



TEST REPORT

Applicant Name : Address : Report Number : FCC ID: DONGGUAN LINPA ACOUSTIC TECHNOLOGY CO., LTD 2A, No 60, Lizhong Road, Dali Qingxi Town, Dongguan,523648, China SZ3220616-26835E-RF 2AKZ8-TWS027

Test Standard (s) FCC PART 15.247

Sample Description

Product Type: Test Model:

Trade Mark: Date Received: Date of Test: Report Date: TRUE WIRELESS EARBUDS TWS027 PATW-1014-WH, PATW-1014-PR, PATW-1014-NV, PATW-1014-PK PATW-1017-PR, PATW-1017-RG, PATW-1017-GN, PATW-1017-SV N/A 2022-06-16 2022-06-28 to 2022-07-08 2022-07-11

Test Result:

Pass*

* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Andy. Yu

Audy.Yu EMC Engineer

Approved By:

ont li

Robert Li EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk " \star ".

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Shenzhen Accurate Technology Co., Ltd.

1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China Tel: +86 755-26503290 Fax: +86 755-26503396 Web: www.atc-lab.com

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FCC-BT

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Shenzhen Accurate Technology Co., Ltd.	Report No.: SZ3220616-26835E-RF
APPLICABLE STANDARD	
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FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWEL	L TIME)40
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TEST DATA	

GENERAL INFORMATION

Product	TRUE WIRELESS EARBUDS
Tested Model	TWS027
Multiple Model	PATW-1014-WH, PATW-1014-PR, PATW-1014-NV, PATW-1014-PK PATW-1017-PR, PATW-1017-RG, PATW-1017-GN, PATW-1017-SV
Model difference	Please refer to DOS letter.
Frequency Range	2402~2480MHz
Maximum conducted Peak output power	-6.98dBm
Modulation Technique	BDR(GFSK)/EDR(1/4-DQPSK)/EDR(8DPSK)
Antenna Specification*	Internal on board Antenna: 0 dBi(provided by the applicant)
Voltage Range	DC 5V from adapter or DC 3.7V from battery
Sample number	SZ3220616-26835E-RF-S1(RF Radiated Test) SZ3220616-26835E-RF-S2(RF Conducted Test) (Assigned by ATC, Shenzhen)
Sample/EUT Status	Good condition

Product Description for Equipment under Test (EUT)

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Char	nnel Bandwidth	5%
RF output pov	wer, conducted	0.73dB
Unwanted Emis	ssion, conducted	1.6dB
AC Power Lines Conducted Emissions		2.72dB
	30MHz - 1GHz	4.28dB
Emissions, Radiated	1GHz - 18GHz	4.98dB
Rudiated	18GHz - 26.5GHz	5.06dB
Temperature		1°C
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISEDC), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

EUT Exercise Software

Software "FCC Assist 1.0.2.2"* was used during testing and the power level was Default Power level 10*.

Special Accessories

N/A.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

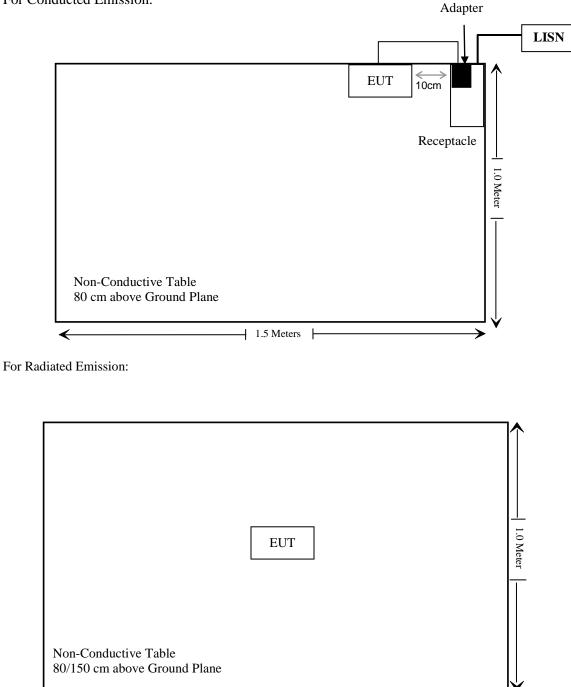
Manufacturer	Description	Model	Serial Number
TECNO	Adapter	U050TSA	AH07015321906

External I/O Cable

Cable Description	Length (m)	From/Port	То
Un-shielding Detachable USB Cable	0.3	EUT	Adapter
Unshielded Un-detachable AC cable	1.2	LISN	Receptacle

Block Diagram of Test Setup

For Conducted Emission:



ŀ

1.5 Meters

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 15.247 (i), §1.1307 (b) (1) &§2.1093	RF EXPOSURE	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliant
§15.247(a)(1)	20 dB Emission Bandwidth & 99% Occupied Bandwidth	Compliant
§15.247(a)(1)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	Peak Output Power Measurement	Compliant
§15.247(d)	Band edges	Compliant

Note: The right and left earbuds are identical, please refer to the Declaration letter for more detail, Per verified the output power of both unit, the output power for them is consistent, only the left earbud was full tested and reported.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date		
	Conducted Emissions Test						
Rohde & Schwarz	EMI Test Receiver	ESCI	100784	2021/12/13	2022/12/12		
Rohde & Schwarz	L.I.S.N.	ENV216	101314	2021/12/13	2022/12/12		
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2021/12/13	2022/12/12		
Unknown	RF Coaxial Cable	No.17	N0350	2021/12/14	2022/12/13		
	Conducted E	mission Test Soft	ware: e3 19821b ((V9)			
		Radiated Emissi	ons Test				
Rohde & Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12		
Rohde & Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12		
SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08		
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2021/11/09	2022/11/08		
Quinstar	Amplifier	QLW-184055 36-J0	15964001002	2021/11/11	2022/11/10		
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05		
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04		
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04		
Wainwright	High Pass Filter	WHKX3.6/18 G-10SS	5	2021/12/14	2022/12/13		
Unknown	RF Coaxial Cable	No.10	N050	2021/12/14	2022/12/13		
Unknown	RF Coaxial Cable	No.11	N1000	2021/12/14	2022/12/13		
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13		
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13		
Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13		
Unknown	RF Coaxial Cable	No.15	N600	2021/12/14	2022/12/13		
Unknown	RF Coaxial Cable	No.16	N650	2021/12/14	2022/12/13		
	Radiated Emission Test Software: e3 19821b (V9)						
RF Conducted Test							
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2021/12/13	2022/12/12		
Rohde & Schwarz	Open Switch and Control Unit	OSP120 + OSP-B157	101244 + 100866	2021/12/13	2022/12/12		
WEINSCHEL	10dB Attenuator	5324	AU 3842	2021/12/14	2022/12/13		
Unknown	RF Coaxial Cable	No.33	RF-03	Each	time		

* **Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.247 (i), §1.1307 (b) & §2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D04 Interim General RF Exposure Guidance v01, clause 2.1.2 – 1-mW test Exemption:

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

Test Result:

For worst case:

Mode	Frequency	Maximum Tune-up Conducted Power		Ant. Gain	EII	RP	1-mW test Exemption
	(MHz)	(dBm)	(mW)	(dBi)	(dBm)	(mW)	
BDR/EDR	2402-2480	-6	0.25	0	-6	0.25	Yes

Result: Compliant.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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.

