FCC C2PC Test Report

FCC ID	:	**KQL-AC4490**
Equipment	:	**902 - 928 MHz FHSS, 0 - 1 W, MMCX** **902 - 928 MHz FHSS, 0 - 1 W, MMCX, Long Range**
Model No.	:	**AC4490-1000M** **AC4790-1000M** **AC4490LR-1000M** **AC4790LR-1000M**
Brand Name	:	**Laird Connectivity**
Applicant	:	**Laird Connectivity LLC**
Address	:	**W66N220 Commerce Court, Cedarburg, WI 53012** **United States Of America**
Standard	:	**47 CFR FCC Part 15.247**
Received Date	:	**Mar. 29, 2022**
Tested Date	:	**Mar. 29 ~ Jul. 08, 2022**

We, International Certification Corporation, 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 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**

Table of Contents

1 GENERAL DESCRIPTION 5

1.1 Information 5
1.2 Local Support Equipment List 7
1.3 Test Setup Chart 7
1.4 The Equipment List 8
1.5 Test Standards 9
1.6 Reference Guidance 9
1.7 Deviation from Test Standard and Measurement Procedure 9
1.8 Measurement Uncertainty 9

2 TEST CONFIGURATION 10

2.1 Testing Facility 10
2.2 The Worst Test Modes and Channel Details 10

3 TRANSMITTER TEST RESULTS 11

3.1 Unwanted Emissions into Restricted Frequency Bands 11
3.2 Unwanted Emissions into Non-Restricted Frequency Bands 13
3.3 Conducted Output Power 14
3.4 Number of Hopping Frequency 15
3.5 20dB and Occupied Bandwidth 16
3.6 Channel Separation 17
3.7 Number of Dwell Time 18
3.8 AC Power Line Conducted Emissions 19

4 TEST LABORATORY INFORMATION 20

Appendix A. Unwanted Emissions into Restricted Frequency Bands
Appendix B. Unwanted Emissions into Non-Restricted Frequency Bands
Appendix C. Conducted Output Power
Appendix D. Number of Hopping Frequency
Appendix E. 20dB and Occupied Bandwidth
Appendix F. Channel Separation
Appendix G. Number of Dwell Time
Appendix H. AC Power Line Conducted Emissions

Release Record

Report No.	Version	Description	Issued Date
FR232902	Rev. 01	Initial issue	Sep. 22, 2022

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emission	[dBuV]: 0.150MHz 58.43 (Margin -7.57dB) - QP	Pass
15.247(d) 15.209	Unwanted Emissions	[dBuV/m at 3m]: 546.59MHz 42.59 (Margin -3.41dB) - PK	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(2)(3)	Conducted Output Power	Power [dBm]: 28.03	Pass
15.247(a)(1)(i)	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(f)	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

This is a Class II Permissive Change report (C2PC).

1.1.1 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product Name	Description
Laird Connectivity	AC4490-1000M	902 - 928 MHz FHSS, 0 - 1 W, MMCX	---
	AC4790-1000M	902 - 928 MHz FHSS, 0 - 1 W, MMCX	Different FW
	AC4490LR-1000M	902 - 928 MHz FHSS, 0 - 1 W, MMCX, Long Range	Add LNA with Different FW
	AC4790LR-1000M	902 - 928 MHz FHSS, 0 - 1 W, MMCX, Long Range	Add LNA with Different FW
✦ The above models, model AC4490LR-1000M were chosen for final test and only its data was recorded in this report.			

1.1.2 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (MHz)	**Ch. Freq. (MHz)**	**Channel List**	**Data Rate (bit/sec)**	**Channel Bandwidth (kHz)**
902 ~ 928	902.213~927.492	50 channels	76.8 kbps	145
Note 1: RF output power specifies that Maximum Conducted (Average) Output Power. Note 2: The device uses FSK modulation.				

1.1.3 Antenna Details

Ant. No.	Model	Laird Part #	Type	Connector	Gain (dBi)
1	S467FL-L-RMM-915S	0600-00019	Dipole	R/A MMCX Plug (male)	2
2	S467FL-L-RMM-915	0600-00025	Dipole	R/A MMCX Plug (male)(Swivel)	2
3	S467AH-915S	--	Dipole	RPSMA (female)	2
4	S467AH-915	0600-00024	Dipole	RPSMA (female)	2
5	S161AH-915R	0600-00028	Dipole	RPSMA	2.5
6	S161AH-915	0600-00029	Dipole	RPSMA (female)	2.5

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3.3Vdc from host

1.1.5 Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	902.213	13	909.06	26	915.903	39	922.751
1	902.74	14	909.585	27	916.431	40	923.278
2	903.267	15	910.111	28	916.958	41	923.805
3	903.795	16	910.638	29	917.486	42	924.333
4	904.321	17	911.167	30	918.012	43	924.858
5	904.846	18	911.692	31	918.538	44	925.385
6	905.375	19	912.217	32	919.063	45	925.911
7	905.9	20	912.743	33	919.591	46	926.439
8	906.428	21	913.27	34	920.116	47	926.965
9	906.952	22	913.7	35	920.643	48	927.492
10	907.478	23	914.325	36	921.172	49	927.256
11	908.01	24	914.852	37	921.697	---	---
12	908.532	25	915.378	38	922.223	---	---

1.1.6 Test Tool and Duty Cycle

Test Tool	Laird Technologies Config, Version: V6.07	
Modulation Mode	**Duty Cycle (%)**	**Duty Factor (dB)**
FSK	100	0

1.1.7 Power Index of Test Tool

Channel Bandwidth: 145KHz	
Test Frequency (MHz)	**Power Index**
902.213	default
915.378	default
927.492	default

1.1.8 Test Sample Information

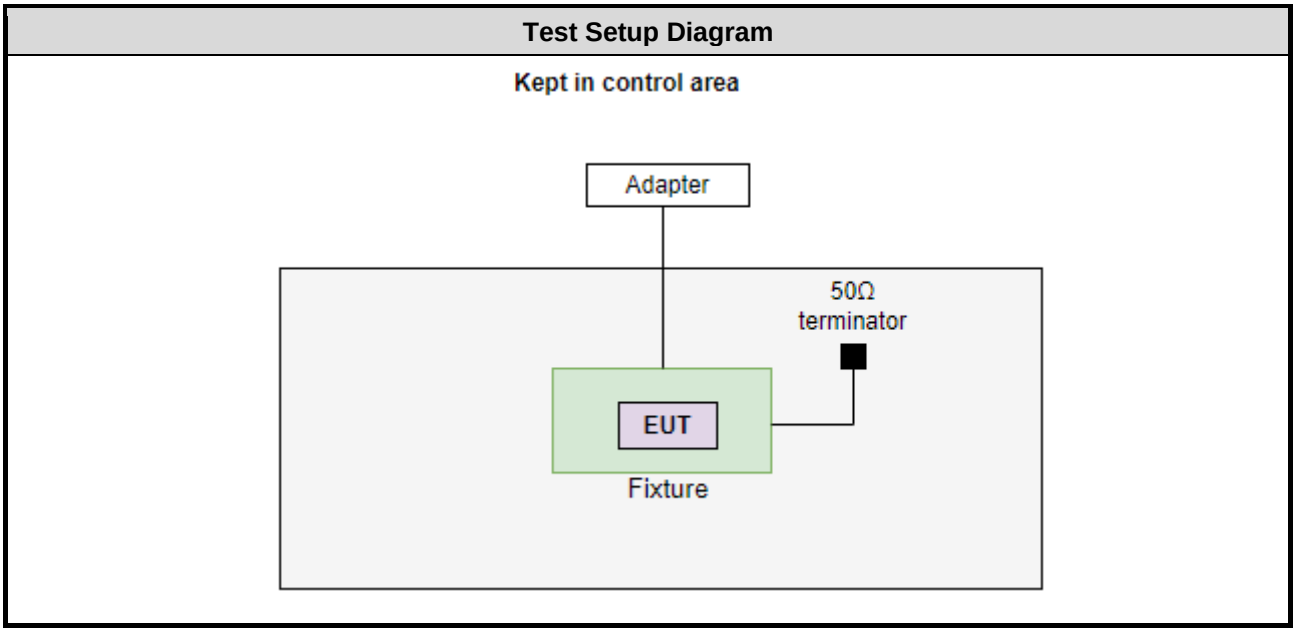
Serial Number of Test Sample	Radiated Emission: C11011183 AC Power Line Conducted Emission: C11011183 Antenna Port Conducted: C11011183

1.2 Local Support Equipment List

Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**FCC ID**	**Remarks**
1	Adapter	ITE	MU12AY120100-A1	---	Provided by applicant.
2	Fixture	---	---	---	Provided by applicant.
3	RS232	Laird	Laird-1	---	Provided by applicant.
4	PC	MSI	Cubi B164	---	Provided by applicant.

1.3 Test Setup Chart

Test Setup Diagram



Note: The PC and RS232 cable are 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	Jul. 08, 2022				
Instrument	**Brand**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101658	Feb. 16, 2022	Feb. 15, 2023
LISN	R&S	ENV216	101579	Apr. 21, 2022	Apr. 20, 2023
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127667	Jan .07, 2022	Jan .06, 2023
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 19, 2021	Oct. 18, 2022
50 ohm terminal (Support Unit)	NA	50	01	May 10, 2022	May 09, 2023
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	Apr. 20, 2022				
Instrument	**Brand**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101657	Mar. 15, 2022	Mar. 14, 2023
Spectrum Analyzer	R&S	FSV40	101498	Nov. 29, 2021	Nov. 28, 2022
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jun. 30, 2021	Jun. 29, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 03, 2021	Dec. 02, 2022
Preamplifier	EMC	EMC02325	980225	Jun. 29, 2021	Jun. 28, 2022
Preamplifier	Agilent	83017A	MY39501308	Sep. 28, 2021	Sep. 27, 2022
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 05, 2021	Oct. 04, 2022
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 05, 2021	Oct. 04, 2022
LF cable 11M	EMC	EMCCFD400-NW-NW-11000	200801	Oct. 05, 2021	Oct. 04, 2022
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	160502	Oct. 05, 2021	Oct. 04, 2022
RF Cable	EMC	EMC104-35M-35M-8000	210920	Oct. 05, 2021	Oct. 04, 2022
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 05, 2021	Oct. 04, 2022
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	Mar. 29 ~ Apr. 14, 2022				
Instrument	**Brand**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Nov. 29, 2021	Nov. 28, 2022
Power Meter	Anritsu	ML2495A	1241002	Nov. 07, 2021	Nov. 06, 2022
Power Sensor	Anritsu	MA2411B	1207366	Nov. 07, 2021	Nov. 06, 2022
Measurement Software	Sporton	SENSE-15247_FS	V5.10.7.11	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

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
Conducted power	±0.808 dB
Unwanted Emission ≤ 1GHz	±3.41 dB
Unwanted Emission > 1GHz	±4.59 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, 03CH01-WS, TH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, 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	Modulation Mode	Channel Bandwidth (kHz)	Radiated / Conducted Measurement	Test Frequency (MHz)	Test model	Mode
AC Power Line Conducted Emission Unwanted Emissions Hopping Channel Separation 20dB and Occupied bandwidth	FSK	145	Conducted	902.213 915.378 927.492	AC4490LR-1000M	Tx
Unwanted Emissions	FSK	145	Radiated	902.213 915.378 927.492	AC4490LR-1000M	Tx
Conducted Output Power	FSK	145	Conducted	902.213 915.378 927.492	AC4490LR-1000M AC4490-1000M	Tx
Number of Hopping Channels	FSK	145	Conducted	902.213 ~ 927.492	AC4490LR-1000M	Tx
Dwell Time	FSK	145	Conducted	902.213	AC4490LR-1000M AC4790LR-1000M	Tx

NOTE:
1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Y-plane** result was found as the worst case and was shown in this report.
2. Model AC4490-1000M & AC4490LR-1000M had been covered during the pretest and found that AC4490LR-1000M was the worst case and was chosen for final test.
3. 50Ω terminators was connected to antenna port of EUT for radiated emission measurement.
4. Dipole antenna with highest gain was for conducted emission measurement.

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

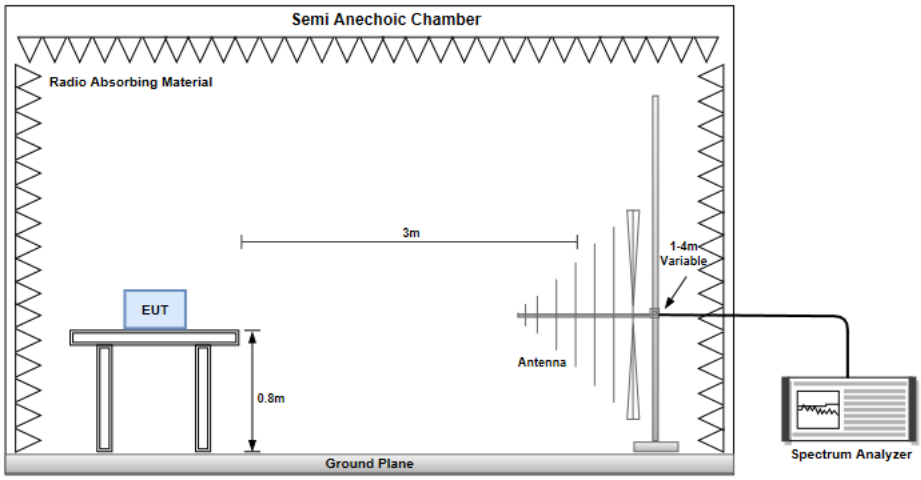
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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:

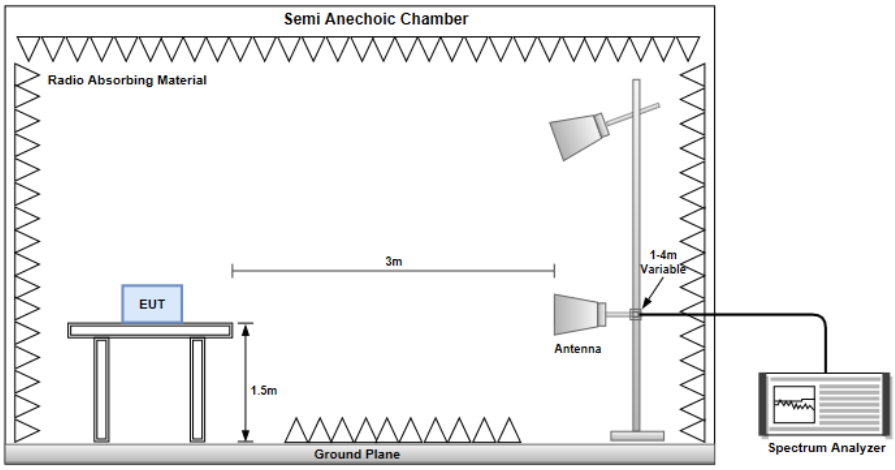
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.1.3 Test Setup

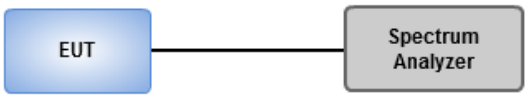
Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



Transmitter Conducted Unwanted Emissions



.

3.1.4 Test Results

Refer to Appendix A.

3.2 Unwanted Emissions into Non-Restricted Frequency Bands

3.2.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

The peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.2.2 Test Procedures

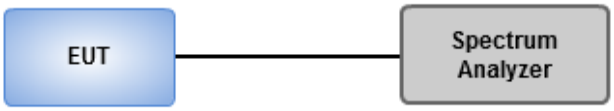
Reference Level Measurement

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 Test Results

Ambient Condition	21-23°C / 65-68%	Tested By	Aska Huang

Refer to Appendix B.

