

Date : 2016-08-12 No. : HM170347	Page 1 of 45	
Applicant:	Venture Global Limited Room 1102, 11/F., Fabrico Industrial Building, 78-84 Kwai Chec Road, Kwai Chung, N.T., Hong Kong	ong
Manufacturer:	Venture Global Limited Room 1102, 11/F., Fabrico Industrial Building, 78-84 Kwai Cheo Road, Kwai Chung, N.T., Hong Kong	ong
Description of Sample(s):	Product:Wireless Outdoor Motion DetectorBrand Name:GuardmanModel Number:DWS-K200FCC ID:YAHDWKSK2	
Date Sample(s) Received:	2016-07-20	
Date Tested:	2016-08-05	
Investigation Requested:	Perform ElectroMagnetic Interference measurement in accordance with FCC 47 CFR [Codes of Federal Regulations] Part 15: 2015 and ANSI C63.10-2013 for FCC Certification.	
Conclusion(s):	The submitted product <u>COMPLIED</u> with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.	
Remark(s):		

CHEUNG Chi, Kenneth Authorized Signatory ElectroMagnetic Compatibility Department For and on behalf of The Hong Kong Standards and Testing Centre Ltd.



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<u>1.0</u> General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd. EMC Laboratory 10 Dai Wang Street, Taipo Industrial Estate

Telephone:(852) 26661888Fax:(852) 26644353

1.2 Equipment Under Test [EUT] Description of Sample(s)

Product:	Wireless Outdoor Motion Detector
Manufacturer:	Venture Global Limited
	Room 1102, 11/F., Fabrico Industrial Building, 78-84 Kwai
	Cheong Road, Kwai Chung, N.T., Hong Kong
Brand Name:	Guardman
Model Number:	DWS-K200
Rating:	6Vd.c. ("AA" size battery x 4)

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a Wireless Outdoor Motion Detector. The R.F. signal was modulated by IC, the type of modulation is FSK modulation and the spread spectrum technique used is Frequency hopping spread spectrum modulation.

1.3 Date of Order

2016-07-20

1.4 Submitted Sample(s):

2 Sample(s)

1.5 Test Duration

2016-08-05

1.6 Country of Origin

China

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1.7 **RF Module Details**

Si4432
GFSK
902-928MHz
902.25MHz - 926.75MHz

Module Specification (specification provided by manufacturer)

1.8 Antenna Details

Antenna Model: Antenna Type: Antenna Length: Antenna Gain: N/A Omnidirectional antenna 25.5mm 0dBi



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<u>2.0</u> <u>Technical Details</u>

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2015 Regulations and ANSI C63.10-2013 Test Method for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION (RFID) Results Summary						
Test Condition Test Requirement Test Method Class / Test Result						t
			Severity	Pass	Fail	N/A
Maximum Peak Conducted Output Power	FCC 47CFR 15.247(b)(2)	ANSI C63.10-2013	N/A	\boxtimes		
Radiated Spurious Emissions	FCC 47CFR 15.209	ANSI C63.10-2013	N/A	\boxtimes		
Number of Hopping	FCC 47CFR	ANSI C63.10-2013	N/A	\boxtimes		
Frequency	15.247(a)(1)					
20dB Bandwidth	FCC 47CFR 15.247(a)(1)	ANSI C63.10-2013	N/A	\boxtimes		
Hopping Channel Separation	FCC 47CFR 15.247(a)(1)	ANSI C63.10-2013	N/A	\boxtimes		
Band-edge measurement (Radiated)	FCC 47CFR 15.247(d)	ANSI C63.10-2013	N/A	\boxtimes		
Pseudorandom Hopping Algorithm	FCC 47CFR 15.247(a)(1)	N/A	N/A	\boxtimes		
Time of Occupancy (Dwell Time)	FCC 47CFR 15.247(a)(1)	ANSI C63.10-2013	N/A	\boxtimes		
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	\boxtimes		
RF Exposure	FCC 47CFR 15.247(i)	N/A	N/A	\boxtimes		

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2.3 Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate in the table below is the worst case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode
Maximum Peak Conducted Output Power	GFSK
Hopping Channel Separation	GFSK
Number of Hopping Frequency	GFSK
Time of Occupancy(Dwell Time)	GFSK
Radiated Spurious Emissions	GFSK
Band-edge compliance of Conducted Emission	GFSK



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- <u>3.0</u> <u>Test Results</u>
- 3.1 Emission

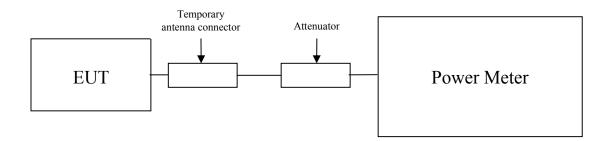
3.1.1 Maximum Peak Conducted Output Power

Test Requirement:	FCC 47CFR 15.247(b)(2)
Test Method:	ANSI C63.10-2013
Test Date:	2016-08-05
Mode of Operation:	Tx mode

Test Method:

The RF output of the EUT was connected to the Power Meter. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in dBm.

