

APPENDIX REPORT

Project No.	SHT2108017501EW	Radio Specification	Bluetooth EDR
Test sample No.	YPHT21080175003	Model No.	E554
Start test date	2021-08-16	Finish date	2021-08-16
Temperature	26.3°C	Humidity	35%
Test Engineer	Weiyang Xiang	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

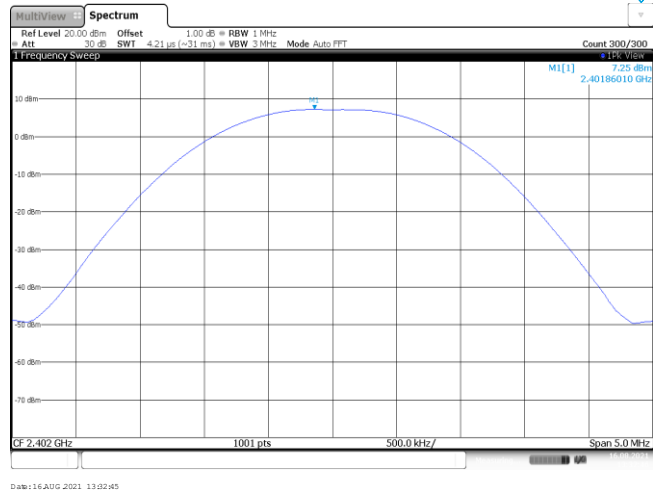
Appendix A: Peak Output Power

Modulation type	Channel	Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	00	7.25	7.24	≤ 30.00	Pass
	39	7.10	7.07		
	78	7.36	7.33		
π/4DQPSK	00	8.27	7.67	≤ 21.00	Pass
	39	8.32	7.71		
	78	8.69	8.05		
8DPSK	00	8.59	7.90	≤ 21.00	Pass
	39	8.67	7.94		
	78	9.02	8.33		

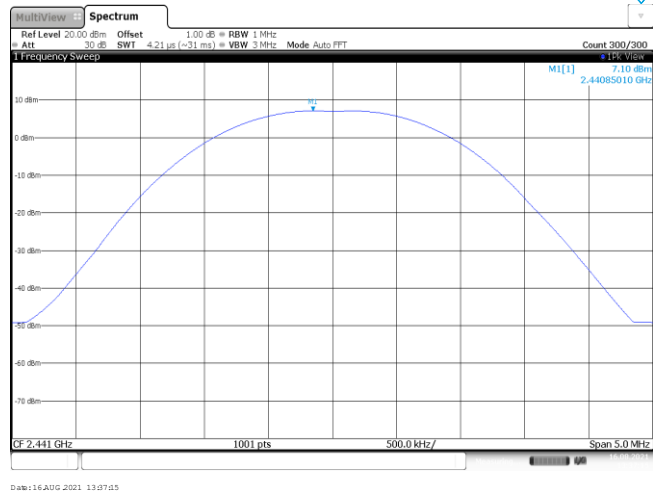
Modulation Type:

