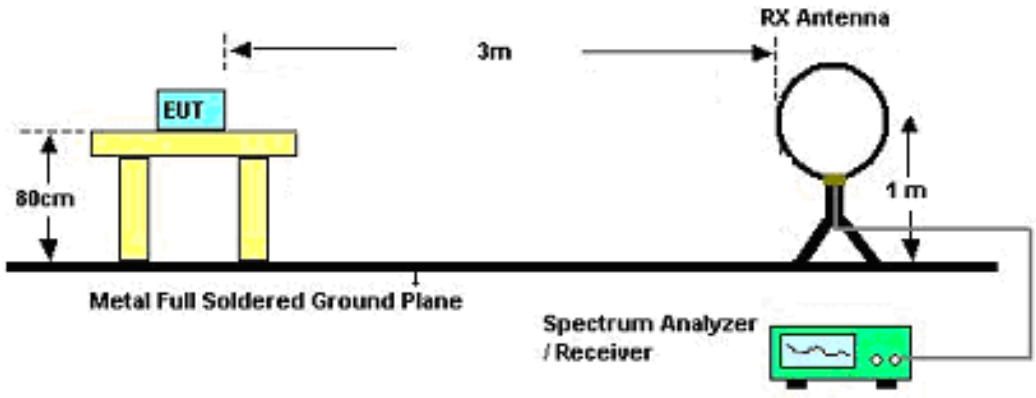
Refer a test equipment and calibration data table in this test report.

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

Emission Bandwidth



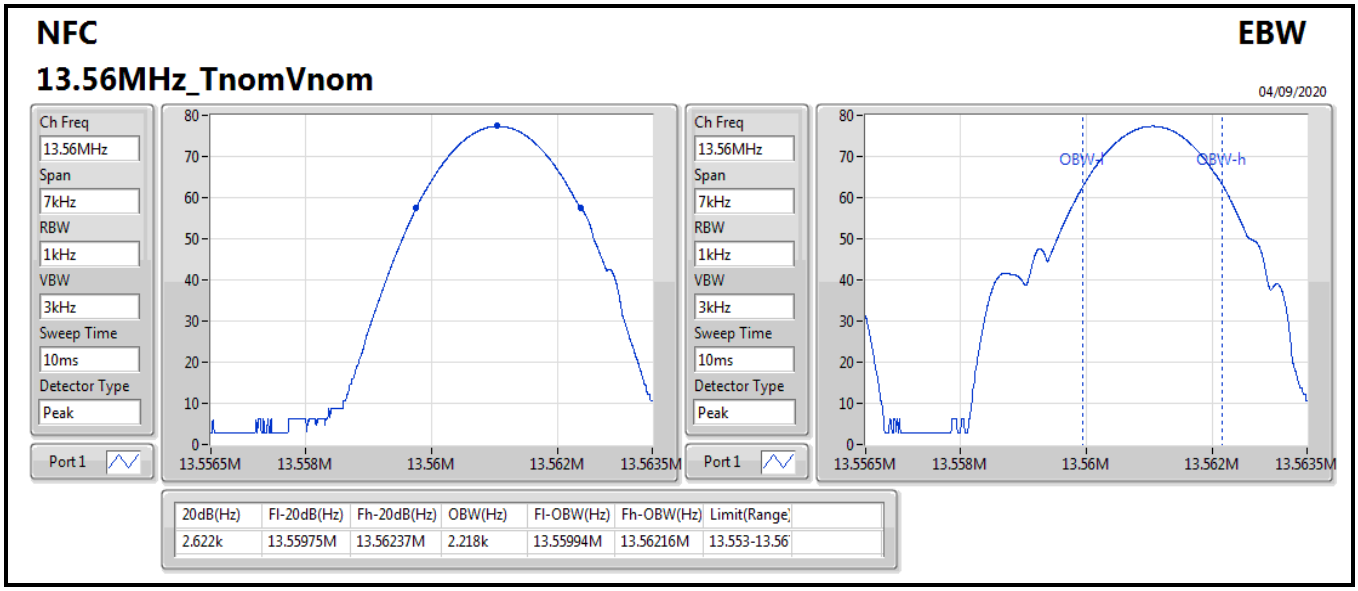
3.2.5 Test Result of Emission Bandwidth

Summary

Mode	20dB (Hz)	Fl-20dB (Hz)	Fh-20dB (Hz)	OBW (Hz)	Limit (Range)
13.553-13.567MHz	-	-	-	-	-
NFC	2.622k	13.55975M	13.56237M	2.218k	13.553-13.567

