

FCC Test Report

Equipment : NFC/RFID Reader
Brand Name : COBAN
Model No. : FCS-H1-NFC
FCC ID : ZPJ-FCS-H1-NFC
Standard : 47 CFR FCC Part 15.225
Operating Band : 13.553 – 13.567 MHz
Applicant : COBAN Technologies, Inc
11375 W. Sam Houston Parkway S. # 800 Houston Texas
77031 United States
Manufacturer : Jogtek Corp.
2F., No.300, Yangguang St., Neihu Dist., Taipei City 114,
Taiwan, R.O.C

The product sample received on Mar. 22, 2017 and completely tested on Mar. 31, 2017. We, SPORTON, 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., the test report shall not be reproduced except in full.


Phoenix Chen
SPORTON INTERNATIONAL INC.



Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	Testing Applied Standards	7
1.3	Testing Location Information	7
1.4	Measurement Uncertainty	7
2	TEST CONFIGURATION OF EUT.....	8
2.1	The Worst Case Modulation Configuration	8
2.2	Test Channel Frequencies Configuration.....	8
2.3	The Worst Case Measurement Configuration.....	9
2.4	Accessories and Support Equipment	10
2.5	Test Setup Diagram	11
3	TRANSMITTER TEST RESULT	13
3.1	AC Power-line Conducted Emissions	13
3.2	Emission Bandwidth	17
3.3	Field Strength of Fundamental Emissions and Spectrum Mask	19
3.4	Transmitter Radiated Unwanted Emissions	21
3.5	Frequency Stability.....	28
4	TEST EQUIPMENT AND CALIBRATION DATA	30

APPENDIX A. TEST PHOTOS

PHOTOGRAPHS OF EUT v01

Summary of Test Result

Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Measured	Limit	Result
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	[dBuV]: 0.49 MHz 38.68 (Margin 17.42 dB) - QP 31.26 (Margin 14.84 dB) - AV	FCC 15.207	Complied
3.2	15.215(c)	Emission Bandwidth	20dB Bandwidth 2.54700 [kHz] F_L : 13.55864 MHz F_H : 13.56119 MHz	Fall in band $F_L \geq 13.553$ MHz $F_H \leq 13.567$ MHz	Complied
3.3	15.225(a)~(d)	Field Strength of Fundamental Emissions and Spectrum Mask	Fundamental Emissions peak: 65.23 dBuV/m at 3m Device complies with spectrum mask – refer to test data	124 dBuV/m at 3m	Complied
3.4	15.225(d)	Transmitter Radiated Unwanted Emissions	[dBuV/m at 3m]: 582.1628 MHz 42.98 (Margin 3.02 dB) - PK	FCC 15.209	Complied
3.5	15.225(e)	Frequency Stability	3.17 ppm	$\pm 0.01\%$ (100ppm)	Complied



SPORTON INTERNATIONAL INC.
TEL : 886-3-327-3456
FAX : 886-3-327-0973

1 General Description

1.1 Information

1.1.1 RF General Information

NFC Chip	Brand Name	Model Name
	TI	TRF7970A

RF General Information				
Frequency Range	Modulation	Ch. Frequency (MHz)	Channel Number	Field Strength (dBuV/m)
13.553 – 13.567 MHz	ISO ISO 15693 (ASK)	13.56	1	65.23
Note 1: Field strength performed peak level at 3m.				

1.1.2 Antenna Information

Antenna Category	
<input checked="" type="checkbox"/>	Integral antenna (antenna permanently attached)
<input type="checkbox"/>	Temporary RF connector provided
<input checked="" type="checkbox"/>	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.
<input type="checkbox"/>	External antenna (dedicated antennas)

Antenna General Information		
No.	Ant. Cat.	Ant. Type
1	Integral	Coil / embeded

1.1.3 Type of EUT

Type of EUT	
<input checked="" type="checkbox"/>	Stand-alone
<input type="checkbox"/>	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.:
<input type="checkbox"/>	Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.:
<input type="checkbox"/>	Other:

1.1.4 Test Signal Duty Cycle

Duty Cycle Operation Restriction			
The transmitter is used for		The transmitter is operated	
<input checked="" type="checkbox"/> Inductive applications		<input checked="" type="checkbox"/> Automatically triggered	
<input type="checkbox"/> Duty cycle fixed mode		<input checked="" type="checkbox"/> Duty cycle random mode	
Duty cycle mode - NFC-A (ISO 14443-3A)			
Declare transmitter duty cycle / 1 hour =		100%	
Duty cycle Limit			
<input type="checkbox"/> Class 1 - < 0.1 %		<input type="checkbox"/> Class 2 - < 1.0 %	
<input type="checkbox"/> Class 3 - < 10 %		<input checked="" type="checkbox"/> Class 4 - Up to 100 %	
Duty cycle mode - NFC-B (ISO 14443-3B)			
Declare transmitter duty cycle / 1 hour =		100%	
Duty cycle Limit			
<input type="checkbox"/> Class 1 - < 0.1 %		<input type="checkbox"/> Class 2 - < 1.0 %	
<input type="checkbox"/> Class 3 - < 10 %		<input type="checkbox"/> Class 4 - Up to 100 %	
Duty cycle mode - NFC-F (ISO 18092)			
Declare transmitter duty cycle / 1 hour =		100%	
Duty cycle Limit			
<input type="checkbox"/> Class 1 - < 0.1 %		<input type="checkbox"/> Class 2 - < 1.0 %	
<input type="checkbox"/> Class 3 - < 10 %		<input type="checkbox"/> Class 4 - Up to 100 %	
Duty cycle mode - NFC-V (ISO 15693)			
Declare transmitter duty cycle / 1 hour =		100%	
Duty cycle Limit			
<input type="checkbox"/> Class 1 - < 0.1 %		<input type="checkbox"/> Class 2 - < 1.0 %	
<input type="checkbox"/> Class 3 - < 10 %		<input checked="" type="checkbox"/> Class 4 - Up to 100 %	

1.1.5 EUT Operational Condition

Supply Voltage	<input type="checkbox"/> AC mains	<input checked="" type="checkbox"/> DC	
Type of DC Source	<input type="checkbox"/> External AC adapter	<input checked="" type="checkbox"/> From Host System	<input type="checkbox"/> Battery
Test Voltage	<input checked="" type="checkbox"/> Vnom (5 V)	<input checked="" type="checkbox"/> Vmax (5.75 V)	<input checked="" type="checkbox"/> Vmin (4.25 V)
Test Climatic	<input checked="" type="checkbox"/> Tnom (20°C)	<input checked="" type="checkbox"/> Tmax (50°C)	<input checked="" type="checkbox"/> Tmin (-30°C)

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
- ♦ KDB 174176 D01 v01r01

1.3 Testing Location Information

Testing Location				
<input checked="" type="checkbox"/>	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan 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	Bear	20.3°C / 65%	31/Mar/2017
RF Conducted	TH06-HY	Gary	21.4°C / 62.8%	29/Mar/2017
Radiated	03CH02-HY	Ryan	22.2°C / 51.8%	30/Mar/2017

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))