3.3 Conducted Output Power

3.3.1 Limit of Conducted Output Power

1W

3.3.2 Test Procedures

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

Ambient Condition	21-23°C / 65-68%	**Tested By**	Aska Huang

Refer to Appendix C.

3.4 Number of Hopping Frequency

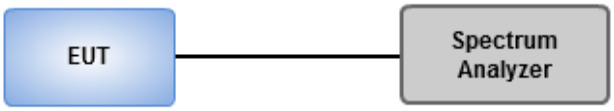
3.4.1 Limit of Number of Hopping Frequency

Number of Hopping Frequencies Limit for Frequency Hopping Systems	
☒	902-928 MHz Band:
	☐ N ≥ 50, 20 dB bandwidth of the hopping channel is less than 250 kHz
	☐ N ≥ 25, 20 dB bandwidth of the hopping channel is 250 kHz or greater
	☒ Hybrid mode, No minimum number of hopping channels associated with hybrid system.
N: Number of Hopping Frequencies	

3.4.2 Test Procedures

1. Set RBW = 100kHz, VBW = 300kHz, Sweep time = Auto, Detector = Peak Trace max hold.
2 Allow trace to stabilize.

3.4.3 Test Setup



3.4.4 Test Results

Ambient Condition	21-23°C / 65-68%	**Tested By**	Aska Huang

Refer to Appendix D.

3.5 20dB and Occupied Bandwidth

3.5.1 Test Procedures

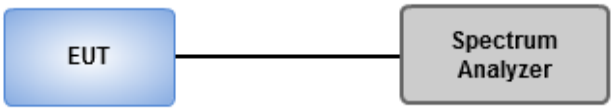
20dB Bandwidth

1. Set RBW=3kHz, VBW=10kHz, Sweep time=Auto, Detector=Peak Trace max hold.
2 Allow trace to stabilize.
3 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 20 dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

1. Set RBW=3kHz, VBW=10kHz,Sweep time = Auto, Detector=Peak, Trace max hold
2 Allow trace to stabilize
3. Use Occupied bandwidth function of spectrum analyzer to measuring 99% occupied bandwidth

3.5.2 Test Setup



3.5.3 Test Results

Ambient Condition	21-23°C / 65-68%	Tested By	Aska Huang

Refer to Appendix E.

3.6 Channel Separation

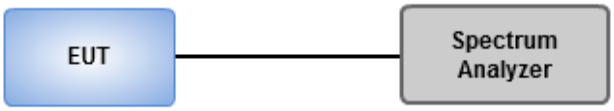
3.6.1 Limit of Channel Separation

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=10kHz, VBW=30kHz, 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 Results

Ambient Condition	21-23°C / 65-68%	**Tested By**	Aska Huang

Refer to Appendix F.

3.7 Number of Dwell Time

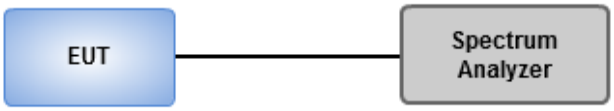
3.7.1 Limit of Dwell time

Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems		
☒	902-928 MHz Band:	
	☐	≤ 0.4 second within a 20 second period, 20 dB bandwidth of the hopping channel is less than 250 kHz
	☐	≤ 0.4 second within a 10 second period, 20 dB bandwidth of the hopping channel is 250 kHz or greater
	☒	Hybrid mode ,an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4

3.7.2 Test Procedures

1. Set RBW=200kHz, VBW=1000kHz, Sweep time=3.2s / 500ms, Detector=Peak, Span=0Hz, Trace max hold for 8 hopping channels.
2. Set RBW=200kHz, VBW=1000kHz, Sweep time=6.4s / 500ms, Detector=Peak, Span=0Hz, Trace max hold for 16 hopping channels.
3. Set RBW=200kHz, VBW=1000kHz, Sweep time=25.6s / 500ms, Detector=Peak, Span=0Hz, Trace max hold for 64 hopping channels.
4. Measure and record the burst on time.

3.7.3 Test Setup



3.7.4 Test Results

Ambient Condition	21-23°C / 65-68%	Tested By	Aska Huang

Refer to Appendix G.

3.8 AC Power Line Conducted Emissions

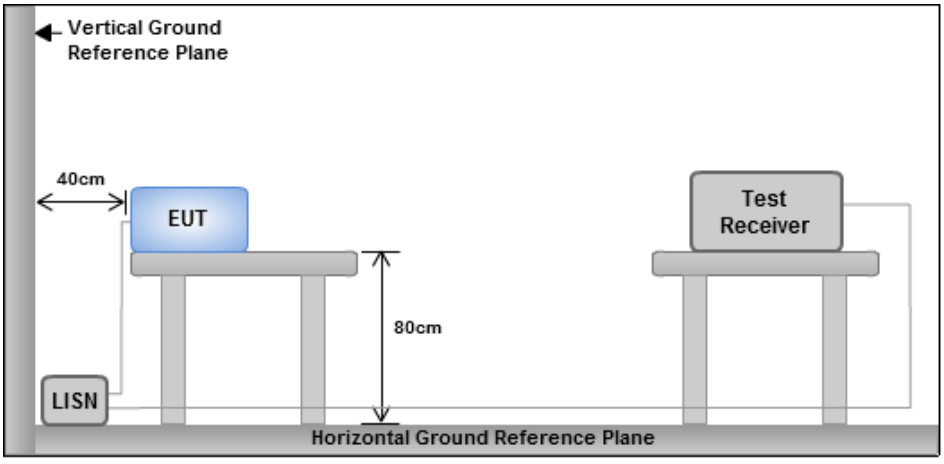
3.8.1 Limit of AC Power Line Conducted Emissions

Conducted Emissions Limit		
Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.8.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

3.8.3 Test Setup



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.8.4 Test Result of Conducted Emissions

Refer to Appendix H.

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 Corporation (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

Tel: 886-2-2601-1640

No.30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan (R.O.C.)

Kwei Shan

Tel: 886-3-271-8666

No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

No.2-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640

No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 333, Taiwan (R.O.C.)

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

Tel: 886-3-271-8666
Fax: 886-3-318-0345
Email: ICC_Service@icertifi.com.tw

==END==

Summary

Mode	Result	F-Start (Hz)	F-Stop (Hz)	Type	Freq (Hz)	DG (dBi)	Psum (dBm)	GRF (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
902-928MHz	-	-	-	-	-	-	-	-	-	-	-
FSK-145k	Pass	30M	88M	PK	74.28M	2.50	-70.23	4.7	-63.03	-55.20	-7.83

DG = Directional Gain ; PX=Port X; Psum=P1

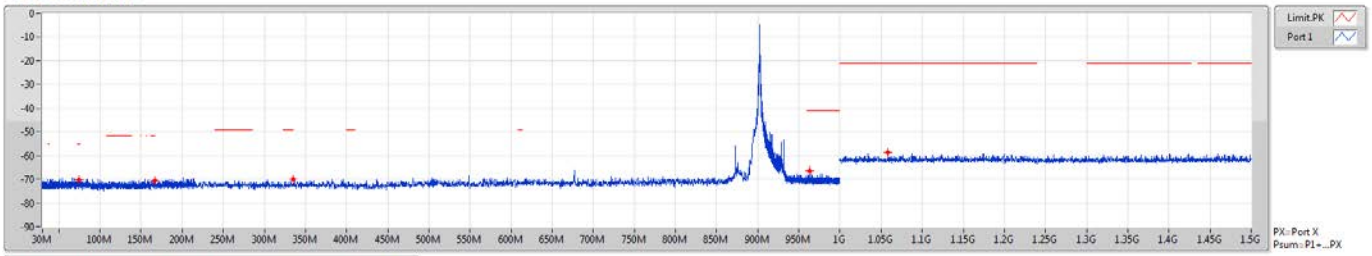
Result

Mode	Result	F-Start (Hz)	F-Stop (Hz)	Type	Freq (Hz)	DG (dBi)	Psum (dBm)	GRF (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
FSK-145k	-	-	-	-	-	-	-	-	-	-	-
902.213MHz	Pass	1G	1.5G	AV	1.1275G	2.50	-69.04	0	-66.54	-21.20	-45.34
902.213MHz	Pass	30M	88M	PK	74.28M	2.50	-70.23	4.7	-63.03	-55.20	-7.83
902.213MHz	Pass	88M	216M	PK	167.04M	2.50	-70.64	4.7	-63.44	-51.70	-11.74
902.213MHz	Pass	216M	902M	PK	335.02M	2.50	-69.87	4.7	-62.67	-49.20	-13.47
902.213MHz	Pass	928M	1G	PK	963.24M	2.50	-66.46	4.7	-59.26	-41.20	-18.06
902.213MHz	Pass	1G	1.5G	PK	1.05825G	2.50	-58.73	0	-56.23	-21.20	-35.03
915.378MHz	Pass	1G	1.5G	AV	1.144G	2.50	-68.59	0	-66.09	-21.20	-44.89
915.378MHz	Pass	30M	88M	PK	37.98M	2.50	-72.06	4.7	-64.86	-55.20	-9.66
915.378MHz	Pass	88M	216M	PK	117.06M	2.50	-70.68	4.7	-63.48	-51.70	-11.78
915.378MHz	Pass	216M	902M	PK	261.96M	2.50	-69.89	4.7	-62.69	-49.20	-13.49
915.378MHz	Pass	928M	1G	PK	972.24M	2.50	-67.80	4.7	-60.60	-41.20	-19.40
915.378MHz	Pass	1G	1.5G	PK	1.44525G	2.50	-58.99	0	-56.49	-21.20	-35.29
927.492MHz	Pass	1G	1.5G	AV	1.15925G	2.50	-67.06	0	-64.56	-21.20	-43.36
927.492MHz	Pass	30M	88M	PK	37.54M	2.50	-71.76	4.7	-64.56	-55.20	-9.36
927.492MHz	Pass	88M	216M	PK	113.28M	2.50	-70.16	4.7	-62.96	-51.70	-11.26
927.492MHz	Pass	216M	902M	PK	608.05M	2.50	-70.18	4.7	-62.98	-49.20	-13.78
927.492MHz	Pass	928M	1G	PK	961.16M	2.50	-62.94	4.7	-55.74	-41.20	-14.54
927.492MHz	Pass	1G	1.5G	PK	1.36025G	2.50	-59.54	0	-57.04	-21.20	-35.84

DG = Directional Gain ; PX=Port X; Psum=P1

FSK-145k **CSE-FS [PK]**

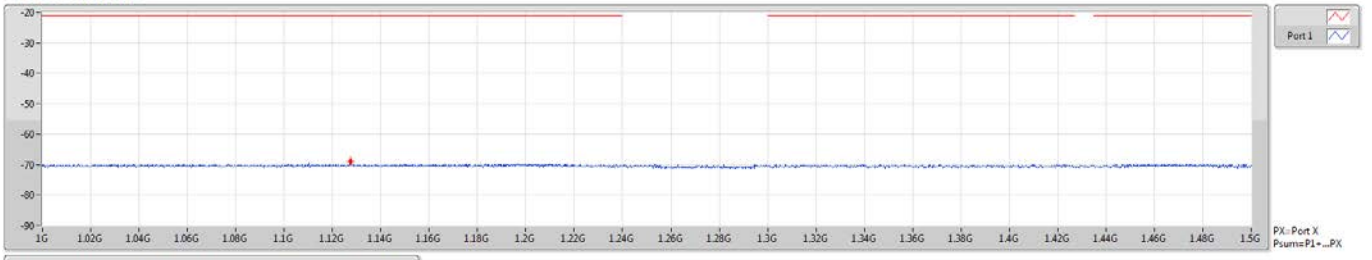
902.213MHz



F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm
30M	88M	100k	PK	74.28M	-70.23	-70.23
88M	216M	100k	PK	167.04M	-70.64	-70.64
216M	902M	100k	PK	335.02M	-69.87	-69.87
928M	1G	100k	PK	963.24M	-66.46	-66.46
1G	1.5G	1M	PK	1.05825G	-58.73	-58.73

FSK-145k **CSE-FS [AV]**

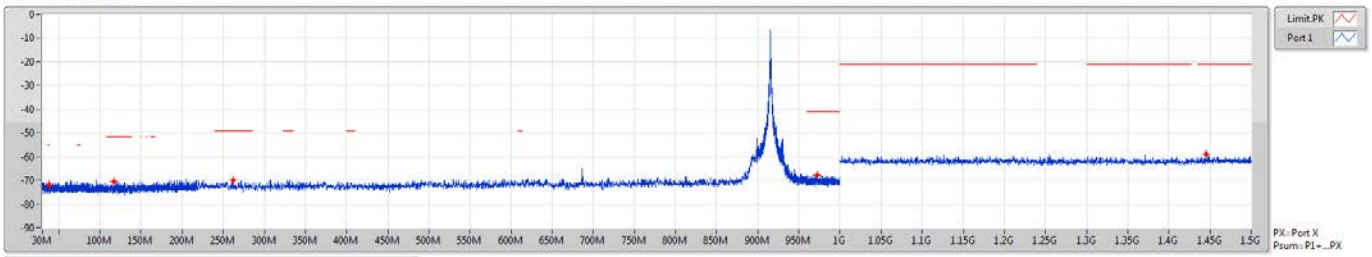
902.213MHz



F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm
1G	1.5G	1M	AV	1.1275G	-69.04	-69.04

FSK-145k **CSE-FS [PK]**

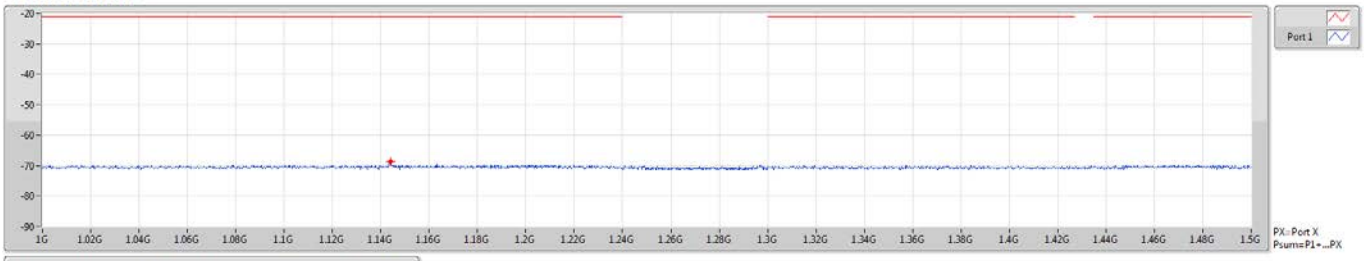
915.378MHz



F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm
30M	88M	100k	PK	37.98M	-72.06	-72.06
88M	216M	100k	PK	117.06M	-70.68	-70.68
216M	902M	100k	PK	261.96M	-69.89	-69.89
928M	1G	100k	PK	972.24M	-67.80	-67.80
1G	1.5G	1M	PK	1.44525G	-58.99	-58.99

FSK-145k **CSE-FS [AV]**

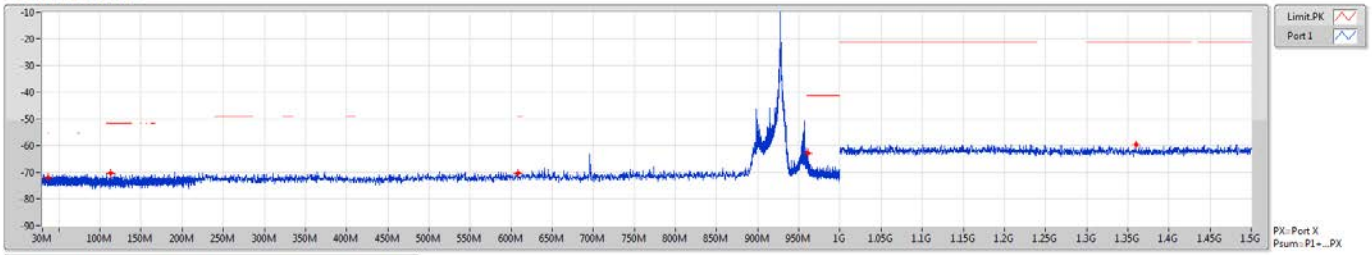
915.378MHz



F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm
1G	1.5G	1M	AV	1.344G	-68.59	-68.59

