

APPENDIX REPORT

Project No.	SHT2208214102EW	Radio Specification	Bluetooth EDR
Test sample No.	YPHT22082141009	Model No.	SF650
Start test date	2022-11-23	Finish date	2022-11-24
Temperature	25.6℃	Humidity	62%
Test Engineer	Xiaoxiao Li	Auditor	Xiaodong Zheo

Appendix clause	Test item	Result
A	Peak Output Power	PASS
B	20 dB Bandwidth	PASS
C	99% Occupied Bandwidth	PASS
D	Carrier Frequencies Separation	PASS
E	Hopping Channel Number	PASS
F	Dwell Time	PASS
G	Duty Cycle Correction Factor (DCCF)	PASS
H	Band edge and Spurious Emissions(coducted)	PASS

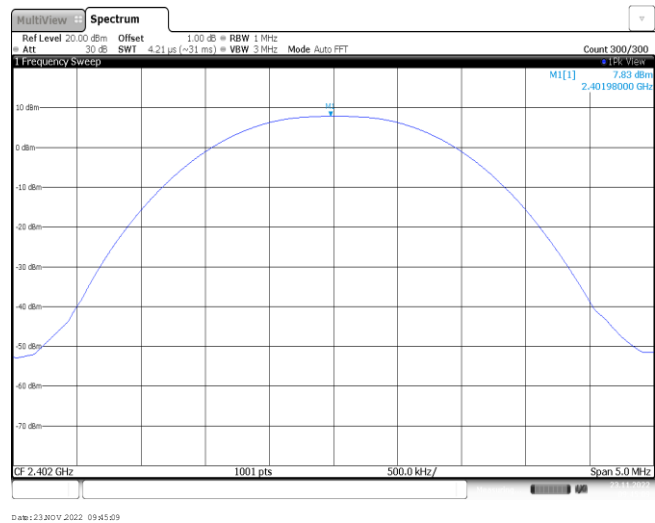
Appendix A: Peak Output Power

Modulation type	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	00	7.83	7.65	≤ 30.00	Pass
	39	5.51	5.41		
	78	7.33	7.26		
$\pi/4$ DQPSK	00	6.94	6.87	≤ 21.00	Pass
	39	5.16	5.05		
	78	6.64	6.54		
8DPSK	00	6.92	6.87	≤ 21.00	Pass
	39	5.13	5.04		
	78	6.63	6.52		

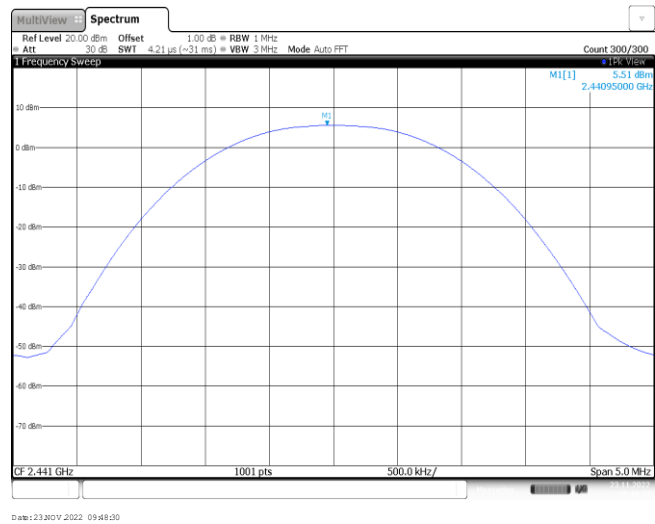
Modulation Type:

GFSK

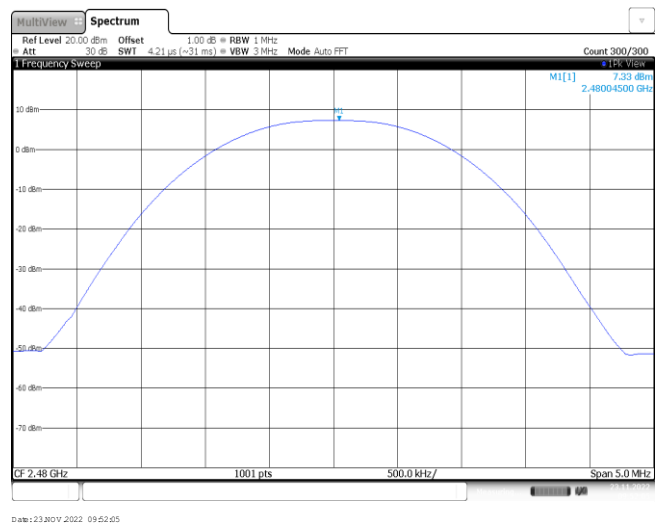
CH00



CH39



CH78

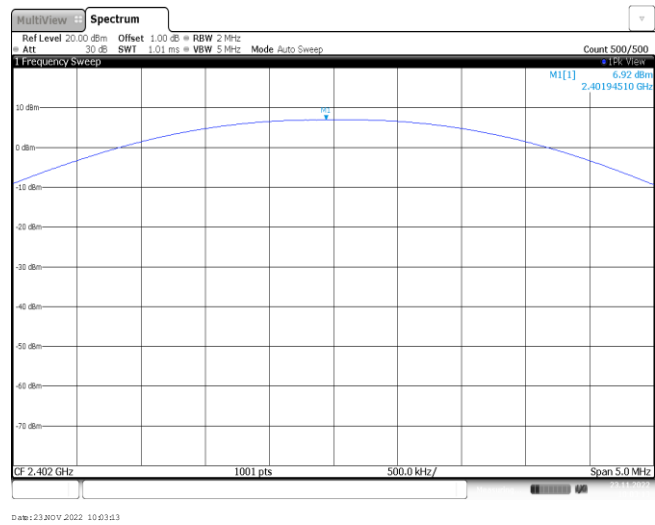


Modulation Type: $\pi/4$ DQPSK	
CH00	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 2 MHz Att 30 dB SWT 1.01 ms VBW 5 MHz Mode Auto Sweep Count 500/500 1 Frequency Sweep M1[1] 6.34 dBm 2.40196000 GHz 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm CF 2.402 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz Date: 23.NOV.2022 09:54:05
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] 5.16 dBm 2.44093510 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: 23.NOV.2022 09:58:33
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] 6.64 dBm 2.47995000 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: 23.NOV.2022 10:01:12

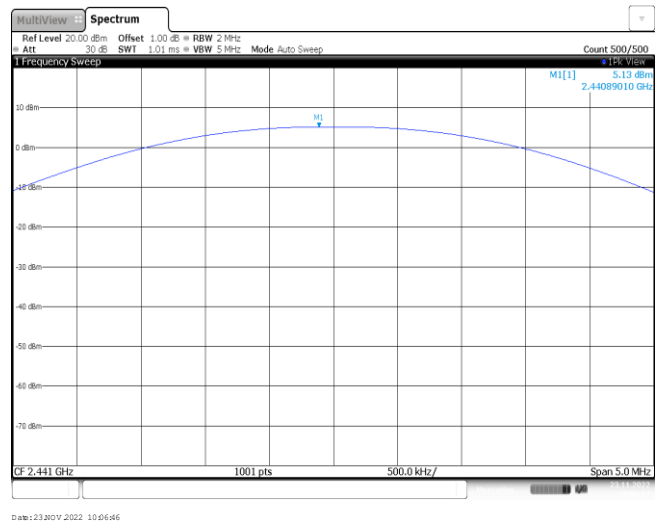
Modulation Type:

8DPSK

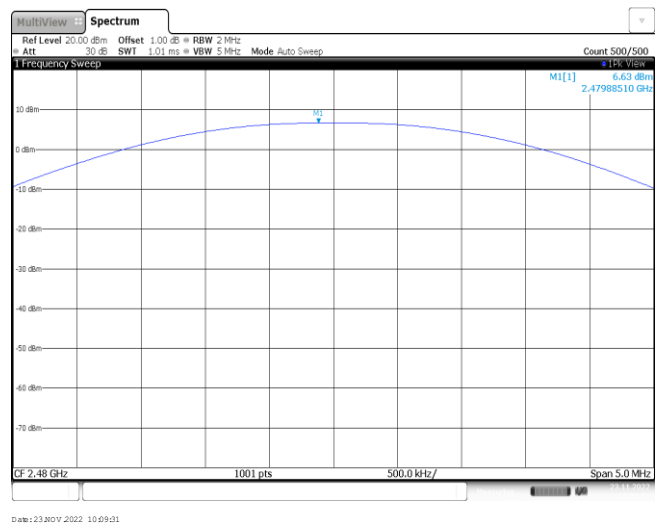
CH00



CH39



CH78



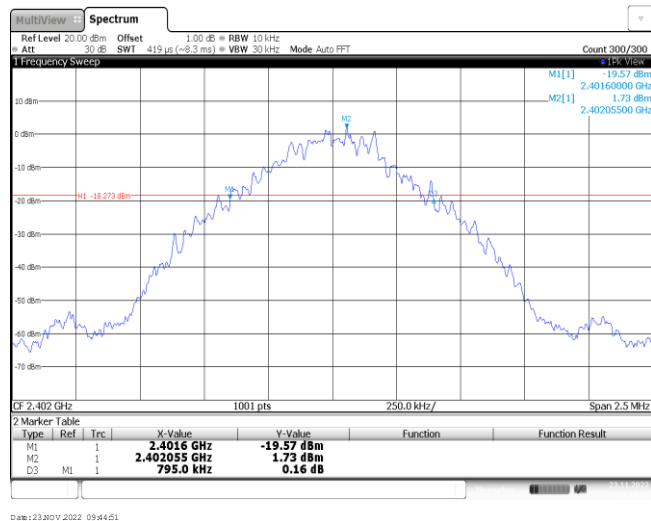
Appendix B : 20 dB Bandwidth

Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	795.00	-	Pass
	39	792.50		
	78	792.50		
$\pi/4$ DQPSK	00	1265.00	-	Pass
	39	1267.50		
	78	1257.50		
8DPSK	00	1260.00	-	Pass
	39	1257.50		
	78	1270.00		

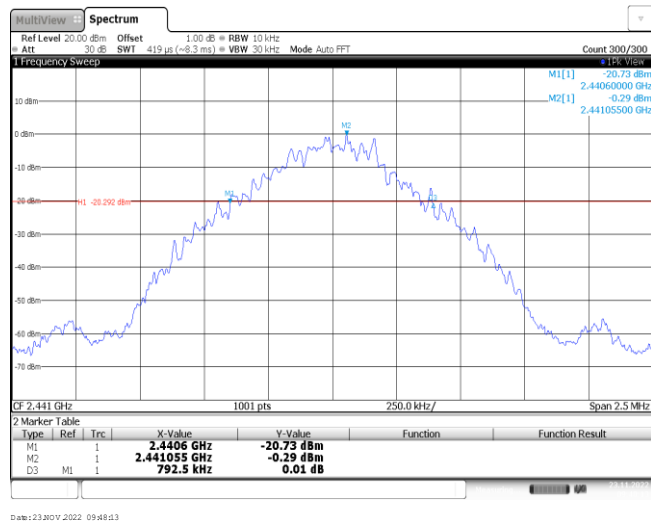
Modulation Type:

