

FCC Test Report

Equipment : RFID
Brand Name : Elo Touch Solutions
Model No. : KIT,NFC,USB,ESY X Series/AAiO/02 Series
FCC ID : RBWELO-RFID
Standard : 47 CFR FCC Part 15.225
Operating Band : 13.553 – 13.567 MHz (channel freq. 13.56 MHz)
Equipment Class : DXX
Applicant : Elo Touch Solutions, Inc
Manufacturer : 1033 McCarthy Blvd. Milpitas, CA
95035, USA.

The product sample received on Nov. 10, 2012 and completely tested on Mar. 07, 2015. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 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.

Reviewed by:


Kevin Liang / Assistant Manager

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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]:13.56MHz 41.52 (Margin 8.48dB) - AV 43.44 (Margin 16.56dB) - QP	FCC 15.207	Complied
3.2	15.215(c)	Emission Bandwidth	20dB Bandwidth 2.66 [kHz] F_L :13.5590 MHz F_H :13.5616 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: 60.46 dBuV/m at 10m Device complies with spectrum mask – refer to test data	103.1 dBuV/m at 10m	Complied
3.4	15.225(d)	Transmitter Radiated Unwanted Emissions	[dBuV/m at 3m]: 468.44MHz 41.57 (Margin 4.43dB) - PK	FCC 15.209	Complied
3.5	15.225(e)	Frequency Stability	30.97 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

RF General Information				
Frequency Range	Modulation	Ch. Frequency (MHz)	Channel Number	Field Strength (dBuV/m)
13.553 – 13.567 MHz	ISO 14443-2 (ASK)	13.56	1	60.46
Note 1: Field strength performed peak level at 10m.				

1.1.2 Antenna Information

Antenna Category	
☐	Equipment placed on the market without antennas
☒	Integral antenna (antenna permanently attached)
☐	External antenna (dedicated antennas)

1.1.3 Type of EUT

Identify EUT	
EUT Serial Number	N/A
Presentation of Equipment	☒ Production ; ☐ Pre-Production ; ☐ Prototype
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

Operated Mode for Worst Duty Cycle	
☐	Operated normally mode for worst duty cycle
☒	Operated test mode for worst duty cycle
Test Signal Duty Cycle (x)	Voltage Duty Factor [dB] – (20 log 1/x)
☒ 100%	0

1.1.5 EUT Operational Condition

Supply Voltage	☒ AC mains	☒ DC	
Type of DC Source	☐ Internal DC supply	☒ External DC adapter	☒ Battery

1.2 Support Equipment

Support Equipment				
No.	Equipment	Brand Name	Model Name	Serial No.
1	Notebook	DELL	E5520	DoC
2	Adapter for Notebook	DELL	DA90PE3-00	DoC
3	LCD Monitor	Elo	ET1723L	DoC
4	Adapter for LCD Monitor	Delta	ADP-50YH B	DoC

Note: The LCD Monitor provided by Customer.

1.3 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
- ♦ FCC KDB 174176

1.4 Testing Location Information

Testing Location				
☒	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
RF Conducted		TH01-HY	Ian	23.6°C / 48%
AC Conduction		CO04-HY	Zeus	24°C / 47%
Radiated Emission		10CH02-HY	Daniel	25°C / 46%
Radiated Emission		03CH02-HY	Jay	22.3°C / 54%

1.5 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	Limit
AC power-line conducted emissions		±2.2 dB	N/A
Emission bandwidth		±1.4 %	N/A
Unwanted emissions, conducted	9 – 150 kHz	±0.3 dB	N/A
	0.15 – 30 MHz	±0.4 dB	N/A
	30 – 1000 MHz	±0.5 dB	N/A
All emissions, radiated	9 – 150 kHz	±2.4 dB	N/A
	0.15 – 30 MHz	±2.2 dB	N/A
	30 – 1000 MHz	±2.5 dB	N/A
Temperature		±0.8 °C	N/A
Humidity		±3 %	N/A
DC and low frequency voltages		±3 %	N/A
Time		±1.4 %	N/A
Duty Cycle		±1.4 %	N/A

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Modulation Used for Conformance Testing	
Modulation Mode	Field Strength (dBuV/m at 10 m)
NFC-Read/Write	60.46

2.2 Test Channel Frequencies Configuration

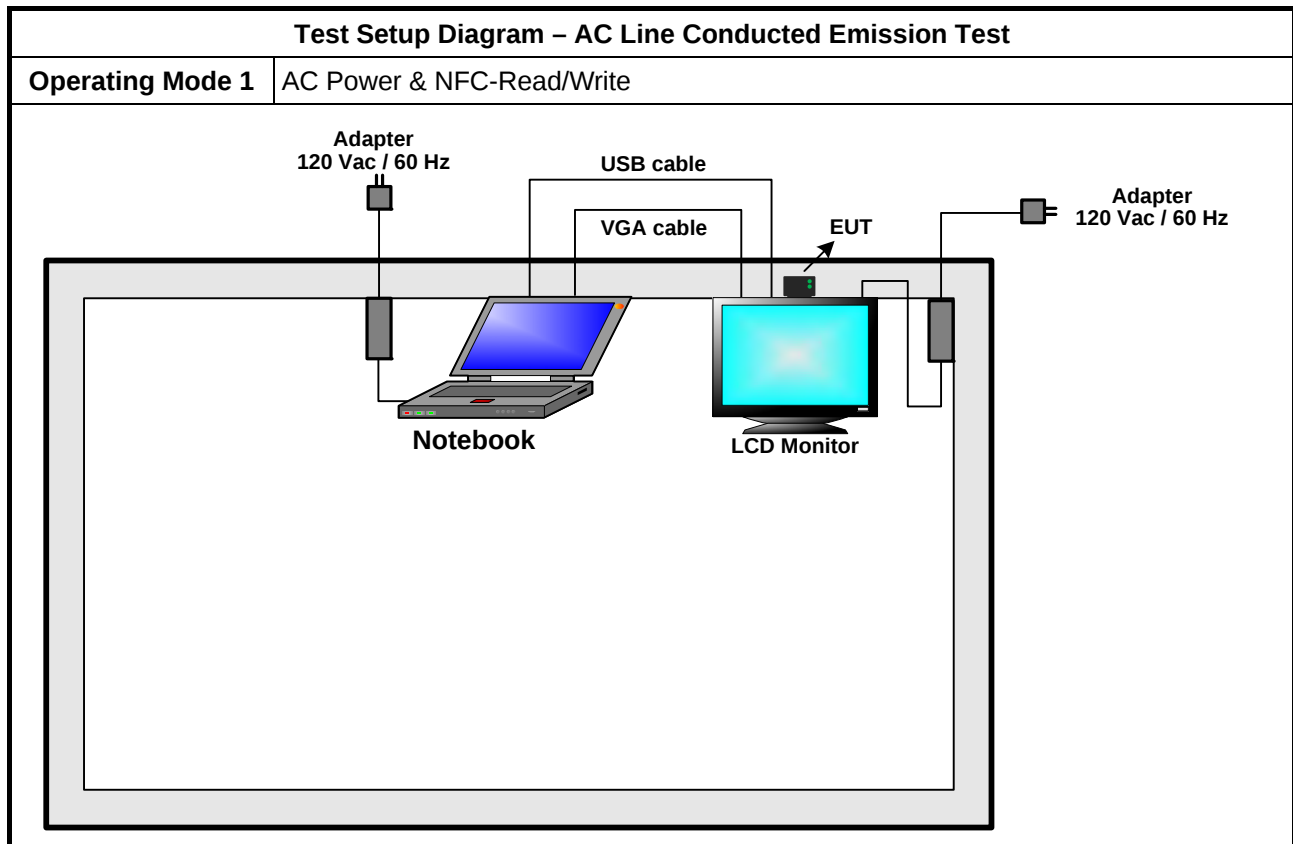
Test Channel Frequencies Configuration	
Modulation Mode	Test Channel Frequencies (MHz) – FX (Frequencies Abbreviations)
NFC-Read/Write	13.56-(F1)

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	Operating Mode Description
1	AC Power & NFC-Read/Write

