

APPENDIX REPORT

Project No.	SHT2204124301EW	Radio Specification	Bluetooth EDR
Test sample No.	YPHT22041243002	Model No.	HX320
Start test date	2022-11-07	Finish date	2022-11-07
Temperature	24.6℃	Humidity	36%
Test Engineer	Xiaoxiao Li	Auditor	Xiaodong Zheo

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	9.01	8.72	≤ 30.00	Pass
	39	8.64	8.35		
	78	7.32	7.24		
$\pi/4$ DQPSK	00	8.43	8.02	≤ 21.00	Pass
	39	8.05	7.71		
	78	7.15	6.71		
8DPSK	00	8.77	8.42	≤ 21.00	Pass
	39	8.31	7.70		
	78	7.27	6.81		

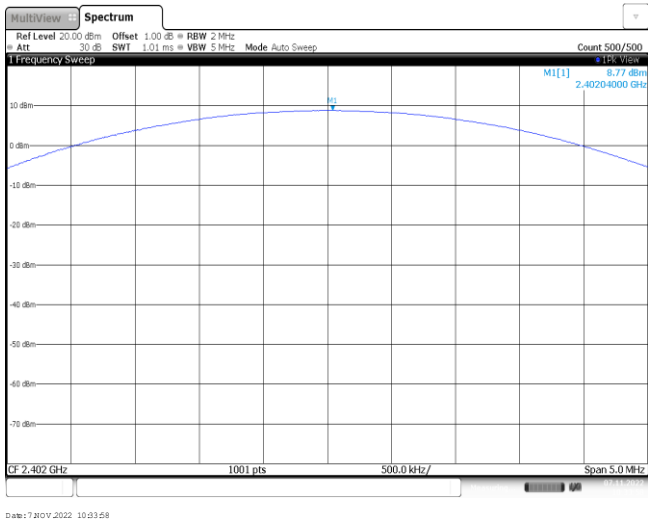
Appendix report page: 3 of 41

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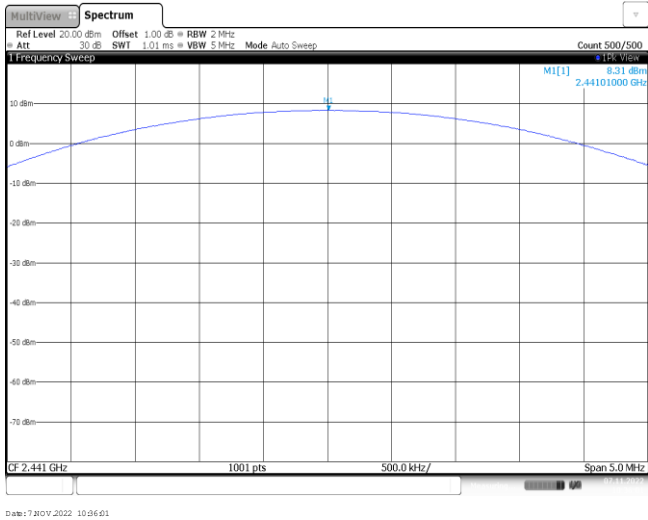
Modulation Type:

8DPSK

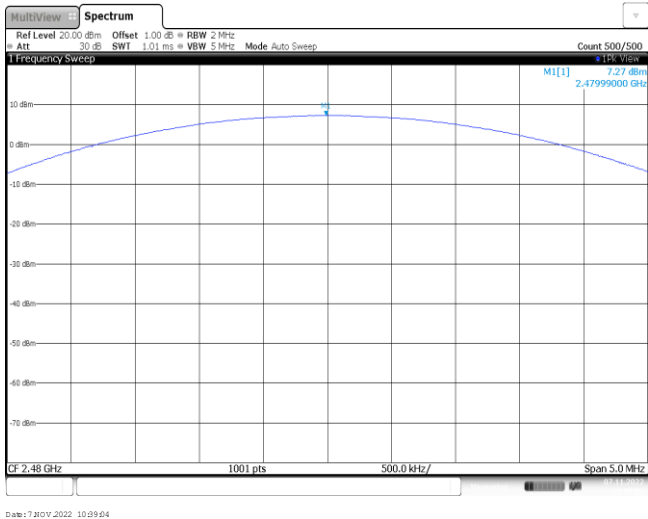
CH00



CH39



CH78



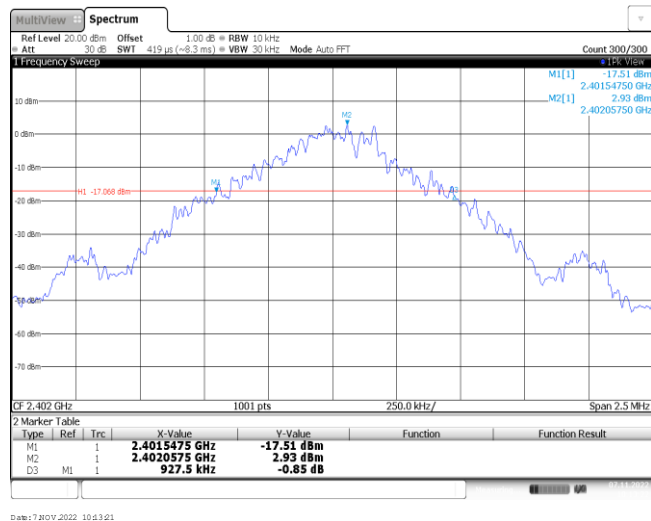
Appendix B : 20 dB Bandwidth

Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	927.50	-	Pass
	39	927.50		
	78	927.50		
$\pi/4$ DQPSK	00	1355.00	-	Pass
	39	1357.50		
	78	1362.50		
8DPSK	00	1337.50	-	Pass
	39	1340.00		
	78	1340.00		

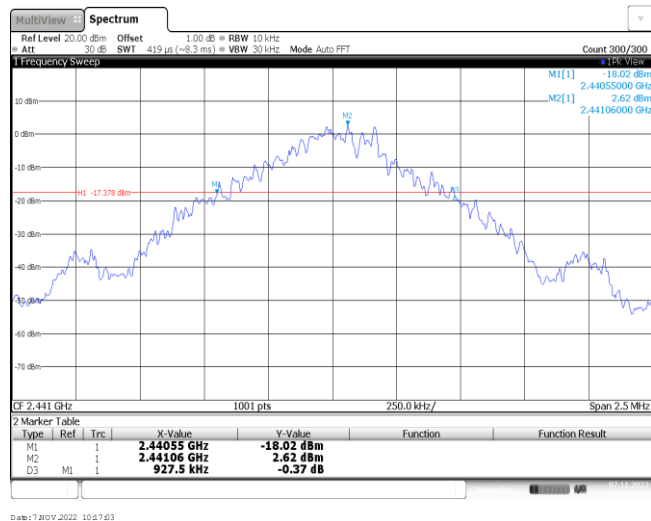
Modulation Type:

GFSK

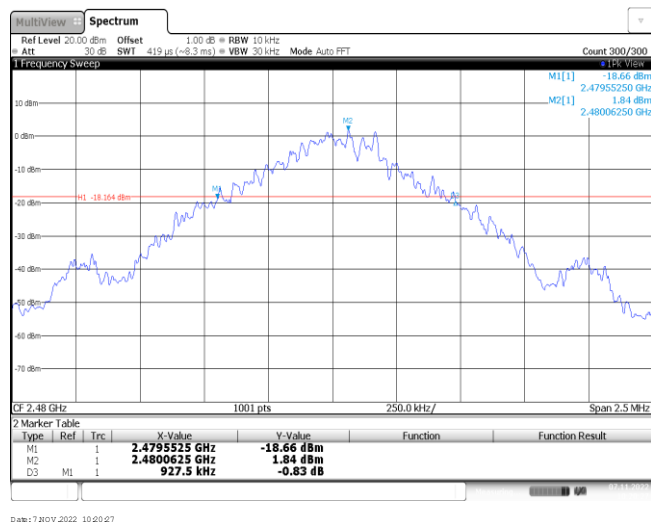
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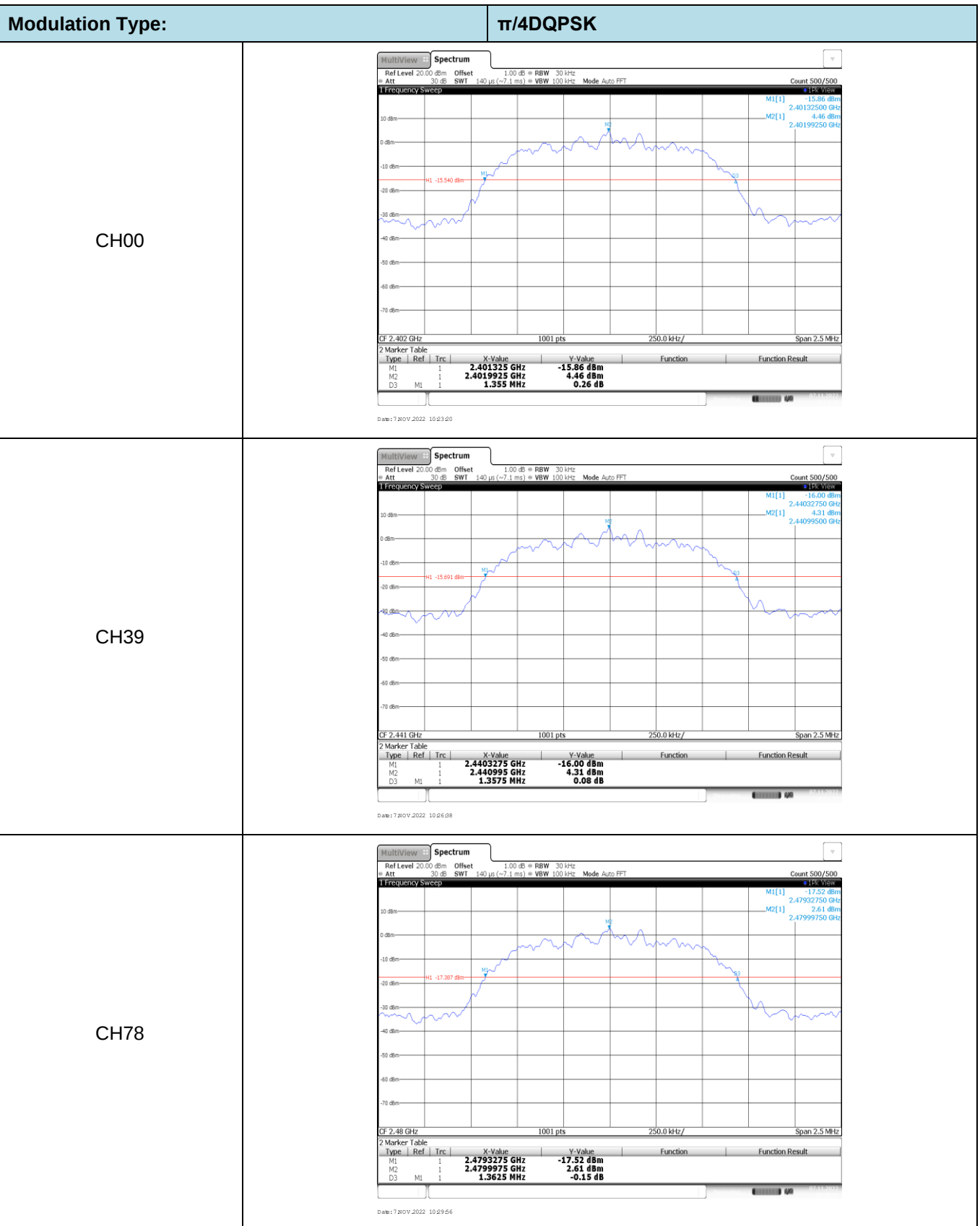


