



FCC AND ISED CERTIFICATION TEST REPORT

Applicant	:	Transom Post OPCO LLC
Address of Applicant	:	117 South Street Hopkinton Massachusetts 01748 United States
Manufacturer	:	Transom Post OPCO LLC
Address of Manufacturer	:	117 South Street Hopkinton Massachusetts 01748 United States
Equipment under Test	:	BT Module
Model No.	:	IBTM24
FCC ID	:	2BC3VIBTM24
IC	:	31389-IBTM24
Host Marketing Name	:	Veritas 250BL, Veritas 1100BH, Veritas 2160BL, Veritas 2160BH
Test Standard(s)	:	FCC Rules and Regulations Part 15 Subpart C, RSS-247 Issue 3 August 2023, ANSI C63.10:2020, RSS-Gen Issue 5, Apr. 2018, Amendment 2 (February 2021)
Report No.	:	DDT-RE24072701-1E03
Issue Date	:	2024/12/02
Issue By	:	Guangdong Dongdian Testing Service Co., Ltd. Unit 2, Building 1, No. 17, Zongbu 2nd Road, Songshan Lake Park, Dongguan, Guangdong, China, 523808

REPORT

Table of Contents

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.	Block diagram of EUT configuration for test	9
2.4.	Decision of final test mode	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.	99% Bandwidth	18
5.1.	Block diagram of test setup	18
5.2.	Limits	18
5.3.	Test procedure	18
5.4.	Test result	19
5.5.	Test graphs	20
6.	Maximum Peak Output Power	23
6.1.	Block diagram of test setup	23
6.2.	Limits	23
6.3.	Test procedure	23
6.4.	Test result	24
6.5.	Test graphs	25
7.	Carrier Frequency Separation	28
7.1.	Block diagram of test setup	28
7.2.	Limits	28
7.3.	Test procedure	28
7.4.	Test result	29
7.5.	Test graphs	30
8.	Dwell Time	31

8.1.	Block diagram of test setup	31
8.2.	Limits.....	31
8.3.	Test procedure.....	31
8.4.	Test result	32
8.5.	Test graphs.....	33
9.	Number of Hopping Channel.....	39
9.1.	Block diagram of test setup	39
9.2.	Limits.....	39
9.3.	Test procedure.....	39
9.4.	Test result	40
9.5.	Test graphs.....	41
10.	Band Edge Compliance (Conducted Method).....	42
10.1.	Block diagram of test setup	42
10.2.	Limit.....	42
10.3.	Test procedure.....	42
10.4.	Test result	43
10.5.	Test graphs.....	44
11.	RF Conducted Spurious Emissions.....	48
11.1.	Block diagram of test setup	48
11.2.	Limits.....	48
11.3.	Test procedure.....	48
11.4.	Test result	49
11.5.	Test graphs.....	50
12.	Duty cycle	59
12.1.	Block diagram of test setup	59
12.2.	Limit.....	59
12.3.	Test procedure.....	59
12.4.	Test result	60
12.5.	Test graphs.....	61
13.	Antenna Requirements	64
13.1.	Limit.....	64
13.2.	Result.....	64
14.	Radiated Emission.....	65
14.1.	Test equipment	65
14.2.	Block diagram of test setup	66
14.3.	Limits.....	67
14.4.	Assistant equipment used for test	69
14.5.	Test procedure.....	69

14.6.	Test result	71
14.7.	Test data	72
15.	Band Edge Compliance	104
15.1.	Test equipment	104
15.2.	Block diagram of test setup	105
15.3.	Limits	105
15.4.	Assistant equipment used for test	105
15.5.	Test procedure	105
15.6.	Test result	105
15.7.	Test data	106
16.	Power Line Conducted Emissions	130
16.1.	Test equipment	130
16.2.	Block diagram of test setup	130
16.3.	Limits	130
16.4.	Assistant equipment used for test	130
16.5.	Test procedure	131
16.6.	Test result	131
17.	Test Setup Photograph	140
18.	Photos of the EUT	147

Test Report Declare

Applicant	:	Transom Post OPCO LLC
Address of Applicant	:	117 South Street Hopkinton Massachusetts 01748 United States
Equipment under Test	:	BT Module
Model No.	:	IBTM24
Host Marketing Name	:	Veritas 250BL, Veritas 1100BH, Veritas 2160BL, Veritas 2160BH
Manufacturer	:	Transom Post OPCO LLC
Address of Manufacturer	:	117 South Street Hopkinton Massachusetts 01748 United States

Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C,

RSS-247 Issue 3 August 2023,

ANSI C63.10:2020,

RSS-Gen Issue 5, Apr. 2018, Amendment 2 (February 2021)

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.

Report No.:	DDT-RE24072701-1E03		
Date of Receipt:	2024/09/02	Date of Test:	2024/09/03 – 2024/11/30

Prepared By:**Jacky Huang/Engineer****Approved By:****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	2024/12/02	

1. Summary of Test Results

No.	Test Parameter	Clause No.	Condition	Result
1	Maximum Peak Output Power	FCC Part 15: 15.247(b)(1), RSS-247 Issue 3 clause 5.4(b)	/	Pass
2	20 dB Bandwidth	FCC Part 15: 15.247(a)(1), RSS-247 Issue 3 clause 5.1(a)	/	Pass
3	99% Bandwidth	RSS-Gen Issue 5 clause 6.7	/	Pass
4	Carrier Frequency Separation	FCC Part 15: 15.247(a)(1), RSS-247 Issue 3 clause 5.1(b)	/	Pass
5	Number of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii), RSS-247 Issue 3 clause 5.1(d)	/	Pass
6	Dwell Time	FCC Part 15: 15.247(a)(1)(iii), RSS-247 Issue 3 clause 5.1(d)	/	Pass
7	RF Conducted Spurious Emissions	FCC Part 15: 15.247(d), RSS-247 Issue 3 clause 5.5	/	Pass
8	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
9	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
10	Power Line Conducted Emissions	FCC Part 15: 15.207(a), RSS-Gen Issue 5 clause 8.8	/	Pass
11	Antenna Requirement	FCC Part 15: 15.203, RSS-Gen Issue 5 clause 6.8	/	Pass

Note 1: N/A is an abbreviation for Not Applicable, and means this item is not applicable for this device or no need to test according to standard.

Note 2: Except for Radiated Emission, Band Edge Compliance and Power Line Conducted Emissions, only the worst data was recorded for the remaining test items.

2. General Test Information

2.1. Description of EUT

EUT Name	: BT Module
Model Number	: IBTM24
Host Marketing Name	: Veritas 250BL, Veritas 1100BH, Veritas 2160BL, Veritas 2160BH
EUT Function Description	: Please reference user manual of this device
Power Supply	: AC 100-240V~50/60Hz
Radio Specification	: Bluetooth BR/EDR
Operation Frequency	: 2402 MHz-2480 MHz
Modulation	: GFSK, $\pi/4$ -DQPSK, 8DPSK
Antenna Type	: FPC antenna
Max Antenna Gain (dBi)	: 1.72 (model: C4207-810023-A(SSR-2400194)-x3) 1.29 (model: C4207-810024-A(SSR-2400191)-X3)

Note 1: This EUT support Bluetooth BR/EDR/LE, this report only for Bluetooth BR/EDR.

Note 2: The Bluetooth module has two alternative antennas, which are completely the same except for the line length (22cm and 40cm) and the gain (the loss is different due to the different line length), All the test items were used the module: C4207-810023-A(SSR-2400194)-x3, which has the maximum gain.

Note 3: The limited modular was used for the host product: Veritas, which include 4 model: Veritas 250BL, Veritas 1100BH, Veritas 2160BL and Veritas 2160BH.

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

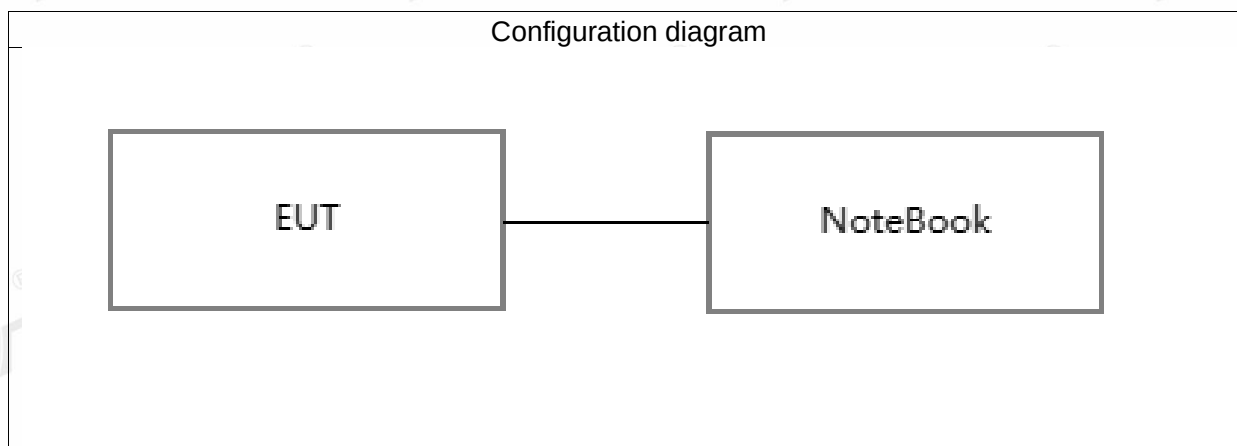
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

Note: 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

Accessories	Manufacturer	Model number	Description
/	/	/	/

2.3. Block diagram of EUT configuration for test



2.4. Decision of final test mode

According pre-test, the worst test modes were reported as below:

Test software: BK32xx RF Test_V1.8.2.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	0	CH0 to CH78	2402 to 2480
$\pi/4$ -DQPSK hopping on Tx mode	0	CH0 to CH78	2402 to 2480
8DPSK hopping on Tx mode	0	CH0 to CH78	2402 to 2480
GFSK hopping off Tx mode	0	CH0	2402
	0	CH39	2441
	0	CH78	2480
$\pi/4$ -DQPSK hopping off Tx mode	0	CH0	2402
	0	CH39	2441
	0	CH78	2480
8DPSK hopping off Tx mode	0	CH0	2402
	0	CH39	2441
	0	CH78	2480
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

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

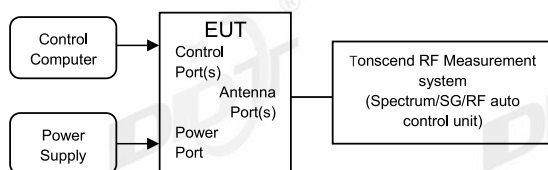
Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power (Conducted) (Spectrum analyzer)	0.86 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	1.38 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
Peak Output Power (Conducted) (Power Sensor)	0.74 dB
Power Spectral Density	0.74 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	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	Cal. Interval
☒ RF Connected Test (RF Measurement System 2#)					
SPECTRUM ANALYZER	R&S	FSU26	201124	2025/07/08	1 Year
Power Sensor	R&S	NRP-Z22	101254	2025/07/08	1 Year
Test Software	Tonscend	JS1120-3	Ver.3.2.22	N/A	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 C63.10-2020 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:

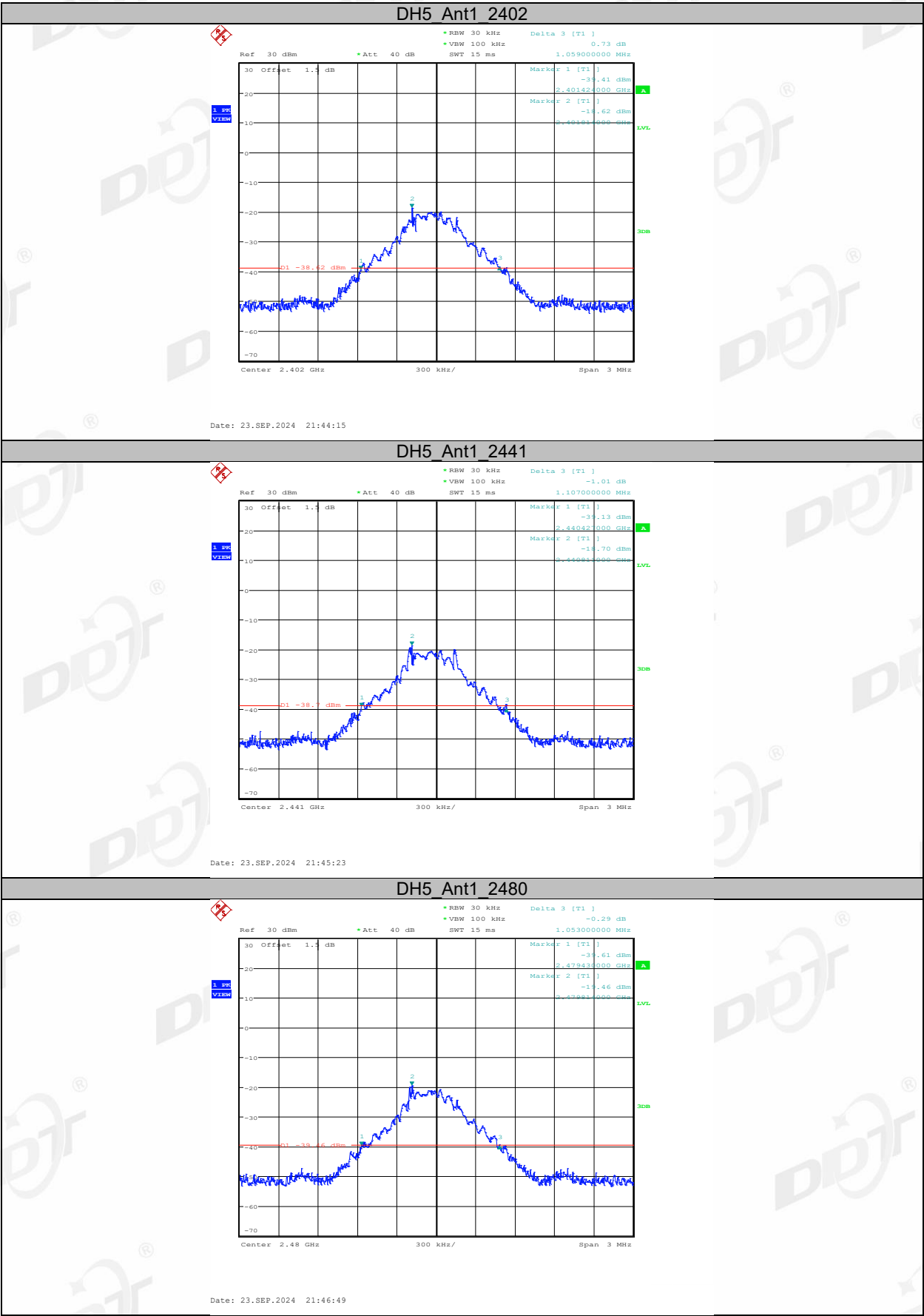
RBW:	1% to 5% of the OBW
VBW:	approximately three times RBW
Span:	between 2 times and 5 times the OBW
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold
- (5) Measure and record the results in the report.

