

APPENDIX REPORT

Project No.	SHT2208193404EW	Radio Specification	Bluetooth EDR
Test sample No.	YPHT22081934002	Model No.	NeoPix 320
Start test date	2022-09-01	Finish date	2022-09-02
Temperature	24.9°C	Humidity	41%
Test Engineer	Xiaoxiao Li	Auditor	Xiaodong Zhuo

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

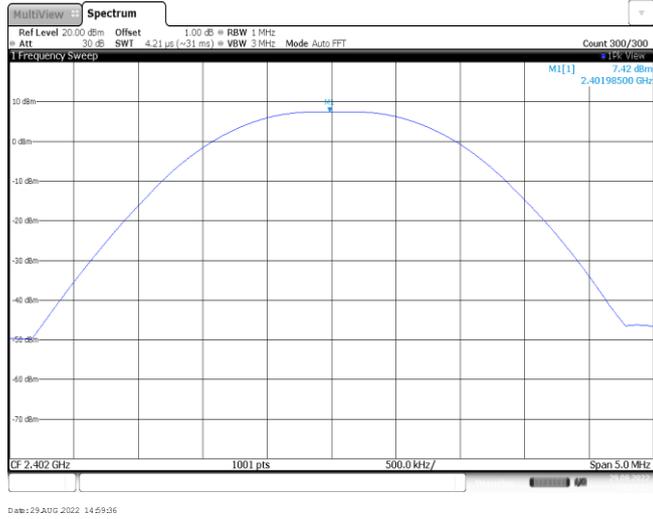
Appendix A: Peak Output Power

Modulation type	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	00	7.42	7.40	≤ 30.00	Pass
	39	8.82	8.79		
	78	9.15	9.13		
π/4DQPSK	00	9.47	8.93	≤ 21.00	Pass
	39	10.66	10.15		
	78	10.76	10.35		
8DPSK	00	9.89	9.22	≤ 21.00	Pass
	39	11.07	10.39		
	78	11.04	10.38		

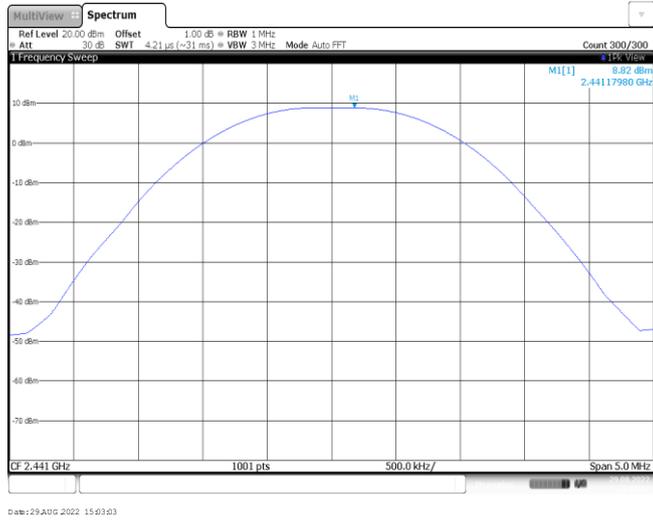
Modulation Type:

GFSK

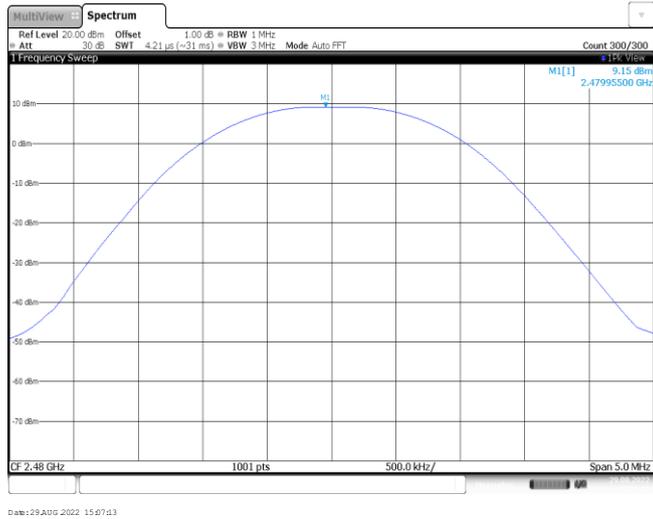
CH00



CH39

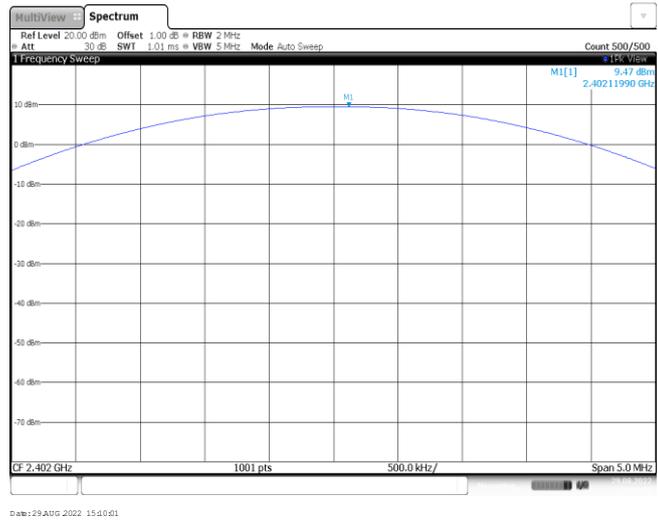


CH78

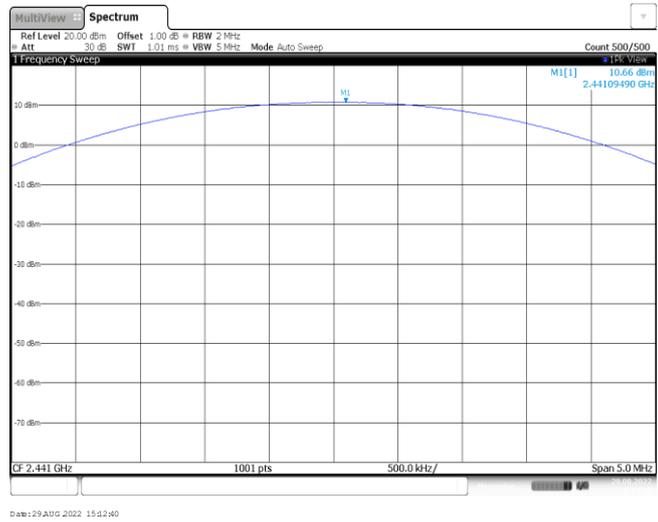


Modulation Type: $\pi/4$ DQPSK

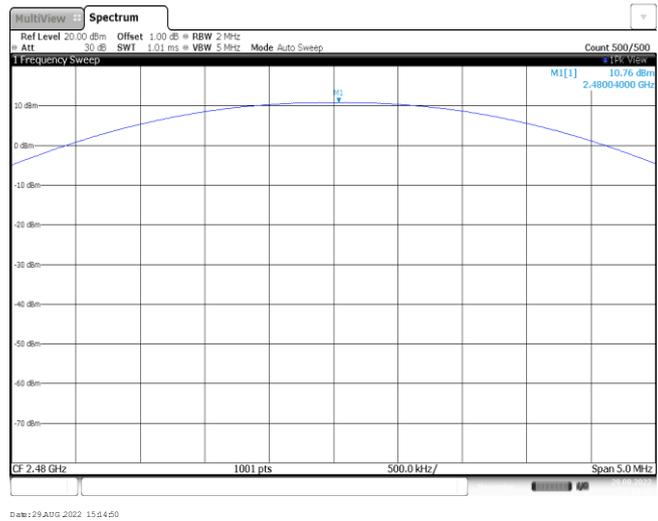
CH00



CH39

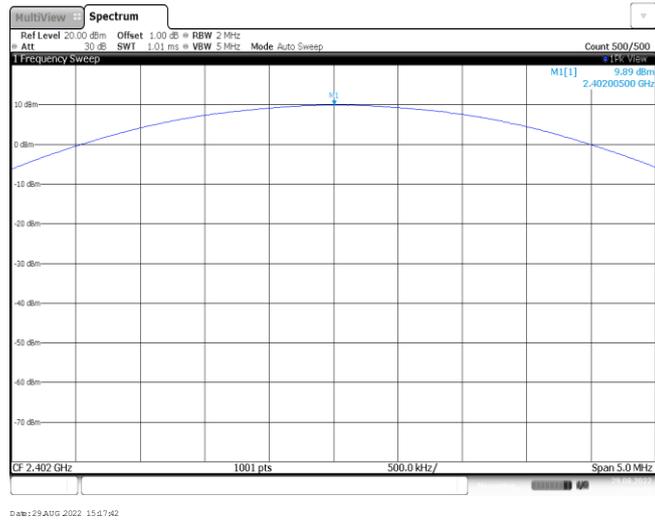


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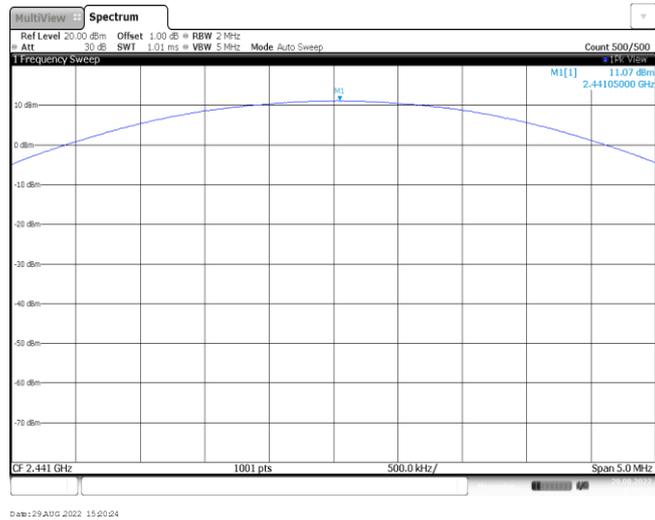


Modulation Type: 8DPSK

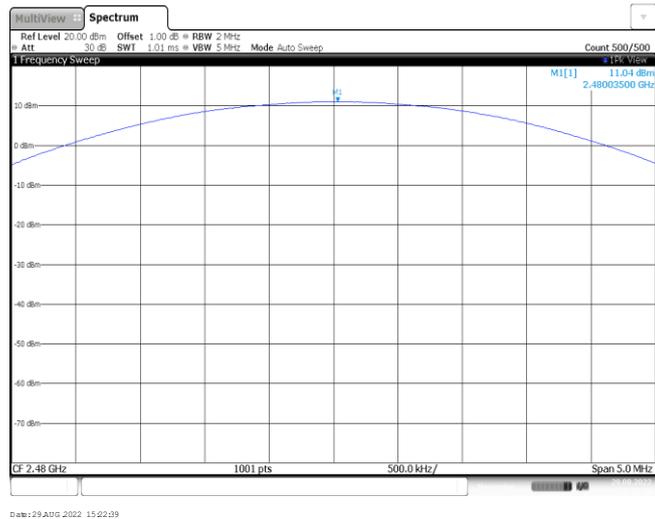
CH00



CH39



CH78

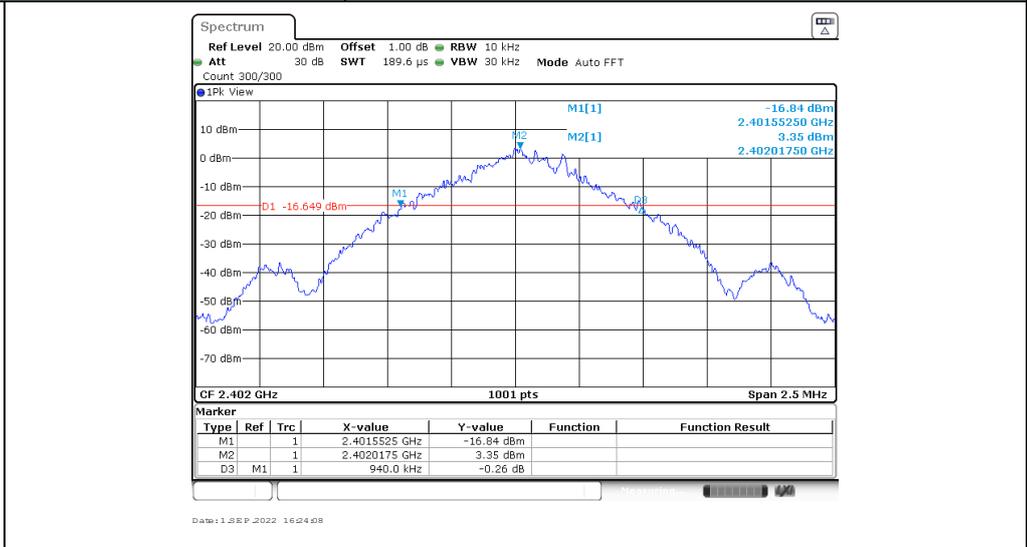


Appendix B : 20 dB Bandwidth

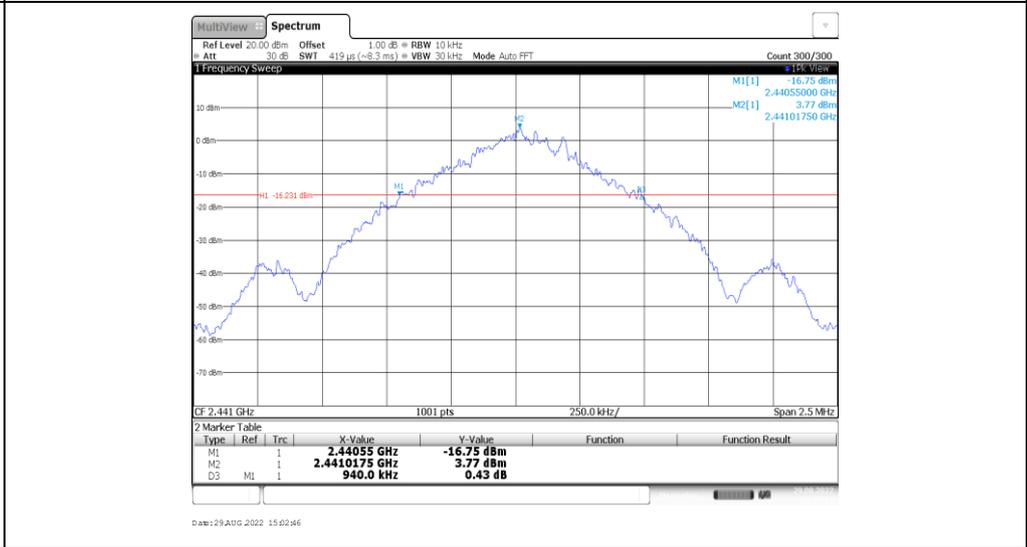
Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	940.00	-	Pass
	39	940.00		
	78	940.00		
$\pi/4$ DQPSK	00	1305.00	-	Pass
	39	1305.00		
	78	1310.00		
8DPSK	00	1302.50	-	Pass
	39	1305.00		
	78	1305.00		