GFSK

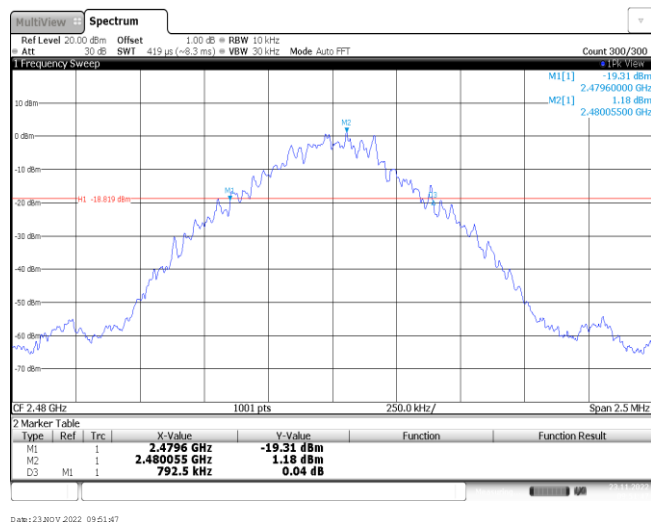
CH00



CH39



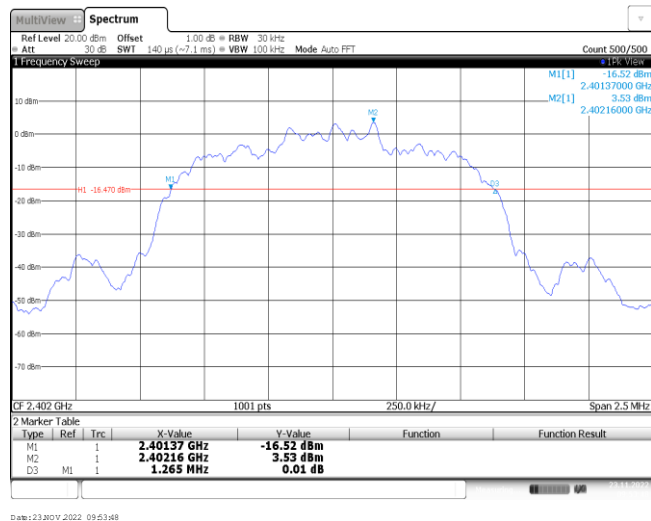
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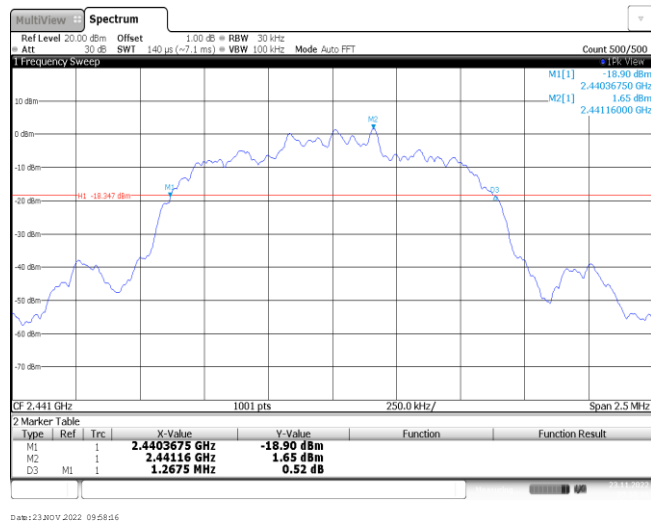
Modulation Type:

 $\pi/4$ DQPSK

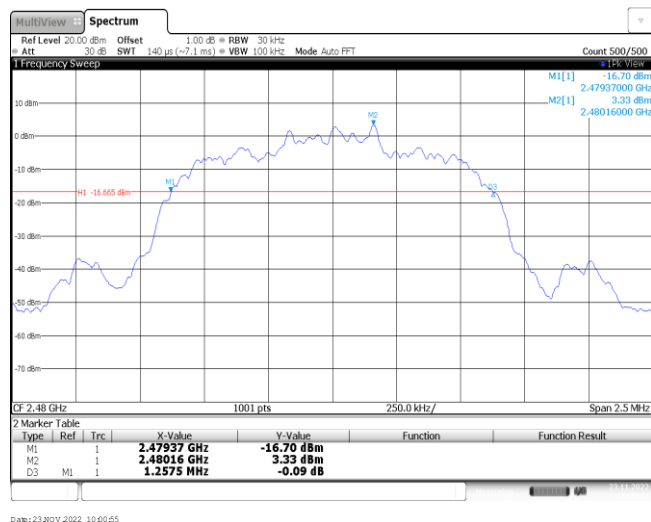
CH00



CH39



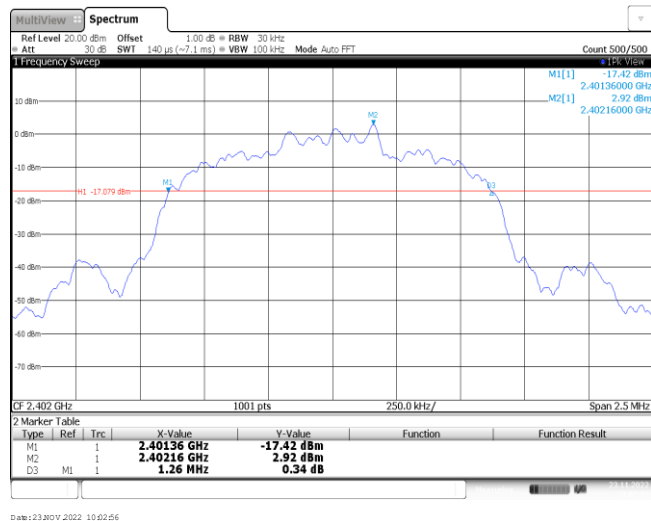
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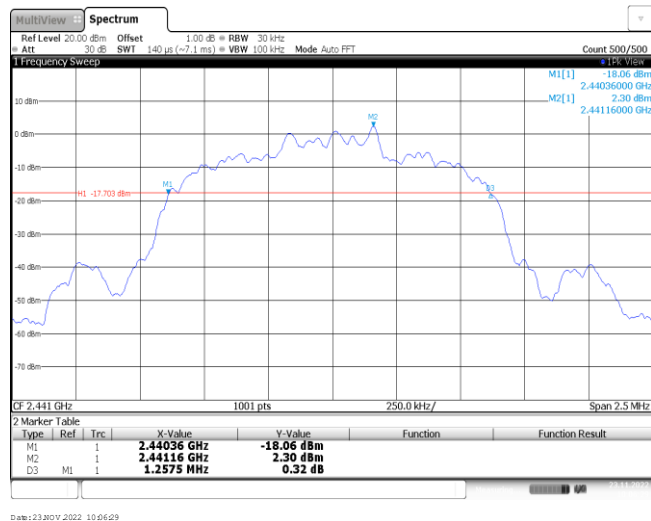
Modulation Type:

8DPSK

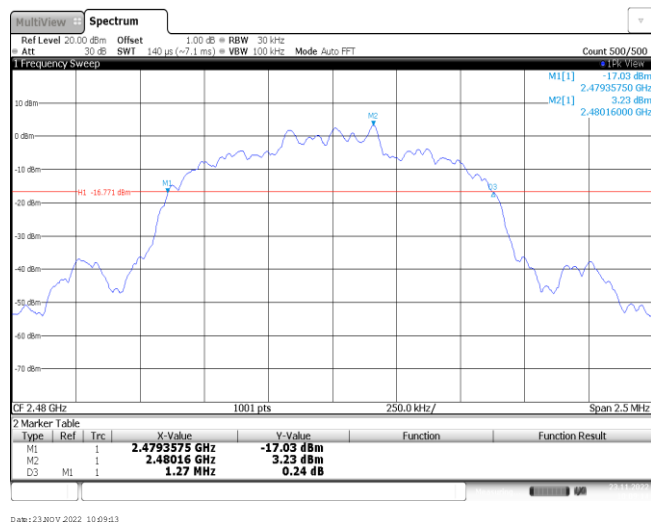
CH00



CH39



CH78



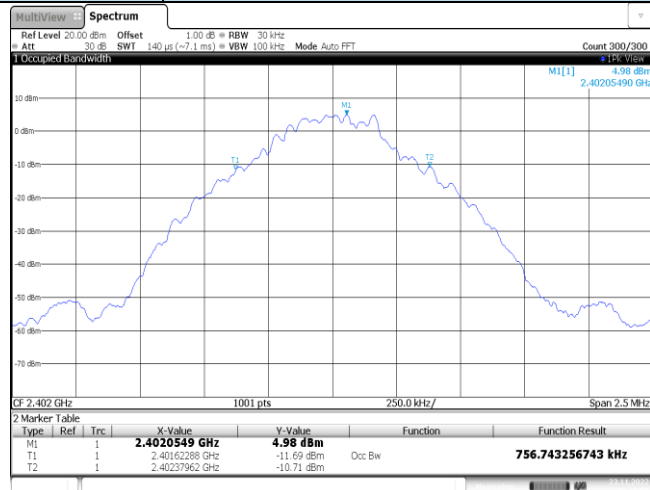
Appendix C: 99% Occupied Bandwidth

Modulation type	Channel	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.76	-	Pass
	39	0.75		
	78	0.76		
$\pi/4$ DQPSK	00	1.14	-	Pass
	39	1.14		
	78	1.14		
8DPSK	00	1.14	-	Pass
	39	1.14		
	78	1.14		

Modulation Type:

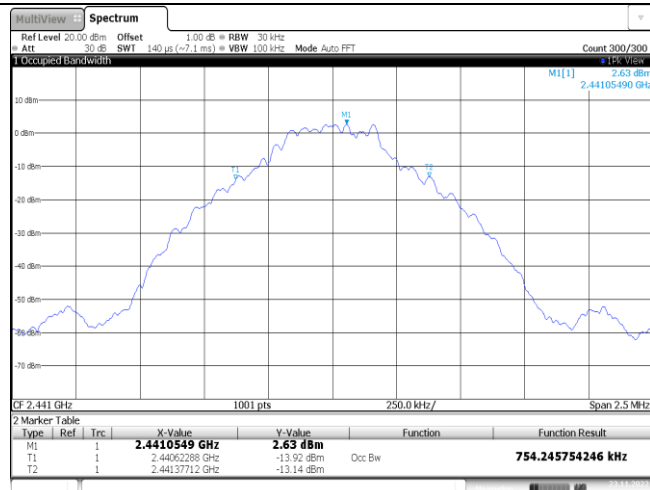
GFSK

CH00



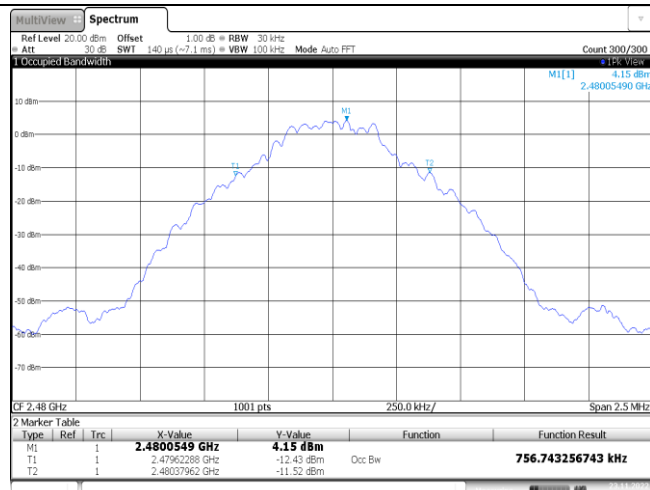
Date: 23.NOV.2022 09:45:00

CH39



Date: 23.NOV.2022 09:48:21

CH78



Date: 23.NOV.2022 09:51:56

Modulation Type:

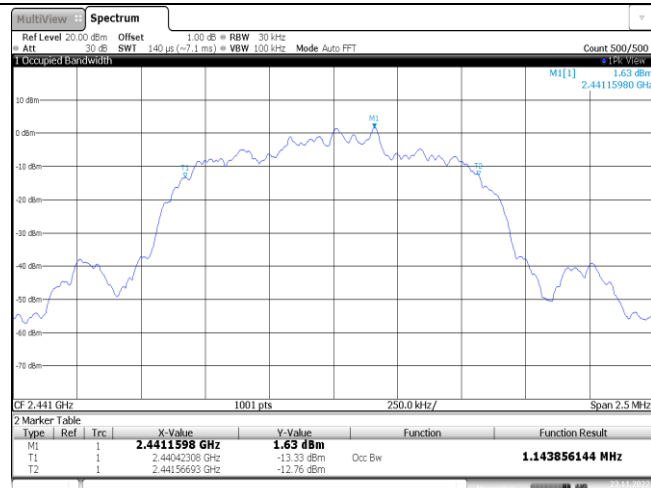
 π /4DQPSK

CH00



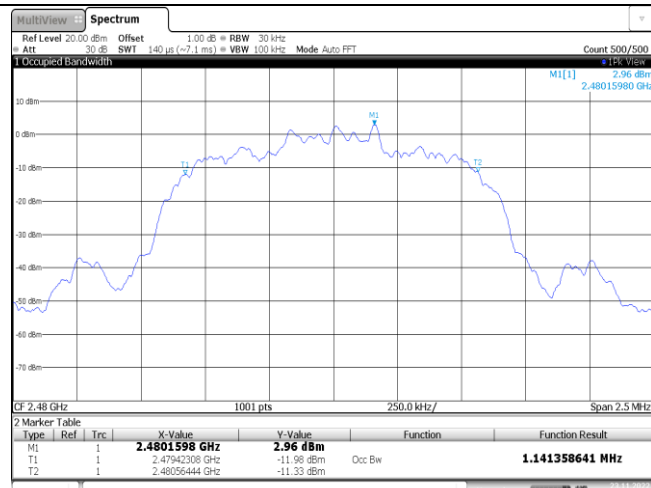
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CH39



Date: 23.NOV.2022 09:58:24

CH78



Date: 23.NOV.2022 10:01:03

Modulation Type:

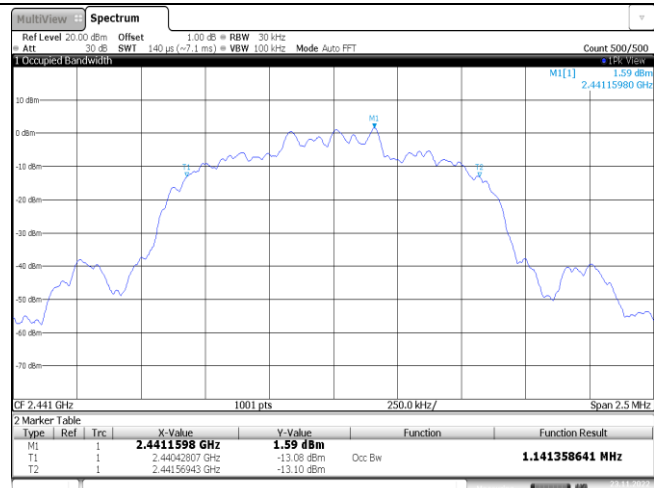
8DPSK

CH00



Date: 23.NOV.2022 10:03:04

CH39



Date: 23.NOV.2022 10:06:07

CH78



Date: 23.NOV.2022 10:09:22

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	≥845.00	Pass
8DPSK	39	1.00	≥846.67	Pass

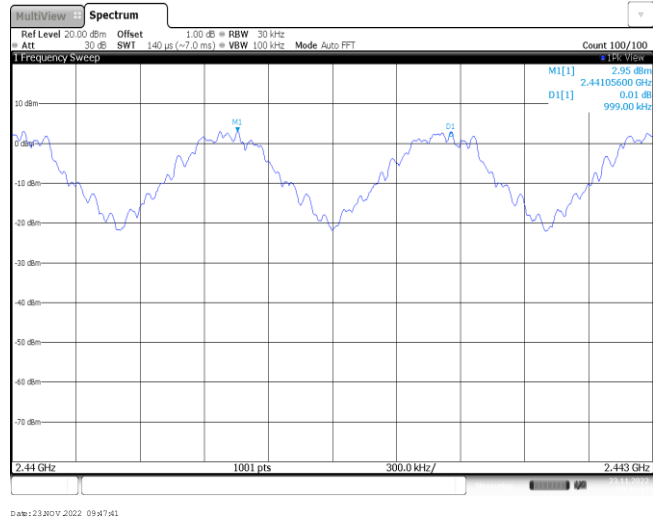
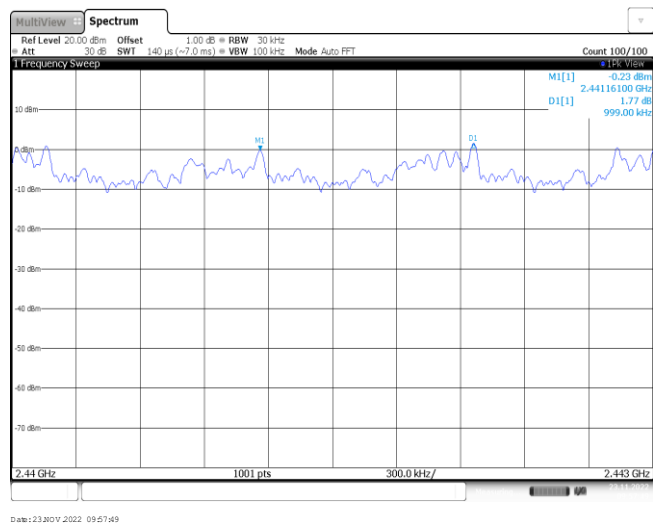
Note:

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

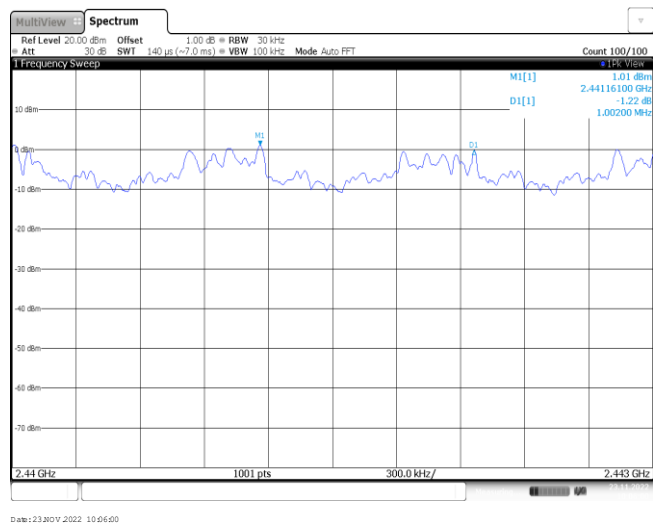
π/4DQPSK limit = 2/3 * The maximum 20 dB Bandwidth for π/4DQPSK modulation on the appendix B.

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

GFSK

 $\pi/4$ DQPSK

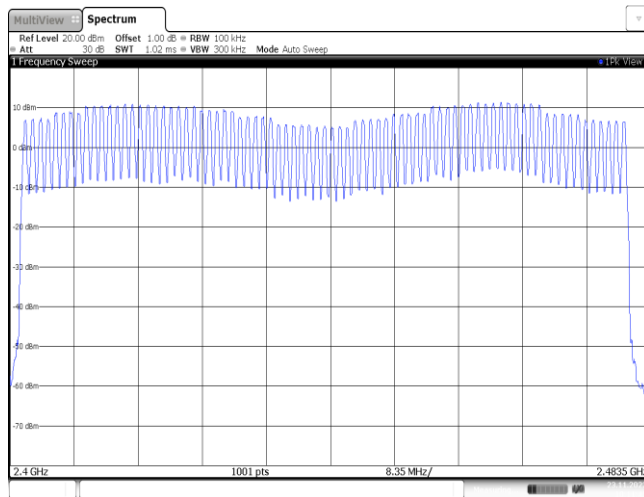
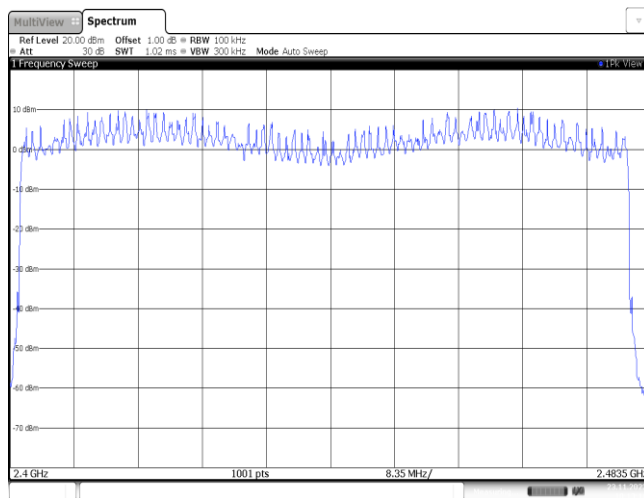
8DPSK



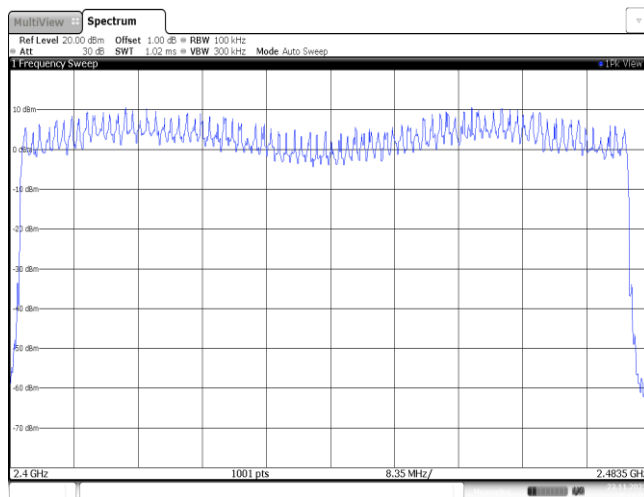
Appendix E: Hopping Channel Number

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

GFSK

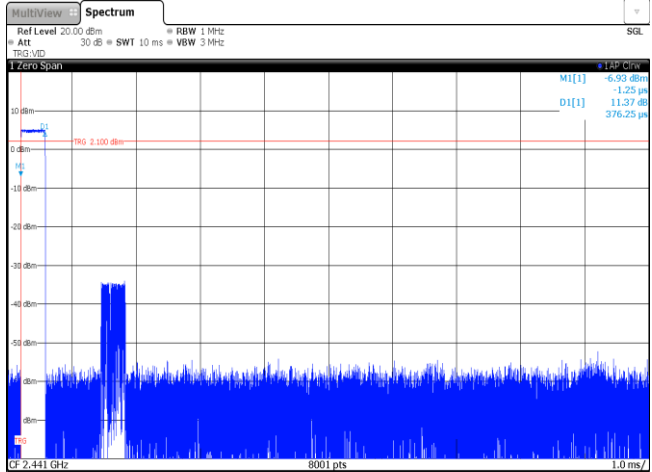
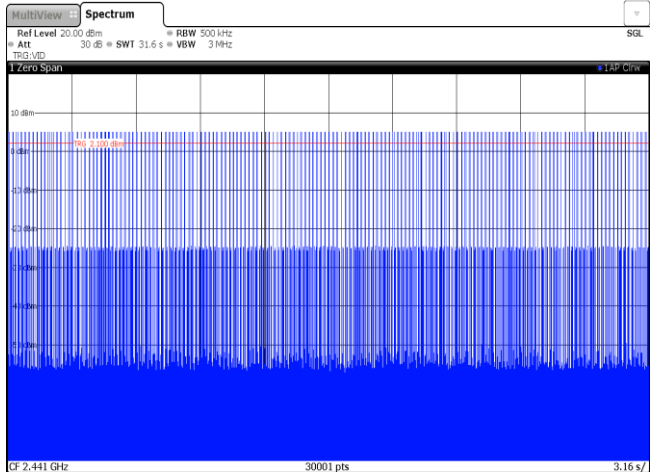
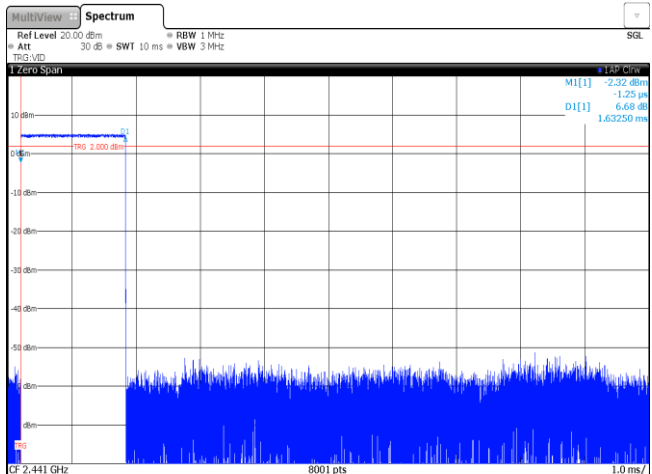
 $\pi/4$ DQPSK

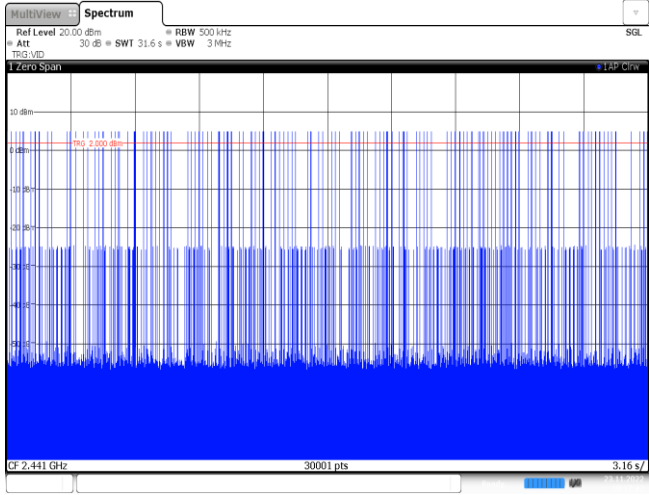
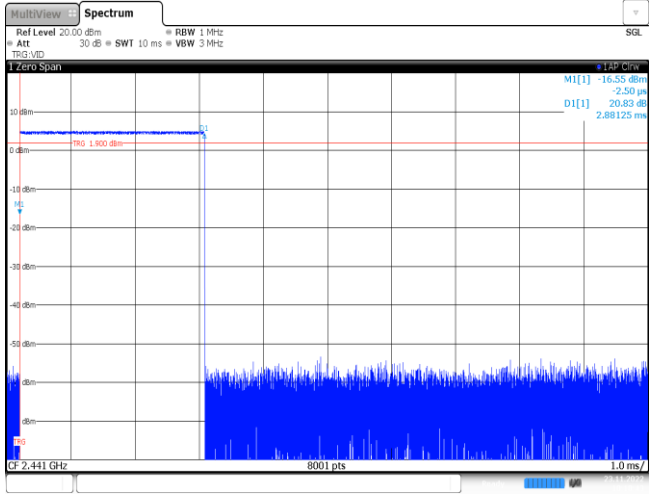
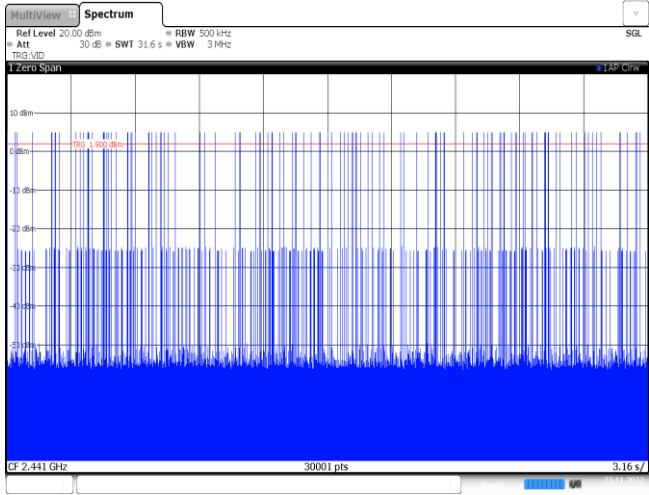
8DPSK



