RF Test Report

Issued Date: Mar. 24, 2021

Applicant	:	RONDISH COMPANY LIMITED
Product Type	:	Receiver Dongle
Trade Name	:	Rondish
Model Number	:	DON-40-915
FCC ID	:	WNG-DON-40
EUT Rated Voltage	:	DC 5 V , 50 mA
Test Voltage	:	DC 5 V
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C（2020） ANSI C63.10:2013
Receive Date	:	Dec. 22, 2020
Test Period	:	Mar. 10, 2021

Issue by

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Certificate #3464.02

American Association for Laboratory Accreditation number: 3464.02
Test Firm MRA designation number: CN1168

Note:

1.The test results are valid only for samples provided by customers and under the test conditions described in this report.
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3.The relevant information is provided by customers in this test report. According to the correctness, appropriateness or completeness of the information provided by the customer, if there is any doubt or error in the information which affects the validity of the test results, the laboratory does not take the responsibility.

Approved By	:	Louis Shen	Reviewed By	:	Joyce Feng
(Manager)		(Louis Shen)	(Testing Engineer)		(Joyce Feng)

Revision History

Rev.	Issue Date	Revisions
00	Mar. 24, 2021	Initial Issue

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1 General Information

1.1. Summary of Test Result

Standard	Item	Results	Remark
15.207	AC Power Conducted Emission	PASS	----
15.209&15.249(a)	Transmitter Radiated Emissions	PASS	----
15.203	Antenna Requirement	PASS	----
CFR 47 / ANSI C63.10:2013			

Standard	Description
CFR47, Part 15, Subpart C	Intentional Radiators
ANSI C63. 10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Decision Rule

■ Uncertainty is not included.

□ Uncertainty is included.

1.2. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Conducted Emission	150 kHz ~ 30 MHz	2.7
Radiated Emission	30 MHz ~ 1000 MHz	1.7
	1000 MHz ~ 18000 MHz	5.7
	18000 MHz ~ 26500 MHz	5.5
	26500 MHz ~ 40000 MHz	4.8
RF Bandwidth	4.96 %	

2 EUT Description

Applicant	RONDISH COMPANY LIMITED UNIT G&H, 4/F, Block 1, KWAI TAK IND. CTR, 15-33 K Hong Kong	
Manufacturer	RONDISH COMPANY LIMITED UNIT G&H, 4/F, Block 1, KWAI TAK IND. CTR, 15-33 K Hong Kong	
Product Type	Receiver Dongle	
Trade Name	Rondish	
Model Number	DON-40-915	
FCC ID	WNG-DON-40	
Frequency Range	922.5 MHz	
Modulation Type	GFSK	
Number of Channels	1 Channel	
Antenna Type	Chip Antenna	
Antenna Gain	-0.6 dBi	
RF Cable information	Cable Loss(dB)	Provided by
	0.5	□Manufacturer ■Testing Laboratory
Operate Temp. Range	5~40℃	

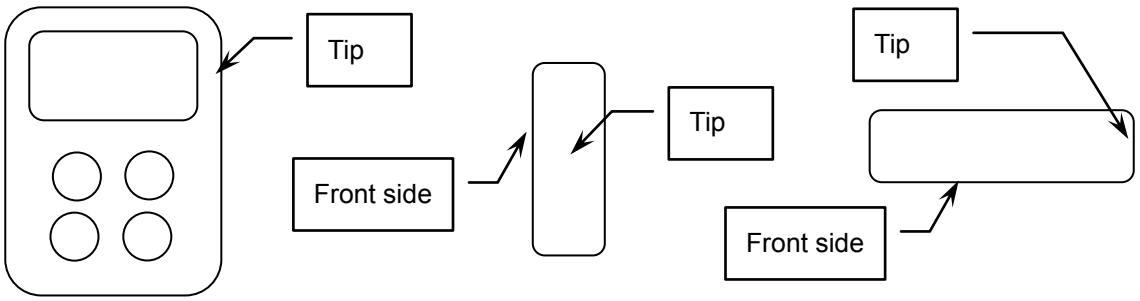
3 Test Methodology

3.1. Mode of Operation

Test Mode
Mode 1: Transmitter Mode
Mode 2: Continuous TX Mode

Then, the above highest fundamental level mode of the configuration of the EUT and antenna was chosen for all final test items.

