Testing Tomorrow's Technology

Application for Certification

Per

Title 47 USC Part 2, Subpart J, Equipment Authorization Procedures, Paragraph 2.907, Certification and Part 15, Subpart C, Intentional Radiators, Paragraph 15.207, Conducted limits and 209, Radiated emission limits; general requirements.

For the

Radio Systems Corporation

Microchip Cat Flap

Model: 300-3274

UST Project: 18-0038
Issue Date: May 29, 2018

Number of Pages in this report: 21

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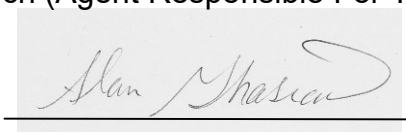
Testing Tomorrow's Technology

I certify that I am authorized to sign for the test facility and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US Tech (Agent Responsible For Test):

By: 

Name: Alan Ghasiani

Title: President – Consulting Engineer

Date: May 25, 2018

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MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: **Radio Systems Corporation**

MODEL: **300-3274**

FCC ID: **KE3-3003274**
IC: **2721A-3003274**

DATE: **May 29, 2018**

This report concerns (check one): Original grant X
Class II change_____

Equipment type: 135 kHz intentional transmitter

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes_____ No X

If yes, defer until:_____
date

N.A. agrees to notify the Commission by N.A.
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

US Tech
3505 Francis Circle
Alpharetta, GA 30004

Phone Number: (770) 740-0717
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1. General Information

The information contained in this report is presented for the FCC Equipment Authorization of Certification of the Equipment under Test (EUT).

1.1 Product Description

This product is an electronic pet door. The door uses passive RFID to detect and decode the RFID transponder either mounted on the pet's collar or implanted in the pet. If the pet door being tested detects an ID matching one stored in the pet door, it will automatically respond according to the owner's setting by pet to allow the pet to enter, exit, or neither. If the ID is not recognized, the door ignores the pet. This allows an owner to prevent unwanted entry of stray animals and wildlife into their residence as well as have very refined control of their own pet's access through the door.

1.2 Characterization of Test Sample

The sample used for testing was received by US Tech on May 15, 2018 in good operating condition.

1.3 Related Submittal(s)/Grant(s)

None.

1.4 The EUT is subject to the following authorizations:

a) Certification of the transmitter circuitry.
b) Verification of the non-transmitter circuitry as a Digital Device.

2. Tests and Measurements

2.1 Configuration of Tested System

The Test sample was tested per *ANSI C63.4:2014, Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2014) and ANSI C63.10:2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (2013).* Radiated emissions data were taken according to the respective sections of each test standard. All measurements are peak unless stated otherwise.

There were no interconnecting cables to manipulate in an attempt to maximize emissions. The EUT was tested in the position in which it would be mounted in a door, right side up. This is considered the worse case position and used for final measurements. A block diagram of the tested system is shown in Figure 1. All test configuration photographs are shown in the Test Configuration Exhibit.

2.2 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and registered with the FCC, under site registration number US5301. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number 9900A-1. US Tech is also a NVLAP accredited test lab; lab code 200162-0.

2.3 Test Equipment

Table 1. EUT and Peripherals

PERIPHERAL AND MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID and IC Number	CABLES P/D
Microchip Cat Flap Radio Systems Corp (EUT)	300-3274	Engineering Sample	Pending: FCC ID: KE3-3003274 IC: 2721A-3003274	P

P = Power D = data S = Shielded U = Unshielded

Table 2. Test Instruments

TEST INSTRUMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	CALIBRATION DUE DATE
SPECTRUM ANALYZER	E4407B	Agilent	US41442935	6/22/2018
PREAMP	8449B	HEWLETT-PACKARD	3008A00480	12/1/2018
PREAMP	8447D	HEWLETT-PACKARD	1937A02980	3/7/2019
LOOP ANTENNA	6502	EMCO	9810-3246	1/22/2020 2 yr
BICONICAL ANTENNA	3110B	EMCO	9307-1431	10/23/2019 2 yr
LOG PERIODIC ANTENNA	3146	EMCO	9110-3236	9/21/2019 2 yr
HORN ANTENNA	3115	EMCO	9107-3723	9/22/2018 2 yr

Note: The calibration interval of the above test instruments is 12 months unless stated otherwise, and all calibrations are traceable to NIST/USA.

2.4 Modifications to Equipment

No modifications necessary to meet the requirements of this subpart.

2.5 Test Procedure

The EUT was configured as shown in the following block diagram(s) and photograph(s). Conducted and radiated emissions data were taken with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter on the spectrum analyzer was OFF or 3 x the RBW throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. The EUT was rotated 360 degrees with the turntable to maximize emissions. The physical position of the EUT was the same as would used in normal installation. The final setup description is found in the test section of this report.

