

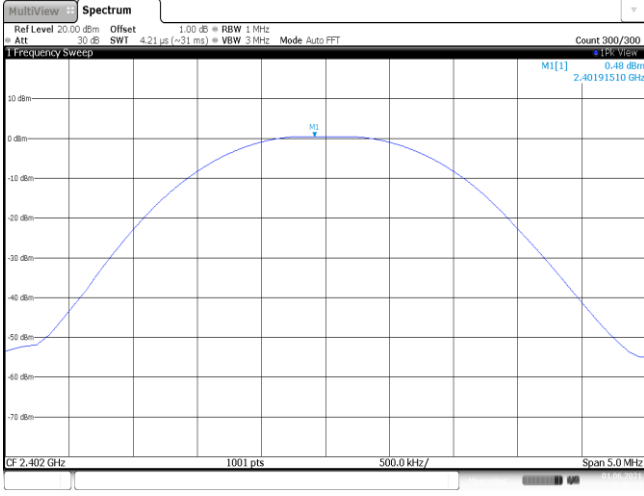
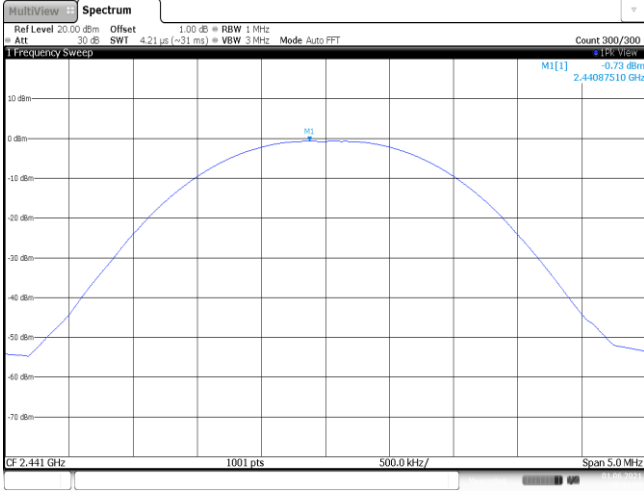
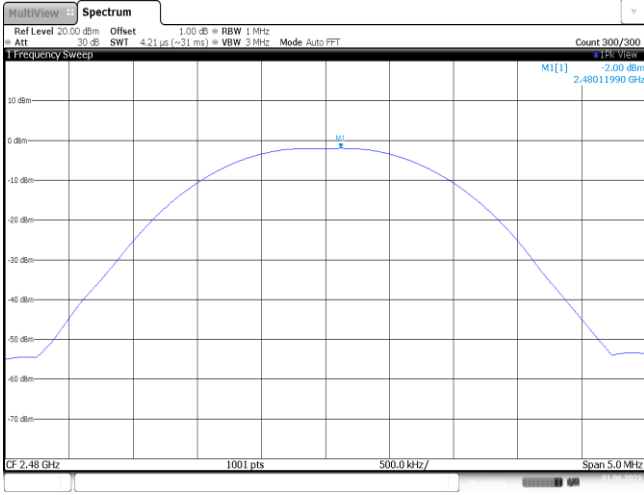
APPENDIX REPORT

Project No.	SHT2104093902EW	Radio Specification	Bluetooth EDR
Test sample No.	YPHT21040939006	Model No.	M11
Start test date	2021/6/1	Finish date	2021/6/1
Temperature	26.5°C	Humidity	46%
Test Engineer	Jiongsheng.Feng	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	Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	00	0.48	0.46	≤ 30.00	Pass
	39	-0.73	-0.75		
	78	-2.00	-2.01		
$\pi/4$ DQPSK	00	2.90	2.33	≤ 21.00	Pass
	39	1.56	1.03		
	78	0.39	-0.14		
8DPSK	00	3.34	2.56	≤ 21.00	Pass
	39	1.98	1.21		
	78	0.58	-0.20		

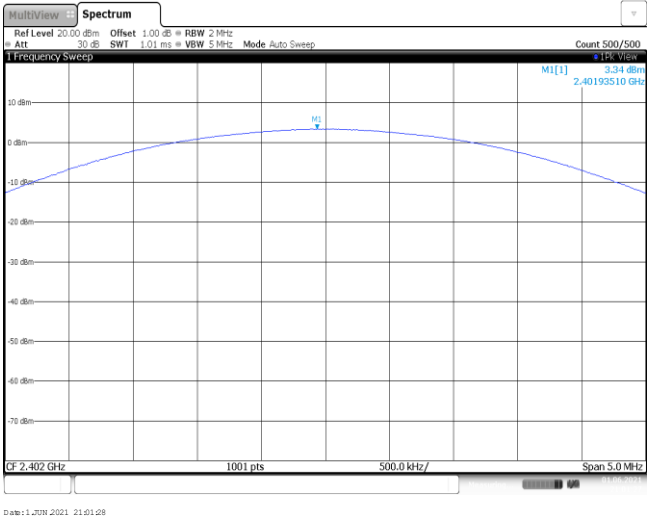
Modulation Type:	GFSK
CH00	 Ref Level 20.00 dBm Offset 1.00 dB RBW 1 MHz Att 30 dB SWI 4.21 us (~31 ms) VBW 3 MHz Mode Auto FFT Count 300/300 1 Frequency Sweep M1[1] 0.48 dBm 2.40191510 GHz CF 2.402 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz Date: 1 JUN 2021 20:26:55
CH39	 Ref Level 20.00 dBm Offset 1.00 dB RBW 1 MHz Att 30 dB SWI 4.21 us (~31 ms) VBW 3 MHz Mode Auto FFT Count 300/300 1 Frequency Sweep M1[1] -0.73 dBm 2.44087510 GHz CF 2.441 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz Date: 1 JUN 2021 20:46:09
CH78	 Ref Level 20.00 dBm Offset 1.00 dB RBW 1 MHz Att 30 dB SWI 4.21 us (~31 ms) VBW 3 MHz Mode Auto FFT Count 300/300 1 Frequency Sweep M1[1] -2.00 dBm 2.48011990 GHz CF 2.48 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz Date: 1 JUN 2021 20:48:00

Modulation Type: $\pi/4$ DQPSK	
CH00	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 2 MHz Att 30 dB SWT 1.01 ms VBW 5 MHz Mode Auto Sweep Count 500/500 1 Frequency Sweep M1[1] 2.90 dBm 2.40189510 GHz 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm CF 2.402 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz Date: 1 JUN 2021 20:51:11
CH39	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 2 MHz Att 30 dB SWT 1.01 ms VBW 5 MHz Mode Auto Sweep Count 500/500 1 Frequency Sweep M1[1] 1.56 dBm 2.44090510 GHz 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm CF 2.441 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz Date: 1 JUN 2021 20:56:04
CH78	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 2 MHz Att 30 dB SWT 1.01 ms VBW 5 MHz Mode Auto Sweep Count 500/500 1 Frequency Sweep M1[1] 0.39 dBm 2.47985510 GHz 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm CF 2.48 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz Date: 1 JUN 2021 20:58:25

Modulation Type:

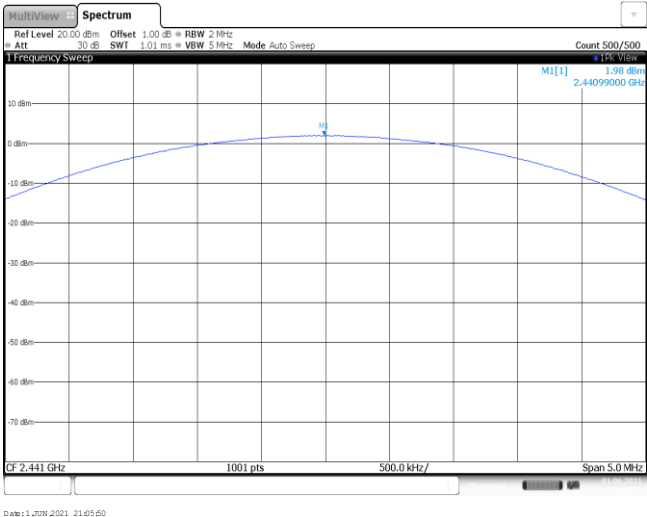
8DPSK

CH00



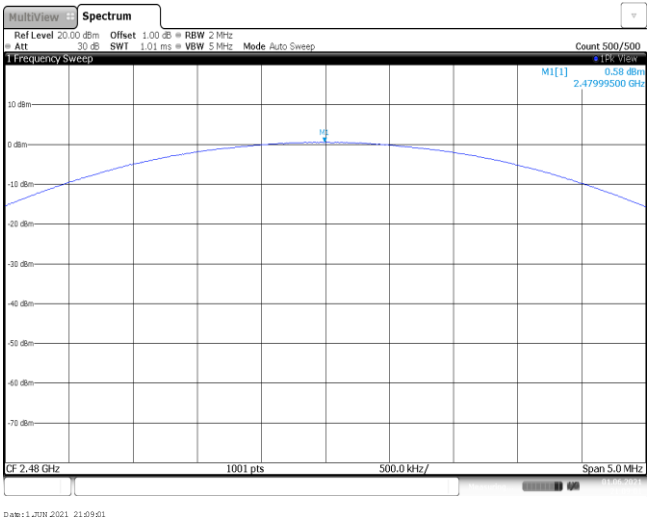
Date: 1 JUN 2021 21:01:28

CH39



Date: 1 JUN 2021 21:05:50

CH78



Date: 1 JUN 2021 21:09:01

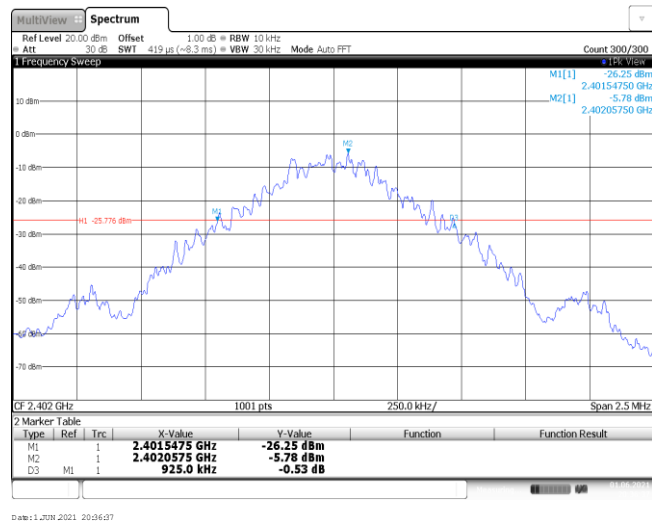
Appendix B : 20 dB Bandwidth

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	1342.50		
	78	1342.50		
8DPSK	00	1335.00	-	Pass
	39	1337.50		
	78	1322.50		

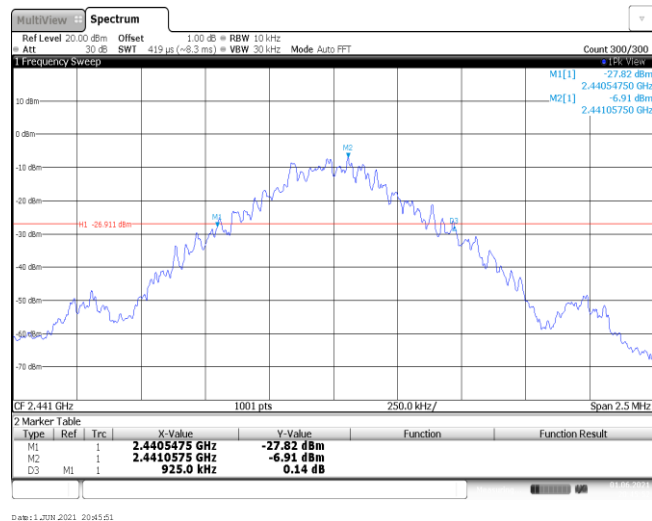
Modulation Type:

GFSK

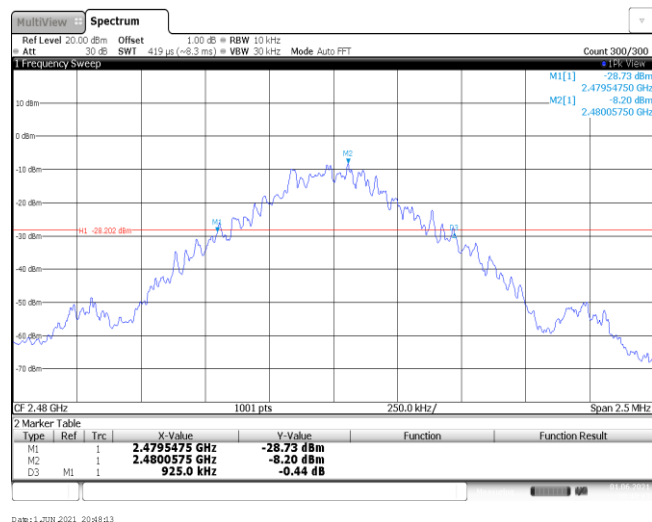
CH00

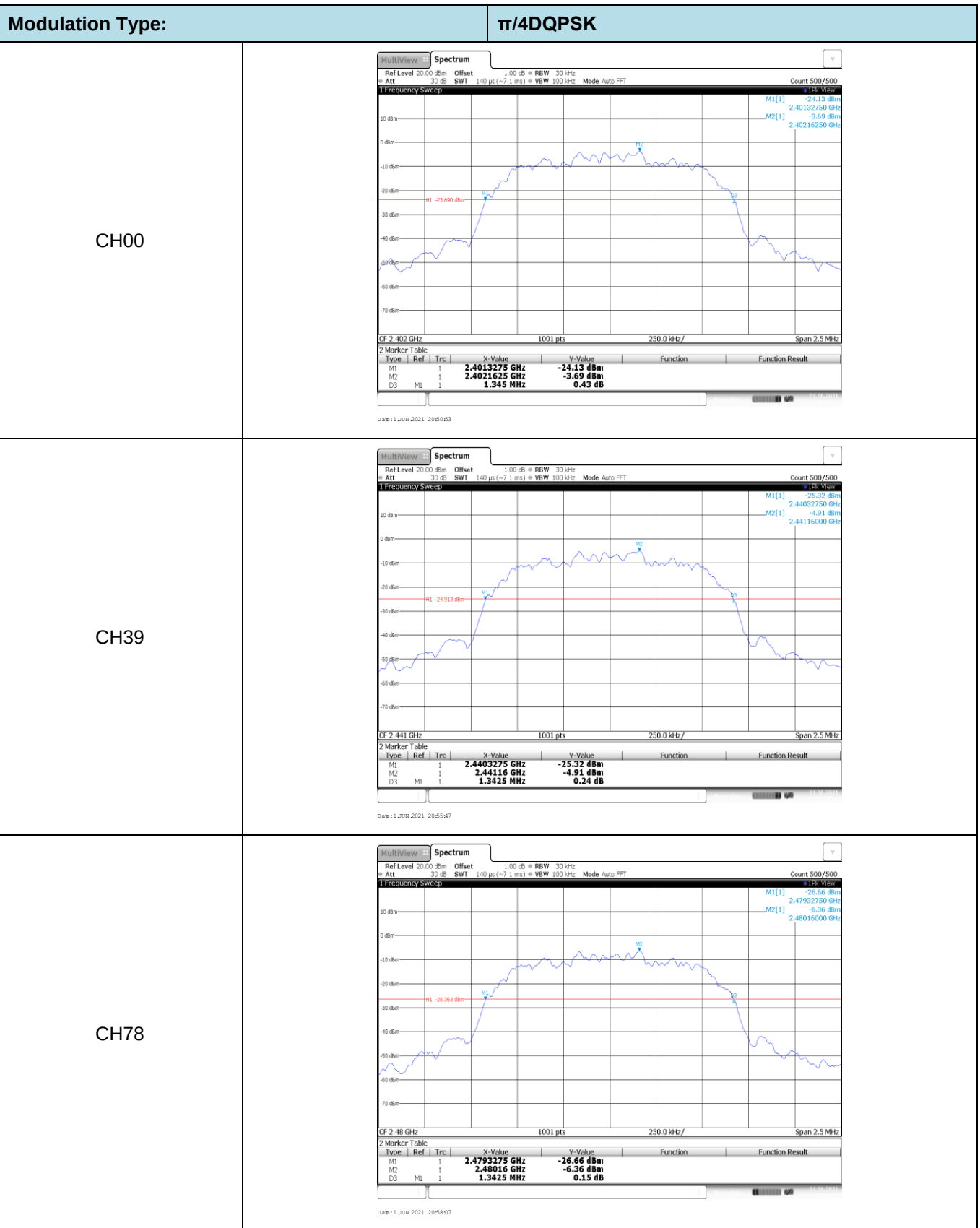


CH39



CH78

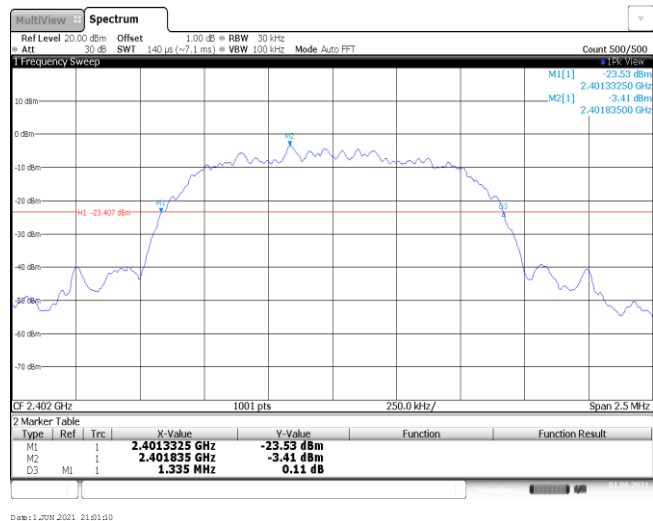




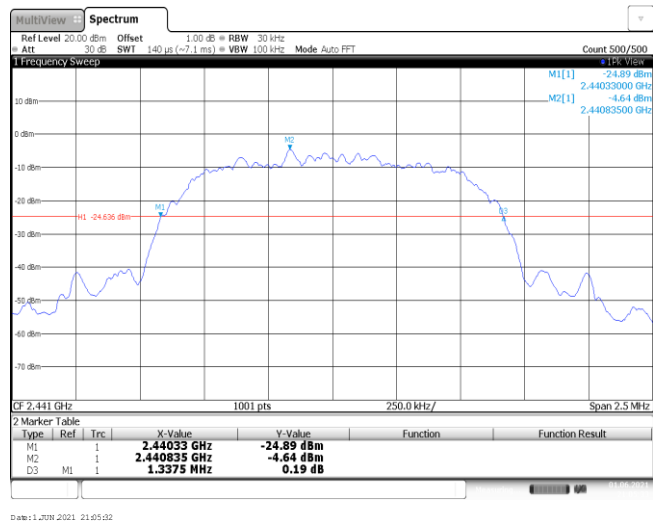
Modulation Type:

8DPSK

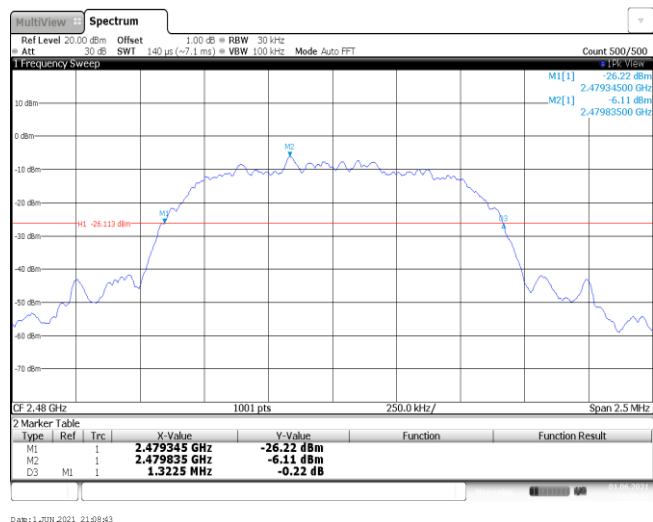
CH00



CH39

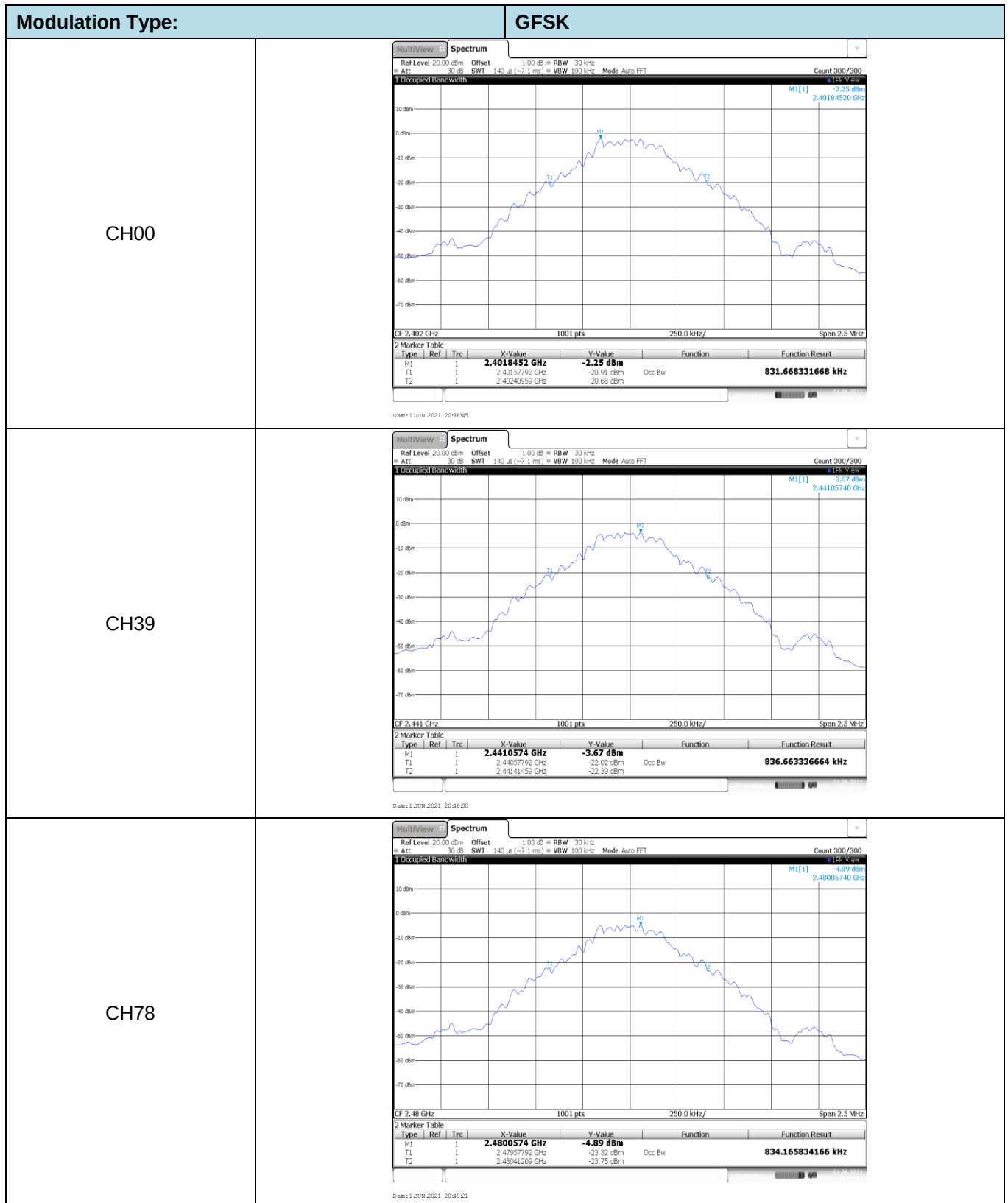


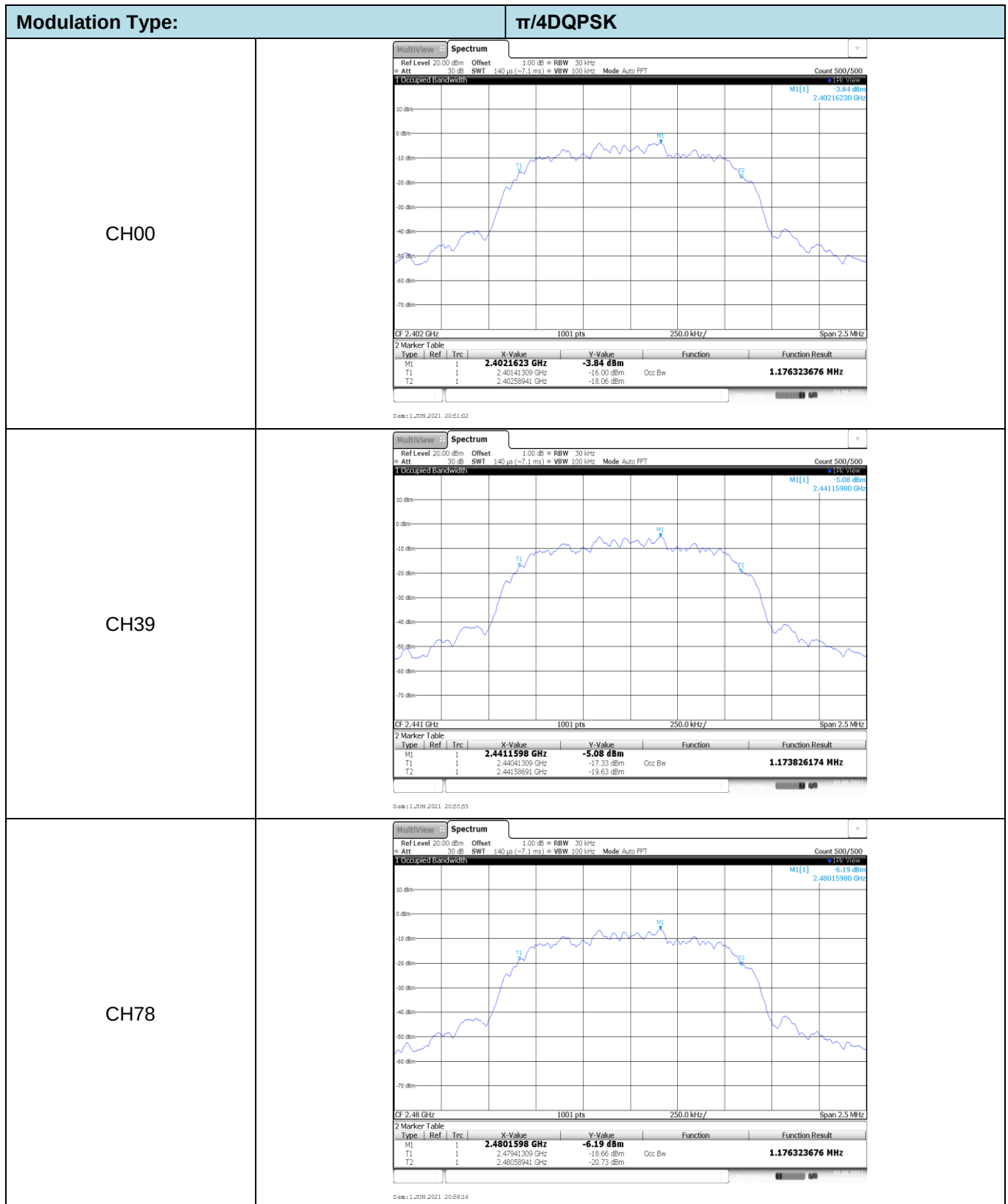
CH78



Appendix C: 99% Occupied Bandwidth

Modulation type	Channel	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.83	-	Pass
	39	0.84		
	78	0.83		
$\pi/4$ DQPSK	00	1.18	-	Pass
	39	1.17		
	78	1.18		
8DPSK	00	1.18	-	Pass
	39	1.18		
	78	1.18		

