

TEST REPORT**Report Number: 103769042MPK-001B****Project Number: G103769042****January 10, 2019****Testing performed on the****PKP reader****Model: PKP****FCC ID: T8H-BESTPM104****IC: 7713A-BESTPM104****to****FCC Part 15 Subpart C (15.209)****FCC Part 15 Subpart C (15.207)****RSS-210 Issue 9****FCC Part 15, Subpart B****Industry Canada ICES-003****For****Dormakaba USA, Inc.**

Test Performed by:

Intertek

1365 Adams Court

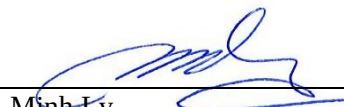
Menlo Park, CA 94025 USA

Test Authorized by:

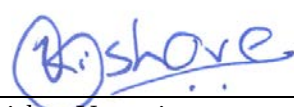
Dormakaba USA, Inc.

6161 E. 75th Street.

Indianapolis, IN 46250

Prepared by: 

Minh Ly

Date: January 10, 2019Reviewed by: 

Krishna Vemuri

Date: January 10, 2019

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Report No. 103769042MPK-001B	
Equipment Under Test:	PKP reader
Trade Name:	Dormakaba USA, Inc.
Model Number:	PKP
Serial Number:	MPK1812101554-004 (PKP Module)
Applicant:	Dormakaba USA, Inc.
Contact:	E.J. Caylor
Address:	Dormakaba USA, Inc. 6161 E. 75th Street. Indianapolis, IN 46250
Country:	USA
Tel. Number:	(317) 806-3501
Email:	Ej.caylor@dormakaba.com
Applicable Regulation:	FCC Part 15 Subpart C (15.209) FCC Part 15 Subpart C (15.207) RSS-210 Issue 9 FCC Part 15, Subpart B Industry Canada ICES-003 Issue 6
Test Site Location:	ITS – Site 1 1365 Adams Drive Menlo Park, CA 94025
Date(s) of Test:	December 10 to January 04, 2019

We attest to the accuracy of this report:


Minh Ly
EMC Project Engineer

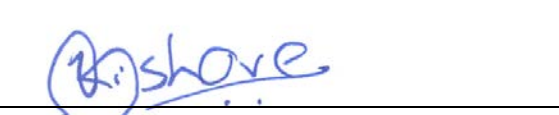

Krishna K Vemuri
Engineering Team Lead

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1.0 Summary of Tests

TEST	REFERENCE FCC 15.225	REFERENCE RSS- 210	RESULTS
Radiated Transmitter Emissions	15.209	RSS-GEN	Complies
Line Conducted Emissions	15.207	RSS-GEN	Complies
Radiated Emission from Digital Part and Receiver	15.109	ICES 003	Complies
AC Line Conducted Emission	15.107	ICES 003	Complies
Occupied Bandwidth	-	RSS-GEN	Complies
Antenna Requirement	15.203	RSS-GEN	Complies ¹

¹ EUT utilizes an internal Antenna.

2.0 General Description

2.1 Product Description

Dormakaba USA, Inc. supplied the following description of the EUT:

The PKP is a 125kHz low power RFID card reader.

For more information, refer to the following product specification, declared by the manufacturer.

Overview of the EUT	
Applicant name & address:	Dormakaba USA, Inc. 6161 E. 75th Street. Indianapolis, IN 46250
Contact info / Email:	E.J. Caylor / Ej.caylor@dormakaba.com
Model:	PKP
FCC Identifier:	T8H-BESTPM104
IC Identifier:	7713A-BESTPM104
Operating Frequency:	Single frequency, 125 kHz
Number of Channels:	1
Type of Modulation:	CW
Antenna Type:	Internal Antenna

EUT receive date: December 10, 2018
EUT receive condition: The EUT was received in good condition with no apparent damage. As declared by the Applicant it is identical to the production units.
Test start date: December 10, 2018
Test completion date: January 04, 2019

2.2 Related Submittal(s) Grants

None

2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4: 2014. Radiated tests were performed at an antenna to EUT distance of 10 meters, unless stated otherwise in this test report. All other measurements were made in accordance with the procedures in part 2 of CFR 47, ANSI C63.10: 2013 & RSS-GEN Issue 5.

