Test Report

FCC Part15 Subpart C

Product Name	:	Ring Bridge
Model No.	:	5B01S8
HVIN	:	5B01S8
FVIN	:	0.7.5-33
FCC ID	:	2AEUPBHARB001

Applicant	:	Ring, LLC.
Address	:	1523 26th St, Santa Monica, CA 90404

Date of Receive the sample	:	Feb. 02, 2020
Test Date	:	Feb. 02, 2020 ~ Sep. 22, 2020
Issued Date	:	Sep. 22, 2020
Report No.	:	2080843R-RF-US-P06V01
Report Version	:	V1.1

This Report is based on DEKRA report No.: 1922002R-RF-US-P06V02 , the EUT add a 250K/FSK mode.

The test results presented in this report relate only to the object tested.

The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result, unless the specification, standard or customer have special requirements

This report is not used for social proof in China (or Mainland China) market.

Test Report Certification

Issued Date : Sep. 22, 2020
Report No. : 2080843R-RF-US-P06V01

Product Name	:	Ring Bridge
Applicant	:	Ring, LLC.
Address	:	1523 26th St, Santa Monica, CA 90404
Manufacturer	:	Ring, LLC.
Address	:	1523 26th St, Santa Monica, CA 90404
Model No.	:	5B01S8
HVIN	:	5B01S8
FVIN	:	0.7.5-33
FCC ID	:	2AEUPBHARB001
EUT Voltage	:	DC 5V
Test Voltage	:	AC120V/60Hz
Applicable Standard	:	FCC CFR Title 47 Part 15 Subpart C ANSI C63.10: 2013
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 Designation Number: CN1199

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(Supervisor: Jack Zhang)

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
2080843R-RF-US-P06V01	V1.0	Initial Issued Report	Apr. 07, 2020
2080843R-RF-US-P06V01	V1.1	1. Page 46, updated the dwell time test plot. 2. Page 49, updated the power. 3. Page 52, updated the Emissions in non-restricted frequency bands	Sep. 22, 2020

1. General Information

1.1. EUT Description

Product Name	Ring Bridge
Model No.	5B01S8
HVIN	5B01S8
FVIN	0.7.5-33
Working Voltage	DC 5V
Test Voltage	120V/60Hz
Modulation & Bandwidth/data rate & Frequency Range & Channel Separation	902- 928 MHz
	FSK FHSS 250Kbps: 902.5~927.5MHz, 500KHz
Type of Modulation	FSK
Data Rate	FSK: 250Kbps
Antenna Type	Reference to Antenna List
Peak Antenna Gain	Reference to Antenna List

FSK FHSS 250Kbps (902.5MHz~927.5MHz)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
01	902.5 MHz	02	903.0 MHz	03	903.5 MHz	04	904.0 MHz
05	904.5 MHz	06	905.0 MHz	07	905.5 MHz	08	906.0 MHz
09	906.5 MHz	10	907.0 MHz	11	907.5 MHz	12	908.0 MHz
13	908.5 MHz	14	909.0 MHz	15	909.5 MHz	16	910.0 MHz
17	910.5 MHz	18	911.0 MHz	19	911.5 MHz	20	912.0 MHz
21	912.5 MHz	22	913.0 MHz	23	913.5 MHz	24	914.0 MHz
25	914.5 MHz	26	915.0 MHz	27	915.5 MHz	28	916.0 MHz
29	916.5 MHz	30	917.0 MHz	31	917.5 MHz	32	918.0 MHz
33	918.5 MHz	34	919.0 MHz	35	919.5 MHz	36	920.0 MHz
37	920.5 MHz	38	921.0 MHz	39	921.5 MHz	40	922.0 MHz
41	922.5 MHz	42	923.0 MHz	43	923.5 MHz	44	924.0 MHz
45	924.5 MHz	46	925.0 MHz	47	925.5 MHz	48	926.0 MHz
49	926.5 MHz	50	927.0 MHz	51	927.5 MHz	N/A	N/A

1.2. Antenna information

Model No.	N/A					
Antenna manufacturer	N/A					
Antenna Delivery	☒	1*TX+1*RX	☐	2*TX+2*RX	☐	3*TX+3*RX
Antenna technology	☒	SISO				
	☐	MIMO	☐	Basic		
			☐	CDD		
			☐	Beam-forming		
Antenna Type	☐	External	☐	Dipole		
	☒	Internal	☐	PIFA		
			☒	PCB		
			☐	Ceramic Chip Antenna		
			☐	Metal plate type F antenna		
			☐	Printed Antenna		
Antenna Gain	-1dBi					

1.3. Mode of Operation

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmit by FSK FHSS with 250Kbps data rate(902.5-927.5MHz)

Note:

1. For portable device, radiated spurious emission was verified over X, Y, Z Axis, and shown the worst case on this report.
2. Regards to the frequency band operation for systems using FHSS modulation: normal operation (hopping) was selected to test for conducted spurious test.
3. The extreme test condition for voltage and temperature were declared by the manufacturer.
4. The reading values of all the test items contain cable loss.

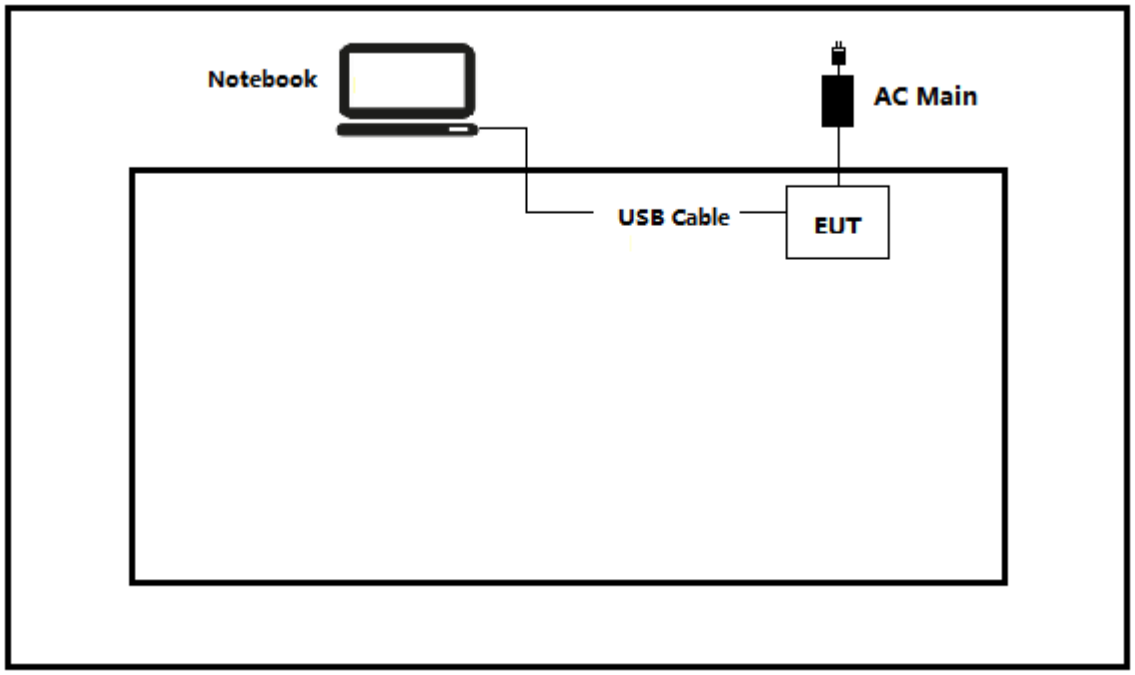
1.4. Tested System Details

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

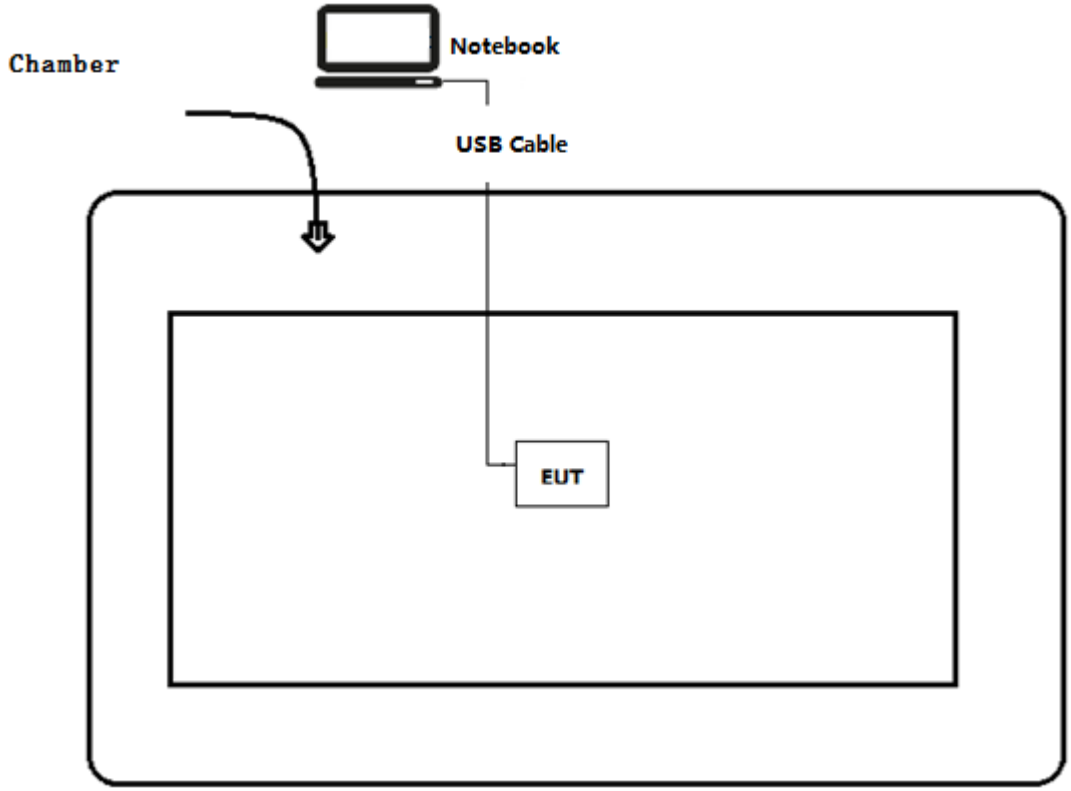
No.	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	Lenovo	Think pad x220	SUA0600195	Power by adapter
A	USB Cable	N/A	N/A	N/A	Shield, 0.75m
B	Serial Cable	N/A	N/A	N/A	Shield, 0.75m
C	USB Cable	N/A	N/A	N/A	Shield, 10m
D	Serial Cable	N/A	N/A	N/A	Shield, 10m

1.5. Configuration of Tested System

Test setup Diagram- AC Line Conducted Emission Test



Test setup Diagram- Radiated Emission



1.6. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	Run “cmd”, and set the test mode and channel, then start continue Transmit.

