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 Feb. 13, 2025 and testing was started from Mar. 14, 2025 to Mar. 22, 2025. 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 **3**
Summary of Test Result **4**
1 General Description **5**
1.1 Product Feature of Equipment Under Test 5
1.2 Product Specification of Equipment Under Test 6
1.3 Modification of EUT 6
1.4 Testing Location 6
1.5 Applicable Standards 7
2 Test Configuration of Equipment Under Test **8**
2.1 Carrier Frequency Channel 8
2.2 Test Mode 9
2.3 Connection Diagram of Test System 10
2.4 Support Unit used in test configuration and system 11
2.5 EUT Operation Test Setup 11
2.6 Measurement Results Explanation Example 11
3 Test Result **12**
3.1 Number of Channel Measurement 12
3.2 Hopping Channel Separation Measurement 14
3.3 Dwell Time Measurement 16
3.4 20dB and 99% Bandwidth Measurement 18
3.5 Output Power Measurement 21
3.6 Conducted Band Edges Measurement 23
3.7 Conducted Spurious Emission Measurement 26
3.8 Radiated Band Edges and Spurious Emission Measurement 28
3.9 AC Power Line Conducted Emissions Measurement 32
3.10 Antenna Requirements 34
4 List of Measuring Equipment **35**
5 Measurement Uncertainty **37**
Appendix A. AC Conducted Emission Test Result
Appendix B. Radiated Spurious Emission
Appendix C. Radiated Spurious Emission Plots
Appendix D. Duty Cycle Plots
Appendix E. Setup Photographs

History of this test report

Report No.	Version	Description	Issue Date
FR1N1506-13	01	Initial issue of report	Apr. 21, 2025

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(1)	Number of Channels	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	Pass	-
3.4	2.1049	99% Occupied Bandwidth	Pass	-
3.5	15.247(b)(1)	Output Power	Pass	-
3.6	15.247(d)	Conducted Band Edges	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	8.36 dB under the limit at 54.30 MHz
3.9	15.207	AC Conducted Emission	Pass	14.29 dB under the limit at 0.16 MHz
3.10	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Note: This is a variant report which replacing the original non-pin-to-pin compatible RF Power Amplifier. For the detailed changed items are described in change note exhibits. All the test cases were performed on original report which can be referred to Sporton Report Number FR1N1506-12. 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
EUT supports Radios application	UHF RFID
HW Version	Rev: C
FW Version	SAAFKS00-006-R01
MFD	23JAN25
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**	TC77HL
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	**<Long Range>:** 29.76 dBm (0.9462W) **<Standard Range>:** 29.87 dBm (0.9705W)
20dB Bandwidth	**<Standard Range>:** 0.087 MHz
99% Occupied Bandwidth	**<Standard Range>:** 0.084 MHz
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.**
	CO05-HY, 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	902.75	28	916.25
	2	903.25	29	916.75
	3	903.75	30	917.25
	4	904.25	31	917.75
	5	904.75	32	918.25
	6	905.25	33	918.75
	7	905.75	34	919.25
	8	906.25	35	919.75
	9	906.75	36	920.25
	10	907.25	37	920.75
	11	907.75	38	921.25
	12	908.25	39	921.75
	13	908.75	40	922.25
	14	909.25	41	922.75
	15	909.75	42	923.25
	16	910.25	43	923.75
	17	910.75	44	924.25
	18	911.25	45	924.75
	19	911.75	46	925.25
	20	912.25	47	925.75
	21	912.75	48	926.25
	22	913.25	49	926.75
	23	913.75	50	927.25
	24	914.25		
	25	914.75		
	26	915.25		
	27	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: conduction emission (150 kHz to 30 MHz), 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.

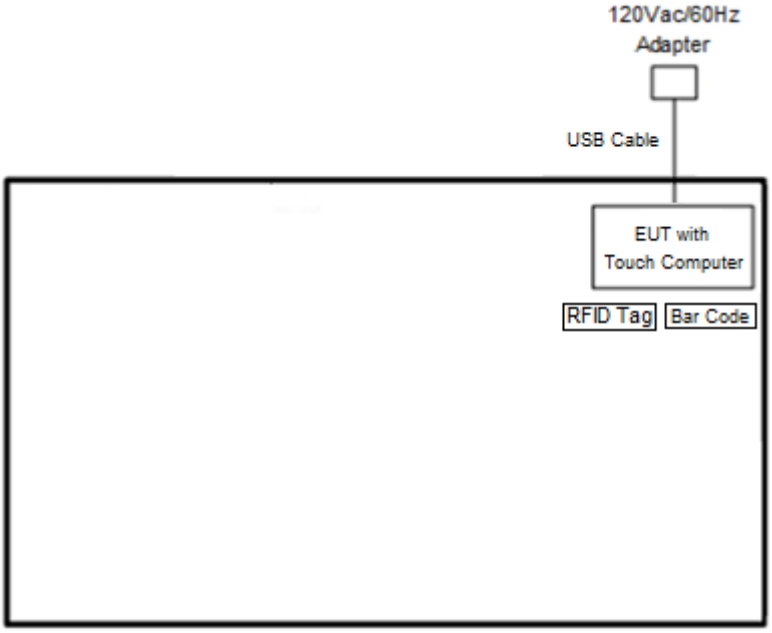
b. AC power line Conducted Emission was tested under maximum output power.

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

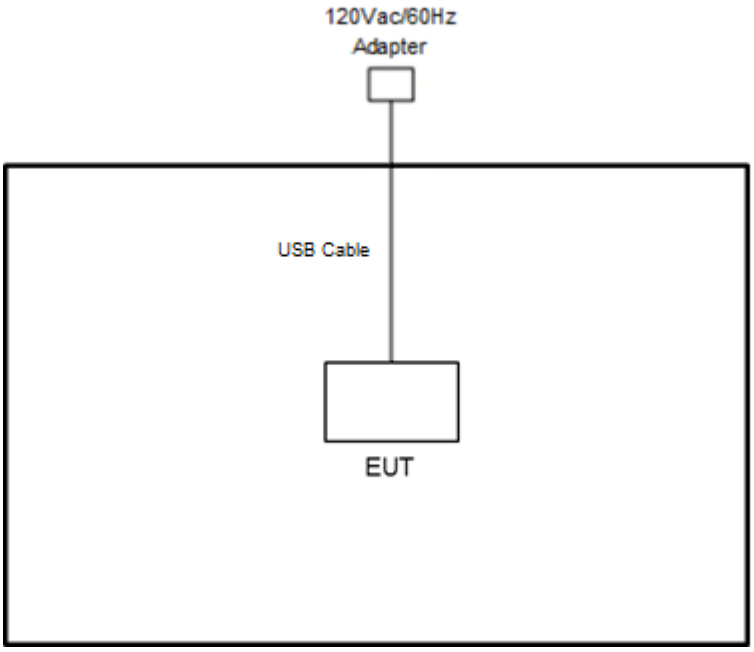
Summary table of Test Cases	
Test Item	**UHF RFID**
Conducted Test Cases	**<Long Range>** Mode 1: UHF RFID Tx 902.75 MHz Mode 2: UHF RFID Tx 914.75 MHz Mode 3: UHF RFID Tx 927.25 MHz **<Standard Range>** Mode 1: UHF RFID Tx 902.75 MHz Mode 2: UHF RFID Tx 914.75 MHz Mode 3: UHF RFID Tx 927.25 MHz
Radiated Test Cases	**<Long Range>** Mode 1: UHF RFID Tx CH00_902.75 MHz for Sample 3 Mode 2: UHF RFID Tx CH24_914.75 MHz for Sample 3 Mode 3: UHF RFID Tx CH49_927.25 MHz for Sample 3 **<Standard Range>** Mode 1: UHF RFID Tx CH00_920.75 MHz for Sample 2 Mode 2: UHF RFID Tx CH24_914.75 MHz for Sample 2 Mode 3: UHF RFID Tx CH49_927.25 MHz for Sample 2
AC Conducted Emission	Mode 1: UHF RFID Link + Touch Computer + USB Cable 2 (Charging from AC Adapter) + Scan Bar Code for Sample 1
Remark: 1. For Conducted Test Cases, the Long Range mode has no higher power than Standard Range mode, thus the Standard Range mode is chosen as main test configuration, and the Long Range mode is verified the power. 2. For Radiated Test Cases, the tests were performed with USB Cable 2.	

2.3 Connection Diagram of Test System

<AC Conducted Emission Mode>



<Radiated Spurious Emission Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	RFID Tag	N/A	N/A	N/A	N/A	N/A

2.5 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.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.
Following shows an offset computation example with cable loss 4.2 dB and 10 dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

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; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

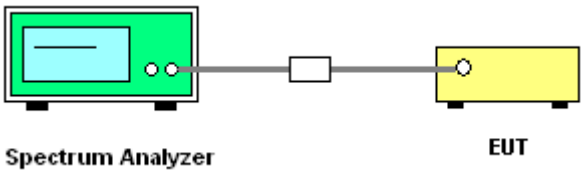
3.1.2 Measuring Instruments

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

3.1.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.3.
2. The RF output of EUT was connected to the spectrum analyzer 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. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW = 300 kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

3.1.4 Test Setup



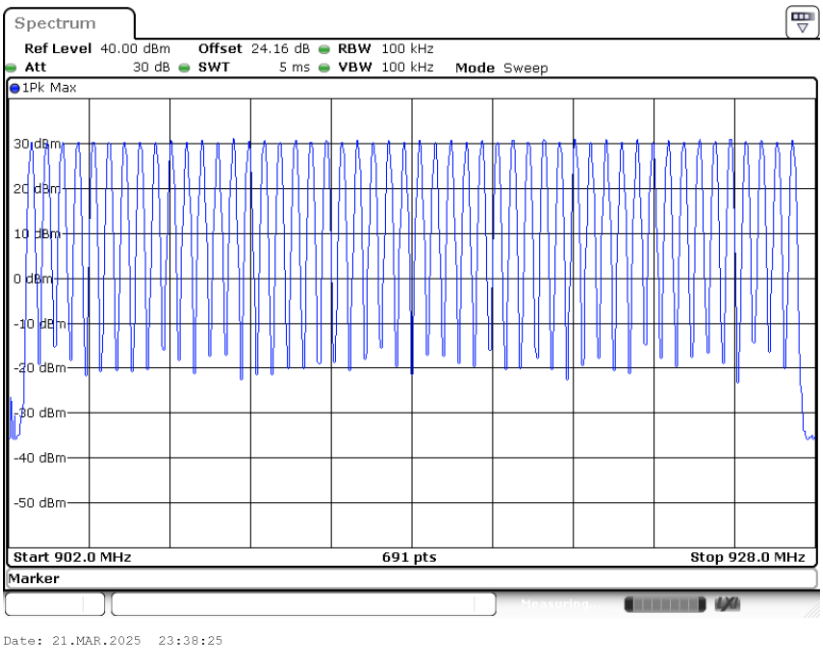
3.1.5 Test Result of Number of Hopping Frequency

Test Mode :	UHF RFID	**Temperature :**	20~25℃
Test Engineer :	Willy Chang	**Relative Humidity :**	50~56%

<Standard Range>

Number of Hopping (Channel)	Limits (Channel)	Pass/Fail
50	≧ 50	Pass

Number of Hopping Channel Plot on Channel 01-50



3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

Frequency hopping systems operating in the 902.75-927.25 MHz band may have hopping channel carrier frequencies that are 20 dB bandwidth of the hopping channel.

