

APPENDIX REPORT

Project No.	SHT2311064901EW	Radio Specification	Bluetooth EDR
Test sample No.	YPHT23110649001	Model No.	ATMET2K
Start test date	2024-03-18	Finish date	2024-03-18
Temperature	25℃	Humidity	51%
Test Engineer	Xiangyu Wei	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	5.67	5.62	≤ 30.00	Pass
	39	5.64	5.49		
	78	7.22	7.18		
$\pi/4$ DQPSK	00	7.37	7.34	≤ 21.00	Pass
	39	7.67	7.65		
	78	8.24	8.22		
8DPSK	00	7.83	7.81	≤ 21.00	Pass
	39	8.07	8.01		
	78	8.70	8.65		

Modulation Type: GFSK	
CH00	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 1 MHz Att 30 dB SWT 1 ms VBW 3 MHz Mode Auto Sweep Count 300/300 1Pk View 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm M1[1] 5.67 dBm 2.40203620 GHz CF 2.402 GHz 691 pts Span 5.0 MHz Date: 18 MAR 2024 12:38:29
CH39	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 1 MHz Att 30 dB SWT 1 ms VBW 3 MHz Mode Auto Sweep Count 300/300 1Pk View 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm M1[1] 5.64 dBm 2.44102890 GHz CF 2.441 GHz 691 pts Span 5.0 MHz Date: 18 MAR 2024 12:40:04
CH78	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 1 MHz Att 30 dB SWT 1 ms VBW 3 MHz Mode Auto Sweep Count 300/300 1Pk View 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm M1[1] 7.22 dBm 2.48002170 GHz CF 2.48 GHz 691 pts Span 5.0 MHz Date: 18 MAR 2024 12:41:22

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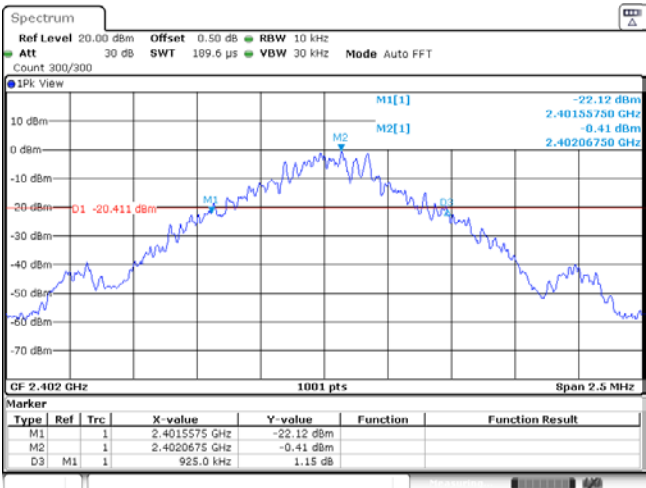
Appendix B : 20 dB Bandwidth

Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	925.00	-	Pass
	39	925.00		
	78	925.00		
$\pi/4$ DQPSK	00	1345.00	-	Pass
	39	1350.00		
	78	1352.00		
8DPSK	00	1302.00	-	Pass
	39	1303.00		
	78	1305.00		

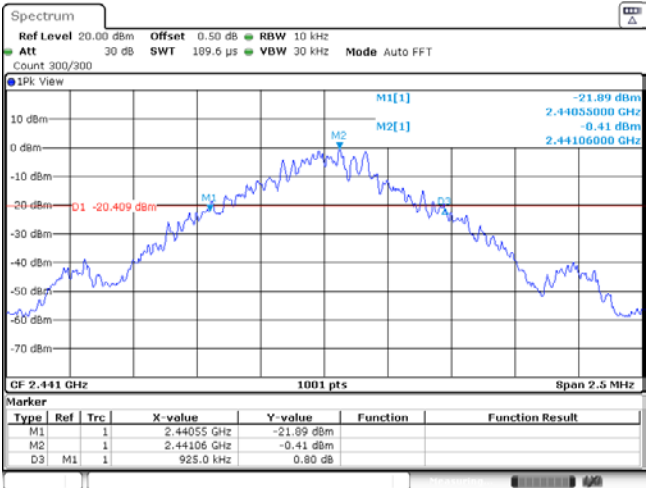
Modulation Type:

GFSK

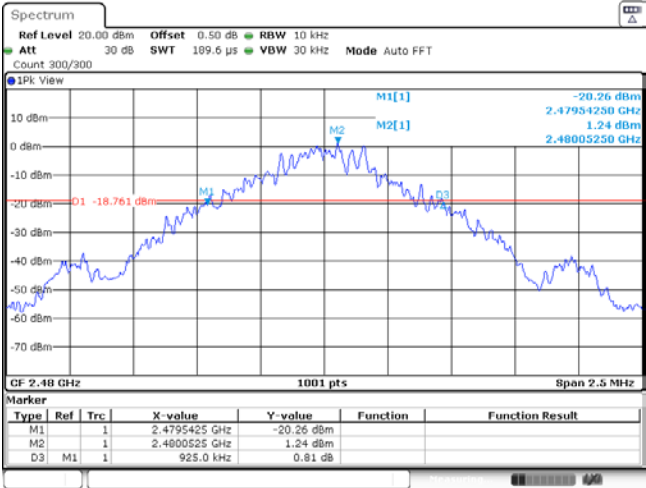
CH00



CH39



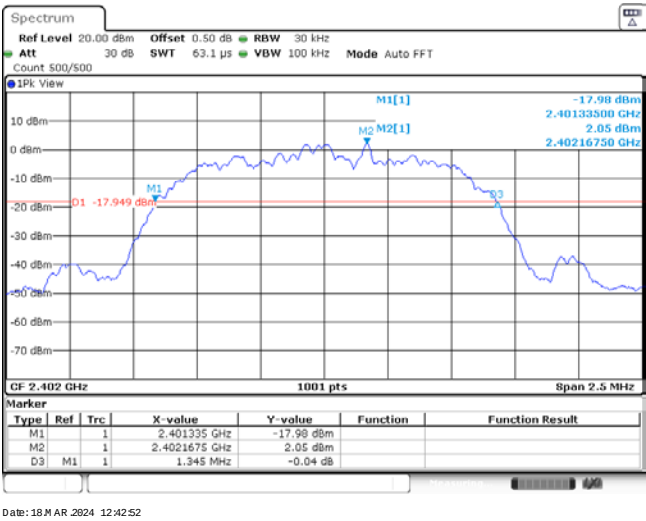
CH78



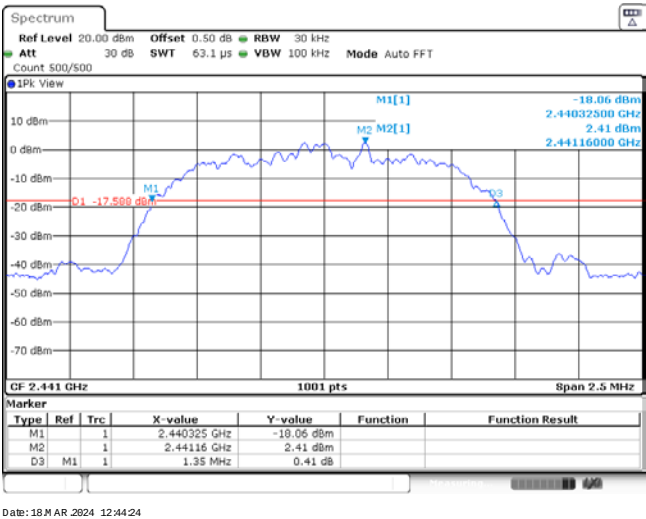
Modulation Type:

$\pi/4$ DQPSK

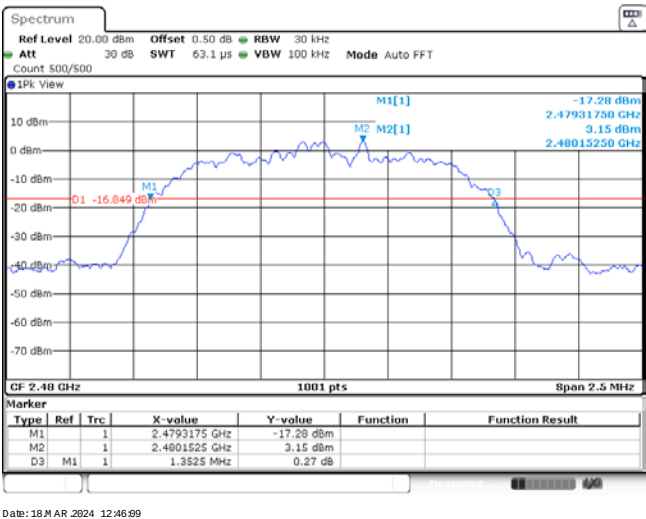
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CH39



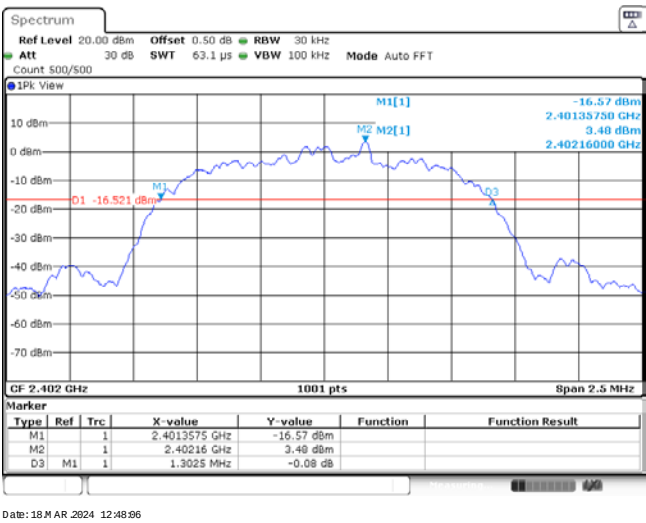
CH78



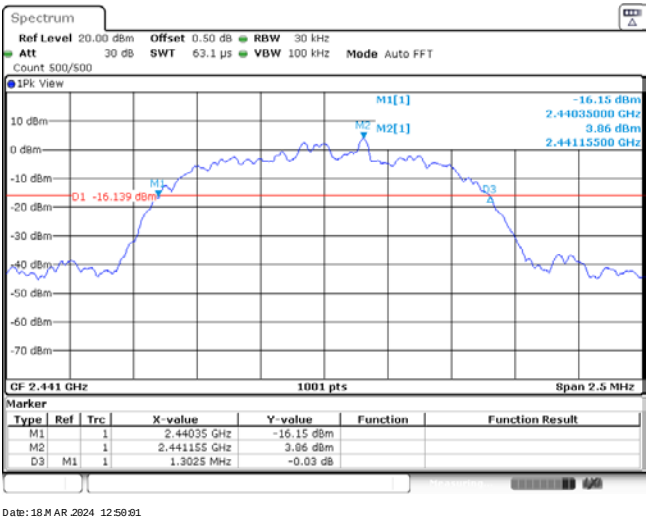
Modulation Type:

8DPSK

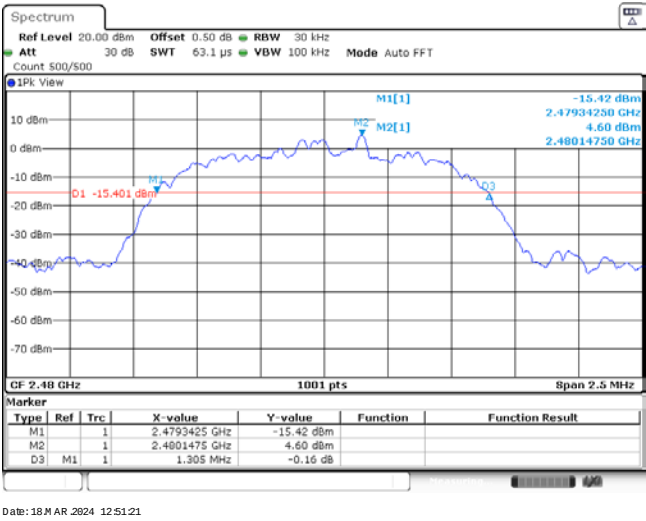
CH00



CH39



CH78

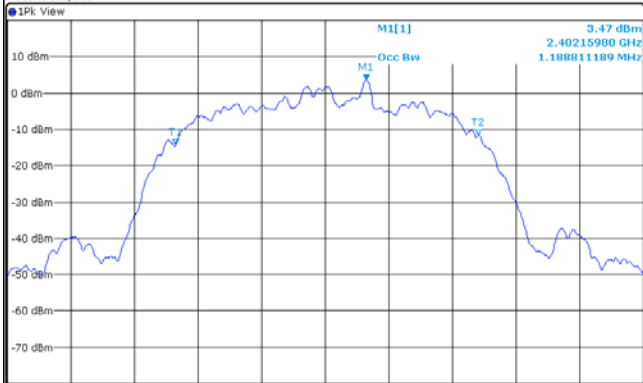
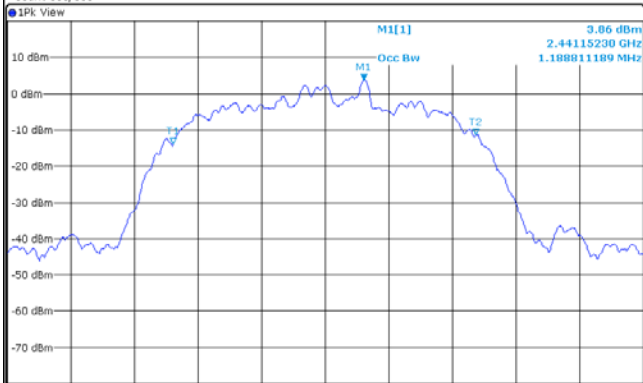
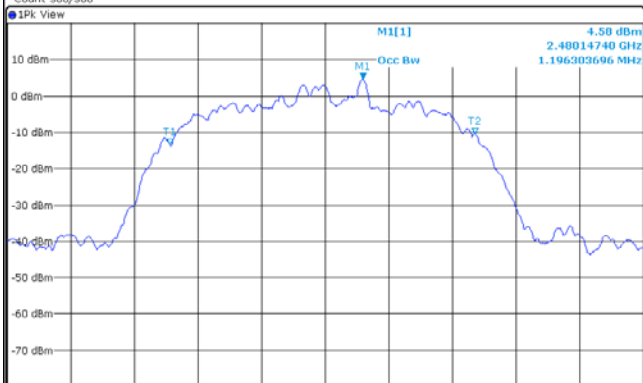


Appendix C: 99% Occupied Bandwidth

Modulation type	Channel	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.89	-	Pass
	39	0.89		
	78	0.89		
$\pi/4$ DQPSK	00	1.19	-	Pass
	39	1.19		
	78	1.19		
8DPSK	00	1.19	-	Pass
	39	1.19		
	78	1.20		

Modulation Type:		GFSK
CH00	Date: 18 MAR 2024 12:38:11	
CH39	Date: 18 MAR 2024 12:39:56	
CH78	Date: 18 MAR 2024 12:41:14	

Modulation Type:		$\pi/4$ DQPSK
CH00	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 30 kHz Att 30 dB SWT 63.1 μs VBW 100 kHz Mode Auto FFT Count S00/S00 1Pk View MI[1] 2.02 dBm 2.40216730 GHz 1.188811189 MHz CF 2.402 GHz 1001 pts Span 2.5 MHz Date: 18 MAR 2024 12:43:00	
CH39	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 30 kHz Att 30 dB SWT 63.1 μs VBW 100 kHz Mode Auto FFT Count S00/S00 1Pk View MI[1] 2.40 dBm 2.44115900 GHz 1.191308691 MHz CF 2.441 GHz 1001 pts Span 2.5 MHz Date: 18 MAR 2024 12:44:32	
CH78	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 30 kHz Att 30 dB SWT 63.1 μs VBW 100 kHz Mode Auto FFT Count S00/S00 1Pk View MI[1] 3.12 dBm 2.40015230 GHz 1.193806194 MHz CF 2.40 GHz 1001 pts Span 2.5 MHz Date: 18 MAR 2024 12:46:17	

Modulation Type:		8DPSK
CH00	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 30 kHz Att 30 dB SWT 63.1 μs VBW 100 kHz Mode Auto FFT Count 500/500 1Pk View M1[1] 9.47 dBm 2.40215980 GHz 1.188811189 MHz M1 Occ Bw T2  CF 2.402 GHz1001 ptsSpan 2.5 MHz Date: 18 MAR 2024 12:48:13	
CH39	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 30 kHz Att 30 dB SWT 63.1 μs VBW 100 kHz Mode Auto FFT Count 500/500 1Pk View M1[1] 9.86 dBm 2.44115230 GHz 1.188811189 MHz M1 Occ Bw T2  CF 2.441 GHz1001 ptsSpan 2.5 MHz Date: 18 MAR 2024 12:50:88	
CH78	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 30 kHz Att 30 dB SWT 63.1 μs VBW 100 kHz Mode Auto FFT Count 500/500 1Pk View M1[1] 4.58 dBm 2.48014740 GHz 1.196303696 MHz M1 Occ Bw T2  CF 2.480 GHz1001 ptsSpan 2.5 MHz Date: 18 MAR 2024 12:51:29	

Appendix D: Carrier Frequencies Separation

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (kHz) *	Result
GFSK	39	1.00	≥925	Pass
$\pi/4$ DQPSK	39	1.24	≥901	Pass
8DPSK	39	1.00	≥870	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.

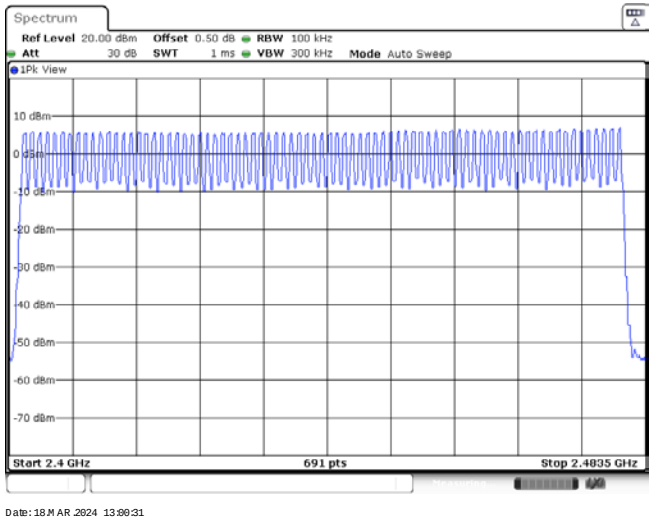
8DPSK limit = $2/3$ * The maximum 20 dB Bandwidth for 8DPSK modulation on the appendix B

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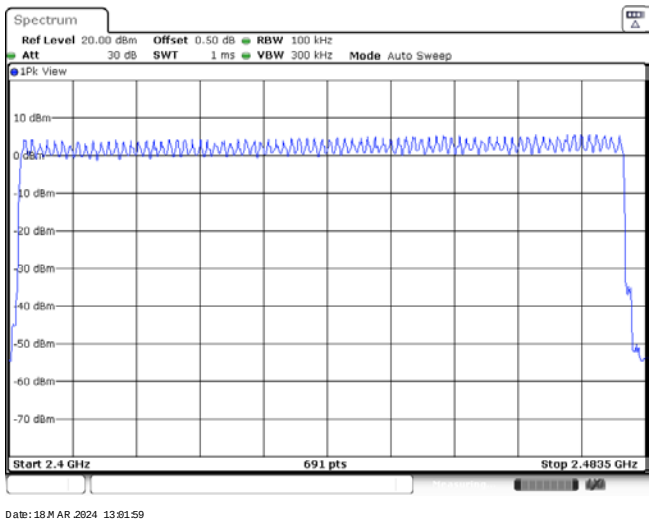
Appendix E: Hopping Channel Number

