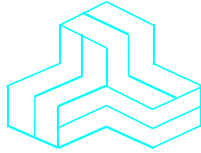


ENGINEERING TEST REPORT



TX-9 Transmitter
Model: CM-TX-9
FCC ID: 2AHAB-TX9

Applicant:

Camden Door Control
5502 Timberlea Blvd.
Mississauga, ON L4W 2T7

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.249
Operating in the Frequency Band 902 – 928 MHz

UltraTech's File No.: 15EMSI026_FCC15249

This Test report is Issued under the Authority of
Tri M. Luu
Vice President of Engineering
UltraTech Group of Labs

Date: September 17, 2015

Report Prepared by: Dharmajit Solanki

Tested by: Mr. Hung Trinh

Issued Date: September 17, 2015

Test Dates: September 1 to 4, 2015

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

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91038



1309



46390-2049



NVLAP LAB
CODE 200093-0



AT-1945



SL2-IN-E-
1119R



Korea
KCC-RRR

CA2049



TL363_B



TPTDP
DA1300

TABLE OF CONTENTS

EXHIBIT 1.	INTRODUCTION	1
1.1.	SCOPE.....	1
1.2.	RELATED SUBMITTAL(S)/GRANT(S).....	1
1.3.	NORMATIVE REFERENCES	1
EXHIBIT 2.	PERFORMANCE ASSESSMENT	2
2.1.	CLIENT INFORMATION	2
2.2.	EQUIPMENT UNDER TEST (EUT) INFORMATION	2
2.3.	EUT'S TECHNICAL SPECIFICATIONS	3
2.4.	ASSOCIATED ANTENNA DESCRIPTIONS	3
2.5.	LIST OF EUT'S PORTS	3
2.6.	ANCILLARY EQUIPMENT	3
EXHIBIT 3.	EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS.....	4
3.1.	CLIMATE TEST CONDITIONS.....	4
3.2.	OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS	4
EXHIBIT 4.	SUMMARY OF TEST RESULTS.....	5
4.1.	LOCATION OF TESTS	5
4.2.	APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS	5
4.3.	MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES	5
EXHIBIT 5.	TEST DATA.....	6
5.1.	OCCUPIED BANDWIDTH [§15.215(c)]	6
5.2.	FUNDAMENTAL FIELD STRENGTH AND HARMONIC EMISSIONS (RADIATED AT 3M) [47 CFR §§ 15.249(A), 15.209 & 15.205]	10
EXHIBIT 6.	TEST EQUIPMENT LIST	14
EXHIBIT 7.	MEASUREMENT UNCERTAINTY.....	15
7.1.	RADIATED EMISSION MEASUREMENT UNCERTAINTY	15

EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.249
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
Purpose of Test:	Single Modular Approval Equipment Certification for Low Power Licensed-Exempt Transmitters operating in the Frequency Band 902-928 MHz.
Test Procedures:	<ul style="list-style-type: none">▪ ANSI C63.4▪ ANSI C63.10
Environmental Classification:	<ul style="list-style-type: none">[x] Commercial, industrial or business environment[x] Residential environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2015	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
CISPR 22 & EN 55022	2008-09, Edition 6.0 2006	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement
CISPR 16-1-1 +A1 +A2	2006 2006 2007	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-1-2 +A1 +A2	2003 2004 2006	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-2: Conducted disturbances

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September 17, 2015

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EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Camden Door Control
Address:	5502 Timberlea Blvd. Mississauga, ON L4W 2T7 CANADA
Contact Person:	Mr. Frank Gerlach Phone #: 905-282-1750 Fax #: 905-282-9691 Email Address: fgerlach@embeddedsense.com

MANUFACTURER	
Name:	Embedded Sense Inc.
Address:	5155 Spectrum Way Mississauga, ON L4W 5A1 CANADA
Contact Person:	Mr. Frank Gerlach Phone #: 905-282-1750 Fax #: 905-282-9691 Email Address: fgerlach@embeddedsense.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Camden Door Control
Product Name:	TX-9 Transmitter
Model Name or Number:	CM-TX-9
Serial Number:	Test Sample
Type of Equipment:	Digital Transmission System (DTS), Single Modular Approval
Input Power Supply:	3 VDC
Primary User Functions of EUT:	Transmits Key Code

