Intentional Radiator Test Report

Applicable Standards:
FCC 47 CFR Part 15.225 Subpart C – Intentional Radiators

Equipment Under Test:	FunkyGate IP POE
Model Number:	FGPOE01
FCC ID:	TYQ-FGPOE01
Serial Number:	0050C20BABE2
Prepared for:	SpringCard SAS 2 Voie la cardon Parc Gutenberg Palaiseau 91120 France
Tested by:	Bob Cole
Prepared by:	Amy Jones
Verified and Approved by:	Bob Cole
	Authorized Signatory

EMCE Engineering, Inc.
1726 Ringwood Avenue
San Jose, CA 95131

NVLAP Testing Lab Code 200092-0

ACCREDITED BY THE NATIONAL VOLUNTARY LABORATORY
ACCREDITATION PROGRAM FOR THE SPECIFIC SCOPE
OF ACCREDITATION UNDER LAB CODE #: 200092-0

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Test Report Revision History

Report No.	Report Version	Description	Issue Date
4338	0	Original	12-12-2017

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ADMINISTRATIVE INFORMATION

Test Laboratory:	EMCE Engineering 1726 Ringwood Avenue San Jose, CA 95131 Tel : 510-490-4307, Fax : 510-490-3441
Facility No. registered through NVLAP:	NVLAP Testing Lab Code: 200092-0
Test Site:	FCC : US0125, IC : 3324A
Applicant Company Name :	SpringCard SAS
Applicant Contact Name/Title :	Denis Pierterstoone / VP
Application Purpose :	Original
EUT Description :	RFID Card Reader
Product Name :	FunkyGate IP POE
Model Number :	FGPOE01
Serial Number :	0050C20BABE2
Applied Requirements :	FCC 47 CFR §15.207, 15.209, 15.225
FCC ID :	TYQ-FGPOE01
IC :	N/A
Equipment Class :	DXX
Power Supply:	POE Port and DC12V
RF Operating Frequency (ies)	13.56 MHz
Modulation	RFID
Emission Designator	N/A
Receipt of EUT :	10/23/2017
Date of Testing :	10/27/2017 thru 11/09/2017
Tested By :	Bob Cole
Peak Power :	40.13 dBuV/m
Test Report Approved By -CTO :	Bob Cole
Test Report Number :	4338
Test Report Issue Date :	12/12/2017
Test Report Prepared By:	Amy Jones
Test Report Reviewed By:	Bob Cole

The tests listed in this report have been completed to demonstrated compliance to the FCC 47 CFR Section 15/205. 15/209, 15.225

2.0 EUT AND ACCESSORY INFORMATION

PREPARATION OF EUT FOR TEST

Setup of EUT

Power to EUT: POE Port / DC12V
Grounding of EUT: N/A
Software: N/A

Support Equipment				
Description	Model Number	Serial Number	Manufacturer	Power Cable Description
Laptop PC	ZHG	NUSH6AA001241	ACER	Unshielded / 1.5M
Router	-	-	Netgear	Unshielded / 1.5M
Printer	B162A	EJSY163375	EPSON	Unshielded / 1.7M
Cable Description				
From	To	Length (Meters)	Shielded (Y/N)	Ferrite Loaded (Y/N)
EUT	POE Port	2.0	N	N

3.0 SUMMARY OF TEST RESULTS

Test Standard	Description	Pass / Fail
47 CFR Part 15.225: 2010		
15.203	Antenna Requirement	**Pass**
15.207(a)	Conducted Emissions Voltage	**Pass**
15.225(a)	Limit in the band of 13.553 – 13.567 MHz	**Pass**
15.225(b)	Limit in the band of 13.410 – 13.553 MHz and 13.567 – 13.710 MHz	**Pass**
15.225(c)	Limit in the band of 13.110 –13.410 MHz and 13.710 – 14.010 MHz	**Pass**
15.225(d), 15.209	Limit outside the band of 13.110 – 14.010 MHz	**Pass**
15.225(e)	Frequency Stability	**Pass**
For information purpose only	Occupied Bandwidth	**Pass**
ANSI C63.4: 2014 PS: All measurement uncertainties are not taken into consideration for all presented test result.		