2.4 Test Facility

The radiated emission test site and conducted measurement facility used to collect the data is 10m semi-anechoic chamber located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC and Industry Canada (Site # 2042L-1).

3.0 System Test Configuration

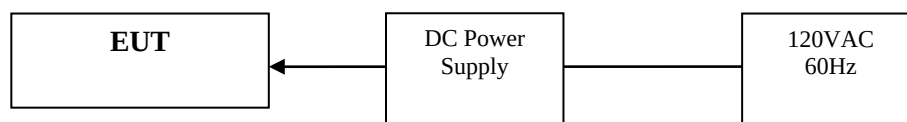
3.1 Support Equipment and description

Support Equipment			
Type	Model #	Quantity	S/N
DC Power Supply	Extech	1	D30030012

3.2 Block Diagram of Test Setup

The diagram shown below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.

PKP MODULE Only



S = Shielded	F = With Ferrite
U = Unshielded	m = Length in Meters

3.3 Justification

The EUT was configured to continuously transmit and looking for tags. This report covers the RFID radio only.

For radiated emission measurements the EUT is placed on a non-conductive table.

The highest clock frequency used is 8 MHz, as specified by Dormakaba USA, Inc., so radiated emissions were performed up to 1 GHz for the module.

This report was generated from Intertek report number: 103769042MPK-001 with the data for the PKP module only.

3.4 Software Exercise Program

EUT was programmed to continuously transmit and read tags.

3.5 Mode of Operation during test

EUT was continuously transmitting during the tests.

3.6 Modifications required for Compliance

No modifications were installed by Intertek Testing Services during compliance testing in order to bring the product into compliance.

3.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.

4.0 Measurement Results

4.1 Field Strength of Fundamental and Radiated Emissions Outside the band

4.1.1 Requirements

§15.209 Radiated emission limits; general requirements.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/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

Limits for Electromagnetic Radiated Disturbance, FCC Section 15.109(b)

Frequency (MHz)	Class A at 10m dB(μV/m)	Class B at 3m dB(μV/m)
30-88	39.0	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

Note: Three sets of units are commonly used for EMI measurement, decibels below one milliwatt (-dBm), decibels above a microvolt (dBμV), and microvolts (μV). To convert between them, use the following formulas: $20 \text{ LOG}_{10}(\mu\text{V}) = \text{dB}\mu\text{V}$, $\text{dBm} = \text{dB}\mu\text{V} - 107$

4.1.2 Procedure

Radiated Measurements Below 30 MHz

During the test the EUT is rotated and the measuring antenna angles are varied during the search for maximum signal level.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for below 30 MHz were made at 10 meters. Data results below are corrected for distance back to 30 meters.

Radiated Measurements Above 30 MHz

During the test the EUT is rotated and the measuring antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for above 30 MHz were made at 10 meters.

Radiated emission measurements were performed from 9kHz to 1 GHz.
Analyzer resolution is:

200Hz or greater for 9kHz to 150kHz
9 kHz or greater for 150kHz to 30 MHz
120 kHz or greater for 30MHz to 1000 MHz
For those frequencies quasi-peak detector applies

Data includes of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follows:

$$FS = RA + AF + CF - AG - DCF$$

Where FS = Field Strength in dB (μ V/m)

RA = Receiver Amplitude (including preamplifier) in dB (μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB (1/m)

