NFC (Near Field Communications)

FCC/IC Test Report

FOR:

Hatchett Entry Systems

Model Name: KS200

Product Description: RFID Server Cabinet Lock

47 CFR Part 15 Subpart C Section 15.209, 15.225
RSS-210 Issue 8, Annex 2, Section 6, RSS-Gen Issue 4

TEST REPORT #: EMC_HANC1-003-15501_15.225_NFC_KS200
DATE: 2015-05-06

ACCREDITED TESTING LABORATORY Certificate #2135.01

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Test Lab LAB CODE 20020328-00

FCC listed
A2LA Accredited

IC recognized #
3462B

CETECOM Inc.

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1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.209, 15.225 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS-210 Issue 8, Annex 2 and no deviations were ascertained during the course of the tests performed.

Company	Description	Model #
Hatchett Entry Systems	RFID Server Cabinet Lock	KS200

This report is reviewed by:

Date	Section	Name	Signature
2015-05-06	Compliance	Franz Engert (Compliance Manager)	Digitally signed by Franz Engert DN: cn=Franz Engert, c=US, o=CETECOM, ou=Complience, email=franz.engert@cetecom.com Date: 2015.05.07 09:42:28 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2015-05-06	Compliance	Douglas Antioco (EMC Engineer)	Douglas Antioco 2015.05.06 17:59:25 -07'00'

The test results of this test report relate exclusively to the test item specified in Section3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Compliance Manager:	Franz Engert
Responsible Project Leader:	Douglas Antioco

2.2 Identification of the Client

Client:	Hatchett Entry Systems
Street Address:	10027 South 51st Street, Suite 102
City/Zip Code	Phoenix, Arizona
Country	The United States of America
Contact Person:	Baruch Spence
Phone No.	+1 623-582-4626 x7137
E-mail:	Baruch.spence@assaabloy.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as Client
Manufacturers Address:	
City/Zip Code:	
Country:	

2.4 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:
Ambient Temperature: 20 - 25°C
Relative humidity: 40-60%

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name / Model No:	KS200
Product Description:	RFID Server Cabinet Lock
Product Type:	NFC (Near Field Communications), RFID
FCC-ID :	VC3-K200
IC-ID:	7160A-K200
Operating Frequencies:	125KHz, 13.56 MHz
Type(s) of Modulation:	ASK (Amplitude Shift Keying)
Number of channels:	1 (per frequency band)
Antenna Info:	1. Internal 125 KHz Magnetic Loop antenna 2. Internal 13.56 MHz Magnetic Loop antenna
Rated Operating Voltage Range (DC):	12-24 VDC ± 10%
Operating Temperature Range:	-10 ^{o}C to 50 ^{o}C
Test Sample status:	Prototype
Other Radios included in the device:	None

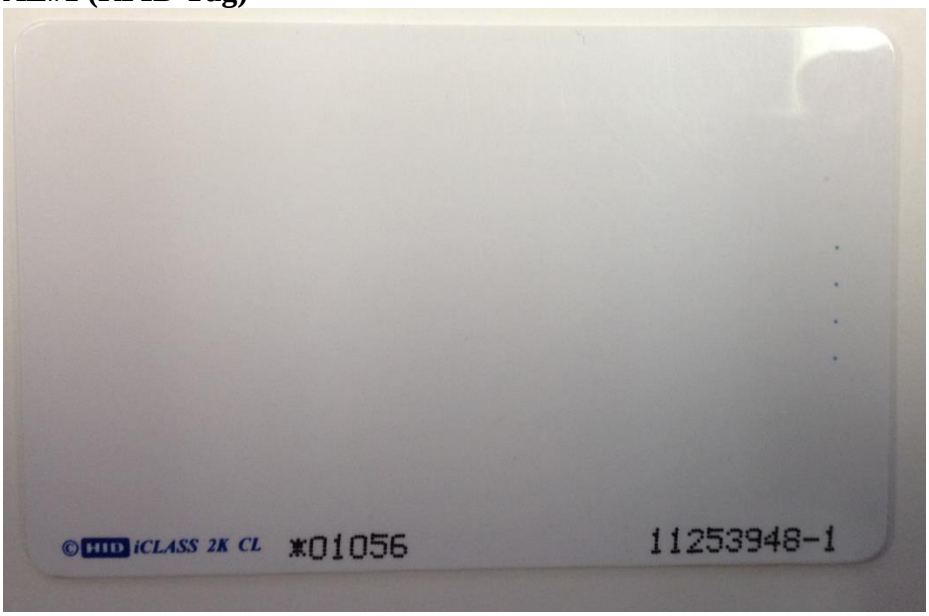
3.2 Identification of the Equipment under Test (EUT)

EUT #	Serial Number	HW Version	Firmware Version	Notes/Comments
1	3085043.003 X03	Main PCBA: Rev. X03 Secure PCBA: Rev. X03 SE3200AP0: Rev. D	Secure PCBA: SVN Rev. 893 SE3200AP0 Core: 0129 SE3200AP0 SAM: 0133	Radiated RF Sample

3.3 Identification of ancillary equipment (used for testing purposes only)

AE #	Type	Manufacturer	Model	Serial Number
1	RFID Tag	HID Corporation	11253948-1	01295

AE#1 (RFID Tag)



3.4 Dates of Testing:

03/19/2015 – 04/02/2015

3.5 Testing notes:

- For NFC radios the Carrier conveys all the power available to the transmitter.
  This power is either radiated off as
  - A CW signal to carry energy to any NFC tags in the vicinity of the NFC transmitter or
  - The CW carrier is modulated via ASK modulation to carry any information to the tags or other NFC receivers.
- The EUT is constantly transmitting in both Rx and Tx mode. The main difference between the Tx and Rx mode is that the duty cycle of the transmit signal is lower in Tx mode. The output power levels were verified to be the same. This is consistent with both the 125 KHz and 13.56 MHz radios.
- Tx mode is with a 13.56MHz RFID card attached to the receiver. Rx mode is the EUT as standalone device.
- The operating and nominal voltage range is considered to be between 12-24VDC. Unless otherwise noted, nominal voltage was 12 VDC throughout testing.

4 Subject of Investigation

The objective of the evaluation documented in this report was to assess if the performance of the EUT meets the relevant requirements specified by:

- 47 CFR 2: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communication Commission: Frequency allocations and radio treaty matters; general rules and regulations.
- 47 CFR 15: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communication Commission: Part 15 – Radio Frequency Devices – Subpart C – Intentional Radiators – Section 15.225: Operation within the band 13.110-14.010 MHz.
- 47 CFR 15: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communication Commission: Part 15 – Radio Frequency Devices – Subpart C – Intentional Radiators – Section 15.209: Radiated emissions limits; general requirements.
- RSS-GEN- Issue 4: General Requirements for Compliance of Radio Apparatus.
- RSS-210- Issue 8: Licence-exempt Radio Apparatus (All Frequency Bands): Category 1 Equipment –Annex 2, section 6: Band 13.110-14.010 MHz

4.1 Dates of Testing:

03/19/2015 – 04/02/2015

5 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Pass	Fail	NA	NP	Result
FCC §15.225 (a) RSS-210 A2.6 (a)	In-band Emissions	Nominal	■	☐	☐	☐	Complies
FCC §15.225 (e) RSS-210 A2.6	Frequency Tolerance	Nominal & Extreme	■	☐	☐	☐	Complies
§15.209 §15.225 (d) RSS-Gen 6.13	TX Radiated Spurious Emissions	Nominal	■	☐	☐	☐	Complies
RSS-Gen 6.6	Occupied Bandwidth	Nominal	■	☐	☐	☐	Reference Measurement

Note: NA = Not Applicable; NP = Not Performed

6 In-band Field Strength (Fundamental)

6.1 References

FCC: 15.225 (a)
RSS 210: A2.6 (a)

6.2 Limits

FCC: The field strength of any emissions within band 13.553 – 13.567 MHz shall not exceed 15,848 microvolts/meter (84 dBuV/m) at 30 meters distance.

