FCC RADIO TEST REPORT

FCC ID	:	UZ7RFD90
Equipment	:	RFID Sled
Brand Name	:	ZEBRA
Model Name	:	RFD90
Applicant	:	Zebra Technologies Corporation 3 Overlook Point, Lincolnshire, IL 60069 USA
Manufacturer	:	Zebra Technologies Corporation 3 Overlook Point, Lincolnshire, IL 60069 USA
Standard	:	FCC Part 15 Subpart C §15.247

The product was received on Nov. 26, 2024 and testing was started from Dec. 13, 2024 to Dec. 19, 2024. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

Sporton International Inc. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Description	Issue Date
FR1N1506-12	01	Initial issue of report	Jan. 14, 2025

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.247(a)(1)	Number of Channels	Pass	See Note
-	15.247(a)(1)	Hopping Channel Separation	Pass	See Note
-	15.247(a)(1)	Dwell Time of Each Channel	Pass	See Note
-	15.247(a)(1)	20dB Bandwidth	Pass	See Note
-	2.1049	99% Occupied Bandwidth	Pass	See Note
3.1	15.247(b)(1)	Output Power	Pass	-
-	15.247(d)	Conducted Band Edges	Pass	See Note
-	15.247(d)	Conducted Spurious Emission	Pass	See Note
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	5.37 dB under the limit at 2744.25 MHz
-	15.207	AC Conducted Emission	Pass	See Note
3.3	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Note: This is a variant report by adding antenna. All the test cases were performed on original report which can be referred to Sporton Report Number FR1N1506D. Based on the original report, only worst case was verified.

Conformity Assessment Condition:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account. 2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”.
Disclaimer:
The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Wei Chen

Report Producer: Lucy Wu

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	RFID Sled
Brand Name	ZEBRA
Model Name	RFD90
FCC ID	UZ7RFD90
Sample 1	long range with SE4850
Sample 2	standard range with SE4850
Sample 3	long range with SE4750
Sample 4	standard range with SE4750
EUT supports Radios application	UHF RFID
HW Version	Rev: C
FW Version	SAAFKS00-006-R01
MFD	23AUG24
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer.

Specification of Accessories				
Battery	**Brand Name**	ZEBRA	**Model Name**	BT-000380

Supported Unit used in test configuration and system				
AC Adapter	**Brand Name**	ZEBRA	**Part Number**	PWR-BGA12V50W0WW
USB Cable 1	**Brand Name**	ZEBRA	**Part Number**	CBL-TC7X-USB1-01
USB Cable 2	**Brand Name**	ZEBRA	**Part Number**	CBL-RFD49-USB1-01
RFD90 Sled eConnex Adaptor for TC78A1	**Brand Name**	ZEBRA	**Part Number**	ADP-RFD90-TC7X-2E
Touch Computer	**Brand Name**	ZEBRA	**Model Name**	TC78A1
Battery for TC78A1	**Brand Name**	ZEBRA	**Model Name**	BT-000442

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard	
Tx/Rx Frequency Range	902.75 MHz ~ 927.25 MHz
Number of Channels	50
Maximum Output Power to Antenna	**<Standard Range>:** **<Ant. 2>:** 29.61 dBm (0.9141 W)
Antenna Type / Gain	**<Long Range>:** Linear Antenna with gain 6.02 dBi **<Standard Range>:** **<Ant. 1>:** Helix Antenna with gain -0.87 dBi **<Ant. 2>:** Helix Antenna with gain 0.24 dBi
Type of Modulation	ASK

Remark: The above EUT's information was declared by manufacturer. Please refer to Disclaimer in report summary.

1.3 Modification of EUT

No modifications are made to the EUT during all test items.

1.4 Testing Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	03CH07-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	TH05-HY (TAF Code: 3786)
Remark	The Conducted test item subcontracted to Sporton International Inc. Wensan Laboratory.

