

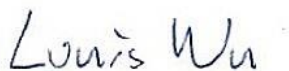


FCC RADIO TEST REPORT

FCC ID : UZ7RE40
Equipment : RFID Module
Brand Name : Zebra
Model Name : RE40
Applicant : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
Manufacturer : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
Standard : FCC Part 15 Subpart C §15.247

The product was received on Jul. 26, 2022 and testing was started from Aug. 04, 2022 to Aug. 05, 2022. 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 of Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.



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.)



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History of this test report

Report No.	Version	Description	Issue Date
FR051819-03	01	Initial issue of report	Aug. 23, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.247(a)(1)	Number of Channels	Not Required	-
-	15.247(a)(1)	Hopping Channel Separation	Not Required	-
-	15.247(a)(1)	Dwell Time of Each Channel	Not Required	-
-	15.247(a)(1)	20dB Bandwidth	Not Required	-
-	2.1049	99% Occupied Bandwidth	Not Required	-
3.1	15.247(b)(1)	Output Power	Pass	-
-	15.247(d)	Conducted Band Edges	Not Required	-
-	15.247(d)	Conducted Spurious Emission	Not Required	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	3.03 dB under the limit at 2745.000 MHz
-	15.207	AC Conducted Emission	Not Required	-
3.3	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Note:

- Not required means after assessing, test items are not necessary to carry out.
- This is a variant report by adding RF port 2 and port 3. All the test cases were performed on original report which can be referred to Sporton Report Number FR051819. Based on the original report, the test cases were verified.

Declaration of Conformity:

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
- The measurement uncertainty please refer to this report "Uncertainty of Evaluation".

Comments and Explanations:

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Wei Chen
Report Producer: Clio Lo

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	RFID Module
Brand Name	Zebra
Model Name	RE40
FCC ID	UZ7RE40
Sample 1	with carrier board
Sample 2	only the shielded module
EUT supports Radios application	RFID
HW Version	V21
FW Version	CAAFBS00-001-R00BN (3.0.13.0)
MFD	26APR21
EUT Stage	Identical Prototype

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

Specification of Accessories				
Adapter	Brand Name	Zebra	Part Number	PWR-WUA5V12W0WW
Micro USB Cable (power supply)	Brand Name	USI	Part Number	54-286614-01
Micro USB Cable (data transmission)	Brand Name	USI	Part Number	54-286510-01
Development Kit Radio Engine	Brand Name	Zebra	Part Number	DKRE-4000-00WW
Antenna 1	Model Name	AN480		
		AN610		
		AN620		
		AN710		
		AN720		
		AN510		
		AN440		
		S9025PL; S9025PR		
Antenna 2	Model Name	P1046176-01/ P1092482-01/ P1113980-01		

Supported Unit Used in Test Configuration and System				
carrier board without swith	Brand Name	Zebra	Part Number	N/A

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard	
Tx/Rx Frequency Range	902 MHz ~ 928 MHz
Number of Channels	50
Maximum Output Power to Antenna	Port 2: 27.06 dBm (0.5082 W) Port 3: 27.04 dBm (0.5058 W)
Antenna Type / Gain	<Ant. 1>: Patch Antenna gain 6 dBi <Ant. 2>: Loop Antenna gain -30 dBi
Type of Modulation	ASK

Remark: The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations 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	1	915.45	28	922.20
	2	915.70	29	922.45
	3	915.95	30	922.70
	4	916.20	31	922.95
	5	916.45	32	923.20
	6	916.70	33	923.45
	7	916.95	34	923.70
	8	917.20	35	923.95
	9	917.45	36	924.20
	10	917.70	37	924.45
	11	917.95	38	924.70
	12	918.20	39	924.95
	13	918.45	40	925.20
	14	918.70	41	925.45
	15	918.95	42	925.70
	16	919.20	43	925.95
	17	919.45	44	926.20
	18	919.70	45	926.45
	19	919.95	46	926.70
	20	920.20	47	926.95
	21	920.45	48	927.20
	22	920.70	49	927.45
	23	920.95	50	927.70
	24	921.20		
	25	921.45		
	26	921.70		
	27	921.95		