Antenna Connector Construction

The EUT has one internal on board Antenna arrangement, which was permanently attached and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

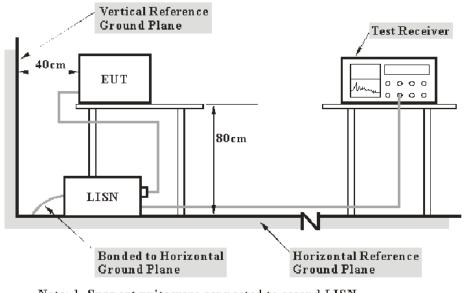
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Factor & Margin Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

Factor = LISN VDF + Cable Loss

The "**Over limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over limit of -7 dB means the emission is 7 dB below the limit. The equation for calculation is as follows:

Over Limit = Level – Limit Level = Read Level + Factor

Test Data

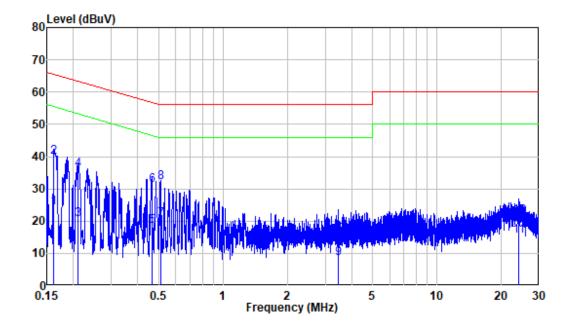
Environmental Conditions

Temperature:	24 °C
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

The testing was performed by Jason Liu on 2022-06-23.

EUT operation mode: Charging

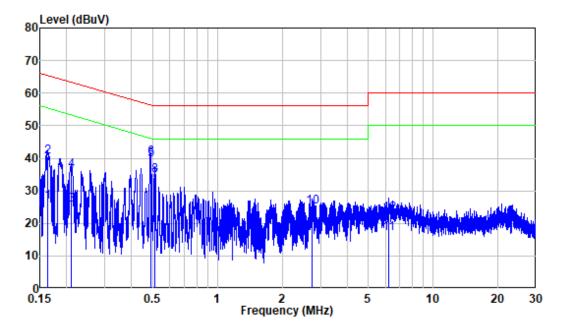
AC 120V/60 Hz, Line



Site :	Shielding Room
Condition:	Line
Mode :	Charging
Model :	TWS027
Power :	AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.162	9.80	14.36	24.16	55.36	-31.20	Average
2	0.162	9.80	30.17	39.97	65.36	-25.39	QP
3	0.209	9.80	10.70	20.50	53.23	-32.73	Average
4	0.209	9.80	26.10	35.90	63.23	-27.33	QP
5	0.464	9.80	8.47	18.27	46.63	-28.36	Average
6	0.464	9.80	21.17	30.97	56.63	-25.66	QP
7	0.512	9.81	10.63	20.44	46.00	-25.56	Average
8	0.512	9.81	22.32	32.13	56.00	-23.87	QP
9	3.440	9.83	-1.49	8.34	46.00	-37.66	Average
10	3.440	9.83	5.89	15.72	56.00	-40.28	QP
11	24.015	10.04	5.31	15.35	50.00	-34.65	Average
12	24.015	10.04	11.28	21.32	60.00	-38.68	QP

AC 120V/60 Hz, Neutral



Site :	Shielding Room
Condition:	Neutral
Mode :	Charging
Model :	TWS027
Power :	AC 120V 60Hz

			Read		Limit	0ver	
	Freq	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.163	9.80	16.83	26.63	55.33	-28.70	Average
2	0.163	9.80	30.61	40.41	65.33	-24.92	QP
3	0.210	9.80	15.96	25.76	53.20	-27.44	Average
4	0.210	9.80	26.49	36.29	63.20	-26.91	QP
5	0.489	9.80	29.61	39.41	46.19	-6.78	Average
6	0.489	9.80	30.44	40.24	56.19	-15.95	QP
7	0.511	9.81	23.25	33.06	46.00	-12.94	Average
8	0.511	9.81	25.01	34.82	56.00	-21.18	QP
9	2.747	9.83	10.61	20.44	46.00	-25.56	Average
10	2.747	9.83	15.10	24.93	56.00	-31.07	QP
11	6.207	9.94	7.07	17.01	50.00	-32.99	Average
12	6.207	9.94	12.94	22.88	60.00	-37.12	QP

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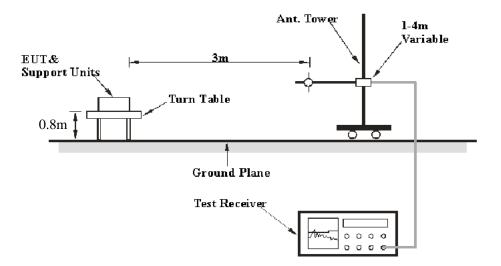
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

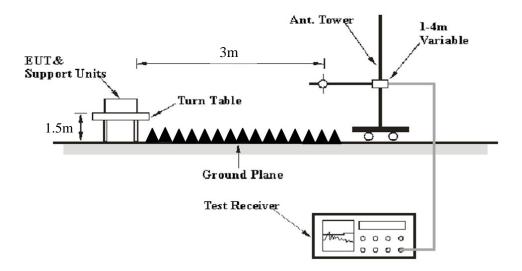
FCC §15.205; §15.209; §15.247(d)

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 CUr	1 MHz	3 MHz	/	РК
Above 1 GHz	1 MHz	10 Hz	/	AV

The EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

If the maximized peak measured value complies with the limit, then it is unnecessary to perform QP/Average measurement.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Factor & Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit/Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

Over Limit/Margin = Level / Corrected Amplitude – Limit Level / Corrected Amplitude = Read Level + Factor

Test Data

Environmental Conditions

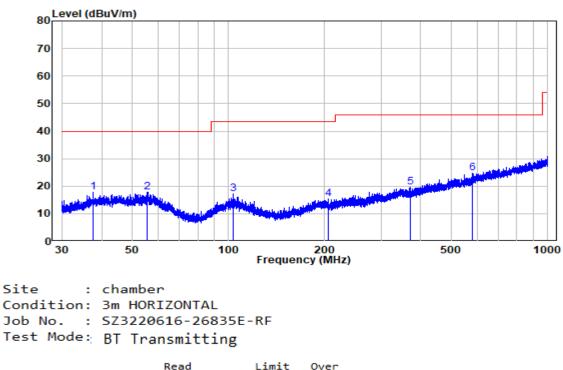
Temperature:	28 °C
Relative Humidity:	60 %
ATM Pressure:	108.0 kPa

The testing was performed by Level Li on 2022-07-08.

EUT operation mode: BT Transmitting

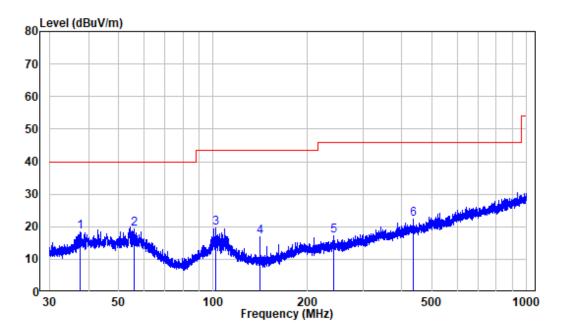
(Scan with GFSK, $\pi/4$ -DQPSK, 8DPSK mode at X axis, Y axis, Z axis, the worst case is 8DPSK Mode at X axis)

Below 1GHz: 8DPSK High Channel



Horizontal

	Freq	Factor			Line		Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	37.531	-10.90	28.61	17.71	40.00	-22.29	Peak
2	55.658	-10.23	28.12	17.89	40.00	-22.11	Peak
3	103.624	-11.71	28.89	17.18	43.50	-26.32	Peak
4	204.596	-11.80	27.27	15.47	43.50	-28.03	Peak
5	371.190	-7.30	27.07	19.77	46.00	-26.23	Peak
6	581.467	-3.25	27.90	24.65	46.00	-21.35	Peak



Vertical

Site : chamber Condition: 3m VERTICAL Job No. : SZ3220616-26835E-RF Test Mode: BT Transmitting

	Freq	Factor			Limit Line		Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	37.531	-10.90	29.42	18.52	40.00	-21.48	Peak
2	55.976	-10.18	29.61	19.43	40.00	-20.57	Peak
3	101.912	-11.58	31.07	19.49	43.50	-24.01	Peak
4	140.712	-15.49	32.53	17.04	43.50	-26.46	Peak
5	241.676	-10.79	28.14	17.35	46.00	-28.65	Peak
6	433.875	-5.73	28.05	22.32	46.00	-23.68	Peak

Above 1GHz (worst case for 8DPSK):

