

FCC RF Test Report

APPLICANT	: Ring LLC
EQUIPMENT	: Test Kit
BRAND NAME	: ring
MODEL NAME	: 5UM3E5
FCC ID	: 2AEUP-BHAGF001
STANDARD	: FCC Part 15 Subpart C §15.247
CLASSIFICATION	: (DSS) Spread Spectrum Transmitter
TEST DATE(S)	: Nov. 03, 2020 ~ Mar. 23, 2022

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

JasonJia

Reviewed by: Jason Jia / Supervisor

Aceswany

Approved by: Alex Wang / Manager



Sporton International Inc. (Kunshan) No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China



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AP	PEND	X A. CONDUCTED TEST RESULTS	
AP	PEND	X B. AC CONDUCTED EMISSION TEST RESULT	
AP	PEND	X C. RADIATED SPURIOUS EMISSION	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR151806C	Rev. 01	Initial issue of report	May 16, 2022



Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)(i)	Number of Channels	≥ 50Chs	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	≥ 20dB Bandwidth	Pass	-
3.3	15.247(a)(1)(i)	Dwell Time of Each Channel	≤ 0.4sec in 20sec period	Pass	-
3.4	15.247(a)(1)(i)	20dB Bandwidth	≤ 500 kHz	Pass	-
3.4	-	99% Bandwidth	-	Pass	-
3.5	15.247(b)(2)	Peak Output Power	≤ 1 W	Pass	-
3.6	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	≤ 20dBc	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 5.29 dB at 2483.500 MHz
3.9	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 10.27 dB at 0.442 MHz
3.10	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



1 General Description

1.1 Applicant

Ring LLC

1523 26th Street, Santa Monica CA 90404, USA

1.2 Product Feature of Equipment Under Test

Product Feature			
Equipment Test Kit			
Brand Name	ring		
Model Name	5UM3E5		
FCC ID	2AEUP-BHAGF001		
	Bluetooth LE		
	LoRa		
EUT supports Radios application	FSK		
	GPS		
	WIFI sniffing		
HW Version	D-SS-A35-01A-A-V2.2		
SW Version	nordic-diagnostics-images-1.2.0.5		
EUT Stage	Identical Prototype		

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.3 Product Specification of Equipment Under Test

Standards-related Product Specification			
Tx/Rx Frequency Range	902 MHz ~ 928 MHz		
Number of Channels	129		
Bandwidth / Spreading Factor	125kHz / 7, 8, 9, 10		
	SF7 : 26.73 dBm (0.4710 W)		
Maximum Output Power to Antenna	SF8 : 26.63 dBm (0.4603 W)		
Maximum Output Fower to Antenna	SF9 : 26.65 dBm (0.4624 W)		
	SF10 : 26.71 dBm (0.4688 W)		
	SF7 : 0.130MHz		
99% Occupied Bandwidth	SF8 : 0.132MHz		
	SF9 : 0.131MHz		
	SF10 : 0.132MHz		
Antenna Type / Gain	IFA stamping Antenna with gain -1.20 dBi		
Type of Modulation LoRa-FHSS			



1.4 Modification of EUT

No modifications are made to the EUT during all test items.

1.5 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)			
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958			
	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.	
Test Site No.	CO01-KS 03CH04-KS 03CH06-KS TH01-KS	CN1257	314309	

1.6 Test Software

ltem	Site	Manufacture	Name	Version
1.	03CH04-KS	AUDIX	E3	6.2009-8-24a
2.	03CH06-KS	AUDIX	E3	6.2009-8-24al
3.	CO01-KS	AUDIX	E3	6.2009-8-24

1.7 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.



2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
	1	902.2	44	910.8	87	919.4
	2	902.4	45	911	88	919.6
	3	902.6	46	911.2	89	919.8
	4	902.8	47	911.4	90	920
	5	903	48	911.6	91	920.2
	6	903.2	49	911.8	92	920.4
	7	903.4	50	912	93	920.6
	8	903.6	51	912.2	94	920.8
	9	903.8	52	912.4	95	921
	10	904	53	912.6	96	921.2
	11	904.2	54	912.8	97	921.4
	12	904.4	55	913	98	921.6
	13	904.6	56	913.2	99	921.8
	14	904.8	57	913.4	100	922
	15	905	58	913.6	101	922.2
	16	905.2	59	913.8	102	922.4
	17	905.4	60	914	103	922.6
	18	905.6	61	914.2	104	922.8
	19	905.8	62	914.4	105	923
	20	906	63	914.6	106	923.2
	21	906.2	64	914.8	107	923.4
902-928 MHz	22	906.4	65	915	108	923.6
	23	906.6	66	915.2	109	923.8
	24	906.8	67	915.4	110	924
	25	907	68	915.6	111	924.2
	26	907.2	69	915.8	112	924.4
	27	907.4	70	916	113	924.6
	28	907.6	71	916.2	114	924.8
	29	907.8	72	916.4	115	925
	30	908	73	916.6	116	925.2
	31	908.2	74	916.8	117	925.4
	32	908.4	75	917	118	925.6
	33	908.6	76	917.2	119	925.8
	34	908.8	77	917.4	120	926
	35	909	78	917.6	121	926.2
	36	909.2	79	917.8	122	926.4
	37	909.4	80	918	123	926.6
	38	909.6	81	918.2	124	926.8
	39	909.8	82	918.4	125	927
	40	910	83	918.6	126	927.2
	41	910.2	84	918.8	127	927.4
	42	910.4	85	919	128	927.6
	43	910.6	86	919.2	129	927.8

Note: The above EUT's information was declared by manufacturer.



2.2 Test Mode

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower) For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report,
- b. AC power line Conducted Emission was tested under maximum output power.

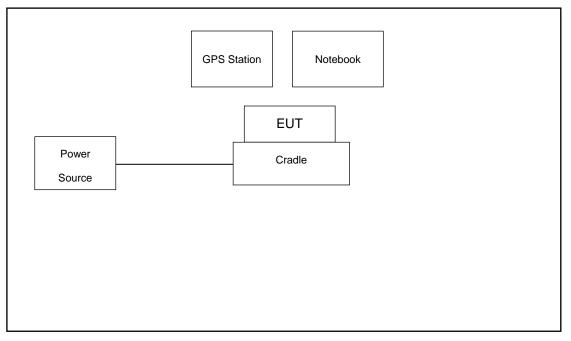
The following summary table is showing all test modes to domenstrate in a	ompliance with the standard
The following summary table is showing all test modes to demonstrate in c	ompliance with the standard.

Summary table of Test Cases						
Test Item	Modulation / Spreading Factor					
lest item	LoRa FHSS / SF7	LoRa FHSS / SF9	LoRa FHSS / SF10			
	Mode 1: CH1_902.2 MHz	Mode 4: CH1_902.2 MHz	Mode 7: CH1_902.2 MHz			
	Mode 2: CH65_915 MHz	Mode 5: CH65_915 MHz	Mode 8: CH65_915 MHz			
Conducted	Mode 3: CH129_927.8 MHz	Mode 6: CH129_927.8 MHz	Mode 9: CH129_927.8 MHz			
Test Cases	LoRa FHSS / SF8					
Test Cases	Mode 10: CH1_902.2 MHz					
	Mode 11: CH65_915 MHz					
	Mode 12: CH129_927.8 MHz					
	LoRa FHSS / SF7	LoRa FHSS / SF9	LoRa FHSS / SF10			
	Mode 1: CH1_902.2 MHz	Mode 4: CH1_902.2 MHz	Mode 7: CH1_902.2 MHz			
	Mode 2: CH65_915 MHz	Mode 5: CH65_915 MHz	Mode 8: CH65_915 MHz			
Radiated	Mode 3: CH129_927.8 MHz	Mode 6: CH129_927.8 MHz	Mode 9: CH129_927.8 MHz			
Test Cases	LoRa FHSS / SF8					
	Mode 10: CH1_902.2 MHz					
	Mode 11: CH65_915 MHz					
	Mode 12: CH129_927.8 MHz					
AC	AC					
Conducted	Mode 1 : Lora Tx + Bluetooth Tx + GPS RX + Cradle + Charging from Adapter					
Emission						
Co-location	Mode 1: Bluetooth Tx CH39_2480 MHz + LoRa FHSS SF8 Tx_915 MHz					



2.3 Connection Diagram of Test System

For Conducted Emission:



For Radiated Emission:





ltem	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	GPS Station	RACELOGIC	RLLS03-2RP	N/A	N/A	Unshielded, 1.8m
2.	Adapter	chenyang	C-P56	N/A	N/A	N/A
3.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m

2.4 Support Unit used in test configuration and system

2.5 EUT Operation Test Setup

For LoRa FHSS function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

2.6 Measurement Results Explanation Example

For all conducted test items:

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

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.5 dB and 10dB attenuator.

 $Offset(dB) = RF \ cable \ loss(dB) + attenuator \ factor(dB).$ = 4.5 + 10 = 14.5 (dB)



3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

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

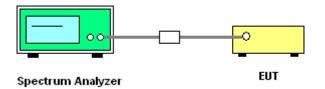
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedure

- 1. The testing follows ANSI C63.10-2013 clause 7.8.3.
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Enable the EUT hopping function.
- Use the following spectrum analyzer settings: Span = the frequency band of operation;
 RBW = 50kHz; VBW = 100KHz; Sweep = auto; Detector function = peak; Trace = max hold.
- 6. The number of hopping frequency used is defined as the number of total channel.
- 7. Record the measurement data derived from spectrum analyzer.

