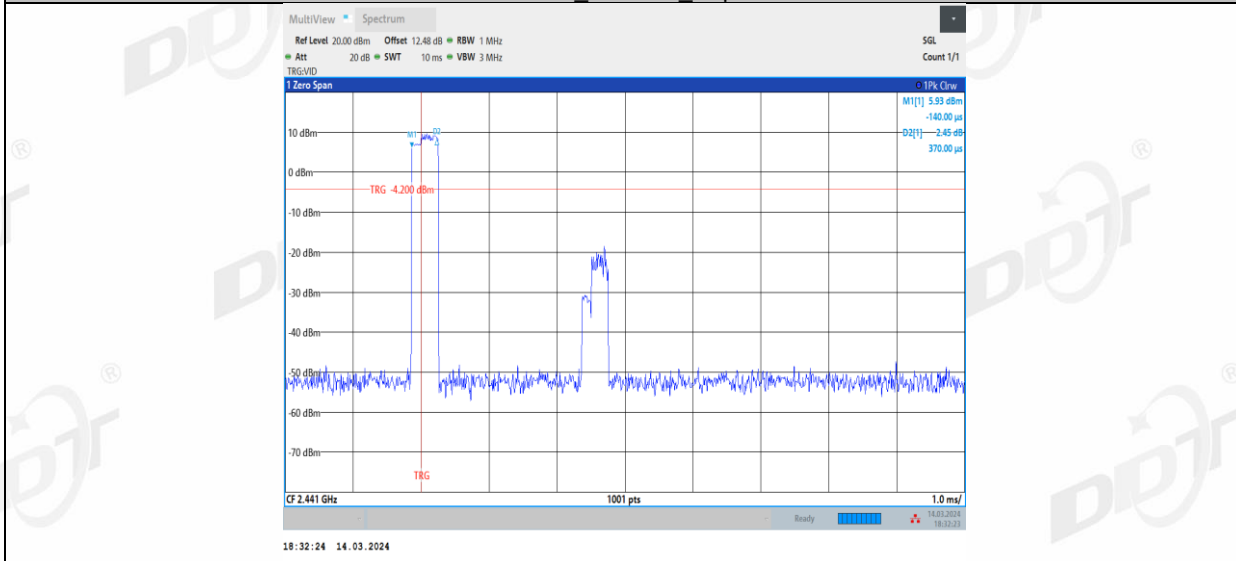
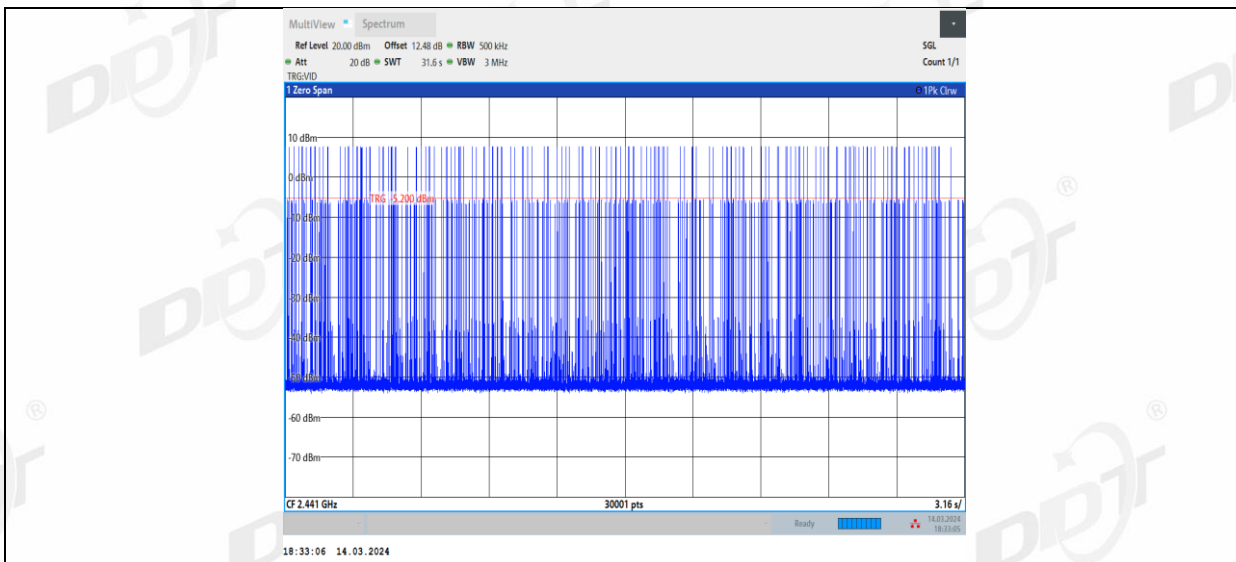
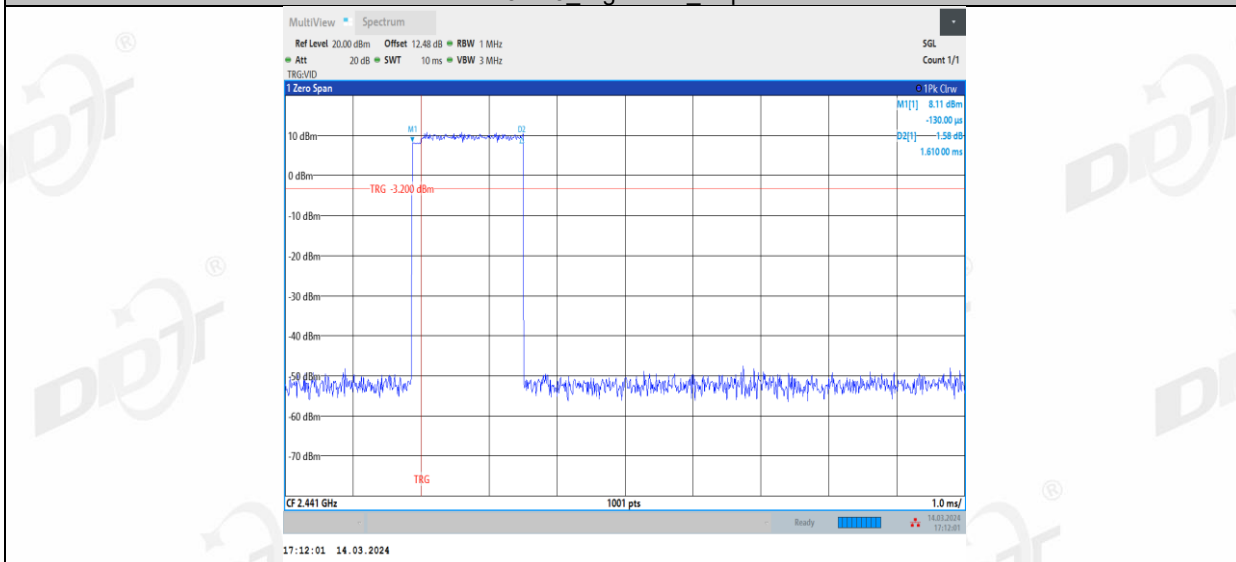


3DH1\_Left side\_Hop

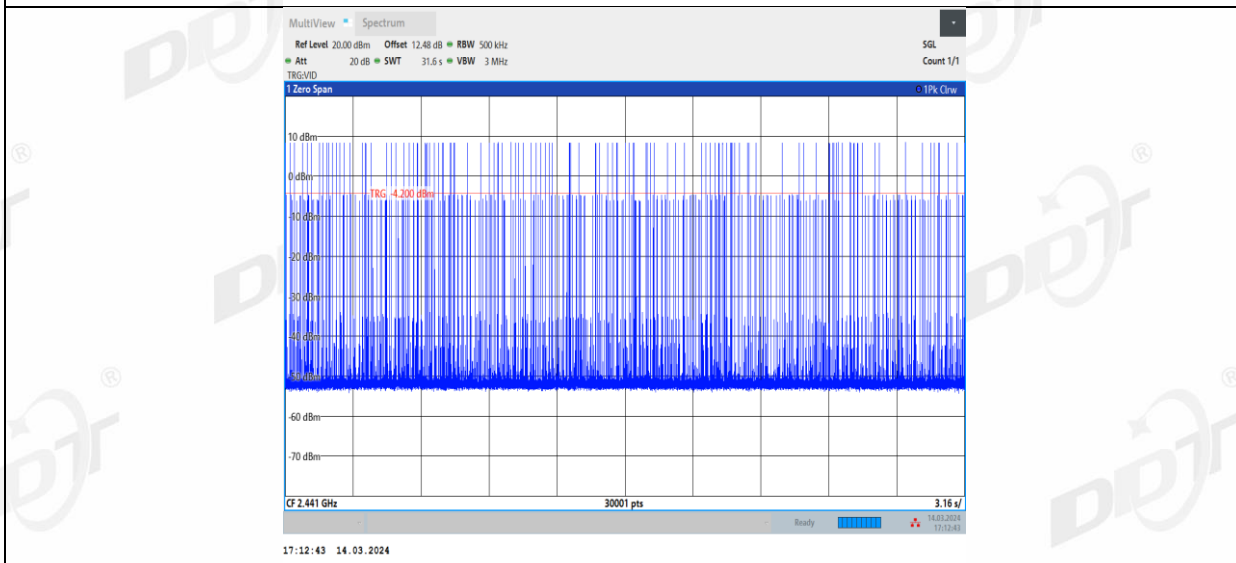


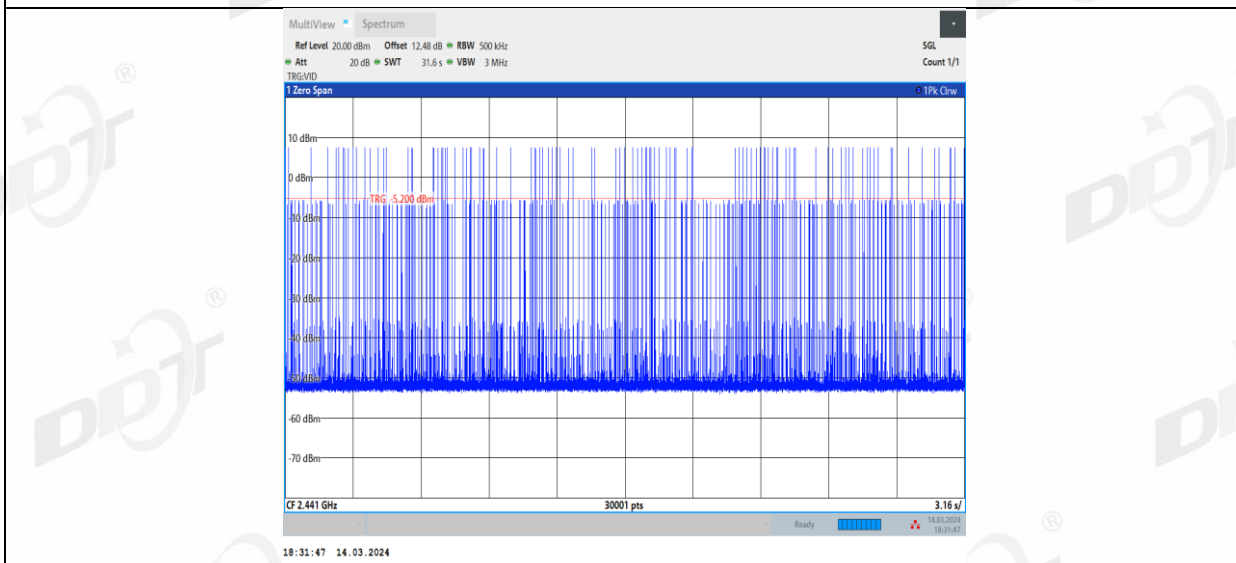
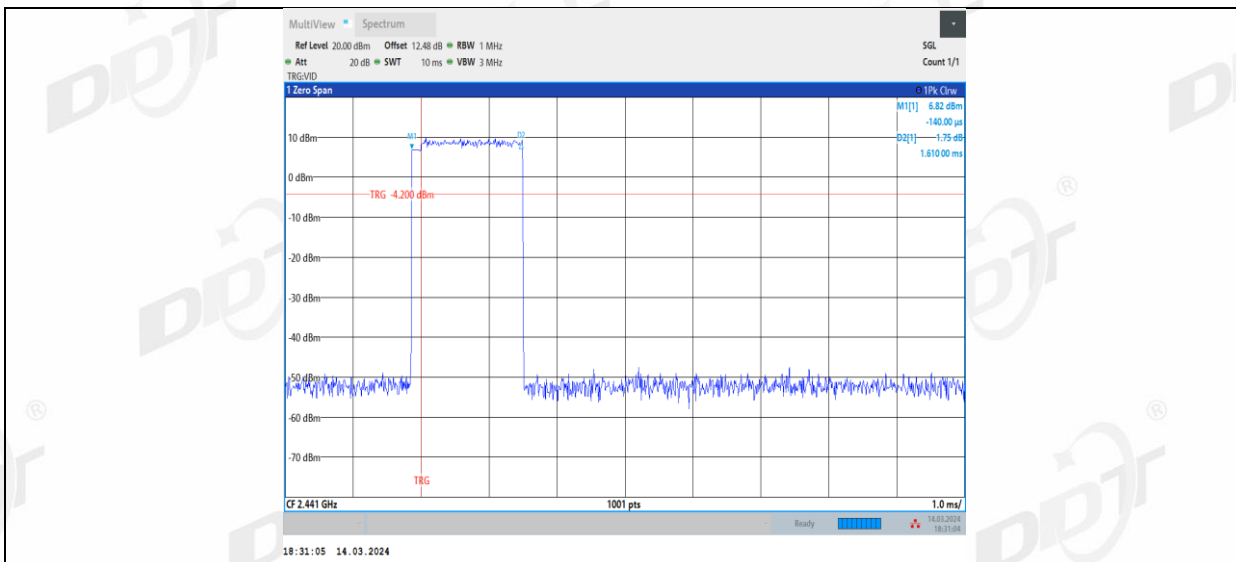


3DH3\_Right side\_Hop

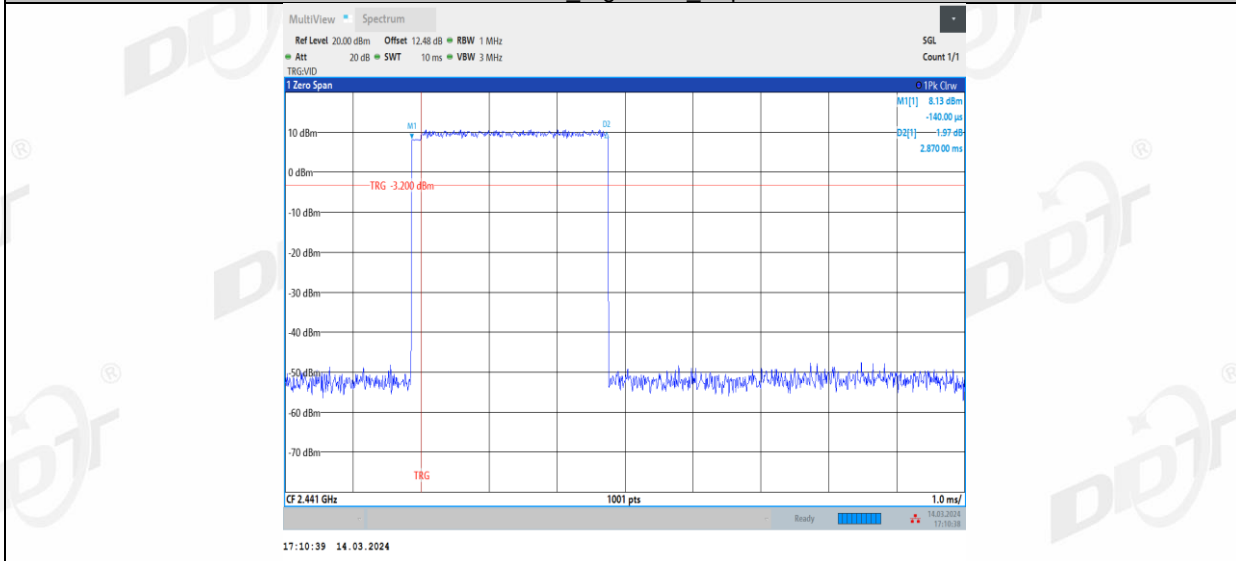


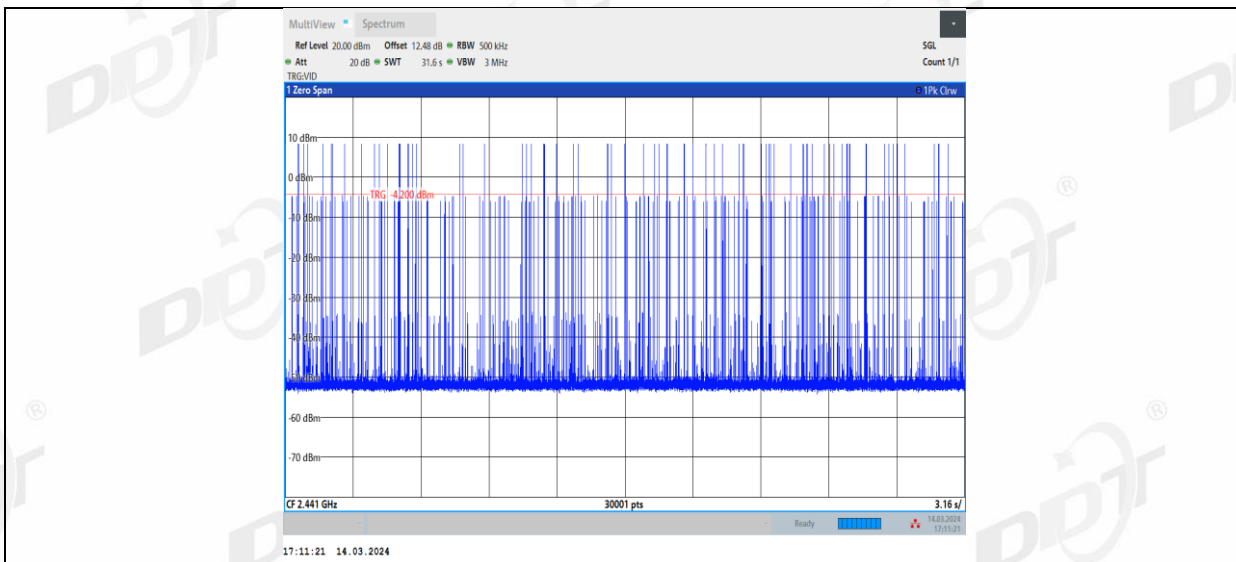
3DH3\_Left side\_Hop



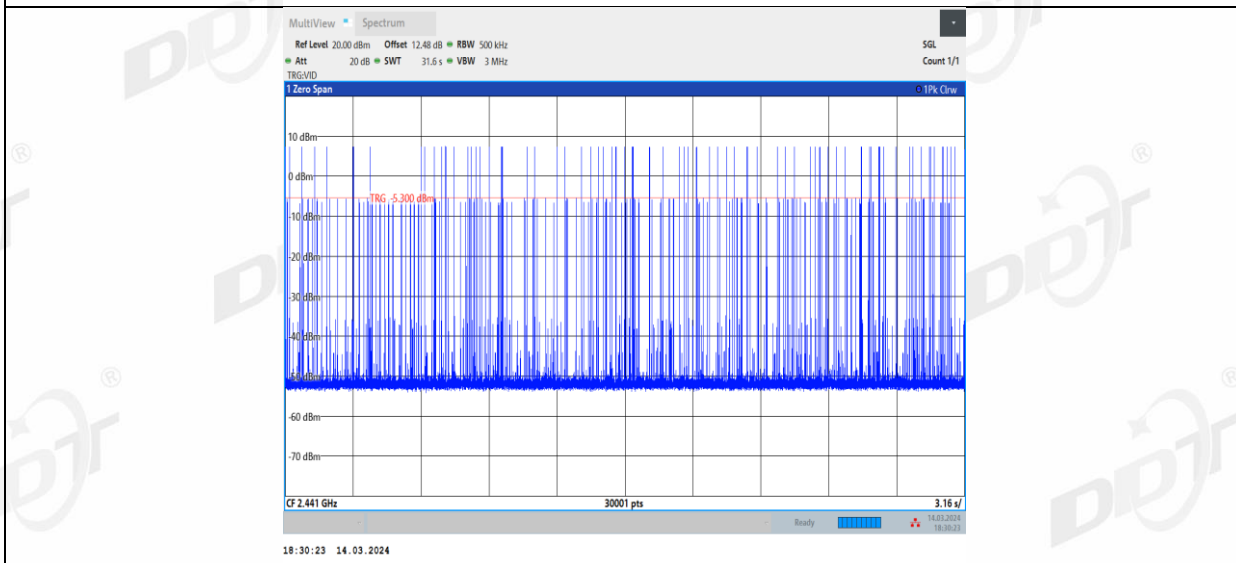
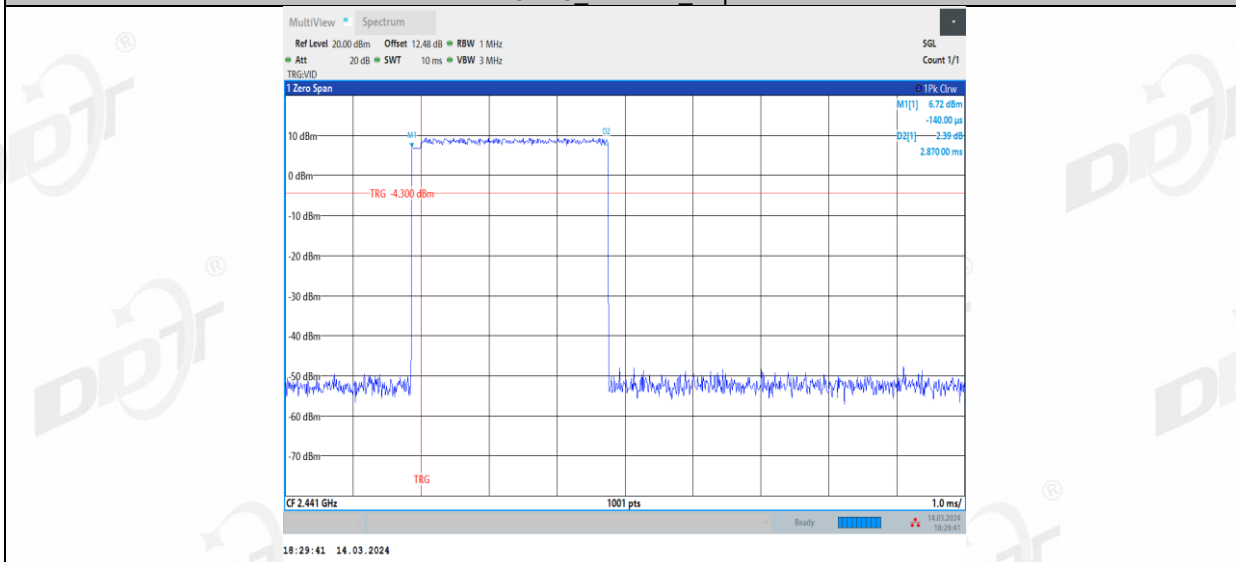


3DH5\_Right side\_Hop



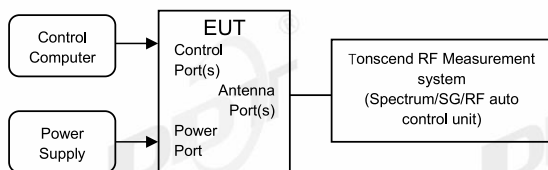


3DH5\_Left side\_Hop



## 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:
 

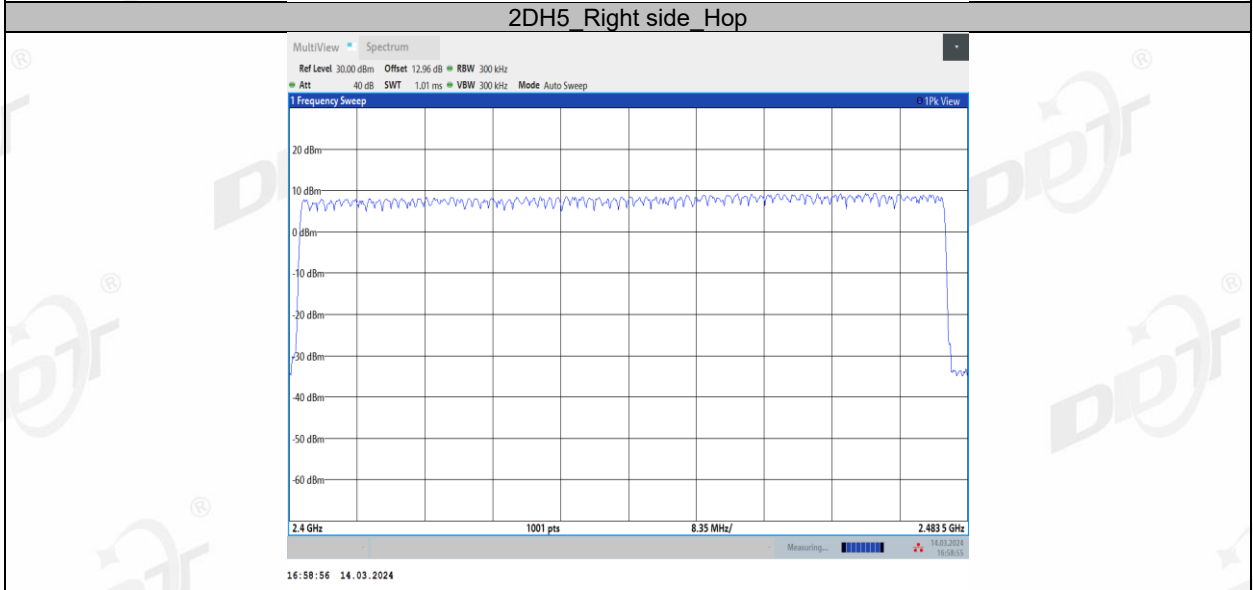
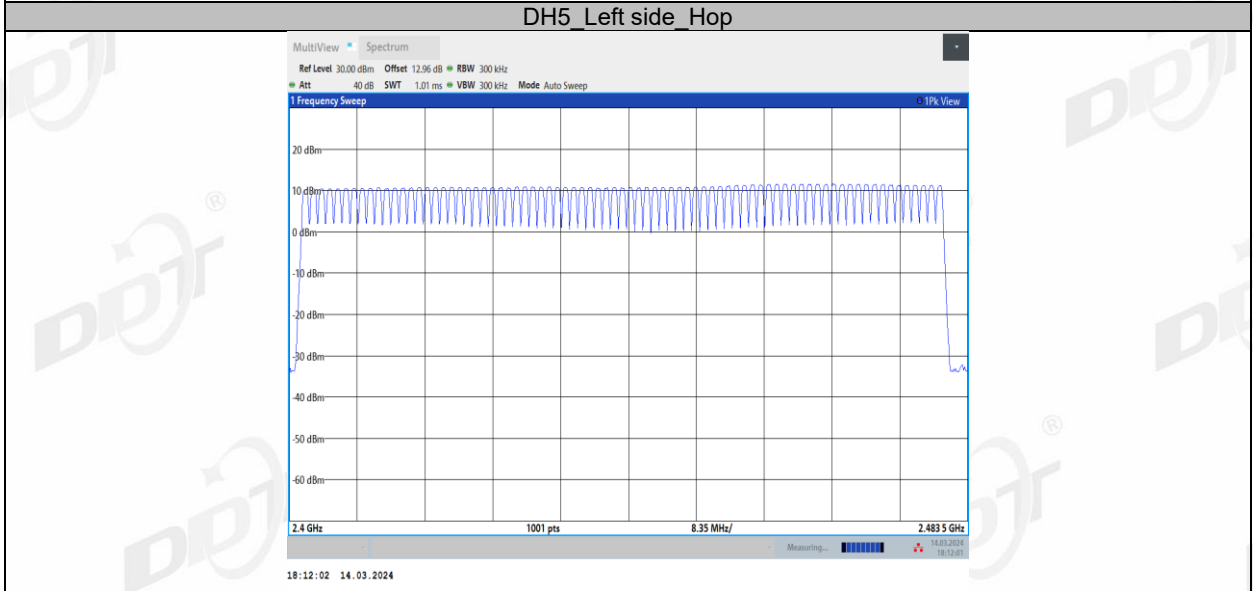
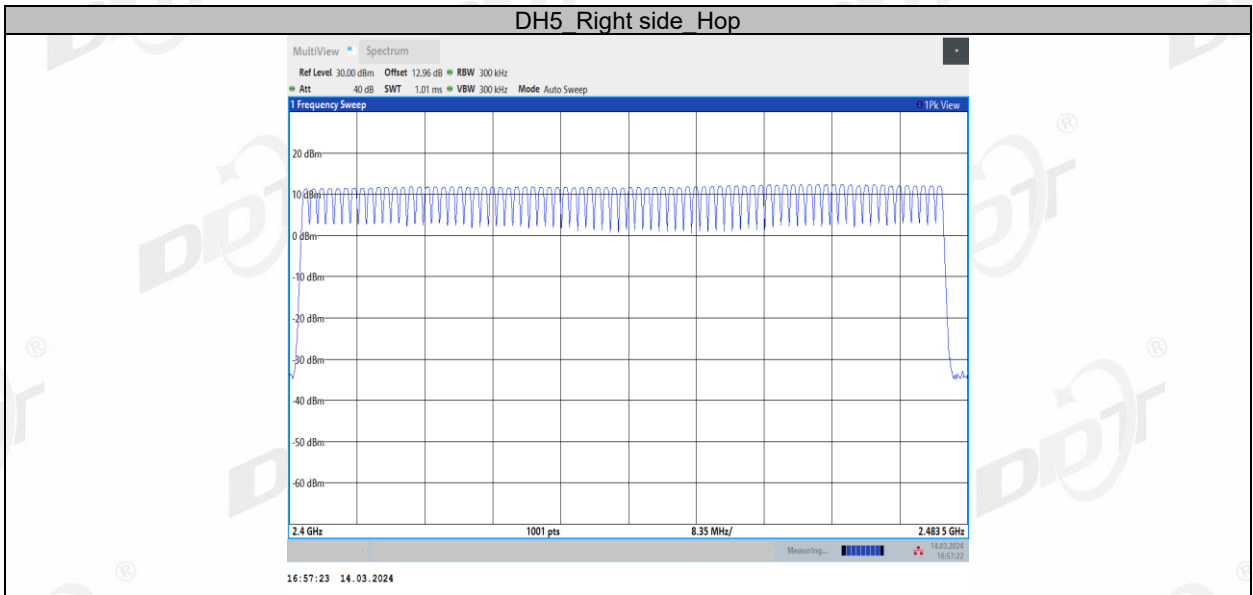
RBW:	RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
VBW:	VBW $\geq$ RBW.
Span:	The frequency band of operation
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold
- (5) Measure the hopping number and record the results in the report.
- (6) Measure and record the results in the report.

