



FCC RADIO TEST REPORT

Applicant : YEON TECHNOLOGIES CO., LTD.
Address : 17F, 51, Sec.2, ChungChing South Rd.,
Zhongzheng Dist., Taipei City 100, Taiwan
(R.O.C.)
Equipment : UHF RFID Reader
Model No. : YRU-150
Trade Name : YEON
FCC ID : 2AJ92YRU150

I HEREBY CERTIFY THAT :

The sample was received on Nov. 04, 2016 and the testing was carried out on Nov. 21, 2016 at CerpPASS Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of CerpPASS Technology Corp., the test report shall not be reproduced except in full.

Approved by:

Ray Chou / Assistant Manager

Tested by:

Spree Yei / Engineer

Laboratory Accreditation:

☒ CerpPASS Technology Corporation Test Laboratory



☐ CerpPASS Technology(SuZhou) Co., Ltd.





Contents

1.	Summary of Test Procedure and Test Results.....	5
1.1	Applicable Standards	5
2.	Test Configuration of Equipment under Test.....	6
2.1	Feature of Equipment under Test.....	6
2.2	Carrier Frequency of Channels	6
2.3	Test Mode & Test Software	7
2.4	Description of Test System.....	7
2.5	General Information of Test.....	8
2.6	Measurement Uncertainty	8
3.	Test Equipment and Ancillaries Used for Tests	9
4.	Antenna Requirements.....	10
4.1	Standard Applicable	10
4.2	Antenna Construction and Directional Gain.....	10
5.	Test of AC Power Line Conducted Emission	11
6.	Test of Spurious Emission (Radiated)	12
6.1	Test Limit	12
6.2	Test Procedures.....	12
6.3	Typical Test Setup	13
6.4	Test Result and Data (9kHz ~ 30MHz).....	14
6.5	Test Result and Data (30MHz ~ 1GHz).....	14
6.6	Test Result and Data (1GHz ~ 10GHz).....	20
6.7	Restricted Bands of Operation	26
6.8	Test Photographs (30MHz ~ 1GHz)	27
6.9	Test Photographs (1GHz ~ 25GHz)	28
7.	Test of Spurious Emission (Conducted).....	29
7.1	Test Limit	29
7.2	Test Procedure	29
7.3	Test Setup Layout	29
7.4	Test Result and Data	29
8.	20dB Bandwidth Measurement Data.....	31
8.1	Test Limit	31
8.2	Test Procedures	31
8.3	Test Setup Layout	31
8.4	Test Result and Data	31
9.	Frequencies Separation	33
9.1	Test Limit	33
9.2	Test Procedures	33
9.3	Test Setup Layout	33
9.4	Test Result and Data	33
10.	Dwell Time on each channel	35
10.1	Test Limit	35



10.2	Test Procedures	35
10.3	Test Setup Layout	35
10.4	Test Result and Data	35
11.	Number of Hopping Channels	37
11.1	Test Limit	37
11.2	Test Procedures	37
11.3	Test Setup Layout	37
11.4	Test Result and Data	37
12.	Maximum Peak and Average Output Power	39
12.1	Test Limit	39
12.2	Test Procedures	39
12.3	Test Setup Layout	39
12.4	Test Result and Data	39

[illegible]



1. Summary of Test Procedure and Test Results

1.1 Applicable Standards

ANSI C63.4: 2025

FCC Rules and Regulations Part 15 Subpart C §15.247

FCC Rule	Description of Test	Result
15.203	. Antenna Requirement	Pass
15.207	. AC Power Line Conducted Emission	Pass
15.209 15.205	. Spurious Emission(Radiated)	Pass
15.247(d)	. Spurious Emission(Conducted)	Pass
15.247(a)(1)	. Channel Carrier Frequencies Separation	Pass
15.247(a)(1)	. 20dB Bandwidth Measurement	Pass
15.247(a)(1)	. Dwell Time	Pass
15.247(b)	. Number of Hopping Channels	Pass
15.247(b)	. Peak Output Power Measurement Data	Pass

This EUT has been also tested and compiled with the requirement of FCC Part 15, Subpart B, recorded in a separate test report.



2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

Modulation Type		ASK
Frequency Range		902MHz ~ 928MHz
Antenna Type/ gain	Antenna A	Directional Antenna / 7dBi
	Antenna B	Directional Antenna / 7dBi
	Antenna C	Directional Antenna / 7dBi
	Antenna D	Directional Antenna / 7dBi

2.2 Carrier Frequency of Channels

Channel	Frequency(MHz)	Channel	Frequency(MHz)
*1	903.24	26	915.24
2	903.72	27	915.72
3	904.20	28	916.20
4	904.68	29	916.68
5	905.16	30	917.16
6	905.64	31	917.64
7	906.12	32	918.12
8	906.60	33	918.60
9	907.08	34	919.08
10	907.56	35	919.56
11	908.04	36	920.04
12	908.52	37	920.52
13	909.00	38	921.00
14	909.48	39	921.48
15	909.96	40	921.96
16	910.44	41	922.44
17	910.92	42	922.92
18	911.40	43	923.04
19	911.88	44	923.88
20	912.36	45	924.36
21	912.84	46	924.84
22	913.32	47	925.32
23	913.80	48	925.80
24	914.28	49	926.28
*25	914.76	*50	926.76



2.3 Test Mode & Test Software

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4
- b. The complete test system included Notebook and EUT for RF test.
- c. The test program "ReaderUtility" under WIN 7 was executed to keep transmit and receive data via Bluetooth.
- d. The following test mode was performed for the test:
Test Mode 1. ASK

2.4 Description of Test System

Device	Manufacturer	Model No.	Description
Notebook	DELL	LatitudeE5450/5450	Power Cable, Unshielding 1.8m



2.5 General Information of Test

☒ Test Site	Cerpass Technology Corporation Test Laboratory Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881 Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C. Tel: +886-2-2663-8582	
	FCC	TW1079, TW1061, 390316, 228391, 641184
	IC	4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication Test C-4663 for Conducted emission test R-4218 for Radiated emission test G-812, G-813 for radiated disturbance above 1GHz
☐ Test Site	Cerpass Technology (Suzhou) Co.,Ltd Address: No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China Tel: +86-512-6917-5888 Fax: +86-512-6917-5666	
	FCC	916572, 331395
	IC	7290A-1, 7290A-2
	VCCI	T-343 for Telecommunication Test C-2919 for Conducted emission test R-2670 for Radiated emission test G-227 for radiated disturbance above 1GHz
Frequency Range Investigated:		Conducted: from 150kHz to 30 MHz Radiation: from 30 MHz to 25,000MHz
Test Distance:		The test distance of radiated emission from antenna to EUT is 3 M.

2.6 Measurement Uncertainty

Measurement Item	Measurement Frequency	Polarization	Uncertainty
Conducted Emission	9 kHz ~ 30 MHz	Line / Neutral	±2.9076 dB
Radiated Emission	9 kHz ~ 25,000 MHz	Vertical / Horizontal	±0.948 dB
Spurious Emission (Conducted)	-	-	±4.011 dB
Maximum Peak and Average Output Power	-	-	±0.322 dB
Power Spectral Density	-	-	±0.322 dB
Bandwidth	-	-	±74.224Hz



3. Test Equipment and Ancillaries Used for Tests

Instrument	Model No.	Manufacturer	Serial No.	Calibration Date	Valid Date
EMI Receiver	R&S	ESCI3	100443	2016/03/28	2017/03/27
LISN	Schwarzbeck	NSLK 8127	8127-740	2016/08/30	2017/08/29
LISN	Schwarzbeck	NSLK 8127	8127-516	2016/09/06	2017/09/05
Pulse Limiter	R&S	ESH3-Z2	101934	2016/03/09	2017/03/08
Bilog Antenna	Schwarzbeck	VULB9168	369	2016/03/22	2017/03/21
Active Loop Antenna	EMCO	6507	40855	2016/05/11	2017/05/10
Horn Antenna	EMCO	3115	31601	2016/09/05	2017/09/04
Horn Antenna	EMCO	3116	31970	2016/03/18	2017/03/17
EXA Signal Analyzer	KEYSIGHT	N9010A	MY54200207	2016/03/16	2017/03/15
Preamplifier	EM	EM330	60660	2016/03/16	2017/03/15
Preamplifier	EMC INSTRUMENTS	EMC051845 SE	980333	2016/09/13	2017/09/12
Preamplifier	Agilent	8449B	3008A01954	2016/03/04	2017/03/03
Preamplifier	MITEQ	AMF-7D-001 0100-30-10P	1860212	2016/03/16	2017/03/15
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2016/11/04	2017/11/03
MXG MW Analog Signal Generator	KEYSIGHT	N5183A	MY50142931	2016/03/18	2017/03/17
Spectrum Analyzer	R&S	FSP40	100219	2016/09/01	2017/08/31
Bluetooth Tester	R&S	CBT	101133	2016/03/18	2017/03/17
Attenuator	KEYSIGHT	8491B	MY39250703	2016/03/07	2017/03/06
Rotary Attenuator	Agilent	8494B	MY42154466	2016/03/08	2017/03/07
Rotary Attenuator	Agilent	8495B	MY42146680	2016/03/08	2017/03/07
Temp & Humi chamber	T-MACHINE	TMJ-9712	T-12-040111	2016/09/05	2017/09/04
Series Power Meter	Anritsu	ML2495A	1224005	2016/03/03	2017/03/02
Power Sensor	Anritsu	MA2411B	1207295	2016/03/03	2017/03/02
Cable	HUBER SUHNER	SUCOFLEX 102	28422/2	2016/03/15	2017/03/14
Cable	HUBER SUHNER	SUCOFLEX 102	28418/2	2016/03/16	2017/03/15
Cable	HUBER SUHNER	SUCOFLEX 102	28417/2	2016/03/04	2017/03/03
Software	Farad	Ez-EMC	ver.ct3a1	N/A	N/A
Software	AUDIX	E3	V8.2014-8-6	N/A	N/A
Software	Keysight	N7607B Signal Studio	v2.0.0.1	N/A	N/A
Software	Keysight	Inservice MonitorUtility	N/A	N/A	N/A



