FCC Test Report

Report No.: RFACXM-WTW-P21060766-4

FCC ID: 2AEUPBHASG001

Test Model: 5F48E9

Received Date: 2021/6/22

Test Date: 2021/7/16 ~ 2021/8/26

Issued Date: 2021/11/3

Applicant: Ring LLC

Address: 1523 26th Street, Santa Monica CA 90404 USA

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory

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FCC Registration / Designation Number: 723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RFACXM-WTW-P21060766-4	Original release.	2021/11/3

1 Certificate of Conformity

Product: Amazon Sidewalk Bridge Pro by Ring

Brand: Ring LLC

Test Model: 5F48E9

Sample Status: Engineering sample

Applicant: Ring LLC

Test Date: 2021/7/16 ~ 2021/8/26

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** 2021/11/3
Phoenix Huang / Specialist

Approved by : _____ , **Date:** 2021/11/3
Clark Lin / Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -4.56 dB at 0.41172 MHz.
15.247(a)(1)(i)	Number of Hopping Frequency Used	Pass	Meet the requirement of limit.
15.247(a)(1)(i)	Dwell Time on Each Channel	Pass	Meet the requirement of limit.
15.247(a)(1)(i)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	Pass	Meet the requirement of limit.
15.247(b)(2)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
15.205 & 209 & 15.247(d)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -4.3 dB at 59.46 MHz and 59.12 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is R-N type(F) and R-N type(M) not a standard connector.

Note:
1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Conducted emissions	-	2.5 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.5 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.1 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Amazon Sidewalk Bridge Pro by Ring
Brand	Ring LLC
Test Model	5F48E9
Status of EUT	Engineering sample
Power Supply Rating	DC 6V from battery or DC 53V from POE
Modulation Type	FSK
Modulation Technology	FHSS
Transfer Rate	Refer to Note
Operating Frequency	902.2 ~ 927.8 MHz
Number of Channel	Refer to Note
Output Power	587.489 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. The FSK technology information as below table.

Channel Spacing	Data Rate	Number of Channel
200 kHz	50 kbps	129
400 kHz	150 kbps	64
500 kHz	250 kbps	51

2. The EUT contains certified WWAN (LTE) modular which FCC ID: ZMONL668AM00.
3. The EUT has below radios as following table:

Radio 1	Radio 2	Radio 3	Radio 4
WLAN 2.4GHz+ WLAN 5GHz+ Bluetooth	WWAN (LTE)	GPS	LoRa + FSK

4. Simultaneously transmission condition.

Condition	Technology			
1	WLAN (2.4GHz)	LoRa	Bluetooth	-
2	WLAN (5GHz)	LoRa	Bluetooth	-
3	WLAN (2.4GHz)	FSK	Bluetooth	-
4	WLAN (5GHz)	FSK	Bluetooth	-
5	LTE	LoRa	Bluetooth	-
6	LTE	FSK	Bluetooth	-
7	WLAN (2.4GHz)	LoRa	FSK	Bluetooth
8	WLAN (5GHz)	LoRa	FSK	Bluetooth
9	LTE	LoRa	FSK	Bluetooth
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.				

5. The EUT must be supplied with a battery and following below table:

Brand	Model No.	Spec.
WELLTECH ENERGY INC.	5F48E9	6 Vdc, 3100 mAh

6. The antennas provided to the EUT, please refer to the following table:

RF Chain No	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connector Type	Cable Length (mm)
WiFi 0	Inpaq	RFPCA520814IMLB301	8.04	2.4~2.4835 GHz	PIFA	i-pex(MHF)	149
			8.81	5.15~5.85 GHz			
WiFi 1	Inpaq	RFPCA501016IMLB301	8.26	2.4~2.4835 GHz	PIFA	i-pex(MHF)	165
			8.64	5.15~5.85 GHz			
BT	Inpaq	RFPCA520815IMAB301	6.88	2.4~2.4835 GHz	PIFA	i-pex(MHF)	210
LoRa/FSK (Outdoor)	Inpaq	RFDPA563600AFRBX01	5.5	902~928 MHz	Dipole	R-N type(F)	1000
LoRa/FSK (Indoor)	Inpaq	FDPA161500AMUB801	2.8	902~928 MHz	Dipole	R-N type(M)	NA
GPS(L1)	Inpaq	RFPCA621512IMTB301	7.26	1575 MHz	PIFA	i-pex(MHF)	NA
GPS(L5)	Inpaq	RFPCA711620IMTB301	6.06	1176 MHz	PIFA	i-pex(MHF)	NA
Note: For LoRa/FSK Radiated Emission test item the max. gain was selected for the final test .							

7. For Radiated Emission test, the EUT was pre-tested under the following modes:

Pre-test Mode	Description
Mode A	**Power from POE**
Mode B	Power from Battery
From the above modes, the worst case was found in **Mode A**. Therefore only the test data of the mode was recorded in this report.	

8. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.
9. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.2 Description of Test Modes

129 channels are provided for channel spacing 200 kHz:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	902.2	26	907.4	52	912.6	78	917.8	104	923
1	902.4	27	907.6	53	912.8	79	918	105	923.2
2	902.6	28	907.8	54	913	80	918.2	106	923.4
3	902.8	29	908	55	913.2	81	918.4	107	923.6
4	903	30	908.2	56	913.4	82	918.6	108	923.8
5	903.2	31	908.4	57	913.6	83	918.8	109	924
6	903.4	32	908.6	58	913.8	84	919	110	924.2
7	903.6	33	908.8	59	914	85	919.2	111	924.4
8	903.8	34	909	60	914.2	86	919.4	112	924.6
9	904	35	909.2	61	914.4	87	919.6	113	924.8
10	904.2	36	909.4	62	914.6	88	919.8	114	925
11	904.4	37	909.6	63	914.8	89	920	115	925.2
12	904.6	38	909.8	64	915	90	920.2	116	925.4
13	904.8	39	910	65	915.2	91	920.4	117	925.6
14	905	40	910.2	66	915.4	92	920.6	118	925.8
15	905.2	41	910.4	67	915.6	93	920.8	119	926
16	905.4	42	910.6	68	915.8	94	921	120	926.2
17	905.6	43	910.8	69	916	95	921.2	121	926.4
18	905.8	44	911	70	916.2	96	921.4	122	926.6
19	906	45	911.2	71	916.4	97	921.6	123	926.8
20	906.2	46	911.4	72	916.6	98	921.8	124	927
21	906.4	47	911.6	73	916.8	99	922	125	927.2
22	906.6	48	911.8	74	917	100	922.2	126	927.4
23	906.8	49	912	75	917.2	101	922.4	127	927.6
24	907	50	912.2	76	917.4	102	922.6	128	927.8
25	907.2	51	912.4	77	917.6	103	922.8		

64 channels are provided for channel spacing 400 kHz:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	902.4	16	908.8	32	915.2	48	921.6
1	902.8	17	909.2	33	915.6	49	922
2	903.2	18	909.6	34	916	50	922.4
3	903.6	19	910	35	916.4	51	922.8
4	904	20	910.4	36	916.8	52	923.2
5	904.4	21	910.8	37	917.2	53	923.6
6	904.8	22	911.2	38	917.6	54	924
7	905.2	23	911.6	39	918	55	924.4
8	905.6	24	912	40	918.4	56	924.8
9	906	25	912.4	41	918.8	57	925.2
10	906.4	26	912.8	42	919.2	58	925.6
11	906.8	27	913.2	43	919.6	59	926
12	907.2	28	913.6	44	920	60	926.4
13	907.6	29	914	45	920.4	61	926.8
14	908	30	914.4	46	920.8	62	927.2
15	908.4	31	914.8	47	921.2	63	927.6

51 channels are provided for channel spacing 500 kHz:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	902.5	16	910.5	32	918.5	48	926.5
1	903	17	911	33	919	49	927
2	903.5	18	911.5	34	919.5	50	927.5
3	904	19	912	35	920		
4	904.5	20	912.5	36	920.5		
5	905	21	913	37	921		
6	905.5	22	913.5	38	921.5		
7	906	23	914	39	922		
8	906.5	24	914.5	40	922.5		
9	907	25	915	41	923		
10	907.5	26	915.5	42	923.5		
11	908	27	916	43	924		
12	908.5	28	916.5	44	924.5		
13	909	29	917	45	925		
14	909.5	30	917.5	46	925.5		
15	910	31	918	47	926		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
1	√	-	-	√	Channel Spacing: 200 kHz
2	√	√	√	√	Channel Spacing: 400 kHz
3	√	-	-	√	Channel Spacing: 500 kHz

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

Eut Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (kbps)
1	0 to 128	0, 64, 128	FHSS	FSK	50
2	0 to 63	0, 32, 63	FHSS	FSK	150
3	0 to 50	0, 25, 50	FHSS	FSK	250

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

Eut Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (kbps)
2	0 to 63	63	FHSS	FSK	150

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

Eut Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (kbps)
2	0 to 63	63	FHSS	FSK	150

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Eut Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (kbps)
1	0 to 128	0, 64, 128	FHSS	FSK	50
2	0 to 63	0, 32, 63	FHSS	FSK	150
3	0 to 50	0, 25, 50	FHSS	FSK	250

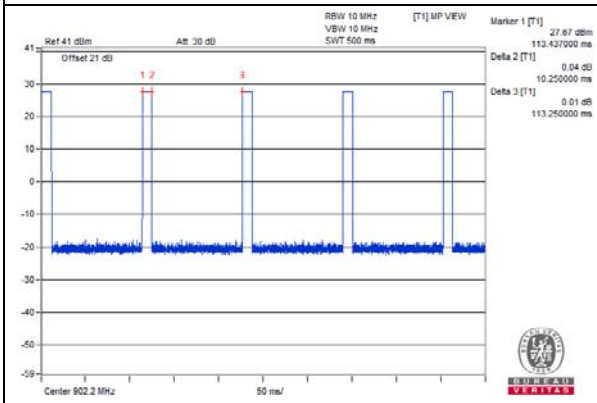
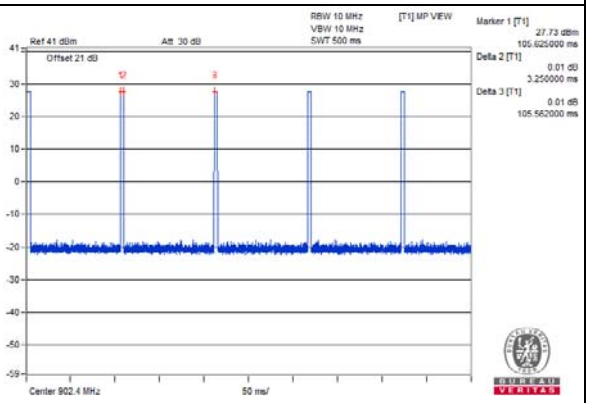
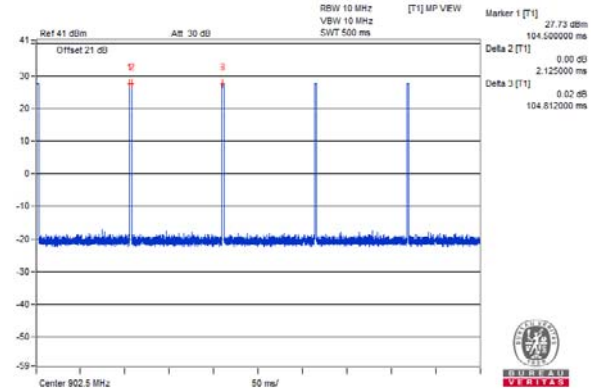
Test Condition:

Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE≥1G	25deg. C, 75%RH	120Vac, 60Hz	Tom Yang
RE<1G	23~25deg. C, 67~71%RH	120Vac, 60Hz	Sampson Chen, Andy Ho
PLC	26deg. C, 61%RH	120Vac, 60Hz	Sampson Chen
APCM	25deg. C, 60%RH	120Vac, 60Hz	Kevin Ko

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered.

Mode 1: Duty cycle = 10.25 ms/113.25 ms = 0.091, Duty factor = 10 * log(1/Duty cycle) = 9.89 dB
Mode 2: Duty cycle = 3.25 ms/105.562 ms = 0.031, Duty factor = 10 * log(1/Duty cycle) = 14.88 dB
Mode 3: Duty cycle = 2.125 ms/104.812 ms = 0.02, Duty factor = 10 * log(1/Duty cycle) = 16.73 dB

Mode 1	Mode 2
	
Mode 3	
	

3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

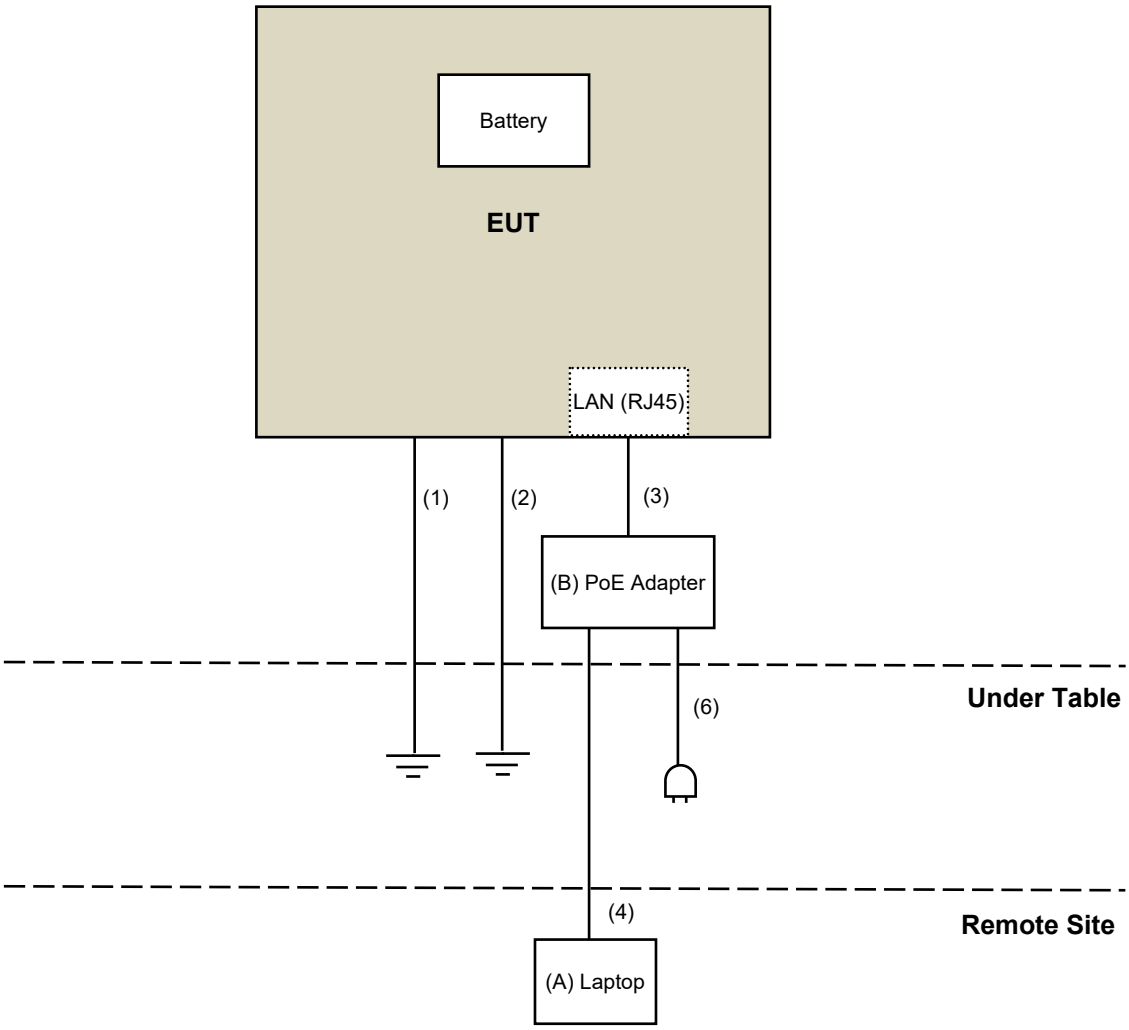
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	Lenovo	20U5S01X00 L14	PF-1ANPYA	NA	Provided by Lab
B.	PoE Adapter	Gospower	G0545-530-060-P SE1000	NA	NA	Supplied by client

Note: 1. All power cords of the above support units are non-shielded (1.8m).