FCC designation No.: TW1190 and TW3786

1.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r01
- FCC KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
902.75-927.25 MHz	0	902.75	27	916.25
	1	903.25	28	916.75
	2	903.75	29	917.25
	3	904.25	30	917.75
	4	904.75	31	918.25
	5	905.25	32	918.75
	6	905.75	33	919.25
	7	906.25	34	919.75
	8	906.75	35	920.25
	9	907.25	36	920.75
	10	907.75	37	921.25
	11	908.25	38	921.75
	12	908.75	39	922.25
	13	909.25	40	922.75
	14	909.75	41	923.25
	15	910.25	42	923.75
	16	910.75	43	924.25
	17	911.25	44	924.75
	18	911.75	45	925.25
	19	912.25	46	925.75
	20	912.75	47	926.25
	21	913.25	48	926.75
	22	913.75	49	927.25
	23	914.25		
	24	914.75		
	25	915.25		
	26	915.75		

2.2 Test Mode

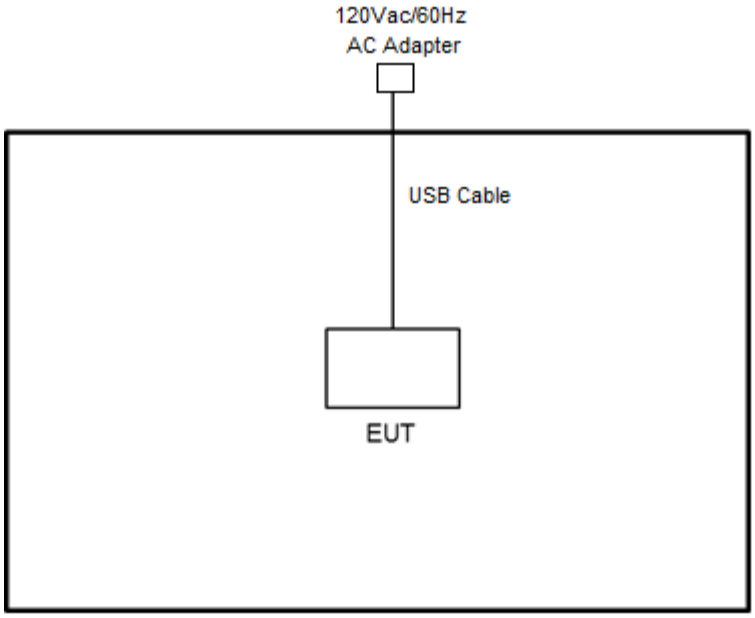
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst case emissions were reported in this report.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
Test Item	**UHF RFID**
Radiated Test Cases	**<Standard Range>** **<Ant. 2>** Mode 1: UHF RFID Tx 902.75 MHz Mode 2: UHF RFID Tx 914.75 MHz Mode 3: UHF RFID Tx 927.25 MHz
Remark: For Radiated Test Cases, the tests were performed USB Cable 2 and Sample 2.	

2.3 Connection Diagram of Test System

<Radiated Spurious Emission Mode>



2.4 EUT Operation Test Setup

The RF test items, utility “Tera Term Version 4.95” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

3 Test Result

3.1 Output Power Measurement

3.1.1 Limit of Output Power

Section 15.247 (a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions: (1)(i) 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; 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. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (2) 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, as permitted under paragraph (a)(1)(i) of this section.

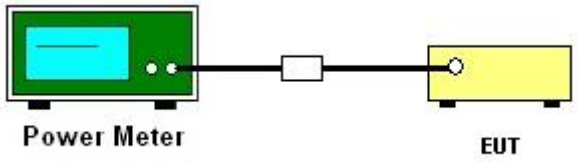
3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.5.
1. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
2. Set the maximum power setting and enable the EUT to transmit continuously.
3. Measure the conducted output power with cable loss and record the results in the test report.
4. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Output Power

Test Mode :	UHF RFID	Temperature :	20~25℃
Test Engineer :	Derek Hsu	Relative Humidity :	50~56%

<Standard Range>

<Ant. 2>

Frequency (MHz)	RF Power (dBm)		
	UHF	Max. Limits (dBm)	Pass/Fail
902.75	29.32	30.00	Pass
914.75	29.44	30.00	Pass
927.25	29.61	30.00	Pass

3.1.6 Test Result of Average Power (Reporting Only)

Test Mode :	UHF RFID	Temperature :	20~25℃
Test Engineer :	Derek Hsu	Relative Humidity :	50~56%

