FCC Test Report

FCC ID	:	**2AW34DS3423ST00**
Equipment	:	**GPS TRACKER**
Model No.	:	**DS-3423ST-00**
Brand Name	:	**SeniorAdom**
Applicant	:	**KRG CORPORATE**
Address	:	**5 rue Benjamin Raspail , 92240 Malakoff, France**
Standard	:	**47 CFR FCC Part 15.247**
Received Date	:	**Jul. 06, 2020**
Tested Date	:	**Jul. 22 ~ Aug. 07, 2020**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by: **Approved by:**

Along Chen / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
FR070602	Rev. 01	Initial issue	Aug. 21, 2020

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 4.478MHz 43.48 (Margin -12.52dB) - QP	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 142.46MHz 35.52 (Margin -7.98dB) - PK	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(1)	Conducted Output Power	Power [dBm]: 22.32	Pass
15.247(a)(1)(iii)	Number of Hopping Channels	Meet the requirement of limit	Pass
15.247(a)(1)	Hopping Channel Separation	Meet the requirement of limit	Pass
15.247(a)(1)(iii)	Dwell Time	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information			
Frequency Range (MHz)	**Ch. Freq. (MHz)**	**Modulation**	**Data Rate**
902 ~ 905	902.1375 ~ 904.6625	FHSS-DBPSK	600kbps

1.1.2 Antenna Details

Ant. No.	Brand / Model	Type	Connector	Antenna Gain (dBi)
1	INPAQ/Sigfox	Printed antenna	Contact shrapnel	1.5

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3.8 Vdc from battery / 5Vdc from host

1.1.4 Accessories

Accessories		
No.	**Equipment**	**Description**
1	Battery	Brand: APACK Model: APP00198 Power Rating: 3.8Vdc, 630mAH

1.1.5 Channel List

UL	MHz	Micro ch.1	Micro ch.2	Micro ch.3	Micro ch.4	Micro ch.5	Micro ch.6
1	902.2	902.1375	902.1625	902.1875	902.2125	902.2375	902.2625
2	902.5	902.4375	902.4625	902.4875	902.5125	902.5375	902.5625
3	902.8	902.7375	902.7625	902.7875	902.8125	902.8375	902.8625
4	903.1	903.0375	903.0625	903.0875	903.1125	903.1375	903.1625
5	903.4	903.3375	903.3625	903.3875	903.4125	903.4375	903.4625
6	903.7	903.6375	903.6625	903.6875	903.7125	903.7375	903.7625
7	904.0	903.9375	903.9625	903.9875	904.0125	904.0375	904.0625
8	904.3	904.2375	904.2625	904.2875	904.3125	904.3375	904.3625
9	904.6	904.5375	904.5625	904.5875	904.6125	904.6375	904.6625

1.1.6 Test Tool and Duty Cycle

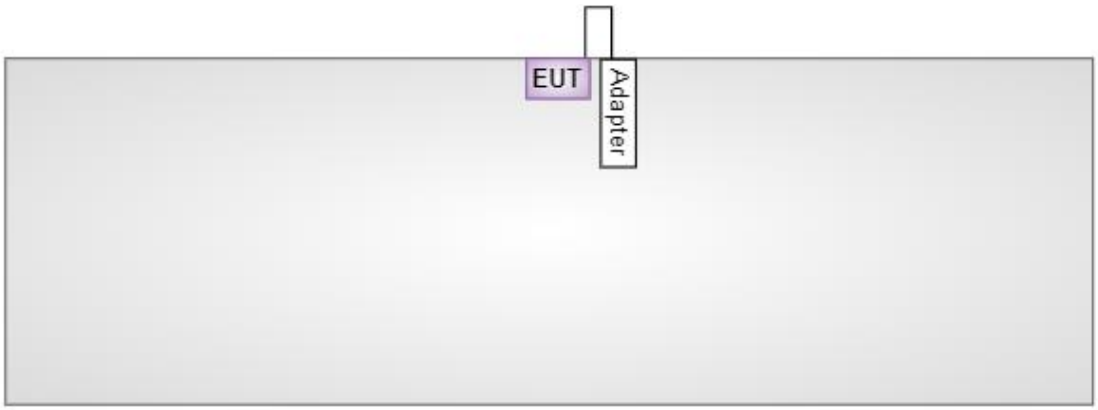
Test Tool	Tera Term, Version: V4.7.4	
Duty Cycle and Duty Factor	**Duty Cycle (%)**	**Duty Factor (dB)**
	95.65%	0.19

1.2 Local Support Equipment List

Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**FCC ID**	**Remarks**
1	Notebook	DELL	Latitude E5470	DoC	---
2	Adapter	Samsung	ETA-U90JWS	---	---
3	Fixture	---	---	---	Provided by applicant.

1.3 Test Setup Chart

Test Setup Diagram



Note: The fixture and notebook is disconnected from EUT and removed from test table when EUT is set to transmit continuously.

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Aug. 07, 2020				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101658	Dec. 12, 2019	Dec. 11, 2020
LISN	R&S	ENV216	101579	Mar. 12, 2020	Mar. 11, 2021
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 22, 2019	Oct. 21, 2020
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Jul. 22 ~ Jul. 28, 2020				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Dec. 17, 2019	Dec. 16, 2020
Receiver	R&S	ESR3	101657	Feb. 14, 2020	Feb. 13, 2021
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 10, 2020	Jul. 09, 2021
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 12, 2019	Dec. 11, 2020
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2019	Nov. 14, 2020
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2019	Nov. 12, 2020
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 07, 2019	Oct. 06, 2020
Preamplifier	EMC	EMC02325	980225	Jul. 03, 2020	Jul. 02, 2021
Preamplifier	Agilent	83017A	MY39501308	Oct. 08, 2019	Oct. 07, 2020
Preamplifier	EMC	EMC184045B	980192	Jul. 21, 2020	Jul. 20, 2021
RF Cable	EMC	EMC104-SM-SM-8000	181106	Oct. 07, 2019	Oct. 06, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 07, 2019	Oct. 06, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Oct. 07, 2019	Oct. 06, 2020
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	160502	Oct. 07, 2019	Oct. 06, 2020
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 07, 2019	Oct. 06, 2020
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Oct. 07, 2019	Oct. 06, 2020
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	Jul. 30, 2020				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101063	Apr. 30, 2020	Apr. 29, 2021
Power Meter	Anritsu	ML2495A	1241002	Oct. 23, 2019	Oct. 22, 2020
Power Sensor	Anritsu	MA2411B	1207366	Oct. 23, 2019	Oct. 22, 2020
DC POWER SOURCE	GW INSTEK	GPC-6030D	GES855395	Oct. 29, 2019	Oct. 28, 2020
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 02, 2019	Dec. 01, 2020
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247
ANSI C63.10-2013

1.6 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

1.7 Deviation from Test Standard and Measurement Procedure

None

1.8 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Uncertainty	
Parameters	**Uncertainty**
Bandwidth	±34.130 Hz
AC conducted emission	±2.92 dB
Radiated emission ≤ 1GHz	±3.41 dB
Radiated emission > 1GHz	±4.59 dB

2 Test Configuration

2.1 Testing Condition

Test Laboratory	International Certification Corp.
Test Site	CO01-WS, 03CH01-WS, TH01-WS
Address of Test Site	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- ISED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Data Rate (Mbps)	Test Configuration
Conducted Emissions	FHSS-DBPSK	902.1375 / 904.6625	600kbps	---
Radiated Emissions ≤ 1GHz				
Radiated Emissions > 1GHz				
Conducted Output Power				
Number of Hopping Channels				
Hopping Channel Separation 20dB and Occupied bandwidth				
Dwell Time	FHSS-DBPSK	902.3	600kbps	---

