

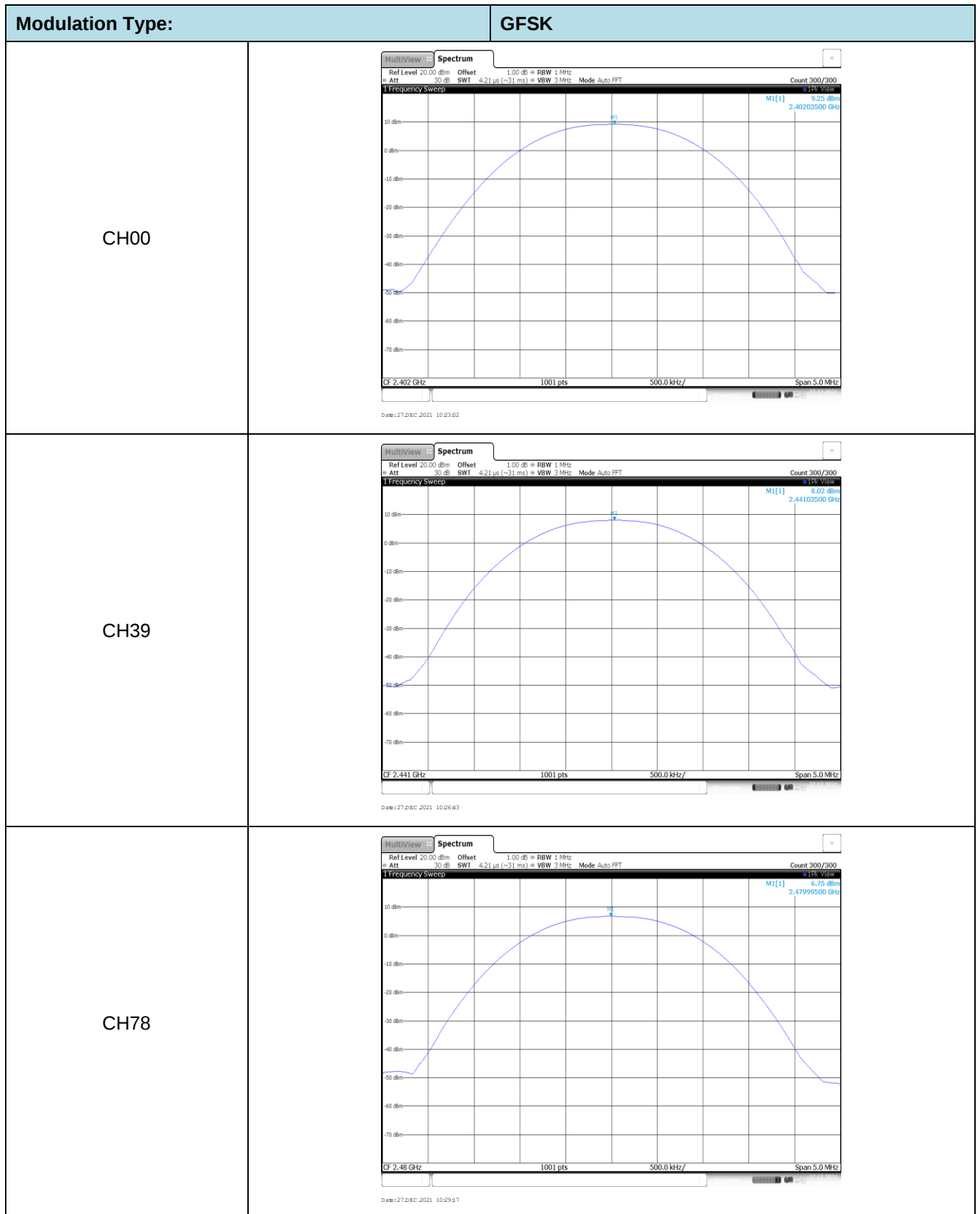
APPENDIX REPORT

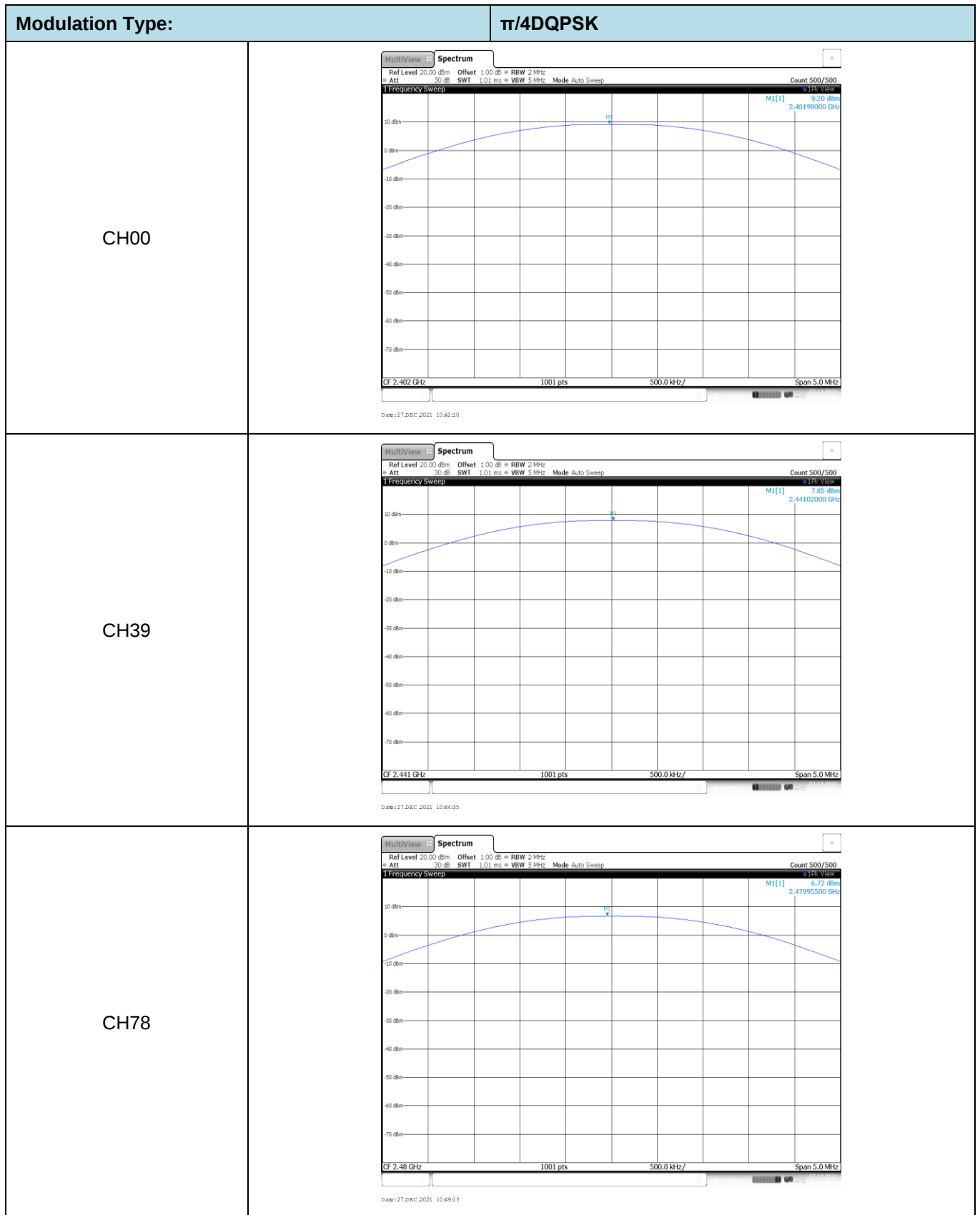
Project No.	SHT2111035102EW	Radio Specification	Bluetooth EDR
Test sample No.	YPHT21110351010	Model No.	LitBike
Start test date	2021-12-27	Finish date	2021-12-27
Temperature	22.9℃	Humidity	38%
Test Engineer	Hailey Chen	Auditor	Xiaodong Zheo

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	9.25	9.15	≤ 30.00	Pass
	39	8.02	7.99		
	78	6.75	6.70		
$\pi/4$ DQPSK	00	9.20	9.14	≤ 21.00	Pass
	39	7.85	7.78		
	78	6.72	6.67		
8DPSK	00	9.24	9.12	≤ 21.00	Pass
	39	7.87	7.80		
	78	6.71	6.57		

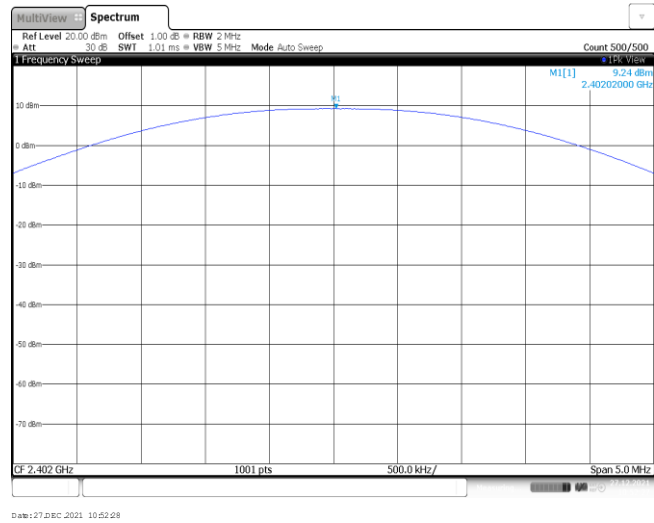




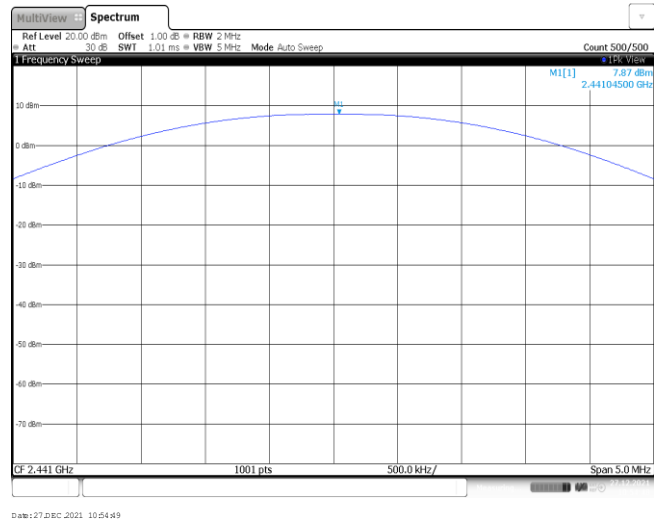
Modulation Type:

8DPSK

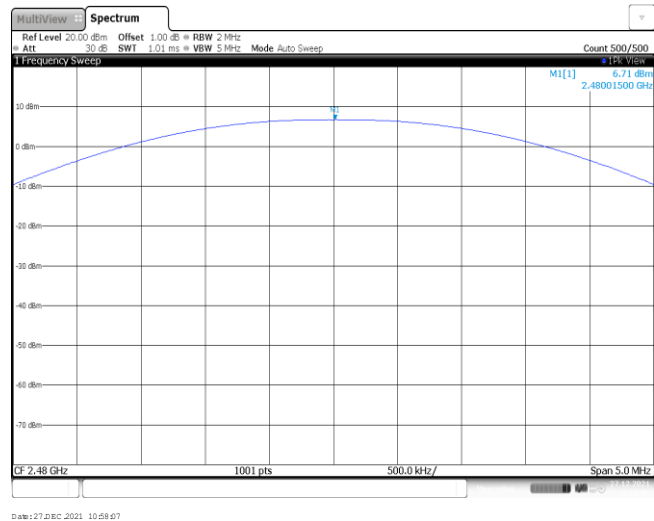
CH00



CH39



CH78



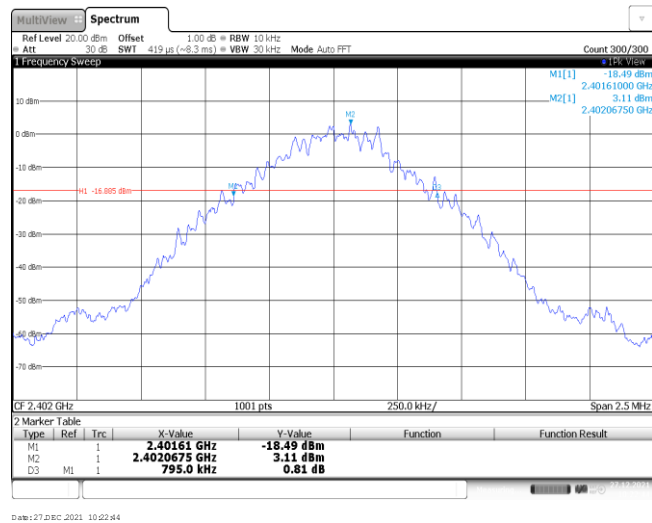
Appendix B : 20 dB Bandwidth

Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	795.00	-	Pass
	39	792.50		
	78	795.00		
$\pi/4$ DQPSK	00	1262.50	-	Pass
	39	1257.50		
	78	1270.00		
8DPSK	00	1275.00	-	Pass
	39	1262.50		
	78	1275.00		