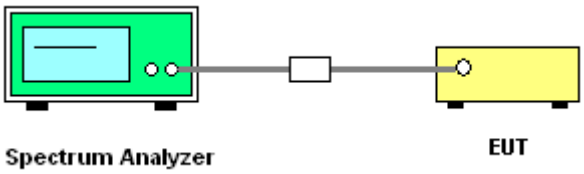
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.2.
2. The RF output of EUT was connected to the spectrum analyzer 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. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels;
   RBW = 100 kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.2.4 Test Setup



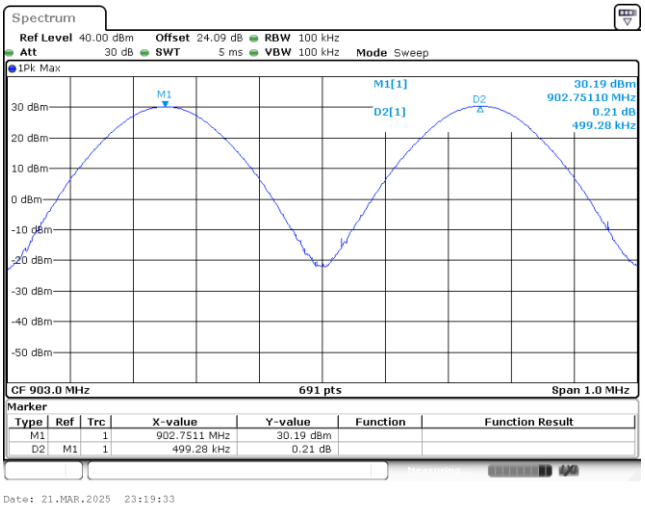
3.2.5 Test Result of Hopping Channel Separation

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

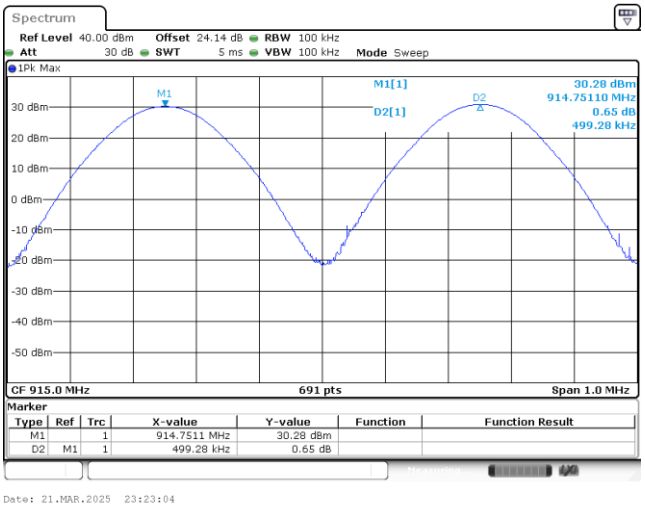
<Standard Range>

Mod.	NTX	Freq. (MHz)	Hopping Channel Separation Measurement (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
UHF RFID	1	902.75	0.499	0.0853	Pass
UHF RFID	1	914.75	0.499	0.0871	Pass
UHF RFID	1	927.25	0.499	0.0781	Pass

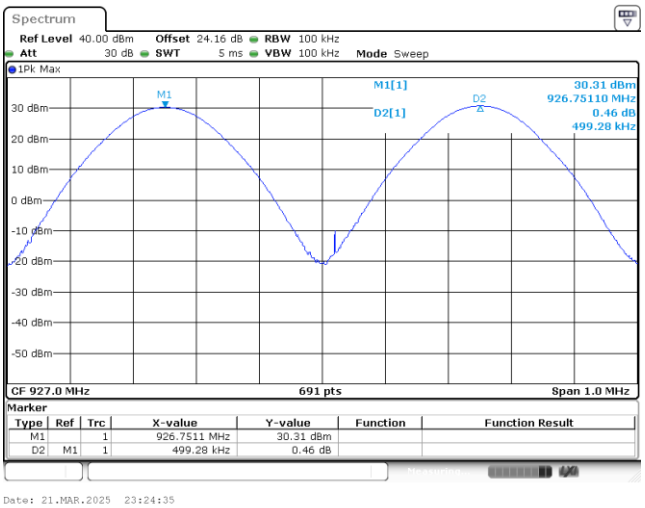
Channel Separation Plot on 902.75 MHz



Channel Separation Plot on 914.75 MHz



Channel Separation Plot on 927.25 MHz



3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 20 seconds multiplied by the number of hopping channels employed.

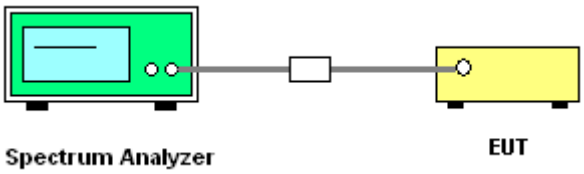
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.4.
2. The RF output of EUT was connected to the spectrum analyzer 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. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.3.4 Test Setup



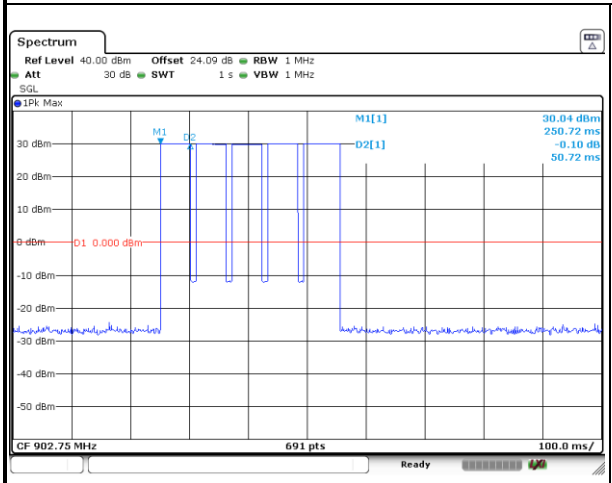
3.3.5 Test Result of Dwell Time

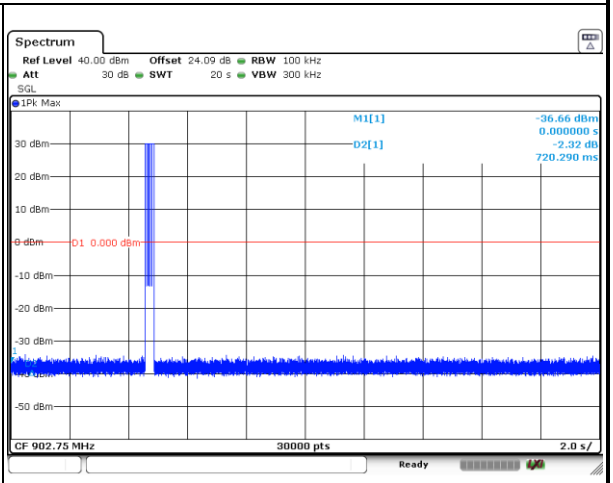
Test Mode :	UHF RFID	**Temperature :**	20~25℃
Test Engineer :	Willy Chang	**Relative Humidity :**	50~56%

<Standard Range>

Mod.	Channel Number Rate	Package Transfer Time (msec)	Hops Over Occupancy Time (hops)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Nomal	50	50.72	5.00	0.254	0.4	Pass

Package Transfer Time Plot





Remark: Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

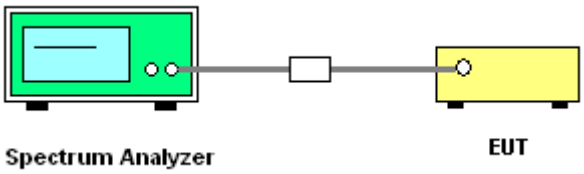
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 6.9.2 and 6.9.3.
2. The RF output of EUT was connected to the spectrum analyzer 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. Use the following spectrum analyzer settings for 20 dB Bandwidth measurement.
   Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;
   RBW ≥ 1% of the 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
5. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
   Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;
   RBW ≥ 1-5% of the 99% bandwidth; VBW ≥ 3 * RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
6. Measure and record the results in the test report.

3.4.4 Test Setup



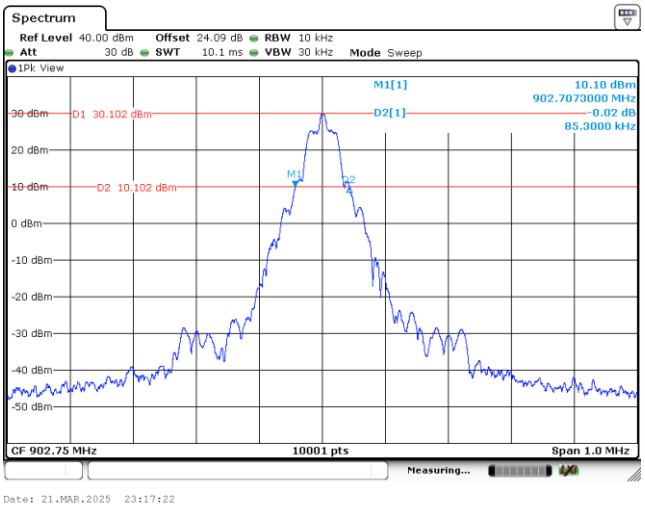
3.4.5 Test Result of 20dB Bandwidth

Test Mode :	UHF RFID	**Temperature :**	20~25℃
Test Engineer :	Willy Chang	**Relative Humidity :**	50~56%

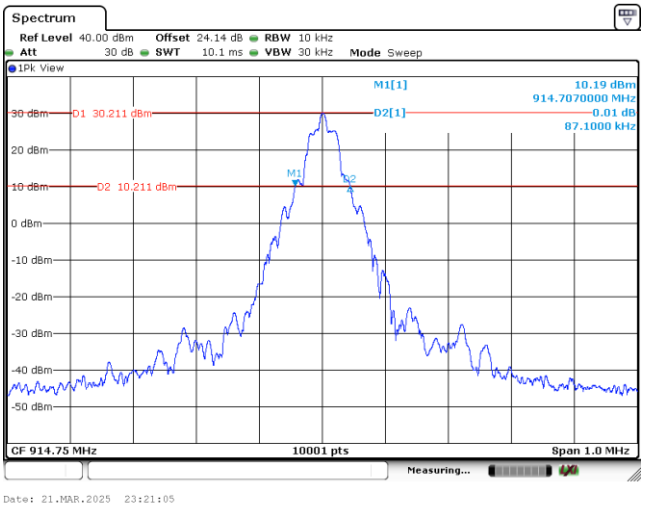
<Standard Range>

Mod.	NTX	Freq.(MHz)	20db BW (MHz)	Pass/Fail
UHF RFID	1	902.75	0.085	Pass
UHF RFID	1	914.75	0.087	Pass
UHF RFID	1	927.25	0.078	Pass

