



FCC CERTIFICATION TEST REPORT

Applicant	:	Little Bird Co., Ltd
Address of Applicant	:	18/F, Building D, The Truth Plaza, No.7 Zhichun Road, Haidian District, Beijing, China
Manufacturer	:	Little Bird Co., Ltd
Address of Manufacturer	:	18/F, Building D, The Truth Plaza, No.7 Zhichun Road, Haidian District, Beijing, China
Equipment under Test	:	LIBRATONE AIR H BLUETOOTH EARPHONES
Model No.	:	LTW612
FCC ID	:	2AW92LTW612
Test Standard(s)	:	FCC Rules and Regulations Part 15 Subpart C, ANSI C63.10:2013
Report No.	:	DDT-RE23120513-4E01
Issue Date	:	2024/01/02
Issue By	:	Guangdong 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.....	14
4.5.	Test graphs	15
5.	Maximum Peak Output Power	21
5.1.	Block diagram of test setup.....	21
5.2.	Limits	21
5.3.	Test procedure	21
5.4.	Test Result	22
5.5.	Test graphs	23
6.	Carrier Frequency Separation.....	29
6.1.	Block diagram of test setup.....	29
6.2.	Limits	29
6.3.	Test procedure	29
6.4.	Test result.....	30
6.5.	Test graphs	31
7.	Dwell Time.....	33
7.1.	Block diagram of test setup.....	33
7.2.	Limits	33
7.3.	Test procedure	33
7.4.	Test result.....	34
7.5.	Test graphs	35
8.	Number of Hopping Channel	47

8.1.	Block diagram of test setup.....	47
8.2.	Limits	47
8.3.	Test procedure	47
8.4.	Test result.....	48
8.5.	Test graphs	49
9.	Band Edge Compliance (Conducted Method)	51
9.1.	Block diagram of test setup.....	51
9.2.	Limit	51
9.3.	Test procedure	51
9.4.	Test result.....	52
9.5.	Test graphs	53
10.	RF Conducted Spurious Emissions	61
10.1.	Block diagram of test setup.....	61
10.2.	Limits	61
10.3.	Test procedure	61
10.4.	Test result.....	62
10.5.	Test graphs	63
11.	Duty cycle.....	81
11.1.	Block diagram of test setup.....	81
11.2.	Limit	81
11.3.	Test procedure	81
11.4.	Test result.....	82
11.5.	Test graphs	83
12.	Radiated Emission	89
12.1.	Test equipment.....	89
12.2.	Block diagram of test setup.....	90
12.3.	Limit	92
12.4.	Test Procedure.....	93
12.5.	Test result.....	94
13.	Band Edge Compliance (Radiated Method)	111
13.1.	Test equipment.....	111
13.2.	Block diagram of test setup.....	111
13.3.	Limit	111
13.4.	Test Procedure.....	111
13.5.	Test result.....	112
14.	Power Line Conducted Emission	137
14.1.	Test equipment.....	137
14.2.	Block diagram of test setup.....	137

14.3.	Power line conducted emission limits	137
14.4.	Test procedure	137
14.5.	Test result.....	138
15.	Antenna Requirements	141
15.1.	Limit	141
15.2.	Result	141
16.	Test Setup Photograph	142
17.	Photos of the EUT	146

Test Report Declare

Applicant	:	Little Bird Co., Ltd
Address of Applicant	:	18/F, Building D, The Truth Plaza, No.7 Zhichun Road, Haidian District, Beijing, China
Equipment under Test	:	LIBRATONE AIR H BLUETOOTH EARPHONES
Model No.	:	LTW612
Manufacturer	:	Little Bird Co., Ltd
Address of Manufacturer	:	18/F, Building D, The Truth Plaza, No.7 Zhichun Road, Haidian District, Beijing, China

Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C

Test Procedure Used:

ANSI C63.10:2013

We Declare:

The equipment described above is tested by Guangdong 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 Guangdong 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 standards.

Report No.:	DDT-RE23120513-4E01		
Date of Receipt:	2023/12/07	Date of Test:	2023/12/07 ~ 2024/01/02

Prepared By:**Approved By:****Bobo Chen/Engineer****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 Guangdong Dongdian Testing Service Co., Ltd.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	2024/01/02	

1. Summary of Test Results

Description of Test Item	Standard	Verdict
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1)	Pass
20 dB Bandwidth	FCC Part 15: 15.247(a)(1)	Pass
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1)	Pass
Number of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii)	Pass
Dwell Time	FCC Part 15: 15.247(a)(1)(iii)	Pass
RF Conducted Spurious Emissions	FCC Part 15: 15.247(d)	Pass
Radiated Emission	FCC Part 15: 15.205 FCC Part 15: 15.209 FCC Part 15: 15.247(d)	Pass
Band Edge Compliance	FCC Part 15: 15.205 FCC Part 15: 15.209 FCC Part 15: 15.247(d)	Pass
Power Line Conducted Emissions	FCC Part 15: 15.207(a)	Pass
Antenna Requirement	FCC Part 15: 15.203	Pass

2. General Test Information

2.1. Description of EUT

EUT Name	: LIBRATONE AIR H BLUETOOTH EARPHONES
Model Number	: LTW612
EUT Function Description	: Please reference user manual of this device
Power Supply	: CHARGING CASE: DC 5V from USB cable EARBUDS: DC 5V from external charging case CHARGING CASE: DC 3.7V Polymer Li-ion built-in battery EARBUDS: DC 3.85V Rechargeable lithium-ion coin cell
Radio Specification	: Bluetooth V5.3 (BR/EDR/LE)
Operation Frequency	: Bluetooth (BR/EDR/LE): 2402 MHz-2480 MHz
Modulation	: Bluetooth BR/EDR: GFSK, $\pi/4$ -DQPSK, 8DPSK Bluetooth LE: GFSK

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 BR/EDR.

Note 3: Antenna information:

Bluetooth Antenna information	
Antenna Type	: FPC antenna
Antenna Gain(dBi)	: Left side: -2.05 dBi Right side: -2.00 dBi

Note 4: Channel information:

Bluetooth BR/EDR Channel information					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	27	2429	54	2456
1	2403	28	2430	55	2457
2	2404	29	2431	56	2458
3	2405	30	2432	57	2459
4	2406	31	2433	58	2460
5	2407	32	2434	59	2461
6	2408	33	2435	60	2462
7	2409	34	2436	61	2463
8	2410	35	2437	62	2464
9	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470

15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

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.

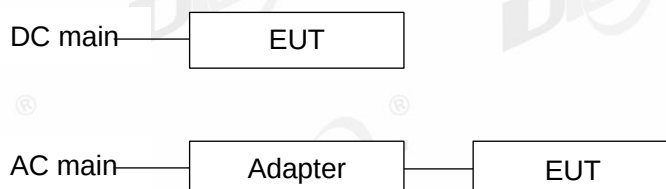
2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Description	Remark
N/A	N/A	N/A	N/A	N/A

2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	EMC Compliance	SN
Adapter	SAMSUNG	EP-TA200	N/A	Input: 100-240~, 50/60Hz, 0.5A; Output: 9V/1.67A or 5V/2A

2.4. Block diagram of EUT configuration for test



Test software: Airoha.Tool.Kit.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	61(Default)	CH0 to CH78	2402 to 2480
$\pi/4$ -DQPSK hopping on Tx mode	61(Default)	CH0 to CH78	2402 to 2480
8DPSK hopping on Tx mode	61(Default)	CH0 to CH78	2402 to 2480
GFSK hopping off Tx mode	61(Default)	CH0	2402
	61(Default)	CH39	2441
	61(Default)	CH78	2480
$\pi/4$ -DQPSK hopping off Tx mode	61(Default)	CH0	2402
	61(Default)	CH39	2441
	61(Default)	CH78	2480
8DPSK hopping off Tx mode	61(Default)	CH0	2402
	61(Default)	CH39	2441
	61(Default)	CH78	2480

2.5. Deviations of test standard

No deviation.

2.6. Test environment conditions

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

2.7. Test laboratory

Guangdong Dongdian Testing Service Co., Ltd.

Add.: Unit 2, Building 1, No.17, Zongbu 2nd Road, Songshan Lake Park, Dongguan, Guangdong, 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 ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	1.38 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
Peak Output Power (Conducted) (Power Sensor)	0.74 dB
Power Spectral Density	0.74 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	1.38 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
Frequencies Stability	6.7×10^{-8} (Antenna couple method)
	5.5×10^{-8} (Conducted method)
Conducted spurious emissions	0.86 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	1.40 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
	1.66 dB ($8 \text{ GHz} \leq f < 26.5 \text{ GHz}$)
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)

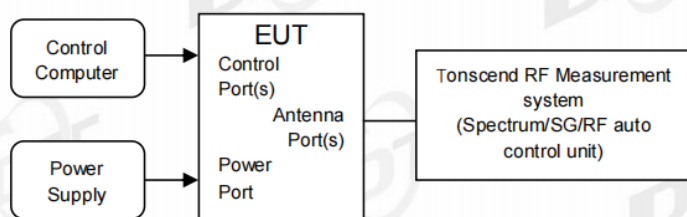
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3. Equipment Used During Conductive Test

Equipment	Manufacturer	Model No.	Serial Number	Due Date
☒ RF Connected Test (RF Measurement System 2#)				
SPECTRUM ANALYZER	R&S	FSU26	201124	2024/07/11
Power Sensor	R&S	NRP-Z22	101254	2024/07/11
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 Engineer:	Haofeng	Test Site:	RF Measurement System2#
Ambient Condition:	21.2℃,35.8%RH	Test Date:	2023.12.20
Test Power Supply:	DC 5V	EUT:	LIBRATONE AIR H BLUETOOTH EARPHONES
Sample Number:	S23120513-01	Model No.:	LTW612

Left side:

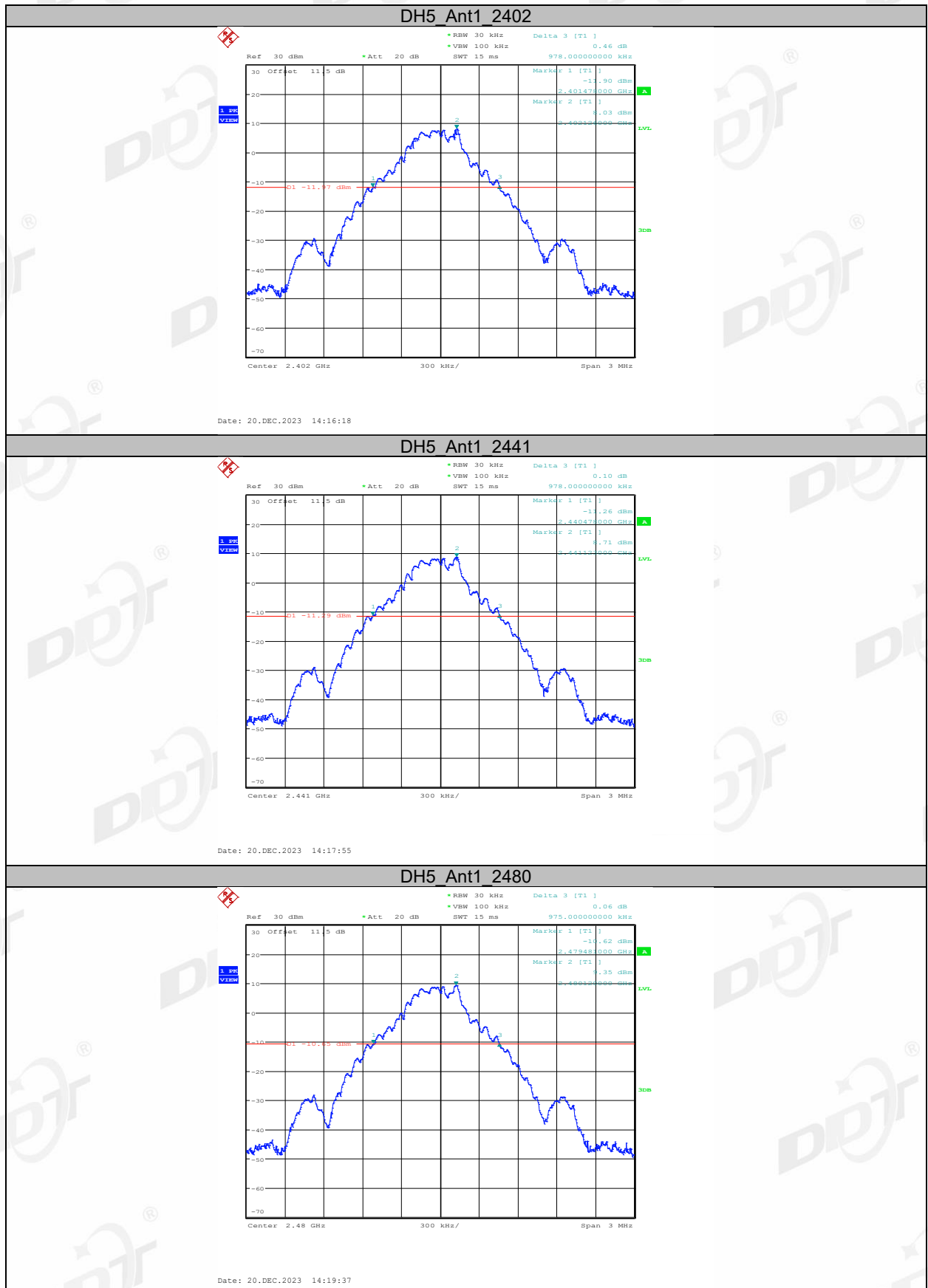
Test Mode	Antenna	Frequency [MHz]	20dB EBW[MHz]
DH5	Ant1	2402	0.98
		2441	0.98
		2480	0.97
2DH5	Ant1	2402	1.27
		2441	1.26
		2480	1.26
3DH5	Ant1	2402	1.30
		2441	1.29
		2480	1.29

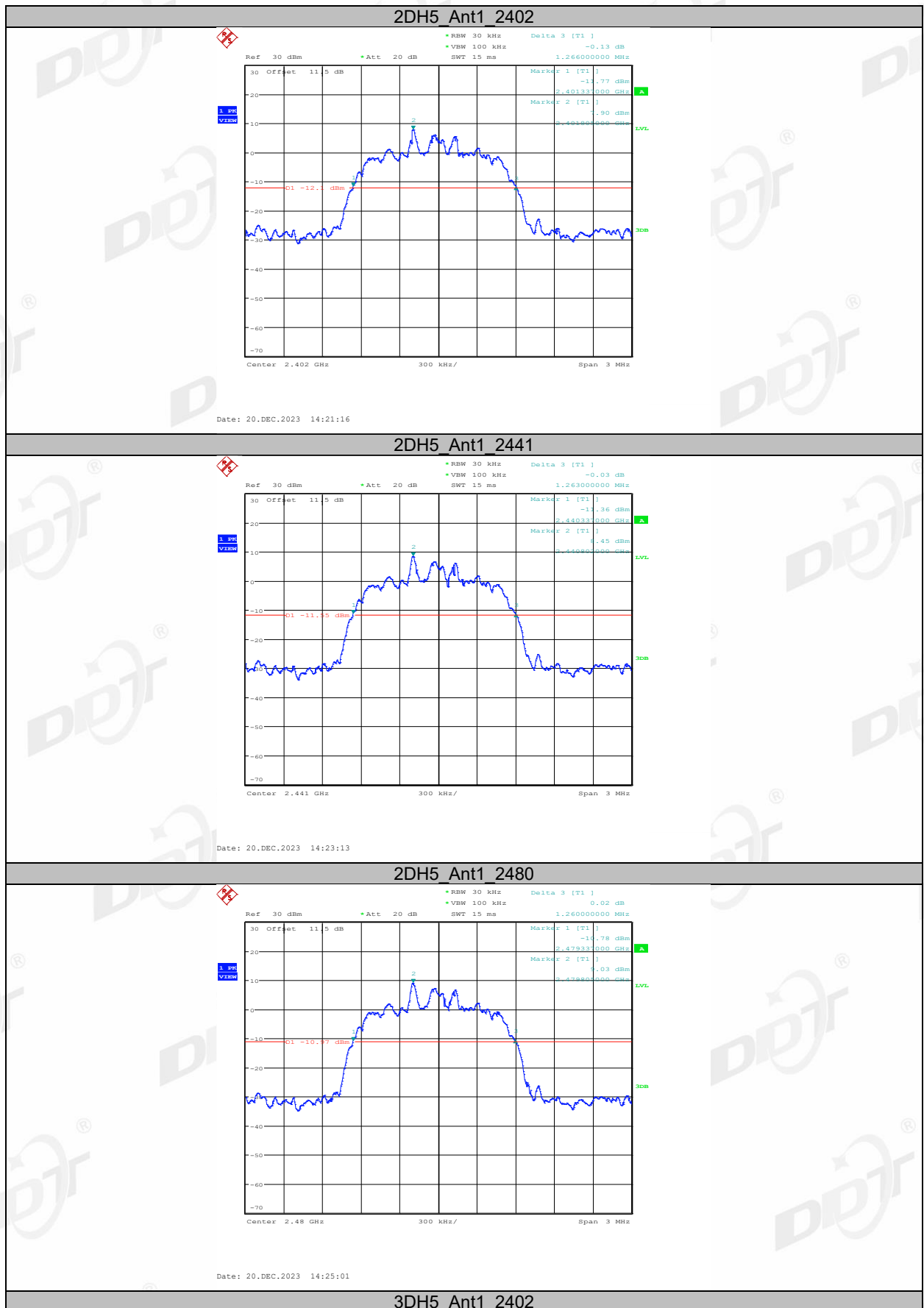
Right side:

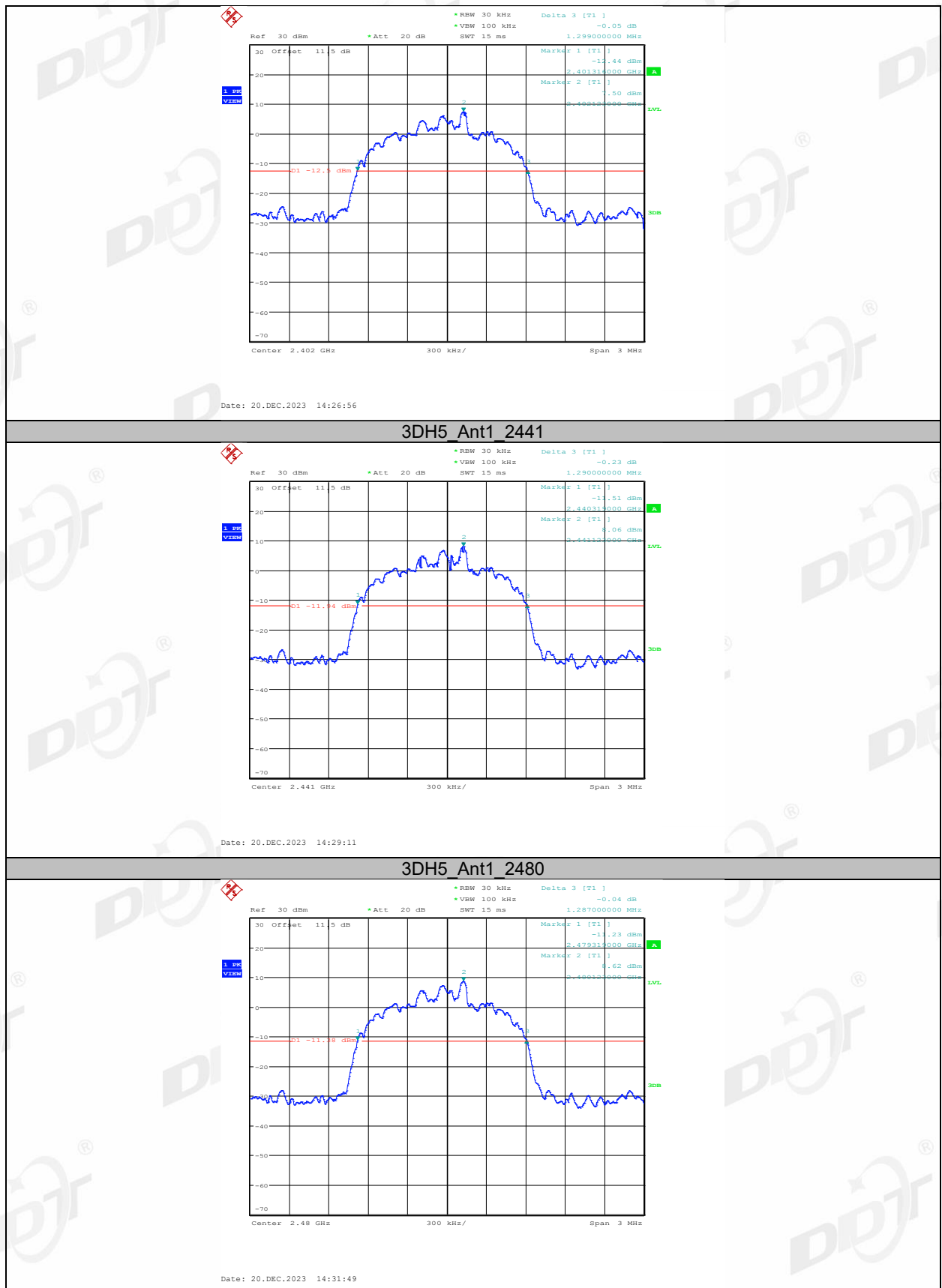
Test Mode	Antenna	Frequency [MHz]	20dB EBW[MHz]
DH5	Ant1	2402	0.97
		2441	0.97
		2480	0.98
2DH5	Ant1	2402	1.28
		2441	1.27
		2480	1.27
3DH5	Ant1	2402	1.30
		2441	1.30
		2480	1.29

4.5. Test graphs

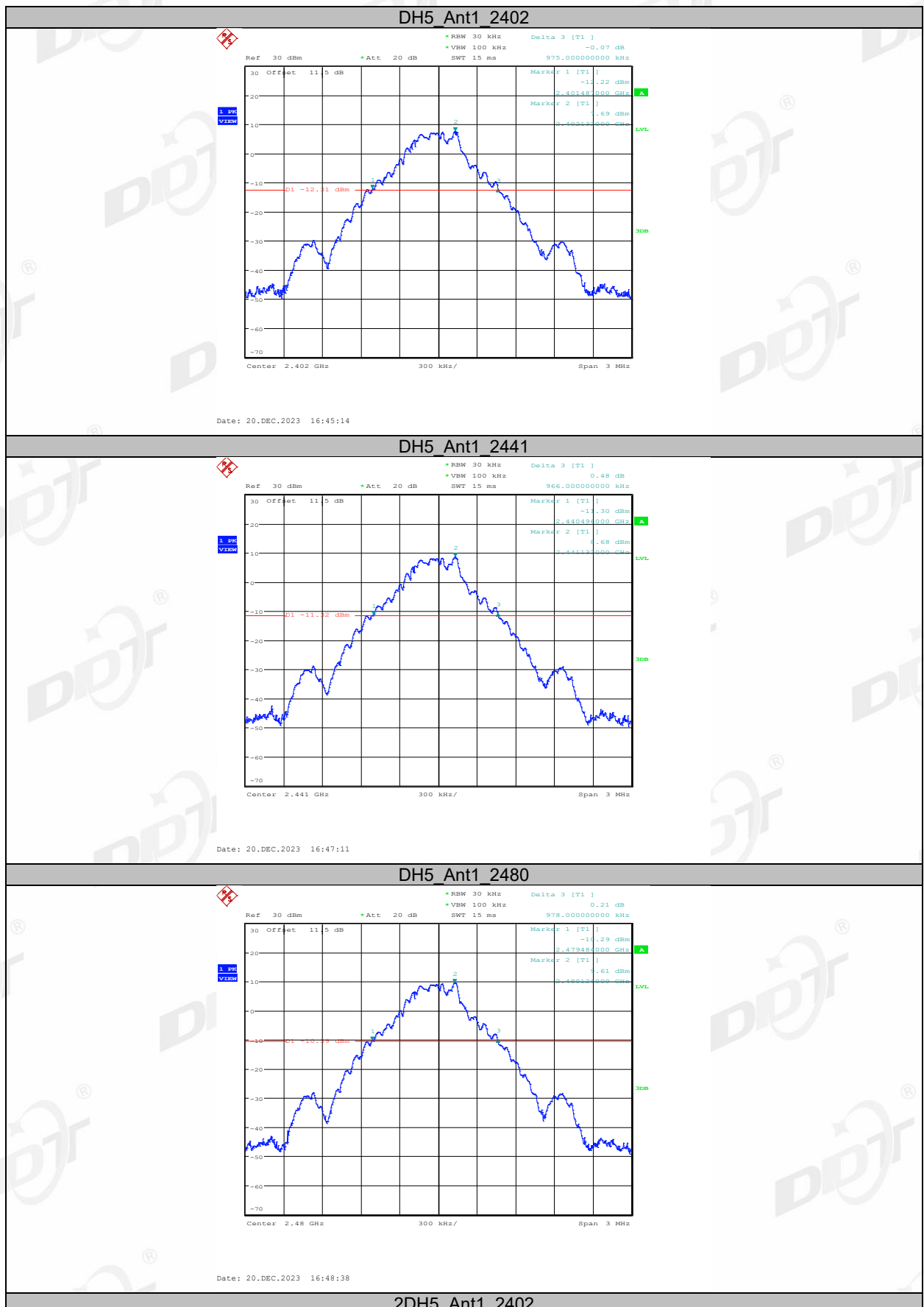
Left side:

