

APPENDIX REPORT

Project No.	SHT2107112207EW	Radio Specification	Bluetooth EDR
Model No.	Screeneo U4		
Start test date	2021-12-30	Finish date	2021-12-30
Temperature	23.3℃	Humidity	44%
Test Engineer	Xiaoqin 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

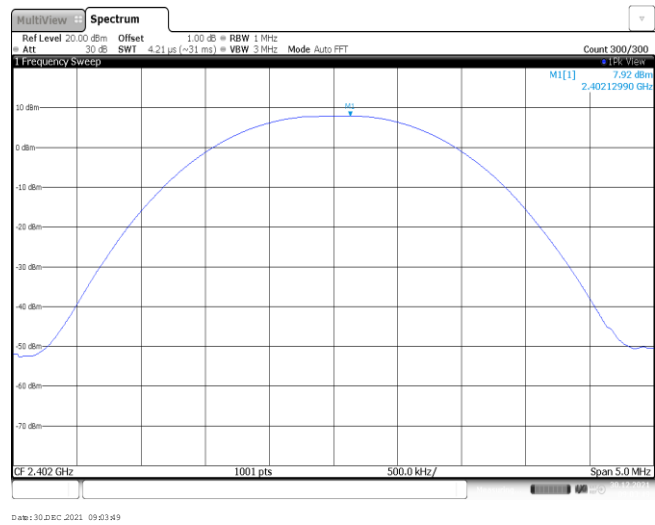
Appendix A: Peak Output Power

Modulation type	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	00	7.92	7.88	≤ 30.00	Pass
	39	8.40	8.36		
	78	7.69	7.65		
$\pi/4$ DQPSK	00	9.01	8.92	≤ 21.00	Pass
	39	8.77	8.66		
	78	6.34	6.29		
8DPSK	00	9.07	8.95	≤ 21.00	Pass
	39	8.50	8.41		
	78	6.75	6.29		

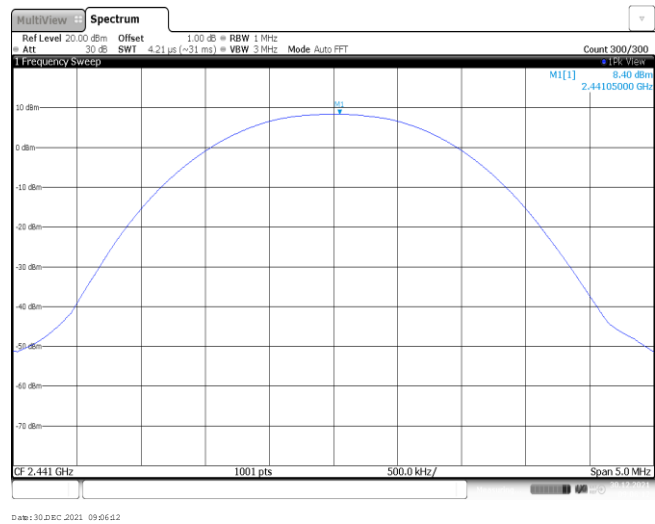
Modulation Type:

GFSK

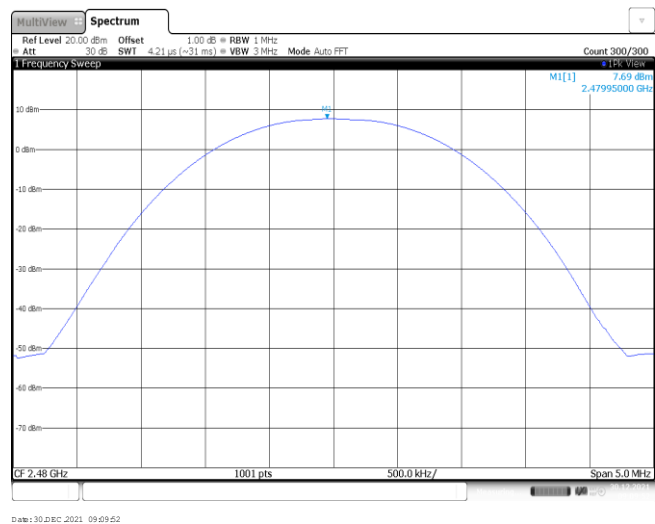
CH00

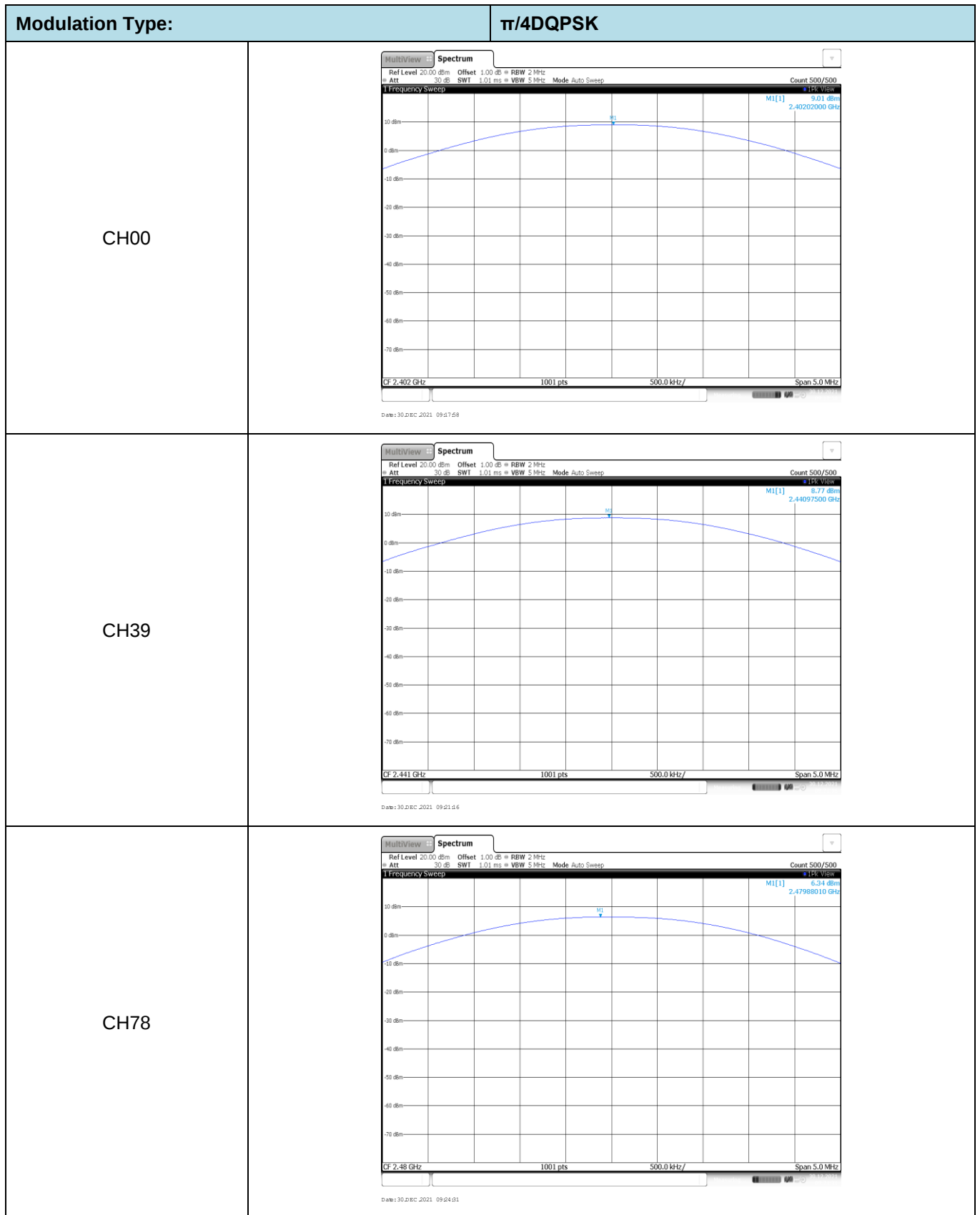


CH39



CH78

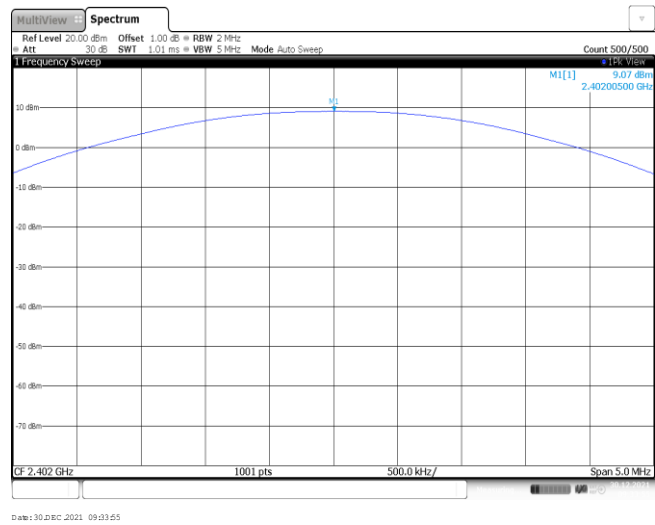




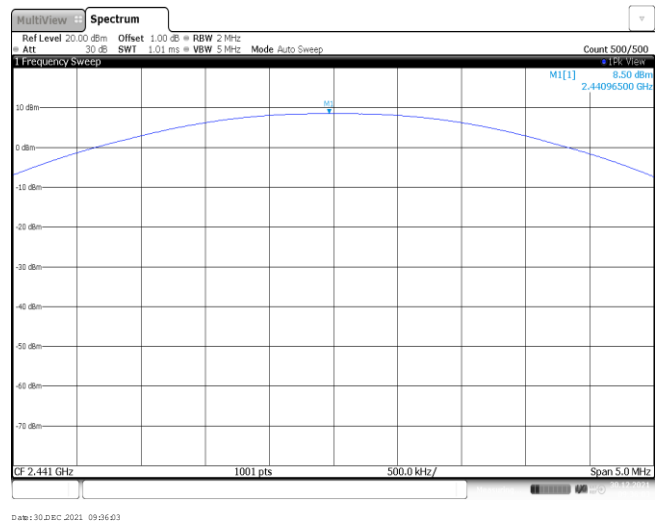
Modulation Type:

8DPSK

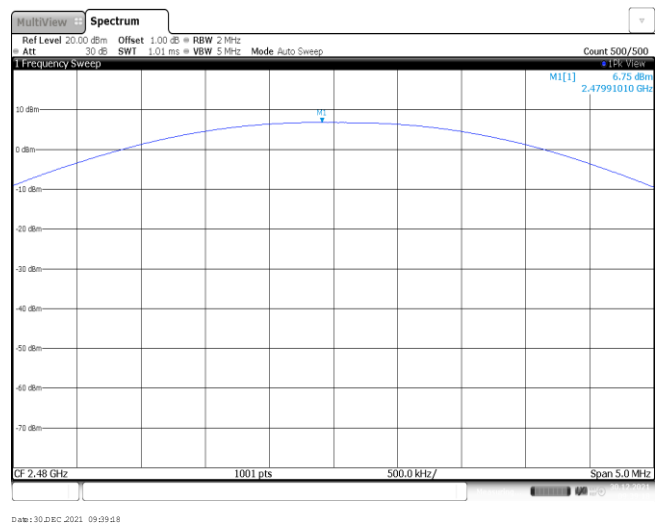
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CH39



CH78



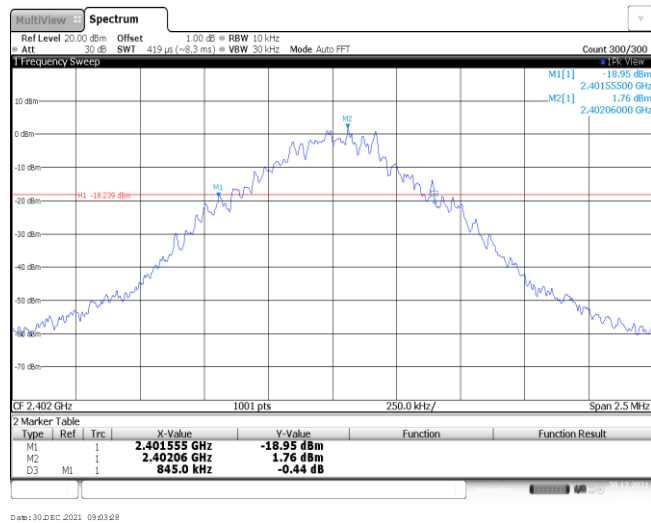
Appendix B : 20 dB Bandwidth

Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	845.00	-	Pass
	39	845.00		
	78	792.50		
$\pi/4$ DQPSK	00	1292.50	-	Pass
	39	1280.00		
	78	1270.00		
8DPSK	00	1295.00	-	Pass
	39	1292.50		
	78	1280.00		

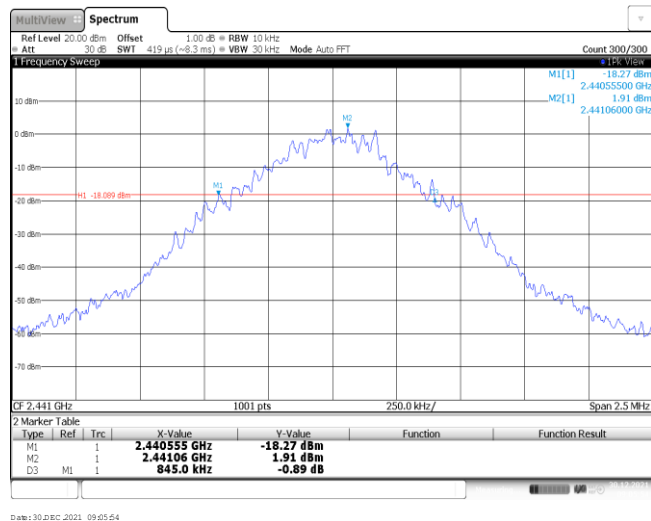
Modulation Type:

GFSK

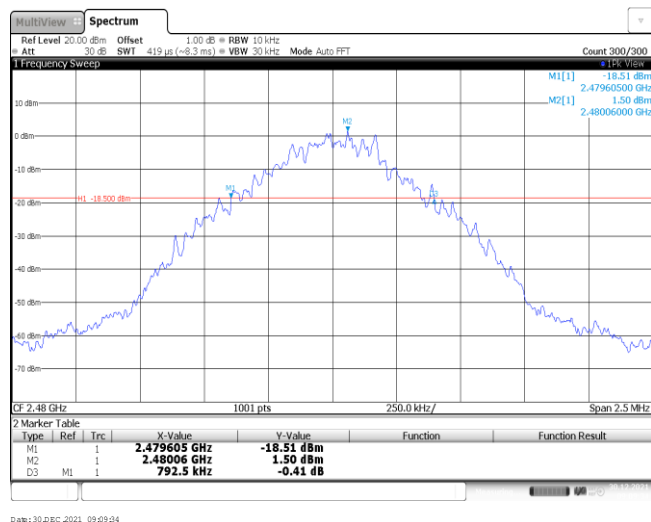
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CH39



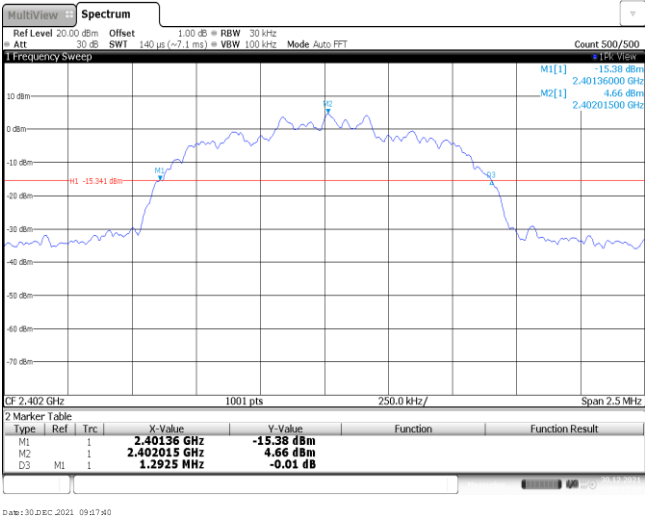
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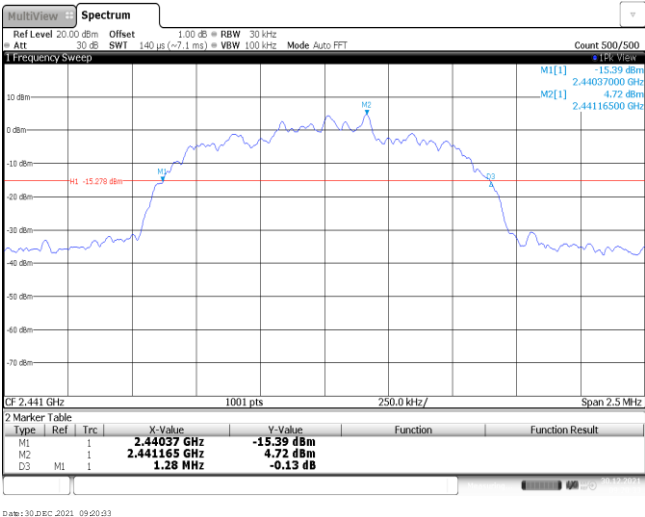
Modulation Type:

$\pi/4$ DQPSK

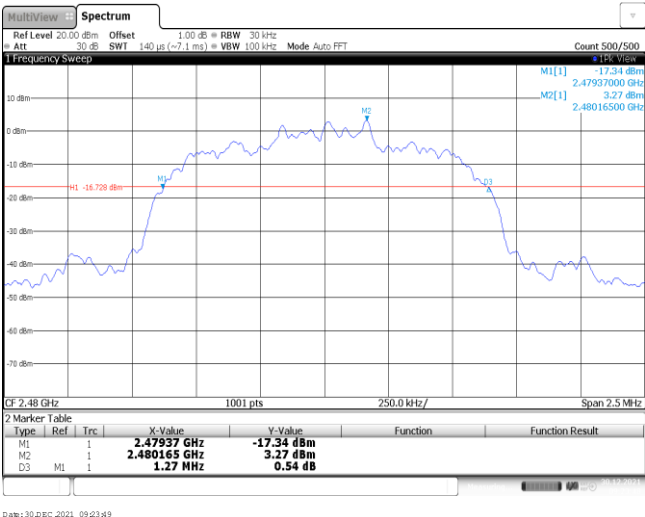
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CH39



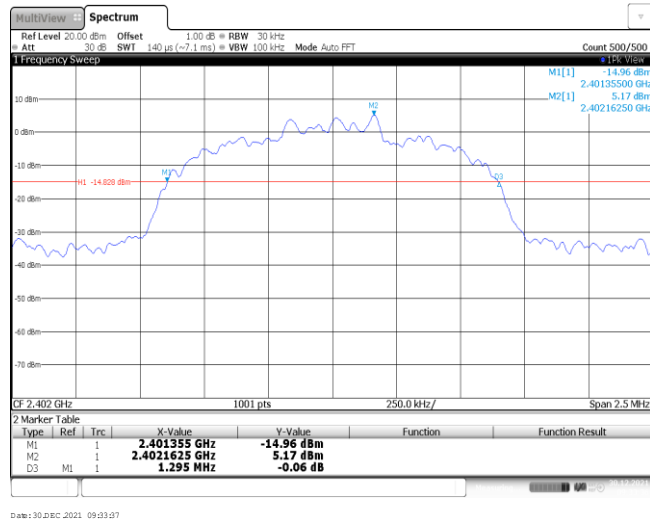
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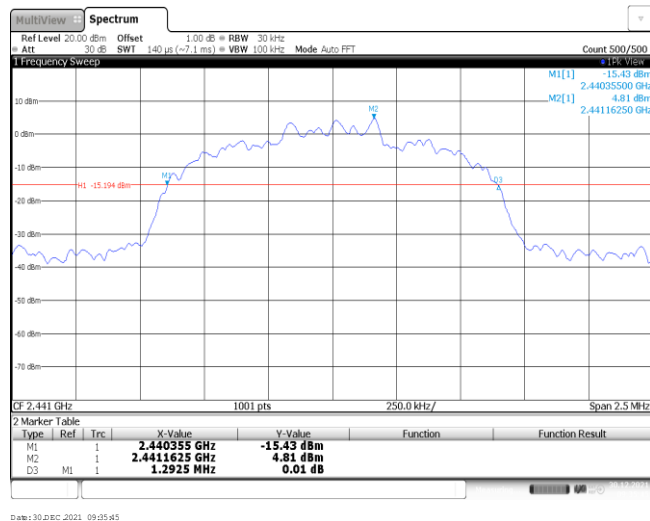
Modulation Type:

8DPSK

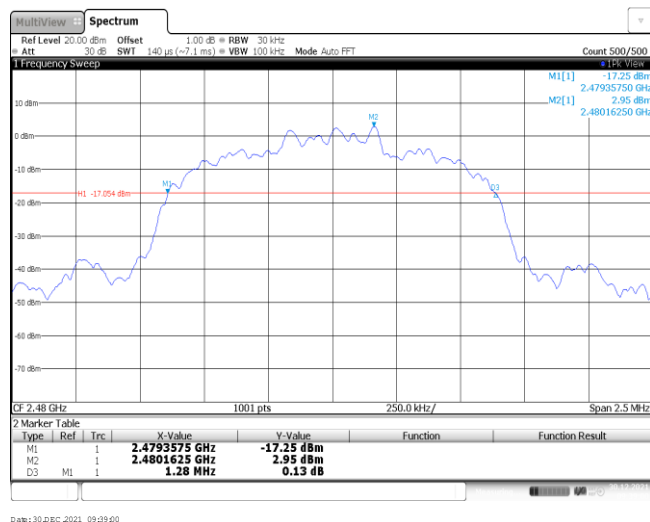
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CH39



CH78



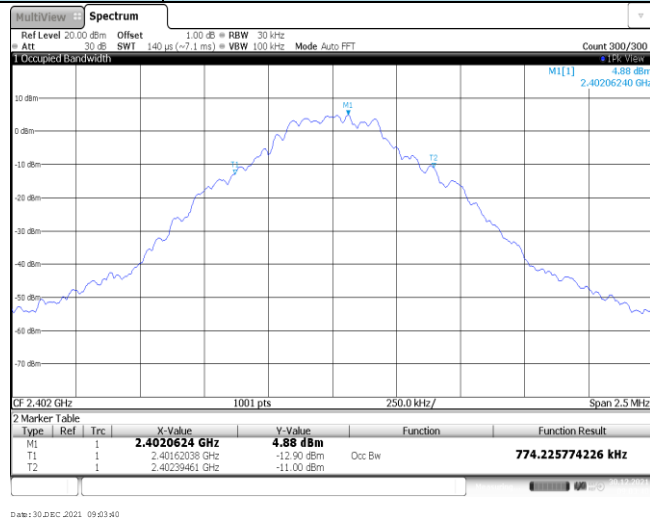
Appendix C: 99% Occupied Bandwidth

Modulation type	Channel	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.77	-	Pass
	39	0.78		
	78	0.76		
$\pi/4$ DQPSK	00	1.16	-	Pass
	39	1.16		
	78	1.15		
8DPSK	00	1.17	-	Pass
	39	1.17		
	78	1.15		

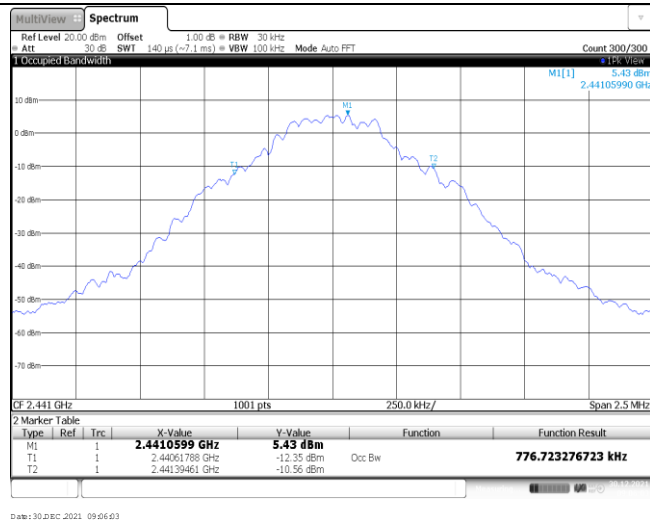
Modulation Type:

GFSK

CH00

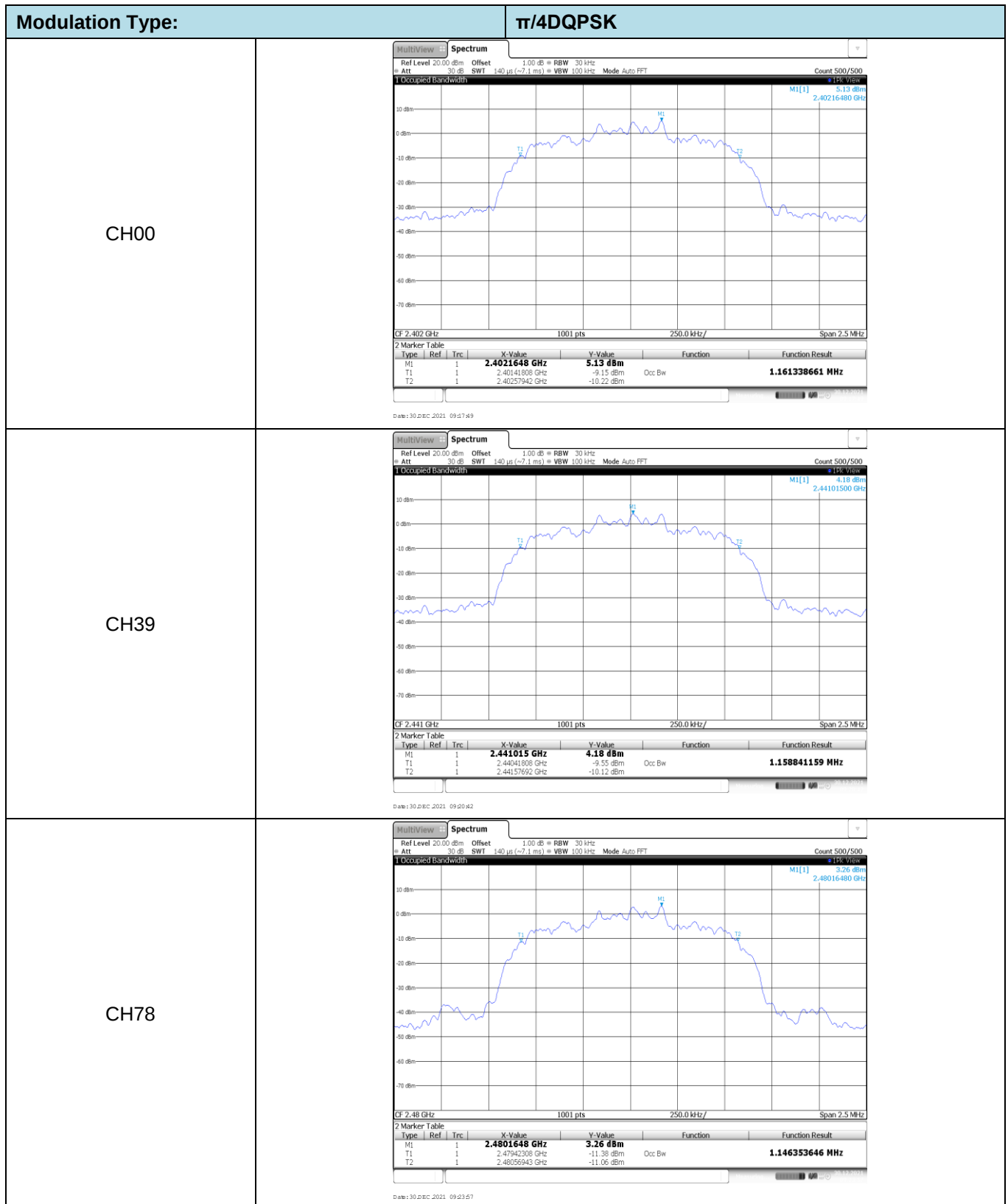


CH39



CH78

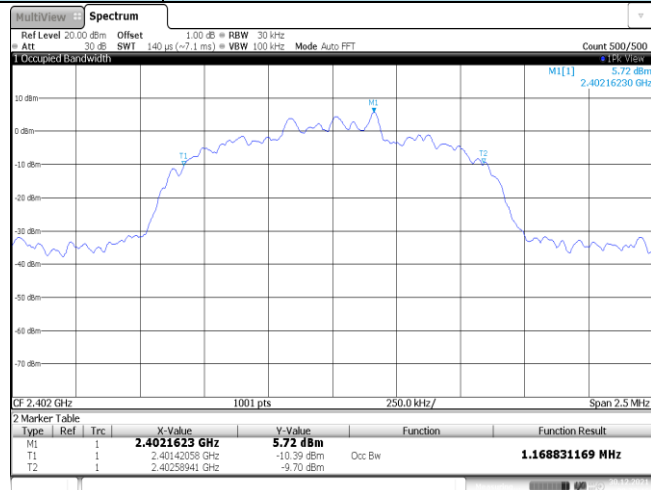




Modulation Type:

8DPSK

CH00



Date: 30 DEC 2021 09:03:66

CH39



Date: 30 DEC 2021 09:05:64

CH78



Date: 30 DEC 2021 09:09:09

Appendix D: Carrier Frequencies Separation

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (kHz) *	Result
GFSK	39	1.00	≥845.00	Pass
π/4DQPSK	39	1.00	≥861.67	Pass
8DPSK	39	1.00	≥863.33	Pass

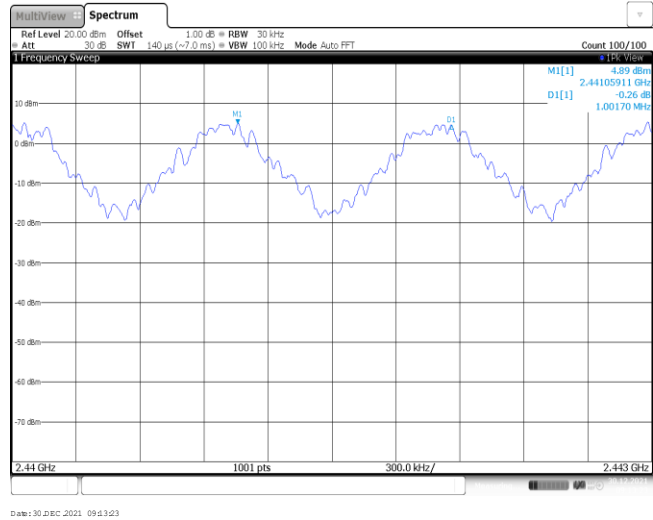
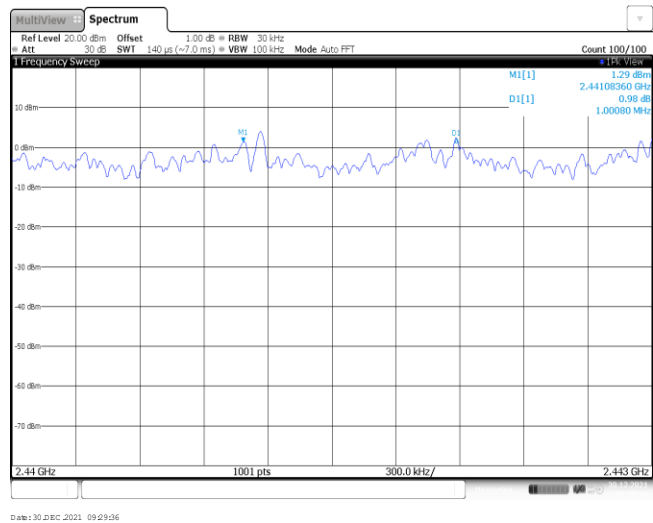
Note:

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

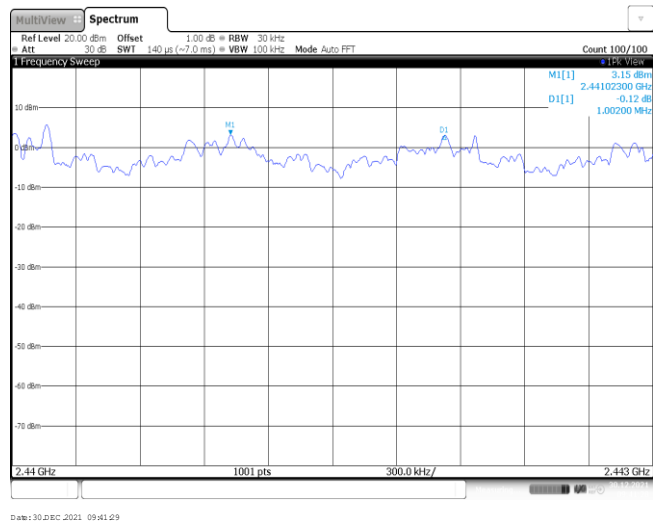
π/4DQPSK limit = 2/3 * The maximum 20 dB Bandwidth for π/4DQPSK modulation on the appendix B.

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

GFSK

 $\pi/4$ DQPSK

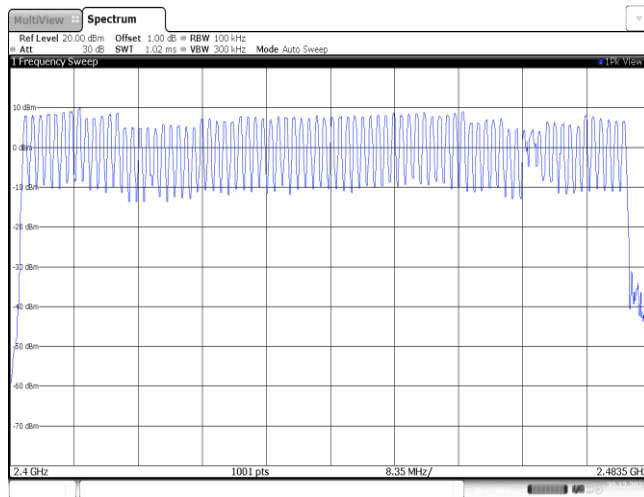
8DPSK



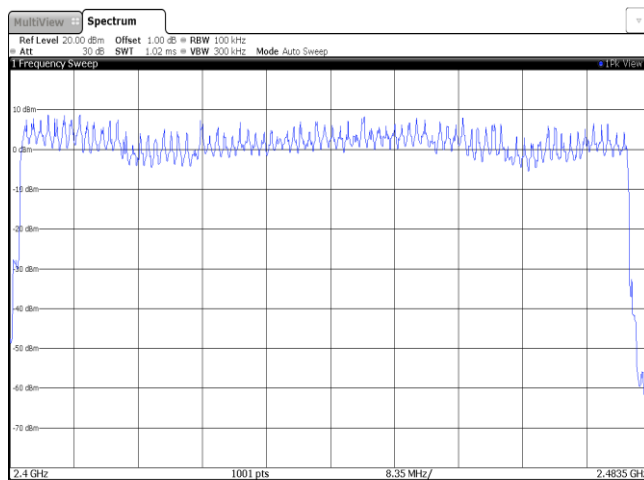
Appendix E: Hopping Channel Number

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

GFSK

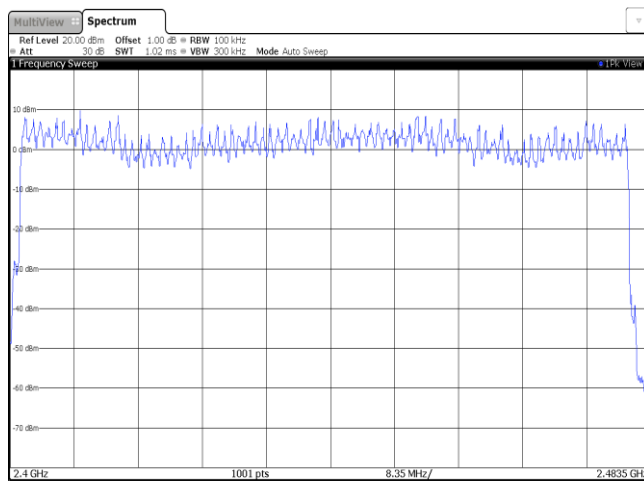


Date: 30 DEC 2021 09:44:52

 $\pi/4$ DQPSK

Date: 30 DEC 2021 09:00:56

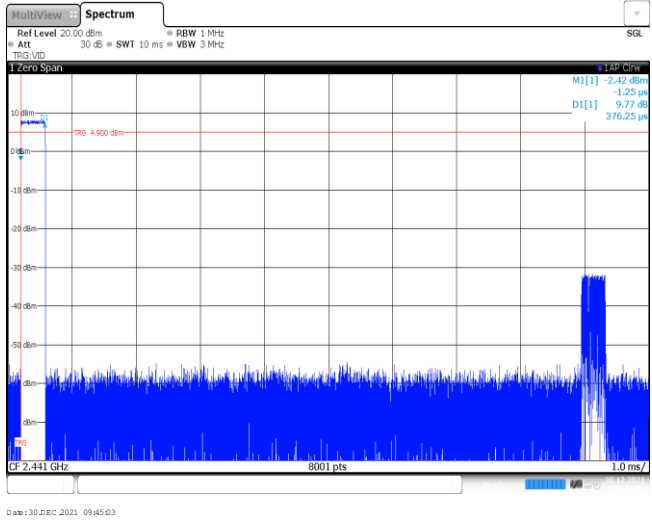
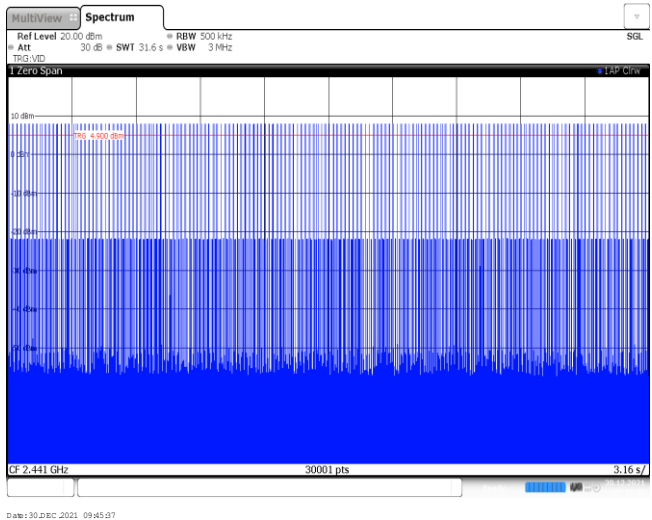
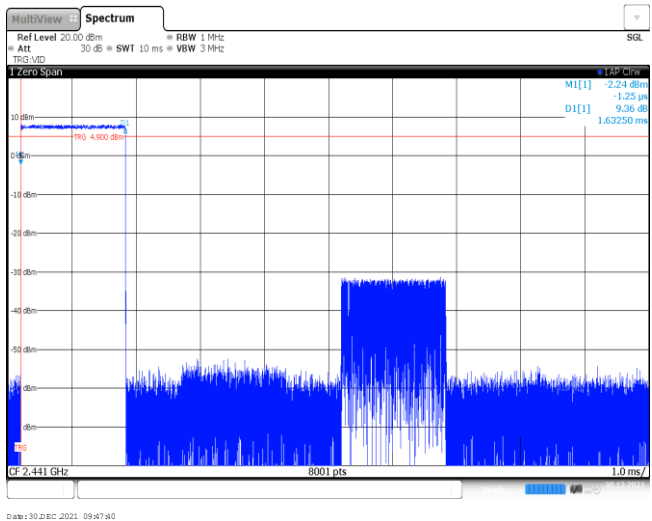
8DPSK