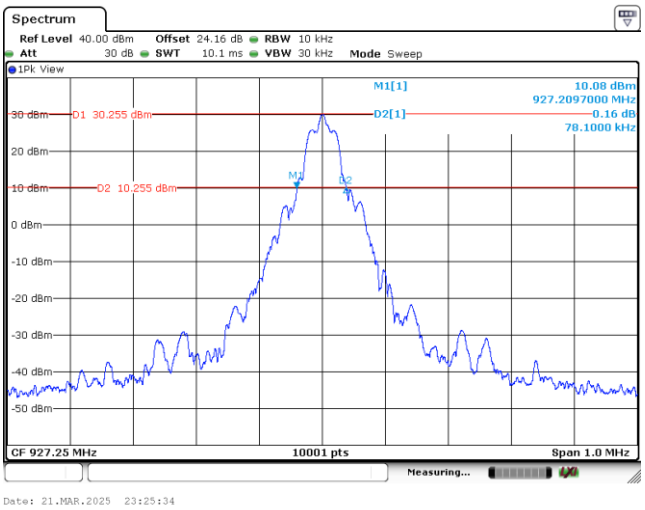
20 dB Bandwidth Plot on 902.75 MHz



20 dB Bandwidth Plot on 914.75 MHz



20 dB Bandwidth Plot on 927.25 MHz



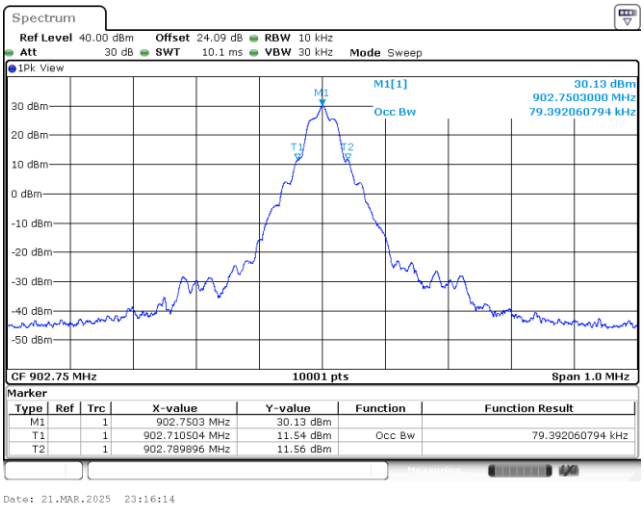
3.4.6 Test Result of 99% Occupied Bandwidth

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

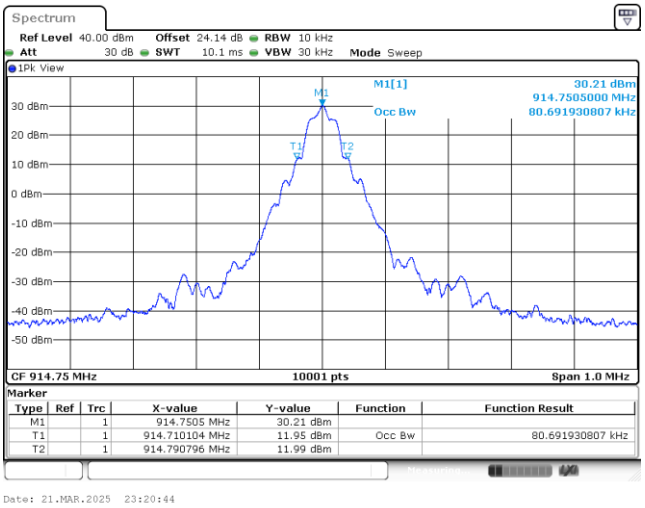
<Standard Range>

Mod.	NTX	Freq. (MHz)	99% Bandwidth (MHz)	Pass/Fail
UHF RFID	1	902.75	0.079	Reporting Only
UHF RFID	1	914.75	0.081	Reporting Only
UHF RFID	1	927.25	0.084	Reporting Only

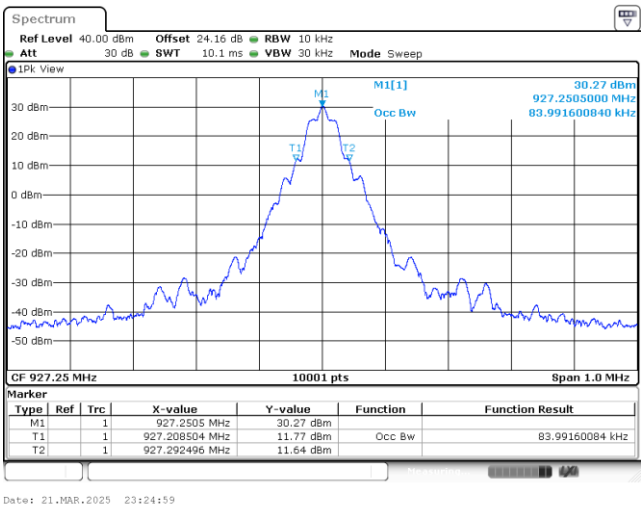
99% Occupied Bandwidth Plot on 902.75 MHz



99% Occupied Bandwidth Plot on 914.75 MHz



99% Occupied Bandwidth Plot on 927.25 MHz



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.5 Output Power Measurement

3.5.1 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.

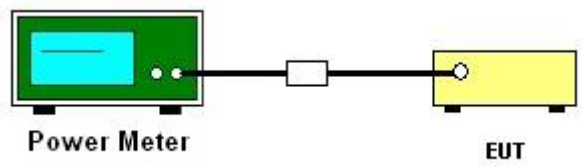
3.5.2 Measuring Instruments

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

3.5.3 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.

3.5.4 Test Setup



3.5.5 Test Result of Output Power

Test Mode :	UHF RFID	**Temperature :**	20~25℃
Test Engineer :	Willy Chang	**Relative Humidity :**	50~56%

<Long Range>

Frequency (MHz)	RF Power (dBm)		
	UHF	Max. Limits (dBm)	Pass/Fail
902.75	29.69	30.00	Pass
914.75	29.76	30.00	Pass
927.25	29.74	30.00	Pass

<Standard Range>

Frequency (MHz)	RF Power (dBm)		
	UHF	Max. Limits (dBm)	Pass/Fail
902.75	29.71	30.00	Pass
914.75	29.81	30.00	Pass
927.25	29.87	30.00	Pass

3.5.6 Test Result of Average Power (Reporting Only)

Test Mode :	UHF RFID	**Temperature :**	20~25℃
Test Engineer :	Willy Chang	**Relative Humidity :**	50~56%

<Long Range>

Frequency (MHz)	RF Power (dBm)
	UHF
902.75	28.93
914.75	29.09
927.25	29.06

<Standard Range>

Frequency (MHz)	RF Power (dBm)
	UHF
902.75	29.35
914.75	29.41
927.25	29.51

3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

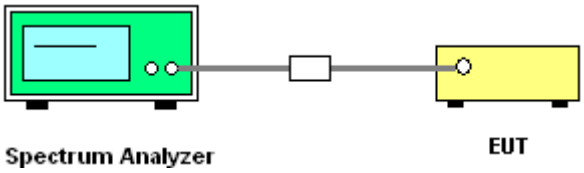
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.6.
2. Set the maximum power setting and enable the EUT to transmit continuously.
3. Set RBW = 100 kHz, VBW = 300 kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2 and 3.
5. Measure and record the results in the test report.

3.6.4 Test Setup

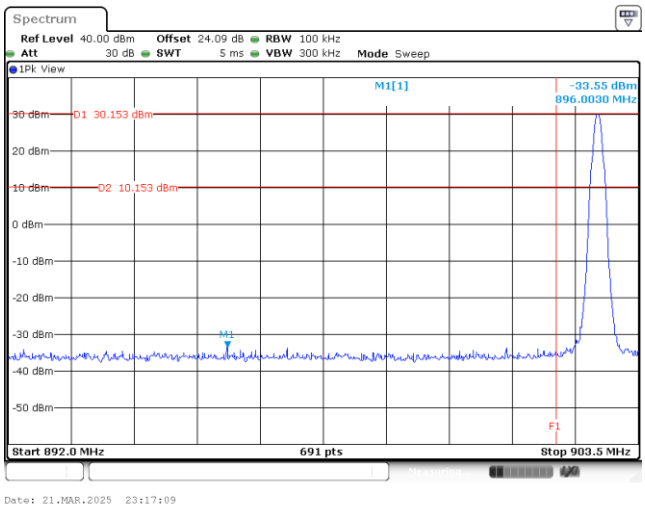


3.6.5 Test Result of Conducted Band Edges

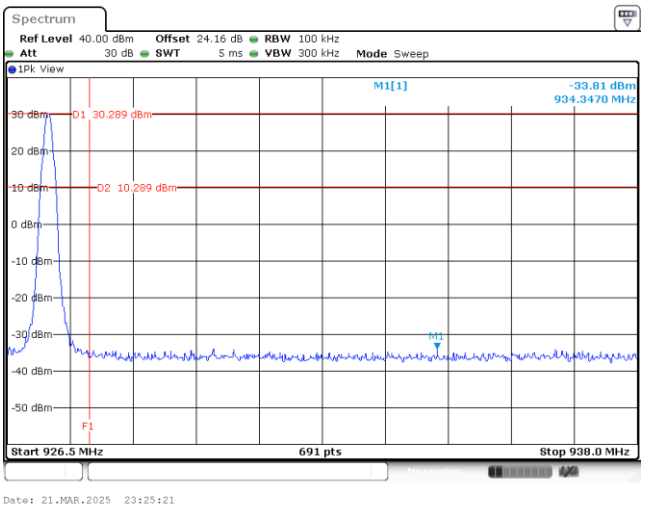
Test Mode :	UHF RFID	**Temperature :**	20~25℃
Test Engineer :	Willy Chang	**Relative Humidity :**	50~56%

<Standard Range>

Low Band Edge Plot on 902.75 MHz



High Band Edge Plot on 927.25 MHz

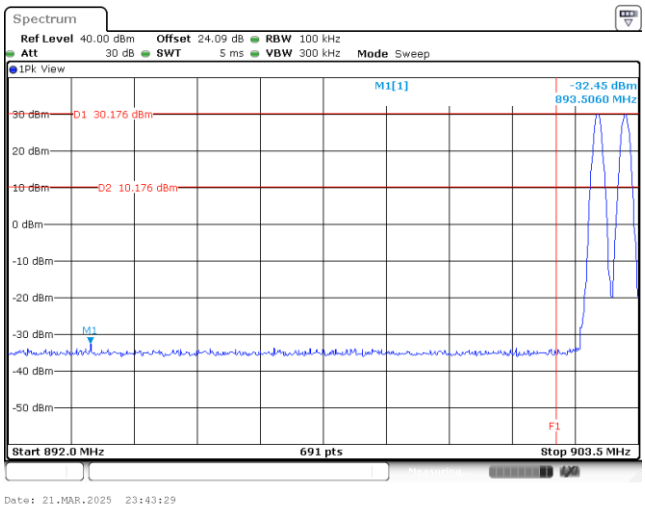


3.6.6 Test Result of Conducted Hopping Mode Band Edges

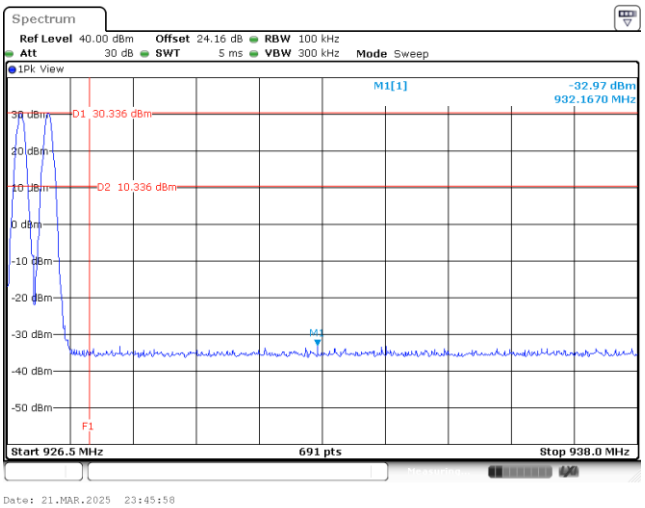
Test Mode :	UHF RFID	**Temperature :**	20~25℃
Test Engineer :	Willy Chang	**Relative Humidity :**	50~56%

