

# APPENDIX REPORT

Project No.	SHT2211001301EW	Radio Specification	Bluetooth EDR
Test sample No.	YPHT22110013001	Model No.	Power K 4G
Start test date	2022-11-09	Finish date	2022-11-09
Temperature	25.3°C	Humidity	37%
Test Engineer	Xiaoxiao Li	Auditor	Xiaodong Zhu

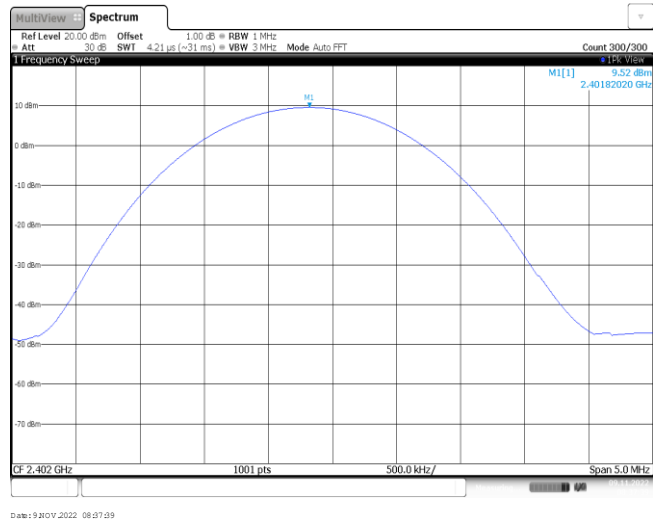
Appendix clause	Test item	Result
A	Peak Output Power	PASS
B	20 dB Bandwidth	PASS
C	99% Occupied Bandwidth	PASS
D	Carrier Frequencies Separation	PASS
E	Hopping Channel Number	PASS
F	Dwell Time	PASS
G	Duty Cycle Correction Factor (DCCF)	PASS
H	Band edge and Spurious Emissions(coducted)	PASS

**Appendix A: Peak Output Power**

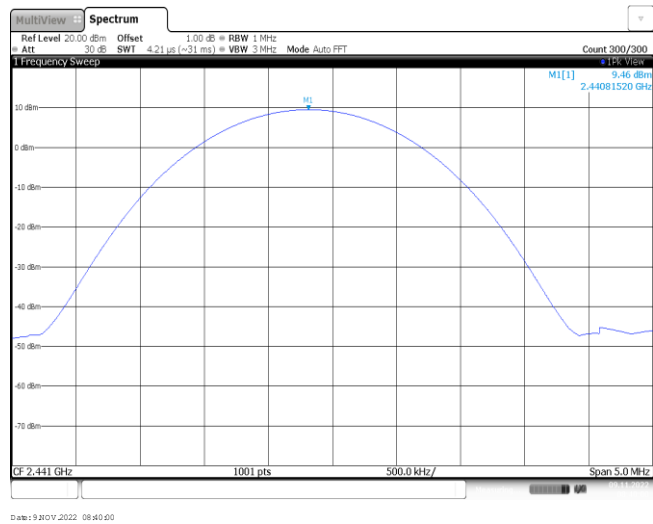
Modulation type	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	00	9.52	9.50	≤ 30.00	Pass
	39	9.46	9.44		
	78	8.03	7.59		
π/4DQPSK	00	9.96	9.14	≤ 21.00	Pass
	39	9.67	9.50		
	78	8.66	7.76		
8DPSK	00	9.99	9.14	≤ 21.00	Pass
	39	9.81	8.93		
	78	8.57	7.51		

**Modulation Type: GFSK**

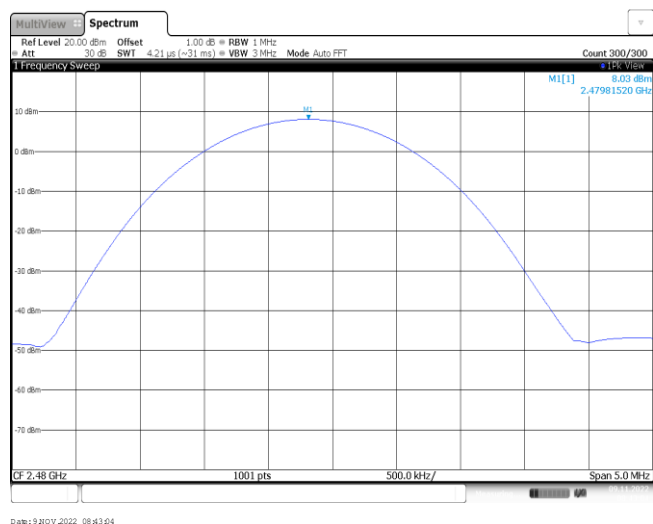
CH00



CH39

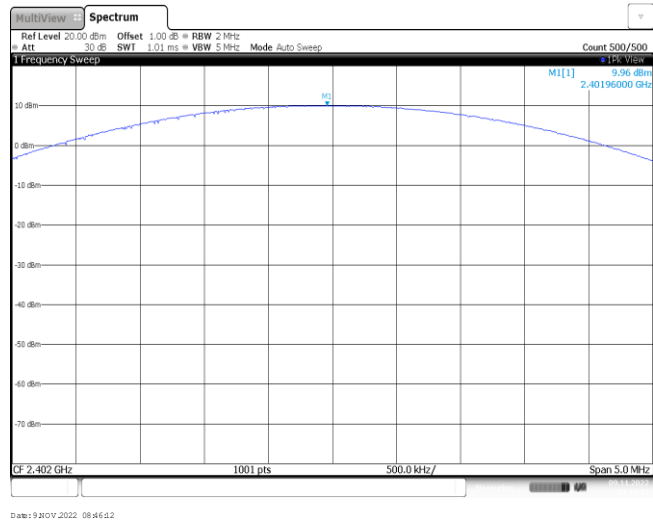


CH78

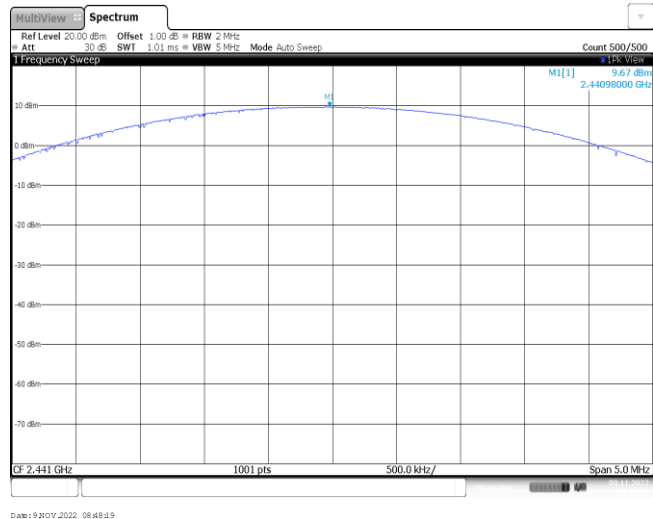


**Modulation Type:**  $\pi/4$ DQPSK

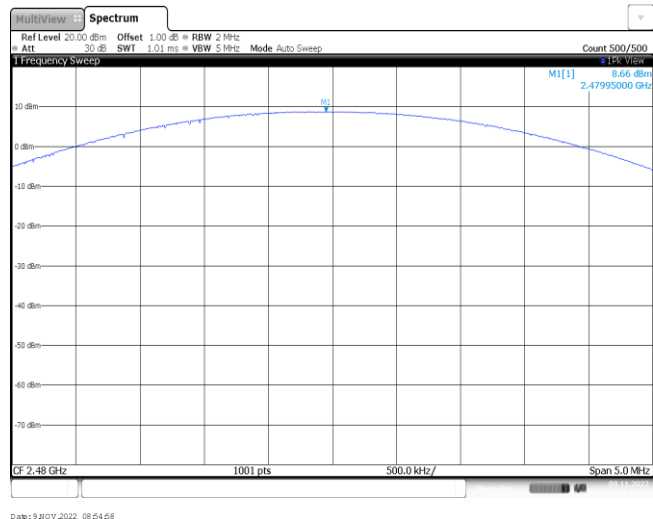
CH00



CH39

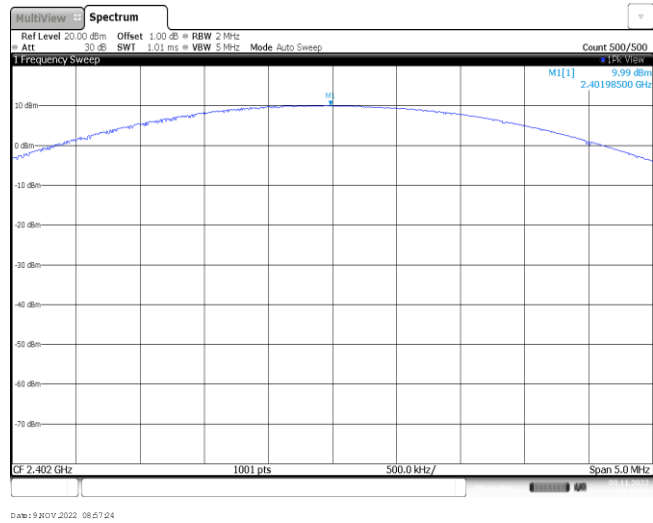


CH78

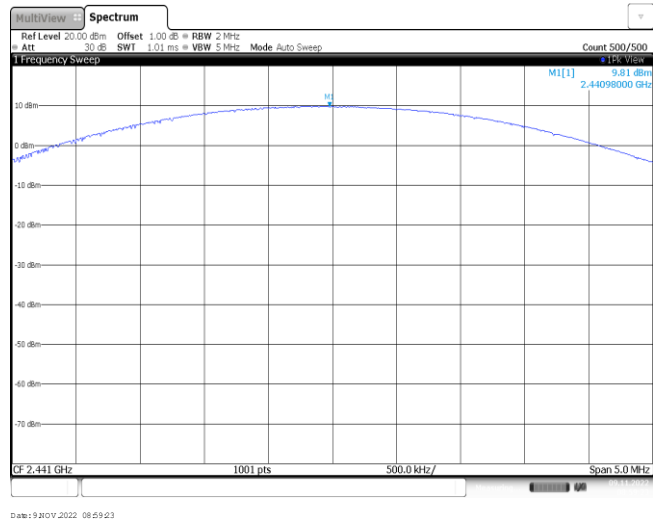


**Modulation Type: 8DPSK**

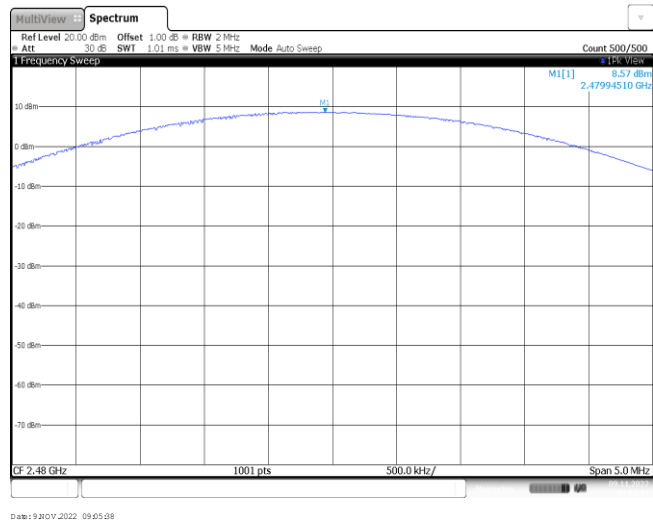
CH00



CH39



CH78

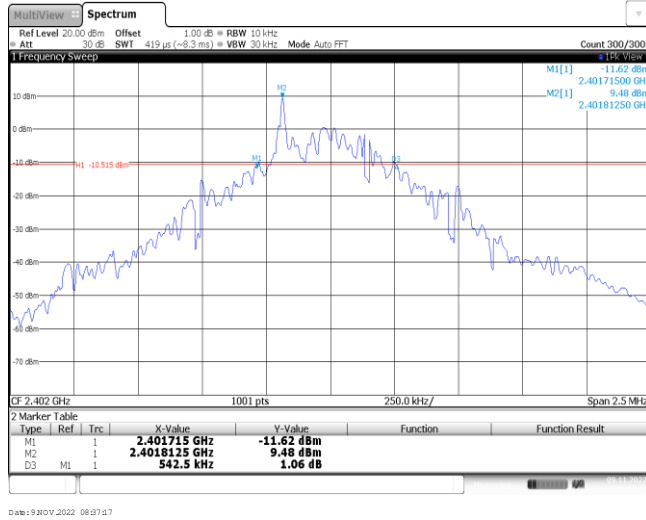


**Appendix B : 20 dB Bandwidth**

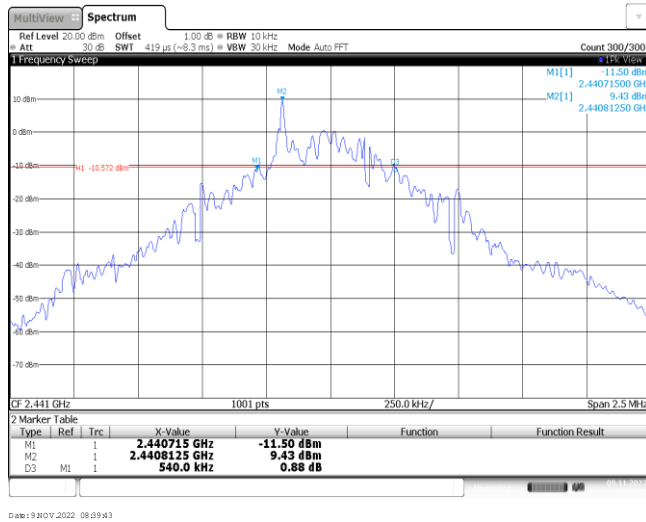
Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	542.50	-	Pass
	39	540.00		
	78	537.50		
$\pi/4$ DQPSK	00	1147.50	-	Pass
	39	1150.00		
	78	1147.50		
8DPSK	00	1140.00	-	Pass
	39	1135.00		
	78	1142.50		