Result

Mode	Result	20dB (Hz)	Fl-20dB (Hz)	Fh-20dB (Hz)	OBW (Hz)	Fl-OBW (Hz)	Fh-OBW (Hz)	Limit (Range)
NFC	-	-	-	-	-	-	-	-
13.56MHz_TnomVnom	Pass	2.622k	13.55975M	13.56237M	2.218k	13.55994M	13.56216M	13.553-13.567



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

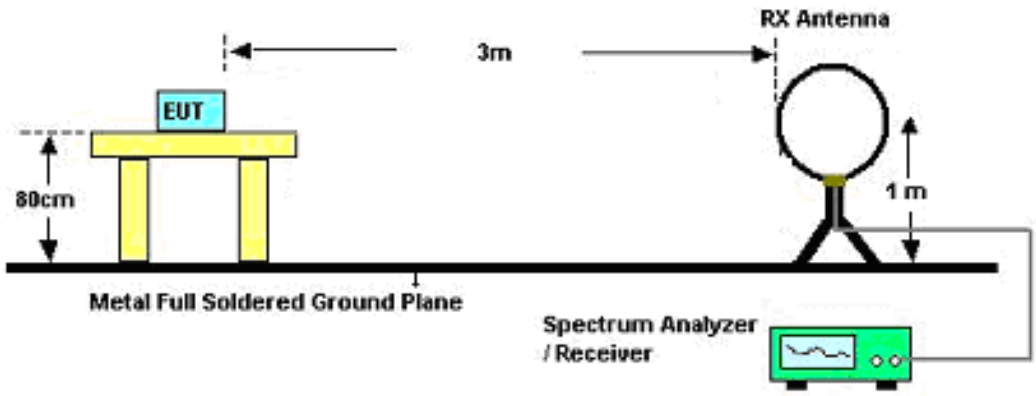
Test Method	
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.
☒	At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; however, an attempt should be made to avoid making measurements 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(Preamp Factor).

3.3.5 Test Setup

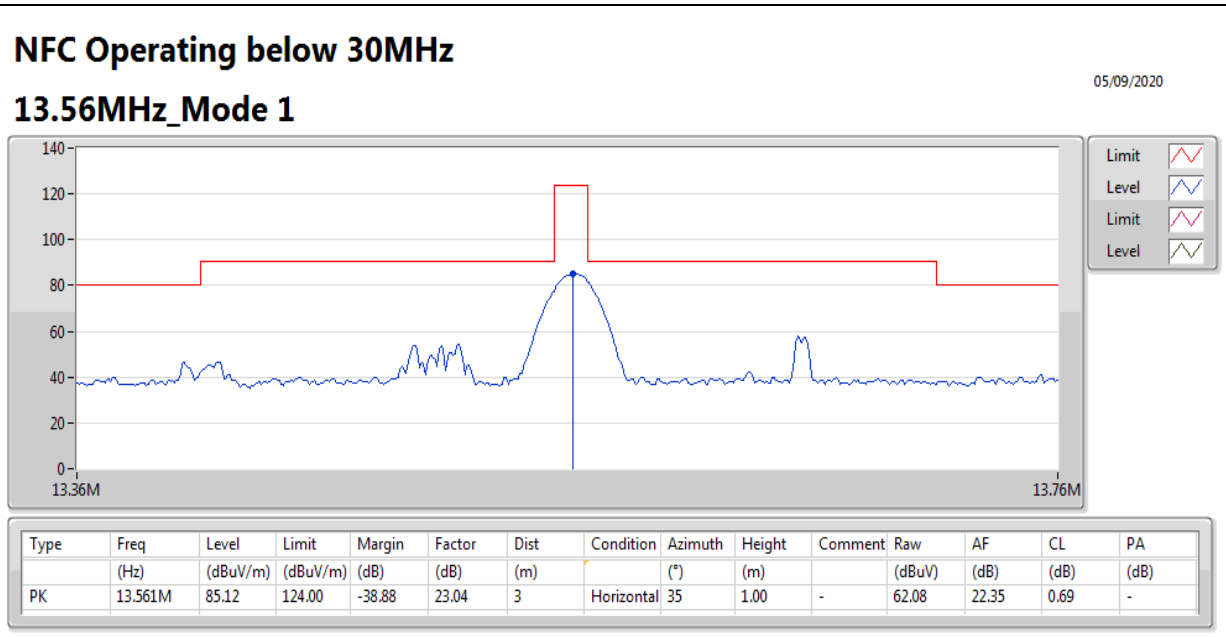
Field Strength of Fundamental Emissions and Spectrum Mask