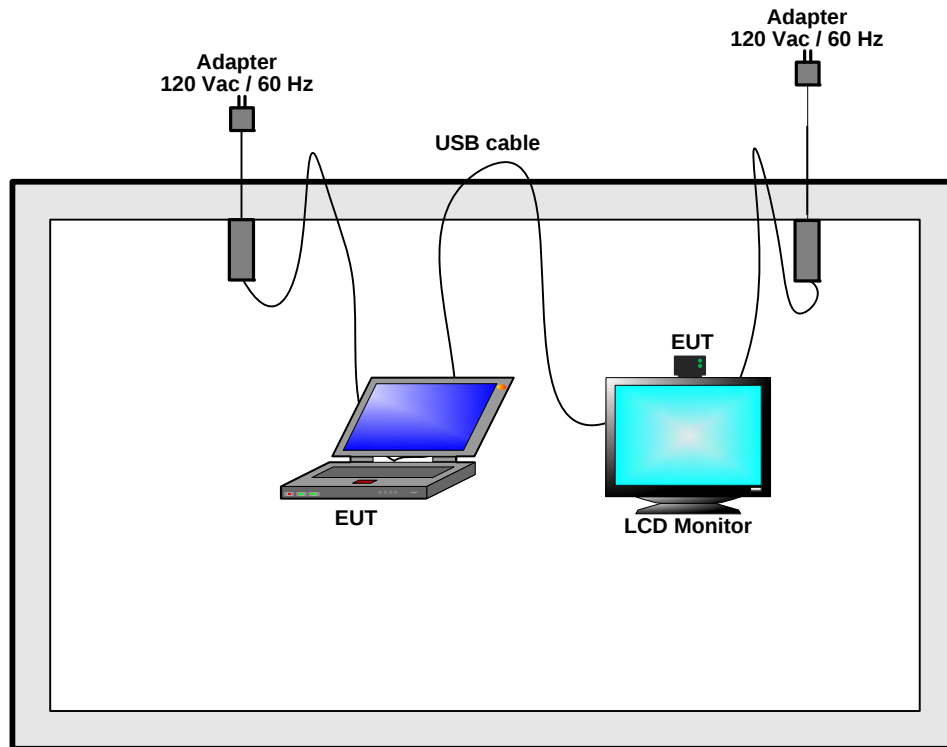
The Worst Case Mode for Following Conformance Tests	
Tests Item	Emission Bandwidth, Field Strength of Fundamental Emissions Spectrum Mask, Transmitter Radiated Unwanted Emissions Frequency Stability
Test Condition	Radiated measurement
User Position	☒ EUT will be placed in fixed position.
	☐ EUT will be placed in mobile position and operating multiple positions.
	☐ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions.
Operating Mode < 1GHz	☒ 1. AC Power & NFC-Read/Write
Modulation Mode	NFC-Read/Write
Orthogonal Planes of EUT	Y Plane
	
Worst Planes of EUT	V

2.4 Test Setup Diagram



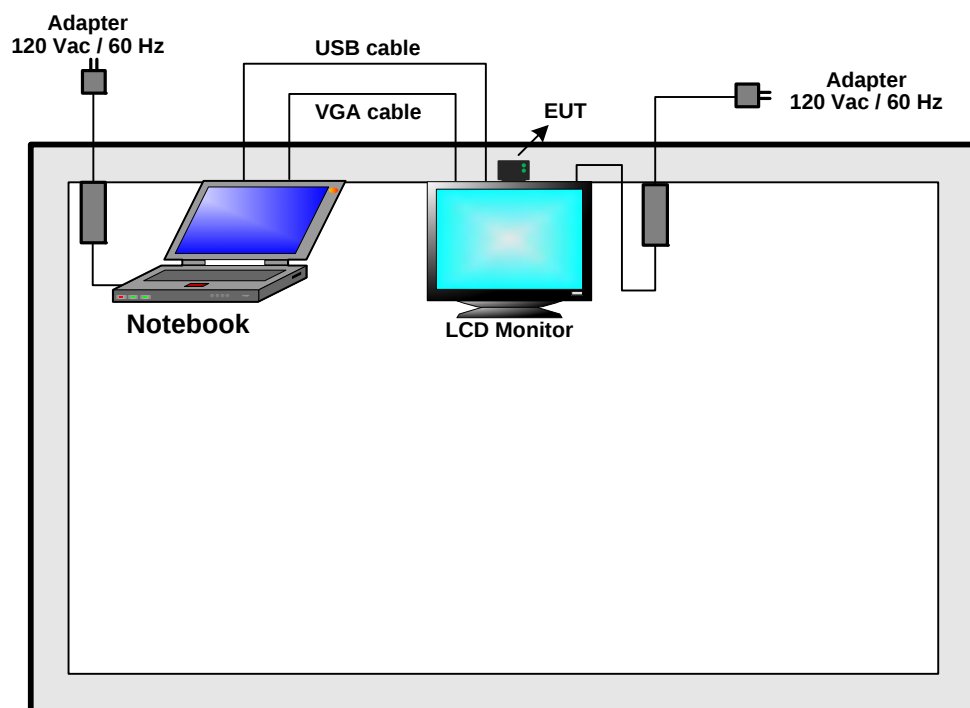
Test Setup Diagram - Radiated Test (9kHz~30MHz)

Operating Mode 1 | AC Power & NFC-Read/Write



Test Setup Diagram - Radiated Test (30MHz~1GHz)

Operating Mode 1 | AC Power & NFC-Read/Write



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.

