ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant:	Immedia Semiconductor LLC. 100 Riverpark Drive, Suite 125 North Reading, MA 01864, United States of America
Manufacturer:	Immedia Semiconductor LLC. 100 Riverpark Drive, Suite 125 North Reading, MA 01864, United States of America
Product Name:	Outdoor camera
Brand Name:	blink
Model No.:	BCM00500U
Model Difference:	N/A
Report Number:	TERF2304001072E2
FCC ID	2AF77-H2211810
Date of EUT Received:	March 28, 2023
Date of Test:	April 26, 2023～May 2, 2023
Issue Date:	May 9, 2023

Approved By Arno Hsieh
Arno Hsieh

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT comply with FCC rule part §15.247.

The results of this report relate only to the sample identified in this report.

Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2304001072E2	00	Original	May 9, 2023	Violetta Tang	

Note:

1、 The remark "*" indicates modification of the report upon requests from certification body.

Table of Contents

1 GENERAL INFORMATION

1.1 Product description

Product Name:	Outdoor camera
Brand Name:	blink
Model No.:	BCM00500U
Model Difference:	N/A
Hardware Version:	PVT
Firmware Version:	N/A
EUT Series No.:	TE_SP_20230302603
Power Supply:	3V
Test Software (Name/Version)	Tera Term V4.106

1.2 RF Specification

Radio Technology:	SRD
Frequency Range:	902 – 928MHz
Modulation type:	FSK
Transmit Power:	20.66 dBm (Peak)
Dwell Time:	<= 0.4s

1.3 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Inverted F	Immedia Semiconductor LLC.	BCM00500U	902~928	-2.10

Note: Antenna information is provided by the applicant.

1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247
FCC KDB 558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10:2013

1.5 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027	TW3702
		SAC 2		
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C	TW0028	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		

Note: Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.

1.6 Special Accessories

There are no special accessories used while test was conducted.

1.7 Equipment Modifications

There was no modification incorporated into the EUT.

2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

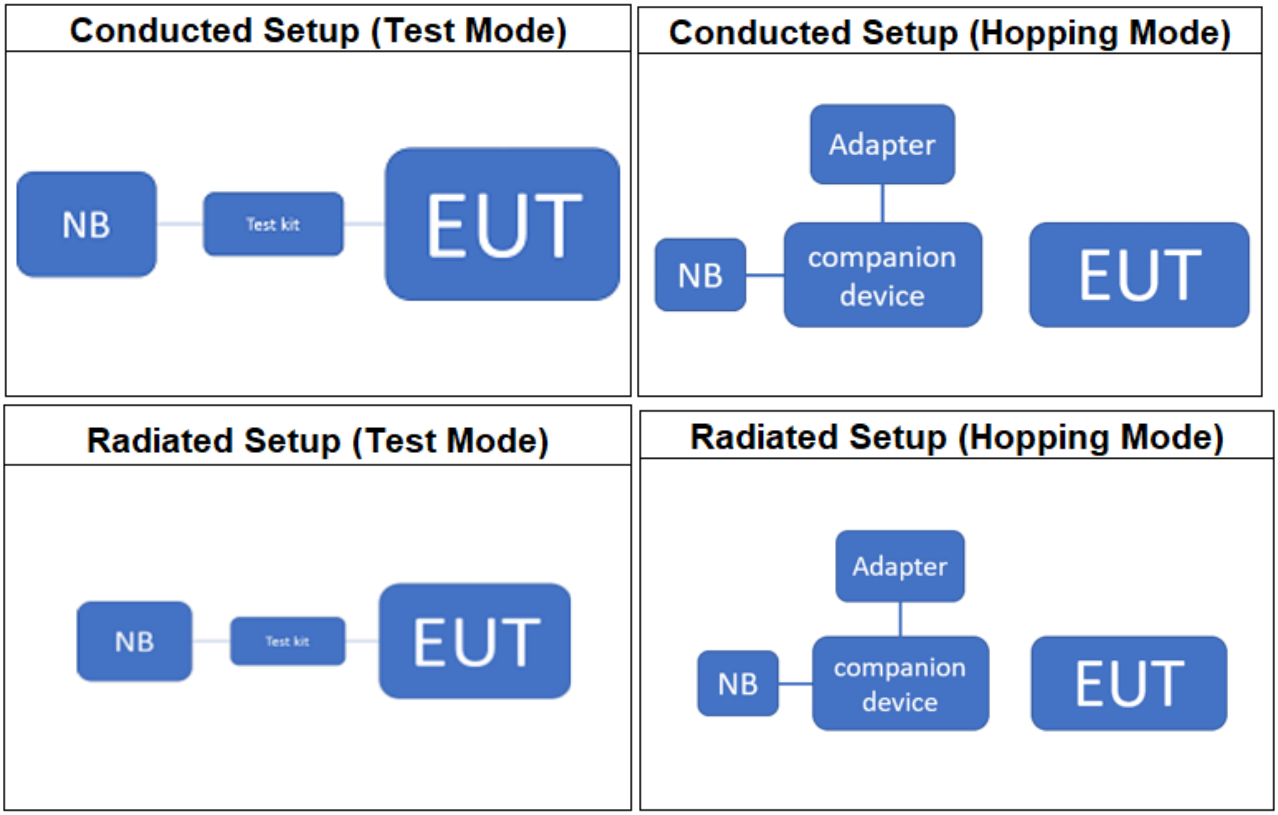
2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*6m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.
There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

2.4.2 For all conducted test items:

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

2.5 Test Configuration



2.6 Control Unit(s)

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Adapter	amazon	FANA7R	N/A	N/A	N/A
companion device	amazon	BSM00401U	N/A	N/A	N/A
Notebook	Lenovo	L420	S0011721	N/A	N/A

Radiated Emission Test Site: SAC D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Adapter	amazon	FANA7R	N/A	N/A	N/A
companion device	amazon	BSM00401U	N/A	N/A	N/A
Notebook	Lenovo	L420	S0011721	N/A	N/A

3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	N/A
§15.247(b)(2)	Peak Output Power	Compliant
§15.247(a)(1)(i)	Emission Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	Conducted & Radiated Band Edge and Spurious Emission	Compliant
§15.247(a)(1)(i)	Frequency Separation Number of hopping frequency Time of Occupancy	Compliant
§15.203	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operating Frequencies

	CH	Freq. (MHz)	CH	Freq. (MHz)	CH	Freq. (MHz)
Channel List	1	902.4	24	911.6	47	920.8
	2	902.8	25	912.0	48	921.2
	3	903.2	26	912.4	49	921.6
	4	903.6	27	912.8	50	922.0
	5	904.0	28	913.2	51	922.4
	6	904.4	29	913.6	52	922.8
	7	904.8	30	914.0	53	923.2
	8	905.2	31	914.4	54	923.6
	9	905.6	32	914.8	55	924.0
	10	906.0	33	915.2	56	924.4
	11	906.4	34	915.6	57	924.8
	12	906.8	35	916.0	58	925.2
	13	907.2	36	916.4	59	925.6
	14	907.6	37	916.8	60	926.0
	15	908.0	38	917.2	61	926.4
	16	908.4	39	917.6	62	926.8
	17	908.8	40	918.0	63	927.2
	18	909.2	41	918.4	64	927.6
	19	909.6	42	918.8		
	20	910.0	43	919.2		
	21	910.4	44	919.6		
	22	910.8	45	920.0		
	23	911.2	46	920.4		

4.2 The Worst Test Modes and Channel Details

1 The EUT has been tested under operating condition.
2 Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
3 Investigation has been done on all the possible configurations for searching the worst case.

ANTNNA PORT CONDUCTED TEST		
MODE	AVAILABLE CHANNEL	TESTED CHANNEL
Peak Output Power, 20dB Band Width		
FSK	1 to 64	1,33,64
Band Edge		
FSK	1 to 64	1,64
Frequency Separation		
FSK	1 to 64	1,2,33,34,63,64
Number of Hopping Frequency, Hopping Band edge		
FSK	1 to 64	1 to 64
Time of Occupancy(Dwell time)		
FSK	1 to 64	33

RADIATED EMISSION TEST (BELOW 1 GHz)		
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)
FSK	1 to 64	33

RADIATED EMISSION TEST (ABOVE 1 GHz)		
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)
FSK	1 to 64	1,33,64

Note: The field strength of radiated emission was measured as the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.

5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty		
AC Power Line Conducted Emission	+/-	2.32	dB
Output Power measurement	+/-	1	dB
Emission Bandwidth	+/-	1.53	Hz
Undesignable radiated emission measurement	+/-	1.68	dB
Frequency Separation	+/-	1.53	Hz
Number of hopping frequency	+/-	1.53	Hz
Time of Occupancy	+/-	1.53	Hz
Temperature	+/-	0.7	°C
Humidity	+/-	3	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty				
Polarization: Vertical	**+/-**	**2.8**	**dB**	9kHz~30MHz
	+/-	**4.82**	**dB**	30MHz - 1000MHz
	+/-	**4.37**	**dB**	1GHz - 18GHz
	+/-	**4.21**	**dB**	18GHz - 40GHz
Polarization: Horizontal	**+/-**	**2.8**	**dB**	9kHz~30MHz
	+/-	**4.54**	**dB**	30MHz - 1000MHz
	+/-	**4.37**	**dB**	1GHz - 18GHz
	+/-	**4.21**	**dB**	18GHz - 40GHz

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

6 MEASUREMENT EQUIPMENT USED

6.1 Emission from AC power line

N/A

6.2 Conducted Measurement

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	05/16/2022	05/15/2023
Power Meter	Anritsu	ML2496A	1326001	08/11/2022	08/10/2023
Power Sensor	Anritsu	MA2411B	1315048	08/11/2022	08/10/2023
Power Sensor	Anritsu	MA2411B	1315049	08/11/2022	08/10/2023
DC Power Supply	Agilent	E3640A	MY53140006	05/16/2022	05/15/2023
Attenuator	Woken	WATT-218FS-10	RF18	11/16/2022	11/15/2023
Attenuator	Woken	WATT-218FS-10	RF19	11/16/2022	11/15/2023
DC Block	PASTERNACK	PE8210	RF158	11/16/2022	11/15/2023

