



FCC AND ISCED CERTIFICATION TEST REPORT

Applicant	:	Harman International Industries, Inc.
Address of Applicant	:	8500 Balboa Boulevard, Northridge, CA 91329, UNITED STATES
Manufacturer	:	Harman International Industries, Inc.
Address of Manufacturer	:	8500 Balboa Boulevard, Northridge, CA 91329, UNITED STATES
Equipment under Test	:	Portable Bluetooth Speaker
Model No.	:	XTREME 4G
Trade Mark	:	JBL
FCC ID	:	APIJBLXTREME4G
IC	:	6132A-JBLXTREME4G
Test Standard(s)	:	FCC Rules and Regulations Part 15 Subpart C, RSS-247 Issue 3 August 2023, ANSI C63.10:2013, RSS-Gen Issue 5, Apr. 2018, Amendment 2 (February 2021)
Report No.	:	DDT-RE23090419-2E03
Issue Date	:	2023/10/10
Issue By	:	Dongguan Dongdian Testing Service Co., Ltd.
Address of Laboratory	:	Unit 2, Building 1, No. 17, Zongbu 2nd Road, Songshan Lake Park, Dongguan, Guangdong, China, 523808

REPORT

Table of Contents

	Test report declares.....	4
1.	Summary of Test Results.....	7
2.	General Test Information	8
2.1.	Description of EUT	8
2.2.	Accessories of EUT.....	9
2.3.	Assistant equipment used for test.....	9
2.4.	Block diagram of EUT configuration for test	9
2.5.	Deviations of test standard.....	10
2.6.	Test environment conditions	10
2.7.	Test laboratory	10
2.8.	Measurement uncertainty.....	11
3.	Equipment Used During Conductive Test.....	12
4.	20 dB Bandwidth	13
4.1.	Block diagram of test setup.....	13
4.2.	Limits	13
4.3.	Test procedure	13
4.4.	Test result.....	13
4.5.	Test graphs	14
5.	99% Bandwidth	17
5.1.	Block diagram of test setup.....	17
5.2.	Limits	17
5.3.	Test procedure	17
5.4.	Test Result	17
5.5.	Test Graphs.....	18
6.	Maximum Peak Output Power	21
6.1.	Block diagram of test setup.....	21
6.2.	Limits	21
6.3.	Test procedure	21
6.4.	Test Result	22
6.5.	Test graphs	23
7.	Carrier Frequency Separation.....	26
7.1.	Block diagram of test setup.....	26
7.2.	Limits	26
7.3.	Test procedure	26
7.4.	Test result.....	26
7.5.	Test graphs	27
8.	Dwell Time.....	28

8.1.	Block diagram of test setup.....	28
8.2.	Limits	28
8.3.	Test procedure	28
8.4.	Test result.....	29
8.5.	Test graphs	30
9.	Number of Hopping Channel	36
9.1.	Block diagram of test setup.....	36
9.2.	Limits	36
9.3.	Test procedure	36
9.4.	Test result.....	36
9.5.	Test graphs	37
10.	Band Edge Compliance (Conducted Method)	38
10.1.	Block diagram of test setup.....	38
10.2.	Limit	38
10.3.	Test procedure	38
10.4.	Test result.....	38
10.5.	Test graphs	39
11.	RF Conducted Spurious Emissions	43
11.1.	Block diagram of test setup.....	43
11.2.	Limits	43
11.3.	Test procedure	43
11.4.	Test result.....	44
11.5.	Test graphs	45
12.	Duty cycle.....	54
12.1.	Block diagram of test setup.....	54
12.2.	Limit	54
12.3.	Test procedure	54
12.4.	Test result.....	54
12.5.	Test graphs	55
13.	Radiated Emission	58
13.1.	Test equipment.....	58
13.2.	Block diagram of test setup.....	58
13.3.	Limit	60
13.4.	Test procedure	61
13.5.	Test result.....	64
14.	Band Edge Compliance (Radiated Method)	73
14.1.	Test equipment.....	73
14.2.	Block diagram of test setup.....	73

14.3.	Limit.....	73
14.4.	Test procedure	73
14.5.	Test result.....	74
15.	Power Line Conducted Emission	87
15.1.	Test equipment.....	87
15.2.	Block diagram of test setup.....	87
15.3.	Power line conducted emission limits	87
15.4.	Test procedure	87
15.5.	Test result.....	88
16.	Antenna Requirements	91
16.1.	Limit	91
16.2.	Result	91
17.	Test Setup Photograph	92
18.	Photos of the EUT	95

Test Report Declare

Applicant	:	Harman International Industries, Inc.
Address of Applicant	:	8500 Balboa Boulevard, Northridge, CA 91329, UNITED STATES
Equipment under Test	:	Portable Bluetooth Speaker
Model No.	:	XTREME 4G
Trade Mark	:	JBL
Manufacturer	:	Harman International Industries, Inc.
Address of Manufacturer	:	8500 Balboa Boulevard, Northridge, CA 91329, UNITED STATES

Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C, RSS-247 Issue 3 August 2023.

Test Procedure Used:

ANSI C63.10:2013, RSS-Gen Issue 5, Apr. 2018, Amendment 2 (February 2021)

We Declare:

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC&ISED standards.

Report No.:	DDT-RE23090419-2E03		
Date of Receipt:	2023/09/14	Date of Test:	2023/09/14 ~ 2023/10/10

Prepared By:

Bobo Chen
Bobo Chen/Engineer

Approved By:

Damon Hu
Damon Hu/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	2023/10/10	

1. Summary of Test Results

Description of Test Item	Standard	Result
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1) RSS-247 Issue 3 clause 5.4(b)	Pass
20 dB Bandwidth	FCC Part 15: 15.247(a)(1) RSS-247 Issue 3 clause 5.1(a)	Pass
99% Bandwidth	RSS-Gen Issue 5 clause 6.7	Pass
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) RSS-247 Issue 3 clause 5.1(b)	Pass
Number of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii) RSS-247 Issue 3 clause 5.1(d)	Pass
Dwell Time	FCC Part 15: 15.247(a)(1)(iii) RSS-247 Issue 3 clause 5.1(d)	Pass
RF Conducted Spurious Emissions	FCC Part 15: 15.247(d) RSS-247 Issue 3 clause 5.5	Pass
Radiated Emission	FCC Part 15: 15.205 FCC Part 15: 15.209 FCC Part 15: 15.247(d) RSS-247 Issue 3 clause 5.5 RSS-Gen Issue 5 clause 8.9 RSS-Gen Issue 5 clause 8.10	Pass
Band Edge Compliance	FCC Part 15: 15.205 FCC Part 15: 15.209 FCC Part 15: 15.247(d) RSS-247 Issue 3 clause 5.5 RSS-Gen Issue 5 clause 8.9 RSS-Gen Issue 5 clause 8.10	Pass
Power Line Conducted Emissions	FCC Part 15: 15.207(a) RSS-Gen Issue 5 clause 8.8	Pass
Antenna Requirement	FCC Part 15: 15.203 RSS-Gen Issue 5 clause 6.8	Pass
Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.		

2. General Test Information

2.1. Description of EUT

EUT Name	: Portable Bluetooth Speaker
Model Number	: XTREME 4G
EUT Function Description	: Please reference user manual of this device
Power Supply	: DC 5V/9V/12V/15V/20V --- 3.0A from external AC Adapter DC 7.2V Polymer Li-ion built-in battery
Radio Specification	: Bluetooth V5.3 (BR/EDR/LE), 2.4GHz SRD
Operation Frequency	: Bluetooth (BR/EDR/LE): 2402 MHz-2480 MHz 2.4GHz SRD: 2407 MHz-2475 MHz
Modulation	: Bluetooth BR/EDR: GFSK, $\pi/4$ -DQPSK, 8DPSK Bluetooth LE: GFSK 2.4GHz SRD: GFSK, $\pi/4$ -DQPSK, 8DPSK
Sample Number	: S23090419-24 for conductive, S23090419-25 for radiation

Note 1: “☑” means to be chosen or applicable; “☐” means don't to be chosen or not applicable; This note applies to entire report.

Note 2: This report only for Bluetooth 2.4GHz SRD.

Note 3: Simultaneously transmission condition:

Condition	RF Technology	
1	Bluetooth	2.4GHz SRD
The emission of the simultaneous operation has been evaluated and no non-compliance was found.		

Note 4: Antenna information:

2.4GHz SRD Antenna information	
Antenna Type	: FPC
Antenna Gain(dBi)	: 2.09

Note 5: 2.4GHz SRD Channel information:

2.4GHz SRD Channel information					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2407	23	2430	46	2453
1	2408	24	2431	47	2454
2	2409	25	2432	48	2455
3	2410	26	2433	49	2456
4	2411	27	2434	50	2457
5	2412	28	2435	51	2458
6	2413	29	2436	52	2459
7	2414	30	2437	53	2460
8	2415	31	2438	54	2461

9	2416	32	2439	55	2462
10	2417	33	2440	56	2463
11	2418	34	2441	57	2464
12	2419	35	2442	58	2465
13	2420	36	2443	59	2466
14	2421	37	2444	60	2467
15	2422	38	2445	61	2468
16	2423	39	2446	62	2469
17	2424	40	2447	63	2470
18	2425	41	2448	64	2471
19	2426	42	2449	65	2472
20	2427	43	2450	66	2473
21	2428	44	2451	67	2474
22	2429	45	2452	68	2475

Note 6: The above EUT information is declared by manufacturer and for more detailed features description please refer to the manufacturer's specifications or User's Manual. The above Antenna information is declared by manufacturer and for more detailed features description please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

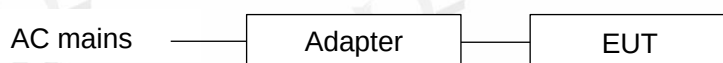
2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Description	Remark
AC Adapter	Group Intellect Power Technology Limited	GHWM-PD60W-X4	Input: 100-240V ~ 50/60 Hz 1.5A Output: 5.0V---3.0A, 9.0V---3.0A, 12.0V---3.0A, 15.0V---3.0A, 20.0V---3.0A	N/A

2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	EMC Compliance	SN
N/A	N/A	N/A	N/A	N/A

2.4. Block diagram of EUT configuration for test



Test software: Zgmicro Bluetooth * Authentication Tool V2.3.167.892 - 1ToN/PB2.0.exe

The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

The pathloss of external cable: 0.5 dB (According to the manufacturer's claims)

Tested mode, channel, information			
Mode	Setting Tx Power	Channel	Frequency (MHz)
GFSK hopping on Tx mode	Default	CH0 to CH68	2407 to 2475
$\pi/4$ -DQPSK hopping on Tx mode	Default	CH0 to CH68	2407 to 2475
8DPSK hopping on Tx mode	Default	CH0 to CH68	2407 to 2475
GFSK hopping off Tx mode	Default	CH0	2407
	Default	CH34	2441
	Default	CH68	2475
$\pi/4$ -DQPSK hopping off Tx mode	Default	CH0	2407
	Default	CH34	2441
	Default	CH68	2475
8DPSK hopping off Tx mode	Default	CH0	2407
	Default	CH34	2441
	Default	CH68	2475
Worst-case data rates were: GFSK mode: DH5, $\pi/4$ -DQPSK mode: 2DH5, 8DPSK mode: 3DH5			

2.5. Deviations of test standard

No deviation.

2.6. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	+15°C to +35 °C
Humidity range:	20% to 75%
Pressure range:	86 kPa to 106 kPa

Note: The specific temperature and humidity information of each test item refers to the temperature and humidity record in the corresponding test data.

2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

Tel.: +86-0769-38826678, <http://www.dgddt.com>, Email: ddt@dgddt.com.