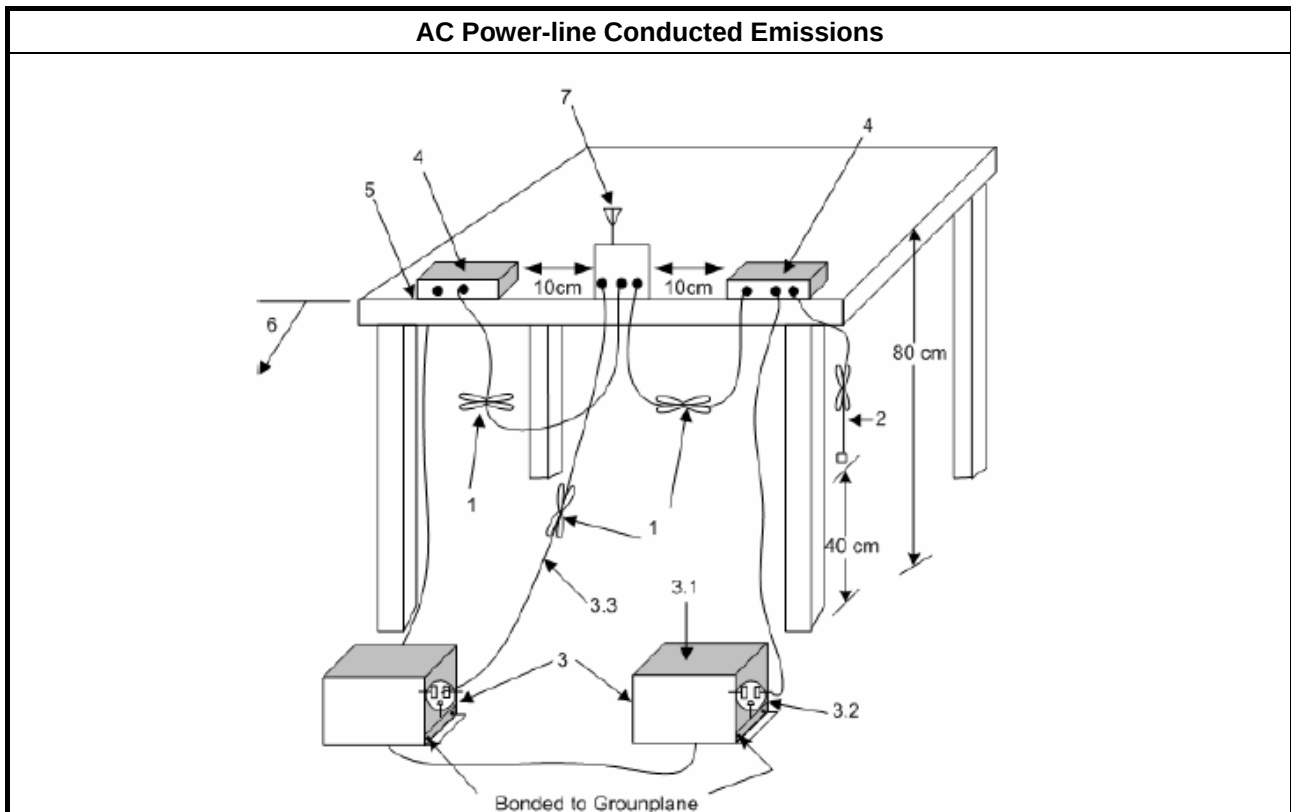
3.1.2 Measuring Instruments

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

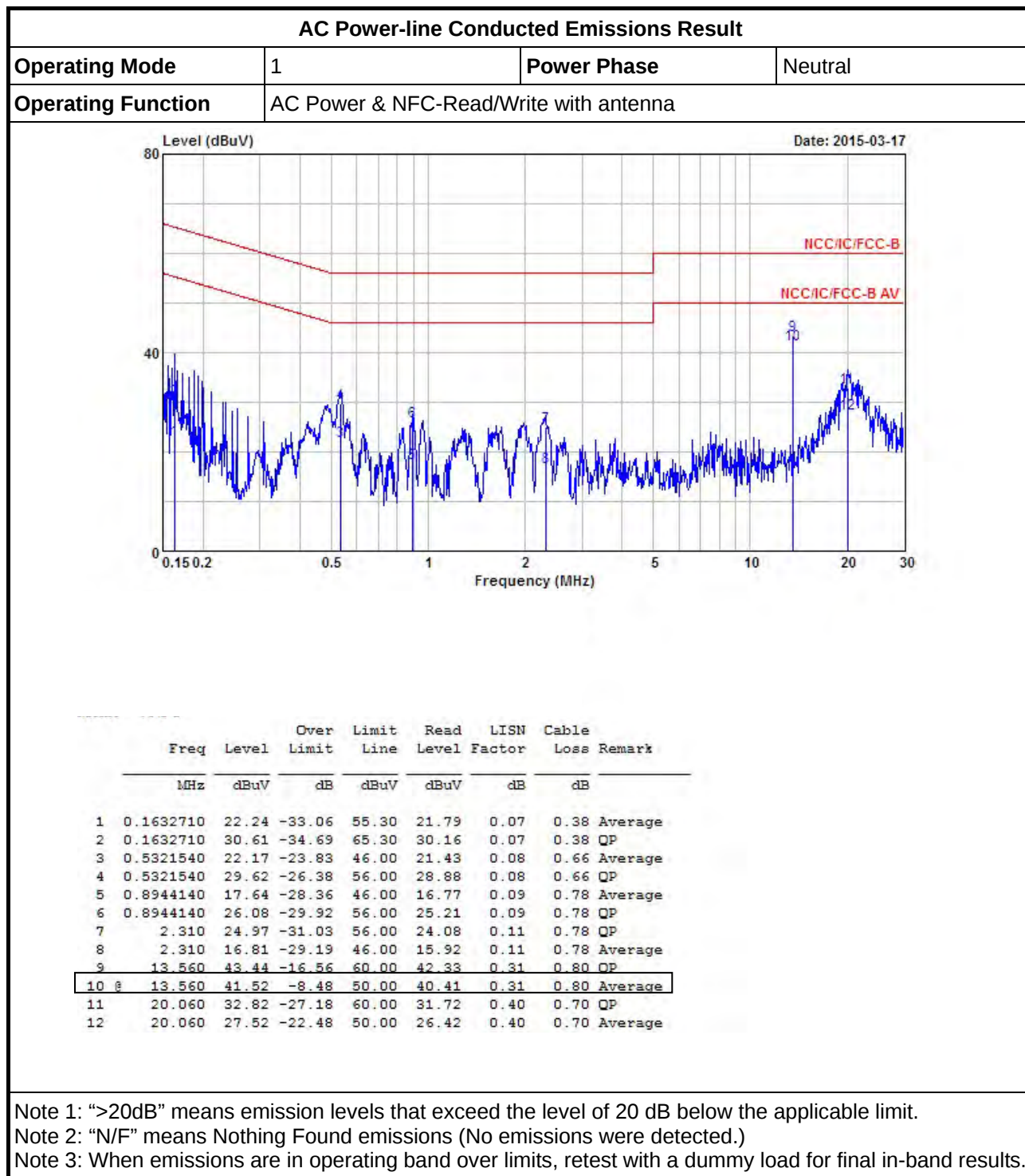
3.1.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 6.2 for AC power-line conducted emissions.
☒	If AC conducted emissions fall in operating band, then following below test method confirm final result.
☐	Accept measurements done with a suitable dummy load replacing the antenna under the following conditions: (1) Perform the AC line conducted tests with the antenna connected to determine compliance with FCC 15.207 limits outside the transmitter's fundamental emission band; (2) Retest with a dummy load to determine compliance with FCC 15.207 limits within the transmitter's fundamental emission band.
☒	For a device with a permanent antenna operating at or below 30 MHz, accept measurements done with a suitable dummy load, in lieu of the permanent antenna under the following conditions: (1) Perform the AC line conducted tests with the permanent antenna to determine compliance with the FCC 15.207 limits outside the transmitter's fundamental emission band; (2) Retest with a dummy load in lieu of the permanent antenna to determine compliance with the FCC 15.207 limits within the transmitter's fundamental emission band.

3.1.4 Test Setup

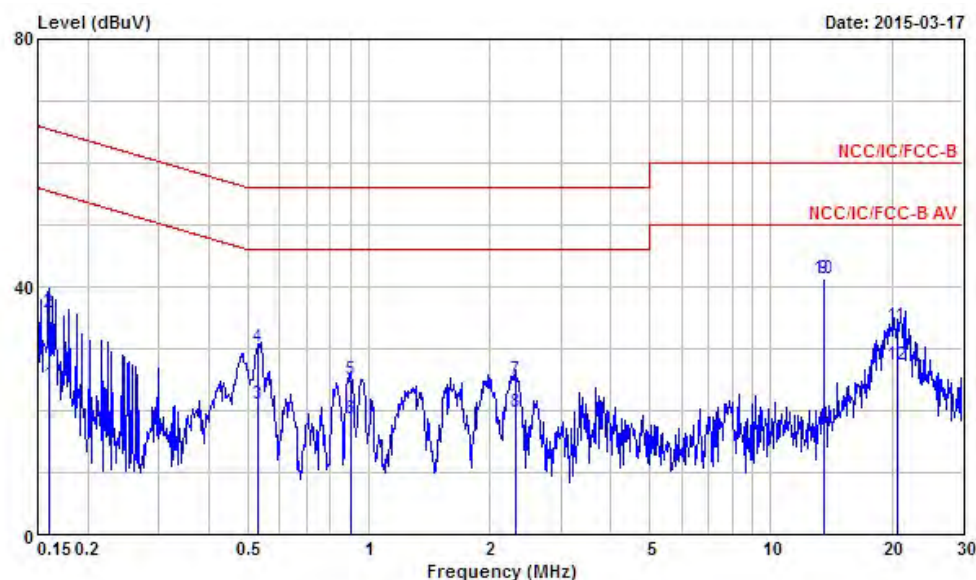


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	AC Power & NFC-Read/Write with antenna		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1606960	24.29	-31.14	55.43	23.87	0.05	0.37	Average
2	0.1606960	35.78	-29.65	65.43	35.36	0.05	0.37	QP
3	0.5293420	21.01	-24.99	46.00	20.28	0.07	0.66	Average
4	0.5293420	30.25	-25.75	56.00	29.52	0.07	0.66	QP
5	0.8991650	24.90	-31.10	56.00	24.04	0.08	0.78	QP
6	0.8991650	18.64	-27.36	46.00	17.78	0.08	0.78	Average
7	2.310	24.95	-31.05	56.00	24.06	0.11	0.78	QP
8	2.310	19.86	-26.14	46.00	18.97	0.11	0.78	Average
9	13.560	41.32	-8.68	50.00	40.23	0.29	0.80	Average
10	13.560	41.34	-18.66	60.00	40.25	0.29	0.80	QP
11	20.590	33.75	-26.25	60.00	32.69	0.37	0.69	QP
12	20.590	27.24	-22.76	50.00	26.18	0.37	0.69	Average

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	
☒	Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (13.553 – 13.567 MHz).

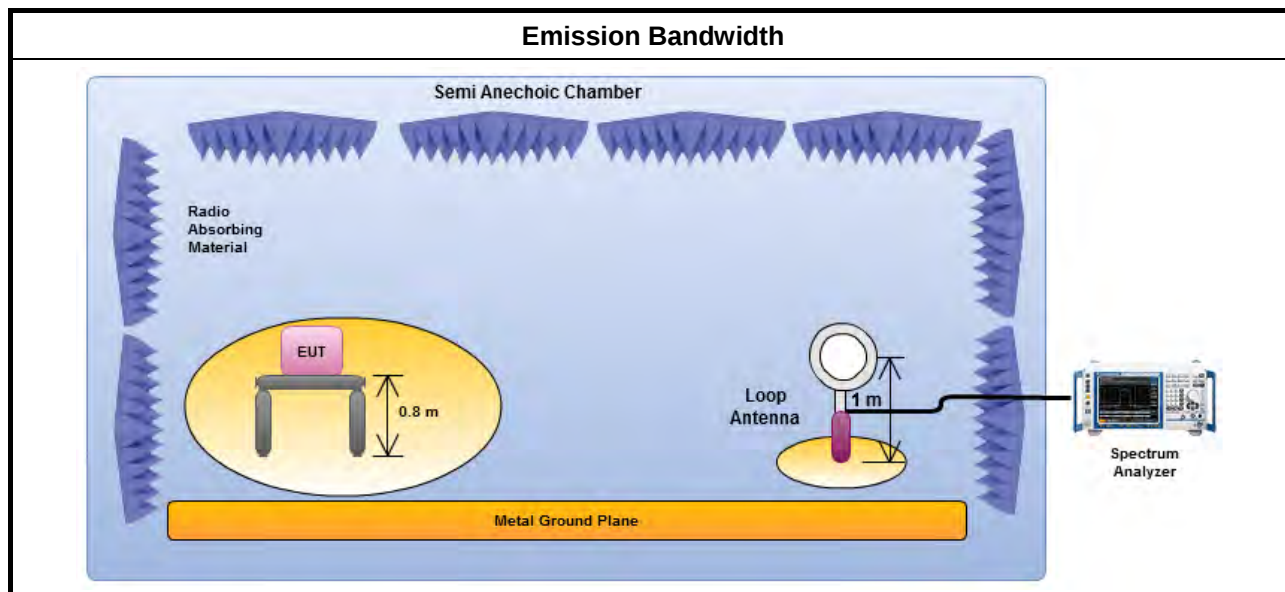
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