AG = Amplifier Gain in dB

DCF = Distance Correction Factor

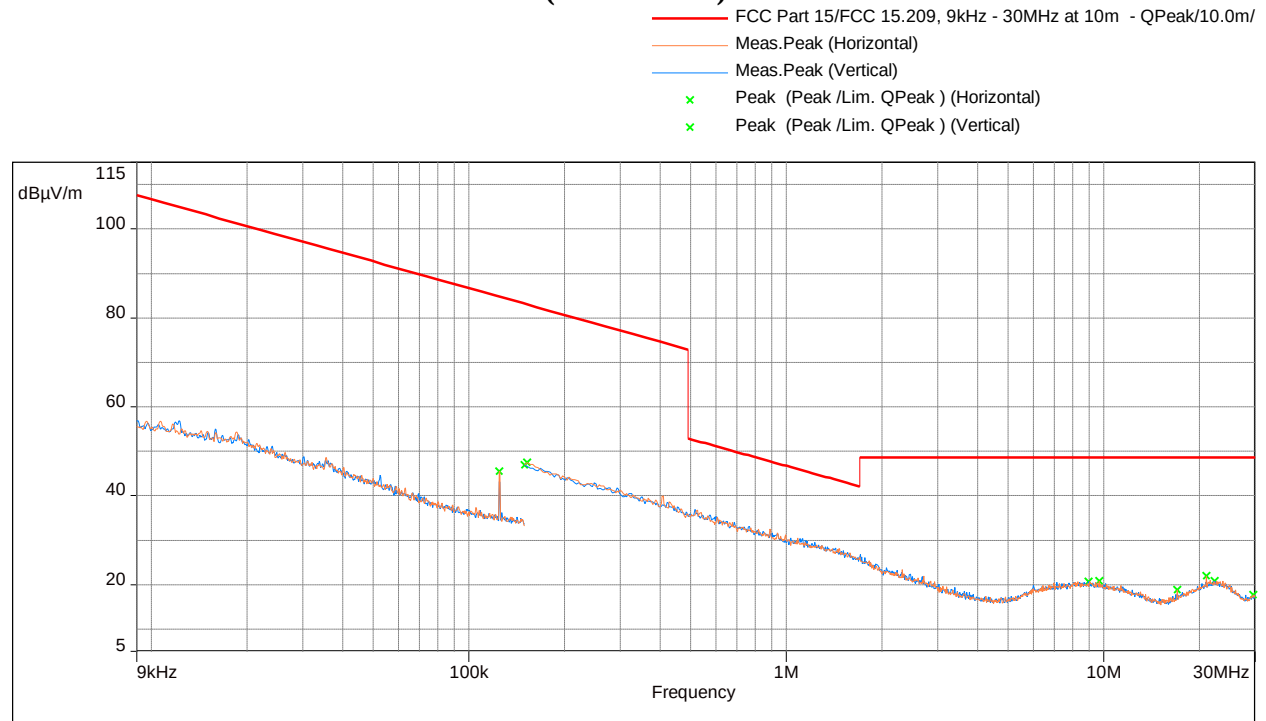
Note: FS was measured with loop antenna below 30MHz

4.1.3 Test Result

Test date: December 13, 2018 to January 04, 2019

The data below shows the significant emission frequencies, the limit and the margin of compliance.
Note: Measurements were performed at parallel and perpendicular orientation of loop antenna, and vertical and horizontal orientations of EUT.

15.209 Radiated Spurious Emissions from 9 kHz to 30MHz (PKP Module)



Frequency (MHz)	Peak @10m dB(μV/m)	QP-Limit@10m dB(μV/m)	Margin (dB)	Angle (°)	Antenna Orientation	Correction (dB)
0.125	45.5	84.76	-39.3	11.5	Parallel	31.9
0.125	43.2	84.76	-41.6	80.0	Perpendicular	31.9

**15.109 Class B & 15.209 Radiated Spurious Emissions from 30 MHz to 1000 MHz
(PKP Module)**



Model: ; Client: ; Comments: ; Test Date: 12/14/2018 18:26

Frequency (MHz)	QPeak@10m dB(μV/m)	Lim. QPeak dB(μV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
30.485	21.7	29.5	-7.8	207.3	4.0	Horizontal	-9.7
57.516	16.4	29.5	-13.1	275.8	4.0	Horizontal	-15.6
801.829	27.4	35.5	-8.1	163.5	1.0	Horizontal	-3.1
57.419	19.2	29.5	-10.4	200.3	4.0	Vertical	-15.6
60.620	18.0	29.5	-11.5	326.5	4.0	Vertical	-16.7
801.829	26.6	35.5	-8.9	54.3	2.0	Vertical	-3.1

Results	Complies
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4.1.4 Test Configuration Photographs

The following photographs show the testing configurations used.