Appendix F: Dwell Time

Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.38	314	0.12	≤ 0.40	Pass
	DH3	1.63	159	0.26		
	DH5	2.88	113	0.33		
$\pi/4$ DQPSK	2DH1	0.38	314	0.12	≤ 0.40	Pass
	2DH3	1.64	159	0.26		
	2DH5	2.89	100	0.29		
8DPSK	3DH1	0.38	314	0.12	≤ 0.40	Pass
	3DH3	1.64	160	0.26		
	3DH5	2.89	111	0.32		

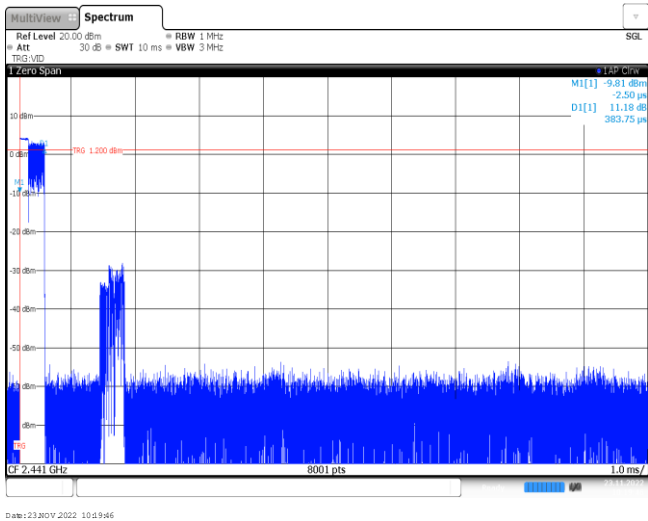
Modulation Type:	GFSK
DH1 Burst width	 The spectrum plot shows a single burst of energy at 2.441 GHz. The y-axis represents power in dBm, ranging from -50 to 10. The x-axis represents frequency in MHz, ranging from 2.435 to 2.447. A red horizontal line indicates the noise floor at -100 dBm. The burst reaches a peak power of approximately -20 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, SWT 10 ms, VBW 3 MHz. The date is 23 NOV 2022 10:46:02.
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 -50 to 10. The x-axis represents frequency in MHz, ranging from 2.435 to 2.447. A red horizontal line indicates the noise floor at -100 dBm. The burst reaches a peak power of approximately -20 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, SWT 31.6 s, VBW 3 MHz. The date is 23 NOV 2022 10:46:06.
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 -50 to 10. The x-axis represents frequency in MHz, ranging from 2.435 to 2.447. A red horizontal line indicates the noise floor at -100 dBm. The burst reaches a peak power of approximately -20 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 20.00 dBm, Att 30 dB, SWT 10 ms, VBW 3 MHz. The date is 23 NOV 2022 10:47:08.

DH3 Burst number	 The spectrum plot shows a dense burst of energy across the frequency range. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents frequency in GHz, centered at 2.441 GHz. The plot shows a wideband signal with many narrow peaks. The date and time are 23 NOV 2022 10:17:42.
DH5 Burst width	 The spectrum plot shows a burst of energy with a specific width. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents frequency in GHz, centered at 2.441 GHz. The plot shows a wideband signal with many narrow peaks. The date and time are 23 NOV 2022 10:18:43.
DH5 Burst number	 The spectrum plot shows a dense burst of energy across the frequency range. The y-axis represents power in dBm, ranging from -60 to 10. The x-axis represents frequency in GHz, centered at 2.441 GHz. The plot shows a wideband signal with many narrow peaks. The date and time are 23 NOV 2022 10:19:17.

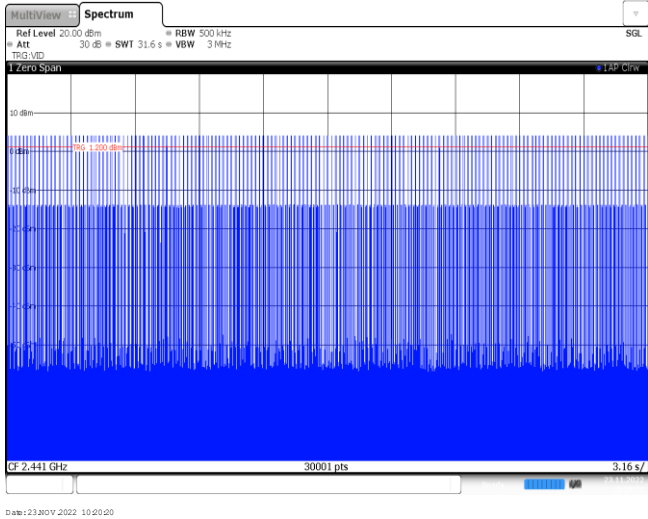
Modulation Type:

$\pi/4$ DQPSK

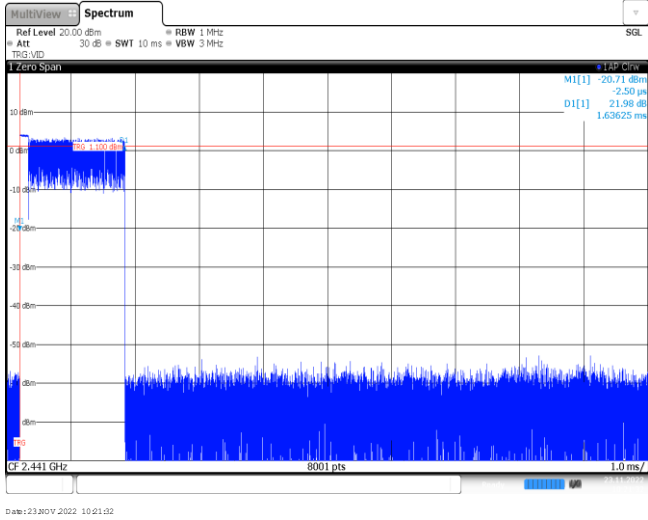
2DH1
Burst width

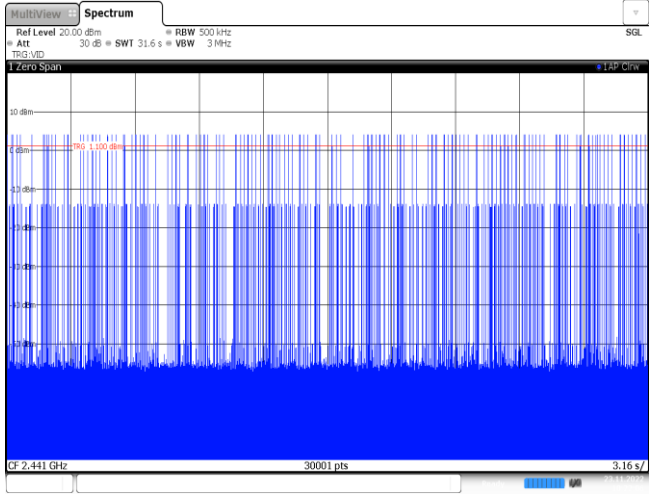
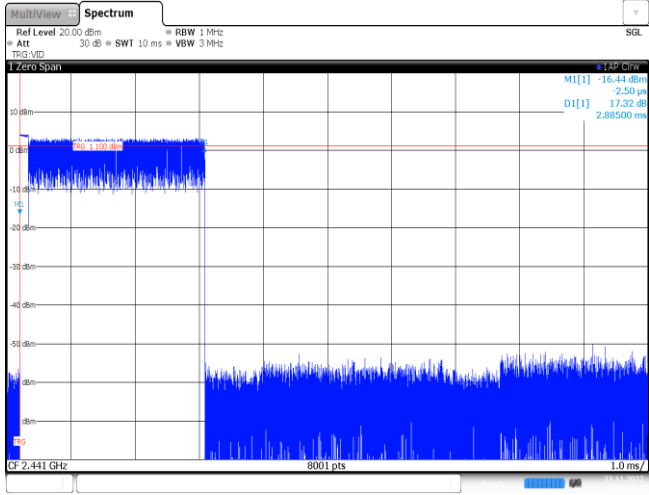
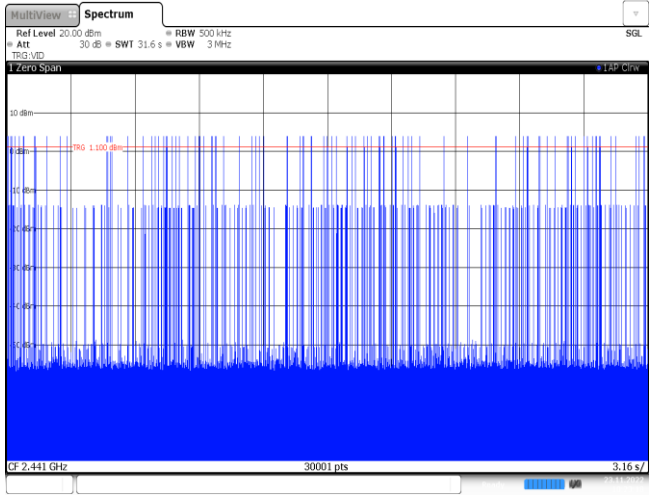


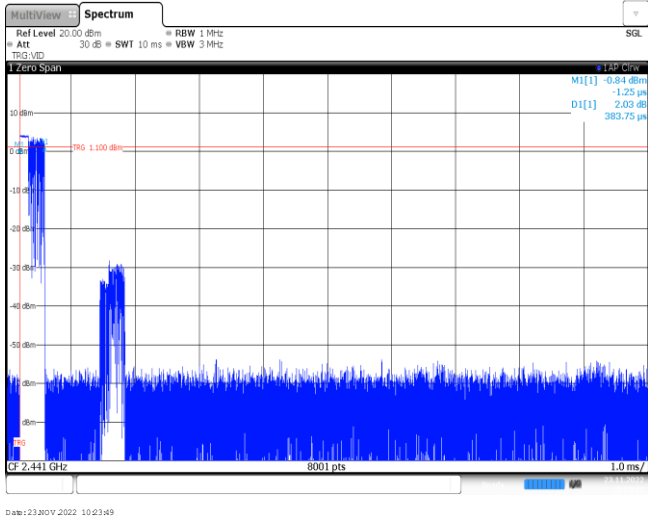
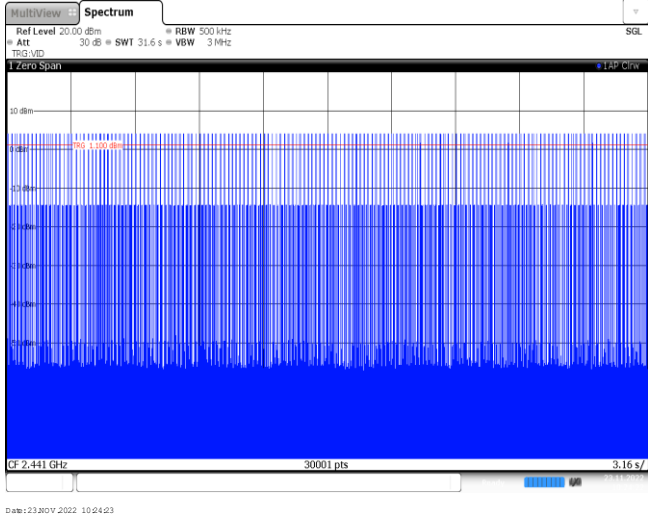
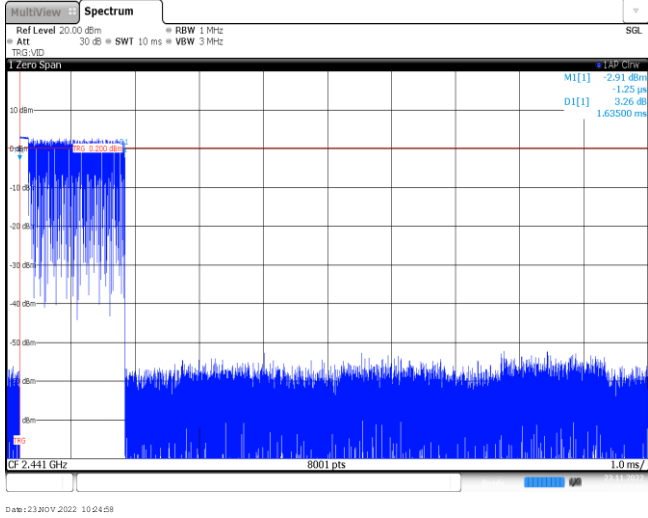
2DH1
Burst number