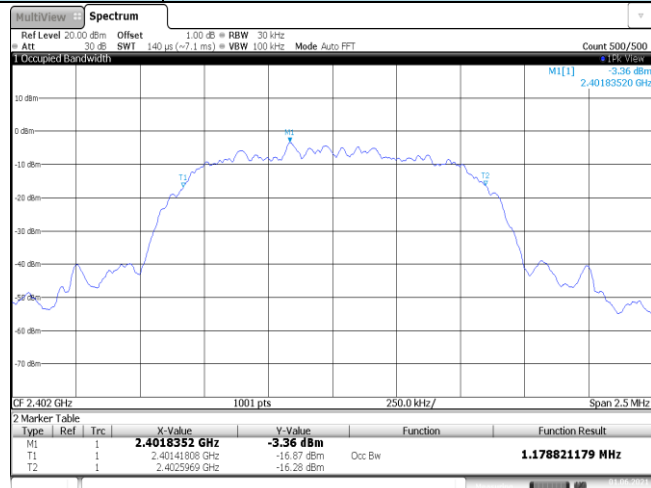




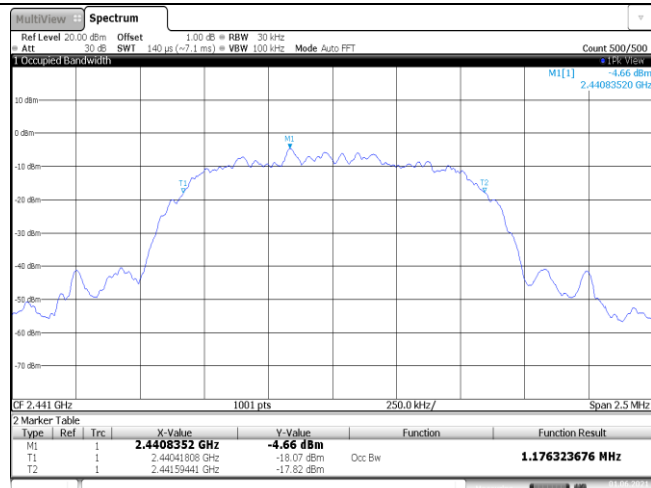
Modulation Type:

8DPSK

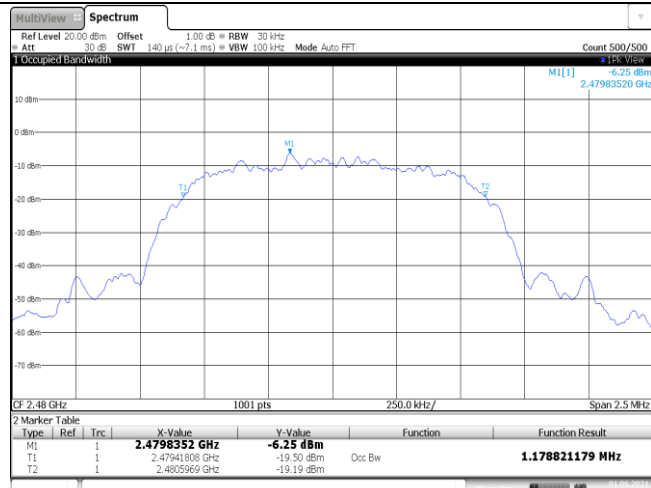
CH00



CH39



CH78



Appendix D: Carrier Frequencies Separation

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (kHz) *	Result
GFSK	39	1.00	≥925	Pass
π/4DQPSK	39	1.00	≥896.67	Pass
8DPSK	39	1.00	≥891.67	Pass

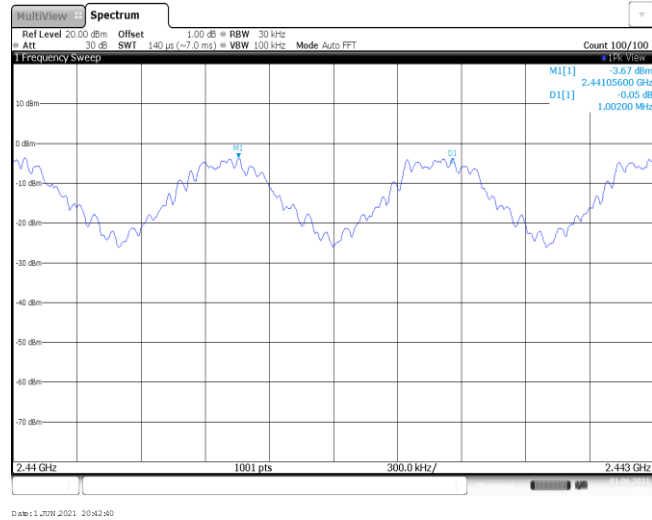
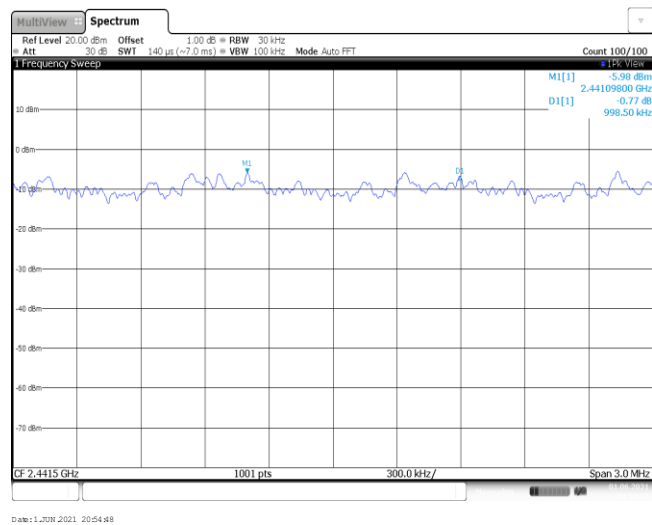
Note:

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

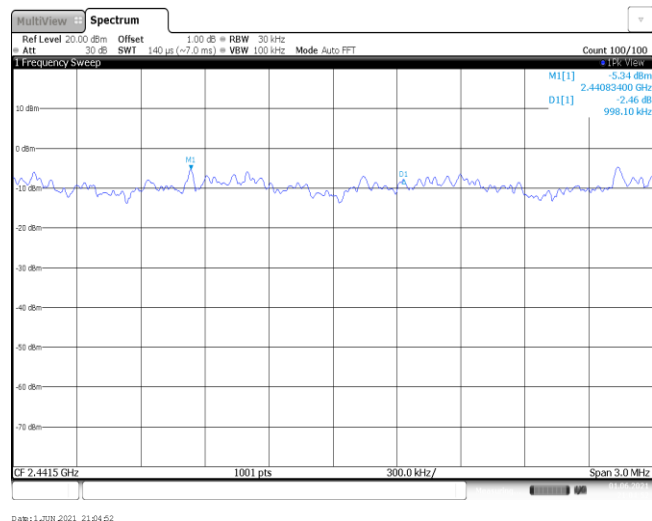
π/4DQPSK limit = $\frac{2}{3}$ * The maximum 20 dB Bandwidth for π/4DQPSK modulation on the appendix B.

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

GFSK

 $\pi/4$ DQPSK

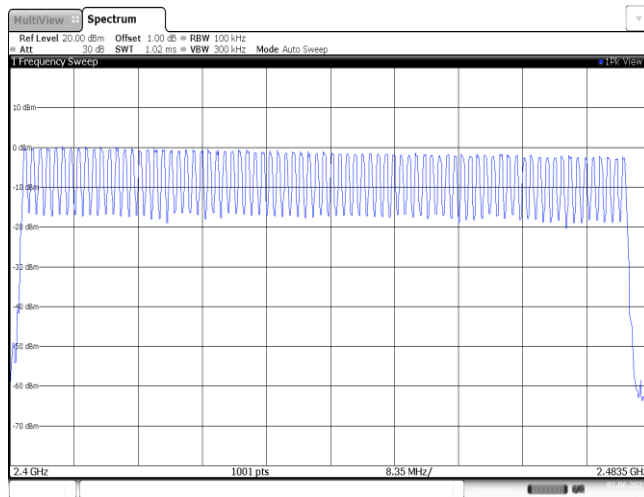
8DPSK



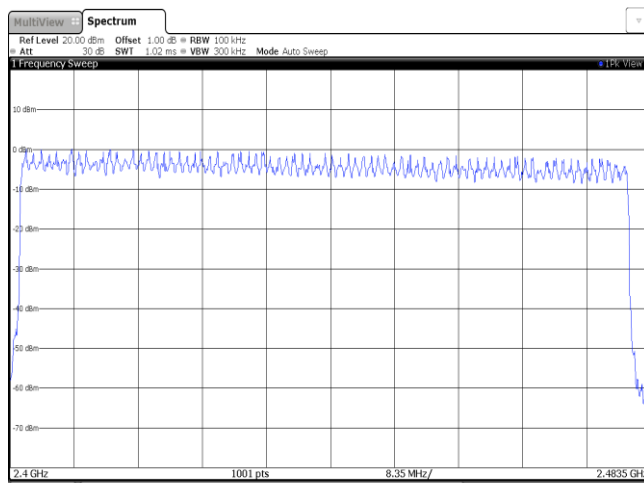
Appendix E: Hopping Channel Number

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

GFSK

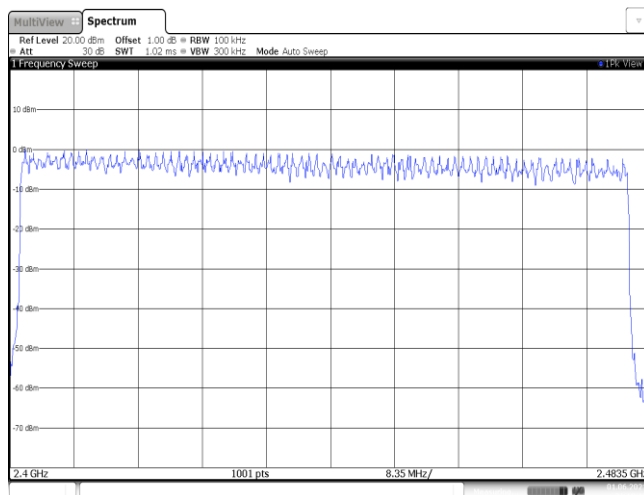


Date: 1 JUN 2021 21:12:27

 $\pi/4$ DQPSK

Date: 1 JUN 2021 21:15:49

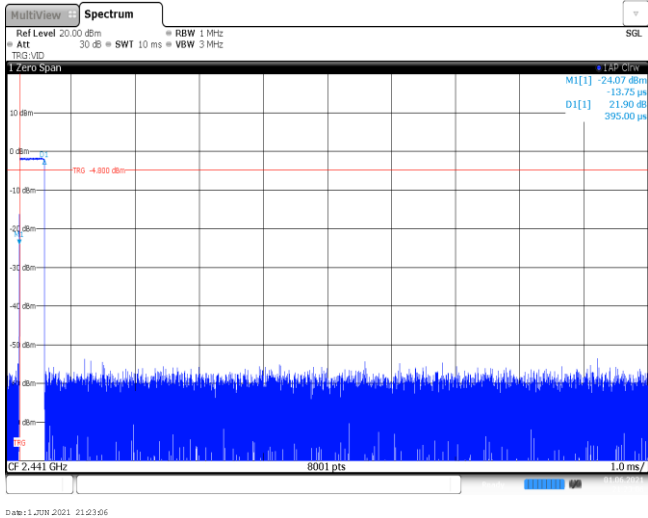
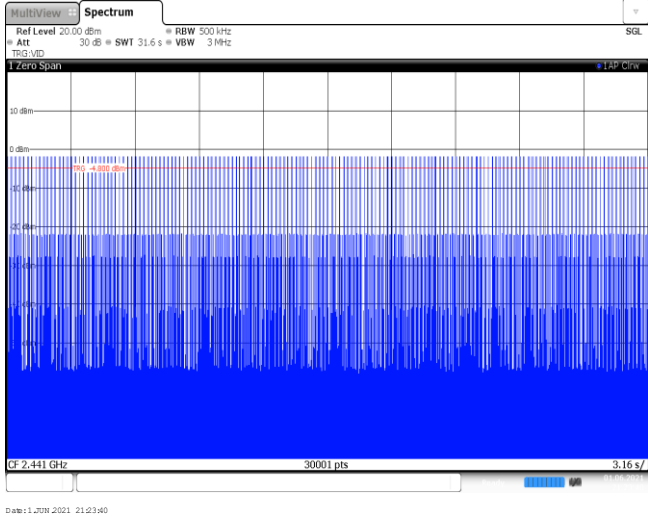
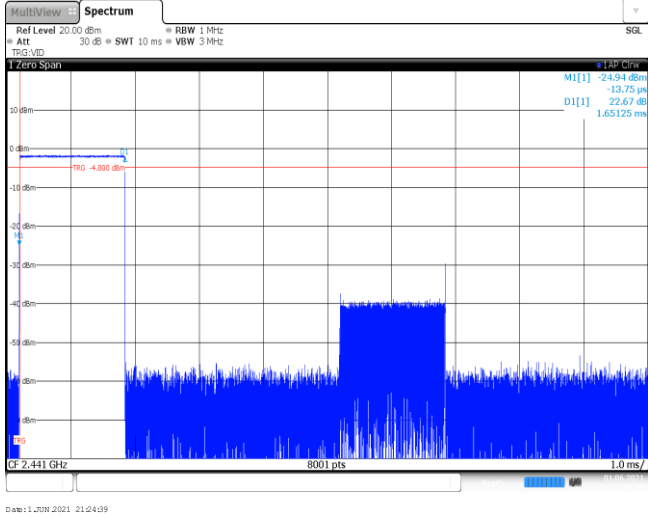
8DPSK