4. Antenna Requirements

4.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.2 Antenna Construction and Directional Gain

Antenna Type		Antenna Gain
Antenna A	Directional Antenna	7.0dBi
Antenna B	Directional Antenna	7.0dBi
Antenna C	Directional Antenna	7.0dBi
Antenna D	Directional Antenna	7.0dBi



5. Test of AC Power Line Conducted Emission

The power is DC source, so this item doesn't require testing.



6. Test of Spurious Emission (Radiated)

6.1 Test Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

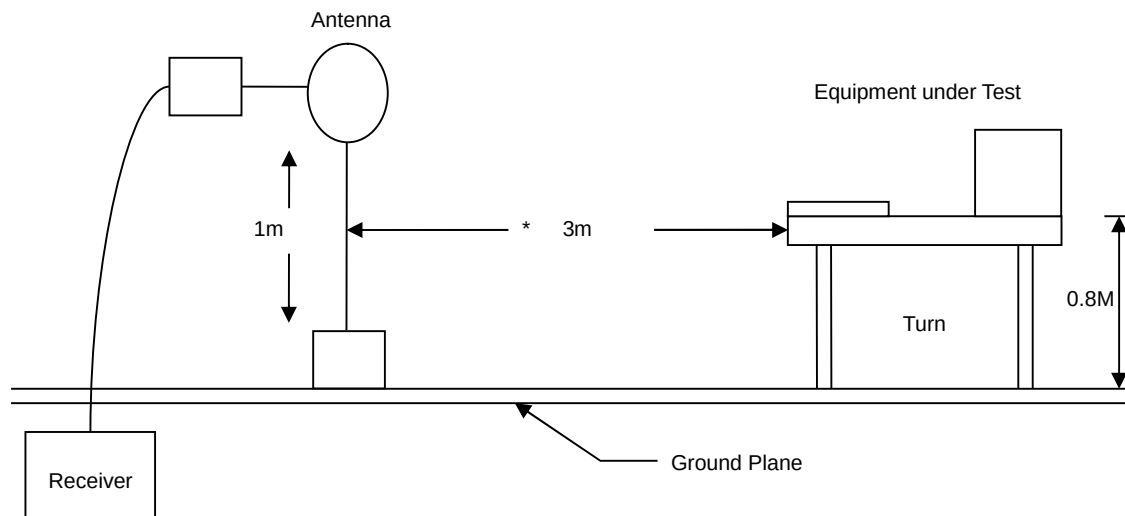
6.2 Test Procedures

- The EUT was placed on a rotatable table top below 1GHz 0.8 meter above ground. above 1GHz 1.5 meter above ground.
- The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The table was rotated 360 degrees to determine the position of the highest radiation.
- The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

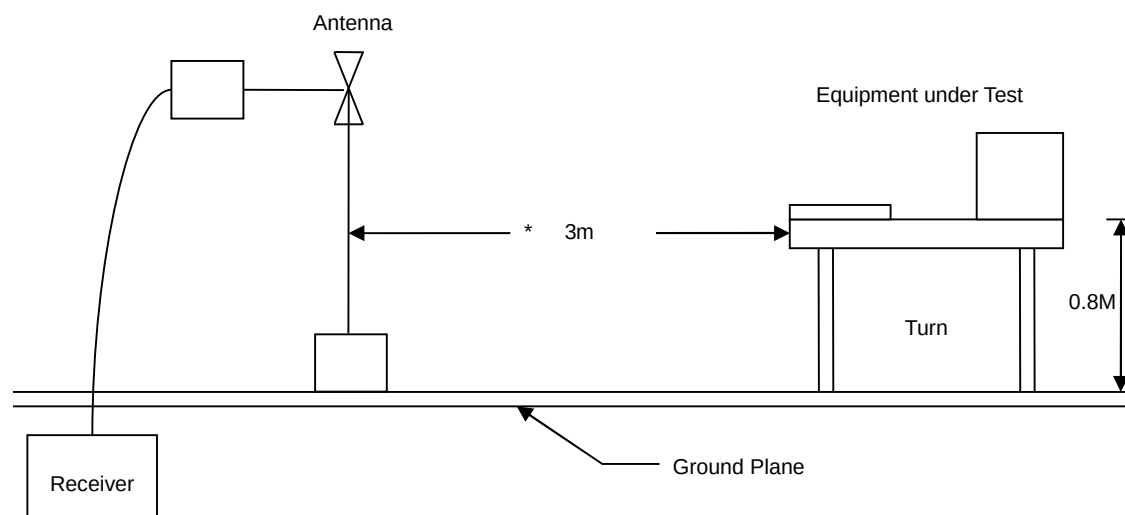


6.3 Typical Test Setup

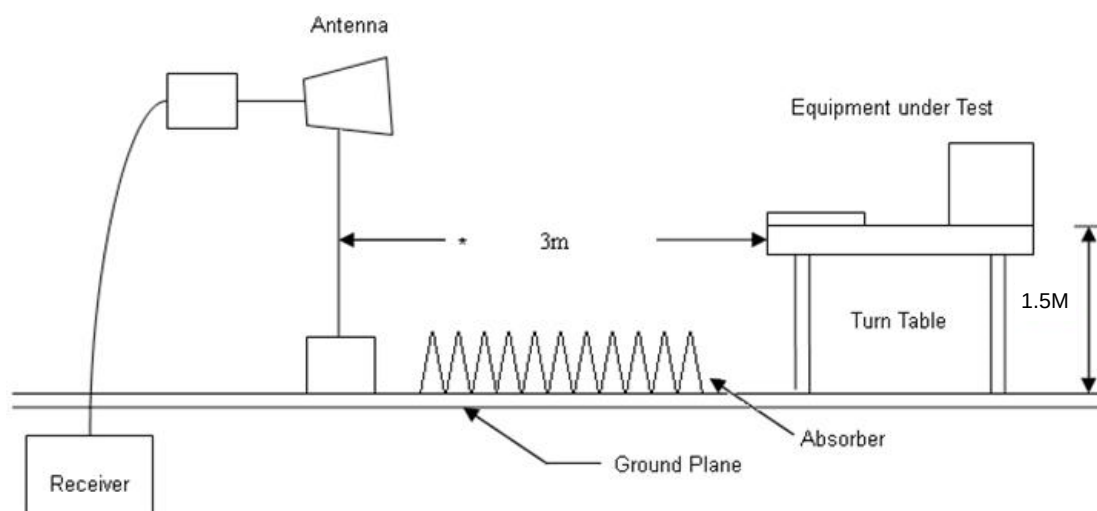
Below 30MHz test setup



30MHz- 1GHz Test Setup



Above 1GHz Test Setup



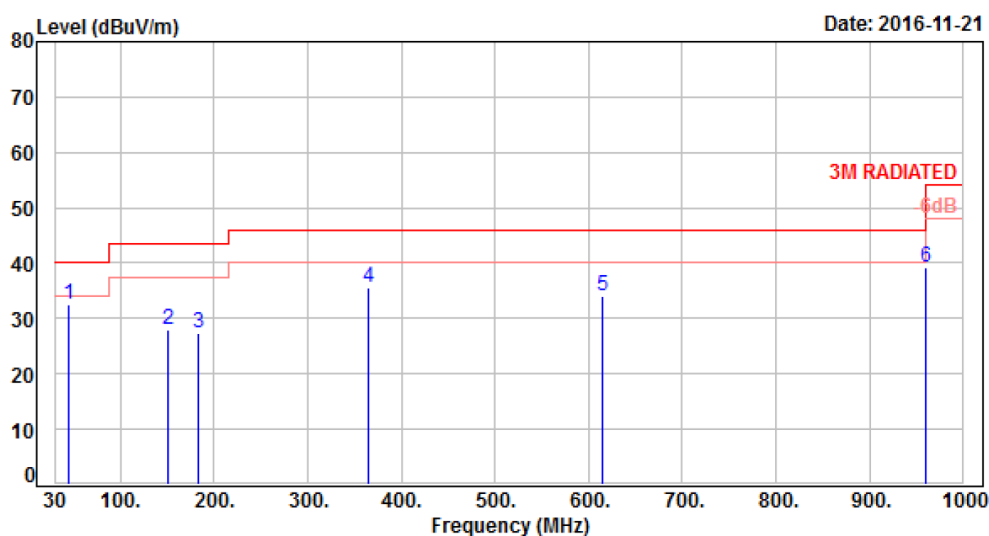


6.4 Test Result and Data (9kHz ~ 30MHz)

The 9kHz-30MHz spurious emission is under limit 20dB more.