GFSK

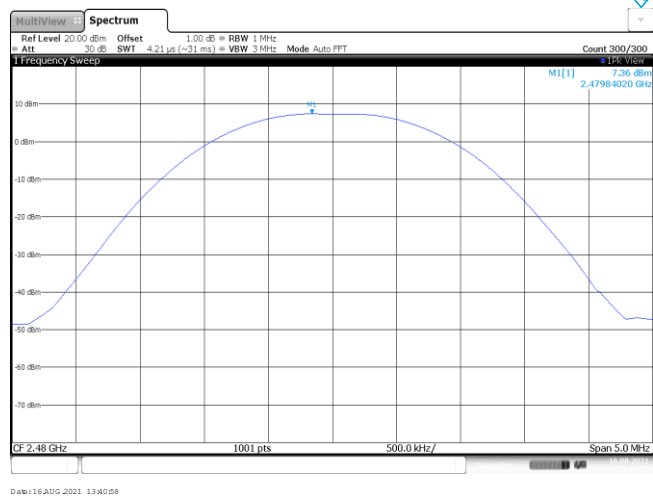
CH00



CH39

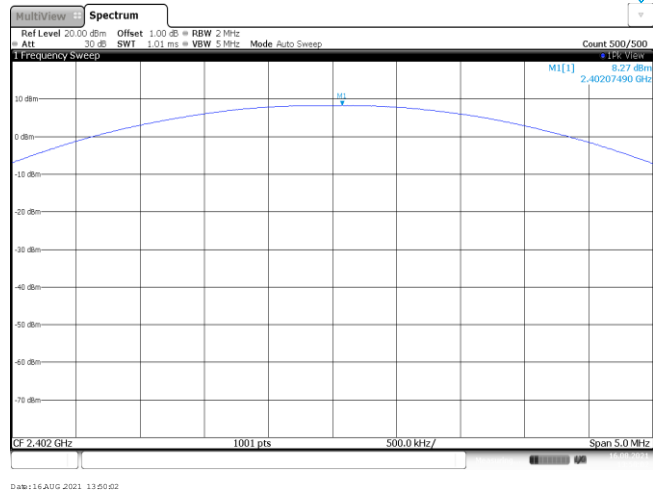


CH78



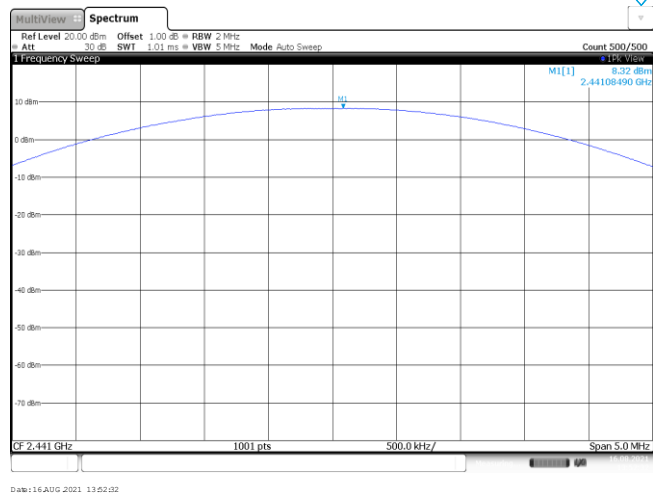
Modulation Type: $\pi/4$ DQPSK

CH00



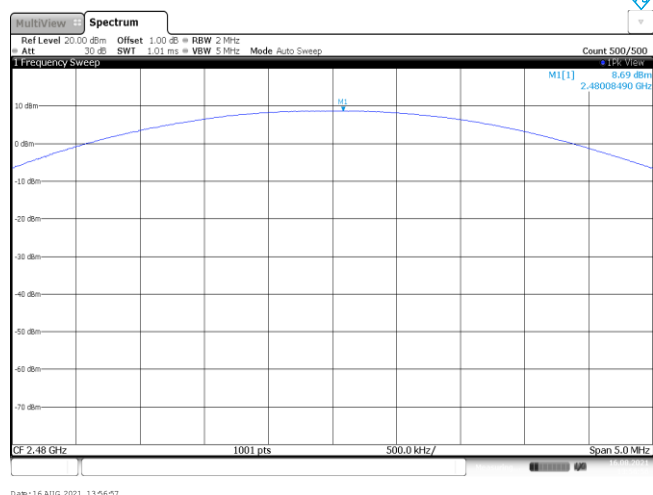
Date: 16 AUG 2021 13:50:02

CH39



Date: 16 AUG 2021 13:52:02

CH78

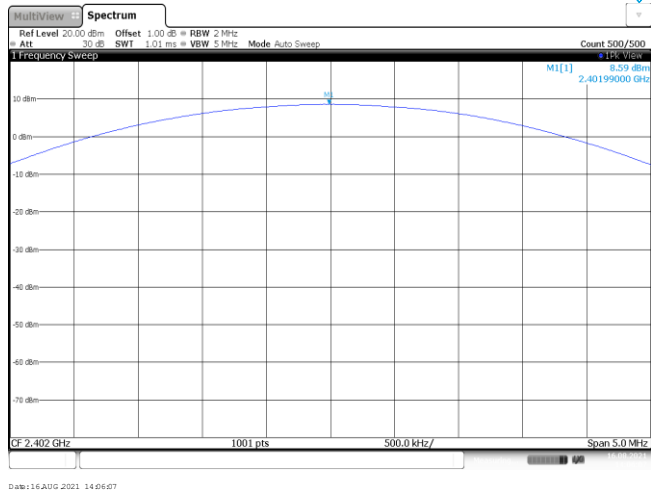


Date: 16 AUG 2021 13:56:07

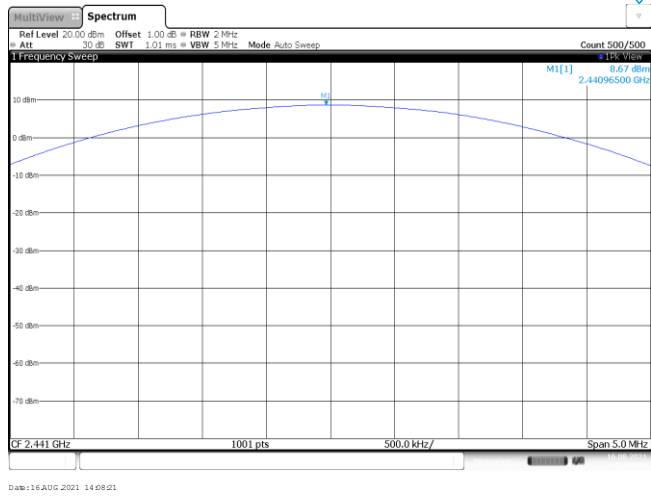
Modulation Type:

8DPSK

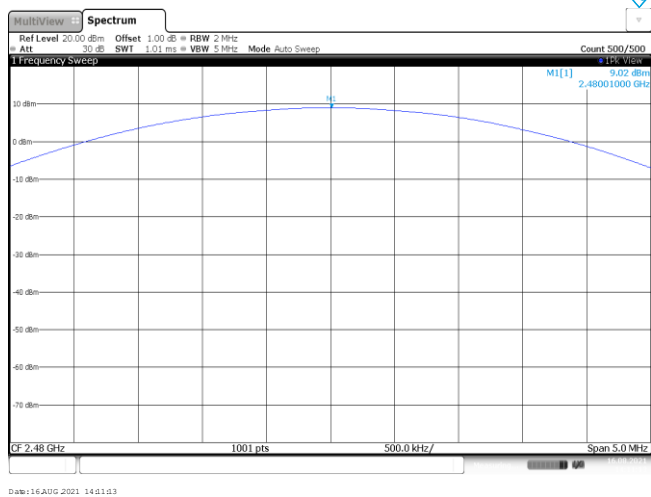
CH00



CH39



CH78

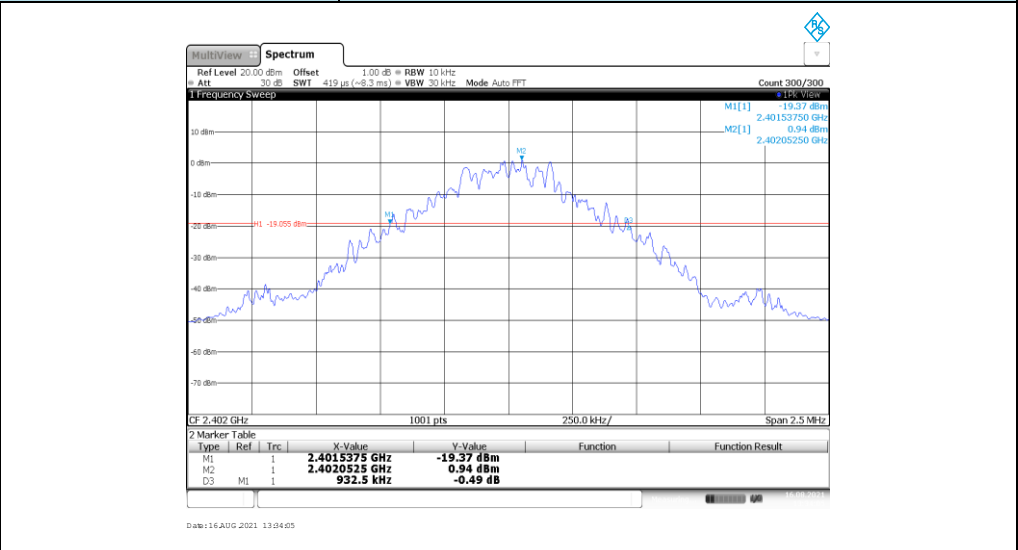


Appendix B : 20 dB Bandwidth

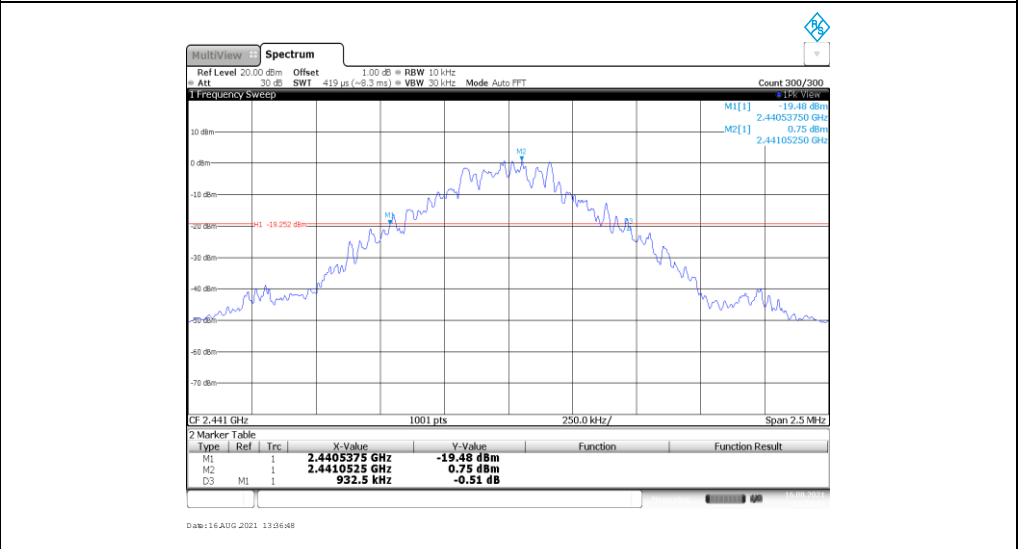
Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	932.50	-	Pass
	39	932.50		
	78	932.50		
$\pi/4$ DQPSK	00	1295.00	-	Pass
	39	1295.00		
	78	1290.00		
8DPSK	00	1295.00	-	Pass
	39	1302.50		
	78	1305.00		

