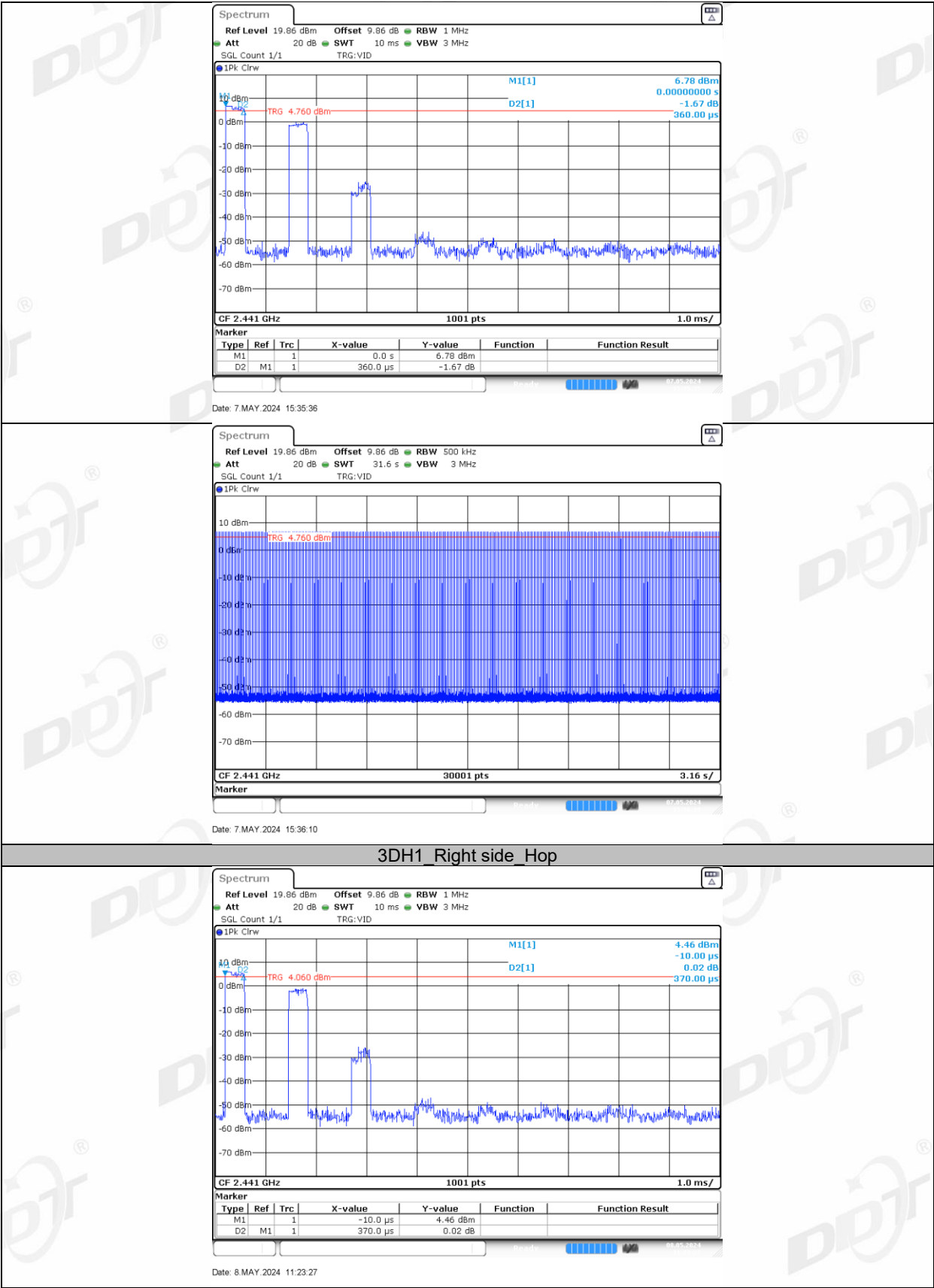
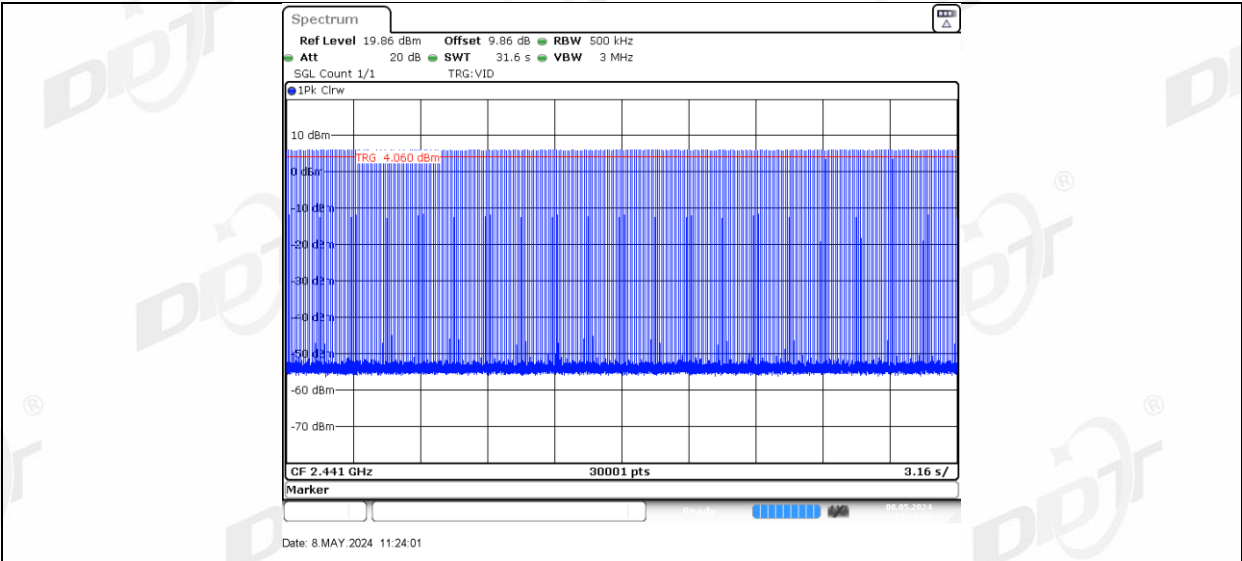
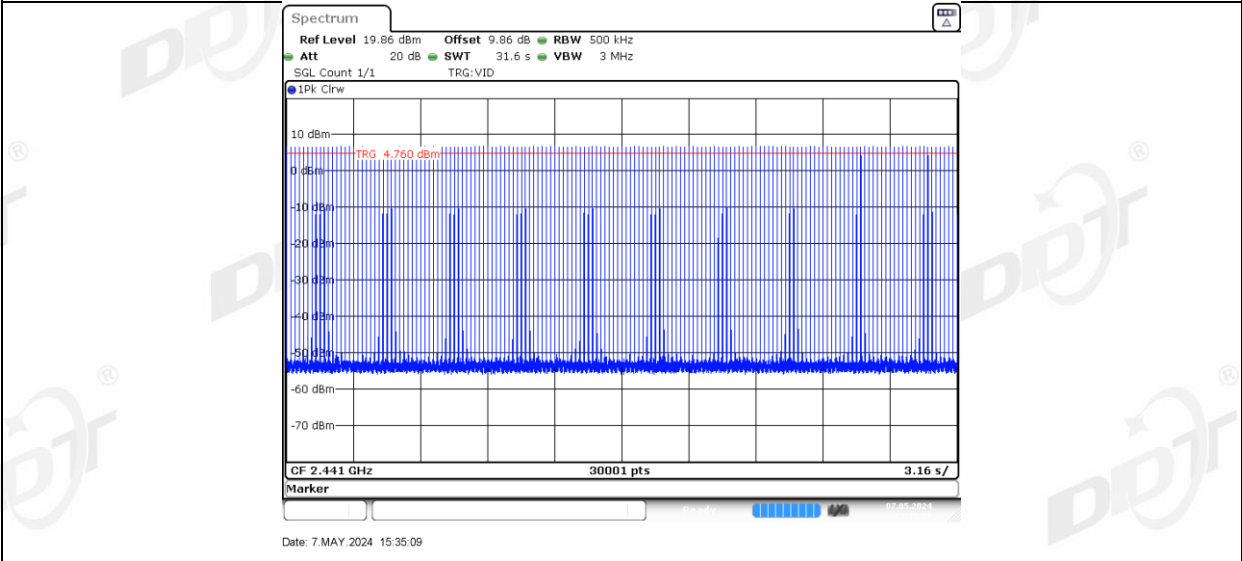
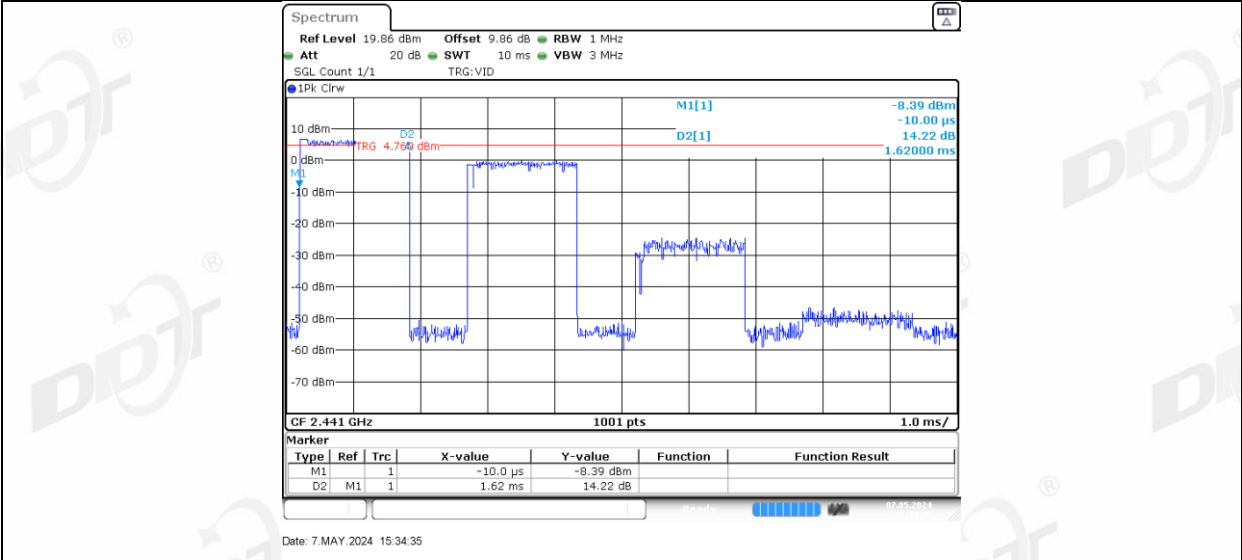


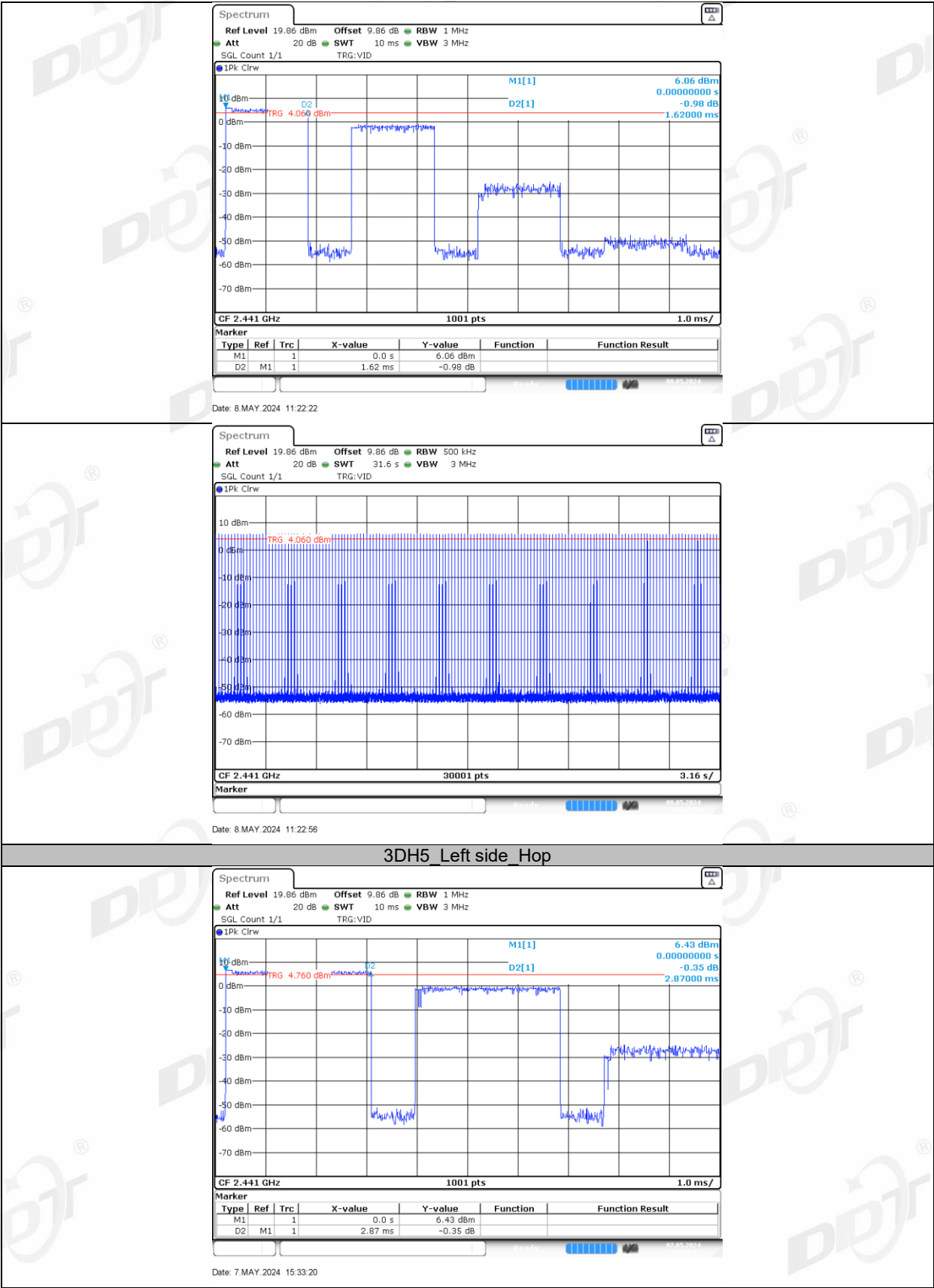


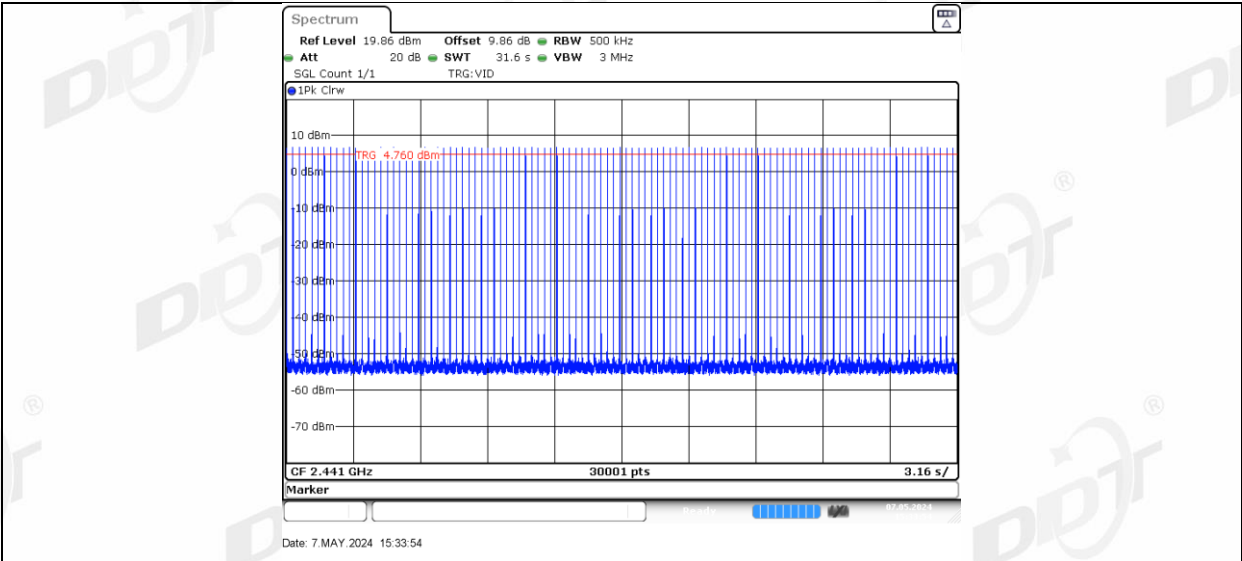


3DH3_Left side_Hop

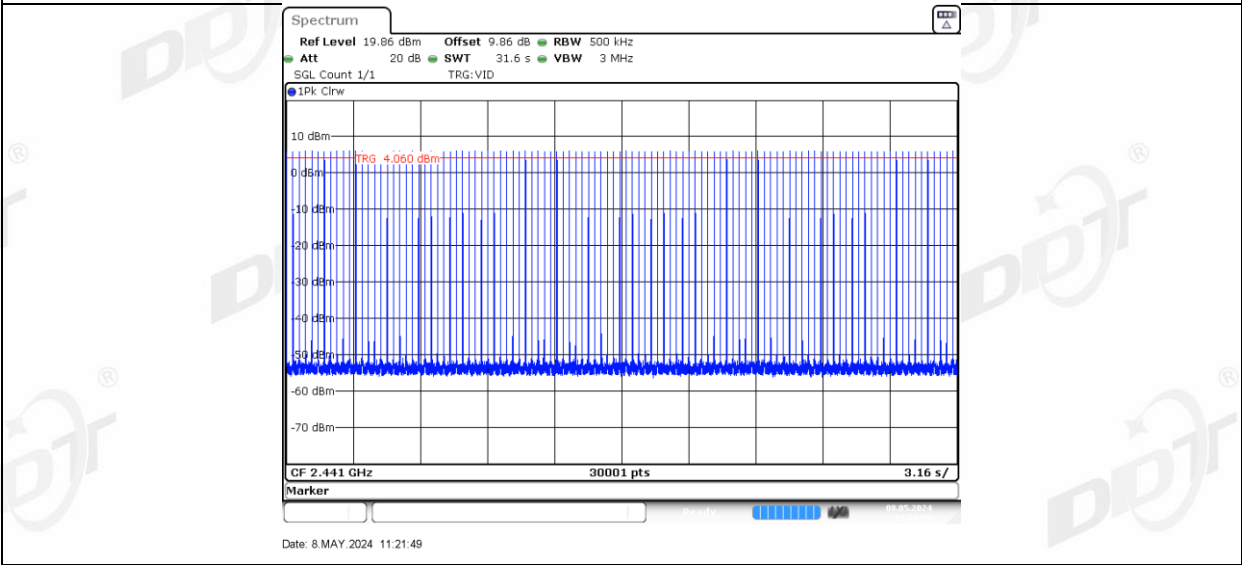
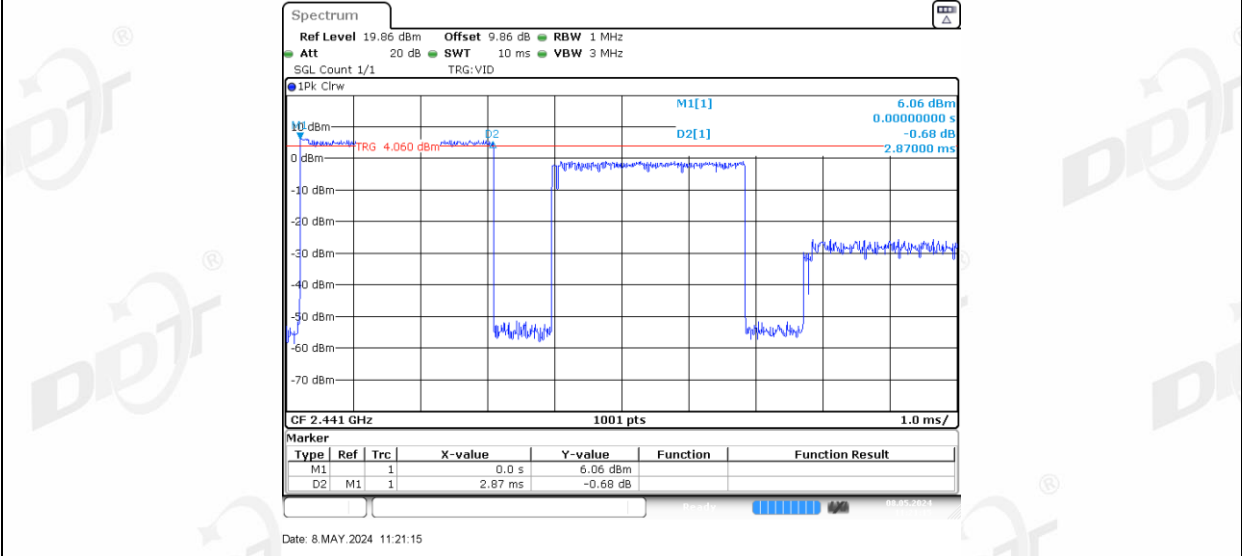


3DH3_Right side_Hop



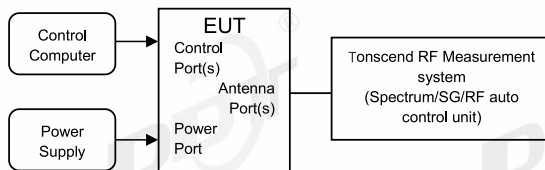


3DH5_Right side_Hop



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

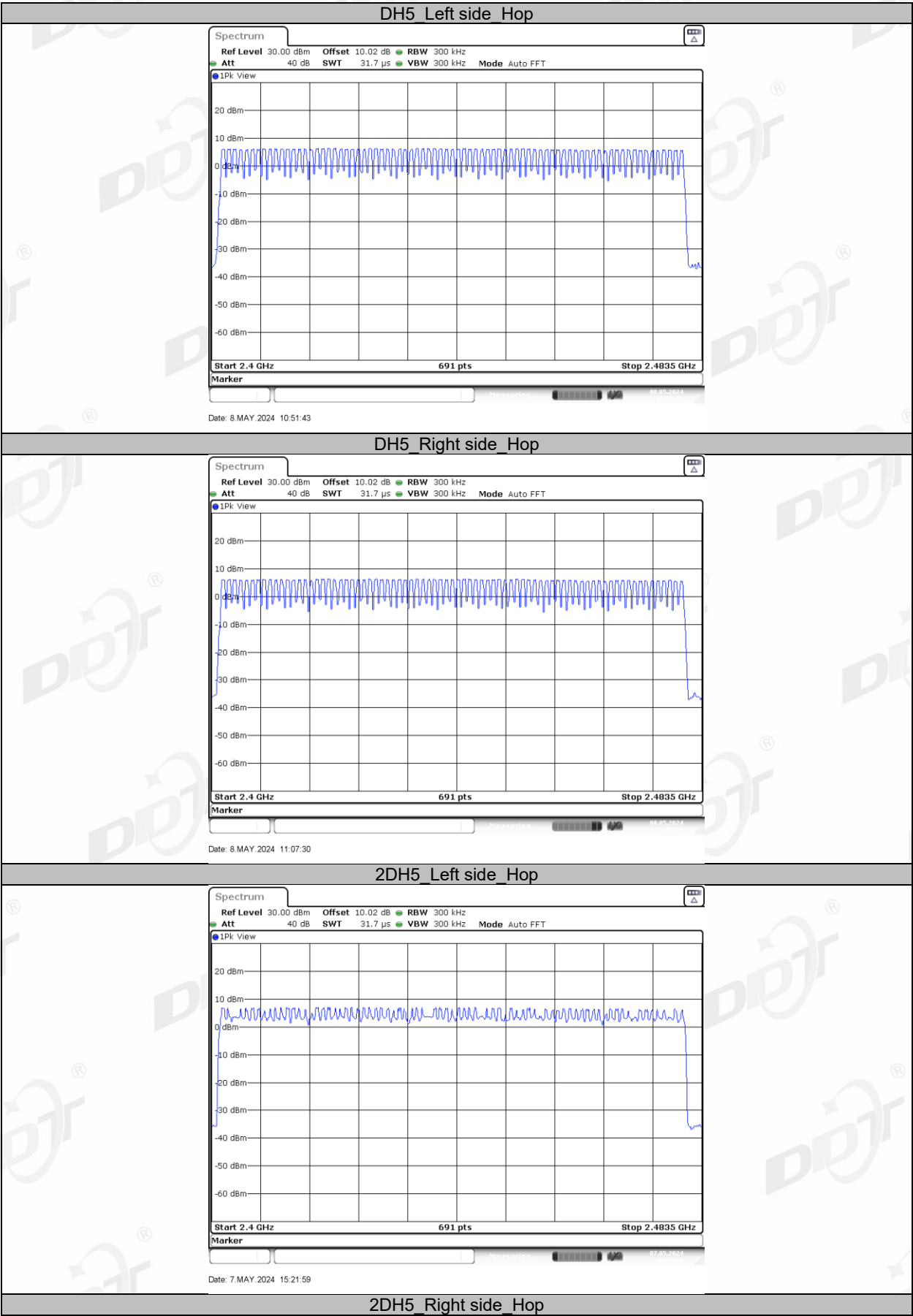
- (5) Measure the hopping number and record the results in the report.
- (6) Measure and record the results in the report.