6.5 Test Result and Data (30MHz ~ 1GHz)

Power	: DC 12V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 21, 2016	Humidity	: 68 %
Memo	: CH00	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	45.52	-9.76	42.38	32.62	40.00	-7.38	QP	100	137	P
2	150.28	-10.03	38.12	28.09	43.50	-15.41	Peak	100	0	P
3	183.26	-11.64	39.12	27.48	43.50	-16.02	Peak	100	0	P
4	365.62	-7.34	42.87	35.53	46.00	-10.47	Peak	100	0	P
5	614.00	-1.83	36.04	34.21	46.00	-11.79	QP	194	164	P
6	960.00	3.17	36.11	39.28	46.00	-6.72	QP	194	164	P

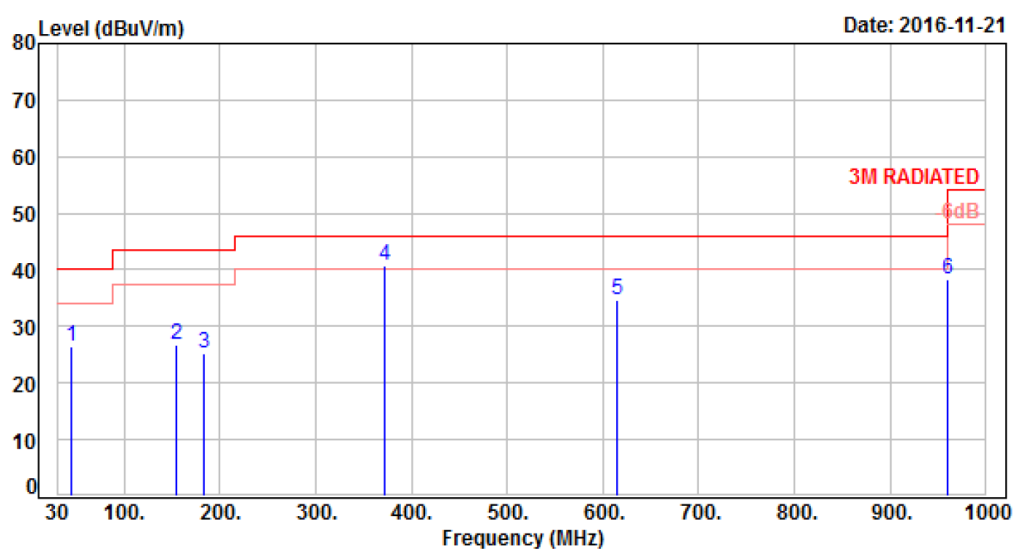
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 21, 2016	Humidity	: 68 %
Memo	: CH00	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	45.52	-9.76	36.14	26.38	40.00	-13.62	Peak	100	0	P
2	154.16	-9.97	36.71	26.74	43.50	-16.76	Peak	100	0	P
3	183.26	-11.64	36.82	25.18	43.50	-18.32	Peak	100	0	P
4	371.44	-7.18	47.85	40.67	46.00	-5.33	QP	100	246	P
5	614.00	-1.83	36.42	34.59	46.00	-11.41	QP	248	165	P
6	960.00	3.17	35.27	38.44	46.00	-7.56	QP	248	165	P

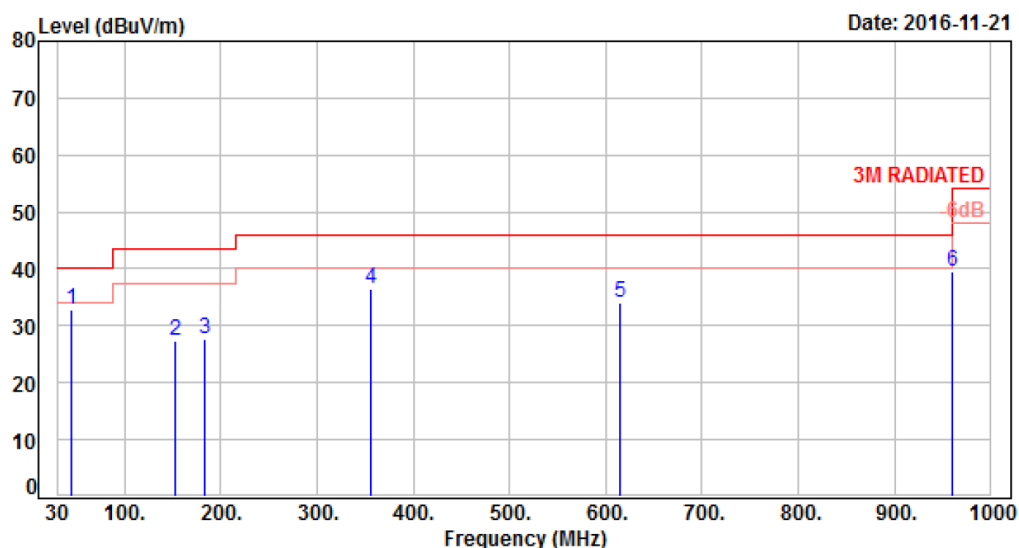
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 21, 2016	Humidity	: 68 %
Memo	: CH25	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	45.52	-9.76	42.75	32.99	40.00	-7.01	QP	100	161	P
2	152.22	-9.99	37.25	27.26	43.50	-16.24	Peak	100	0	P
3	183.26	-11.64	39.34	27.70	43.50	-15.80	Peak	100	0	P
4	355.92	-7.60	43.98	36.38	46.00	-9.62	Peak	100	0	P
5	614.00	-1.83	35.98	34.15	46.00	-11.85	QP	186	170	P
6	960.00	3.17	36.37	39.54	46.00	-6.46	QP	186	170	P

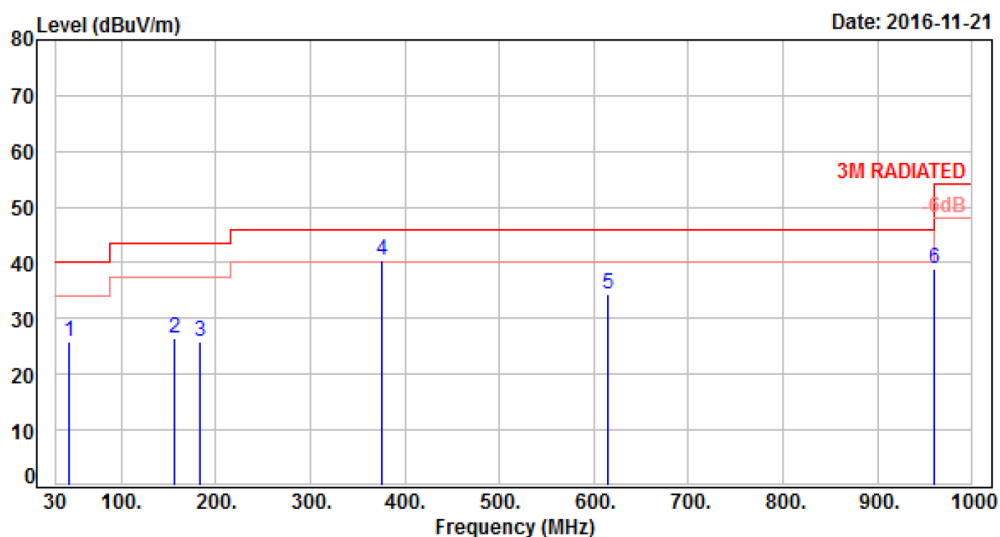
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 21, 2016	Humidity	: 68 %
Memo	: CH25	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	45.52	-9.76	35.71	25.95	40.00	-14.05	Peak	100	0	P
2	156.10	-9.95	36.49	26.54	43.50	-16.96	Peak	100	0	P
3	183.26	-11.64	37.53	25.89	43.50	-17.61	Peak	100	0	P
4	375.32	-7.06	47.62	40.56	46.00	-5.44	QP	100	216	P
5	614.00	-1.83	36.15	34.32	46.00	-11.68	QP	244	172	P
6	960.00	3.17	35.63	38.80	46.00	-7.20	QP	244	172	P