CH39



CH78

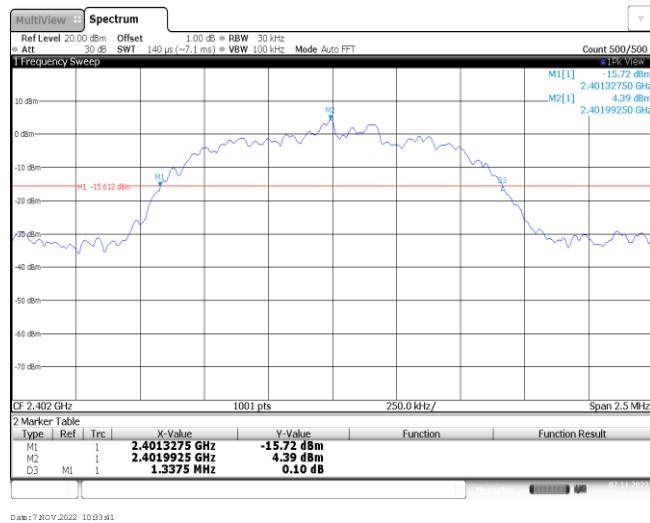




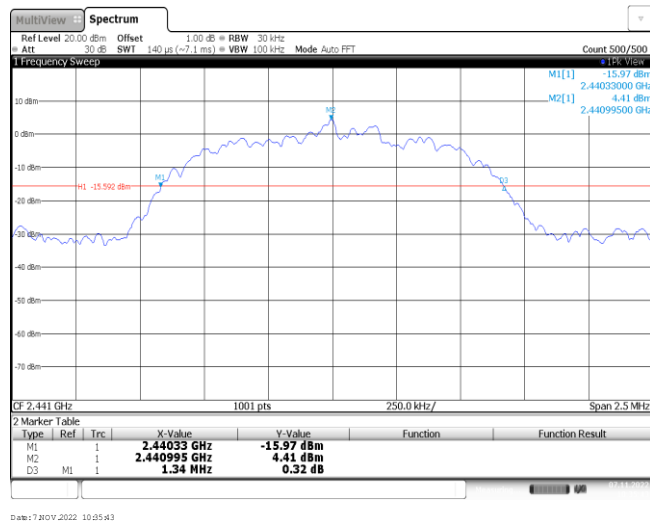
Modulation Type:

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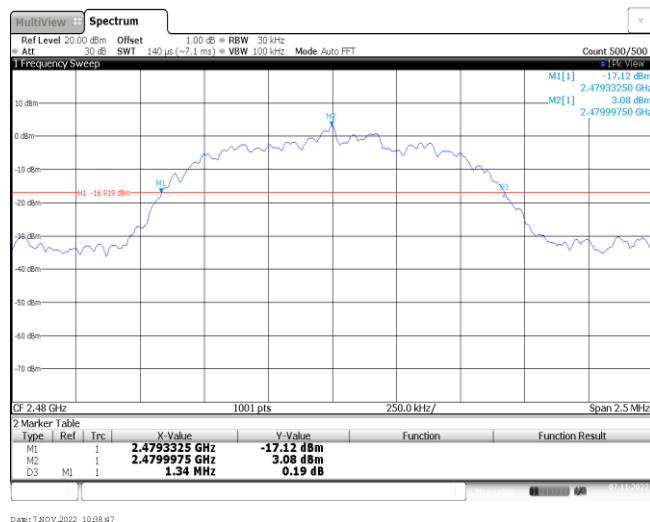
CH00



CH39



CH78



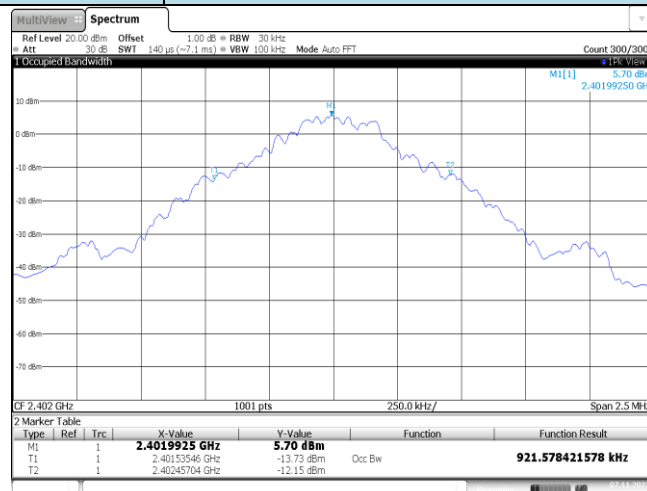
Appendix C: 99% Occupied Bandwidth

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	1.22	-	Pass
	39	1.22		
	78	1.22		
8DPSK	00	1.23	-	Pass
	39	1.23		
	78	1.23		

Modulation Type:

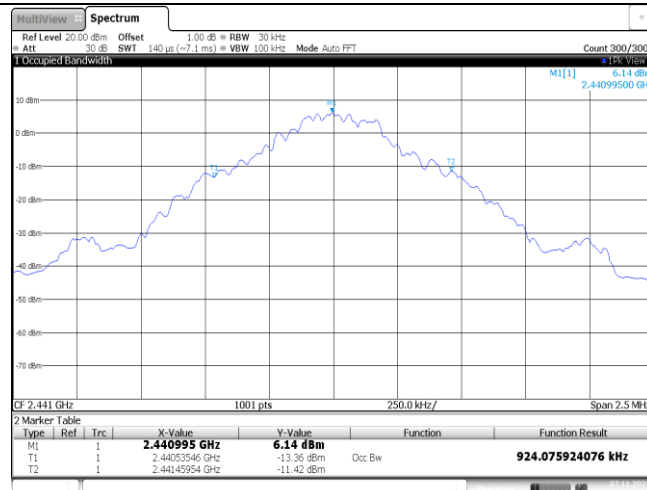
GFSK

CH00



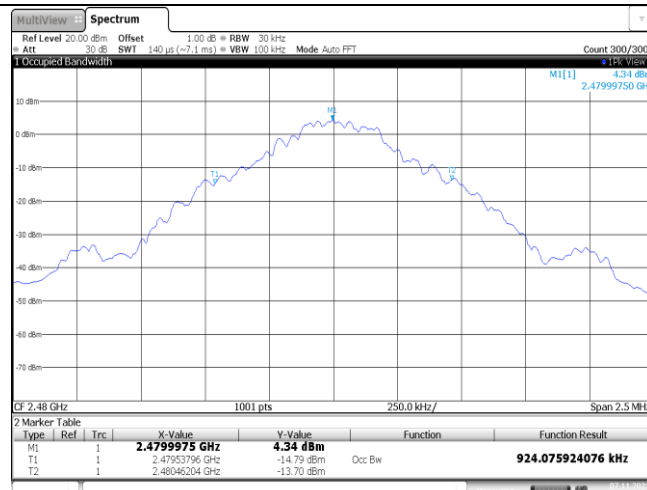
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CH39



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CH78

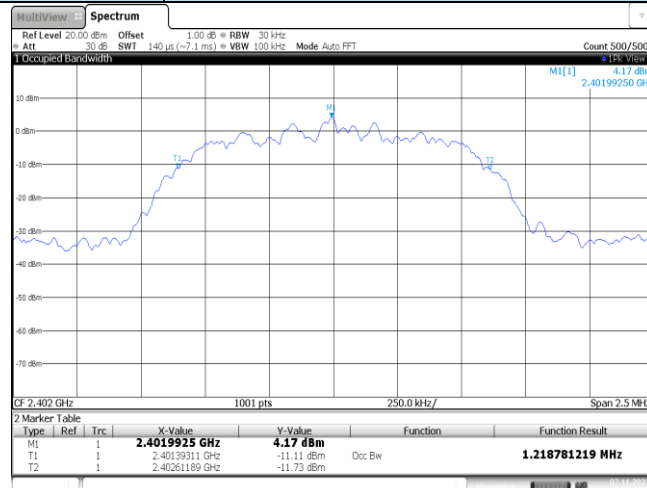


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Modulation Type:

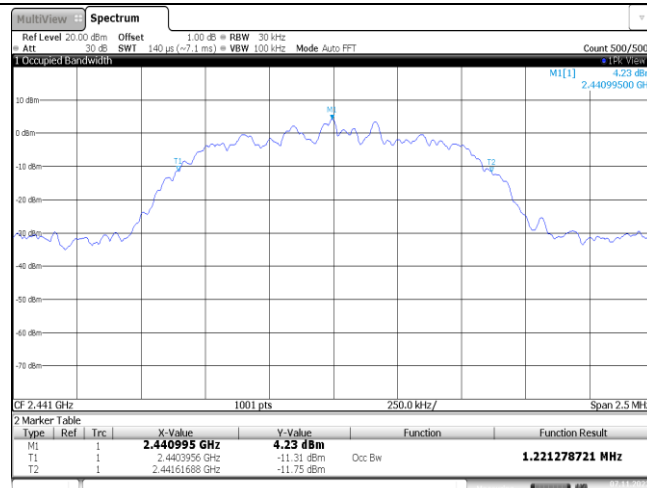
 $\pi/4$ DQPSK

CH00



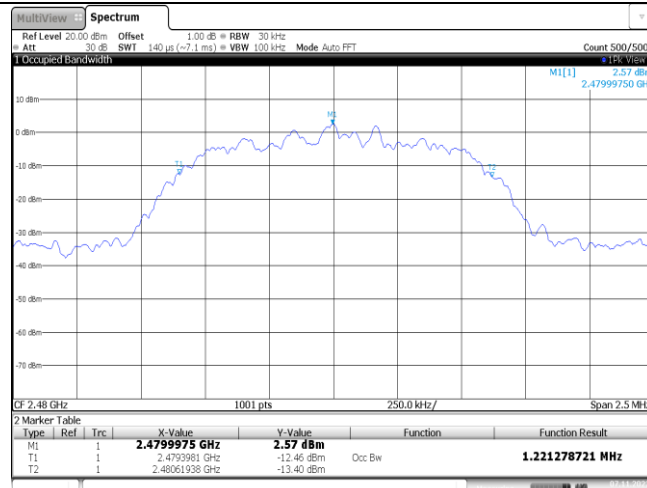
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CH39



Date: 7/30/2022 10:24:46

CH78

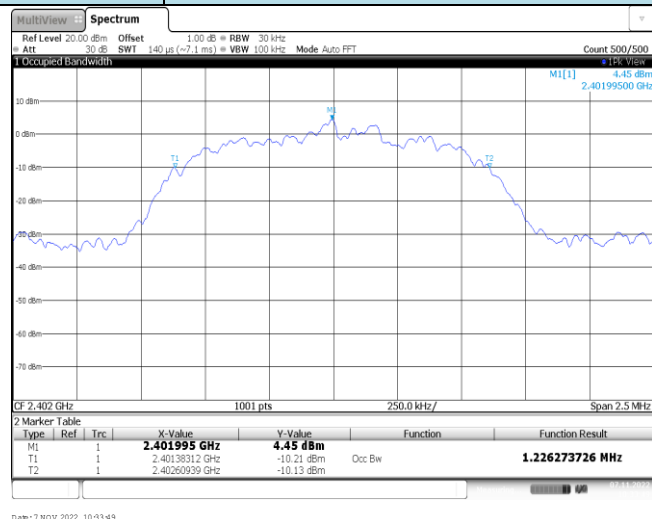


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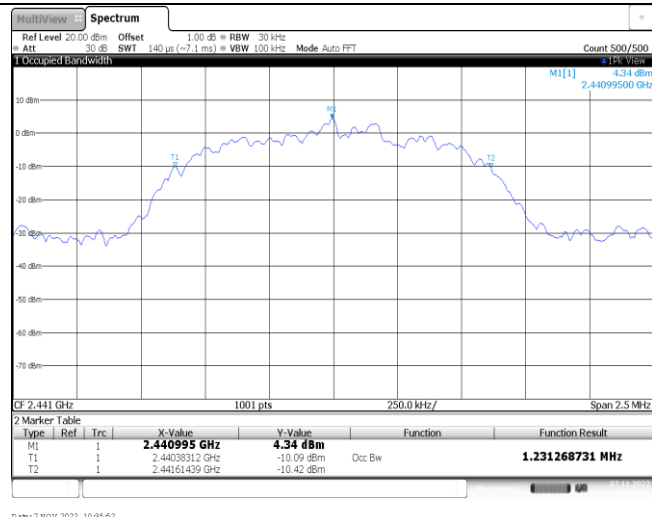
Modulation Type:

8DPSK

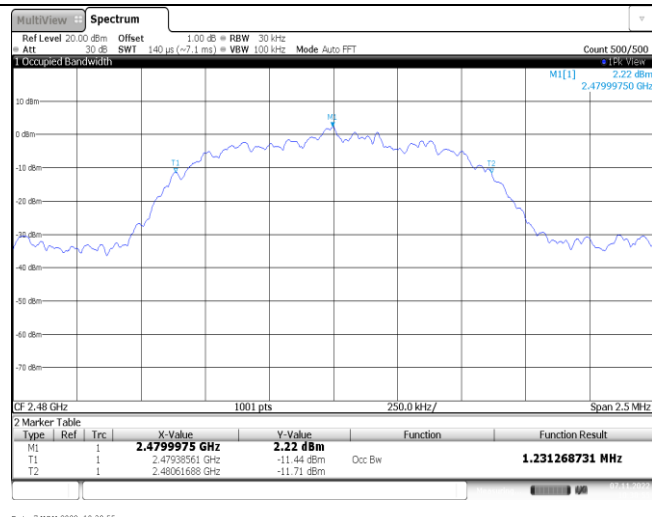
CH00



CH39



CH78



Appendix D: Carrier Frequencies Separation

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (kHz) *	Result
GFSK	39	1.00	≥927.50	Pass
π/4DQPSK	39	1.00	≥908.33	Pass
8DPSK	39	1.00	≥893.33	Pass