RSS 210: The field strength of any emission shall not exceed the following limits:
(a) 15.848 millivolts/m (84 dBµV/m) at 30 meters, within the band 13.553-13.567 MHz.

The 30m limit is converted to 3m, using the 40 dB/decade extrapolation factor formula as specified by FCC part 15.31 (f)(2) for frequencies below 30MHz.

Therefore, 40 dB shall be added to the specified limit (84 dBuV @ 30 m) to convert to actual test limit **124 dBuV** @ 3m.

6.3 Test Conditions

Tnom: 21°C
Vnom: 12 V dc

6.4 Measurement Settings

Ref: ANSI C63.10 Section 4.1.4
Radiated Measurement

RBW = 9kHz (see section 6); VBW = 3 x RBW
Span wide enough to capture bandwidth of emission being measured
Detector = Peak; Trace = Max Hold
Sweep time: Auto.

6.5 Measurement Uncertainty

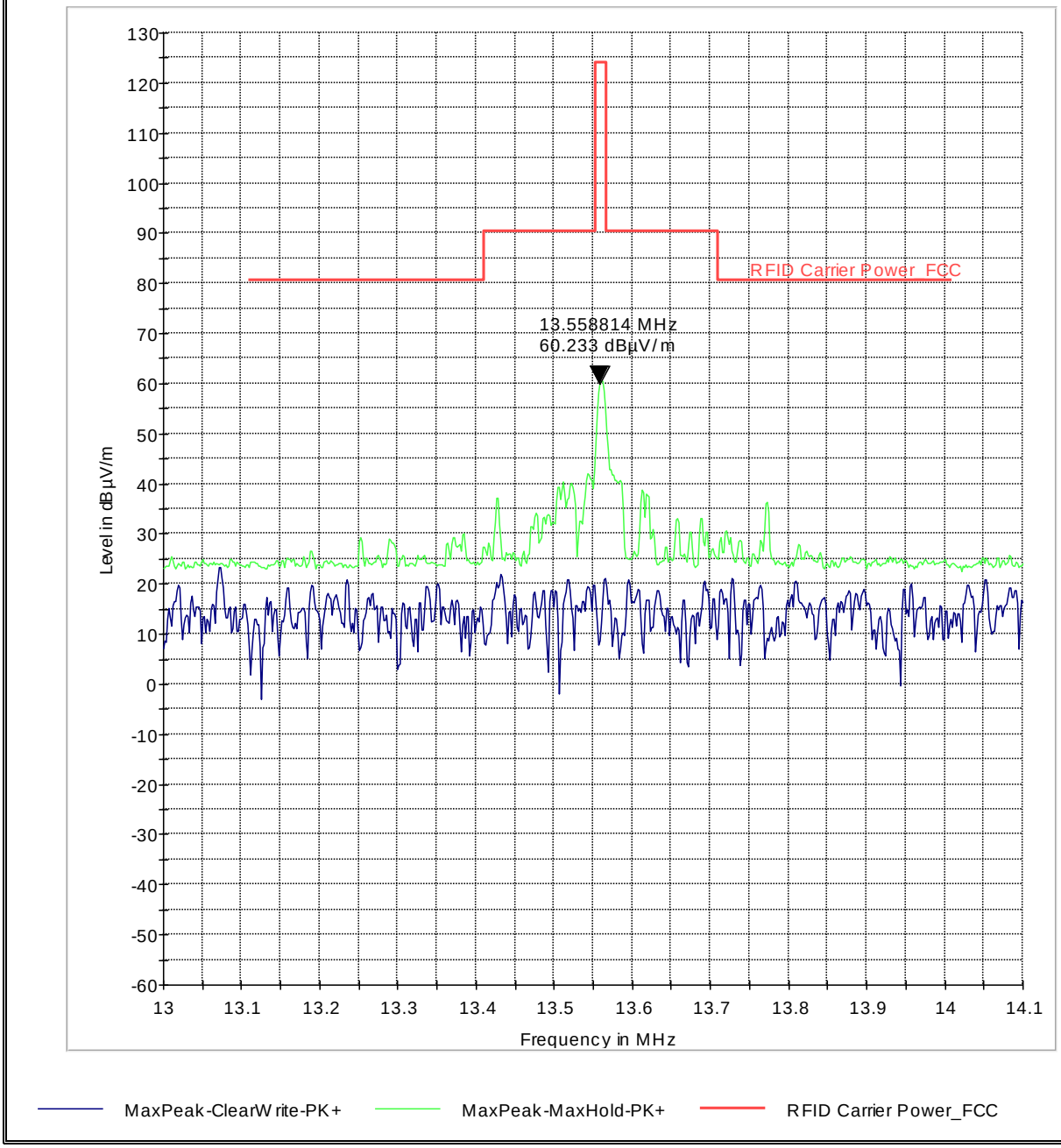
+/- 3 dB

6.6 Measurement Verdict

Pass.