Modulation Type: GFSK

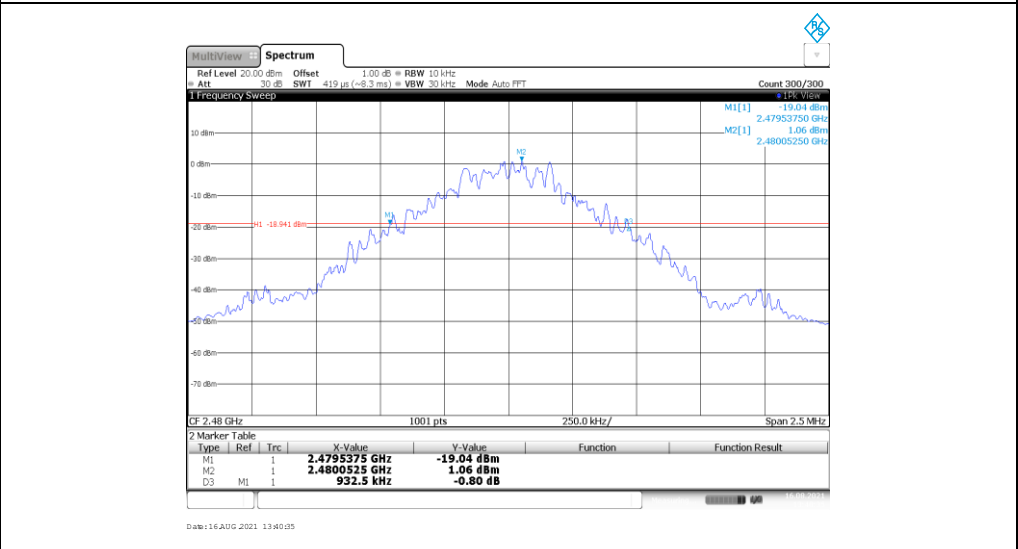
CH00



CH39

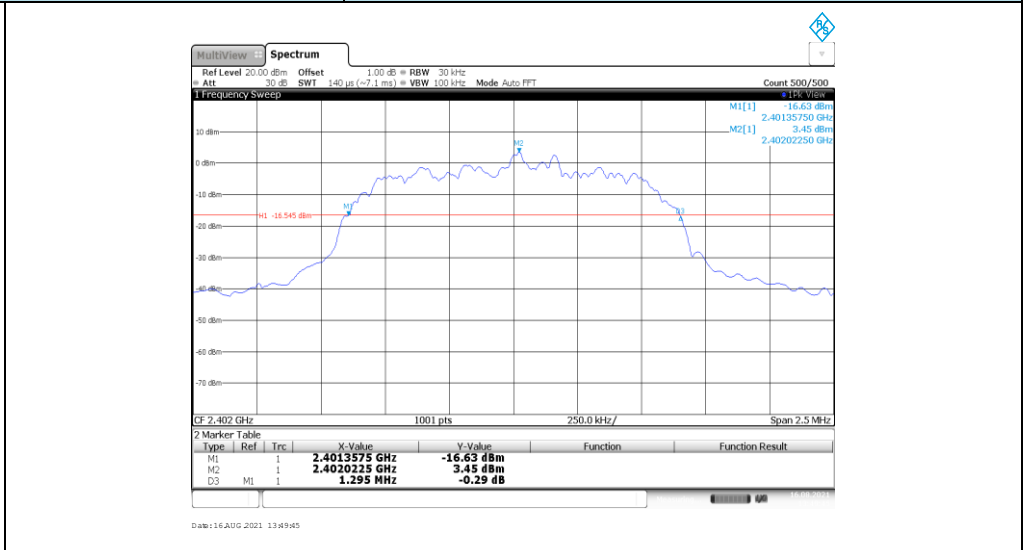


CH78

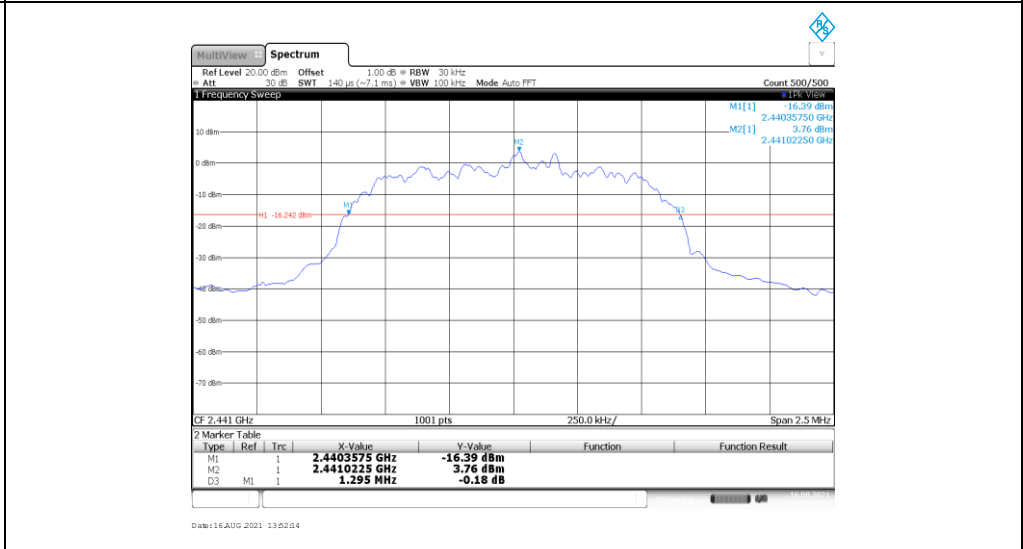


Modulation Type: **$\pi/4$ DQPSK**

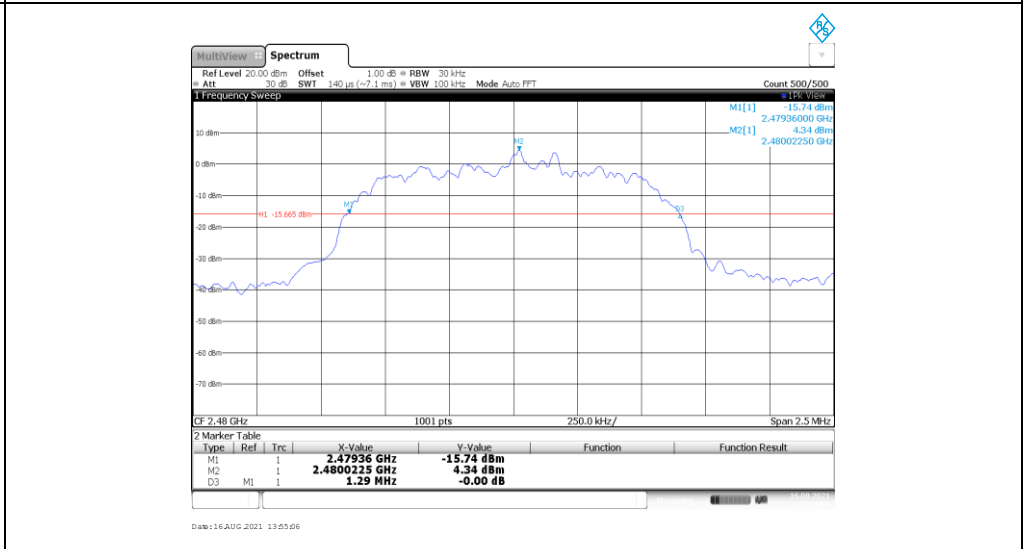
CH00