2.2 Test Mode

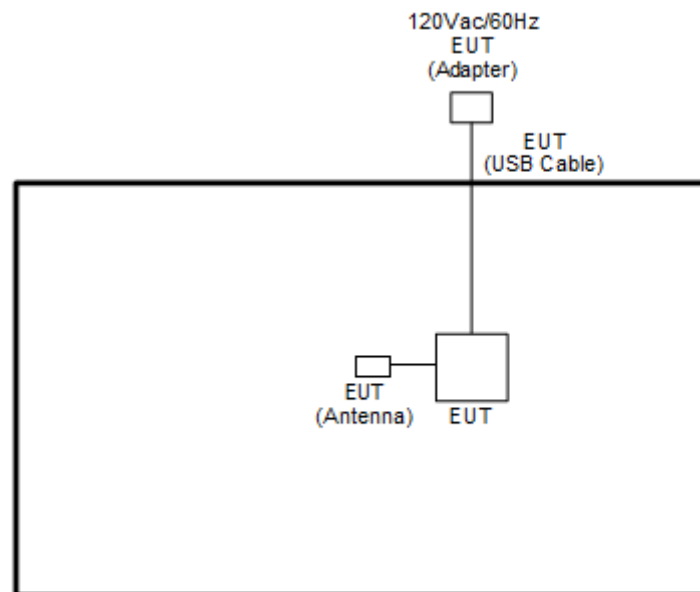
- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever 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 find Y plane as worst plane.

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
Conducted Test Cases	Mode 1: UHF RFID Tx 902.75 MHz Mode 2: UHF RFID Tx 914.75 MHz Mode 3: UHF RFID Tx 927.25 MHz
Radiated Test Cases	Mode 1: UHF RFID Tx 902.75 MHz for DKRE Port 2 Mode 2: UHF RFID Tx 915.00 MHz for DKRE Port 2 Mode 3: UHF RFID Tx 927.25 MHz for DKRE Port 2 Mode 4: UHF RFID Tx 915.00 MHz for DKRE Port 3
Remark: For Radiated Test Cases, the tests were performed with Antenna 1 and Sample 1.	

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.

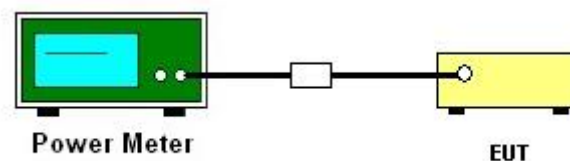
3.1.2 Measuring Instruments

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.
2. 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.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.
5. 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 :	22.2~23.7℃
Test Engineer :	Hank Hsu	Relative Humidity :	51~53.6%

<Port 2>

Frequency (MHz)	RF Power (dBm)		
	UHF	Max. Limits (dBm)	Pass/Fail
902.75	27.06	33.00	Pass
914.75	26.90	33.00	Pass
927.25	26.75	33.00	Pass

<Port 3>

Frequency (MHz)	RF Power (dBm)		
	UHF	Max. Limits (dBm)	Pass/Fail
902.75	27.04	33.00	Pass
914.75	26.90	33.00	Pass
927.25	26.79	33.00	Pass

**3.1.6 Test Result of Average Power (Reporting Only)**

Test Mode :	UHF RFID	Temperature :	22.2~23.7℃
Test Engineer :	Hank Hsu	Relative Humidity :	51~53.6%

