



Test Report

FCC Part15 Subpart C

Product Name : Rylo
Model No. : A0101
FCC ID : 2AK270101A

Applicant : Magenta Labs Inc
Address : 164 Townsend St. Unit 1 San Francisco California United
States 94107

Date of Receipt : July. 25th, 2017
Test Date : July. 26th, 2017~Aug. 22nd, 2017
Issued Date : Sept. 19th, 2017
Report No. : 1772163R-RF-US-P06V01
Report Version : V1.0

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 DEKRA Testing & Certification (Suzhou) Co., Ltd.

Test Report Certification

Issued Date : Sept. 19th, 2017

Report No. : 1772163R-RF-US-P06V01



Product Name : Rylo
Applicant : Magenta Labs Inc
Address : 164 Townsend St. Unit 1 San Francisco California United States 94107
Manufacturer : Magenta Labs Inc
Address : 164 Townsend St. Unit 1 San Francisco California United States 94107
Model No. : A0101
FCC ID : 2AK270101A
EUT Voltage : DC 3.7V
Test Voltage : AC 120V/60Hz
Brand Name : Rylo
Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2015
ANSI C63.4:2014; ANSI C63.10:2013;
KDB 558074 D01v04
Test Result : Complied
Performed Location : DEKRA Testing & Certification (Suzhou) Co., Ltd.
No.99 Hongye Rd., Suzhou Industrial Park, Suzhou, 215006,
Jiangsu, China
TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098
FCC Registration Number: 800392; IC Lab Code: 4075B

Documented By :



(Adm. Specialist: Kitty Li)

Reviewed By :



(Senior Engineer: Frank He)

Approved By :



(Engineering Manager: Harry Zhao)

TABLE OF CONTENTS

Description	Page
1. General Information	6
1.1. EUT Description	6
1.2. Working Frequency of Each Channel:	7
1.3. Antenna information	7
1.4. Mode of Operation	8
1.5. Tested System Details	8
1.6. Configuration of Tested System	9
1.7. EUT Exercise Software	10
2. Technical Test	11
2.1. Summary of Test Result	11
2.2. Test Frequency configuration:	12
2.3. Test Environment	13
2.4. Measurement Uncertainty	13
3. AC Power Line Conducted Emission	14
3.1. Test Equipment	14
3.2. Test Setup	14
3.3. Limit	15
3.4. Test Procedure	15
3.5. Test Result	16
4. Emissions in restricted frequency bands	18
4.1. Test Equipment	18
4.2. Test Setup	19
4.3. Limit	20
4.4. Test Procedure	22
4.5. EUT test Axis definition	23
4.6. Test Result	24
5. Emissions in non-restricted frequency bands	32
5.1. Test Equipment	32
5.2. Test Setup	32
5.3. Limit	33
5.4. Test Procedure	34
5.5. EUT test Axis definition	35
5.6. Test Result	36
6. Radiated Emission Band Edge	37
6.1. Test Equipment	37
6.2. Test Setup	38
6.3. Limit	38

6.4.	Test Procedure	39
6.5.	EUT test definition	40
6.6.	Duty Cycle	41
6.7.	Test Result	42
7.	Occupied Bandwidth	50
7.1.	Test Equipment.....	50
7.2.	Test Setup.....	50
7.3.	Limit.....	51
7.4.	Test Procedure	51
7.5.	EUT test definition	52
7.6.	Test Result.....	53
8.	Fundamental emission output power	54
8.1.	Test Equipment.....	54
8.2.	Test Setup.....	54
8.3.	Limit.....	55
8.4.	Test Procedure	56
8.5.	EUT test definition	57
8.6.	Test Result.....	58
9.	Power Spectral Density	59
9.1.	Test Equipment.....	59
9.2.	Test Setup.....	59
9.3.	Limit.....	59
9.4.	Test Procedure	60
9.5.	EUT test definition	61
9.6.	Test Result.....	62

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1772163R-RF-US-P06V01	V1.0	Initial Issued Report	Sept. 19th, 2017

1. General Information

1.1. EUT Description

Product Name	Rylo
Model No.	A0101
EUT Voltage	DC 3.7V
Test Voltage	AC 120V/60Hz
Bluetooth Specification	V4.0
Frequency Range	2402- 2480 MHz
Channel Number	V4.0: 40
Channel Separation	V4.0: 2MHz
Type of Modulation	V4.0: GFSK
Data Rate	V4.0: 1Mbps(GFSK)
Antenna Type	Reference to Antenna List
Peak Antenna Gain	Reference to Antenna List

1.2. Working Frequency of Each Channel:

Bluetooth Working Frequency of Each Channel: (For V4.0)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2404 MHz	02	2406 MHz	03	2408 MHz
04	2410 MHz	05	2412 MHz	06	2414 MHz	07	2416 MHz
08	2418 MHz	09	2420 MHz	10	2422 MHz	11	2424 MHz
12	2426 MHz	13	2428 MHz	14	2430 MHz	15	2432 MHz
16	2434 MHz	17	2436 MHz	18	2438 MHz	19	2440 MHz
20	2442 MHz	21	2444 MHz	22	2446 MHz	23	2448 MHz
24	2450 MHz	25	2452 MHz	26	2454 MHz	27	2456 MHz
28	2458 MHz	29	2460 MHz	30	2462 MHz	31	2464 MHz
32	2466 MHz	33	2468 MHz	34	2470 MHz	35	2472 MHz
36	2474 MHz	37	2476 MHz	38	2478 MHz	39	2480 MHz

1.3. Antenna information

Model No.	N/A					
Antenna manufacturer	N/A					
Antenna Delivery	<input checked="" type="checkbox"/>	1*TX+1*RX	<input type="checkbox"/>	2*TX+2*RX	<input type="checkbox"/>	3*TX+3*RX
Antenna technology	<input checked="" type="checkbox"/>	SISO				
	<input type="checkbox"/>	MIMO	<input type="checkbox"/>	Basic		
			<input type="checkbox"/>	CDD		
			<input type="checkbox"/>	Sectorized		
			<input type="checkbox"/>	Beam-forming		
Antenna Type	<input type="checkbox"/>	External	<input type="checkbox"/>	Dipole		
			<input type="checkbox"/>	Sectorized		
	<input checked="" type="checkbox"/>	Internal	<input type="checkbox"/>	PIFA		
			<input checked="" type="checkbox"/>	PCB		
			<input type="checkbox"/>	Ceramic Chip Antenna		
			<input type="checkbox"/>	Stamping Antenna		
			<input type="checkbox"/>	Metal housing Antenna		
Antenna Technology	Ant Gain (dBi)					
<input checked="" type="checkbox"/> SISO	-1.59					

1.4. Mode of Operation

Test Mode
Mode 1: Transmit-1Mbps(GFSK_BLE)

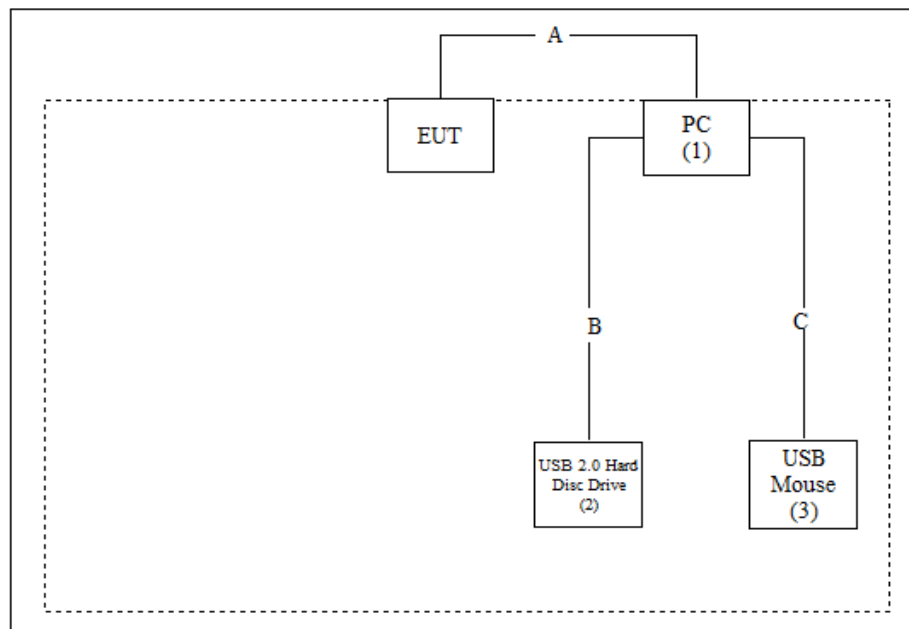
1.5. Tested System Details

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

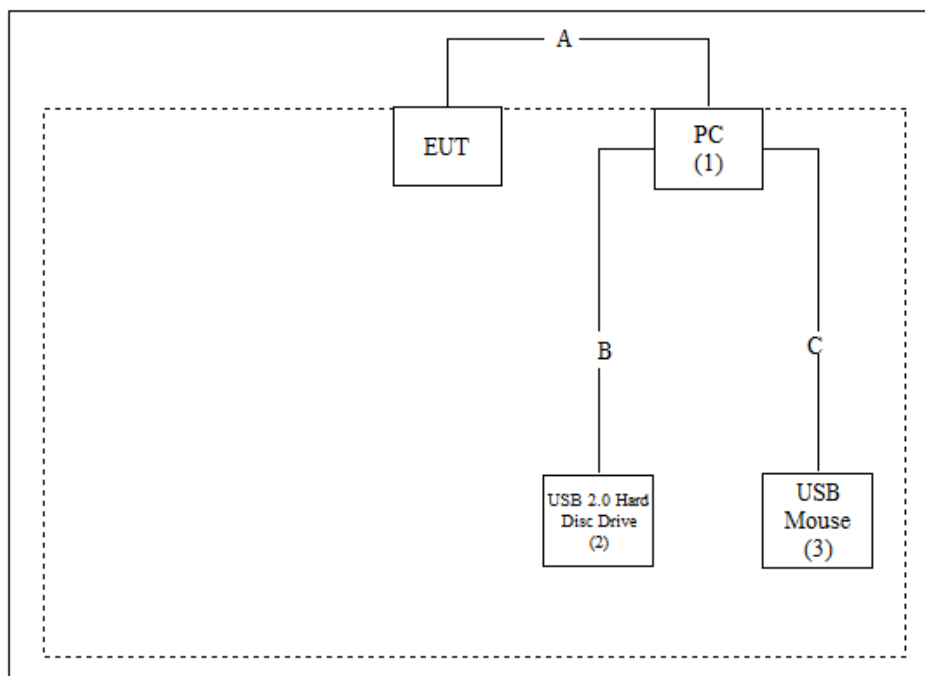
Product		Manufacturer	Model No.	Serial No.	Power Cord
1	PC	DELL	LATITUNE 3440	253KC12	Power by adapter
2	USB 2.0 Hard Disc Drive	TOSHIBA	593400-A	Z0G1P11DTLX4	Power by PC
3	USB Mouse	DELL	MS111	CH-0X9DCG-71616-597-NKYX	Power by PC

1.6. Configuration of Tested System

Test setup Diagram- AC Line Conducted Emission Test



Test setup Diagram- Radiated Emission



Signal Cable Type		Signal Cable Description
A	USB Cable	Shielded, 1.2m
B	USB Cable	Shielded, 0.5m
C	USB Mouse Cable	Shielded, 1.8m

1.7. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Run the RF test software.
4	Select the transmission mode and test channel, then start test.

2. Technical Test

2.1. Summary of Test Result

Performed Test Item	Normative References	Worst case mode	Limit	Result
AC Power Line Conducted Emission	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.207	Mode 1	FCC 15.207	PASS
Emissions in restricted frequency bands	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.209	Mode 1	FCC 15.209	PASS
Emissions in non-restricted frequency bands	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(d)	Mode 1	20dBc	PASS
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2015 15.247(d)	Mode 1	FCC 15.209	PASS
Occupied Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(a)(2)	Mode 1	500kHz	PASS
Fundamental emission output power	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(b)(3)	Mode 1	30dBm	PASS
Power Spectral Density	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(e)	Mode 1	8dBm/3kHz	PASS
Antenna Requirement	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.203	N/A	FCC 15.203	PASS

2.2. Test Frequency configuration:

Modulation Mode	Channel	Frequency	Channel	Frequency	Channel	Frequency
BLE	00	2402 MHz	19	2440 MHz	39	2480MHz

2.3. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

2.4. Measurement Uncertainty

Test Items	Uncertainty
AC Power Line Conducted Emission	$\pm 2.02\text{dB}$
Radiated Emission	Below 1GHz $\pm 3.8\text{ dB}$
	Above 1GHz $\pm 3.9\text{ dB}$
RF Antenna Port Conducted Emission	$\pm 1.27\text{dB}$
Radiated Emission Band Edge	$\pm 3.9\text{dB}$
Occupied Bandwidth	$\pm 1\text{kHz}$
Power Spectral Density	$\pm 1.27\text{dB}$