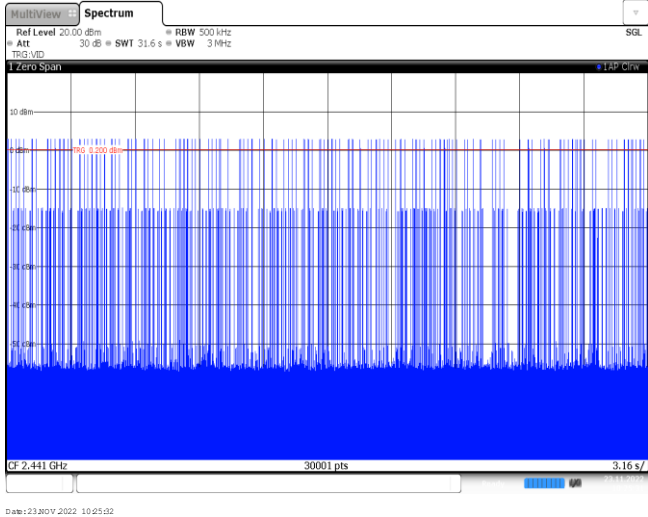
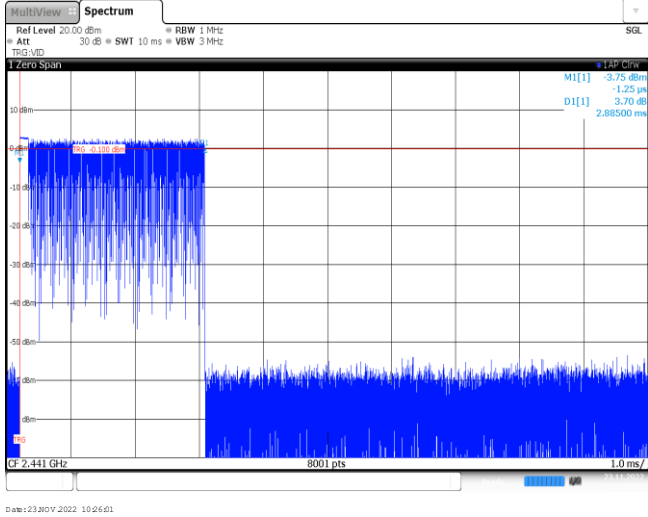
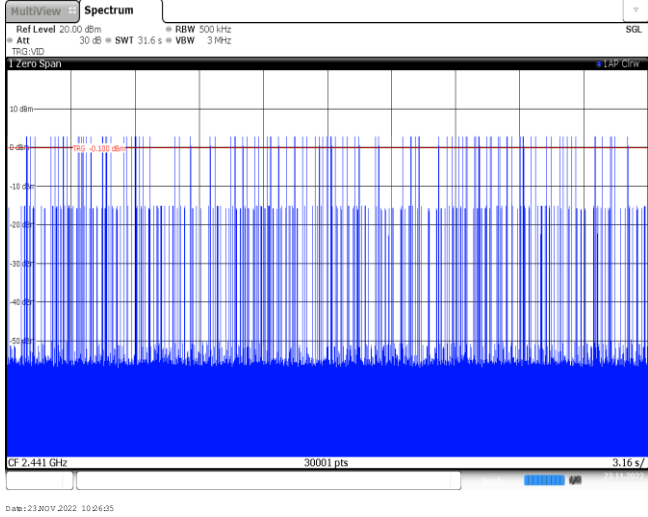


2DH3
Burst width



2DH3 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 -60 to 10. A red horizontal line is drawn at approximately -10 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 x-axis is labeled 'CF 2.441 GHz' and '30001 pts'. The date is 23 NOV 2022 10:22:26.
2DH5 Burst width	 The spectrum plot shows a signal burst between 2.441 GHz and 2.50 GHz. The y-axis represents power in dBm, ranging from -60 to 10. A red horizontal line is drawn at approximately -10 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 x-axis is labeled 'CF 2.441 GHz' and '8001 pts'. The date is 23 NOV 2022 10:22:45.
2DH5 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 -60 to 10. A red horizontal line is drawn at approximately -10 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 x-axis is labeled 'CF 2.441 GHz' and '30001 pts'. The date is 23 NOV 2022 10:23:19.

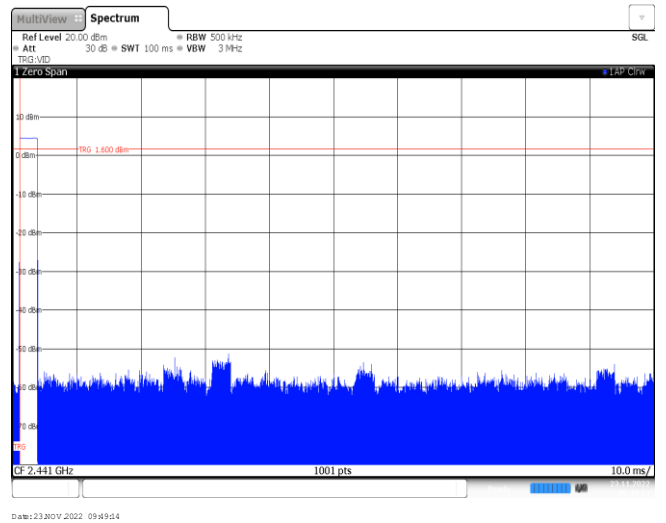
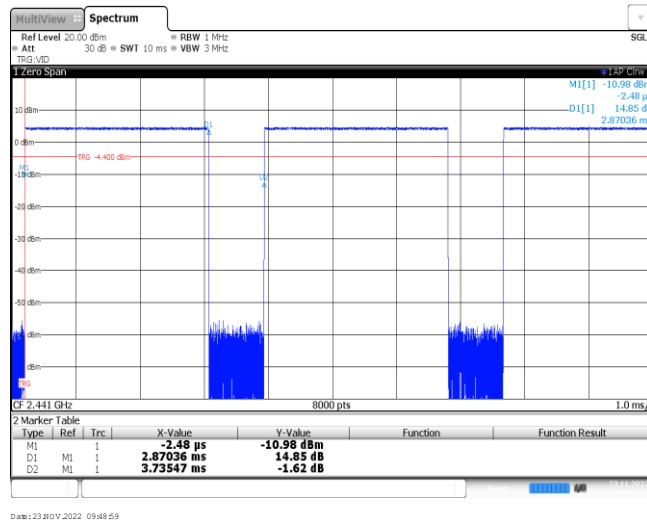
Modulation Type: 8DPSK	
3DH1 Burst width	
3DH1 Burst number	
3DH3 Burst width	

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

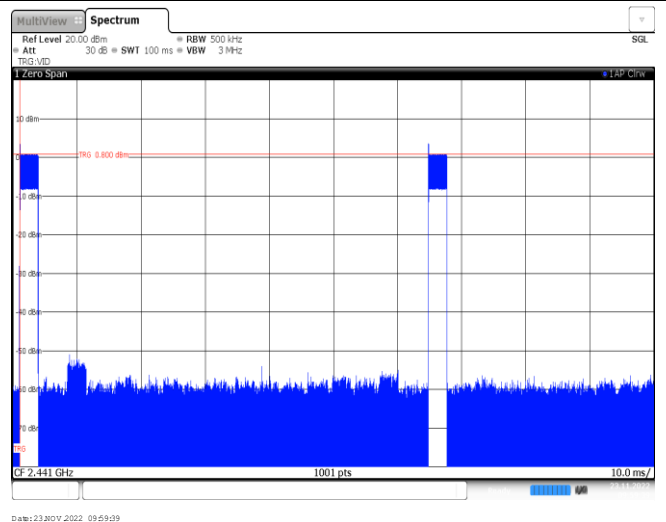
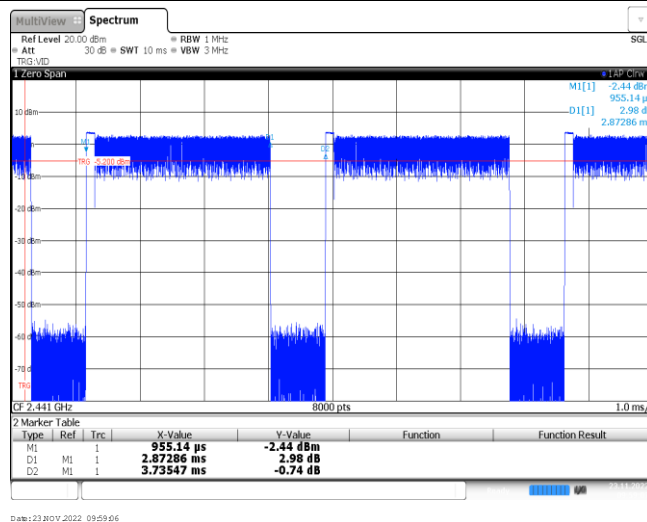
Appendix G: Duty Cycle Correction Factor (DCCF)

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	2	-24.82
8DPSK	2441	2.88	100	2	-24.79

GFSK

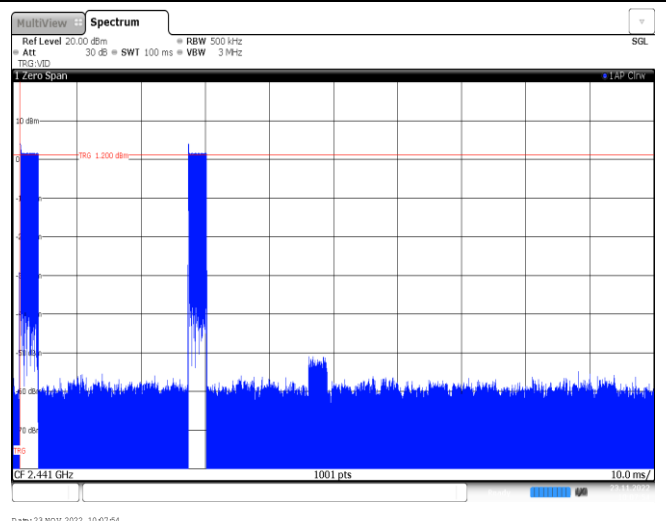
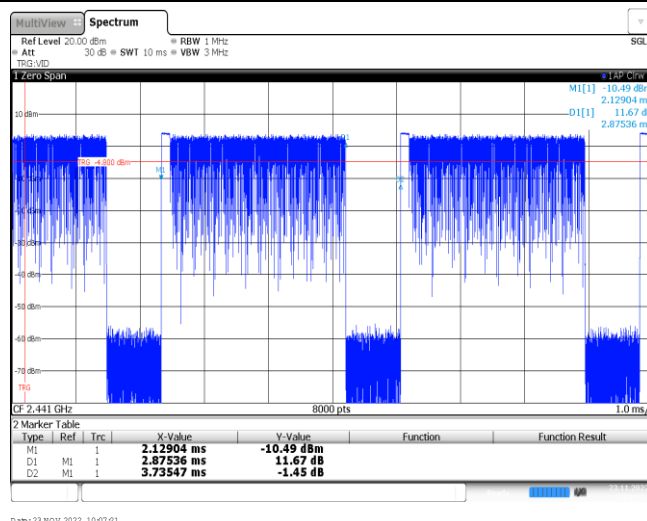
T_{on} time for single burst