Test Setup:





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Limits for Maximum Peak Conducted Output Power [FCC 47CFR 15.247]:

902–928 MHz band:

For frequency hopping systems employing at least 50 hopping channels: 1Watt For frequency hopping systems employing less than 50 hopping: 0.25 Watts

Results of RFID mode (Fundamental Power): Pass

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
902.25	0.00454
Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
914.75	0.00721
· · · · · · · · · · · · · · · · · · ·	
Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
926.75	0.01171

Calculated measurement uncertainty	:	30MHz to 1GHz	1.7dB
		1GHz to 18GHz	1.7dB

Remark:

1. All test data for each data rate were verified, but only the worst case was reported.

2. The EUT is programmed to transmit signals continuously for all testing.



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3.1.2 Radiated Spurious Emissions

Test Requirement:	FCC 47CFR 15.209
Test Method:	ANSI C63.10-2013
Test Date:	2016-08-05
Mode of Operation:	Tx mode

Test Method:

The sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating 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.

* Semi-anechoic chamber located on the G/F of "The Hong Kong Standards and Testing Centre Ltd." with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

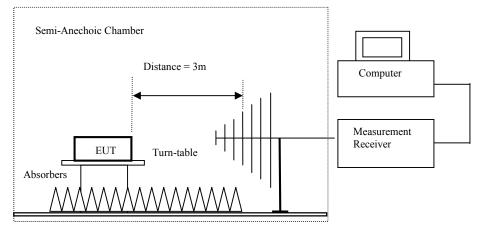


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Spectrum Analyzer Setting:

9KHz – 30MHz (Pk & Av)	RBW: VBW: Sweep: Span: Trace:	10kHz 30kHz Auto Fully capture the emissions being measured Max. hold
30MHz – 1GHz (QP)	RBW: VBW: Sweep: Span: Trace:	120kHz 120kHz Auto Fully capture the emissions being measured Max. hold
Above 1GHz (Pk & Av)	RBW: VBW: Sweep: Span: Trace:	1MHz 3MHz Auto Fully capture the emissions being measured Max. hold

Test Setup:



Ground Plane

- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.

- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used, 9kHz to 30MHz loop antennas are used.

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Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range	Quasi-Peak Limits
[MHz]	$[\mu V/m]$
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Result of Rx mode (9kHz - 30MHz): Pass

	Field Strength of Spurious Emissions								
Peak Value									
Frequency	Measured	Correction	Field	Field	Limit	E-Field			
	Level	Factor	Strength	Strength		Polarity			
MHz	dBµV	dB/m	dBµV/m	μV/m	μV/m				
	Emissions detected are more than 20 dB below the FCC Limits								

Radiated Emissions Average Value							
Frequency Measured Correction Field Limit Margin E-Field							
1 5	Level @3m	Factor	Strength	@3m	U	Polarity	
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dBuV/m	-	
	Emissions detected are more than 20 dB below the FCC Limits						

Result of Rx mode (30MHz - 1GHz): Pass

	Radiated Emissions								
Quasi-Peak Value									
Frequency	Measured	Correction	Field	Limit	Margin	E-Field			
	Level @3m	Factor	Strength	@3m		Polarity			
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dBuV/m				
45.6	0.8	8.2	9.0	40.0	31.0	Vertical			
68.1	1.5	7.0	8.5	40.0	31.5	Vertical			
101.2	0.8	8.3	9.1	43.5	34.4	Vertical			
300.8	0.5	13.8	14.3	46.0	31.7	Horizontal			
488.2	1.1	18.7	19.8	46.0	26.2	Horizontal			
923.1	2.1	24.9	27.0	46.0	19.0	Horizontal			

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Result of Rx mode (Above 1GHz): Pass

Field Strength of Spurious Emissions								
Peak Value								
Frequency	Measured	Correction	Field	Field	Limit	E-Field		
	Level	Factor	Strength	Strength		Polarity		
MHz	dBµV	dB/m	dBµV/m	μV/m	μV/m			
	Emissions	detected are	more than 20	dB below the	FCC Limits			

