

NCC Test Report

Equipment : 無線整合型 IC 卡與磁條卡終端機
Brand Name : Verifone
Model Name : e280 DB
Applicant : 新加坡商惠爾訊科技股份有限公司台灣分公司
台北市南港區三重路 19-2 號 2 樓
Manufacturer : Verifone, Inc.
Standard : LP0002 Section 3.2 (2018-01-10)

The product was received on Jan. 30, 2020, and testing was started from Feb. 01, 2020 and completed on Feb. 03, 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 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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Appendix A. Test Photos

Photographs of EUT V01



History of this test report

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Summary of Test Result

Report Clause	Ref. Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	2.2	Antenna Requirement	PASS	LP0002-2.2
3.1	2.3	AC Power-line Conducted Emissions	PASS	LP0002-2.3
3.2	3.2	Emission Bandwidth	PASS	Fall in band $F_L \geq 13.553 \text{ MHz}$ $F_H \leq 13.567 \text{ MHz}$
3.3	3.2.1.1	Field Strength of Fundamental Emissions	PASS	124 dBuV/m at 3m
3.4	3.2.1.2	Transmitter Radiated Unwanted Emissions	PASS	LP0002-2.8
3.5	2.11	Receiver Radiated Unwanted Emissions	PASS	LP0002-2.8
3.6	3.2.1.3	Frequency Stability	PASS	$\pm 0.01\%$ (100ppm)

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	Modulation Mode	Ch. Frequency (MHz)	Channel Number	Field Strength (dBuV/m)
13.553 – 13.567 MHz	ISO 14443-3A (ASK)	13.56	1	80.31
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 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
☒ 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:

- ♦ LP0002 Section 3.2 (2018-01-10)
- ♦ ANSI C63.10-2013
- ♦ KDB 174176 D01 v01r01
- ♦ KDB 414788 D01 v01r01
- ♦ ANSI C63.4-2014

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 Condition	Test Site No.	Test Engineer	Test Environment	Test Date
AC Conduction	CO04-HY	Edward	19.2~21.0°C / 30~34%	Feb/01/2020
RF Conducted	TH07-HY	Gary	23.1~24.3°C / 60~64%	Feb/03/2020
Radiated Emission	03CH03-HY	Patrick	25.5~26.2°C / 51.8~53.7%	Feb/01/2020

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)	3.54 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	1.6 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	4.3 dB	Confidence levels of 95%
Conducted Emission	1.3 dB	Confidence levels of 95%
Temperature	0.7 °C	Confidence levels of 95%
Humidity	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	50°C
-	Vnom	230V
-	Vmin	207V
-	Vmax	253V

2.2 The Worst Case Modulation Configuration

Modulation Used for Conformance Testing	
Modulation Mode	Field Strength (dBuV/m at 3 m)
NFC	80.31

2.3 Test Channel Frequencies Configuration

Modulation Mode	Test Channel Frequencies (MHz)
NFC	13.56

2.4 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	AC 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, Transmitter Radiated Unwanted Emissions, Receiver Radiated Unwanted Emissions		
Test Condition	Radiated measurement		
Pretest Mode	☒ 1. EUT Built in NFC A type		
	☒ 2. EUT Built in NFC B type		
	☐ 3. EUT Built in NFC F type		
	☐ 4. EUT Built in NFC V type		
Mode 1 configuration was pretested and found to be the worst case and measured during the test.			
Operating Mode	AC Adapter Mode		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			
Worst Planes of EUT		V	

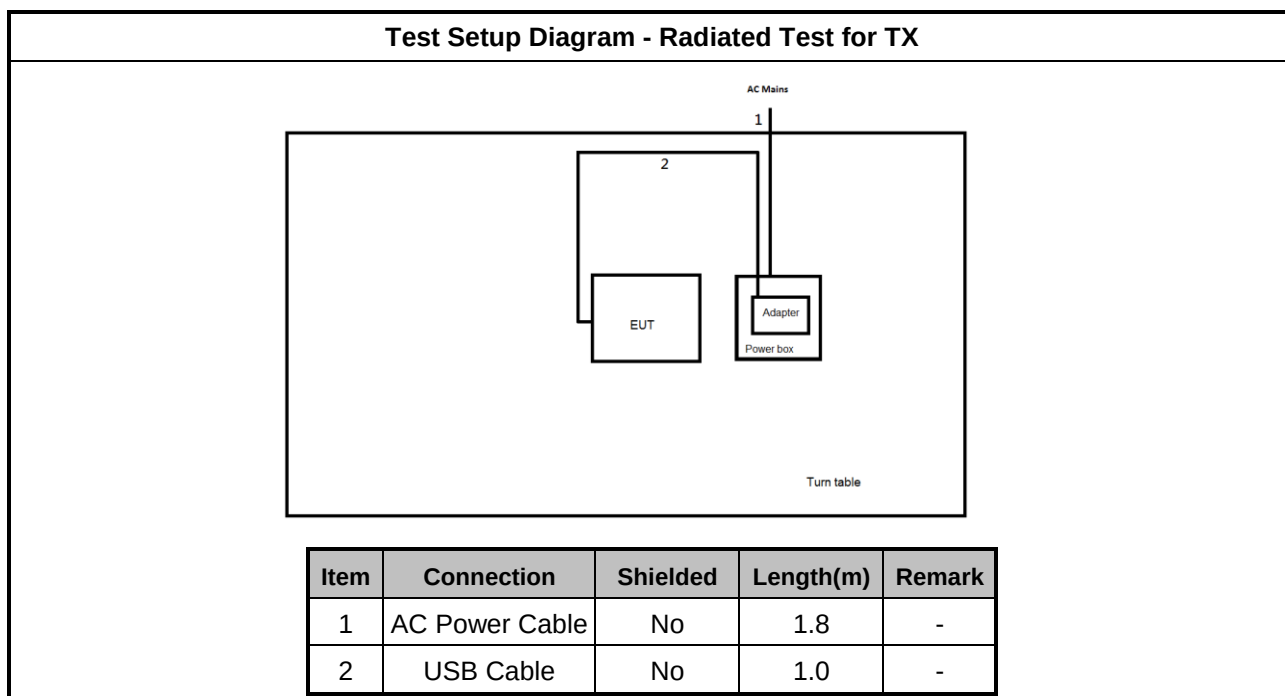
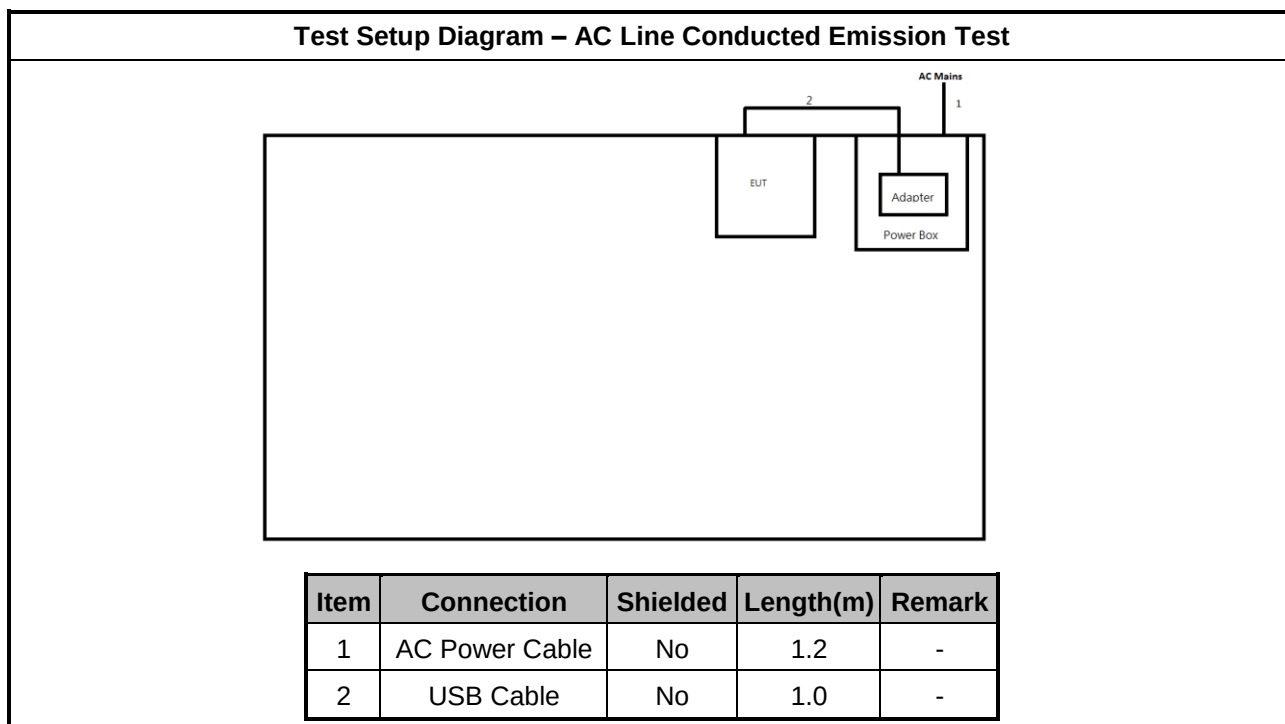
2.5 Accessories and Support Equipment