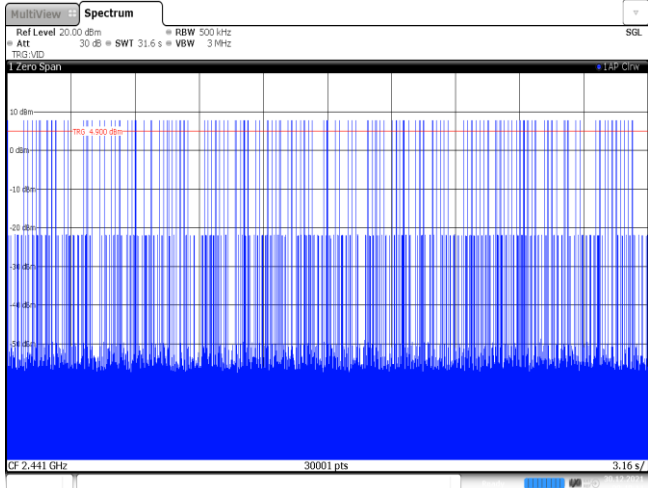
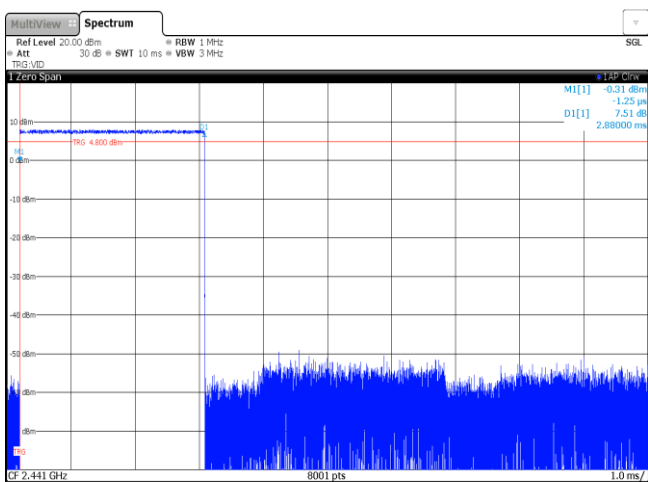
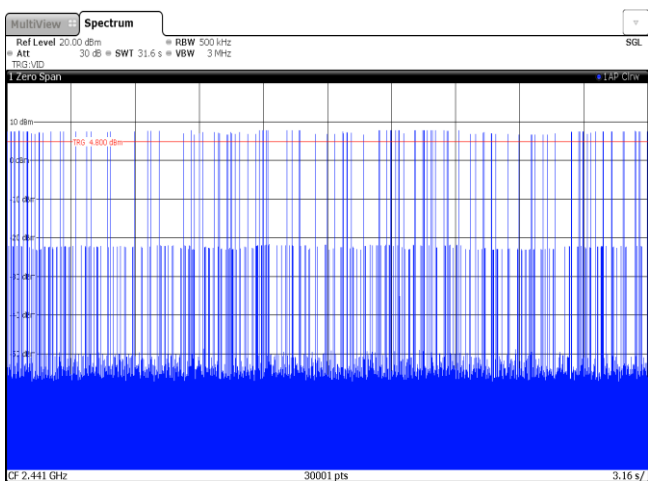


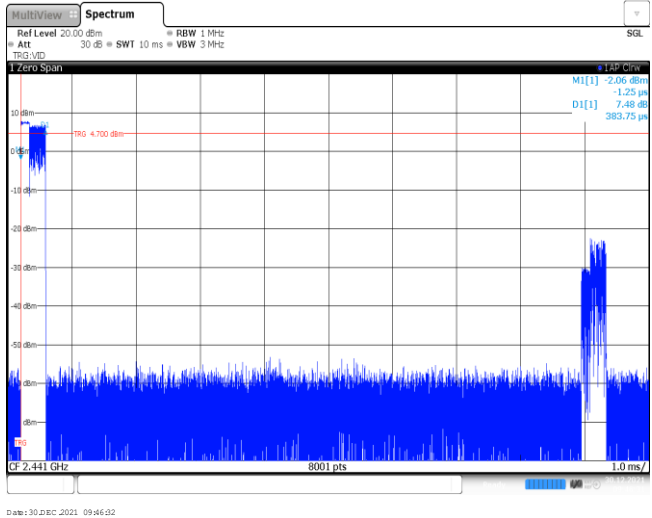
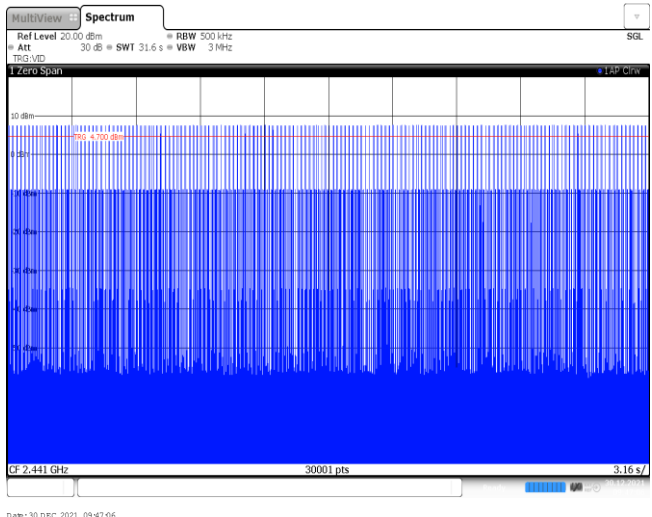
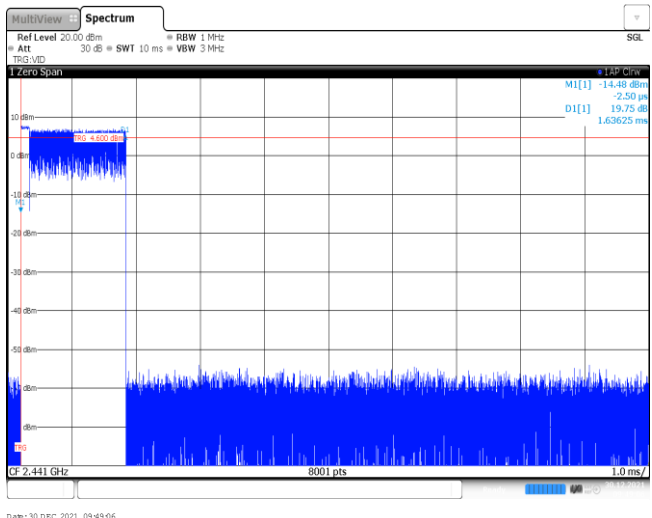
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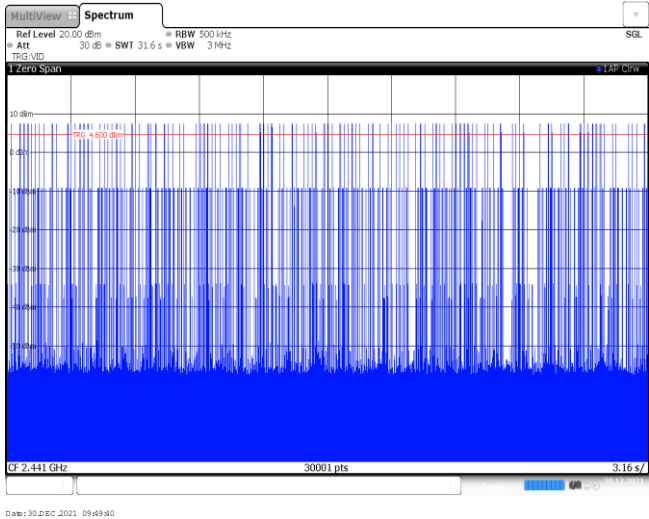
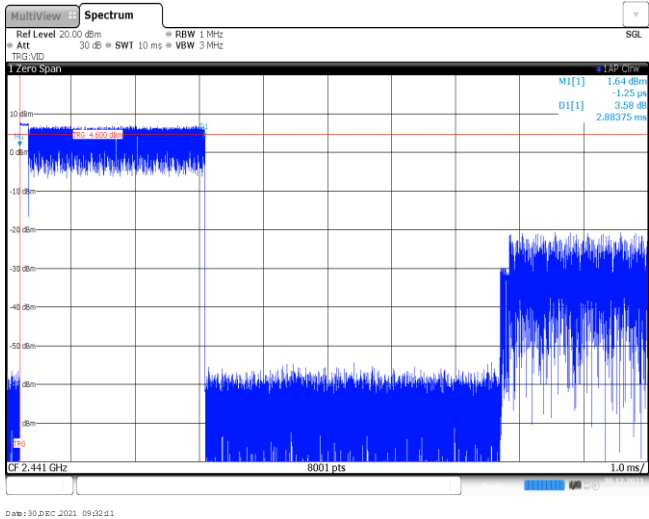
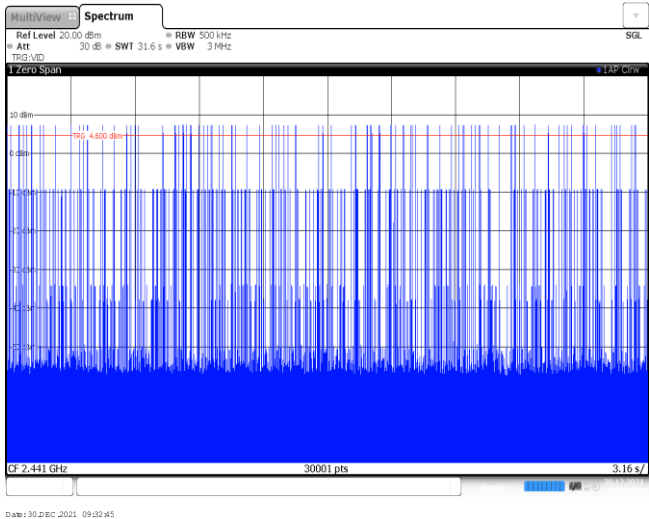
Appendix F: Dwell Time

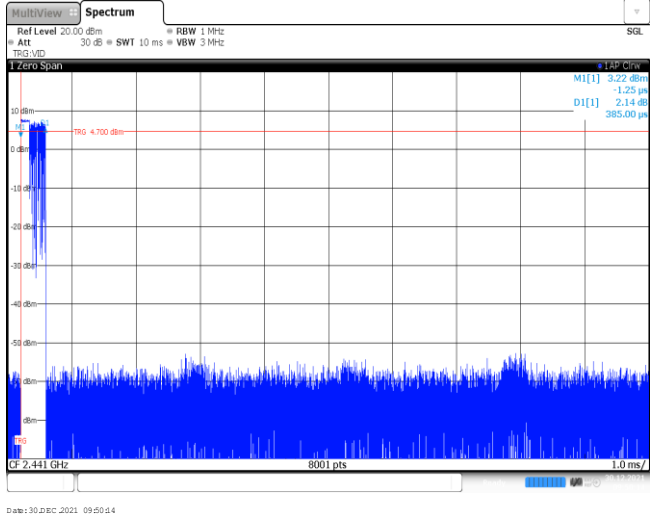
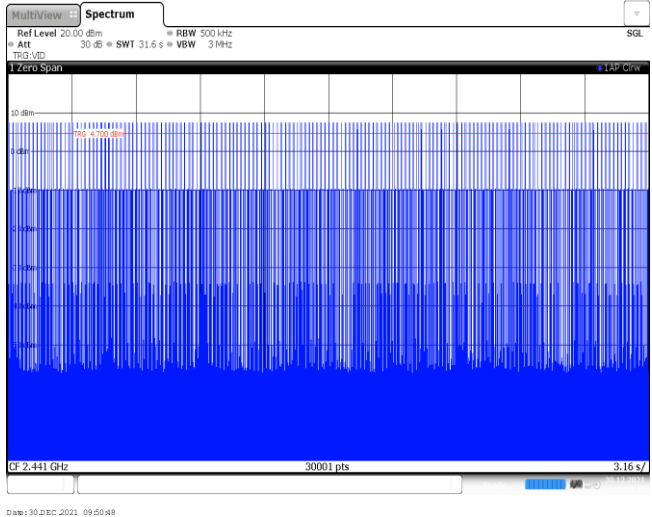
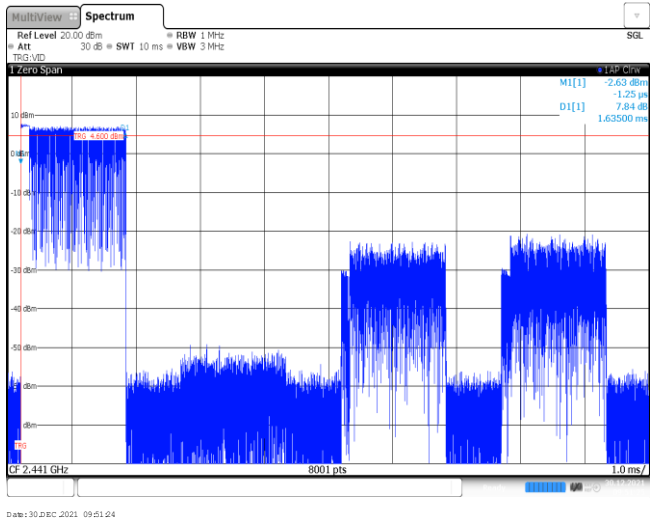
Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.38	313	0.12	≤ 0.40	Pass
	DH3	1.63	156	0.26		
	DH5	2.88	114	0.33		
$\pi/4$ DQPSK	2DH1	0.38	313	0.12	≤ 0.40	Pass
	2DH3	1.64	158	0.26		
	2DH5	2.88	107	0.31		
8DPSK	3DH1	0.38	314	0.12	≤ 0.40	Pass
	3DH3	1.64	158	0.26		
	3DH5	2.89	107	0.31		