FSK-145k **CSE-FS [PK]**

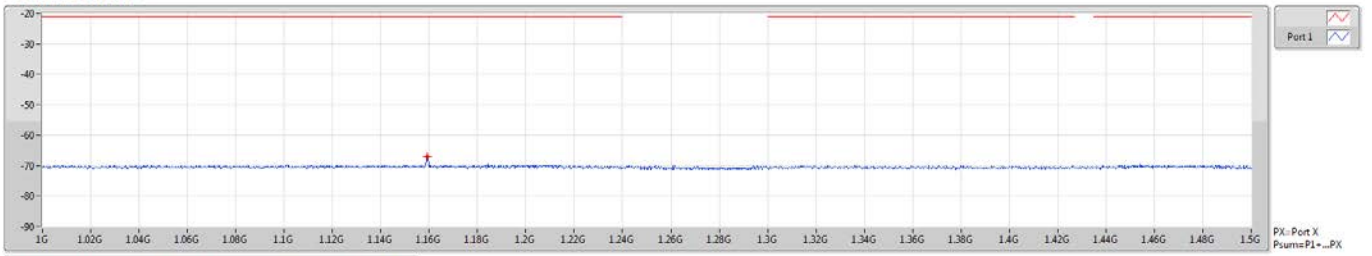
927.492MHz



F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm
30M	88M	100k	PK	37.54M	-71.76	-71.76
88M	216M	100k	PK	113.28M	-70.16	-70.16
216M	902M	100k	PK	608.05M	-70.18	-70.18
928M	1G	100k	PK	961.16M	-62.94	-62.94
1G	1.5G	1M	PK	1.36025G	-59.54	-59.54

FSK-145k **CSE-FS [AV]**

927.492MHz



F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm
1G	1.5G	1M	AV	1.15925G	-67.06	-67.06

Summary

Mode	Result	F-Start (Hz)	F-Stop (Hz)	Type	Freq (Hz)	DG (dBi)	Psum (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
902-928MHz	-	-	-	-	-	-	-	-	-	-
FSK-145k	Pass	4G	7G	AV	4.57938G	2.50	-54.25	-51.75	-41.20	-10.55

DG = Directional Gain ; PX=Port X; Psum=P1

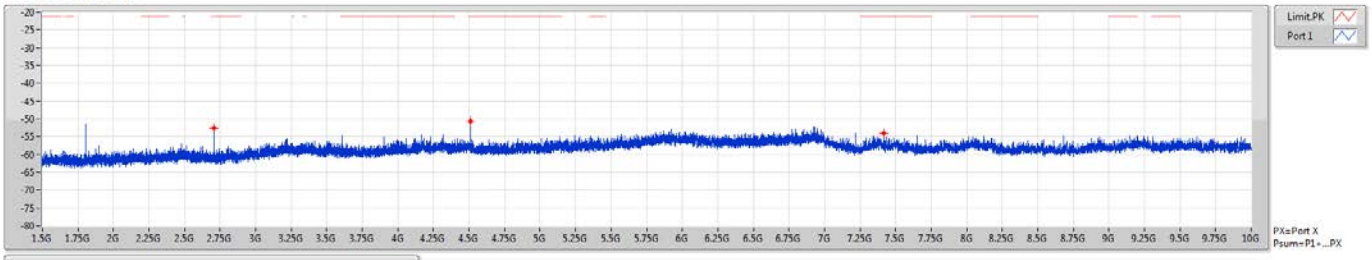
Result

Mode	Result	F-Start (Hz)	F-Stop (Hz)	Type	Freq (Hz)	DG (dBi)	Psum (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
FSK-145k	-	-	-	-	-	-	-	-	-	-
902.213MHz	Pass	1.5G	4G	AV	2.70656G	2.50	-56.66	-54.16	-41.20	-12.96
902.213MHz	Pass	4G	7G	AV	4.51113G	2.50	-54.29	-51.79	-41.20	-10.59
902.213MHz	Pass	7G	10G	AV	8.12013G	2.50	-64.67	-62.17	-41.20	-20.97
902.213MHz	Pass	1.5G	4G	PK	2.70688G	2.50	-52.47	-49.97	-21.20	-28.77
902.213MHz	Pass	4G	7G	PK	4.51113G	2.50	-50.81	-48.31	-21.20	-27.11
902.213MHz	Pass	7G	10G	PK	7.4146G	2.50	-54.01	-51.51	-21.20	-30.31
915.378MHz	Pass	1.5G	4G	AV	2.74781G	2.50	-57.58	-55.08	-41.20	-13.88
915.378MHz	Pass	4G	7G	AV	4.57938G	2.50	-54.25	-51.75	-41.20	-10.55
915.378MHz	Pass	7G	10G	AV	7.32738G	2.50	-64.01	-61.51	-41.20	-20.31
915.378MHz	Pass	1.5G	4G	PK	2.74844G	2.50	-54.07	-51.57	-21.20	-30.37
915.378MHz	Pass	4G	7G	PK	4.57975G	2.50	-49.78	-47.28	-21.20	-26.08
915.378MHz	Pass	7G	10G	PK	9.3904G	2.50	-54.11	-51.61	-21.20	-30.41
927.492MHz	Pass	1.5G	4G	AV	2.78281G	2.50	-60.48	-57.98	-41.20	-16.78
927.492MHz	Pass	4G	7G	AV	4.6375G	2.50	-57.91	-55.41	-41.20	-14.21
927.492MHz	Pass	7G	10G	AV	9.19675G	2.50	-64.78	-62.28	-41.20	-21.08
927.492MHz	Pass	1.5G	4G	PK	3.955G	2.50	-54.89	-52.39	-21.20	-31.19
927.492MHz	Pass	4G	7G	PK	4.6375G	2.50	-52.82	-50.32	-21.20	-29.12
927.492MHz	Pass	7G	10G	PK	7.4482G	2.50	-54.92	-52.42	-21.20	-31.22

DG = Directional Gain ; PX=Port X; Psum=P1

FSK-145k **CSE-FS [PK]**

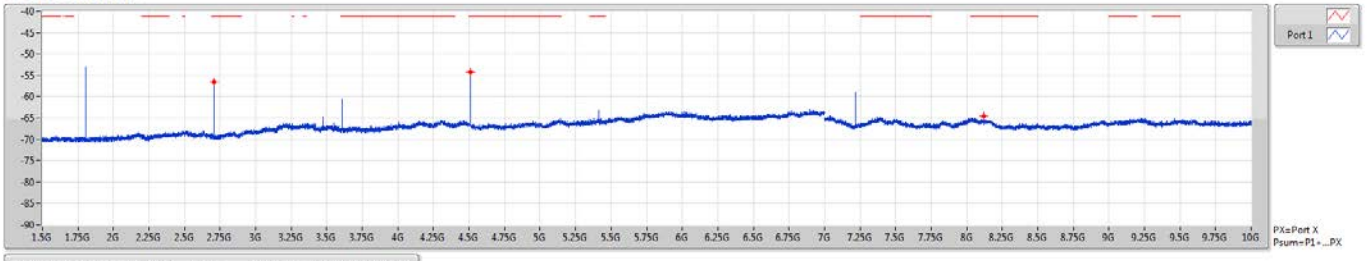
902.213MHz



F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm)
1.5G	4G	1M	PK	2.70688G	-52.47	-52.47
4G	7G	1M	PK	4.5111.3G	-50.81	-50.81
7G	10G	1M	PK	7.4146G	-54.01	-54.01

FSK-145k **CSE-FS [AV]**

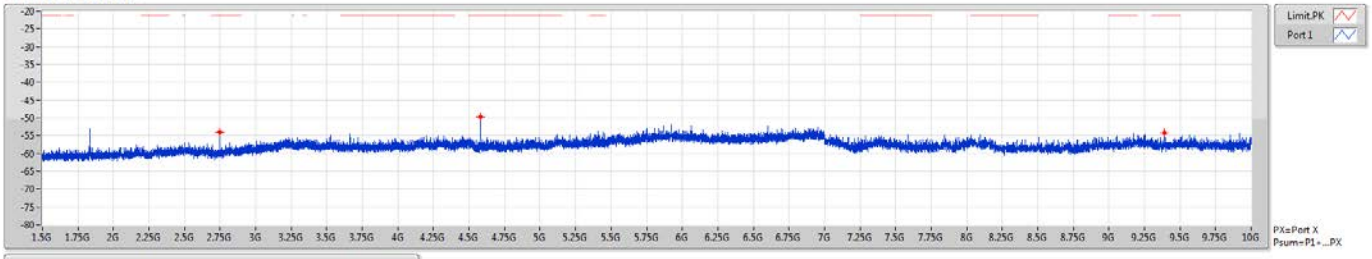
902.213MHz



F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm)
1.5G	4G	1M	AV	2.70656G	-56.66	-56.66
4G	7G	1M	AV	4.5111.3G	-54.29	-54.29
7G	10G	1M	AV	8.12013G	-64.67	-64.67

FSK-145k **CSE-FS [PK]**

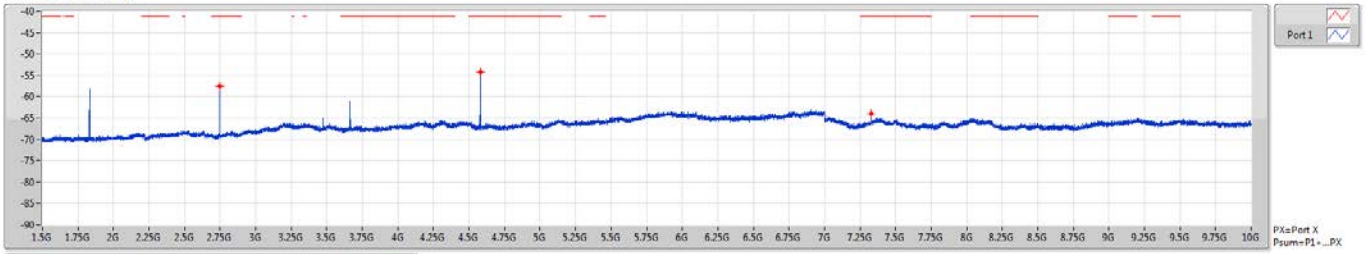
915.378MHz



F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm)
1.5G	4G	1M	PK	2.74844G	-54.07	-54.07
4G	7G	1M	PK	4.57975G	-49.78	-49.78
7G	10G	1M	PK	9.3904G	-54.11	-54.11

FSK-145k **CSE-FS [AV]**

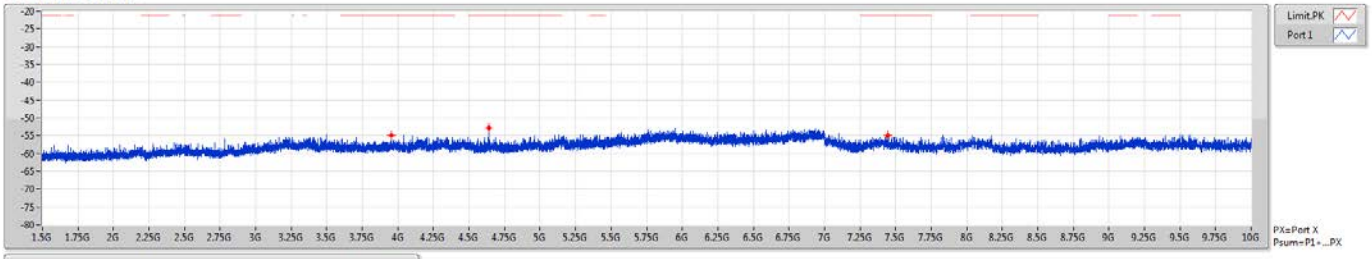
915.378MHz



F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm)
1.5G	4G	1M	AV	2.74781G	-57.58	-57.58
4G	7G	1M	AV	4.57938G	-54.25	-54.25
7G	10G	1M	AV	7.32738G	-64.01	-64.01

FSK-145k **CSE-FS [PK]**

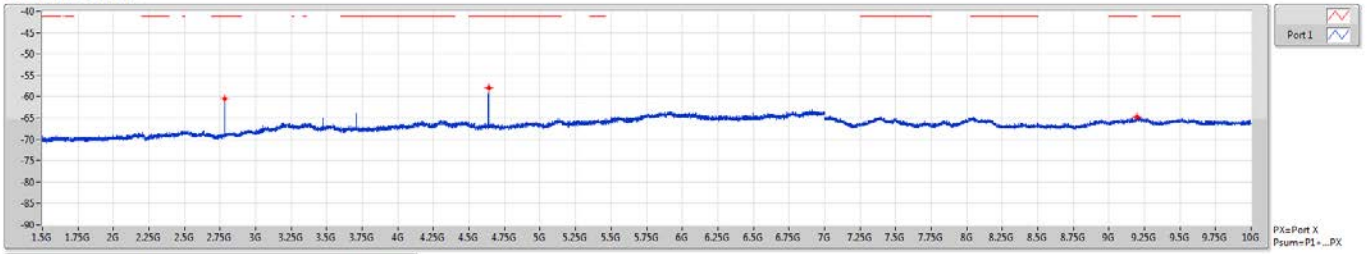
927.492MHz



F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm)
1.5G	4G	1M	PK	3.955G	-54.89	-54.89
4G	7G	1M	PK	4.6375G	-52.82	-52.82
7G	10G	1M	PK	7.4482G	-54.92	-54.92

FSK-145k **CSE-FS [AV]**

927.492MHz

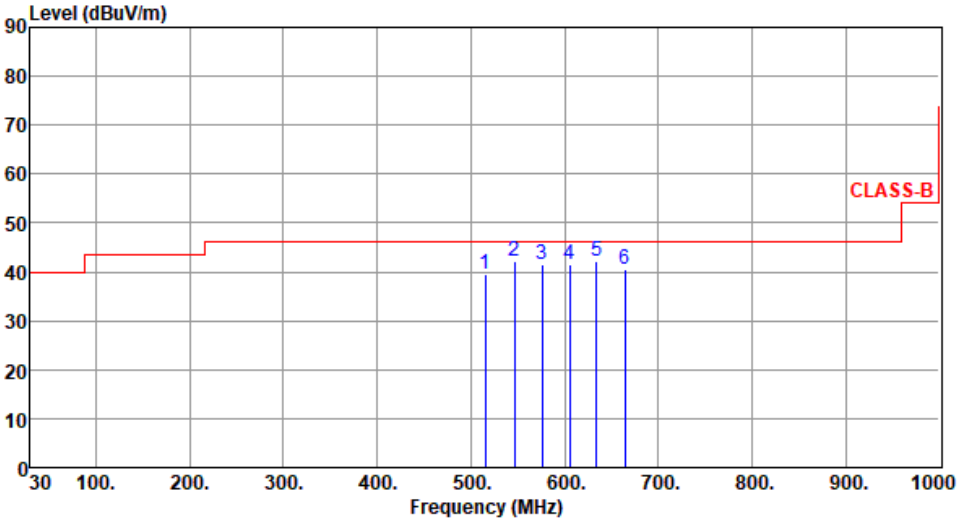


F-Start(Hz)	F-Stop(Hz)	RBW(Hz)	Type	Freq(Hz)	Psum(dBm)	P1(dBm)
1.5G	4G	1M	AV	2.78281G	-60.48	-60.48
4G	7G	1M	AV	4.6375G	-57.91	-57.91
7G	10G	1M	AV	9.19675G	-64.78	-64.78

Emission below 1GHz

Mode	FSK-145k	**Test Freq. (MHz)**	902.213
Polarization	Horizontal		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65

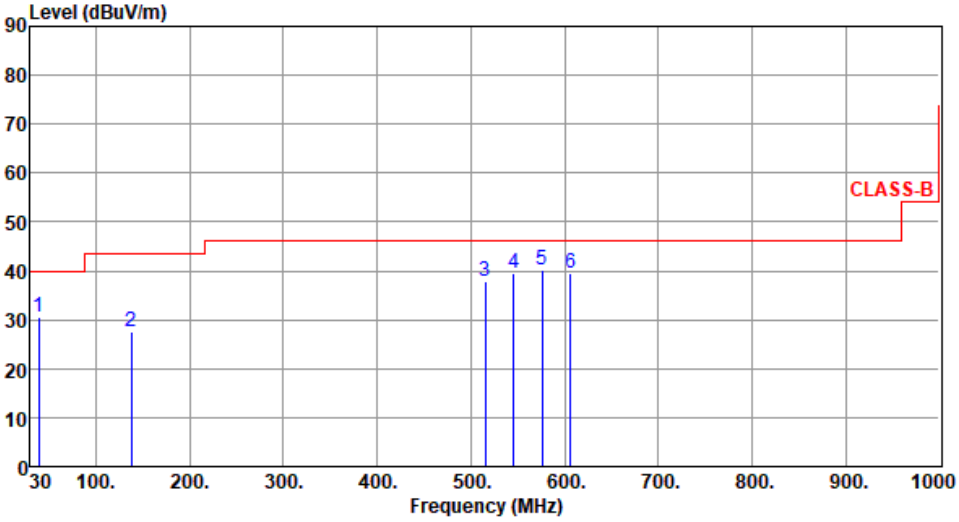


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	515.56	39.45	46.00	-6.55	42.40	-2.95	Peak	---	---
2	546.56	42.15	46.00	-3.85	44.76	-2.61	Peak	---	---
3	575.86	41.59	46.00	-4.41	43.35	-1.76	Peak	---	---
4	605.59	41.56	46.00	-4.44	42.54	-0.98	Peak	---	---
5	634.31	42.25	46.00	-3.75	42.60	-0.35	Peak	---	---
6	664.56	40.59	46.00	-5.41	40.95	-0.36	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).