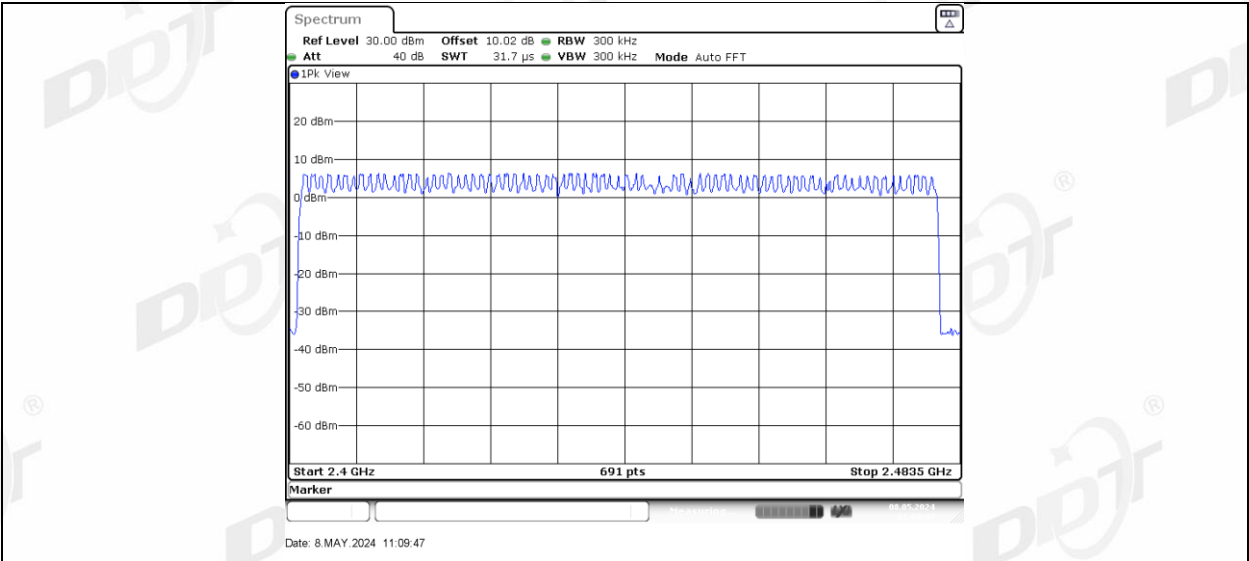
9.4. Test result

Test Engineer:	Zhongyao	Test Site:	RF Measurement System 3#
Ambient Condition:	24.4-25.3℃,47.5-47.9%RH	Test Date:	2024.05.07-2024.05.08
Test Power Supply:	Battery	Sample Number:	S24020411-012

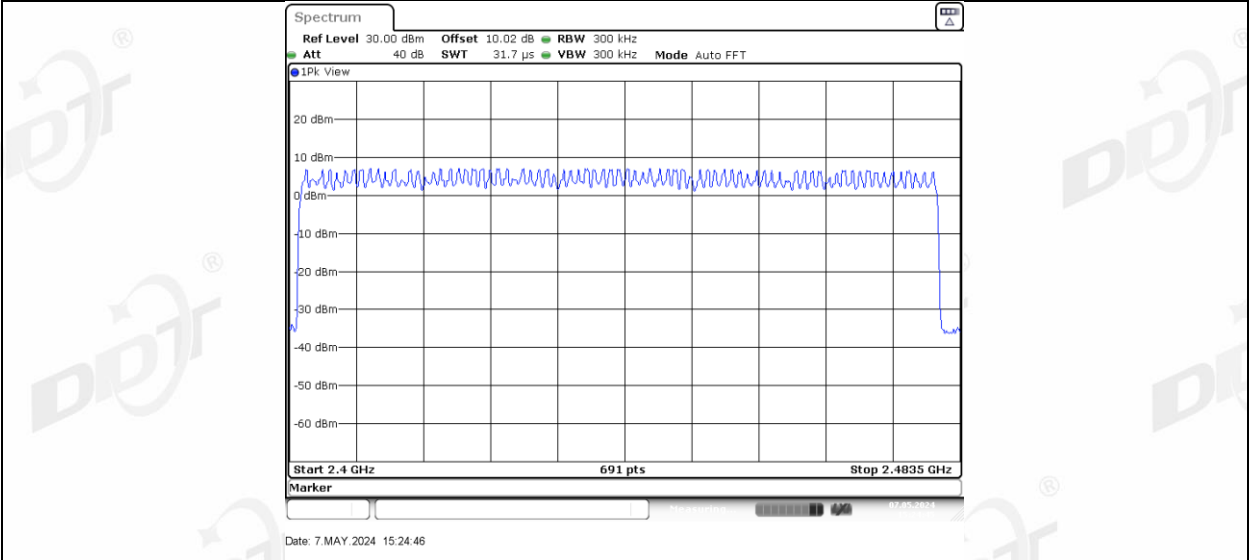
Test Mode	Antenna	Frequency [MHz]	Result [Num]	Limit [Num]	Verdict
DH5	Left side	Hop	79	≥15	PASS
	Right side	Hop	79	≥15	PASS
2DH5	Left side	Hop	79	≥15	PASS
	Right side	Hop	79	≥15	PASS
3DH5	Left side	Hop	79	≥15	PASS
	Right side	Hop	79	≥15	PASS

9.5.Test graphs

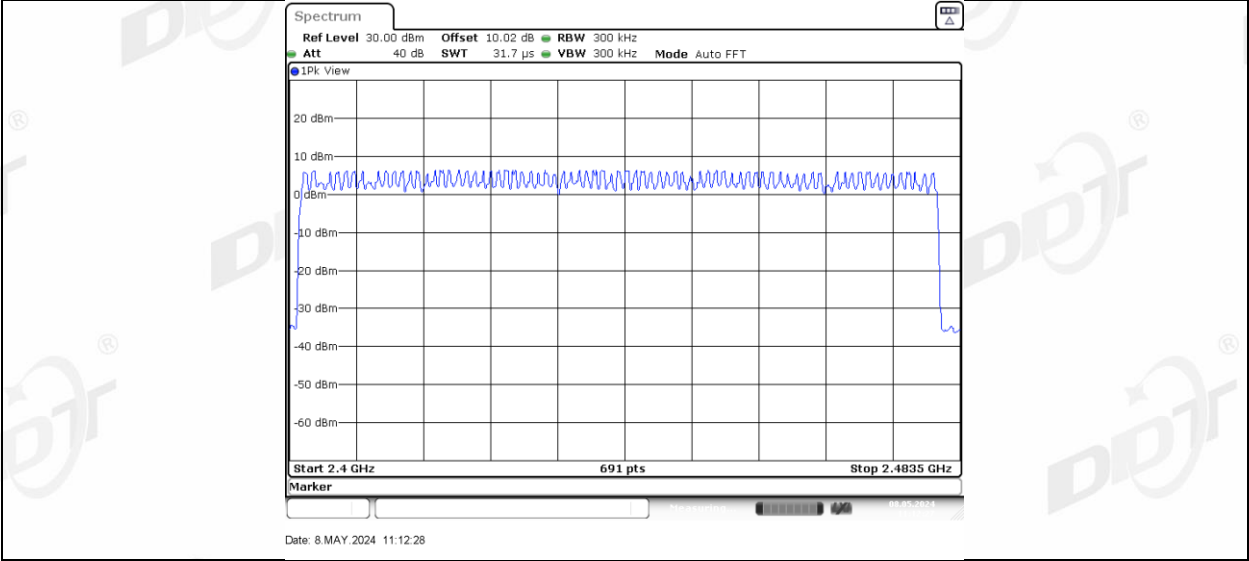




3DH5_Left side_Hop

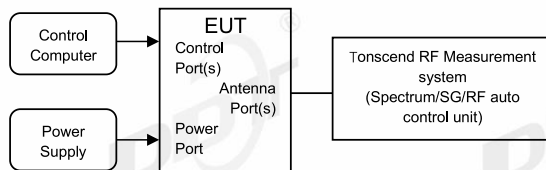


3DH5_Right side_Hop



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.

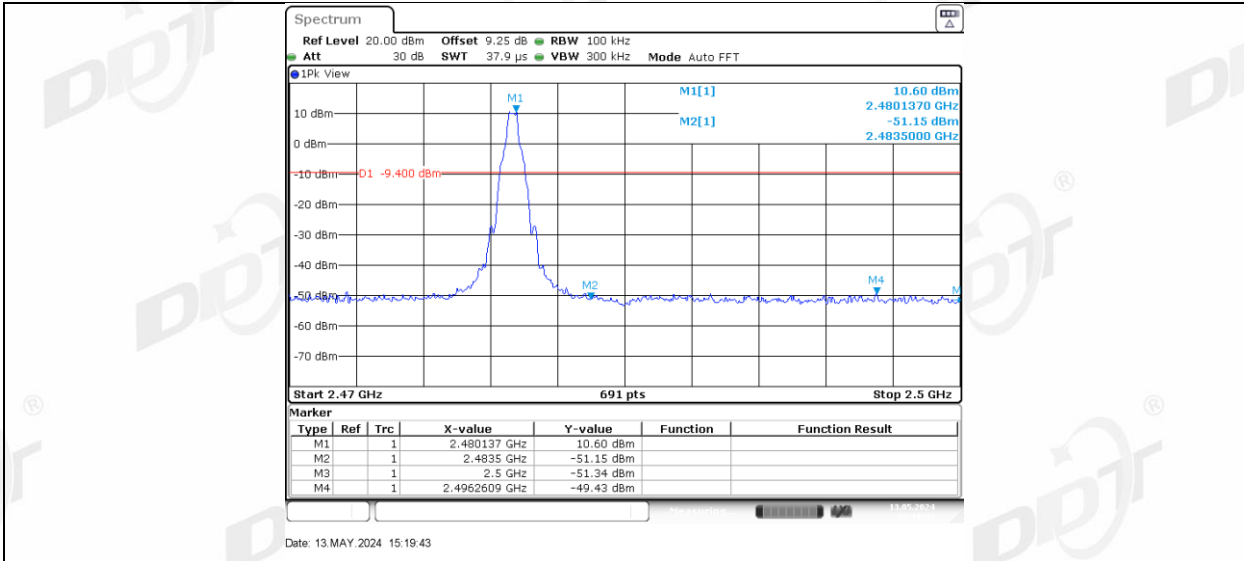
10.4. Test result

Test Engineer:	Zhongyao	Test Site:	RF Measurement System 3#
Ambient Condition:	25.3℃, 47.9%RH	Test Date:	2024.05.13
Test Power Supply:	Battery	Sample Number:	S24020411-012

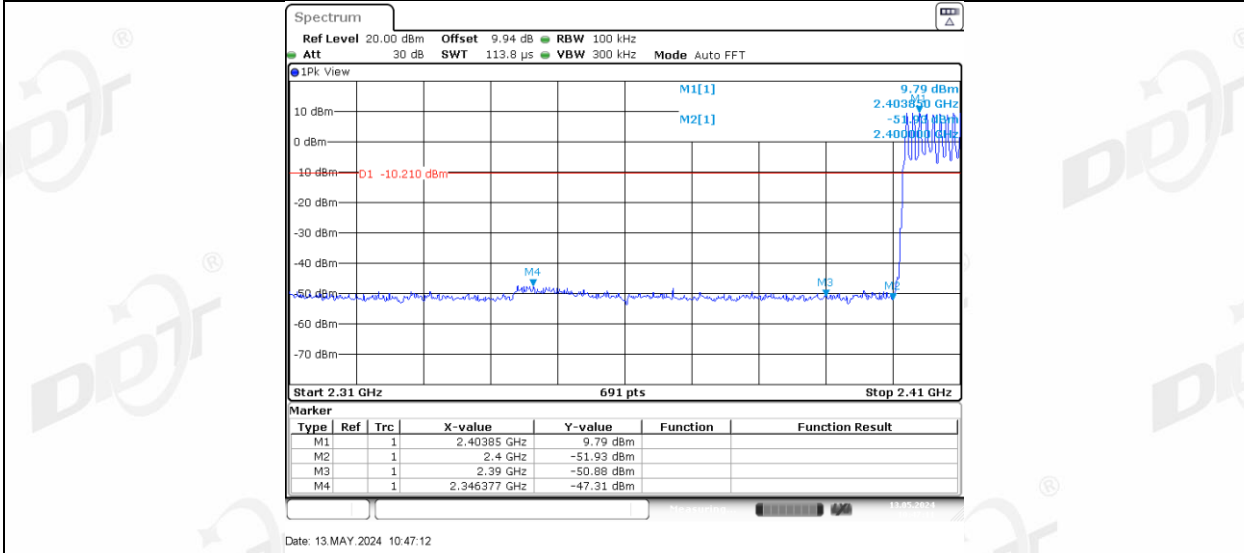
Mode	Freq. (MHz)	Verdict
GFSK	Hopping off 2402	Pass
	Hopping off 2480	Pass
	Hopping on	Pass
$\pi/4$ -DQPSK	Hopping off 2402	Pass
	Hopping off 2480	Pass
	Hopping on	Pass
8DPSK	Hopping off 2402	Pass
	Hopping off 2480	Pass
	Hopping on	Pass

