

FCC Test Report

Product Name	Evoko Liso Room Manager /Evoko Liso
Model No.	ERM2001
FCC ID.	2AH64-ERM2001

Applicant	Evoko Unlimited AB
Address	Hästholmsvägen 32, 5th floor, 131 30 Nacka, SWEDEN

Date of Receipt	Apr. 26, 2016
Issued Date	May 12, 2016
Report No.	1650010R-RFUSP23V00
Report Version	V1.0
W ^W ^W ^W	\bigcirc



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

The test report shall not be reproduced without the written approval of QuieTek Corporation.

Test Report

Issued Date: May 12, 2016 Report No.: 1650010R-RFUSP23V00



Product Name	Evoko Liso Room Manager /Evoko Liso		
Applicant	Evoko Unlimited AB		
Address	Hästholmsvägen 32, 5th floor, 131 30 Nacka, SWEDEN		
Manufacturer	Ubiqconn Technology, Inc.		
Model No.	ERM2001		
FCC ID.	2AH64-ERM2001		
EUT Rated Voltage	AC 100-240V, 50/60Hz		
EUT Test Voltage	AC 120V/60Hz		
Trade Name	Evoko		
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2015		
	ANSI C63.4: 2014, ANSI C63.10: 2013		
Test Result	Complied		

Documented By :

Gente Chang

(Senior Adm. Specialist / Genie Chang)

Tested By

:

Nick

(Engineer / Nick Chen)

Approved By :

(Director / Vincent Lin)

TABLE OF CONTENTS

Des	scription	Page
1.	GENERAL INFORMATION	5
1.1.	EUT Description	5
1.2.	Operational Description	7
1.3.	Tested System Details	
1.4.	Configuration of Tested System	
1.5.	EUT Exercise Software	
1.6.	Test Facility	
2.	CONDUCTED EMISSION	10
2.1.	Test Equipment	
2.2.	Test Setup	
2.3.	Limits	
2.4.	Test Procedure	
2.5.	Uncertainty	
2.6.	Test Result of Conducted Emission	
3.	PEAK POWER OUTPUT	14
3.1.	Test Equipment	
3.2.	Test Setup	
3.3.	Limit	
3.4.	Test Procedure	
3.5.	Uncertainty	
3.6.	Test Result of Peak Power Output	
4.	RADIATED EMISSION	
4.1.	Test Equipment	
4.2.	Test Setup	
4.3.	Limits	
4.4.	Test Procedure	
4.5.	Uncertainty	
4.6.	Test Result of Radiated Emission	
5.	RF ANTENNA CONDUCTED TEST	
5.1.	Test Equipment	
5.2.	Test Setup	
5.3.	Limits	
5.4.	Test Procedure	
5.5.	Uncertainty	
5.6.	Test Result of RF Antenna Conducted Test	
6.	BAND EDGE	
6.1.	Test Equipment	
6.2.	Test Setup	
6.3.	Limit	
6.4.	Test Procedure	
6.5.	Uncertainty	
	, ,	

6.6.	Test Result of Band Edge	
7.	CHANNEL NUMBER	49
7.1.	Test Equipment	49
7.2.	Test Setup	49
7.3.	Limit	49
7.4.	Test Procedure	49
7.5.	Uncertainty	49
7.6.	Test Result of Channel Number	
8.	CHANNEL SEPARATION	52
8.1.	Test Equipment	
8.2.	Test Setup	
8.3.	Limit	
8.4.	Test Procedure	
8.5.	Uncertainty	
8.6.	Test Result of Channel Separation	53
9.	DWELL TIME	57
9.1.	Test Equipment	
9.2.	Test Setup	
9.3.	Limit	
9.4.	Test Procedure	
9.5.	Uncertainty	
9.6.	Test Result of Dwell Time	
10.	OCCUPIED BANDWIDTH	62
10.1.	Test Equipment	
10.2.	Test Setup	62
10.3.	Limits	62
10.4.	Test Procedure	
10.5.	Uncertainty	
10.6.	Test Result of Occupied Bandwidth	
11.	EMI REDUCTION METHOD DURING COMPLIANCE TESTING	67
Attachi Attachi	ment 1: EUT Test Photographs ment 2: EUT Detailed Photographs	

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Evoko Liso Room Manager /Evoko Liso		
Trade Name	Evoko		
Model No.	ERM2001		
FCC ID.	2AH64-ERM2001		
Frequency Range	2402 – 2480MHz		
Channel Number	79		
Type of Modulation	FHSS: GFSK(1Mbps) / π /4DQPSK(2Mbps) / 8DPSK(3Mbps)		
Antenna Type	PIFA Antenna		
Channel Control	Auto		
Antenna Gain	Refer to the table "Antenna List"		
Power Adapter	MFR: Elementech, M/N: A124-11202050		
Input: AC 100-240V~50/60Hz, 0.6A			
Output: 12V==2A			
Cable Out: Non-Shielded, 1.2m			
Contain Module	AMPAK/AP62X2SD a/b/g/n +BT+BLE		

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Anjie	N/A	PIFA Antenna	2.89dBi for 2.4 GHz

Note:

1. The antenna of EUT conforms to FCC 15.203.

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 20:	2422 MHz	Channel 40:	2442 MHz	Channel 60:	2462 MHz
Channel 01:	2403 MHz	Channel 21:	2423 MHz	Channel 41:	2443 MHz	Channel 61:	2463 MHz
Channel 02:	2404 MHz	Channel 22:	2424 MHz	Channel 42:	2444 MHz	Channel 62:	2464 MHz
Channel 03:	2405 MHz	Channel 23:	2425 MHz	Channel 43:	2445 MHz	Channel 63:	2465 MHz
Channel 04:	2406 MHz	Channel 24:	2426 MHz	Channel 44:	2446 MHz	Channel 64:	2466 MHz
Channel 05:	2407 MHz	Channel 25:	2427 MHz	Channel 45:	2447 MHz	Channel 65:	2467 MHz
Channel 06:	2408 MHz	Channel 26:	2428 MHz	Channel 46:	2448 MHz	Channel 66:	2468 MHz
Channel 07:	2409 MHz	Channel 27:	2429 MHz	Channel 47:	2449 MHz	Channel 67:	2469 MHz
Channel 08:	2410 MHz	Channel 28:	2430 MHz	Channel 48:	2450 MHz	Channel 68:	2470 MHz
Channel 09:	2411 MHz	Channel 29:	2431 MHz	Channel 49:	2451 MHz	Channel 69:	2471 MHz
Channel 10:	2412 MHz	Channel 30:	2432 MHz	Channel 50:	2452 MHz	Channel 70:	2472 MHz
Channel 11:	2413 MHz	Channel 31:	2433 MHz	Channel 51:	2453 MHz	Channel 71:	2473 MHz
Channel 12:	2414 MHz	Channel 32:	2434 MHz	Channel 52:	2454 MHz	Channel 72:	2474 MHz
Channel 13:	2415 MHz	Channel 33:	2435 MHz	Channel 53:	2455 MHz	Channel 73:	2475 MHz
Channel 14:	2416 MHz	Channel 34:	2436 MHz	Channel 54:	2456 MHz	Channel 74:	2476 MHz
Channel 15:	2417 MHz	Channel 35:	2437 MHz	Channel 55:	2457 MHz	Channel 75:	2477 MHz
Channel 16:	2418 MHz	Channel 36:	2438 MHz	Channel 56:	2458 MHz	Channel 76:	2478 MHz
Channel 17:	2419 MHz	Channel 37:	2439 MHz	Channel 57:	2459 MHz	Channel 77:	2479 MHz
Channel 18:	2420 MHz	Channel 38:	2440 MHz	Channel 58:	2460 MHz	Channel 78:	2480 MHz
Channel 19:	2421 MHz	Channel 39:	2441 MHz	Channel 59:	2461 MHz		

- 1. The EUT is an Evoko Liso Room Manager /Evoko Liso with a built-in WLAN
 Bluetooth and NFC transceiver, this report for Bluetooth.
- 2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
- 3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
- 4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
- 5. Bluetooth operation was evaluated at both 1Mb/s and 3Mb/s data rates. 2Mb/s data rate was found, through pre-testing, to produce emissions similar to those for 3Mb/s.

Test Mode	Mode 1: Transmit - 1Mbps (GFSK)
	Mode 2: Transmit - 3Mbps (8DPSK)



1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Keyboard	Logitech	Y-UR83	SY848UK	N/A
2	Mouse	acer	M-VrACR1	N/A	N/A

Signal Cable Type		Signal cable Description
А	RJ45 Cable	Shielded, 1.8m
В	Keyboard Cable	Shielded, 1.8m
С	Mouse Cable	Shielded, 1.8m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

- 1. Setup the EUT as shown in Section 1.4.
- 2. Execute software "Terminal" on the EUT.
- 3. Configure the test mode, the test channel, and the data rate.
- 4. Press "OK" to start the continuous Transmit.
- 5. Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded

from QuieTek Corporation's Web Site: <u>http://www.quietek.com/chinese/about/certificates.aspx?bval=5</u> The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site: <u>http://www.quietek.com/</u>

Site Description:	File on Federal Communications Commission FCC Engineering Laboratory			
	7435 Oakland Mills Road			
	Columbia, MD 21046			
	Registration Number: 92195			
Site Name:	Quietek Corporation			
Site Address:	No.5-22, Ruishukeng,			
	Linkou Dist. New Taipei City 24451,			
	Taiwan, R.O.C.			
	TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789			
	E-Mail : service@quietek.com			

FCC Accreditation Number: TW1014

2. Conducted Emission

2.1. Test Equipment

	Equipment Manufacturer		Model No. / Serial No.	Last Cal.	Remark
Х	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2015	
Х	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2016	Peripherals
Х	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2016	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar., 2016	EUT
Х	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2016	
	No.1 Shielded Room				

Note:

- 1. All equipments are calibrated every one year.
- 2. The test instruments marked by "X" are used to measure the final test results.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBµV) Limit						
Frequency MHz	Limits					
	QP	AV				
0.15 - 0.50	66-56	56-46				
0.50-5.0	56	46				
5.0 - 30	60	50				

Remarks: In the above table, the tighter limit applies at the band edges.

2.4. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Conducted Emission Test
Power Line	:	Line 1
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Frequency	ncy Correct Reading Mea		Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBµV	dBµV	dB	dBµV
LINE 1					
Quasi-Peak					
0.156	9.783	17.440	27.223	-38.663	65.886
0.268	9.780	3.750	13.530	-49.127	62.657
0.549	9.792	13.190	22.982	-33.018	56.000
0.616	9.797	17.180	26.977	-29.023	56.000
6.716	10.041	2.250	12.291	-47.709	60.000
14.428	10.147	17.950	28.097	-31.903	60.000
Average					
0.156	9.783	13.000	22.783	-33.103	55.886
0.268	9.780	0.240	10.020	-42.637	52.657
0.549	9.792	9.720	19.512	-26.488	46.000
0.616	9.797	11.580	21.377	-24.623	46.000
6.716	10.041	-1.610	8.431	-41.569	50.000
14.428	10.147	13.080	23.227	-26.773	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.