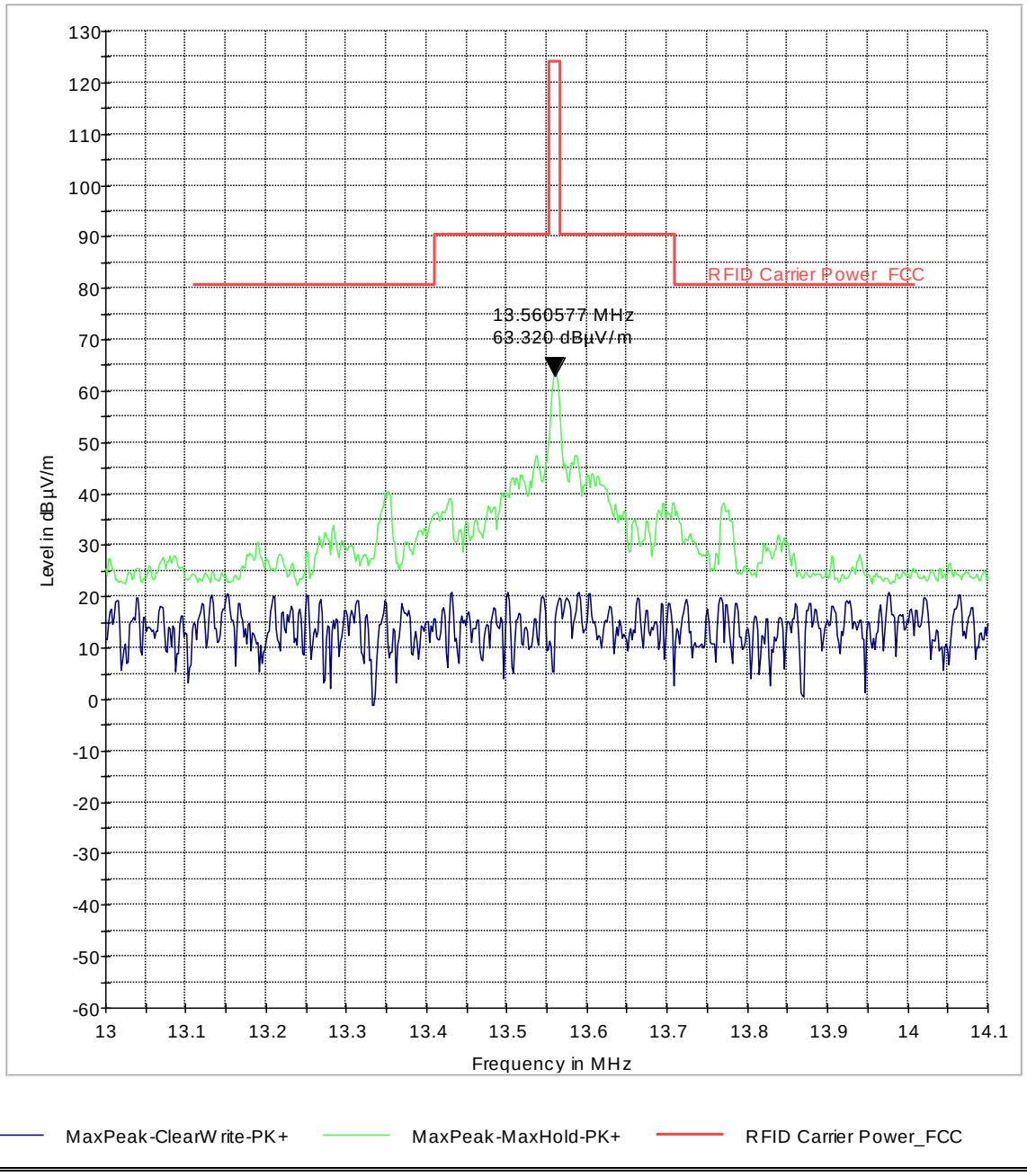
6.7 Measurement Plots

Field Strength		
Frequency: 13.56 MHz	**NFC –Tx Mode**	**Modulation: ASK**

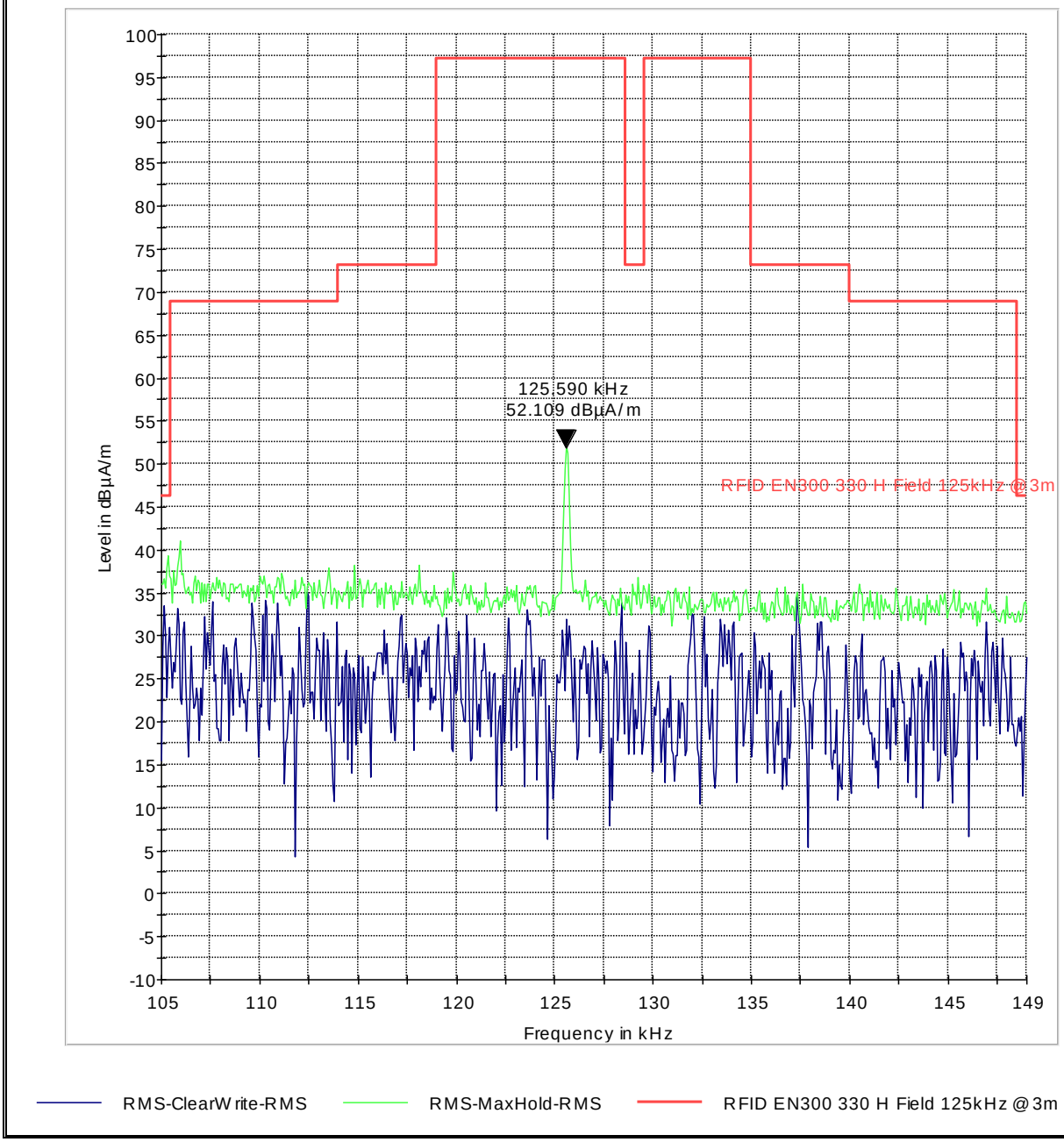


Field Strength

Frequency: 13.56 MHz	NFC –Rx Mode	Modulation: ASK



Field Strength		
Frequency: 125KHz	**NFC –Rx Mode**	**Modulation: ASK**



7 Transmitter Spurious Emissions – Radiated

7.1 Limits

FCC: 15.225 (d)
FCC: 15.209
RSS-Gen 6.13

FCC 15.209 & RSS-Gen Section 7.2.5

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30 (29.5 dBµV/m)	30
30–88	100 (40dBµV/m)	3
88–216	150 (43.5 dBµV/m)	3
216–960	200 (46 dBµV/m)	3
Above 960	500 (54 dBµV/m)	3

The 300m and 30m limit is converted to 3m, using the 40 dB/decade extrapolation factor formula as specified by FCC part 15.31 (f)(2) for frequencies below 30MHz.

