

APPENDIX REPORT

Project No.	SHT2208229901EW	Radio Specification	Bluetooth EDR
Test sample No.	YPHT22082299007	Model No.	L1
Start test date	2022-09-02	Finish date	2022-09-02
Temperature	25.1℃	Humidity	39%
Test Engineer	Xiaoxiao Xi	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(ducted)	PASS

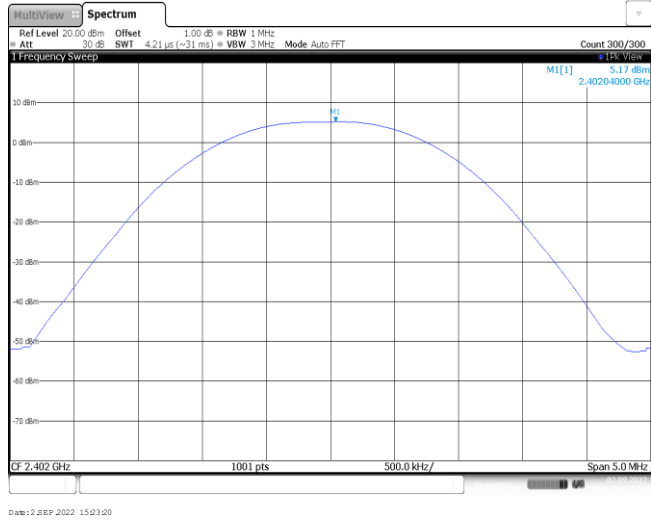
Appendix A: Peak Output Power

Modulation type	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	00	5.17	5.16	≤ 30.00	Pass
	39	4.58	4.55		
	78	3.67	3.58		
π/4DQPSK	00	6.04	5.39	≤ 21.00	Pass
	39	5.24	4.59		
	78	4.38	3.80		
8DPSK	00	6.74	5.84	≤ 21.00	Pass
	39	5.93	5.05		
	78	5.11	4.22		

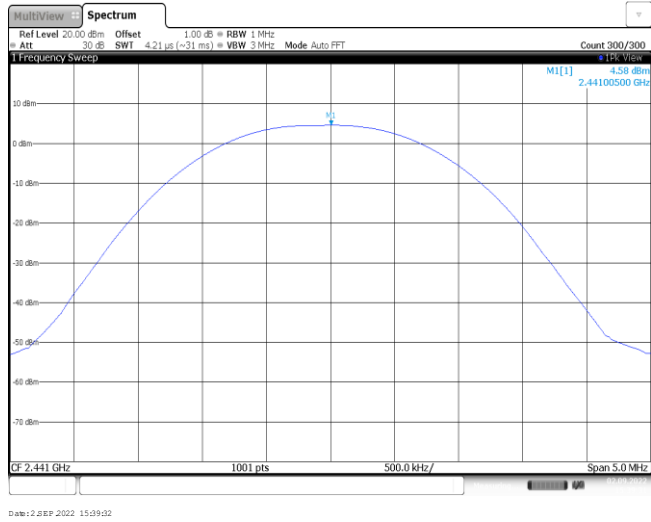
Modulation Type:

GFSK

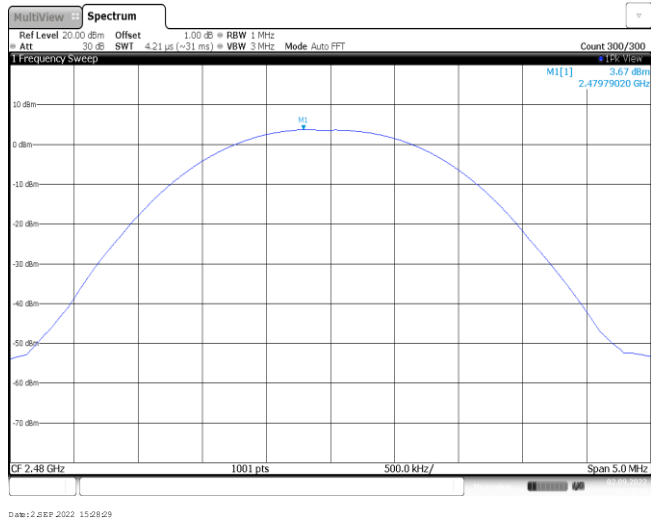
CH00



CH39

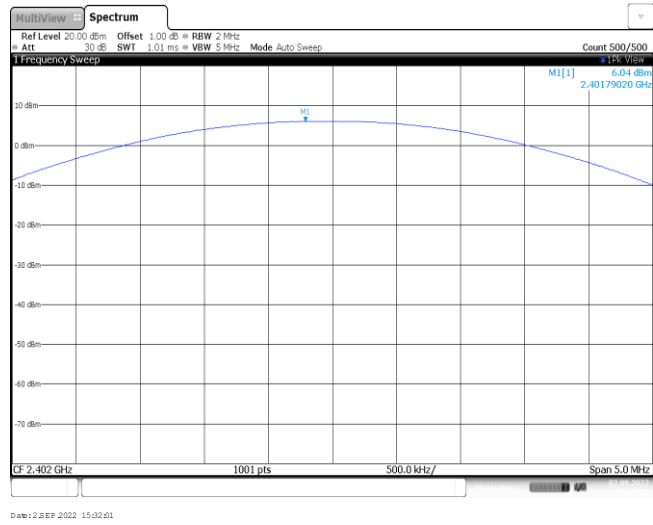


CH78

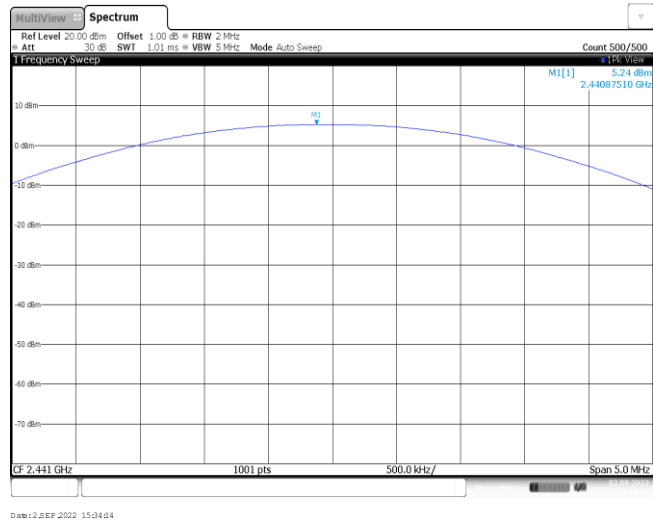


Modulation Type: $\pi/4$ DQPSK

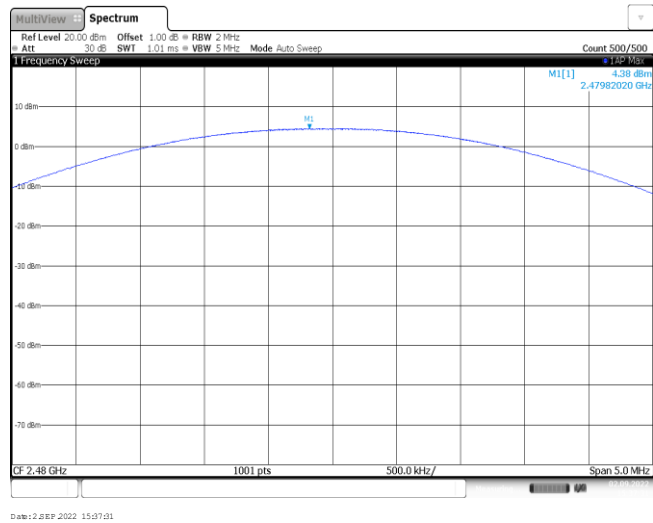
CH00



CH39

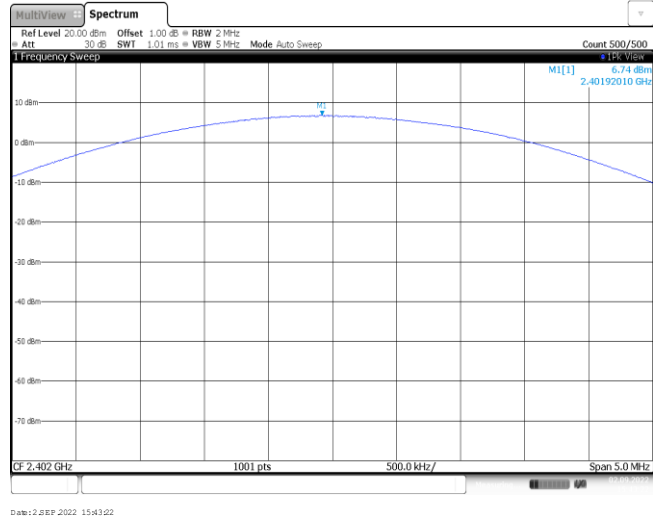


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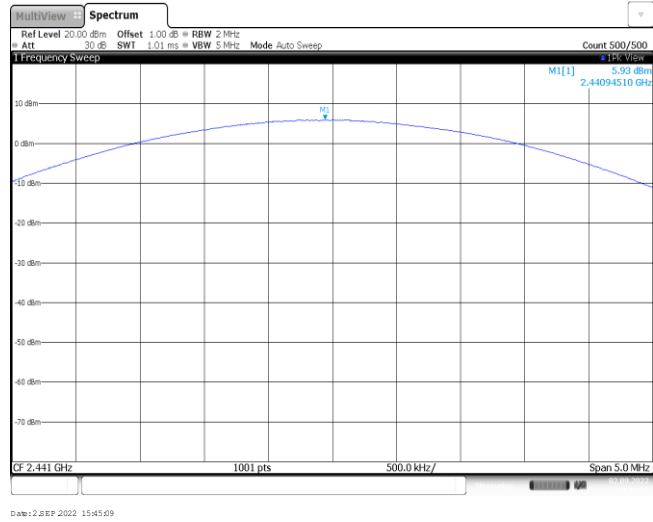
Modulation Type: 8DPSK

CH00



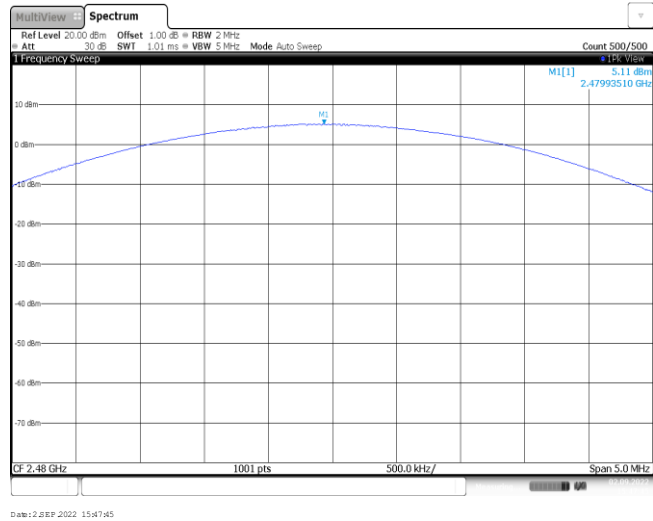
Date: 2 SEP 2022 15:43:22

CH39



Date: 2 SEP 2022 15:45:09

CH78



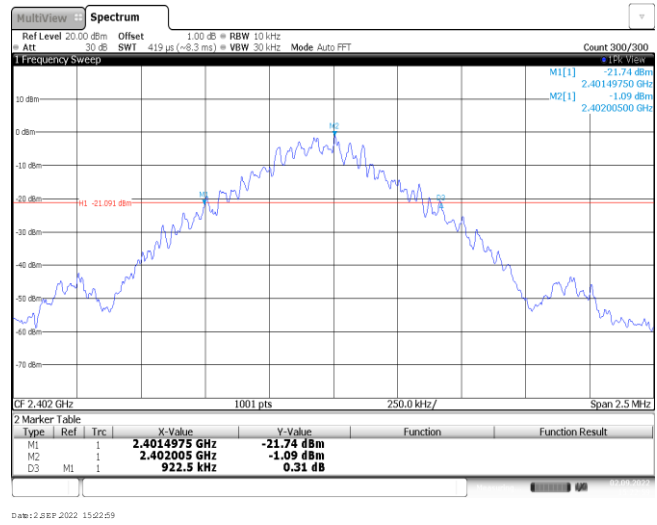
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Appendix B : 20 dB Bandwidth

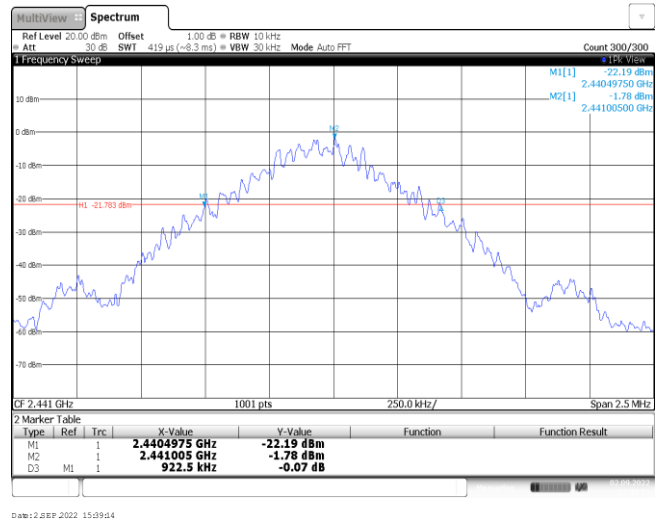
Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	922.50	-	Pass
	39	922.50		
	78	922.50		
$\pi/4$ DQPSK	00	1295.00	-	Pass
	39	1292.50		
	78	1317.50		
8DPSK	00	1297.50	-	Pass
	39	1307.50		
	78	1310.00		