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

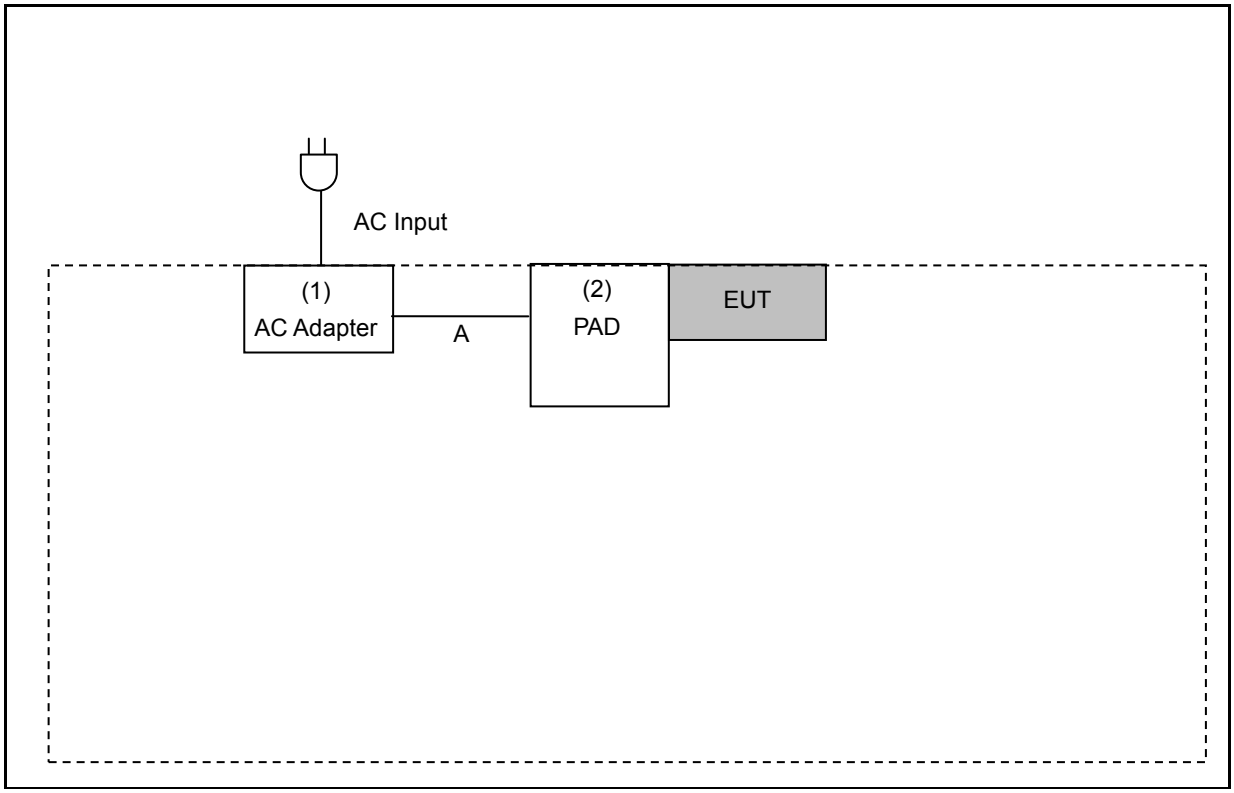


3.2. EUT Test Step

1.	Setup the EUT and simulators as shown on 1.3.

Measurement Software			
No.	Description	Software	Version
1	Radiated Emission	EZ EMC	1.1.4.4