6.3 Radiated Measurement

Radiated Emission Test Site: SAC D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-617	12/19/2022	12/18/2023
Horn Antenna	Schwarzbeck	BBHA9170	184	12/30/2022	12/29/2023
Horn Antenna	Schwarzbeck	BBHA9170	185	08/22/2022	08/21/2023
Horn Antenna	Schwarzbeck	BBHA9120D	1341	05/31/2022	05/30/2023
Loop Antenna	ETS.LINDGREN	6502	143303	05/14/2022	05/13/2023
3m Site NSA	SGS	966 chamber D	N/A	04/30/2022	04/29/2023
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R
Pre-Amplifier	EMC Instruments	EMC18405SEE	980881	10/25/2022	10/24/2023
Pre-Amplifier	EMC Instruments	EMC9135	980234	11/16/2022	11/15/2023
Pre-Amplifier	EMC Instruments	EMC12630SE	980273	11/16/2022	11/15/2023
DC Power Supply	Agilent	E3640A	MY53130054	09/29/2022	09/28/2023
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	11/16/2022	11/15/2023
Coaxial Cable	Huber Suhner	EMC106-SM-SM-7200	150703	11/16/2022	11/15/2023
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17413/4	11/16/2022	11/15/2023

NOTE: *N.C.R refers to Not Calibrated Required.*

7 CONDUCTED EMISSION TEST

7.1 Standard Applicable

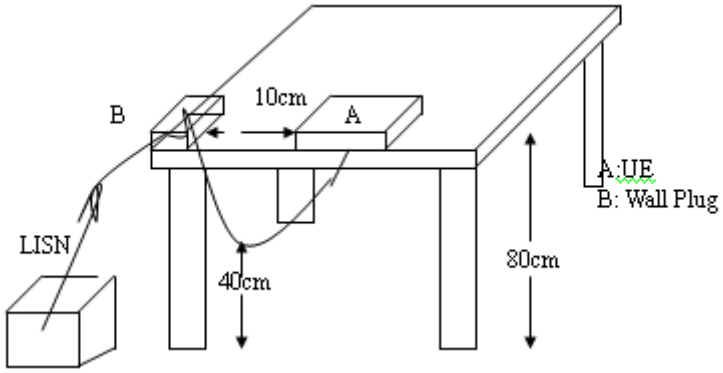
Frequency within 150 kHz to 30MHz shall not exceed the limit table as below.

Frequency range MHz	Limits (dBuV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

7.2 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

7.3 Test Setup



7.4 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

7.5 Measurement Result

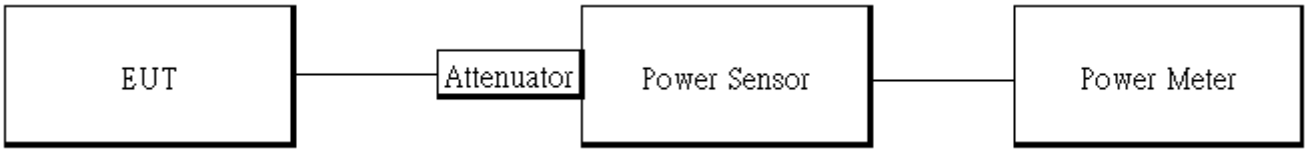
N/A; Powered from AA batteries.

8 PEAK OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

For frequency hopping systems operating in the 902-928 MHz band employing at least 50 hopping channels, conducted output power shall not exceed 1Watt.
For systems employing less than 50 hopping channels, conducted output power shall not exceed 0.25Watt.

8.2 Test Setup



8.3 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max Hold, Detector = Peak, RBW >=20dB bandwidth)
4. Record the max. reading.
5. Repeat above procedures until all default test channel is completed.

8.4 Measurement Result

FSK mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	902.4	13	20.53	112.980	1000
Mid	915.2	13	**20.66**	116.413	1000
High	927.6	13	20.47	111.429	1000

FSK mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	902.4	13	20.42	110.154	1000
Mid	915.2	13	20.51	112.460	1000
High	927.6	13	20.35	108.393	1000

Note: Max. Output include tune up tolerance Power measured by using average detector.

EIRP

FSK mode EIRP

Channel	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	902.4	13	20.42	-2.10	67.920	4000
Mid	915.2	13	20.51	-2.10	69.343	4000
High	927.6	13	20.35	-2.10	66.834	4000

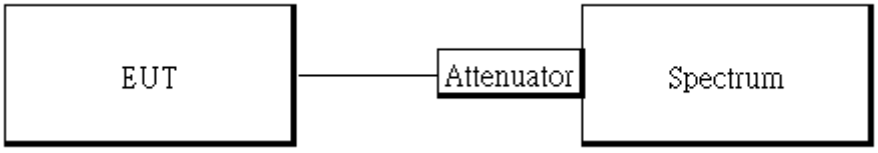
* ***Note:*** EIRP = Average Power + Gain

9 EMISSION BANDWIDTH

9.1 Standard Applicable

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

9.2 Test Setup



9.3 Measurement Procedure:

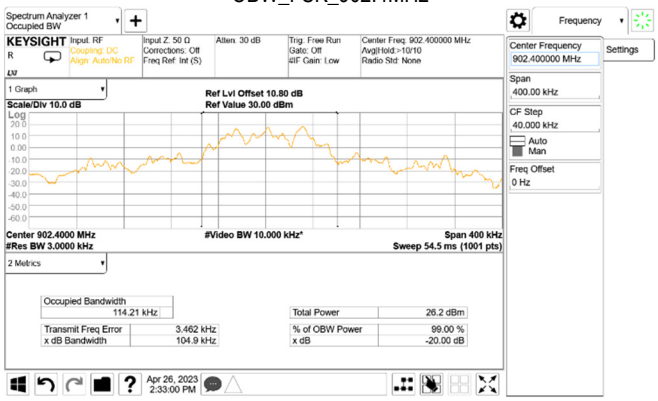
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=1% to 5% OBW, VBW = 3 x RBW, Span= large enough to capture all products of the modulation process, Sweep=auto, Detector = Peak, and Max hold for 20dB Bandwidth test.
4. Mark the peak frequency and –20dB (upper and lower) frequency and Turn on the 99% bandwidth function, max reading.
5. Repeat above procedures until all test default channel is completed

9.4 20dB Bandwidth

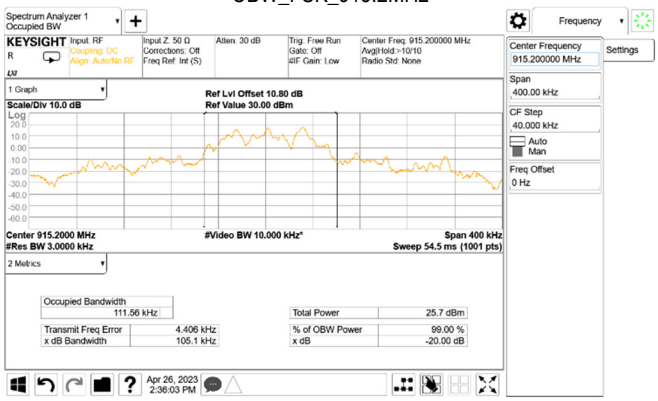
FSK

CH	20 dB BW (MHz)
Low	0.1049
Mid	0.1051
High	0.1046

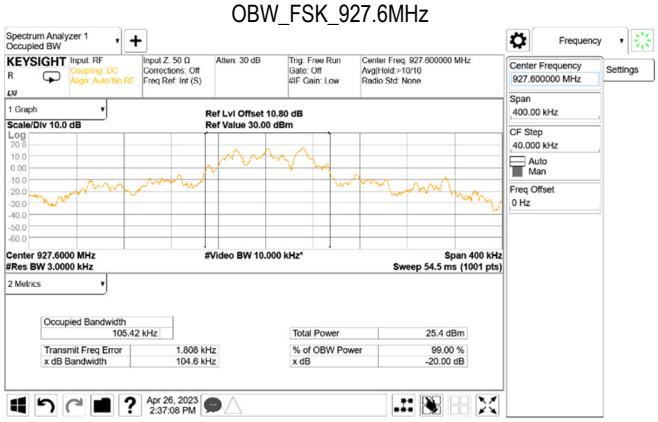
OBW_FSK_902.4MHz



OBW_FSK_915.2MHz



OBW_FSK_927.6MHz

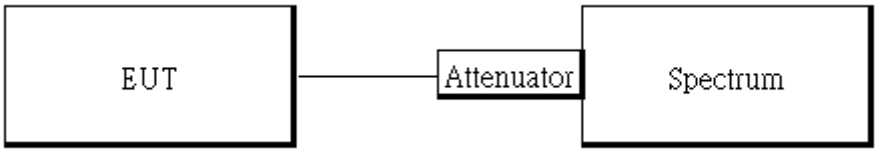


10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

10.2 Test Setup



10.3 Measurement Procedure

Conducted Band Edge:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set center frequency of spectrum analyzer = operating frequency.
5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Sweep = auto
6. Mark Peak and record the max. level.
7. Repeat above procedures until all frequency measured were complete.

Conducted Spurious Emission:

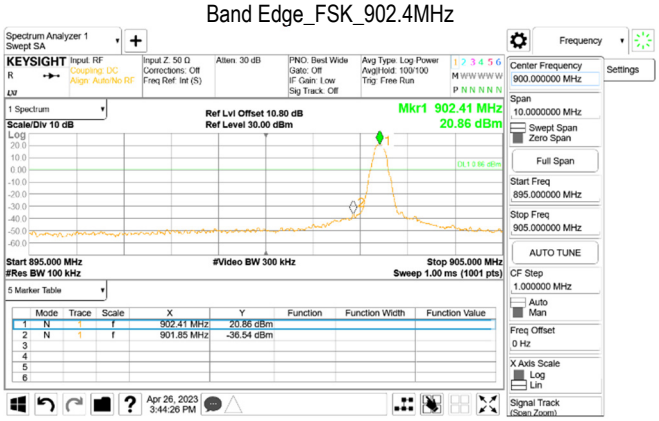
1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows ANSI C63.10:2013.
3. Set RBW = 100 kHz & VBW = 300 kHz, Detector =Peak, Sweep = Auto
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

NOTE: cable loss as 10.80dB that offsets in the spectrum.