Radiated Emissions								
Average Value								
Frequency	Measured	Correction	Field	Limit	Margin	E-Field		
	Level @3m	Factor	Strength	@3m		Polarity		
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dBuV/m			
	Emissions d	etected are m	ore than 20 o	iB below the F	CC Limits			

Result of Tx mode (9kHz - 30MHz): Pass

Field Strength of Spurious Emissions								
Peak Value								
Frequency	Measured	Correction	Field	Field	Limit	E-Field		
	Level	Factor	Strength	Strength		Polarity		
MHz	dBµV	dB/m	dBµV/m	μV/m	μV/m			
	Emissions detected are more than 20 dB below the FCC Limits							

Radiated Emissions								
Average Value								
Frequency	Measured	Correction	Field	Limit	Margin	E-Field		
	Level @3m	Factor	Strength	@3m		Polarity		
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dBuV/m			
	Emissions d	etected are m	ore than 20 o	iB below the F	TCC Limits			

Result of Tx mode (30MHz - 1GHz): Pass

	Radiated Emissions								
Quasi-Peak Value									
Frequency	Measured	Correction	Field	Limit	Margin	E-Field			
	Level @3m	Factor	Strength	@3m		Polarity			
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dBuV/m				
	Emission	detected mor	e than 20 dB	below the FC	C Limits				

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Result of Tx mode (Lower Channel 902.25MHz) (Above 1GHz): Pass

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	Field Strength of Spurious Emissions								
Peak Value									
Frequency	Measured	Correction	Field	Limit	Margin	E-Field			
	Level @3m	Factor	Strength	@3m		Polarity			
MHz	dBµV	dB/m	$dB\mu V/m$	dBµV/m	dBµV/m				
902.25	77.50	23.90	101.40	N/A	N/A	Vertical			
1804.50	28.50	26.30	54.80	81.40	26.60	Vertical			
2706.10	26.90	28.90	55.80	74.00	18.20	Vertical			

Result of Tx mode (Lower Channel 902.25MHz) (Above 1GHz): Pass

	Field Strength of Spurious Emissions								
	Average Value								
Frequency	Measured	Correction	Field	Limit	Margin	E-Field			
	Level @3m	Factor	Strength	@3m		Polarity			
MHz	dBµV	dB/m	$dB\mu V/m$	dBµV/m	dBµV/m				
902.25	76.90	23.90	100.80	N/A	N/A	Vertical			
1804.50	18.20	26.30	44.50	80.80	36.30	Vertical			
2706.10	15.70	28.90	44.60	54.00	9.40	Vertical			

Result of Tx mode (Middle Channel 914.75MHz) (Above 1GHz): Pass

	Field Strength of Spurious Emissions								
	Peak Value								
Frequency	Measured	Correction	Field	Limit	Margin	E-Field			
	Level @3m	Factor	Strength	@3m		Polarity			
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m				
914.75	79.80	23.90	103.70	N/A	N/A	Vertical			
1829.50	28.70	26.40	55.10	83.70	28.60	Vertical			
2744.20	28.70	28.90	57.60	74.00	16.40	Vertical			

Result of Tx mode (Middle Channel 914.75MHz) (Above 1GHz): Pass

	Field Strength of Spurious Emissions								
	Average Value								
Frequency	Measured	Correction	Field	Limit	Margin	E-Field			
	Level @3m	Factor	Strength	@3m		Polarity			
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m				
914.75	79.20	23.90	103.10	N/A	N/A	Vertical			
1829.50	19.20	26.40	45.60	83.10	37.50	Vertical			
2744.20	17.60	28.90	46.50	54.00	7.50	Vertical			

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Result of Tx mode (Highest Channel 926.75MHz) (Above 1GHz): Pass

	Field Strength of Spurious Emissions								
	Peak Value								
Frequency	Measured	Correction	Field	Limit	Margin	E-Field			
	Level @3m	Factor	Strength	@3m		Polarity			
MHz	dBµV	dB/m	dBµV/m	dBµV/m	dBµV/m				
926.75	81.90	23.90	105.80	N/A	N/A	Vertical			
1853.50	29.40	26.40	55.80	85.80	30.00	Vertical			
2780.25	22.80	29.10	51.90	74.00	22.10	Vertical			

Result of Tx mode (Highest Channel 926.75MHz) (Above 1GHz): Pass

	Field Strength of Spurious Emissions								
			verage Valu						
Frequency	Measured	Correction	Field	Limit	Margin	E-Field			
	Level @3m	Factor	Strength	@3m		Polarity			
MHz	dBµV	dB/m	$dB\mu V/m$	dBµV/m	dBµV/m				
926.75	81.20	23.90	105.10	N/A	N/A	Vertical			
1853.50	18.20	26.40	44.60	85.10	40.50	Vertical			
2780.25	13.20	29.10	42.30	54.00	11.70	Vertical			

Remarks:

Denotes restricted band of operation.

Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty: (9kHz - 30MHz): 3.3dB

(30MHz - 1GHz): 4.6dB

(1GHz - 26GHz): 4.4dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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3.1.3 Number of Hopping Frequency

Limit of Number of Hopping Frequency

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels

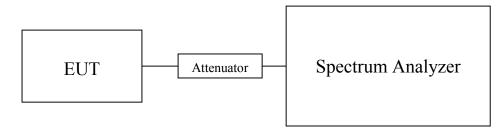
Frequency hopping systems in the 902-928 MHz band shall use at least 25 channels

The RF output of the EUT was connected to the spectrum analyzer by a low loss cable.

Spectrum Analyzer Setting:

RBW = 1MHz, $VBW \ge RBW$, Sweep = Auto, Span = the frequency band of operation Detector = Peak, Trace = Max. hold

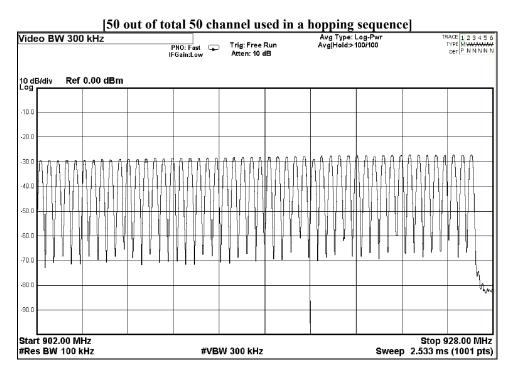
Test Setup:





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Measurement Data:



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3.1.4 20dB Bandwidth

Test Requirement:	
Test Method:	
Test Date:	
Mode of Operation:	

FCC 47CFR 15.247(a)(1) ANSI C63.10-2013 2016-08-05 Tx mode

Remark:

The result has been done on all the possible configurations for searching the worst cases.

Test Method:

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Test Setup:

As Test Setup of clause 3.1.3 in this test report.



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Fundamental Frequency	20dB Bandwidth	FCC Limits
[MHz]	[kHz]	[MHz]
902.25	87	<0.5

(Lowest Operating Frequency)

	None
a contract of the second secon	e: BTS
a contract of the second secon	
order 902.3 MHz es BW 10 kHz Coccupied Bandwidth Coccupied Bandwidth Cocupied Bandwidth C	
Image: constraint of the second of the se	
nter 902.3 MHz sp s BW 10 kHz #VBW 30 kHz Sw Occupied Bandwidth Total Power -32.1 dBm	
Image: Spectrum of the second seco	
nter 902.3 MHz Sp es BW 10 kHz #VBW 30 kHz Sw Occupied Bandwidth Total Power -32.1 dBm	
nter 902.3 MHz Sp es BW 10 kHz #VBW 30 kHz Sw Occupied Bandwidth Total Power -32.1 dBm	man
nter 902.3 MHz Sp es BW 10 kHz #VBW 30 kHz Sw Occupied Bandwidth Total Power -32.1 dBm	
nter 902.3 MHz Sp es BW 10 kHz #VBW 30 kHz Sw Occupied Bandwidth Total Power -32.1 dBm	
nter 902.3 MHz Sp es BW 10 kHz #VBW 30 kHz Swo Occupied Bandwidth Total Power -32.1 dBm	
es BW 10 kHz #VBW 30 kHz Swo Occupied Bandwidth Total Power -32.1 dBm	
	an 500 k eep 6.2 i
77 969 kHz	
Fransmit Freq Error -3.580 kHz OBW Power 99.00 %	
k dB Bandwidth 86.96 kHz x dB -20.00 dB	

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Fundamental Frequency	20dB Bandwidth	FCC Limits
[MHz]	[kHz]	[MHz]
914.75	88.3	<0.5