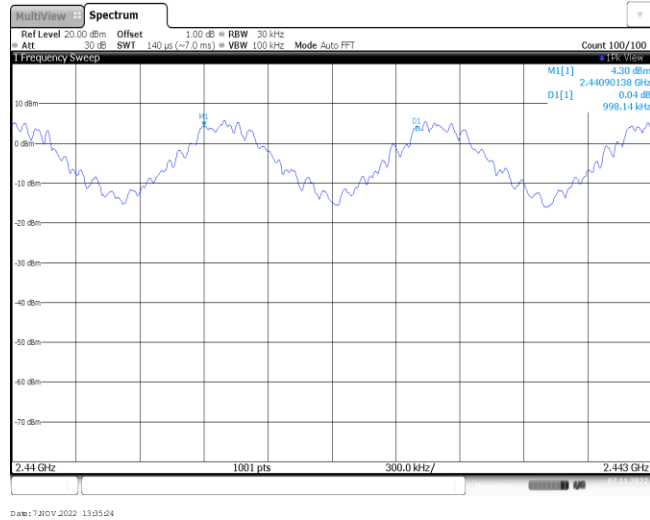
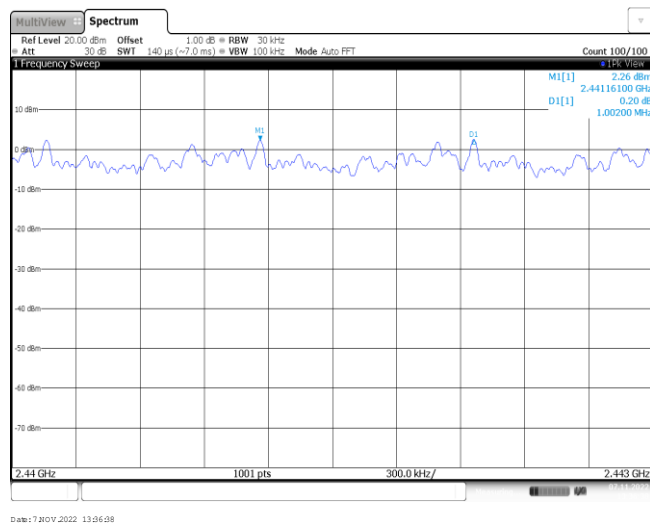
Note:

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

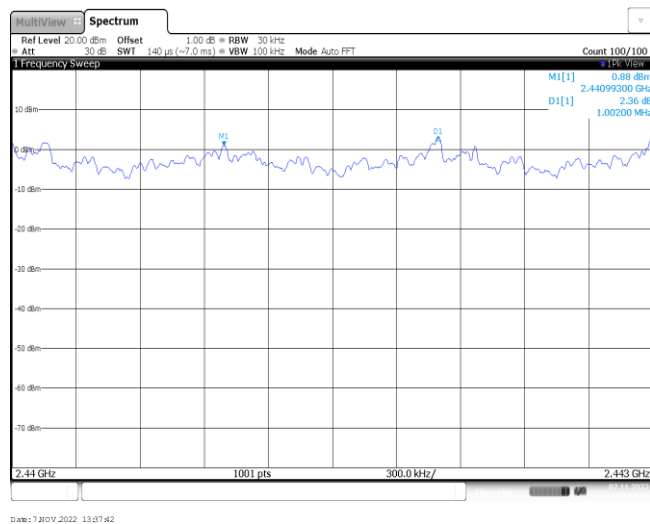
π/4DQPSK limit = $\frac{2}{3}$ * The maximum 20 dB Bandwidth for π/4DQPSK modulation on the appendix B.

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

GFSK

 $\pi/4$ DQPSK

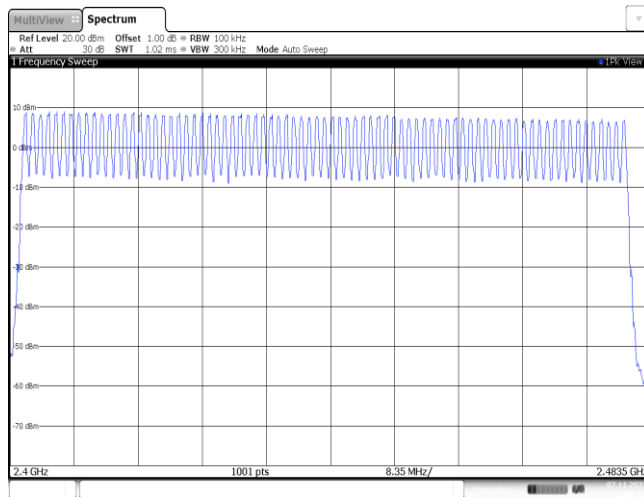
8DPSK



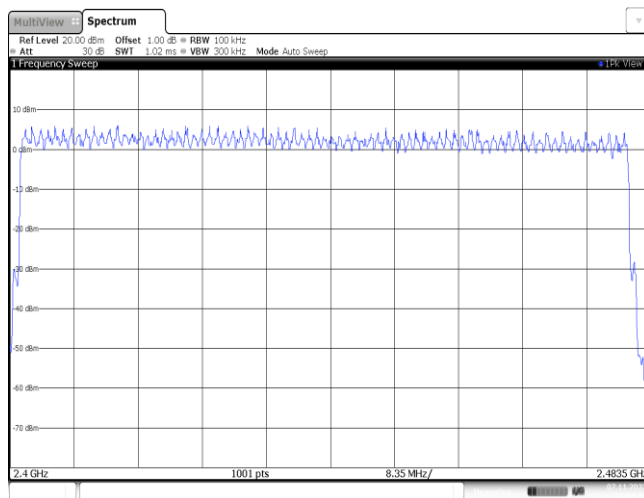
Appendix E: Hopping Channel Number

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

GFSK

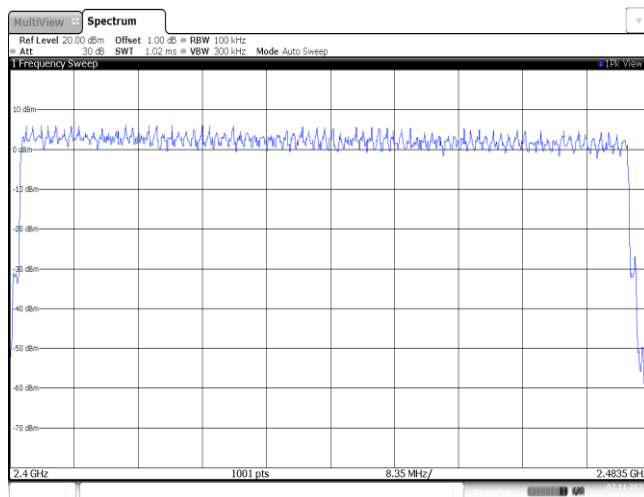


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 $\pi/4$ DQPSK

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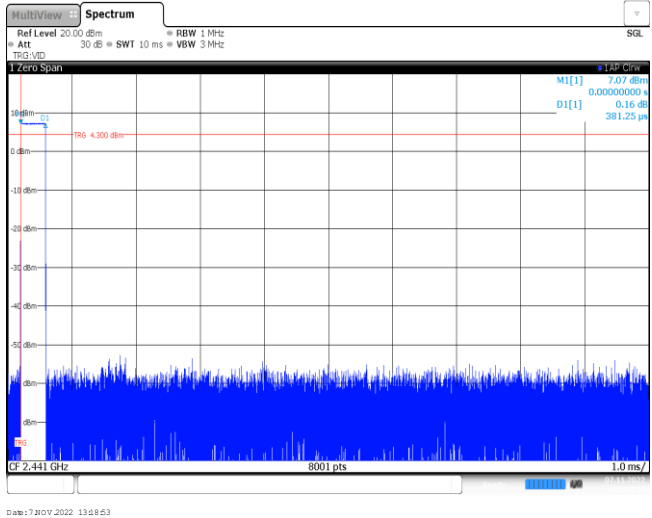
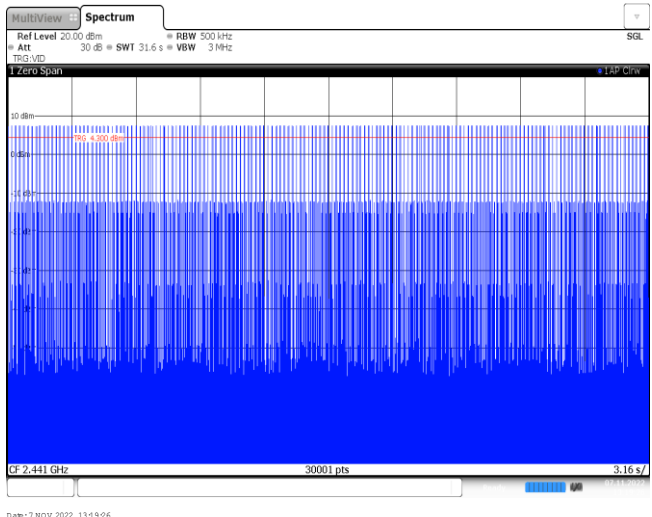
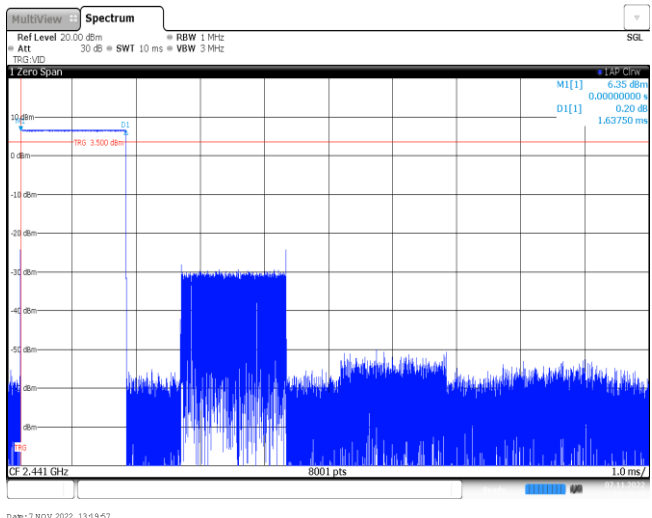
8DPSK

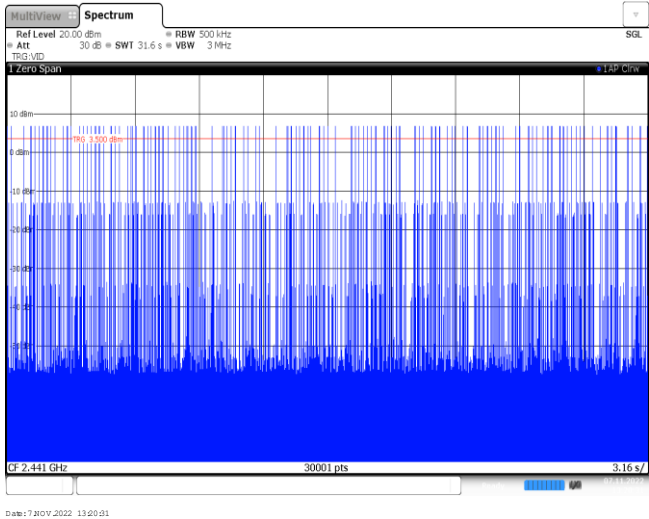
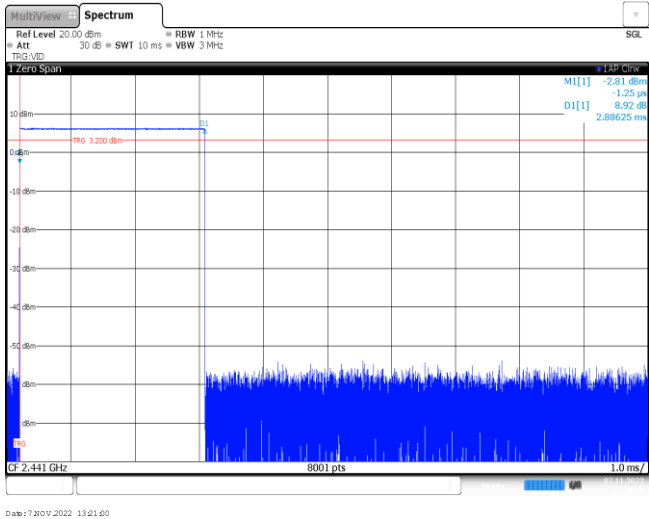
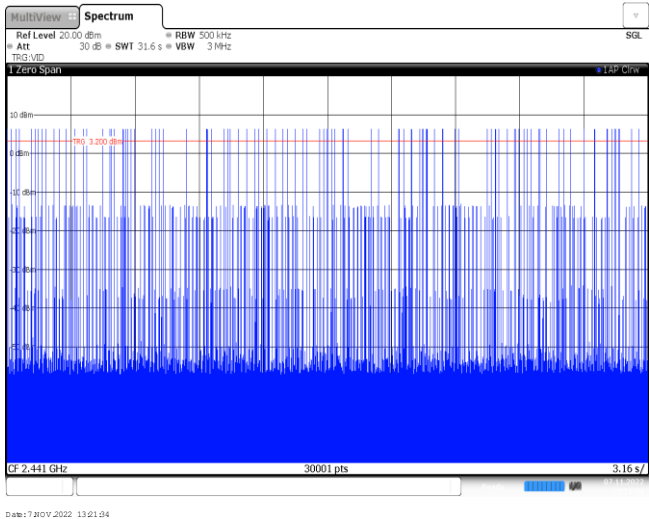