<Port 2>

Frequency (MHz)	RF Power (dBm)
	UHF
902.75	26.69
914.75	26.49
927.25	26.35

<Port 3>

Frequency (MHz)	RF Power (dBm)
	UHF
902.75	26.64
914.75	26.49
927.25	26.40

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

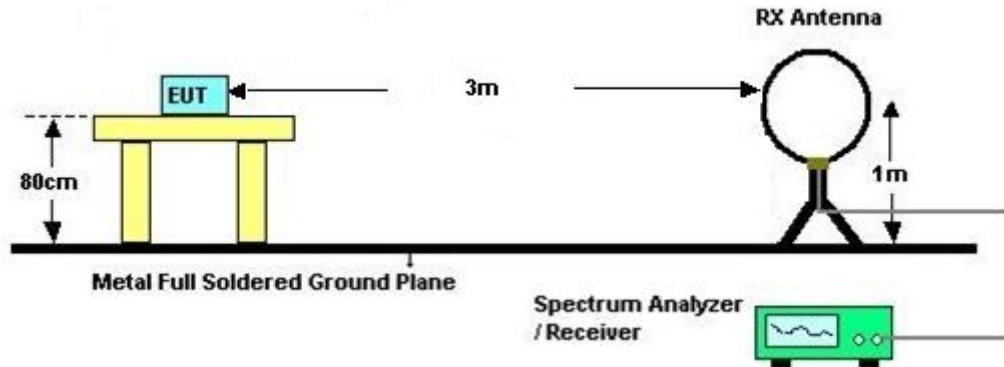
Please refer to the measuring equipment list in this test report.

3.2.3 Test Procedures

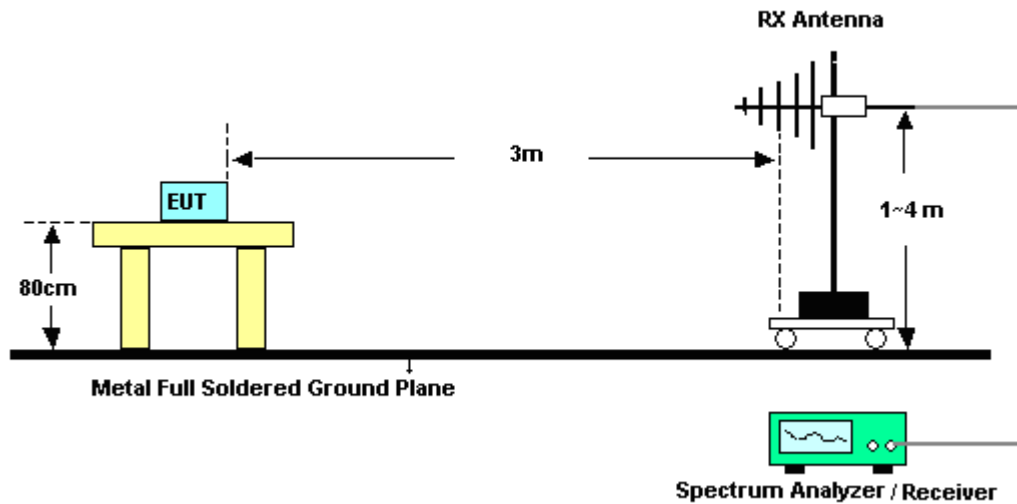
1. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
1. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
2. For each suspected emission, the 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 $\geq$ 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 = $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$
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

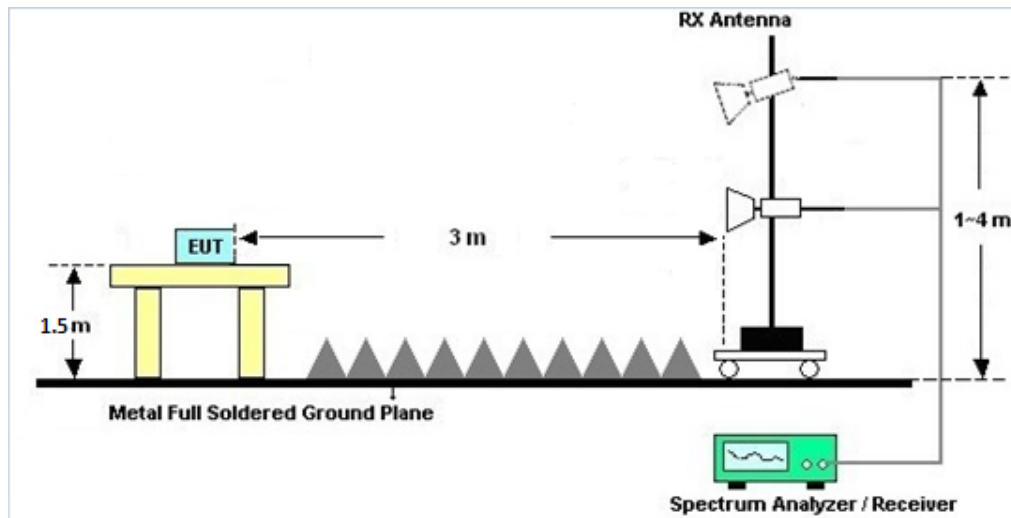
For radiated emissions below 30MHz



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

If directional gain of transmitting Antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. 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 rule.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 Antenna Gain