(Middle Operating Frequency)

enter Freq 914.750000 N		Center Freq: 914.7500 Trig: Free Run	Radio Std: None	
	#IFGain:Low	#Atten: 10 dB	Avg Hold≫10/10	Radio Device: BTS
.0	1 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
20 20 20 20 20 20 20 20 20 20 20 20 20 2		#VBW 30 kH		Span 500 kł Sweep 6.2 n
Occupied Bandwidth	1 2.148 kHz	Total Power	-31.5 dBm	
Transmit Freq Error	-2.949 kHz	OBW Power	99.00 %	
x dB Bandwidth	88.30 kHz	x dB	-20.00 dB	

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Fundamental Frequency	20dB Bandwidth	FCC Limits
[MHz]	[kHz]	[MHz]
926.75	86.6	<0.5

(Highest Operating Frequency)

IB -20.00 dB	#IFGain:Low	Center Freq: 926.7500 Trig: Free Run #Atten: 10 dB	00 MHz Avg Hold:>10/10	Radio Std: None Radio Device: BTS
dB/div Ref -30.00 dBr	n			
)		∕Ĩ_∖_		
	- Andrew and			
	mont			and the second s
m	×			
)				
nter 926.8 MHz es BW 10 kHz		#VBW 30 kH	lz	Span 500 kl Sweep 6.2 n
Occupied Bandwidtl	า	Total Power	-32.0 dBm	
1	10.29 kHz			
fransmit Freq Error	10.894 kHz	OBW Power	99.00 %	
dB Bandwidth	86.60 kHz	x dB	-20.00 dB	

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3.1.5 Hopping Channel Separation

Requirements:

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 or the 20 dB bandwidth of the hopping channel, whichever is greater.

Limit:

The measured maximum bandwidth = 88.3 kHz



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Channel separation = 500kHz Channel 0 – Channel 1, Pass

Marker 1	Δ -500.000000	P	'NO: Wide 🕞 Gain:Low	Trig: Free Atten: 10 d		Avg Type: Avg Hold:>*	Log-Pwr 100/100	۹T ·	ACE 123456 IYPE MWWWWW DET PINNNN
10 dB/div Log	Ref 0.00 dBm							∆Mkr1 -	-500 kHz 0.132 dB
-10.0									
-20.0		▲ 1∆2							
-30.0									
-40.0			-			1		M	
-50.0	کم ا		, h	X,	ſ			ļ	1
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-70.0 N				The second	~N~~				M
-80.0 V				(in-					
-90.0									
Center 90 #Res BW	2.5000 MHz 100 kHz	1	#VB	W 300 kHz	1	1	Swee	Span 0 1.000 ms	1.000 MHz (1001 pts)

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Channel separation = 501kHz Channel 25 – Channel 26, Pass

Marker 1 Δ 501.000000 k	HZ PNO: Wide Trig: Free I IFGain:Low Atten: 10 o		TRACE 1 2 3 4 5 (TYPE M WWWWW DET P N N N N
10 dB/div Ref 0.00 dBm			∆Mkr1 501 kH: 0.082 dE
-10.0			
-20.0			
-30.0		●1∆2	
	-**2		
40.0	h h h h h h h h h h h h h h h h h h h	l l l l l l l l l l l l l l l l l l l	M
-50.0		and the second s	M N
-60.0 Ar	ha.	an	W.
-70.0 m v	H W W W	and the second s	Yh W
80.0			
90.0			
Center 914.5000 MHz #Res BW 100 kHz	#VBW 300 kHz	Sweet	Span 1.000 MH 5 1.000 ms (1001 pts

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Channel separation = 500kHz Channel 49 – Channel 50, Pass

Marker 1	Δ 500.000000	F	PNO: Wide 😱 FGain:Low	Trig: Free F Atten: 10 d	Run IB	Avg Type: I Avg Hold:>1		Th ·	ACE 1 2 3 4 5 1 TYPE M WAAWAAW DET P N N N N 1
10 dB/div Log	Ref 0.00 dBm							∆Mkr1 -	500 kH: 0.011 dE
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-20.0		>//					1∆2		
-30.0		~~~~ 						Ny .	
50.0			h	N.	کسی	<i>f</i>		\	Ŵ
60.0 70.0 Mr. 4	M				WY				White the second
80.0									
-90.0									
Center 92 #Res BW	26.5000 MHz 100 kHz		#VB	W 300 kHz			Sweep	Span 0 1.000 ms	1.000 MH (1001 pts

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3.1.6 Band-edge Compliance of RF Conducted Emissions Measurement:

Limit :

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. Attenuation below the general limits specified in Section 15.209(a) is not required.