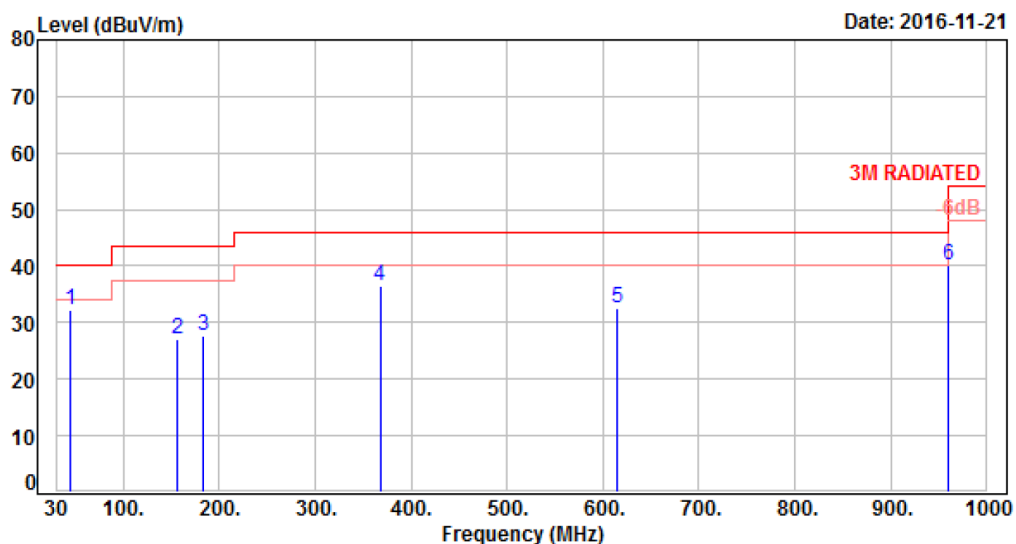
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 21, 2016	Humidity	: 68 %
Memo	: CH50	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	45.52	-9.76	42.04	32.28	40.00	-7.72	QP	100	159	P
2	156.10	-9.95	37.08	27.13	43.50	-16.37	Peak	100	0	P
3	183.26	-11.64	39.28	27.64	43.50	-15.86	Peak	100	0	P
4	367.56	-7.28	43.71	36.43	46.00	-9.57	Peak	100	0	P
5	614.00	-1.83	34.46	32.63	46.00	-13.37	QP	239	162	P
6	960.00	3.17	37.08	40.25	46.00	-5.75	QP	239	162	P

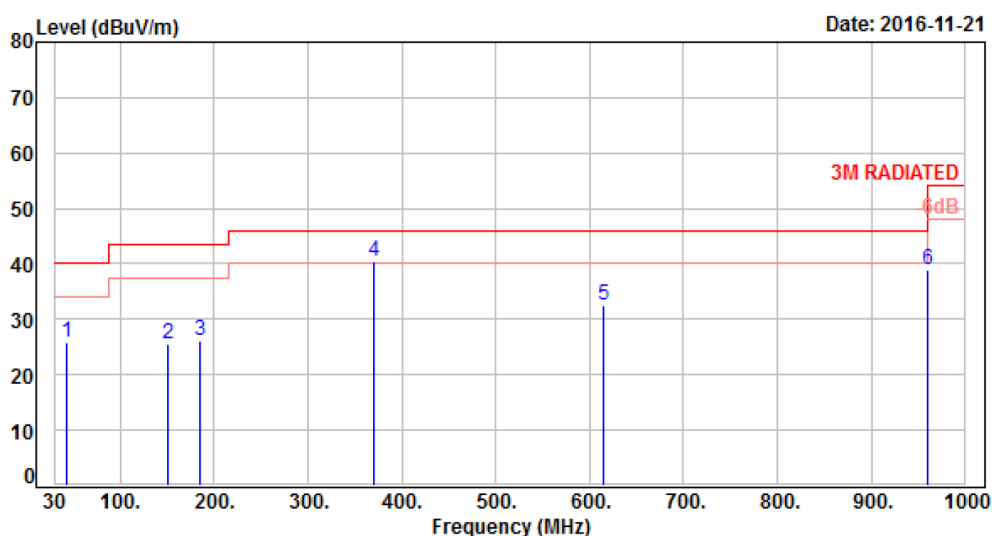
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 21, 2016	Humidity	: 68 %
Memo	: CH50	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	43.58	-9.87	35.84	25.97	40.00	-14.03	Peak	100	0	P
2	150.28	-10.03	35.62	25.59	43.50	-17.91	Peak	100	0	P
3	185.20	-11.80	37.99	26.19	43.50	-17.31	Peak	100	0	P
4	369.50	-7.22	47.62	40.40	46.00	-5.60	QP	100	249	P
5	614.00	-1.83	34.28	32.45	46.00	-13.55	QP	258	152	P
6	960.00	3.17	35.62	38.79	46.00	-7.21	QP	258	152	P

Note: Level = Reading + Factor

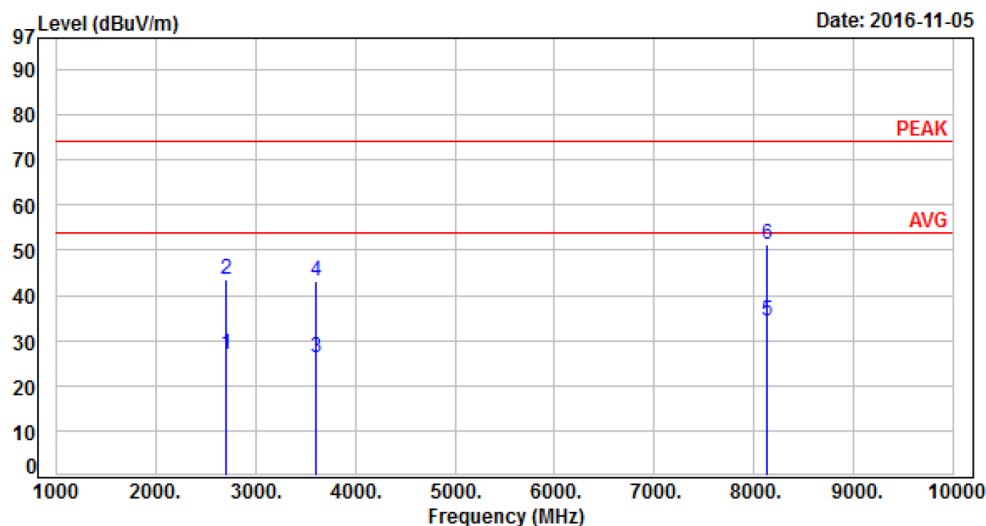
Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



6.6 Test Result and Data (1GHz ~ 10GHz)

Power	: DC 12V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 05 2016	Humidity	: 68 %
Memo	: CH00	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2709.72	-14.35	41.19	26.84	54.00	-27.16	Average	116	174	P
2	2709.72	-14.35	58.02	43.67	74.00	-30.33	Peak	116	174	P
3	3612.96	-10.71	37.05	26.34	54.00	-27.66	Average	119	9	P
4	3612.96	-10.71	53.88	43.17	74.00	-30.83	Peak	119	9	P
5	8129.16	-2.82	37.18	34.36	54.00	-19.64	Average	139	328	P
6	8129.16	-2.82	54.01	51.19	74.00	-22.81	Peak	139	328	P

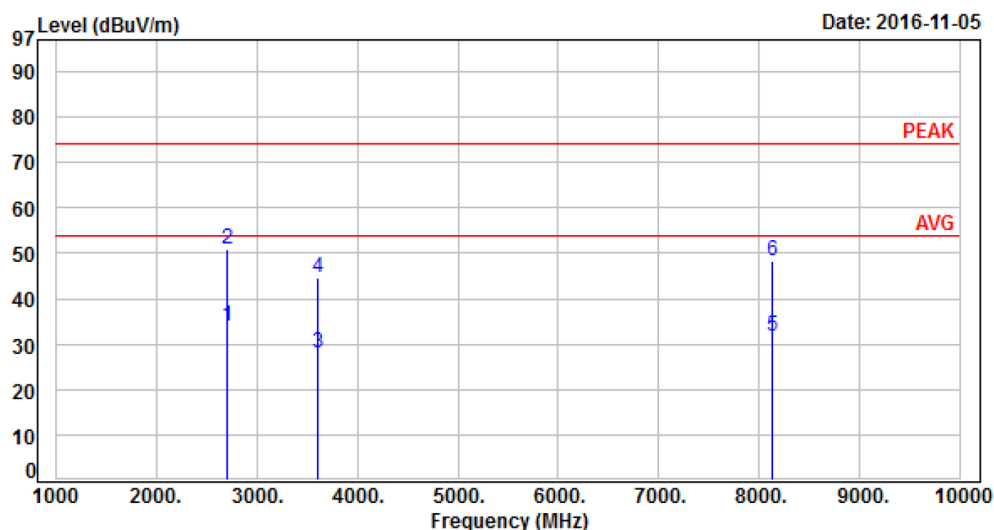
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 05 2016	Humidity	: 68 %
Memo	: CH00	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2709.72	-14.35	48.40	34.05	54.00	-19.95	Average	235	0	P
2	2709.72	-14.35	65.23	50.88	74.00	-23.12	Peak	235	0	P
3	3612.96	-10.71	38.61	27.90	54.00	-26.10	Average	167	341	P
4	3612.96	-10.71	55.44	44.73	74.00	-29.27	Peak	167	341	P
5	8129.16	-2.82	34.41	31.59	54.00	-22.41	Average	175	62	P
6	8129.16	-2.82	51.24	48.42	74.00	-25.58	Peak	175	62	P