The antenna peak gain of EUT is 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



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. 24, 2022	Aug. 04, 2022~ Aug. 05, 2022	Apr. 23, 2023	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 03, 2021	Aug. 04, 2022~ Aug. 05, 2022	Dec. 02, 2022	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Jan. 07, 2022	Aug. 04, 2022~ Aug. 05, 2022	Jan. 06, 2023	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	1GHz~18GHz	Apr. 21, 2022	Aug. 04, 2022~ Aug. 05, 2022	Apr. 20, 2023	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	Oct. 04, 2021	Aug. 04, 2022~ Aug. 05, 2022	Oct. 03, 2022	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Jul. 22, 2022	Aug. 04, 2022~ Aug. 05, 2022	Jul. 21, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY15682/4	30MHz to 18GHz	Feb. 23, 2022	Aug. 04, 2022~ Aug. 05, 2022	Feb. 22, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971/4	9kHz to 18GHz	Feb. 23, 2022	Aug. 04, 2022~ Aug. 05, 2022	Feb. 22, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4	9kHz to 18GHz	Feb. 23, 2022	Aug. 04, 2022~ Aug. 05, 2022	Feb. 22, 2023	Radiation (03CH07-HY)
Controller	EMEC	EM1000	N/A	Control Ant Mast	N/A	Aug. 04, 2022~ Aug. 05, 2022	N/A	Radiation (03CH07-HY)
Controller	MF	MF-7802	N/A	Control Turn table	N/A	Aug. 04, 2022~ Aug. 05, 2022	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	N/A	Aug. 04, 2022~ Aug. 05, 2022	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Aug. 04, 2022~ Aug. 05, 2022	N/A	Radiation (03CH07-HY)
Attenuator	HONOVA	5910 SMA-50-005-1 9-NE	ATT-36	N/A	Oct. 30, 2021	Aug. 04, 2022~ Aug. 05, 2022	Oct. 29, 2022	Radiation (03CH07-HY)
Software	Audix	E3	N/A	N/A	N/A	Aug. 04, 2022~ Aug. 05, 2022	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	Mar. 07, 2022	Aug. 04, 2022~ Aug. 05, 2022	Mar. 06, 2023	Radiation (03CH07-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 16, 2021	Aug. 05, 2022	Nov. 15, 2022	Conducted (TH05-HY)
Power Meter	Anritsu	ML2495A	0932001	N/A	Sep. 30, 2021	Aug. 05, 2022	Sep. 29, 2022	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	0846202	300MHz~40GHz	Sep. 30, 2021	Aug. 05, 2022	Sep. 29, 2022	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 30, 2021	Aug. 05, 2022	Aug. 29, 2022	Conducted (TH05-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.1 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.8 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.0 dB
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Appendix A. Radiated Spurious Emission

Test Engineer :	Jesse Wang	Temperature :	24.7~25.3°C
		Relative Humidity :	60.2~62.4%

RFID

RFID (Band Edge @ 3m)

