

FCC REPORT

Applicant: AISOLUTION CO., LTD.

Address of Applicant: 28-4, Samyang-ro 29-gil, Gangbuk-gu, Seoul, South Korea

Equipment Under Test (EUT)

Product Name: KDCSLED UHF 1.0W RFID Module

Model No.: KDCSLED-UHF1.0W

Trade mark: KOAMTAC

FCC ID: VH9-KDCUHF10

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: 11 Oct., 2018

Date of Test: 11 Oct., to 11 Dec., 2018

Date of report issued: 13 Dec., 2018

Test Result: PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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2 Version

Version No.	Date	Description
00	13 Dec., 2018	Original

Tested by: Zora Lee **Date:** 13 Dec., 2018
Test Engineer

Reviewed by: Wimer Zhang **Date:** 13 Dec., 2018
Project Engineer

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4 Test Summary

Test Items	Section in CFR 47	Result
Antenna Requirement	15.203 & 15.247 (c)	Pass
Conducted Peak Output Power	15.247 (b)(2)(1)	Pass
20dB Occupied Bandwidth	15.247 (a)(1) (i)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1) (i)	Pass
Dwell Time	15.247 (a)(1) (i)	Pass
Spurious Emission	15.205 & 15.209	Pass

Pass: The EUT complies with the essential requirements in the standard.
N/A: N/A: Not Applicable.

5 General Information

5.1 Client Information

Applicant:	AISOLUTION CO., LTD.
Address:	28-4, Samyang-ro 29-gil, Gangbuk-gu, Seoul, South Korea
Manufacturer/Factory:	AISOLUTION CO., LTD.
Address:	28-4, Samyang-ro 29-gil, Gangbuk-gu, Seoul, South Korea

5.2 General Description of E.U.T.

Product Name:	KDCSLED UHF 1.0W RFID Module
Model No.:	KDCSLED-UHF1.0W
Operation Frequency:	902 MHz~927MHz
Number of channel:	51
Modulation type:	ASK
Modulation technology:	FHSS
Antenna Type:	PCB antenna
Antenna gain:	4 dBi
Power supply:	Rechargeable Li-polymer DC3.7V-6000mAh
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	902.5 MHz	13	909.0 MHz	26	915.5 MHz	39	922.0 MHz
1	903.0 MHz	14	909.5 MHz	27	916.0 MHz	40	922.5 MHz
2	903.5 MHz	15	910.0 MHz	28	916.5 MHz	41	923.0 MHz
3	904.0 MHz	16	910.5 MHz	29	917.0 MHz	42	923.5 MHz
4	904.5 MHz	17	911.0 MHz	30	917.5 MHz	43	924.0MHz
5	905.0 MHz	18	911.5 MHz	31	918.0 MHz	44	924.5 MHz
6	905.5 MHz	19	912.0 MHz	32	918.5 MHz	45	925.0 MHz
7	906.0 MHz	20	912.5 MHz	33	919.0 MHz	46	925.5 MHz
8	906.5 MHz	21	913.0 MHz	34	919.5 MHz	47	926.0 MHz
9	907.0 MHz	22	913.5 MHz	35	920.0 MHz	48	926.5 MHz
10	907.5 MHz	23	914.0 MHz	36	920.5 MHz	49	927.0 MHz
11	908.0 MHz	24	914.5 MHz	37	921.0 MHz	50	927.5 MHz
12	908.5 MHz	25	915.0 MHz	38	921.5 MHz		

Remark: Channel 0, 25 & 50 selected for tested.

5.3 Test environment and test mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test Modes:	
Non-hopping mode:	Keep the EUT in continuous transmitting mode with worst case data rate.
Hopping mode:	Keep the EUT in hopping mode.

The sample was placed 0.8m (below 1GHz)/1.5m (above 1GHz) above the ground plane of 3m chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working with a fresh battery, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

5.4 Description of Support Units

Manufacturer	Description	Model	S/N	FCC ID/DoC
AlSolution	motherboard	KDC470	N/A	N/A

5.5 Measurement Uncertainty

Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	±2.22 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±2.76 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.28 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.72 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±2.88 dB (k=2)

5.6 Laboratory Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> ● FCC - Registration No.: 727551 Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The Registration No. is 727551. ● IC - Registration No.: 10106A-1 The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1. ● CNAS - Registration No.: CNAS L6048 Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048. ● A2LA - Registration No.: 4346.01 This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: https://portal.a2la.org/scopepdf/4346-01.pdf

5.7 Laboratory Location

<p>Shenzhen Zhongjian Nanfang Testing Co., Ltd. Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road, Bao'an District, Shenzhen, Guangdong, China Tel: +86-755-23118282, Fax: +86-755-23116366 Email: info@ccis-cb.com, Website: http://www.ccis-cb.com</p>

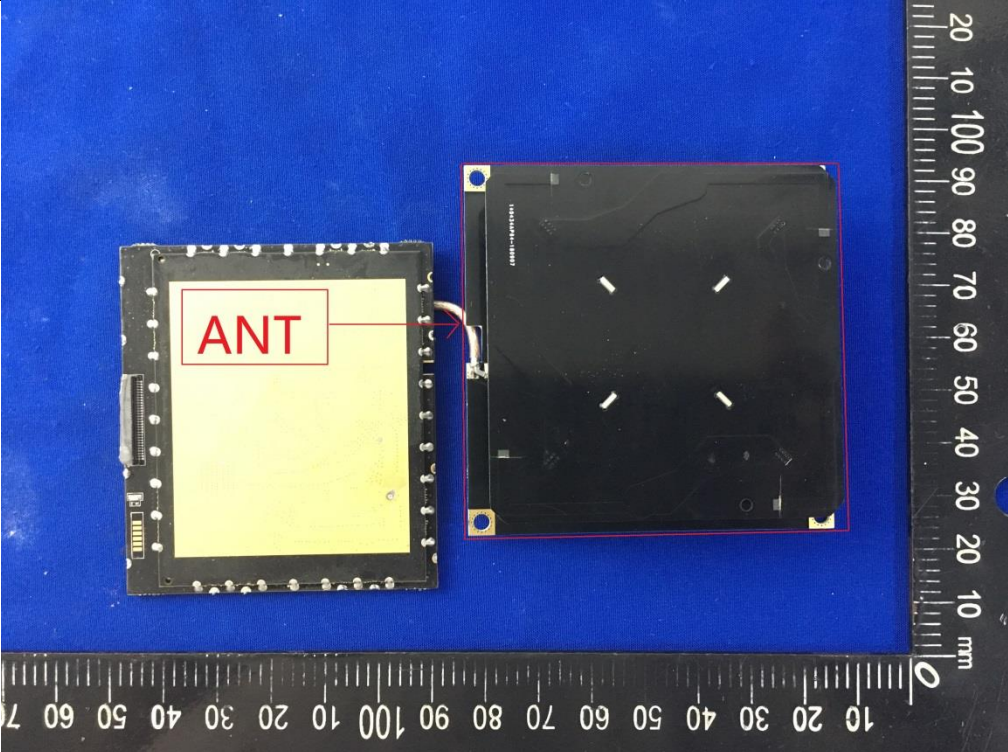
5.8 Test Instruments list

Radiated Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	SAEMC	9m*6m*6m	966	07-22-2017	07-21-2020
Loop Antenna	SCHWARZBECK	FMZB1519B	00044	03-16-2018	03-15-2019
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-16-2018	03-15-2019
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-16-2018	03-15-2019
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-22-2017	06-21-2020
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-21-2017	11-20-2018
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-07-2018	03-06-2019
Pre-amplifier	CD	PAP-1G18	11804	03-07-2018	03-06-2019
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-07-2018	03-06-2019
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-21-2017	11-20-2018
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-07-2018	03-06-2019
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-07-2018	03-06-2019
Cable	MICRO-COAX	MFR64639	K10742-5	03-07-2018	03-06-2019
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-07-2018	03-06-2019
RF Switch Unit	MWRFTTEST	MW200	N/A	N/A	N/A
Test Software	MWRFTTEST	MTS8200	Version: 2.0.0.0		