<Standard Range>

Hopping Mode Low Band Edge Plot on 902.75 MHz



Hopping Mode High Band Edge Plot on 927.25 MHz



3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

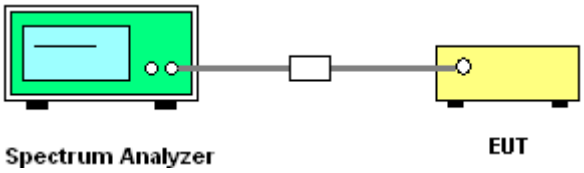
3.7.2 Measuring Instruments

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

3.7.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.8.
2. The RF output of EUT was connected to the spectrum analyzer 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. Set RBW = 100 kHz, VBW = 300 kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.7.4 Test Setup

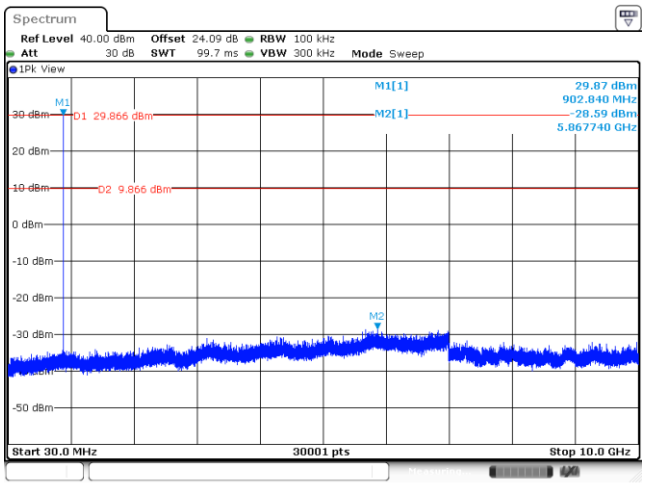


3.7.5 Test Result of Conducted Spurious Emission

Test Mode :	UHF RFID	**Temperature :**	20~25℃
Test Engineer :	Willy Chang	**Relative Humidity :**	50~56%

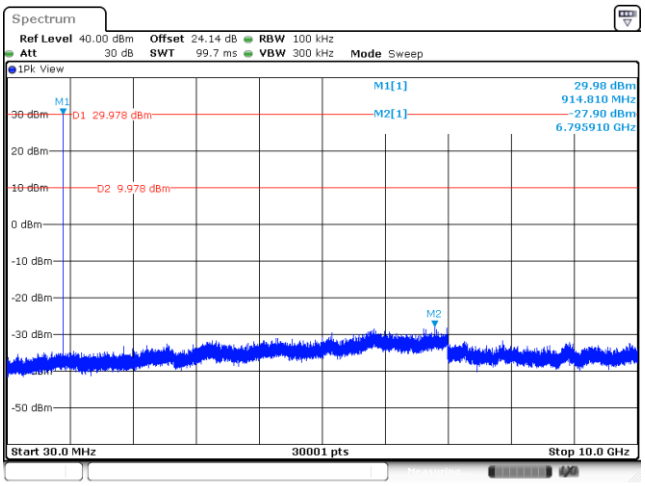
<Standard Range>

CSE Plot on 902.75 MHz between 30MHz ~ 10 GHz



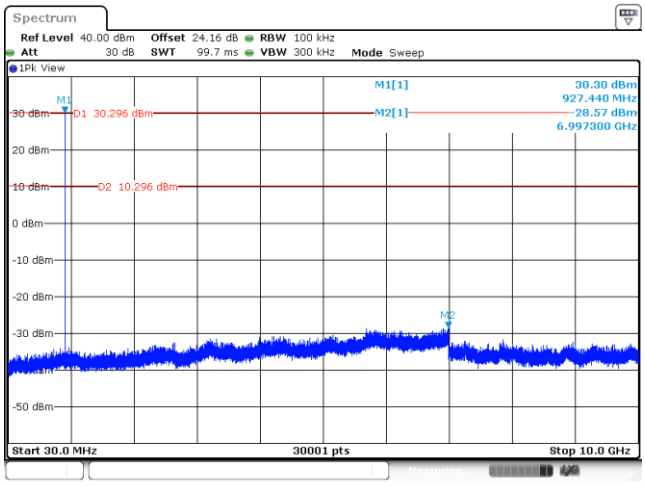
Date: 21.MAR.2025 23:18:12

CSE Plot on 914.75 MHz between 30MHz ~ 10 GHz



Date: 21.MAR.2025 23:21:43

CSE Plot on 927.25 MHz between 30MHz ~ 10 GHz



Date: 21.MAR.2025 23:26:14

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 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

3.8.2 Measuring Instruments

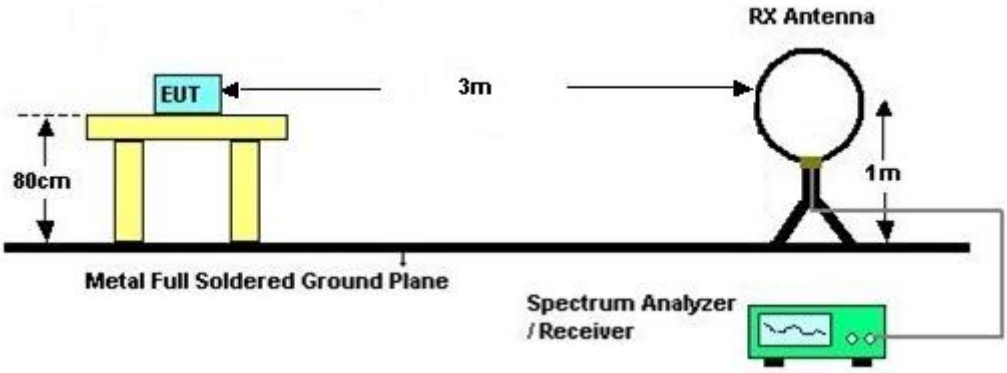
Please refer to the measuring equipment list in this test report.

3.8.3 Test Procedures

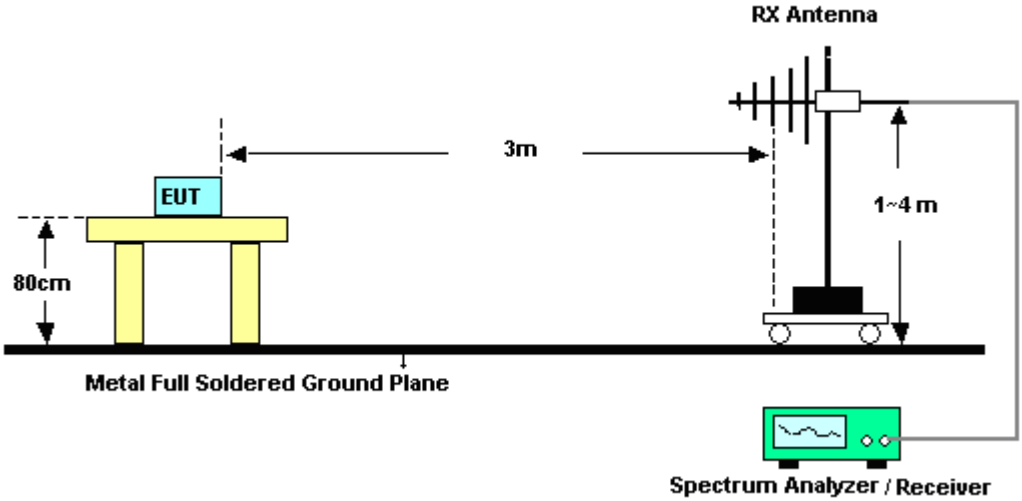
1. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
2. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
3. For each suspected emission, the 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.
4. Set the maximum power setting and enable the EUT to transmit continuously.
5. 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)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. 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 “-“.
8. 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 “-“.

3.8.4 Test Setup

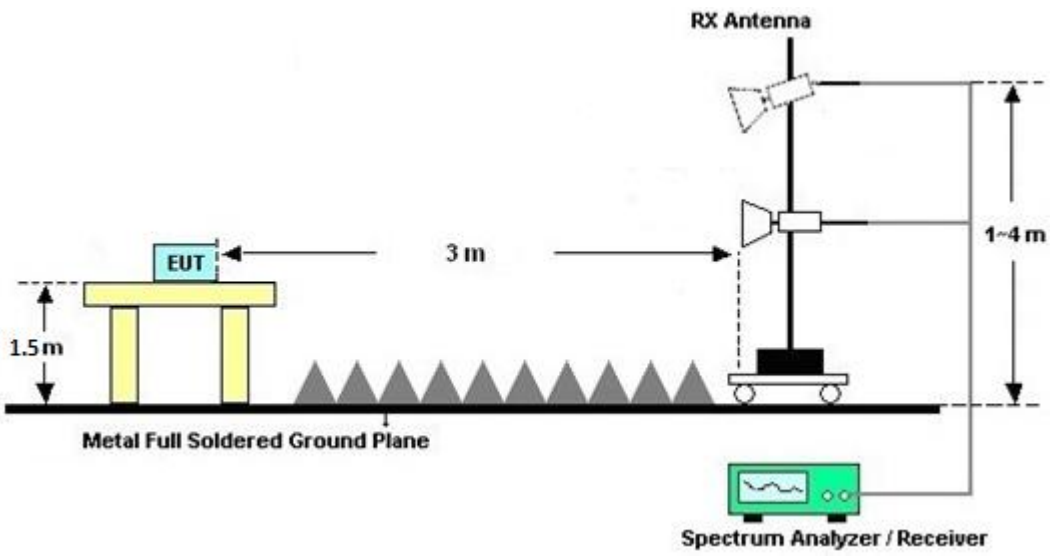
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.8.5 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.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

3.8.7 Duty Cycle

Please refer to Appendix D.

3.8.8 Test Result of Radiated Spurious Emission

Please refer to Appendix B and C.