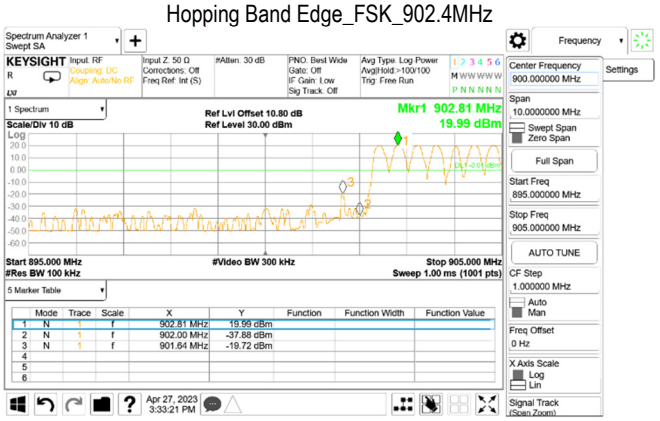
10.4 Measurement Result

See next page for test plots.

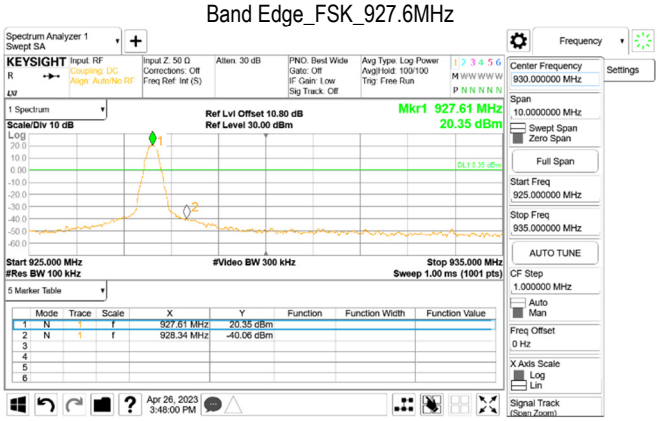
Band Edge_FSK_902.4MHz



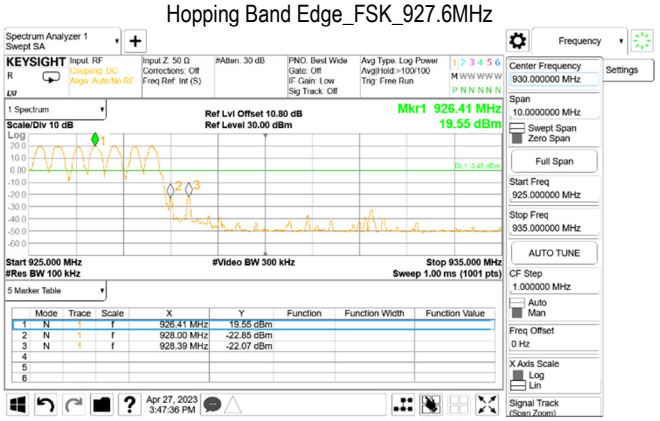
Hopping Band Edge_FSK_902.4MHz



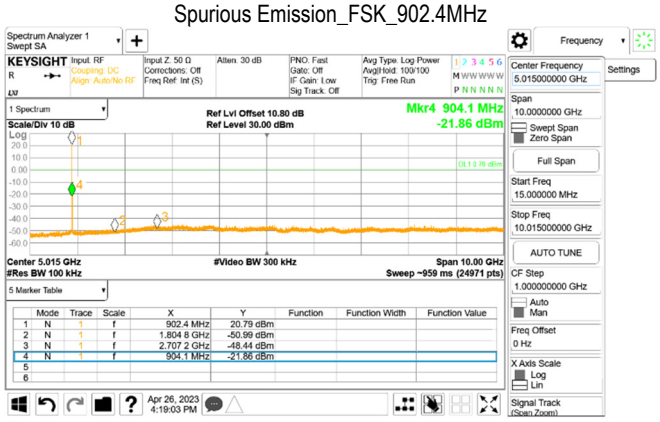
Band Edge_FSK_927.6MHz



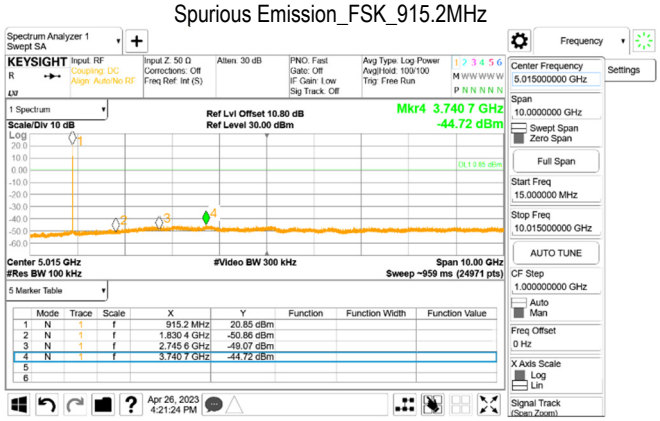
Hopping Band Edge_FSK_927.6MHz



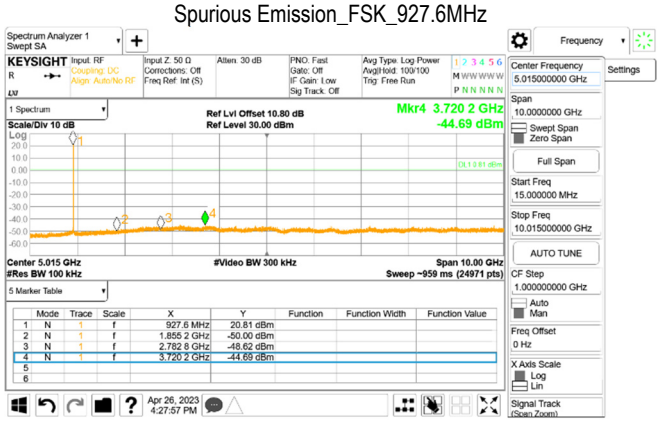
Spurious Emission_FSK_902.4MHz



Spurious Emission_FSK_915.2MHz



Spurious Emission_FSK_927.6MHz



11 SPURIOUS RADIATED EMISSION TEST

11.1 Standard Applicable

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.
And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

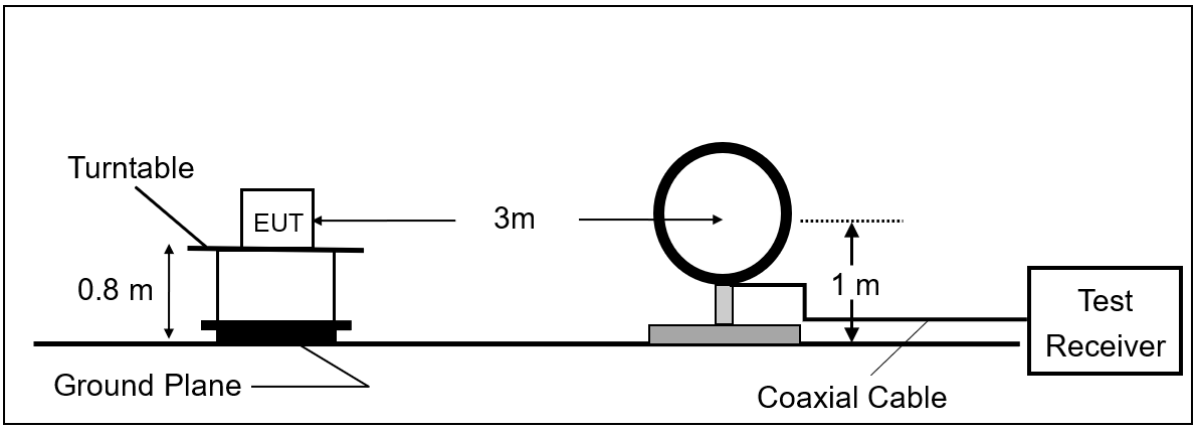
Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

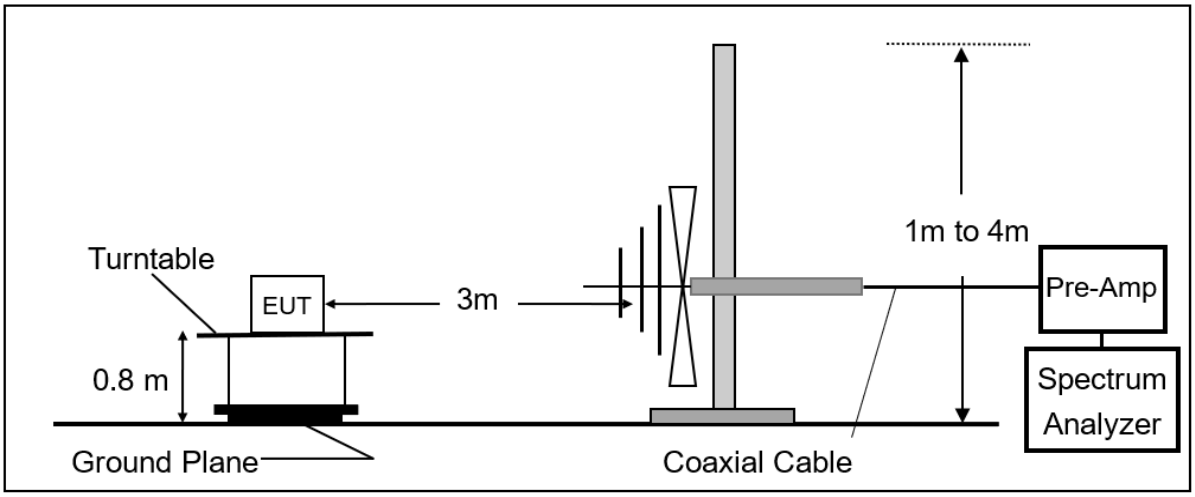
1. The lower limit shall apply at the transition frequencies.