Measurement Uncertainty		
Test Item		Uncertainty
AC power-line conducted emissions		±2.2 dB
Emission bandwidth		±1.4 %
Unwanted emissions, conducted	9 – 150 kHz	±0.38 dB
	0.15 – 30 MHz	±0.42 dB
	30 – 1000 MHz	±0.51 dB
All emissions, radiated	9 – 150 kHz	±2.49 dB
	0.15 – 30 MHz	±2.28 dB
	30 – 1000 MHz	±2.56 dB
Temperature		±0.8 °C
Humidity		±3 %
DC and low frequency voltages		±3 %
Time		±1.4 %
Duty Cycle		±1.4 %

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Modulation Used for Conformance Testing	
Modulation Mode	Field Strength (dBuV/m at 3 m)
NFC-Read/Write	65.23




2.2 Test Channel Frequencies Configuration

Modulation Mode	Test Channel Frequencies (MHz)
NFC-Read/Write	13.56

2.3 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	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		
User Position	<input type="checkbox"/> EUT will be placed in fixed position.		
	<input type="checkbox"/> EUT will be placed in mobile position and operating multiple positions.		
	<input checked="" type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions.		
Pretest Mode	<input checked="" type="checkbox"/> 1. EUT Built in NFC A type		
	<input checked="" type="checkbox"/> 2. EUT Built in NFC V type		
	Mode 2 configuration was pretested and found to be the worst case and measured during the test.		
Operating Mode < 1GHz	<input checked="" type="checkbox"/> 1. USB Mode		
Modulation Mode	NFC-Read/Write		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			
Worst Planes of EUT		V	

2.4 Accessories and Support Equipment

Accessories Information		
USB Cable	In/Out door	In door
	Power Cord	3 meter, non-shielded cable, w/o ferrite core

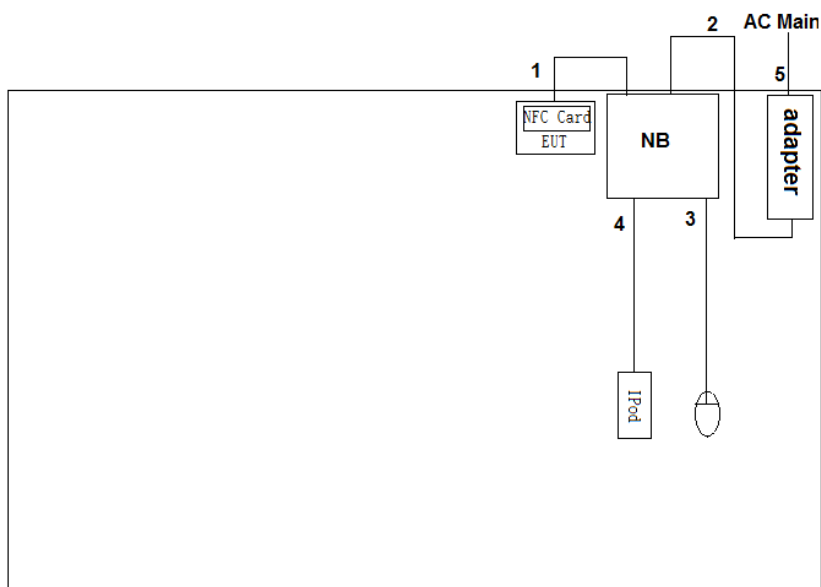
Reminder: Regarding to more detail and other information, please refer to user manual.

Support Equipment - AC Conduction and Radiated				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NFC Card	-	-	-
2	Notebook	DELL	E5410	DoC
3	Adapter for NB	DELL	LA65NS2-01	DoC
4	iPod	APPLE	A1199	DoC
5	Mouse(USB)	Dell	MS111-L	DoC

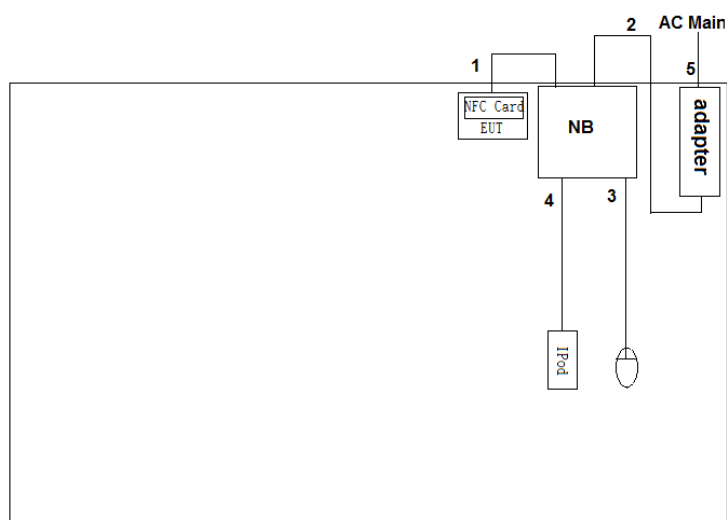
Support Equipment- RF Conducted				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NFC Card	-	-	-
2	Notebook	DELL	E5410	DoC
3	Adapter for NB	DELL	HA65NM130	DoC

2.5 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



Item	Connection	Shielded	Length(m)
1	USB cable	No	3m
2	DC Power line	No	1.8m
3	USB cable	No	1.9m
4	USB cable	No	1.0m
5	AC Power line	No	1.8m

Test Setup Diagram - Radiated Test


Item	Connection	Shielded	Length(m)
1	USB cable	No	3m
2	DC Power line	No	1.8m
3	USB cable	No	1.0m
4	USB cable	No	1.9m
5	AC Power line	No	1.8m

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.