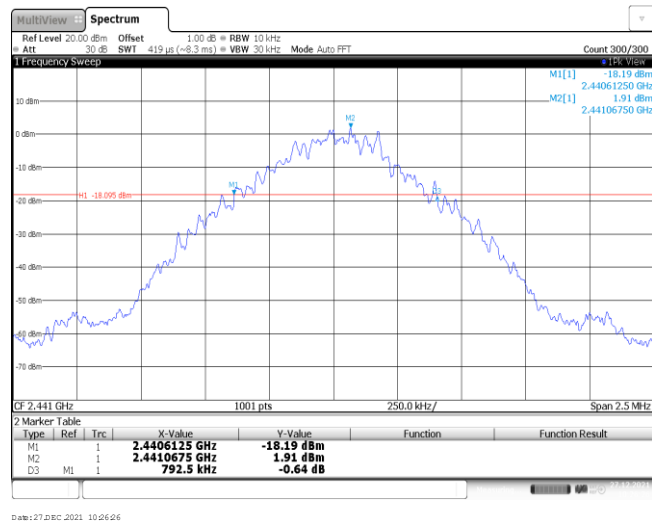
Modulation Type:

GFSK

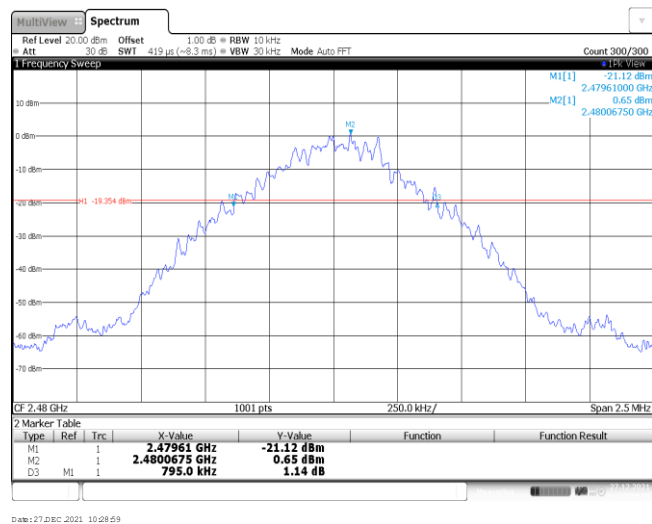
CH00



CH39



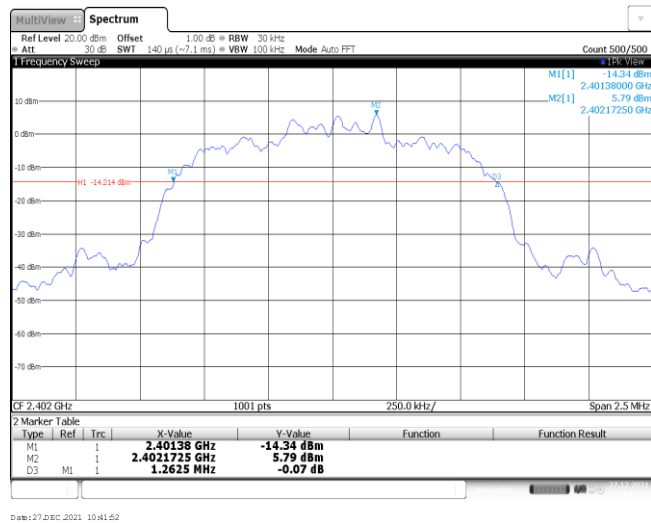
CH78



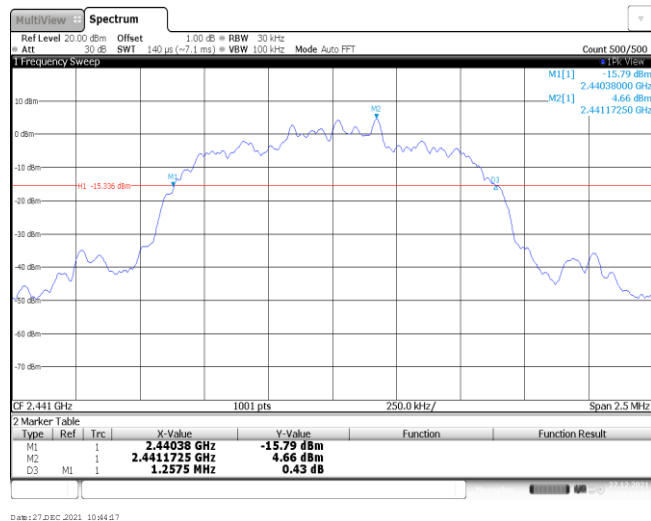
Modulation Type:

 $\pi/4$ DQPSK

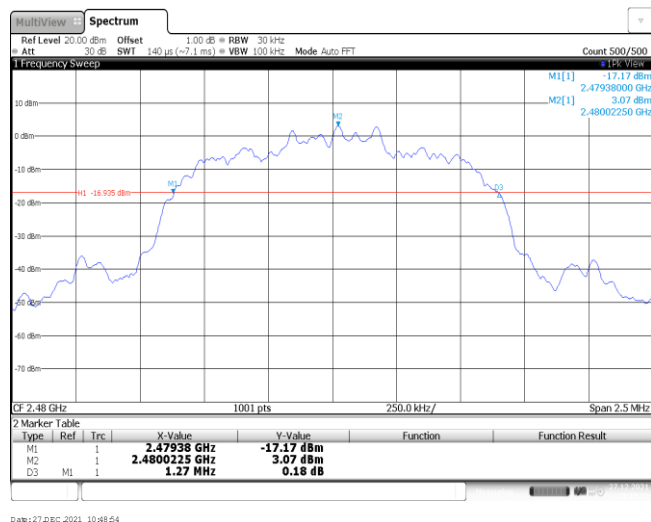
CH00



CH39



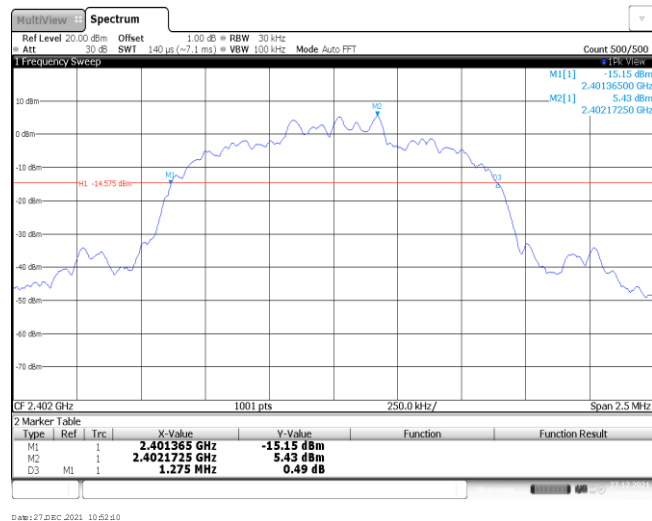
CH78



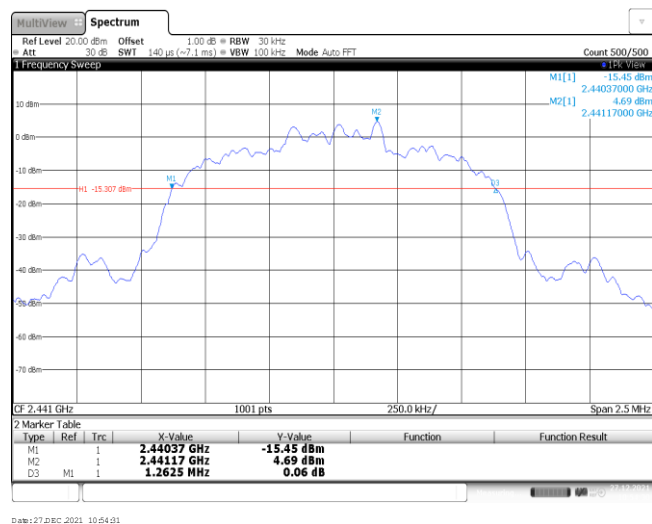
Modulation Type:

8DPSK

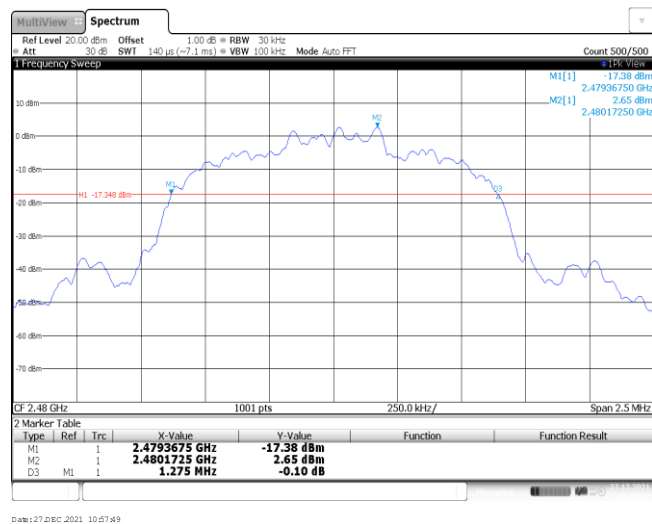
CH00



CH39



CH78



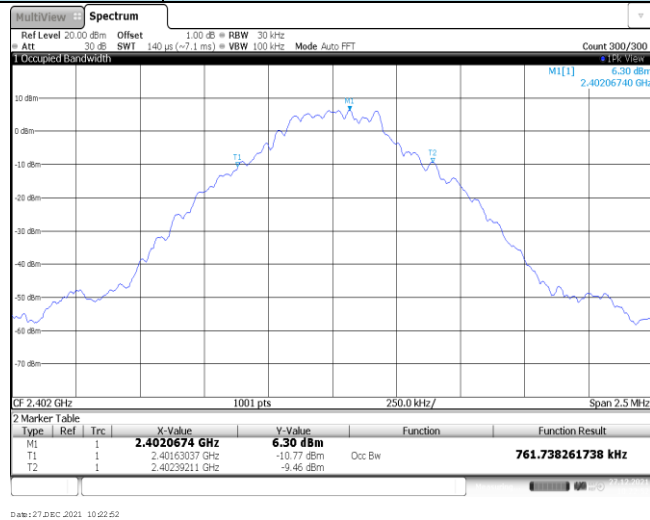
Appendix C: 99% Occupied Bandwidth

Modulation type	Channel	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.76	-	Pass
	39	0.76		
	78	0.76		
$\pi/4$ DQPSK	00	1.14	-	Pass
	39	1.14		
	78	1.15		
8DPSK	00	1.14	-	Pass
	39	1.14		
	78	1.14		

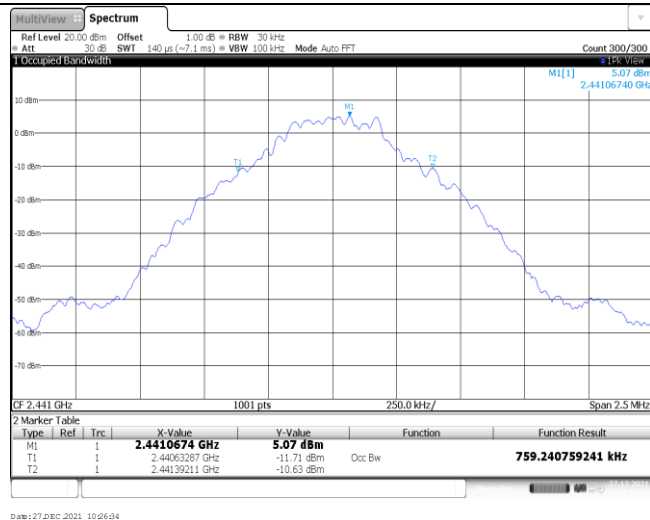
Modulation Type:

GFSK

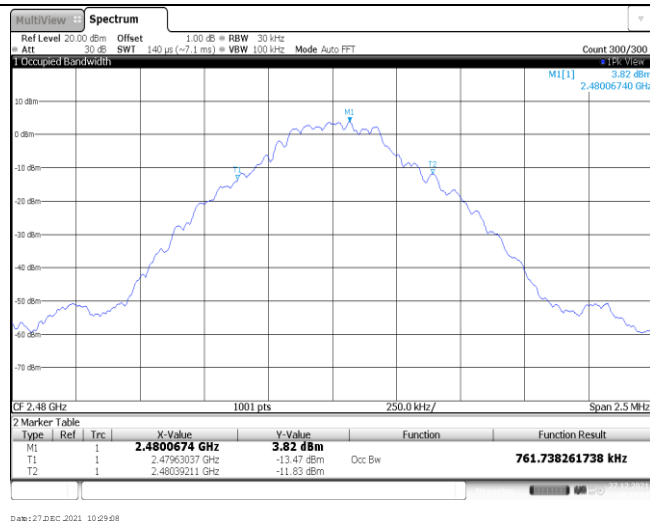
CH00



CH39



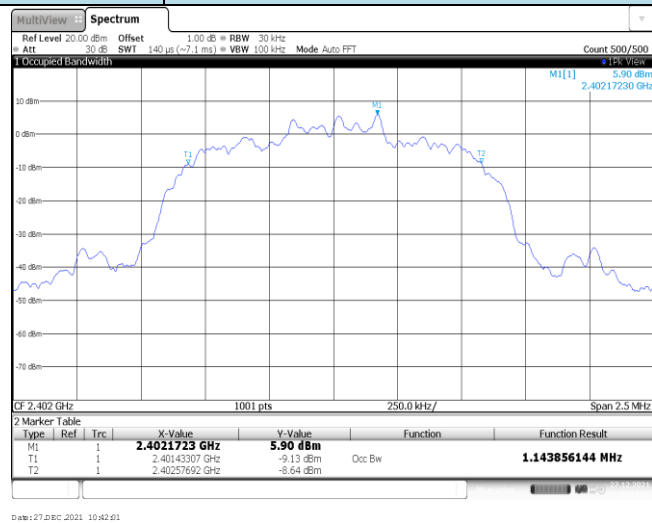
CH78



Modulation Type:

 $\pi/4$ DQPSK

CH00



CH39



CH78



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	≥795.00	Pass
π/4DQPSK	39	1.00	≥846.67	Pass
8DPSK	39	1.00	≥850.00	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.