Frequency	Receiver		Turntable Angle	Rx An	tenna	Factor	tor Level	Limit	Margin	
(MHz)	Reading	PK/AV	Degree	Height	Polar	(dB / m)	(dBuV/m)	(dBuV/m)	(dB)	
	(dBuV)	ΓΛ/Αν	Degree	(m)	(H/V)		· · ·			
	Low Channel									
2310	46.98	РК	111	1.0	Н	-7.23	39.75	74	-34.25	
2310	49.05	РК	143	1.5	V	-7.23	41.82	74	-32.18	
2390	48.64	PK	289	2.1	Н	-7.21	41.43	74	-32.57	
2390	51.06	PK	138	1.1	V	-7.21	43.85	74	-30.15	
4804	53.37	PK	325	1.3	Н	-3.52	49.85	74	-24.15	
4804	55.14	РК	76	1.2	V	-3.52	51.62	74	-22.38	
				Middle C	hannel					
4882	53.42	PK	80	2.0	Н	-3.37	50.05	74	-23.95	
4882	55.32	РК	73	1.8	V	-3.37	51.95	74	-22.05	
				High Ch	annel					
2483.5	48.03	РК	71	1.2	Н	-7.2	40.83	74	-33.17	
2483.5	49.66	РК	83	1.7	V	-7.2	42.46	74	-31.54	
2500	46.51	РК	158	1.1	Н	-7.18	39.33	74	-34.67	
2500	48.56	PK	304	1.2	V	-7.18	41.38	74	-32.62	
4960	54.85	РК	156	1.4	Н	-3.01	51.84	74	-22.16	
4960	56.7	РК	49	1.3	V	-3.01	53.69	74	-20.31	

Note:

Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Absolute Level (Corrected Amplitude) = Factor + Reading

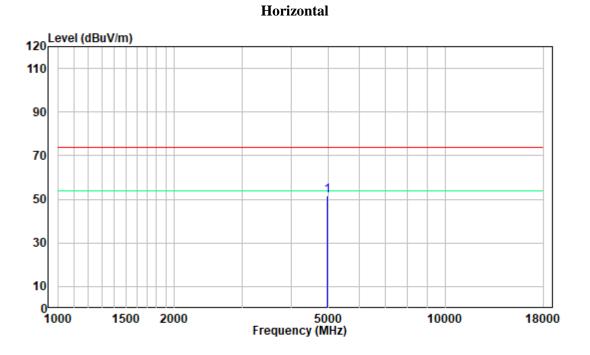
Margin = Absolute Level (Corrected Amplitude) – Limit

The other spurious emission which is in the noise floor level was not recorded.

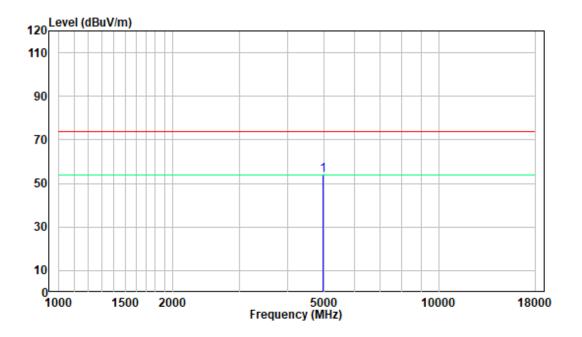
For above 1GHz, the test result of peak was 20dB below to the limit of peak, which can be compliant to the average limit, so just peak value was recorded.

1 GHz - 18 GHz: (Pre-Scan plots)

Worst case for 8DPSK High Channel:

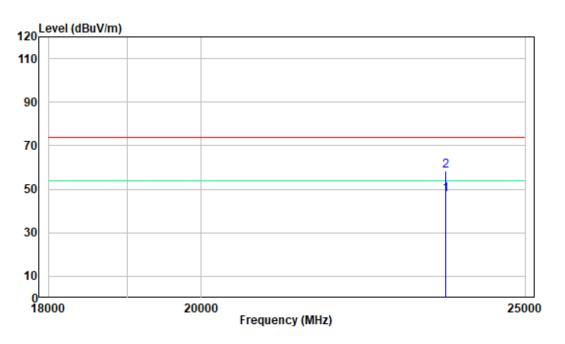


Vertical



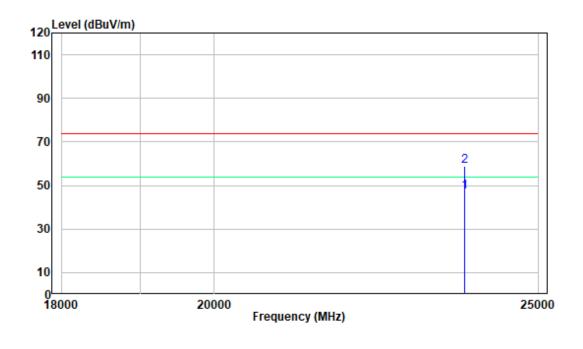
18-25GHz: (Pre-Scan plots)

Worst case for 8DPSK High Channel:



Horizontal





Version 11: 2021-11-09

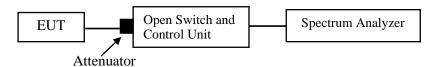
FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

Applicable Standard

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Procedure

- 1. Set the EUT in transmitting mode, max hold the channel.
- 2. Set the adjacent channel of the EUT and max hold another trace.
- 3. Measure the channel separation.



Test Data

Environmental Conditions

Temperature:	23 °C
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

The testing was performed by Cat Kang on 2022-06-28.

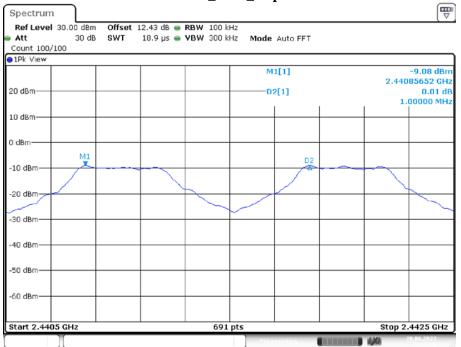
EUT operation mode: Transmitting

Test Result: Compliant.

TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH1	Ant1	Нор	1	>=0.616	PASS
2DH1	Ant1	Нор	1.003	>=0.842	PASS
3DH1	Ant1	Нор	1	>=0.832	PASS

Note: The limit = (2/3) * 20dB bandwidth

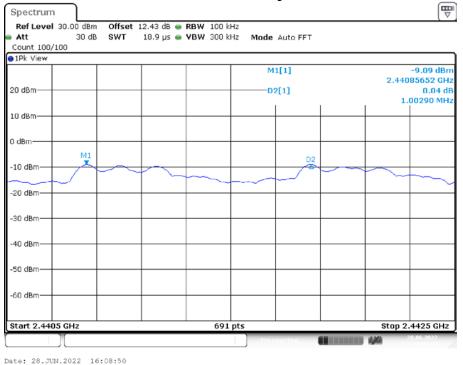
Please refer to the below plots:



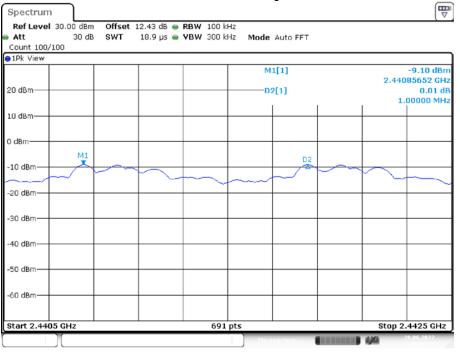
DH1_Ant1_Hop

Date: 28.JUN.2022 15:59:33

2DH1_Ant1_Hop



Shenzhen Accurate Technology Co., Ltd.



3DH1_Ant1_Hop

Date: 28.JUN.2022 16:12:56

FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH & 99% OCCUPIED BANDWIDTH

Applicable Standard

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Procedure

The following conditions shall be observed for measuring the occupied bandwidth and 20 dB bandwidth:

• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

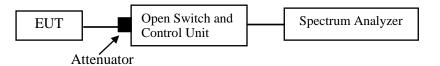
• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

• The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / 20 dB bandwidth if the device is not transmitting continuously.