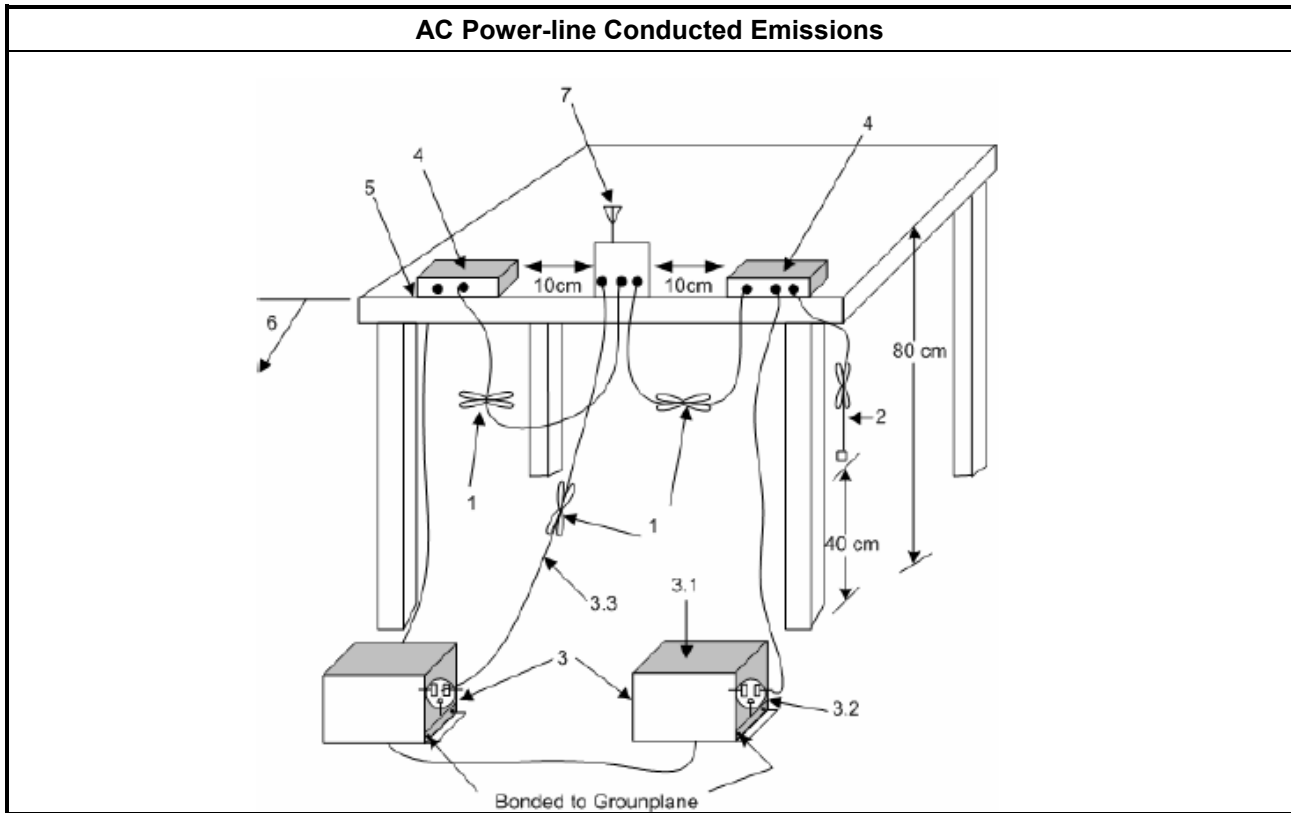
3.1.2 Measuring Instruments

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

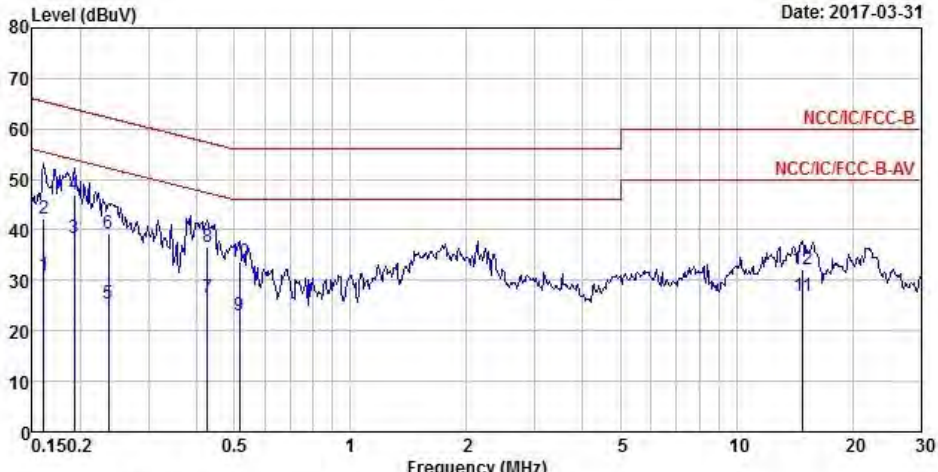
3.1.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.
<input checked="" type="checkbox"/>	If AC conducted emissions fall in operating band, then following below test method confirm final result.
<input type="checkbox"/>	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.
<input checked="" type="checkbox"/>	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			Neutral	
Operating Function	USB Mode							
<div><div><div>Level (dBuV)</div><div></div><div>Date: 2017-03-31</div></div></div>								
	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.16	30.87	-24.56	55.43	21.01	9.62	0.24	Average
2	0.16	42.32	-23.11	65.43	32.46	9.62	0.24	QP
3 MAX	0.19	38.36	-15.57	53.93	28.41	9.66	0.29	Average
4	0.19	47.03	-16.90	63.93	37.08	9.66	0.29	QP
5	0.24	25.38	-26.84	52.22	15.47	9.66	0.25	Average
6	0.24	39.38	-22.84	62.22	29.47	9.66	0.25	QP
7	0.43	26.55	-20.78	47.33	16.82	9.63	0.10	Average
8	0.43	36.51	-20.82	57.33	26.78	9.63	0.10	QP
9	0.52	23.13	-22.87	46.00	13.41	9.62	0.10	Average
10	0.52	33.74	-22.26	56.00	24.02	9.62	0.10	QP
11	14.83	26.74	-23.26	50.00	16.72	9.82	0.20	Average
12	14.83	32.13	-27.87	60.00	22.11	9.82	0.20	QP

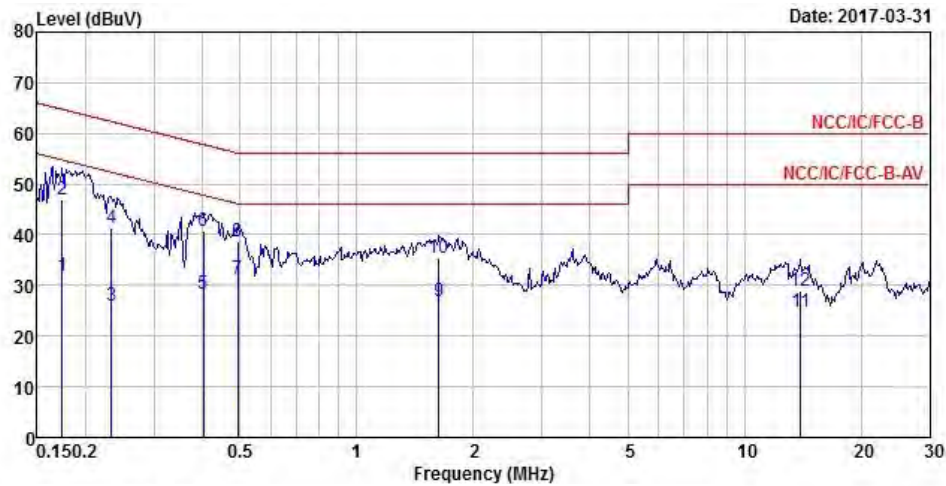
Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

Note 3: When emissions are in operating band over limits, retest with a dummy load for final in-band results.

AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	USB Mode		



	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.17	31.97	-22.80	54.77	22.06	9.65	0.26	Average
2	0.17	47.08	-17.69	64.77	37.17	9.65	0.26	QP
3	0.23	25.93	-26.42	52.35	16.01	9.66	0.26	Average
4	0.23	41.38	-20.97	62.35	31.46	9.66	0.26	QP
5	0.40	28.39	-19.42	47.81	18.61	9.68	0.10	Average
6	0.40	40.66	-17.15	57.81	30.88	9.68	0.10	QP
7 MAX	0.49	31.26	-14.84	46.10	21.49	9.67	0.10	Average
8	0.49	38.68	-17.42	56.10	28.91	9.67	0.10	QP
9	1.63	26.98	-19.02	46.00	17.00	9.74	0.24	Average
10	1.63	35.43	-20.57	56.00	25.45	9.74	0.24	QP
11	13.99	24.72	-25.28	50.00	14.70	9.82	0.20	Average
12	13.99	28.79	-31.21	60.00	18.77	9.82	0.20	QP

Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

Note 3: When emissions are in operating band over limits, retest with a dummy load for final in-band results.