10.5. Test graphs

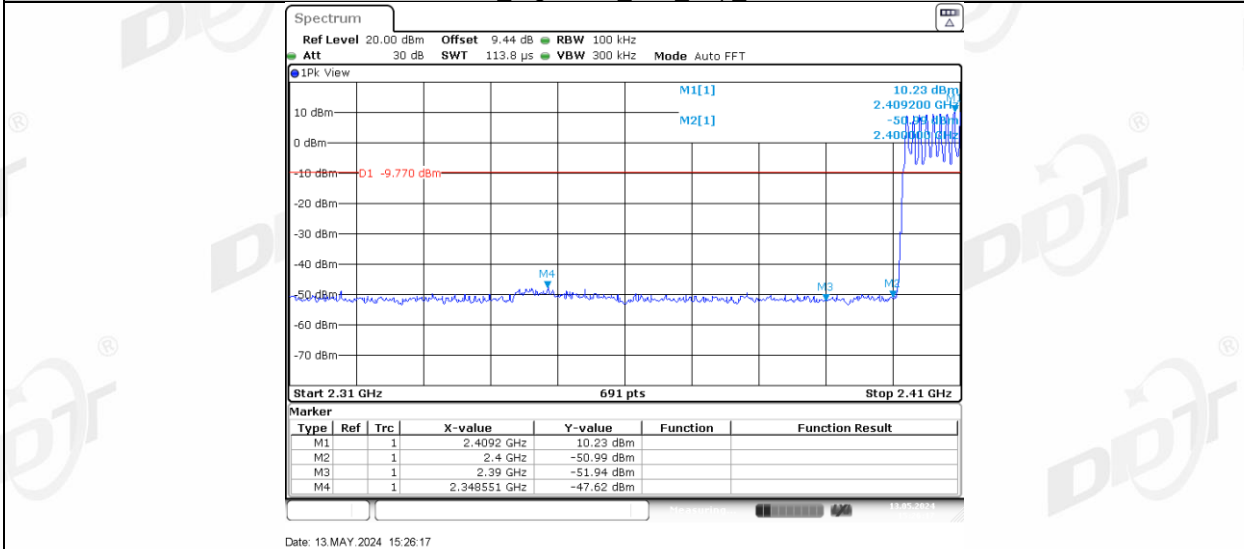




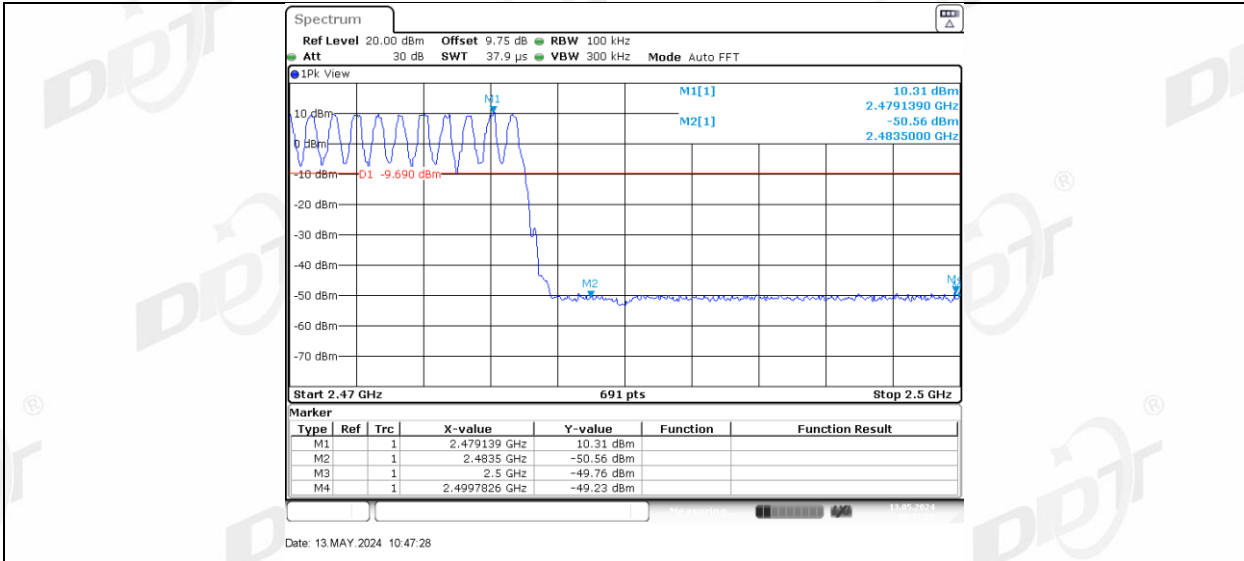
DH5 Left side Low Hop 2402



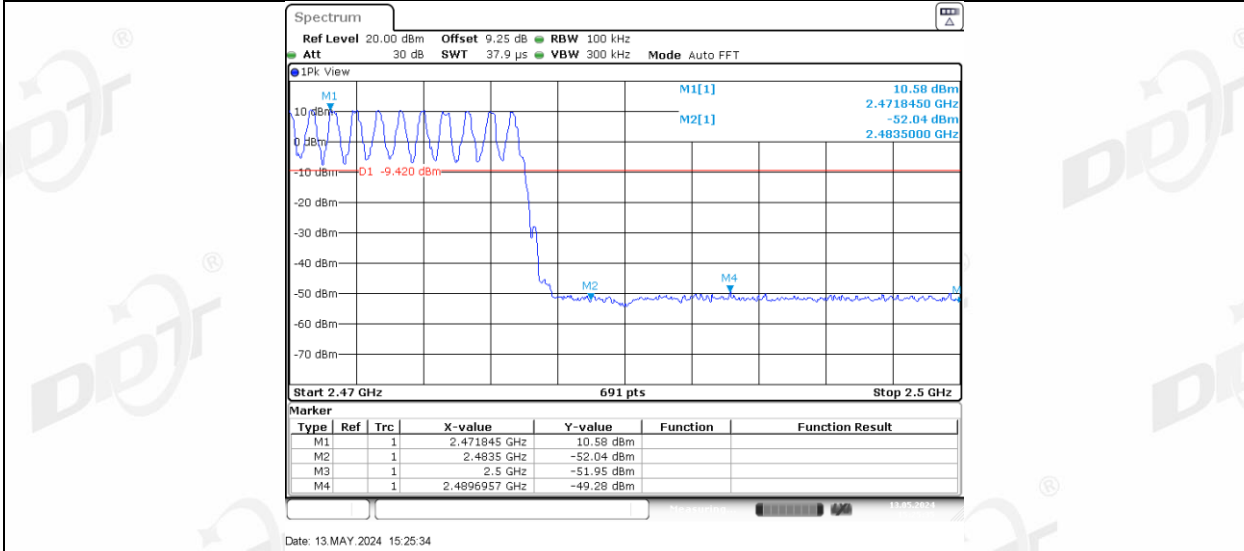
DH5 Right side Low Hop 2402



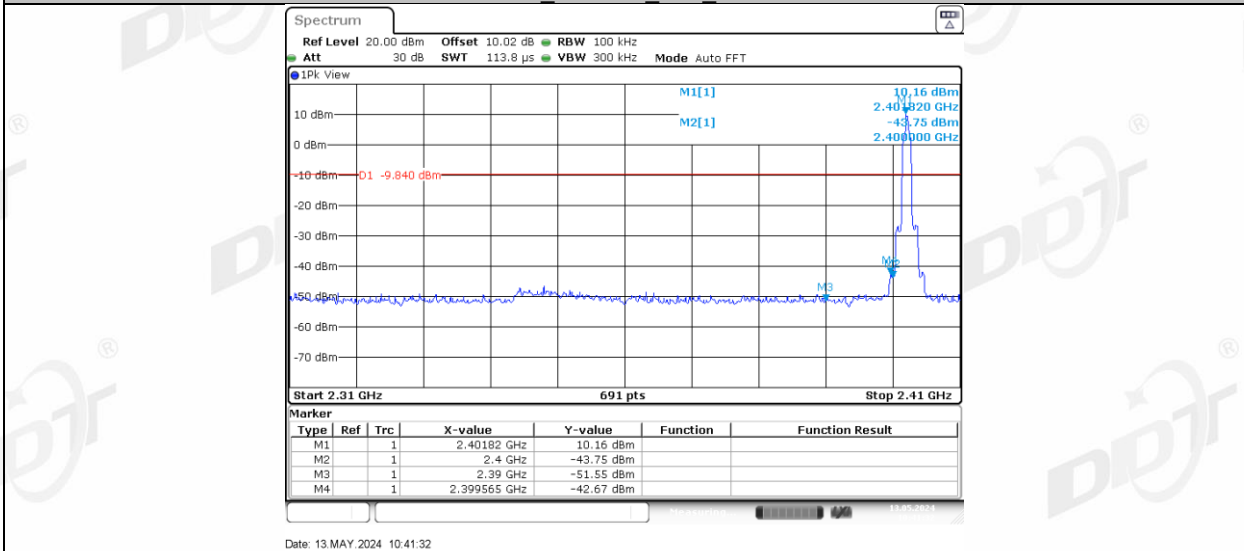
DH5 Left side High Hop 2480



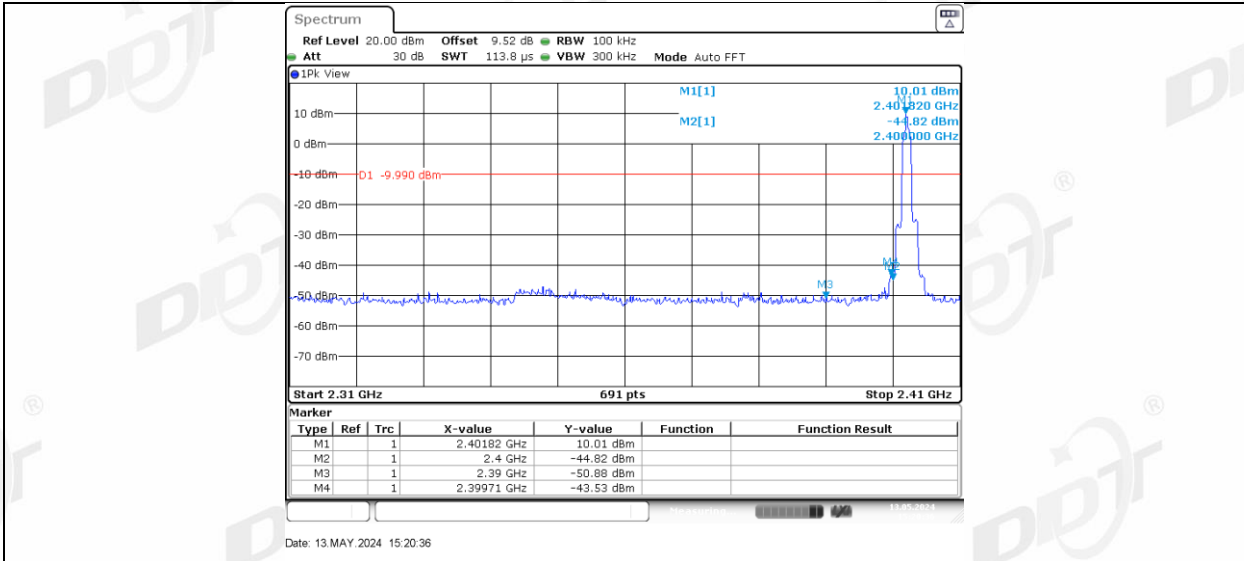
DH5 Right side High Hop 2480



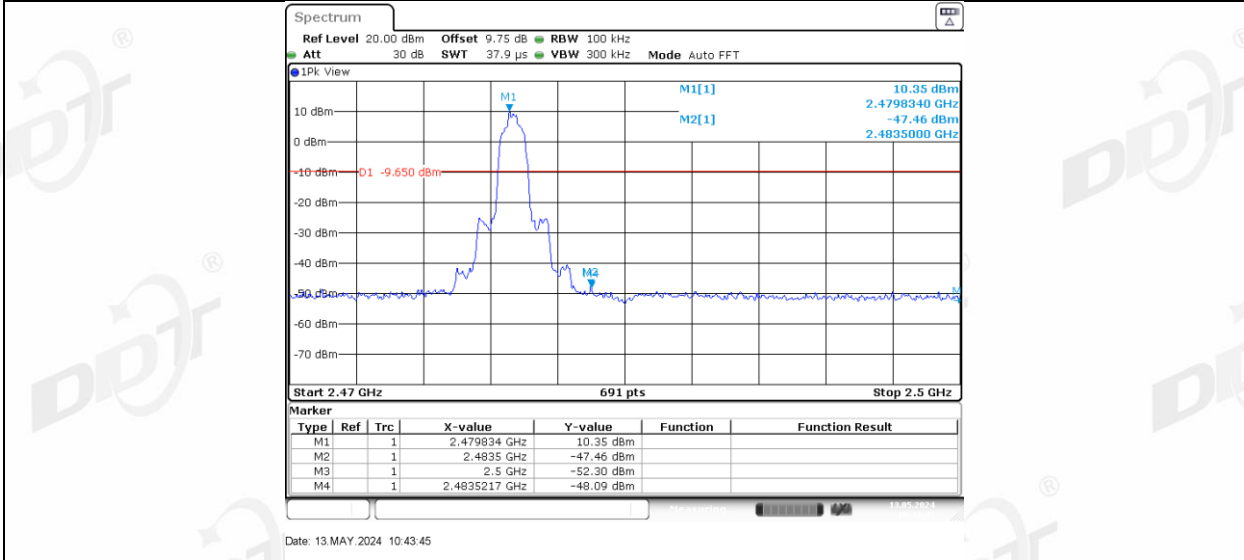
2DH5 Left side Low 2402



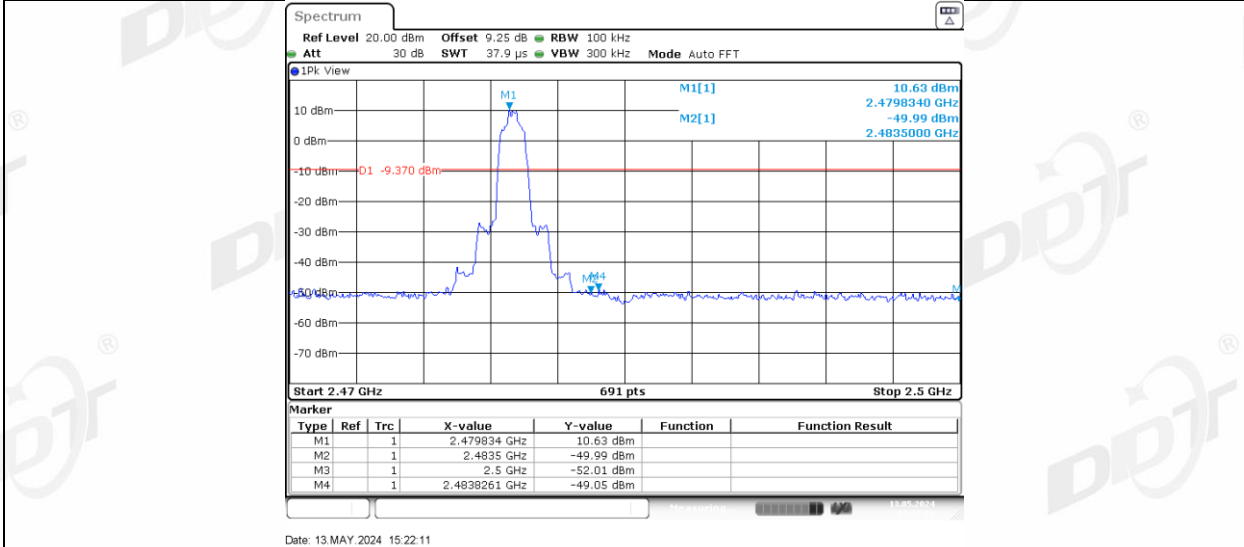
2DH5 Right side Low 2402



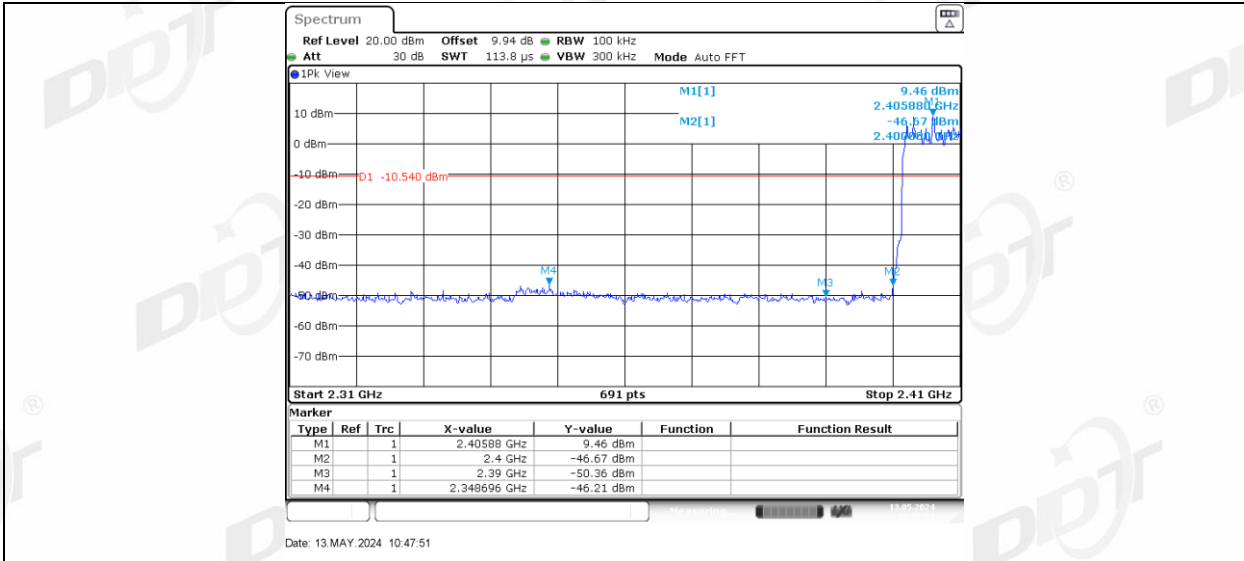
2DH5_Left side_High_2480



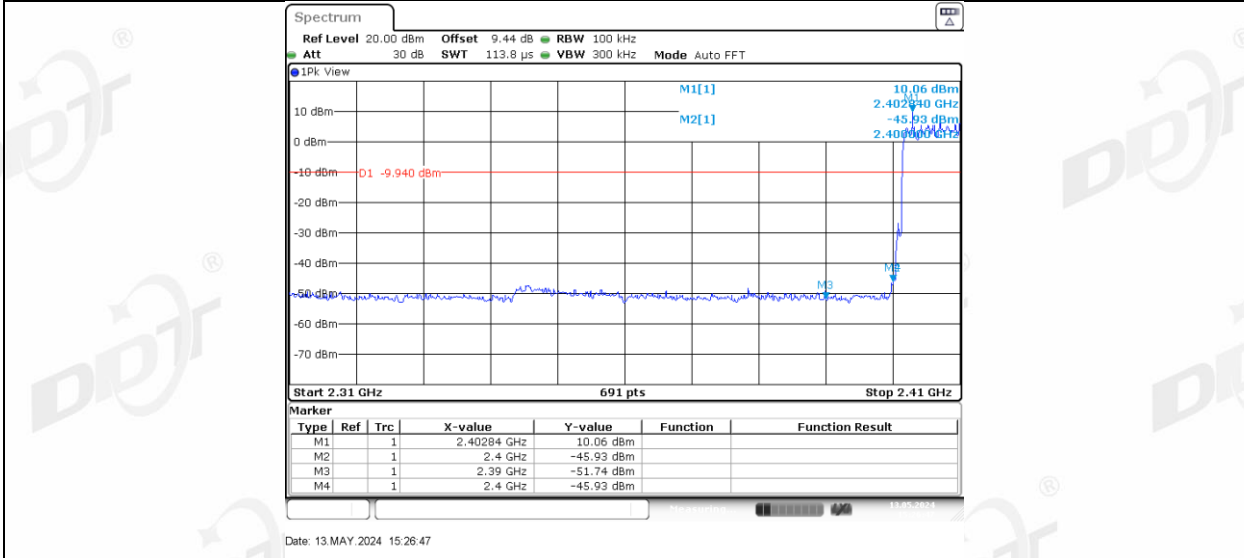
2DH5_Right side_High_2480



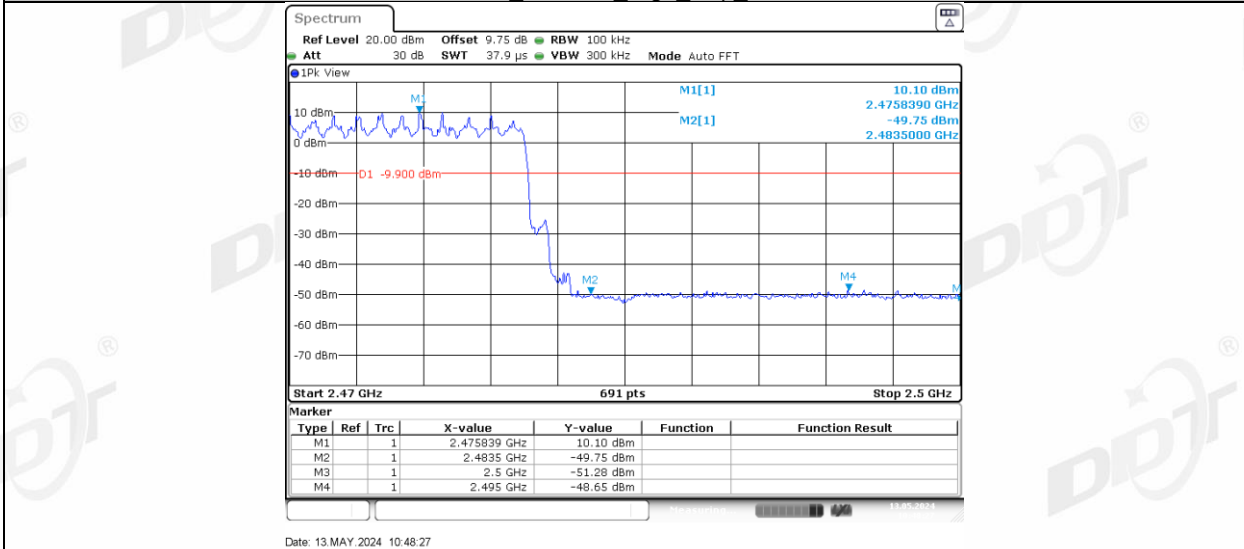
2DH5_Left side_Low_Hop_2402



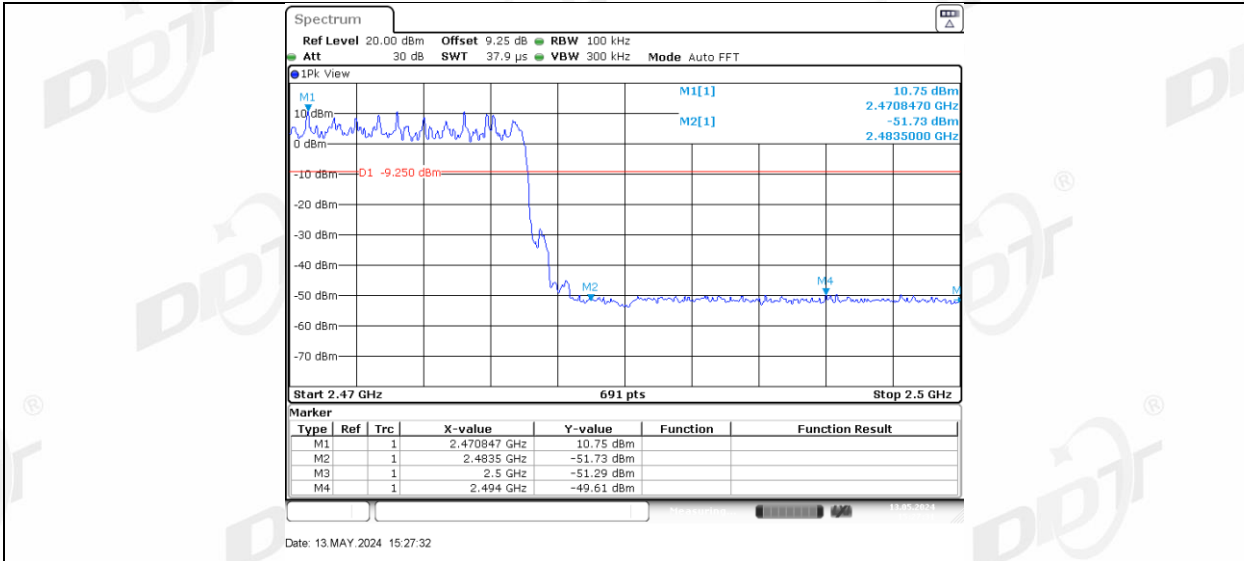
2DH5_Right side_Low_Hop_2402



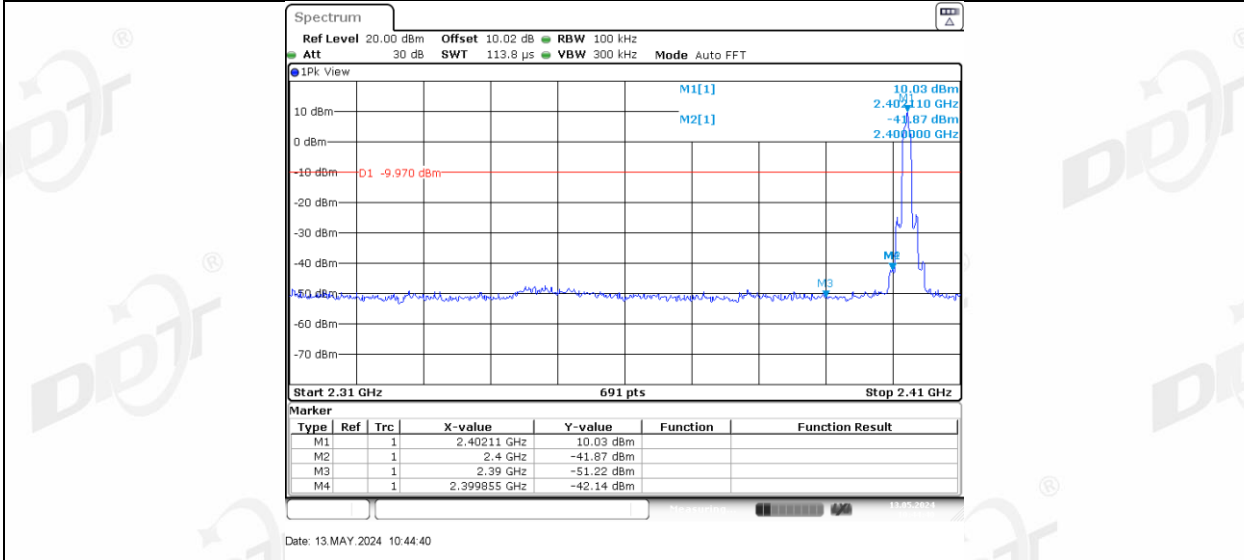
2DH5_Left side_High_Hop_2480



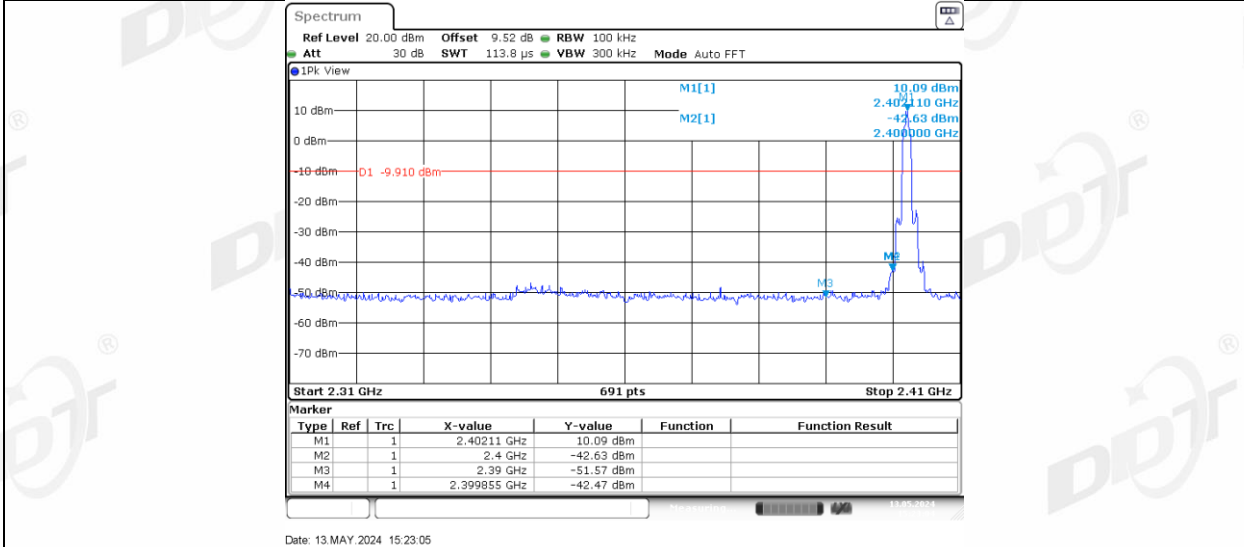
2DH5_Right side_High_Hop_2480



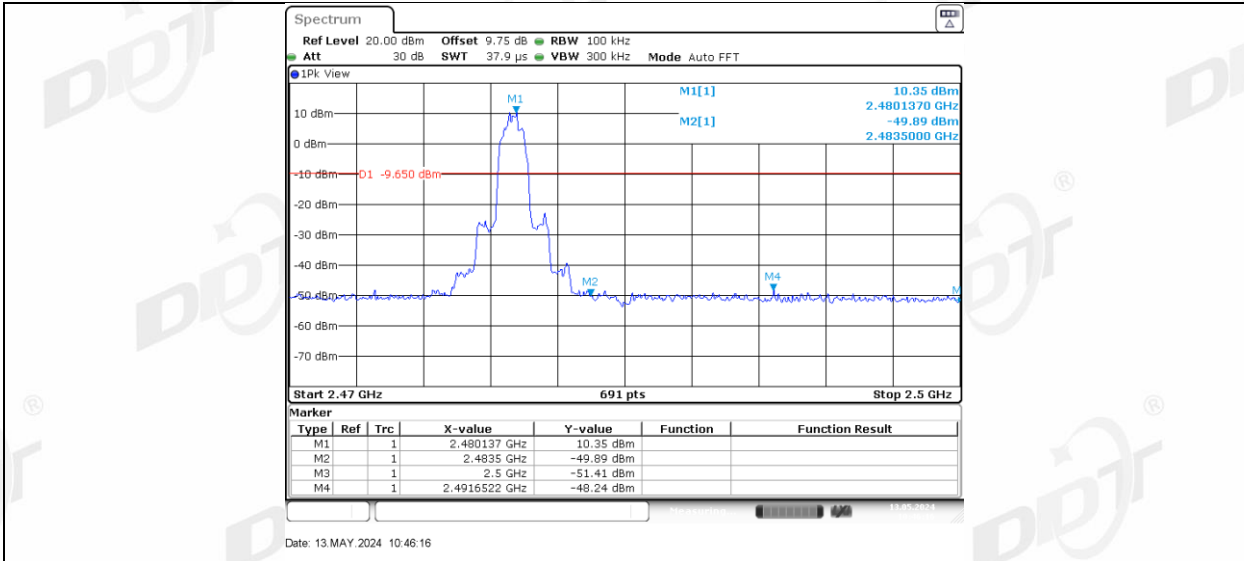
3DH5 Left side Low 2402



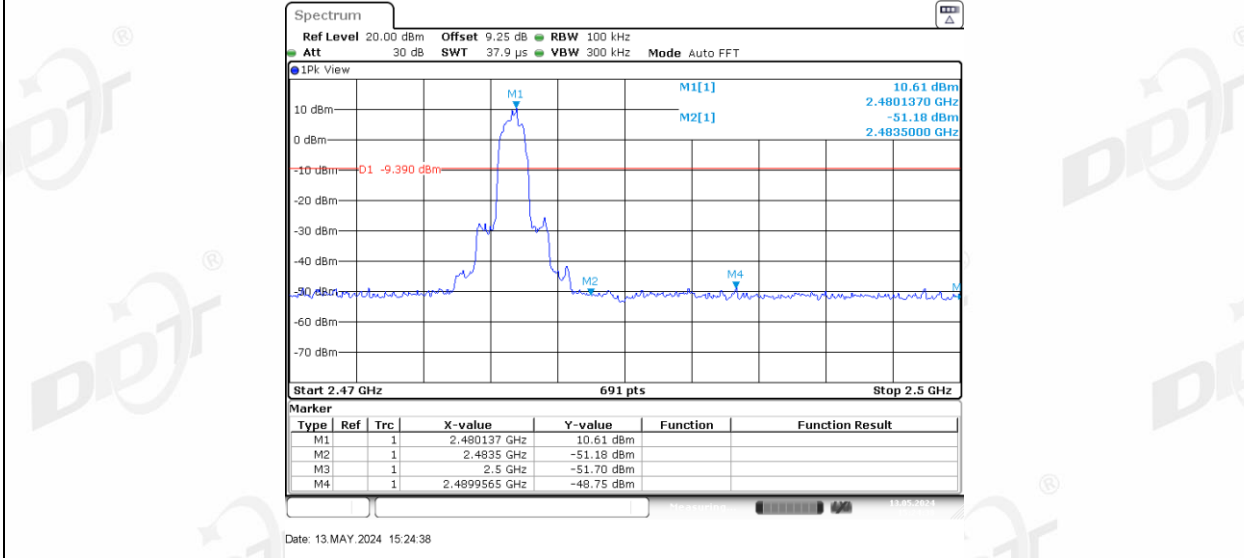
3DH5 Right side Low 2402