**Modulation Type: GFSK**

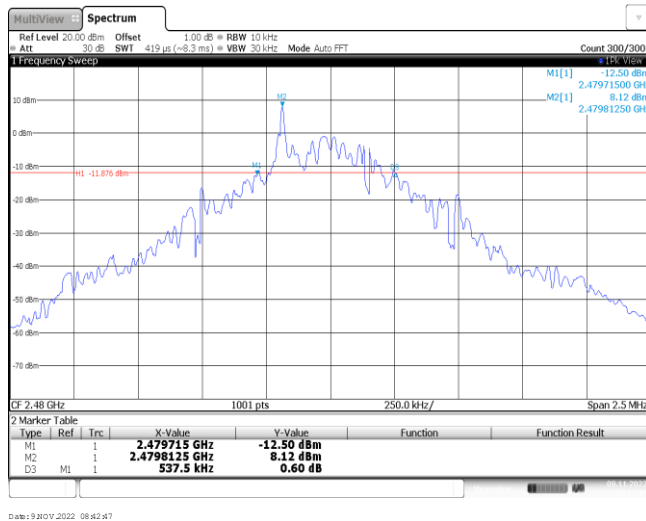
CH00



CH39

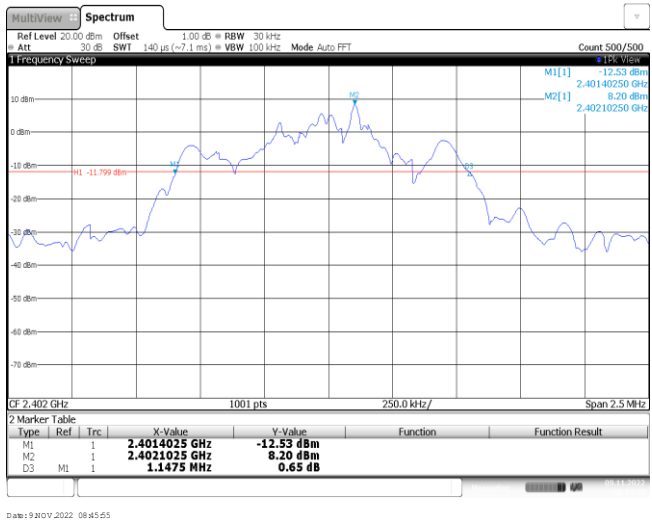


CH78

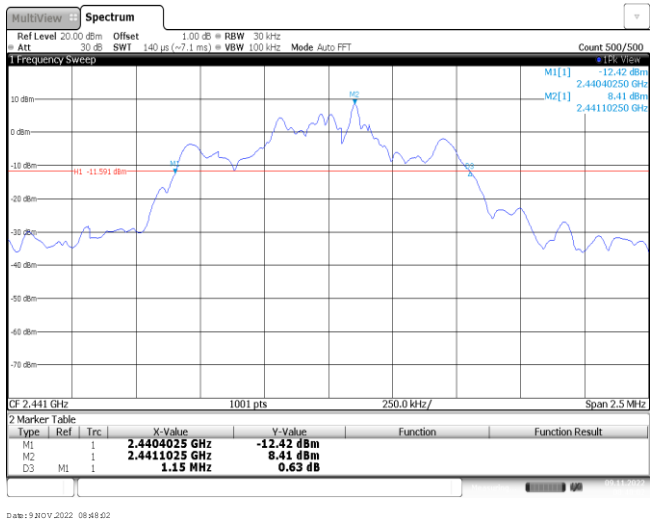


**Modulation Type:**  **$\pi/4$ DQPSK**

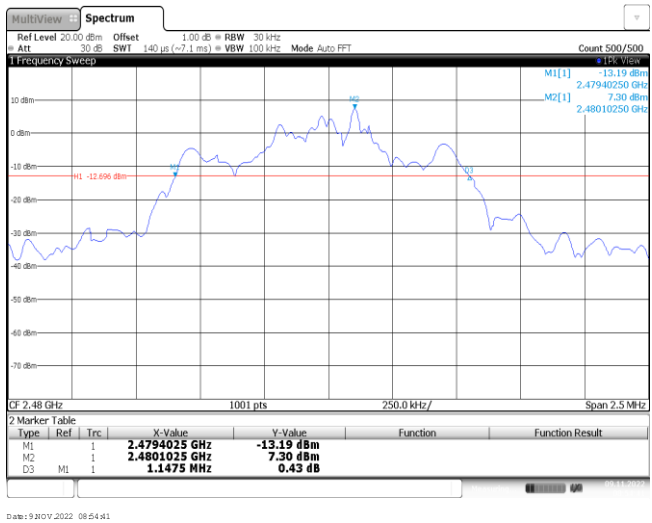
CH00



CH39



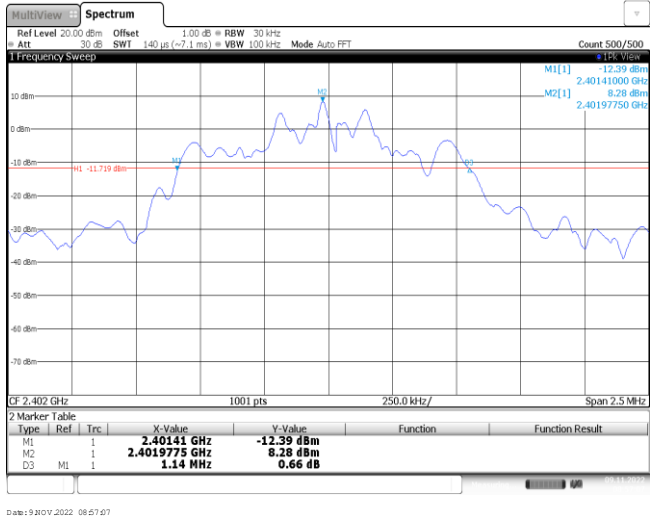
CH78



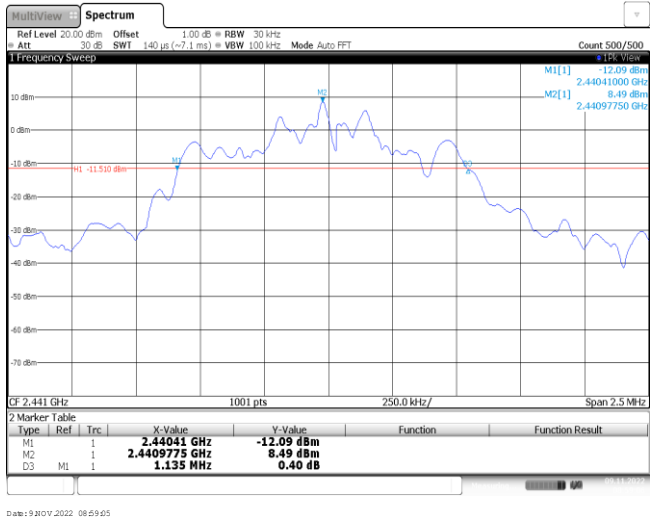


**Modulation Type: 8DPSK**

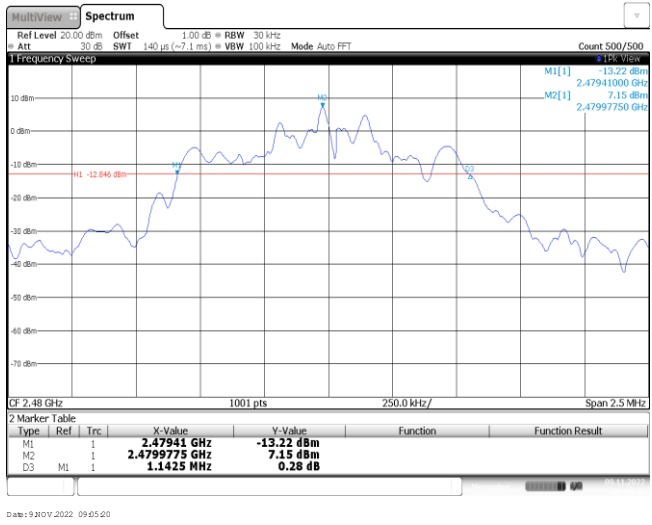
CH00



CH39



CH78



**Appendix C: 99% Occupied Bandwidth**

Modulation type	Channel	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.84	-	Pass
	39	0.83		
	78	0.82		
$\pi/4$ DQPSK	00	1.10	-	Pass
	39	1.10		
	78	1.10		
8DPSK	00	1.10	-	Pass
	39	1.10		
	78	1.10		