• The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / 20 dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).



Test Data

Environmental Conditions

Temperature:	23 °C
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

The testing was performed by Cat Kang on 2022-06-28.

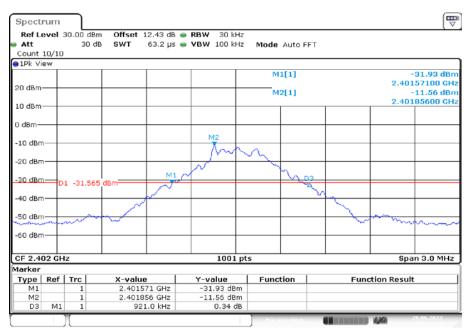
EUT operation mode: Transmitting

Test Result: Compliant.

TestMode	Antenna	Channel	20db EBW[MHz]	99% OCCUPIED BANDWIDTH[MHz]	Verdict
		2402	0.921	0.854	PASS
DH1	Ant1	2441	0.924	0.857	PASS
		2480	0.888	0.86	PASS
	Ant1	2402	1.260	1.172	PASS
2DH1		2441	1.263	1.175	PASS
		2480	1.263	1.178	PASS
	Ant1	2402	1.245	1.166	PASS
3DH1		2441	1.248	1.166	PASS
		2480	1.245	1.169	PASS

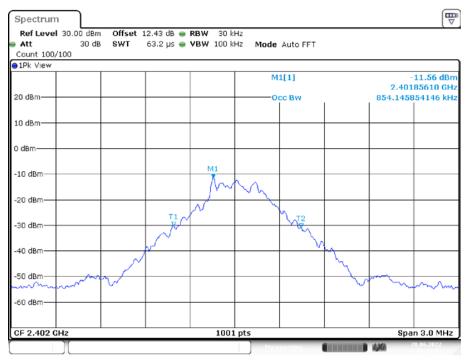
Please refer to the below plots:

20 dB EMISSION BANDWIDTH_DH1_Ant1_2402

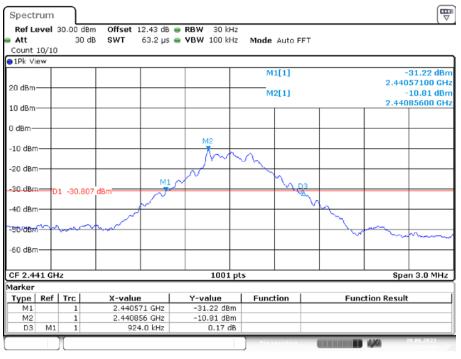


Date: 28.JUN.2022 15:23:37





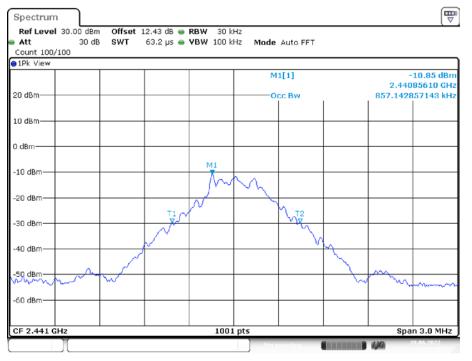
Date: 28.JUN.2022 15:23:54



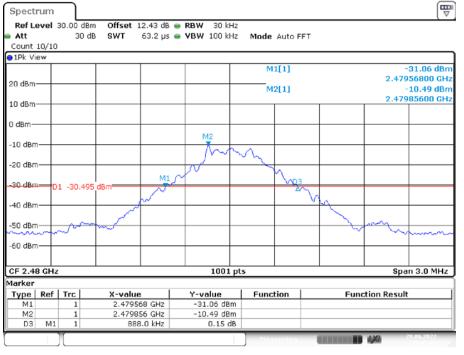
20 dB EMISSION BANDWIDTH_DH1 _Ant1_2441

Date: 28.JUN.2022 15:33:43





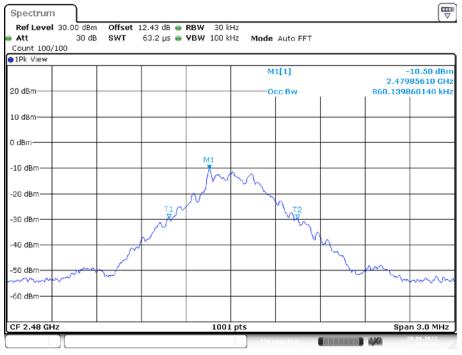
Date: 28.JUN.2022 15:34:47



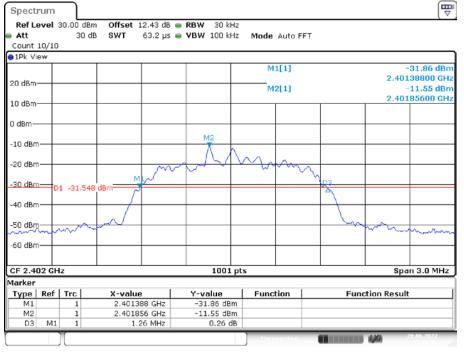
20 dB EMISSION BANDWIDTH_DH1 _Ant1_2480

Date: 28.JUN.2022 15:45:24

99% OCCUPIED BANDWIDTH_DH1 _Ant1_2480



Date: 28.JUN.2022 15:47:26



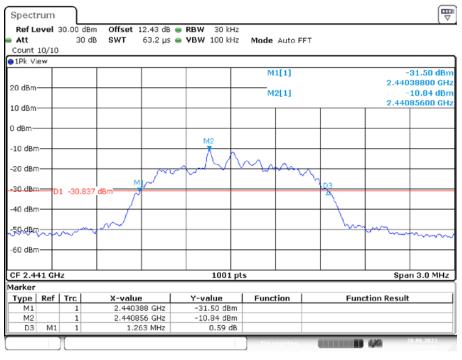
20 dB EMISSION BANDWIDTH_2DH1 _Ant1_2402

Date: 28.JUN.2022 15:49:41





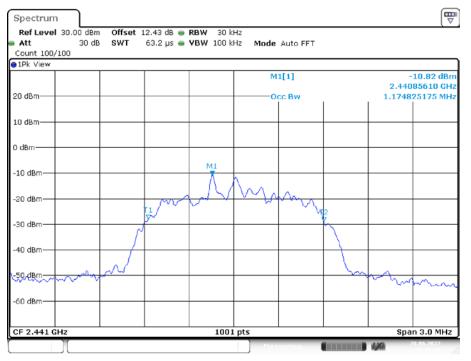
Date: 28.JUN.2022 15:49:58



20 dB EMISSION BANDWIDTH_2DH1 _Ant1_2441

Date: 28.JUN.2022 15:50:58





Date: 28.JUN.2022 15:51:15



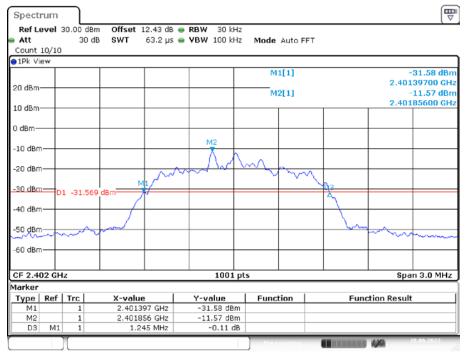
20 dB EMISSION BANDWIDTH _2DH1_Ant1_2480