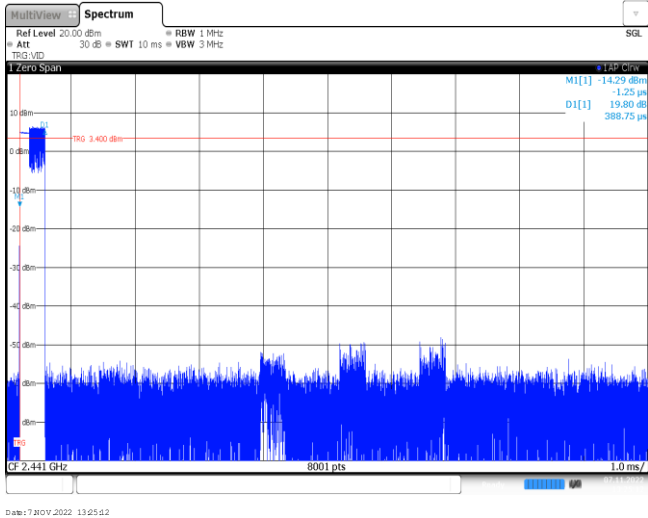
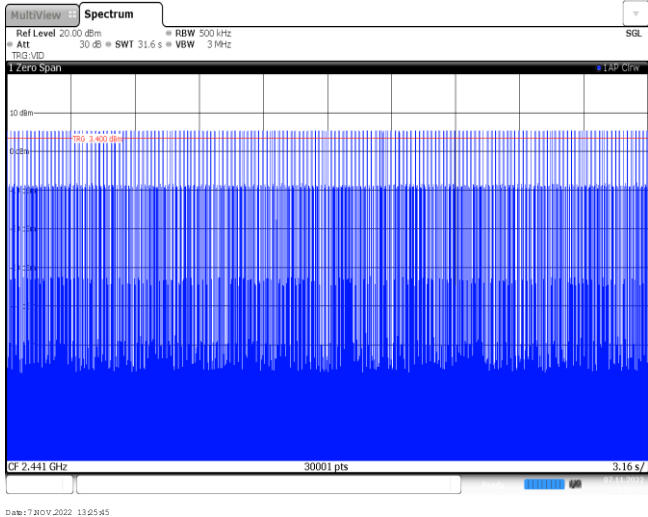
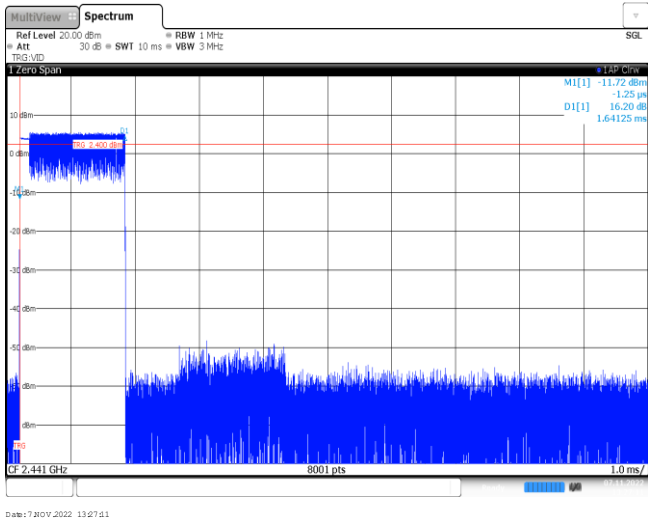
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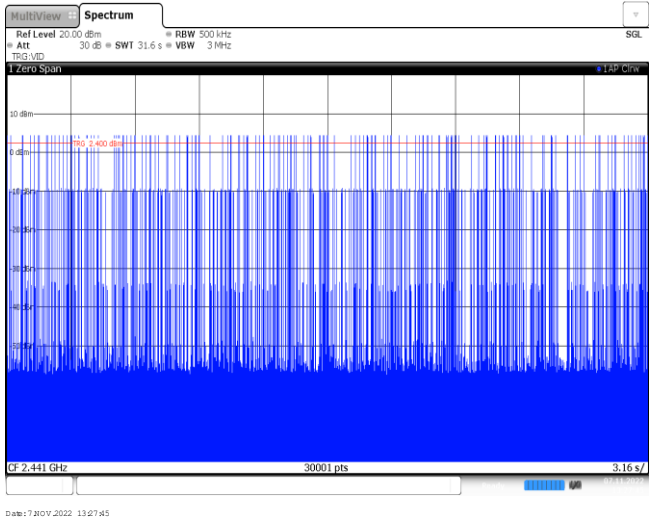
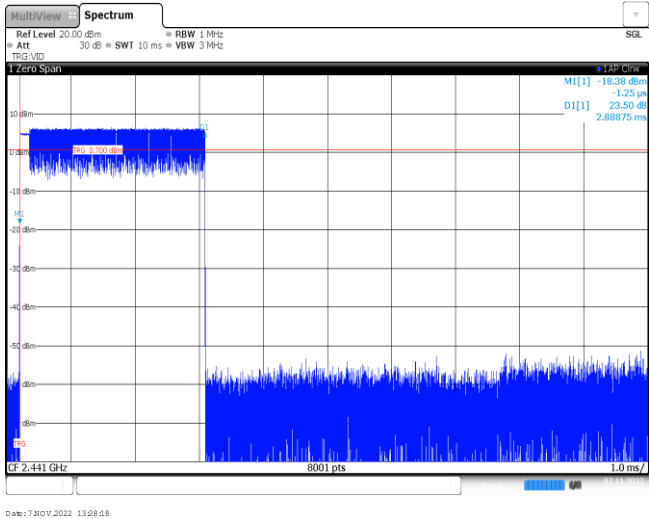
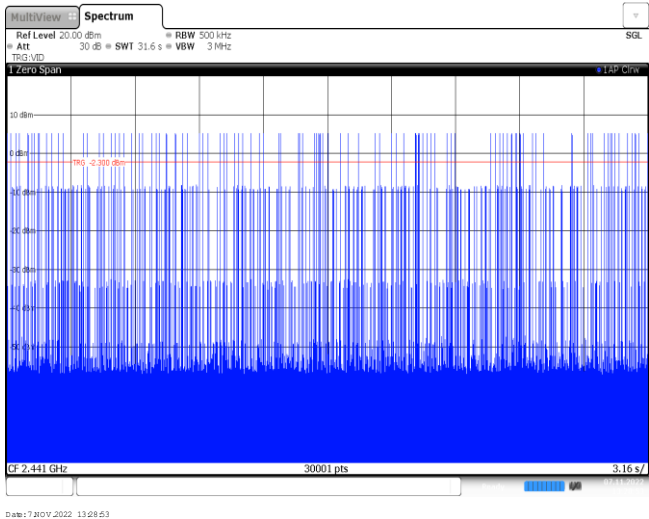
Appendix F: Dwell Time

Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.38	319	0.12	≤ 0.40	Pass
	DH3	1.64	156	0.26		
	DH5	2.89	99	0.29		
$\pi/4$ DQPSK	2DH1	0.39	320	0.12	≤ 0.40	Pass
	2DH3	1.64	164	0.27		
	2DH5	2.89	101	0.29		
8DPSK	3DH1	0.39	318	0.12	≤ 0.40	Pass
	3DH3	1.64	161	0.26		
	3DH5	2.89	102	0.30		

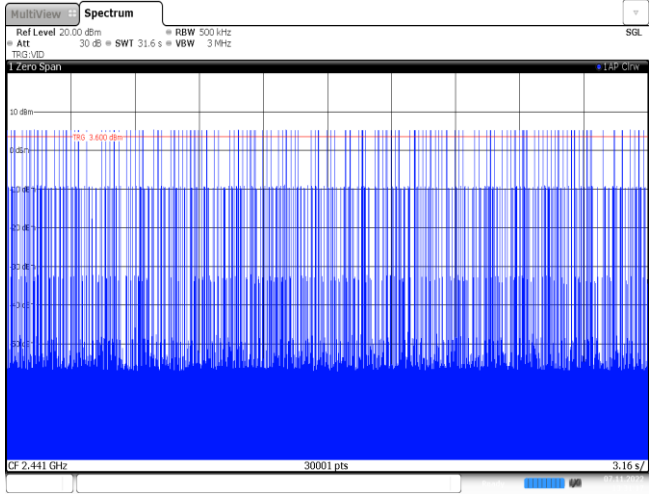
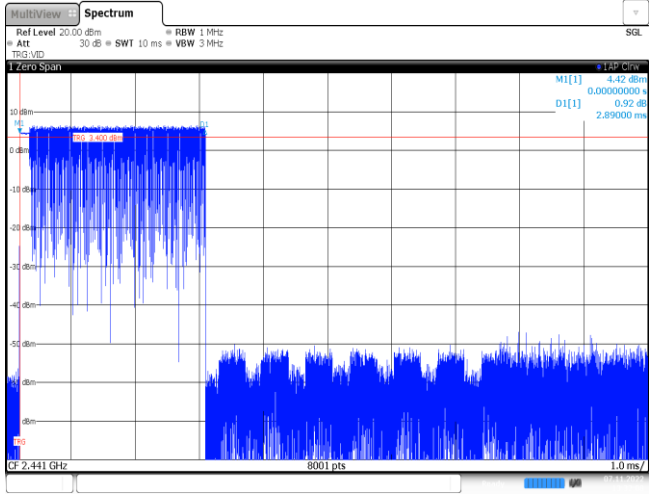
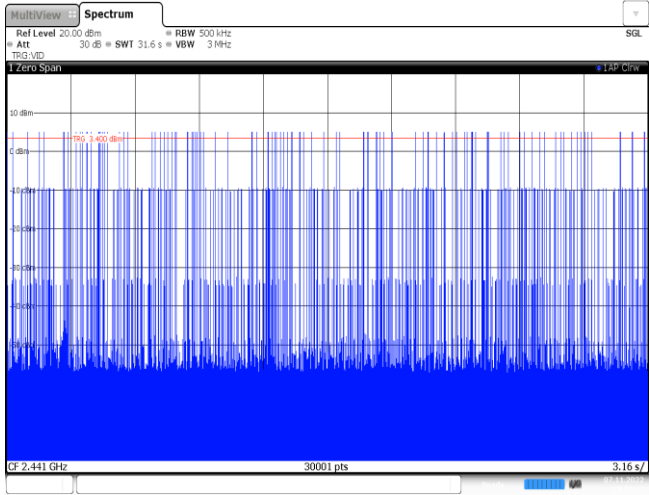
Modulation Type:	GFSK
DH1 Burst width	 The spectrum plot shows a single burst of signal at 2.441 GHz. The y-axis represents power in dBm, ranging from -50 to 10. The x-axis represents frequency in MHz, ranging from 2.440 to 2.442. A red line indicates the burst width at -30 dBm, which is 4.300 dBm. The plot shows a sharp peak at the center frequency, with a bandwidth of approximately 1 MHz. The signal is centered at 2.441 GHz. The plot is titled 'Spectrum' and shows 'Zero Span'. Ref Level 20.00 dBm Att 30 dB RBW 1 MHz SWT 10 ms VBW 3 MHz CF 2.441 GHz 8001 pts 1.0 ms/ Date: 7/20/2022 13:48:53
DH1 Burst number	 The spectrum plot shows a continuous burst of signal at 2.441 GHz. The y-axis represents power in dBm, ranging from -50 to 10. The x-axis represents frequency in MHz, ranging from 2.440 to 2.442. The plot shows a dense, continuous signal across the entire frequency range. The plot is titled 'Spectrum' and shows 'Zero Span'. Ref Level 20.00 dBm Att 30 dB RBW 500 kHz SWT 31.6 s VBW 3 MHz CF 2.441 GHz 30001 pts 3.16 s/ Date: 7/20/2022 13:49:26
DH3 Burst width	 The spectrum plot shows a burst of signal at 2.441 GHz. The y-axis represents power in dBm, ranging from -50 to 10. The x-axis represents frequency in MHz, ranging from 2.440 to 2.442. A red line indicates the burst width at -30 dBm, which is 3.500 dBm. The plot shows a sharp peak at the center frequency, with a bandwidth of approximately 1 MHz. The signal is centered at 2.441 GHz. The plot is titled 'Spectrum' and shows 'Zero Span'. Ref Level 20.00 dBm Att 30 dB RBW 1 MHz SWT 10 ms VBW 3 MHz CF 2.441 GHz 8001 pts 1.0 ms/ Date: 7/20/2022 13:49:57