PASS The EUT passed that particular test.
FAIL The EUT failed that particular test.
008 Not Applicable due to product type.

4.0 MODIFICATIONS

There were no modifications installed by EMCE Engineering.

Any modifications installed previous to testing by the Manufacturer will be incorporated in each production model sold or leased.

5.0 TEST RESULTS

5.1 Antenna Requirement

Requirement(s): 47 CFR §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

The antenna must meet at least one of the following requirements:

a) Antenna must be permanently attached to the device.
b) Antenna must use a unique type of connector to attach to the device.
c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

Results: **PASS**

Comments: The Funkygate IP POE antenna is an N turn loop symmetrical topology with middle point grounded.

5.2 Conducted Emissions Voltage

Requirement(s): 47 CFR §15.207

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

Procedures:

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. "Ave" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±3.5dB.
4. Environmental Conditions

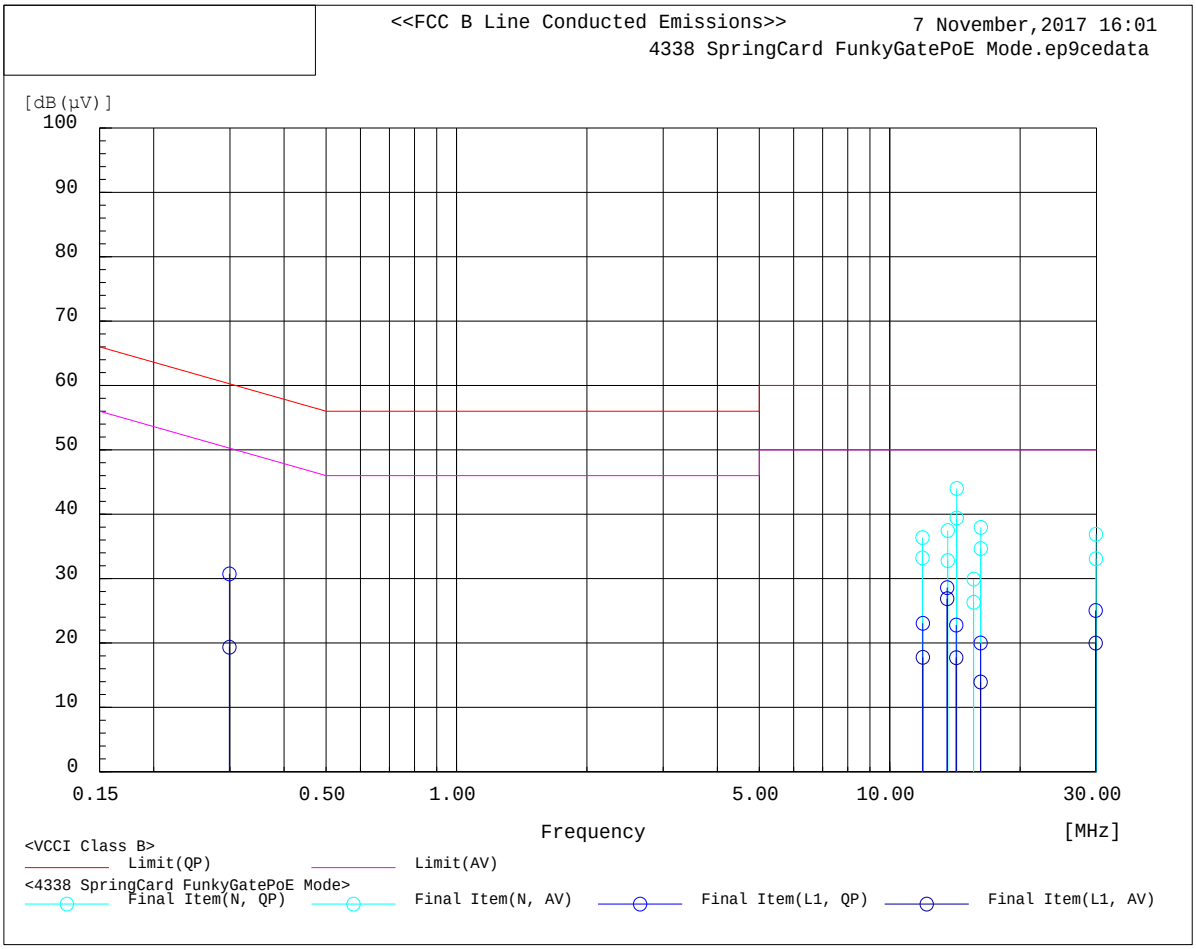
Temperature	23ºC
Relative Humidity	45%
Atmospheric Pressure	1010mbar