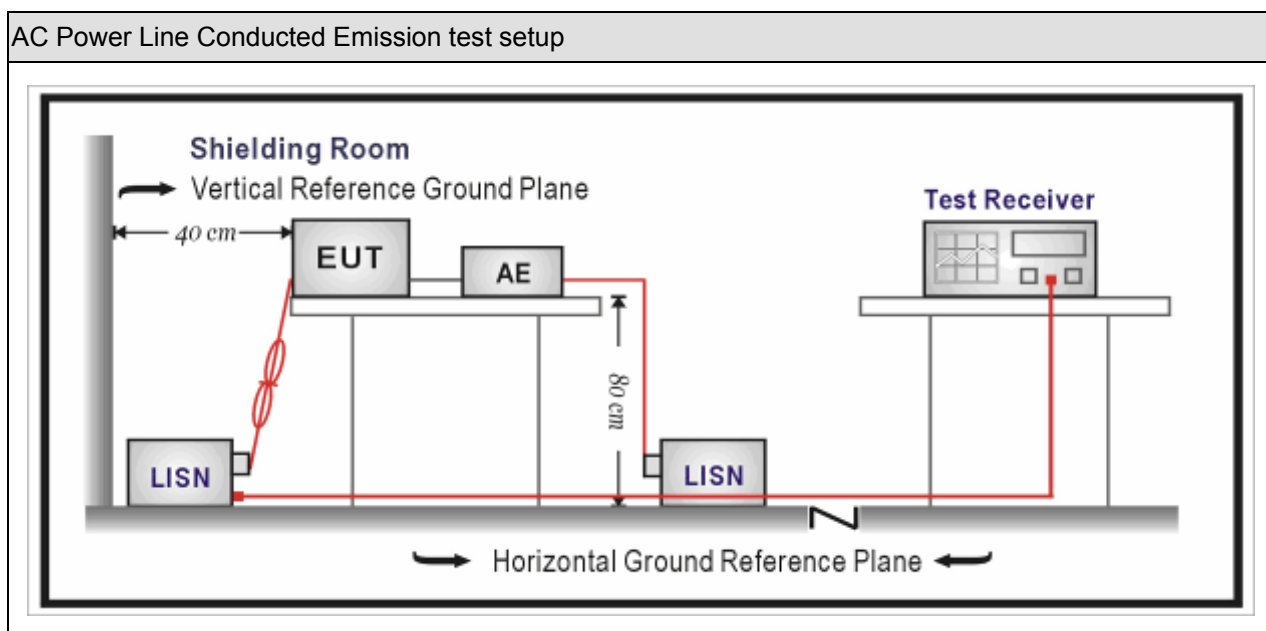
3. AC Power Line Conducted Emission

3.1. Test Equipment

AC Power Line Conducted Emission / TR-1					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100906	2017.03.05	2018.03.04
Two-Line V-Network	R&S	ENV 216	101189	2017.07.16	2018.07.15
Two-Line V-Network	R&S	ENV 216	101044	2016.09.16	2017.09.15
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	N/A	N/A
50ohm Termination	SHX	TF2	07081402	2016.09.16	2017.09.15
Temperature/Humidity Meter	Zhichen	ZC1-2	TR1-TH	2017.01.04	2018.01.03

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

3.2. Test Setup



3.3. Limit

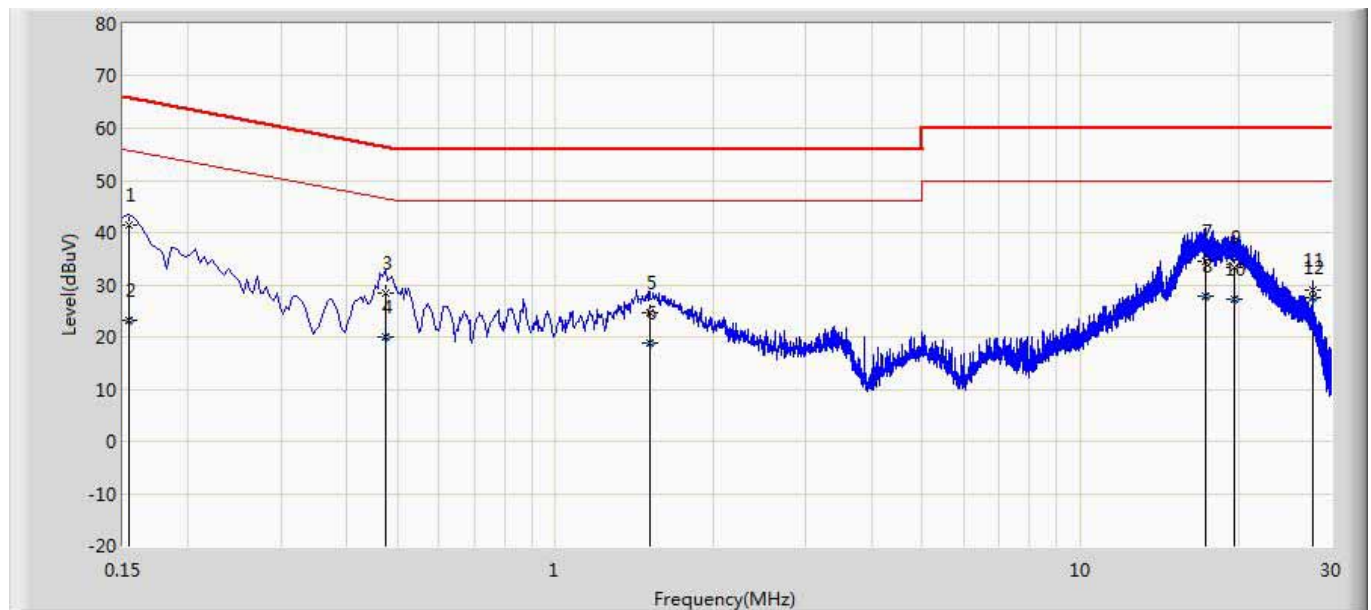
Frequency of Emission (MHz)	Conducted Limit	
	Quasi-peak (dB μ V)	Average (dB μ V)
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50
Note 1: The lower limit shall apply at the transition frequencies.		
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.		

3.4. Test Procedure

Test Method			
	References Rule	Chapter	Item
<input checked="" type="checkbox"/>	ANSI C63.10-2013	6.2	Standard test method for ac power-line conducted emissions from unlicensed wireless devices
<input checked="" type="checkbox"/>	ANSI C63.4-2014	7	AC power-line conducted emission measurements

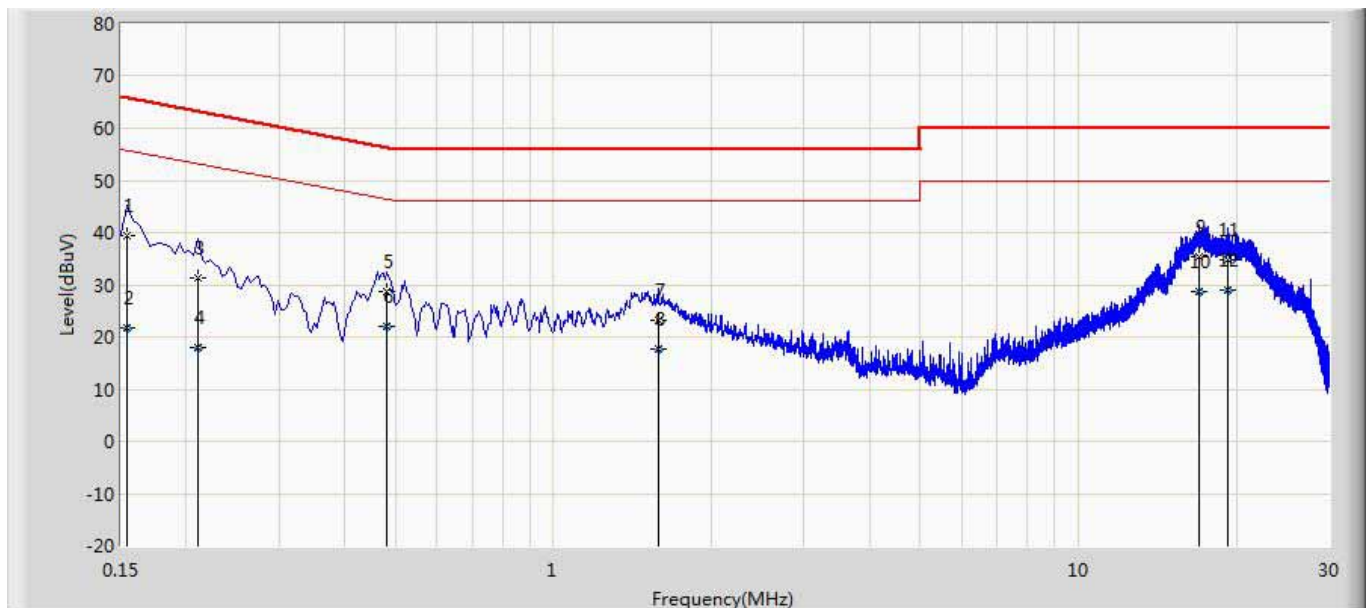
3.5. Test Result

Engineer: Scott	
Site: TR1	Time: 2017/08/09
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101190(0.009-30MHz)	Polarity: Line
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.154	41.396	31.761	-24.386	65.781	9.634	QP
2		0.154	23.116	13.481	-32.666	55.781	9.634	AV
3		0.474	28.400	18.759	-28.044	56.444	9.641	QP
4		0.474	20.043	10.402	-26.401	46.444	9.641	AV
5		1.510	24.693	15.008	-31.307	56.000	9.685	QP
6		1.510	18.827	9.143	-27.173	46.000	9.685	AV
7		17.298	34.618	24.340	-25.382	60.000	10.277	QP
8	*	17.298	27.830	17.552	-22.170	50.000	10.277	AV
9		19.630	33.380	22.972	-26.620	60.000	10.408	QP
10		19.630	27.313	16.905	-22.687	50.000	10.408	AV
11		27.650	28.853	18.088	-31.147	60.000	10.764	QP
12		27.650	27.456	16.692	-22.544	50.000	10.764	AV

Engineer: Scott	
Site: TR1	Time: 2017/08/09
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101190(0.009-30MHz)	Polarity: Neutral
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.154	39.399	29.781	-26.383	65.781	9.618	QP
2		0.154	21.852	12.234	-33.929	55.781	9.618	AV
3		0.210	31.387	21.759	-31.819	63.205	9.628	QP
4		0.210	18.018	8.390	-35.188	53.205	9.628	AV
5		0.482	28.577	18.946	-27.727	56.305	9.631	QP
6		0.482	22.123	12.492	-24.181	46.305	9.631	AV
7		1.582	23.093	13.416	-32.907	56.000	9.677	QP
8		1.582	17.551	7.874	-28.449	46.000	9.677	AV
9		16.922	35.418	25.108	-24.582	60.000	10.310	QP
10		16.922	28.603	18.293	-21.397	50.000	10.310	AV
11		19.234	34.689	24.260	-25.311	60.000	10.429	QP
12	*	19.234	28.925	18.496	-21.075	50.000	10.429	AV

4. Emissions in restricted frequency bands

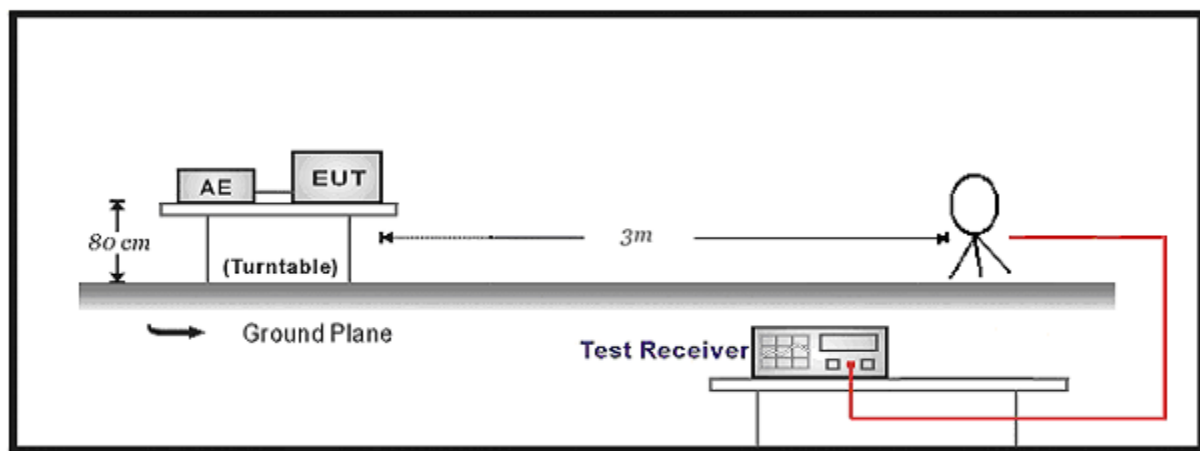
4.1. Test Equipment

Radiated Emission(Below 1GHz) / AC-2					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2017.03.29	2018.03.28
Loop Antenna	R&S	HFH2-Z2	833799/003	2016.11.16	2017.11.15
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2016.10.16	2017.10.15
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2016.03.02	2018.03.01
Temperature/Humidity Meter	Zhichen	ZC1-2	AC2-TH	2017.01.03	2018.01.02
Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

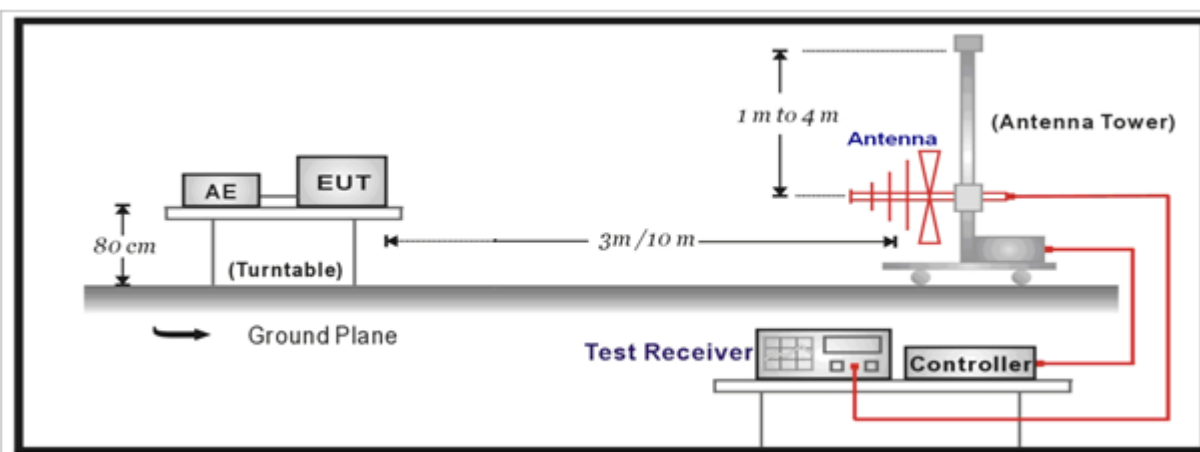
Radiated Emission(Above 1GHz) / AC-5					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2017.01.04	2018.01.03
Preamplifier	Miteq	NSP1800-25	1364185	2017.05.06	2018.05.05
Preamplifier	QuieTek	AP-040G	CHM-0906001	2017.05.06	2018.05.05
DRG Horn	ETS-Lindgren	3117	00123988	2017.01.22	2018.01.21
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2016.11.25	2017.11.24
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2017.03.02	2018.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2017.03.02	2018.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2017.03.02	2018.03.01
EMI Receiver	Agilent	N9038A	MY51210196	2017.06.10	2018.06.09
Temperature/Humidity Meter	Zhichen	ZC1-2	AC5-TH	2017.01.04	2018.01.03
Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