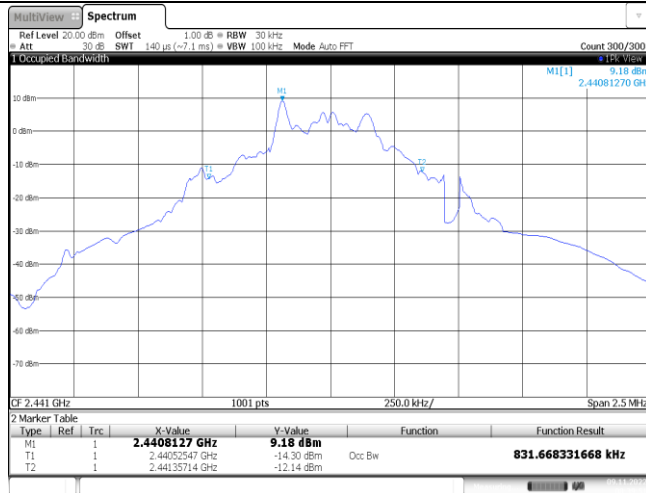
**Modulation Type: GFSK**

CH00



Date: 9 NOV 2022 08:27:30

CH39



Date: 9 NOV 2022 08:29:51

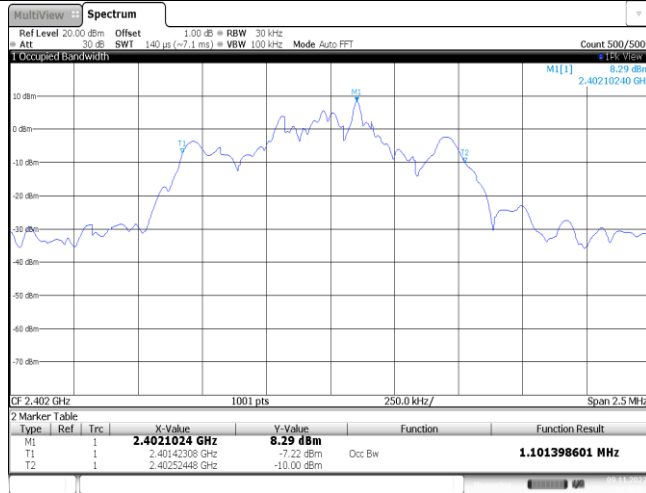
CH78



Date: 9 NOV 2022 08:42:55

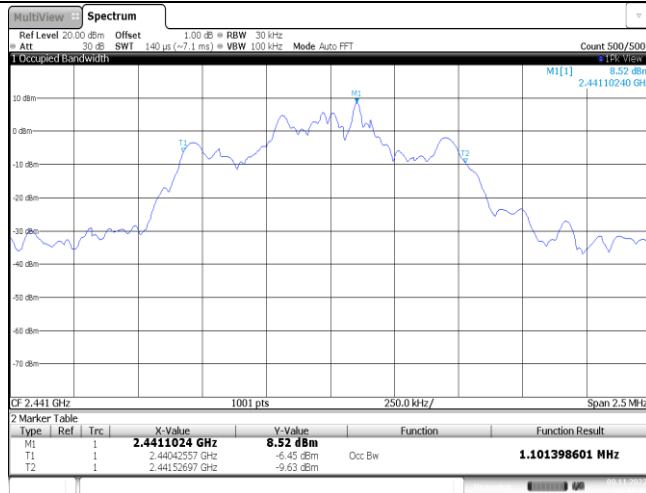
**Modulation Type:**  **$\pi/4$ QPSK**

CH00



Date: 9 NOV 2022 08:46:03

CH39



Date: 9 NOV 2022 08:48:10

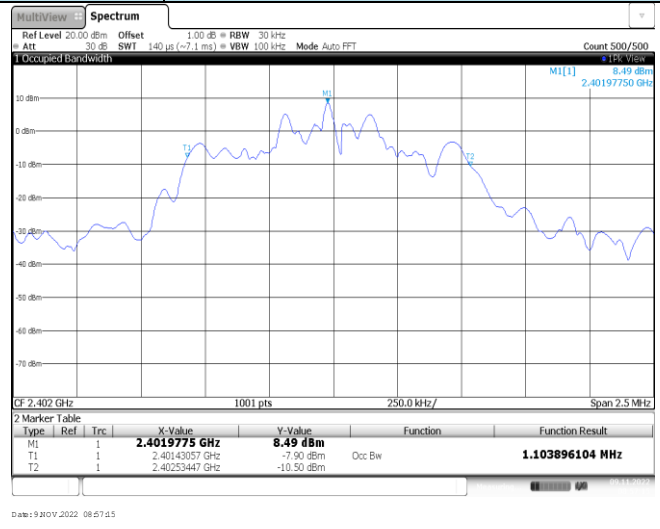
CH78



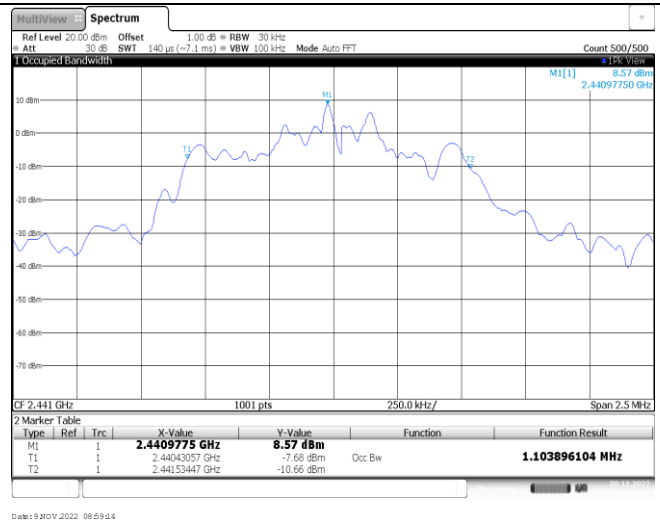
Date: 9 NOV 2022 08:54:49

**Modulation Type: 8DPSK**

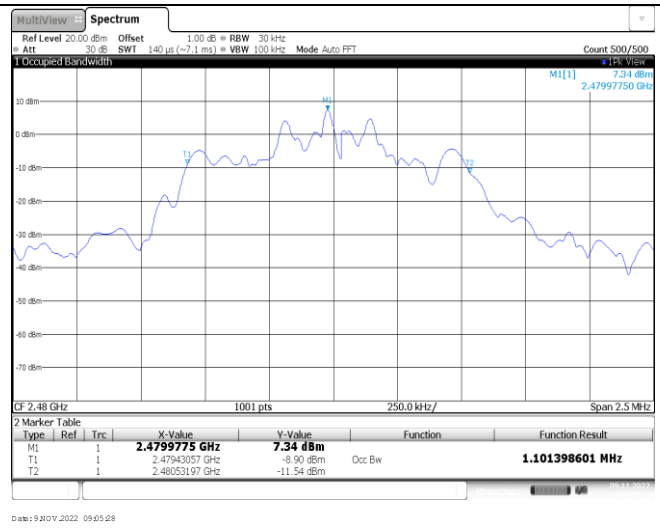
CH00



CH39



CH78



**Appendix D: Carrier Frequencies Separation**

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (kHz) *	Result
GFSK	39	1.00	≥542.50	Pass
$\pi/4$ DQPSK	39	1.00	≥766.67	Pass
8DPSK	39	1.00	≥761.67	Pass

**Note:**

\*: GFSK limit = The maximum 20 dB Bandwidth for GFSK modulation on the appendix B.

$\pi/4$ DQPSK limit =  $2/3$  \* The maximum 20 dB Bandwidth for  $\pi/4$ DQPSK modulation on the appendix B.

8DPSK limit =  $2/3$  \* The maximum 20 dB Bandwidth for 8DPSK modulation on the appendix B

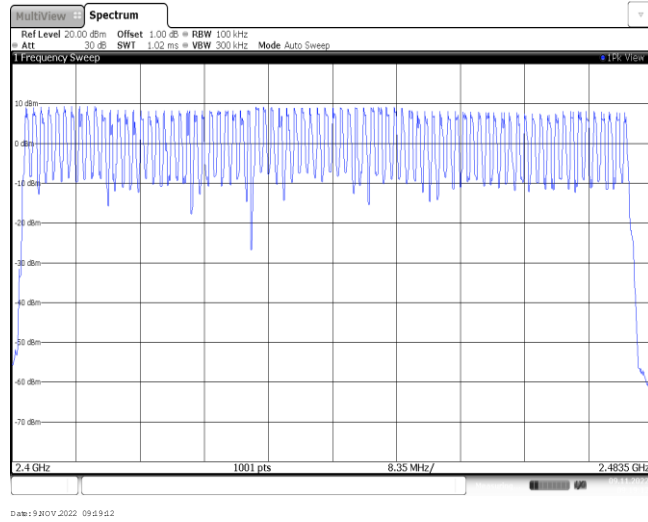
<p style="text-align: center;">GFSK</p>	
<p style="text-align: center;"><math>\pi/4</math>DQPSK</p>	
<p style="text-align: center;">8DPSK</p>	

**Appendix E: Hopping Channel Number**

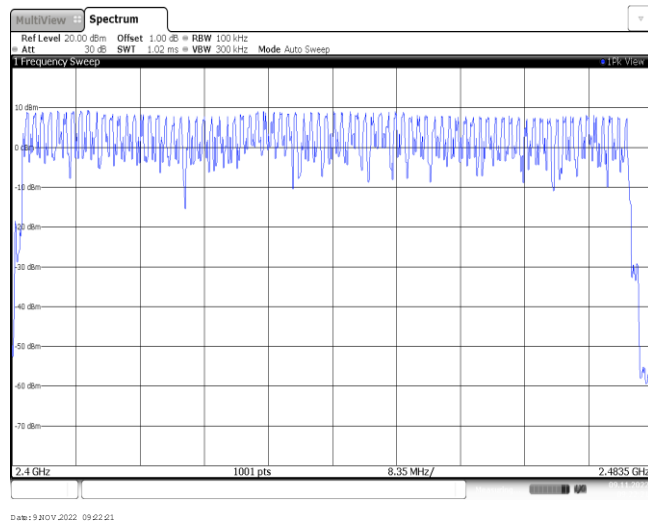
Modulation type	Channel number	Limit	Result
GFSK	79	≥15.00	Pass
π/4DQPSK	79		
8DPSK	79		



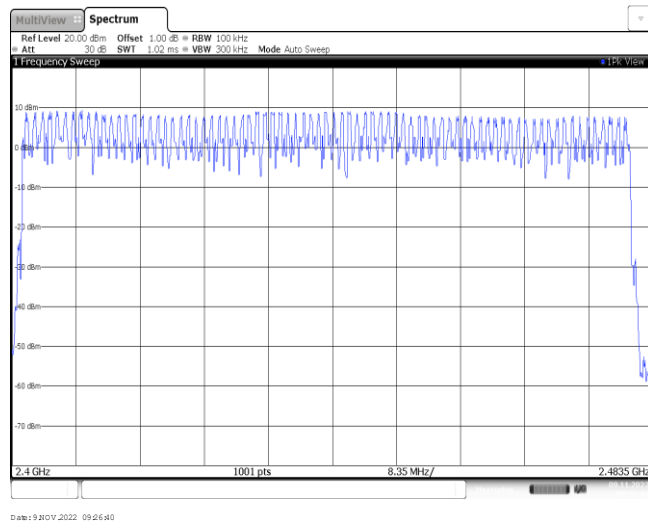
GFSK



$\pi/4$ DQPSK

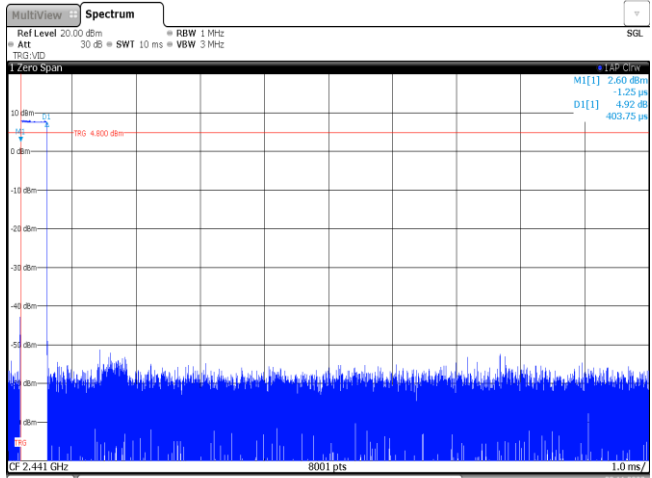
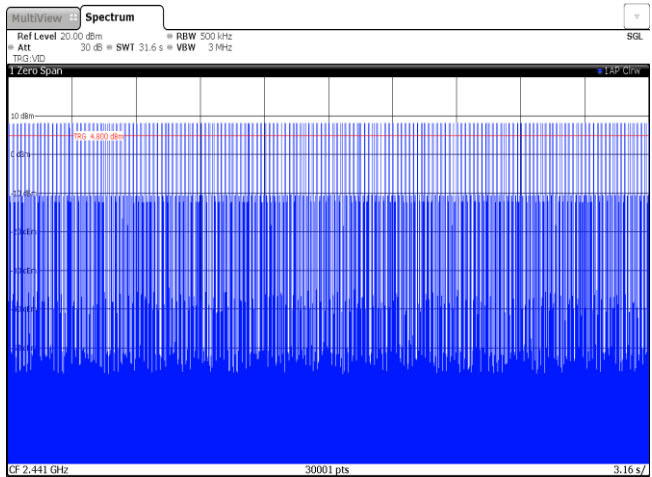
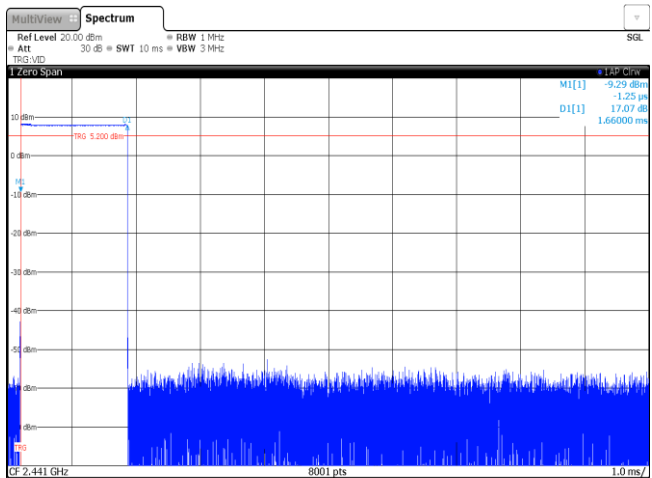