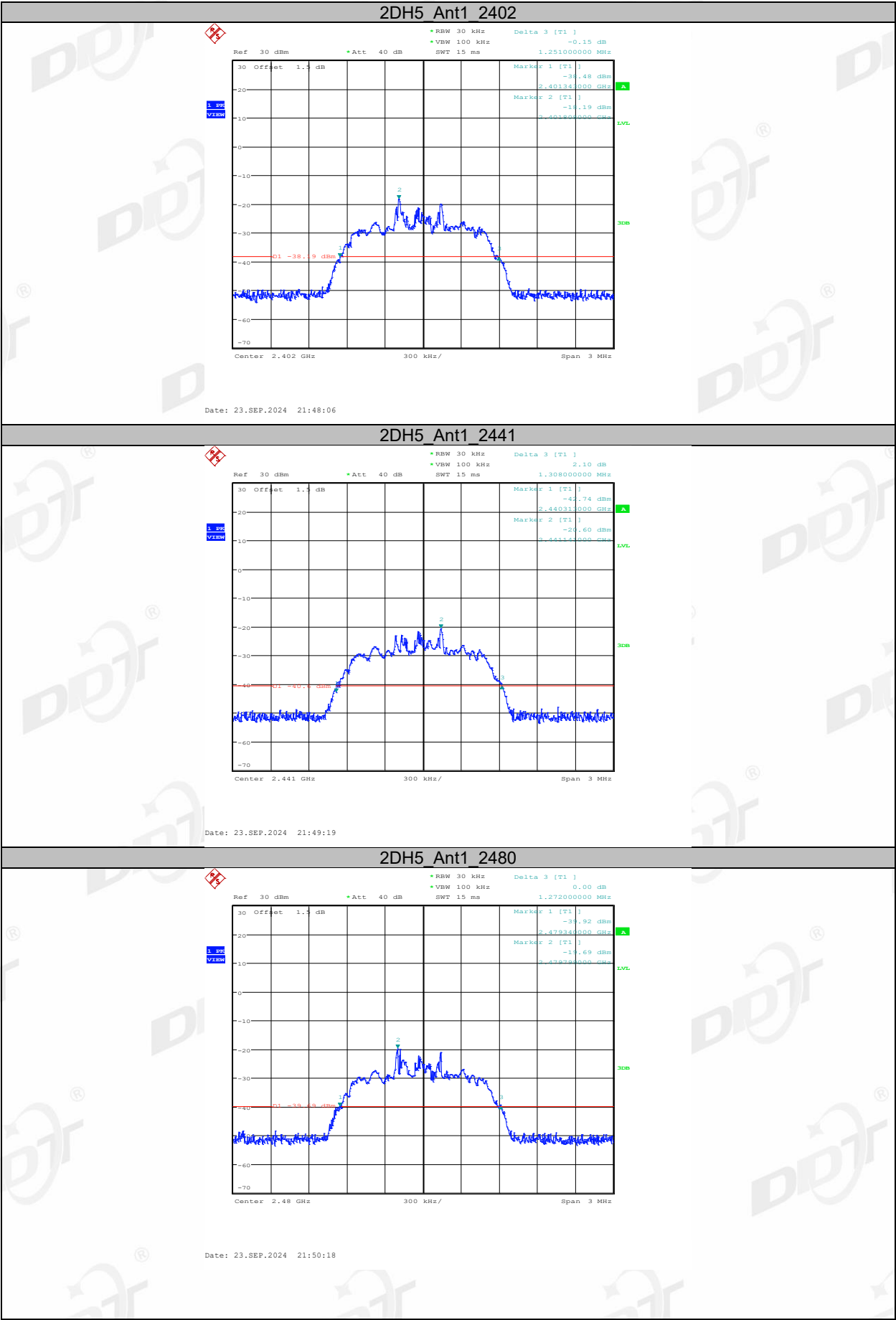
4.4. Test result

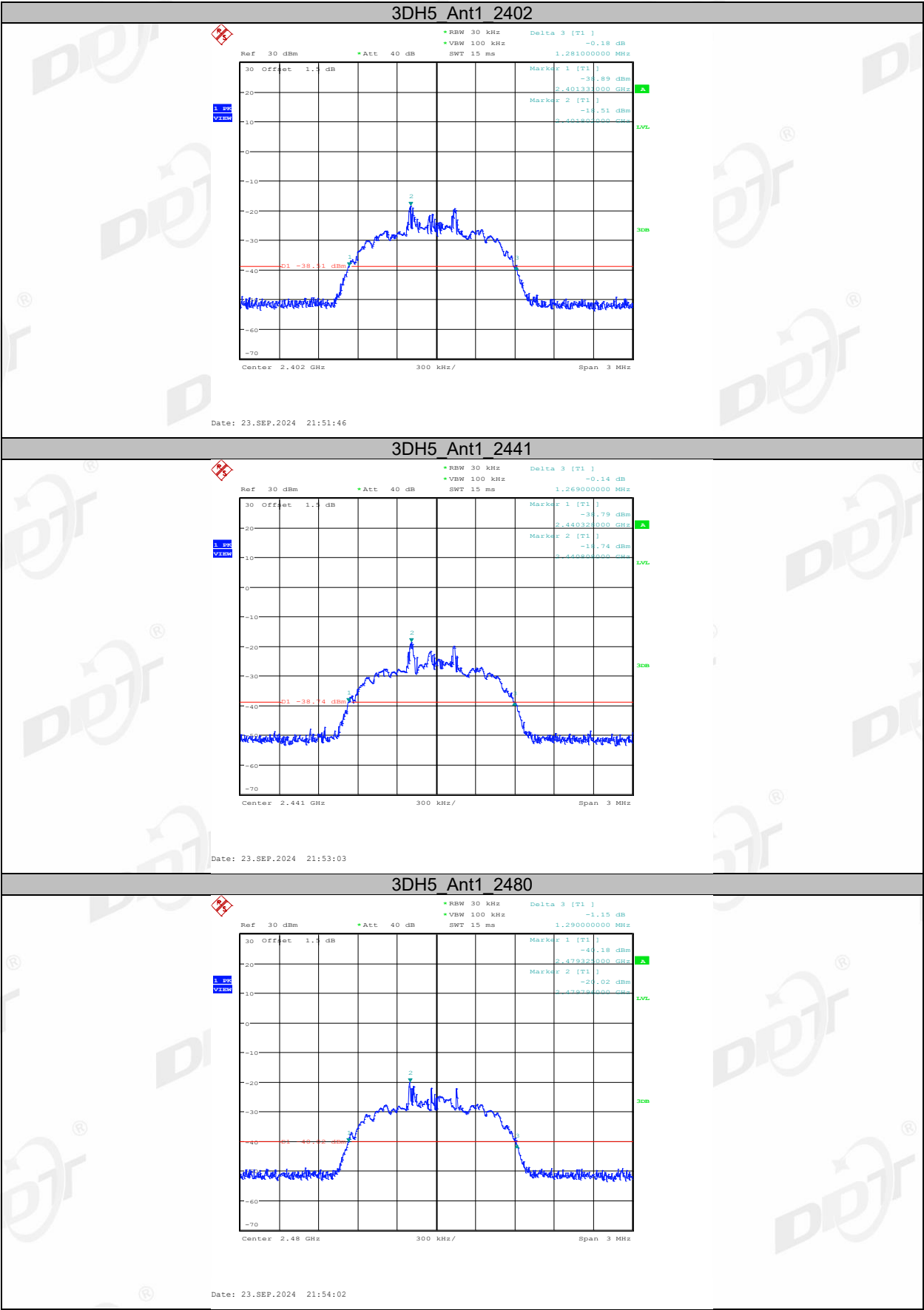
Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 2#
Ambient Condition:	25.2℃, 42%RH	Test Date:	2024.09.10-2024.09.23
Test Power Supply:	AC 120V	Sample Number:	S24072701-001

Test Mode	Antenna	Frequency [MHz]	20dB EBW [MHz]
DH5	Ant1	2402	1.06
		2441	1.11
		2480	1.05
2DH5	Ant1	2402	1.25
		2441	1.31
		2480	1.27
3DH5	Ant1	2402	1.28
		2441	1.27
		2480	1.29

4.5.Test graphs

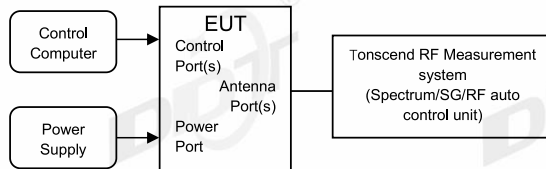






5. 99% Bandwidth

5.1. Block diagram of test setup



5.2. Limits

Just for Report.

5.3. Test procedure

- (1) The test according to ANSI C63.10-2020 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:

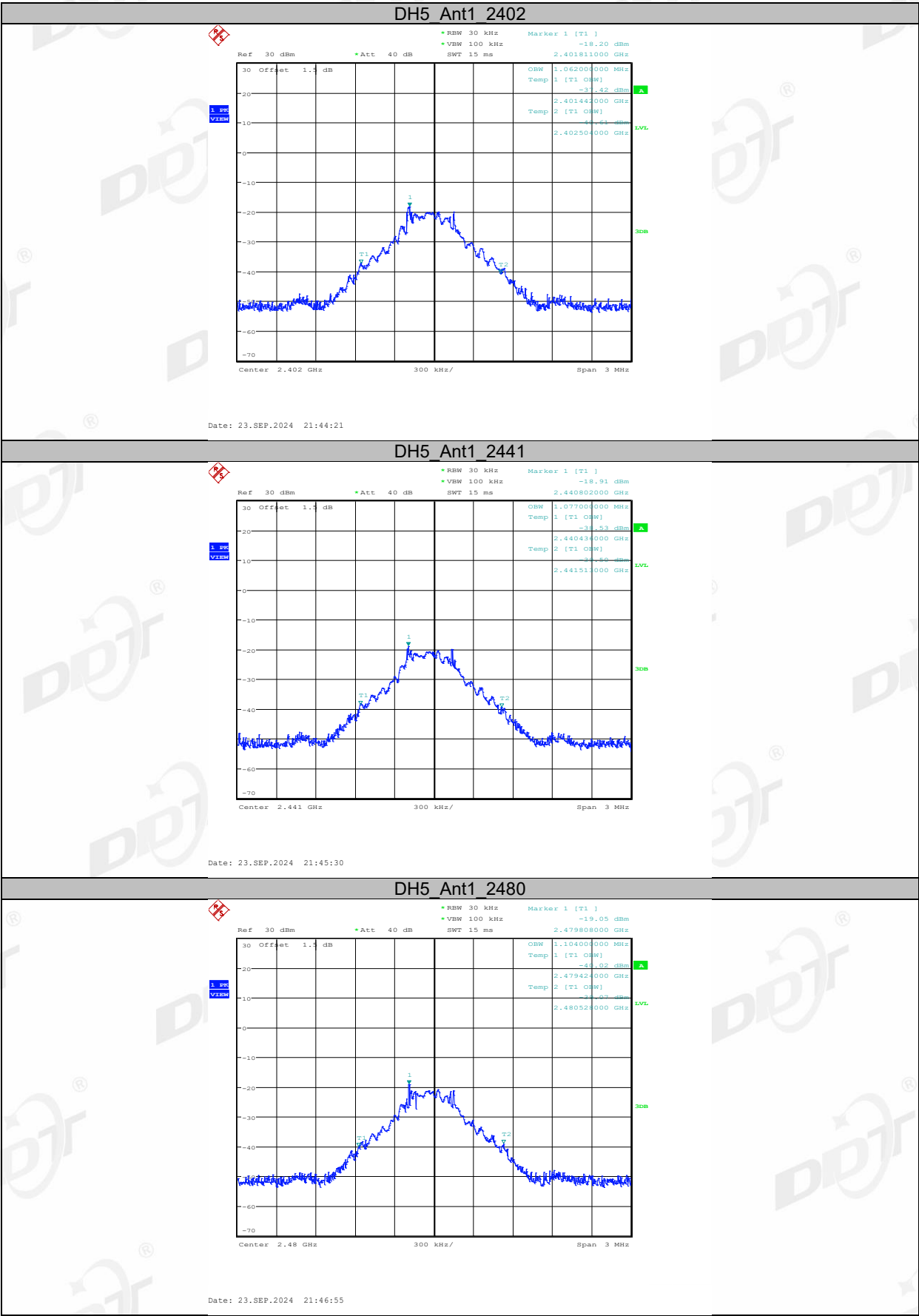
RBW:	1% to 5% of the OBW
VBW:	approximately three times RBW
Span:	between 1.5 times and 5.0 times the OBW
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold
- (5) Measure and record the results in the report.