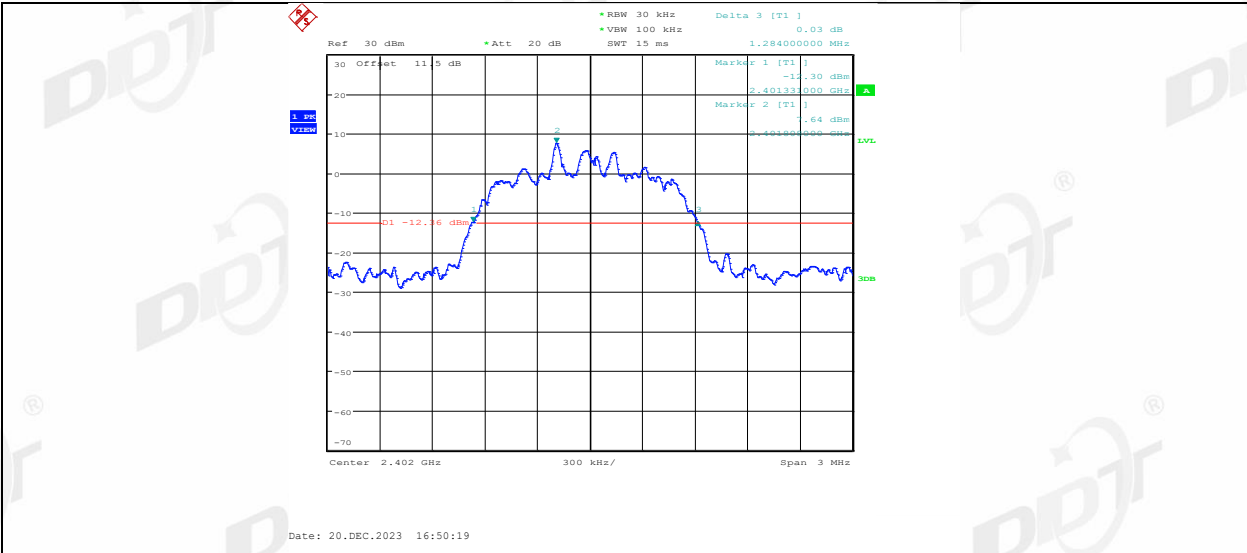




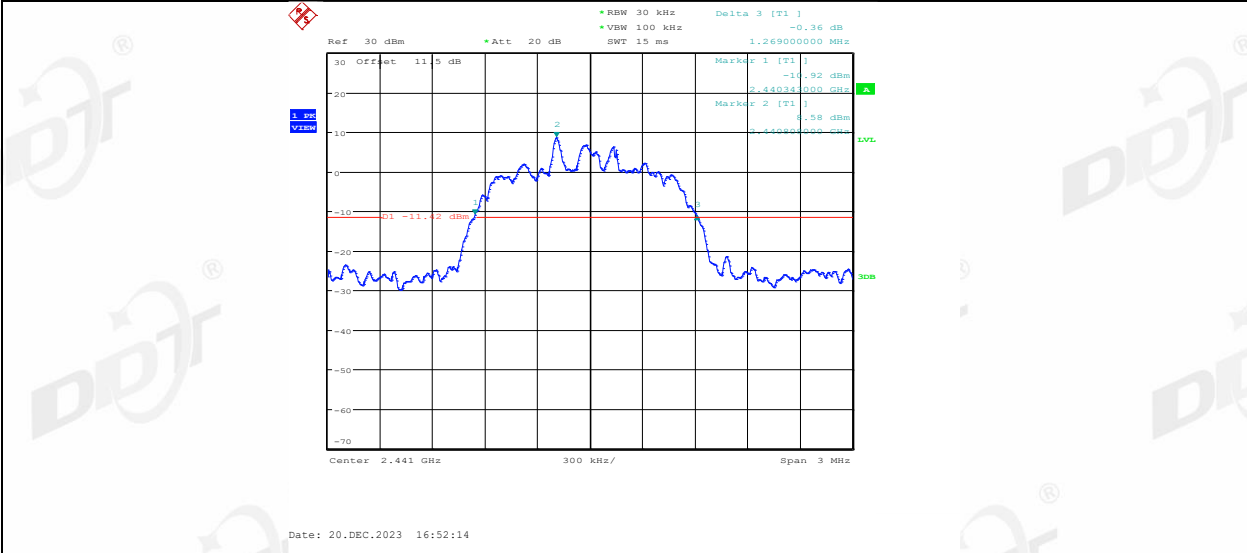


Right side:





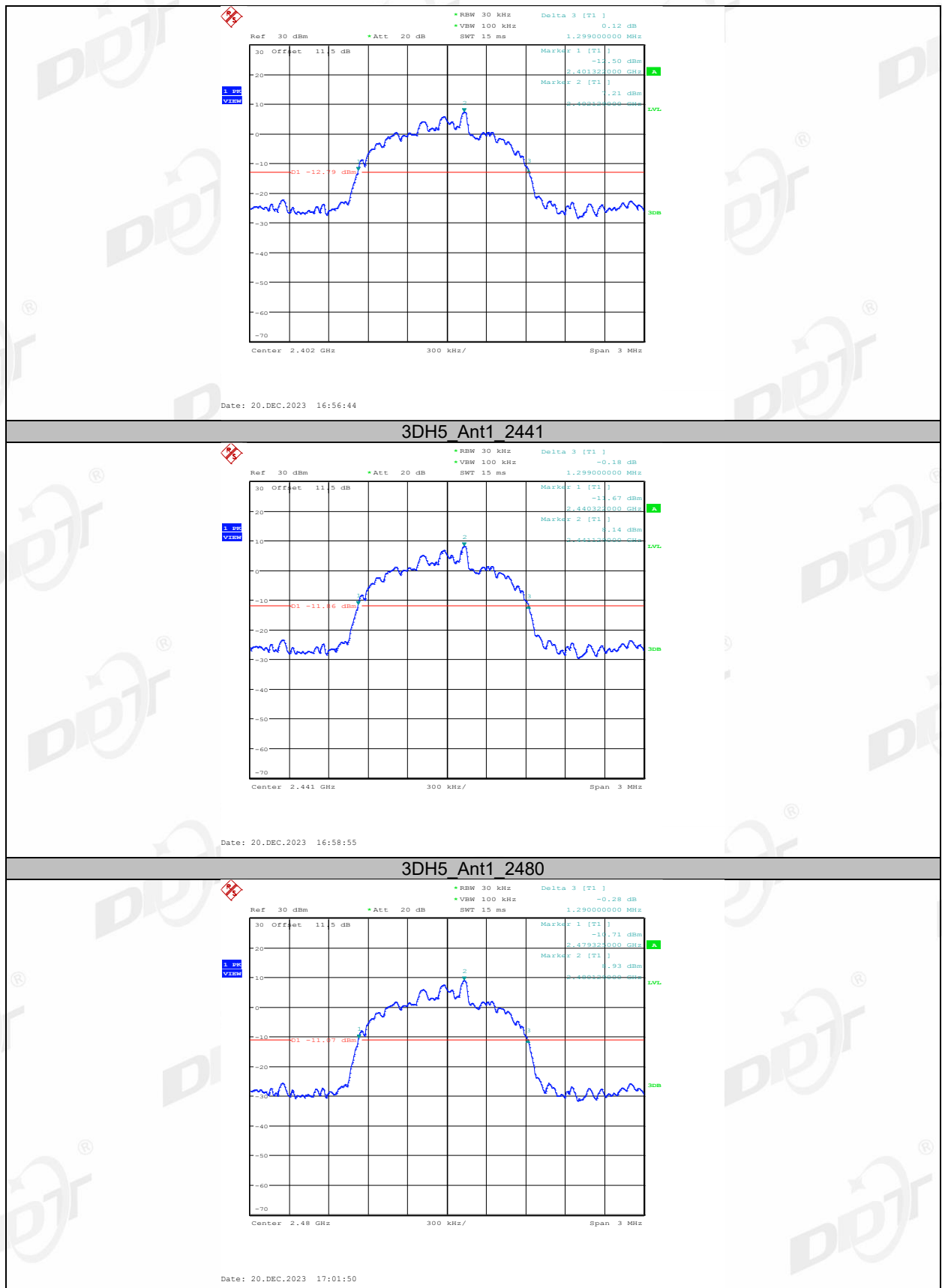
2DH5 Ant1_2441



2DH5 Ant1_2480

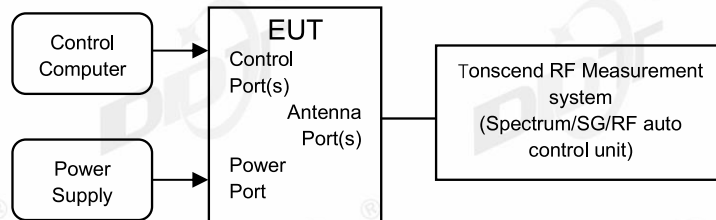


3DH5 Ant1_2402



5. Maximum Peak Output Power

5.1. Block diagram of test setup



5.2. 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.

5.3. 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.

5.4. Test Result

Test Engineer:	Haofeng	Test Site:	RF Measurement System2#
Ambient Condition:	21.2℃,35.8%RH	Test Date:	2023.12.20
Test Power Supply:	DC 5V	EUT:	LIBRATONE AIR H BLUETOOTH EARPHONES
Sample Number:	S23120513-01	Model No.:	LTW612

Left side:

Test Mode	Antenna	Frequency [MHz]	Conducted Peak Power[dBm]	Conducted Limit[dBm]	EIRP[dBm]	EIRP Limit[dBm]	Verdict
DH5	Ant1	2402	10.72	≤20.97	8.67	≤36	PASS
		2441	11.47	≤20.97	9.42	≤36	PASS
		2480	12.13	≤20.97	10.08	≤36	PASS
2DH5	Ant1	2402	10.27	≤20.97	8.22	≤36	PASS
		2441	10.80	≤20.97	8.75	≤36	PASS
		2480	11.46	≤20.97	9.41	≤36	PASS
3DH5	Ant1	2402	10.27	≤20.97	8.22	≤36	PASS
		2441	10.83	≤20.97	8.78	≤36	PASS
		2480	11.48	≤20.97	9.43	≤36	PASS

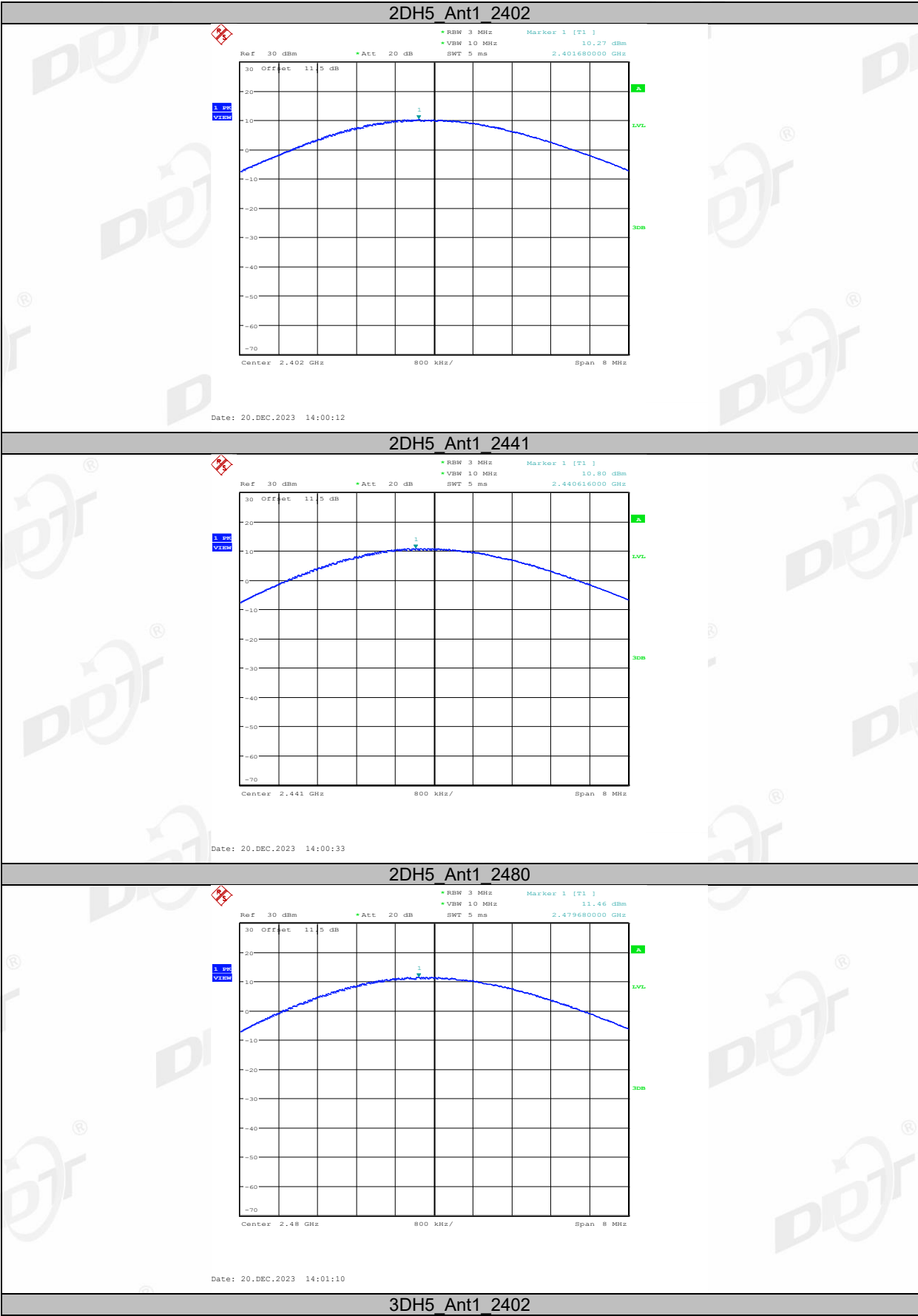
Right side:

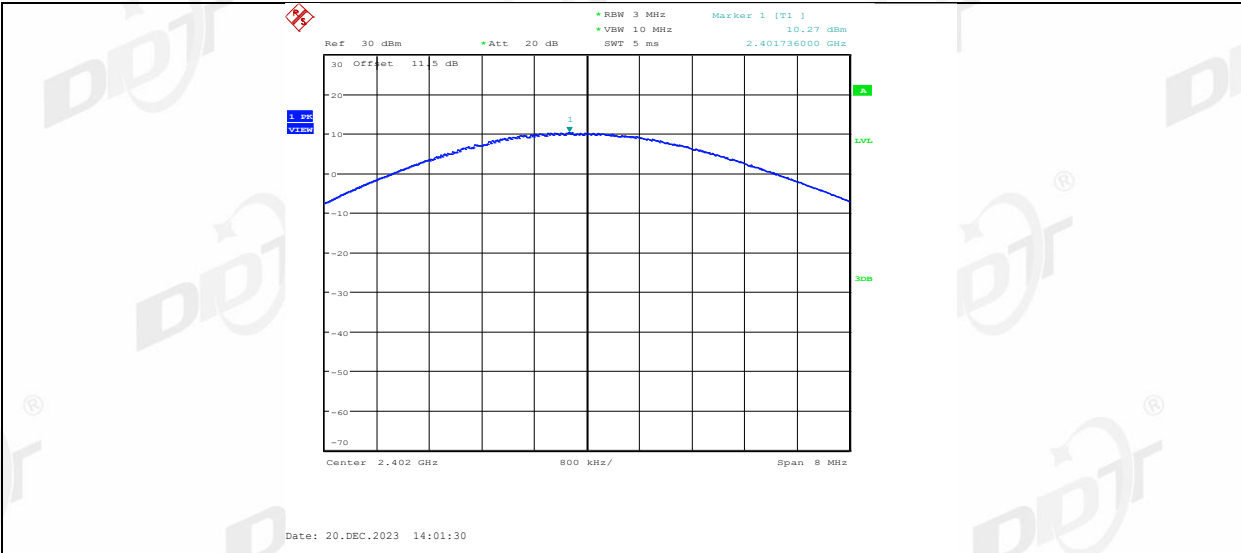
Test Mode	Antenna	Frequency [MHz]	Conducted Peak Power[dBm]	Conducted Limit[dBm]	EIRP[dBm]	EIRP Limit[dBm]	Verdict
DH5	Ant1	2402	10.57	≤20.97	8.57	≤36	PASS
		2441	11.53	≤20.97	9.53	≤36	PASS
		2480	12.47	≤20.97	10.47	≤36	PASS
2DH5	Ant1	2402	10.07	≤20.97	8.07	≤36	PASS
		2441	10.99	≤20.97	8.99	≤36	PASS
		2480	11.78	≤20.97	9.78	≤36	PASS
3DH5	Ant1	2402	10.05	≤20.97	8.05	≤36	PASS
		2441	10.98	≤20.97	8.98	≤36	PASS
		2480	11.76	≤20.97	9.76	≤36	PASS

5.5. Test graphs

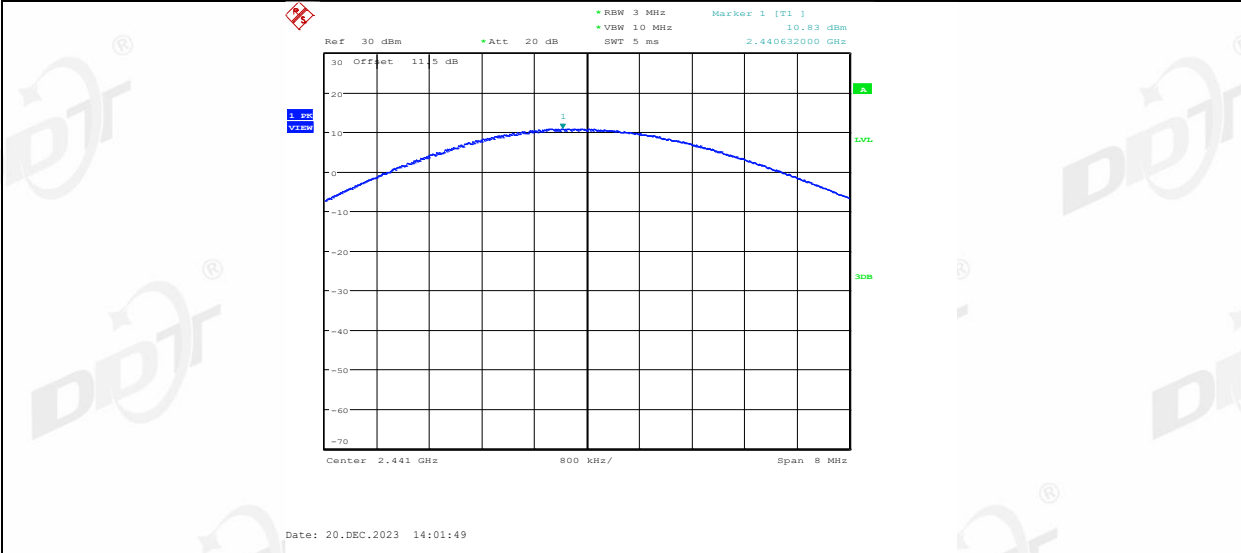
Left side:



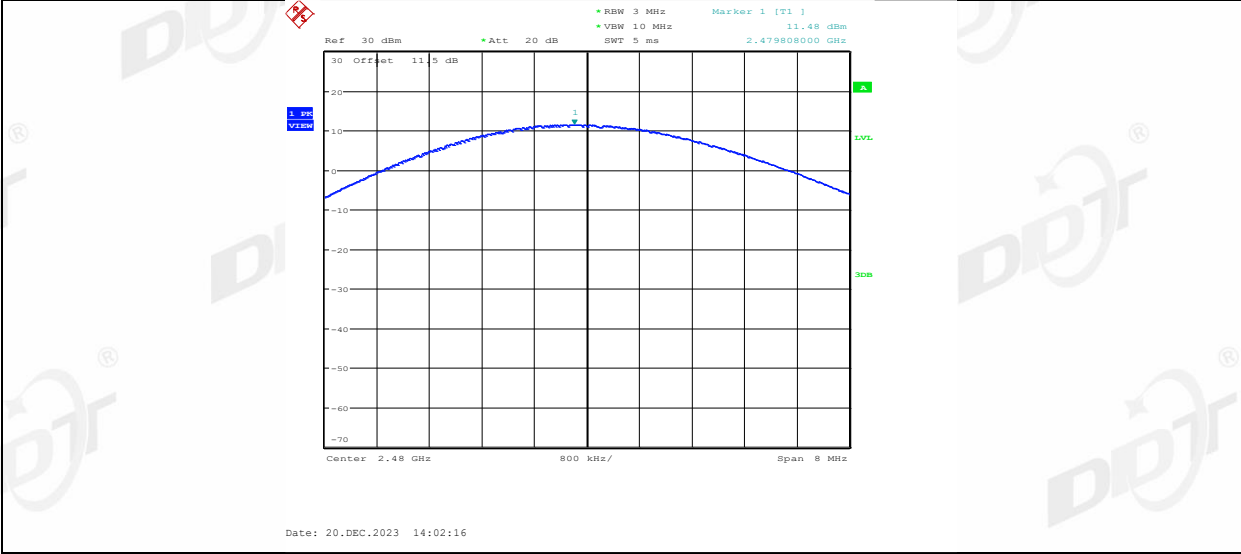




3DH5 Ant1_2441

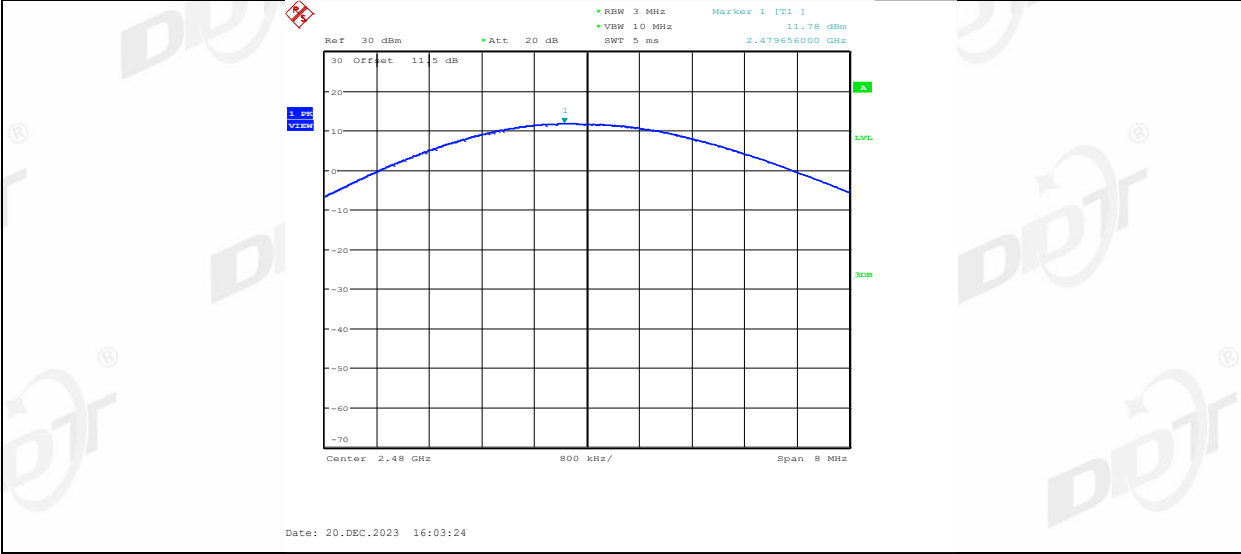
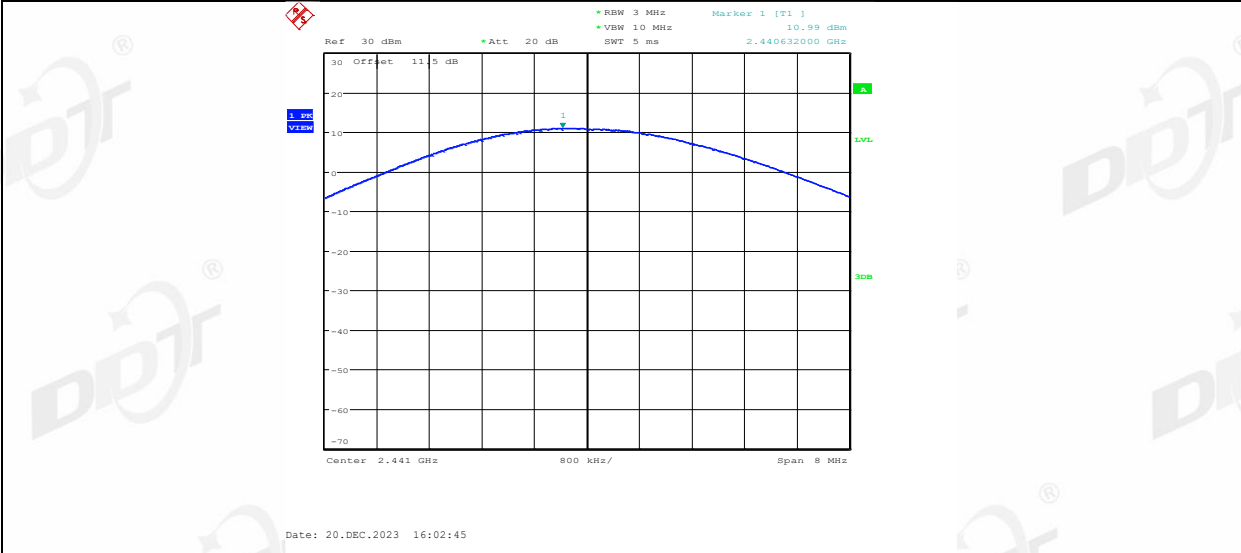
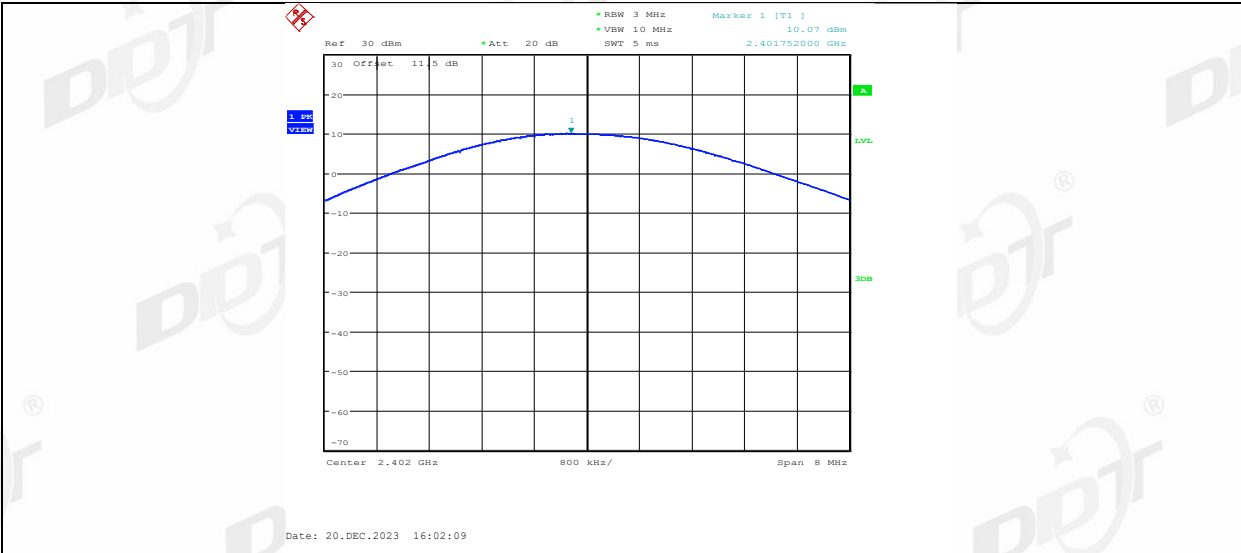