2. " " means the worst emission level.

3. Measurement Level = Reading Level + Correct Factor

Product Test Item Power Line	 Evoko Liso Room Manager /Evoko Liso Conducted Emission Test Line 2 				
Test Mode	: Mode 2:	: Transmit - 3Mbp	s (8DPSK) (2441MH	[z)	
Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV	dB	dBµV
LINE 2					
Quasi-Peak					
0.161	9.832	15.890	25.722	-39.935	65.657
0.208	9.835	12.350	22.185	-42.129	64.314
0.616	9.867	17.220	27.087	-28.913	56.000
1.108	9.905	1.120	11.025	-44.975	56.000
4.604	10.073	1.330	11.403	-44.597	56.000
13.573	10.255	16.520	26.775	-33.225	60.000
Average					
0.161	9.832	1.480	11.312	-44.345	55.657
0.208	9.835	7.830	17.665	-36.649	54.314
0.616	9.867	10.640	20.507	-25.493	46.000
1.108	9.905	-2.180	7.725	-38.275	46.000
4.604	10.073	-1.830	8.243	-37.757	46.000
13.573	10.255	11.970	22.225	-27.775	50.000

1. All Reading Levels are Quasi-Peak and average value.

2. " " means the worst emission level.

3. Measurement Level = Reading Level + Correct Factor

3. Peak Power Output

3.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Х	Power Meter	Anritsu	ML2495A/6K00003357	May, 2016
Х	Power Sensor	Anritsu	MA2411B/0738448	Jun., 2015

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

3.2. Test Setup



3.3. Limit

The maximum peak power shall be less 1Watt.

3.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

3.5. Uncertainty

± 1.27 dB

3.6. Test Result of Peak Power Output

Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Peak Power Output
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Frequency	Measurement	Required Limit	Result
	(MHz)	(dBm)		
Channel 00	2402.00	6.77	1 Watt= 30 dBm	Pass
Channel 39	2441.00	7.22	1 Watt= 30 dBm	Pass
Channel 78	2480.00	7.67	1 Watt= 30 dBm	Pass

:	Evoko Liso Room Manager /Evoko Liso
:	Peak Power Output
:	No.3 OATS
:	Mode 2: Transmit - 3Mbps (8DPSK)
	: : :

Channel No.	Frequency	Measurement	Required Limit	Result
	(MHz)	(dBm)		
Channel 00	2402.00	7.67	1 Watt= 30 dBm	Pass
Channel 39	2441.00	7.67	1 Watt= 30 dBm	Pass
Channel 78	2480.00	7.65	1 Watt= 30 dBm	Pass

4. **Radiated Emission**

4.1. Test Equipment

The following test equipments are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 3	Х	Magnetic Loop Antenna	Teseq	HLA6121/ 37133	Sep, 2015
	Х	Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	Jun., 2015
	Х	EMI Test Receiver	R&S	ESCS 30/838251/ 001	Jun., 2015
	Х	Coaxial Cable	QTK(Arnist)	RG 214/ LC003-RG	Jun., 2015
	Х	Coaxial signal switch	Arnist	MP59B/ 6200798682	Jun., 2015

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
CB # 8	Х	Spectrum Analyzer	R&S	FSP40/ 100339	Oct., 2015
	Х	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar., 2016
	Х	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan., 2016
	Х	Horn Antenna	TRC	AH-0801/95051	Aug., 2015
	Х	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan., 2016
	Х	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul., 2015
	Х	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul., 2015

Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

2. The test instruments marked with "X" are used to measure the final test results.

4.2. Test Setup

sBelow 1GHz



Above 1GHz



4.3. Limits

General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits					
Frequency MHz	uV/m @3m	dBµV/m@3m			
30-88	100	40			
88-216	150	43.5			
216-960	200	46			
Above 960	500	54			

Remarks: 1. RF Voltage $(dB\mu V) = 20 \log RF$ Voltage (uV)

- 2. In the Above Table, the tighter limit applies at the band edges.
- 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.4. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.249 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna. The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

4.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

Product Test Item Test Site Test Mode	 Evoko Liso Room Manager /Evoko Liso Harmonic Radiated Emission No.3 OATS Mode 1: Transmit - 1Mbps (GFSK)(2402MHz) 				
Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBµV	$dB\mu V/m$	dB	dBµV/m
Horizontal					
Peak Detector:					
4804.000	3.327	43.484	46.811	-27.189	74.000
7206.000	10.136	39.135	49.271	-24.729	74.000
9608.000	13.706	35.658	49.364	-24.636	74.000
Average					
Detector:					
Vertical					
Peak Detector:					
4804.000	6.638	42.855	49.492	-24.508	74.000
7206.000	11.005	39.066	50.071	-23.929	74.000
9608.000	14.103	39.544	53.647	-20.353	74.000
Average					
Detector:					

4.6. Test Result of Radiated Emission

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	: Evoko I	liso Room Manag	er /Evoko Liso			
Test Item	: Harmonic Radiated Emission					
Test Site	: No.3 OATS					
Test Mode	Test Mode : Mode 1: Transmit - 1Mbns (GFSK)(2441MHz)					
			())(<u>-</u>)	,		
Frequency	Correct	Reading	Measurement	Margin	Limit	
	Factor	Level	Level	-		
MHz	dB	dBµV	dBµV/m	dB	dBµV/m	
Horizontal						
Peak Detector:						
4882.000	3.001	43.084	46.085	-27.915	74.000	
7323.000	11.846	35.880	47.727	-26.273	74.000	
9764.000	12.563	35.258	47.821	-26.179	74.000	
Average						
Detector:						
Vertical						
Peak Detector:						
4882.000	5.713	36.190	41.904	-32.096	74.000	
7323.000	12.727	35.088	47.816	-26.184	74.000	
9764.000	13.028	35.648	48.676	-25.324	74.000	
Average						
D - 4 4						

Detector:

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	: Evoko Liso Room Manager /Evoko Liso					
Test Item	: Harmon					
Test Site	: No.3 OATS					
Test Mode	: Mode 1	: Transmit - 1Mbp	os (GFSK)(2480MHz))		
Frequency	Correct	Reading	Measurement	Margin	Limit	
	Factor	Level	Level			
MHz	dB	dBµV	dBµV/m	dB	dBµV/m	
Horizontal						
Peak Detector:						
4960.000	2.760	45.680	48.440	-25.560	74.000	
7440.000	12.567	35.088	47.654	-26.346	74.000	
9920.000	13.456	35.320	48.776	-25.224	74.000	
Average						
Detector:						
Vertical						
Peak Detector:						
4960.000	5.557	42.340	47.897	-26.103	74.000	
7440.000	13.426	35.058	48.483	-25.517	74.000	
9920.000	13.958	35.088	49.046	-24.954	74.000	
Average						
-						

Detector:

--

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	: Evoko Liso Room Manager /Evoko Liso					
Test Item	: Harmon	: Harmonic Radiated Emission				
Test Site	: No.3 OA	ATS				
Test Mode	: Mode 2:	Transmit - 3Mbp	os (8DPSK)(2402MHz	z)		
Frequency	Correct	Reading	Measurement	Margin	Limit	
	Factor	Level	Level	8		
MHz	dB	dBµV	dBµV/m	dB	dBµV/m	
Horizontal						
Peak Detector:						
4804.000	3.327	44.033	47.360	-26.640	74.000	
7206.000	10.136	38.199	48.335	-25.665	74.000	
9608.000	13.706	35.088	48.794	-25.206	74.000	
Average						
Detector:						
Vertical						
Peak Detector:						
4804.000	6.638	46.135	52.772	-21.228	74.000	
7206.000	11.005	37.864	48.869	-25.131	74.000	
9608.000	14.103	35.022	49.125	-24.875	74.000	
Average						
Detector:						

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.



Product Test Item Test Site Test Mode	 Evoko Liso Room Manager /Evoko Liso Harmonic Radiated Emission No.3 OATS Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz) 				
Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBµV	dBµV/m	dB	dBµV/m
Horizontal					
Peak Detector:					
4882.000	3.001	41.700	44.701	-29.299	74.000
7323.000	11.846	35.953	47.800	-26.200	74.000
9764.000	12.563	35.211	47.774	-26.226	74.000
Average					
Detector:					
Vertical					
Peak Detector:					
4882.000	5.713	37.800	43.514	-30.486	74.000
7323.000	12.727	35.199	47.927	-26.073	74.000
9764.000	13.028	35.288	48.316	-25.684	74.000
Average					
Detector:					

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.



Product	: Evoko Liso Room Manager /Evoko Liso				
Test Item	: Harmonic Radiated Emission				
Test Site	: No.3 OA	ATS			
Test Mode	: Mode 2:	Transmit - 3Mbp	s (8DPSK) (2480MH	[z)	
Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBµV	dBµV/m	dB	dBµV/m
Horizontal					
Peak Detector:					
4960.000	2.760	44.088	46.848	-27.152	74.000
7440.000	12.567	35.622	48.188	-25.812	74.000
9920.000	13.456	34.889	48.345	-25.655	74.000
Average					
Detector:					
Vertical					
Peak Detector:					
4960.000	5.557	44.822	50.379	-23.621	74.000
7440.000	13.426	35.661	49.086	-24.914	74.000
9920.000	13.958	35.338	49.296	-24.704	74.000
Average					
Detector:					

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	General Radiated Emission
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2441MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBµV	$dB\mu V/m$	dB	dBµV/m
Horizontal					
33.880	-0.840	34.032	33.192	-6.808	40.000
125.060	-7.335	36.616	29.281	-14.219	43.500
326.820	-4.499	35.212	30.713	-15.287	46.000
516.940	3.200	30.160	33.360	-12.640	46.000
842.860	6.248	27.391	33.639	-12.361	46.000
912.700	6.450	29.448	35.898	-10.102	46.000
Vertical					
31.940	-6.355	40.714	34.359	-5.641	40.000
105.660	-4.576	39.700	35.123	-8.377	43.500
326.820	-2.759	36.636	33.877	-12.123	46.000
513.060	0.436	36.351	36.787	-9.213	46.000
687.660	2.292	32.112	34.404	-11.596	46.000
914.640	-0.980	33.135	32.155	-13.845	46.000

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	General Radiated Emission
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBµV	$dB\mu V/m$	dB	$dB\mu V/m$
Horizontal					
33.880	-0.840	35.507	34.667	-5.333	40.000
123.120	-7.320	37.231	29.911	-13.589	43.500
319.060	-4.585	35.405	30.820	-15.180	46.000
538.280	3.316	34.913	38.229	-7.771	46.000
806.000	6.206	28.484	34.690	-11.310	46.000
906.880	6.149	30.942	37.091	-8.909	46.000
Vertical					
31.940	-6.355	41.946	35.591	-4.409	40.000
107.600	-4.027	38.736	34.709	-8.791	43.500
326.820	-2.759	33.768	31.009	-14.991	46.000
513.060	0.436	36.384	36.820	-9.180	46.000
652.740	-3.101	34.154	31.053	-14.947	46.000
910.760	0.574	33.887	34.461	-11.539	46.000

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.
- 8. No emission found between lowest internal used/generated frequency to 30MHz.