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

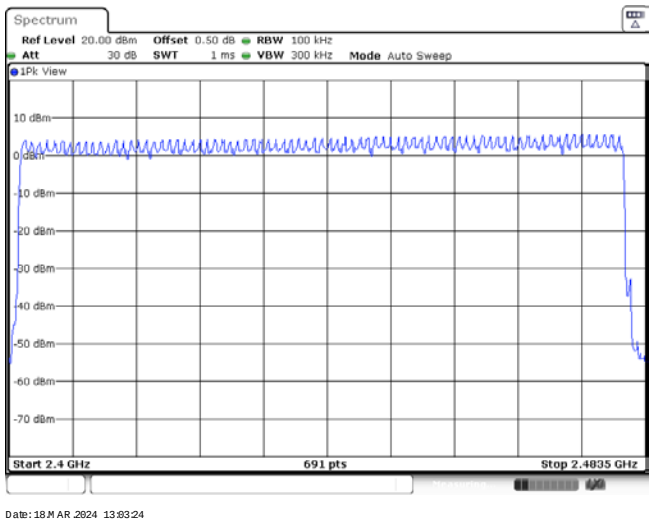
GFSK



$\pi/4$ DQPSK

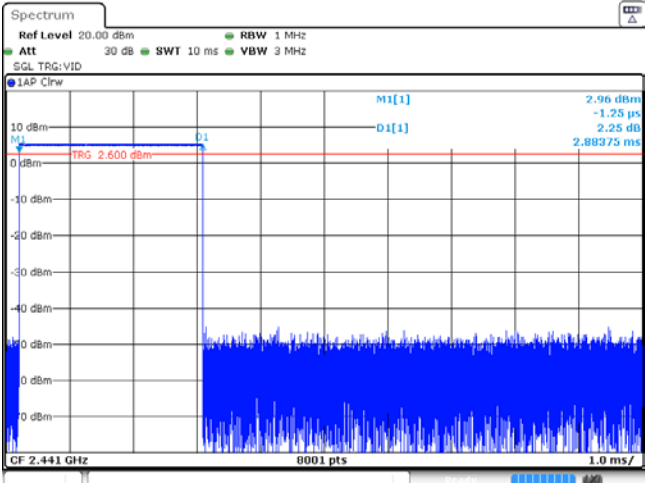
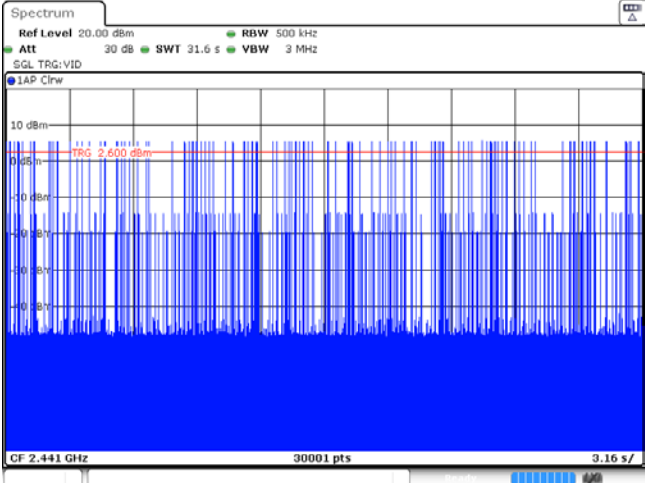
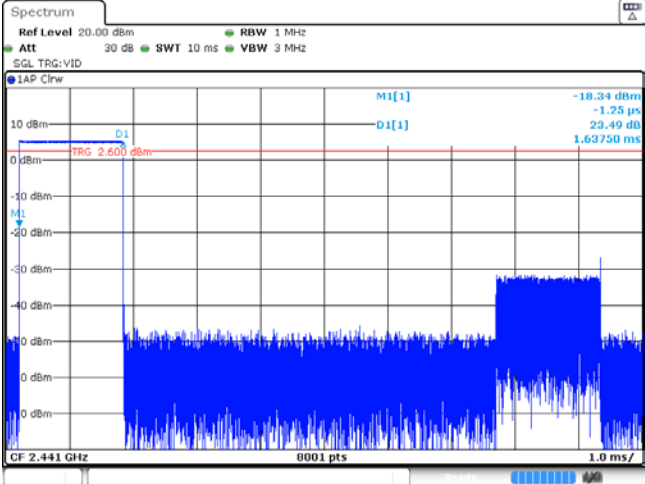


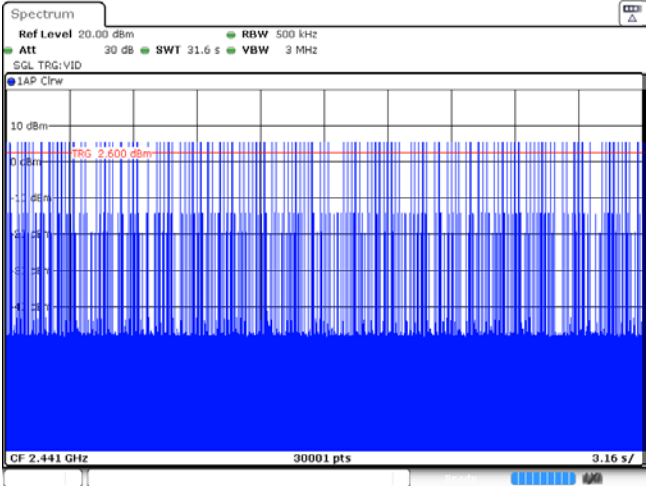
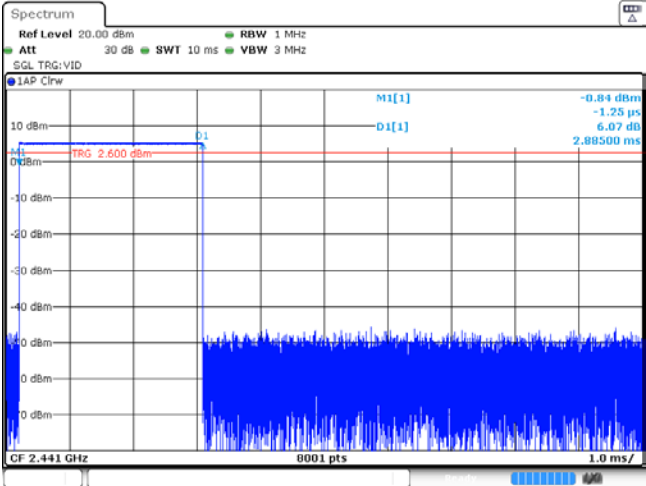
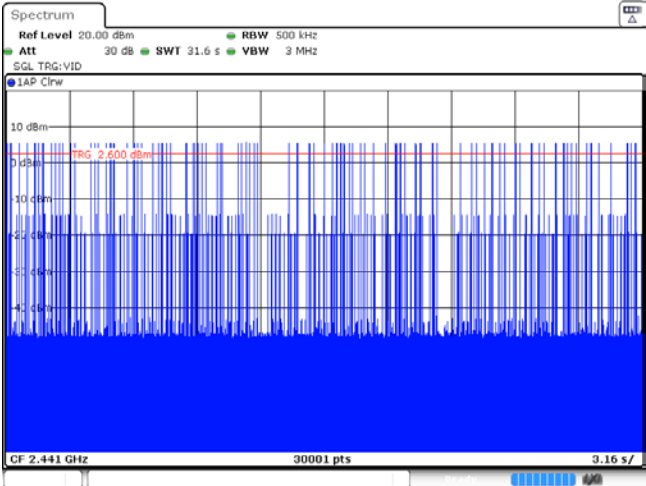
8DPSK



Appendix F: Dwell Time

Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	2.88	123.00	0.36	≤ 0.40	Pass
	DH3	1.64	164.00	0.27		
	DH5	2.89	112.00	0.32		
$\pi/4$ DQPSK	2DH1	0.39	321.00	0.12	≤ 0.40	Pass
	2DH3	1.64	154.00	0.25		
	2DH5	2.89	102.00	0.30		
8DPSK	3DH1	0.39	320.00	0.12	≤ 0.40	Pass
	3DH3	1.64	163.00	0.27		
	3DH5	2.89	101.00	0.29		

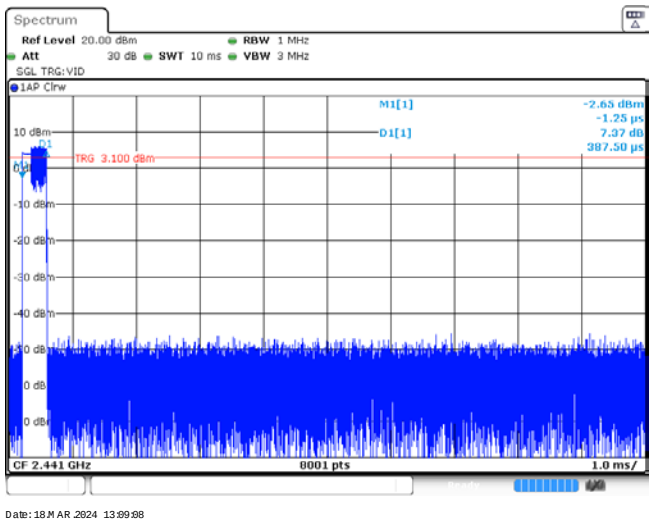
Modulation Type: GFSK	
DH1 Burst width	 Ref Level 20.00 dBm Att 30 dB SGL TRG:VID RBW 1 MHz SWT 10 ms VBW 3 MHz CF 2.441 GHz 8001 pts 1.0 ms/ Date: 18 MAR 2024 13:05:02
DH1 Burst number	 Ref Level 20.00 dBm Att 30 dB SGL TRG:VID RBW 500 kHz SWT 31.6 s VBW 3 MHz CF 2.441 GHz 30001 pts 3.16 s/ Date: 18 MAR 2024 13:05:36
DH3 Burst width	 Ref Level 20.00 dBm Att 30 dB SGL TRG:VID RBW 1 MHz SWT 10 ms VBW 3 MHz CF 2.441 GHz 8001 pts 1.0 ms/ Date: 18 MAR 2024 13:06:32

DH3 Burst number	 Spectrum plot showing a burst of signal. The y-axis represents power in dBm, ranging from -40 to 10. The x-axis represents frequency in GHz, centered at 2.441 GHz. A red trigger line is set at -2.600 dBm. The plot shows a dense burst of signal. The bottom status bar indicates 30001 pts and a date of 18 MAR 2024 13:07:05.
DH5 Burst width	 Spectrum plot showing a burst of signal. The y-axis represents power in dBm, ranging from -40 to 10. The x-axis represents frequency in GHz, centered at 2.441 GHz. A red trigger line is set at -2.600 dBm. The plot shows a burst of signal. The bottom status bar indicates 0001 pts and a date of 18 MAR 2024 13:08:01.
DH5 Burst number	 Spectrum plot showing a burst of signal. The y-axis represents power in dBm, ranging from -40 to 10. The x-axis represents frequency in GHz, centered at 2.441 GHz. A red trigger line is set at -2.600 dBm. The plot shows a dense burst of signal. The bottom status bar indicates 30001 pts and a date of 18 MAR 2024 13:08:34.