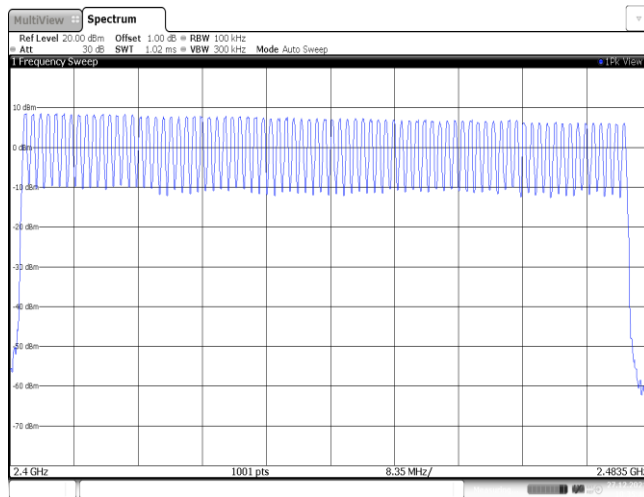
8DPSK limit = 2/3 * The maximum 20 dB Bandwidth for 8DPSK modulation on the appendix B

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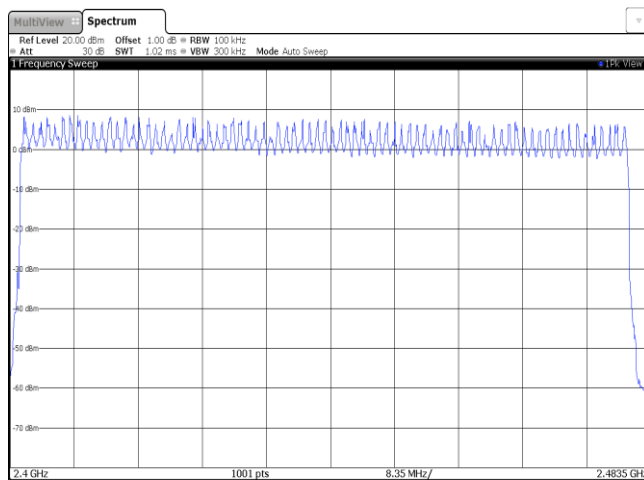
Appendix E: Hopping Channel Number

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

GFSK

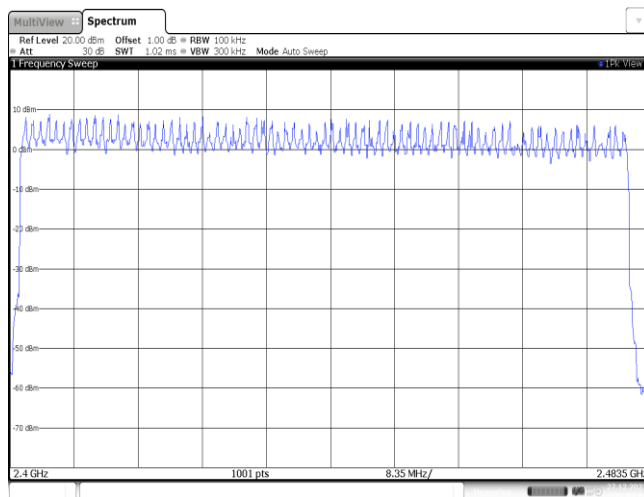


Date: 27 DEC 2021 10:35:40

 $\pi/4$ DQPSK

Date: 27 DEC 2021 10:38:03

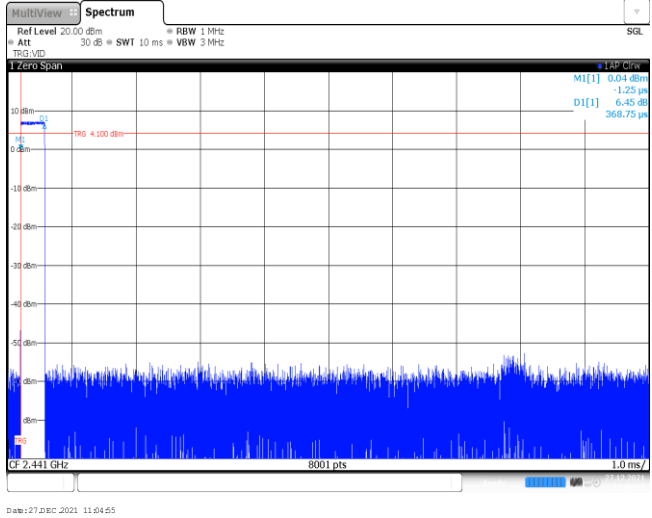
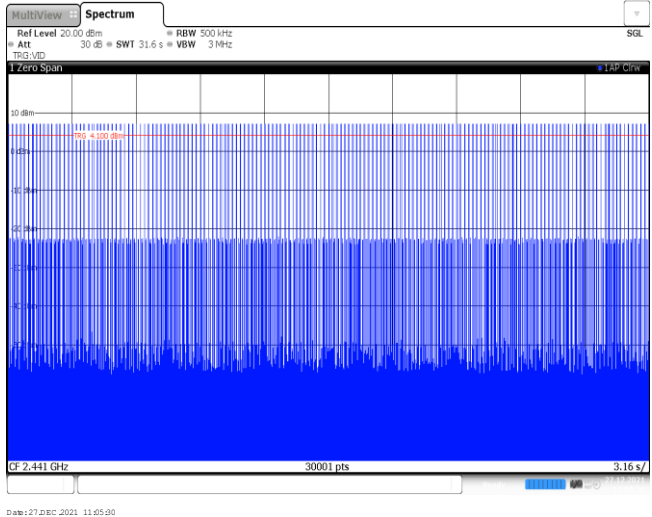
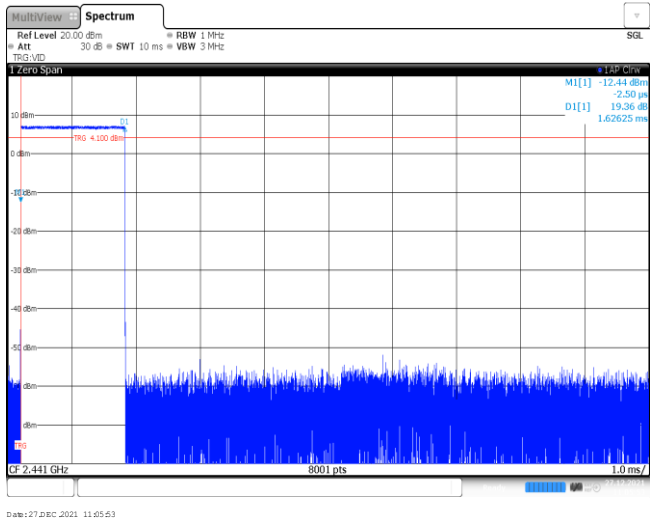
8DPSK

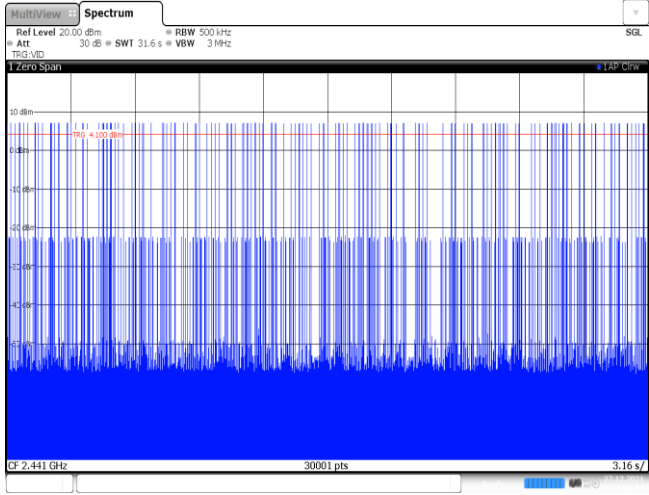
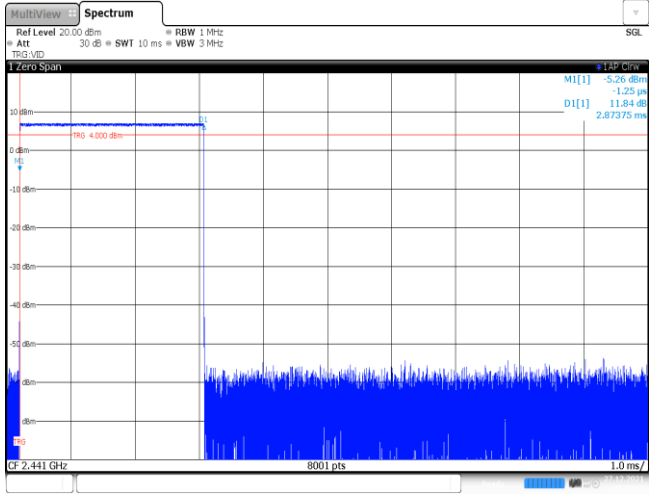
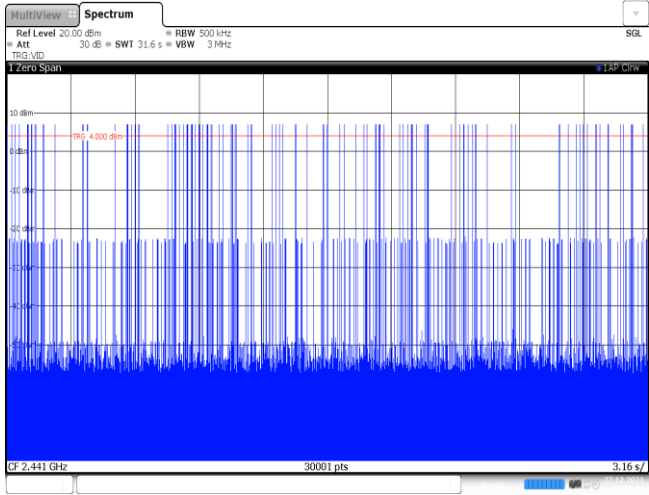


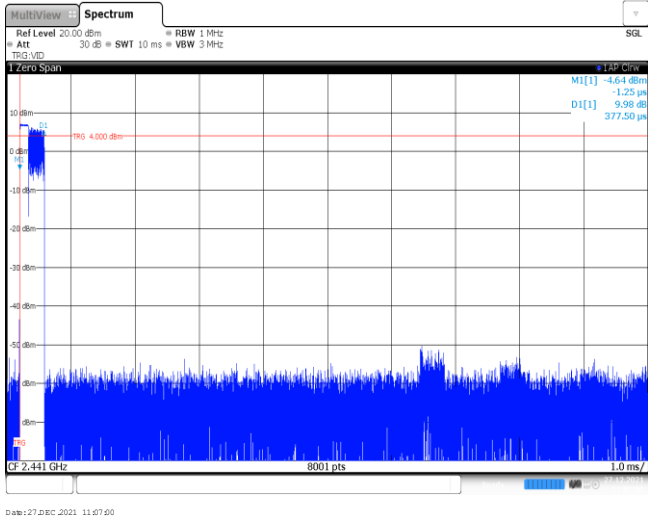
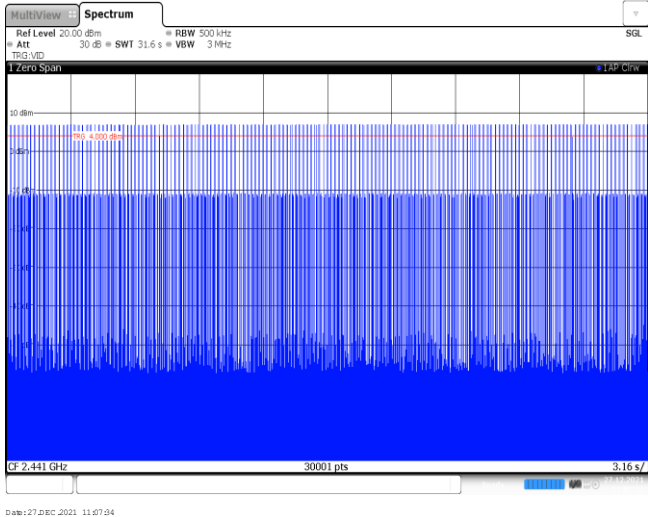
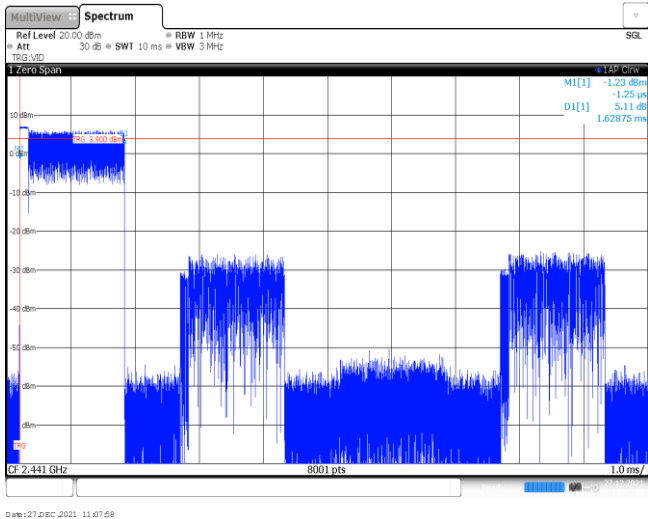
Date: 27 DEC 2021 11:03:04