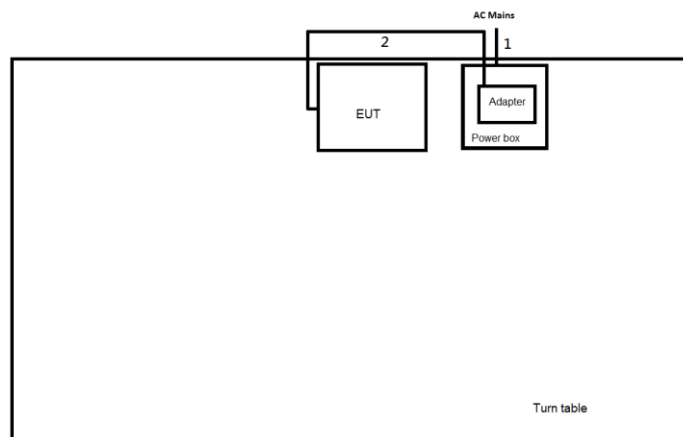
Accessories Information				
AC Adapter	Brand Name	Verifone	Model Name	PSAA05A-050QL6V
	Power Rating	Input:100 – 240Vac, 50 – 60Hz 0.2A; Output:5V/1A		
	Manufacturer	Phihong		
Battery	Brand Name	Verifone	Model Name	BPK087-700
	Power Rating	3.8Vdc,1610 mAh	Type	Li-ion
USB Cable	Brand Name	Verifone		
	Signal Line	1.0 meter, non-shielded cable, w/o ferrite core		

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

Support Equipment - RF Conducted			
No.	Equipment	Brand Name	Model Name
1	Notebook	DELL	E5410
2	Adapter for NB	DELL	HA65NM130

2.6 Test Setup Diagram



Test Setup Diagram - Radiated Test for RX


Item	Connection	Shielded	Length(m)	Remark
1	AC Power Cable	No	1.8	-
2	USB Cable	No	1.0	-

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.

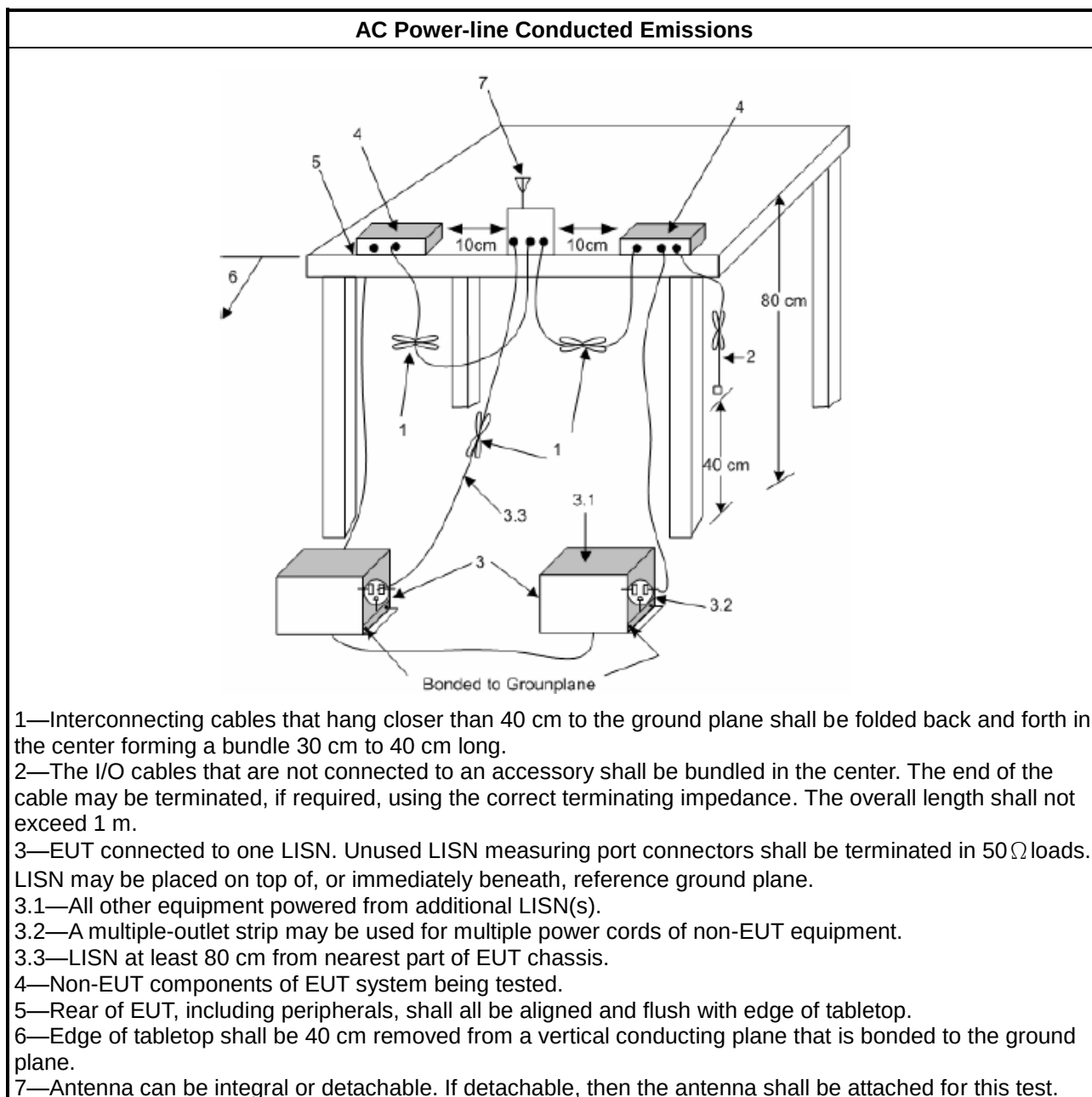
3.1.2 Measuring Instruments

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

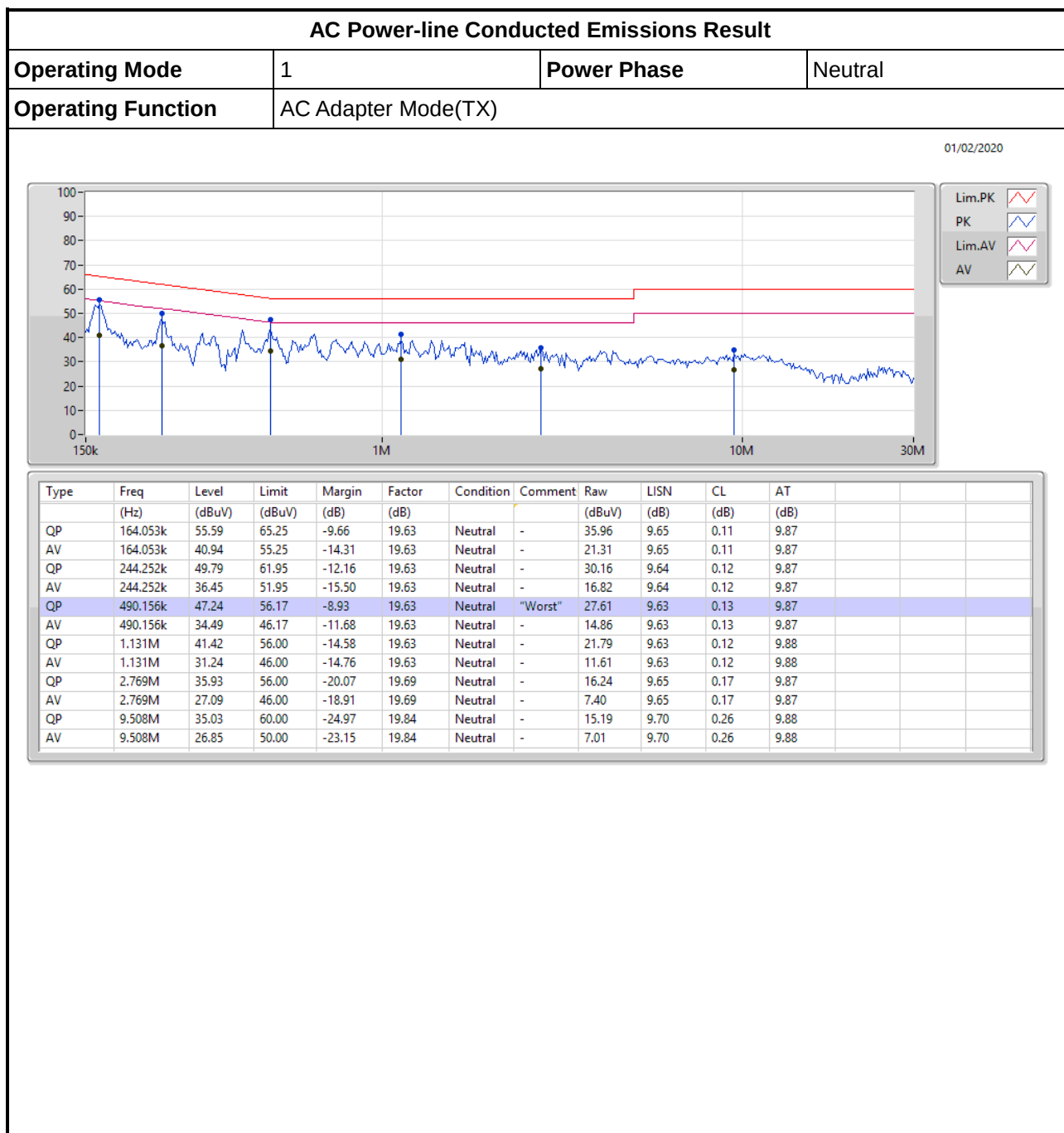
3.1.3 Test Procedures

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 LP0002-2.3 limits outside the transmitter's fundamental emission band; (2) Retest with a dummy load to determine compliance with LP0002-2.3 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 LP0002-2.3 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 LP0002-2.3 limits within the transmitter's fundamental emission band.