Modulation Type: GFSK

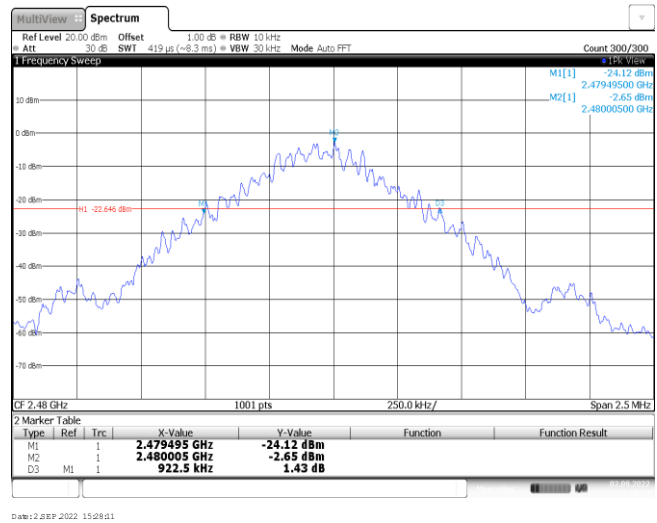
CH00



CH39

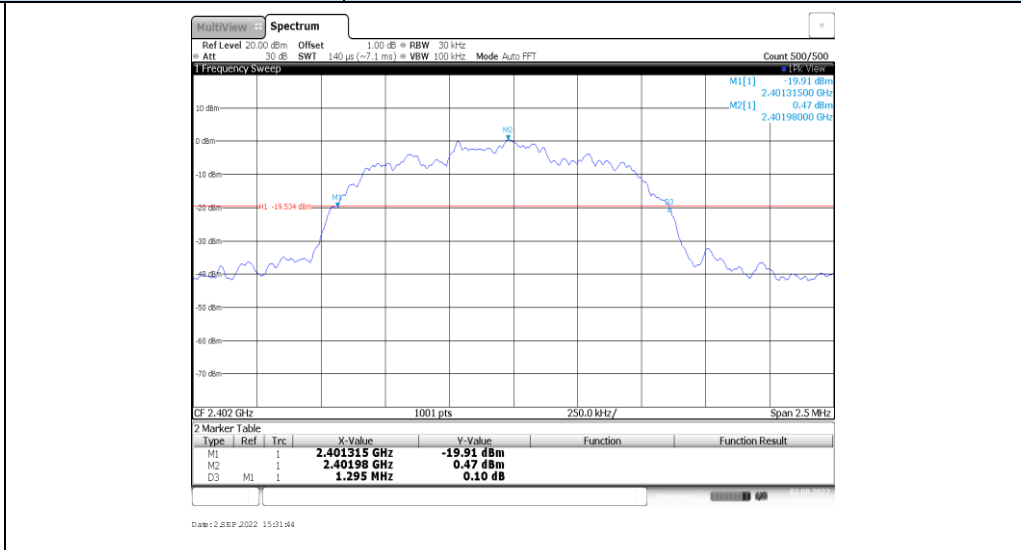


CH78

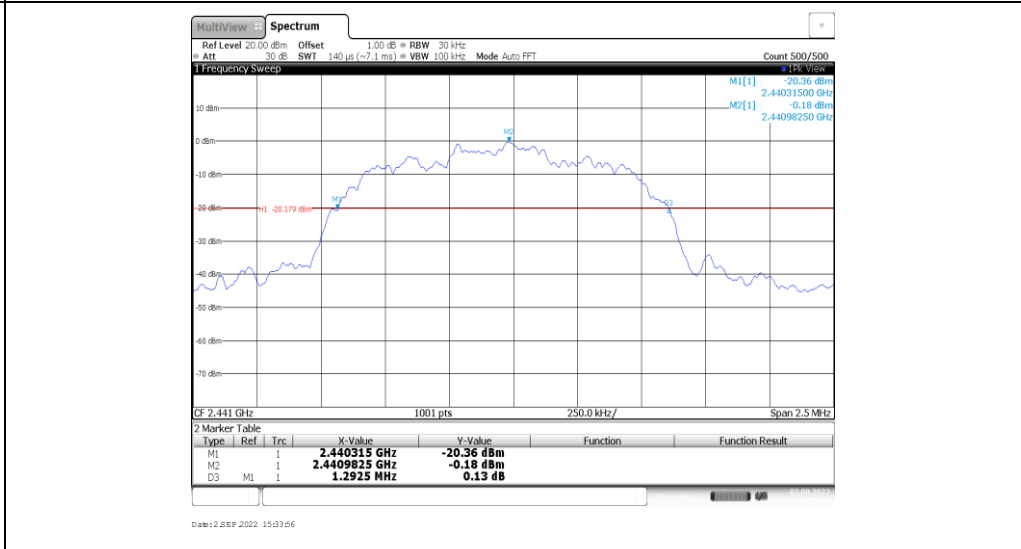


Modulation Type: **$\pi/4$ DQPSK**

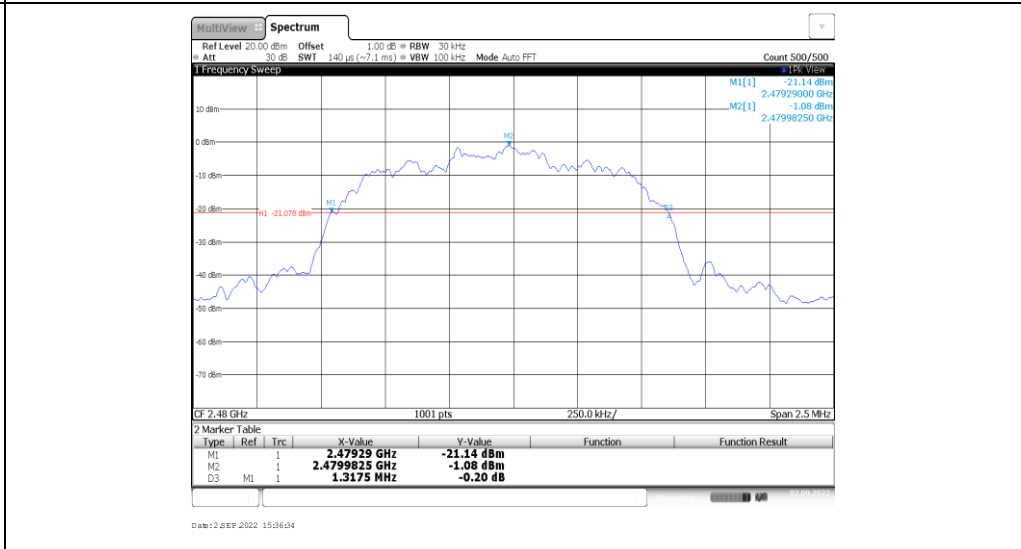
CH00



CH39

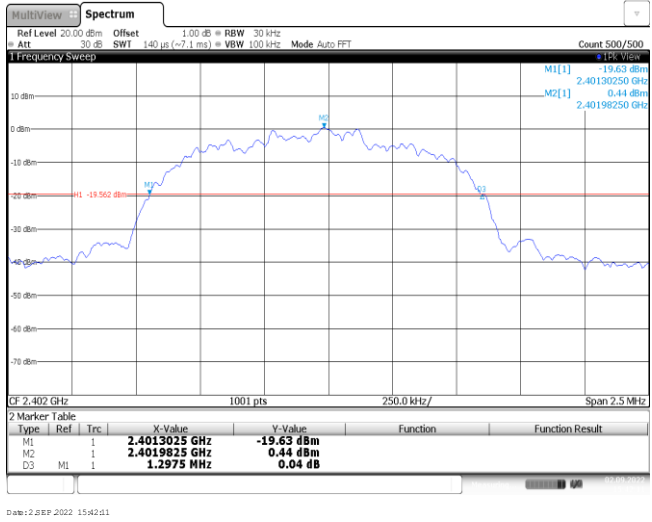


CH78

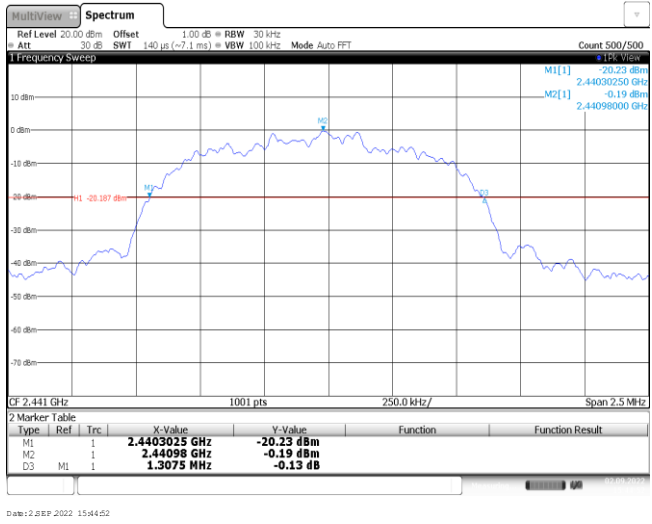


Modulation Type: 8DPSK

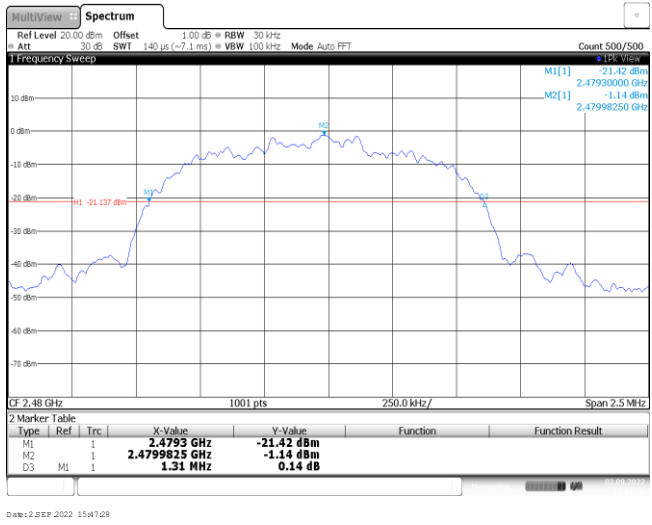
CH00



CH39



CH78

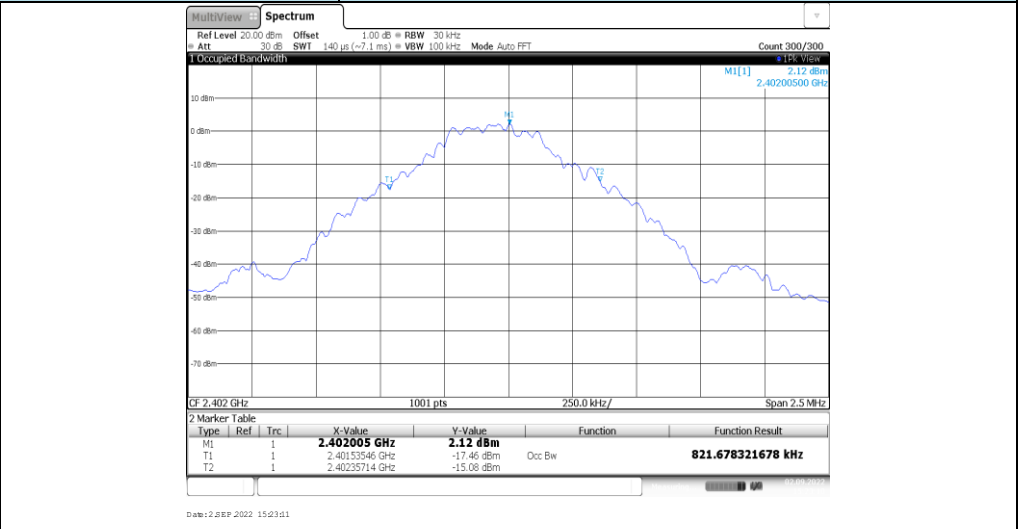


Appendix C: 99% Occupied Bandwidth

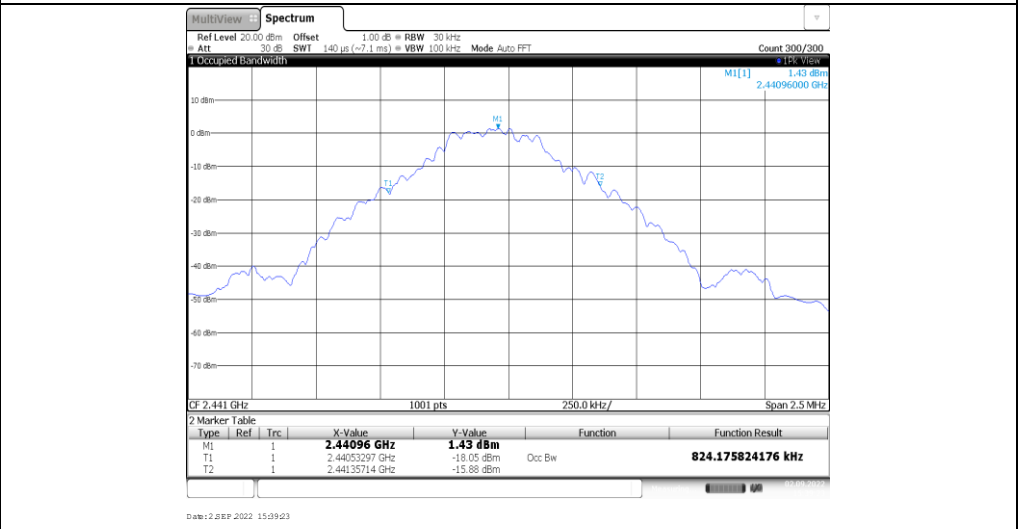
Modulation type	Channel	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.82	-	Pass
	39	0.82		
	78	0.82		
$\pi/4$ DQPSK	00	1.15	-	Pass
	39	1.15		
	78	1.15		
8DPSK	00	1.16	-	Pass
	39	1.16		
	78	1.16		