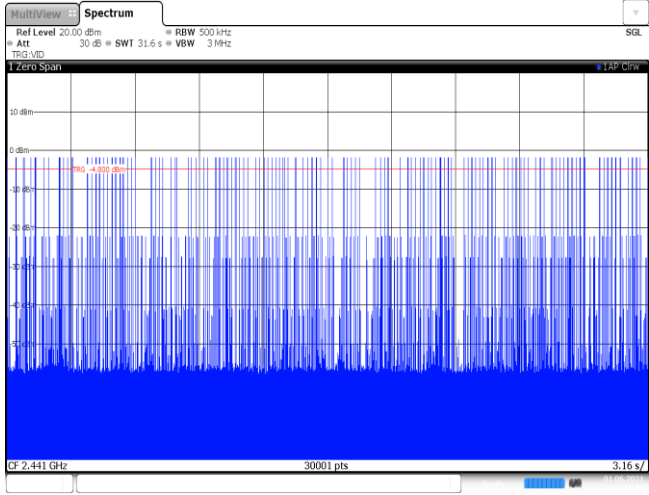
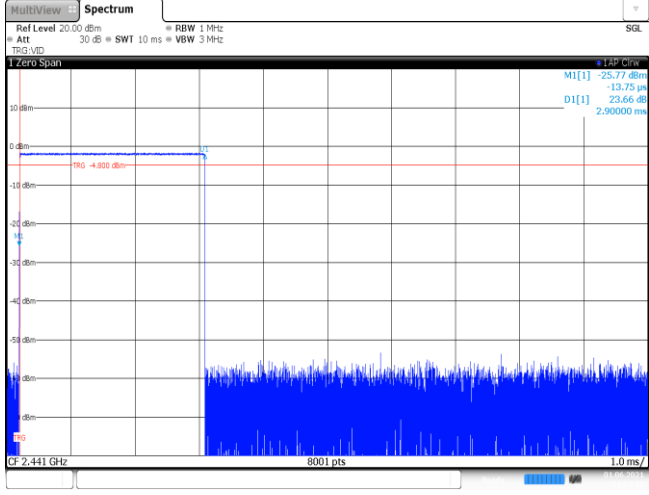
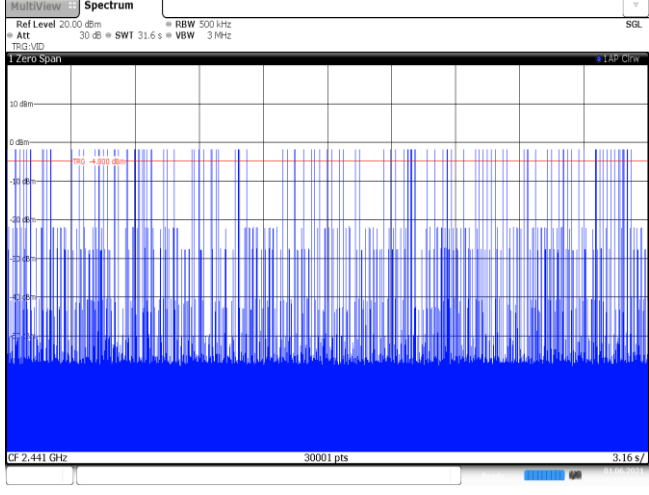


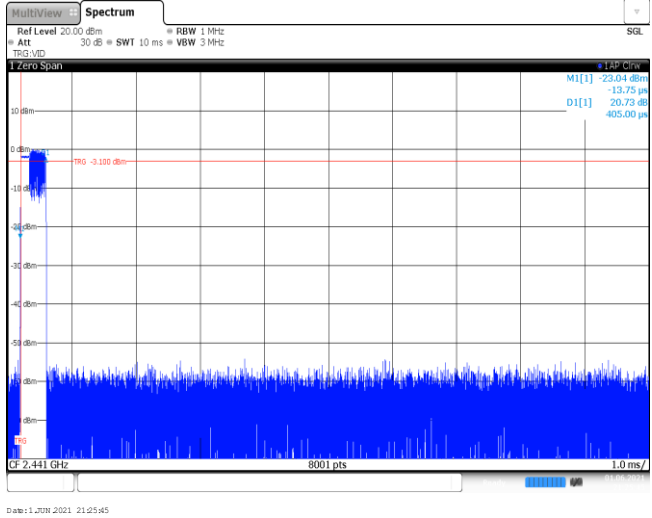
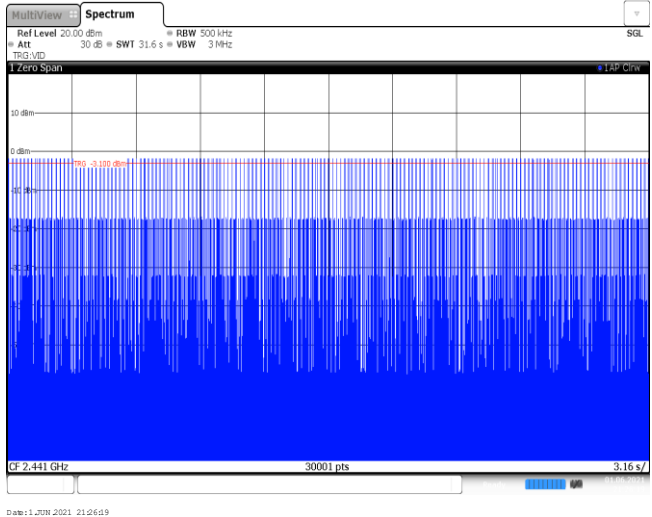
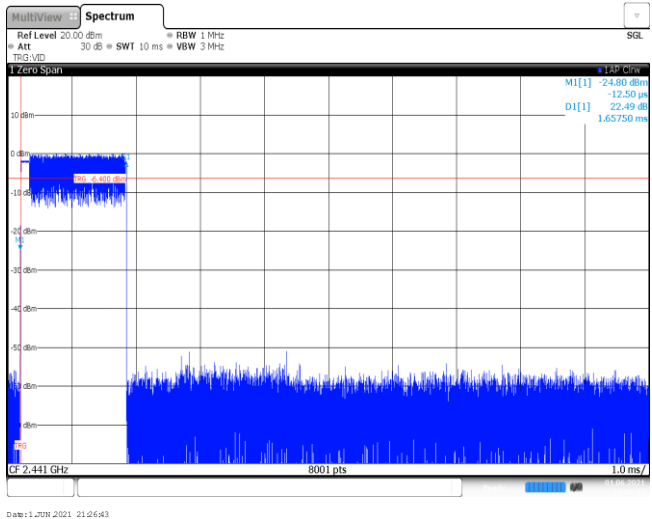
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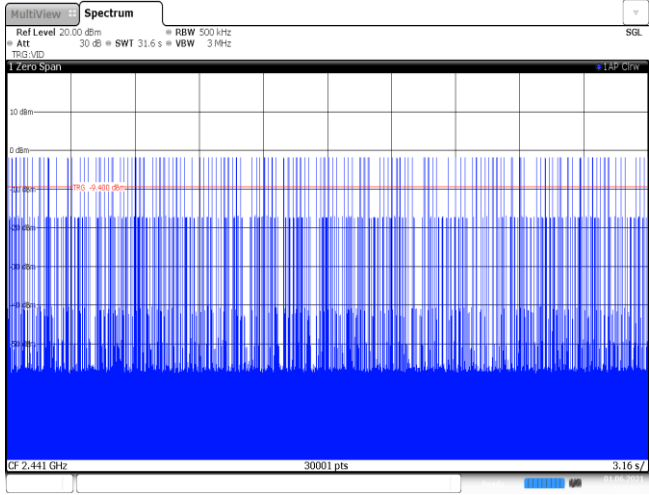
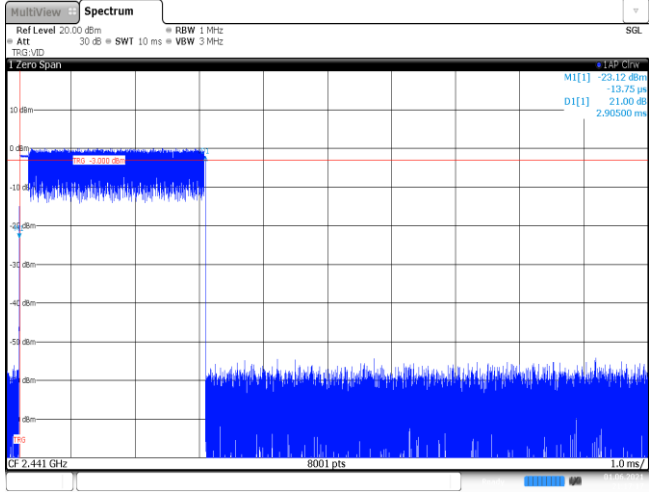
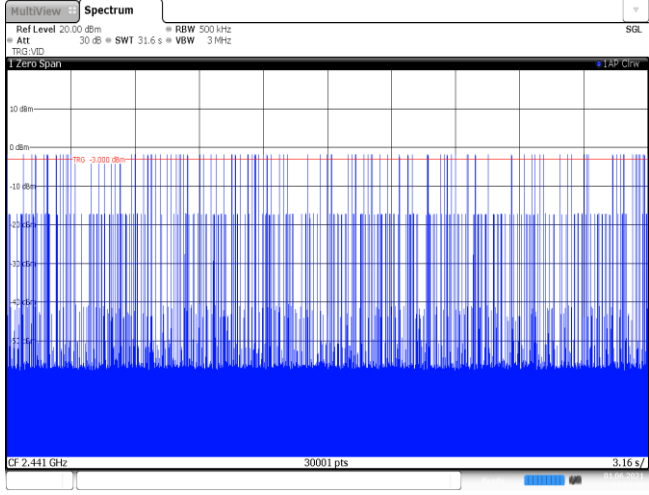
Appendix F: Dwell Time

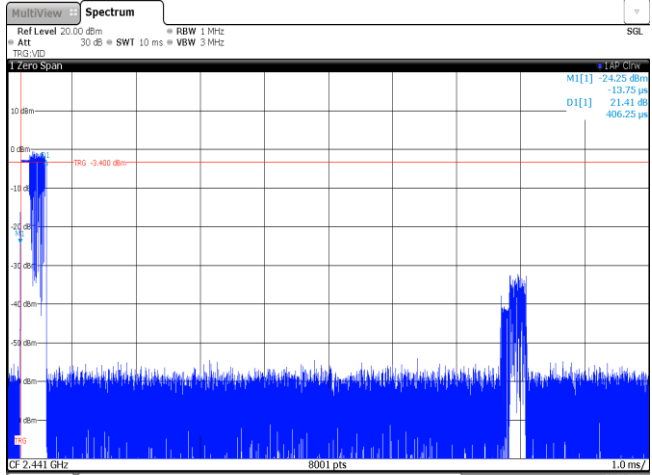
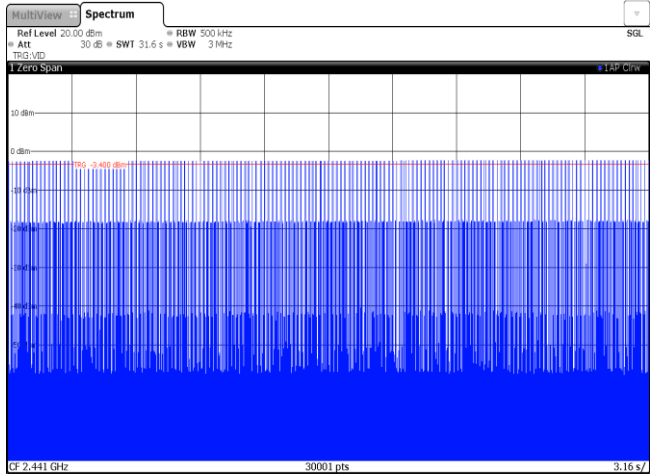
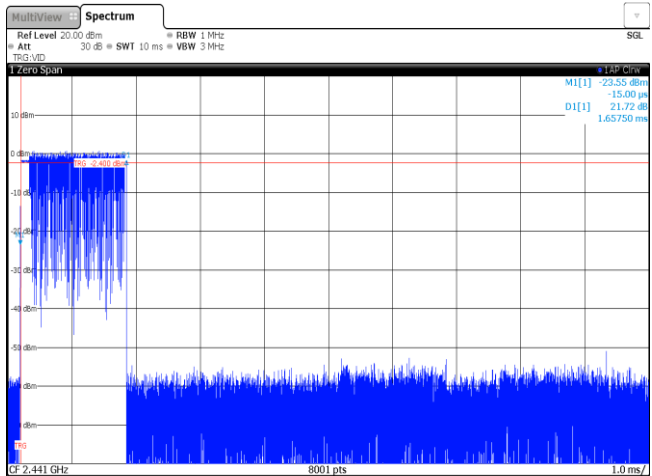
Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.40	317	0.13	≤ 0.40	Pass
	DH3	1.65	164	0.27		
	DH5	2.90	108	0.31		
$\pi/4$ DQPSK	2DH1	0.41	316	0.13	≤ 0.40	Pass
	2DH3	1.66	173	0.29		
	2DH5	2.91	109	0.32		
8DPSK	3DH1	0.41	319	0.13	≤ 0.40	Pass
	3DH3	1.66	179	0.30		
	3DH5	2.91	86	0.25		