3.1.4 Test Setup



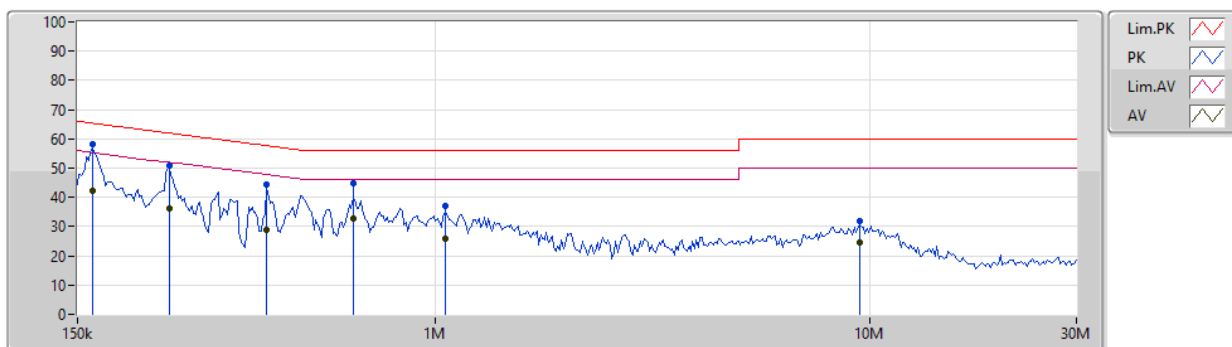
3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	AC Adapter Mode(TX)		

01/02/2020

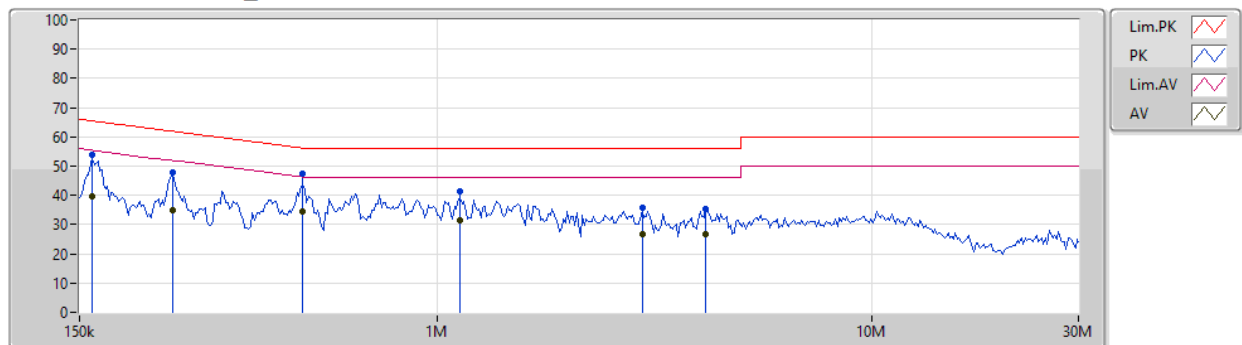


Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)			
QP	162.429k	58.34	65.33	-6.99	19.64	Line	"Worst"	38.70	9.66	0.11	9.87			
AV	162.429k	42.35	55.33	-12.98	19.64	Line	-	22.71	9.66	0.11	9.87			
QP	244.252k	51.07	61.95	-10.88	19.64	Line	-	31.43	9.65	0.12	9.87			
AV	244.252k	36.13	51.95	-15.82	19.64	Line	-	16.49	9.65	0.12	9.87			
QP	409.779k	44.42	57.64	-13.22	19.64	Line	-	24.78	9.64	0.13	9.87			
AV	409.779k	29.05	47.64	-18.59	19.64	Line	-	9.41	9.64	0.13	9.87			
QP	647.639k	44.68	56.00	-11.32	19.63	Line	-	25.05	9.64	0.12	9.87			
AV	647.639k	32.86	46.00	-13.14	19.63	Line	-	13.23	9.64	0.12	9.87			
QP	1.055M	36.91	56.00	-19.09	19.63	Line	-	17.28	9.64	0.11	9.88			
AV	1.055M	25.70	46.00	-20.30	19.63	Line	-	6.07	9.64	0.11	9.88			
QP	9.508M	31.74	60.00	-28.26	19.83	Line	-	11.91	9.69	0.26	9.88			
AV	9.508M	24.47	50.00	-25.53	19.83	Line	-	4.64	9.69	0.26	9.88			

AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Neutral
Operating Function	AC Adapter Mode(RX)		

01/02/2020

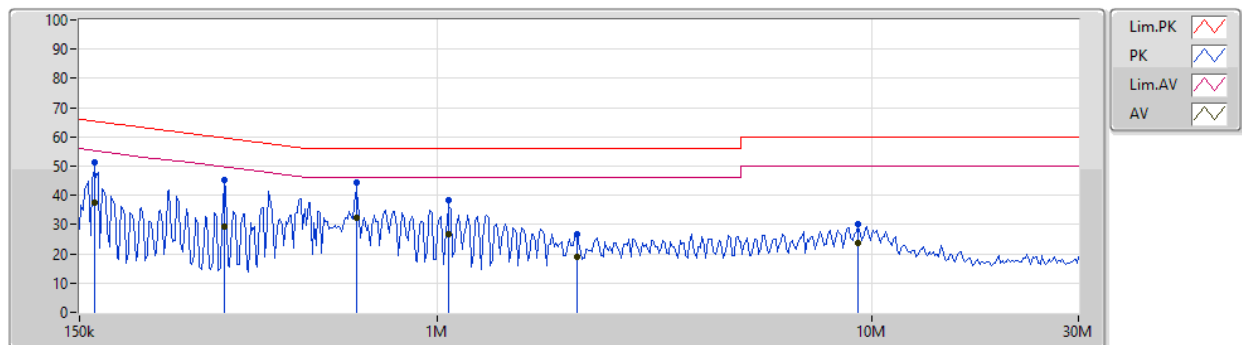


Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)			
QP	160.82k	53.78	65.43	-11.65	19.63	Neutral	-	34.15	9.65	0.11	9.87			
AV	160.82k	39.49	55.43	-15.94	19.63	Neutral	-	19.86	9.65	0.11	9.87			
QP	246.695k	48.01	61.87	-13.86	19.63	Neutral	-	28.38	9.64	0.12	9.87			
AV	246.695k	34.99	51.87	-16.88	19.63	Neutral	-	15.36	9.64	0.12	9.87			
QP	490.156k	47.31	56.17	-8.86	19.63	Neutral	-	27.68	9.63	0.13	9.87			
AV	490.156k	34.45	46.17	-11.72	19.63	Neutral	-	14.82	9.63	0.13	9.87			
QP	1.131M	41.25	56.00	-14.75	19.63	Neutral	-	21.62	9.63	0.12	9.88			
AV	1.131M	31.48	46.00	-14.52	19.63	Neutral	-	11.85	9.63	0.12	9.88			
QP	2.968M	35.86	56.00	-20.14	19.71	Neutral	-	16.15	9.66	0.17	9.88			
AV	2.968M	26.87	46.00	-19.13	19.71	Neutral	-	7.16	9.66	0.17	9.88			
QP	4.163M	35.32	56.00	-20.68	19.73	Neutral	-	15.59	9.66	0.19	9.88			
AV	4.163M	26.75	46.00	-19.25	19.73	Neutral	-	7.02	9.66	0.19	9.88			

AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	AC Adapter Mode(RX)		

01/02/2020



Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)			
QP	162.429k	51.21	65.33	-14.12	19.64	Line	-	31.57	9.66	0.11	9.87			
AV	162.429k	37.60	55.33	-17.73	19.64	Line	-	17.96	9.66	0.11	9.87			
QP	322.728k	45.22	59.63	-14.41	19.63	Line	-	25.59	9.64	0.12	9.87			
AV	322.728k	29.39	49.63	-20.24	19.63	Line	-	9.76	9.64	0.12	9.87			
QP	654.116k	44.35	56.00	-11.65	19.63	Line	"Worst"	24.72	9.64	0.12	9.87			
AV	654.116k	32.35	46.00	-13.65	19.63	Line	-	12.72	9.64	0.12	9.87			
QP	1.065M	38.35	56.00	-17.65	19.63	Line	-	18.72	9.64	0.11	9.88			
AV	1.065M	26.61	46.00	-19.39	19.63	Line	-	6.98	9.64	0.11	9.88			
QP	2.095M	26.89	56.00	-29.11	19.67	Line	-	7.22	9.65	0.15	9.87			
AV	2.095M	18.92	46.00	-27.08	19.67	Line	-	-0.75	9.65	0.15	9.87			
QP	9.321M	30.16	60.00	-29.84	19.83	Line	-	10.33	9.69	0.26	9.88			
AV	9.321M	23.75	50.00	-26.25	19.83	Line	-	3.92	9.69	0.26	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).

