

Brilliant Network & Automation
Integrated System Co.,Ltd

TEST REPORT

Model:

BR-RW-0005

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Radio Spectrum TEST REPORT

Applicant:	Brilliant Network & Automation Integrated System Co.,Ltd No. 41, Keyi St., Zhunan Township, Miaoli County 350402, Taiwan
Product:	RFID Multifunction system
Model No.:	BR-RW-0005
FCC ID:	2A583-RW0005
Test Method/ Standard:	47 CFR FCC Part 15.209
Test By:	Intertek Testing Services Taiwan Ltd., Hsinchu Laboratory No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li, Shiang-Shan District, Hsinchu City, Taiwan



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Reviewer

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Revision History

Report No.	Issue Date	Revision Summary
220900253THC-001	Oct. 07, 2022	Original report

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Summary of Test Data

Test Requirement	Applicable Rule	Result
Radiated Emission test	15.209	Pass
Conducted Emission test	15.207	N/A
Antenna Requirement	15.203	Pass

Note: Please note that the test results with statement of conformity, the decision rules which are based on: Safety Testing: the specification, standard or IEC Guide 115.

Other Testing: the specification, standard and not taking into account the measurement uncertainty.

1. General Information

1.1 Identification of the EUT

Product:	RFID Multifunction system
Model No.:	BR-RW-0005
Operating Frequency:	134.2kHz
Rated Power:	DC 18V
Power Cord:	N/A
Sample receiving date:	2022/09/16
Sample condition:	Workable
Test Date(s):	2022/09/21

1.2 Antenna description

Antenna Type : Dipole antenna

Connector Type : PH

2. Test specifications

2.1 Test standard

The EUT was performed according to the requirement in FCC Part 15 Subpart C Section 15.209.

2.2 Operation mode

The EUT transmit 134.2kHz continuously while we power on the EUT.

The signal is maximized through rotation and placement in the three orthogonal axes.



X axis



Y axis



Z axis

After verifying three axes, we found the maximum electromagnetic field was occurred at Z axis. The final test data was executed under this configuration.