Mode	FSK-145k	**Test Freq. (MHz)**	902.213
Polarization	Vertical		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65

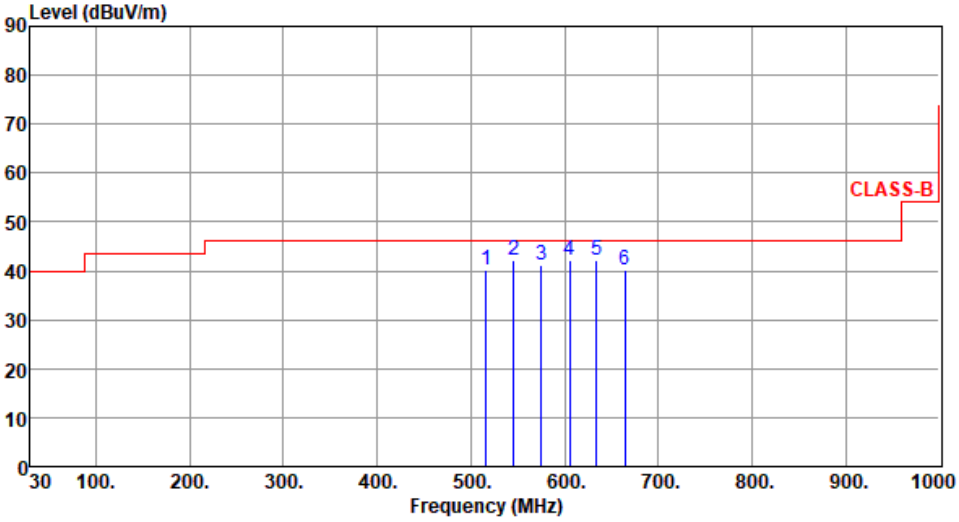


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	38.97	30.45	40.00	-9.55	39.25	-8.80	Peak	---	---
2	137.45	27.46	43.50	-16.04	36.87	-9.41	Peak	---	---
3	515.46	37.97	46.00	-8.03	40.92	-2.95	Peak	---	---
4	545.86	39.58	46.00	-6.42	42.22	-2.64	Peak	---	---
5	576.32	40.18	46.00	-5.82	41.93	-1.75	Peak	---	---
6	606.31	39.45	46.00	-6.55	40.40	-0.95	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).

Mode	FSK-145k	**Test Freq. (MHz)**	915.378
Polarization	Horizontal		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65

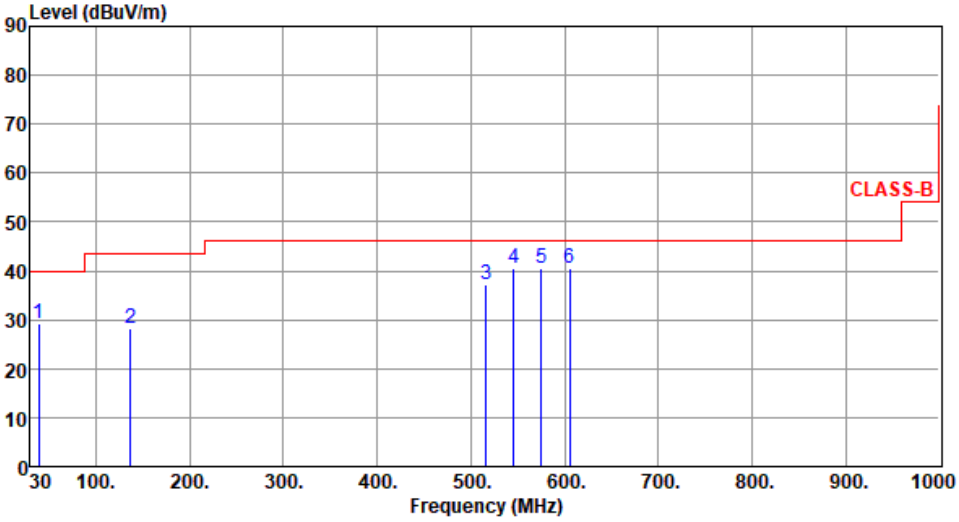


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	515.97	40.21	46.00	-5.79	43.16	-2.95	Peak	---	---
2	546.04	42.32	46.00	-3.68	44.95	-2.63	Peak	---	---
3	575.14	41.35	46.00	-4.65	43.13	-1.78	Peak	---	---
4	605.21	42.06	46.00	-3.94	43.05	-0.99	Peak	---	---
5	634.31	42.25	46.00	-3.75	42.60	-0.35	Peak	---	---
6	664.38	40.14	46.00	-5.86	40.50	-0.36	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).

Mode	FSK-145k	**Test Freq. (MHz)**	915.378
Polarization	Vertical		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65

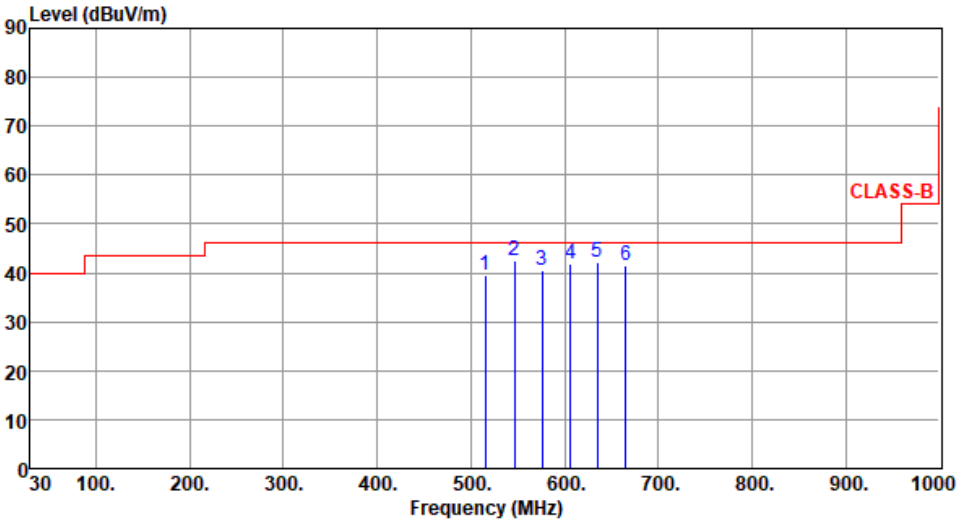


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	38.73	29.37	40.00	-10.63	38.24	-8.87	Peak	---	---
2	136.70	28.19	43.50	-15.31	37.64	-9.45	Peak	---	---
3	515.97	37.10	46.00	-8.90	40.05	-2.95	Peak	---	---
4	546.04	40.63	46.00	-5.37	43.26	-2.63	Peak	---	---
5	575.14	40.38	46.00	-5.62	42.16	-1.78	Peak	---	---
6	605.21	40.62	46.00	-5.38	41.61	-0.99	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).

Mode	FSK-145k	**Test Freq. (MHz)**	927.492
Polarization	Horizontal		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65

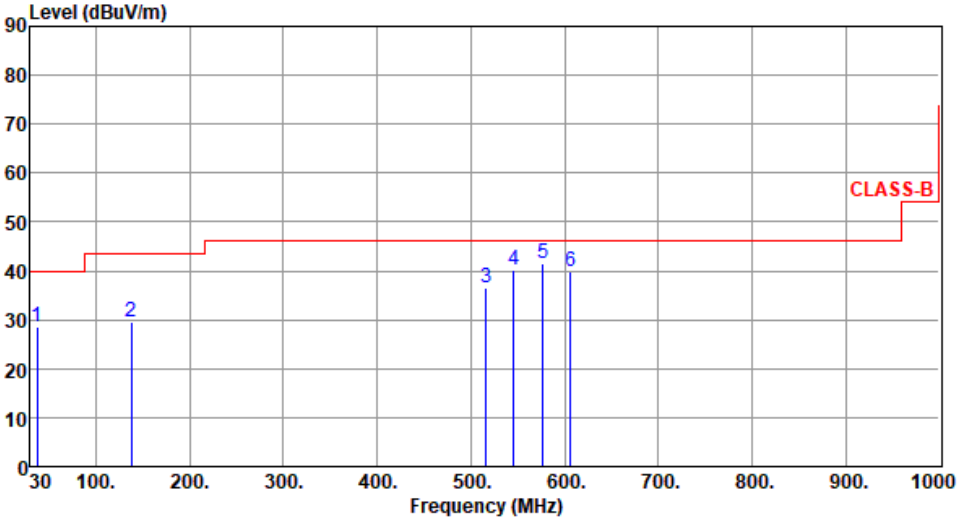


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	515.65	39.67	46.00	-6.33	42.62	-2.95	Peak	---	---
2	546.59	42.59	46.00	-3.41	45.20	-2.61	Peak	---	---
3	576.29	40.58	46.00	-5.42	42.33	-1.75	Peak	---	---
4	606.28	41.79	46.00	-4.21	42.74	-0.95	Peak	---	---
5	635.15	42.05	46.00	-3.95	42.39	-0.34	Peak	---	---
6	665.59	41.38	46.00	-4.62	41.71	-0.33	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).

Mode	FSK-145k	**Test Freq. (MHz)**	927.492
Polarization	Vertical		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65



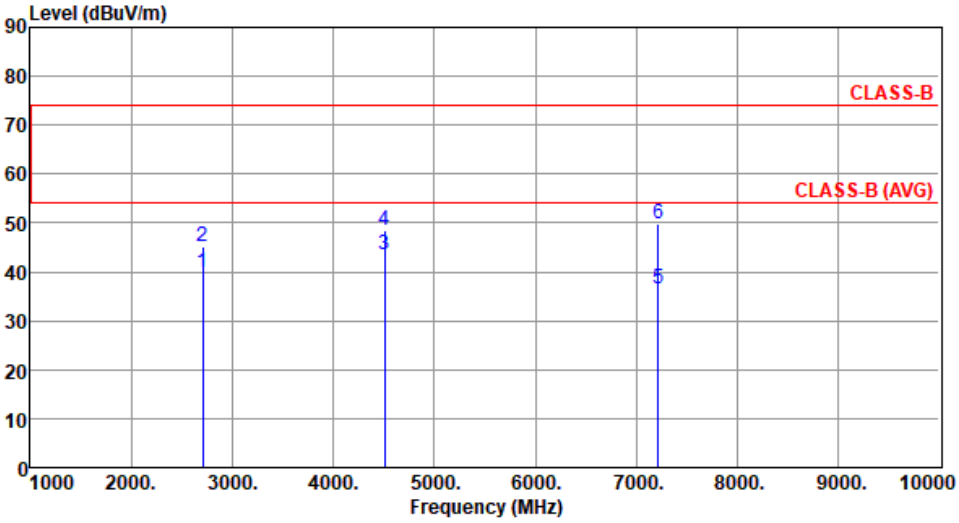
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	37.59	28.56	40.00	-11.44	37.64	-9.08	Peak	---	---
2	137.59	29.58	43.50	-13.92	38.97	-9.39	Peak	---	---
3	516.58	36.48	46.00	-9.52	39.43	-2.95	Peak	---	---
4	545.89	40.02	46.00	-5.98	42.65	-2.63	Peak	---	---
5	576.59	41.58	46.00	-4.42	43.33	-1.75	Peak	---	---
6	606.34	39.84	46.00	-6.16	40.79	-0.95	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).

Emission above 1GHz

Mode	FSK-145k	**Test Freq. (MHz)**	902.213
Polarization	Horizontal		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65

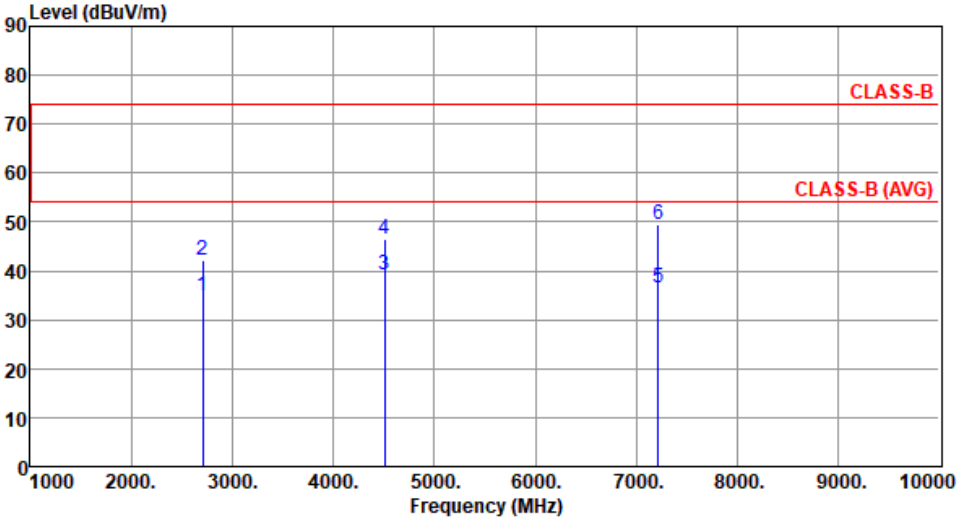


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2706.64	39.85	54.00	-14.15	41.54	-1.69	Average	182	7
2	2706.64	45.10	74.00	-28.90	46.79	-1.69	Peak	182	7
3	4511.07	43.35	54.00	-10.65	40.33	3.02	Average	217	119
4	4511.07	48.51	74.00	-25.49	45.49	3.02	Peak	217	119
5	7217.70	36.56	54.00	-17.44	27.46	9.10	Average	100	80
6	7217.70	49.68	74.00	-24.32	40.58	9.10	Peak	100	80

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).