7.2 Measurement Settings

Ref: ANSI C63.10 Section 4.1.4
Radiated Measurement

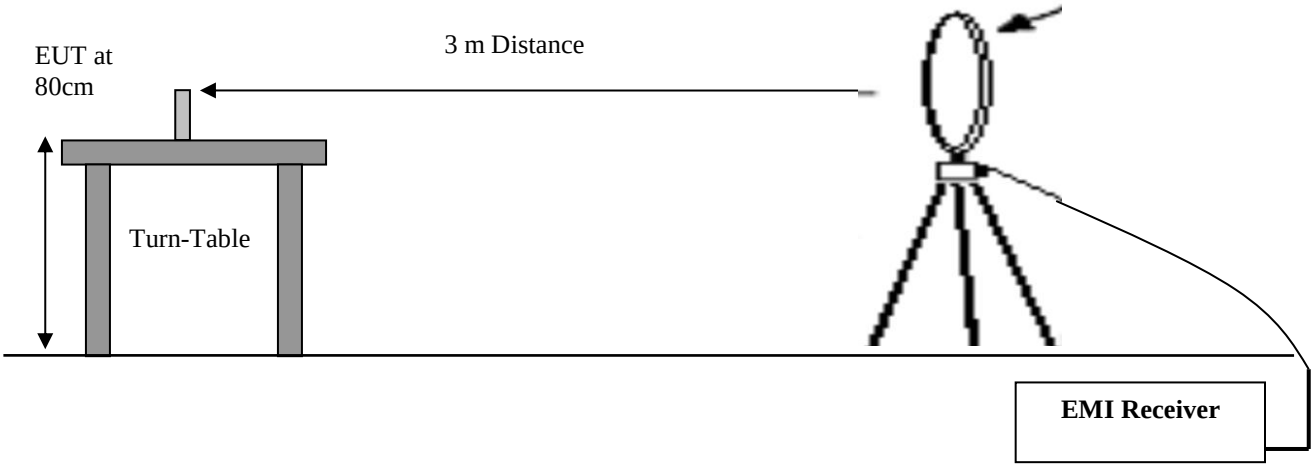
RBW=9 kHz for measurements below 30 MHz
RBW=100 kHz for measurements from 30 MHz – 1 GHz
RBW=1 MHz for measurements above 1GHz
VBW≥ 3x RBW
Span= Entire range of measuring antenna or in segment
Detector: Quasi-Peak from 30 MHz – 1 GHz
1GHz < Average < 30 MHz

The EUT is tested in a Tx and Rx polling mode which the transmitter is operating at both the 125 KHz and 13.56 MHz frequencies. The EUT also transmits at a higher Duty Cycle in Rx Polling mode which is considered worst case as more energy is required during operation.

7.3 Radiated Measurement Procedure

Ref: ANSI C63.10 Section 6.4
Field Strength measurement

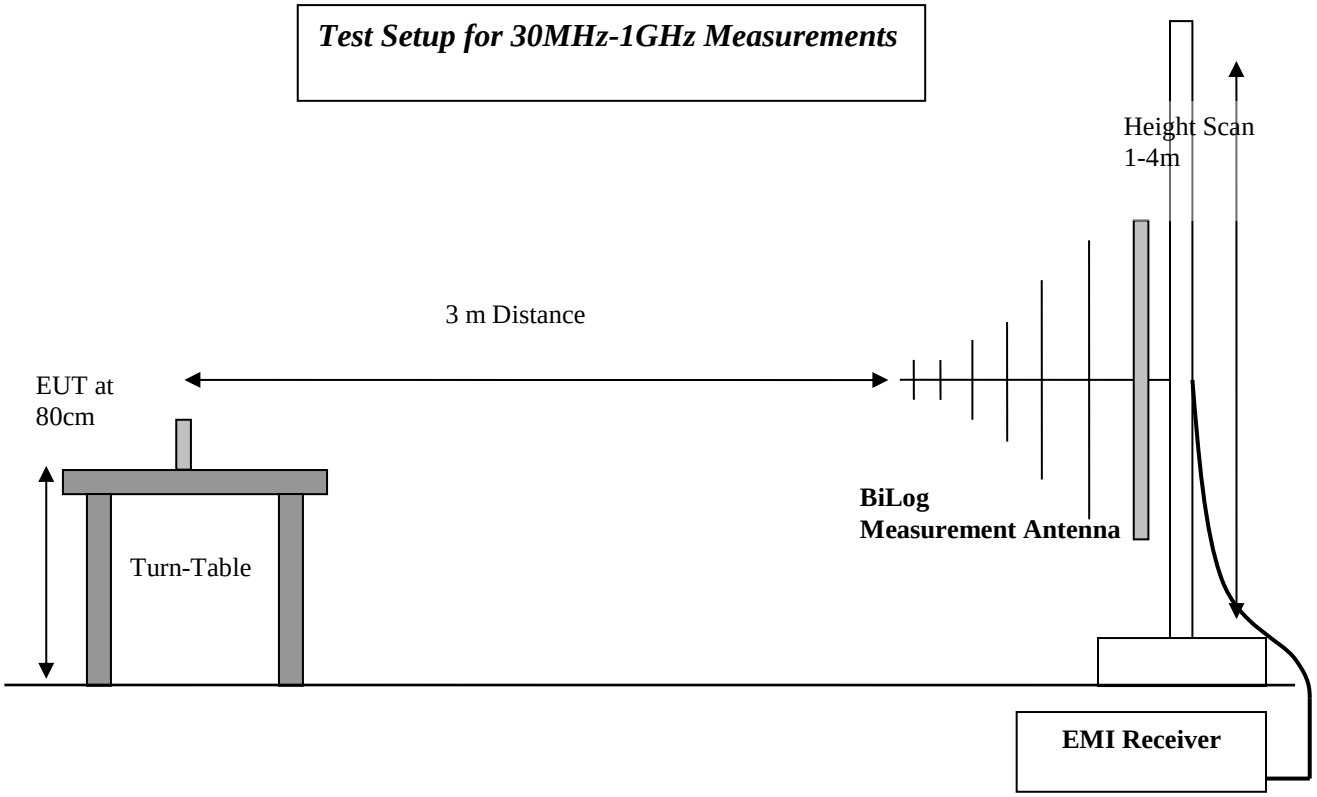
Test Setup for Below 30MHz Measurements



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a vertical orientation.
2. Set the EUT in continuous transmission mode with its maximum power @ 98% - 100% duty cycle.
3. Set the spectrum analyzer to the channel frequency of interest.
4. Maximize the emission amplitude by rotating the turntable 0 - 360°, adjusting the measuring antenna height from 1 – 4 m & changing antenna polarity.
5. Repeat steps 4 with all antennas different polarity and determine the maximized polarity for measurement. Measure and record the peak level of field strength (**LVL**) in dBuV.
6. Adjust correction factors to the measured field strength (**LVL**) and using the field strength approach calculation to convert (**LVL**) from dBuV to transmitter output power (EIRP) in Watts using the following equations:
7. Correction factors (**CF**) in dB = Antenna factor (dB) + Cable loss (dB).
   LVLc (dBuV) = **LVL** (dBdBuV) + **Correction Factors** (dB)