2. Technical Test

2.1. Summary of Test Result

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C Section 15.207	Yes	No
Emissions in restricted frequency bands	FCC CFR Title 47 Part 15 Subpart C Section 15.209	Yes	No
20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C Section 15.247(a)(1)	Yes	No
Carrier Frequency Separation	FCC CFR Title 47 Part 15 Subpart C Section 15.247(a)(1)	Yes	No
Number of Hopping Frequencies	FCC CFR Title 47 Part 15 Subpart C Section 15.247(a)(1)(iii)	Yes	No
Time of Occupancy (Dwell Time)	FCC CFR Title 47 Part 15 Subpart C Section 15.247(a)(1)(iii)	Yes	No
Peak Output Power	FCC CFR Title 47 Part 15 Subpart C Section 15.247(b)(1)	Yes	No
Emissions in non-restricted frequency bands	FCC CFR Title 47 Part 15 Subpart C Section 15.215(c), 15.247(d)	Yes	No
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C Section 15.247(d)	Yes	No
Antenna Requirement	FCC CFR Title 47 Part 15 Subpart C Section 15.203	Yes	No

2.2. 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

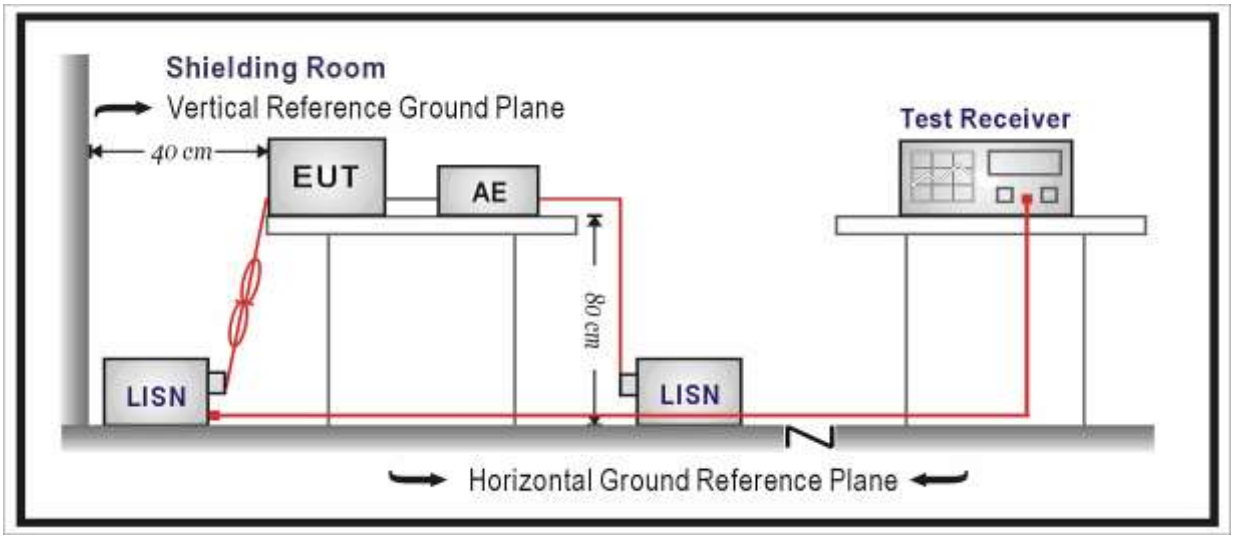
3. Conducted Emission

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	2019.04.20	2020.04.19
Two-Line V-Network	R&S	ENV 216	101189	2019.10.16	2020.10.15
Two-Line V-Network	R&S	ENV 216	101044	2019.05.25	2020.05.24
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	N/A	N/A
50ohm Termination	SHX	TF2	07081402	2019.09.02	2020.09.01
Temperature/Humidity Meter	Riters	RTS-8S	TR1-TH	2019.08.21	2020.08.20
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

3.2. Test Setup

AC Power Line Conducted Emission test setup



3.3. Limit

Frequency of Emission (MHz)	Conducted Limit	
	Quasi-peak (dBμV)	Average(dBμV)
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

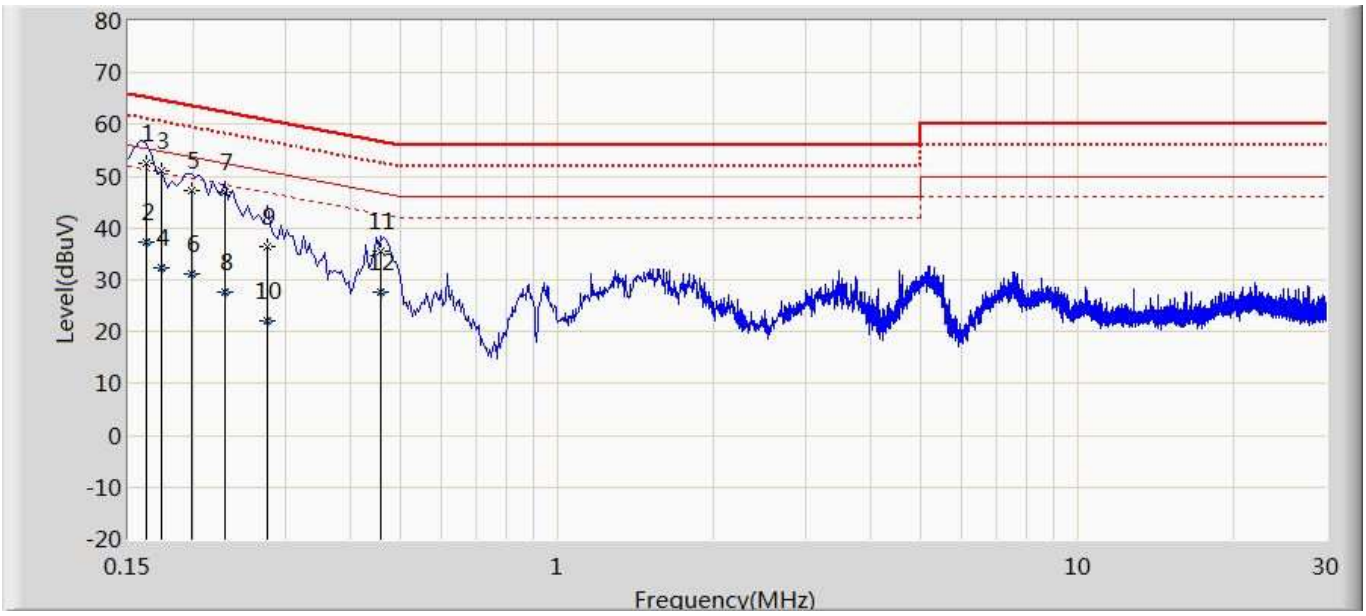
Test Method			
	References Rule	Chapter	Item
☒	ANSI C63.10-2013	6.2	Standard test method for ac power-line conducted emissions from unlicensed wireless devices

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

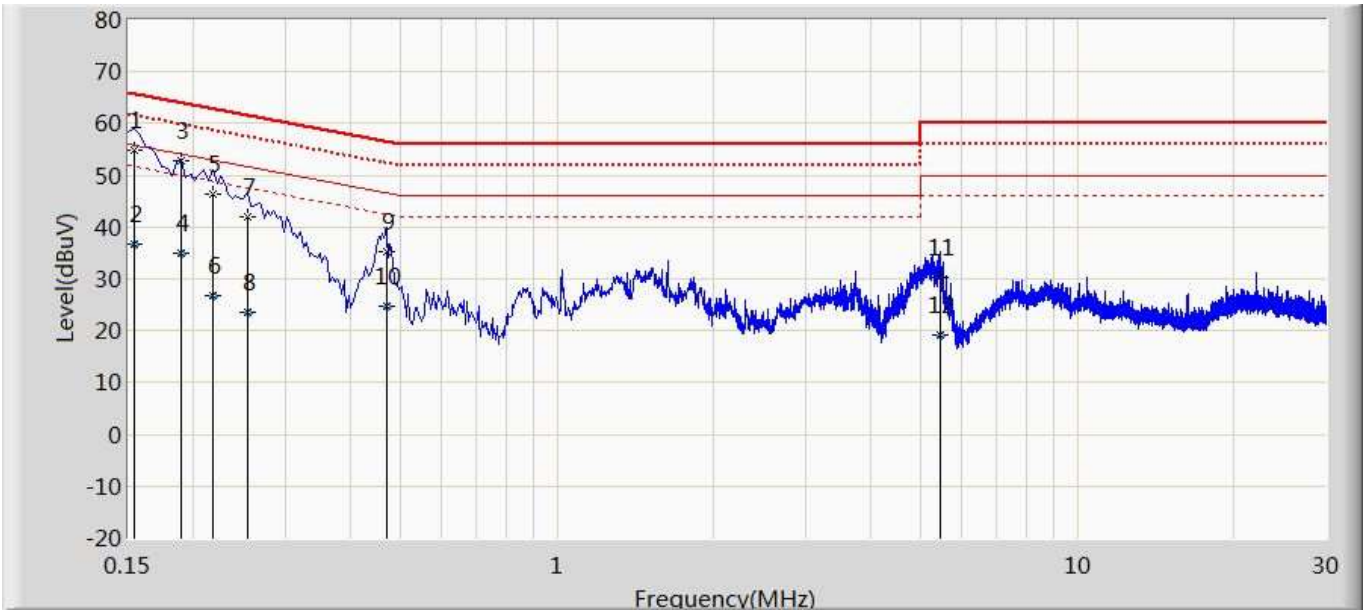
3.6. Test Result

Engineer: YULIU	
Site: TR1	Time: 2020/03/24
Limit: FCC_Part15.207_CE_AC Power	Margin: 4
Probe: ENV216_101190(0.009-30MHz)	Polarity: Line
EUT: Ring Bridge	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	*	0.162	52.627	43.012	-12.734	65.361	9.616	QP
2		0.162	37.186	27.571	-18.174	55.361	9.616	AV
3		0.174	50.926	41.292	-13.842	64.767	9.633	QP
4		0.174	32.457	22.824	-22.310	54.767	9.633	AV
5		0.198	47.211	37.582	-16.483	63.694	9.628	QP
6		0.198	31.125	21.496	-22.569	53.694	9.628	AV
7		0.230	46.862	37.232	-15.588	62.450	9.630	QP
8		0.230	27.651	18.021	-24.799	52.450	9.630	AV
9		0.278	36.465	26.836	-24.410	60.875	9.629	QP
10		0.278	22.044	12.415	-28.831	50.875	9.629	AV
11		0.458	35.533	25.899	-21.196	56.729	9.634	QP
12		0.458	27.806	18.172	-18.923	46.729	9.634	AV

Engineer: YULIU	
Site: TR1	Time: 2020/03/24
Limit: FCC_Part15.207_CE_AC Power	Margin: 4
Probe: ENV216_101190(0.009-30MHz)	Polarity: Neutral
EUT: Ring Bridge	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	54.995	45.373	-10.786	65.781	9.622	QP
2		0.154	36.655	27.033	-19.127	55.781	9.622	AV
3		0.190	52.714	43.088	-11.322	64.037	9.626	QP
4		0.190	34.925	25.298	-19.112	54.037	9.626	AV
5		0.218	46.391	36.763	-16.504	62.895	9.628	QP
6		0.218	26.847	17.218	-26.048	52.895	9.628	AV
7		0.254	42.099	32.470	-19.526	61.625	9.629	QP
8		0.254	23.691	14.062	-27.934	51.625	9.629	AV
9		0.470	35.277	25.646	-21.237	56.514	9.632	QP
10		0.470	24.741	15.109	-21.773	46.514	9.632	AV
11		5.434	30.335	20.525	-29.665	60.000	9.810	QP
12		5.434	19.131	9.321	-30.869	50.000	9.810	AV