Burst Quantity

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

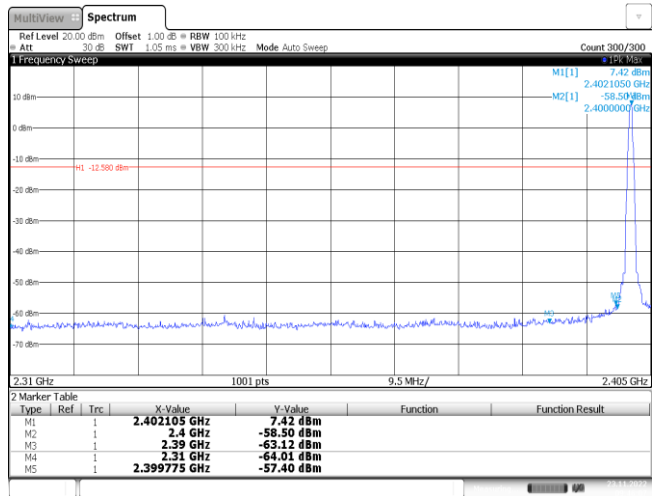
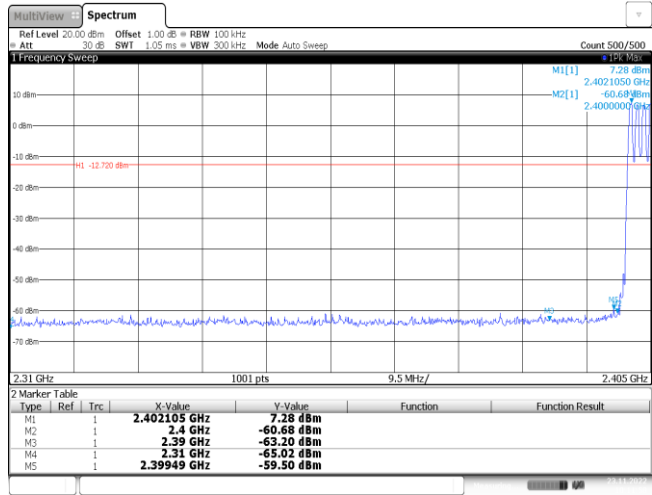
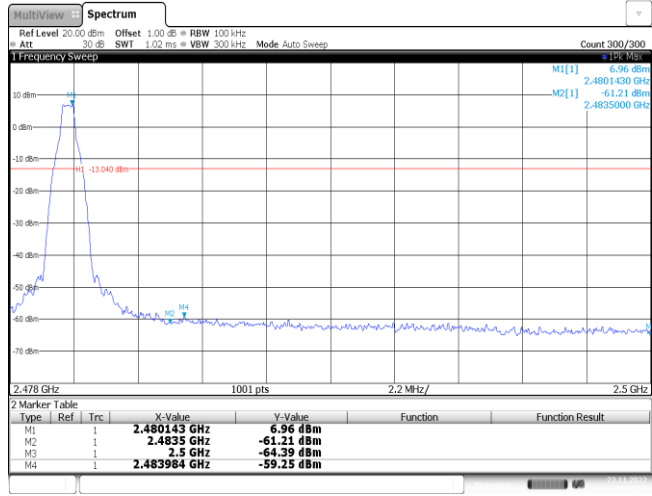
Burst Quantity

8DPSK

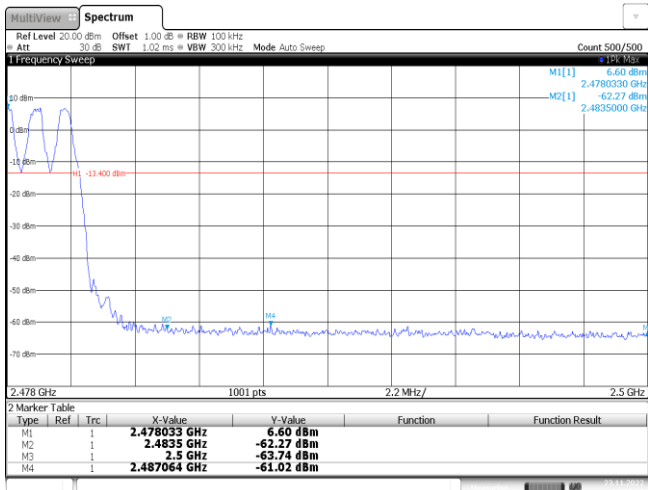
T_{on} time for single burst

Burst Quantity

Appendix H: Band edge and Spurious Emissions (conducted)

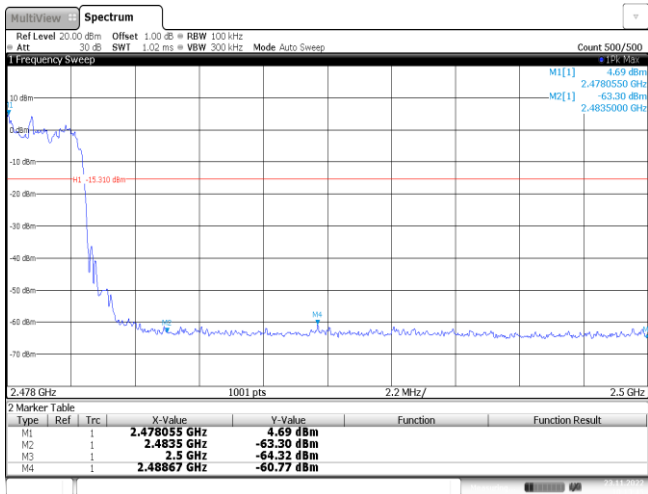
Test Item:	Band edge	Modulation type:	GFSK																																										
CH00 No hopping mode	 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.402105 GHz</td><td>7.42 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-58.50 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-63.12 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-64.01 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.399775 GHz</td><td>-57.40 dBm</td><td></td><td></td></tr></table> Date: 23 NOV 2022 09:46:07	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.402105 GHz	7.42 dBm			M2	1		2.4 GHz	-58.50 dBm			M3	1		2.39 GHz	-63.12 dBm			M4	1		2.31 GHz	-64.01 dBm			M5	1		2.399775 GHz	-57.40 dBm				
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.402105 GHz	7.42 dBm																																									
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Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.402105 GHz	7.28 dBm																																									
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M5	1		2.39949 GHz	-59.50 dBm																																									
CH78 No hopping mode	 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.480143 GHz</td><td>6.96 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4835 GHz</td><td>-61.21 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.5 GHz</td><td>-64.39 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.483984 GHz</td><td>-59.25 dBm</td><td></td><td></td></tr></table> Date: 23 NOV 2022 09:52:35	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.480143 GHz	6.96 dBm			M2	1		2.4835 GHz	-61.21 dBm			M3	1		2.5 GHz	-64.39 dBm			M4	1		2.483984 GHz	-59.25 dBm											
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.480143 GHz	6.96 dBm																																									
M2	1		2.4835 GHz	-61.21 dBm																																									
M3	1		2.5 GHz	-64.39 dBm																																									
M4	1		2.483984 GHz	-59.25 dBm																																									

CH78
Hopping mode



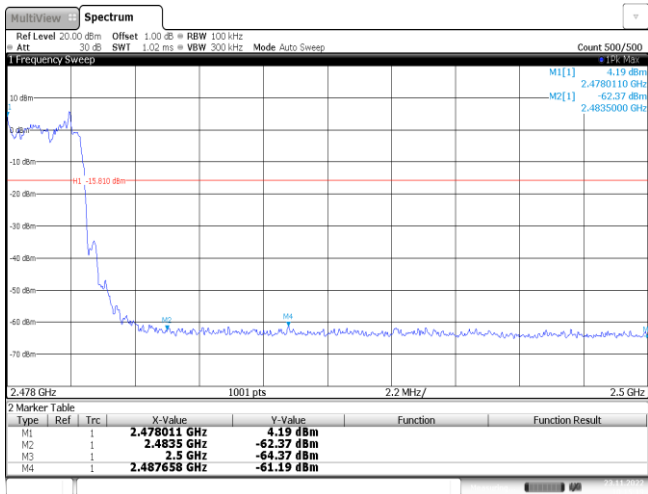
Test Item:	Band edge	Modulation type:	$\pi/4$ DQPSK
CH00 No hopping mode	<		

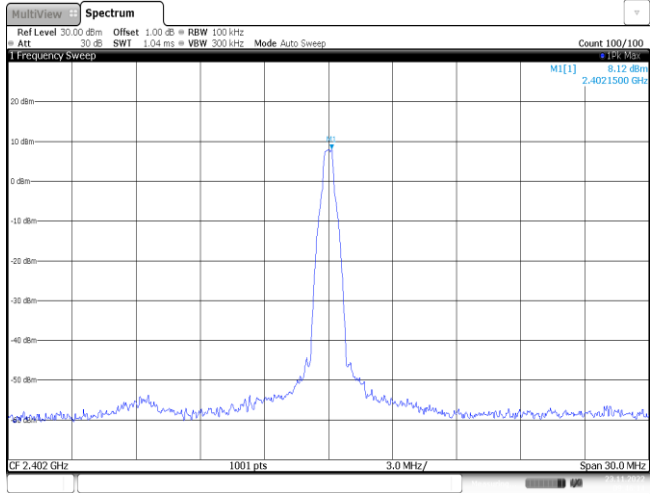
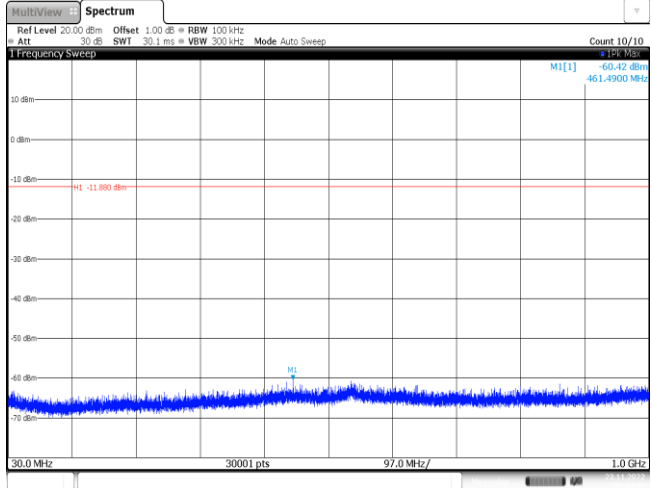
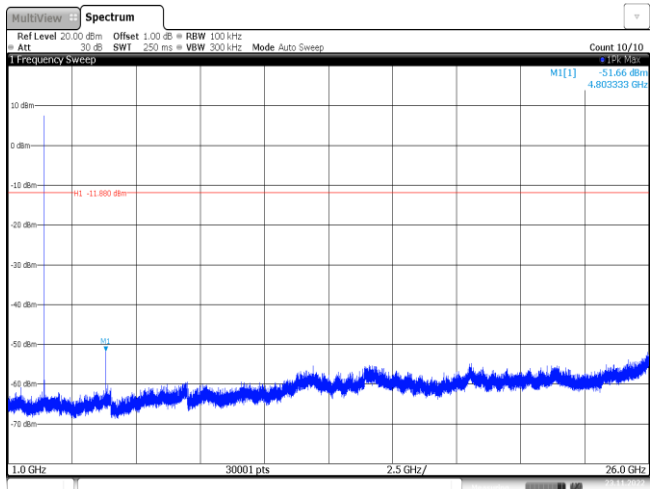
CH78
Hopping mode



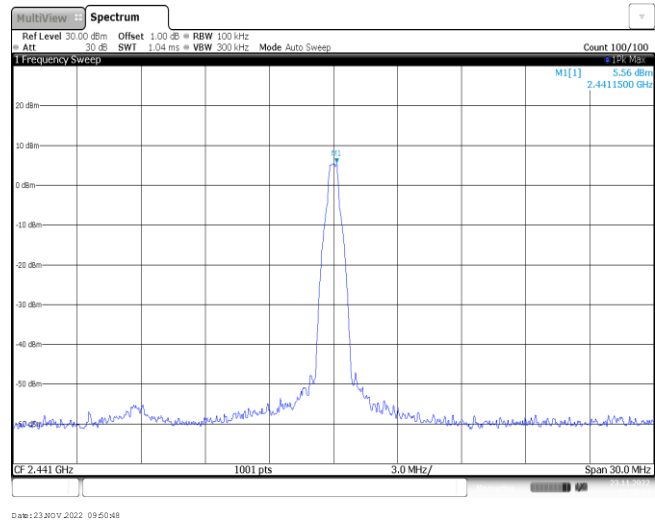
Test Item:	Band edge	Modulation type:	8DPSK
CH00 No hopping mode	</		

CH78
Hoppig mode

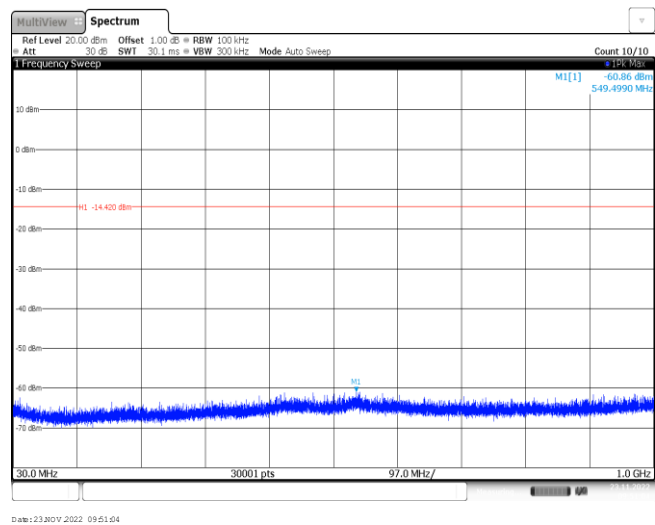


Test Item:	Spurious Emission	Modulation type:	GFSK
CH00 Reference level			
CH00 30MHz~1000MHz			
CH00 1GHz~26GHz			