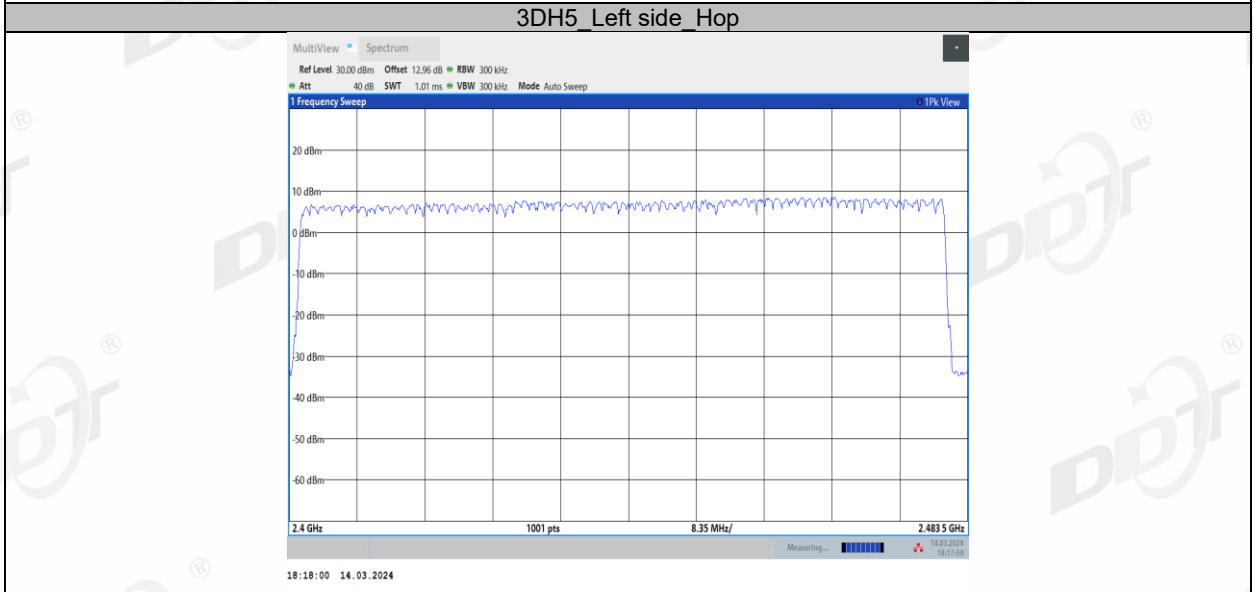
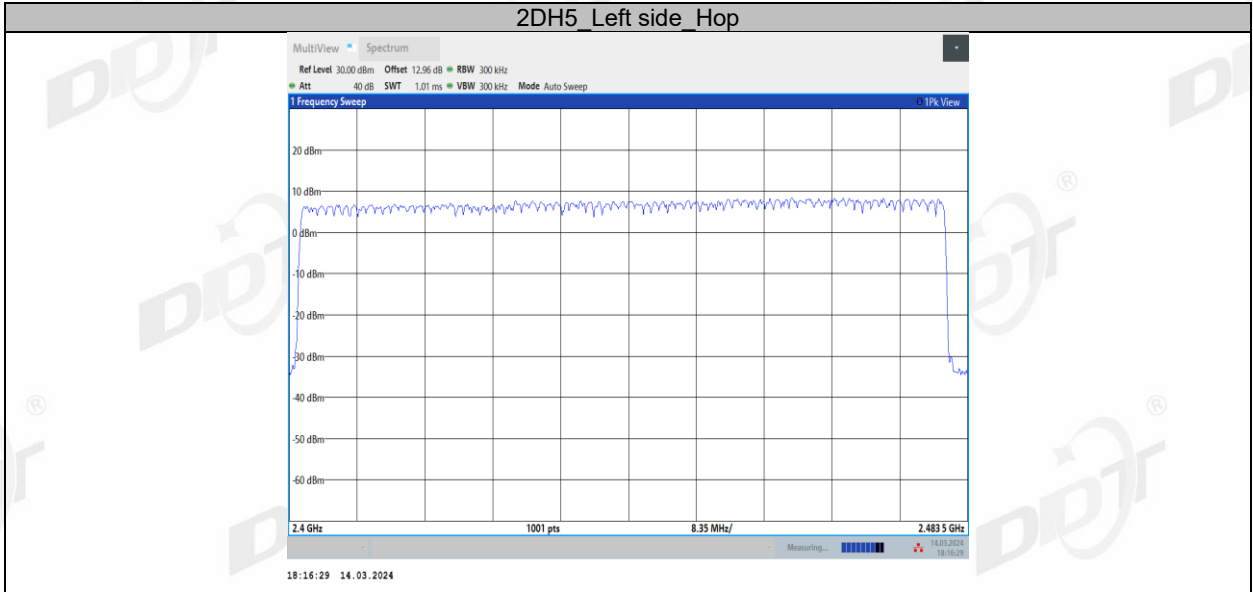
#### 9.4. Test result

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 4#
Ambient Condition:	23.6°C,53.3%RH	Test Date:	2024.03.14
Test Power Supply:	Battery	Sample Number:	S24031112-001

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

### 9.5. Test graphs

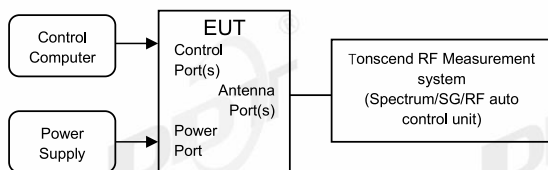






## 10. Band Edge Compliance (Conducted Method)

### 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:
 

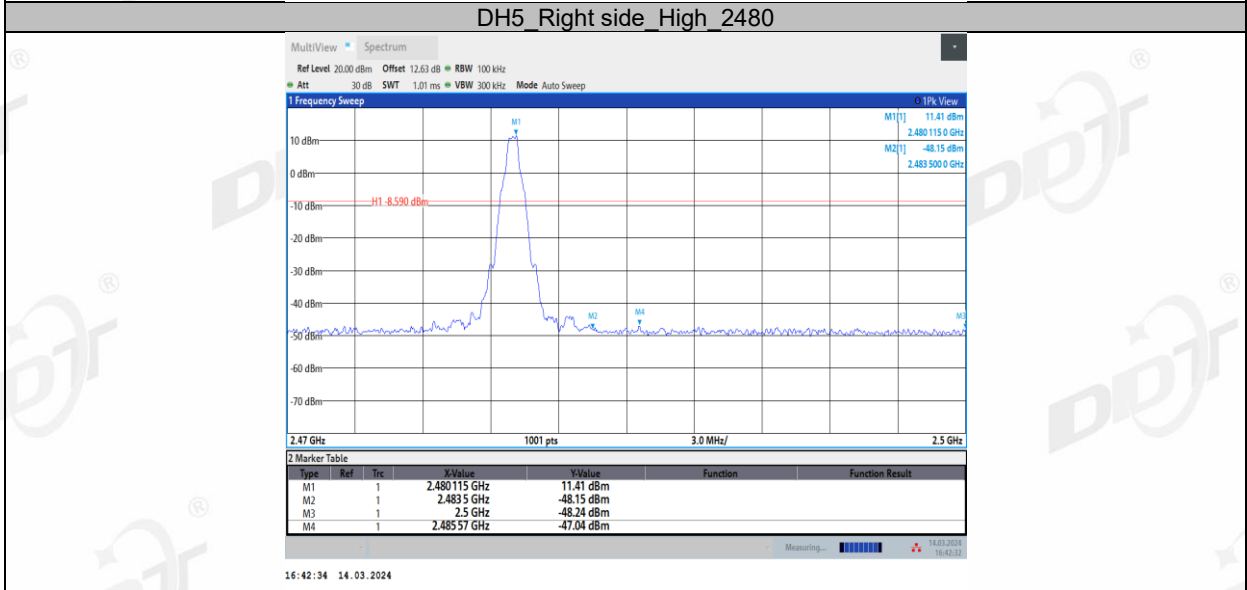
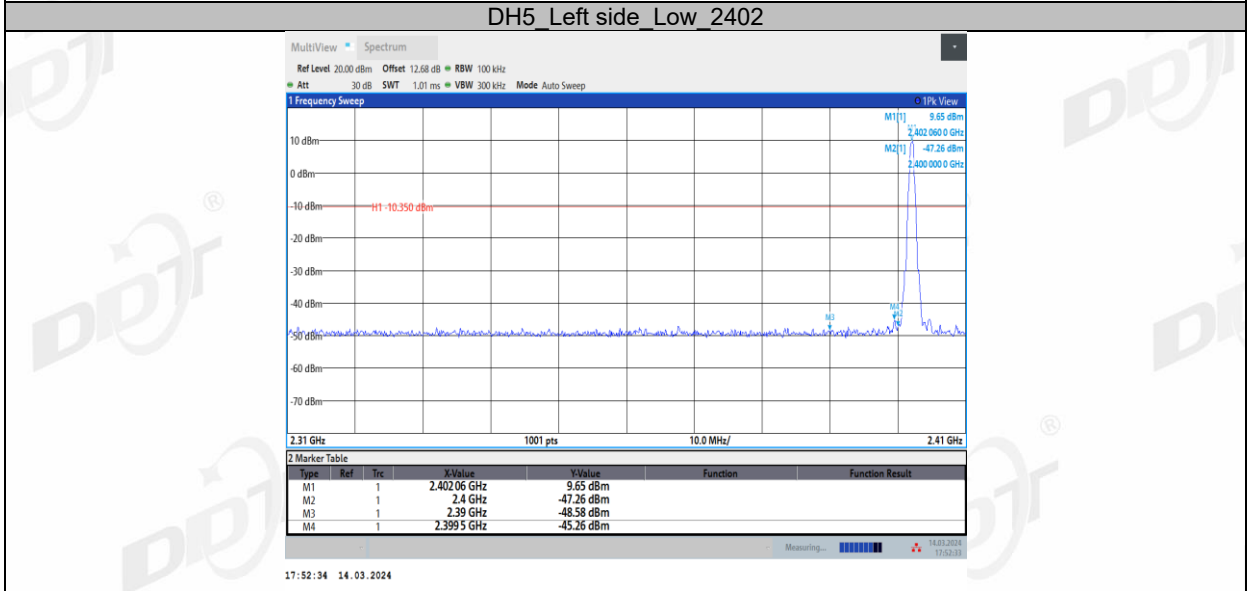
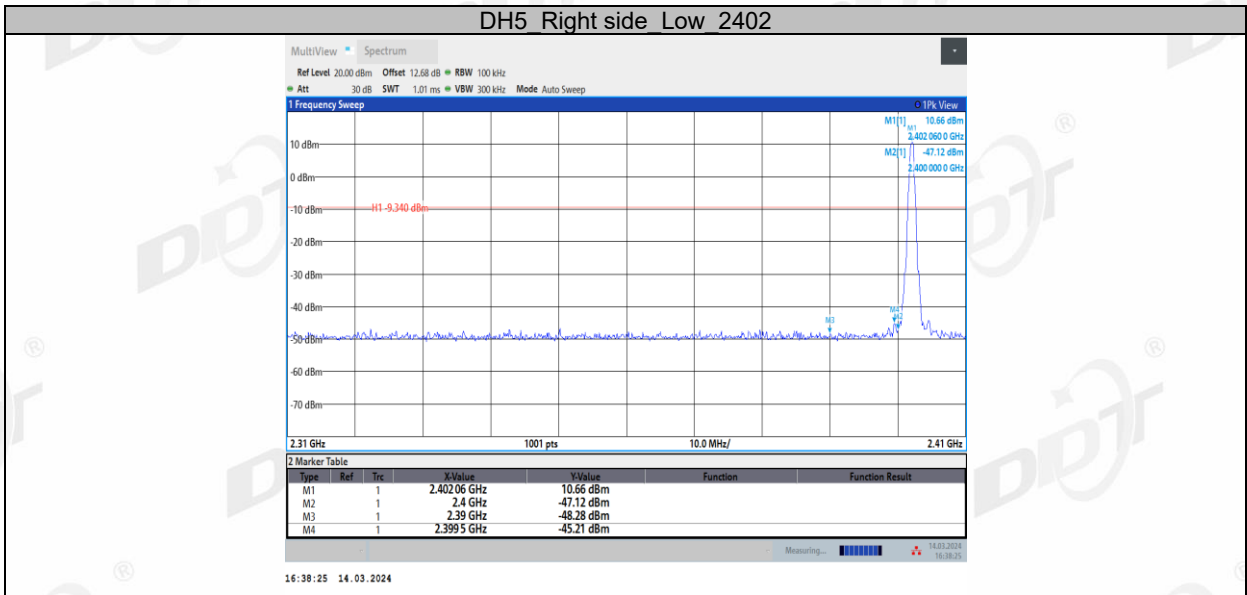
RBW:	100 kHz
VBW:	300 kHz
Span	Encompass frequency range to be measured
Detector Mode:	Peak
Sweep time:	Auto
Trace mode	Max hold
- (3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.
- (4) Then mark the maximum amplitude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

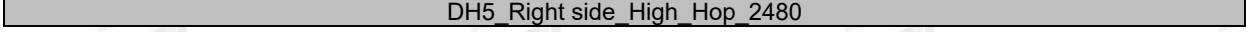
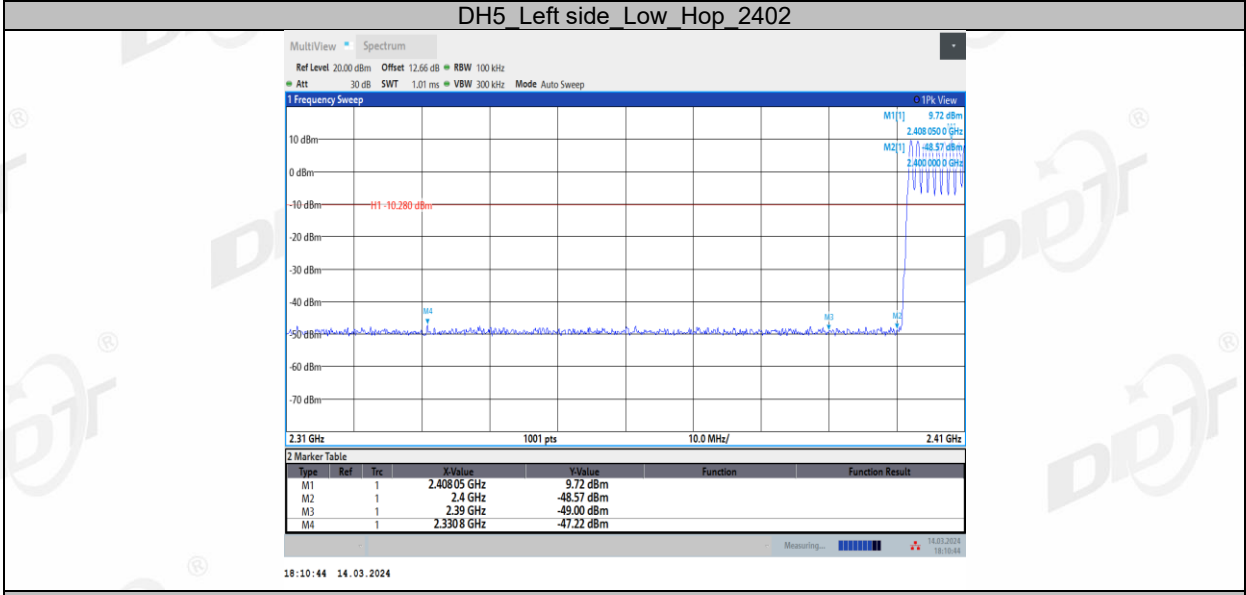
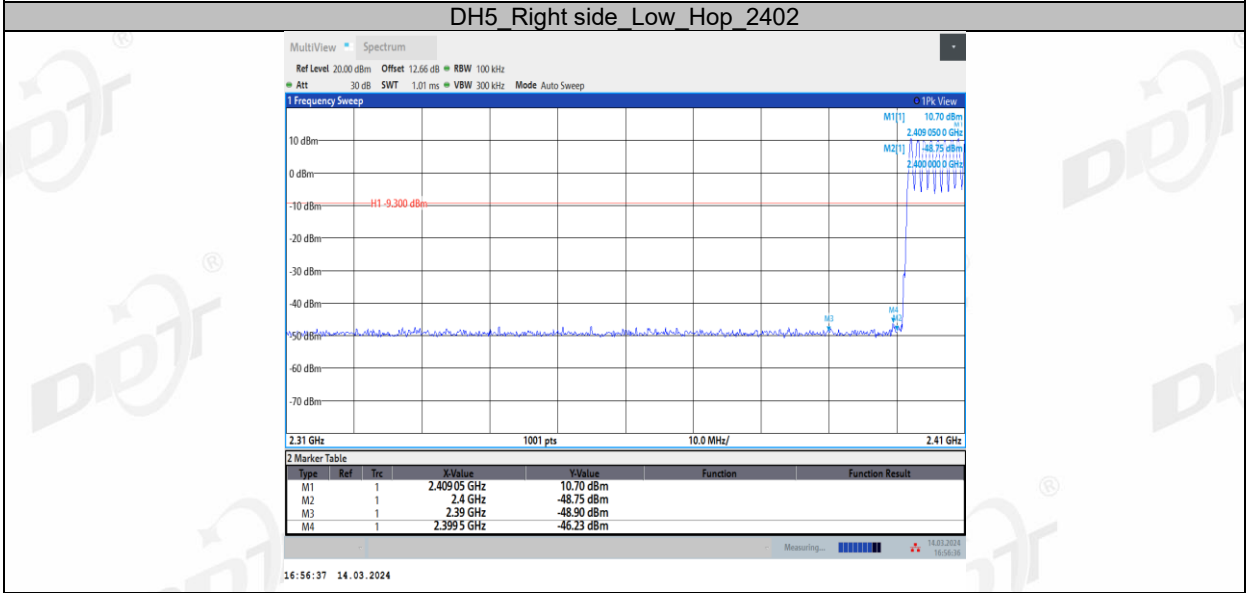
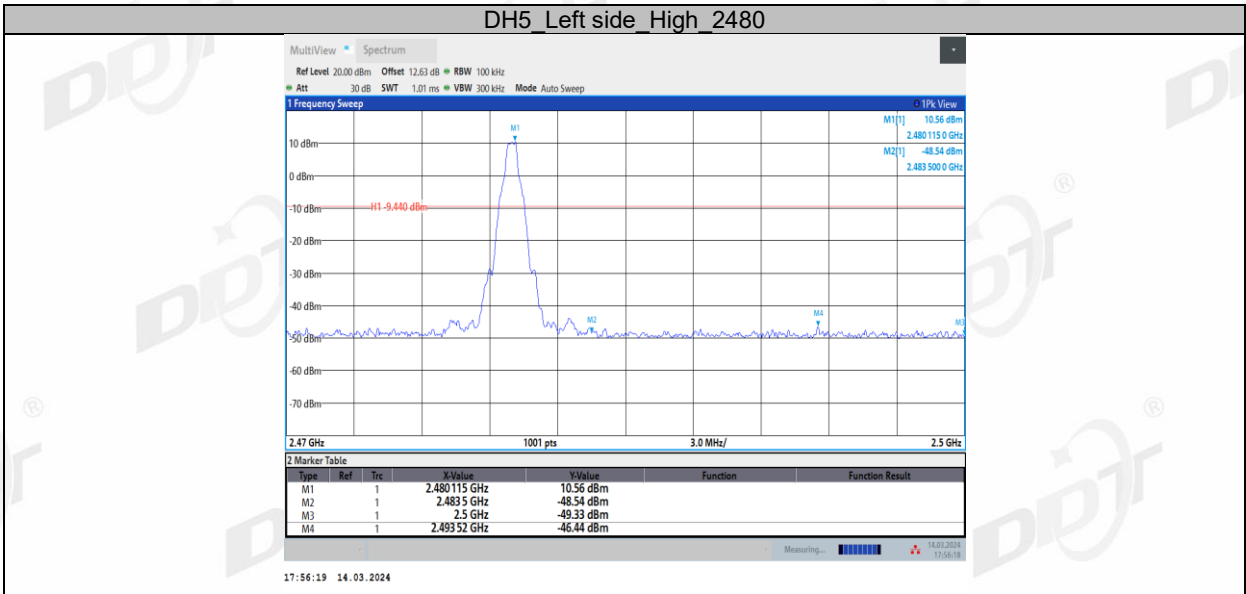
**10.4. Test result**

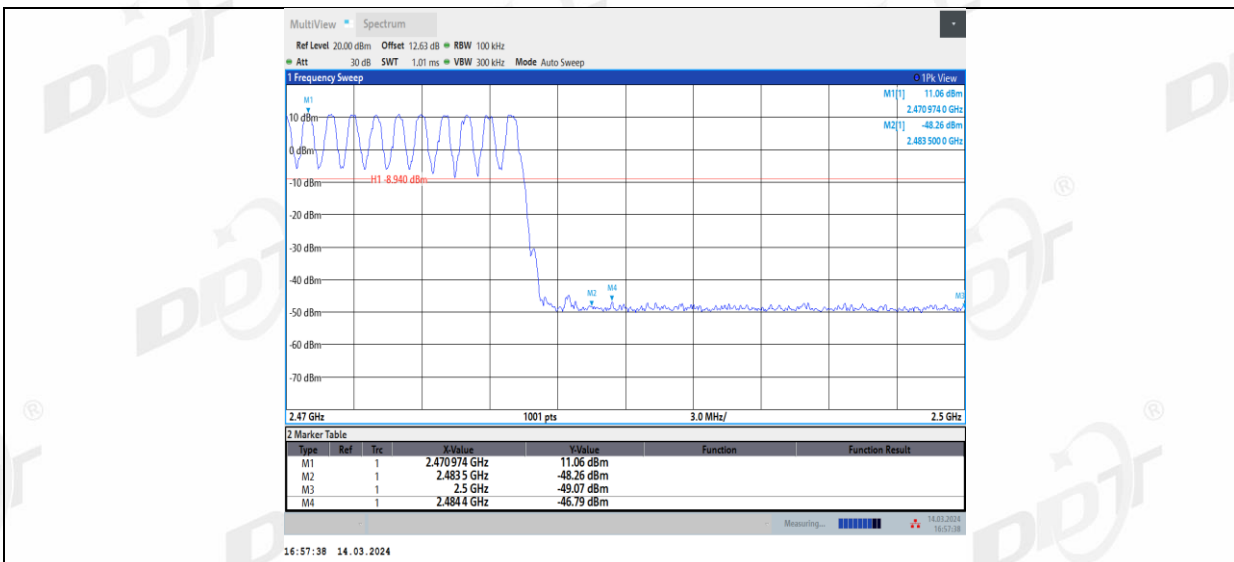
Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 4#
Ambient Condition:	23.6°C,53.3%RH	Test Date:	2024.03.14
Test Power Supply:	Battery	Sample Number:	S24031112-001