3.3. Configuration of Test System Details



Devices Description					
Product		Manufacturer	Model Number	Serial Number	Power Cord
(1)	AC Adapter	SIMBANS	KA23-05020000DEU	N/A	Non-Shielded, 1.0 m
(2)	PAD	SIMBANS	CE700	TX921289	Non-Shielded, 1.0 m

3.4. Test Instruments

For Conducted Emission

Test Period: Mar. 10, 2021

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Test Receiver	R&S	ESR3	101923	09/01/2020	1 year
LISN	R&S	ENV216	101942	09/01/2020	1 year
LISN	R&S	ENV216	101943	09/01/2020	1 year
RF Cable	EMCI	EMCCFD400	433LFC	09/01/2020	1 year
Test Site	ATL	CE	CE	N.C.R.	-----

For Radiated Emission

Test Period: Mar. 10, 2021

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Preamplifier (10 kHz~3 GHz)	EMCI	EMC001330	980300	09/01/2020	1 year
Preamplifier (0.1 GHz~26.5 GHz)	EMCI	EMC012645SE	980318	09/01/2020	1 year
Preamplifier (26.5 GHz~40 GHz)	EMCI	EMC2654045	980028	09/01/2020	1 year
Bilog Antenna (30 MHz~1.4 GHz)	Schwarzbeck	VULB 9168	672	10/17/2020	1 year
Horn Antenna (1 GHz~18 GHz)	ETS	3117	00204949	10/17/2020	1 year
Horn Antenna (18 GHz~26.5 GHz)	ETS	3160-09	00202549	10/17/2020	1 year
Receiver (3 Hz~26.5 GHz)	Keysight	N9038A	MY51210179	09/01/2020	1 year
Spectrum Analyzer (3 Hz~43 GHz)	Keysight	N9030A	MY55410268	09/01/2020	1 year
Cable (30 MHz~1 GHz)	EMCI	N/A	1066LFC	09/01/2020	1 year
Cable (1 GHz~18 GHz)	EMCI	N/A	160719	09/01/2020	1 year
Cable (1 GHz~18 GHz)	EMCI	N/A	160324	09/01/2020	1 year
Cable (1 GHz~18 GHz)	EMCI	N/A	160322	09/01/2020	1 year
Loop Antenna	EMCI	LPA600	272	09/01/2020	1 year
Test Site	OuHeng	MFAC3M	RE-026	02/23/2021	1 year

Note: N.C.R. = No Calibration Request.

For Conducted
Test Period: Mar. 10, 2021

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Power Sensor	Anritsu	U2021XA	SG54130003	09/01/2020	1 year
Spectrum Analyzer (10 Hz~26.5 GHz)	Agilent	N9020A	MY53420615	09/01/2020	1 year
Spectrum Analyzer (9 KHz~26.5 GHz)	Agilent	E4445A	MY46181814	09/01/2020	1 year
Programmable temp &humi chamber	ETAI	9712A	647	10/16/2020	1 year
Test Site	ATL	RF	RF	N.C.R.	-----