3.9 AC Power Line Conducted Emissions Measurement

3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

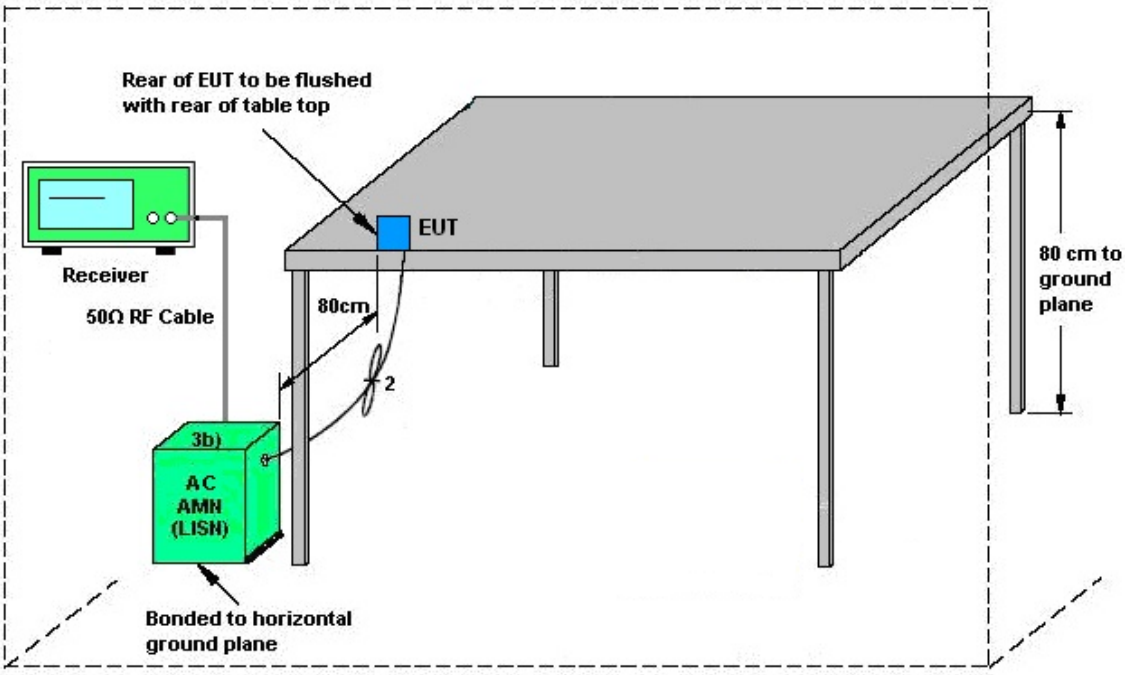
3.9.2 Measuring Instruments

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

3.9.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.9.4 Test setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.9.5 Test Result of AC Conducted Emission

Please refer to Appendix A.

3.10 Antenna Requirements

3.10.1 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.

3.10.2 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	Mar. 20, 2025~ Mar. 22, 2025	Apr. 21, 2025	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00075962	1GHz ~ 18GHz	Nov. 28, 2024	Mar. 20, 2025~ Mar. 22, 2025	Nov. 27, 2025	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Mar. 06, 2025	Mar. 20, 2025~ Mar. 22, 2025	Mar. 05, 2026	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	1GHz~18GHz	Apr. 19, 2024	Mar. 20, 2025~ Mar. 22, 2025	Apr. 18, 2025	Radiation (03CH07-HY)
Amplifier	SONOMA	310N	186713	9kHz~1GHz	Apr. 16, 2024	Mar. 20, 2025~ Mar. 22, 2025	Apr. 15, 2025	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Mar. 26, 2024	Mar. 20, 2025~ Mar. 22, 2025	Mar. 25, 2025	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4 MY24971/4 MY15682/4	30MHz to 18GHz	Feb. 20, 2025	Mar. 20, 2025~ Mar. 22, 2025	Feb. 19, 2026	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4 MY24971/4	9kHz to 30MHz	Feb. 20, 2025	Mar. 20, 2025~ Mar. 22, 2025	Feb. 19, 2026	Radiation (03CH07-HY)
Controller	EMEC	EM1000	N/A	Control Ant Mast	N/A	Mar. 20, 2025~ Mar. 22, 2025	N/A	Radiation (03CH07-HY)
Controller	MF	MF-7802	N/A	Control Turn table	N/A	Mar. 20, 2025~ Mar. 22, 2025	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	N/A	Mar. 20, 2025~ Mar. 22, 2025	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Mar. 20, 2025~ Mar. 22, 2025	N/A	Radiation (03CH07-HY)
Software	Audix	E3	N/A	N/A	N/A	Mar. 20, 2025~ Mar. 22, 2025	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	DTM-303A	TP201973	N/A	Oct. 14, 2024	Mar. 20, 2025~ Mar. 22, 2025	Oct. 13, 2025	Radiation (03CH07-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 01, 2024	Mar. 18, 2025~ Mar. 21, 2025	Oct. 31, 2025	Conducted (TH05-HY)
Power Meter	Anritsu	ML2495A	1036004	N/A	Jul. 04, 2024	Mar. 18, 2025~ Mar. 21, 2025	Jul. 03, 2025	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Jul. 04, 2024	Mar. 18, 2025~ Mar. 21, 2025	Jul. 03, 2025	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 23, 2024	Mar. 18, 2025~ Mar. 21, 2025	Aug. 22, 2025	Conducted (TH05-HY)
Switch Control Mainframe	Burgeon	ETF-058	EC1300484 (BOX3)	N/A	May 20, 2024	Mar. 18, 2025~ Mar. 21, 2025	May 19, 2025	Conducted (TH05-HY)
Software	Sporton	BTWIFI_Final_ version_240513	N/A	Conducted Other Test Item	N/A	Mar. 18, 2025~ Mar. 21, 2025	N/A	Conducted (TH05-HY)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Mar. 14, 2025	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 10, 2024	Mar. 14, 2025	Dec. 09, 2025	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Oct. 14, 2024	Mar. 14, 2025	Oct. 13, 2025	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 14, 2024	Mar. 14, 2025	Nov. 13, 2025	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Mar. 14, 2025	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	00691	N/A	Jul. 30, 2024	Mar. 14, 2025	Jul. 29, 2025	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	MQT24082501	N/A	Oct. 15, 2024	Mar. 14, 2025	Oct. 14, 2025	Conduction (CO05-HY)

5 Measurement Uncertainty

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.7 dB

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)

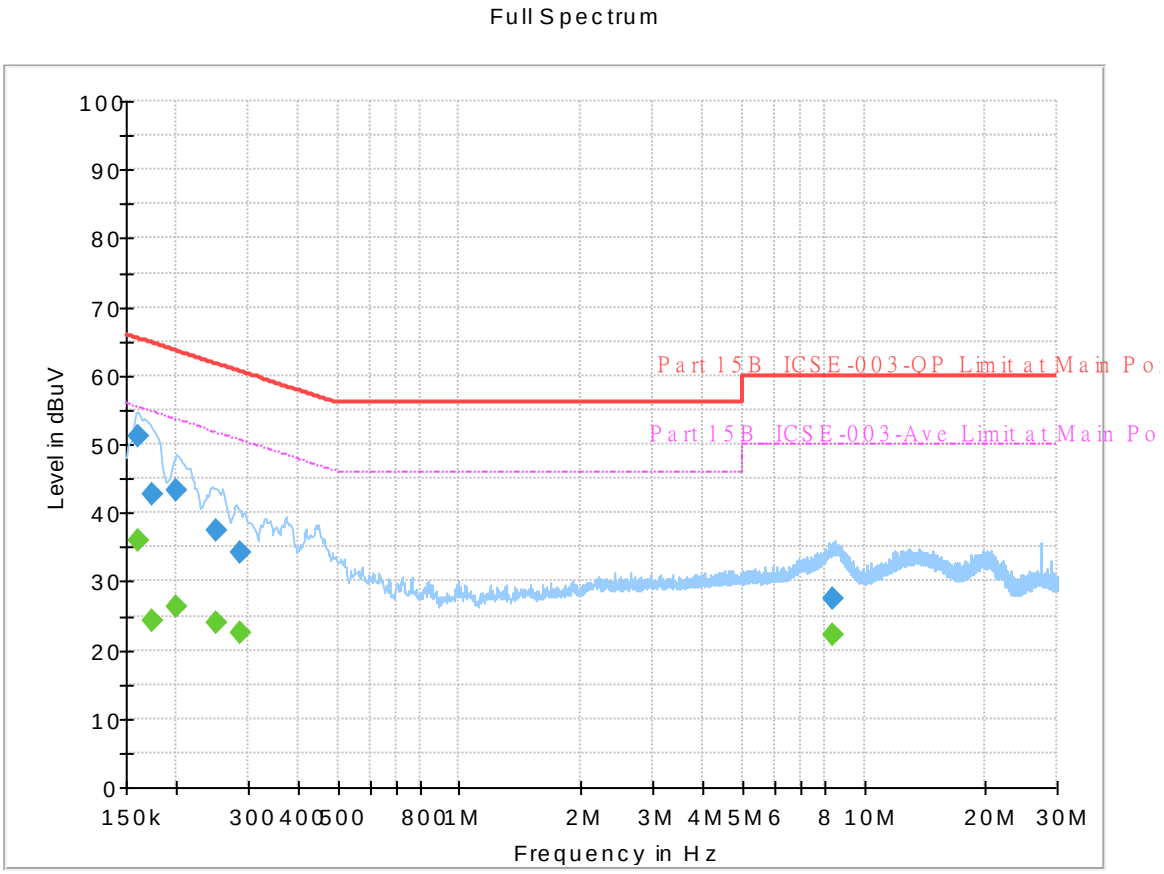
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.3 dB

Appendix A. AC Conducted Emission Test Results

Test Engineer :	Calvin Wang	**Temperature :**	23~26℃
		Relative Humidity :	45~55%