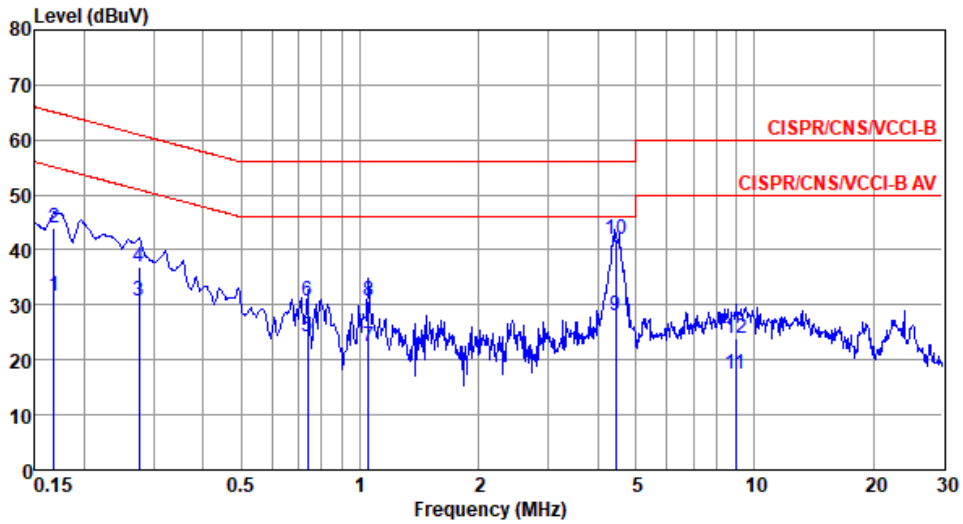
NOTE:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Z-plane** results were found as the worst case and were shown in this report.

2.2.1 Test Result of Conducted Emissions

Modulation	FHSS-DBPSK	Test Freq. (MHz)	902.1375
Power Phase	Line		

Test by : Alex Tsai Temperature: 23°C Humidity: 62%

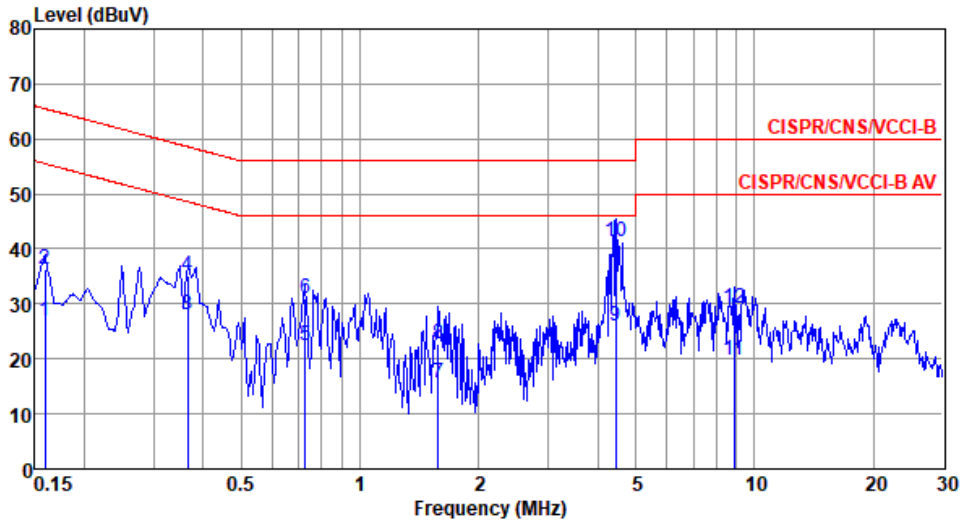


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.168	31.55	55.08	-23.53	21.69	9.64	0.05	Average
2	0.168	43.91	65.08	-21.17	34.05	9.64	0.05	QP
3	0.276	30.83	50.94	-20.11	20.91	9.63	0.07	Average
4	0.276	36.86	60.94	-24.08	26.94	9.63	0.07	QP
5	0.735	24.33	46.00	-21.67	14.29	9.63	0.11	Average
6	0.735	30.78	56.00	-25.22	20.74	9.63	0.11	QP
7	1.049	22.33	46.00	-23.67	12.26	9.63	0.12	Average
8	1.049	30.64	56.00	-25.36	20.57	9.63	0.12	QP
9	4.445	28.16	46.00	-17.84	17.84	9.65	0.30	Average
10*	4.445	42.06	56.00	-13.94	31.74	9.65	0.30	QP
11	8.964	17.35	50.00	-32.65	6.88	9.69	0.38	Average
12	8.964	23.94	60.00	-36.06	13.47	9.69	0.38	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation	FHSS-DBPSK	Test Freq. (MHz)	902.1375
Power Phase	Neutral		

Test by : Alex Tsai Temperature: 23°C Humidity: 62%

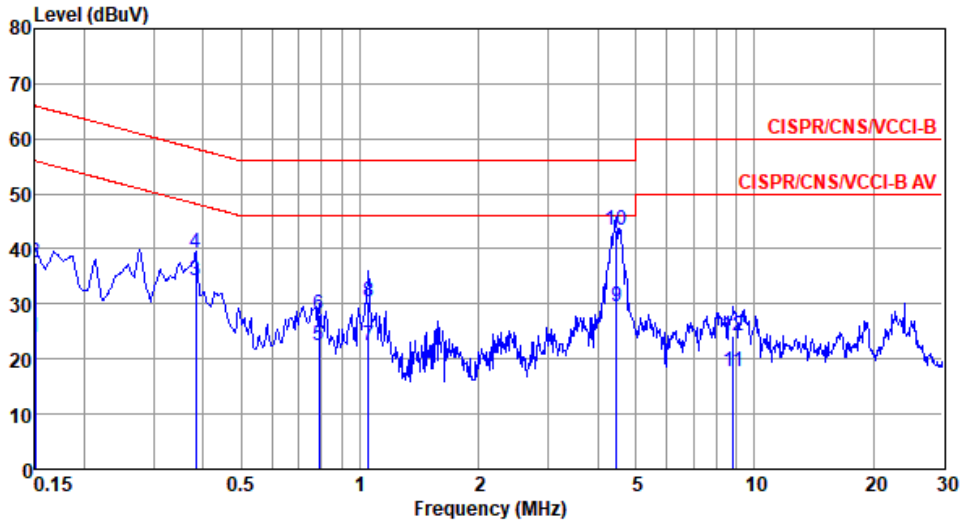


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.159	26.81	55.52	-28.71	16.97	9.66	0.05	Average
2	0.159	36.40	65.52	-29.12	26.56	9.66	0.05	QP
3	0.365	28.12	48.61	-20.49	18.22	9.65	0.08	Average
4	0.365	35.05	58.61	-23.56	25.15	9.65	0.08	QP
5	0.727	22.40	46.00	-23.60	12.45	9.65	0.11	Average
6	0.727	31.01	56.00	-24.99	21.06	9.65	0.11	QP
7	1.577	15.57	46.00	-30.43	5.51	9.66	0.16	Average
8	1.577	22.84	56.00	-33.16	12.78	9.66	0.16	QP
9	4.454	26.10	46.00	-19.90	15.85	9.68	0.30	Average
10*	4.454	41.19	56.00	-14.81	30.94	9.68	0.30	QP
11	8.869	19.82	50.00	-30.18	9.40	9.72	0.38	Average
12	8.869	29.20	60.00	-30.80	18.78	9.72	0.38	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation	FHSS-DBPSK	Test Freq. (MHz)	904.6625
Power Phase	Line		