11.2 Test Setup

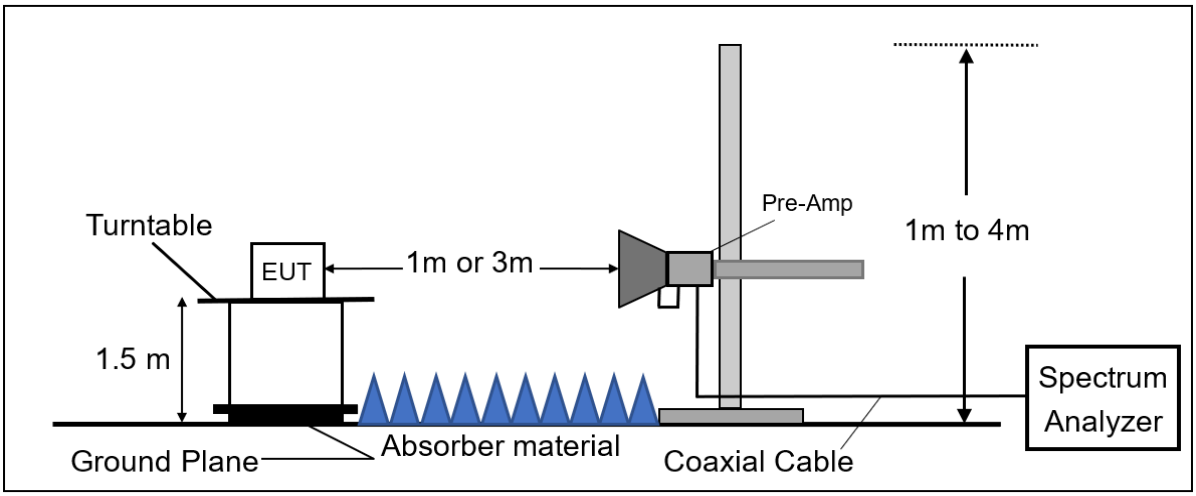
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



(C) Radiated Emission Test Set-Up, Frequency Above 1GHz.



11.3 Measurement Procedure

1. The testing follows the Measurement Procedure of ANSI C63.10:2013.
2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz.
6. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Measurements at frequency above 1 GHz.
8. According to C63.10:2013 Section 7.5 Procedure for determining the average value of pulsed emissions with duty cycle correction factor 20 log (T_{on}/100ms).
9. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
12. Repeat above procedures until all default test channel measured were complete.

11.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

The limit of the emission level is expressed in dBuV/m, which converts 20*log(uV/m)

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

11.5 Test Results of Radiated Spurious Emissions from 9 kHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

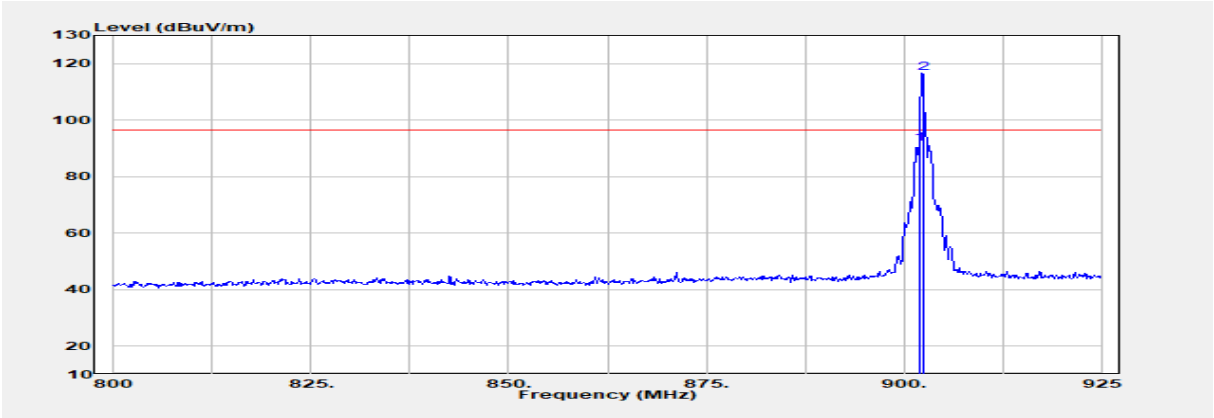
11.6 AVG Duty Cycle Factor calculation

Duty Cycle calculating			
Ton of 100ms=	9.600	msec	
Duty Cycle=9.6ms / 100ms=	0.096		
Duty Cycle correction factor= 20 LOG 0.096=		-20.35	dB

11.7 Measurement Result:

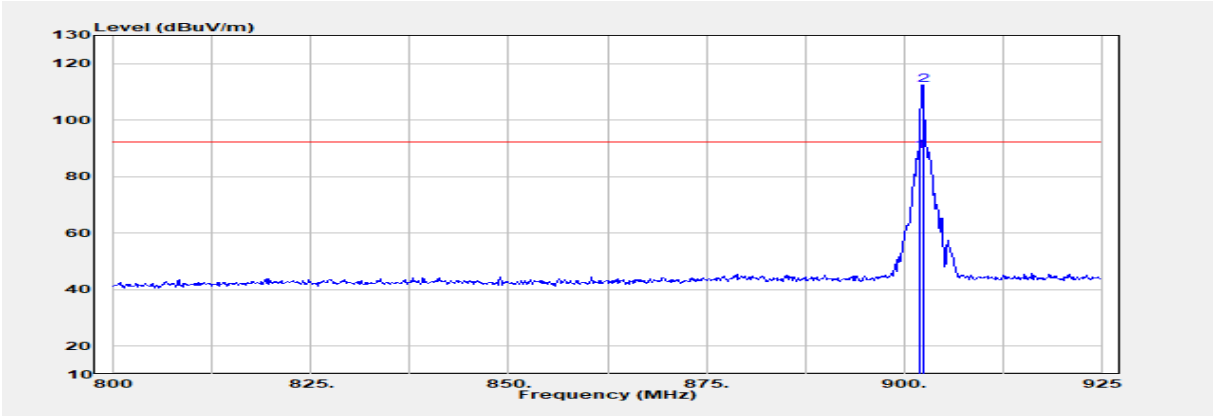
11.7.1 Bandedge Result

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-27
Test Frequency	:902.4 MHz	Temp./Humi.	:20.5/69
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Howard Huang



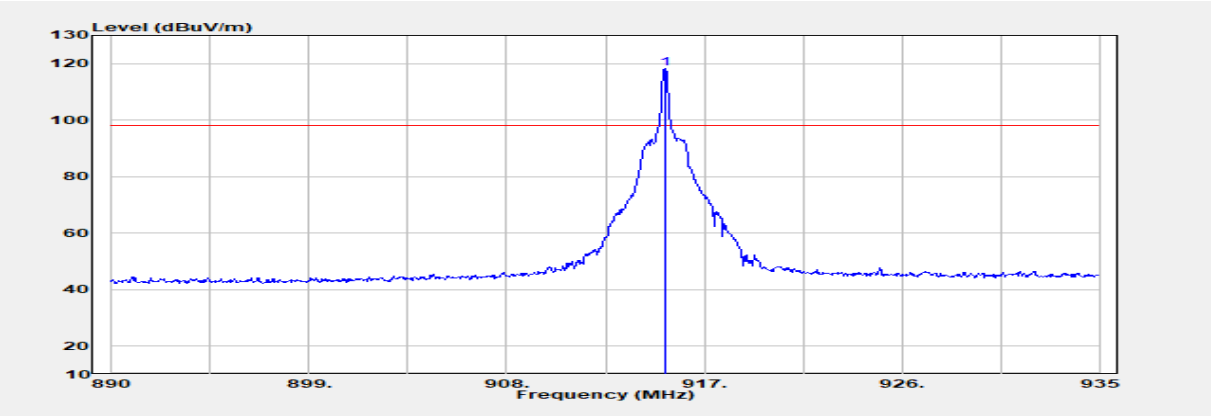
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
902.000	Peak	97.50	-5.82	91.67	96.60	-4.93
902.400	Peak	122.40	-5.81	116.60	96.60	-

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-27
Test Frequency	:902.4 MHz	Temp./Humi.	:20.5/69
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:E2 Plane	Engineer	:Howard Huang



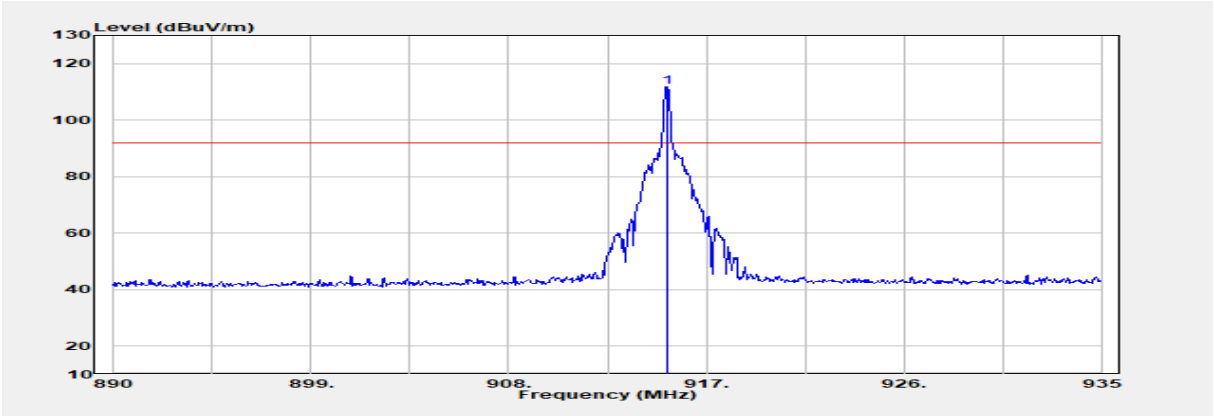
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
902.000	Peak	94.89	-5.82	89.06	92.35	-3.29
902.400	Peak	118.15	-5.81	112.35	92.35	-

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-27
Test Frequency	:915.2 MHz	Temp./Humi.	:20.5/69
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Howard Huang