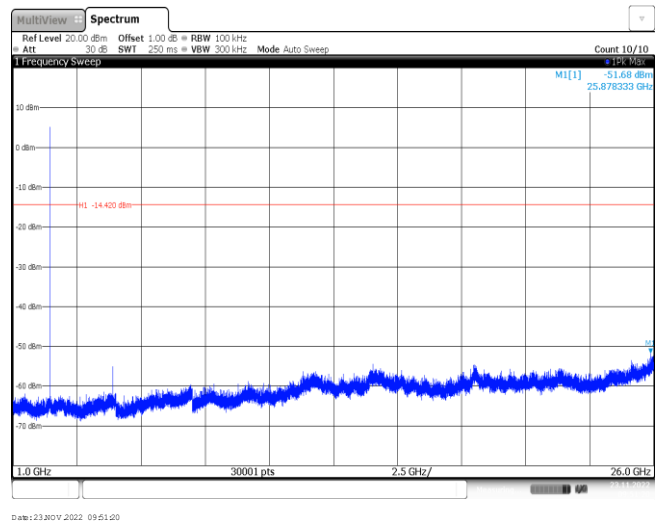
CH39
Reference level



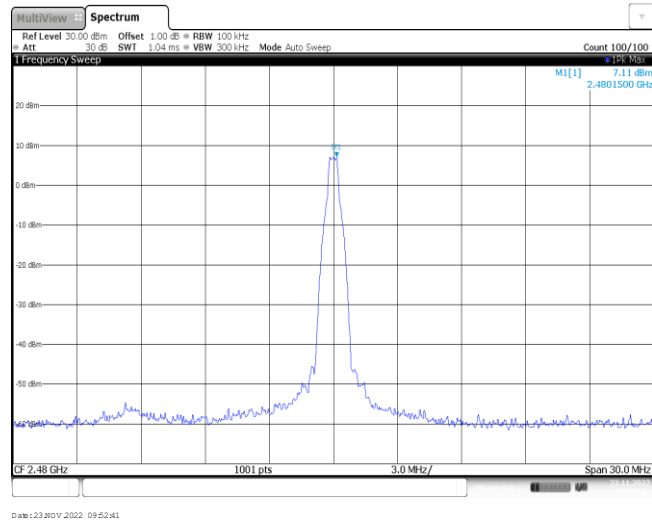
CH39
30MHz~1000MHz



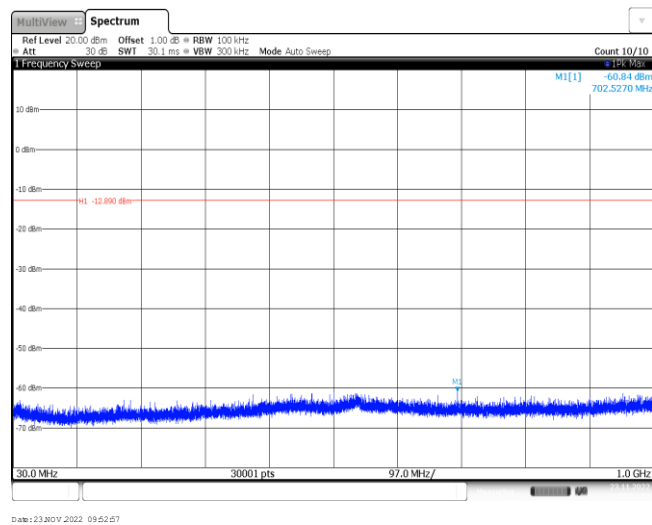
CH39
1GHz~26GHz



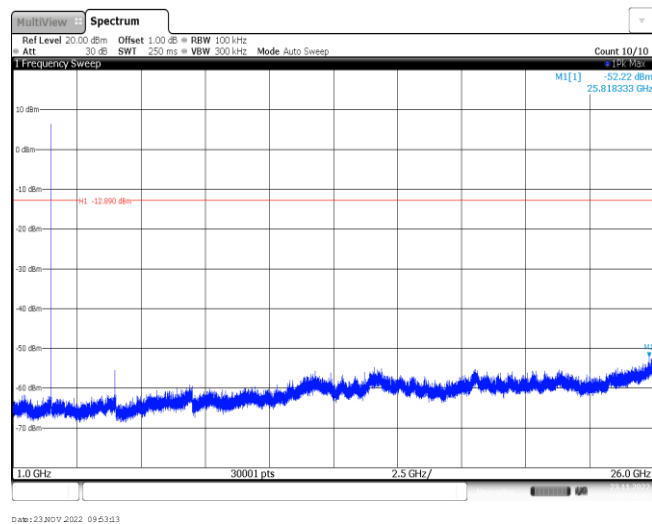
CH78
Reference level

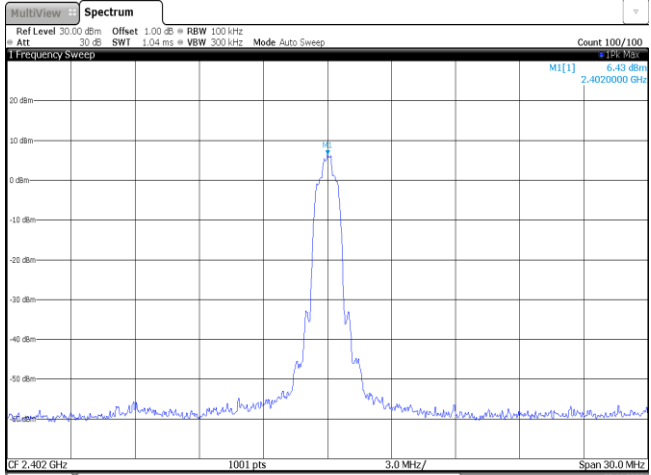
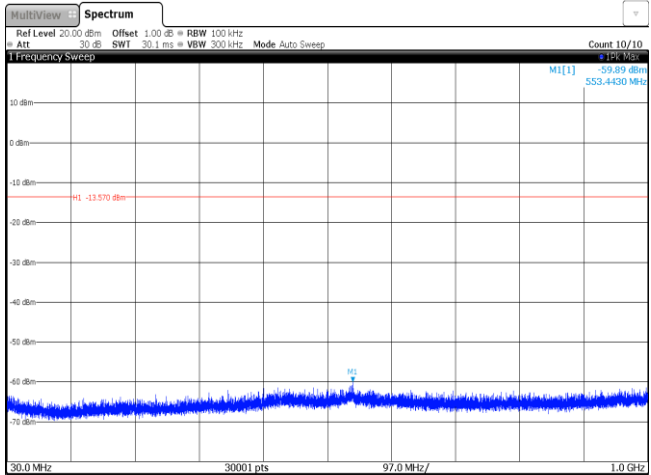
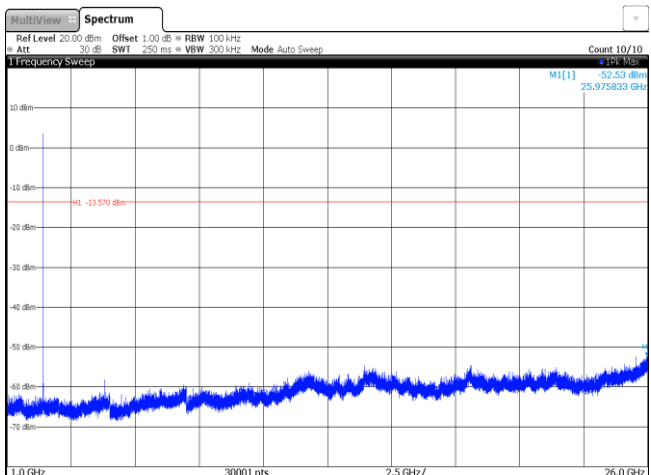


CH78
30MHz~1000MHz

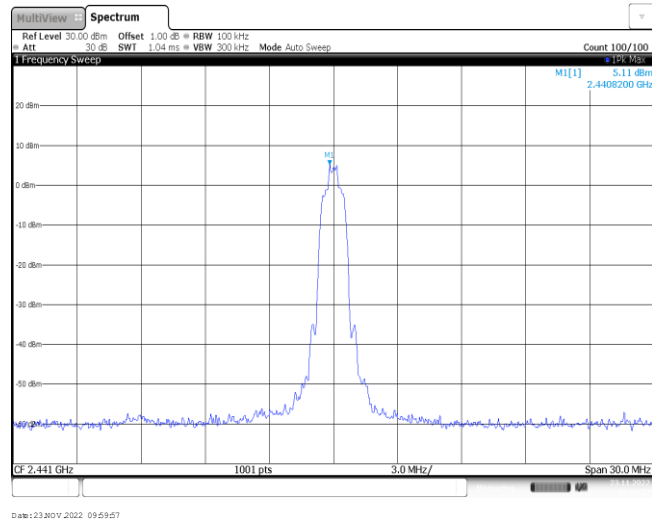


CH78
1GHz~26GHz

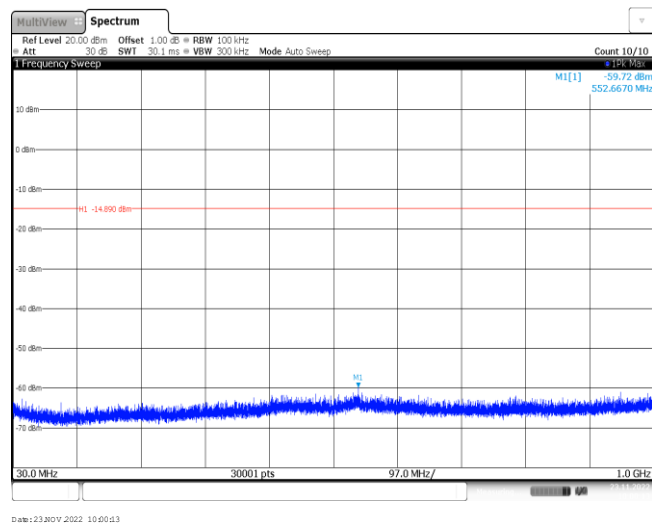


Test Item:	Spurious Emission	Modulation type:	$\pi/4$ DQPSK
CH00 Reference level	 CH00 Reference level		
CH00 30MHz~1000MHz	 CH00 30MHz~1000MHz		
CH00 1GHz~26GHz	 CH00 1GHz~26GHz		