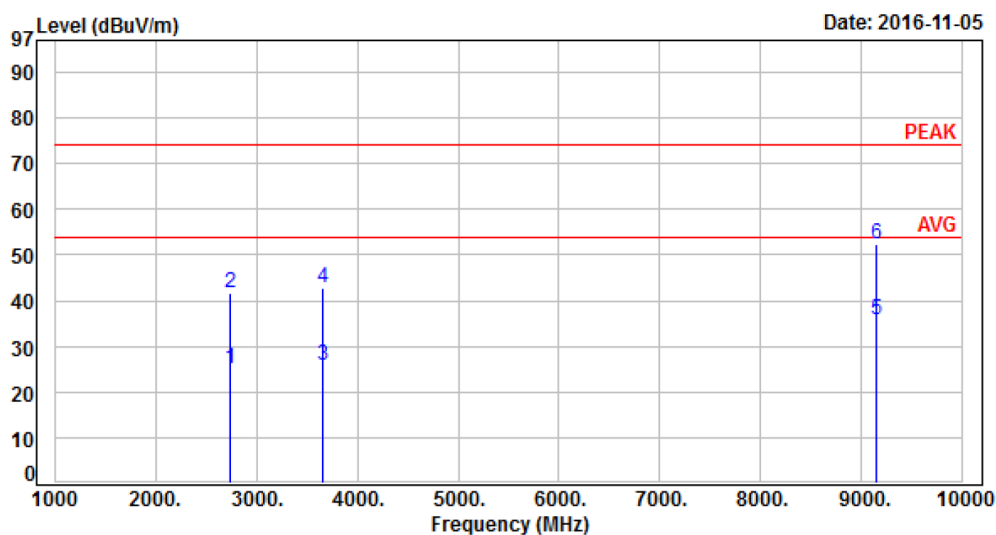
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 05 2016	Humidity	: 68 %
Memo	: CH25	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2744.28	-14.17	39.14	24.97	54.00	-29.03	Average	112	66	P
2	2744.28	-14.17	55.97	41.80	74.00	-32.20	Peak	112	66	P
3	3659.04	-10.52	36.38	25.86	54.00	-28.14	Average	121	145	P
4	3659.04	-10.52	53.21	42.69	74.00	-31.31	Peak	121	145	P
5	9147.60	-0.86	36.56	35.70	54.00	-18.30	Average	149	348	P
6	9147.60	-0.86	53.39	52.53	74.00	-21.47	Peak	149	348	P

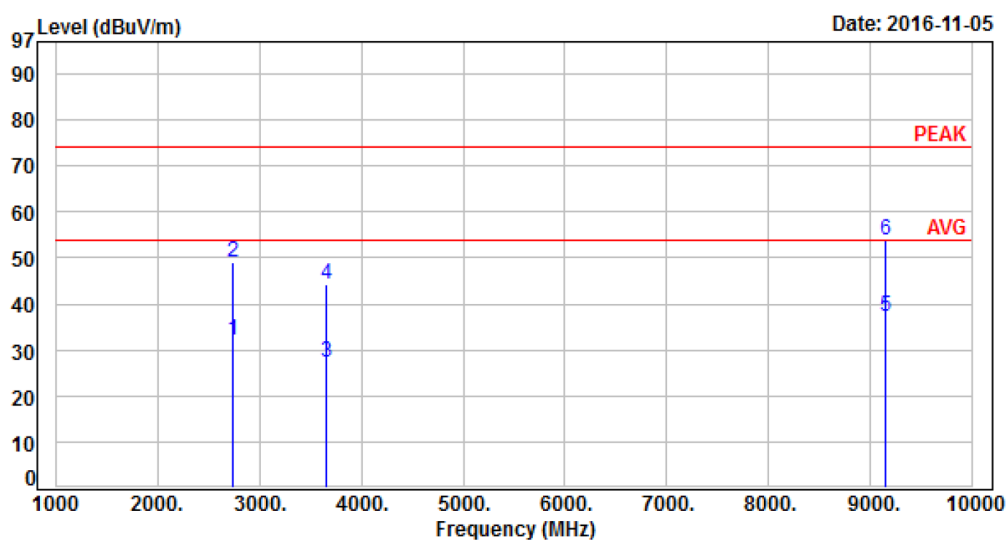
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 05 2016	Humidity	: 68 %
Memo	: CH25	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2744.28	-14.17	46.39	32.22	54.00	-21.78	Average	100	3	P
2	2744.28	-14.17	63.22	49.05	74.00	-24.95	Peak	100	3	P
3	3659.04	-10.52	37.92	27.40	54.00	-26.60	Average	217	347	P
4	3659.04	-10.52	54.75	44.23	74.00	-29.77	Peak	217	347	P
5	9147.60	-0.86	37.94	37.08	54.00	-16.92	Average	232	340	P
6	9147.60	-0.86	54.77	53.91	74.00	-20.09	Peak	232	340	P

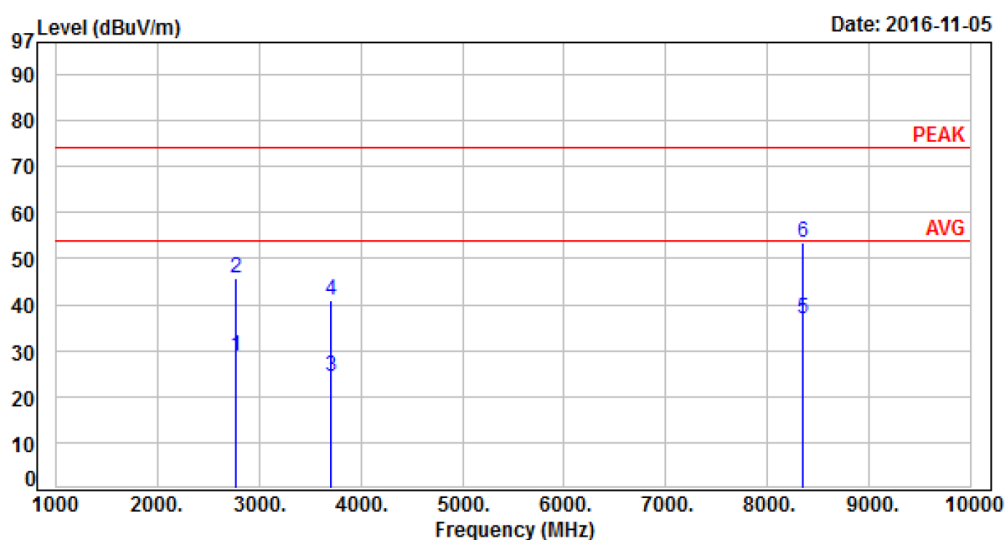
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 05 2016	Humidity	: 68 %
Memo	: CH50	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2780.28	-13.99	42.83	28.84	54.00	-25.16	Average	112	347	P
2	2780.28	-13.99	59.66	45.67	74.00	-28.33	Peak	112	347	P
3	3707.04	-10.32	34.52	24.20	54.00	-29.80	Average	100	116	P
4	3707.04	-10.32	51.35	41.03	74.00	-32.97	Peak	100	116	P
5	8340.84	-2.12	38.88	36.76	54.00	-17.24	Average	152	355	P
6	8340.84	-2.12	55.71	53.59	74.00	-20.41	Peak	152	355	P