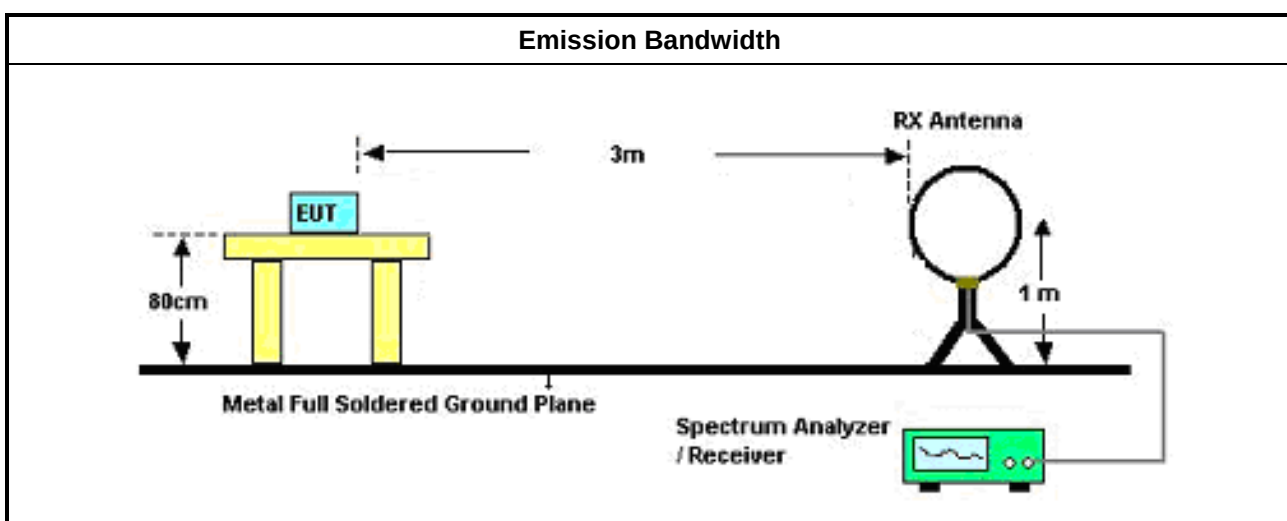
3.2.2 Measuring Instruments

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



3.2.5 Test Result of Emission Bandwidth

Summary

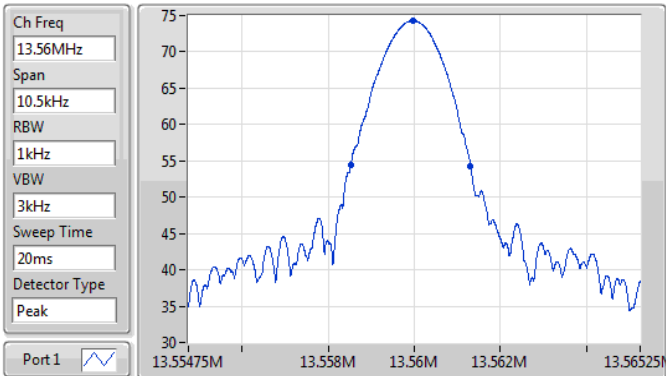
Mode	20dB (Hz)	OBW (Hz)
13.553-13.567MHz	-	-
NFC	2.777k	2.567k

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	2.777k	13.55853M	13.56131M	2.567k	13.55865M	13.56122M	13.553-13.567

NFC

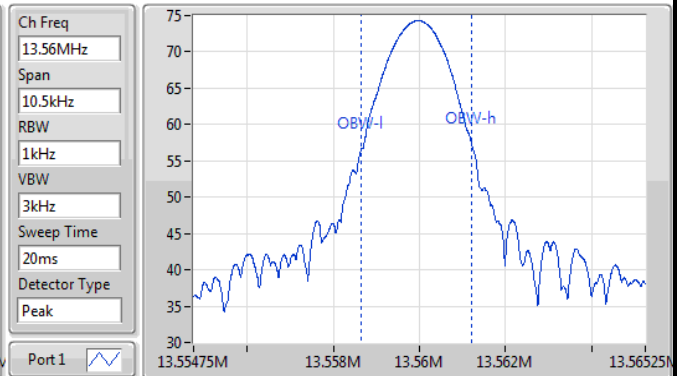
13.56MHz_TnomVnom



20dB(Hz)	FI-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	FI-OBW(Hz)	Fh-OBW(Hz)	Limit(Range)
2.777k	13.55853M	13.56131M	2.567k	13.55865M	13.56122M	13.553-13.56

EBW

03/02/2020



3.3 Field Strength of Fundamental Emissions

3.3.1 Field Strength of Fundamental Emissions Limit

Field Strength of Fundamental Emissions					
Emissions	($\mu\text{V/m}$)@30m	(dB $\mu\text{V/m}$)@30m	(dB $\mu\text{V/m}$)@10m	(dB $\mu\text{V/m}$)@3m	(dB $\mu\text{V/m}$)@1m
fundamental	15848	84.0	103.1	124.0	143.1
Quasi peak measurement of the fundamental.					

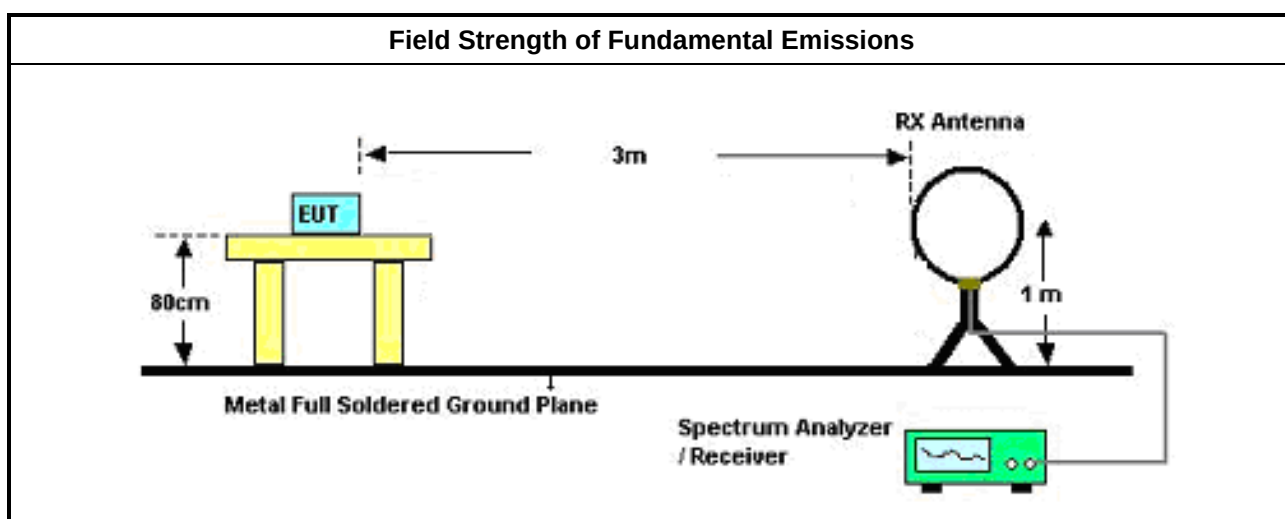
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