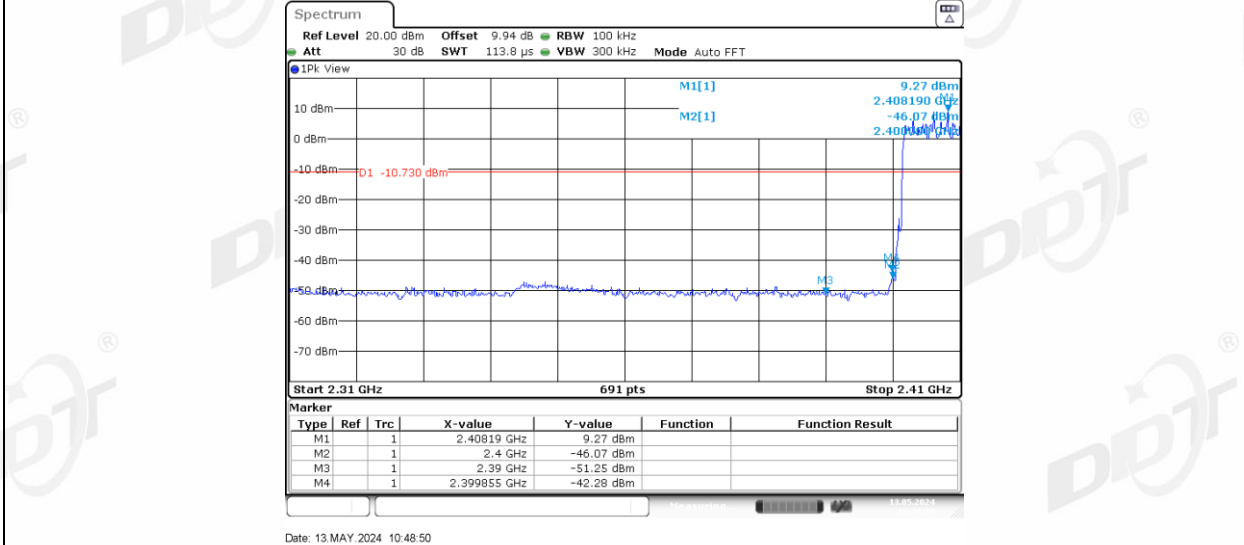
3DH5 Left side High 2480



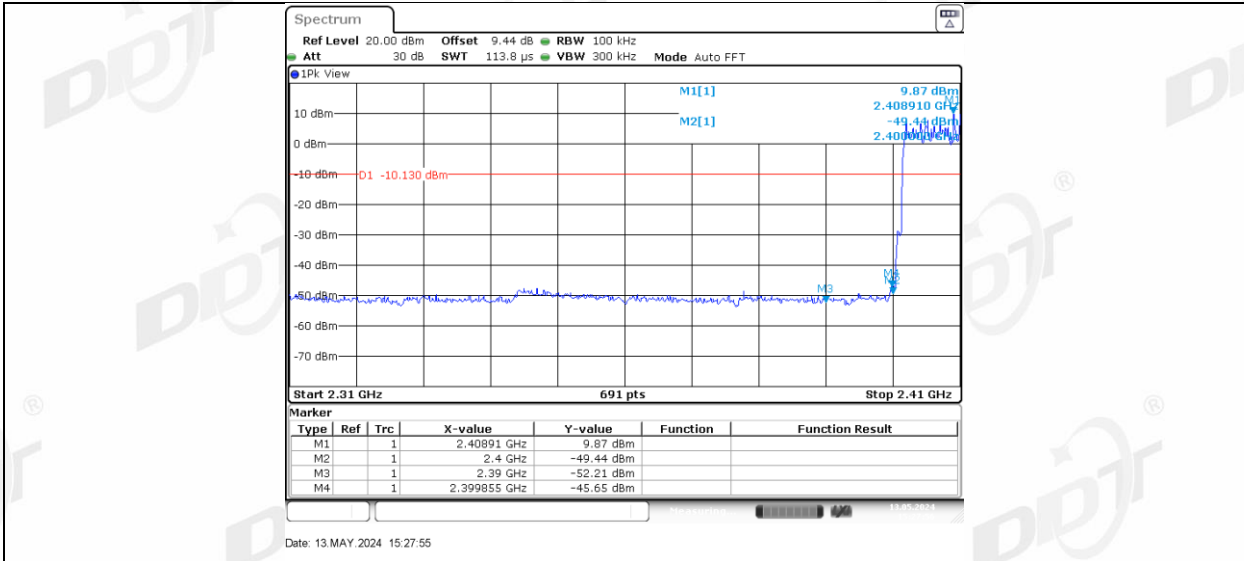
3DH5 Right side High 2480



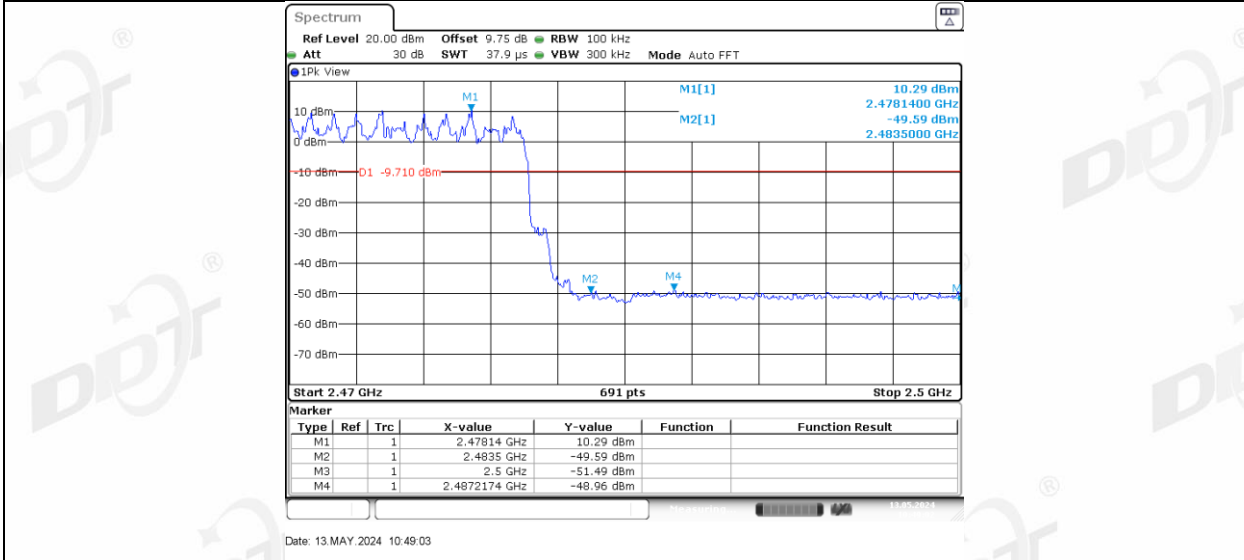
3DH5 Left side Low Hop 2402



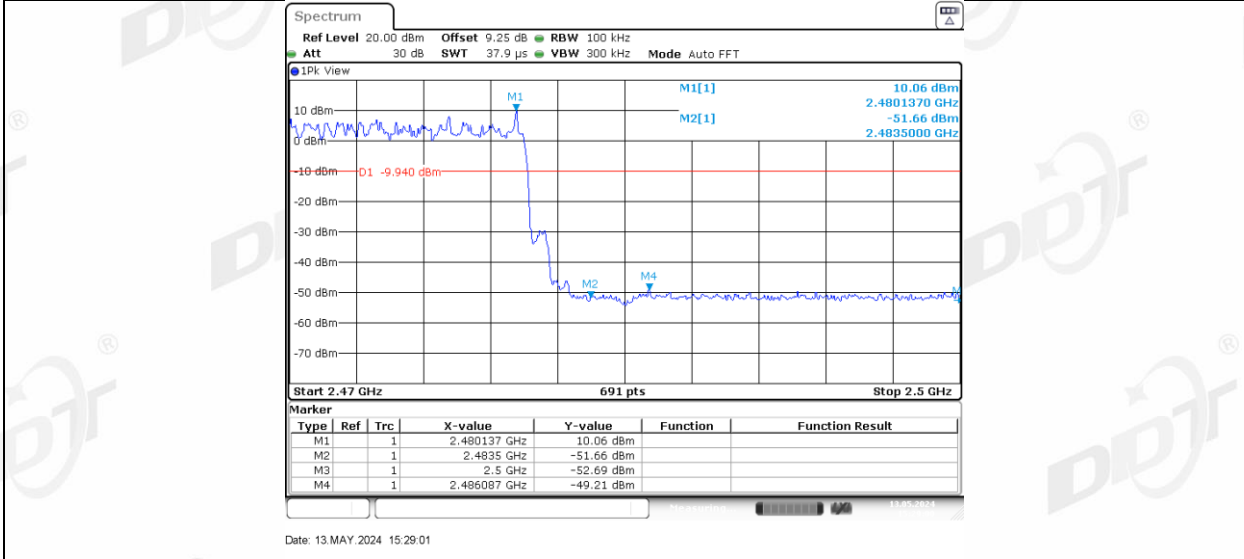
3DH5 Right side Low Hop 2402



3DH5 Left side High Hop 2480

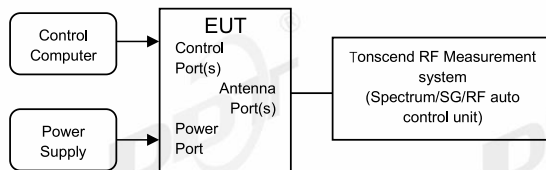


3DH5 Right side High Hop 2480



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

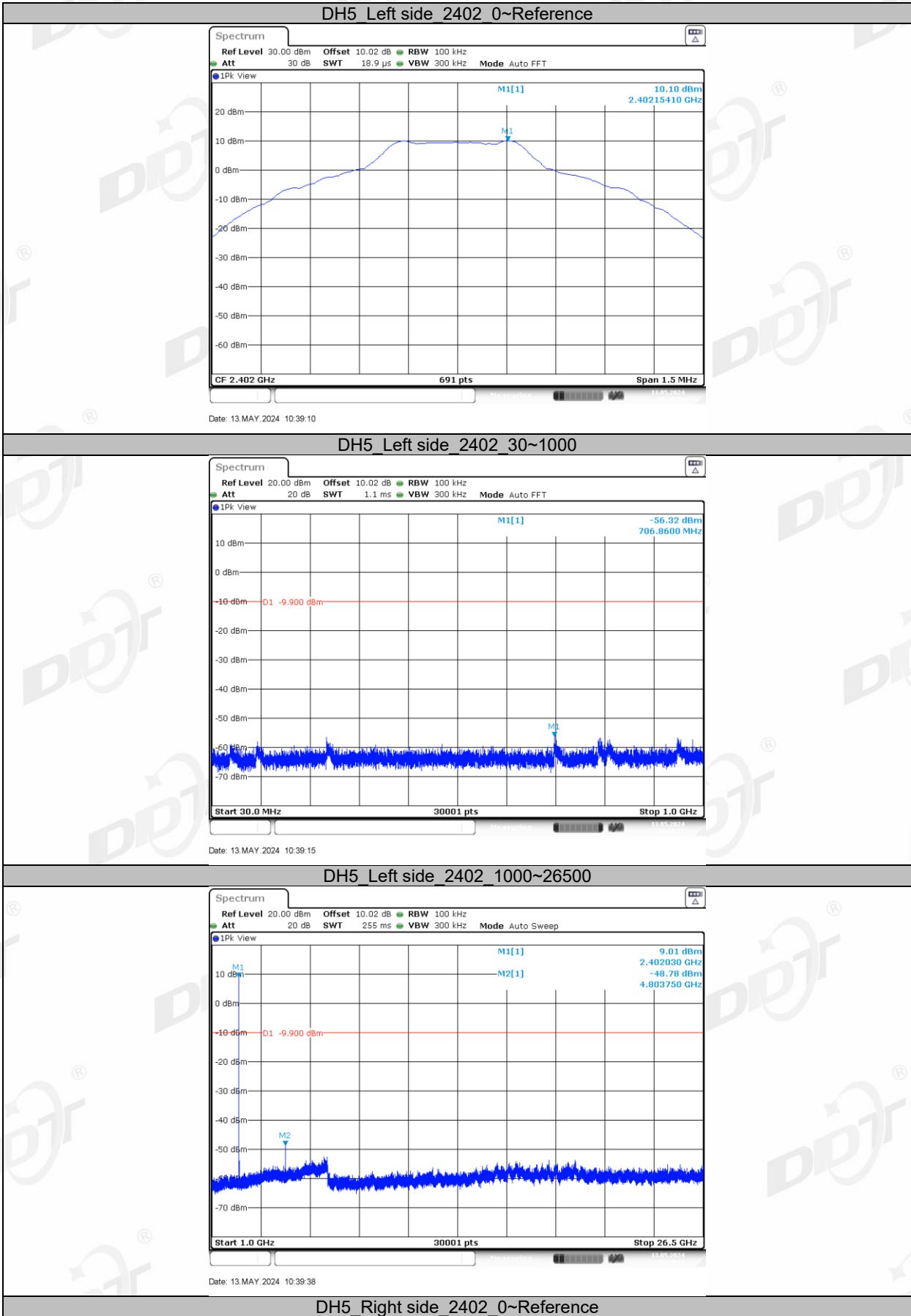
Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

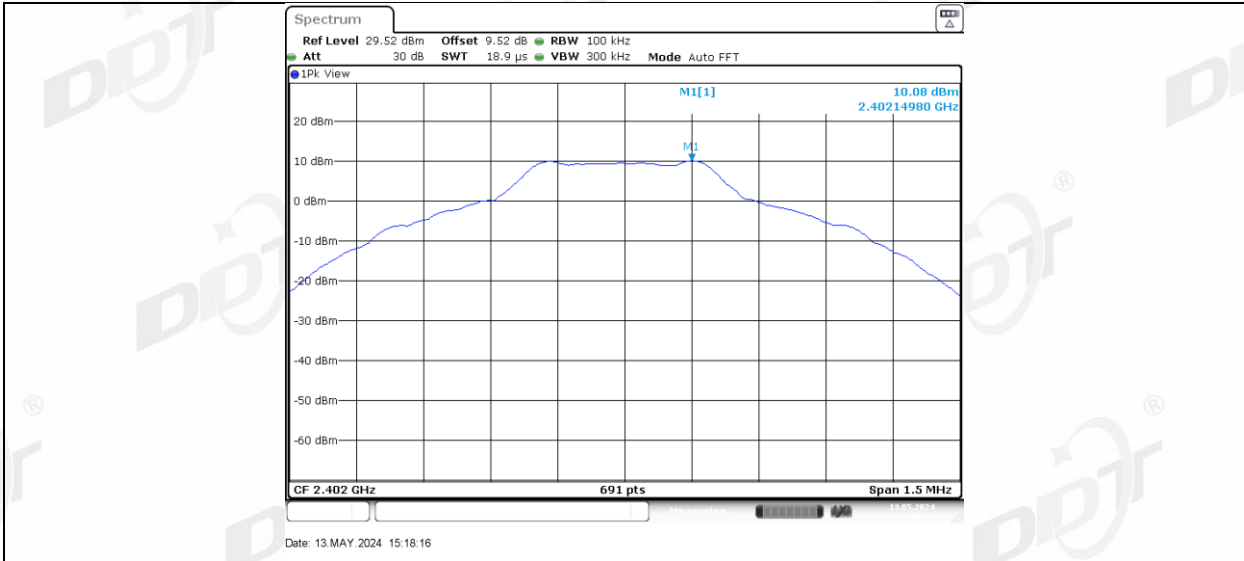
11.4. Test result

Test Engineer:	Zhongyao	Test Site:	RF Measurement System 3#
Ambient Condition:	25.3℃, 47.9%RH	Test Date:	2024.05.13
Test Power Supply:	Battery	Sample Number:	S24020411-012

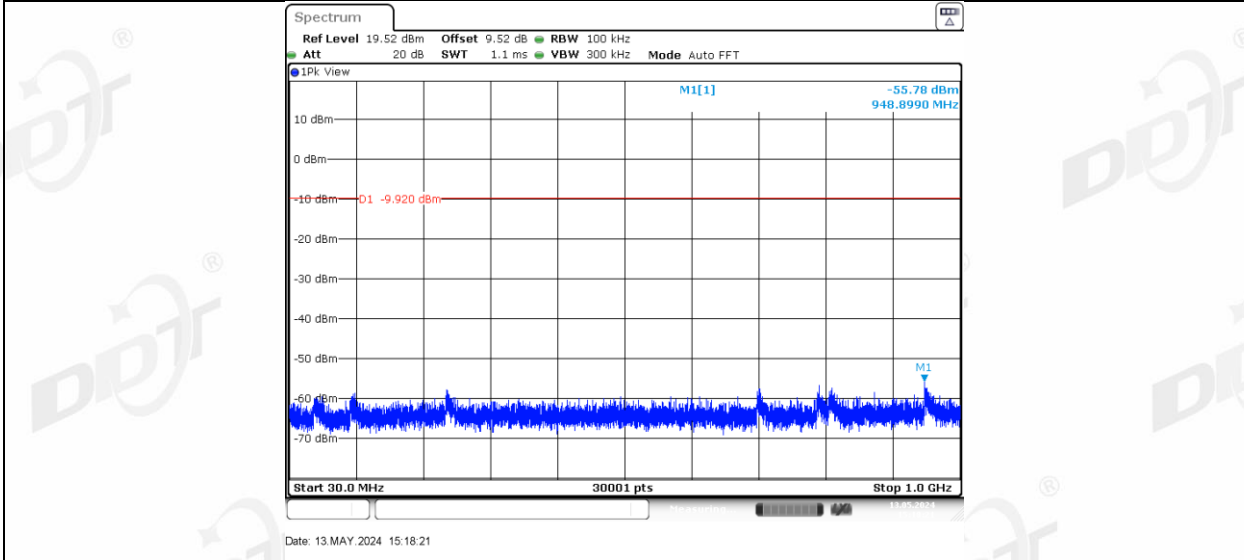
Mode	Freq. (MHz)	Verdict
GFSK	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass
$\pi/4$ -DQPSK	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass
8DPSK	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass

11.5. Test graphs

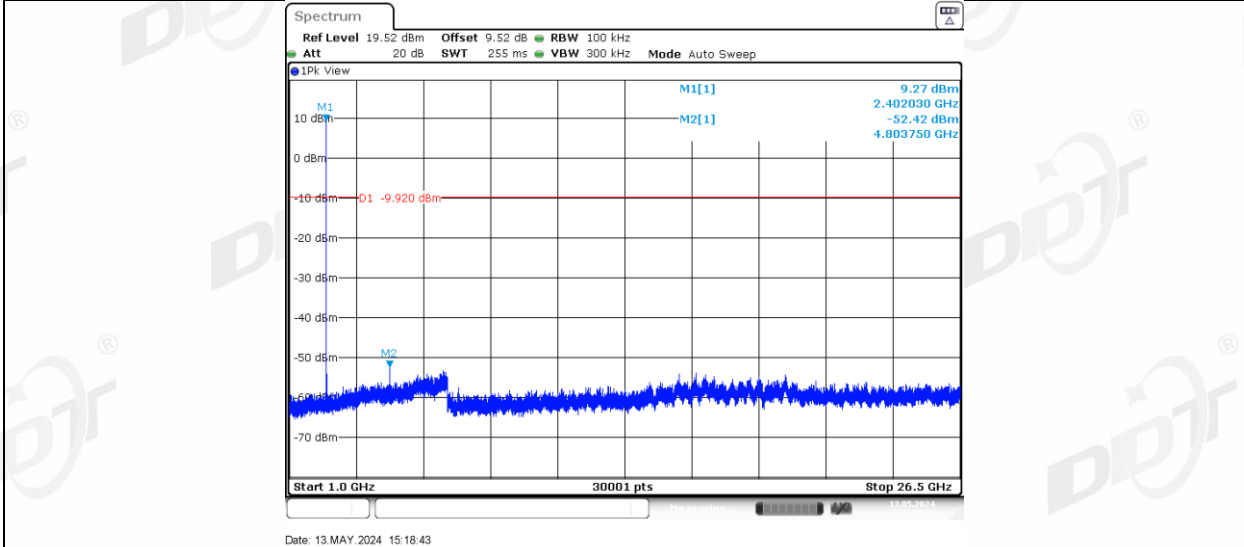




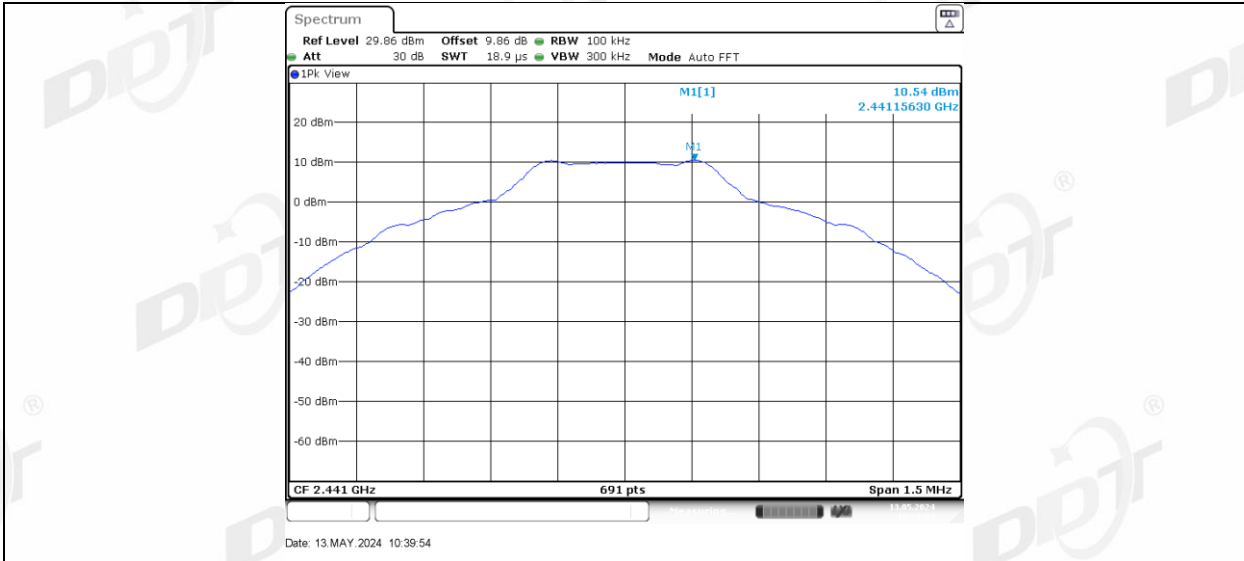
DH5_Right side_2402_30~1000



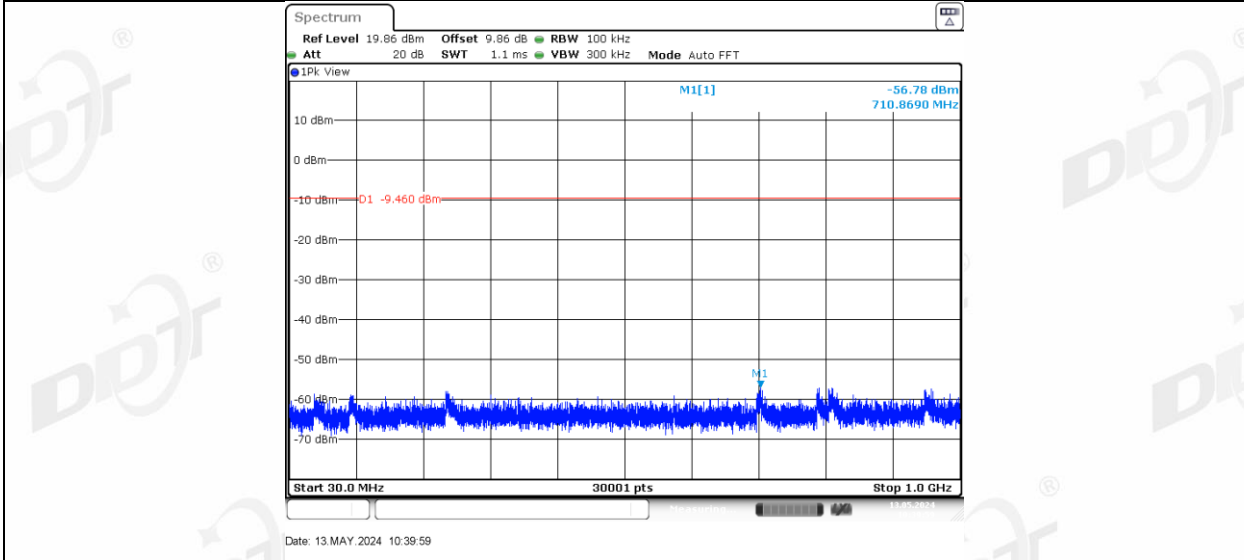
DH5_Right side_2402_1000~26500



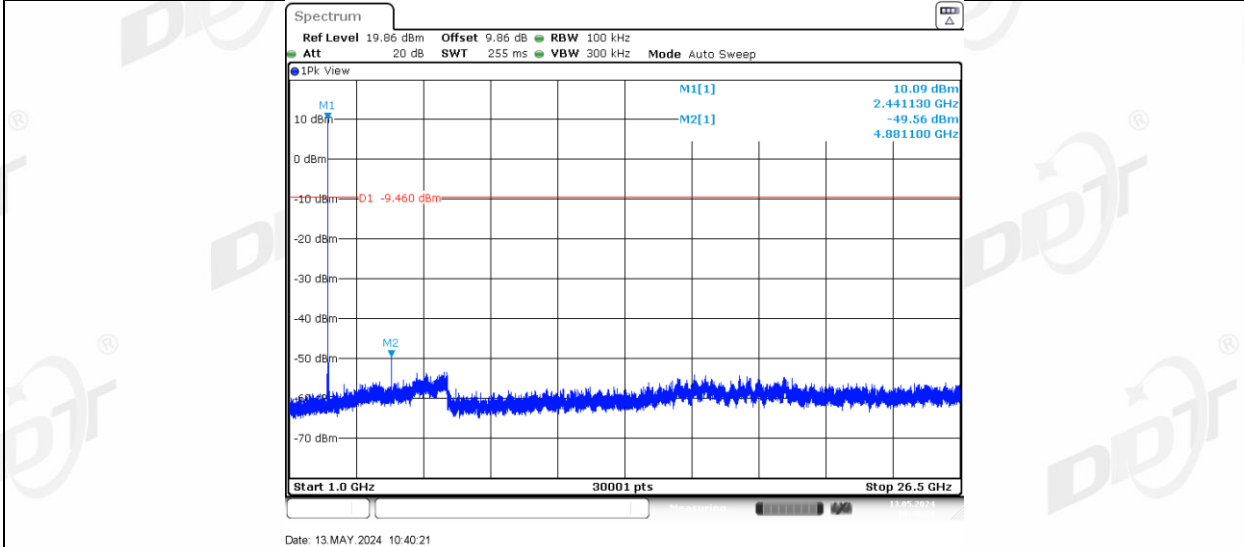
DH5_Left side_2441_0~Reference



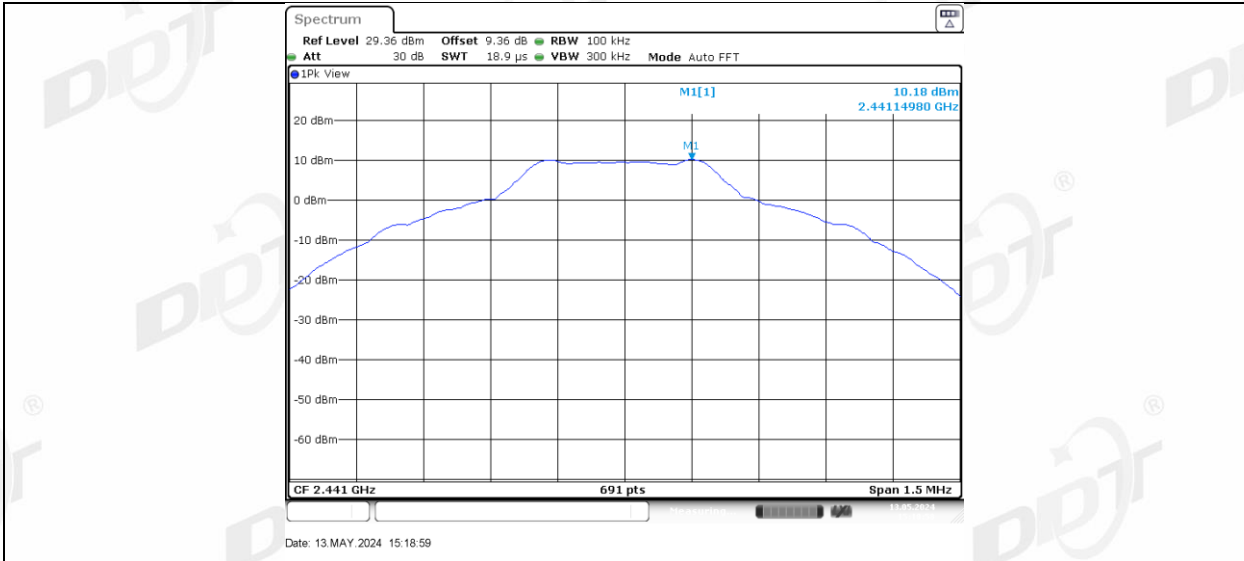
DH5_Left side_2441_30~1000



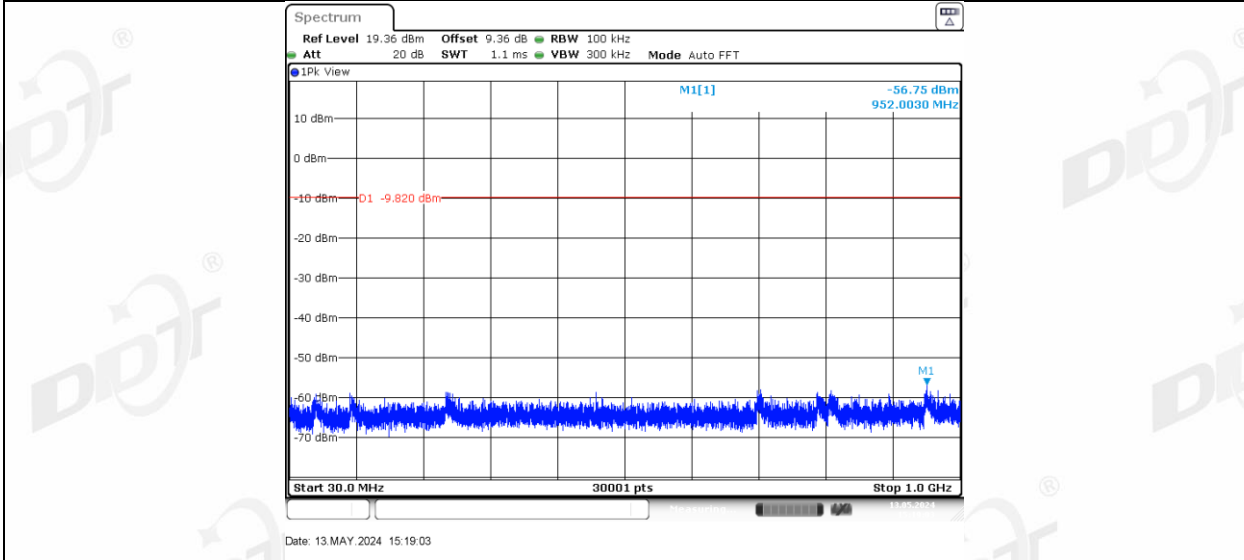
DH5_Left side_2441_1000~26500



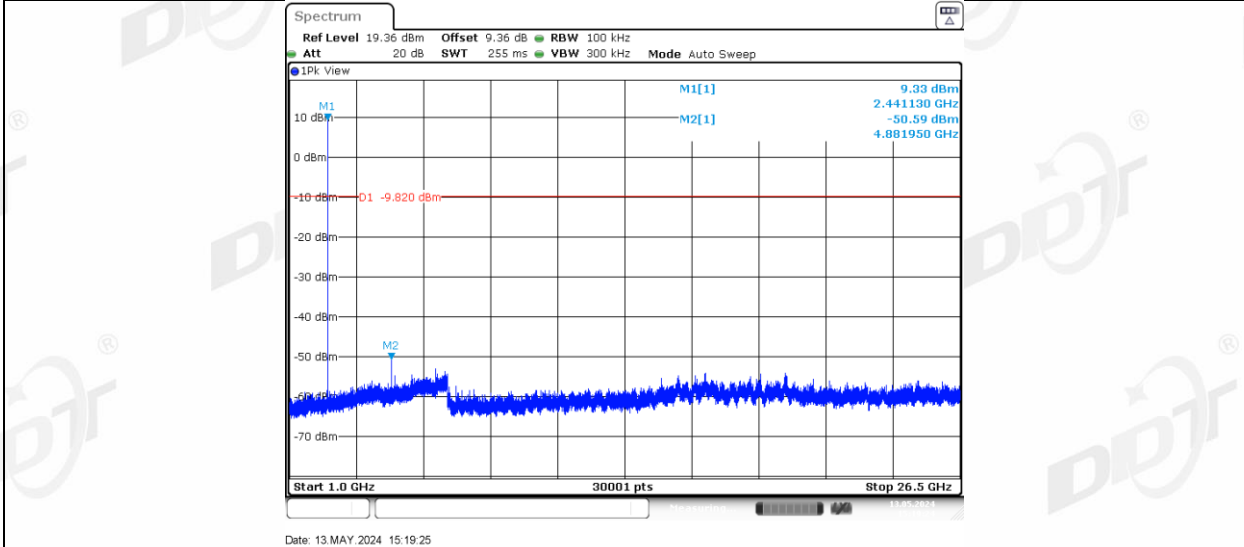
DH5_Right side_2441_0~Reference



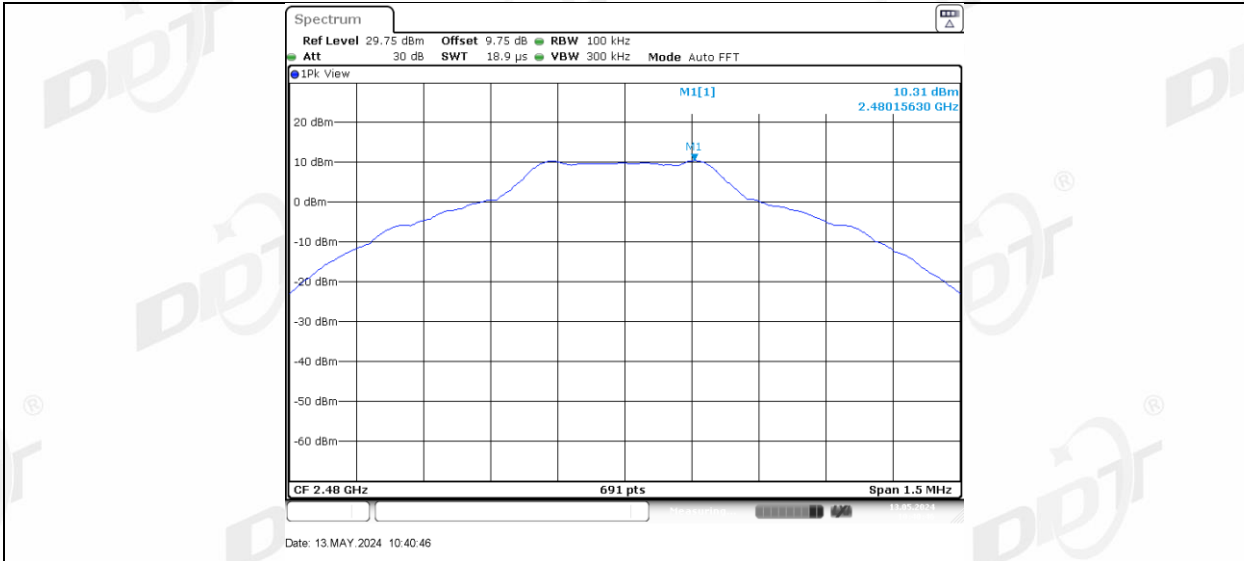
DH5_Right side_2441_30~1000



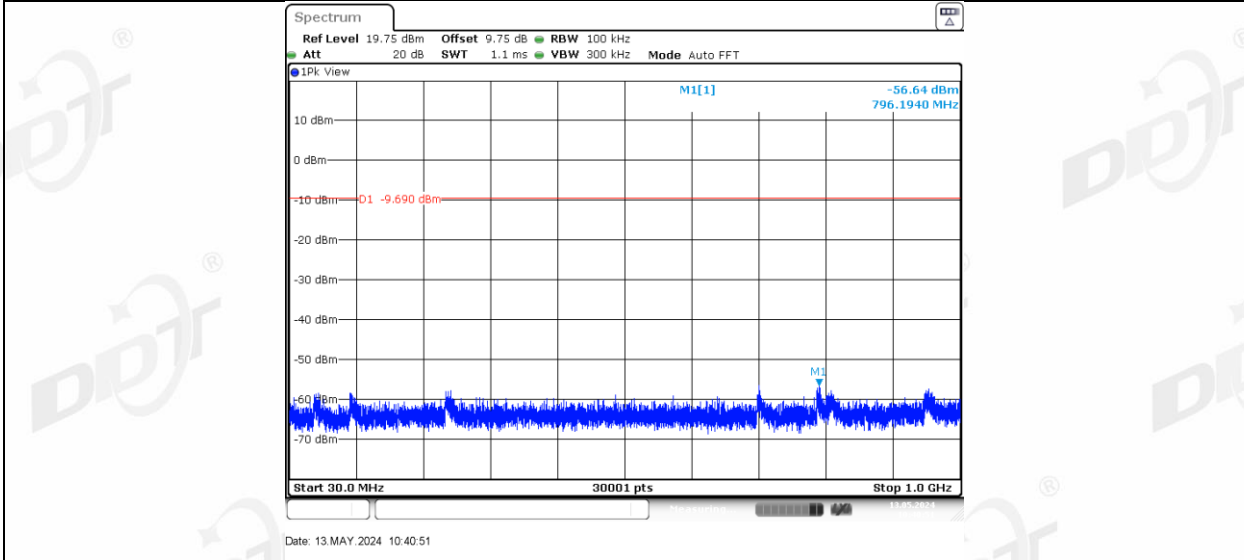
DH5_Right side_2441_1000~26500



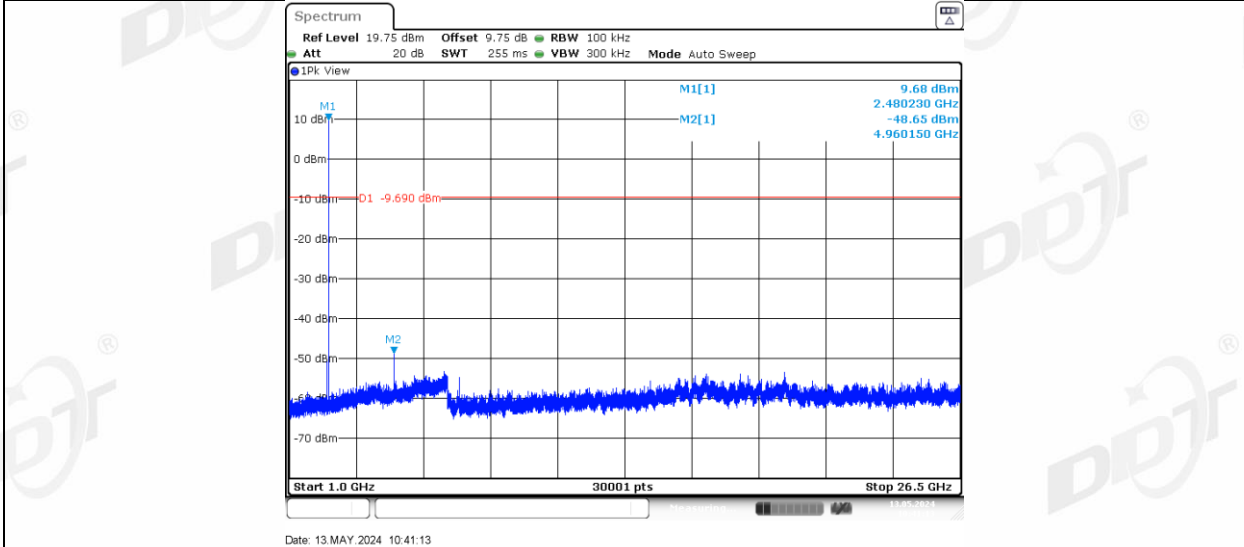
DH5_Left side_2480_0~Reference



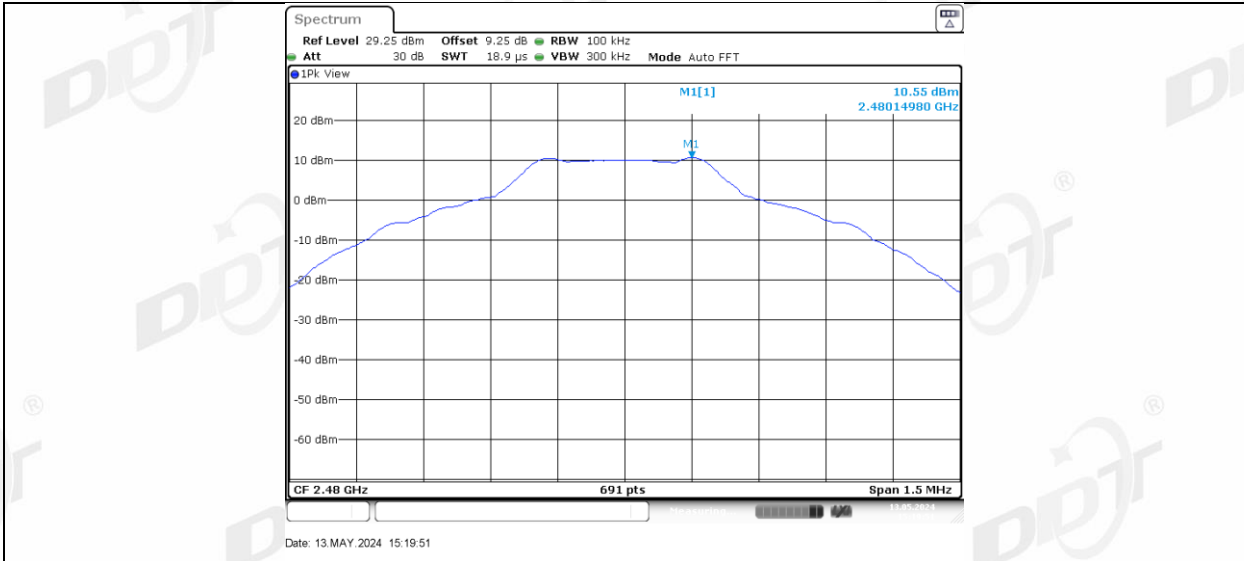
DH5_Left side_2480_30~1000



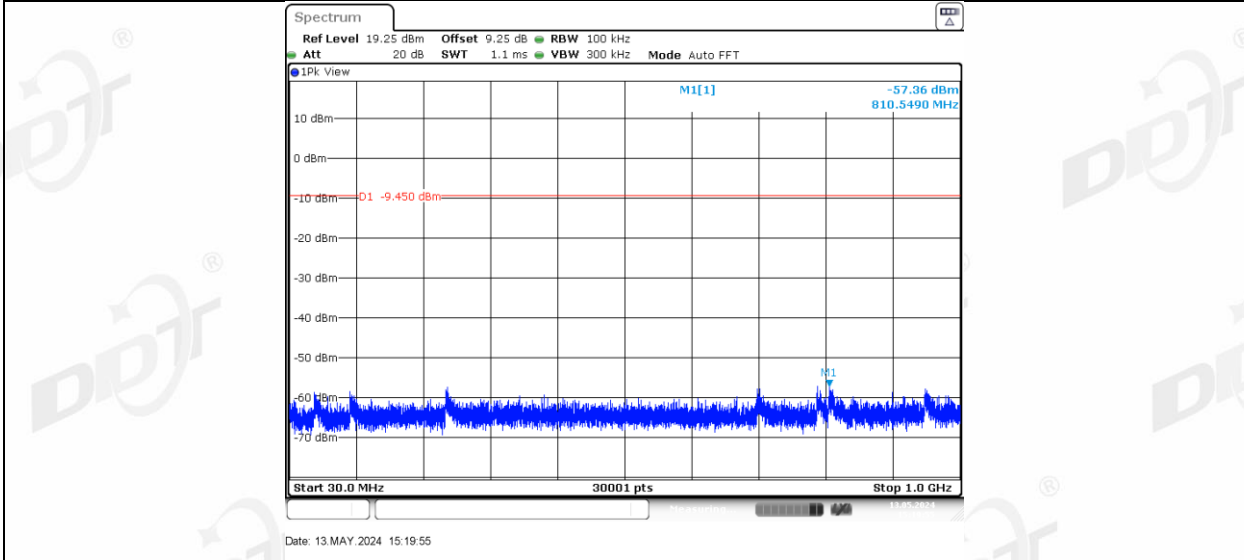
DH5_Left side_2480_1000~26500



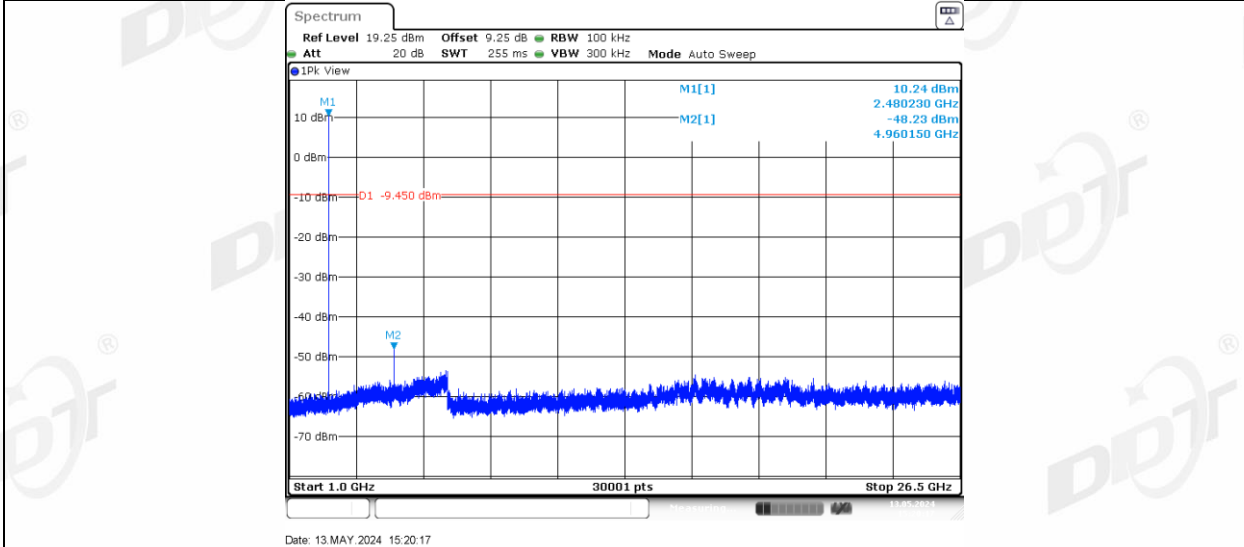
DH5_Right side_2480_0~Reference



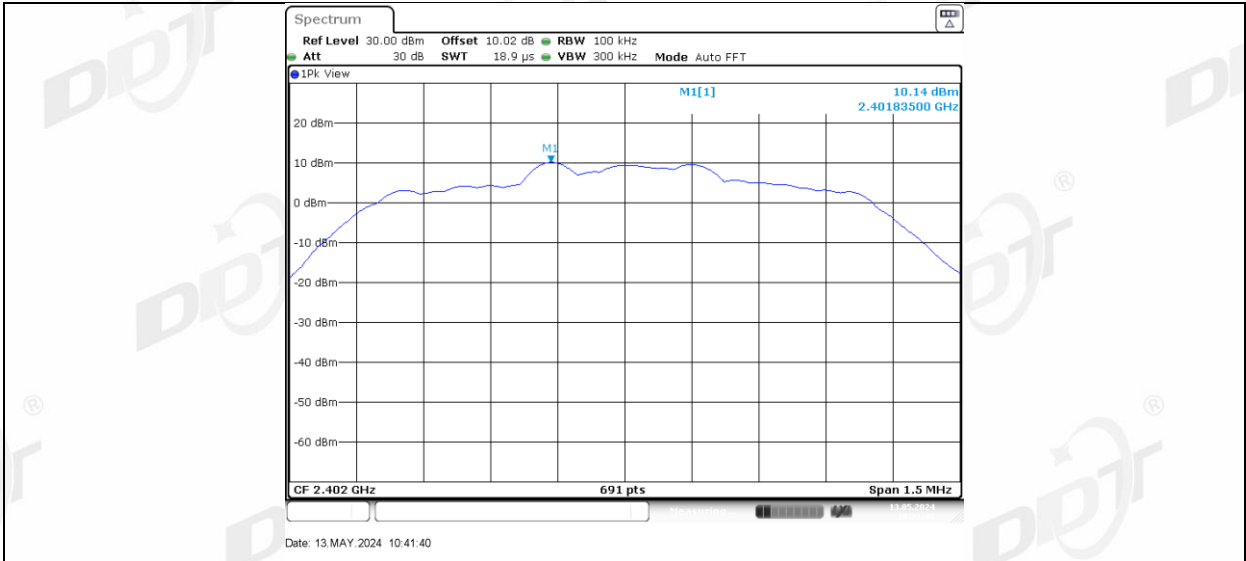
DH5_Right side_2480_30~1000



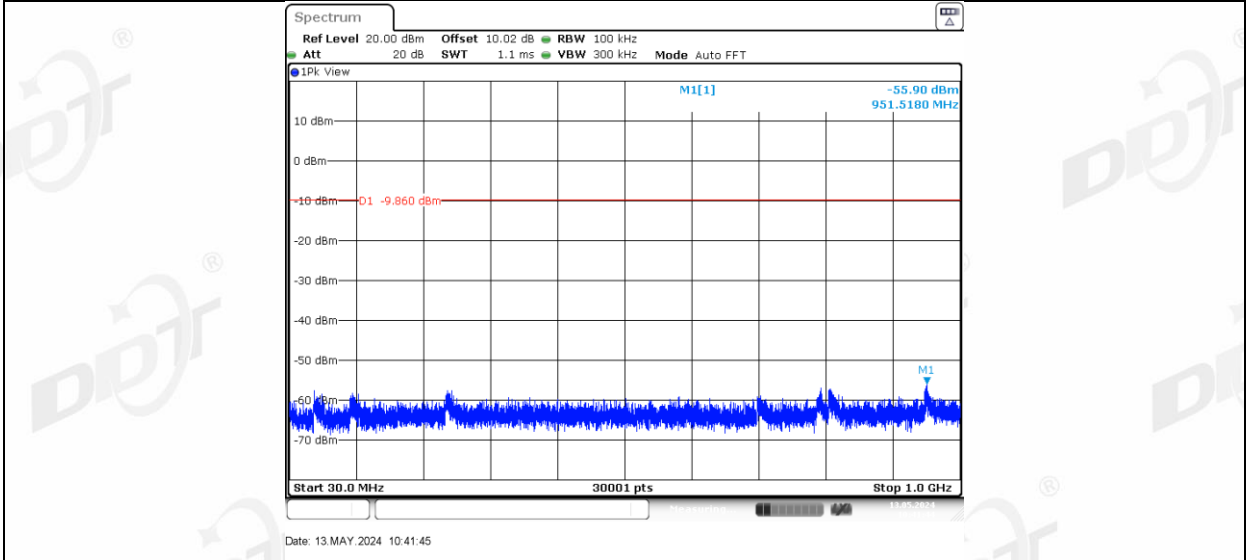
DH5_Right side_2480_1000~26500



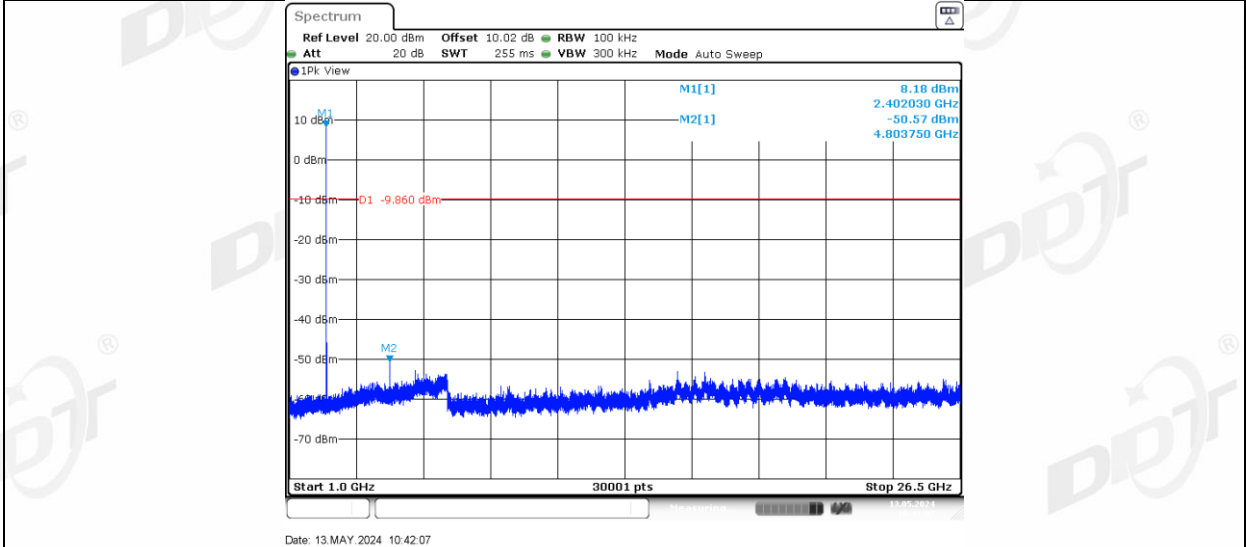
2DH5_Left side_2402_0~Reference



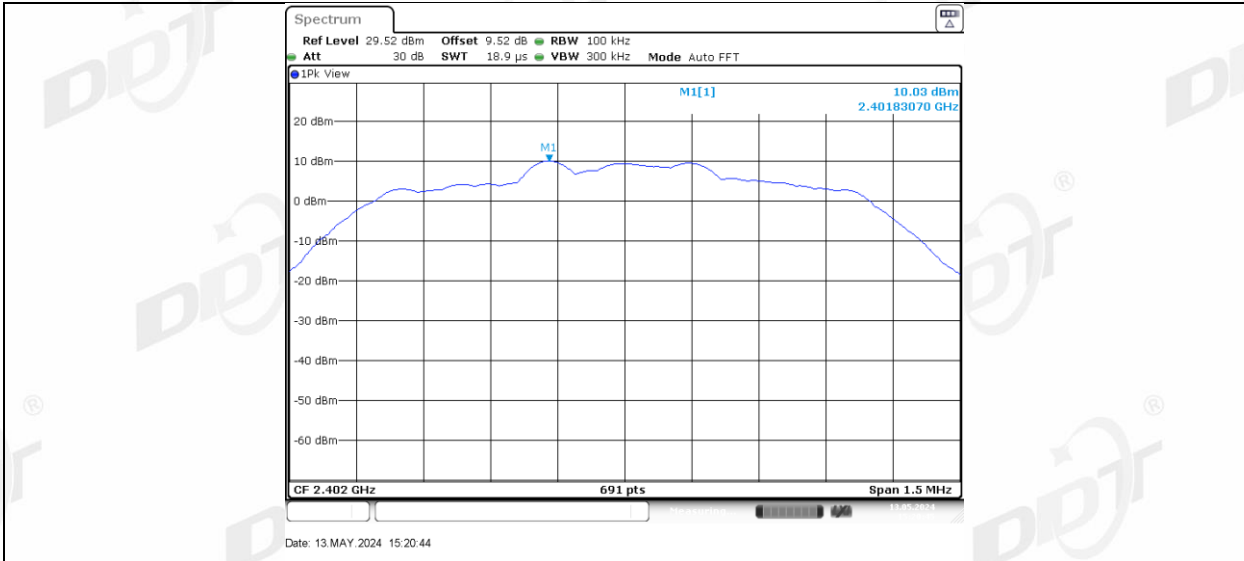
2DH5_Left side_2402_30~1000



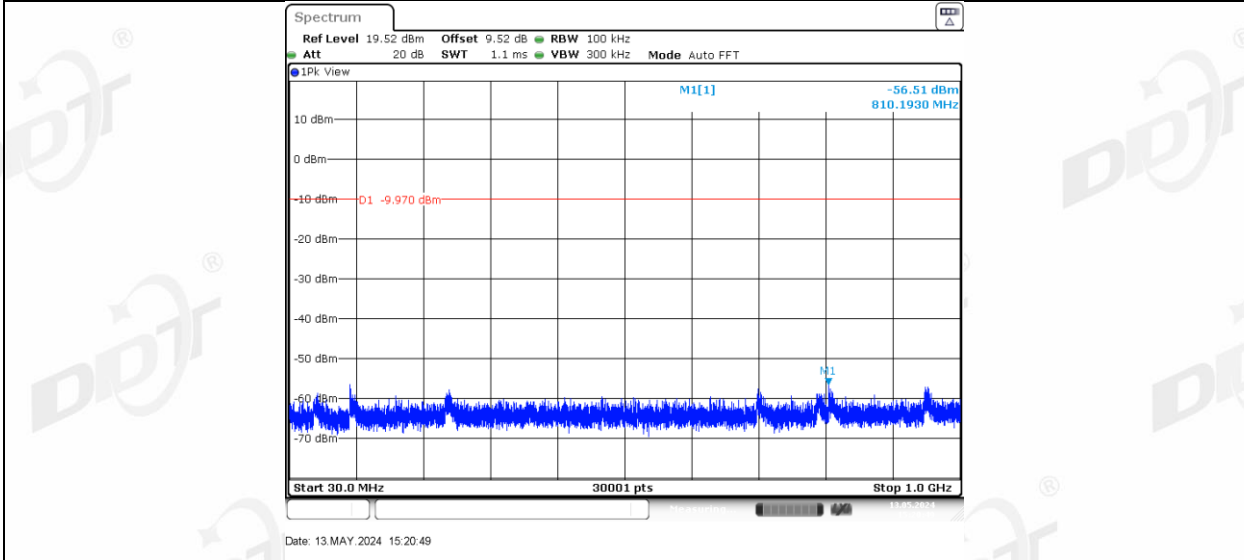
2DH5_Left side_2402_1000~26500



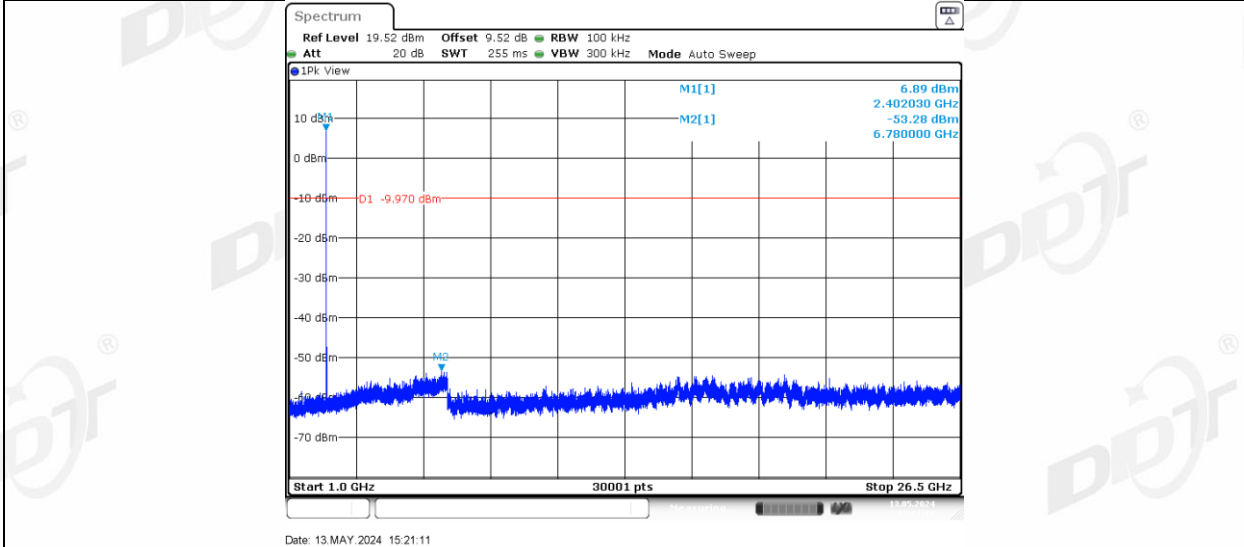
2DH5_Right side_2402_0~Reference



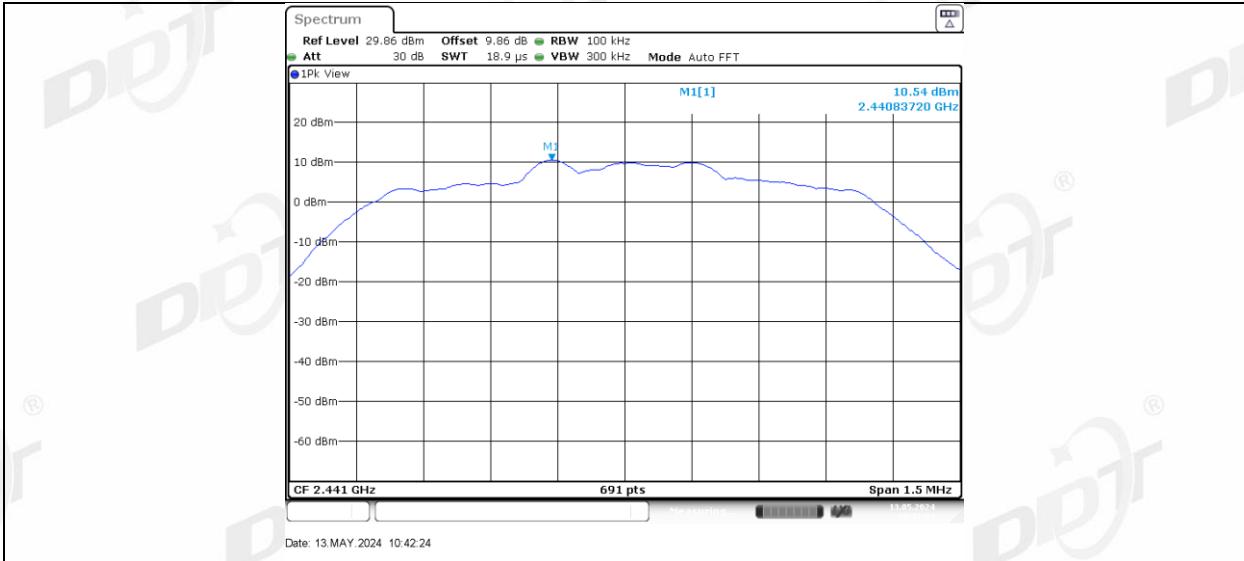
2DH5_Right side_2402_30~1000



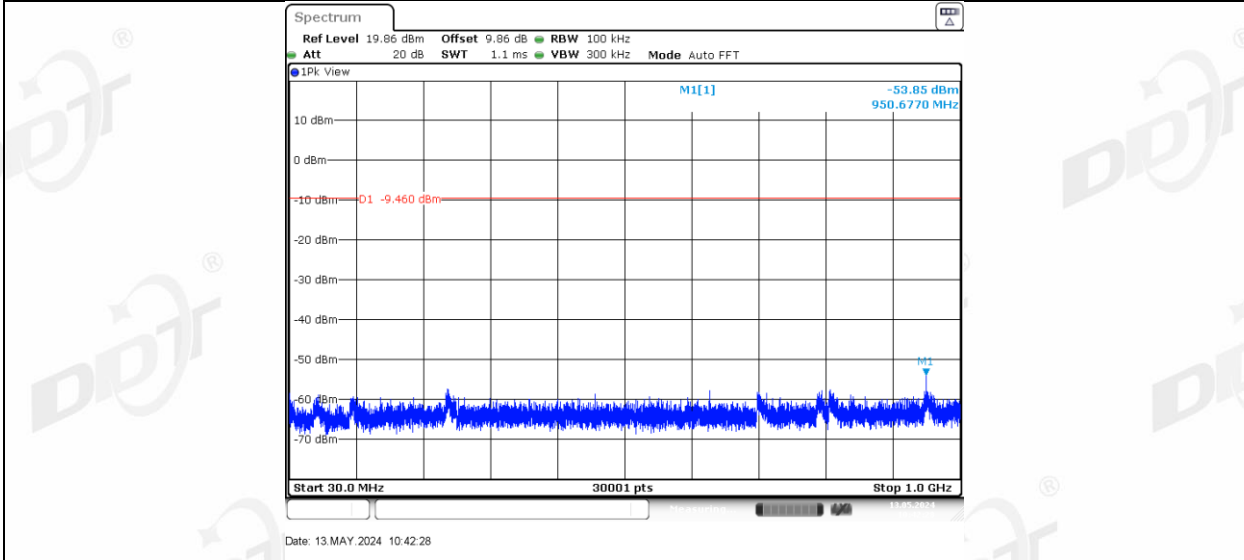
2DH5_Right side_2402_1000~26500



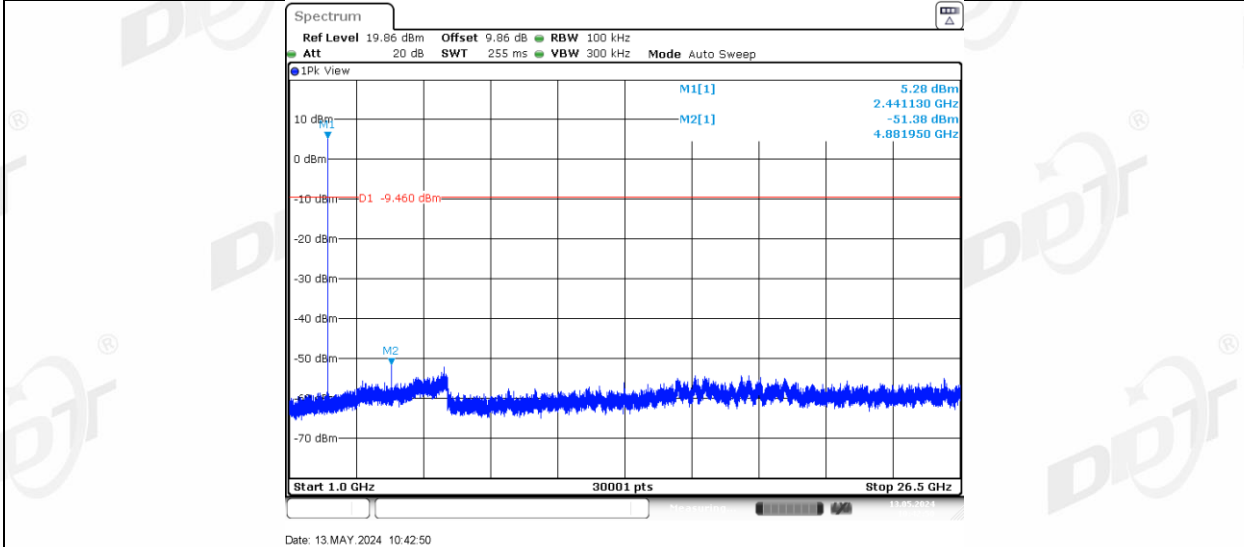
2DH5_Left side_2441_0~Reference