8DPSK

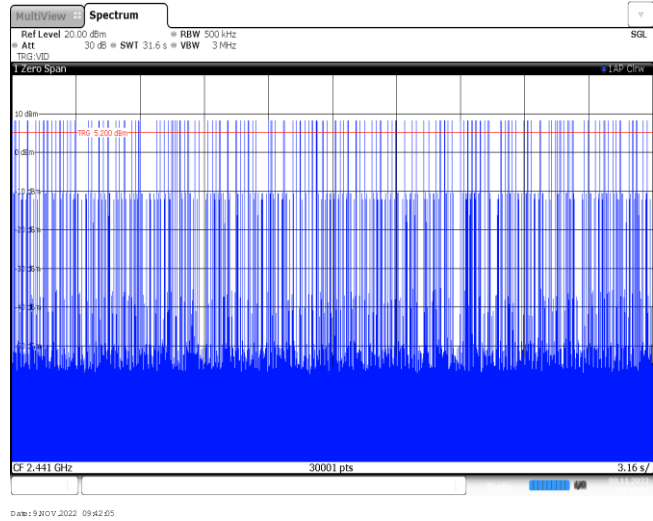


**Appendix F: Dwell Time**

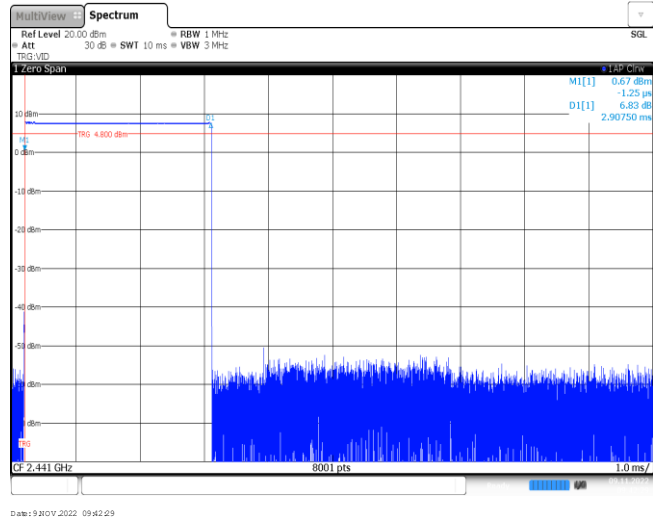
Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.40	320	0.13	≤ 0.40	Pass
	DH3	1.66	166	0.28		
	DH5	2.91	110	0.32		
π/4DQPSK	2DH1	0.40	321	0.13	≤ 0.40	Pass
	2DH3	1.65	160	0.26		
	2DH5	2.90	99	0.29		
8DPSK	3DH1	0.39	320	0.13	≤ 0.40	Pass
	3DH3	1.65	160	0.26		
	3DH5	2.90	111	0.32		

Modulation Type:	GFSK
<p>DH1 Burst width</p>	 <p>The spectrum plot shows a signal centered at 2.441 GHz. The y-axis represents power in dBm, ranging from -50 to 10. A red horizontal line is drawn at 4.800 dBm. The signal shows a burst of activity. The plot includes parameters: Ref Level 20.00 dBm, Att 30 dB, SWT 10 ms, RBW 1 MHz, VBW 3 MHz. The x-axis is labeled 'CF 2.441 GHz' and '8001 pts'. The date is 9/20/2022 09:40:35.</p>
<p>DH1 Burst number</p>	 <p>The spectrum plot shows a signal centered at 2.441 GHz. The y-axis represents power in dBm, ranging from -50 to 10. A red horizontal line is drawn at 4.800 dBm. The signal shows a burst of activity. The plot includes parameters: Ref Level 20.00 dBm, Att 30 dB, SWT 31.6 s, RBW 500 kHz, VBW 3 MHz. The x-axis is labeled 'CF 2.441 GHz' and '30001 pts'. The date is 9/20/2022 09:41:09.</p>
<p>DH3 Burst width</p>	 <p>The spectrum plot shows a signal centered at 2.441 GHz. The y-axis represents power in dBm, ranging from -50 to 10. A red horizontal line is drawn at 5.200 dBm. The signal shows a burst of activity. The plot includes parameters: Ref Level 20.00 dBm, Att 30 dB, SWT 10 ms, RBW 1 MHz, VBW 3 MHz. The x-axis is labeled 'CF 2.441 GHz' and '8001 pts'. The date is 9/20/2022 09:41:51.</p>

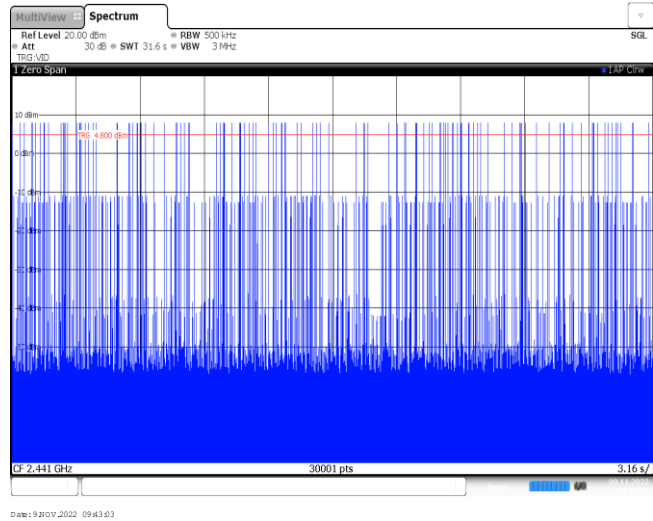
DH3  
Burst number



DH5  
Burst width

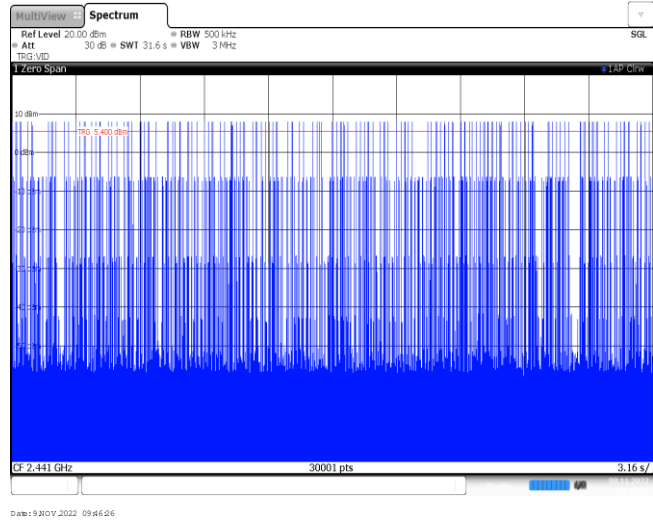


DH5  
Burst number

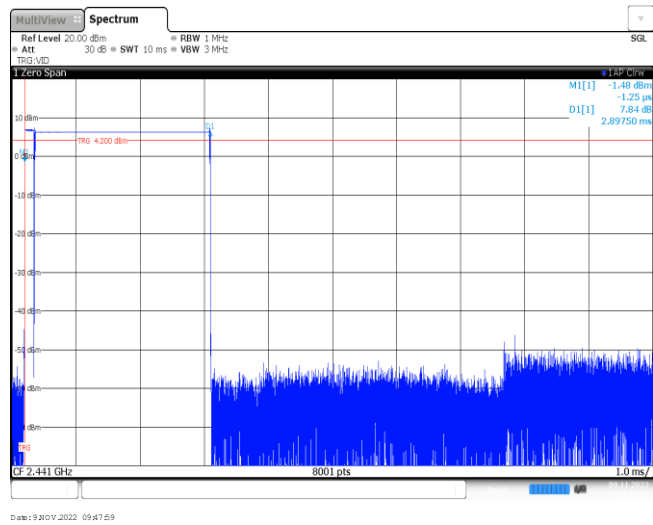


Modulation Type: $\pi/4$ DQPSK	
2DH1 Burst width	
2DH1 Burst number	
2DH3 Burst width	