Test by : Alex Tsai Temperature: 23°C Humidity: 62%

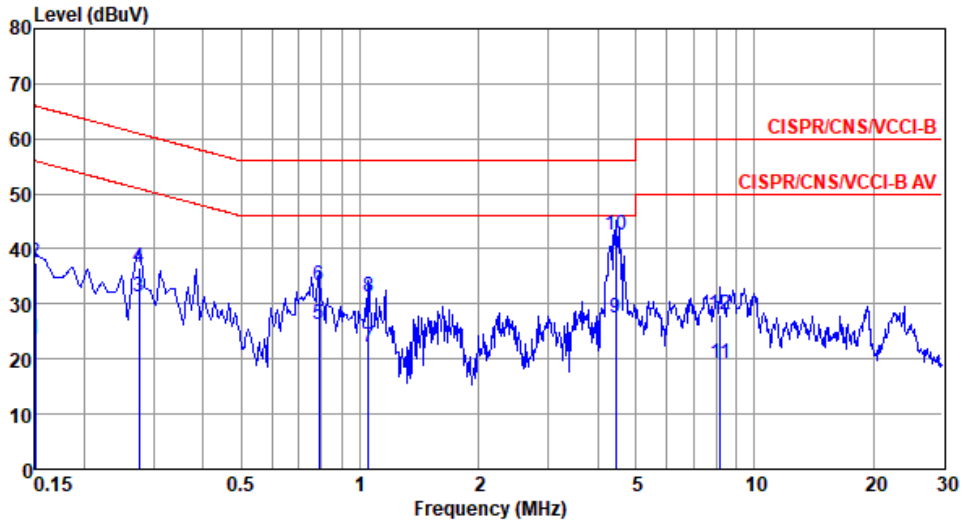


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.150	24.04	56.00	-31.96	14.19	9.64	0.05	Average
2	0.150	37.40	66.00	-28.60	27.55	9.64	0.05	QP
3	0.383	34.20	48.21	-14.01	24.24	9.63	0.08	Average
4	0.383	39.19	58.21	-19.02	29.23	9.63	0.08	QP
5	0.788	22.41	46.00	-23.59	12.37	9.63	0.11	Average
6	0.788	27.91	56.00	-28.09	17.87	9.63	0.11	QP
7	1.049	22.32	46.00	-23.68	12.25	9.63	0.12	Average
8	1.049	30.45	56.00	-25.55	20.38	9.63	0.12	QP
9	4.478	29.49	46.00	-16.51	19.17	9.65	0.30	Average
10*	4.478	43.48	56.00	-12.52	33.16	9.65	0.30	QP
11	8.822	17.66	50.00	-32.34	7.20	9.68	0.38	Average
12	8.822	24.26	60.00	-35.74	13.80	9.68	0.38	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation	FHSS-DBPSK	Test Freq. (MHz)	904.6625
Power Phase	Neutral		

Test by : Alex Tsai Temperature: 23°C Humidity: 62%



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.150	23.49	56.00	-32.51	13.66	9.66	0.05	Average
2	0.150	37.43	66.00	-28.57	27.60	9.66	0.05	QP
3	0.276	31.29	50.94	-19.65	21.41	9.65	0.07	Average
4	0.276	36.66	60.94	-24.28	26.78	9.65	0.07	QP
5	0.788	26.17	46.00	-19.83	16.22	9.65	0.11	Average
6	0.788	33.39	56.00	-22.61	23.44	9.65	0.11	QP
7	1.049	22.22	46.00	-23.78	12.25	9.65	0.12	Average
8	1.049	31.30	56.00	-24.70	21.33	9.65	0.12	QP
9	4.454	27.40	46.00	-18.60	17.15	9.68	0.30	Average
10*	4.454	42.43	56.00	-13.57	32.18	9.68	0.30	QP
11	8.192	19.24	50.00	-30.76	8.84	9.72	0.37	Average
12	8.192	27.93	60.00	-32.07	17.53	9.72	0.37	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

3 Transmitter Test Results

3.1 Unwanted Emissions into Restricted Frequency Bands

3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.2 Test Procedures

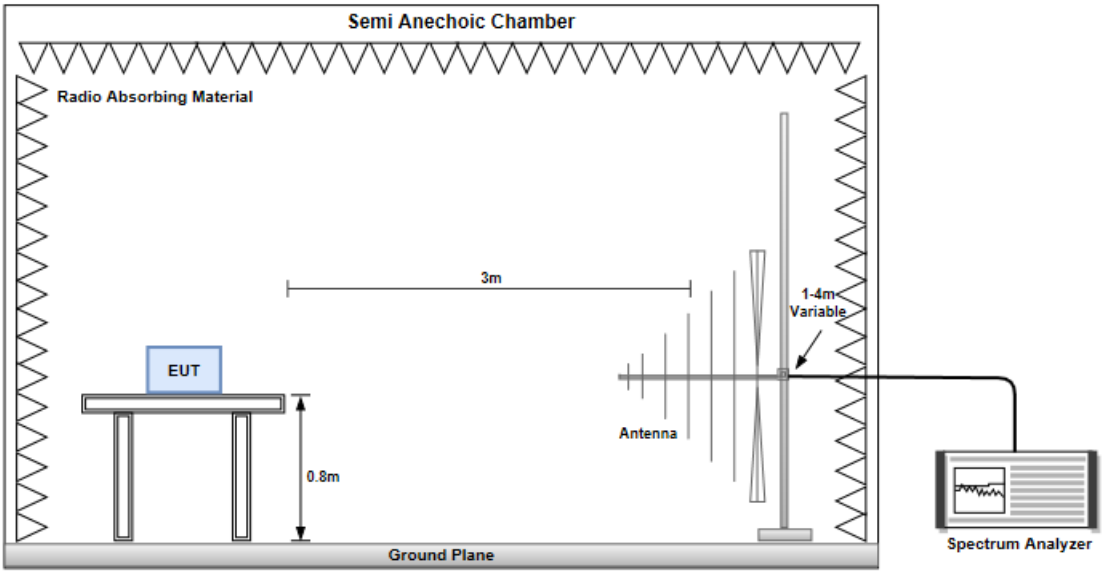
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

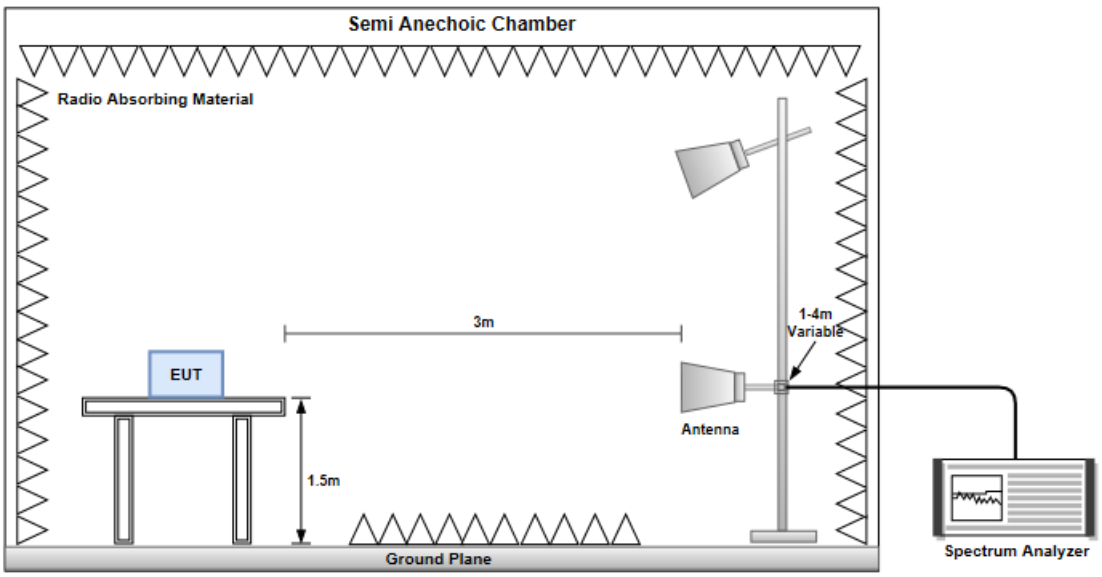
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.1.3 Test Setup

