

**Brilliant Network & Automation  
Integrated System Co.,Ltd**

# TEST REPORT

**Model:**

MF Reader

**REPORT NUMBER**

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# Radio Spectrum TEST REPORT

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<b>Product:</b>	Semiconductor RFID
<b>Model No.:</b>	MF Reader
<b>FCC ID:</b>	2A583-MFREADER
<b>Test Method/ Standard:</b>	47 CFR FCC Part 15.209
<b>Test By:</b>	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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## Revision History

Report No.	Issue Date	Revision Summary
221000226THC-001	Apr. 17, 2023	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

<b>Product:</b>	Semiconductor RFID
<b>Model No.:</b>	MF Reader
<b>Operating Frequency:</b>	134kHz
<b>Rated Power:</b>	DC 24V
<b>Power Cord:</b>	N/A
<b>Sample receiving date:</b>	2022/11/15
<b>Sample condition:</b>	Workable
<b>Test Date(s):</b>	2023/01/07

### 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 connected to Notebook PC USB port, executing “Omron1ToNV1.0322.exe” and start.

### 2.3 Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Data cable
Notebook PC	HP	HP ProBook 440 G3	5CD8021S9H	USB To RS232 Cable 3m
USB to RS-232 (Customer provided)	N/A	N/A	N/A	N/A
DC Power Supply	Twintex	TP-1603C	N/A	N/A
Getway (Customer provided)	N/A	N/A	N/A	USB To RS232 Cable 3m

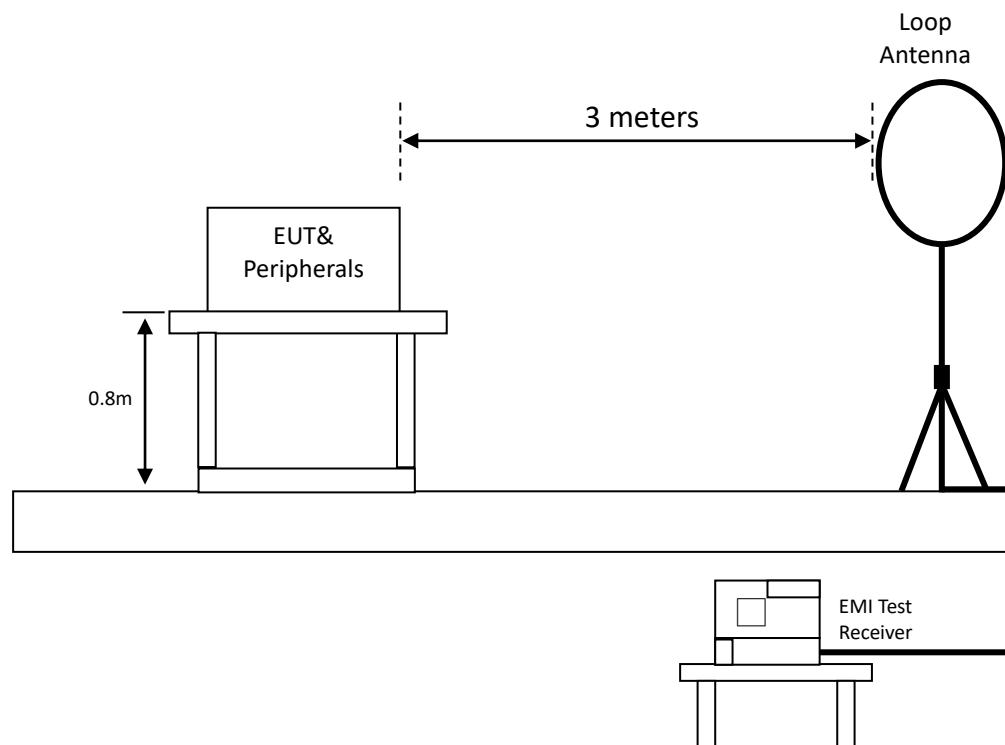
### 3. Radiated emission test FCC 15.209