Mode	FSK-145k	**Test Freq. (MHz)**	902.213
Polarization	Vertical		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65

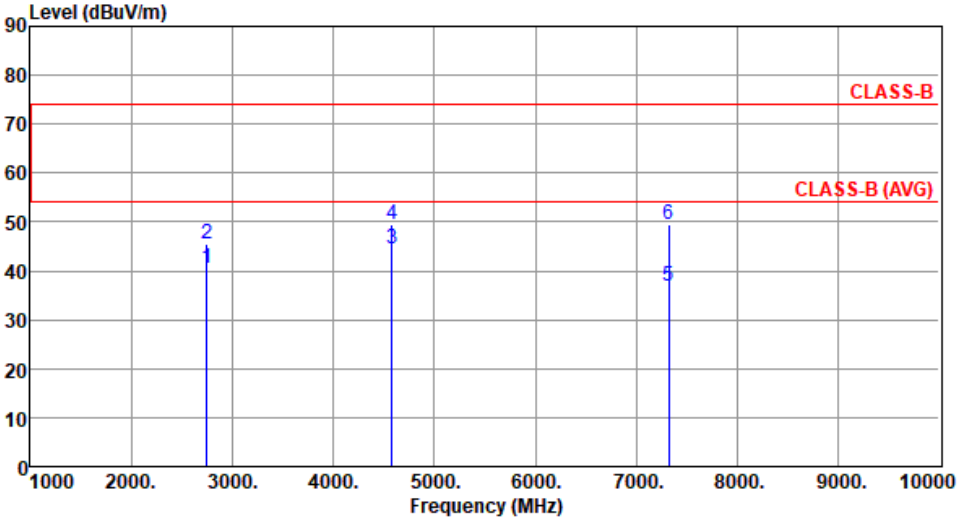


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2706.64	34.76	54.00	-19.24	36.45	-1.69	Average	100	22
2	2706.64	42.28	74.00	-31.72	43.97	-1.69	Peak	100	22
3	4511.07	39.14	54.00	-14.86	36.12	3.02	Average	210	41
4	4511.07	46.47	74.00	-27.53	43.45	3.02	Peak	210	41
5	7217.70	36.42	54.00	-17.58	27.32	9.10	Average	100	60
6	7217.70	49.53	74.00	-24.47	40.43	9.10	Peak	100	60

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).

Mode	FSK-145k	**Test Freq. (MHz)**	915.378
Polarization	Horizontal		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65

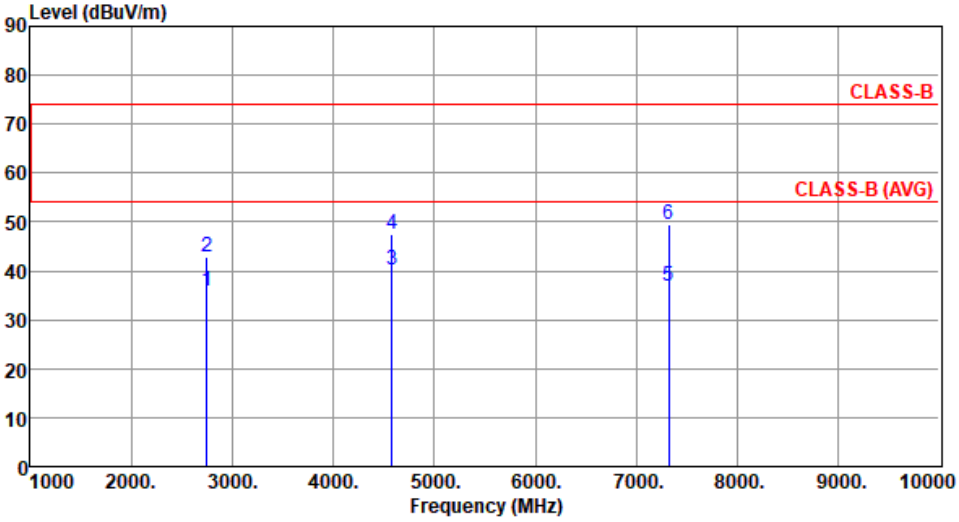


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2746.13	40.49	54.00	-13.51	42.05	-1.56	Average	171	3
2	2746.13	45.64	74.00	-28.36	47.20	-1.56	Peak	171	3
3	4576.89	44.60	54.00	-9.40	41.33	3.27	Average	201	126
4	4576.89	49.55	74.00	-24.45	46.28	3.27	Peak	201	126
5	7323.02	36.84	54.00	-17.16	27.57	9.27	Average	100	90
6	7323.02	49.59	74.00	-24.41	40.32	9.27	Peak	100	90

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).

Mode	FSK-145k	**Test Freq. (MHz)**	915.378
Polarization	Vertical		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65

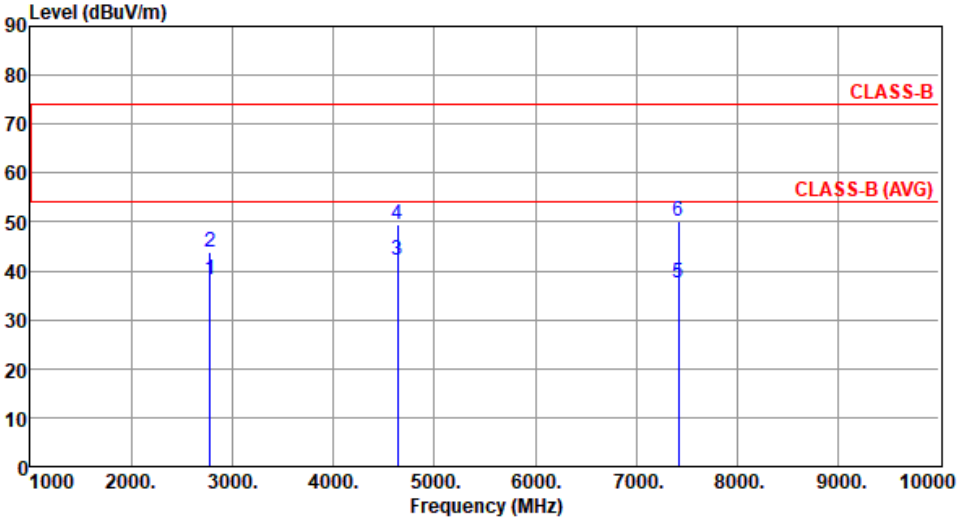


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2746.13	35.77	54.00	-18.23	37.33	-1.56	Average	100	19
2	2746.13	42.73	74.00	-31.27	44.29	-1.56	Peak	100	19
3	4576.89	40.27	54.00	-13.73	37.00	3.27	Average	212	47
4	4576.89	47.39	74.00	-26.61	44.12	3.27	Peak	212	47
5	7323.02	36.77	54.00	-17.23	27.50	9.27	Average	100	30
6	7323.02	49.57	74.00	-24.43	40.30	9.27	Peak	100	30

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).

Mode	FSK-145k	**Test Freq. (MHz)**	927.492
Polarization	Horizontal		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65

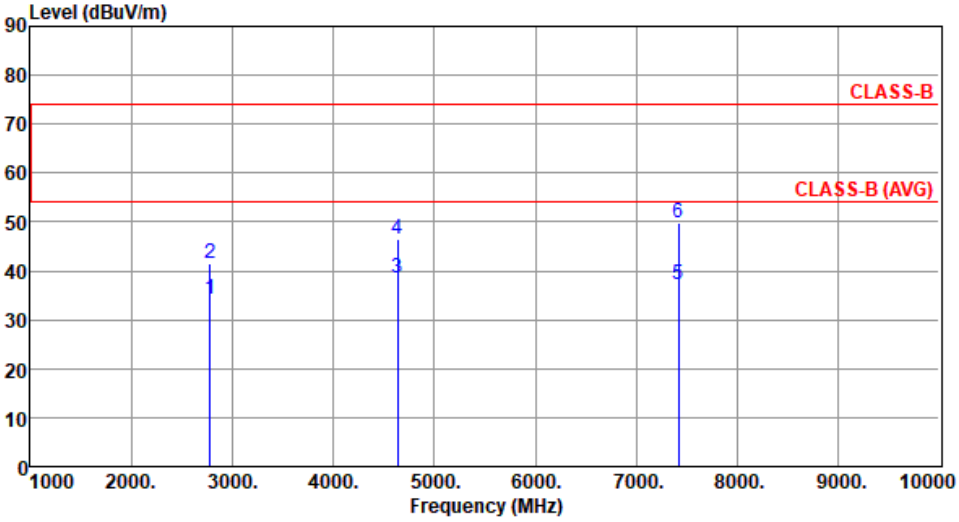


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2782.48	38.10	54.00	-15.90	39.55	-1.45	Average	221	8
2	2782.48	43.82	74.00	-30.18	45.27	-1.45	Peak	221	8
3	4637.46	42.25	54.00	-11.75	38.65	3.60	Average	191	123
4	4637.46	49.32	74.00	-24.68	45.72	3.60	Peak	191	123
5	7419.94	37.43	54.00	-16.57	28.12	9.31	Average	100	30
6	7419.94	50.10	74.00	-23.90	40.79	9.31	Peak	100	30

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).

Mode	FSK-145k	**Test Freq. (MHz)**	927.492
Polarization	Vertical		

Test By :Roger Lu Temperature(℃):23 Humidity(%):65

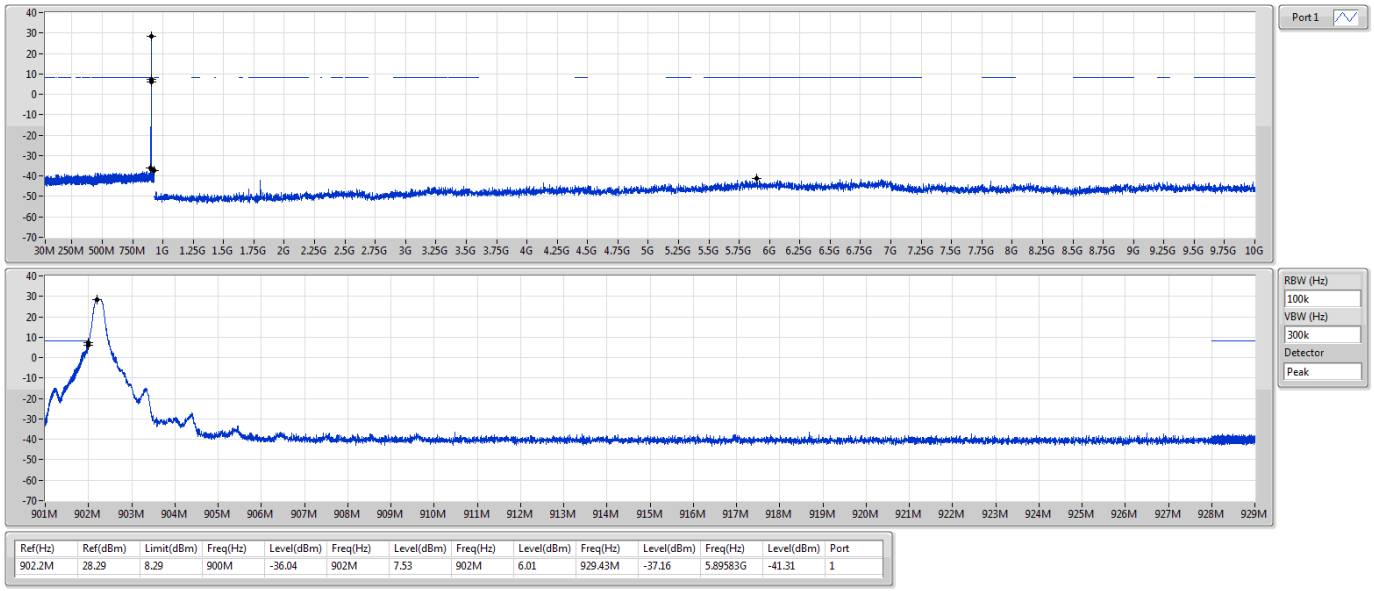


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2782.48	34.18	54.00	-19.82	35.63	-1.45	Average	100	20
2	2782.48	41.42	74.00	-32.58	42.87	-1.45	Peak	100	20
3	4637.46	38.49	54.00	-15.51	34.89	3.60	Average	216	51
4	4637.46	46.49	74.00	-27.51	42.89	3.60	Peak	216	51
5	7419.94	37.29	54.00	-16.71	27.98	9.31	Average	100	100
6	7419.94	49.87	74.00	-24.13	40.56	9.31	Peak	100	100

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).

FSK-145k **CSENdB-FS**

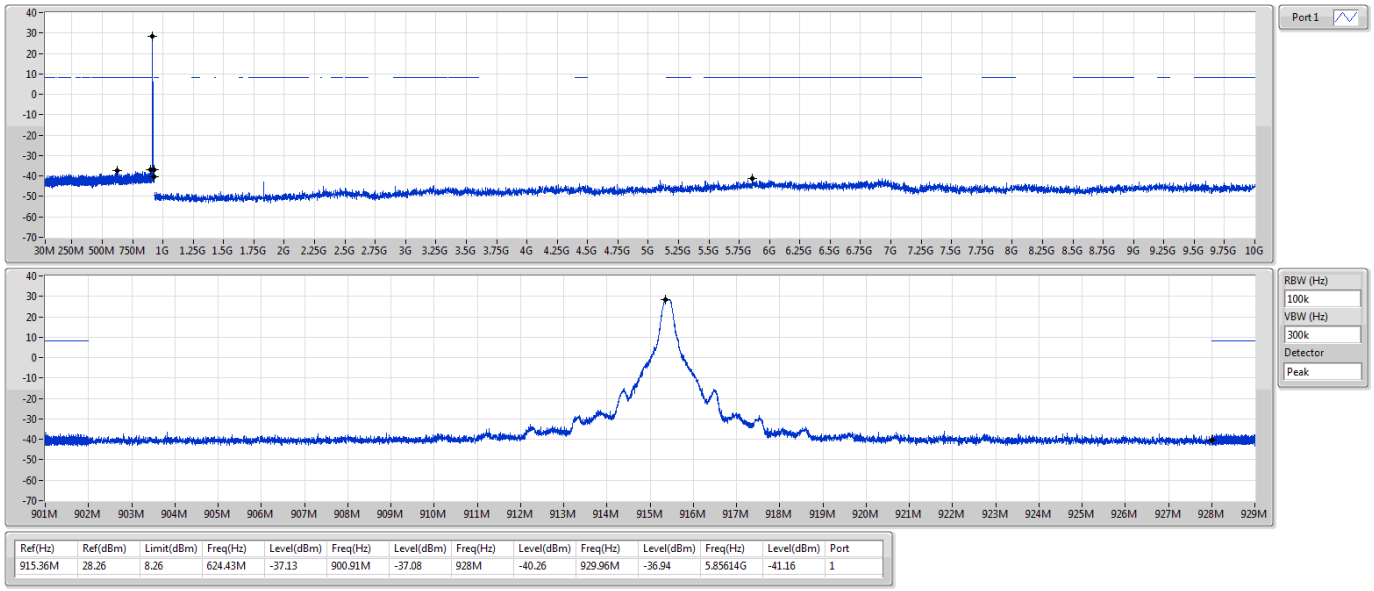
902.213MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
902.2M	28.29	8.29	900M	-36.04	902M	7.53	902M	6.01	929.43M	-37.16	5.89583G	-41.31	1