5. RF Antenna Conducted Test

5.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note: 1. All equipments are calibrated every one year.

2. The test instruments Marked "X" are used to measure the final test results.

5.2. Test Setup



5.3. Limits

According to FCC Section 15.247(d). 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 measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

5.5. Uncertainty

± 150Hz

5.6. Test Result of RF Antenna Conducted Test

Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	RF Antenna Conducted Test
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)

Figure Channel 00:



Figure Channel 39:



Figure Channel 78:



Note: The above test pattern is synthesized by multiple of the frequency range.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	RF Antenna Conducted Test
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK)



Figure Channel 39:



Figure Channel 78: Spurious Emission(30MHz-25GHz) Limit line: -19.08 Reading Value 20 RBW: 100k, VBW: 1M Sweep Time: Auto 10 0 -10 dBm -20 -30 -40 -50 -60 -70 15 5 10 20 25 GHz

Note: The above test pattern is synthesized by multiple of the frequency range.

6. Band Edge

6.1. Test Equipment

RF Radiated Measurement:

The following test equipments are used during the band edge tests:

Test Site	Equipment		Manufacturer	Model No./Serial No.	Last Cal.
⊠CB # 8	Х	Spectrum Analyzer	R&S	FSP40/ 100339	Oct., 2015
	Х	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar., 2016
	Х	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan., 2016
	Х	Horn Antenna	TRC	AH-0801/95051	Aug., 2015
	Х	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan., 2016
	Х	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul., 2015
	Х	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul., 2015

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

6.2. Test Setup

RF Radiated Measurement:

Above 1GHz



6.3. 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.4. Test Procedure

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

6.5. Uncertainty

- ± 3.9 dB above 1GHz
- ± 3.8 dB below 1GHz



6.6. **Test Result of Band Edge**

Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

RF Radiated Measurement (Horizontal):

Channal Ma	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Dogult
Channel No.	(MHz)	(dB)	(dBµV)	(dBµV/m)	$(dB\mu V/m)$	$(dB\mu V/m)$	Result
00 (Peak)	2388.000	-2.695	51.699	49.004	74.00	54.00	Pass
00 (Peak)	2390.000	-2.687	51.354	48.668	74.00	54.00	Pass
00 (Peak)	2400.000	-2.659	71.959	69.299			
00 (Peak)	2402.200	-2.656	104.283	101.627			
00 (Average)	2390.000	-2.687	38.806	36.120	74.00	54.00	Pass
00 (Average)	2400.000	-2.659	50.425	47.765	74.00	54.00	Pass
00 (Average)	2402.100	-2.656	90.475	87.818			

Horizontal (Peak)

Figure Channel 00:



Figure Channel 00:

Horizontal (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1.
- 2. 3.
- 4.
- 5.
- Measurement Level = Reading Level + Correction Factor. The average measurement was not performed when the peak measured data is under the limit of 6. average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Dogult
Channel No.	(MHz)	(dB)	(dBµV)	(dBµV/m)	(dBµV/m)	$(dB\mu V/m)$	Result
00 (Peak)	2382.100	-4.133	52.525	48.393	74.00	54.00	Pass
00 (Peak)	2390.000	-4.159	50.227	46.069	74.00	54.00	Pass
00 (Peak)	2400.000	-4.170	70.287	66.117			
00 (Peak)	2402.200	-4.170	104.514	100.344			
00 (Average)	2390.000	-4.159	39.093	34.935	74.00	54.00	Pass
00 (Average)	2400.000	-4.170	50.674	46.504	74.00	54.00	Pass
00 (Average)	2402.100	-4.170	90.681	86.511			

Figure Channel 00:

VERTICAL (Peak)



Figure Channel 00:

VERTICAL (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. Measurement Level = Reading Level + Correction Factor.
- 1. 2. 3.
- 4.
- 5.
- The average measurement was not performed when the peak measured data is under the limit of 6. average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test Mode		Mode 1 [•] Transmit - 1Mbps (GFSK) (2480MHz)

RF Radiated Measurement (Horizontal):

Channel No	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Result
Channel NO.	(MHz)	(dB)	(dBµV)	$(dB\mu V/m)$	$(dB\mu V/m)$	$(dB\mu V/m)$	Result
78 (Peak)	2479.900	-2.605	104.687	102.082			
78 (Peak)	2483.500	-2.601	51.590	48.988	74.00	54.00	Pass
78 (Peak)	2487.200	-2.599	52.136	49.538	74.00	54.00	Pass
78 (Average)	2480.100	-2.605	90.836	88.231			
78 (Average)	2483.500	-2.601	40.089	37.487	74.00	54.00	Pass

Figure Channel 78:

Horizontal (Peak)



Figure Channel 78:

Horizontal (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1.
- 2. 3.
- 4. 5.
- Measurement Level = Reading Level + Correction Factor. The average measurement was not performed when the peak measured data is under the limit of 6. average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2480MHz)

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Dogult
	(MHz)	(dB)	(dBµV)	(dBµV/m)	$(dB\mu V/m)$	$(dB\mu V/m)$	Result
78 (Peak)	2479.800	-3.978	102.979	99.001			
78 (Peak)	2483.500	-3.966	51.779	47.813	74.00	54.00	Pass
78 (Average)	2480.100	-3.977	89.443	85.466			
78 (Average)	2483.500	-3.966	39.674	35.708	74.00	54.00	Pass

Figure Channel 78:

VERTICAL (Peak)



Figure Channel 78:

VERTICAL (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1.
- 2.
- 3.
- 4.
- 5. Measurement Level = Reading Level + Correction Factor.
- 6. The average measurement was not performed when the peak measured data is under the limit of average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test Mode		Mode 2 [·] Transmit - 3Mbps (8DPSK) (2402MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Result
	(MHz)	(dB)	(dBµV)	$(dB\mu V/m)$	$(dB\mu V/m)$	$(dB\mu V/m)$	
00 (Peak)	2372.200	-2.766	53.715	50.950	74.00	54.00	Pass
00 (Peak)	2390.000	-2.687	49.578	46.892	74.00	54.00	Pass
00 (Peak)	2400.000	-2.659	70.063	67.403			
00 (Peak)	2402.000	-2.656	103.025	100.368			
00 (Average)	2390.000	-2.687	38.502	35.816	74.00	54.00	Pass
00 (Average)	2400.000	-2.659	54.506	51.846	74.00	54.00	Pass
00 (Average)	2402.100	-2.656	86.981	84.324			



Horizontal (Peak)



Figure Channel 00:

Horizontal (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1.
- 2.
- 3.
- 4.
- Measurement Level = Reading Level + Correction Factor. 5.
- The average measurement was not performed when the peak measured data is under the limit of 6. average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test Mode		Mode 2 [·] Transmit - 3Mbps (8DPSK) (2402MHz)

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Result
	(MHz)	(dB)	(dBµV)	$(dB\mu V/m)$	$(dB\mu V/m)$	$(dB\mu V/m)$	
00 (Peak)	2372.000	-4.098	52.708	48.610	74.00	54.00	Pass
00 (Peak)	2390.000	-4.159	49.124	44.966	74.00	54.00	Pass
00 (Peak)	2400.000	-4.170	69.403	65.233			
00 (Peak)	2402.000	-4.170	102.334	98.164			
00 (Average)	2390.000	-4.159	38.544	34.386	74.00	54.00	Pass
00 (Average)	2400.000	-4.170	54.152	49.982	74.00	54.00	Pass
00 (Average)	2402.000	-4.170	86.433	82.263			

Figure Channel 00:

VERTICAL (Peak)



Figure Channel 00:

VERTICAL (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1.
- 2.
- 3.
- 4.
- Measurement Level = Reading Level + Correction Factor. 5.
- The average measurement was not performed when the peak measured data is under the limit of 6. average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Dogult
	(MHz)	(dB)	(dBµV)	(dBµV/m)	(dBµV/m)	$(dB\mu V/m)$	Result
78 (Peak)	2479.900	-2.605	103.629	101.024			
78 (Peak)	2483.500	-2.601	51.416	48.814	74.00	54.00	Pass
78 (Average)	2480.000	-2.605	87.400	84.795			
78 (Average)	2483.500	-2.601	39.403	36.801	74.00	54.00	Pass

Figure Channel 00:

Horizontal (Peak)



Figure Channel 00:

Horizontal (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1.
- 2. 3.
- 4.
- 5. Measurement Level = Reading Level + Correction Factor.
- The average measurement was not performed when the peak measured data is under the limit of 6. average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test Mode		Mode 2 [·] Transmit - 3Mbps (8DPSK) (2480MHz)

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Dogult
	(MHz)	(dB)	(dBµV)	(dBµV/m)	$(dB\mu V/m)$	$(dB\mu V/m)$	Result
78 (Peak)	2480.000	-3.978	102.145	98.168			
78 (Peak)	2483.500	-3.966	50.492	46.526	74.00	54.00	Pass
78 (Peak)	2491.100	-3.943	52.401	48.458	74.00	54.00	Pass
78 (Average)	2480.100	-3.977	86.194	82.217			
78 (Average)	2483.500	-3.966	39.103	35.137	74.00	54.00	Pass

Figure Channel 78:

VERTICAL (Peak)



Figure Channel 78:

VERTICAL (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1.
- 2. 3.
- 4. 5.
- Measurement Level = Reading Level + Correction Factor. The average measurement was not performed when the peak measured data is under the limit of 6. average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Hopping Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)(Hopping)

RF Radiated Measurement (Horizontal):

Channel No	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Result
Chamiler 140.	(MHz)	(dB)	(dBµV)	$(dB\mu V/m)$	$(dB\mu V/m)$	$(dB\mu V/m)$	Result
00 (Peak)	2389.100	-2.690	51.689	48.998	74.00	54.00	Pass
00 (Peak)	2390.000	-2.687	50.730	48.043	74.00	54.00	Pass
00 (Peak)	2400.000	-2.660	59.736	57.076			
00 (Peak)	2438.800	-2.637	103.427	100.790			
00 (Average)	2372.500	-2.764	43.734	40.970	74.00	54.00	Pass
00 (Average)	2390.000	-2.687	42.061	39.374	74.00	54.00	Pass
00 (Average)	2400.000	-2.660	53.621	50.961			
00 (Average)	2438.100	-2.637	103.389	100.752			

Figure Channel 00:

Horizontal (Peak)



Figure Channel 00:

Horizontal (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level.
- 1. 2. 3. 4.
- 5. Measurement Level = Reading Level + Correction Factor.
- 6. The average measurement was not performed when the peak measured data is under the limit of average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Hopping Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2402MHz) (Hopping)

RF Radiated Measurement (VERTICAL):

Channal Ma	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Dogult
Channel No.	(MHz)	(dB)	(dBµV)	$(dB\mu V/m)$	$(dB\mu V/m)$	$(dB\mu V/m)$	Result
00 (Peak)	2379.100	-4.122	55.289	51.166	74.00	54.00	Pass
00 (Peak)	2390.000	-4.159	50.979	46.820	74.00	54.00	Pass
00 (Peak)	2400.000	-4.171	63.879	59.708			
00 (Peak)	2411.900	-4.167	105.294	101.127			
00 (Average)	2371.700	-4.096	44.060	39.963	74.00	54.00	Pass
00 (Average)	2390.000	-4.159	42.490	38.331	74.00	54.00	Pass
00 (Average)	2400.000	-4.171	56.342	52.171			
00 (Average)	2409.100	-4.169	105.272	101.103			

Figure Channel 00:

VERTICAL (Peak)



Figure Channel 00:

VERTICAL (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1.
- 2. 3.
- 4.
- 5.
- Measurement Level = Reading Level + Correction Factor. The average measurement was not performed when the peak measured data is under the limit of 6. average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Hopping Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2480MHz) (Hopping)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Dogult
	(MHz)	(dB)	(dBµV)	(dBµV/m)	$(dB\mu V/m)$	$(dB\mu V/m)$	Result
78 (Peak)	2444.900	-2.636	104.260	101.624			
78 (Peak)	2483.500	-2.601	52.120	49.518	74.00	54.00	Pass
78 (Peak)	2497.600	-2.600	52.979	50.380	74.00	54.00	Pass
78 (Average)	2444.200	-2.636	104.326	101.690			
78 (Average)	2483.500	-2.601	42.648	40.046	74.00	54.00	Pass
78 (Average)	2499.100	-2.606	43.457	40.851	74.00	54.00	Pass

Figure Channel 78:

Horizontal (Peak)



Figure Channel 78:

Horizontal (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1. 2. 3. 4.