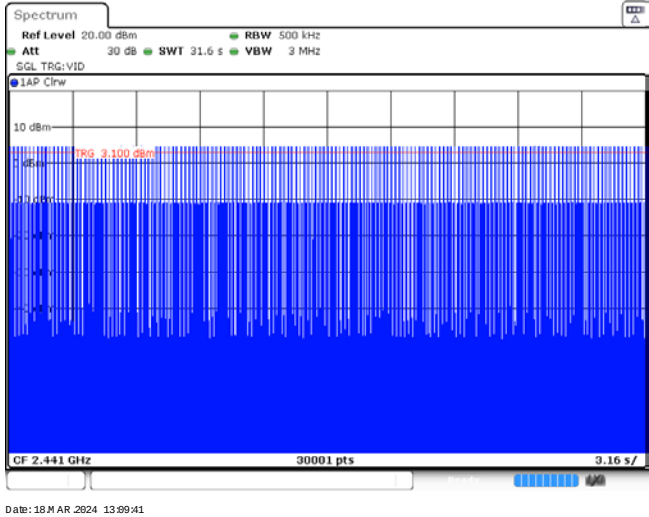
Modulation Type:

$\pi/4$ DQPSK

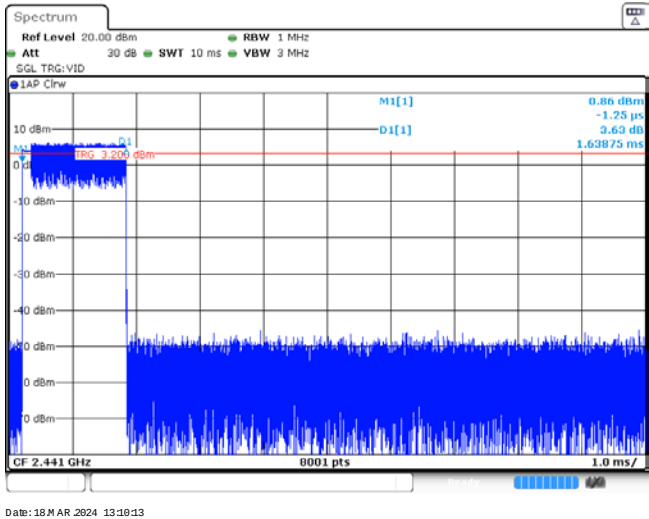
2DH1
Burst width

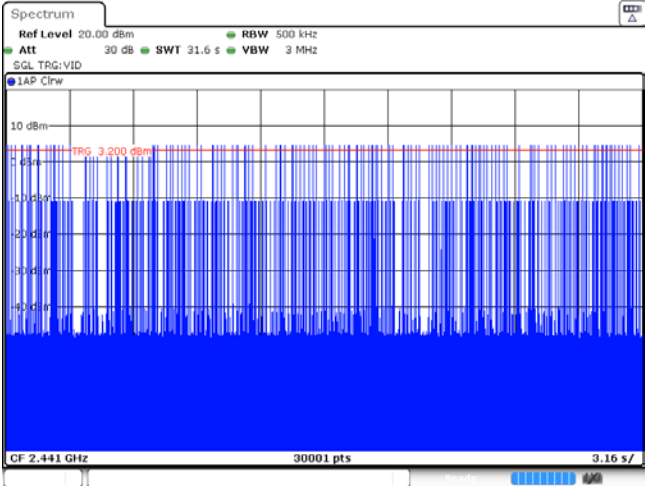
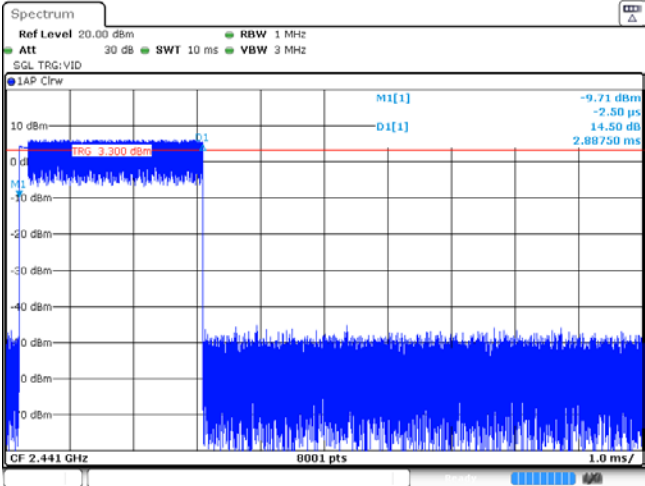
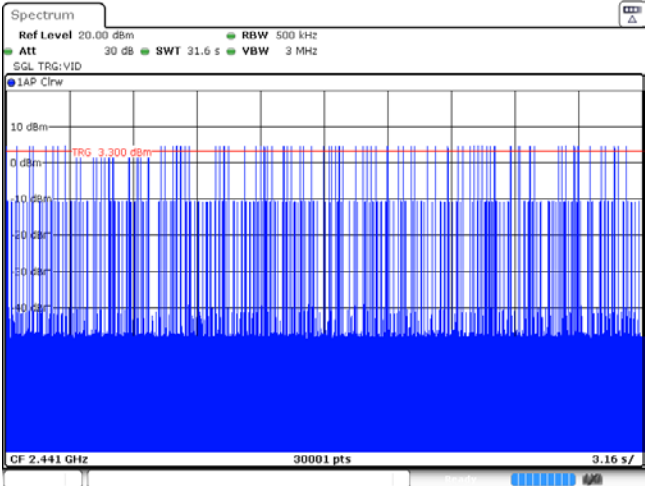


2DH1
Burst number



2DH3
Burst width

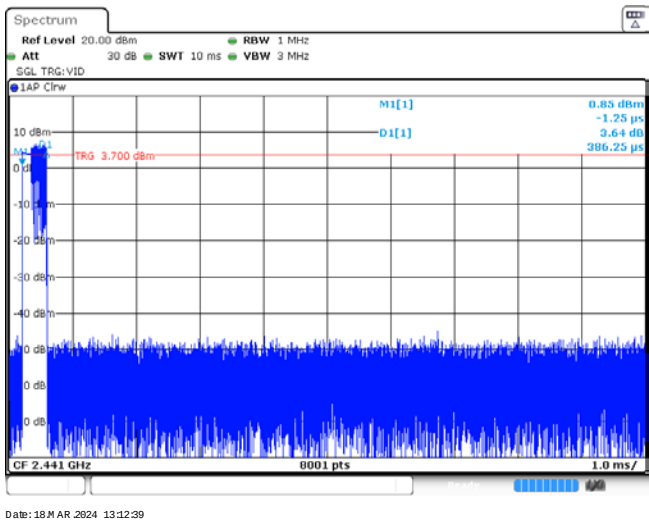


2DH3 Burst number	 Date: 18 MAR 2024 13:18:46
2DH5 Burst width	 Date: 18 MAR 2024 13:11:36
2DH5 Burst number	 Date: 18 MAR 2024 13:12:59

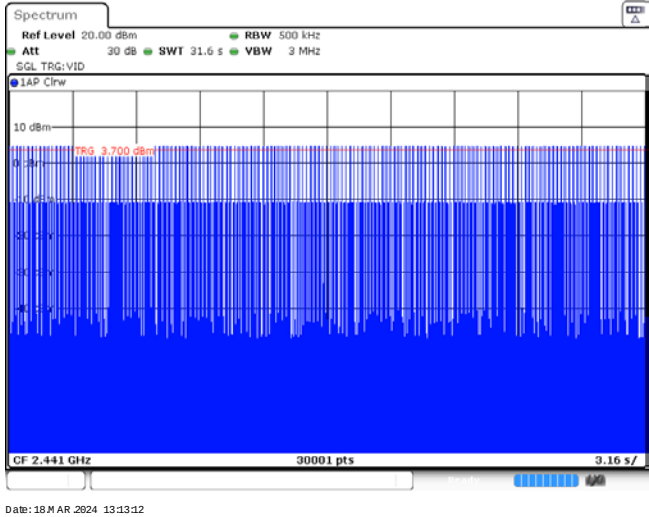
Modulation Type:

8DPSK

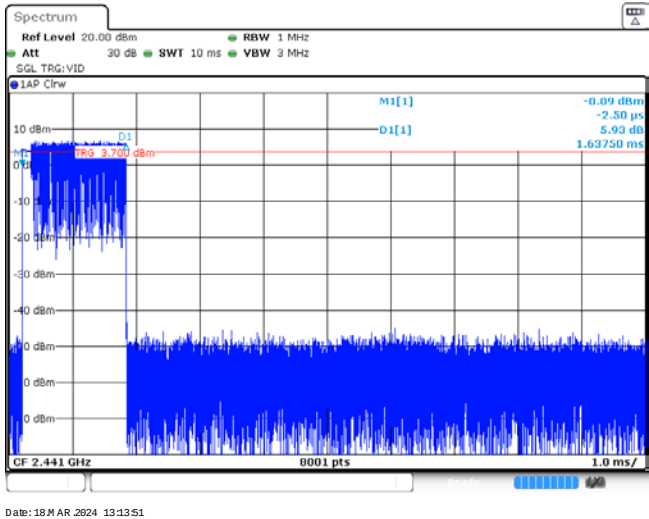
3DH1
Burst width

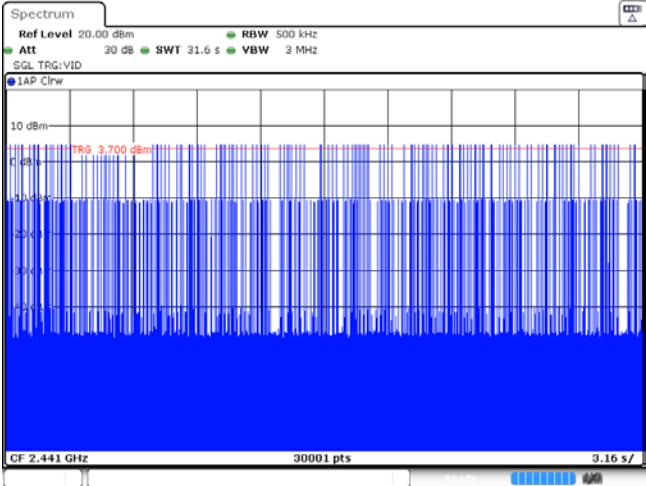
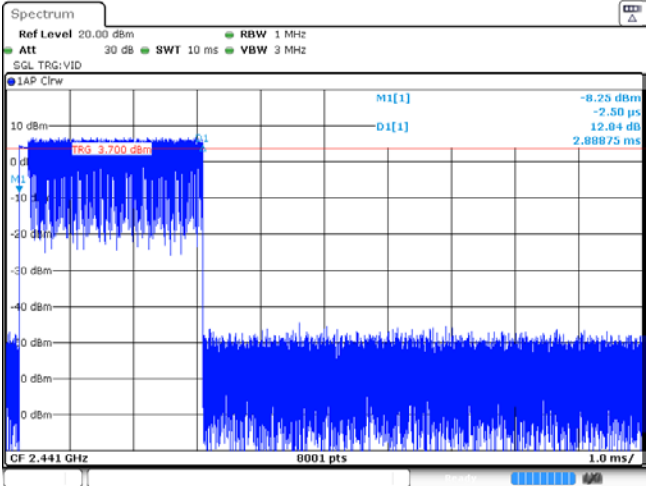
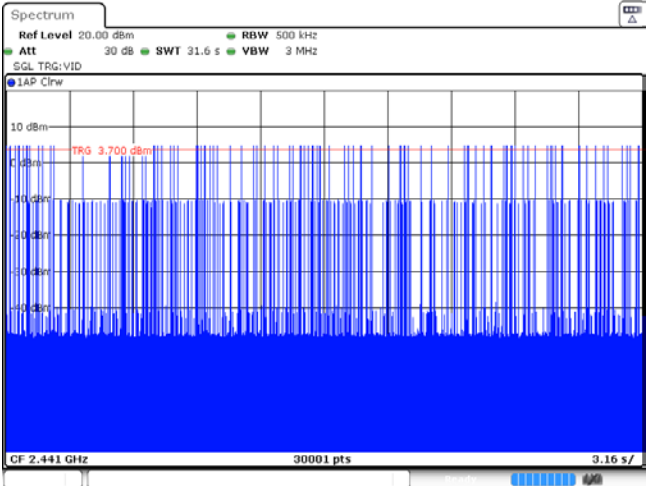


3DH1
Burst number



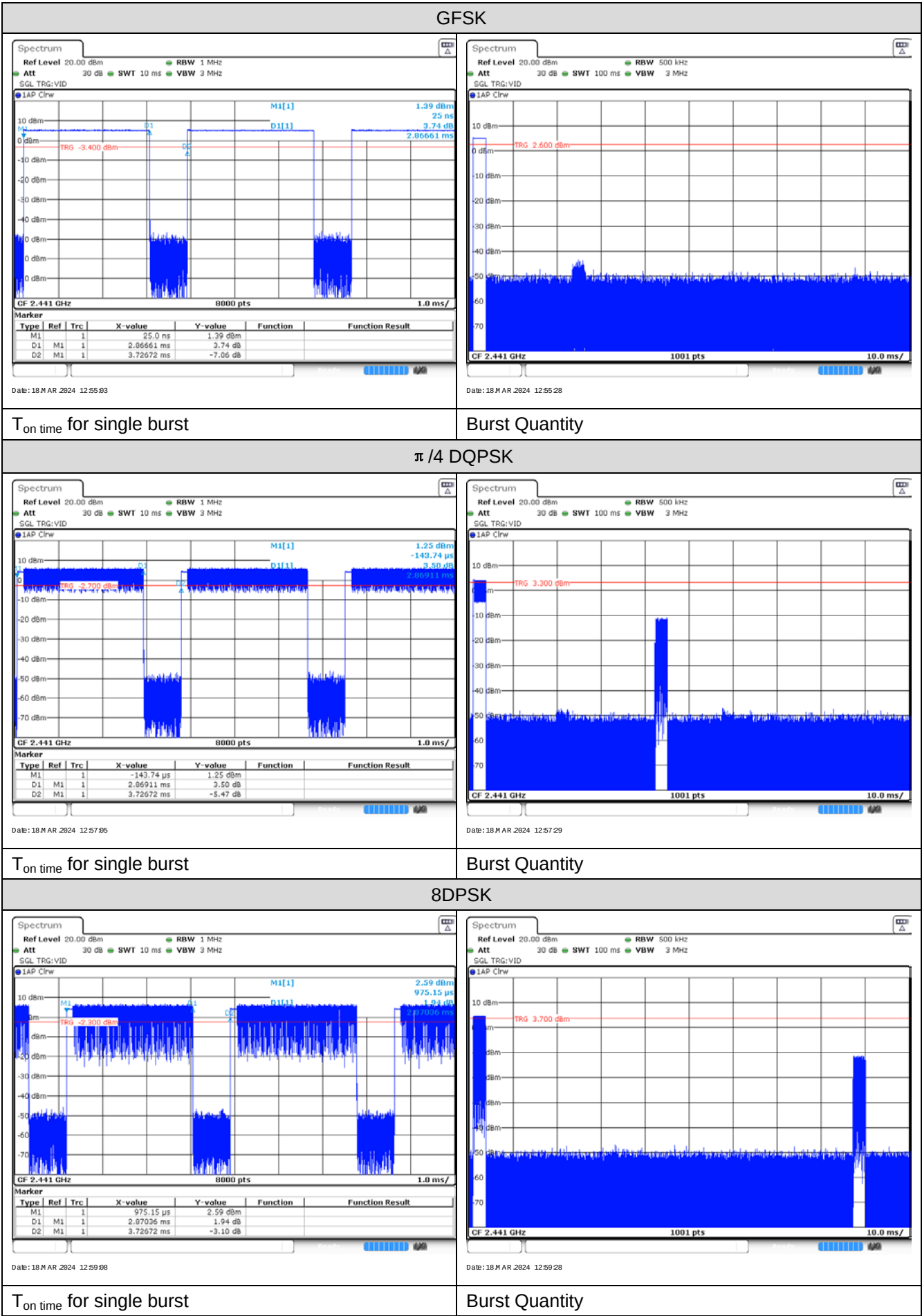
3DH3
Burst width



3DH3 Burst number	 Date: 18 MAR 2024 13:14:24
3DH5 Burst width	 Date: 18 MAR 2024 13:14:59
3DH5 Burst number	 Date: 18 MAR 2024 13:15:32

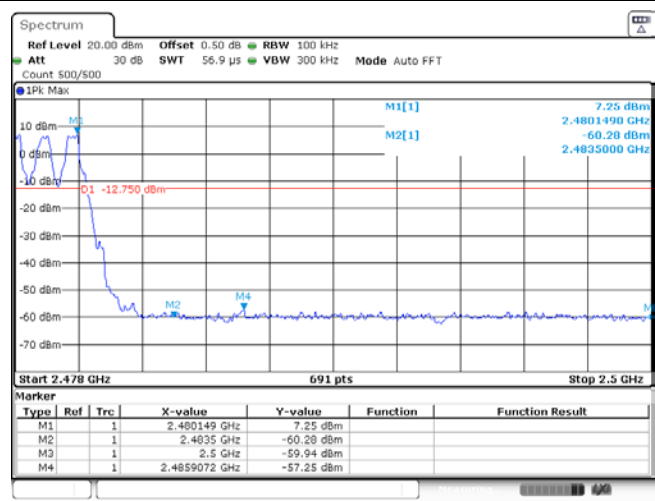
Appendix G: Duty Cycle Correction Factor (DCCF)

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	2.87	100	1.00	-30.84
$\pi/4$ DQPSK	2441	2.87	100	1.00	-30.84
8DPSK	2441	2.87	100	1.00	-30.84



Test Item:	Band edge	Modulation type:	GFSK
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CH00 Hopping mode	18 MAR 2024 13:00:44		
CH78 No hopping mode	18 MAR 2024 12:41:35		