RFID Port 2	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamplifier Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
RFID 902.75MHz		38.25	18.48	-21.52	40	27.24	20.39	0.92	30.07	-	-	P	H
		115.32	29.45	-14.05	43.5	40.39	17.28	1.74	29.96	-	-	P	H
		263.82	18.68	-27.32	46	26.08	19.71	2.65	29.76	-	-	P	H
		407.8	21.63	-24.37	46	26.04	22.06	3.27	29.74	-	-	P	H
		611.5	25.35	-20.65	46	25.89	25.12	4.04	29.7	-	-	P	H
	*	902.75	117.06	-	-	112.17	28.62	5.07	28.8	100	181	P	H
		990.2	33.97	-20.03	54	26.98	30.2	5.32	28.53	-	-	P	H
													H
		38.25	29.09	-10.91	40	37.85	20.39	0.92	30.07	-	-	P	V
		111.81	30.4	-13.1	43.5	41.66	17	1.71	29.97	-	-	P	V
		264.9	18.23	-27.77	46	25.58	19.75	2.66	29.76	-	-	P	V
		409.9	21.43	-24.57	46	25.74	22.15	3.28	29.74	-	-	P	V
		608.7	25.56	-20.44	46	26.1	25.13	4.03	29.7	-	-	P	V
	*	902.75	117.02	-	-	112.13	28.62	5.07	28.8	100	141	P	V
		965.7	36.83	-17.17	54	29.3	30.89	5.24	28.6	-	-	P	V
													V
	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.												

RFID Port 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)
RFID 915MHz		38.25	20.15	-19.85	40	28.91	20.39	0.92	30.07	-	-	P	H
		111.54	28.16	-15.34	43.5	39.44	16.98	1.71	29.97	-	-	P	H
		264.09	18.63	-27.37	46	26.02	19.72	2.65	29.76	-	-	P	H
		409.9	21.05	-24.95	46	25.36	22.15	3.28	29.74	-	-	P	H
		612.9	24.79	-21.21	46	25.31	25.13	4.05	29.7	-	-	P	H
	*	915	117.3	-	-	112.09	28.87	5.1	28.76	100	177	P	H
		991.6	35.18	-18.82	54	28.21	30.17	5.33	28.53	-	-	P	H
													H
													H
													H
													H
													H
		38.25	28.55	-11.45	40	37.31	20.39	0.92	30.07	-	-	P	V
		109.92	29.97	-13.53	43.5	41.43	16.82	1.69	29.97	-	-	P	V
		263.28	19.41	-26.59	46	26.83	19.69	2.65	29.76	-	-	P	V
		401.5	20.74	-25.26	46	25.48	21.75	3.24	29.73	-	-	P	V
		611.5	24.45	-21.55	46	24.99	25.12	4.04	29.7	-	-	P	V
	*	915	117.34	-	-	112.13	28.87	5.1	28.76	100	143	P	V
		977.6	36.76	-17.24	54	29.36	30.69	5.28	28.57	-	-	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.												

RFID Port 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)
RFID 927.25MHz		38.25	21.25	-18.75	40	30.01	20.39	0.92	30.07	-	-	P	H
		112.89	29.23	-14.27	43.5	40.41	17.06	1.72	29.96	-	-	P	H
		282.45	18.95	-27.05	46	27.07	18.88	2.76	29.76	-	-	P	H
		405.7	21.57	-24.43	46	26.07	21.98	3.26	29.74	-	-	P	H
		612.2	25.84	-20.16	46	26.36	25.13	4.05	29.7	-	-	P	H
	*	927.25	118.2	-	-	112.68	29.11	5.13	28.72	100	182	P	H
		965.7	35.07	-18.93	54	27.54	30.89	5.24	28.6	-	-	P	H
													H
													H
													H
													H
													H
													H
		37.83	28.34	-11.66	40	36.88	20.61	0.92	30.07	-	-	P	V
		109.38	29.97	-13.53	43.5	41.47	16.78	1.69	29.97	-	-	P	V
		263.82	19.14	-26.86	46	26.54	19.71	2.65	29.76	-	-	P	V
		403.6	21.81	-24.19	46	26.42	21.87	3.25	29.73	-	-	P	V
		608	25.8	-20.2	46	26.33	25.14	4.03	29.7	-	-	P	V
	*	927.25	118.25	-	-	112.73	29.11	5.13	28.72	100	140	P	V
		988.1	36.22	-17.78	54	29.17	30.27	5.32	28.54	-	-	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.												