- 5. Measurement Level = Reading Level + Correction Factor.
- The average measurement was not performed when the peak measured data is under the limit of 6. average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Hopping Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2480MHz) (Hopping)

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Dogult
	(MHz)	(dB)	(dBµV)	(dBµV/m)	$(dB\mu V/m)$	$(dB\mu V/m)$	Result
78 (Peak)	2466.900	-4.019	102.042	98.023			
78 (Peak)	2483.500	-3.966	51.100	47.134	74.00	54.00	Pass
78 (Peak)	2508.300	-3.871	52.141	48.271	74.00	54.00	Pass
78 (Average)	2471.200	-4.005	102.036	98.030			
78 (Average)	2483.500	-3.966	42.485	38.519	74.00	54.00	Pass
78 (Average)	2507.100	-3.876	43.640	39.764	74.00	54.00	Pass

Figure Channel 78:

VERTICAL (Peak)



Figure Channel 78:

VERTICAL (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1.
- 1. 2. 3. 4.

- 5. Measurement Level = Reading Level + Correction Factor.
- 6. The average measurement was not performed when the peak measured data is under the limit of average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Hopping Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz) (Hopping)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Result
	(MHZ)	(dB)	(αβμν)	(aBµv/m)	(dBµv/m)	(aBµv/m)	
00 (Peak)	2374.800	-2.753	54.003	51.249	74.00	54.00	Pass
00 (Peak)	2390.000	-2.687	50.884	48.198	74.00	54.00	Pass
00 (Peak)	2400.000	-2.659	67.503	64.843			
00 (Peak)	2440.000	-2.636	103.554	100.917			
00 (Average)	2384.200	-2.713	43.515	40.803	74.00	54.00	Pass
00 (Average)	2390.000	-2.687	42.212	39.526	74.00	54.00	Pass
00 (Average)	2400.000	-2.659	60.696	58.036			
00 (Average)	2431.100	-2.638	101.223	98.585			

Figure Channel 00:

Horizontal (Peak)



Figure Channel 00:

Horizontal (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1.
- 2. 3.
- 4.
- 5. Measurement Level = Reading Level + Correction Factor.
- 6. The average measurement was not performed when the peak measured data is under the limit of average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Hopping Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz) (Hopping)

RF Radiated Measurement (VERTICAL):

Channal Ma	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Dogult
Channel No.	(MHz)	(dB)	(dBµV)	(dBµV/m)	$(dB\mu V/m)$	$(dB\mu V/m)$	Result
00 (Peak)	2384.200	-4.140	52.978	48.839	74.00	54.00	Pass
00 (Peak)	2390.000	-4.159	51.428	47.270	74.00	54.00	Pass
00 (Peak)	2400.000	-4.170	71.176	67.006			
00 (Peak)	2411.000	-4.168	103.679	99.511			
00 (Average)	2384.800	-4.141	44.095	39.954	74.00	54.00	Pass
00 (Average)	2390.000	-4.159	42.842	38.684	74.00	54.00	Pass
00 (Average)	2400.000	-4.170	62.327	58.157			
	2407.200	-4.169	101.612	97.443			

Figure Channel 00:

VERTICAL (Peak)



Figure Channel 00:

VERTICAL (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level. 1.
- 2. 3.
- 4.
- 5. Measurement Level = Reading Level + Correction Factor.
- 6. The average measurement was not performed when the peak measured data is under the limit of average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Hopping Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz) (Hopping)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Dogult
	(MHz)	(dB)	(dBµV)	(dBµV/m)	(dBµV/m)	$(dB\mu V/m)$	Result
78 (Peak)	2441.000	-2.637	102.890	100.253			
78 (Peak)	2483.500	-2.601	51.122	48.520	74.00	54.00	Pass
78 (Peak)	2493.700	-2.592	52.676	50.084	74.00	54.00	Pass
78 (Average)	2450.200	-2.632	100.524	97.892			
78 (Average)	2483.500	-2.601	43.216	40.614	74.00	54.00	Pass
78 (Average)	2485.700	-2.600	43.358	40.758	74.00	54.00	Pass

Figure Channel 00:

Horizontal (Peak)



Figure Channel 00:

Horizontal (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level 1.
- 2. 3. 4.

- "*", means this data is the worst emission level. Measurement Level = Reading Level + Correction Factor. 5.
- 6. The average measurement was not performed when the peak measured data is under the limit of average detection.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Hopping Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz) (Hopping)

RF Radiated Measurement (VERTICAL):

Channal No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Arerage Limit	Dogult
Channel No.	(MHz)	(dB)	(dBµV)	(dBµV/m)	$(dB\mu V/m)$	$(dB\mu V/m)$	Result
78 (Peak)	2434.000	-4.113	103.006	98.893			
78 (Peak)	2483.500	-3.966	50.981	47.015	74.00	54.00	Pass
78 (Peak)	2498.400	-3.916	52.902	48.986	74.00	54.00	Pass
78 (Average)	2435.100	-4.111	100.443	96.332			
78 (Average)	2483.500	-3.966	42.480	38.514	74.00	54.00	Pass
78 (Average)	2494.400	-3.932	43.705	39.773	74.00	54.00	Pass

Figure Channel 78:

VERTICAL (Peak)



Figure Channel 78:

VERTICAL (Average)



- All readings above 1GHz are performed with peak and/or average measurements as necessary. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. "*", means this data is the worst emission level.
- 1. 2. 3. 4.
- 5. Measurement Level = Reading Level + Correction Factor.
- The average measurement was not performed when the peak measured data is under the limit of 6. average detection.



7. Channel Number

7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

7.2. Test Setup



7.3. Limit

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 hopping frequencies.

7.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

7.5. Uncertainty

N/A

7.6. Test Result of Channel Number

:	Evoko Liso Room Manager /Evoko Liso
:	Channel Number
:	No.3 OATS
:	Mode 1: Transmit - 1Mbps (GFSK)
	:

Frequency Range	Measurement	Required Limit	Result		
(MHz)	(Hopping Channel)	(Hopping Channel)			
2402 ~ 2480	79	>75	Pass		

2402-2421MHz

2422-2441MHz

Keysight Spectrum	Analyzer - Swept SA	- W	14 M M M M M M M M M M M M M M M M M M M		0.0	BE Key	sight Spect	trum An	salyzer - Swep	e SA	14	1010133	0.000	11	Manufactory			0.0
Center Freq	2.411000000 GHz	SENSE	Avg Type: Log-Pwr	04:00:29 PM May 05, 2016 TRACE 1 2 3 4 5 6 TVPE M WWWWW	Frequency	Cent	ter Fre	eq 2.	431500	0000 GH	z	Trig: Free	Run	Avg Typ	ALIGN AUTO	04:01:31 P	M May 05, 2016 2E 1 2 3 4 5 6 PE M WWWWW	Frequency
Re 10 dB/div Re	F Offset 0.5 dB	n:Low #Atten: 30 df	B Mkr2	2.421 000 GHz 6.38 dBm	Auto Tune	10 dB	Udiv	Ref	Offset 0.5	dB Bm	ainclow	#Atten: 30	dB		Mkr	2 2.441	00 GHz	Auto Tune
Log 10.5 0.500	www	www	www	MM	Center Freq 2.411000000 GHz	10.5 0.500	Â	V	M		M	M	ЛЛ	N	M	ЛЛ	M	Center Freq 2.431500000 GHz
-19.5 -29.5 -39.5					Start Freq 2.400500000 GHz	-19.5 -29.5 -39.5												Start Freq 2.421500000 GHz
49.5 -69.5 -69.5					Stop Freq 2.421500000 GHz	-49.5 -59.5 -69.5		-	_						-			Stop Freq 2.441500000 GHz
Start 2.40050 #Res BW 100) GHz) kHz	#VBW 100 kHz	Sweep 2	Stop 2.42150 GHz 2.533 ms (1001 pts)	CF Step 2.100000 MHz Auto Man	Start #Res	2.421 BW 1	150 G 100 k	SHz Hz		#VBW	/ 100 kHz			Sweep 2	Stop 2.44 .467 ms (150 GHz 1001 pts)	CF Step 2.000000 MHz
1 N 1 F 2 N 1 F 3 4 5	2,402,000 0 2,421,000 0	SHz 6.16 dBm SHz 6.38 dBm	FUNCTION FUNCTION WOTH		Freq Offset 0 Hz	1 2 3 4 5	N 1 N 1	1		2.422.00 2.441.00	GHz GHz	6,11 dE 6.04 dE	im im	108	INCTION WOTH	FUNCTO		Freq Offset 0 Hz
6 7 8 9 10 11						6 7 8 9 10 11												
MSG			STAT	6		* MSG									STATU	4		