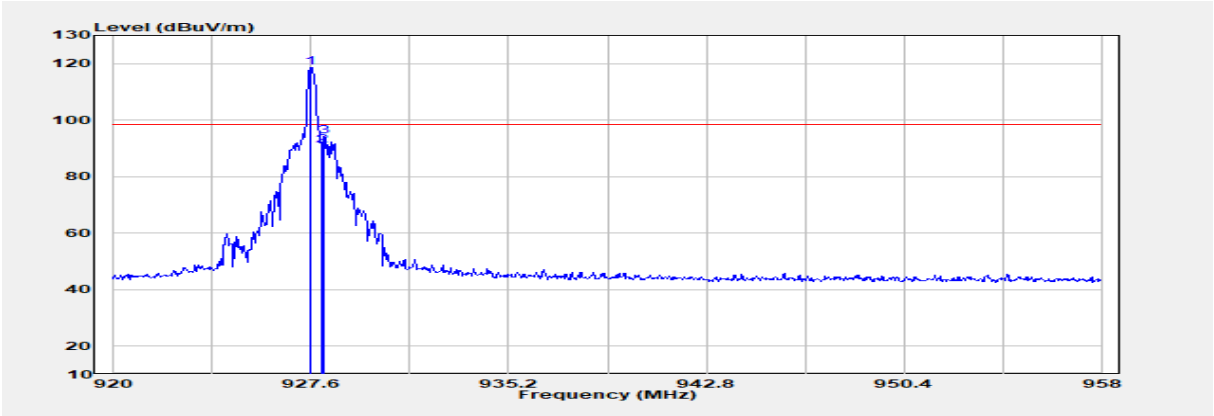
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
915.200	Peak	123.53	-5.31	118.22	98.22	-

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-27
Test Frequency	:915.2 MHz	Temp./Humi.	:20.5/69
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:E2 Plane	Engineer	:Howard Huang



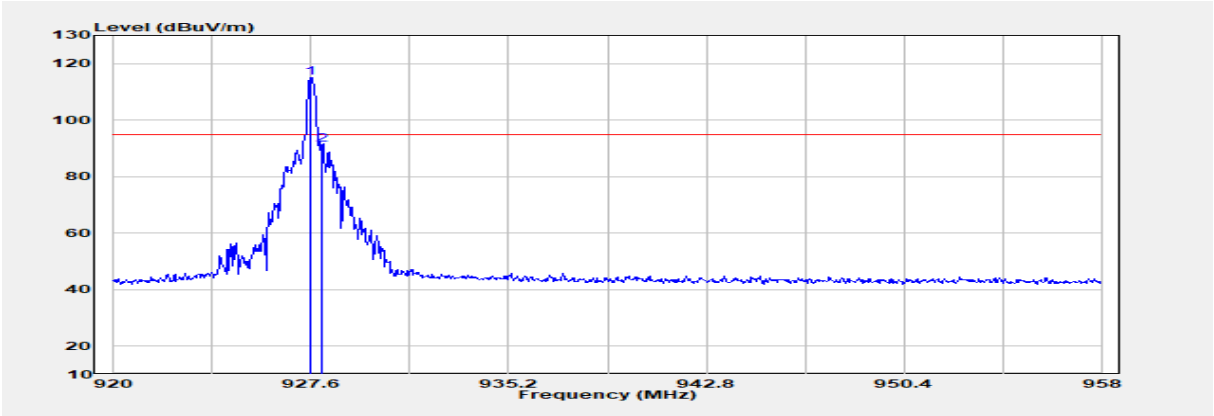
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
915.200	Peak	117.22	-5.31	111.91	91.91	-

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-27
Test Frequency	:927.6 MHz	Temp./Humi.	:20.5/69
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Howard Huang



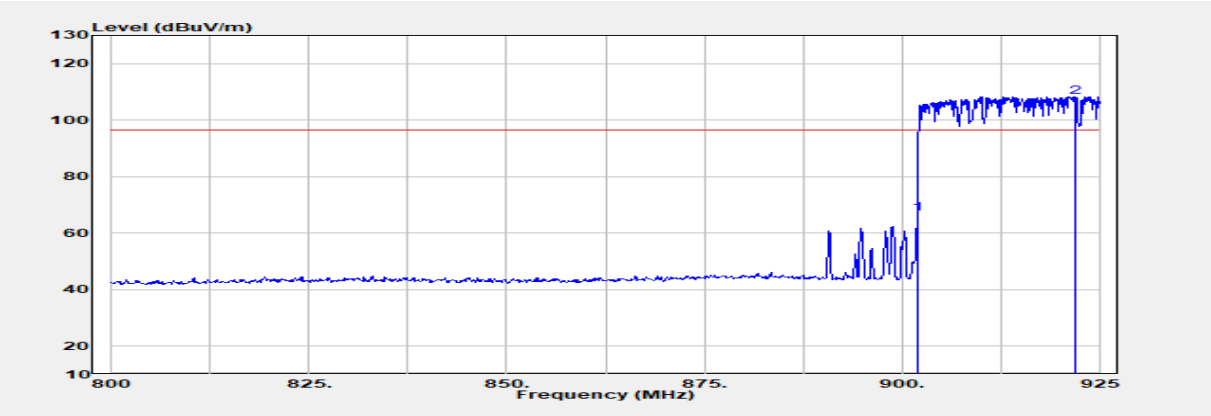
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
927.600	Peak	123.44	-4.86	118.58	98.58	-
928.000	Peak	95.92	-4.86	91.06	98.58	-7.52
928.094	Peak	98.93	-4.86	94.07	98.58	-4.51

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-27
Test Frequency	:927.6 MHz	Temp./Humi.	:20.5/69
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:E2 Plane	Engineer	:Howard Huang



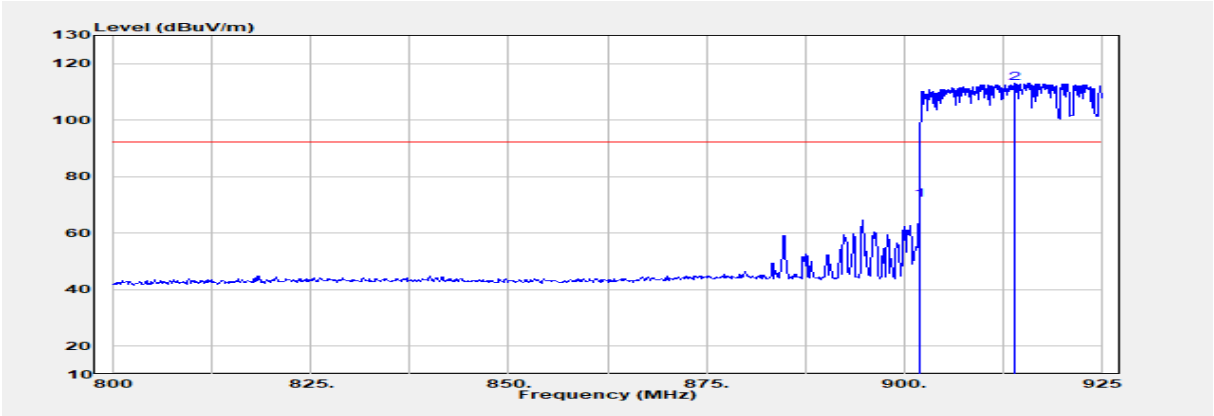
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
927.600	Peak	119.86	-4.86	114.99	94.99	-
928.000	Peak	96.15	-4.86	91.30	94.99	-3.69

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-27
Test Frequency	:902.4 MHz	Temp./Humi.	:20.5/69
Test Mode	:Bandedge Hopping	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Howard Huang



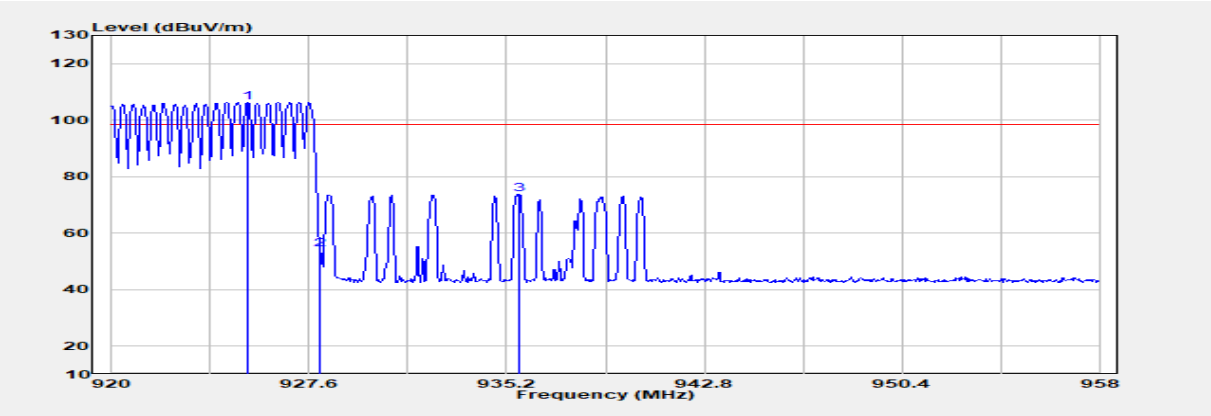
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
902.000	Peak	72.68	-5.82	66.86	88.37	-21.51
922.000	Peak	113.42	-5.06	108.37	88.37	-

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-27
Test Frequency	:902.4 MHz	Temp./Humi.	:20.5/69
Test Mode	:Bandedge Hopping	Antenna Pol.	:Horizontal
EUT Pol	:E2 Plane	Engineer	:Howard Huang



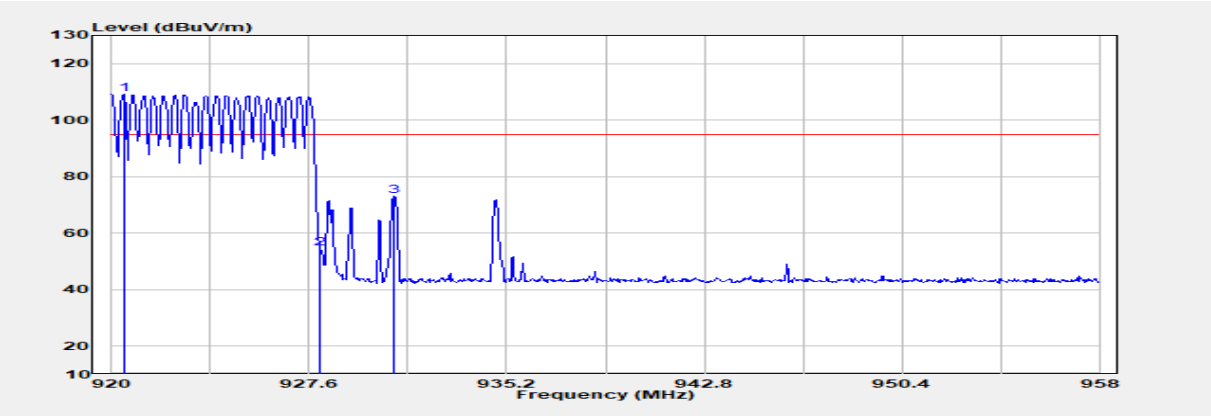
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
902.000	Peak	77.60	-5.82	71.78	93.19	-21.41
914.125	Peak	118.54	-5.36	113.19	93.19	-