Appendix F: Dwell Time

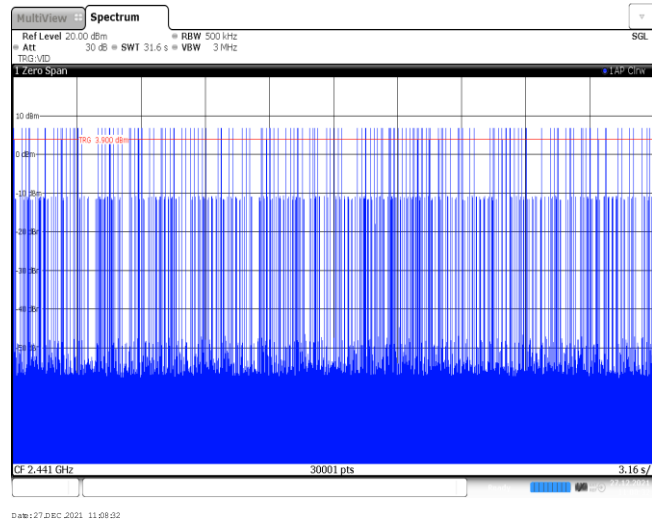
Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.37	314	0.12	≤ 0.40	Pass
	DH3	1.63	160	0.26		
	DH5	2.87	107	0.31		
$\pi/4$ DQPSK	2DH1	0.38	314	0.12	≤ 0.40	Pass
	2DH3	1.63	158	0.26		
	2DH5	2.88	121	0.35		
8DPSK	3DH1	0.38	315	0.12	≤ 0.40	Pass
	3DH3	1.63	158	0.26		
	3DH5	2.88	116	0.33		

Modulation Type:	GFSK
DH1 Burst width	 The spectrum plot shows a single burst of energy at 2.441 GHz. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents frequency in MHz, ranging from 2.435 to 2.447. A red trace line indicates a peak power of 4.100 dBm. The plot shows a narrowband signal with a bandwidth of approximately 1 MHz. The data is captured at 8001 points with a resolution bandwidth of 1 MHz and a video bandwidth of 3 MHz. The date and time of capture are 27 DEC 2021 11:04:55.
DH1 Burst number	 The spectrum plot shows a continuous burst of energy at 2.441 GHz. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents frequency in MHz, ranging from 2.435 to 2.447. A red trace line indicates a peak power of 4.100 dBm. The plot shows a narrowband signal with a bandwidth of approximately 1 MHz. The data is captured at 30001 points with a resolution bandwidth of 500 kHz and a video bandwidth of 3 MHz. The date and time of capture are 27 DEC 2021 11:05:00.
DH3 Burst width	 The spectrum plot shows a single burst of energy at 2.441 GHz. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents frequency in MHz, ranging from 2.435 to 2.447. A red trace line indicates a peak power of 4.100 dBm. The plot shows a narrowband signal with a bandwidth of approximately 1 MHz. The data is captured at 8001 points with a resolution bandwidth of 1 MHz and a video bandwidth of 3 MHz. The date and time of capture are 27 DEC 2021 11:05:03.

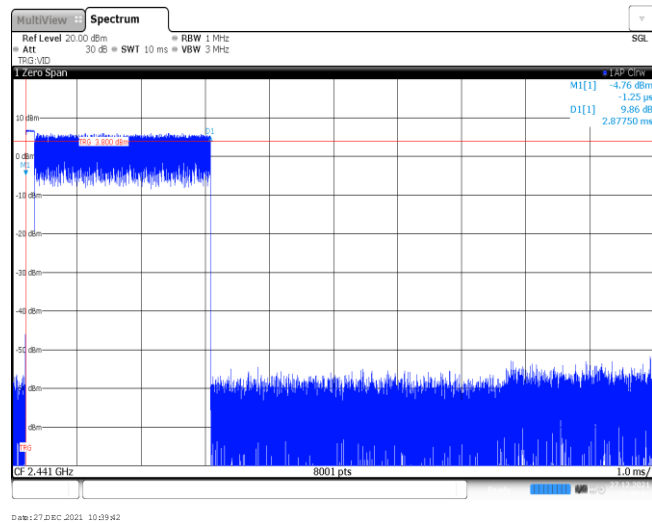
DH3 Burst number	 The screenshot shows a spectrum analyzer interface with the title 'Spectrum'. The y-axis represents power in dBm, ranging from -50 to 10. The x-axis represents frequency in GHz, centered at 2.441 GHz. A red horizontal line is drawn at approximately 0 dBm. The plot shows a dense, noisy signal across the entire frequency range. The status bar at the bottom indicates 'CF 2.441 GHz', '30001 pts', and '3.16 s'. The date and time are 'Date: 27 DEC 2021 11:06:27'.
DH5 Burst width	 The screenshot shows a spectrum analyzer interface with the title 'Spectrum'. The y-axis represents power in dBm, ranging from -50 to 10. The x-axis represents frequency in GHz, centered at 2.441 GHz. A red horizontal line is drawn at approximately 0 dBm. The plot shows a signal that is mostly flat at the noise floor, with a single, sharp, narrow peak. The status bar at the bottom indicates 'CF 2.441 GHz', '8001 pts', and '1.0 ms'. The date and time are 'Date: 27 DEC 2021 10:36:19'.
DH5 Burst number	 The screenshot shows a spectrum analyzer interface with the title 'Spectrum'. The y-axis represents power in dBm, ranging from -50 to 10. The x-axis represents frequency in GHz, centered at 2.441 GHz. A red horizontal line is drawn at approximately 0 dBm. The plot shows a dense, noisy signal across the entire frequency range. The status bar at the bottom indicates 'CF 2.441 GHz', '30001 pts', and '3.16 s'. The date and time are 'Date: 27 DEC 2021 10:36:54'.

Modulation Type: $\pi/4$ DQPSK	
2DH1 Burst width	
2DH1 Burst number	
2DH3 Burst width	

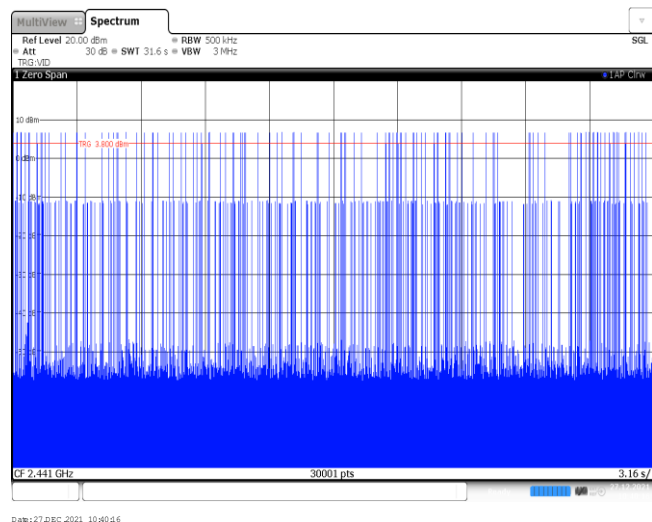
2DH3
Burst number

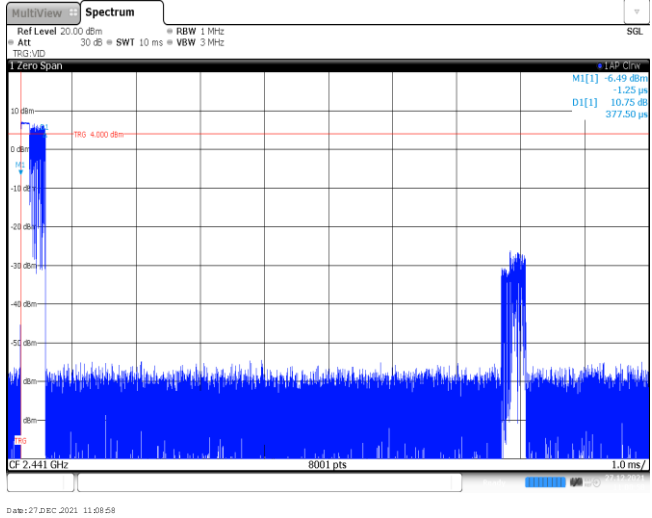
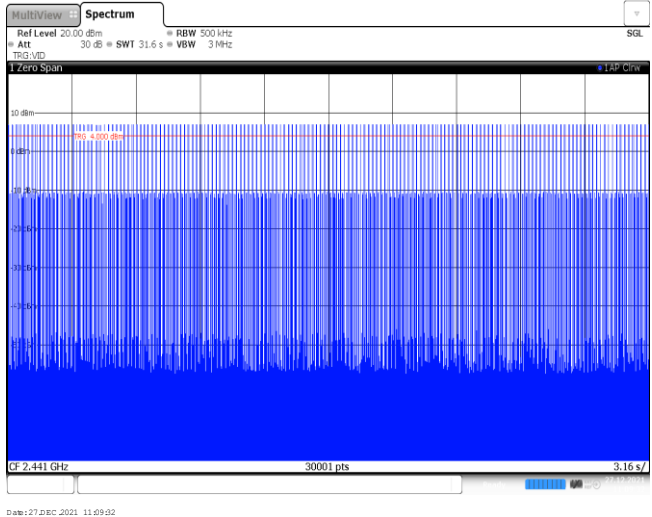
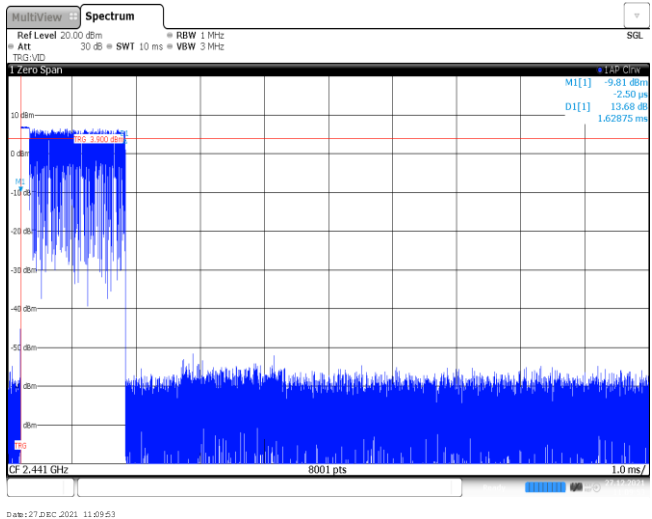


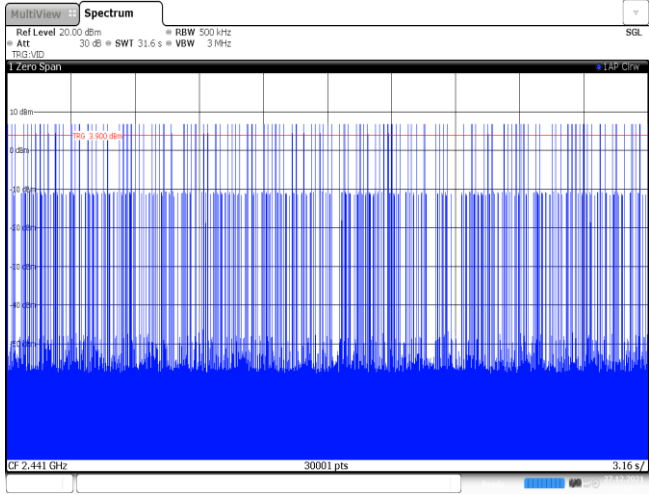
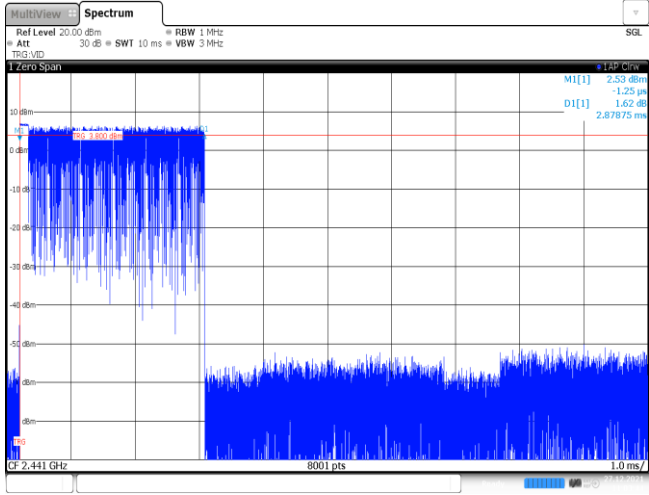
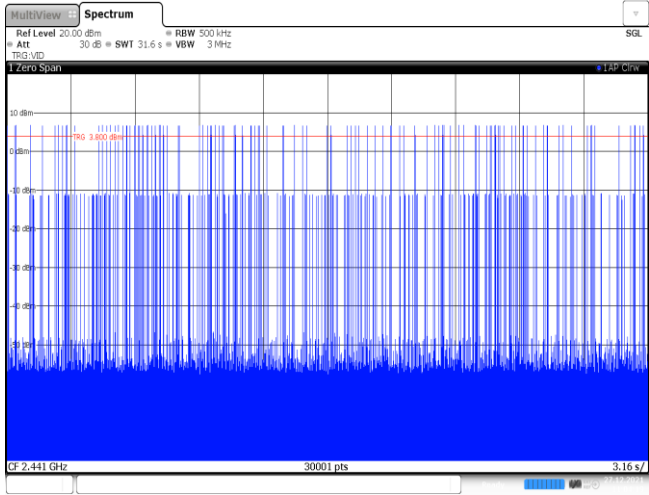
2DH5
Burst width