CH39

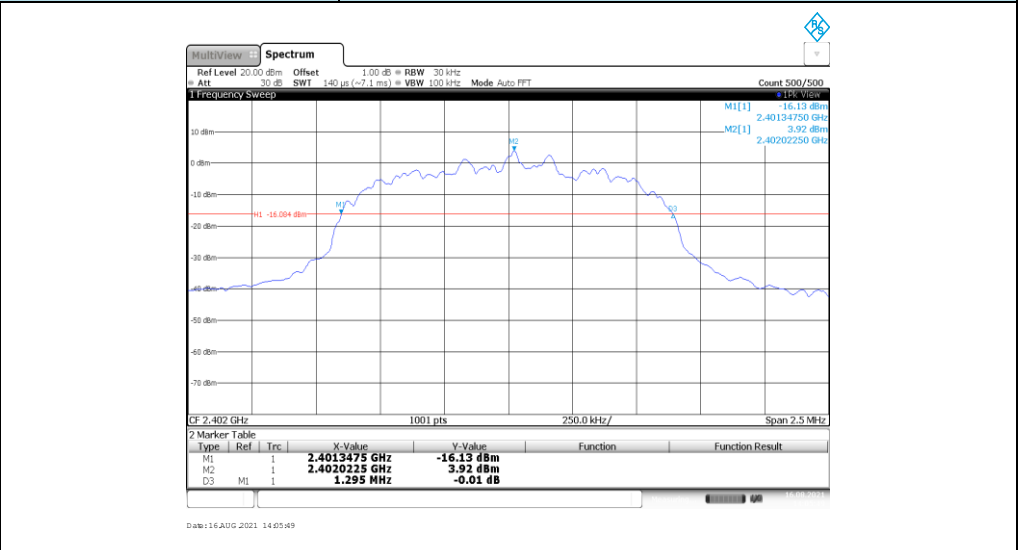


CH78

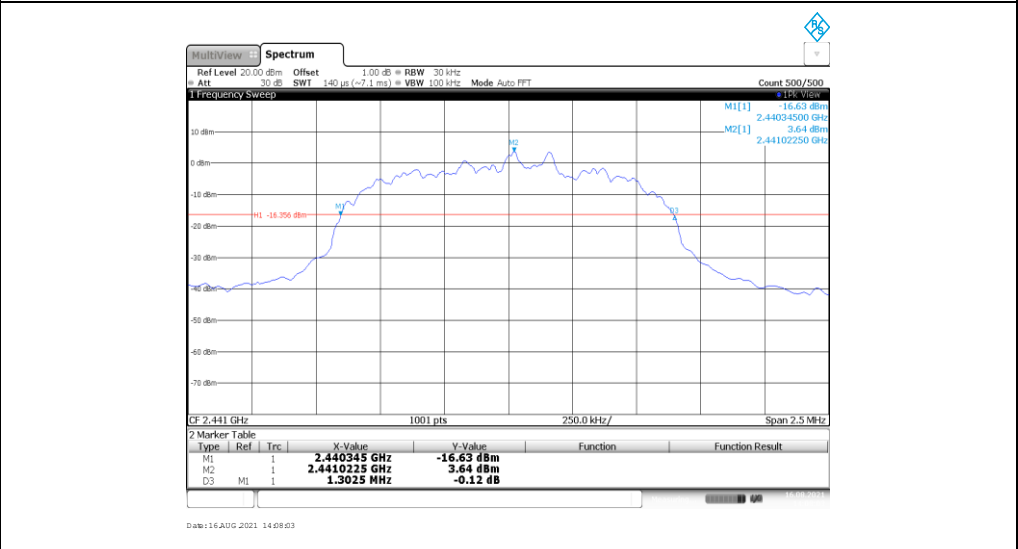


Modulation Type: 8DPSK

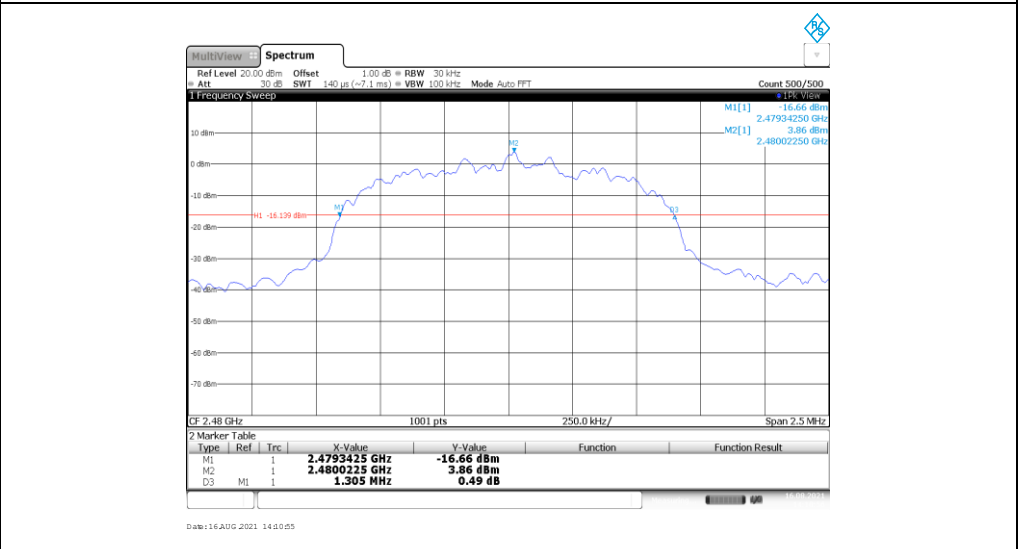
CH00



CH39



CH78

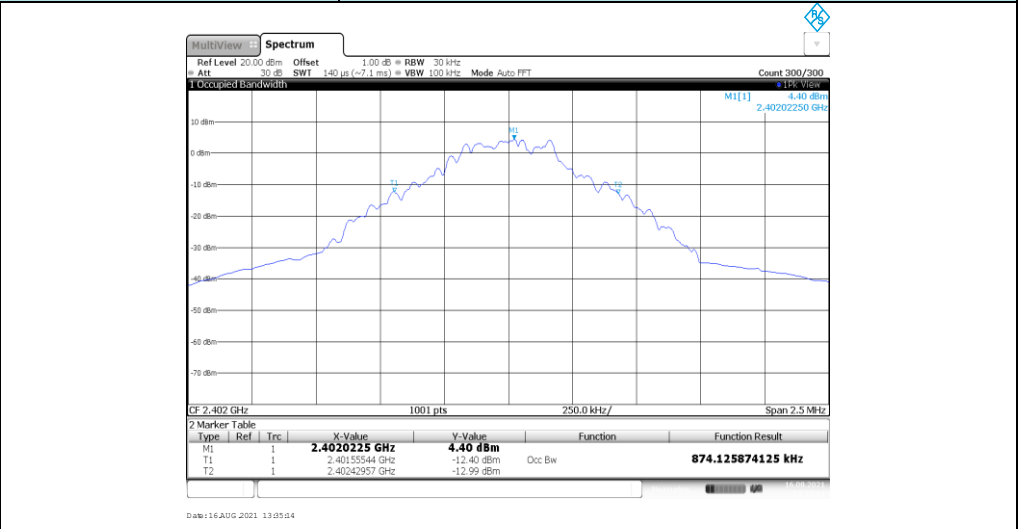


Appendix C: 99% Occupied Bandwidth