Test Date : Nov. 07, 2017

Tested By : Bob Cole

Results: **PASS**

Frequency MHz	Line	Reading dB(µV)		Factor dB	Level dB(µV)		Limit dB(µV)		Margin dB		Pass/Fail
		QP	AV		QP	AV	QP	AV	QP	AV	
0.299	L1	20.70	9.40	10.00	30.70	19.40	60.30	50.30	29.60	30.90	Pass
11.923	L1	12.50	7.20	10.60	23.10	17.80	60.00	50.00	36.90	32.20	Pass
13.566	L1	18.00	16.30	10.60	28.60	26.90	60.00	50.00	31.40	23.10	Pass
14.236	L1	12.20	7.10	10.60	22.80	17.70	60.00	50.00	37.20	32.30	Pass
16.205	L1	9.30	3.20	10.70	20.00	13.90	60.00	50.00	40.00	36.10	Pass
29.867	L1	14.30	9.20	10.80	25.10	20.00	60.00	50.00	34.90	30.00	Pass
11.898	N	25.80	22.60	10.60	36.40	33.20	60.00	50.00	23.60	16.80	Pass
13.606	N	26.90	22.20	10.60	37.50	32.80	60.00	50.00	22.50	17.20	Pass
14.275	N	33.40	28.80	10.60	44.00	39.40	60.00	50.00	16.00	10.60	Pass
15.612	N	19.20	15.60	10.70	29.90	26.30	60.00	50.00	30.10	23.70	Pass
16.225	N	27.30	24.00	10.70	38.00	34.70	60.00	50.00	22.00	15.30	Pass
29.911	N	26.10	22.30	10.80	36.90	33.10	60.00	50.00	23.10	16.90	Pass



5.3 Radiated Emission < 30MHz (9kHz - 30MHz, H-Field)

Requirement(s): 47 CFR §15.225

Procedures: For < 30MHz, Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set 3 meters away from the measuring antenna. The loop antenna was positioned 1 meters above the ground from the centre of the loop. The measuring bandwidth was set to 10 kHz. (Note: During testing the receive antenna was rotated about its axis to maximize the emission from the EUT.)

The limit is converted from microvolt/meter to decibel microvolt/meter.

Sample Calculation: Corrected Amplitude = Raw Amplitude (dBµV/m) + ACF (dB) + Cable Loss (dB) – Distance Correction Factor

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.