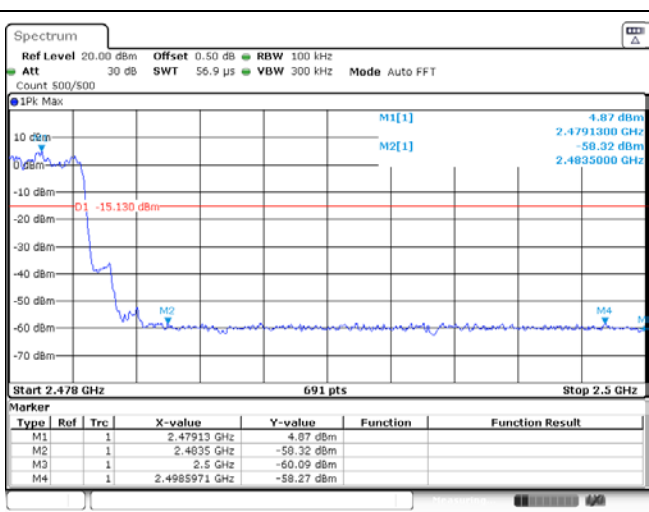
CH78
Hopping mode



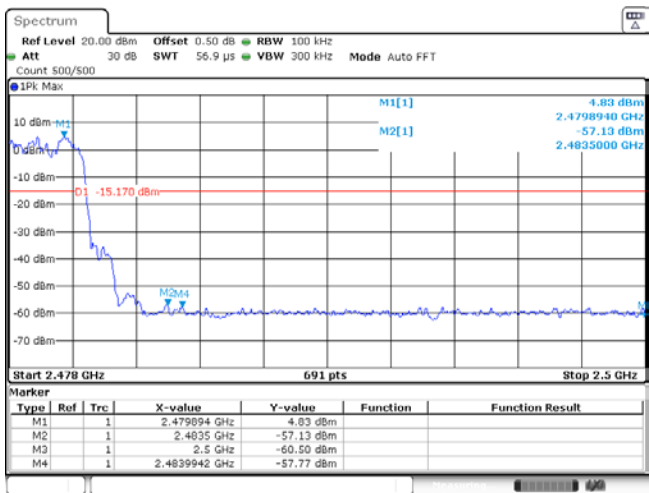
Date: 18 MAR 2024 13:06:57

Test Item:	Band edge	Modulation type:	$\pi/4$ DQPSK																																										
CH00 No hopping mode	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 100 kHz Att 30 dB SWT 1.1 ms VBW 300 kHz Mode Auto Sweep Count 500/500 1Pk Max 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm M1[1] M2[1] M3 M4 4.26 dBm 2.402040 GHz -51.93 dBm 2.400000 GHz D1 -15.740 dBm Start 2.31 GHz 691 pts Stop 2.405 GHz Marker <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>1</td><td>2.40204 GHz</td><td>4.26 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td>1</td><td>2.4 GHz</td><td>-51.93 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td>1</td><td>2.39 GHz</td><td>-55.65 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td>1</td><td>2.31 GHz</td><td>-55.73 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td>1</td><td>2.399906 GHz</td><td>-53.18 dBm</td><td></td><td></td></tr></table> Date: 18 MAR 2024 12:43:21			Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1	1	2.40204 GHz	4.26 dBm			M2	1	1	2.4 GHz	-51.93 dBm			M3	1	1	2.39 GHz	-55.65 dBm			M4	1	1	2.31 GHz	-55.73 dBm			M5	1	1	2.399906 GHz	-53.18 dBm		
Type	Ref	Trc	X-value	Y-value	Function	Function Result																																							
M1	1	1	2.40204 GHz	4.26 dBm																																									
M2	1	1	2.4 GHz	-51.93 dBm																																									
M3	1	1	2.39 GHz	-55.65 dBm																																									
M4	1	1	2.31 GHz	-55.73 dBm																																									
M5	1	1	2.399906 GHz	-53.18 dBm																																									
CH00 Hopping mode	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 100 kHz Att 30 dB SWT 1.1 ms VBW 300 kHz Mode Auto Sweep Count 500/500 1Pk Max 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm M1[1] M2[1] M3 M4 M5 9.07 dBm 2.404930 GHz -55.02 dBm 2.400000 GHz 2.399926 GHz D1 -16.930 dBm Start 2.31 GHz 691 pts Stop 2.405 GHz Marker <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>1</td><td>2.40493 GHz</td><td>9.07 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td>1</td><td>2.4 GHz</td><td>-55.02 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td>1</td><td>2.39 GHz</td><td>-55.95 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td>1</td><td>2.31 GHz</td><td>-55.77 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td>1</td><td>2.399926 GHz</td><td>-53.41 dBm</td><td></td><td></td></tr></table> Date: 18 MAR 2024 13:02:11			Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1	1	2.40493 GHz	9.07 dBm			M2	1	1	2.4 GHz	-55.02 dBm			M3	1	1	2.39 GHz	-55.95 dBm			M4	1	1	2.31 GHz	-55.77 dBm			M5	1	1	2.399926 GHz	-53.41 dBm		
Type	Ref	Trc	X-value	Y-value	Function	Function Result																																							
M1	1	1	2.40493 GHz	9.07 dBm																																									
M2	1	1	2.4 GHz	-55.02 dBm																																									
M3	1	1	2.39 GHz	-55.95 dBm																																									
M4	1	1	2.31 GHz	-55.77 dBm																																									
M5	1	1	2.399926 GHz	-53.41 dBm																																									
CH78 No hopping mode	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 100 kHz Att 30 dB SWT 56.9 μs VBW 300 kHz Mode Auto FFT Count 500/500 1Pk Max 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm M1[1] M2[1] M3 M4 5.78 dBm 2.4799900 GHz -56.44 dBm 2.4835000 GHz D1 -14.220 dBm Start 2.478 GHz 691 pts Stop 2.5 GHz Marker <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>1</td><td>2.47999 GHz</td><td>5.78 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td>1</td><td>2.4835 GHz</td><td>-56.44 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td>1</td><td>2.5 GHz</td><td>-59.00 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td>1</td><td>2.4835159 GHz</td><td>-56.19 dBm</td><td></td><td></td></tr></table> Date: 18 MAR 2024 12:46:38			Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1	1	2.47999 GHz	5.78 dBm			M2	1	1	2.4835 GHz	-56.44 dBm			M3	1	1	2.5 GHz	-59.00 dBm			M4	1	1	2.4835159 GHz	-56.19 dBm									
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CH78
Hopping mode

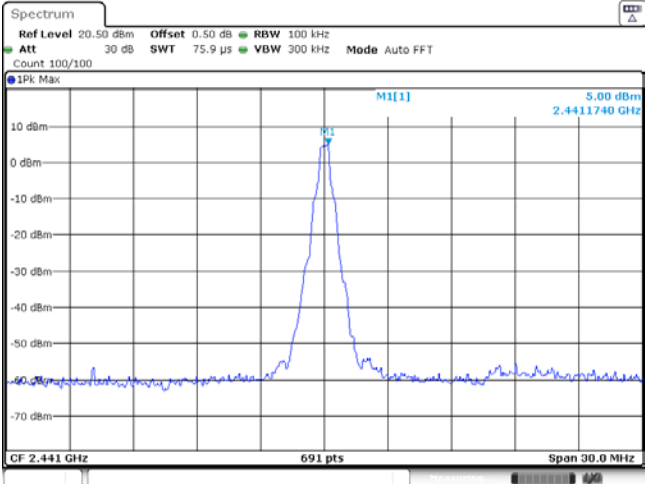
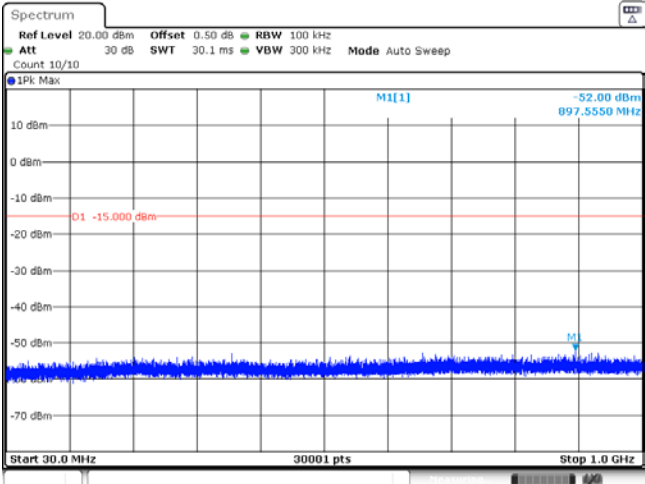
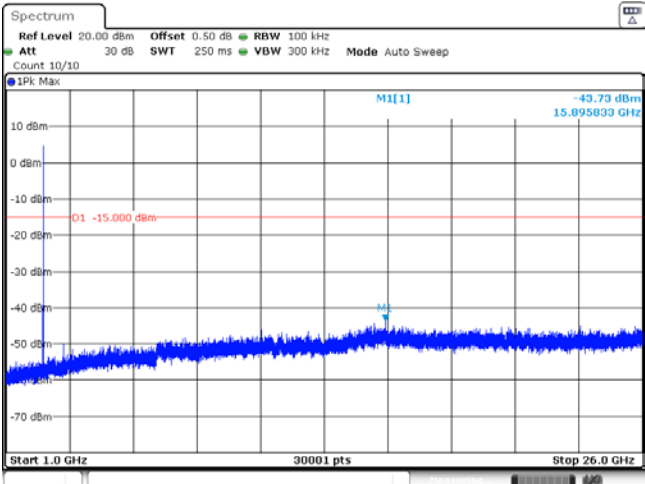


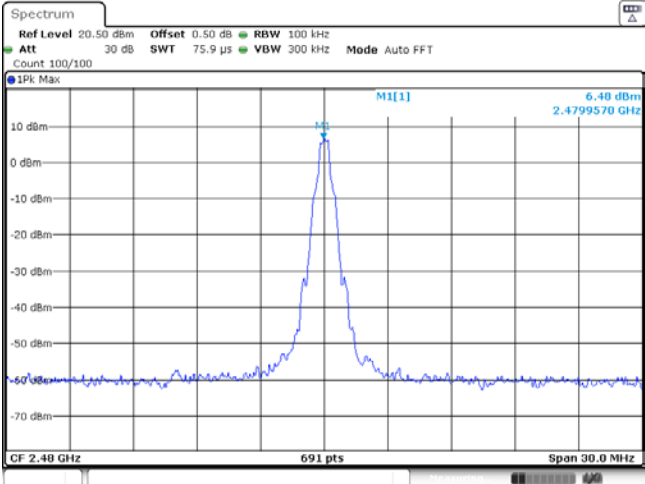
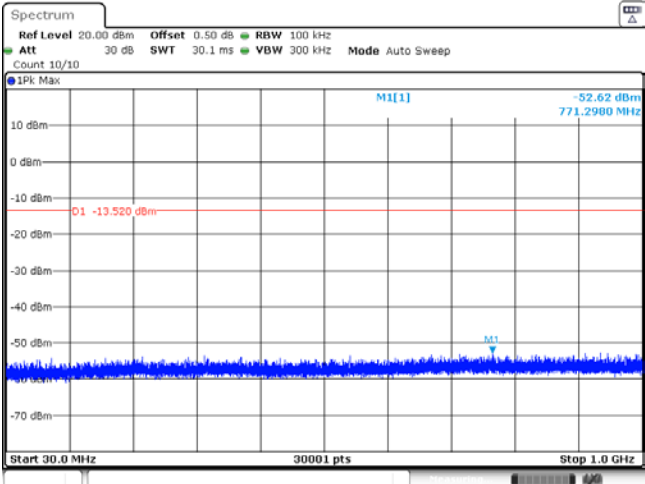
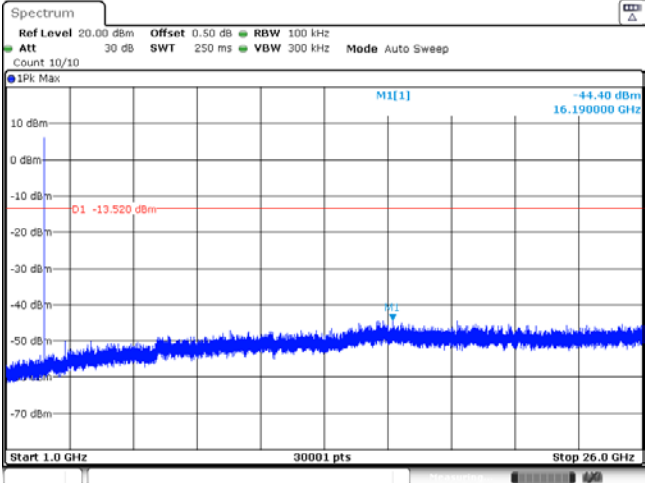
CH78
Hoppig mode