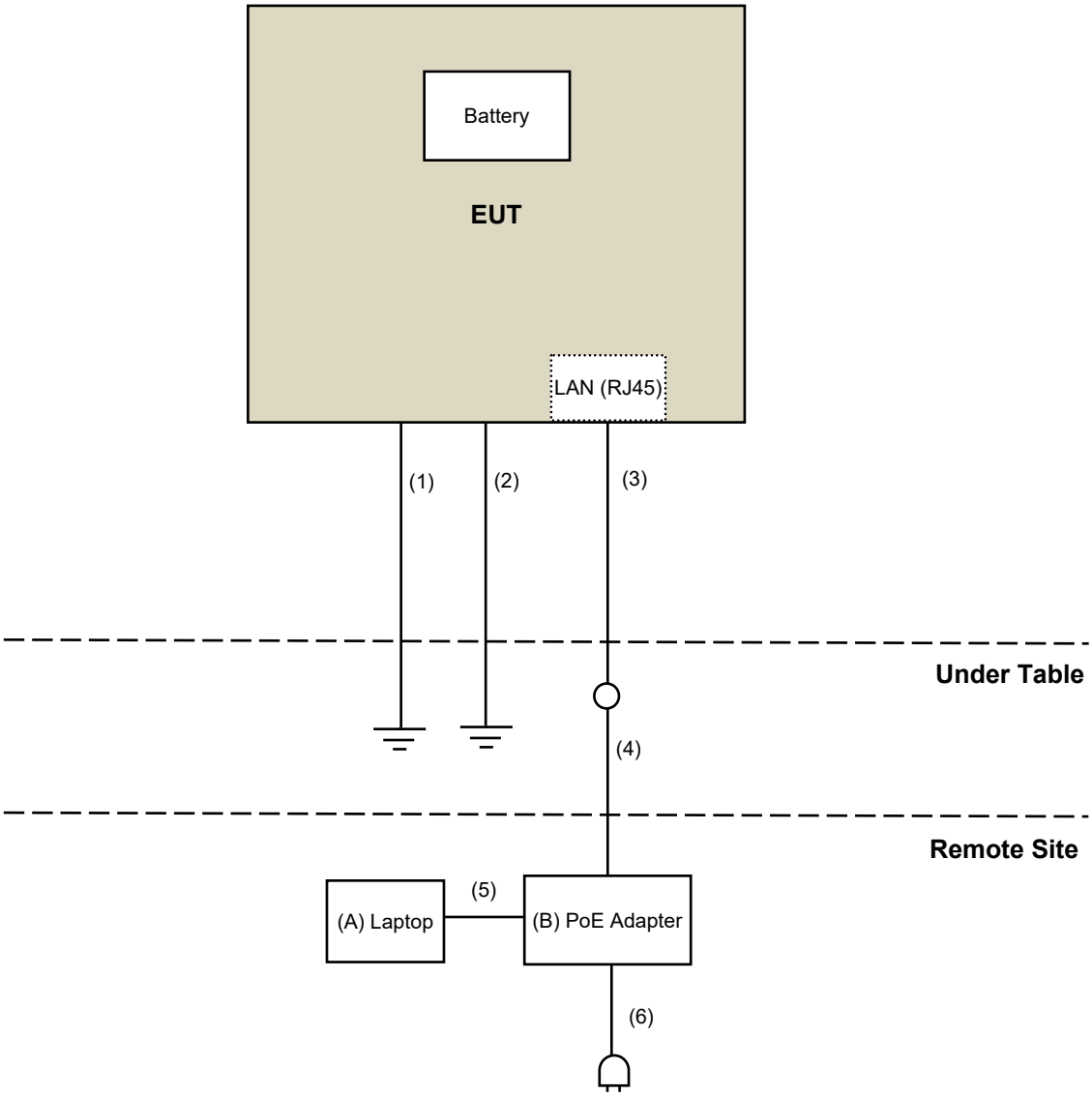
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	GND Cable	1	2	Yes	0	Provided by Lab
2.	GND Cable	1	2	Yes	0	Provided by Lab
3.	RJ-45 Cable	1	1	No	0	Supplied by client
4.	RJ-45 Cable	1	10	No	0	Provided by Lab
5.	RJ-45 Cable	1	1.5	No	0	Provided by Lab
6.	AC Cable	1	1	No	0	Supplied by client

3.4.1 Configuration of System under Test

For AC Power Conducted Emission test:



For Radiated Emission test:



3.5 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test standard:
FCC Part 15, Subpart C (15.247)
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

References Test Guidance:
KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

For Radiated Emission test:

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Test Receiver Agilent	N9038A	MY51210202	2020/12/1	2021/11/30
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Pre_Amplifier EMCI	EMC001340	980142	2021/5/24	2022/5/23
LOOP ANTENNA Electro-Metrics	EM-6879	264	2021/3/5	2022/3/4
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-001	2021/1/7	2022/1/6
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-002	2021/1/7	2022/1/6
Pre_Amplifier EMCI	EMC330N	980701	2021/3/10	2022/3/9
Trilog Broadband Antenna Schwarzbeck	VULB 9168	9168-406	2020/11/6	2021/11/5
RF Coaxial Cable COMMATE/PEWC	8D	966-4-1	2021/3/17	2022/3/16
RF Coaxial Cable COMMATE/PEWC	8D	966-4-2	2021/3/17	2022/3/16
RF Coaxial Cable COMMATE/PEWC	8D	966-4-3	2021/3/17	2022/3/16
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-03	2021/1/11	2022/1/10
Horn Antenna SCHWARZBECK	BBHA 9120D	9120D-783	2020/11/22	2021/11/21
Pre_Amplifier EMCI	EMC 12630 SE	980638	2021/4/7	2022/4/6
RF Cable-Frequency Range : 1-26.5GHz EMCI	EMC104-SM-SM-1200	160922	2020/12/25	2021/12/24
RF Coaxial Cable EMCI	EMC104-SM-SM-2000	180502	2021/4/26	2022/4/25
RF Coaxial Cable EMCI	EMC104-SM-SM-6000	180418	2021/4/26	2022/4/25

Note: 1. The test was performed in 966 Chamber No. 4.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: 2021/7/16 ~ 2021/8/26

For other test items:

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer R&S	FSV40	101516	2021/3/8	2022/3/7
Power Meter Anritsu	ML2495A	1529002	2021/6/21	2022/6/20
Pulse Power Sensor Anritsu	MA2411B	1339443	2021/5/31	2022/5/30
Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	2021/4/13	2022/4/12
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

Note: 1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: 2021/8/26

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

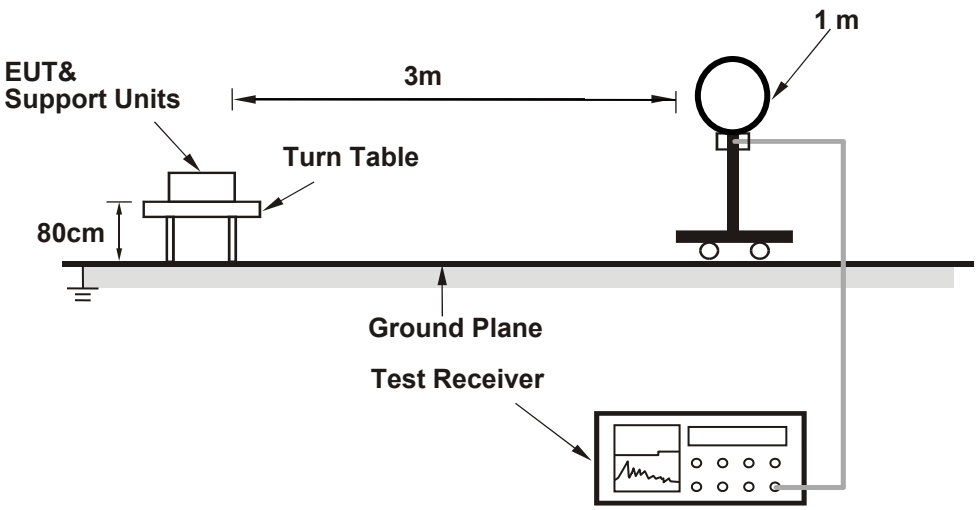
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

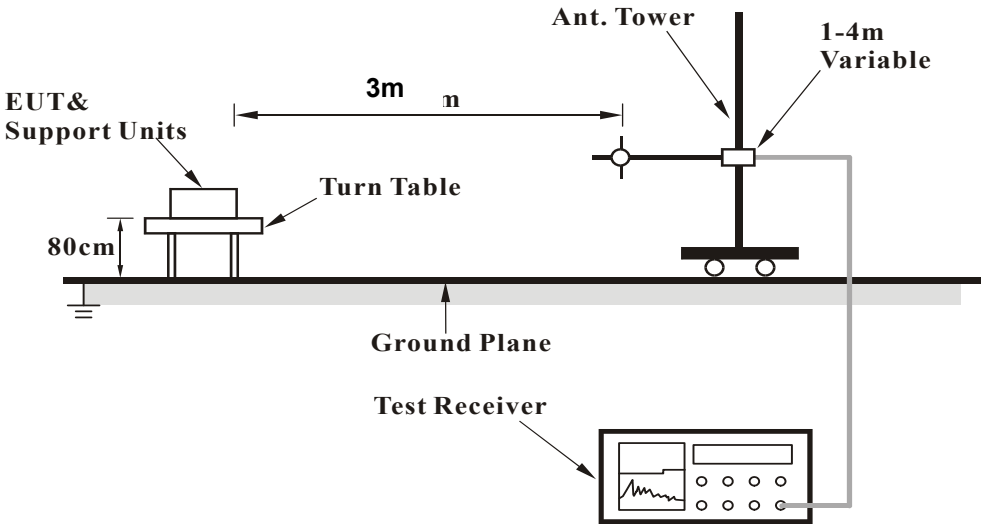
No deviation.

4.1.5 Test Setup

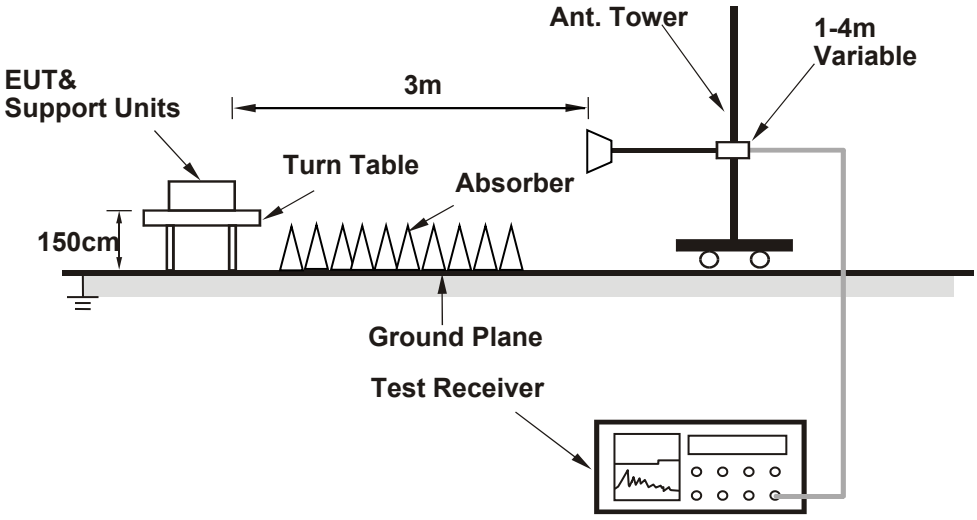
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Controlling software (Run Putty.exe paste FSK_Test_Command_20210701.txt Command) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results (Mode 1)

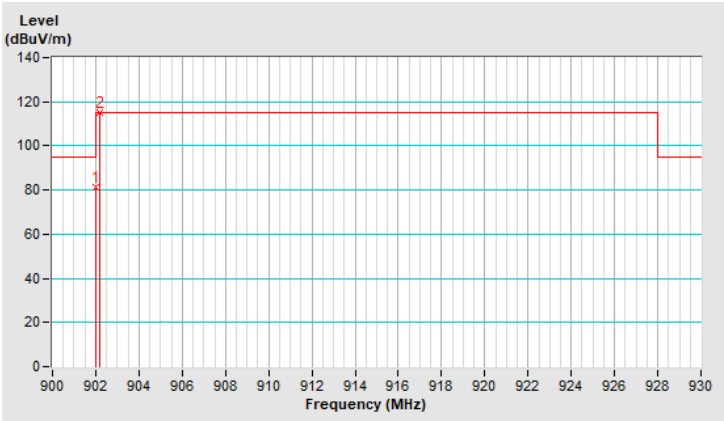
Bandedge Data:

RF Mode	TX FSK_50kbps	**Channel**	CH 0：902.2 MHz
Frequency Range	900MHz ~ 930MHz	**Detector Function**	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	902.00	81.3 QP	94.9	-13.6	1.36 H	347	46.3	35.0
2	*902.20	114.9 QP			1.36 H	347	79.9	35.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

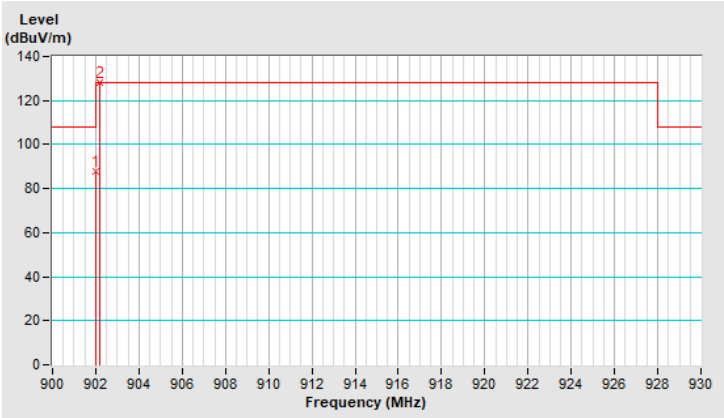


RF Mode	TX FSK_50kbps	Channel	CH 0：902.2 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	87.5 QP	107.9	-20.4	1.52 V	340	52.5	35.0
2	*902.20	127.9 QP			1.52 V	340	92.9	35.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

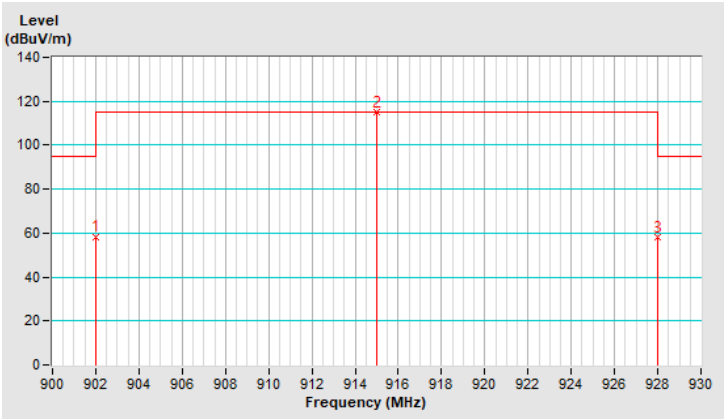


RF Mode	TX FSK_50kbps	Channel	CH 64：915 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	58.4 QP	95.1	-36.7	1.29 H	326	23.4	35.0
2	*915.00	115.1 QP			1.29 H	326	79.8	35.3
3	928.00	58.0 QP	95.1	-37.1	1.29 H	326	22.5	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

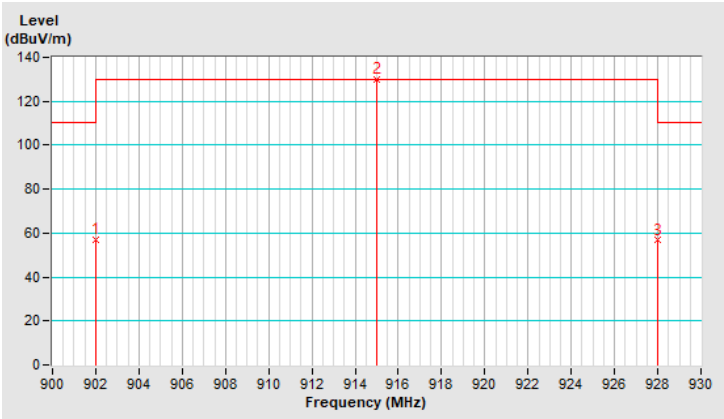


RF Mode	TX FSK_50kbps	Channel	CH 64：915 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	57.0 QP	110.1	-53.1	1.46 V	332	22.0	35.0
2	*915.00	130.1 QP			1.46 V	332	94.8	35.3
3	928.00	56.9 QP	110.1	-53.2	1.46 V	332	21.4	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

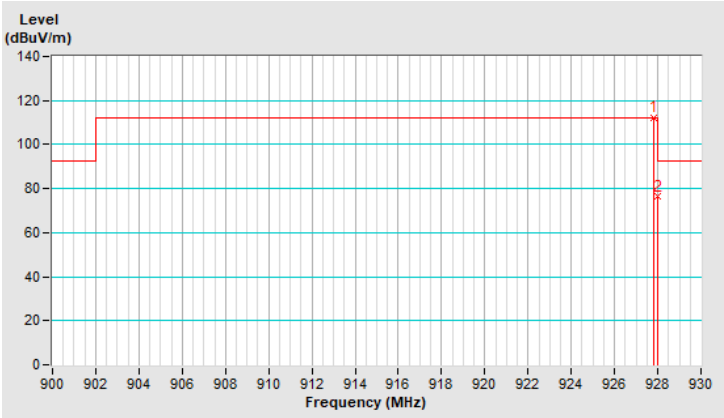


RF Mode	TX FSK_50kbps	Channel	CH 128：927.8 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.80	112.4 QP			1.30 H	347	76.9	35.5
2	928.00	76.4 QP	92.4	-16.0	1.30 H	347	40.9	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

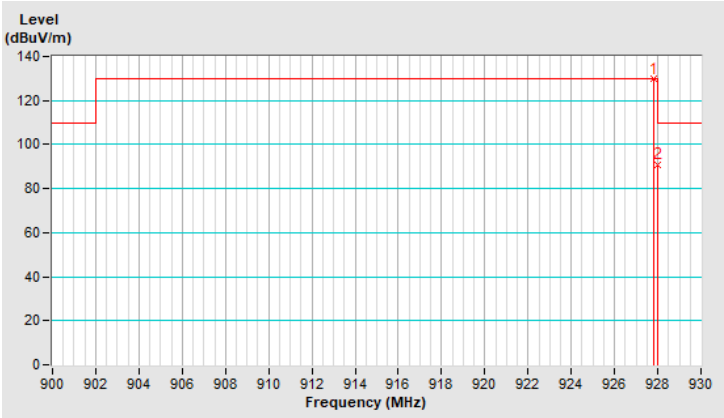


RF Mode	TX FSK_50kbps	Channel	CH 128：927.8 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.80	129.9 QP			1.50 V	199	94.4	35.5
2	928.00	91.0 QP	109.9	-18.9	1.50 V	199	55.5	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.