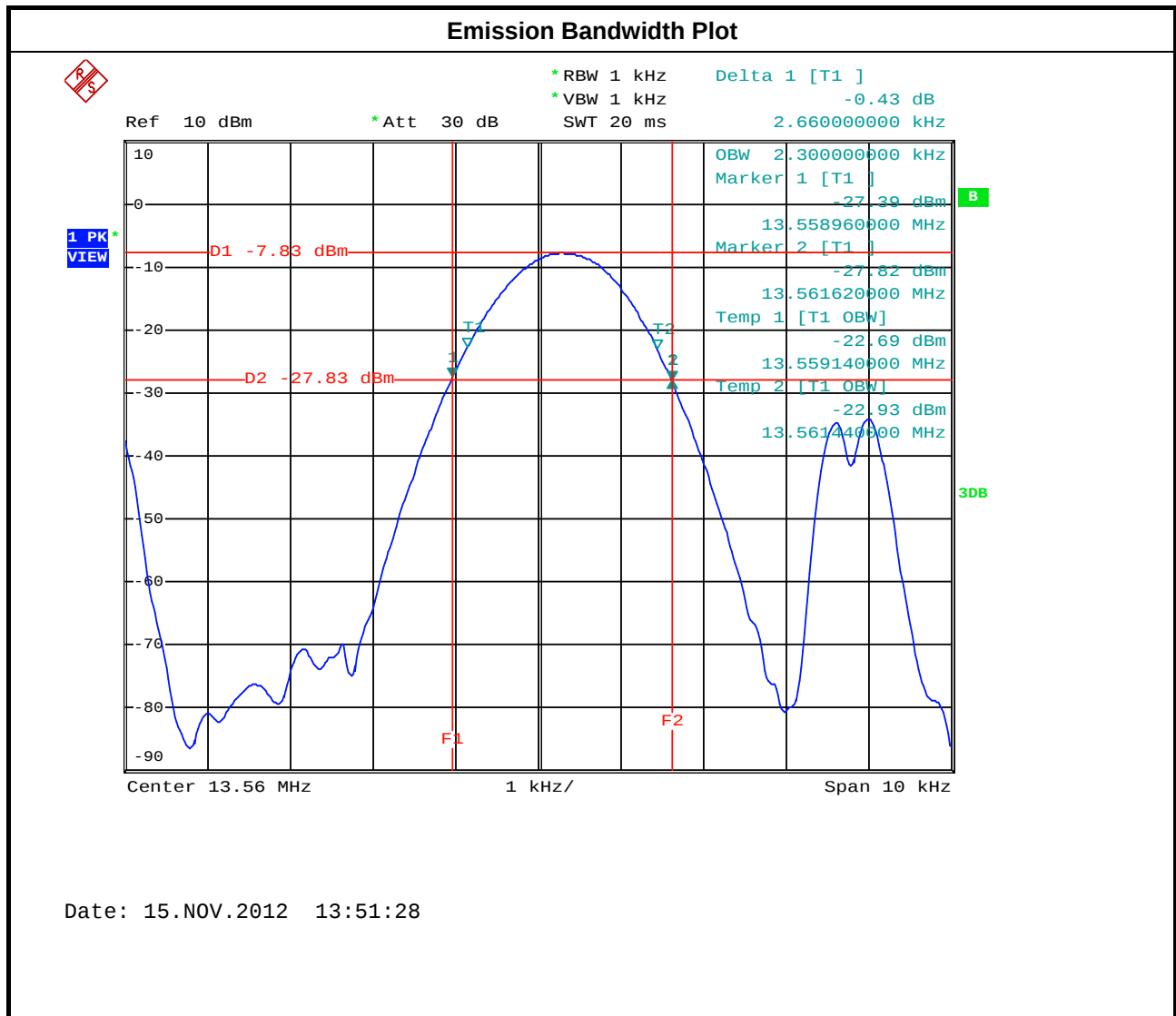
Test Method	
☒	For the emission bandwidth refer ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
☒	For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field 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	2.66	13.5590	13.5616	2.30
Limit		N/A	13.553	13.567	N/A
Result		Complied			



3.3 Field Strength of Fundamental Emissions and Spectrum Mask

3.3.1 Field Strength of Fundamental Emissions and Spectrum Mask Limit

Field Strength of Fundamental Emissions					
Emissions	(uV/m)@30m	(dBuV/m)@30m	(dBuV/m)@10m	(dBuV/m)@3m	(dBuV/m)@1m
Fundamental	15848	84.0	103.1	124.0	143.1
Quasi peak measurement of the fundamental.					

Spectrum Mask					
Freq. of Emission (MHz)	(uV/m)@30m	(dBuV/m)@30m	(dBuV/m)@10m	(dBuV/m)@3m	(dBuV/m)@1m
1.705~13.110	30	29.5	48.6	69.5	88.6
13.110~13.410	106	40.5	59.6	80.5	99.6
13.410~13.553	334	50.5	69.6	90.5	109.6
13.553~13.567	15848	84.0	103.1	124.0	143.1
13.567~13.710	334	50.5	69.6	90.5	109.6
13.710~14.010	106	40.5	59.6	80.5	99.6
14.010~30.000	30	29.5	48.6	69.5	88.6

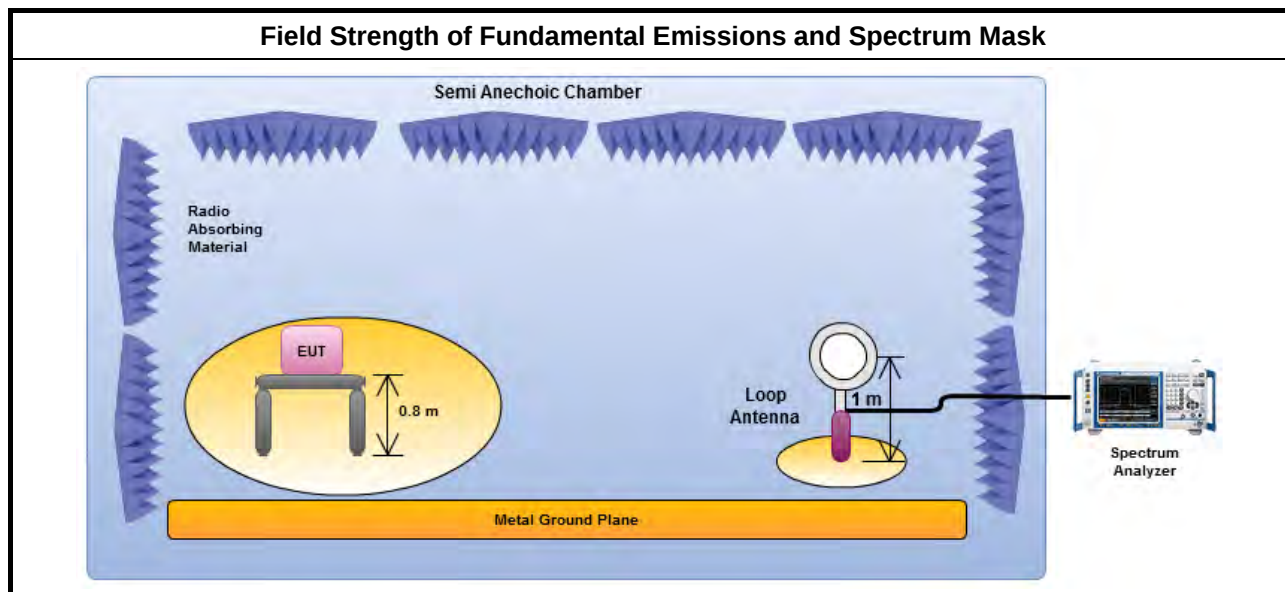
3.3.2 Measuring Instruments

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. quasi peak measurement of the fundamental.
☒	At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be following below methods.
☐	The results shall be extrapolated to the specified distance by making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor.
☒	The results shall be by using the square of an inverse linear distance extrapolation factor (40 dB/decade).
☒	For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level.