3.2 Emission Bandwidth

3.2.1 Emission Bandwidth Limit

20dB Bandwidth Limit	
<input checked="" type="checkbox"/>	Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (13.553 – 13.567 MHz).

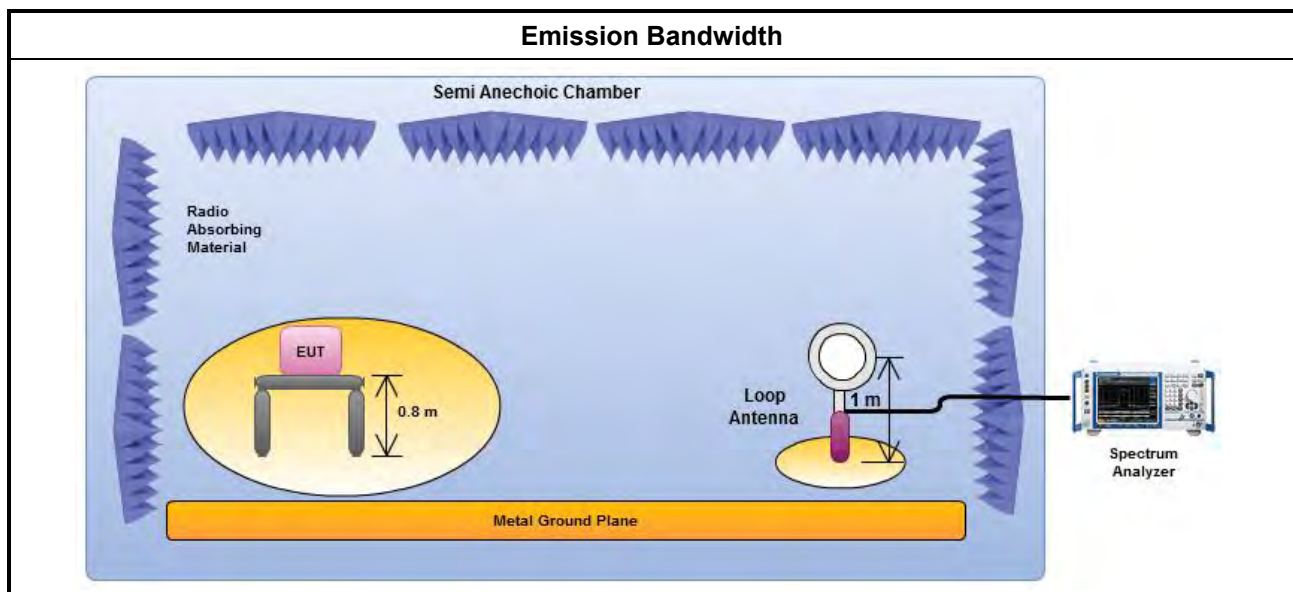
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	For the emission bandwidth refer ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
<input checked="" type="checkbox"/>	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.

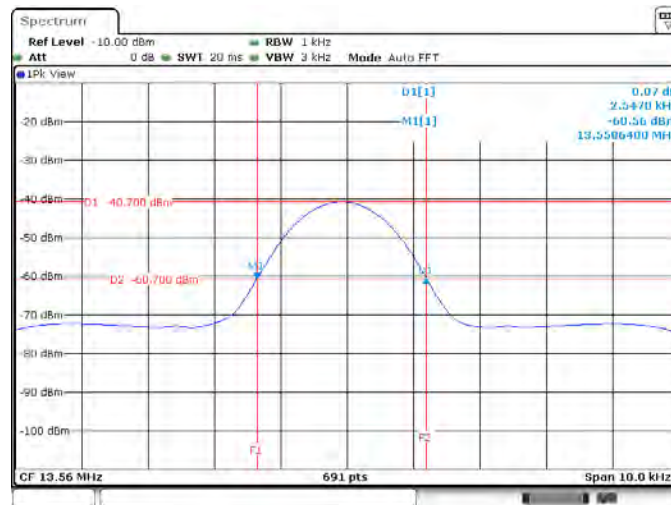
3.2.4 Test Setup



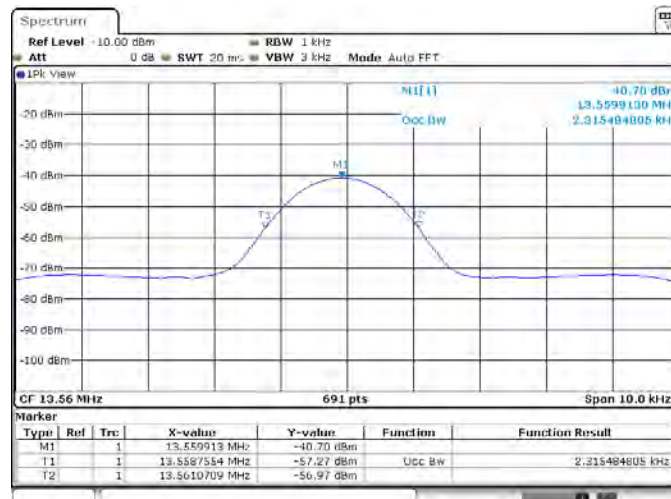
3.2.5 Test Result of Emission Bandwidth

Occupied Channel Bandwidth Result					
Modulation Mode	Frequency (MHz)	20dB Bandwidth (kHz)	F _L at 20dB BW (MHz)	F _H at 20dB BW (MHz)	99% Bandwidth (kHz)
NFC-Read/Write	13.56	2.54700	13.55864	13.56119	2.31548
Limit		N/A	13.553	13.567	N/A
Result		Complied			