Ref: ANSI C63.10-2013 Section 6.5

Test Setup for 30MHz-1GHz Measurements



7.4 Test Conditions

Tnom: 24°C
Vnom: 12 V dc

7.5 Measurement Uncertainty

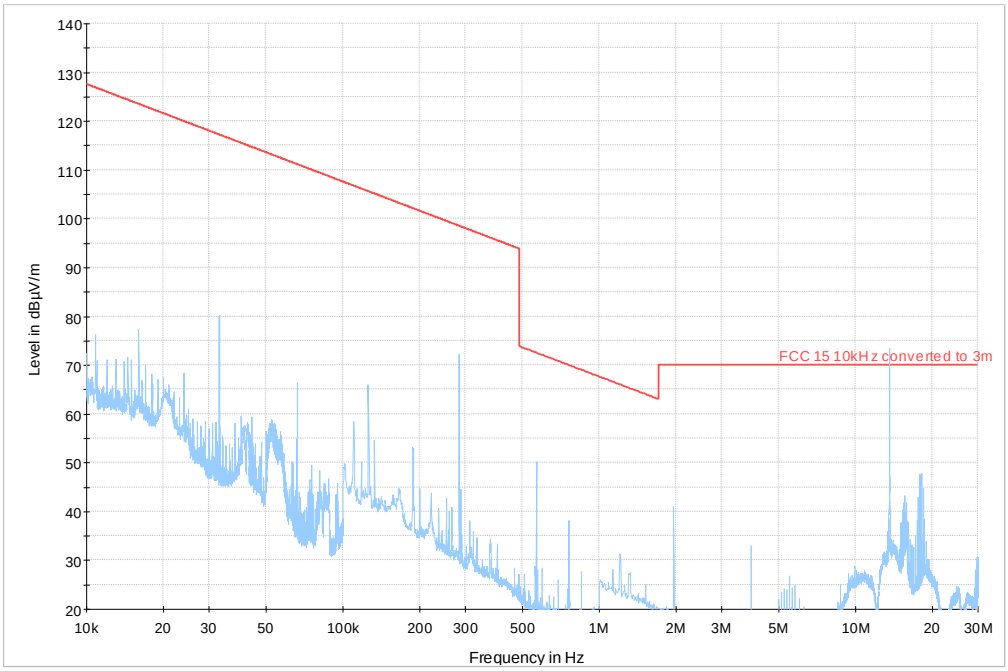
+/- 3dB

7.6 Measurement Verdict

Pass.

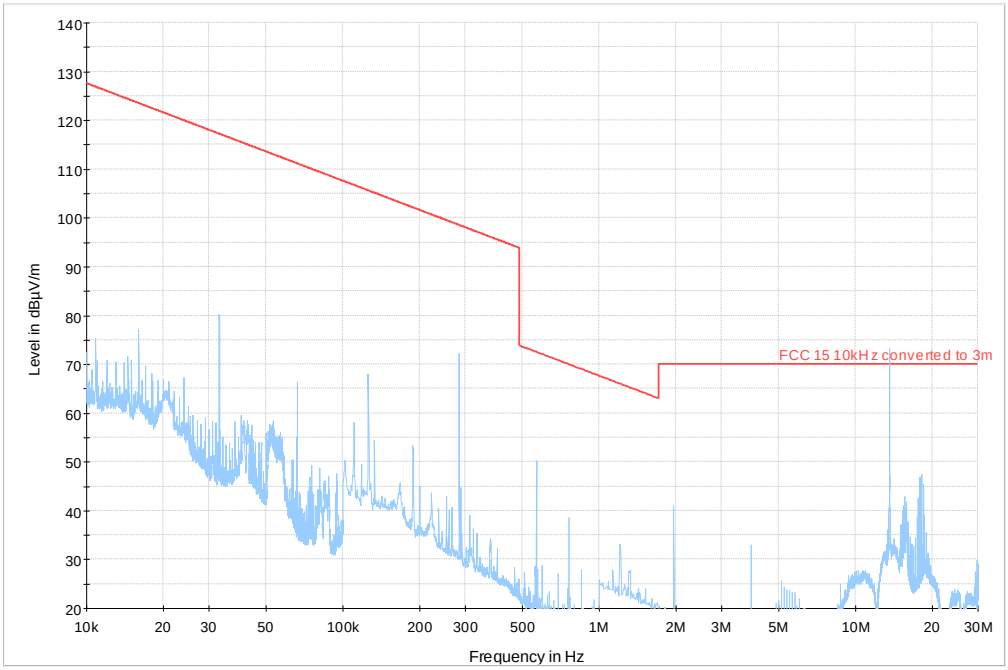
7.7 Measurement Plots:

Radiated Spurious Emissions: 9kHz – 30MHz		
Frequency:13.56 MHz & 125KHz	**NFC Tx**	**Modulation: ASK**



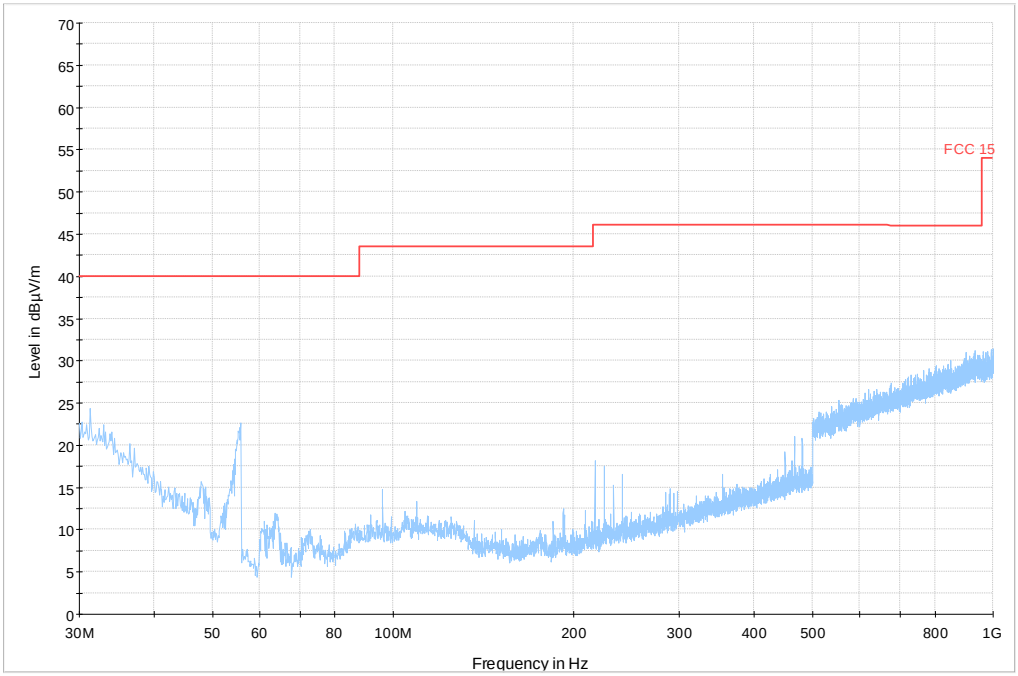
Note: Emission above limit is Tx Signal.