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, R-20155, G-20118

2.8. Measurement uncertainty

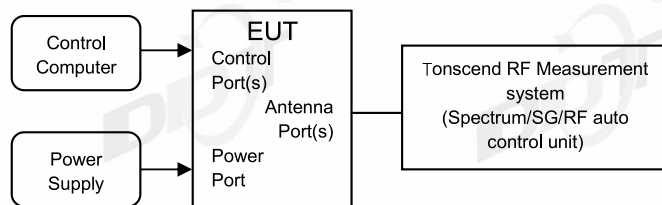
Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power (Conducted) (Spectrum analyzer)	0.86 dB (10 MHz $\leq$ f < 3.6 GHz);
	1.38 dB (3.6 GHz $\leq$ f < 8 GHz)
Peak Output Power (Conducted) (Power Sensor)	0.74 dB
Power Spectral Density	0.74 dB (10 MHz $\leq$ f < 3.6 GHz);
	1.38 dB (3.6 GHz $\leq$ f < 8 GHz)
Frequencies Stability	6.7×10^{-8} (Antenna couple method)
	5.5×10^{-8} (Conducted method)
Conducted spurious emissions	0.86 dB (10 MHz $\leq$ f < 3.6 GHz);
	1.40 dB (3.6 GHz $\leq$ f < 8 GHz)
	1.66 dB (8 GHz $\leq$ f < 26.5 GHz)
Uncertainty for radio frequency (RBW < 20 kHz)	3×10^{-8}
Temperature	0.4 °C
Humidity	2 %
Uncertainty for Radiation Emission test (9 kHz – 30 MHz)	3.44 dB
Uncertainty for Radiation Emission test (30 MHz - 1 GHz)	4.70 dB (Antenna Polarize: V)
	4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1 GHz - 40 GHz)	4.10 dB (1 - 6 GHz)
	4.40 dB (6 GHz - 18 GHz)
	3.54 dB (18 GHz - 26 GHz)
	4.30 dB (26 GHz - 40 GHz)
Uncertainty for Power line conduction emission test	3.34dB (150KHz-30MHz)
	3.72dB (9KHz-150KHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3. Equipment Used During Conductive Test

Equipment	Manufacturer	Model No.	Serial Number	Due Date
☒ RF Connected Test (RF Measurement System 3#)				
SIGNAL ANALYZER	R&S	FSV40	101407	2024/07/11
Wideband Radio Communication Tester	R&S	CMW500	117491	2024/04/26
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY62153058	2024/07/11
MXG Vector Signal Generator	Agilent	N5182A	MY48180912	2024/04/22
RF Control Unit	Tonscend	JS0806-2	20C8060230	2024/04/26
TEMP&HUMI Programmable Chamber	ZHIXIANG	ZXGDJS-150L	ZX170110-A	2024/05/14
Test Software	Tonscend	JS1120-3	Ver.3.2.22	N/A

4. 20 dB Bandwidth

4.1. Block diagram of test setup



4.2. Limits

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.3. Test procedure

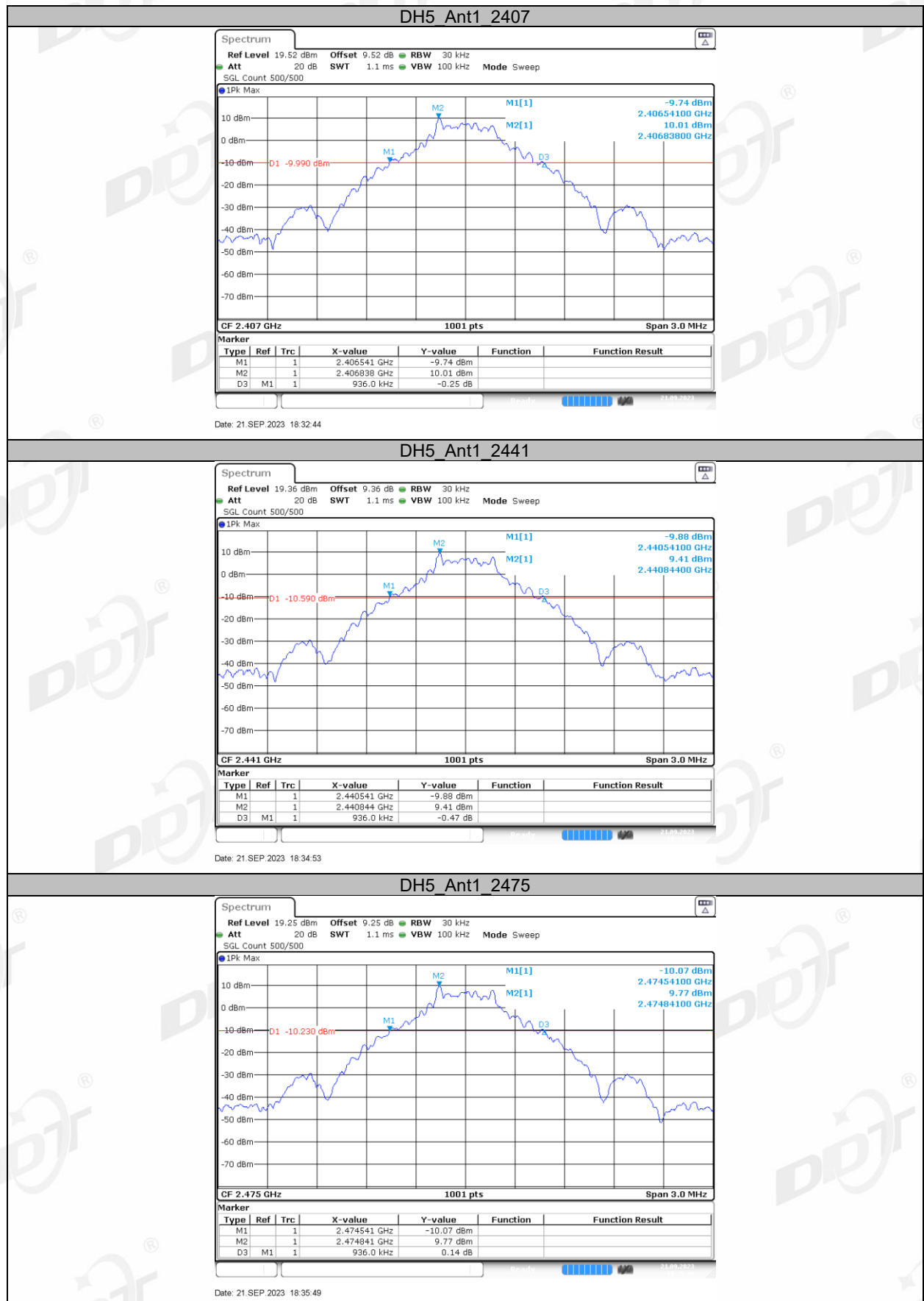
- (1) The test according to ANSI C63.10-2013 clause 6.9.2.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results
- (3) Set the EUT as maximum power setting and enable the EUT transmit continuously
- (4) Use the following spectrum analyzer settings for the 20 dB bandwidth measurement:

RBW:	1% to 5% of the OBW
VBW:	approximately three times RBW
Span:	between 2 times and 5 times the OBW
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold
- (5) Measure and record the results in the report.

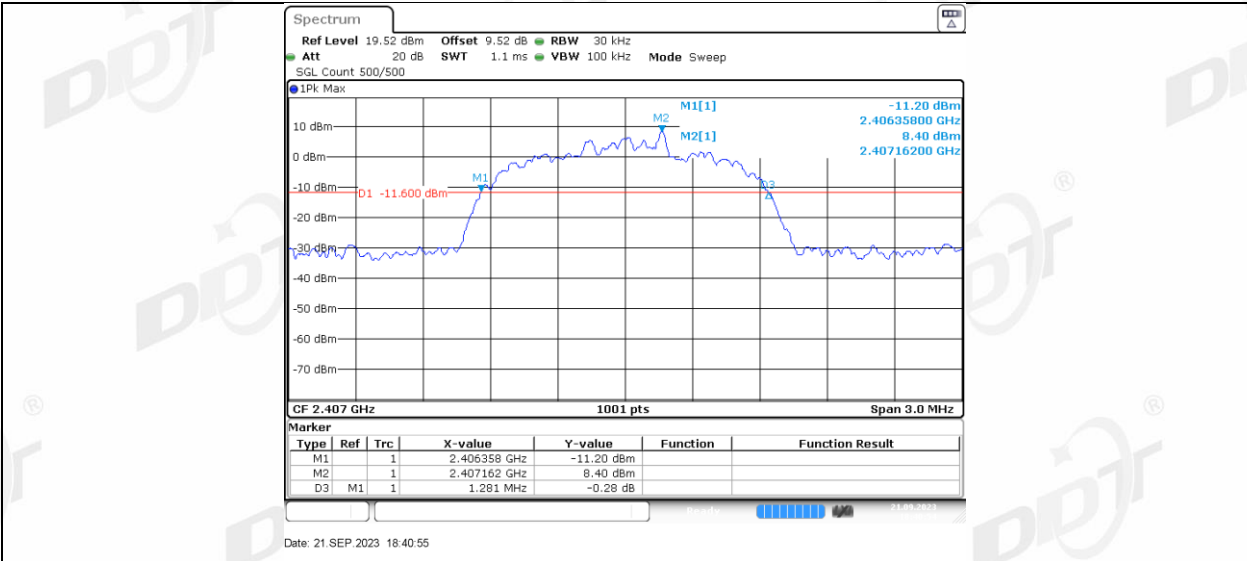
4.4. Test result

Test Mode	Antenna	Frequency [MHz]	20dB EBW[MHz]
DH5	Ant1	2407	0.94
		2441	0.94
		2475	0.94
2DH5	Ant1	2407	1.28
		2441	1.28
		2475	1.30
3DH5	Ant1	2407	1.28
		2441	1.29
		2475	1.28

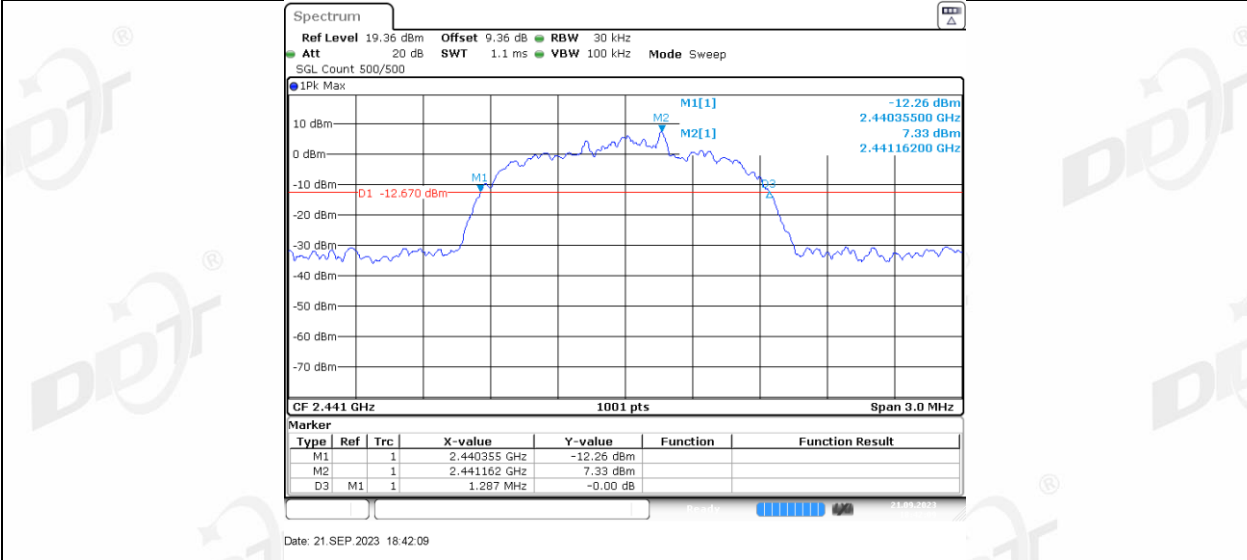
4.5. Test graphs



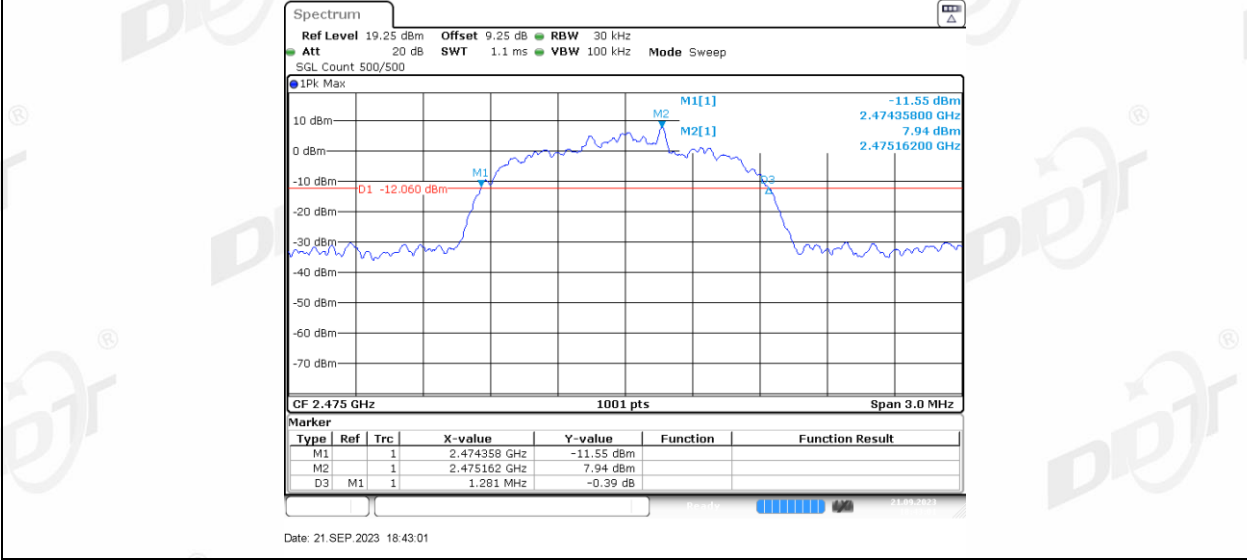




3DH5_Ant1_2441

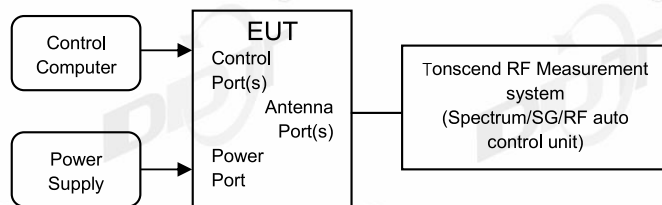


3DH5_Ant1_2475



5. 99% Bandwidth

5.1. Block diagram of test setup



5.2. Limits

Just for Report.