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

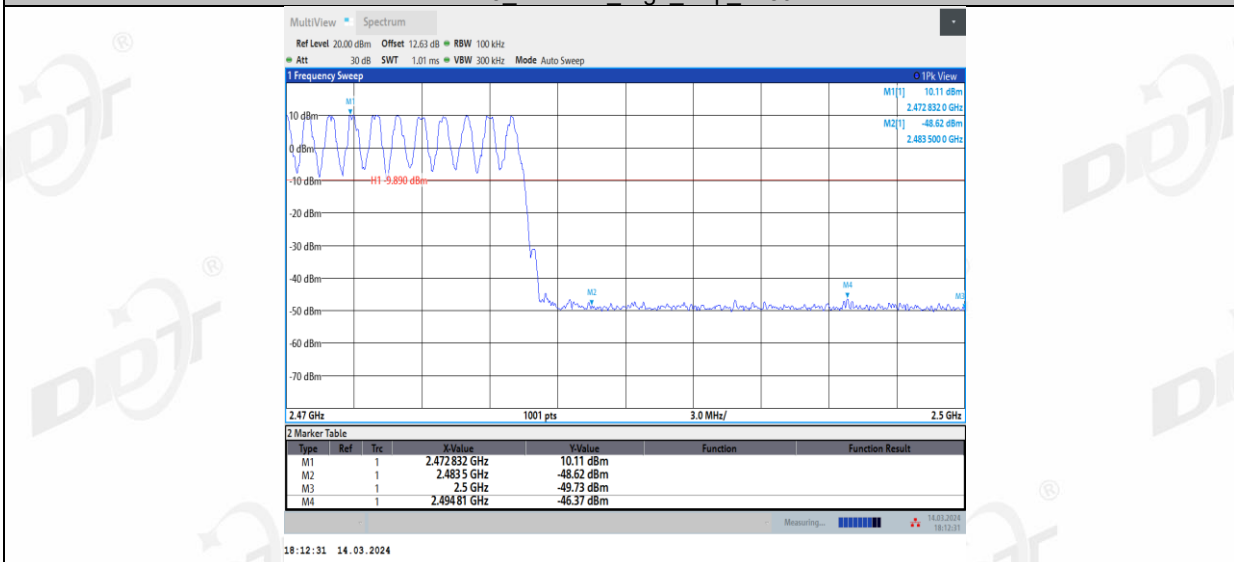
### 10.5. Test graphs



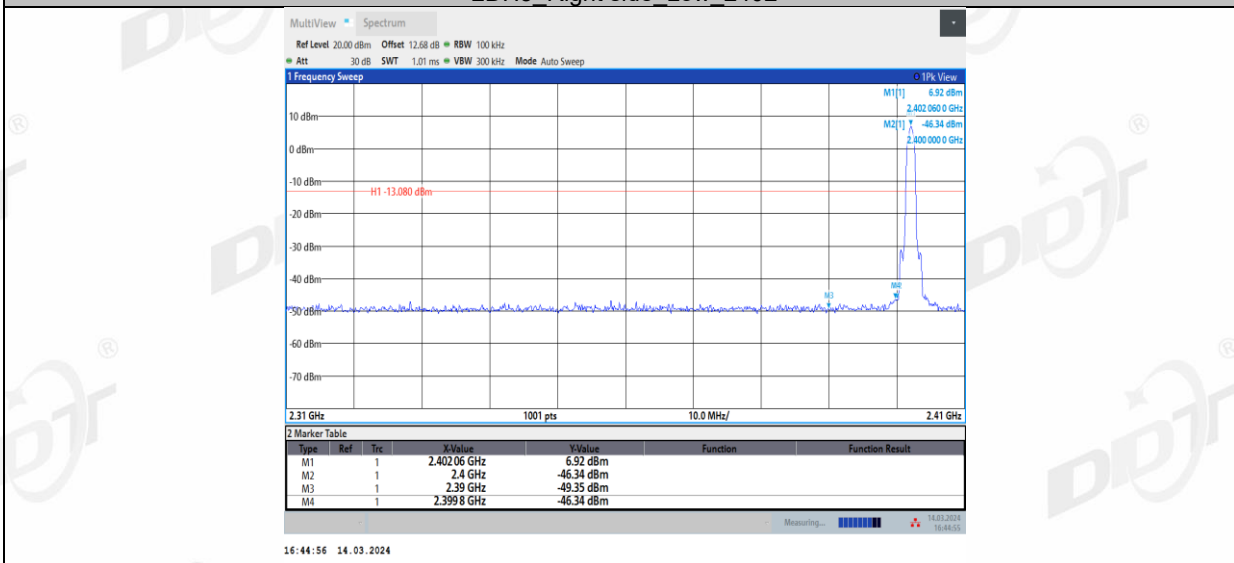




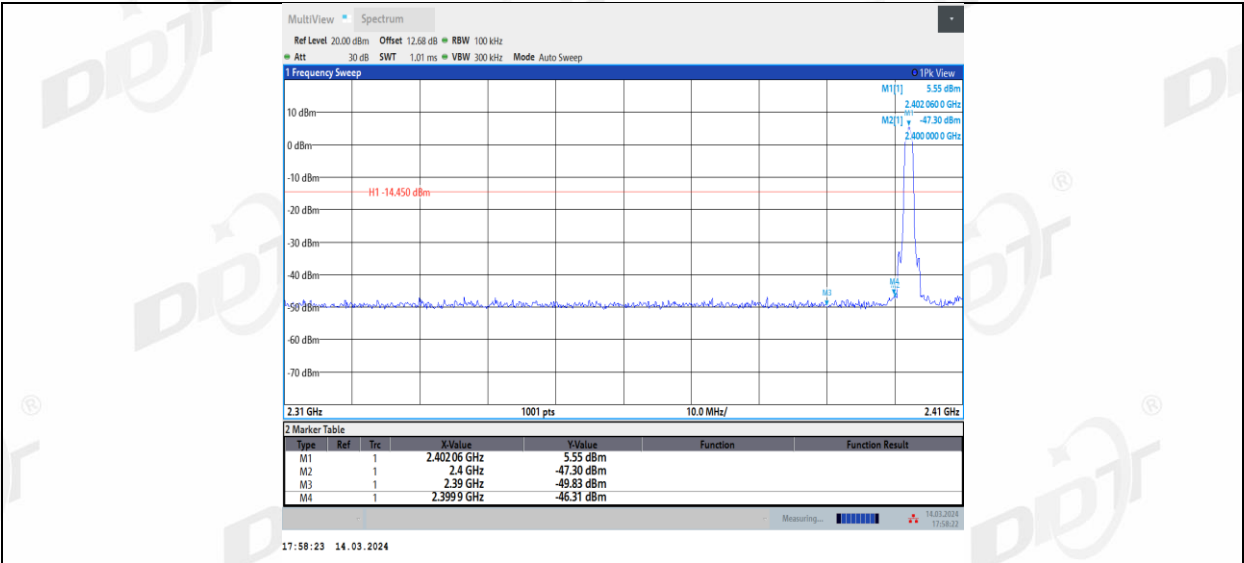
DH5 Left side High Hop 2480



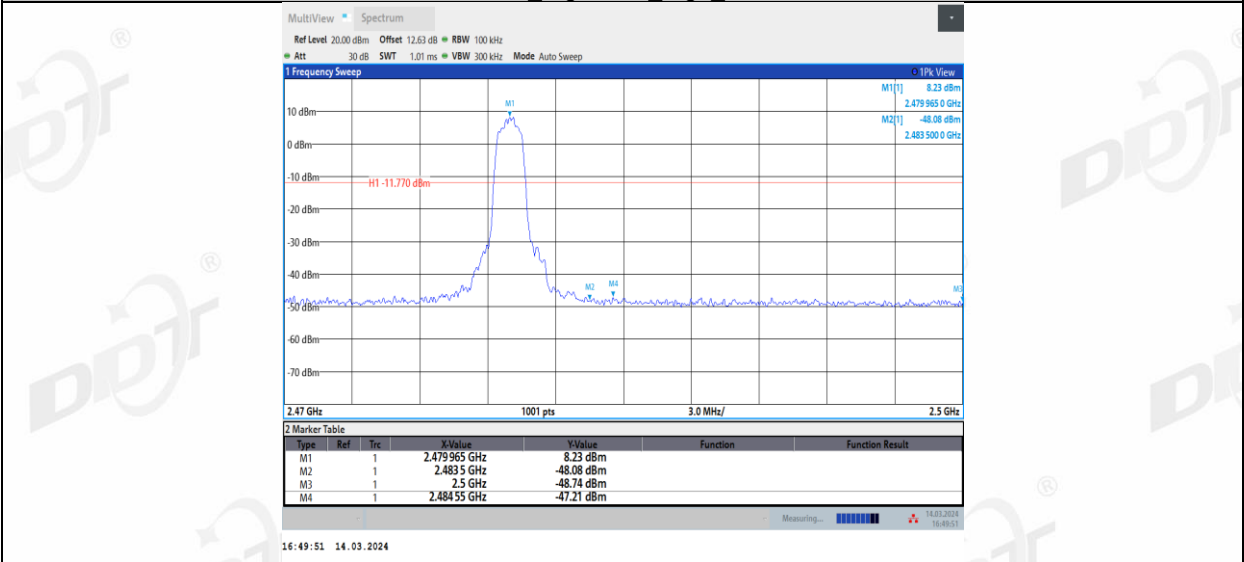
2DH5 Right side Low 2402



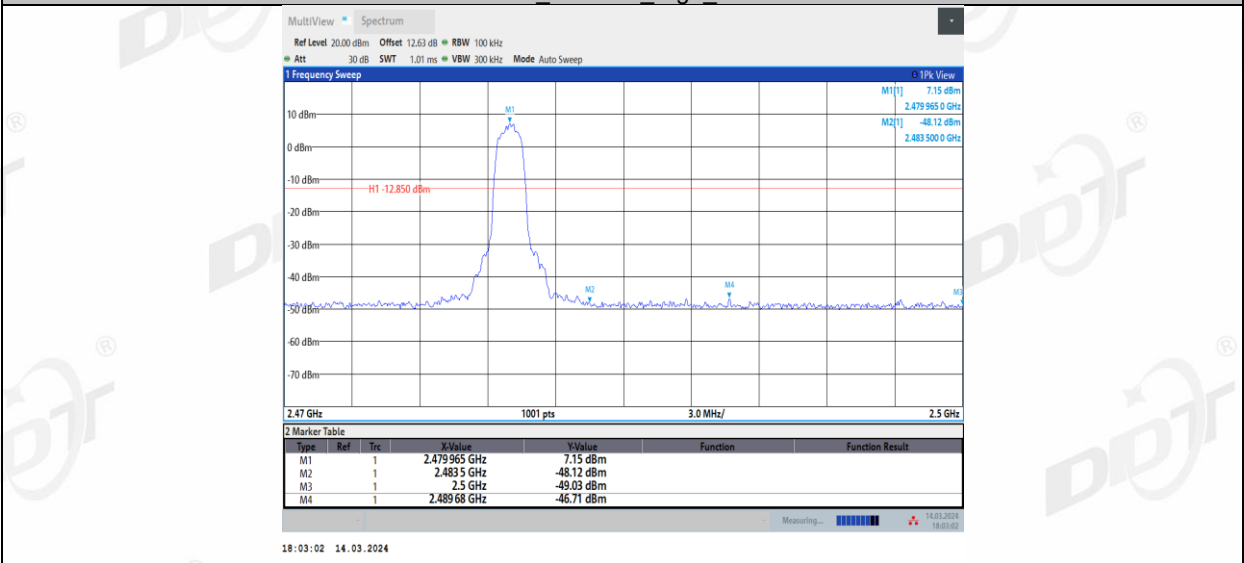
2DH5 Left side Low 2402



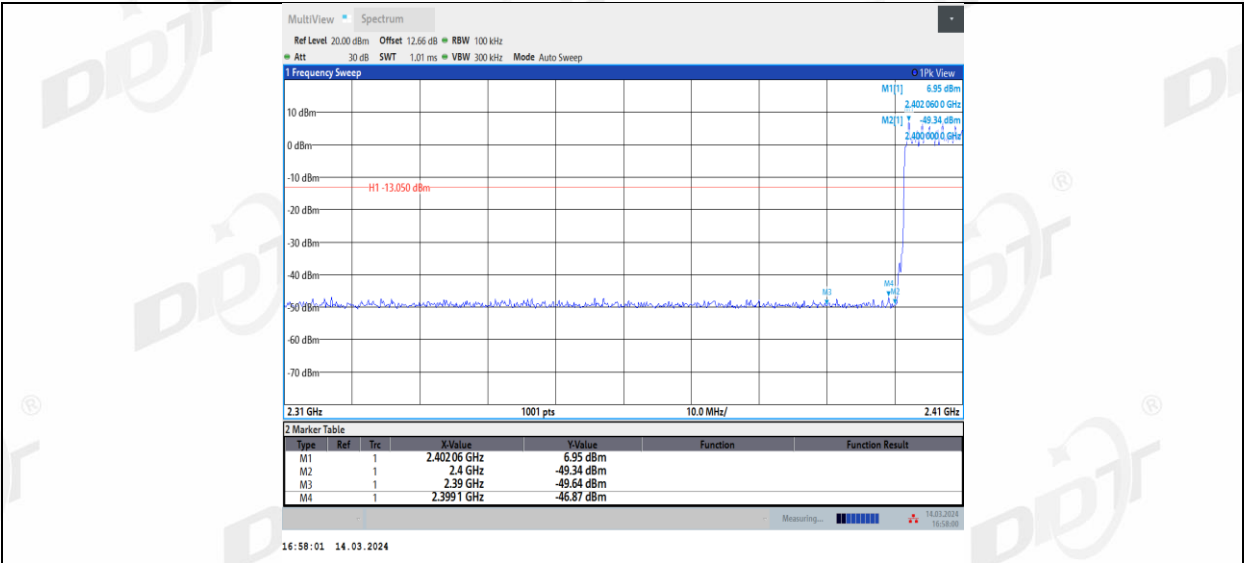
2DH5 Right side High 2480



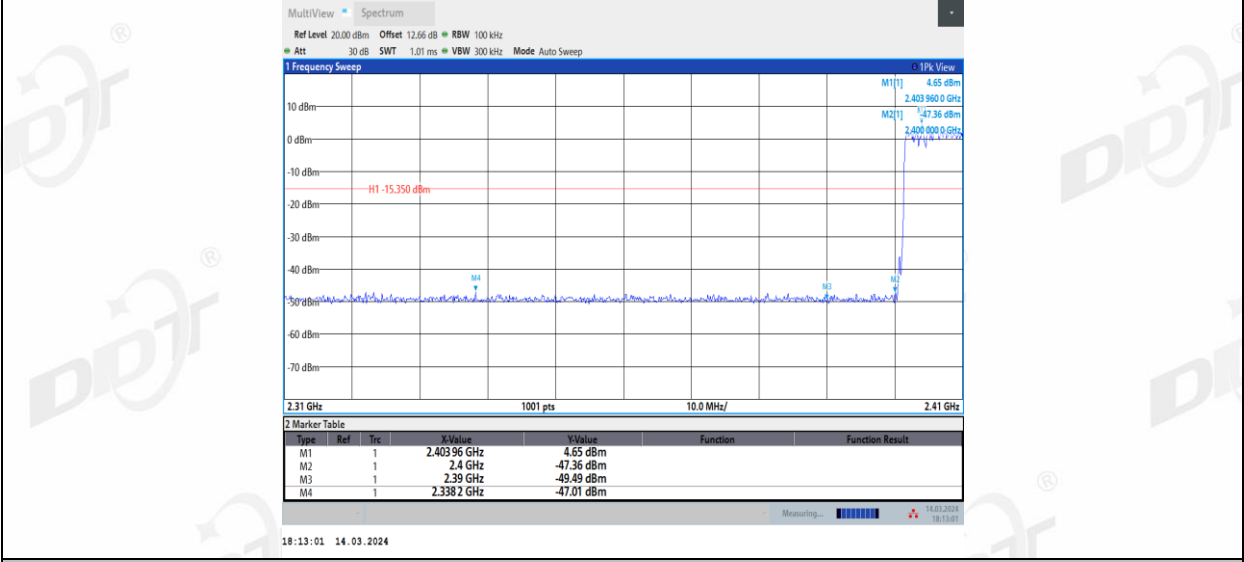
2DH5 Left side High 2480



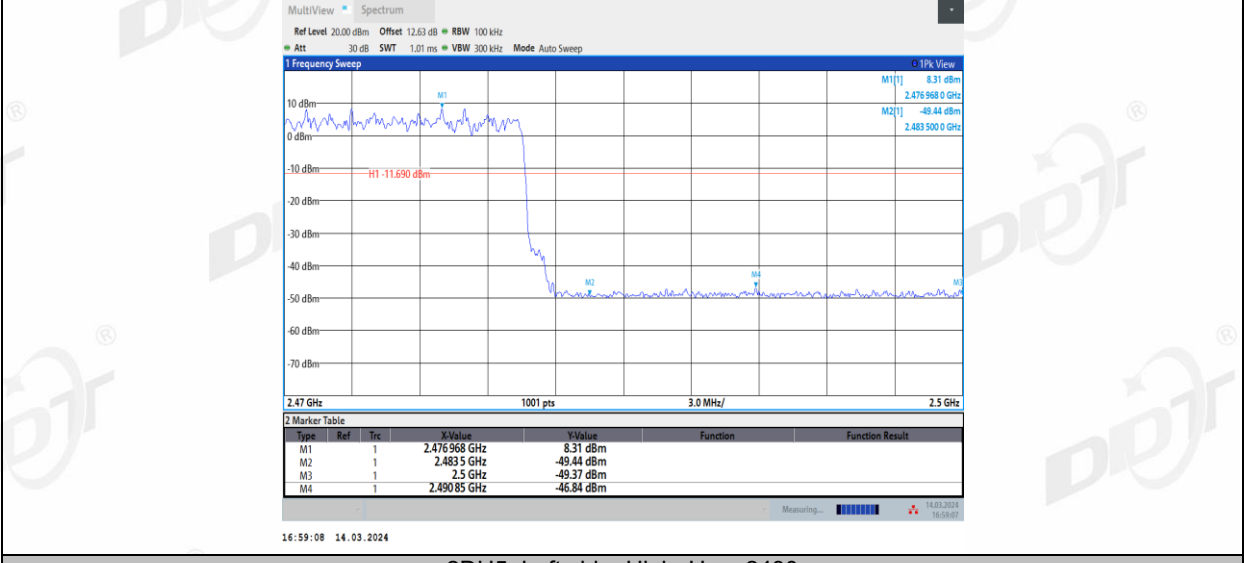
2DH5 Right side Low Hop 2402



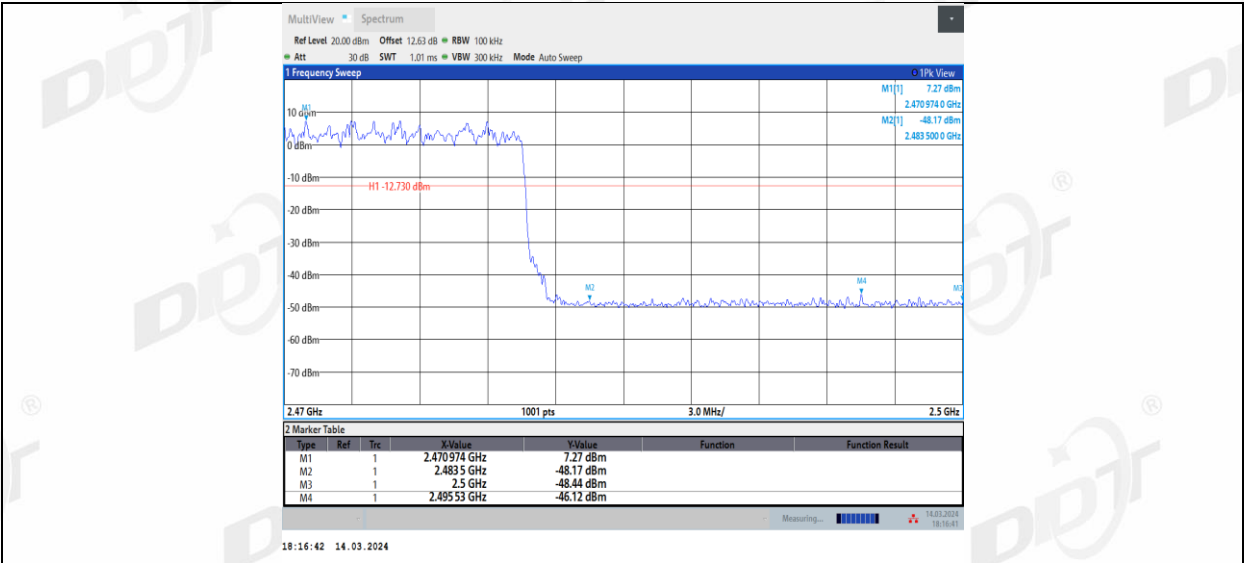
2DH5\_Left side\_Low\_Hop\_2402



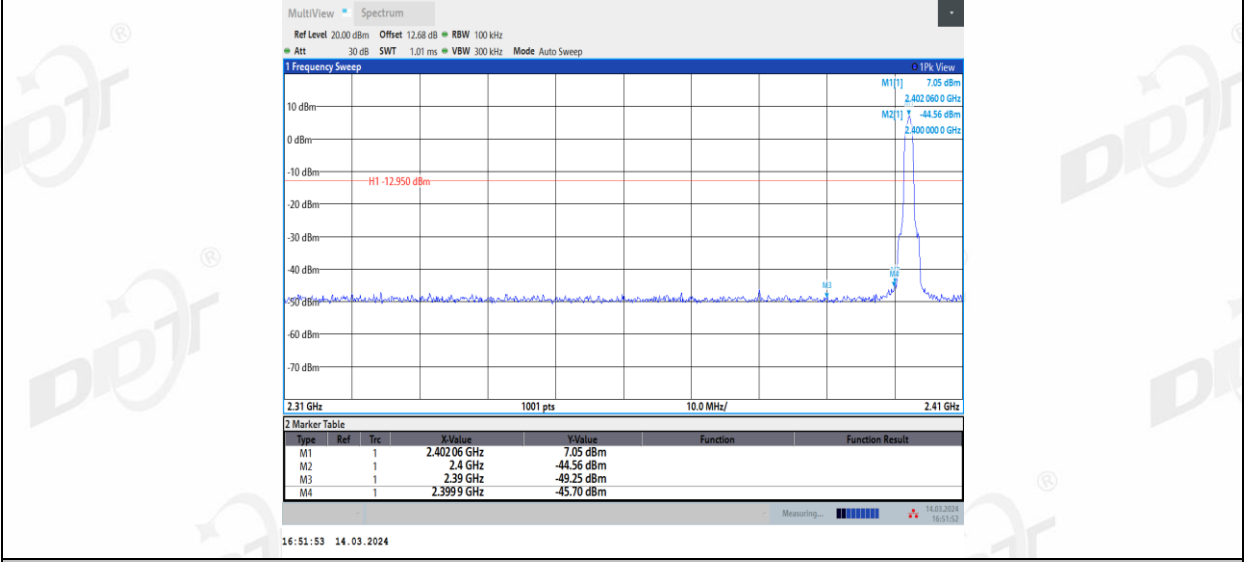
2DH5\_Right side\_High\_Hop\_2480



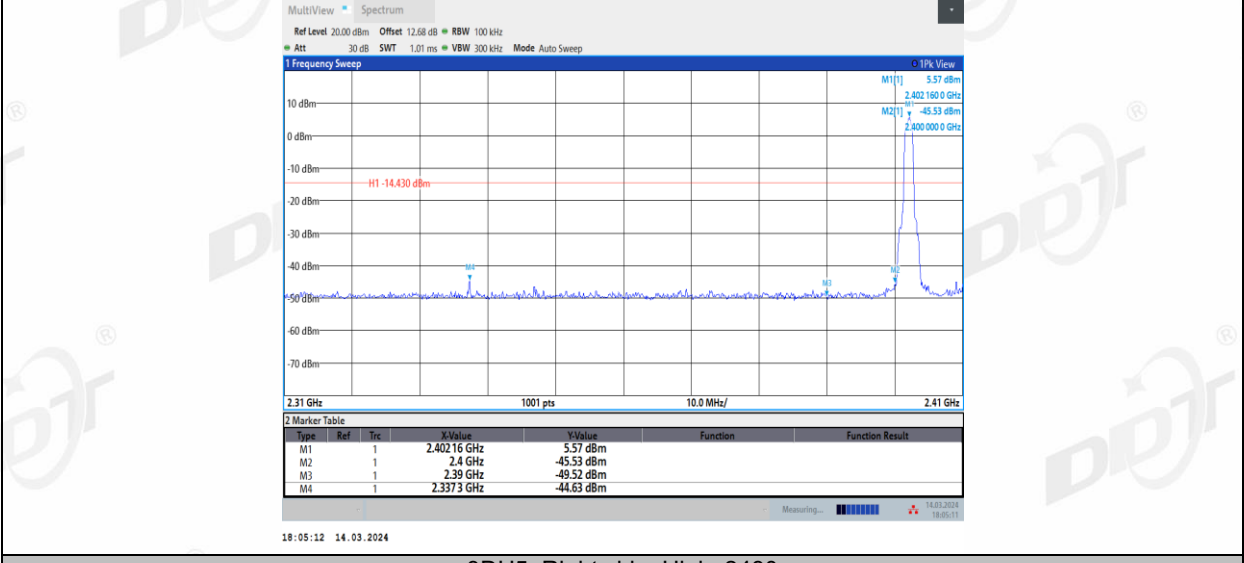
2DH5\_Left side\_High\_Hop\_2480



3DH5 Right side Low 2402

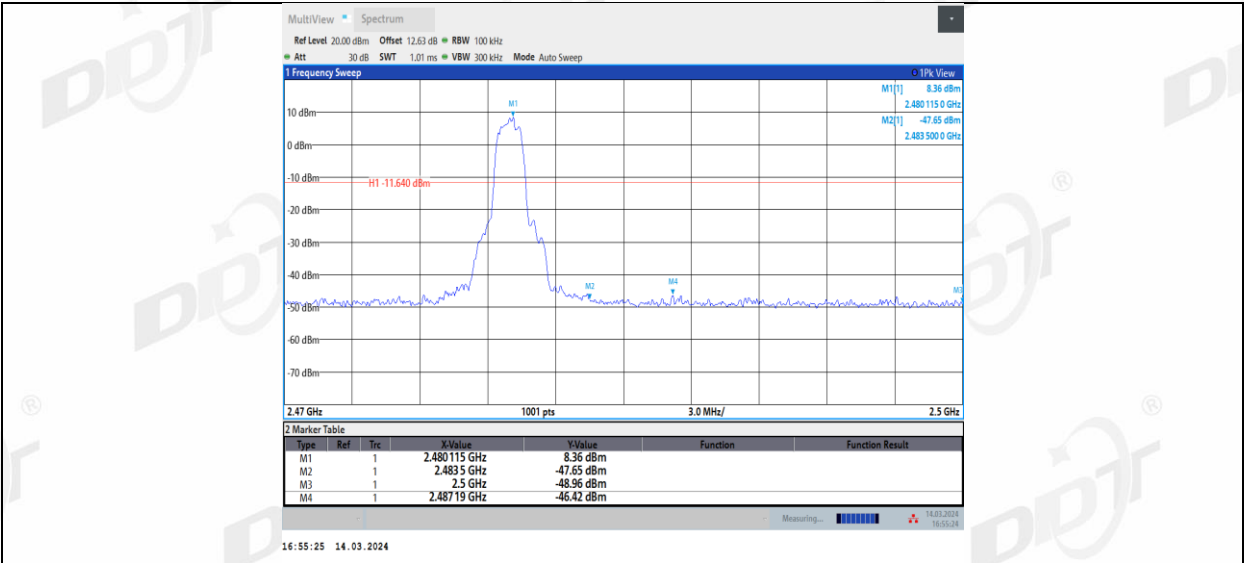


3DH5 Left side Low 2402

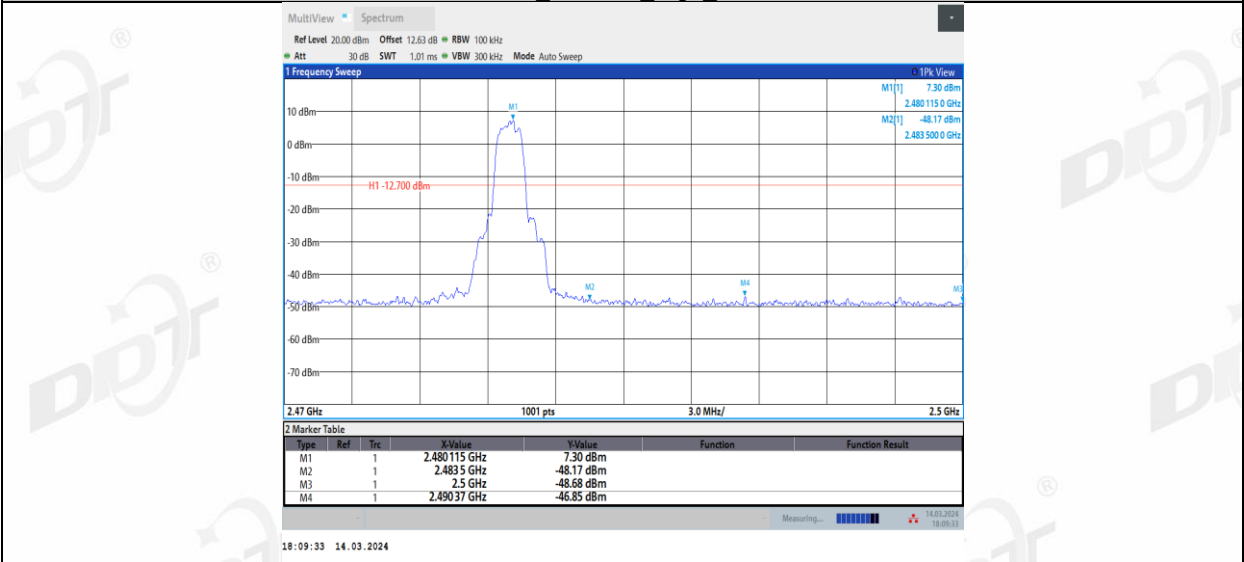


3DH5 Right side High 2480

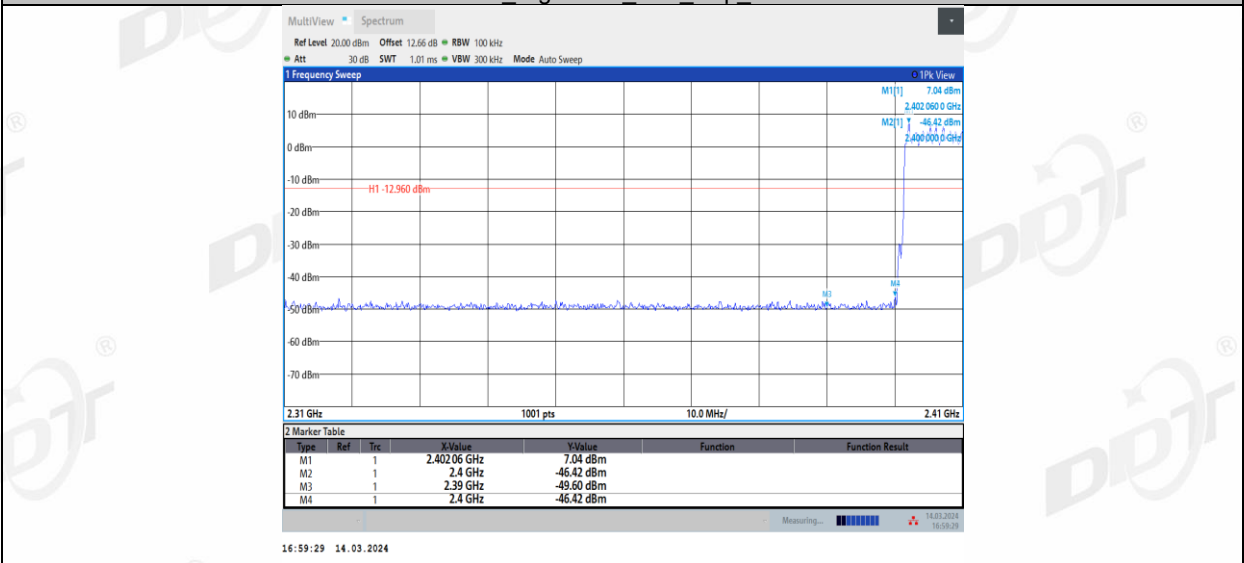




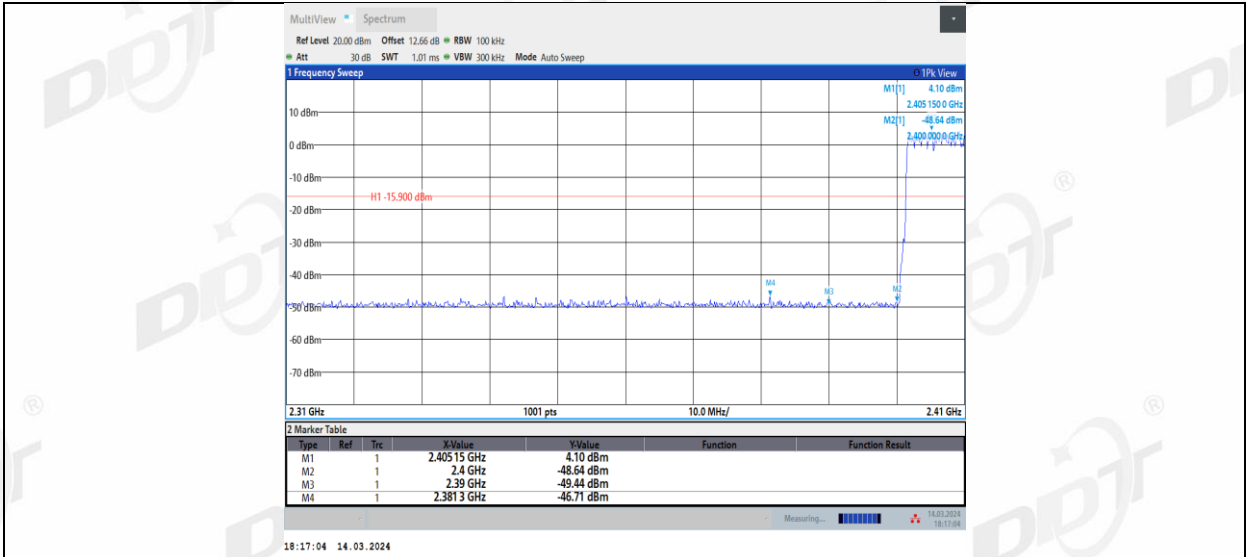
3DH5 Left side High 2480