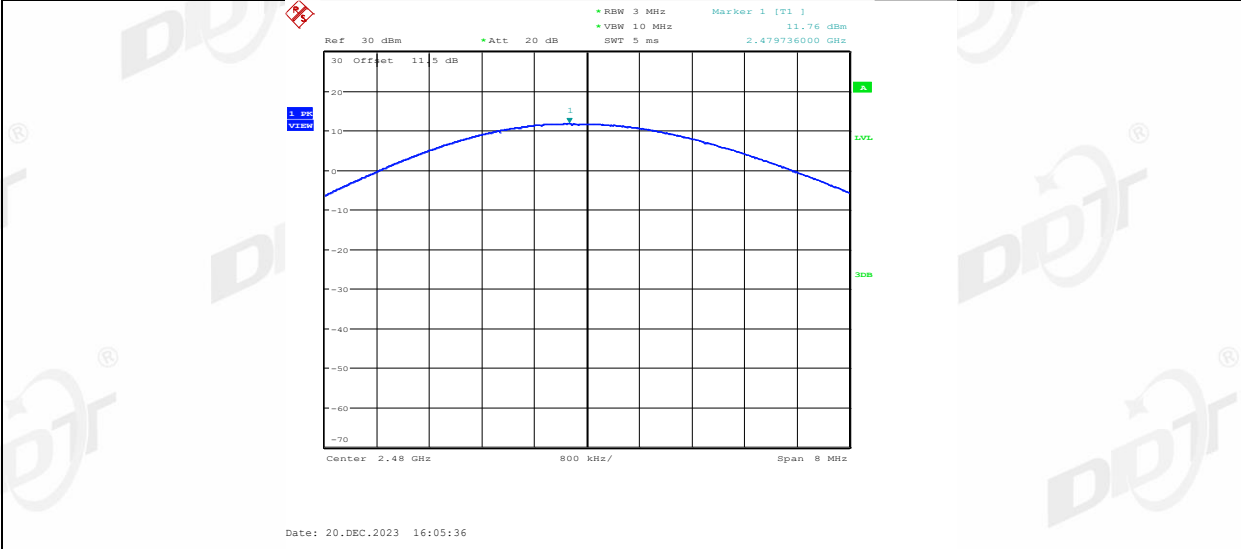
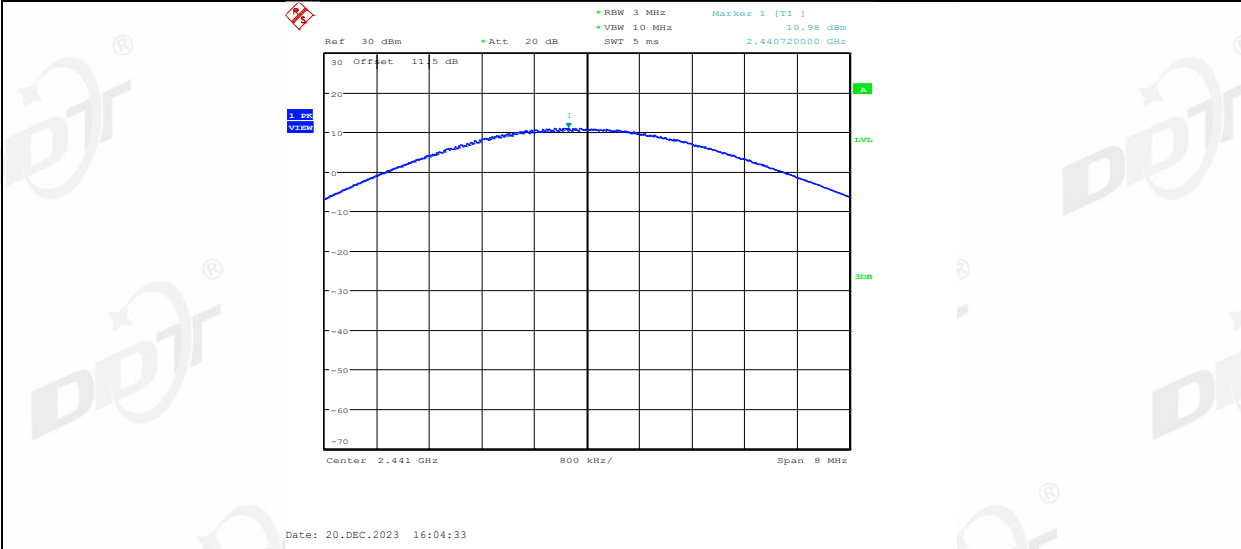
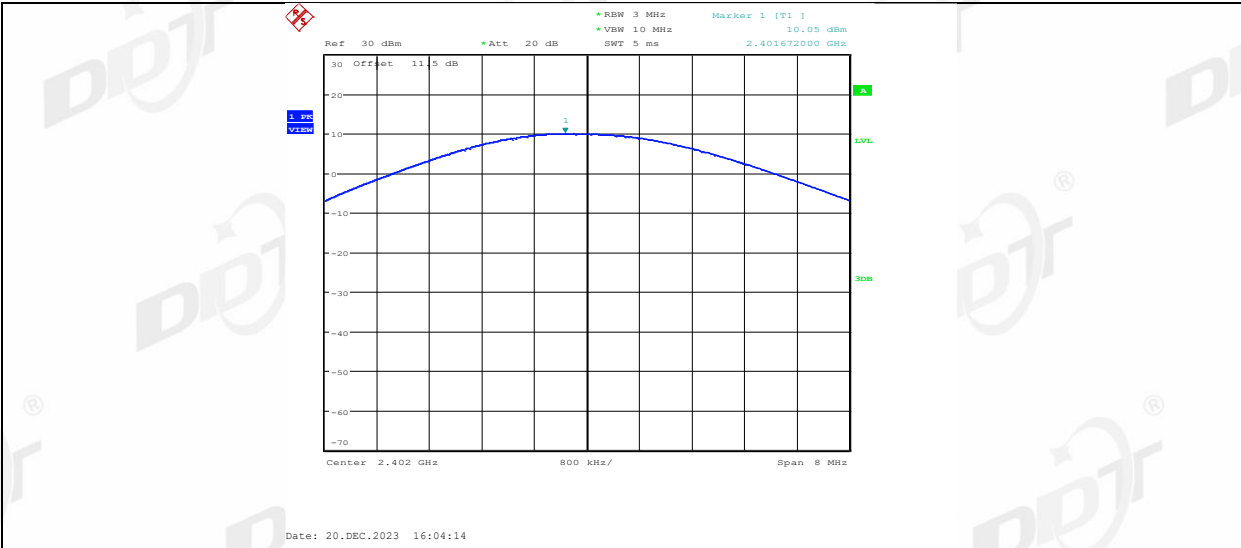
3DH5 Ant1_2480



Right side:

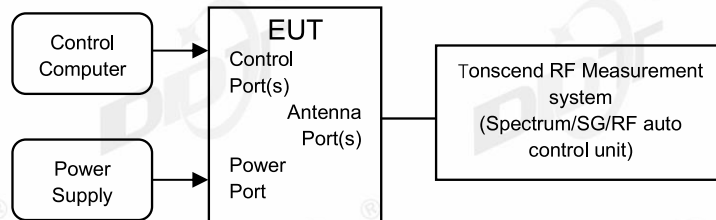






6. Carrier Frequency Separation

6.1. Block diagram of test setup



6.2. 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.

6.3. 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.

6.4. Test result

Test Engineer:	Haofeng	Test Site:	RF Measurement System2#
Ambient Condition:	21.2℃,35.8%RH	Test Date:	2023.12.20
Test Power Supply:	DC 5V	EUT:	LIBRATONE AIR H BLUETOOTH EARPHONES
Sample Number:	S23120513-01	Model No.:	LTW612

Left side:

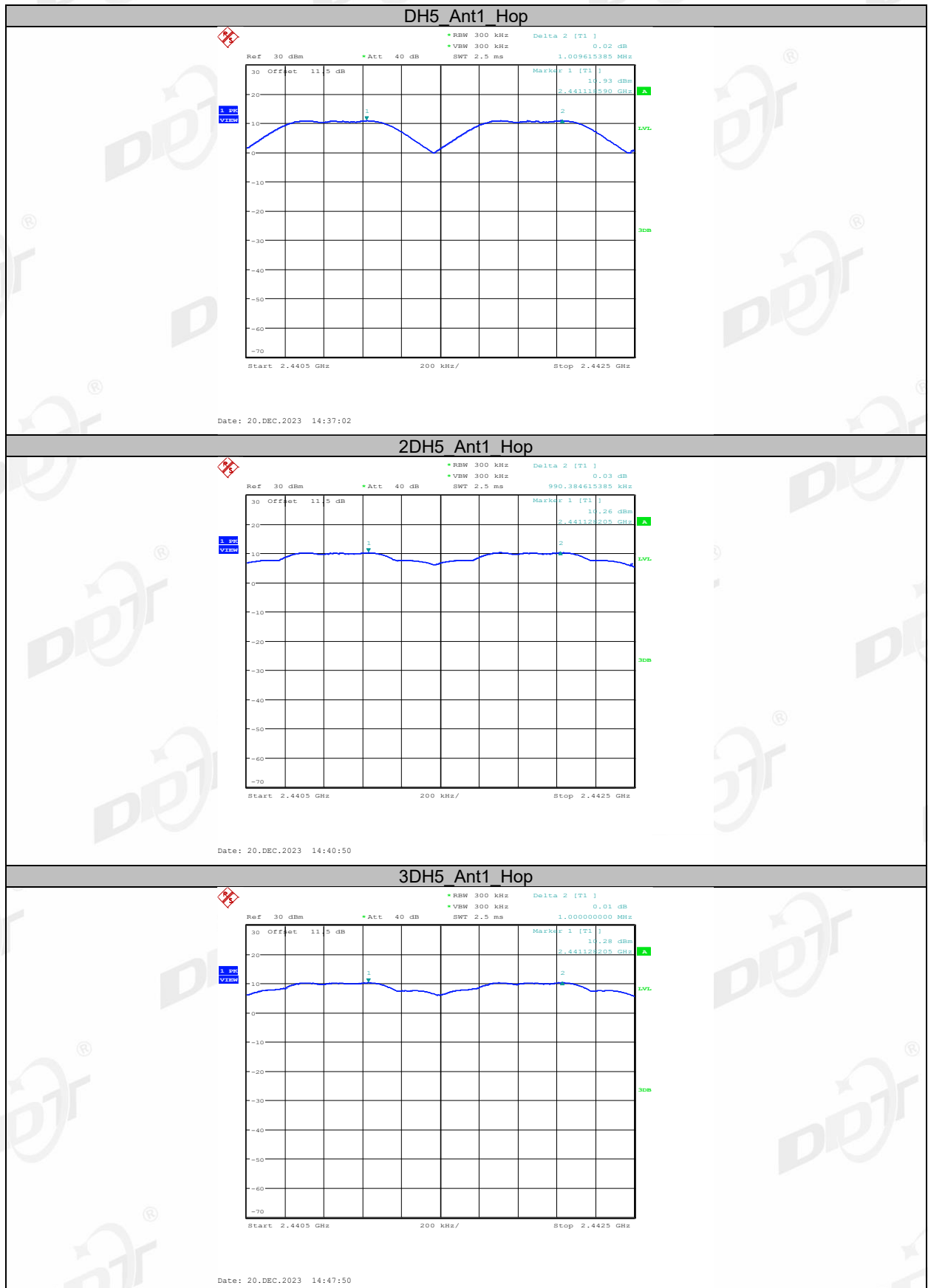
Test Mode	Antenna	Frequency [MHz]	Result [MHz]	Limit [MHz]	Verdict
DH5	Ant1	Hop	1.01	≥0.960	PASS
2DH5	Ant1	Hop	0.99	≥0.827	PASS
3DH5	Ant1	Hop	1.00	≥0.847	PASS

Right side:

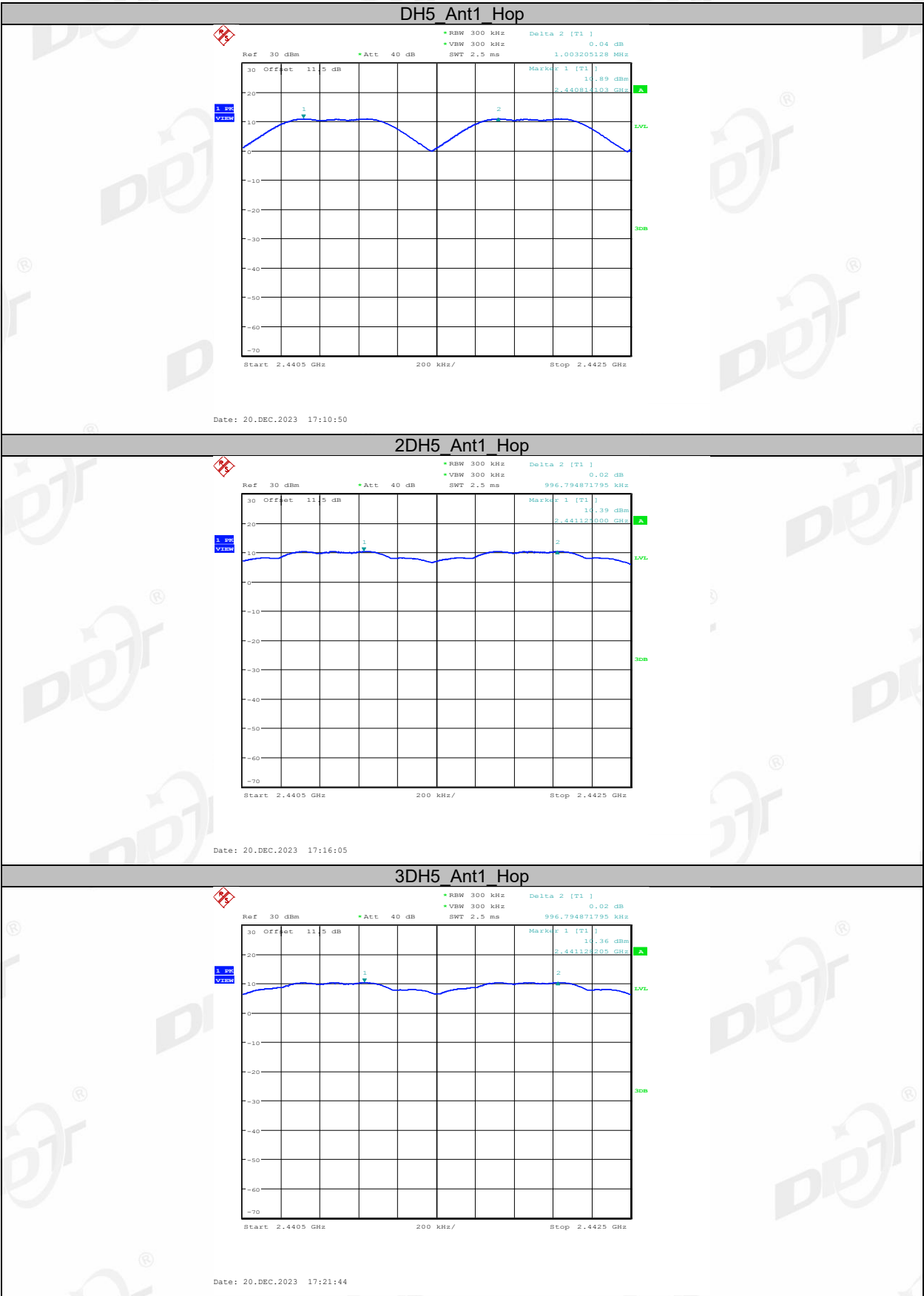
Test Mode	Antenna	Frequency [MHz]	Result [MHz]	Limit [MHz]	Verdict
DH5	Ant1	Hop	1.003	≥0.980	PASS
2DH5	Ant1	Hop	0.997	≥0.853	PASS
3DH5	Ant1	Hop	0.997	≥0.867	PASS

6.5. Test graphs

Left side:

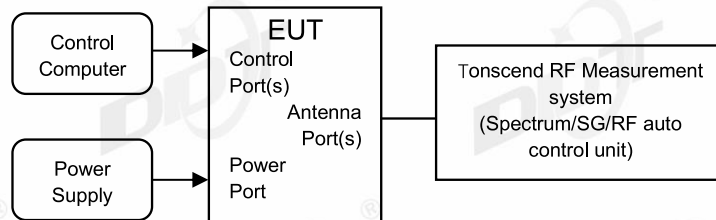


Right side:



7. Dwell Time

7.1. Block diagram of test setup



7.2. 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.

7.3. 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: $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$
- (6) Measure the hopping number and on time of each pulse with spectrum analyzer in zero span set, and calculate dwell time with formula $\text{Dwell time} = \text{total hops} \times \text{pulse's on time}$.

7.4. Test result

Test Engineer:	Haofeng	Test Site:	RF Measurement System2#
Ambient Condition:	21.2℃,35.8%RH	Test Date:	2023.12.20
Test Power Supply:	DC 5V	EUT:	LIBRATONE AIR H BLUETOOTH EARPHONES
Sample Number:	S23120513-01	Model No.:	LTW612

Left side:

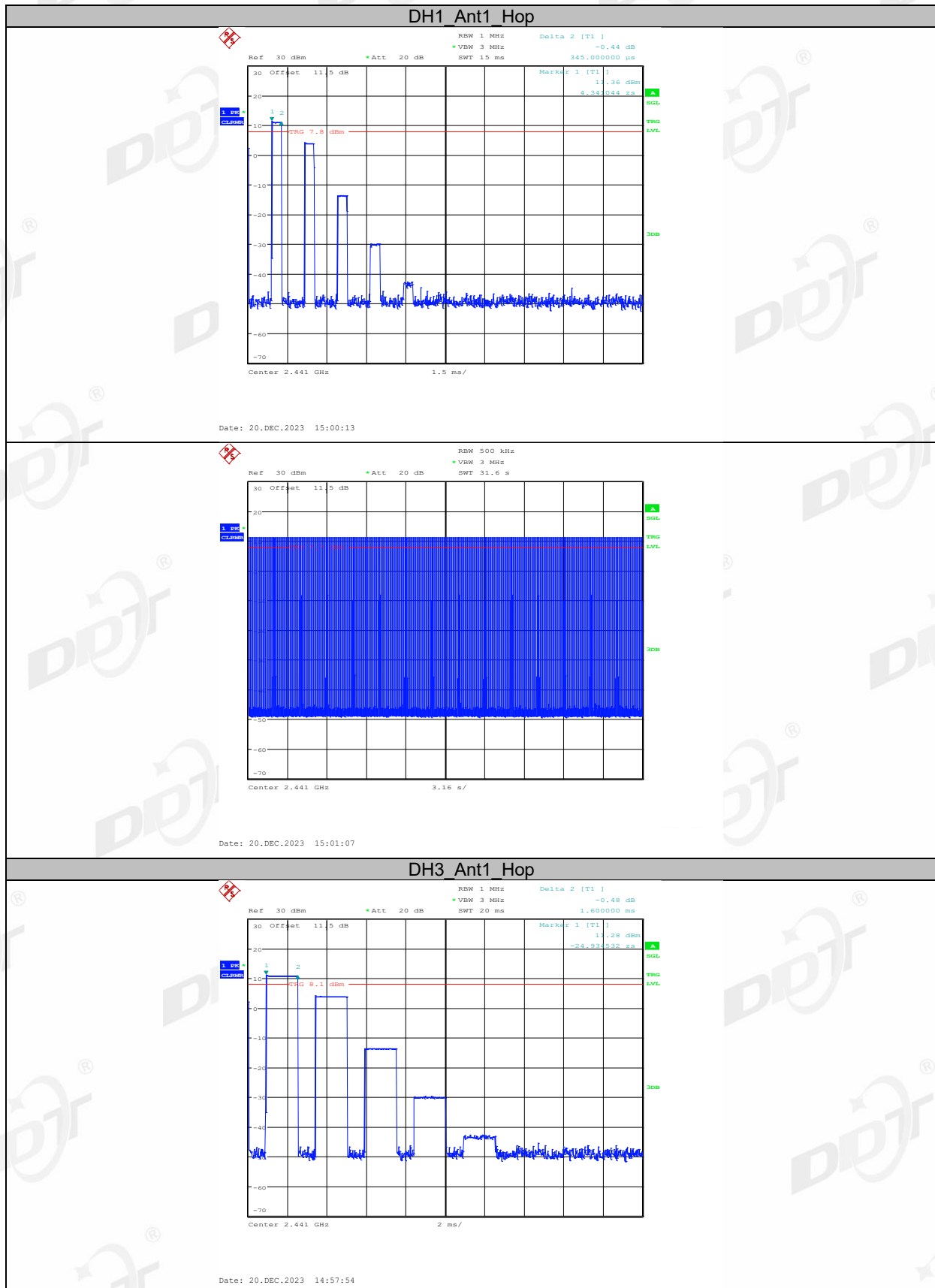
Test Mode	Antenna	Frequency [MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.345	320	0.110	≤0.4	PASS
DH3	Ant1	Hop	1.600	160	0.256	≤0.4	PASS
DH5	Ant1	Hop	2.850	107	0.305	≤0.4	PASS
2DH1	Ant1	Hop	0.360	320	0.115	≤0.4	PASS
2DH3	Ant1	Hop	1.600	160	0.256	≤0.4	PASS
2DH5	Ant1	Hop	2.865	107	0.307	≤0.4	PASS
3DH1	Ant1	Hop	0.360	320	0.115	≤0.4	PASS
3DH3	Ant1	Hop	1.605	160	0.257	≤0.4	PASS
3DH5	Ant1	Hop	2.880	107	0.308	≤0.4	PASS

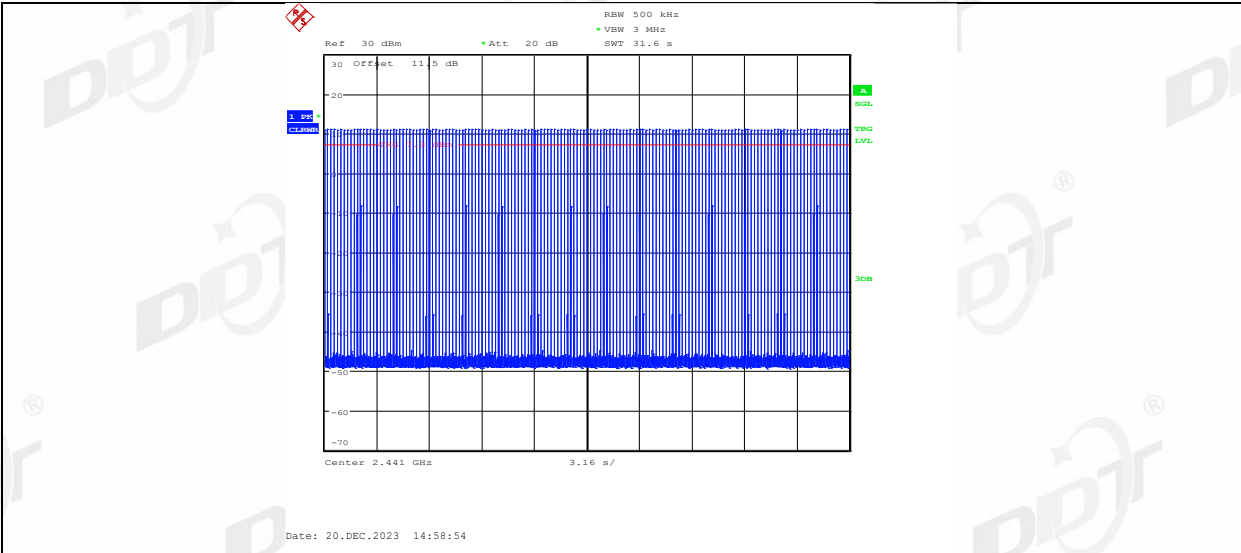
Right side:

Test Mode	Antenna	Frequency [MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.360	320	0.115	≤0.4	PASS
DH3	Ant1	Hop	1.620	160	0.259	≤0.4	PASS
DH5	Ant1	Hop	2.870	107	0.307	≤0.4	PASS
2DH1	Ant1	Hop	0.360	320	0.115	≤0.4	PASS
2DH3	Ant1	Hop	1.620	160	0.259	≤0.4	PASS
2DH5	Ant1	Hop	2.870	107	0.307	≤0.4	PASS
3DH1	Ant1	Hop	0.360	320	0.115	≤0.4	PASS
3DH3	Ant1	Hop	1.620	160	0.259	≤0.4	PASS
3DH5	Ant1	Hop	2.870	107	0.307	≤0.4	PASS