Date: 28.JUN.2022 15:52:15

99% OCCUPIED BANDWIDTH _2DH1_Ant1_2480



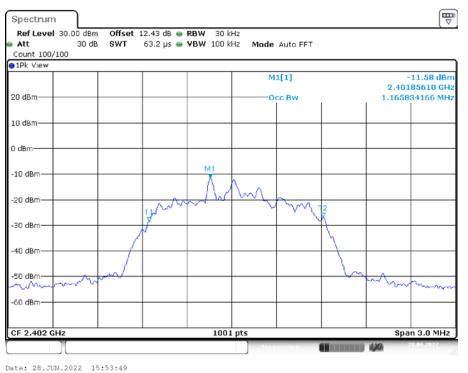
Date: 28.JUN.2022 15:52:32



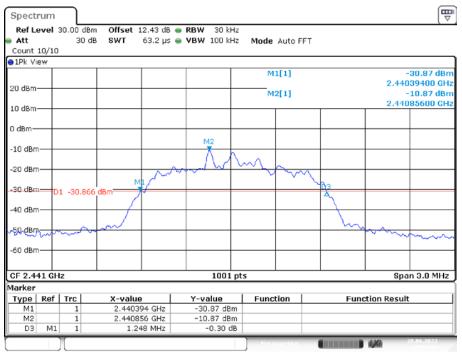
20 dB EMISSION BANDWIDTH_3DH1_Ant1_2402

Date: 28.JUN.2022 15:53:32

99% OCCUPIED BANDWIDTH_3DH1_Ant1_2402



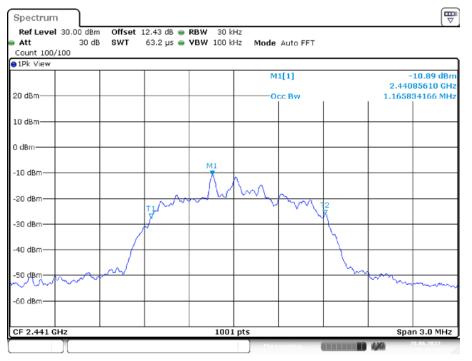
Date: 20.000.2022 10:000



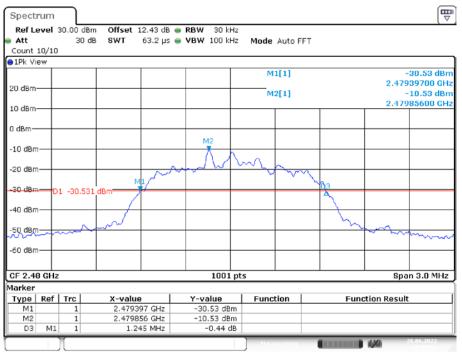
20 dB EMISSION BANDWIDTH_3DH1_Ant1_2441

Date: 28.JUN.2022 15:54:57





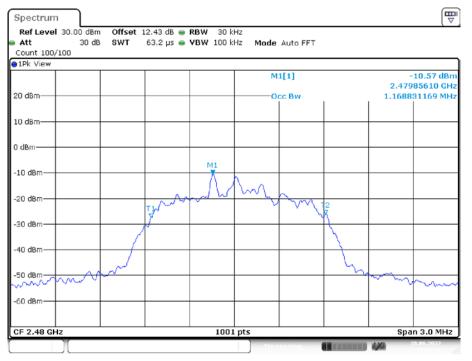
Date: 28.JUN.2022 15:55:13



20 dB EMISSION BANDWIDTH_3DH1_Ant1_2480

Date: 28.JUN.2022 15:55:57





Date: 28.JUN.2022 15:56:13

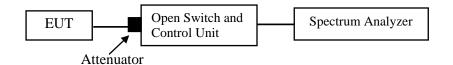
FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

- 1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- 2. Set the EUT in hopping mode from first channel to last.
- 3. By using the max-hold function record the quantity of the channel.



Test Data

Environmental Conditions

Temperature:	23°C
Relative Humidity:	51%
ATM Pressure:	101.1 kPa

The testing was performed by Cat Kang on 2022-06-28.

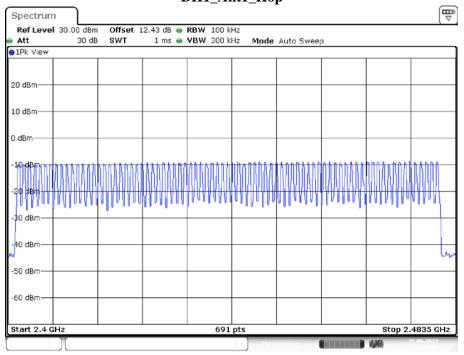
EUT operation mode: Transmitting

Test Result: Compliant.

TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH1	Ant1	Нор	79	>=15	PASS
2DH1	Ant1	Нор	79	>=15	PASS
3DH1	Ant1	Нор	79	>=15	PASS

Please refer to the below plots:

Shenzhen Accurate Technology Co., Ltd.



DH1_Ant1_Hop

Date: 28.JUN.2022 16:00:03

2DH1_Ant1_Hop

Spectrum											₽
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10 dBm											
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-30 dBm											
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-50 dBm											
-60 dBm											
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)[Mea	suring		4/4	8.06.2022	

Date: 28.JUN.2022 16:09:15

Shenzhen Accurate Technology Co., Ltd.

							· F			
Spectrum										
	30.00 dBm		12.43 dB							
Att	30 dB	SWT	1 ms	VBW	300 kHz	Mode	Auto Swee	р		
1Pk View										
20 dBm										
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-50 dBm				_						
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Start 2.4 G	Hz		1		691 pt	5			Stop 2	.4835 GHz
	Y								100	28.06.2022

3DH1_Ant1_Hop

Date: 28.JUN.2022 16:13:26

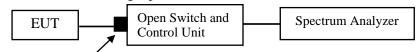
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

- 1. The EUT was worked in channel hopping.
- 2. Set the RBW to: 1MHz.
- 3. Set the VBW \geq 3×RBW.
- 4. Set the span to 0Hz.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Recorded the time of single pulses



Attenuator

Test Data

Environmental Conditions

Temperature:	23 °C
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

The testing was performed by Cat Kang on 2022-06-28.

EUT operation mode: Transmitting

Test Result: Compliant.

TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Нор	0.37	330	0.123	<=0.4	PASS
DH3	Ant1	Нор	1.62	190	0.308	<=0.4	PASS
DH5	Ant1	Нор	2.86	100	0.286	<=0.4	PASS
2DH1	Ant1	Нор	0.38	330	0.126	<=0.4	PASS
2DH3	Ant1	Нор	1.63	160	0.26	<=0.4	PASS
2DH5	Ant1	Нор	2.87	90	0.258	<=0.4	PASS
3DH1	Ant1	Нор	0.38	330	0.127	<=0.4	PASS
3DH3	Ant1	Нор	1.63	160	0.26	<=0.4	PASS
3DH5	Ant1	Нор	2.87	120	0.344	<=0.4	PASS

Note 1: A period time=0.4*79=31.6(s), Result=Burst Width*Total Hops

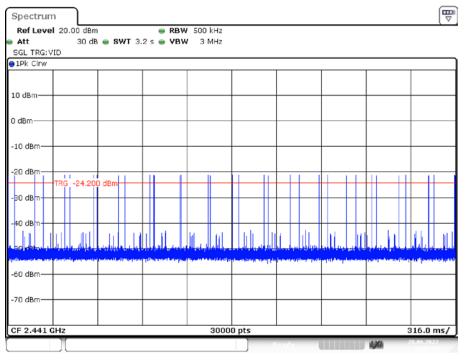
Note 2: Total Hops =Hopping Number in 3.16s*10

Note 3: Hoping Number in 3.16s=Total of highest signals in 3.16s (Second high signals were other channel)

LPk Cirw				M1[1]		-	37.36 dBn
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DH1_Ant1_Hop

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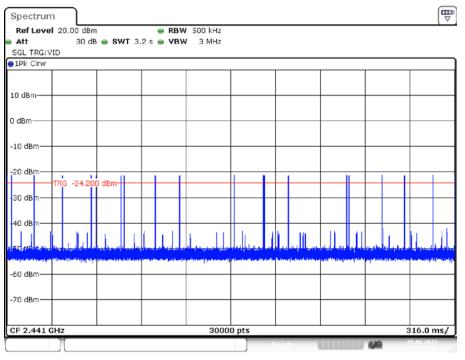


Date: 28.JUN.2022 16:00:26

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DH3_Ant1_Hop

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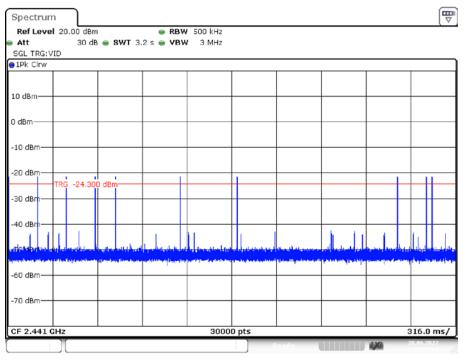