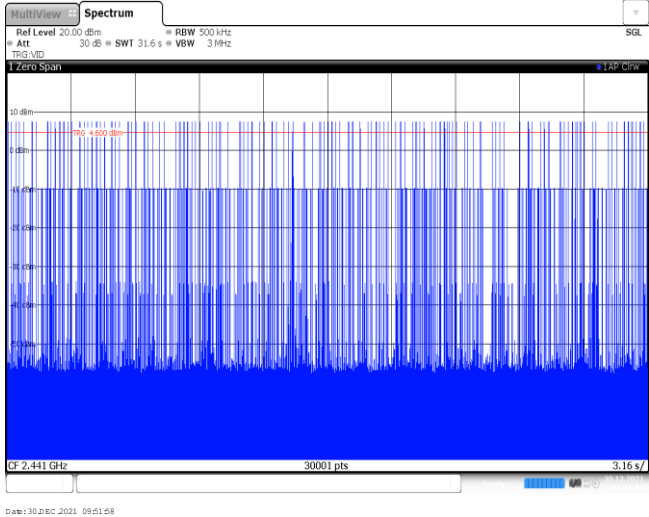
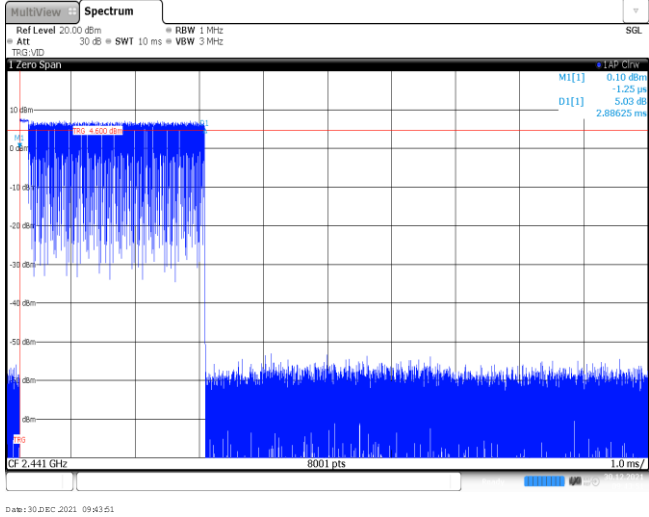
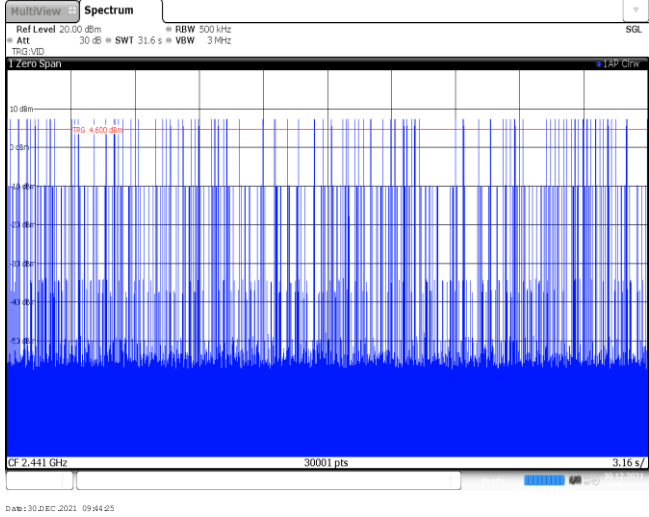
Modulation Type:	GFSK
DH1 Burst width	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 8001 pts. The y-axis represents power in dBm, ranging from -100 to 10. A red line indicates a threshold at -4.900 dBm. The signal is a narrowband burst. The plot includes parameters: Ref Level 20.00 dBm, Att 30 dB, RBW 1 MHz, SWT 10 ms, VBW 3 MHz. The date is 30 DEC 2021 09:45:03.
DH1 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 -100 to 10. A red line indicates a threshold at -4.900 dBm. The signal is a narrowband burst. The plot includes parameters: Ref Level 20.00 dBm, Att 30 dB, RBW 500 kHz, SWT 31.6 s, VBW 3 MHz. The date is 30 DEC 2021 09:45:07.
DH3 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 -100 to 10. A red line indicates a threshold at -4.900 dBm. The signal is a narrowband burst. The plot includes parameters: Ref Level 20.00 dBm, Att 30 dB, RBW 1 MHz, SWT 10 ms, VBW 3 MHz. The date is 30 DEC 2021 09:47:40.

DH3 Burst number	 MultiView Spectrum Ref Level 20.00 dBm Att 30 dB RBW 500 kHz SWT 31.6 s VBW 3 MHz Zero Span 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm CF 2.441 GHz 30001 pts 3.16 s
DH5 Burst width	 MultiView Spectrum Ref Level 20.00 dBm Att 30 dB RBW 1 MHz SWT 10 ms VBW 3 MHz Zero Span 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm CF 2.441 GHz 8001 pts 1.0 ms M1[1] -0.31 dBm -1.25 μs DI[1] 7.51 dB 2.88000 ms
DH5 Burst number	 MultiView Spectrum Ref Level 20.00 dBm Att 30 dB RBW 500 kHz SWT 31.6 s VBW 3 MHz Zero Span 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm CF 2.441 GHz 30001 pts 3.16 s

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. A red line indicates a reference level at -4.700 dBm. The plot shows a burst of signal at the top of the scale, with a duration of 1.0 ms. 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. A red line indicates a reference level at -4.700 dBm. The plot shows a burst of signal at the top of the scale, with a duration of 3.16 s. 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. A red line indicates a reference level at -4.600 dBm. The plot shows a burst of signal at the top of the scale, with a duration of 1.0 ms. The signal is identified as 2DH3.

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

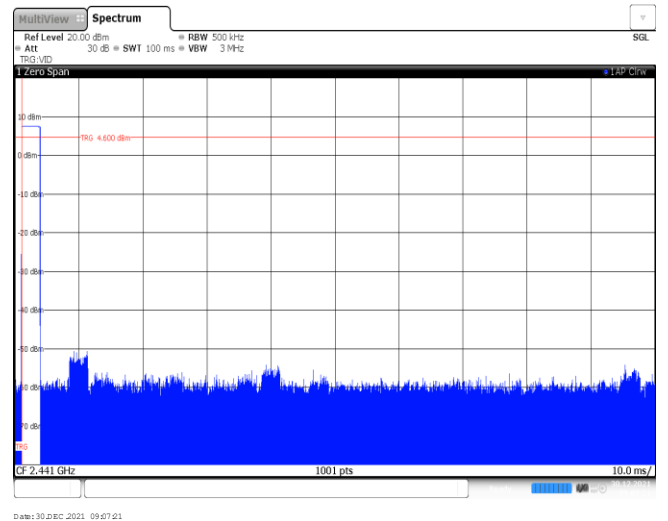
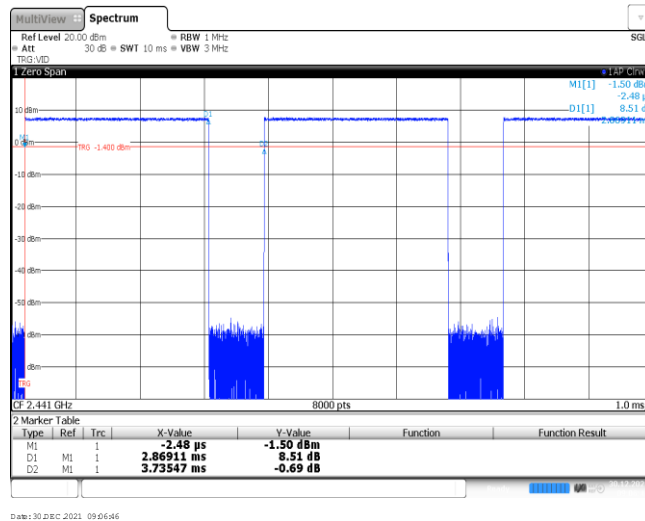
Modulation Type:	8DPSK
3DH1 Burst width	 The spectrum plot shows a single burst of signal at 2.441 GHz. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents frequency in MHz, ranging from 2.435 to 2.447. A red horizontal line indicates the reference level at 0 dBm. The signal is centered around 2.441 GHz. The plot shows a sharp peak at the center frequency, with a bandwidth of approximately 1 MHz. The signal is labeled with a peak power of 4.700 dBm. The plot also shows the signal-to-noise ratio (SNR) and the signal-to-interference ratio (SIR) as 2.14 dB and 385.00 dB respectively. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, SWT 10 ms, RBW 1 MHz, VBW 3 MHz. The plot is dated 30 DEC 2021 09:50:14.
3DH1 Burst number	 The spectrum plot shows a continuous signal 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 horizontal line indicates the reference level at 0 dBm. The signal is centered around 2.441 GHz. The plot shows a continuous signal with a bandwidth of approximately 1 MHz. The signal is labeled with a peak power of 4.700 dBm. The plot also shows the signal-to-noise ratio (SNR) and the signal-to-interference ratio (SIR) as 2.14 dB and 385.00 dB respectively. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, SWT 31.6 s, RBW 500 kHz, VBW 3 MHz. The plot is dated 30 DEC 2021 09:50:48.
3DH3 Burst width	 The spectrum plot shows a burst of signal 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 horizontal line indicates the reference level at 0 dBm. The signal is centered around 2.441 GHz. The plot shows a sharp peak at the center frequency, with a bandwidth of approximately 1 MHz. The signal is labeled with a peak power of 4.700 dBm. The plot also shows the signal-to-noise ratio (SNR) and the signal-to-interference ratio (SIR) as 2.14 dB and 385.00 dB respectively. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, SWT 10 ms, RBW 1 MHz, VBW 3 MHz. The plot is dated 30 DEC 2021 09:51:24.

3DH3 Burst number	
3DH5 Burst width	
3DH5 Burst number	

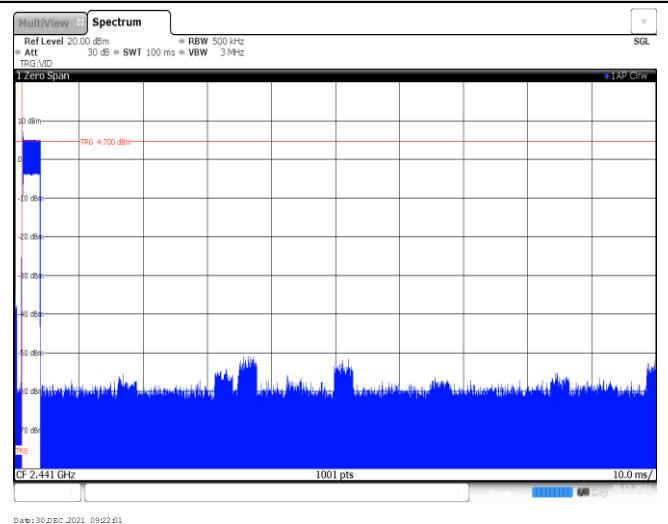
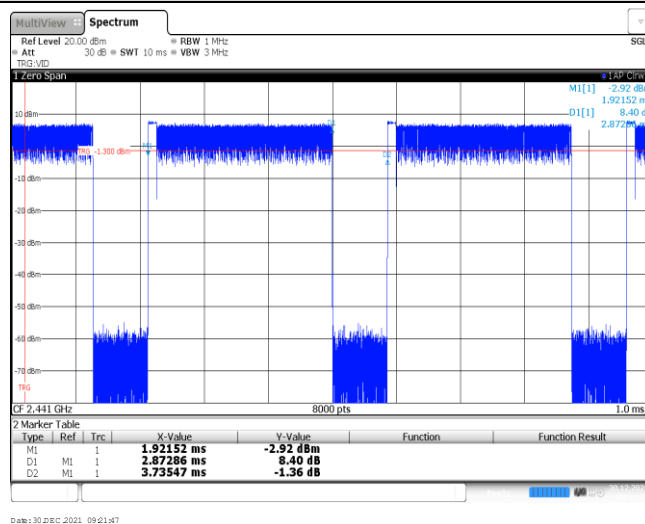
Appendix G: Duty Cycle Correction Factor (DCCF)

DCCF Calculate Formula					
DCCF=20 * Log(duty cycle) = 20 * Log($T_{\text{on time}} / T_{\text{period}}$)					
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	-30.84
$\pi/4$ DQPSK	2441	2.87	100	1	-30.84
8DPSK	2441	2.88	100	2	-24.79

GFSK

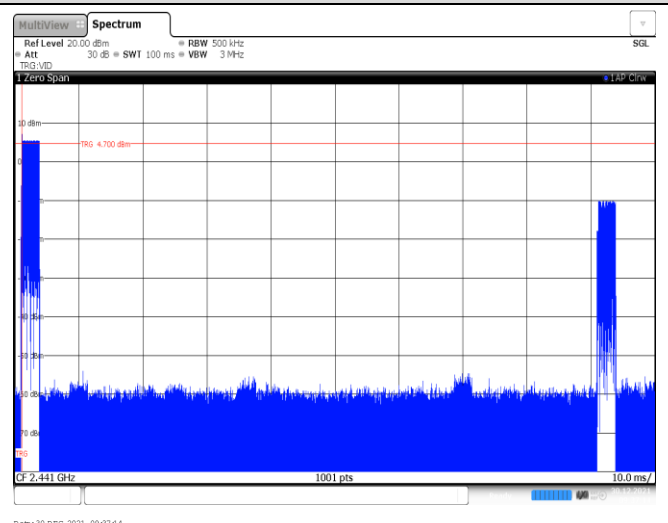
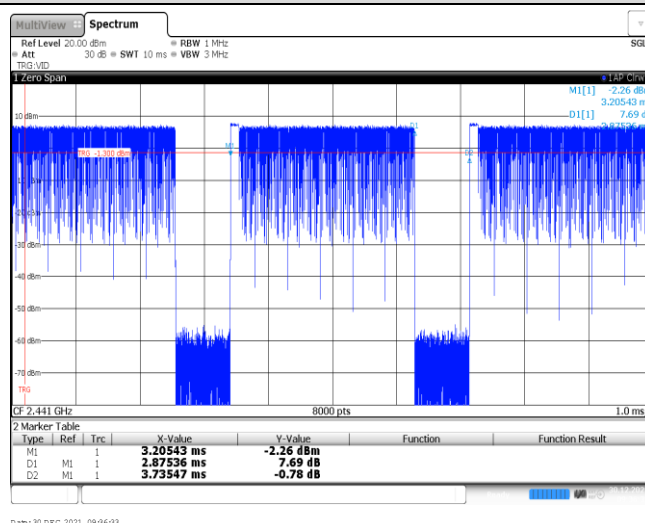
T_{on} time for single burst