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

4. Emissions in restricted frequency bands

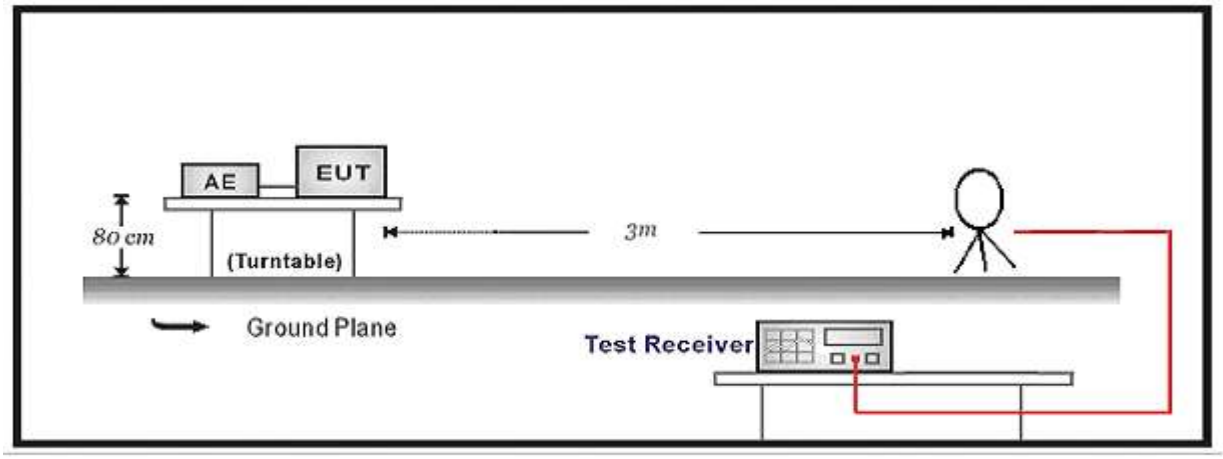
4.1. Test Equipment

Radiated Emission(Below 1GHz) / AC-2					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2019.12.28	2020.12.27
Loop Antenna	R&S	HFH2-Z2	833799/003	2020.02.17	2021.02.16
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2019.09.23	2020.09.22
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2019.04.13	2020.04.12
Temperature/Humidity Meter	Riters	RTS-8S	AC2-TH	2019.09.02	2020.09.01
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

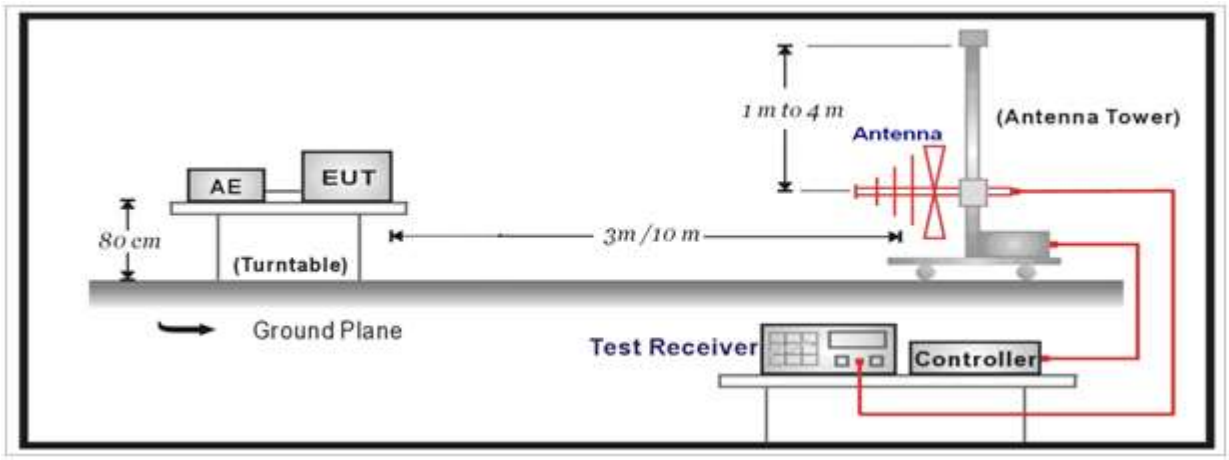
Radiated Emission(Above 1GHz) / AC-5					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9038A	MY51210196	2019.05.25	2020.05.24
Preamplifier	BXT	NA2651D	LNA17040209	2019.04.13	2020.04.12
Preamplifier	EMCI	EMC184045SE	980263	2019.06.13	2020.06.12
DRG Horn	ETS-Lindgren	3117	00167055	2019.05.25	2020.05.24
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2020.03.23	2021.03.22
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2019.04.13	2020.04.12
Temperature/Humidity Meter	Riters	RTS-8S	AC5-TH	2019.09.02	2020.09.01
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

4.2. Test Setup

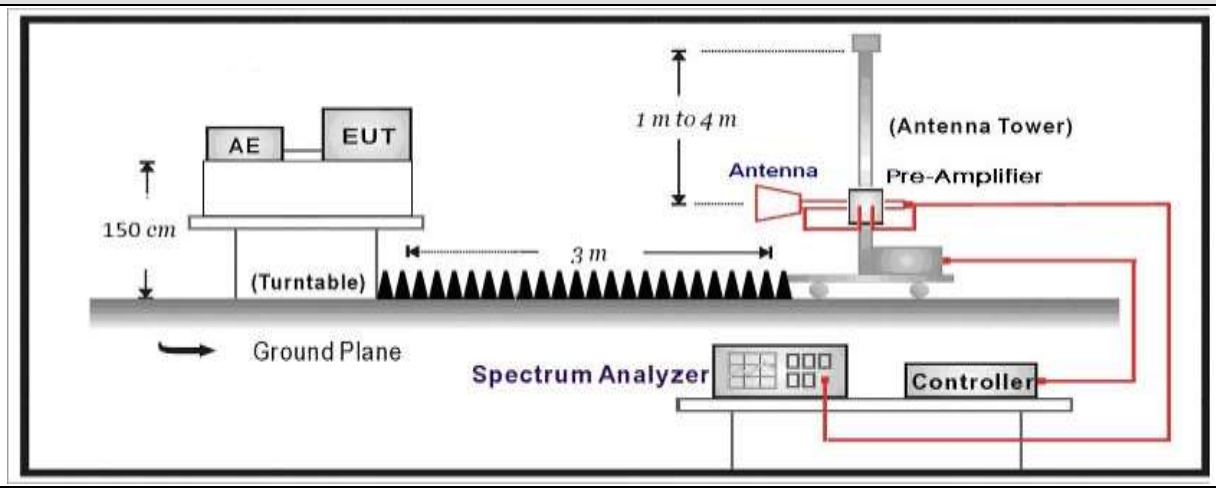
Below 30MHz Test Setup:



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 (μV/m)	Field strength (dBμV/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)

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).

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).

4.4. Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
☒	ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
☒	ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

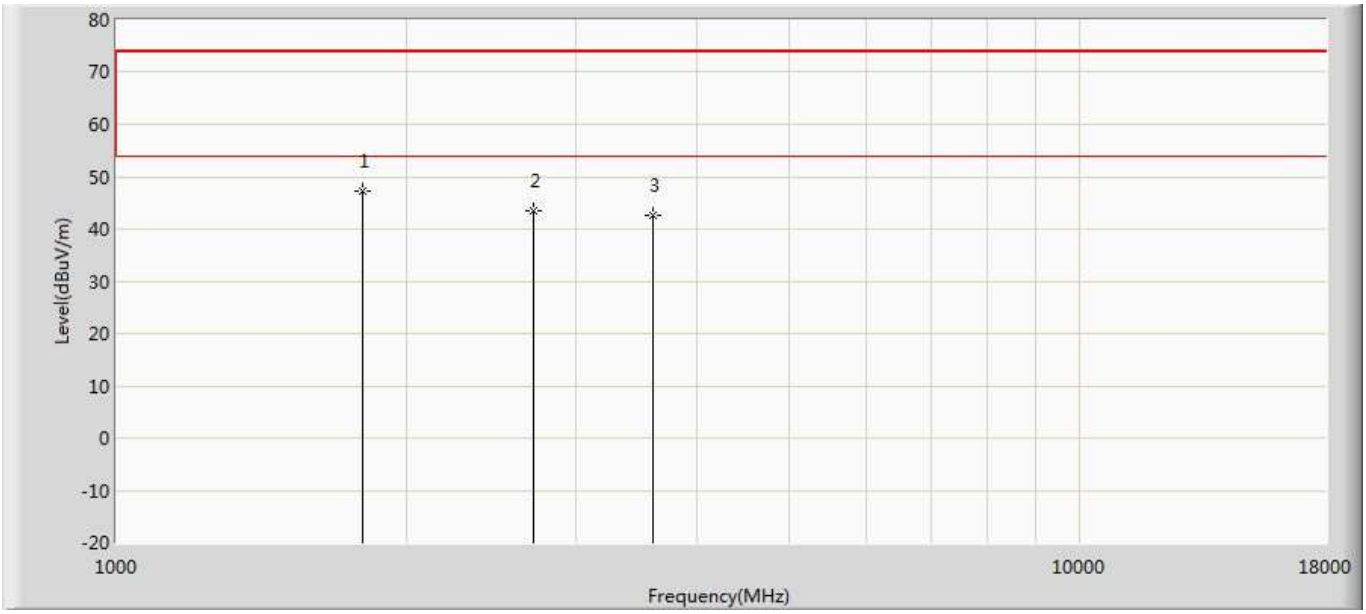
4.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB

below 1G is defined as ± 3.8 dB

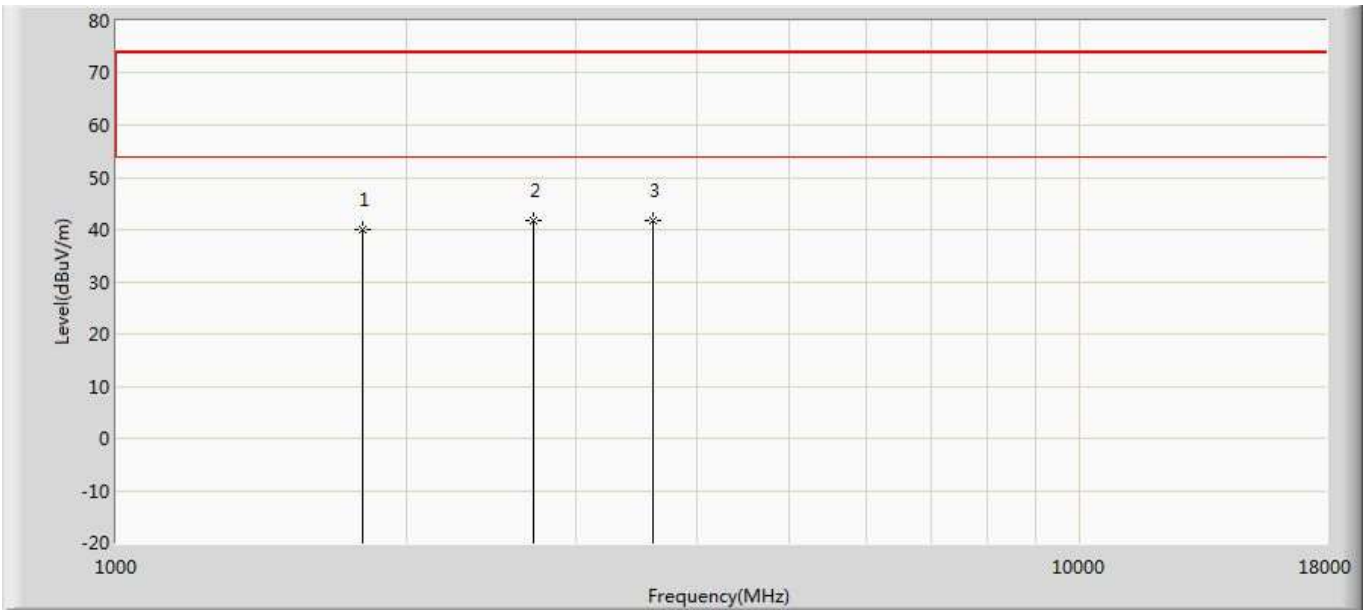
4.6. Test Result

Engineer: YULIU	
Site: AC5	Time: 2020/03/26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Ring Bridge	Power: AC 120V/60Hz
Note: Mode8:Transmit at 902.5MHz	