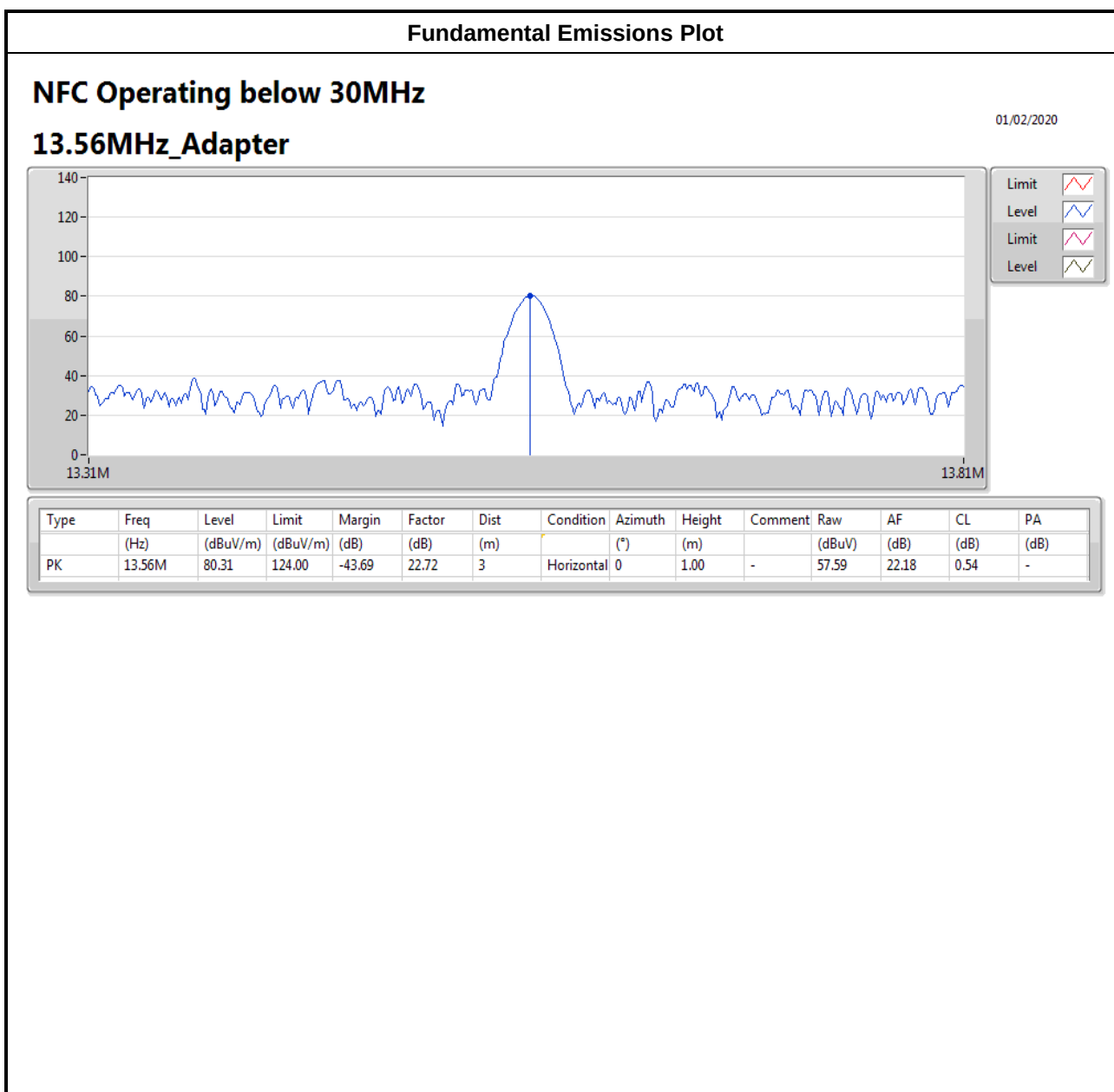
Test Method	
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.
☒	At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; however, an attempt should be made to avoid making measurements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

Field Strength of Fundamental Emissions Result					
Modulation Mode	Frequency (MHz)	Fundamental (dBuV/m)@3m	Polarization	Margin (dB)	Limit (dBuV/m)@3m
NFC	13.56	80.31	H	-43.69	124.00
Result		Complied			
Note 1: Measurement worst emissions of receive antenna polarization: H(Horizontal).					



3.4 Transmitter Radiated Unwanted Emissions

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	1.046M	43.08	67.24	-24.16	20.26	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_Adapter	Pass	PK	13.56M	80.31	124.00	-43.69	22.72	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	10.128k	45.46	127.46	-82.00	19.46	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	17.178k	39.28	122.88	-83.60	19.81	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	34.38k	33.66	116.87	-83.21	20.42	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	388.8k	41.27	95.80	-54.53	20.19	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	1.046M	43.08	67.24	-24.16	20.26	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	3.911M	39.55	69.50	-29.95	20.47	3	0	1.00	-

NFC Operating below 30MHz

01/02/2020

13.56MHz_Adapter

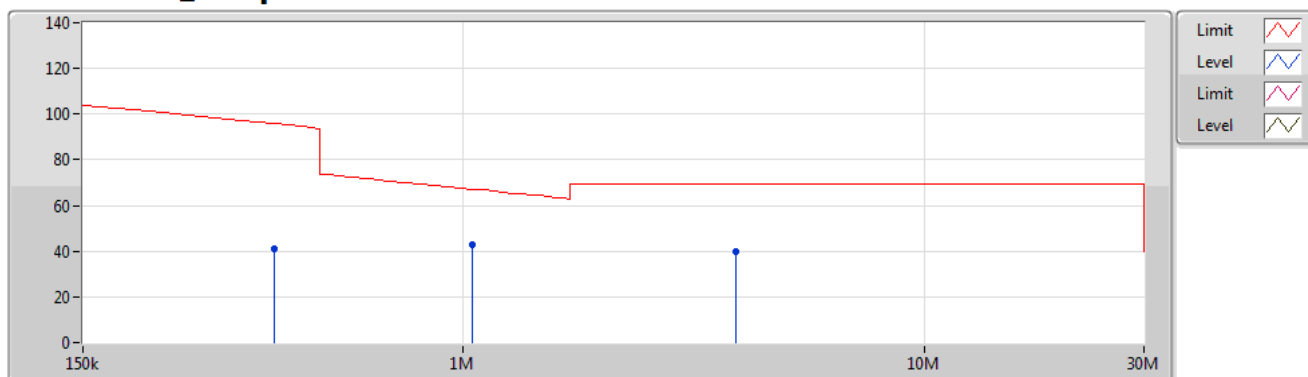


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	10.128k	45.46	127.46	-82.00	19.46	3	Horizontal	360	1.00	-	26.00	19.41	0.05	-
PK	17.178k	39.28	122.88	-83.60	19.81	3	Horizontal	360	1.00	-	19.47	19.75	0.06	-
PK	34.38k	33.66	116.87	-83.21	20.42	3	Horizontal	360	1.00	-	13.24	20.35	0.07	-

NFC Operating below 30MHz

01/02/2020

13.56MHz_Adapter



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	388.8k	41.27	95.80	-54.53	20.19	3	Horizontal	0	1.00	-	21.08	20.07	0.12	-
PK	1.046M	43.08	67.24	-24.16	20.26	3	Horizontal	0	1.00	-	22.82	20.10	0.16	-
PK	3.911M	39.55	69.50	-29.95	20.47	3	Horizontal	0	1.00	-	19.08	20.24	0.23	-

3.4.1 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	QP	212.36M	40.43	43.50	-3.07	-10.44	3	206	1.08	-

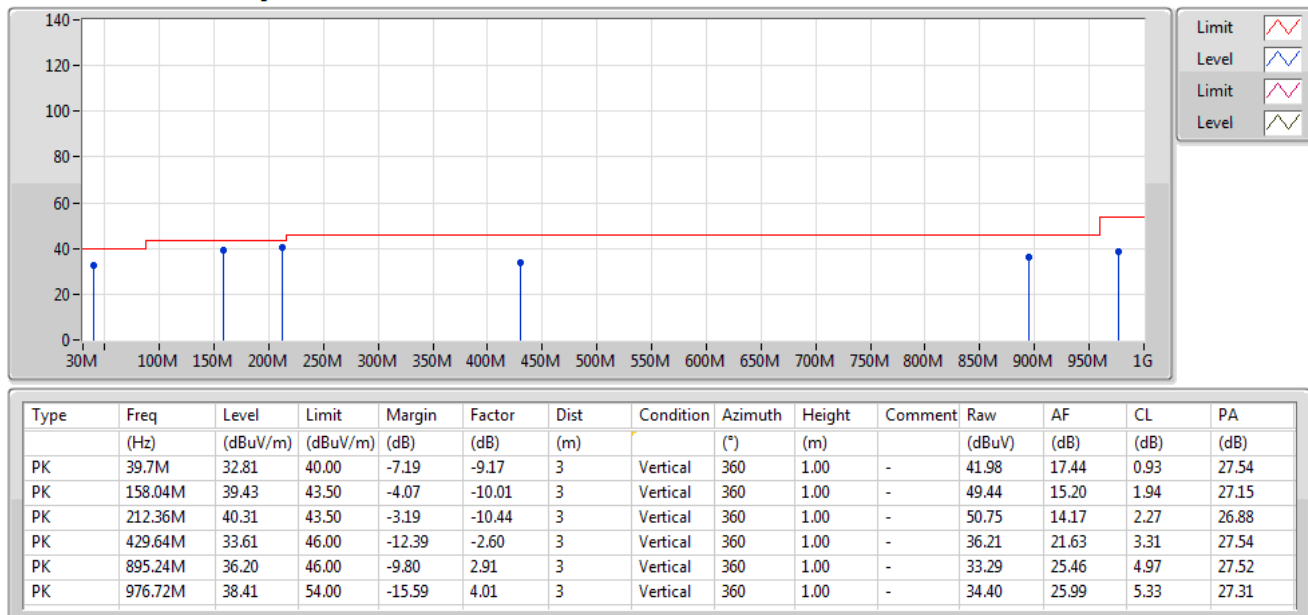
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Azimuth (°)	Height (m)	Comments
NFC	-	-	-	-	-	-	-	-	-	-	-
13.56MHz_Adapter	Pass	PK	39.7M	32.81	40.00	-7.19	-9.17	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	158.04M	39.43	43.50	-4.07	-10.01	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	212.36M	40.31	43.50	-3.19	-10.44	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	429.64M	33.61	46.00	-12.39	-2.60	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	895.24M	36.20	46.00	-9.80	2.91	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	976.72M	38.41	54.00	-15.59	4.01	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	39.7M	36.02	40.00	-3.98	-9.17	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	431.58M	37.19	46.00	-8.81	-2.60	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	895.24M	41.79	46.00	-4.21	2.91	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	949.56M	41.07	46.00	-4.93	3.64	3	0	1.00	-
13.56MHz_Adapter	Pass	QP	158.04M	40.20	43.50	-3.30	-10.01	3	52	1.16	-
13.56MHz_Adapter	Pass	QP	212.36M	40.43	43.50	-3.07	-10.44	3	206	1.08	-