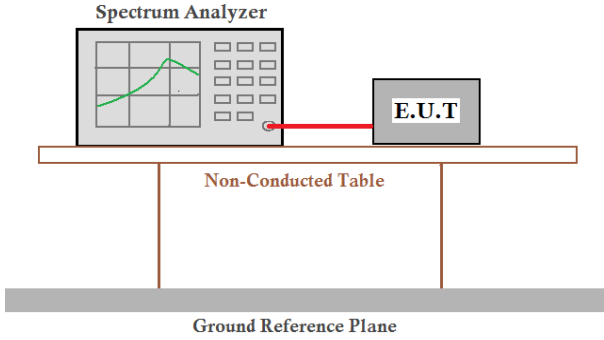
Conducted Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI	101189	03-07-2018	03-06-2019
Pulse Limiter	SCHWARZBECK	OSRAM 2306	9731	03-07-2018	03-06-2019
LISN	CHASE	MN2050D	1447	03-19-2018	03-18-2019
LISN	Rohde & Schwarz	ESH3-Z5	8438621/010	07-21-2018	07-20-2019
Cable	HP	10503A	N/A	03-07-2018	03-06-2019
EMI Test Software	AUDIX	E3	Version: 6.110919b		

6 Test results and measurement data

6.1 Antenna Requirement

Standard requirement:	FCC Part 15 C Section 15.203 & 247(c)
<p>15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.</p>	
E.U.T Antenna:	
<p>The antenna is a Helix antenna which permanently attached, and the best case gain of the antenna is 4 dBi.</p>	
	

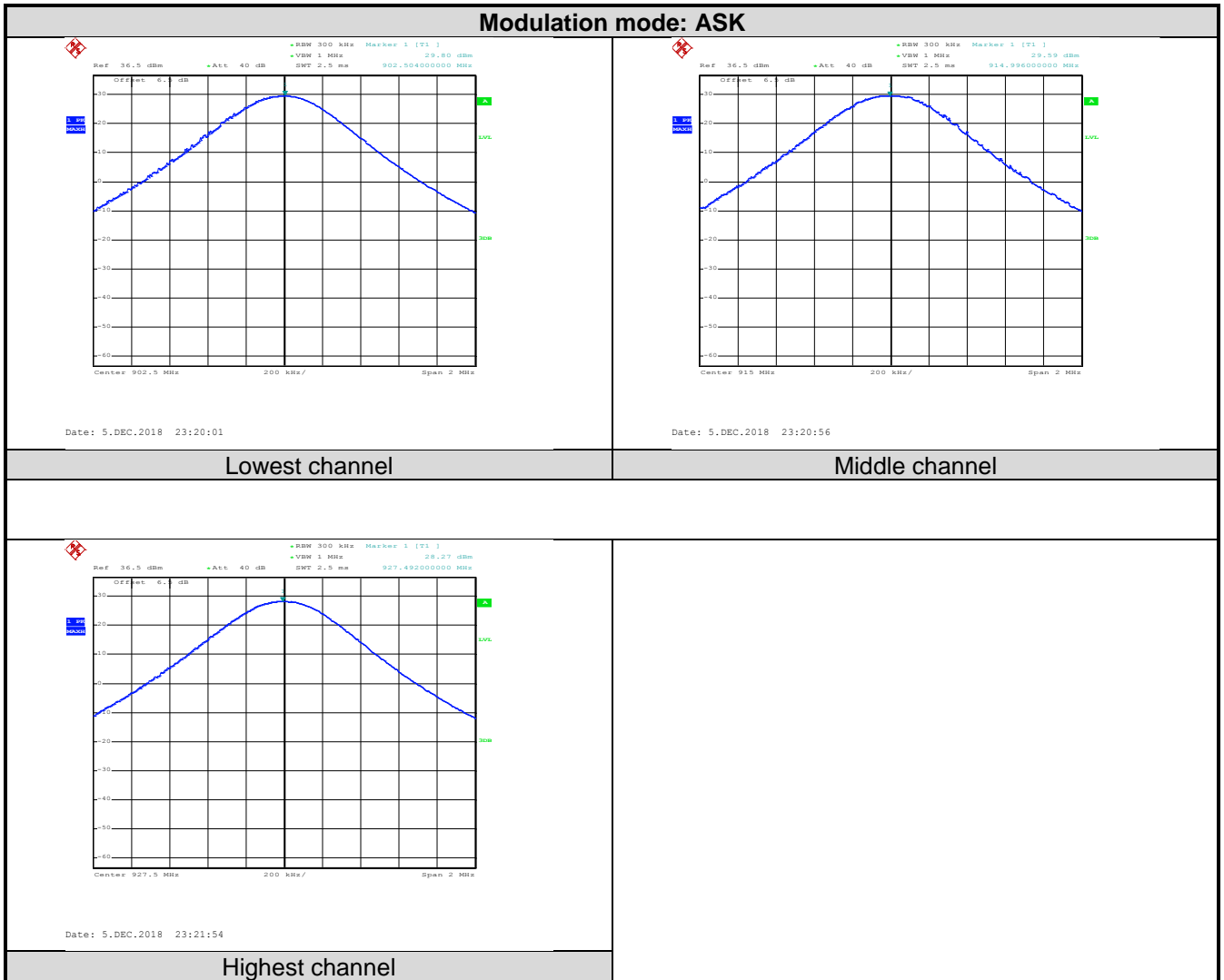
6.2 Conducted Output Power

Test Requirement:	FCC Part 15 C Section 15.247 (b)(2)(1)
Test Method:	ANSI C63.10:2013 and KDB 558074
Receiver setup:	RBW=1MHz, VBW=3MHz, Detector=Peak
Limit:	For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels;
Test setup:	 <p>The diagram shows a Spectrum Analyzer and an E.U.T. (Equipment Under Test) connected by a red cable. They are positioned on a table labeled 'Non-Conducted Table', which is supported by a 'Ground Reference Plane'.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Non-hopping mode
Test results:	Pass

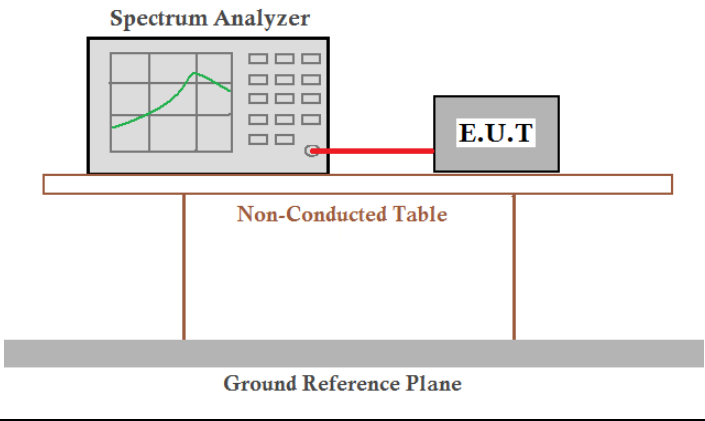
Measurement Data:

Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
ASK mode			
Lowest channel	29.80	30.00	Pass
Middle channel	29.59	30.00	Pass
Highest channel	28.27	30.00	Pass

Test plot as follows:



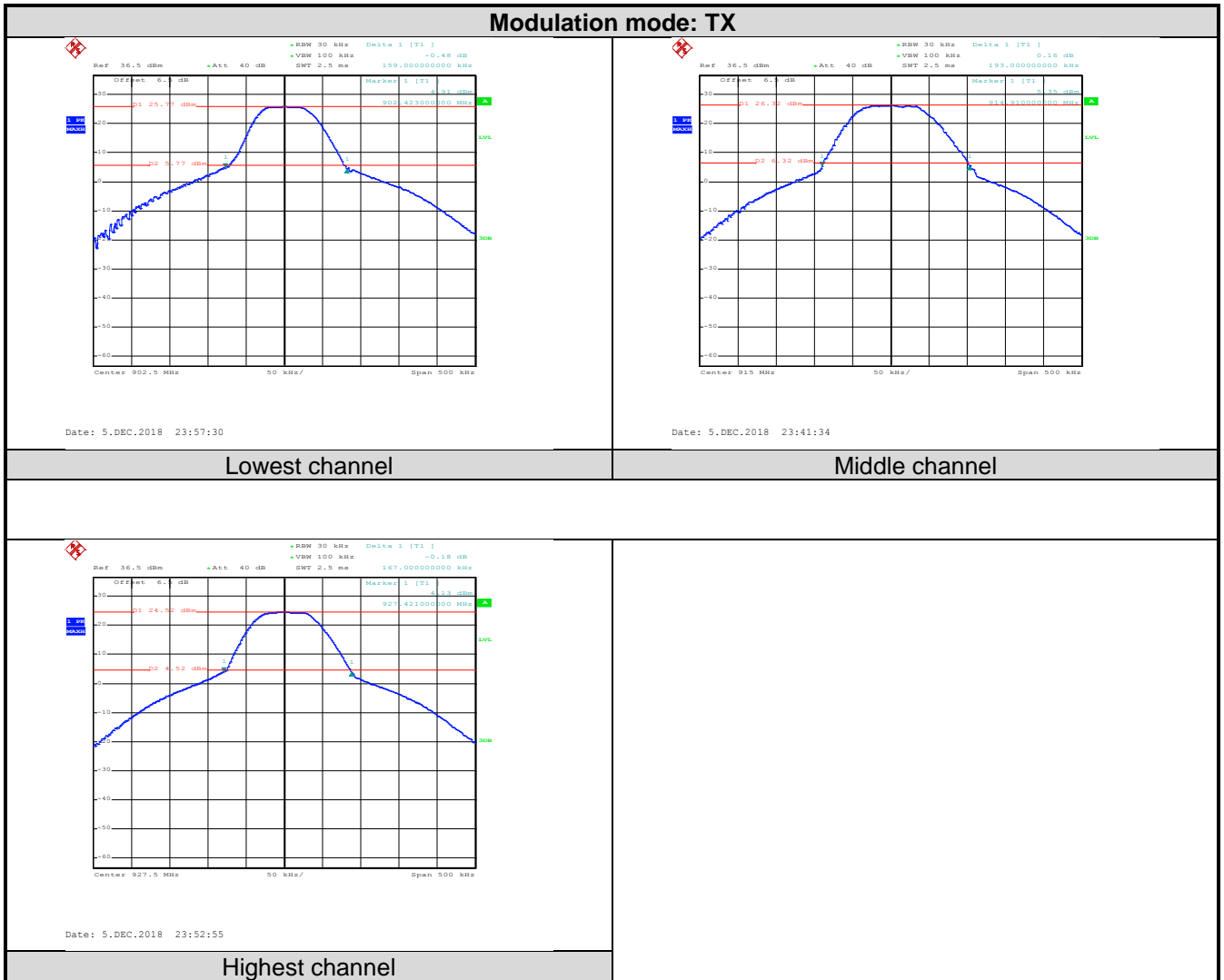
6.3 20dB Occupy Bandwidth

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1)(i)
Test Method:	ANSI C63.10:2013 and KDB 558074
Receiver setup:	RBW=30 kHz, VBW=100 kHz, detector=Peak
Limit:	<500KHz
Test setup:	 <p>The diagram shows a Spectrum Analyzer on the left and an E.U.T. (Equipment Under Test) on the right. They are connected by a red cable. Both are placed on a table labeled 'Non-Conducted Table'. Below the table is a 'Ground Reference Plane'.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Non-hopping mode
Test results:	Pass

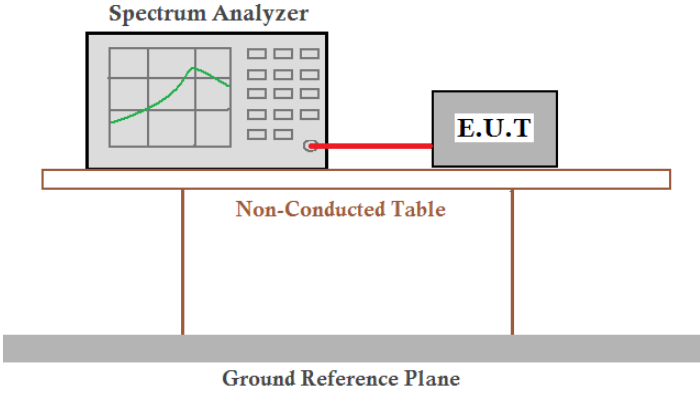
Measurement Data:

Test channel	20dB Occupy Bandwidth (kHz)			
	Lowest	Middle	Highest	Result
	159	193	167	PASS

Test plot as follows:



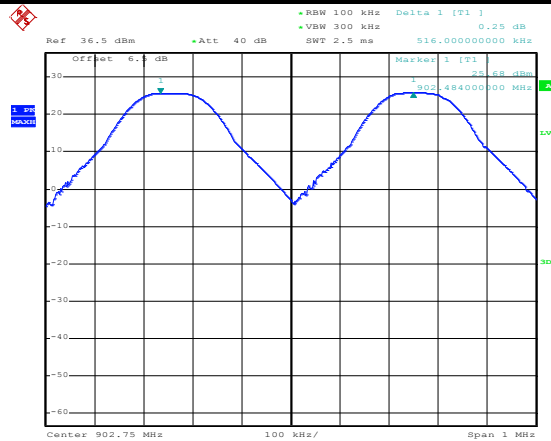
6.4 Carrier Frequencies Separation

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 and KDB 558074
Receiver setup:	RBW=100 kHz, VBW=300 kHz, detector=Peak
Limit:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Hopping mode
Test results:	Pass

Measurement Data

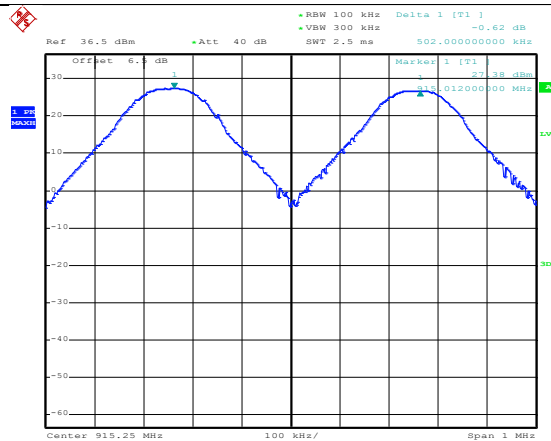
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
ASK			
Lowest	516	159	Pass
Middle	502	193	Pass
Highest	502	167	Pass

Test plot as follows:



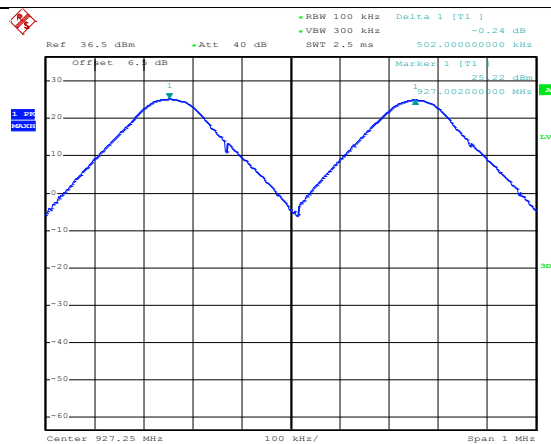
Date: 6.DEC.2018 00:11:12

Lowest channel



Date: 6.DEC.2018 00:43:32

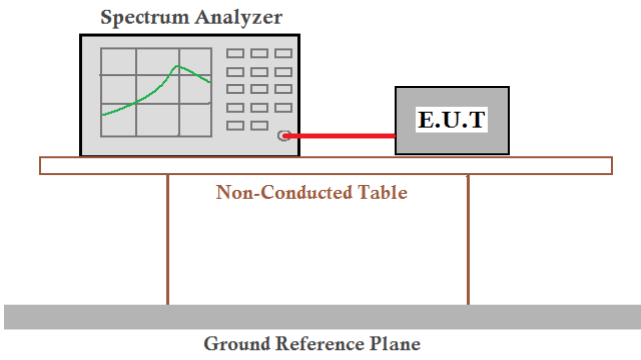
Middle channel



Date: 6.DEC.2018 00:50:54

Highest channel

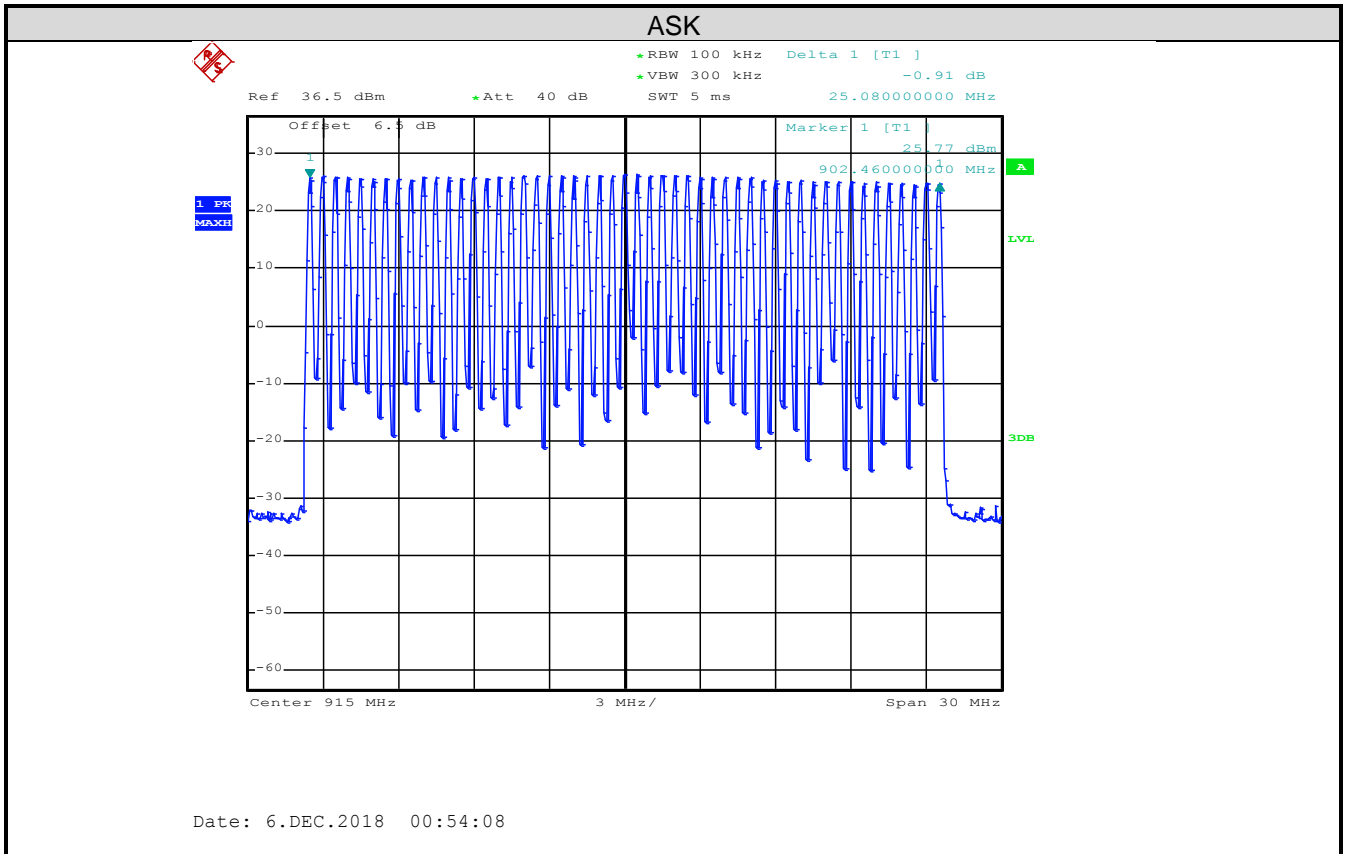
6.5 Hopping Channel Number

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1)(i)
Test Method:	ANSI C63.10:2013 and KDB 558074
Receiver setup:	RBW=100 kHz, VBW=300 kHz, Detector=Peak
Limit:	For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Hopping mode
Test results:	Pass

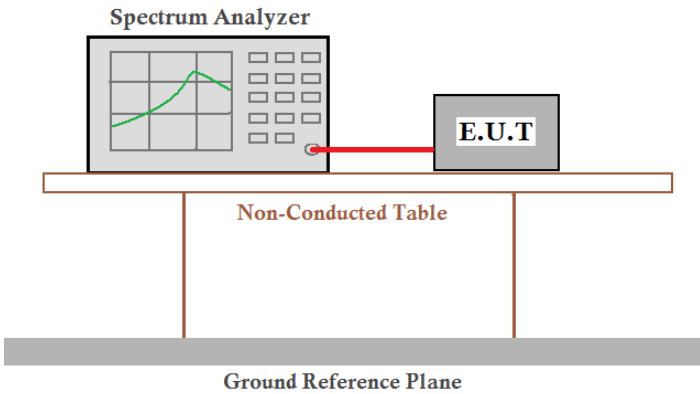
Measurement Data:

Mode	Hopping channel numbers	Limit	Result
ASK	51	50	Pass

Test plot as follows:



6.6 Dwell Time

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1)(i)
Test Method:	ANSI C63.10:2013 and KDB 558074
Receiver setup:	RBW=1 MHz, VBW=1 MHz, Span=0 Hz, Detector=Peak
Limit:	Occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Hopping mode
Test results:	Pass

Measurement Data:

Mode	20 second period (numbers)	Dwell time (second)	Limit (second)	Result
ASK	18	0.29268	0.4	Pass

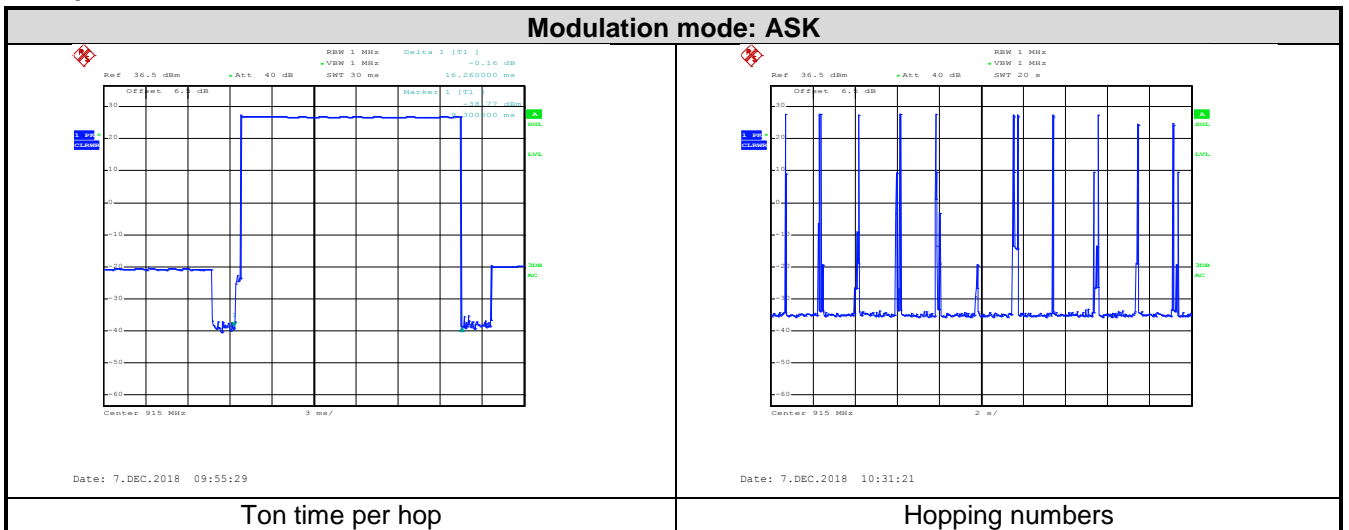
Note:

Calculation Formula: Dwell time = Ton time per hop * Hopping numbers

For example:

Time slot=0.01626*18 =0.29268s

Test plot as follows:

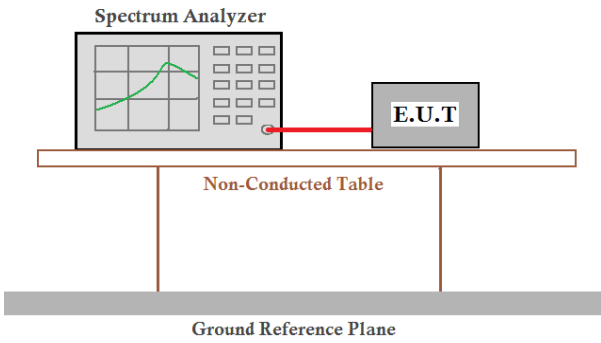


6.7 Pseudorandom Frequency Hopping Sequence

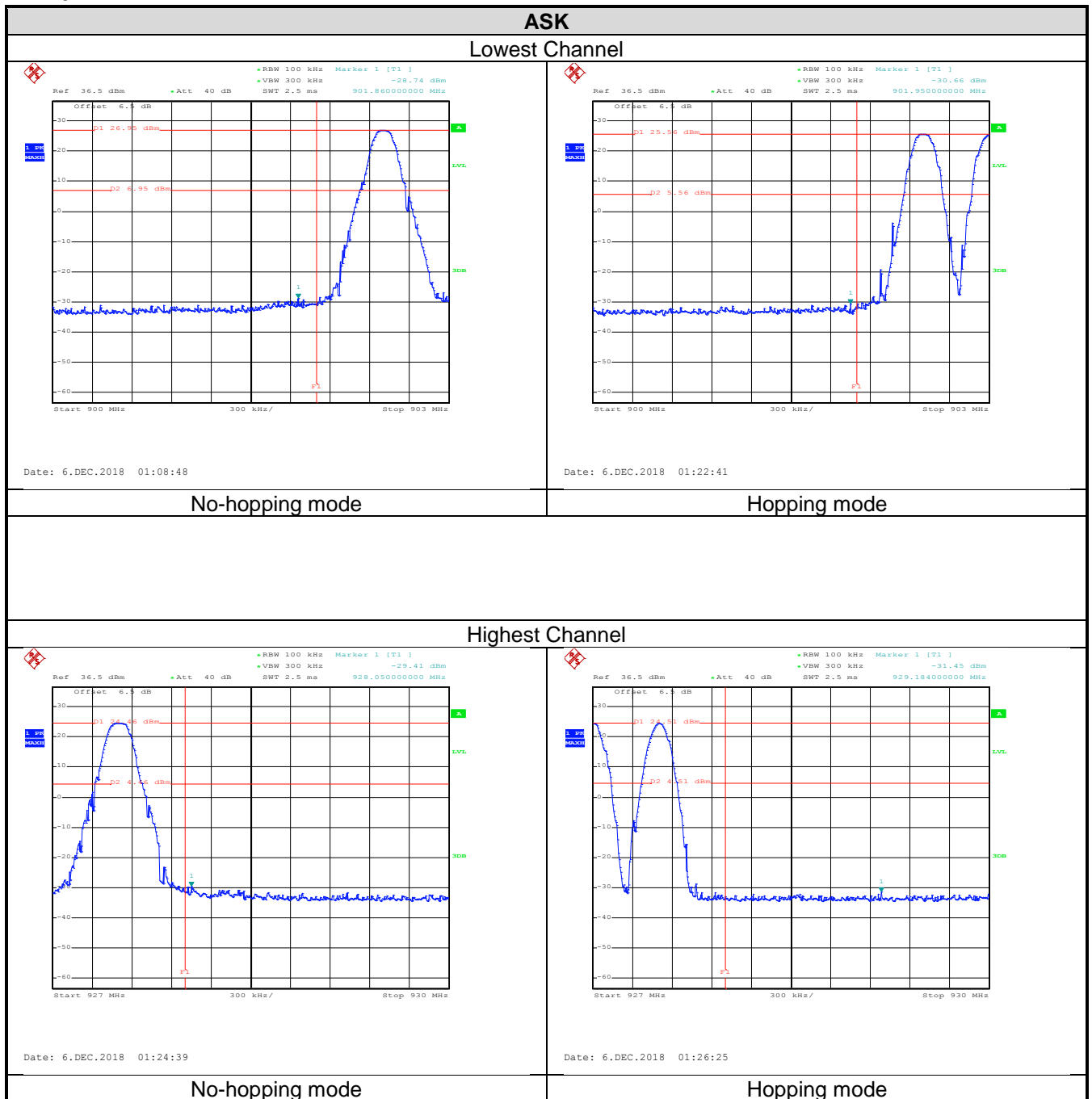
Test Requirement:	FCC Part 15 C Section 15.247 (a)(1) requirement:
<p>Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.</p> <p>Alternatively, Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.</p>	
EUT Pseudorandom Frequency Hopping Sequence	
<p>The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones.</p> <ul style="list-style-type: none"> • Number of shift register stages: 9 • Length of pseudo-random sequence: $2^9 - 1 = 511$ bits • Longest sequence of zeros: 8 (non-inverted signal) <div data-bbox="256 909 1294 1055" style="text-align: center;"> </div> <p style="text-align: center;"><i>Linear Feedback Shift Register for Generation of the PRBS sequence</i></p> <p>An example of Pseudorandom Frequency Hopping Sequence as follow:</p> <div data-bbox="256 1155 1241 1301" style="text-align: center;"> </div> <p>Each frequency used equally on the average by each transmitter. The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.</p>	

6.8 Band Edge

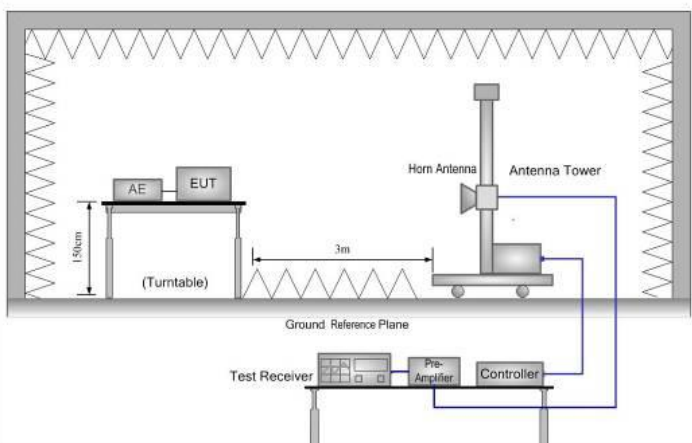
6.8.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB 558074
Receiver setup:	RBW=100 kHz, VBW=300 kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Non-hopping mode and hopping mode
Test results:	Pass

Test plot as follows:

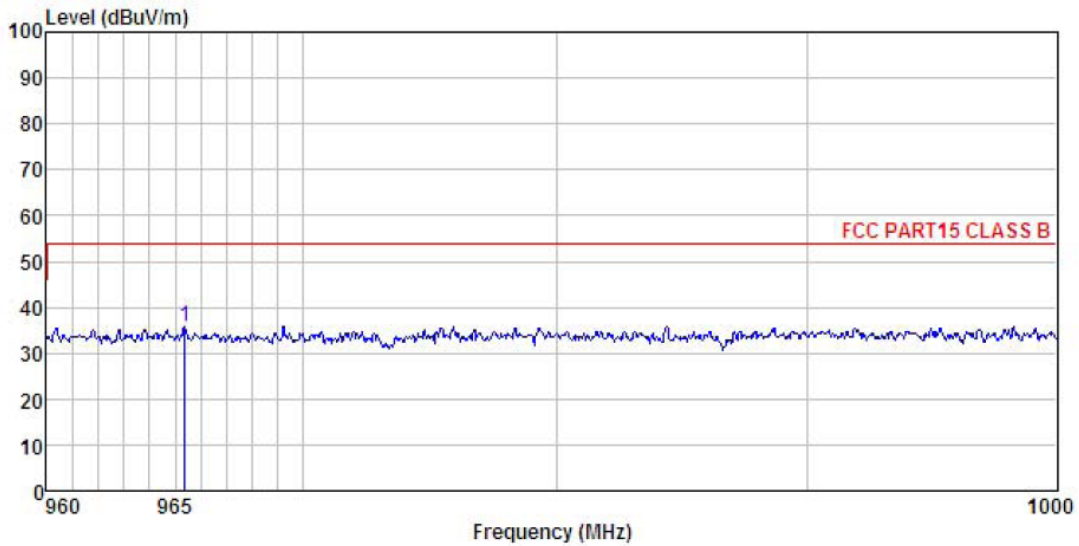


6.8.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10: 2013				
Test Frequency Range:	960MHz to1240MHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value
Limit:	Frequency	Limit (dBuV/m @3m)		Remark	
	Above 1GHz	54.00		Average Value	
		74.00		Peak Value	
Test setup:					
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 1.5meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 				
Test Instruments:	Refer to section 5.8 for details				
Test mode:	Non-hopping mode				
Test results:	Passed				

Below 1GHz:

Product Name:	KDCSLED UHF 1.0W RFID Module	Product Model:	KDCSLED-UHF1.0W
Test By:	Zora	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Vertical
Test Voltage:	DC 3.7V	Environment:	Temp: 24°C Humi: 57%