<Standard Range>

<Ant. 2>

Frequency (MHz)	RF Power (dBm)
	UHF
902.75	29.13
914.75	29.17
927.25	29.28

3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

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

3.2.2 Measuring Instruments

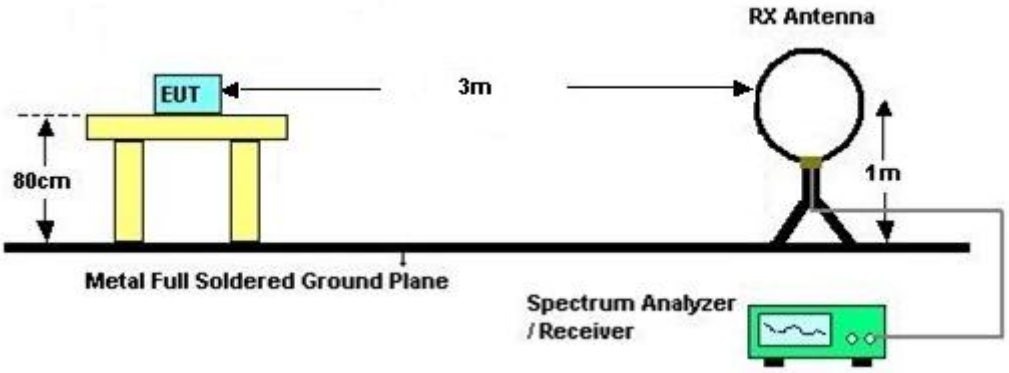
Please refer to the measuring equipment list in this test report.

3.2.3 Test Procedures

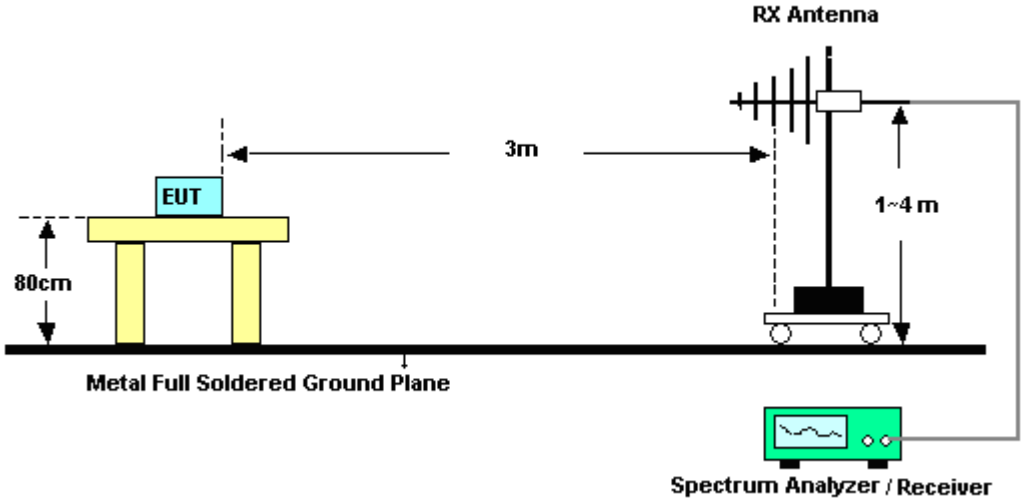
1. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
1. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
2. For each suspected emission, the EUT is arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW = 100 kHz for f < 1 GHz, RBW = 1 MHz for f>1 GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log (Duty cycle)
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as “-“.
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as “-“.

3.2.4 Test Setup

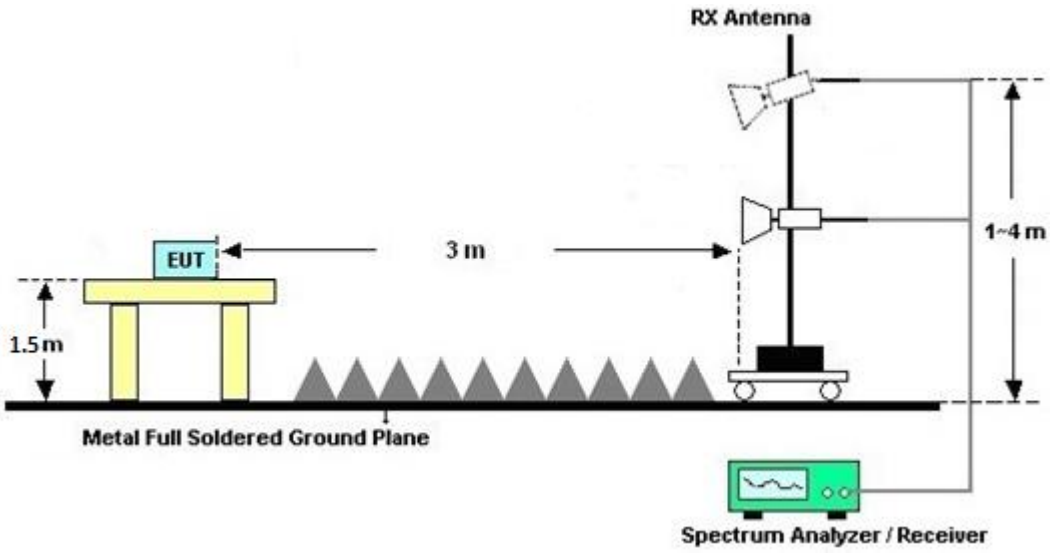
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.2.7 Duty Cycle

Please refer to Appendix C.