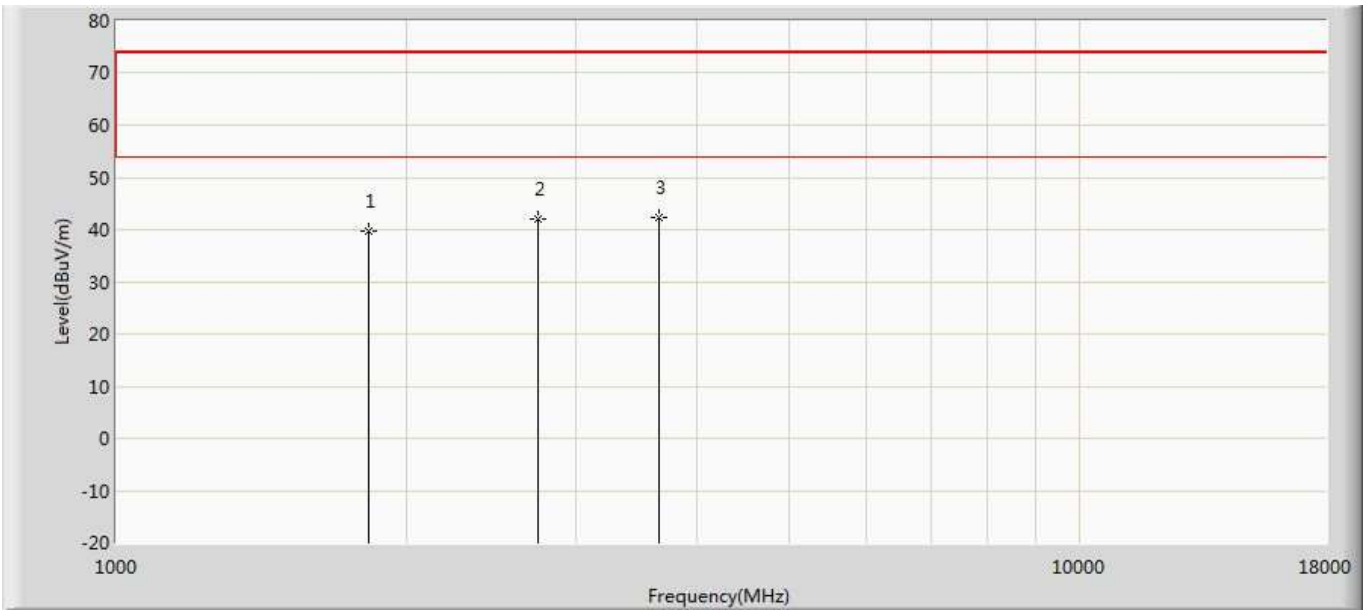
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	1805.000	47.379	47.687	-26.621	74.000	-0.308	PK
2		2707.500	43.386	41.559	-30.614	74.000	1.827	PK
3		3610.000	42.573	38.777	-31.427	74.000	3.796	PK

Engineer: YULIU	
Site: AC5	Time: 2020/03/26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Ring Bridge	Power: AC 120V/60Hz
Note: Mode 8: Transmit at 902.5MHz	



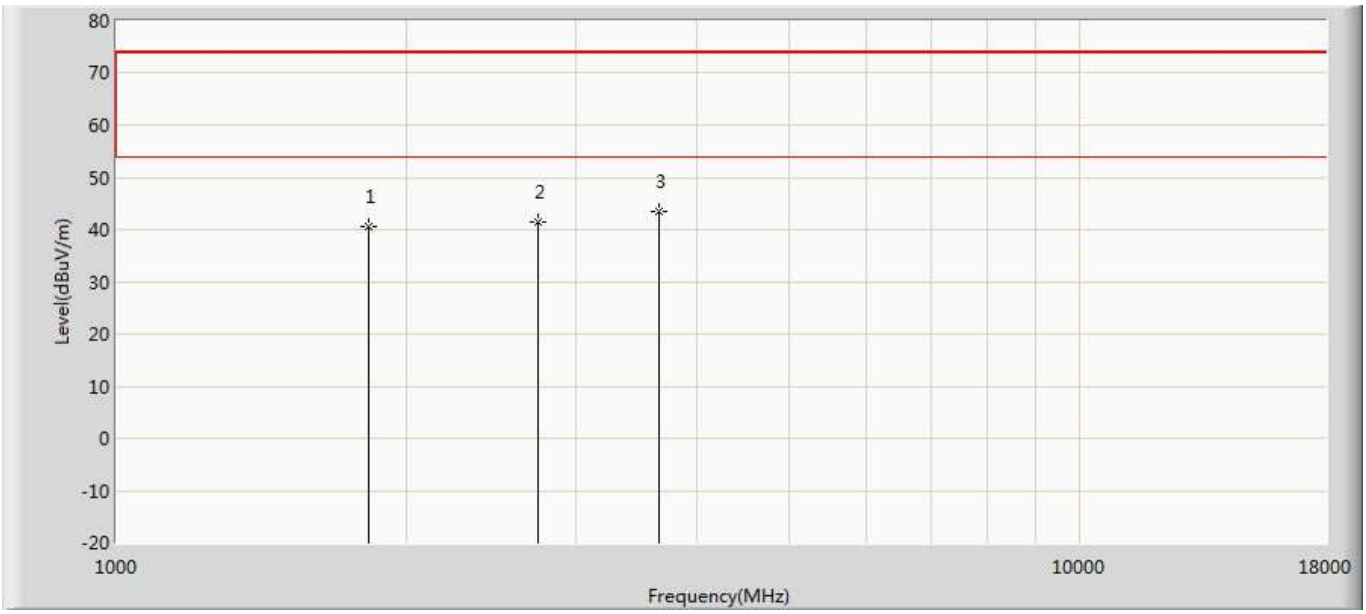
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1805.000	39.859	40.167	-34.141	74.000	-0.308	PK
2		2707.500	41.843	40.016	-32.157	74.000	1.827	PK
3	*	3610.000	41.871	38.075	-32.129	74.000	3.796	PK

Engineer: YULIU	
Site: AC5	Time: 2020/03/26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Ring Bridge	Power: AC 120V/60Hz
Note: Mode 8: Transmit at 915MHz	



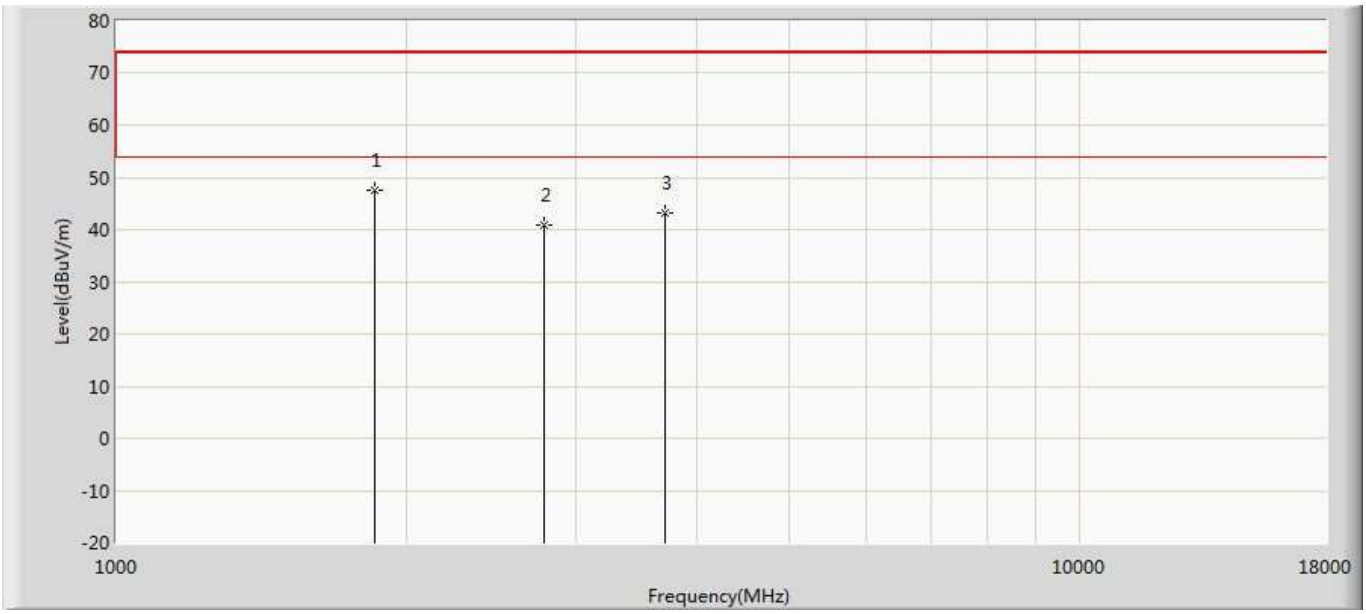
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1830.000	39.805	39.682	-34.195	74.000	0.124	PK
2		2745.000	41.933	39.989	-32.067	74.000	1.944	PK
3	*	3660.000	42.203	38.313	-31.797	74.000	3.890	PK

Engineer: YULIU	
Site: AC5	Time: 2020/03/26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Ring Bridge	Power: AC 120V/60Hz
Note: Mode 8: Transmit at 915MHz	



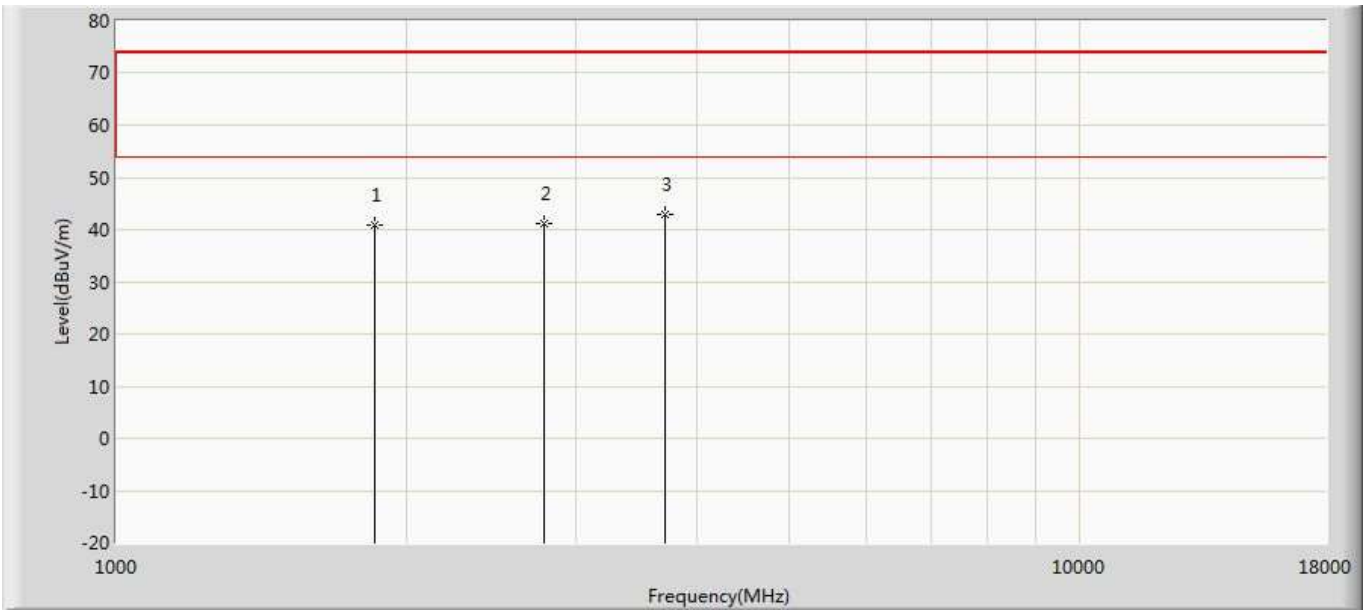
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1830.000	40.460	40.337	-33.540	74.000	0.124	PK
2		2745.000	41.572	39.628	-32.428	74.000	1.944	PK
3	*	3660.000	43.504	39.614	-30.496	74.000	3.890	PK