Date: 28.JUN.2022 16:01:23

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DH5_Ant1_Hop

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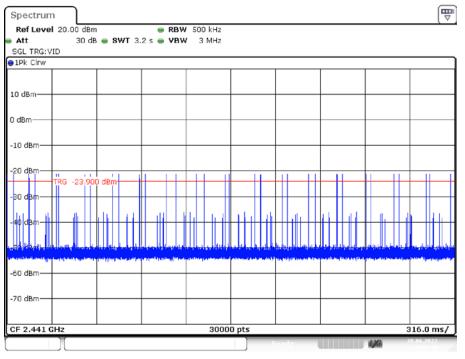


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2DH1_Ant1_Hop

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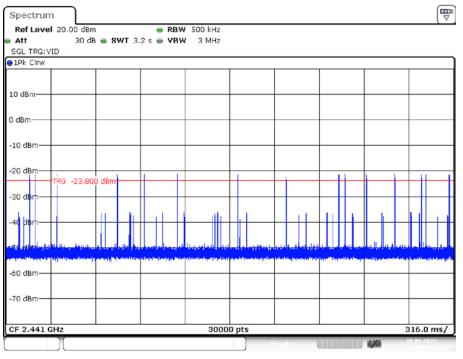


Date: 28.JUN.2022 16:09:39

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2DH3_Ant1_Hop

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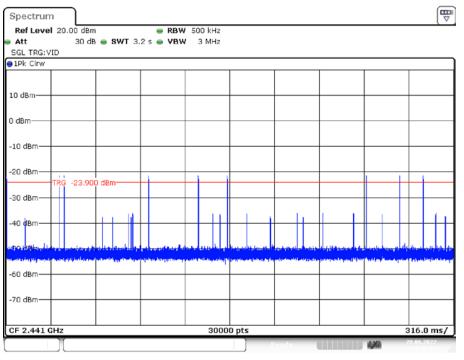


Date: 28.JUN.2022 16:10:14

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2DH5_Ant1_Hop

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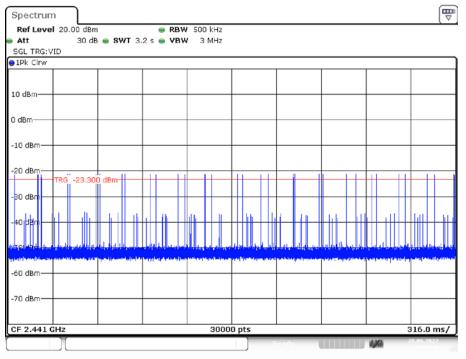


Date: 28.JUN.2022 16:10:52

1Pk Cirw				м	1[1]			28.93 dBr
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3DH1_Ant1_Hop

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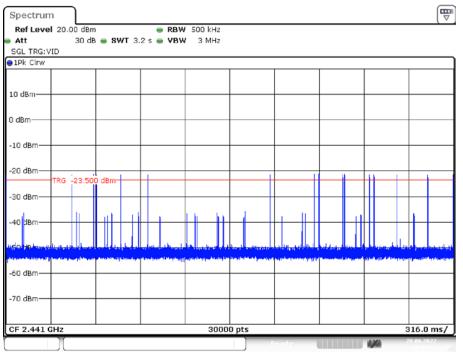


Date: 28.JUN.2022 16:13:49

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3DH3_Ant1_Hop

Date: 28.JUN.2022 16:14:51

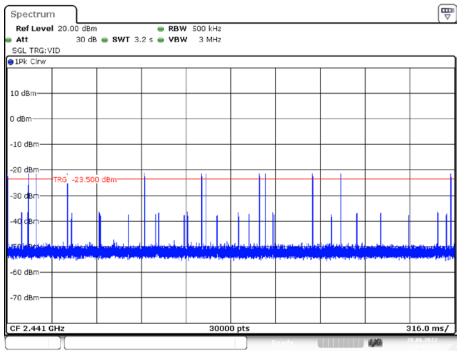


Date: 28.JUN.2022 16:14:56

				м	1[1]			-23.19 dBr -1.23 μ
0 dBm				D	2[1]			0.38 d
					I	I		2.86911 m
dBm								
LO dBm								
0 dBm	a thaile the desired products							
0 dBm	23.500 dBm							
0 dBm								
0 dBm					ndinfactively we want	-	inger Frietun	u i ling hot i
0 dBm		diapated b.	լ <mark>և հրվիները</mark> ։	utte då þági	dependent.	na kalèr ka	du a bianti di	hhhhh

3DH5_Ant1_Hop

Date: 28.JUN.2022 16:15:28



Date: 28.JUN.2022 16:15:34

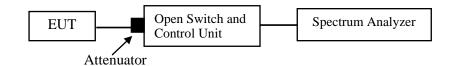
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Test Procedure

- 1. Place the EUT on a bench and set in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
- 3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	23°C
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

The testing was performed by Cat Kang on 2022-06-28.

EUT operation mode: Transmitting

Test Result: Compliant.

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
		2402	-9.18	<=20.97	PASS
DH1	Ant1	2441	-8.57	<=20.97	PASS
		2480	-8.29	<=20.97	PASS
		2402	-8.49	<=20.97	PASS
2DH1	Ant1	2441	-7.7	<=20.97	PASS
		2480	-7.58	<=20.97	PASS
		2402	-7.98	<=20.97	PASS
3DH1	Ant1	2441	-7.26	<=20.97	PASS
		2480	-6.98	<=20.97	PASS

Please refer to the below plots:

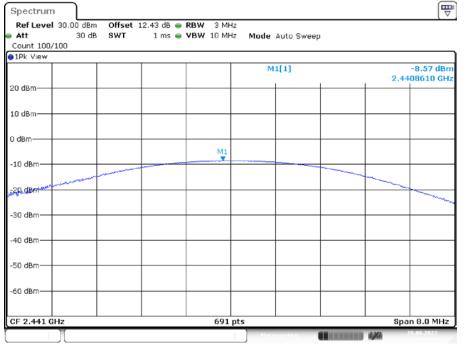
Shenzhen Accurate Technology Co., Ltd.

Ref Level 30.00 dB		12.43 dB 😑						
Att 30 d	B SWT	1 ms 👄	VBW 10 M	Hz Mode	Auto Sweep)		
Count 100/100 1Pk View								
TEK AIRM		1			1[1]			-9.18 dBm
					1[1]		2.40	21390 GH
20 dBm								
10 dBm								
D dBm								
				M1				
-10 dBm				T				
		T						
-20 dBm								
and the second s								- mark
-30 dBm								
-40 dBm								
-50 dBm								
-60 dBm								
CF 2.402 GHz			601	pts			Sna	n 8.0 MHz
							100	28.06.2022

DH1_Ant1_2402

Date: 28.JUN.2022 15:11:57

DH1_Ant1_2441



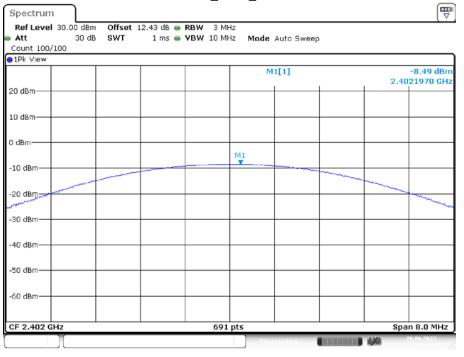
Date: 28.JUN.2022 15:13:30

Spectrum Ref Level 30.00 dB	m Offset 12.43 dB 👄	RBW 3 MHz			
Att 30 d	IB SWT 1 ms 👄	VBW 10 MHz Mod	le Auto Sweep		
Count 100/100					
1Pk View					
			M1[1]	2 47	-8.29 dBm 99190 GHz
20 dBm				2.177	55150 012
10 dBm					
0 dBm					
		M1			
-10 dBm					
	~				
-20 dBm					and the second second
					- and
-30 dBm					
-40 dBm					
-50 dBm					
(0.40					
-60 dBm					
CF 2.48 GHz		691 pts		Spa	n 8.0 MHz
			te a suring 📲 💷	100	8.06.2022