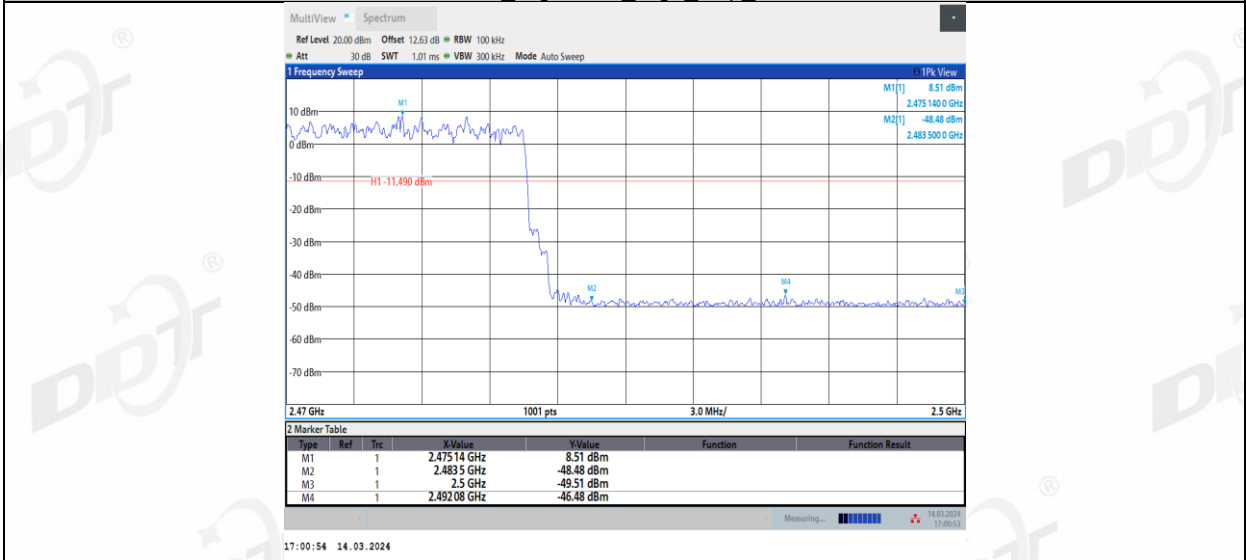
3DH5 Right side Low Hop 2402



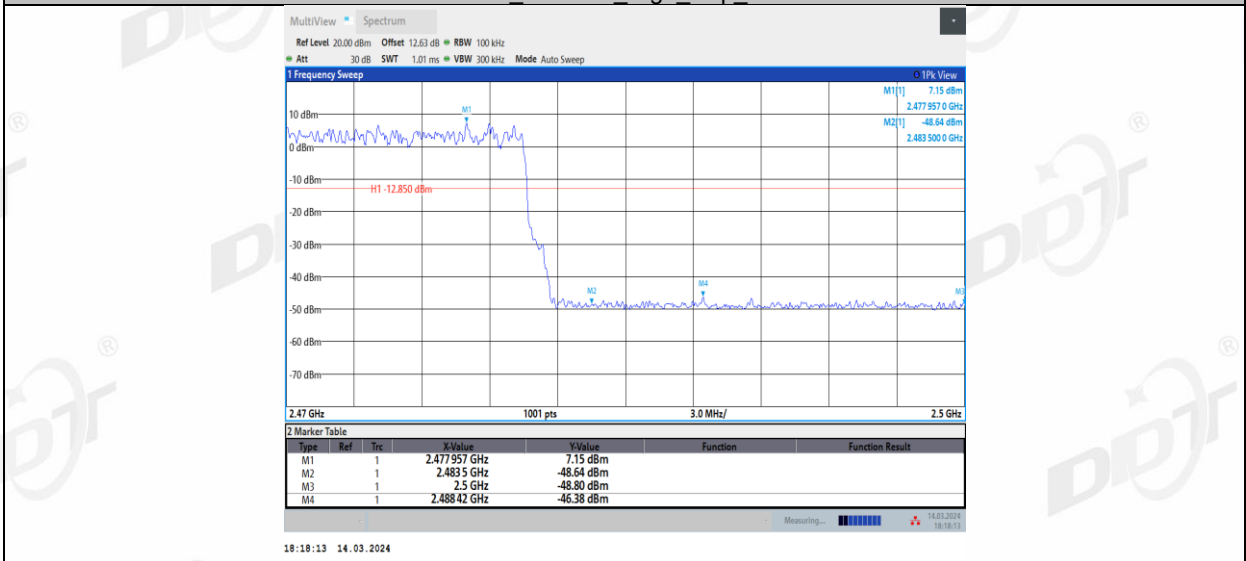
3DH5 Left side Low Hop 2402



3DH5 Right side High Hop 2480

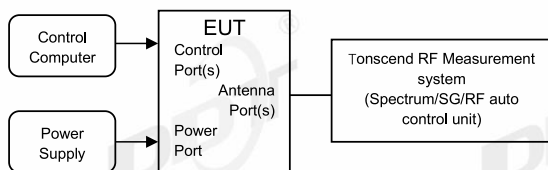


3DH5 Left side High Hop 2480



## 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

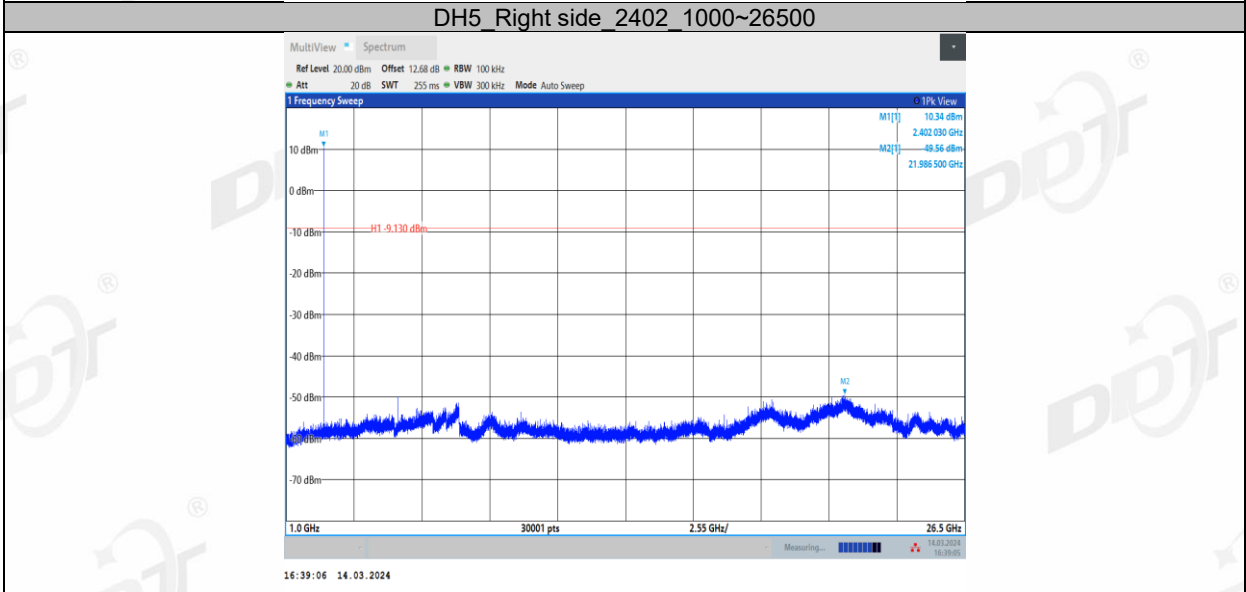
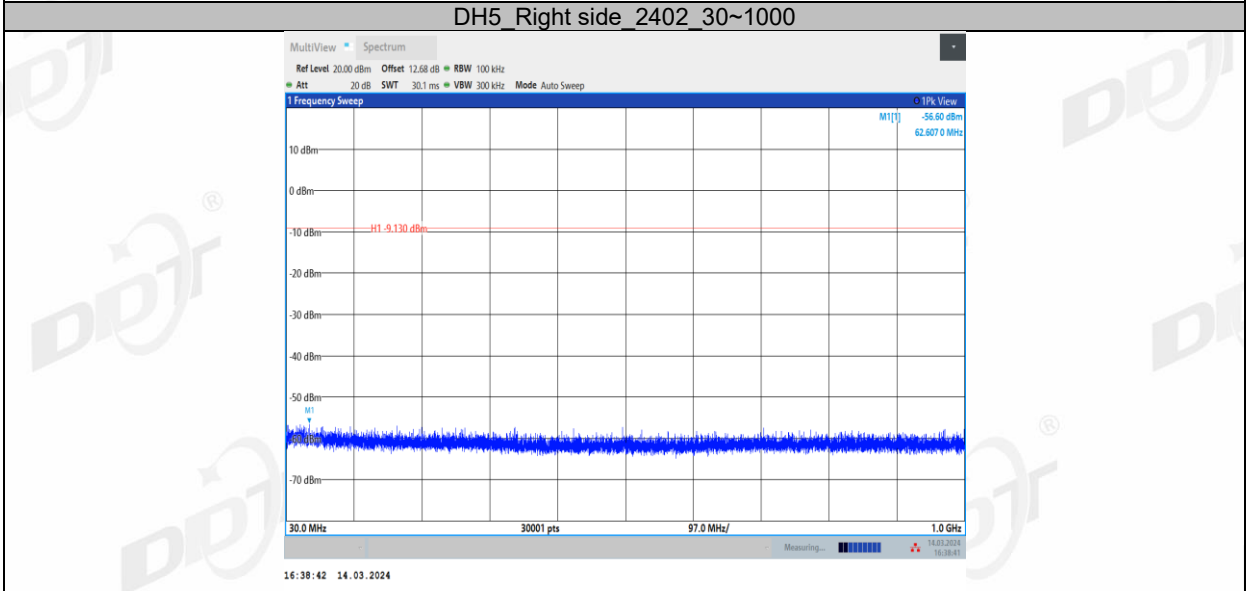
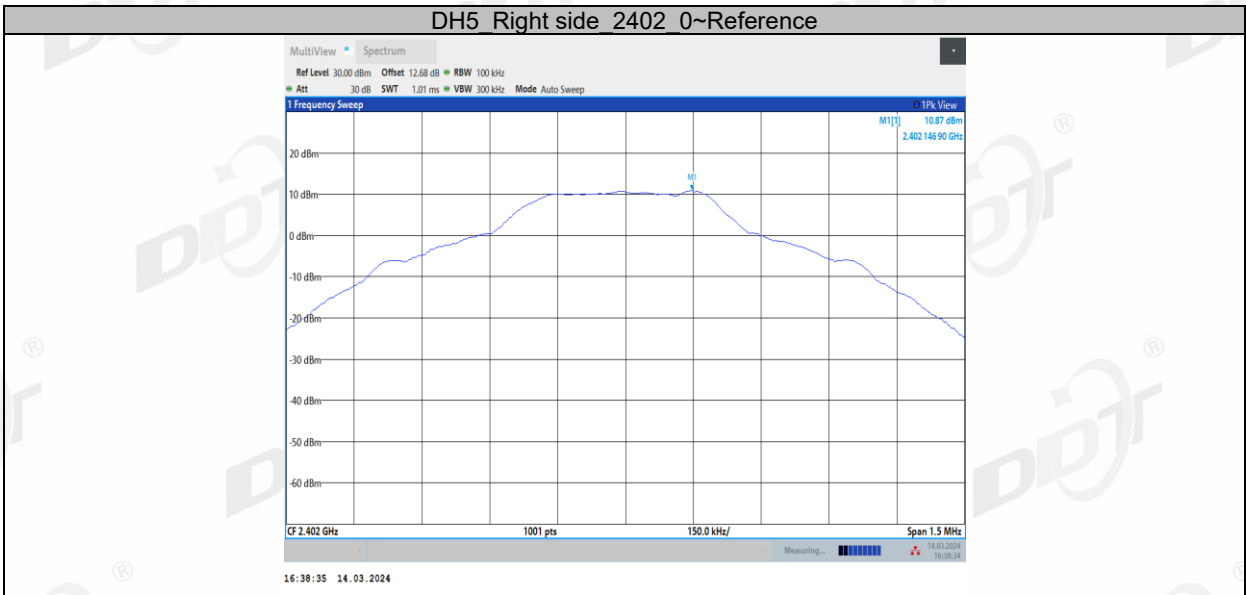
Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

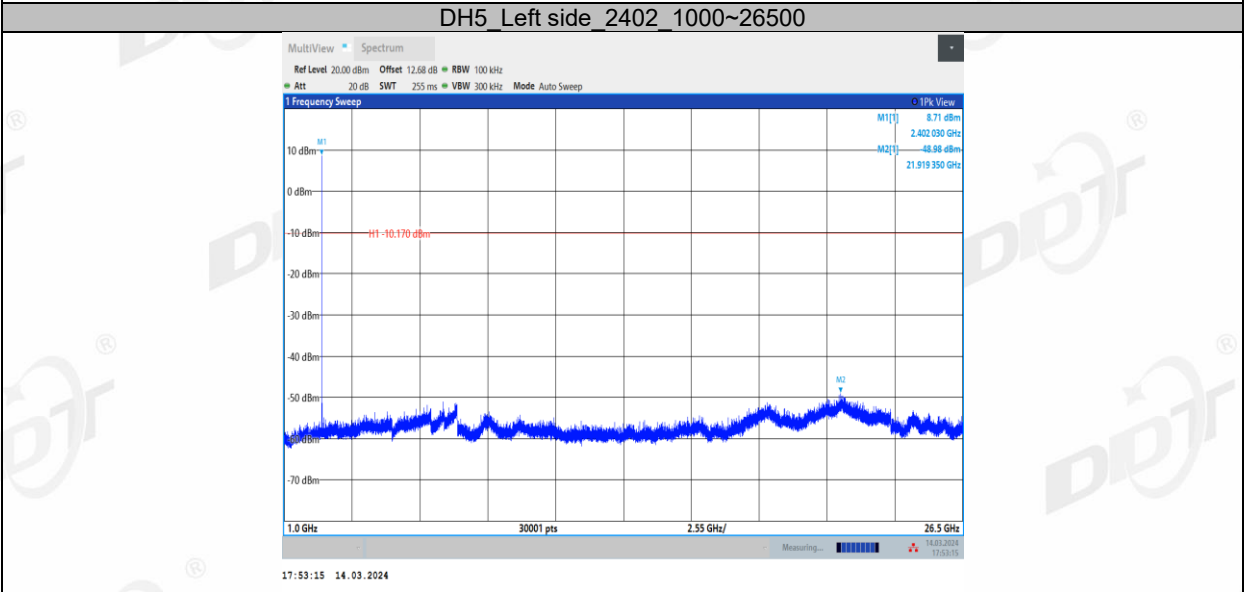
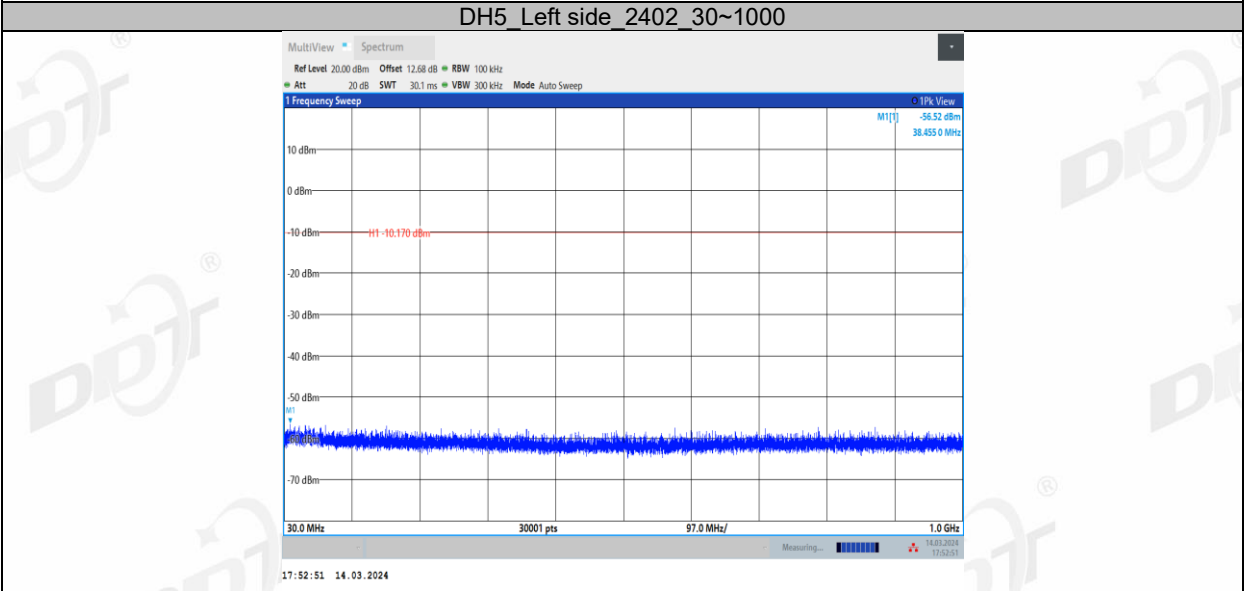
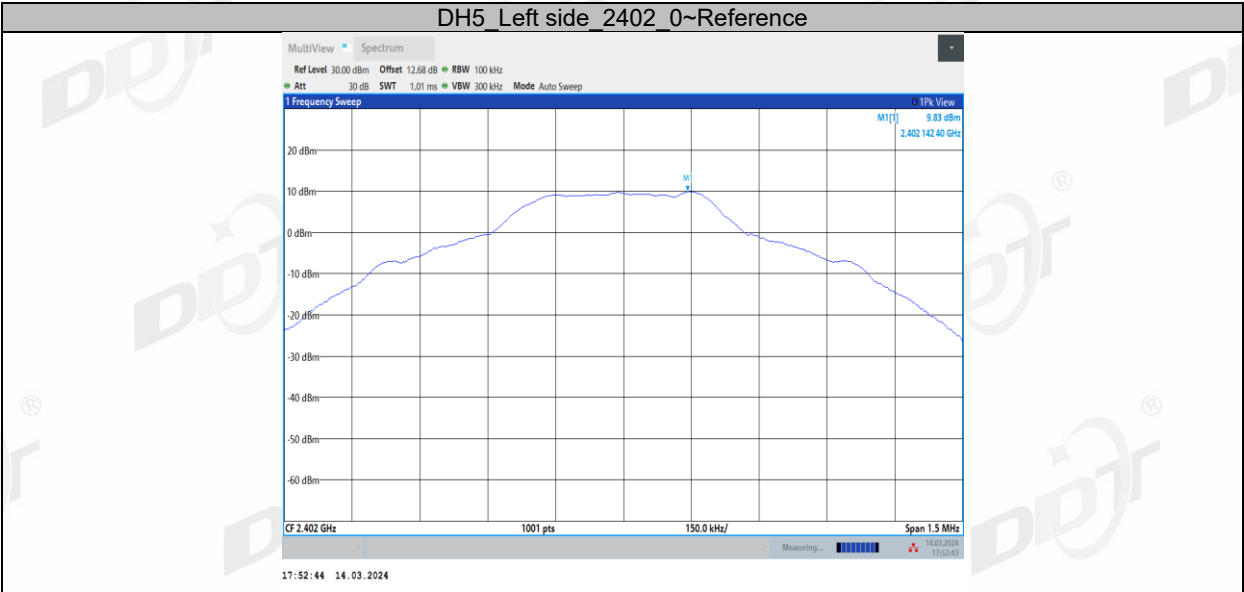
**11.4. Test result**

Test Engineer:	Zora Zhang	Test Site:	RF Measurement System 4#
Ambient Condition:	23.6°C,53.3%RH	Test Date:	2024.03.14
Test Power Supply:	Battery	Sample Number:	S24031112-001

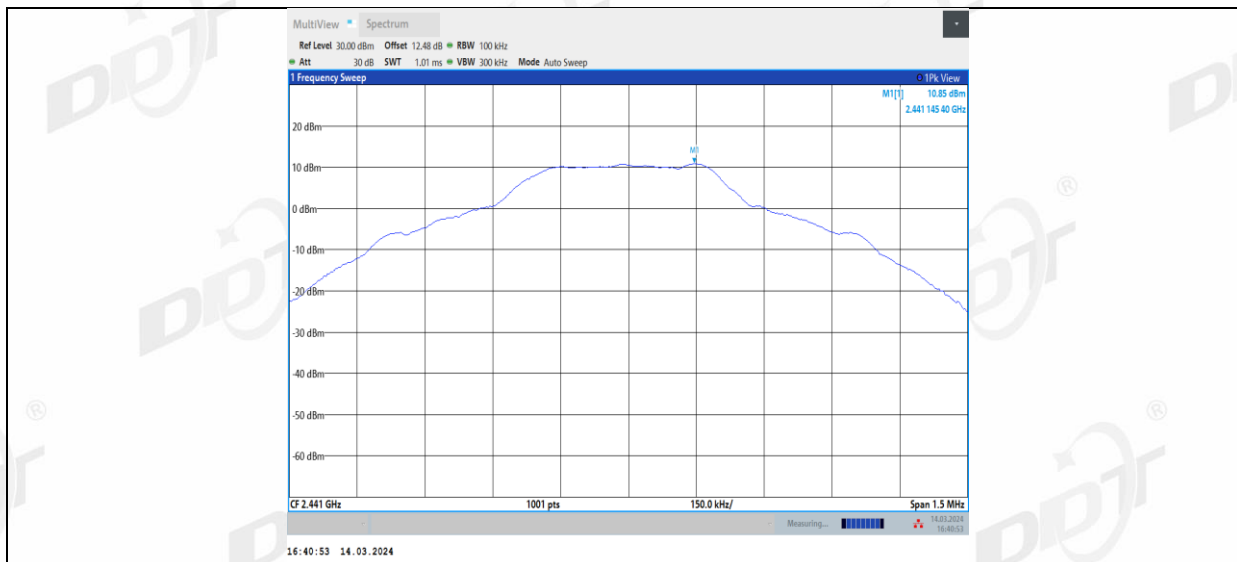
Mode	Freq. (MHz)	Verdict
GFSK	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass
$\pi/4$ -DQPSK	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass
8DPSK	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass

### 11.5. Test graphs

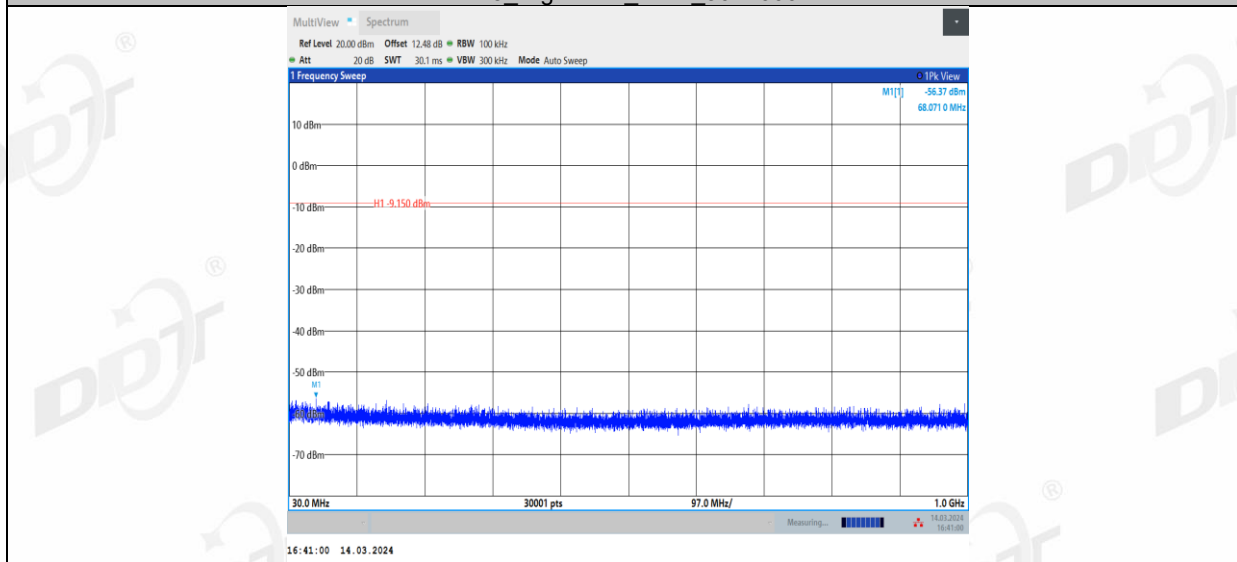




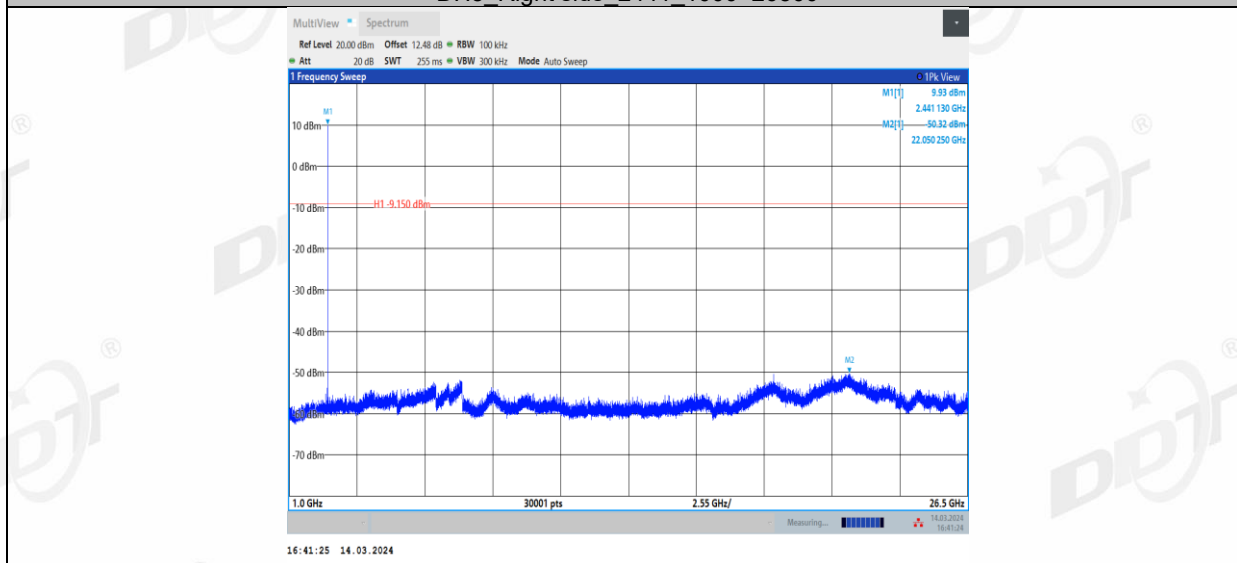
### DH5 Right side 2441\_0~Reference



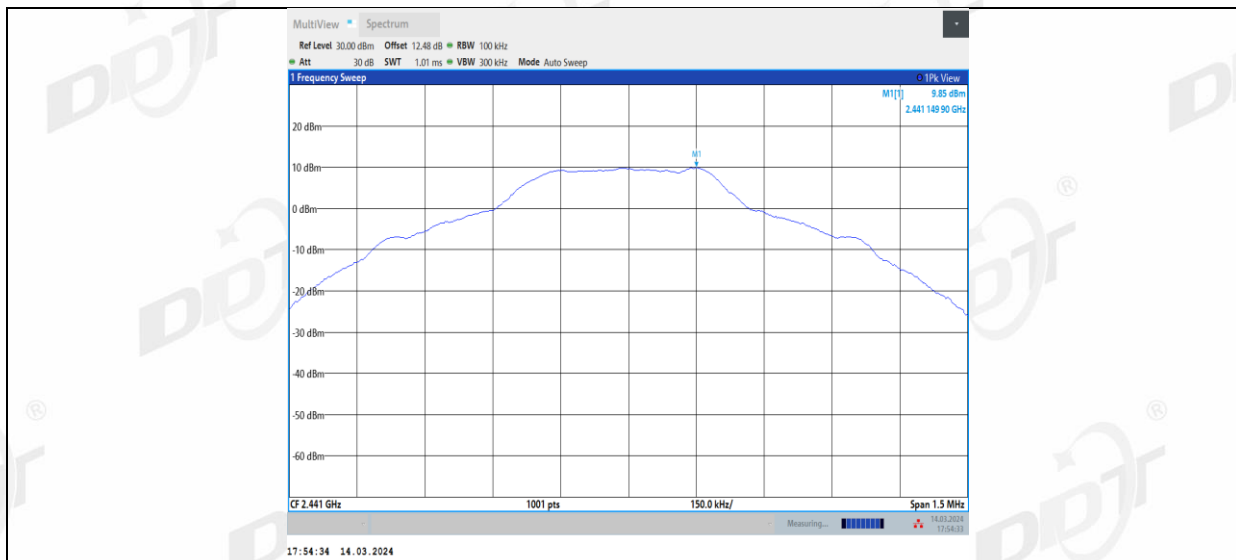
DH5 Right side 2441 30~1000



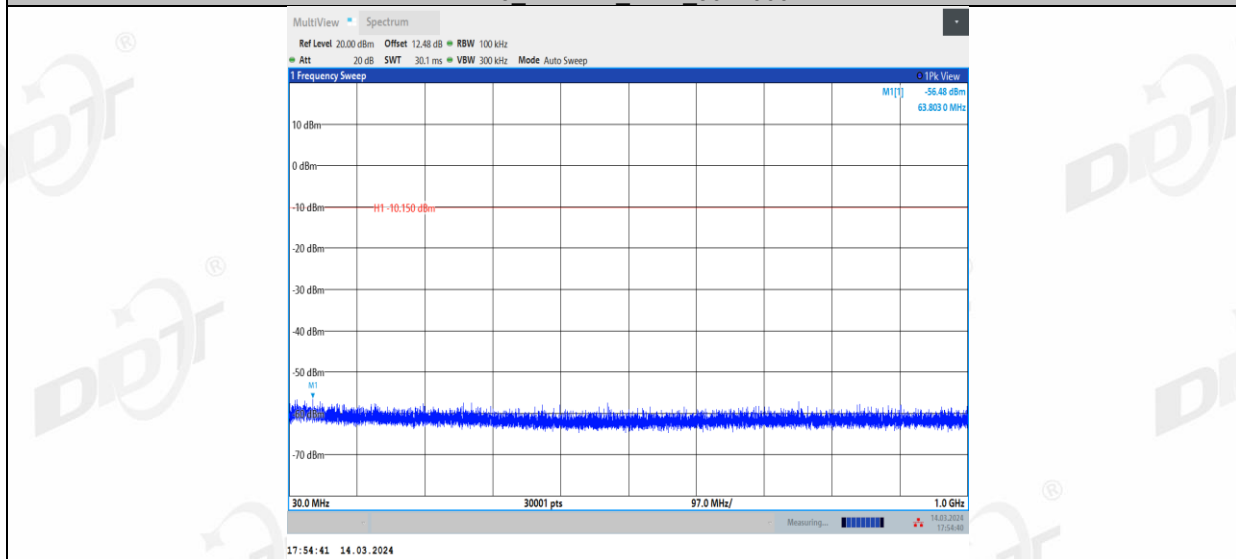
DH5 Right side 2441 1000~26500



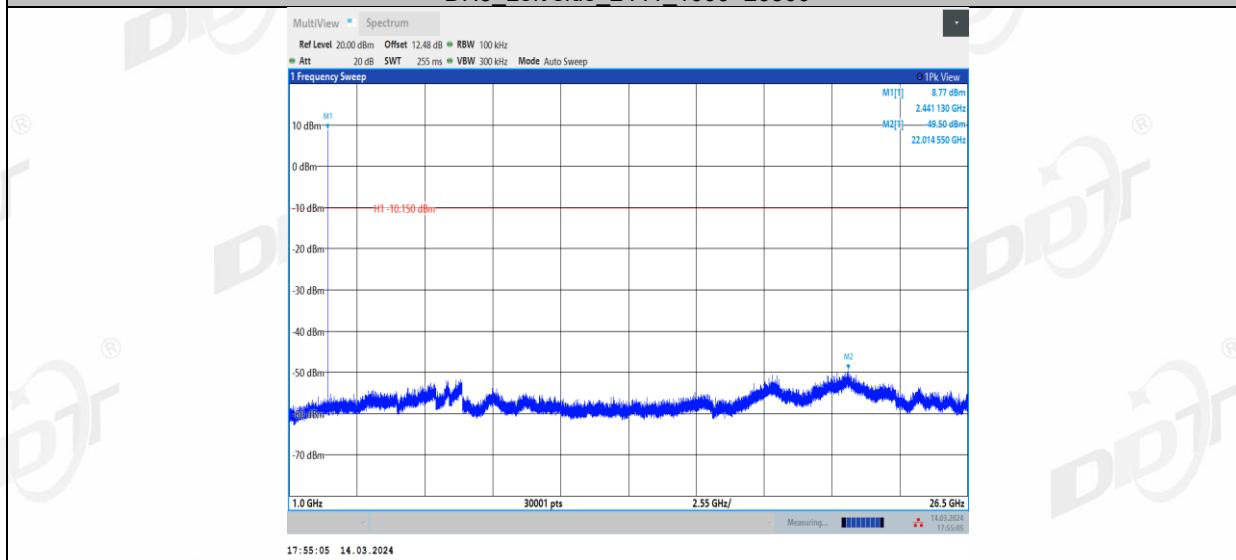
DH5 Left side 2441 0~Reference



DH5 Left side 2441\_30~1000

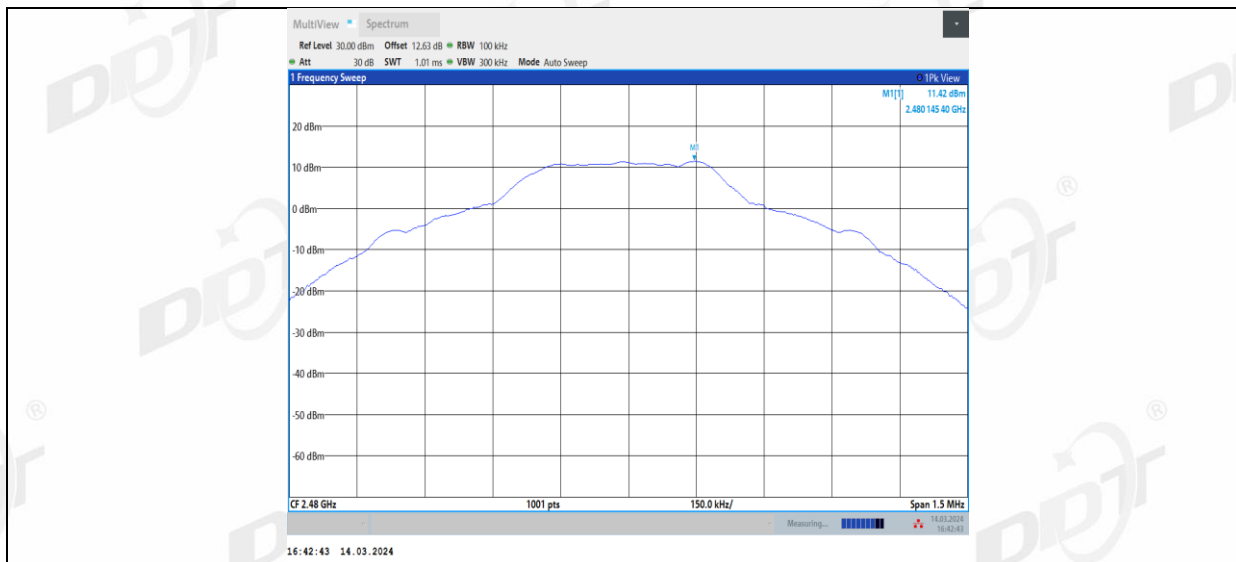


DH5 Left side 2441\_1000~26500

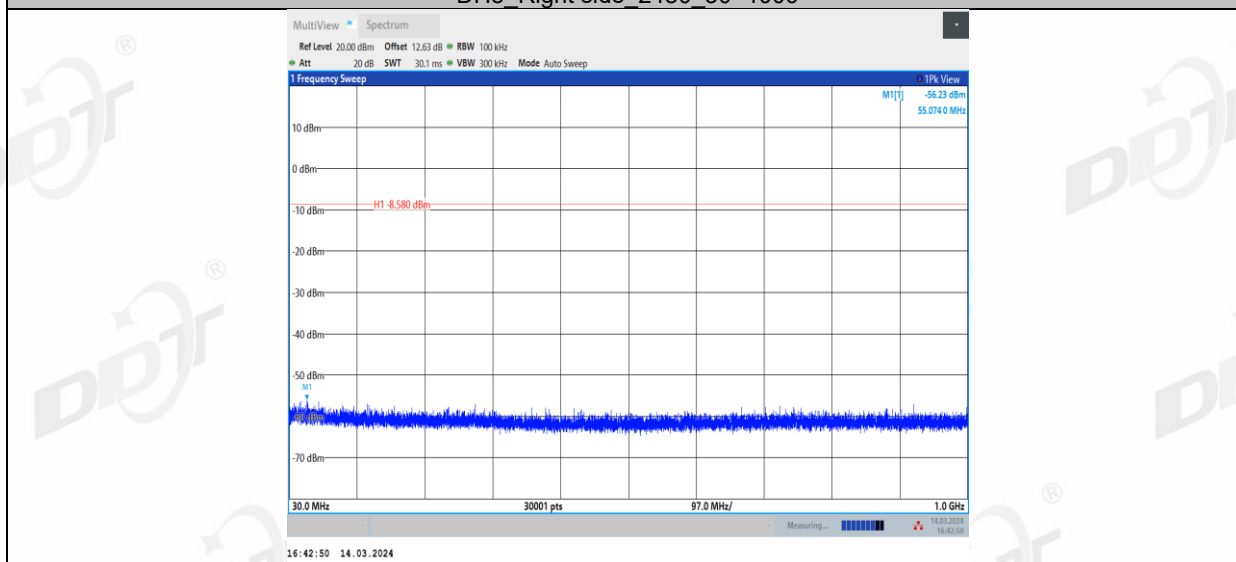


DH5 Right side 2480\_0~Reference

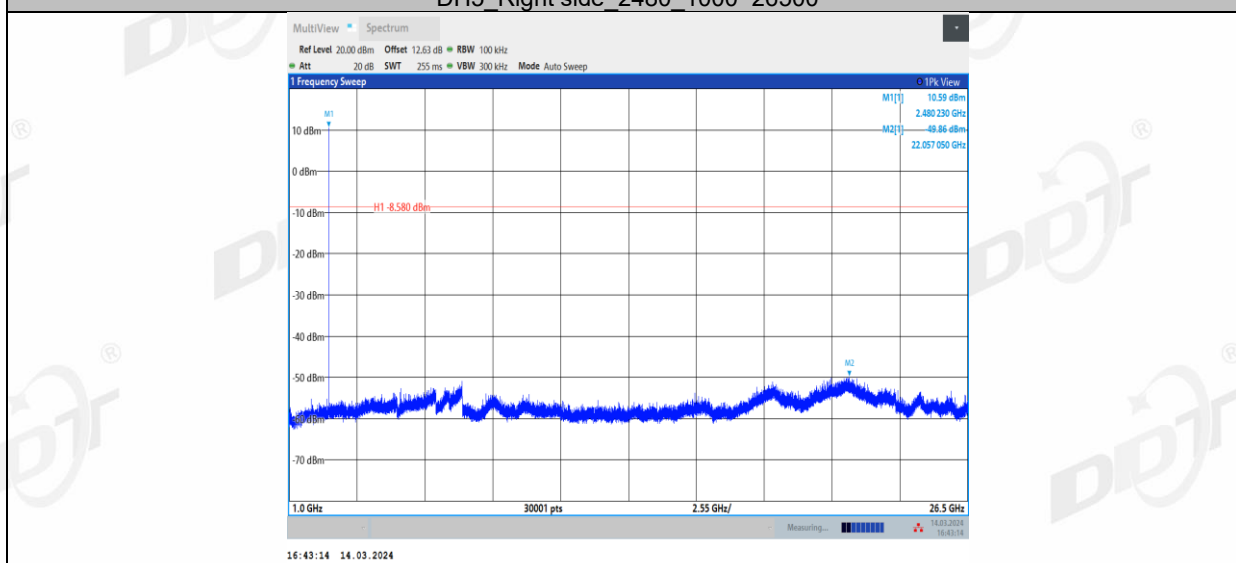




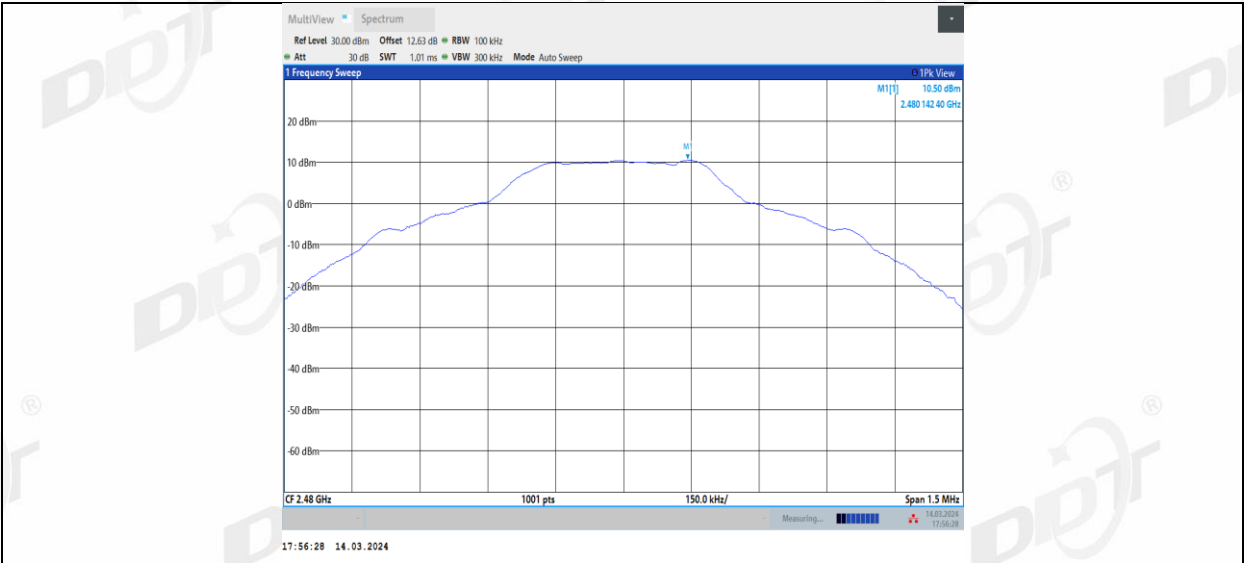
DH5 Right side 2480 30~1000



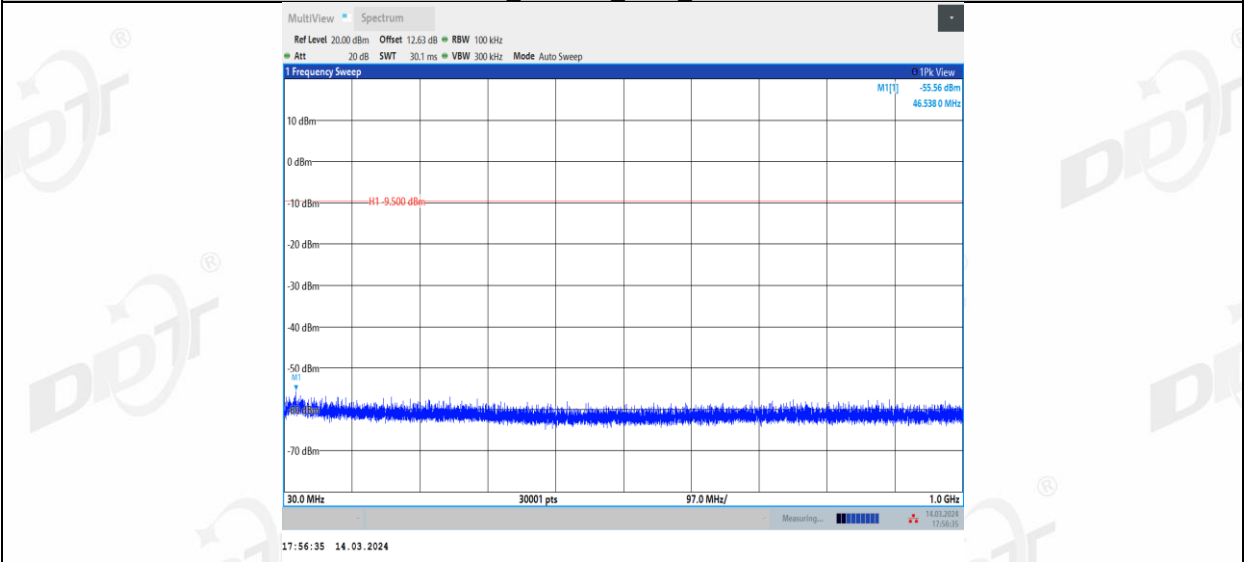
DH5 Right side 2480 1000~26500



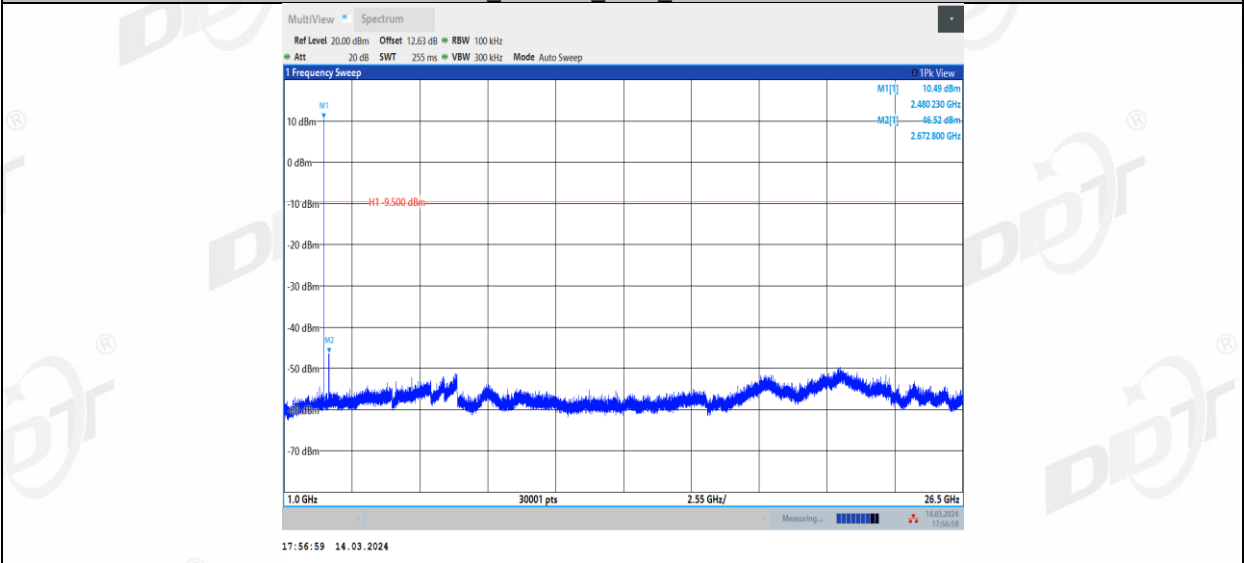
DH5 Left side 2480 0~Reference



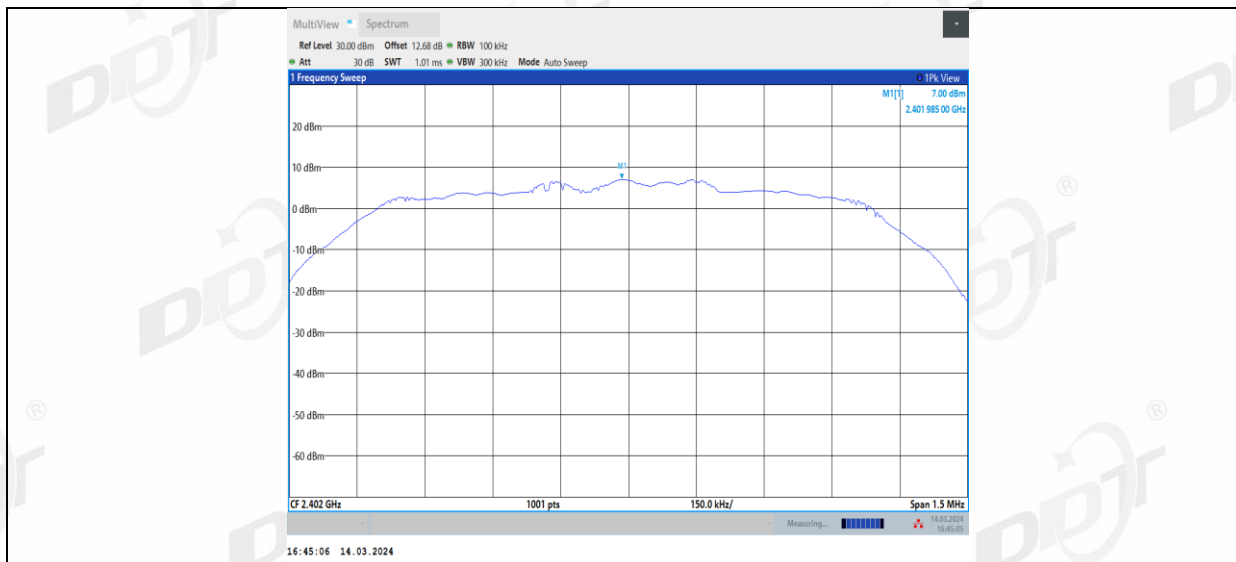
DH5 Left side 2480\_30~1000



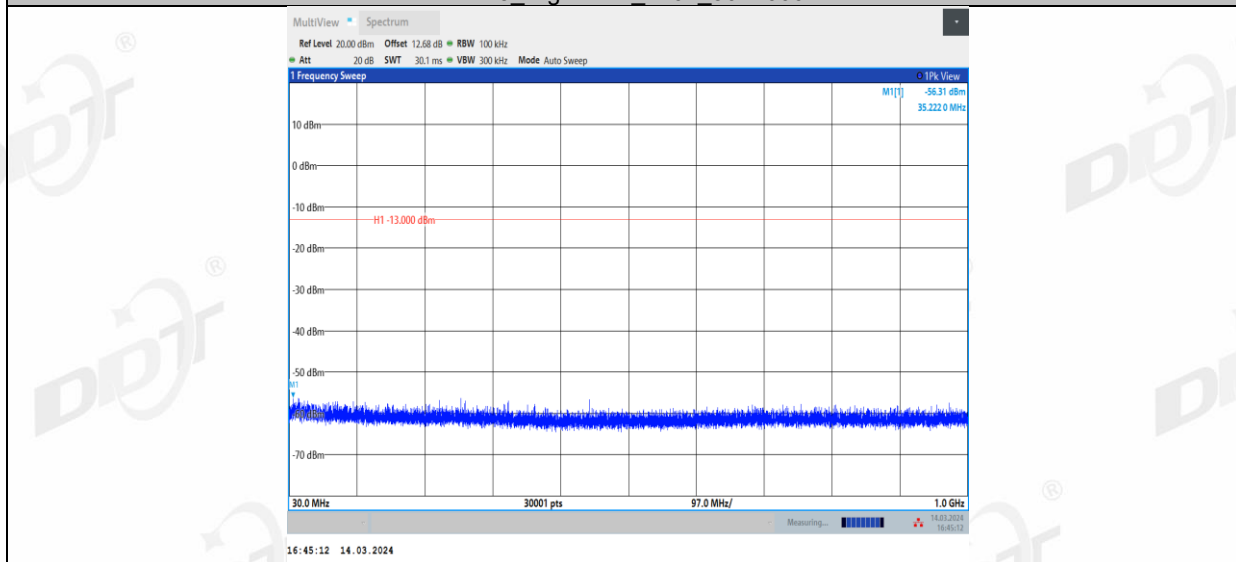
DH5 Left side 2480\_1000~26500



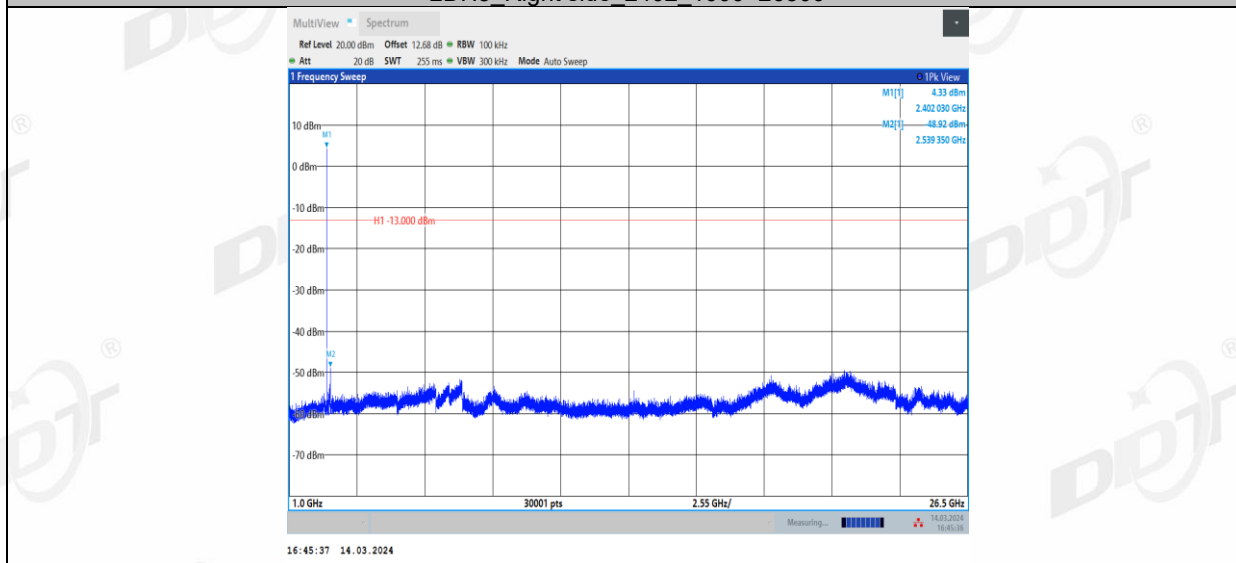
2DH5 Right side 2402\_0~Reference



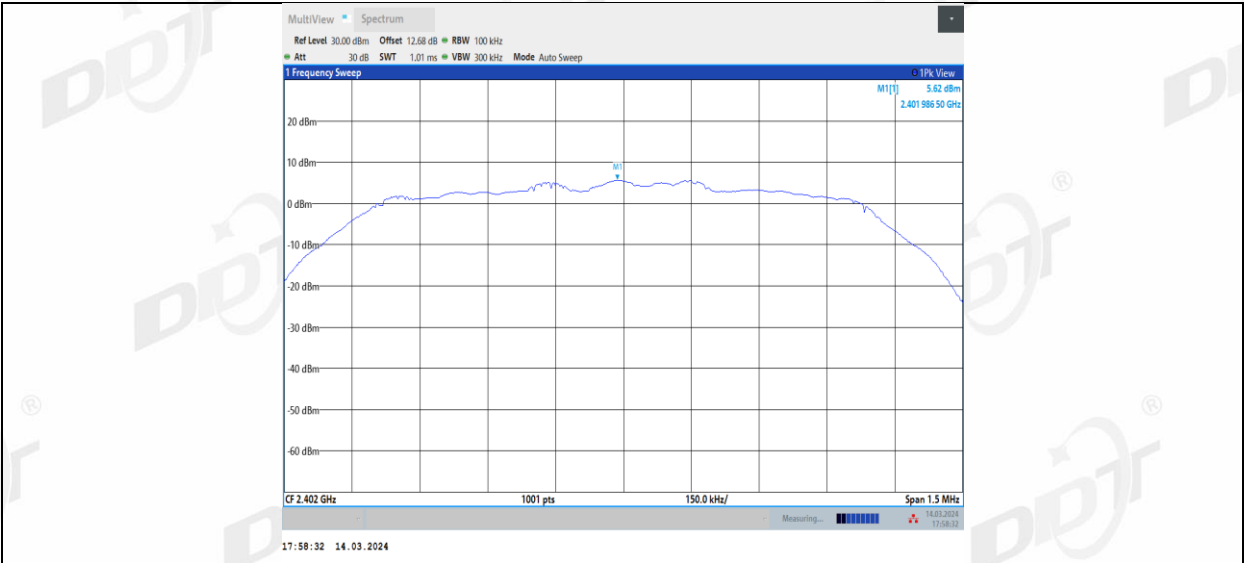
2DH5\_Right side\_2402\_30~1000



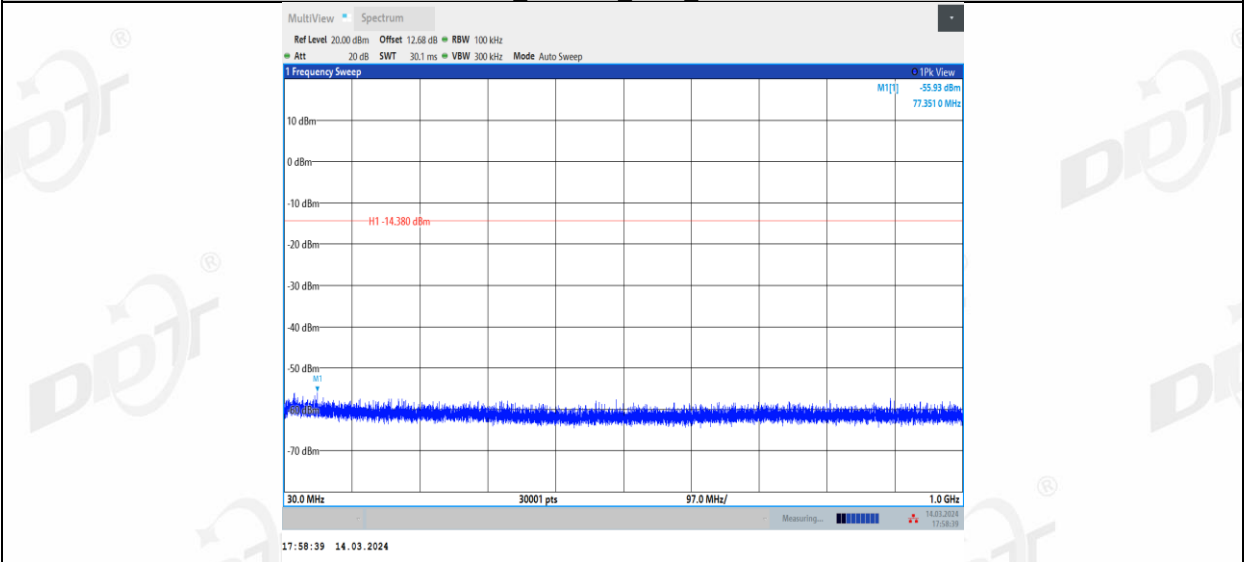