3.1.4 Test Setup



3.1.5 Test Result of Number of Hopping Frequency

Please refer to Appendix A.



SF7:

Number of Hopping Channel Plot on Channel 1 - 129

Ref Level Att		Offset	14.50 dB 😑	RBW 50 VBW 100	IkHz Mode	e Auto FFT			
1Pk Max	30 ut		1 1115	VDW 100	INN2 MUU	B AULU FFI			
30 dBm									
הההחיי	יקרףיקרר	יריקרואן		ההיהה		իդորդ	הטטעטע	היהיהיה	הקהחקה
20 dBm						1.1			
10 dBm									
0 dBm									
-10 dBm									
10 0.0111									
-20 dBm									
-20 ubiii									
-30 dBm									[
-40 dBm									
-50 dBm									
									Í
-60 dBm									
Start 902.0) MHz		1	69	1 pts			Stop 9	915.0 MHz
) (Measuri	na 💷		

Date: 3.NOV.2020 19:45:48

Spectrum	'n								
Ref Level Att	34.50 dBm 30 dB	Offset SWT	14.50 dB 👄 1 ms 👄	RBW 50 VBW 100		e Auto FFT			
⊖1Pk Max								_	
30 dBm									
20 dBm	010110	Inchat		8 1 - 81 - 1	A C A A T I		1 9 9 9 8 9	a s l o f l i	.
10 dBm									
0 dBm									
-10 dBm									
-20 dBm									
-30 dBm									
-40 dBm									
-50 dBm									
-60 dBm									
Start 915.0) MHz			691	pts		· · · · · · · · · · · · · · · · · · ·	Stop 9	28.0 MHz
						Measuri	ng 🔳		

Date: 3.NOV.2020 19:46:47



SF8:

Number of Hopping Channel Plot on Channel 1 - 129

Spectrum		ectrum 2		Spectru		X	Spectrum 4	4 ⊗]		
Ref Level 35 Att		Offset			50 kHz 100 kHz	Mod	le Auto FFT			
1Pk Max	50 ab	9 341	1 1113 1	1011	100 KHZ	MOU	e Autorri			
30 dBm										
								กกกกก		
20 dBm	0110	LARRAR	0 0 0 0	dila	ากๆก		In Invia		Laklaka	1 1 1 2 2 4
10 dBm				_						
0 dBm					_					-
-10 dBm										+
-20 dBm										
-20 dBm										
-30 dBm										
-40 dBm				_						
-50 dBm										+
-60 dBm									1	+
Start 902.0 M	Hz				691 pts				Stop	915.0 MHz
							Measuri	ng 🔳		<u> </u>

Date: 4.JAN.2022 15:45:47

Spectrum	-	ectrum 2	-	pectrum 3	x s	pectrum -	4 🛛		
Ref Leve Att	35.10 dBm 30 dB	Offset	15.10 dB 👄 1 ms 👄	RBW 50 VBW 100	kHz kHz Mode	Auto FFT			
⊖1Pk Max									
30 dBm									
20 dBm	יורריורי	հոհու	ուսու			ուսուս		ուլուլ	huhh
10 dBm									
0 dBm									
-10 dBm									
-20 dBm									
-30 dBm									
-50 dBm									
-60 dBm									
Start 915.	0 MHz			691	pts			Stop 9	28.0 MHz
][]					Measuri	ng 💵		

Date: 4.JAN.2022 15:47:34



SF9:

Ref Leve Att	1 34.50 dB 30 d	m Offset iB = SWT	14.50 dB e	RBW 50 VBW 100	kHz kHz Mod	e Auto FFT		
1Pk Max						- Auto III		
30 dBm								
	իկիկի	փուրու	իսիսի		Julul	աստո	որդու	իրդիղ
20 dBm								
LO dBm								
) dBm——	<u> </u>							
10 dBm-								
10 UBIII-								
20 dBm—								
30 dBm								
40 dBm								
-50 dBm								
60 dBm								
					<u> </u>			
Start 902.				69.	L pts	Measur	 stop 9	915.0 MHz

Number of Hopping Channel Plot on Channel 1 - 129

Date: 3.NOV.2020 21:29:18

Spectrum	'n								
Ref Level Att	1 34.50 dBm 30 dB	Offset	14.50 dB 👄 1 ms 👄	RBW 50 VBW 100		e Auto FFT			
⊖1Pk Max									
30 dBm									
רריררייו		רהירהין	արտր			היריורוי		որդոր	
20 dBm-									
10 dBm									
0 dBm									
-10 dBm									
-20 dBm									
-30 dBm									
-40 dBm									
-50 dBm									
-60 dBm									
Start 915.	D MHz			691	pts			Stop 9	28.0 MHz
	J					Measuri	ng 🔳		

Date: 3.NOV.2020 21:26:34



SF10:

Ref Leve Att	34.50 dBr	n Offset B = SWT	14.50 dB =	VBW 100	kHz kHz Mode	a Auto FFT		
1Pk Max						Addonn	 	
30 dBm								
20 dBm	וועריוריו		ուստ			ոհուհո	ուլուլ	որուր
LO dBm								
) dBm								
10 dBm—								
20 dBm								
30 dBm								
40 dBm—								
-50 dBm								
-60 dBm								

Number of Hopping Channel Plot on Channel 1 - 129

Date: 3.NOV.2020 22:30:20

Spectrum	'n								
Ref Level Att	1 34.50 dBm 30 dB	Offset	14.50 dB 👄 1 ms 👄	RBW 50 VBW 100		e Auto FFT			
●1Pk Max		_					_	_	
30 dBm									
	עררערה	רריירריין			וריוריו	הירטרה			hulu
20 dBm		•					•		
10 dBm									
0 dBm									
-10 dBm									
-20 dBm									
-30 dBm									
-40 dBm									
-50 dBm									
-60 dBm									
Start 915.	D MHz			691	pts				28.0 MHz
						Measuri	ng 🔳		

Date: 3.NOV.2020 23:02:43



3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

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

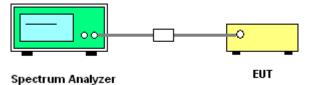
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 7.8.2.
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Enable the EUT hopping function.
- 5. Use the following spectrum analyzer settings:
 Span = wide enough to capture the peaks of two adjacent channels;
 RBW = 50kHz; VBW = 100KHz; Sweep = auto; Detector function = peak; Trace = max hold.
- 6. Measure and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Hopping Channel Separation

Please refer to Appendix A.



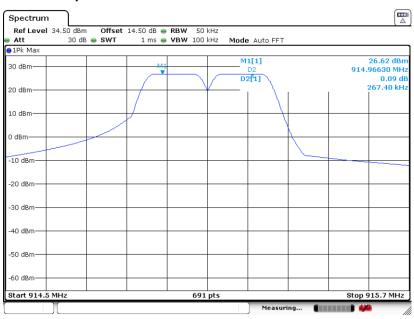


Spectrum Offset 14.50 dB ● RBW 50 kHz SWT 38 µs ● VBW 100 kHz Ref Level 34.50 dBm Mode Auto FFT Att 30 dB ⊖1Pk Max M1[1] 26.87 dBm 30 dBm M 902.17150 MH D2[1] -0.10 dE 272.60 kHz 20 dBm 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBn -60 dBm Stop 902.9 MHz Start 901.7 MHz 691 pt Measuring...

Date: 3.NOV.2020 19:22:29

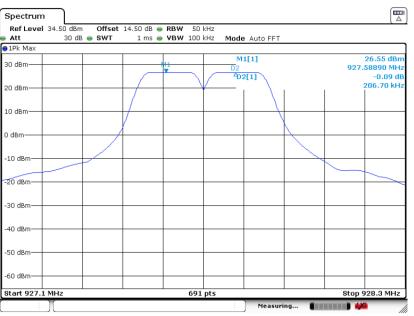
Channel Separation Plot on Channel 64 - 65

Channel Separation Plot on Channel 1 - 2



Date: 3.NOV.2020 20:10:03



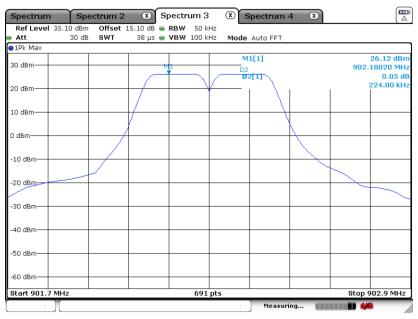


Channel Separation Plot on Channel 128 - 129

Date: 3.NOV.2020 20:39:21

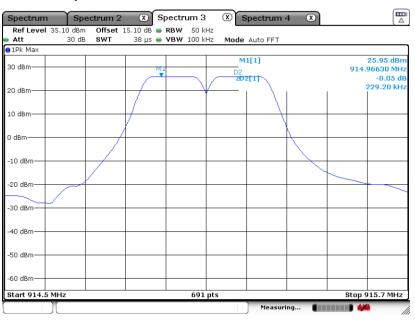
SF8:

Channel Separation Plot on Channel 1 - 2



Date: 4.JAN.2022 14:45:50

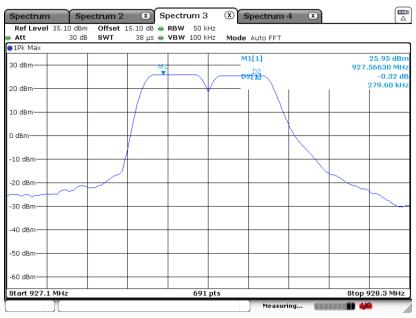




Channel Separation Plot on Channel 64 - 65

Date: 4.JAN.2022 14:52:04

Channel Separation Plot on Channel 128 - 129

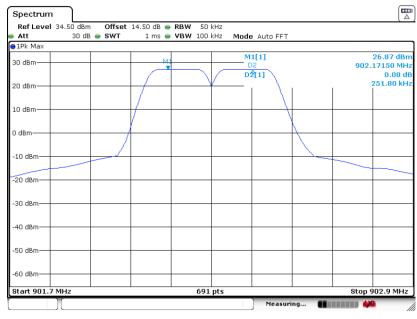


Date: 4.JAN.2022 15:00:47





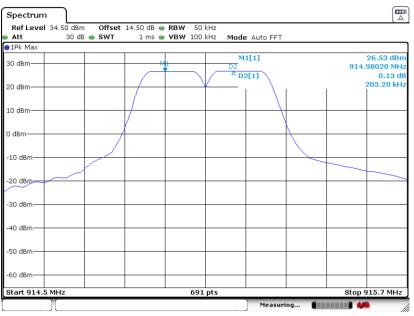
SF9:



Channel Separation Plot on Channel 1 - 2

Date: 3.NOV.2020 22:03:02

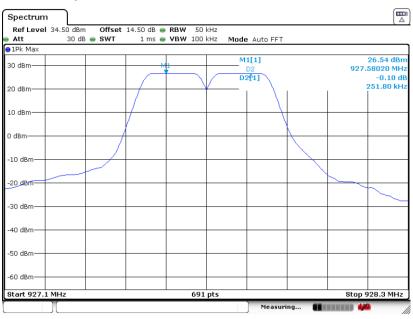




Channel Separation Plot on Channel 64 - 65

Date: 3.NOV.2020 21:34:34

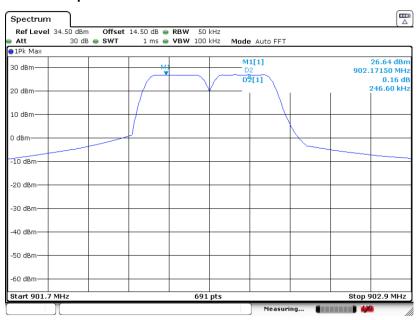
Channel Separation Plot on Channel 128 - 129



Date: 3.NOV.2020 21:38:26



SF10:



Channel Separation Plot on Channel 1 - 2

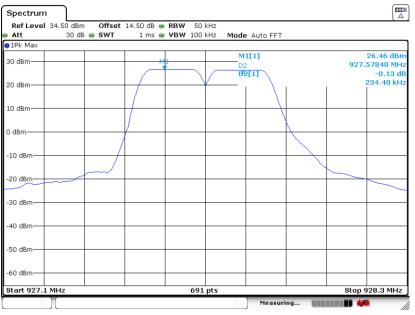
Date: 3.NOV.2020 23:14:35

Channel Separation Plot on Channel 64 - 65



Date: 3.NOV.2020 23:32:15





Channel Separation Plot on Channel 128 - 129

Date: 3.NOV.2020 23:30:28



3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

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

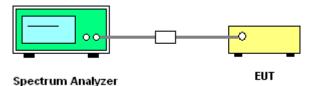
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 7.8.4.
- The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Enable the EUT hopping function.
- 5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 20 KHz; VBW = 20KHz; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
- 6. Measure and record the results in the test report.

3.3.4 Test Setup

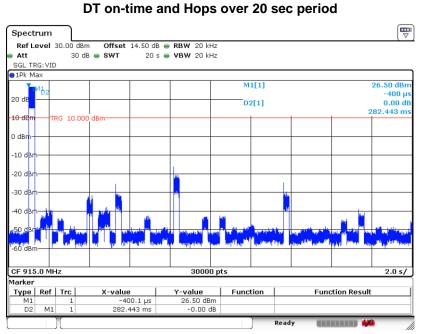




3.3.5 Test Result of Dwell Time

Please refer to Appendix A.

SF7:



Date: 4.NOV.2020 09:59:40

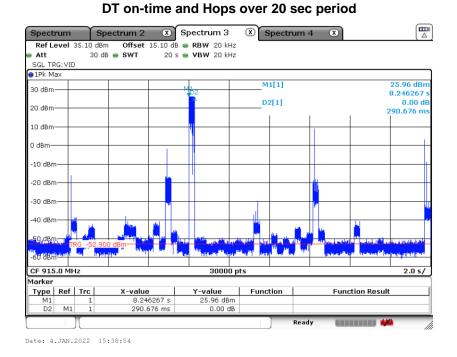
Remark:

Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

- = 1 (hop) x 282.443 (ms)
- = 0.282 (sec)



SF8:



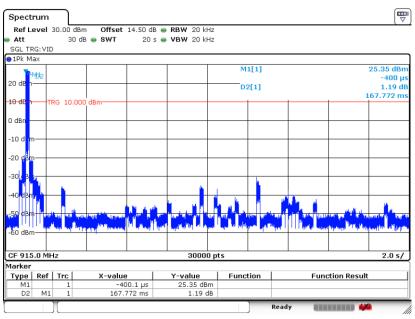
Remark:

Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

= 1 (hop) x 290.676 (ms) = 0.291 (sec)







DT on-time and Hops over 20 sec period

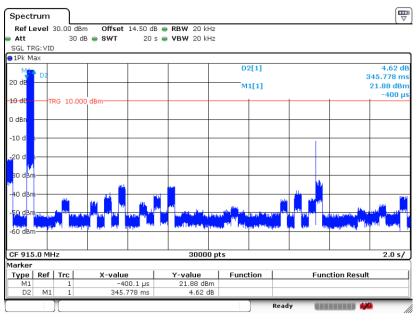
Date: 4.NOV.2020 09:53:54

Remark:

Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time



SF10:



DT on-time and Hops over 20 sec period

Date: 4.NOV.2020 09:55:13

Remark:

Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time



3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

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

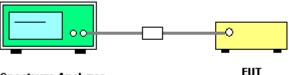
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 6.9.2 and 6.9.3.
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
 Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;
 RBW ≥ 1% of the 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak;
 Trace = max hold.
- Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
 Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;
 RBW ≥ 1% of the 99% bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = sample;
 Trace = max hold.
- 6. Measure and record the results in the test report.

3.4.4 Test Setup



Spectrum Analyzer

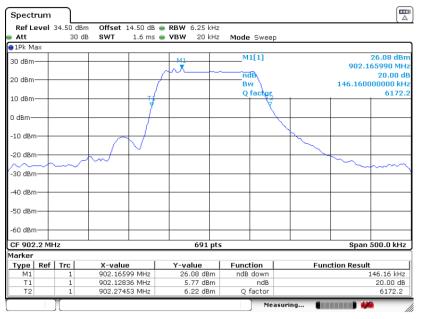
3.4.5 Test Result of 20dB Bandwidth

Please refer to Appendix A.



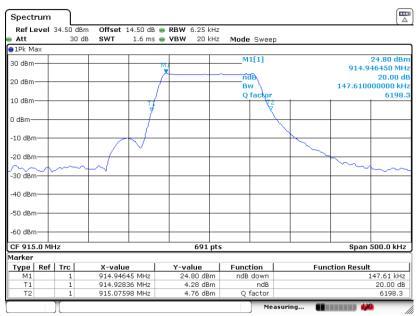
SF7:

20 dB Bandwidth Plot on Channel 1



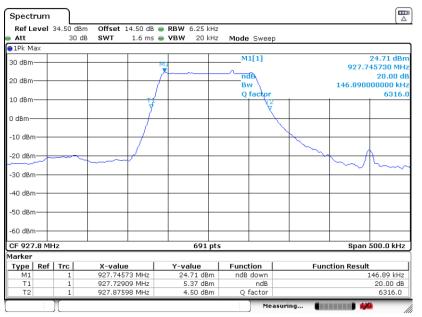
Date: 3.NOV.2020 19:09:16

20 dB Bandwidth Plot on Channel 65



Date: 3.NOV.2020 20:03:34



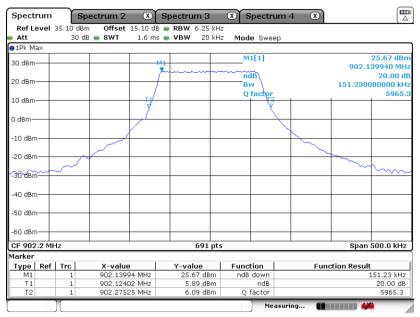


20 dB Bandwidth Plot on Channel 129

Date: 3.NOV.2020 20:34:17

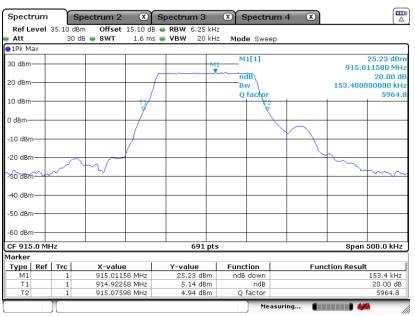
SF8:

20 dB Bandwidth Plot on Channel 1



Date: 4.JAN.2022 14:38:20

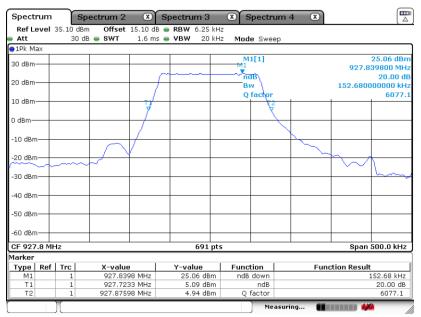




20 dB Bandwidth Plot on Channel 65

Date: 4.JAN.2022 14:49:17

20 dB Bandwidth Plot on Channel 129



Date: 4.JAN.2022 14:54:02



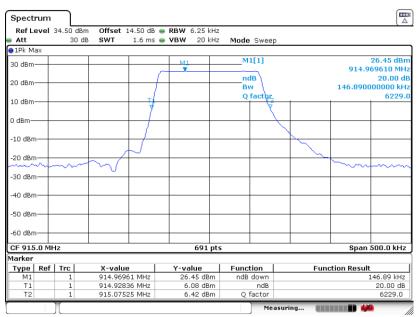
SF9:



20 dB Bandwidth Plot on Channel 1

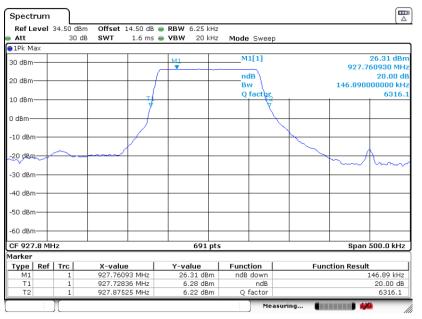
Date: 3.NOV.2020 20:53:41

20 dB Bandwidth Plot on Channel 65



Date: 3.NOV.2020 21:31:23



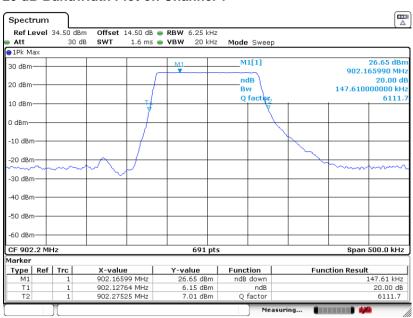


20 dB Bandwidth Plot on Channel 129

Date: 3.NOV.2020 21:35:27

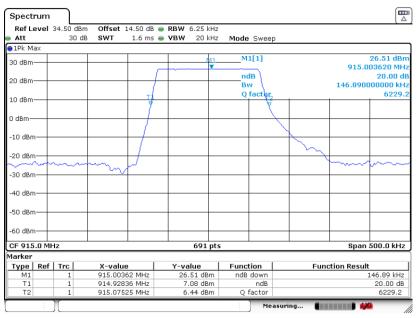
SF10:

20 dB Bandwidth Plot on Channel 1



Date: 3.NOV.2020 23:09:19

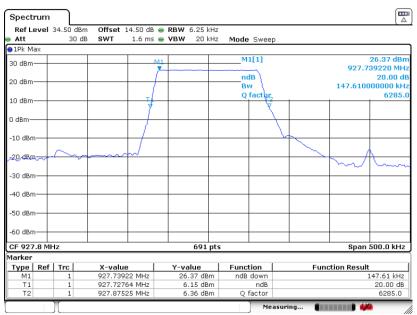




20 dB Bandwidth Plot on Channel 65

Date: 3.NOV.2020 23:23:30

20 dB Bandwidth Plot on Channel 129



Date: 3.NOV.2020 23:25:57



3.4.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

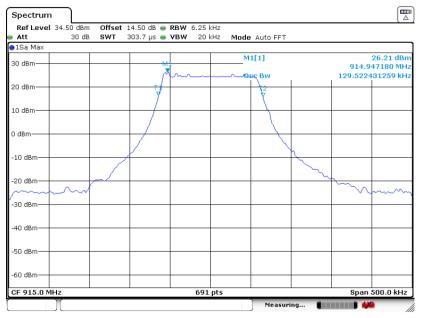
SF7:

99% Occupied Bandwidth Plot on Channel 1



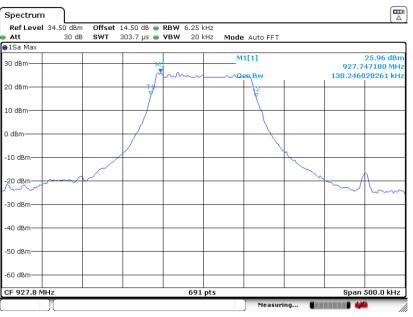
Date: 3.NOV.2020 19:24:15

99% Occupied Bandwidth Plot on Channel 65



Date: 3.NOV.2020 20:04:06



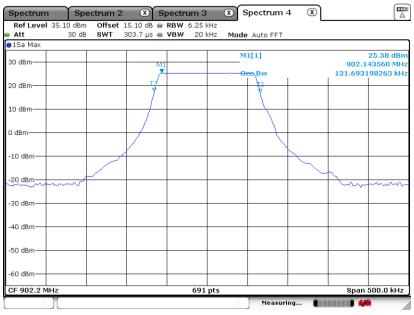


99% Occupied Bandwidth Plot on Channel 129

Date: 3.NOV.2020 20:35:49

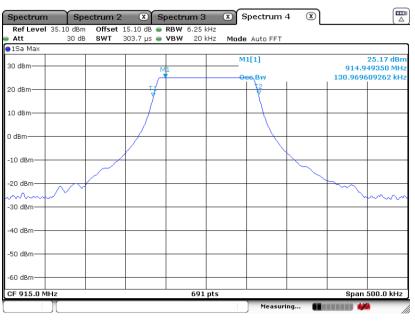
SF8:

99% Occupied Bandwidth Plot on Channel 1



Date: 4.JAN.2022 14:47:18

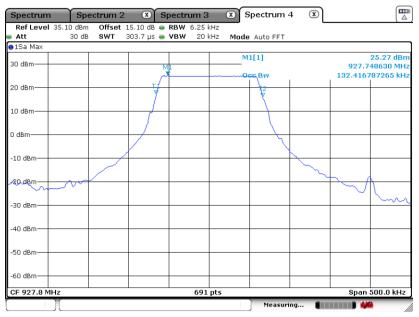




99% Occupied Bandwidth Plot on Channel 65

Date: 4.JAN.2022 14:48:41

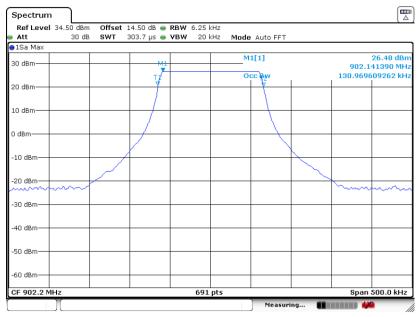
99% Occupied Bandwidth Plot on Channel 129



Date: 4.JAN.2022 14:53:24



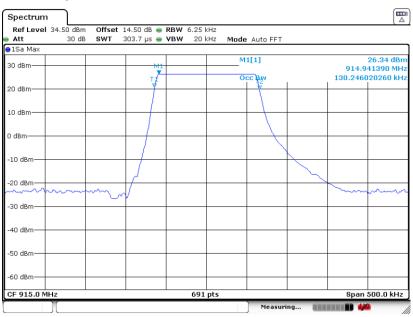
SF9:



99% Occupied Bandwidth Plot on Channel 1

Date: 3.NOV.2020 20:54:44

99% Occupied Bandwidth Plot on Channel 65



Date: 3.NOV.2020 21:31:57



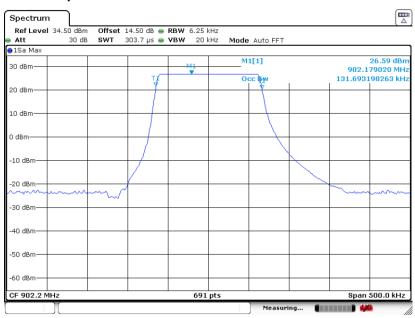


99% Occupied Bandwidth Plot on Channel 129

Date: 3.NOV.2020 21:35:43

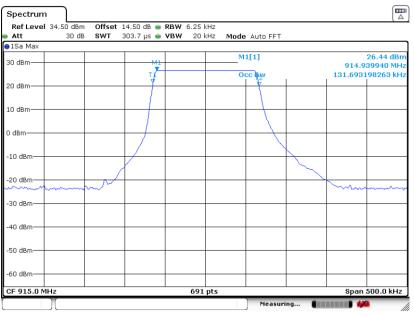
SF10:

99% Occupied Bandwidth Plot on Channel 1



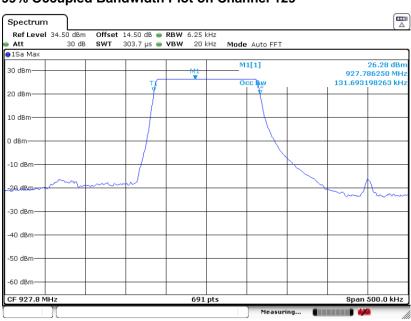
Date: 3.NOV.2020 23:10:32





99% Occupied Bandwidth Plot on Channel 65

Date: 3.NOV.2020 23:23:52



99% Occupied Bandwidth Plot on Channel 129

Date: 3.NOV.2020 23:26:44

Note : The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



3.5 Output Power Measurement

3.5.1 Limit of Output Power

The maximum peak conducted output power of the intentional radiator shall not exceed the following: For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

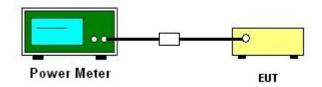
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 7.8.5.
- 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Measure the conducted output power with cable loss and record the results in the test report.
- 5. Measure and record the results in the test report.