3.2.8 Test Result of Radiated Spurious Emission

Please refer to Appendix A and B.

3.3 Antenna Requirements

3.3.1 Standard Applicable

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, 15.221, or § 15.236. 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.

3.3.2 Antenna Anti-Replacement Construction

Antenna permanently attached.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N -06	35419 & 03	30MHz~1GHz	Apr. 22, 2024	Dec. 13, 2024~ Dec. 14, 2024	Apr. 21, 2025	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00227880	1GHz ~ 18GHz	Oct. 04, 2024	Dec. 13, 2024~ Dec. 14, 2024	Oct. 03, 2025	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Feb. 23, 2024	Dec. 13, 2024~ Dec. 14, 2024	Feb. 22, 2025	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	1GHz~18GHz	Apr. 19, 2024	Dec. 13, 2024~ Dec. 14, 2024	Apr. 18, 2025	Radiation (03CH07-HY)
Amplifier	SONOMA	310N	186713	9kHz~1GHz	Apr. 16, 2024	Dec. 13, 2024~ Dec. 14, 2024	Apr. 15, 2025	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Mar. 26, 2024	Dec. 13, 2024~ Dec. 14, 2024	Mar. 25, 2025	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4 MY24971/4 MY15682/4	30MHz to 18GHz	Feb. 21, 2024	Dec. 13, 2024~ Dec. 14, 2024	Feb. 20, 2025	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4 MY24971/4	9kHz to 30MHz	Feb. 21, 2024	Dec. 13, 2024~ Dec. 14, 2024	Feb. 20, 2025	Radiation (03CH07-HY)
Controller	EMEC	EM1000	N/A	Control Ant Mast	N/A	Dec. 13, 2024~ Dec. 14, 2024	N/A	Radiation (03CH07-HY)
Controller	MF	MF-7802	N/A	Control Turn table	N/A	Dec. 13, 2024~ Dec. 14, 2024	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	N/A	Dec. 13, 2024~ Dec. 14, 2024	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Dec. 13, 2024~ Dec. 14, 2024	N/A	Radiation (03CH07-HY)
Software	Audix	E3	N/A	N/A	N/A	Dec. 13, 2024~ Dec. 14, 2024	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	Mar. 01, 2024	Dec. 13, 2024~ Dec. 14, 2024	Feb. 28, 2025	Radiation (03CH07-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 01, 2024	Dec. 19, 2024	Oct. 30, 2025	Conducted (TH05-HY)
Power Meter	Anritsu	ML2495A	1036004	N/A	Jul. 04, 2024	Dec. 19, 2024	Jul. 03, 2025	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Jul. 04, 2024	Dec. 19, 2024	Jul. 03, 2025	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV3044	101466	10HZ~44GHZ	Jan. 24, 2024	Dec. 19, 2024	Jan. 23, 2025	Conducted (TH05-HY)
Switch Control Mainframe	Burgeon	ETF-058	EC1300484 (BOX3)	N/A	May 20, 2024	Dec. 19, 2024	May 19, 2025	Conducted (TH05-HY)
Software	Sporton	BTWIFI_Final_ version_240513	N/A	Conducted Other Test Item	N/A	Dec. 19, 2024	N/A	Conducted (TH05-HY)

5 Measurement Uncertainty

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.2 dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.6 dB**

Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.3 dB**

Appendix A. Radiated Spurious Emission

Test Engineer :	Ken Wu	Temperature :	19.8~20.2°C
		Relative Humidity :	60.8~62.3%

<Standard Range>

UHF RFID

UHF RFID (LF @ 3m)