PKP MODULE



4.1.4 Test Configuration Photographs (Continued)

PKP MODULE



4.2 AC Line Conducted Emission FCC Rule 15.107/15.207

4.2.1 Requirement

Frequency Band MHz	Class B Limit dB(μV)		Class A Limit dB(μV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *	79	66
0.50-5.00	56	46	73	60
5.00-30.00	60	50	73	60

Note: *Decreases linearly with the logarithm of the frequency. At the transition frequency the lower limit applies.

4.2.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

EUT was placed in transmission mode then tested for conducted emissions per 15.207 and 15.107.

Test date: December 19, 2018

4.2.3 Test Result

15.107 Class B & 15.207 AC Line Conducted Emission from 150kHz to 30 MHz

Phase 1

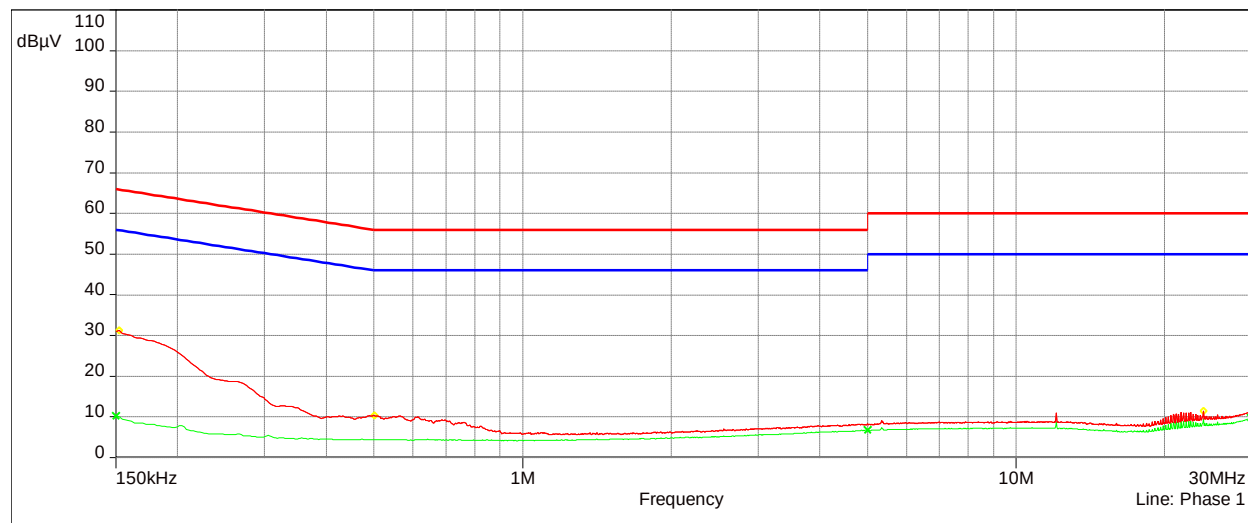
Sub-range 1

Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)

Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, Lim Preamp: Off, Preselector: On

Line:Phase 1

- FCC Part 15/FCC Part 15.107 B - Average/
- FCC Part 15/FCC Part 15.107 B - QPeak/
- Mes. QPeak (Phase 1)
- Mes. CISPR AVG (Phase 1)
- ◊ QPeak (QPeak /Lim. QPeak) (Phase 1)
- × CISPR AVG (CISPR AVG /Lim. Average) (Phase 1)