#### 3.1 Operating environment

Temperature:	20	°C
Relative Humidity:	63	%
Test Date:	2023/1/7	

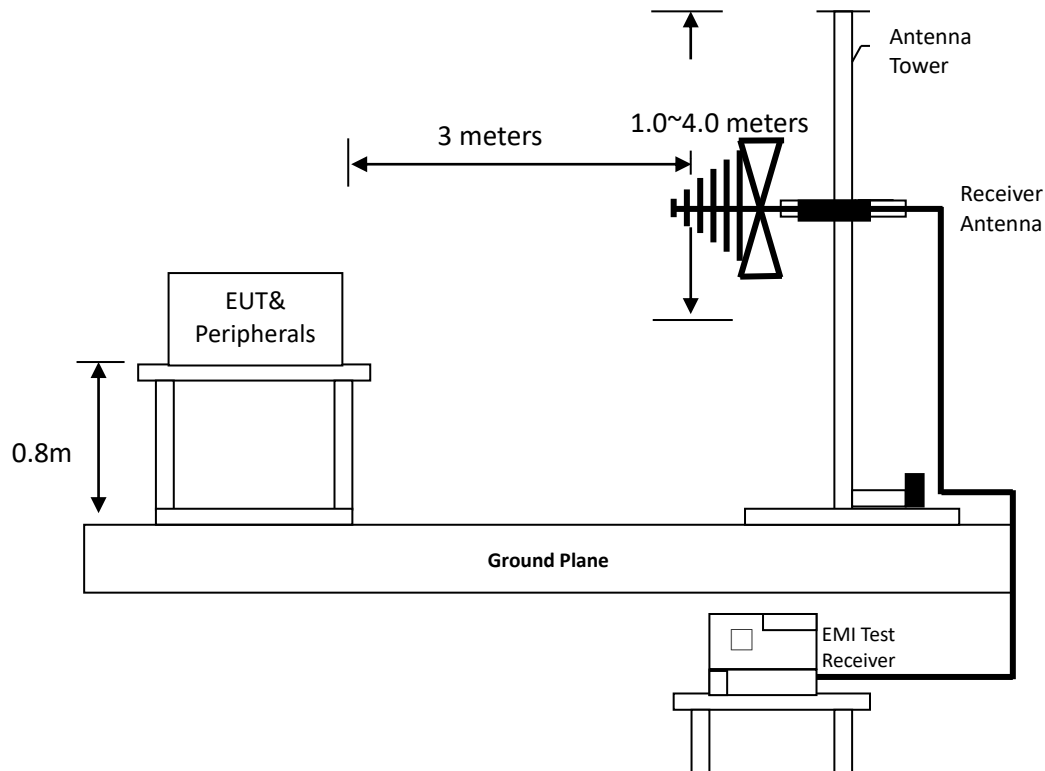
#### 3.2 Test setup & procedure

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.

### 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

### 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	0.134	AV	18.06	86.82	104.88	105.16	-0.28
Parallel	0.134	AV	18.06	82.75	100.81	105.16	-4.35
Ground-parallel	0.134	AV	18.06	72.68	90.74	105.16	-14.42

Remark: Corr. Factor = Antenna Factor + Cable Loss

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

### 9kHz-30MHz

Test condition : Tx mode

Antenna Polarization	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Perpendicular	0.399	AV	18.71	54.61	73.32	95.59	-22.27
Perpendicular	0.669	QP	18.90	44.22	63.12	71.18	-8.06
Perpendicular	0.909	QP	19.04	37.32	56.36	68.49	-12.13
Perpendicular	1.179	QP	19.10	36.43	55.53	66.19	-10.66
Perpendicular	1.449	QP	19.10	27.41	46.51	64.40	-17.89
Perpendicular	1.778	QP	19.10	26.59	45.69	69.54	-23.85

Antenna Polarization	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Parallel	0.399	AV	18.71	50.04	68.75	95.59	-26.84
Parallel	0.639	QP	18.89	39.86	58.75	71.55	-12.80
Parallel	0.909	QP	19.04	33.10	52.14	68.49	-16.35
Parallel	1.179	QP	19.10	29.07	48.17	66.19	-18.02
Parallel	1.778	QP	19.10	24.67	43.77	69.54	-25.77
Parallel	2.378	QP	19.10	20.93	40.03	69.54	-29.51

Antenna Polarization	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Ground-parallel	0.399	AV	18.71	39.25	57.96	95.59	-37.63
Ground-parallel	0.639	QP	18.89	29.00	47.89	71.55	-23.66
Ground-parallel	0.909	QP	19.04	22.89	41.93	68.49	-26.56
Ground-parallel	1.179	QP	19.10	20.40	39.50	66.19	-26.69
Ground-parallel	1.808	QP	19.10	17.42	36.52	69.54	-33.02
Ground-parallel	2.258	QP	19.10	15.26	34.36	69.54	-35.18

Remark: Corr. Factor = Antenna Factor + Cable Loss

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### 30MHz-1GHz

Test condition : Tx mode

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	95.96	QP	18.53	6.89	25.42	43.50	-18.08
Horizontal	167.74	QP	18.69	5.61	24.30	43.50	-19.20
Horizontal	335.55	QP	23.08	9.31	32.39	46.00	-13.61
Horizontal	431.58	QP	25.55	6.33	31.88	46.00	-14.12
Horizontal	527.61	QP	27.05	3.79	30.84	46.00	-15.16
Horizontal	729.37	QP	29.55	2.05	31.60	46.00	-14.40

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	167.74	QP	18.69	7.75	26.44	43.50	-17.06
Vertical	254.07	QP	20.40	3.25	23.65	46.00	-22.35
Vertical	263.77	QP	20.83	4.87	25.70	46.00	-20.30
Vertical	431.58	QP	25.55	4.25	29.80	46.00	-16.20
Vertical	498.51	QP	26.25	5.39	31.64	46.00	-14.36
Vertical	522.76	QP	26.89	5.39	32.28	46.00	-13.72

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.

## Appendix A: Test equipment list

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	R&S	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
Bilog Hybrid Antenna	ETC	MCTD 2786B	BLB17J04019 & JB-5-019	2022/10/04	2023/10/03
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	3.08 dB