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	

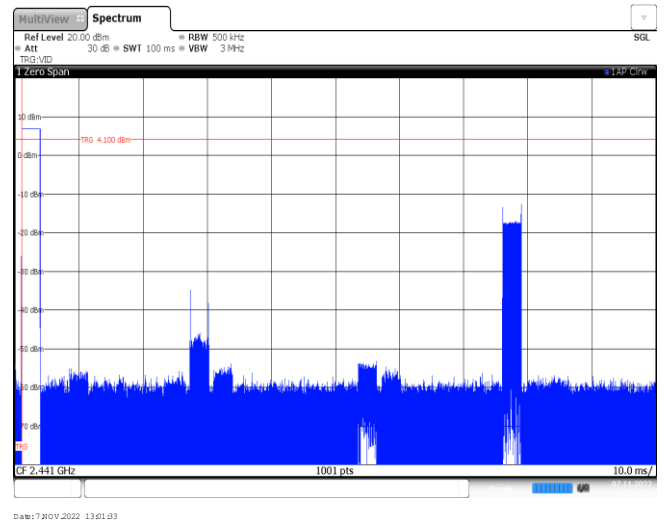
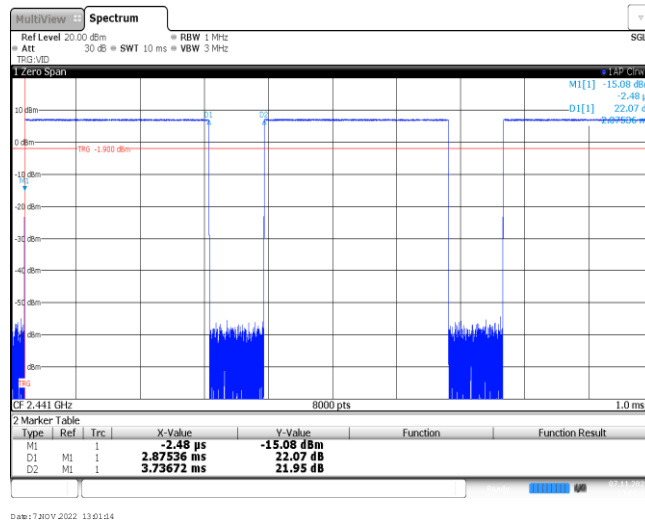
Modulation Type:		8DPSK
3DH1 Burst width		
3DH1 Burst number		
3DH3 Burst width		

3DH3 Burst number	 The spectrum plot shows a dense, continuous signal across the frequency range from 2.441 GHz to 3.16 GHz. The y-axis represents power in dBm, ranging from -50 to 10. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, RBW 500 kHz, BW 31.6 s, and VSW 3 MHz. The x-axis is labeled 'CF 2.441 GHz' and '30001 pts'. The date is 7 NOV 2022 13:01:46.
3DH5 Burst width	 The spectrum plot shows a signal burst that is wider than the previous one. The y-axis represents power in dBm, ranging from -50 to 10. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, RBW 1 MHz, BW 10 ms, and VSW 3 MHz. The x-axis is labeled 'CF 2.441 GHz' and '8001 pts'. The date is 7 NOV 2022 13:02:08.
3DH5 Burst number	 The spectrum plot shows a dense, continuous signal across the frequency range from 2.441 GHz to 3.16 GHz. The y-axis represents power in dBm, ranging from -50 to 10. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, RBW 500 kHz, BW 31.6 s, and VSW 3 MHz. The x-axis is labeled 'CF 2.441 GHz' and '30001 pts'. The date is 7 NOV 2022 13:02:41.

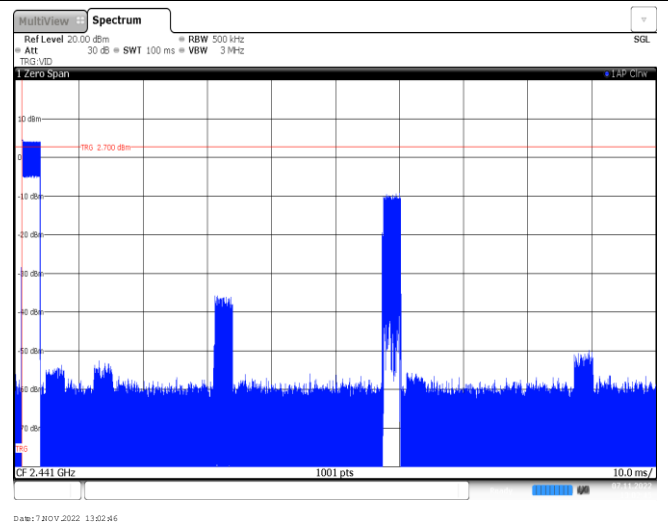
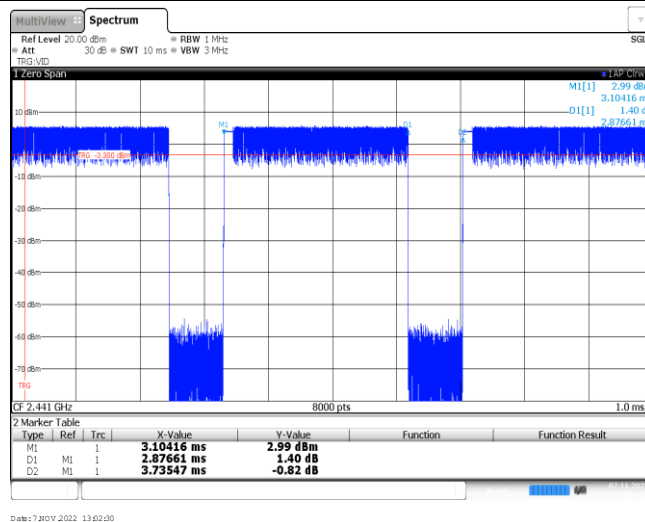
Appendix G: Duty Cycle Correction Factor (DCCF)

DCCF Calculate Formula					
$DCCF = 20 * \text{Log}(\text{duty cycle}) = 20 * \text{Log}(T_{\text{on time}} / T_{\text{period}})$					
Modulation type	Test Frequency (MHz)	$T_{\text{on time}}$ for single burst [ms]	T_{period} [ms]	Burst Quantity	DCCF [dB]
GFSK	2441	2.88	100	2	-24.79
$\pi/4$ DQPSK	2441	2.88	100	2	-24.79
8DPSK	2441	2.88	100	2	-24.79

GFSK

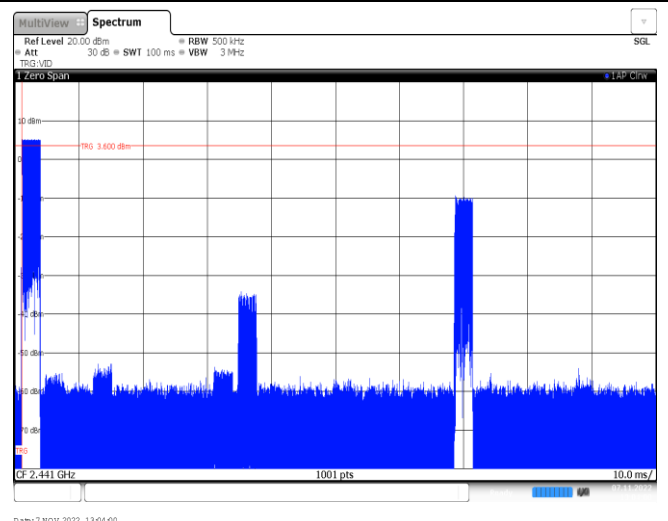
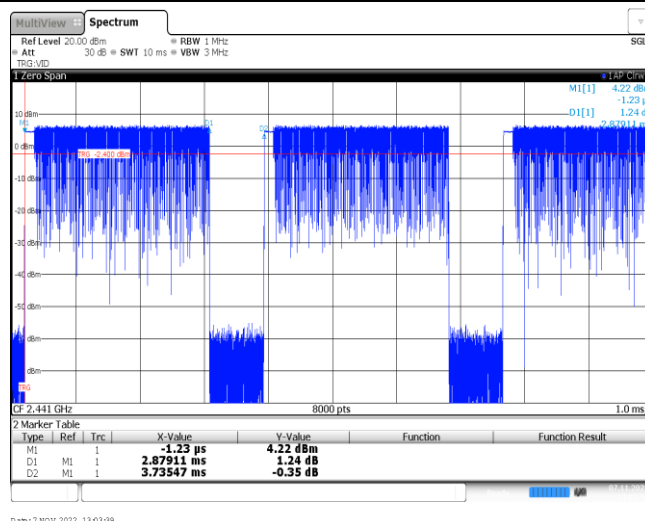
T_{on} time for single burst

Burst Quantity

 $\pi/4$ DQPSKT_{on} time for single burst

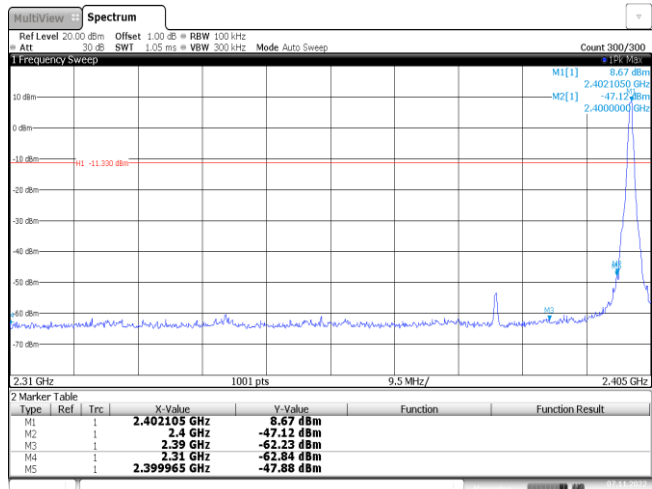
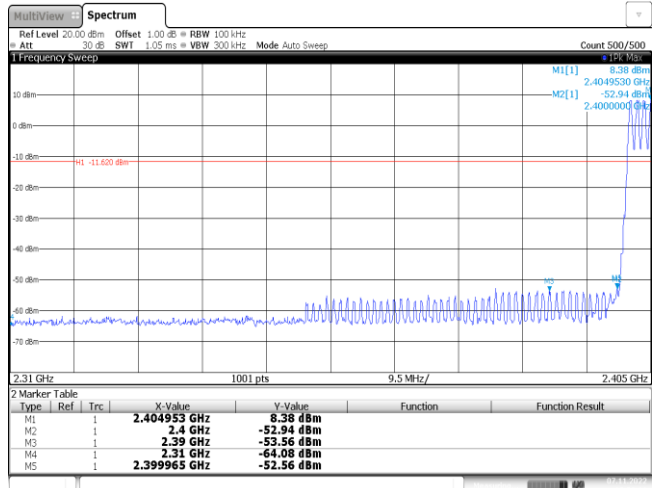
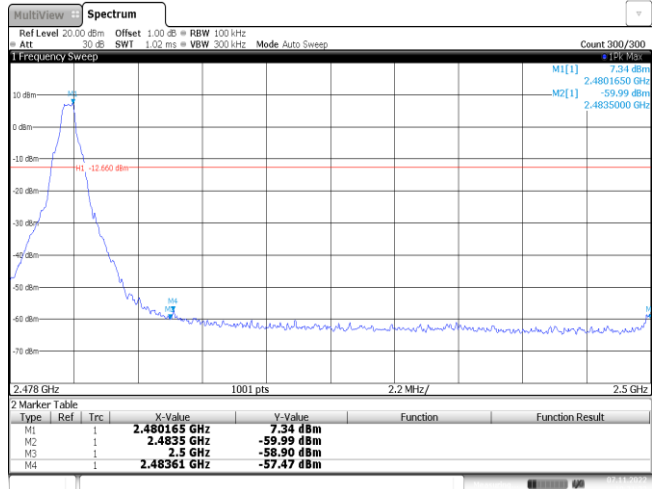
Burst Quantity