3.5.4 Test Setup



3.5.5 Test Result of Peak Output Power

Please refer to Appendix A.



3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

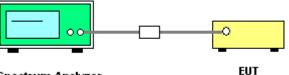
3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.6.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 7.8.6.
- 2. Set to the maximum power setting and enable the EUT transmit continuously.
- 3. Set RBW = 100kHz, VBW = 300kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
- 4. Enable hopping function of the EUT and then repeat step 2. and 3.
- 5. Measure and record the results in the test report.

3.6.4 Test Setup



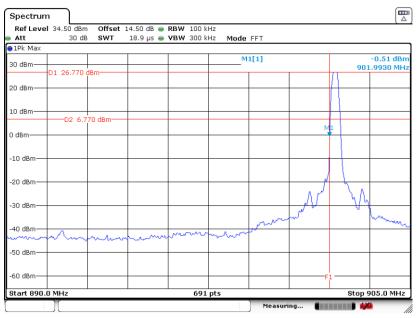
Spectrum Analyzer



3.6.5 Test Result of Conducted Band Edges

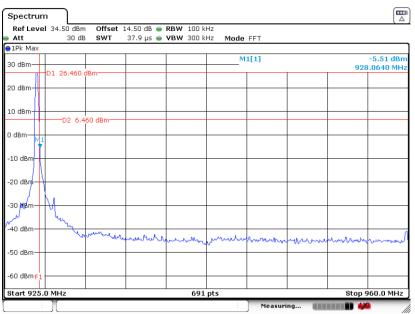
SF7:

Low Band Edge Plot on Channel 1



Date: 3.NOV.2020 19:11:58

High Band Edge Plot on Channel 129



Date: 3.NOV.2020 20:35:13



SF8:

Low Band Edge Plot on Channel 1

Spectrun	n Sp	ectrum 2	2 🗶 5	pectrum	з (х	Spectrum	4 X		
Ref Leve Att	35.10 dBm 30 dB		15.10 dB						
1Pk Max	30 GB	SWI	18'A hz 🖷	VBW 300	KHZ M	ode Auto FFT			
30 dBm	D1 26.180 (18m-				M1[1]	1	90:	-0.52 dBm 1.9720 MHz
20 dBm	20.100							Α	
10 dBm	D2 6.1	80 dBm							
0 dBm							M	1	
-10 dBm—								$\left(- \right)$	
-20 dBm—								4	
-30 dBm						mm	J~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	han
-40 dBm	mon	mm	manna	www	m	month			~~~
-50 dBm									
-60 dBm							F	1	
Start 890.	U MHz			69	1 pts				905.0 MHz
						Measur	ing 🔳		

Date: 4.JAN.2022 14:40:13

High Band Edge Plot on Channel 129

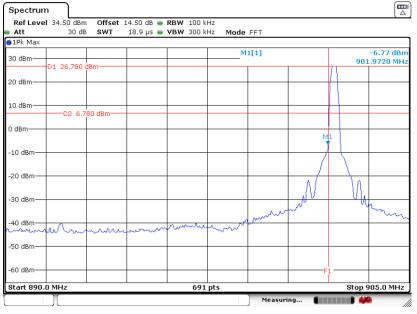
Spectrum	Spectrum 2	Spectrum 3	s 🗴 Sp	ectrum 4 (×	
Ref Level 35.10 () dB 👄 RBW 100 k Эµs 👄 VBW 300 k		uto FFT		
∋1Pk Max						
30 dBm	00 d0-		M1[1]	928	-4.90 dBm 3.0640 MHz
20 dBm	20 08m					
10 dBm	5.920 dBm					
0 dBm	3.920 dbm					
-10 dBm						
-20 dBm						
-30 dBh						
-40 dBm	My James a Jon mo	mentionentiment	mound	umming	nennenn	mound
-50 dBm						
-60 dBm F1						
Start 925.0 MHz		691	pts		Stop 9	960.0 MHz
				Measuring	•••••	

Date: 4.JAN.2022 15:55:44



SF9:

Low Band Edge Plot on Channel 1



Date: 3.NOV.2020 20:54:15

High Band Edge Plot on Channel 129

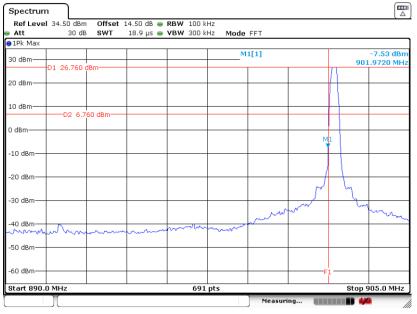
Spectrum								
Ref Level 34.50 d	Bm Offset	14.50 dB 👄	RBW 100 k	Hz				(4
Att 30			VBW 300 k		FFT			
●1Pk Max								
30 dBm	00 dBm			M	1[1]			-6.93 dBm 1.0640 MHz
20 dBm								
10 dBm	5.430 dBm							
0 dBm								
-10 dBm								
-20 dBm								
-30 dBm								
-40 dBm	monnegoes	monto	amany	round	merun	mourne	umun	manard
-50 dBm								
-60 dBm _{F1}								
Start 925.0 MHz			691	pts			Stop 9	960.0 MHz
					Measur	ing 🚺		• //

Date: 3.NOV.2020 21:40:04



SF10:

Low Band Edge Plot on Channel 1



Date: 3.NOV.2020 23:09:53

High Band Edge Plot on Channel 129

Spectrum								
Ref Level 34.50 dBn	Offset	14.50 dB 😑	RBW 100 ki	Hz				
Att 30 di	B SWT	37.9 µs 👄	VBW 300 ki	Hz Mode	FFT			
●1Pk Max								
30 dBm	d8m			M	1[1]		928	-9.07 dBm 3.0640 MHz
20 dBm								
10 dBm	330 dBm							
0 dBm								
-10 dBm								
-20 dBm								
-30 dBth What								
-40 dBm	menter	anna	mound	mound	mmun	mun	mare	munul
-50 dBm								
-60 dBm F1								
Start 925.0 MHz			691	pts			Stop 9	960.0 MHz
					Measuri	ing 💷		•

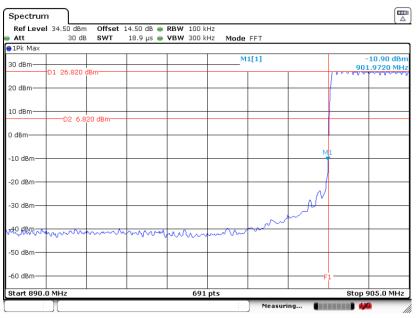
Date: 3.NOV.2020 23:29:11



3.6.6 Test Result of Conducted Hopping Mode Band Edges

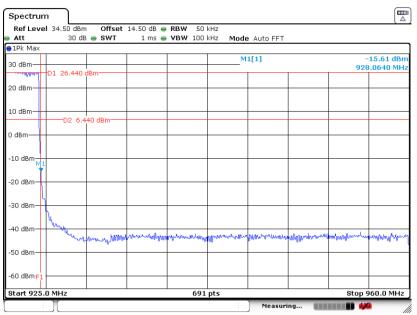
SF7:





Date: 3.NOV.2020 19:30:54

Hopping Mode High Band Edge Plot

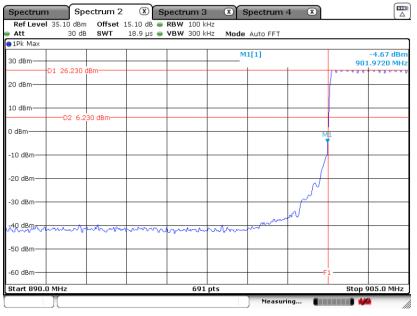


Date: 3.NOV.2020 20:40:59



SF8:

Hopping Mode Low Band Edge Plot



Date: 4.JAN.2022 15:50:00

Hopping Mode High Band Edge Plot

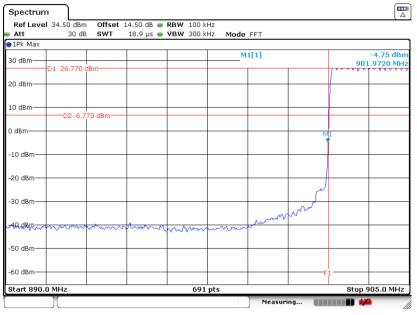
Spectrum		ectrum 2		ectrum 3	_	Spectrum -	4 🗶		
Ref Level Att	35.10 dBm 30 dB	Offset SWT	15.10 dB 👄 37.9 μs 👄	RBW 100 k VBW 300 k		Auto FFT			
●1Pk Max									
30 dBm)1 25.670 d	Bm			N	11[1]	1		-17.43 dBm 3.0640 MHz
20 dBm)1 23.0/00	ып							
10 dBm	D2 5.67	70 d0m							
0 dBm	D2 3.6	O UBIII							
-10 dBm									
-20 dBm									
-30 dBm									
-40 dBm	may now	munnell	month	workthe	margale	manuluh	mentel	alund Hours	www.
-50 dBm									
-60 dBm F1									
Start 925.0	MHz			691	pts			Stop	960.0 MHz
][]					Measuri	ng 🔳		a ///