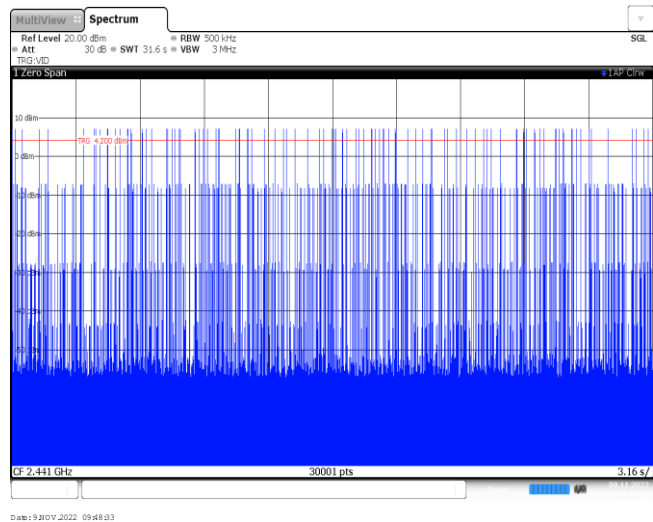
2DH3  
Burst number



2DH5  
Burst width



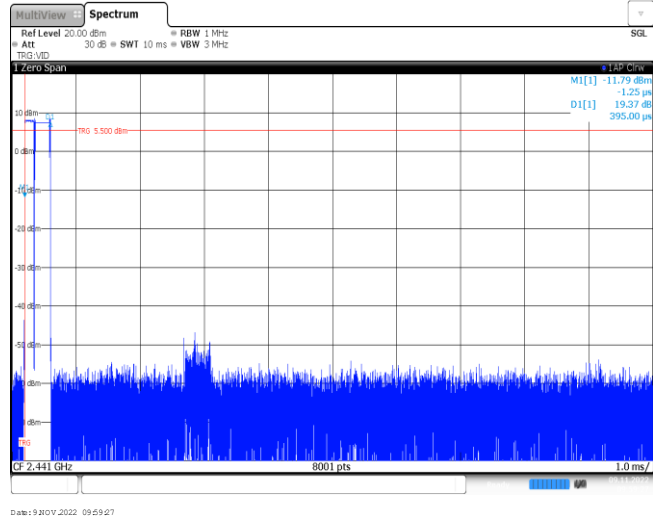
2DH5  
Burst number



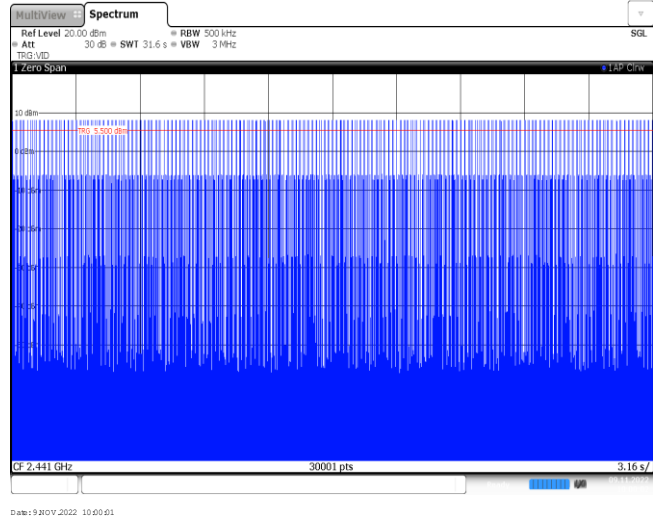
**Modulation Type:**

**8DPSK**

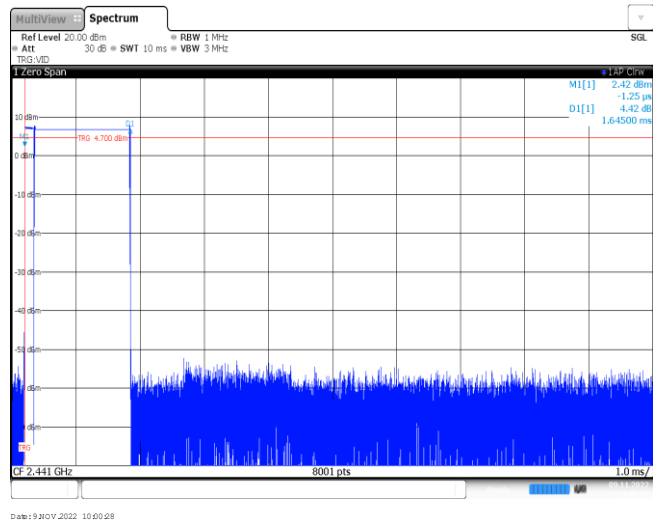
3DH1  
Burst width



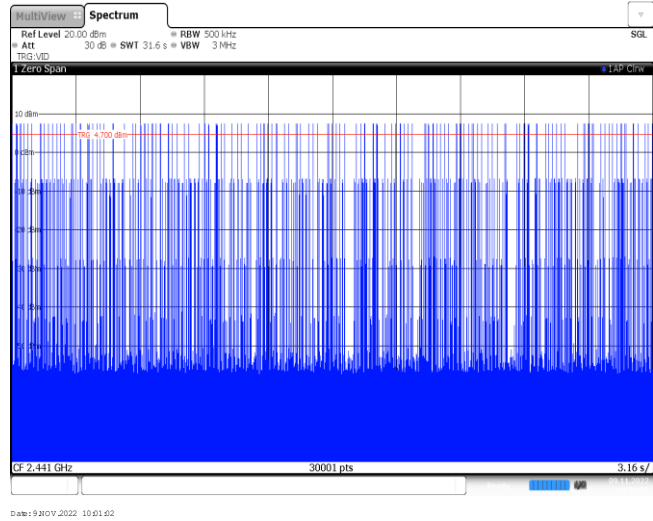
3DH1  
Burst number



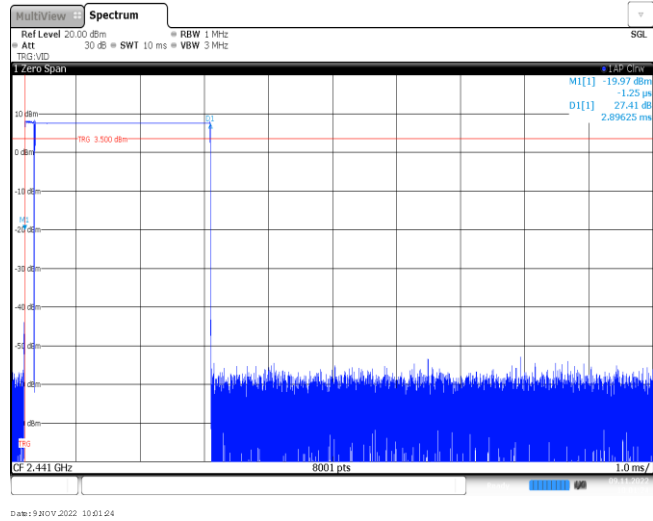
3DH3  
Burst width



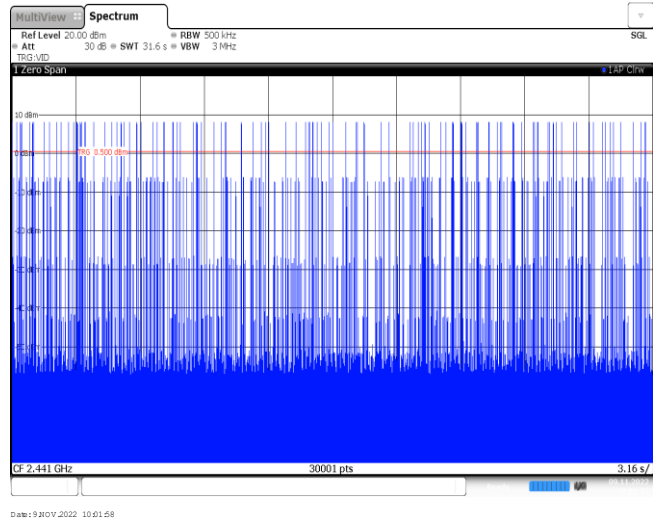
3DH3  
Burst number



3DH5  
Burst width



3DH5  
Burst number

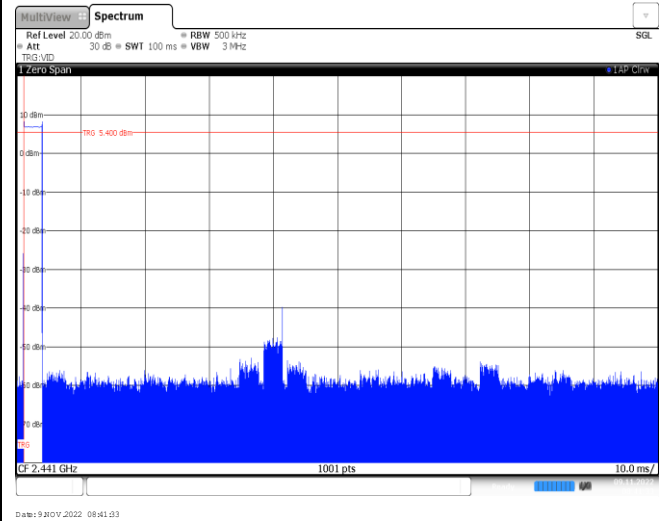
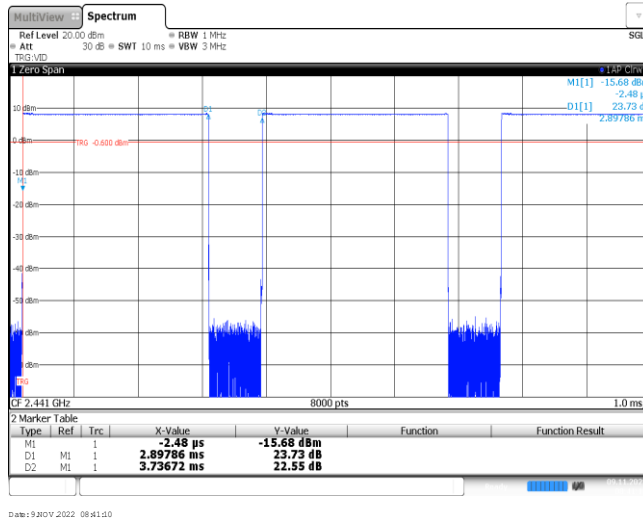




**Appendix G: Duty Cycle Correction Factor (DCCF)**

DCCF Calculate Formula					
DCCF=20 * Log(duty cycle) = 20 * Log( $T_{on\ time} / T_{period}$ )					
Modulation type	Test Frequency (MHz)	$T_{on\ time}$ for single burst [ms]	$T_{period}$ [ms]	Burst Quantity	DCCF [dB]
GFSK	2441	2.90	100	1	-30.75
$\pi/4$ DQPSK	2441	2.89	100	2	-24.76
8DPSK	2441	2.89	100	1	-30.78

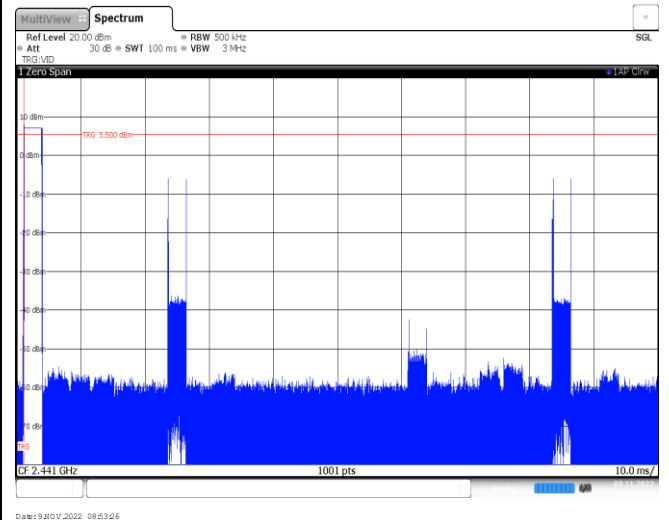
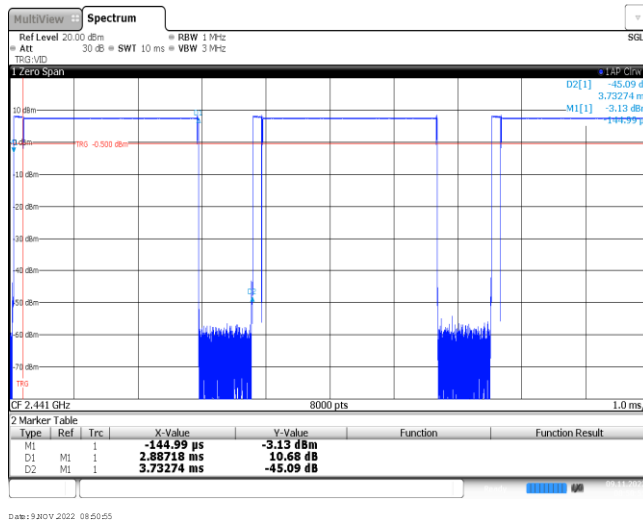
GFSK



Ton time for single burst

Burst Quantity

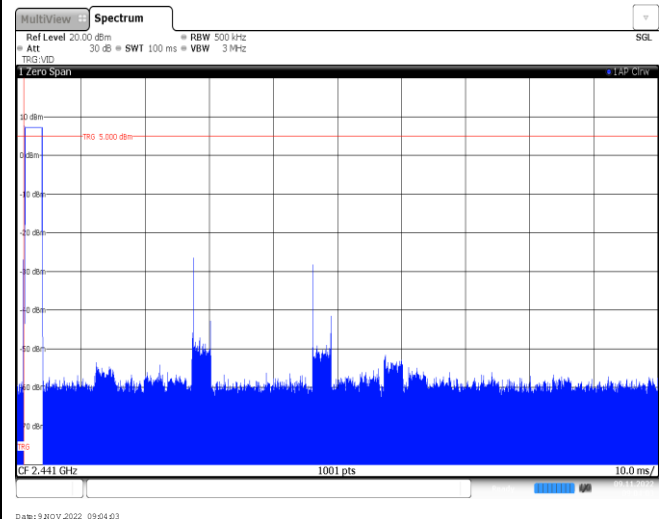
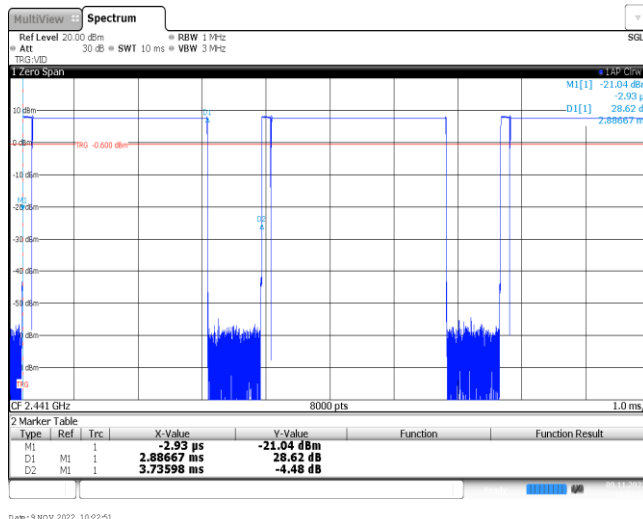
$\pi/4$  DQPSK



Ton time for single burst

Burst Quantity

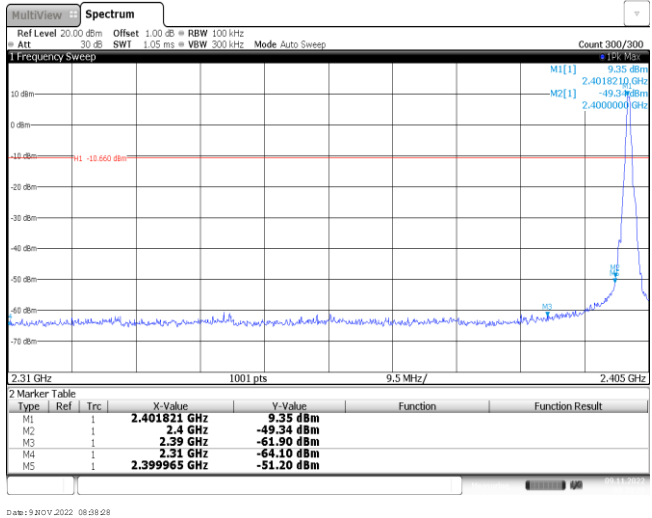
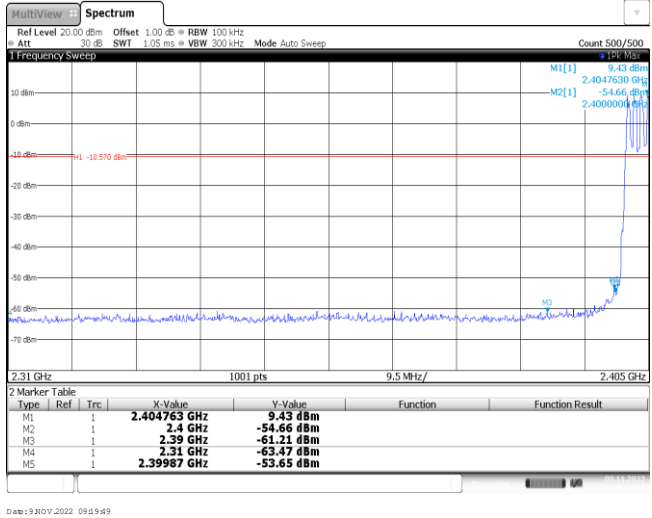
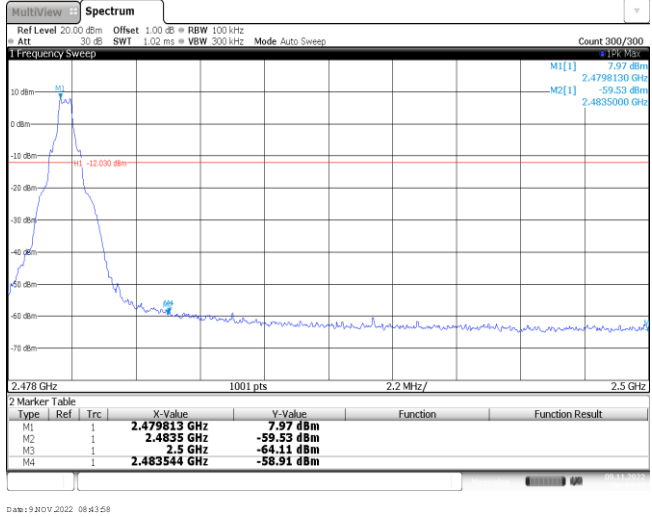
8DPSK