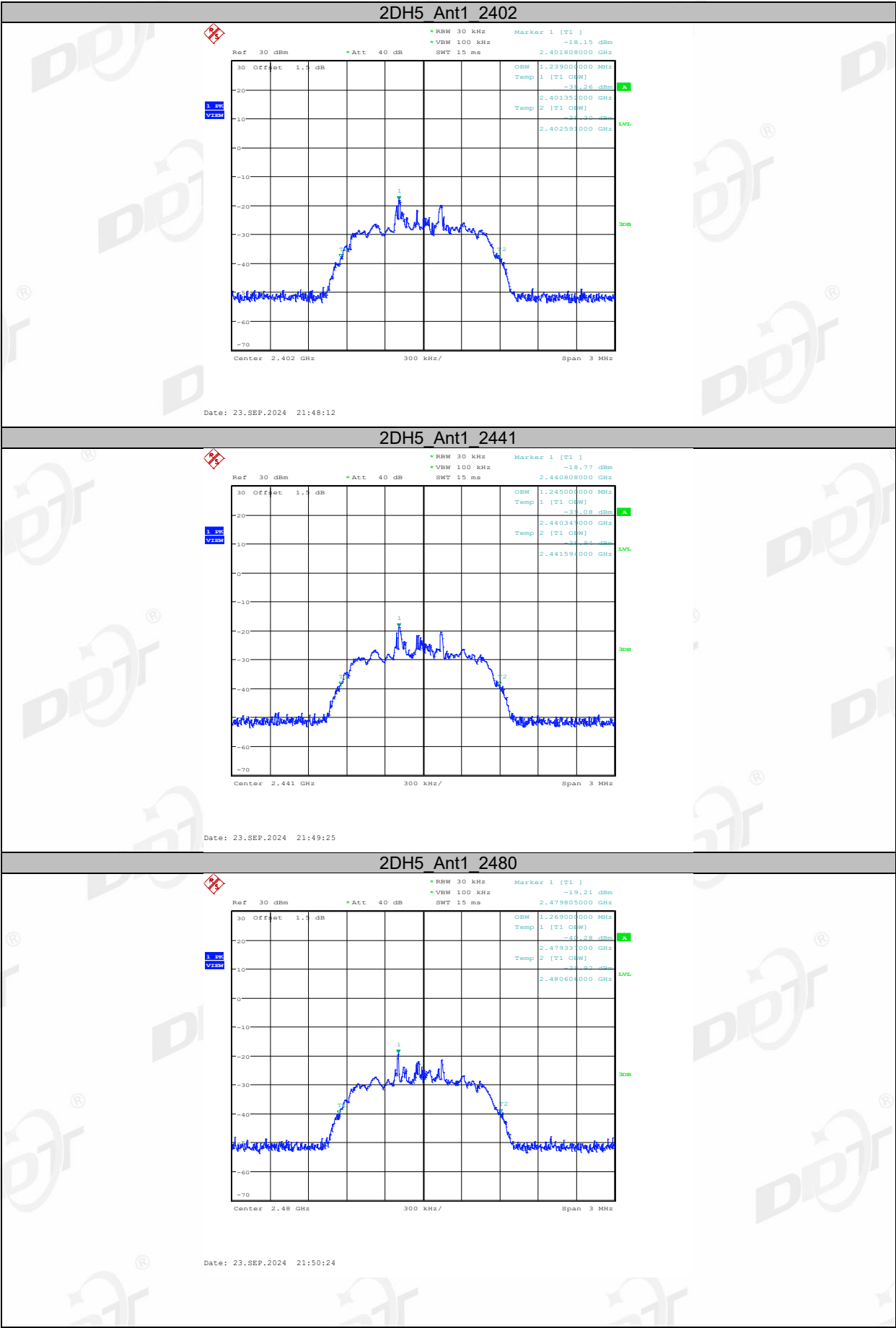
5.4. Test result

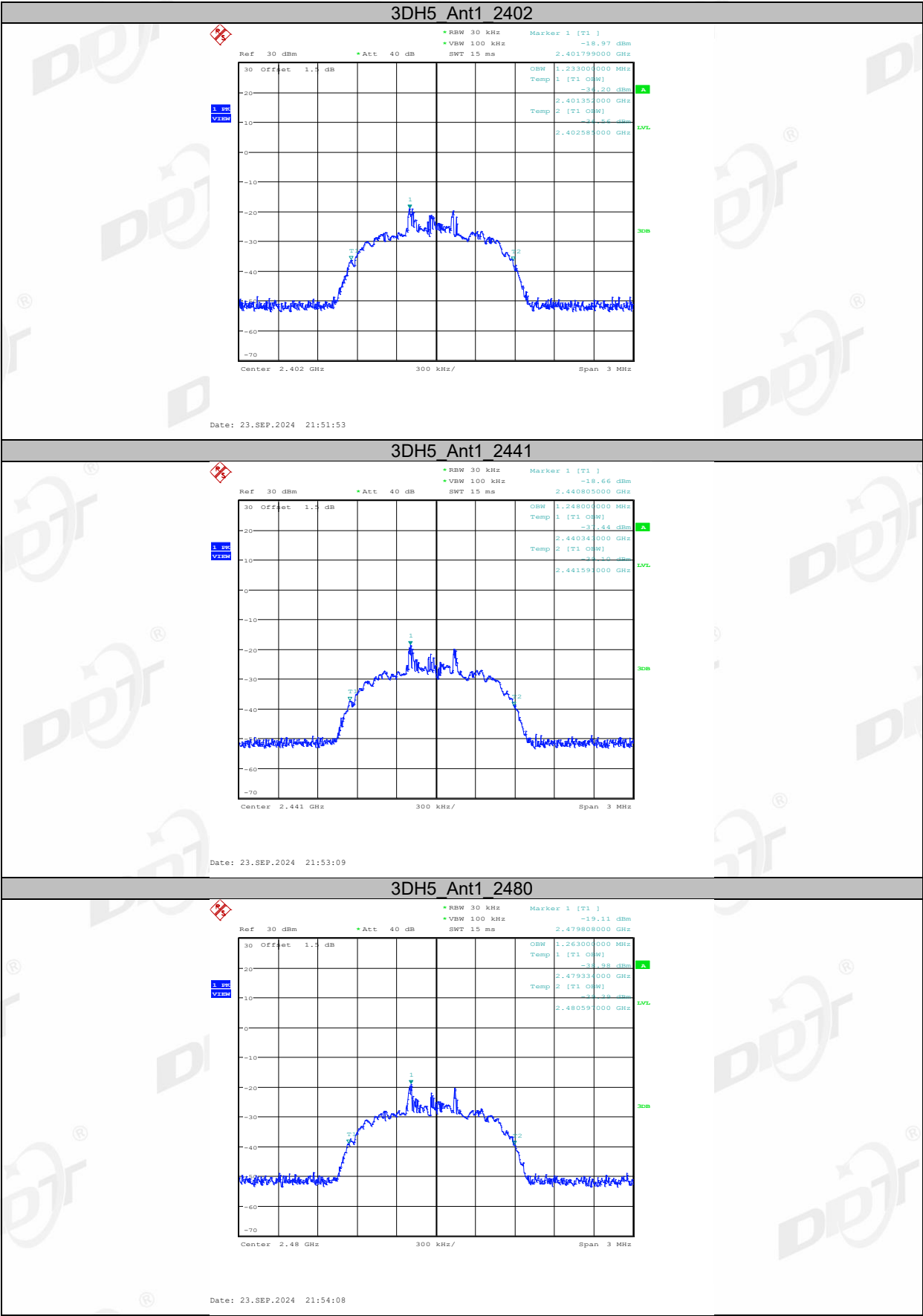
Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 2#
Ambient Condition:	25.2℃, 42%RH	Test Date:	2024.09.10-2024.09.23
Test Power Supply:	AC 120V	Sample Number:	S24072701-001

Test Mode	Antenna	Frequency [MHz]	OCB [MHz]	FL [MHz]	FH [MHz]
DH5	Ant1	2402	1.062	2401.4420	2402.5040
		2441	1.077	2440.4360	2441.5130
		2480	1.104	2479.4240	2480.5280
2DH5	Ant1	2402	1.239	2401.3520	2402.5910
		2441	1.245	2440.3490	2441.5940
		2480	1.269	2479.3370	2480.6060
3DH5	Ant1	2402	1.233	2401.3520	2402.5850
		2441	1.248	2440.3430	2441.5910
		2480	1.263	2479.3340	2480.5970

5.5.Test graphs

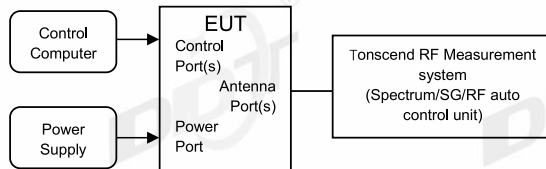






6. Maximum Peak Output Power

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 C63.10-2020 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 ≥ 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 Engineer:	Zora Zhang	Test Site:	RF Measurement System 2#
Ambient Condition:	25.2℃, 42%RH-25.8℃, 39%RH	Test Date:	2024.09.10-2024.11.30
Test Power Supply:	AC 120V	Sample Number:	S24072701-001

Test Mode	Antenna	Frequency [MHz]	Conducted Peak Power [dBm]	Conducted Limit [dBm]	EIRP [dBm]	EIRP Limit [dBm]	Verdict
DH5	Ant1	2402	-15.86	≤20.97	-14.14	≤30	PASS
		2441	-16.90	≤20.97	-15.18	≤30	PASS
		2480	-16.75	≤20.97	-15.03	≤30	PASS
2DH5	Ant1	2402	-16.06	≤20.97	-14.34	≤30	PASS
		2441	-16.86	≤20.97	-15.14	≤30	PASS
		2480	-16.97	≤20.97	-15.25	≤30	PASS
3DH5	Ant1	2402	-16.04	≤20.97	-14.32	≤30	PASS
		2441	-17.01	≤20.97	-15.29	≤30	PASS
		2480	-16.85	≤20.97	-15.13	≤30	PASS

6.5.Test graphs

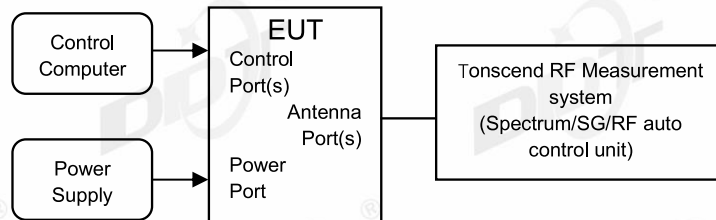






7. Carrier Frequency Separation

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 C63.10-2020 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:

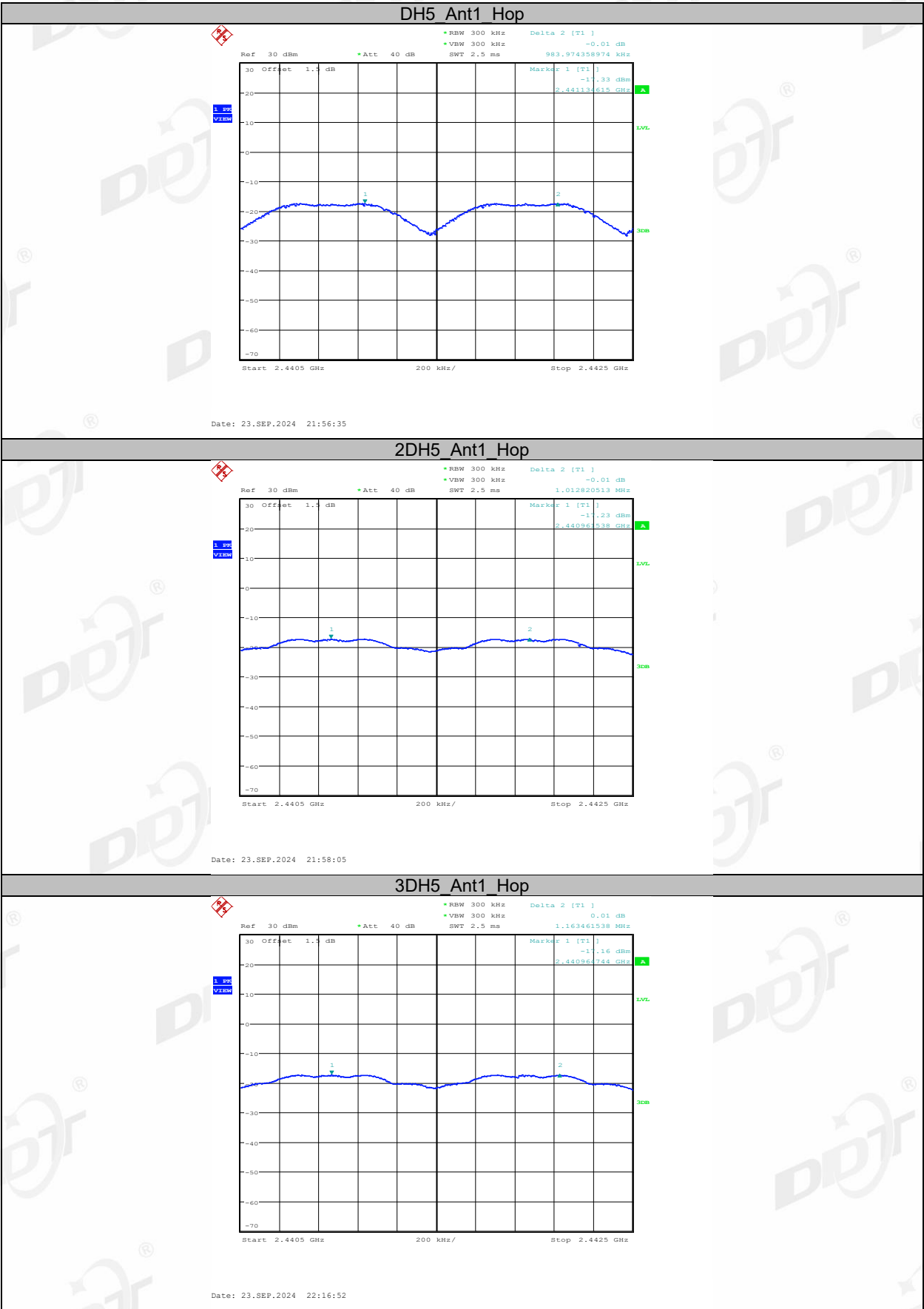
RBW:	approximately 30% of the channel spacing
VBW:	$VBW \geq RBW$.
Span:	Wide enough to capture the peaks of two adjacent channels.
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold
- (5) Use the marker-delta function to determine the separation between the peaks of the adjacent channels and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