RFID (Harmonic @ 3m)

RFID Port 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)
RFID 902.75MHz		2708.25	50.24	-23.76	74	66.75	32.65	9.2	58.86	376	146	P	H
		2708.25	48.18	-5.82	54	64.69	32.65	9.2	58.86	376	146	A	H
		3611	39.73	-34.27	74	54.63	33.12	10.63	59.32	-	-	P	H
		4513.75	42.22	-31.78	74	55.83	34.01	11.19	59.52	-	-	P	H
		5416.5	40.08	-33.92	74	49.82	34.7	12.03	57.33	-	-	P	H
		8124.75	40.57	-33.43	74	46.57	35.8	14.82	57.46	-	-	P	H
		9027.5	41.87	-32.13	74	47.65	36.3	15.59	58.56	-	-	P	H
		2708.25	52.04	-21.96	74	68.55	32.65	9.2	58.86	303	219	P	V
		2708.25	50.01	-3.99	54	66.52	32.65	9.2	58.86	303	219	A	V
		3611	40.52	-33.48	74	55.42	33.12	10.63	59.32	-	-	P	V
		4513.75	41.94	-32.06	74	55.55	34.01	11.19	59.52	-	-	P	V
		5416.5	39.89	-34.11	74	49.63	34.7	12.03	57.33	-	-	P	V
		8124.75	40.64	-33.36	74	46.64	35.8	14.82	57.46	-	-	P	V
		9027.5	41.52	-32.48	74	47.3	36.3	15.59	58.56	-	-	P	V
RFID 915MHz		2745	51.6	-22.4	74	68.19	32.43	9.32	58.86	400	144	P	H
		2745	49.85	-4.15	54	66.44	32.43	9.32	58.86	400	144	A	H
		3660	42.35	-31.65	74	57.15	33.2	10.66	59.38	-	-	P	H
		4575	45.66	-28.34	74	58.81	34.35	11.13	59.41	-	-	P	H
		7320	41.29	-32.71	74	48.06	35.68	14.03	57.5	-	-	P	H
		8235	41.09	-32.91	74	47.08	35.8	14.9	57.48	-	-	P	H
		9150	40.34	-33.66	74	46.65	36.1	15.7	58.81	-	-	P	H
		2745	52.37	-21.63	74	68.96	32.43	9.32	58.86	100	208	P	V
		2745	50.97	-3.03	54	67.56	32.43	9.32	58.86	100	208	A	V
		3660	42.06	-31.94	74	56.86	33.2	10.66	59.38	-	-	P	V
		4575	44.47	-29.53	74	57.62	34.35	11.13	59.41	-	-	P	V
		7320	41.2	-32.8	74	47.97	35.68	14.03	57.5	-	-	P	V
		8235	39.95	-34.05	74	45.94	35.8	14.9	57.48	-	-	P	V
		9150	40.6	-33.4	74	46.91	36.1	15.7	58.81	-	-	P	V



RFID 927.25MHz		2781.75	48.88	-25.12	74	65.34	32.4	9.44	58.86	-	-	P	H
		3709	43.01	-30.99	74	57.8	33.2	10.68	59.44	-	-	P	H
		4636.25	42.12	-31.88	74	55.07	34.4	11.17	59.3	-	-	P	H
		7418	40.66	-33.34	74	47.22	35.86	14.14	57.58	-	-	P	H
		8345.25	40.21	-33.79	74	46.38	35.8	14.81	57.5	-	-	P	H
		2781.75	48.01	-25.99	74	64.47	32.4	9.44	58.86	-	-	P	V
		3709	41.42	-32.58	74	56.21	33.2	10.68	59.44	-	-	P	V
		4636.25	39.35	-34.65	74	52.3	34.4	11.17	59.3	-	-	P	V
		7418	40.1	-33.9	74	46.66	35.86	14.14	57.58	-	-	P	V
		8345.25	40.15	-33.85	74	46.32	35.8	14.81	57.5	-	-	P	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.												