NFC Operating above 30MHz

01/02/2020

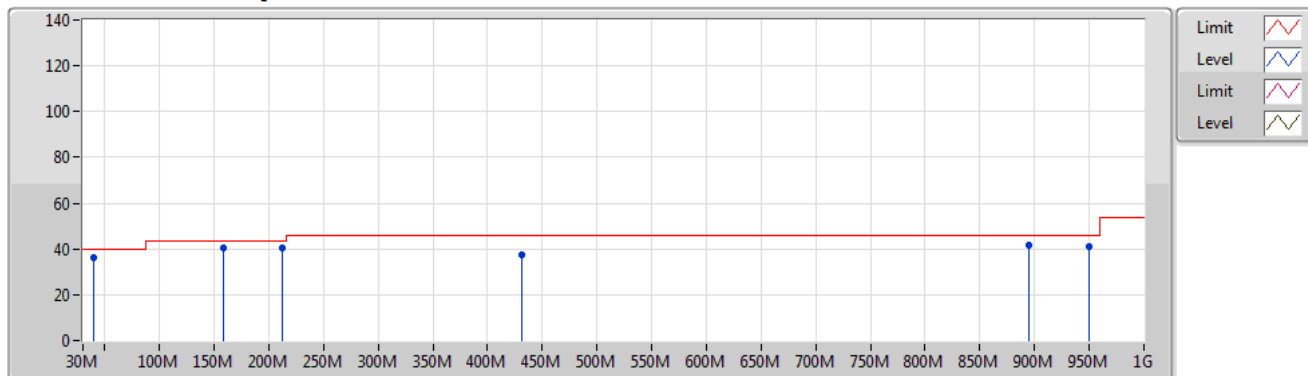
13.56MHz_Adapter



NFC Operating above 30MHz

01/02/2020

13.56MHz_Adapter



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	39.7M	36.02	40.00	-3.98	-9.17	3	Horizontal	0	1.00	-	45.19	17.44	0.93	27.54
PK	431.58M	37.19	46.00	-8.81	-2.60	3	Horizontal	0	1.00	-	39.79	21.63	3.32	27.55
PK	895.24M	41.79	46.00	-4.21	2.91	3	Horizontal	0	1.00	-	38.88	25.46	4.97	27.52
PK	949.56M	41.07	46.00	-4.93	3.64	3	Horizontal	0	1.00	-	37.43	25.75	5.29	27.40
QP	158.04M	40.20	43.50	-3.30	-10.01	3	Horizontal	52	1.16	-	50.21	15.20	1.94	27.15
QP	212.36M	40.43	43.50	-3.07	-10.44	3	Horizontal	206	1.08	-	50.87	14.17	2.27	26.88

3.5 Receiver Radiated Spurious Emissions

3.5.1 Receiver in Radiated Spurious Emissions Limit

Restricted Spurious 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.

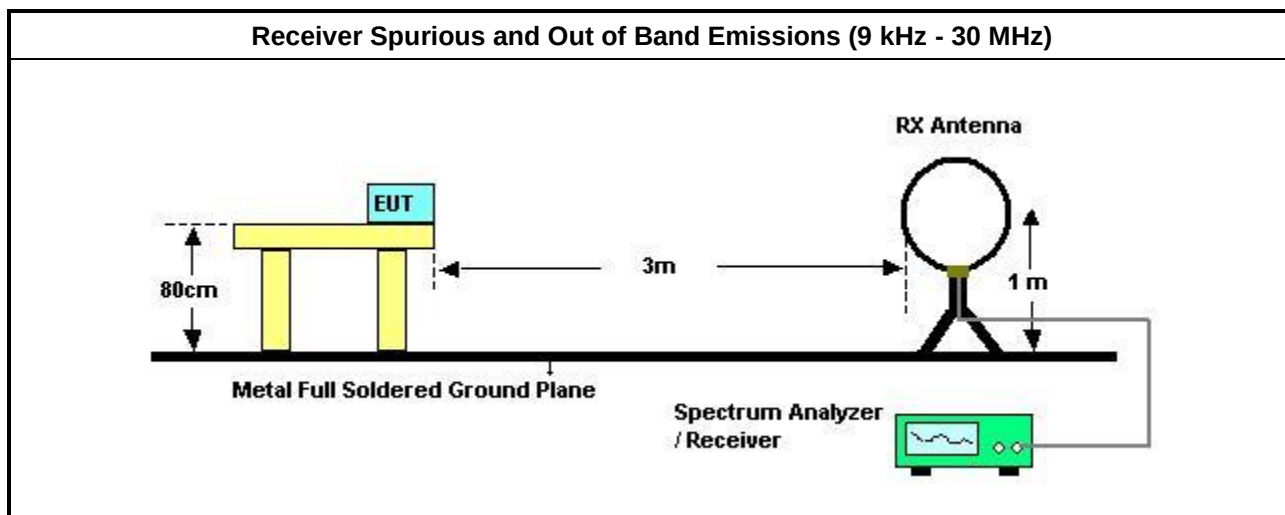
3.5.2 Measuring Instruments

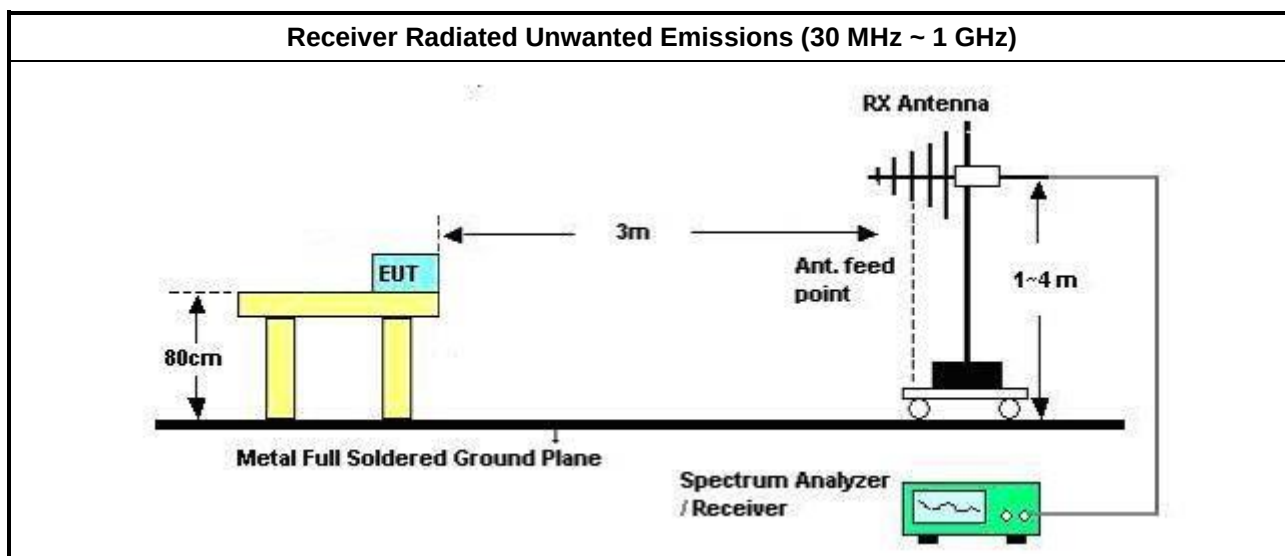
Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method	
☒	The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is higher, without exceeding 40 GHz.
☒	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).
☒	For radiated measurement, refer as ANSI C63.4, clause 8.3.
☒	Refer as ANSI C63.4, clause 8.3.1.1 and 8.3.2.1 for radiated emissions from below 30 MHz.
☒	Refer as ANSI C63.4, clause 8.3.1.1 and 8.3.2.1 for radiated emissions from 30 MHz-1 GHz. For the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the QP-Limit so that the QP level does not need to be reported in addition.
☒	Refer as ANSI C63.4, clause 8.3.1.2 and 8.3.2.2 for radiated emissions from above 1 GHz. For the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
☒	All amplitude of spurious emissions that are attenuated by more than 30 dB below the permissible value has no need to be reported.