Emission Bandwidth Plot - 20dB Bandwidth



Emission Bandwidth Plot - 99% Bandwidth



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

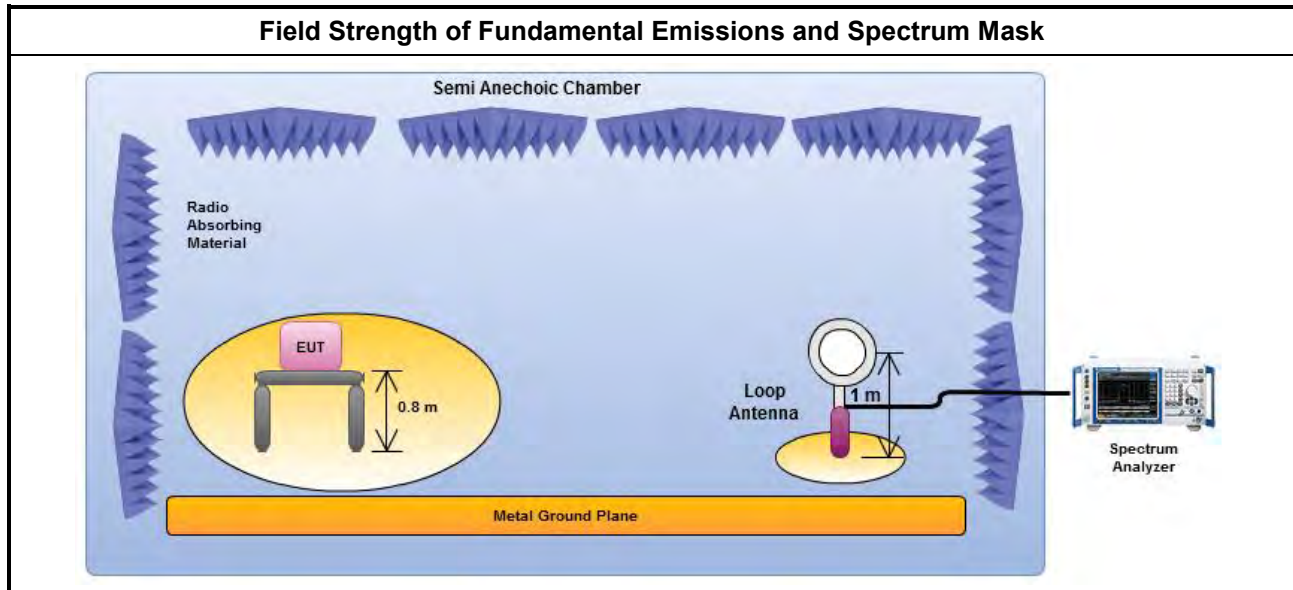
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

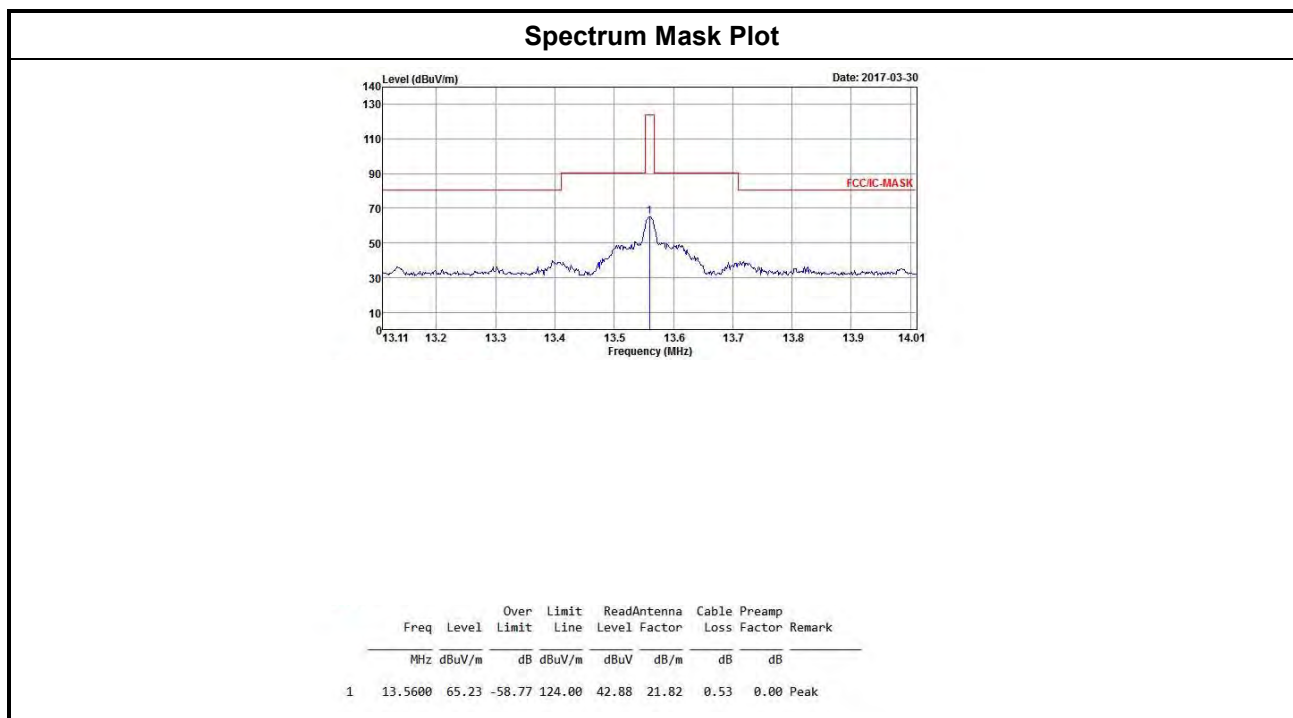
Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.
<input checked="" type="checkbox"/>	At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; 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.
<input type="checkbox"/>	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.
<input checked="" type="checkbox"/>	The results shall be by using the square of an inverse linear distance extrapolation factor (40 dB/decade).
<input checked="" type="checkbox"/>	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-Read/Write	13.56	65.23	H	58.77	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.