Date: 4.JAN.2022 15:51:49



SF9:

Hopping Mode Low Band Edge Plot



Date: 3.NOV.2020 21:57:54

Hopping Mode High Band Edge Plot

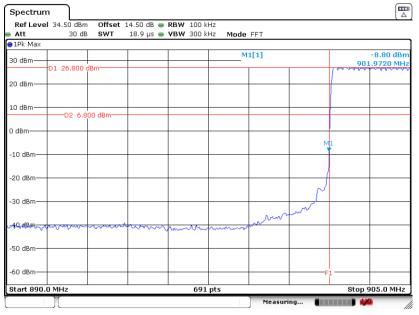
Spectrum									
•	34.50 dBm	Offset	14.50 dB 👄	RBW 100	kHz				
Att 🗧	30 dB	SWT	37.9 µs 👄	VBW 300	kHz Mode	FFT			
⊖1Pk Max									
30 dBm	01 26.820	dBm			M	1[1]	1		12.38 dBm 3.0640 MHz
20 dBm									
10 dBm	D2 6.8	20 dBm							
0 dBm									
-10 dBm 1									
-20 dBm									
-30 dBm	Mun								
-40 dBm		Mahanth	manul	mumm	William	muranm	normalala	Marymour	marana
-50 dBm									
-60 dBm _{F1}									
Start 925.0	MHz			69:	l pts			Stop	960.0 MHz
						Measur	ing 🚺		i 11

Date: 3.NOV.2020 21:23:46



SF10:

Hopping Mode Low Band Edge Plot



Date: 3.NOV.2020 22:14:14

Hopping Mode High Band Edge Plot

Spectrum				
Ref Level 34.50 de Att 30		 RBW 100 kHz VBW 300 kHz Mode 		(=
1Pk Max	ub 3wi 37.9µsi	••••••••••••••••••••••••••••••••••••••) FF I	
30 dBm	0 dBm	N	M1[1]	-10.25 dBm 928.0640 MHz
20 dBm				
10 dBm	5.330 dBm			
0 dBm				
-10 dBm				
-20 dBm				
-30 dBm				
-40 dBm	Marine market	mon worky well how	- Matrin manufacture	hopman
-50 dBm				
-60 dBm _{F1}				
Start 925.0 MHz		691 pts		Stop 960.0 MHz
			Measuring 📗	💼 🗰 🚧

Date: 3.NOV.2020 23:20:34



3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

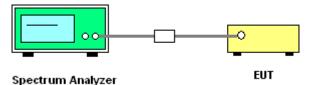
3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.7.3 Test Procedure

- 1. The testing follows ANSI C63.10-2013 clause 7.8.8.
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
- 5. Measure and record the results in the test report.
- 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

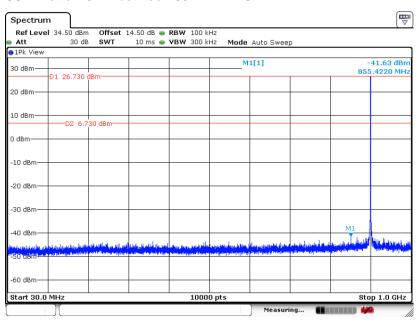
3.7.4 Test Setup





3.7.5 Test Result of Conducted Spurious Emission

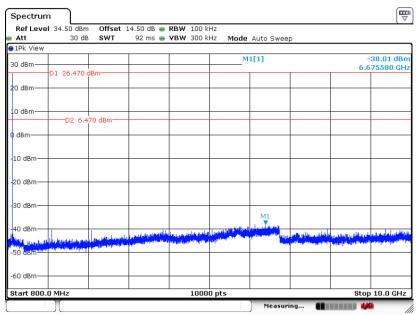
SF7:



CSE Plot on Ch 1 between 30MHz ~ 1 GHz

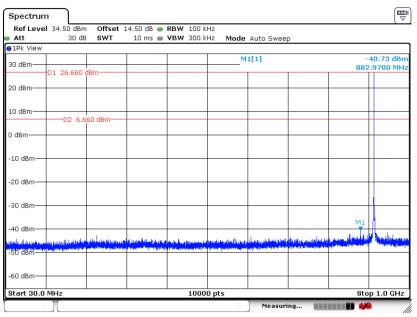
Date: 4.NOV.2020 14:46:59

CSE Plot on Ch 1 between 800 MHz ~ 10 GHz



Date: 4.NOV.2020 14:48:09





CSE Plot on Ch 65 between 30MHz ~ 1 GHz

Date: 4.NOV.2020 14:50:52

CSE Plot on Ch 65 between 800 MHz ~ 10 GHz

Spectrun	ı)								
Ref Level	1 34.50 dBm 30 dB	Offset SWT	14.50 dB 👄 92 ms 👄	RBW 100 VBW 300		Auto Swee	p		(*)
⊖1Pk View									
30 dBm	D1 26.660 d	3m			M	1[1]			37.70 dBm 45340 GHz
20 dBm									
10 dBm	D2 6.66	0 dBm							
0 dBm									
-10 dBm									
-20 dBm									
-30 dBm		11							
-40 dBm		t. ed bud	a second state of a	n das bas de la del la del				الله والمارية والمارية. الإسرالية والمراجعة الم	difference allines
-50 dbm	n ferend ferfillen og sen den sen fer Filmen om en sen sen sen ferende for sen sen Filmen og sen	and the strength				1	, da filo na Andra, ar na hito	Dente a serie de la Disc.	and the second
-60 dBm									
Start 800.	0 MHz			100	00 pts			Stop	10.0 GHz
						Measur	ing 💷		

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Spectrum	ī									
Ref Level	34.50 dBm	Offset	L4.50 dB 👄	RBW 100 k	Hz				('	
Att	30 dB	SWT	10 ms 👄	VBW 300 k	Hz Mode	Auto Swee	р			
∋1Pk View										
30 dBm	D1 26.530 d	D ==			M		-40.80 dBn 895.8710 MH			
20 dBm	01 20.530 0	BIII								
10 dBm	D2 6.53									
0 dBm		SU dBm								
-10 dBm										
-20 dBm										
-30 dBm										
-40 dBm								M	n di na alaman	
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-60 dBm										
Start 30.0	MHz		1	1000	D pts	1	1	Sto	p 1.0 GHz	
						Measur	ing 🔳			

CSE Plot on Ch 129 between 30MHz ~ 1 GHz

Date: 4.NOV.2020 14:51:54

CSE Plot on Ch 129 between 800 MHz ~ 10 GHz

Spectrum							
Ref Level 34.50 dBm		iB 👄 RBW 100					
Att 30 dB	SWT 92 n	ns 👄 VBW 300	KHz Mode	Auto Swee	р		
1Pk View							
30 dBm D1 26,430 d	0		M	1[1]			38.31 dBn 47900 GH:
	Bm						
0 dBm							
0 dBm							
D2 6.43	30 dBm						
dBm							
10 dBm							
20 dBm							
30 dBm							
				M1			
40 dBm		all and a state of the second second				a Hildenson M	La Die erste die erste d
50 abm	A REAL PROPERTY AND A REAL	and the state provide a second se			dah harapatan pada pa	and the second	
-60 dBm							
Start 800.0 MHz		1000	0 pts			Stop	0 10.0 GHz
1 I				Measuri	ina		4

Date: 4.NOV.2020 14:52:34



SF8:

CSE Plot on Ch 1 between 30MHz ~ 1 GHz

	×	pectrum 4	× 5	um 3	Spect	X	ctrum 2	Spe	Spectrum
				100 kH	RBW	15.10 dB	Offset	35.10 dBm	Ref Level
		Auto Sweep	Mode	300 kH	o vbw	10 ms	SWT	30 dB	Att
									1Pk View
-43.12 dBr 194.6580 MH		[1]	M1				am)1 25.890 dl	30 dBm
							500	1 23.890 di	20 dBm
					_		0.40		10 dBm
							o asm		D dBm
					_				-10 dBm
									-20 dBm
									-30 dBm
								M1	-40 dBm
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					_				-60 dBm
Stop 1.0 GHz			ts	10000		1		1Hz	Start 30.0
	g 🔳	Measurin)()	

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CSE Plot on Ch 1 between 800 MHz ~ 10 GHz

Spectrum	Spectrum	2 🕱 Spe	ectrum 3	Spectrum	4 🗶		
Ref Level 35.1 Att	LOdBm Offset 30 dB SWT	15.10 dB 👄 R 92 ms 👄 V	BW 100 kHz BW 300 kHz	Mode Auto Swee	2		
1Pk View	55 db - 6111	52 m5 🖕 🕻	DI OGO KIL	Mode Auto Swee	, 		
30 dBm				M1[1]	1		36.50 dBm 84700 GHz
20 dBm	5.870 dBm						
10 dBm	D2 5.870 dBm-						
0 dBm	52 3.870 UBIII						
-10 dBm							
20 dBm							
-30 dBm				M1			
40 dBm	والم المربية الم	ى ئىلىتىلىغان يىلى	والق والعامين والع				
-50 dBm		rine unit la la secondation e		¥			
-60 dBm							
Start 800.0 MHz	z	-	10000 pt	ts	1	Stop	10.0 GHz
				Measuri	ng 🔳		1

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Spectrum 2 🗴 Spectrum 3 🗶 Spectrum 4	X
10 dBm Offset 15.10 dB 👄 RBW 100 kHz	
30 dB SWT 10 ms 👄 VBW 300 kHz Mode Auto Sweep	
	10.07.10
M1[1]	-43.27 dBn 549.2900 MH
25.620 dBm	
-D2 5.620 dBm	
	فيربع والاعلال المتحاد والمتحاد والمراجع والمحاد
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2 10000 pts	Stop 1.0 GHz
Measuring.	