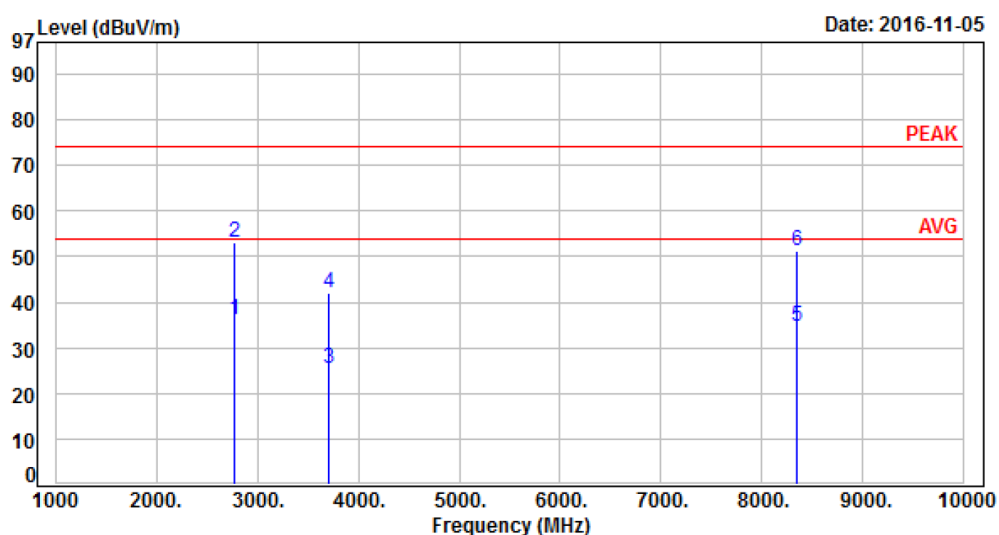
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Nov. 05 2016	Humidity	: 68 %
Memo	: CH50	Atmospheric Pressure	: 1030 hPa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2780.28	-13.99	50.31	36.32	54.00	-17.68	Average	250	306	P
2	2780.28	-13.99	67.14	53.15	74.00	-20.85	Peak	250	306	P
3	3707.04	-10.32	35.70	25.38	54.00	-28.62	Average	153	323	P
4	3707.04	-10.32	52.53	42.21	74.00	-31.79	Peak	153	323	P
5	8340.84	-2.12	36.65	34.53	54.00	-19.47	Average	151	333	P
6	8340.84	-2.12	53.48	51.36	74.00	-22.64	Peak	151	333	P

Note: Level = Reading + Factor

Margin = Level – Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor



6.7 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 – 410.0	4.500 – 5.250
0.49500 – 0.505**	16.69475 – 16.69525	608.0 – 614.0	5.350 – 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 – 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 – 8.500
4.17725 – 4.17775	37.50000 – 38.25000	1435.0 – 1626.5	9.000 – 9.200
4.20725 – 4.20775	73.00000 – 74.60000	1645.5 – 1646.5	9.300 – 9.500
6.21500 – 6.21800	74.80000 – 75.20000	1660.0 – 1710.0	10.600 – 12.700
6.26775 – 6.26825	108.00000 – 121.94000	1718.8 – 1722.2	13.250 – 13.400
6.31175 – 6.31225	123.00000 – 138.00000	2200.0 – 2300.0	14.470 – 14.500
8.29100 – 8.29400	149.90000 – 150.05000	2310.0 – 2390.0	15.350 – 16.200
8.36200 – 8.36600	156.52475 – 156.52525	2483.5 – 2500.0	17.700 – 21.400
8.37625 – 8.38675	156.70000 – 156.90000	2655.0 – 2900.0	22.010 – 23.120
8.41425 – 8.41475	162.01250 – 167.17000	3260.0 – 3267.0	23.600 – 24.000
12.29000 – 12.29300	167.72000 – 173.20000	3332.0 – 3339.0	31.200 – 31.800
12.51975 – 12.52025	240.00000 – 285.00000	3345.8 – 3358.0	36.430 – 36.500
12.57675 – 12.57725	322.00000 – 335.40000	3600.0 – 4400.0	Above 38.6
13.36000 – 13.41000			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz



7. Test of Spurious Emission (Conducted)

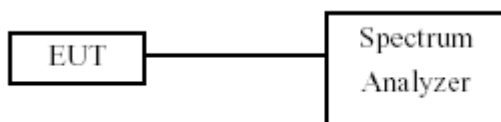
7.1 Test Limit

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

7.2 Test Procedure

- The transmitter output was connected to the spectrum analyzer via a low lose cable.
- Set both RBW and VBW of spectrum analyzer to 100 KHz with convenient frequency span including 300 KHz bandwidth from band edge.
- The band edges was measured and recorded.

7.3 Test Setup Layout



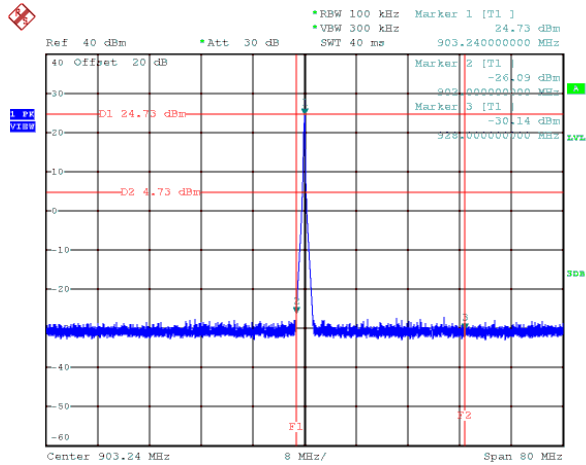
7.4 Test Result and Data

Test Date	: Nov. 04, 2016	Temperature	: 23°C
Atmospheric pressure	: 1015 hPa	Humidity	: 64%
Test Result	: PASS		

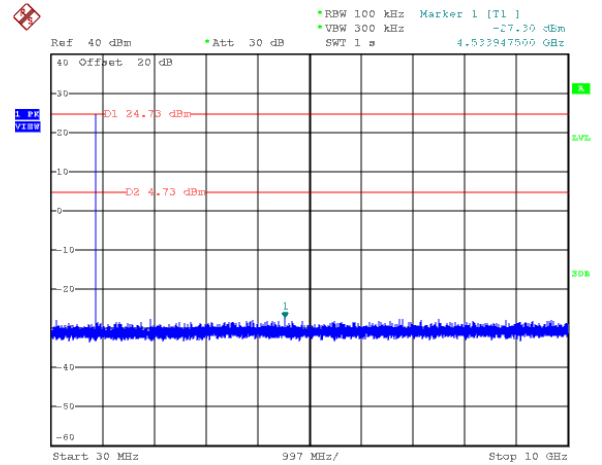
Note: Test plots refer to the following pages.



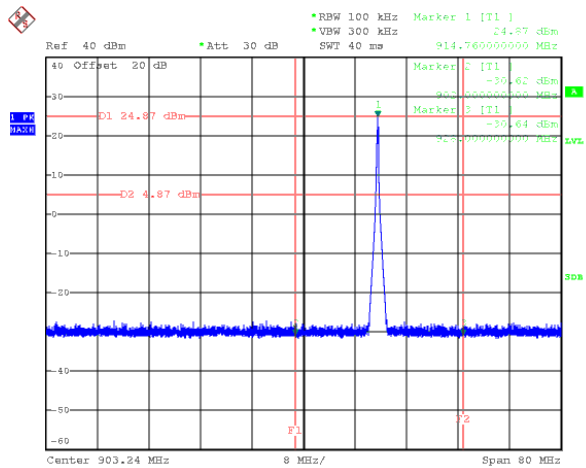
Modulation Type: ASK
CH00



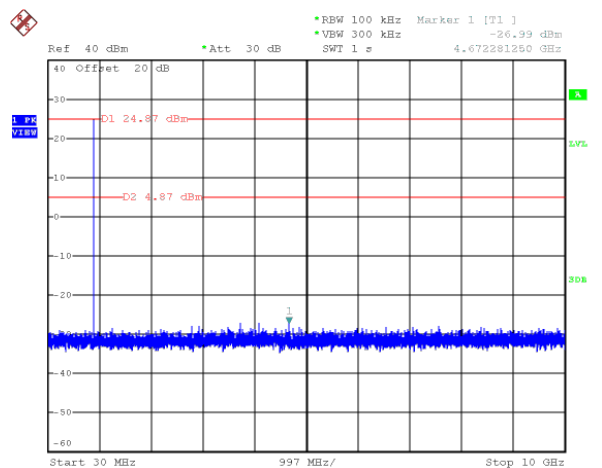
CH00



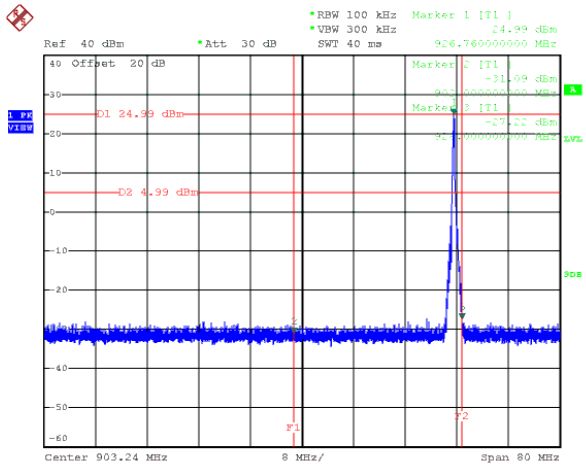
CH25



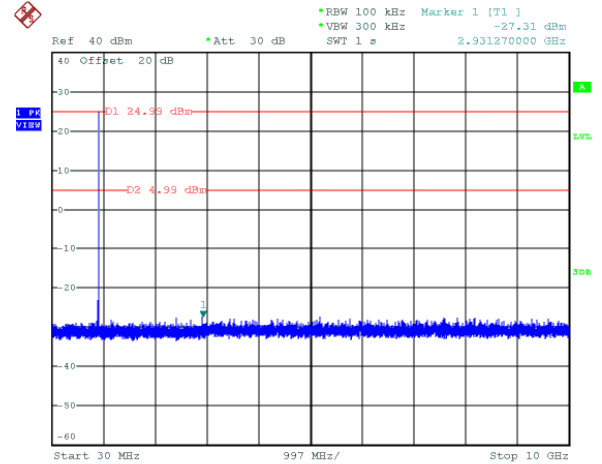
CH25



CH50



CH50





8. 20dB Bandwidth Measurement Data

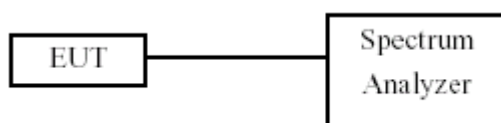
8.1 Test Limit

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

8.2 Test Procedures

- The transmitter output was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 10 KHz and VBW to 30 KHz.
- The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