UHF RFID Ant.	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		30	22.81	-17.19	40	27.43	24.29	1.07	29.98	-	-	P	H
		109.65	27.75	-15.75	43.5	38.87	16.82	1.97	29.91	-	-	P	H
		266.79	34.05	-11.95	46	41.57	19.3	3	29.82	-	-	P	H
		370	33.08	-12.92	46	38.82	20.6	3.45	29.79	-	-	P	H
		564.6	26.44	-19.56	46	26.59	25.31	4.25	29.71	-	-	P	H
	*	902.75	119.07	-	-	114.16	28.41	5.28	28.78	200	186	P	H
		997.2	36.75	-17.25	54	30.73	28.6	5.61	28.19	-	-	P	H
													H
													H
													H
													H
UHF RFID													
902.75MHz		30	29.02	-10.98	40	33.64	24.29	1.07	29.98	-	-	P	V
		40.53	29.79	-10.21	40	39.07	19.47	1.23	29.98	-	-	P	V
		65.37	28.18	-11.82	40	44.54	12.03	1.53	29.92	-	-	P	V
		370.7	27.36	-18.64	46	33.09	20.61	3.45	29.79	-	-	P	V
		559	28.38	-17.62	46	28.47	25.38	4.23	29.7	-	-	P	V
	*	902.75	118.79	-	-	113.88	28.41	5.28	28.78	100	135	P	V
		969.2	35.27	-18.73	54	28.27	29.96	5.48	28.44	-	-	P	V
													V
													V
													V
													V

UHF RFID Ant. 2	Note	Frequency (MHz)	Level (dBµV/m)	Margin (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		30.54	23.19	-16.81	40	27.96	24.13	1.08	29.98	-	-	P	H
		98.31	27.49	-16.01	43.5	39.87	15.65	1.88	29.91	-	-	P	H
		266.52	36.12	-9.88	46	43.61	19.33	3	29.82	-	-	P	H
		358.1	26.29	-19.71	46	32.24	20.44	3.4	29.79	-	-	P	H
		559.7	26.43	-19.57	46	26.46	25.44	4.23	29.7	-	-	P	H
	*	914.75	119.14	-	-	114.2	28.37	5.31	28.74	200	189	P	H
		972	33.35	-20.65	54	26.27	30.01	5.49	28.42	-	-	P	H
													H
													H
													H
													H
UHF RFID													H
914.75MHz		30	29.13	-10.87	40	33.75	24.29	1.07	29.98	-	-	P	V
		40.8	28.06	-11.94	40	37.48	19.33	1.23	29.98	-	-	P	V
		62.4	29.1	-10.9	40	45.5	12.02	1.51	29.93	-	-	P	V
		266.79	27.32	-18.68	46	34.84	19.3	3	29.82	-	-	P	V
		564.6	26.04	-19.96	46	26.19	25.31	4.25	29.71	-	-	P	V
	*	914.75	118.83	-	-	113.89	28.37	5.31	28.74	100	135	P	V
		980.4	35.94	-18.06	54	28.67	30.08	5.53	28.34	-	-	P	V
													V
													V
													V
													V
													V

UHF RFID Ant. 2	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		30	22.7	-17.3	40	27.32	24.29	1.07	29.98	-	-	P	H
		199.02	26.21	-17.29	43.5	38.58	14.85	2.61	29.83	-	-	P	H
		266.79	31.37	-14.63	46	38.89	19.3	3	29.82	-	-	P	H
		332.2	26.59	-19.41	46	33.51	19.58	3.3	29.8	-	-	P	H
		532.4	32.85	-13.15	46	34.96	23.49	4.13	29.73	-	-	P	H
	*	927.25	118.81	-	-	114.24	27.93	5.34	28.7	200	202	P	H
		965.7	33.32	-20.68	54	26.66	29.68	5.46	28.48	-	-	P	H
													H
													H
													H
													H
UHF RFID													H
927.25MHz		38.37	28.36	-11.64	40	36.66	20.48	1.2	29.98	-	-	P	V
		66.45	27.9	-12.1	40	44.16	12.11	1.55	29.92	-	-	P	V
		108.57	25.86	-17.64	43.5	37.14	16.67	1.96	29.91	-	-	P	V
		400.1	24.6	-21.4	46	29.44	21.4	3.56	29.8	-	-	P	V
		558.3	26.74	-19.26	46	26.87	25.33	4.23	29.69	-	-	P	V
	*	927.25	118.76	-	-	114.19	27.93	5.34	28.7	100	162	P	V
		992.3	36.38	-17.62	54	29.66	29.37	5.58	28.23	-	-	P	V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. Non restricted band limit is radio frequency level down 20db.
4. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.