Radiated Emissions below 1 GHz



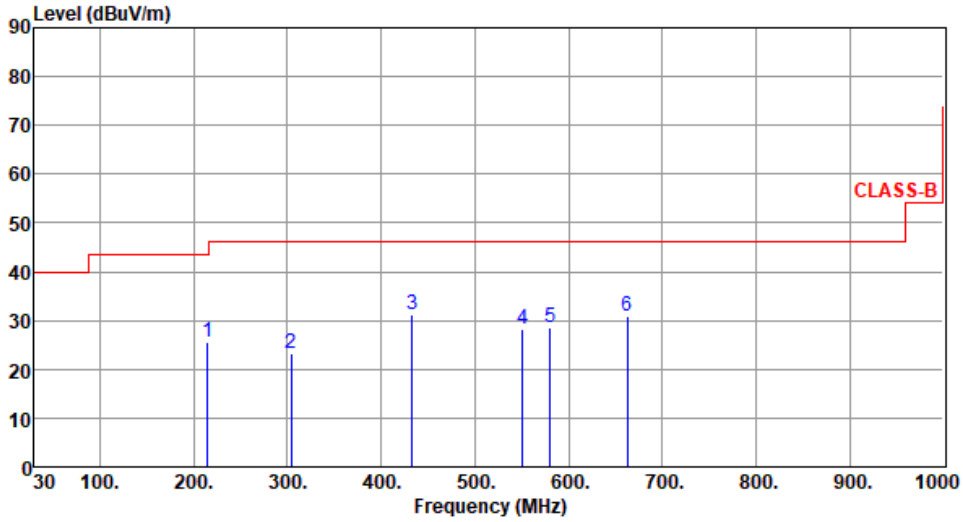
Radiated Emissions above 1 GHz



3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	FHSS-DBPSK	**Test Freq. (MHz)**	902.1375
Polarization	Horizontal		

Test By :Roger Lu Temperature(℃):23 Humidity(%):64

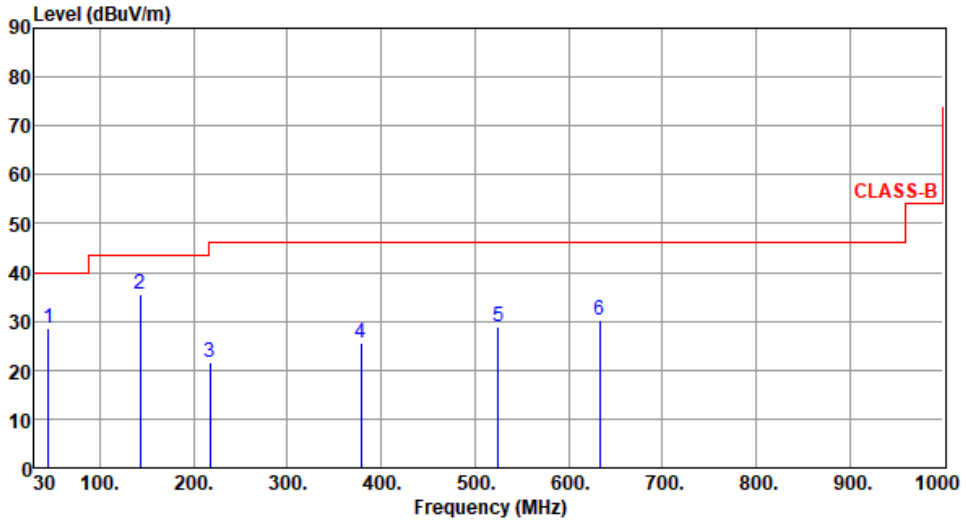


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	215.20	25.41	43.50	-18.09	37.29	-11.88	Peak	---	---
2	304.00	23.16	46.00	-22.84	31.09	-7.93	Peak	---	---
3	432.80	31.10	46.00	-14.90	35.66	-4.56	Peak	---	---
4	551.20	28.20	46.00	-17.80	30.34	-2.14	Peak	---	---
5	580.00	28.66	46.00	-17.34	30.07	-1.41	Peak	---	---
6	662.40	30.83	46.00	-15.17	30.88	-0.05	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	FHSS-DBPSK	Test Freq. (MHz)	902.1375
Polarization	Vertical		

Test By :Roger Lu Temperature(℃):23 Humidity(%):64

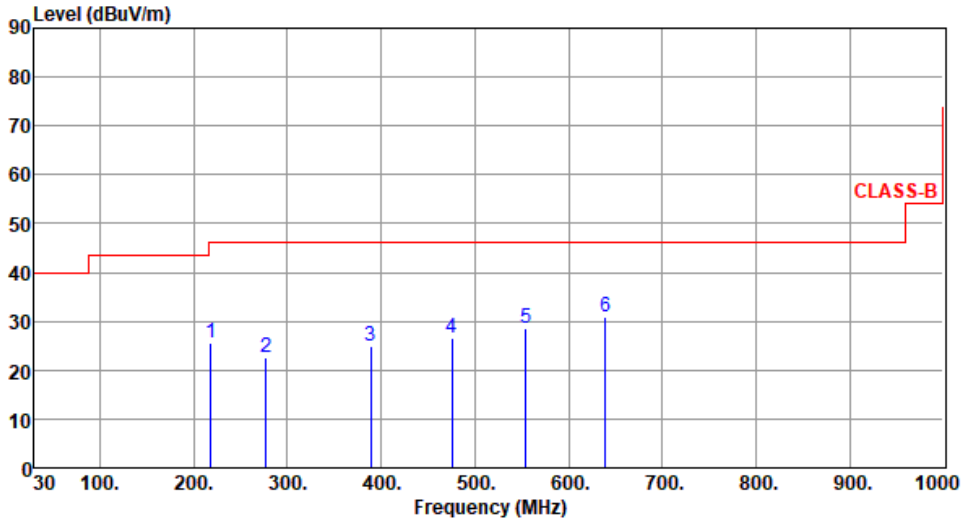


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	45.46	28.47	40.00	-11.53	36.50	-8.03	Peak	---	---
2	142.52	35.39	43.50	-8.11	44.21	-8.82	Peak	---	---
3	217.60	21.68	46.00	-24.32	33.55	-11.87	Peak	---	---
4	378.40	25.59	46.00	-20.41	31.56	-5.97	Peak	---	---
5	524.80	29.03	46.00	-16.97	31.69	-2.66	Peak	---	---
6	633.60	30.25	46.00	-15.75	30.43	-0.18	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	FHSS-DBPSK	Test Freq. (MHz)	904.6625
Polarization	Horizontal		

Test By :Roger Lu Temperature(℃):23 Humidity(%):64

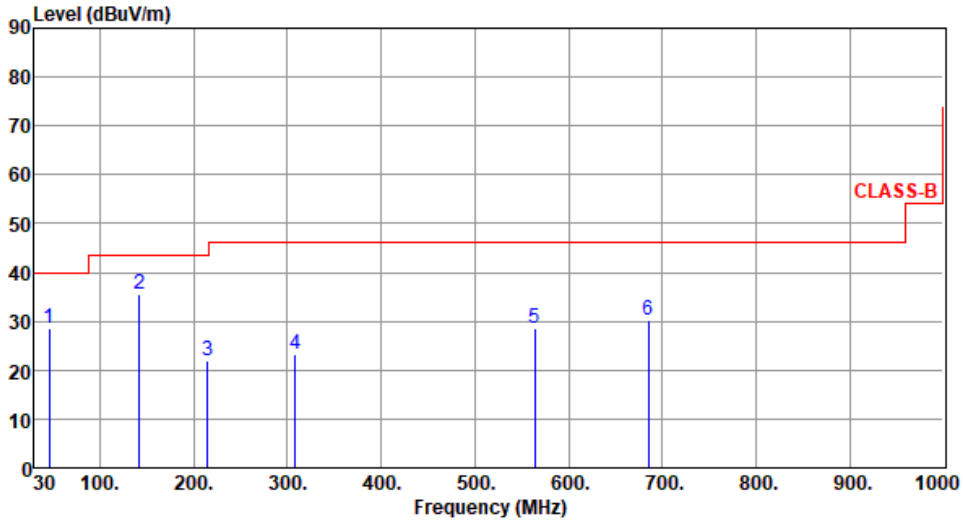


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	218.40	25.50	46.00	-20.50	37.37	-11.87	Peak	---	---
2	277.60	22.44	46.00	-23.56	31.10	-8.66	Peak	---	---
3	388.80	24.86	46.00	-21.14	30.68	-5.82	Peak	---	---
4	476.00	26.73	46.00	-19.27	30.26	-3.53	Peak	---	---
5	554.40	28.69	46.00	-17.31	30.75	-2.06	Peak	---	---
6	639.20	30.97	46.00	-15.03	31.06	-0.09	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	FHSS-DBPSK	Test Freq. (MHz)	904.6625
Polarization	Vertical		