2DH5\_Right side\_2402\_1000~26500



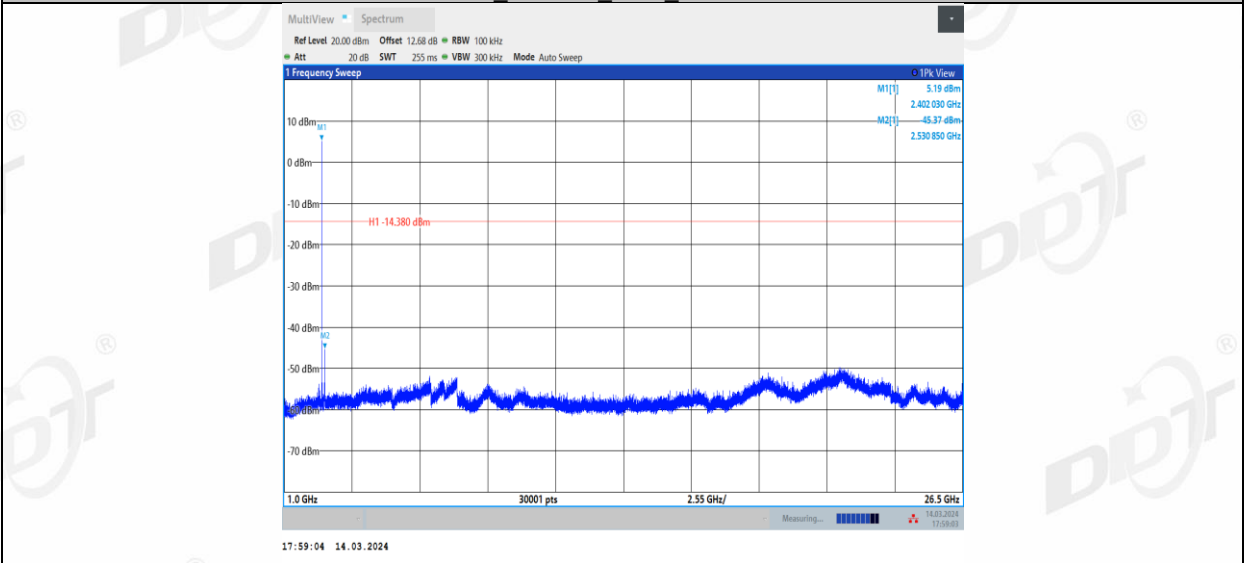
2DH5\_Left side\_2402\_0~Reference



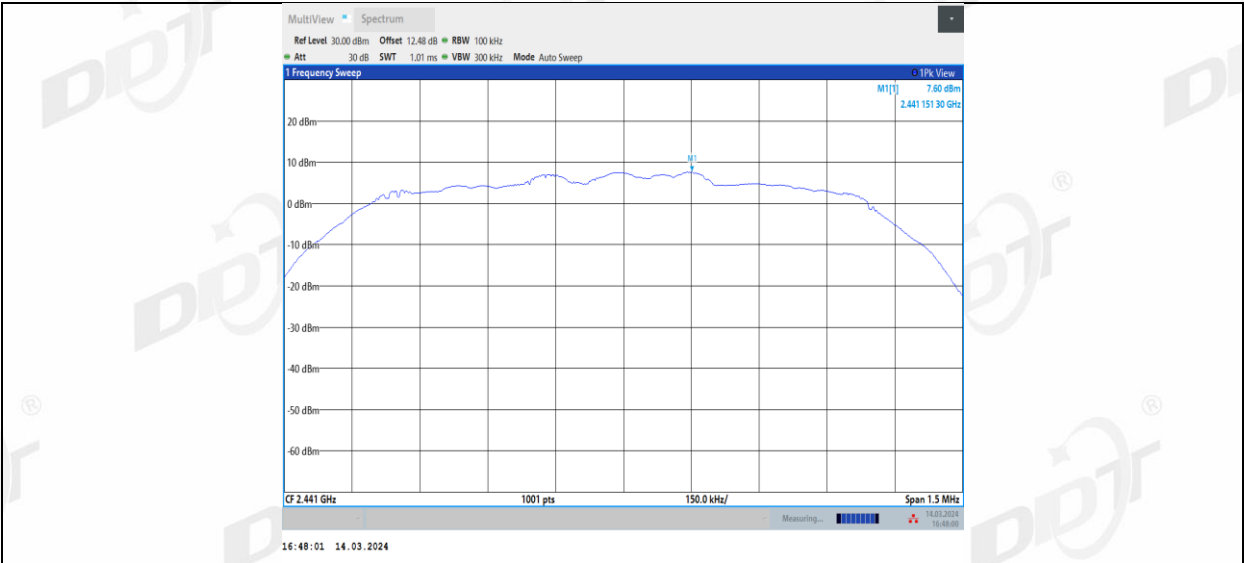
2DH5 Left side 2402\_30~1000



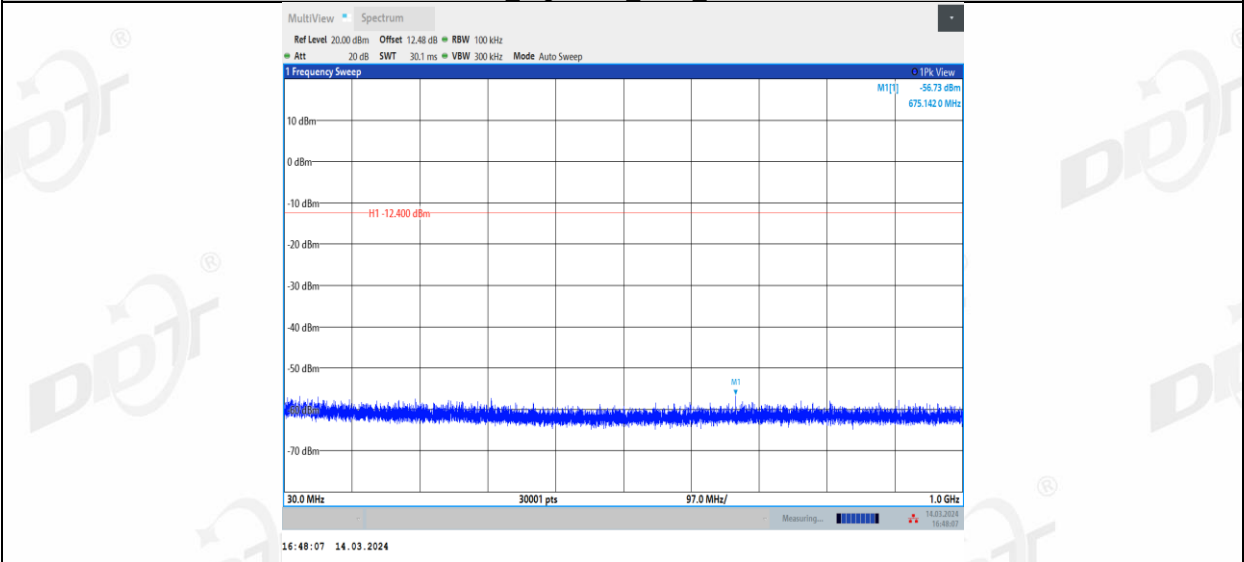
2DH5 Left side 2402\_1000~26500



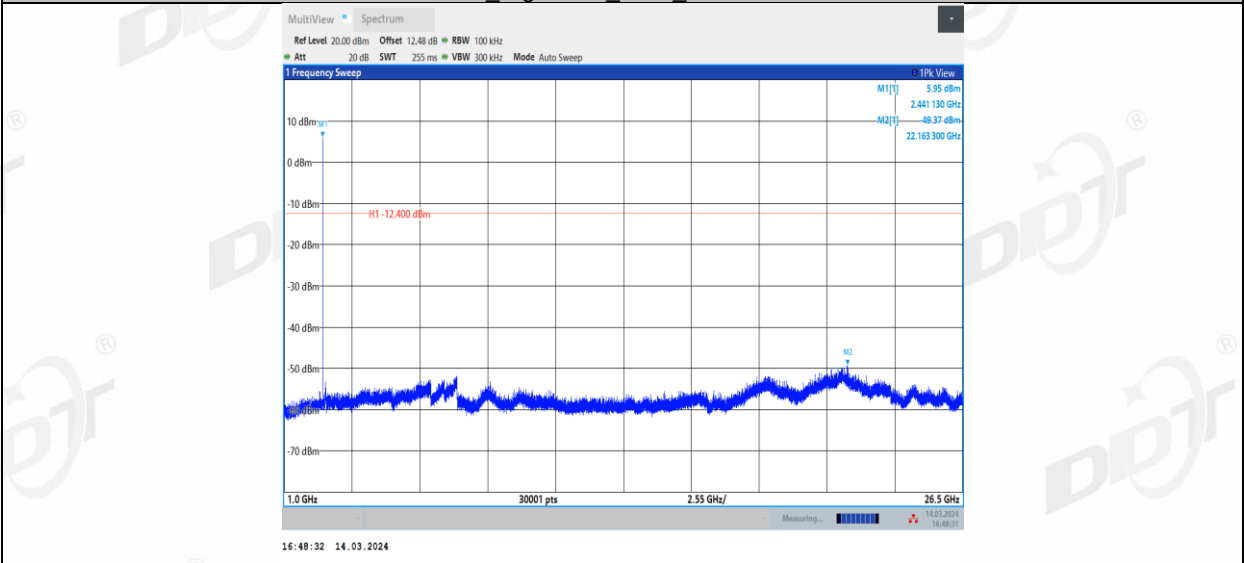
2DH5 Right side 2441\_0~Reference



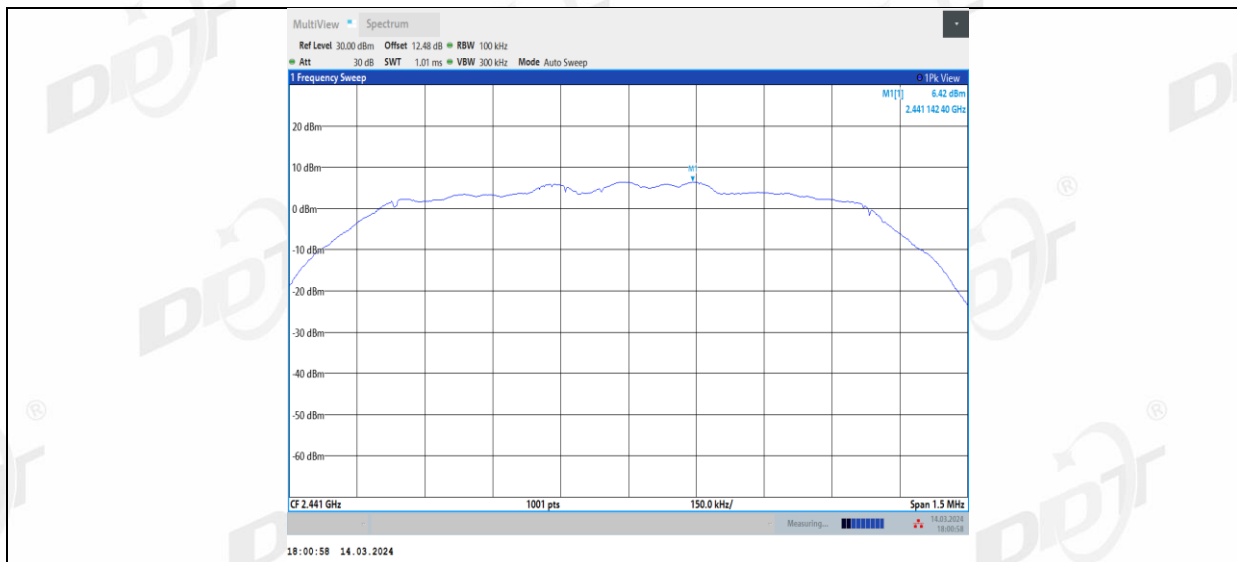
2DH5\_Right side\_2441\_30~1000



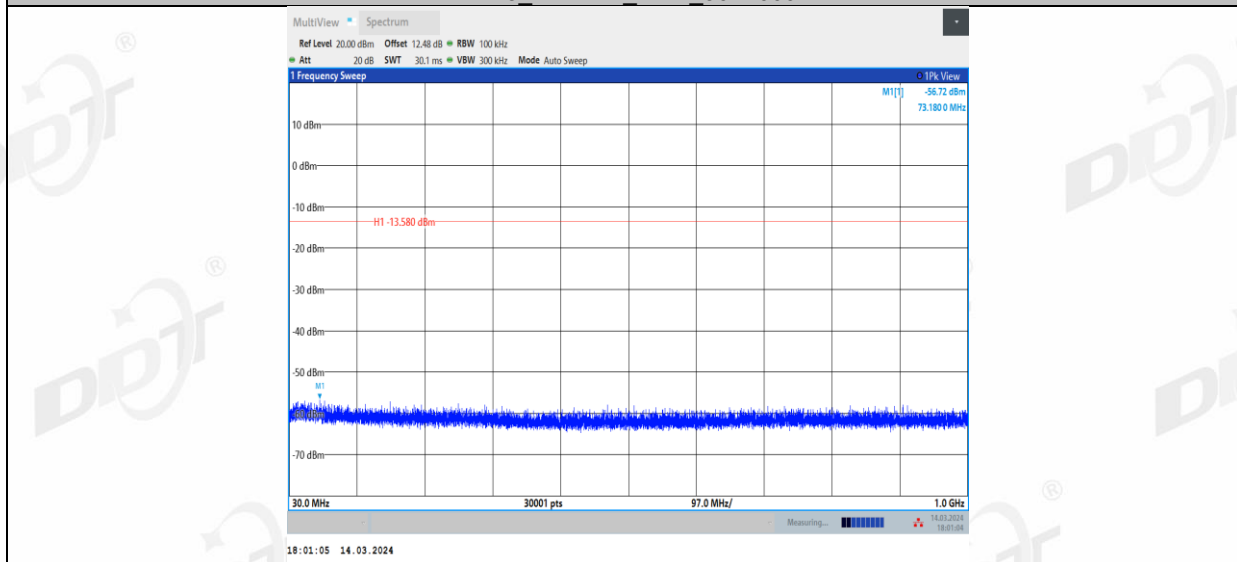
2DH5\_Right side\_2441\_1000~26500



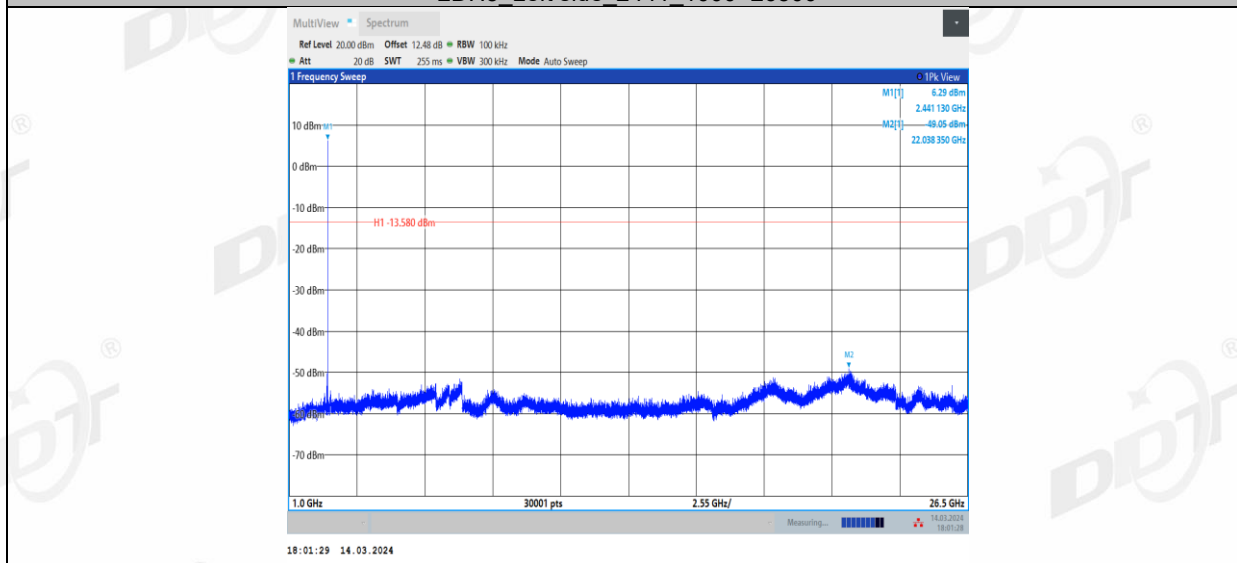
2DH5\_Left side\_2441\_0~Reference



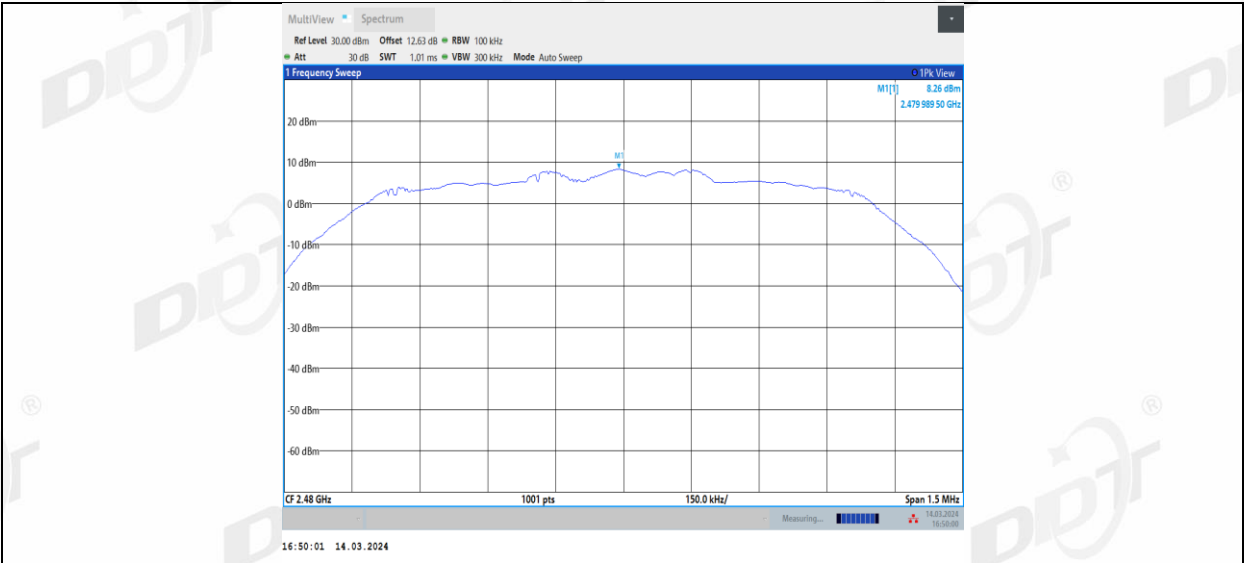
2DH5 Left side 2441 30~1000



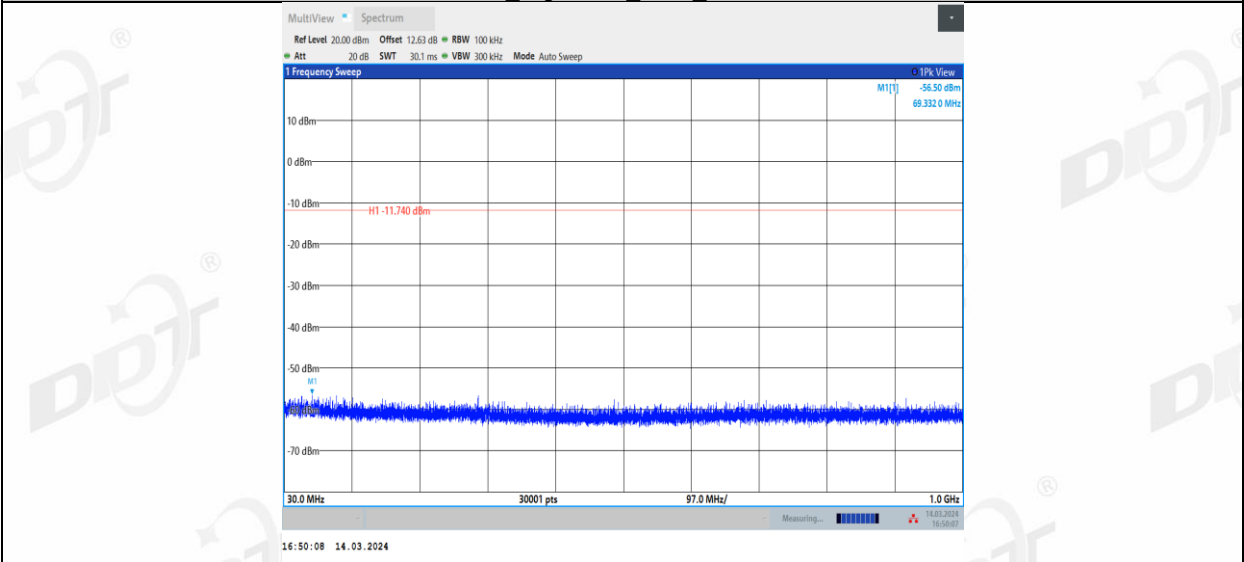
2DH5 Left side 2441 1000~26500



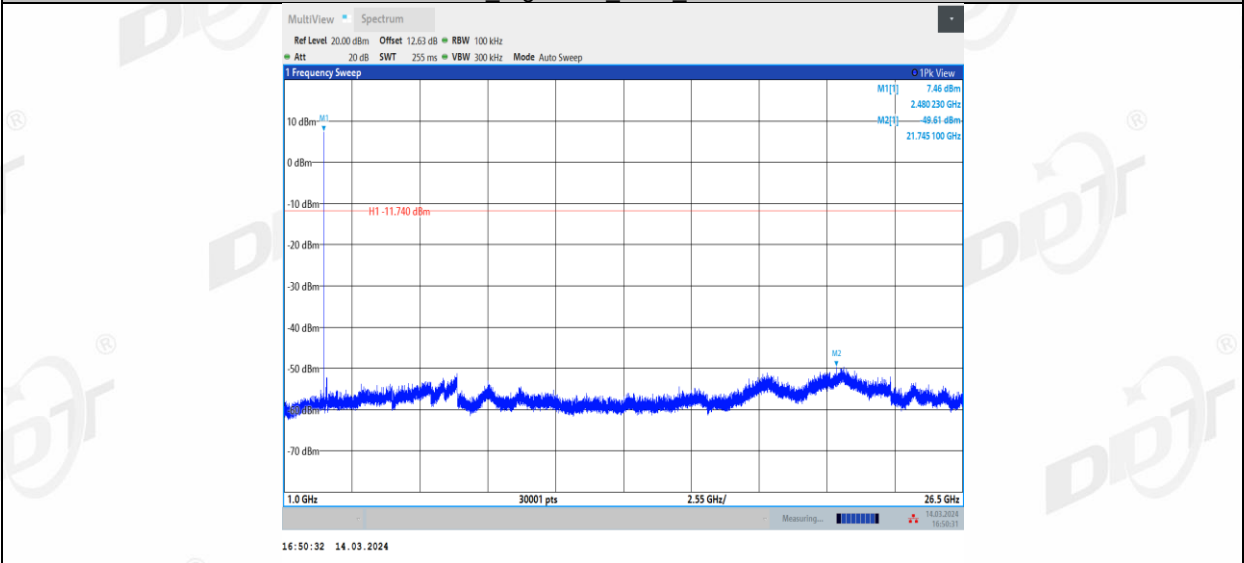
2DH5 Right side 2480 0~Reference



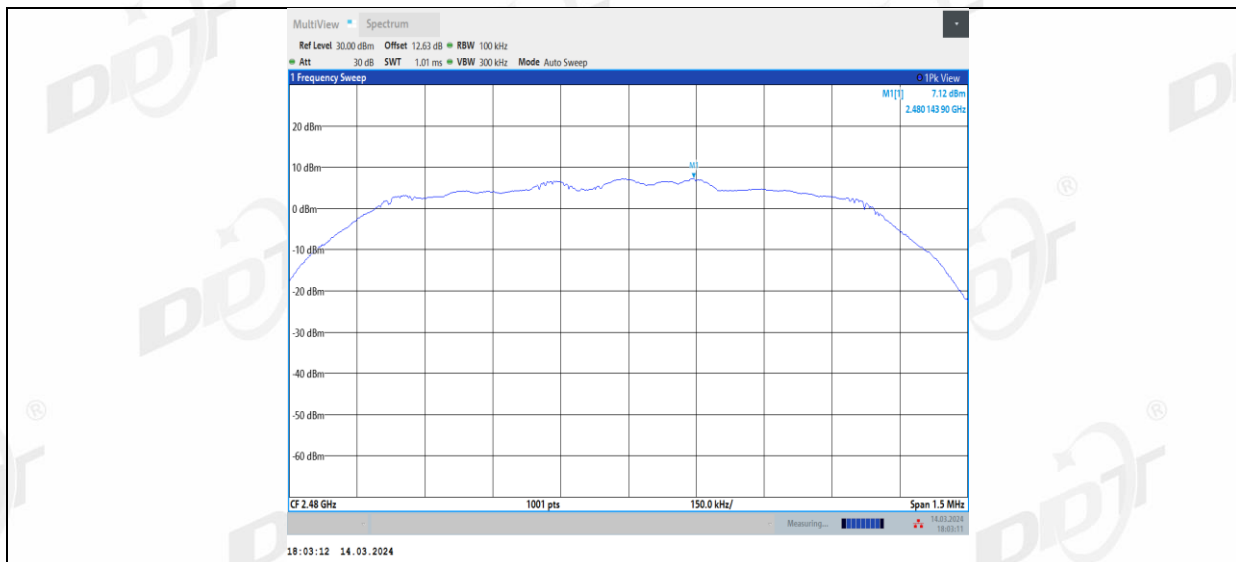
2DH5\_Right side\_2480\_30~1000



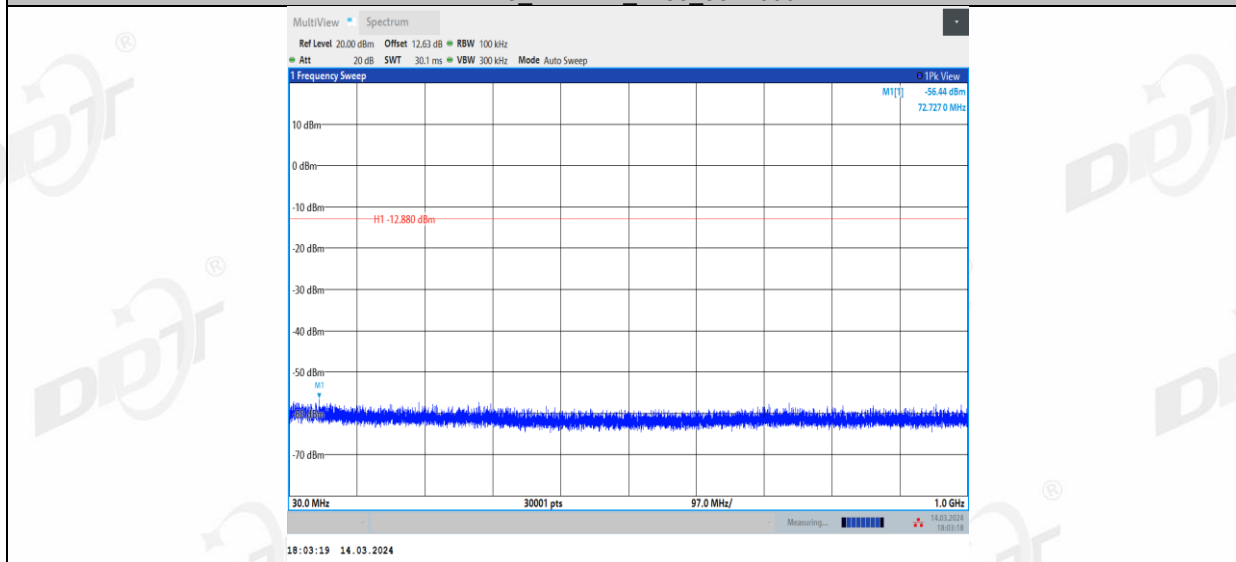
2DH5\_Right side\_2480\_1000~26500



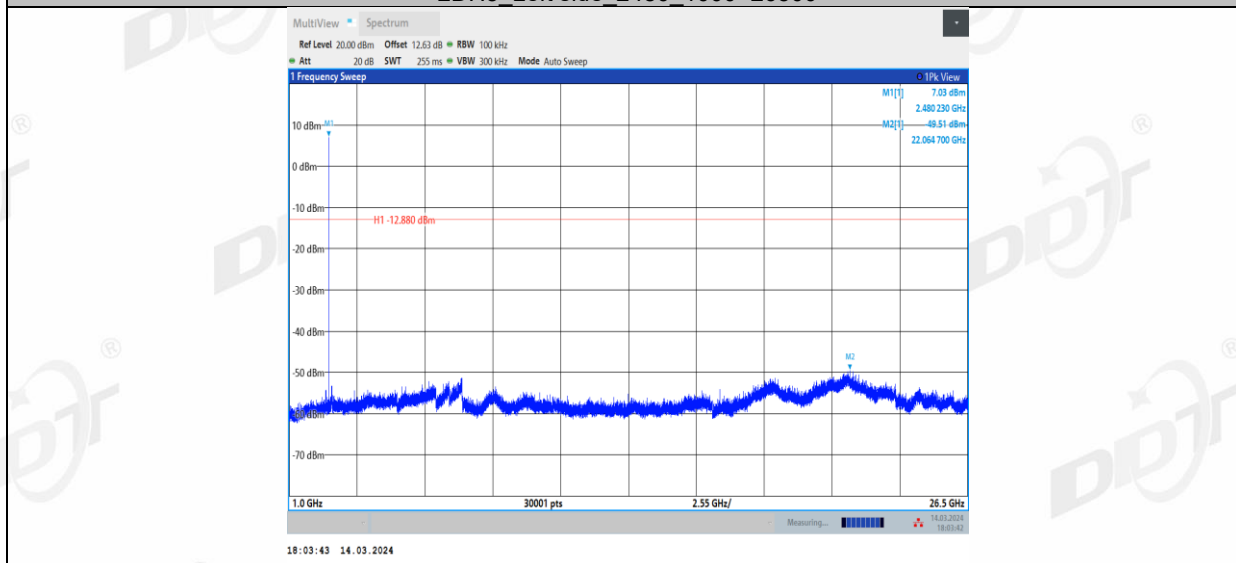
2DH5\_Left side\_2480\_0~Reference



2DH5 Left side 2480\_30~1000

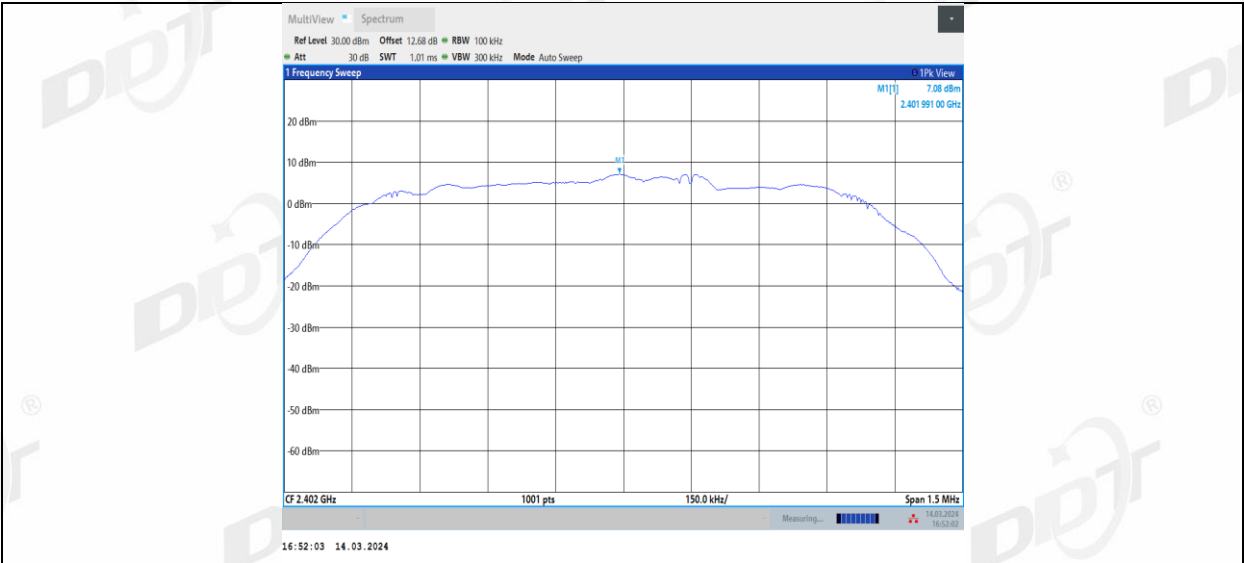


2DH5 Left side 2480\_1000~26500