CSE Plot on Ch 65 between 30MHz ~ 1 GHz

Date: 4.JAN.2022 15:10:38

CSE Plot on Ch 65 between 800 MHz ~ 10 GHz

Spectrum	Spectrum 2	2 🗴 SI	ectrum 3	Spectro	um 4 🛛 🖸	0	
Ref Level 35.1 Att	0 dBm Offset 30 dB SWT		RBW 100 kHz VBW 300 kHz		weep		
1Pk View							
30 dBm				M1[1]		2	-37.30 dBn .745340 GH:
:0 dBm	5.810 dBm						
.0 dBm							
dBm	2 5.810 dBm-						
10 dBm							
20 dBm							
30 dBm	M1						
40 dBm		a dan Marin Mana	المتلكان الشاعات والمراجب المراج				
50 aam		and a star barren to a bland a barren ba	Nara ang Palana ang Pal Palana ang Palana ang Pa		Vert det de la		
60 dBm							
Start 800.0 MHz			10000	pts		St	op 10.0 GHz
T I				Me	asuring		10

Date: 4.JAN.2022 15:11:23



Spectrum	Spectrum	2 🗶 S	pectrum (3 X	Spectrum 4	×			
Ref Level 35.1			RBW 100						
Att	30 dB SWT	10 ms 👄	VBW 300	kHz Mode	a Auto Sweep				
1Pk View									
30 dBm				N	41[1]				47 dBn 70 MH
D1 25	5.640 dBm				1		39	.02	70 1919
20 dBm									
10 dBm									
	2 5.640 dBm-								
0 dBm									
-10 dBm									
-10 0.0111									
-20 dBm									
-20 0011									
-30 dBm									
-30 0611									
-40 dBm				M					
					7		الساء الاستريز الطاري	. I	li ku sa sa
الار تصريحان أخر إن ول الارتبال (هره باستشم الإسمام و رون روان م	en en en de Maria Malaignes Altre Frankrike de antal	hanselige filled bestelf provi	te her styphotosidettik	distriction of the state		ini ang Pagaliyan. Katalagan ng Katalagan ng Katalagan ng Katalagan ng Katalagan ng Katalagan ng Katalagan ng K	A Street Barrier and the		and the second
-ac contraction		and the second sec	The second se						
-60 dBm									
Start 30.0 MHz	1		1000	0 pts			Sto	p 1	.0 GHz
Υ Γ					Measuring			4	

CSE Plot on Ch 129 between 30MHz ~ 1 GHz

Date: 4.JAN.2022 15:08:14

CSE Plot on Ch 129 between 800 MHz ~ 10 GHz

Spectrum	Spectrum 2	2 🗷 Sp	ectrum 3	Spectrun 🛞	14 🗶		
Ref Level 35.1 Att	.0 dBm Offset 30 dB SWT	15.10 dB 👄 R 92 ms 👄 V	BW 100 kHz BW 300 kHz	Mode Auto Swe	en		
1Pk View							
30 dBm				M1[1]	1		36.20 dBm 91140 GHz
0 dBm	5.940 dBm						
10 dBm	02 5.940 dBm-						
dBm	52 3.940 dbm						
10 dBm							
20 dBm							
30 dBm				MI	L		
40 dBm	in here the little	ار والا ومار الأحمد ويار ومني را مه		A line in constant line for a line	g d allenster og s ^{akter} isker,		i
50 asm		No. or Article of Southeast Local	and here and here and				and a first state of the second state of the s
-60 dBm							
Start 800.0 MHz	2		10000 p	ts		Stop	10.0 GHz
				Meas	uring 🔳		

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SF9:

Ref Leve	al 34.50 dBm 30 dB		14.50 dB 👄 10 ms 👄		Mode	Auto Sweep			
1Pk View							-		
30 dBm	-D1 26.690 (18m			M	1[1]			39.41 dBr).1660 MH
20 dBm	01 20.000								
10 dBm	D2 6 6	90 dBm							
0 dBm	02 0.0								
-10 dBm—									
-20 dBm—									
-30 dBm—									
-40 dBm—				 				M1	Harden and
-50 dBm	l estructure de la companya de la co La companya de la comp			and a she day at a second s		a sultan a sultan gana sultan a sultan su	atsun (ofisian privation Anterprivation		and the second sec
-60 dBm—									
-60 dBm—									p 1.0 GH

CSE Plot on Ch 1 between 30MHz ~ 1 GHz

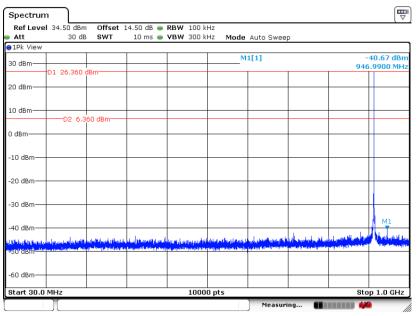
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CSE Plot on Ch 1 between 800 MHz ~ 10 GHz

Spectrun	ī								
Ref Leve Att	34.50 dBm 30 dB	Offset SWT	14.50 dB 👄 92 ms 👄	RBW 100 0		Auto Swee	p		
⊖1Pk View									
30 dBm	D1 26.570 dl	300-			M	1[1]	_		38.14 dBm 84140 GHz
20 dBm	D1 20.570 di								
10 dBm	D2 6.57	0 dBm							
0 dBm									
-10 dBm									
-20 dBm									
-30 dBm						M1			
-40 dBm		ىدىلتى بىر		I CAN DO TO THE			and the state of the state of the	any, any shad the shad	يرون المراجع ا
-50 dBm		al provinsi in a station of the section of the sect	1	a colonită și con aliană			a an		and the second second
-60 dBm									
Start 800.	0 MHz			1000	0 pts			Stop	10.0 GHz
][]					Measur	ing 🔳		

Date: 4.NOV.2020 14:54:25





CSE Plot on Ch 65 between 30MHz ~ 1 GHz

Date: 4.NOV.2020 14:58:08

CSE Plot on Ch 65 between 800 MHz ~ 10 GHz

Spectrum								[₩
Ref Level 34.50 dBm			RBW 100 k					
Att 30 dE	SWT	92 ms 👄	VBW 300 k	Hz Mode	Auto Swee	р		
1Pk View								
30 dBm				M	1[1]			-38.14 dBn /45340 GH:
D1 26.450	dBm							
20 dBm								
10 dBm								
D2 6.4	50 dBm							
0 dBm								
10 dBm								
-10 UBIII								
-20 dBm								
-30 dBm								
oo ubiii	м1							
40 dBm	1	11.4444	والكار الأمير المحرك	and the state of the	ua ante	Maria I. 1941	فلير فقابلنا المعارفة	
والمحمالة ومعار ومراجع والاربي والمح			(International System)	And a state of the state		a da na la sana na san Na sana na sana	in the second	Annual strength of the second second
50 abm	1							
-60 dBm								
Start 800.0 MHz	1	1	1000	0 pts	1	1	Stop) 10.0 GHz
					Measur	ing 🔳		-

Date: 4.NOV.2020 14:59:00



Spectrum							
Ref Level 34.50 dBm	Offset 14.50	dB 👄 RBW 100	kHz				(!
Att 30 dB	SWT 10	ms 👄 VBW 300	kHz Mode	Auto Sweep)		
1Pk View							
30 dBm			M	1[1]			0.82 dBm 7940 MHz
D1 26.410 d	Bm						
10 dBm							
0 dBm	U asm						
-10 dBm							
-20 dBm							
-30 dBm							
40 dBm						المارية بعرور الم	M1
-50 dBm	en de la la colta da sua da sente de la francé. A la colta de la	Descarded to be plot deal of the	den and distant fail and	a too too dalaha wa	and and the particular line in the second	and the product of the second s	
-50 dBm							
-60 dBm							
Start 30.0 MHz		1000	0 pts		I	Stop	1.0 GHz
Y				Measuri	ng 🔳	····	

CSE Plot on Ch 129 between 30MHz ~ 1 GHz

Date: 4.NOV.2020 15:01:12

CSE Plot on Ch 129 between 800 MHz ~ 10 GHz

Spectrun	ı)								
Ref Leve	34.50 dBm 30 dB	Offset SWT	14.50 dB 👄 92 ms 👄	RBW 100 k VBW 300 k		Auto Swee	5		()
01Pk View							-		
30 dBm	D1 26.430 dE	200			M	1[1]			37.79 dBm 89300 GHz
20 dBm	D1 20.450 dt								
10 dBm	D2 6.43	0 d8m							
C dBm									
-10 dBm									
-20 dBm									
-30 dBm						M1			
-40 dBm		المربعين والمراجع	مرابله ومدوم را ا	and a second line and			والألاد وملاحلين والع	lune in the later of the	addard, a shekirin aya
-50 dBm		A dama in providence dis	the state of the s	(magnetic state) and the state of the stat				and the second secon	141
-60 dBm									
Start 800.	0 MHz		1	1000	0 pts			Stop	10.0 GHz
][]					Measuri	ng 🔳		