Above 1GHz Data:

RF Mode	TX FSK_50kbps	Channel	CH 0：902.2 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2706.60	33.0 PK	74.0	-41.0	1.65 H	145	36.8	-3.8
2	2706.60	21.2 AV	54.0	-32.8	1.65 H	145	25.0	-3.8
3	3608.80	33.8 PK	74.0	-40.2	1.46 H	161	36.1	-2.3
4	3608.80	29.4 AV	54.0	-24.6	1.46 H	161	31.7	-2.3
5	4511.00	35.4 PK	74.0	-38.6	1.63 H	150	35.5	-0.1
6	4511.00	27.1 AV	54.0	-26.9	1.63 H	150	27.2	-0.1
7	5413.20	36.2 PK	74.0	-37.8	3.21 H	117	34.9	1.3
8	5413.20	30.1 AV	54.0	-23.9	3.21 H	117	28.8	1.3
9	8119.80	39.7 PK	74.0	-34.3	1.51 H	2	31.4	8.3
10	8119.80	33.7 AV	54.0	-20.3	1.51 H	2	25.4	8.3
11	9022.00	39.0 PK	74.0	-35.0	1.13 H	43	31.3	7.7
12	9022.00	29.4 AV	54.0	-24.6	1.13 H	43	21.7	7.7
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2706.60	34.0 PK	74.0	-40.0	1.63 V	154	37.8	-3.8
2	2706.60	22.0 AV	54.0	-32.0	1.63 V	154	25.8	-3.8
3	3608.80	36.5 PK	74.0	-37.5	1.68 V	45	38.8	-2.3
4	3608.80	32.1 AV	54.0	-21.9	1.68 V	45	34.4	-2.3
5	4511.00	38.3 PK	74.0	-35.7	1.65 V	300	38.4	-0.1
6	4511.00	30.8 AV	54.0	-23.2	1.65 V	300	30.9	-0.1
7	5413.20	38.9 PK	74.0	-35.1	1.57 V	216	37.6	1.3
8	5413.20	33.3 AV	54.0	-20.7	1.57 V	216	32.0	1.3
9	8119.80	42.1 PK	74.0	-31.9	1.58 V	208	33.8	8.3
10	8119.80	36.4 AV	54.0	-17.6	1.58 V	208	28.1	8.3
11	9022.00	42.0 PK	74.0	-32.0	2.06 V	173	34.3	7.7
12	9022.00	32.0 AV	54.0	-22.0	2.06 V	173	24.3	7.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

RF Mode	TX FSK_50kbps	Channel	CH 64：915 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2745.00	33.0 PK	74.0	-41.0	1.66 H	154	36.8	-3.8
2	2745.00	21.3 AV	54.0	-32.7	1.66 H	154	25.1	-3.8
3	3660.00	33.4 PK	74.0	-40.6	1.51 H	159	35.4	-2.0
4	3660.00	29.1 AV	54.0	-24.9	1.51 H	159	31.1	-2.0
5	4575.00	34.9 PK	74.0	-39.1	1.60 H	157	35.0	-0.1
6	4575.00	26.8 AV	54.0	-27.2	1.60 H	157	26.9	-0.1
7	7320.00	34.6 PK	74.0	-39.4	3.17 H	111	27.8	6.8
8	7320.00	26.8 AV	54.0	-27.2	3.17 H	111	20.0	6.8
9	8235.00	39.6 PK	74.0	-34.4	1.47 H	1	31.9	7.7
10	8235.00	33.8 AV	54.0	-20.2	1.47 H	1	26.1	7.7
11	9150.00	39.2 PK	74.0	-34.8	1.09 H	36	31.1	8.1
12	9150.00	29.5 AV	54.0	-24.5	1.09 H	36	21.4	8.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2745.00	34.3 PK	74.0	-39.7	1.57 V	154	38.1	-3.8
2	2745.00	22.5 AV	54.0	-31.5	1.57 V	154	26.3	-3.8
3	3660.00	35.0 PK	74.0	-39.0	1.58 V	24	37.0	-2.0
4	3660.00	29.0 AV	54.0	-25.0	1.58 V	24	31.0	-2.0
5	4575.00	37.2 PK	74.0	-36.8	1.73 V	7	37.3	-0.1
6	4575.00	27.0 AV	54.0	-27.0	1.73 V	7	27.1	-0.1
7	7320.00	37.4 PK	74.0	-36.6	1.72 V	46	30.6	6.8
8	7320.00	29.6 AV	54.0	-24.4	1.72 V	46	22.8	6.8
9	8235.00	43.7 PK	74.0	-30.3	1.50 V	134	36.0	7.7
10	8235.00	32.3 AV	54.0	-21.7	1.50 V	134	24.6	7.7
11	9150.00	41.3 PK	74.0	-32.7	1.42 V	153	33.2	8.1
12	9150.00	30.7 AV	54.0	-23.3	1.42 V	153	22.6	8.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

RF Mode	TX FSK_50kbps	Channel	CH 128：927.8 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2783.40	32.8 PK	74.0	-41.2	1.71 H	159	36.5	-3.7
2	2783.40	20.9 AV	54.0	-33.1	1.71 H	159	24.6	-3.7
3	3711.20	33.8 PK	74.0	-40.2	1.42 H	166	35.6	-1.8
4	3711.20	29.3 AV	54.0	-24.7	1.42 H	166	31.1	-1.8
5	4639.00	35.6 PK	74.0	-38.4	1.63 H	161	35.5	0.1
6	4639.00	27.1 AV	54.0	-26.9	1.63 H	161	27.0	0.1
7	7422.40	34.8 PK	74.0	-39.2	3.18 H	126	27.5	7.3
8	7422.40	26.7 AV	54.0	-27.3	3.18 H	126	19.4	7.3
9	8350.20	40.4 PK	74.0	-33.6	1.48 H	11	32.9	7.5
10	8350.20	34.1 AV	54.0	-19.9	1.48 H	11	26.6	7.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2783.40	34.8 PK	74.0	-39.2	1.57 V	160	38.5	-3.7
2	2783.40	22.9 AV	54.0	-31.1	1.57 V	160	26.6	-3.7
3	3711.20	34.3 PK	74.0	-39.7	1.55 V	39	36.1	-1.8
4	3711.20	28.6 AV	54.0	-25.4	1.55 V	39	30.4	-1.8
5	4639.00	37.1 PK	74.0	-36.9	1.77 V	14	37.0	0.1
6	4639.00	27.0 AV	54.0	-27.0	1.77 V	14	26.9	0.1
7	7422.40	37.8 PK	74.0	-36.2	1.77 V	40	30.5	7.3
8	7422.40	29.8 AV	54.0	-24.2	1.77 V	40	22.5	7.3
9	8350.20	43.8 PK	74.0	-30.2	1.55 V	130	36.3	7.5
10	8350.20	32.1 AV	54.0	-21.9	1.55 V	130	24.6	7.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

4.1.8 Test Results (Mode 2)

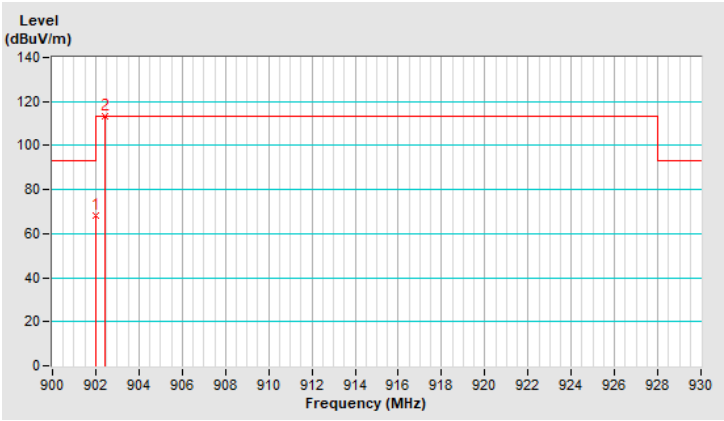
Bandedge Data:

RF Mode	TX FSK_150kbps	**Channel**	CH 0：902.4 MHz
Frequency Range	900MHz ~ 930MHz	**Detector Function**	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	902.00	68.5 QP	93.4	-24.9	1.34 H	349	33.5	35.0
2	*902.40	113.4 QP			1.34 H	349	78.4	35.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

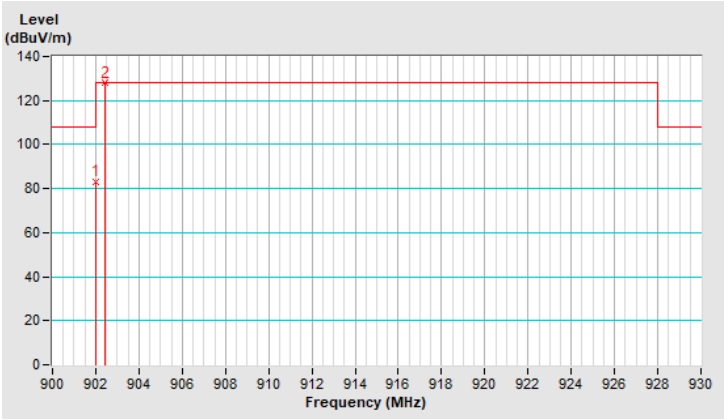


RF Mode	TX FSK_150kbps	Channel	CH 0：902.4 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	83.1 QP	107.9	-24.8	1.51 V	324	48.1	35.0
2	*902.40	127.9 QP			1.51 V	324	92.9	35.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

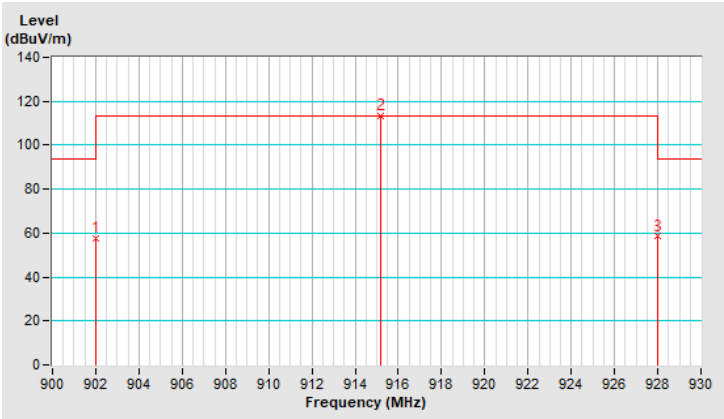


RF Mode	TX FSK_150kbps	Channel	CH 32：915.2 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	57.8 QP	93.5	-35.7	1.32 H	350	22.8	35.0
2	*915.20	113.5 QP			1.32 H	350	78.1	35.4
3	928.00	58.7 QP	93.5	-34.8	1.32 H	350	23.2	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

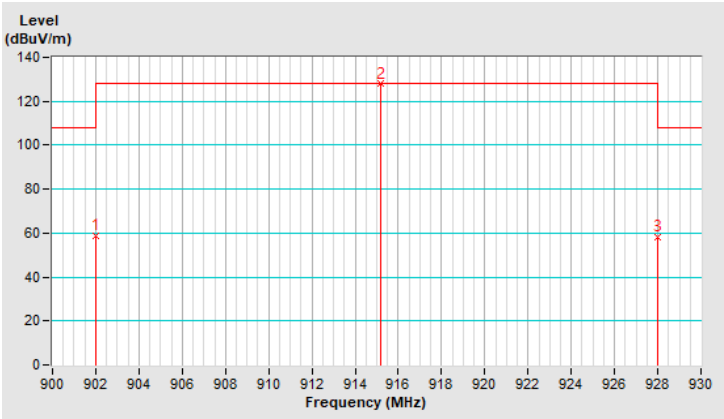


RF Mode	TX FSK_150kbps	Channel	CH 32：915.2 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	58.9 QP	107.9	-49.0	1.62 V	198	23.9	35.0
2	*915.20	127.9 QP			1.62 V	198	92.5	35.4
3	928.00	58.3 QP	107.9	-49.6	1.62 V	198	22.8	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

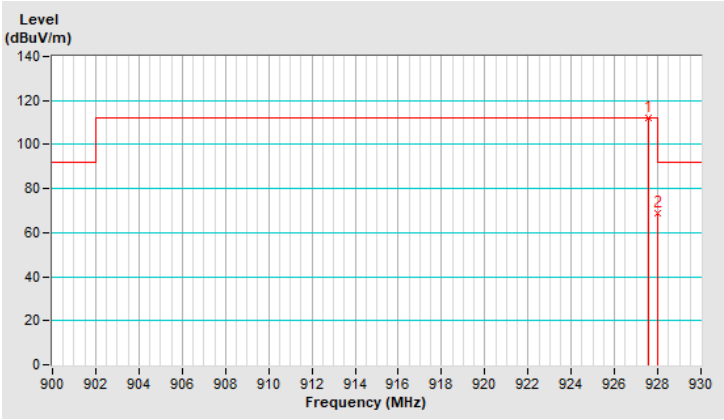


RF Mode	TX FSK_150kbps	Channel	CH 63：927.6 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.60	112.2 QP			1.27 H	350	76.7	35.5
2	928.00	69.0 QP	92.2	-23.2	1.27 H	350	33.5	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

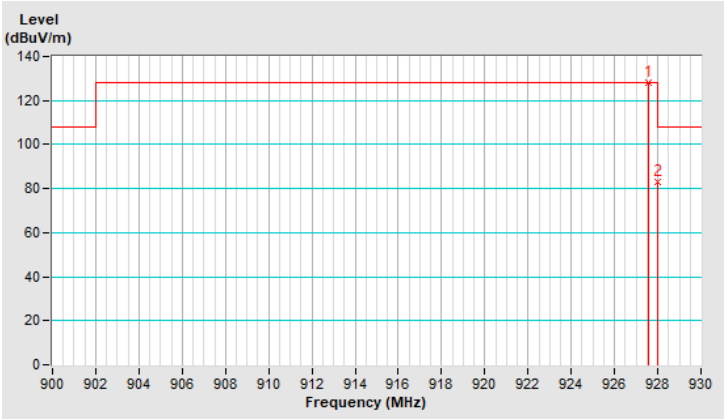


RF Mode	TX FSK_150kbps	Channel	CH 63：927.6 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.60	128.2 QP			1.51 V	197	92.7	35.5
2	928.00	83.2 QP	108.2	-25.0	1.51 V	197	47.7	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.