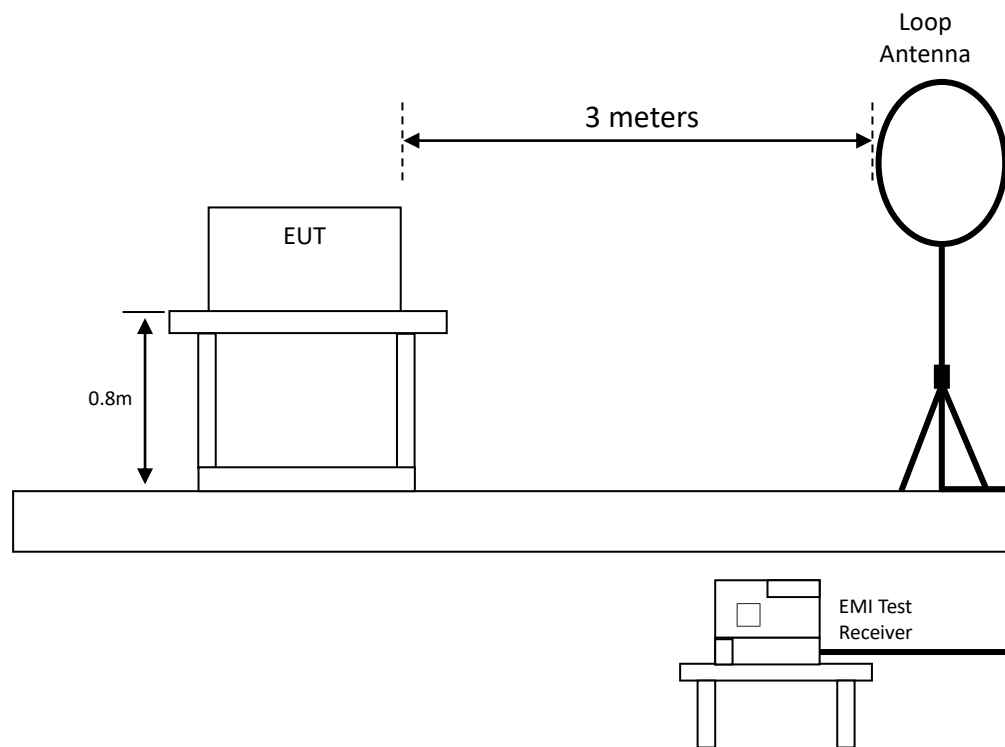
3. Radiated emission test FCC 15.209

3.1 Operating environment

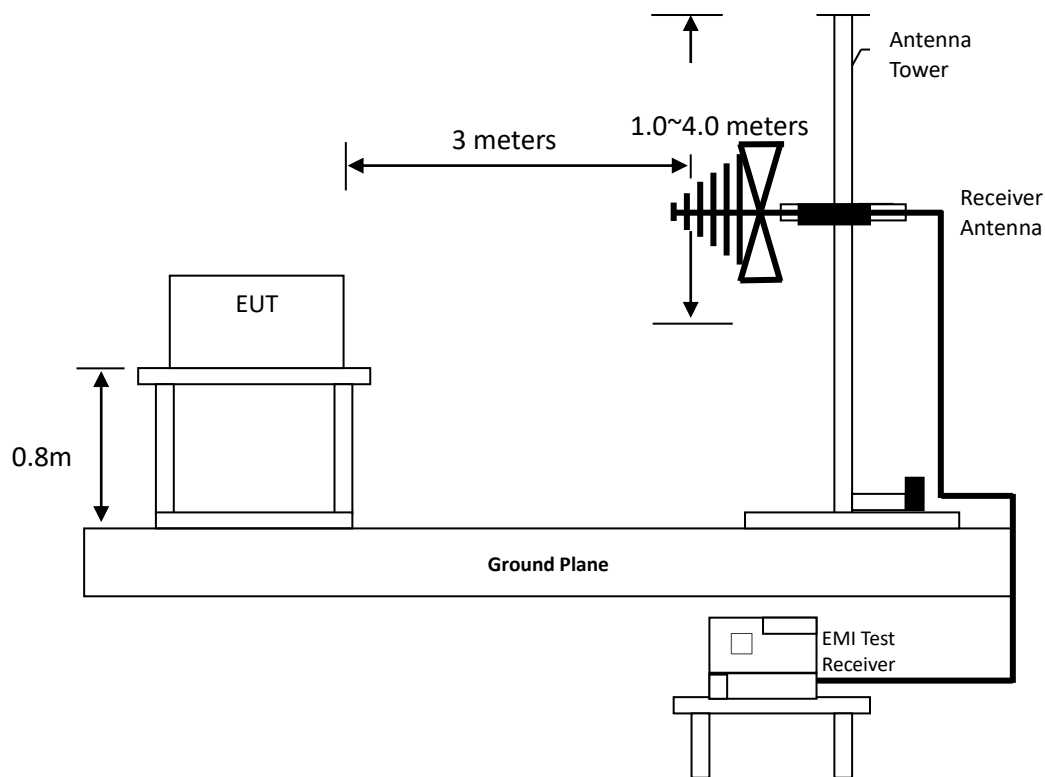
Temperature:	26	°C
Relative Humidity:	61	%
Test Date:	2022/09/21	

3.2 Test setup & procedure

Radiated emission from 9kHz to 30MHz uses Loop Antenna:



Radiated emission below 1GHz using Bilog Antenna



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report.