2. Radiated Emissions Measurement Uncertainty < 30 MHz
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/- 3.2 dB.

3. Environmental Conditions

Temperature	22.5ºC
Relative Humidity	52%
Atmospheric Pressure	1031mbar

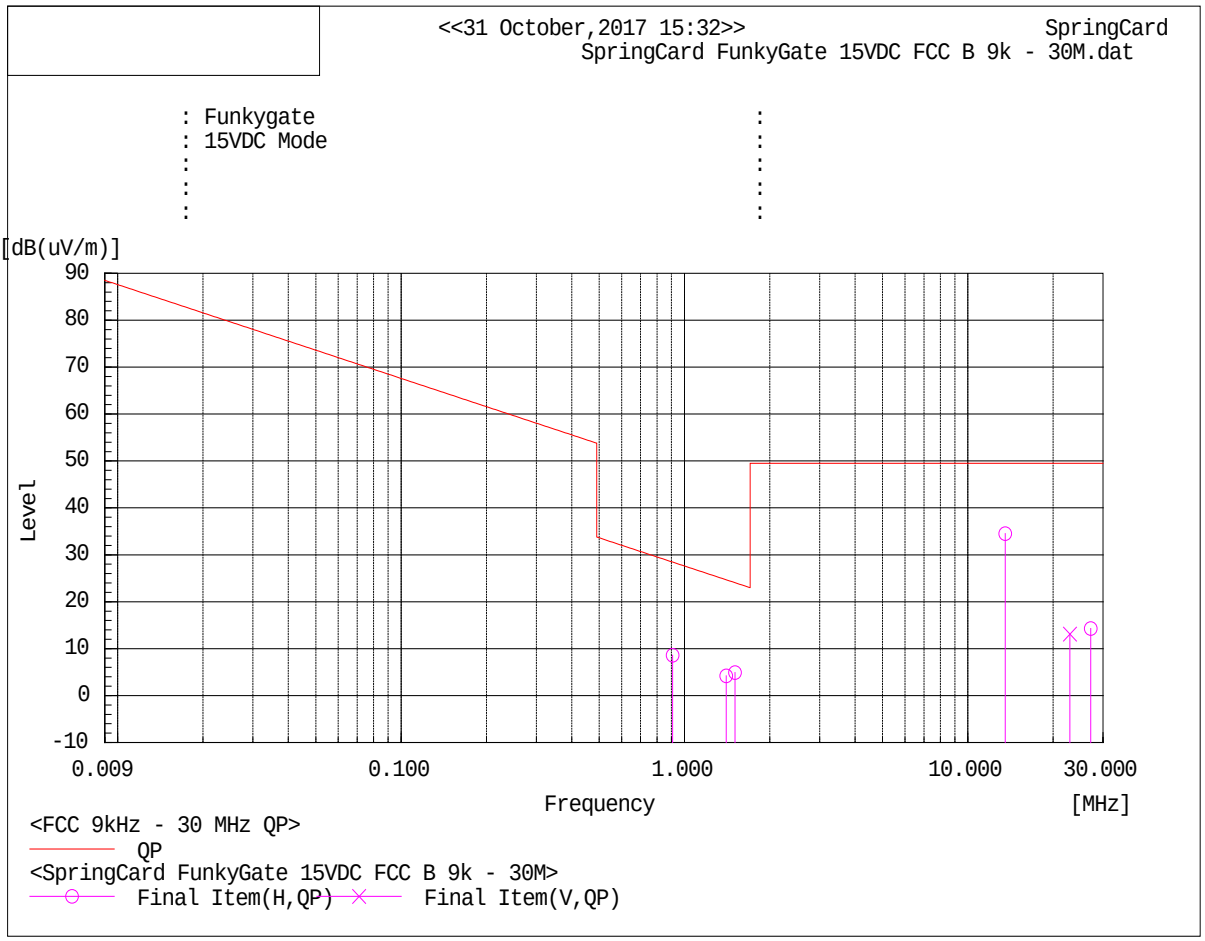
Test Date : 10/31/2017

Tested By : Bob Cole

Results: **PASS**

FCC 47 CFR §15.225 Radiated Emissions
9 kHz – 30 MHz

Frequency [MHz]	Pol	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit\QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
13.561	H	47.40	-12.90	34.50	49.50	15.00	120.20	225.60
1.509	H	18.40	-13.50	4.90	24.10	19.20	107.20	275.00
1.404	H	17.70	-13.50	4.20	24.70	20.50	100.20	183.60
27.140	H	28.60	-14.30	14.30	49.50	35.20	149.40	99.70
22.905	V	26.40	-13.30	13.10	49.50	36.40	115.60	158.80
0.909	H	22.10	-13.50	8.60	28.40	19.80	112.50	171.00



5.4 Radiated Emissions > 30 MHz (30MHz – 1 GHz, E-Field)

Requirement(s): 47 CFR §15.209; 47 CFR §15.225(d) & RSS-210 (A2.6)

Procedures: For > 30MHz, Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set 10 meter away from the measuring antenna. The Log periodic antenna was positioned 1 meter above the ground from the centre of the antenna. The measuring bandwidth was set to 120 kHz. (Note: During testing the receive antenna was raise from 1~4 meters to maximize the emission from the EUT.)