RFID
RFID (Band Edge @ 3m)

RFID	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Port 3					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
RFID 915MHz		38.25	17.56	-22.44	40	26.32	20.39	0.92	30.07	-	-	P	H
		116.94	28.46	-15.04	43.5	39.36	17.31	1.75	29.96	-	-	P	H
		263.82	19.09	-26.91	46	26.49	19.71	2.65	29.76	-	-	P	H
		409.2	21.31	-24.69	46	25.65	22.12	3.28	29.74	-	-	P	H
		609.4	26.36	-19.64	46	26.91	25.12	4.03	29.7	-	-	P	H
	*	915	117.74	-	-	112.53	28.87	5.1	28.76	116	197	P	H
		962.2	33.68	-20.32	54	26.22	30.85	5.22	28.61	-	-	P	H
													H
													H
													H
		38.25	28.49	-11.51	40	37.25	20.39	0.92	30.07	-	-	P	V
		115.59	28.05	-15.45	43.5	38.97	17.3	1.74	29.96	-	-	P	V
		263.01	18.7	-27.3	46	26.13	19.68	2.65	29.76	-	-	P	V
		402.2	21.19	-24.81	46	25.89	21.79	3.24	29.73	-	-	P	V
		608.7	25.33	-20.67	46	25.87	25.13	4.03	29.7	-	-	P	V
	*	915	117.84	-	-	112.63	28.87	5.1	28.76	100	160	P	V
		977.6	35.92	-18.08	54	28.52	30.69	5.28	28.57	-	-	P	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.											



RFID (Harmonic @ 3m)

RFID Port 3	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)
RFID 915MHz		2745	52.07	-21.93	74	68.66	32.43	9.32	58.86	394	147	P	H
		2745	50.3	-3.7	54	66.89	32.43	9.32	58.86	394	147	A	H
		3660	40.03	-33.97	74	54.83	33.2	10.66	59.38	-	-	P	H
		4575	43.25	-30.75	74	56.4	34.35	11.13	59.41	-	-	P	H
		7320	40.67	-33.33	74	47.44	35.68	14.03	57.5	-	-	P	H
		8235	40.44	-33.56	74	46.43	35.8	14.9	57.48	-	-	P	H
		9150	41.2	-32.8	74	47.51	36.1	15.7	58.81	-	-	P	H
		2745	52.4	-21.6	74	68.99	32.43	9.32	58.86	270	222	P	V
		2745	50.8	-3.2	54	67.39	32.43	9.32	58.86	270	222	A	V
		3660	40.51	-33.49	74	55.31	33.2	10.66	59.38	-	-	P	V
		4575	41.89	-32.11	74	55.04	34.35	11.13	59.41	-	-	P	V
		7320	40.72	-33.28	74	47.49	35.68	14.03	57.5	-	-	P	V
		8235	40.54	-33.46	74	46.53	35.8	14.9	57.48	-	-	P	V
		9150	41.66	-32.34	74	47.97	36.1	15.7	58.81	-	-	P	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 and emission level has at least 6dB margin against limit or emission is 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 over limit line.
P/A	Peak or Average
H/V	Horizontal or Vertical



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.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
UHF RFID 913.25MHz		2739.75	38.54	-35.46	74	55.12	32.46	9.82	58.86	103	308	P	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 @ 2739.75MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.46(dB/m) + 9.82(dB) + 55.12(dBμV) – 58.86 (dB)
= 38.54 (dBμV/m)
2. Margin(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 38.54(dBμV/m) – 74(dBμV/m)
= -35.46(dB)

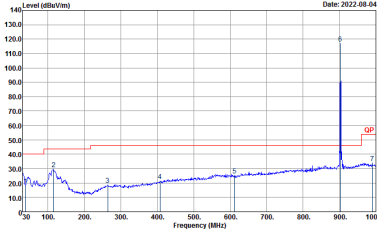
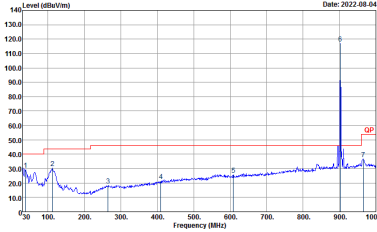
Peak measured complies with the limit line, so test result is “PASS”.