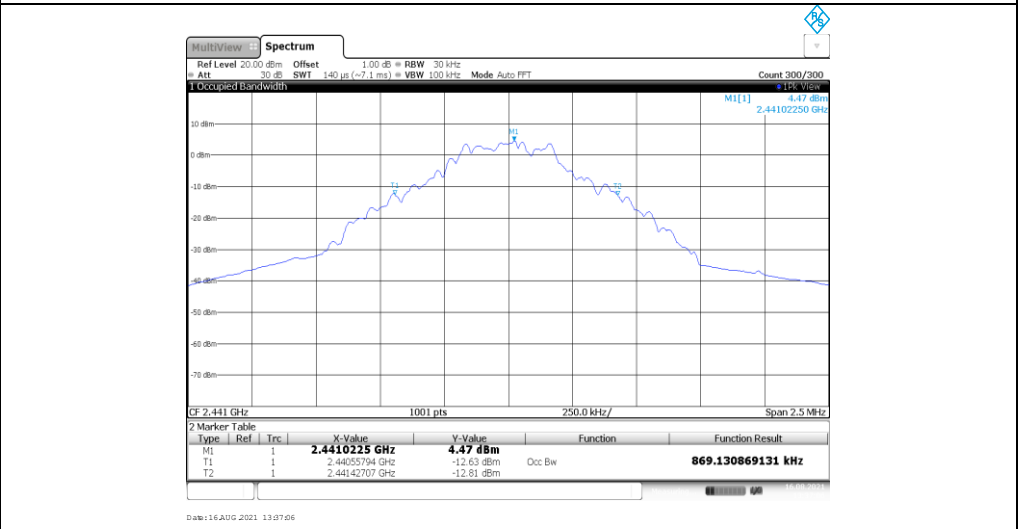
Modulation type	Channel	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.87	-	Pass
	39	0.87		
	78	0.87		
$\pi/4$ DQPSK	00	1.18	-	Pass
	39	1.18		
	78	1.18		
8DPSK	00	1.18	-	Pass
	39	1.18		
	78	1.19		