Engineer: YULIU	
Site: AC5	Time: 2020/03/26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Ring Bridge	Power: AC 120V/60Hz
Note: Mode 8: Transmit at 927.5MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	1855.000	47.417	47.179	-26.583	74.000	0.237	PK
2		2782.500	40.877	38.911	-33.123	74.000	1.966	PK
3		3710.000	43.129	38.950	-30.871	74.000	4.179	PK

Engineer: YULIU	
Site: AC5	Time: 2020/03/26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Ring Bridge	Power: AC 120V/60Hz
Note: Mode 8: Transmit at 927.5MHz	



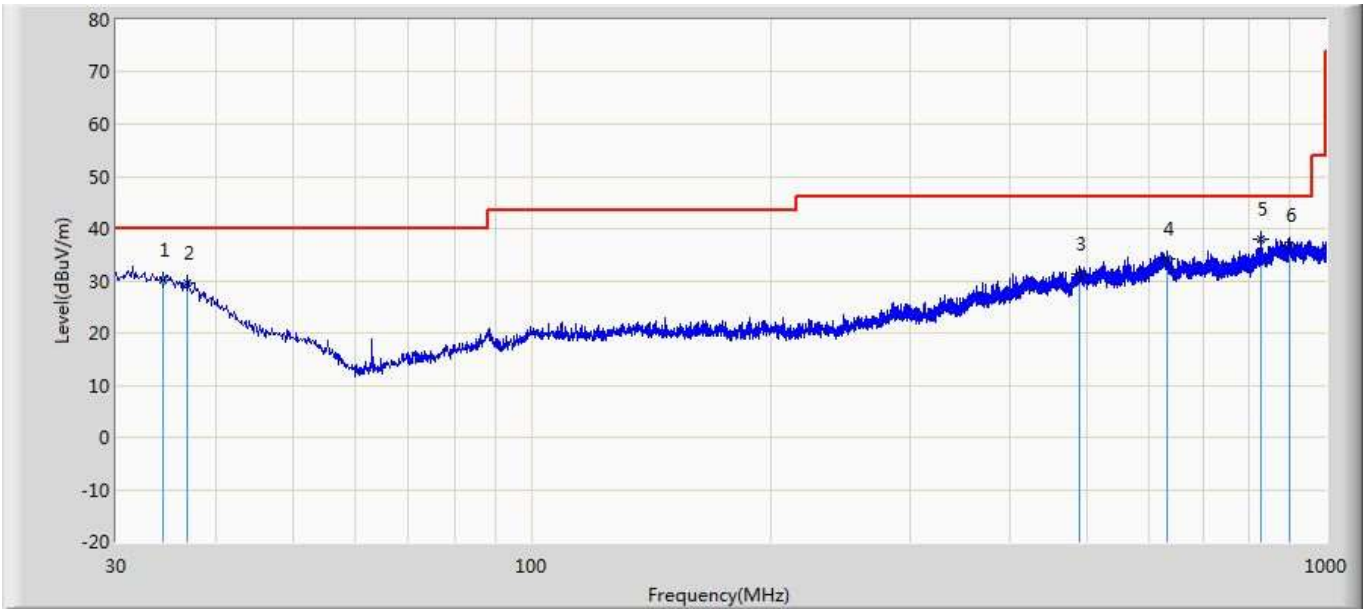
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1855.000	40.988	40.750	-33.012	74.000	0.237	PK
2		2782.500	41.237	39.271	-32.763	74.000	1.966	PK
3	*	3710.000	42.776	38.597	-31.224	74.000	4.179	PK

Note:

1. Measured Level = Reading Level + Factor.
2. The test frequency range, 9kHz~30MHz, the worst case are at least 20dB below the limits, therefore no data appear in the report.
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.
4. As the radiated emission was performed, so conducted emission was not tested.

The worst case of Radiated Emission below 1GHz:

Engineer: YULIU	
Site: AC2	Time: 2020/03/25
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Horizontal
EUT: Ring Bridge	Power: AC 120V/60Hz
Note: Mode 1	

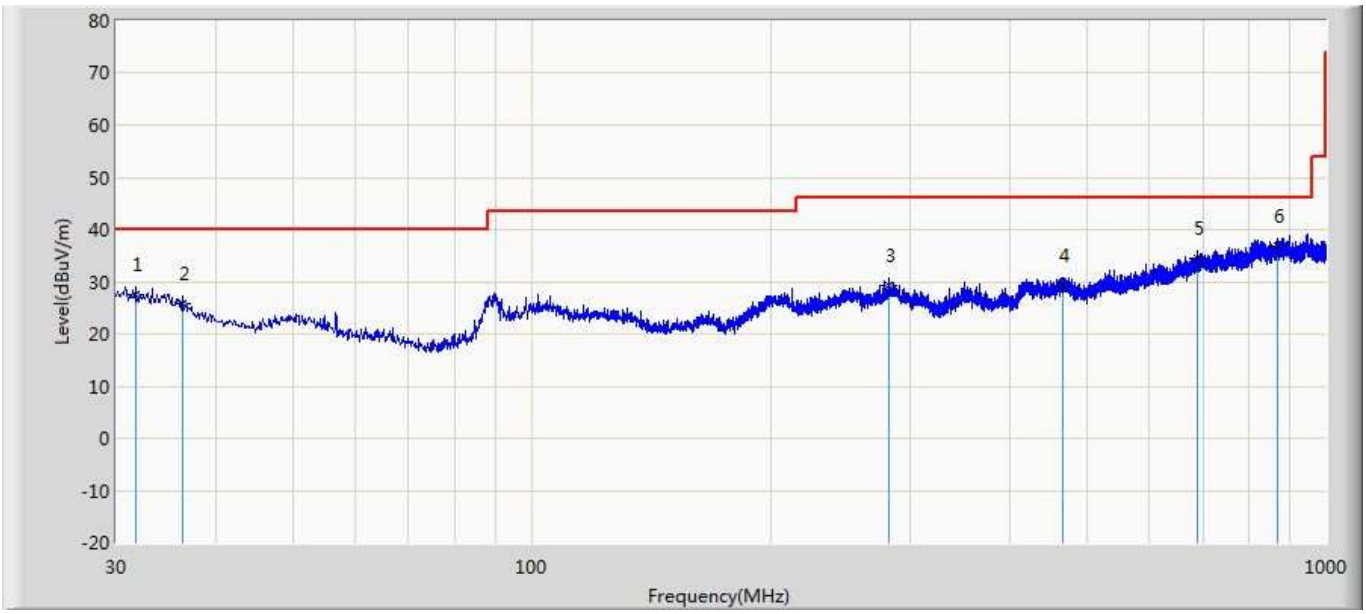


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1		34.365	30.148	3.122	-9.852	40.000	27.025	165	350	QP
2		36.911	29.686	4.495	-10.314	40.000	25.191	150	320	QP
3		489.538	31.301	3.027	-14.699	46.000	28.275	120	250	QP
4		630.430	34.301	4.117	-11.699	46.000	30.184	110	235	QP
5	*	827.097	38.028	6.349	-7.972	46.000	31.678	100	180	QP
6		901.545	36.715	3.554	-9.285	46.000	33.161	135	117	QP

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

Engineer: YULIU	
Site: AC2	Time: 2020/03/25
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Vertical
EUT: Ring Bridge	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)	Ant Pos (cm)	Table Pos (deg)	Type
1		31.698	27.559	4.119	-12.441	40.000	23.440	120	188	QP
2		36.305	25.890	4.234	-14.110	40.000	21.656	100	355	QP
3		282.321	29.344	4.297	-16.656	46.000	25.047	150	245	QP
4		466.015	29.378	2.558	-16.622	46.000	26.820	120	114	QP
5		690.206	34.409	4.314	-11.591	46.000	30.095	140	246	QP
6	*	867.838	36.917	3.951	-9.083	46.000	32.966	180	360	QP

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

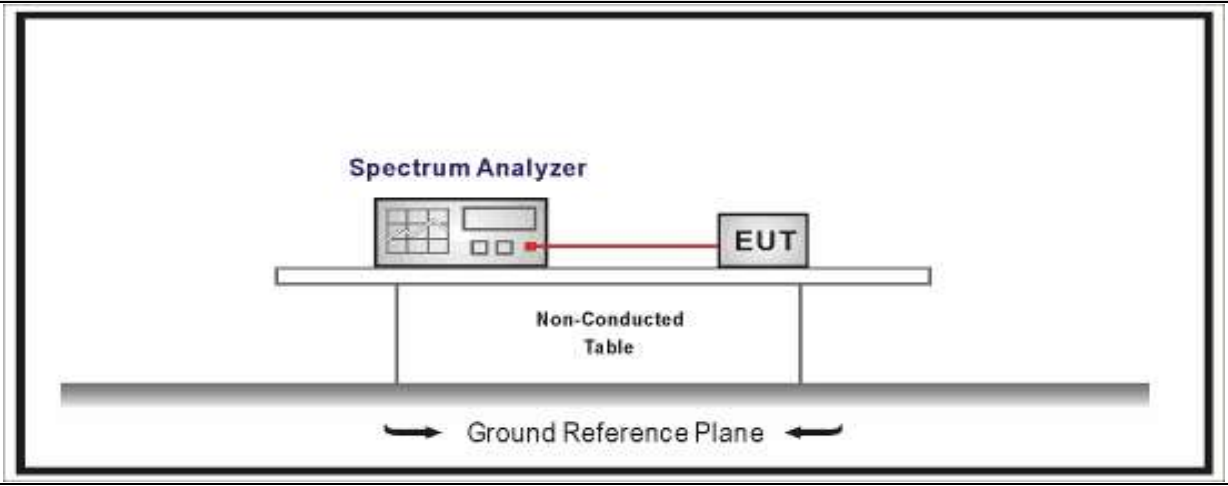
5. 20dB Bandwidth

5.1 Test Equipment

20dB/6dB Bandwidth / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.09.28	2020.09.27
MXA Signal Analyzer	Keysight	N9020B	MY59050482	2019.12.13	2020.12.12
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2019.09.02	2020.09.01
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

5.2 Test Setup

20dB/6dB Bandwidth test setup:



5.3 Limit

20dB/6dB Bandwidth	
☐	For frequency hopping systems operating in 2400-2483.5 MHz band, within frequency range.
☒	For frequency hopping systems operating in 902-928 MHz band, the maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
☒	Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
☐	For frequency hopping systems operating in 5725-5850 MHz band, the maximum 20 dB bandwidth of the hopping channel is 1 MHz.