3.5.4 Test Setup





3.5.5 Receiver 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	1.165M	42.22	66.31	-24.09	20.27	3	360	1.00	-

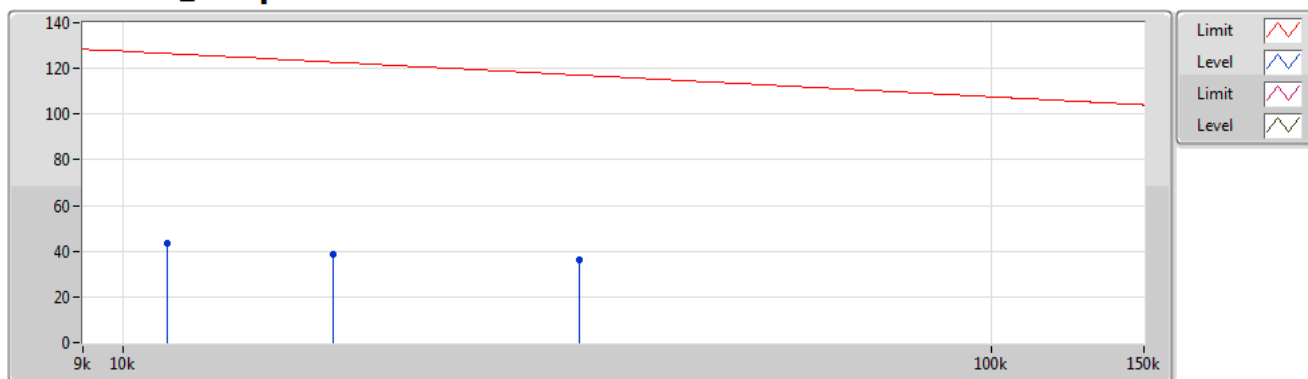
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Azimuth (°)	Height (m)	Comments
NFC	-	-	-	-	-	-	-	-	-	-	-
13.56MHz_Adapter	Pass	PK	11.256k	43.42	126.56	-83.14	19.53	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	17.46k	38.37	122.74	-84.37	19.82	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	33.534k	36.16	117.09	-80.93	20.41	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	448.5k	41.71	94.56	-52.85	20.09	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	1.165M	42.22	66.31	-24.09	20.27	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	3.493M	40.49	69.50	-29.01	20.40	3	360	1.00	-

NFC Standby below 30MHz

01/02/2020

13.56MHz_Adapter

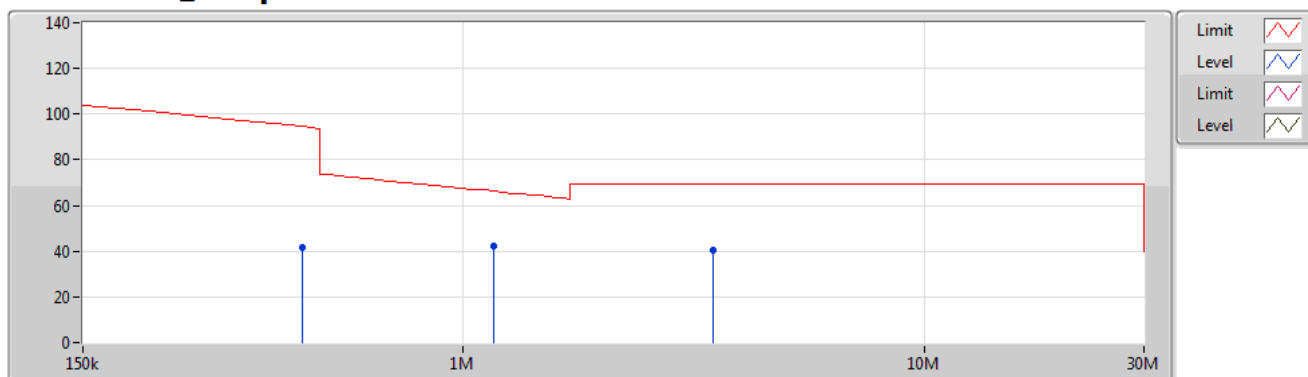


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	11.256k	43.42	126.56	-83.14	19.53	3	Horizontal	0	1.00	-	23.89	19.48	0.05	-
PK	17.46k	38.37	122.74	-84.37	19.82	3	Horizontal	0	1.00	-	18.55	19.76	0.06	-
PK	33.534k	36.16	117.09	-80.93	20.41	3	Horizontal	0	1.00	-	15.75	20.34	0.07	-

NFC Standby below 30MHz

01/02/2020

13.56MHz_Adapter



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	448.5k	41.71	94.56	-52.85	20.09	3	Horizontal	360	1.00	-	21.62	19.97	0.12	-
PK	1.165M	42.22	66.31	-24.09	20.27	3	Horizontal	360	1.00	-	21.95	20.10	0.17	-
PK	3.493M	40.49	69.50	-29.01	20.40	3	Horizontal	360	1.00	-	20.09	20.18	0.22	-

3.5.6 Receiver 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	730.34M	42.88	46.00	-3.12	1.04	3	360	1.00	-

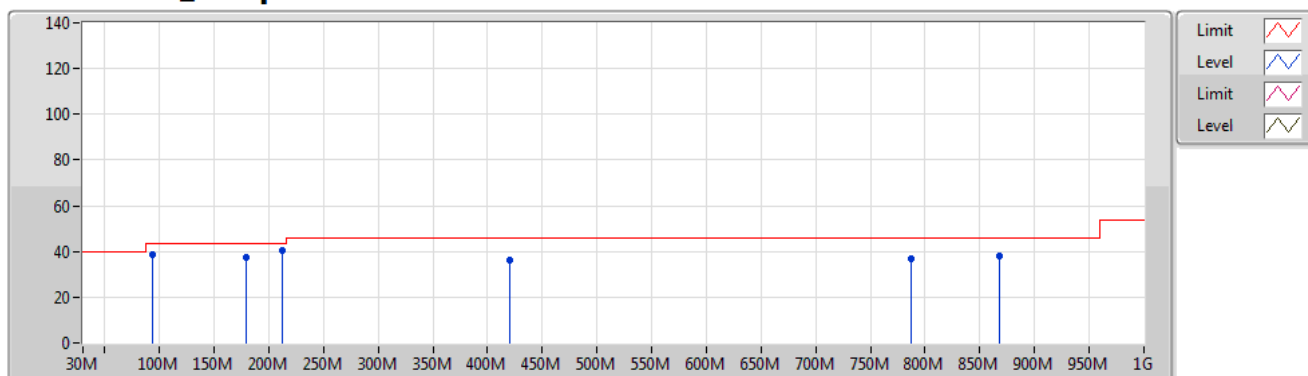
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Azimuth (°)	Height (m)	Comments
NFC	-	-	-	-	-	-	-	-	-	-	-
13.56MHz_Adapter	Pass	PK	94.02M	38.47	43.50	-5.03	-11.10	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	179.38M	37.65	43.50	-5.85	-10.54	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	212.36M	40.35	43.50	-3.15	-10.44	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	419.94M	36.35	46.00	-9.65	-2.39	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	786.6M	37.09	46.00	-8.91	1.58	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	868.08M	37.93	46.00	-8.07	2.65	3	0	1.00	-
13.56MHz_Adapter	Pass	PK	179.38M	36.28	43.50	-7.22	-10.54	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	224M	37.63	46.00	-8.37	-9.88	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	278.32M	36.05	46.00	-9.95	-6.12	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	419.94M	35.38	46.00	-10.62	-2.39	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	730.34M	42.88	46.00	-3.12	1.04	3	360	1.00	-
13.56MHz_Adapter	Pass	PK	949.56M	40.97	46.00	-5.03	3.64	3	360	1.00	-

NFC Standby above 30MHz

01/02/2020

13.56MHz_Adapter

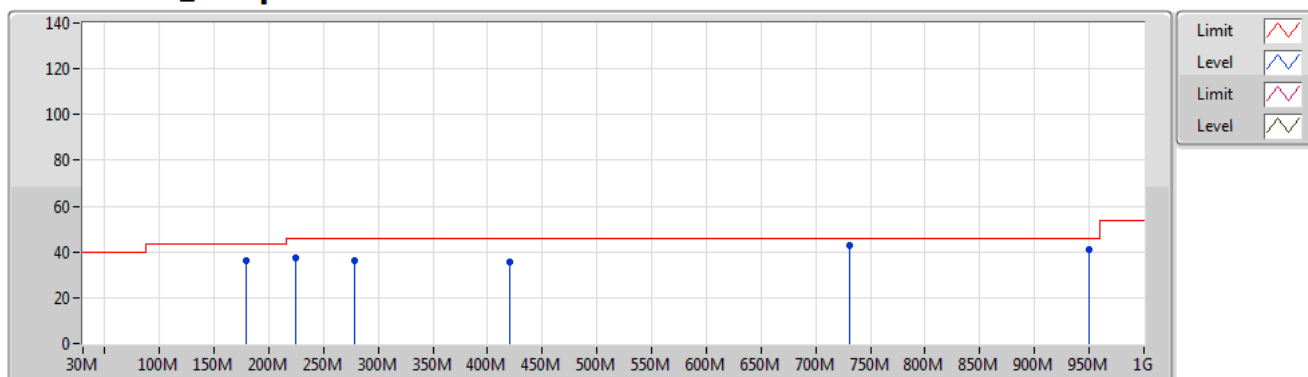


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	94.02M	38.47	43.50	-5.03	-11.10	3	Vertical	0	1.00	-	49.57	14.83	1.46	27.39
PK	179.38M	37.65	43.50	-5.85	-10.54	3	Vertical	0	1.00	-	48.19	14.40	2.10	27.04
PK	212.36M	40.35	43.50	-3.15	-10.44	3	Vertical	0	1.00	-	50.79	14.17	2.27	26.88
PK	419.94M	36.35	46.00	-9.65	-2.39	3	Vertical	0	1.00	-	38.74	21.80	3.26	27.45
PK	786.6M	37.09	46.00	-8.91	1.58	3	Vertical	0	1.00	-	35.51	24.81	4.68	27.91
PK	868.08M	37.93	46.00	-8.07	2.65	3	Vertical	0	1.00	-	35.28	25.39	4.91	27.65