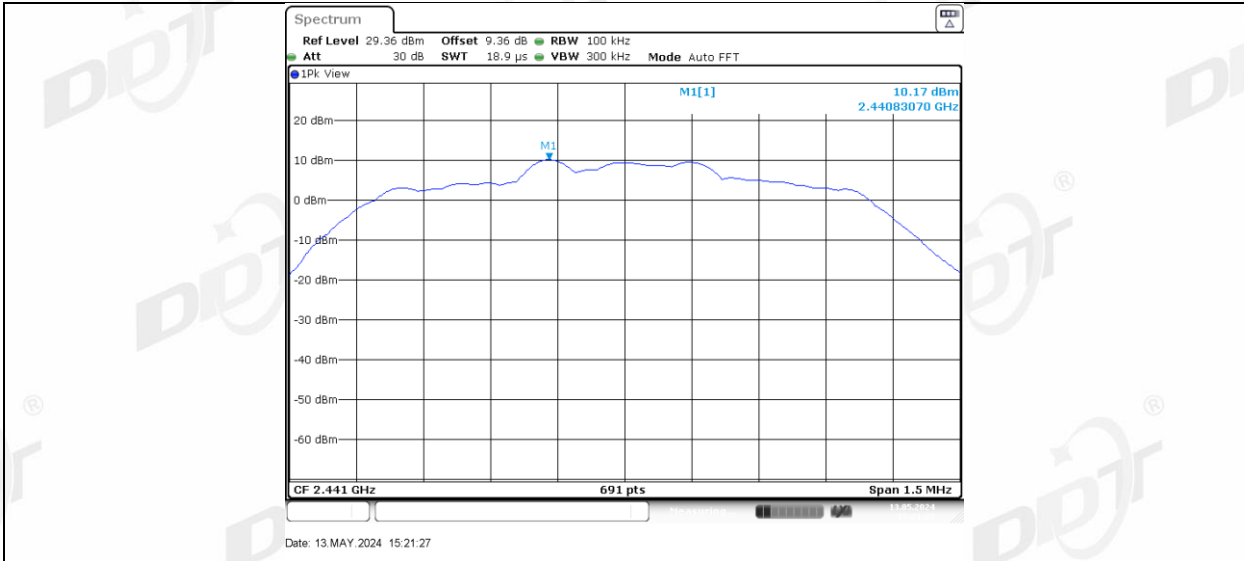
2DH5_Left side_2441_30~1000



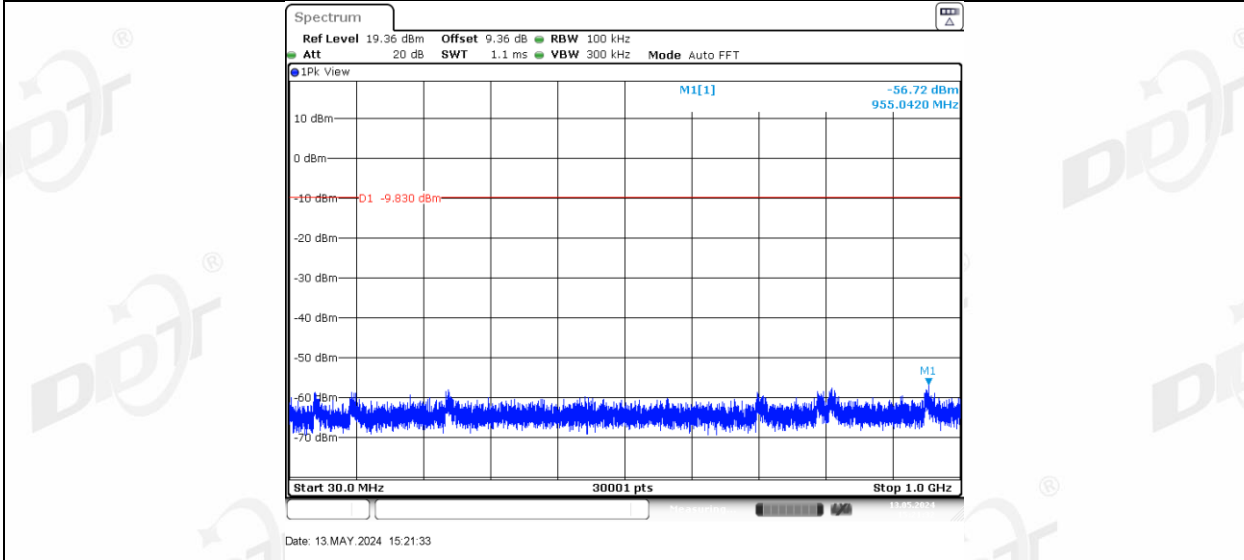
2DH5_Left side_2441_1000~26500



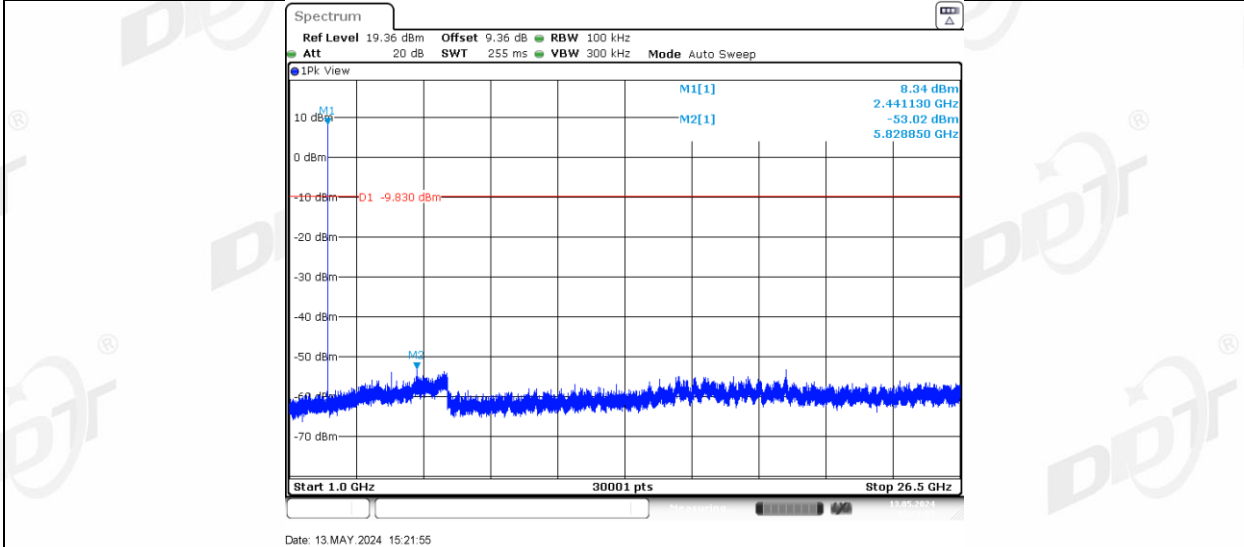
2DH5_Right side_2441_0~Reference



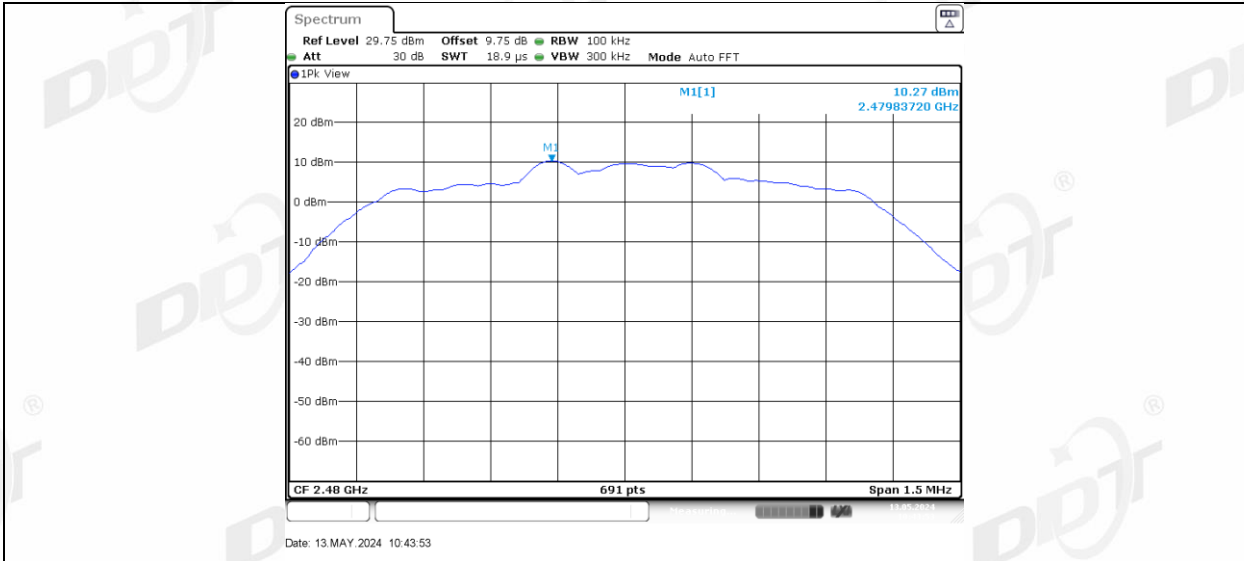
2DH5_Right side_2441_30~1000



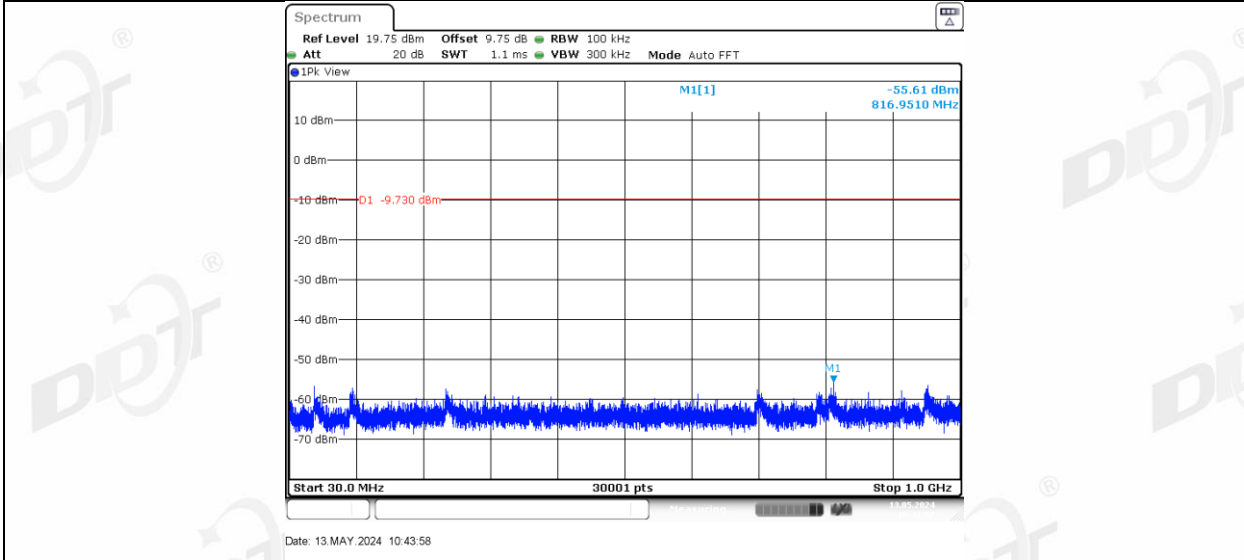
2DH5_Right side_2441_1000~26500



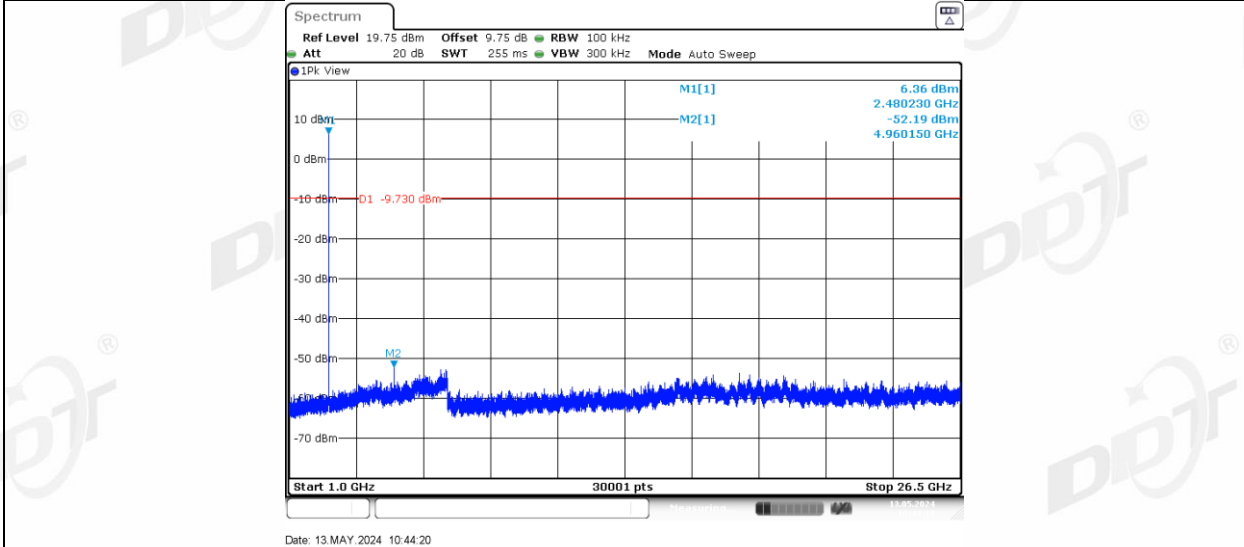
2DH5_Left side_2480_0~Reference



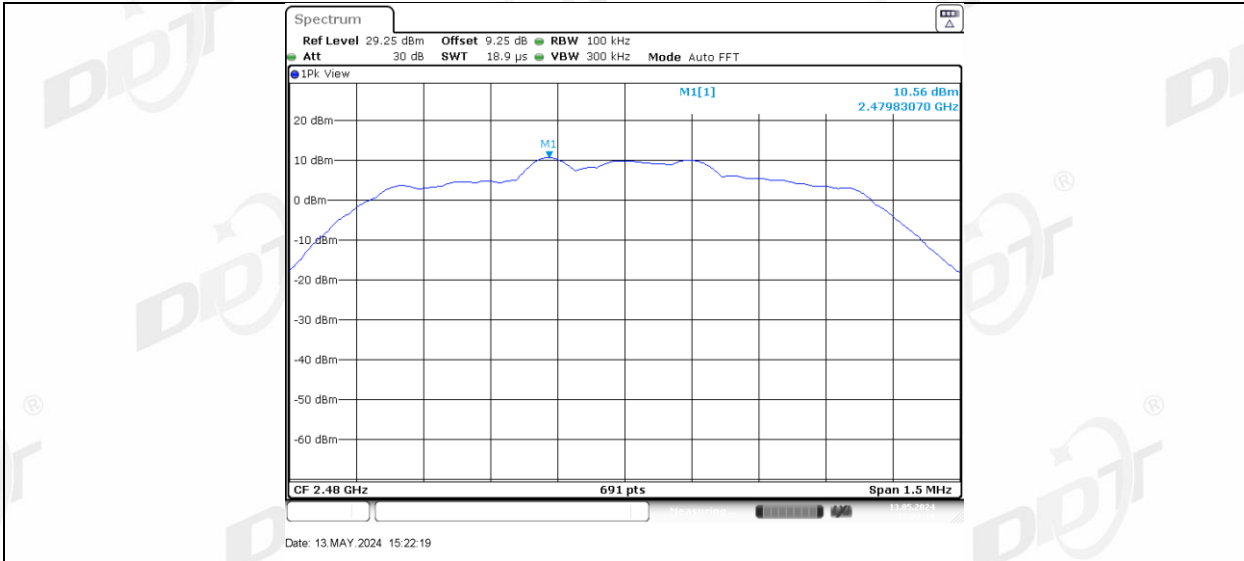
2DH5_Left side_2480_30~1000



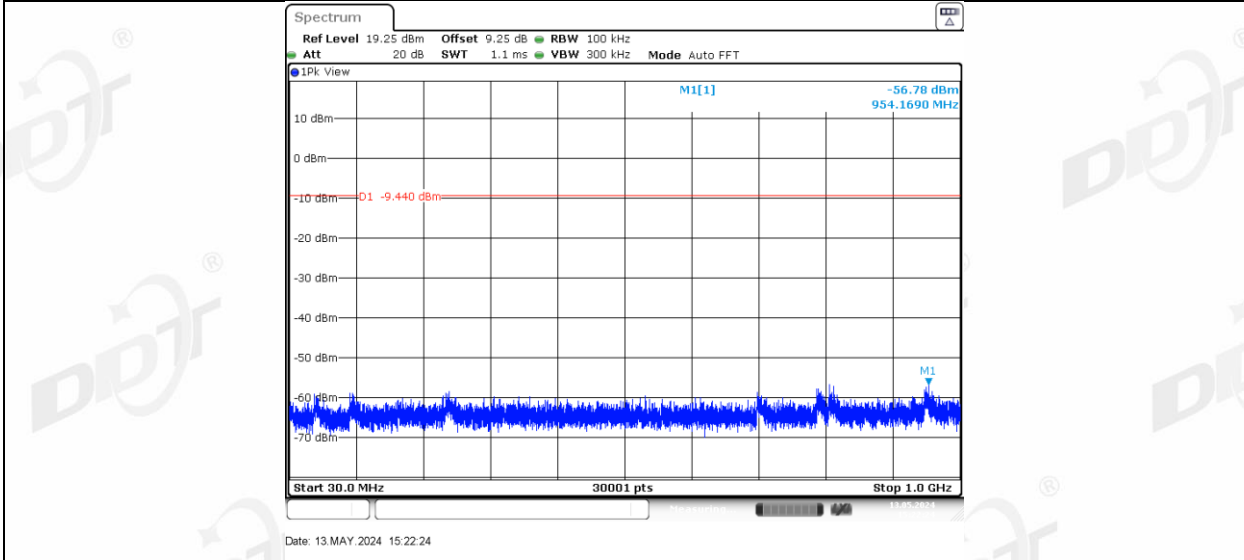
2DH5_Left side_2480_1000~26500



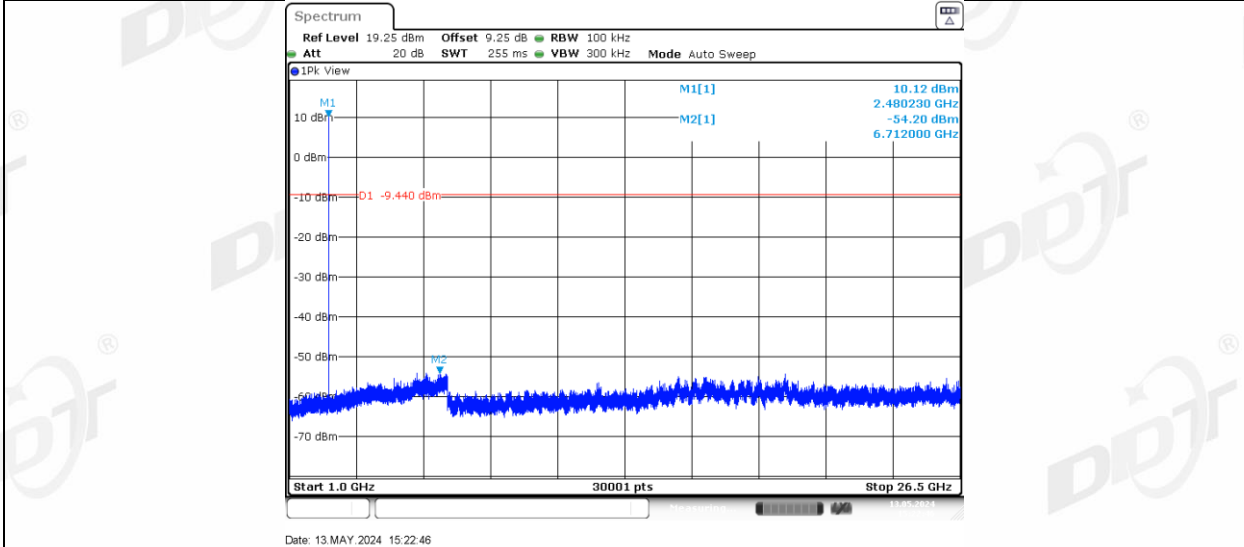
2DH5_Right side_2480_0~Reference



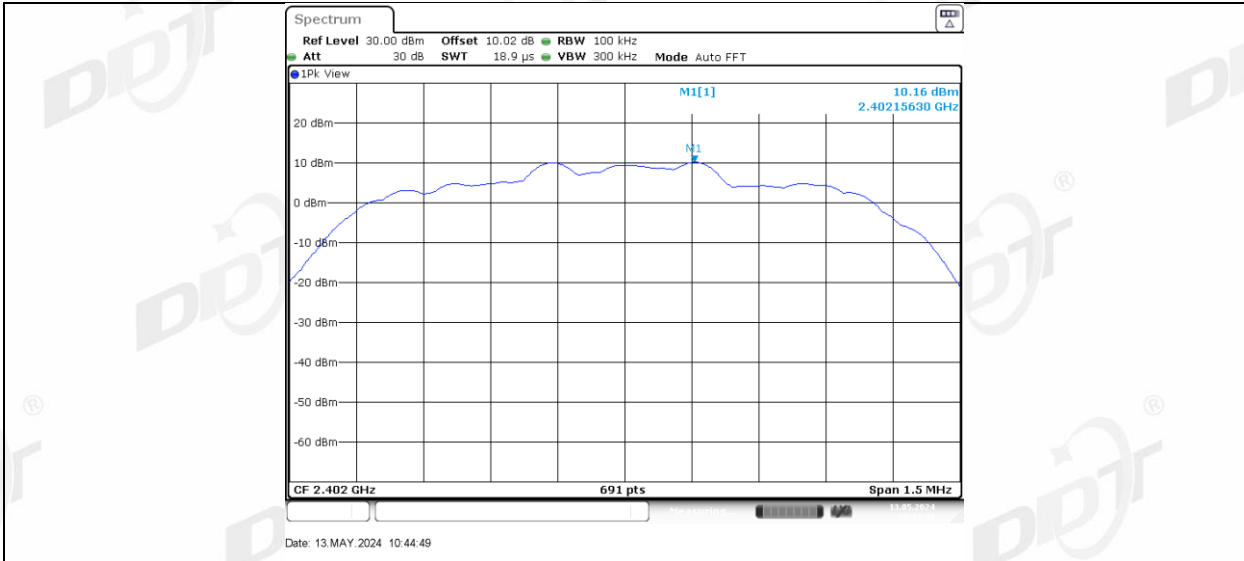
2DH5_Right side_2480_30~1000



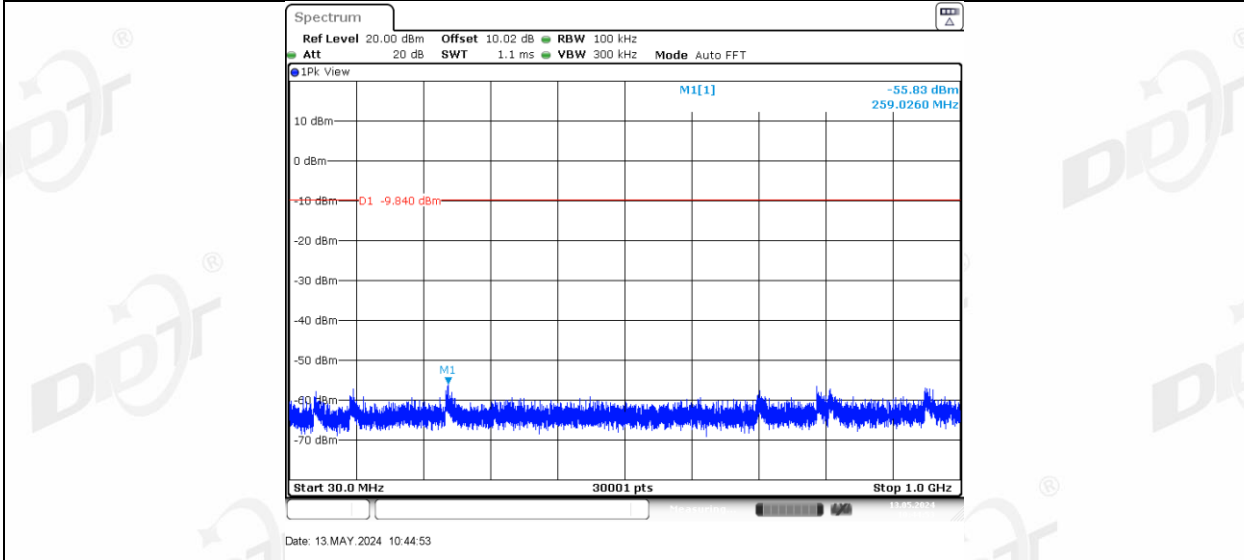
2DH5_Right side_2480_1000~26500



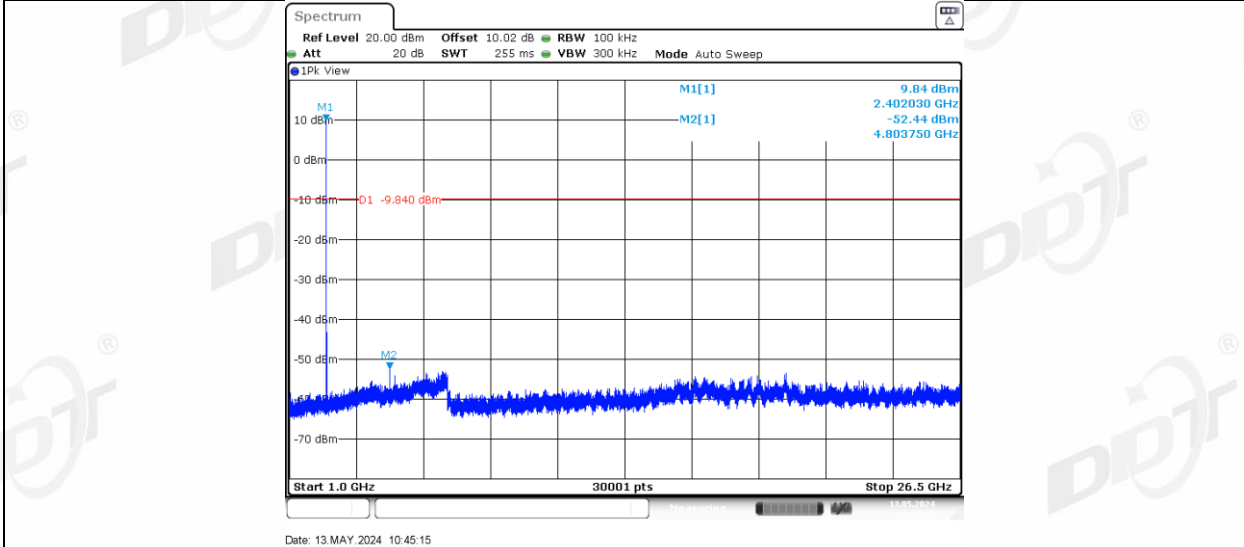
3DH5_Left side_2402_0~Reference



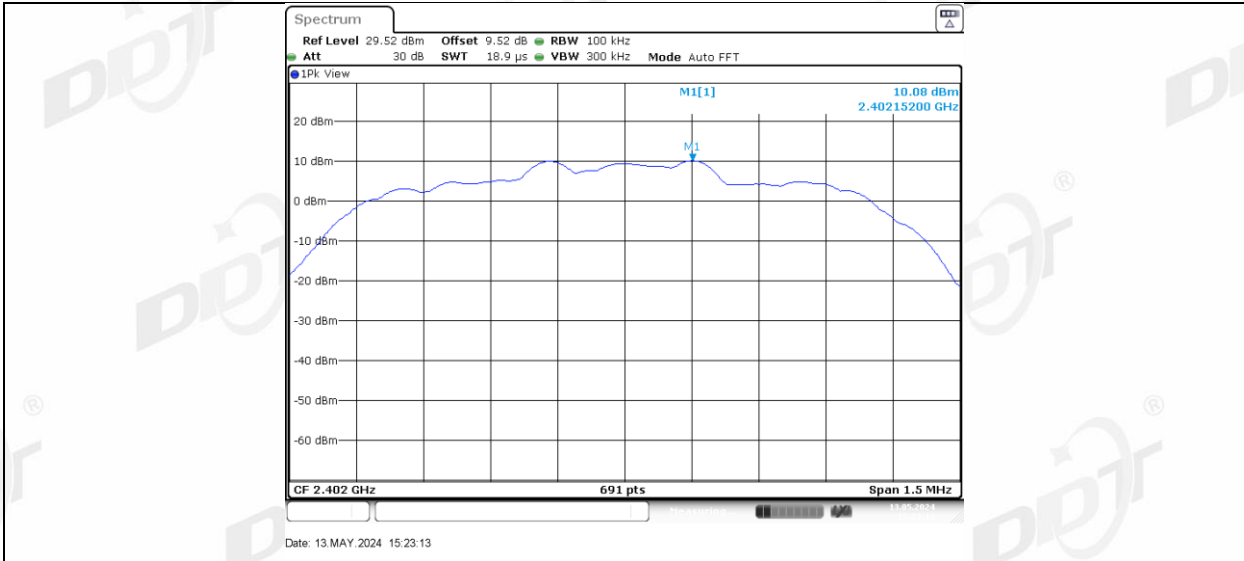
3DH5_Left side_2402_30~1000



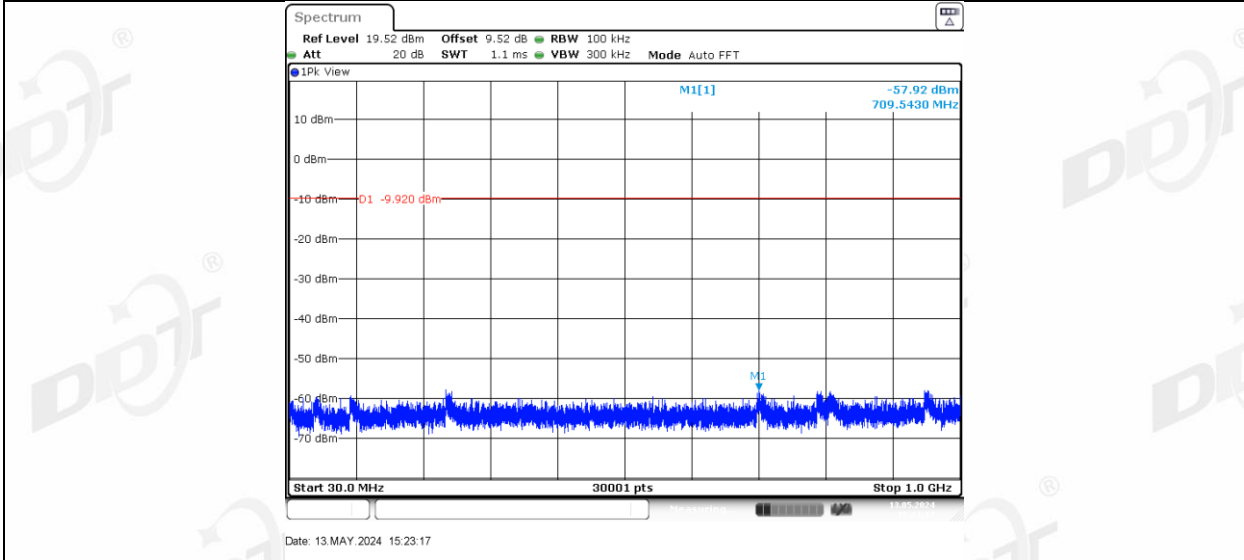
3DH5_Left side_2402_1000~26500



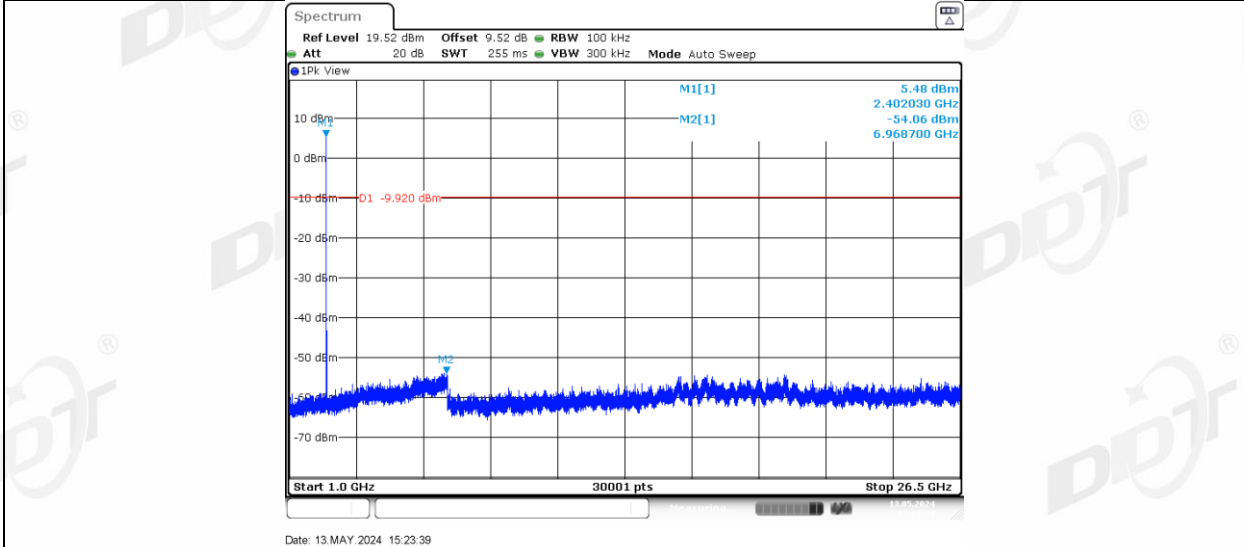
3DH5_Right side_2402_0~Reference



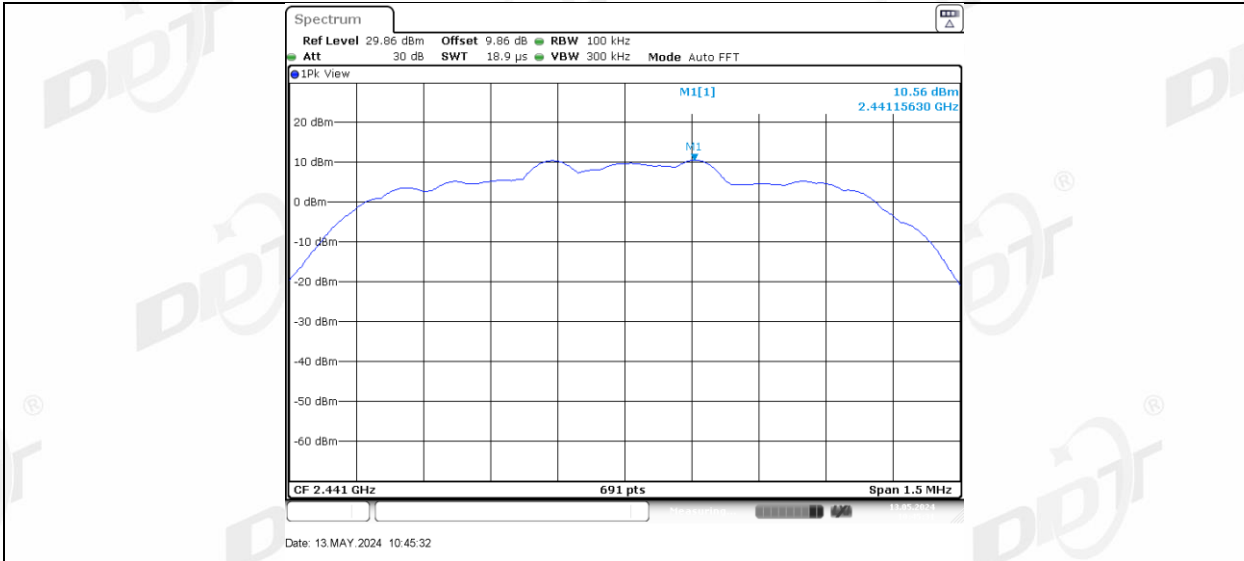
3DH5_Right side_2402_30~1000



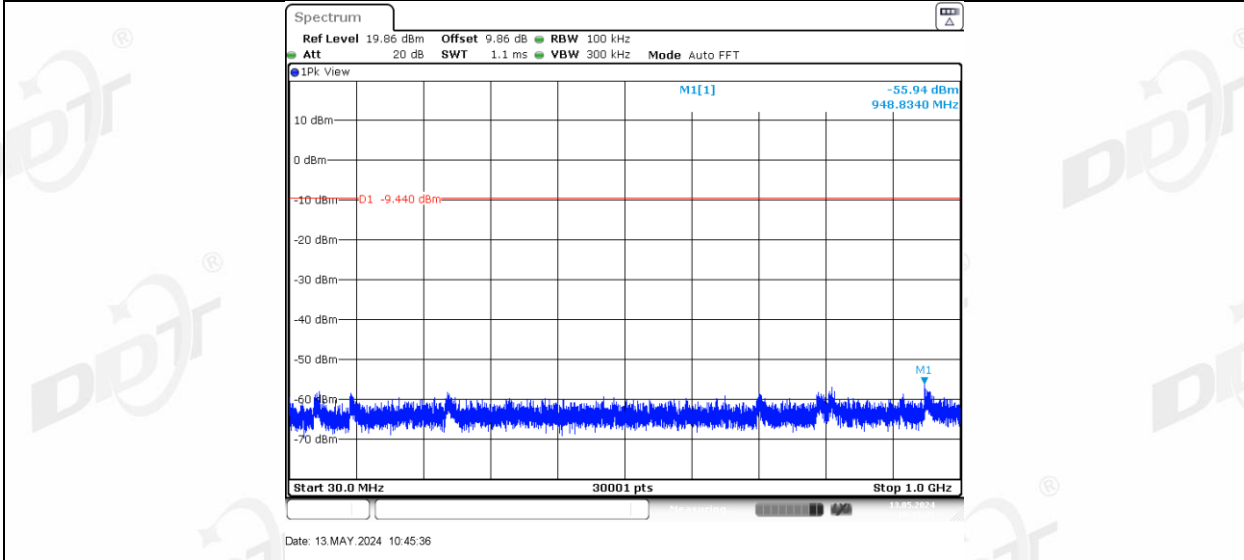
3DH5_Right side_2402_1000~26500



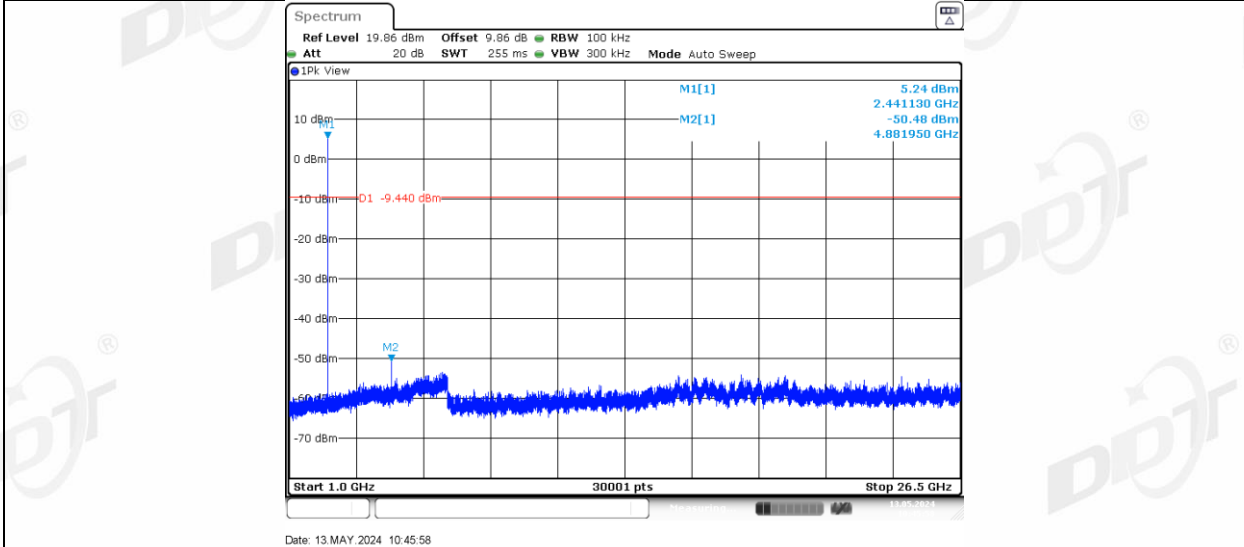
3DH5_Left side_2441_0~Reference



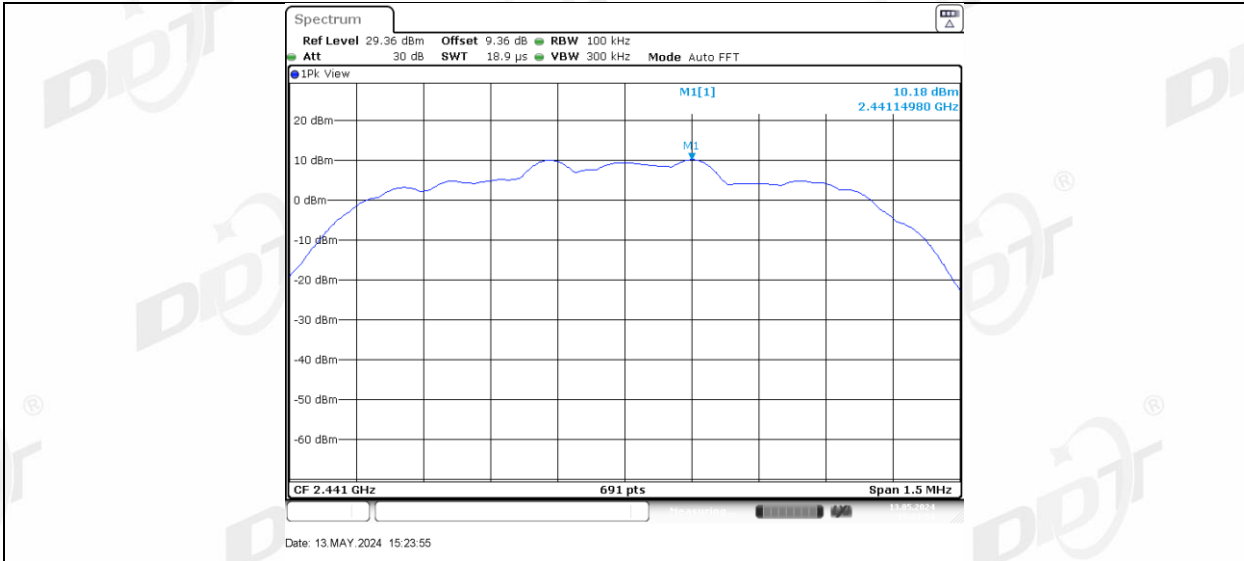
3DH5_Left side_2441_30~1000



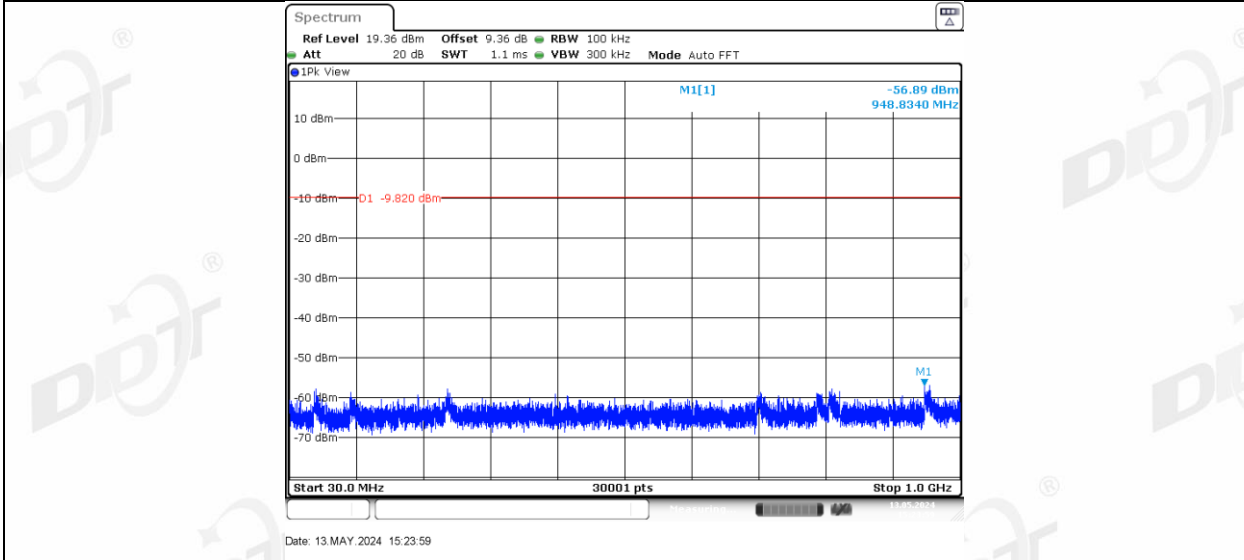
3DH5_Left side_2441_1000~26500



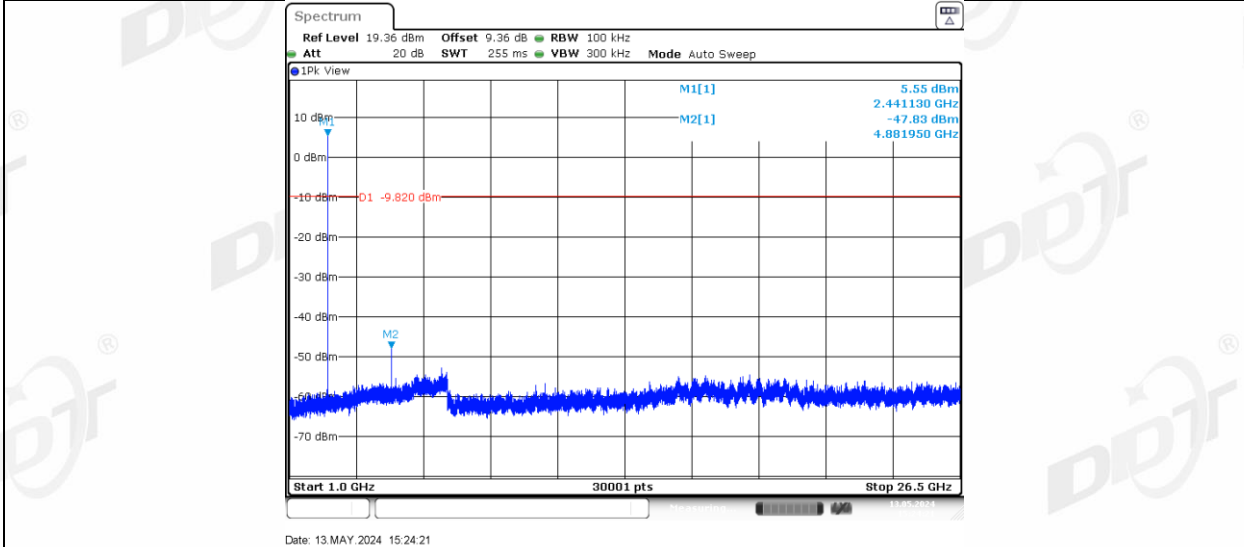
3DH5_Right side_2441_0~Reference



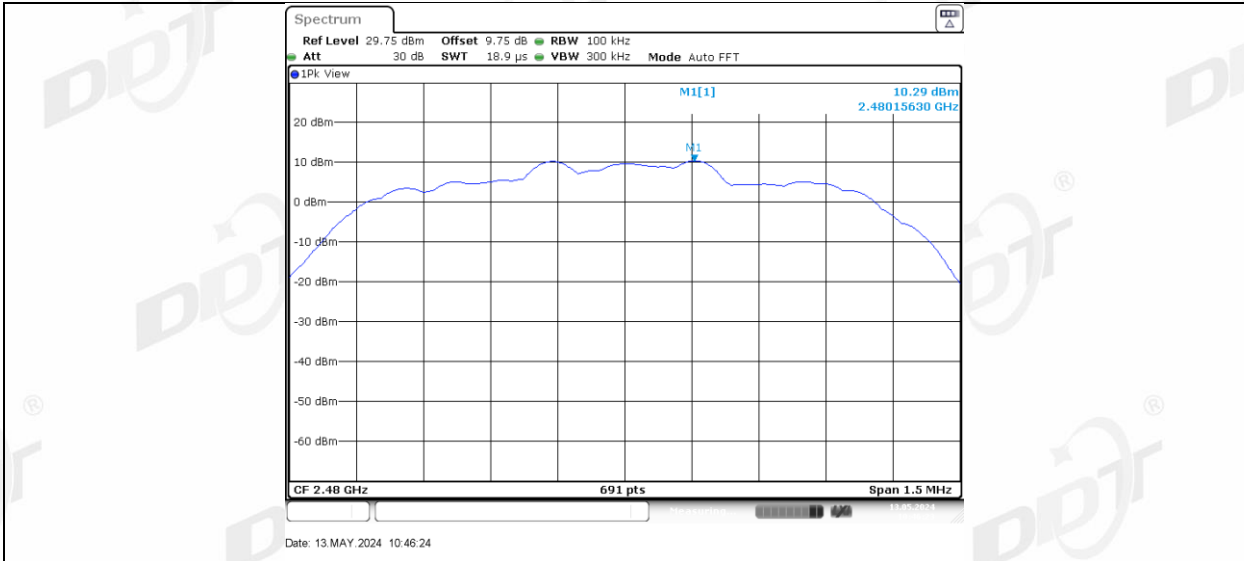
3DH5_Right side_2441_30~1000