Modulation Type: GFSK

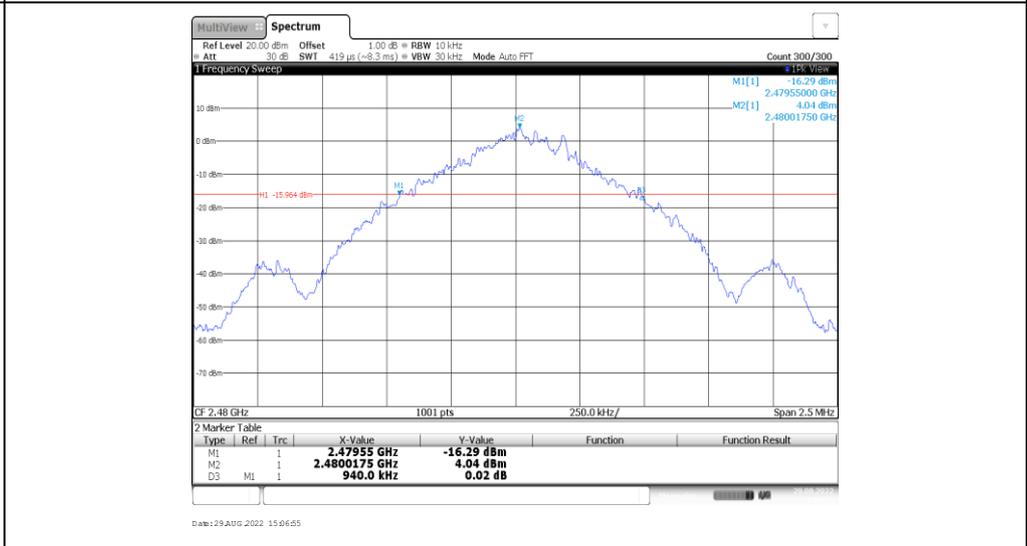
CH00



CH39

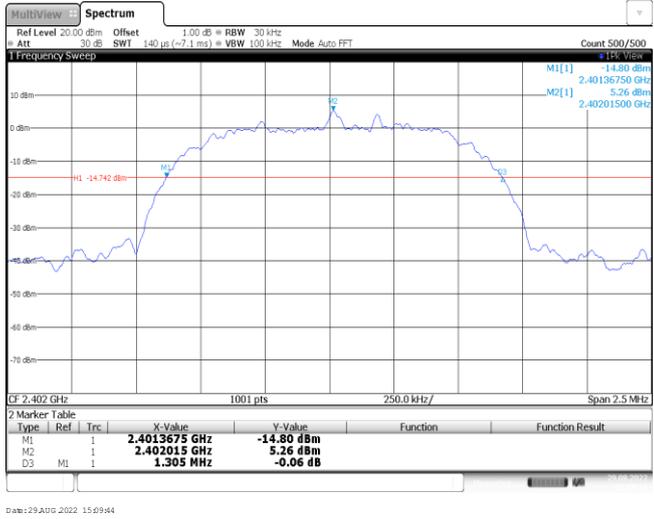


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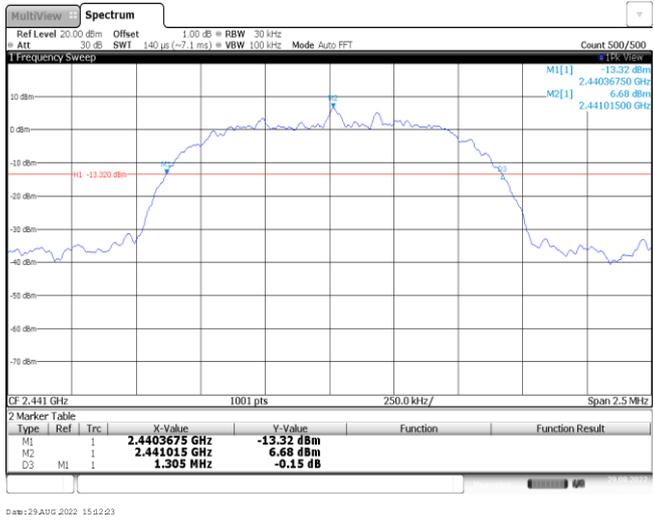


Modulation Type: **$\pi/4$ DQPSK**

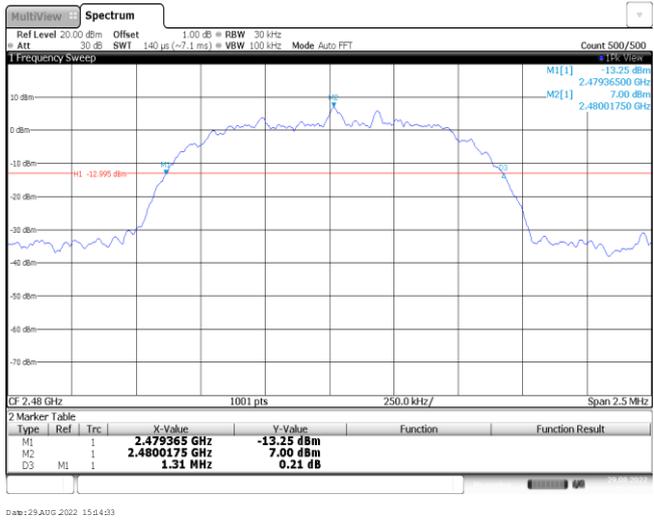
CH00



CH39

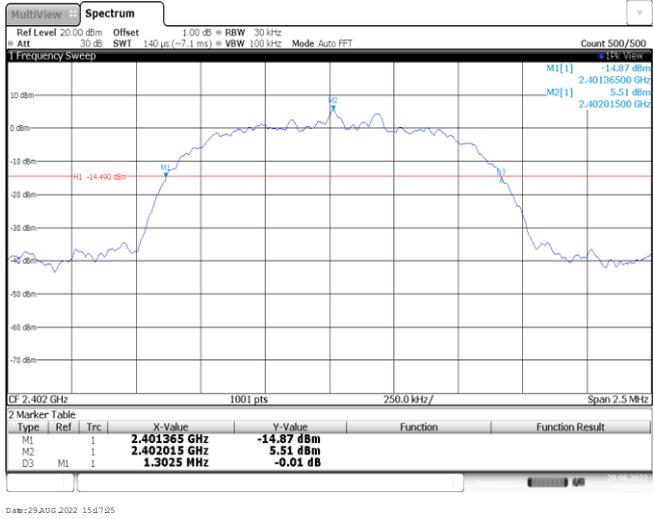


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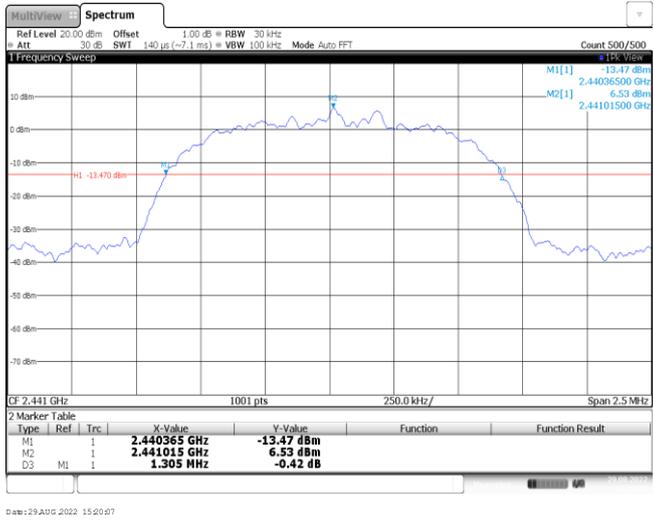
Modulation Type: 8DPSK

CH00



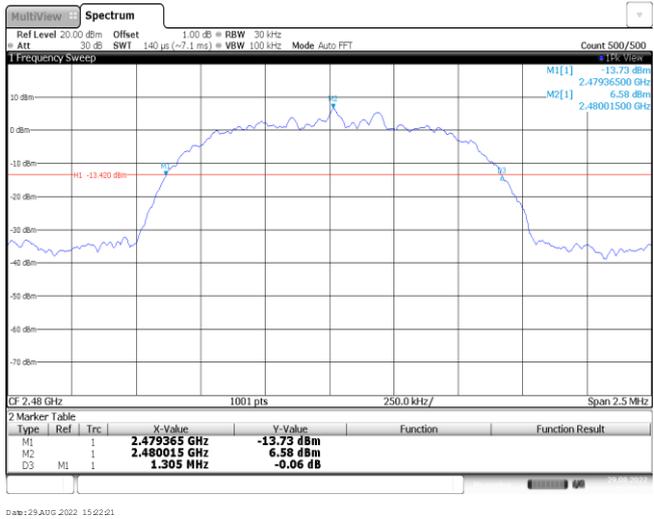
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CH39



Date: 29.AUG.2022 15:20:27

CH78



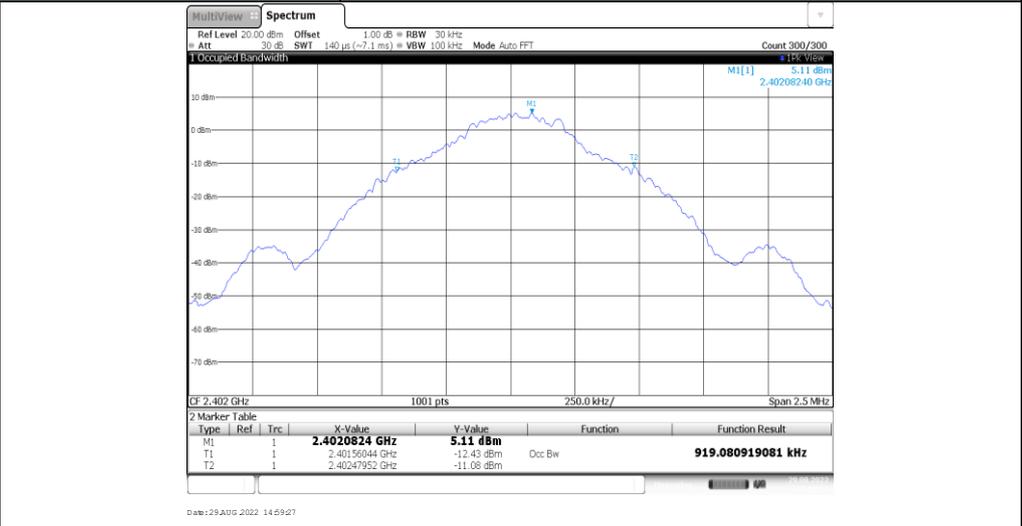
Date: 29.AUG.2022 15:22:21

Appendix C: 99% Occupied Bandwidth

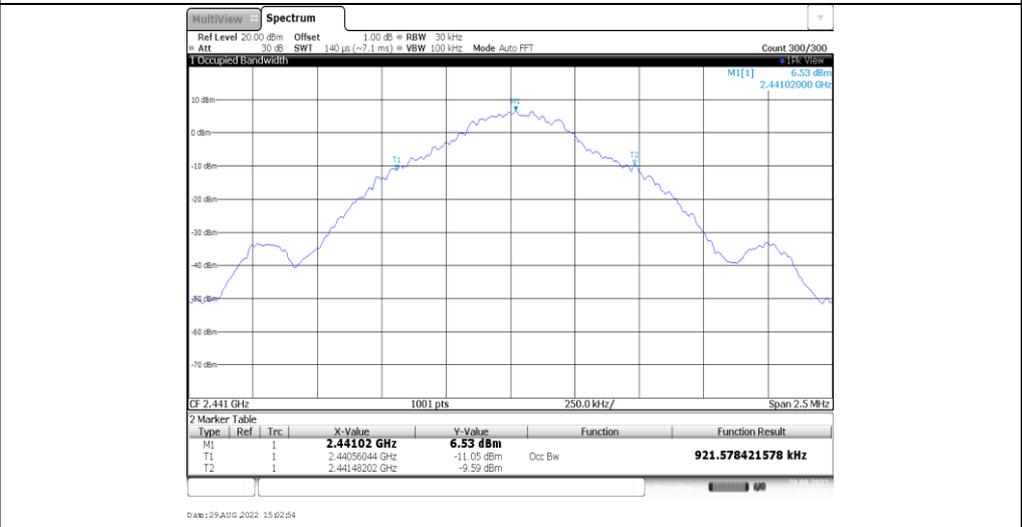
Modulation type	Channel	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.92	-	Pass
	39	0.92		
	78	0.92		
$\pi/4$ DQPSK	00	1.19	-	Pass
	39	1.18		
	78	1.19		
8DPSK	00	1.18	-	Pass
	39	1.18		
	78	1.18		