FSK-145k **CSENdB-FS**

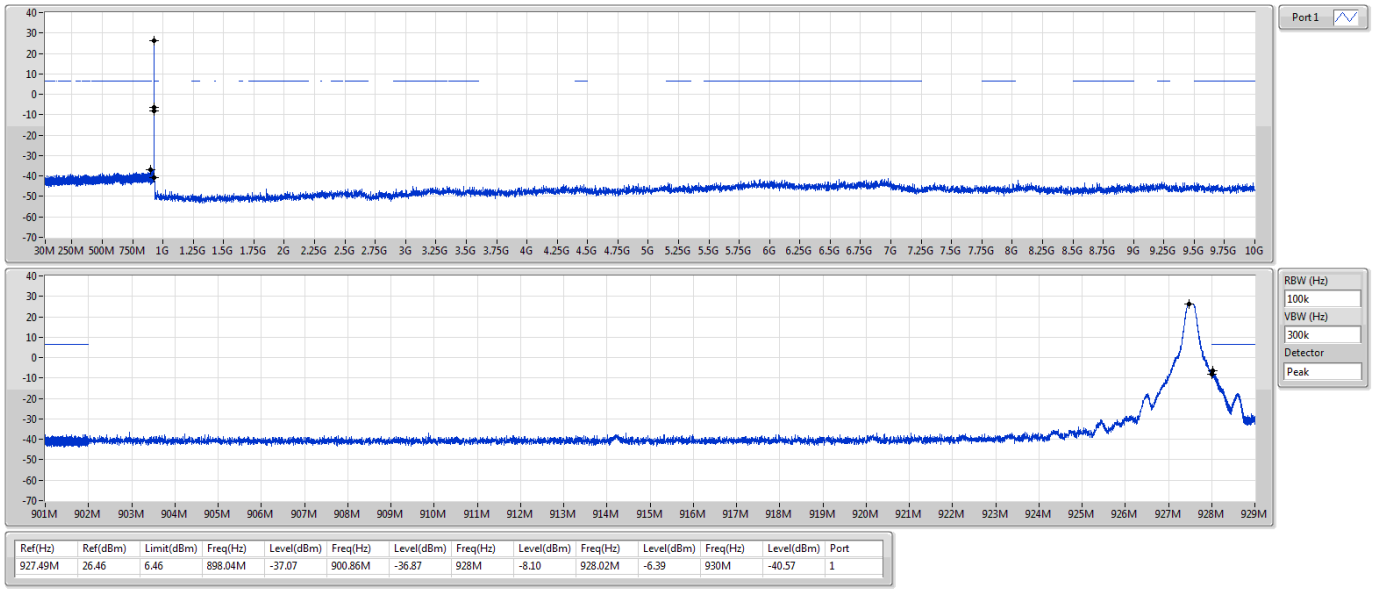
915.378MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
915.36M	28.26	8.26	624.43M	-37.13	900.91M	-37.08	928M	-40.26	929.96M	-36.94	5.85614G	-41.16	1

FSK-145k **CSENdB-FS**

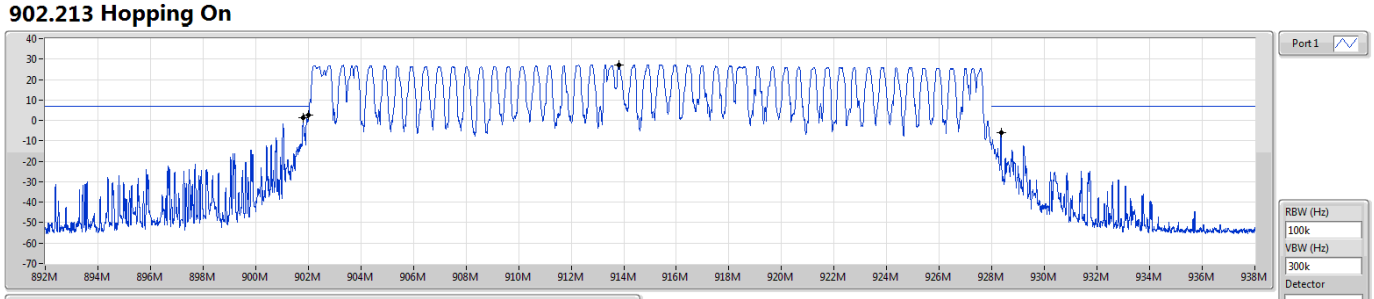
927.492MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
927.49M	26.46	6.46	898.04M	-37.07	900.86M	-36.87	928M	-8.10	928.02M	-6.39	930M	-40.57	1

FSK-145k **CSENdB-FS**

902.213 Hopping On



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
913.8M	27.11	7.11	901.81M	1.45	902M	2.45	928.35M	-6.07	1

Model: AC4490LR-1000M

Summary of Peak Power

Mode	Power (dBm)	Power (W)
902-928MHz	-	-
FSK-145k	28.03	0.63533

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
FSK-145k	-	-	-	-
902.213MHz	Pass	2.50	27.68	30.00
915.378MHz	Pass	2.50	28.03	30.00
927.492MHz	Pass	2.50	26.79	30.00

Summary of Average Power

Mode	Power (dBm)	Power (W)
902-928MHz	-	-
FSK-145k	27.95	0.62373

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
FSK-145k	-	-	-	-
902.213MHz	Pass	2.50	27.61	-
915.378MHz	Pass	2.50	27.95	-
927.492MHz	Pass	2.50	26.69	-

Note: Average power is for reference only.

Model: AC4490-1000M

Summary of Peak Power

Mode	Power (dBm)	Power (W)
902-928MHz	-	-
FSK-145k	27.98	0.62806

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
FSK-145k	-	-	-	-
902.213MHz	Pass	2.50	27.51	30.00
915.378MHz	Pass	2.50	27.98	30.00
927.492MHz	Pass	2.50	26.89	30.00

Summary of Average Power

Mode	Power (dBm)	Power (W)
902-928MHz	-	-
FSK-145k	27.91	0.61802

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
FSK-145k	-	-	-	-
902.213MHz	Pass	2.50	27.42	-
915.378MHz	Pass	2.50	27.91	-
927.492MHz	Pass	2.50	26.81	-

Note: Average power is for reference only.

Summary

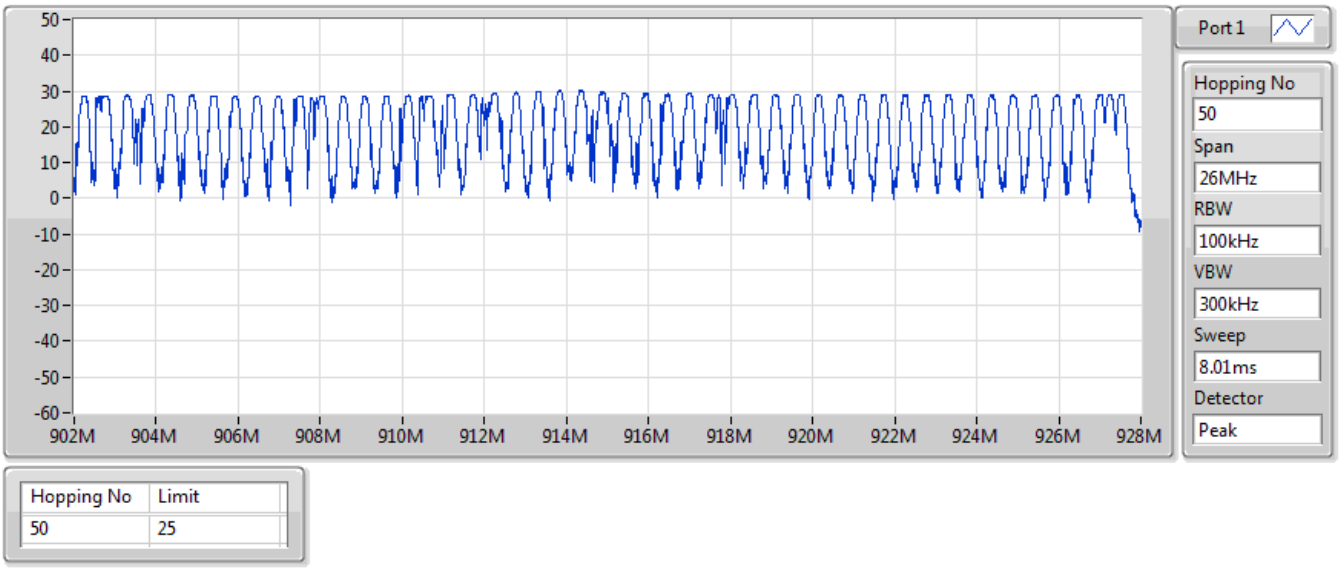
Mode	Max-Hop No
902-928MHz	-
FSK-145k	50

Result

Mode	Result	Hopping No	Limit
FSK-145k	-	-	-
902.213MHz	Pass	50	50

FSK-145k **Hopping-FS**

902.213MHz



Hopping No	Limit
50	25

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
902-928MHz	-	-	-	-	-
FSK-145k	146.739k	280.391k	280KF1D	139.493k	218.886k

Max-N dB = Maximum 20dB down bandwidth; Max-OBW = Maximum 99% occupied bandwidth;
Min-N dB = Minimum 20dB down bandwidth; Min-OBW = Minimum 99% occupied bandwidth

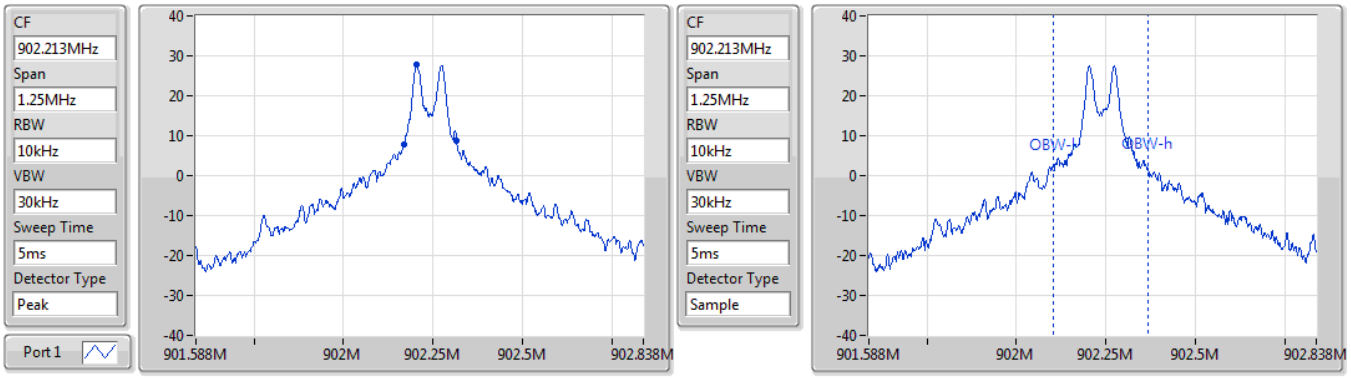
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
FSK-145k	-	-	-	-
902.213MHz	Pass	Inf	146.739k	265.919k
915.378MHz	Pass	Inf	139.493k	280.391k
927.492MHz	Pass	Inf	146.739k	218.886k

Port X-N dB = Port X 20dB down bandwidth;
Port X-OBW = Port X 99% occupied bandwidth

FSK-145k **EBW-FS**

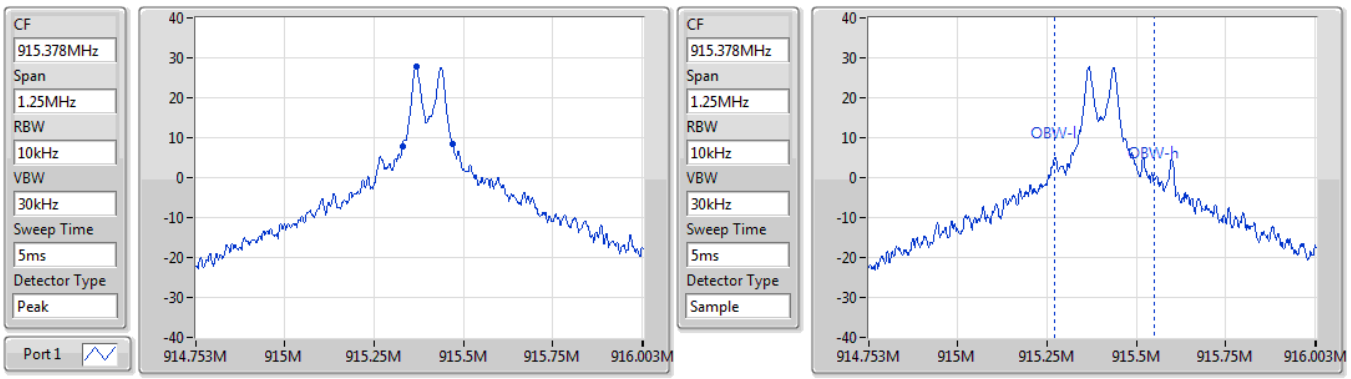
902.213MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
146.739k	902.169522M	902.316261M	265.919k	902.102653M	902.368572M	Inf	1

FSK-145k **EBW-FS**

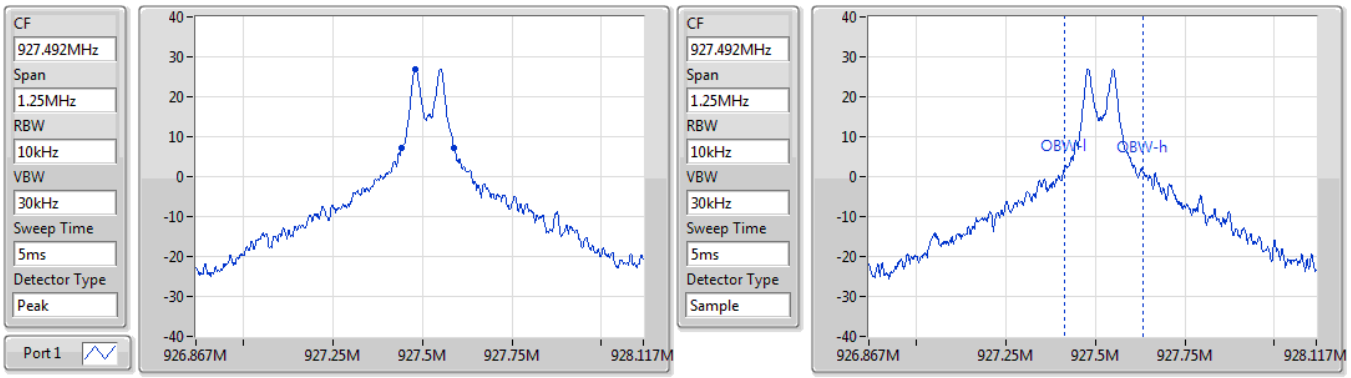
915.378MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
139.493k	915.330899M	915.470391M	280.391k	915.271271M	915.551661M	Inf	1