Above 1GHz Data:

RF Mode	TX FSK_150kbps	Channel	CH 0：902.4 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2707.20	33.2 PK	74.0	-40.8	1.65 H	134	37.0	-3.8
2	2707.20	21.5 AV	54.0	-32.5	1.65 H	134	25.3	-3.8
3	3609.60	33.4 PK	74.0	-40.6	1.52 H	159	35.7	-2.3
4	3609.60	29.2 AV	54.0	-24.8	1.52 H	159	31.5	-2.3
5	4512.00	35.2 PK	74.0	-38.8	1.60 H	165	35.3	-0.1
6	4512.00	26.9 AV	54.0	-27.1	1.60 H	165	27.0	-0.1
7	5414.40	36.9 PK	74.0	-37.1	3.18 H	115	35.6	1.3
8	5414.40	30.6 AV	54.0	-23.4	3.18 H	115	29.3	1.3
9	8121.60	39.9 PK	74.0	-34.1	1.53 H	13	31.6	8.3
10	8121.60	34.2 AV	54.0	-19.8	1.53 H	13	25.9	8.3
11	9024.00	39.2 PK	74.0	-34.8	1.09 H	33	31.5	7.7
12	9024.00	29.5 AV	54.0	-24.5	1.09 H	33	21.8	7.7
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2707.20	33.6 PK	74.0	-40.4	1.61 V	151	37.4	-3.8
2	2707.20	21.8 AV	54.0	-32.2	1.61 V	151	25.6	-3.8
3	3609.60	36.5 PK	74.0	-37.5	1.62 V	40	38.8	-2.3
4	3609.60	32.2 AV	54.0	-21.8	1.62 V	40	34.5	-2.3
5	4512.00	38.4 PK	74.0	-35.6	1.71 V	297	38.5	-0.1
6	4512.00	31.0 AV	54.0	-23.0	1.71 V	297	31.1	-0.1
7	5414.40	38.5 PK	74.0	-35.5	1.58 V	208	37.2	1.3
8	5414.40	32.9 AV	54.0	-21.1	1.58 V	208	31.6	1.3
9	8121.60	42.5 PK	74.0	-31.5	1.58 V	198	34.2	8.3
10	8121.60	36.6 AV	54.0	-17.4	1.58 V	198	28.3	8.3
11	9024.00	42.3 PK	74.0	-31.7	2.09 V	163	34.6	7.7
12	9024.00	32.2 AV	54.0	-21.8	2.09 V	163	24.5	7.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

RF Mode	TX FSK_150kbps	Channel	CH 32：915.2 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2745.60	32.9 PK	74.0	-41.1	1.71 H	156	36.7	-3.8
2	2745.60	21.3 AV	54.0	-32.7	1.71 H	156	25.1	-3.8
3	3660.80	33.8 PK	74.0	-40.2	1.47 H	166	35.8	-2.0
4	3660.80	29.3 AV	54.0	-24.7	1.47 H	166	31.3	-2.0
5	4576.00	34.3 PK	74.0	-39.7	1.65 H	163	34.4	-0.1
6	4576.00	26.3 AV	54.0	-27.7	1.65 H	163	26.4	-0.1
7	7321.60	34.8 PK	74.0	-39.2	3.17 H	111	28.0	6.8
8	7321.60	27.2 AV	54.0	-26.8	3.17 H	111	20.4	6.8
9	8236.80	40.1 PK	74.0	-33.9	1.52 H	2	32.4	7.7
10	8236.80	34.3 AV	54.0	-19.7	1.52 H	2	26.6	7.7
11	9152.00	39.8 PK	74.0	-34.2	1.11 H	49	31.7	8.1
12	9152.00	29.9 AV	54.0	-24.1	1.11 H	49	21.8	8.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2745.60	34.8 PK	74.0	-39.2	1.56 V	144	38.6	-3.8
2	2745.60	22.8 AV	54.0	-31.2	1.56 V	144	26.6	-3.8
3	3660.80	35.1 PK	74.0	-38.9	1.58 V	38	37.1	-2.0
4	3660.80	29.2 AV	54.0	-24.8	1.58 V	38	31.2	-2.0
5	4576.00	37.1 PK	74.0	-36.9	1.68 V	17	37.2	-0.1
6	4576.00	27.1 AV	54.0	-26.9	1.68 V	17	27.2	-0.1
7	7321.60	37.4 PK	74.0	-36.6	1.76 V	44	30.6	6.8
8	7321.60	29.8 AV	54.0	-24.2	1.76 V	44	23.0	6.8
9	8236.80	44.3 PK	74.0	-29.7	1.46 V	120	36.6	7.7
10	8236.80	32.7 AV	54.0	-21.3	1.46 V	120	25.0	7.7
11	9152.00	41.9 PK	74.0	-32.1	1.38 V	153	33.8	8.1
12	9152.00	31.1 AV	54.0	-22.9	1.38 V	153	23.0	8.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

RF Mode	TX FSK_150kbps	Channel	CH 63：927.6 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2782.80	32.9 PK	74.0	-41.1	1.74 H	154	36.6	-3.7
2	2782.80	20.9 AV	54.0	-33.1	1.74 H	154	24.6	-3.7
3	3710.40	33.4 PK	74.0	-40.6	1.38 H	163	35.2	-1.8
4	3710.40	29.1 AV	54.0	-24.9	1.38 H	163	30.9	-1.8
5	4638.00	35.4 PK	74.0	-38.6	1.59 H	152	35.3	0.1
6	4638.00	26.8 AV	54.0	-27.2	1.59 H	152	26.7	0.1
7	7420.80	34.2 PK	74.0	-39.8	3.22 H	136	26.9	7.3
8	7420.80	26.3 AV	54.0	-27.7	3.22 H	136	19.0	7.3
9	8348.40	40.4 PK	74.0	-33.6	1.47 H	14	32.9	7.5
10	8348.40	33.9 AV	54.0	-20.1	1.47 H	14	26.4	7.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2782.80	34.5 PK	74.0	-39.5	1.58 V	163	38.2	-3.7
2	2782.80	22.9 AV	54.0	-31.1	1.58 V	163	26.6	-3.7
3	3710.40	34.4 PK	74.0	-39.6	1.51 V	53	36.2	-1.8
4	3710.40	28.9 AV	54.0	-25.1	1.51 V	53	30.7	-1.8
5	4638.00	37.4 PK	74.0	-36.6	1.76 V	10	37.3	0.1
6	4638.00	27.4 AV	54.0	-26.6	1.76 V	10	27.3	0.1
7	7420.80	37.5 PK	74.0	-36.5	1.78 V	43	30.2	7.3
8	7420.80	29.7 AV	54.0	-24.3	1.78 V	43	22.4	7.3
9	8348.40	43.7 PK	74.0	-30.3	1.53 V	135	36.2	7.5
10	8348.40	32.1 AV	54.0	-21.9	1.53 V	135	24.6	7.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

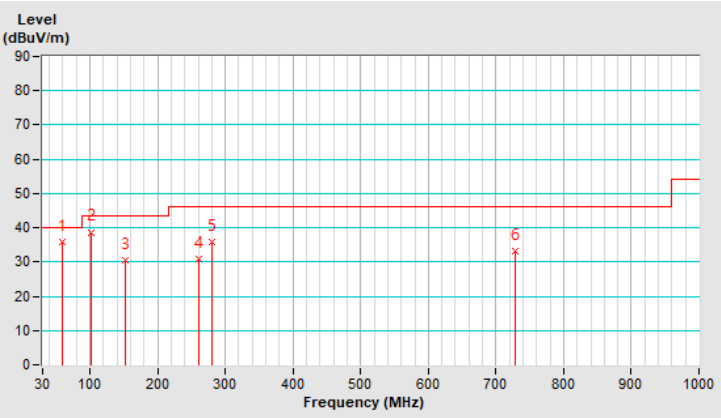
Below 1GHz Data:

RF Mode	TX FSK_150kbps	Channel	CH 63：927.6 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	**59.46**	**35.7 QP**	**40.0**	**-4.3**	**3.00 H**	**161**	**48.8**	**-13.1**
2	102.36	38.7 QP	43.5	-4.8	2.00 H	38	54.9	-16.2
3	151.67	30.4 QP	43.5	-13.1	2.00 H	46	42.4	-12.0
4	261.40	30.8 QP	46.0	-15.2	1.00 H	115	43.1	-12.3
5	280.77	35.7 QP	46.0	-10.3	1.00 H	242	47.0	-11.3
6	727.98	33.1 QP	46.0	-12.9	3.00 H	30	33.0	0.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

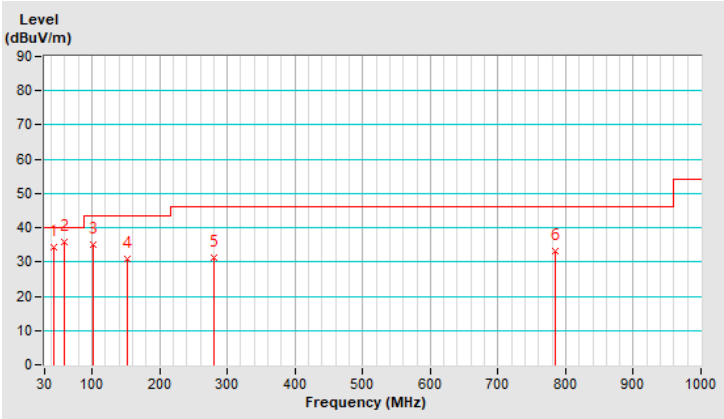


RF Mode	TX FSK_150kbps	Channel	CH 63：927.6 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	44.25	34.4 QP	40.0	-5.6	1.00 V	317	47.0	-12.6
2	**59.12**	**35.7 QP**	**40.0**	**-4.3**	**1.00 V**	**244**	**48.8**	**-13.1**
3	101.81	35.2 QP	43.5	-8.3	1.00 V	93	51.5	-16.3
4	151.89	30.9 QP	43.5	-12.6	1.00 V	78	42.9	-12.0
5	280.53	31.4 QP	46.0	-14.6	1.50 V	50	42.8	-11.4
6	784.69	33.3 QP	46.0	-12.7	3.00 V	320	32.0	1.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.1.9 Test Results (Mode 3)

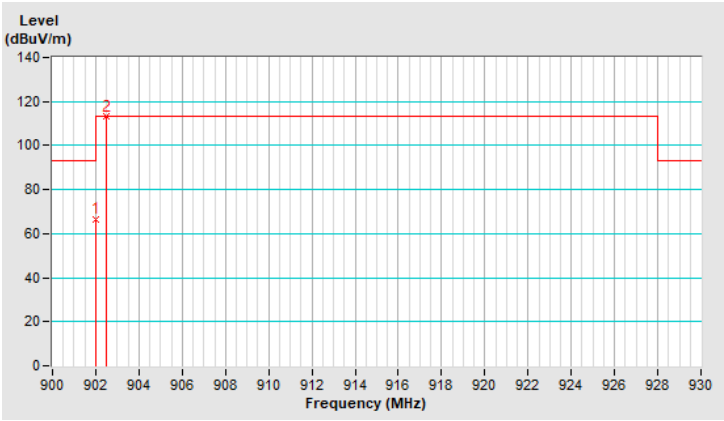
Bandedge Data:

RF Mode	TX FSK_250kbps	**Channel**	CH 0：902.5 MHz
Frequency Range	900MHz ~ 930MHz	**Detector Function**	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	902.00	66.7 QP	93.3	-26.6	1.33 H	351	31.7	35.0
2	*902.50	113.3 QP			1.33 H	351	78.3	35.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

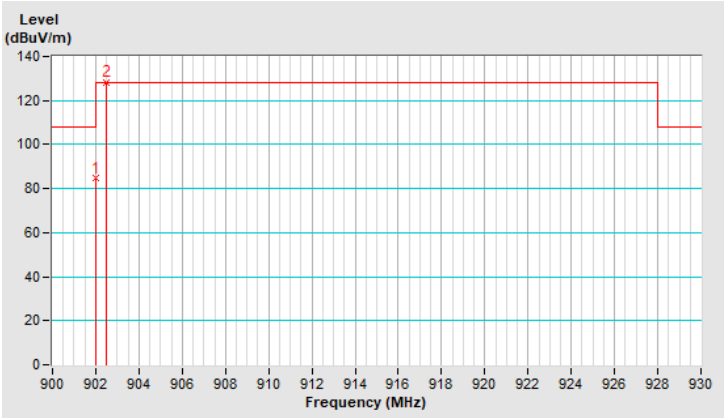


RF Mode	TX FSK_250kbps	Channel	CH 0：902.5 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	84.8 QP	108.2	-23.4	1.42 V	331	49.8	35.0
2	*902.50	128.2 QP			1.42 V	331	93.2	35.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

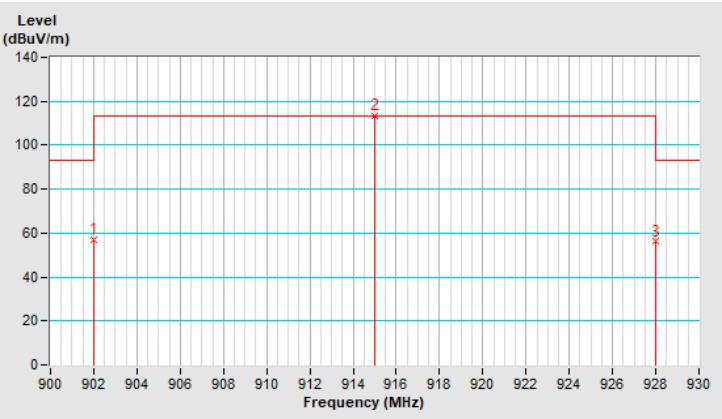


RF Mode	TX FSK_250kbps	Channel	CH 25：915 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	57.2 QP	93.4	-36.2	1.25 H	325	22.2	35.0
2	*915.00	113.4 QP			1.25 H	325	78.1	35.3
3	928.00	56.3 QP	93.4	-37.1	1.25 H	325	20.8	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

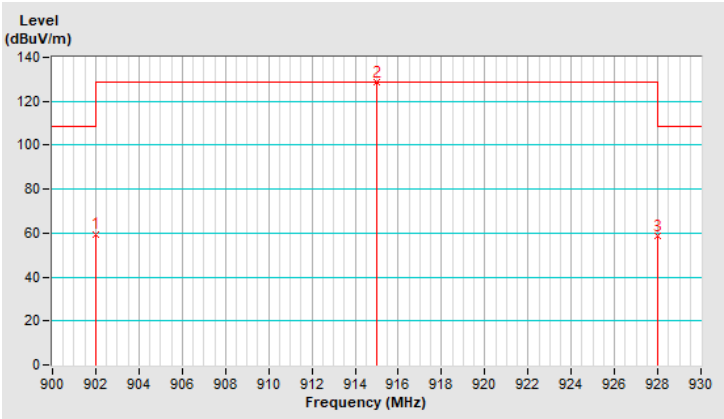


RF Mode	TX FSK_250kbps	Channel	CH 25：915 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	59.5 QP	108.5	-49.0	1.40 V	333	24.5	35.0
2	*915.00	128.5 QP			1.40 V	333	93.2	35.3
3	928.00	58.7 QP	108.5	-49.8	1.40 V	333	23.2	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

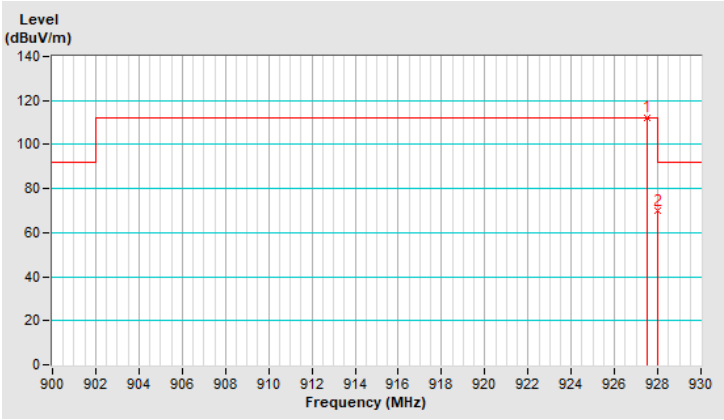


RF Mode	TX FSK_250kbps	Channel	CH 50：927.5 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.50	112.2 QP			1.26 H	351	76.7	35.5
2	928.00	70.0 QP	92.2	-22.2	1.26 H	351	34.5	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.