Modulation Type: GFSK

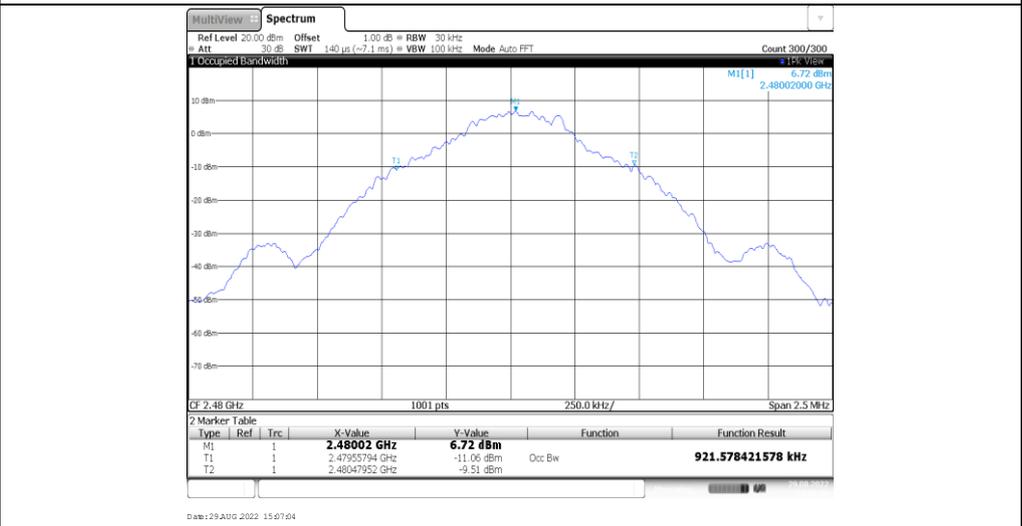
CH00



CH39



CH78



Modulation Type:

$\pi/4$ DQPSK

CH00



CH39

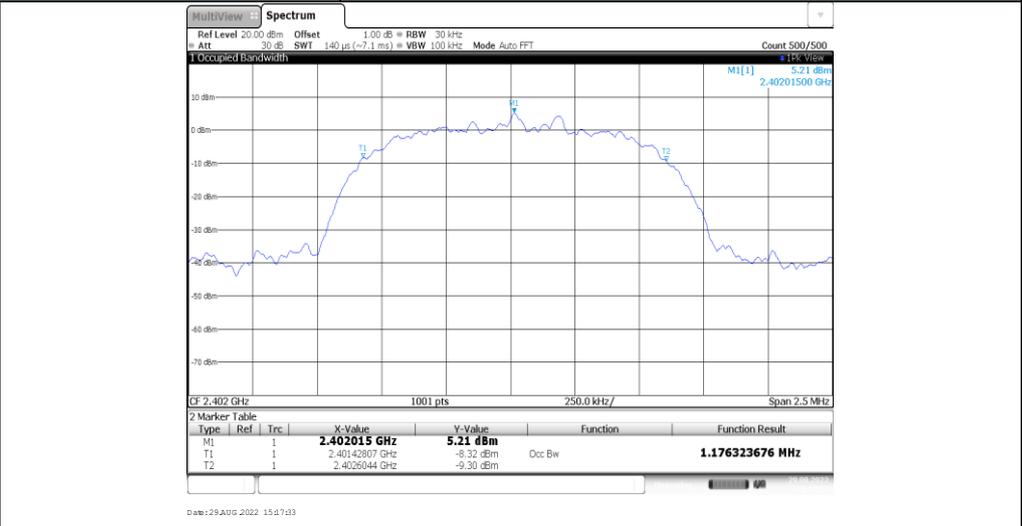


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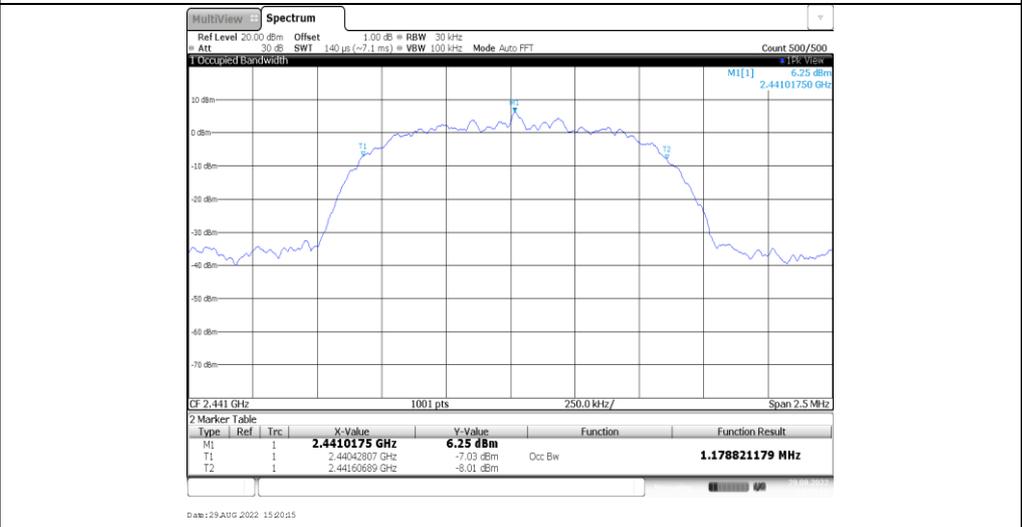


Modulation Type: 8DPSK

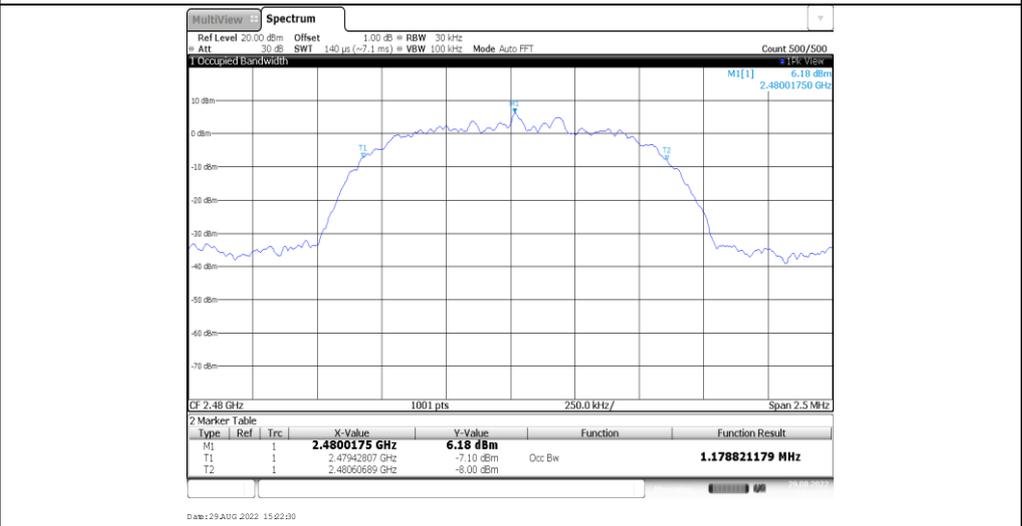
CH00



CH39



CH78



Appendix D: Carrier Frequencies Separation

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (kHz) *	Result
GFSK	39	1.00	≥940.00	Pass
π/4DQPSK	39	1.00	≥873.33	Pass
8DPSK	39	1.00	≥870.00	Pass

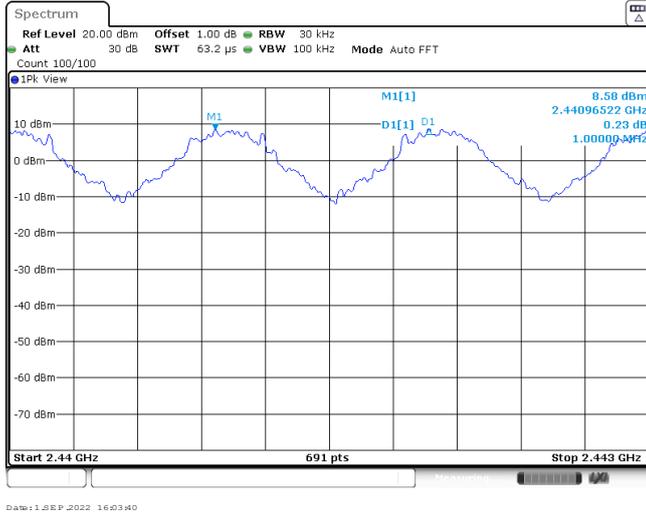
Note:

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

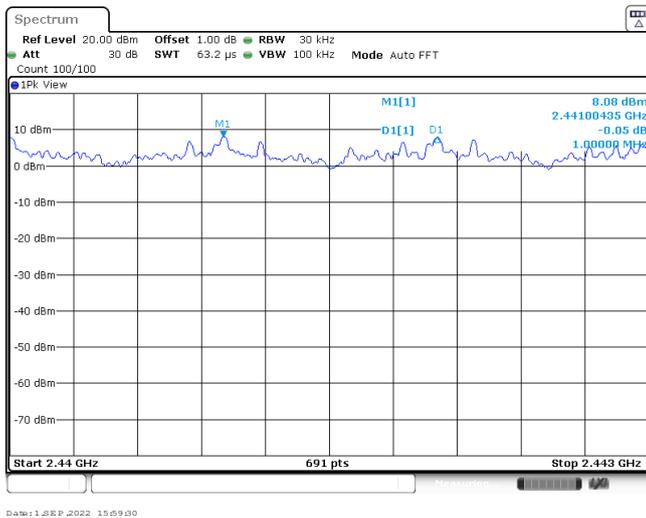
π/4DQPSK limit = 2/3 * The maximum 20 dB Bandwidth for π/4DQPSK modulation on the appendix B.