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2.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	<ul style="list-style-type: none">• Mobile• Base station (fixed use)
Intended Operating Environment:	<ul style="list-style-type: none">▪ Commercial, industrial or business environment▪ Residential environment
Power Supply Requirement:	3.0 - 3.3 VDC
RF Output Power Rating:	92.4 dBμV/m Peak at 3m distance
Operating Frequency Range:	903 to 927 MHz
20 dB Bandwidth:	241.2 kHz
RF Output Impedance:	50 Ohm
Modulation Type:	2-FSK, F1D
Antenna Connector Type:	Integral PCB Antenna

2.4. ASSOCIATED ANTENNA DESCRIPTIONS

Antenna Type	Maximum Gain (dBi)
Integral PCB Antenna	0.0

2.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
No I/O port.				

2.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

None.

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21 to 23 °C
Humidity:	45 to 58%
Pressure:	102 kPa
Power Input Source:	3V DC using 2 AAA Batteries

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	Each of lowest, middle and highest channel frequencies transmits continuously for emissions measurements.
Special Test Software:	Special software provided by the Applicant to operate the EUT at each channel frequency continuously. For example, the transmitter will be operated at each of the lowest, middle and highest frequencies individually continuously during testing.
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment as described with the test results.

Transmitter Test Signals	
Frequency Band(s):	903 - 927 MHz
Frequency(ies) Tested:	903 MHz, 910.25 MHz and 927 MHz
RF Power Output: (measured maximum output power at antenna terminals)	92.4 dBµV/m Peak at 3m distance
Normal Test Modulation:	2-FSK
Modulating Signal Source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).
- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2017-04-02.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna requirements	Yes
15.207(a)	AC Power Line Conducted Emissions	N/A
15.215(c)	20 dB Bandwidth	Yes
15.249(a), 15.209, 15.205	Transmitter Radiated Emissions, Harmonic Emissions	Yes

* The EUT complies with the requirement; it employs an integral antenna.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

EXHIBIT 5. TEST DATA

5.1. OCCUPIED BANDWIDTH [§15.215(c)]

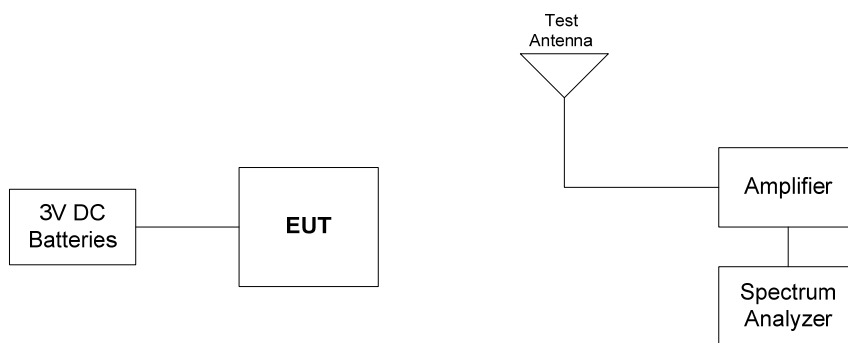
5.1.1. Limit(s)

The fundamental emission must be in the authorized bandwidth.