Modulation Type: GFSK

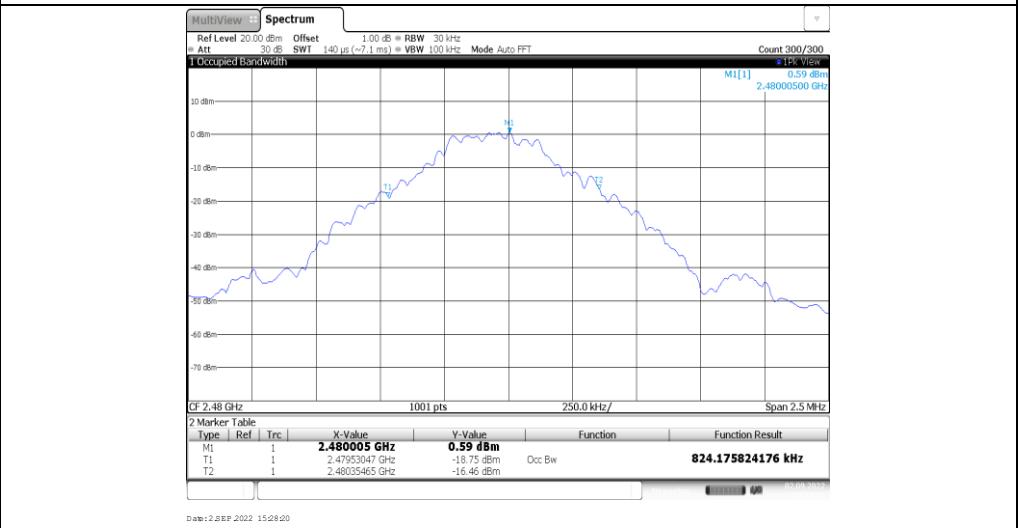
CH00



CH39



CH78



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

CH00



Date: 2 SEP 2022 15:01:52

CH39



Date: 2 SEP 2022 15:04:05

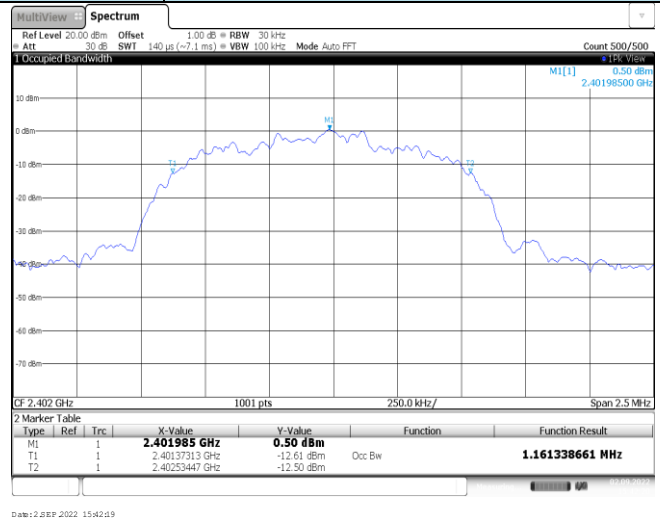
CH78



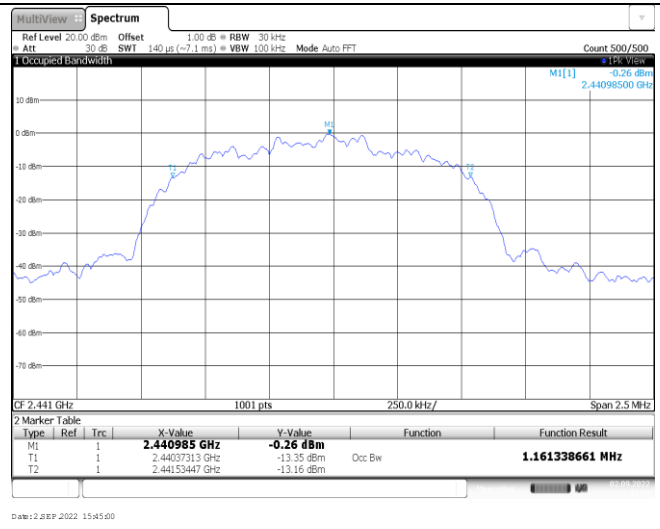
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Modulation Type: 8DPSK

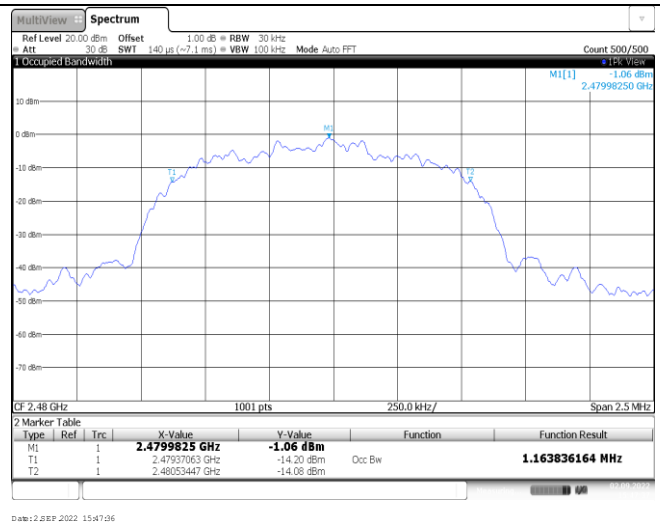
CH00



CH39



CH78



Appendix D: Carrier Frequencies Separation

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (kHz) *	Result
GFSK	39	1.00	≥922.50	Pass
$\pi/4$ DQPSK	39	1.00	≥878.33	Pass
8DPSK	39	1.00	≥873.33	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.

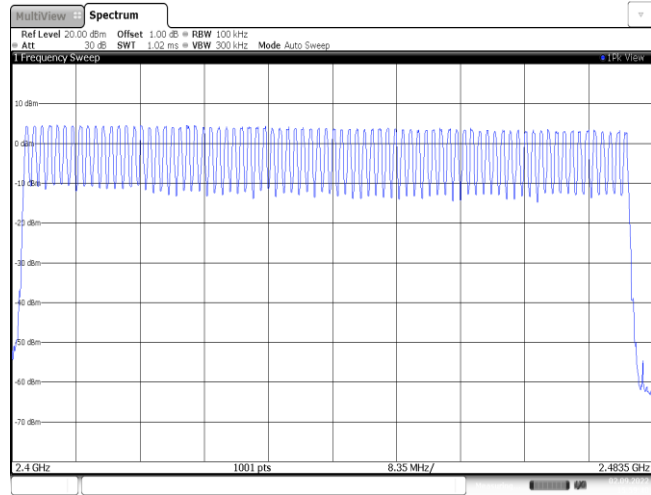
8DPSK limit = $2/3$ * The maximum 20 dB Bandwidth for 8DPSK modulation on the appendix B

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

Appendix E: Hopping Channel Number

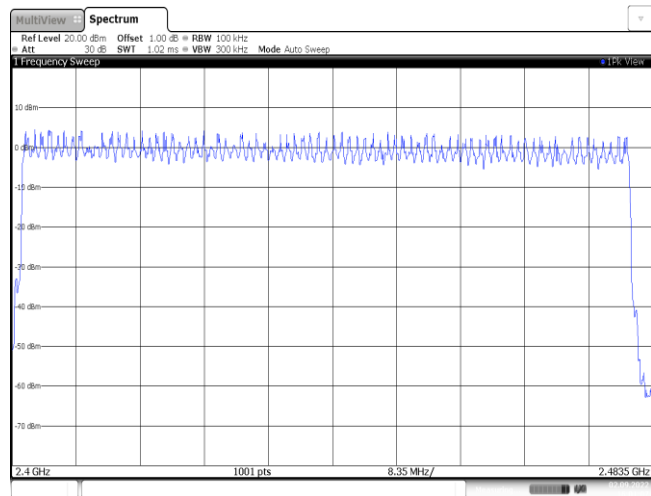
Modulation type	Channel number	Limit	Result
GFSK	79	≥15.00	Pass
π/4DQPSK	79		
8DPSK	79		

GFSK



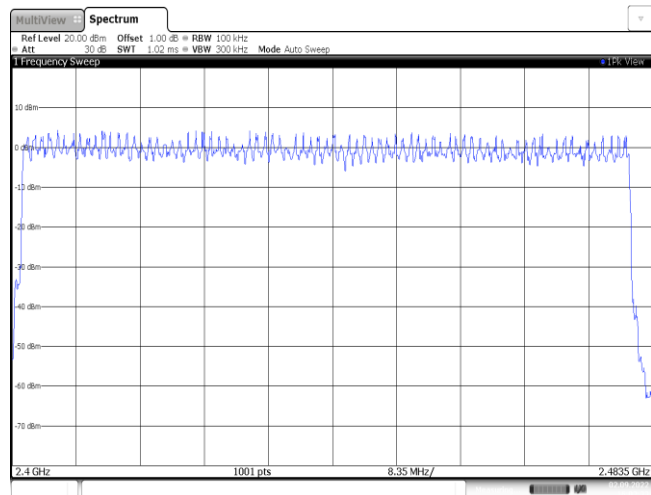
Date: 2022-09-02 15:59:40

$\pi/4$ DQPSK



Date: 2022-09-02 16:01:07

8DPSK



Date: 2022-09-02 16:02:02

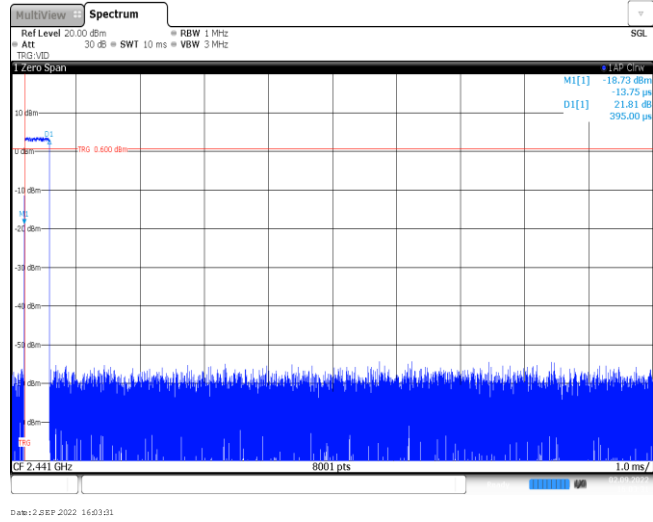
Appendix F: Dwell Time

Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.40	318	0.13	≤ 0.40	Pass
	DH3	1.65	147	0.24		
	DH5	2.90	114	0.33		
π/4DQPSK	2DH1	0.41	319	0.13	≤ 0.40	Pass
	2DH3	1.66	149	0.25		
	2DH5	2.91	113	0.33		
8DPSK	3DH1	0.41	319	0.13	≤ 0.40	Pass
	3DH3	1.66	147	0.24		
	3DH5	2.91	113	0.33		

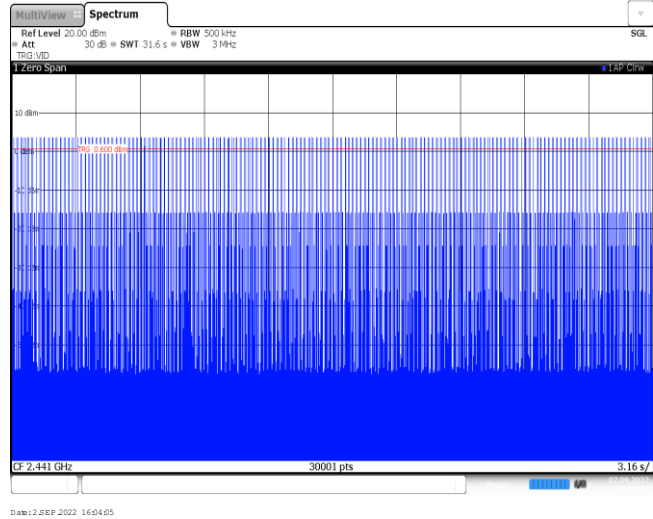
Modulation Type:

GFSK

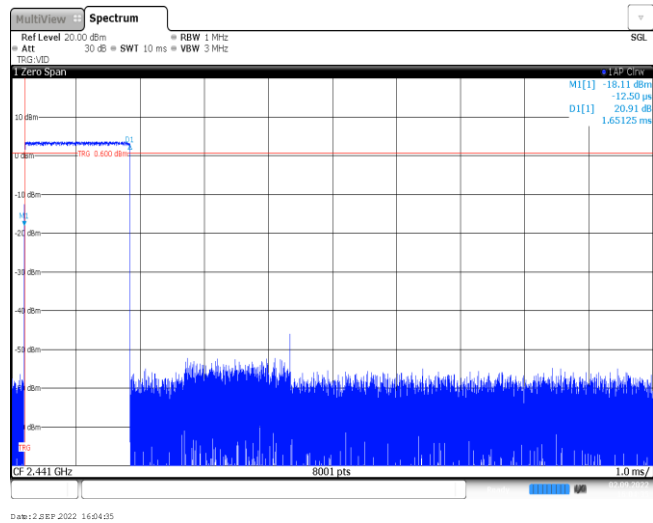
DH1
Burst width



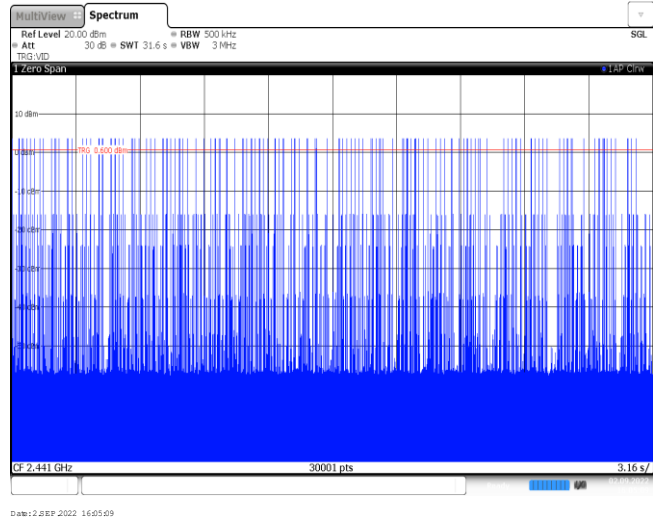
DH1
Burst number



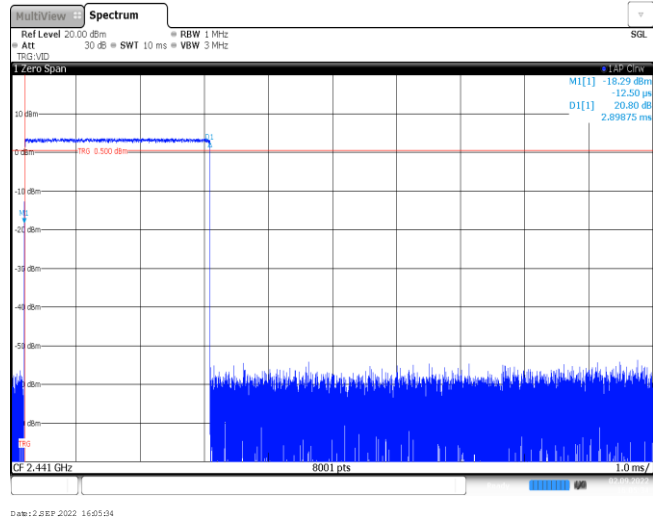
DH3
Burst width



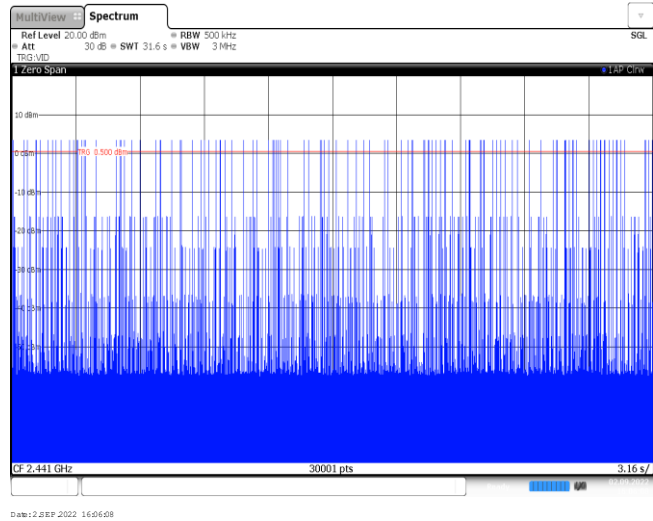
DH3
Burst number



DH5
Burst width

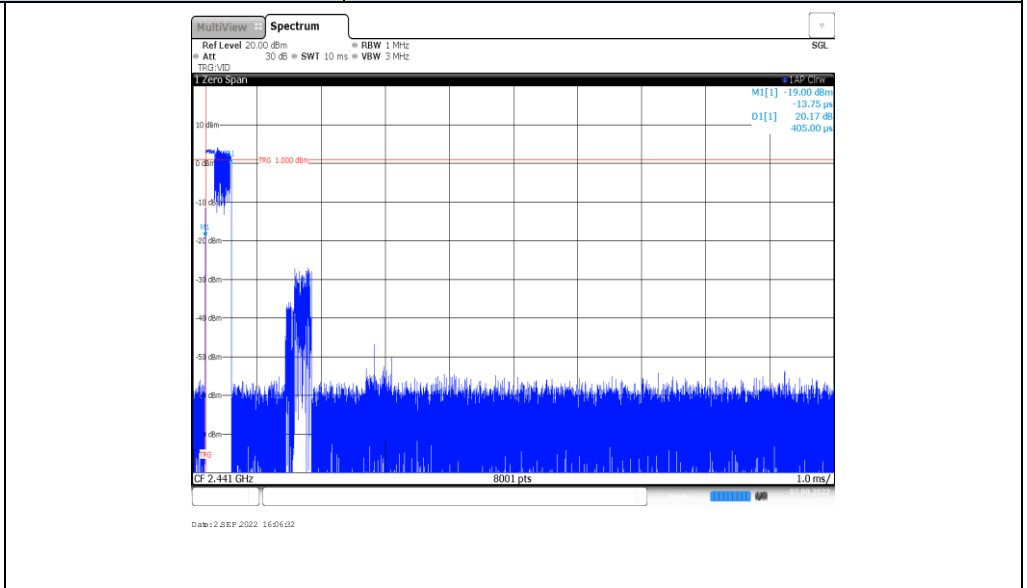


DH5
Burst number

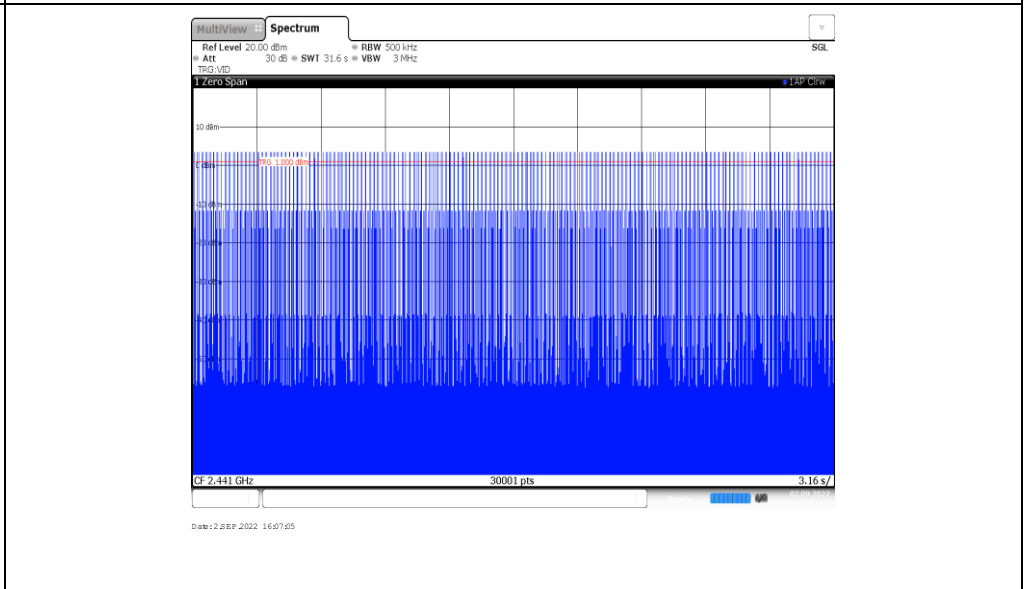


Modulation Type: $\pi/4$ DQPSK

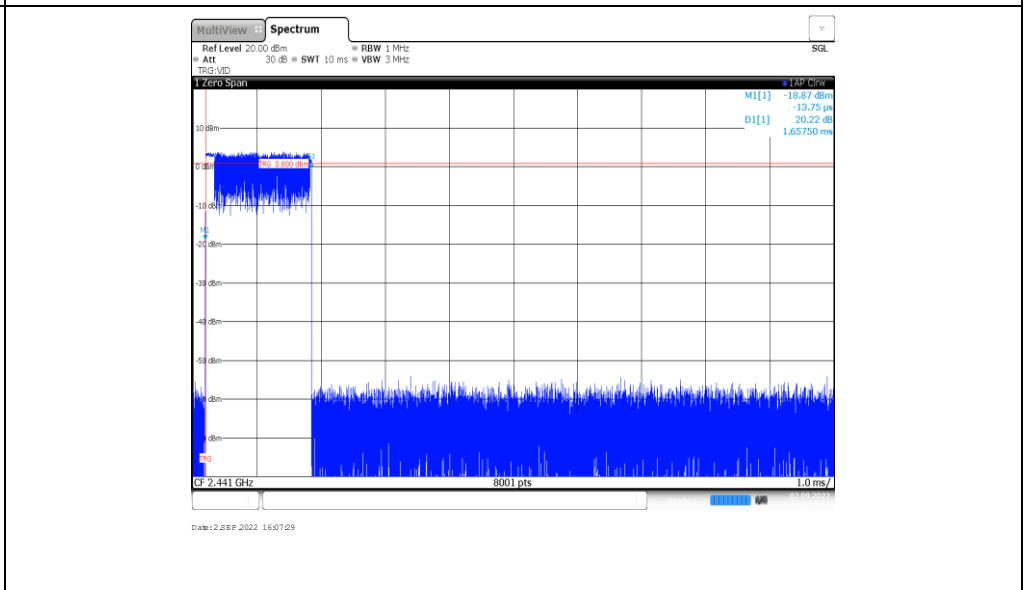
2DH1
Burst width



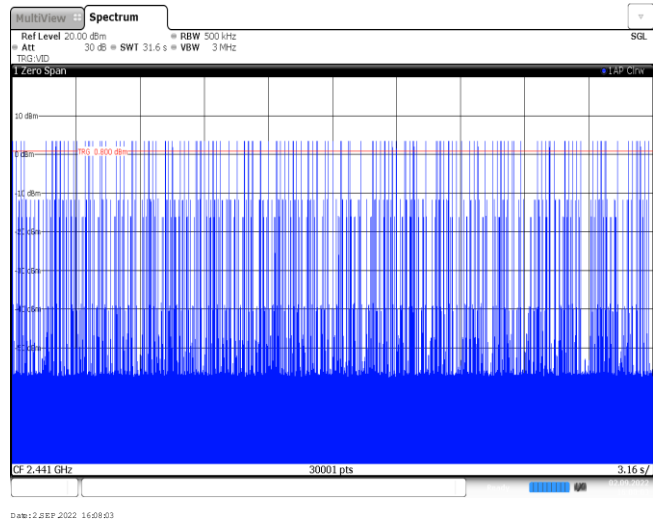
2DH1
Burst number



2DH3
Burst width

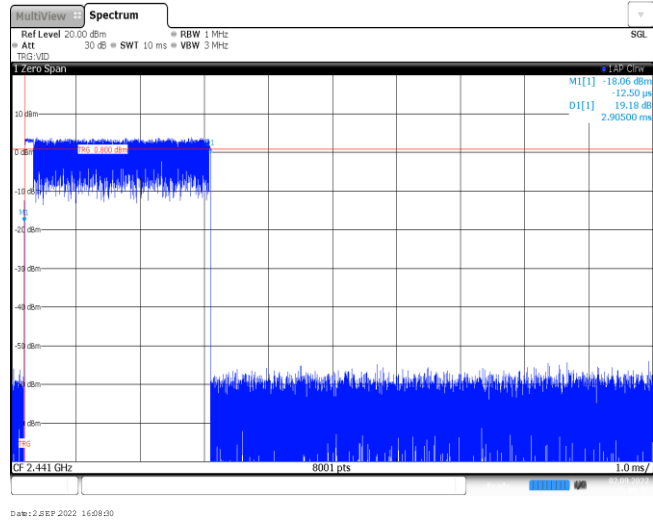


2DH3
Burst number



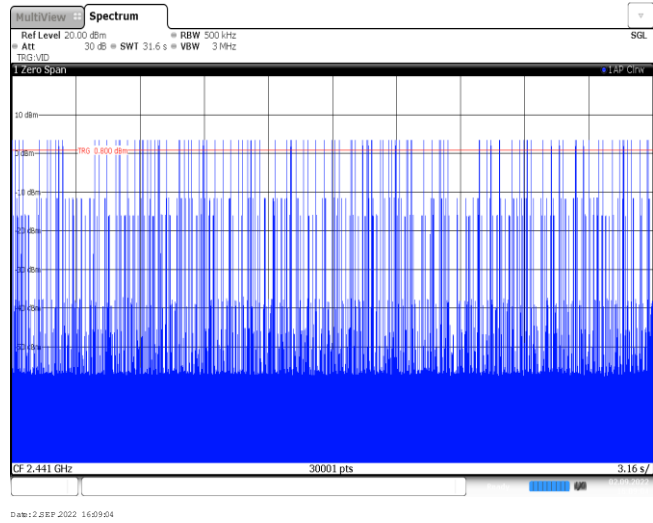
Date: 2 SEP 2022 16:08:03

2DH5
Burst width



Date: 2 SEP 2022 16:08:00

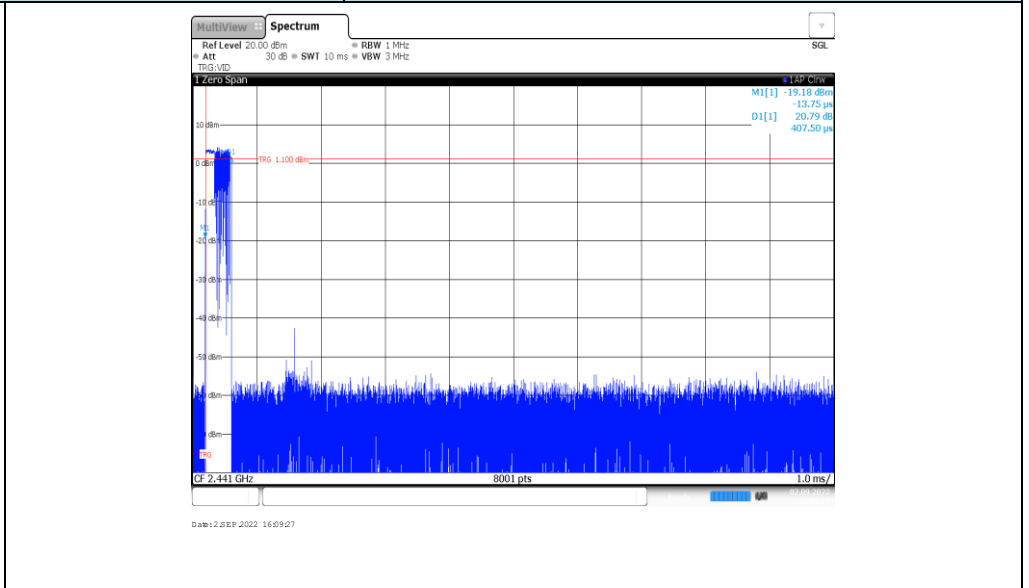
2DH5
Burst number



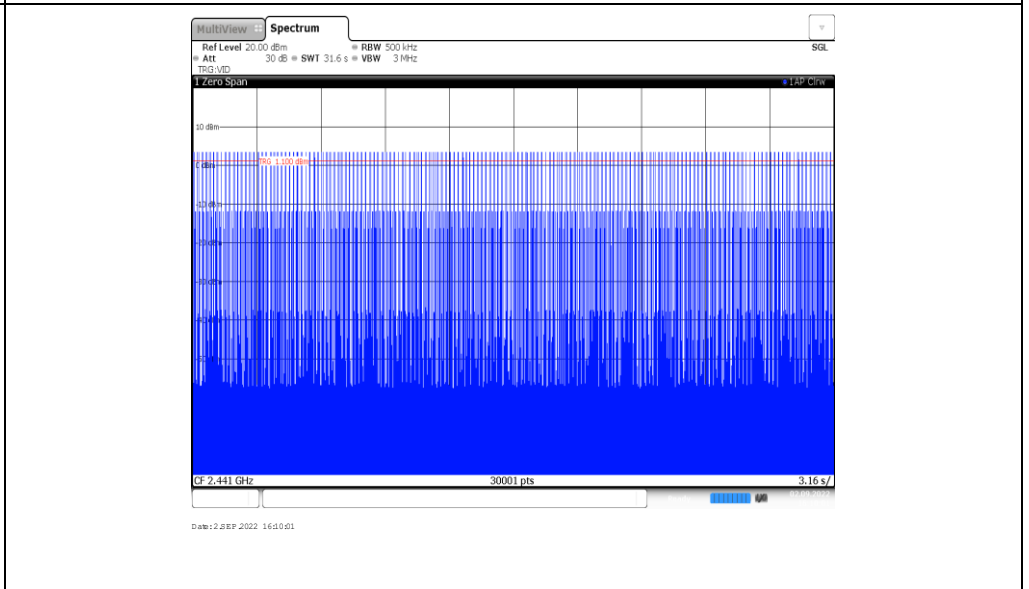
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Modulation Type: 8DPSK