2.5.1 Number of Measurements for Intentional Radiators (15.31(m))

Measurements of intentional radiators or receivers shall be performed and reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in Table 3 below.

Table 3. Number of Test Frequencies for Intentional Radiators

Frequency Range over which the device operates	Number of Frequencies	Location in the Range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near the top 1 near the bottom
Greater than 10 MHz	3	1 near top 1 near middle 1 near bottom

The EUT operates at a single channel therefore only one channel was selected and tested.

2.5.2 Frequency Range of Radiated Emissions (Part 15.33(a)/RSS Gen 4.10)

Intentional Radiator

The spectrum shall be investigated for the intentional radiator from the lowest RF signal generated in the EUT, without going below 9 kHz to the 10th harmonic of the highest fundamental frequency generated or 40 GHz, whichever is the lowest.

Unintentional Radiator

For the digital device, an unintentional radiator, the frequency range shall be 30 MHz to 1000 MHz, or to the range specified in 2.4.1 above, whichever is the higher range of investigation and according to the table in 47 CFR 15.33(b).

Figure 1. Block Diagram of Test Configuration

2.6 EUT Antenna Description (FCC Sec. 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 use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Radio Systems Corporation Model: 300-3274 transmitter incorporates the following antenna(s) only.

Table 4. Antenna Description

MANUFACTURER	TYPE	MODEL	GAIN dB_i
Radio Systems Corporation	Passive Loop Antenna	Integral	N/A

2.7 Field Strength of Fundamental (47 CFR 15.209)

The results of the measurements for peak fundamental emissions are given in the test tables below. The EUT emissions measurement was started by setting up the receiver antenna in the vertical orientation at a distance of 3 meters from the EUT and at a height of 1.0 meters above the ground. The EUT packages' major axis was set normal to the direction of the measuring antenna.

The Spectrum Analyzer (SA) displays were set to: Channel A free-running, Channel B to Max-Hold. Choose a frequency or frequency range and scan it at a coupled rate. When a suspicious signal is found, center the signal on the screen and raise the receive antenna to the 4-meter height while observing the SA display for changes to the max-hold and free-running display. Next, the antenna is lowered to 1 meter height above the ground plane while observing the channel A and B displays. The display having max-hold shows the maximum signal seen across the height range of 1 to 4 meters. The next action is to raise or lower the antenna until the free-running display matches the Max-hold display's magnitude on the SA screen. When this occurs, the signal is maximized for antenna height. Record the antenna height on the data sheet corresponding to the present frequency.

When the antenna height has been maximized, the next step in the measurement process is to maximize the EUT direction with respect to the receiving antenna. Rotate the turn-table through 360 degrees with one SA channel set for max-hold and the other channel in free-run mode. The object is to find that azimuth direction where the free-running indication just matches the greatest max-hold indication. This is the direction where the signal is peaked for azimuth. Record the direction on the data sheet next to the frequency.

Radiated emissions within the band of 9 kHz to 30 MHz were investigated using a calibrated Loop Antenna and per the requirements of ANSI C63.10:2013. The resolution bandwidth was set to 300 Hz between 9 kHz to 150 kHz and 9 kHz up to 30 MHz; the video bandwidth was set to three times the resolution bandwidth.

2.8 Intentional Radiated Emissions, 9 kHz to 30 MHz (47 CFR 15.205, 15.209)

The peak radiated spurious emissions were measured over the frequency range of 9 kHz to 10 times the fundamental frequency, or 30 MHz.

Table 5. Intentional Radiated Emissions (9kHz to 30 MHz)

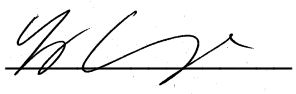
Intentional Radiator Radiated Emissions								
Test By: GY	Test: Part 15B, Para 15.209				Client: Radio Systems Corporation			
	Project: 18-0038				Model: 300-3274			
Frequency (MHz)	**Peak Test Data (dBuV)**	**Additional factor**	**AF+CL-PA (dB/m)**	**Peak Corrected Results (dBuV/m)**	**Limits (dBuV/m)**	**Application Test Distance/ Polarization**	**Margin (dB)**	**Detector Used**
Measurements were made over the frequency range of fundamental to 10th harmonic								
0.135	105.80	--	11.94	117.74	125.0(1)	m./meters	7.2	**PK**
0.270	61.95	--	11.84	73.79	98.9	m./meters.	25.1	**PK**
0.410	54.69	--	11.54	66.23	95.3	m./meters.	29.1	**PK**
0.540	48.26	--	11.82	60.08	72.9	m./meters.	12.8	**PK**
6.300	41.06	--	11.09	52.15	69.5	m./meters.	17.4	**PK**

* frequency falls in restricted band of CFR 15.205.