Test By :Roger Lu Temperature(℃):23 Humidity(%):64



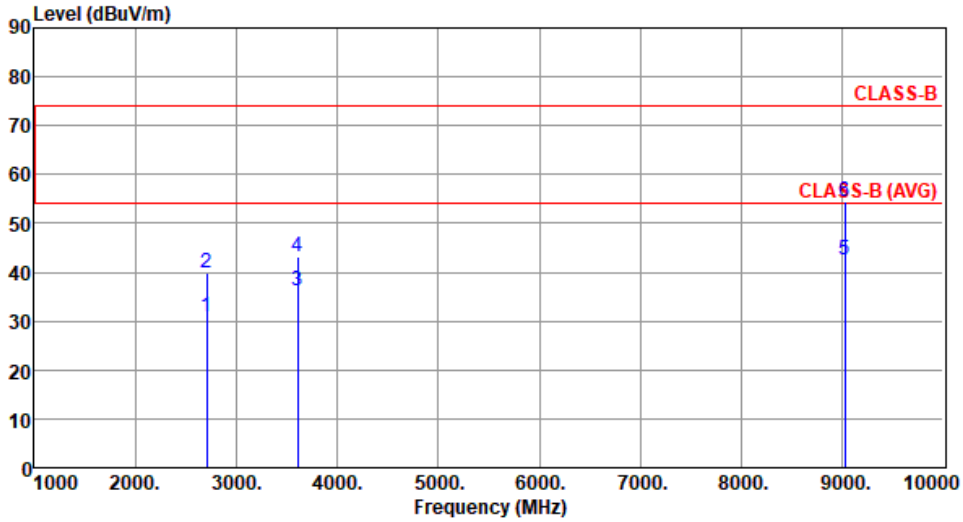
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	45.52	28.41	40.00	-11.59	36.44	-8.03	Peak	---	---
2	142.46	35.52	43.50	-7.98	44.34	-8.82	Peak	---	---
3	215.20	22.06	43.50	-21.44	33.94	-11.88	Peak	---	---
4	308.00	23.19	46.00	-22.81	30.94	-7.75	Peak	---	---
5	564.00	28.66	46.00	-17.34	30.52	-1.86	Peak	---	---
6	684.80	30.31	46.00	-15.69	30.15	0.16	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	FHSS-DBPSK	**Test Freq. (MHz)**	902.1375
Polarization	Horizontal		

Test By :Akun Chung Temperature(℃):25 Humidity(%):61

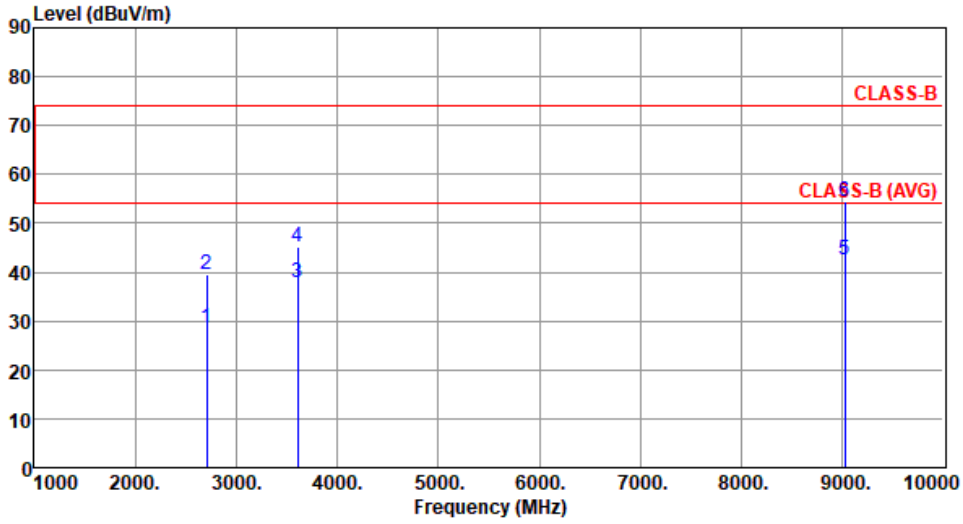


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2706.41	30.87	54.00	-23.13	33.14	-2.27	Average	309	190
2	2706.41	39.78	74.00	-34.22	42.05	-2.27	Peak	309	190
3	3608.55	36.24	54.00	-17.76	36.18	0.06	Average	267	326
4	3608.55	43.13	74.00	-30.87	43.07	0.06	Peak	267	326
5	9021.38	42.44	54.00	-11.56	30.89	11.55	Average	100	109
6	9021.38	54.42	74.00	-19.58	42.87	11.55	Peak	100	109

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	FHSS-DBPSK	Test Freq. (MHz)	902.1375
Polarization	Vertical		

Test By :Akun Chung Temperature(℃):25 Humidity(%):61

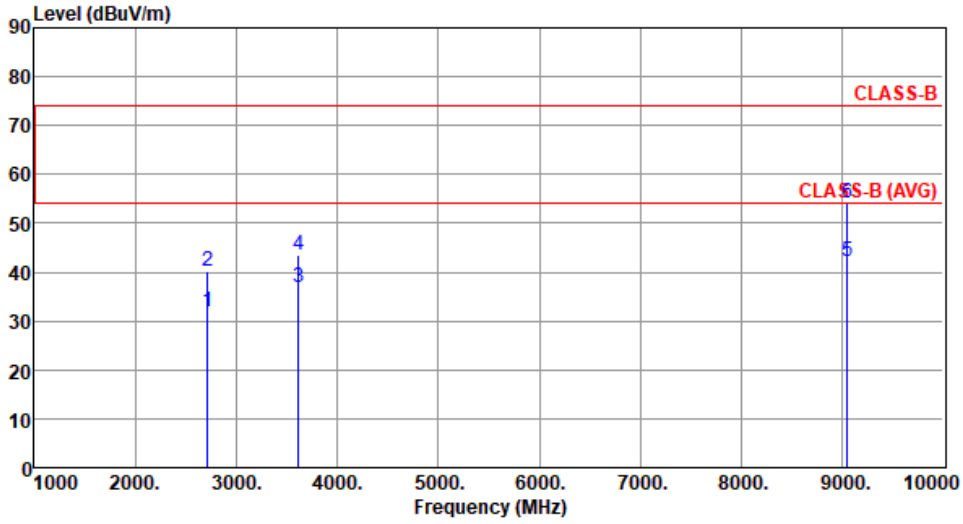


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2706.41	28.42	54.00	-25.58	30.69	-2.27	Average	333	19
2	2706.41	39.45	74.00	-34.55	41.72	-2.27	Peak	333	19
3	3608.55	37.96	54.00	-16.04	37.90	0.06	Average	226	197
4	3608.55	45.07	74.00	-28.93	45.01	0.06	Peak	226	197
5	9021.38	42.50	54.00	-11.50	30.95	11.55	Average	100	58
6	9021.38	54.53	74.00	-19.47	42.98	11.55	Peak	100	58

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	FHSS-DBPSK	Test Freq. (MHz)	904.6625
Polarization	Horizontal		