4.2. Test Setup

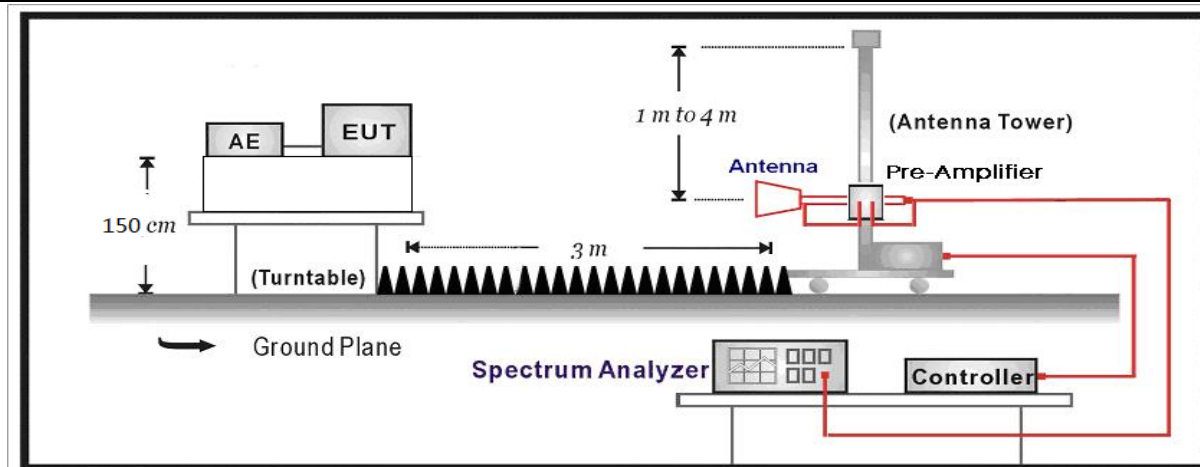
Below 30MHz Test Setup:



30MHz-1GHz Test Setup:



Above 1GHz Test Setup:



4.3. Limit

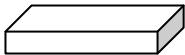
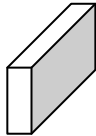
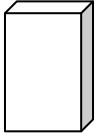



Restricted Bands of operation			
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.81425 – 8.81475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	
13.36 – 13.41			

Restricted Band Emissions Limit			
Frequency (MHz)	Field strength (μ V/m)	Field strength (dB μ V/m)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 – 13.8	300 _(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30 _(Note 1)
1.705 - 30	30	29.5	30 _(Note 1)
30 - 88	100	40	3 _(Note 2)
88 - 216	150	43.5	3 _(Note 2)
216 - 960	200	46	3 _(Note 2)
Above 960	500	54	3 _(Note 2)
<p>Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).</p> <p>Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).</p>			

4.4. Test Procedure

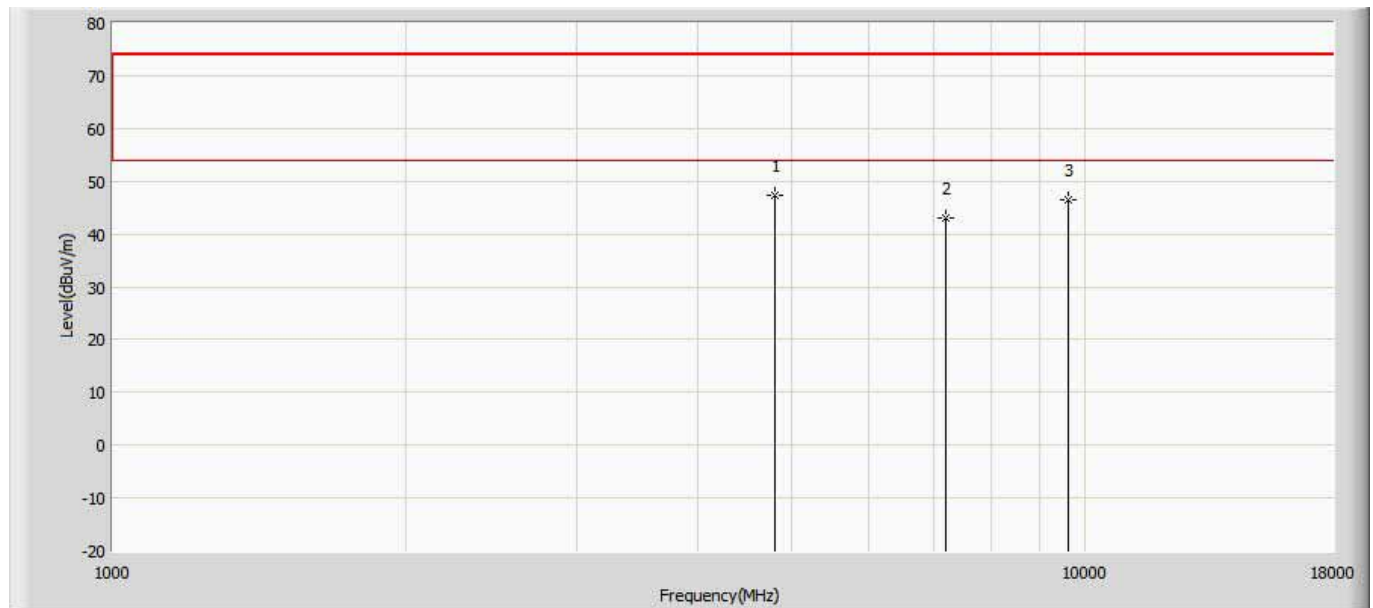
Test Method						
	References Rule		Chapter	Description		
<input type="checkbox"/>	ANSI C63.10		11.11	Emissions in non-restricted frequency bands		
	<input type="checkbox"/>	ANSI C63.10	11.11.2	Reference level measurement		
	<input type="checkbox"/>	ANSI C63.10	11.11.3	Emission level measurement		
<input checked="" type="checkbox"/>	ANSI C63.10		11.12	Emissions in restricted frequency bands		
	<input checked="" type="checkbox"/>	ANSI C63.10	11.12.1	Radiated emission measurements		
	<input checked="" type="checkbox"/>	ANSI C63.10	11.12.2.7	Radiated spurious emission test		
		<input checked="" type="checkbox"/>	ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz	
		<input checked="" type="checkbox"/>	ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz	
		<input checked="" type="checkbox"/>	ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz	
		<input type="checkbox"/>	ANSI C63.10	11.12.2.3	Quasi-peak measurement procedure	
		<input checked="" type="checkbox"/>	ANSI C63.10	11.12.2.4	Peak power measurement procedure	
		<input checked="" type="checkbox"/>	ANSI C63.10	11.12.2.5	Average power measurement procedures	
			<input type="checkbox"/>	ANSI C63.10	11.12.2.5.1	Trace averaging with continuous EUT transmission at full power
			<input type="checkbox"/>	ANSI C63.10	11.12.2.5.2	Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction
			<input checked="" type="checkbox"/>	ANSI C63.10	11.12.2.5.3	Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold

4.5. EUT test Axis definition

Item	Emissions in restricted frequency bands			
Device Category	<input type="checkbox"/>	Fixed point-to-point		
	<input type="checkbox"/>	Emit multiple directional beams, simultaneously or sequentially		
	<input checked="" type="checkbox"/>	Other cases		
Test mode	Mode 1			
Test method	<input checked="" type="checkbox"/>	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis <input checked="" type="checkbox"/>	Worst Axis <input type="checkbox"/>	Worst Axis <input type="checkbox"/>
	<input type="checkbox"/>	Conducted		
	<input type="checkbox"/>	Chain 0		
				
	<input type="checkbox"/>	Chain 0	Chain 1	
				
	<input type="checkbox"/>	Chain 0	Chain 1	Chain 2
				

4.6. Test Result

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 10:06
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



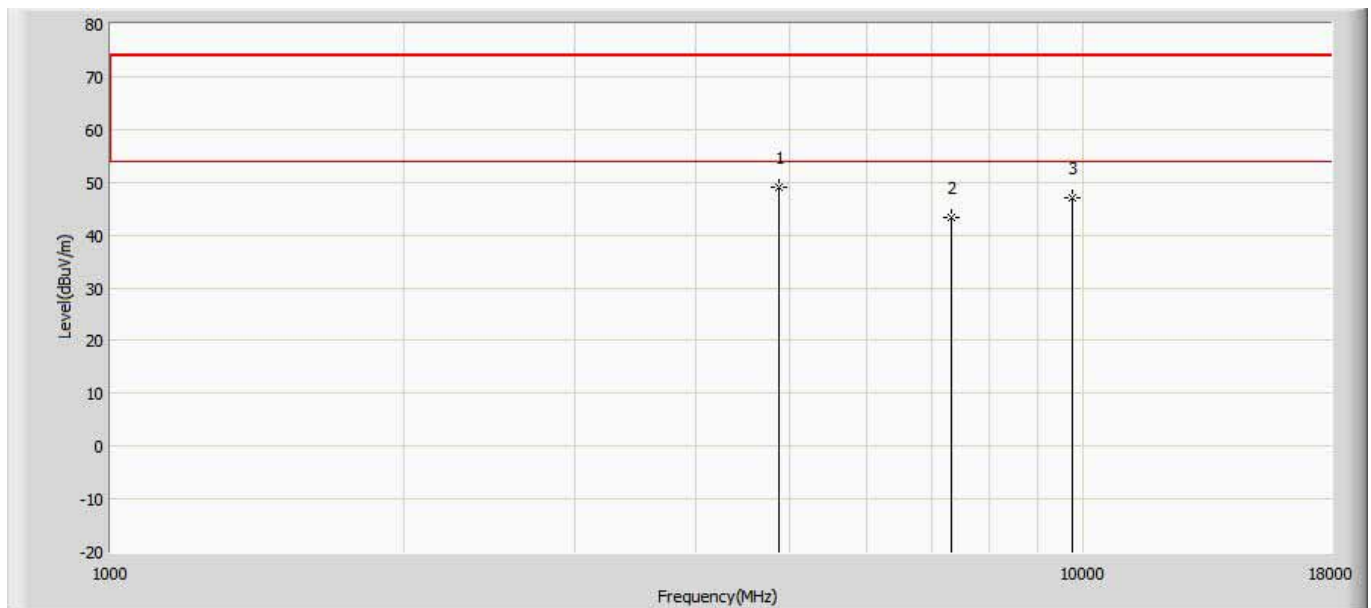
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	4808.000	47.233	60.243	-26.767	74.000	-13.010	PK
2		7206.000	43.140	50.850	-30.860	74.000	-7.710	PK
3		9608.000	46.520	48.110	-27.480	74.000	-1.590	PK

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 10:06
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



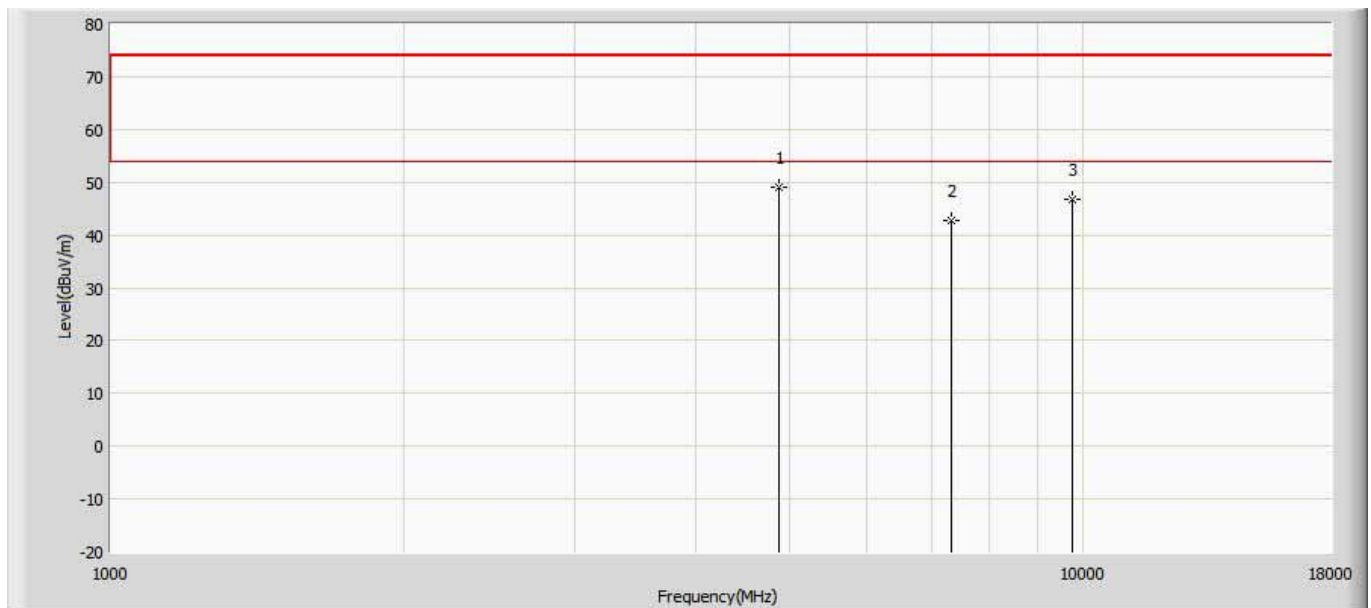
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4803.720	35.150	48.160	-18.850	54.000	-13.010	AV
2	*	4808.000	56.403	69.413	-17.597	74.000	-13.010	PK
3		7206.000	42.696	50.406	-31.304	74.000	-7.710	PK
4		9608.000	46.709	48.299	-27.291	74.000	-1.590	PK

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 10:06
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2440MHz by BLE	