3.5. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	990

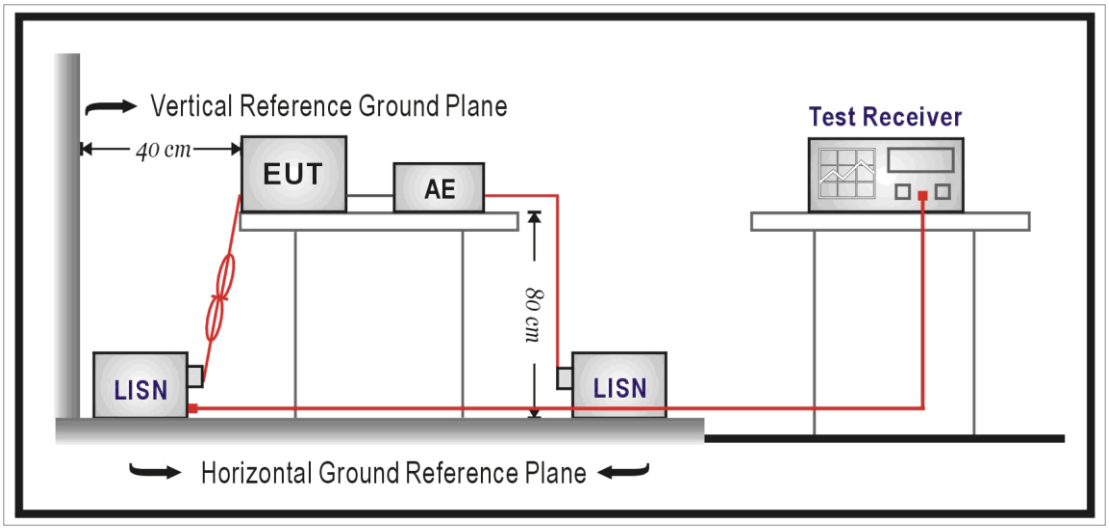
4 Measurement Procedure

4.1. AC Power Line Conducted Emission Measurement

■ **Limit**

Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

■ **Test Setup**



■ **Test Procedure**

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50Ω// 50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω// 50uH coupling impedance with 50ohm termination.

Tabletop device shall be placed on a non-conducting platform, of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The wall of screened room shall be located 40cm to the rear of the EUT. Other surfaces of tabletop or floor standing EUT shall be at least 80cm from any other ground conducting surface including one or more LISNs. For floor-standing device shall be placed under the EUT with a 12mm insulating material.

Conducted emissions were investigated over the frequency range from 0.15 MHz to 30 MHz using a resolution bandwidth of 9 kHz. The equipment under test (EUT) shall be meet the limits in section 4.1, as applicable, including the average limit and the quasi-peak limit when using respectively, an average detector and quasi-peak detector measured in accordance with the methods described of related standard. When all of peak value were complied with quasi-peak and average limit from 150kHz to 30MHz then quasi-peak and average measurement was unnecessary.

The AMN shall be placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for AMNs mounted on top of the ground reference plane. This distance is between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment shall be at least 0,8 m from the AMN. If the mains power cable is longer than 1m then the cable shall be folded back and forth at the centre of the lead to form a bundle no longer than 0.4m. All of interconnecting cables that hang closer than 40cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long. All of EUT and AE shall be separate place more than 0.1m. All 50 Ω ports of the LISN shall be resistively terminated into 50 Ω loads when not connected to the measuring instrument.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

4.2. Radiated Emissions Measurement

■ Limit

According to FCC Part 15.231(b) requirement:

In addition to the provisions of §15.205, the field strength of emissions from intentional radiator operated under this section shall not exceed the following:

Fundamental and harmonics emission limits

Frequency range	Average Field Strength of Fundamental	Peak Field Strength of Fundamental
(MHz)	(dBμV/m@3 m)	(dBμV/m@3 m)
922.5	94	114