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-27
Test Frequency	:927.6 MHz	Temp./Humi.	:20.5/69
Test Mode	:Bandedge Hopping	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Howard Huang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
925.244	Peak	111.28	-4.88	106.40	86.40	-
928.000	Peak	59.07	-4.86	54.21	86.40	-32.19
935.694	Peak	78.22	-4.45	73.76	86.40	-12.64

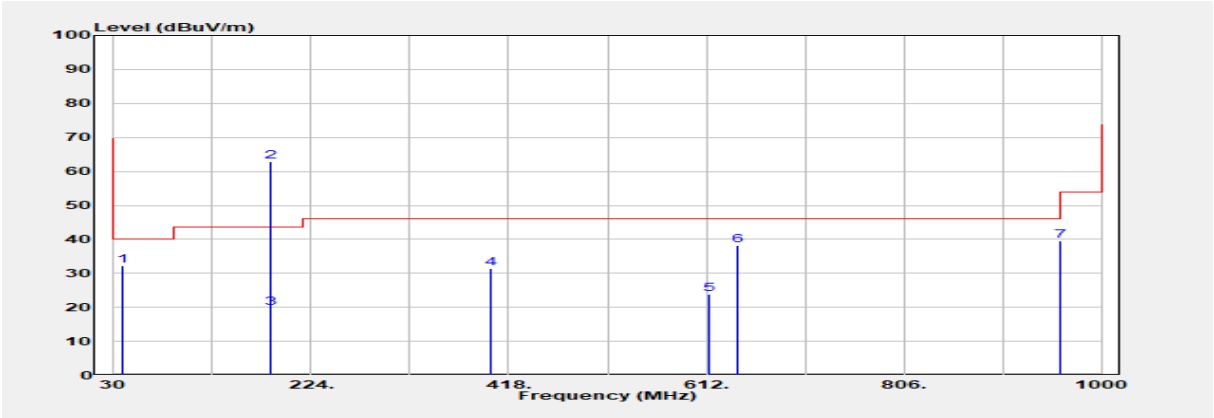
Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-27
Test Frequency	:927.6 MHz	Temp./Humi.	:20.5/69
Test Mode	:Bandedge Hopping	Antenna Pol.	:Horizontal
EUT Pol	:E2 Plane	Engineer	:Howard Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
920.456	Peak	114.19	-5.15	109.05	89.05	-
928.000	Peak	59.44	-4.86	54.58	89.05	-34.47
930.868	Peak	77.72	-4.77	72.95	89.05	-16.10

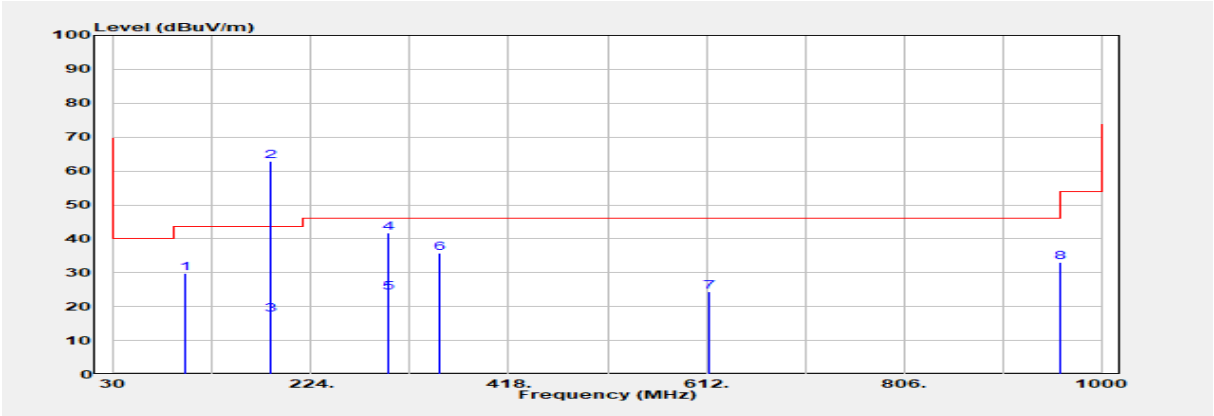
11.7.2 Radiated Spurious Emission

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:FSK	Test Date	:2023-04-26
Test Frequency	:915.2 MHz	Temp./Humi.	:24.2/60
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Howard Huang



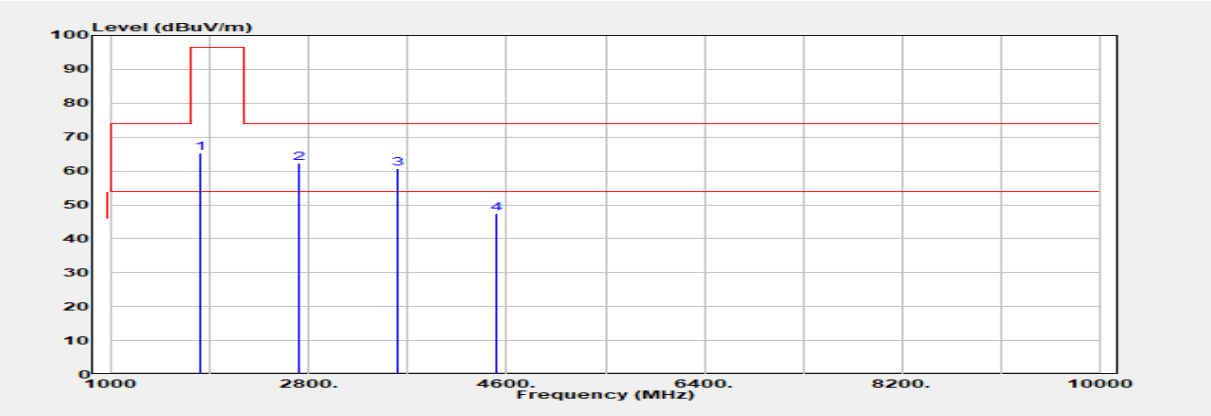
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
37.760	Peak	51.05	-18.82	32.23	40.00	-7.77
184.230	Peak	81.42	-18.52	62.90	43.50	-
184.230	QP	38.40	-18.52	19.88	43.50	-23.62
399.570	Peak	45.11	-13.65	31.47	46.00	-14.53
614.000	Peak	32.63	-8.73	23.90	46.00	-22.10
642.070	Peak	47.03	-8.84	38.20	46.00	-7.80
960.000	Peak	43.91	-4.43	39.49	46.00	-6.51

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:FSK	Test Date	:2023-04-26
Test Frequency	:915.2 MHz	Temp./Humi.	:24.2/60
Test Mode	:Tx	Antenna Pol.	:Horizontal
EUT Pol	:E2 Plane	Engineer	:Howard Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
99.840	Peak	51.25	-21.44	29.81	43.50	-13.69
184.230	Peak	81.49	-18.52	62.97	43.50	-
184.230	QP	36.20	-18.52	17.68	43.50	-25.82
299.660	Peak	57.93	-16.16	41.77	46.00	-
299.660	QP	40.40	-16.16	24.24	46.00	-21.76
350.100	Peak	50.60	-14.94	35.65	46.00	-10.35
614.000	Peak	33.20	-8.73	24.47	46.00	-21.53
960.000	Peak	37.50	-4.43	33.08	46.00	-12.92

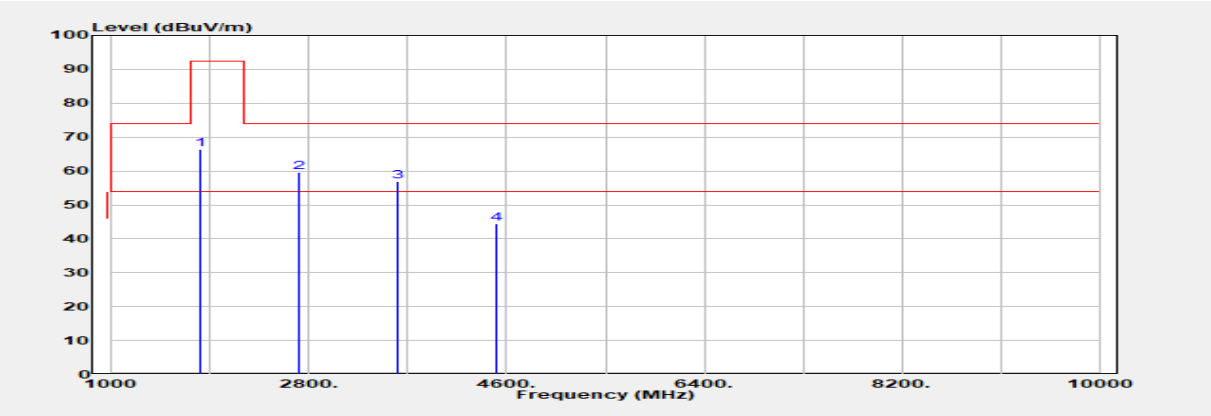
Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-26
Test Frequency	:902.4 MHz	Temp./Humi.	:24.2/60
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Howard Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1804.800	Peak	75.13	-9.72	65.42	96.60	-31.18
2707.200	Peak	68.88	-6.49	62.38	74.00	-11.62
3609.600	Peak	65.22	-4.54	60.67	74.00	-13.33
4512.000	Peak	50.12	-2.66	47.45	74.00	-26.55