Modulation Type: GFSK

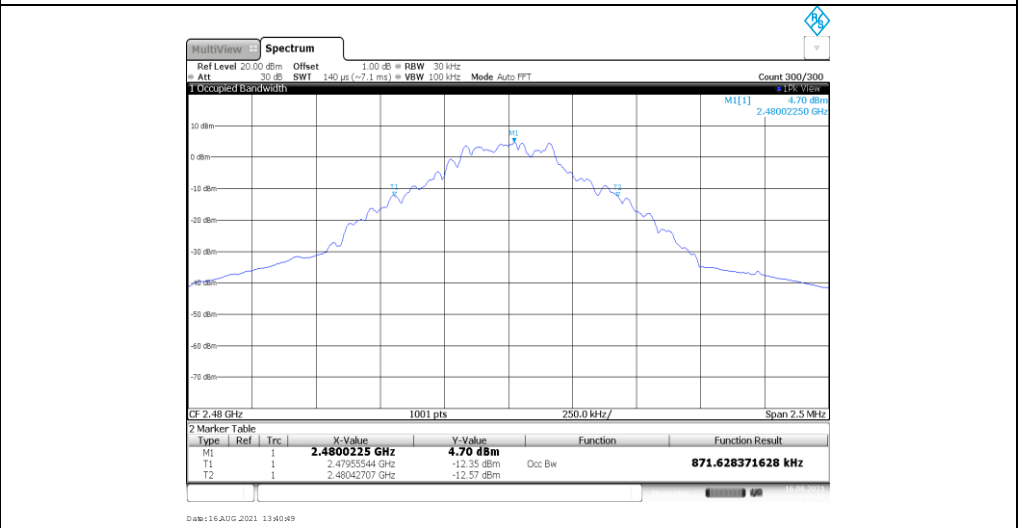
CH00



CH39

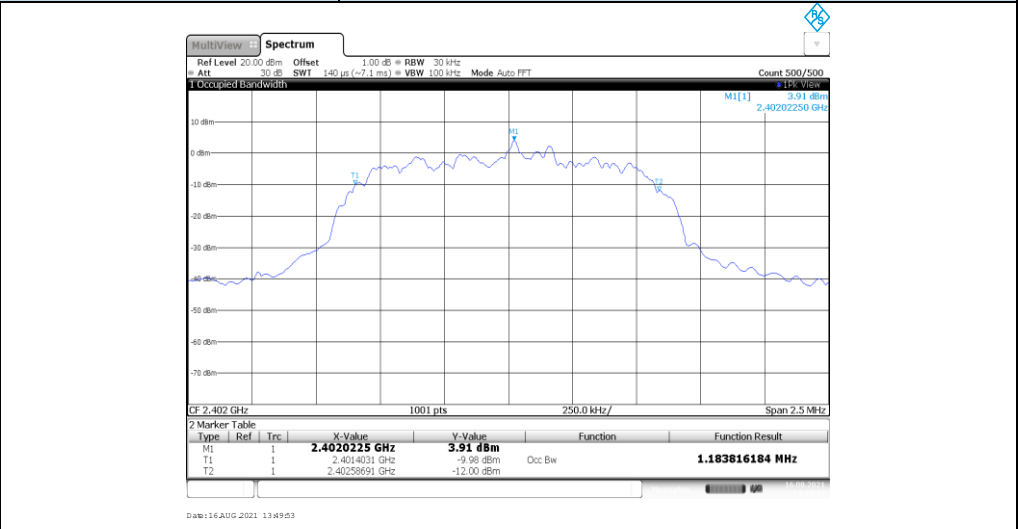


CH78

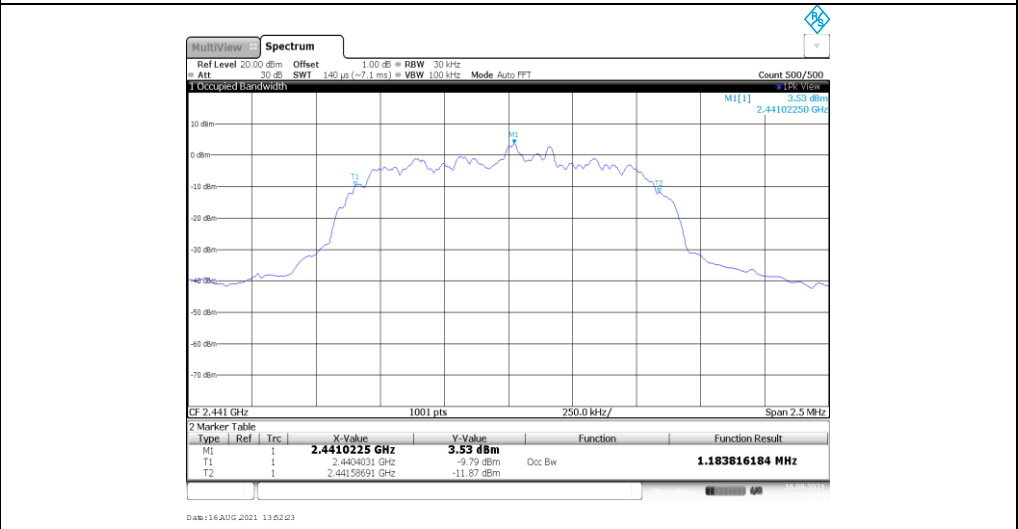


Modulation Type: $\pi/4$ QPSK

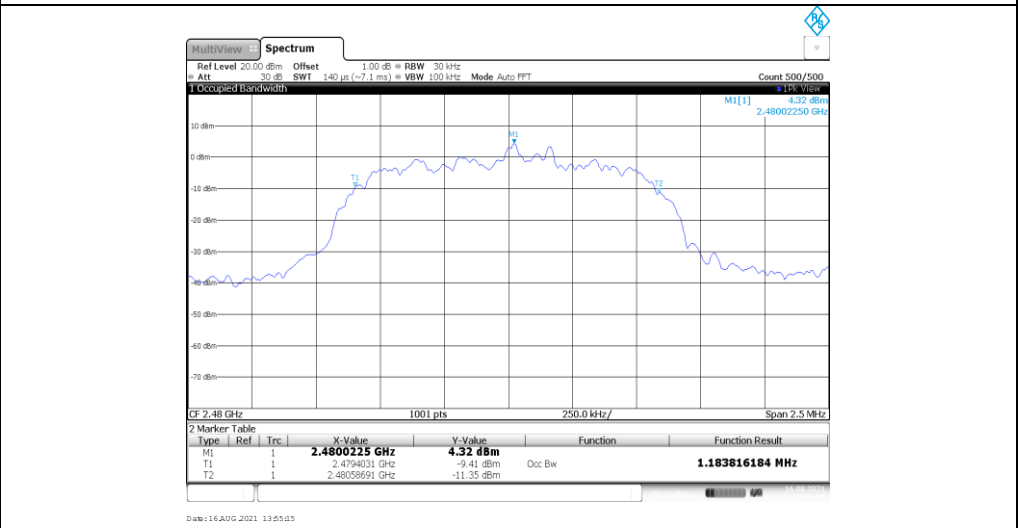
CH00



CH39