5.3. Test procedure

- (1) The test according to ANSI C63.10-2013 clause 6.9.3.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results
- (3) Set the EUT as maximum power setting and enable the EUT transmit continuously
- (4) Use the following spectrum analyzer settings for the 99% bandwidth measurement:

RBW:	1% to 5% of the OBW
VBW:	approximately three times RBW
Span:	between 1.5 times and 5.0 times the OBW
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold
- (5) Measure and record the results in the report.

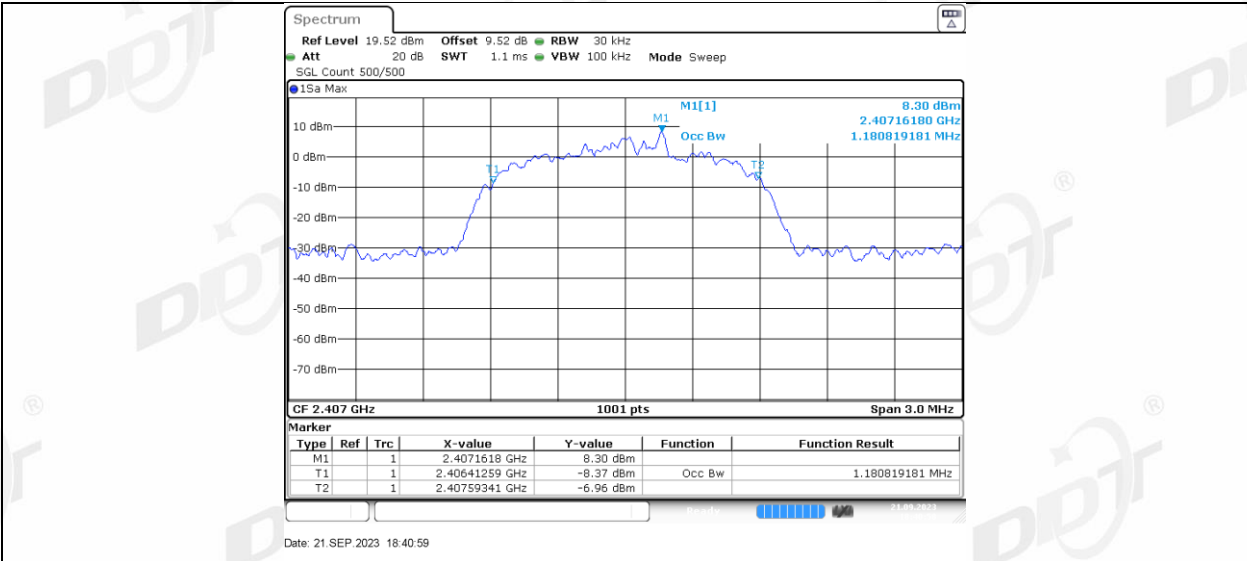
5.4. Test Result

Test Mode	Antenna	Frequency [MHz]	OCB [MHz]	FL[MHz]	FH[MHz]
DH5	Ant1	2407	0.887	2406.5564	2407.4436
		2441	0.887	2440.5564	2441.4436
		2475	0.890	2474.5564	2475.4466
2DH5	Ant1	2407	1.172	2406.4126	2407.5844
		2441	1.166	2440.4156	2441.5814
		2475	1.172	2474.4126	2475.5844
3DH5	Ant1	2407	1.181	2406.4126	2407.5934
		2441	1.175	2440.4156	2441.5904
		2475	1.172	2474.4186	2475.5904

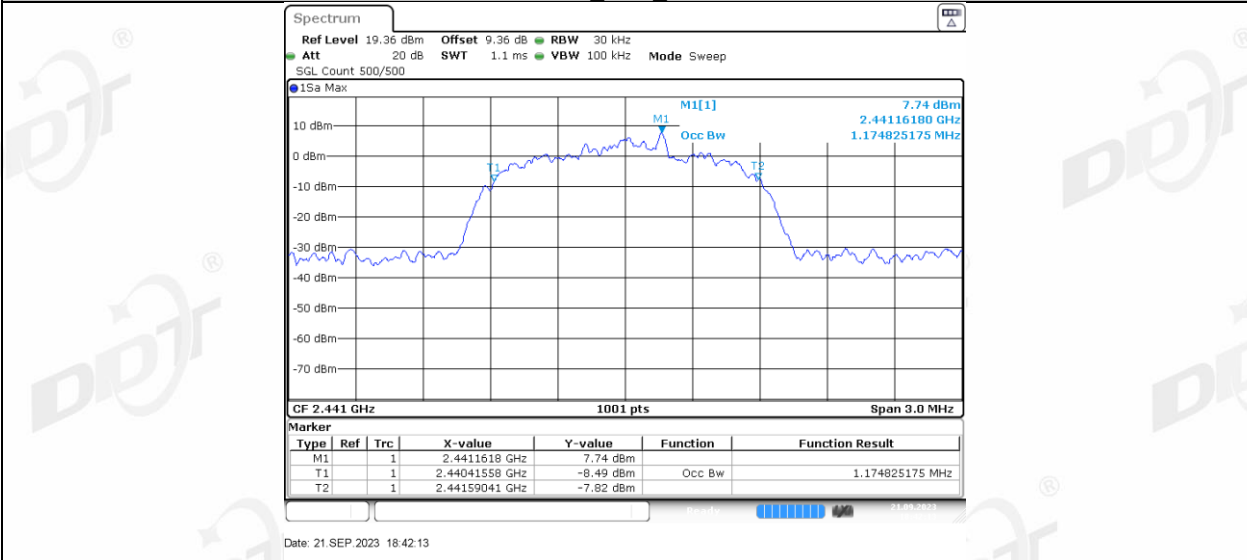
5.5. Test Graphs



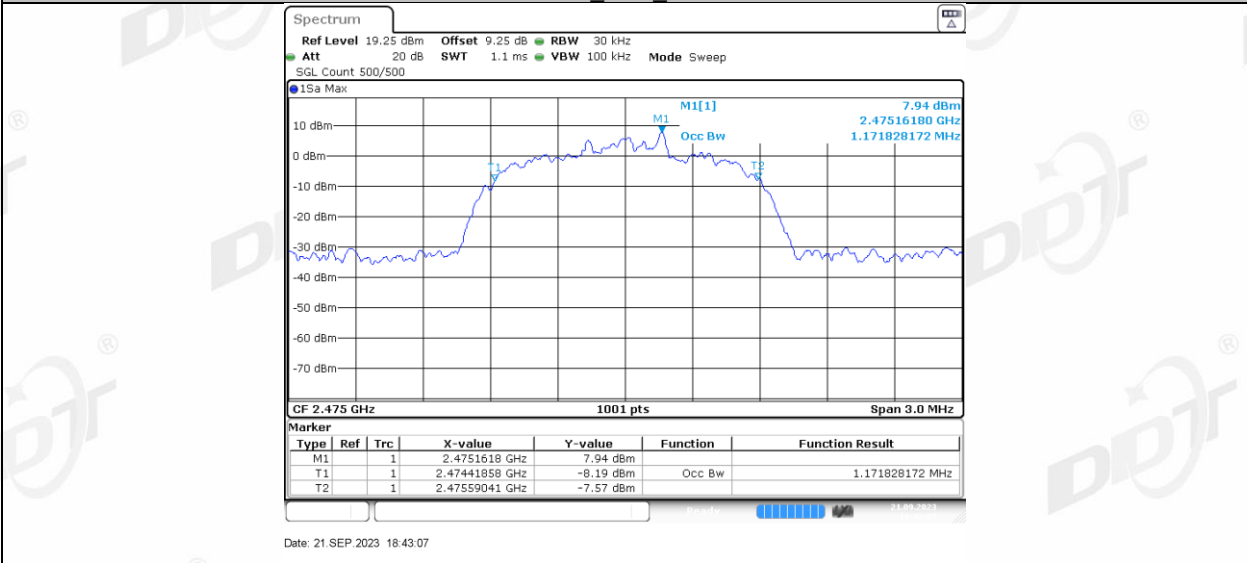




3DH5_Ant1_2441

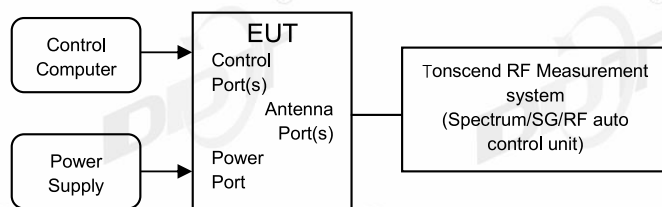


3DH5_Ant1_2475



6. Maximum Peak Output Power

6.1. Block diagram of test setup



6.2. Limits

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. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts, the e.i.r.p shall not exceed 4W.

6.3. Test procedure

- (1) The test according to ANSI C63.10-2013 clause 7.8.5.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results.
- (3) Set the EUT as maximum power setting and enable the EUT transmit continuously.
- (4) Use the following spectrum analyzer settings for the maximum peak output power measurement:

RBW:	> 20 dB bandwidth of the emission being measured.
VBW:	$VBW \geq RBW$.
Span:	Approximately five times the 20 dB bandwidth, centered on a hopping channel.
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold
- (5) Use the marker-to-peak function to set the marker to the peak of the emission and record the results in the report.

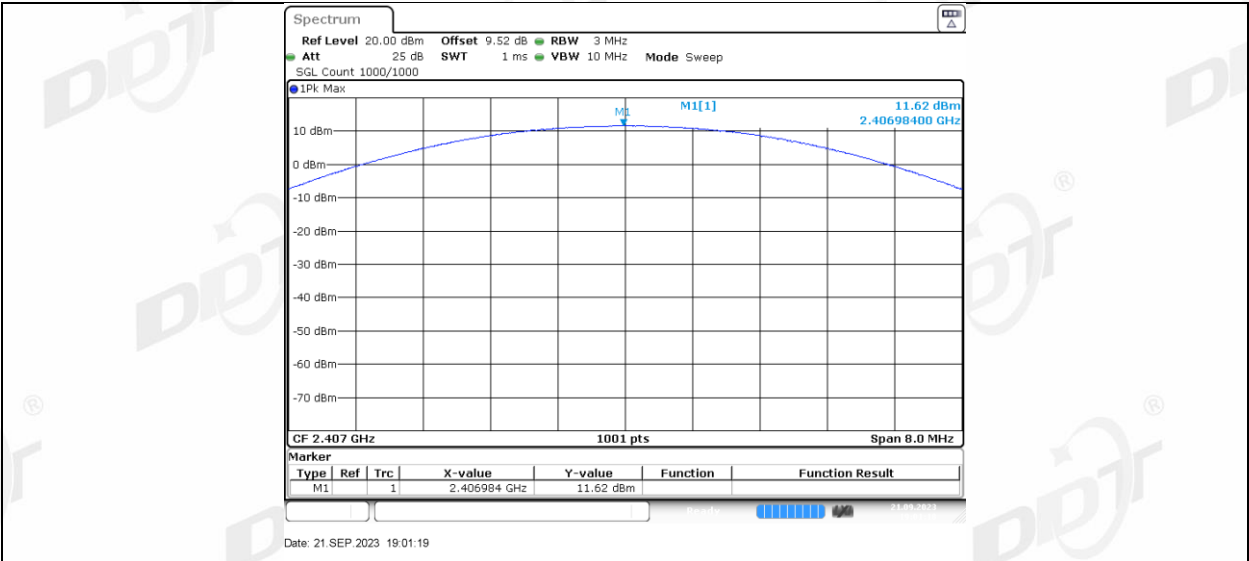
6.4. Test Result

Test Mode	Antenna	Frequency [MHz]	Conducted Peak Power[dBm]	Conducted Limit [dBm]	EIRP [dBm]	EIRP Limit [dBm]	Verdict
DH5	Ant1	2407	10.96	≤20.97	13.05	≤36.00	PASS
		2441	10.41	≤20.97	12.50	≤36.00	PASS
		2475	10.63	≤20.97	12.72	≤36.00	PASS
2DH5	Ant1	2407	11.44	≤20.97	13.53	≤36.00	PASS
		2441	10.90	≤20.97	12.99	≤36.00	PASS
		2475	11.08	≤20.97	13.17	≤36.00	PASS
3DH5	Ant1	2407	11.62	≤20.97	13.71	≤36.00	PASS
		2441	11.09	≤20.97	13.18	≤36.00	PASS
		2475	11.26	≤20.97	13.35	≤36.00	PASS