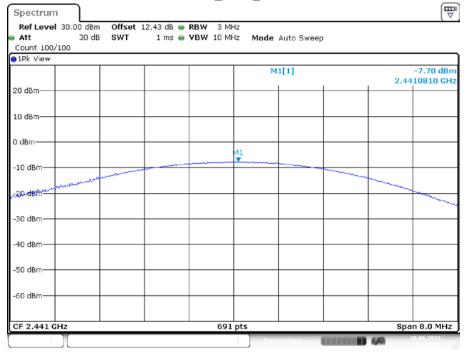
DH1_Ant1_2480

Date: 28.JUN.2022 15:14:33

2DH1_Ant1_2402



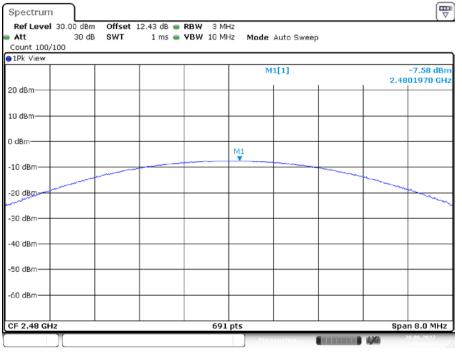
Date: 28.JUN.2022 15:16:26



2DH1_Ant1_2441

Date: 28.JUN.2022 15:17:40

2DH1_Ant1_2480



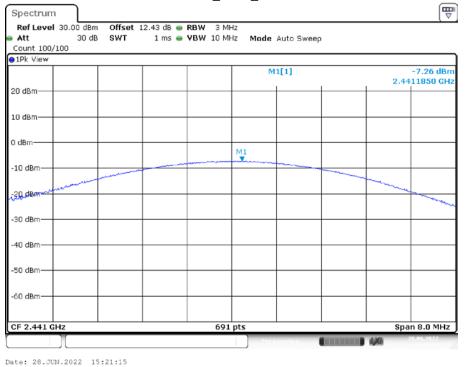
Date: 28.JUN.2022 15:18:53

Ref Level 30.00 dBm	Offset 12.43 dB				
Att 30 dB	SWT 1 ms	VBW 10 MHz Mod	e Auto Sweep		
Count 100/100 1Pk View					
ITEN VIEW			M1[1]		7.98 dBm 1970 GHz
20 dBm					
10 dBm					
) dBm		M1			
10 dBm		X			
-20 dBm					annan an a
-30 dBm					
40 dBm					
50 dBm					
-60 dBm					
CF 2.402 GHz		691 pts		Span	8.0 MHz

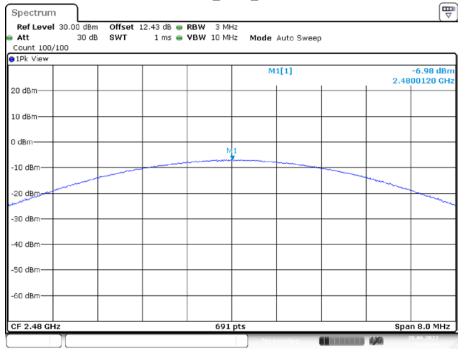
3DH1_Ant1_2402

Date: 28.JUN.2022 15:20:20

3DH1_Ant1_2441



Shenzhen Accurate Technology Co., Ltd.



3DH1_Ant1_2480

Date: 28.JUN.2022 15:22:04

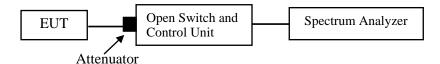
FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c)).

Test Procedure

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
- 3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- 5. Repeat above procedures until all measured frequencies were complete.



Test Data

Environmental Conditions

Temperature:	23°C
Relative Humidity:	51 %
ATM Pressure:	101.1kPa

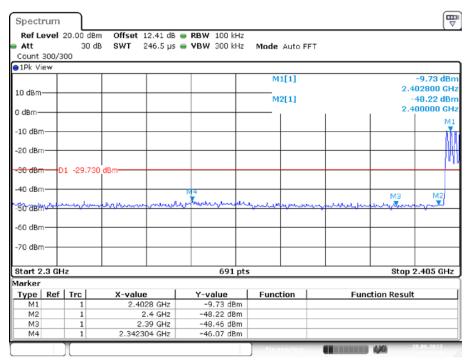
The testing was performed by Cat Kang on 2022-06-28.

EUT operation mode: Transmitting

Test Result: Compliant

Please refer to the below plots:

DH1: Band Edge-Left Side Hopping



Date: 28.JUN.2022 15:59:00

Single

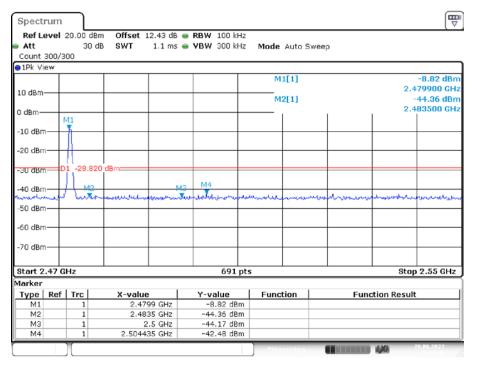
Spectrum					(₩
		RBW 100 kHz			
Att 30 dB SW Count 300/300	246.5 µs e	VBW 300 kHz	Mode Auto F	-F-1	
1Pk View					
			M1[1]		-9.93 dBr
			and the		2.402190 GH
10 dBm			M2[1]		-50.07 dBr
D dBm					2.400000 GH
					M1
10 dBm					T T
-20 dBm					
30 dBiii 101 -29,930 dBiii					
-40 dBm			04		
					M3 M2
50 ¹ 1381% at a second	and the second second	at all a stream and all and a	40-00-00 -00-000	Manual Annal Contraction	and the state of t
-60 dBm					
-ou abm					
-70 dBm					
Start 2.3 GHz		691 pts			Stop 2.405 GHz
Marker		· · ·			
Type Ref Trc X-	value	Y-value	Function	Fun	ction Result
	2.40219 GHz	-9.93 dBm			
M2 1	2.4 GHz	-50.07 dBm			
M3 1	2.39 GHz	-50.57 dBm			
M4 1	2.363 GHz	-45.95 dBm			
			Meacurine		28.06.2022

Date: 28.JUN.2022 15:24:10

			nobb			
Spectrum						E
Ref Level	20.00 dBr	n Offset 12.43 dB	RBW 100 kHz			(,
Att	30 d		VBW 300 kHz	Mode Auto S	weep	
Count 300/3	300					
1Pk View						
				M1[1]		-8.91 dBn
						2.478860 GH
				M2[1]		-44.08 dBn
						2.483500 GH
1	1					
100 PB m - 1						
առուսու	NI					
-£0) 9844 -1, 11	1					
3U dBm	28.91	dBm				
-40 dBm	M2		M2 M4			
	haven	in moundary with	Tome to damage	mound	uphoremente	ah malanah maranah
50 dBm —						
		1 1				
60 dBm						
-70 dBm						
-70 dBm	GHz		691 pt	s		Stop 2.55 GHz
-70 dBm Start 2.47 G larker						
70 dBm Start 2.47 C Iarker Type Ref	Trc	X-value	Y-value	s Function	Func	Stop 2.55 GHz
70 dBm Start 2.47 C larker Type Ref M1	Trc 1	2.47886 GHz	Y-value -8.91 dBm		Func	
-70 dBm Start 2.47 C larker Type Ref M1 M2	Trc 1 1	2.47886 GHz 2.4835 GHz	Y-value -8.91 dBm -44.08 dBm		Func	
M1	Trc 1	2.47886 GHz	Y-value -8.91 dBm		Func	