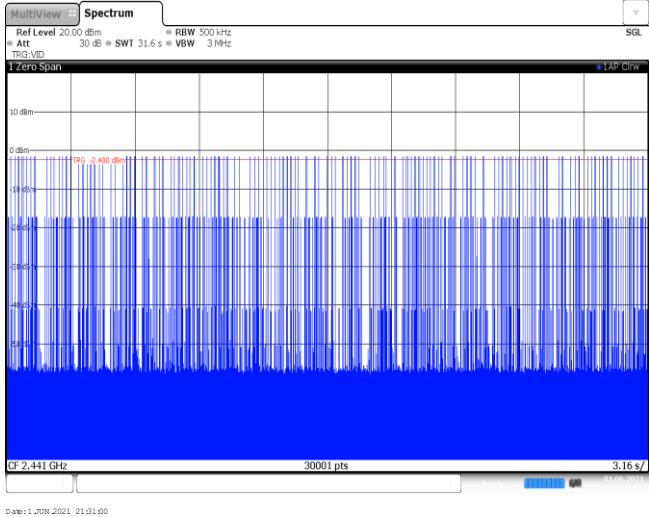
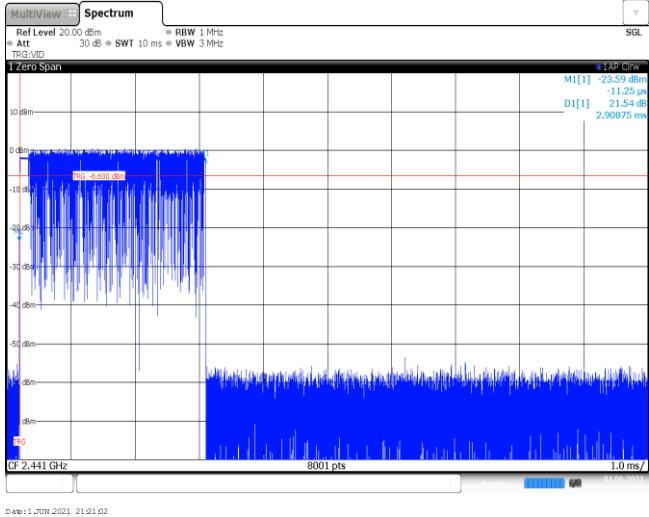
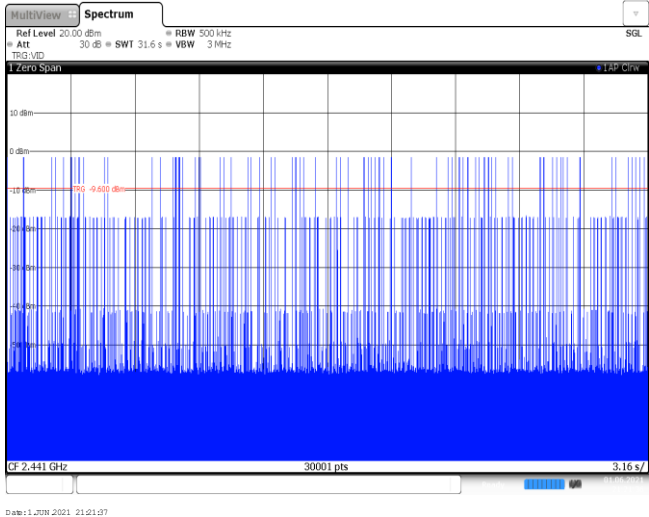
Modulation Type: GFSK	
DH1 Burst width	
DH1 Burst number	
DH3 Burst width	

DH3 Burst number	
DH5 Burst width	
DH5 Burst number	

Modulation Type:	$\pi/4$ DQPSK
2DH1 Burst width	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 8001 pts. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents frequency in MHz, ranging from 2.440 to 2.442. A red line indicates the signal level at -3.100 dBm. The plot shows a sharp peak at the center frequency, with a noise floor around -60 dBm. The signal is identified as 2DH1.
2DH1 Burst number	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 30001 pts. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents frequency in MHz, ranging from 2.440 to 2.442. A red line indicates the signal level at -3.100 dBm. The plot shows a sharp peak at the center frequency, with a noise floor around -60 dBm. The signal is identified as 2DH1.
2DH3 Burst width	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 8001 pts. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents frequency in MHz, ranging from 2.440 to 2.442. A red line indicates the signal level at -3.100 dBm. The plot shows a sharp peak at the center frequency, with a noise floor around -60 dBm. The signal is identified as 2DH3.

2DH3 Burst number	
2DH5 Burst width	
2DH5 Burst number	

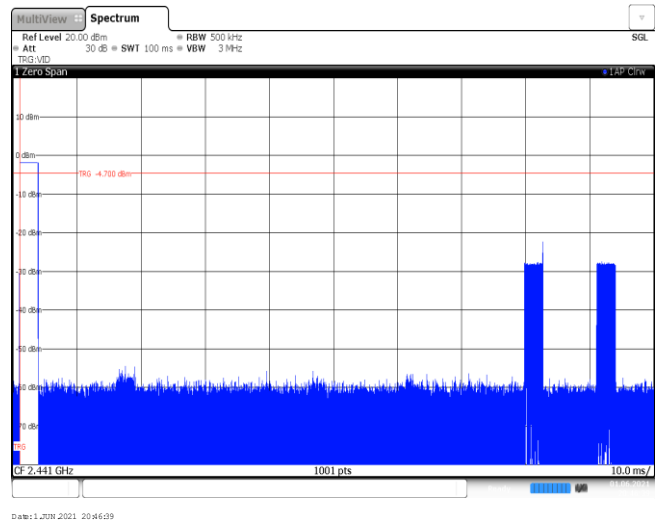
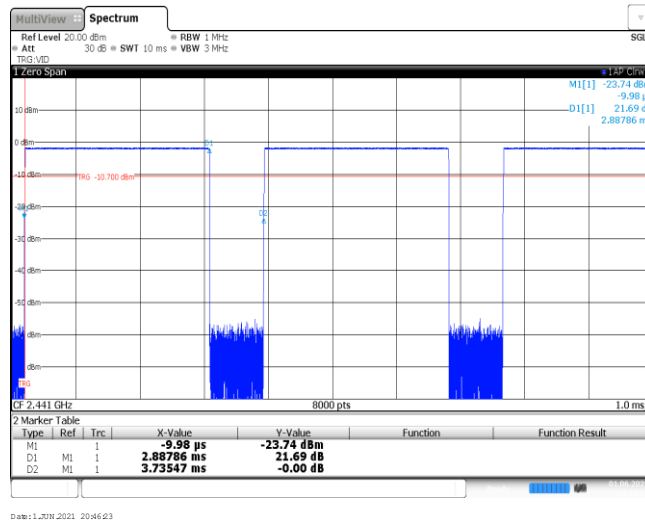
Modulation Type:	8DPSK
3DH1 Burst width	 The spectrum plot shows a signal at 2.441 GHz. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents time, ranging from 0 to 1.0 ms. A red line indicates a threshold at -3.400 dBm. The signal is a burst of energy, with a peak power of approximately -24.25 dBm. The plot is labeled 'Spectrum' and '1 Zero Span'. The date is 1 JUN 2021 21:27:47.
3DH1 Burst number	 The spectrum plot shows a signal at 2.441 GHz. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents time, ranging from 0 to 3.16 s. A red line indicates a threshold at -3.400 dBm. The signal is a burst of energy, with a peak power of approximately -24.25 dBm. The plot is labeled 'Spectrum' and '1 Zero Span'. The date is 1 JUN 2021 21:28:21.
3DH3 Burst width	 The spectrum plot shows a signal at 2.441 GHz. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents time, ranging from 0 to 1.0 ms. A red line indicates a threshold at -3.400 dBm. The signal is a burst of energy, with a peak power of approximately -23.55 dBm. The plot is labeled 'Spectrum' and '1 Zero Span'. The date is 1 JUN 2021 21:30:26.

3DH3 Burst number	 The spectrum plot shows a dense 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, SWT 31.6 s, and VBW 3 kHz. The signal is centered around 2.441 GHz.
3DH5 Burst width	 The spectrum plot shows a signal burst between 2.441 GHz and 2.90875 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 1 MHz, SWT 10 ms, and VBW 3 MHz. The signal is centered around 2.441 GHz.
3DH5 Burst number	 The spectrum plot shows a dense 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, SWT 31.6 s, and VBW 3 kHz. The signal is centered around 2.441 GHz.

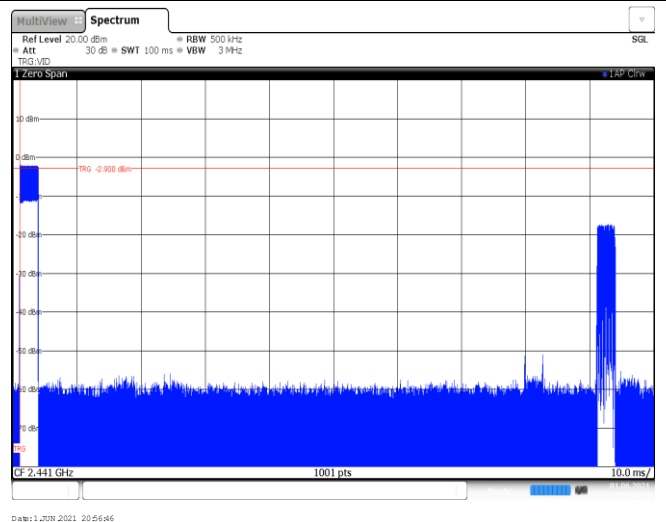
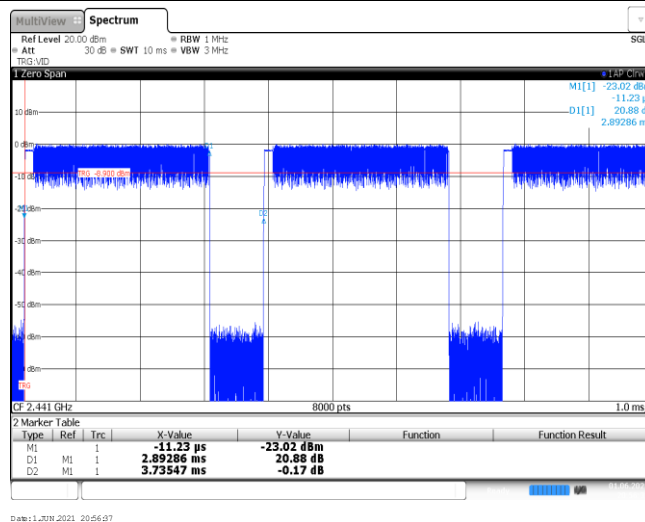
Appendix G: Duty Cycle Correction Factor (DCCF)

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	2.89	100	3.00	-21.24
$\pi/4$ DQPSK	2441	2.89	100	2.00	-24.76
8DPSK	2441	2.90	100	1.00	-30.75