EUT Information

Report NO :	1N1506-13
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

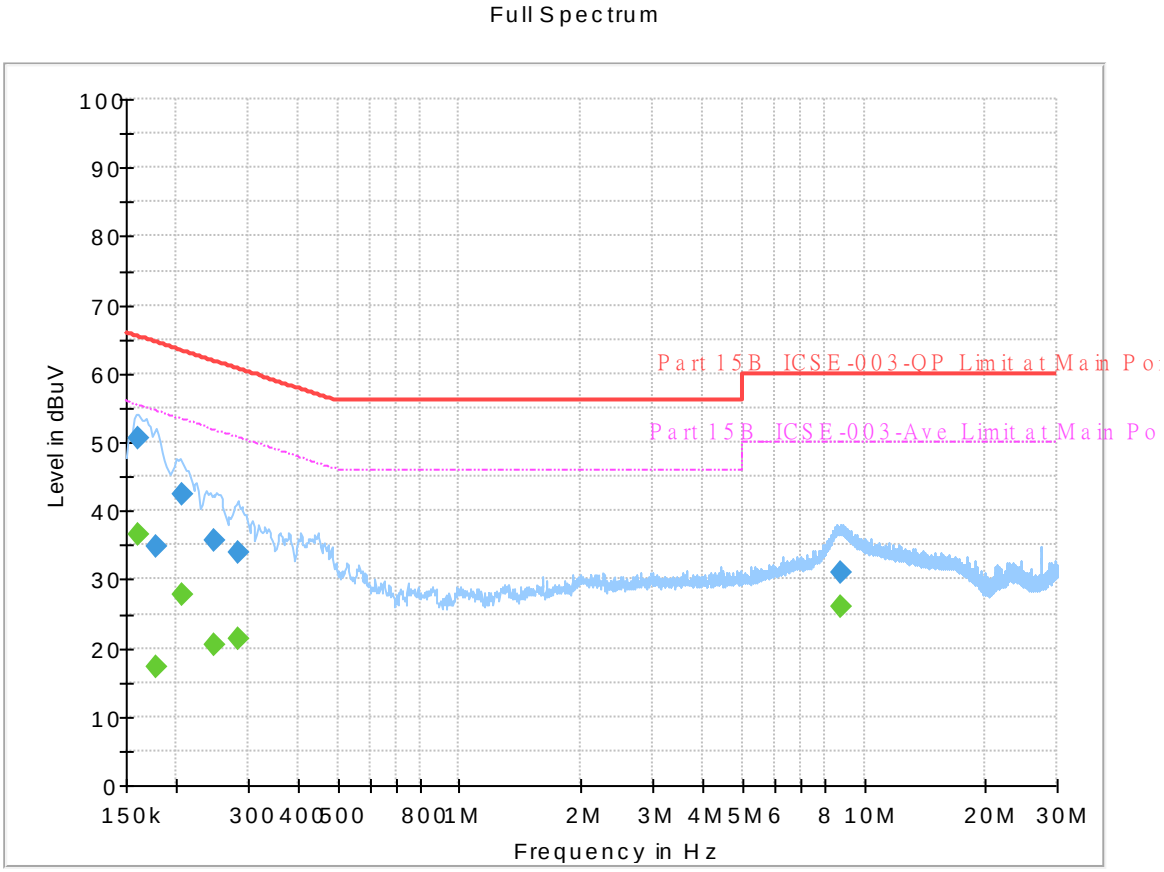


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.161250	---	35.89	55.40	19.51	L1	OFF	19.8
0.161250	51.11	---	65.40	14.29	L1	OFF	19.8
0.174750	---	24.21	54.73	30.52	L1	OFF	19.8
0.174750	42.58	---	64.73	22.15	L1	OFF	19.8
0.199500	---	26.31	53.63	27.32	L1	OFF	19.8
0.199500	43.17	---	63.63	20.46	L1	OFF	19.8
0.251250	---	24.05	51.72	27.67	L1	OFF	19.8
0.251250	37.51	---	61.72	24.21	L1	OFF	19.8
0.287250	---	22.63	50.60	27.97	L1	OFF	19.8
0.287250	34.23	---	60.60	26.37	L1	OFF	19.8
8.346750	---	22.16	50.00	27.84	L1	OFF	19.9
8.346750	27.35	---	60.00	32.65	L1	OFF	19.9

EUT Information

Report NO :	1N1506-13
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.161250	---	36.47	55.40	18.93	N	OFF	19.8
0.161250	50.47	---	65.40	14.93	N	OFF	19.8
0.177000	---	17.26	54.63	37.37	N	OFF	19.8
0.177000	34.78	---	64.63	29.85	N	OFF	19.8
0.206250	---	27.65	53.36	25.71	N	OFF	19.8
0.206250	42.34	---	63.36	21.02	N	OFF	19.8
0.249000	---	20.52	51.79	31.27	N	OFF	19.8
0.249000	35.53	---	61.79	26.26	N	OFF	19.8
0.285000	---	21.45	50.67	29.22	N	OFF	19.8
0.285000	34.03	---	60.67	26.64	N	OFF	19.8
8.720250	---	26.07	50.00	23.93	N	OFF	19.9
8.720250	31.01	---	60.00	28.99	N	OFF	19.9

Appendix B. Radiated Spurious Emission

Test Engineer :	Jesse Wang, Stan Haieh and Ken Wu	Temperature :	19~20.7°C
		Relative Humidity :	43~47.4%

<Sample 3>

Emission below 1GHz

UHF RFID (LF @ 3m)

UHF RFID	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp 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)
UHF RFID 902.75MHz		30.27	30.63	-9.37	40	35.79	24.21	0.61	29.98	-	-	P	H
		45.12	30.02	-9.98	40	41.78	16.98	1.23	29.97	-	-	P	H
		154.47	25.4	-18.1	43.5	36.34	16.75	2.19	29.88	-	-	P	H
		578.6	34.6	-11.4	46	35.11	25.06	4.16	29.73	-	-	P	H
		691.3	36.52	-9.48	46	35.5	26.08	4.48	29.54	-	-	P	H
	*	902.75	118.47	72.47	46	113.7	28.41	5.14	28.78	200	300	P	H
		979.7	34.76	-19.24	54	27.59	30.09	5.43	28.35	-	-	P	H
													H
													H
													H
													H
													H
		30	26.17	-13.83	40	31.28	24.29	0.58	29.98	-	-	P	V
		76.71	23	-17	40	38.09	13.26	1.58	29.93	-	-	P	V
		91.02	25.03	-18.47	43.5	38.5	14.74	1.71	29.92	-	-	P	V
		333.6	23.64	-22.36	46	30.64	19.62	3.18	29.8	-	-	P	V
		537.3	29.1	-16.9	46	31.1	23.72	4	29.72	-	-	P	V
	*	902.75	118.17	72.17	46	113.4	28.41	5.14	28.78	100	231	P	V
		979.7	37.14	-16.86	54	29.97	30.09	5.43	28.35	-	-	P	V
													V
													V
													V
													V
													V

UHF RFID	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)
		30.27	28.31	-11.69	40	33.47	24.21	0.61	29.98	-	-	P	H
		47.28	24.75	-15.25	40	37.71	15.74	1.26	29.96	-	-	P	H
		266.79	31.48	-14.52	46	39.14	19.3	2.86	29.82	-	-	P	H
		333.6	30.12	-15.88	46	37.12	19.62	3.18	29.8	-	-	P	H
		518.4	33.36	-12.64	46	35.5	23.69	3.94	29.77	-	-	P	H
		691.3	35.69	-10.31	46	34.67	26.08	4.48	29.54	-	-	P	H
	*	914.75	118.34	72.34	46	113.52	28.37	5.19	28.74	189	321	P	H
													H
													H
													H
													H
UHF RFID													H
914.75MHz		30.27	25.97	-14.03	40	31.13	24.21	0.61	29.98	-	-	P	V
		76.71	24.57	-15.43	40	39.66	13.26	1.58	29.93	-	-	P	V
		91.02	24.49	-19.01	43.5	37.96	14.74	1.71	29.92	-	-	P	V
		499.5	29.07	-16.93	46	31.53	23.49	3.87	29.82	-	-	P	V
		537.3	30.18	-15.82	46	32.18	23.72	4	29.72	-	-	P	V
	*	914.75	118.65	72.65	46	113.83	28.37	5.19	28.74	100	233	P	V
		991.6	35.6	-18.4	54	28.94	29.43	5.47	28.24	-	-	P	V
													V
													V
													V
													V
													V

UHF RFID	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)
		30.27	28.44	-11.56	40	33.6	24.21	0.61	29.98	-	-	P	H
		47.82	24.17	-15.83	40	37.4	15.46	1.26	29.95	-	-	P	H
		91.02	24.48	-19.02	43.5	37.95	14.74	1.71	29.92	-	-	P	H
		333.6	32.29	-13.71	46	39.29	19.62	3.18	29.8	-	-	P	H
		537.3	32.61	-13.39	46	34.61	23.72	4	29.72	-	-	P	H
		691.3	37.37	-8.63	46	36.35	26.08	4.48	29.54	-	-	P	H
	*	927.25	117.23	71.23	46	112.77	27.93	5.23	28.7	191	317	P	H
													H
													H
													H
													H
													H
		30.54	24.88	-15.12	40	30.09	24.13	0.64	29.98	-	-	P	V
		54.84	21.3	-18.7	40	37.25	12.65	1.34	29.94	-	-	Q	V
		91.29	24.75	-18.75	43.5	38.18	14.78	1.71	29.92	-	-	P	V
		499.5	29.52	-16.48	46	31.98	23.49	3.87	29.82	-	-	P	V
		689.2	34.93	-11.07	46	34.07	25.93	4.48	29.55	-	-	P	V
	*	927.25	117.7	71.7	46	113.24	27.93	5.23	28.7	100	257	P	V
		965.7	34.88	-19.12	54	28.3	29.68	5.38	28.48	-	-	P	V
													V
													V
													V
													V
													V

UHF RFID 927.25MHz

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	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	39.41	-34.59	74	56.7	32.3	8.98	59.09	-	-	P	H
		3611	41	-33	74	56.52	33.14	10.31	59.54	-	-	P	H
		4513.75	42.04	-31.96	74	55.51	34	11.57	59.84	-	-	P	H
		5416.5	46.86	-27.14	74	56.44	34.63	12.61	57.48	100	298	P	H
		5416.5	41.34	-12.66	54	50.92	34.63	12.61	57.48	100	298	A	H
		8124.75	41.08	-32.92	74	46.2	35.9	15.63	57.59	-	-	P	H
		9027.5	43.28	-30.72	74	47.85	36.2	16.73	58.53	-	-	P	H
UHF RFID													
902.75MHz		2708.25	38.95	-35.05	74	56.24	32.3	8.98	59.09	-	-	P	V
		3611	40.11	-33.89	74	55.63	33.14	10.31	59.54	-	-	P	V
		4513.75	41.62	-32.38	74	55.09	34	11.57	59.84	-	-	P	V
		5416.5	43.61	-30.39	74	53.19	34.63	12.61	57.48	216	356	P	V
		5416.5	36.61	-17.39	54	46.19	34.63	12.61	57.48	216	356	A	V
		8124.75	41.25	-32.75	74	46.37	35.9	15.63	57.59	-	-	P	V
		9027.5	43.18	-30.82	74	47.75	36.2	16.73	58.53	-	-	P	V

UHF RFID	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	39.64	-34.36	74	56.78	32.34	9.07	59.09	-	-	P	H
		3659	42.16	-31.84	74	57.5	33.26	10.39	59.59	-	-	P	H
		4573.75	41.53	-32.47	74	54.7	34.05	11.65	59.7	-	-	P	H
		7318	43.64	-30.36	74	50.27	35.7	14.7	57.74	-	-	P	H
		8232.75	42.33	-31.67	74	47.52	35.83	15.73	57.57	-	-	P	H
		9145	44.99	-29.01	74	49.51	36.29	16.84	58.83	-	-	P	H
UHF RFID													
914.75MHz		2744.25	39.59	-34.41	74	56.73	32.34	9.07	59.09	-	-	P	V
		3659	40.55	-33.45	74	55.89	33.26	10.39	59.59	-	-	P	V
		4573.75	41.21	-32.79	74	54.38	34.05	11.65	59.7	-	-	P	V
		7318	42.26	-31.74	74	48.89	35.7	14.7	57.74	-	-	P	V
		8232.75	42.3	-31.7	74	47.49	35.83	15.73	57.57	-	-	P	V
		9147.5	44.46	-29.54	74	48.99	36.29	16.84	58.84	-	-	P	V

UHF RFID	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	40.43	-33.57	74	57.28	32.52	9.16	59.08	-	-	P	H
		3709	41.05	-32.95	74	56.47	33.12	10.47	59.64	-	-	P	H
		4636.25	40.56	-33.44	74	53.38	34.17	11.73	59.56	-	-	P	H
		7418	41.67	-32.33	74	48.34	35.7	14.85	57.86	-	-	P	H
		8345.25	42.46	-31.54	74	47.61	35.89	15.71	57.55	-	-	P	H
UHF RFID													
927.25MHz		2781.75	40.47	-33.53	74	57.32	32.52	9.16	59.08	-	-	P	V
		3709	40.49	-33.51	74	55.91	33.12	10.47	59.64	-	-	P	V
		4636.25	40.75	-33.25	74	53.57	34.17	11.73	59.56	-	-	P	V
		7418	41.25	-32.75	74	47.92	35.7	14.85	57.86	-	-	P	V
		8345.25	42.73	-31.27	74	47.88	35.89	15.71	57.55	-	-	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.