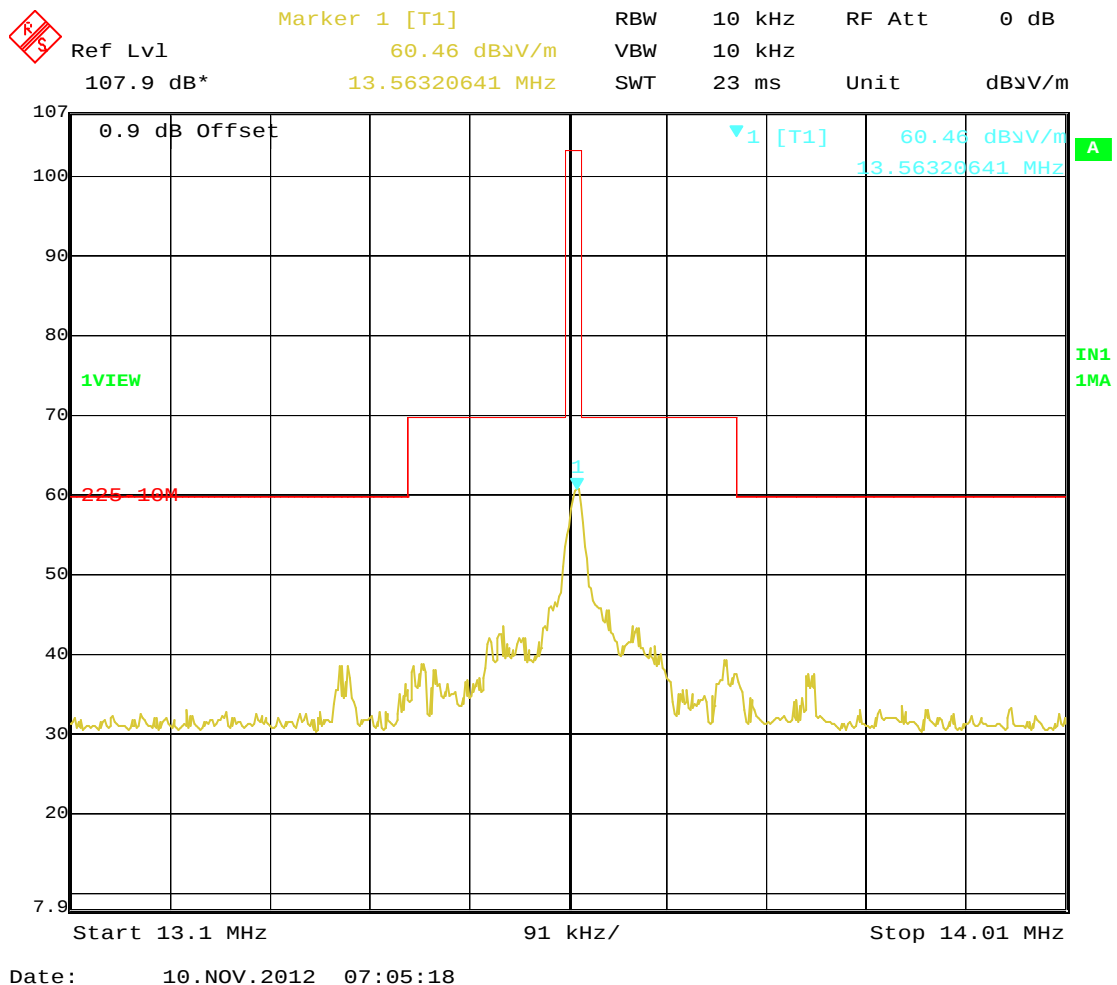
3.3.4 Test Setup



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

Field Strength of Fundamental Emissions Result					
Modulation Mode	Frequency (MHz)	Fundamental (dBuV/m)@10m	Polarization	Margin (dB)	Limit (dBuV/m)@10m
NFC-Read/Write	F1	60.46	V	42.64	103.1
Result		Complied			
Note 1: Measurement worst emissions of receive antenna polarization: V (Vertical).					

Spectrum Mask Plot



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.

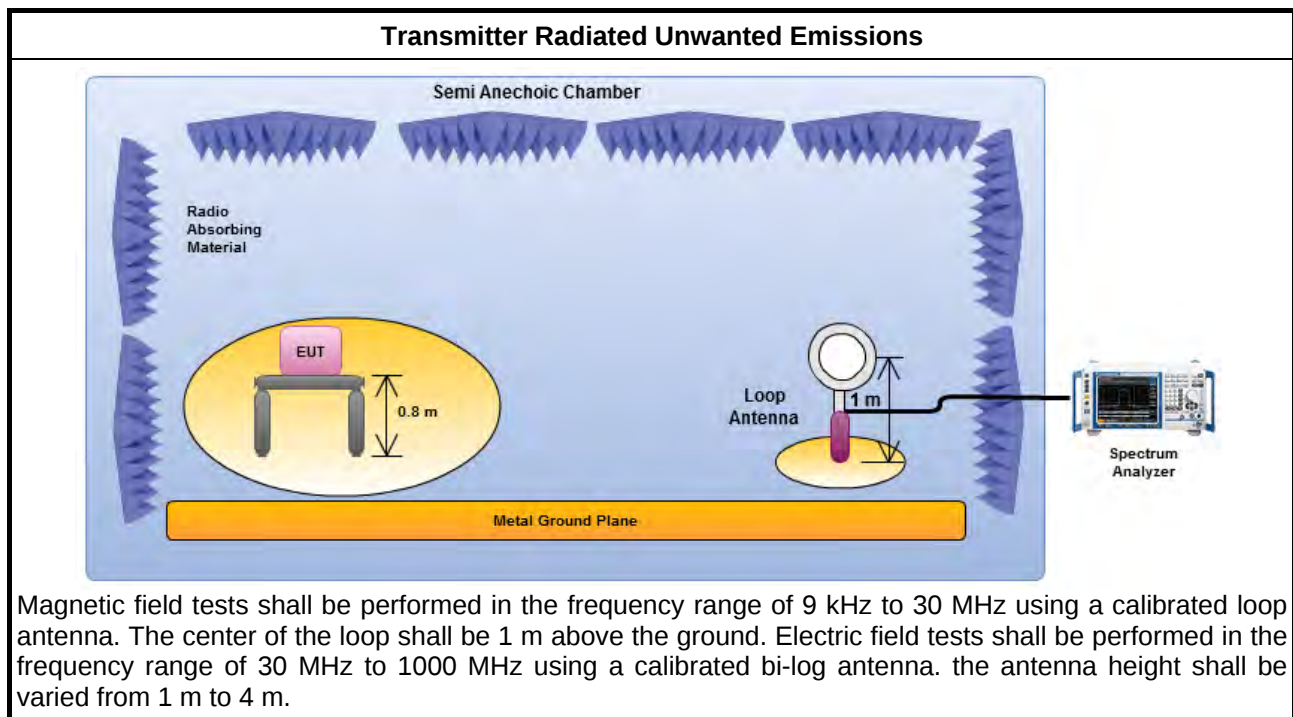
3.4.2 Measuring Instruments

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

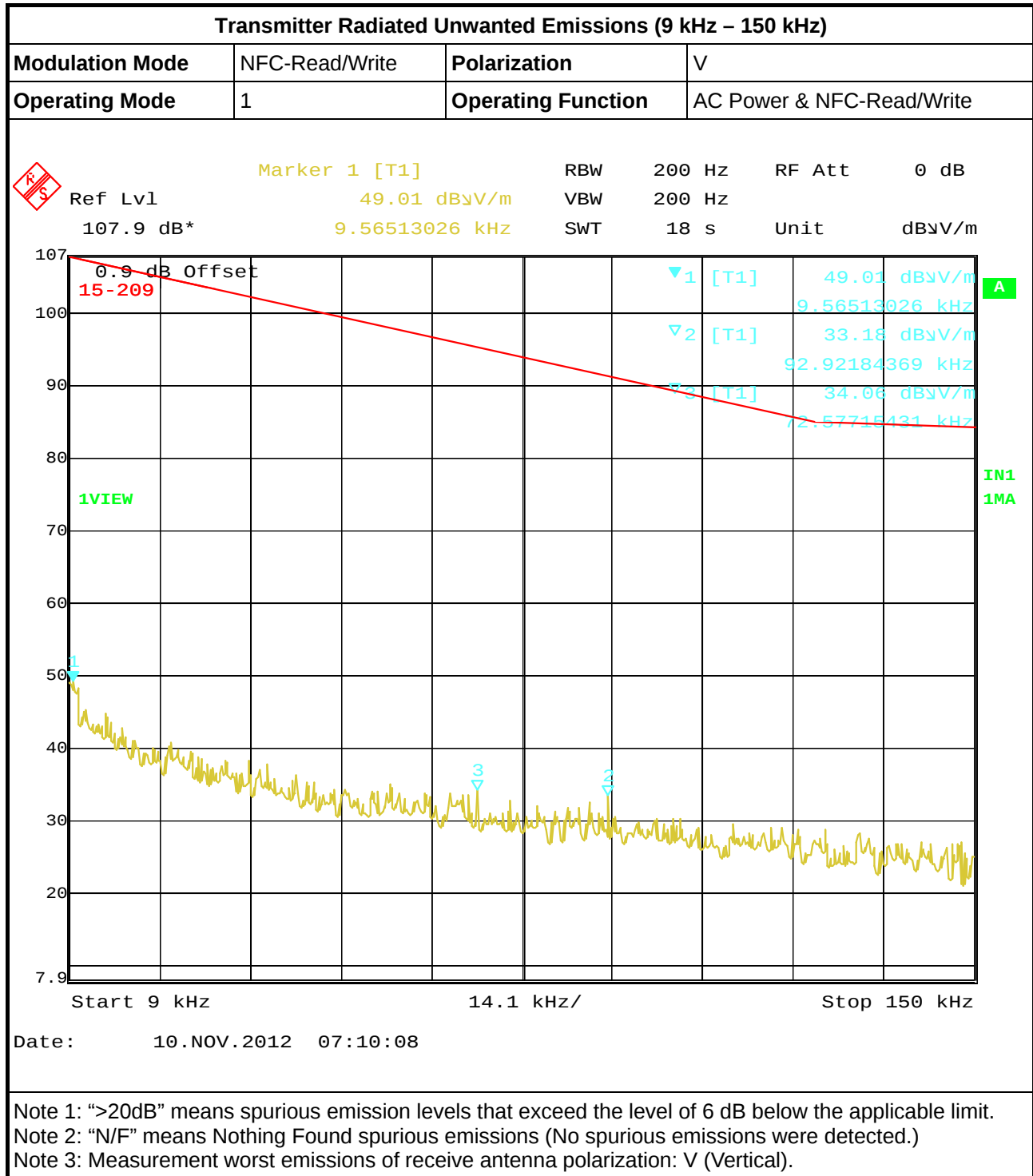
3.4.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz. quasi peak measurement of the fundamental.
☒	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.