GFSK

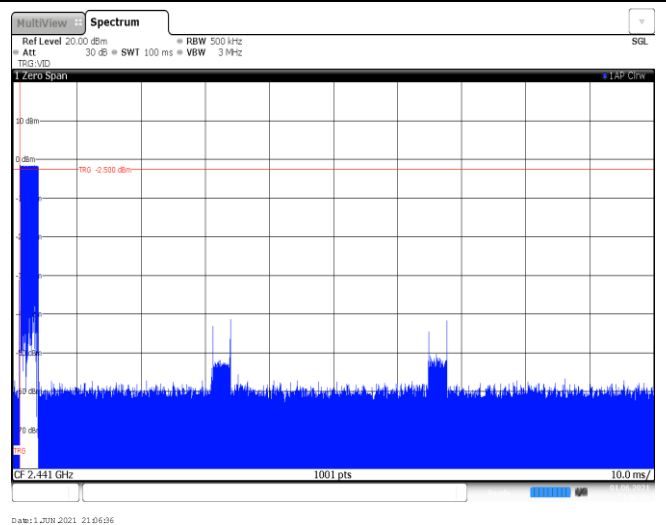
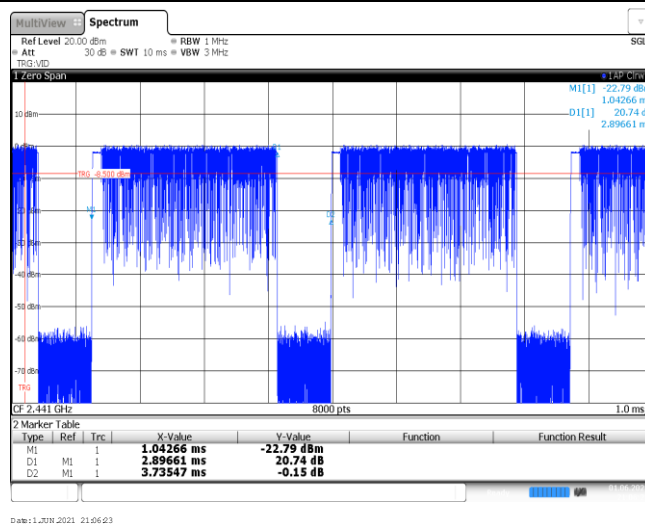
T_{on} time for single burst

Burst Quantity

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

Burst Quantity

8DPSK

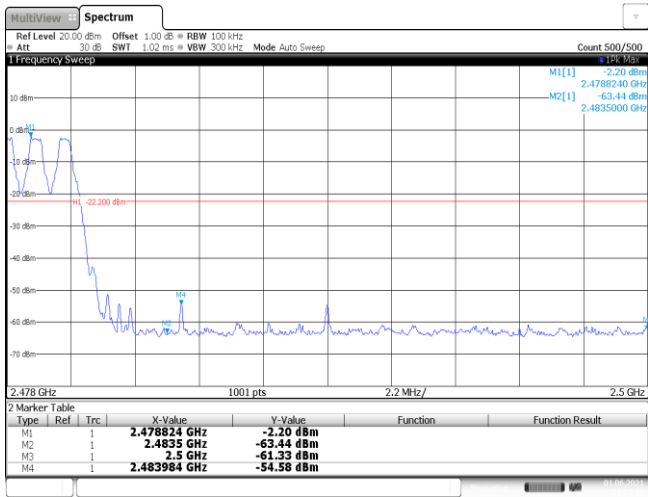
T_{on} time for single burst

Burst Quantity

Appendix H: Band edge and Spurious Emissions (conducted)

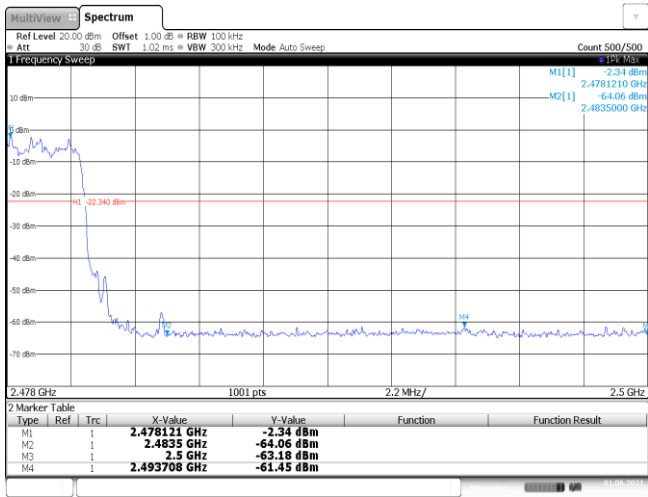
Test Item:	Band edge	Modulation type:	GFSK
CH00 No hopping mode			

CH78
Hopping mode



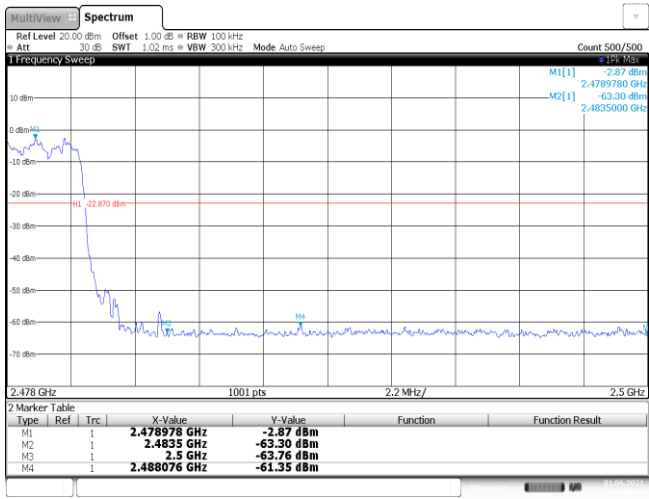
Test Item:	Band edge	Modulation type:	$\pi/4$ DQPSK																																										
CH00 No hopping mode	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 1.05 ms VBW 300 kHz Mode Auto Sweep Count 500/500 Frequency Sweep M1[1] 0.35 dBm 2.4021050 GHz M2[1] -54.12 dBm 2.4000000 GHz 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm 2.31 GHz 1001 pts 9.5 MHz/ 2.405 GHz 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>0.35 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-54.12 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-63.85 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-64.12 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.39873 GHz</td><td>-53.05 dBm</td><td></td><td></td></tr></table> Date: 1 JUN 2021 20:52:12			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.402105 GHz	0.35 dBm			M2	1		2.4 GHz	-54.12 dBm			M3	1		2.39 GHz	-63.85 dBm			M4	1		2.31 GHz	-64.12 dBm			M5	1		2.39873 GHz	-53.05 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.402105 GHz	0.35 dBm																																									
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M4	1		2.31 GHz	-64.12 dBm																																									
M5	1		2.39873 GHz	-53.05 dBm																																									
CH00 Hopping mode	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 1.05 ms VBW 300 kHz Mode Auto Sweep Count 500/500 Frequency Sweep M1[1] -2.75 dBm 2.4030540 GHz M2[1] -54.73 dBm 2.4000000 GHz 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm 2.31 GHz 1001 pts 9.5 MHz/ 2.405 GHz 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>2.403054 GHz</td><td>-2.75 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-54.73 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-62.00 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-64.35 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.399965 GHz</td><td>-59.34 dBm</td><td></td><td></td></tr></table> Date: 1 JUN 2021 21:16:43			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.403054 GHz	-2.75 dBm			M2	1		2.4 GHz	-54.73 dBm			M3	1		2.39 GHz	-62.00 dBm			M4	1		2.31 GHz	-64.35 dBm			M5	1		2.399965 GHz	-59.34 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.403054 GHz	-2.75 dBm																																									
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M3	1		2.39 GHz	-62.00 dBm																																									
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M5	1		2.399965 GHz	-59.34 dBm																																									
CH78 No hopping mode	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 1.02 ms VBW 300 kHz Mode Auto Sweep Count 500/500 Frequency Sweep M1[1] -2.22 dBm 2.4801430 GHz M2[1] -62.18 dBm 2.4835000 GHz 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm 2.478 GHz 1001 pts 2.2 MHz/ 2.5 GHz 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>2.480143 GHz</td><td>-2.22 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4835 GHz</td><td>-62.18 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.5 GHz</td><td>-63.76 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.483698 GHz</td><td>-61.65 dBm</td><td></td><td></td></tr></table> Date: 1 JUN 2021 20:59:26			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.480143 GHz	-2.22 dBm			M2	1		2.4835 GHz	-62.18 dBm			M3	1		2.5 GHz	-63.76 dBm			M4	1		2.483698 GHz	-61.65 dBm									
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.480143 GHz	-2.22 dBm																																									
M2	1		2.4835 GHz	-62.18 dBm																																									
M3	1		2.5 GHz	-63.76 dBm																																									
M4	1		2.483698 GHz	-61.65 dBm																																									

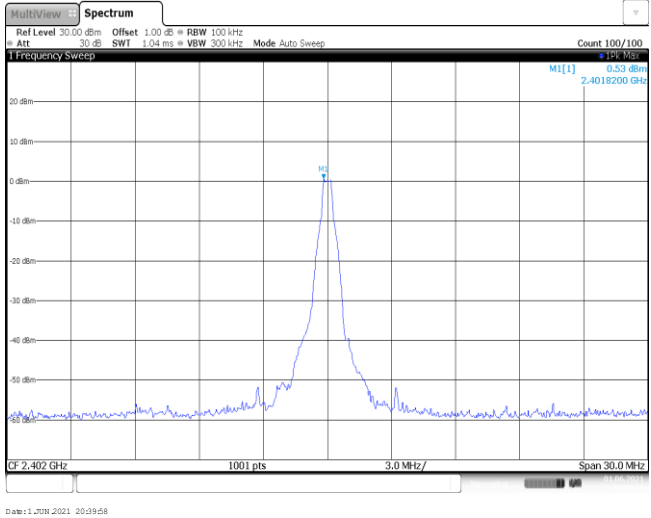
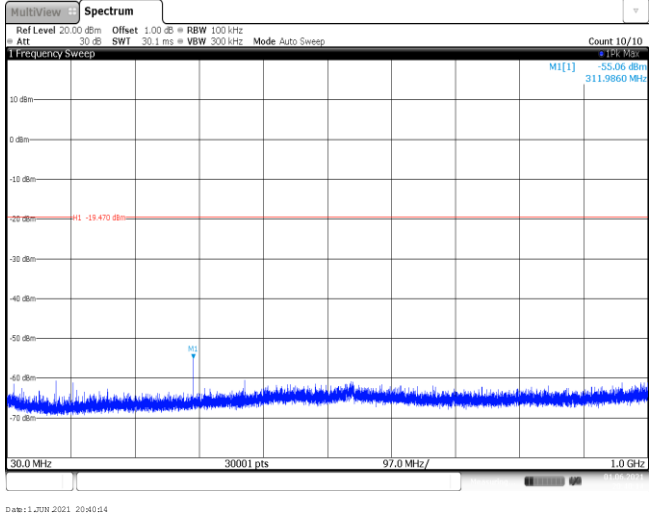
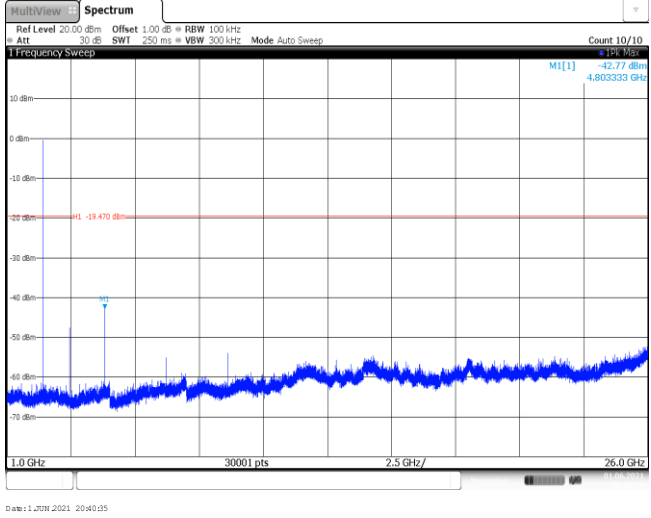
CH78
Hopping mode



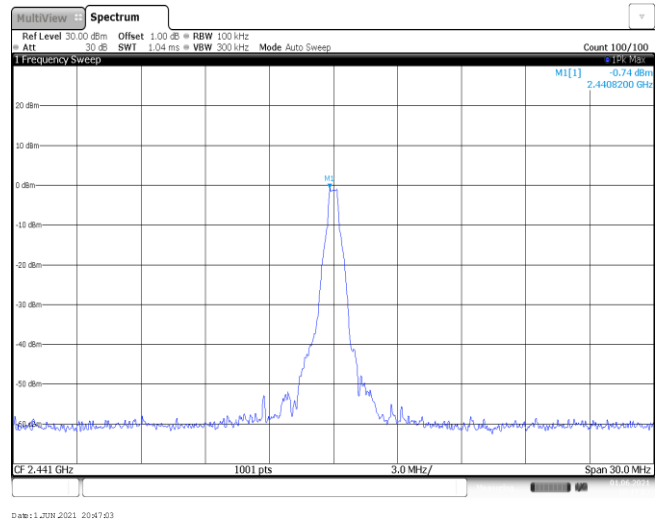
Test Item:	Band edge	Modulation type:	8DPSK
CH00 No hopping mode			

CH78
Hoppig mode

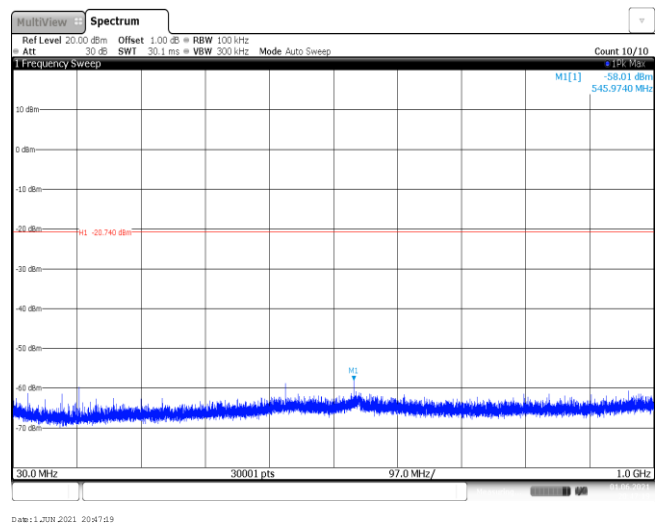


Test Item:	Spurious Emission	Modulation type:	GFSK
CH00 Reference level			
CH00 30MHz~1000MHz			
CH00 1GHz~26GHz			