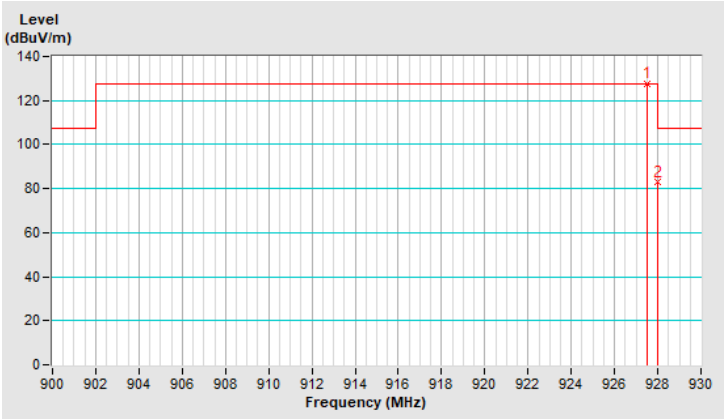


RF Mode	TX FSK_250kbps	Channel	CH 50：927.5 MHz
Frequency Range	900MHz ~ 930MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.50	127.6 QP			1.37 V	192	92.1	35.5
2	928.00	82.9 QP	107.6	-24.7	1.37 V	192	47.4	35.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " * ": Fundamental frequency.



Above 1GHz Data:

RF Mode	TX FSK_250kbps	Channel	CH 0：902.5 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2707.50	33.2 PK	74.0	-40.8	1.68 H	121	37.0	-3.8
2	2707.50	21.3 AV	54.0	-32.7	1.68 H	121	25.1	-3.8
3	3610.00	33.3 PK	74.0	-40.7	1.57 H	170	35.6	-2.3
4	3610.00	29.1 AV	54.0	-24.9	1.57 H	170	31.4	-2.3
5	4512.50	35.4 PK	74.0	-38.6	1.62 H	178	35.5	-0.1
6	4512.50	27.4 AV	54.0	-26.6	1.62 H	178	27.5	-0.1
7	5415.00	37.1 PK	74.0	-36.9	3.18 H	112	35.8	1.3
8	5415.00	30.8 AV	54.0	-23.2	3.18 H	112	29.5	1.3
9	8122.50	40.1 PK	74.0	-33.9	1.48 H	26	31.8	8.3
10	8122.50	34.2 AV	54.0	-19.8	1.48 H	26	25.9	8.3
11	9025.00	39.5 PK	74.0	-34.5	1.07 H	47	31.8	7.7
12	9025.00	30.0 AV	54.0	-24.0	1.07 H	47	22.3	7.7
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2707.50	33.5 PK	74.0	-40.5	1.66 V	155	37.3	-3.8
2	2707.50	21.9 AV	54.0	-32.1	1.66 V	155	25.7	-3.8
3	3610.00	36.8 PK	74.0	-37.2	1.66 V	52	39.1	-2.3
4	3610.00	32.3 AV	54.0	-21.7	1.66 V	52	34.6	-2.3
5	4512.50	38.4 PK	74.0	-35.6	1.69 V	301	38.5	-0.1
6	4512.50	31.1 AV	54.0	-22.9	1.69 V	301	31.2	-0.1
7	5415.00	37.8 PK	74.0	-36.2	1.59 V	223	36.5	1.3
8	5415.00	32.5 AV	54.0	-21.5	1.59 V	223	31.2	1.3
9	8122.50	42.7 PK	74.0	-31.3	1.56 V	207	34.4	8.3
10	8122.50	36.6 AV	54.0	-17.4	1.56 V	207	28.3	8.3
11	9025.00	42.0 PK	74.0	-32.0	2.08 V	162	34.3	7.7
12	9025.00	31.9 AV	54.0	-22.1	2.08 V	162	24.2	7.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

RF Mode	TX FSK_250kbps	Channel	CH 25：915 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2745.00	33.0 PK	74.0	-41.0	1.72 H	155	36.8	-3.8
2	2745.00	21.5 AV	54.0	-32.5	1.72 H	155	25.3	-3.8
3	3660.00	33.4 PK	74.0	-40.6	1.52 H	164	35.4	-2.0
4	3660.00	28.9 AV	54.0	-25.1	1.52 H	164	30.9	-2.0
5	4575.00	34.1 PK	74.0	-39.9	1.66 H	158	34.2	-0.1
6	4575.00	26.2 AV	54.0	-27.8	1.66 H	158	26.3	-0.1
7	7320.00	34.2 PK	74.0	-39.8	3.13 H	97	27.4	6.8
8	7320.00	26.7 AV	54.0	-27.3	3.13 H	97	19.9	6.8
9	8235.00	40.2 PK	74.0	-33.8	1.55 H	0	32.5	7.7
10	8235.00	34.3 AV	54.0	-19.7	1.55 H	0	26.6	7.7
11	9150.00	39.6 PK	74.0	-34.4	1.07 H	53	31.5	8.1
12	9150.00	29.8 AV	54.0	-24.2	1.07 H	53	21.7	8.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2745.00	35.1 PK	74.0	-38.9	1.51 V	159	38.9	-3.8
2	2745.00	23.2 AV	54.0	-30.8	1.51 V	159	27.0	-3.8
3	3660.00	34.7 PK	74.0	-39.3	1.52 V	25	36.7	-2.0
4	3660.00	28.7 AV	54.0	-25.3	1.52 V	25	30.7	-2.0
5	4575.00	37.1 PK	74.0	-36.9	1.70 V	30	37.2	-0.1
6	4575.00	26.8 AV	54.0	-27.2	1.70 V	30	26.9	-0.1
7	7320.00	36.9 PK	74.0	-37.1	1.70 V	49	30.1	6.8
8	7320.00	29.5 AV	54.0	-24.5	1.70 V	49	22.7	6.8
9	8235.00	44.4 PK	74.0	-29.6	1.48 V	106	36.7	7.7
10	8235.00	32.5 AV	54.0	-21.5	1.48 V	106	24.8	7.7
11	9150.00	42.3 PK	74.0	-31.7	1.36 V	165	34.2	8.1
12	9150.00	31.4 AV	54.0	-22.6	1.36 V	165	23.3	8.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

RF Mode	TX FSK_250kbps	Channel	CH 50：927.5 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2782.50	33.3 PK	74.0	-40.7	1.69 H	159	37.0	-3.7
2	2782.50	21.2 AV	54.0	-32.8	1.69 H	159	24.9	-3.7
3	3710.00	33.5 PK	74.0	-40.5	1.33 H	153	35.4	-1.9
4	3710.00	28.9 AV	54.0	-25.1	1.33 H	153	30.8	-1.9
5	4637.50	35.4 PK	74.0	-38.6	1.65 H	143	35.3	0.1
6	4637.50	26.6 AV	54.0	-27.4	1.65 H	143	26.5	0.1
7	7420.00	34.0 PK	74.0	-40.0	3.20 H	146	26.7	7.3
8	7420.00	26.4 AV	54.0	-27.6	3.20 H	146	19.1	7.3
9	8347.50	40.8 PK	74.0	-33.2	1.49 H	14	33.3	7.5
10	8347.50	34.4 AV	54.0	-19.6	1.49 H	14	26.9	7.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2782.50	34.8 PK	74.0	-39.2	1.54 V	178	38.5	-3.7
2	2782.50	23.2 AV	54.0	-30.8	1.54 V	178	26.9	-3.7
3	3710.00	35.2 PK	74.0	-38.8	1.46 V	62	37.1	-1.9
4	3710.00	29.4 AV	54.0	-24.6	1.46 V	62	31.3	-1.9
5	4637.50	36.8 PK	74.0	-37.2	1.72 V	20	36.7	0.1
6	4637.50	26.9 AV	54.0	-27.1	1.72 V	20	26.8	0.1
7	7420.00	37.4 PK	74.0	-36.6	1.81 V	50	30.1	7.3
8	7420.00	29.9 AV	54.0	-24.1	1.81 V	50	22.6	7.3
9	8347.50	43.3 PK	74.0	-30.7	1.54 V	134	35.8	7.5
10	8347.50	31.8 AV	54.0	-22.2	1.54 V	134	24.3	7.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Test Receiver R&S	ESCS 30	847124/029	2020/10/20	2021/10/19
LISN R&S	ESH3-Z5	848773/004	2020/10/27	2021/10/26
LISN R & S	ESH3-Z5	835239/001	2021/3/26	2022/3/25
50 ohms Terminator	50	3	2020/10/26	2021/10/25
RF Coaxial Cable JYEBO	5D-FB	COCCAB-001	2020/9/26	2021/9/25
Fixed attenuator STI	STI02-2200-10	005	2020/8/29	2021/8/28
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The test was performed in Conduction 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: 2021/8/26

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

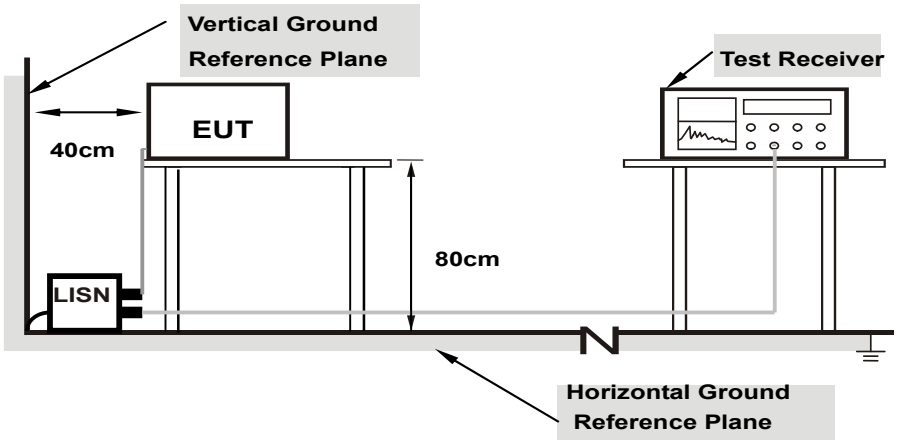
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Condition

Same as 4.1.6.

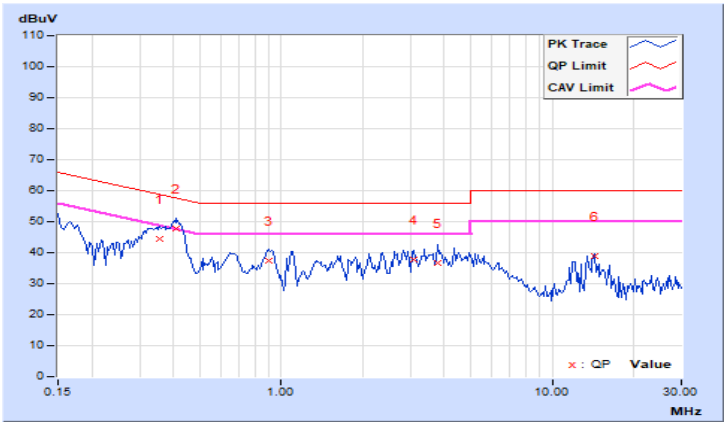
4.2.7 Test Results

RF Mode	TX FSK_150kbps	Channel	CH 63：927.6 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.35703	9.99	34.28	28.54	44.27	38.53	58.80	48.80	-14.53	-10.27
2	**0.41172**	**9.99**	**37.90**	**33.06**	**47.89**	**43.05**	**57.61**	**47.61**	**-9.72**	**-4.56**
3	0.90000	10.02	27.47	22.77	37.49	32.79	56.00	46.00	-18.51	-13.21
4	3.09766	10.12	27.49	21.81	37.61	31.93	56.00	46.00	-18.39	-14.07
5	3.79688	10.16	26.36	20.87	36.52	31.03	56.00	46.00	-19.48	-14.97
6	14.33594	10.79	28.10	24.79	38.89	35.58	60.00	50.00	-21.11	-14.42

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

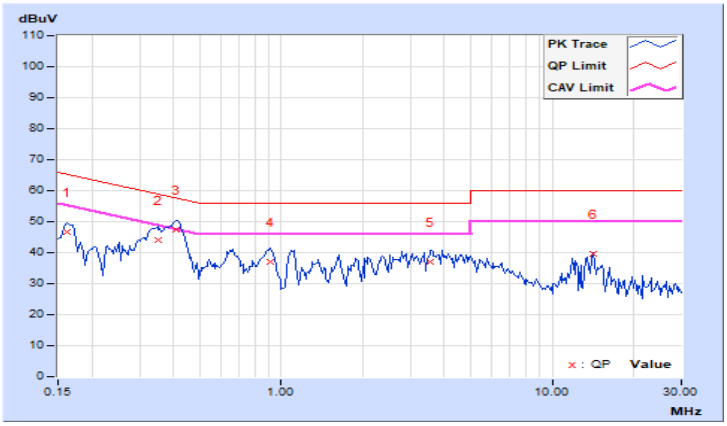


RF Mode	TX FSK_150kbps	Channel	CH 63：927.6 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	9.93	36.83	27.69	46.76	37.62	65.38	55.38	-18.62	-17.76
2	0.34922	9.96	33.98	29.79	43.94	39.75	58.98	48.98	-15.04	-9.23
3	0.40781	9.96	37.61	32.39	47.57	42.35	57.69	47.69	-10.12	-5.34
4	0.91563	9.99	27.19	22.85	37.18	32.84	56.00	46.00	-18.82	-13.16
5	3.56641	10.10	26.86	21.76	36.96	31.86	56.00	46.00	-19.04	-14.14
6	14.21484	10.60	29.05	25.55	39.65	36.15	60.00	50.00	-20.35	-13.85

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

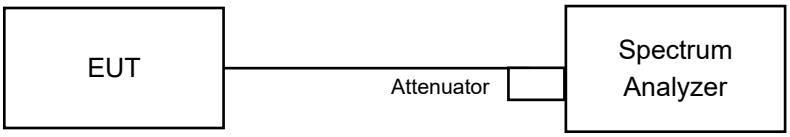


4.3 Number of Hopping Frequency Used

4.3.1 Limits of Hopping Frequency Used Measurement

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.

c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.

d. Set the SA on View mode and then plot the result on SA screen.

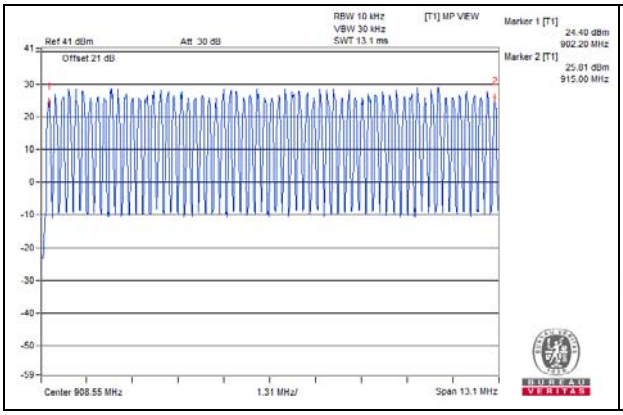
e. Repeat above procedures until all frequencies measured were complete.

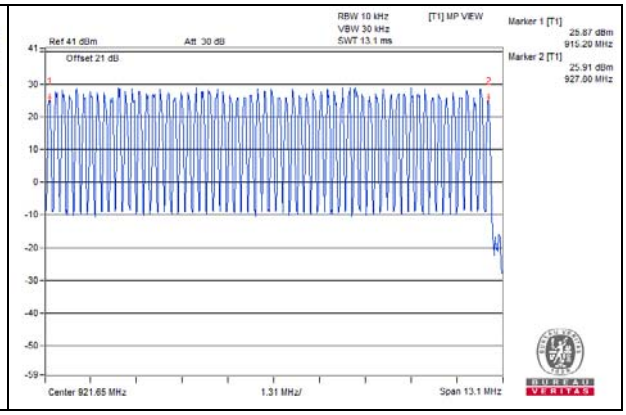
4.3.5 Deviation from Test Standard

No deviation.