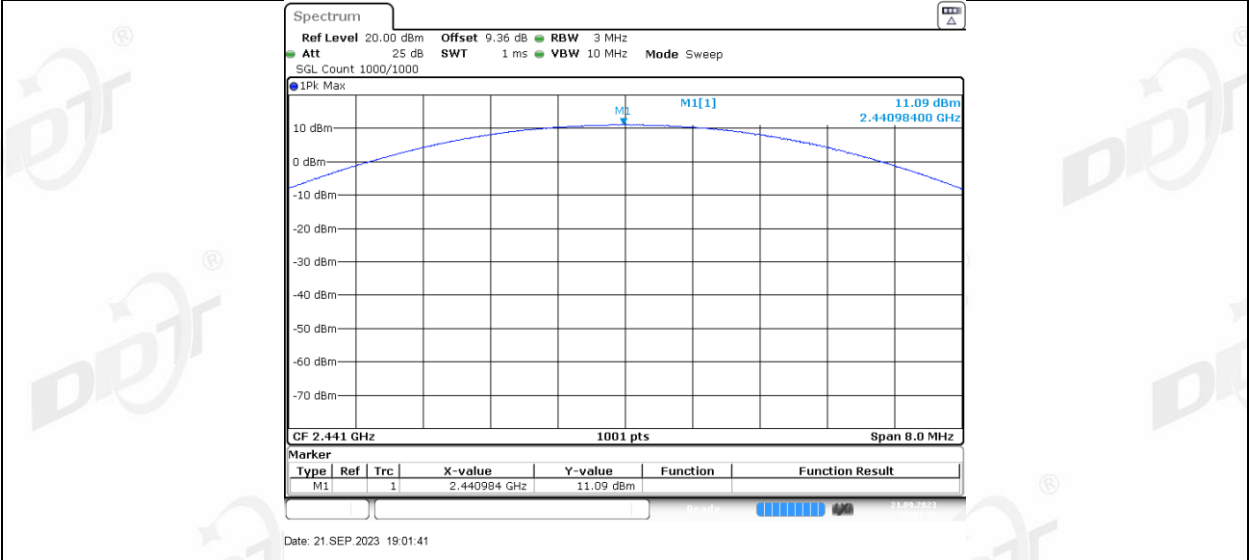
6.5.Test graphs



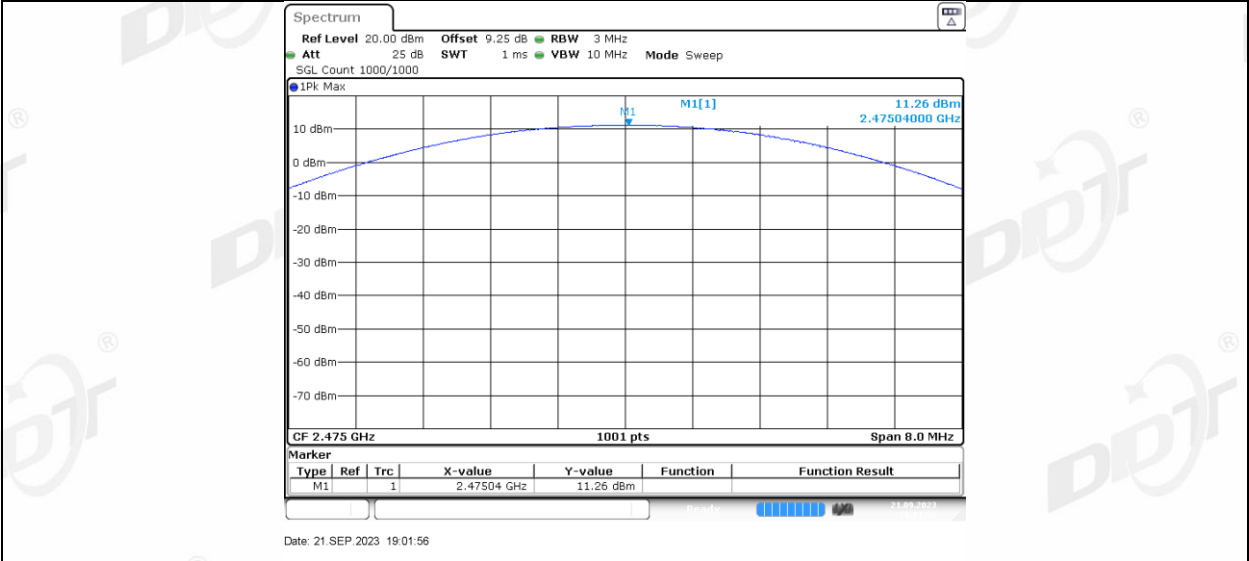




3DH5_Ant1_2441

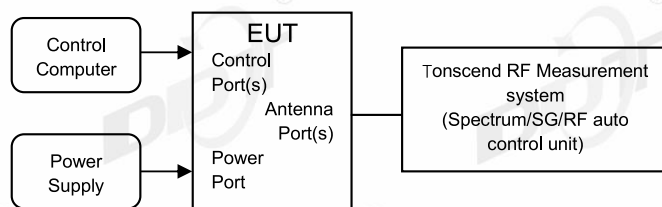


3DH5_Ant1_2475



7. Carrier Frequency Separation

7.1. Block diagram of test setup



7.2. Limits

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.

7.3. Test procedure

- (1) The test according to ANSI C63.10-2013 clause 7.8.2.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results.
- (3) Set the EUT as maximum power setting and enable the EUT transmit continuously.
- (4) Use the following spectrum analyzer settings for the maximum peak output power measurement:

RBW:	approximately 30% of the channel spacing
VBW:	$VBW \geq RBW$.
Span:	Wide enough to capture the peaks of two adjacent channels.
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold
- (5) Use the marker-delta function to determine the separation between the peaks of the adjacent channels and record the results in the report.

7.4. Test result

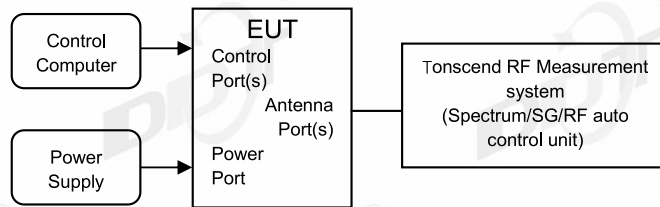
Test Mode	Antenna	Frequency [MHz]	Result [MHz]	Limit [MHz]	Verdict
DH5	Ant1	Hop	1.02	≥ 0.627	PASS
2DH5	Ant1	Hop	1.02	≥ 0.853	PASS
3DH5	Ant1	Hop	1.00	≥ 0.860	PASS

7.5. Test graphs



8. Dwell Time

8.1. Block diagram of test setup



8.2. Limits

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.

8.3. Test procedure

- (1) The test according to ANSI C63.10-2013 clause 7.8.4.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results.
- (3) Set the EUT as maximum power setting and enable the EUT transmit continuously.
- (4) Use the following spectrum analyzer settings for the maximum peak output power measurement:

RBW:	≤ channel spacing and where possible RBW should be set $\gg 1 / T$
VBW:	$VBW \geq RBW$.
Span:	Zero span, centered on a hopping channel.
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Clear Write.

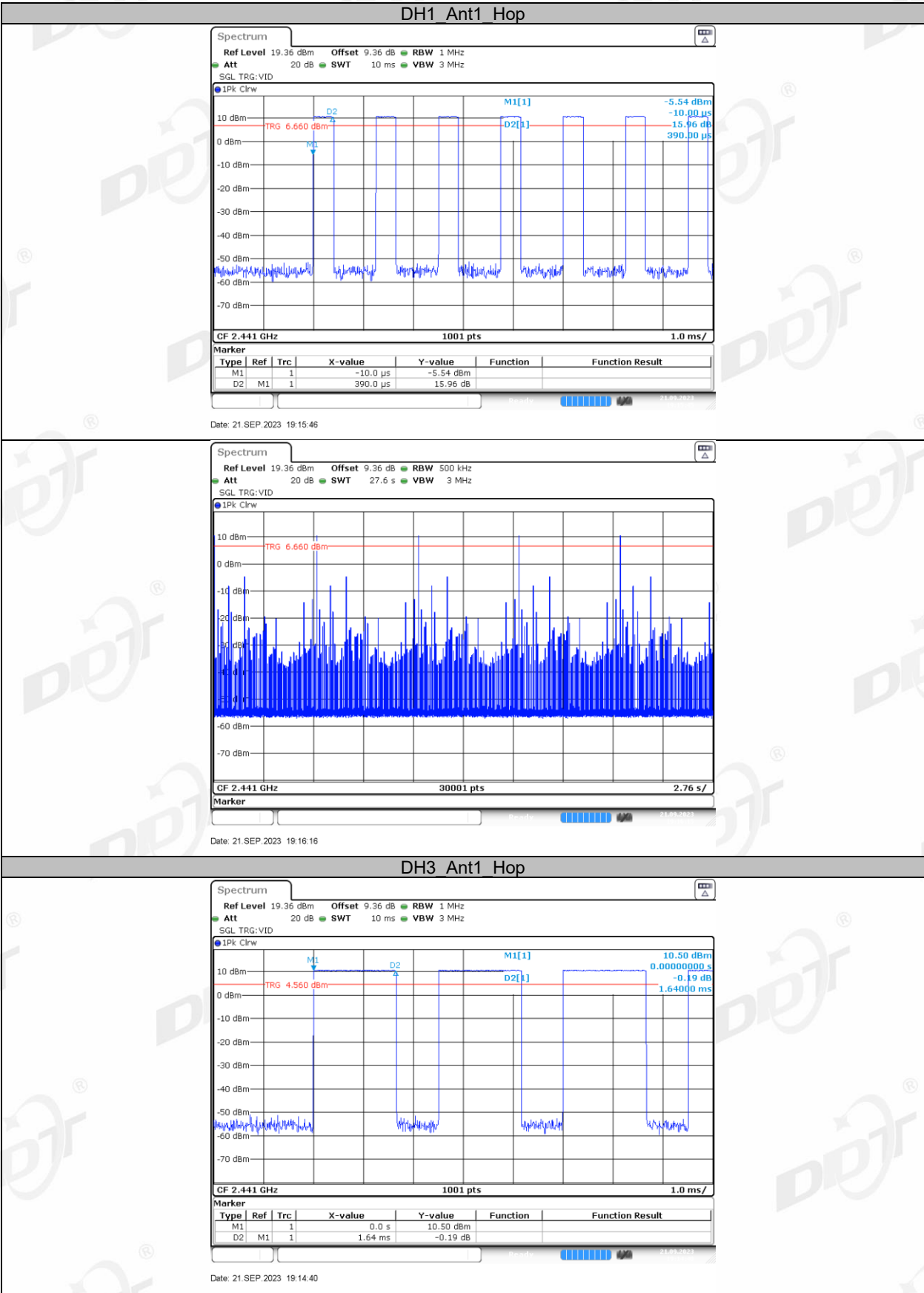
Measure and record the results in the report.

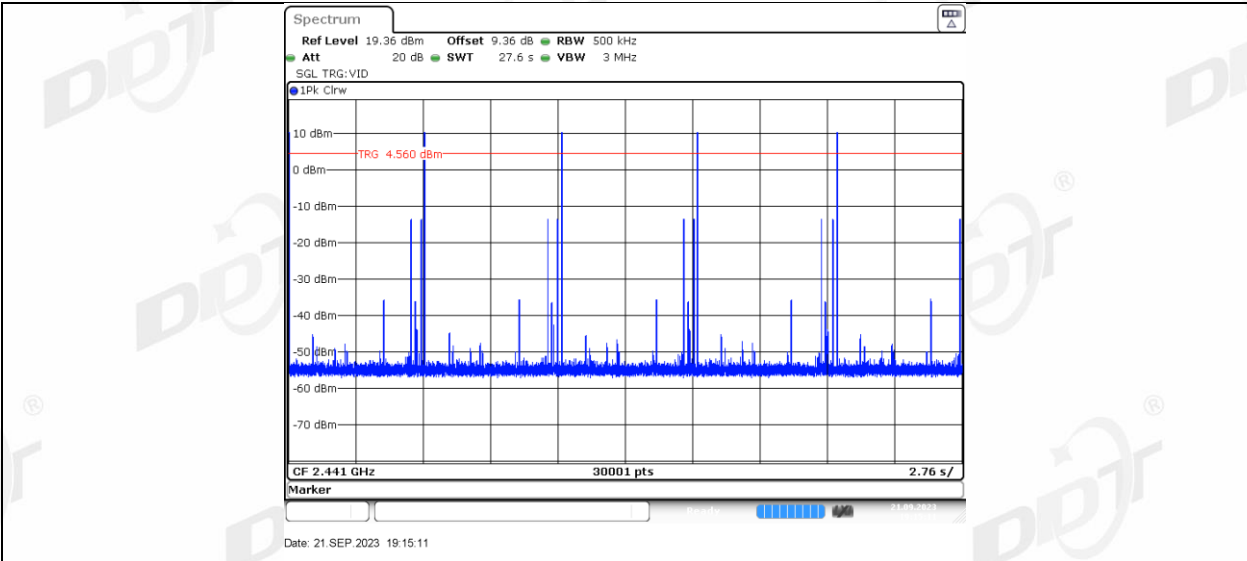
- (5) The test period: $T = 0.4 \text{ Second/Channel} \times 69 \text{ Channel} = 27.6 \text{ s}$
- (6) Measure the hopping number and on time of each pulse with spectrum analyzer in zero span set, and calculate dwell time with formula $\text{Dwell time} = \text{total hops} \times \text{pulse's on time}$.