2DH5
Burst number



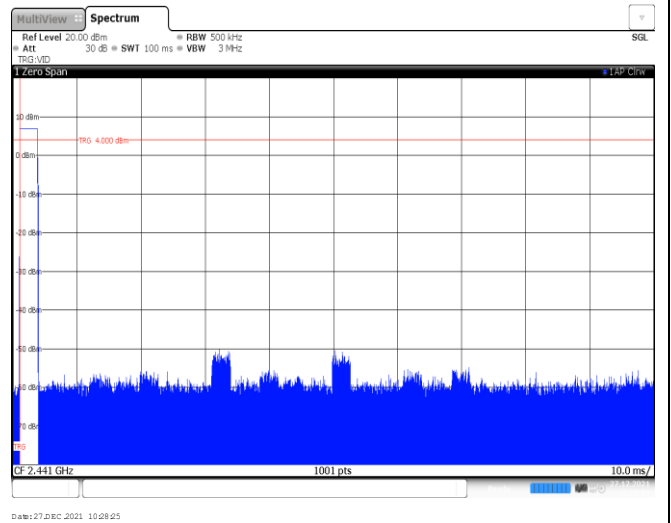
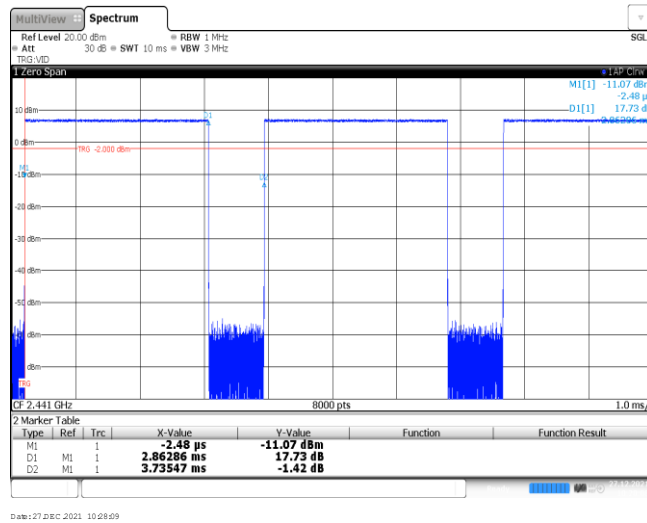
Modulation Type:	8DPSK
3DH1 Burst width	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 1.0 ms. The plot displays a burst of signal at the top of the frequency range, with a peak level of approximately 10 dBm. The plot includes a red line indicating the signal level and a blue line indicating the noise floor. The plot also shows a red line indicating the signal level and a blue line indicating the noise floor. 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: 27 DEC 2021 11:08:58
3DH1 Burst number	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 3.16 s. The plot displays a burst of signal at the top of the frequency range, with a peak level of approximately 10 dBm. The plot includes a red line indicating the signal level and a blue line indicating the noise floor. The plot also shows a red line indicating the signal level and a blue line indicating the noise floor. 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: 27 DEC 2021 11:09:02
3DH3 Burst width	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 1.0 ms. The plot displays a burst of signal at the top of the frequency range, with a peak level of approximately 10 dBm. The plot includes a red line indicating the signal level and a blue line indicating the noise floor. The plot also shows a red line indicating the signal level and a blue line indicating the noise floor. 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: 27 DEC 2021 11:09:03

3DH3 Burst number	 The spectrum plot shows a signal centered 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 2.435 to 2.447. The signal is a burst of energy, with a peak power of approximately 0 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, RBW 500 kHz, SWT 31.6 s, VBW 3 MHz. The date is 27 DEC 2021 11:00:27.
3DH5 Burst width	 The spectrum plot shows a signal centered 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 2.435 to 2.447. The signal is a burst of energy, with a peak power of approximately 0 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, RBW 1 MHz, SWT 10 ms, VBW 3 MHz. The date is 27 DEC 2021 11:03:44.
3DH5 Burst number	 The spectrum plot shows a signal centered 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 2.435 to 2.447. The signal is a burst of energy, with a peak power of approximately 0 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, RBW 500 kHz, SWT 31.6 s, VBW 3 MHz. The date is 27 DEC 2021 11:04:19.

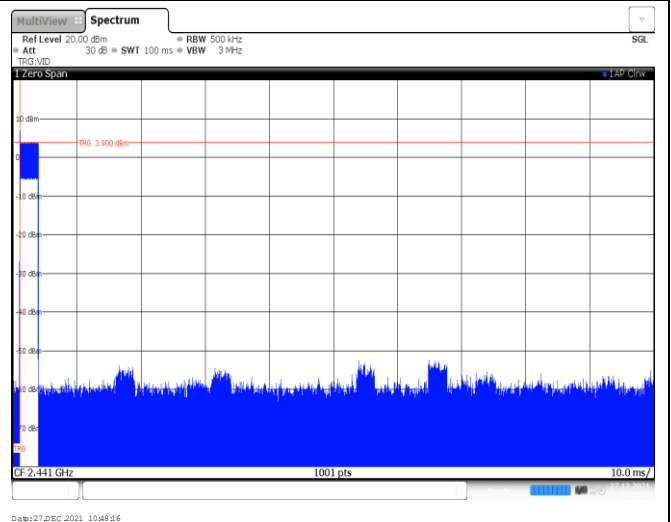
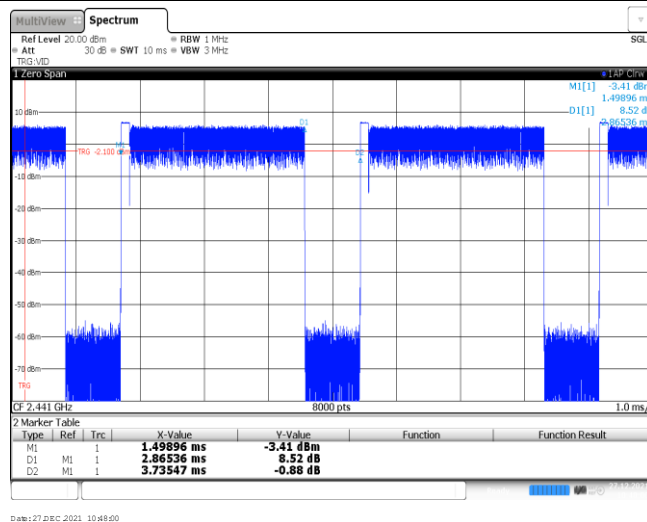
Appendix G: Duty Cycle Correction Factor (DCCF)

DCCF Calculate Formula					
DCCF=20 * Log(duty cycle) = 20 * 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	2.86	100	1.00	-30.87
$\pi/4$ DQPSK	2441	2.87	100	1.00	-30.84
8DPSK	2441	2.87	100	2.00	-24.82

GFSK

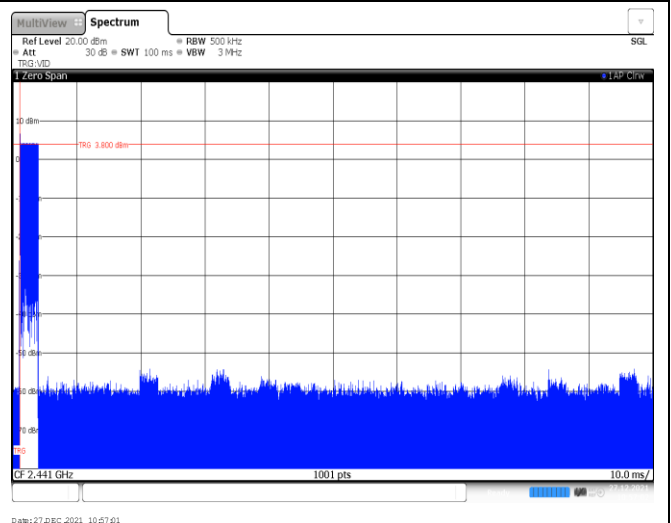
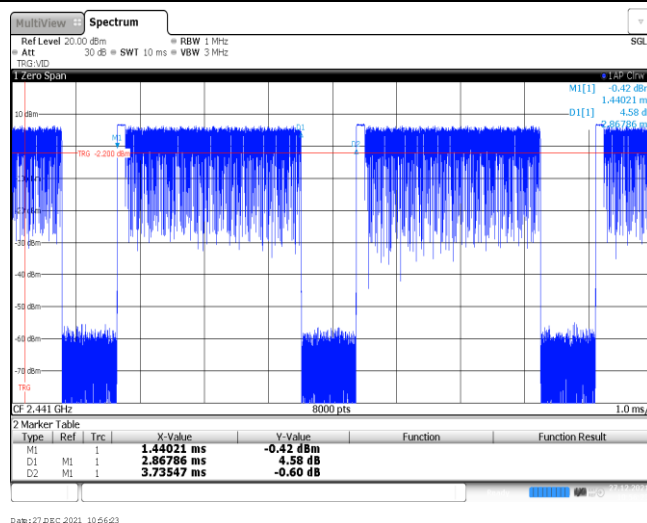
T_{on} time for single burst

Burst Quantity

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

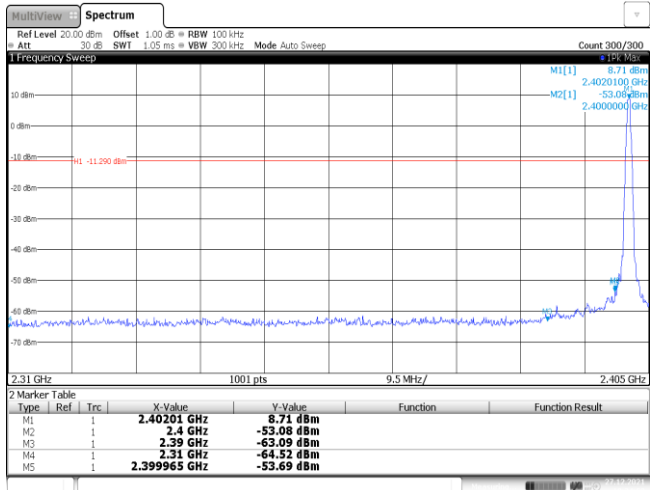
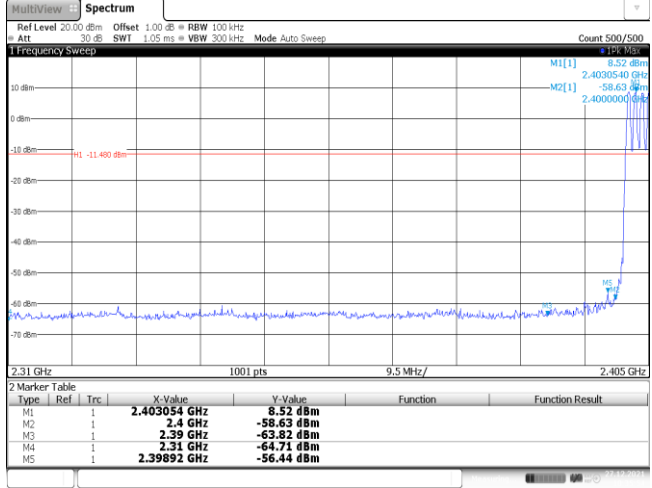
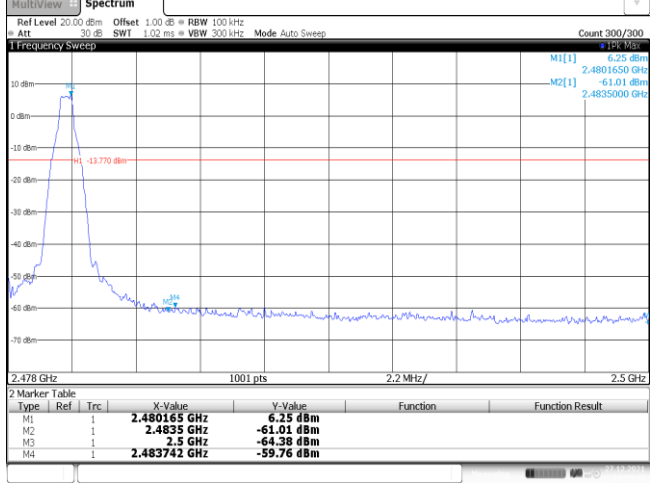
Burst Quantity

8DPSK

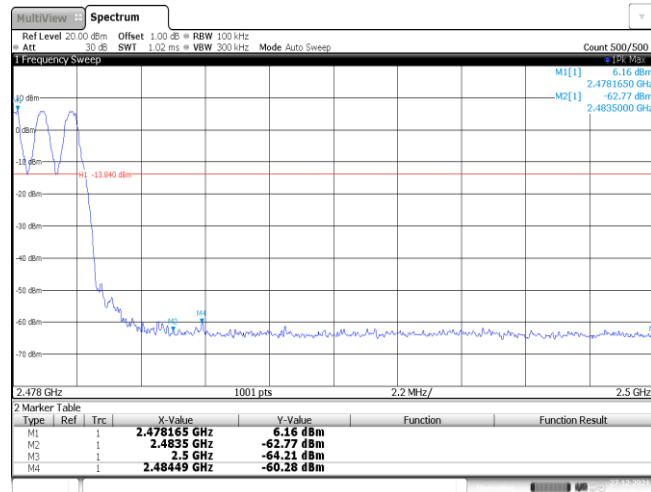
T_{on} time for single burst

Burst Quantity

Appendix H: Band edge and Spurious Emissions (conducted)