<Sample 2>

Emission below 1GHz

UHF RFID (LF @ 3m)

UHF RFID	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp 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)
UHF RFID 902.75MHz		30	28.22	-11.78	40	33.33	24.29	0.58	29.98	-	-	P	H
		138.27	30.66	-12.84	43.5	41.16	17.29	2.09	29.88	-	-	P	H
		264.63	35.02	-10.98	46	42.39	19.6	2.85	29.82	-	-	P	H
		333.6	26.08	-19.92	46	33.08	19.62	3.18	29.8	-	-	P	H
		595.4	29.16	-16.84	46	29.69	25	4.23	29.76	-	-	P	H
	*	902.75	118.63	72.63	46	113.86	28.41	5.14	28.78	200	167	P	H
		979.7	34.64	-19.36	54	27.47	30.09	5.43	28.35	-	-	P	H
													H
													H
													H
													H
													H
		35.4	26.99	-13.01	40	33.83	22.03	1.11	29.98	-	-	P	V
		75.9	28.21	-11.79	40	43.36	13.22	1.56	29.93	-	-	P	V
		91.02	24.39	-19.11	43.5	37.86	14.74	1.71	29.92	-	-	P	V
		400.1	28.05	-17.95	46	33.04	21.4	3.41	29.8	-	-	P	V
		689.2	28.66	-17.34	46	27.8	25.93	4.48	29.55	-	-	P	V
	*	902.75	118.58	72.58	46	113.81	28.41	5.14	28.78	100	167	P	V
		979.7	34.62	-19.38	54	27.45	30.09	5.43	28.35	-	-	P	V
													V
													V
													V
													V
													V

UHF RFID	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)
		54.3	31.64	-8.36	40	47.52	12.73	1.33	29.94	-	-	P	H
		147.99	32.22	-11.28	43.5	42.86	17.09	2.15	29.88	-	-	P	H
		266.79	30.58	-15.42	46	38.24	19.3	2.86	29.82	-	-	P	H
		333.6	27.84	-18.16	46	34.84	19.62	3.18	29.8	-	-	P	H
		615	27.56	-18.44	46	27.66	25.34	4.28	29.72	-	-	P	H
	*	914.75	117.6	71.6	46	112.78	28.37	5.19	28.74	200	188	P	H
		991.6	37.4	-16.6	54	30.74	29.43	5.47	28.24	-	-	P	H
													H
													H
													H
													H
UHF RFID													H
914.75MHz		34.86	27.43	-12.57	40	34.03	22.29	1.09	29.98	-	-	P	V
		75.36	30.27	-9.73	40	45.46	13.18	1.56	29.93	-	-	P	V
		170.4	26.5	-17	43.5	38.52	15.55	2.3	29.87	-	-	P	V
		400.1	27.73	-18.27	46	32.72	21.4	3.41	29.8	-	-	P	V
		686.4	29.16	-16.84	46	28.41	25.83	4.47	29.55	-	-	P	V
	*	914.75	117.6	71.6	46	112.78	28.37	5.19	28.74	100	160	P	V
		979	33.21	-20.79	54	26.17	29.97	5.42	28.35	-	-	P	V
													V
													V
													V
													V
													V

UHF RFID	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)
		30.27	28.38	-11.62	40	33.54	24.21	0.61	29.98	-	-	P	H
		91.02	23.25	-20.25	43.5	36.72	14.74	1.71	29.92	-	-	P	H
		266.79	30.75	-15.25	46	38.41	19.3	2.86	29.82	-	-	P	H
		400.1	26.57	-19.43	46	31.56	21.4	3.41	29.8	-	-	P	H
		661.2	27.4	-18.6	46	26.64	25.95	4.39	29.58	-	-	P	H
	*	927.25	118.29	72.29	46	113.83	27.93	5.23	28.7	200	197	P	H
		965.7	35.29	-18.71	54	28.71	29.68	5.38	28.48	-	-	P	H
													H
													H
													H
													H
UHF RFID													H
927.25MHz		35.94	26.8	-13.2	40	33.9	21.77	1.11	29.98	-	-	P	V
		76.44	29.26	-10.74	40	44.37	13.25	1.57	29.93	-	-	Q	V
		91.02	23.63	-19.87	43.5	37.1	14.74	1.71	29.92	-	-	P	V
		400.1	30.9	-15.1	46	35.89	21.4	3.41	29.8	-	-	P	V
		700.4	27.69	-18.31	46	26.67	26.04	4.51	29.53	-	-	P	V
	*	927.25	118.26	72.26	46	113.8	27.93	5.23	28.7	100	158	P	V
		981.1	33.48	-20.52	54	26.43	29.95	5.43	28.33	-	-	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	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	40.81	-33.19	74	58.1	32.3	8.98	59.09	-	-	P	H
		3611	41.63	-32.37	74	57.15	33.14	10.31	59.54	-	-	P	H
		4513.75	41.72	-32.28	74	55.19	34	11.57	59.84	-	-	P	H
		5416.5	40.31	-33.69	74	49.89	34.63	12.61	57.48	-	-	P	H
		8124.75	41.6	-32.4	74	46.72	35.9	15.63	57.59	-	-	P	H
		9027.5	44.28	-29.72	74	48.85	36.2	16.73	58.53	-	-	P	H
UHF RFID													
902.75MHz		2708.25	40.96	-33.04	74	58.25	32.3	8.98	59.09	-	-	P	V
		3611	40.01	-33.99	74	55.53	33.14	10.31	59.54	-	-	P	V
		4513.75	40.92	-33.08	74	54.39	34	11.57	59.84	-	-	P	V
		5416.5	39.72	-34.28	74	49.3	34.63	12.61	57.48	-	-	P	V
		8124.75	41.67	-32.33	74	46.79	35.9	15.63	57.59	-	-	P	V
		9027.5	43.13	-30.87	74	47.7	36.2	16.73	58.53	-	-	P	V

UHF RFID	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	42.01	-31.99	74	59.15	32.34	9.07	59.09	200	165	P	H
		2744.25	39.14	-14.86	54	56.28	32.34	9.07	59.09	200	165	A	H
		3659	40.63	-33.37	74	55.97	33.26	10.39	59.59	-	-	P	H
		4573.75	40.95	-33.05	74	54.12	34.05	11.65	59.7	-	-	P	H
		7318	41.07	-32.93	74	47.7	35.7	14.7	57.74	-	-	P	H
		8232.75	41.7	-32.3	74	46.89	35.83	15.73	57.57	-	-	P	H
		9147.5	43.02	-30.98	74	47.55	36.29	16.84	58.84	-	-	P	H
UHF RFID													
914.75MHz		2744.25	43.7	-30.3	74	60.84	32.34	9.07	59.09	100	10	P	V
		2744.25	41.06	-12.94	54	58.2	32.34	9.07	59.09	100	10	A	V
		3659	39.77	-34.23	74	55.11	33.26	10.39	59.59	-	-	P	V
		4573.75	40.1	-33.9	74	53.27	34.05	11.65	59.7	-	-	P	V
		7318	41.09	-32.91	74	47.72	35.7	14.7	57.74	-	-	P	V
		8232.75	41.52	-32.48	74	46.71	35.83	15.73	57.57	-	-	P	V
		9147.5	44.01	-29.99	74	48.54	36.29	16.84	58.84	-	-	P	V

UHF RFID	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	48.12	-25.88	74	64.97	32.52	9.16	59.08	106	350	P	H
		2781.75	40.26	-13.74	54	57.11	32.52	9.16	59.08	106	350	A	H
		3709	39.84	-34.16	74	55.26	33.12	10.47	59.64	-	-	P	H
		4636.25	39.84	-34.16	74	52.66	34.17	11.73	59.56	-	-	P	H
		7418	40.53	-33.47	74	47.2	35.7	14.85	57.86	-	-	P	H
		8345.25	42.3	-31.7	74	47.45	35.89	15.71	57.55	-	-	P	
UHF RFID													
927.25MHz		2781.75	49.37	-24.63	74	66.22	32.52	9.16	59.08	147	360	P	V
		2781.75	41.86	-12.14	54	58.71	32.52	9.16	59.08	147	360	A	V
		3709	38.97	-35.03	74	54.39	33.12	10.47	59.64	-	-	P	V
		4636.25	39.23	-34.77	74	52.05	34.17	11.73	59.56	-	-	P	V
		7418	40.27	-33.73	74	46.94	35.7	14.85	57.86	-	-	P	V
		8345.25	42.86	-31.14	74	48.01	35.89	15.71	57.55	-	-	P	

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.
					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)
UHF RFID 913.25MHz		2781.75	43.71	-30.29	74	60.74	32.3	9.75	59.08	400	76	P	H
		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”.

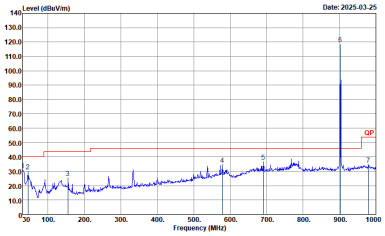
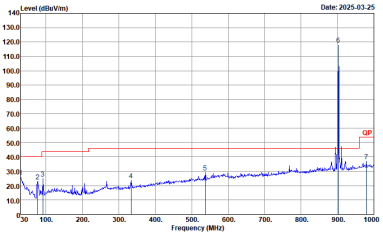
Appendix C. Radiated Spurious Emission Plots

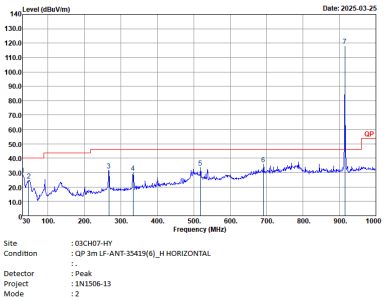
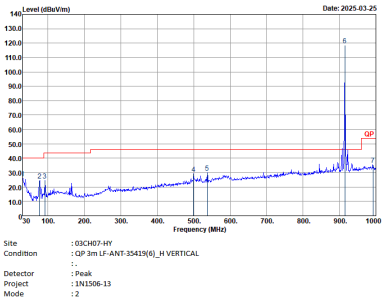
Test Engineer :	Jesse Wang, Stan Haieh and Ken Wu	**Temperature :**	19~20.7°C
		Relative Humidity :	43~47.4%