The limit is converted from microvolt/meter to decibel microvolt/meter.

Sample Calculation: Corrected Amplitude = Raw Amplitude (dBµV/m) + ACF (dB) + Cable Loss(dB) – Distance Correction Factor

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.

2. Radiated Emissions Measurement Uncertainty 30 MHz – 1 GHz
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/- 3.46 dB.

3. Environmental Conditions

Temperature	22.2°C
Relative Humidity	52.3%
Atmospheric Pressure	1025 mbar

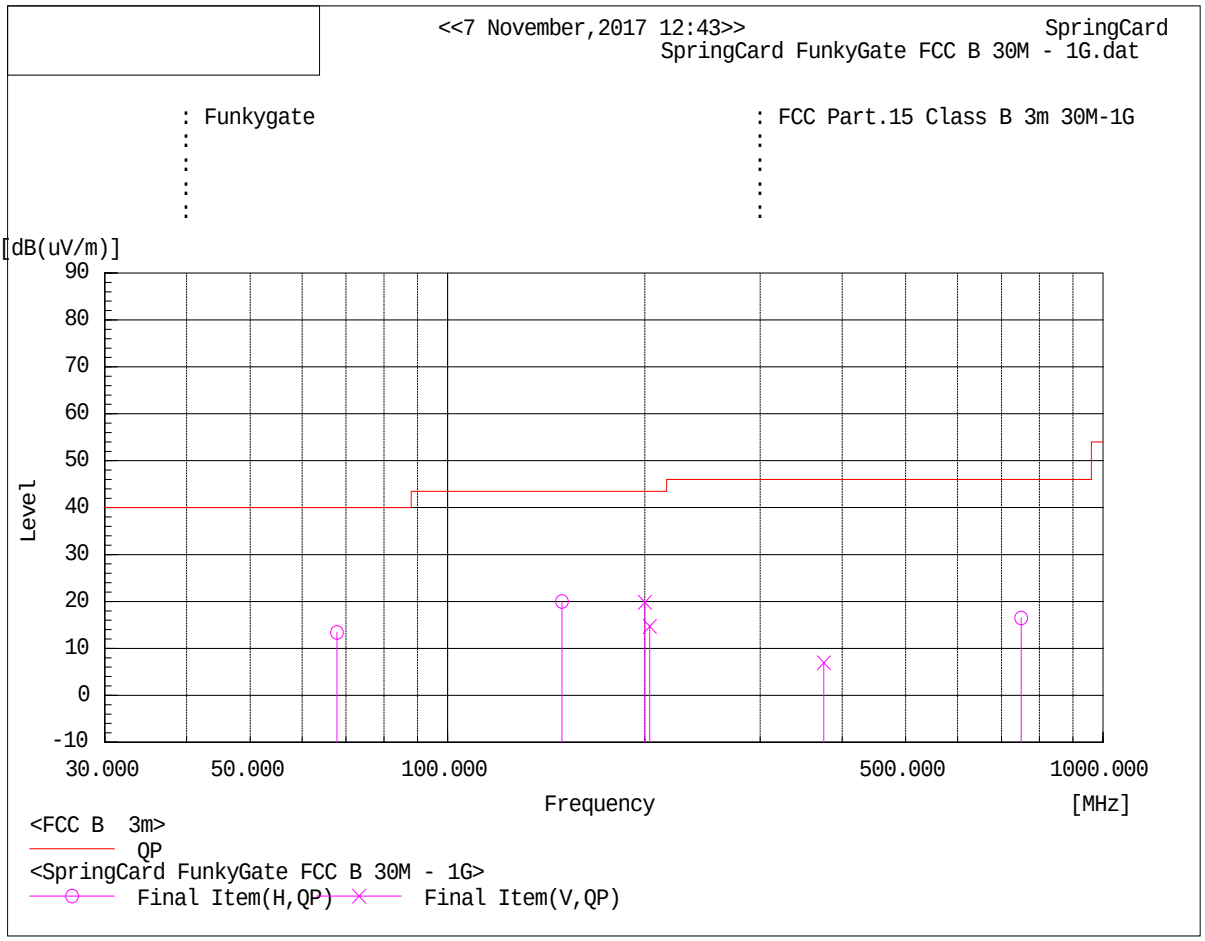
Test Date : 11/07/2017

Tested By : Bob Cole

Results: **PASS**

FCC Part 15B Radiated Emissions
30 MHz – 1 GHz

Frequency MHz	Polarization	Reading dB(uV)	Factor dB(1/m)	Level dB(uV/m)	Limit dB(uV/m)	Margin dB	Pass /Fail	Height cm	Angle deg
					QP	QP			
31.5	H	28.0	-7.4	20.6	40.0	19.4	Pass	100	0.0
200.1	V	33.6	-14.1	19.5	43.5	24.0	Pass	100	229.5
224.0	V	37.3	-15.8	21.5	46.0	24.5	Pass	100	79.8
249.3	V	35.9	-15.1	20.8	46.0	25.2	Pass	100	249.8
374.4	V	33.7	-11.7	22.0	46.0	24.0	Pass	100	143.3
749.8	H	20.3	-4.0	16.3	46.0	29.7	Pass	200	164.8



5.5 Frequency Stability

Requirement(s): 47 CFR §15.225(e) & RSS-210 (A2.6)

Procedures: Frequency Stability was measured according to 47 CFR §2.1055. Measurement was taken with spectrum analyzer. The spectrum analyzer bandwidth and span was set to read in hertz. A voltmeter was used to monitor when varying the voltage.