The EUT for testing is arranged on a turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

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3.3 Radiated emission limit

3.3.1 General radiated emission limit

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log (uV/m)	300
0.490-1.705	2400/F(KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Remark:

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

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3.4 Radiated emission test data FCC 15.209

3.4.1 Measurement results: Fundamental emission

Antenna Polarization	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Perpendicular	0.1342	AV	18.06	79.02	97.08	105.19	-8.11
Parallel	0.1342	AV	18.06	78.65	96.71	105.19	-8.48
Ground-parallel	0.1342	AV	18.06	78.52	96.58	105.19	-8.61

Remark: Corr. Factor = Antenna Factor + Cable Loss

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3.4.2 Measurement results: Frequencies equal to or less than 1 GHz

Test condition : Tx mode

9kHz-30MHz

Antenna Polarization	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Perpendicular	0.129	AV	18.04	78.21	96.25	105.56	-9.31
Perpendicular	0.399	AV	18.71	42.12	60.83	95.59	-34.76
Perpendicular	0.669	QP	18.90	32.92	51.82	71.18	-19.36
Perpendicular	0.939	QP	19.07	27.26	46.33	68.19	-21.86
Perpendicular	1.209	QP	19.10	23.72	42.82	65.96	-23.14
Perpendicular	1.479	QP	19.10	21.43	40.53	64.22	-23.69

Antenna Polarization	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Parallel	0.129	AV	18.04	77.21	95.25	105.56	-10.31
Parallel	0.399	AV	18.71	42.14	60.85	95.59	-34.74
Parallel	0.669	QP	18.90	33.28	52.18	71.18	-19.00
Parallel	0.939	QP	19.07	27.20	46.27	68.19	-21.92
Parallel	1.209	QP	19.10	23.51	42.61	65.96	-23.35
Parallel	1.479	QP	19.10	20.94	40.04	64.22	-24.18

Antenna Polarization	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Ground-parallel	0.129	AV	18.04	78.20	96.24	105.56	-9.32
Ground-parallel	0.399	AV	18.71	42.20	60.91	95.59	-34.68
Ground-parallel	0.669	QP	18.90	33.25	52.15	71.18	-19.03
Ground-parallel	0.939	QP	19.07	27.46	46.53	68.19	-21.66
Ground-parallel	1.209	QP	19.10	23.68	42.78	65.96	-23.18
Ground-parallel	1.479	QP	19.10	20.48	39.58	64.22	-24.64

Remark: Corr. Factor = Antenna Factor + Cable Loss

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30MHz-1GHz

Antenna Polarization	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Horizontal	165.80	QP	20.33	4.48	24.81	43.50	-18.69
Horizontal	491.72	QP	26.39	9.13	35.52	46.00	-10.48
Horizontal	514.03	QP	26.90	8.08	34.98	46.00	-11.02
Horizontal	731.31	QP	31.10	8.93	40.03	46.00	-5.97
Horizontal	745.86	QP	31.62	5.37	36.99	46.00	-9.01
Horizontal	806.97	QP	32.13	0.90	33.03	46.00	-12.97

Antenna Polarization	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Vertical	494.63	QP	26.52	9.37	35.89	46.00	-10.11
Vertical	515.00	QP	26.90	8.44	35.34	46.00	-10.66
Vertical	572.23	QP	28.14	1.34	29.48	46.00	-16.52
Vertical	601.33	QP	28.93	1.03	29.96	46.00	-16.04
Vertical	644.01	QP	29.68	1.85	31.53	46.00	-14.47
Vertical	730.34	QP	31.10	2.30	33.40	46.00	-12.60

Remark: Corr. Factor = Antenna Factor + Cable Loss

4. Conducted emission FCC 15.207

Since the EUT is not connected to AC source, therefore, the test can be waived.

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Appendix A: Test equipment list

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde & Schwarz	ESR7	101822	2022/08/09	2023/08/08
Signal Analyzer	Agilent	N9030A	MY51380492	2022/08/09	2023/08/08
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2022/04/13	2023/04/12
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2022/01/20	2023/01/19
966-2(A) Cable	SUHNER	SMA / EX 100	N/A	2022/03/04	2023/03/03
966-2(B) Cable	SUHNER	SUCOFLEX 104P	CB0005	2022/03/04	2023/03/03
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2022/01/14	2023/01/13
Test software	Audix	e3	V9	NCR	NCR

Note: No Calibration Required (NCR)

Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of $k=2$.

Item	Uncertainty
Timing requirement of manually operated transmitter	1.27 dB
Occupied Bandwidth	7.78 %
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	3.70 dB
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.16 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.02 dB
AC Power Line Conducted Emission	2.52 dB