8.4. Test result

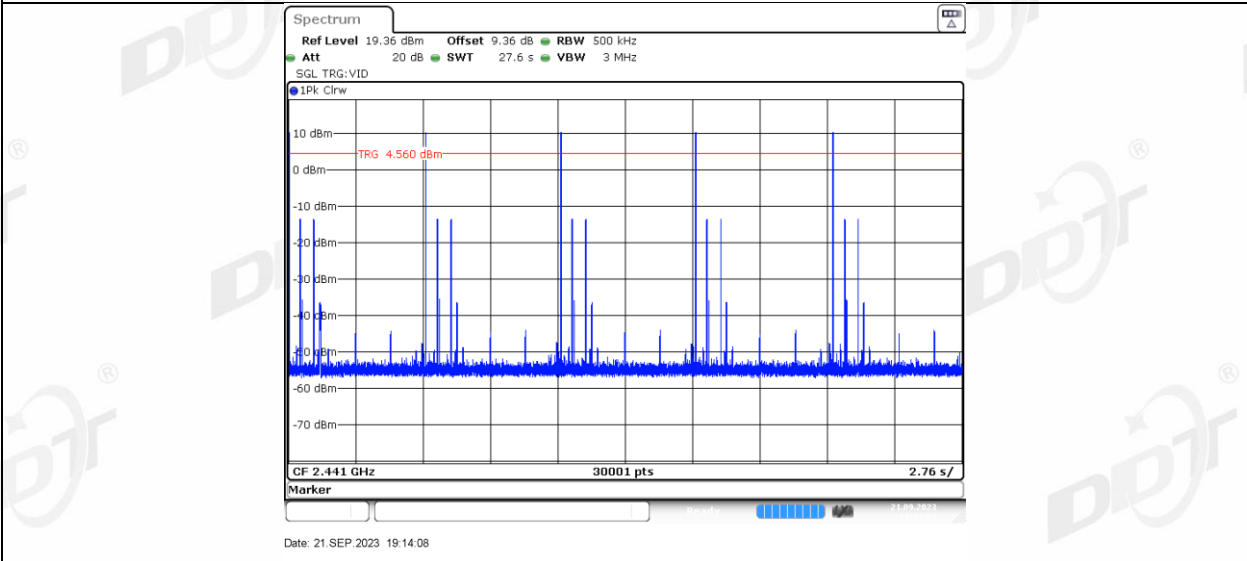
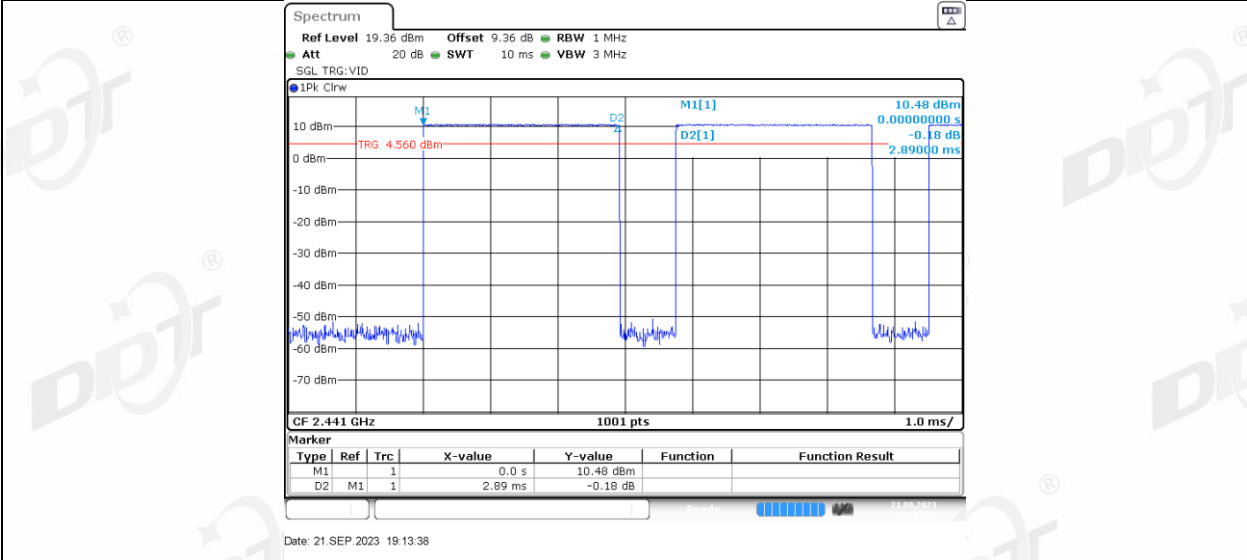
Test Mode	Antenna	Frequency [MHz]	Burst Width [ms]	Total Hops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.390	5	0.002	≤0.4	PASS
DH3	Ant1	Hop	1.640	5	0.008	≤0.4	PASS
DH5	Ant1	Hop	2.890	5	0.014	≤0.4	PASS
2DH1	Ant1	Hop	0.380	5	0.002	≤0.4	PASS
2DH3	Ant1	Hop	1.630	5	0.008	≤0.4	PASS
2DH5	Ant1	Hop	2.880	5	0.014	≤0.4	PASS
3DH1	Ant1	Hop	0.370	5	0.002	≤0.4	PASS
3DH3	Ant1	Hop	1.620	5	0.008	≤0.4	PASS
3DH5	Ant1	Hop	2.880	5	0.014	≤0.4	PASS

8.5. Test graphs

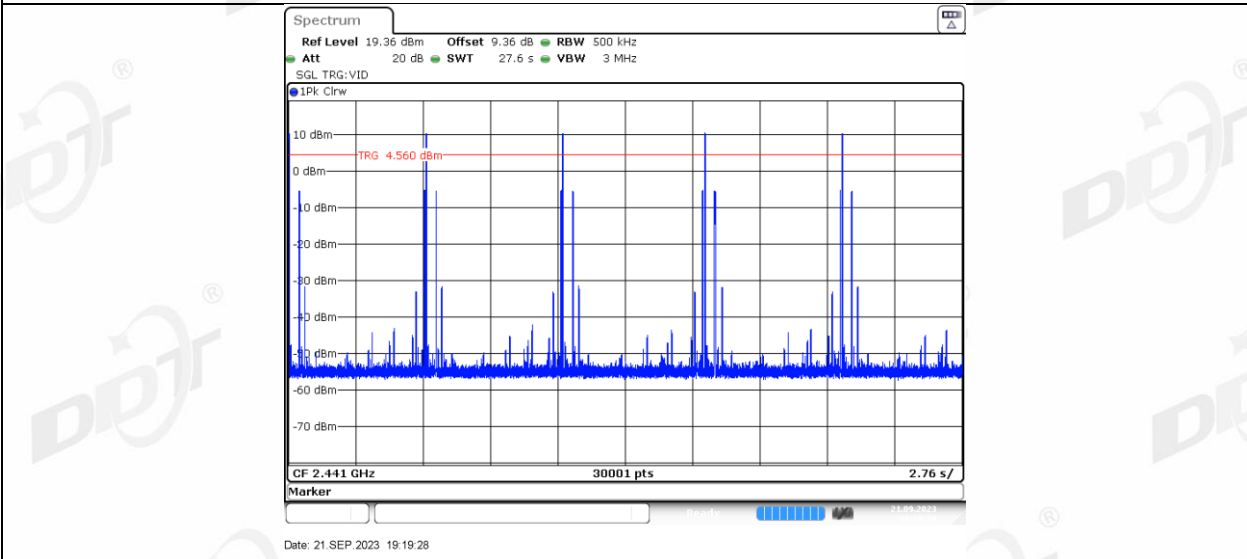
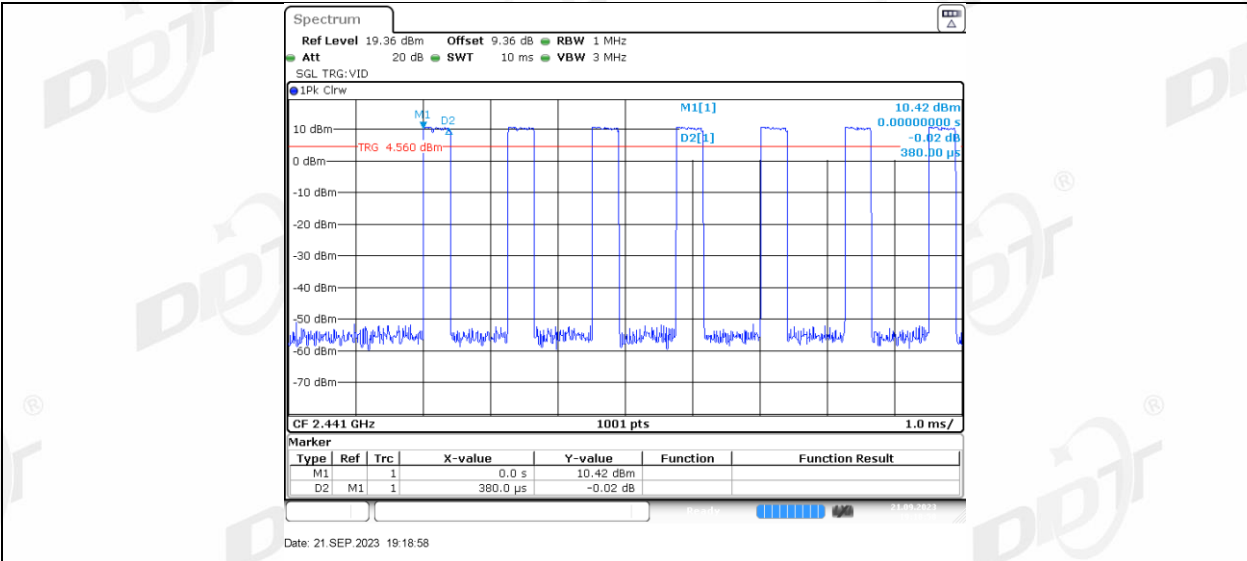