Limit: ±0.01% of 13.5589 MHz = 1355 Hz

Environmental Conditions	Temperature	24ºC
	Relative Humidity	45%
	Atmospheric Pressure	1010mbar

Test Date : 11/02/2017

Tested By : Bob Cole

Results: **PASS**

Frequency Stability versus Temperature: The Frequency tolerance of the carrier signal shall be maintained within ± 0.01% of the operating frequency over a temperature variation of -20ºC to +50ºC at normal supply voltage.

Frequency Stability versus Input Voltage: The Frequency tolerance of the carrier signal shall be maintained within ± 0.01%, the frequency of the transmitter was measured at 85% and at 115% of the rated power supply voltage.

SpringCard FunkyGate PoE

Temperature (ºC)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
50	13.560000	120	+/- 1356	Pass
40	13.559909	39	+/-1356	Pass
30	13.559880	0	+/-1356	Pass
20	Reference (13.559880 MHz)			
10	13.559880	0	+/-1356	Pass
0	13.559845	35	+/-1356	Pass
-10	13.559844	36	+/-1356	Pass

Measured Voltage ±15% of nominal (DC)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
10.8	13.559880	0	<0.01	Pass
13.2	13.559880	0	<0.01	Pass

5.6 Fundamental Field Strength Test Result

Requirement(s):