Burst Quantity

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

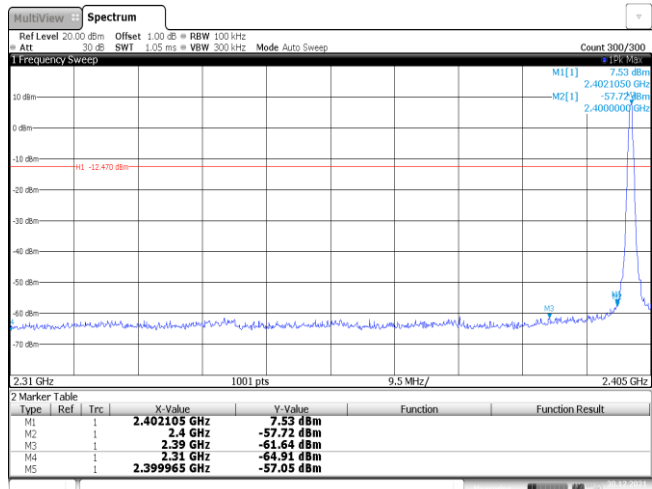
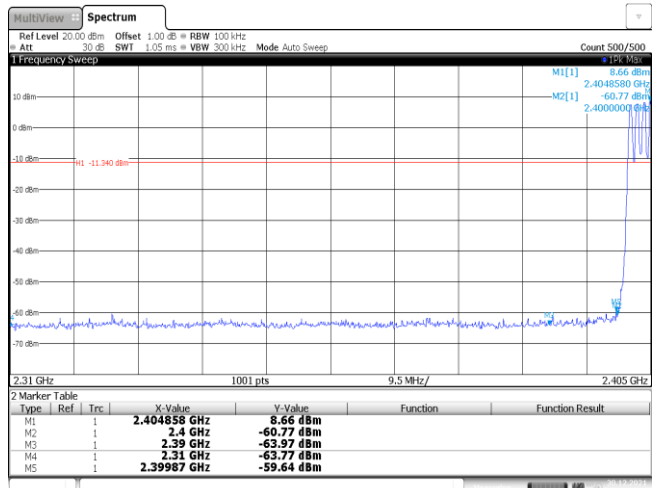
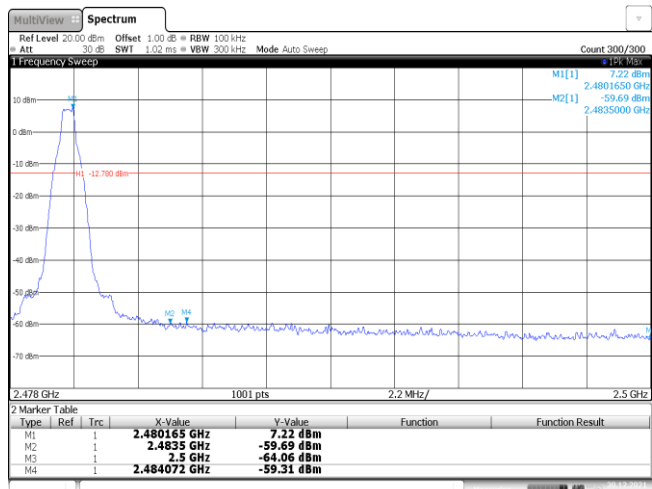
Burst Quantity

8DPSK

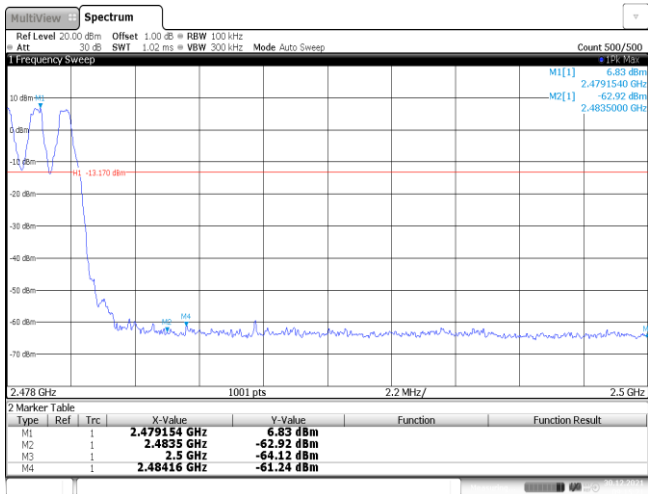
T_{on} time for single burst

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>7.53 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-57.72 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-61.64 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-64.91 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.399965 GHz</td><td>-57.05 dBm</td><td></td><td></td></tr></table> Date: 30 DEC 2021 09:04:37	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.402105 GHz	7.53 dBm			M2	1		2.4 GHz	-57.72 dBm			M3	1		2.39 GHz	-61.64 dBm			M4	1		2.31 GHz	-64.91 dBm			M5	1		2.399965 GHz	-57.05 dBm				
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
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Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
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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>7.22 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4835 GHz</td><td>-59.69 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.5 GHz</td><td>-64.06 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.484072 GHz</td><td>-59.31 dBm</td><td></td><td></td></tr></table> Date: 30 DEC 2021 09:00:31	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.480165 GHz	7.22 dBm			M2	1		2.4835 GHz	-59.69 dBm			M3	1		2.5 GHz	-64.06 dBm			M4	1		2.484072 GHz	-59.31 dBm											
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M4	1		2.484072 GHz	-59.31 dBm																																									

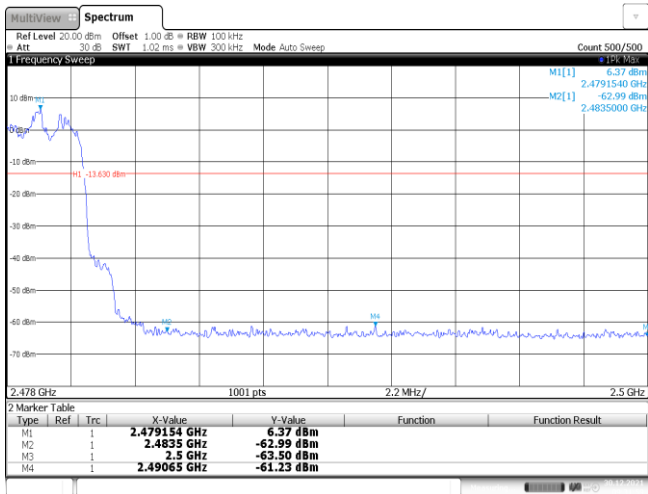
CH78
Hopping mode



Date: 30 DEC 2021 09:15:21

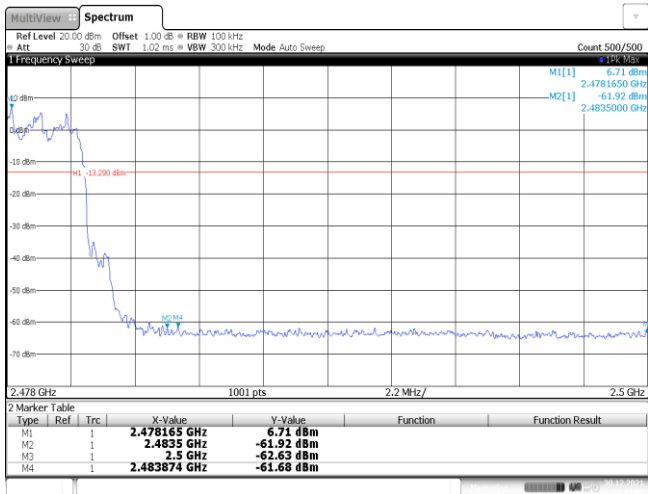
Test Item:	Band edge	Modulation type:	$\pi/4$ DQPSK
CH00 No hopping mode	<		

CH78
Hopping mode

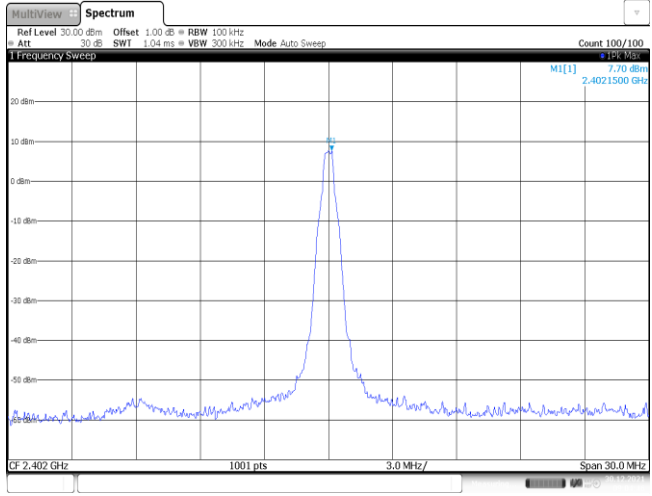
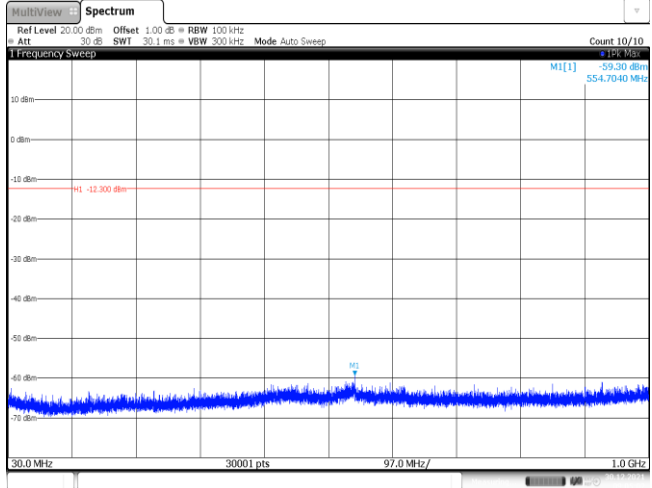
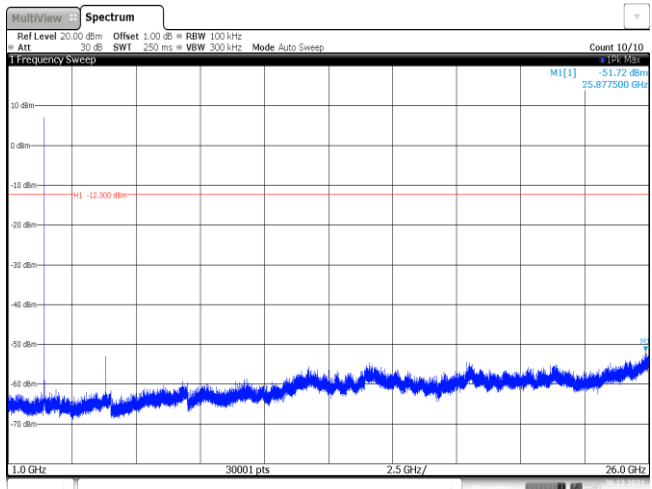