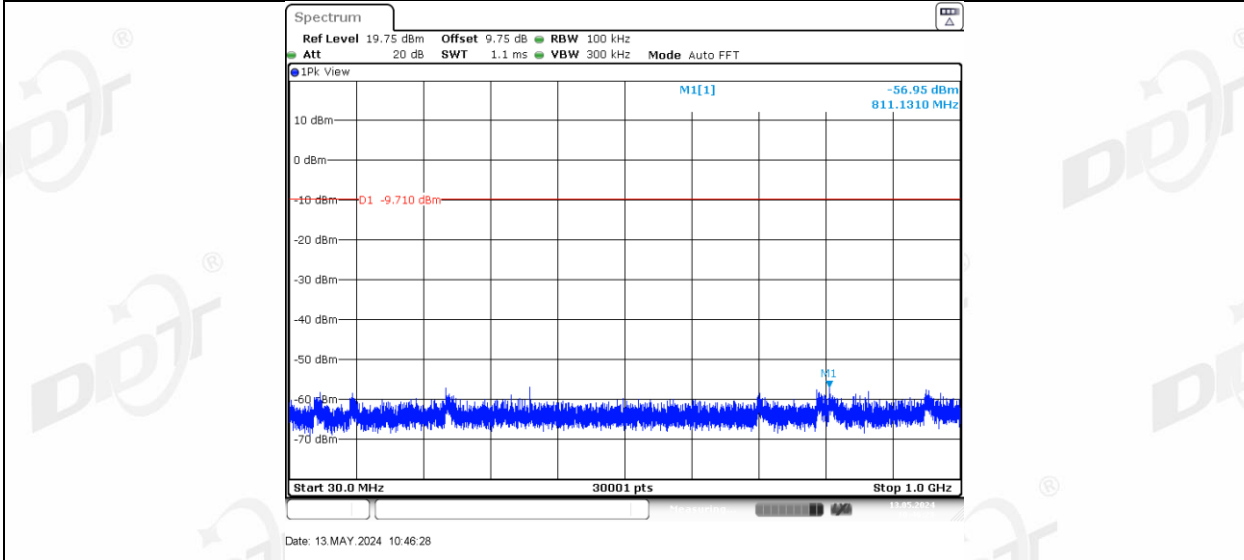
3DH5_Right side_2441_1000~26500



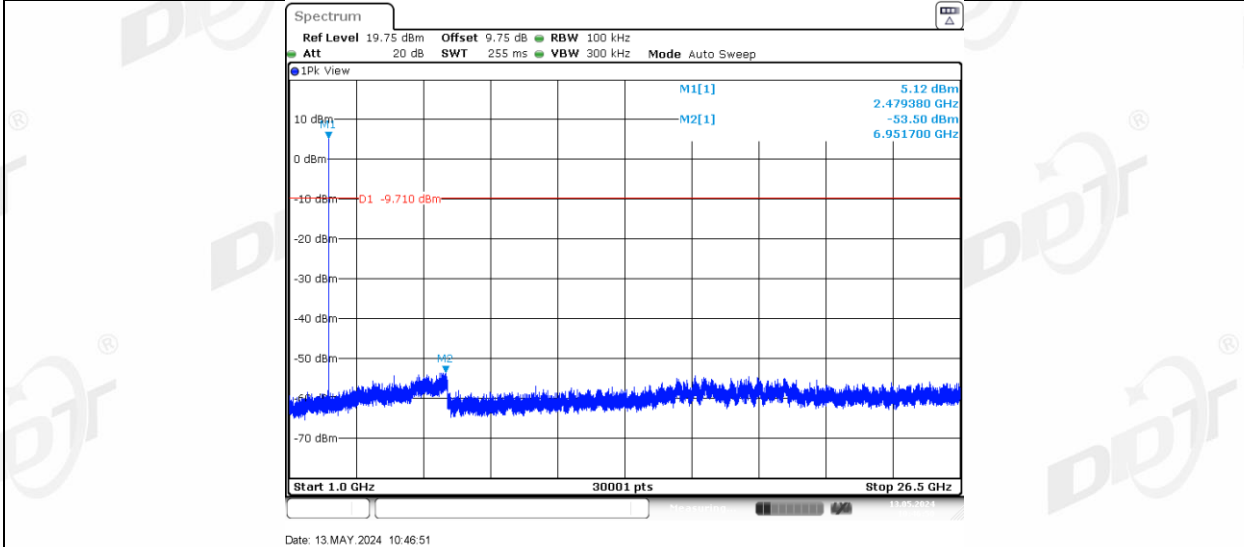
3DH5_Left side_2480_0~Reference



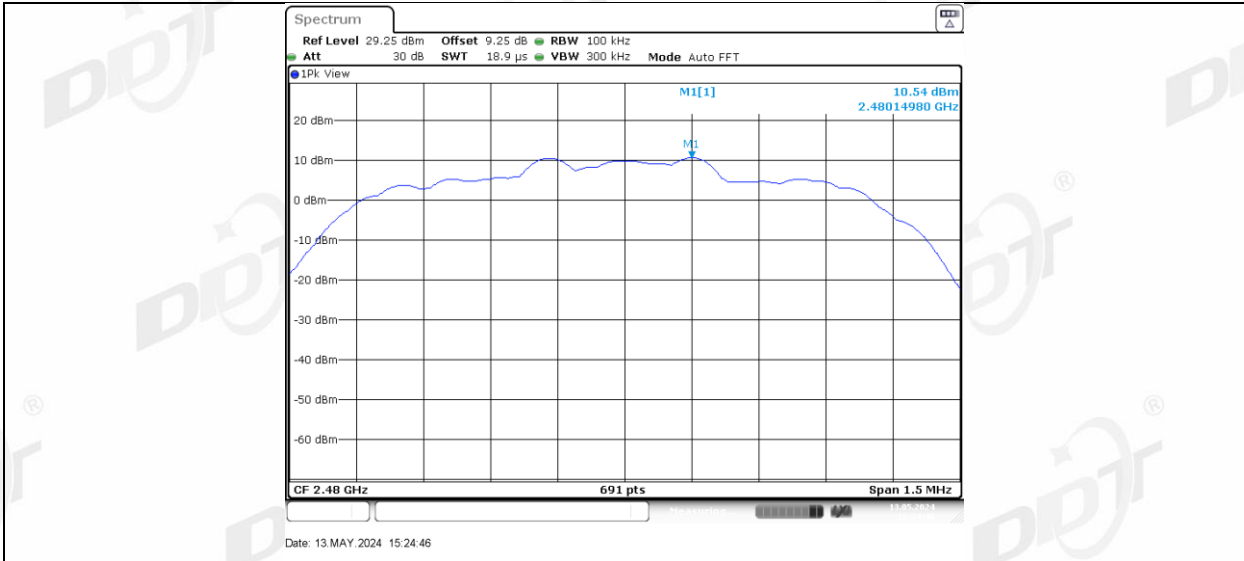
3DH5_Left side_2480_30~1000



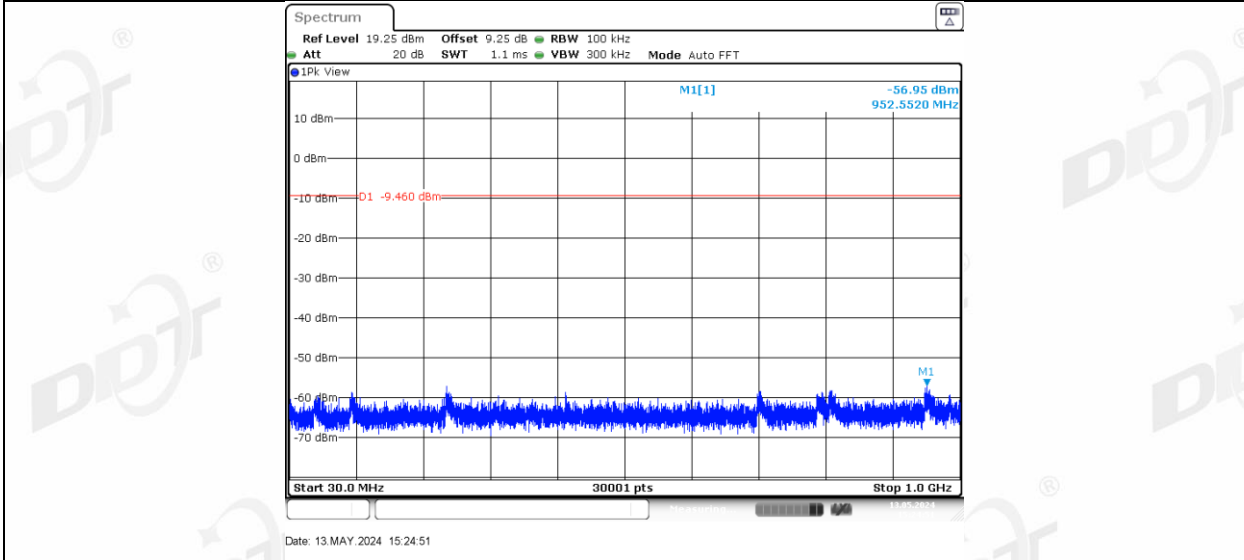
3DH5_Left side_2480_1000~26500



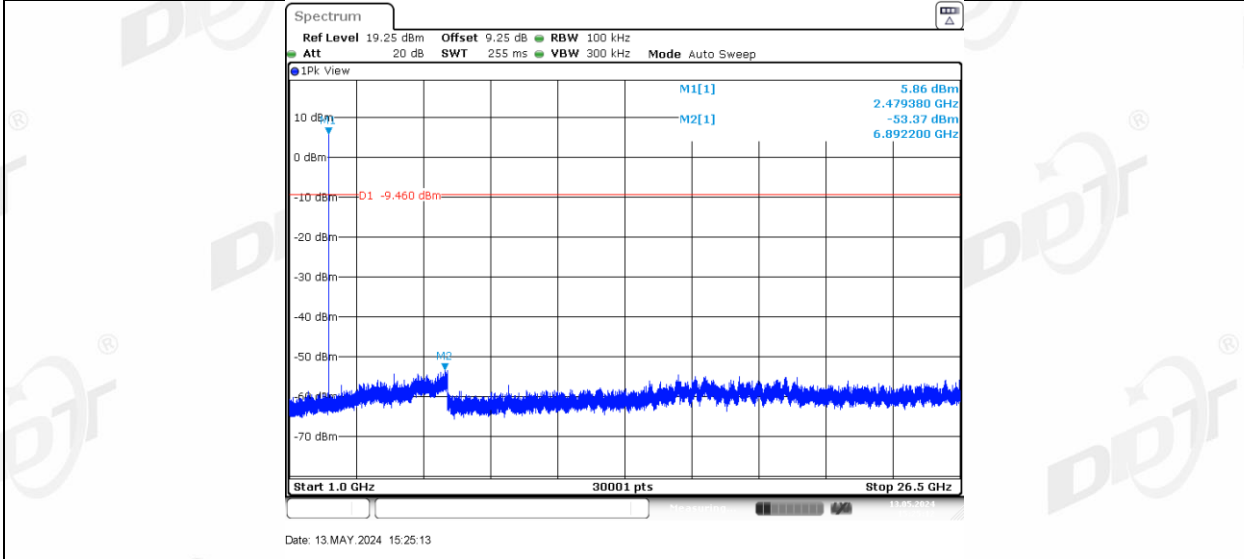
3DH5_Right side_2480_0~Reference



3DH5_Right side_2480_30~1000

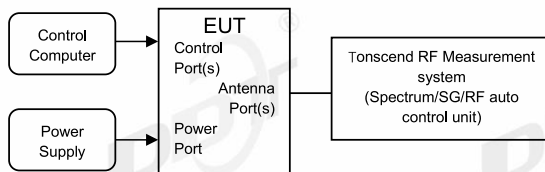


3DH5_Right side_2480_1000~26500



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:	Zhongyao	Test Site:	RF Measurement System 3#
Ambient Condition:	24.4-25.3℃,47.5-47.9%RH	Test Date:	2024.05.07-2024.05.08
Test Power Supply:	Battery	Sample Number:	S24020411-012

Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]
DH5	Left side	2402	2.89	3.75	77.07	1.13
	Right side	2402	2.89	3.75	77.07	1.13
	Left side	2441	2.89	3.75	77.07	1.13
	Right side	2441	2.89	3.76	76.86	1.14
	Left side	2480	2.89	3.75	77.07	1.13
	Right side	2480	2.89	3.76	76.86	1.14
2DH5	Left side	2402	2.88	3.76	76.60	1.16
	Right side	2402	2.89	3.76	76.86	1.14
	Left side	2441	2.88	3.75	76.80	1.15
	Right side	2441	2.89	3.76	76.86	1.14
	Left side	2480	2.88	3.75	76.80	1.15
	Right side	2480	2.89	3.76	76.86	1.14
3DH5	Left side	2402	2.90	3.76	77.13	1.13
	Right side	2402	2.89	3.75	77.07	1.13
	Left side	2441	2.90	3.76	77.13	1.13
	Right side	2441	2.89	3.76	76.86	1.14
	Left side	2480	2.89	3.75	77.07	1.13
	Right side	2480	2.89	3.76	76.86	1.14

12.5. Test graphs













13. Antenna Requirements

13.1. Limit

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For intentional device, according to RSS-Gen issue 5 section 6.8.