Harmonics emission limits

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

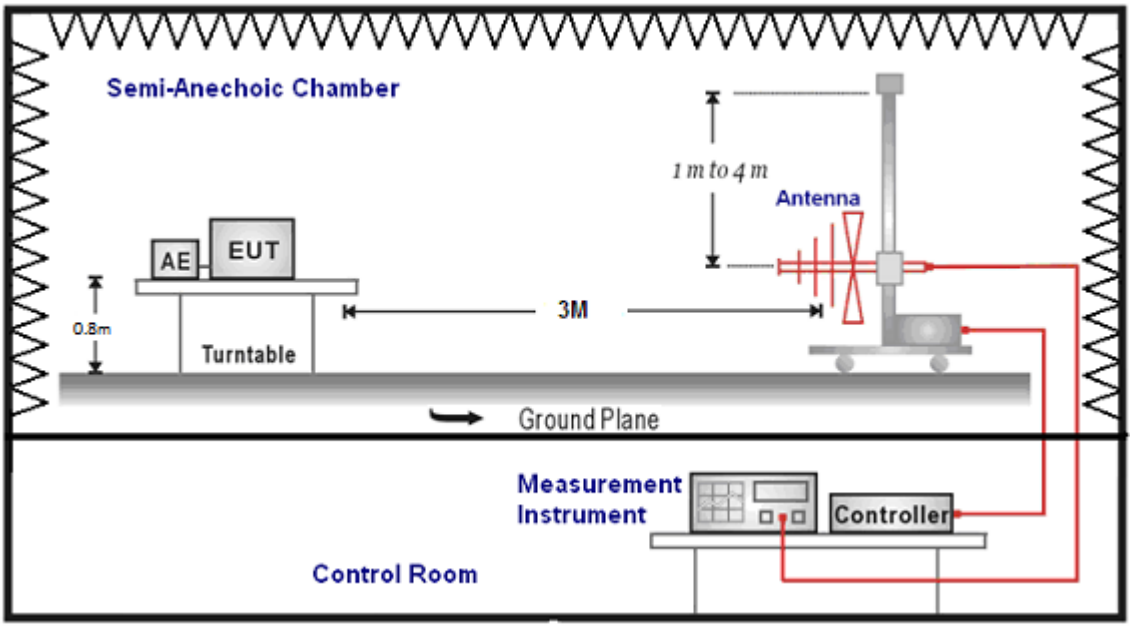
General Radiated emission Limit

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

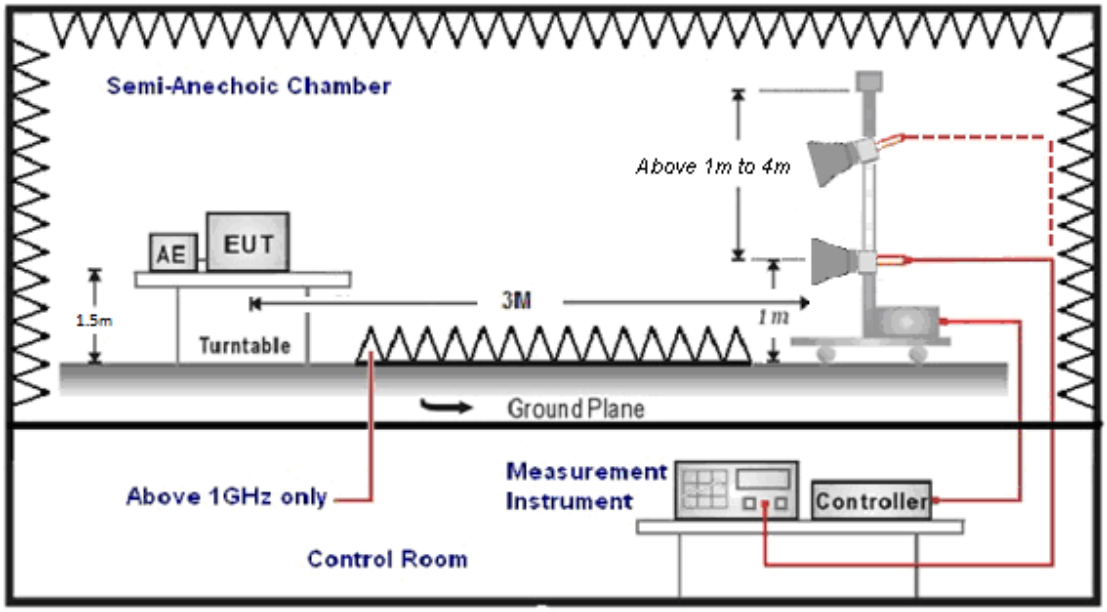
Remark: 1. The measurement distance in meters, which that between form closest point of EUT to instrument antenna.