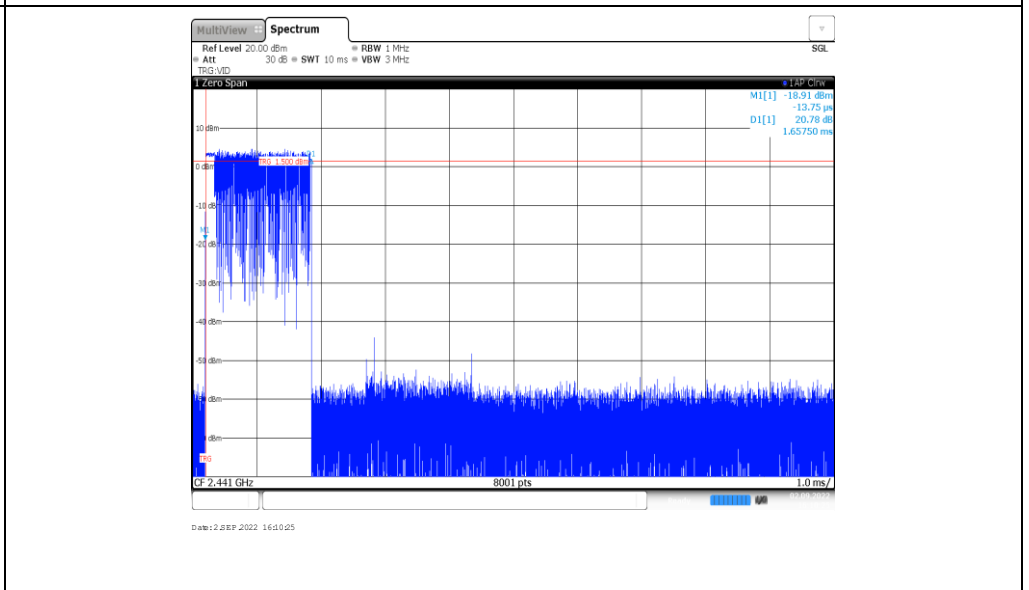
3DH1
Burst width



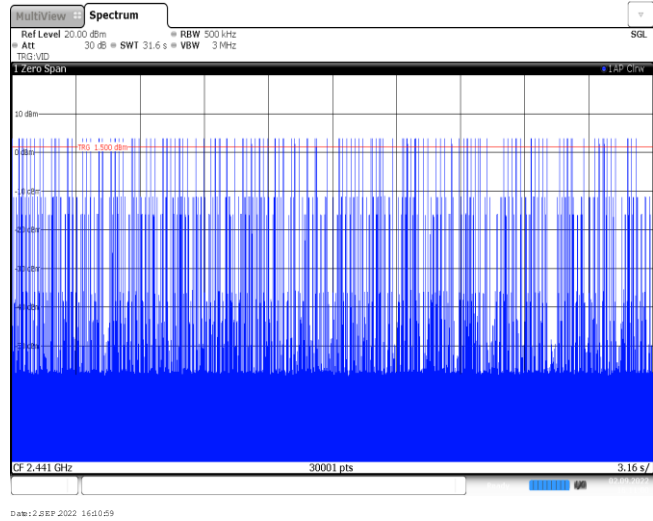
3DH1
Burst number



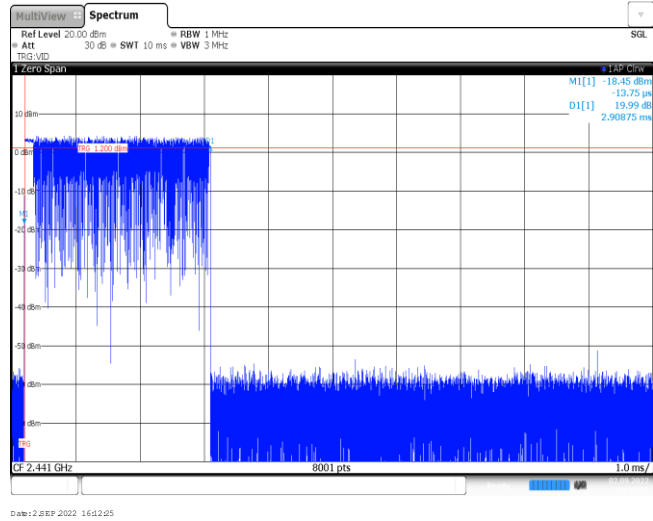
3DH3
Burst width



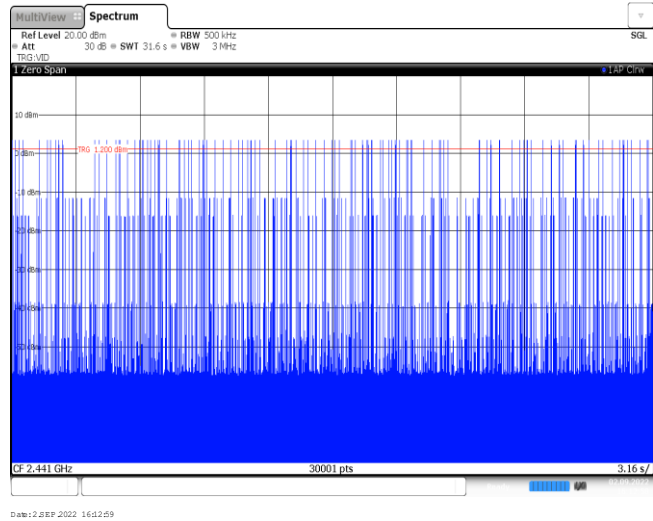
3DH3
Burst number



3DH5
Burst width



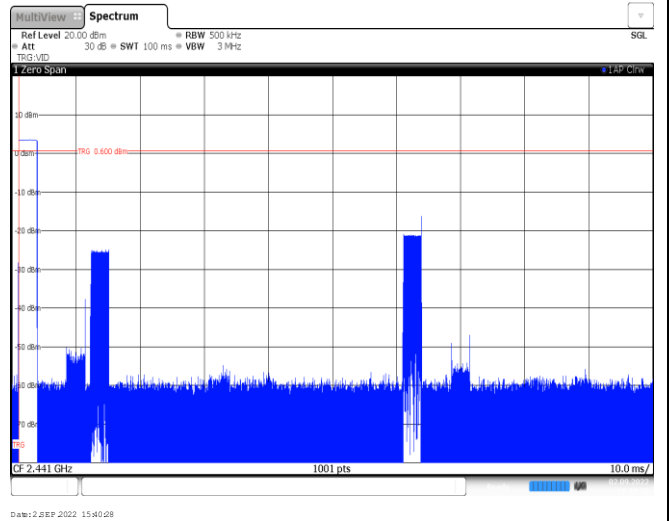
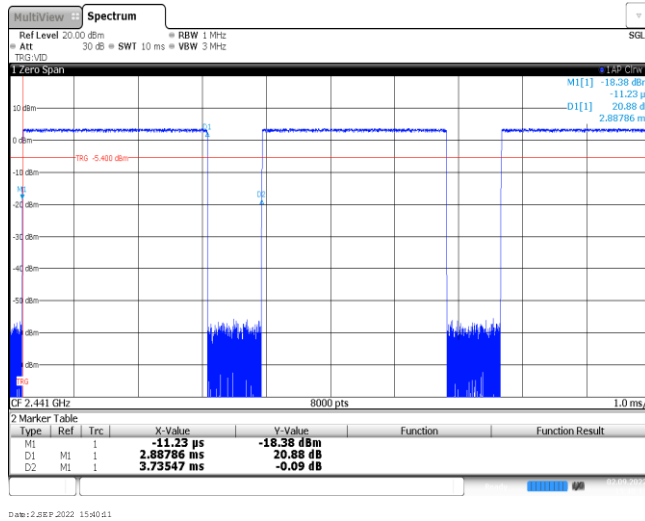
3DH5
Burst number



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	2.89	100	2	-24.76
$\pi/4$ DQPSK	2441	2.89	100	1	-30.78
8DPSK	2441	2.90	100	1	-30.75

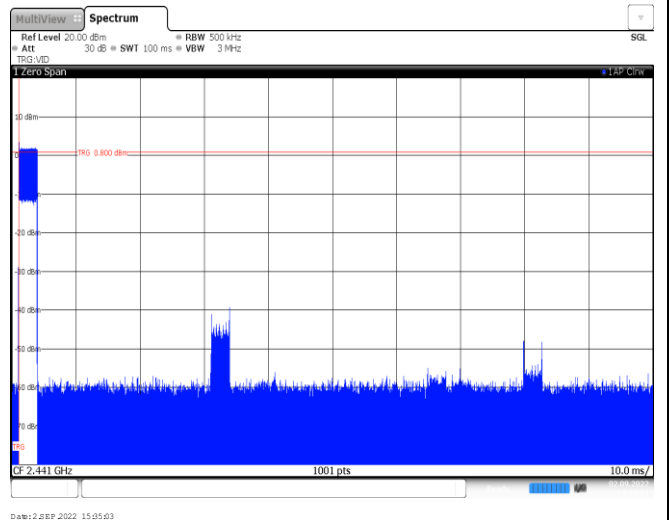
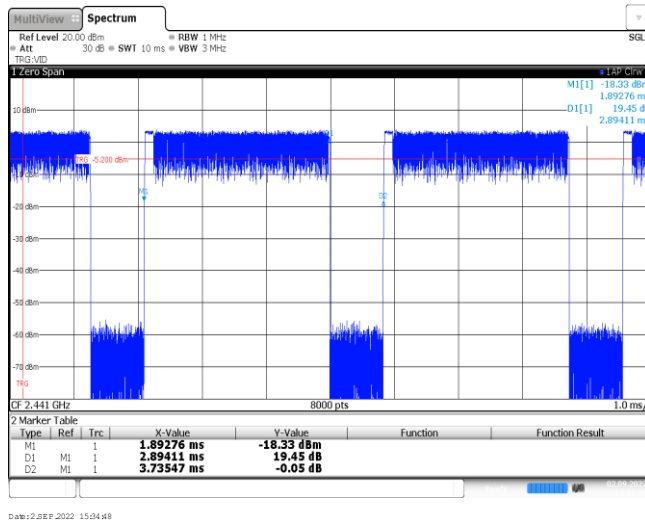
GFSK



Ton time for single burst

Burst Quantity

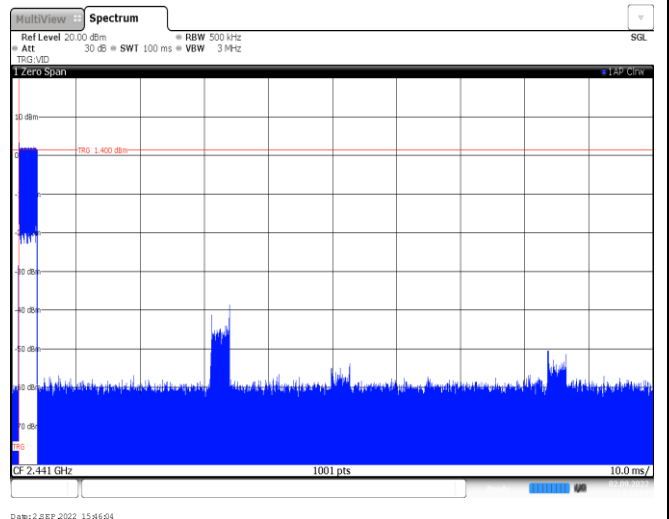
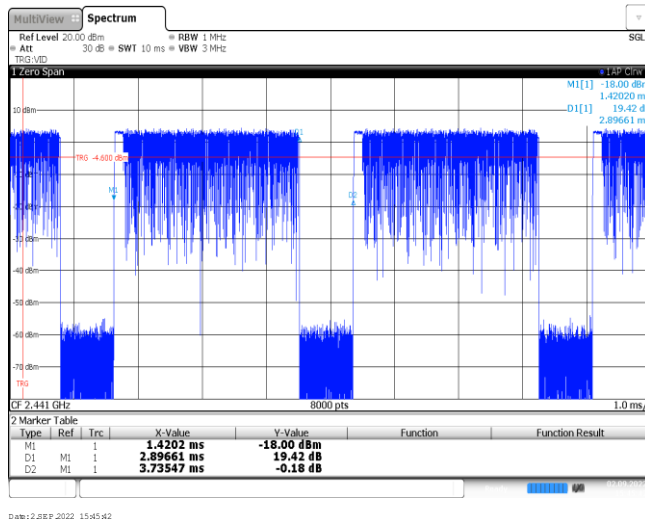
$\pi/4$ DQPSK



Ton time for single burst

Burst Quantity

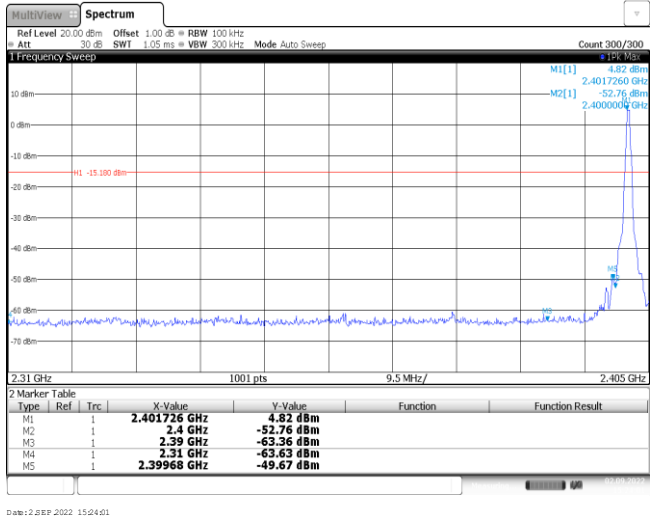
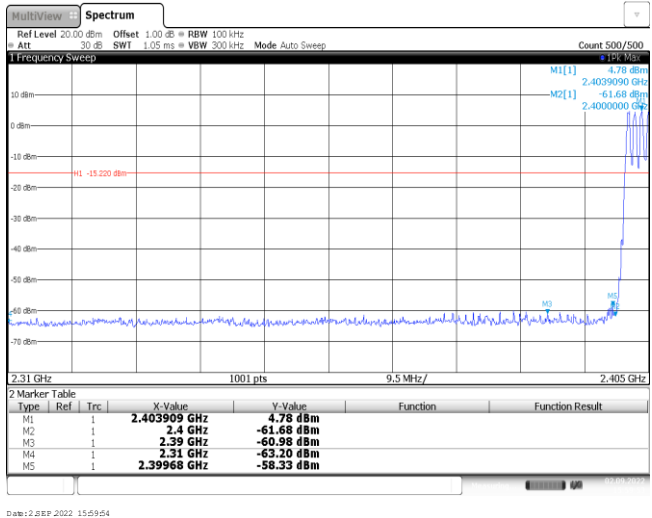
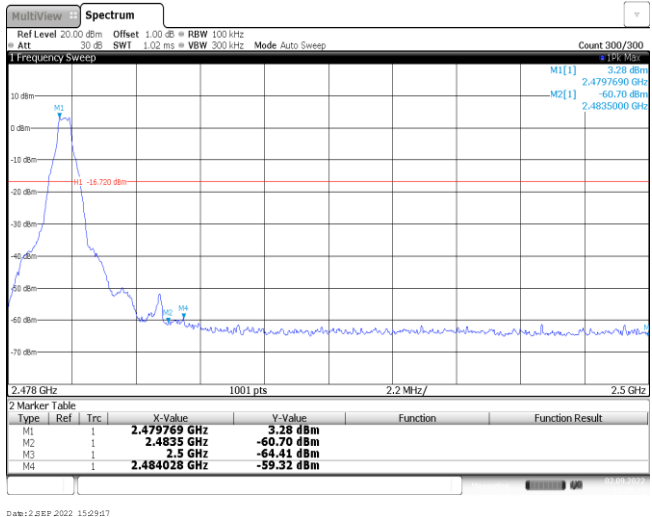
8DPSK