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

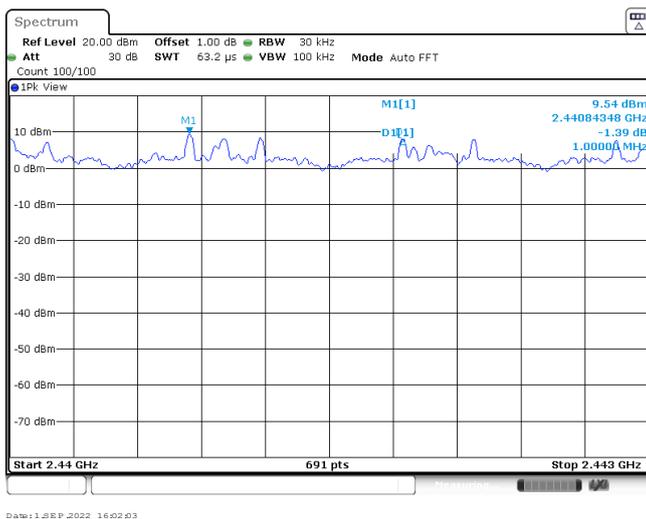
GFSK



$\pi/4$ DQPSK



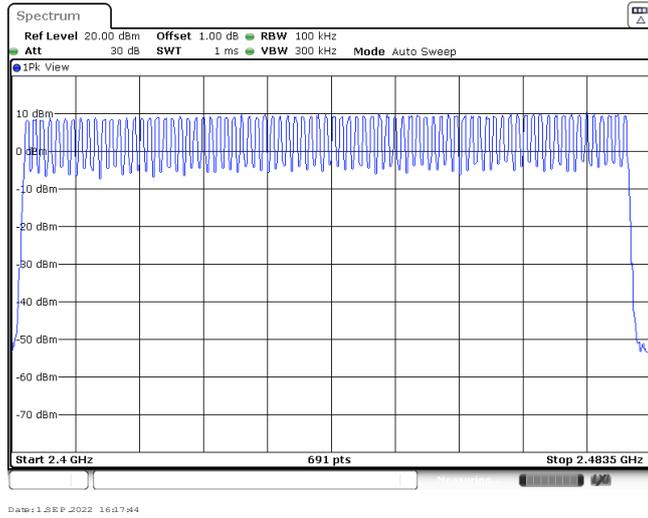
8DPSK



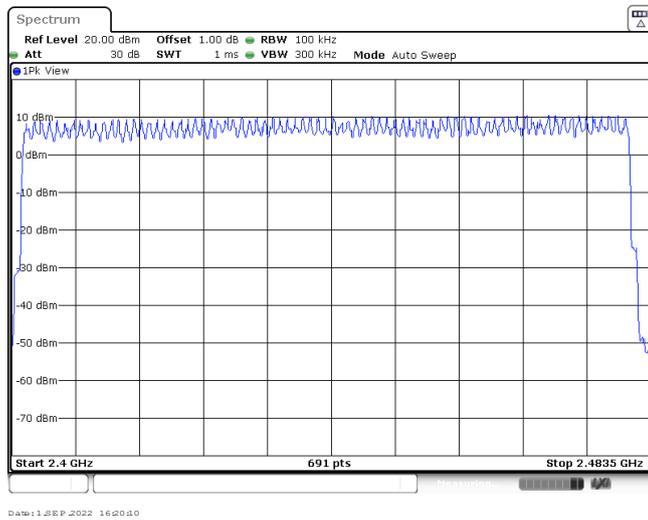
Appendix E: Hopping Channel Number

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

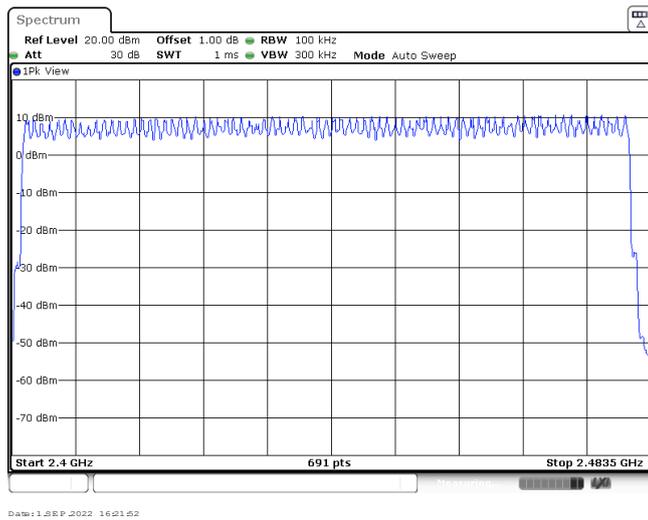
GFSK



$\pi/4$ DQPSK



8DPSK

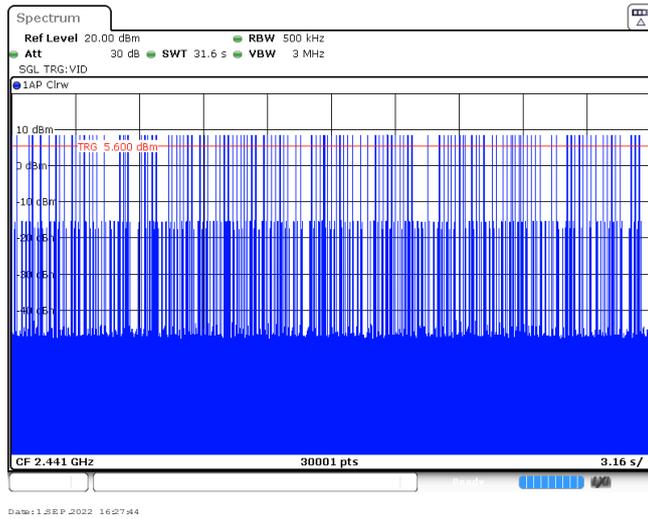


Appendix F: Dwell Time

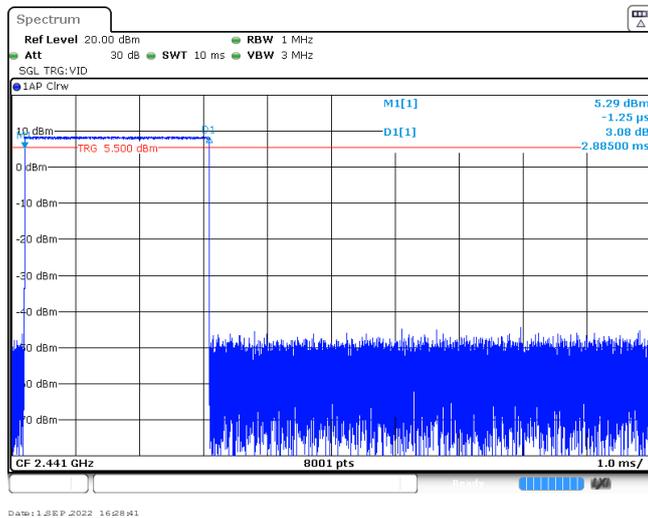
Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.38	316	0.12	≤ 0.40	Pass
	DH3	1.64	162	0.27		
	DH5	2.89	118	0.34		
π/4DQPSK	2DH1	0.39	318	0.12	≤ 0.40	Pass
	2DH3	1.64	155	0.25		
	2DH5	2.89	122	0.35		
8DPSK	3DH1	0.39	314	0.12	≤ 0.40	Pass
	3DH3	1.64	160	0.26		
	3DH5	2.89	103	0.30		

Modulation Type: GFSK	
DH1 Burst width	<p> Spectrum Ref Level 20.00 dBm RBW 1 MHz Att 30 dB SWT 10 ms VBW 3 MHz SGL TRG:VID 1AP Cirw M1[1] 4.10 dBm D1[1] -1.25 μs TRG 5.700 dBm 4.47 dB 381.25 μs CF 2.441 GHz 8001 pts 1.0 ms/ </p> <p>Date: 1 SEP 2022 16:25:45</p>
DH1 Burst number	<p> Spectrum Ref Level 20.00 dBm RBW 500 kHz Att 30 dB SWT 31.6 s VBW 3 MHz SGL TRG:VID 1AP Cirw TRG 5.700 dBm CF 2.441 GHz 30001 pts 3.16 s/ </p> <p>Date: 1 SEP 2022 16:26:18</p>
DH3 Burst width	<p> Spectrum Ref Level 20.00 dBm RBW 1 MHz Att 30 dB SWT 10 ms VBW 3 MHz SGL TRG:VID 1AP Cirw M1[1] -9.94 dBm D1[1] -1.25 μs TRG 5.600 dBm 18.38 dB 1.63750 ms CF 2.441 GHz 8001 pts 1.0 ms/ </p> <p>Date: 1 SEP 2022 16:27:11</p>

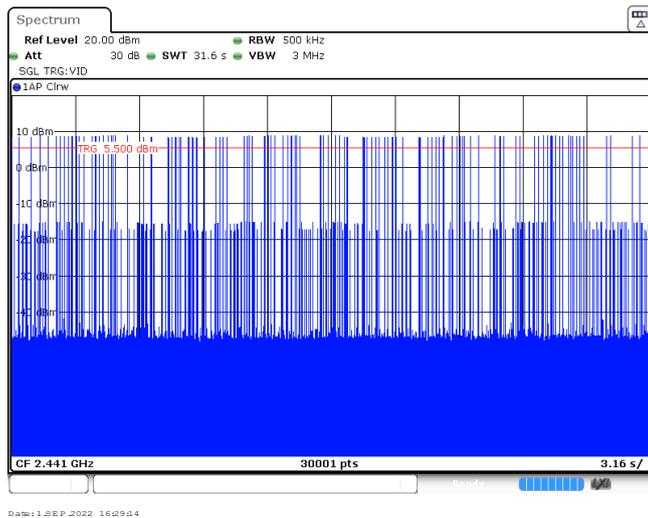
DH3
Burst number



DH5
Burst width



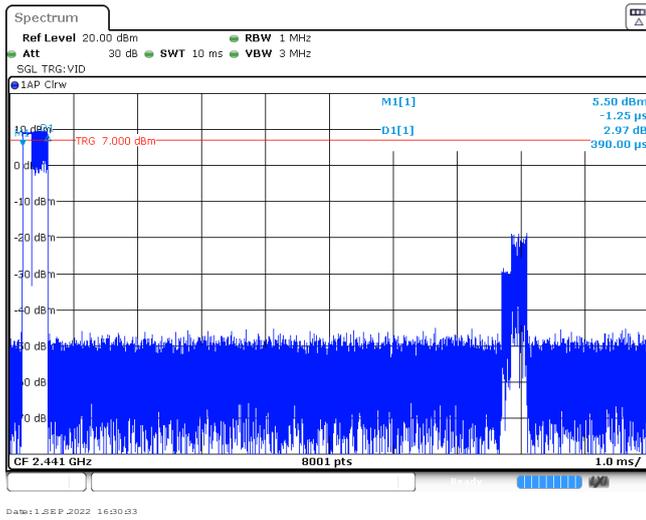
DH5
Burst number



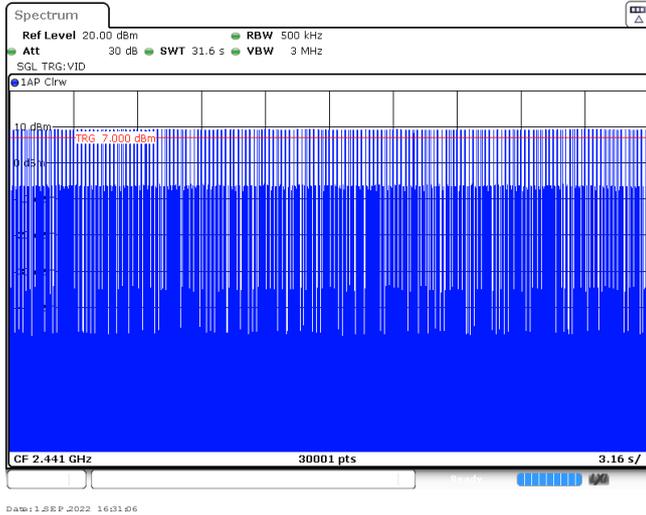
Modulation Type:

$\pi/4$ DQPSK

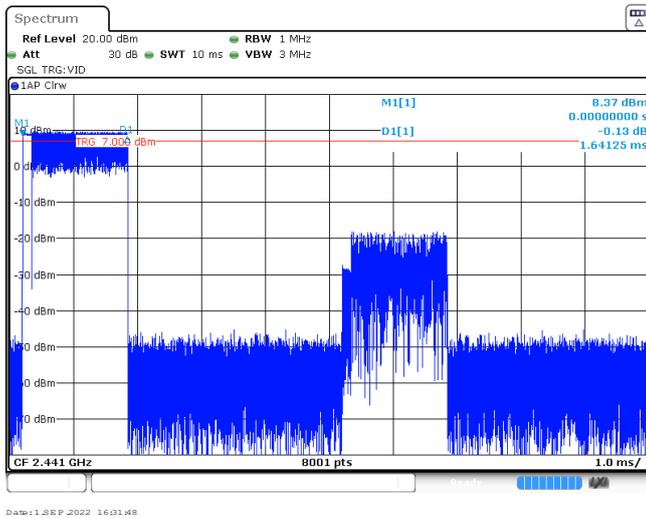
2DH1
Burst width



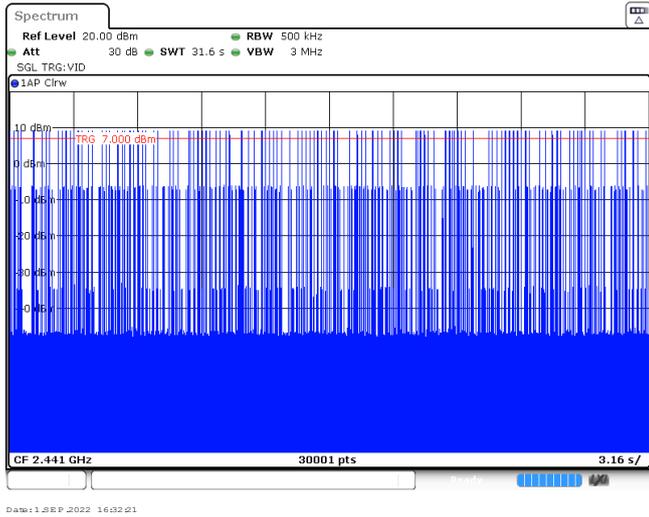
2DH1
Burst number



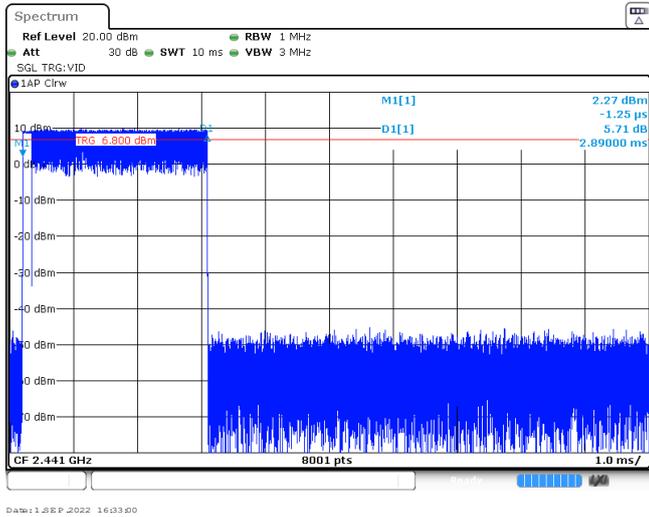
2DH3
Burst width



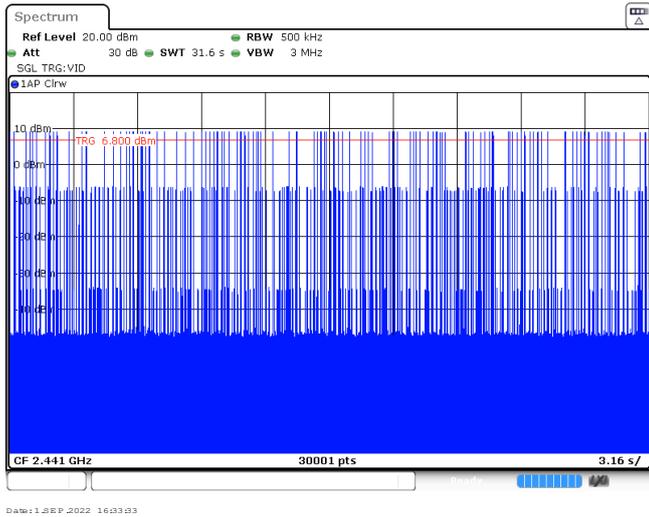
2DH3
Burst number



2DH5
Burst width

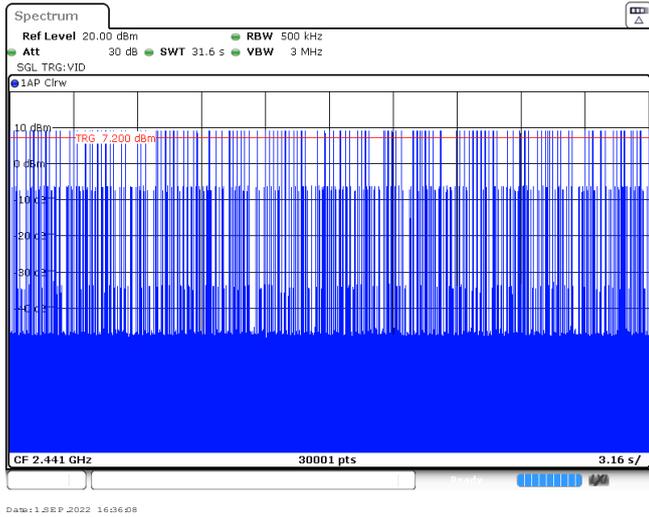


2DH5
Burst number

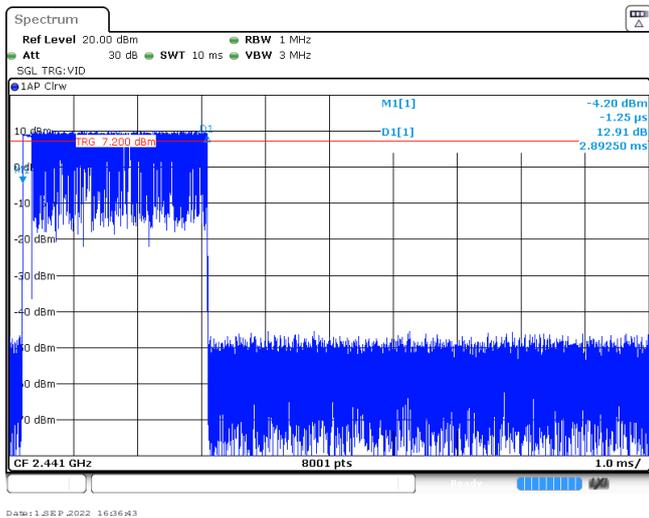


Modulation Type: 8DPSK	
3DH1 Burst width	<p>CF 2.441 GHz 8001 pts 1.0 ms/</p> <p>Date: 1 SEP 2022 16:34:23</p>
3DH1 Burst number	<p>CF 2.441 GHz 30001 pts 3.16 s/</p> <p>Date: 1 SEP 2022 16:34:26</p>
3DH3 Burst width	<p>CF 2.441 GHz 8001 pts 1.0 ms/</p> <p>Date: 1 SEP 2022 16:35:05</p>

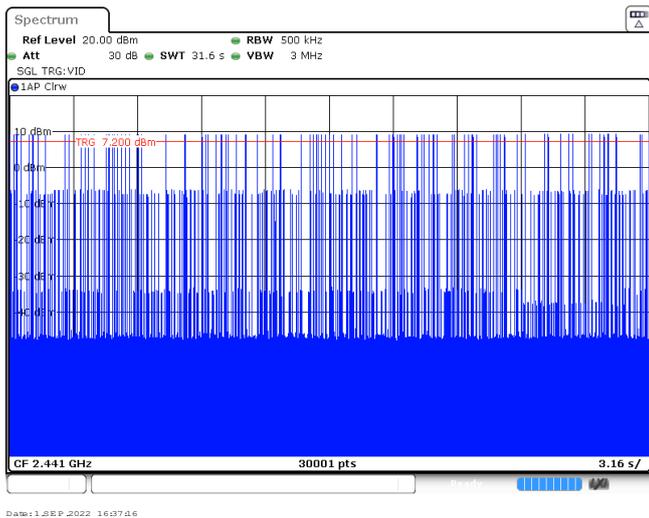
3DH3
Burst number



3DH5
Burst width



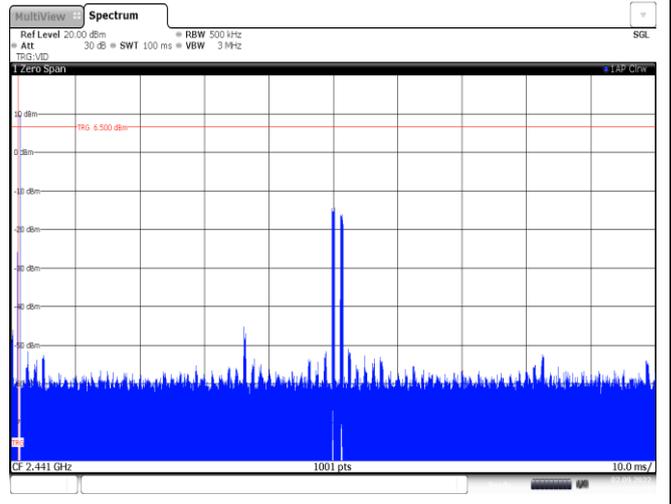
3DH5
Burst number



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	2.87	100	2	-24.82
$\pi/4$ DQPSK	2441	2.88	100	2	-24.79
8DPSK	2441	2.88	100	2	-24.79

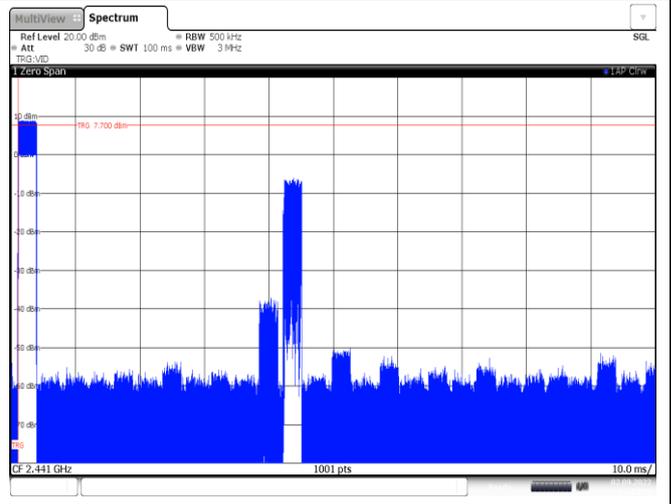
GFSK



T_{on} time for single burst

Burst Quantity

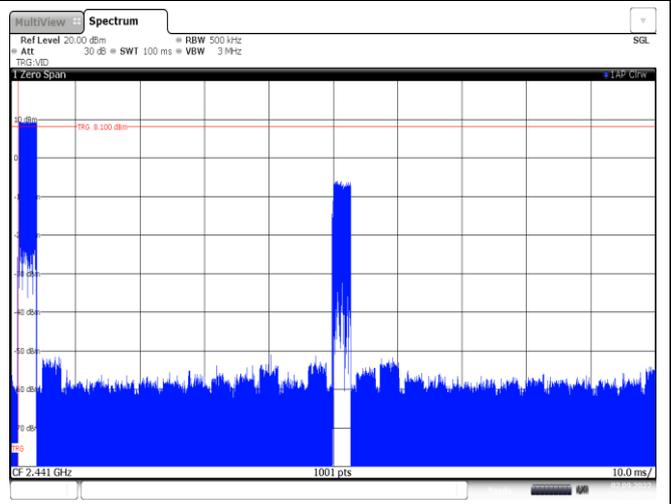
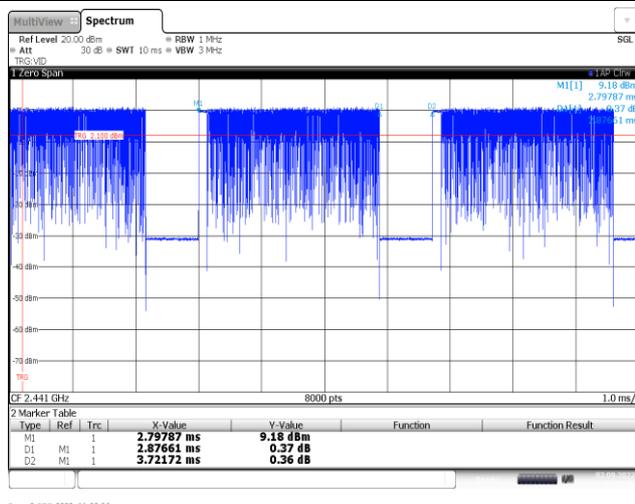
$\pi/4$ DQPSK



T_{on} time for single burst

Burst Quantity

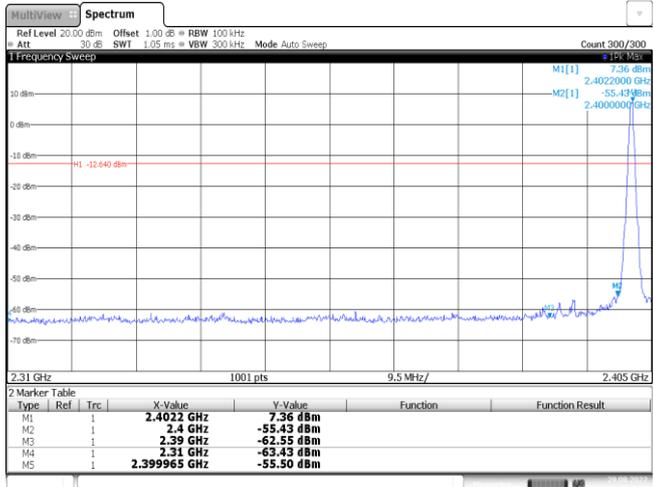
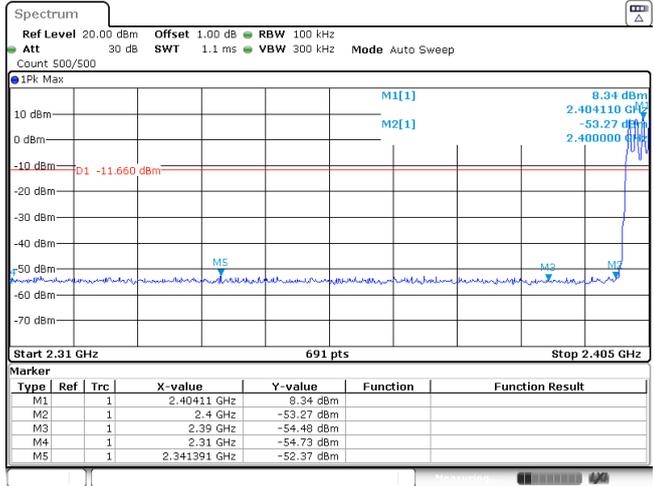
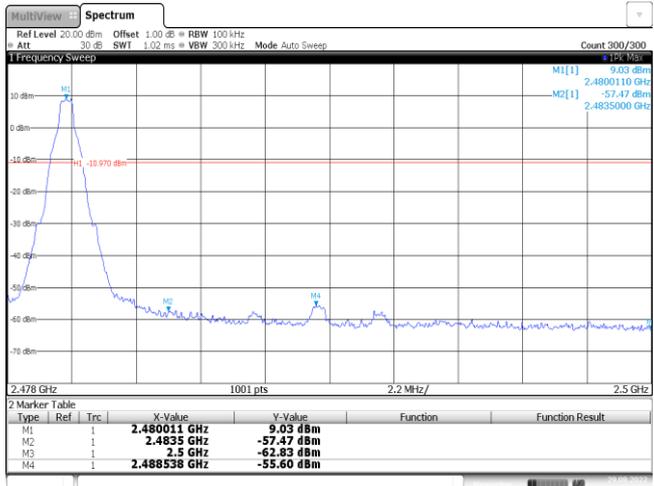
8DPSK



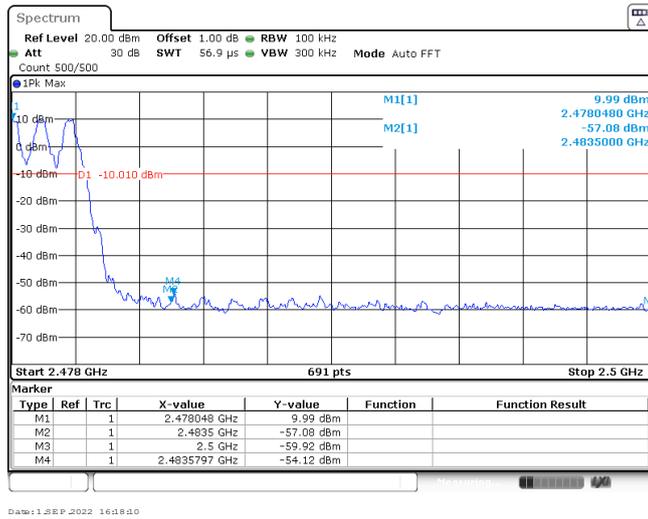
T_{on} time for single burst

Burst Quantity

Appendix H: Band edge and Spurious Emissions (conducted)