8.3 Test Setup Layout



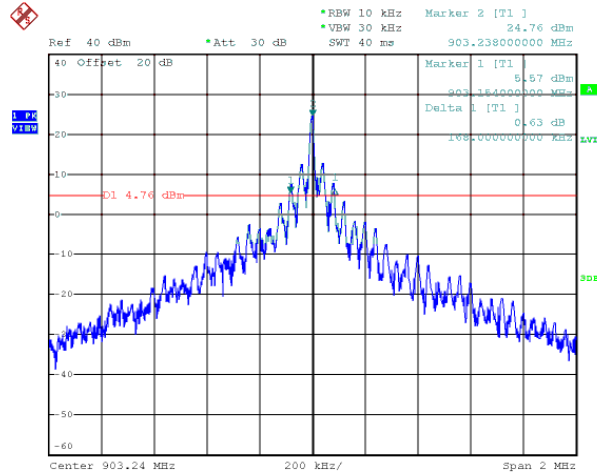
8.4 Test Result and Data

Test Date : Nov. 04, 2016 Temperature : 23°C
Atmospheric pressure : 1015 hPa Humidity : 64%

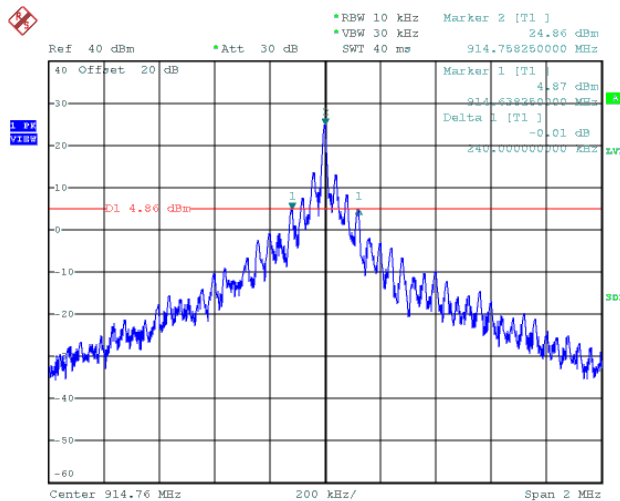
Modulation Type	Channel	Frequency (MHz)	20dB Bandwidth (MHz)
ASK	00	903.24	0.168
	25	914.76	0.240
	50	926.76	0.241



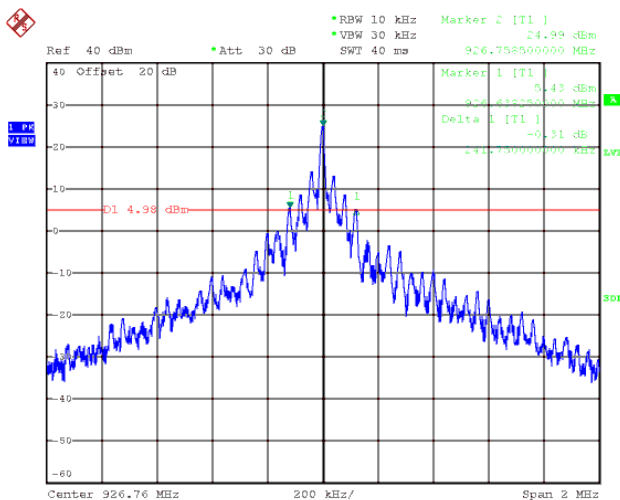
Modulation Type: ASK
CH00



CH25



CH50





9. Frequencies Separation

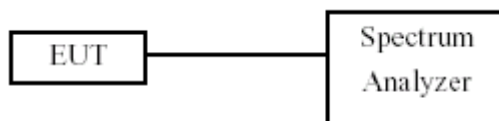
9.1 Test Limit

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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies.

9.2 Test Procedures

- The transmitter output was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 10 KHz and VBW to 30 KHz.
- By using the MaxHold function record the separation of two adjacent channels.
- Measure the frequency difference of these two adjacent channels.

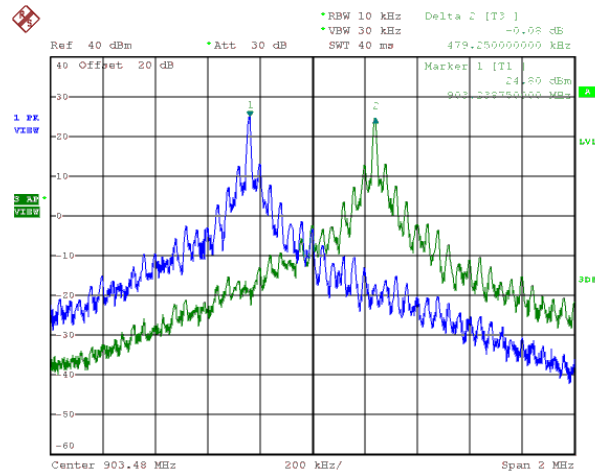
9.3 Test Setup Layout



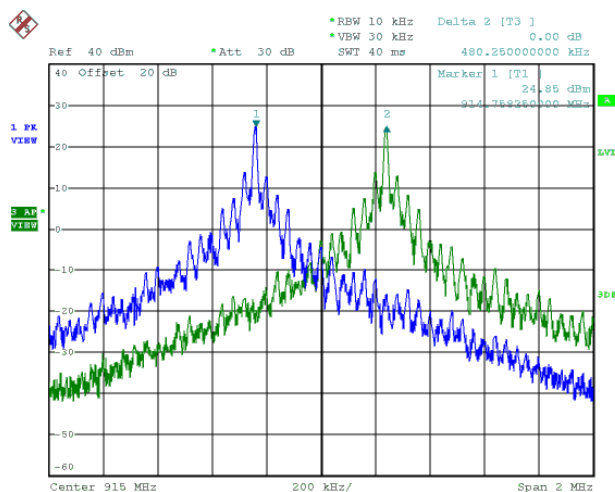
9.4 Test Result and Data

Test Date : Nov. 04, 2016 Temperature : 23°C
Atmospheric pressure : 1015 hPa Humidity : 64%

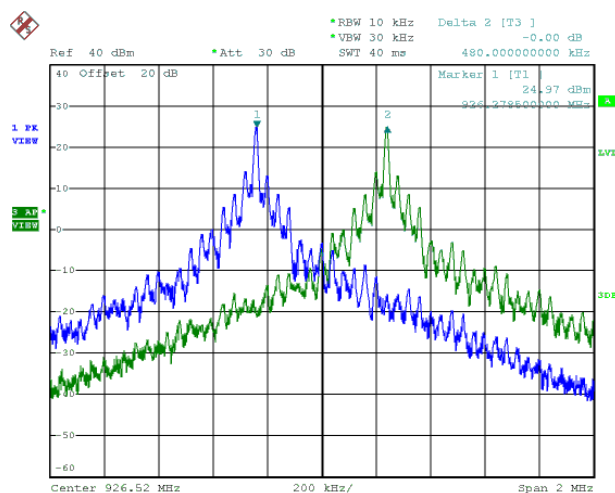
Modulation Type	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
ASK	00	903.24	0.48	0.168
	25	914.76	0.48	0.24
	50	926.76	0.48	0.241

Modulation Type: ASK
CH00

CH25



CH50





10. Dwell Time on each channel

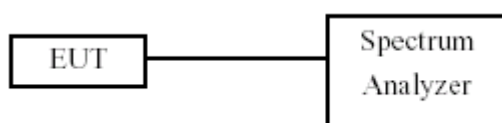
10.1 Test Limit

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

10.2 Test Procedures

1. The transmitter output was connected to the spectrum analyzer.
2. Adjust the center frequency to measure frequency, then set zero span mode.
2. Set RBW of spectrum analyzer to 10 kHz and VBW to 30 kHz.
4. Measure the time duration of one transmission on the measured frequency.