Freq. MHz	Detector Mode AV	Peak Actual FS (dBµV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2707.200	Average	62.38	-20.35	42.03	54.00	-11.97
3609.600	Average	60.67	-20.35	40.32	54.00	-13.68
4512.000	Average	47.45	-20.35	27.10	54.00	-26.90

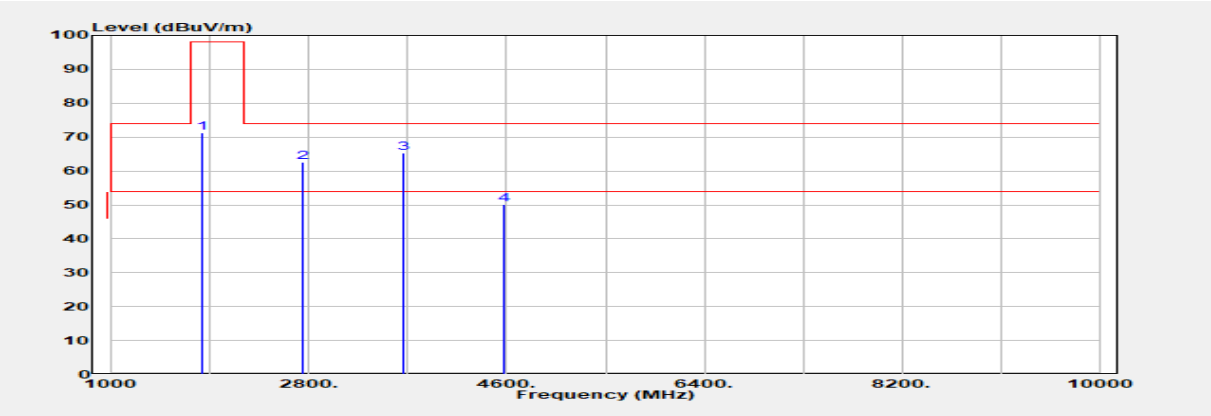
Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-26
Test Frequency	:902.4 MHz	Temp./Humi.	:24.2/60
Test Mode	:Tx	Antenna Pol.	:Horizontal
EUT Pol	:E2 Plane	Engineer	:Howard Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1804.800	Peak	76.04	-9.72	66.33	92.35	-26.02
2707.200	Peak	66.04	-6.49	59.55	74.00	-14.45
3609.600	Peak	61.33	-4.54	56.79	74.00	-17.21
4512.000	Peak	47.09	-2.66	44.43	74.00	-29.57

Freq. MHz	Detector Mode AV	Peak Actual FS (dBµV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2707.200	Average	59.55	-20.35	39.20	54.00	-14.80
3609.600	Average	56.79	-20.35	36.44	54.00	-17.56
4512.000	Average	44.43	-20.35	24.08	54.00	-29.92

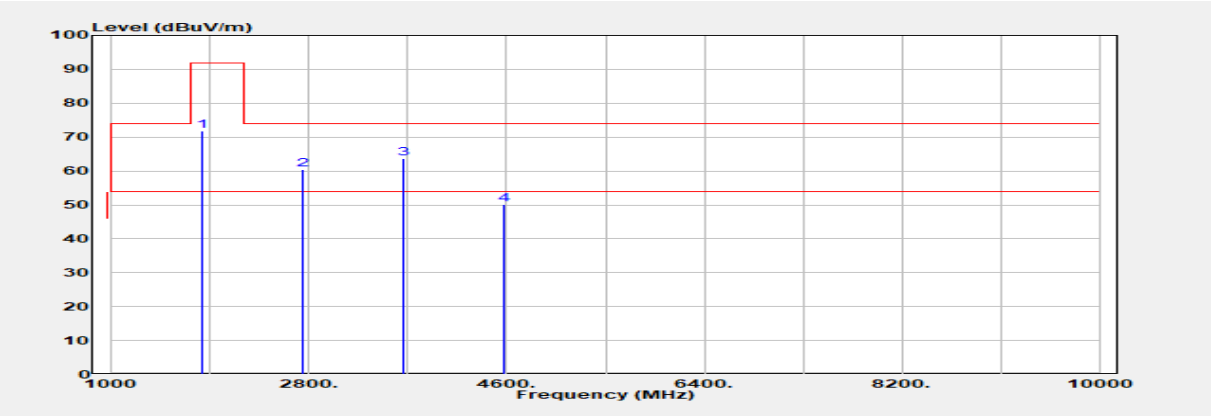
Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-26
Test Frequency	:915.2 MHz	Temp./Humi.	:24.2/60
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Howard Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1830.400	Peak	80.74	-9.55	71.19	98.22	-27.03
2745.600	Peak	68.93	-6.31	62.62	74.00	-11.38
3660.800	Peak	69.78	-4.60	65.18	74.00	-8.82
4576.000	Peak	52.53	-2.27	50.25	74.00	-23.75

Freq. MHz	Detector Mode AV	Peak Actual FS (dBµV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2745.600	Average	62.62	-20.35	42.27	54.00	-11.73
3660.800	Average	65.18	-20.35	44.83	54.00	-9.17
4576.000	Average	50.25	-20.35	29.90	54.00	-24.10

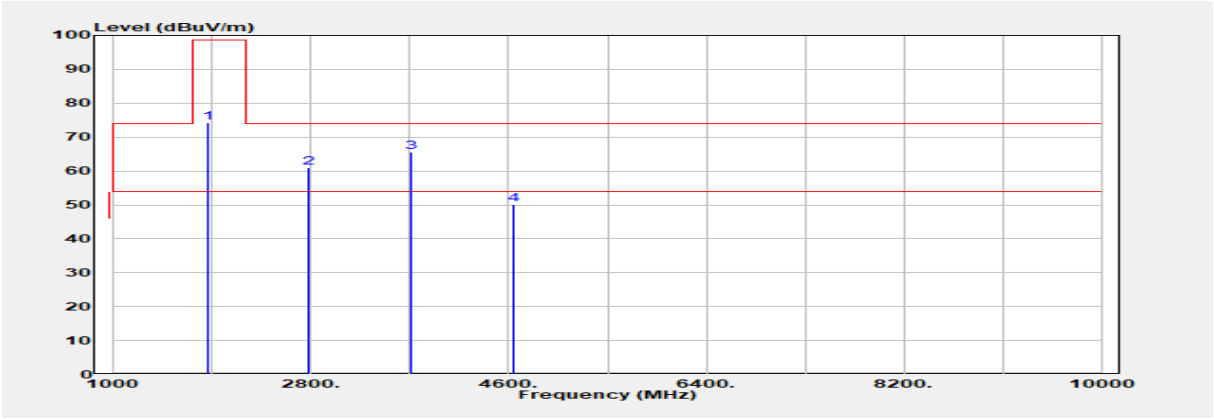
Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-26
Test Frequency	:915.2 MHz	Temp./Humi.	:24.2/60
Test Mode	:Tx	Antenna Pol.	:Horizontal
EUT Pol	:E2 Plane	Engineer	:Howard Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1830.400	Peak	81.26	-9.55	71.70	91.91	-20.21
2745.600	Peak	66.65	-6.31	60.34	74.00	-13.66
3660.800	Peak	68.18	-4.60	63.57	74.00	-10.43
4576.000	Peak	52.34	-2.27	50.07	74.00	-23.93

Freq. MHz	Detector Mode AV	Peak Actual FS (dBµV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2745.600	Average	60.34	-20.35	39.99	54.00	-14.01
3660.800	Average	63.57	-20.35	43.22	54.00	-10.78
4576.000	Average	50.07	-20.35	29.72	54.00	-24.28

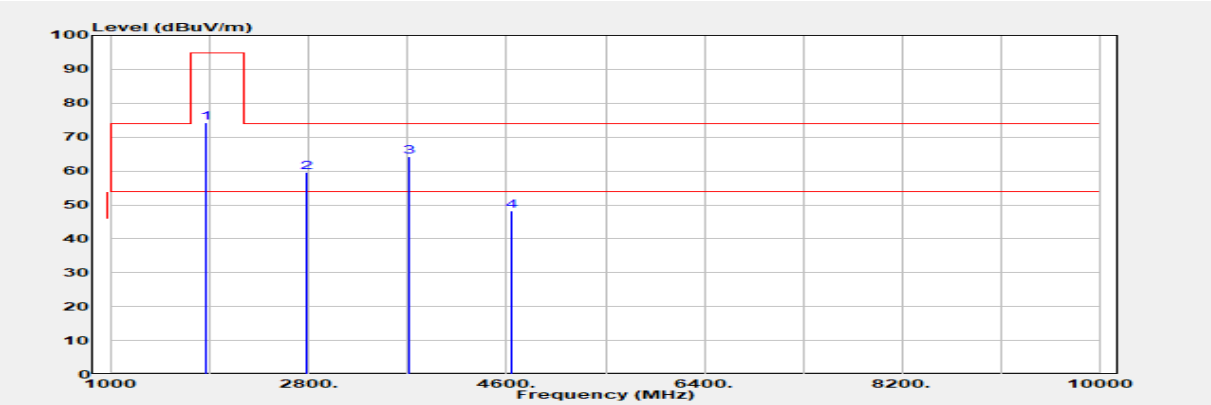
Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-26
Test Frequency	:927.6 MHz	Temp./Humi.	:24.2/60
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Howard Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1855.200	Peak	83.79	-9.43	74.37	98.58	-24.21
2782.800	Peak	67.29	-6.33	60.96	74.00	-13.04
3710.400	Peak	69.91	-4.39	65.52	74.00	-8.48
4638.000	Peak	52.43	-2.28	50.16	74.00	-23.84

Freq. MHz	Detector Mode AV	Peak Actual FS (dBµV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2782.800	Average	60.96	-20.35	40.61	54.00	-13.39
3710.400	Average	65.52	-20.35	45.17	54.00	-8.83
4638.000	Average	50.16	-20.35	29.81	54.00	-24.19

Report Number	:TERF2304001072E2	Test Site	:SAC D
Operation Mode	:900M FSK	Test Date	:2023-04-26
Test Frequency	:927.6 MHz	Temp./Humi.	:24.2/60
Test Mode	:Tx	Antenna Pol.	:Horizontal
EUT Pol	:E2 Plane	Engineer	:Howard Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1855.200	Peak	83.68	-9.43	74.25	94.90	-20.65
2782.800	Peak	66.06	-6.33	59.72	74.00	-14.28
3710.400	Peak	68.68	-4.39	64.29	74.00	-9.71
4638.000	Peak	50.38	-2.28	48.10	74.00	-25.90