7.4. Test result

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 2#
Ambient Condition:	25.2℃, 42%RH	Test Date:	2024.09.10-2024.09.23
Test Power Supply:	AC 120V	Sample Number:	S24072701-001

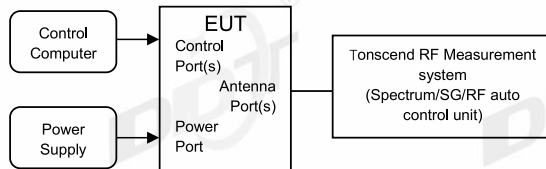
Test Mode	Antenna	Frequency [MHz]	Result [MHz]	Limit [MHz]	Verdict
DH5	Ant1	Hop	0.984	≥0.740	PASS
2DH5	Ant1	Hop	1.013	≥0.873	PASS
3DH5	Ant1	Hop	1.163	≥0.860	PASS

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 C63.10-2020 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:

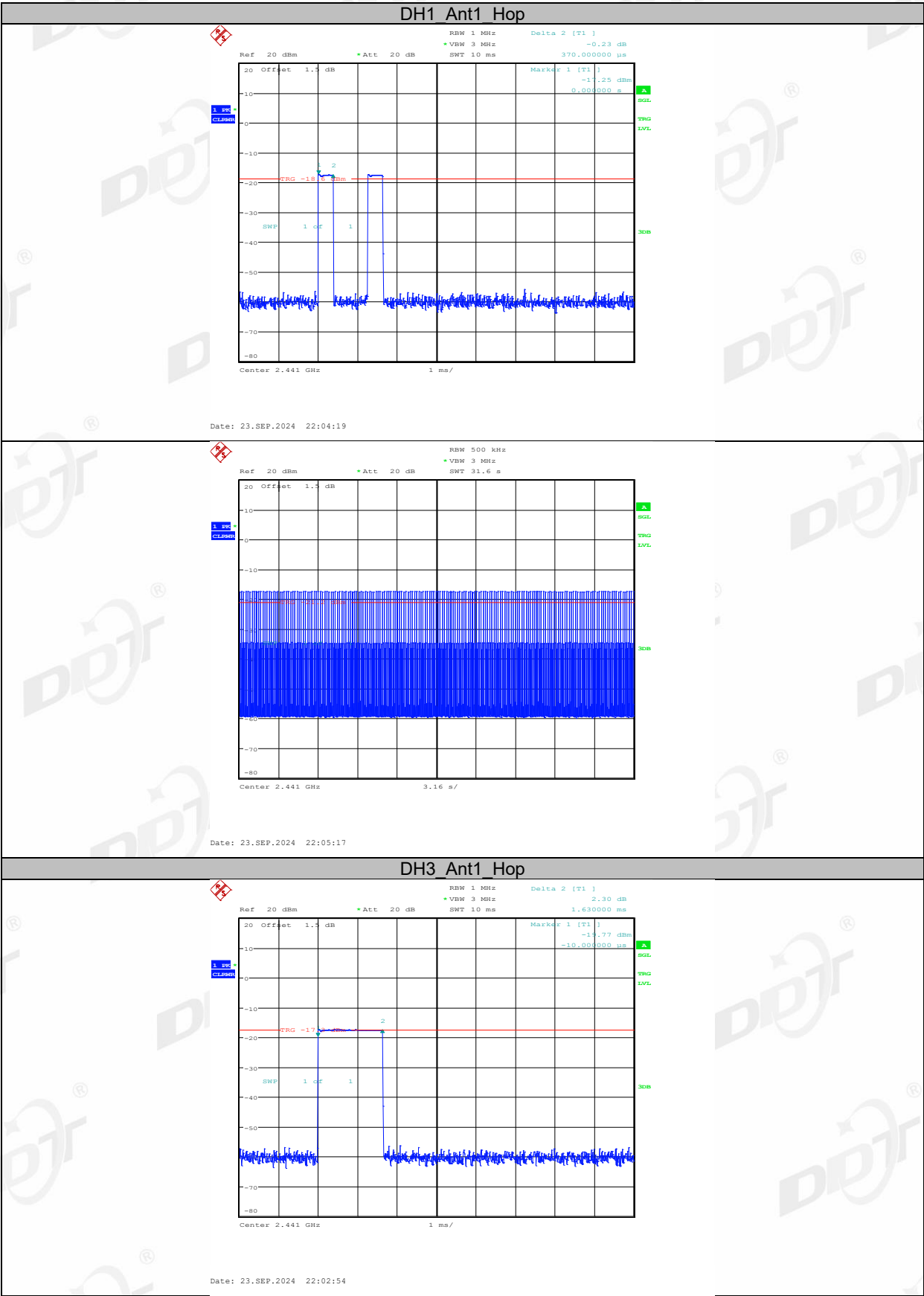
RBW:	$\leq$ channel spacing and where possible RBW should be set $\gg 1 / T$
VBW:	$VBW \geq RBW$.
Span:	Zero span, centered on a hopping channel.
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Clear Write.
- (5) The test period: $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$
- (6) Measure the hopping number and on time of each pulse with spectrum analyzer in zero span set, and calculate dwell time with formula Dwell time = total hops * pulse's on time.
- (7) Measure and record the results in the report.

8.4. Test result

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 2#
Ambient Condition:	25.2℃, 42%RH	Test Date:	2024.09.10-2024.09.23
Test Power Supply:	AC 120V	Sample Number:	S24072701-001

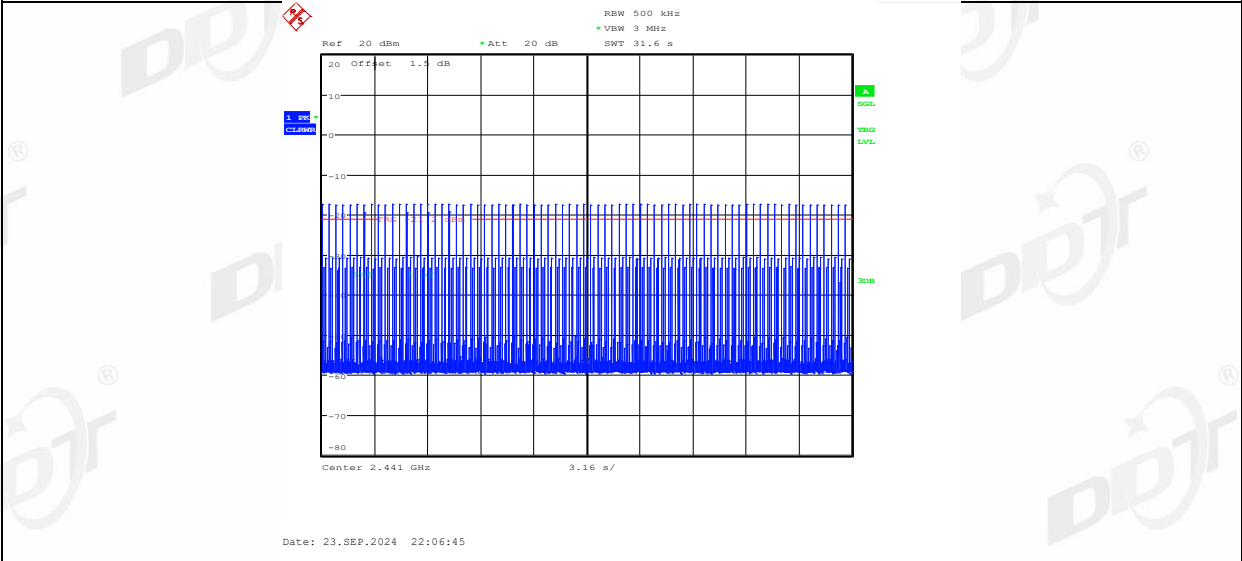
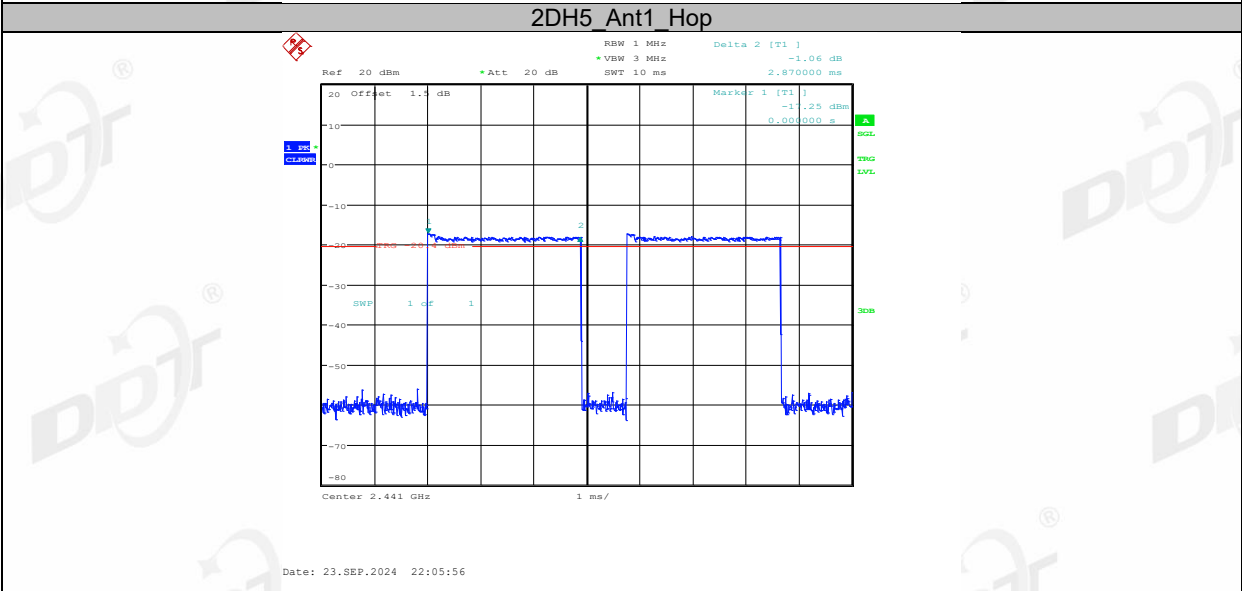
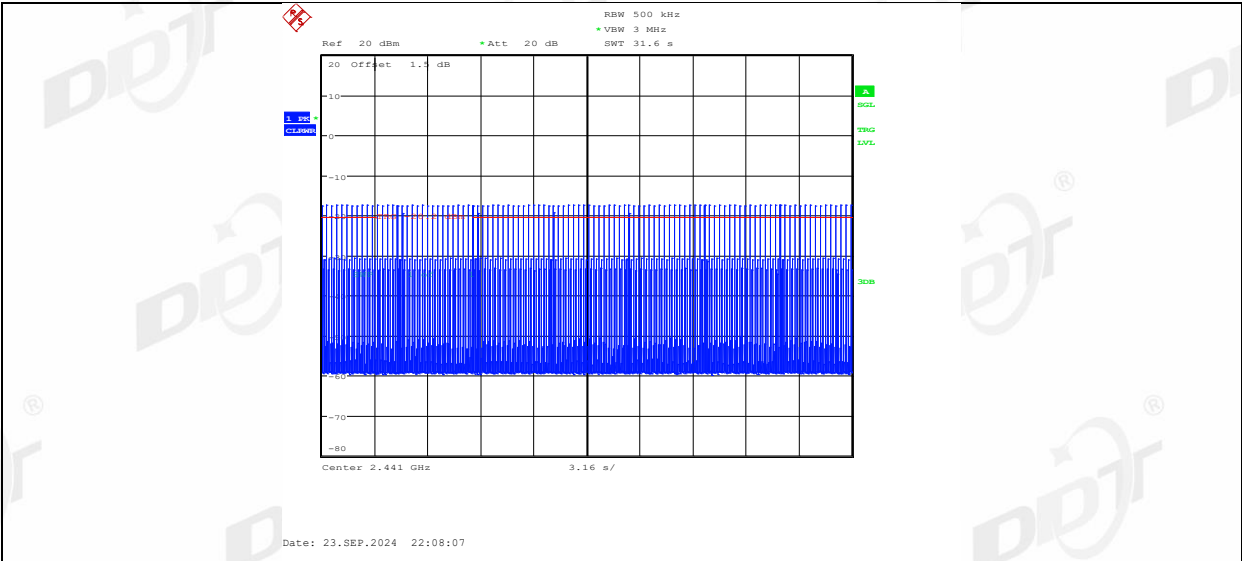
Test Mode	Antenna	Frequency [MHz]	Burst Width [ms]	Total Hops [Num]	Result [s]	Limit [s]	Verdict
DH1	Ant1	Hop	0.370	185	0.068	≤0.4	PASS
DH3	Ant1	Hop	1.630	107	0.174	≤0.4	PASS
DH5	Ant1	Hop	2.880	75	0.216	≤0.4	PASS
2DH1	Ant1	Hop	0.370	188	0.070	≤0.4	PASS
2DH3	Ant1	Hop	1.630	106	0.173	≤0.4	PASS
2DH5	Ant1	Hop	2.870	75	0.215	≤0.4	PASS
3DH1	Ant1	Hop	0.370	183	0.068	≤0.4	PASS
3DH3	Ant1	Hop	1.630	110	0.179	≤0.4	PASS
3DH5	Ant1	Hop	2.880	78	0.225	≤0.4	PASS