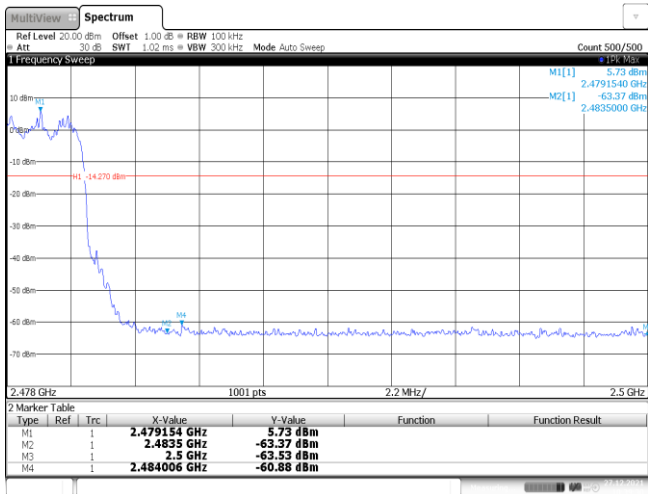
Test Item:	Band edge	Modulation type:	GFSK
CH00 No hopping mode	 CH00 No hopping mode		
CH00 Hopping mode	 CH00 Hopping mode		
CH78 No hopping mode	 CH78 No hopping mode		

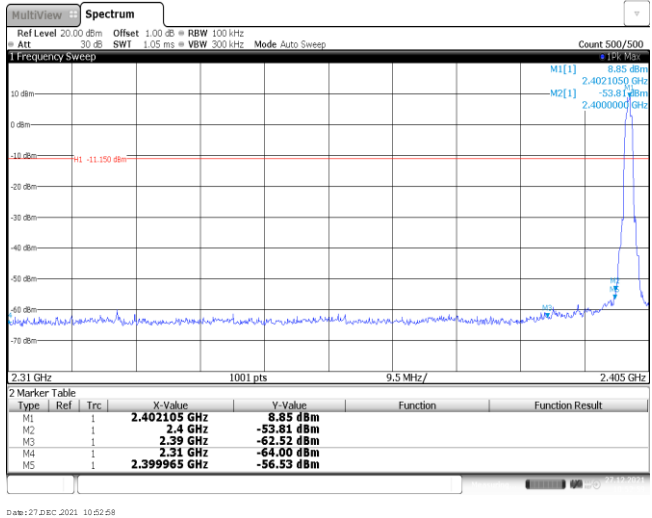
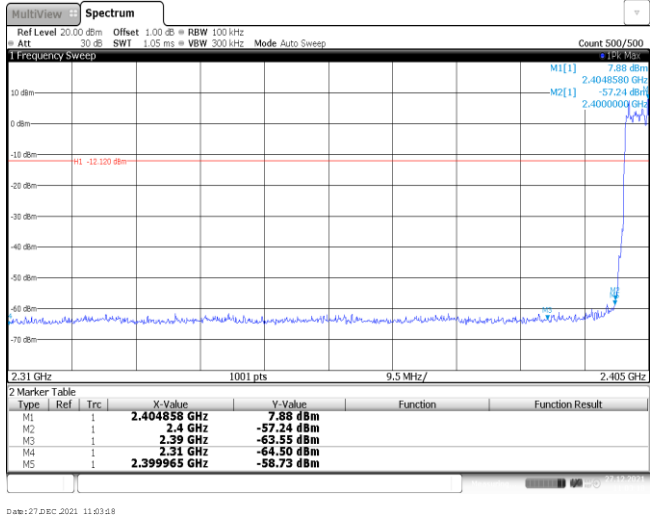
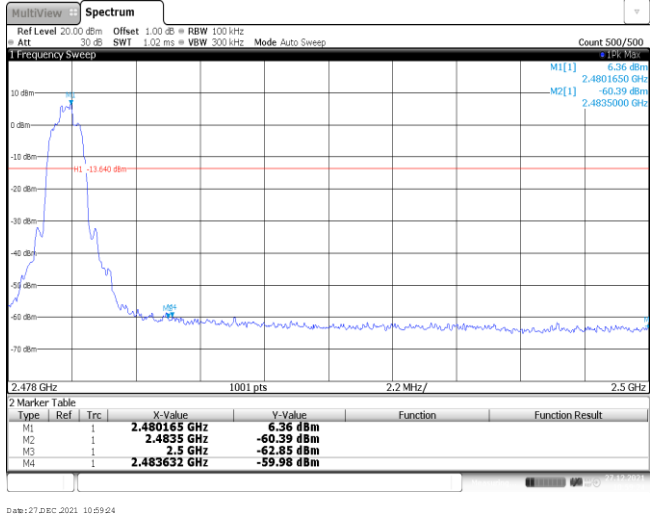
CH78
Hopping mode



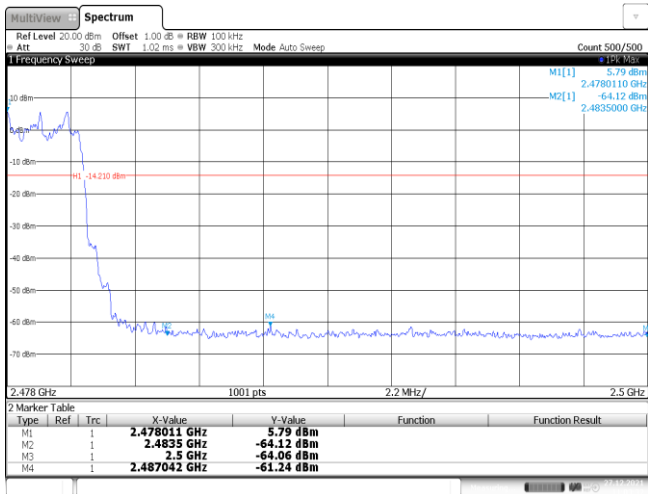
Test Item:	Band edge	Modulation type:	$\pi/4$ DQPSK																																										
CH00 No hopping mode	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SW 1.05 ms VBW 300 kHz Mode Auto Sweep Count 500/500 Frequency Sweep 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm 2.31 GHz 1001 pts 9.5 MHz/ 2.405 GHz M1[1] 8.93 dBm M2[1] 2.401821 GHz M2[1] -54.46 dBm M2[1] 2.400000 GHz 2.31 GHz 1001 pts 9.5 MHz/ 2.405 GHz <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>2.401821 GHz</td><td>8.93 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-54.46 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-62.44 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-63.00 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.399965 GHz</td><td>-55.35 dBm</td><td></td><td></td></tr></table> Date: 27 DEC 2021 10:42:44			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.401821 GHz	8.93 dBm			M2	1		2.4 GHz	-54.46 dBm			M3	1		2.39 GHz	-62.44 dBm			M4	1		2.31 GHz	-63.00 dBm			M5	1		2.399965 GHz	-55.35 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.401821 GHz	8.93 dBm																																									
M2	1		2.4 GHz	-54.46 dBm																																									
M3	1		2.39 GHz	-62.44 dBm																																									
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M5	1		2.399965 GHz	-55.35 dBm																																									
CH00 Hopping mode	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SW 1.05 ms VBW 300 kHz Mode Auto Sweep Count 500/500 Frequency Sweep 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 M1[1] 8.79 dBm M2[1] 2.404098 GHz M2[1] -56.06 dBm M2[1] 2.400000 GHz 2.31 GHz 1001 pts 9.5 MHz/ 2.405 GHz <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>2.404098 GHz</td><td>8.79 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-56.06 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-62.90 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-63.72 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.399965 GHz</td><td>-57.32 dBm</td><td></td><td></td></tr></table> Date: 27 DEC 2021 10:09:04			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.404098 GHz	8.79 dBm			M2	1		2.4 GHz	-56.06 dBm			M3	1		2.39 GHz	-62.90 dBm			M4	1		2.31 GHz	-63.72 dBm			M5	1		2.399965 GHz	-57.32 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.404098 GHz	8.79 dBm																																									
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M3	1		2.39 GHz	-62.90 dBm																																									
M4	1		2.31 GHz	-63.72 dBm																																									
M5	1		2.399965 GHz	-57.32 dBm																																									
CH78 No hopping mode	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SW 1.02 ms VBW 300 kHz Mode Auto Sweep Count 500/500 Frequency Sweep 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 M1[1] 6.32 dBm M2[1] 2.479857 GHz M2[1] -59.46 dBm M2[1] 2.483500 GHz 2.478 GHz 1001 pts 2.2 MHz/ 2.5 GHz <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>2.479857 GHz</td><td>6.32 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4835 GHz</td><td>-59.46 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.5 GHz</td><td>-63.25 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.483654 GHz</td><td>-59.76 dBm</td><td></td><td></td></tr></table> Date: 27 DEC 2021 10:49:02			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.479857 GHz	6.32 dBm			M2	1		2.4835 GHz	-59.46 dBm			M3	1		2.5 GHz	-63.25 dBm			M4	1		2.483654 GHz	-59.76 dBm									
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.479857 GHz	6.32 dBm																																									
M2	1		2.4835 GHz	-59.46 dBm																																									
M3	1		2.5 GHz	-63.25 dBm																																									
M4	1		2.483654 GHz	-59.76 dBm																																									

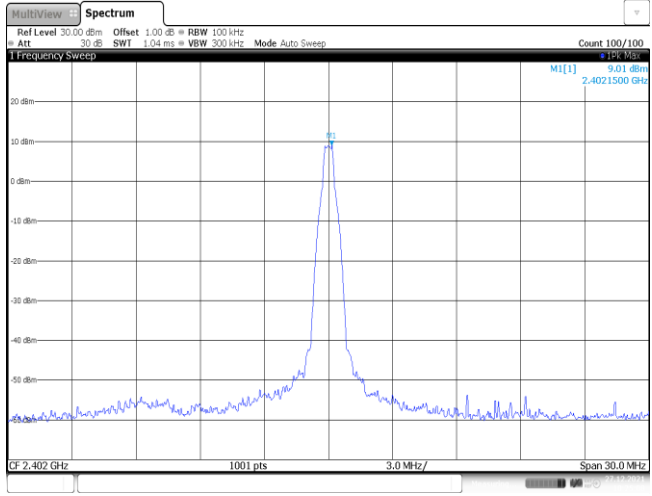
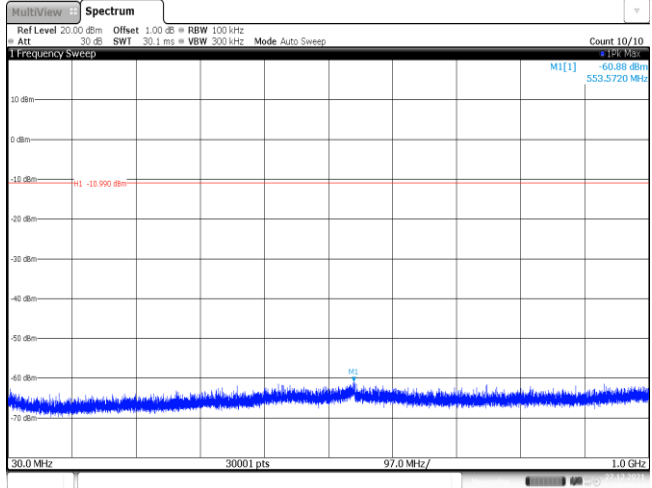
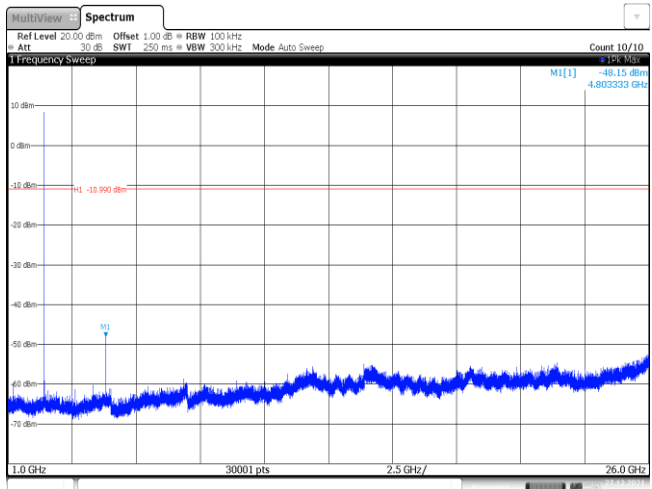
CH78
Hopping mode



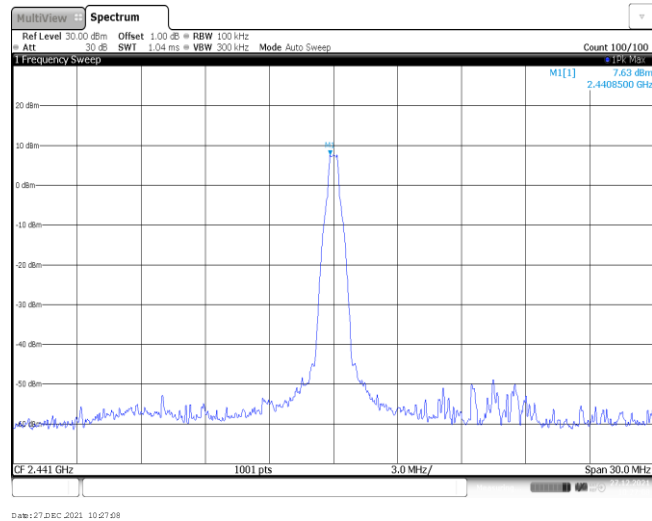
Test Item:	Band edge	Modulation type:	8DPSK
CH00 No hopping mode			
CH00 Hopping mode			
CH78 No hopping mode			