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

Field Strength of Fundamental Emissions Result				
Frequency (MHz)	**Fundamental (dBuV/m)@3m**	**Polarization**	**Margin (dB)**	**Limit (dBuV/m)@3m**
13.56	85.12	H	-38.88	124.00
Result	**Complied**			
Note 1: Measurement worst emissions of receive antenna polarization: H(Horizontal).				

Spectrum Mask Plot



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	13.561M	85.12	124.00	-38.88	23.04	3	Horizontal	35	1.00	-	62.08	22.35	0.69	-

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

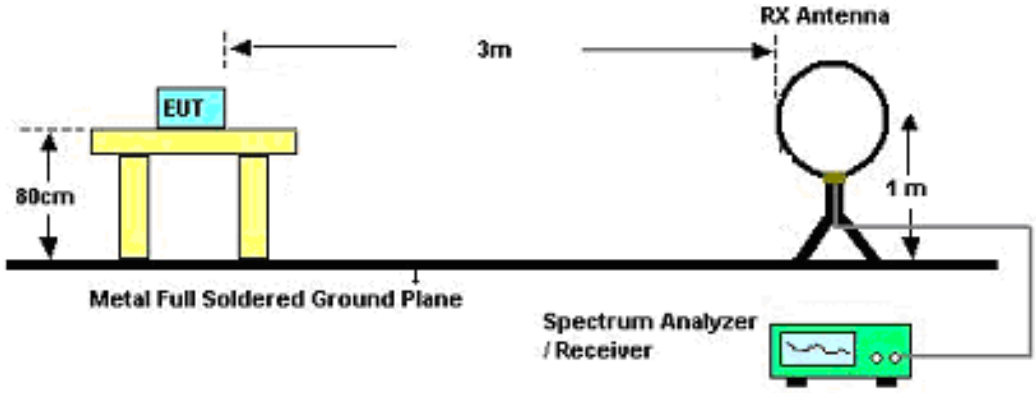
Test Method		
☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1 GHz and test distance is 3m.	
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.	
☒	At frequencies below 30 MHz, measurements may be performed at a distance closer 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(Preamp Factor)

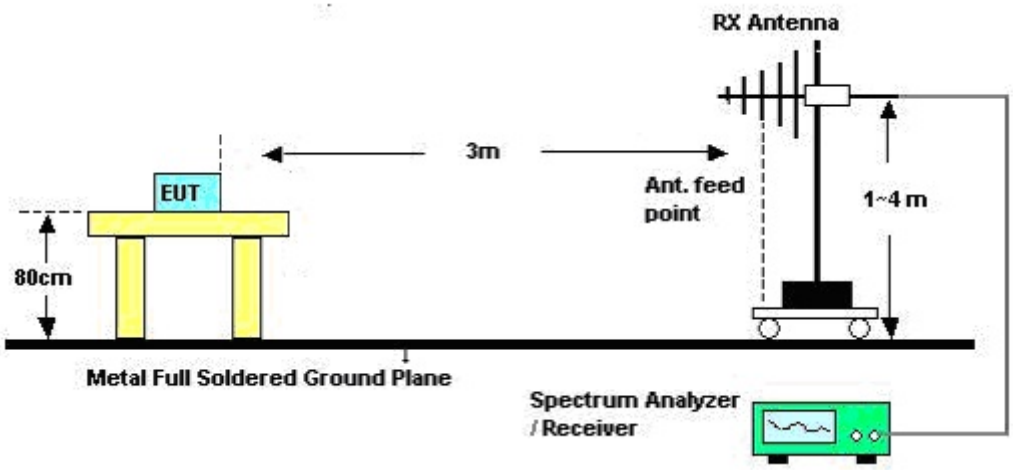
3.4.5 Test Setup

Transmitter Radiated Unwanted Emissions



Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. The center of the loop shall be 1 m above the ground.