Model: ; Client: ; Comments: ; Test Date: 12/19/2018 16:50

Phase 2

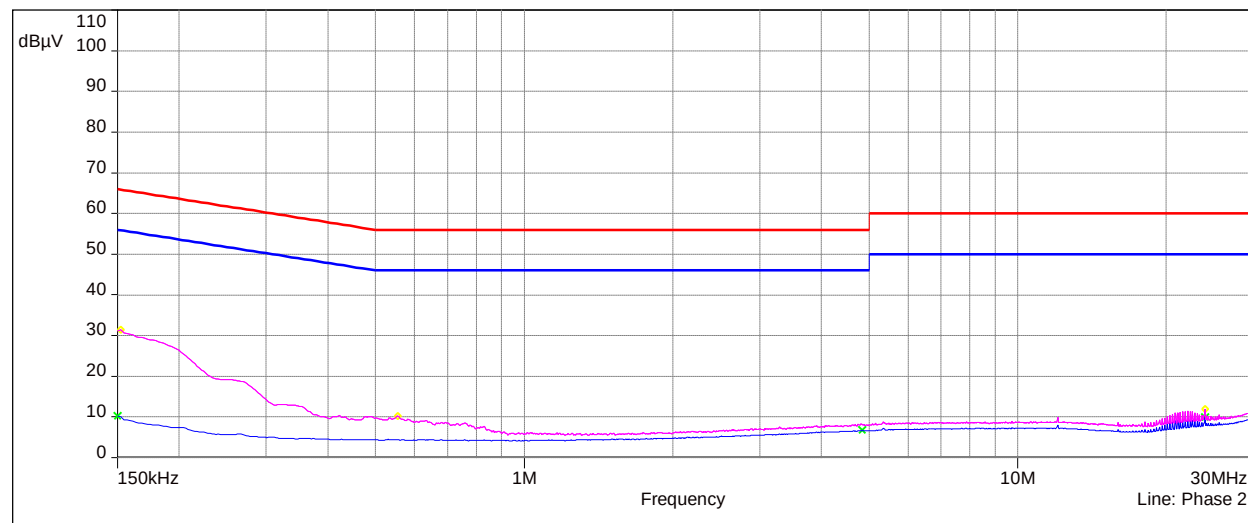
Sub-range 2

Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)

Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, Lim Preamp: Off, Preselector: On

Line:Phase 2

- FCC Part 15/FCC Part 15.107 B - Average/
- FCC Part 15/FCC Part 15.107 B - QPeak/
- Mes. QPeak (Phase 2)
- Mes. CISPR AVG (Phase 2)
- ◊ QPeak (QPeak /Lim. QPeak) (Phase 2)
- × CISPR AVG (CISPR AVG /Lim. Average) (Phase 2)