8DPSK

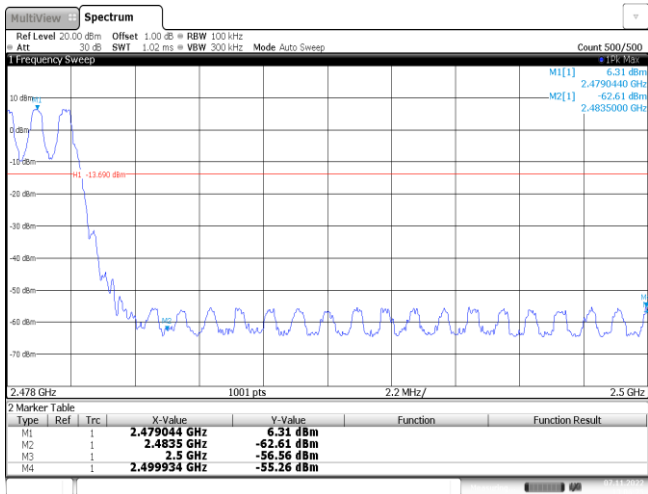
T_{on} time for single burst

Burst Quantity

Appendix H: Band edge and Spurious Emissions (conducted)

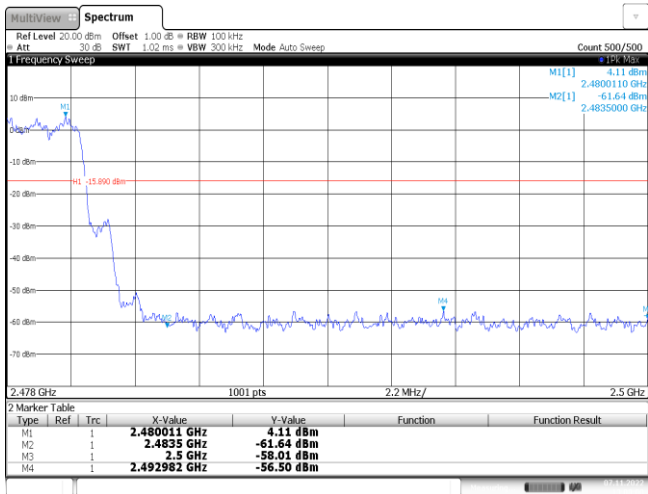
Test Item:	Band edge	Modulation type:	GFSK																																										
CH00 No hopping mode	 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.402105 GHz</td><td>8.67 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-47.12 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-62.23 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-62.84 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.399965 GHz</td><td>-47.88 dBm</td><td></td><td></td></tr></table> Date: 7 NOV 2022 10:54:46	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.402105 GHz	8.67 dBm			M2	1		2.4 GHz	-47.12 dBm			M3	1		2.39 GHz	-62.23 dBm			M4	1		2.31 GHz	-62.84 dBm			M5	1		2.399965 GHz	-47.88 dBm				
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.402105 GHz	8.67 dBm																																									
M2	1		2.4 GHz	-47.12 dBm																																									
M3	1		2.39 GHz	-62.23 dBm																																									
M4	1		2.31 GHz	-62.84 dBm																																									
M5	1		2.399965 GHz	-47.88 dBm																																									
CH00 Hopping mode	 2 Marker Table <table><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><tr><td>M1</td><td>1</td><td></td><td>2.404953 GHz</td><td>8.38 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-52.94 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-53.56 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-64.08 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.399965 GHz</td><td>-52.56 dBm</td><td></td><td></td></tr></table> Date: 7 NOV 2022 13:06:11	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.404953 GHz	8.38 dBm			M2	1		2.4 GHz	-52.94 dBm			M3	1		2.39 GHz	-53.56 dBm			M4	1		2.31 GHz	-64.08 dBm			M5	1		2.399965 GHz	-52.56 dBm				
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.404953 GHz	8.38 dBm																																									
M2	1		2.4 GHz	-52.94 dBm																																									
M3	1		2.39 GHz	-53.56 dBm																																									
M4	1		2.31 GHz	-64.08 dBm																																									
M5	1		2.399965 GHz	-52.56 dBm																																									
CH78 No hopping mode	 2 Marker Table <table><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><tr><td>M1</td><td>1</td><td></td><td>2.480165 GHz</td><td>7.34 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4835 GHz</td><td>-59.99 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.5 GHz</td><td>-58.90 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.48361 GHz</td><td>-57.47 dBm</td><td></td><td></td></tr></table> Date: 7 NOV 2022 10:21:21	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.480165 GHz	7.34 dBm			M2	1		2.4835 GHz	-59.99 dBm			M3	1		2.5 GHz	-58.90 dBm			M4	1		2.48361 GHz	-57.47 dBm											
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CH78
Hopping mode



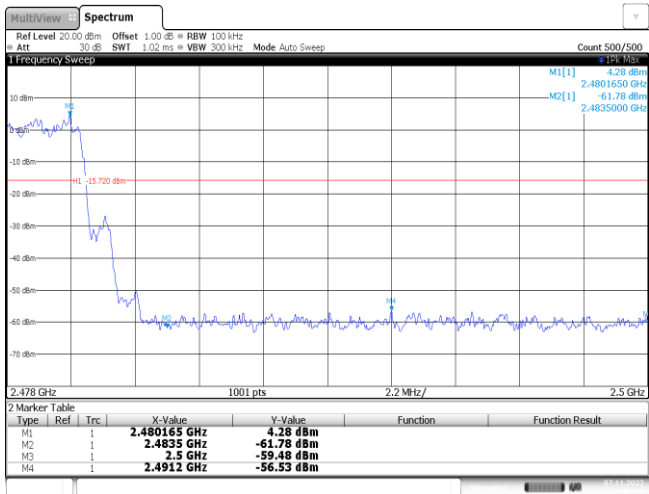
Test Item:	Band edge	Modulation type:	$\pi/4$ DQPSK
CH00 No hopping mode	<		

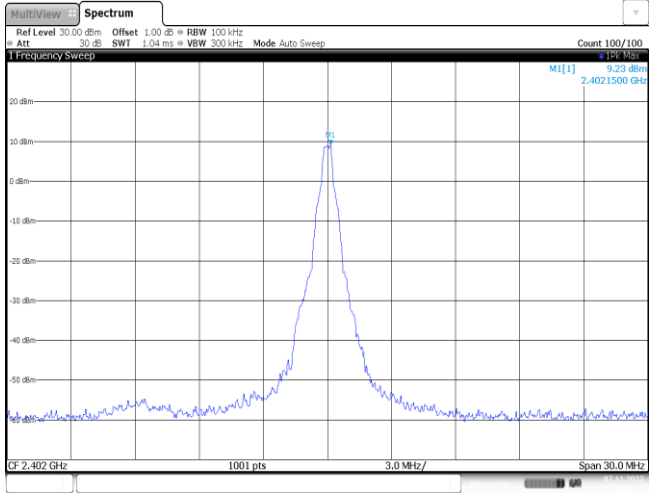
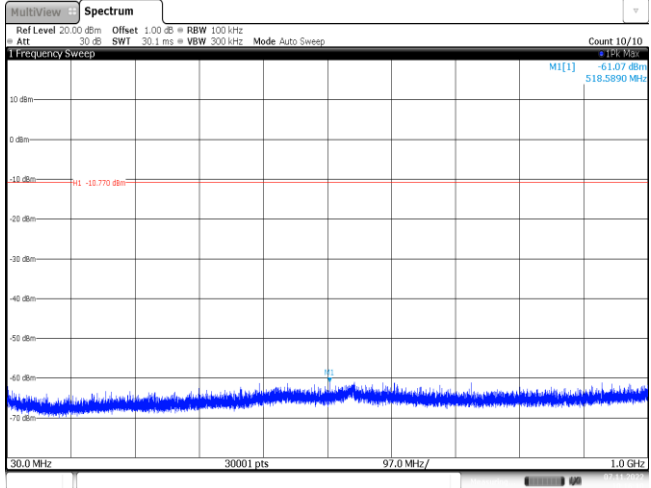
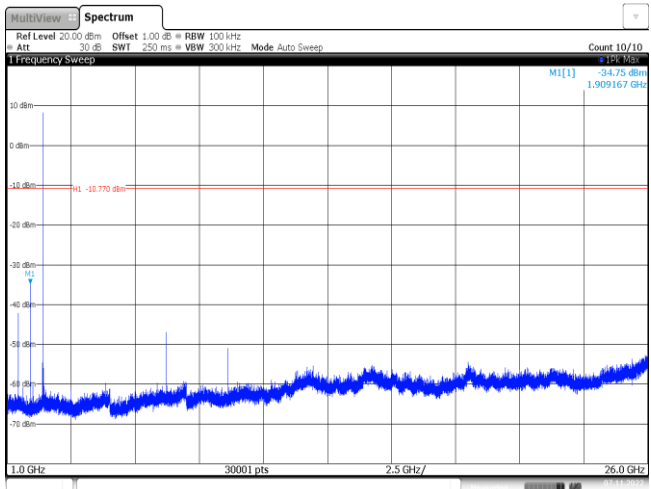
CH78
Hopping mode



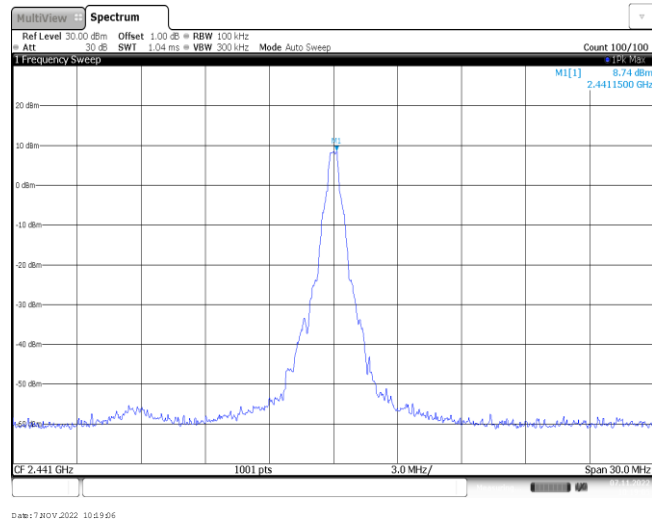
Test Item:	Band edge	Modulation type:	8DPSK
CH00 No hopping mode	</		

CH78
Hoppig mode

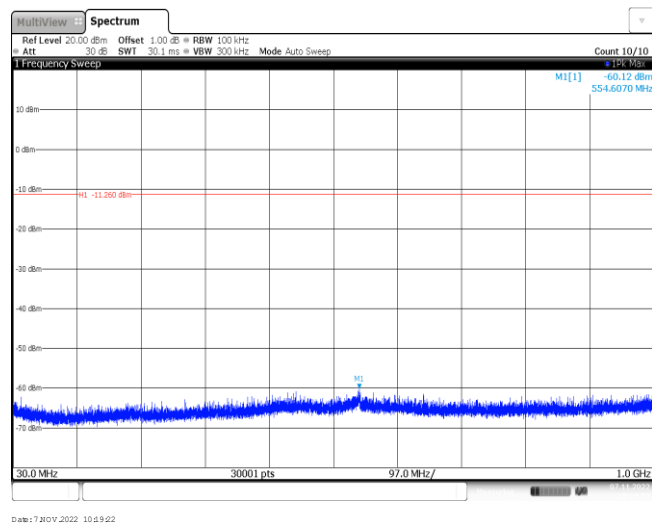


Test Item:	Spurious Emission	Modulation type:	GFSK
CH00 Reference level			
CH00 30MHz~1000MHz			
CH00 1GHz~26GHz			