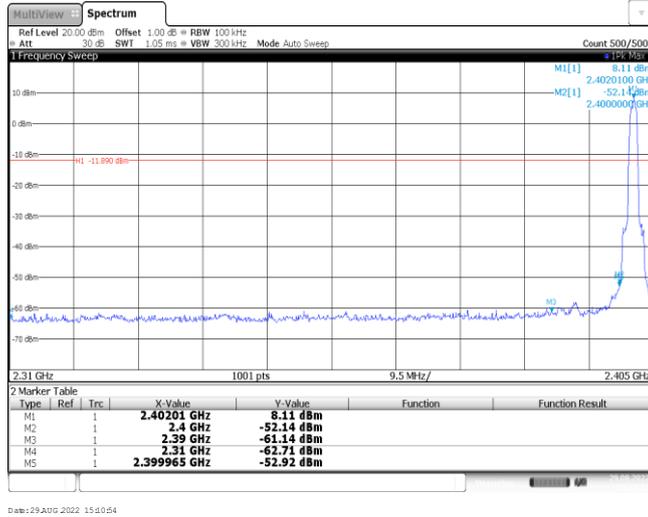
Test Item:	Band edge	Modulation type:	GFSK																																										
<p>CH00 No hopping mode</p>	 <table border="1" data-bbox="683 739 1337 840"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.4022 GHz</td> <td>7.36 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4 GHz</td> <td>-55.43 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.39 GHz</td> <td>-62.55 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.31 GHz</td> <td>-63.43 dBm</td> <td></td> <td></td> </tr> <tr> <td>M5</td> <td>1</td> <td></td> <td>2.399965 GHz</td> <td>-55.50 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 29 AUG 2022 15:00:52</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.4022 GHz	7.36 dBm			M2	1		2.4 GHz	-55.43 dBm			M3	1		2.39 GHz	-62.55 dBm			M4	1		2.31 GHz	-63.43 dBm			M5	1		2.399965 GHz	-55.50 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.4022 GHz	7.36 dBm																																									
M2	1		2.4 GHz	-55.43 dBm																																									
M3	1		2.39 GHz	-62.55 dBm																																									
M4	1		2.31 GHz	-63.43 dBm																																									
M5	1		2.399965 GHz	-55.50 dBm																																									
<p>CH00 Hopping mode</p>	 <table border="1" data-bbox="683 1265 1337 1388"> <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>2.40411 GHz</td> <td>8.34 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4 GHz</td> <td>-53.27 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.39 GHz</td> <td>-54.48 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.31 GHz</td> <td>-54.73 dBm</td> <td></td> <td></td> </tr> <tr> <td>M5</td> <td>1</td> <td></td> <td>2.341391 GHz</td> <td>-52.37 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 1 SEP 2022 16:17:57</p>			Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.40411 GHz	8.34 dBm			M2	1		2.4 GHz	-53.27 dBm			M3	1		2.39 GHz	-54.48 dBm			M4	1		2.31 GHz	-54.73 dBm			M5	1		2.341391 GHz	-52.37 dBm		
Type	Ref	Trc	X-value	Y-value	Function	Function Result																																							
M1	1		2.40411 GHz	8.34 dBm																																									
M2	1		2.4 GHz	-53.27 dBm																																									
M3	1		2.39 GHz	-54.48 dBm																																									
M4	1		2.31 GHz	-54.73 dBm																																									
M5	1		2.341391 GHz	-52.37 dBm																																									
<p>CH78 No hopping mode</p>	 <table border="1" data-bbox="683 1848 1337 1933"> <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>2.480011 GHz</td> <td>9.03 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4835 GHz</td> <td>-57.47 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.5 GHz</td> <td>-62.83 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.488538 GHz</td> <td>-55.60 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 29 AUG 2022 15:07:53</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.480011 GHz	9.03 dBm			M2	1		2.4835 GHz	-57.47 dBm			M3	1		2.5 GHz	-62.83 dBm			M4	1		2.488538 GHz	-55.60 dBm									
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CH78
Hopping mode

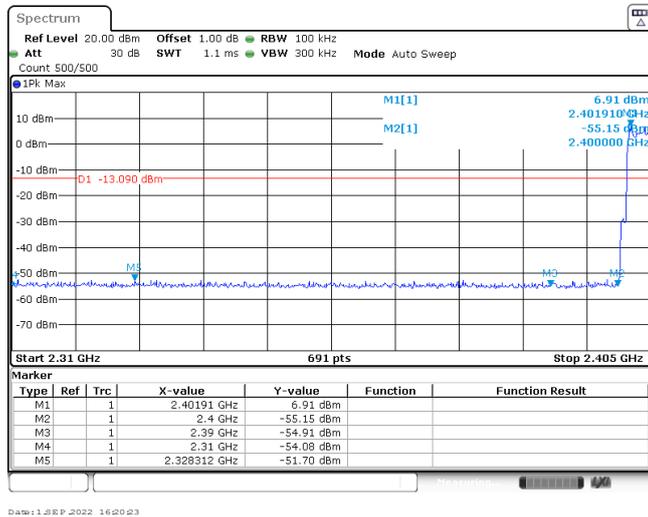


Test Item:	Band edge	Modulation type:	$\pi/4$DQPSK
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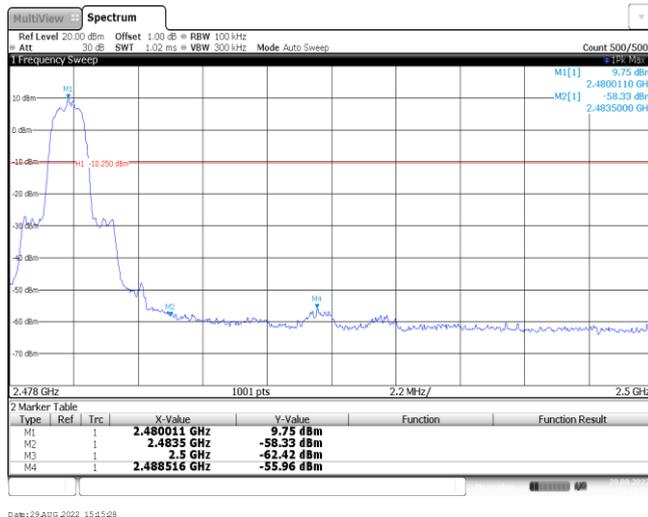
CH00
No hopping mode



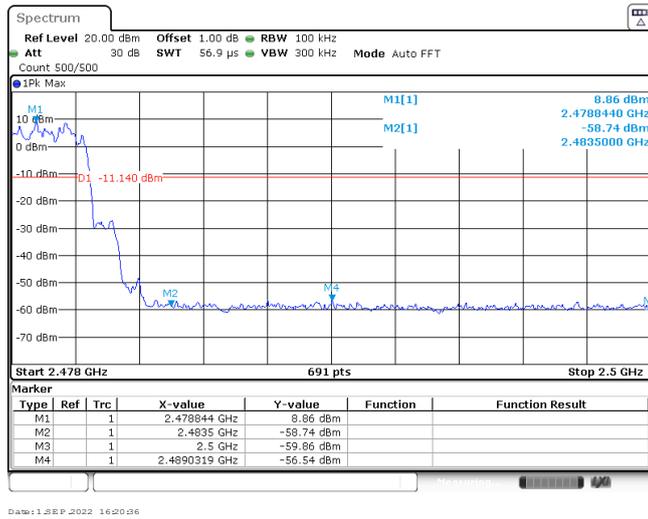
CH00
Hopping mode



CH78
No hopping mode

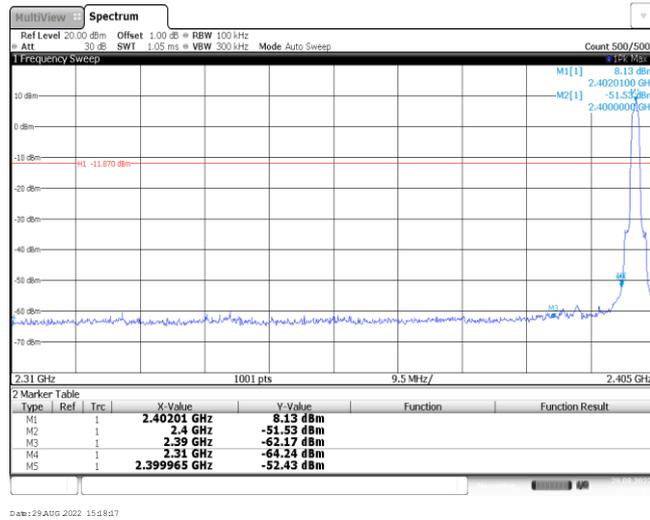


CH78
Hopping mode

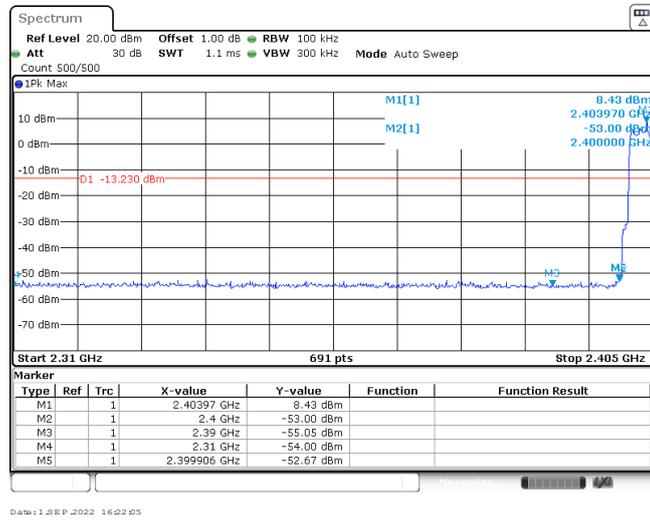


Test Item:	Band edge	Modulation type:	8DPSK
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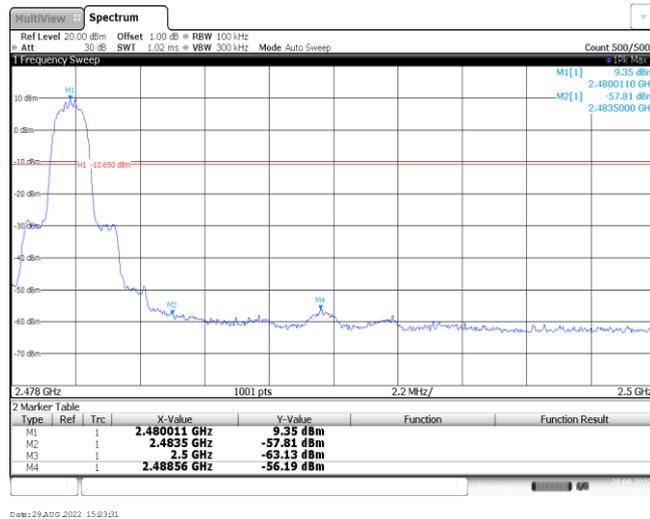
CH00
No hopping mode



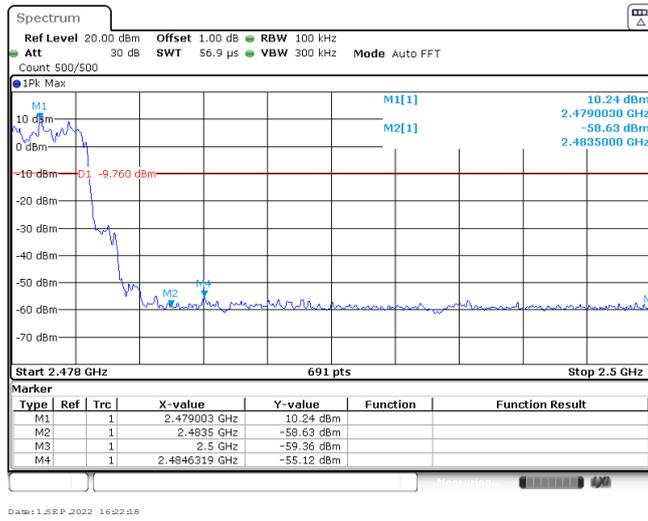
CH00
Hopping mode



CH78
No hopping mode

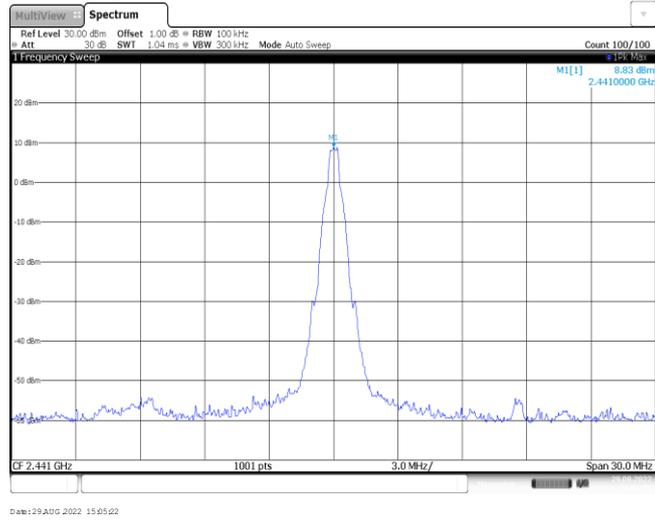


CH78
Hoppig mode

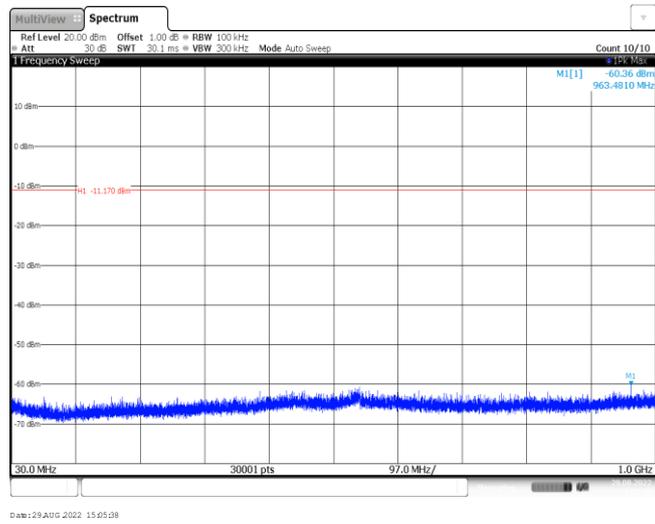


Test Item:	Spurious Emission	Modulation type:	GFSK
<p>CH00 Reference level</p>			
<p>CH00 30MHz~1000MHz</p>			
<p>CH00 1GHz~26GHz</p>			