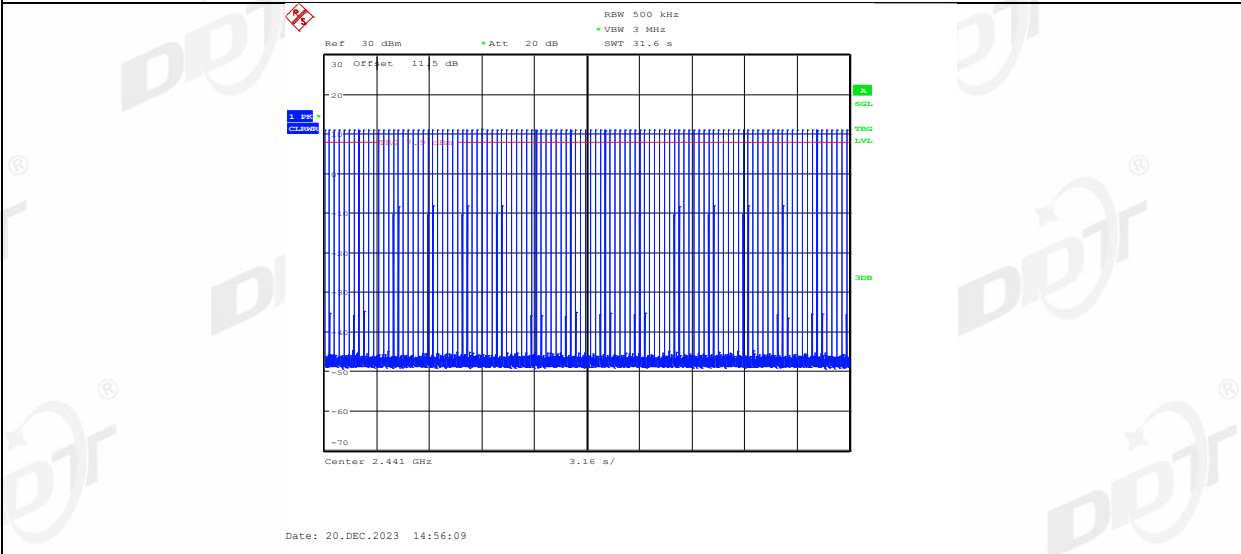
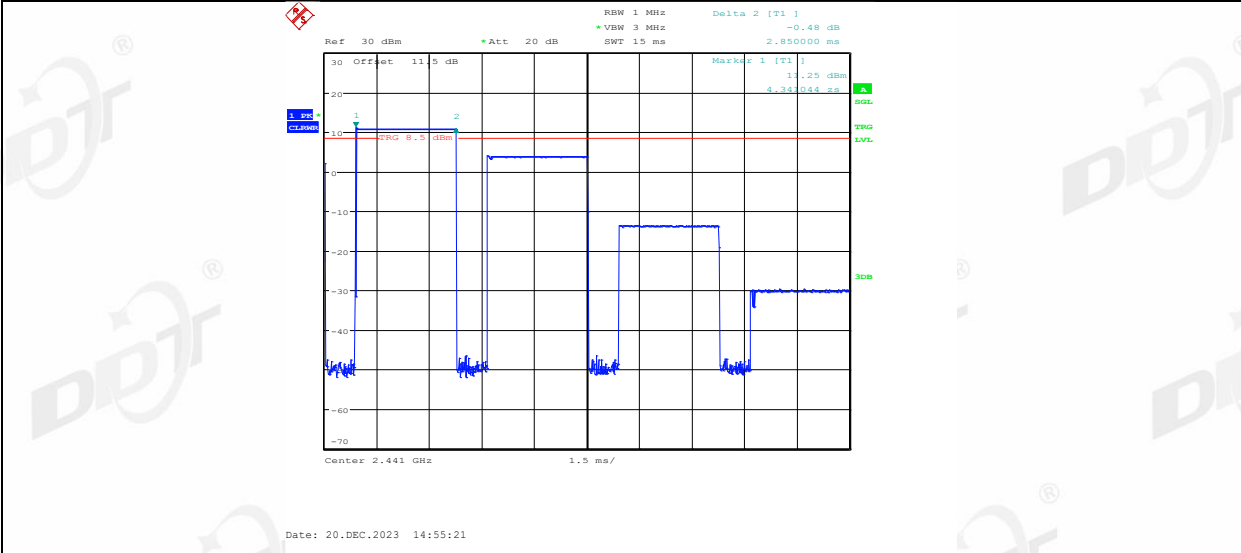
7.5. Test graphs

Left side:

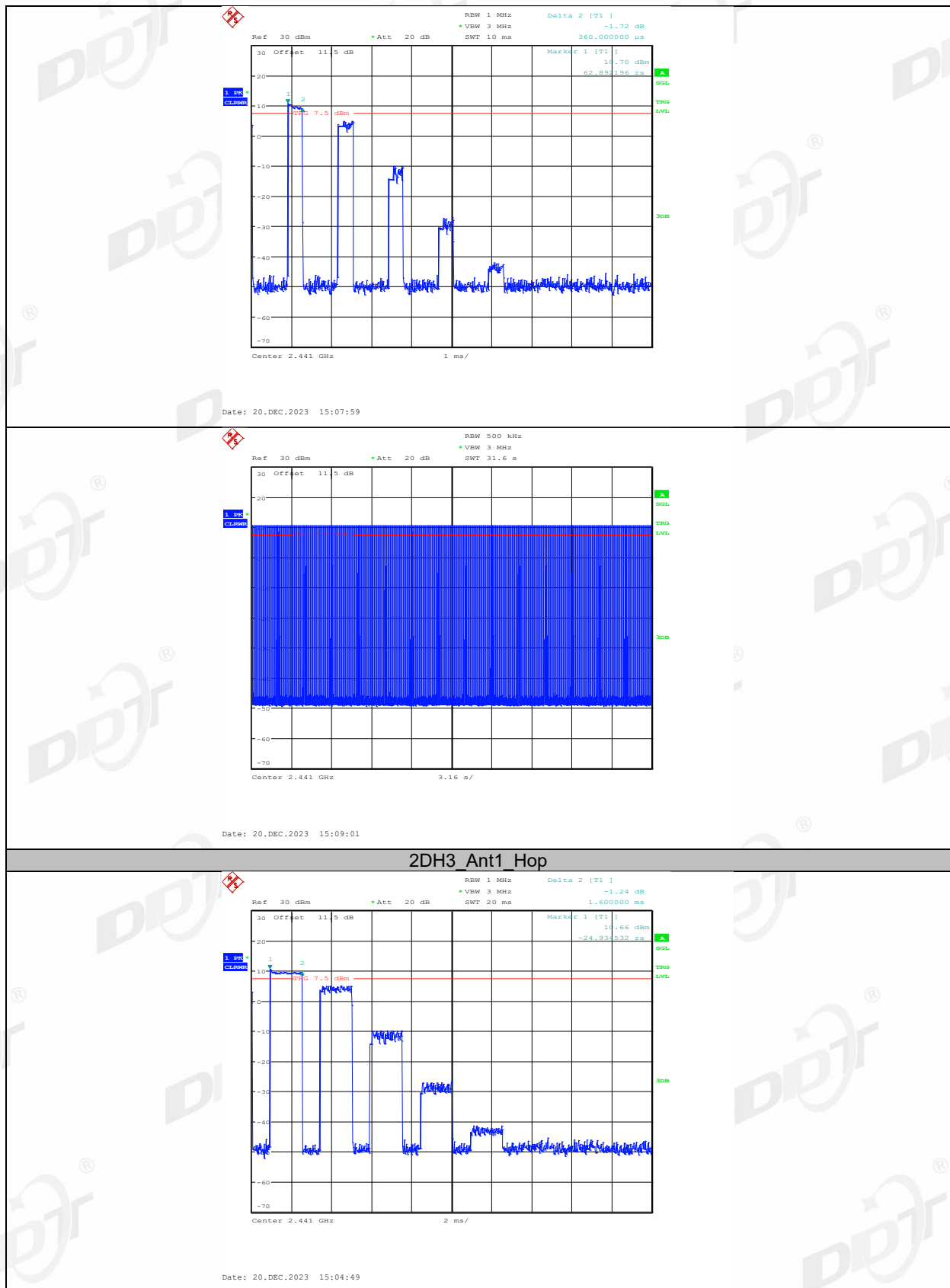


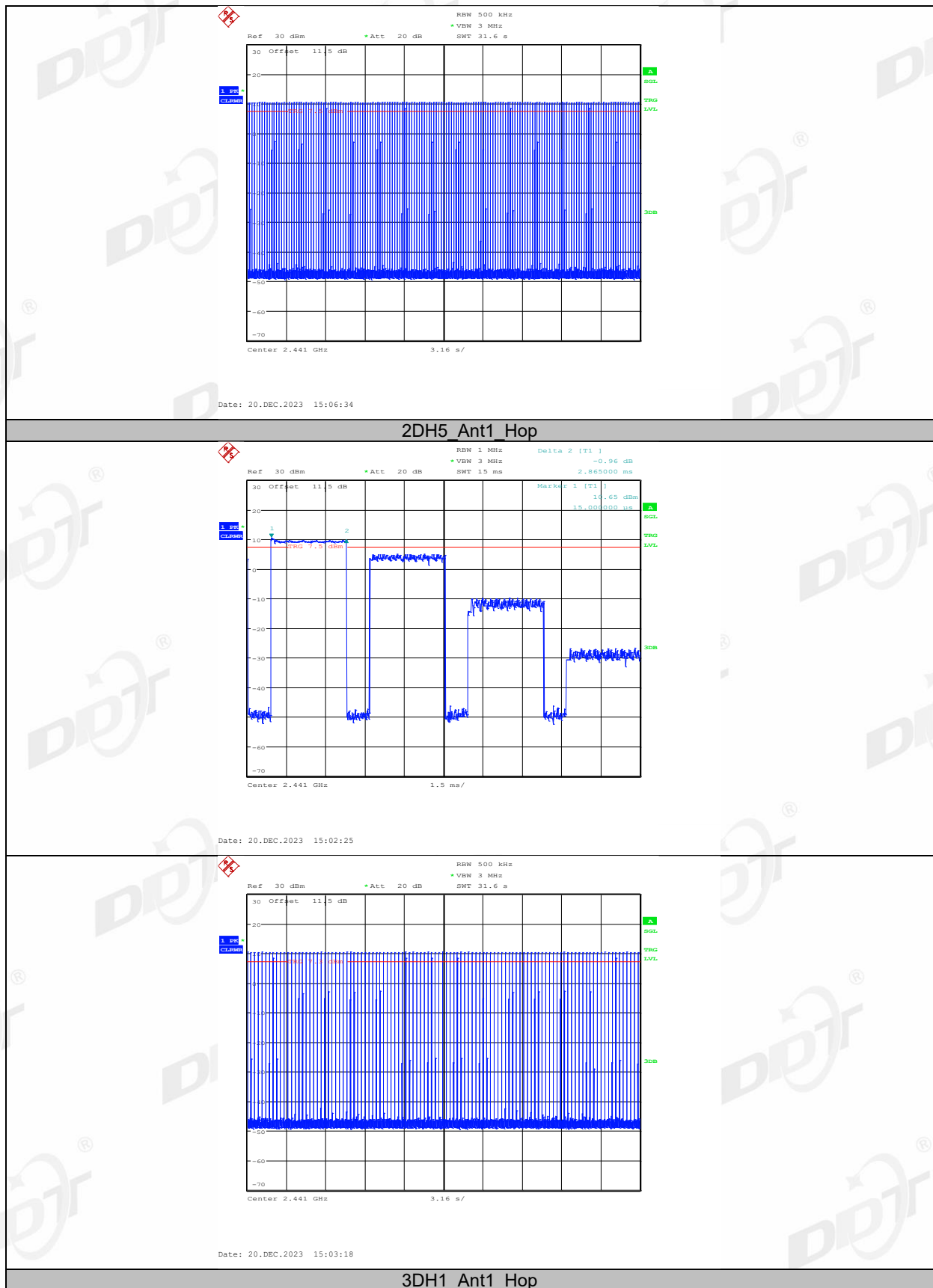


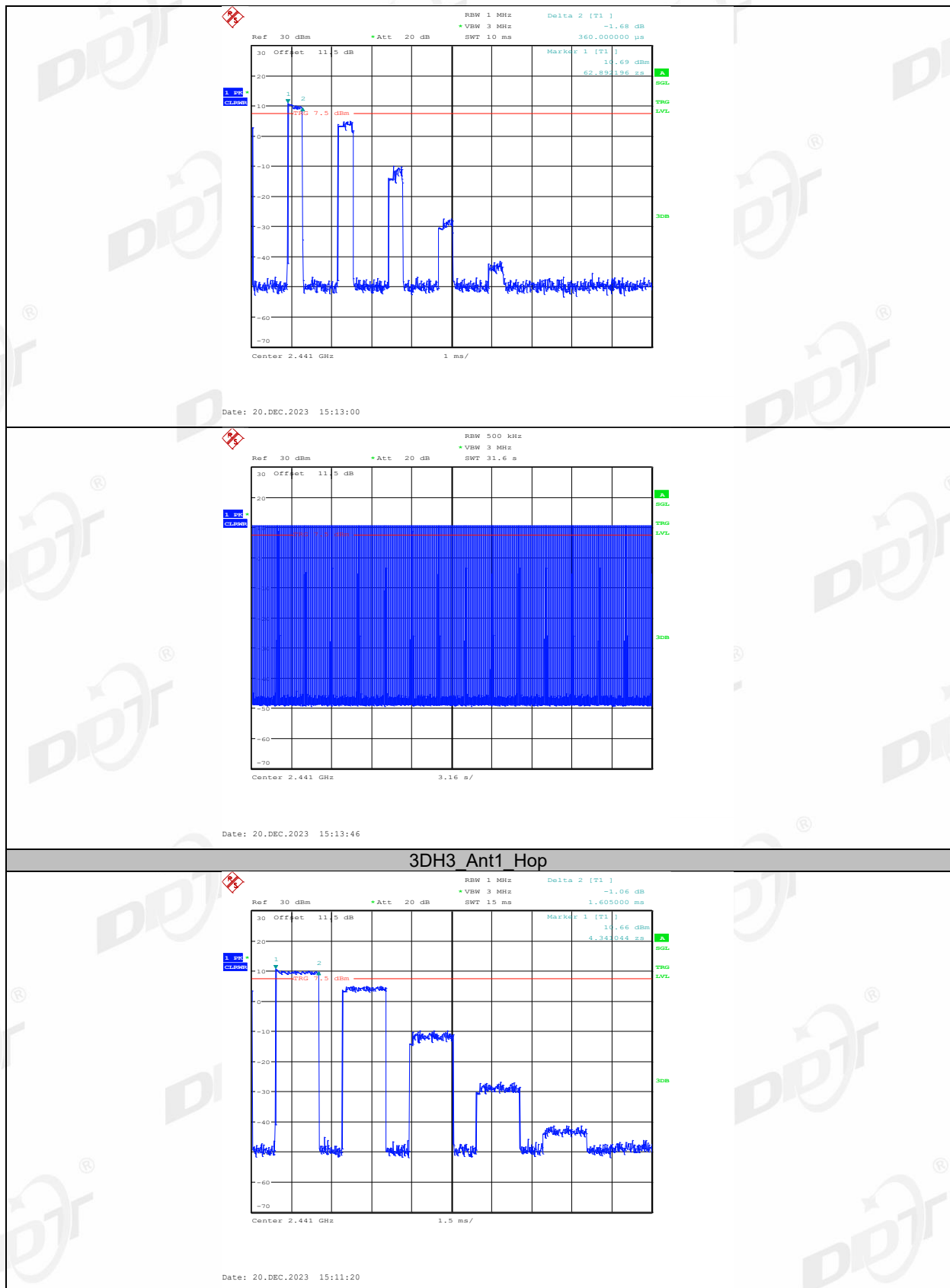
DH5_Ant1_Hop

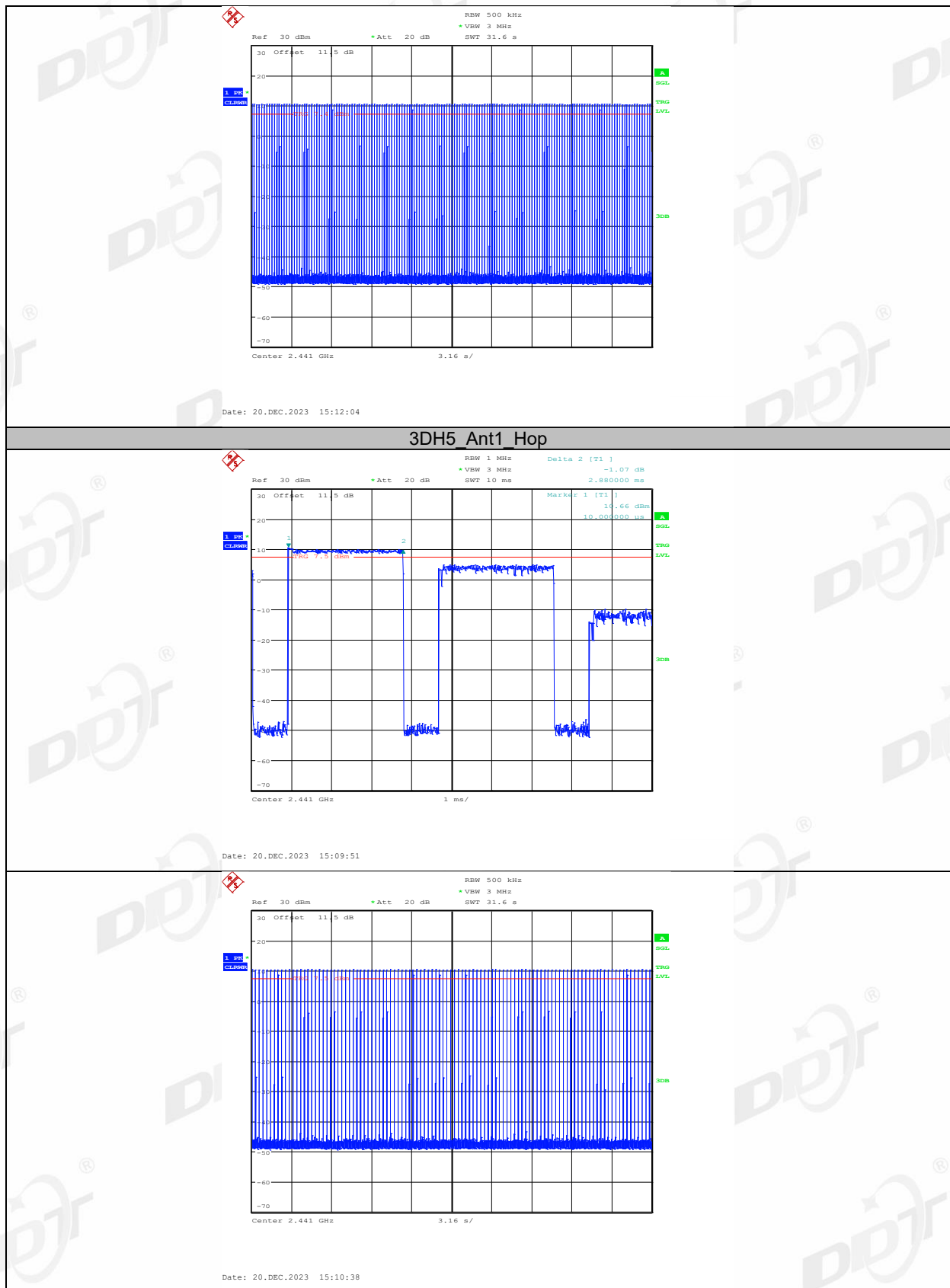


2DH1_Ant1_Hop

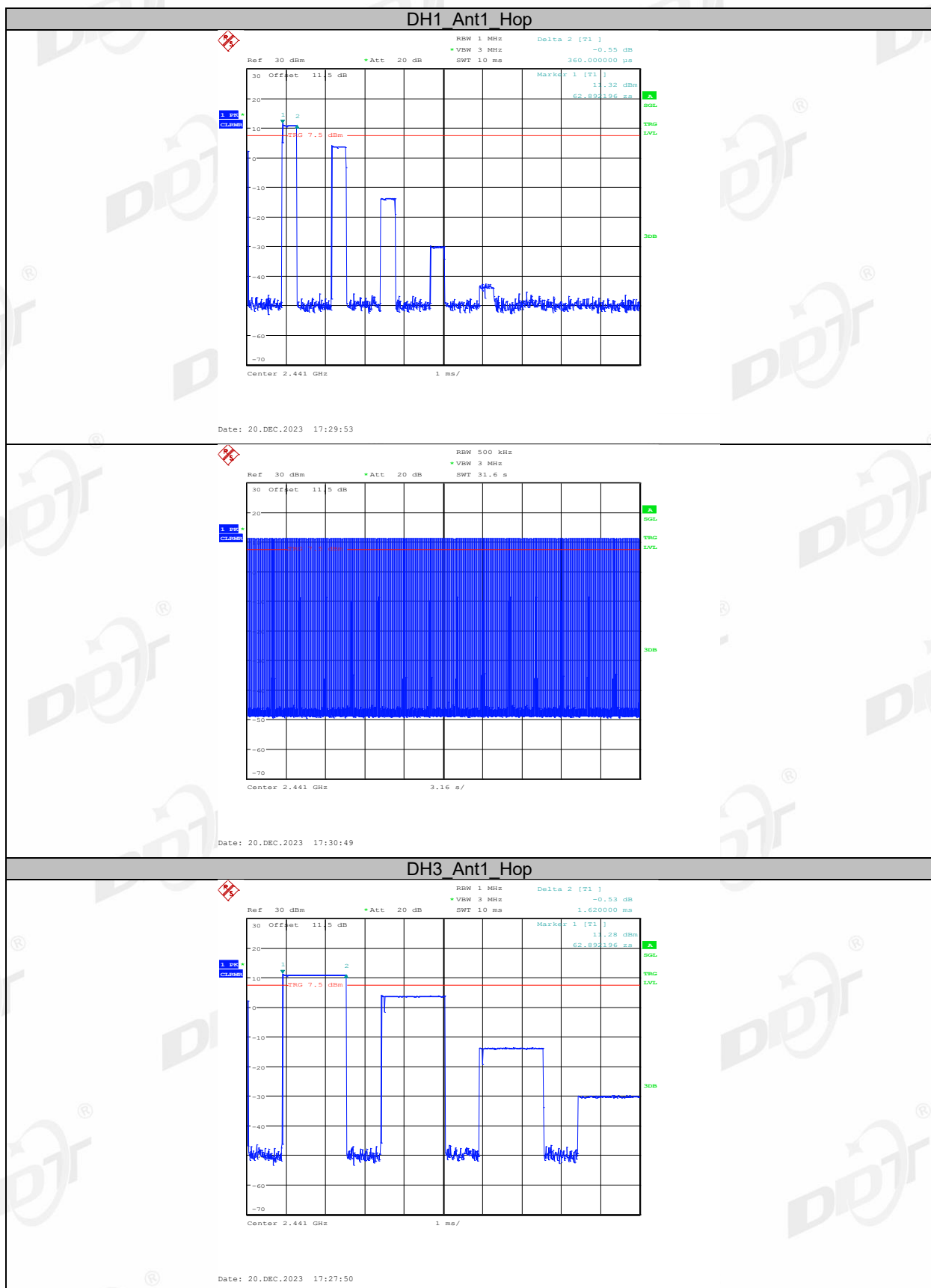


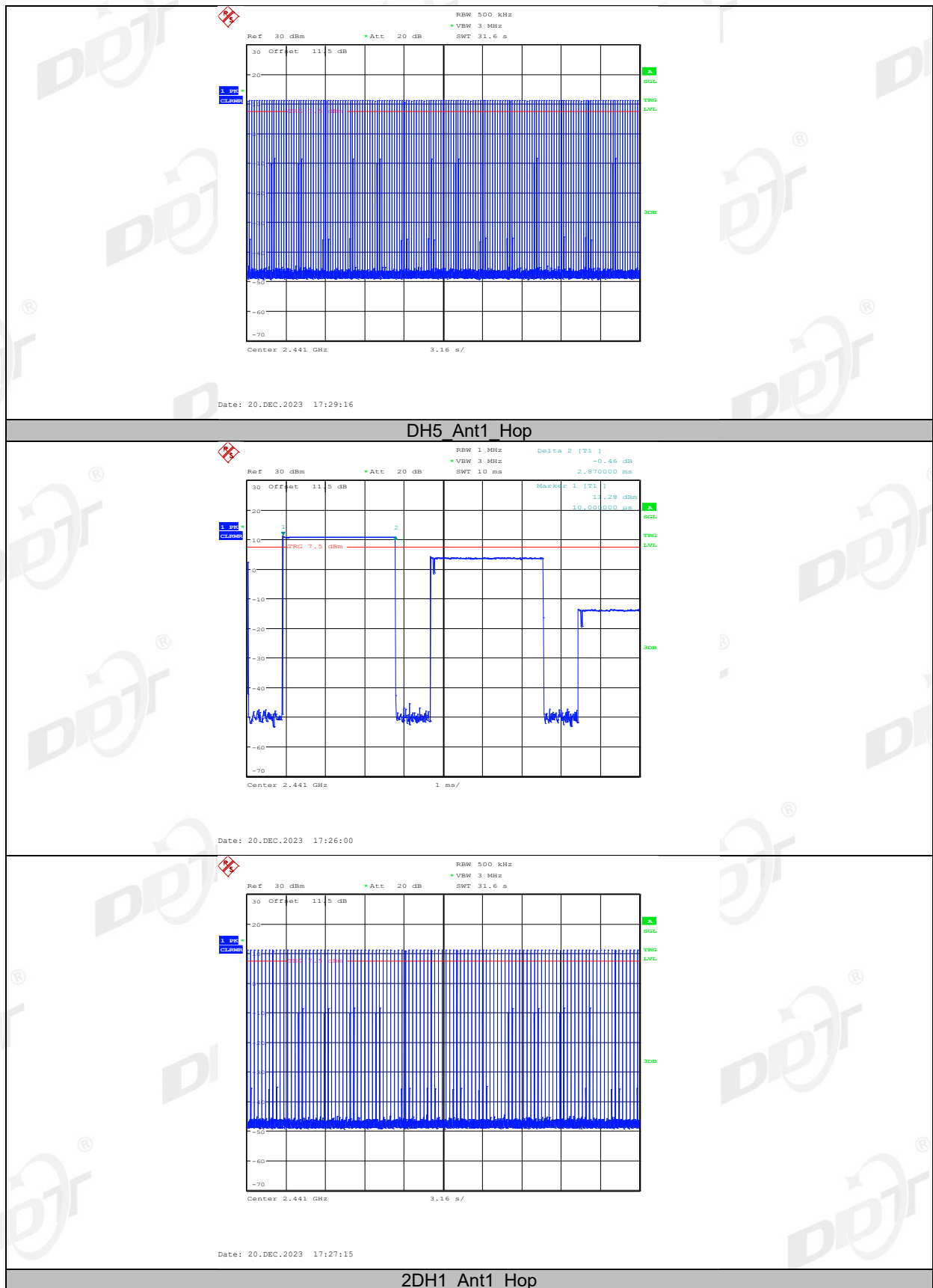


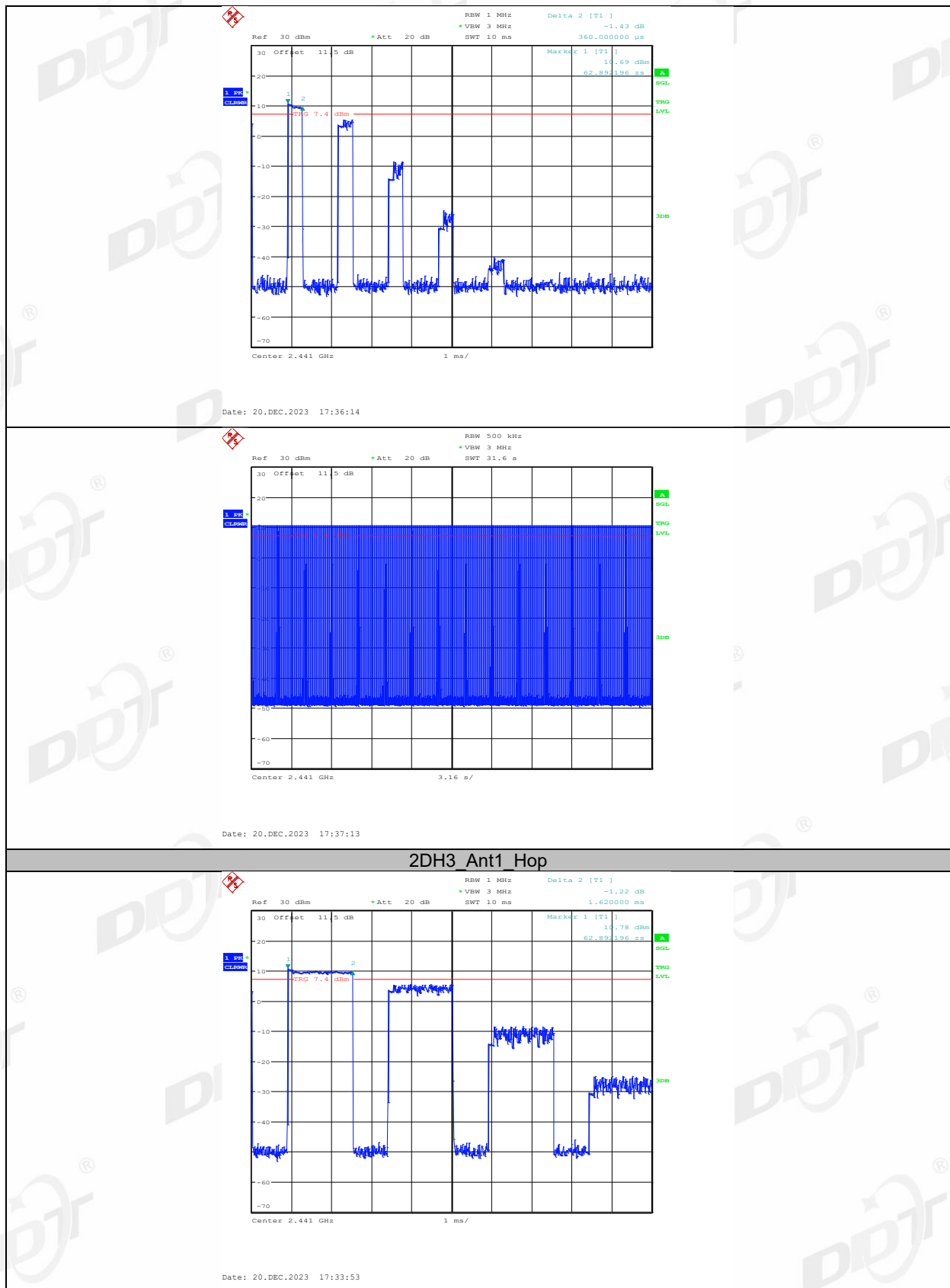


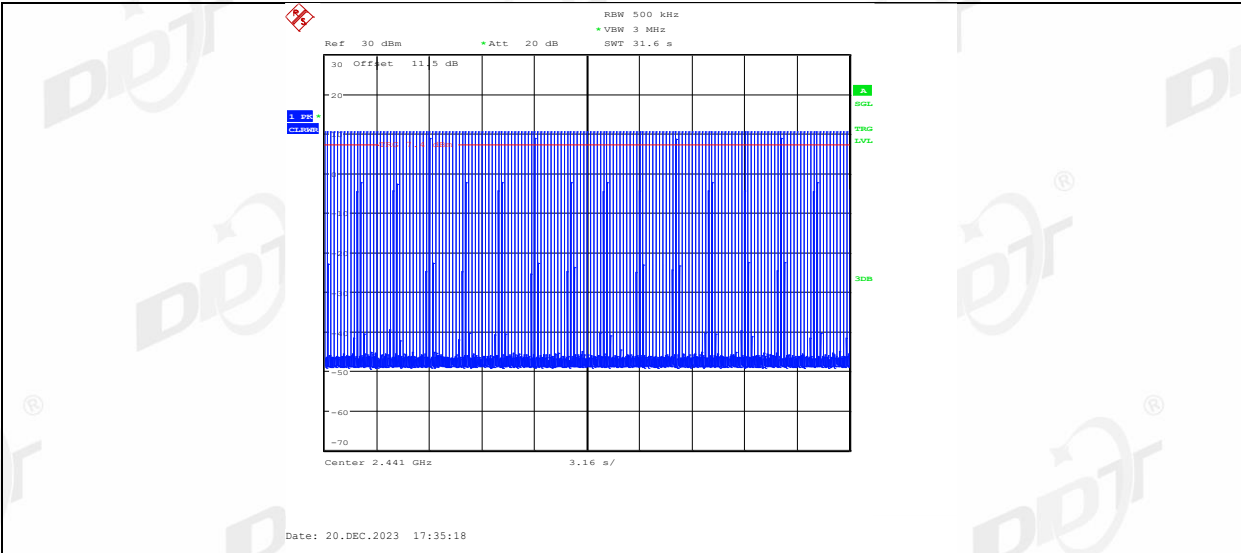


Right side:

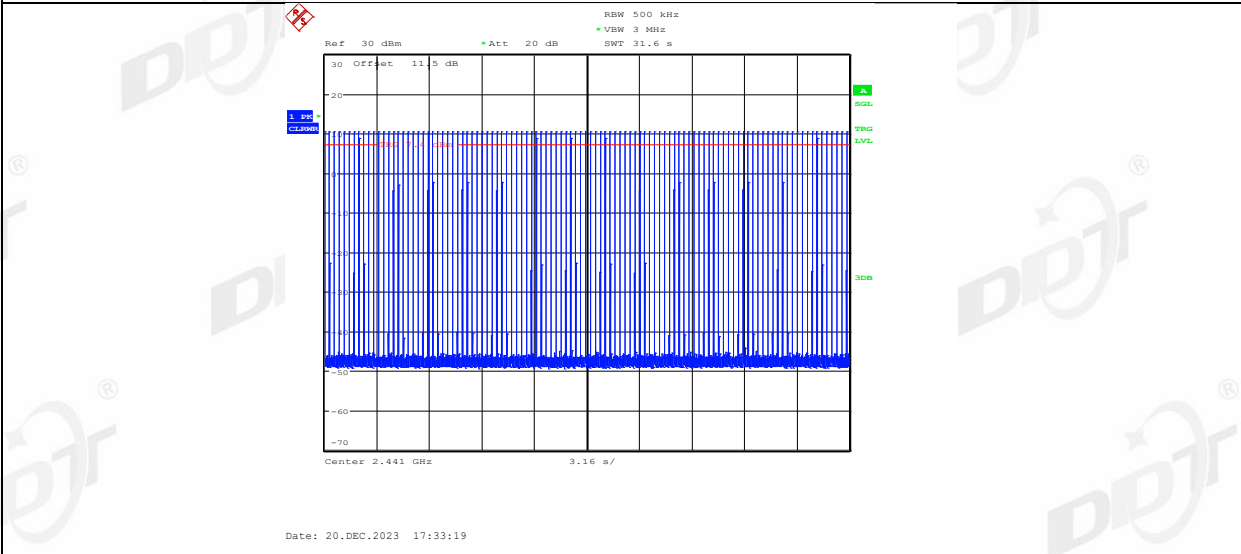
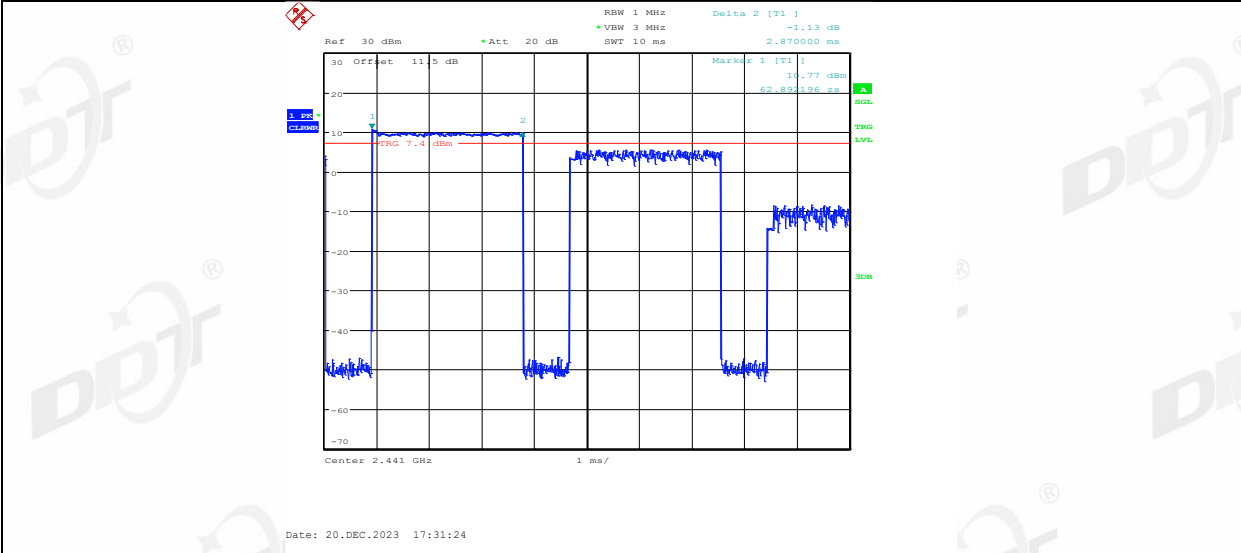




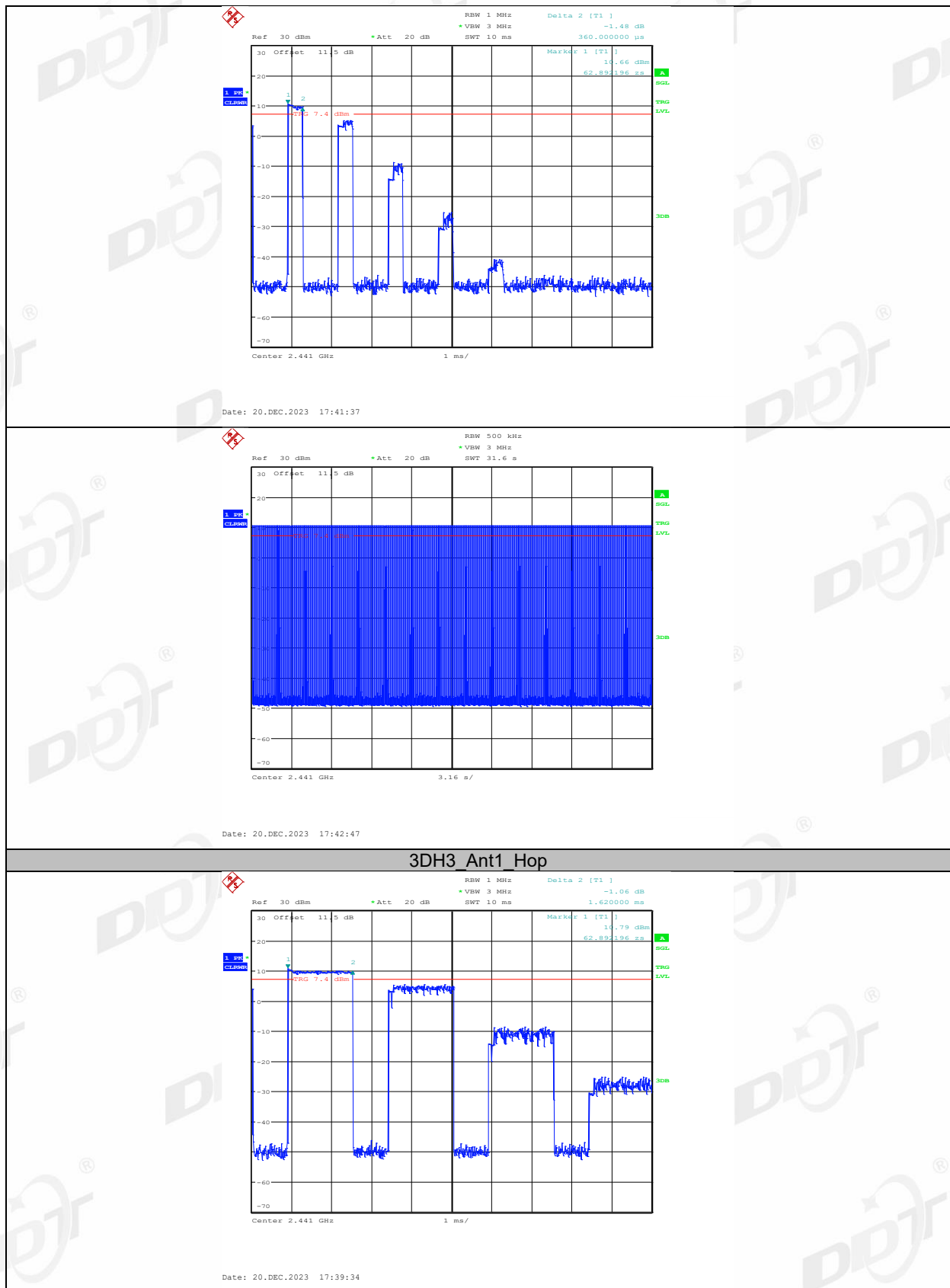


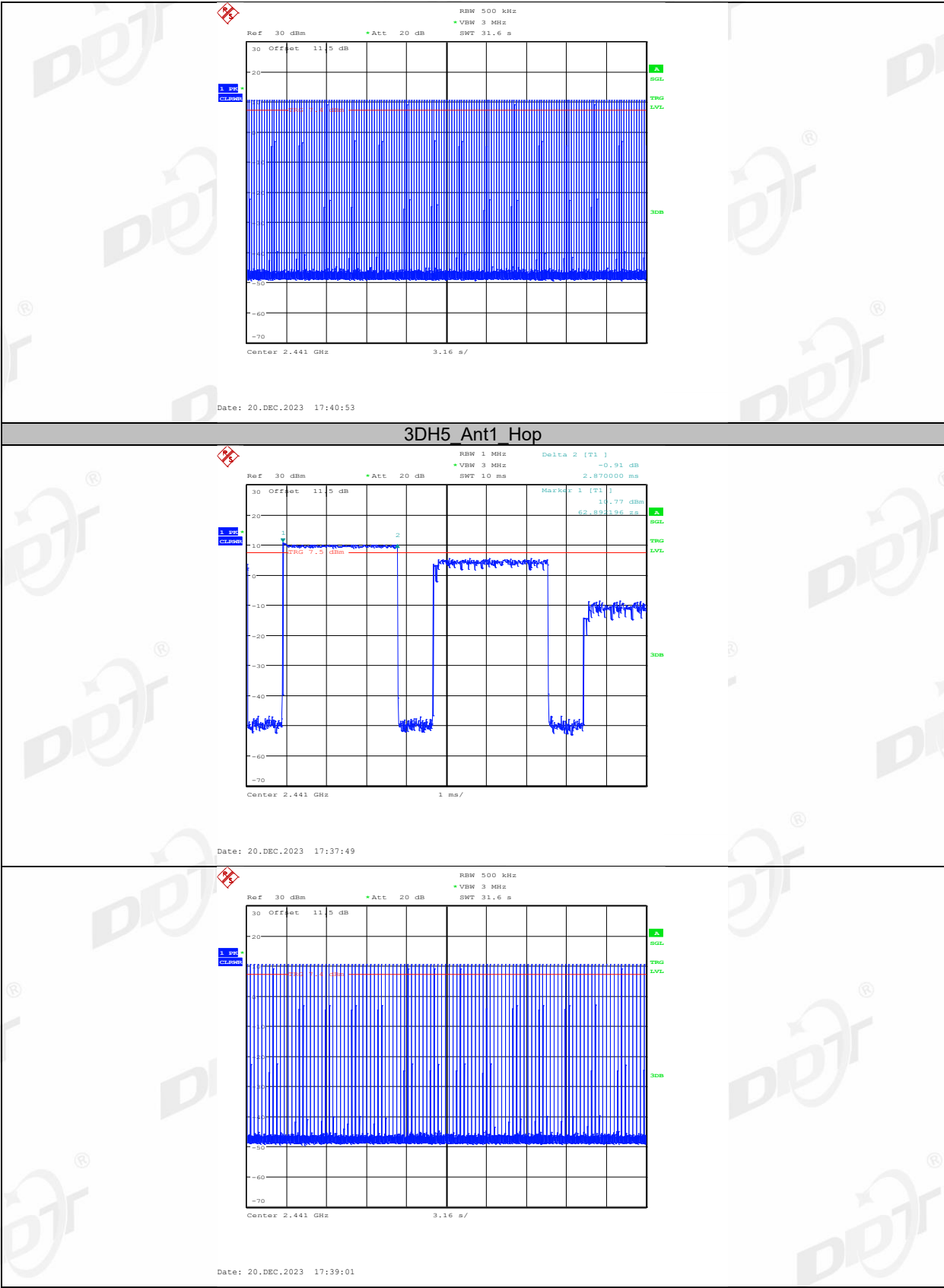


2DH5_Ant1_Hop



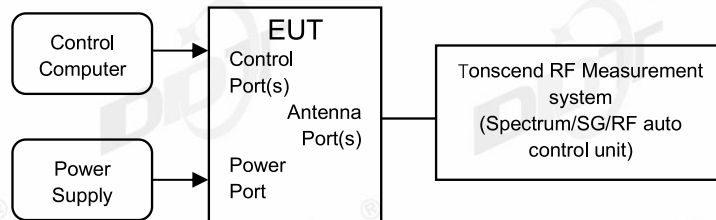
3DH1_Ant1_Hop





8. Number of Hopping Channel

8.1. Block diagram of test setup



8.2. Limits

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

8.3. 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.

8.4. Test result

Test Engineer:	Haofeng	Test Site:	RF Measurement System2#
Ambient Condition:	21.2℃,35.8%RH	Test Date:	2023.12.20
Test Power Supply:	DC 5V	EUT:	LIBRATONE AIR H BLUETOOTH EARPHONES
Sample Number:	S23120513-01	Model No.:	LTW612

Left side:

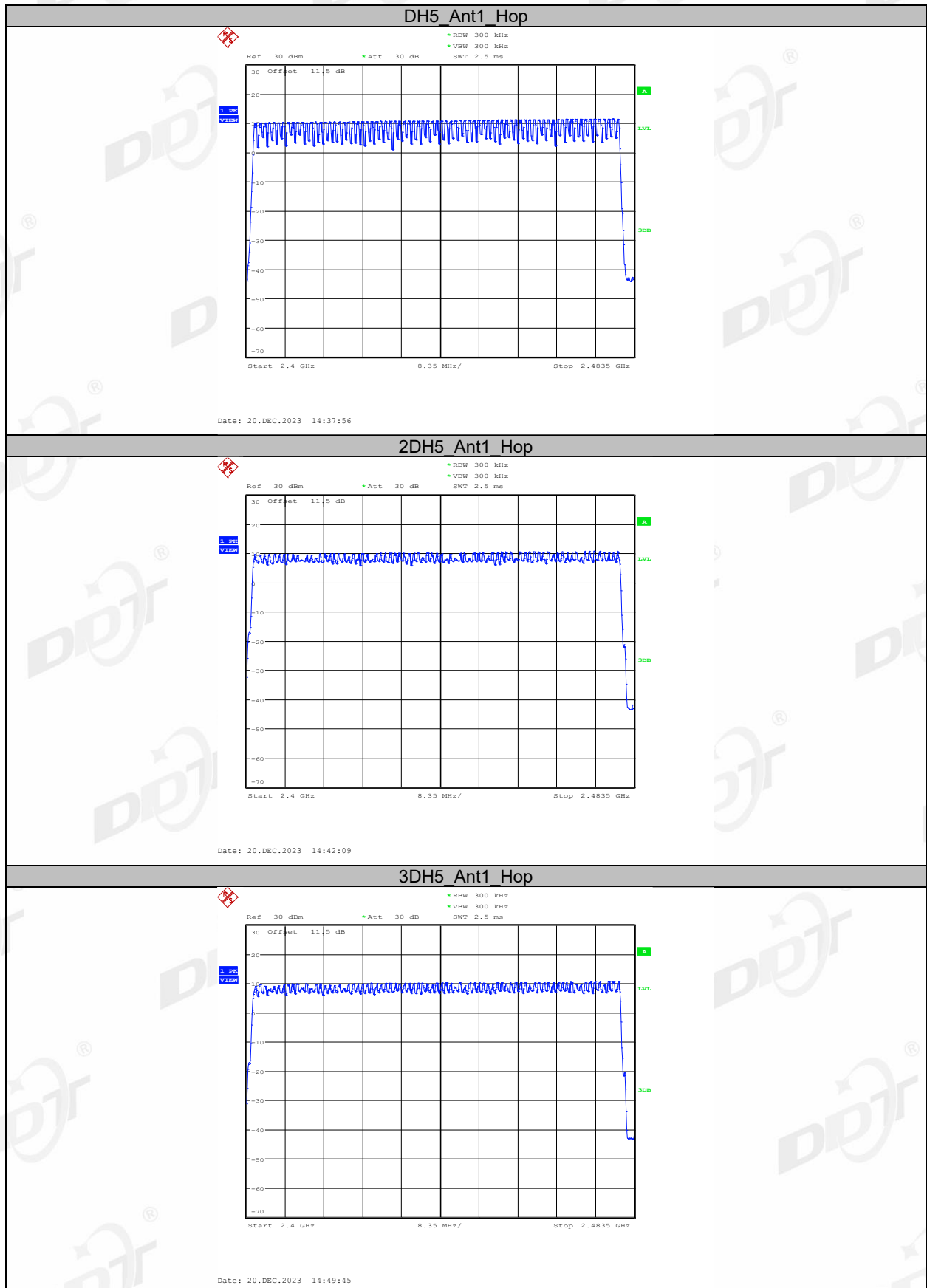
Test Mode	Antenna	Frequency [MHz]	Result [Num]	Limit [Num]	Verdict
DH5	Ant1	Hop	79	≥15	PASS
2DH5	Ant1	Hop	79	≥15	PASS
3DH5	Ant1	Hop	79	≥15	PASS

Right side:

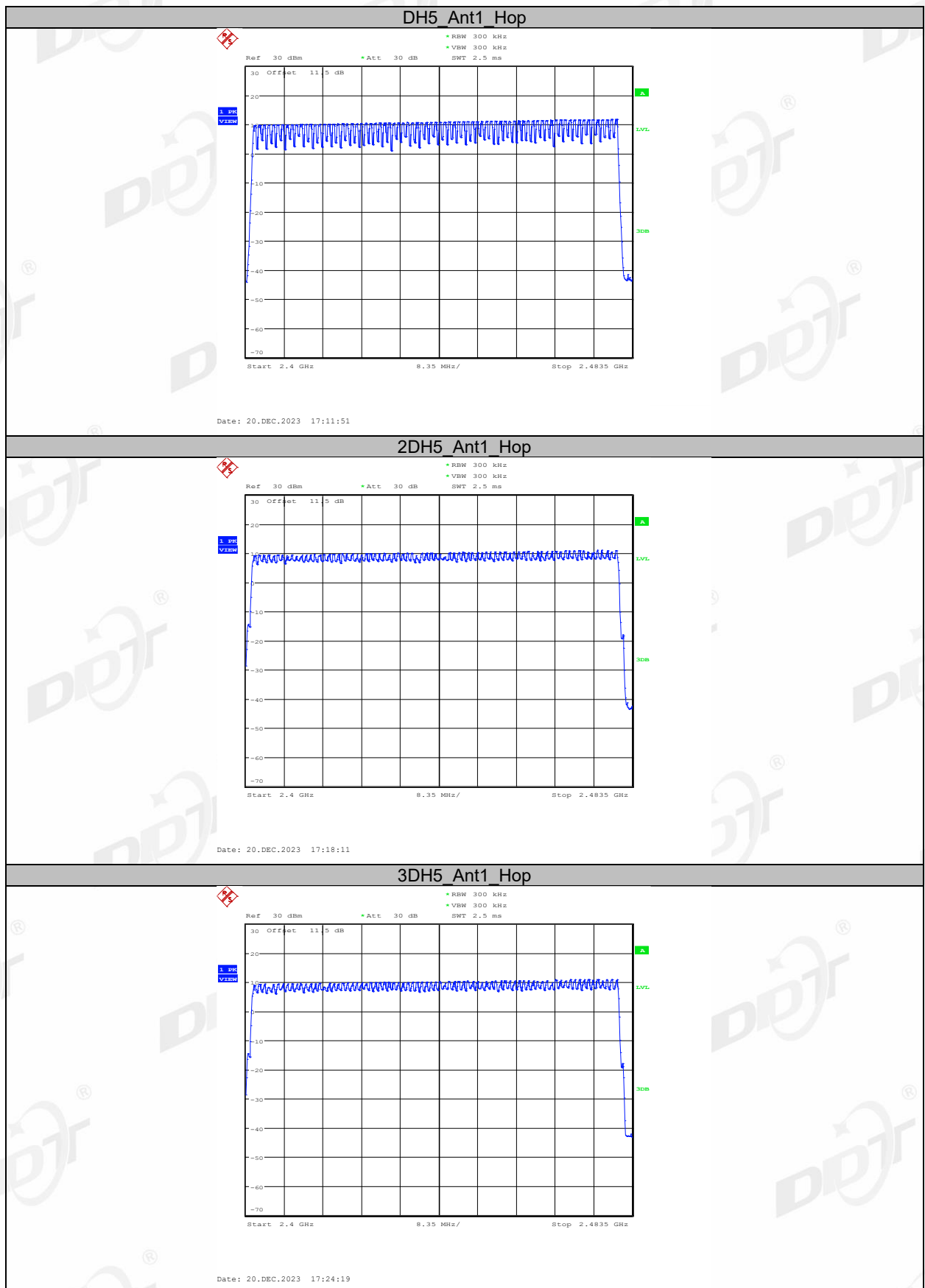
Test Mode	Antenna	Frequency [MHz]	Result [Num]	Limit [Num]	Verdict
DH5	Ant1	Hop	79	≥15	PASS
2DH5	Ant1	Hop	79	≥15	PASS
3DH5	Ant1	Hop	79	≥15	PASS

8.5. Test graphs

Left side:

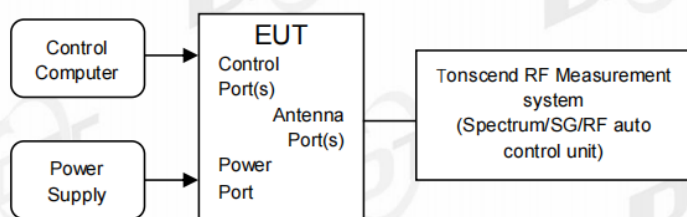


Right side:



9. Band Edge Compliance (Conducted Method)

9.1. Block diagram of test setup



9.2. Limit

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

9.3. 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.