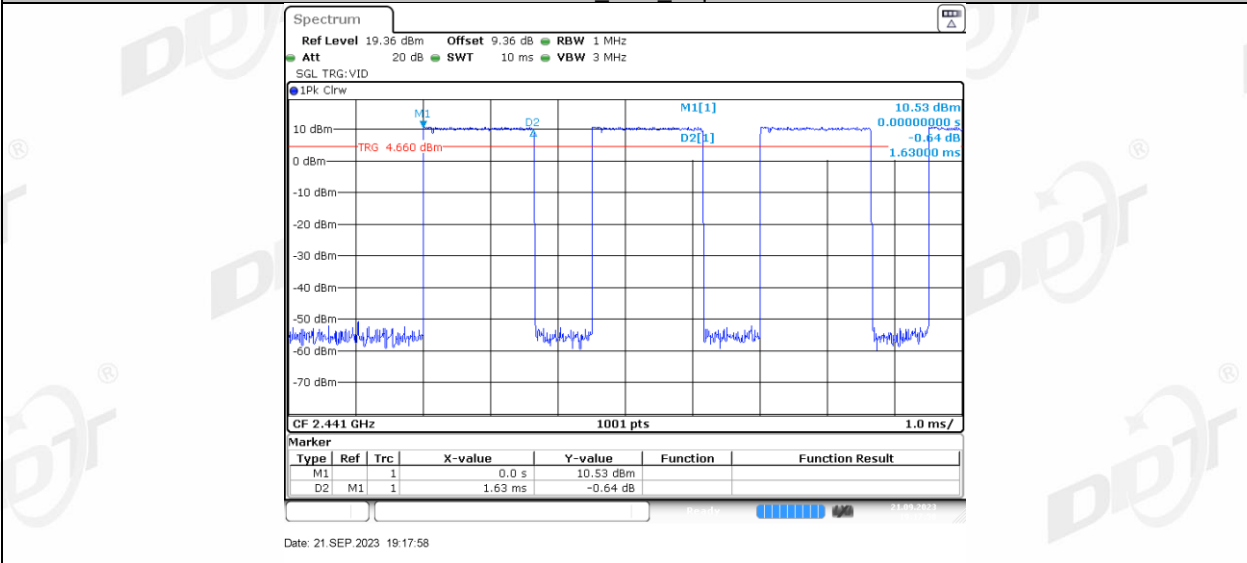
DH5_Ant1_Hop

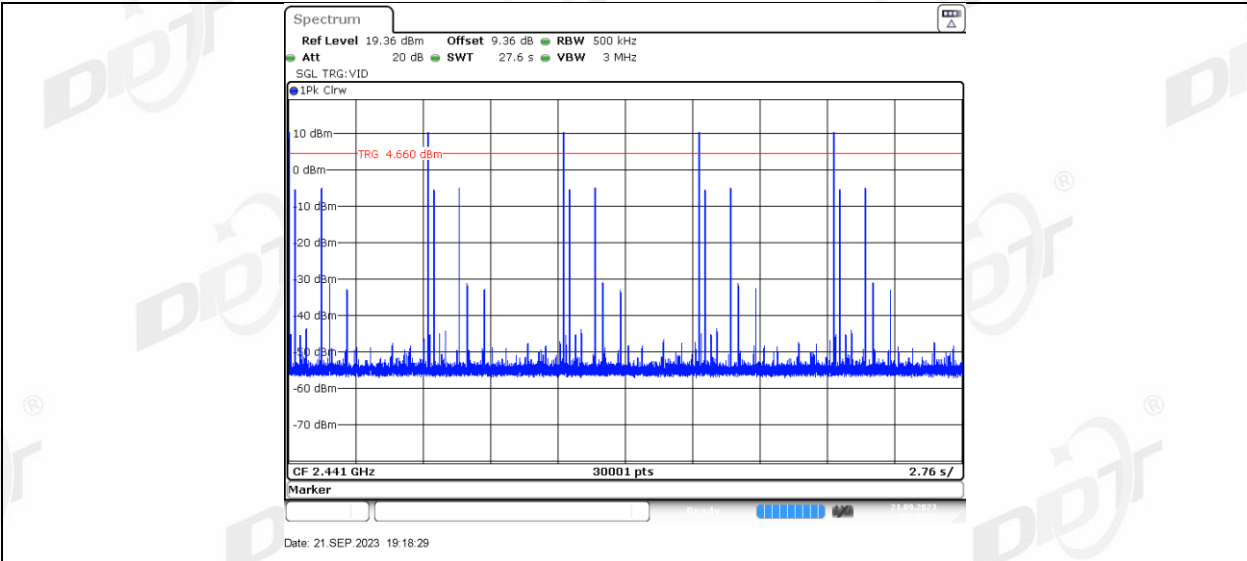


2DH1_Ant1_Hop

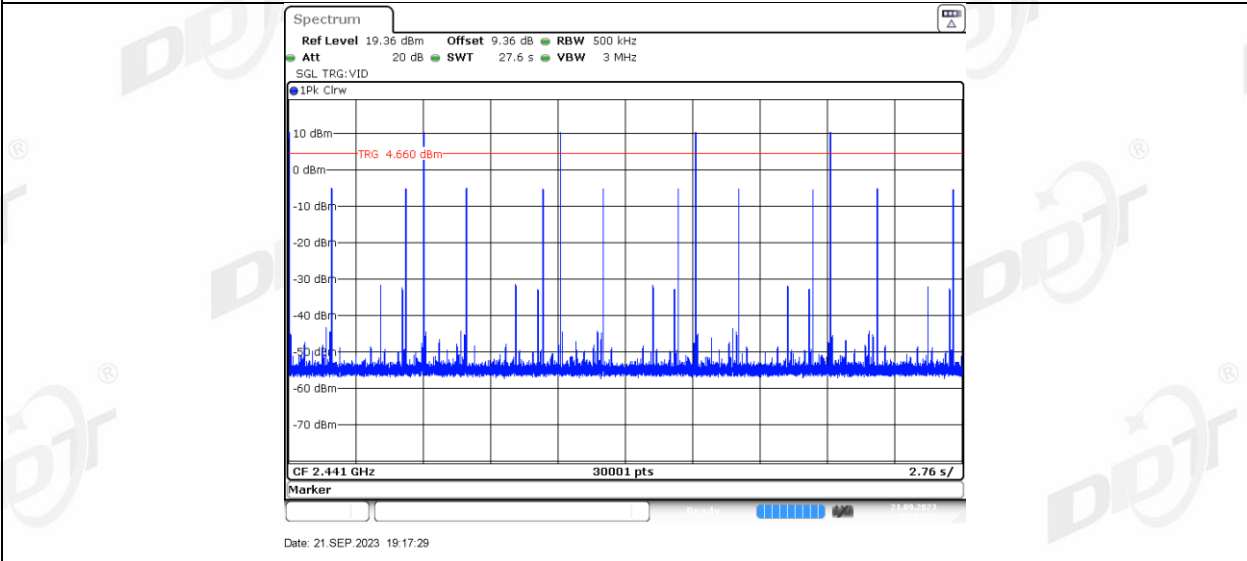
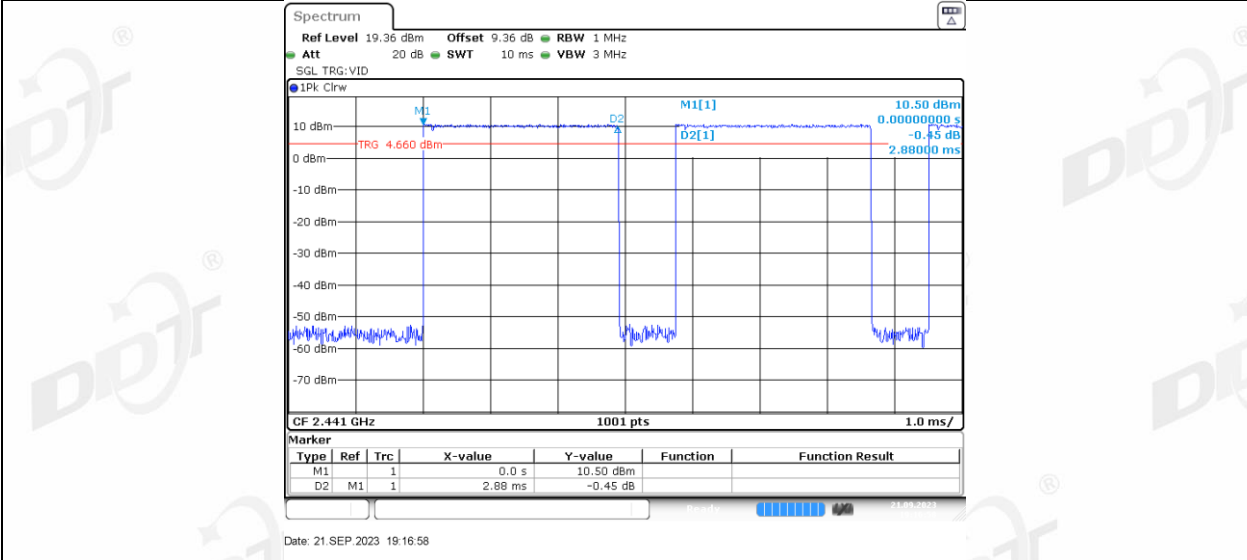