Transmitter Radiated Bandedge Emissions



Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna. the antenna height shall be varied from 1 m to 4 m.

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	2.18M	52.62	69.50	-16.88	20.33	3	0	1.00	-

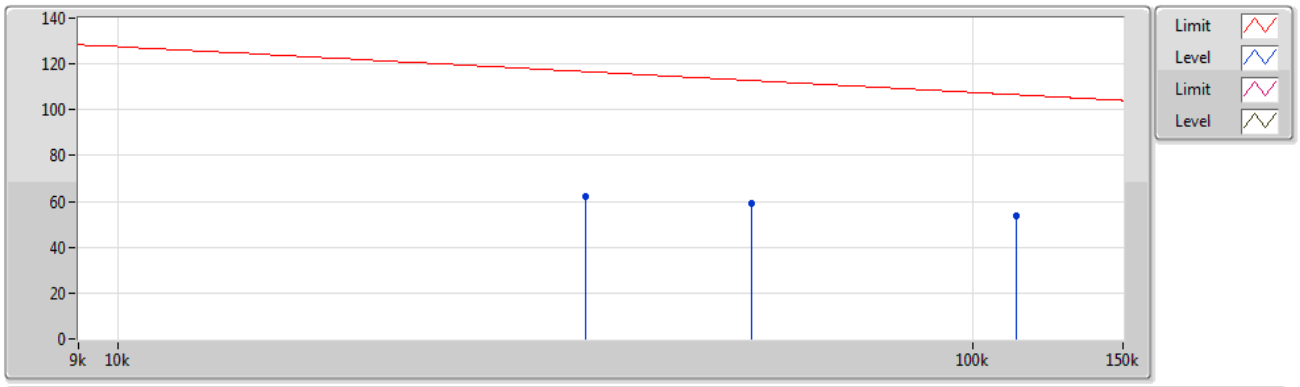
Result

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	13.561M	85.12	124.00	-38.88	23.04	3	35	1.00	-
13.56MHz_Mode 1	Pass	PK	35.226k	62.32	116.65	-54.33	21.27	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	55.248k	59.32	112.75	-53.43	21.08	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	112.494k	53.48	106.57	-53.09	20.03	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	209.7k	53.25	101.16	-47.91	20.35	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	490k	61.67	93.80	-32.13	20.67	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	2.18M	52.62	69.50	-16.88	20.33	3	0	1.00	-

NFC Operating below 30MHz

05/09/2020

13.56MHz_Mode 1

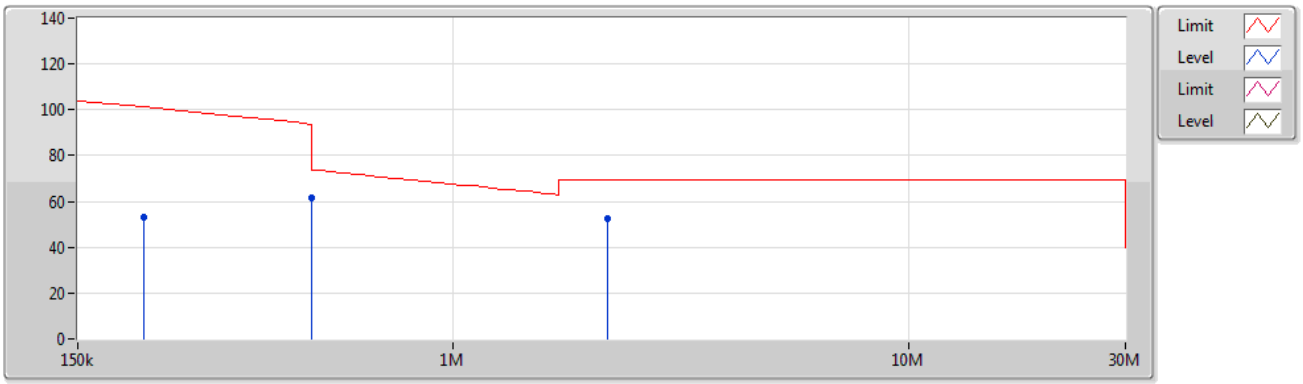


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	35.226k	62.32	116.65	-54.33	21.27	3	Horizontal	360	1.00	-	41.05	21.20	0.07	-
PK	55.248k	59.32	112.75	-53.43	21.08	3	Horizontal	360	1.00	-	38.24	21.01	0.07	-
PK	112.494k	53.48	106.57	-53.09	20.03	3	Horizontal	360	1.00	-	33.45	19.95	0.08	-