4.3.6 Test Results (Mode 1)

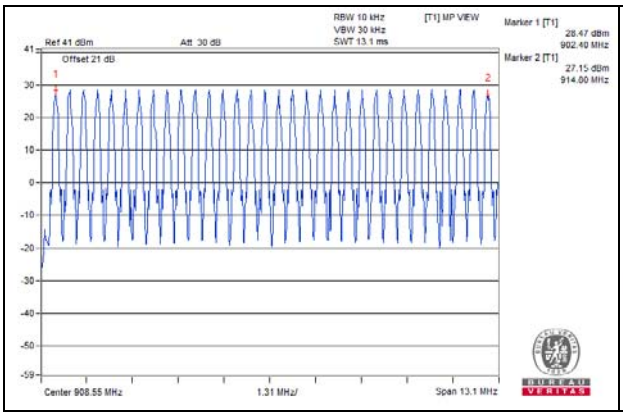
There are 129 hopping frequencies in the hopping mode. Please refer to below plots for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

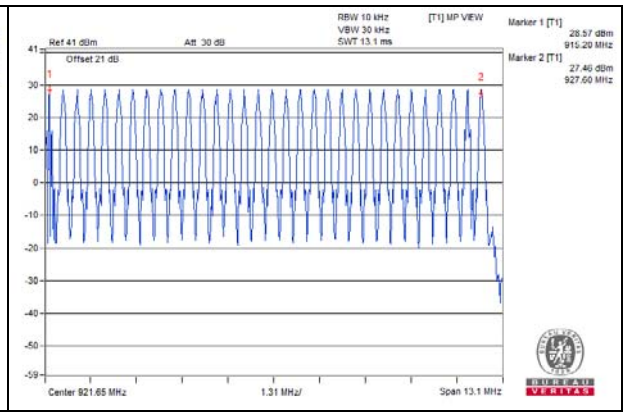




4.3.7 Test Results (Mode 2)

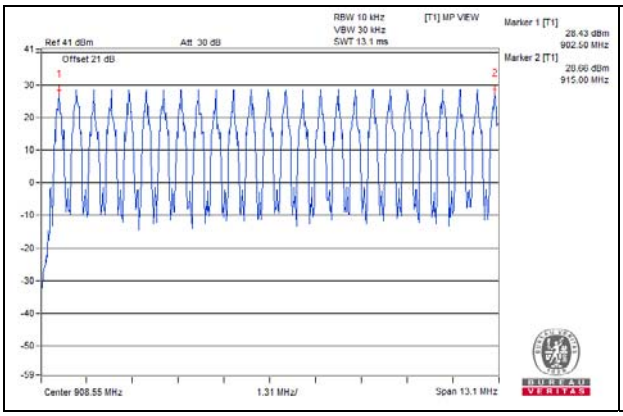
There are 64 hopping frequencies in the hopping mode. Please refer to below plots for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

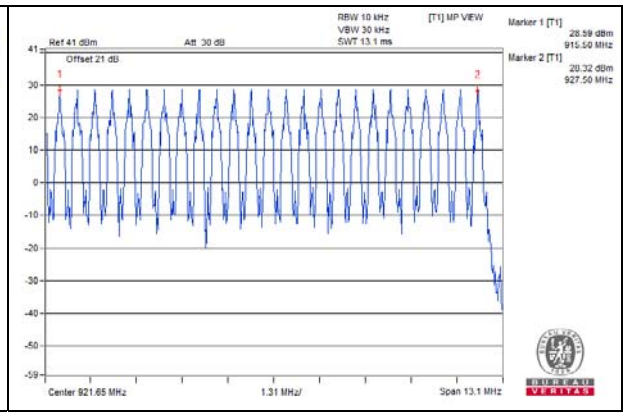




4.3.8 Test Results (Mode 3)

There are 51 hopping frequencies in the hopping mode. Please refer to below plots for the test result. On the plots, it shows that the hopping frequencies are equally spaced.



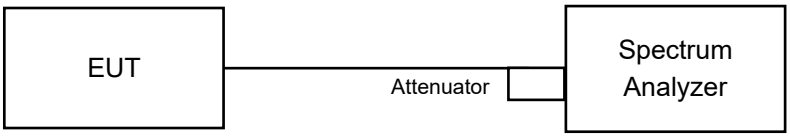


4.4 Dwell Time on Each Channel

4.4.1 Limits of Dwell Time on Each Channel Measurement

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.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

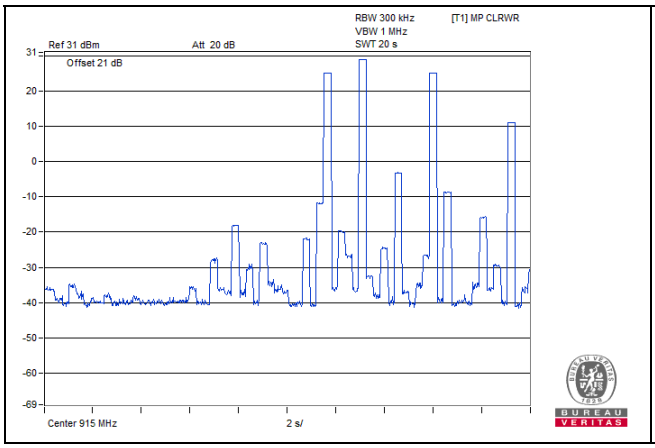
a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.

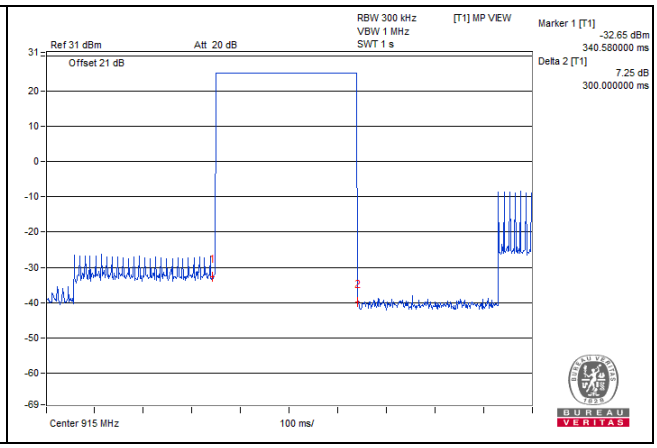
4.4.5 Deviation from Test Standard

No deviation.

4.4.6 Test Results (Mode 1)

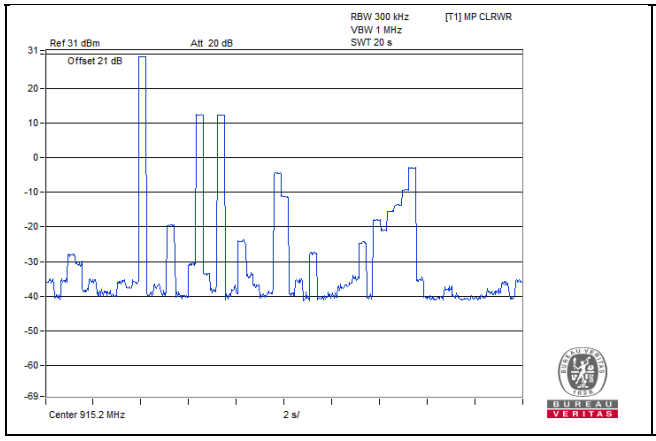
Mode	Number of transmission in 20 sec	Length of transmission time (msec)	Result (msec)	Limit (msec)	Test Result
FHSS	1 times	300	300	400	Pass

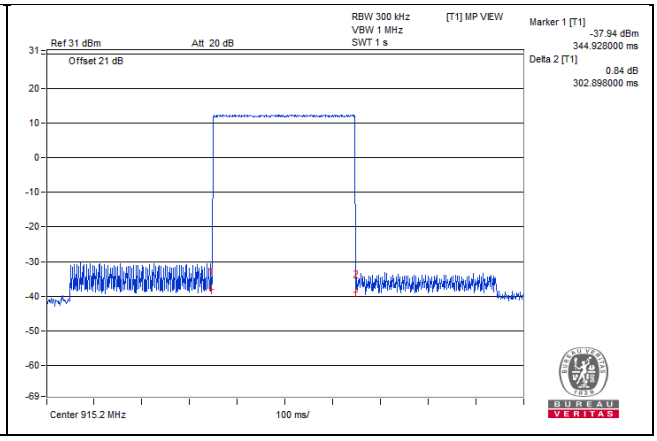




4.4.7 Test Results (Mode 2)

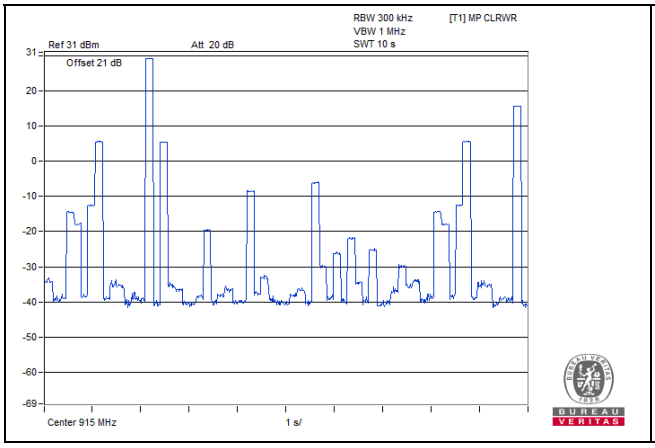
Mode	Number of transmission in 20 sec	Length of transmission time (msec)	Result (msec)	Limit (msec)	Test Result
FHSS	1 times	302.898	302.898	400	Pass

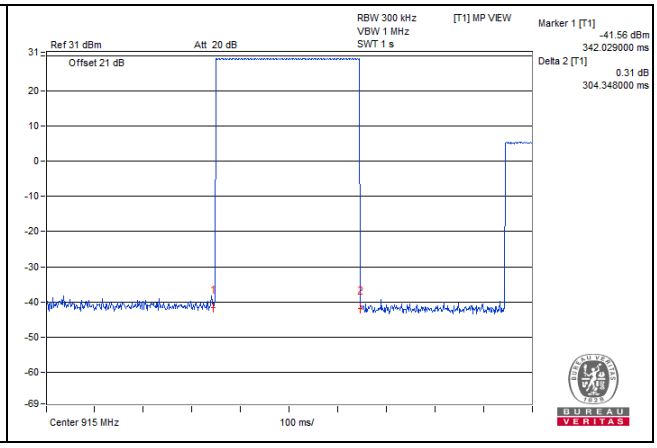




4.4.8 Test Results (Mode 3)

Mode	Number of transmission in 10 sec	Length of transmission time (msec)	Result (msec)	Limit (msec)	Test Result
FHSS	1 times	304.348	304.348	400	Pass



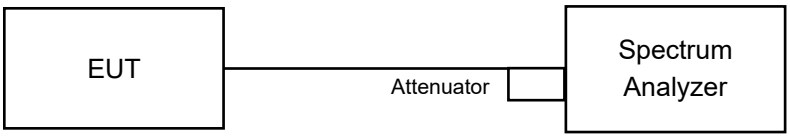


4.5 Channel Bandwidth

4.5.1 Limits of Channel Bandwidth Measurement

For frequency hopping system operating in the 902-928MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.

d. Repeat above procedures until all frequencies measured were complete.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

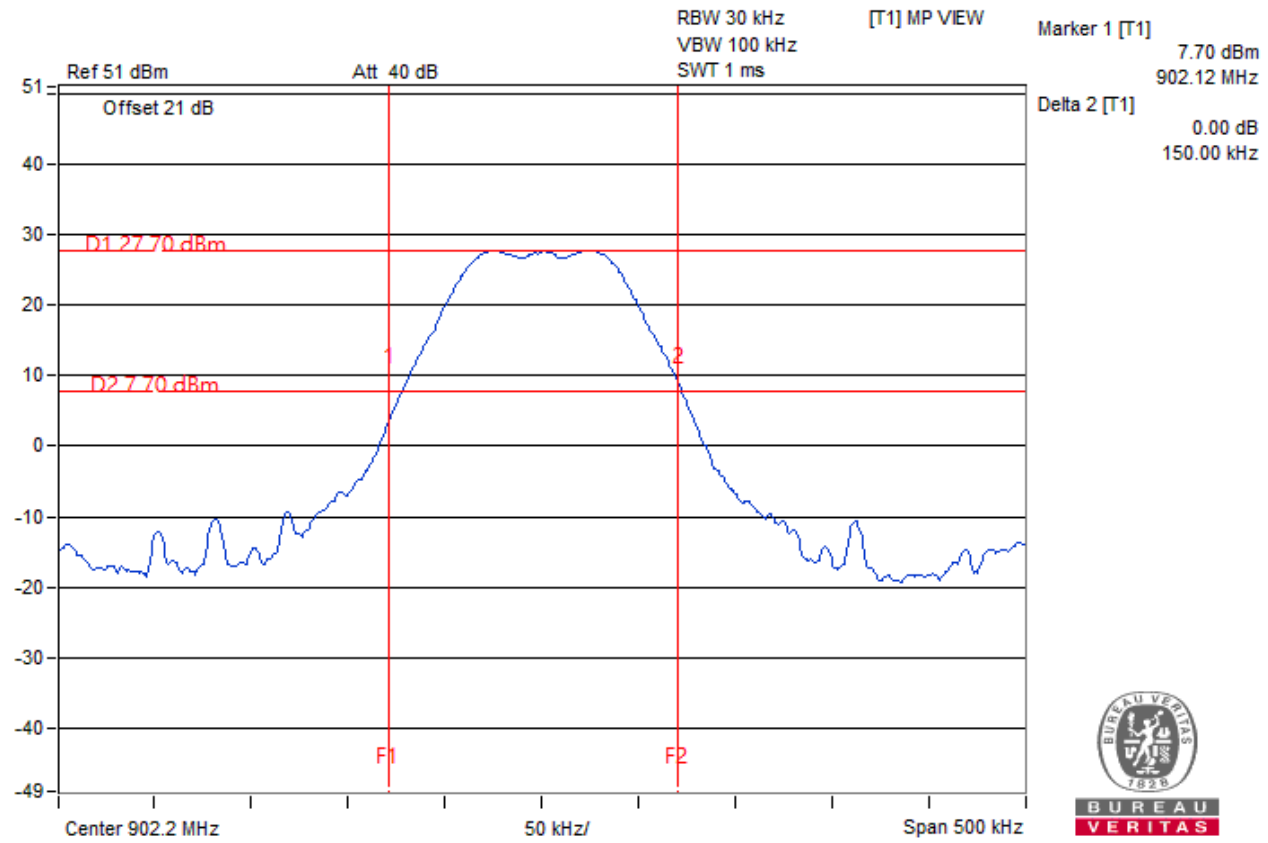
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 Test Results (Mode 1)

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Maximum Limit (MHz)	>= 25kHz
0	902.2	0.15	0.5	Yes
64	915	0.15	0.5	Yes
128	927.8	0.15	0.5	Yes

Spectrum Plot of Min. Value

CH 0

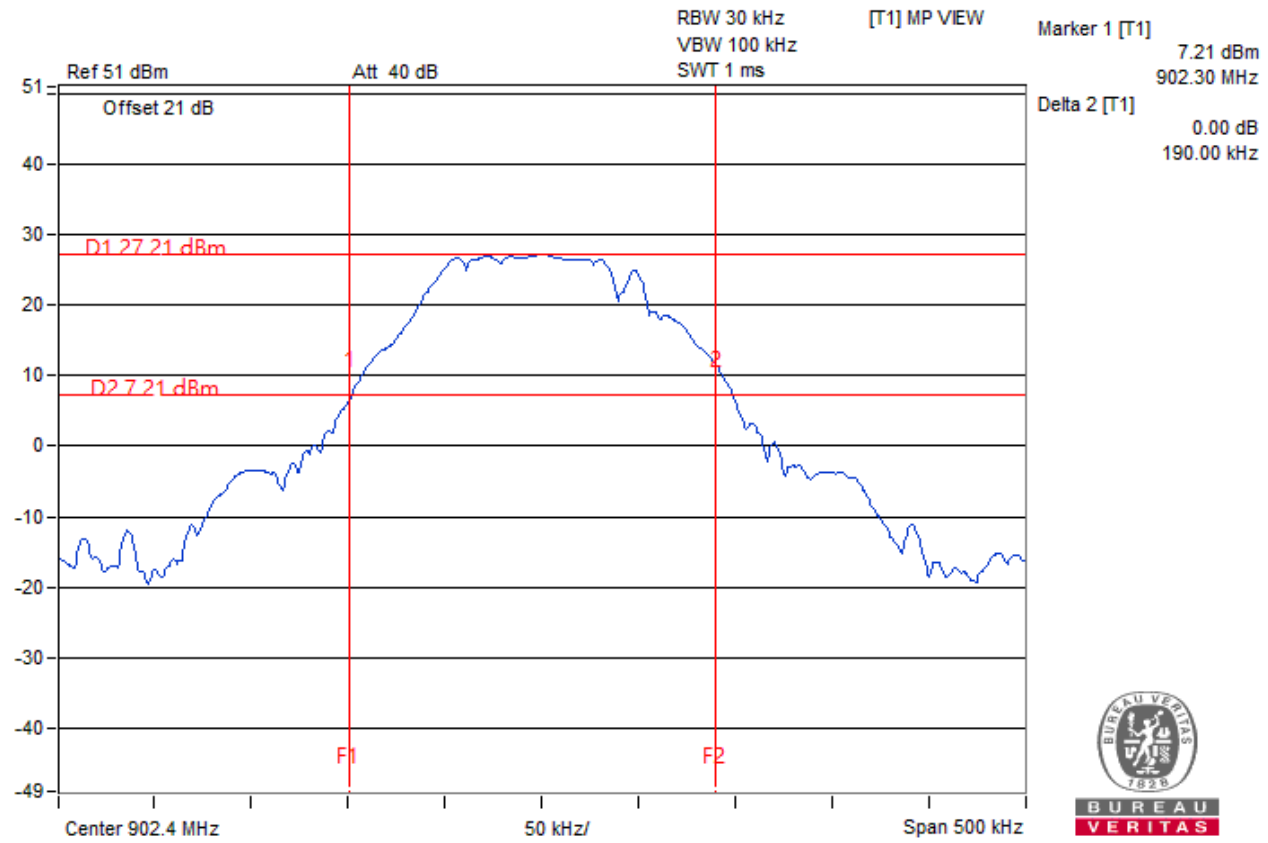


4.5.8 Test Results (Mode 2)

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Maximum Limit (MHz)	>= 25kHz
0	902.4	0.19	0.5	Yes
32	915.2	0.19	0.5	Yes
63	927.6	0.19	0.5	Yes