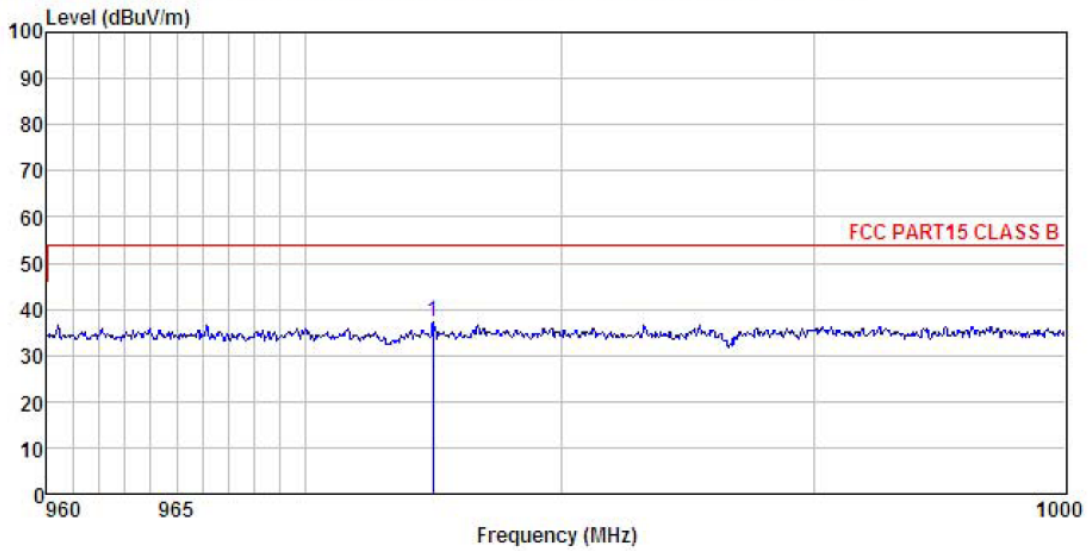
Remark :

	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 965.384	9.04	22.53	4.29	0.00	35.86	54.00	-18.14

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	KDCSLED UHF 1.0W RFID Module	Product Model:	KDCSLED-UHF1.0W
Test By:	Zora	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Horizontal
Test Voltage:	DC 3.7V	Environment:	Temp: 24°C Humi: 57%



Remark :

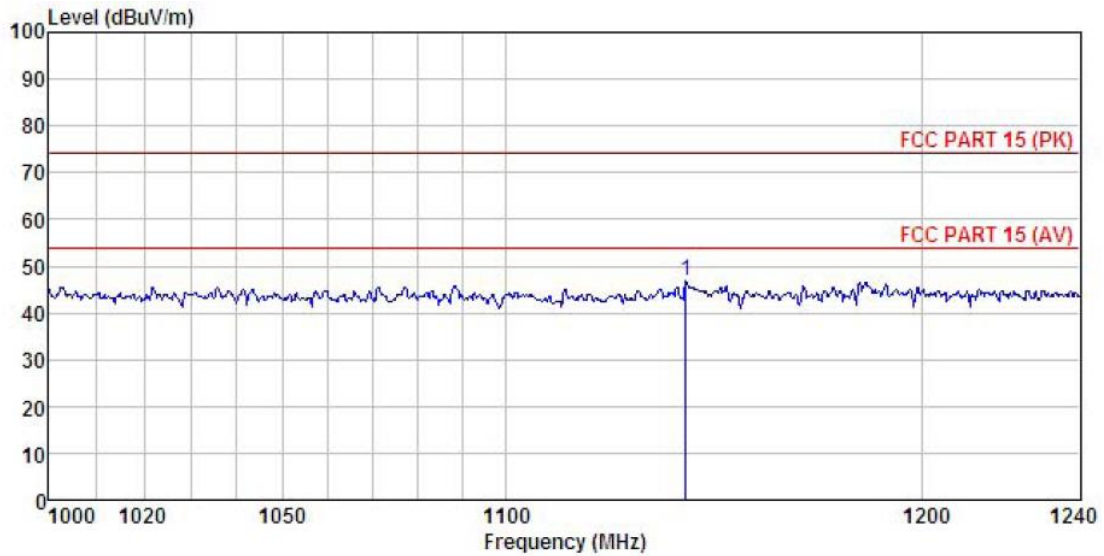
	ReadAntenna	Cable Preamp	Limit	Over				
Freq	Level	Factor	Loss	Factor	Level			
-----	-----	-----	-----	-----	-----			
MHz	dBuV	dB/m	dB	dB	dBuV/m			
1	974.968	10.33	22.60	4.34	0.00	37.27	54.00	-16.73

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Above 1GHz:

Product Name:	KDCSLED UHF 1.0W RFID Module	Product Model:	KDCSLED-UHF1.0W
Test By:	Zora	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Vertical
Test Voltage:	DC 3.7V	Environment:	Temp: 24°C Huni: 57%



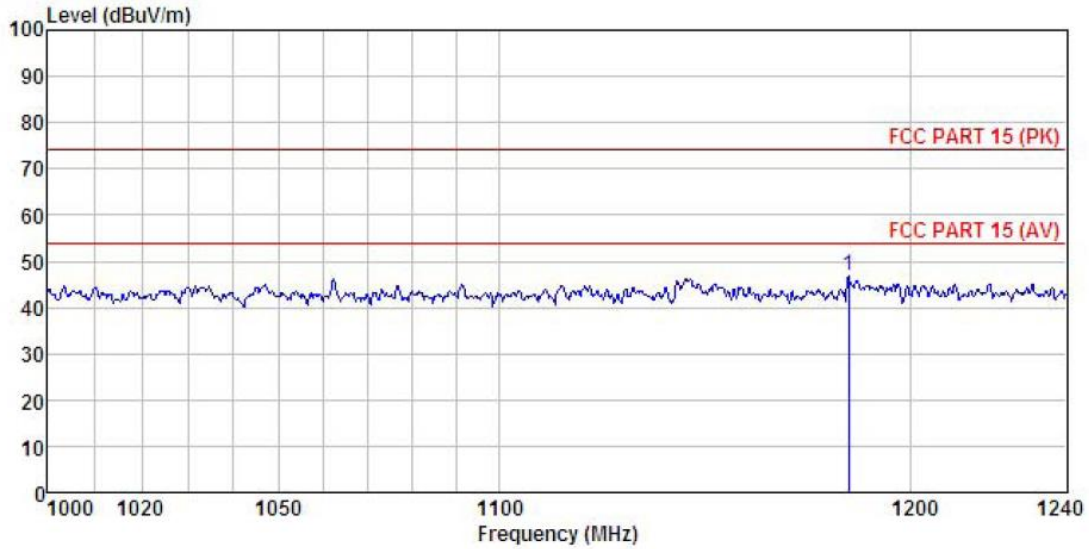
Remark :

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1142.180	19.38	24.12	3.23	0.00	46.73	74.00	-27.27	

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	KDCSLED UHF 1.0W RFID Module	Product Model:	KDCSLED-UHF1.0W
Test By:	Zora	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Horizontal
Test Voltage:	DC 3.7V	Environment:	Temp: 24°C Huni: 57%



Remark :

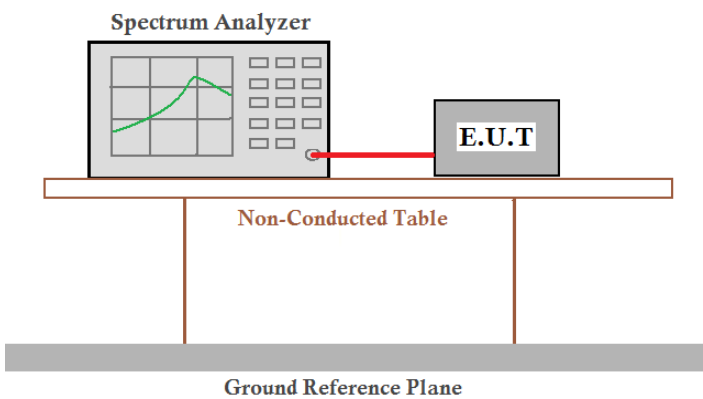
	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 1184.212	19.23	24.27	3.29	0.00	46.79	74.00	-27.21

Remark:

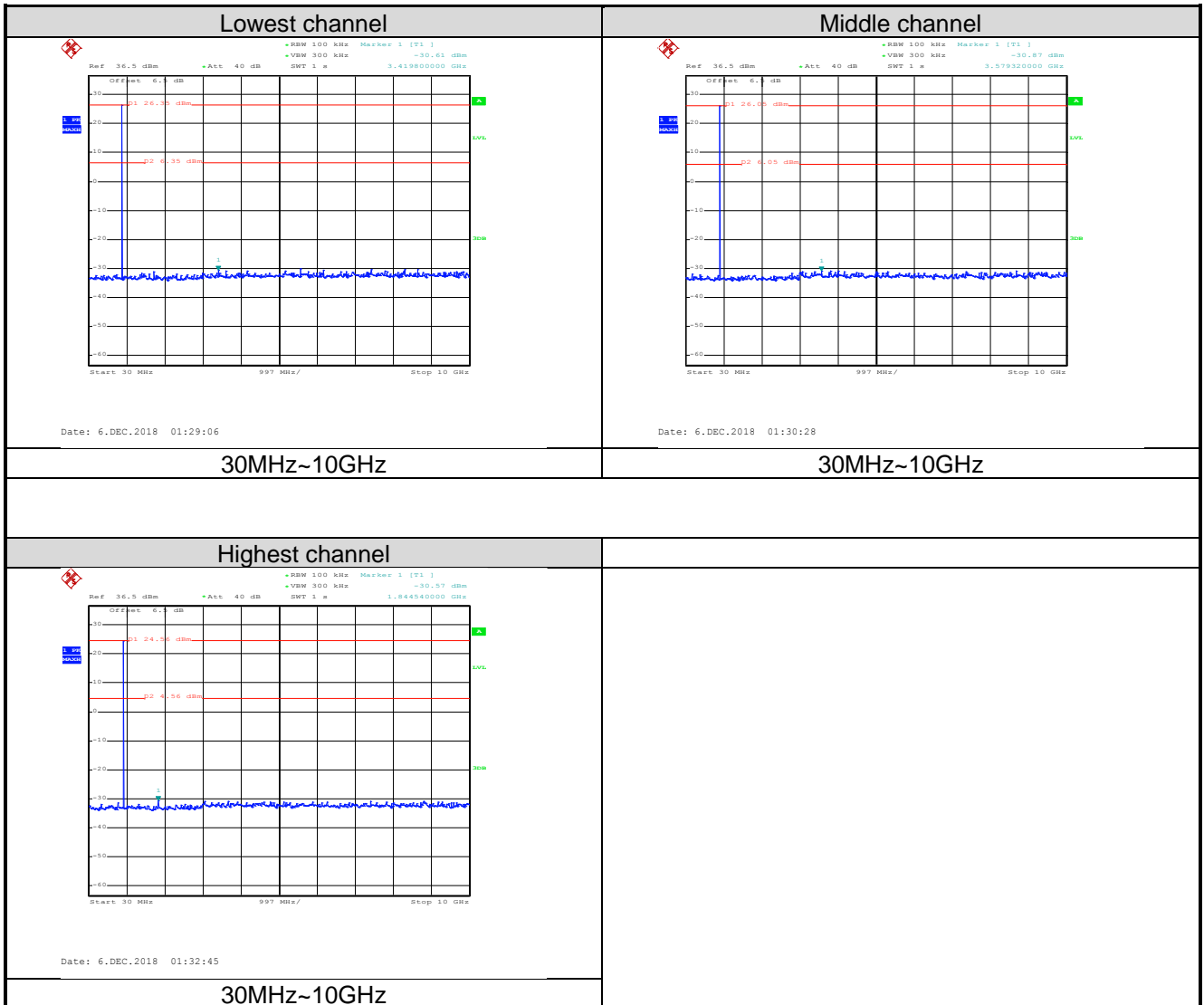
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

6.9 Spurious Emission

6.9.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB 558074
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Non-hopping mode
Test results:	Pass

Test plot as follows:



6.9.2 Radiated Emission Method

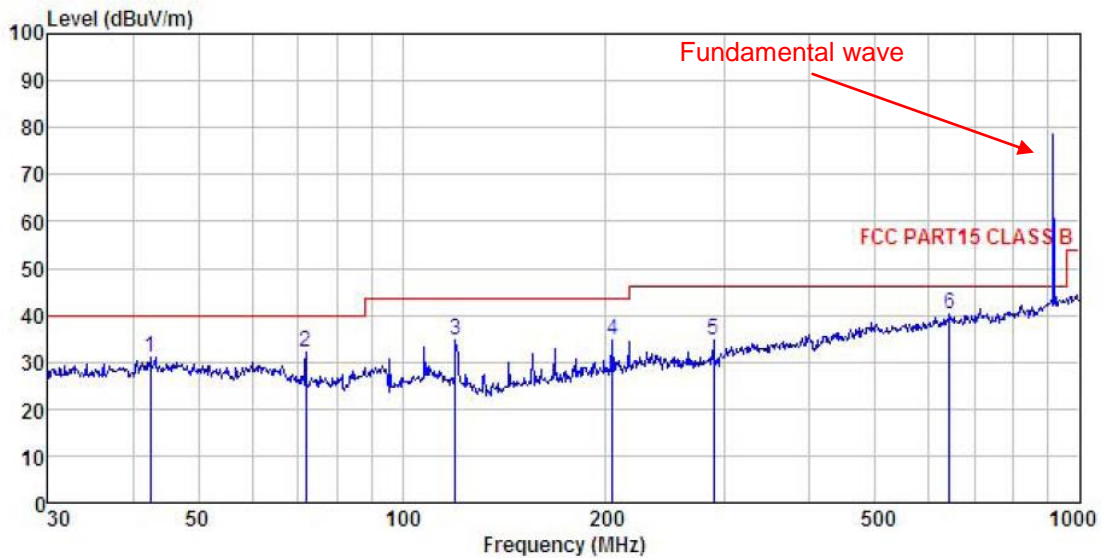
Test Requirement:	FCC Part 15 C Section 15.209				
Test Method:	ANSI C63.10: 2013				
Test Frequency Range:	9 kHz to 10 GHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
RMS		1MHz	3MHz	Average Value	
Limit:	Frequency	Limit (dBuV/m @3m)		Remark	
	30MHz-88MHz	40.0		Quasi-peak Value	
	88MHz-216MHz	43.5		Quasi-peak Value	
	216MHz-960MHz	46.0		Quasi-peak Value	
	Above 1GHz	54.0		Average Value	
		74.0		Peak Value	
Test setup:	Below 1GHz				
Test setup:	Above 1GHz				
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz) /1.5m(above 1GHz) above the ground at a 3 meter chamber. The table				

	<p>was rotated 360 degrees to determine the position of the highest radiation.</p> <ol style="list-style-type: none"> 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Non-hopping mode
Test results:	Pass
Remark:	<ol style="list-style-type: none"> 1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case. 2. 9 kHz to 30 MHz is noise floor, so only shows the data of above 30MHz in this report.

Measurement Data (worst case):

Below 1GHz:

Product Name:	KDCSLED UHF 1.0W RFID Module	Product Model:	KDCSLED-UHF1.0W
Test By:	Zora	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	DC 3.7V	Environment:	Temp: 24°C Humi: 57%



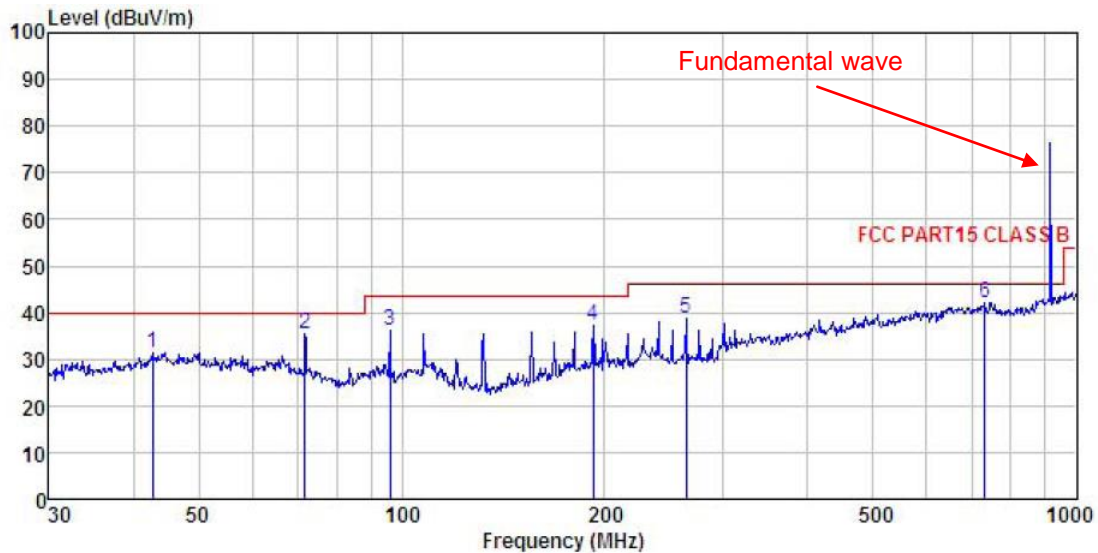
Remark :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	42.451	16.49	13.25	1.25	0.00	30.99	40.00	-9.01	QP
2	72.084	21.52	8.88	1.56	0.00	31.96	40.00	-8.04	QP
3	119.856	22.33	10.23	2.17	0.00	34.73	43.50	-8.77	QP
4	204.238	19.99	11.67	2.87	0.00	34.53	43.50	-8.97	QP
5	287.990	18.33	13.53	2.91	0.00	34.77	46.00	-11.23	QP
6	642.861	16.67	19.72	3.87	0.00	40.26	46.00	-5.74	QP