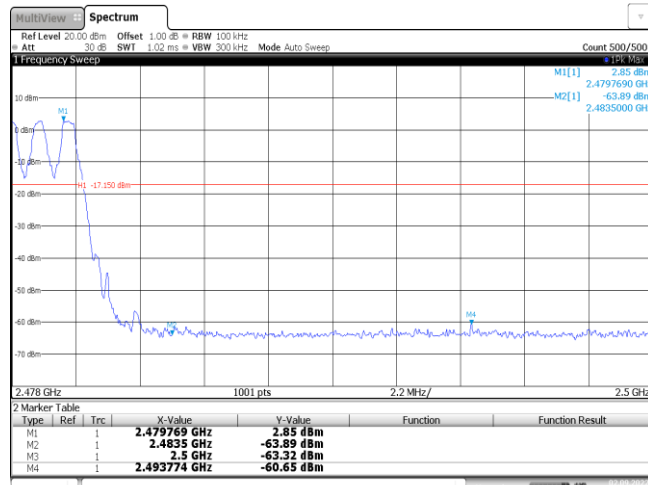
Ton time for single burst

Burst Quantity

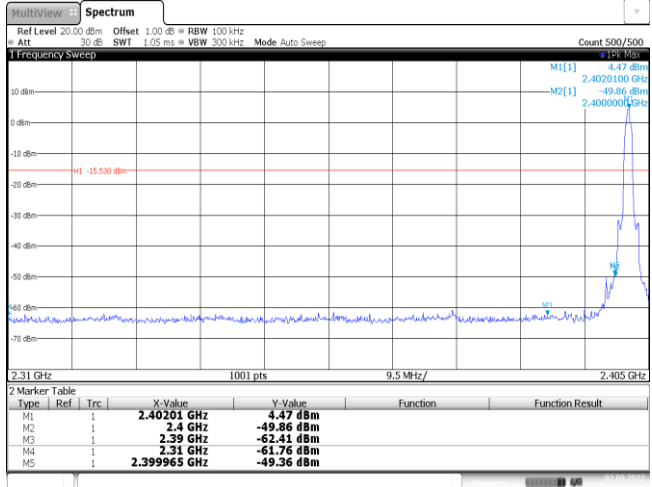
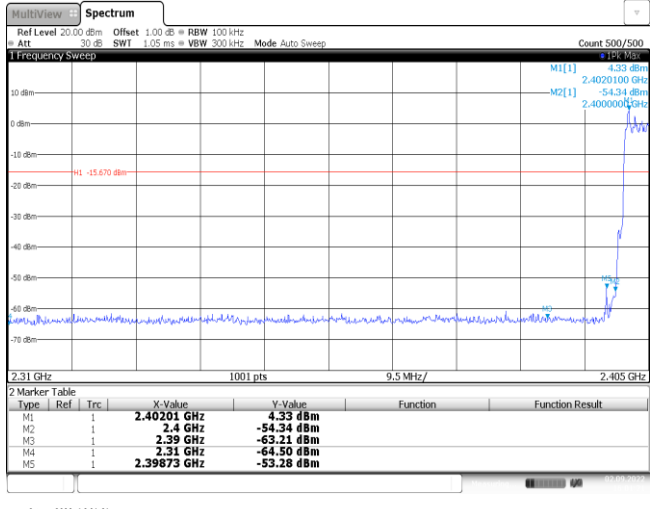
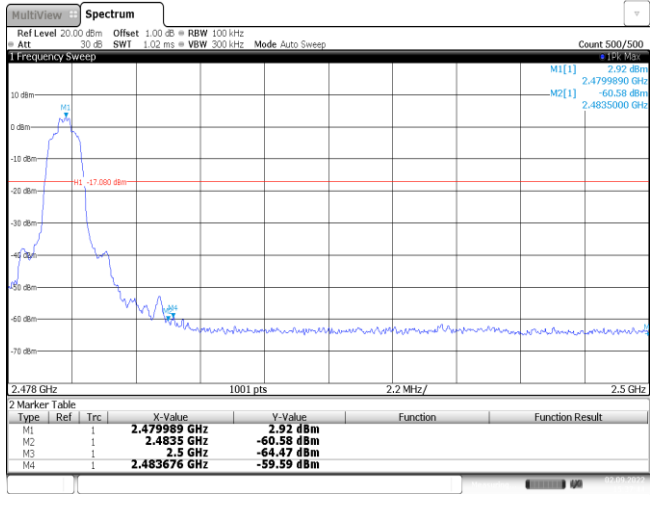
Appendix H: Band edge and Spurious Emissions (conducted)

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

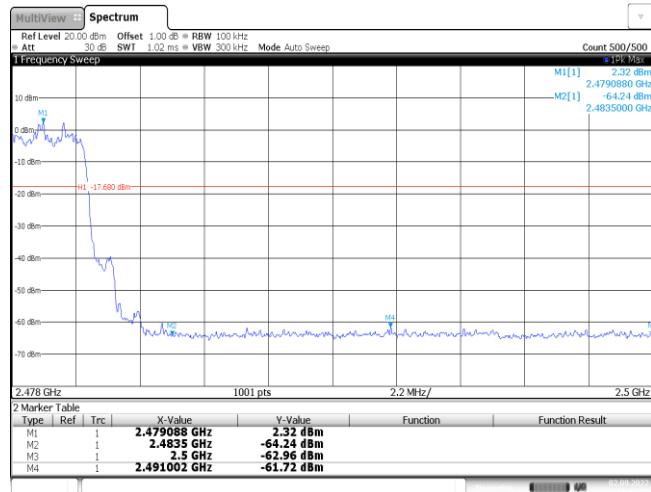
CH78
Hopping mode



Date: 2 SEP 2022 16:00:08

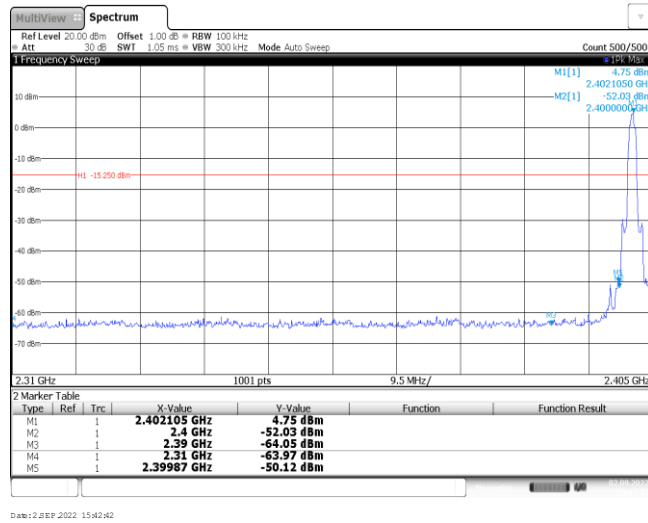
Test Item:	Band edge	Modulation type:	π/4DQPSK																																										
<p>CH00 No hopping mode</p>	 <table border="1" data-bbox="683 638 1337 734"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.40201 GHz</td> <td>4.47 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4 GHz</td> <td>-49.86 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.39 GHz</td> <td>-62.41 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.31 GHz</td> <td>-61.76 dBm</td> <td></td> <td></td> </tr> <tr> <td>M5</td> <td>1</td> <td></td> <td>2.399965 GHz</td> <td>-49.36 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 2 SEP 2022 15:02:34</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.40201 GHz	4.47 dBm			M2	1		2.4 GHz	-49.86 dBm			M3	1		2.39 GHz	-62.41 dBm			M4	1		2.31 GHz	-61.76 dBm			M5	1		2.399965 GHz	-49.36 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.40201 GHz	4.47 dBm																																									
M2	1		2.4 GHz	-49.86 dBm																																									
M3	1		2.39 GHz	-62.41 dBm																																									
M4	1		2.31 GHz	-61.76 dBm																																									
M5	1		2.399965 GHz	-49.36 dBm																																									
<p>CH00 Hopping mode</p>	 <table border="1" data-bbox="683 1193 1337 1290"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.40201 GHz</td> <td>4.33 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4 GHz</td> <td>-54.34 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.39 GHz</td> <td>-63.21 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.31 GHz</td> <td>-64.50 dBm</td> <td></td> <td></td> </tr> <tr> <td>M5</td> <td>1</td> <td></td> <td>2.39873 GHz</td> <td>-53.28 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 2 SEP 2022 16:01:21</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.40201 GHz	4.33 dBm			M2	1		2.4 GHz	-54.34 dBm			M3	1		2.39 GHz	-63.21 dBm			M4	1		2.31 GHz	-64.50 dBm			M5	1		2.39873 GHz	-53.28 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
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<p>CH78 No hopping mode</p>	 <table border="1" data-bbox="683 1740 1337 1836"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.479989 GHz</td> <td>2.92 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4835 GHz</td> <td>-60.58 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.5 GHz</td> <td>-64.47 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.483676 GHz</td> <td>-59.59 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 2 SEP 2022 15:07:44</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.479989 GHz	2.92 dBm			M2	1		2.4835 GHz	-60.58 dBm			M3	1		2.5 GHz	-64.47 dBm			M4	1		2.483676 GHz	-59.59 dBm									
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M4	1		2.483676 GHz	-59.59 dBm																																									

CH78
Hopping mode

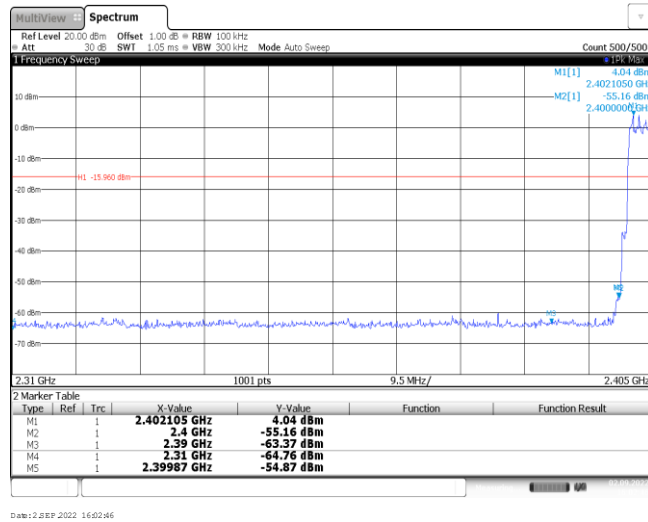


Test Item:	Band edge	Modulation type:	8DPSK
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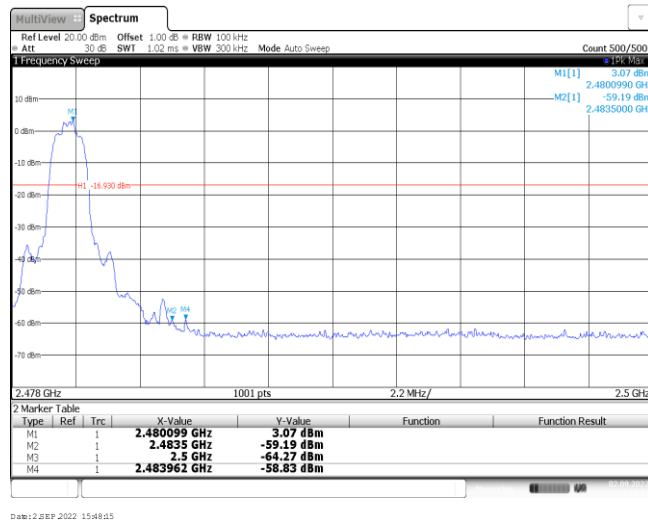
CH00
No hopping mode



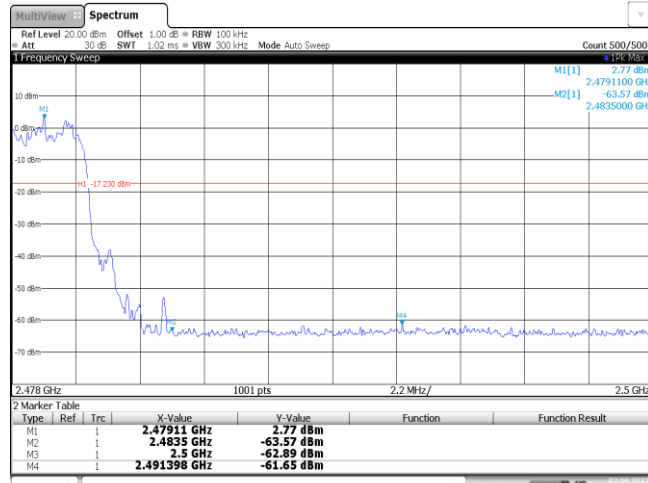
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Hopping mode



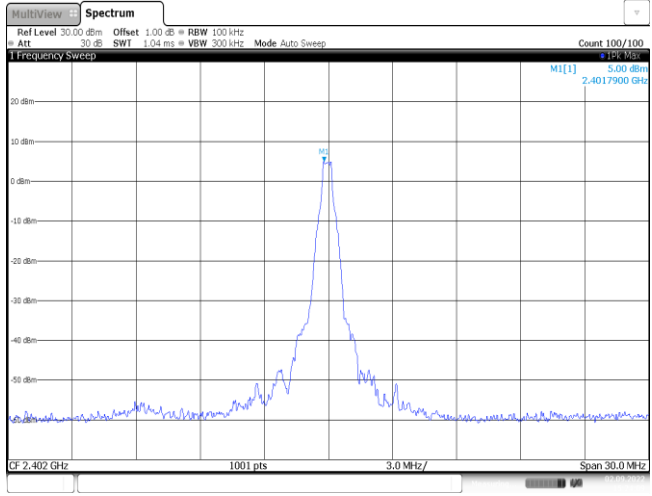
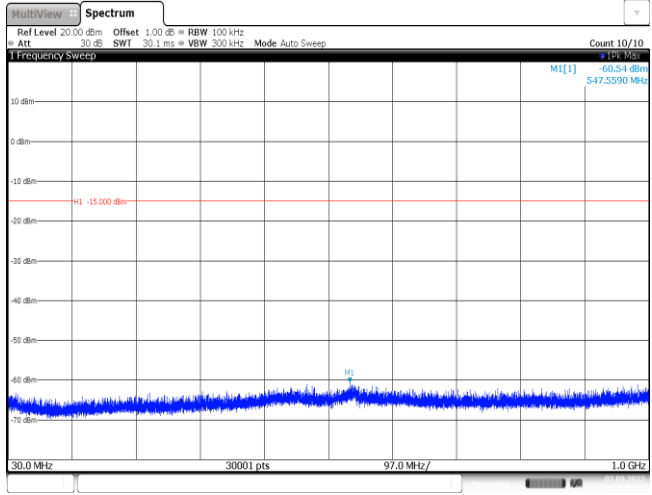
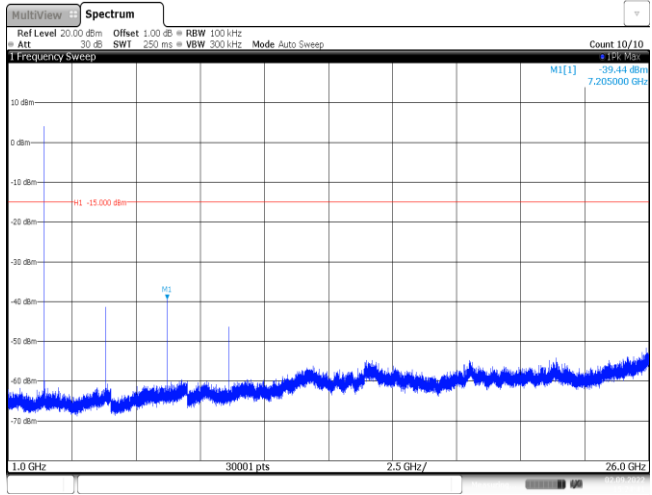
CH78
No hopping mode