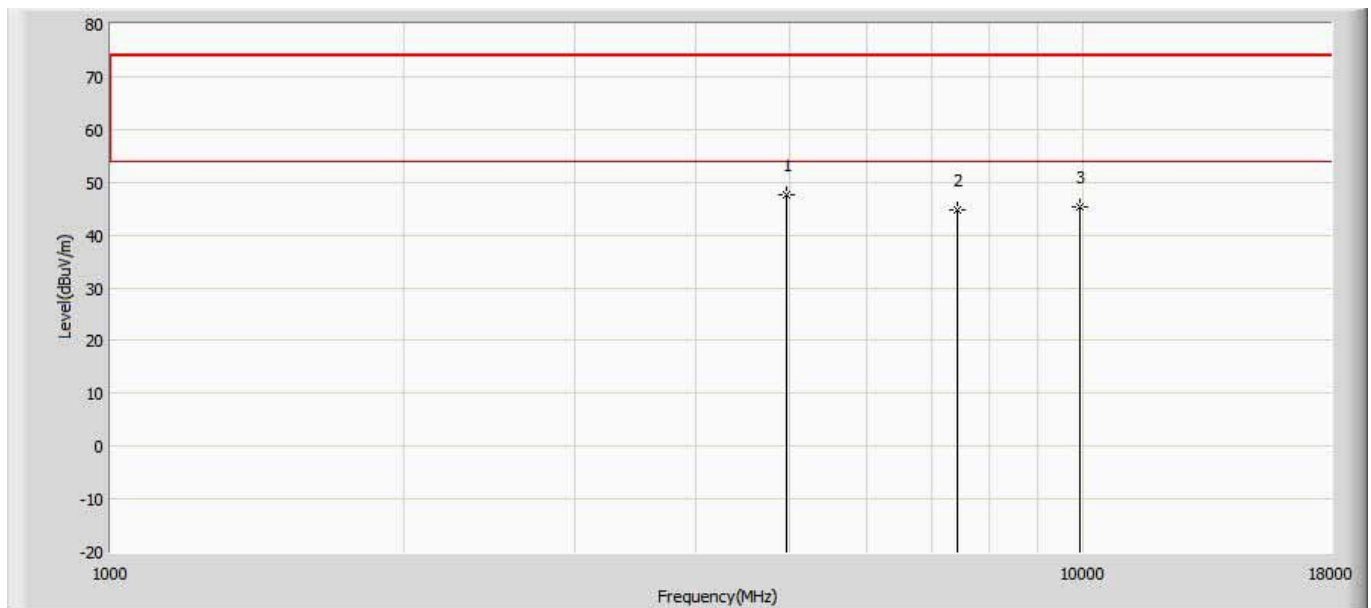
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	4876.000	49.014	62.024	-24.986	74.000	-13.010	PK
2		7320.000	43.353	51.063	-30.647	74.000	-7.710	PK
3		9760.000	47.158	48.748	-26.842	74.000	-1.590	PK

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 10:06
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2440MHz by BLE	



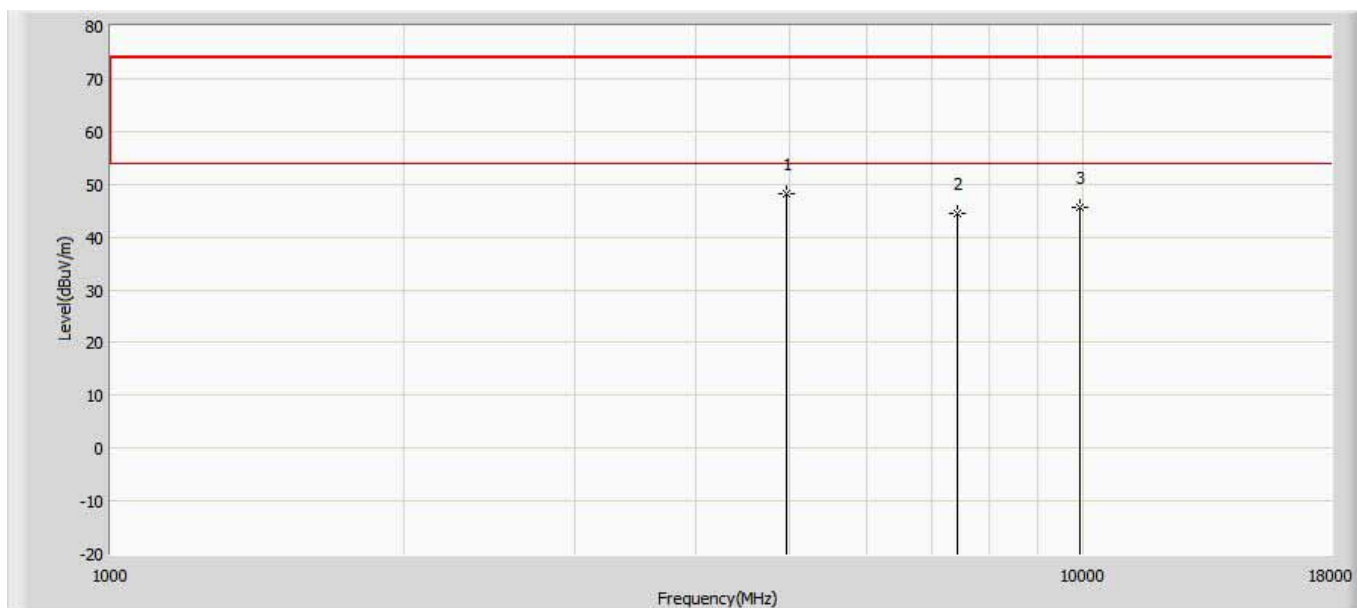
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	4876.000	49.014	62.024	-24.986	74.000	-13.010	PK
2		7320.000	42.785	50.495	-31.215	74.000	-7.710	PK
3		9760.000	46.687	48.277	-27.313	74.000	-1.590	PK

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 10:07
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	4961.000	47.569	59.799	-26.431	74.000	-12.230	PK
2		7440.000	44.838	51.498	-29.162	74.000	-6.660	PK
3		9920.000	45.420	47.380	-28.580	74.000	-1.960	PK

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 10:07
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	4961.000	48.223	60.453	-25.777	74.000	-12.230	PK
2		7440.000	44.492	51.152	-29.508	74.000	-6.660	PK
3		9920.000	45.581	47.541	-28.419	74.000	-1.960	PK

Note: 1. Measure Level = Reading Level + Factor.

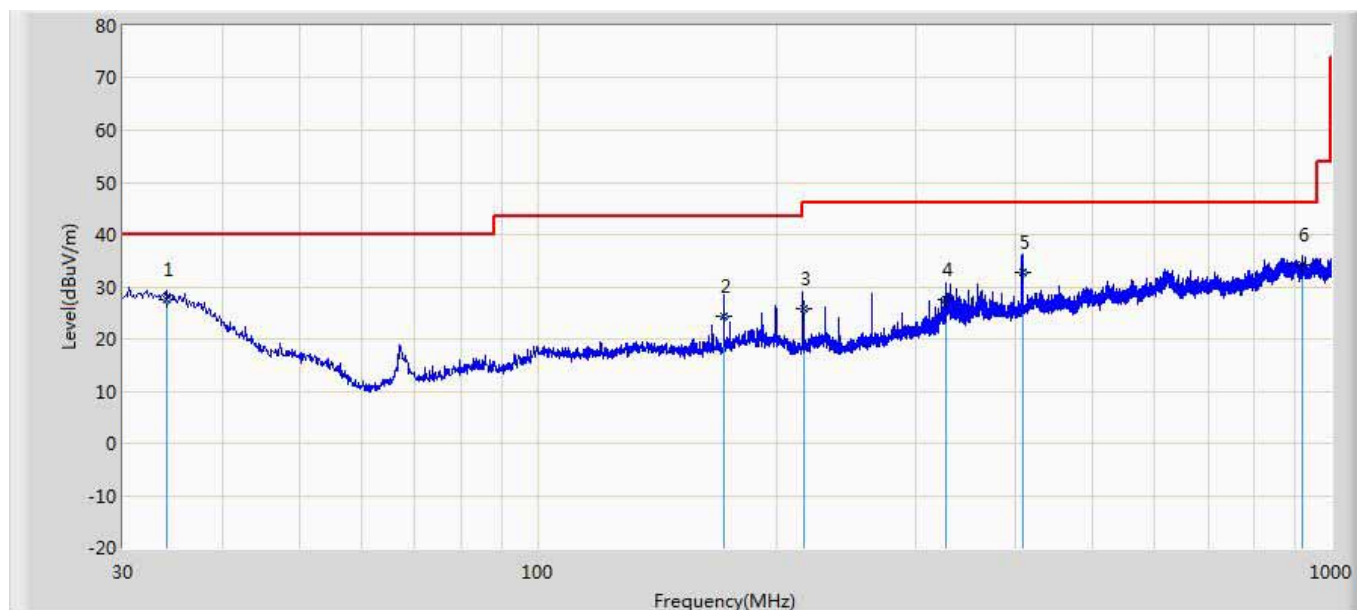
Note: 2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 20dB below the limits, therefore no data appear in the report.

Note: 3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

Note: 4. The RBW set up, see Clause 6.6.

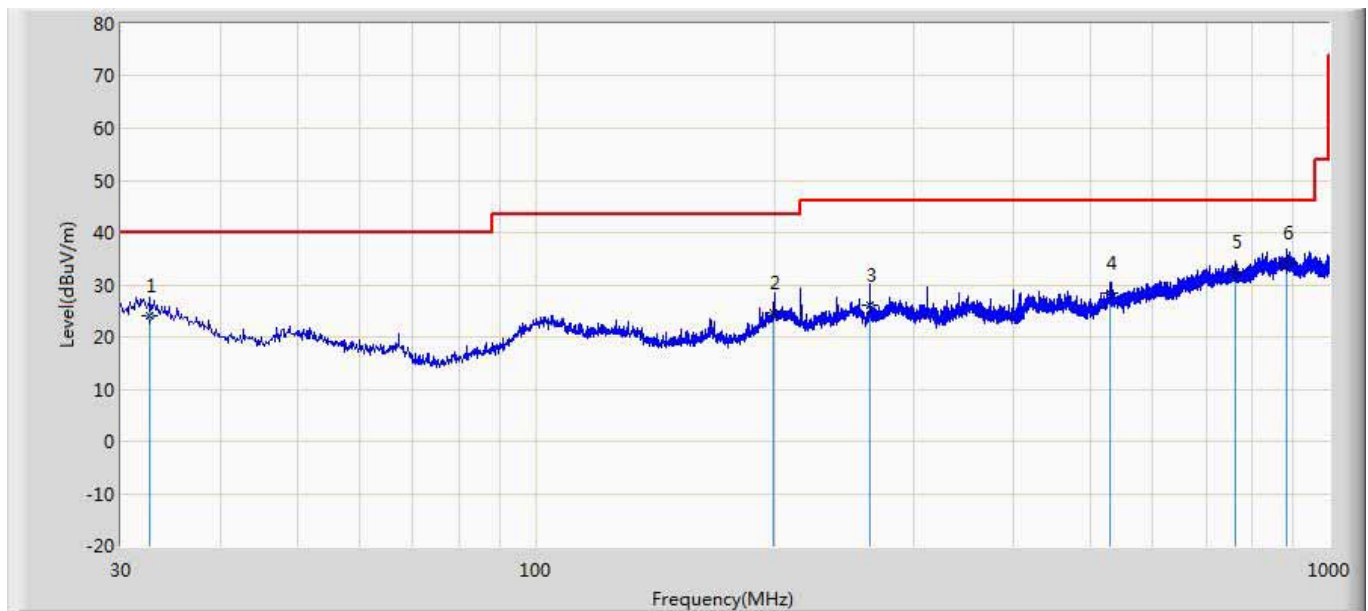
The worst case of Radiated Emission below 1GHz:

Engineer: Scott	
Site: AC2	Time: 2017/08/09
Limit: FCC_Part15.109_RE(3m)_ClassB	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Horizontal
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		34.020	27.679	0.320	-12.321	40.000	27.358	QP
2		171.950	24.464	7.120	-19.036	43.500	17.344	QP
3		216.650	25.715	8.450	-20.285	46.000	17.265	QP
4		327.210	27.505	5.220	-18.495	46.000	22.285	QP
5		408.450	32.869	7.260	-13.131	46.000	25.609	QP
6	*	921.350	34.201	1.230	-11.799	46.000	32.971	QP

Engineer: Scott	
Site: AC2	Time: 2017/08/09
Limit: FCC_Part15.109_RE(3m)_ClassB	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Vertical
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1	



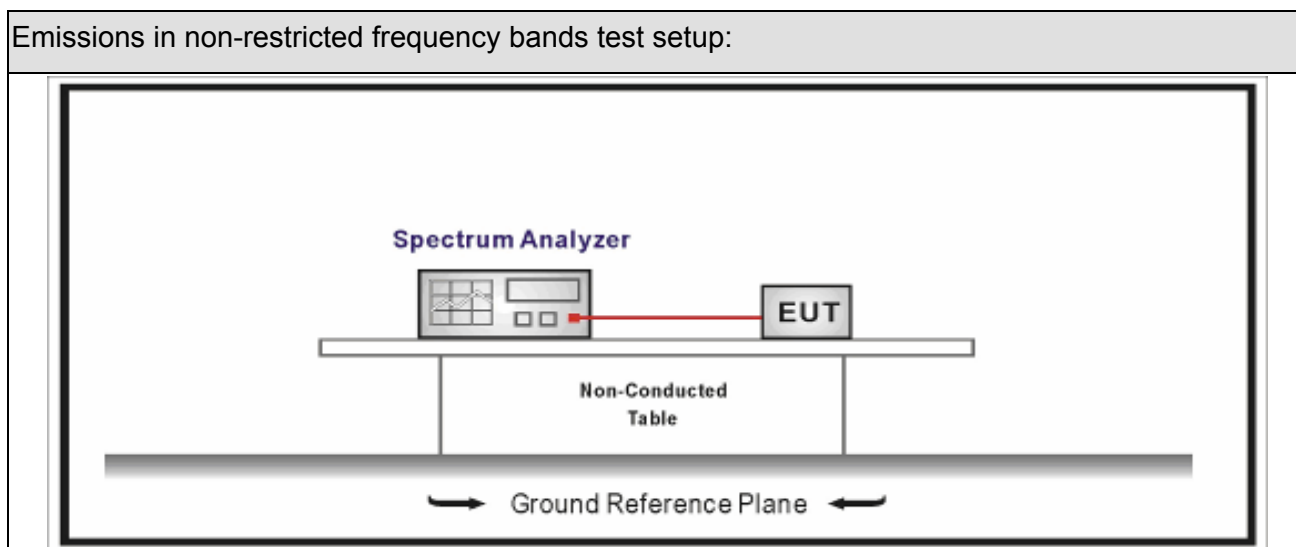
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		32.600	24.138	0.650	-15.862	40.000	23.488	QP
2		199.600	24.497	0.990	-19.003	43.500	23.507	QP
3		264.200	26.056	2.600	-19.944	46.000	23.455	QP
4		530.650	28.310	1.230	-17.690	46.000	27.080	QP
5		762.450	32.491	1.220	-13.509	46.000	31.271	QP
6	*	885.650	34.210	1.230	-11.790	46.000	32.980	QP