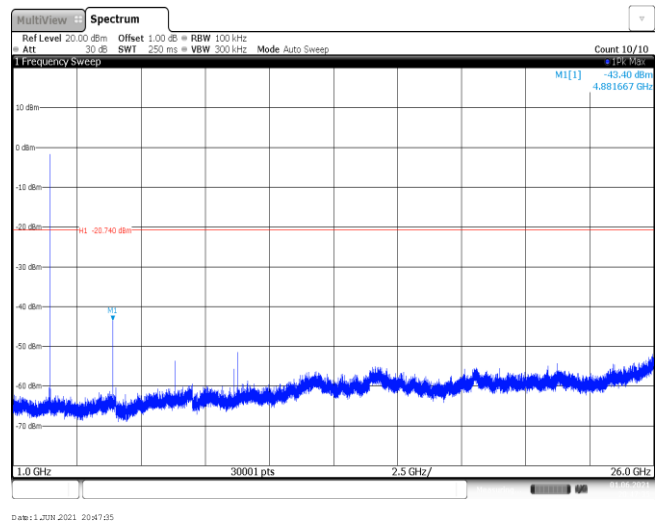
CH39
Reference level

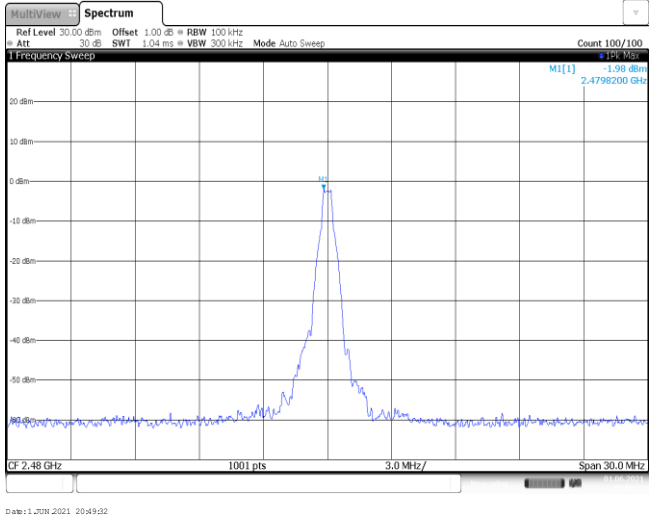
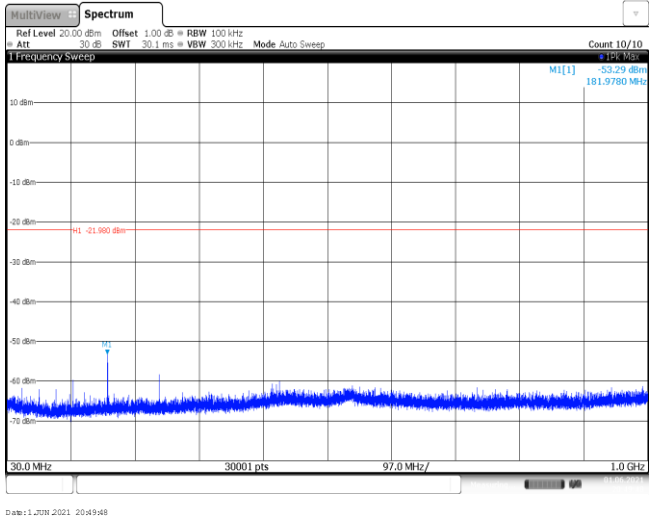
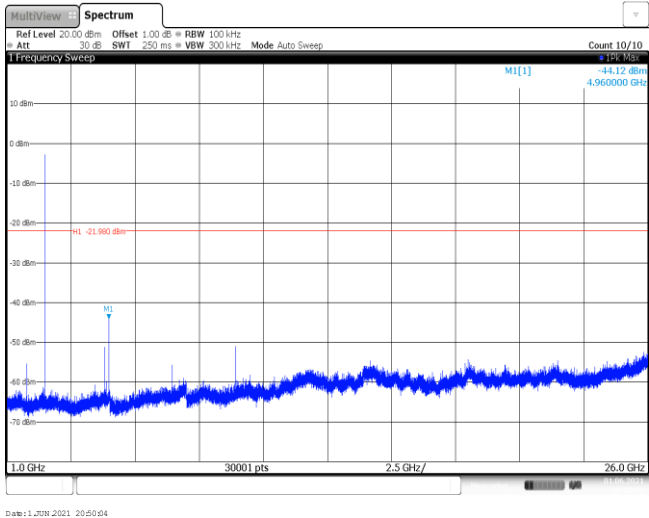


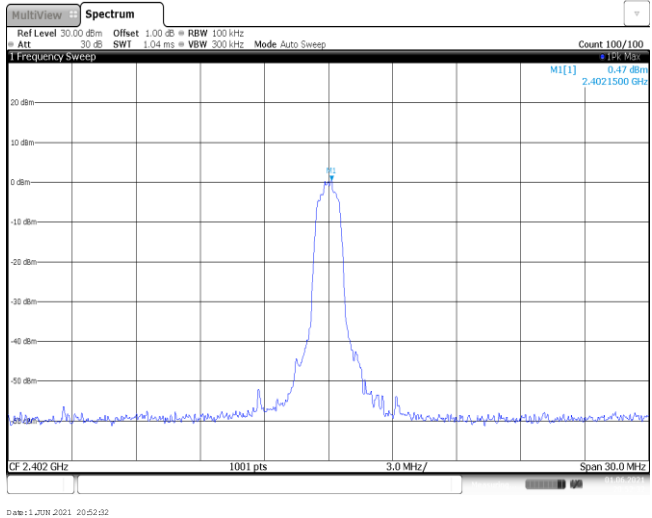
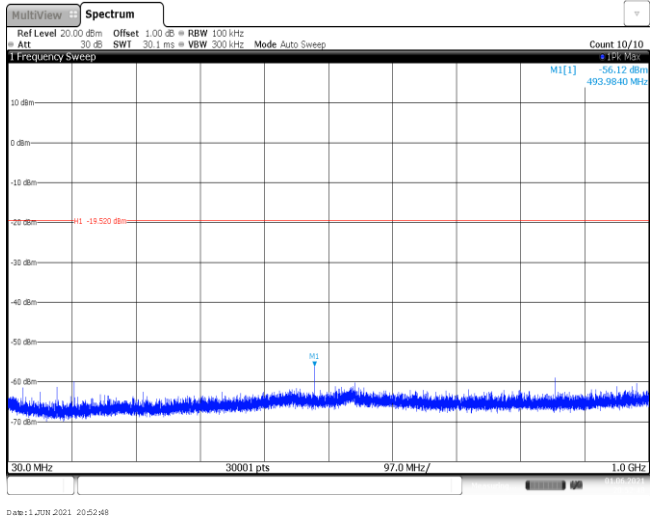
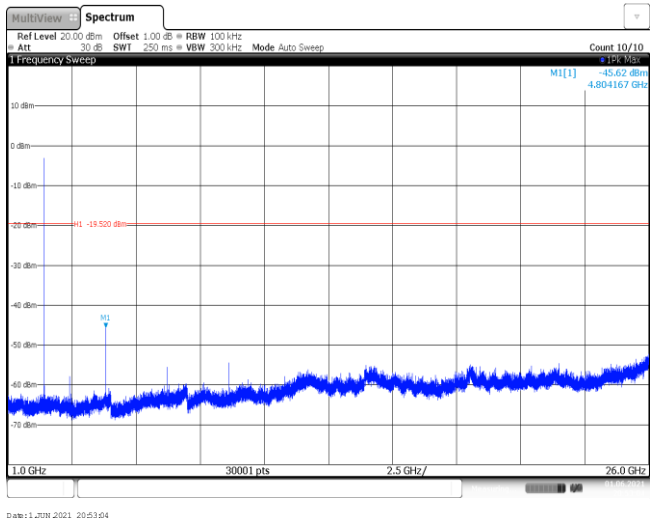
CH39
30MHz~1000MHz



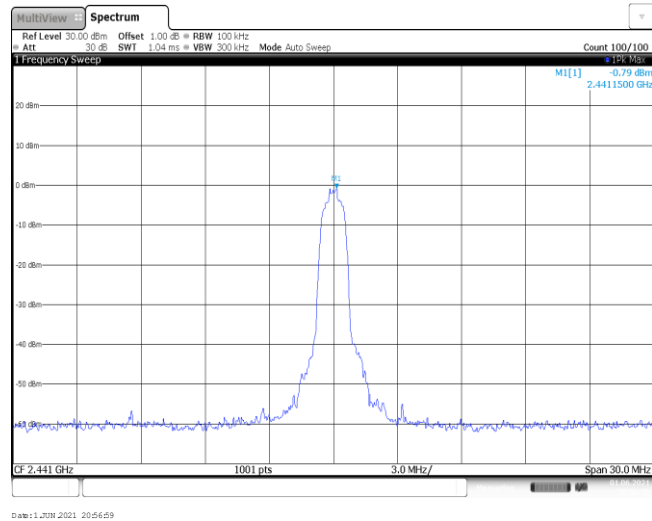
CH39
1GHz~26GHz



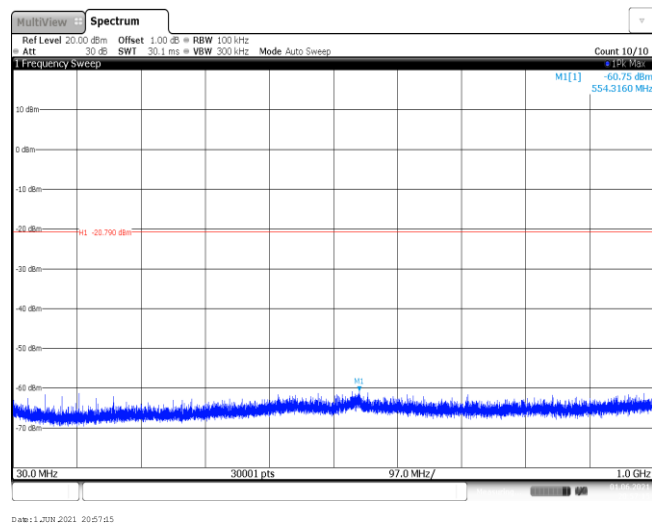
CH78 Reference level	 A spectrum plot showing a single sharp peak at 2.48 GHz. The y-axis represents power in dBm, ranging from -80 to 20. The x-axis represents frequency in MHz, with a span of 30.0 MHz. The peak is labeled with a magnitude of -1.98 dBm at 2.4798200 GHz. The plot includes a grid and various measurement parameters like Ref Level, Offset, and Span.
CH78 30MHz~1000MHz	 A wideband spectrum plot from 30 MHz to 1000 MHz. The y-axis ranges from -70 to 10 dBm. The plot shows a noisy baseline with a small peak at 181.9780 MHz labeled -53.29 dBm. A red horizontal line is drawn at -21.960 dBm. The x-axis is labeled with 30.0 MHz, 30001 pts, 97.0 MHz/, and 1.0 GHz.
CH78 1GHz~26GHz	 A wideband spectrum plot from 1 GHz to 26 GHz. The y-axis ranges from -70 to 10 dBm. The plot shows a noisy baseline with a small peak at 4.960000 GHz labeled -44.12 dBm. A red horizontal line is drawn at -21.960 dBm. The x-axis is labeled with 1.0 GHz, 30001 pts, 2.5 GHz/, and 26.0 GHz.