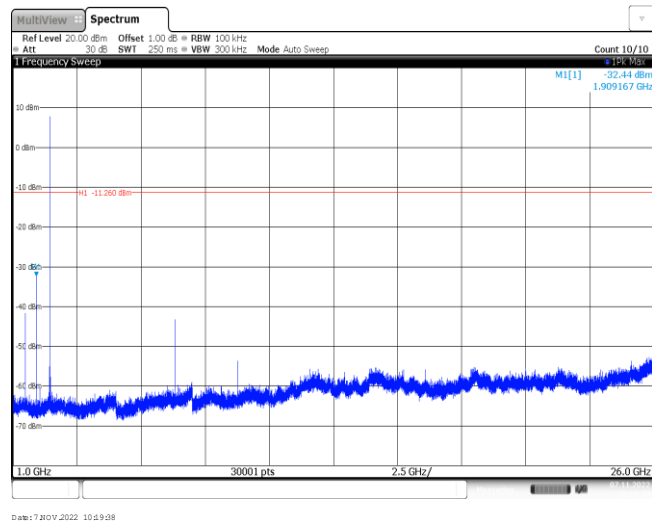
CH39
Reference level



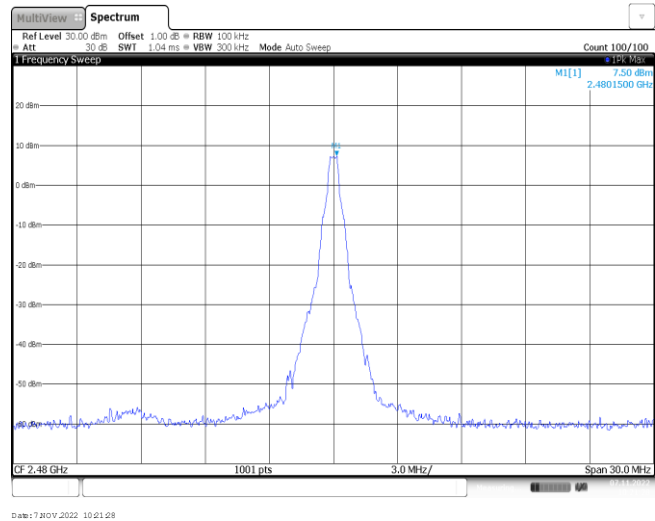
CH39
30MHz~1000MHz



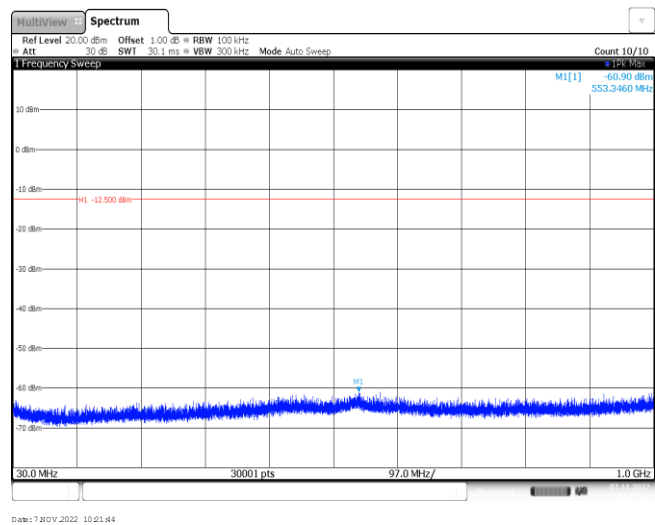
CH39
1GHz~26GHz



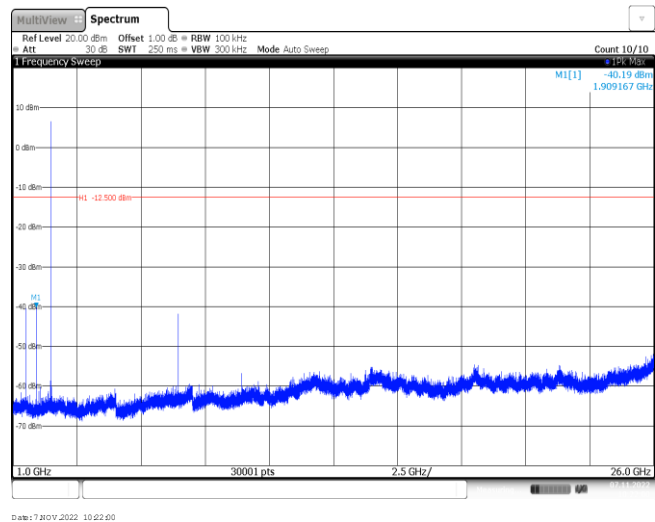
CH78
Reference level

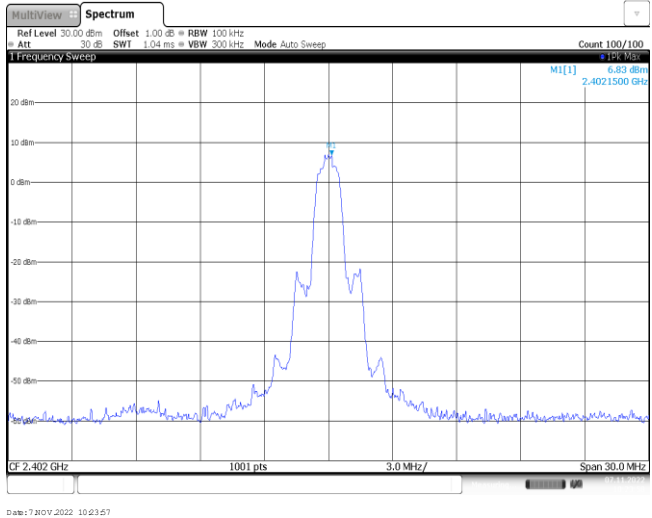
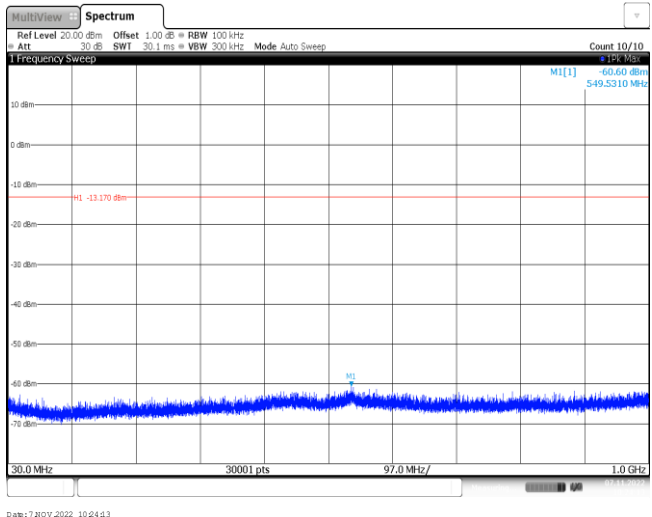
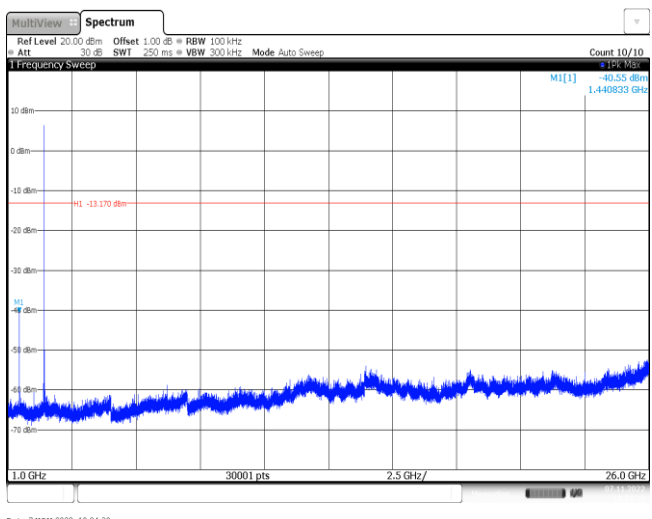


CH78
30MHz~1000MHz

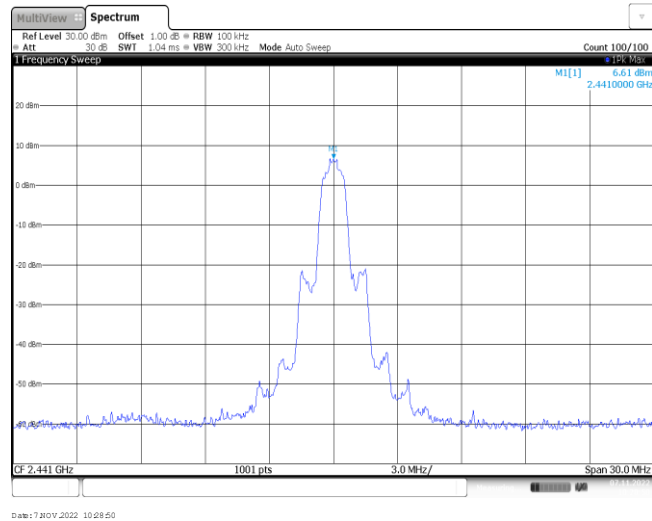


CH78
1GHz~26GHz

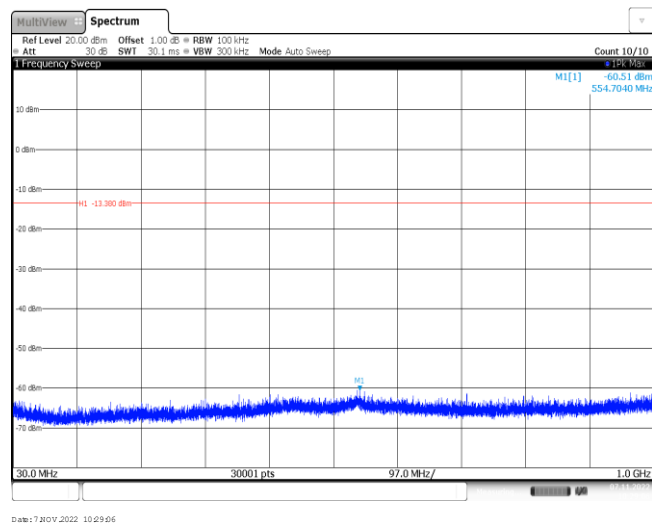


Test Item:	Spurious Emission	Modulation type:	$\pi/4$ DQPSK
CH00 Reference level			
CH00 30MHz~1000MHz			
CH00 1GHz~26GHz			