UHF RFID (Harmonic @ 3m)

UHF RFID Ant. 2	Note	Frequency (MHz)	Level (dBµV/m)	Margin (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		2708.25	44.83	-29.17	74	62.14	32.2	9.58	59.09	210	330	P	H
		2708.25	40.48	-13.52	54	57.79	32.2	9.58	59.09	210	330	A	H
		3611	43.05	-30.95	74	58.54	33.14	10.91	59.54	226	262	P	H
		3611	41.75	-12.25	54	57.24	33.14	10.91	59.54	226	262	A	H
		4513.75	42.23	-31.77	74	55.51	34.13	12.43	59.84	-	-	P	H
		5416.5	40.12	-33.88	74	49.59	34.77	13.24	57.48	-	-	P	H
		8124.75	40.84	-33.16	74	46.2	36.05	16.18	57.59	-	-	P	H
		9027.5	42.33	-31.67	74	47.65	36.15	17.06	58.53	-	-	P	H
UHF RFID													
902.75MHz		2708.25	42.19	-31.81	74	59.5	32.2	9.58	59.09	112	330	P	V
		2708.25	38.42	-15.58	54	55.73	32.2	9.58	59.09	112	330	A	V
		3611	40.94	-33.06	74	56.43	33.14	10.91	59.54	-	-	P	V
		4513.75	41.95	-32.05	74	55.23	34.13	12.43	59.84	-	-	P	V
		5416.5	40.64	-33.36	74	50.11	34.77	13.24	57.48	-	-	P	V
		8124.75	40.99	-33.01	74	46.35	36.05	16.18	57.59	-	-	P	V
		9027.5	41.99	-32.01	74	47.31	36.15	17.06	58.53	-	-	P	V

UHF RFID Ant. 2	Note	Frequency (MHz)	Level (dBµV/m)	Margin (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		2744.25	51.43	-22.57	74	68.5	32.34	9.68	59.09	194	331	P	H
		2744.25	48.63	-5.37	54	65.7	32.34	9.68	59.09	194	331	A	H
		3659	45.96	-28.04	74	61.26	33.28	11.01	59.59	300	256	P	H
		3659	42.6	-11.4	54	57.9	33.28	11.01	59.59	300	256	A	H
		4573.75	43.72	-30.28	74	56.65	34.25	12.52	59.7	200	56	P	H
		4573.75	38.26	-15.74	54	51.19	34.25	12.52	59.7	200	56	A	H
		7318	45.71	-28.29	74	52.36	35.8	15.29	57.74	300	44	P	H
		7318	42.16	-11.84	54	48.81	35.8	15.29	57.74	300	44	A	H
		8232.75	40.93	-33.07	74	46.36	36.03	16.11	57.57	-	-	P	H
UHF RFID		9147.5	42.88	-31.12	74	48.06	36.39	17.27	58.84	-	-	P	H
914.75MHz		2744.25	47.87	-26.13	74	64.94	32.34	9.68	59.09	100	340	P	V
		2744.25	45.87	-8.13	54	62.94	32.34	9.68	59.09	100	340	A	V
		3659	45.67	-28.33	74	60.97	33.28	11.01	59.59	100	94	P	V
		3659	42.75	-11.25	54	58.05	33.28	11.01	59.59	100	94	A	V
		4573.75	44.19	-29.81	74	57.12	34.25	12.52	59.7	400	24	P	V
		4573.75	39.02	-14.98	54	51.95	34.25	12.52	59.7	400	24	A	V
		7318	47.12	-26.88	74	53.77	35.8	15.29	57.74	200	299	P	V
		7318	43.66	-10.34	54	50.31	35.8	15.29	57.74	200	299	A	V
		8232.75	41.71	-32.29	74	47.14	36.03	16.11	57.57	-	-	P	V
		9147.5	42.48	-31.52	74	47.66	36.39	17.27	58.84	-	-	P	V

UHF RFID Ant. 2	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		2781.75	51.7	-22.3	74	68.4	32.6	9.78	59.08	200	193	P	H
		2781.75	48.62	-5.38	54	65.32	32.6	9.78	59.08	200	193	A	H
		3709	42.15	-31.85	74	57.44	33.24	11.11	59.64	-	-	P	H
		4636.25	40.61	-33.39	74	53.28	34.3	12.59	59.56	-	-	P	H
		7418	43.98	-30.02	74	50.65	35.86	15.33	57.86	100	142	P	H
		7418	40.52	-13.48	54	47.19	35.86	15.33	57.86	100	142	A	H
		8345.25	42.19	-31.81	74	47.7	35.9	16.14	57.55	-	-	P	H
													H
UHF RFID													H
927.25MHz		2781.75	47.1	-26.9	74	63.8	32.6	9.78	59.08	100	331	P	V
		2781.75	42.08	-11.92	54	58.78	32.6	9.78	59.08	100	331	A	V
		3709	42.15	-31.85	74	57.44	33.24	11.11	59.64	-	-	P	V
		4636.25	41.65	-32.35	74	54.32	34.3	12.59	59.56	-	-	P	V
		7418	45.54	-28.46	74	52.21	35.86	15.33	57.86	200	55	P	V
		7418	43.54	-10.46	54	50.21	35.86	15.33	57.86	200	55	A	V
		8345.25	41.57	-32.43	74	47.08	35.9	16.14	57.55	-	-	P	V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. Non restricted band limit is radio frequency level down 20db.
4. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **Margin** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