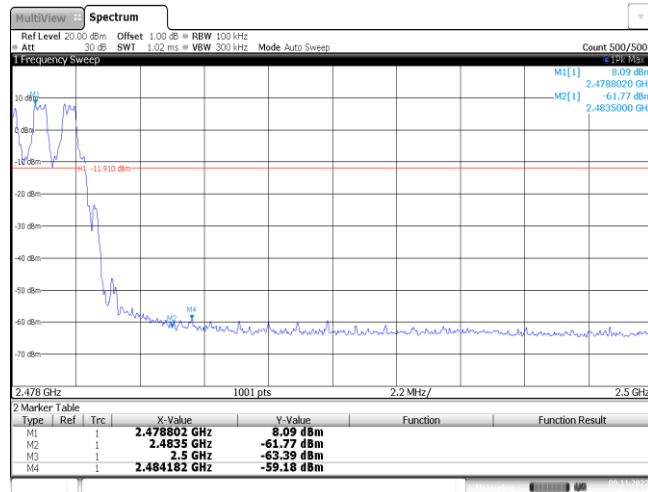
Ton time for single burst

Burst Quantity

**Appendix H: Band edge and Spurious Emissions (conducted)**

Test Item:	Band edge	Modulation type:	GFSK
<p>CH00 No hopping mode</p>			
<p>CH00 Hopping mode</p>			
<p>CH78 No hopping mode</p>			

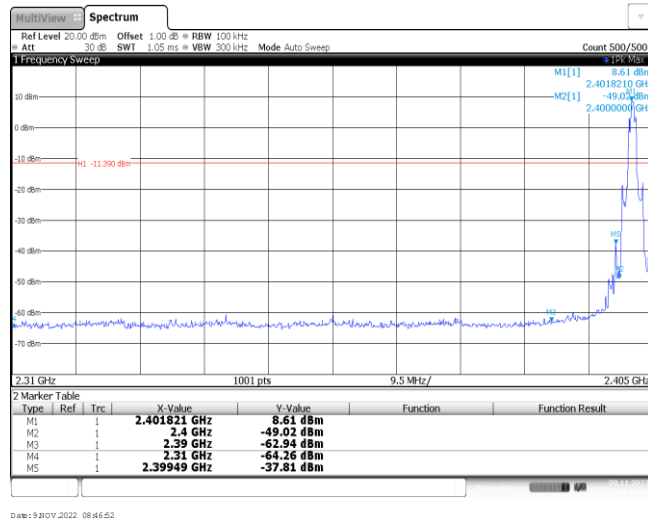
CH78  
Hopping mode



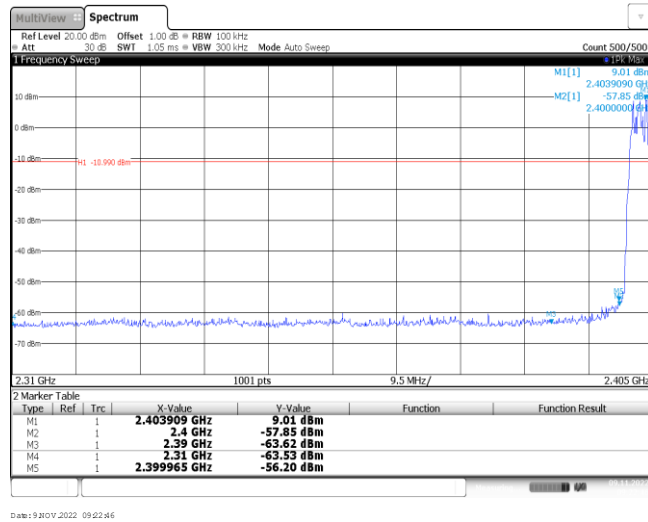
Date: 9 NOV 2022 09:20:27

<b>Test Item:</b>	<b>Band edge</b>	<b>Modulation type:</b>	<b><math>\pi/4</math>DQPSK</b>
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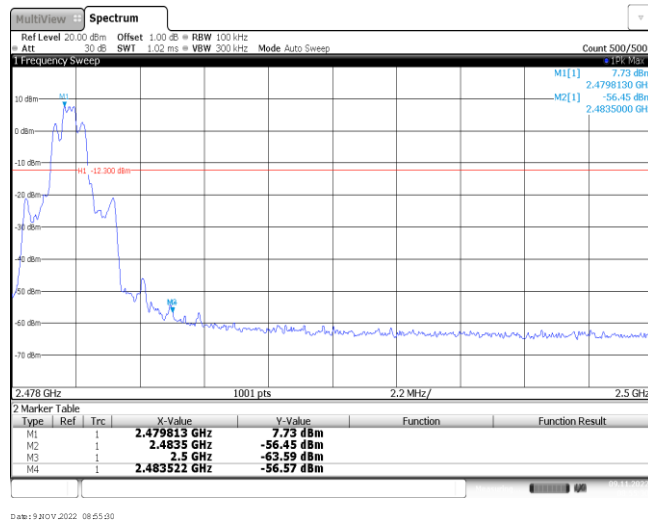
CH00  
No hopping mode



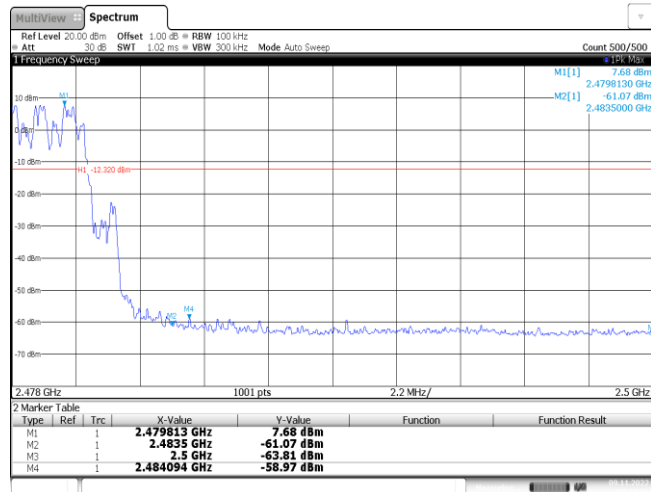
CH00  
Hopping mode



CH78  
No hopping mode



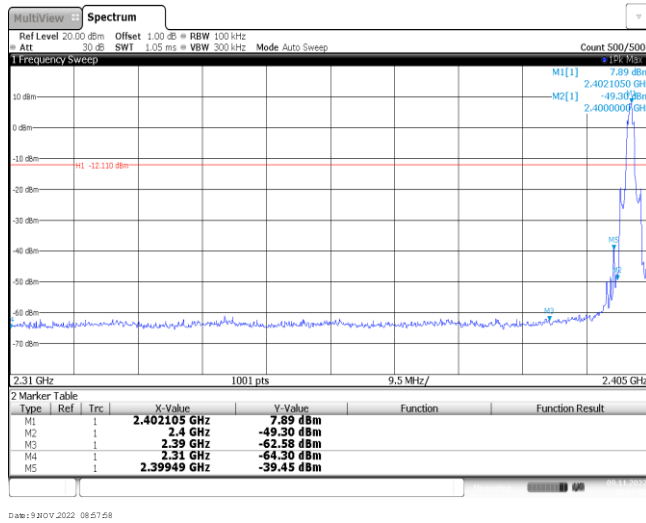
CH78  
Hopping mode



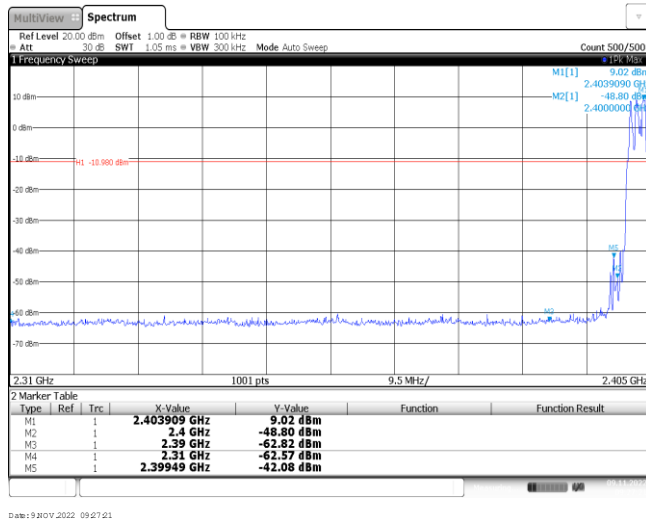
Date: 9 NOV 2022 09:23:41

<b>Test Item:</b>	<b>Band edge</b>	<b>Modulation type:</b>	<b>8DPSK</b>
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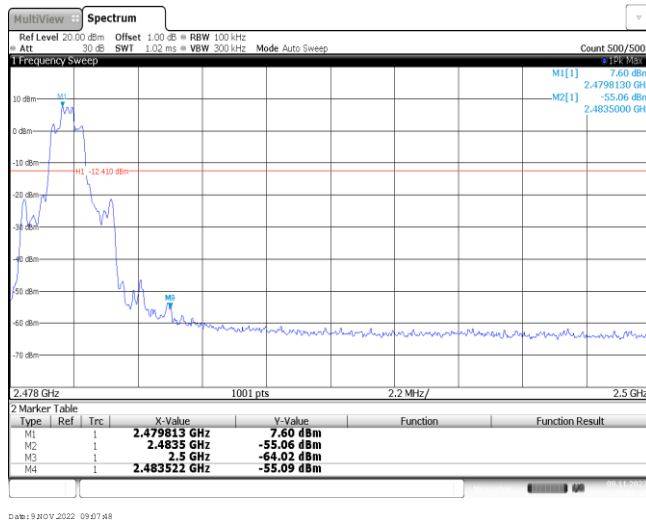
CH00  
No hopping mode



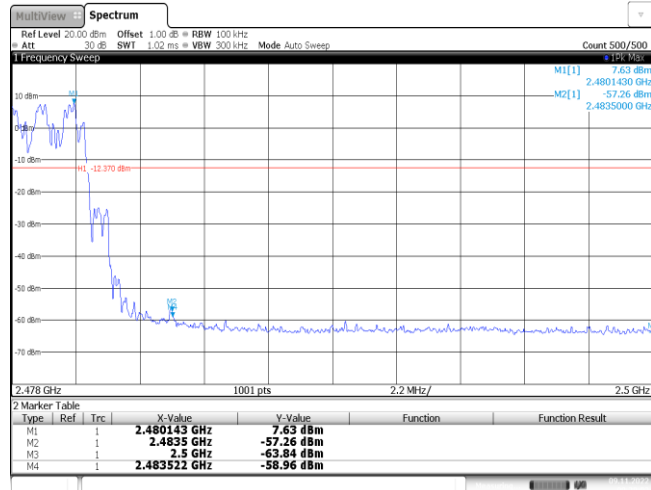
CH00  
Hopping mode



CH78  
No hopping mode



CH78  
Hoppig mode

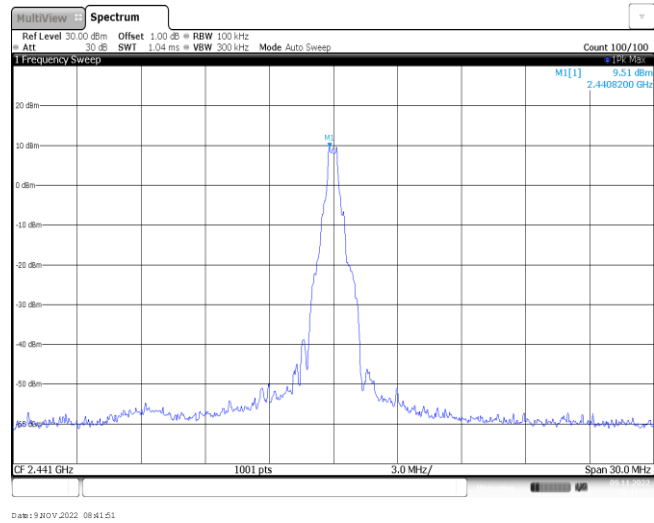


Date: 9 NOV 2022 09:28:02

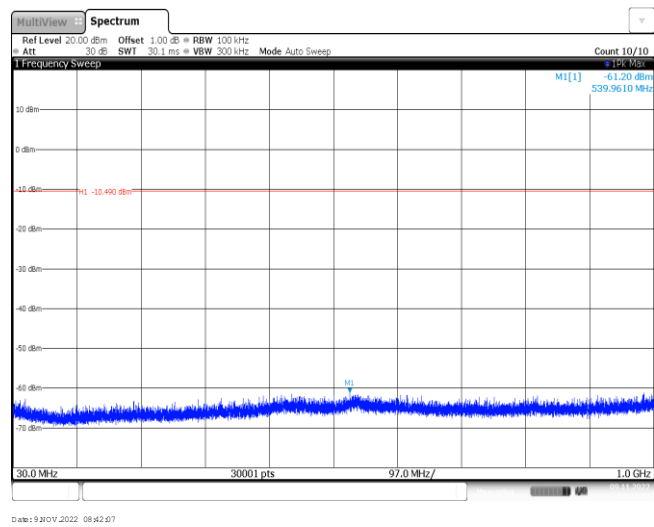


Test Item:	Spurious Emission	Modulation type:	GFSK
<p>CH00 Reference level</p>			
<p>CH00 30MHz~1000MHz</p>			
<p>CH00 1GHz~26GHz</p>			