NFC Operating below 30MHz

05/09/2020

13.56MHz_Mode 1



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	209.7k	53.25	101.16	-47.91	20.35	3	Horizontal	0	1.00	-	32.90	20.24	0.11	-
PK	490k	61.67	93.80	-32.13	20.67	3	Horizontal	0	1.00	-	41.00	20.50	0.17	-
PK	2.18M	52.62	69.50	-16.88	20.33	3	Horizontal	0	1.00	-	32.29	19.97	0.36	-

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	474.26M	36.93	46.00	-9.07	-2.15	3	360	1.00	-

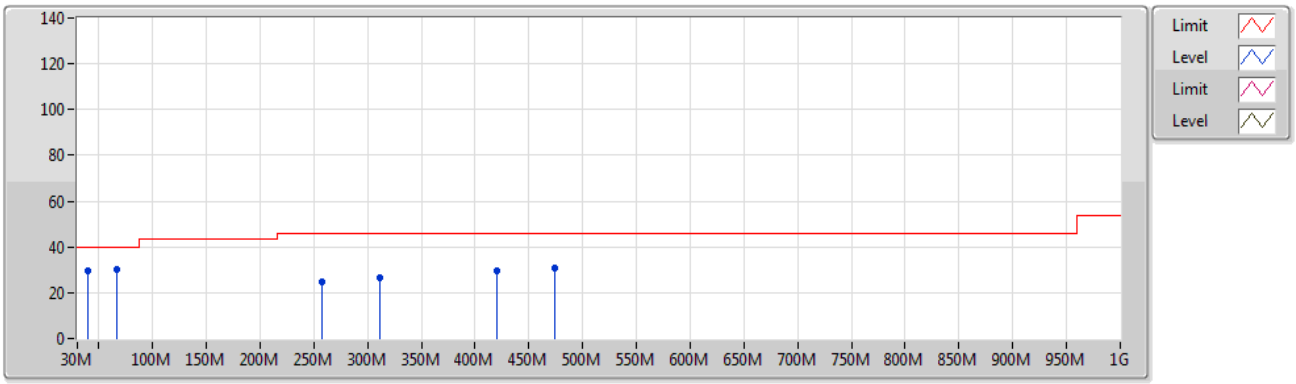
Result

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	39.7M	29.52	40.00	-10.48	-8.06	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	66.86M	29.98	40.00	-10.02	-15.38	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	256.98M	24.96	46.00	-21.04	-5.94	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	311.3M	26.48	46.00	-19.52	-5.68	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	419.94M	29.41	46.00	-16.59	-2.65	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	474.26M	30.75	46.00	-15.25	-2.15	3	0	1.00	-
13.56MHz_Mode 1	Pass	PK	30M	28.64	40.00	-11.36	-2.80	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	66.86M	28.13	40.00	-11.87	-15.38	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	148.34M	29.33	43.50	-14.17	-9.89	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	311.3M	26.88	46.00	-19.12	-5.68	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	392.78M	28.86	46.00	-17.14	-3.83	3	360	1.00	-
13.56MHz_Mode 1	Pass	PK	474.26M	36.93	46.00	-9.07	-2.15	3	360	1.00	-