3.4.4 Test Setup

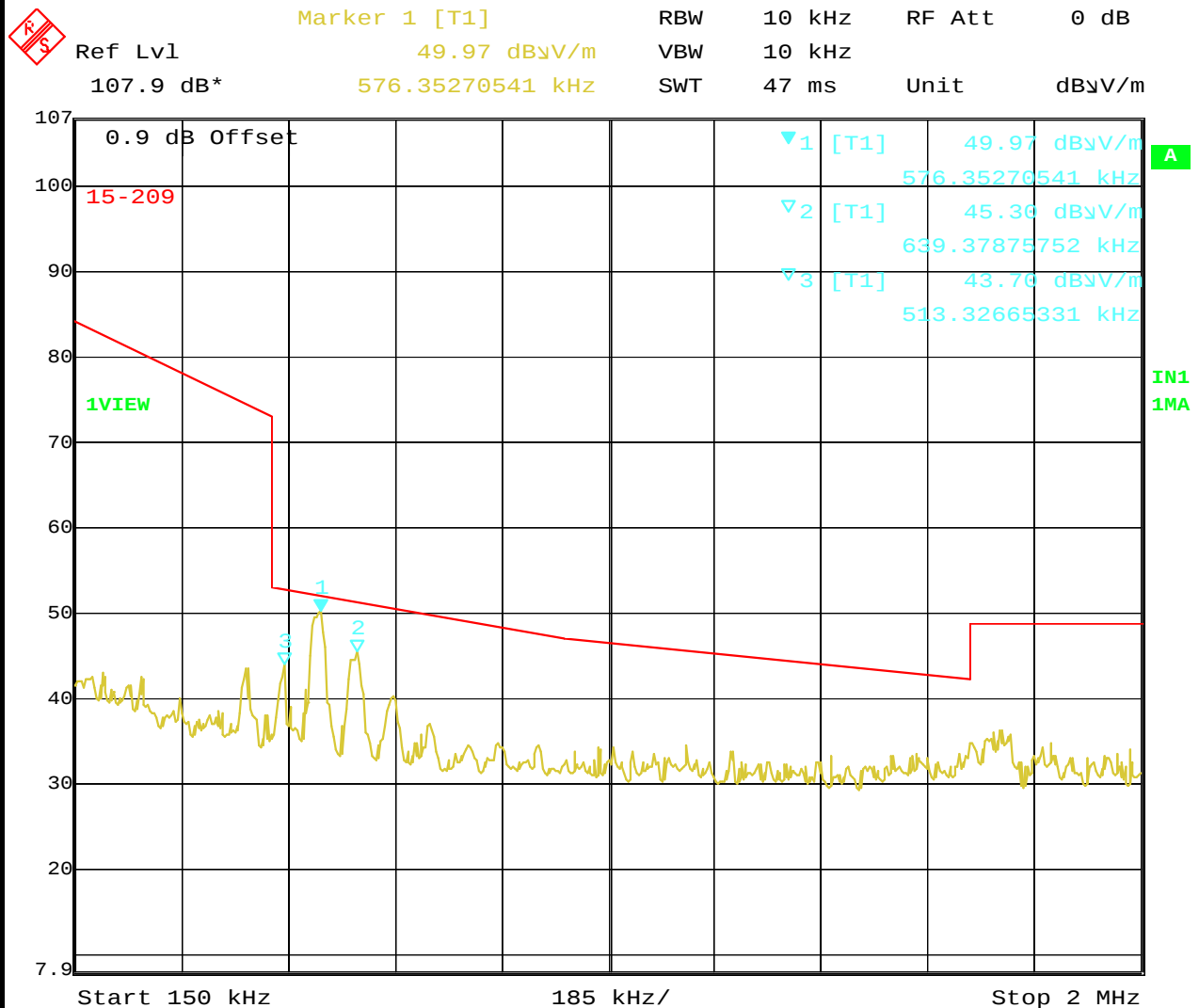


3.4.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)



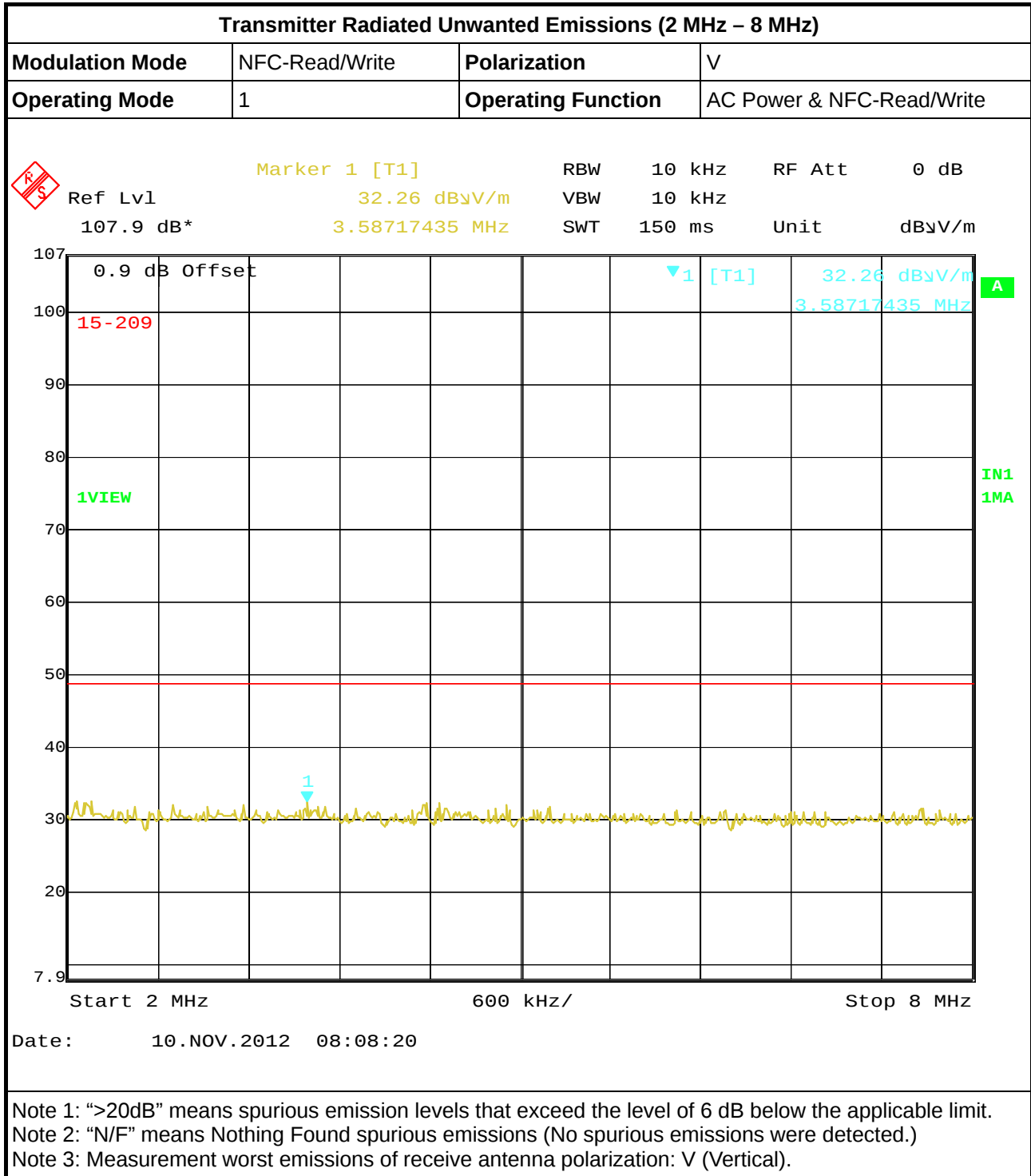
Transmitter Radiated Unwanted Emissions (150 kHz – 2 MHz)