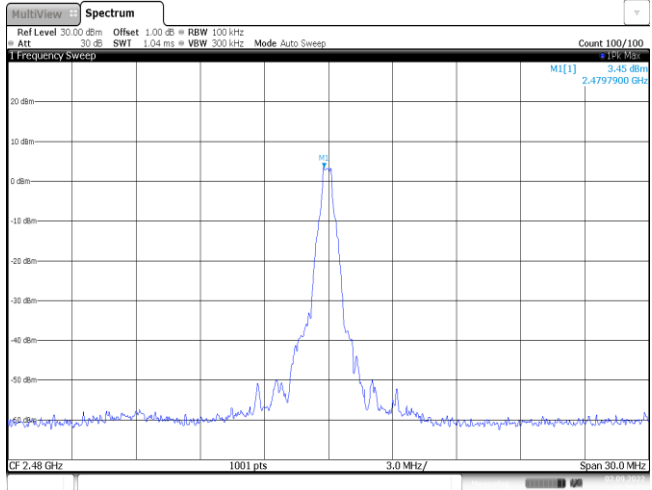
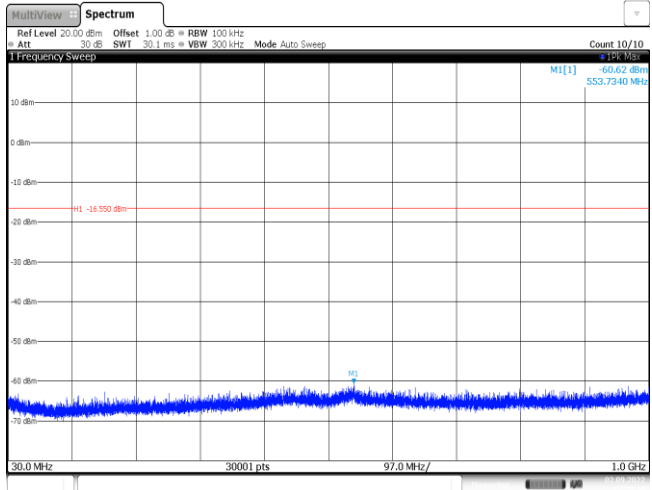
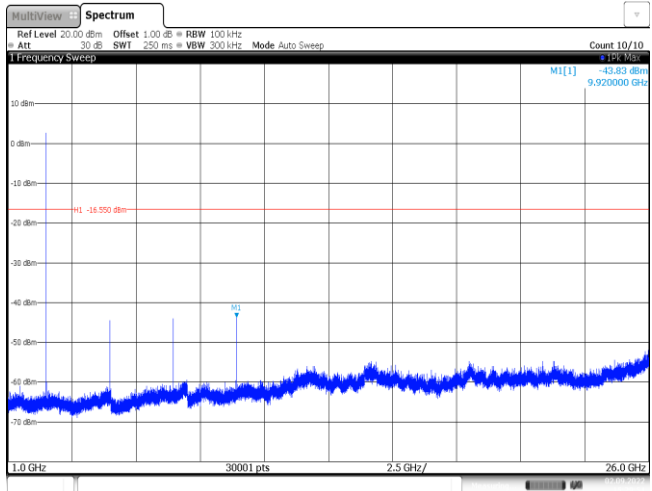
CH78
Hoppig mode

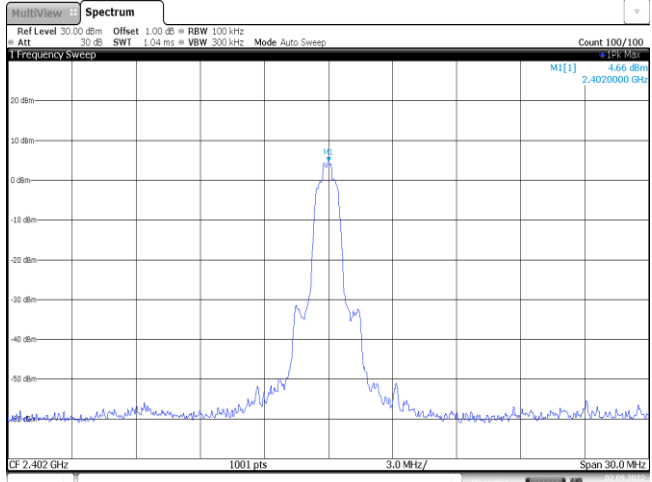
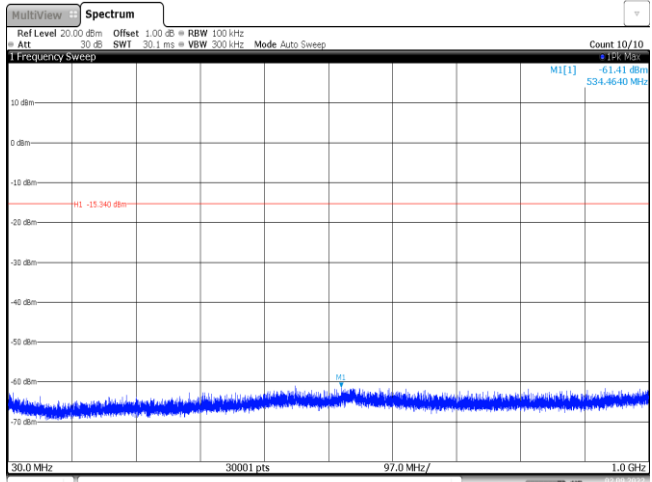
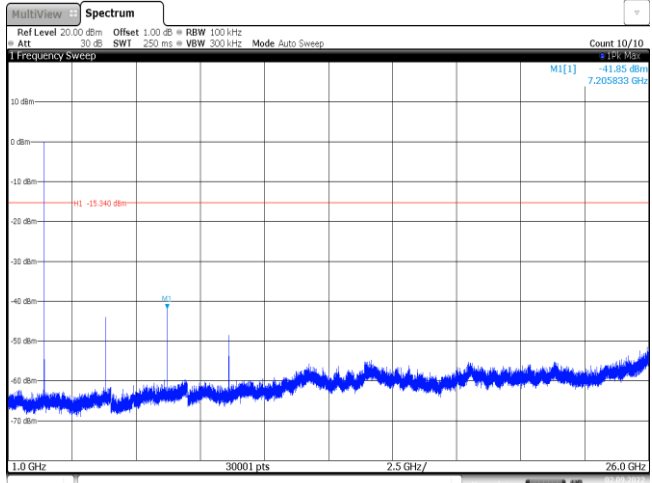


Date: 2 SEP 2022 16:03:00

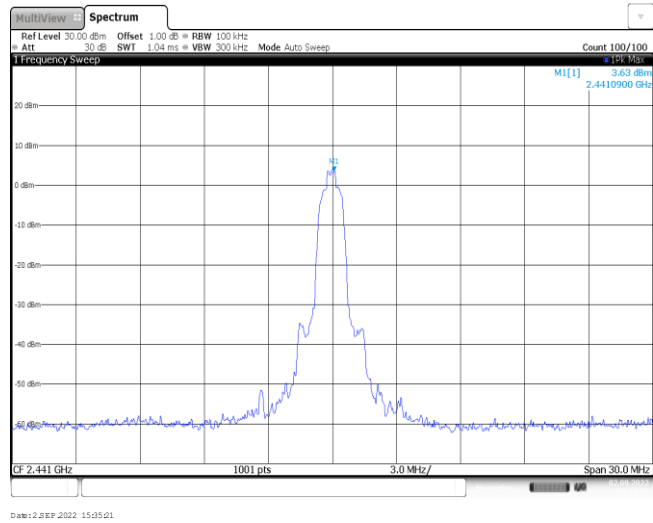
Test Item:	Spurious Emission	Modulation type:	GFSK
<p>CH00 Reference level</p>	 <p>MultiView Spectrum</p> <p>Ref Level 30.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 1.04 ms VBW 300 kHz Mode Auto Sweep</p> <p>Count 100/100</p> <p>Frequency Sweep</p> <p>M1[1] 5.09 dBm 2.4017900 GHz</p> <p>CF 2.402 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz</p> <p>Date: 2 SEP 2022 15:24:09</p>		
<p>CH00 30MHz~1000MHz</p>	 <p>MultiView Spectrum</p> <p>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</p> <p>Count 10/10</p> <p>Frequency Sweep</p> <p>M1[1] -60.54 dBm 547.5590 MHz</p> <p>M1 -15.00 dBm</p> <p>30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz</p> <p>Date: 2 SEP 2022 15:24:05</p>		
<p>CH00 1GHz~26GHz</p>	 <p>MultiView Spectrum</p> <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 250 ms VBW 300 kHz Mode Auto Sweep</p> <p>Count 10/10</p> <p>Frequency Sweep</p> <p>M1[1] -59.44 dBm 7.205000 GHz</p> <p>M1 -15.00 dBm</p> <p>1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz</p> <p>Date: 2 SEP 2022 15:24:41</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] 4.28 dBm 2.4407900 GHz CF 2.441 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 2 SEP 2022 15:40:48</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] -60.55 dBm 551.0500 MHz MI -15.720 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 2 SEP 2022 15:41:04</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] -39.69 dBm 7.323333 GHz MI -15.720 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 2 SEP 2022 15:41:20</p>

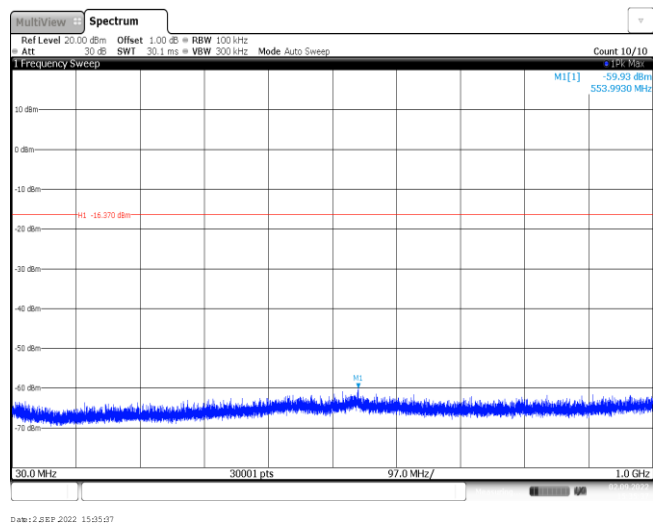
<p>CH78 Reference level</p>	 <p>The plot shows a spectrum with a prominent peak at 2.4797900 GHz. The y-axis represents power in dBm, ranging from -60 to 20. The x-axis represents frequency in MHz, with a span of 30.0 MHz. The peak is labeled M1[1] with a value of 3.45 dBm. The plot title is 'Spectrum' and it includes parameters like Ref Level 30.00 dBm, Offset 1.00 dB, RBW 100 kHz, and Mode Auto Sweep.</p>
<p>CH78 30MHz~1000MHz</p>	 <p>The plot shows a wide frequency range from 30.0 MHz to 1.0 GHz. The y-axis ranges from -70 to 10 dBm. The spectrum shows a relatively flat noise floor around -60 dBm. A red horizontal line is drawn at -16.550 dBm. The plot title is 'Spectrum' and it includes parameters like Ref Level 20.00 dBm, Offset 1.00 dB, RBW 100 kHz, and Mode Auto Sweep.</p>
<p>CH78 1GHz~26GHz</p>	 <p>The plot shows a wide frequency range from 1.0 GHz to 26.0 GHz. The y-axis ranges from -70 to 10 dBm. The spectrum shows a noise floor around -60 dBm. A red horizontal line is drawn at -16.550 dBm. The plot title is 'Spectrum' and it includes parameters like Ref Level 20.00 dBm, Offset 1.00 dB, RBW 100 kHz, and Mode Auto Sweep.</p>

Test Item:	Spurious Emission	Modulation type:	$\pi/4$ DQPSK
<p>CH00 Reference level</p>	 <p>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 MI[1] -4.66 dBm 2.4020000 GHz CF 2.402 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 2 SEP 2022 15:32:41</p>		
<p>CH00 30MHz~1000MHz</p>	 <p>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 MI[1] -61.41 dBm 534.4640 MHz MI -15.340 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 2 SEP 2022 15:32:56</p>		
<p>CH00 1GHz~26GHz</p>	 <p>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 MI[1] -41.85 dBm 7.205833 GHz MI -15.340 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 2 SEP 2022 15:33:12</p>		