1. All possible modes of operation were investigated.

2. Radiated Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/-3.24 dB.

4. Environmental Conditions

Temperature	22.1°C
Relative Humidity	48.4%
Atmospheric Pressure	1017 mbar

Test Date : 11/07/2017

Tested By : Bob Cole

Results: **PASS**

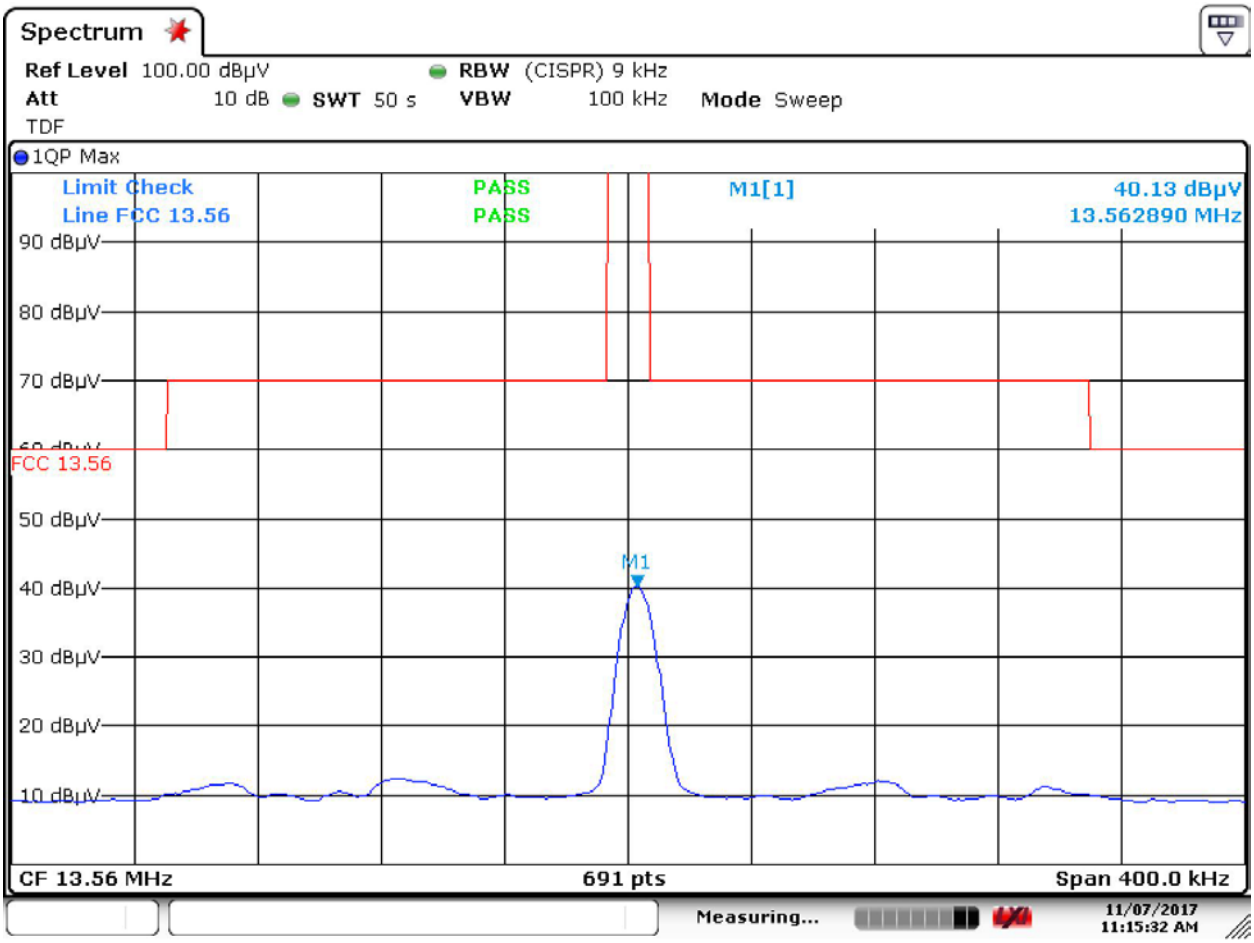
Comments: EUT Operates at a frequency of 13.56 MHz.

Test Requirement:

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

Note: Spectrum Analyzer amplitude was offset to reflect total Rx path and distance factors.