Note (1): limit extrapolated using the factor of 50dB/decade. See Extrapolation Factor Statement attachment for details.

SAMPLE CALCULATIONS: At 0.1350 MHz = 105.80 dBuV + (11.94) = 117.74 dBuV

Test Date: May 25, 2018

Tested By
Signature:  Name: George Yang

2.9 Bandwidth of Fundamental (RSS-210, A8.1(a))

The 99% occupied bandwidth of the radio module shall be recorded to show compliance with RSS-210.

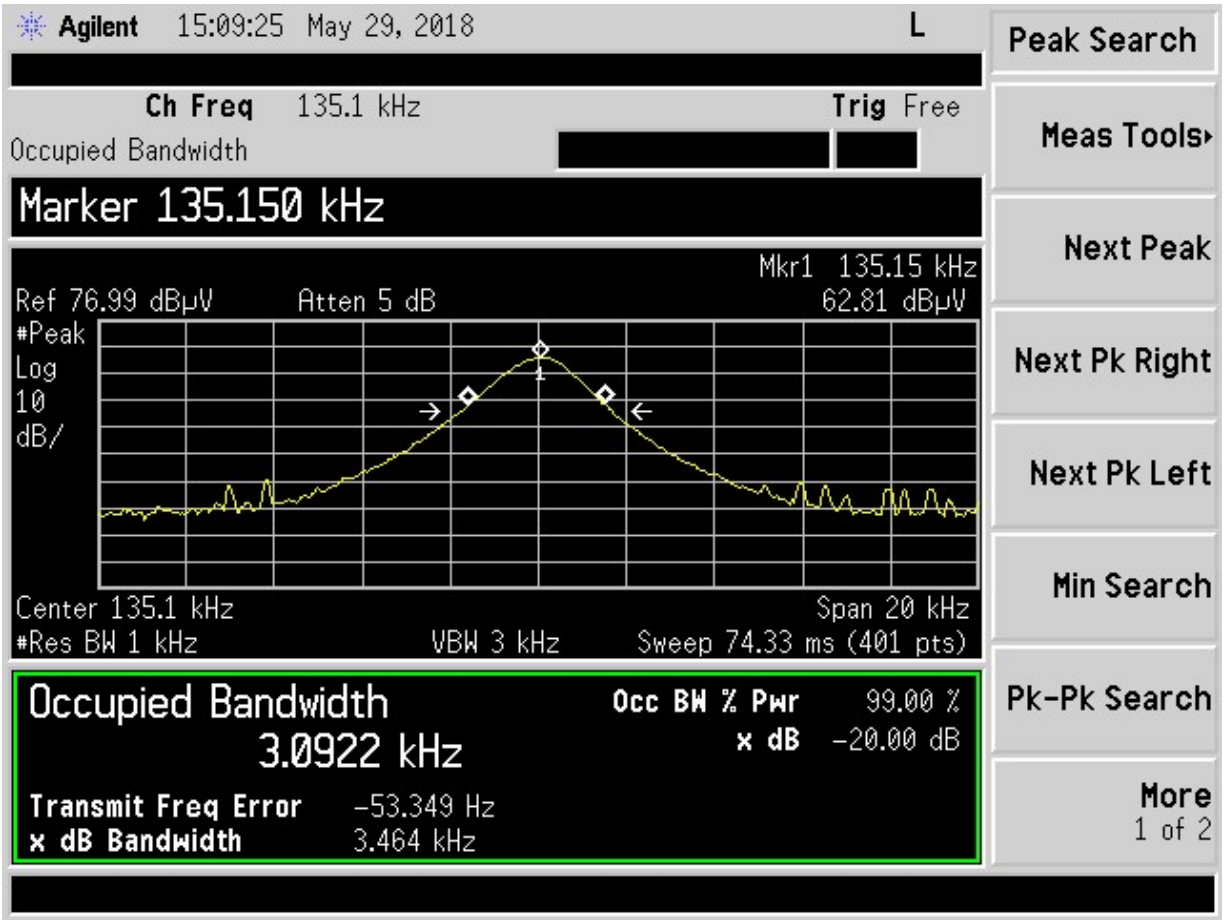


Figure 2. Occupied Bandwidth

2.10 Power Line Conducted Emissions for Transmitter and Receiver/Digital Apparatus (47 CFR 15.107/15.207).

The EUT is battery operated with no means to connect to the AC mains therefore this test is deemed not applicable.