UHF RFID	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
UHF RFID		2781.75	43.71	-30.29	74	60.74	32.3	9.75	59.08	400	76	P	H
913.25MHz		2781.75	39.67	-14.33	54	56.7	32.3	9.75	59.08	400	76	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Margin(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2781.75MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.30(dB/m) + 9.75(dB) + 60.74(dBμV) – 59.08 (dB)

= 43.71 (dBμV/m)

2. Margin(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.71(dBμV/m) – 74(dBμV/m)

= -30.29(dB)

For Average Limit @ 2781.75MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.30(dB/m) + 9.75(dB) + 56.70(dBμV) – 59.08 (dB)

= 39.67 (dBμV/m)

2. Margin(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 39.67(dBμV/m) – 54(dBμV/m)

= -14.33(dB)

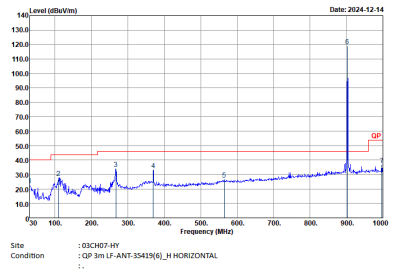
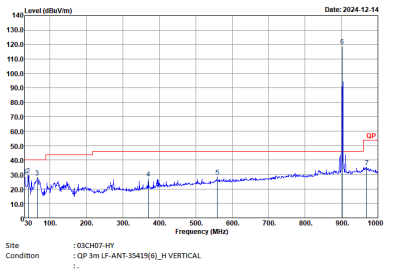
Both peak and average measured complies with the limit line, so test result is "PASS".

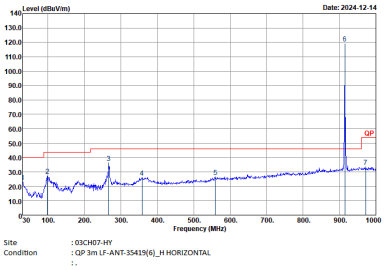
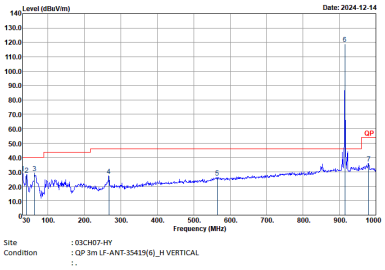
Appendix B. Radiated Spurious Emission Plots

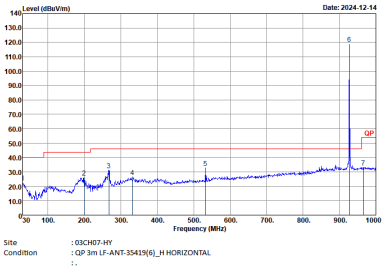
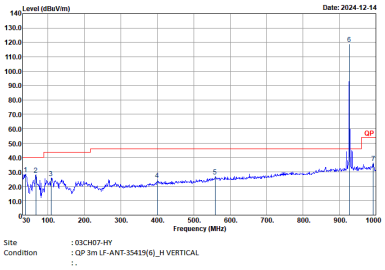
Test Engineer :	Ken Wu	**Temperature :**	19.8~20.2°C
		Relative Humidity :	60.8~62.3%

<Standard Range>

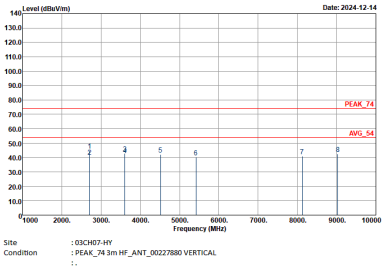
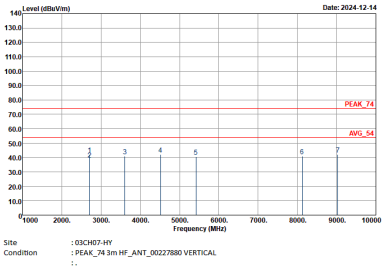
UHF RFID (LF @ 3m)