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

13.2. Result

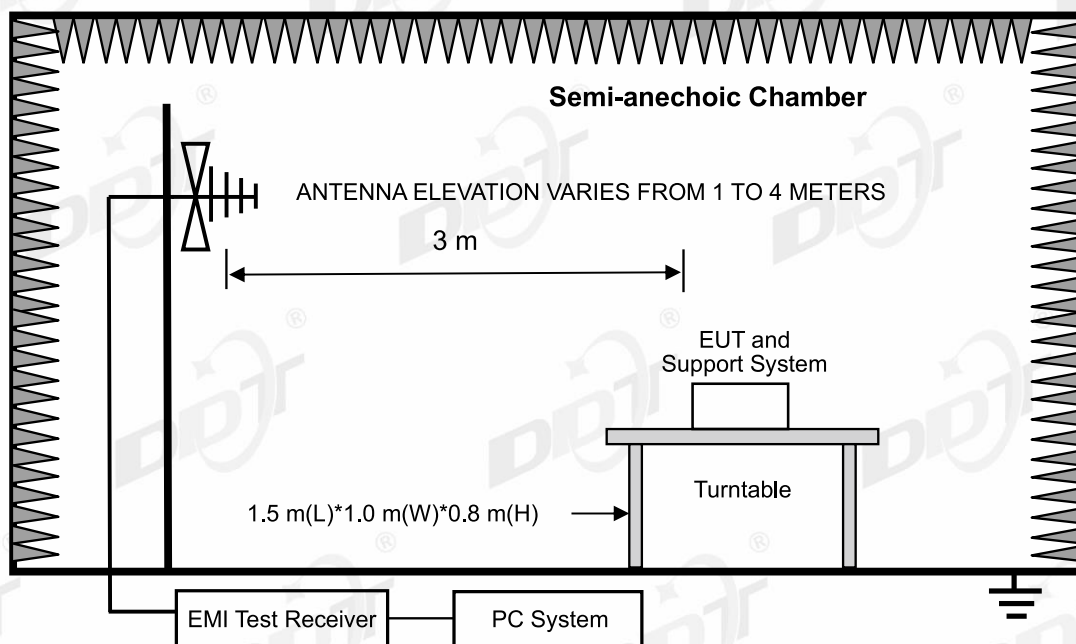
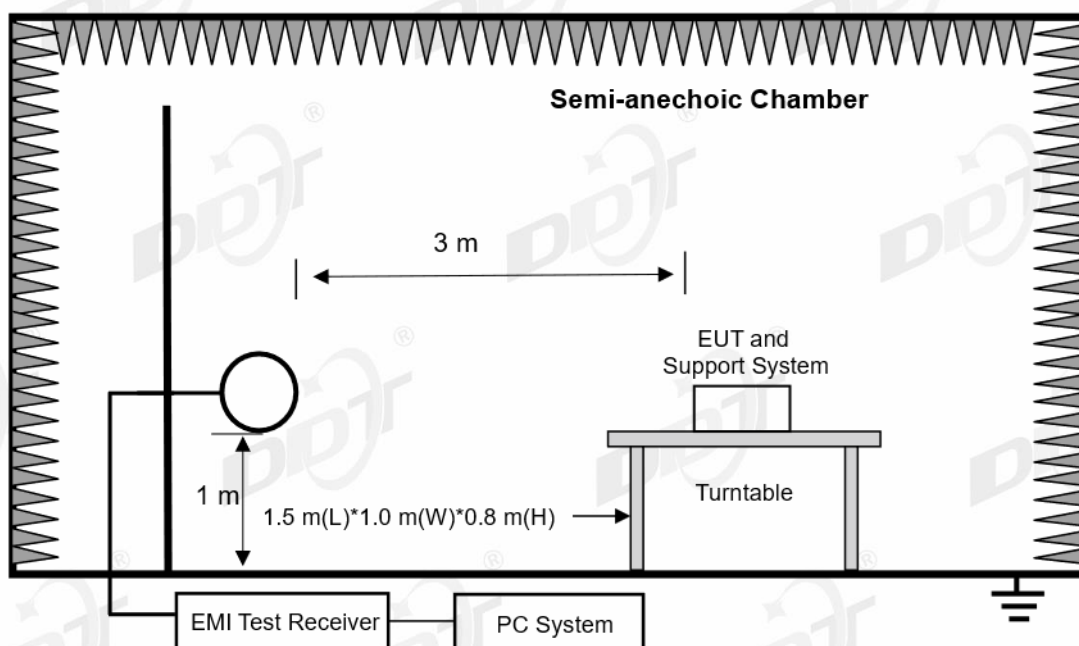
The antenna used for this product as Antenna information described in section 2.1 of the report, and there is no other antenna than that furnished by the responsible party shall be used with the device.

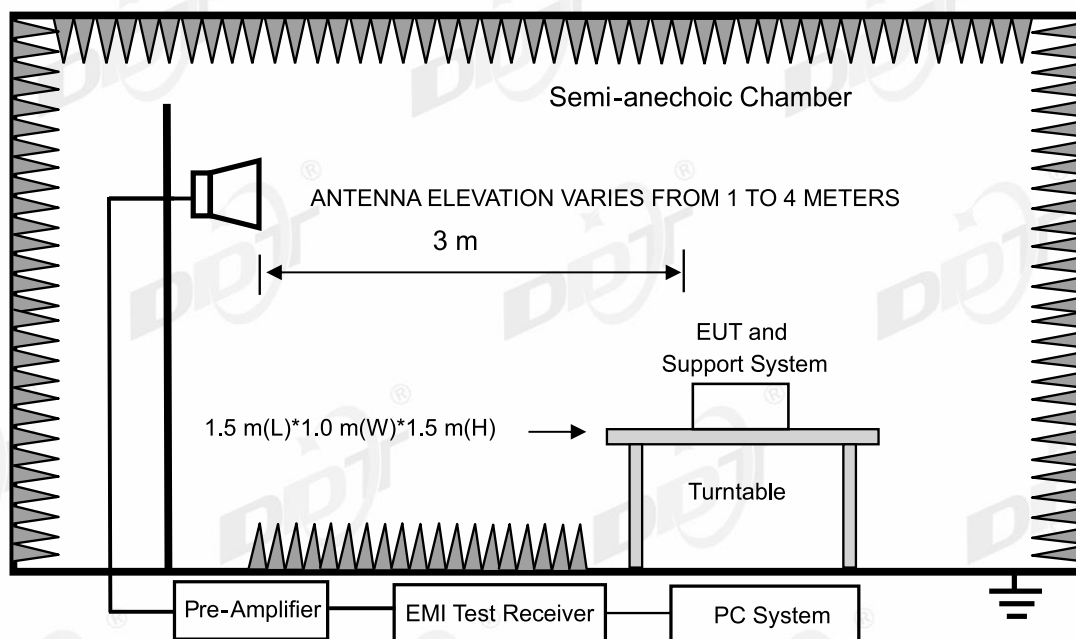
14.Radiated Emission

14.1. Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Cal Due To
EMI TEST RECEIVER	R&S	ESU26	100472	2025/03/31
PSA Series Spectrum Analyzer	Agilent	E4447A	MY50180031	2025/03/31
Active Loop Antenna	Schwarzbeck	FMZB-1519	1519-038	2025/09/10
Trilog Broadband Antenna	Schwarzbeck	VULB 9163	01429	2025/07/11
Double Ridged Horn Antenna	Schwarzbeck	BBHA 9120 D	02468	2024/09/17
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	2025/04/25
Pre-amplifier	COM-POWER	PAM-118A	18040084	2024/07/14
Pre-amplifier	COM-POWER	PAM-840A	461369	2025/03/31
RE Cable	N/A	W23.02 CP1-X2 + W23.09 AP1-X8+ JCT26S-NJ-NJ-1.5M	4.5M+8M+1.5M	2025/03/31
RF Cable	Yuhu	JCTB810-NJ-NJ-9M+ ZT26S-SMAJ-SMAJ-1M	21123964	2025/03/31
Band Reject Filter(2400-2500 MHz)	REBES	BRM50702	G555	N/A
Band Reject Filter(5150-5880 MHz)	REBES	BRM50716	G392	N/A
High Pass Filter(8000-25000 MHz)	XB	XBLBQ-GTA67	210820-2-3	N/A
Test Software	Tonscend	JS32-RE	V 5.0.0.1	N/A
RF cable	Zhongke Junchuang	JCT26S-NJ-NJ-1.5M	DDT-ZC02762	2025/04/01
Micro-Tronics filters	REBES	BRM50716	DDT-ZC03240	/
High pass filter	Micro-Tronics	HPM50108	DDT-ZC00560	2025/04/22

14.2. Block diagram of test setup





14.3. Limits

(1) FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

²Above 38.6