Model: ; Client: ; Comments: ; Test Date: 12/19/2018 16:50

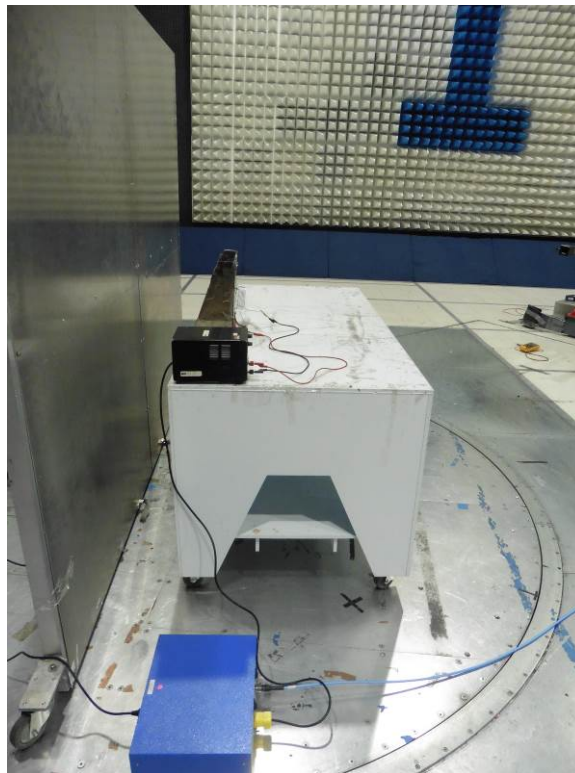
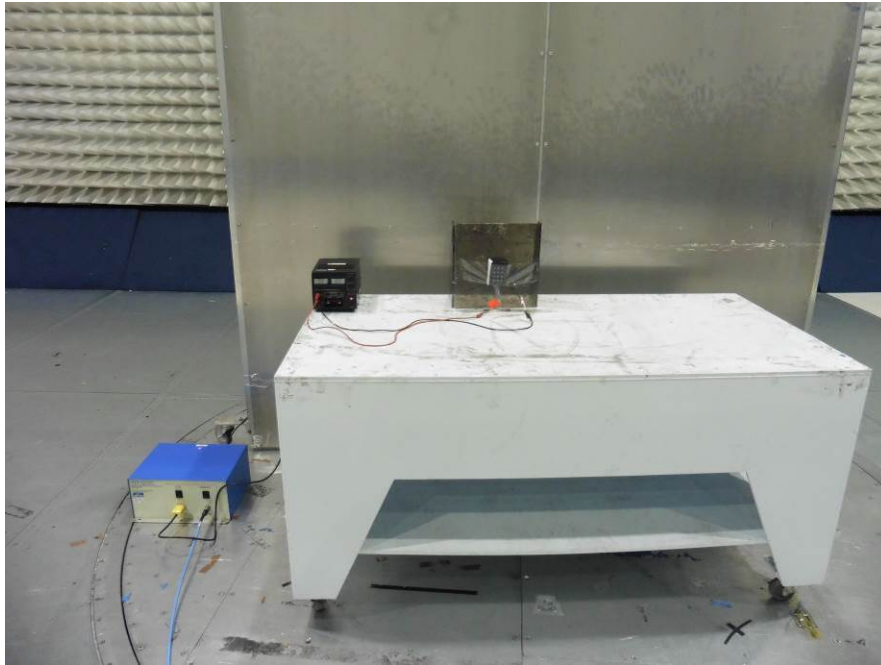
Quasi Peak Table					
Frequency (MHz)	QPeak (dB μ V)	Lim. QPeak (dB μ V)	QPeak-Lim (dB)	Phase	Correction (dB)
0.2	2.0	31.4	65.9	-34.5	Phase 2
0.2	1.0	31.3	65.9	-34.6	Phase 1
0.5	1.0	10.3	56.0	-45.7	Phase 1
0.6	2.0	10.3	56.0	-45.7	Phase 2
24.0	2.0	12.0	60.0	-48.0	Phase 2
24.0	1.0	11.5	60.0	-48.5	Phase 1

Average Table					
Frequency (MHz)	AVG (dB μ V)	Lim. Average (dB μ V)	AVG-Lim (dB)	Phase	Correction (dB)
0.2	2.0	10.2	56.0	-45.8	Phase 2
0.2	1.0	10.2	56.0	-45.8	Phase 1
4.8	2.0	6.7	46.0	-39.3	Phase 2
5.0	1.0	6.8	46.0	-39.3	Phase 1
24.0	2.0	10.0	50.0	-40.0	Phase 2
29.9	1.0	9.8	50.0	-40.2	Phase 1

Results	Complies
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4.2.4 Test Configuration Photographs

The following photographs show the testing configurations used.



4.3 Occupied Bandwidth RSS-GEN

4.3.1 Requirements

The the occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSS.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. 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 (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