FSK-145k **EBW-FS**

927.492MHz



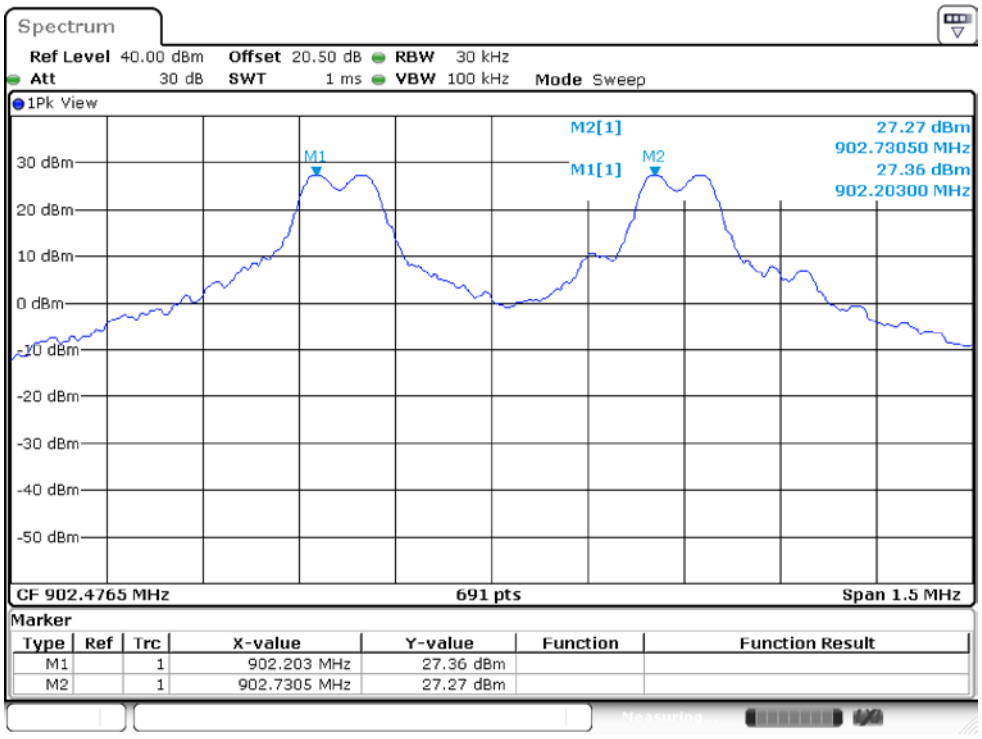
20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
146.739k	927.441275M	927.588014M	218.886k	927.412405M	927.631291M	Inf	1

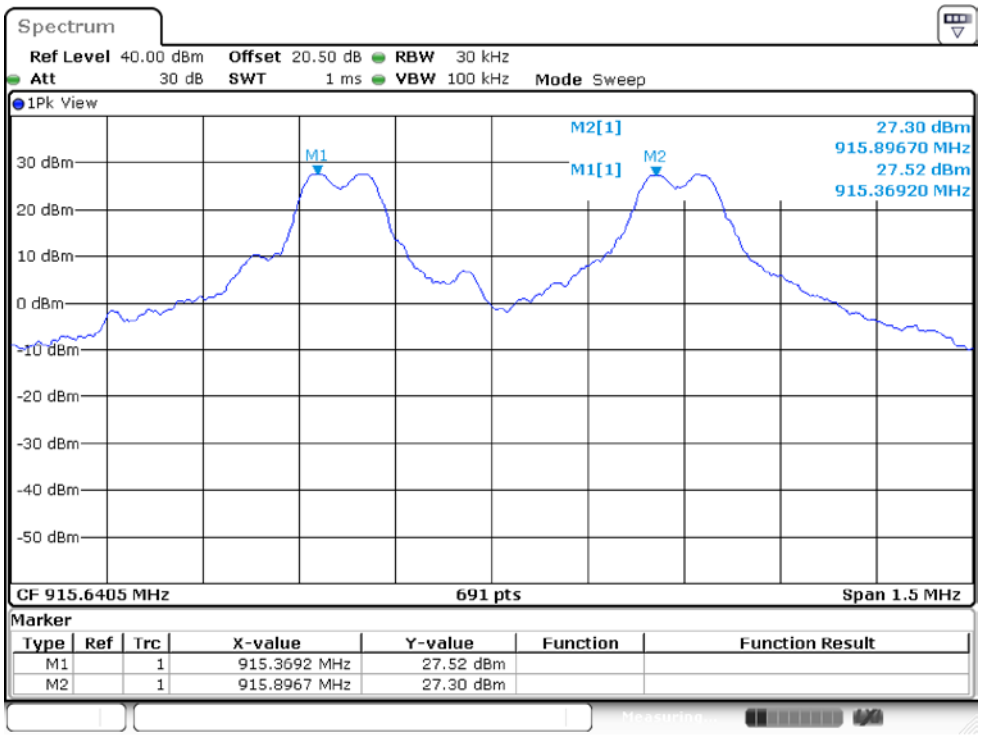
Summary

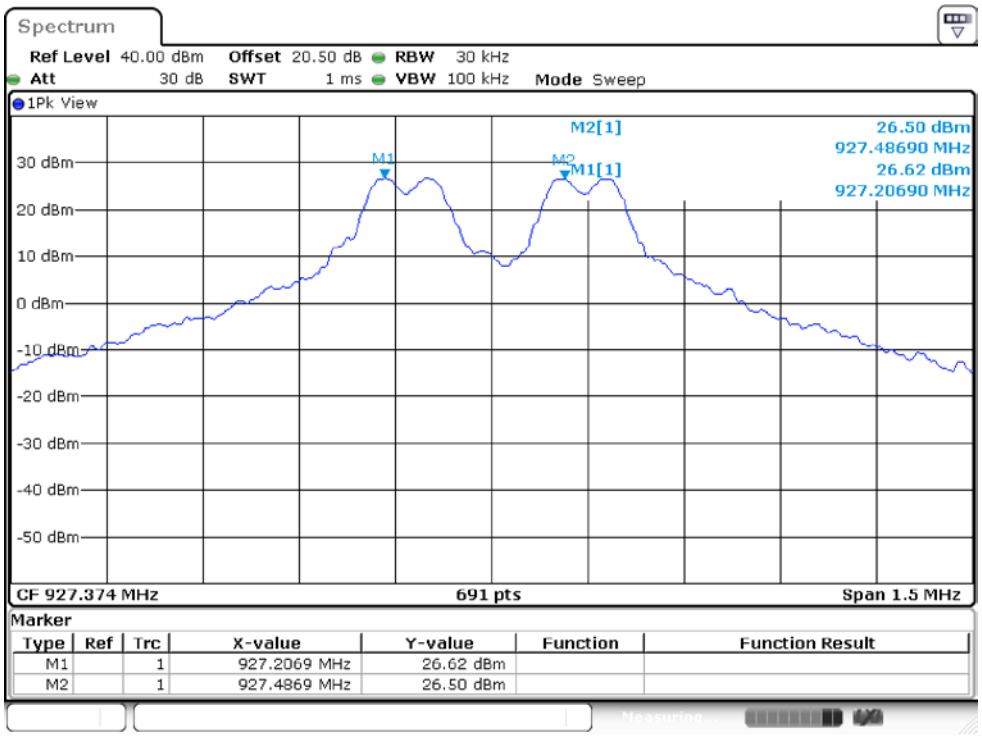
Mode	Max-Space (Hz)	Min-Space (Hz)
902-928MHz	-	-
FSK-145k	527.5k	280k

Result

Mode	Result	Fl (Hz)	Fh (Hz)	Ch.Space (Hz)	Limit (Hz)
FSK-145k	-	-	-	-	-
902.213MHz	Pass	902.203M	902.7305M	527.5k	146.739k
915.378MHz	Pass	915.3692M	915.8967M	527.5k	139.493k
927.492MHz	Pass	927.2069M	927.4869M	280k	146.739k

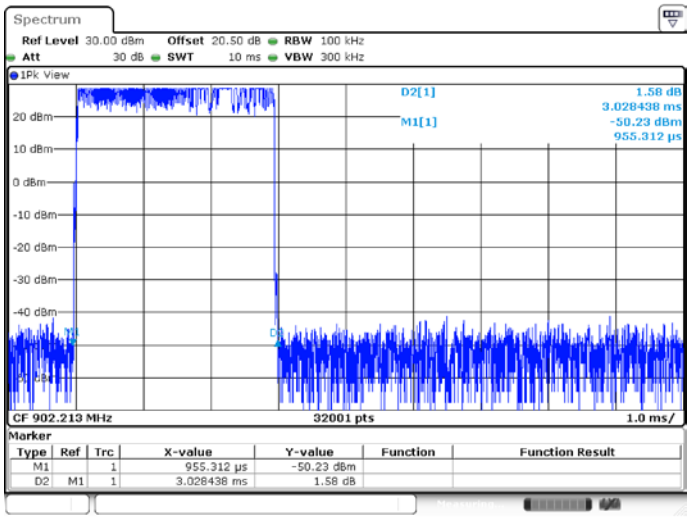

Spectrum
Ref Level 40.00 dBm Offset 20.50 dB RBW 30 kHz
Att 30 dB SWT 1 ms VBW 100 kHz Mode Sweep
1Pk View
M2[1] 27.27 dBm
902.73050 MHz
M1[1] 27.36 dBm
902.20300 MHz
30 dBm
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
CF 902.4765 MHz
691 pts
Span 1.5 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 902.203 MHz 27.36 dBm
M2 1 902.7305 MHz 27.27 dBm

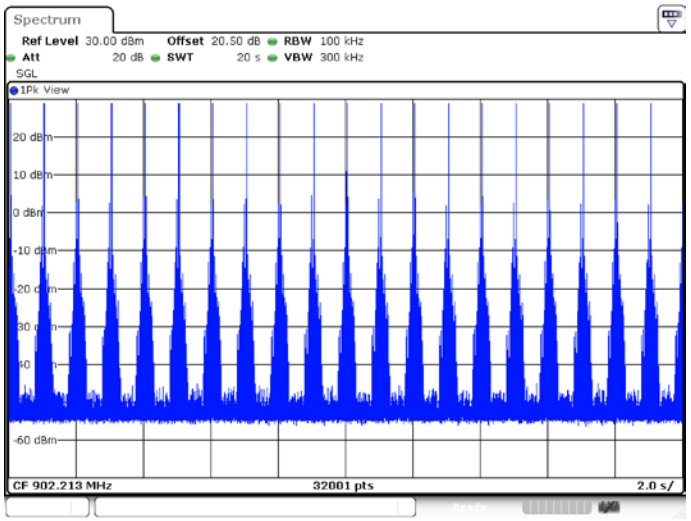

Spectrum
Ref Level 40.00 dBm Offset 20.50 dB RBW 30 kHz
Att 30 dB SWT 1 ms VBW 100 kHz Mode Sweep
1Pk View
M2[1] 27.30 dBm
915.89670 MHz
M1[1] 27.52 dBm
915.36920 MHz
30 dBm
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
CF 915.6405 MHz
691 pts
Span 1.5 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 915.3692 MHz 27.52 dBm
M2 1 915.8967 MHz 27.30 dBm


Spectrum
Ref Level 40.00 dBm Offset 20.50 dB RBW 30 kHz
Att 30 dB SWT 1 ms VBW 100 kHz Mode Sweep
1Pk View
M2[1] 26.50 dBm
927.48690 MHz
M1[1] 26.62 dBm
927.20690 MHz
30 dBm
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
CF 927.374 MHz
691 pts
Span 1.5 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 927.2069 MHz 26.62 dBm
M2 1 927.4869 MHz 26.50 dBm

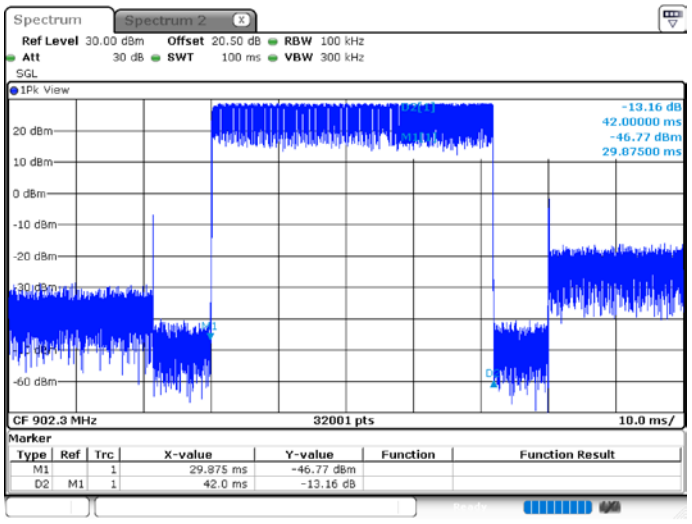
Model	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in a 20 s	Result (s)	Limit (s)
AC4490LR-1000M	902.213	0.003028438	20	0.060569	0.4
AC4790LR-1000M	902.213	0.042	9	0.378000	0.4

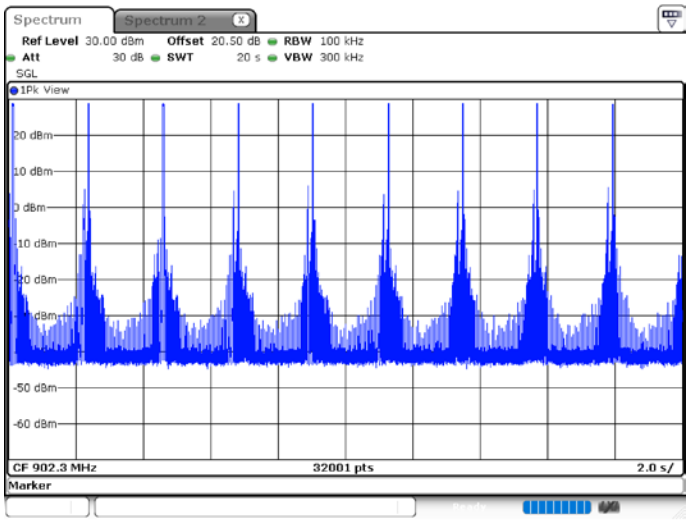
AC4490 series





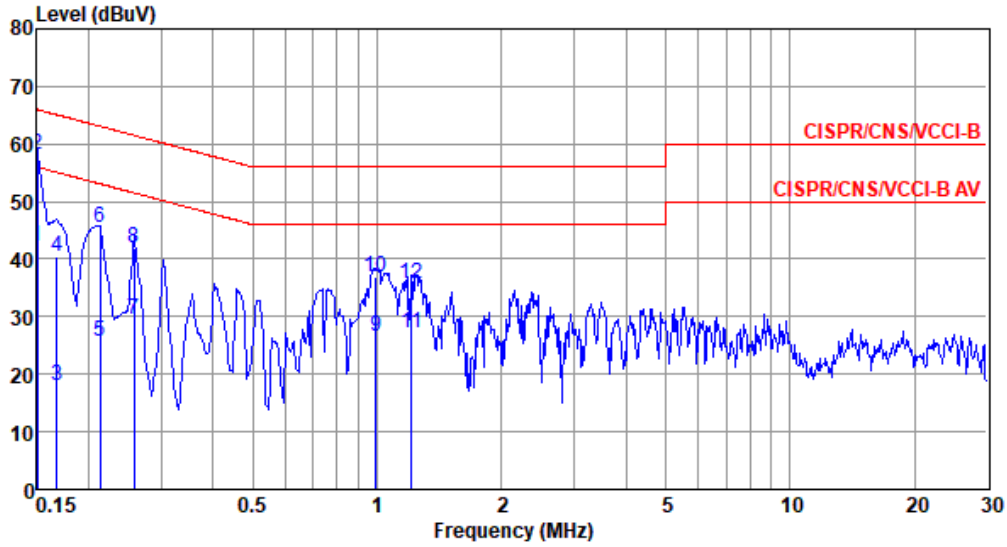
AC4790 series





Power Phase	Line	**Test Freq. (MHz)**	902.213

Test by : Joe Liao Temperature: 24°C Humidity: 62%

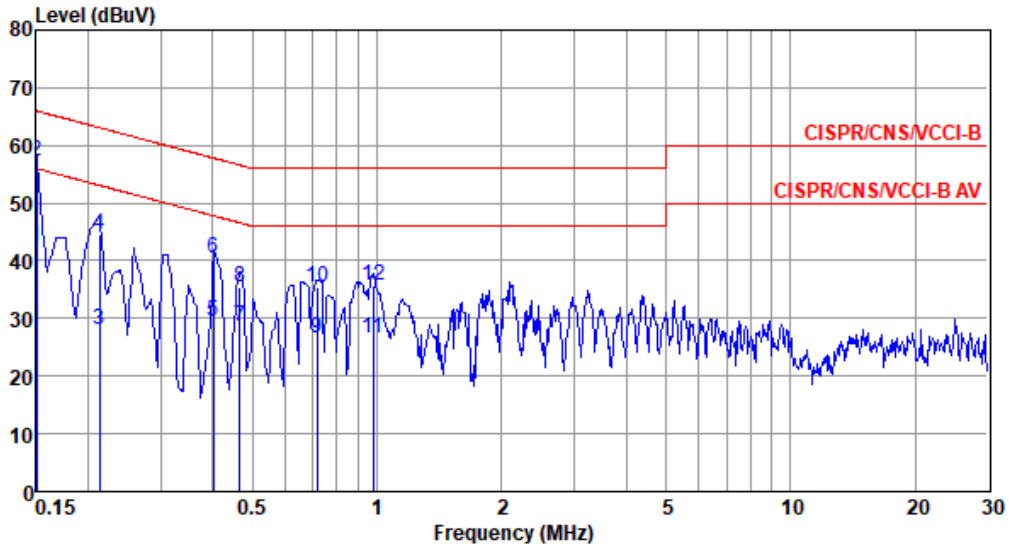


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Aux	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	
1	0.150	42.23	56.00	-13.77	32.27	9.68	0.08	0.20	Average
2*	0.150	58.06	66.00	-7.94	48.10	9.68	0.08	0.20	QP
3	0.168	17.92	55.08	-37.16	7.95	9.68	0.08	0.21	Average
4	0.168	40.36	65.08	-24.72	30.39	9.68	0.08	0.21	QP
5	0.213	25.73	53.10	-27.37	15.74	9.68	0.08	0.23	Average
6	0.213	45.41	63.10	-17.69	35.42	9.68	0.08	0.23	QP
7	0.258	29.66	51.51	-21.85	19.63	9.68	0.08	0.27	Average
8	0.258	42.00	61.51	-19.51	31.97	9.68	0.08	0.27	QP
9	0.994	26.53	46.00	-19.47	16.32	9.68	0.16	0.37	Average
10	0.994	36.83	56.00	-19.17	26.62	9.68	0.16	0.37	QP
11	1.210	27.27	46.00	-18.73	17.04	9.68	0.17	0.38	Average
12	1.210	35.69	56.00	-20.31	25.46	9.68	0.17	0.38	QP