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Band-edge Compliance of RF Conducted Emissions Measurement:

Fixed Frequency:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
902 - Lowest Fundamental (902.25)	36.6

	Band-edge		e of RF C	onducted	Emissions				
Marker 1	Δ -270.00000	P	NO: Fast ↔ Gain:Low	Trig: Free #Atten: 16		Avg Type: Avg Hold:		TΓ	ACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N
10 dB/div	Ref 0.00 dBm								-270 kHz 6.609 dB
-10.0									
-20.0									
-30.0							2		
-40.0									
-50.0									
-60.0						∮ ¹²	12 ——— 		
	www.www.	marywarhave	ᡧᢇᡔᢇᡘᡃᠰᢆᢣᠬᢑᢂᢏ	_ՠ ֈՠՠ _ո ֈ _{ՠՠՠ} ֈՠ	J. malan www.	ar frint	Warn	Mary Allonana	^w r-walkaraanna
-90.0									
Start 890 #Res BW			#VB	W 300 kHz			Swee	Stop 90 p 1.733 ms	8.000 MHz
MKR MODE T	FC SCL	× -270 kHz	Υ (Δ) -36.60	FUN	CTION FUNC	TION WIDTH		UNCTION VALUE	(1001 pts)
2 F (1 f	902.258 MHz	-29.713	dBm					×

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Band-edge Compliance of RF Conducted Emissions Measurement:

Hopping Frequency:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
902 - Lowest Fundamental (902.25)	47.3

		00 kHz	PNO: Fast ↔ IFGain:Low	Trig: Free R #Atten: 16 di		Avg Type: Avg Hold: 1		1	RACE 12345 TYPE MWWWW DET PNNNN
dB/div 9	Ref 0.00 dB	n							-252 kH: 7.296 dE
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0.0							╏╵╎╵╎╵╵╵		
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0.0									
	.000 MHz 100 kHz		#VBI	N 300 kHz			Sweep	Stop 90 0 1.733 ms	 08.000 MH s (1001 pt:
Γ MODE T 1 Δ2 1 2 F 1 3	RC SCL f (Δ) f	× -252 kH 902.240 MH				ION WIDTH		UNCTION VALUE	

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Band-edge Compliance of RF Conducted Emissions Measurement:

Fixed Frequency:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
Highest Fundamental (926.75) - 928	39.0

/larker 1	Δ 1.410000	000 MHz	PNO: Fast ↔ IFGain:Low	Trig: Free Run #Atten: 30 dB	ssions (Highest Avg Type Avg Hold:	: Log-Pwr	Т	RACE 123450 TYPE MWWWW DET PNNNN
10 dB/div	Ref 10.00 d	Bm						1.41 MH: 88.979 dE
0.00								
10.0								
20.0		X2						
30.0								
40.0 50.0								
cn n				0				
איייייי 70.0	[฿] โ _ช ฐ _{าค} ายใ _{ส่} เวงญ _{ี่} งาระห _{ปุ่} รก	ատղղվել՝ Նոյոնտենատ	A MARK A BARA A PARA	Y "haal Veerbelly particularies	₩₩₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽	╊ि [┲] ╊╈╖╟┑┫╍┹╼┸╝╱	ับปู/นี้นำเ _{ขม} างจัดหรักษาไห	(1 74,74,74,74,74,74,74,74,74,74,74,74,74,7
80.0								
tart 920. Res BW			#VBW	/ 300 kHz		Swee	Stop 9 9 2.933 ms	950.00 MH s (1001 pts
1 Δ2 1 2 F 1 3	10 SOL f (Δ) f	× <u>1.41 MH</u> ; 926.75 MH;		dB	FUNCTION WIDTH		FUNCTION VALUE	
				F	1			>

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Band-edge Compliance of RF Conducted Emissions Measurement:

Hopping Frequency:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
Highest Fundamental (926.75) - 928	36.5

CE 1 2 3 4 5 6 PE MWWWWW ET P NNNNN
44 MHz .476 dB
ᡧᢉᠬᠥᡃᡏᡳ᠉ᡀᡘ᠊ᡁᡥ᠇ᢘ
0 00 MIL-
0.00 MHz (1001 pts)
^
<u> </u>

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3.1.7 Time of Occupancy (Dwell Time)

Requirements

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 and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

Dwell Time = Pulse Duration * hop rate

Observed duration: 20s

Measurement Data:

Channel Occupied: 50 of 50 Channel

Average Dwell time (at any 20s observation period) of

- 1) Lowest Channel = 28 pulses x 3.63ms(pulse period) x2 (double time of graph) = 203.3ms = 0.203s
- 2) Middle Channel = 28 pulses x 3.63ms(pulse period) x2 (double time of graph) = 203.3ms = 0.203s
- 3) Highest Channel = 28 pulses x 3.63 ms(pulse period) x2 (double time of graph) = 203.3 ms = 0.203 s

For hopping system, channel bandwidth <250kHz, at least 50 hopping should be used (PASS), dwell time < 0.4s at any 20s period (PASS).