2442-2461MHz

2462-2480MHz

Keysight Spectrum Analyzer - Swept SA							0.0	BE Key	sight Spec	trum Ana	ilyzer - Sweg	et SA								0 0 0
Center Freq 2.451500000	GHz	SENSE	E:INT]	Aug Type: Log-Pw	05:05:45 F	CE 1 2 3 4 5 6	Frequency	Cent	ter Fr	eq 2.4	47150	0000 GH	Iz		ESE: INT	Avg Typ	e: Log-Pwr	05:22:45 P	H May 05, 2016	Frequency
Ref Offset 0.5 dB 10 dB/div Ref 20.50 dBm	PNO: Fast G	#Atten: 30 d	dB	M	(r2 2.461 6.	00 GHz 26 dBm	Auto Tune	10 dE	3/div	Ref 0	ffset 0.5 20.50 d	dB Bm	VO: Fast G	#Atten: 3	0 dB		Mkr	2 2.480 6.	00 GHz 63 dBm	Auto Tune
	M	w	V	ww	vv	M.	Center Freq 2.451500000 GHz	10.5 0.500 -9.50	Â	V	N	M	M	M	M	m	M	M	* ²	Center Freq 2.471500000 GHz
-19.5							Start Freq 2.441500000 GHz	-19.5 -29.5 -39.5											1	Start Freq 2.461500000 GHz
49 5 	_						Stop Freq 2.461500000 GHz	-49.5 -59.5 -69.5		-					-					Stop Freq 2.481500000 GHz
Start 2.44150 GHz #Res BW 100 kHz	#VBW	100 kHz		Sweep	Stop 2.4 2.467 ms	6150 GHz (1001 pts)	CF Step 2.000000 MHz Auto Man	Start #Res	t 2.46 BW	150 G 100 ki	Hz Hz		#VBW	100 kHz			Sweep 2	Stop 2.41 .467 ms (8150 GHz 1001 pts)	CF Step 2.000000 MHz Auto Man
M22 1000 110 11 1 24 2 N 1 1 24 3 4 5 5	442 00 GHz 61 00 GHz	6.34 dBn 6.26 dBn	P.85	FUNCTION WO	FUNCT		Freq Offset 0 Hz	1 2 3 4 5 6	N 1 N 1	1		2.462 0 2.480 0	0 GHz 0 GHz	6.24 di 6.63 di	3m 3m	CTION P3	201003/0010	FUNCTI		Freq Offset 0 Hz
7 8 9 10 11								7 8 9 10 11												
MSG				STA	rus.			MSG J	Align	nent Co	ompleted	1					STATUS	1 C		

Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Channel Number
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK)

Frequency Range	Measurement	Required Limit	Result		
(MHz)	(Hopping Channel)	(Hopping Channel)			
$2402 \sim 2480$	79	>75	Pass		

2402-2421MHz

2422-2441MHz



2442-2461MHz

2462-2480MHz

🗱 Keysight Spectnum Analyzer - Swept SA	04	🗱 Keysight Spectrum Analyzer - Swept SA
RL RF S0:0 AC SENSE:DNT ALION AUTO 0/755:S55 FMMApr.05, 201 Center Freq 2.451500000 GHz Trig: Free Run Avg Type: Log-Pwr TRACE [2 3 4 5 Trig: Ree Run	Frequency	M RL RF SN 02 Acc SEXES:INT ALIGN Autro 07:56/21 PMMay 05, 2016 Frequency Center Freq 2.471500000 GHz Avg Type: Log-Pwr Tract[1:2:3:4:5:6 Frequency
Breaklaw #Atten: 30 dB Cert // MIANA Breaklaw Ref Offset 0.5 dB Mkr2 2.461 00 GH2 10 dB/div Ref 20.50 dBm 1.43 dBn	Auto Tune	Bridentow Sector NUMAR Ref Offset 0.5 dB Mkr2 2.480 00 GHz Auto Tun 10 dBidir Ref 20.50 dBm 0.01 dBm
	Center Freq 2.451500000 GHz	105 105 105 105 105 105 105 105
- 05 	Start Freq 2.441500000 GHz	195 295 295 295
485	Stop Freq 2.461500000 GHz	495 Stop Fre 2481500000 GH
Start 2.44150 GHz Stop 2.46150 GH: #Res BW 100 kHz #VBW 100 kHz Sweep 2.467 ms (1001 pts	CF Step 2.000000 MHz Auto Man	Start 2.46150 GHz Stop 2.48150 GHz CF Ste PRes BW 100 kHz #VBW 100 kHz Sweep 2.467 ms (1001 pts) 4.000 MM
Control Table Set X Y Revenue Revenue <threvenue< th=""> Revenue <thre< td=""><td>Freq Offset 0 Hz</td><td>Control margine X Y Tubercon Tu</td></thre<></threvenue<>	Freq Offset 0 Hz	Control margine X Y Tubercon Tu
9		9
*		MSG STATUS



8. Channel Separation

8.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note: 1. All equipments are calibrated every one year.

2. The test instruments mark by "X" are used to measure the final test results.

8.2. Test Setup



8.3. 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.

8.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

8.5. Uncertainty

 \pm 150Hz

8.6. Test Result of Channel Separation

Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Channel Separation
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Fraguanay	Measurement	Limit	Limit of (2/3)*20dB		
	(MHz)	Level	(kHz)	Bandwidth (kHz)	Result	
	(WIIIZ)	(kHz)	(KIIZ)	Dandwidtii (KHZ)		
00	2402	1000	>25 kHz	740.0	Pass	
39	2441	1000	>25 kHz	740.0	Pass	
78	2480	1000	>25 kHz	753.3	Pass	

NOTE: The 20dB Bandwidth is refer to section 10.

🊺 Ke	eysight	Spectru	ım A	nalyzer - Swe	ept SA								
<mark>w</mark> ℝ Cer	iter	Fre	RF q2	50 Ω 2.40200	AC 0000 GH	lz	SEI	NSE:INT	Avg Type	ALIGN AUTO E: Log-Pwr	03:32:52 PI TRAC	May 05, 2016	Frequency
10 d	Bidiy	F	Ref	Offset 0.5	dB	IO: Wide G	#Atten: 3	0 dB		Mkr	2 2.403 5.0	00 GHz	Auto Tune
10.6 10.5 0.500 -9.50				20.30 0				1	2				Center Freq 2.402000000 GHz
-19.5 -29.5 -39.5	i								The second secon				Start Freq 2.397000000 GHz
-49.5 -59.5 -69.5	bilandig-r	ng faan af t	-	an advancer of	- Joseph and State BA					10 TAL	4. horizandagia mene	l-auto-tanta	Stop Freq 2.407000000 GHz
Cer #Re	nter: sB\ MODE	2.40 N 10	200)0 SCL)0 GHz kHz	×	#VBV	√ 100 kHz	FUN	#	Sweep 5	Span 1 00.0 ms (FUNCTION	0.00 MHz 1001 pts) NVALUE	CF Step 1.000000 MHz <u>Auto</u> Man
1 2 3 4 5 6 7 8 9 10 11	NN		f		2.402 0 2.403 0	0 GHz 0 GHz	5.77 dl 5.69 dl						Freq Offset 0 Hz
MSG			_							STATUS		•	

Channel 00 (2402MHz)



							•		(
🍺 K	eysigh	nt Spec	trum	Analyzer - Swe	ept SA								
<mark>⊮</mark> γ Cer	nter	r Fr	RF eq	50 Ω 2.44100	AC	z	SE	NSE:INT	Avg	ALIGN AUT Type: Log-Pw	0 03:44:18 F	M May 05, 2016 CE 1 2 3 4 5 6	Frequency
					PN IFC	lO:Wide ⊂ Gain:Low	#Atten: 3	e Run 80 dB			C		
10 c	IB/di	iv	Ref Re	Offset 0.5 f 20.50 (dB 1 Bm					MI	kr2 2.442 5.	00 GHz 77 dBm	Auto Tulle
Log 10.6								1	2				Center Freq
0.500								1	Æ				2.441000000 GHz
-9.50									\sim				
-29.5	;												Start Freq 2.436000000 GHz
-39.5	;—						/			-			
-49.5	Marina		men	- mandapalanagara	Nerman House and the state is a second	- week				- No	margaren an march	www.waterware	Stop Freq
-69.5	;												2.446000000 GHz
Cer #Re	nter es B	· 2.4	410	00 GHz		#VB	A/ 100 kHz			#Sween	Span 1 500.0 ms	0.00 MHz	CF Step
MKB	мор	E TR	-l sci		×	*	Y		FUNCTION	FUNCTION WID	THI FUNCT		<u>Auto</u> Man
1	N	1	f		2.441 0	0 GHz	5.81 d	Bm Bm					
3					2.112.0		•						Freq Offset 0 Hz
5 6												=	
8								-					
10 11												•	
MSG	ĴА	lignr	nent	Complete	ed		III			STA	TUS	•	

Channel 39 (2441MHz)

Channel 78 (2480MHz)

🊺 Keys	ight Sp	ectrum	Analyzer - Swe	ept SA								
Cent	er F	RI req	50 Ω 2.48000	AC 0000 GH	z	SE	NSE:INT	Avg T	ALIGN AUT	0 03:53:36 Vr TRA	PM May 05, 2016 CE 1 2 3 4 5 6 (PE M WWWWW	Frequency
10 dB	/div	Re Re	f Offset 0.5	dB IBm	O:Wide ∟ Sain:Low	#Atten: 3	0 dB		М	kr1 2.479 6	00 GHz 12 dBm	Auto Tune
Log 10.5 - 0.500 - -9.50 -							2					Center Freq 2.480000000 GHz
-19.5 -29.5 -39.5 -								1	-			Start Freq 2.475000000 GHz
-49.5 -59.5 -69.5	~l^,/. ~~^	nustra.	مىروالدىنى اور يەرى مەرىيە ئادىنى اور يەرى	august -				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	had monuschings	-ship-rabilition-reasons	hidha-a-shidada anga	Stop Freq 2.485000000 GHz
Cent #Res	er 2. BW	4800 100	000 GHz kHz		#VBV	V 100 kHz			#Sweep	Span 500.0 ms	10.00 MHz (1001 pts)	CF Step 1.000000 MHz Auto Man
MKR M 1 2 3 4 5 6 7 8 9 10 11 <				× 2.479 00 2.480 00) GHz) GHz	Y 6.12 d 6.10 d	Bm Bm I I I I I I I I I I I I I I I I I		FUNCTION WIE	FUNCT		Freq Offset
MSG									STA	TUS		L



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Channel Separation
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK)

	Fraguanay	Measurement	Limit	Limit of (2/3)*20dB	
Channel No.	(MHz)	Level	(1,11,2)	Dandwidth (1247)	Result
	(MITZ)	(kHz)	(кпz)	Bandwidtii (KHZ)	
00	2402	1000	>25 kHz	926.7	Pass
39	2441	1000	>25 kHz	926.7	Pass
78	2480	1000	>25 kHz	926.7	Pass

NOTE: The 20dB Bandwidth is refer to section 10.