5.4 Test Procedure

Test Method			
	References Rule	Chapter	Item
☒	ANSI C63.10-2013	6.9	Occupied bandwidth tests
☒	ANSI C63.10-2013	11.8	DTS bandwidth

5.5 Uncertainty

The measurement uncertainty is defined as ± 1 kHz

5.6 Test Result

Product Name	:	Ring Bridge	Power	:	AC 120V/60Hz
Test Mode	:	Mode 1	Test Site	:	TR-8
Test Date	:	2020.03.21			

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
01	902.5	268.6	251.49
26	915	272.2	251.98
51	927.5	266.7	252.64

Channel 01 (902.5MHz)

Channel 26 (915MHz)

Channel 51 (927.5MHz)

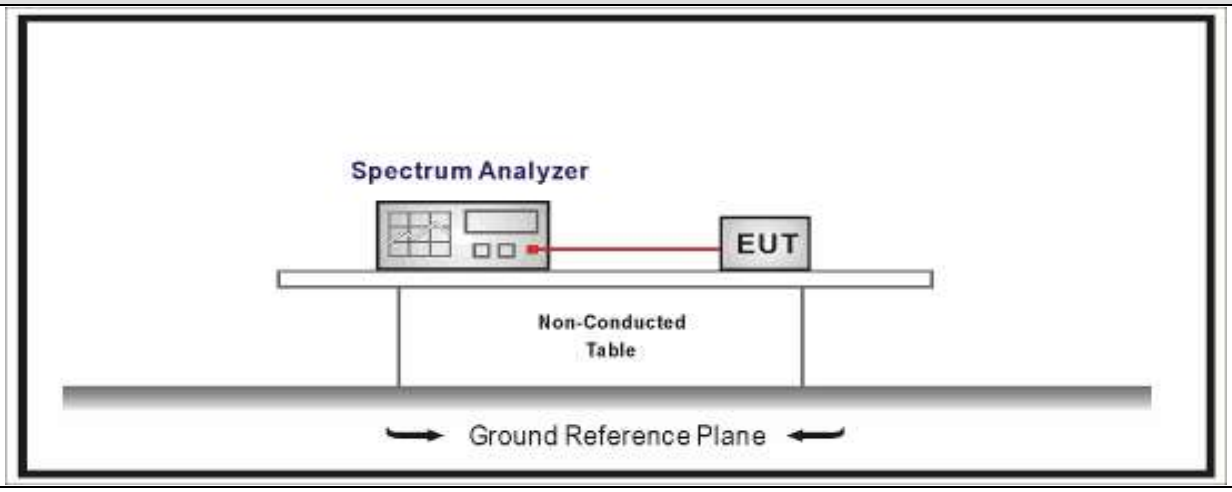
6. Carrier Frequency Separation

6.1. Test Equipment

Carrier Frequency Separation / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.09.28	2020.09.27
MXA Signal Analyzer	Keysight	N9020B	MY59050482	2019.12.13	2020.12.12
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2019.09.02	2020.09.01
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

6.2. Test Setup

Carrier Frequency Separation test setup:



6.3. Limit

Carrier Frequency Separation	
☒	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.
☐	Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel.
☐	The 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period;
☐	The 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
☐	Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz.

6.4. Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ANSI C63.10	7.8.2	Carrier frequency separation

6.5. Uncertainty

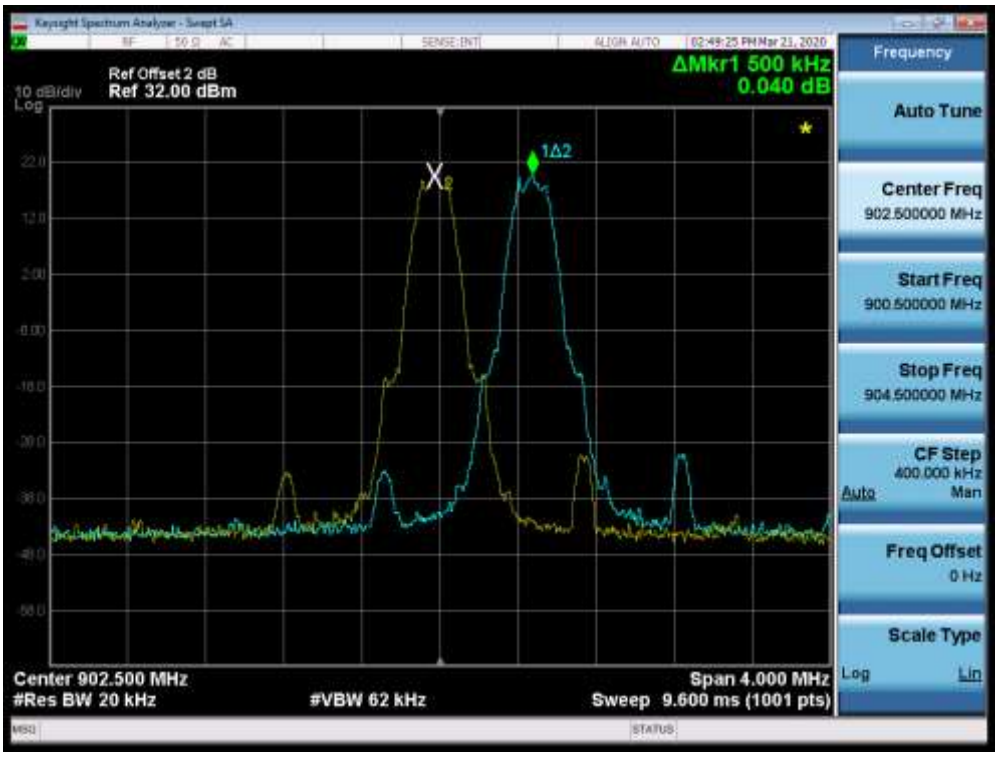
The measurement uncertainty is defined as ± 1 kHz

6.6. Test Result

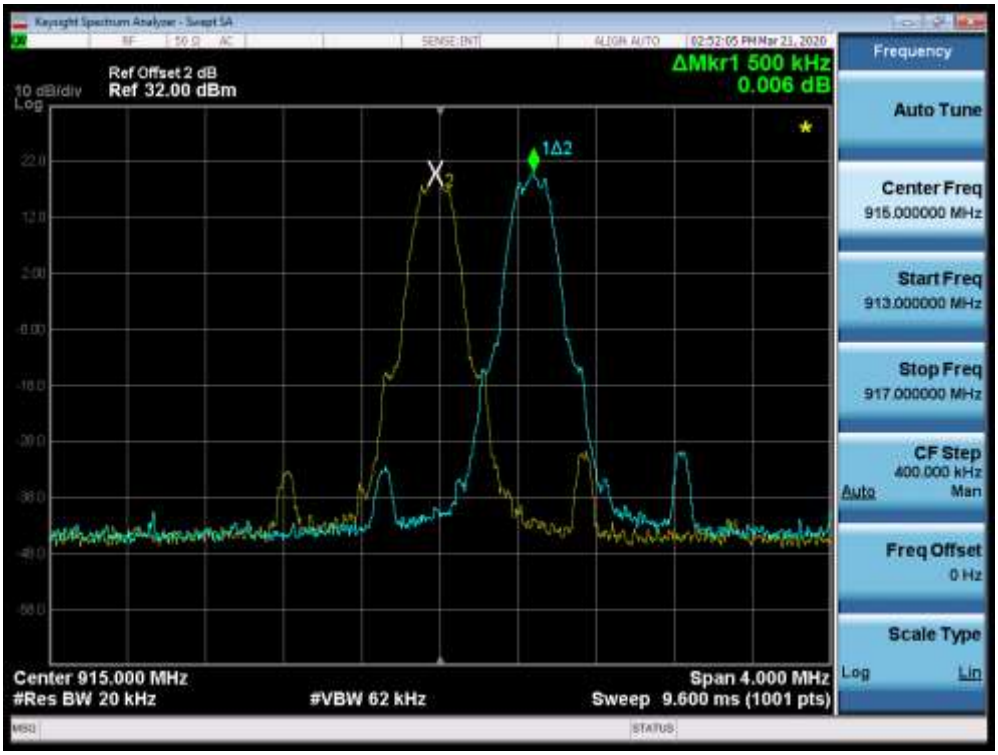
Product Name	:	Ring Bridge	Power	:	AC 120V/60Hz
Test Mode	:	Mode 1	Test Site	:	TR-8
Test Date	:	2020.03.21			

Channel No.	Frequency (MHz)	Carrier Frequency Separation (kHz)	Limit (kHz)	Result
01	902.5	500	268.6	Pass
26	915.0	500	272.2	Pass
51	927.5	500	266.7	Pass

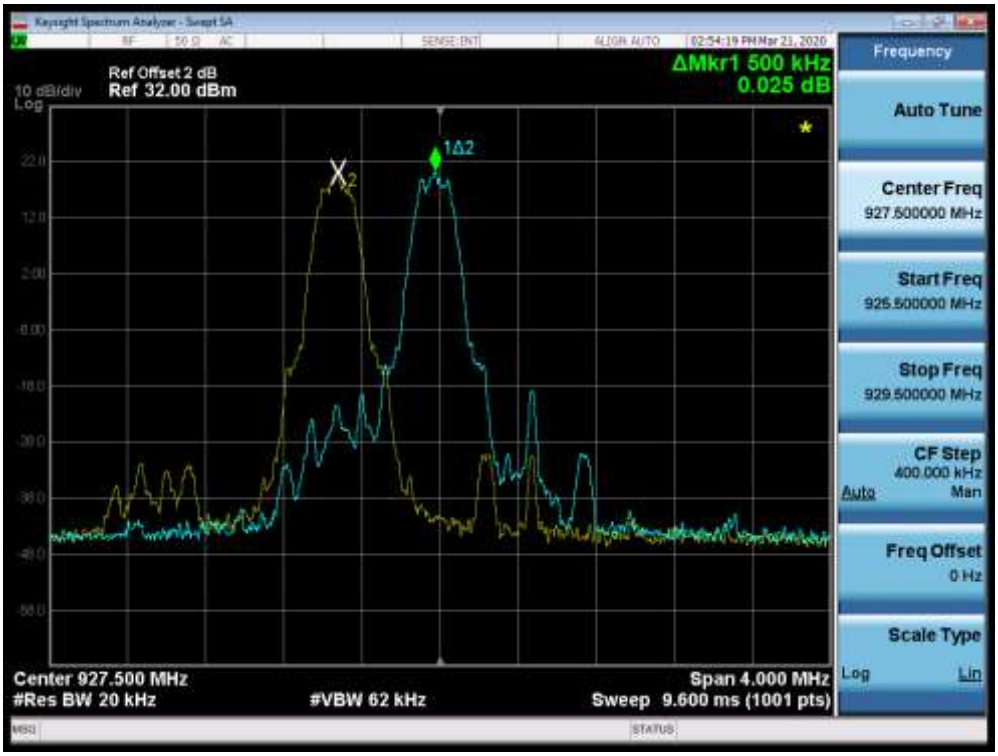
Channel 01 (902.5MHz)



Channel 26 (915.0MHz)



Channel 51 (927.5MHz)