5. Emissions in non-restricted frequency bands

5.1. Test Equipment

Emissions in non-restricted frequency bands / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04	2018.02.03
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2017.04.09	2018.04.08
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2017.04.09	2018.04.08
Temperature/Humidity Meter	zhichen	ZC1-2	TR8-TH	2017.04.10	2018.04.09
Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

5.2. Test Setup



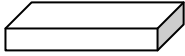
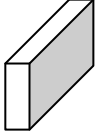
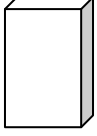



5.3. Limit

Un-Restricted Band Emissions Limit	
RF Output power (Detection methods)	Limit(dB)
RF Output power(Average detector)	30c(Note1)
RF Output power(PK detector)	20c(Note2)
<p>Note 1: If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).</p> <p>Note 2: If the maximum peak conducted output power procedure was used, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).</p>	

5.4. Test Procedure

Test Method				
	References Rule		Chapter	Description
<input checked="" type="checkbox"/>	ANSI C63.10		11.11	Emissions in non-restricted frequency bands
	<input checked="" type="checkbox"/>	ANSI C63.10	11.11.2	Reference level measurement
	<input checked="" type="checkbox"/>	ANSI C63.10	11.11.3	Emission level measurement
<input type="checkbox"/>	ANSI C63.10		11.12	Emissions in restricted frequency bands
	<input type="checkbox"/>	ANSI C63.10	11.12.1	Radiated emission measurements
	<input type="checkbox"/>	ANSI C63.10	11.12.2.7	Radiated spurious emission test
<input type="checkbox"/>	ANSI C63.10		6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
<input type="checkbox"/>	ANSI C63.10		6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
<input type="checkbox"/>	ANSI C63.10		6.6	Radiated emissions from unlicensed wireless devices above 1 GHz
	<input checked="" type="checkbox"/>	ANSI C63.10	11.12.2	Antenna-port conducted measurements
	<input type="checkbox"/>	ANSI C63.10	11.12.2.3	Quasi-peak measurement procedure
		<input checked="" type="checkbox"/>	ANSI C63.10	Peak power measurement procedure
		<input type="checkbox"/>	ANSI C63.10	Average power measurement procedures
	<input type="checkbox"/>	<input type="checkbox"/>	ANSI C63.10	11.12.2.5.1 Trace averaging with continuous EUT transmission at full power
		<input type="checkbox"/>	ANSI C63.10	11.12.2.5.2 Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction
		<input type="checkbox"/>	ANSI C63.10	11.12.2.5.3 Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold

5.5. EUT test Axis definition

Item	Emissions in non-restricted frequency bands			
Device Category	<input type="checkbox"/>	Fixed point-to-point		
	<input type="checkbox"/>	Emit multiple directional beams, simultaneously or sequentially		
	<input checked="" type="checkbox"/>	Other cases		
Test mode	Mode 1			
Test method	<input type="checkbox"/>	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis <input type="checkbox"/>	Worst Axis <input type="checkbox"/>	Worst Axis <input type="checkbox"/>
	<input checked="" type="checkbox"/>	Conducted		
	<input checked="" type="checkbox"/>	Chain 0		
				
	<input type="checkbox"/>	Chain 0	Chain 1	
				
	<input type="checkbox"/>	Chain 0	Chain 1	Chain 2
				

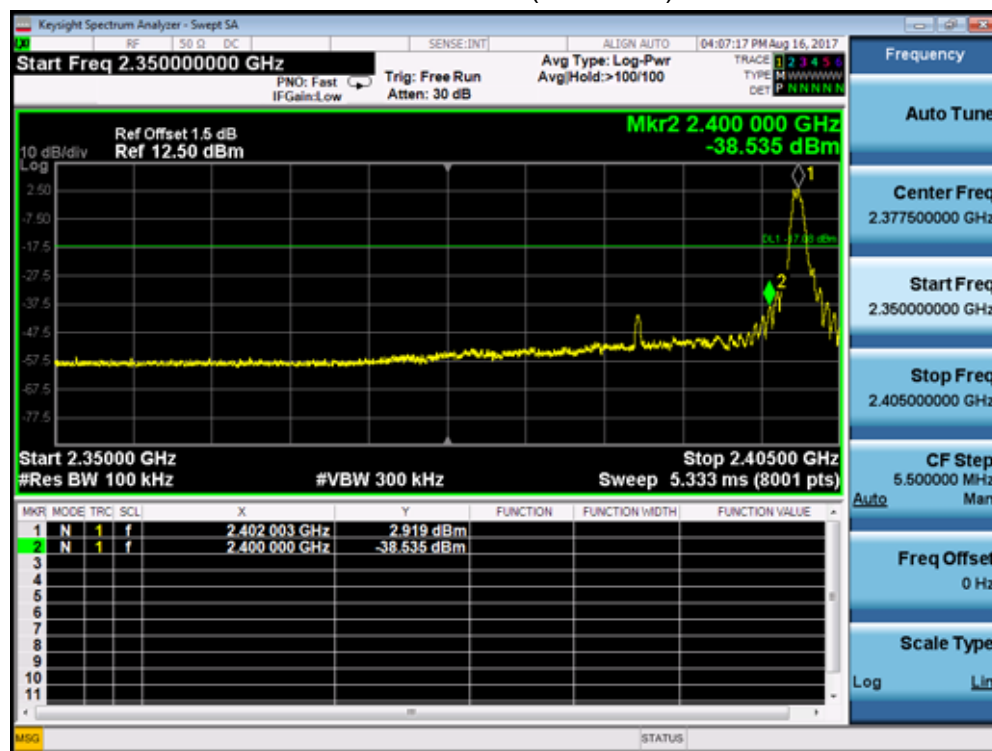
5.6. Test Result

Product Name	: Rylo	Power	: AC 120V/60Hz
Test Mode	: Mode 1	Test Site	: TR-8
Test Date	: 2017.08.16	Test Engineer	: Scott

Mode	Channel	Test Frequency (MHz)	In-Band PSD[a] (dBm/100kHz)	Frequency (MHz)	Out-Band PSD[b] (dBm/100kHz)	[a]-[b] (dB)	Limit (dB)	Result
1	00	2402	2.919	2400.00	-38.535	41.454	>20	Pass
1	39	2480	2.818	2500.00	-42.301	45.119	>20	Pass

Note: The worst case of Emissions in non-restricted frequency bands as below:

Mode 1 CH00 (2402MHz)



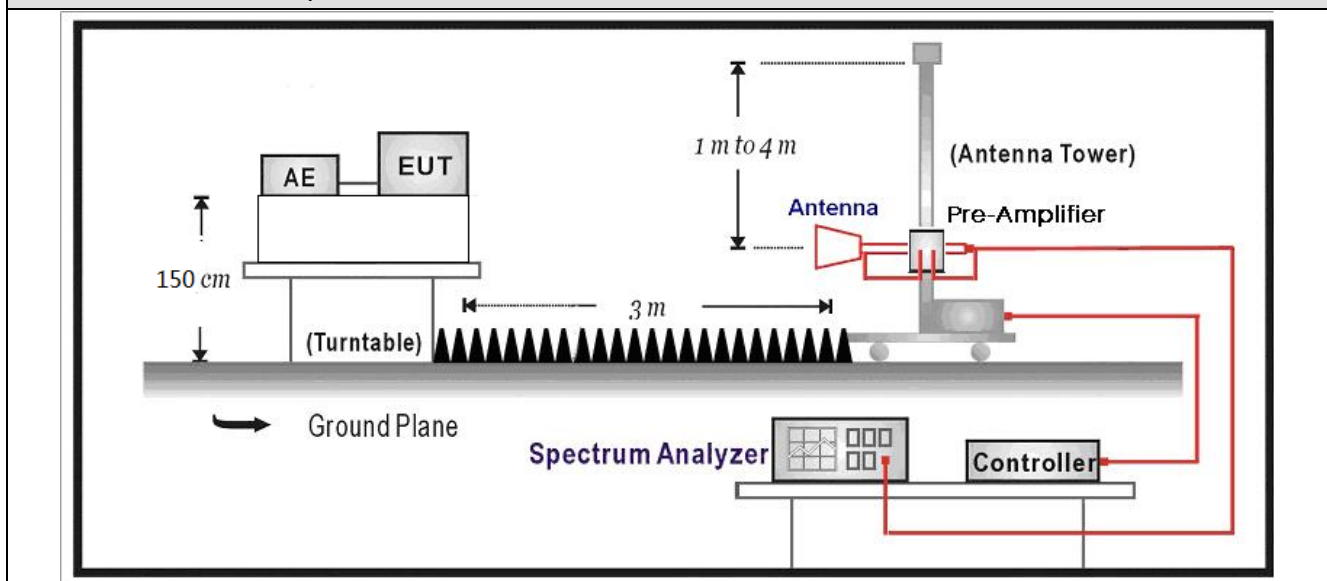
6. Radiated Emission Band Edge

6.1. Test Equipment

Radiated Emission(Above 1GHz) / AC-5					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
EMI Receiver	Agilent	N9038A	MY51210196	2017.07.16	2018.07.15
Pre-Amplifier	Miteq	NSP1800-25	1364185	2017.05.03	2018.05.02
DRG Horn Antenna	ETS-Lindgren	3117	00167055	2017.07.12	2018.07.11
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2016.09.18	2017.09.17
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2017.02.28	2018.02.27
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2017.02.28	2018.02.27
Temperature/Humidity Meter	Zhichen	ZC1-2	AC5-TH	2017.01.05	2018.01.04

6.2. Test Setup

Above 1GHz Test Setup:



6.3. Limit

Band edge Limit

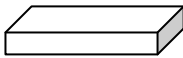
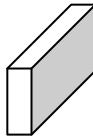
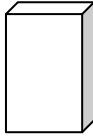
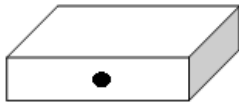


Frequency bands (MHz)	Detector	Limit (dB μ V/m)	RBW (MHz)	Distance (m)
2310-2390	PK	74	1	3
2483.5-2500	AV	54	1	3

Note: The field strength of emissions appearing within these frequency bands shall not exceed the limits.

6.4. Test Procedure

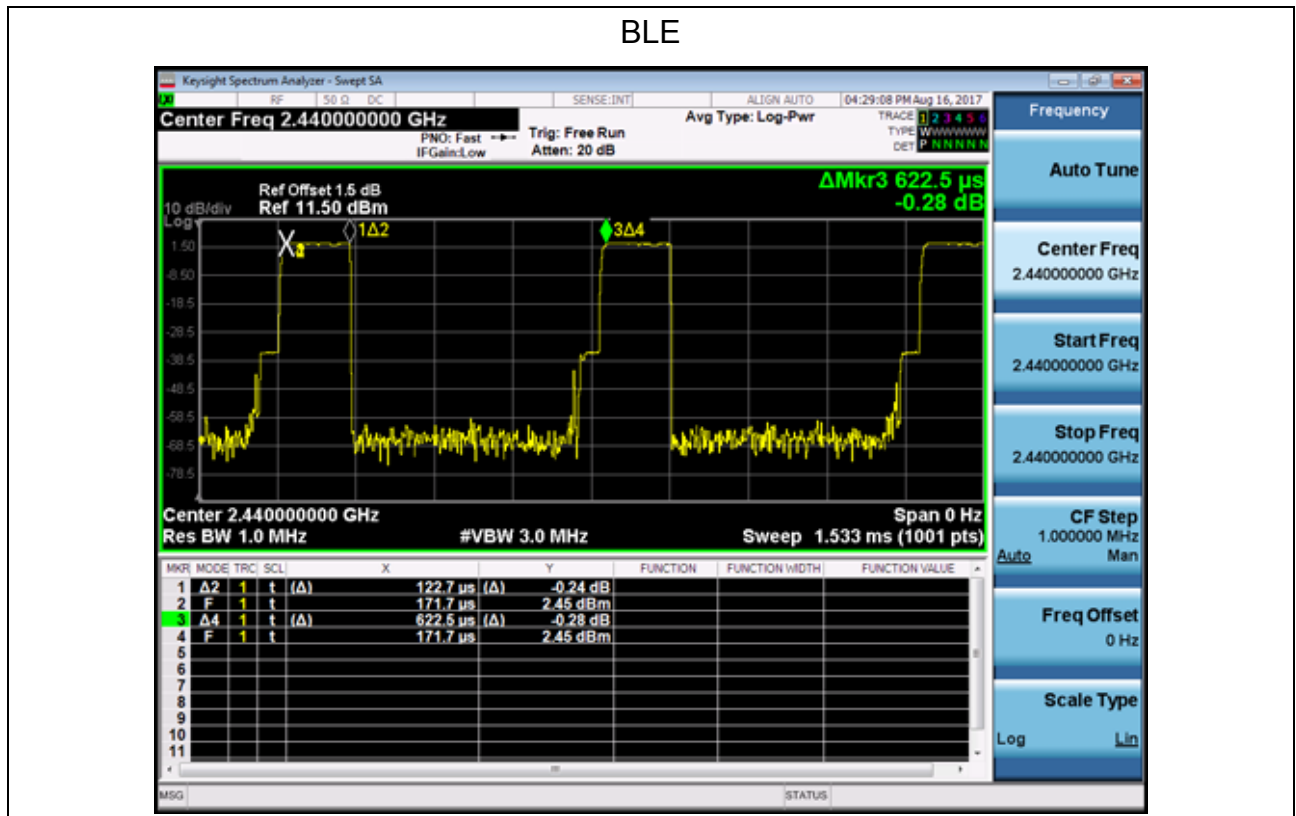
Test Method						
	References Rule			Chapter	Description	
<input checked="" type="checkbox"/>	ANSI C63.10			6.10	Band-edge testing	
	<input checked="" type="checkbox"/>	ANSI C63.10		6.10.5	Restricted-band band-edge measurements	
	<input type="checkbox"/>	ANSI C63.10		6.10.6	Marker-delta method	
<input checked="" type="checkbox"/>	ANSI C63.10			11.12	Emissions in restricted frequency bands	
	<input checked="" type="checkbox"/>	ANSI C63.10		11.12.1	Radiated emission measurements	
	<input checked="" type="checkbox"/>	ANSI C63.10		11.12.2.7	Radiated spurious emission test	
<input type="checkbox"/>	ANSI C63.10			6.4	Radiated emissions from unlicensed wireless devices below 30 MHz	
<input type="checkbox"/>	ANSI C63.10			6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz	
<input checked="" type="checkbox"/>	ANSI C63.10			6.6	Radiated emissions from unlicensed wireless devices above 1 GHz	
		<input type="checkbox"/>	ANSI C63.10	11.12.2.3	Quasi-peak measurement procedure	
		<input checked="" type="checkbox"/>	ANSI C63.10	11.12.2.4	Peak power measurement procedure	
		<input checked="" type="checkbox"/>	ANSI C63.10	11.12.2.5	Average power measurement procedures	
			<input type="checkbox"/>	ANSI C63.10	11.12.2.5.1	Trace averaging with continuous EUT transmission at full power
			<input type="checkbox"/>	ANSI C63.10	11.12.2.5.2	Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction
			<input checked="" type="checkbox"/>	ANSI C63.10	11.12.2.5.3	Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold

6.5. EUT test definition

Item	Radiated Emission Band Edge			
Device Category	<input type="checkbox"/>	Fixed point-to-point		
	<input type="checkbox"/>	Emit multiple directional beams, simultaneously or sequentially		
	<input checked="" type="checkbox"/>	Other cases		
Test mode	Mode 1			
Test method	<input checked="" type="checkbox"/>	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis <input checked="" type="checkbox"/>	Worst Axis <input type="checkbox"/>	Worst Axis <input type="checkbox"/>
	<input type="checkbox"/>	Conducted		
	<input type="checkbox"/>	Chain 0		
				
	<input type="checkbox"/>	Chain 0	Chain 1	
				
	<input type="checkbox"/>	Chain 0	Chain 1	Chain 2
				

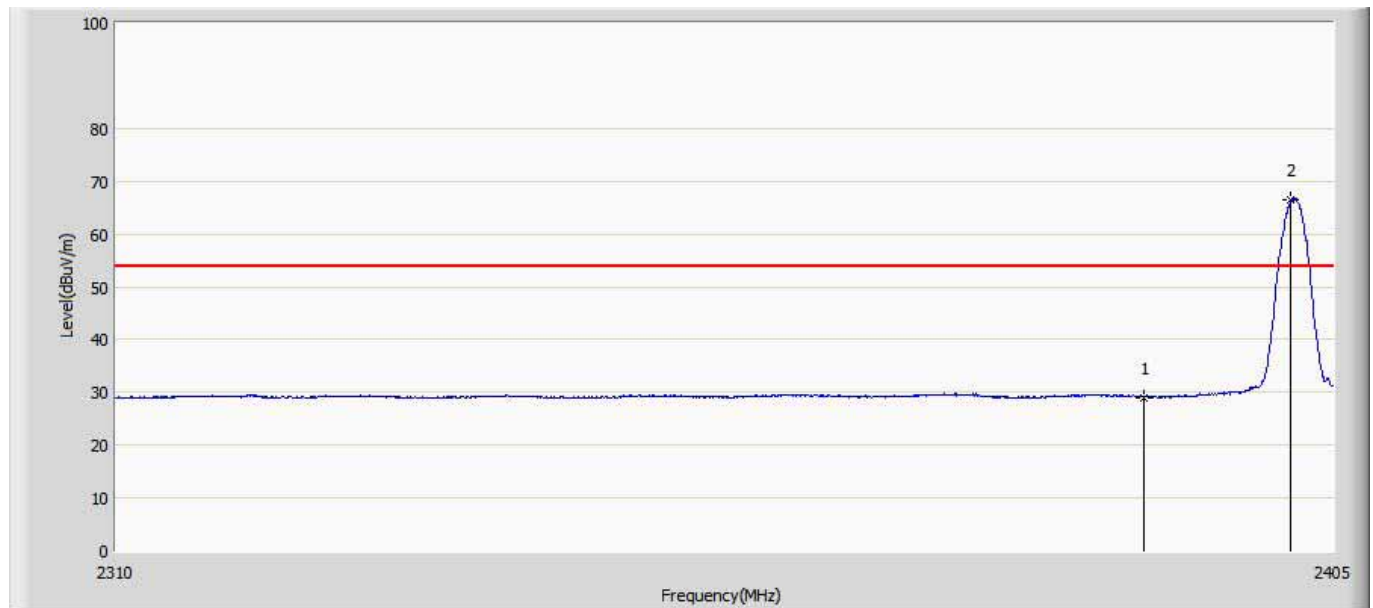
6.6. Duty Cycle

Test Mode	Tx On (ms)	Tx Off (ms)	Reduced VBW (Hz)	Tx On + Tx Off (ms)	Duty Cycle
BLE	0.123	0.500	8.2KHz	0.623	19.74%



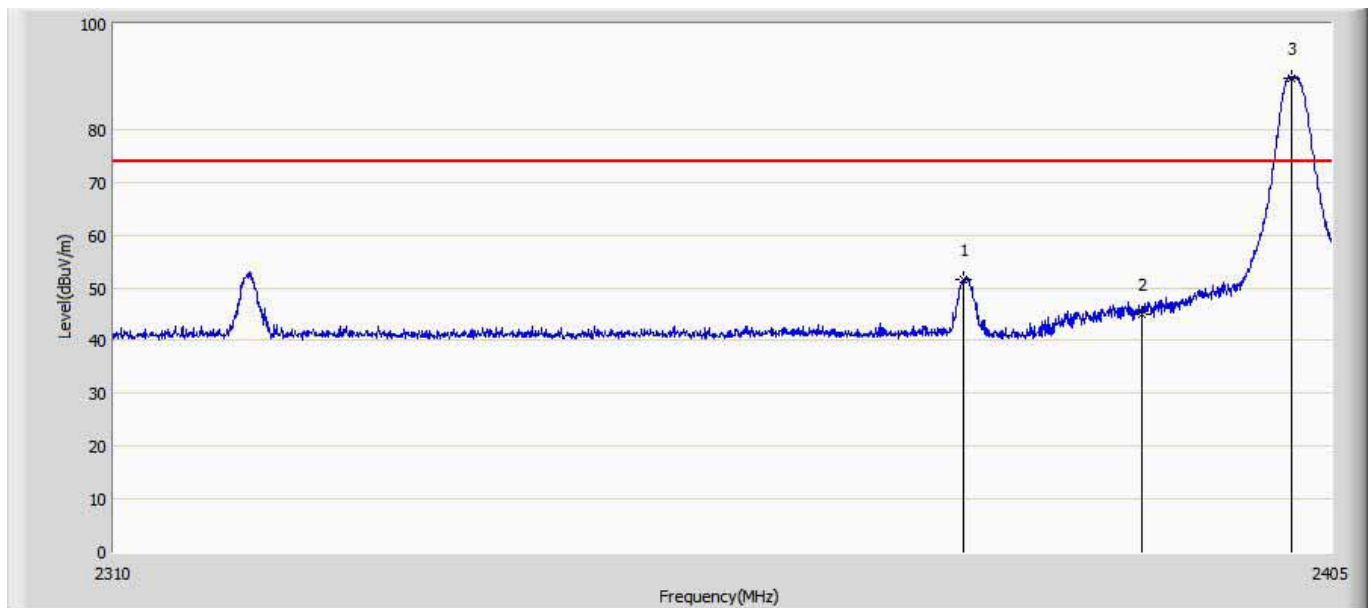
6.7 Test Result

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 14:43
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



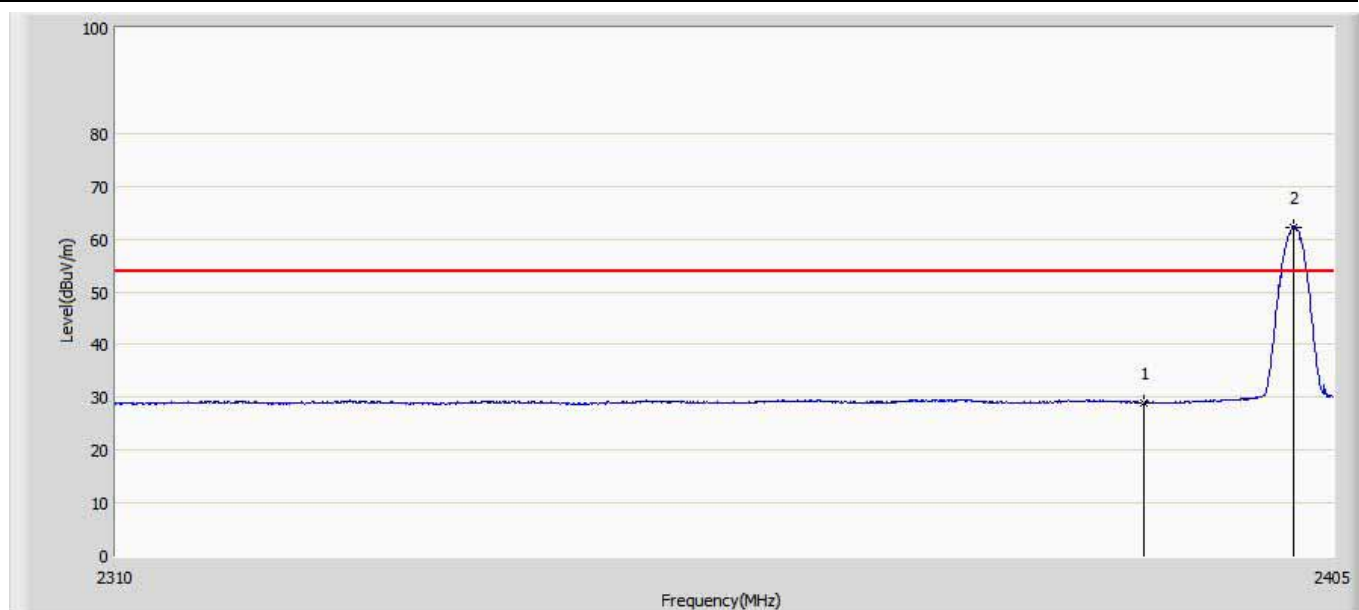
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	29.082	0.034	-24.918	54.000	29.048	AV
2	*	2401.675	66.373	37.409	12.373	54.000	28.964	AV

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 15:05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



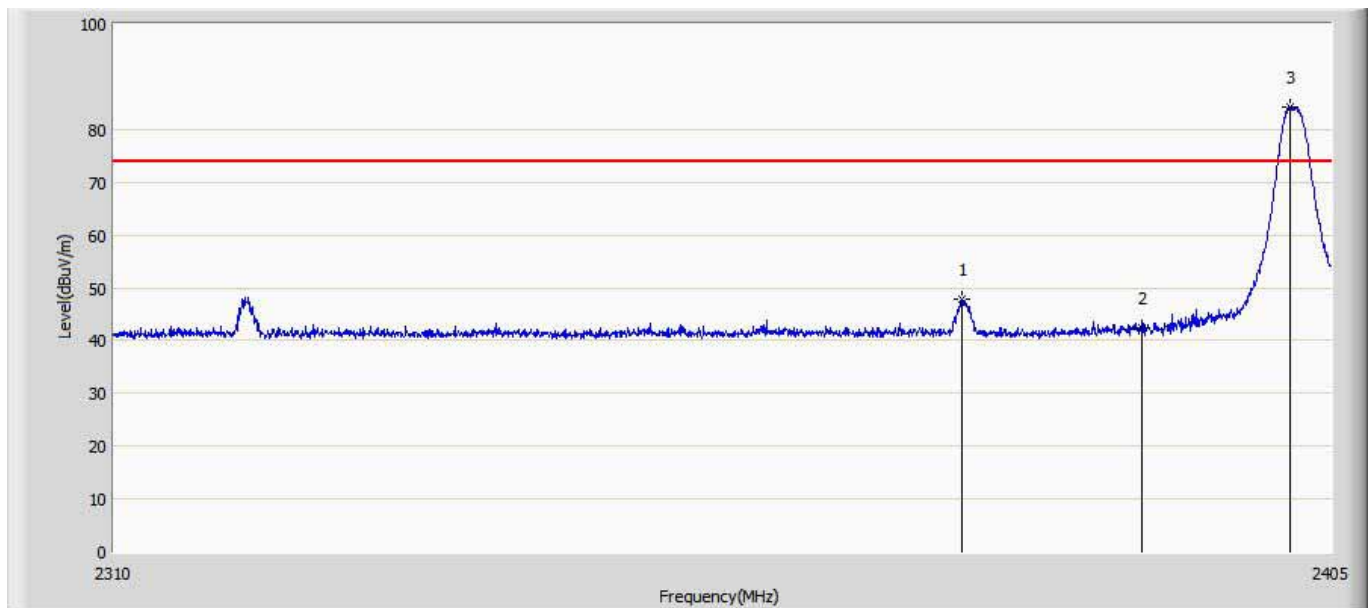
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2375.883	51.672	22.622	-22.328	74.000	29.050	PK
2		2390.000	45.068	16.020	-28.932	74.000	29.048	PK
3	*	2401.865	89.678	60.716	15.678	74.000	28.962	PK

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 15:11
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