2DH3_Ant1_Hop

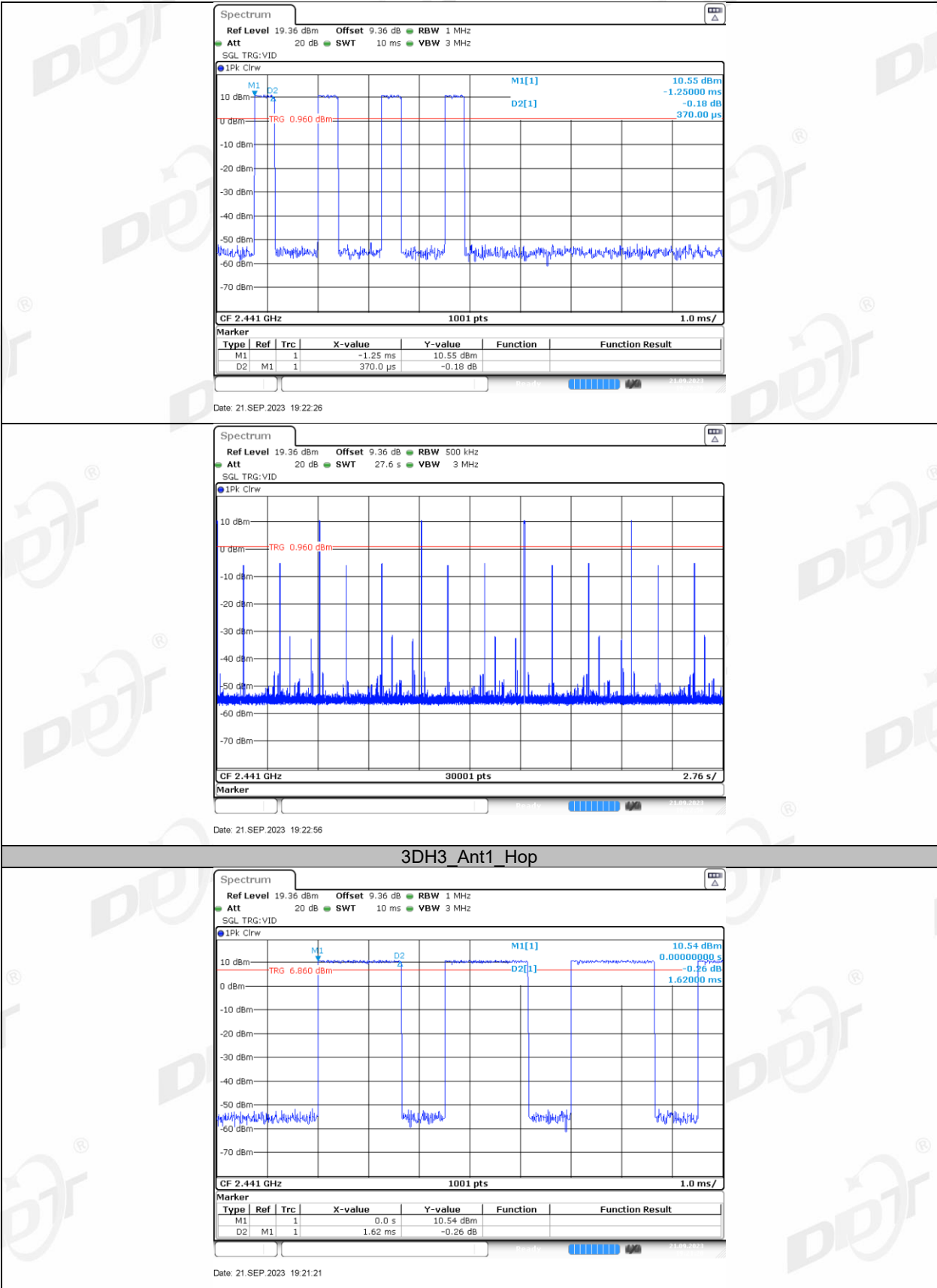


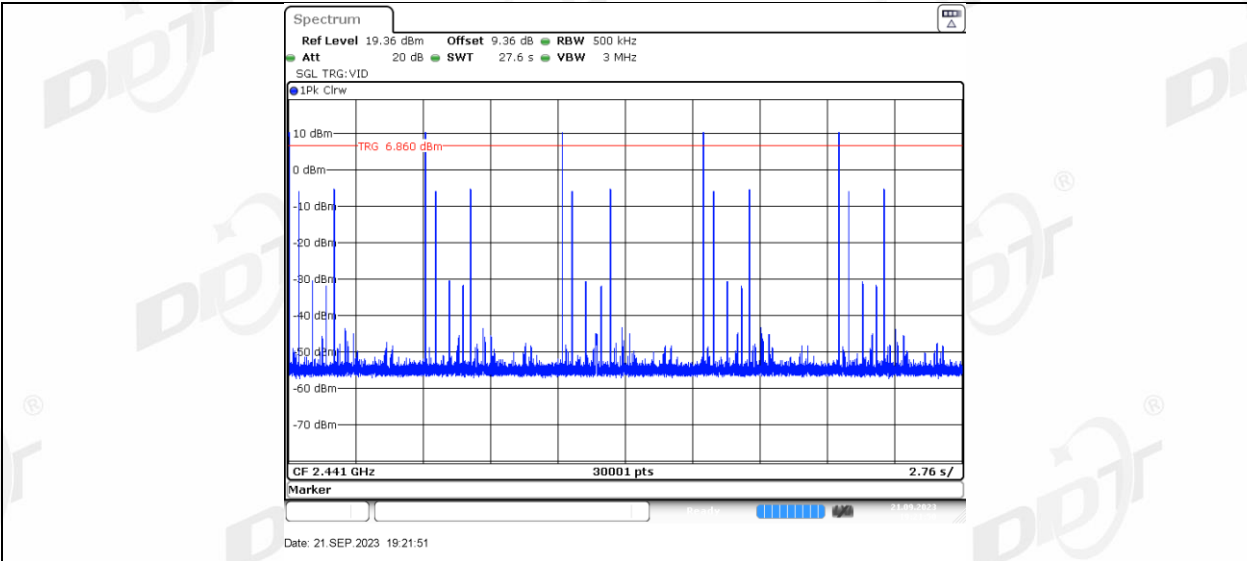


2DH5_Ant1_Hop

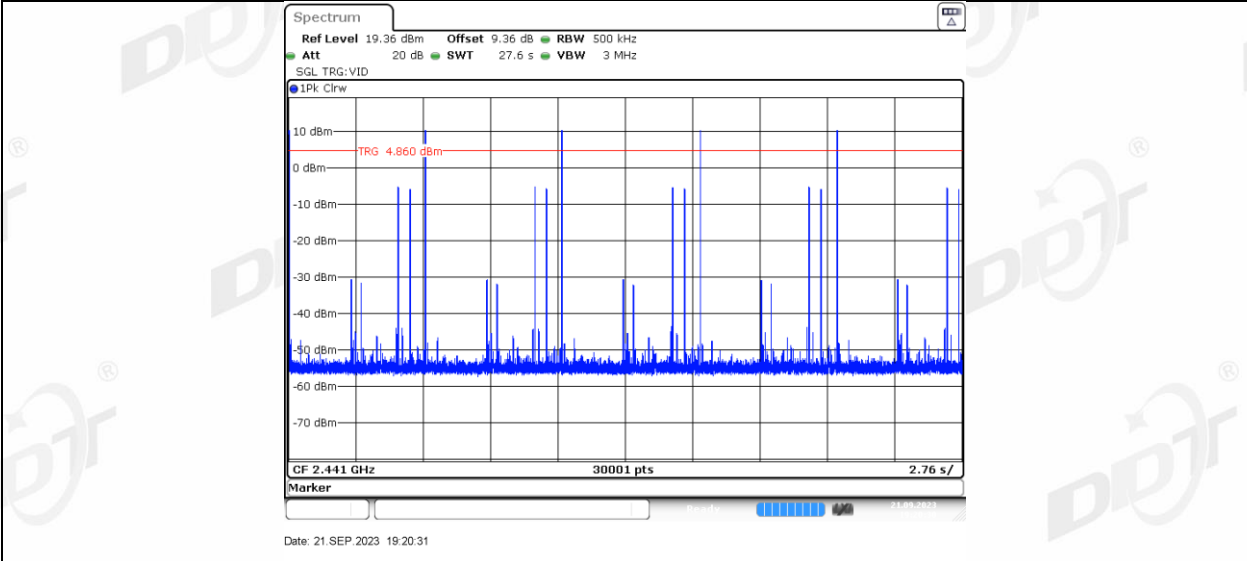
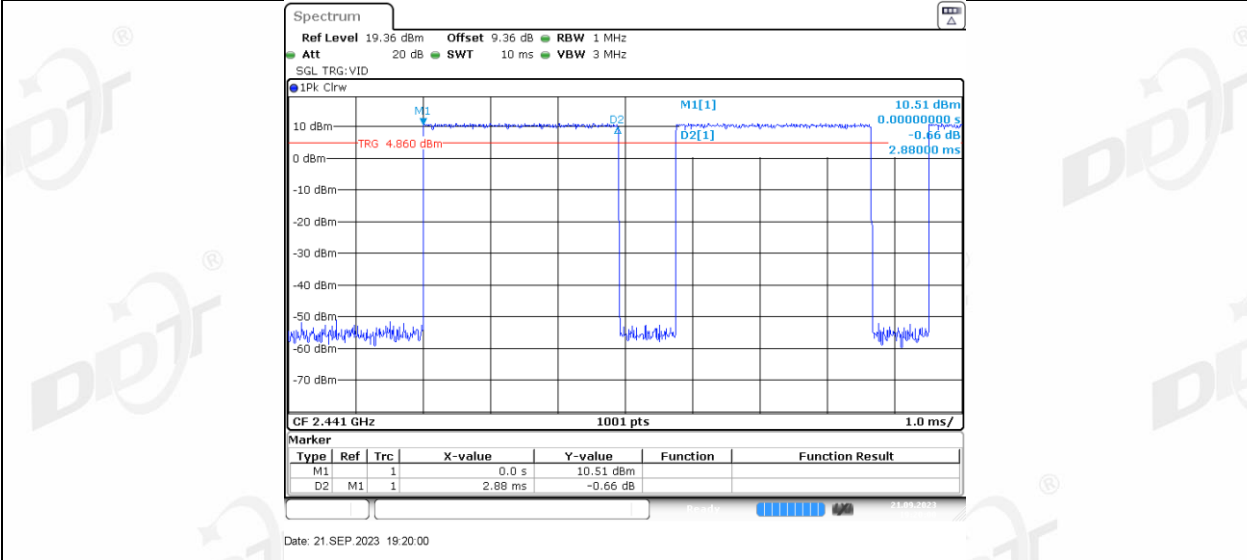


3DH1_Ant1_Hop



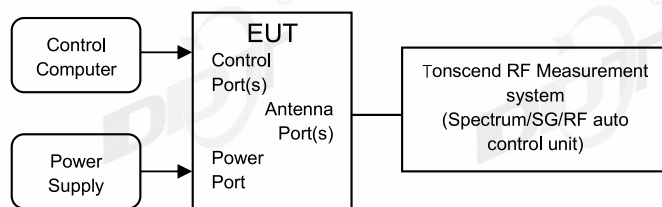


3DH5_Ant1_Hop



9. Number of Hopping Channel

9.1. Block diagram of test setup



9.2. Limits

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

9.3. Test procedure

- (1) The test according to ANSI C63.10-2013 clause 7.8.3.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results.
- (3) Set the EUT as maximum power setting and enable the EUT transmit continuously.
- (4) Use the following spectrum analyzer settings for the maximum peak output power measurement:

RBW:	RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
VBW:	$VBW \geq RBW$.
Span:	The frequency band of operation
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold

Measure and record the results in the report.

- (5) Measure the hopping number and record the results in the report.

9.4. Test result

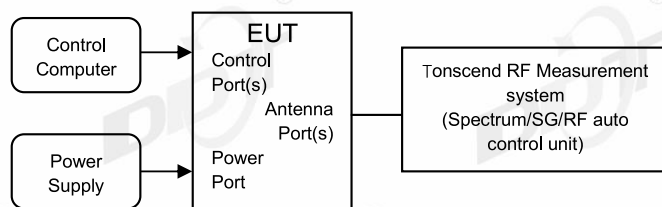
Test Mode	Antenna	Frequency [MHz]	Result [Num]	Limit [Num]	Verdict
DH5	Ant1	Hop	69	≥ 15	PASS
2DH5	Ant1	Hop	69	≥ 15	PASS
3DH5	Ant1	Hop	69	≥ 15	PASS

9.5. Test graphs



10. Band Edge Compliance (Conducted Method)

10.1. Block diagram of test setup



10.2. Limit

All restriction band should comply with 15.209, other emission should be at least 20dB below the fundamental.

10.3. Test procedure

- (1) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (2) Establish a reference level by using the following procedure:

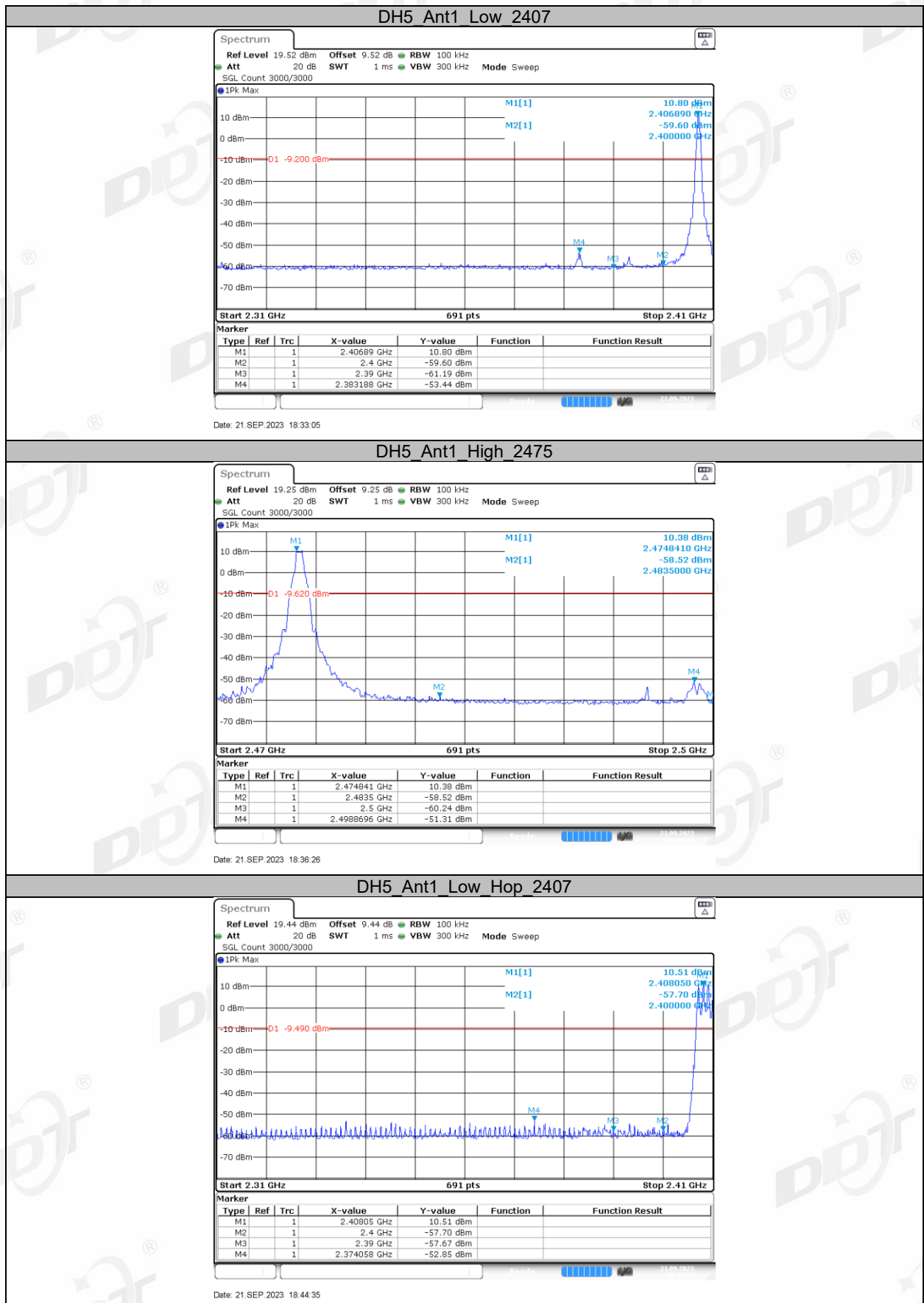
RBW:	100 kHz
VBW:	300 kHz
Span	Encompass frequency range to be measured
Detector Mode:	Peak
Sweep time:	Auto
Trace mode	Max hold

- (3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.
- (4) Then mark the maximum amplitude of all unwanted emissions outside of the authorized frequency band.

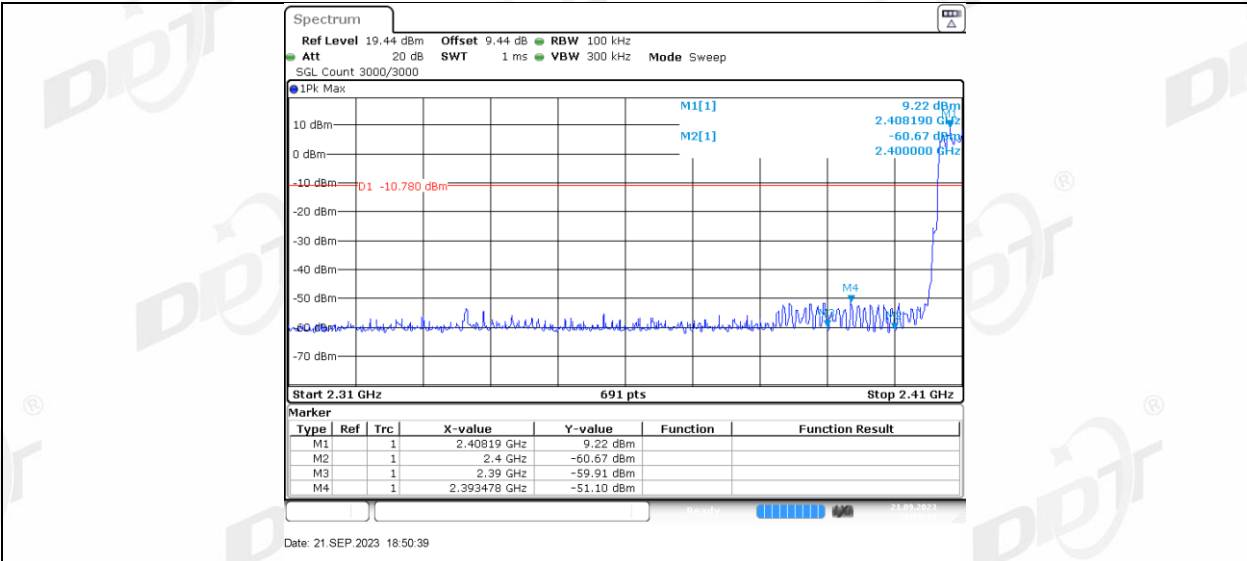
10.4. Test result

Mode	Freq. (MHz)	Verdict
GFSK	Hopping off 2407	Pass
	Hopping off 2475	Pass
	Hopping on	Pass
$\pi/4$ -DQPSK	Hopping off 2407	Pass
	Hopping off 2475	Pass
	Hopping on	Pass
8DPSK	Hopping off 2407	Pass
	Hopping off 2475	Pass
	Hopping on	Pass