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

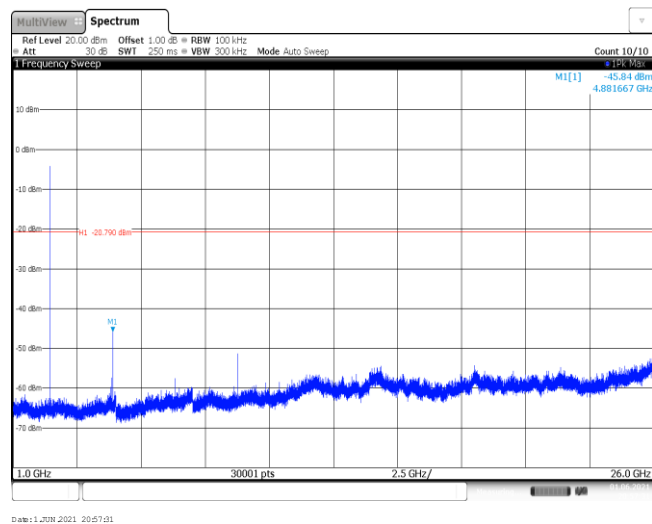
CH39
Reference level



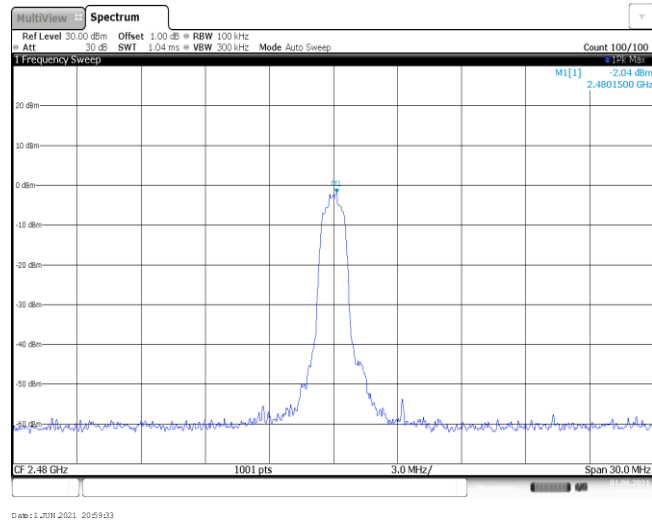
CH39
30MHz~1000MHz



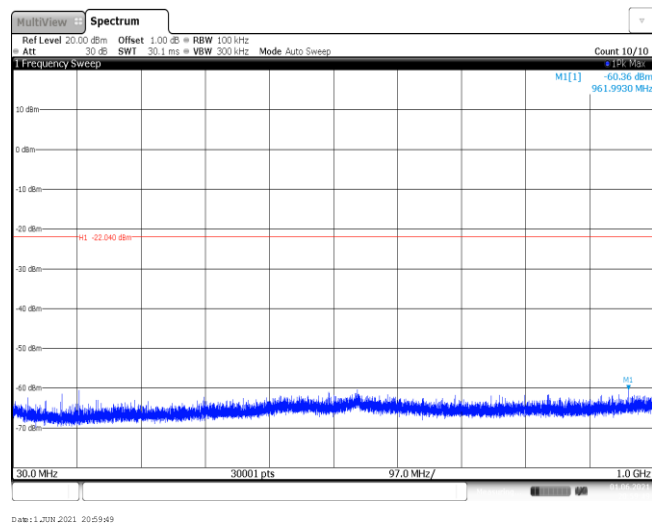
CH39
1GHz~26GHz



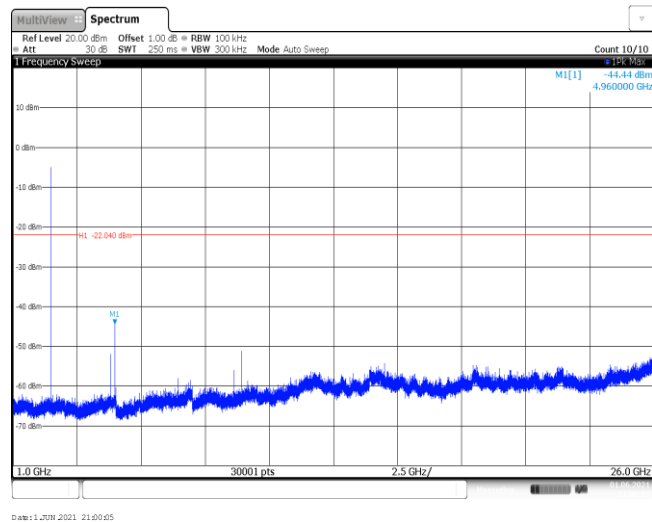
CH78
Reference level

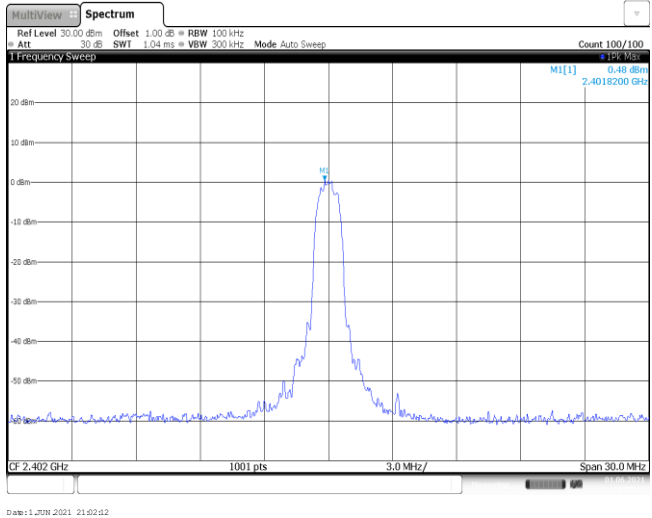
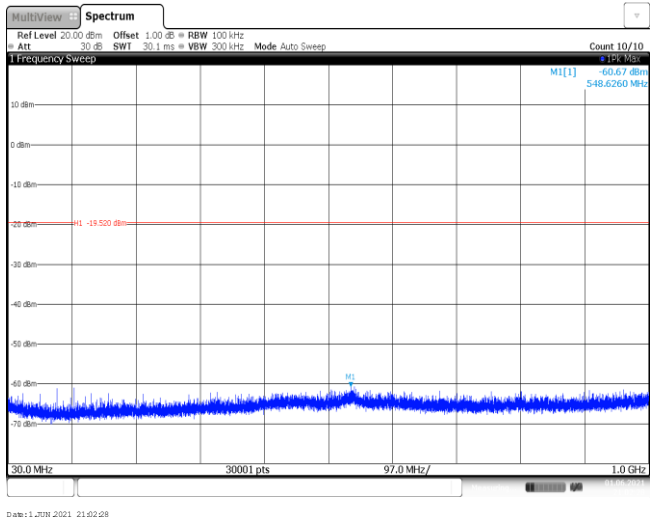
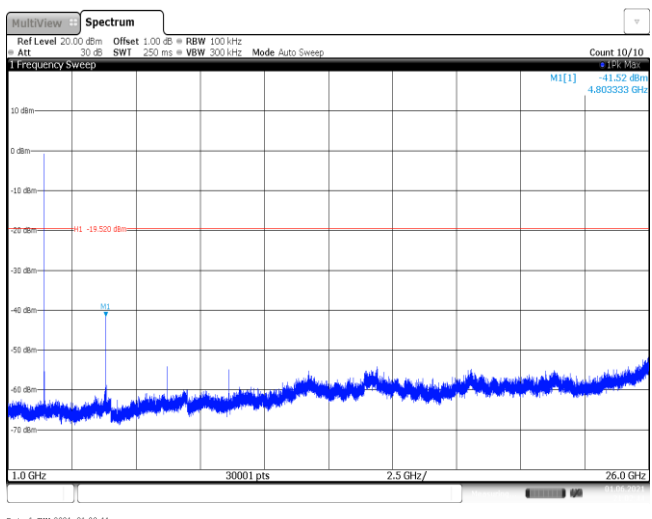


CH78
30MHz~1000MHz

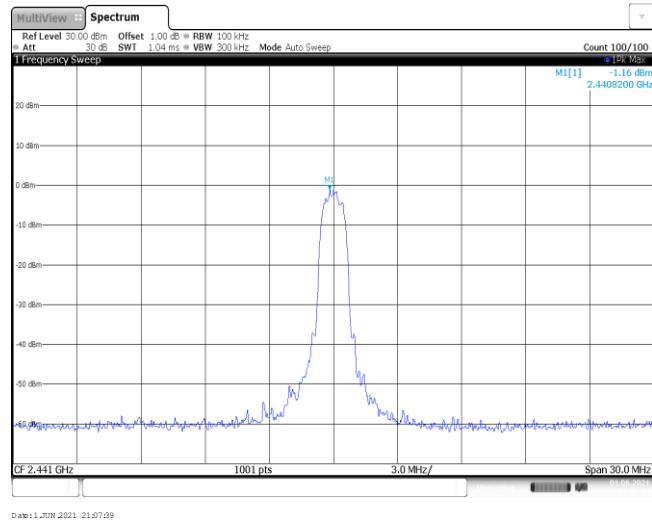


CH78
1GHz~26GHz

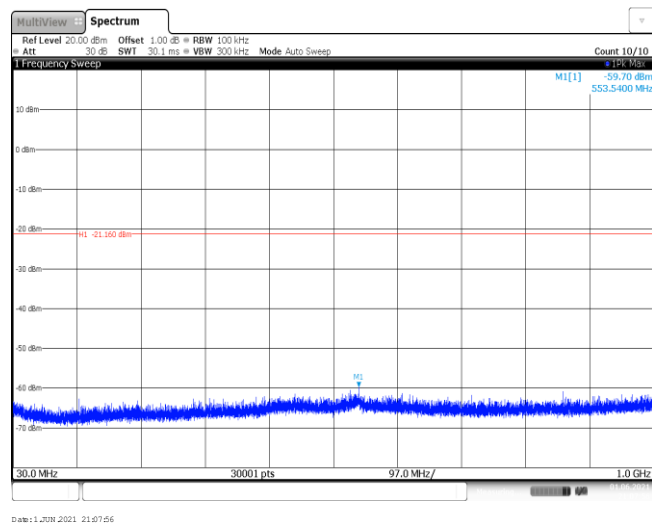


Test Item:	Spurious Emission	Modulation type:	8DPSK
CH00 Reference level			
CH00 30MHz~1000MHz			
CH00 1GHz~26GHz			

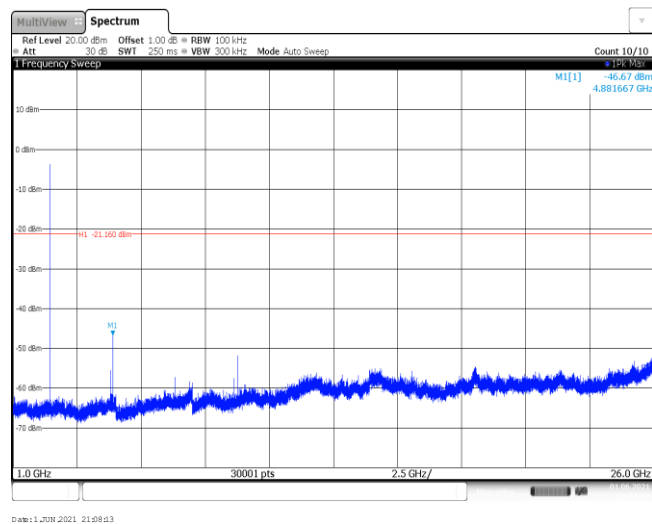
CH39
Reference level



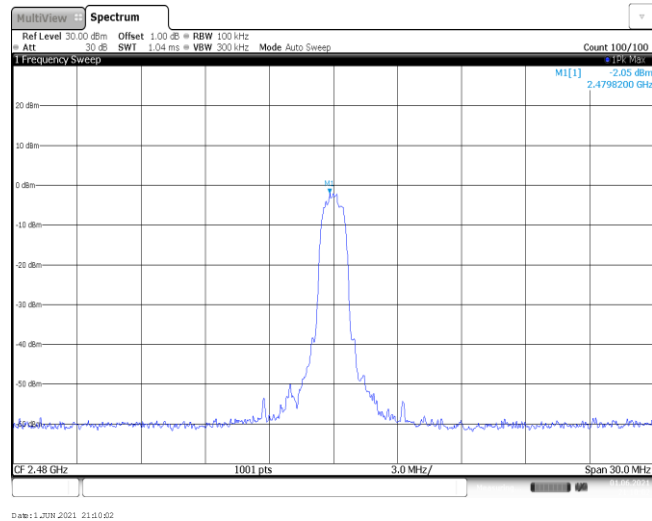
CH39
30MHz~1000MHz



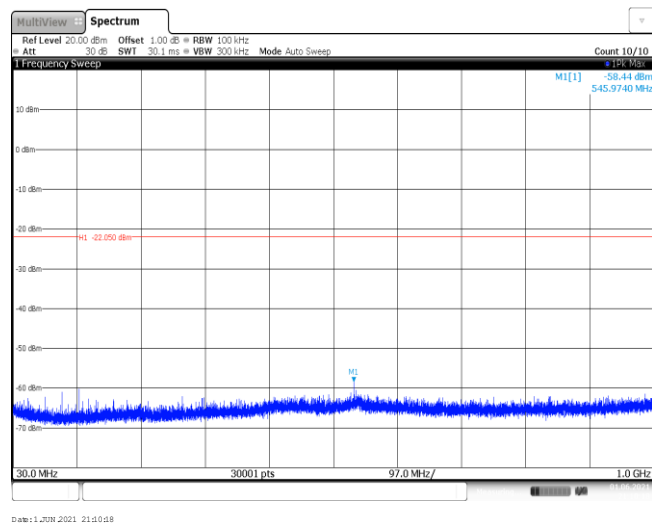
CH39
1GHz~26GHz



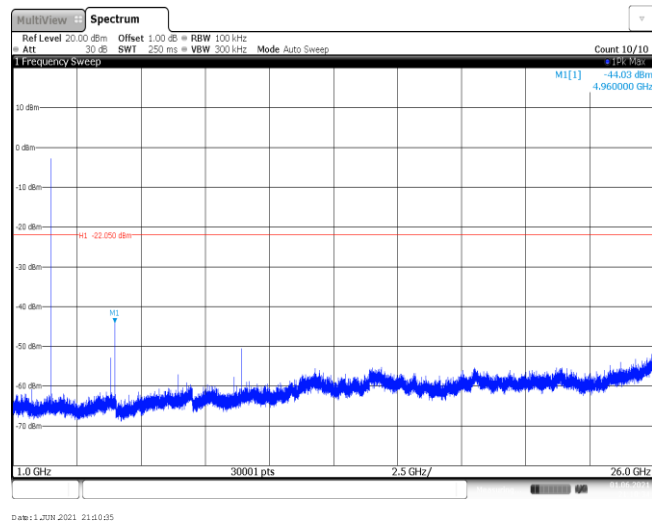
CH78
Reference level



CH78
30MHz~1000MHz



CH78
1GHz~26GHz



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