Test Item:	Band edge	Modulation type:	8DPSK
CH00 No hopping mode	</		

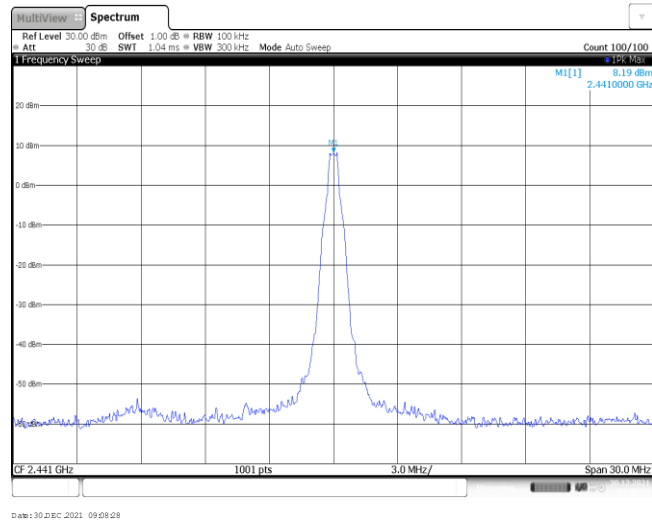
CH78
Hoppig mode



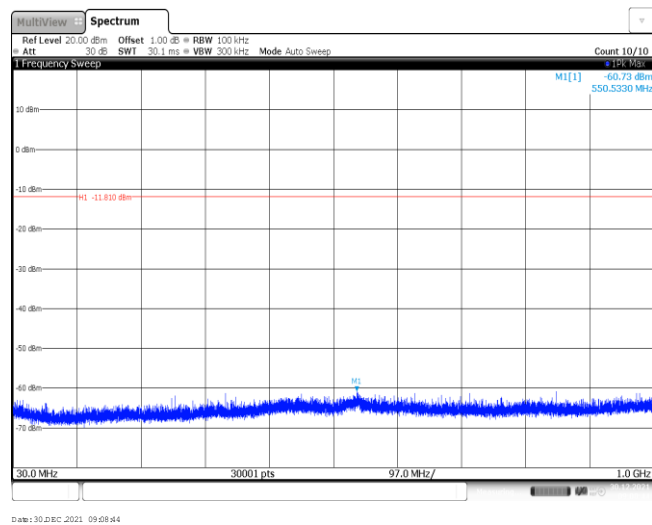
Date: 30 DEC 2021 09:43:02

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CH00 1GHz~26GHz			

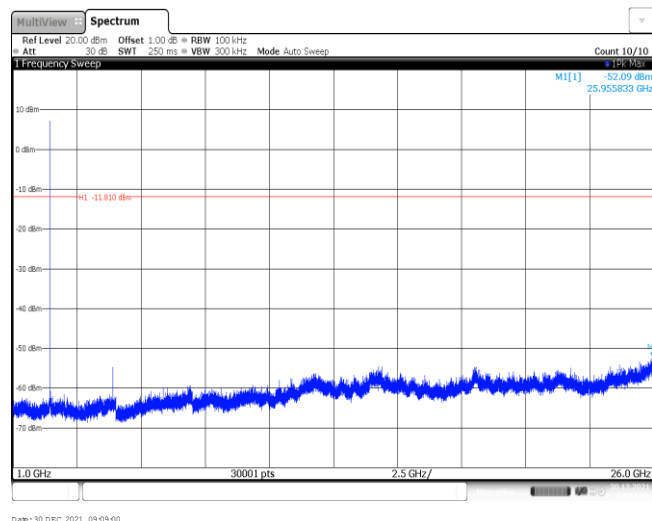
CH39
Reference level



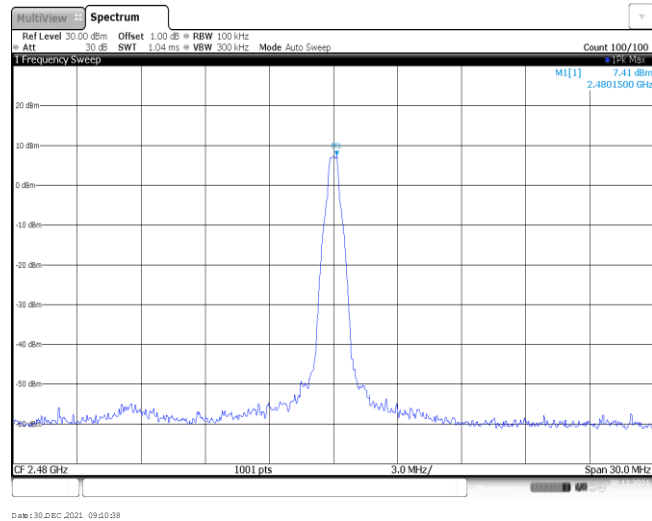
CH39
30MHz~1000MHz



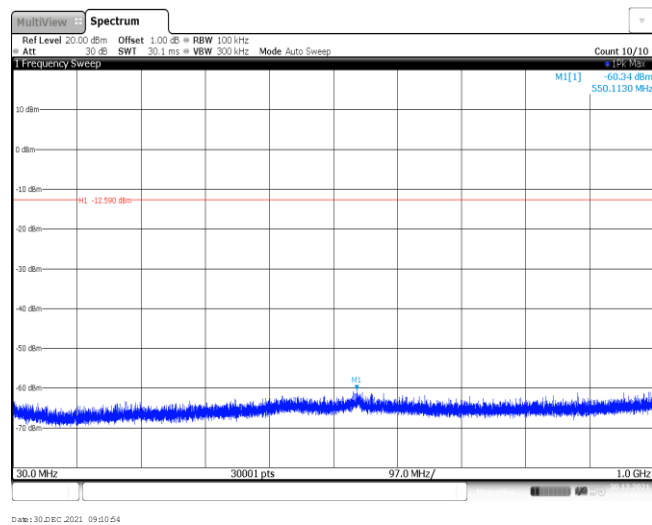
CH39
1GHz~26GHz



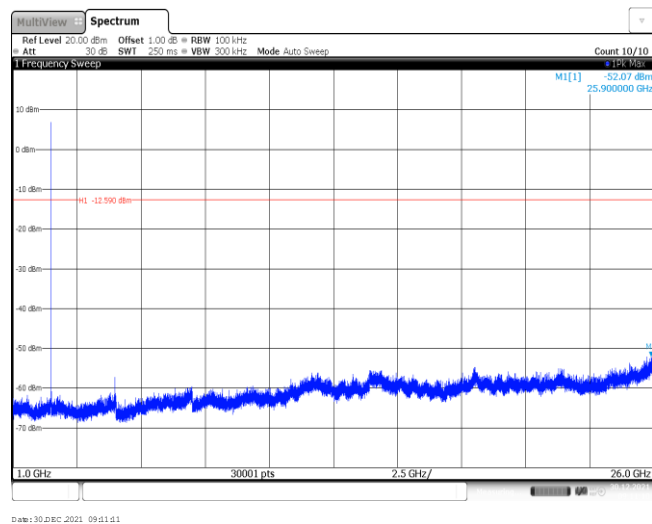
CH78
Reference level

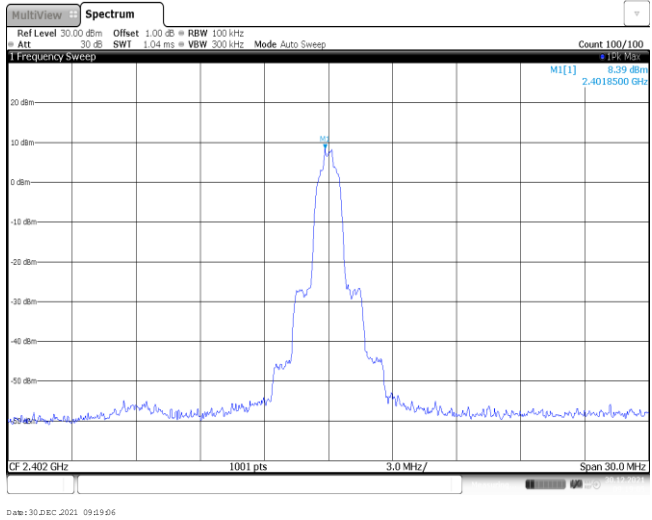
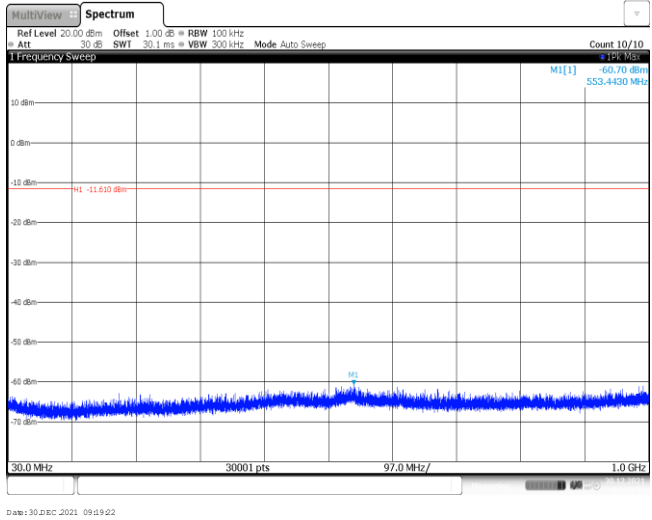
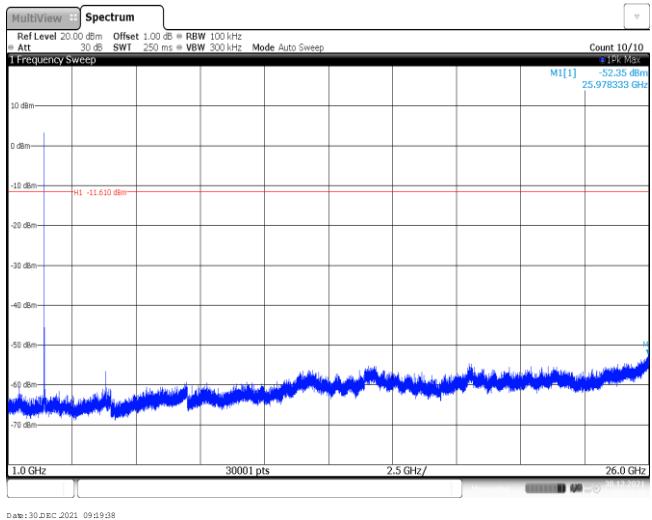


CH78
30MHz~1000MHz

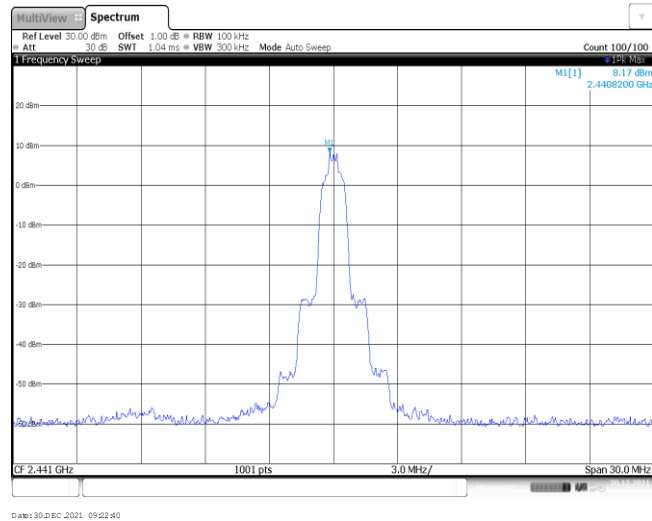


CH78
1GHz~26GHz

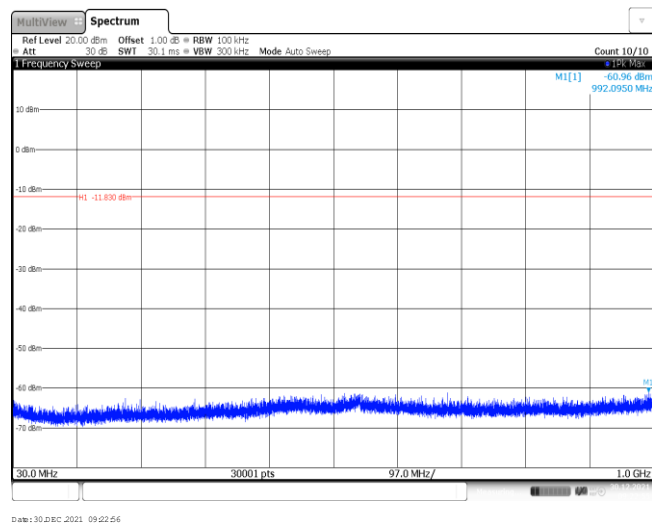


Test Item:	Spurious Emission	Modulation type:	$\pi/4$ DQPSK
CH00 Reference level	 CH00 Reference level		
CH00 30MHz~1000MHz	 CH00 30MHz~1000MHz		
CH00 1GHz~26GHz	 CH00 1GHz~26GHz		