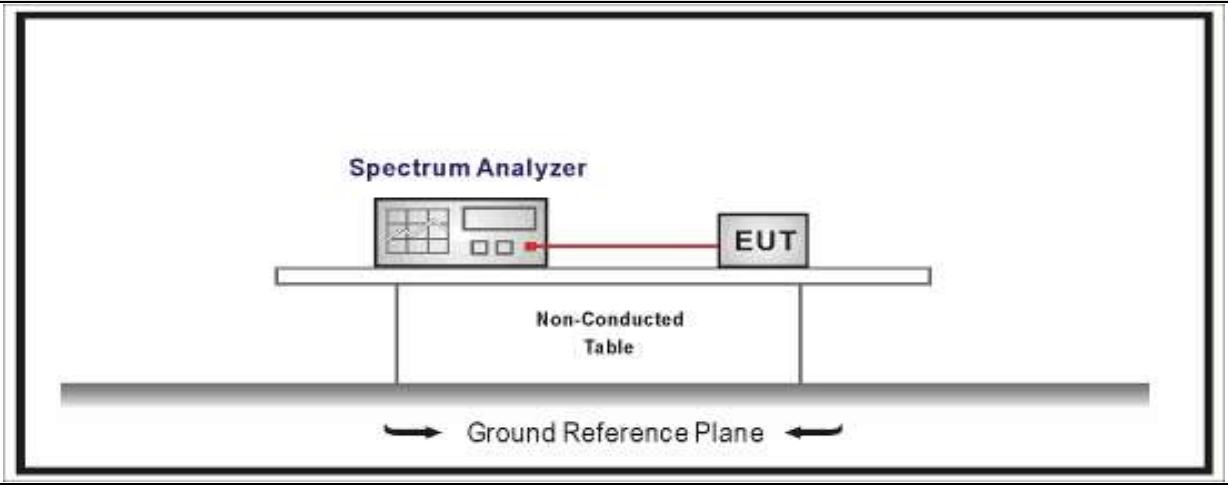
7. Number of Hopping Frequencies

7.1. Test Equipment

Number of Hopping Frequencies / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.09.28	2020.09.27
MXA Signal Analyzer	Keysight	N9020B	MY59050482	2019.12.13	2020.12.12
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2019.09.02	2020.09.01
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

7.2. Test Setup

Number of Hopping Frequencies test setup:



7.3. Limit

Carrier Frequency Separation	
☐	For frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping frequencies.
☒	For frequency hopping systems operating in 902-928 MHz band, if the 20 dB bandwidth of the hopping channel is less than 250 kHz, shall use at least 50 hopping frequencies.
☒	For frequency hopping systems operating in 902-928 MHz band, if the 20 dB bandwidth of the hopping channel is higher than 250 kHz, shall use at least 25 hopping frequencies.
☐	For frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies.

7.4. Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ANSI C63.10	7.8.3	Number of Hopping Frequencies

7.5. Uncertainty

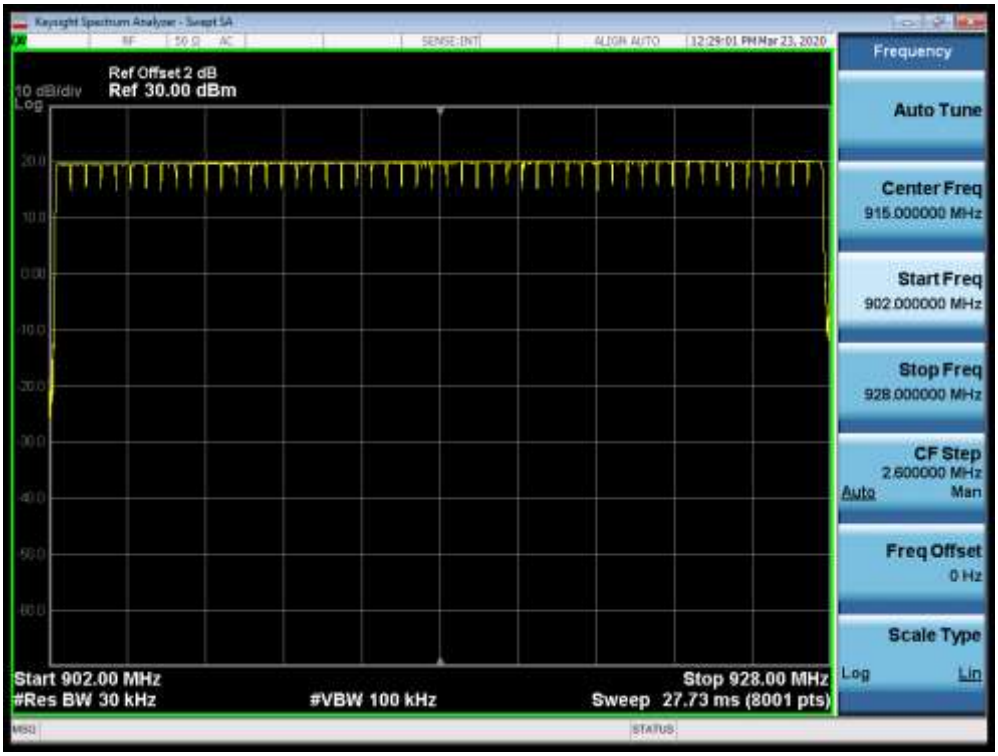
The measurement uncertainty is defined as ± 1 kHz

7.6. Test Result

Product Name	:	Ring Bridge	Power	:	AC 120V/60Hz
Test Mode	:	Mode 1	Test Site	:	TR-8
Test Date	:	2020.03.23			

Frequency Band (MHz)	Number of Hopping Frequencies	Limit	Result
902.5-927.5	51	>25	Pass

902.5 - 927.5MHz



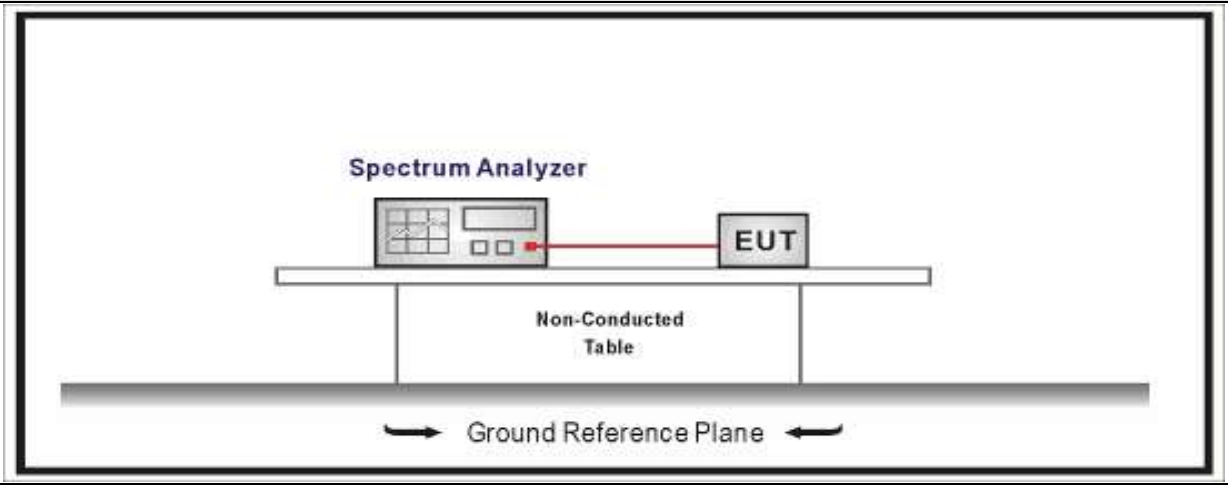
8. Time of Occupancy (Dwell Time)

8.1. Test Equipment

Time of Occupancy (Dwell Time) / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.09.28	2020.09.27
MXA Signal Analyzer	Keysight	N9020B	MY59050482	2019.12.13	2020.12.12
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2020.09.02	2021.09.01
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

8.2. Test Setup

Time of Occupancy (Dwell Time) test setup:



8.3. Limit

Time of Occupancy (Dwell Time)	
☐	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.
☒	For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period
☐	For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4

	seconds within a 10 second period.
☐	Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

8.4. Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ANSI C63.10	7.8.4	Time of Occupancy (Dwell Time)

8.5. Uncertainty

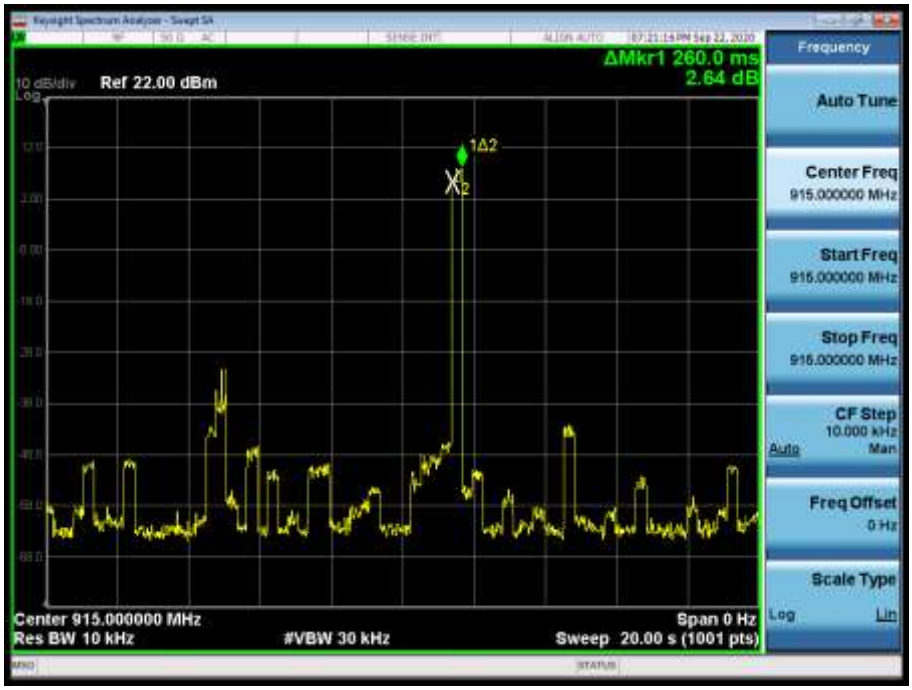
The measurement uncertainty is defined as ± 0.1 us

8.6. Test Result

Product Name	:	Ring Bridge	Power	:	AC 120V/60Hz
Test Mode	:	Mode 1	Test Site	:	TR-8
Test Date	:	2020.09.22			

Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
01	915	260	< 400	Pass

Channel 01 (902.5MHz)