NFC Operating above 30MHz

05/09/2020

13.56MHz_Mode 1

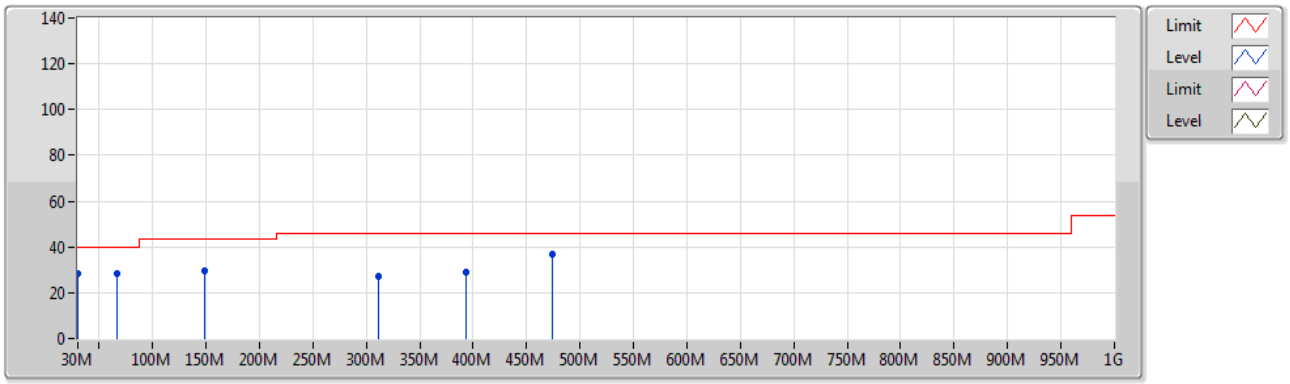


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	39.7M	29.52	40.00	-10.48	-8.06	3	Vertical	0	1.00	-	37.58	18.35	0.92	27.33
PK	66.86M	29.98	40.00	-10.02	-15.38	3	Vertical	0	1.00	-	45.36	11.24	1.20	27.82
PK	256.98M	24.96	46.00	-21.04	-5.94	3	Vertical	0	1.00	-	30.90	18.67	2.44	27.05
PK	311.3M	26.48	46.00	-19.52	-5.68	3	Vertical	0	1.00	-	32.16	18.71	2.71	27.10
PK	419.94M	29.41	46.00	-16.59	-2.65	3	Vertical	0	1.00	-	32.06	22.06	3.16	27.87
PK	474.26M	30.75	46.00	-15.25	-2.15	3	Vertical	0	1.00	-	32.90	22.62	3.40	28.17

NFC Operating above 30MHz

05/09/2020

13.56MHz_Mode 1



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	30M	28.64	40.00	-11.36	-2.80	3	Horizontal	360	1.00	-	31.44	23.64	0.77	27.21
PK	66.86M	28.13	40.00	-11.87	-15.38	3	Horizontal	360	1.00	-	43.51	11.24	1.20	27.82
PK	148.34M	29.33	43.50	-14.17	-9.89	3	Horizontal	360	1.00	-	39.22	15.90	1.80	27.59
PK	311.3M	26.88	46.00	-19.12	-5.68	3	Horizontal	360	1.00	-	32.56	18.71	2.71	27.10
PK	392.78M	28.86	46.00	-17.14	-3.83	3	Horizontal	360	1.00	-	32.69	20.79	3.05	27.67
PK	474.26M	36.93	46.00	-9.07	-2.15	3	Horizontal	360	1.00	-	39.08	22.62	3.40	28.17

3.5 Frequency Stability

3.5.1 Frequency Stability Limit

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

3.5.2 Measuring Instruments

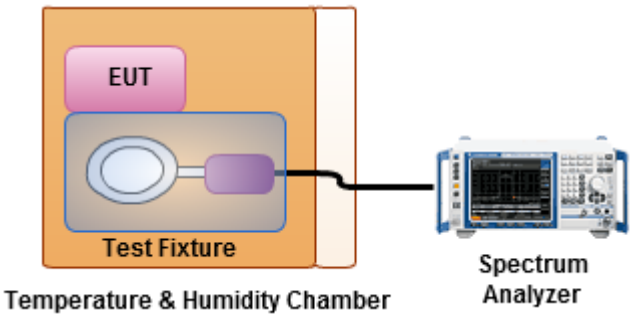
Refer a test equipment and calibration data table in this test report.

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

Frequency Stability



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	13.561073M	79.166	100	1	10 min