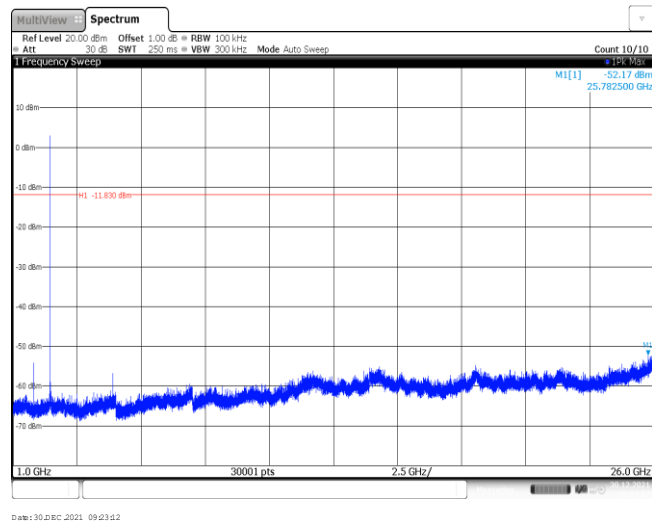
CH39
Reference level



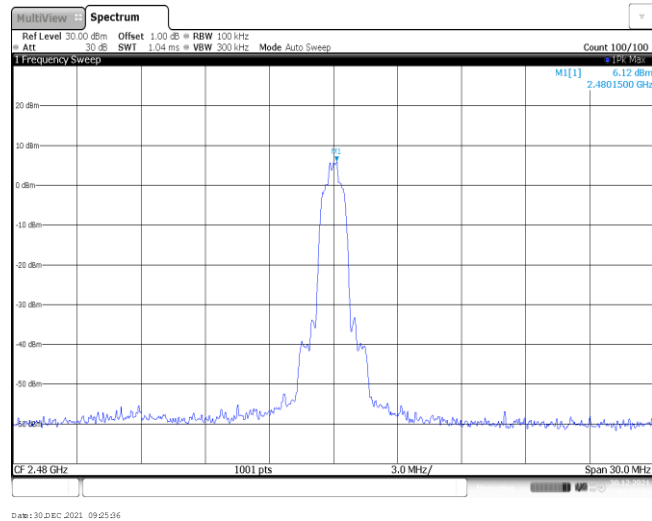
CH39
30MHz~1000MHz



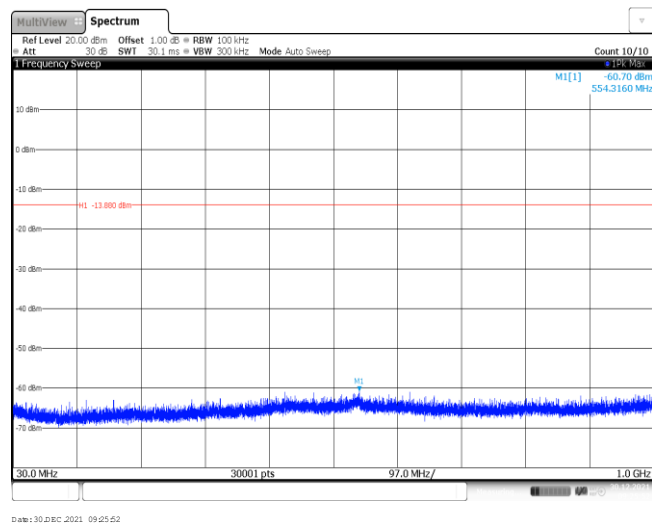
CH39
1GHz~26GHz



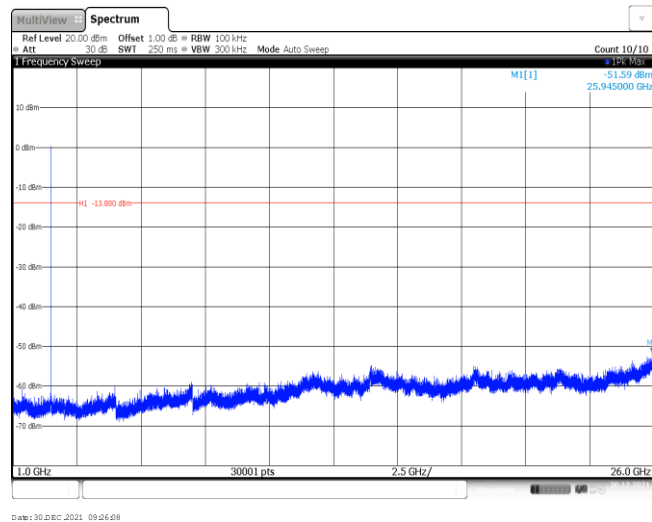
CH78
Reference level

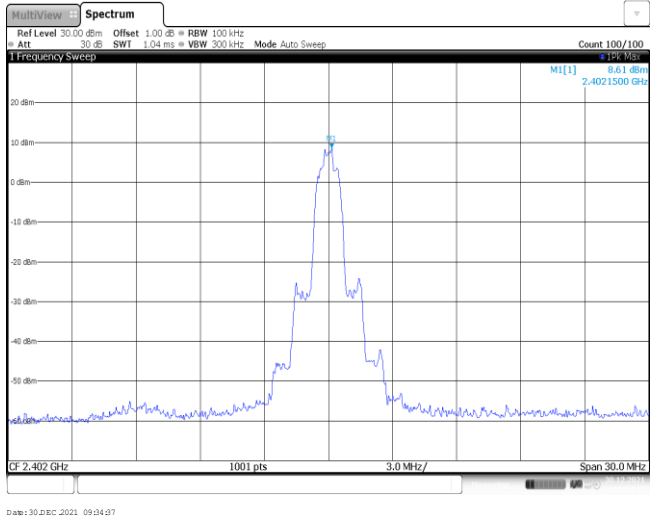
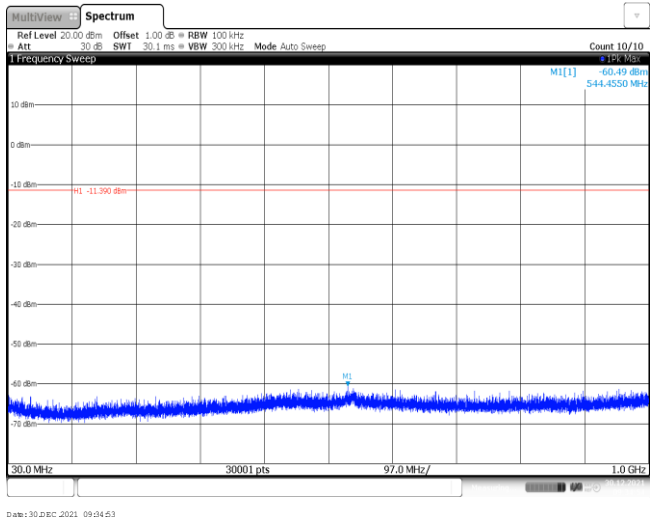
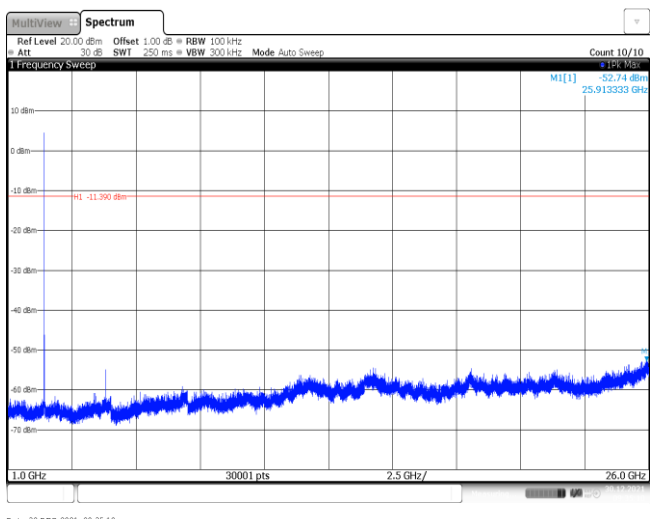


CH78
30MHz~1000MHz

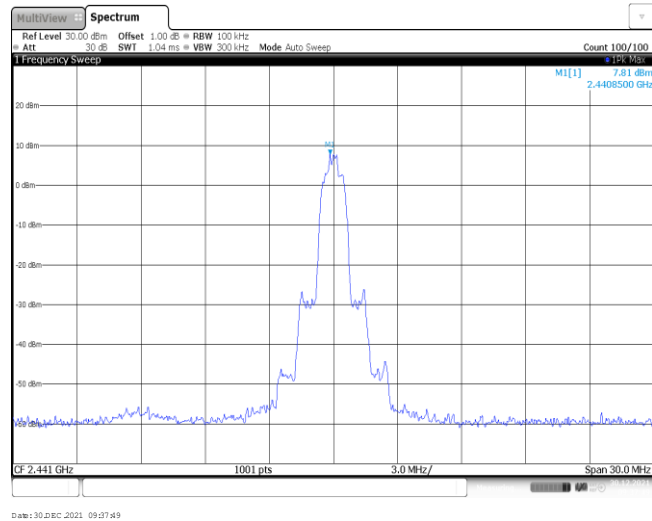


CH78
1GHz~26GHz

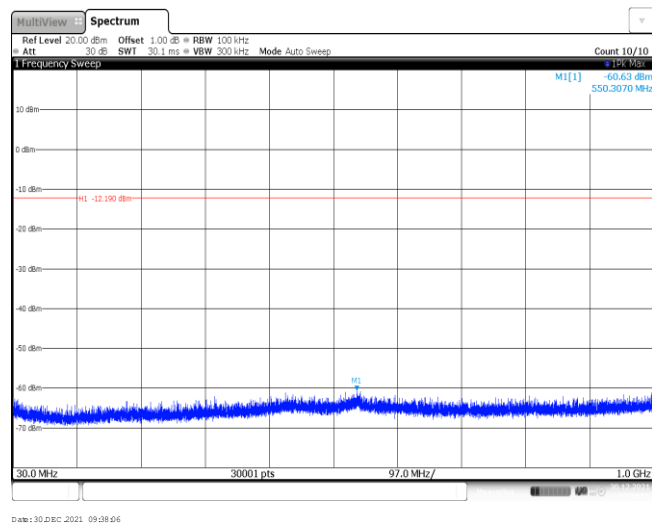


Test Item:	Spurious Emission	Modulation type:	8DPSK
CH00 Reference level			
CH00 30MHz~1000MHz			
CH00 1GHz~26GHz			

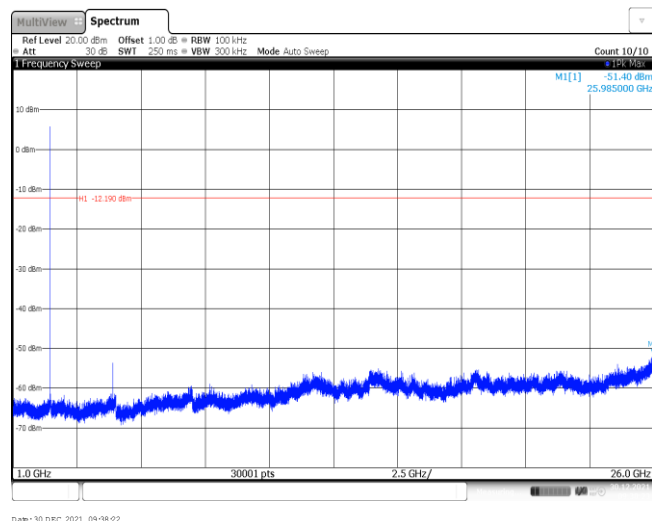
CH39
Reference level

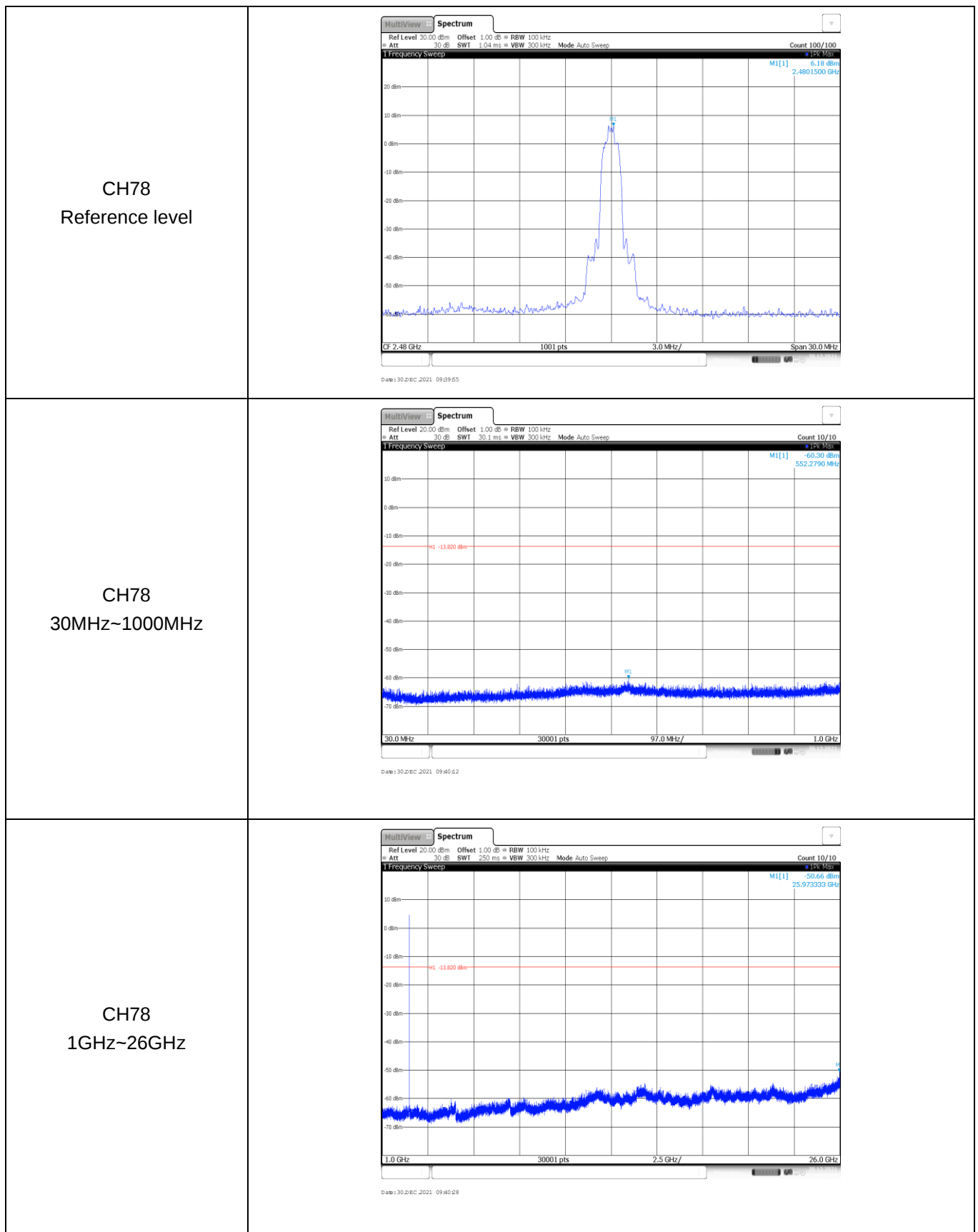


CH39
30MHz~1000MHz



CH39
1GHz~26GHz





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