8.5.Test graphs











3DH3_Ant1_Hop

Ref 20 dBm

Offset 1.5 dB

Att 20 dB

RBW 1 MHz

VBW 3 MHz

SWT 10 ms

Delta 2 [T1]

5.59 dB

1.630000 ms

Marker 1 [T1]

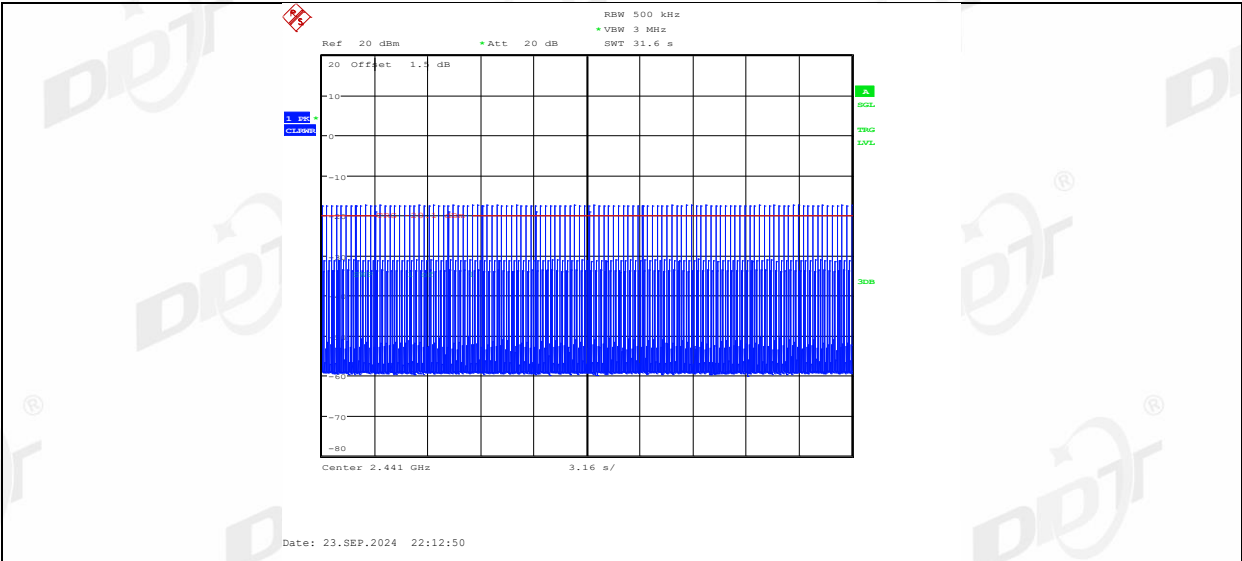
-23.78 dBm

-10.000000 μ s

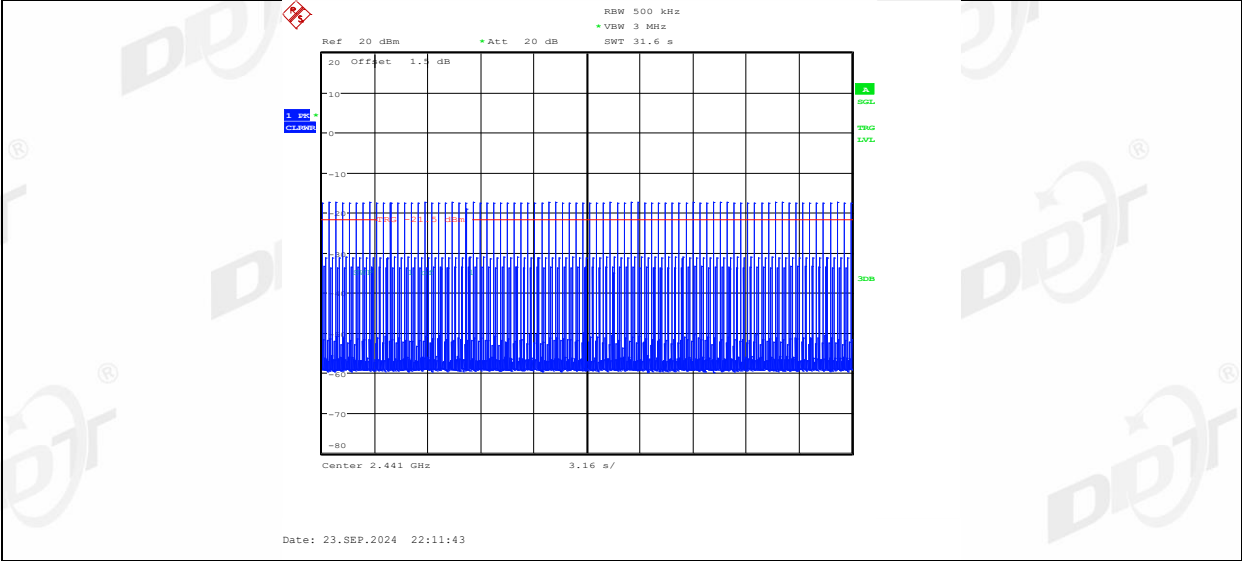
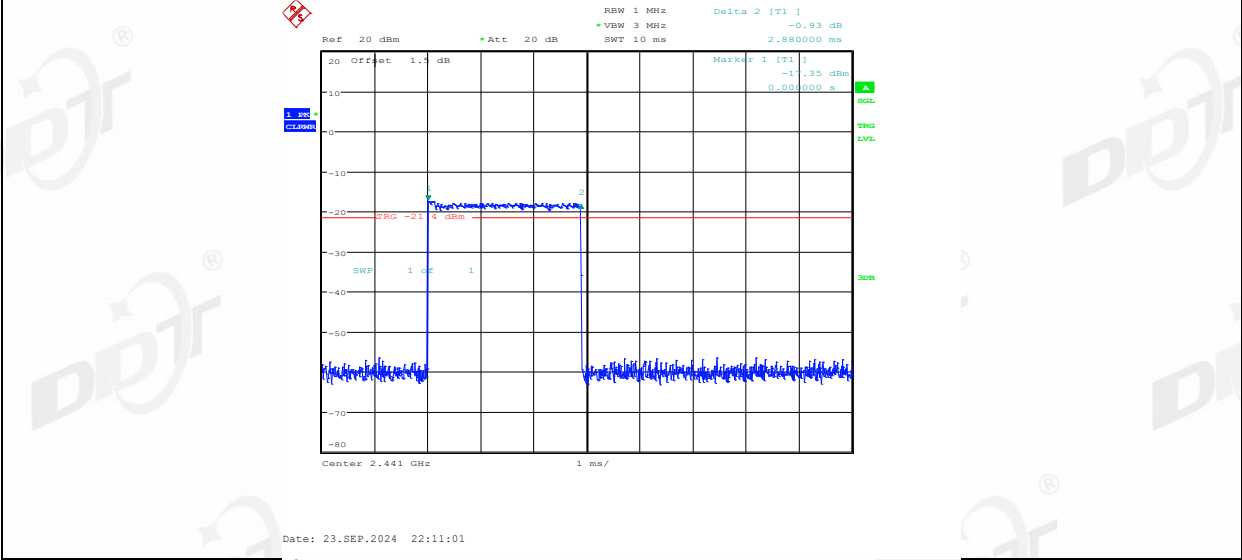
Center 2.441 GHz

1 ms/

Date: 23.SEP.2024 22:12:08

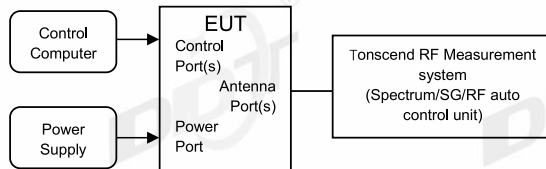


3DH5_Ant1_Hop



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 C63.10-2020 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
- (5) Measure the hopping number and record the results in the report.
- (6) Measure and record the results in the report.

9.4. Test result

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 2#
Ambient Condition:	25.2℃, 42%RH	Test Date:	2024.09.10-2024.09.23
Test Power Supply:	AC 120V	Sample Number:	S24072701-001

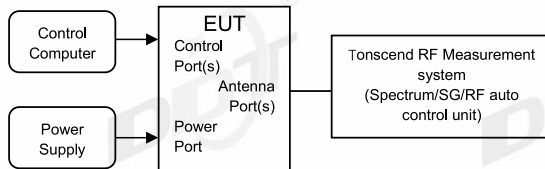
Test Mode	Antenna	Frequency [MHz]	Result [Num]	Limit [Num]	Verdict
DH5	Ant1	Hop	79	≥15	PASS
2DH5	Ant1	Hop	79	≥15	PASS
3DH5	Ant1	Hop	79	≥15	PASS

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:

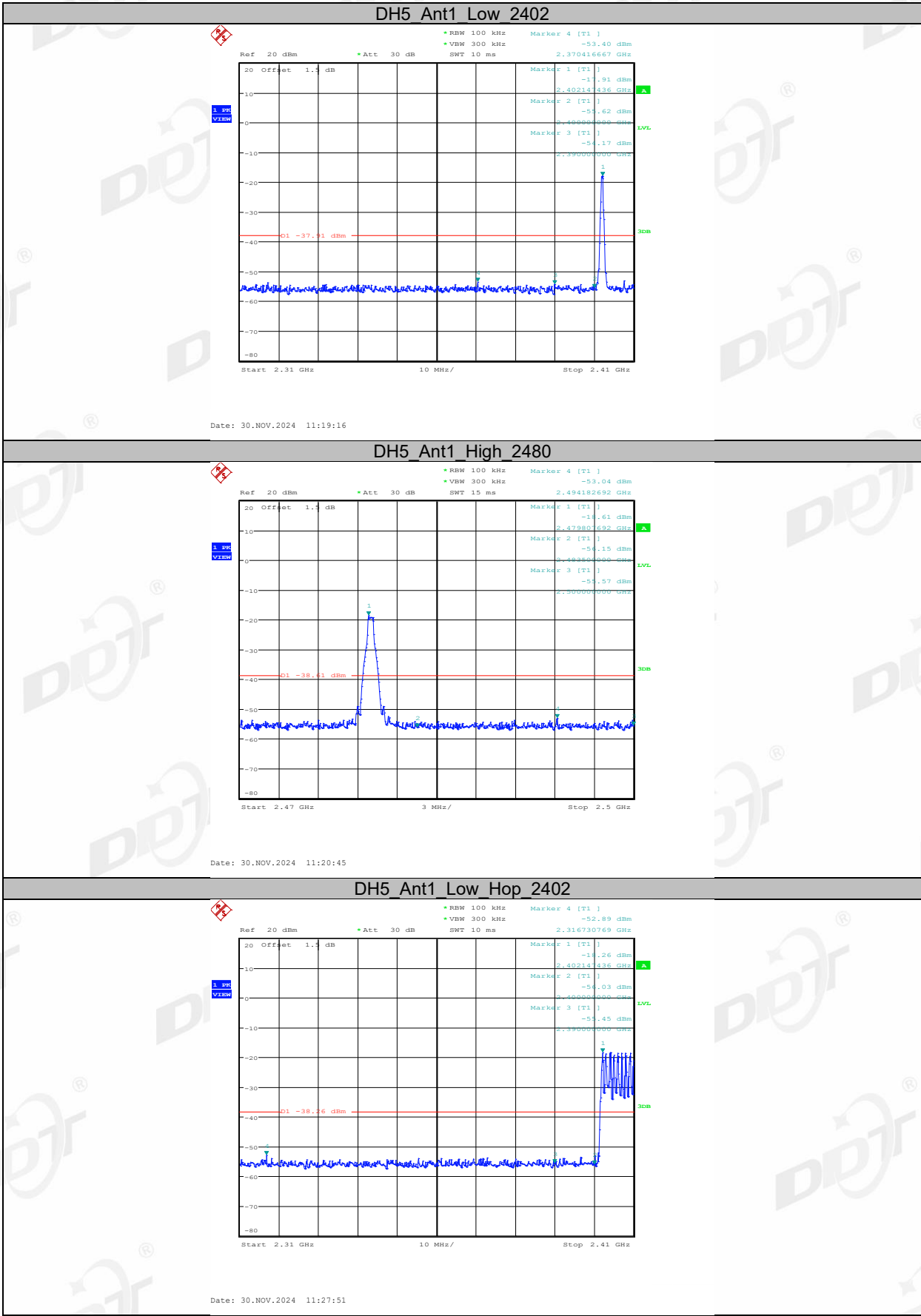
RBW:	100 kHz
VBW:	300 kHz
Span	Encompass frequency range to be measured
Detector Mode:	Peak
Sweep time:	Auto
Trace mode	Max hold
- (3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.
- (4) Then mark the maximum amplitude of all unwanted emissions outside of the authorized frequency band.