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									28	pu	lses	Fi wit	g. thi		0s r	oer	·ioc	1]									
Sweep Ti	me ′	10.0	1 s				P	NO:	Wide 1:Low		. т	rig: V Atten:	deo				А	vg	Type	Log	j-Pwi	•			TF.	ACE 1 IYPE W DET N	2345 ////////////////////////////////////
0 dB/div	Ref	8.00) dB	m																			Δ	۷kı	·1 -	3.61 -9.0	15 m 69 dl
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12.0																											
22.0																											
32.0 1Δ2 -	_		-	\downarrow	+											\vdash		_				-			-	1	$\left \right $
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52.0																		_								_	
62.0																		_				-					$\left \right $
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82.0																											
Center 90 Res BW 1			MH	z						#VB	w a	00 k	H7									Swi	en	10.			in 0 H 01 pts

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	[Each p	Fig. B ulse period = 3.6	30ms]	
Marker 1 ∆ 3.63000 ms	PNO: Wide ↔ IFGain:Low	Trig Delay3.910 ms Trig: Video #Atten: 18 dB	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE WWWWWWW DET N N N N N N
10 dB/div Ref 8.00 dBm				∆Mkr1 3.630 ms -2.12 dB
2.00				
12.0				
-22.0	¥2	******	^{1Δ2}	
-32.0				TRIG LVL
42.0				
52.0				
-62.0				
-72.0				المتعادا
Center 902.250000 MHz Res BW 100 kHz	#VB	N 300 kHz	Swe	Span 0 Hz ep 10.00 ms (1001 pts)

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enter Freq 914.755000 MH	Z PNO: Wide +>- Trig: Video IFGain:Low #Atten: 18 dB	Avg Type: Log-Pwr	TRACE 1 2 3 4 TYPE WWWWM DET N N N N
dB/div Ref 8.00 dBm			
.00			
2.0			
2.0			
2.0			TRG
2.0			
2.0			
2.0			
enter 914.755000 MHz			Span 0 l

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				[Ea	ch pu	Fig.		30ms]			
Marke	er 1 ∆ 3.63	3000 ms		NO: Wid Gain:Lo	le ++++	Trig Delay Trig: Video #Atten: 18	3.910 ms	Avg Type:	Log-Pwr	TF	RACE 1 2 3 4 5 6 TYPE WWWWWW DET N N N N N N
10 dB/d Log	liv Ref 8	.00 dBm								∆Mkr1	3.630 ms -0.44 dB
-2.00											
-12.0 —											
-22.0 —									1Δ2		
-32.0 —				X	2		n-m-n-m-r				TRIG LVL
-42.0 —				_							
-52.0 —											
-62.0 —											
-72.0 —											
-82.0			hai na kirin 1. Matu II. Ji								
	r 914.7500 W 100 kHz				#VB	N 300 kHz	1	1	Sweet	p 10.00 ms	Span 0 Hz s (1001 pts)

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							28	pul	ses	Fi wit			0s j	pe	rio	d] ^{Avg}	Tuna	1.00	Duer				TR	ACE	2.0	4.5
							Wide n:Low			rig: Vi \tten:						Rvg	Type	LUg	- r wr				1	ACE 1 YPE V DET 1	v uun	, www.
0 dB/div og	Ref	8.00	dBn	n																						
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		Fig. F		
Marker 1 Δ 3.63000 ms	Each puls	se period = 3.63 rig Delay3.910 ms	30ms] Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6
	PNO: Wide +++ T	rig: Video Atten: 18 dB		DET N N N N N N
10 dB/div Ref 8.00 dBm				∆Mkr1 3.630 ms -0.24 dB
-2.00				
-12.0				
-22.0			1Δ2	
-32.0	× <u>+</u>	┉┉┉┉┉╗╻┪╱╤╶ᡘ╻┍╲╶┷┻╌╴		
-32.0				TRIG LVL
-42.0				
-52.0				
-62.0				
-02.0				
-72.0				
				1144 - La Constanta de la 1919 - La Constanta da 1919 - La Constanta da Constanta da Constanta da 2019 - La Constanta da Constanta da Constanta da Constanta da
Center 926.750000 MHz Res BW 100 kHz	#VBW 3	00 kHz	Swee	Span 0 Hz p 10.00 ms (1001 pts)

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3.1.8 Channel Centre Frequency

Requirements:

Frequency hopping system in the 902-928MHz band shall use at least 50 (Channel 0 to 49) non-overlapping channels.