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	KDCSLED UHF 1.0W RFID Module	Product Model:	KDCSLED-UHF1.0W
Test By:	Zora	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	DC 3.7V	Environment:	Temp: 24°C Humi: 57%



Remark :

	Read Freq	Antenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	42.750	16.76	13.31	1.25	0.00	31.32	40.00	-8.68	QP
2	71.832	25.00	8.91	1.56	0.00	35.47	40.00	-4.53	QP
3	96.099	23.06	11.06	2.00	0.00	36.12	43.50	-7.38	QP
4	192.419	23.30	11.27	2.82	0.00	37.39	43.50	-6.11	QP
5	263.819	22.61	13.39	2.85	0.00	38.85	46.00	-7.15	QP
6	731.920	17.23	20.58	4.29	0.00	42.10	46.00	-3.90	QP

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Above 1GHz:

Test channel: Lowest channel								
Detector: Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1805.00	71.29	25.98	4.12	41.22	60.17	74.00	-13.83	Vertical
2707.50	57.41	28.04	5.05	41.76	48.74	74.00	-25.26	Vertical
3610.00	54.46	29.21	5.90	41.55	48.02	74.00	-25.98	Vertical
4512.50	49.53	31.13	6.82	42.07	45.41	74.00	-28.59	Vertical
5415.00	50.75	32.32	7.13	41.86	48.34	74.00	-25.66	Vertical
1805.00	68.38	25.98	4.12	41.22	57.26	74.00	-16.74	Horizontal
2707.50	60.34	28.04	5.05	41.76	51.67	74.00	-22.33	Horizontal
3610.00	52.11	29.21	5.90	41.55	45.67	74.00	-28.33	Horizontal
4512.50	48.53	31.13	6.82	42.07	44.41	74.00	-29.59	Horizontal
5415.00	49.68	32.32	7.13	41.86	47.27	74.00	-26.73	Horizontal
Detector: Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1805.00	63.14	25.98	4.12	41.22	52.02	54.00	-1.98	Vertical
2707.50	51.24	28.04	5.05	41.76	42.57	54.00	-11.43	Vertical
3610.00	49.13	29.21	5.90	41.55	42.69	54.00	-11.31	Vertical
4512.50	40.78	31.13	6.82	42.07	36.66	54.00	-17.34	Vertical
5415.00	41.23	32.32	7.13	41.86	38.82	54.00	-15.18	Vertical
1805.00	61.89	25.98	4.12	41.22	50.77	54.00	-3.23	Horizontal
2707.50	54.79	28.04	5.05	41.76	46.12	54.00	-7.88	Horizontal
3610.00	47.14	29.21	5.90	41.55	40.70	54.00	-13.30	Horizontal
4512.50	40.23	31.13	6.82	42.07	36.11	54.00	-17.89	Horizontal
5415.00	41.58	32.32	7.13	41.86	39.17	54.00	-14.83	Horizontal
<p>Remark:</p> <ol style="list-style-type: none"> Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor. The emission levels of other frequencies are very lower than the limit and not show in test report. 								

Test channel: Middle channel								
Detector: Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1854.00	71.30	26.02	4.15	41.27	60.20	74.00	-13.80	Vertical
2781.00	60.95	28.12	5.08	41.72	52.43	74.00	-21.57	Vertical
3708.00	56.27	29.34	5.95	41.62	49.94	74.00	-24.06	Vertical
4635.00	48.63	31.23	6.87	42.12	44.61	74.00	-29.39	Vertical
5562.00	50.12	32.39	7.20	41.83	47.88	74.00	-26.12	Vertical
1854.00	68.40	26.02	4.15	41.27	57.30	74.00	-16.70	Horizontal
2781.00	61.82	28.12	5.08	41.72	53.30	74.00	-20.70	Horizontal
3708.00	52.69	29.34	5.95	41.62	46.36	74.00	-27.64	Horizontal
4635.00	48.78	31.23	6.87	42.12	36.48	74.00	-37.52	Horizontal
5562.00	50.69	32.39	7.20	41.83	48.45	74.00	-25.55	Horizontal
Detector: Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1854.00	63.16	26.02	4.15	41.27	52.06	54.00	-1.94	Vertical
2781.00	53.82	28.12	5.08	41.72	45.30	54.00	-8.70	Vertical
3708.00	50.95	29.34	5.95	41.62	44.62	54.00	-9.38	Vertical
4635.00	40.25	31.23	6.87	42.12	36.23	54.00	-17.77	Vertical
5562.00	41.69	32.39	7.20	41.83	39.45	54.00	-14.55	Vertical
1854.00	61.79	26.02	4.15	41.27	50.69	54.00	-3.31	Horizontal
2781.00	55.73	28.12	5.08	41.72	47.21	54.00	-6.79	Horizontal
3708.00	46.71	29.34	5.95	41.62	40.38	54.00	-13.62	Horizontal
4635.00	40.86	31.23	6.87	42.12	36.84	54.00	-17.16	Horizontal
5562.00	42.58	32.39	7.20	41.83	40.34	54.00	-13.66	Horizontal
<p>Remark:</p> <p>3. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.</p> <p>4. The emission levels of other frequencies are very lower than the limit and not show in test report.</p>								

Test channel: Highest channel								
Detector: Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1855.00	68.31	26.08	4.17	41.32	57.24	74.00	-16.76	Vertical
2782.50	60.82	28.19	5.12	41.68	52.45	74.00	-21.55	Vertical
3710.00	55.19	29.47	6.00	41.68	48.98	74.00	-25.02	Vertical
4637.50	48.56	31.32	6.88	42.07	44.69	74.00	-29.31	Vertical
5565.00	50.23	32.52	7.27	41.80	48.22	74.00	-25.78	Vertical
1855.00	68.77	26.08	4.17	41.32	57.70	74.00	-16.30	Horizontal
2782.50	61.19	28.19	5.12	41.68	52.82	74.00	-21.18	Horizontal
3710.00	52.13	29.47	6.00	41.68	45.92	74.00	-28.08	Horizontal
4637.50	48.52	31.32	6.88	42.07	44.65	74.00	-29.35	Horizontal
5565.00	49.76	32.52	7.27	41.80	47.75	74.00	-26.25	Horizontal
Detector: Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1855.00	61.74	26.08	4.17	41.32	50.67	54.00	-3.33	Vertical
2782.50	54.14	28.19	5.12	41.68	45.77	54.00	-8.23	Vertical
3710.00	50.17	29.47	6.00	41.68	43.96	54.00	-10.04	Vertical
4637.50	40.69	31.32	6.88	42.07	36.82	54.00	-17.18	Vertical
5565.00	41.74	32.52	7.27	41.80	39.73	54.00	-14.27	Vertical
1855.00	61.51	26.08	4.17	41.32	50.44	54.00	-3.56	Horizontal
2782.50	55.46	28.19	5.12	41.68	47.09	54.00	-6.91	Horizontal
3710.00	47.10	29.47	6.00	41.68	40.89	54.00	-13.11	Horizontal
4637.50	40.25	31.32	6.88	42.07	36.38	54.00	-17.62	Horizontal
5565.00	41.75	32.52	7.27	41.80	39.74	54.00	-14.26	Horizontal
<i>Remark:</i> 5. $Final\ Level = Receiver\ Read\ level + Antenna\ Factor + Cable\ Loss - Preamplifier\ Factor.$ 6. <i>The emission levels of other frequencies are very lower than the limit and not show in test report.</i>								