Peak Output Power
Per CFR 47, Section 15.225 and RSS-210 Issue 8 A2.6



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5.7 Occupied Bandwidth

Requirement(s): N/A For information purposes only

Procedures: Measurement was taken with spectrum analyzer. The spectrum analyzer 99% bandwidth function was activated.

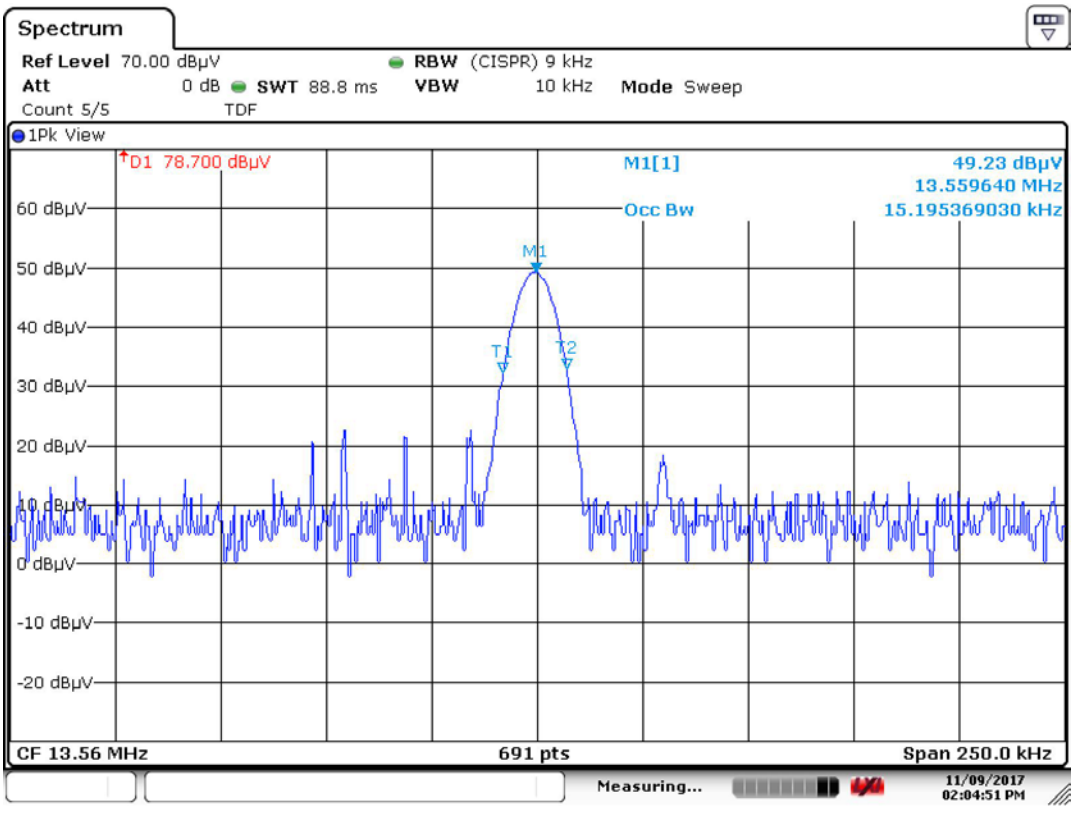
Environmental Conditions	Temperature	22.1ºC
	Relative Humidity	58%
	Atmospheric Pressure	1011 mbar

Test Date : 11/09/2017

Tested By : Bob Cole

Frequency	Occupied Bandwidth (99%)
13.56 MHz	**PASS**

99% BW



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6.0 TEST EQUIPMENT

Equipment	Serial Number	Last Calibration Date	Calibration Due Date
Omega-IBTHXBP Temp / Humidity Meter	14490199	7/8/2017	7/08/2018
EMCO-3816-2	9809-1089	8/12/2017	8/12/2018
Rohde & Schwarz-FSV40	101424	6/20/2017	6/20/2018
Sunol Sciences-JB6	A042610	6/15/2017	6/15/2018
Com-Power AL30-R Loop Antenna	561034	2/22/2017	2/22/2018

END OF REPORT