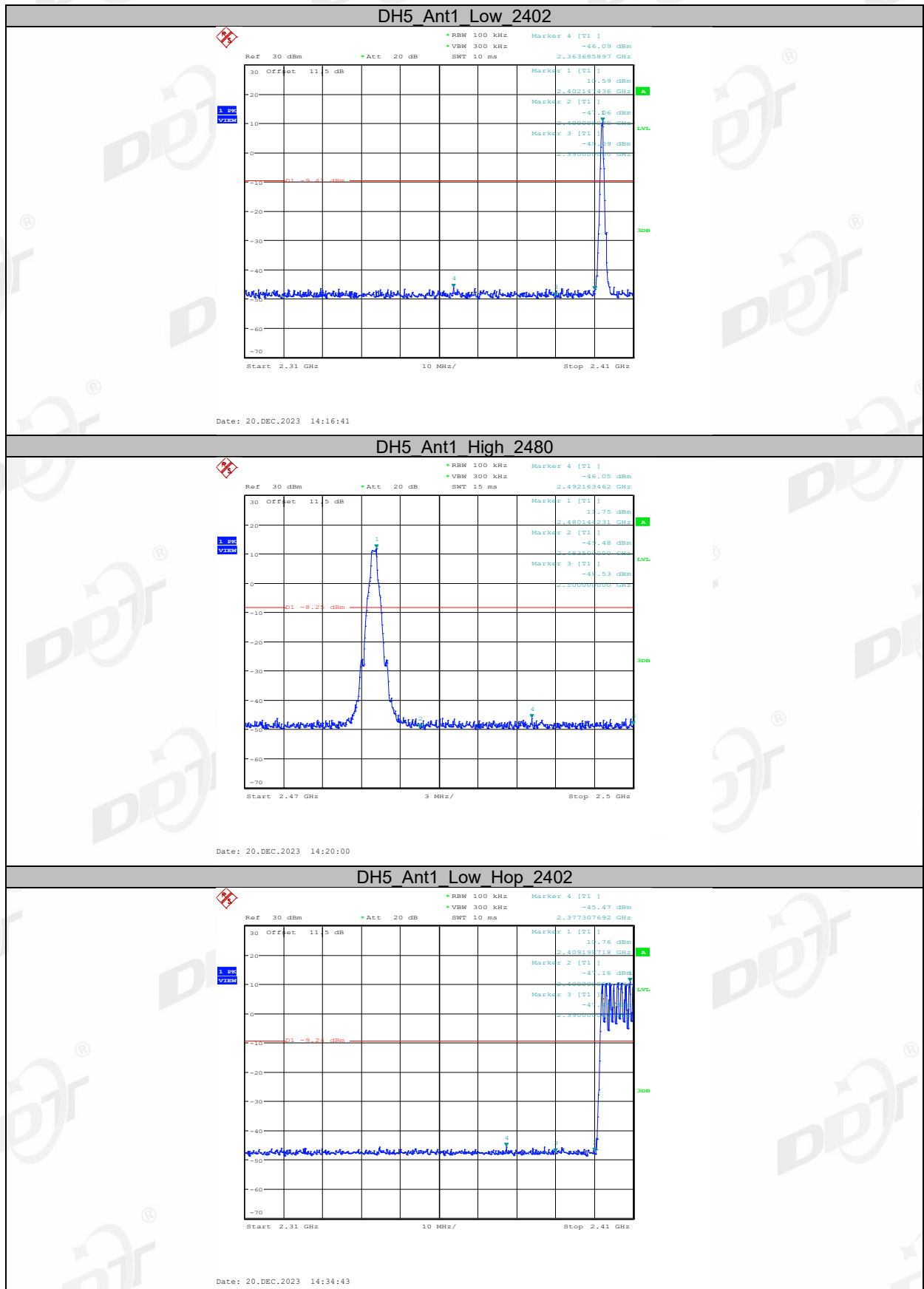
9.4. Test result

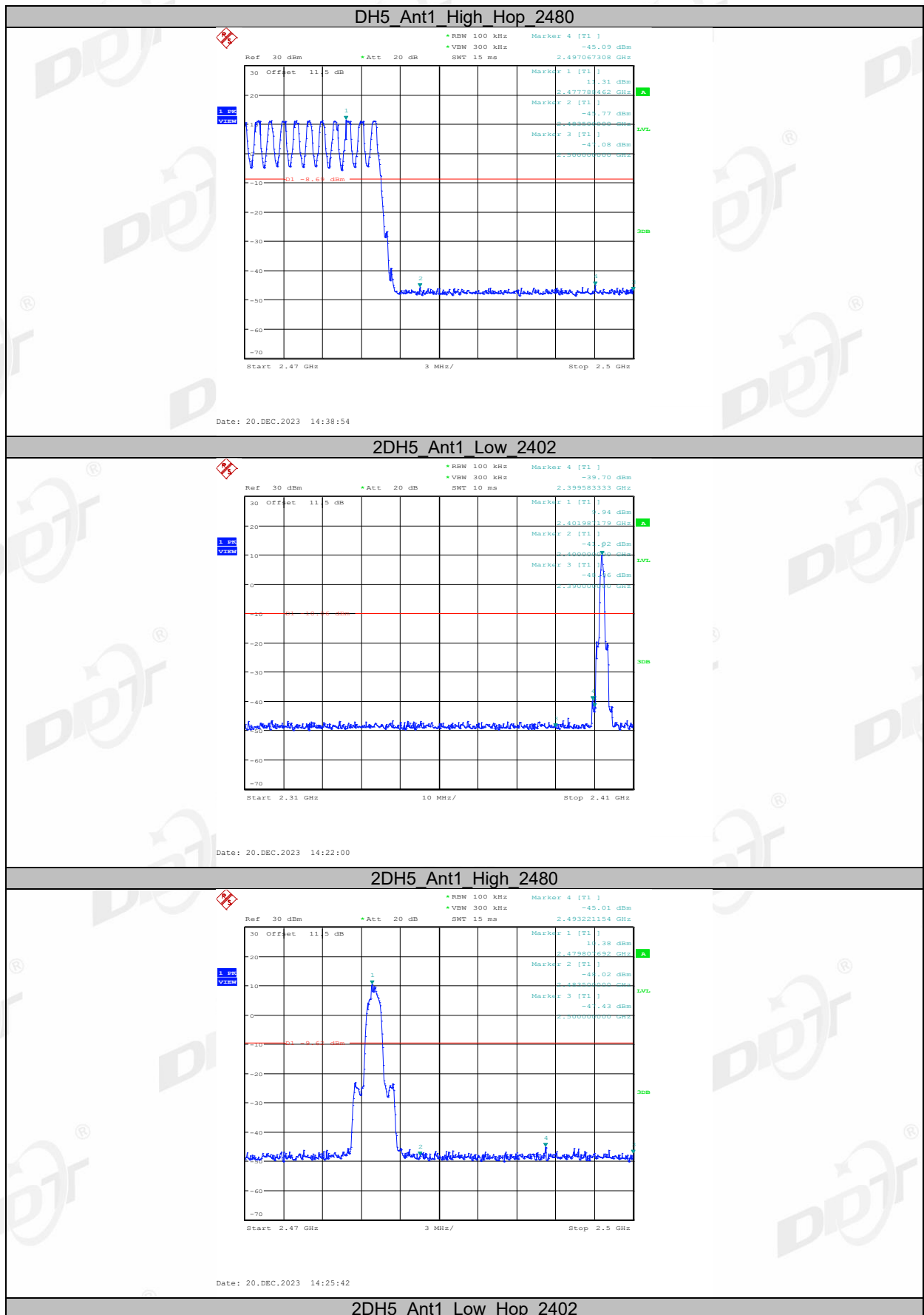
Test Engineer:	Haofeng	Test Site:	RF Measurement System2#
Ambient Condition:	21.2℃,35.8%RH	Test Date:	2023.12.20
Test Power Supply:	DC 5V	EUT:	LIBRATONE AIR H BLUETOOTH EARPHONES
Sample Number:	S23120513-01	Model No.:	LTW612

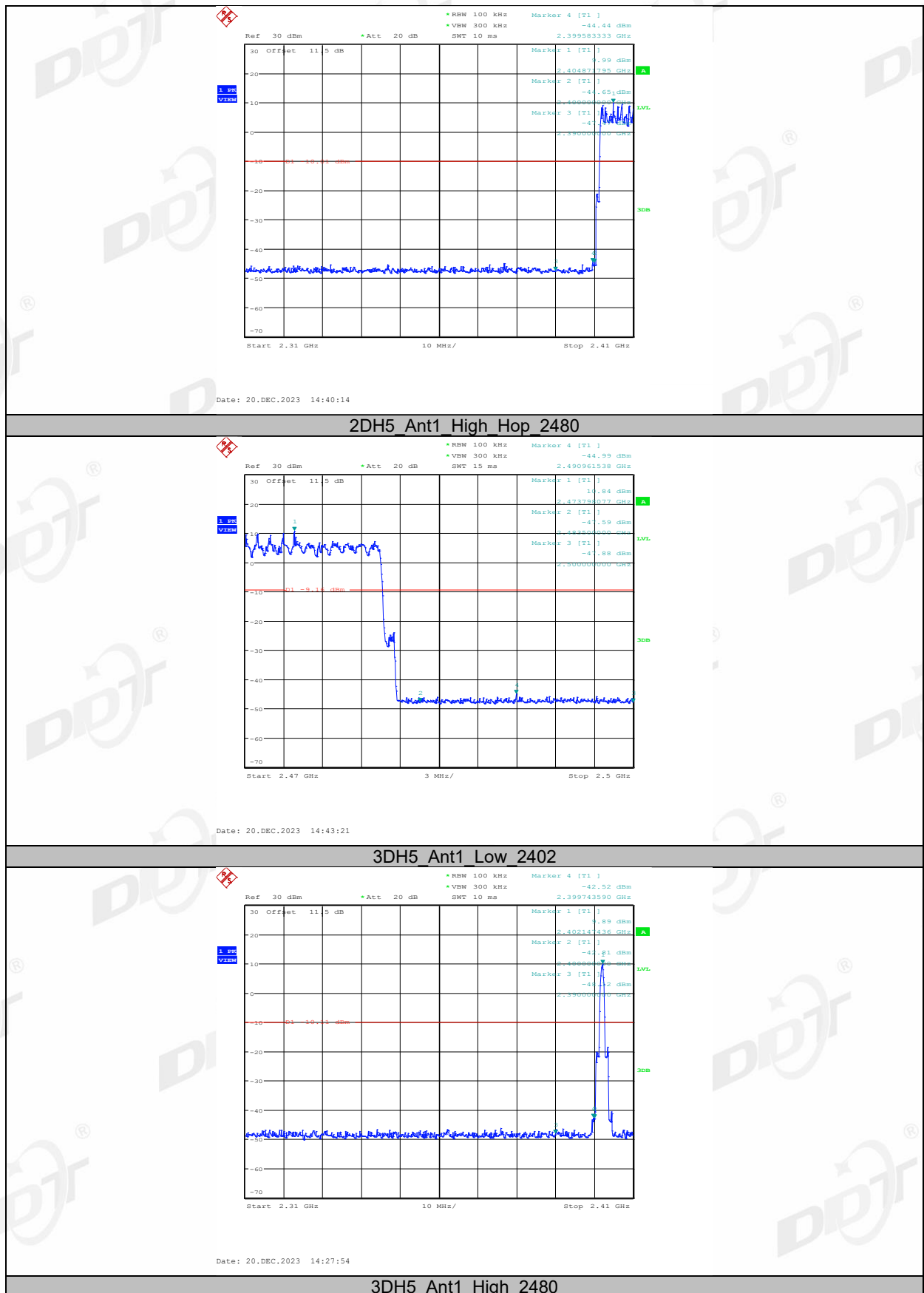
Mode	Freq. (MHz)	Verdict
GFSK	Hopping off 2402	Pass
	Hopping off 2480	Pass
	Hopping on	Pass
$\pi/4$ -DQPSK	Hopping off 2402	Pass
	Hopping off 2480	Pass
	Hopping on	Pass
8DPSK	Hopping off 2402	Pass
	Hopping off 2480	Pass
	Hopping on	Pass

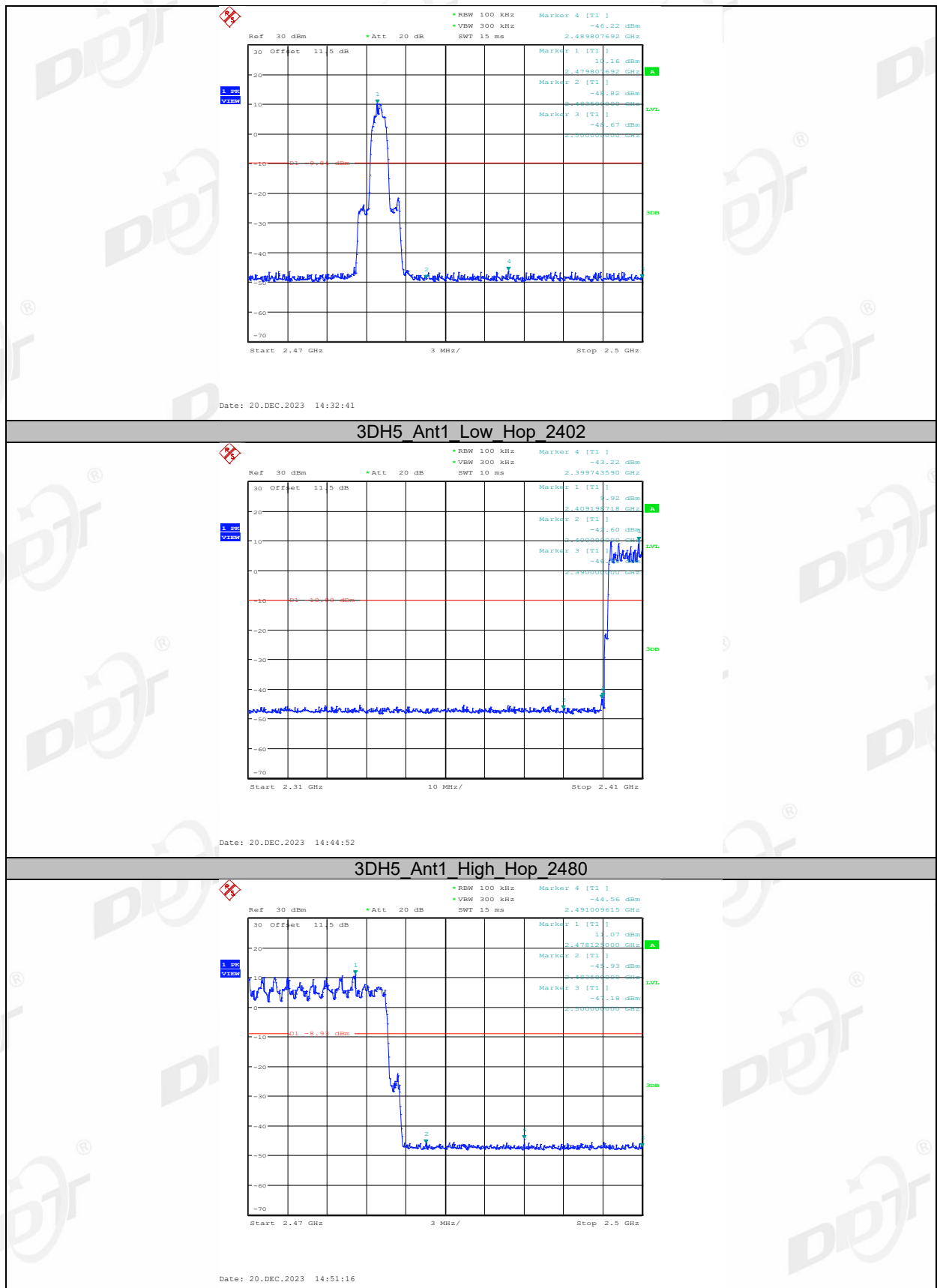
9.5. Test graphs

Left side:

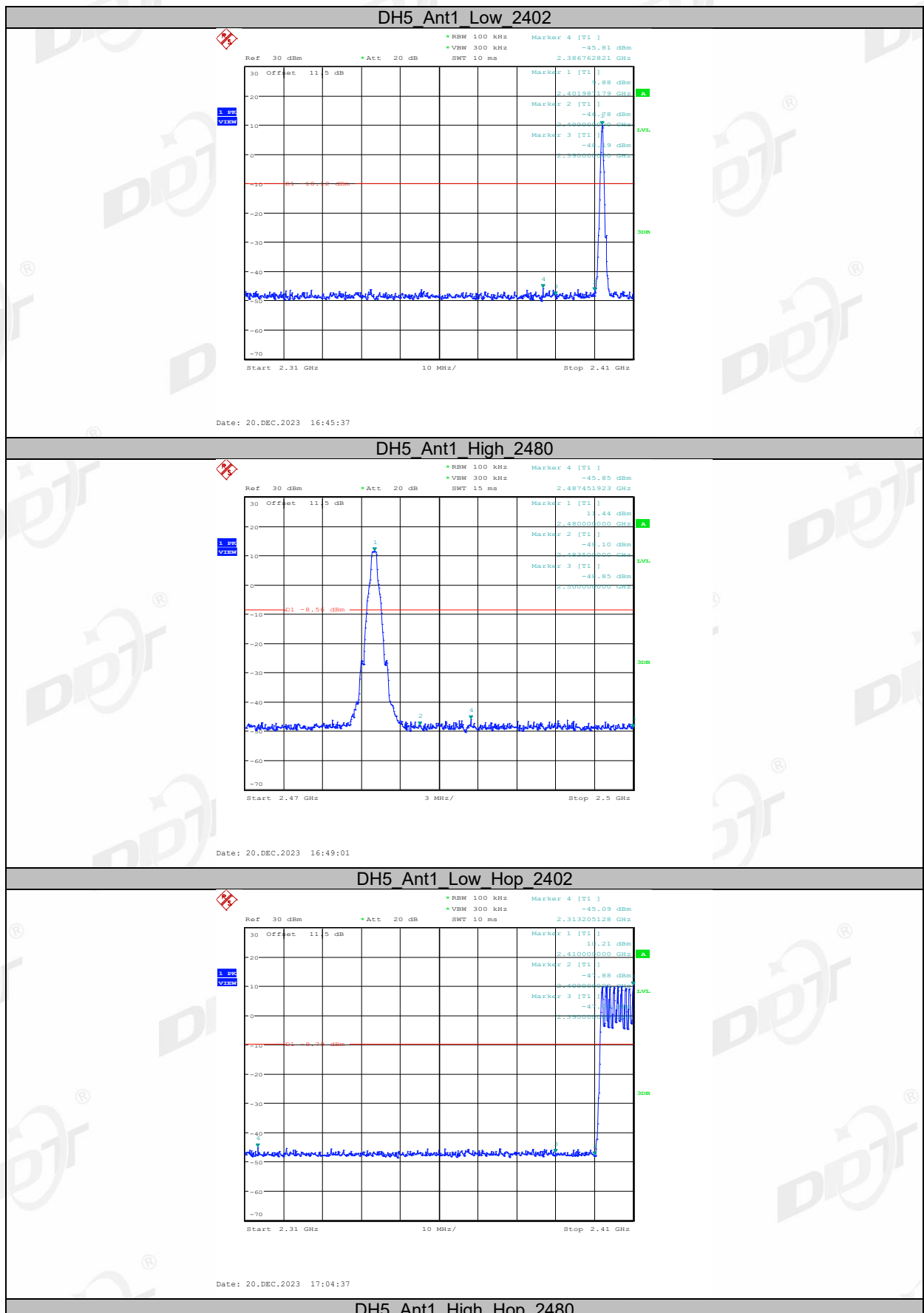


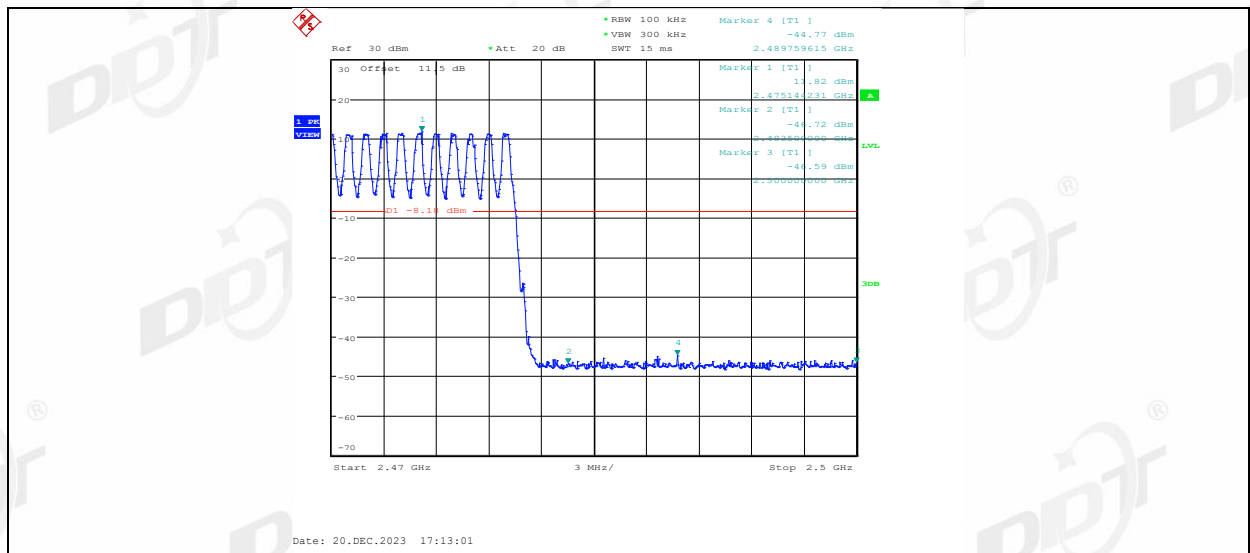




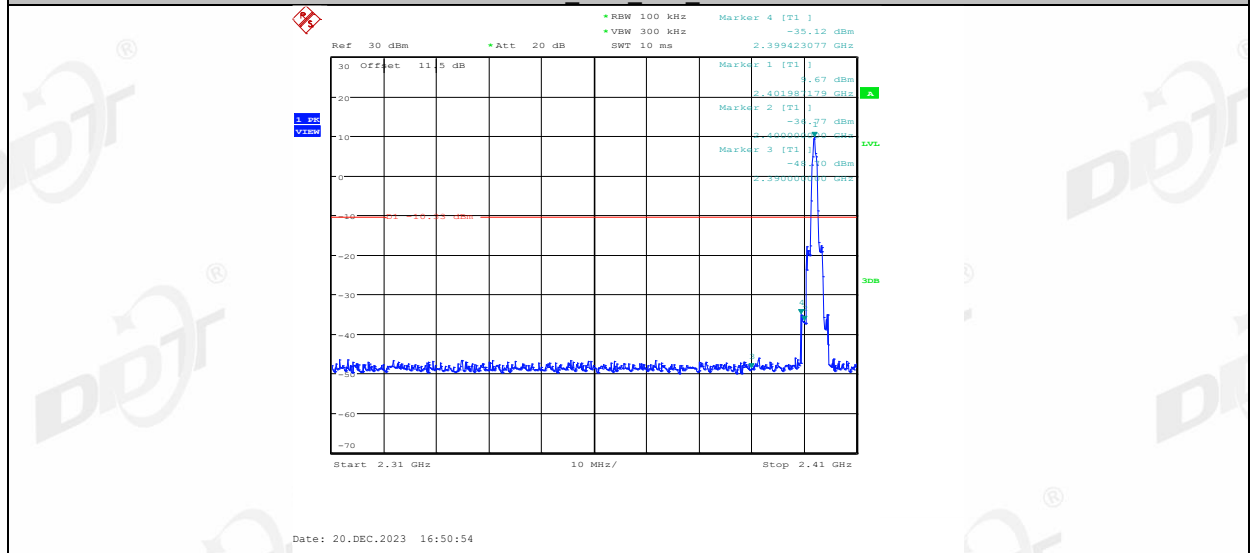


Right side:

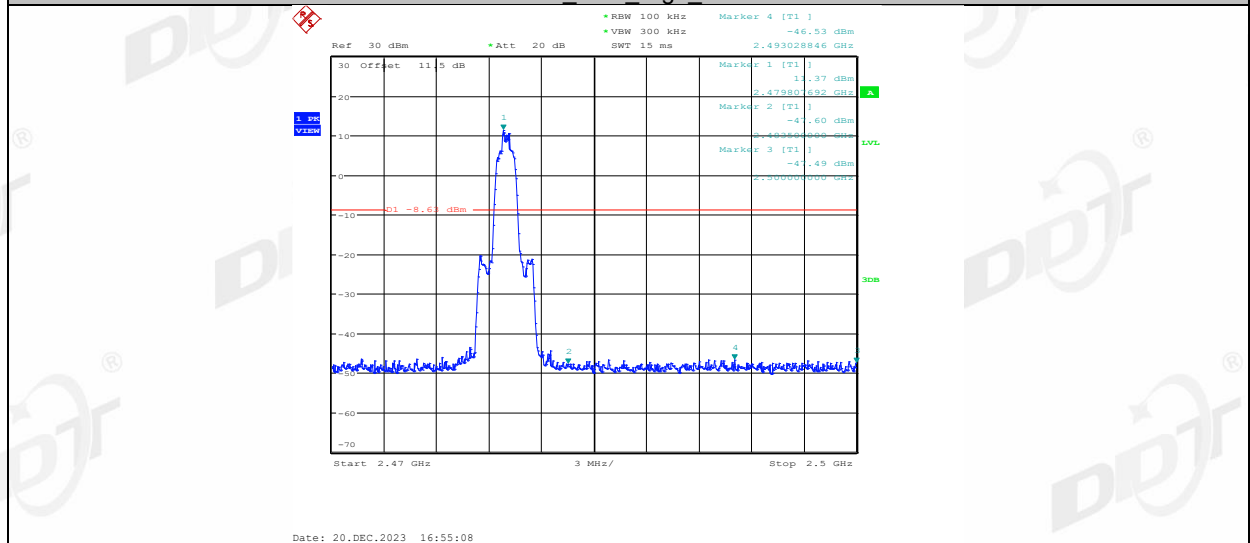




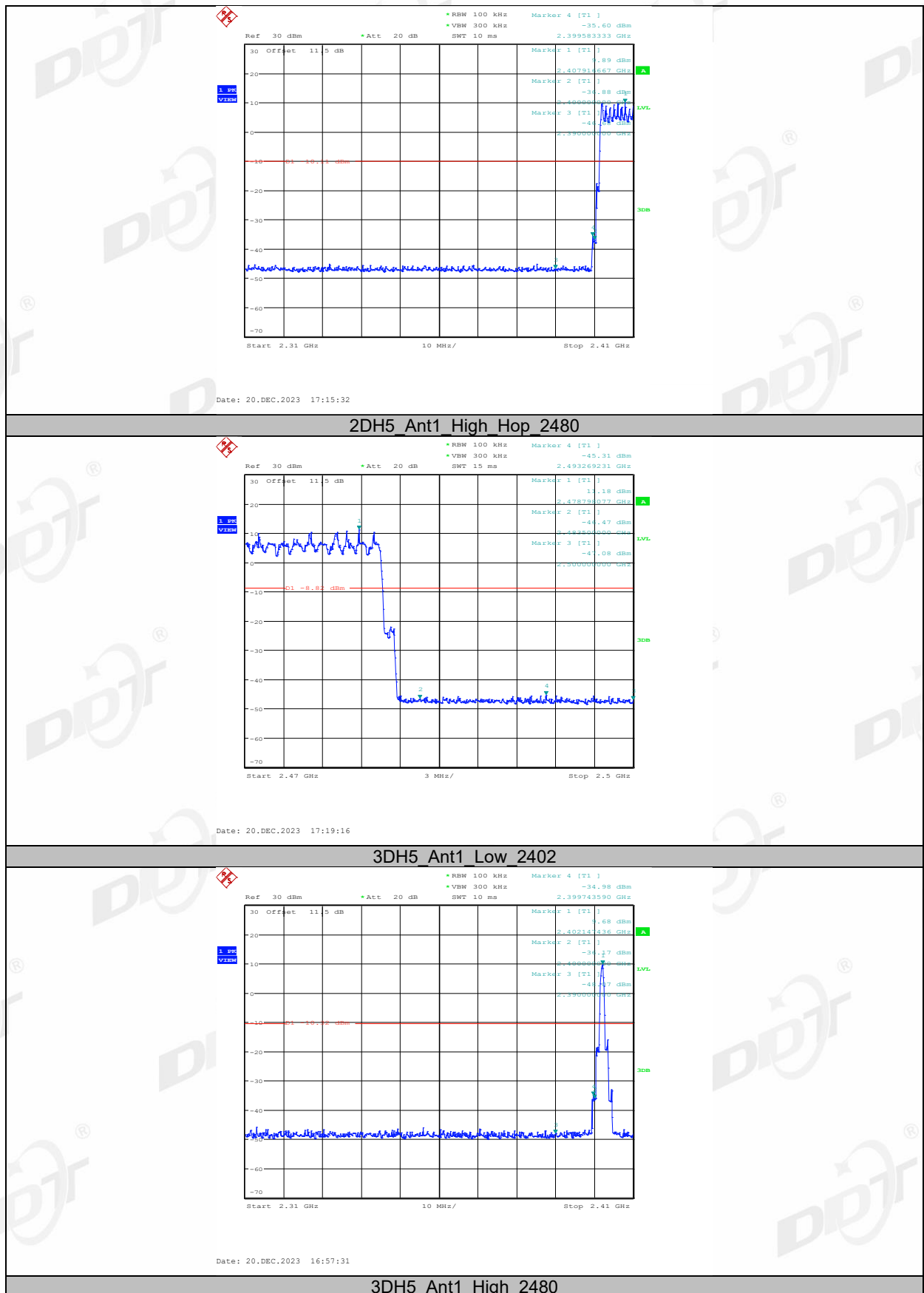
2DH5_Ant1_Low_2402

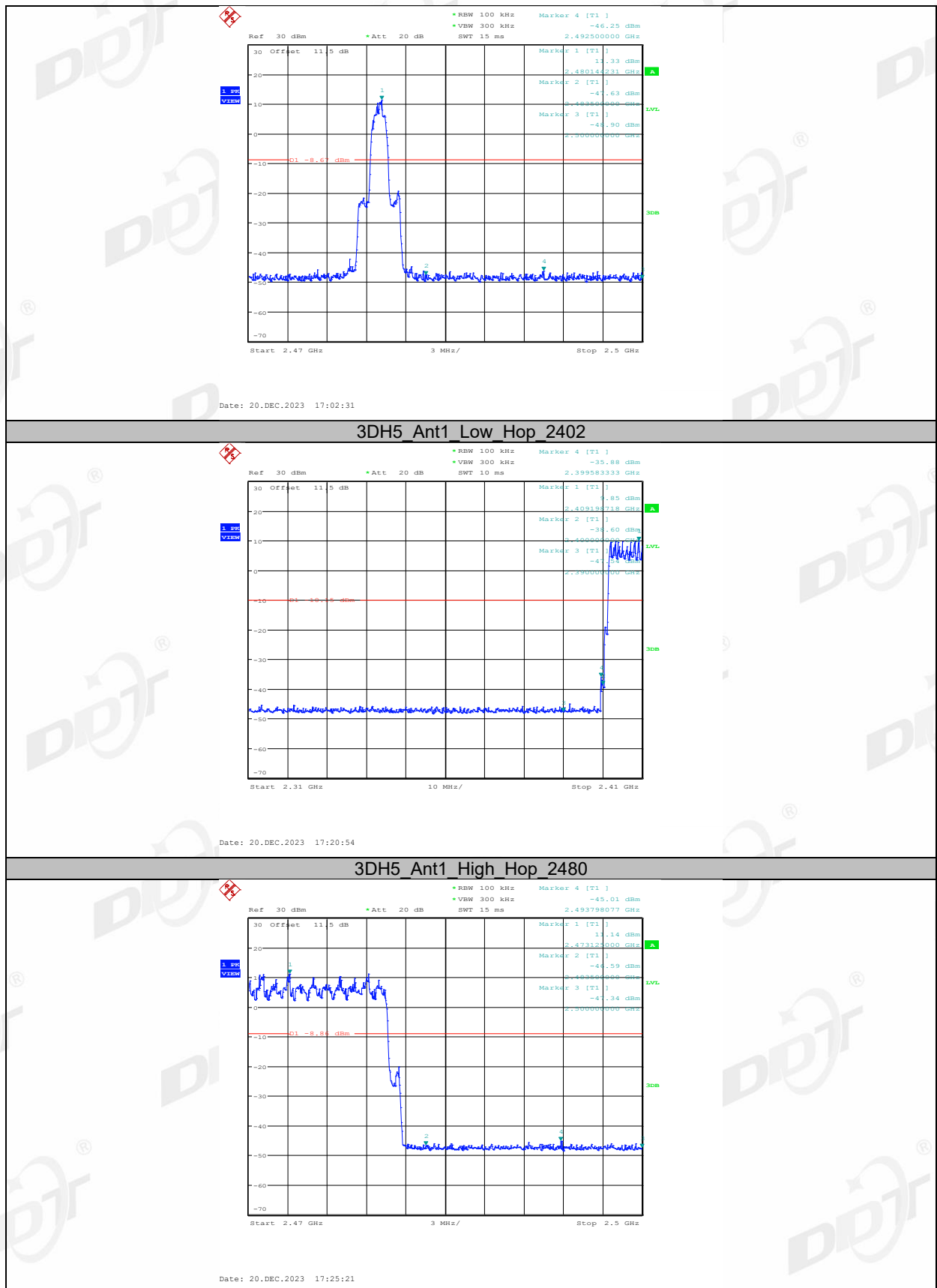


2DH5_Ant1_High_2480



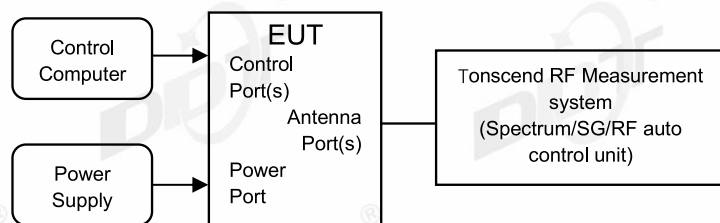
2DH5_Ant1_Low_Hop_2402





10. RF Conducted Spurious Emissions

10.1. Block diagram of test setup



10.2. 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.

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:

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

10.4. Test result

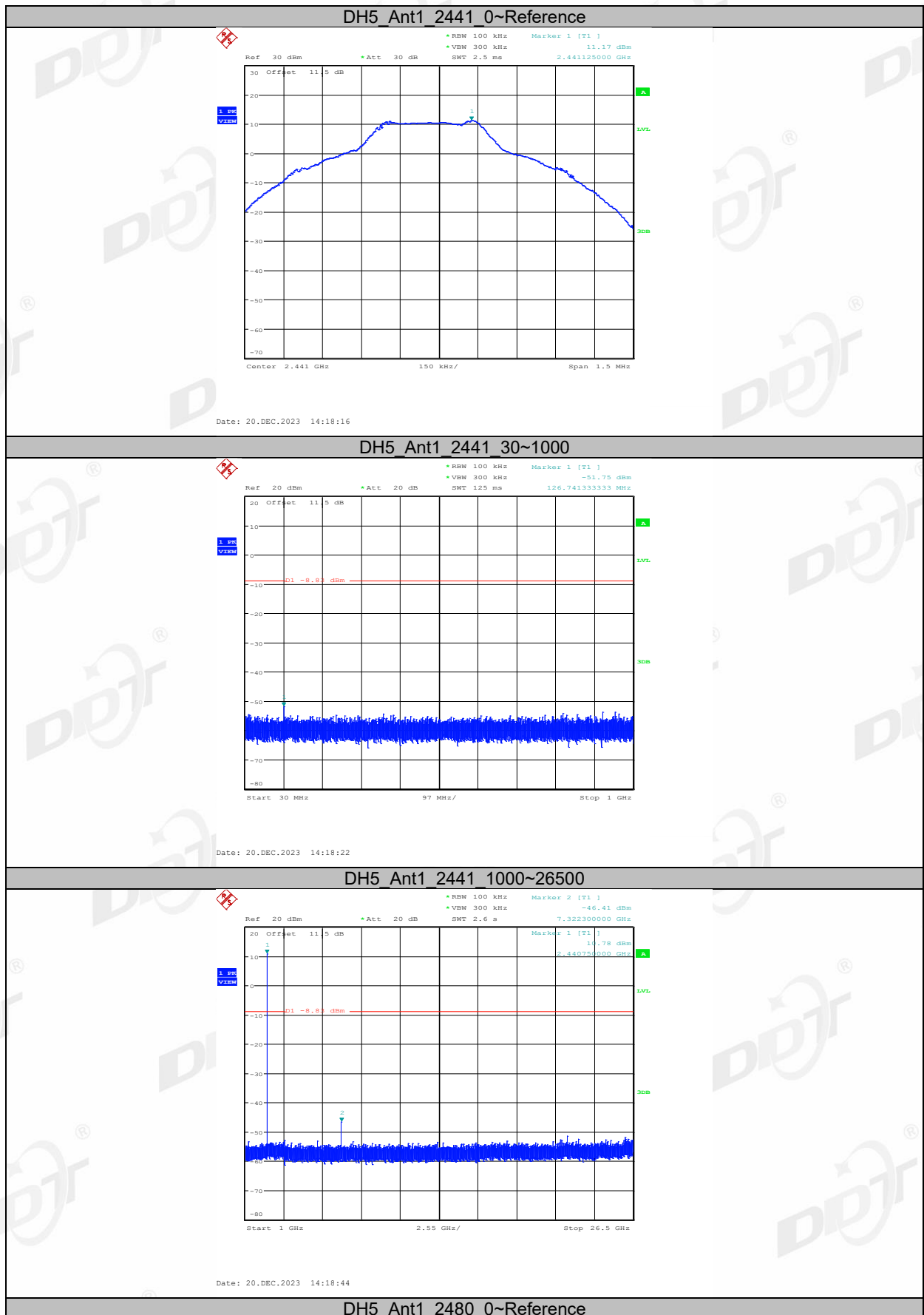
Test Engineer:	Haofeng	Test Site:	RF Measurement System2#
Ambient Condition:	21.2℃,35.8%RH	Test Date:	2023.12.20
Test Power Supply:	DC 5V	EUT:	LIBRATONE AIR H BLUETOOTH EARPHONES
Sample Number:	S23120513-01	Model No.:	LTW612

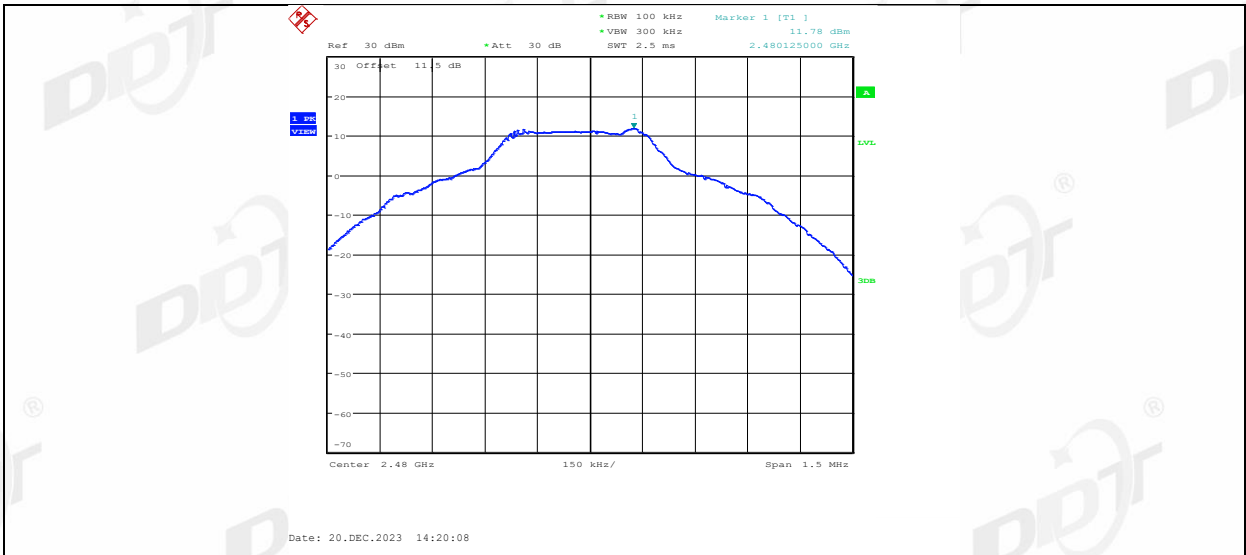
Mode	Freq. (MHz)	Verdict
GFSK	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass
$\pi/4$ -DQPSK	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass
8DPSK	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass

10.5. Test graphs

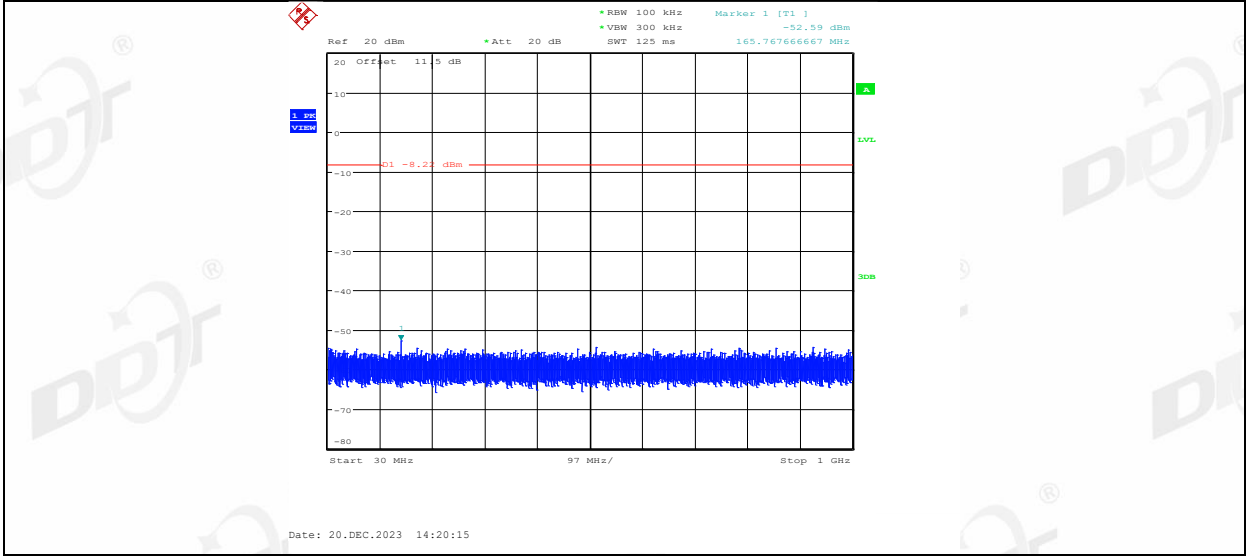
Left side:



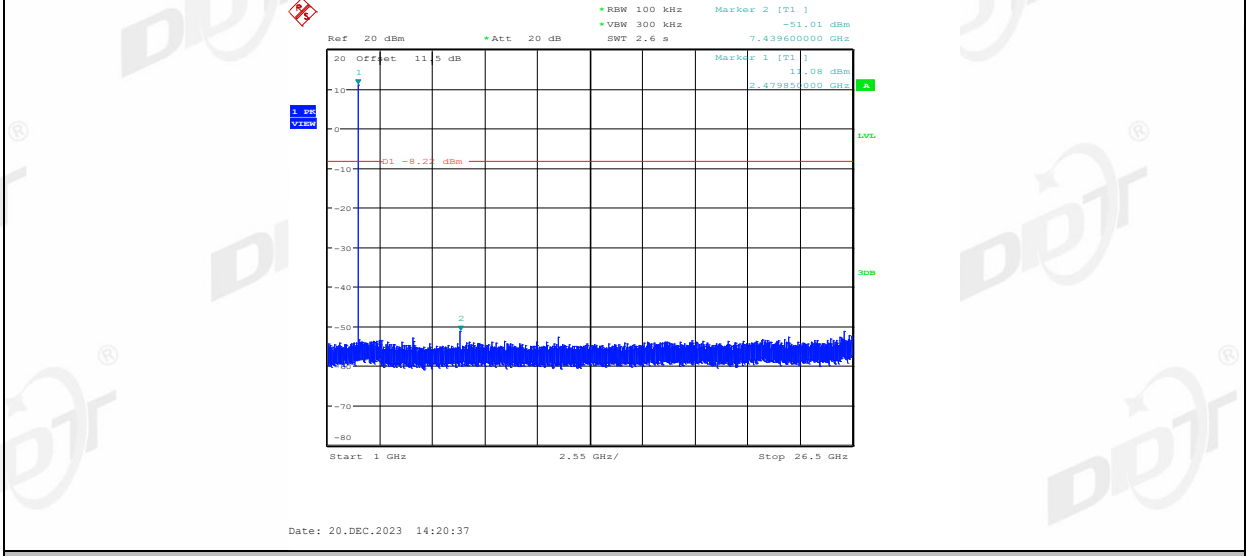




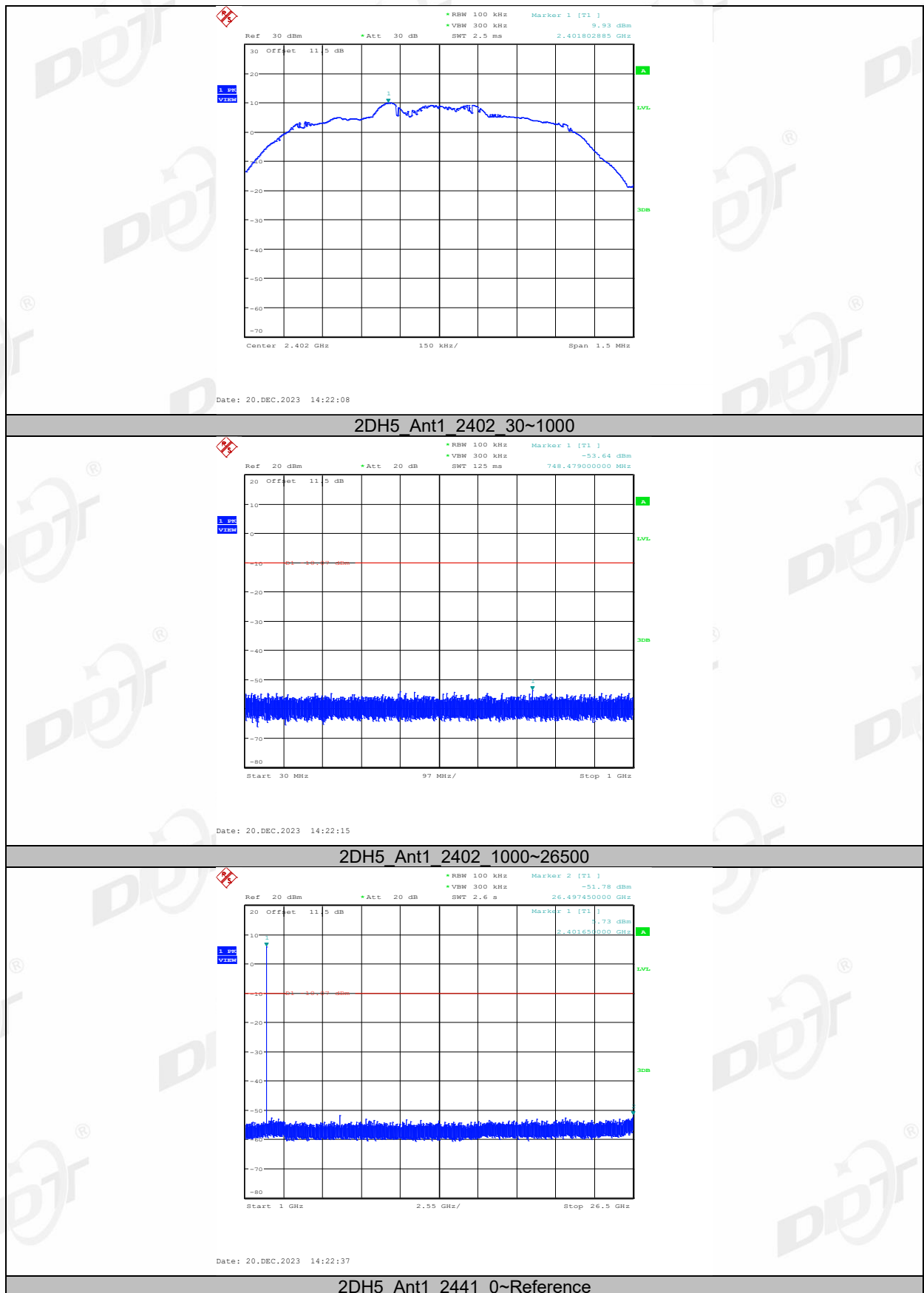
DH5 Ant1 2480 30~1000

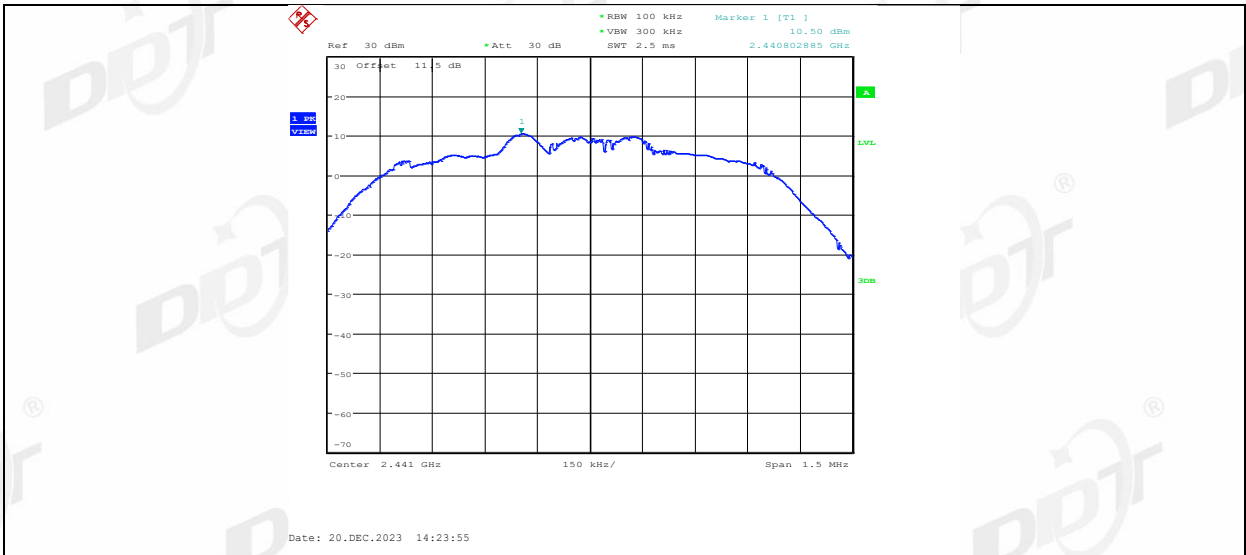


DH5 Ant1 2480 1000~26500

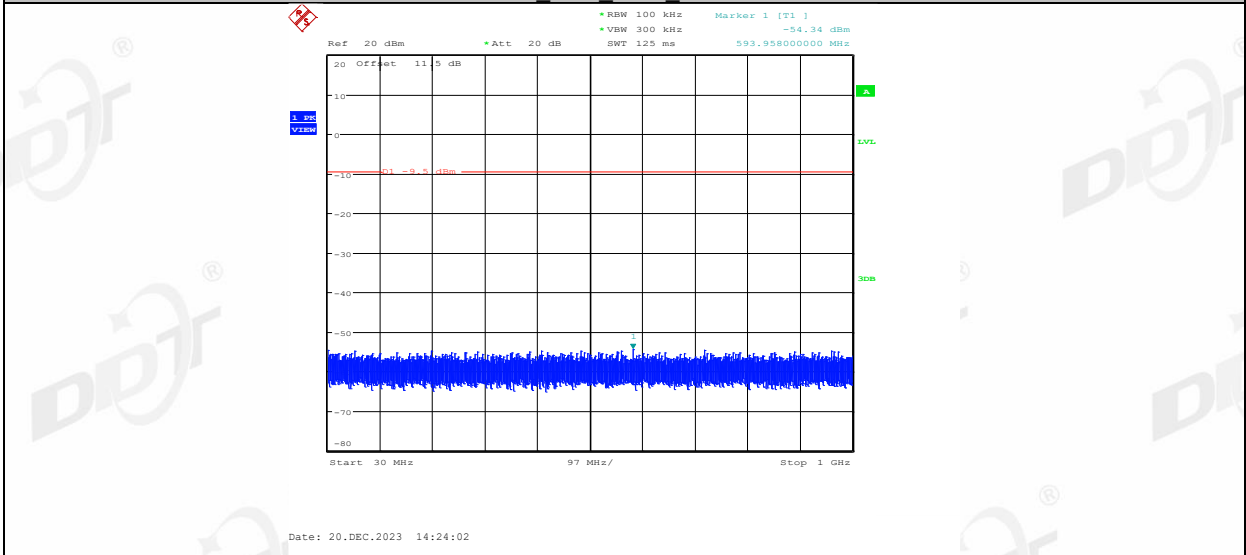


2DH5 Ant1 2402 0~Reference

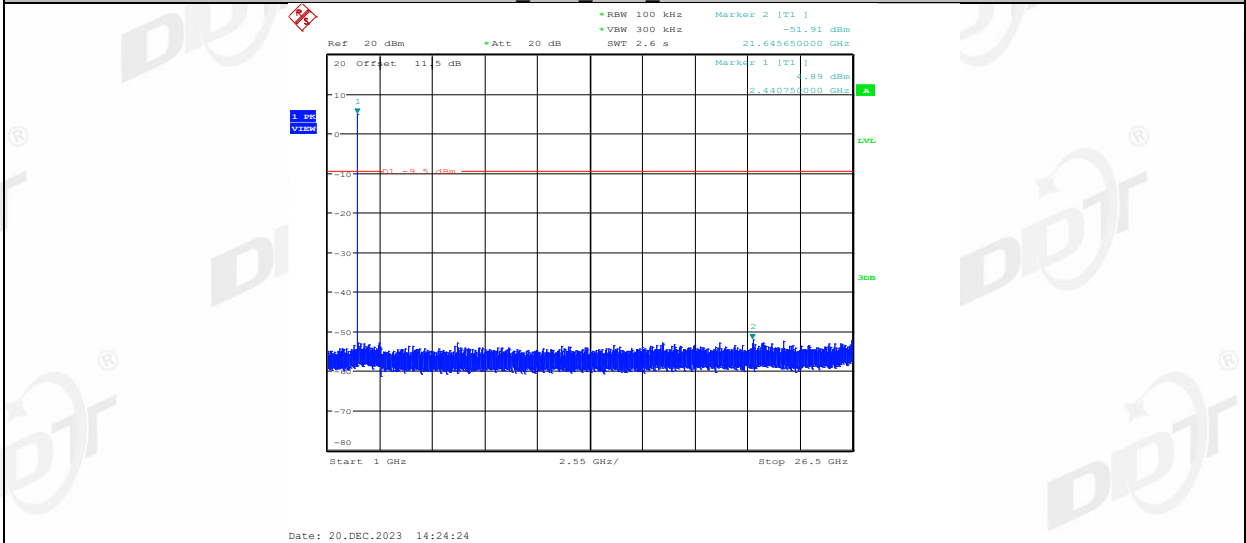




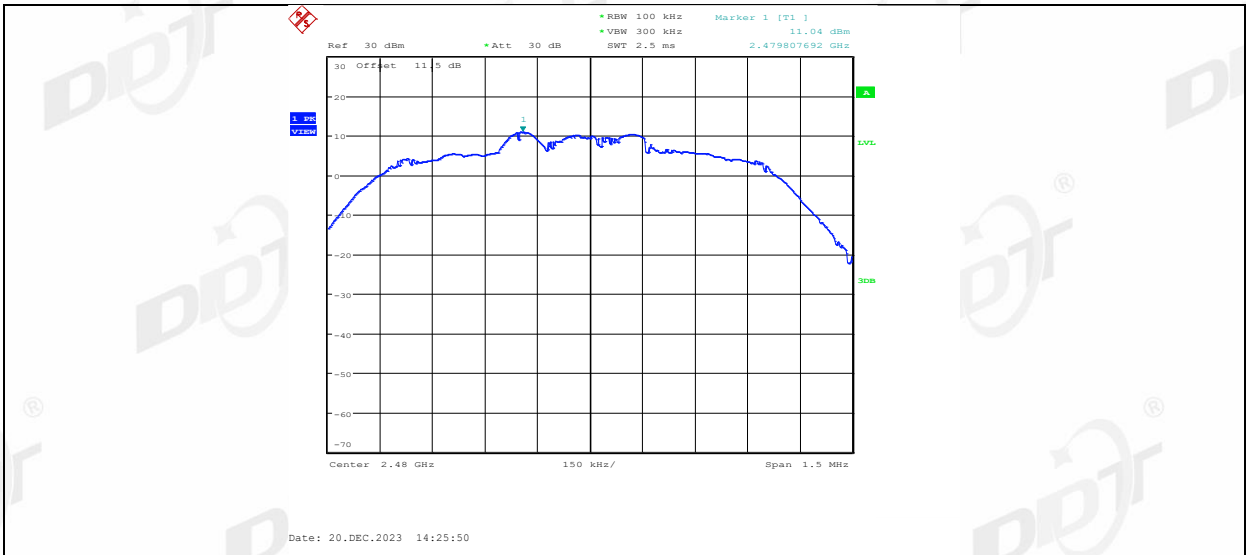
2DH5_Ant1_2441_30~1000



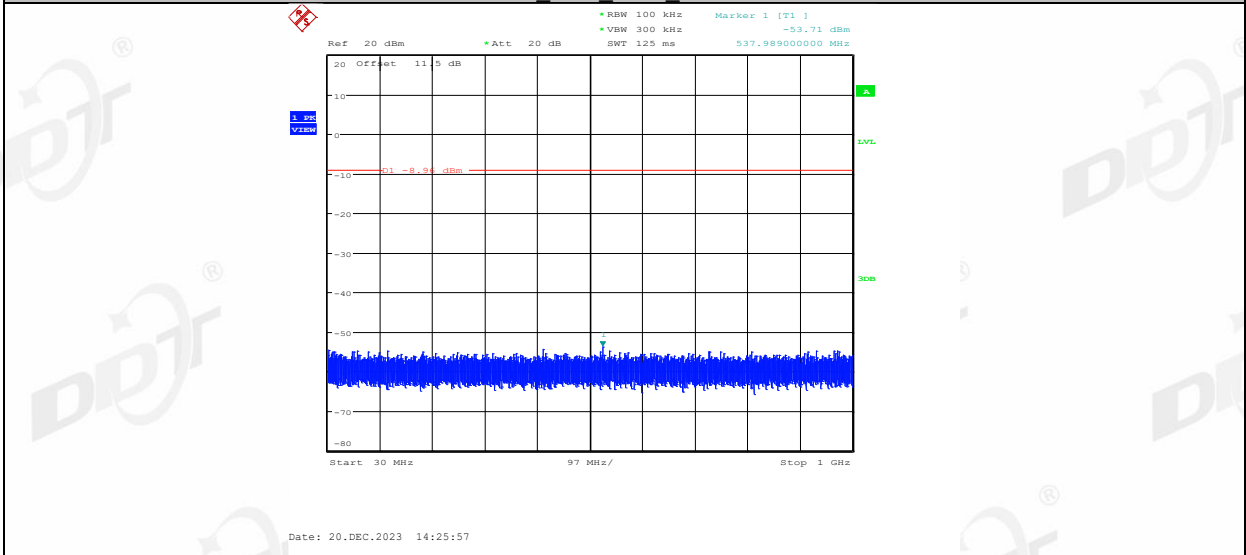
2DH5_Ant1_2441_1000~26500



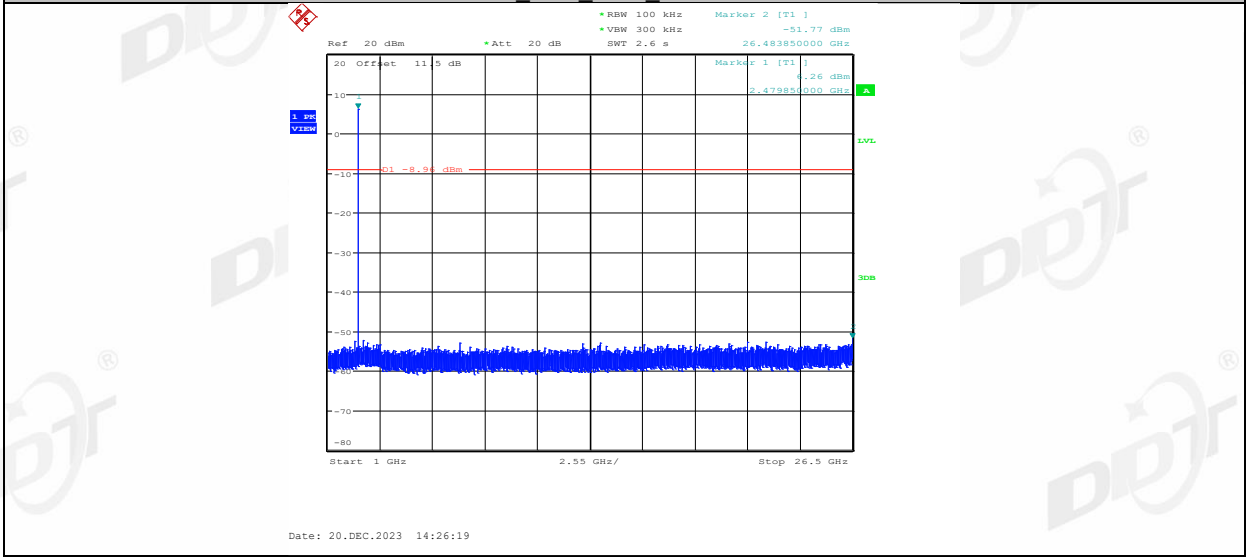
2DH5_Ant1_2480_0~Reference



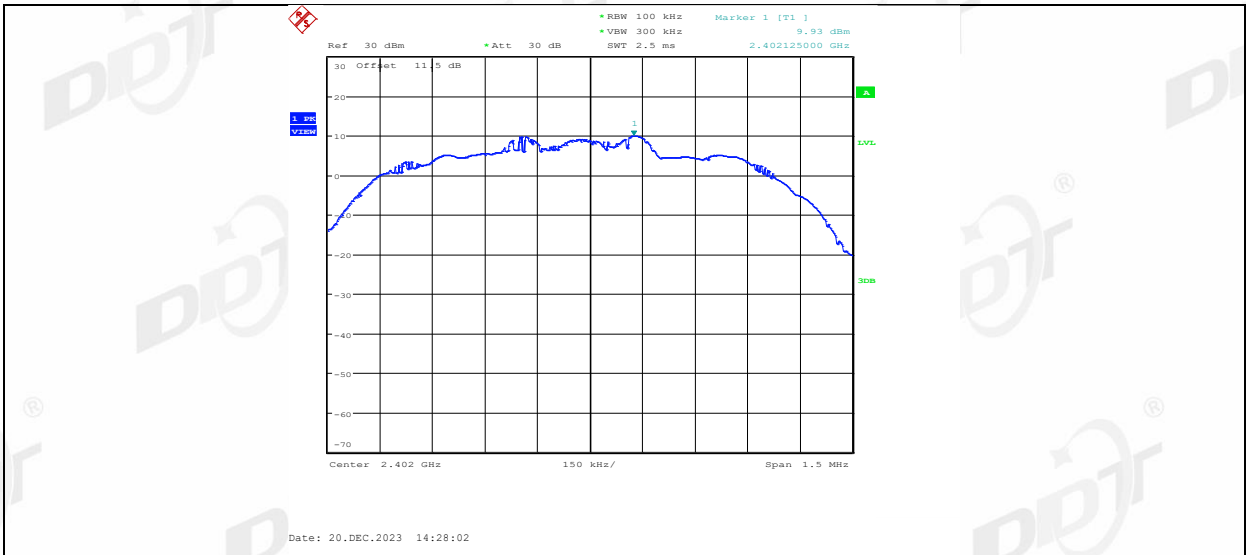
2DH5_Ant1_2480_30~1000



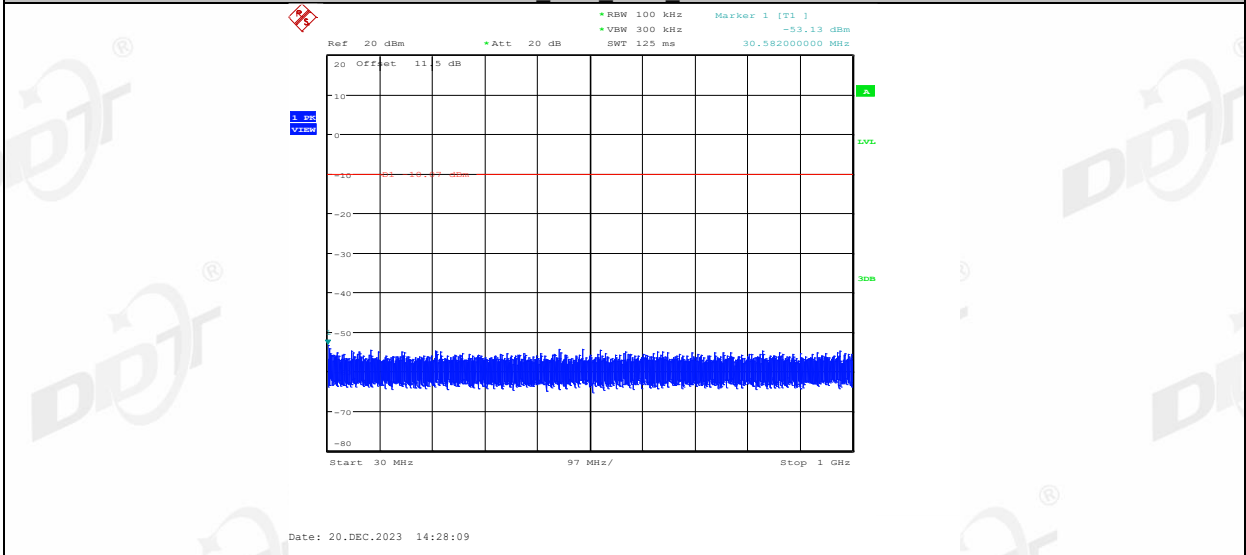
2DH5_Ant1_2480_1000~26500



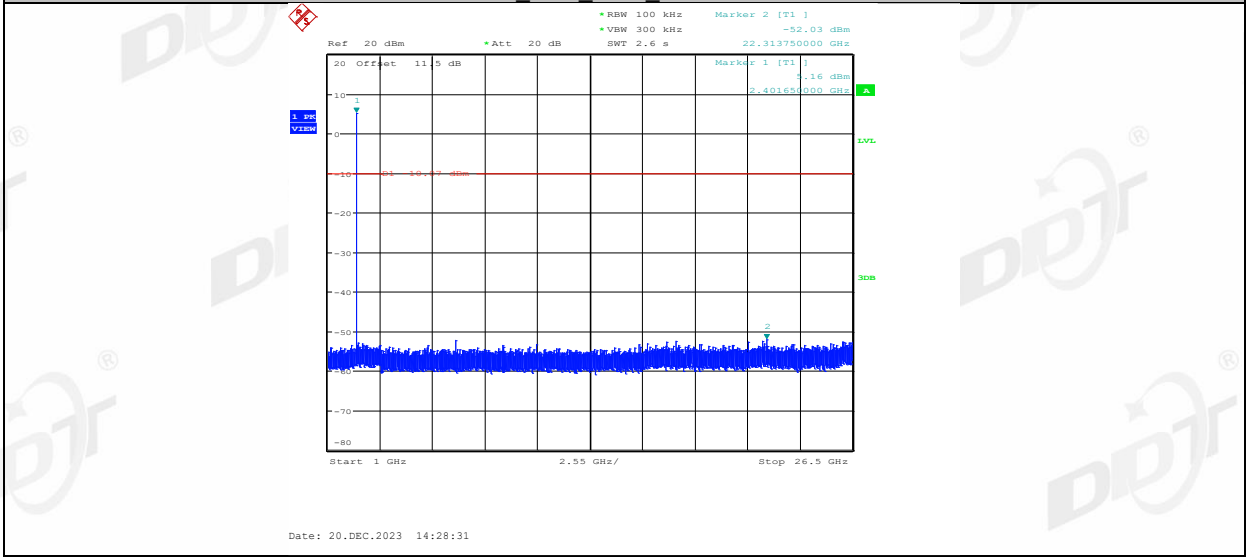
3DH5_Ant1_2402_0~Reference



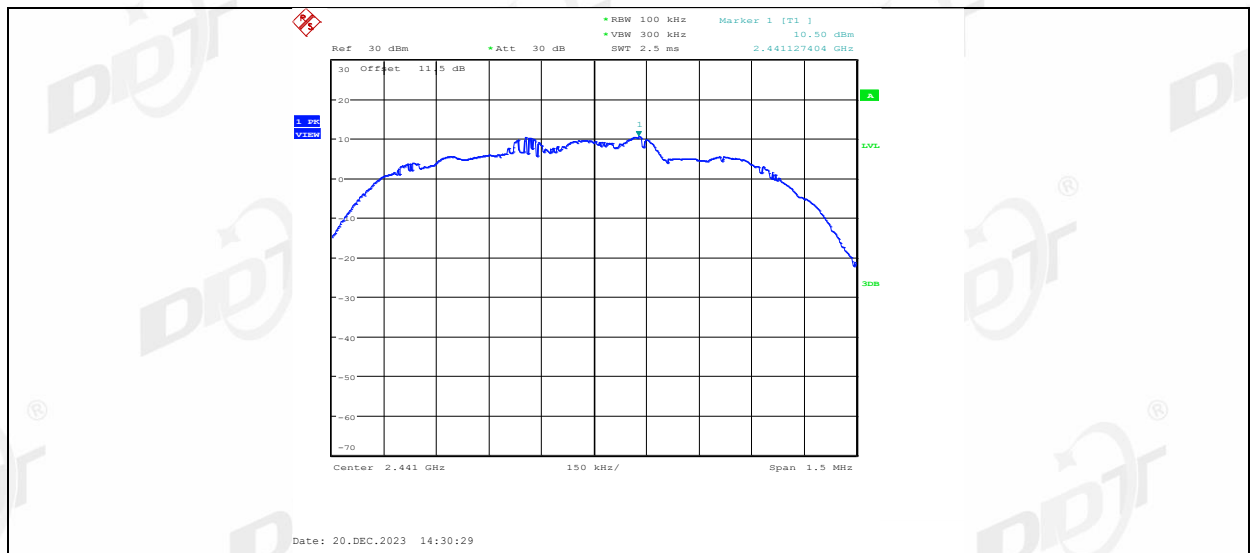
3DH5_Ant1_2402_30~1000



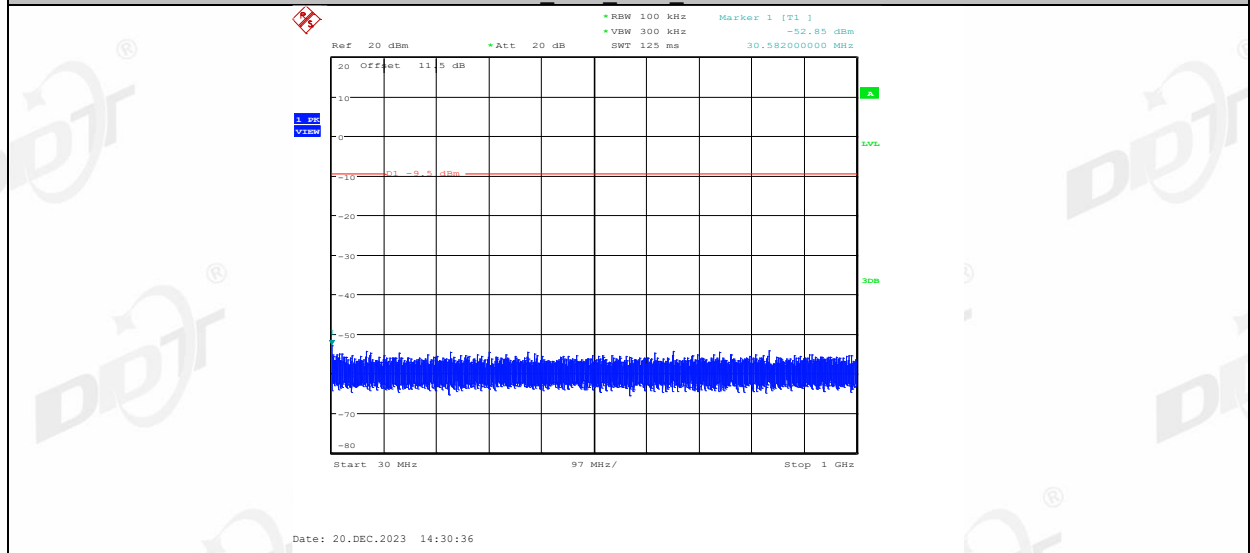
3DH5_Ant1_2402_1000~26500



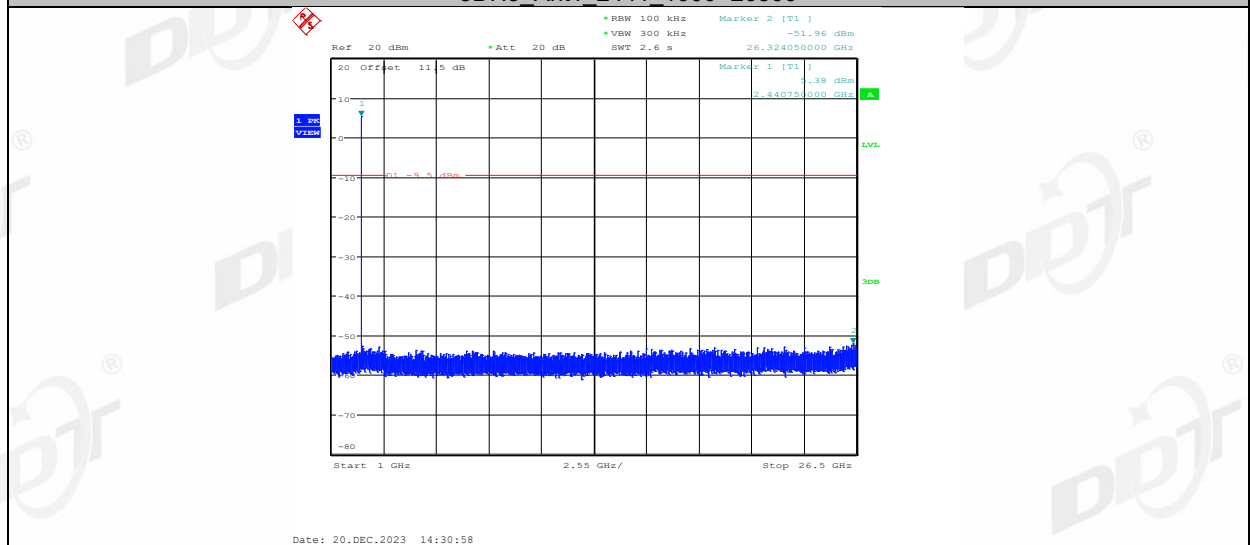
3DH5_Ant1_2441_0~Reference



3DH5_Ant1_2441_30~1000



3DH5_Ant1_2441_1000~26500



3DH5_Ant1_2480_0~Reference