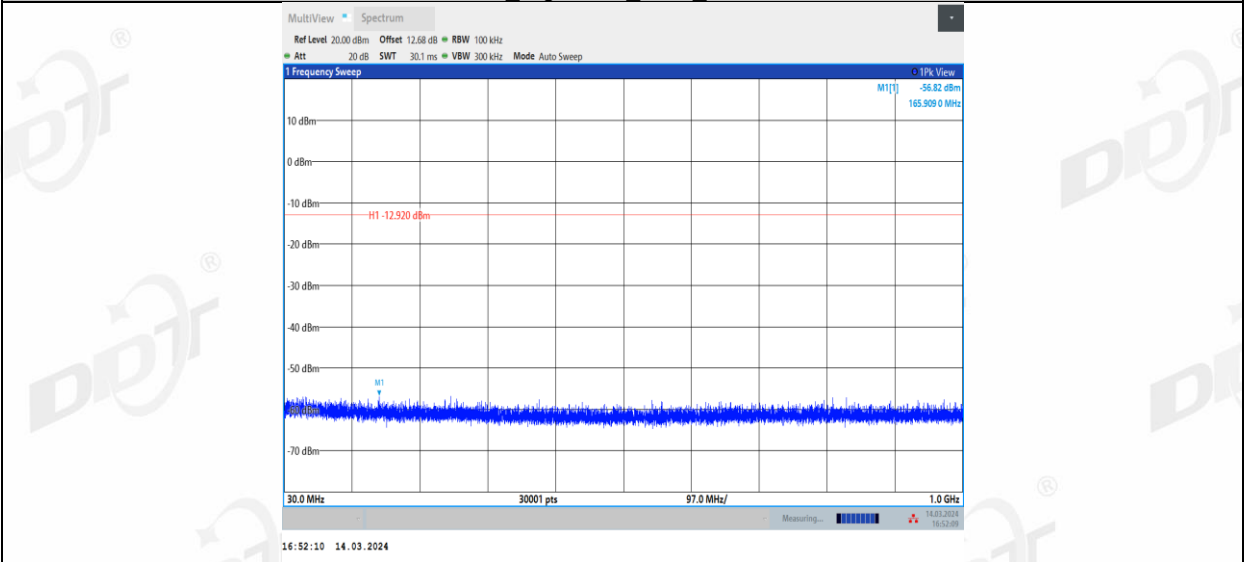


3DH5 Right side 2402\_0~Reference

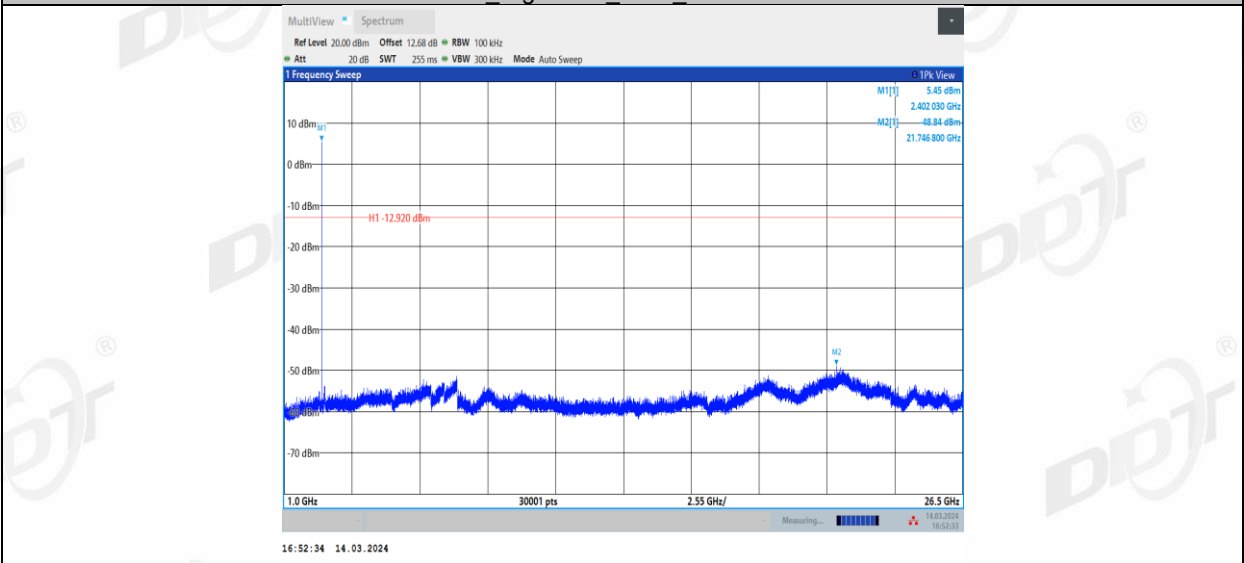




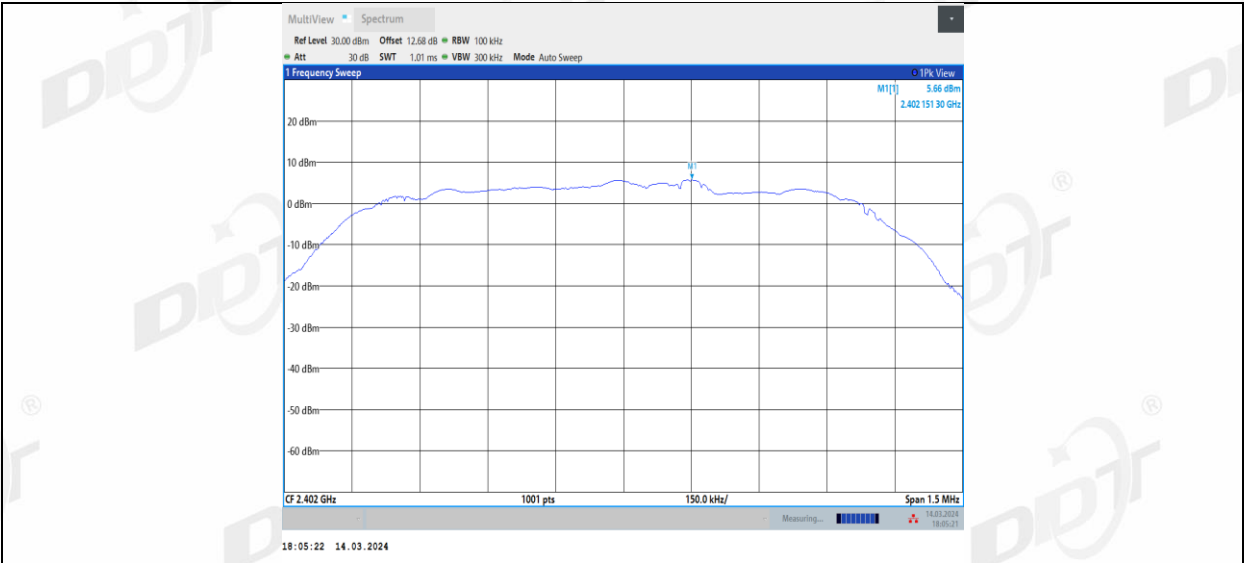
3DH5\_Right side\_2402\_30~1000



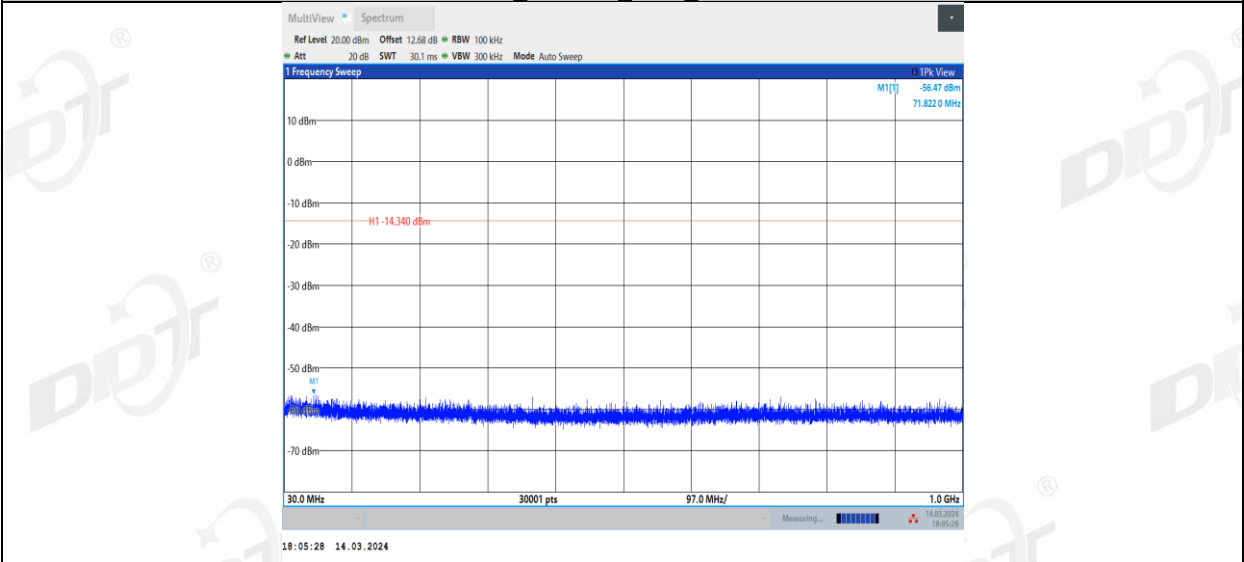
3DH5\_Right side\_2402\_1000~26500



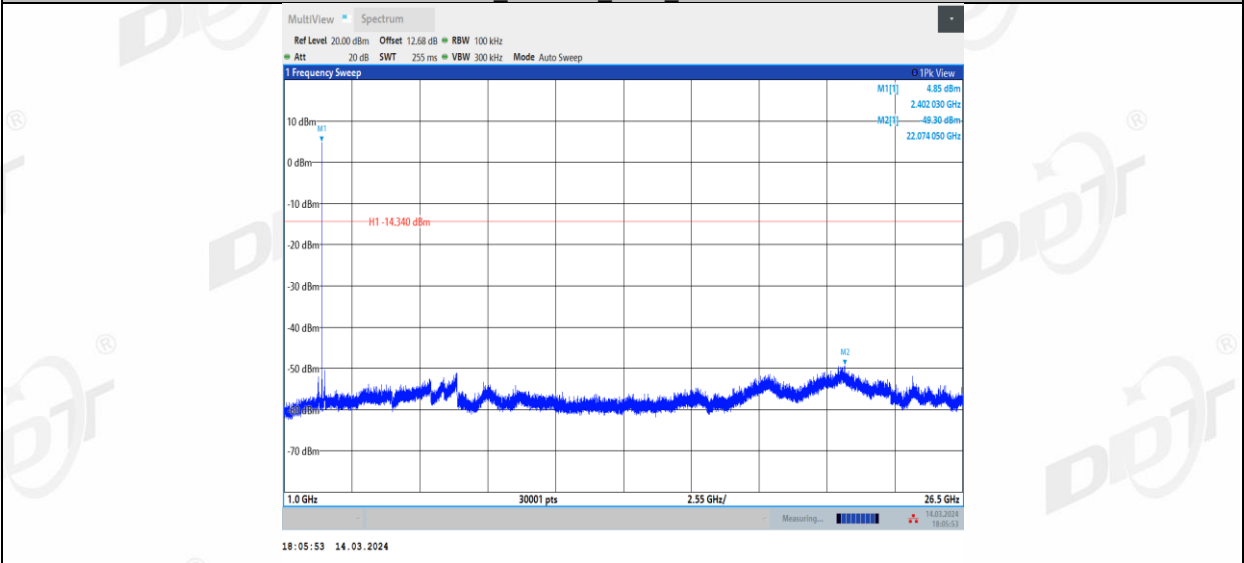
3DH5\_Left side\_2402\_0~Reference



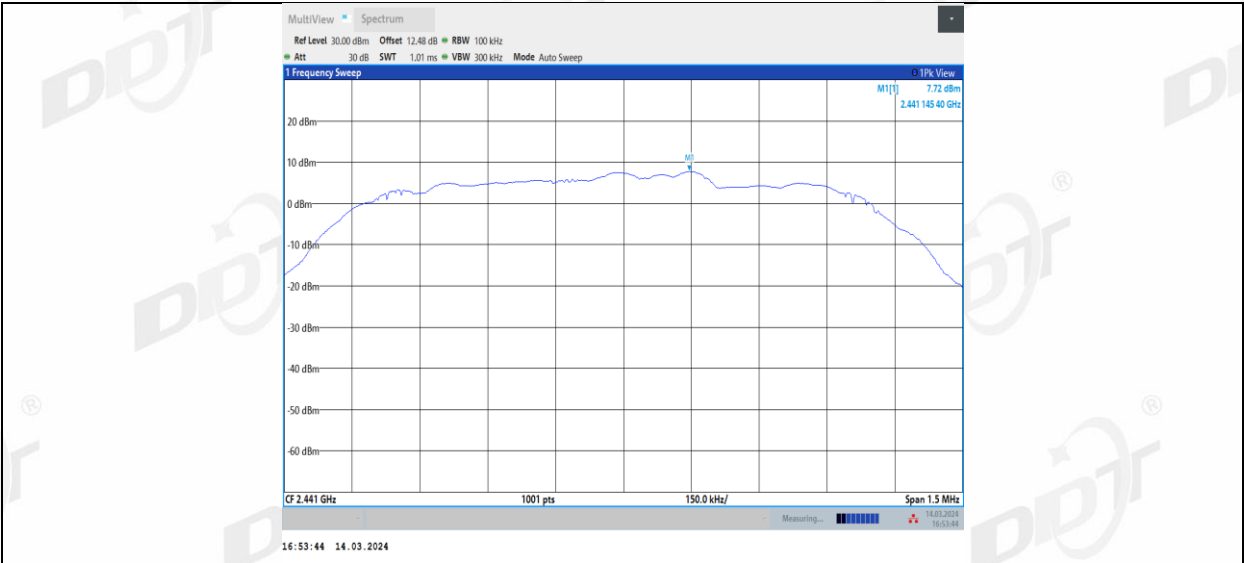
3DH5 Left side 2402\_30~1000



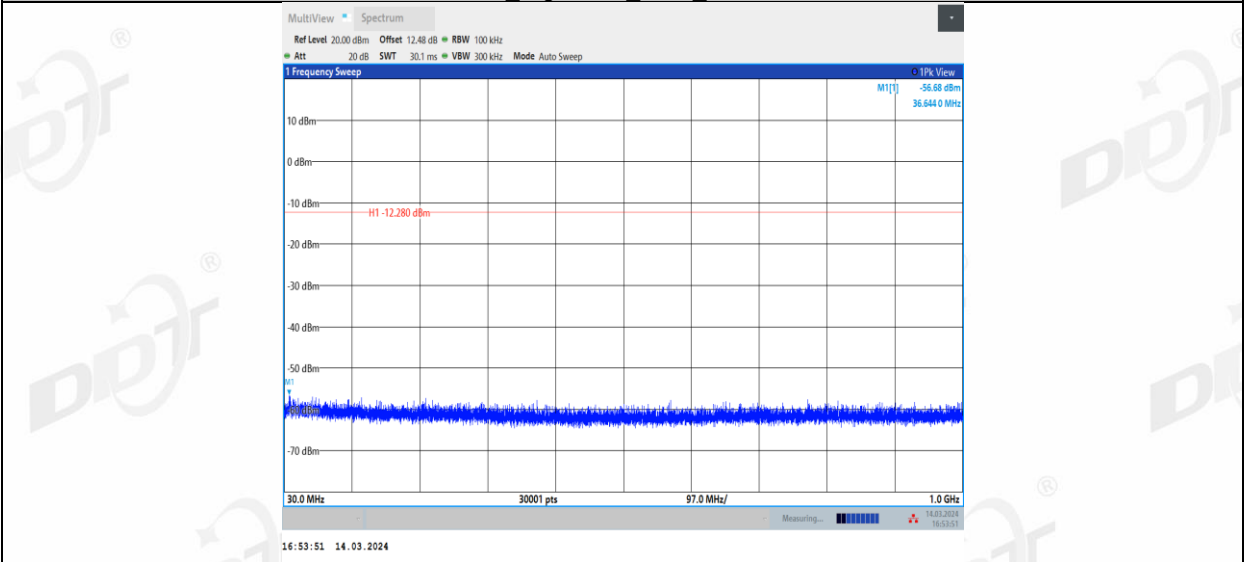
3DH5 Left side 2402\_1000~26500



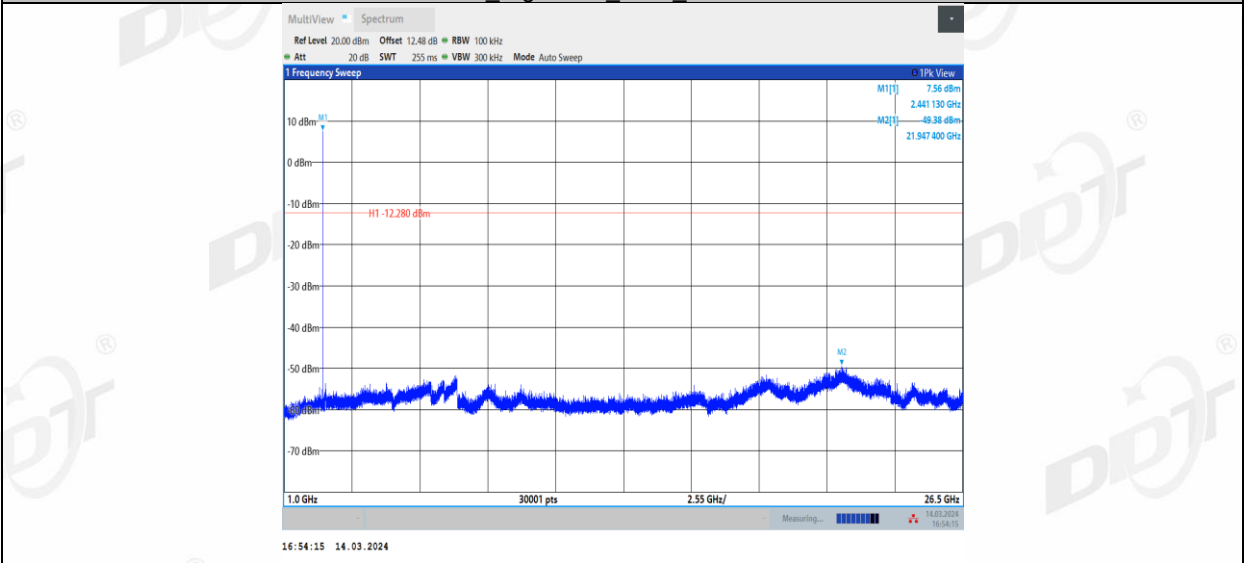
3DH5 Right side 2441\_0~Reference



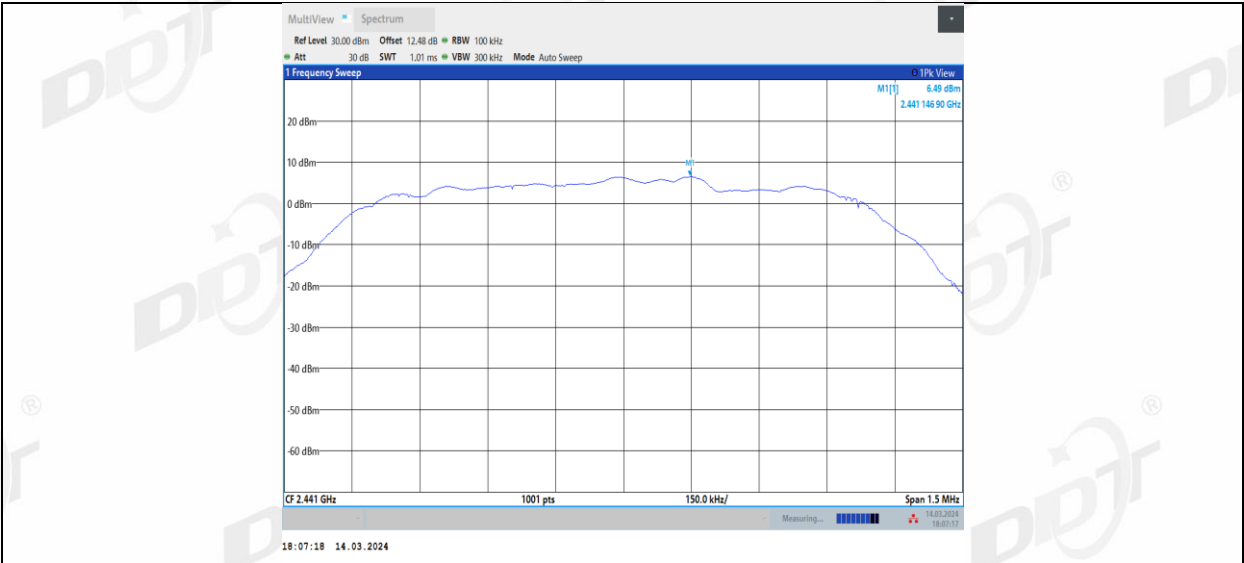
3DH5\_Right side\_2441\_30~1000



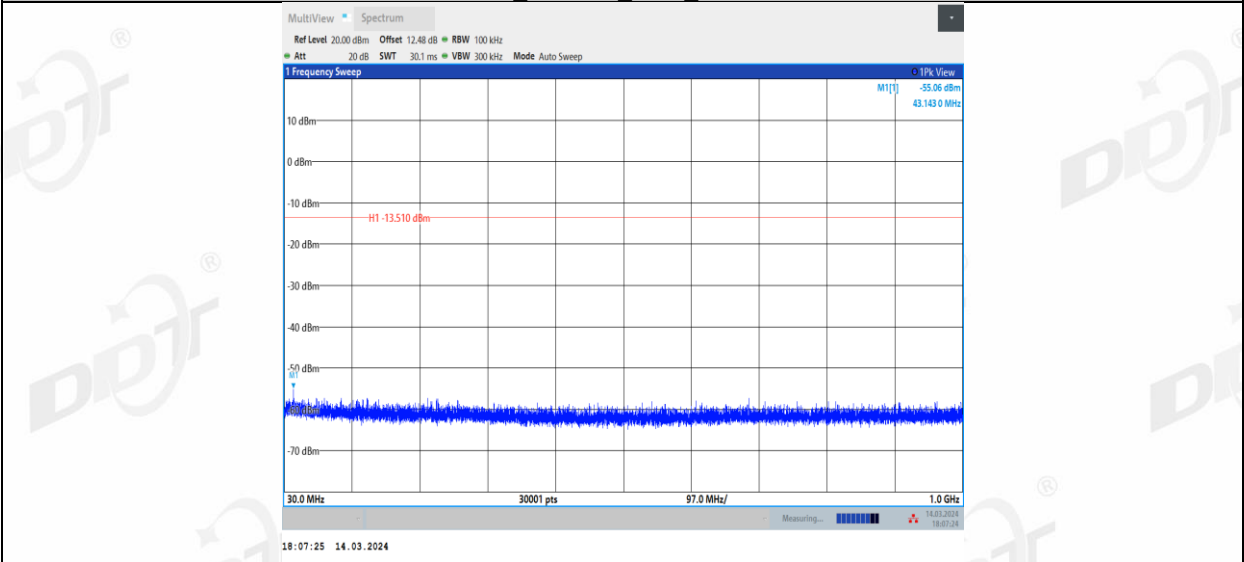
3DH5\_Right side\_2441\_1000~26500



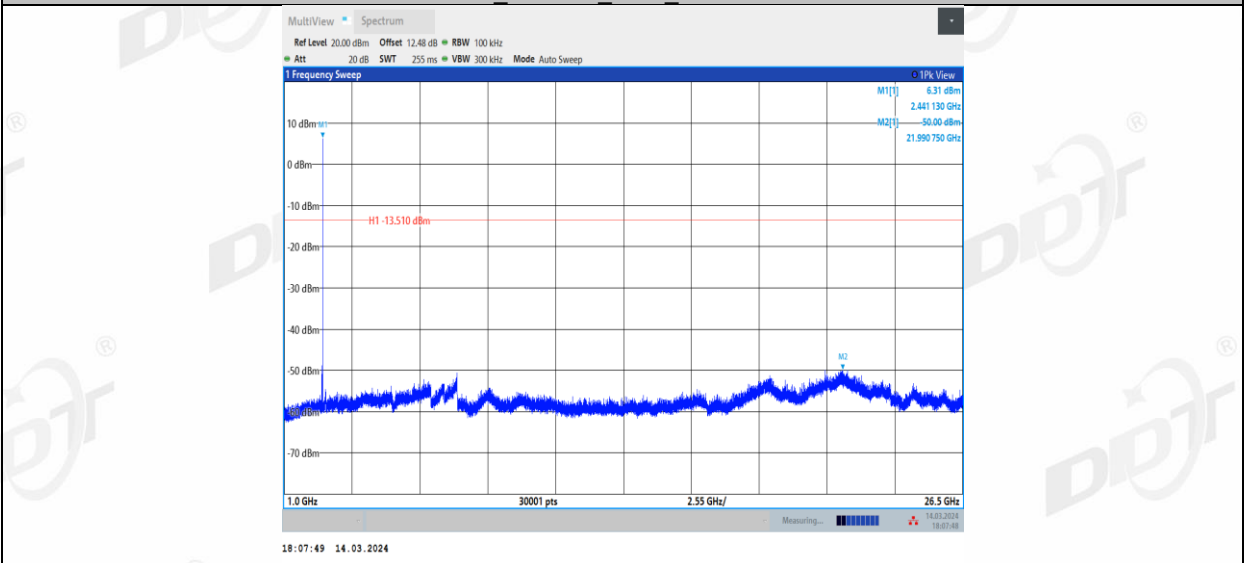
3DH5\_Left side\_2441\_0~Reference



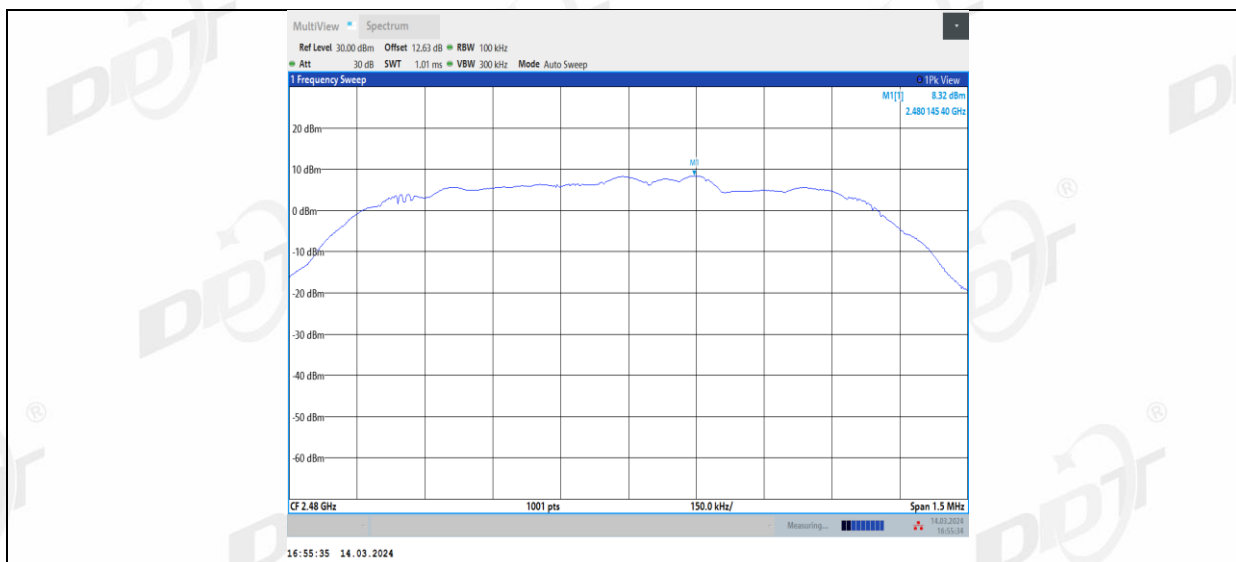
3DH5 Left side 2441 30~1000



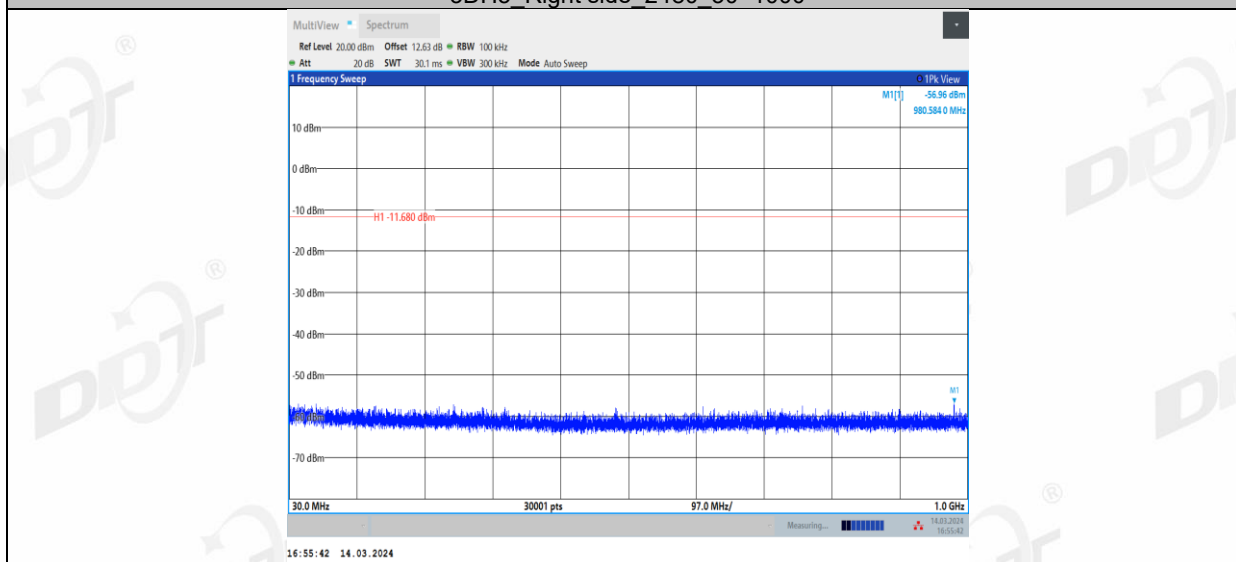
3DH5 Left side 2441 1000~26500



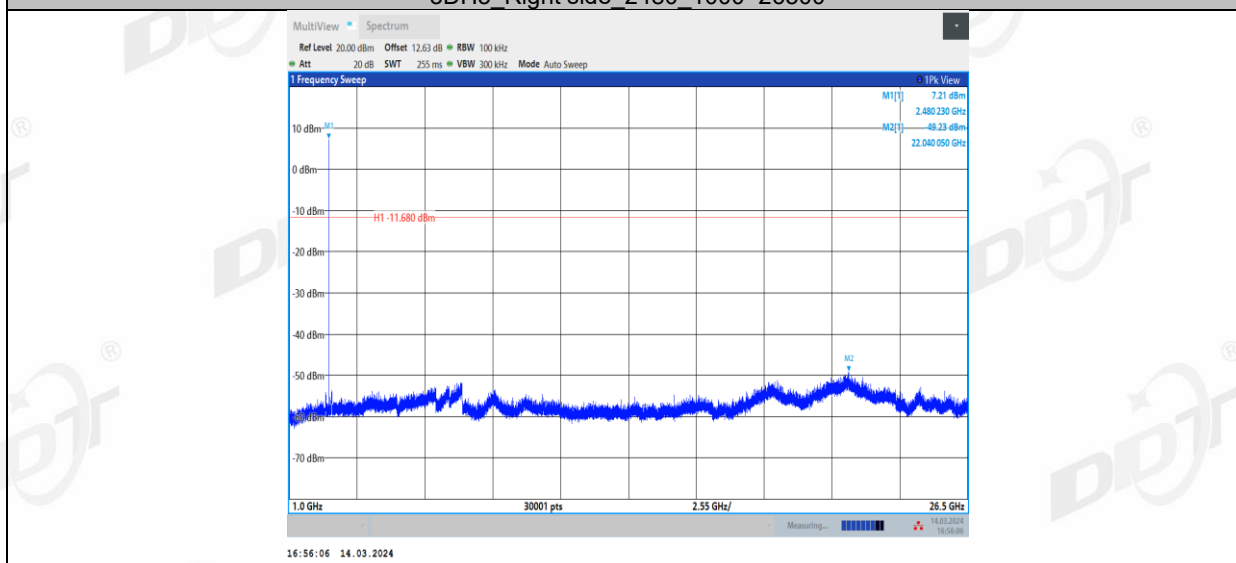
3DH5 Right side 2480 0~Reference



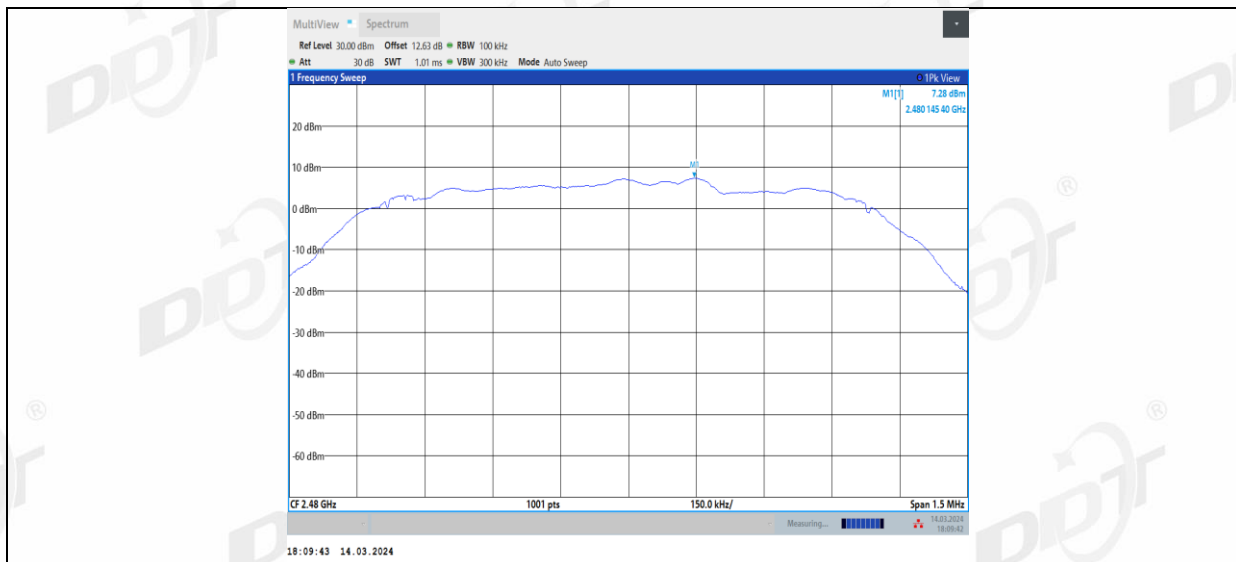
3DH5 Right side 2480 30~1000



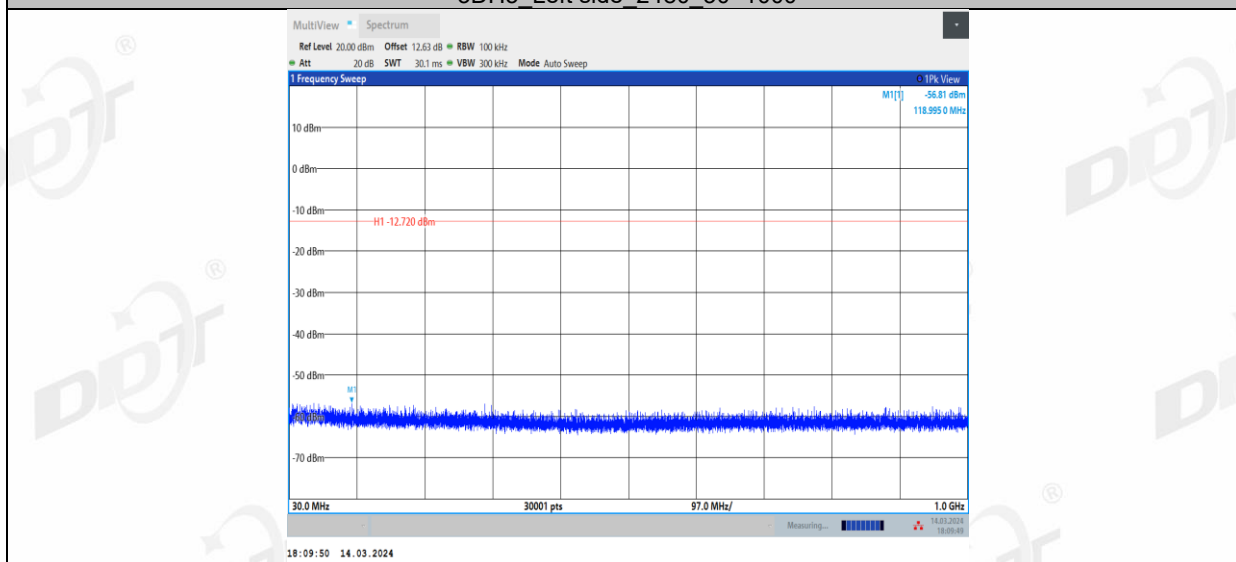
3DH5 Right side 2480 1000~26500