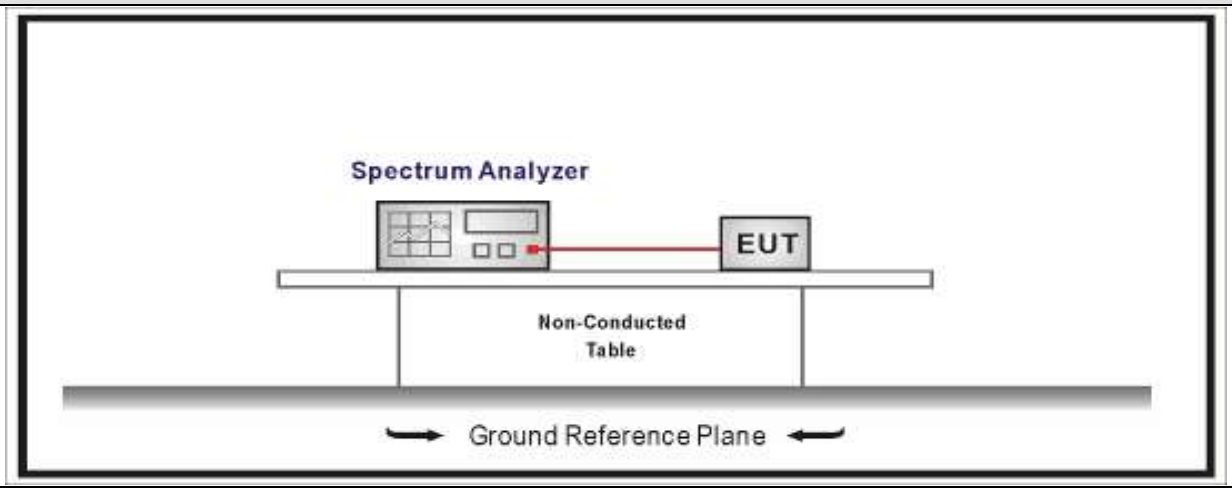
9. Peak Output Power

9.1. Test Equipment

Peak Output Power / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.09.28	2020.09.27
MXA Signal Analyzer	Keysight	N9020B	MY59050482	2019.12.13	2020.12.12
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2020.09.02	2021.09.01
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

9.2. Test Setup

Peak Output Power test setup:



9.3. Limit

Peak Output Power	
☐	Frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
☐	Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
☒	For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels
☒	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

9.4. Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ANSI C63.10	7.8.5	Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices
☒	ANSI C63.10	11.9	Fundamental emission output power

9.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

9.6. Test Result

Product Name	:	Ring Bridge	Power	:	AC 120V/60Hz
Test Mode	:	Mode 1	Test Site	:	TR8
Test Date	:	2020.09.22			

Channel	Test Frequency (MHz)	Measurement Power Output AV (dBm)	Limit (dBm)	Result
01	902.5	17.86	30	Pass
26	915.0	17.89	30	Pass
51	927.5	17.92	30	Pass

Channel	Test Frequency (MHz)	E.I.R.P (dBm)	E.I.R.P Limit (dBm)	Result
01	902.5	16.86	30	Pass
26	915.0	16.89	30	Pass
51	927.5	16.92	30	Pass

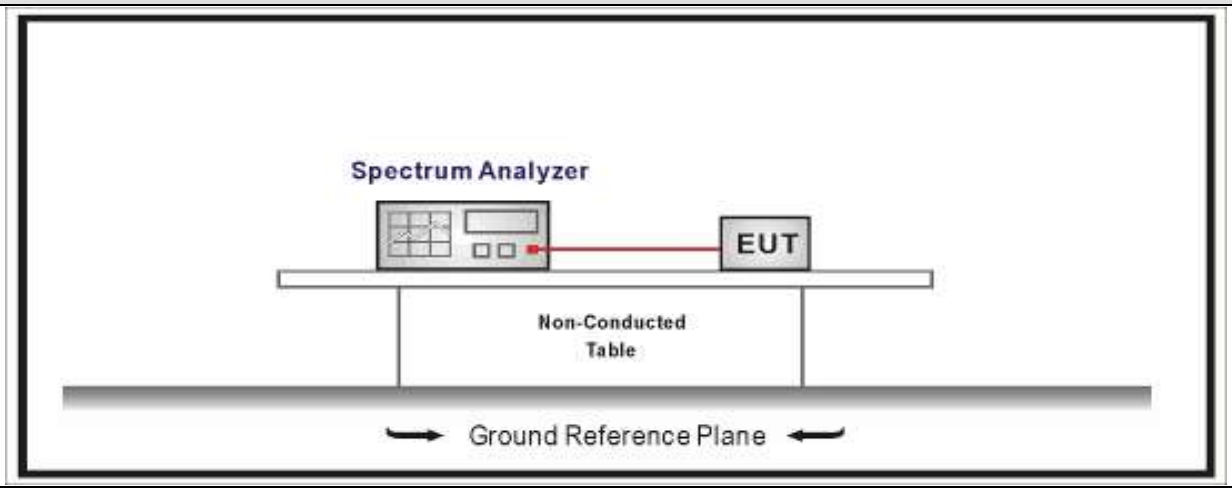
10. Emissions in non-restricted frequency bands

10.1. 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	2019.09.28	2020.09.27
MXA Signal Analyzer	Keysight	N9020B	MY59050482	2019.12.13	2020.12.12
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2020.09.02	2021.09.01
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

10.2. Test Setup

Emissions in non-restricted frequency bands test setup:



10.3. 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)

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).

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).

10.4. Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ANSI C63.10	7.8.6	Band-edge Compliance of RF Conducted Emissions
☒	ANSI C63.10	11.11	Emissions in nonrestricted frequency bands

10.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

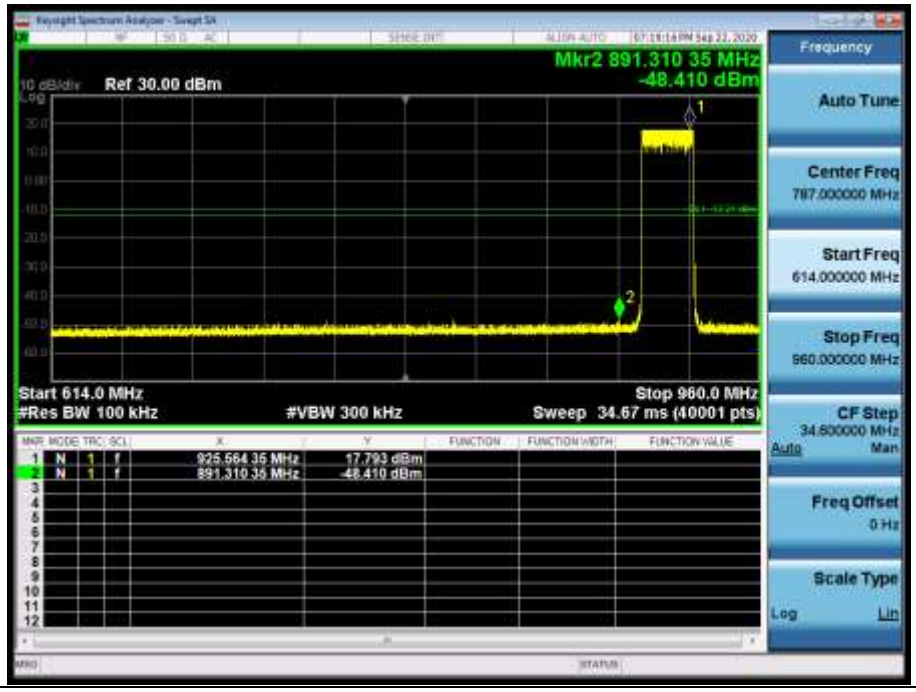
10.6. Test Result

Product Name	:	Ring Bridge	Power	:	AC 120V/60Hz
Test Mode	:	Mode 1	Test Site	:	TR-8
Test Date	:	2020.09.22			

Mode	Channel	Test Frequency (MHz)	In-Band PSD[a] (dBm/100kHz)	Out-Band PSD[b] (dBm/100kHz)	[a]-[b] (dB)	Limit (dB)	Result
1	01	902.5	17.644	-49.748	67.392	>30	Pass
1	51	927.5	17.774	-49.946	67.72	>30	Pass
1	01~51	902.5-927.5	17.793	-48.410	66.203	>30	Pass

Note1: The worst case of Emissions in non-restricted frequency bands as below:

Mode 8 CH01



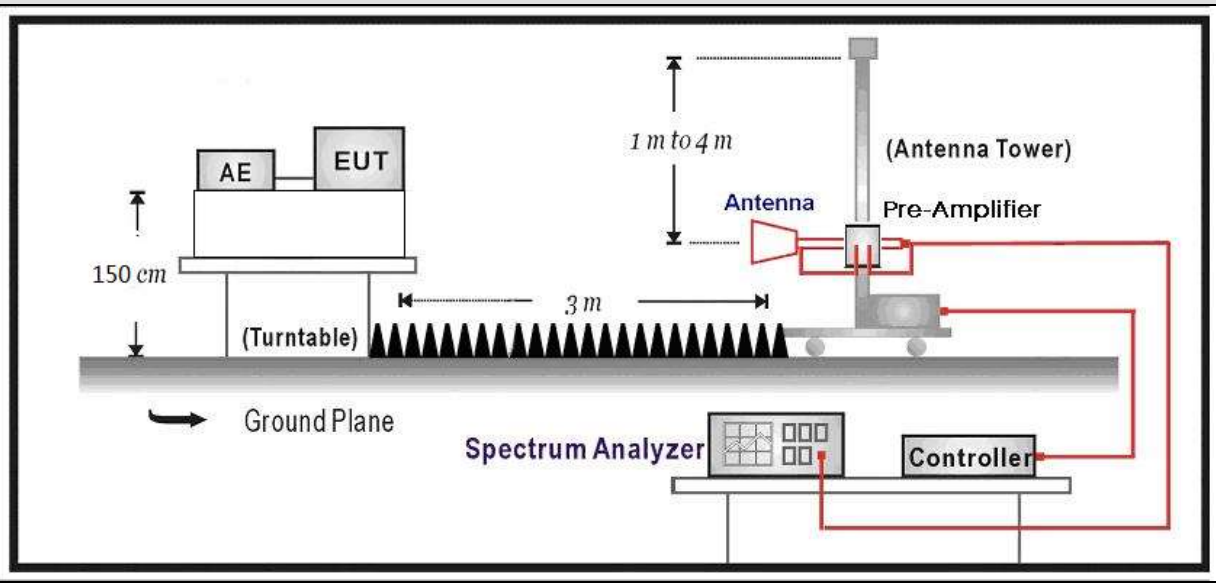
11. Radiated Emission Band Edge

11.1. Test Equipment

Radiated Emission Band Edge / AC-5					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9038A	MY51210196	2019.05.25	2020.05.24
Preamplifier	BXT	NA2651D	LNA17040209	2019.04.13	2020.04.12
Preamplifier	EMCI	EMC184045SE	980263	2019.06.13	2020.06.12
DRG Horn	ETS-Lindgren	3117	00167055	2019.05.25	2020.05.24
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2020.03.23	2021.03.22
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2019.04.13	2020.04.12
Temperature/Humidity Meter	Riters	RTS-8S	AC5-TH	2019.09.02	2020.09.01
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

11.2. Test Setup

Above 1GHz Test Setup:



11.3. Limit

Band edge Limit				
Frequency bands (MHz)	Detector	Limit (dBμV/m)	RBW (KHz)	Distance (m)
608-614	PK	74	100	3
960-1240	AV	54	300	3
Note: The field strength of emissions appearing within these frequency bands shall not exceed the limits.				

11.4. Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ANSI C63.10	6.10	Band-edge testing
	☒ ANSI C63.10	6.10.5	Restricted-band band-edge measurements
	☐ ANSI C63.10	6.10.6	Marker-delta method
☐	ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
☐	ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
☒	ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz
☒	ANSI C63.10	7.8.6	Band-edge measurements for RF conducted emissions

11.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB

below 1G is defined as ± 3.8 dB

11.6. Test Result

No restricted band in the range ± 2 channel bandwidths of the Band-edges of the specified emission band! (608 MHz – 614 MHz and 960 MHz – 1240 MHz).

12. Antenna Requirement

13.1. Limit

Antenna Requirement Limit
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.

13.2. Antenna Connector Construction

Antenna Connector Construction	
☒	The use of a permanently attached antenna
☐	The antenna use of a unique coupling to the intentional radiator
☐	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