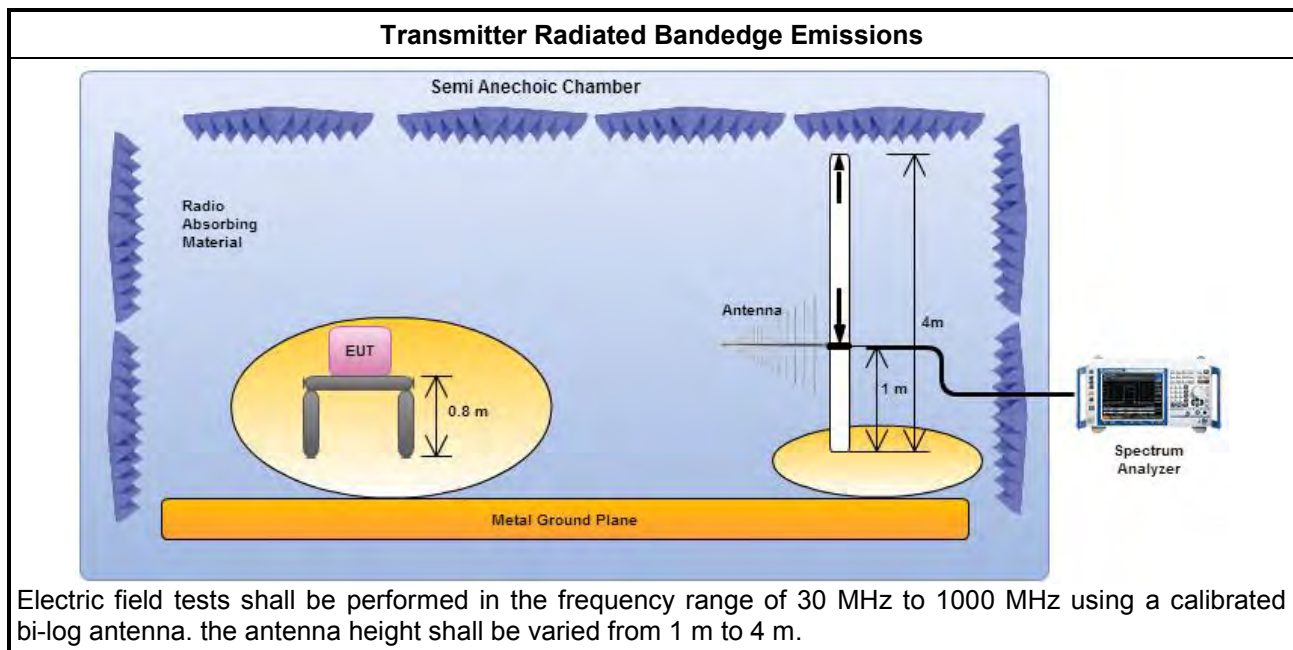
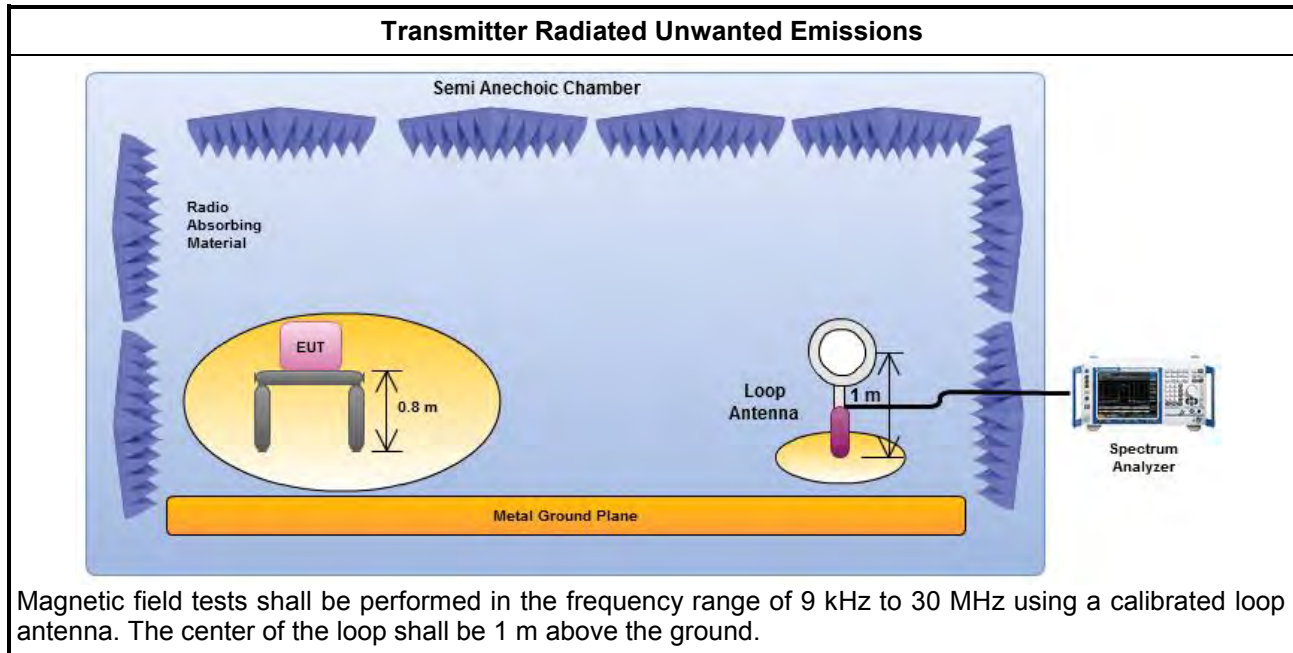
3.4.2 Measuring Instruments

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

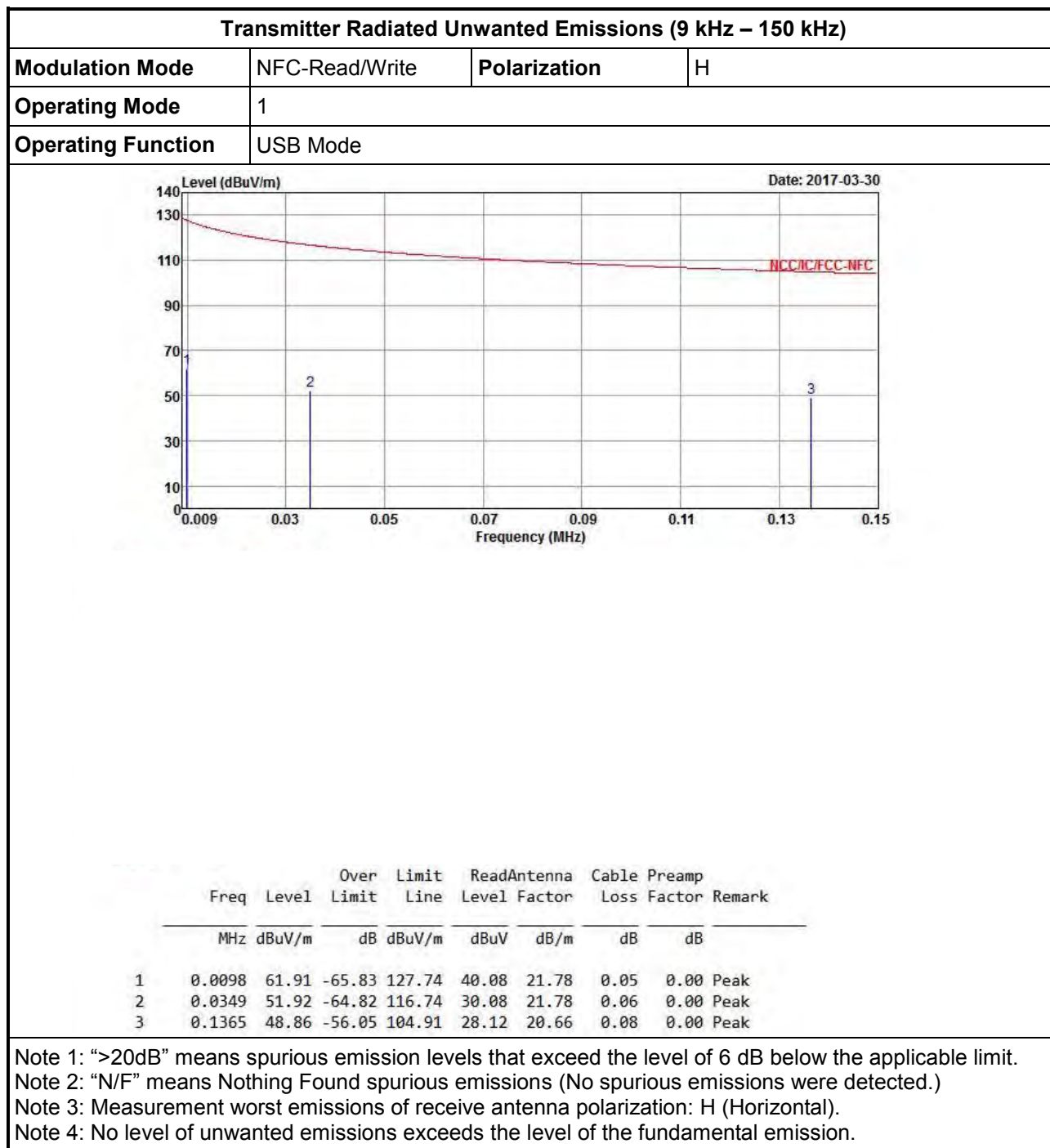
3.4.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1 GHz and test distance is 3m.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.
<input checked="" type="checkbox"/>	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.
<input type="checkbox"/>	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.
<input checked="" type="checkbox"/>	The results shall be by using the square of an inverse linear distance extrapolation factor (40 dB/decade).
<input checked="" type="checkbox"/>	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.
<input checked="" type="checkbox"/>	The any unwanted emissions level shall not exceed the fundamental emission level.
<input checked="" type="checkbox"/>	All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.4.4 Test Setup