5.1.2. Method of Measurements

ANSI C63.10

5.1.3. Test Arrangement

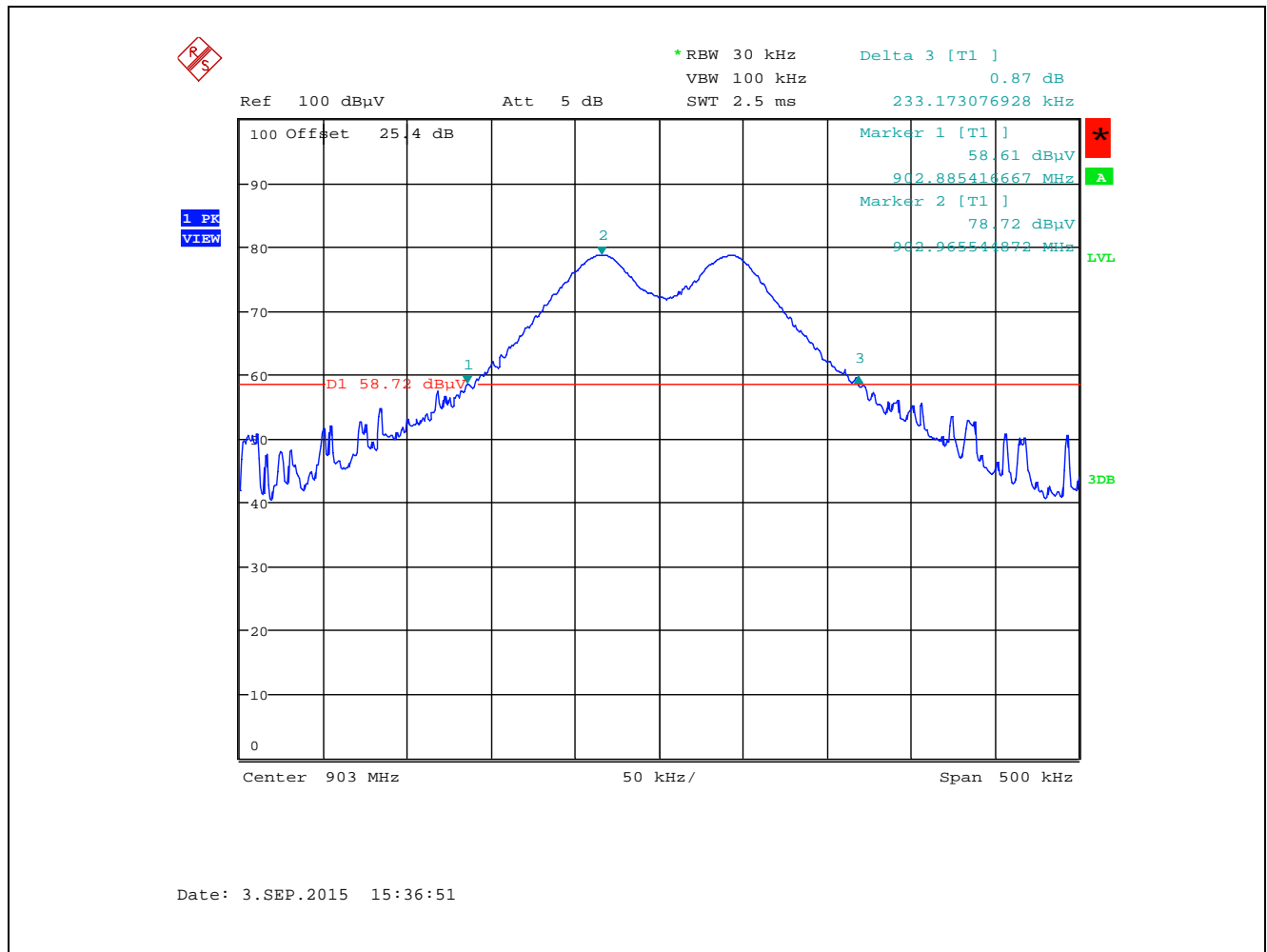


5.1.4. Test Data

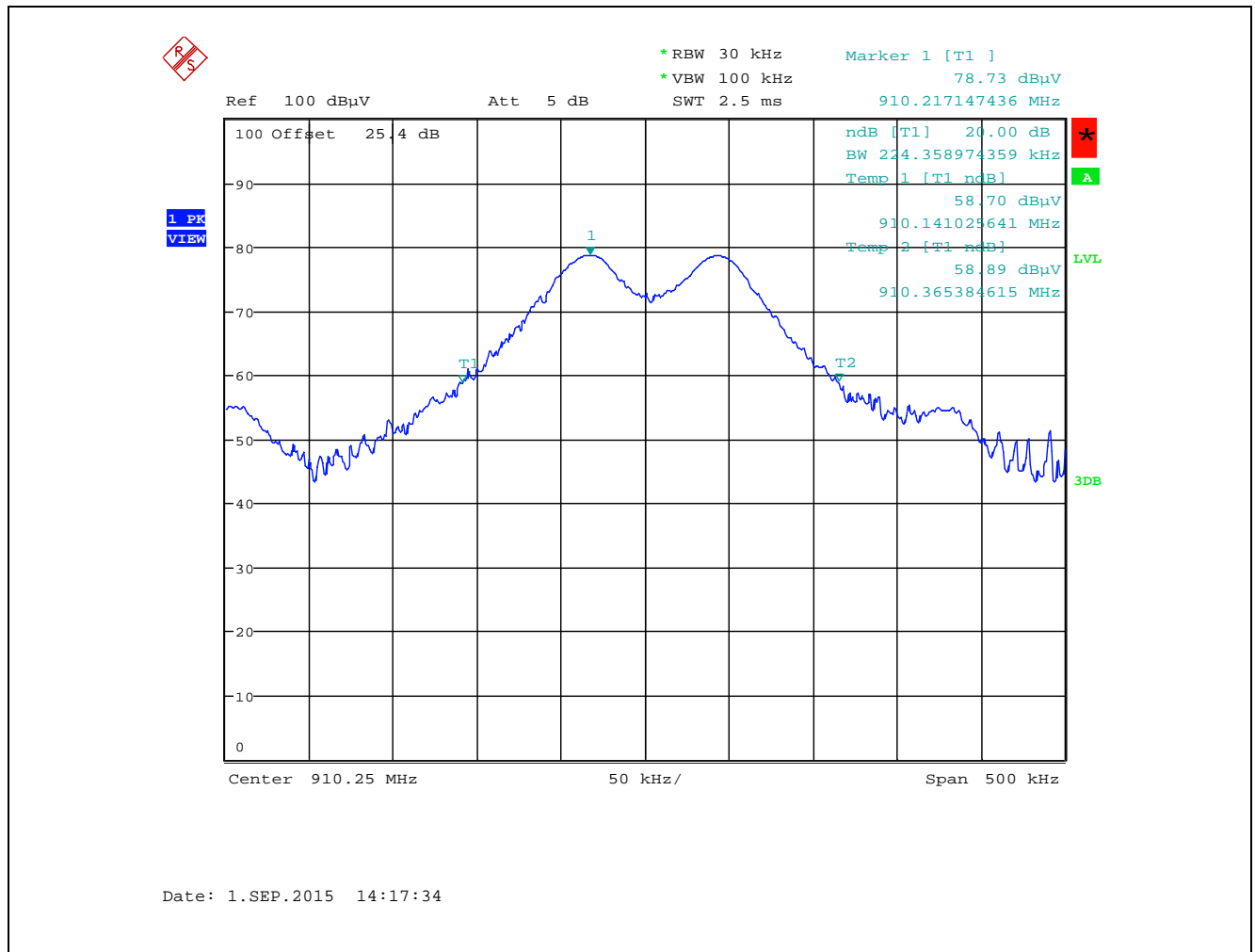
Frequency (MHz)	20 dB Bandwidth (kHz)
903.0	233.17
910.25	224.36
927.0	241.18

See the following plots for detailed measurements.