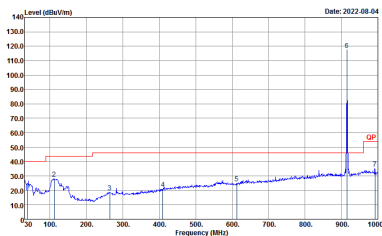
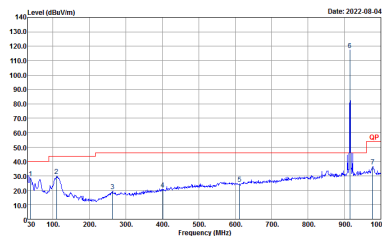
Appendix B. Radiated Spurious Emission Plots

Test Engineer :	Jesse Wang	Temperature :	24.7~25.3°C
		Relative Humidity :	60.2~62.4%

RFID (Band Edge @ 3m)

RFID	RFID	
Port 2	RFID 902.75MHz	
	Horizontal	Vertical
QP / Peak	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(s) HORIZONTAL Detector : Peak Project : 051819-03 Mode : 1	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(s) VERTICAL Detector : Peak Project : 051819-03 Mode : 1



RFID	RFID	
	RFID 915MHz	
	Horizontal	Vertical
QP / Peak	 Site : 03CH07-HY Condition : QP 3m (F-ANT-35419(s) HORIZONTAL Detector : Peak Project : 051819-03 Mode : 2	 Site : 03CH07-HY Condition : QP 3m (F-ANT-35419(s) VERTICAL Detector : Peak Project : 051819-03 Mode : 2



RFID	RFID	
	RFID 927.25MHz	
	Horizontal	Vertical
Peak Avg.	Level (dBuV/m) Date: 2022-08-04 Frequency (MHz) Site : 03CH07-HY Condition : QP 3m (F-ANT-35419(s) HORIZONTAL Detector : Peak Project : 051819-03 Mode : 3	Level (dBuV/m) Date: 2022-08-04 Frequency (MHz) Site : 03CH07-HY Condition : QP 3m (F-ANT-35419(s) VERTICAL Detector : Peak Project : 051819-03 Mode : 3



RFID (Harmonic @ 3m)

RFID	RFID	
	RFID 902.75MHz	
	Horizontal	Vertical
Peak Avg.	Level (dBuV/m) Date: 2022-08-04 Frequency (MHz) Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 051819-03 Mode : 1	Level (dBuV/m) Date: 2022-08-04 Frequency (MHz) Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 051819-03 Mode : 1



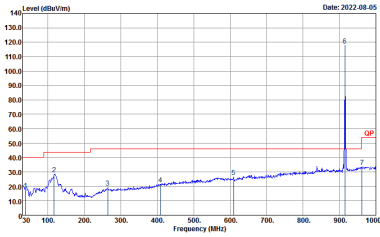
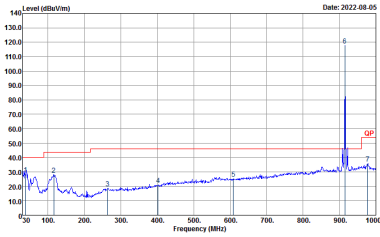
RFID	RFID	
	RFID 915MHz	
	Horizontal	Vertical
Peak Avg.	Level (dBuV/m) Date: 2022-08-05 Site : 03CH07-4Y Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 051819-03 Mode : 2	Level (dBuV/m) Date: 2022-08-05 Site : 03CH07-4Y Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 051819-03 Mode : 2



RFID	RFID	
	RFID 927.25MHz	
	Horizontal	Vertical
Peak Avg.	Level (dBuV/m) Date: 2022-08-05 Frequency (kHz) Site : 03CH07-4Y Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 051819-03 Mode : 3	Level (dBuV/m) Date: 2022-08-05 Frequency (kHz) Site : 03CH07-4Y Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 051819-03 Mode : 3



RFID (Band Edge @ 3m)

RFID	RFID	
Port 3	RFID 915MHz	
	Horizontal	Vertical
QP / Peak	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6) HORIZONTAL Detector : Peak Project : 051819-03 Mode : -4	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6) VERTICAL Detector : Peak Project : 051819-03 Mode : -4



RFID (Harmonic @ 3m)

RFID	RFID	
Port 3	RFID 915MHz	
	Horizontal	Vertical
Peak Avg.	Level (dBuV/m) Date: 2022-08-05 Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 051819-03 Mode : -4	Level (dBuV/m) Date: 2022-08-05 Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 051819-03 Mode : -4



Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
RFID	88.76	49040	0.02	30Hz