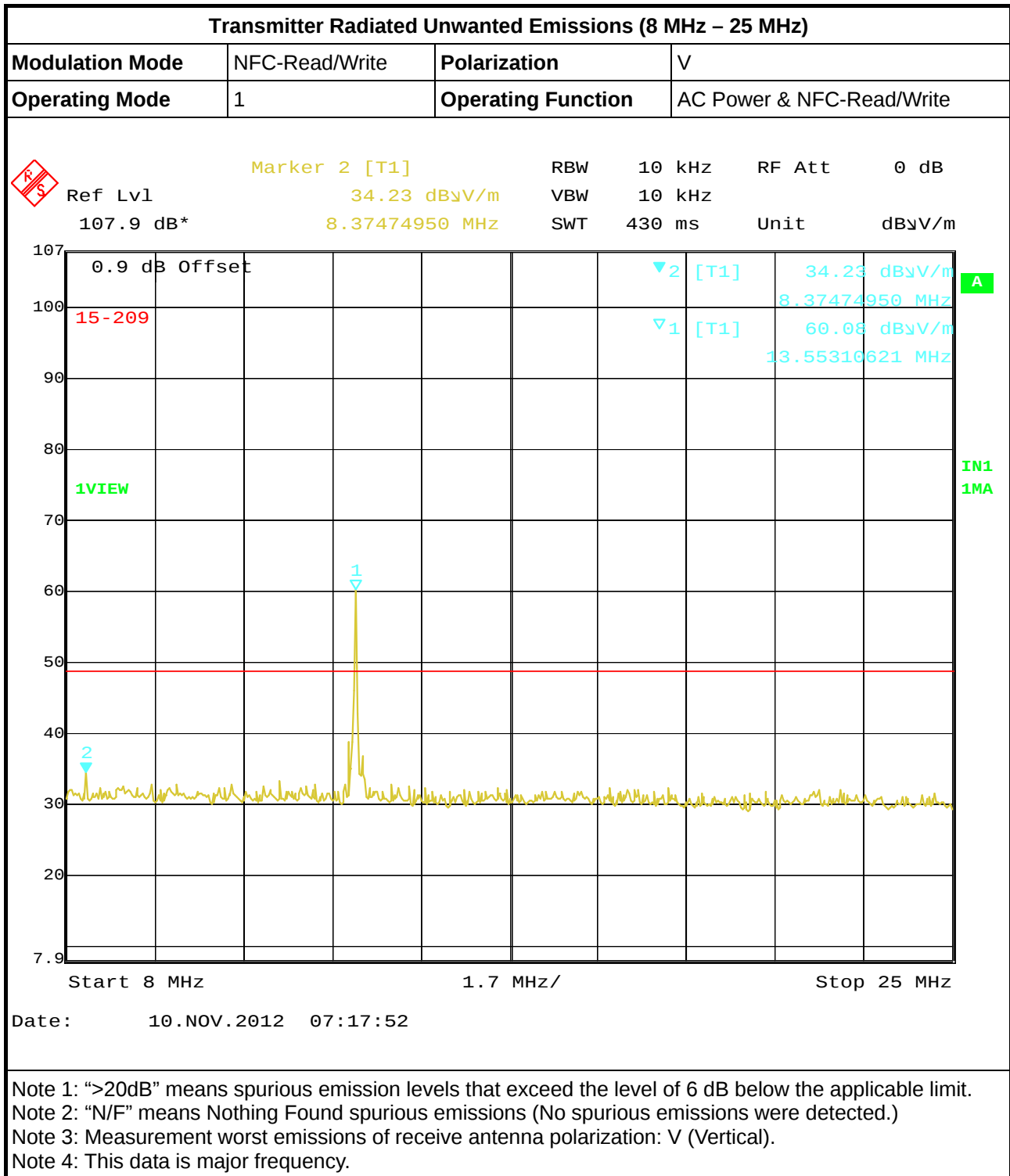
Modulation Mode	NFC-Read/Write	Polarization	V
Operating Mode	1	Operating Function	AC Power & NFC-Read/Write

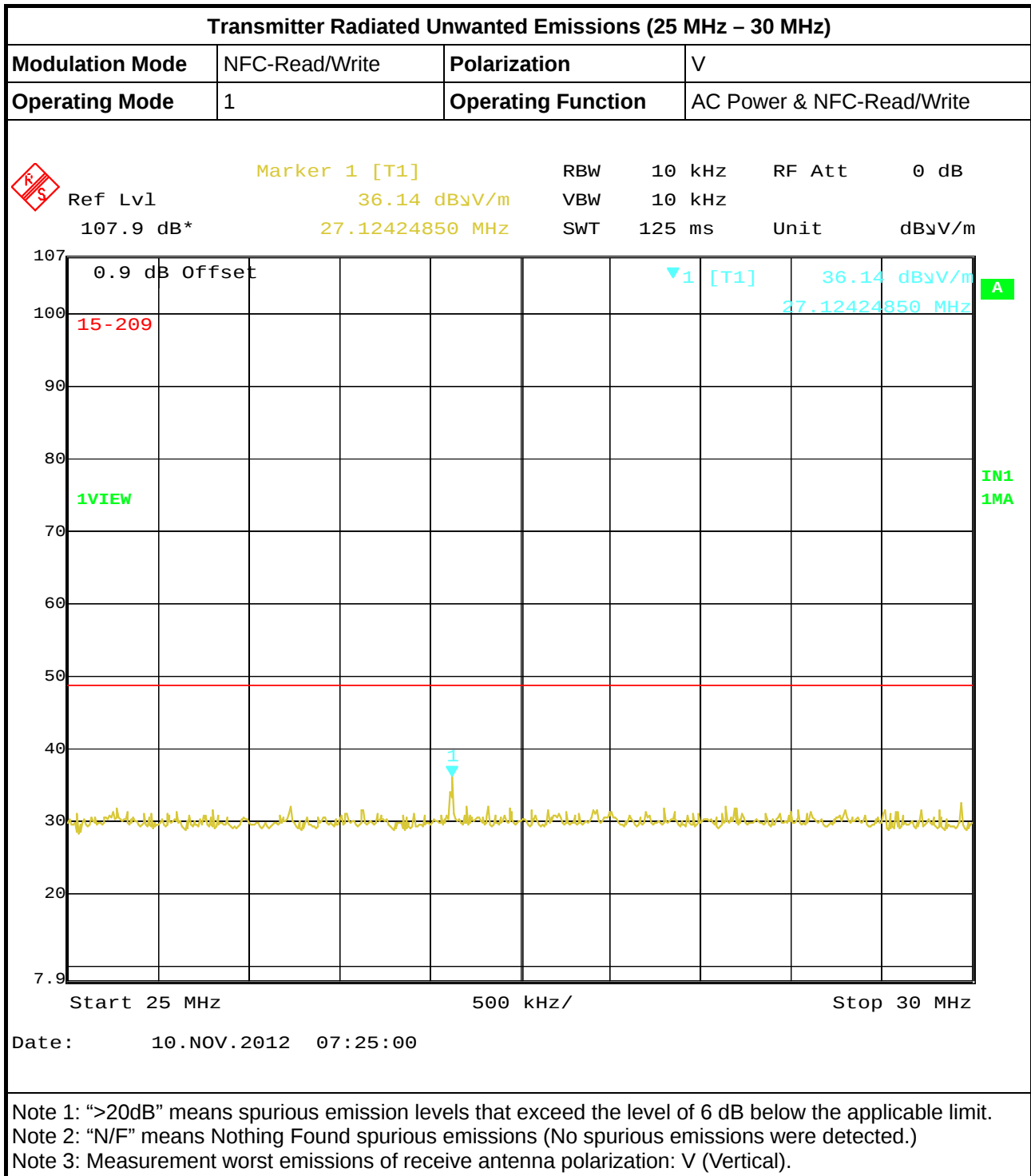


Date: 10.NOV.2012 07:13:20

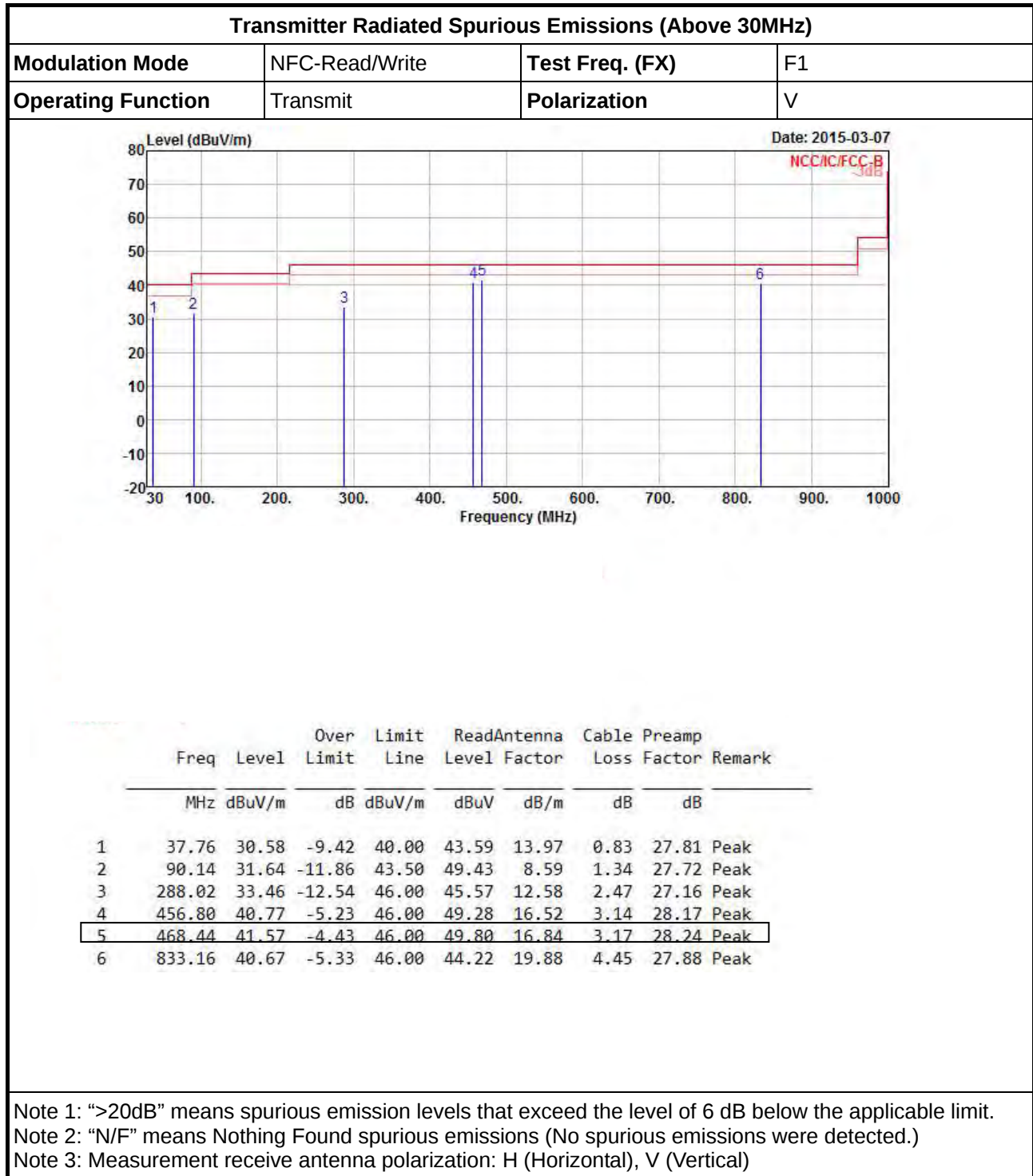
Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement worst emissions of receive antenna polarization: V (Vertical).