Plot 5.1.4.1. 20 dB Bandwidth, 903 MHz



Plot 5.1.4.2. 20 dB Bandwidth, 910.25 MHz



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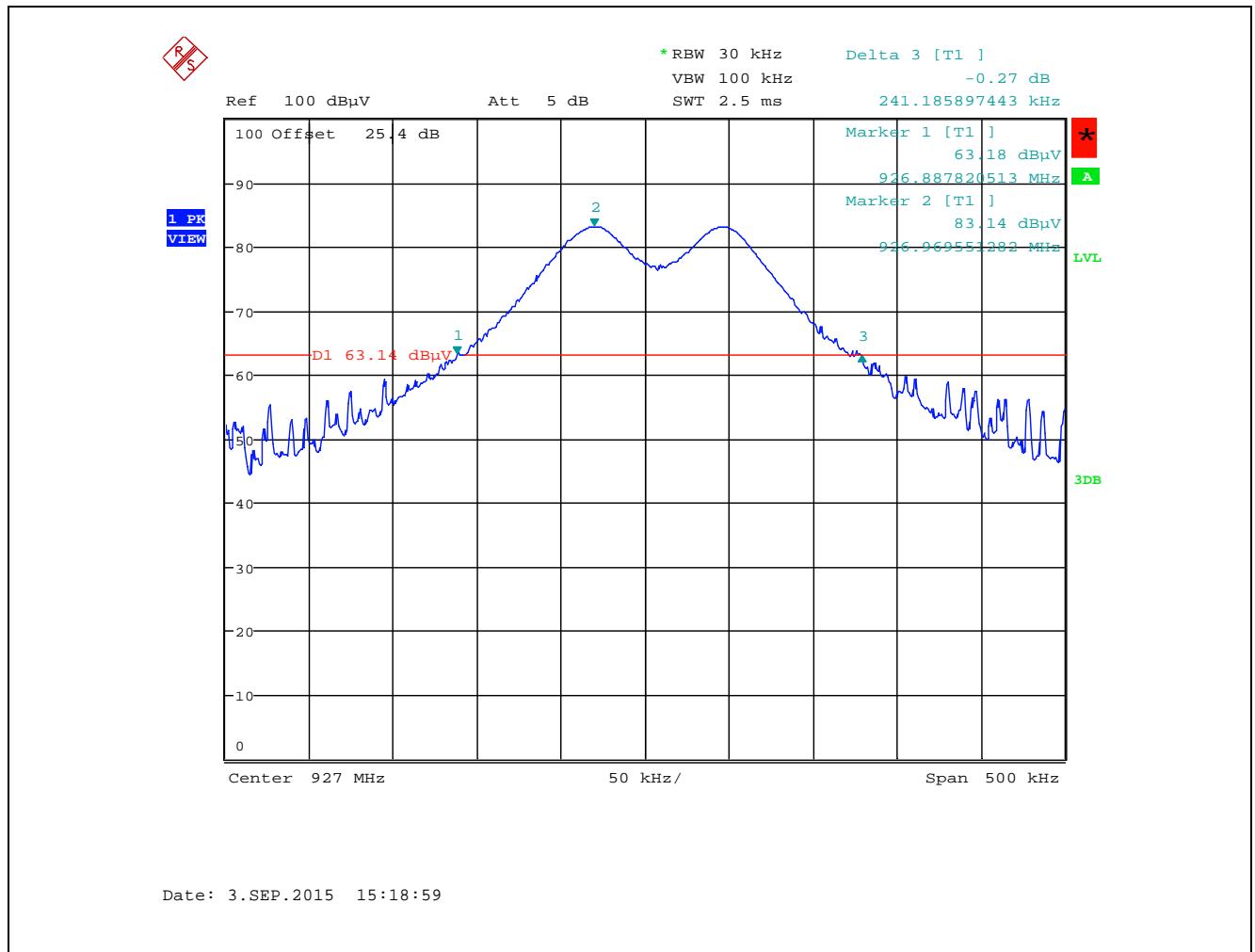
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File #: 15EMSI026_FCC15249

September 17, 2015

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Plot 5.1.4.3. 20 dB Bandwidth, 927 MHz



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5.2. FUNDAMENTAL FIELD STRENGTH AND HARMONIC EMISSIONS (RADIATED at 3m) [47 CFR §§ 15.249(a), 15.209 & 15.205]

5.2.1. Limit(s)

(a) The Field Strength of emissions from intentional radiators operated within 902–928 MHz band shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (mV/m)	Field Strength of Harmonics (µV/m)
902–928 MHz	50	500

(c) Field strength limits specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

- The fundamental frequency shall not fall within any restricted frequency band specified in 15.205. All other emissions that fall in the restricted bands shall not exceed the general radiated emission limits specified in 15.209(a).

47 CFR 15.205 – Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
¹ 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(2)
13.36–13.41.			

¹Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.