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SF10:

Att	34.50 dBm 30 dB		14.50 dB 👄 10 ms 👄	VBW 300		Auto Swee	D		
∋1Pk View							F		
30 dBm	-D1 26.430	dB m			M	1[1]			41.11 dBr).2630 MH
20 dBm	D1 20.430								
10 dBm	D2 6.4	20 dBm							
0 dBm	02 0.4								
-10 dBm—									
-20 dBm—									
-30 dBm—									
-40 dBm—								M1	Maril o com
-So asmal	n a finis a faith a star A da an a cana a sa an	i si potet de Loop d'Ara po norte etmos provinces de p	an a	y haliyota telanetti Yuuniininanye heedar	laten a large de biest generationen de latent			and the second se	A Test Manual State
-60 dBm—									
Start 30.0	MHz			100	00 pts			Sto	p 1.0 GHz

CSE Plot on Ch 1 between 30MHz ~ 1 GHz

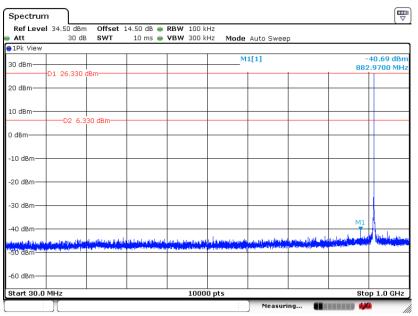
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CSE Plot on Ch 1 between 800 MHz ~ 10 GHz

Spectrum	ī								
Ref Level Att	34.50 dBm 30 dB	Offset SWT	14.50 dB 👄 92 ms 👄	RBW 100 k VBW 300 k		Auto Swee	р		(-)
⊖1Pk View									
30 dBm	D1 26.450 d	0			M	1[1]			38.02 dBm 74020 GHz
20 dBm	DI 26.450 U	ып							
10 dBm	D2 6.45	0.d8m							
0 dBm	02 0.43								
-10 dBm									
-20 dBm									
-30 dBm									
-40 dBm			Index (sector)	المرواطي وراحد		M1	ality attility, it has	فمواجلها والأوراط	an an the terr part of the terr
-50 cem	and an and the state of the state of a fight the state of the state of the state of			nterenne skendtræder.			offering and the	The state of the s	a dhagagadd a dhabhlatan
-60 dBm									
Start 800.	0 MHz			1000	0 pts			Stop	10.0 GHz
][]					Measuri	ing 💷		

Date: 4.NOV.2020 15:03:47





CSE Plot on Ch 65 between 30MHz ~ 1 GHz

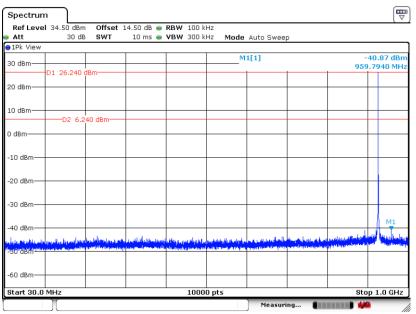
Date: 4.NOV.2020 15:05:21

CSE Plot on Ch 65 between 800 MHz ~ 10 GHz

30 dBm 01 26.500 dBm 2.744420 20 dBm 0 0 10 dBm 0 0 -10 dBm 0 0 -20 dBm 0 0 -10 dBm 0 0 -10 dBm 0 0	Spectrun									(₩
10k View M1[1] -37.47 30 dBm 01 26.500 dBm 2.744420 20 dBm 0 dBm 0 10 dBm 0 0 <										
30 dBm M1[1] -37.47 20 dBm 2.744420 20 dBm 2.744420 10 dBm 2.744420 10 dBm 2.744420 20 dBm 2.744420 20 dBm 2.744420 30 dBm 2.744420 10 dBm 1.744400 10 dBm <		30 dB	SWT	92 ms 👄	VBW 300	kHz Mode	Auto Swee	p		
30 dBm 01 26.500 dBm 2.744420 20 dBm 0 dBm 0 dBm 0 dBm 0 dBm 0 dBm 10 dBm 0 dBm 0 dBm 20 dBm 0 dBm 0 dBm 10 dBm 0 dBm 0 dBm 10 dBm 0 dBm 0 dBm 10 dBm 0 dBm 0 dBm 20 dBm 0 dBm 0 dBm 10 dBm 0 dBm 0 dBm)1Pk View									
20 dBm D2 6.500 dBm D2 6.500 dBm 10 dBm D2 6.500	30 dBm					M	1[1]			-37.47 dBn 744420 GH
0 dBm D2 6.500 dBm D2 6.500 dBm D 1 dBm D D D 10 dBm D D D 20 dBm D D D 30 dBm D D D 10 dBm <td></td> <td>D1 26.500 di</td> <td>Bm</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		D1 26.500 di	Bm							
D2 6.500 dBm Image: Constraint of the second of the secon	20 dBm									
0 dBm Image: Constraint of the second of t	10 dBm									
10 dBm		D2 6.50	i0 dBm							
20 dBm	dBm									
20 dBm	10 d0m									
	-10 aBm—									
	20 dBm—									
	30 dBm									
	bo abiii		11							
	40 dBm—				the state of the second	and the state of the second	1 Martinetter			والمروانية المروري والمراو
	Land Later and	المروان والكريجا	- March 199		all and all all the second	and the second second second	ALC: NO.			A STREET AND
	50 demonst	n palan, mangan pintan berpanan di si	Newson, and		· ·					· ·
-60 dBm	-60 dBm									
Start 800.0 MHz 10000 pts Stop 10.0	Start 800.	0 MHz			1000	00 pts			Stop	10.0 GHz

Date: 4.NOV.2020 15:04:47





CSE Plot on Ch 129 between 30MHz ~ 1 GHz

Date: 4.NOV.2020 15:06:11

CSE Plot on Ch 129 between 800 MHz ~ 10 GHz

Spectrum									
	34.50 dBm		14.50 dB 👄						
Att	30 dB	SWT	92 ms 👄	VBW 300	kHz Mode	Auto Swee	p		
1Pk View									
30 dBm	D1 26.390 dBm			M1[1		1[1]	[1] -37.49 dE 6.426260 G		-37.49 dBn 126260 GH
0 dBm	D1 20.390 di	500							
10 dBm	D2 6.39	0.d8m							
dBm	D2 0.39	U UBIII							
10 dBm									
20 dBm									
30 dBm						м1			
40 dBm		a ta ashaki	العلى الحر اللي أوما إلى رح ال	and the second statements		T	طورية ب _ا يانية في وريا <mark>ال</mark> ال	د. در را ^{ین} در منطقه و م	i uka kerikaki fisit
50 68m-14	in a state of the Automation and a second providence of the second			il vehen kontektionis	allen og som		and the second shifts	terri 164 e ensi fingilit	listerister sidering
60 dBm									
Start 800.0) MHz			100	00 pts	I	1	Stor) 10.0 GHz
	1					Measur	ing 🚛		

Date: 4.NOV.2020 15:06:47



3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency	Field Strength	Measurement Distance		
(MHz)	(microvolts/meter)	(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		

3.8.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.



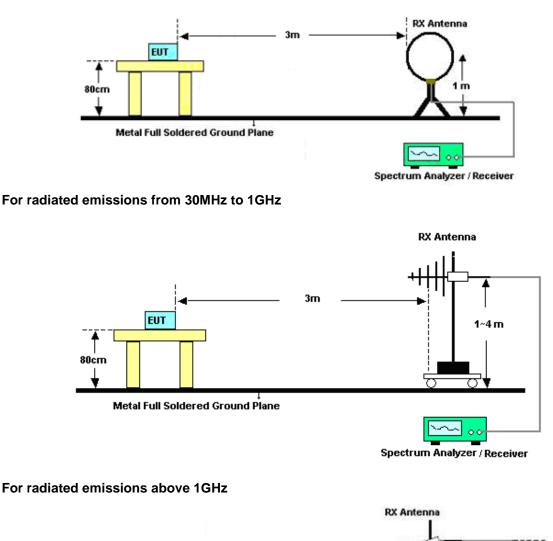
3.8.3 Test Procedures

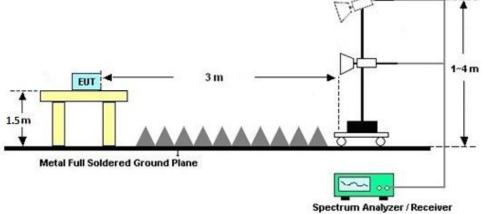
- 1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
- 2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- 4. Set to the maximum power setting and enable the EUT transmit continuously.
- 5. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
- 6. Corrected Reading: Antenna Factor + Cable Loss + Read Level Preamp Factor = Level
- 7. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
- 8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.



3.8.4 Test Setup

For radiated emissions below 30MHz





Sporton International Inc. (Kunshan) TEL : +86-512-57900158 FAX : +86-512-57900958 FCC ID: 2AEUP-BHAGF001



3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 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 line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.8.7 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C.