DH1: Band Edge- Right Side Hopping

Date: 28.JUN.2022 16:06:28

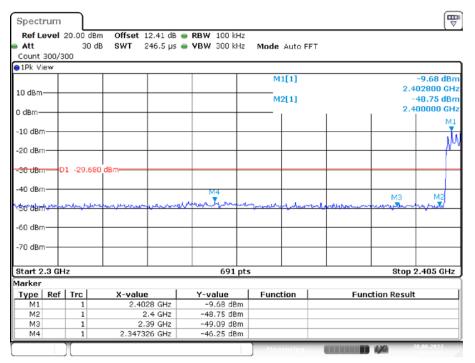


Single

Date: 28.JUN.2022 15:47:42

Version 11: 2021-11-09

2DH1: Band Edge-Left Side Hopping



Date: 28.JUN.2022 16:07:36

₽ Spectrum Offset 12.43 dB 🖷 RBW 100 kHz Ref Level 20.00 dBm 30 dB SWT 246.5 µs 👄 VBW 300 kHz Mode Auto FFT Att Count 300/300 ⊖1Pk View M1[1] •9.70 dBn 2.401880 GHz 10 dBm M2[1] -50.21 dBm 2.400000 GHz 0 dBm M1 -10 dBm--20 dBm--30 dBr D1 -29.700 -40 dBm M3 Ма T X SO dBm -60 dBm -70 dBm-Start 2.3 GHz Stop 2.405 GHz 691 pts Marker Type Ref Trc X-value Y-value Function Function Result M1 2.40188 GHz -9.70 dBm 1 M2 1 2.4 GHz -50.21 dBm 2.39 GHz 2.319783 GHz M3 1 -49.36 dBm M4 -46.24 dBm 1

Single

Date: 28.JUN.2022 15:50:14

2DH1: Band Edge- Right Side Hopping

Spectrum	L						
Ref Level Att	20.00 dB 30 i		B 👄 RBW 100 kł				
Count 300/3		db SWI 1.1 m	is 👄 VBW 300 kł	12 Mode	Auto Sv	weep	
1Pk View	00						
JIPK VIEW					1[1]		-9.08 dBn
I				M.	1[1]		2.473880 GH
LO dBm				M	2[1]		-44.79 dBn
					-[+]		2.483500 GH
) dBm						1	
	•						
12 Bally	រា						
20 dBm 🕂	1						
30 dBm D	1 -29.08	30 dBm					
40 dBm			MO				M4
40 aBm	M2	margundund		-	meno	manufacture	un mener and manufer and
50 dBm							
60 dBm —							
I							
-70 dBm							
I							
Start 2.47 G	Hz		691	pts			Stop 2.55 GHz
1arker							
Type Ref	Trc	X-value	Y-value	Funct	tion	Fu	nction Result
M1	1	2.47388 GHz					
M2	1	2.4835 GHz					
M3	1	2.5 GHz					
M3 M4	1	2.548145 GHz					

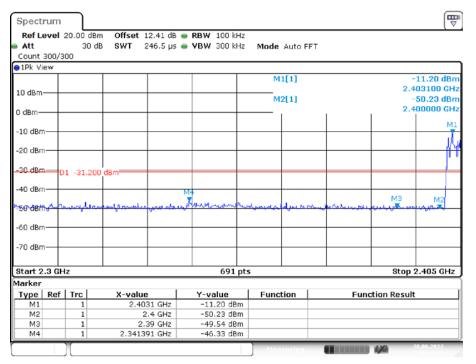
Date: 28.JUN.2022 16:11:27

Att	el 20.00 dB 30 d		RBW 100 kHz VBW 300 kHz	Mode Auto S	Ewoon			
Count 30		30 3WI 1.1 113 1	• • B • 300 KH2	MOUE AULUS	oweeh			
1Pk View								
				M1[1]		-8.79 dBi		
10 dBm—						2.479900 GH		
20 00/11	1			M2[1]		-45.38 dBr		
0 dBm						2.483500 GH		
	M1							
-10 dBm—								
-20 dBm—								
-20 00111								
-30 dBm-	D1 -28.79	0 dBm						
						M4		
-40 dBm—	M2	M. Markow when my			1.00 - 4			
-50 dBm—		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		and the second	where he was a start of the			
-00 abin-								
-60 dBm—								
-70 dBm—	+							
Start 2.4	7 GHz		691 pt	5		Stop 2.55 GHz		
larker								
	ef Trc	X-value	Y-value	Function	Function Result			
M1	1	2.4799 GHz	-8.79 dBm					
M2	1	2.4835 GHz 2.5 GHz	-45.38 dBm -44.86 dBm					
M3	1							

Single

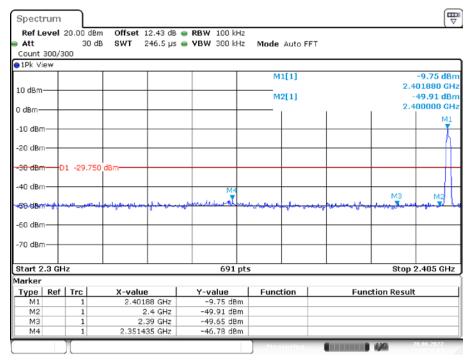
Date: 28.JUN.2022 15:52:47

3DH1: Band Edge-Left Side Hopping



Date: 28.JUN.2022 16:12:16

Single



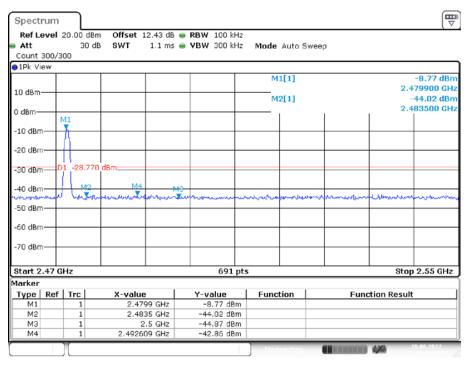
Date: 28.JUN.2022 15:54:04

3DH1: Band Edge- Right Side Hopping

0.00 dBm 30 dB 0			RBW 100 k		de Auto S M1[1] M2[1]	weep		-	-9.18 dBm 76890 GHz 44.65 dBm 83500 GHz
	SWT 1	1.1 ms 👄		Hz Mo	M1[1]	weep		-	44.65 dBm
								-	44.65 dBm
								-	44.65 dBm
						I	I	-	76890 GHz 44.65 dBm
					M2[1]	I	I	-	44.65 dBm
					M2[1]		I		
					-			2.1	
				1					
-29.180	dBm								
			M4						
	an at hun a				the house and	Mile on the last	Muser	and the second	
						-			
					_				
									-
z			691	pts				Stop	2.55 GHz
Trc	X-value		Y-value		nction	Function Result			
1	2.47689	GHz	-9.18 dBm						
1	2.4835 GHz		-44.65 dBm						
1									
1	2.508841	GHz	-42.59 df	sm					
	2 2 1 1	z Trc X-value 1 2.47689 1 2.435 1 2.2.5	M2 M2 Image: State of the state o	M2 M3 M2 M3 Image: State of the	M2 M4 M2 M2 M2 M3 M2 M4 M2 M3 Z 691 pts I 2.47689 GHz -9.18 dBm 1 2.4835 GHz -44.65 dBm 1 2.5 GHz -44.94 dBm	M2 M4 M2 M4 M3 M3 M3 M4 M3 M3 M3 M3 M3 M4 M3 M3 M3 M4 M3 M3 M3 M3 M3 M3 M4 M3 M3 M3 M3 M3 M3 M3 M3 M3 M4 M3 M3 M3 M3 M3 M4 M3 M3 M3 M4 M3 M3 M3 M4 M3 M3 M3 M4 M3 M4 M3	M2 M4 M2 M3 M3 M4 M3 M3 M3 <	M2 M3 M2 M4 M3 M4 M4 <	M2 M4 M3 M4 M4 M4 M4 M4 M4 M4 M4 M4 M4 M4 M4 <

Date: 28.JUN.2022 16:16:15

Single



Date: 28.JUN.2022 15:56:28

***** END OF REPORT *****

Version 11: 2021-11-09