CH78
Hoppig mode

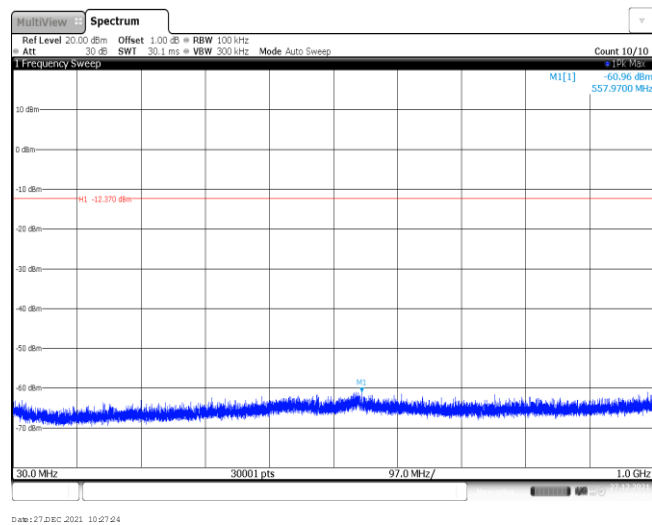


Test Item:	Spurious Emission	Modulation type:	GFSK
CH00 Reference level			
CH00 30MHz~1000MHz			
CH00 1GHz~26GHz			

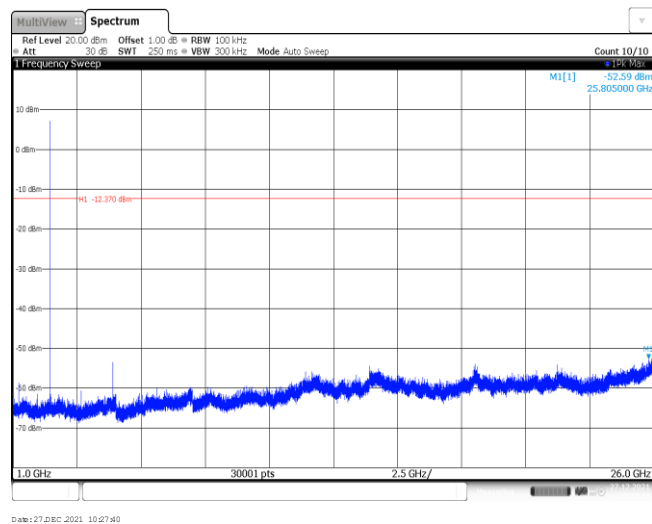
CH39
Reference level



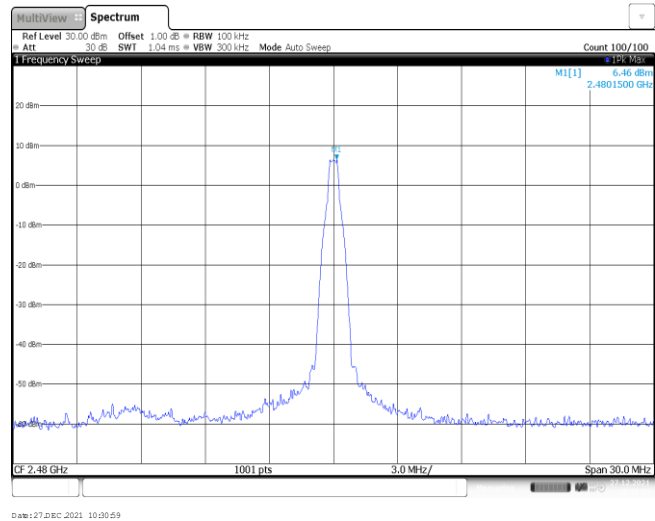
CH39
30MHz~1000MHz



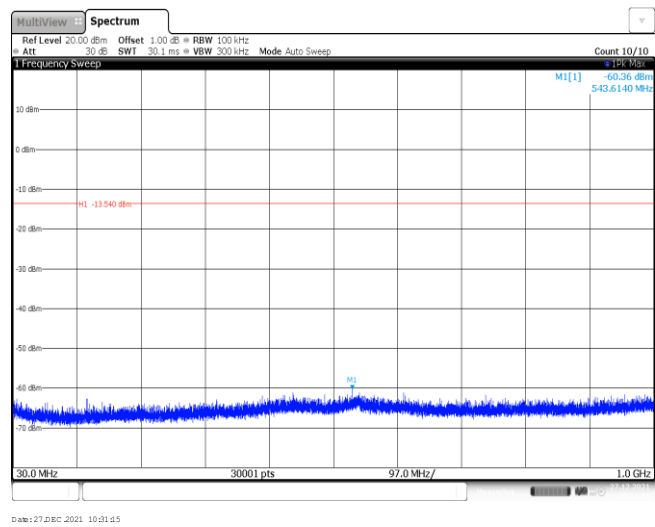
CH39
1GHz~26GHz



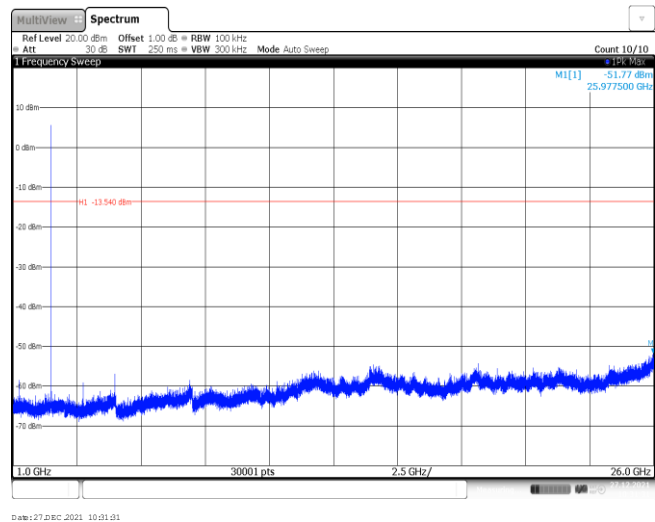
CH78
Reference level

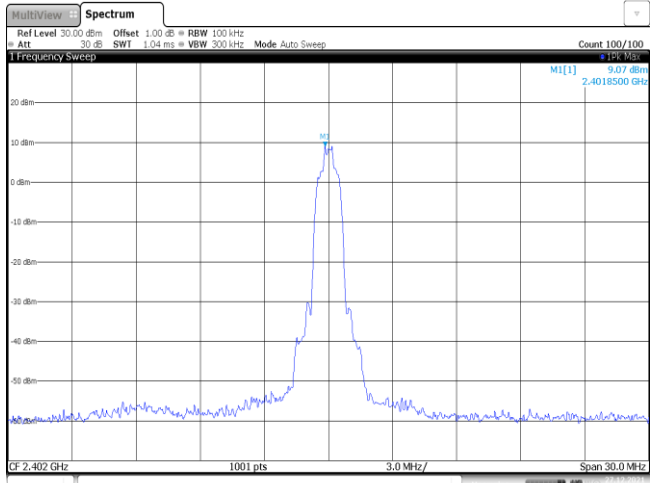
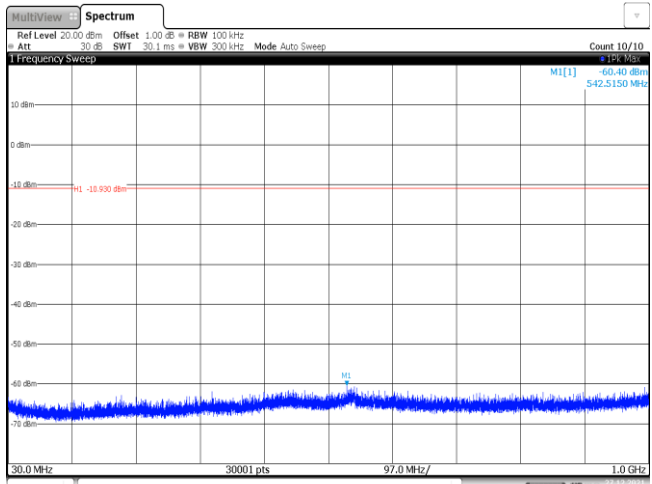
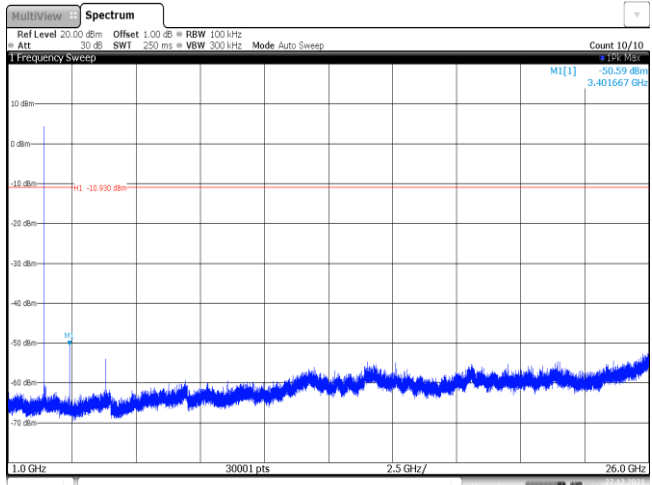


CH78
30MHz~1000MHz

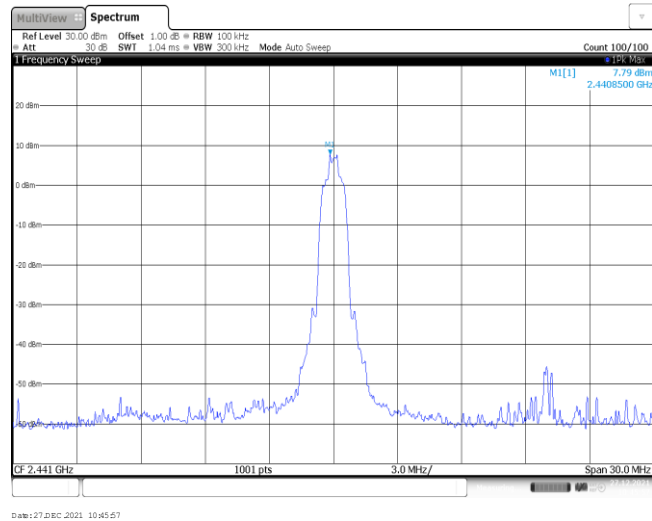


CH78
1GHz~26GHz

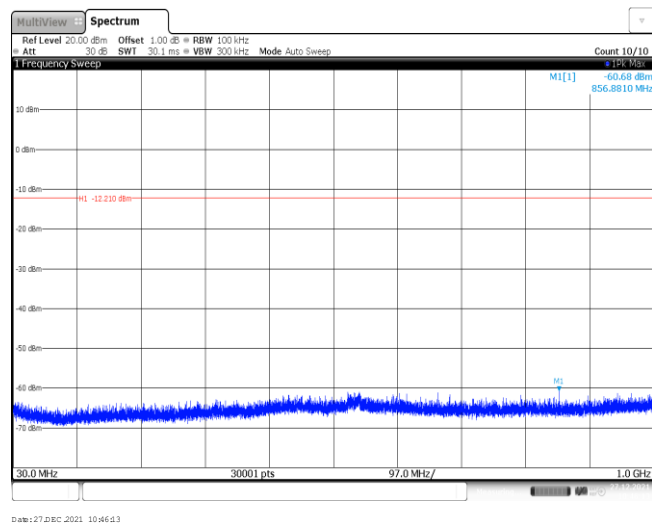


Test Item:	Spurious Emission	Modulation type:	$\pi/4$ DQPSK
CH00 Reference level	 Ref Level 30.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 1.04 ms VBW 300 kHz Mode Auto Sweep Count 100/100 M1[1] 3.07 dBm 2.4018500 GHz CF 2.402 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 27 DEC 2021 10:42:51		
CH00 30MHz~1000MHz	 Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 M1[1] -50.40 dBm 542.5150 MHz H1 -10.930 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 27 DEC 2021 10:43:07		
CH00 1GHz~26GHz	 Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 M1[1] -50.59 dBm 3.401667 GHz H1 -10.930 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 27 DEC 2021 10:43:42		