■ **Setup**

Below 1 GHz



Above 1 GHz



■ Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 or 1.5 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 30 MHz to 26.5 GHz is investigated.
For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 3 MHz for peak measurements and 10 Hz for average measurements.
A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.
SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20 dB/decade).

For testing above 1 GHz, the emission level of the EUT in peak mode was 20 dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.
The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).
The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency : Transmitter Output < +30 dBm

(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.

■ Calculation of Average Factor

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.
Please see the diagrams below.

(*) When the field strength (or envelope power) is not constant or when it is in pulses, and an averaging detector is specified to be used, the value of field strength or power over one complete pulse train, excluding blanking intervals, shall be averaged as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the average value (of field strength or output power) shall be determined during a 0.1 second interval during which the field strength or power is at its maximum value.

4.3. Antenna Requirement

- **Limit**

For intentional device, according to 15.203, 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.

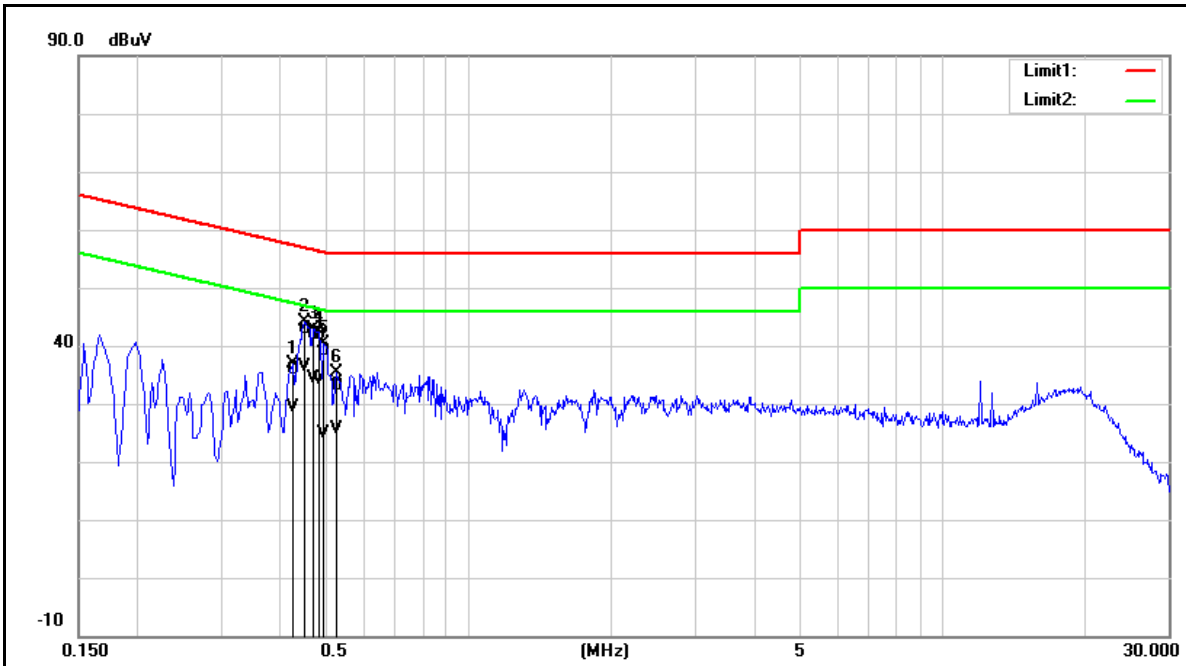
- **Antenna Connector Construction**

See section 2 – antenna information.