4.3.2 Procedure

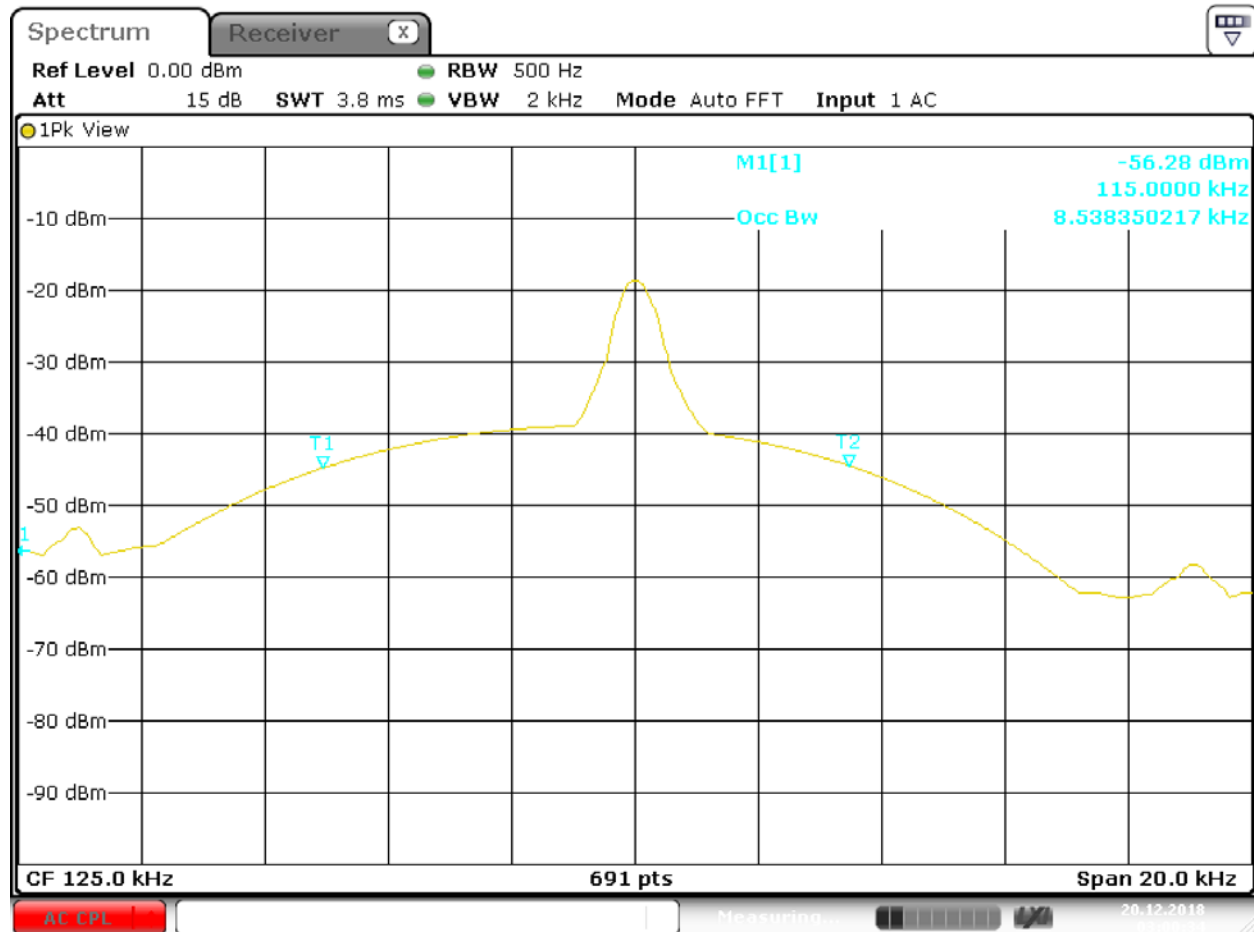
The EUT was setup to transmit in normal operating condition.

Measurements were made with the loop antenna in close proximity of the EUT. Following the procedures of ANSI 63.10, the 99% bandwidth measurements were taken. The Spectrum Analyzers 99% BW measurement function were used to measure the 99% Bandwidth. The following plots show Occupied Bandwidth.

Test date: December 20, 2018

4.3.3 Test Results

Frequency (kHz)	99% Channel Bandwidth (kHz)
125	8.54 kHz



Date: 20.DEC.2018 03:00:34

5.0 List of test equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Asset No.	Calibration Interval	Cal Due
Loop Antenna	EMCO	6512	ITS 01598	12	10/09/19
Pre-Amplifier	Sonoma Instrument	310	ITS 01493	12	10/20/18
EMI Receiver	Rohde and Schwarz	ESR7	ITS 01607	12	10/23/19
BI-Log Antenna	Antenna Research	LPB-2513	ITS 00355	12	02/21/19
LISN	Com Power	LIN-115A	ITS 01283	12	10/03/19
Loop Sensor	Solar Electronics	7334-1	ITS 01608	12	10/09/19

* Calibration performed by ITS prior to the test. # Calibration not required

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.16.0.64	Dormakaba_PKP

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G103769042	ML	KV	January 10, 2019	Original document

END OF REPORT