Test By :Akun Chung Temperature(℃):25 Humidity(%):61

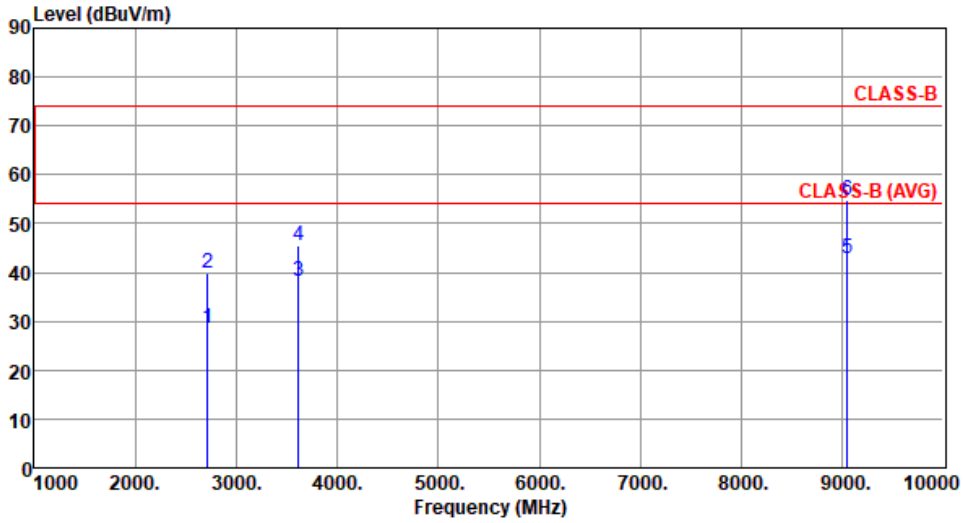


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2713.99	31.74	54.00	-22.26	33.98	-2.24	Average	315	195
2	2713.99	40.35	74.00	-33.65	42.59	-2.24	Peak	315	195
3	3618.65	37.02	54.00	-16.98	36.95	0.07	Average	263	331
4	3618.65	43.66	74.00	-30.34	43.59	0.07	Peak	263	331
5	9046.63	42.10	54.00	-11.90	30.48	11.62	Average	100	112
6	9046.63	54.06	74.00	-19.94	42.44	11.62	Peak	100	112

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	FHSS-DBPSK	Test Freq. (MHz)	904.6625
Polarization	Vertical		

Test By :Akun Chung Temperature(℃):25 Humidity(%):61



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2713.99	28.58	54.00	-25.42	30.82	-2.24	Average	334	21
2	2713.99	39.71	74.00	-34.29	41.95	-2.24	Peak	334	21
3	3618.65	38.30	54.00	-15.70	38.23	0.07	Average	228	205
4	3618.65	45.59	74.00	-28.41	45.52	0.07	Peak	228	205
5	9046.63	42.74	54.00	-11.26	31.12	11.62	Average	100	62
6	9046.63	54.94	74.00	-19.06	43.32	11.62	Peak	100	62

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.2 Unwanted Emissions into Non-Restricted Frequency Bands

3.2.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power

3.2.2 Test Procedures

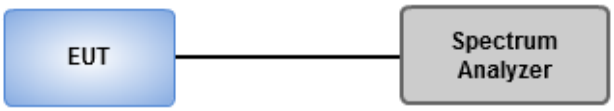
Reference Level Measurement

1. Set the RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
2. Set Sweep time = auto couple, Trace mode = max hold.
3. Allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

Unwanted Emissions Level Measurement

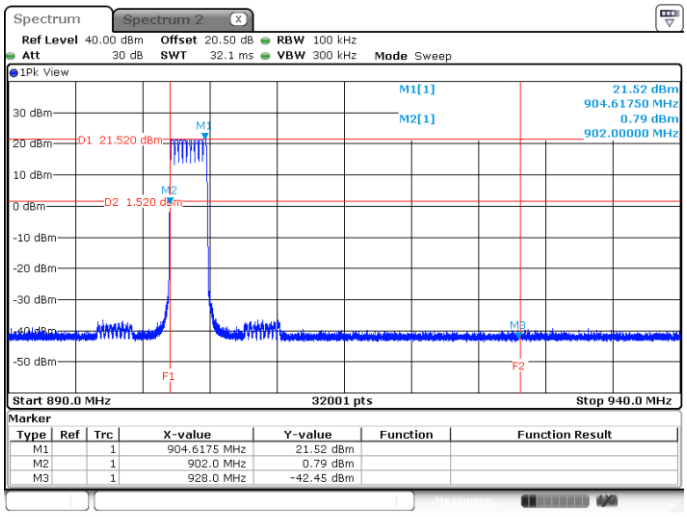
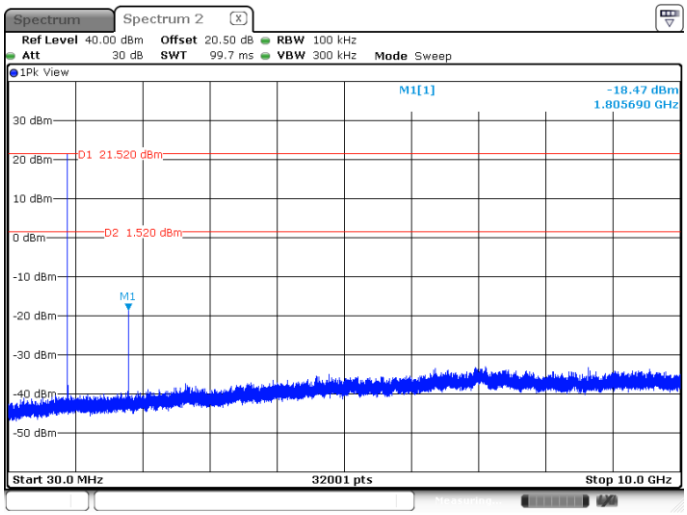
1. Set RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
2. Trace Mode = max hold, Sweep = auto couple.
3. Allow the trace to stabilize.
4. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