Radiated Spurious Emissions: 9kHz – 30MHz		
Frequency:13.56 MHz & 125KHz	**NFC Rx**	**Modulation: ASK**

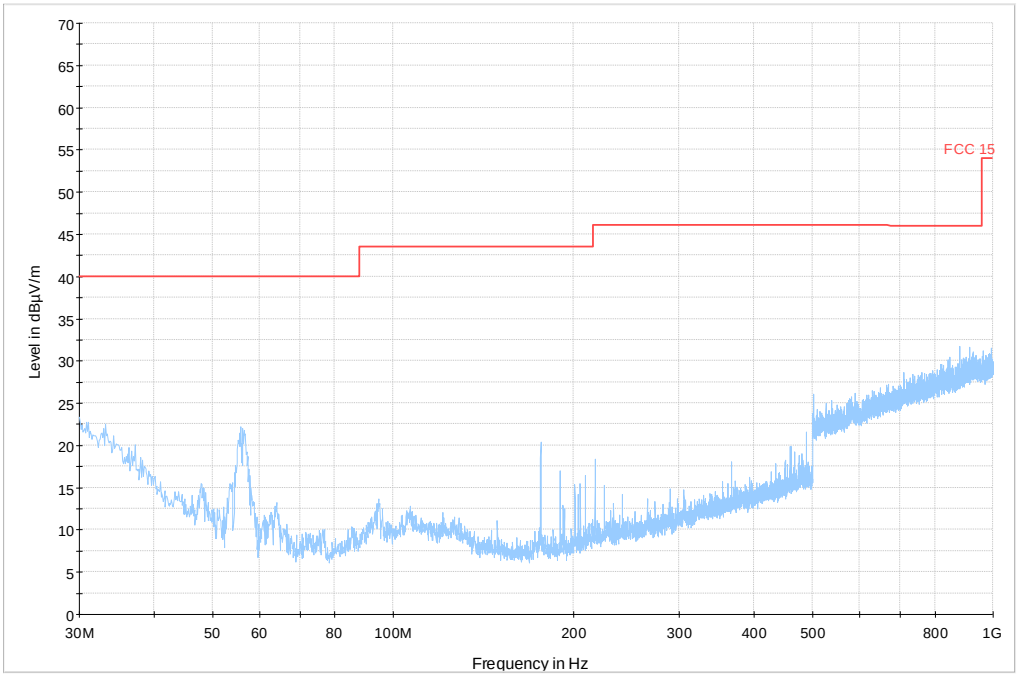


Note: Emission above limit is Tx Signal.

Radiated Spurious Emissions: 30MHz – 1 GHz		
Frequency:13.56 MHz & 125 KHz	**NFC Tx**	**Modulation: ASK**



Radiated Spurious Emissions: 30MHz – 1 GHz		
Frequency:13.56 MHz & 125 KHz	**NFC Rx**	**Modulation: ASK**



8 Frequency Tolerance

8.1 References

FCC: 15.225 (e)
RSS-210 A2.6

8.2 Limits

FCC: ± 0.01 %
RSS-210: ± 0.01 %

8.3 Measurement Setting

Radiated measurements were performed. Testing was performed with the EUT in Rx mode.

Spectrum Analyzer Settings
RBW = 1 KHz
VBW = 3 KHz
Span = 100 KHz
Detector = RMS

8.4 Test Conditions

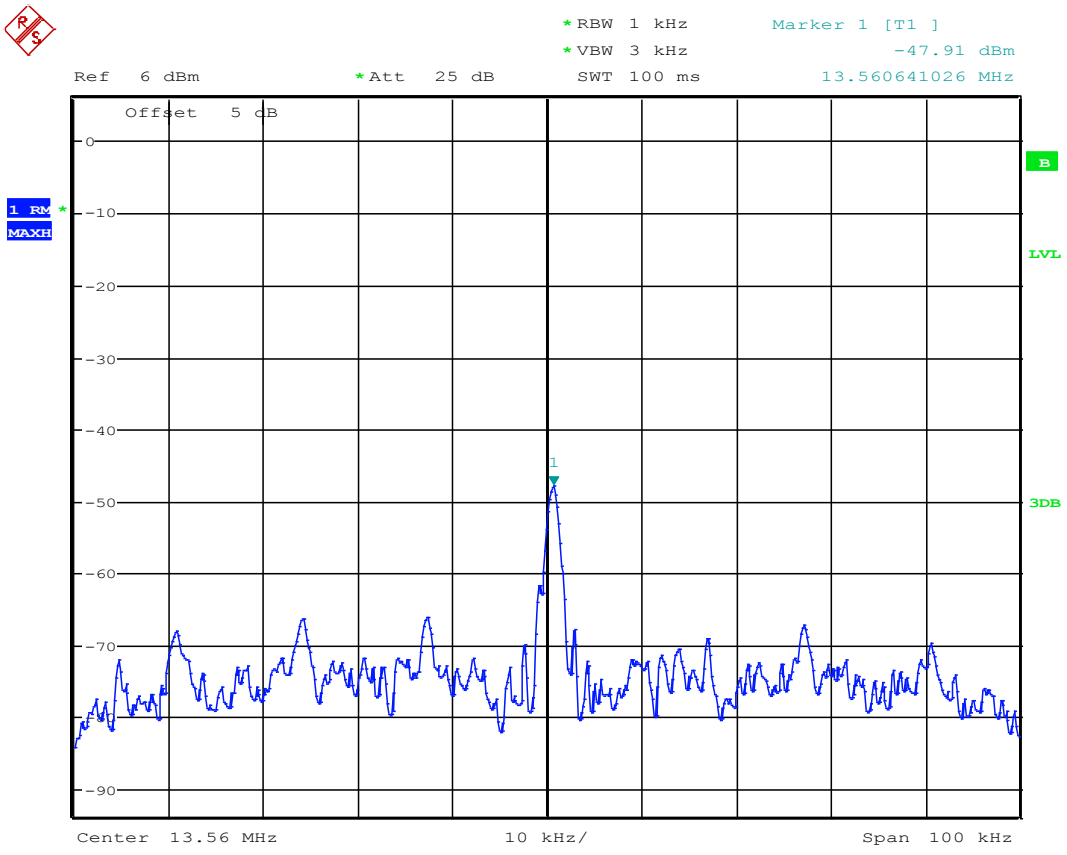
Tnom: 21°C
Vnom: 12 V dc

8.5 Test Data

Frequency Tolerance vs. Voltage Source 20 ºC Test Mode: Rx		
Voltage Source (Vdc)	**Measured Frequency (MHz)**	**Tolerance Deviation (%)**
Vnom = 12	13.56064103	0.0047
Vmax = 30	13.56064103	0.0047
Vmin = 10	13.56064103	0.0047

Frequency Tolerance vs. Temperature Test Mode: Rx			
Voltage Source (Vdc)	**Temperature (°C)**	**Measured Frequency (MHz)**	**Tolerance Deviation (%)**
Vnom = 12	**50**	13.56048077	0.0035
	40	13.56064103	0.0047
	30	13.56064103	0.0047
	20	13.56064103	0.0047
	10	13.56064103	0.0047
	0	13.56064103	0.0047
	-10	13.56064103	0.0047
	-20	13.56064103	0.0047

8.5.1 Spectrum Analyzer Plot at Nominal Conditions (Vnom = 12, Tnom: 21°C)



8.6 Measurement Verdict

Pass

9 Occupied Bandwidth

The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth of the 99 %.

9.1 References

RSS-Gen 6.6

9.2 Limits

RSS-Gen section 6.6
When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

9.3 Measurement Settings

Measurement according to RSS-Gen section 6.6

For 99% occupied Bandwidth, use the occupied bandwidth measurement function with the band set equal to 99% emission bandwidth.
Radiated Measurement

For 125KHz the EUT is tested in an Rx polling mode which the transmitter is operating at both the 125 KHz and 13.56 MHz frequencies. The EUT also transmits at a higher Duty Cycle in Rx Polling mode which is considered worst case as more energy is required during operation.