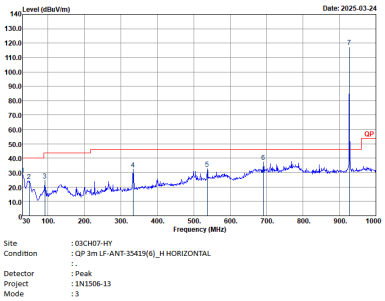
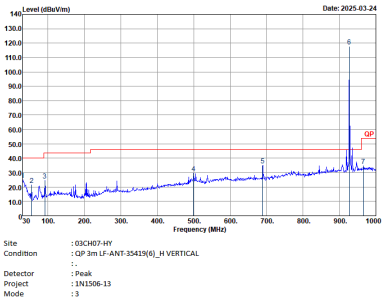
<Sample 3>

Emission below 1GHz

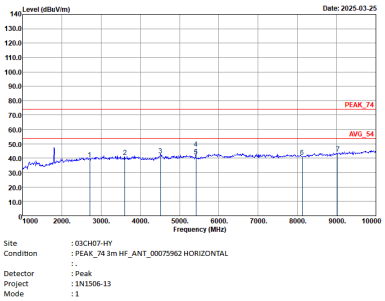
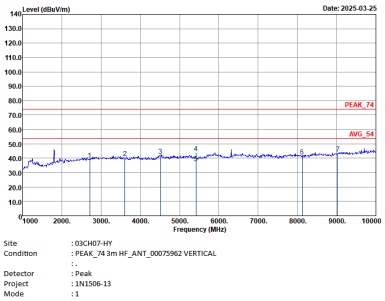
UHF RFID (LF @ 3m)

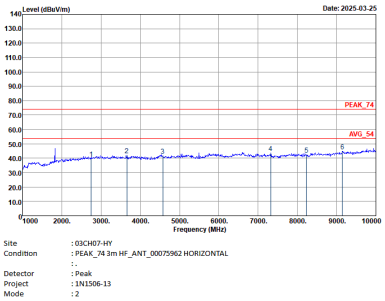
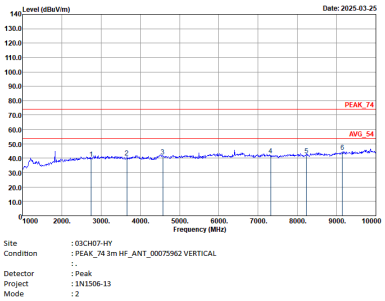
UHF RFID	**UHF RFID**	
	UHF RFID 902.75MHz	
	Horizontal	**Vertical**
QP / Peak		

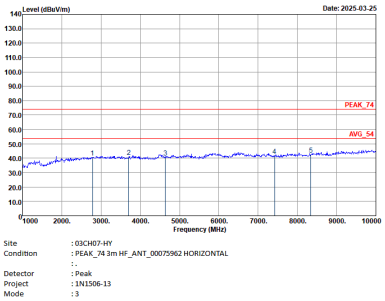
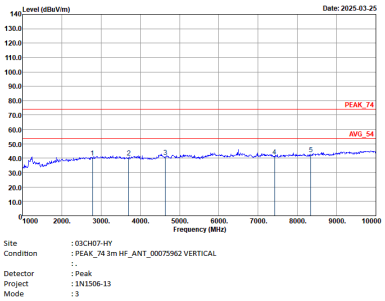
UHF RFID	UHF RFID	
	UHF RFID 914.75MHz	
	Horizontal	Vertical
QP / Peak		

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

UHF RFID (Harmonic @ 3m)

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

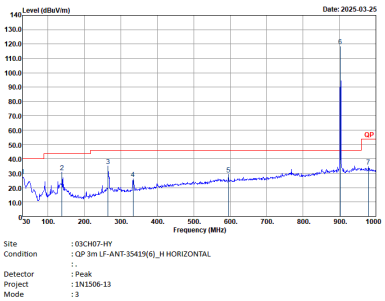
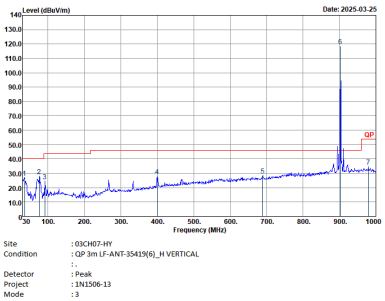
UHF RFID	UHF RFID	
	UHF RFID 914.75MHz	
	Horizontal	Vertical
Peak Avg.		

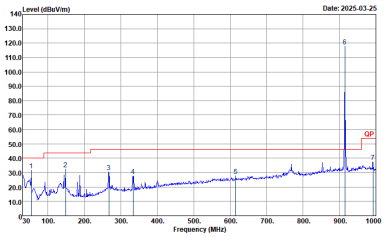
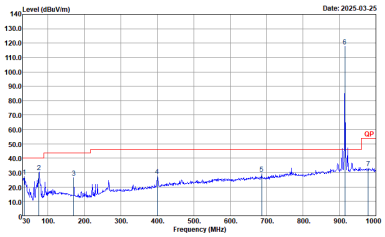
UHF RFID	UHF RFID	
	UHF RFID 927.25MHz	
	Horizontal	Vertical
Peak Avg.		

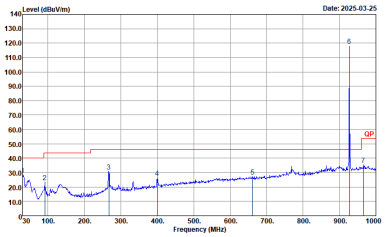
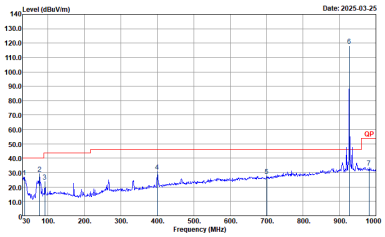
<Sample 2>

Emission below 1GHz

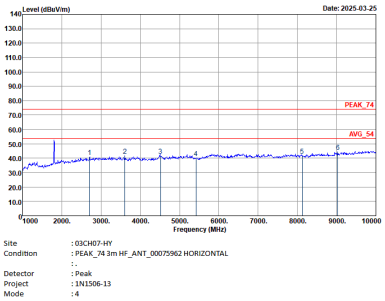
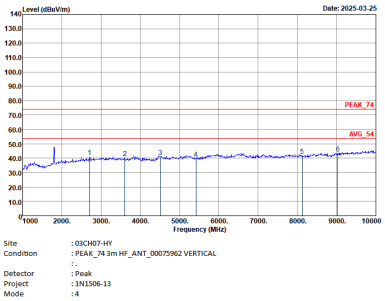
UHF RFID (LF @ 3m)

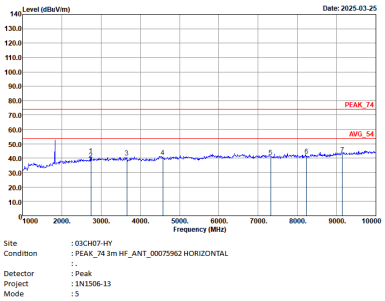
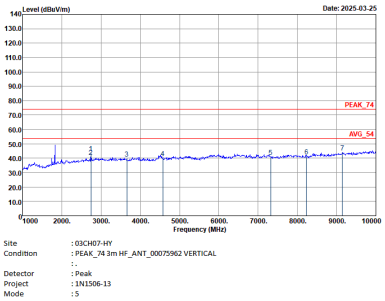
UHF RFID	UHF RFID	
	UHF RFID 902.75MHz	
	Horizontal	Vertical
QP / Peak		

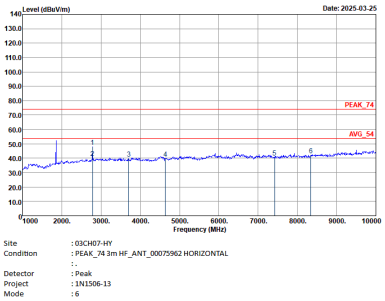
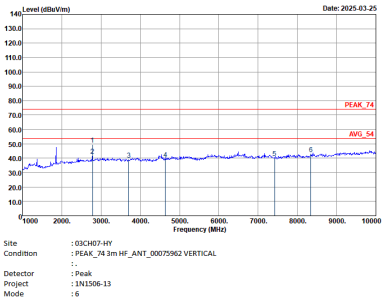
UHF RFID	UHF RFID	
	UHF RFID 914.75MHz	
	Horizontal	Vertical
QP / Peak	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6)_H HORIZONTAL : - Detector : Peak Project : 1N1506-13 Mode : 5	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6)_H VERTICAL : - Detector : Peak Project : 1N1506-13 Mode : 5

UHF RFID	UHF RFID	
	UHF RFID 927.25MHz	
	Horizontal	Vertical
QP / Peak	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6)_H HORIZONTAL : - Detector : Peak Project : 1N1506-13 Mode : 6	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6)_H VERTICAL : - Detector : Peak Project : 1N1506-13 Mode : 6

UHF RFID (Harmonic @ 3m)

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

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

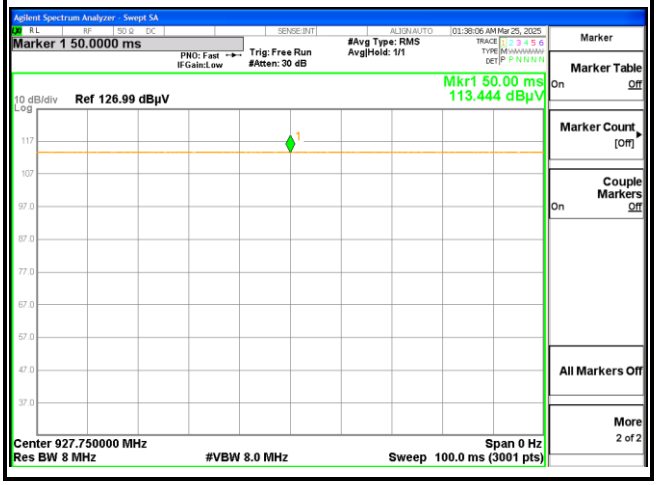
UHF RFID	UHF RFID	
	UHF RFID 927.25MHz	
	Horizontal	Vertical
Peak Avg.	 	

Appendix D. Duty Cycle Plots

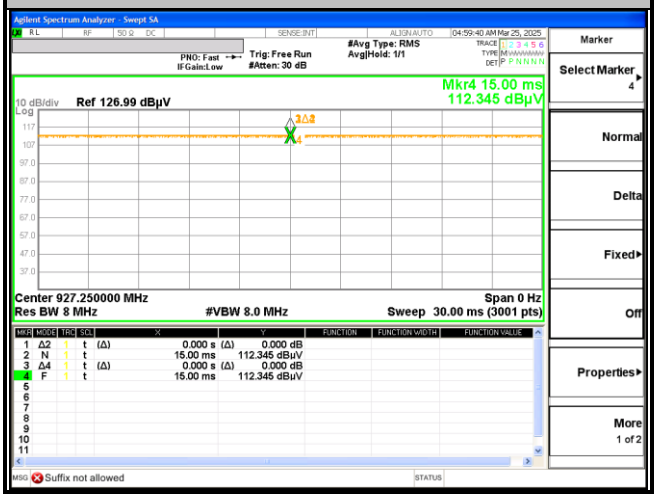
<Sample 3>

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

UHF RFID



<Sample 2>

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

UHF RFID