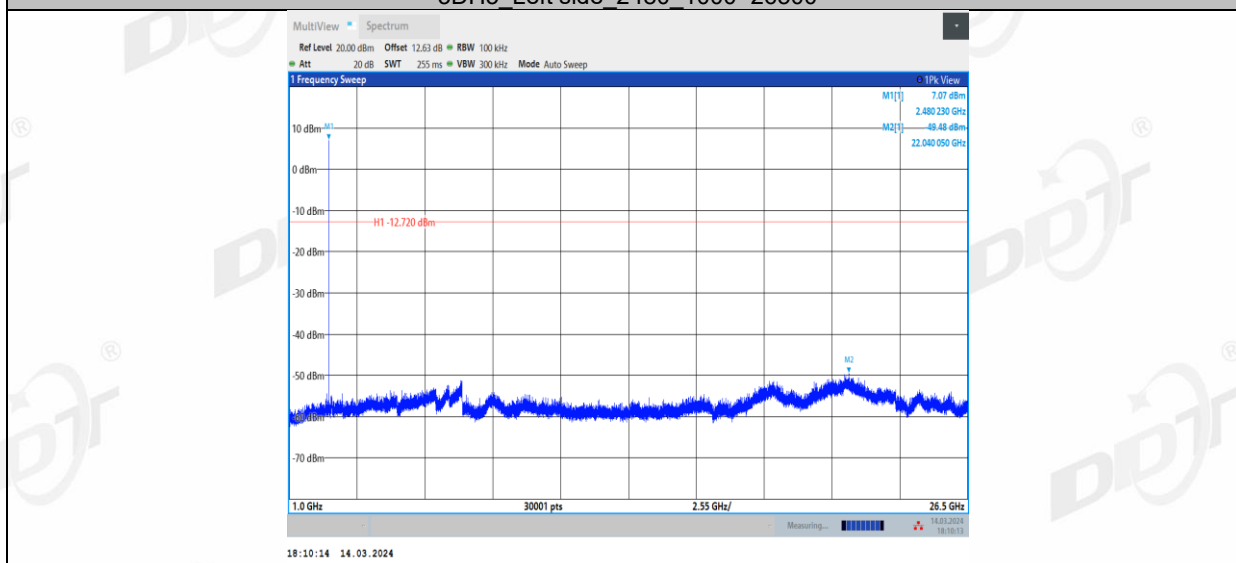
3DH5 Left side 2480 0~Reference



3DH5 Left side 2480\_30~1000

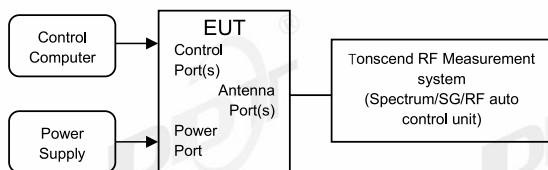


3DH5 Left side 2480\_1000~26500



## 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:	Zora Zhang	Test Site:	RF Measurement System 4#
Ambient Condition:	23.6°C,53.3%RH	Test Date:	2024.03.14
Test Power Supply:	Battery	Sample Number:	S24031112-001

Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]
DH5	Right side	2402	2.88	5.01	57.49	2.40
	Left side	2402	2.88	5.00	57.60	2.40
	Right side	2441	2.88	5.01	57.49	2.40
	Left side	2441	2.88	5.01	57.49	2.40
	Right side	2480	2.88	5.00	57.60	2.40
	Left side	2480	2.88	5.00	57.60	2.40
2DH5	Right side	2402	2.89	5.01	57.68	2.39
	Left side	2402	2.89	5.01	57.68	2.39
	Right side	2441	2.89	5.01	57.68	2.39
	Left side	2441	2.89	5.01	57.68	2.39
	Right side	2480	2.88	5.00	57.60	2.40
	Left side	2480	2.89	5.00	57.80	2.38
3DH5	Right side	2402	2.89	5.01	57.68	2.39
	Left side	2402	2.89	5.01	57.68	2.39
	Right side	2441	2.89	5.00	57.80	2.38
	Left side	2441	2.89	5.00	57.80	2.38
	Right side	2480	2.89	5.00	57.80	2.38
	Left side	2480	2.89	5.01	57.68	2.39