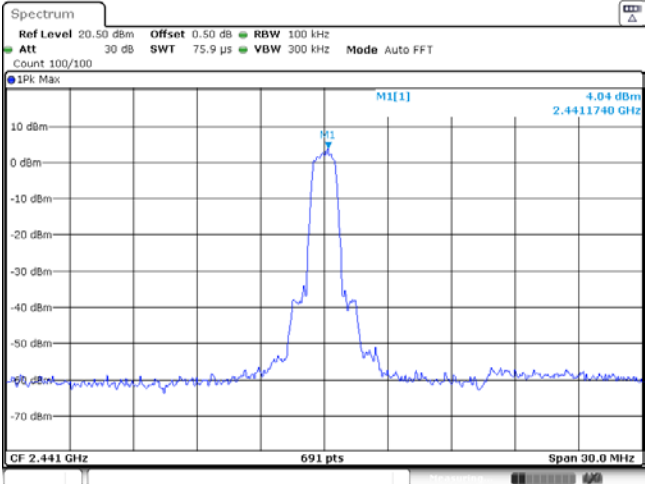
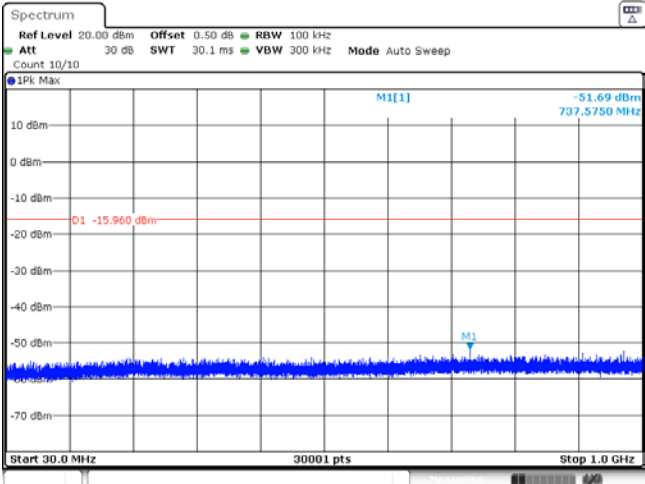
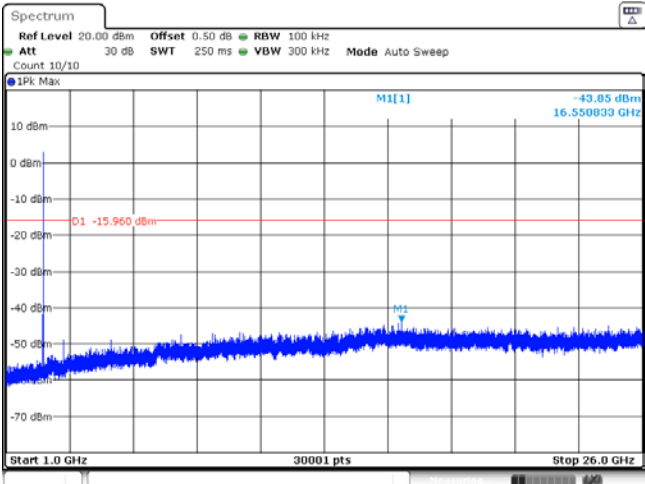
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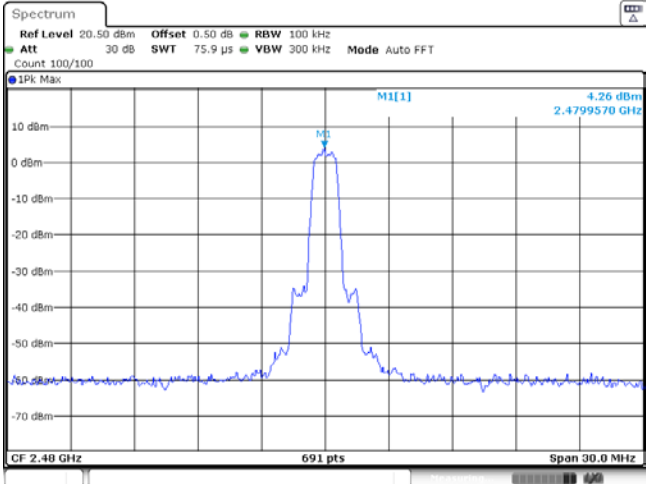
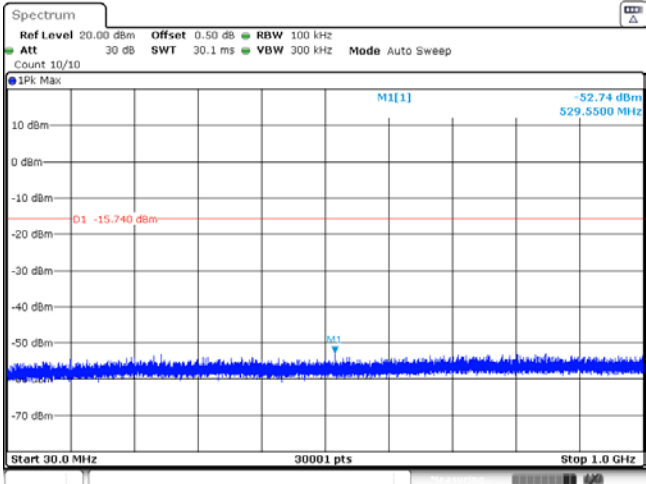
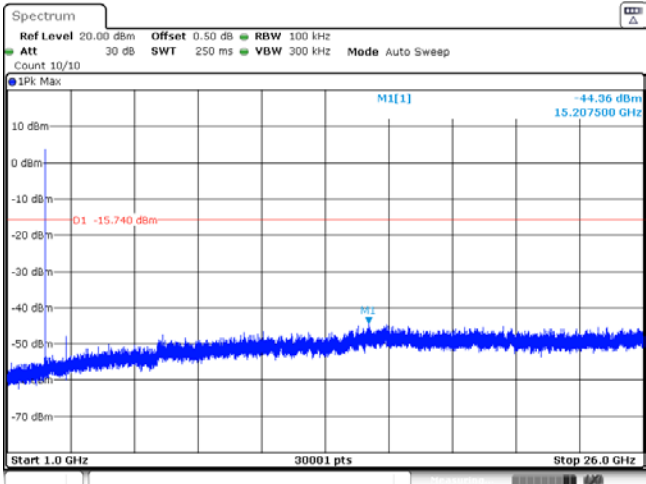
Test Item:	Spurious Emission	Modulation type:	GFSK
CH00 Reference level	Spectrum Ref Level 20.50 dBm Offset 0.50 dB RBW 100 kHz Att 30 dB SWT 75.9 μs VBW 300 kHz Mode Auto FFT Count 100/100 1Pk Max M1[1] 4.79 dBm 2.4020430 GHz 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm CF 2.402 GHz 691 pts Span 30.0 MHz Date: 18 MAR 2024 12:38:41		
CH00 30MHz~1000MHz	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 100 kHz Att 30 dB SWT 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 1Pk Max M1[1] -52.51 dBm 863.6390 MHz O1 -15.130 dBm M1 Start 30.0 MHz 30001 pts Stop 1.0 GHz Date: 18 MAR 2024 12:38:56		
CH00 1GHz~26GHz	Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 100 kHz Att 30 dB SWT 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 1Pk Max M1[1] -44.42 dBm 15.782500 GHz O1 -15.130 dBm M1 Start 1.0 GHz 30001 pts Stop 26.0 GHz Date: 18 MAR 2024 12:39:11		