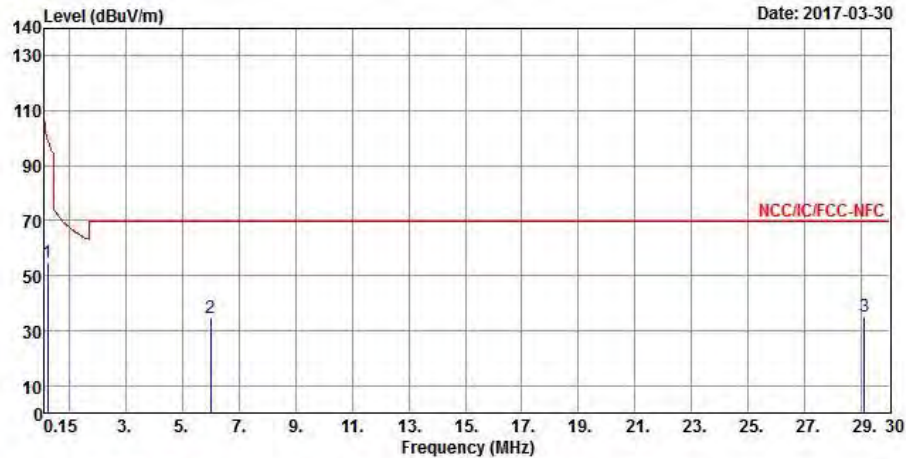


3.4.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)



Transmitter Radiated Unwanted Emissions (150 kHz – 30 MHz)

Modulation Mode	NFC-Read/Write	Polarization	H
Operating Mode	1		
Operating Function	USB Mode		



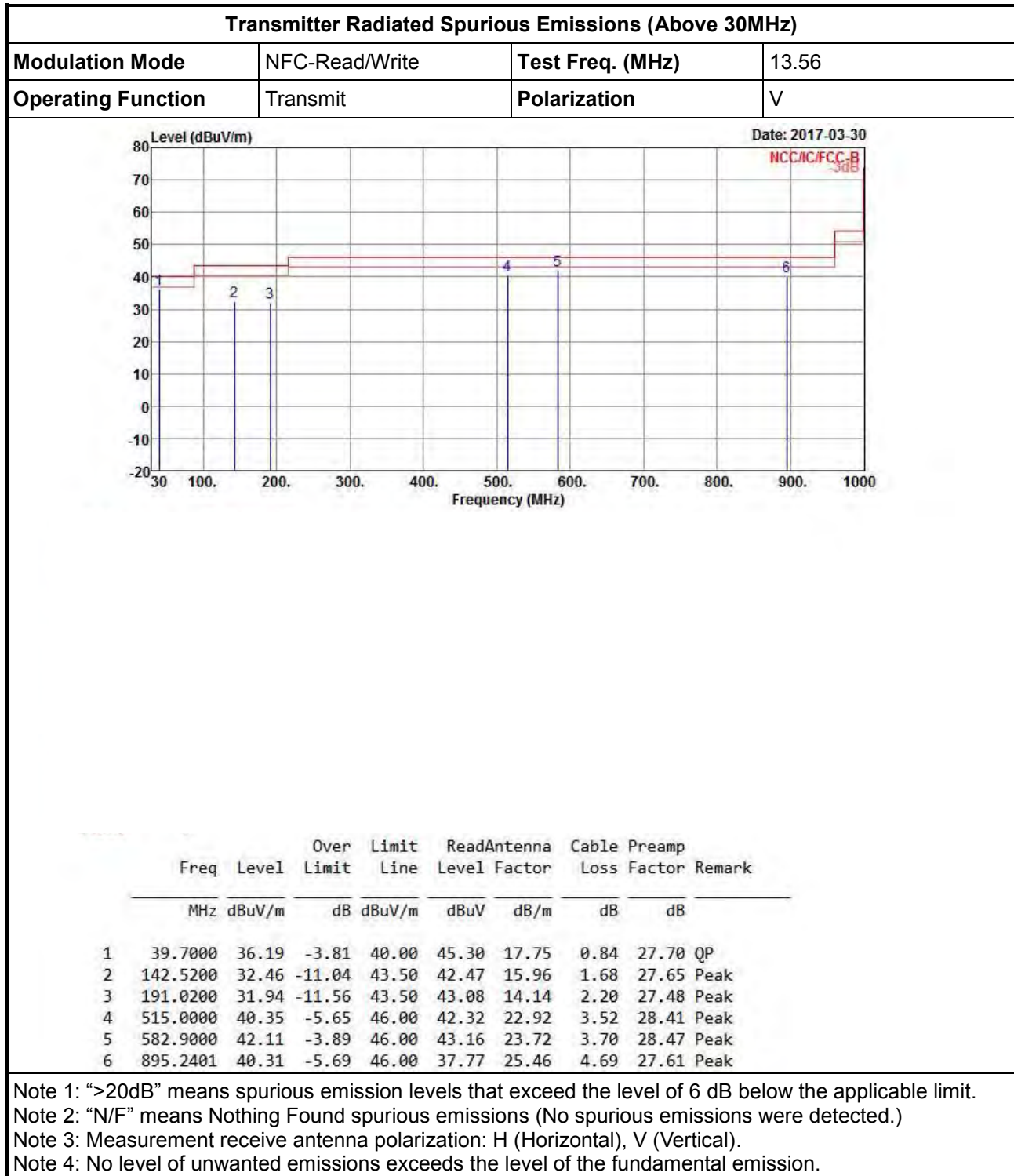
	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark
			dB	dBuV/m	dBuV	dB/m	dB	dB
1	0.2694	54.94	-44.06	99.00	34.30	20.53	0.11	0.00 Peak
2	6.0006	34.52	-35.02	69.54	13.23	20.86	0.43	0.00 Peak
3	29.1045	34.96	-34.58	69.54	11.63	22.67	0.66	0.00 Peak

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

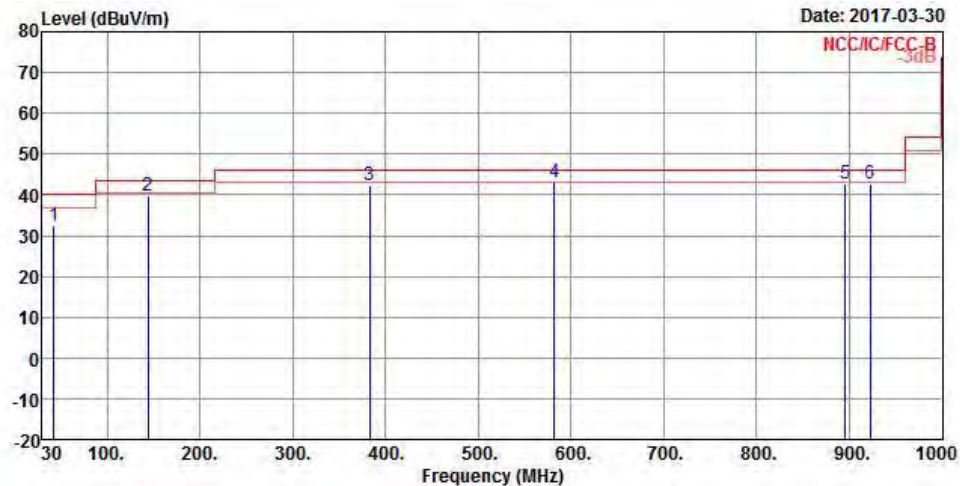
Note 3: Measurement worst emissions of receive antenna polarization: H (Horizontal).

Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

3.4.6 Transmitter Radiated Unwanted Emissions (Above 30MHz)


Transmitter Radiated Spurious Emissions (Above 30MHz)

Modulation Mode	NFC-Read/Write	Test Freq. (MHz)	13.56
Operating Function	Transmit	Polarization	H



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	42.4548	32.46	-7.54	40.00	42.99	16.32	0.86	27.71 Peak
2	144.1690	39.64	-3.86	43.50	49.73	15.85	1.70	27.64 Peak
3	382.8860	42.50	-3.50	46.00	46.80	20.41	3.02	27.73 QP
4	582.1628	42.98	-3.02	46.00	44.02	23.72	3.70	28.46 QP
5	895.6086	42.69	-3.31	46.00	40.15	25.46	4.69	27.61 QP
6	922.5940	42.90	-3.10	46.00	39.98	25.61	4.77	27.46 Peak

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical).

Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

3.5 Frequency Stability

3.5.1 Frequency Stability Limit

Frequency Stability Limit	
<input checked="" type="checkbox"/>	Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

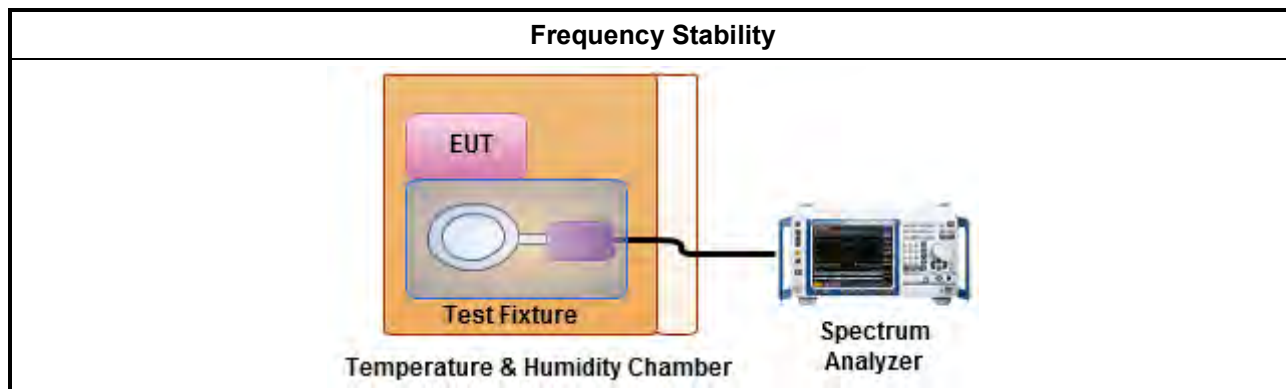
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.8 for frequency stability tests
<input checked="" type="checkbox"/>	Frequency stability with respect to ambient temperature
<input checked="" type="checkbox"/>	Frequency stability when varying supply voltage
<input type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	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

Frequency Stability Result									
Condition	Ch. Freq. (MHz)	Frequency Stability (ppm)							
		Test Frequency (MHz)				Frequency Stability (ppm)			
		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min
T _{20°C} V _{max}	13.56	13.55990	13.55990	13.55990	13.55990	-7.74	-7.74	-7.23	-7.23
T _{20°C} V _{min}	13.56	13.55990	13.55990	13.55990	13.55990	-7.23	-7.23	-7.74	-7.74
T _{50°C} V _{nom}	13.56	13.55985	13.55984	13.55984	13.55984	-11.35	-11.87	-11.87	-11.87
T _{40°C} V _{nom}	13.56	13.55986	13.55986	13.55986	13.55985	-10.32	-10.32	-10.32	-10.83
T _{30°C} V _{nom}	13.56	13.55988	13.55988	13.55987	13.55987	-8.77	-8.77	-9.28	-9.28
T _{20°C} V _{nom}	13.56	13.55990	13.55990	13.55990	13.55990	-7.23	-7.23	-7.23	-7.74
T _{10°C} V _{nom}	13.56	13.55994	13.55994	13.55993	13.55993	-4.65	-4.65	-5.16	-5.16
T _{0°C} V _{nom}	13.56	13.55997	13.55997	13.55997	13.55997	-2.03	-2.06	-2.58	-2.06
T _{-10°C} V _{nom}	13.56	13.56001	13.56001	13.56003	13.56001	1.03	1.03	2.14	1.03
T _{-20°C} V _{nom}	13.56	13.56003	13.56003	13.56003	13.56003	2.14	2.14	2.14	2.14
T _{-30°C} V _{nom}	13.56	13.56004	13.56003	13.56004	13.56004	3.17	2.14	3.17	3.17
Limit (ppm)		100							
Result		Complied							
Note 1: Measure at 85 % [Vmin] and 115 % [Vmax] of the nominal voltage [Vnom]. The nominal voltage refer test report clause 1.1.5 for EUT operational condition.									
Note 2: Measure maximum deviation frequency at operating frequency at startup and two, five, and ten 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	19/Apr/2016	18/Apr/2017
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	24/Oct/2016	23/Oct/2017
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	14/Feb/2017	13/Feb/2018

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101013	9kHz~40GHz	08/Feb/2017	07/Feb/2018
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	4/Jun/2016	3/Jun/2017
Temp. and Humidity Chamber	Giant Force	GTH-225-40-CP-AR	MAA1611-005	-40 ~ 100°C	21/Nov/2016	20/Nov/2018
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	02/Mar/2017	01/Mar/2018

Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSP 40	100593	9kHz~40GHz	26/Oct/2016	25/Oct/2017
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	9kHz ~ 1GHz 3m	03/Jun/2016	02/Jun/2017
RF Cable-R03m	Jye Bao	RG142	CB017	9kHz ~ 1GHz	26/Jan/2017	25/Jan/2018
Amplifier	Agilent	8447D	2944A11149	100kHz-1.3GHz	01/Jul/2016	30/Jun/2017
Bilog Antenna	SCHAFFNER	CBL6112B	2723	30MHz-1GHz	01/Oct/2016	30/Sep/2017
Loop Antenna	TESEQ	HLA 6120	31244	9kHz-30MHz	02/Mar/2017	01/Mar/2018