🊺 Keysigh	t Spectre	um A	nalyzer - Swe	pt SA									
Center	· Fre	RF q 2	50 Ω 2.40200	AC 0000 GH	z	Si Tria: Fr	ENSE:INT	Avg	/ Type	LIGN AUTO	07:13:43 PI TRAC	M May 05, 2016	Frequency
10 dB/di	iv I	Ref Ref	Offset 0.5 20.50 d	dB IBm	IO: Wide Sain:Low	#Atten:	30 dB			Mkr	2 2.403 2.	00 GHz 67 dBm	Auto Tun
10.5							1	2	1				Center Fre 2.402000000 GH
-19.5 — -29.5 — -39.5 —						~~			6	ω <u>γ</u>			Start Fre 2.397000000 GH
-49.5 -59.5 -69.5		urit mi		here on the second second	and a second					Kon	hallow marked by the state	aladita (nata dina)	Stop Fre 2.407000000 GH
Center #Res B	2.40 W 10	200 00	00 GHz kHz		#VE	3W 100 kH:	z		#\$	weep 5	Span 1 00.0 ms (0.00 MHz 1001 pts)	CF Ste 1.000000 MH
MKR MOD 1 N 2 N 3 4 5 6 7 8 9 10 11 <		SCL f f		× 2.402 00 2.403 00	0 GHz 0 GHz	¥ 2.71 c 2.67 c	IBm IBm	FUNCTION	FUN	CTION WIDTH	FUNCTIO	DN VALUE	Freq Offse 0 H
MSG										STATUS			

Channel 00 (2402MHz)



									(- · · ·						
🇾 Key	ysight	Spect	rum A	Analyzer - Swe	ept SA										
LXI R	L		RF	50 Ω	AC		SE	NSE:INT		-	ALIGN AUTO	07:31:19 P	M May 05, 2016		Frequency
Cen	ter	Fre	pd 7	2.44100	0000 GH	z	Tria: Fra	- Bun	Avg	i ype	: Log-Pwr	TVI		5	
					PN	O:Wide	→ fig. Fig. #Atten:	R dB				DI	PNNNI	Ń	
					IFC	Sam:Low	#Atten. (
			Dof	OffectOF	dD.						Mkr	2 2.442	00 GHz	11	Autorune
10 di	Bidis	,	Ref	5 20 50 c	iBm							2.	30 dBm		
Log		·		20.00			1	T							
10.5								1	2						Contor From
10.5								Φ .	•						CenterFreq
0.500								pan,	monthing						2.441000000 GHz
-9.50									l l						
0.00)					
-19.5										+					Start Fred
-29.5															otartireq
20.0										1.					2.436000000 GHz
-39.5							AV			V	La				
-49.5						- part	*				•• \				
10.0		Un	-nh		and an and a start	quar					Juperto	medaning	mound		Stop Freg
-59.5															2 446000000 CH-
-69.5															2.44000000 GH2
00.0															
Con	tor	2.4/	140									Enon 1	0.00 844-		05 01-1
cen «P		2.44	+ I U			<i>4</i> 0 (B		_		щ		Spann		11	CF Step
#ке	S DI	W 1	UU	KITZ		#VD	W 100 KH2	<u> </u>		#3	sweep o	00.0 ms (1001 pts)	١.	1.000000 MHZ
MKR	MODE	TRC	SCL		X		Y		FUNCTION	FUN	CTION WIDTH	FUNCTION	DN VALUE	A	<u>uto</u> Man
1	Ν	1	f		2.441.0	0 GHz	2.35 d	Bm							
2	Ň	1	f		2.442 0	0 GHz	2.30 d	Bm							
3															Freq Offset
4															0 Hz
5													=		
7										-					
8															
9															
10															
11										L					
•		_	_							_			E F		
MSG											STATUS				

Channel 39 (2441MHz)

Channel 78 (2480MHz)



9. Dwell Time

9.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

9.2. Test Setup



9.3. Limit

The dwell time shall be the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

9.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

9.5. Uncertainty

 \pm 25msec



9.6. Test Result of Dwell Time

Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Dwell Time
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (Channel 00,39,78 –DH5)

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
2402	2.847	12	50	0.68	0.273	0.4	Pass
2441	2.847	13	50	0.74	0.296	0.4	Pass
2480	2.848	13	50	0.74	0.296	0.4	Pass

Duty cycle = ((Time slot length(ms)*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) * (79*0.4)

CH 00 Time Interval between hops

CH 00 Transmission Time

Reys	ght Spectry	m Analyzer	- Swept	SA													0.0	BR Ke	eysight	Spectru	100.00	nalyzer - Swept SA										and the state	0.0
Cent	er Free	2.40	2000	000 (GHz			SU	VSE:DNT	1	Avg T	ype: L	.og-Pwr	03:3	TRACE	tay 05, 2016 1 2 3 4 5 6	Frequency	Cen	nter	Free	q 2	.40200000	0 GHz			SENSE:2	A'	vg Typ	Log-Pv	0 03:39: VF	RACE 1 2 3	2016 4 5 6	Frequency
		105			PNO: IFGain	Low	At	tten: 3	dB						DET	PNNNNN	Auto Tune	-					PNC IFGa	I: Fast In:Low	₽ Å	tten: 30 dB				Mkr3	6.563	ms	Auto Tune
10 dB	div F	ef 20.5	50 dB	sm														10 d	B/di	V R	ter	20.50 dBm									6.52 dE	3m	
10.5		-						_		_	_				_	10	Center Freq 2.40200000 GHz	10.5 0.500			-		- 01	-	2		_		F		-	-	Center Freq 2.402000000 GHz
0.500 -9.50			1														Start Freq 2.402000000 GHz	-9.50 -19.5 -29.5 -39.5	5												395	O L YL	Start Freq 2.40200000 GHz
-19.5 -			1													790. 11	Stop Freq 2.402000000 GHz	-49.5 -59.5 -69.5	5		+		¥.fr	فيوجهلو				jid _r a	Rech	-	-		Stop Freq 2.402000000 GHz
-39.5					$\ $	+	\square										CF Step 1.000000 MHz Auto Man	Cen Res	nter s BW	2.403 V 1.0	200 MH	00000 GHz Hz		#VB	SW 1.0	MHz	O.M. DON	FU	Sweep	10.00 m	Span 0 s (1001 p	Hz pts)	CF Step 1.000000 MHz Auto Man
-69.5 -	10		-		**	Na.	*	<u> </u>	ψ.	W	N	+	v	71	M		Freq Offset 0 Hz	1 2 3 4 5	N N	1	1		2.81 3.71 6.56	7 ms 3 ms 3 ms		6.55 dBm 4.14 dBm 6.52 dBm							Freq Offset 0 Hz
-69.5 Cente	er 2.40	200000	10 GH	z											Sp	an 0 Hz		6 7 8 9 10			#												
Res E	W 1.0	MHz				#VBV	V 1.0	MHz				Sv	weep	50.00	ms (1	001 pts)		1.1		+ +	=							1		-		+	
MSG													STAT	15				MSG											57/	rus			

CH39 Time Interval between hops

CH 39Transmission Time

Keysight Se	Spectrum Analyzer - Swept SA	10	1000		14-1	1000000000000		COLUMN ADDRESS	0.0	Keysight Spectrum Ana	lyzer - Swept SA	10000	642 TA	- AMULTANE	and the second	0.0
Center F	Freq 2.441000000	GHz	Trio: Vi	ense:INT	Avg Typ	ALIGN AUTO	03:46:50 PM TRACE TVP	May 05, 2016 E 1 2 3 4 5 4	Frequency	Center Freq 2.4	441000000 GHz	Trig: Video	Avg Ty	ALIGN AUTO	03:47:04 PM May 05, 2016 TRACE 1 2 3 4 5 6 TyPE WWWWW	Frequency
10 dB/div	Ref Offset 0.5 dB Ref 20.50 dBm	IFGain:Low	Atten:	30 dB			DET	r P NNNN	Auto Tune	Ref O	IFGainLow 15et 0.5 dB 20.50 dBm	Atten: 30 dB			Mkr3 6.563 ms 6.53 dBm	Auto Tune
10.5									Center Freq 2.441000000 GHz	10.5 0.500			\$			Center Freq 2.441000000 GHz
-9.50									Start Freq 2.441000000 GHz	-19.5					590 LVL	Start Freq 2.441000000 GHz
-19.5								1990 14	Stop Freq 2.441000000 GHz	49.5 -69.5	ประเทศการ		h	n hwa		Stop Fred 2.441000000 GH:
39.5				+	+				CF Step 1.000000 MHz Auto Man	Center 2.441000 Res BW 1.0 MH	0000 GHz z #V	BW 1.0 MHz	DIN'TON L	Sweep	Span 0 Hz 10.00 ms (1001 pts)	CF Step 1.000000 MH Auto Mar
-49.5 H -69.5	- 	W he			- <u>+</u>	14	ha	si liy	Freq Offset 0 Hz	1 N 1 t 2 N 1 t 3 N 1 t 4 5	2,817 ms 3,716 ms 6,563 ms	6.57 dBm 4.26 dBm 6.53 dBm				Freq Offsel 0 H;
69.5 Center 2	2.441000000 GHz						s	pan 0 Hz		6 7 8 9 10						
Res BW	1.0 MHz	#VBV	V 1.0 MH	z		Sweep 5	50.00 ms (1	1001 pts)							1.	



CH 78 Time Interval between hops

CH 78 Transmission Time

E Keysight S	Spectrum Analyzer - Swept SA								0.0	Keysight Spectrum Analyzer	r - Swept SA				0.0.0
Center I	Freq 2.48000000) GHz	Si Televite	NSE:2NT	Avg Type	Log-Pwr	03:58:27 PM TRACE	May 05, 2016	Frequency	Center Freq 2.48	00000000 GHz	SENSE: 2NT	Avg Type: Log-Pwr	03:58:41 PM May 05, 2016 TRACE 1 2 3 4 5 6	Frequency
		PNO: Fast IFGain:Low	Atten: 3	o dB			DET	PNNNNN	Auto Tuno	10	PNO: Fast (IFGain:Low	Atten: 30 dB		DET PNNNNN	Auto Tuno
10 dB/div	Ref Offset 0.5 dB Ref 20.50 dBm								Auto Tune	10 dB/div Ref Offse	et 0.5 dB 50 dBm		N	1kr3 7.463 ms 6.81 dBm	Auto Tune
10.5									Center Freq 2.480000000 GHz	10.5 0.500		1 (²	······································		Center Freq 2.48000000 GHz
0.500 -9.50									Start Freq 2.480000000 GHz	-19.5 -29.5				5HOLVE	Start Freq 2.48000000 GHz
-19.5								1900 V	Stop Freq 2.480000000 GHz	49.5 59.5 69.5		heipeastu		w	Stop Freq 2.480000000 GH2
39.5									CF Step 1.000000 MHz Auto Man	Center 2.48000000 Res BW 1.0 MHz	00 GHz #VB	W 1.0 MHz	Sweep 10.	Span 0 Hz 00 ms (1001 pts)	CF Step 1.000000 MH: Auto Mar
-69.5	* 14 2/	*	v	W	¥ 14	V ^a	ч °	η μ.	Freq Offset 0 Hz	1 N 1 t 2 N 1 t 3 N 1 t 4 5	3.716 ms 4.615 ms 7.463 ms	6.83 dBm 5.26 dBm 6.81 dBm			Freq Offse 0 H
Center 2	2.480000000 GHz						S	oan 0 Hz		0 7 8 9 10 11					
Kes BW	1.0 MHZ	#VBM	1.0 MHz			Sweep 5	0.00 ms (1	ious pts)		* MSG			STATUS	•	

Note:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.



Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Dwell Time
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (Channel 00,39,78 –DH5)

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
2402	2.838	13	50	0.74	0.295	0.4	Pass
2441	2.837	13	50	0.74	0.295	0.4	Pass
2480	2.837	13	50	0.74	0.295	0.4	Pass

Duty cycle =((Time slot length(ms)*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) * (79*0.4)

CH 00 Time Interval between hops

K = 100 K Sector Report Sector Act | Center Freq 2.402000000 GHz Fix + 100 Fix + 100 GHz enter Freq 2.402000000 GHz PNO: Fast C Trig: Video Atten: 30 di 25 PM May 05, 2016 TRACE 1 2 3 4 5 6 TVPE WWWWWW DET P NNNN Avg Type: Log-Pw Frequency Avg Type: Log-Pwr Frequency Auto Tur Auto Tu Mkr3 7.463 m 4.90 dBn Ref Offset 0.5 dB Ref 20.50 dBm Ref Offset 0.5 dB Ref 20.50 dBm 10 de div 1 02 **♦**³ Center Fre Center Fre 2.402000000 G 02000000 G Start Fre 2.402000000 GH Start Fre 2000000 G harderline antes Stop Fre 2.402000000 GH Stop Fre 000000 G CF Step 1.000000 MHz Man enter 2.402000000 GHz es BW 1.0 MHz Span 0 Hz Sweep 10.00 ms (1001 pts CF Step #VBW 1.0 MHz 1 N 2 N 3 N 3.716 ms 4.625 ms 7.463 ms 4.27 dBm 3.34 dBm 4.90 dBm 1 1 Freq Offse Freq Offse OH OH Span 0 Hz Sweep 50.00 ms (1001 pts) Center 2.402000000 GHz Res BW 1.0 MHz #VBW 1.0 MHz

CH39 Time Interval between hops

CH 39Transmission Time

CH 00 Transmission Time

Keysight Spectrum Analyzer - Swept SA	0.0	Bit Keysight Spectrum Analyzer - Swept SA	0.0
RL RF 59.0 AC SENSE:DNT ALIGN AUTO 07:23:35 PMAyr 05, 20 Center Freq 2.441000000 GHz Trig: Video Trig: Video Trig: Video Trig: Video	Frequency	0 RL RF 50 Ω AC SENSE.INT ALION AUTO 07-02-49 PM Nar 05, 2016 Center Freq 2.441000000 GHz FMC Fave Trig: Video Trig: Video	Frequency
If Gains ov Atten: 30 dB Deri P MNN Ref Offset 0.5 dB 0 dB/div Ref 20.50 dBm	Auto Tune	IFGainLow Atten: 30 dB Ceriff MNMA Ref Offset 0.5 dB Mkr3 6.563 ms 10 dB/div Ref 20.50 dBm 4.74 dBm	Auto Tune
	Center Freq 2.441000000 GHz	244 244 244 244 244 244 244 244 244 244	Center Freq 441000000 GHz
	Start Freq 2.441000000 GHz	200	Start Freq 441000000 GHz
295	Stop Freq 2.441000000 GHz	-85	Stop Freq 441000000 GHz
205	CF Step 1.000000 MHz Auto Man	Center 2.441000000 GHz Span 0 Hz Res BW 1.0 MHz #VBW 1.0 MHz Sweep 10.00 ms (1001 pts) Contract traction water x y	CF Step 1.000000 MHz Man
	Freq Offset 0 Hz	1 N 1 t 247 ms 4.40 dBm 2 N 1 t 3726 ms 2.54 dBm 3 N 3 t 6.553 ms 4.74 dBm 4 4 5	Freq Offset 0 Hz
205	Hz		
50 STATUS		MSG STATUS	



CH 78 Time Interval between hops

CH 78 Transmission Time

	er Fre	n Analys RF q 2.41	50 Q 50 Q 80000	45A 20000 G	SHz PNO:	Fast C	Tri	sen ig: Vide	ISE INT		Avg Typ	ALIGN I pe: Log-	Pwr	07:49:02 TR	PM May 0 AGE 1 2 TYPE WW	5, 2016 3 4 5 6	Frequency	Cento	er Fr	req 2	2.480	Swept SA 000000	0 GH	Z D: Fast		strist:	INT]	Avg Ty	AL10 pe: Lo	N AUTO g-Pwr	07:49:17 TR	PM May 05, 2016 ACE 1 2 3 4 5 4	Frequ	la ka
10 dB	div F	tef Offs Ref 20	et 0.5 .50 di	∃B Bm	IFGair	:Low	At	ten: 30	dB						DET P N	NNNN	Auto Tune	10 dB	/div	Ref	Offset 20.5	0.5 dB 0 dBm	IFG	sin:Low	A	tten: 30 dE					Mkr3	3.563 ms .83 dBm	Au	ito Tune
10.5																	Center Freq 2.48000000 GHz	10.5 0.500		*	- 		-1	Ŷ	2	••	- 10		-	ſ		-	Cent 2.480000	ter Freq 0000 GHz
0.500 -9.50																-	Start Freq 2.480000000 GHz	-9.50 -19.5 -29.5 -39.5														190 LVL	Sta 2.480000	art Freq
-19.5																	Stop Freq 2.48000000 GHz	-49.5 -59.5 -69.5		_			wy.	-qthile		-	_	4	tudije	*			St 2.480000	op Freq
-39.5				-	-	-	F			+	H			+	T		CF Step 1.000000 MHz Auto Man	Cente Res E	er 2.4 BW 1	4800 1.0 M	00000 Hz	0 GHz		#VB	W 1.0	MHz	FUNCTI	on F	Swe	eep 1	0.00 ms	Span 0 Hz (1001 pts)	1.000 Auto	CF Step 0000 MHz Man
-69.5		-	7	¢.	**	- 1		v	m	-	1 4	-	*	ч	45	- 18	Freq Offset 0 Hz	1 2 3 4 5	N 1 N 1 N 1	1			2,81 3,72 6,56	7 ms 6 ms 3 ms		4.43 dBm 2.61 dBm 4.83 dBm							Free	q Offsel 0 Hz
-69.5 Cent	er 2.48	00000	00 Gł	łz											Span	0 Hz		6 7 8 9 10						-										
Res	W 1.0	MHz				#VB	N 1.0	MHz				Swee	ep 50).00 ms	(1001	pts)		*	1	1	-									STATU	3			

Note:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.



10. Occupied Bandwidth

10.1. Test Equipment

_	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

10.2. Test Setup



10.3. Limits

N/A

10.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

10.5. Uncertainty

± 150Hz

10.6. Test Result of Occupied Bandwidth

Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	945		NA
39	2441	942		NA
78	2480	945		NA

Figure Channel 00:

🊺 Keysigh	t Spectrum	Analyzer - Sw	ept SA								
Center	· Freq	F 50 Ω 2.40200	AC 00000 GH	łz	SEN	NSE:INT	Avg Typ	ALIGN AUTO e: Log-Pwr	03:40:35 P TRAC	M May 05, 2016	Frequency
10 dB/di	Re iv R e	f Offset 0.4	5 dB	NO: Wide ⊊ Gain:Low	#Atten: 3	0 dB		Mkr2	2.401 5 -14.	50 GHz 73 dBm	Auto Tune
Log 10.5				2	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~1	3				Center Freq 2.402000000 GHz
-19.5 -29.5 -39.5			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						~~	-14.54 dbm	Start Freq 2.400500000 GHz
-49.5 -59.5 -69.5 —		~								Wean Jaw	Stop Freq 2.403500000 GHz
Center #Res B	2.402 W 30	000 GHz kHz	~	#VBV	V 100 kHz	FINA		Sweep 3	Span 3 .200 ms (.000 MHz 1001 pts)	CF Step 300.000 kHz <u>Auto</u> Man
1 N 2 N 3 N 4 5 6 7 8 9 10 11			x 2.402 16 2.401 55 2.402 49	5 GHz 0 GHz 5 GHz	5.46 dB -14.73 dE -14.80 dE	Bm Bm Bm Bm			FUNCI		Freq Offset 0 Hz
MSG								STATU	5		