10.3 Test Setup Layout



10.4 Test Result and Data

Test Date : Nov. 04, 2016 Temperature : 23°C

Atmospheric pressure : 1015 hPa Humidity : 64%

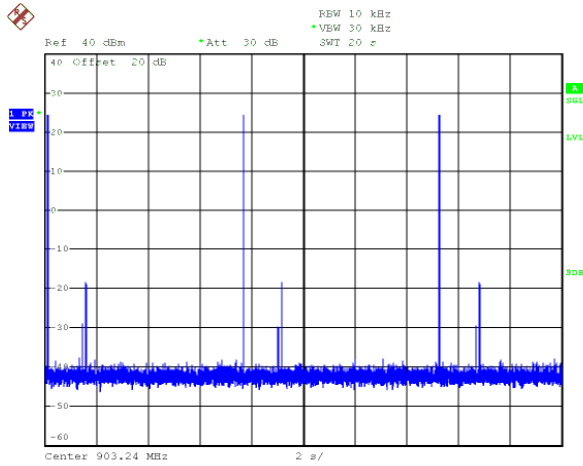
Test Period = 0.4 (second/ channel) x 79 Channel = 31.6 sec

Modulation Type	Channel	Frequency (MHz)	Length of transmission time (ms)	Number of transmission in a 20 sec	Dwell Time (ms)	Limit (ms)
ASK	00	903.24	25.225	3.00	75.68	400
	25	914.76	25.325	3.00	75.98	400
	50	926.76	25.444	3.00	76.33	400

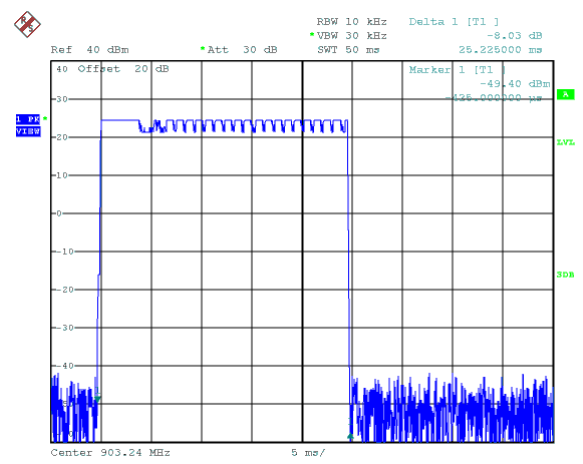


Modulation Type: ASK

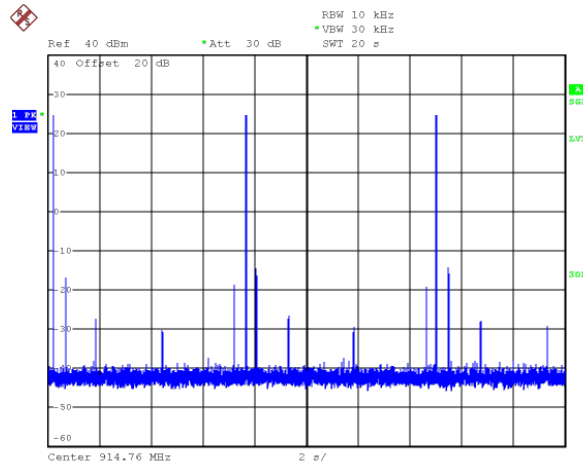
CH00



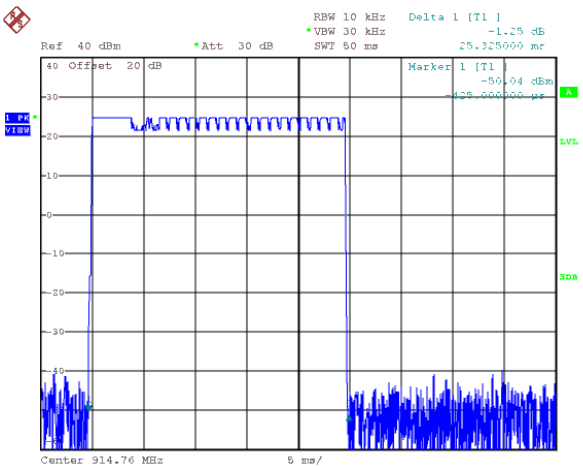
CH00



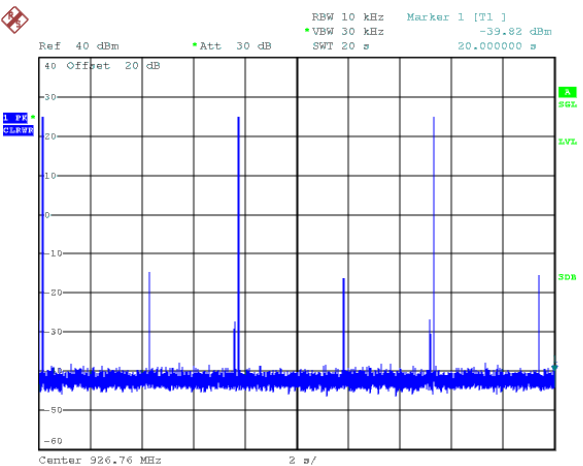
CH25



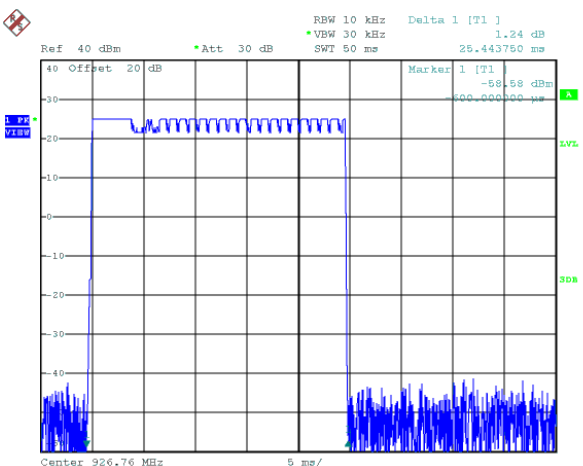
CH25



CH50



CH50





11. Number of Hopping Channels

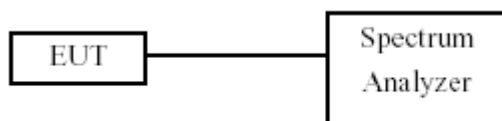
11.1 Test Limit

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

11.2 Test Procedures

- a. The transmitter output was connected to the spectrum analyzer.
- b. 2. Set RBW of spectrum analyzer to 100 KHz and VBW to 100 KHz.
- c. 3. Set the MaxHold function, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been record.

11.3 Test Setup Layout



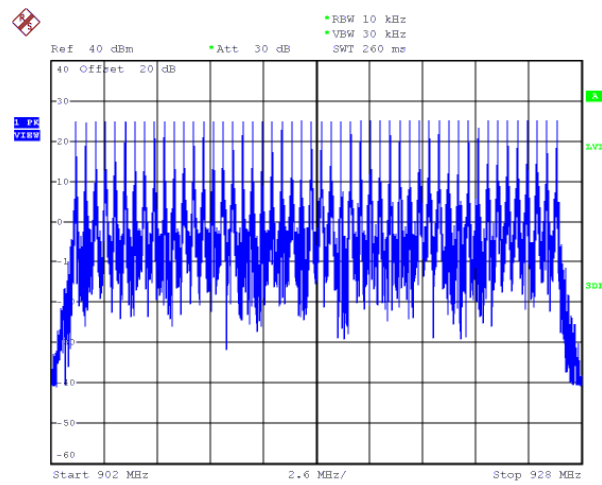
11.4 Test Result and Data

Test Date : Nov. 04, 2016 Temperature : 23°C
Atmospheric pressure : 1015 hPa Humidity : 64%

Modulation Type	Hopping Channels
ASK	50



Modulation Type: ASK





12. Maximum Peak and Average Output Power

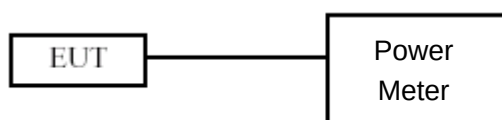
12.1 Test Limit

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

12.2 Test Procedures

The antenna port (RF output) of the EUT was connected to the input (RF input) of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

12.3 Test Setup Layout



12.4 Test Result and Data

Test Date : Nov. 04, 2016 Temperature : 23°C
Atmospheric pressure : 1015 hPa Humidity : 64%

Modulation Type	Channel	Frequency (MHz)	Peak Output Power (dBm)	Peak Output Power (mW)
ASK	00	903.24	24.27	267.30
	25	914.76	24.41	276.06
	50	926.76	24.52	283.14

Modulation Type	Channel	Frequency (MHz)	Avg. Output Power (dBm)	Avg. Output Power (mW)
ASK	00	903.24	24.24	265.46
	25	914.76	24.38	274.16
	50	926.76	24.49	281.19