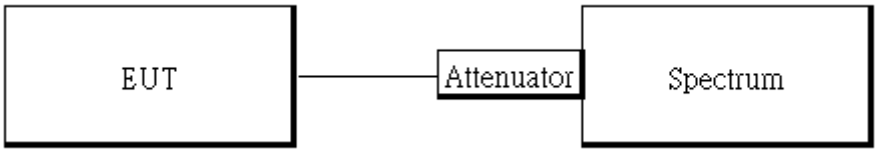
Freq. MHz	Detector Mode AV	Peak Actual FS (dBµV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2782.800	Average	59.72	-20.35	39.37	54.00	-14.63
3710.400	Average	64.29	-20.35	43.94	54.00	-10.06
4638.000	Average	48.10	-20.35	27.75	54.00	-26.25

12 FREQUENCY SEPARATION

12.1 Standard Applicable

Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25 kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

12.2 Test Setup



12.3 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set center frequency of spectrum analyzer = middle of hopping channel.
5. Set the spectrum analyzer as RBW, VBW=100 kHz, Adjust Span to 1.5MHz, Sweep = auto.
6. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

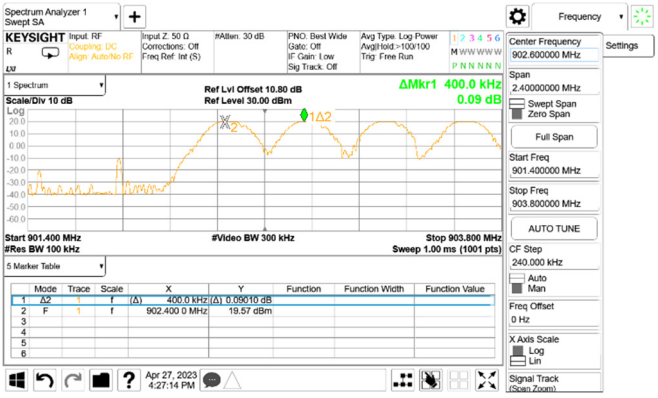
12.4 Measurement Result:

Channel separation (MHz)	Limit	Result
1	>=25 kHz or 20dB bandwidth	PASS

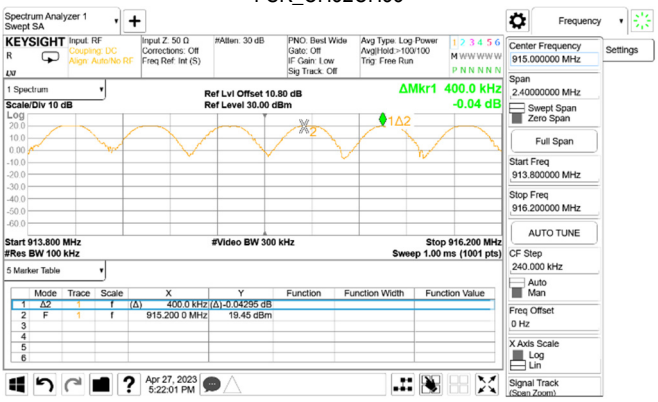
Note: Refer to next page for plots.

12.5 Frequency Separation Test Data

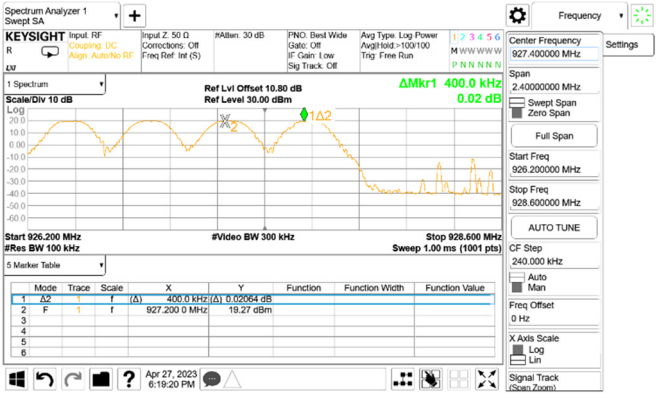
FSK_CH1CH2



FSK_CH32CH33



FSK_CH63CH64

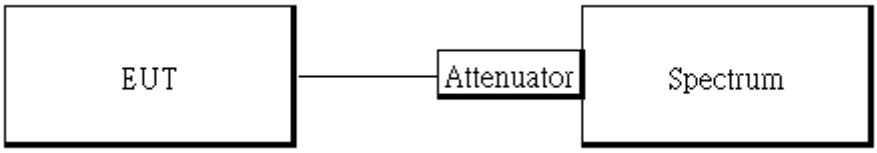


13 NUMBER OF HOPPING FREQUENCY

13.1 Standard Applicable

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.

13.2 Test Setup

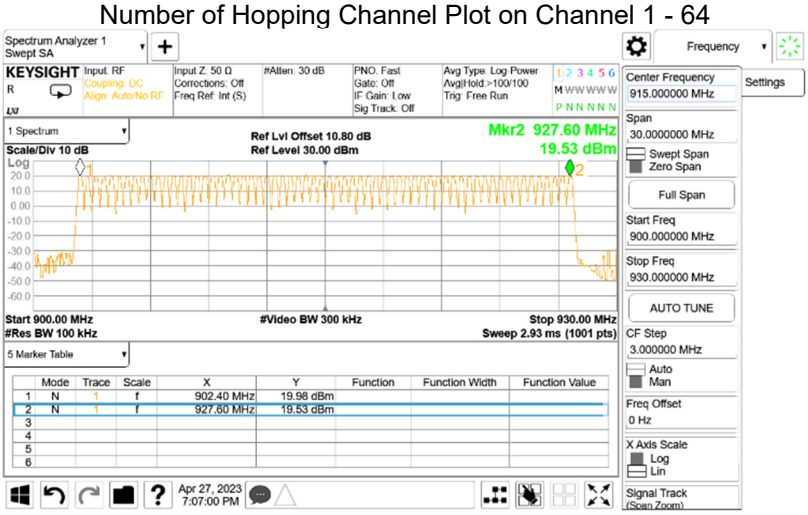


13.3 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set spectrum analyzer Start= 900MHz, Stop = 930MHz, Sweep = auto.
5. Set the spectrum analyzer as RBW< 30% Freq. spacing or the 20 dB bandwidth, whichever is smaller, VBW ≥ RBW, Detector = Peak
6. Max hold, view and count how many channel in the band.

13.4 Measurement Result:

Number of Hopping Channel Plot on Channel 1 - 64

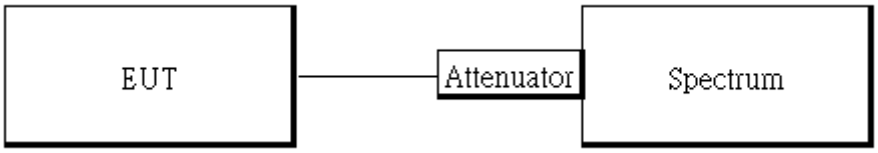


14 TIME OF OCCUPANCY (DWELL TIME)

14.1 Standard Applicable

Frequency hopping systems operating in the 902MHz-928MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within a period of 25.6 seconds.

14.2 Test Setup



14.3 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set center frequency of spectrum analyzer = operating frequency.
5. Set the spectrum analyzer as RBW, VBW=100kHz, 300kHz, Span = 0Hz, Detector = Peak, Adjust Sweep = 50ms.
6. Repeat above procedures until all frequency of the interest measured were complete.

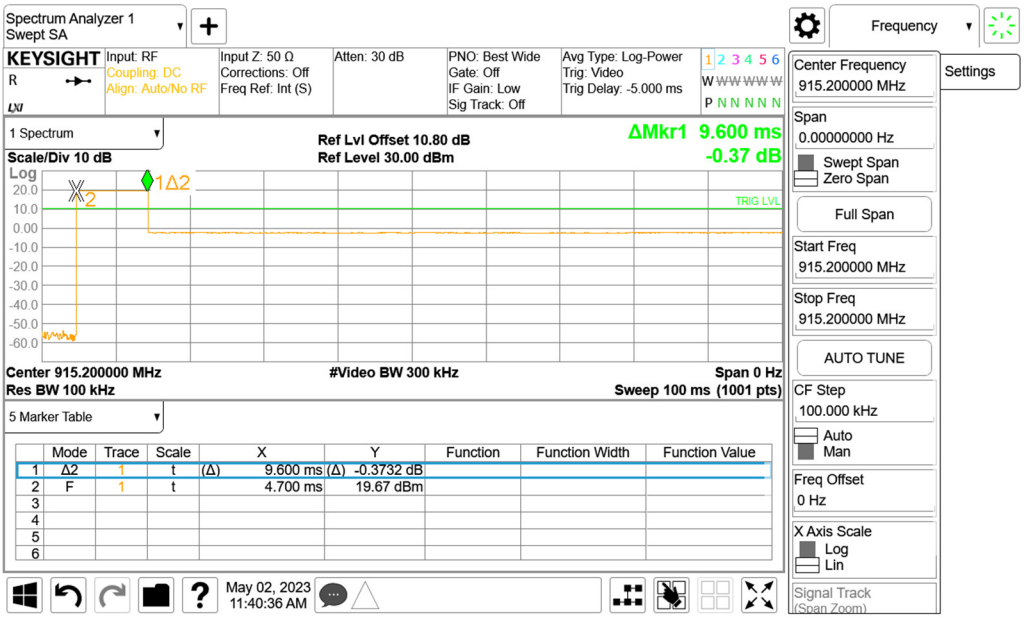
14.4 Tabular Result of the Measurement:

Number of transmission in a 25.6s	Length of transmission time (ms):	Measurement Result (ms):	Limit (ms):
1	9.6	9.6	400

14.5 Measurement Result:

Number of transmission in a 25.6s

Length of transmission time



15 ANTENNA REQUIREMENT

15.1 Standard Applicable

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

15.2 Antenna Connected Construction

The antenna complies with this requirement and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~