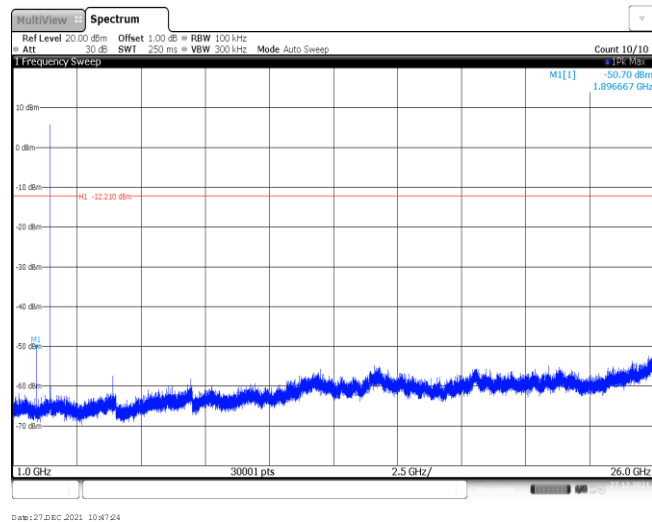
CH39
Reference level



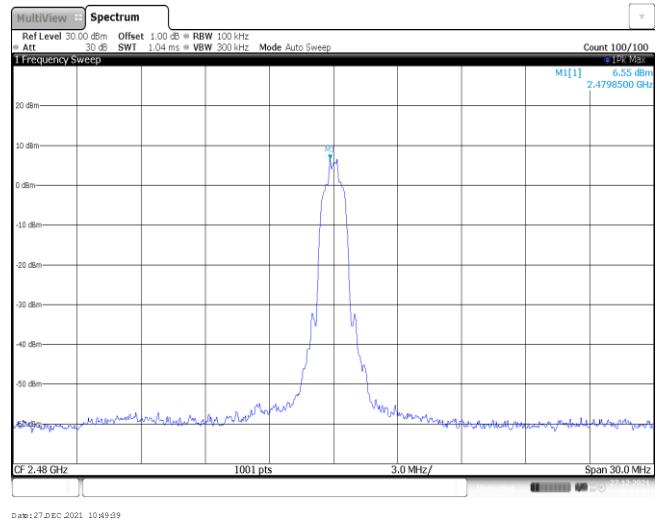
CH39
30MHz~1000MHz



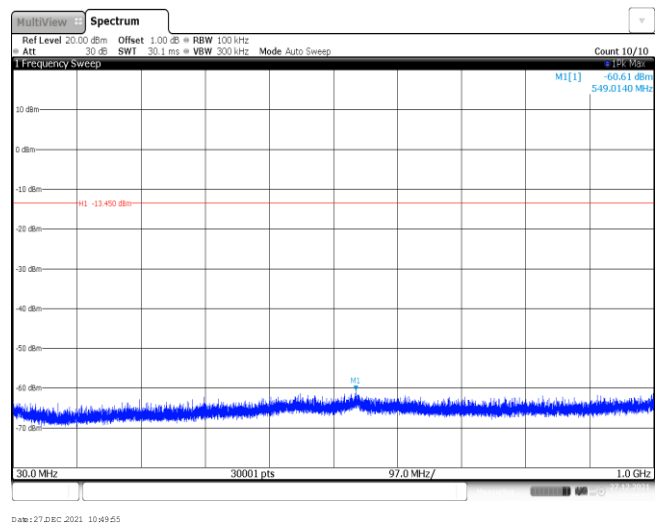
CH39
1GHz~26GHz



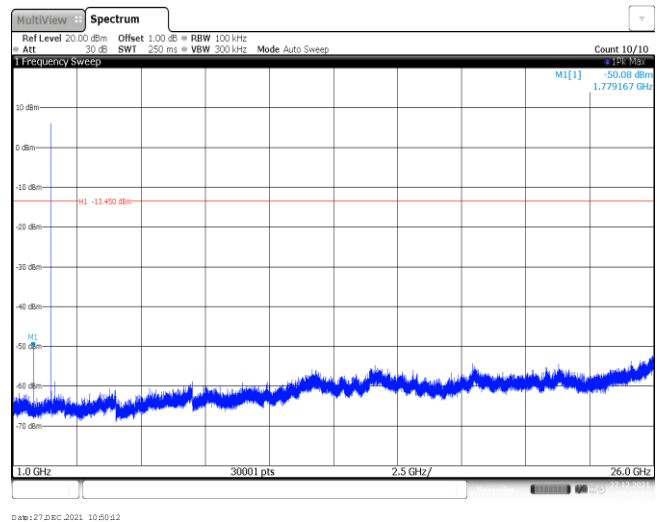
CH78
Reference level

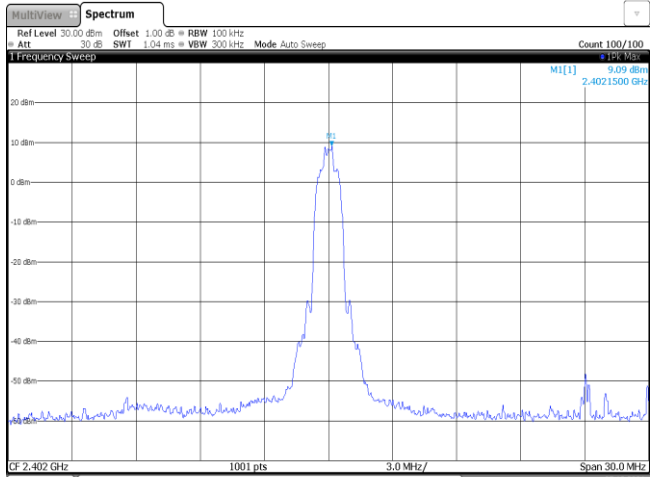
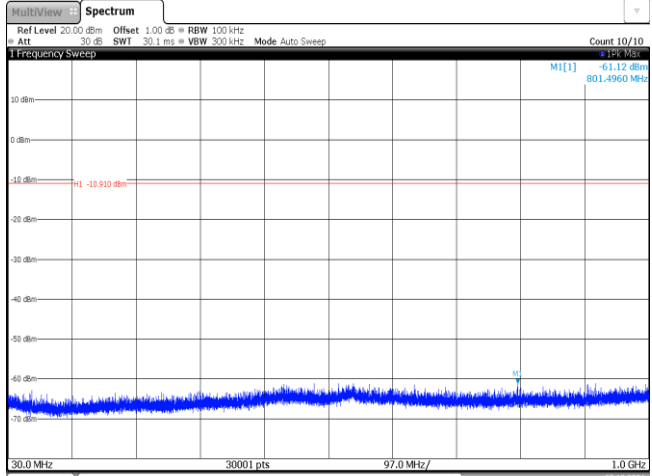
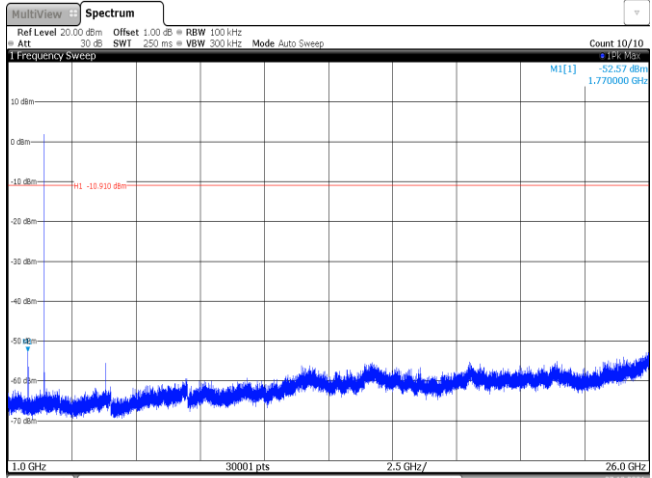


CH78
30MHz~1000MHz

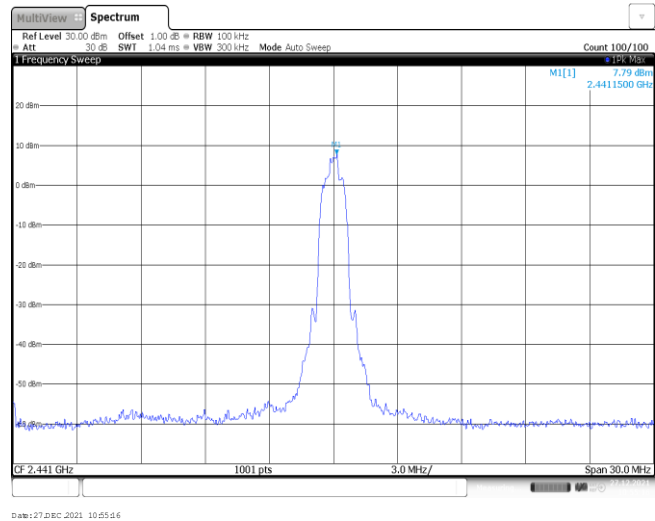


CH78
1GHz~26GHz

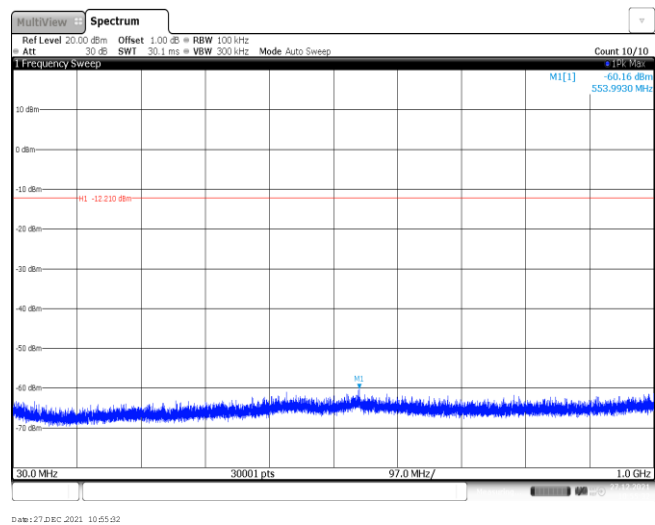


Test Item:	Spurious Emission	Modulation type:	8DPSK
CH00 Reference level	 CH00 Reference level		
CH00 30MHz~1000MHz	 CH00 30MHz~1000MHz		
CH00 1GHz~26GHz	 CH00 1GHz~26GHz		

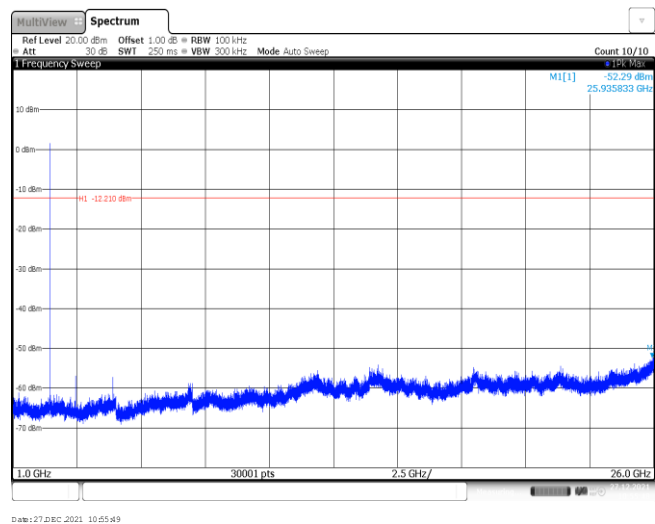
CH39
Reference level

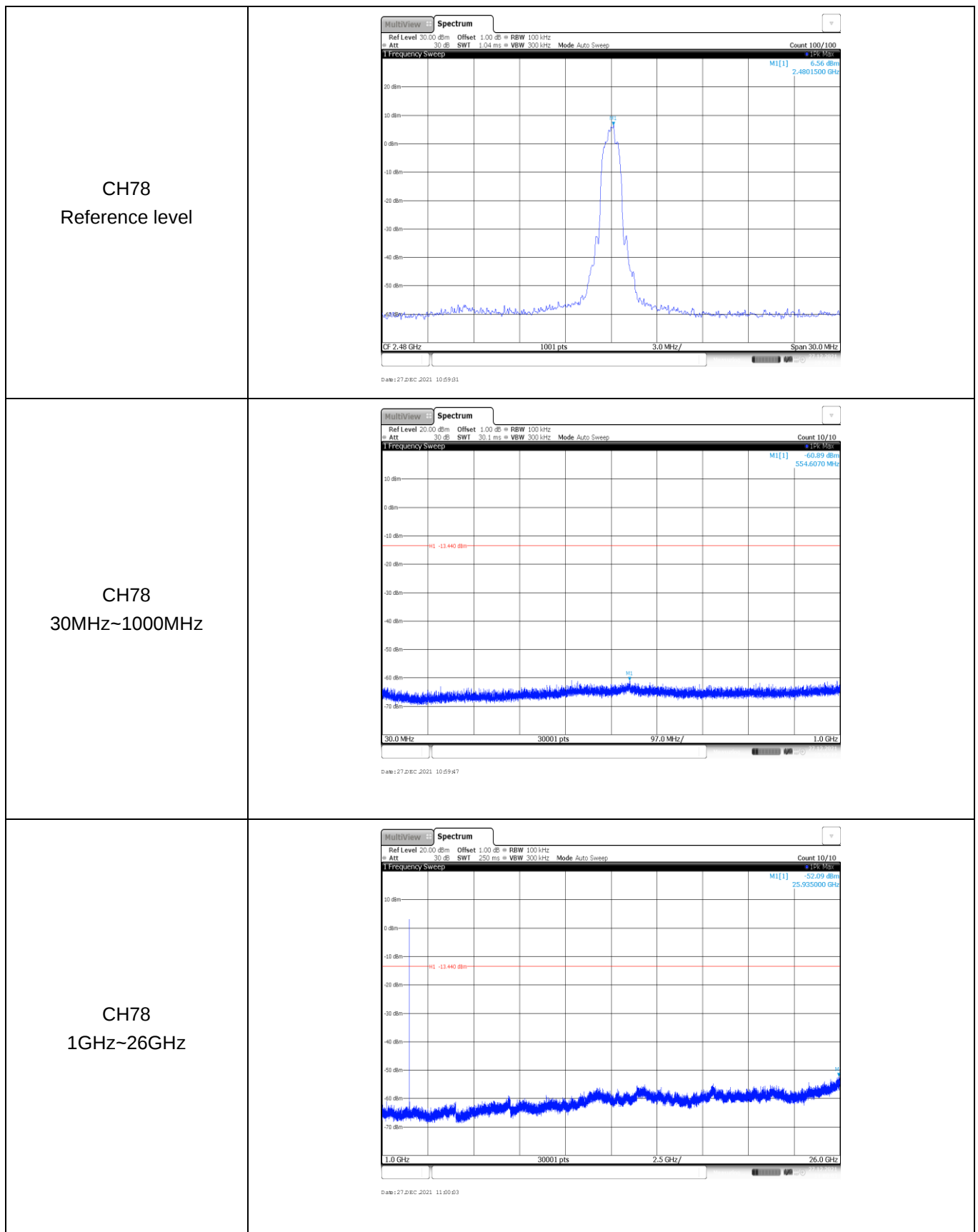


CH39
30MHz~1000MHz



CH39
1GHz~26GHz





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