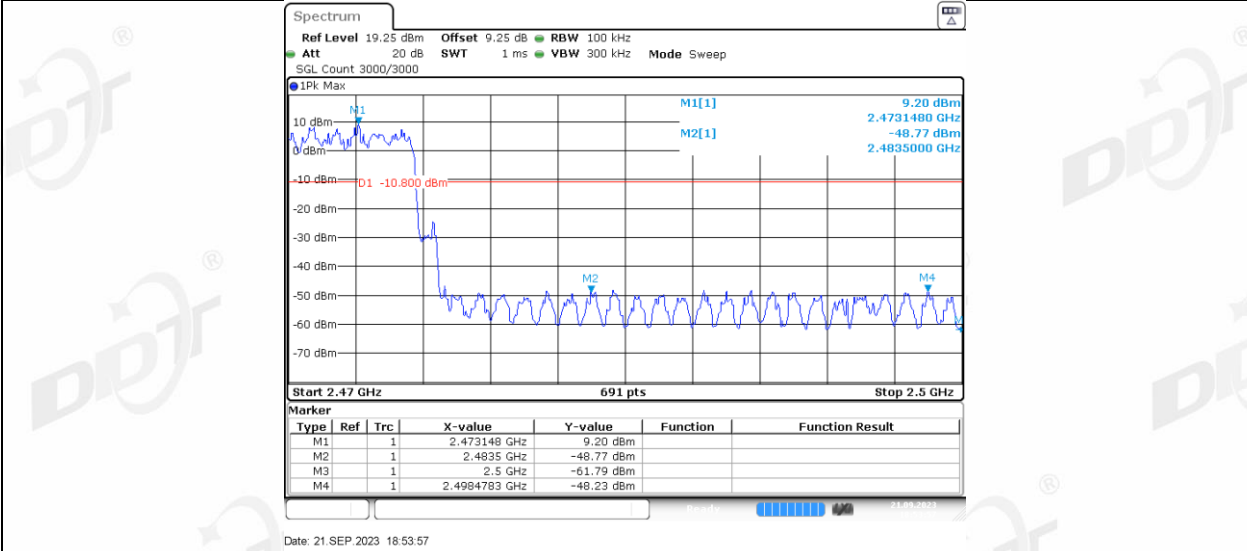
10.5. Test graphs



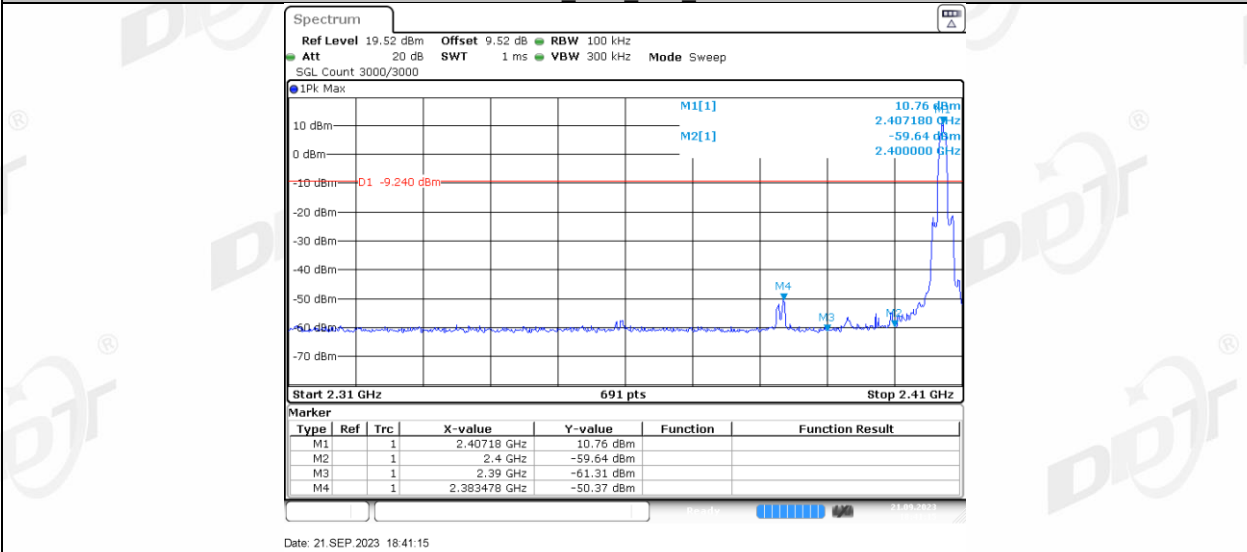




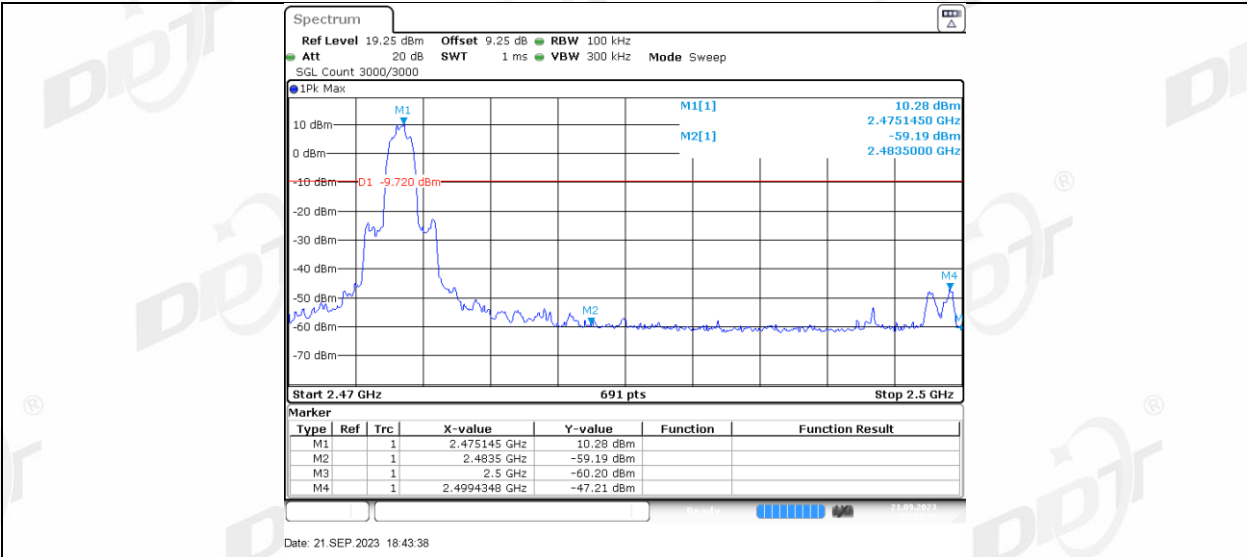
2DH5 Ant1 High Hop 2475



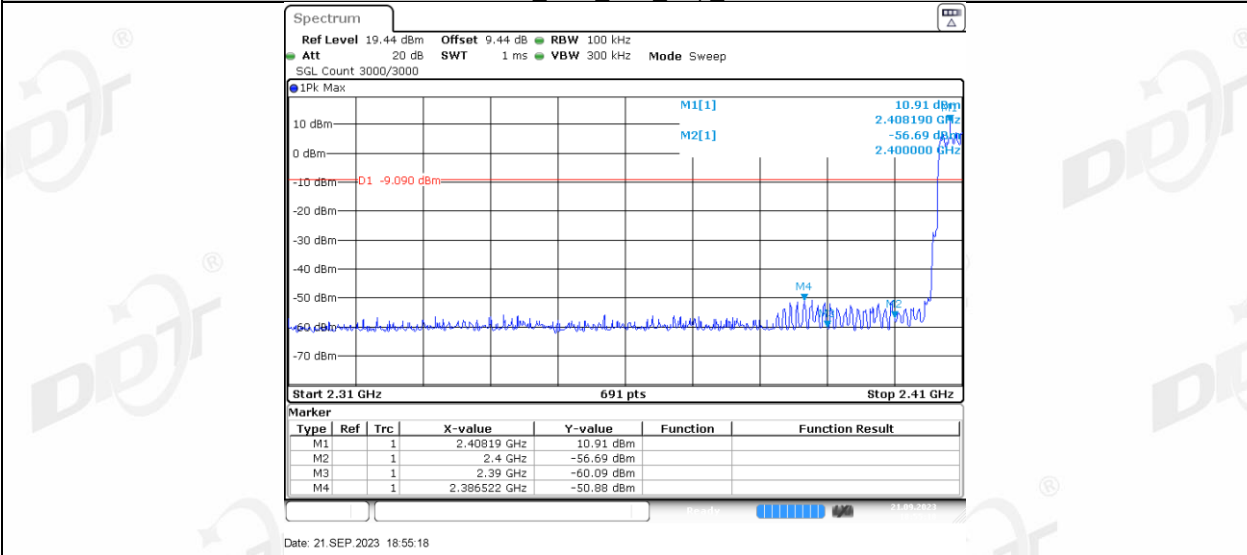
3DH5 Ant1 Low 2407



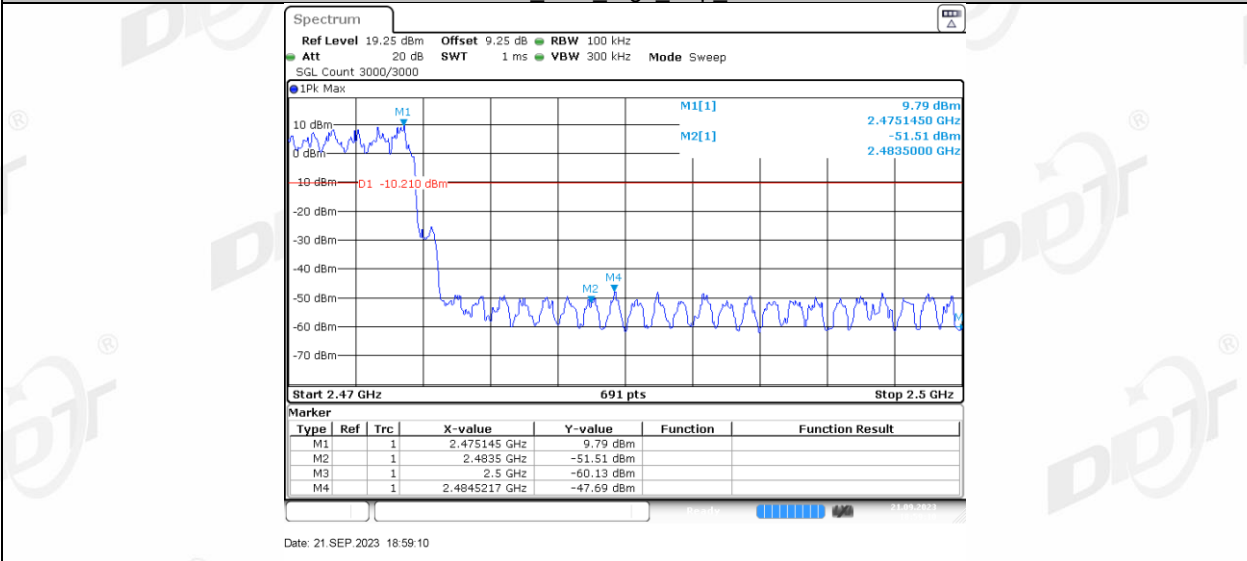
3DH5 Ant1 High 2475



3DH5 Ant1 Low Hop 2407

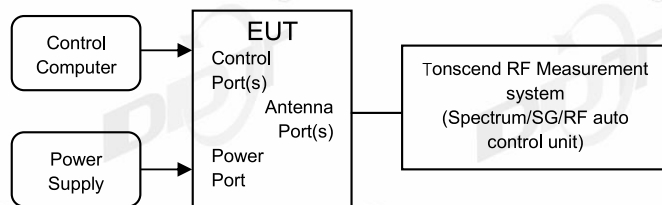


3DH5 Ant1 High Hop 2475



11. RF Conducted Spurious Emissions

11.1. Block diagram of test setup



11.2. Limits

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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.

11.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

Center frequency	Test frequency
RBW:	100 kHz
VBW:	300 kHz
Span	Wide enough to capture the peak level of the in-band emission
Detector Mode:	Peak
Sweep time:	Auto
Trace mode	Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

RBW:	100 kHz
VBW:	300 kHz
Span	Encompass frequency range to be measured
Number of measurement points	$\geq \text{Span/RBW}$
Detector Mode:	Peak
Sweep time:	Auto
Trace mode	Max hold

Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

11.4. Test result

Mode	Freq. (MHz)	Verdict
GFSK	Hopping off 2407	Pass
	Hopping off 2441	Pass
	Hopping off 2475	Pass
$\pi/4$ -DQPSK	Hopping off 2407	Pass
	Hopping off 2441	Pass
	Hopping off 2475	Pass
8DPSK	Hopping off 2407	Pass
	Hopping off 2441	Pass
	Hopping off 2475	Pass

11.5. Test graphs