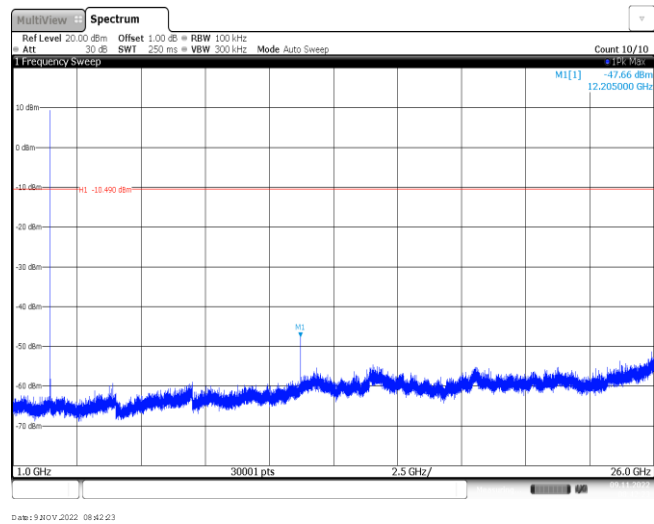
CH39  
Reference level

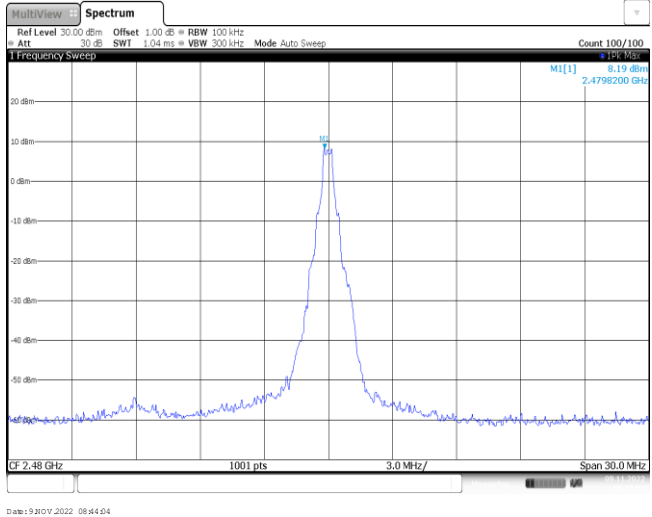
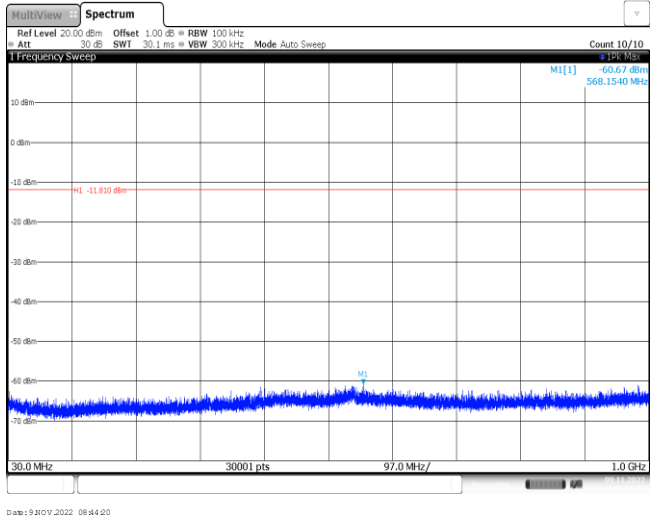
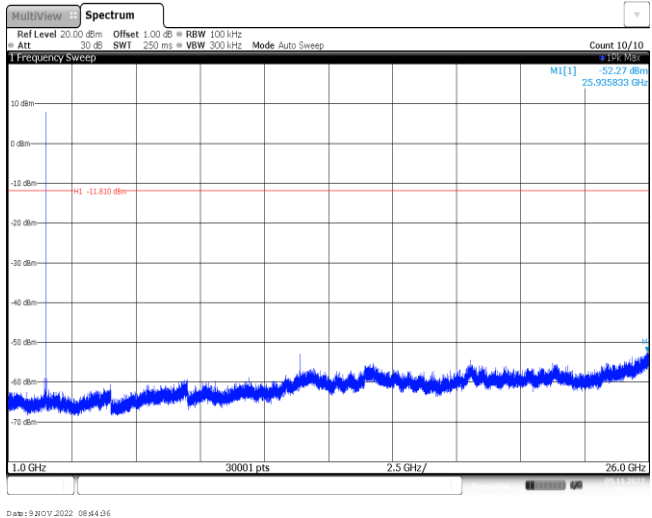


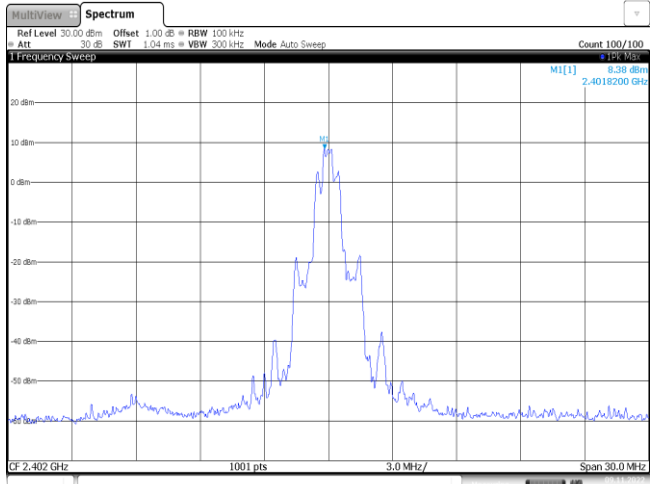
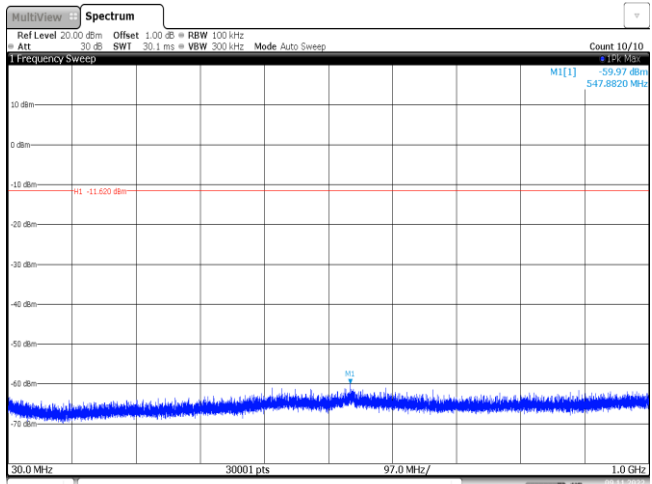
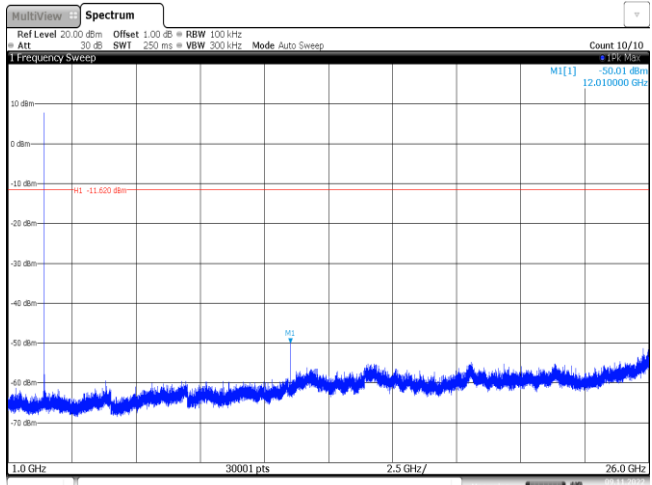
CH39  
30MHz~1000MHz



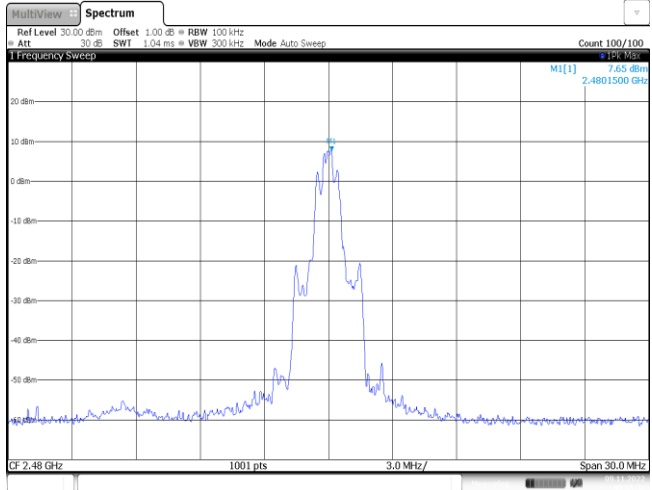
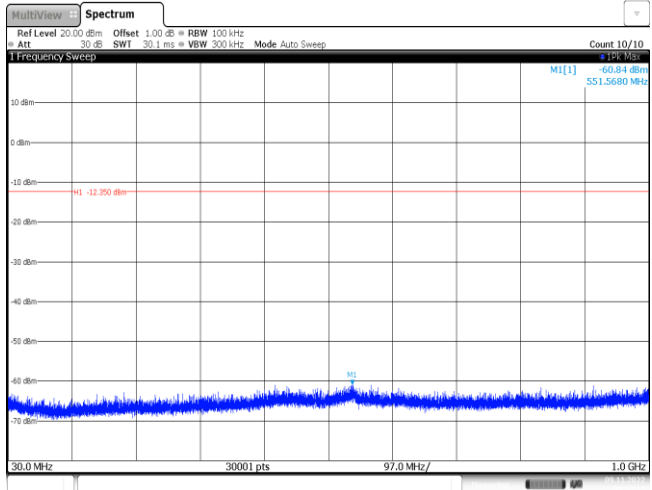
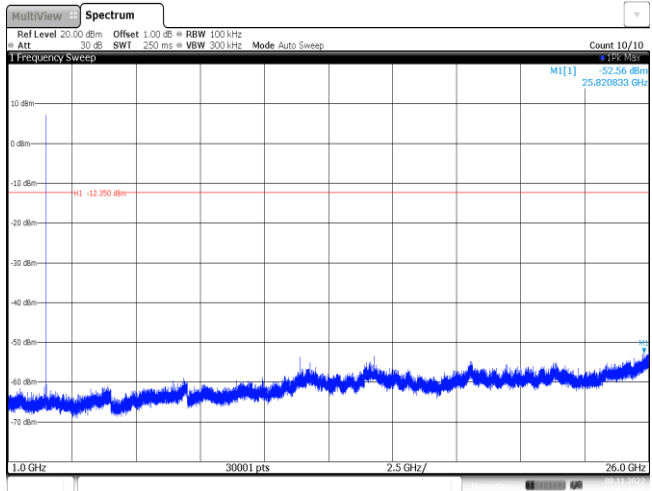
CH39  
1GHz~26GHz