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

Power Phase	Neutral	Test Freq. (MHz)	902.213

Test by : Joe Liao Temperature: 24°C Humidity: 62%

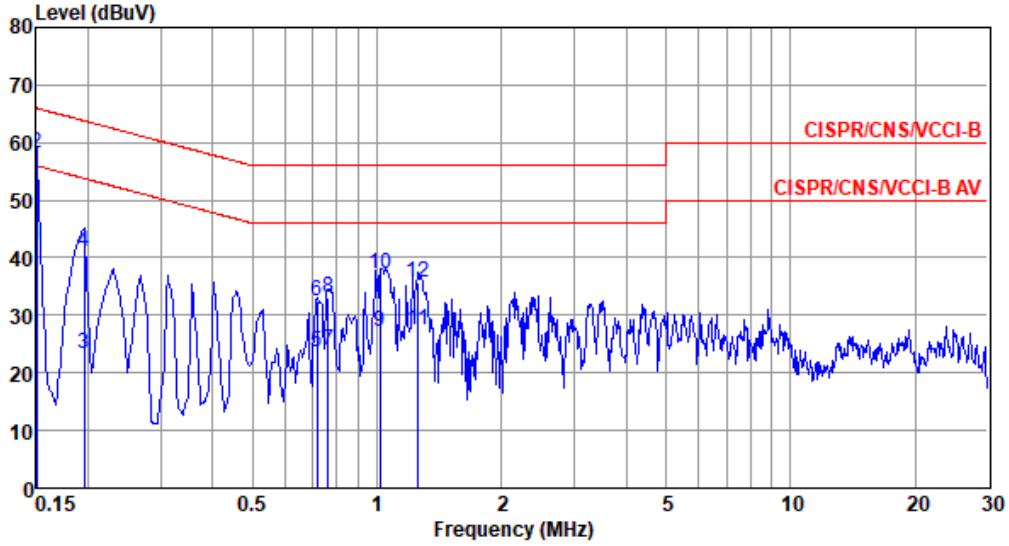


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Aux	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	
1	0.150	42.63	56.00	-13.37	32.78	9.61	0.08	0.16	Average
2*	0.150	57.26	66.00	-8.74	47.41	9.61	0.08	0.16	QP
3	0.213	28.07	53.10	-25.03	18.20	9.61	0.08	0.18	Average
4	0.213	44.55	63.10	-18.55	34.68	9.61	0.08	0.18	QP
5	0.402	29.59	47.81	-18.22	19.71	9.61	0.08	0.19	Average
6	0.402	40.48	57.81	-17.33	30.60	9.61	0.08	0.19	QP
7	0.466	28.66	46.58	-17.92	18.75	9.61	0.09	0.21	Average
8	0.466	35.43	56.58	-21.15	25.52	9.61	0.09	0.21	QP
9	0.716	26.52	46.00	-19.48	16.53	9.61	0.13	0.25	Average
10	0.716	35.40	56.00	-20.60	25.41	9.61	0.13	0.25	QP
11	0.979	26.57	46.00	-19.43	16.52	9.61	0.16	0.28	Average
12	0.979	35.72	56.00	-20.28	25.67	9.61	0.16	0.28	QP

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

Power Phase	Line	**Test Freq. (MHz)**	915.378

Test by : Joe Liao Temperature: 24°C Humidity: 62%

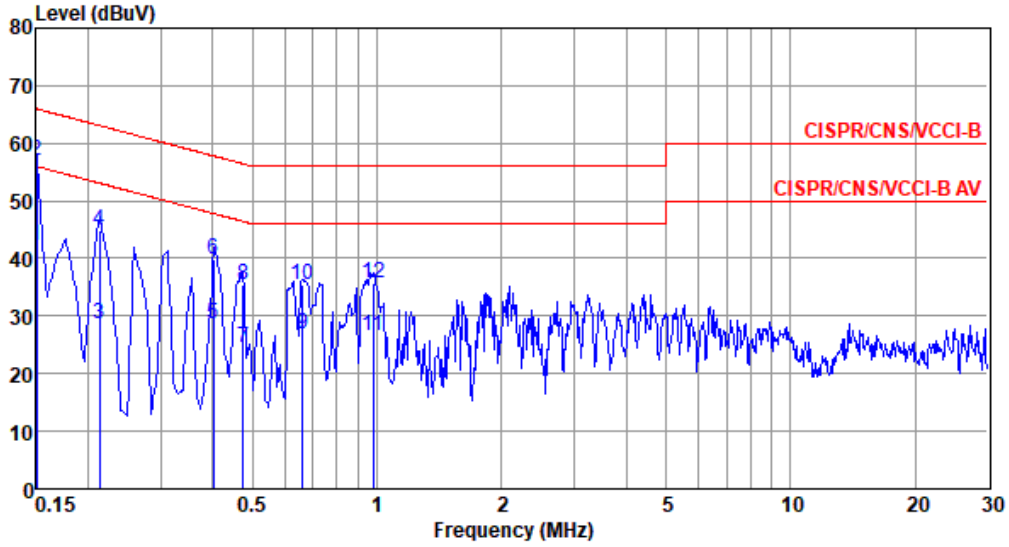


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Aux	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	
1	0.150	42.23	56.00	-13.77	32.27	9.68	0.08	0.20	Average
2*	0.150	58.02	66.00	-7.98	48.06	9.68	0.08	0.20	QP
3	0.195	23.29	53.80	-30.51	13.31	9.68	0.08	0.22	Average
4	0.195	41.04	63.80	-22.76	31.06	9.68	0.08	0.22	QP
5	0.716	23.65	46.00	-22.35	13.47	9.68	0.13	0.37	Average
6	0.716	32.55	56.00	-23.45	22.37	9.68	0.13	0.37	QP
7	0.763	23.85	46.00	-22.15	13.66	9.68	0.14	0.37	Average
8	0.763	33.15	56.00	-22.85	22.96	9.68	0.14	0.37	QP
9	1.016	27.06	46.00	-18.94	16.85	9.68	0.16	0.37	Average
10	1.016	37.16	56.00	-18.84	26.95	9.68	0.16	0.37	QP
11	1.255	27.57	46.00	-18.43	17.34	9.68	0.17	0.38	Average
12	1.255	35.72	56.00	-20.28	25.49	9.68	0.17	0.38	QP

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

Power Phase	Neutral	**Test Freq. (MHz)**	915.378

Test by : Joe Liao Temperature: 24°C Humidity: 62%

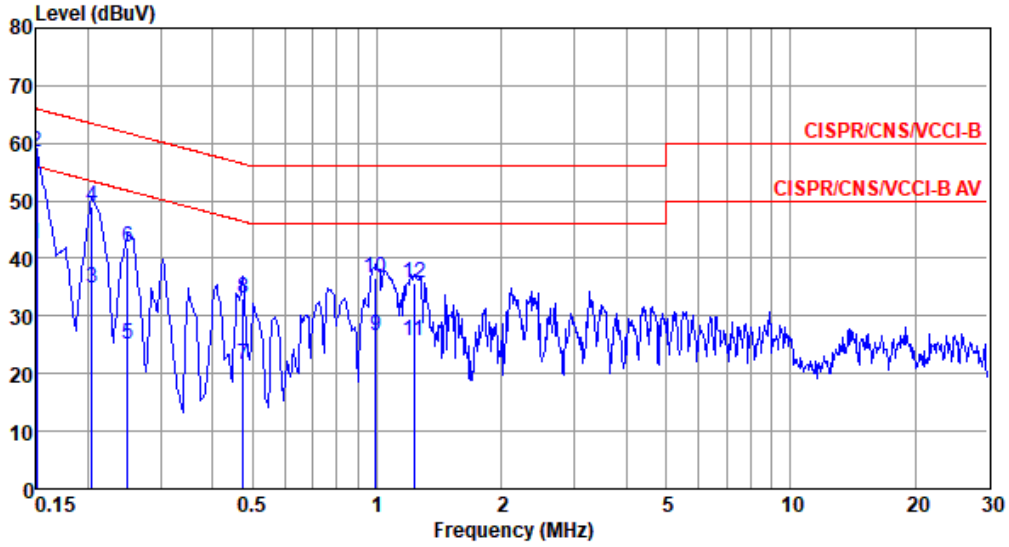


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Aux	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	
1	0.150	42.25	56.00	-13.75	32.40	9.61	0.08	0.16	Average
2*	0.150	57.02	66.00	-8.98	47.17	9.61	0.08	0.16	QP
3	0.213	28.66	53.10	-24.44	18.79	9.61	0.08	0.18	Average
4	0.213	44.93	63.10	-18.17	35.06	9.61	0.08	0.18	QP
5	0.402	28.63	47.81	-19.18	18.75	9.61	0.08	0.19	Average
6	0.402	39.95	57.81	-17.86	30.07	9.61	0.08	0.19	QP
7	0.474	24.46	46.45	-21.99	14.55	9.61	0.09	0.21	Average
8	0.474	35.31	56.45	-21.14	25.40	9.61	0.09	0.21	QP
9	0.661	26.82	46.00	-19.18	16.85	9.61	0.12	0.24	Average
10	0.661	35.33	56.00	-20.67	25.36	9.61	0.12	0.24	QP
11	0.979	26.66	46.00	-19.34	16.61	9.61	0.16	0.28	Average
12	0.979	35.85	56.00	-20.15	25.80	9.61	0.16	0.28	QP

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

Power Phase	Line	Test Freq. (MHz)	927.492

Test by : Joe Liao Temperature: 24°C Humidity: 62%

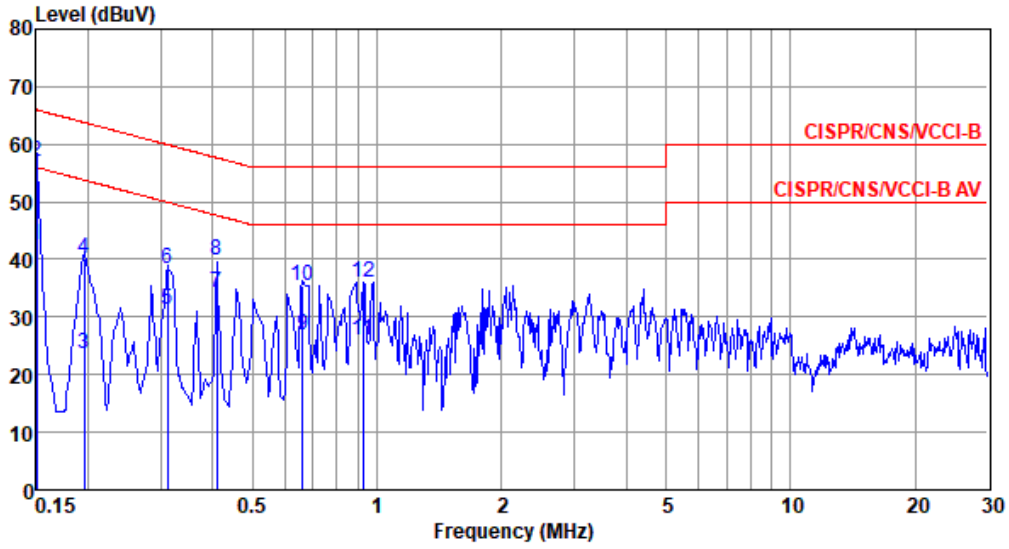


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Aux	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	
1	0.150	42.59	56.00	-13.41	32.63	9.68	0.08	0.20	Average
2*	0.150	58.43	66.00	-7.57	48.47	9.68	0.08	0.20	QP
3	0.204	34.98	53.45	-18.47	25.00	9.68	0.08	0.22	Average
4	0.204	48.89	63.45	-14.56	38.91	9.68	0.08	0.22	QP
5	0.249	25.15	51.78	-26.63	15.13	9.68	0.08	0.26	Average
6	0.249	41.84	61.78	-19.94	31.82	9.68	0.08	0.26	QP
7	0.474	21.55	46.45	-24.90	11.43	9.67	0.09	0.36	Average
8	0.474	33.14	56.45	-23.31	23.02	9.67	0.09	0.36	QP
9	0.994	26.55	46.00	-19.45	16.34	9.68	0.16	0.37	Average
10	0.994	36.71	56.00	-19.29	26.50	9.68	0.16	0.37	QP
11	1.229	25.61	46.00	-20.39	15.38	9.68	0.17	0.38	Average
12	1.229	35.86	56.00	-20.14	25.63	9.68	0.17	0.38	QP

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

Power Phase	Neutral	Test Freq. (MHz)	927.492

Test by : Joe Liao Temperature: 24°C Humidity: 62%



	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Aux	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	
1	0.150	42.49	56.00	-13.51	32.64	9.61	0.08	0.16	Average
2*	0.150	57.10	66.00	-8.90	47.25	9.61	0.08	0.16	QP
3	0.195	23.49	53.80	-30.31	13.62	9.61	0.08	0.18	Average
4	0.195	40.13	63.80	-23.67	30.26	9.61	0.08	0.18	QP
5	0.312	31.34	49.93	-18.59	21.46	9.61	0.08	0.19	Average
6	0.312	38.44	59.93	-21.49	28.56	9.61	0.08	0.19	QP
7	0.410	34.21	47.64	-13.43	24.33	9.61	0.08	0.19	Average
8	0.410	39.80	57.64	-17.84	29.92	9.61	0.08	0.19	QP
9	0.661	26.90	46.00	-19.10	16.93	9.61	0.12	0.24	Average
10	0.661	35.36	56.00	-20.64	25.39	9.61	0.12	0.24	QP
11	0.923	26.10	46.00	-19.90	16.07	9.61	0.15	0.27	Average
12	0.923	35.91	56.00	-20.09	25.88	9.61	0.15	0.27	QP

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