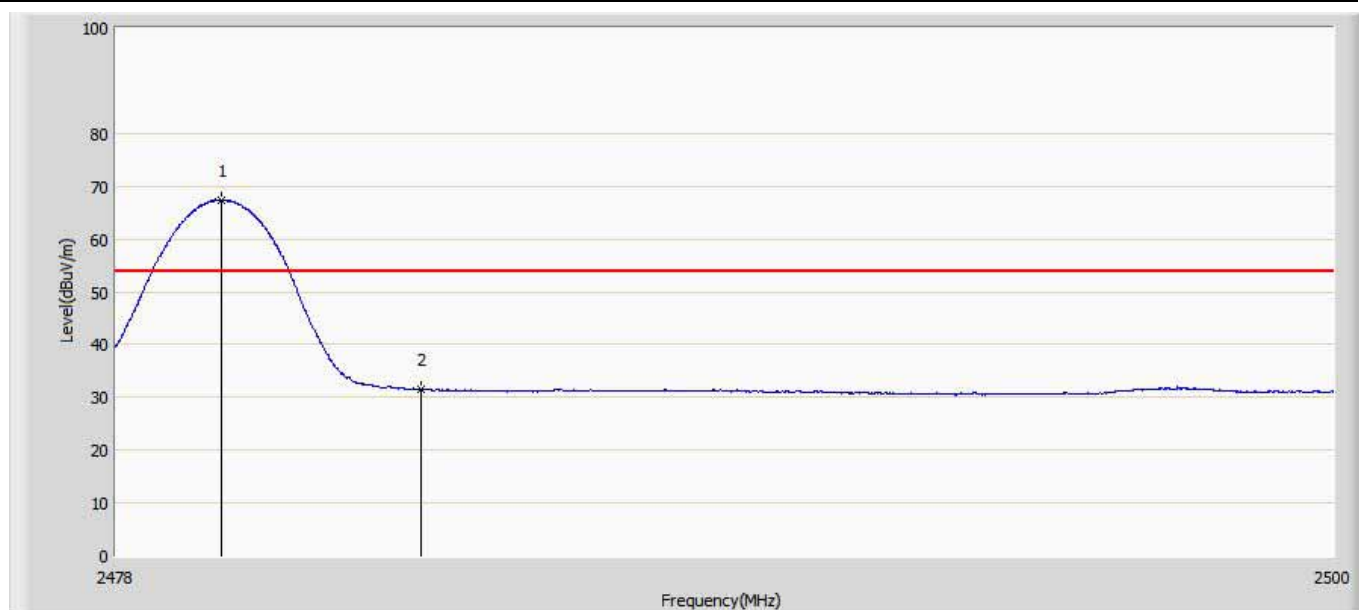
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	29.007	-0.041	-24.993	54.000	29.048	AV
2	*	2401.913	62.278	33.317	8.278	54.000	28.961	AV

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 15:14
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



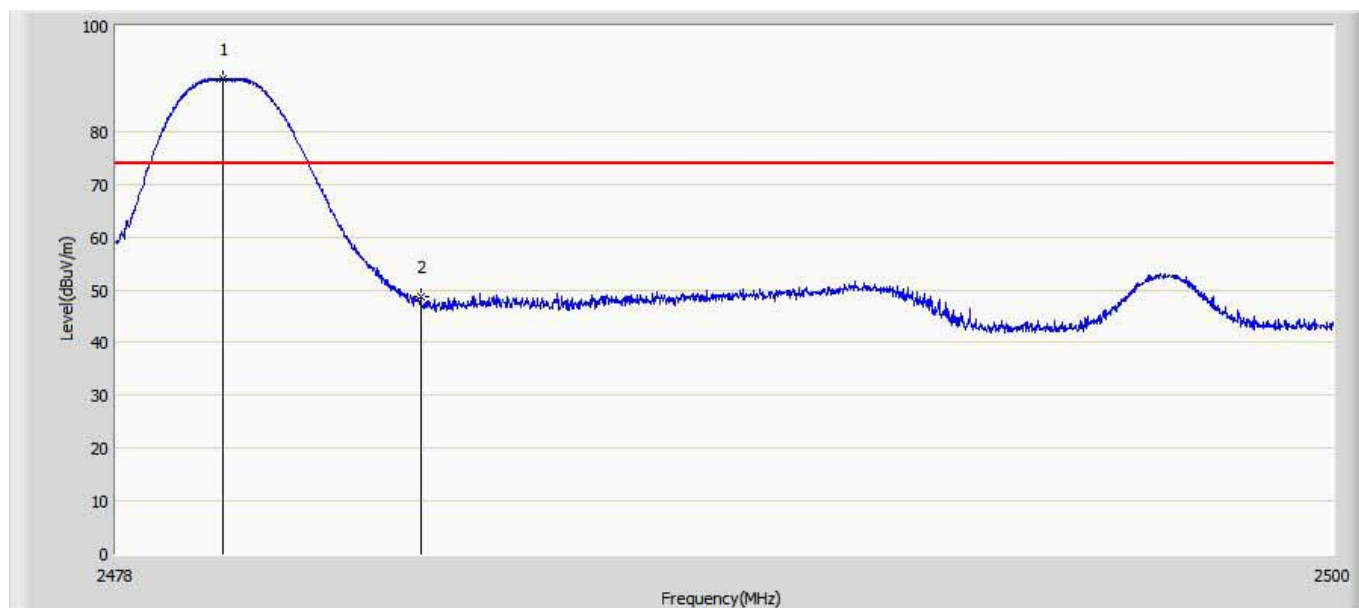
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2375.788	47.712	18.662	-26.288	74.000	29.050	PK
2		2390.000	42.354	13.306	-31.646	74.000	29.048	PK
3	*	2401.770	84.249	55.286	10.249	74.000	28.963	PK

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 16:25
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



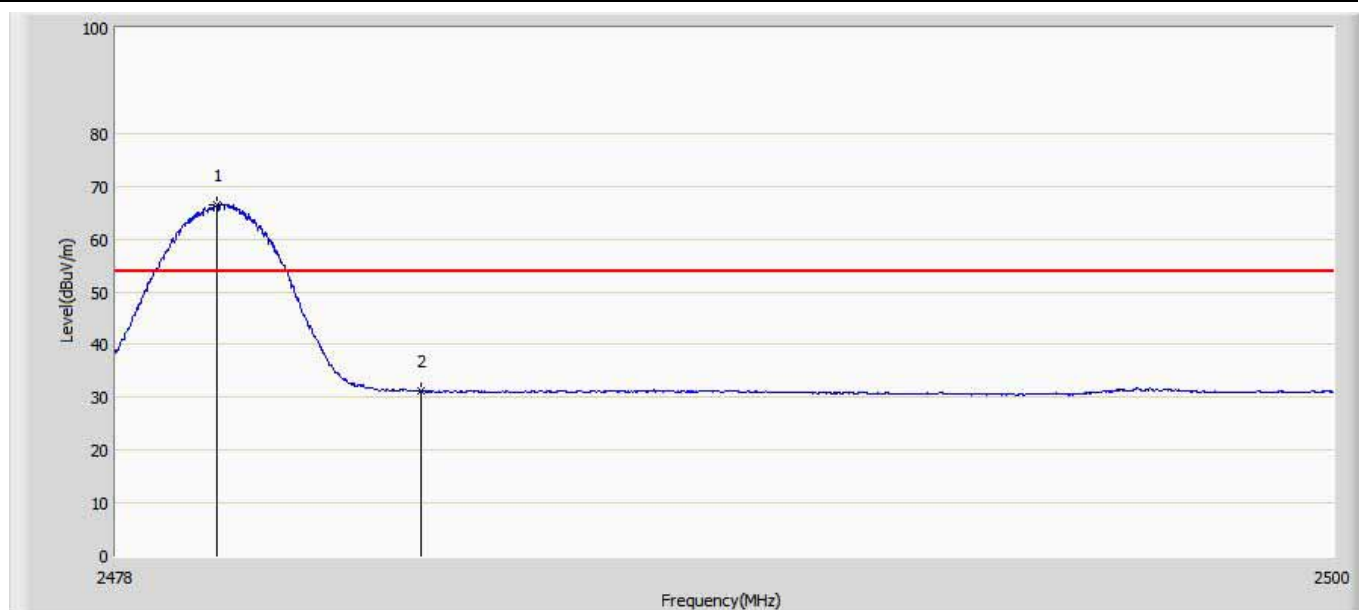
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.914	67.381	36.864	13.381	54.000	30.517	AV
2		2483.500	31.478	0.994	-22.522	54.000	30.484	AV

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 16:31
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



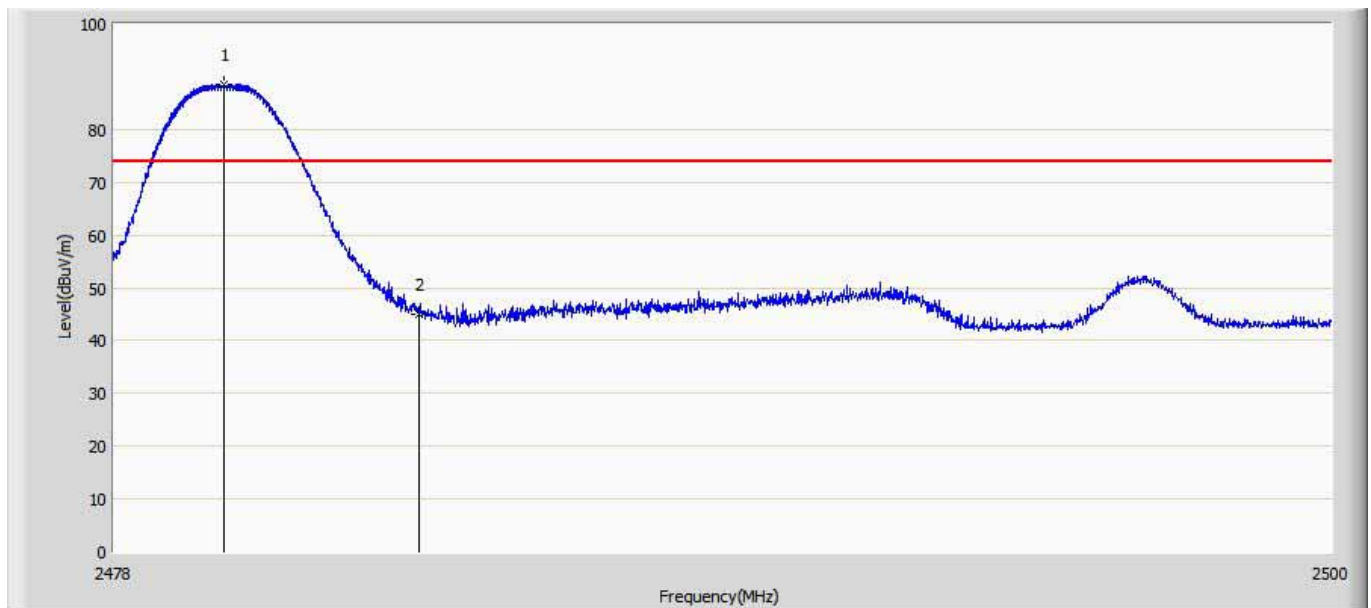
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.925	89.947	59.430	15.947	74.000	30.517	PK
2		2483.500	48.710	18.226	-25.290	74.000	30.484	PK

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 16:33
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.837	66.584	36.067	12.584	54.000	30.517	AV
2		2483.500	31.190	0.706	-22.810	54.000	30.484	AV

Engineer: Scott	
Site: AC5	Time: 2017/08/08 - 16:39
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Rylo	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



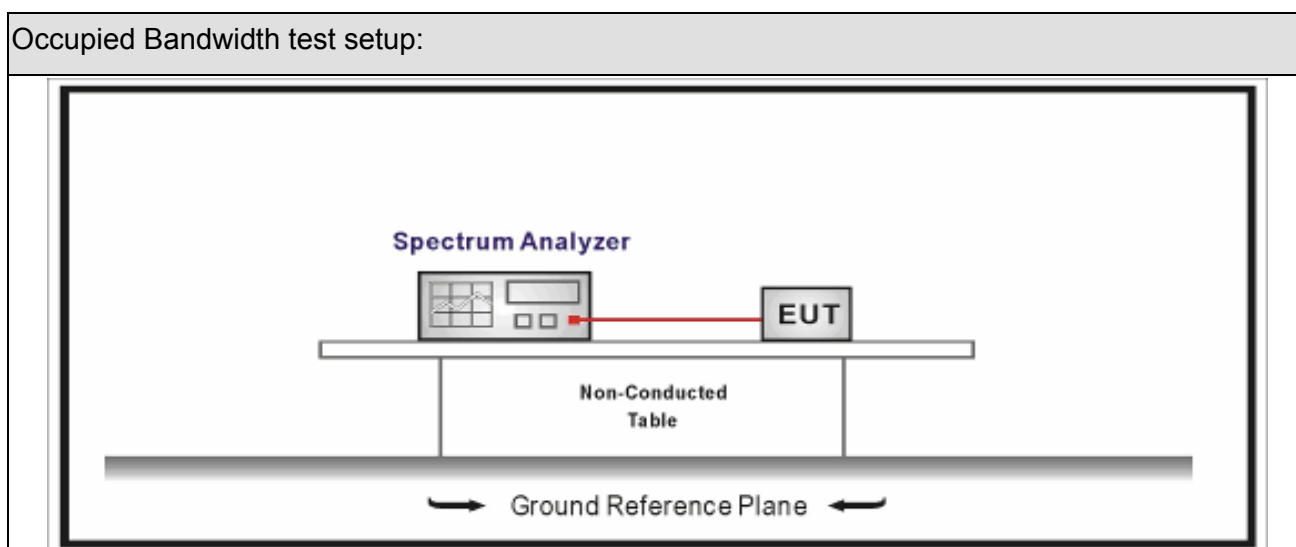
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.980	88.409	57.893	14.409	74.000	30.516	PK
2		2483.500	45.121	14.637	-28.879	74.000	30.484	PK

7. Occupied Bandwidth

7.1. Test Equipment

Occupied Bandwidth / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04	2018.02.03
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2017.04.09	2018.04.08
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2017.04.09	2018.04.08
Temperature/Humidity Meter	zhichen	ZC1-2	TR8-TH	2017.04.10	2018.04.09
Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

7.2. Test Setup



7.3. Limit

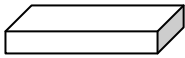
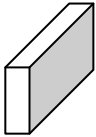
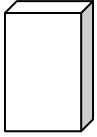
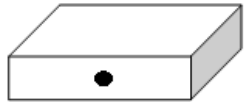
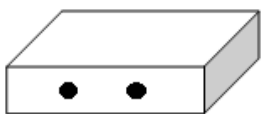

Occupied Bandwidth

Systems using digital modulation techniques operate in the 2400-2483.5 MHz. The minimum 6 dB bandwidth shall be at least 500 kHz

7.4. Test Procedure

Test Method				
	Reference Rule		Chapter	Description
<input checked="" type="checkbox"/>	ANSI C63.10		11.8	DTS bandwidth
	<input type="checkbox"/>	ANSI C63.10	11.8.1	Option 1
	<input checked="" type="checkbox"/>	ANSI C63.10	11.8.2	Option 2

7.5. EUT test definition

Item	Occupied Bandwidth			
Device Category	<input type="checkbox"/>	Fixed point-to-point		
	<input type="checkbox"/>	Emit multiple directional beams, simultaneously or sequentially		
	<input checked="" type="checkbox"/>	Other cases		
Test mode	Mode 1			
Test method	<input type="checkbox"/>	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis <input type="checkbox"/>	Worst Axis <input type="checkbox"/>	Worst Axis <input type="checkbox"/>
	<input checked="" type="checkbox"/>	Conducted		
	<input checked="" type="checkbox"/>	Chain 0		
				