Spectrum Plot of Min. Value

CH 0

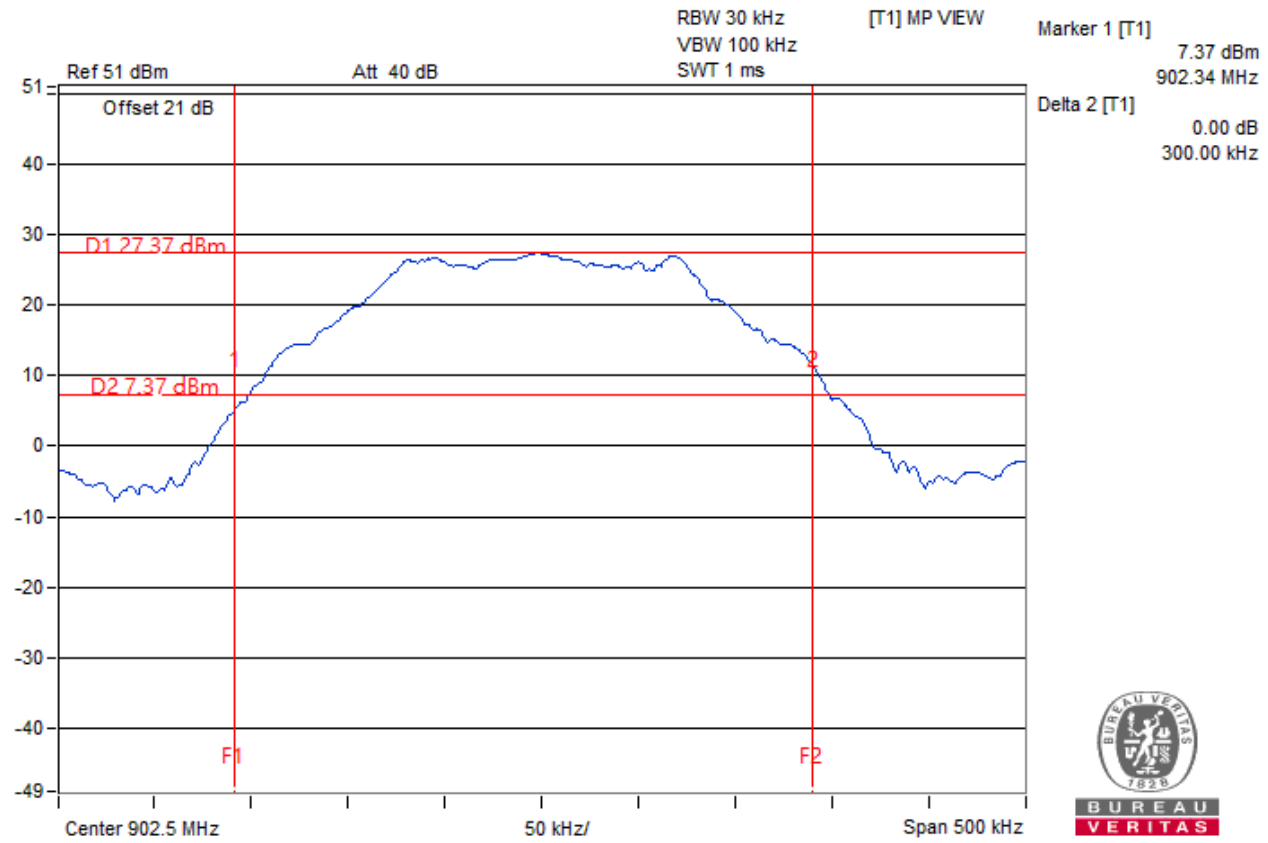


4.5.9 Test Results (Mode 3)

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Maximum Limit (MHz)	>= 25kHz
0	902.5	0.3	0.5	Yes
25	915	0.31	0.5	Yes
50	927.5	0.31	0.5	Yes

Spectrum Plot of Min. Value

CH 0

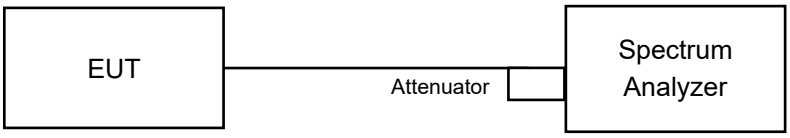


4.6 Hopping Channel Separation

4.6.1 Limits of Hopping Channel Separation Measurement

At least 25kHz or 20dB hopping channel bandwidth (whichever is greater).

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

Measurement Procedure REF

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.

c. By using the MaxHold function record the separation of two adjacent channels.

d. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.

e. Repeat above procedures until all frequencies measured were complete.

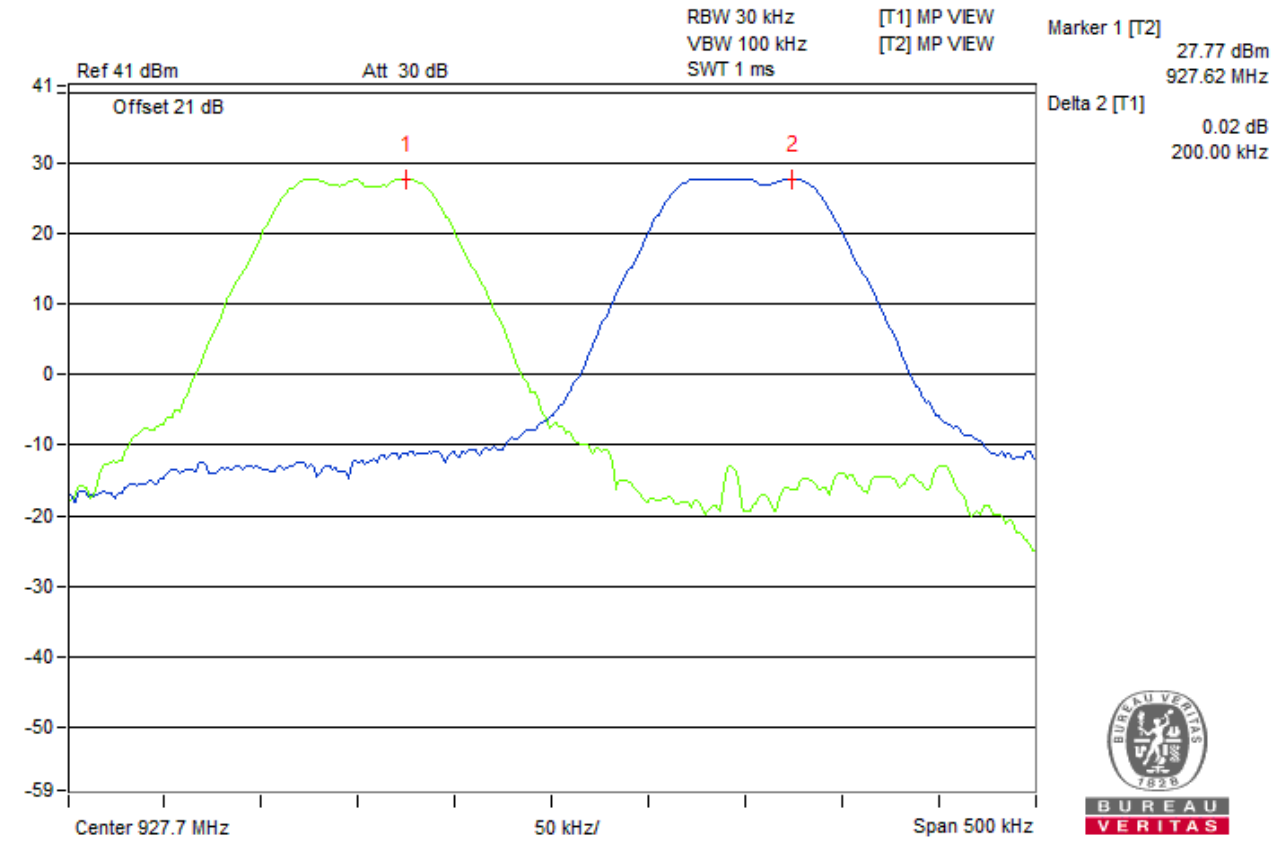
4.6.5 Deviation from Test Standard

No deviation.

4.6.6 Test Results (Mode 1)

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	20dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	902.2	0.2	0.15	0.15	Pass
64	915	0.2	0.15	0.15	Pass
128	927.8	0.2	0.15	0.15	Pass

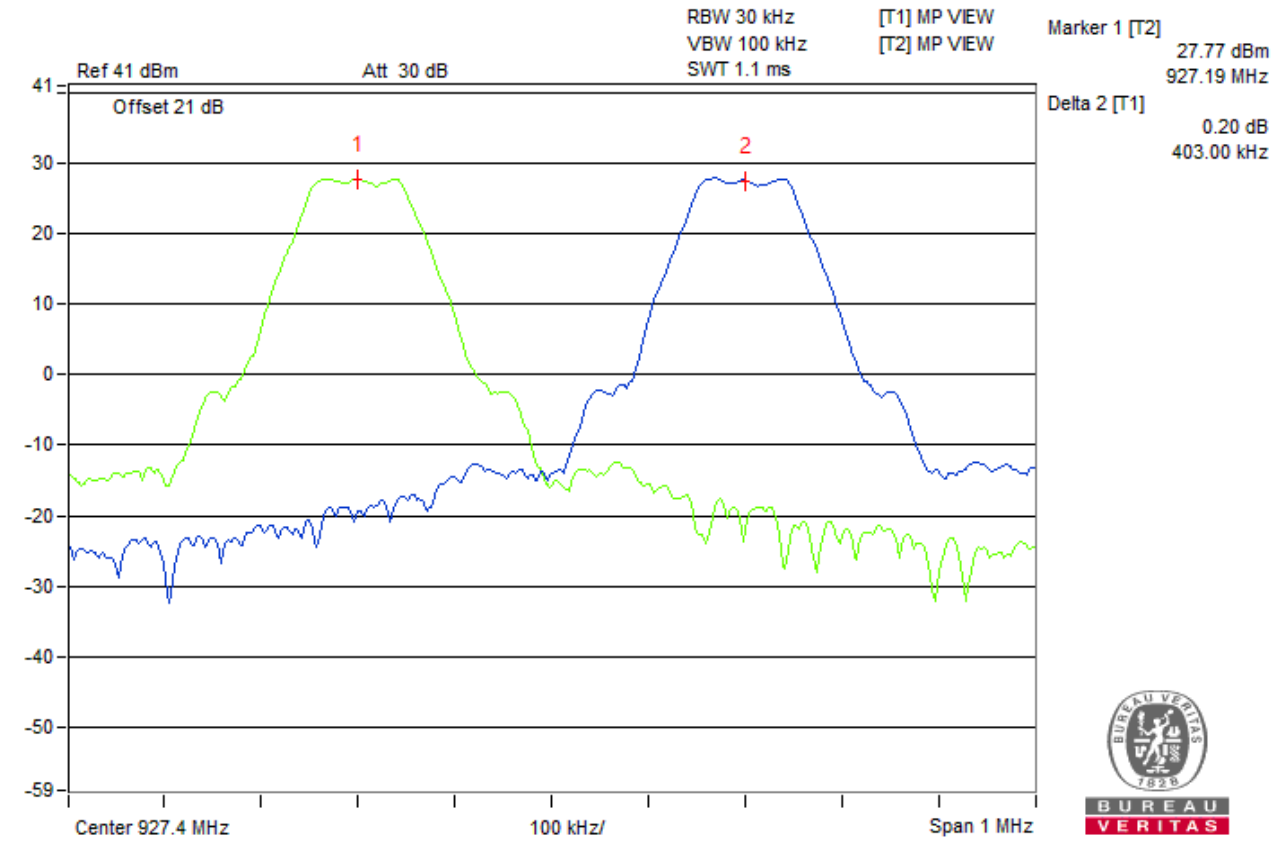
Spectrum Plot of Worst Value
CH 128



4.6.7 Test Results (Mode 2)

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	20dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	902.4	0.4	0.19	0.19	Pass
32	915.2	0.4	0.19	0.19	Pass
63	927.6	0.4	0.19	0.19	Pass

Spectrum Plot of Worst Value
CH 63

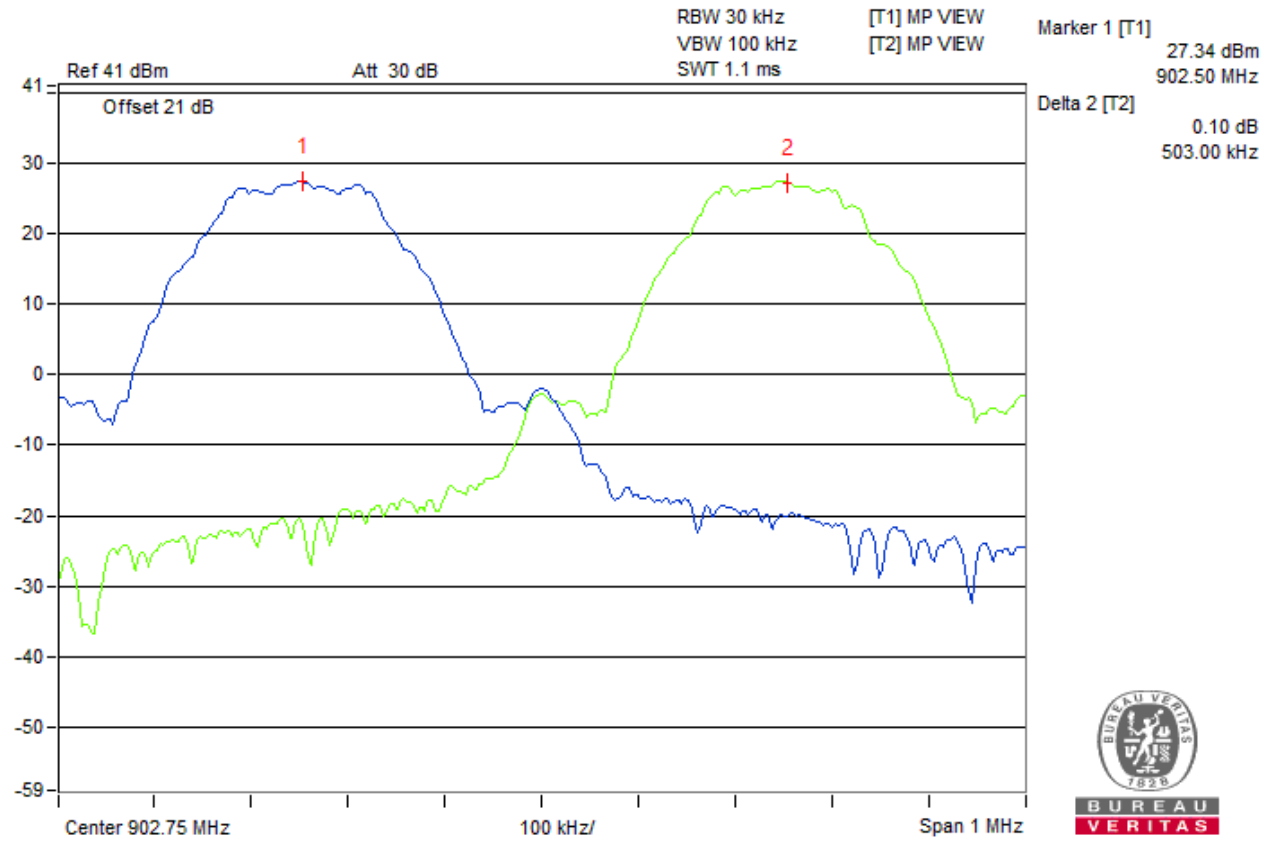


4.6.8 Test Results (Mode 3)

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	20dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	902.5	0.5	0.3	0.3	Pass
25	915	0.5	0.31	0.31	Pass
50	927.5	0.5	0.31	0.31	Pass

Spectrum Plot of Worst Value

CH 0

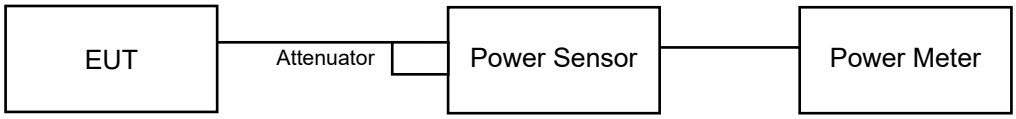


4.7 Maximum Output Power

4.7.1 Limits of Maximum Output Power Measurement

For frequency hopping systems operating in the 902-928 MHz band: 1 watt (30dBm) for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.7.7 Test Results (Mode 1)

FOR PEAK POWER

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
0	902.2	567.545	27.54	30	Pass
64	915	575.44	27.60	30	Pass
128	927.8	574.116	27.59	30	Pass

FOR AVERAGE POWER

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	902.2	552.077	27.42
64	915	563.638	27.51
128	927.8	559.758	27.48

4.7.8 Test Results (Mode 2)

FOR PEAK POWER

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
0	902.4	564.937	27.52	30	Pass
32	915.2	574.116	27.59	30	Pass
63	927.6	587.489	27.69	30	Pass

FOR AVERAGE POWER

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	902.4	554.626	27.44
32	915.2	561.048	27.49
63	927.6	574.116	27.59

4.7.9 Test Results (Mode 3)

FOR PEAK POWER

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
0	902.5	579.429	27.63	30	Pass
25	915	572.796	27.58	30	Pass
50	927.5	567.545	27.54	30	Pass

FOR AVERAGE POWER

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	902.5	564.937	27.52
25	915	558.47	27.47
50	927.5	557.186	27.46

4.8 Conducted Out of Band Emission Measurement

4.8.1 Limits of Conducted Out of Band Emission Measurement

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

4.8.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.8.3 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 and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.8.4 Deviation from Test Standard

No deviation.