5 Test Results

Annex A. Conducted Emission

Standard:	FCC Part 15.231	Line:	L1
Test Mode:	Mode 1	Power:	DC 5 V
		Temp.(℃)/Hum.(%RH):	26(℃)/60 %RH
Description:			

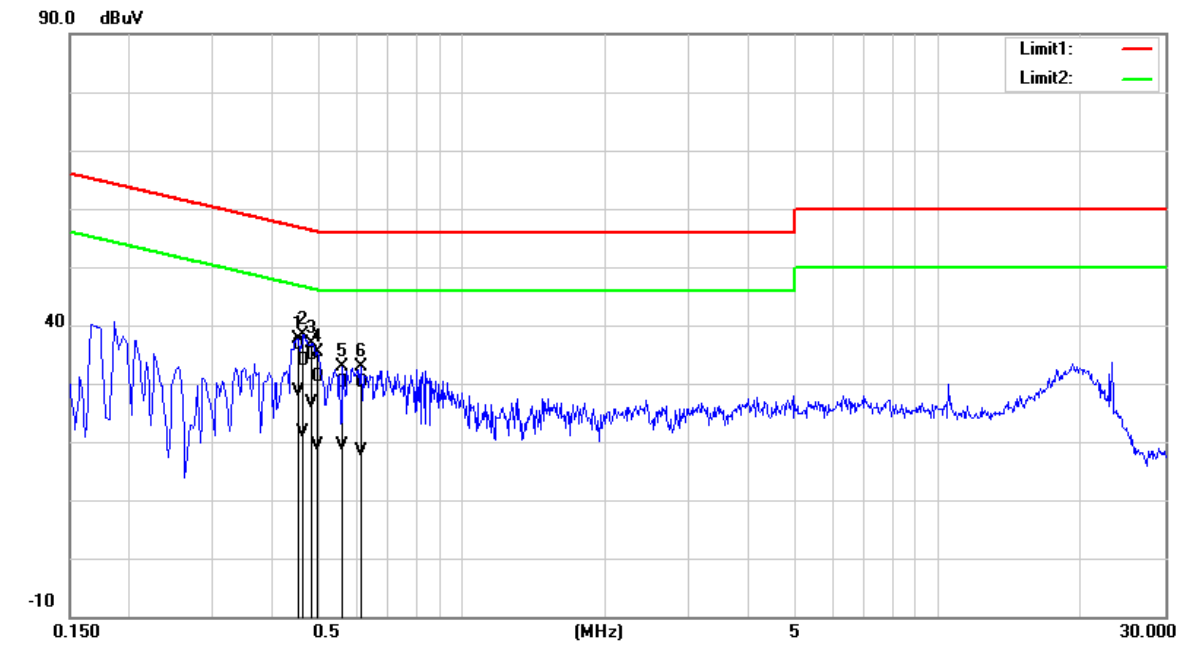


No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.4260	25.92	19.23	10.06	35.98	29.29	57.33	47.33	-21.35	-18.04	Pass
2	0.4500	32.90	26.34	10.07	42.97	36.41	56.88	46.88	-13.91	-10.47	Pass
3	0.4700	31.73	24.23	10.09	41.82	34.32	56.51	46.51	-14.69	-12.19	Pass
4	0.4820	31.78	23.94	10.10	41.88	34.04	56.30	46.30	-14.42	-12.26	Pass
5	0.4940	29.03	14.87	10.11	39.14	24.98	56.10	46.10	-16.96	-21.12	Pass
6	0.5260	23.05	15.57	10.08	33.13	25.65	56.00	46.00	-22.87	-20.35	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

Standard:	FCC Part 15.231	Line:	N
Test Mode:	Mode 1	Power:	DC 5 V
		Temp.(℃)/Hum.(%RH):	26(℃)/60 %RH
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.4540	26.80	18.79	9.94	36.74	28.73	56.80	46.80	-20.06	-18.07	Pass
2	0.4660	23.97	11.65	9.94	33.91	21.59	56.58	46.58	-22.67	-24.99	Pass
3	0.4860	24.90	16.80	9.94	34.84	26.74	56.24	46.24	-21.40	-19.50	Pass
4	0.4980	21.24	9.42	9.94	31.18	19.36	56.03	46.03	-24.85	-26.67	Pass
5	0.5620	20.13	9.50	9.95	30.08	19.45	56.00	46.00	-25.92	-26.55	Pass
6	0.6140	20.13	8.47	9.95	30.08	18.42	56.00	46.00	-25.92	-27.58	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