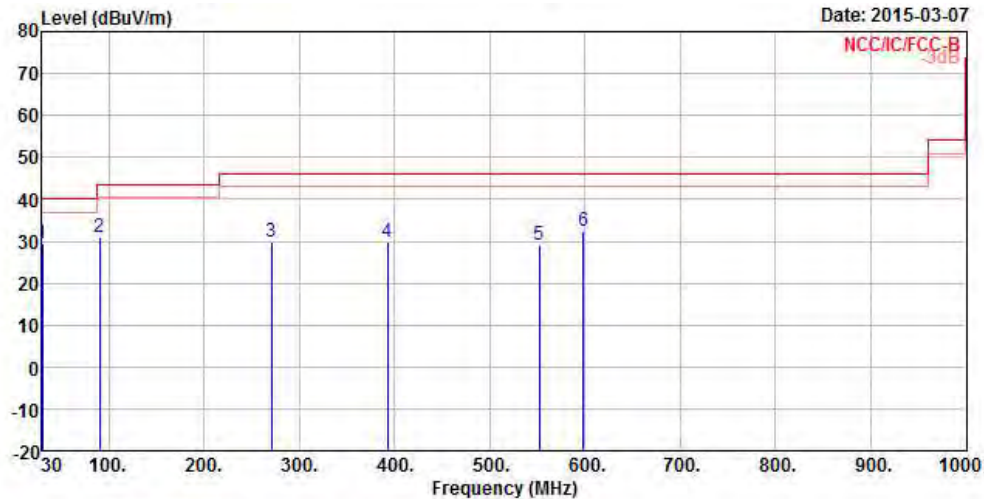


3.4.6 Transmitter Radiated Unwanted Emissions (Above 30MHz)



Transmitter Radiated Spurious Emissions (Above 30MHz)

Modulation Mode	NFC-Read/Write	Test Freq. (FX)	F1
Operating Function	Transmit	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamplifier Loss	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	30.00	29.62	-10.38	40.00	39.09	17.67	0.75	27.89 Peak
2	90.14	30.98	-12.52	43.50	48.77	8.59	1.34	27.72 Peak
3	270.56	29.82	-16.18	46.00	42.05	12.56	2.41	27.20 Peak
4	392.78	29.79	-16.21	46.00	39.57	15.12	2.90	27.80 Peak
5	551.86	29.19	-16.81	46.00	35.61	18.49	3.54	28.45 Peak
6	598.42	32.52	-13.48	46.00	39.03	18.28	3.69	28.48 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)

3.5 Frequency Stability

3.5.1 Frequency Stability Limit

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

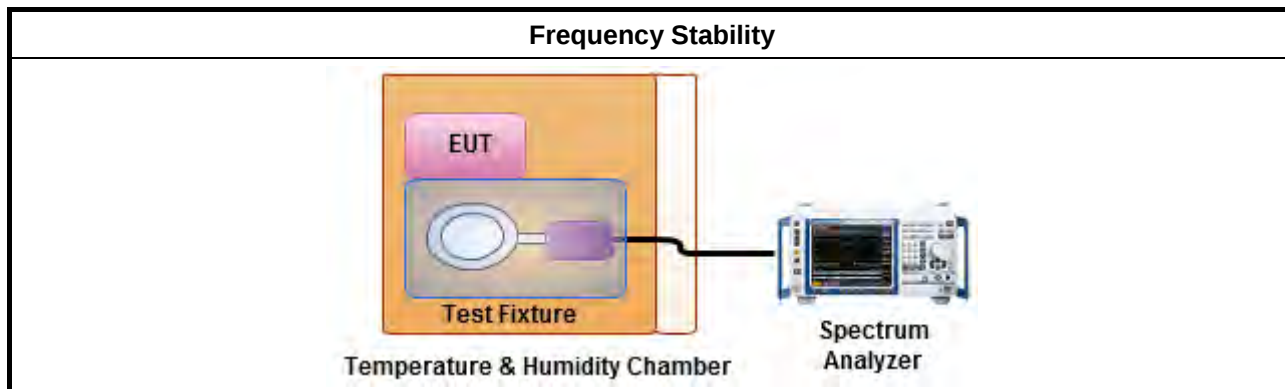
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 6.8 for frequency stability tests
☒	Frequency stability with respect to ambient temperature
☒	Frequency stability when varying supply voltage
☐	For conducted measurement.
☒	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.

3.5.4 Test Setup



3.5.5 Test Result of Frequency Stability

Frequency Stability Result						
Power Level	1	Frequency Stability (ppm)				
Condition	Freq. (MHz)	0 min	2 min	5 min	10 min	Limit
T _{20°C} V _{max}	13.56	23.60	23.60	26.55	26.55	100.0
T _{20°C} V _{min}	13.56	23.60	23.60	26.55	26.55	100.0
T _{50°C} V _{nom}	13.56	29.50	29.50	30.97	30.97	100.0
T _{40°C} V _{nom}	13.56	25.07	25.07	26.55	26.55	100.0
T _{30°C} V _{nom}	13.56	22.12	22.12	23.60	23.60	100.0
T _{20°C} V _{nom}	13.56	23.60	23.60	26.55	26.55	100.0
T _{10°C} V _{nom}	13.56	25.07	25.07	23.60	23.60	100.0
T _{0°C} V _{nom}	13.56	29.50	29.50	26.55	26.55	100.0
T _{-10°C} V _{nom}	13.56	28.02	28.02	29.50	29.50	100.0
T _{-20°C} V _{nom}	13.56	23.60	23.60	28.02	28.02	100.0
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.						

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz ~ 2.75GHz	Apr. 14, 2014	AC Conduction
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 22, 2015	AC Conduction
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	Oct. 31, 2014	AC Conduction
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	AC Conduction

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP 40	100305	9KHz ~ 40GHz	Feb. 21, 2012	RF Conducted
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jun. 19, 2012	RF Conducted
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	Jul. 02, 2012	RF Conducted
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100°C	Nov. 21, 2012	RF Conducted
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jun. 26, 2012	RF Conducted
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	Jan. 12, 2012	RF Conducted
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	Jan. 12, 2012	RF Conducted
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345675/4	1GHz ~ 26.5GHz	NA	RF Conducted
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	SN 345669/4	1GHz ~ 26.5GHz	NA	RF Conducted

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
10m Semi Anechoic Chamber	TDK	SAC-10M	10CH02-HY	30 MHz ~ 1 GHz 10m,3m	Nov. 03, 2012	Radiation
Amplifier	AGILENT	8447D	2944A10827	100 KHz ~ 1.3 GHz	May 03, 2012	Radiation
Amplifier	AGILENT	8447D	2944A10828	100 KHz ~ 1.3 GHz	Apr. 23, 2012	Radiation
Receiver	R&S	ESI	838496/008	20 Hz ~ 7 GHz	May 14, 2012	Radiation
Spectrum Analyzer	R&S	FSP7	100645	9 KHz ~ 7 GHz	Apr. 25, 2012	Radiation
Biconical Antenna	Schwarzbeck	VHBB 9124	287	30 MHz ~ 200 MHz	Dec. 17, 2011	Radiation
Log Antenna	Schwarzbeck	VUSLP 9111	207	200 MHz ~ 1 GHz	Dec. 17, 2011	Radiation
Turn Table	HD	DS 430	430/360	0 -360 degree	N/A	Radiation
Antenna Mast	HD	MA240	240/664	1 m - 4 m	N/A	Radiation
Antenna Mast	HD	MA240	240/667	1 m - 4 m	N/A	Radiation
RF Cable-R10m	Jye Bao	RG142	CB027-INSIDE	30 MHz ~ 1 GHz	Feb. 11, 2012	Radiation
RF Cable-R10m	Suhner Switzerland + BELDEN	RG223/U + RG8/U	CB026-DOOR	30 MHz ~ 1 GHz	Feb. 11, 2012	Radiation

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	R&S	HFH2-Z2	860004/0001	9 kHz ~ 30 MHz	Jul. 03, 2012	Radiation

Note: Calibration Interval of instruments listed above is two years.



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP40	100593	9kHz ~ 40GHz	Oct. 02, 2014	Radiation
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	May 11, 2014	Radiation
Amplifier	Agilent	8447D	2944A11149	100kHz ~ 1.3GHz	Jul. 22, 2014	Radiation
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 08, 2014	Radiation
Turn Table	Chaintek Instruments	3000	MF7802058	0~ 360 degree	N/A	Radiation
Antenna Mast	MF	MF7802	MF780208205	1 ~ 4 m	N/A	Radiation

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz ~ 30 MHz	Feb. 02, 2015	Radiation

Note: Calibration Interval of instruments listed above is two years.