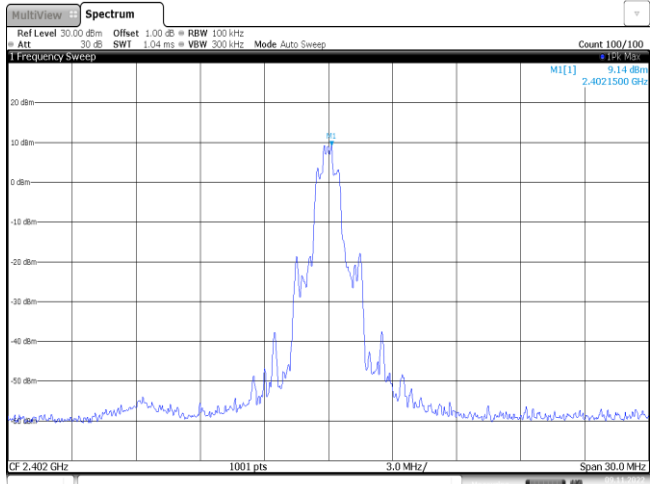
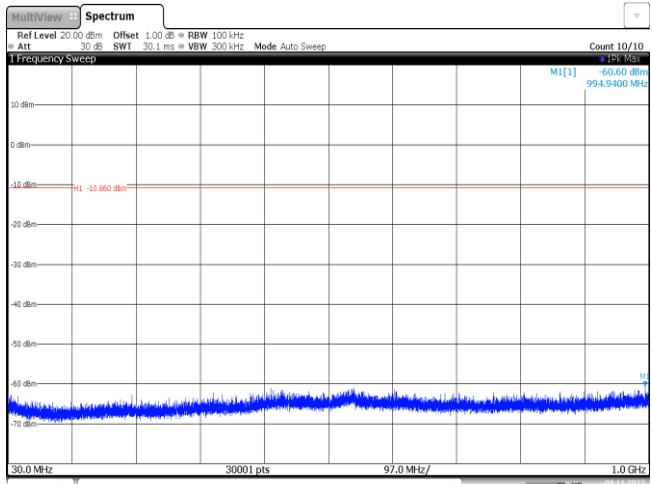
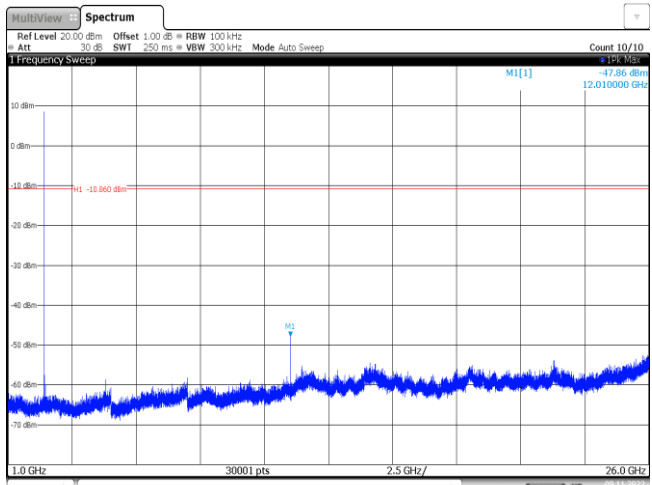


<p>CH78 Reference level</p>	
<p>CH78 30MHz~1000MHz</p>	
<p>CH78 1GHz~26GHz</p>	

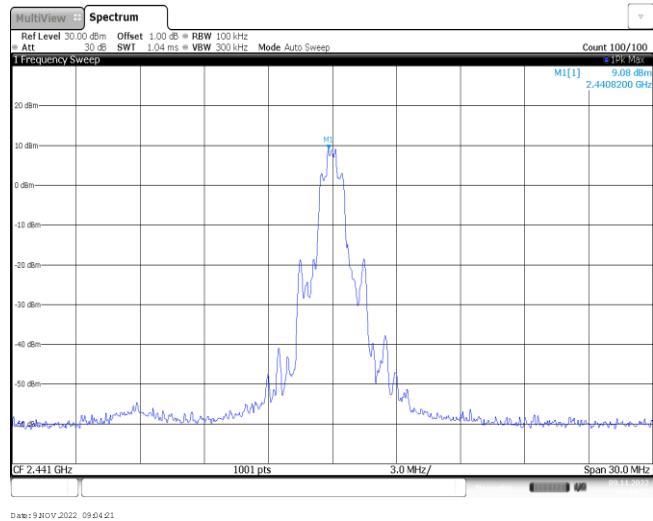
Test Item:	Spurious Emission	Modulation type:	π/4DQPSK
<p>CH00 Reference level</p>	 <p>Ref Level 30.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SW1 1.04 ms VBW 300 kHz Mode Auto Sweep Count 100/100 M1[1] 8.36 dBm 2.4016200 GHz CF 2.402 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 9/30/2022 08:46:58</p>		
<p>CH00 30MHz~1000MHz</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SW1 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 M1[1] -59.97 dBm 547.8820 MHz M1 -11.620 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 9/30/2022 08:47:14</p>		
<p>CH00 1GHz~26GHz</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SW1 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 M1[1] -50.01 dBm 12.010000 GHz M1 -11.620 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 9/30/2022 08:47:20</p>		

<p>CH39 Reference level</p>	<p>Ref Level 30.00 dBm Offset 1.00 dB RBW 100 kHz Att -30 dB SWF 1.04 ms VBW 300 kHz Mode Auto Sweep Count 100/100 MI[1] 9.12 dBm 2.4408200 GHz CF 2.441 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 9 NOV 2022 08:53:44</p>
<p>CH39 30MHz~1000MHz</p>	<p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att -30 dB SWF 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 MI[1] -61.00 dBm 656.1300 MHz 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 9 NOV 2022 08:54:00</p>
<p>CH39 1GHz~26GHz</p>	<p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att -30 dB SWF 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 MI[1] -48.53 dBm 12.205000 GHz 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 9 NOV 2022 08:54:17</p>

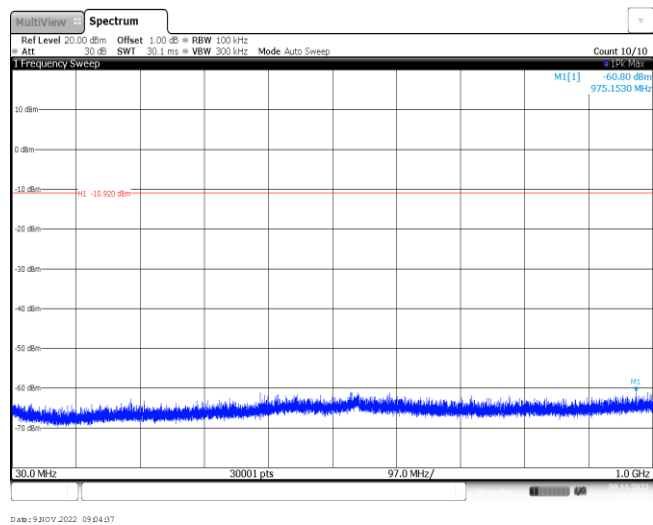
<p>CH78 Reference level</p>	 <p>MultiView Spectrum                  Ref Level 30.00 dBm Offset 1.00 dB RBW 100 kHz                  Att -30 dB SWF 1.04 ms VBW 300 kHz Mode Auto Sweep                  Count 100/100                  1 Frequency Sweep                  MI[1] 7.65 dBm                  2.4801500 GHz                  CF 2.48 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz                  Date: 9 NOV 2022 08:55:07</p>
<p>CH78 30MHz~1000MHz</p>	 <p>MultiView Spectrum                  Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz                  Att -30 dB SWF 30.1 ms VBW 300 kHz Mode Auto Sweep                  Count 10/10                  1 Frequency Sweep                  MI[1] -60.84 dBm                  551.5680 MHz                  H1 -12.90 dBm                  30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz                  Date: 9 NOV 2022 08:55:53</p>
<p>CH78 1GHz~26GHz</p>	 <p>MultiView Spectrum                  Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz                  Att -30 dB SWF 250 ms VBW 300 kHz Mode Auto Sweep                  Count 10/10                  1 Frequency Sweep                  MI[1] -52.56 dBm                  25.820833 GHz                  H1 -12.90 dBm                  1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz                  Date: 9 NOV 2022 08:56:09</p>

Test Item:	Spurious Emission	Modulation type:	8DPSK
<p>CH00 Reference level</p>	 <p>Ref Level 30.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SW1 1.04 ms VBW 300 kHz Mode Auto Sweep Count 100/100 MI[1] 9.14 dBm 2.4021500 GHz CF 2.402 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 9 NOV 2022 08:58:04</p>		
<p>CH00 30MHz~1000MHz</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SW1 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 MI[1] -60.60 dBm 994.9400 MHz MI -10.800 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 9 NOV 2022 08:58:20</p>		
<p>CH00 1GHz~26GHz</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SW1 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 MI[1] -47.86 dBm 12.010000 GHz MI -10.800 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 9 NOV 2022 08:58:27</p>		

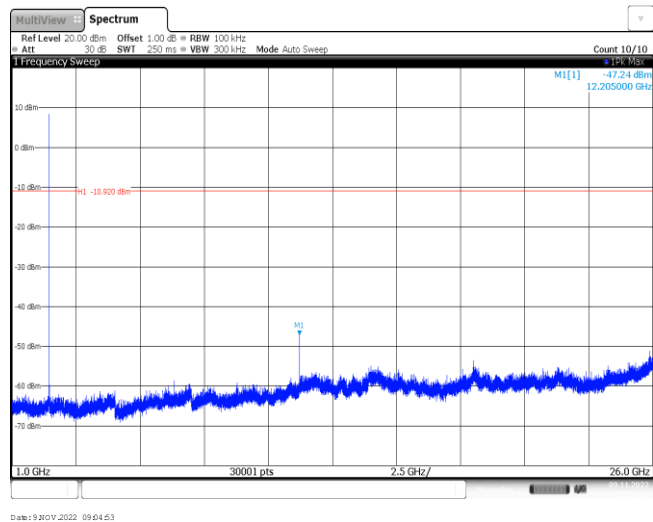
CH39  
Reference level



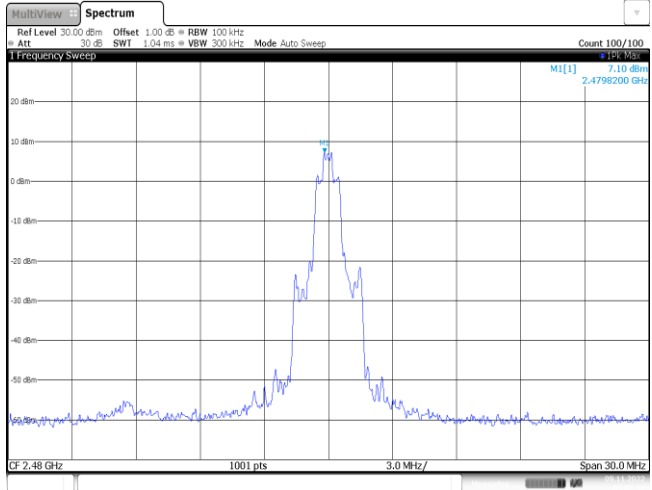
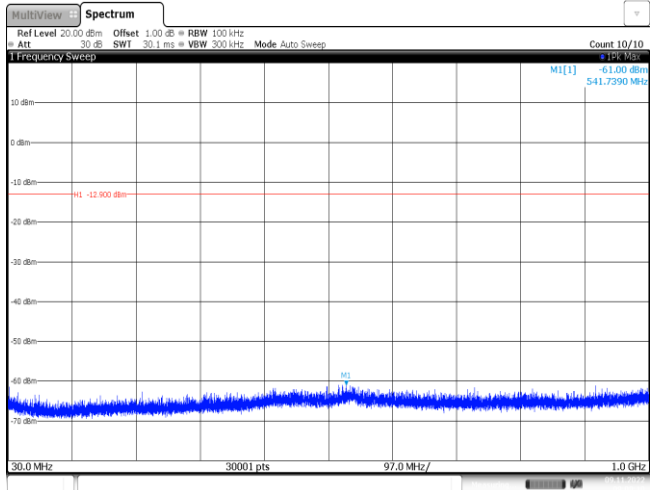
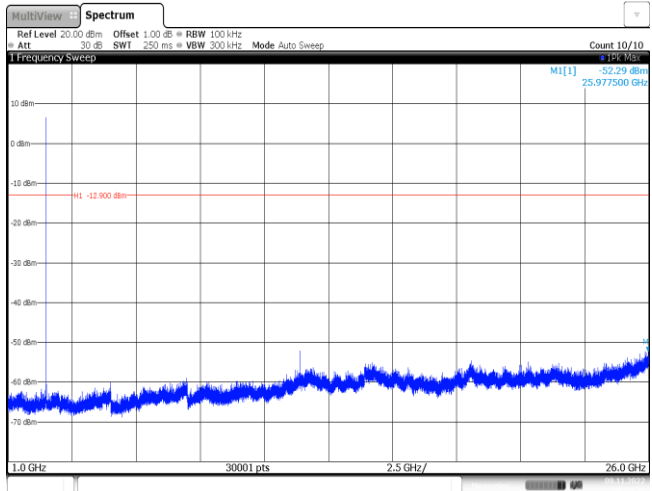
CH39  
30MHz~1000MHz



CH39  
1GHz~26GHz





<p>CH78 Reference level</p>	 <p>MultiView Spectrum Ref Level 30.00 dBm Offset 1.00 dB RBW 100 kHz Att -30 dB SWI 1.04 ms VBW 300 kHz Mode Auto Sweep Count 100/100 1 Frequency Sweep MI[1] 7.10 dBm 2.4796200 GHz CF 2.48 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 9 NOV 2022 09:07:54</p>
<p>CH78 30MHz~1000MHz</p>	 <p>MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att -30 dB SWI 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 1 Frequency Sweep MI[1] -61.00 dBm 541.7390 MHz MI -12.900 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 9 NOV 2022 09:08:10</p>
<p>CH78 1GHz~26GHz</p>	 <p>MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att -30 dB SWI 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 1 Frequency Sweep MI[1] -52.29 dBm 25.977500 GHz MI -12.900 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 9 NOV 2022 09:08:26</p>

-----End of Report-----