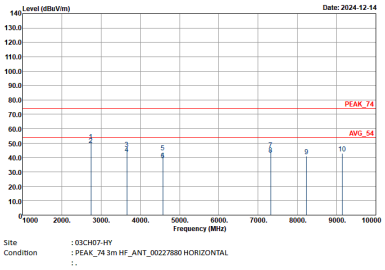
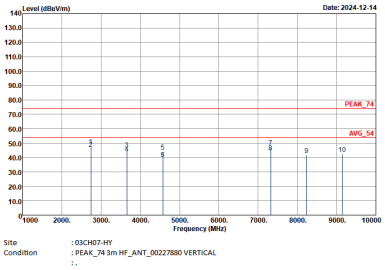
UHF RFID	**UHF RFID**	
ANT	**UHF RFID 902.75MHz**	
2	**Horizontal**	**Vertical**
QP / Peak		

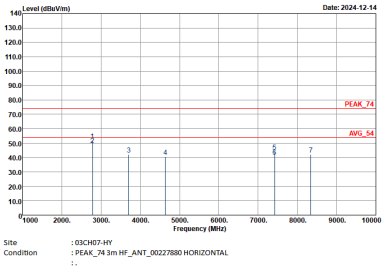
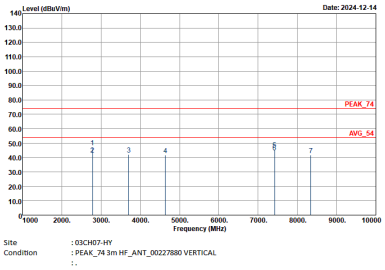
UHF RFID	UHF RFID	
ANT	UHF RFID 914.75MHz	
2	Horizontal	Vertical
QP / Peak		

UHF RFID	UHF RFID	
ANT	UHF RFID 927.25MHz	
2	Horizontal	Vertical
QP / Peak		

UHF RFID (Harmonic @ 3m)

UHF RFID	UHF RFID	
ANT	UHF RFID 902.75MHz	
2	Horizontal	Vertical
Peak Avg.		

UHF RFID	UHF RFID	
ANT	UHF RFID 914.75MHz	
2	Horizontal	Vertical
Peak Avg.		

UHF RFID	UHF RFID	
ANT	UHF RFID 927.25MHz	
2	Horizontal	Vertical
Peak Avg.		

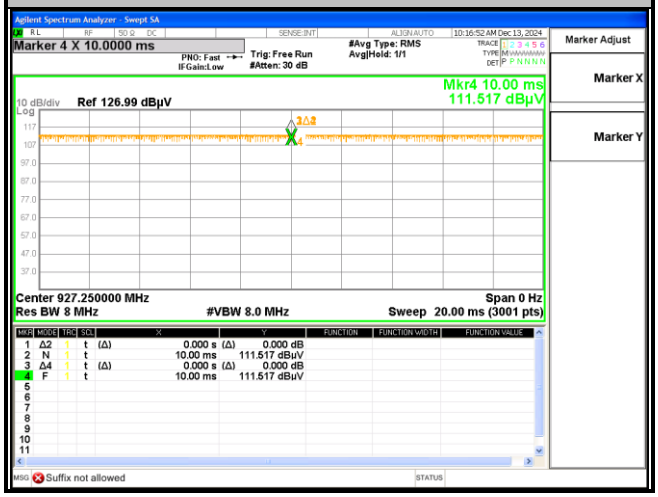
Appendix C. Duty Cycle Plots

<Standard Range>

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
2	UHF RFID	100.00	-	-	10Hz

<Ant. 2>

UHF RFID



Appendix E. Photographs of EUT

Please refer to Sporton report number EP1N1506-12 as below.

Appendix F. Change List

Change Note		
Regression for INPAQ antenna		Memo
Part Number	WA-P-RFID-02-004	800MHz band
Part Number	WA-P-RFID-02-005	900MHz band

	CE	
	LR	
	Original ANT gain	New ANT gain
800M	5.85	NA
900M	5.97	NA

	FCC	
	LR	
	Original ANT gain	New ANT gain
900M	6.02	NA

	CE	
	SR	
	Original ANT gain	New ANT gain
800M	-3.53	0.45
900M	-2.05	0.09

	FCC	
	SR	
	Original ANT gain	New ANT gain
900M	-0.87	0.24