Table 6. Unintentional Powerline Conducted Emissions

Conducted Emissions							
Test By: AF	Test: Part 15.107/207			Client: Radio Systems Corp			
	Project: 18-0038			Model: 300-3274			
Frequency (MHz)	**Test Data (dBuV)**	**LISN+CL-PA (dB)**	**Results (dBuV)**	**Limits AVG (dBuV)**	**Application Point**	**Margin (dB)**	**DET P/QP/AVG**
Not applicable. EUT is battery powered only.							

SAMPLE CALCULATIONS: N/A

Tested by
Signature:  Name: Afzal Fazal

2.11 Unintentional Radiator Radiated Emissions (47 CFR 15.33(a); 15.109/209)

These test data are provided herein to support the Verification requirement for digital devices. Radiated emissions coming from the EUT in a non-transmit state were evaluated as well as in a continuous transmit state from 9 kHz or the lowest emissions generated by the EUT up to 30 MHz per 47 CFR 15.33a and 30 MHz to 1 GHz per ANSI C63.10:2013.

Measurements made below 30 MHz were recorded using the procedure in section 2.7 and are displayed in Table 5. No other emissions were seen within 20 dB of the limit.

For measurements above 30 MHz the measurements were made with the analyzer's resolution bandwidth set to 120 kHz for measurements made below 1 GHz and 1 MHz for measurements made above 1 GHz. The video bandwidth was set to three times the resolution bandwidth. The test data was maximized for magnitude by rotating the turn-table through 360 degrees and raising and lowering the receiving antenna between 1 to 4 meters in height as a part of the measurement procedure. All measured signals were at least 6 db below the specification limit.

The worst-case radiated emission was 6.0 dB below the limit at 57.9900 MHz. All other radiated emissions were at least 7.4 dB below the FCC Part 15.109/209 limit. The data is tabulated in the test table below.

Table 7. Spurious Radiated Emissions (30 MHz to 1000 MHz)

Spurious Radiated Emissions							
Test By: GY	Test: Part 15B, Para 15.33, 15.109/209			Client: Radio Systems Corporation			
	Project: 18-0038	Class: B		Model: 300-3274			
Frequency (MHz)	**Peak Test Data (dBuV)**	**AF+CL-PA (dB/m)**	**Peak Corrected Results (dBuV/m)**	**Average Limits (dBuV/m)**	**Application Test Distance/ Polarization**	**Margin (dB)**	**Detector Used**
Measurements were made over the frequency range of 30 MHz to 1 GHz							
57.99	50.18	-17.55	32.63	40.0	3m./VERT	7.4	**PK**
102.28	42.05	-15.25	26.80	43.5	3m./VERT	16.7	**PK**
109.28	45.95	-15.64	30.31	43.5	3m./HORZ	13.2	**PK**
57.99	51.03	-17.05	33.98	40.0	3m./HORZ	6.0	**PK**
279.24	31.83	-12.20	19.63	46.0	3m./VERT	26.4	**PK**
971.20	28.40	-0.34	28.06	54.0	3m./VERT	25.9	**PK**
249.48	33.64	-13.36	20.28	46.0	3m./HORZ	25.7	**PK**
966.40	28.90	0.41	29.31	54.0	3m./HORZ	24.7	**PK**

Tested from 30 MHz to 1000 MHz

SAMPLE CALCULATIONS: At 57.99 MHz = 50.18 + (-17.55) = 32.63 dBuV

Test Date: May 17 & 18, 2018

Tested by
Signature:  Name: Afzal Fazal

2.12 Measurement Uncertainty

The measurement uncertainties given were calculated using the method detailed in CISPR 16-4. A coverage factor of k=2 was used to give a level of confidence of approximately 95%.

2.12.1 Conducted Emissions Measurement Uncertainty

Measurement Uncertainty (within a 95% confidence level) for this test is ±2.8 dB.

The EUT is battery operated therefore this test was deemed not applicable.

2.12.2 Radiated Emissions Measurement Uncertainty

For a measurement distance of 3 m the measurement uncertainty (with a 95% confidence level) for this test using a Biconical Antenna (30 MHz to 200 MHz) is ±5.3 dB. This value includes all elements of measurement.

The measurement uncertainty (with a 95% confidence level) for this test using a Log Periodic Antenna (200 MHz to 1000 MHz) is ±5.1 dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Horn Antenna is ±2.45

The data listed in this test report does have sufficient margin to negate the effects of uncertainty, therefore, the EUT unconditionally meets this requirement.