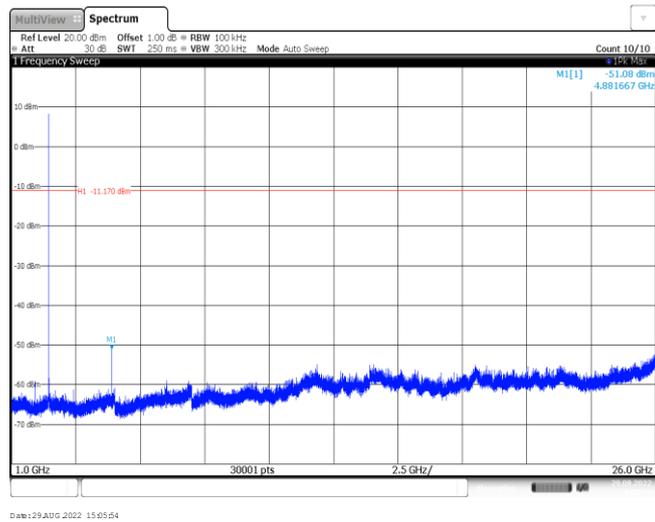
CH39
Reference level

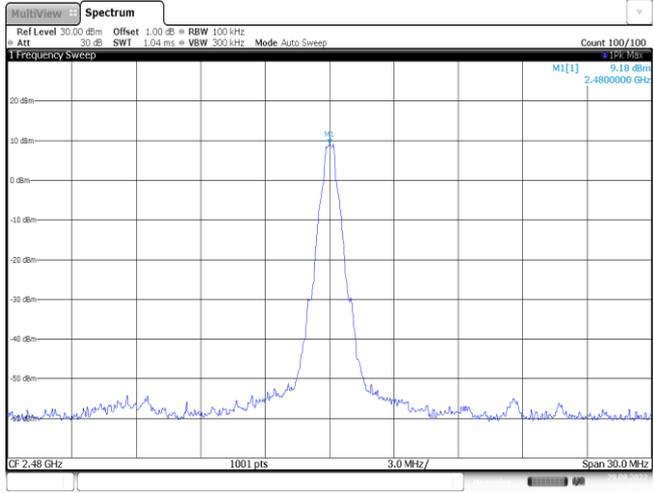
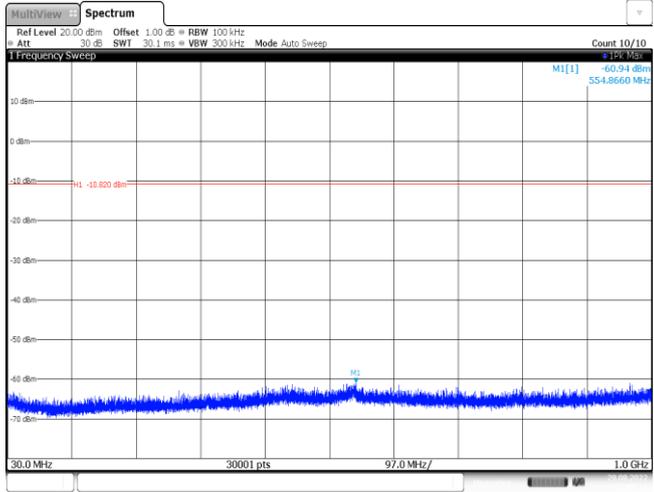
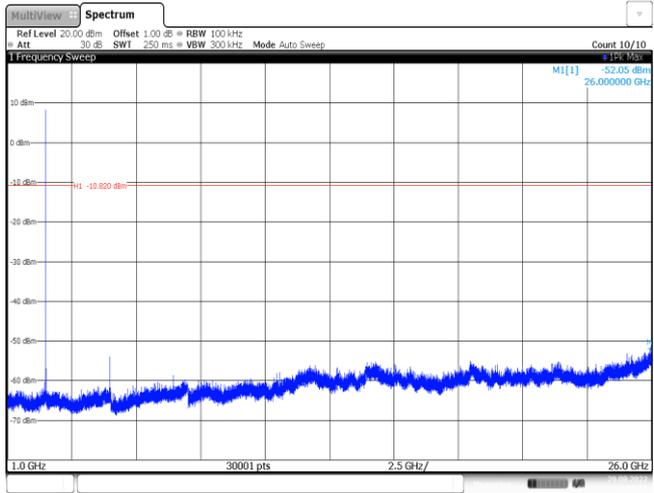


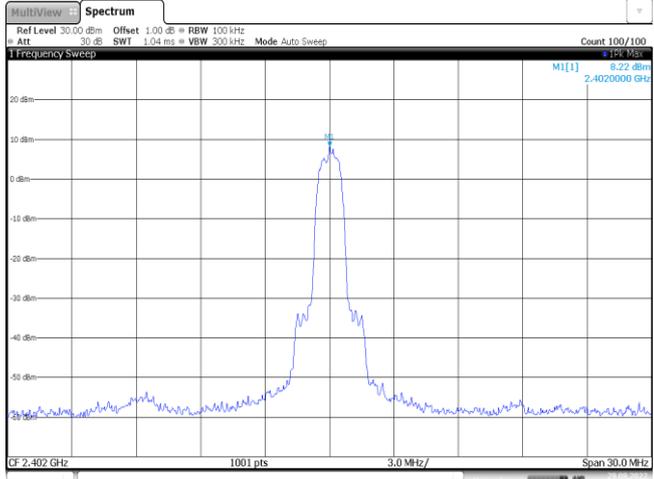
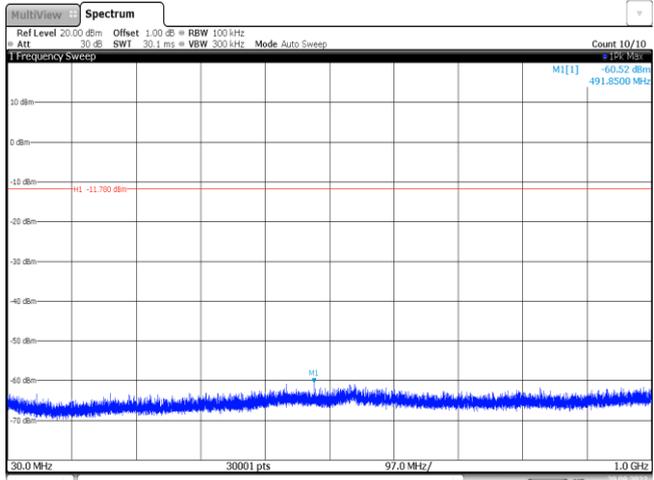
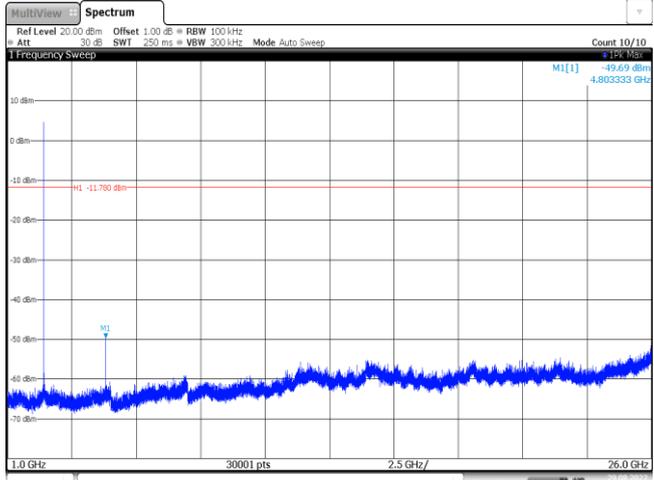
CH39
30MHz~1000MHz



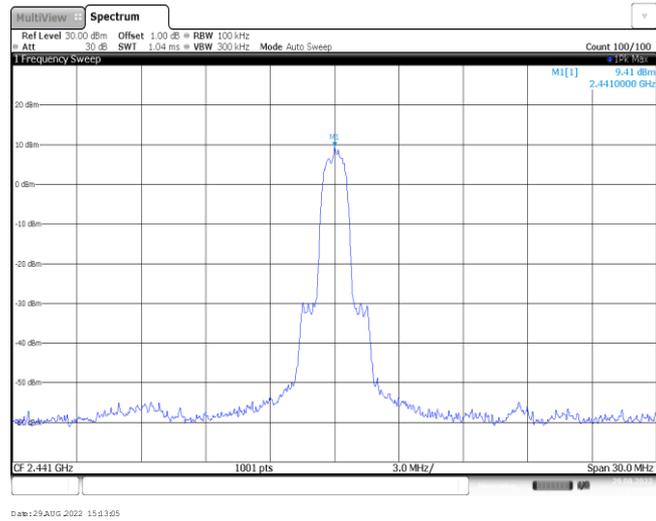
CH39
1GHz~26GHz



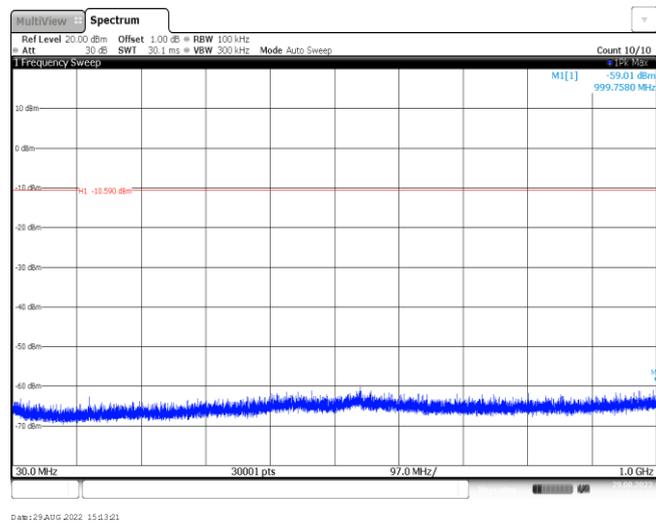
<p>CH78 Reference level</p>	 <p>The plot shows a single sharp peak at 2.48 GHz with a magnitude of 9.18 dBm. The y-axis ranges from -80 dBm to 20 dBm, and the x-axis is centered at 2.48 GHz with a 3.0 MHz span.</p>
<p>CH78 30MHz~1000MHz</p>	 <p>The plot shows a noise floor around -70 dBm across the 30 MHz to 1000 MHz range. A red horizontal line is drawn at -10.820 dBm. A small peak is visible at 554.8660 MHz with a magnitude of -60.94 dBm.</p>
<p>CH78 1GHz~26GHz</p>	 <p>The plot shows a noise floor around -70 dBm across the 1 GHz to 26 GHz range. A red horizontal line is drawn at -10.820 dBm. A small peak is visible at 26.000000 GHz with a magnitude of -52.05 dBm.</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 SW1 1.04 ms VBW 300 kHz Mode Auto Sweep Count 100/100 MI[1] 8.22 dBm 2.4020000 GHz CF 2.402 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 29 AUG 2022 15:11:01</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] -60.52 dBm 491.8500 MHz MI -11.700 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 29 AUG 2022 15:11:17</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] -49.69 dBm 4.803333 GHz MI -11.700 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 29 AUG 2022 15:11:33</p>		