NFC Standby above 30MHz

01/02/2020

13.56MHz_Adapter



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	179.38M	36.28	43.50	-7.22	-10.54	3	Horizontal	360	1.00	-	46.82	14.40	2.10	27.04
PK	224M	37.63	46.00	-8.37	-9.88	3	Horizontal	360	1.00	-	47.51	14.62	2.34	26.84
PK	278.32M	36.05	46.00	-9.95	-6.12	3	Horizontal	360	1.00	-	42.17	17.97	2.63	26.72
PK	419.94M	35.38	46.00	-10.62	-2.39	3	Horizontal	360	1.00	-	37.77	21.80	3.26	27.45
PK	730.34M	42.88	46.00	-3.12	1.04	3	Horizontal	360	1.00	-	41.84	24.63	4.45	28.04
PK	949.56M	40.97	46.00	-5.03	3.64	3	Horizontal	360	1.00	-	37.33	25.75	5.29	27.40

3.6 Frequency Stability

3.6.1 Frequency Stability Limit

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

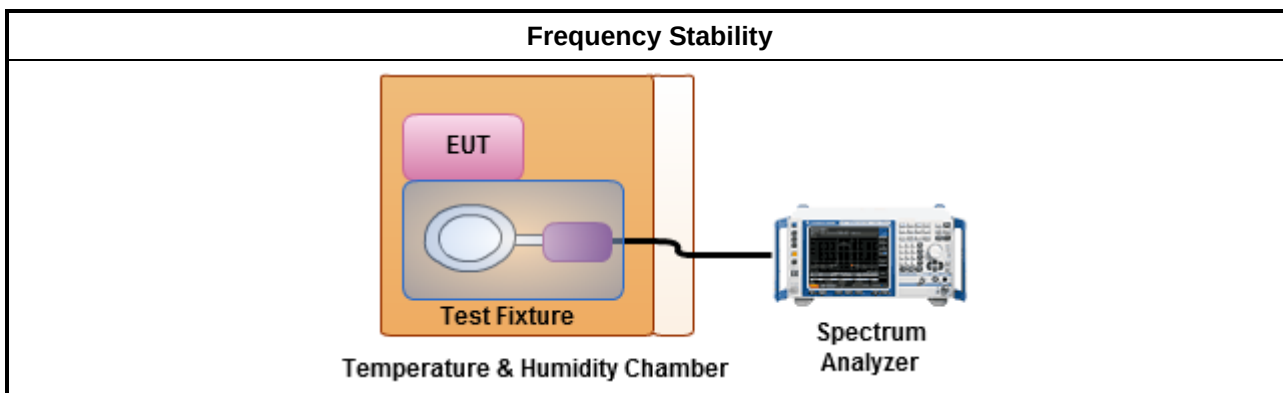
3.6.2 Measuring Instruments

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

3.6.3 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.

3.6.4 Test Setup



3.6.5 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	13.559917M	6.1302	100	1	10 min

Result

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
NFC	-	-	-	-	-	-	-
13.56MHz_-20°C	Pass	13.56M	13.559956M	3.2264	100	1	0 min
13.56MHz_-20°C	Pass	13.56M	13.559947M	3.9362	100	1	2 min
13.56MHz_-20°C	Pass	13.56M	13.559956M	3.2264	100	1	5 min
13.56MHz_-20°C	Pass	13.56M	13.559956M	3.2264	100	1	10 min
13.56MHz_-10°C	Pass	13.56M	13.559949M	3.7426	100	1	0 min
13.56MHz_-10°C	Pass	13.56M	13.559934M	4.8396	100	1	2 min
13.56MHz_-10°C	Pass	13.56M	13.559951M	3.6136	100	1	5 min
13.56MHz_-10°C	Pass	13.56M	13.559955M	3.2909	100	1	10 min
13.56MHz_0°C	Pass	13.56M	13.559964M	2.6456	100	1	0 min
13.56MHz_0°C	Pass	13.56M	13.559952M	3.549	100	1	2 min
13.56MHz_0°C	Pass	13.56M	13.559962M	2.8392	100	1	5 min
13.56MHz_0°C	Pass	13.56M	13.559969M	2.2585	100	1	10 min
13.56MHz_10°C	Pass	13.56M	13.55997M	2.194	100	1	0 min
13.56MHz_10°C	Pass	13.56M	13.559942M	4.2588	100	1	2 min
13.56MHz_10°C	Pass	13.56M	13.559974M	1.9358	100	1	5 min
13.56MHz_10°C	Pass	13.56M	13.559941M	4.3234	100	1	10 min
13.56MHz_20°C	Pass	13.56M	13.559957M	3.1619	100	1	0 min
13.56MHz_20°C	Pass	13.56M	13.559948M	3.8072	100	1	2 min
13.56MHz_20°C	Pass	13.56M	13.559958M	3.0973	100	1	5 min
13.56MHz_20°C	Pass	13.56M	13.559957M	3.1619	100	1	10 min
13.56MHz_30°C	Pass	13.56M	13.559939M	4.517	100	1	0 min
13.56MHz_30°C	Pass	13.56M	13.559943M	4.1943	100	1	2 min
13.56MHz_30°C	Pass	13.56M	13.55996M	2.9683	100	1	5 min
13.56MHz_30°C	Pass	13.56M	13.559941M	4.3234	100	1	10 min
13.56MHz_40°C	Pass	13.56M	13.559935M	4.7751	100	1	0 min
13.56MHz_40°C	Pass	13.56M	13.559932M	5.0332	100	1	2 min
13.56MHz_40°C	Pass	13.56M	13.559926M	5.4849	100	1	5 min
13.56MHz_40°C	Pass	13.56M	13.559917M	6.1302	100	1	10 min
13.56MHz_50°C	Pass	13.56M	13.559934M	4.8396	100	1	0 min
13.56MHz_50°C	Pass	13.56M	13.559933M	4.9687	100	1	2 min
13.56MHz_50°C	Pass	13.56M	13.559937M	4.646	100	1	5 min
13.56MHz_50°C	Pass	13.56M	13.559922M	5.743	100	1	10 min
13.56MHz_20°C-126.5V	Pass	13.56M	13.559963M	2.7102	100	1	0 min

Mode	Result	Ch (Hz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
13.56MHz_20°C-126.5V	Pass	13.56M	13.559938M	4.5815	100	1	2 min
13.56MHz_20°C-126.5V	Pass	13.56M	13.559953M	3.4845	100	1	5 min
13.56MHz_20°C-126.5V	Pass	13.56M	13.559942M	4.2588	100	1	10 min
13.56MHz_20°C-110V	Pass	13.56M	13.559947M	3.9362	100	1	0 min
13.56MHz_20°C-110V	Pass	13.56M	13.559959M	3.0328	100	1	2 min
13.56MHz_20°C-110V	Pass	13.56M	13.559948M	3.8072	100	1	5 min
13.56MHz_20°C-110V	Pass	13.56M	13.559953M	3.4845	100	1	10 min
13.56MHz_20°C-93.5V	Pass	13.56M	13.559948M	3.8072	100	1	0 min
13.56MHz_20°C-93.5V	Pass	13.56M	13.559936M	4.7105	100	1	2 min
13.56MHz_20°C-93.5V	Pass	13.56M	13.559927M	5.3558	100	1	5 min
13.56MHz_20°C-93.5V	Pass	13.56M	13.559939M	4.517	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	102052	9kHz ~ 3.6GHz	09/Apr/2019	08/Apr/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 required.

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	15/Mar/2019	14/Mar/2020
AC Power Source	GW	APS-9102	EL920581	AC 0V~300V	NCR	NCR

NCR:Non-Calibration required.

Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	30/ Aug/2019	29/Aug/2020
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	22/Apr/2019	21/Apr/2020
EMI Test Receiver	R&S	ESR3	102052	9kHz ~ 3.6GHz	09/Apr/2019	08/Apr/2020
Bilog Antenna & 5dB Attenuator	SCHAFFNER / MTJ	CBL 6112B / MTJ6102-05	2723 / 2	30MHz ~ 2GHz	11/Oct/2019	10/Oct/2020
Signal Analyzer	R&S	FSP40	100305	9kHz ~ 40 GHz;-140~+30dBm	10/Jun/2019	09/Jun/2020
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	22/Mar/2019	21/Mar/2020
Loop Antenna	TESEQ	HLA 6120	31244	9k-30MHz	15/Mar/2019	14/Mar/2020