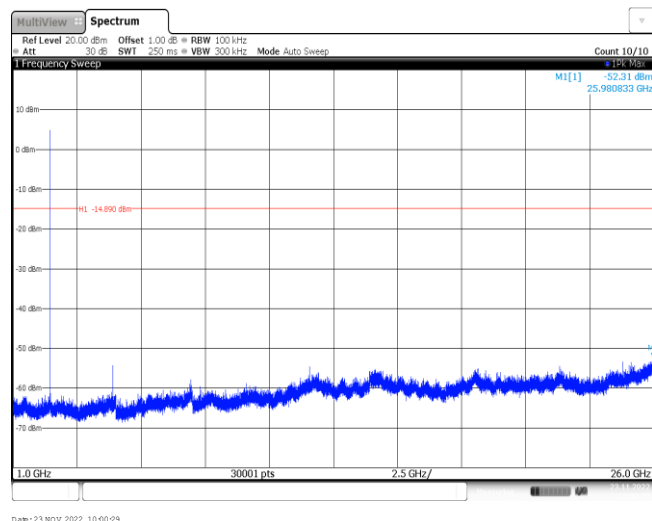
CH39
Reference level



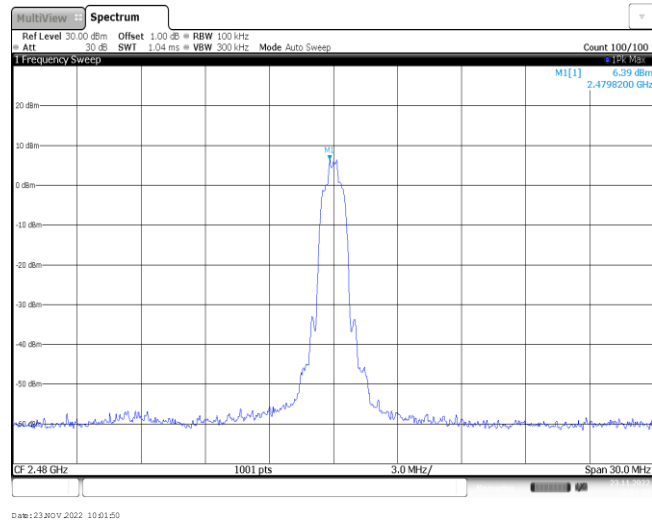
CH39
30MHz~1000MHz



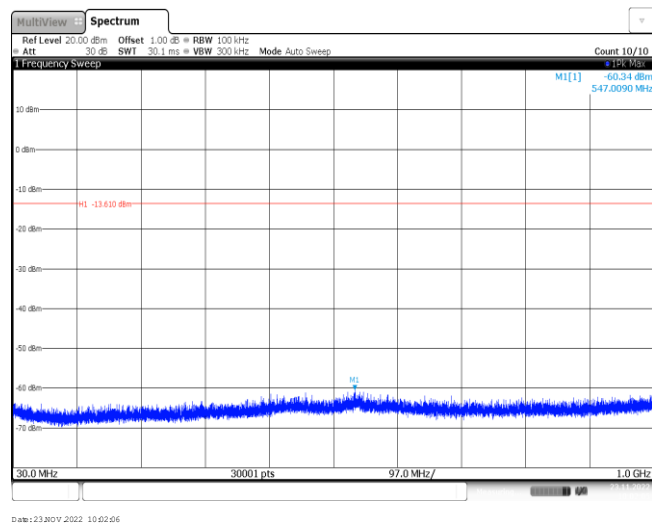
CH39
1GHz~26GHz



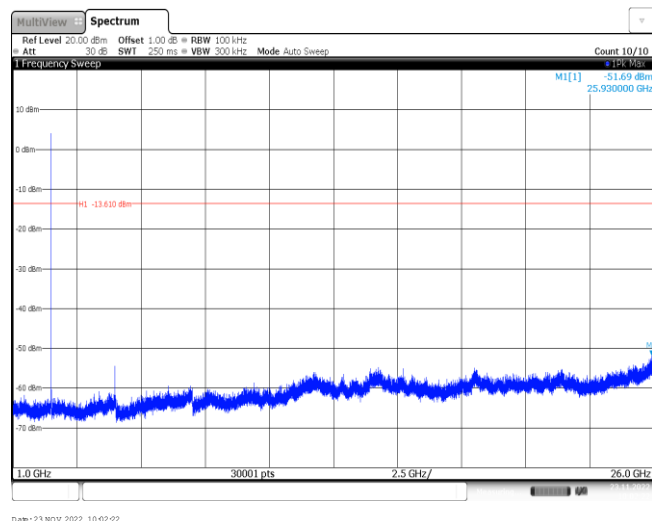
CH78
Reference level

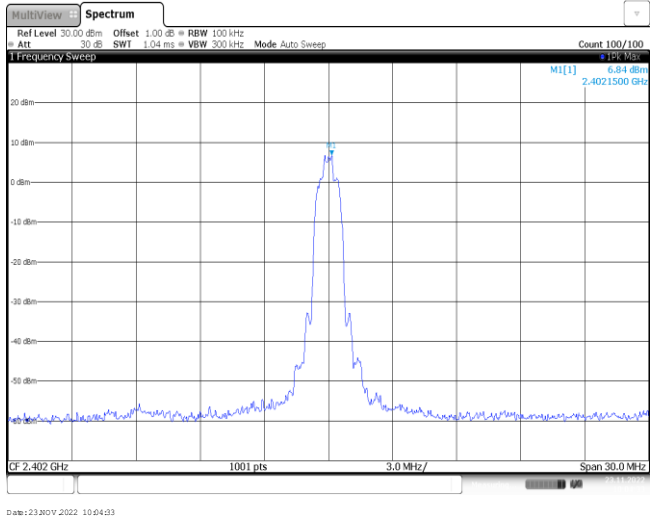
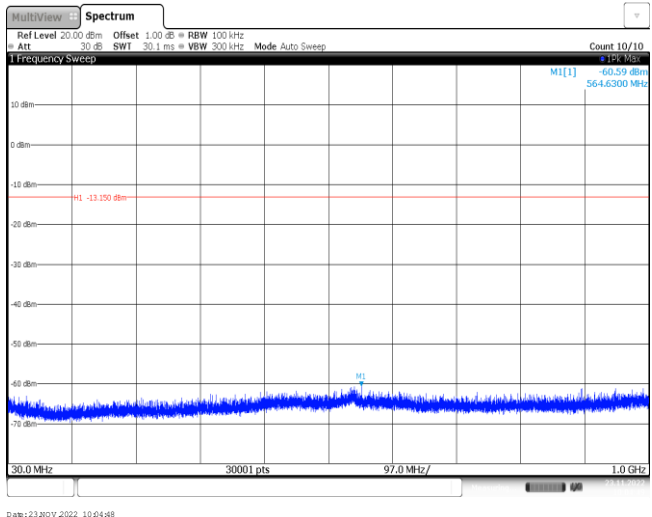
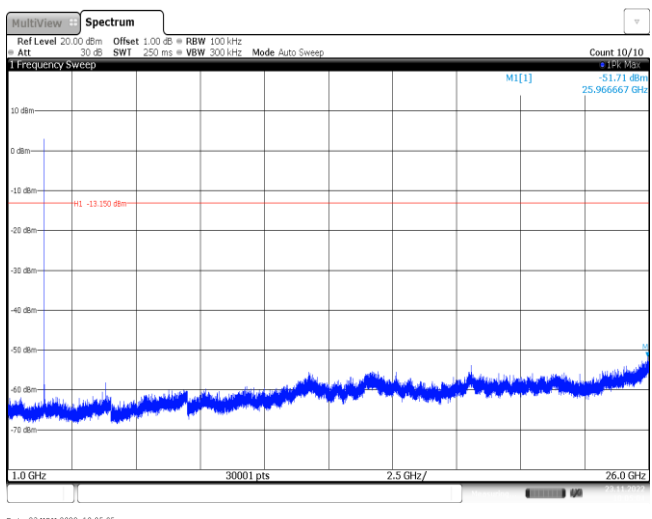


CH78
30MHz~1000MHz

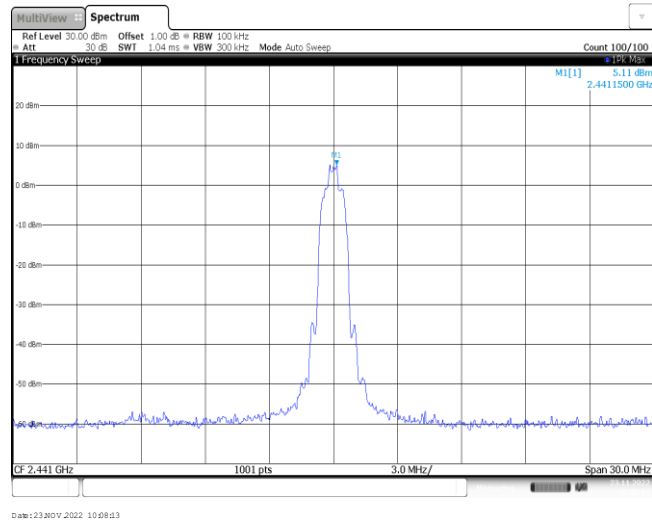


CH78
1GHz~26GHz

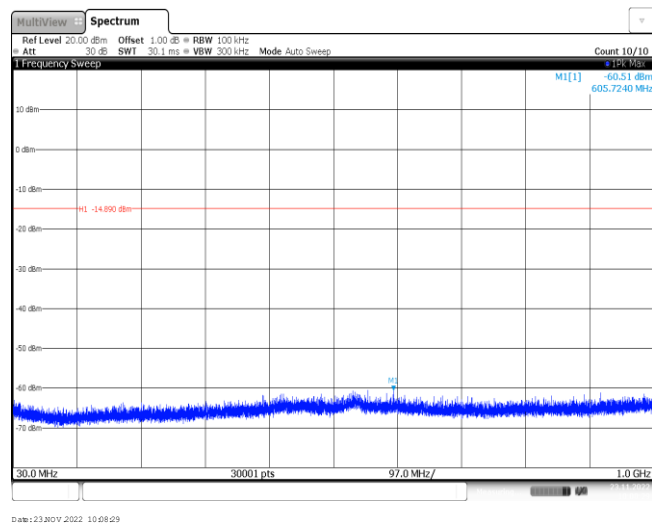


Test Item:	Spurious Emission	Modulation type:	8DPSK
CH00 Reference level			
CH00 30MHz~1000MHz			
CH00 1GHz~26GHz			

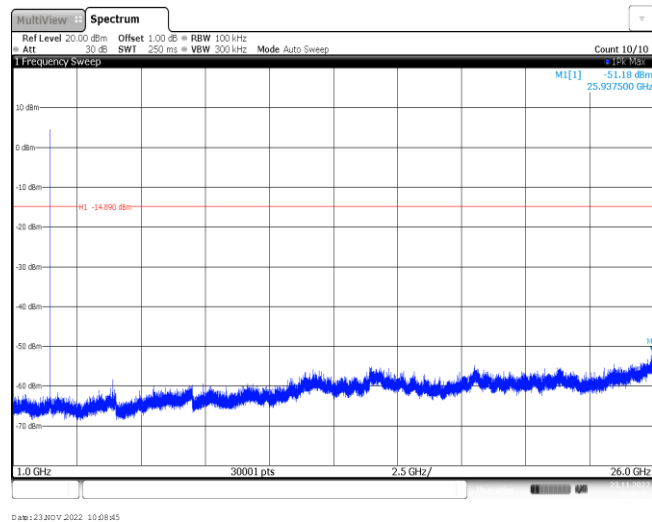
CH39
Reference level



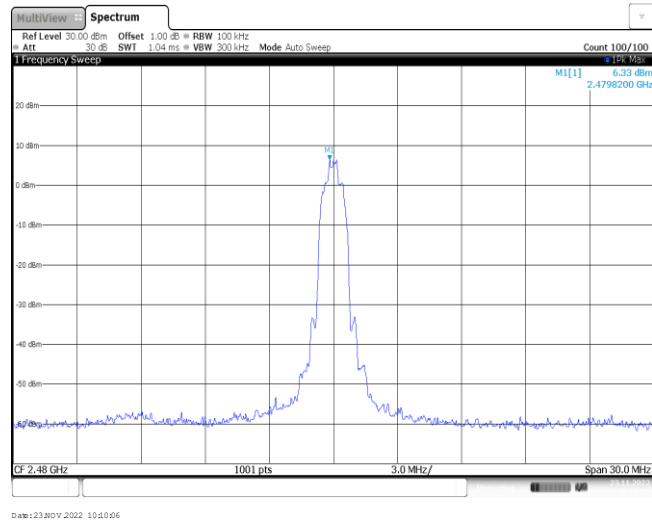
CH39
30MHz~1000MHz



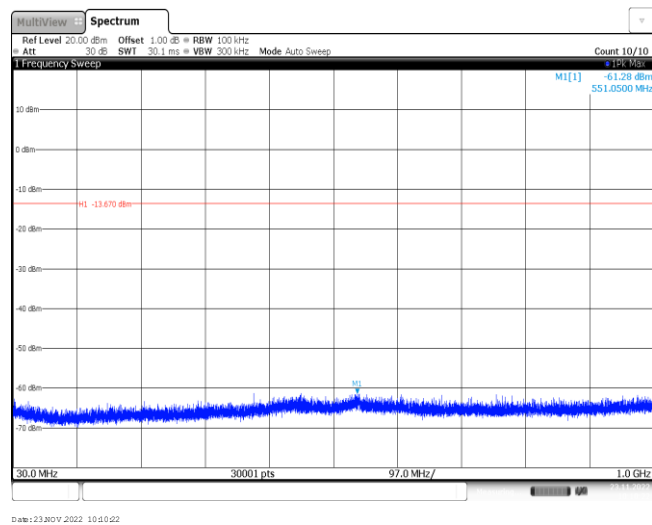
CH39
1GHz~26GHz



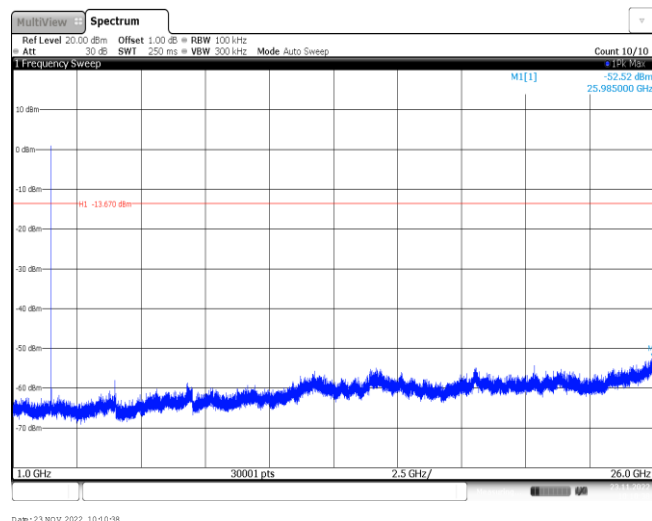
CH78
Reference level



CH78
30MHz~1000MHz



CH78
1GHz~26GHz



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