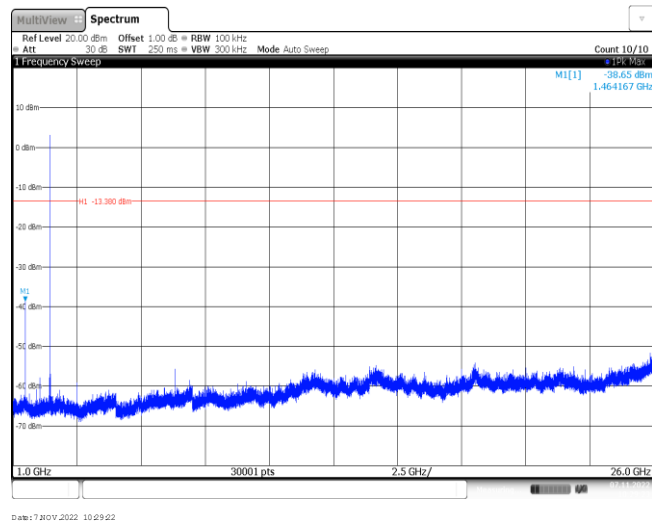
CH39
Reference level



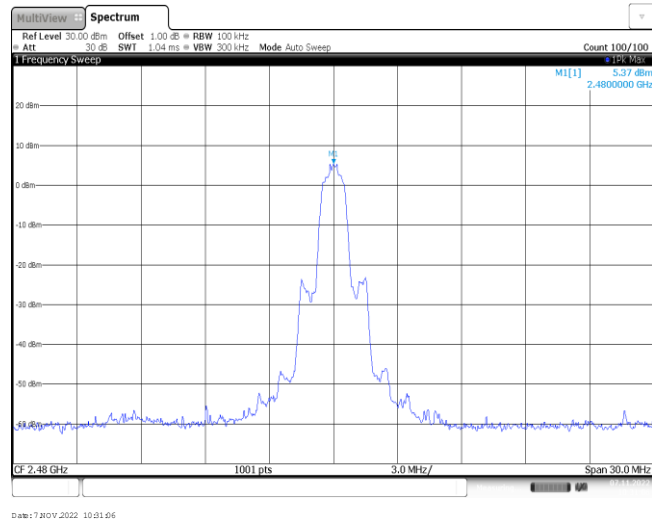
CH39
30MHz~1000MHz



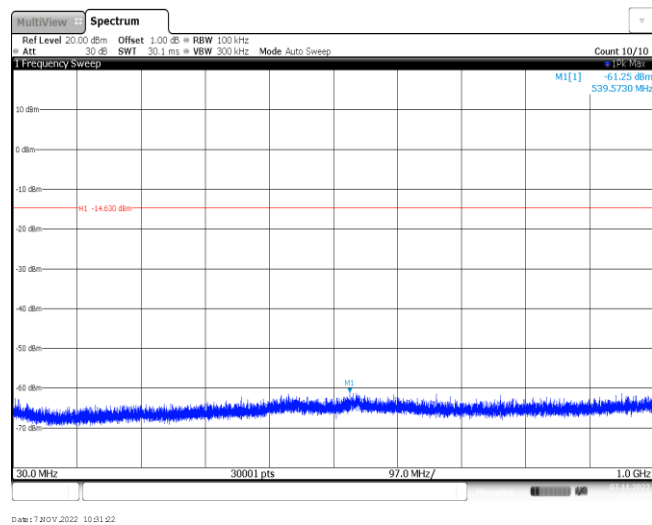
CH39
1GHz~26GHz



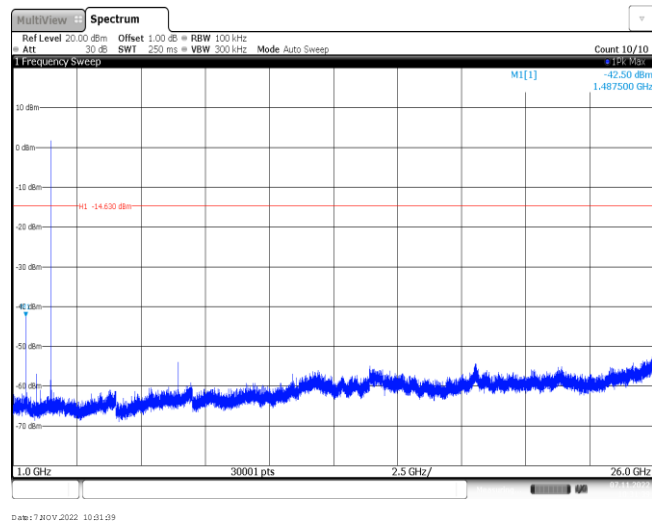
CH78
Reference level

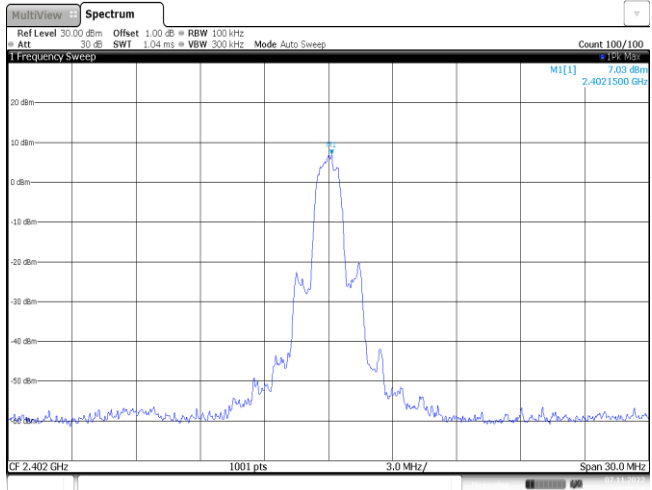
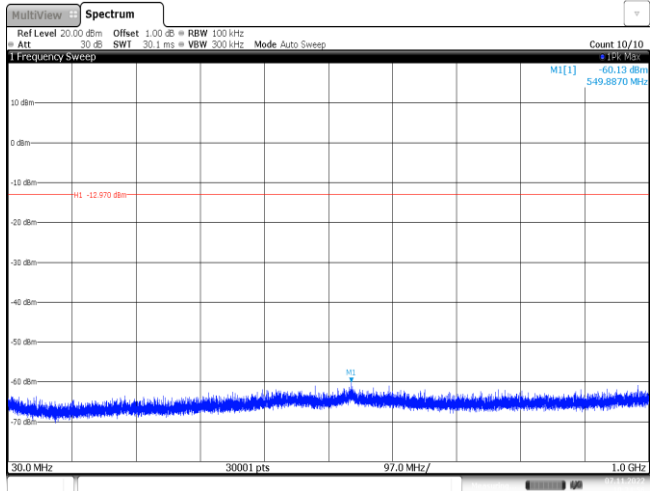
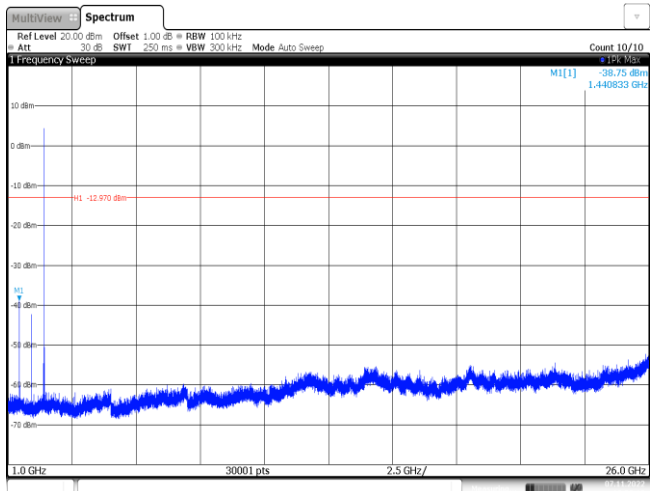


CH78
30MHz~1000MHz

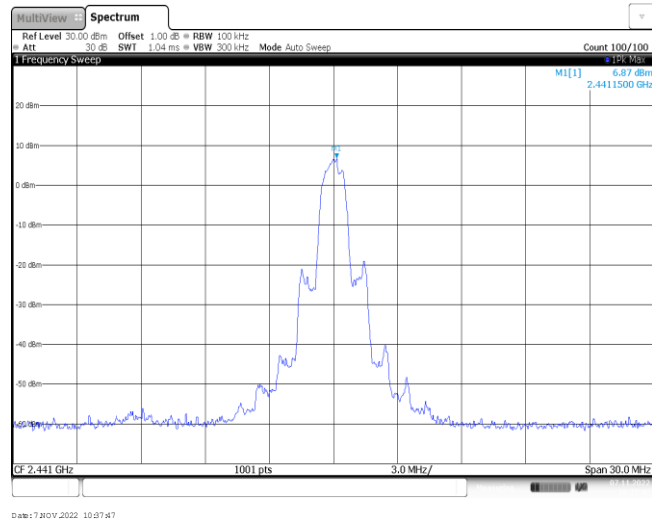


CH78
1GHz~26GHz

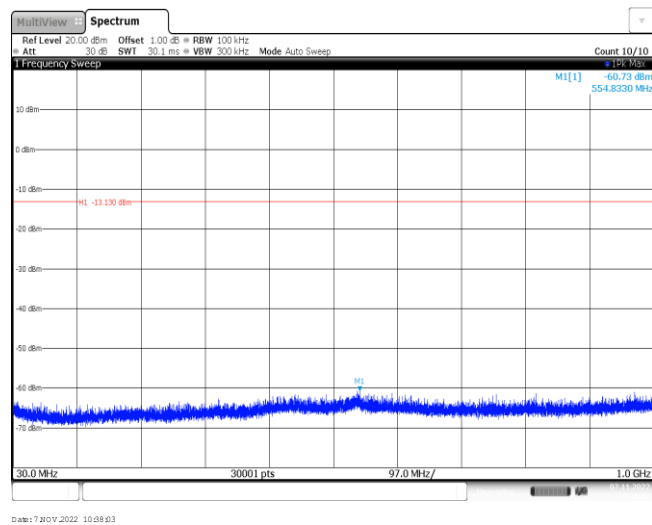


Test Item:	Spurious Emission	Modulation type:	8DPSK
CH00 Reference level	 CH00 Reference level		
CH00 30MHz~1000MHz	 CH00 30MHz~1000MHz		
CH00 1GHz~26GHz	 CH00 1GHz~26GHz		

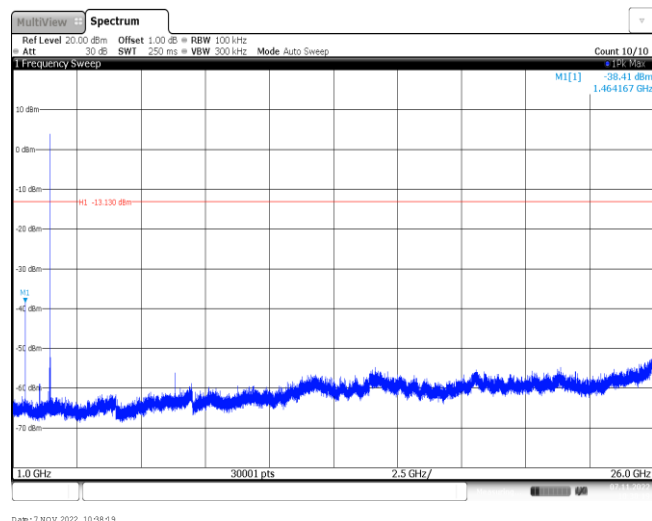
CH39
Reference level

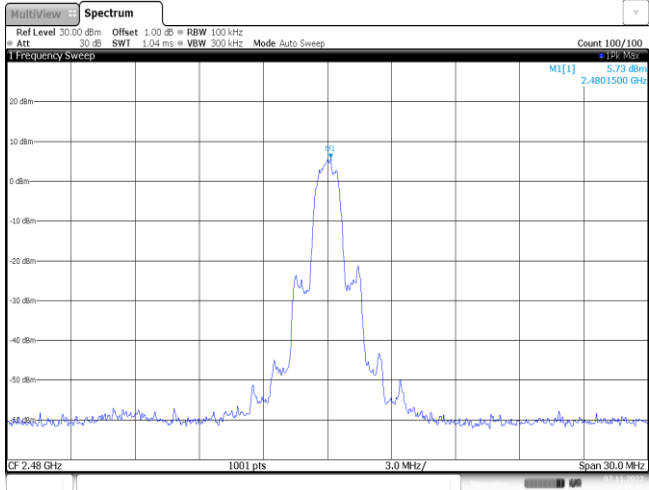
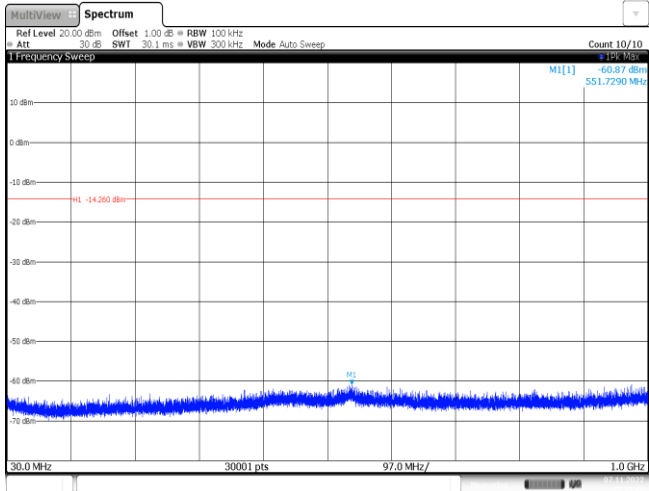
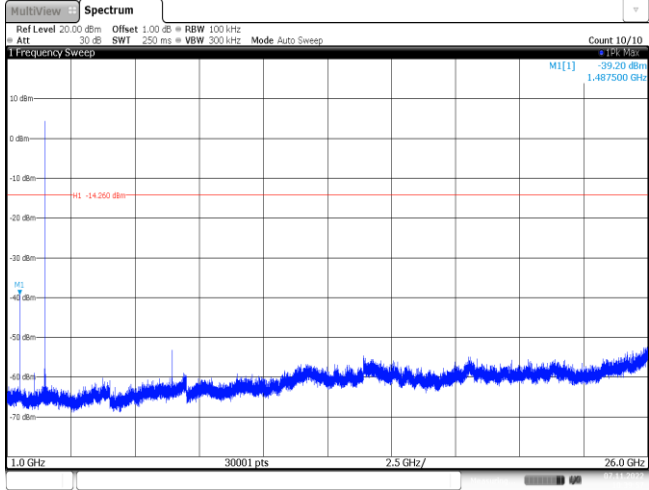


CH39
30MHz~1000MHz



CH39
1GHz~26GHz



CH78 Reference level	
CH78 30MHz~1000MHz	
CH78 1GHz~26GHz	

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