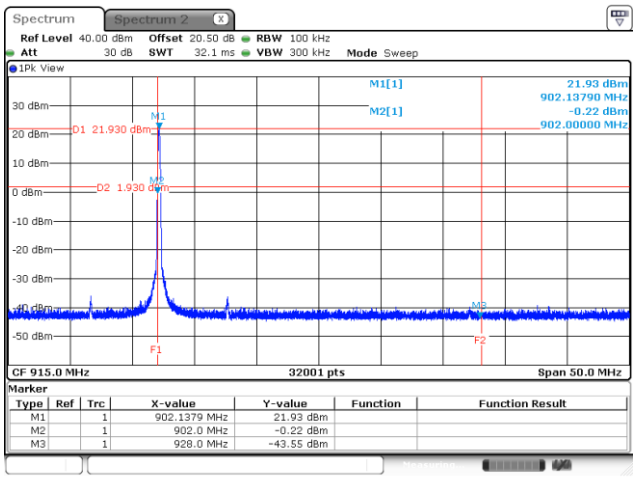
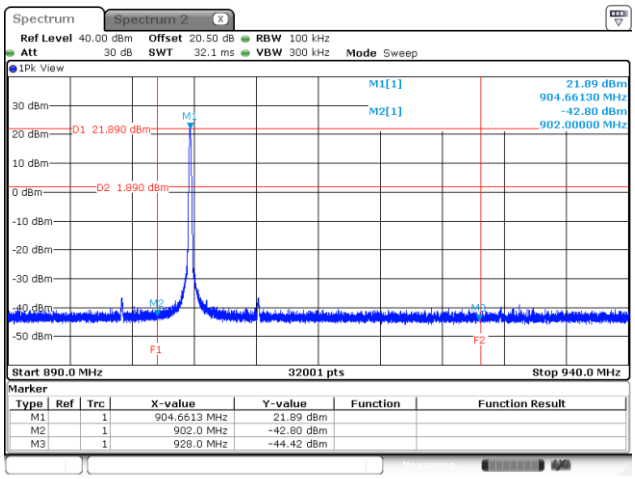
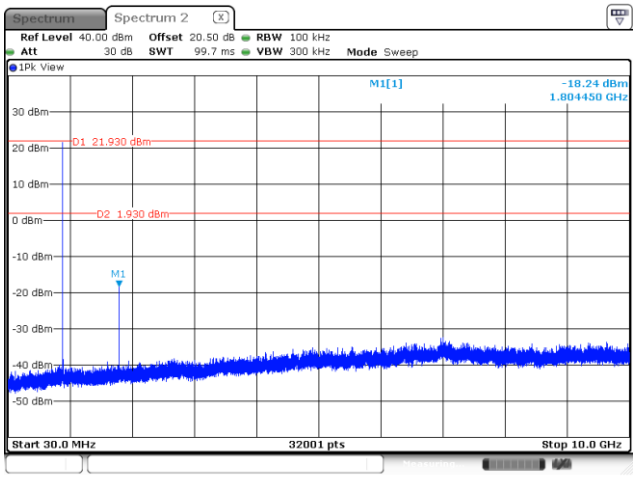
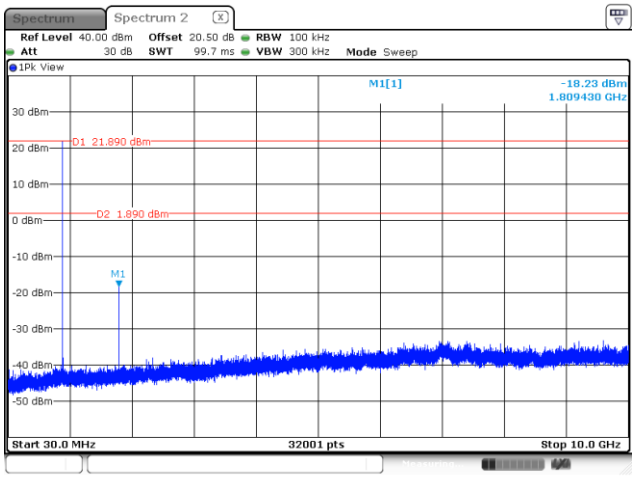
3.2.3 Test Setup



3.2.4 Unwanted Emissions into Non-Restricted Frequency Bands

Ambient Condition	24°C / 67%	Tested By	Aska Huang

Hopping on
30MHz~10GHz (down 20dBc)



Hopping off	Hopping off
902.1375MHz/ 30MHz~10GHz (down 20dBc)	**904.6625MHz / 30MHz~10GHz (down 20dBc)**
	
	

3.3 RF Output Power

3.3.1 Limit of RF Output Power

1 watt for systems employing at least 50 hopping channels

3.3.2 Test Procedures

A wideband power meter is used for power measurement. Bandwidth of power senor and meter is 50MHz

If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power

3.3.3 Test Setup

3.3.4 Test Result of Maximum Output Power

Ambient Condition	24°C / 67%	**Tested By**	Aska Huang

Modulation Mode	Freq. (MHz)	Output Power (mW)	Output Power (dBm)	Limit (dBm)
FHSS-DBPSK	902.1375	162.55	22.11	30
FHSS-DBPSK	904.6625	170.61	22.32	30

Modulation Mode	Freq. (MHz)	AV Output Power (mW)	AV Output Power (dBm)
FHSS-DBPSK	902.1375	160.69	22.06
FHSS-DBPSK	904.6625	169.04	22.28

Note: Average power is for reference only.

3.4 Number of Hopping Frequency

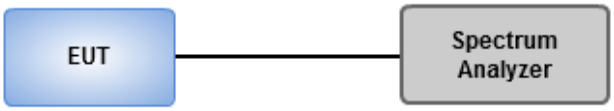
3.4.1 Limit of Number of Hopping Frequency

The 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

3.4.2 Test Procedures

1. Set RBW = 1 kHz, VBW = 3 kHz, Sweep time = Auto, Detector = Peak Trace max hold.
2 Allow trace to stabilize.

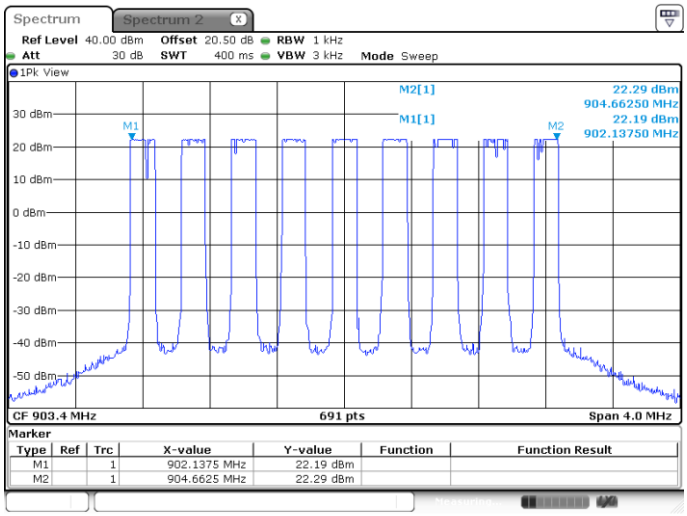
3.4.3 Test Setup

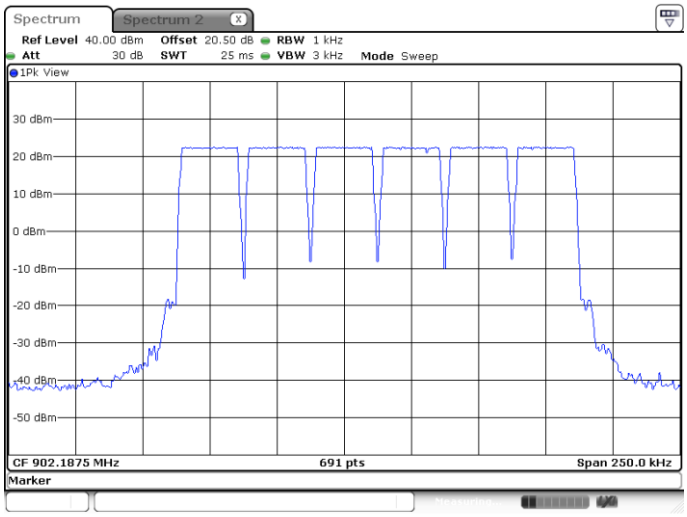


3.4.4 Test Result of Number of Hopping Frequency

Ambient Condition	24°C / 67%	Tested By	Aska Huang

Hopping Frequency





3.5 20dB and Occupied Bandwidth

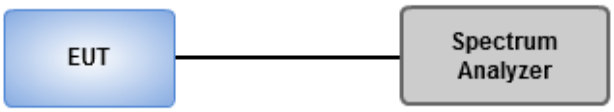
3.5.1 Limit of Number of 20dB Bandwidth

The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

3.5.2 Test Procedures

1. Set resolution bandwidth (RBW) = 500 Hz, Video bandwidth = 2 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20dB relative to the maximum level measured in the fundamental emission.
5. Use the occupied measurement function of specturm analyzer to measure 99% occupied bandwidth.