Rejold Spectrum Analyzer - Swept SA SENSE: UT ALIGN AUTO 02:47:45 PM May 02:34:56 Frequency PNO: Wide Trig: Free Run Avg Type: Log-Pwr Tric: II: 2:34:56 Frequency ID dB/div Ref Offset 0.5 dB Mkr2 2:440 547 GHz -14:53 dBm 0: 0 -14:53 dBm -14:53 dBm Center Freq 0: 0 -2 -3 -14:53 dBm Center Freq 0: 0 -2 -3 -14:51 dBm Center Freq 0: 0 -2 -4 -4 -4 Stop Freq 2: 442500000 GHz Span 3:000 MHz Sweep 3:200 ms (1001 pt) 30:000 kHz 1 N f -44:159 GHz -14:81 dBm -14:81 dBm -14:81 dBm 1 N f -44:						0						
Rt B0 & AC SERVIT ALLER AUTO D0372459 PMRy 05,2016 Center Freq 2.44100000 GHz (FGainLow) Trig: Free Run #Atten: 30 dB Avg Type: Log-Pwr Trace[1:3:4:5 Ref Offset 0.5 dB Mkr2 2.440 547 GHz (-14.53 dBm) Auto Tune 0 dB/div Ref 20.50 dBm -14.53 dBm 0 dB/div Q2 -14.53 dBm -14.51 dem 0 dB/div Q2 -14.51 dem -14.51 dem 0 dB/div Q2 -14.51 dem -14.51 dem 0 dB/div Q2 -14.53 dBm -14.51 dem 0 dB/div WBW 100 KHz Span 3.000 MHz 10 DB/div XMB/DHZ Span 3.000 MHz 2 N 1 f 2.441 159 Hz -14.53 dBm 3 N 1 f 2.441 159 Hz -14.53 dBm 10 dB/div -14.53 dBm -14.51 dBm 10 dB/div -14.53 dBm -14.51 dBm <td< th=""><th>🎉 Keysight Sp</th><th>pectrum An</th><th>alyzer - Swe</th><th>pt SA</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></td<>	🎉 Keysight Sp	pectrum An	alyzer - Swe	pt SA								
Pho: Wide Ing: Free Run #Atten: 30 dB Ref Offset 0.5 dB Mkr2 2.440 547 GHz -14.53 dBm 10 dB/div Ref 20.50 dBm 0 dB/div Precent and the second and the sec	w RL Center F	_R ⊧ Feq 2.	50 Ω .44100	AC 0000 GH	Ηz	SEI	NSE:INT	Avg Typ	ALIGN AUTO e: Log-Pwr	03:47:45 PI TRAC	M May 05, 2016	Frequency
Ref Offset 0.5 dB Mkr2 2.440 547 GHz 0 dB/div Ref 20.50 dBm -14.53 dBm 105 -14.53 dBm -14.53 dBm 106 -14.53 dBm -14.53 dBm 107 -14.53 dBm -14.53 dBm 108 -14.53 dBm -14.53 dBm 119 -14.53 dBm -14.53 dBm 110 -14.53 dBm -14.53 dBm 111 -14.53 dBm -14.53 dBm 111 </td <td></td> <td></td> <td></td> <td>PI IF</td> <td>NO: Wide Ģ Gain:Low</td> <td>#Atten: 3</td> <td>e Run 0 dB</td> <td></td> <td></td> <td>DE</td> <td></td> <td>Auto Tumo</td>				PI IF	NO: Wide Ģ Gain:Low	#Atten: 3	e Run 0 dB			DE		Auto Tumo
Orgonov KR 20.00 GHz Center Freq 2.44100000 GHz Start Freq 2.44100000 GHz 38.6 2.439500000 GHz Start Freq 2.439500000 GHz Start Freq 2.439500000 GHz 2.442500000 GHz Span 3.000 MHz Stop Freq 2.4410000 GHz Span 3.000 MHz Stop Freq 2.44250000 GHz Span 3.000 MHz Stop Freq 2.441 159 GHz 5.49 dBm Function winth 1 1 1 2.441 159 GHz 5.49 dBm 3 1 1 2.441 169 GHz 5.49 dBm 3 N 1 1 2.441 169 GHz 5.49 dBm 3 N 1 1 2.441 169 GHz 5.49 dBm 3 N 1 1 2.441 169 GHz 5.49 dBm 3 N 1 1 2.441 169 GHz 6 6 1 1 1 1.451 dBm 1.451 dBm 8 1 1 1 1.451 dBm 1.451 dBm 9 1 1 1.451 dBm 1.451 dBm 1.451 d	10 dB(diu	Ref ()ffset 0.5	dB				Auto Tune				
10.5 2 3	Log	Kei	20.30 u	ып			1					
500 2 3 -14.51 dBn 950 3 -14.51 dBn Start Freq 2.410000 GHz Freq Span 3.000 MHz Stop Freq 2.442500000 GHz 300.000 kHz Sweep 3.200 ms (1001 pts) 300.000 kHz 1 1 1 2.441 159 GHz -14.53 dBm -14.53 dBm -14.53 dBm 3 1 1 2.441 489 GHz -14.63 dBm -14.53 dBm -14.53 dBm 3 1 1 2.441 489 GHz -14.63 dBm -14.53 dBm -14.53 dBm 3 1 1 1 -14.53 dBm	10.5						\downarrow					Center Freq
9-50 19-5 29-5 39-5 49-5 59-5	0.500				• 2	~~~~	and the					2.441000000 GHz
19.6	-9.50							~ 2			-14.51 dBm	
295 243950000 GHz 395 395 495 395 595 995 605 995 201 1 1 1 1 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 3 1 4 1 5 1 6 1 10 1 11 1 12 1 13 1 14 1 15 1 16 <	-19.5			1	~~~				~			Start Fred
39.5 49.5 59.5 59.5 59.5 50.5	-29.5		~	~~~					2	~		2.439500000 GHz
49.5	-39.5		1	\sim					po	-		
59.5	-49.5		/							- h		Stop From
60.5	-59.5											2 442500000 GH
Center 2.441000 GHz Span 3.000 MHz Span 3.000 MHz gres BW 30 kHz #VBW 100 kHz Sweep 3.200 ms (1001 pts) MKR Model TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE 1 1 1 2.441 159 GHz -14.63 dBm	-69.5											2.442500000 GHZ
Span 3.000 MHz Span 3.000 MHz Span 3.000 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 3.200 ms (1001 pts) MR Model rec Sci 2 N 1 f 2.441 159 GHz -14.63 dBm 1 N 1 f 2.441 489 GHz -14.63 dBm		44400	0.011-							6	000 0011-	
Auto Mar N 1 f 2.441 159 GHz 5.49 GBm FUNCTION WIDTH FUNC	#Res BW	.44100 / 30 kH	U GHZ		#VB۱	V 100 kHz			Sween 3	Span 3 .200 ms (.000 MHZ 1001 pts)	CF Step 300.000 kHz
N 1 f 2.441 159 GHz 5.49 dBm 2 N 1 f 2.441 159 GHz -14.53 dBm 3 N 1 f 2.441 689 GHz -14.63 dBm 3 N 1 f 2.441 489 GHz -14.81 dBm 5 1 1 1 1 1 6 1 1 1 1 1 7 1 1 1 1 1 9 1 1 1 1 1 11 1 1 1 1 1						1 100 1012	euur		oncep o	.200 1115 (1001 pts)	Auto Mar
2 N 1 f 2.440 547 GHz -14.53 dBm Freq Offset 3 N 1 f 2.441 489 GHz -14.81 dBm 6 6 6 6 6 6 6 6 6 6 6 7 6 6 7	1 N	1 f		2.441 15	9 GHz	5.49 dl	Bm	TION FUI	NCTION WIDTH	FUNCTION		
3 N 1 2.441405 GHz 14.61 GBM 5 - - - - 6 - - - - 7 - - - - 8 - - - - 9 - - - - 10 - - - - 11 - - - - \$G STATUS - - -	2 N	1 f		2.440 54	7 GHz	-14.53 di	3m					Freg Offset
5	4			2.44140	5 GHZ	-14.01 ut	5111					0 Hz
7	6						-				E	
9	7											
10 10 10 10 10 10 10 10 10 10 10 10 10 1	9											
sq status	10	+										
SG STATUS	•	1 1			1	III	1	ł			- F	
	MSG								STATUS	6		

Figure Channel 39:

Figure Channel 78:





Product	:	Evoko Liso Room Manager /Evoko Liso
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1317		NA
39	2441	1314		NA
78	2480	1314		NA

Figure Channel 00:

ght Spectrur	n Analyzer - Swe	ept SA								
er Fred	₹ <u>50 Ω</u> 2.40200	AC 0000 GH	lz	SEN	NSE:INT	Avg Type	ALIGN AUTO : Log-Pwr	07:26:20 P TRAC	M May 05, 2016	Frequency
R	ef Offset 0.5	dB	NO: Wide ⊆ _► Gain:Low	#Atten: 3	0 dB		Auto Tune			
			2				.3	10.		Center Freq 2.402000000 GHz
									-17.56 dBm	Start Freq 2.400500000 GHz
										Stop Freq 2.403500000 GHz
Center 2.402000 GHz Span 3.000 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 3.200 ms (1001 pts)										CF Step 300.000 kHz <u>Auto</u> Man
		× 2.402 16 2.401 35 2.402 67	5 GHz 5 GHz 2 GHz	Y 2.44 dE -18.02 dE -17.93 dE	FUN Bm Bm Bm Bm 			FUNCTI	DN VALUE	Freq Offset 0 Hz
	er 2.402 BW 30 DE 1126 E2 L 1 1 L 1 1	Pr 2.402000 GHz BW 30 KHz Pr Field Sci Control of the second seco	Pr Freq 2.40200000 GHz Ref Offset 0.5 dB div Ref 20.50 dBm Pr Freq 2.40200000 GHz Pr Freq 2.402000 GHz Pr 2.402000 GHz BW 30 KHz Pr 2.402000 GHz BW 30 KHz Pr 2.40216 1 f 2.40267	PH Spectrum Analyzer - Swept SA Pr Pr S0 Q AC Pr Pr S0 Q Pr Pro: Wide G IFGain:Low Ref Offset 0.5 dB div Ref 20.50 dBm Pho: Wide G Pho: Wide G IfG Set 0.5 dB Pho: Wide G Pho: Wide G	PHS Spectrum Analyzer - Swept SA SEP PR 50 Ω AC Pr Freq 2.402000000 GHz PNO: Wide Comparison of the second s	ht Spectrum Analyzer - Swept SA SENSE:INT Pr 50 Q AC Pr 50 Q AC Pr Freq 2.402000000 GHz Trig: Free Run PNO: Wide #Atten: 30 dB div Ref Offset 0.5 dB div Ref 20.50 dBm div Q provide Q	Price Sense:INT Pr 50 Q Pr 10 Q Pr	ht Spectrum Analyzer - Swept SA RF 50 Q AC SENSE:INT ALIGN AUTO Pr Freq 2.402000000 GHz PN: Wide Trig: Free Run Hatten: 30 dB MKr2 Ref Offset 0.5 dB div Ref 20.50 dBm Ref 20.50 dBm Ref 20.50 dBm Ref 20.50 dBm	ht Spectrum Analyzer - Swept SA RF 50 Q AC SENSE:INT ALION AUTO 07:26:20 P Pr Freq 2.402000000 GHz PNO: Wide Trig: Free Run #Atten: 30 dB Ref 20.50 dBm -18. Ref Offset 0.5 dB -18. div Ref 20.50 dBm -18. Pr 2.402000 GHz #VBW 100 kHz Span 3 BW 30 kHz #VBW 100 kHz Span 3 BW 30 kHz FUNCTION WIDTH FUNCTO 1 f 2.402 165 GHz -18.02 dBm -11. 1 f 2.402 672 GHz -17.93 dBm -11. 1 f 2.402 672 GHz -17.93 dBm -11. 1 f 2.402 672 GHz -17.93 dBm -11. Trig: Free Run #U -11. Trig: Free Run #U -11. Pr 2.402 000 GHz FUNCTION WIDTH FUNCTO Trig: Free Run #U -11. Trig: Free Run #U -11. #U -11.	pht Spectrum Analyzer - Swept SA Pr Freq 2.402000000 GHz PNO: Wide Trig: Free Run #Atten: 30 dB Ref Offset 0.5 dB div Ref 20.50 dBm PND: Wide Trig: Free Run #Atten: 30 dB Mkr2 2.401 355 GHz -18.02 dBm -18.02 dBm -17.56 dBm



M Key	wight !	Spectr		habrar - Sw	ant SA		-						
	/signt (specu	RE	50.0			SE	NSE-INT		ALIGN AUTO	07:34:31 0	M May 05, 2016	
Cen	ter	Fre	n î	2 44 100	10000 GI	17	30	10E.IIII	Avg Typ	e: Log-Pwr	TRAC	E 1 2 3 4 5 6	Frequency
Con	PNO: Wide Trig: Free Run IFGain:Low #Atten: 30 dB												
10 d	Ref Offset 0.5 dB 10 dB(div. Def 20 50 dBm									Mkr2	Auto Tune		
Log			KCI	20.30 (
10.5								$ \land$					Center Freq
0.500						-		h X	~~~				2.441000000 GHz
-9.50					•	2			m	3		-18.02 dBm	
-19.5			-							1 (Start Freg
-29.5													2,439500000 GHz
-39.5				~							\sim		
-49.5		<u>~</u>	~	\sim	and the second s					L	har	Samo	
-59.5													Stop Freq
-69.5													2.442500000 GHz
Cen #Res	Center 2.441000 GHz Span 3.000 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 3.200 ms (1001 pts)										CF Step 300.000 kHz		
MKR	MODE	TRC	SCL		x		Y	FUN	TION FU	NCTION WIDTH	FUNCTIO	DN VALUE	<u>Auto</u> Man
1	Ν	1	f		2.441 15	9 GHz	1.98 d	Bm					
2	N	1	f		2.440 34	9 GHz	-18.48 d	3m					Freg Offset
4	IN	-			2.441 00		-16.06 0	500					0 Hz
5												=	0112
6													
8													
9													
11													
•							III					•	
MSG										STATUS	;		
											1		

Figure Channel 39:

Figure Channel 78:





11. EMI Reduction Method During Compliance Testing

No modification was made during testing.



Attachment 1: EUT Test Photographs



Attachment 2: EUT Detailed Photographs