Result

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
NFC	-	-	-	-	-	-	-
13.56MHz_-20°C	Pass	13.56M	13.561059M	78.1424	100	1	0 min
13.56MHz_-20°C	Pass	13.56M	13.561066M	78.8437	100	1	2 min
13.56MHz_-20°C	Pass	13.56M	13.561059M	77.6657	100	1	5 min
13.56MHz_-20°C	Pass	13.56M	13.561042M	78.234	100	1	10 min
13.56MHz_-10°C	Pass	13.56M	13.561059M	78.1394	100	1	0 min
13.56MHz_-10°C	Pass	13.56M	13.561046M	78.6571	100	1	2 min
13.56MHz_-10°C	Pass	13.56M	13.561039M	77.6249	100	1	5 min
13.56MHz_-10°C	Pass	13.56M	13.561073M	78.1241	100	1	10 min
13.56MHz_0°C	Pass	13.56M	13.561059M	78.1337	100	1	0 min
13.56MHz_0°C	Pass	13.56M	13.561066M	78.6498	100	1	2 min
13.56MHz_0°C	Pass	13.56M	13.561052M	77.6175	100	1	5 min
13.56MHz_0°C	Pass	13.56M	13.561059M	78.0692	100	1	10 min
13.56MHz_10°C	Pass	13.56M	13.561058M	78.0046	100	1	0 min
13.56MHz_10°C	Pass	13.56M	13.561061M	78.2627	100	1	2 min
13.56MHz_10°C	Pass	13.56M	13.561059M	78.0691	100	1	5 min
13.56MHz_10°C	Pass	13.56M	13.561073M	79.166	100	1	10 min
13.56MHz_20°C	Pass	13.56M	13.561059M	78.1337	100	1	0 min
13.56MHz_20°C	Pass	13.56M	13.561046M	77.1659	100	1	2 min
13.56MHz_20°C	Pass	13.56M	13.561066M	78.5853	100	1	5 min
13.56MHz_20°C	Pass	13.56M	13.561057M	77.9401	100	1	10 min
13.56MHz_30°C	Pass	13.56M	13.561037M	76.4562	100	1	0 min
13.56MHz_30°C	Pass	13.56M	13.56104M	76.7142	100	1	2 min
13.56MHz_30°C	Pass	13.56M	13.561039M	76.6497	100	1	5 min
13.56MHz_30°C	Pass	13.56M	13.561042M	76.8433	100	1	10 min
13.56MHz_40°C	Pass	13.56M	13.561016M	74.9077	100	1	0 min
13.56MHz_40°C	Pass	13.56M	13.561039M	76.6497	100	1	2 min
13.56MHz_40°C	Pass	13.56M	13.56104M	76.7142	100	1	5 min
13.56MHz_40°C	Pass	13.56M	13.561045M	77.1014	100	1	10 min
13.56MHz_55°C	Pass	13.56M	13.561154M	75.0476	100	1	0 min
13.56MHz_55°C	Pass	13.56M	13.561046M	76.5701	100	1	2 min
13.56MHz_55°C	Pass	13.56M	13.56112M	76.813	100	1	5 min
13.56MHz_55°C	Pass	13.56M	13.561154M	77.2234	100	1	10 min
13.56MHz_20°C-126.5V	Pass	13.56M	13.561055M	77.8111	100	1	0 min

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
13.56MHz_20°C-126.5V	Pass	13.56M	13.561053M	77.682	100	1	2 min
13.56MHz_20°C-126.5V	Pass	13.56M	13.561062M	78.3272	100	1	5 min
13.56MHz_20°C-126.5V	Pass	13.56M	13.561066M	78.5853	100	1	10 min
13.56MHz_20°C-93.5V	Pass	13.56M	13.561052M	77.6175	100	1	0 min
13.56MHz_20°C-93.5V	Pass	13.56M	13.561065M	78.5208	100	1	2 min
13.56MHz_20°C-93.5V	Pass	13.56M	13.56106M	78.1982	100	1	5 min
13.56MHz_20°C-93.5V	Pass	13.56M	13.561059M	78.0692	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	101295	9kHz ~ 30MHz	05/Nov/2019	04/Nov/2020
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	24/Sep/2019	23/Sep/2020

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV 40	101029	10Hz ~ 40GHz	01/Oct/2019	30/Sep/2020
Programmable Temp. & Humi. Chamber	Giant Force	GTH-225-40-CP-AR	MAA1611-005	-40 ~ 100℃	09/Dec/2019	08/Dec/2020
SMB100A Signal Generator	R&S	SMB100A03	181147	100kHz ~ 40GHz	12/Nov/2018	11/Nov/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	04/Aug/2020	03/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 with 5dB Attenuator	SCHAFFNER& MTJ	CBL6112D & MTJ6102-05	2678 / 001	30 MHz ~ 2 GHz	05/Jul/2020	04/Jul/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