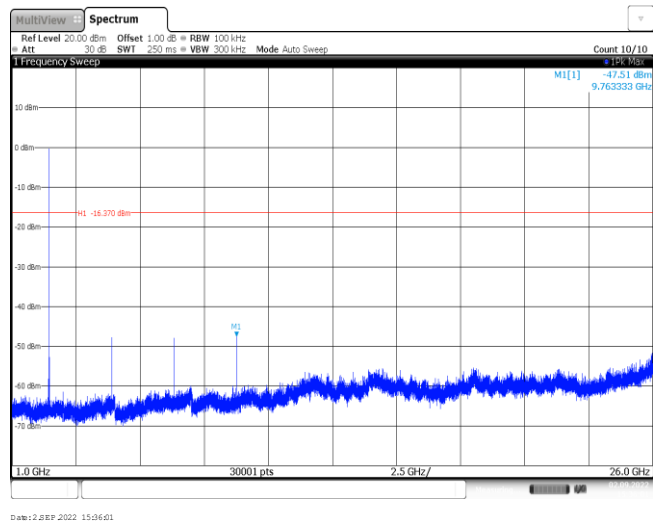
CH39
Reference level

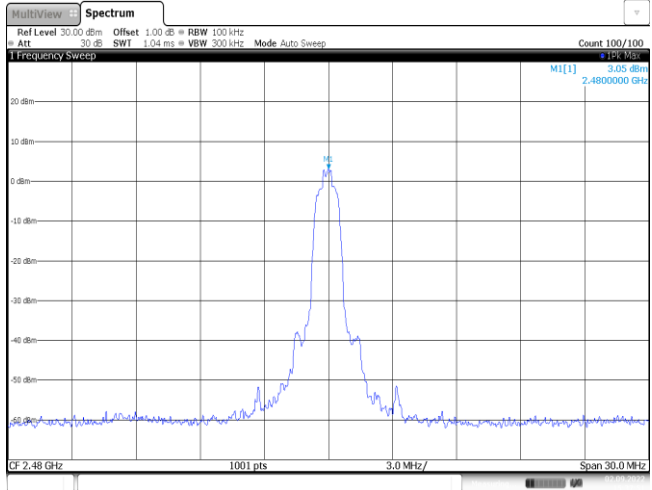
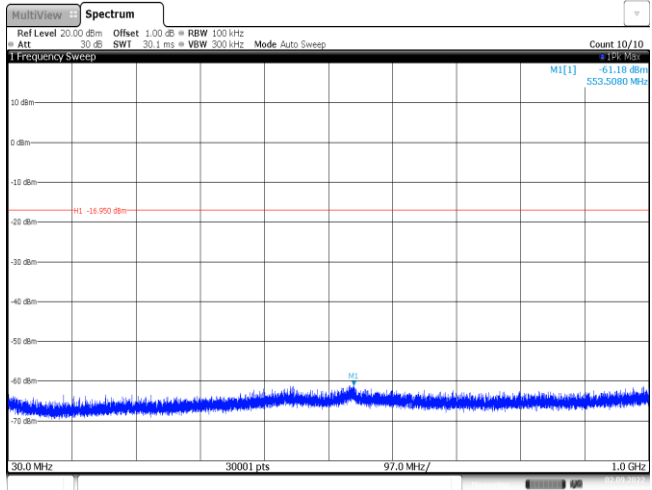
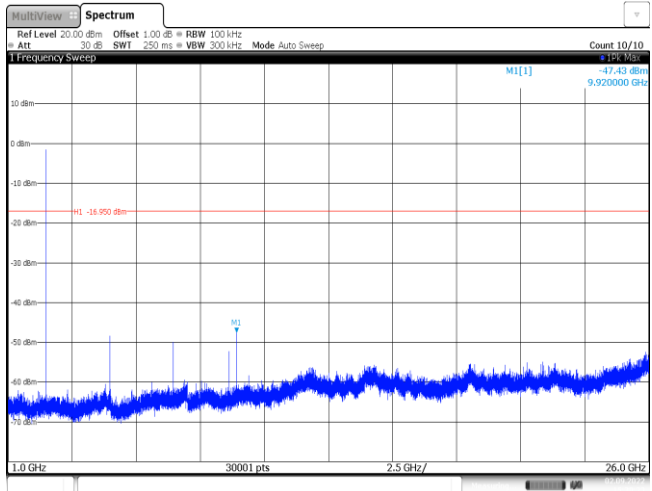


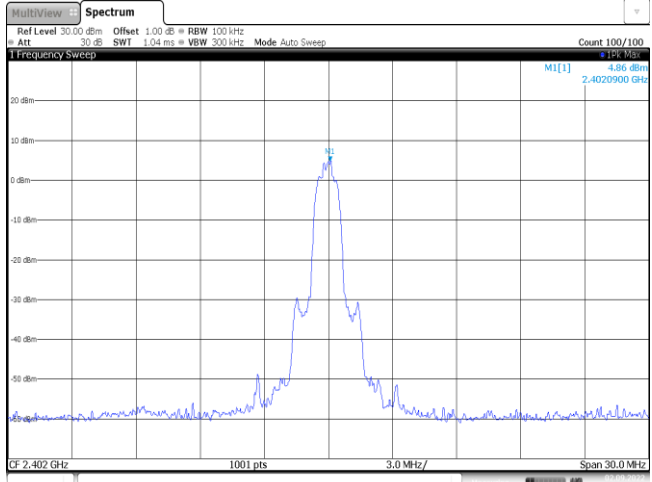
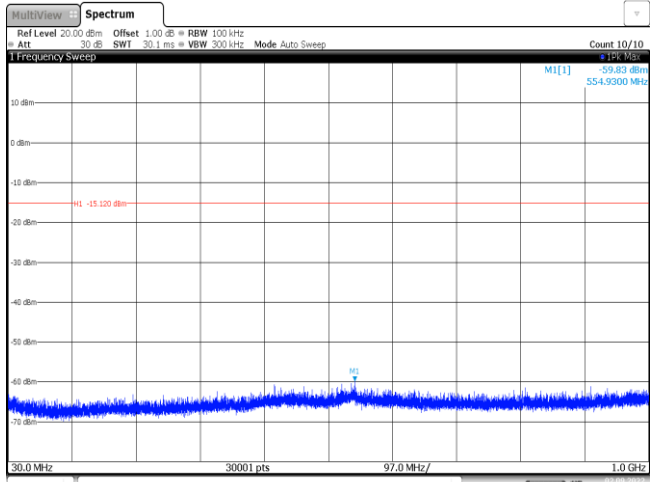
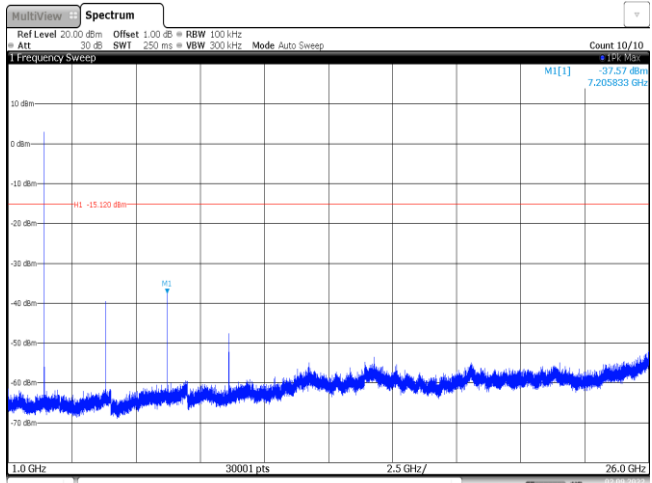
CH39
30MHz~1000MHz



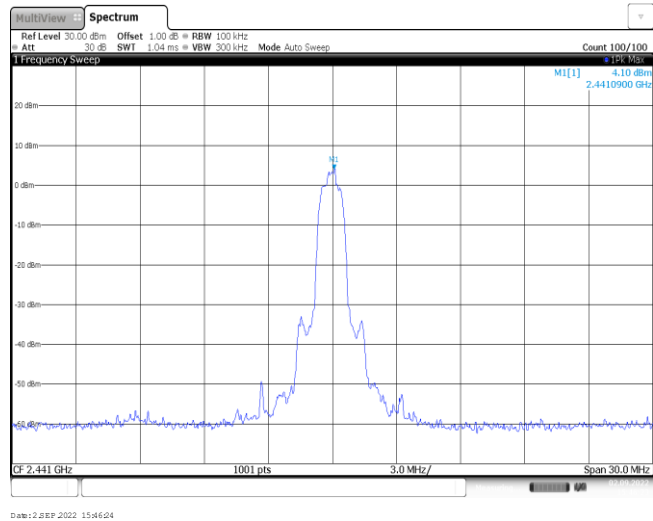
CH39
1GHz~26GHz



<p>CH78 Reference level</p>	 <p>The plot shows a single sharp peak at 2.48 GHz with a peak level of 3.05 dBm. The y-axis ranges from -60 dBm to 20 dBm, and the x-axis ranges from 2.48 GHz to 3.0 MHz. Parameters include Ref Level 30.00 dBm, Offset 1.00 dB, RBW 100 kHz, and Span 30.0 MHz.</p>
<p>CH78 30MHz~1000MHz</p>	 <p>The plot shows a noise floor across the 30 MHz to 1000 MHz range, with a peak level of -61.18 dBm at 553.5080 MHz. The y-axis ranges from -70 dBm to 10 dBm, and the x-axis ranges from 30.0 MHz to 1.0 GHz. Parameters include Ref Level 20.00 dBm, Offset 1.00 dB, RBW 100 kHz, and Span 30.0 MHz.</p>
<p>CH78 1GHz~26GHz</p>	 <p>The plot shows a noise floor across the 1 GHz to 26 GHz range, with a peak level of -47.43 dBm at 9.920000 GHz. The y-axis ranges from -70 dBm to 10 dBm, and the x-axis ranges from 1.0 GHz to 26.0 GHz. Parameters include Ref Level 20.00 dBm, Offset 1.00 dB, RBW 100 kHz, and Span 1.0 GHz.</p>

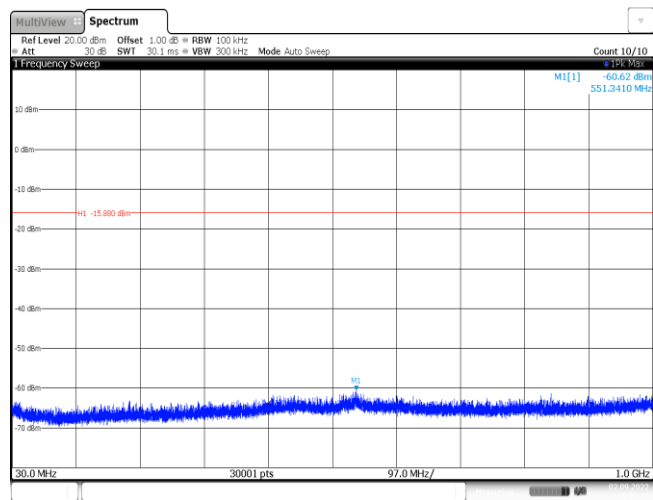
Test Item:	Spurious Emission	Modulation type:	8DPSK
<p>CH00 Reference level</p>	 <p>Ref Level 30.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 1.04 ms VBW 300 kHz Mode Auto Sweep Count 100/100 M1[1] -4.86 dBm 2.4020900 GHz CF 2.402 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 2 SEP 2022 15:43:48</p>		
<p>CH00 30MHz~1000MHz</p>	 <p>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 M1[1] -59.83 dBm 554.9300 MHz M1 -15.120 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 2 SEP 2022 15:44:03</p>		
<p>CH00 1GHz~26GHz</p>	 <p>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 M1[1] -37.57 dBm 7.205833 GHz M1 -15.120 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 2 SEP 2022 15:44:20</p>		

CH39
Reference level



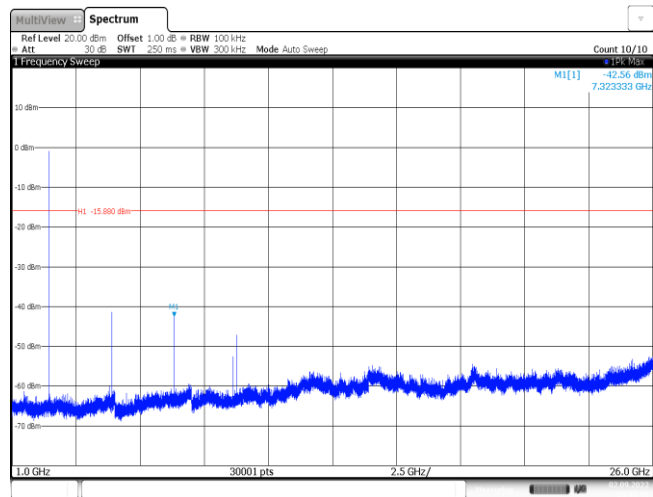
Date: 2 SEP 2022 15:46:04

CH39
30MHz~1000MHz



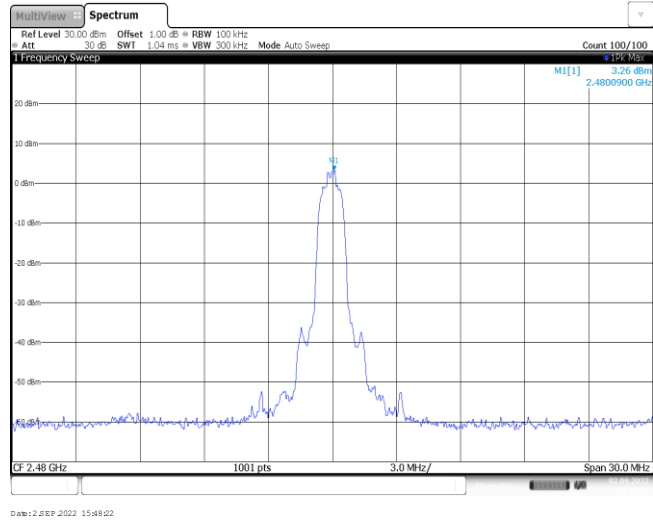
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CH39
1GHz~26GHz

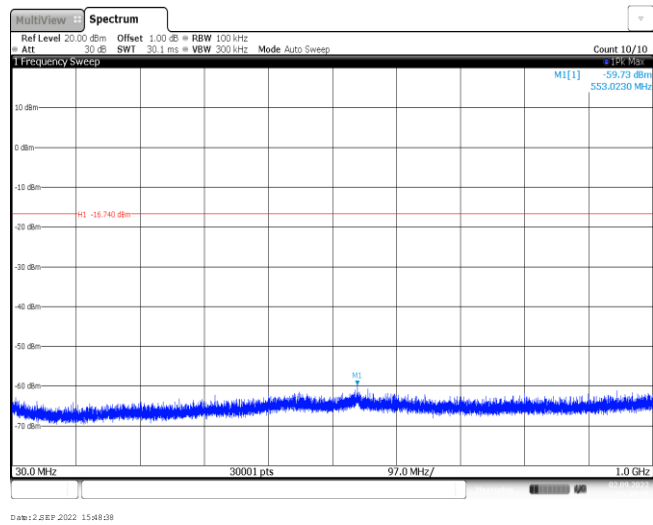


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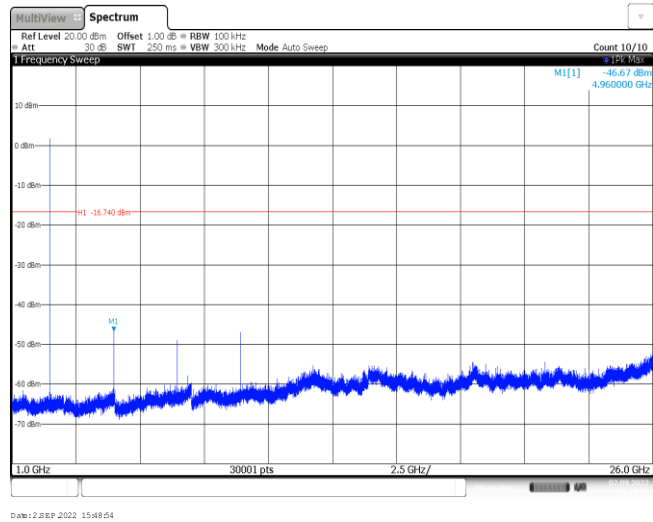
CH78
Reference level



CH78
30MHz~1000MHz



CH78
1GHz~26GHz



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