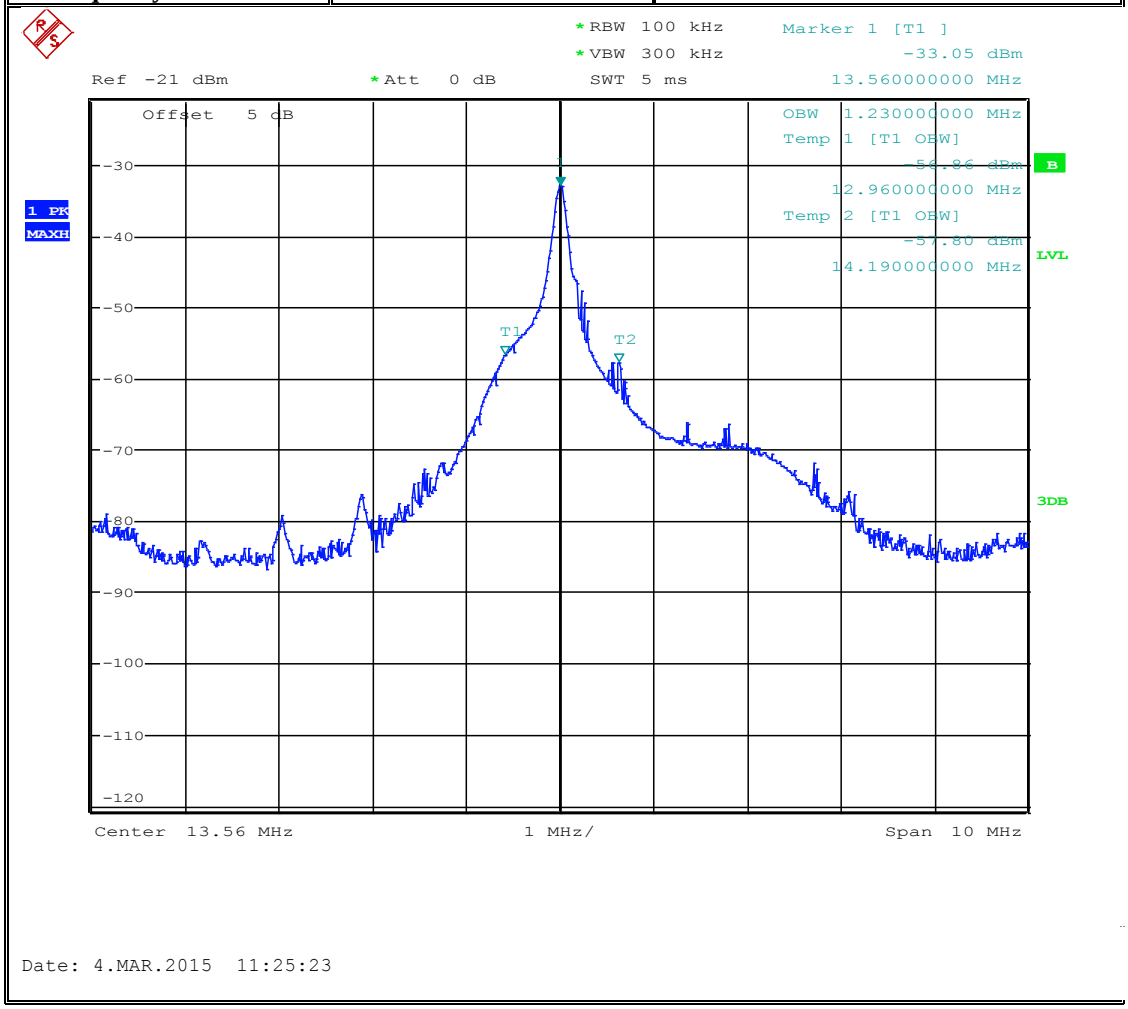
Spectrum Analyzer Settings
Span = wide enough to capture all products of the modulation process, including the emission skirts.
RBW = 1% to 5 % of the OBW
VBW = 3X RBW
Sweep = auto
Detector function = peak
Trace = max hold

9.4 Test Data

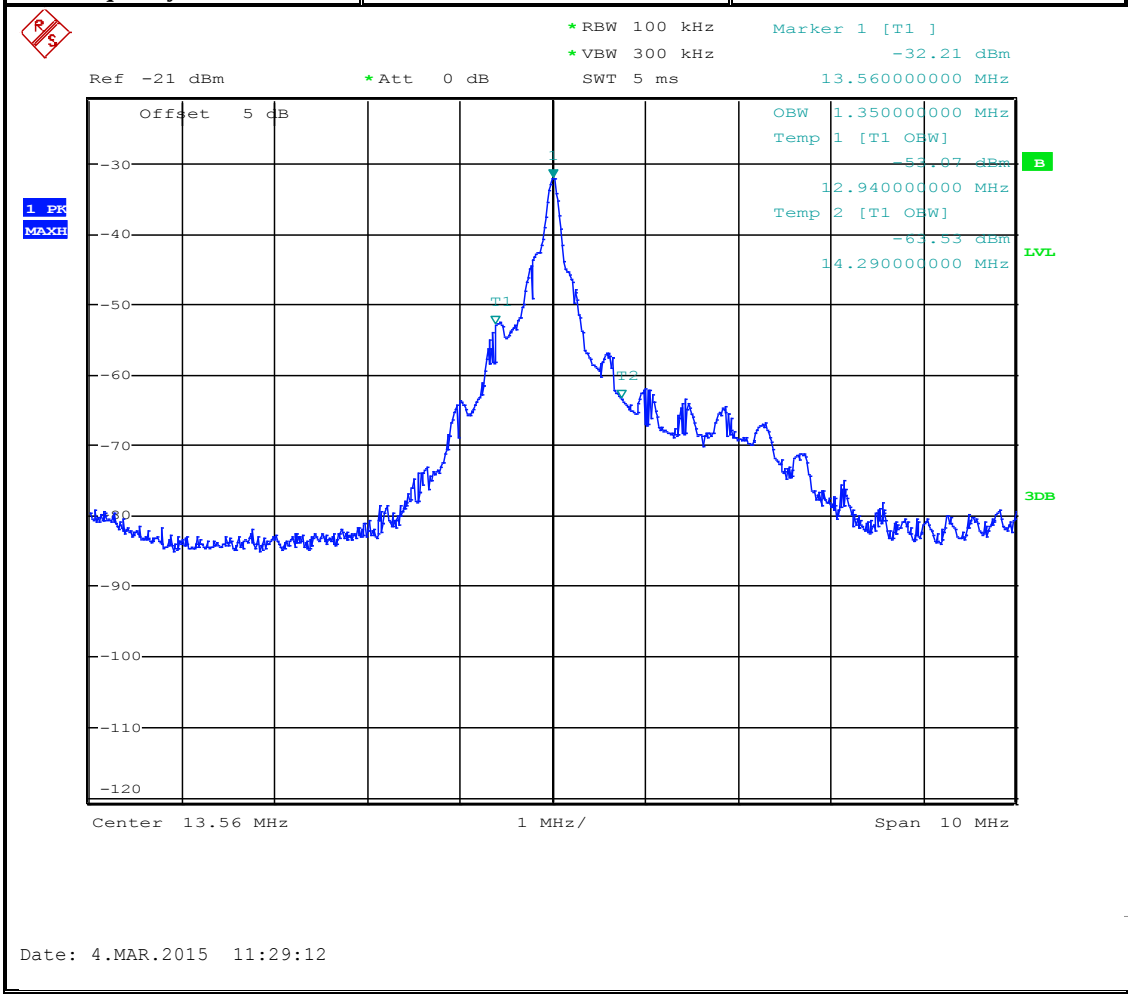
Occupied Bandwidth				
Mode	**Frequency (MHz)**	**99% BW**	**Limit (KHz)**	**Result**
Tx	13.56	1.23 MHz	None, as levels are below part 15.209 restricted band limits. (see sect. 6)	Pass
Rx	13.56	1.35 MHz	None, as levels are below part 15.209 restricted band limits. (see sect. 6)	Pass
Rx	0.125	1.77 KHz	None, as levels are below part 15.209 restricted band limits. (see sect. 6)	Pass