3.5.3 Test Setup

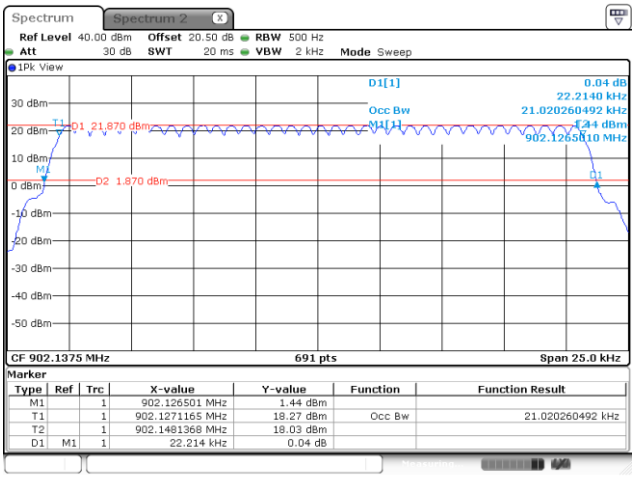


3.5.4 20dB and Occupied Bandwidth

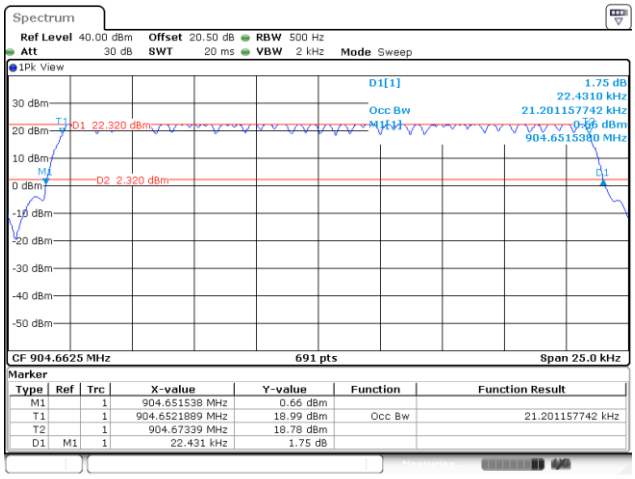
Ambient Condition	24°C / 67%	Tested By	Aska Huang

Modulation Mode	Freq. (MHz)	20dB Bandwidth (kHz)	Occupied Bandwidth (kHz)
FHSS-DBPSK	902.1375	22.21	21.02
FHSS-DBPSK	904.6625	22.43	21.20
Limit(kHz)		500	---

902.1375 MHz



904.6625 MHz



3.6 Channel Separation

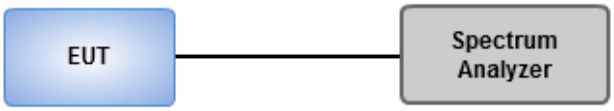
3.6.1 Limit of Channel Separation

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

3.6.2 Test Procedures

1. Set RBW=1 kHz, VBW=3 kHz,Sweep time = Auto, Detector=Peak Trace max hold
2 Allow trace to stabilize
3 Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The EUT shall show compliance with the appropriate regulatory limit

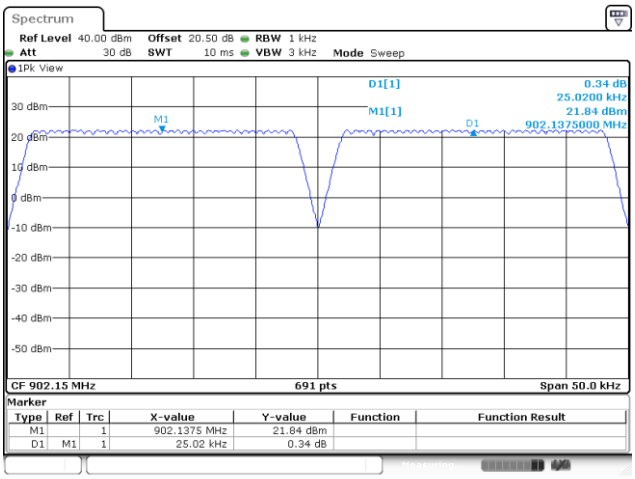
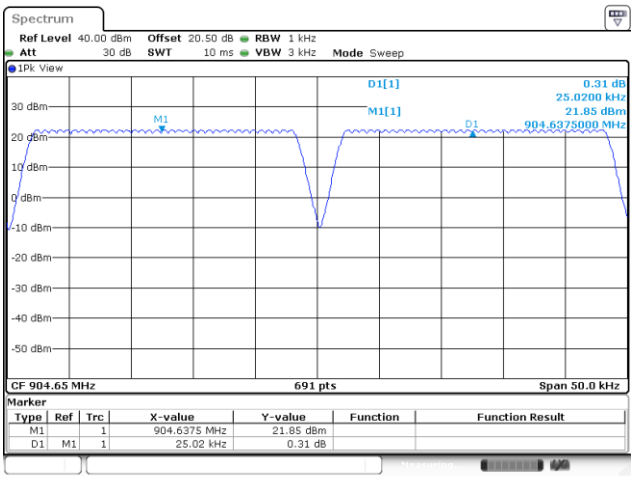
3.6.3 Test Setup



3.6.4 Test result of Channel Separation

Ambient Condition	24°C / 67%	Tested By	Aska Huang

Modulation Mode	Freq. (MHz)	Channel Separation (kHz)	Limit (kHz)
FHSS-DBPSK	902.1375	25.02	25.00
FHSS-DBPSK	904.6625	25.02	25.00

902.1375MHz	904.6625MHz
	

3.7 Number of Dwell Time

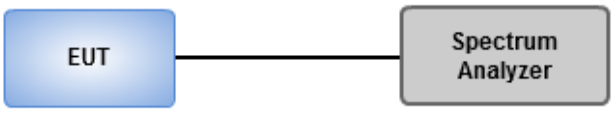
3.7.1 Limit of Dwell time

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period;

3.7.2 Test Procedures

1. Set RBW=100kHz,VBW=300kHz,Sweep time = 500 ms, Detector=Peak, Span=0Hz,Trace max hold
2 Enable gating and trigger function of spectrum analyzer to measure burst on time.

3.7.3 Test Setup

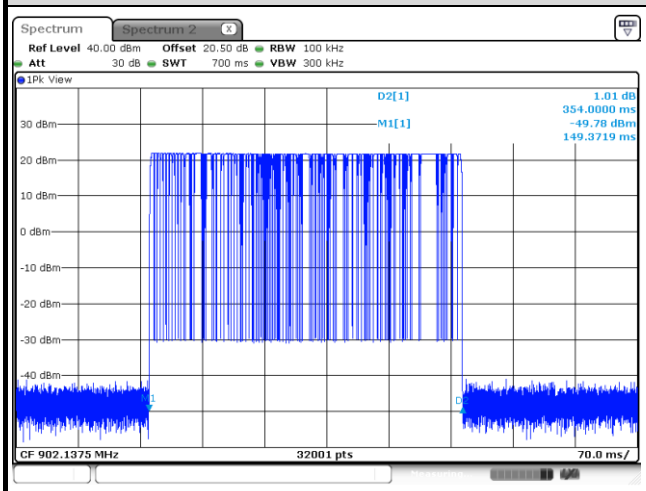


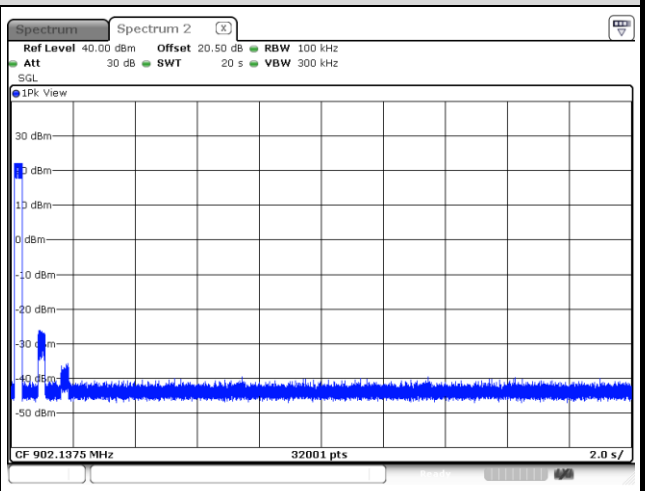
3.7.4 Test Result of Dwell Time

Ambient Condition	24°C / 67%	**Tested By**	Aska Huang

Modulation Mode	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in 9.6s (24 Hopping*0.4)	Result (s)	Limit (s)
FHSS-DBPSK	902.3	0.354000	1	0.354	0.4

Dwell Time





4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

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