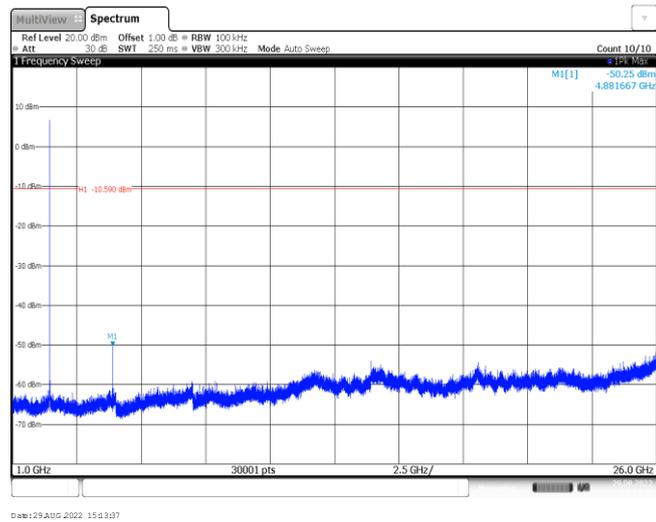
CH39
Reference level



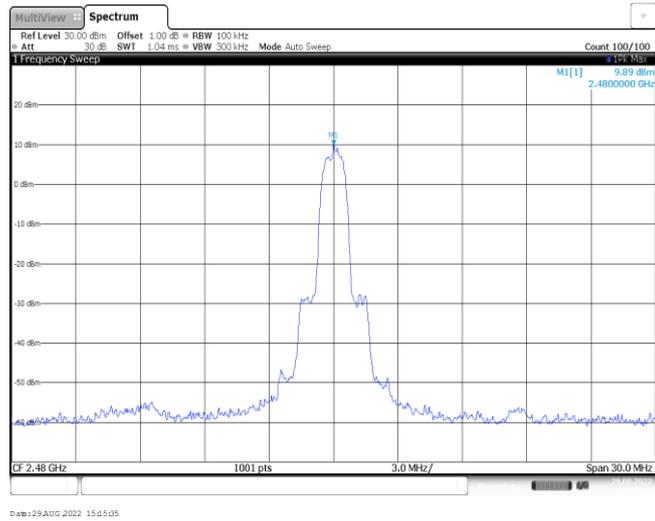
CH39
30MHz~1000MHz



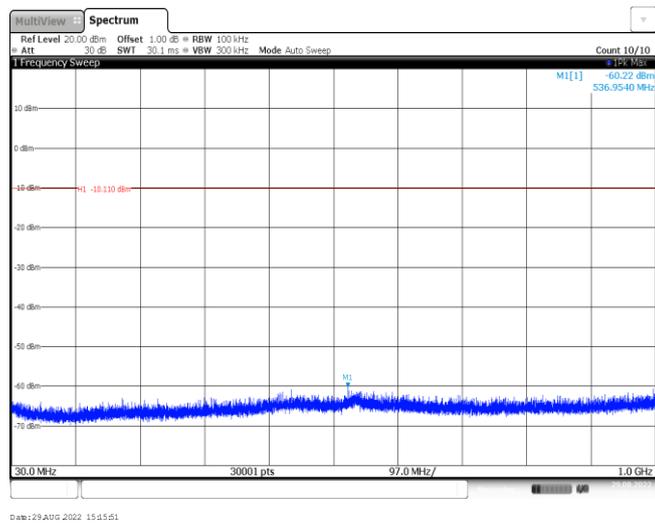
CH39
1GHz~26GHz



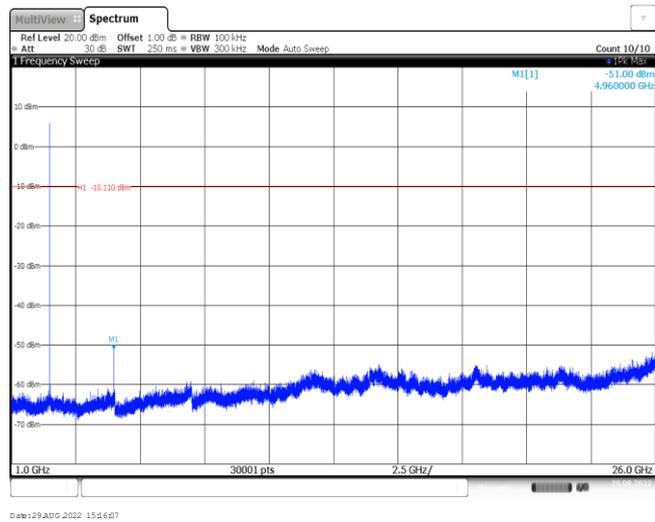
CH78
Reference level

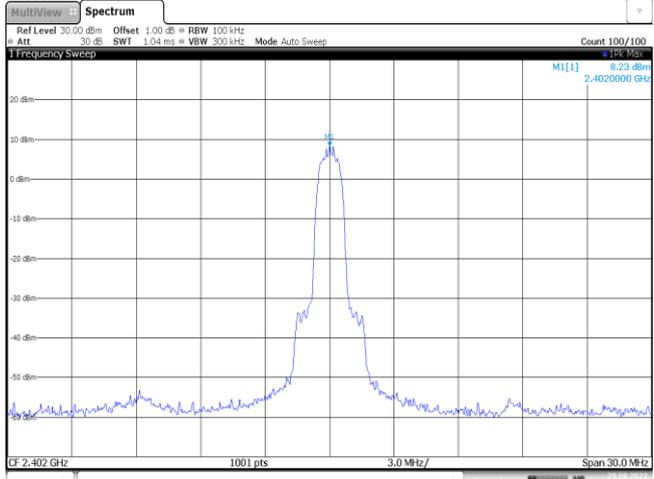
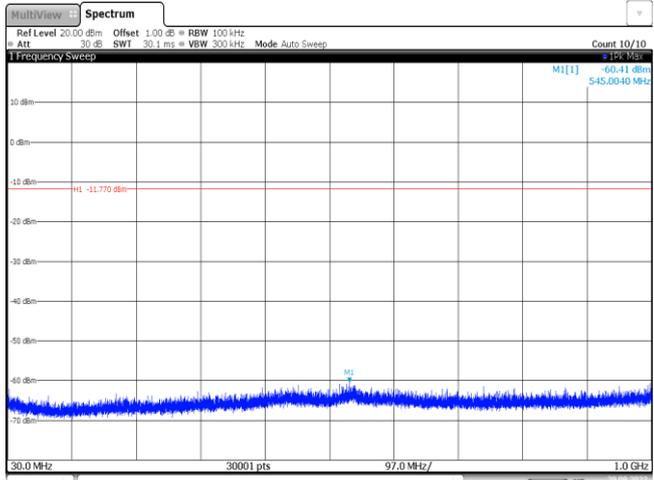
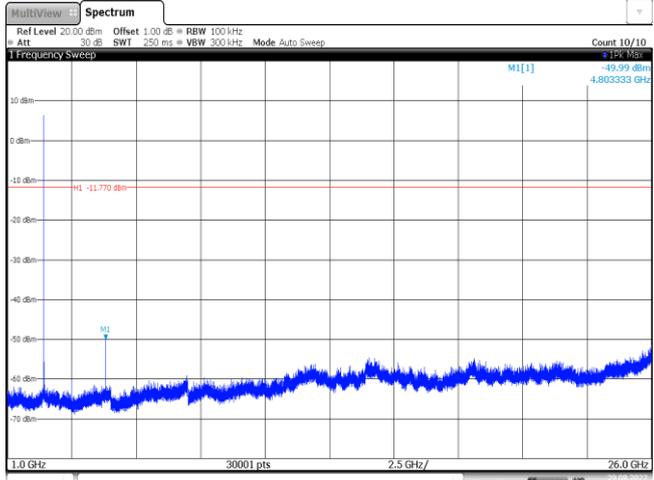


CH78
30MHz~1000MHz

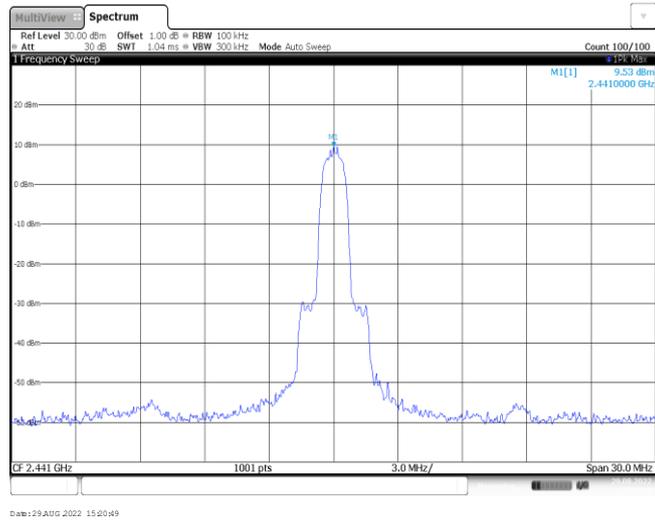


CH78
1GHz~26GHz

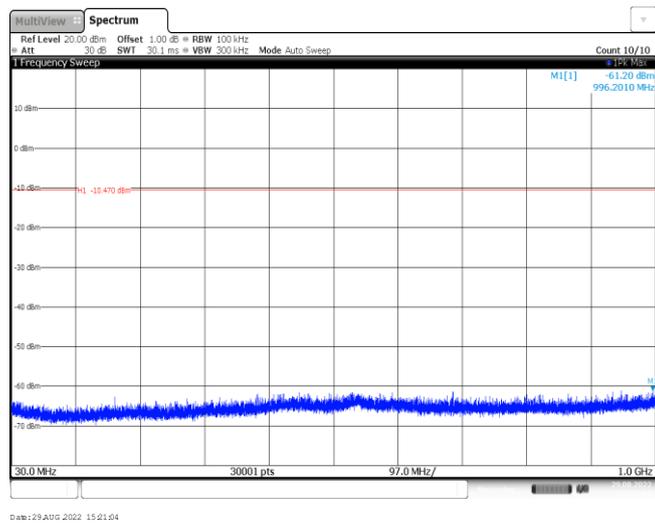


Test Item:	Spurious Emission	Modulation type:	8DPSK
<p>CH00 Reference level</p>	 <p>Ref Level 30.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SW1 1.04 ms VBW 300 kHz Mode Auto Sweep Count 100/100 M1[1] 8.23 dBm 2.402000 GHz CF 2.402 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 29 AUG 2022 15:18:24</p>		
<p>CH00 30MHz~1000MHz</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SW1 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 M1[1] -60.41 dBm 545.0040 MHz M1 -11.70 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 29 AUG 2022 15:18:29</p>		
<p>CH00 1GHz~26GHz</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SW1 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 M1[1] -49.99 dBm 4.803333 GHz M1 -11.70 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 29 AUG 2022 15:18:56</p>		

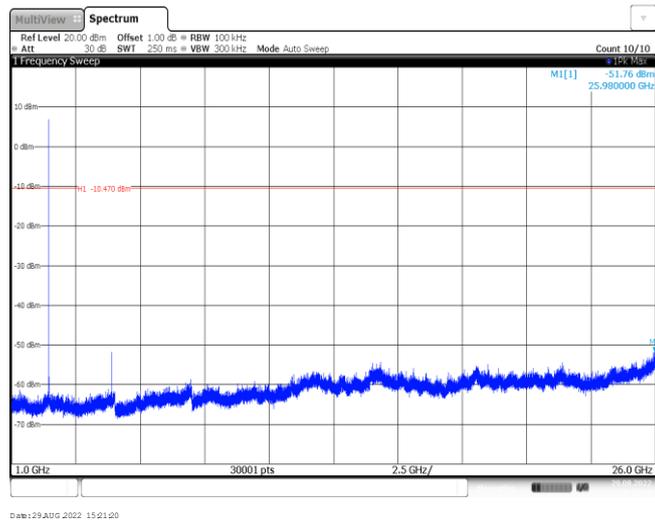
CH39
Reference level



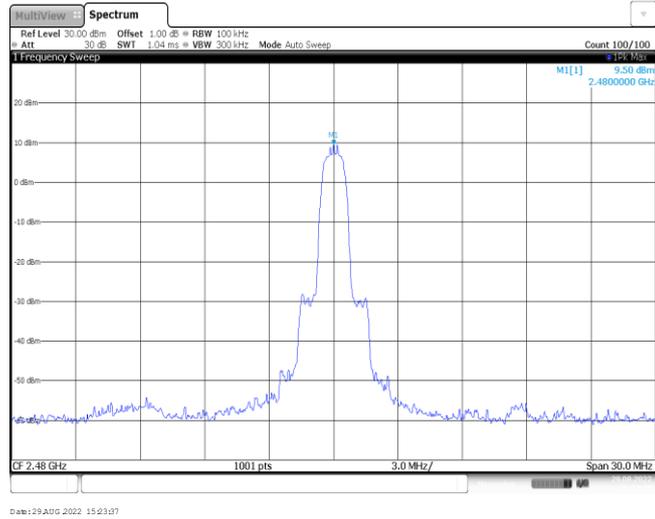
CH39
30MHz~1000MHz



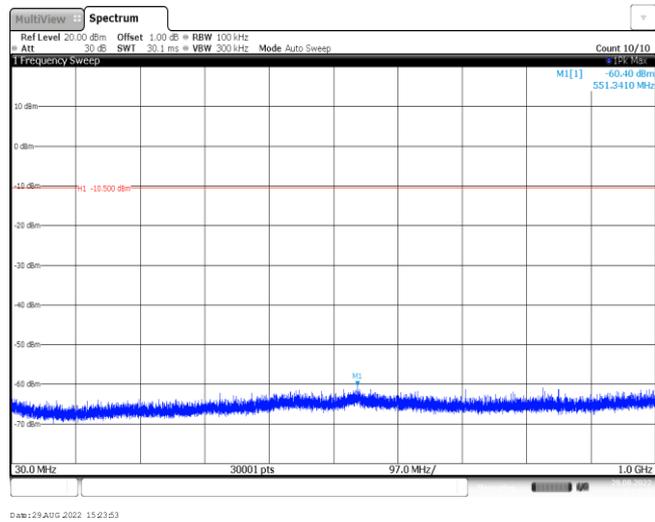
CH39
1GHz~26GHz



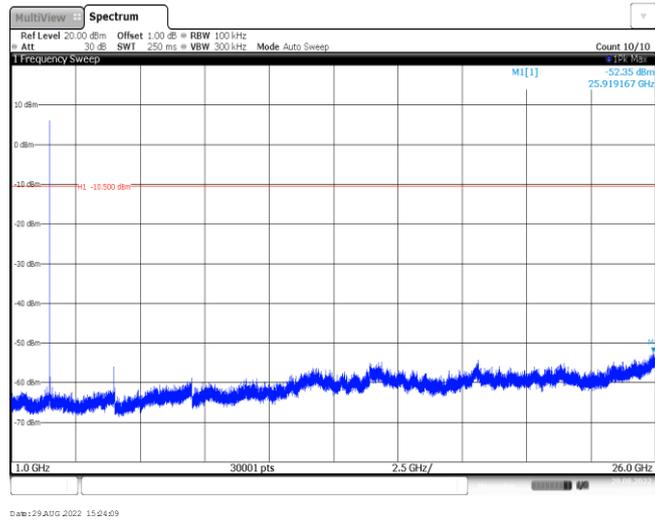
CH78
Reference level



CH78
30MHz~1000MHz



CH78
1GHz~26GHz



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