	<input type="checkbox"/>	Chain 0	Chain 1	
				
	<input type="checkbox"/>	Chain 0	Chain 1	Chain 2
				

7.6. Test Result

Product Name	: Rylo	Power	: AC 120V/60Hz
Test Mode	: Mode 1	Test Site	: TR-8
Test Date	: 2017.08.16	Test Engineer	: Scott

Mode	CH.	Test Freq. (MHz)	6dB Occupied Bandwidth (kHz)	Limit (kHz)	Result
1	00	2402	656.6	>500	Pass
1	19	2440	665.7	>500	Pass
1	39	2480	659.5	>500	Pass

Note : The worst case of Occupied Bandwidth as below:

Mode 1 CH00 (2402MHz)



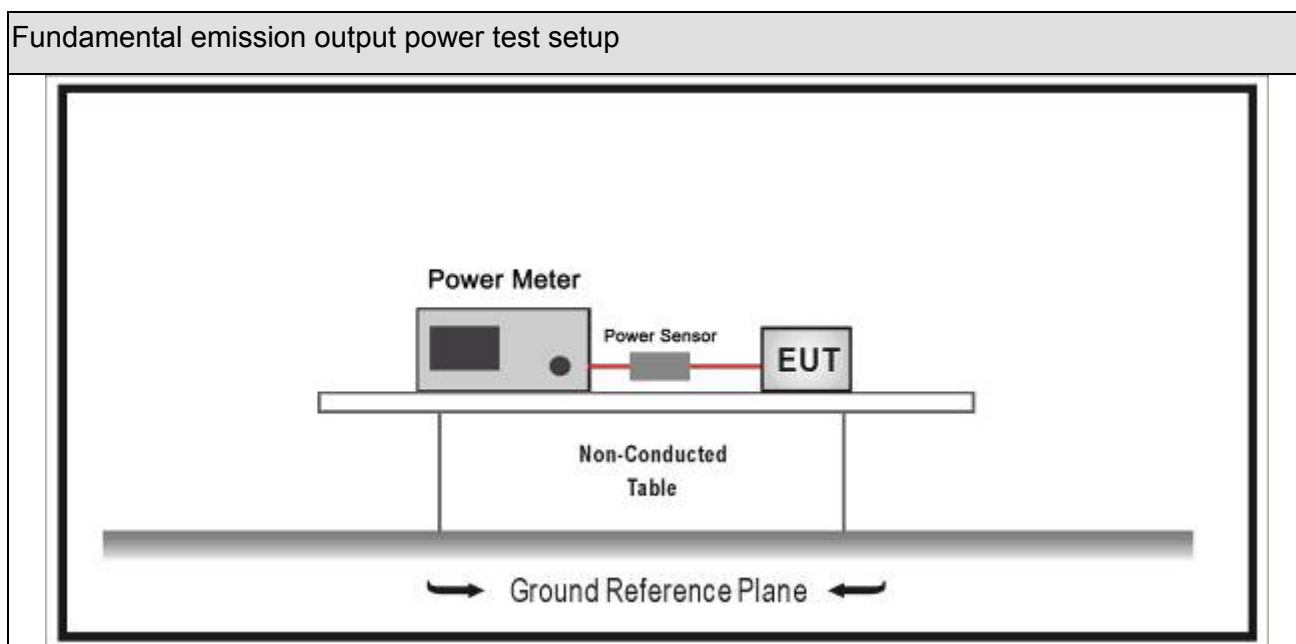
8. Fundamental emission output power

8.1. Test Equipment

Fundamental emission output power/ TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2017.01.04	2018.01.03
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.01.04	2018.01.03
Wideband Peak Power Meter	Anritsu	ML2495A	0905006	2016.10.14	2017.10.13
Power Sensor	Anritsu	MA2411B	0846014	2016.10.14	2017.10.13
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2017.04.10	2018.04.09

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

8.2. Test Setup



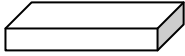
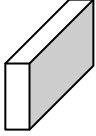
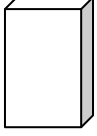



8.3. Limit

Fundamental emission output power Limit			
<input checked="" type="checkbox"/>	$G_{TX} < 6\text{dBi}$		$P_{out} \leq 30\text{dBm}$
<input type="checkbox"/>	$G_{TX} > 6\text{dBi}$		
	<input type="checkbox"/>	Non-Fix point-point	$P_{out} \leq 30 - (G_{TX} - 6)$
	<input type="checkbox"/>	Fix point-point	$P_{out} \leq 30 - [(G_{TX} - 6)]/3$
	<input type="checkbox"/>	Point-to-multipoint	$P_{out} \leq 30 - (G_{TX} - 6)$
	<input type="checkbox"/>	Overlap Beams	$P_{out} \leq 30 - [(G_{TX} - 6)]/3$
	<input type="checkbox"/>	Aggregate power transmitted simultaneously on all beams	$P_{out} \leq 30 - [(G_{TX} - 6)]/3$
	<input type="checkbox"/>	single directional beam	$P_{out} \leq 30 - [(G_{TX} - 6)]/3 + 8\text{dB}$
Note 1 : G_{TX} directional gain of transmitting antennas.			
Note 2 : P_{out} is maximum peak conducted output power .			

8.4. Test Procedure

Fundamental emission output power Test Method						
	References Rule			Chapter	Description	
<input checked="" type="checkbox"/>	ANSI C63.10			11.9	Fundamental emission output power	
	<input checked="" type="checkbox"/>	ANSI C63.10		11.9.1	Maximum peak conducted output power	
		<input type="checkbox"/>	ANSI C63.10	11.9.1.1	RBW ≥ DTS bandwidth	
		<input type="checkbox"/>	ANSI C63.10	11.9.1.2	Integrated band power method	
		<input checked="" type="checkbox"/>	ANSI C63.10	11.9.1.3	PKPM1 Peak power meter method	
	<input type="checkbox"/>	ANSI C63.10		11.9.2	Maximum conducted (average) output power	
		<input type="checkbox"/>	ANSI C63.10		11.9.2.2	Measurement using a spectrum analyzer (SA)
			<input type="checkbox"/>	ANSI C63.10	11.9.2.2.2	Method AVGSA-1(Duty cycle 98%)
			<input type="checkbox"/>	ANSI C63.10	11.9.2.2.3	Method AVGSA-1A(Duty cycle 98%)
			<input type="checkbox"/>	ANSI C63.10	11.9.2.2.4	Method AVGSA-2(Duty cycle 98%)
			<input type="checkbox"/>	ANSI C63.10	11.9.2.2.5	Method AVGSA-2A(Duty cycle 98%)
			<input type="checkbox"/>	ANSI C63.10	11.9.2.2.4	Method AVGSA-3
			<input type="checkbox"/>	ANSI C63.10	11.9.2.2.5	Method AVGSA-3A
		<input type="checkbox"/>	ANSI C63.10		11.9.2.3	Measurement using a power meter (PM)
			<input type="checkbox"/>	ANSI C63.10	11.9.2.3.1	Method AVGPM
			<input type="checkbox"/>	ANSI C63.10	11.9.2.3.2	Method AVGPM-G

8.5. EUT test definition

Item	Fundamental emission output power			
Device Category	<input type="checkbox"/>	Fixed point-to-point		
	<input type="checkbox"/>	Emit multiple directional beams, simultaneously or sequentially		
	<input checked="" type="checkbox"/>	Other cases		
Test mode	Mode 1			
Test method	<input type="checkbox"/>	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis <input type="checkbox"/>	Worst Axis <input type="checkbox"/>	Worst Axis <input type="checkbox"/>
	<input checked="" type="checkbox"/>	Conducted		
	<input checked="" type="checkbox"/>	Chain 0		
				
	<input type="checkbox"/>	Chain 0	Chain 1	
				
	<input type="checkbox"/>	Chain 0	Chain 1	Chain 2
				

8.6. Test Result

Product Name	:	Rylo	Power	:	AC 120V/60Hz
Test Mode	:	Mode 1	Test Site	:	TR-8
Test Date	:	2017.08.15	Test Engineer	:	Scott

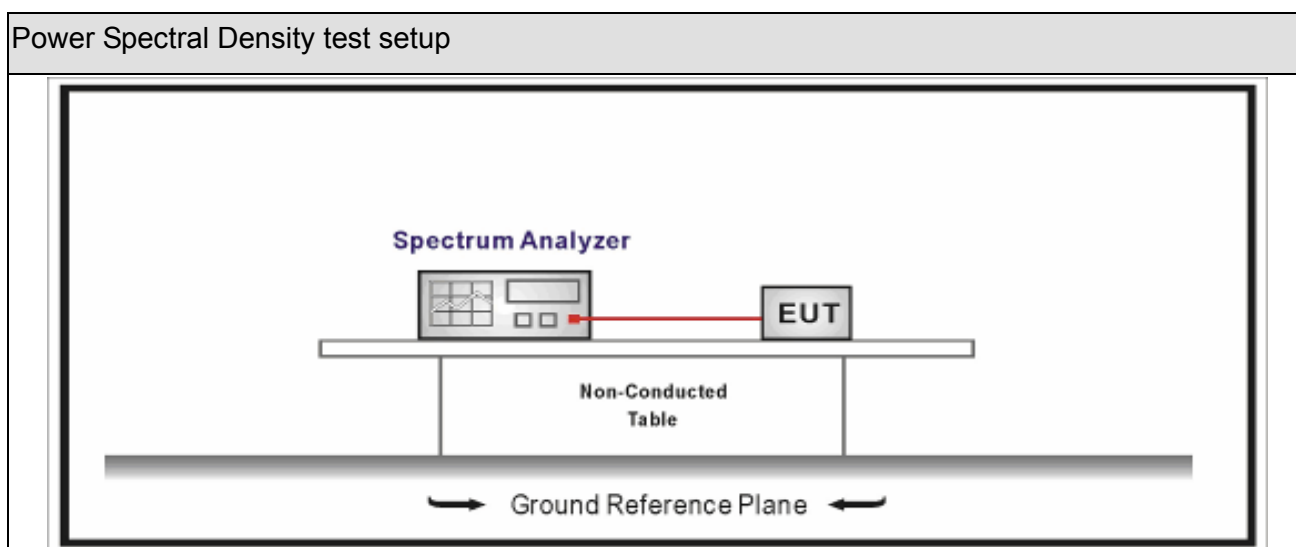
Mode	Channel	Test Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
1	00	2402	2.63	30	Pass
1	19	2440	2.78	30	Pass
1	39	2480	2.55	30	Pass

9. Power Spectral Density

9.1. Test Equipment

Power Spectral Density / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04	2018.02.03
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2017.04.09	2018.04.08
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2017.04.09	2018.04.08
Temperature/Humidity Meter	zhichen	ZC1-2	TR8-TH	2017.04.10	2018.04.09
Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

9.2. Test Setup



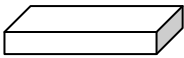
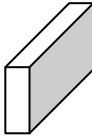
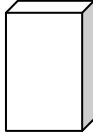
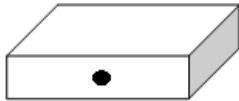
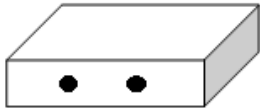
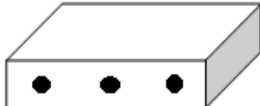
9.3. Limit

Power Spectral Density Limit	
Power Spectral Density	8dBm/3kHz

9.4. Test Procedure

Power Spectral Density Test Method				
	References Rule		Chapter	Description
<input checked="" type="checkbox"/>	ANSI C63.10		11.10	Maximum power spectral density level in the fundamental emission
	<input checked="" type="checkbox"/>	ANSI C63.10	11.10.2	Method PKPSD (peak PSD)
	<input type="checkbox"/>	ANSI C63.10	11.10.3	Method AVGPSD-1(Duty cycle 98%)
	<input type="checkbox"/>	ANSI C63.10	11.10.4	Method AVGPSD-1A(Duty cycle 98%)
	<input type="checkbox"/>	ANSI C63.10	11.10.5	Method AVGPSD-2(Duty cycle < 98%)
	<input type="checkbox"/>	ANSI C63.10	11.10.6	Method AVGPSD-2A(Duty cycle < 98%)
	<input type="checkbox"/>	ANSI C63.10	11.10.7	Method AVGPSD-3
	<input type="checkbox"/>	ANSI C63.10	11.10.8	Method AVGPSD-3A

9.5. EUT test definition

Item	Power Spectral Density Test Method			
Device Category	<input type="checkbox"/>	Fixed point-to-point		
	<input type="checkbox"/>	Emit multiple directional beams, simultaneously or sequentially		
	<input checked="" type="checkbox"/>	Other cases		
Test mode	Mode 1			
Test method	<input type="checkbox"/>	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis <input type="checkbox"/>	Worst Axis <input type="checkbox"/>	Worst Axis <input type="checkbox"/>
	<input checked="" type="checkbox"/>	Conducted		
	<input checked="" type="checkbox"/>	Chain 0		
				
	<input type="checkbox"/>	Chain 0	Chain 1	
				
	<input type="checkbox"/>	Chain 0	Chain 1	Chain 2
				

9.6. Test Result

Product Name	: Rylo	Power	: AC 120V/60Hz
Test Mode	: Mode 1	Test Site	: TR-8
Test Date	: 2017.08.18	Test Engineer	: Scott

Mode	Channel	Test Frequency (MHz)	Measurement PSD (dBm/3kHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
1	00	2402	-11.749	-11.749	8	Pass
1	19	2440	-11.583	-11.583	8	Pass
1	39	2480	-11.953	-11.953	8	Pass

Note : The worst case of Power Spectral Density as below:

Mode 1 CH19(2440MHz)



10. Antenna Requirement

10.1. Limit

Antenna Requirement Limit	
<p>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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.</p>	

10.2. Antenna Connector Construction

Antenna Connector Construction	
<input checked="" type="checkbox"/>	The use of a permanently attached antenna
<input type="checkbox"/>	The antenna use of a unique coupling to the intentional radiator
<input type="checkbox"/>	The use of a nonstandard antenna jack or electrical connector
Please refer to the attached document "Internal Photograph" to show the antenna connector.	

_____ The End _____