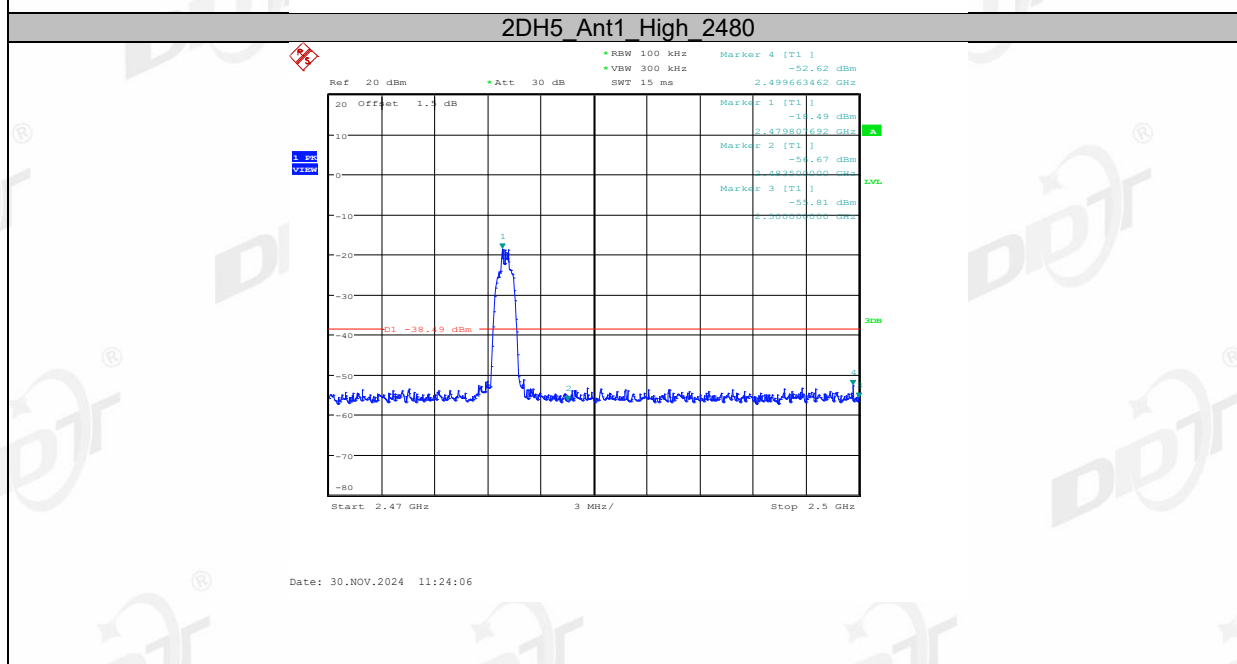
10.4. Test result

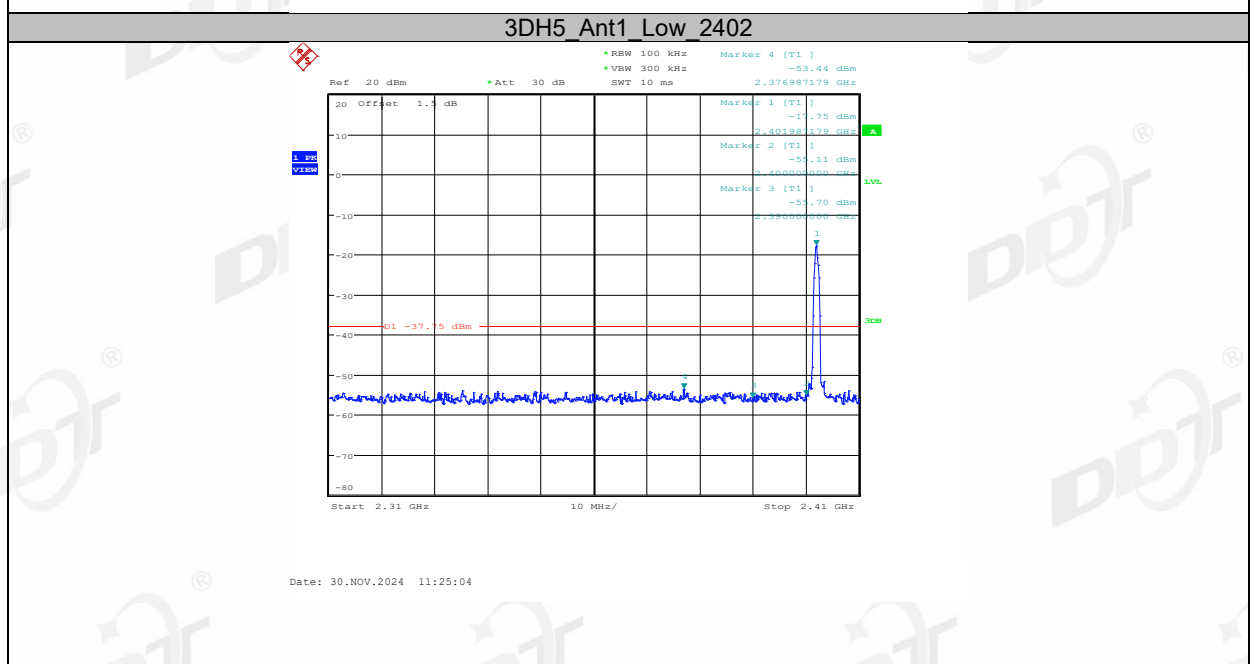
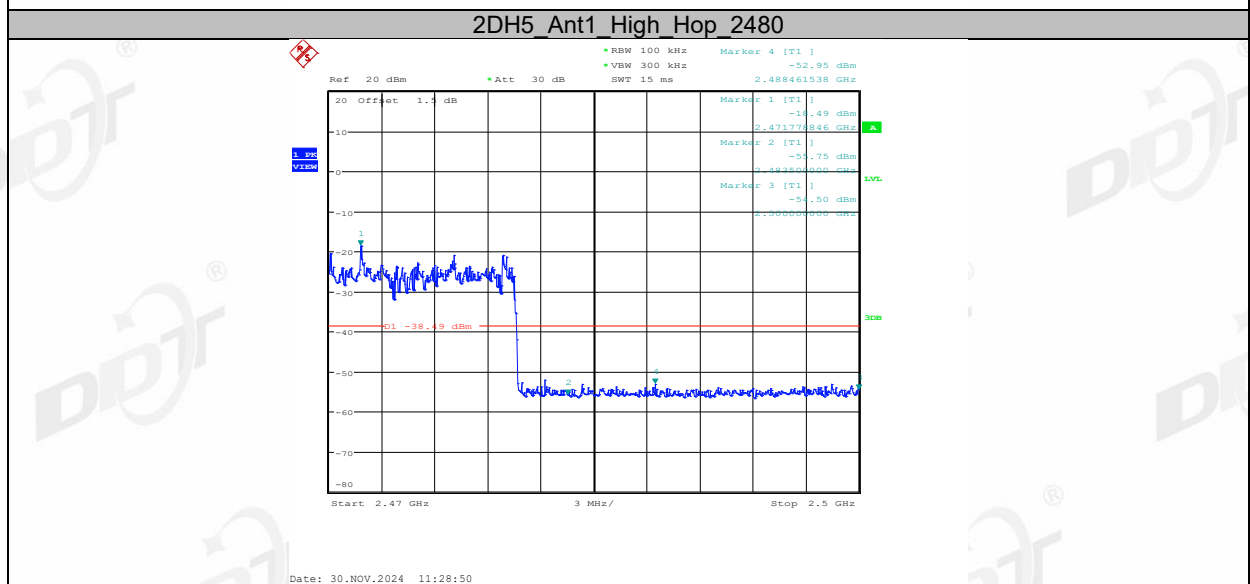
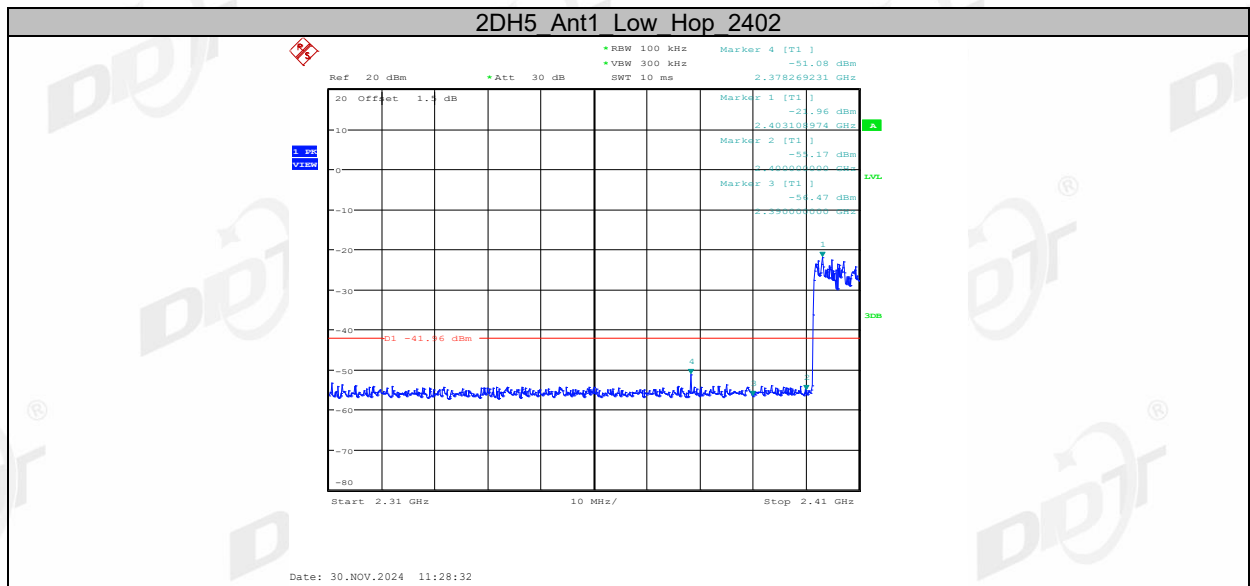
Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 2#
Ambient Condition:	25.2℃, 42%RH-25.8℃, 39%RH	Test Date:	2024.09.10-2024.11.30
Test Power Supply:	AC 120V	Sample Number:	S24072701-001

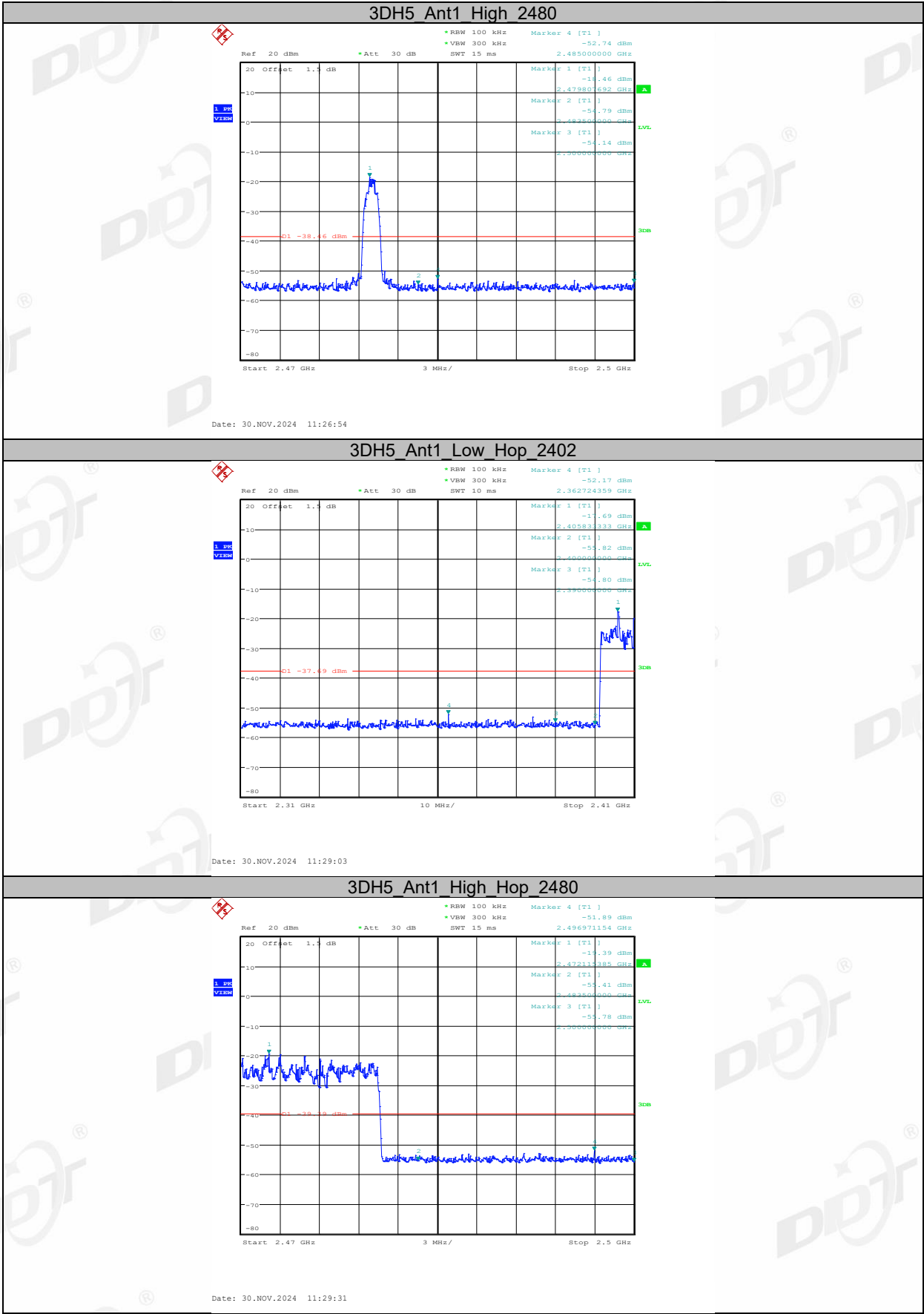
Mode	Frequency (MHz)	Verdict
DH5	Hopping off 2402	Pass
	Hopping off 2480	Pass
	Hopping on	Pass
2DH5	Hopping off 2402	Pass
	Hopping off 2480	Pass
	Hopping on	Pass
3DH5	Hopping off 2402	Pass
	Hopping off 2480	Pass
	Hopping on	Pass