The EUT operates in according with the within the 902.25 – 926.75 MHz frequency band. RF channels for the EUT are spaced 0.25 MHz and are ordered in channel number k. In order to comply with out-of-band regulations, a lower frequency guard band of 0.25 MHz and a higher frequency guard band of 0.25 MHz is used.

The operating frequencies of each channel are as follows:

First RF channel start from 902MHz + 0.25MHz guard band = 902.25MHzFrequency of RF Channel = 902.25+k MHz, k = 0,...,50 (Channel separation = 0.50 MHz)



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3.1.9 Pseudorandom Hopping Algorithm

Requirements:

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally by the transmitter.

EUT Pseudorandom Hopping Algorithm

Refer to the R.F. module specification.



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3.1.10 Antenna Requirement

Test Requirements: § 15.203

Test Specification:

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. 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.

Test Results:

This is Omnidirectional antenna. There is no external antenna, the antenna gain = 0dBi. User is unable to remove or change the Antenna.



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3.1.11 RF Exposure -

Test Requirement: Test Date: Mode of Operation: FCC 47CFR 15.247(i) 2016-08-05 Tx mode

Test Method:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

Test Results:

The EUT complied with the requirement(s) of this section. EUT meets the requirements of these sections as proven through MPE calculation The MPE calculation for EUT @ 20cm Based on the highest P = 11.71 mW (@ 926.7MHz)

Pd = PG/4pi*R² = $(11.7 \text{ x1})/12.566*(20)^2$ = (11.7)/12.566x400=11.7/5026.4= 0.00233mW/cm²

where:

*Pd = power density in mW/cm2

* G = Antenna numeric gain (1); Log G = g/10 (g = 0dBi).

- * P = Conducted RF power to antenna (11.7 mW).
- * R = Minimum allowable distance.(20 cm)
- *The power density $Pd = 0.00233 \text{ mW/cm}^2$ is less than 1 mW/cm² (listed MPE limit)
- *The SAR evaluation is not needed (this is a desk top device, R> 20 cm)

 \ast The EUT(antenna) must be 0.2 meters away from the General Population.

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Appendix A

List of Measurement Equipment

LIST OF MEASUREMENT EQUIPMENT

Radiated Emission											
EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL					
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A					
EM216	MINI MAST SYSTEM	EMCO	2075	00026842	N/A	N/A					
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A					
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3		2016/04/24	2017/04/24					
EM355	BICONILOG ANTENNA	ETS-LINDGREN	3143B	00094856	2016/03/03	2018/03/03					
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2016/06/01	2017/06/01					
EM299	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3115	00114120	2016/04/27	2018/04/27					
EM302	PRECISION OMNIDIRECTIONAL DIPOLE (1 – 6GHZ)	SEIBERSDORF LABORATORIES	POD 16	161806/L	2016/05/11	2018/05/11					
EM303	PRECISION OMNIDIRECTIONAL DIPOLE (6 – 18GHZ)	SEIBERSDORF LABORATORIES	POD 618	6181908/L	2016/05/11	2018/05/11					
EM011	ATTENNUATOR/SWITCH	НР	HP11713A	2508A10595	2015/11/16	2017/11/16					
EM012	PRE-AMPLIFIER	НР	HP8449B	3008A00262	2015/11/16	2017/11/16					
EM525	CABLE FOR ETS CHAMBER	SUHNER	N/A	N/A	2016/01/11	2017/01/11					
EM529	MICROWAVE FREQUENCY CABLE	SUHNER	SUCOFLEX 104	238296	2016/07/22	2018/07/22					

Remarks:-

- CM Corrective Maintenance
- N/A Not Applicable or Not Available

TBD To Be Determined

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Appendix B

Photographs of EUT





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Photographs of EUT

Measurement of Radiated Emission Test Set Up





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Photographs of EUT





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Photographs of EUT



***** End of Test Report *****



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- 6. Sample submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.
- 7. The Company will not be liable for or accept responsibility for any loss or damage howsoever arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.
- 8. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.
- 9. Subject to the variable length of retention time for test data and report stored hereinto as to otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of this test report for a period of three years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after the retention period. Under no circumstances shall we be liable for damages of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.
- 10. Issuance records of the Report are available on the internet at www.stc-group.org. Further enquiry of validity or verification of the Reports should be addressed to the Company.