9.5 Measurement Plot:

99% Occupied Bandwidth		
Frequency:13.56 MHz	**NFC Tx**	**Modulation: ASK**

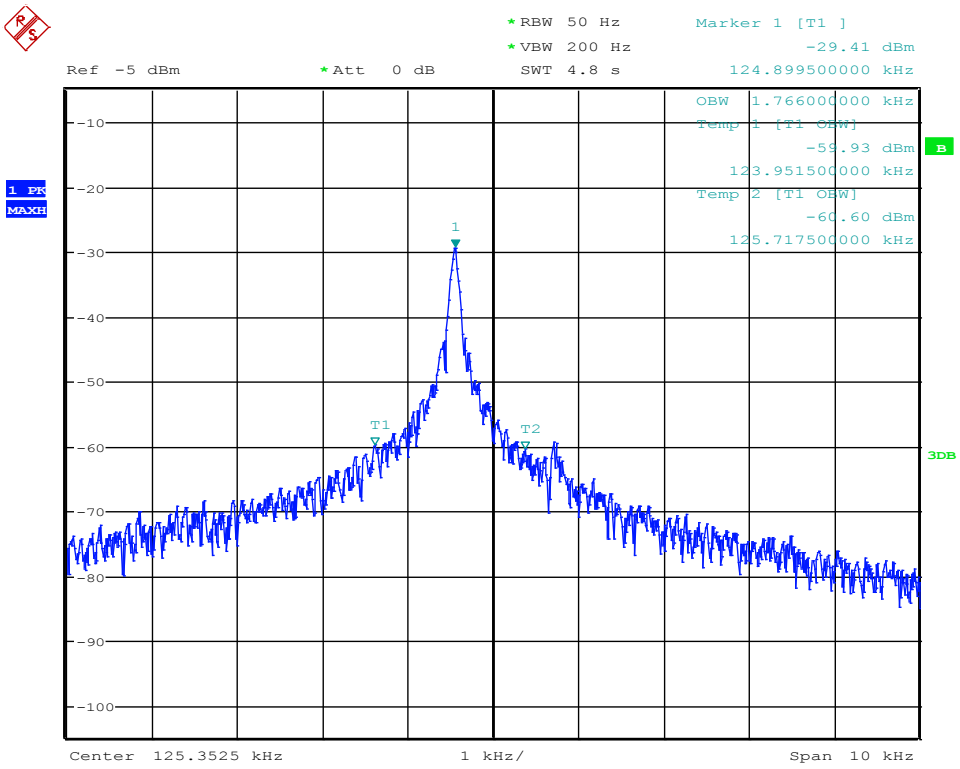


99% Occupied Bandwidth		
Frequency:13.56 MHz	**NFC Rx**	**Modulation: ASK**



99% Occupied Bandwidth

Frequency:125KHz MHz	NFC Rx	Modulation: ASK



10 Test Equipment

No.	Equipment Name	Manufacturer	Type/model	Serial No.	Cal Date	Cal Interval
3m Semi- Anechoic Chamber: In- band Field Strength						
	Turn table	EMCO	2075	N/A	N/A	N/A
	MAPS Position Controller	ETS Lindgren	2092	0004-1510	N/A	N/A
	Antenna Mast	EMCO	2075	N/A	N/A	N/A
	Relay Switch Unit	Rohde&Schwarz	RSU	338964/001	N/A	N/A
	EMI Receiver/Analyzer	Rohde&Schwarz	ESU 40	100251	Sept 2013	2 Years
	Spectrum Analyzer	Rohde&Schwarz	FSU	200302	Jun 2013	2 Years
	1500MHz HP Filter	Filtek	HP12/1700	14c48	N/A	N/A
	2800 MHz HP Filter	Filtek	HP12/2800	14C47	N/A	N/A
	Pre-Amplifier	Miteq	JS40010260	340125	N/A	N/A
	Loop Antenna	EMCO	6512	00049838	Apr 2012	3 years
	Binconilog Antenna	EMCO	3141	0005-1186	Apr 2012	3 Years
	Binconilog Antenna	ETS	3149	J000123908	Feb 2012	3 years
	Horn Antenna	EMCO	3115	35114	Mar 2012	3 Years
	LISN	R&S	ESH3-Z5	836679/003	Jun 2013	3 Years
3m Semi- Anechoic Chamber: Transmitter Spurious Emissions Testing						
	Spectrum Analyzer	Rohde and Schwarz	FSU 26	200302	Jun 2013	2 years
	Spectrum Analyzer	Rohde and Schwarz	FSV 40	0547	Jul 2014	2 years
	Receiver	Rohde and Schwarz	ESR3	101663	Feb2013	3 years
	LISN	Rohde and Schwarz	ENV 216	101129	Jan 2013	3 years
	Radio Communications Tester	Rohde and Schwarz	CMU 200	121672	Jul 2013	2 years
	Log Periodic Antenna	Rohde and Schwarz	HL 050	100515	Apr 2013	3 year
	Ultralog Antenna	Rohde and Schwarz	HL 562	100495	Feb 2012	4 year
	Double-ridge Horn Antenna (1G-18G)	ETS-Lindgren	3117-PA	00167061	Aug 2014	3 year
	Double-ridge Horn Antenna (18G-40G)	ETS-Lindgren	3116C-PA	00166821	Aug 2014	3 year
	Loop Antenna	ETS-Lindgren	6512	00164698	Jul 2014	3 year
	Open Switch Control Unit	Rohde and Schwarz	OPS 130	10085	n/a	n/a
	Extention Unit Open Switch Control Unit	Rohde and Schwarz	OSP 150	10086	n/a	n/a
	Turn Table TT	Maturo	1.5 SI	TT 1.5SI/204/6070 910	n/a	n/a
	Compact antenna Mast	Maturo	CAM 4.0-P	CAM4.0-P/067/6000910	n/a	n/a
	Multiple Control Unit	Maturo	MCU	2140910	n/a	n/a
	Pre-Amplifier	Rohde and Schwarz	TS-PR 18	100072	Part of the system calibration	
	High Pass Filter	Mini-Circuits	SHP-1200+	RUU11201224		
	High Pass Filter	Wainwright Instr.	WHKX 3.0/18	109		
Ancillary equipment						
	Spectrum Analyzer	Rohde&Schwarz	FSU	200065	Jun 2013	2 Years
	Temp Hum Logger	TM325	Dickson	5285354	Apr 2013	2 Year
	Climatic Chamber	Votsch	VT4004	G1115	N/A	N/A

Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.
Calibration due dates, unless defined specifically, falls on the last day of the month.
Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

11 Revision History

Date	Report Name	Changes to report	Report prepared by
2015-05-06	EMC_HANC1-003-15501_15.225_NFC_KS200	First version	Douglas Antioco