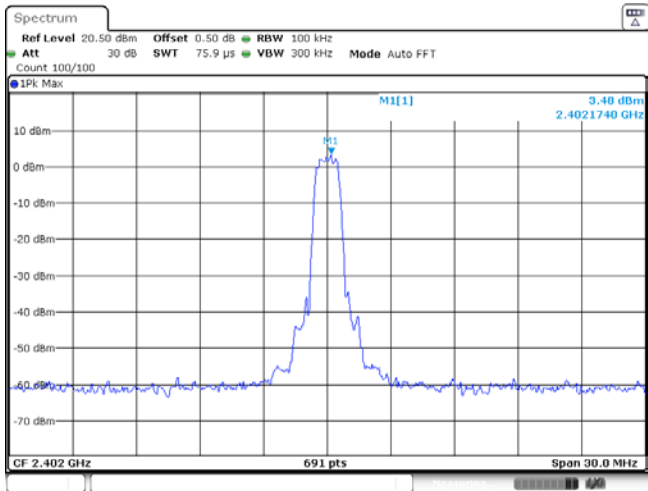
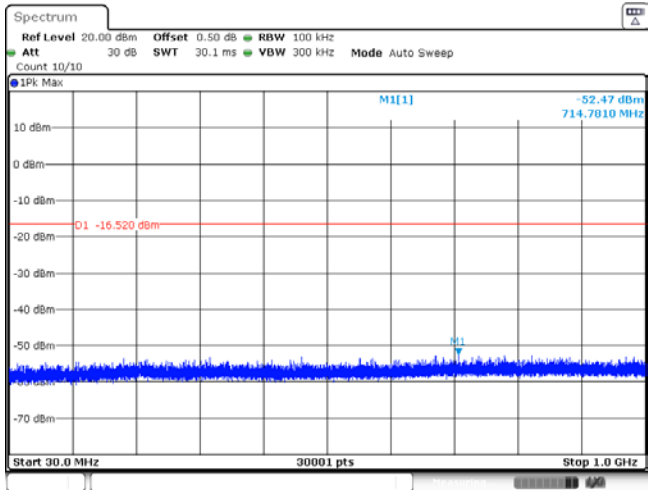
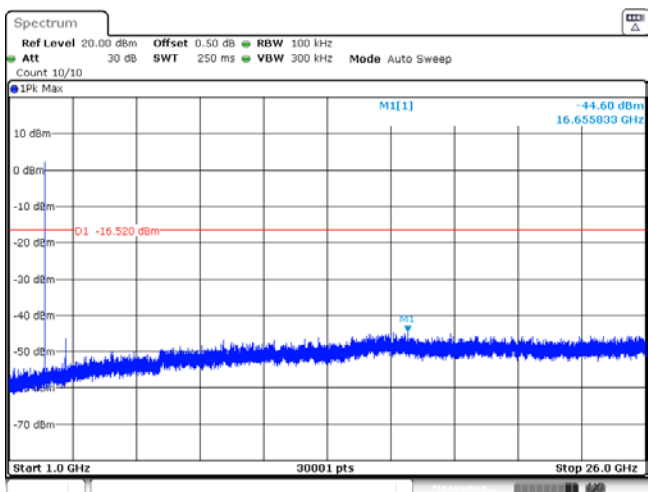
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CH39 30MHz~1000MHz	 Date: 18 MAR 2024 12:46:24
CH39 1GHz~26GHz	 Date: 18 MAR 2024 12:46:40

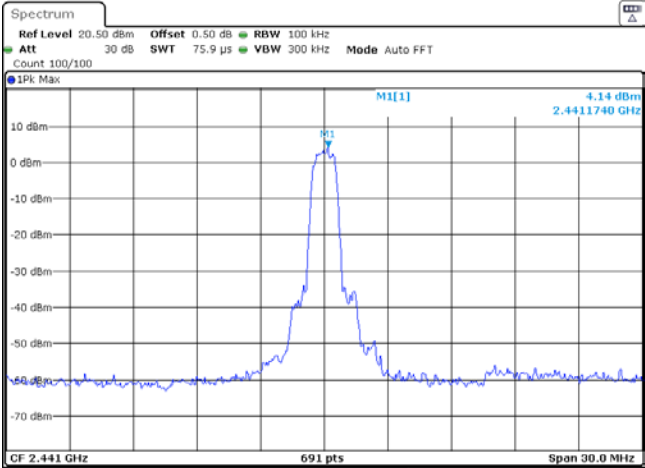
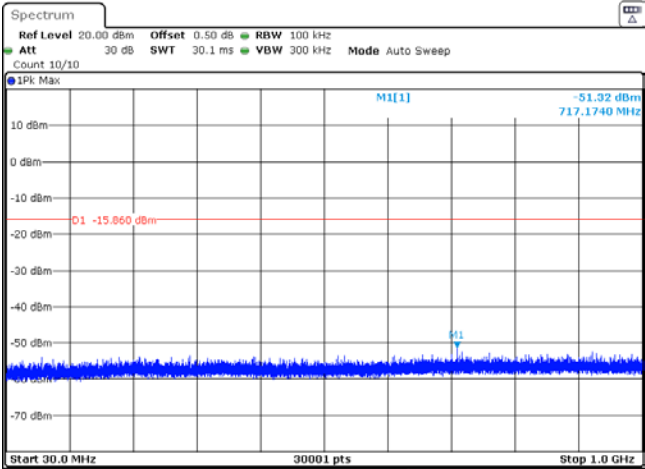
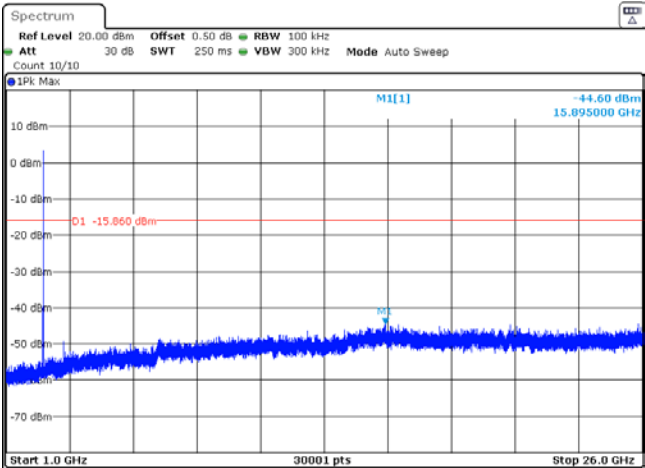
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CH78 30MHz~1000MHz	 Date: 18 MAR 2024 12:41:56
CH78 1GHz~26GHz	 Date: 18 MAR 2024 12:42:11

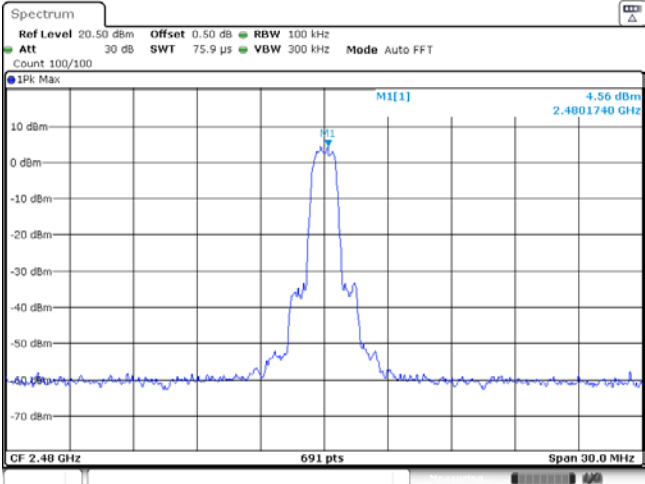
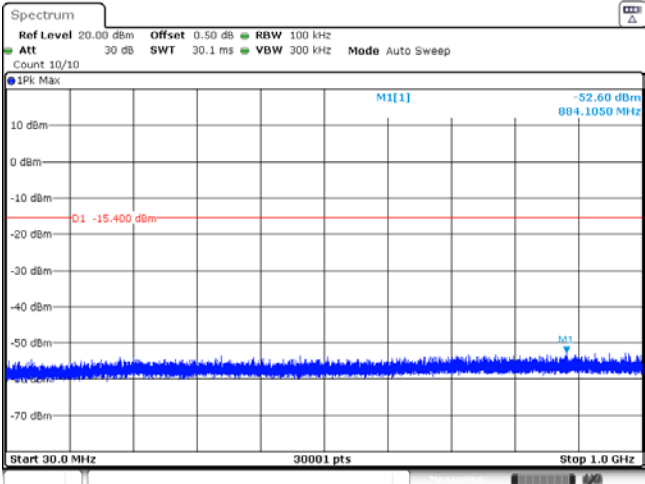
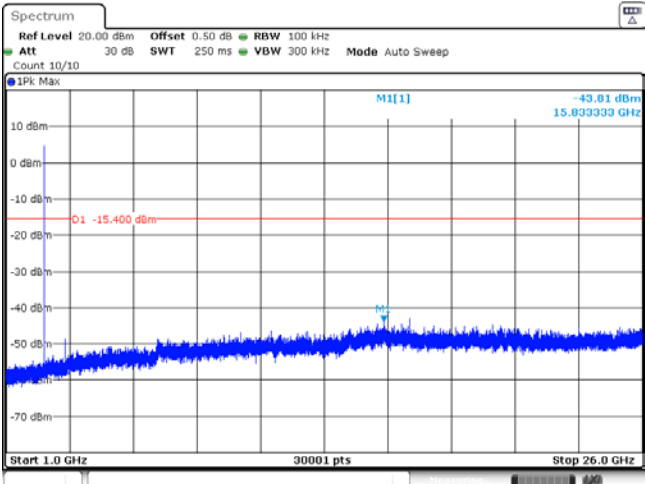
Test Item:	Spurious Emission	Modulation type:	$\pi/4$ DQPSK
CH00 Reference level	Date: 18 MAR 2024 12:43:27		
CH00 30MHz~1000MHz	Date: 18 MAR 2024 12:43:42		
CH00 1GHz~26GHz	Date: 18 MAR 2024 12:43:57		

CH39 Reference level	 Date: 18 MAR 2024 12:44:45
CH39 30MHz~1000MHz	 Date: 18 MAR 2024 12:45:00
CH39 1GHz~26GHz	 Date: 18 MAR 2024 12:45:16

CH78 Reference level	 Date: 18 MAR 2024 12:46:43
CH78 30MHz~1000MHz	 Date: 18 MAR 2024 12:46:58
CH78 1GHz~26GHz	 Date: 18 MAR 2024 12:47:14

Test Item:	Spurious Emission	Modulation type:	8DPSK
CH00 Reference level	 Date: 18 MAR 2024 12:48:40		
CH00 30MHz~1000MHz	 Date: 18 MAR 2024 12:48:55		
CH00 1GHz~26GHz	 Date: 18 MAR 2024 12:49:10		

CH39 Reference level	 Date: 18 MAR 2024 12:56:22
CH39 30MHz~1000MHz	 Date: 18 MAR 2024 12:56:37
CH39 1GHz~26GHz	 Date: 18 MAR 2024 12:56:52

CH78 Reference level	 Date: 18 MAR 2024 12:51:55
CH78 30MHz~1000MHz	 Date: 18 MAR 2024 12:52:19
CH78 1GHz~26GHz	 Date: 18 MAR 2024 12:52:26

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