10.5. Test graphs



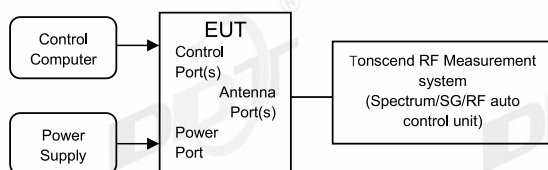






11. RF Conducted Spurious Emissions

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

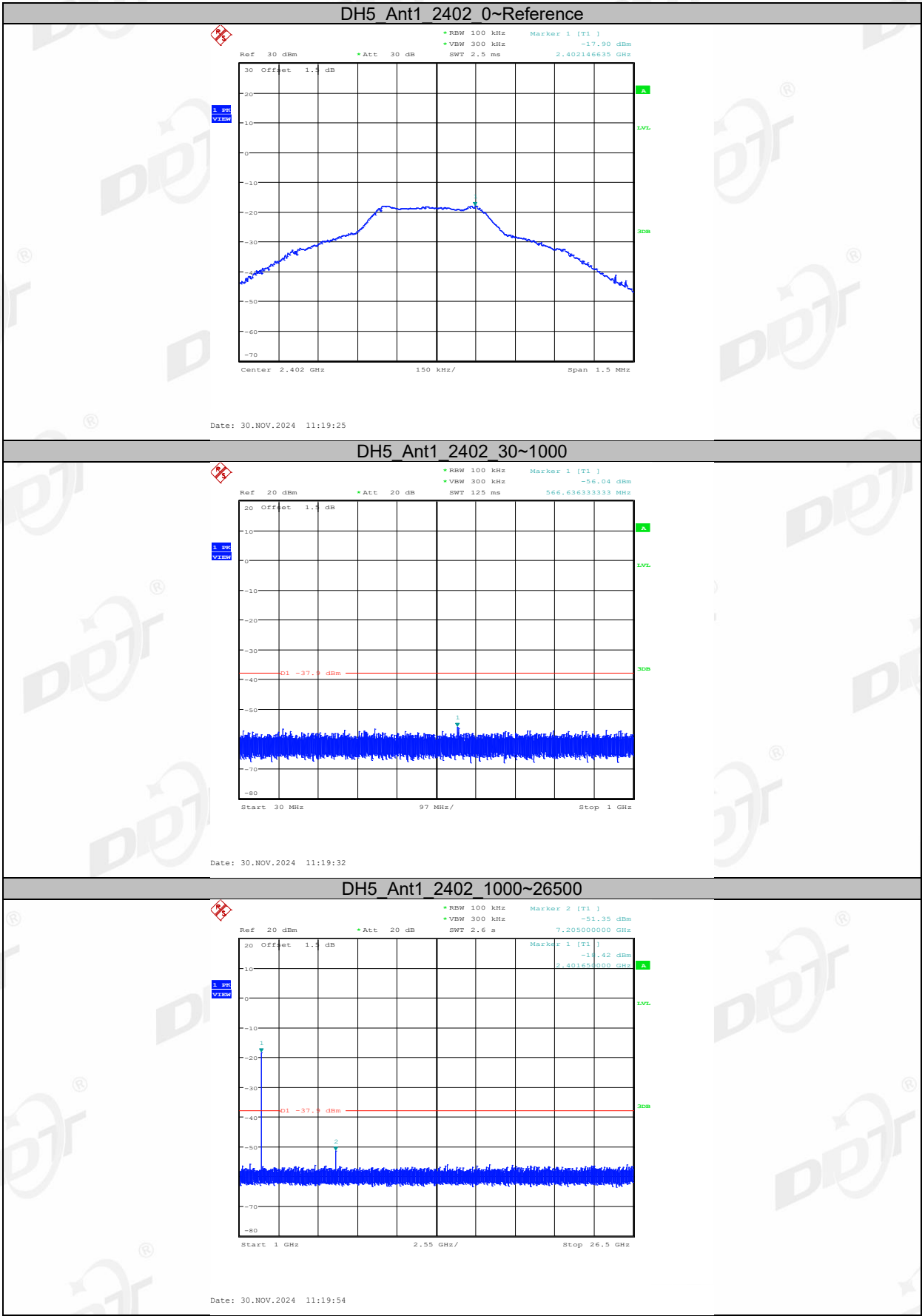
(5) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

11.4. Test result

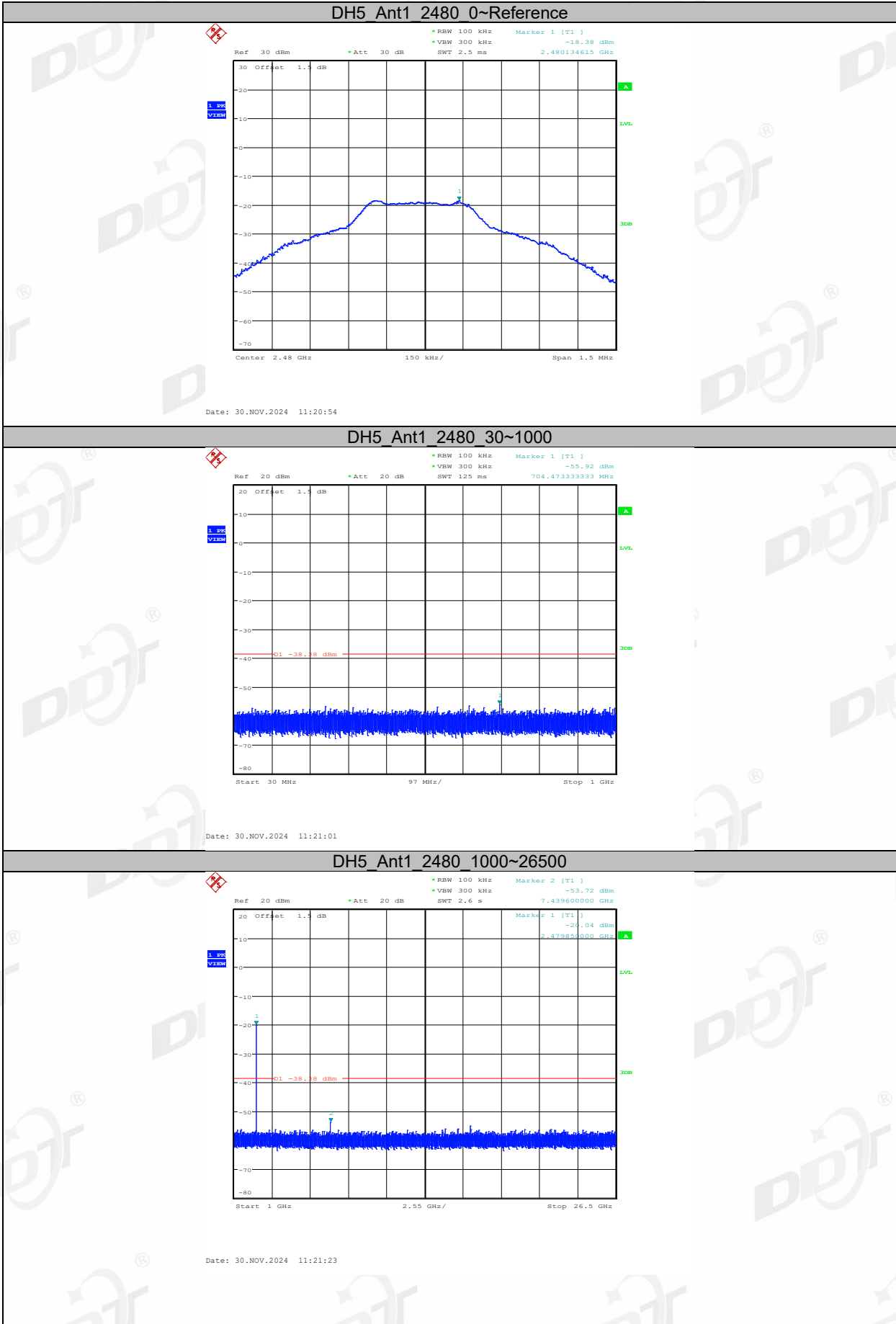
Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 2#
Ambient Condition:	25.2℃, 42%RH-25.8℃, 39%RH	Test Date:	2024.09.10-2024.11.30
Test Power Supply:	AC 120V	Sample Number:	S24072701-001

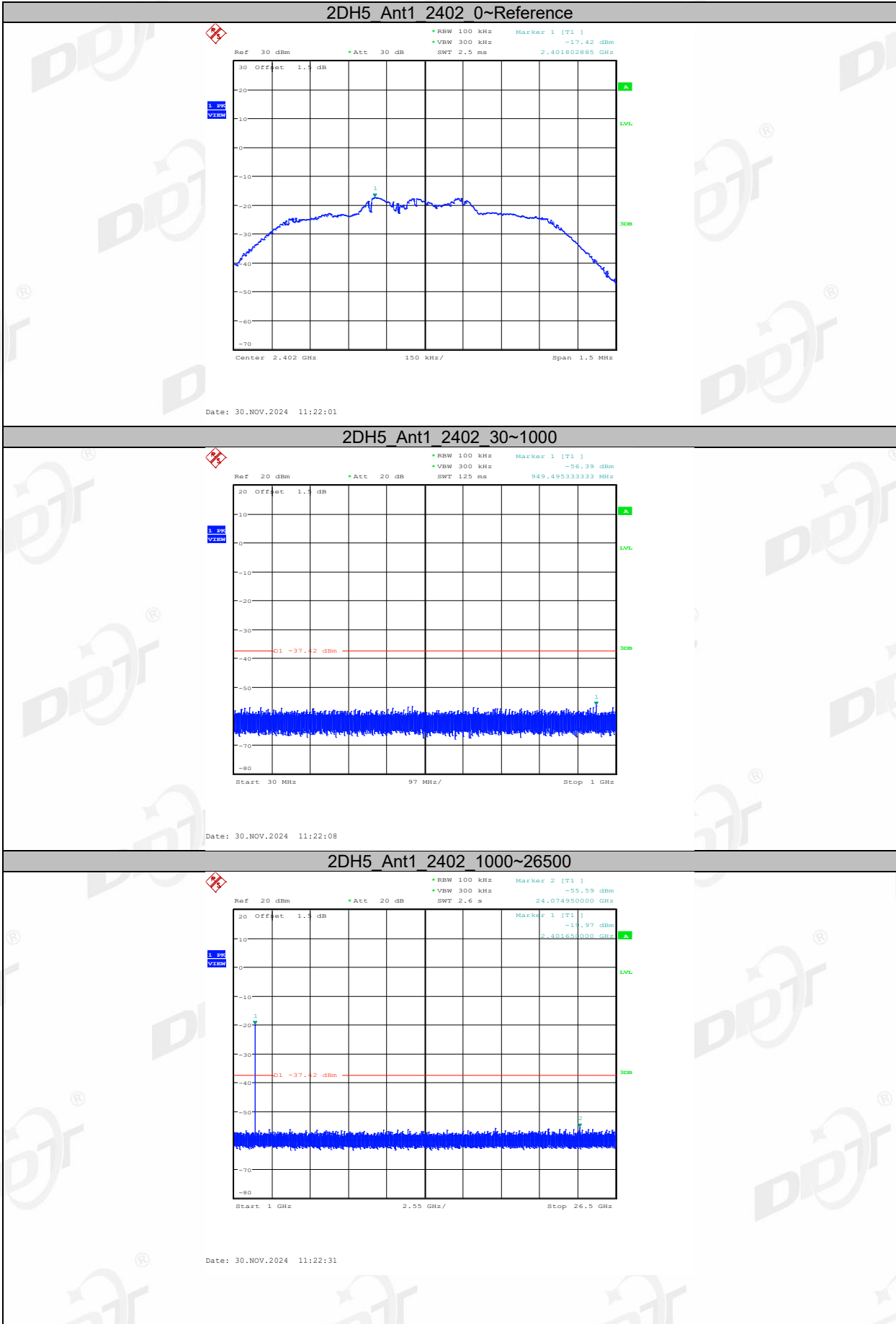
Mode	Frequency (MHz)	Verdict
DH5	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass
2DH5	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass
3DH5	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass

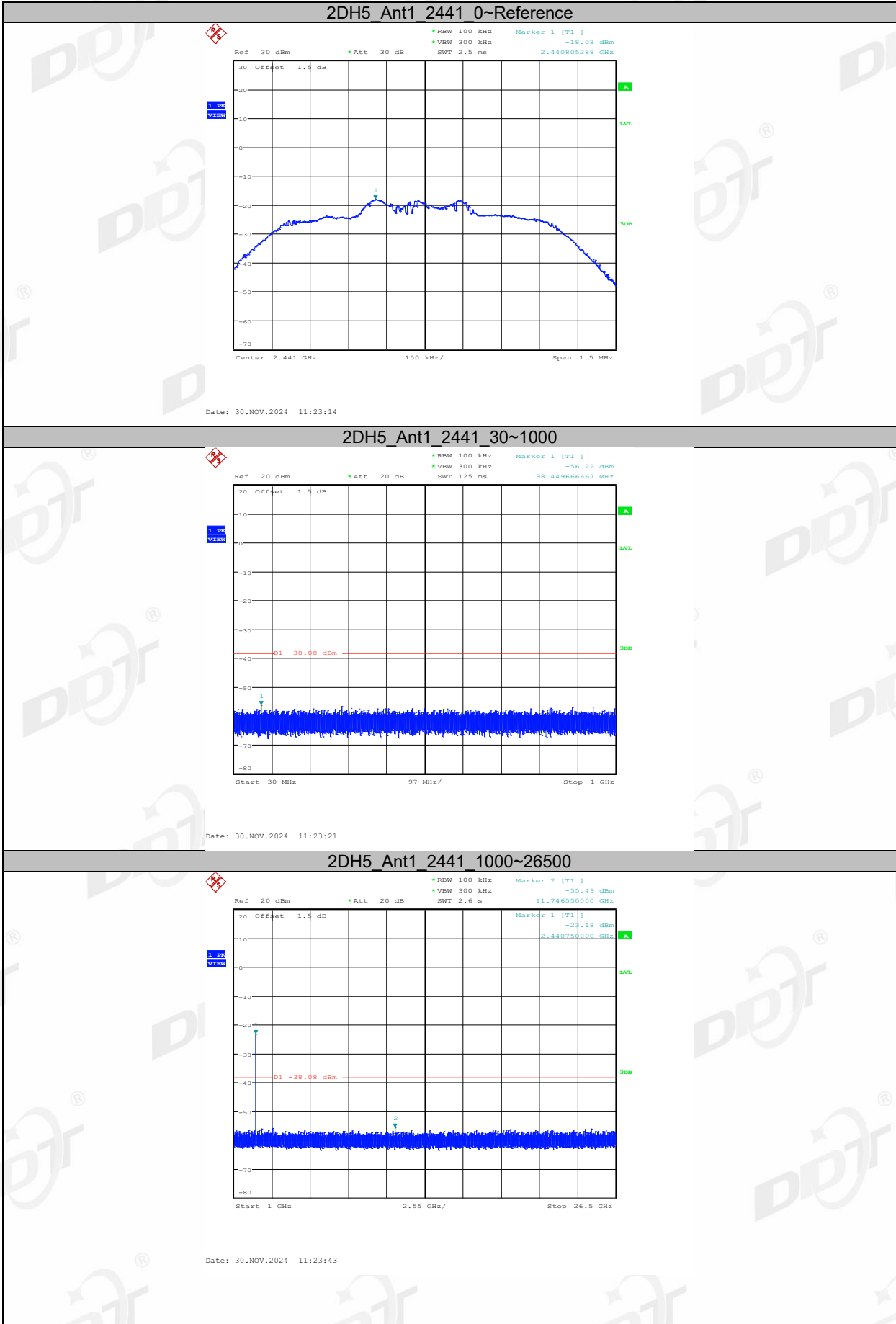
11.5. Test graphs





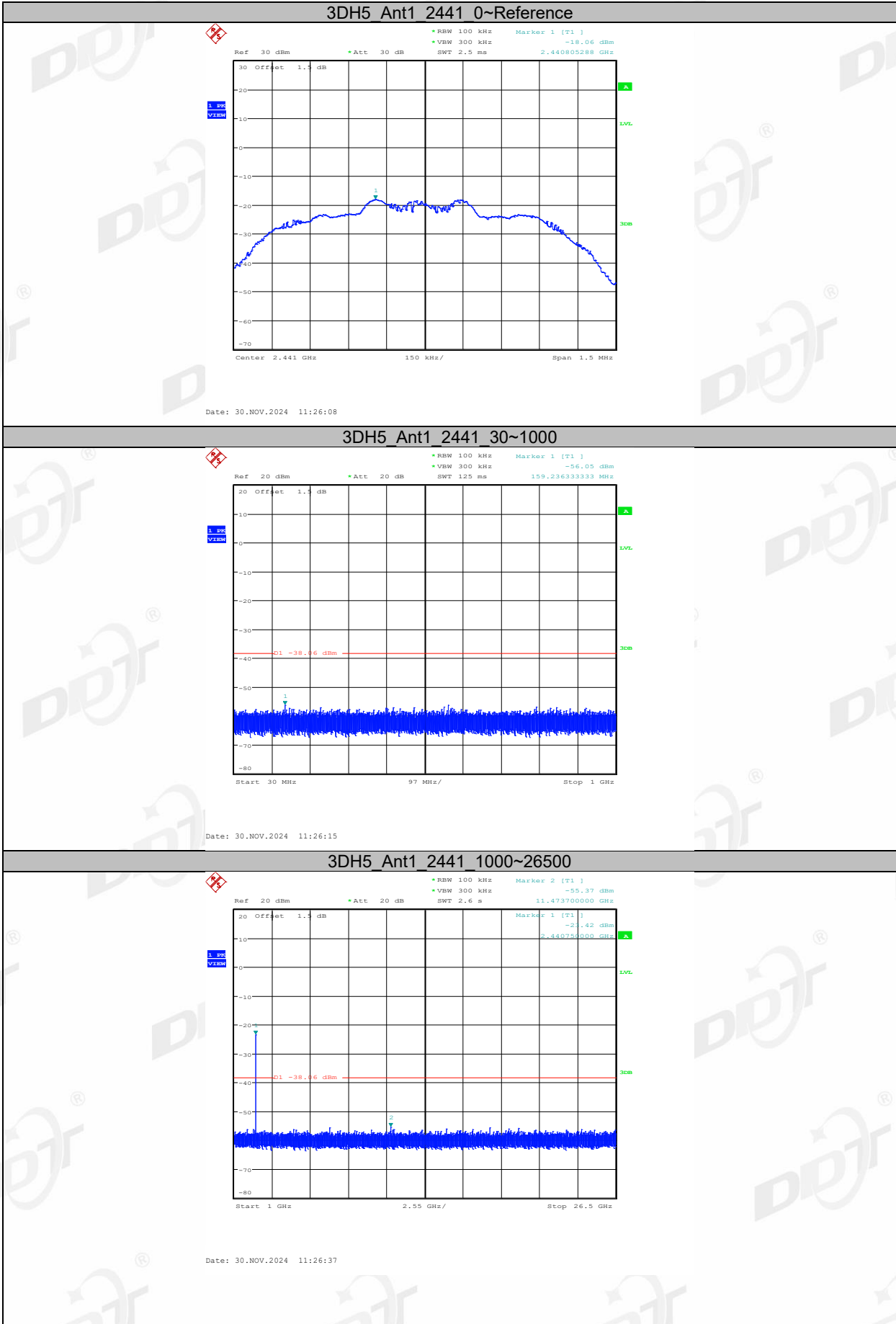


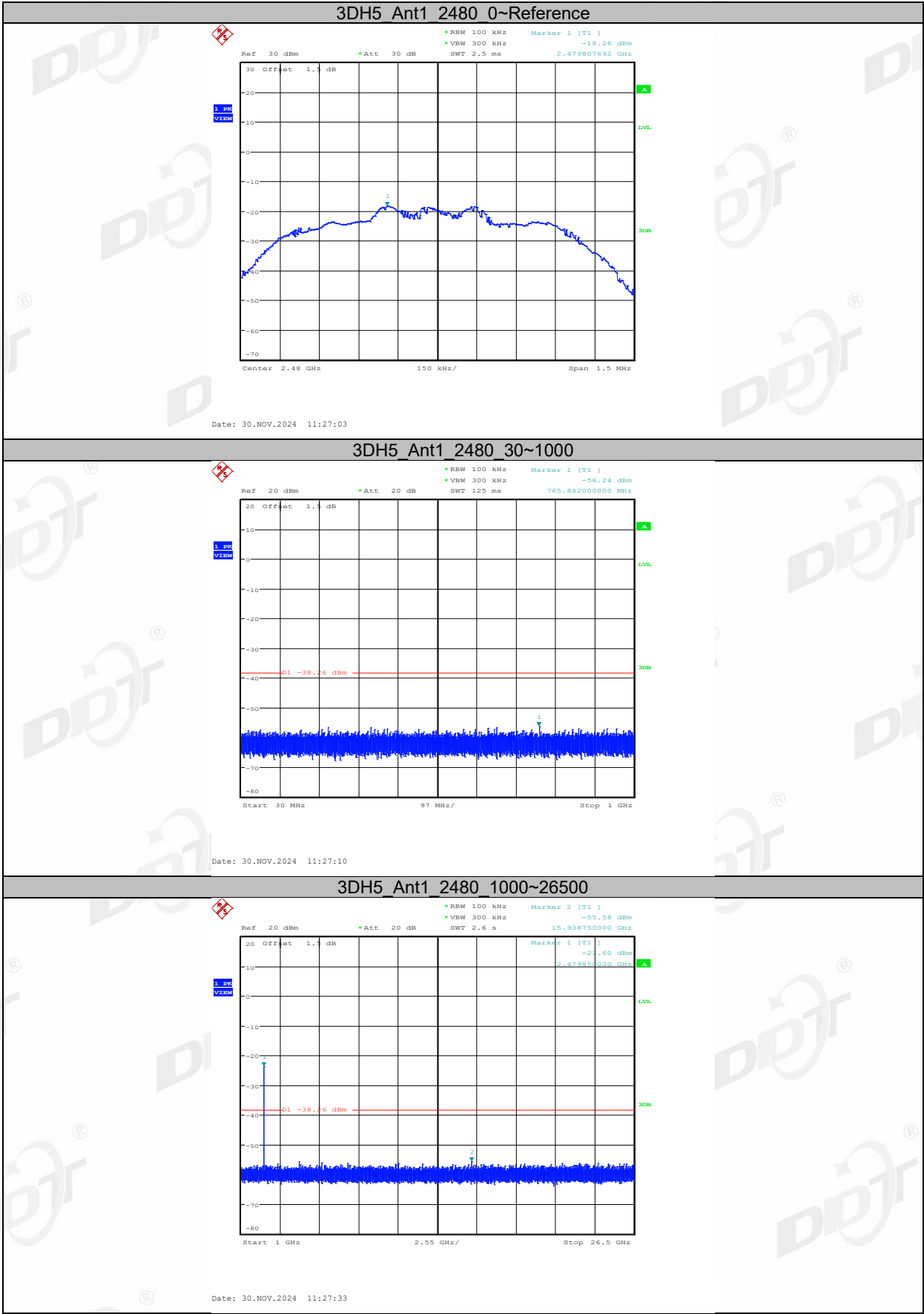






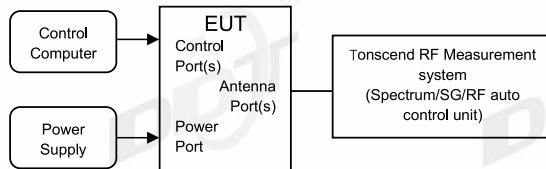






12. Duty cycle

12.1. Block diagram of test setup



12.2. Limit

Just for Report.

12.3. Test procedure

- (1) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, The cable loss and attenuator loss have been put into spectrum analyzer as amplitude offset.

set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the middle hopping channel.

Resolution BW: 10 MHz.

Video BW: 10 MHz.

Span: Zero span.

Detector: Peak.

Trace Mode: Clear Write.

Sweep: Video Trigger

- (2) When the trace is complete, measure the sending time of 1 burst and the duty cycle of 1 burst cycle.

- (3) Calculate dwell time follow below formula:

Duty cycle= Pulse's on time / Burst cycle

12.4. Test result

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 2#
Ambient Condition:	25.2℃, 42%RH	Test Date:	2024.09.10-2024.09.23
Test Power Supply:	AC 120V	Sample Number:	S24072701-001

Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor [dB]
DH5	Ant1	2402	2.91	3.77	77.19	1.12
		2441	2.91	3.77	77.19	1.12
		2480	2.91	3.77	77.19	1.12
2DH5	Ant1	2402	2.89	3.76	76.86	1.14
		2441	2.91	3.77	77.19	1.12
		2480	2.90	3.77	76.92	1.14
3DH5	Ant1	2402	2.89	3.75	77.07	1.13
		2441	2.89	3.76	76.86	1.14
		2480	2.91	3.78	76.98	1.14

12.5. Test graphs