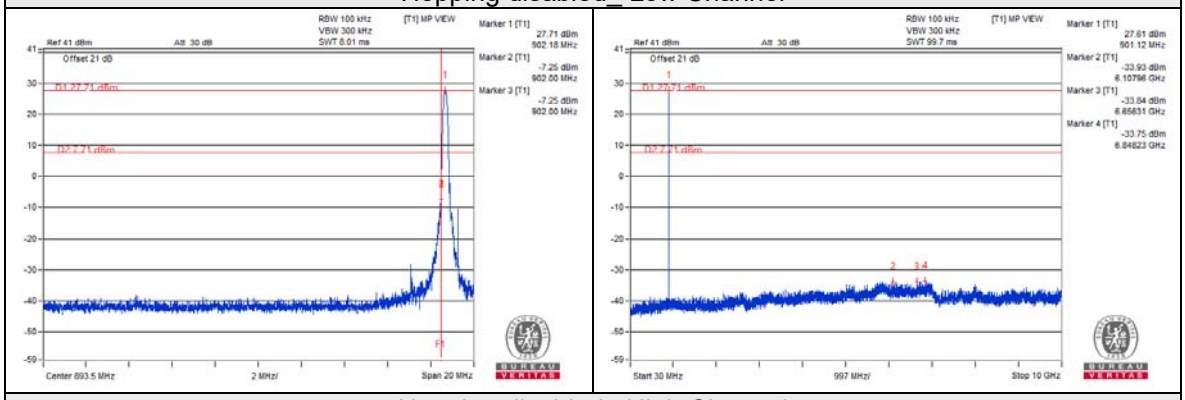
4.8.5 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest and highest channel frequencies individually.

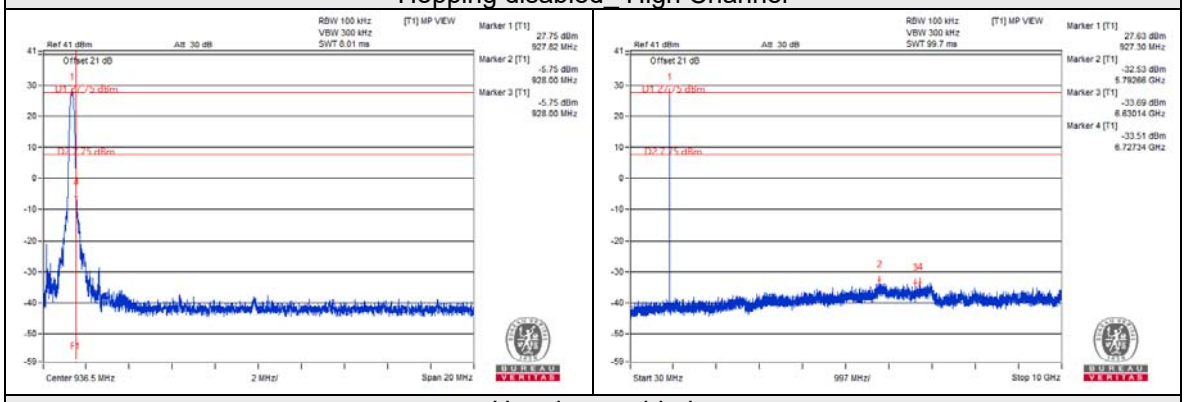
4.8.6 Test Results (Mode 1)

The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

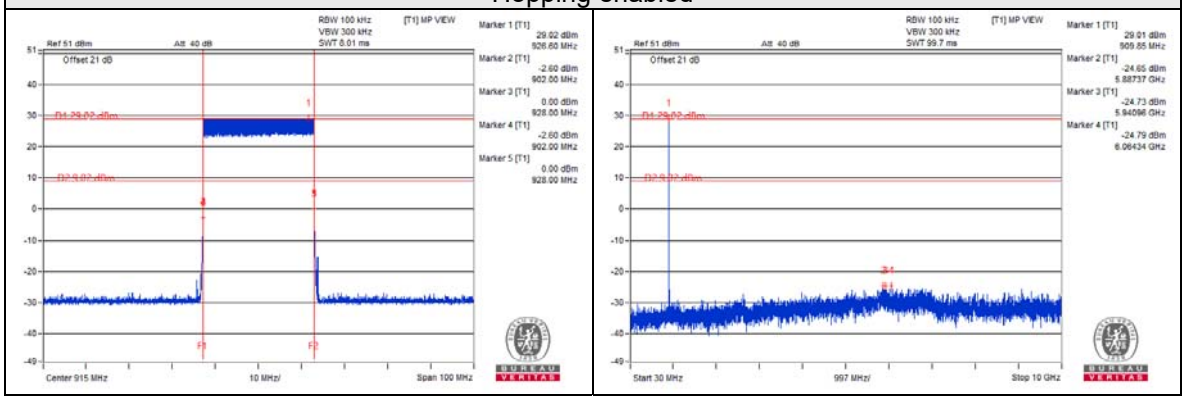
Hopping disabled_ Low Channel



Hopping disabled_ High Channel



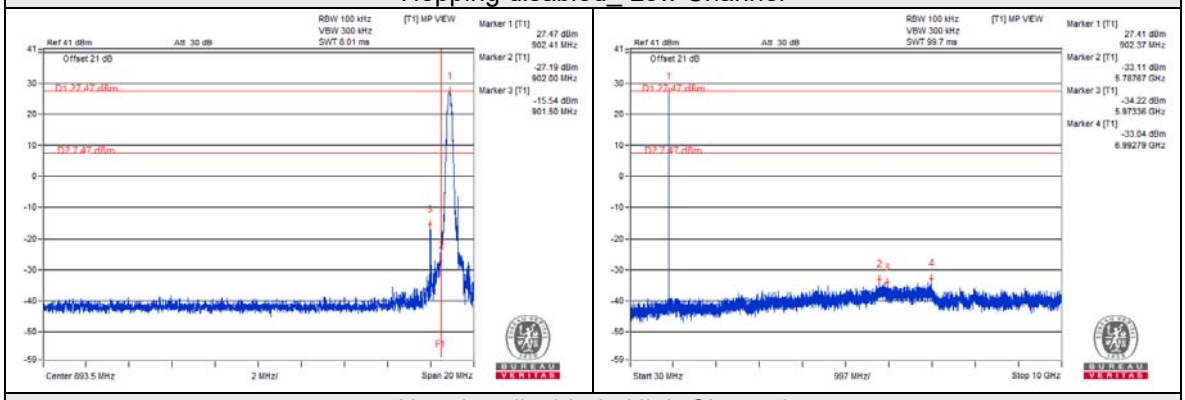
Hopping enabled



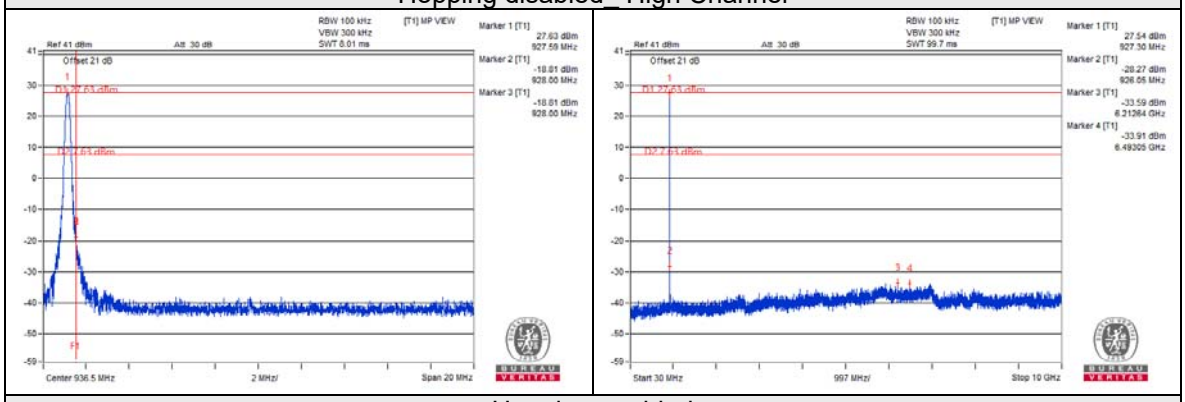
4.8.7 Test Results (Mode 2)

The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

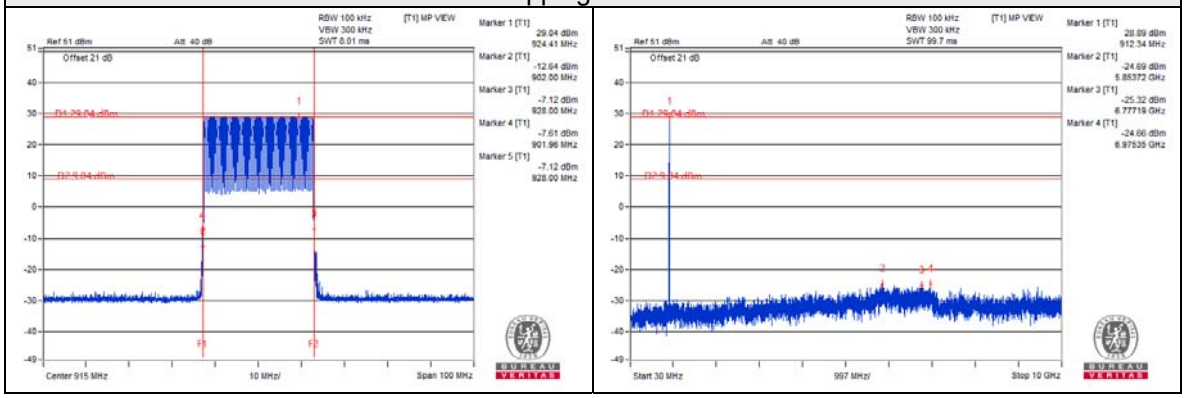
Hopping disabled_ Low Channel



Hopping disabled_ High Channel



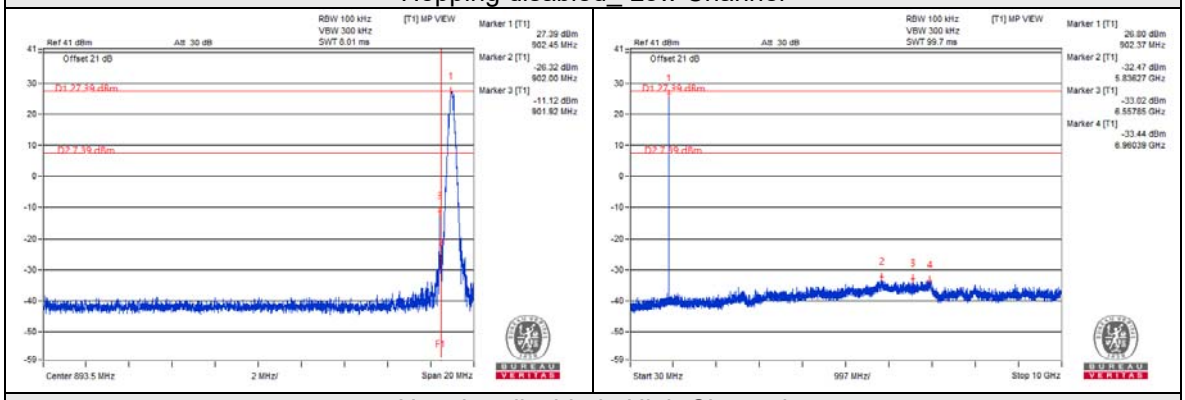
Hopping enabled



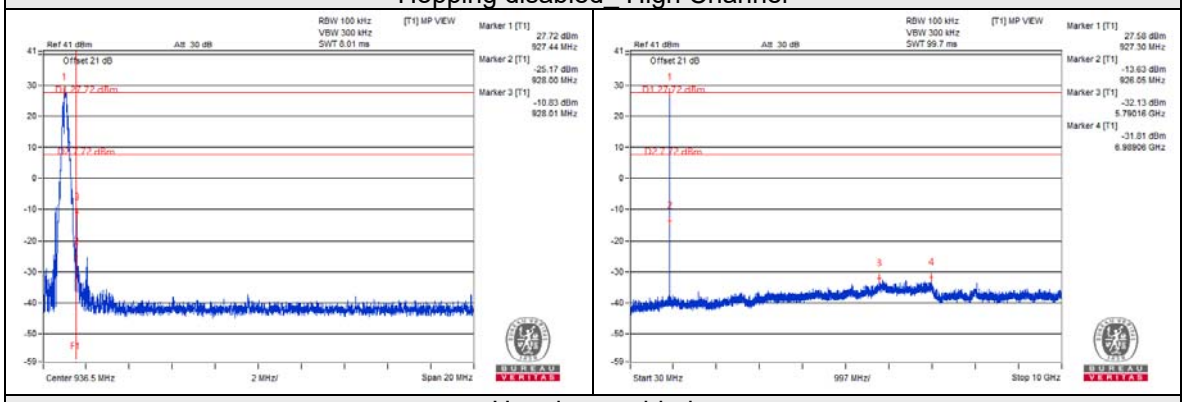
4.8.8 Test Results (Mode 3)

The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

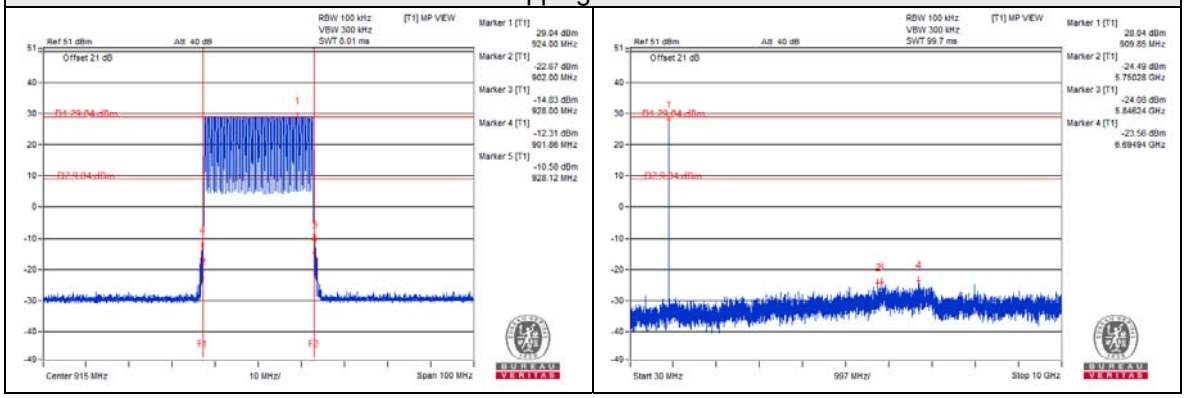
Hopping disabled_ Low Channel



Hopping disabled_ High Channel



Hopping enabled



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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