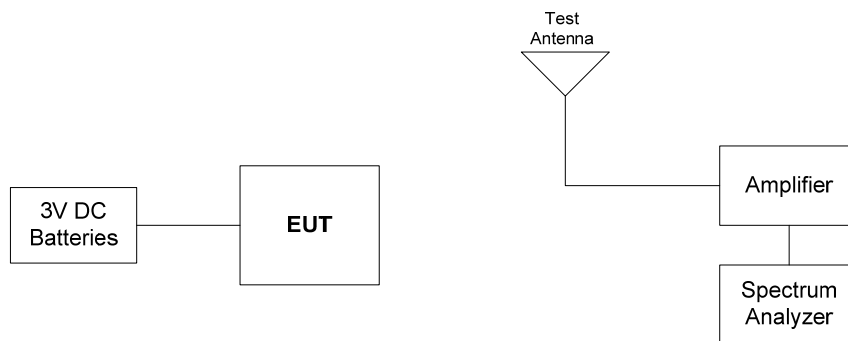
²Above 38.6

47 CFR 15.209(a) - Field Strength Limits within Restricted Frequency Bands		
Frequency (MHz)	Field Strength Limits ($\mu\text{V/m}$)	Distance (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / F (KHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

5.2.2. Method of Measurements

ANSI C63.10 and ANSI C63.4 for measurement methods.

5.2.3. Test Arrangement



5.2.4. Test Data

Remark(s):

- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- EUT shall be tested in three orthogonal positions @ 3m distance.
- The following test results are the worst-case measurements.

5.2.4.1. Spurious Radiated Emissions

Fundamental Frequency:		903 MHz					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit of Fundamental / Harmonics (dBµV/m)	Limit 15.209 (dBµV/m)	Margin (dB)	Pass/Fail
903	88.02	--	V	94.0	--	-6.0	Pass
903	86.47	--	H	94.0	--	-7.5	Pass
5418	54.44	47.85	V	54.0	54.0	-6.1	Pass*
5418	55.04	49.91	H	54.0	54.0	-4.1	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:		910.25 MHz					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit of Fundamental / Harmonics (dBµV/m)	Limit 15.209 (dBµV/m)	Margin (dB)	Pass/Fail
910.25	89.58	--	V	94.0	--	-4.4	Pass
910.25	92.39	--	H	94.0	--	-1.6	Pass
1820.50	49.42	43.53	V	54.0	54.0	-10.5	Pass*
1820.50	50.96	45.67	H	54.0	54.0	-8.3	Pass*
3641.00	47.86	41.18	V	54.0	54.0	-12.8	Pass*
3641.00	49.37	41.66	H	54.0	54.0	-12.3	Pass*
4551.25	50.24	41.91	V	54.0	54.0	-12.1	Pass*
4551.25	48.05	38.27	H	54.0	54.0	-15.7	Pass*
5461.50	54.25	47.86	V	54.0	54.0	-6.1	Pass*
5461.50	54.48	46.30	H	54.0	54.0	-7.7	Pass*
6371.75	48.36	38.79	V	54.0	54.0	-15.2	Pass*
6371.75	48.74	38.32	H	54.0	54.0	-15.7	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

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Fundamental Frequency:		927 MHz					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit of Fundamental / Harmonics (dBµV/m)	Limit 15.209 (dBµV/m)	Margin (dB)	Pass/Fail
927	84.94	--	V	94.0	--	-9.1	Pass
927	89.84	--	H	94.0	--	-4.2	Pass
1854	40.57	32.00	H	54.0	54.0	-22.0	Pass*
5562	56.62	51.06	V	54.0	54.0	-2.9	Pass*
5562	55.09	48.22	H	54.0	54.0	-5.8	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

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EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Attenuator	Pasternack	PE7024-20	-	DC–18 GHz	Cal on use
Spectrum Analyzer	Rohde & Schwarz	FSU260	200946	20Hz–26.5 GHz	Jul 14, 2016
RF Amplifier	Hewlett Packard	84498	3008A00769	1 – 26.5 GHz	Feb 04, 2016
Biconilog Antenna	EMCO	3142C	26873	26-3000 MHz	Apr 14, 2016
Horn Antenna	EMCO	3155	6570	1 – 18 GHz	Sep 11, 2015
Pre Amplifier	Com-Power	PA-118A	551016	500MHz –18 GHz	Jan 06, 2016
High Pass Filter	K & L	11SH10-1500/T8000-0/0	2	Cut off 1500 MHz	Cal on use

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EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

7.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.79	± 5.2

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.78	± 5.2

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.87	Under consideration
U	Expanded uncertainty U: $U = 2u_c(y)$	± 3.75	Under consideration

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