Annex B. Radiated Emissions Measurement

Fundamental Frequency Test Results

Standard:	FCC Part 15.231	Test Distance:	3 m
Test item:	Fundamental	Power:	DC 5 V
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60 %RH
Ant.Polar.:	Horizontal		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	922.5100	86.28	2.11	88.39	114.00	-25.61	peak
2	922.5100	78.96	2.11	81.07	94.00	-12.93	AVG

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

Example: 88.39=2.11+86.28

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3.When the peak results are less than average limit, so not need to evaluate the average.

Standard:	FCC Part 15.231	Test Distance:	3 m
Test item:	Fundamental	Power:	DC 5 V
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60 %RH
Ant.Polar.:	Vertical		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	922.4750	82.20	2.11	84.31	114.00	-29.69	peak
2	922.4750	74.91	2.11	77.02	94.00	-16.98	AVG

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3.When the peak results are less than average limit, so not need to evaluate the average.

Below 1 GHz

Note：Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.

Standard:	FCC Part 15.231	Test Distance:	3 m
Test item:	Harmonic	Power:	DC 5 V
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60 %RH
Description:	Model Number：DON-40-915		

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
166.7700	39.14	-11.24	27.90	43.50	-15.60	QP	H
189.0800	41.73	-13.44	28.29	43.50	-15.21	QP	H
238.5500	42.69	-12.32	30.37	46.00	-15.63	QP	H
312.2700	44.96	-10.01	34.95	46.00	-11.05	QP	H
421.8800	43.63	-7.33	36.30	46.00	-9.70	QP	H
500.4500	43.48	-5.14	38.34	46.00	-7.66	QP	H
32.9100	44.12	-12.59	31.53	40.00	-8.47	QP	V
466.5000	33.85	-6.08	27.77	46.00	-18.23	QP	V
500.4500	42.16	-5.14	37.02	46.00	-8.98	QP	V
532.4600	34.36	-4.40	29.96	46.00	-16.04	QP	V
842.8600	29.33	0.62	29.95	46.00	-16.05	QP	V
967.0200	28.81	1.64	30.45	54.00	-23.55	QP	V

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

Example: 27.90=-11.24+39.14

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3.When the peak results are less than average limit, so not need to evaluate the average.

Above 1 GHz

Standard:	FCC Part 15.231	Test Distance:	3 m
Test item:	Harmonic	Power:	DC 5 V
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60 %RH
Description:	Model Number：DON-40-915		

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2665.000	53.35	-9.97	43.38	74.00	-30.62	peak	H
3691.000	53.11	-8.11	45.00	74.00	-29.00	peak	H
6049.000	50.84	-2.53	48.31	74.00	-25.69	peak	H
6274.000	51.66	-2.33	49.33	74.00	-24.67	peak	H
6841.000	50.74	-1.82	48.92	74.00	-25.08	peak	H
9397.000	47.21	1.70	48.91	74.00	-25.09	peak	H
2665.000	54.15	-9.97	44.18	74.00	-29.82	peak	V
4924.000	53.18	-5.39	47.79	74.00	-26.21	peak	V
6058.000	51.68	-2.52	49.16	74.00	-24.84	peak	V
6499.000	51.59	-2.14	49.45	74.00	-24.55	peak	V
7264.000	49.56	-1.27	48.29	74.00	-25.71	peak	V
9892.000	46.68	2.73	49.41	74.00	-24.59	peak	V

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3.When the peak results are less than average limit, so not need to evaluate the average.

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