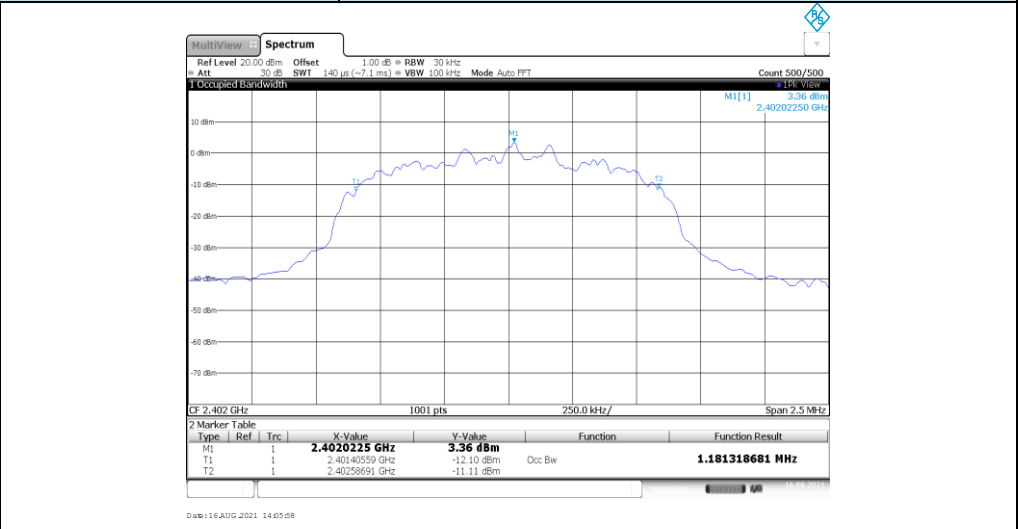


CH78

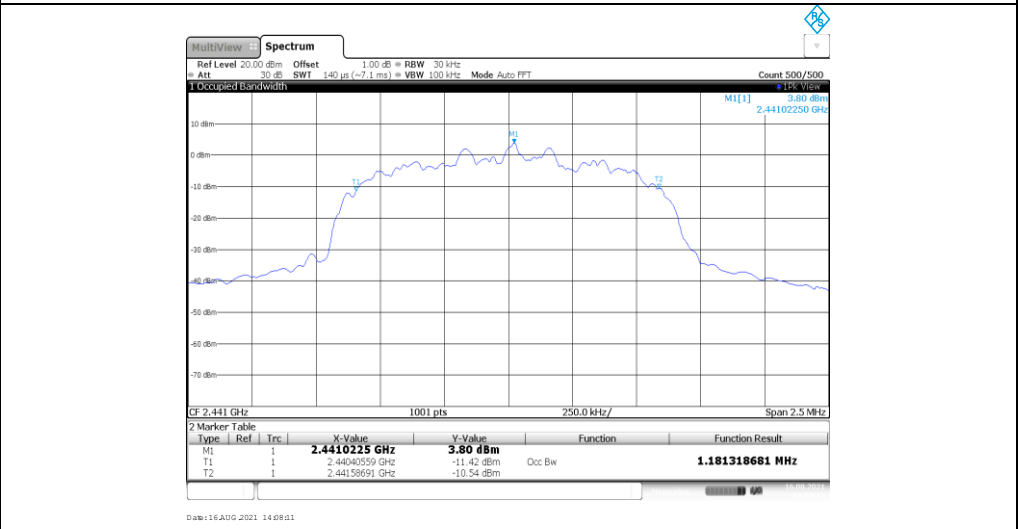


Modulation Type: 8DPSK

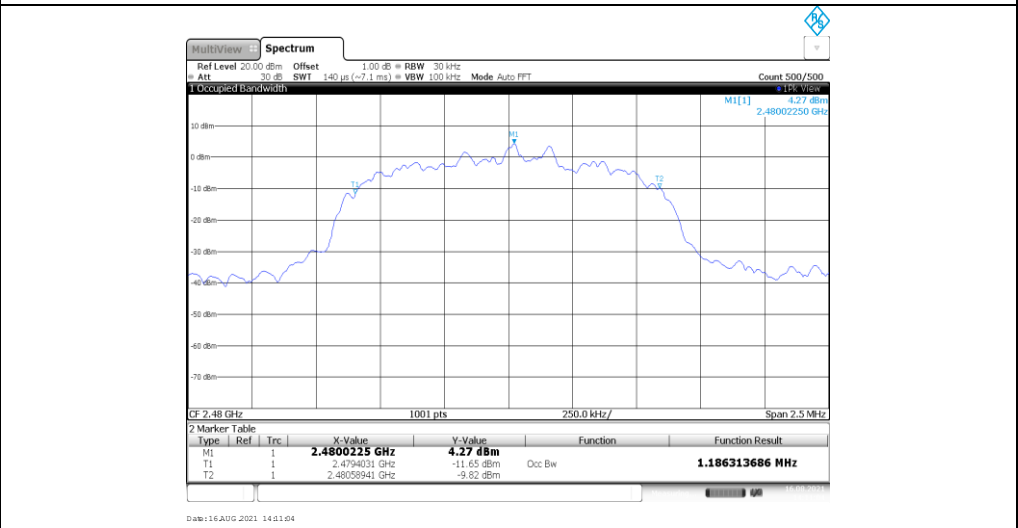
CH00



CH39



CH78



Appendix D: Carrier Frequencies Separation

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (kHz) *	Result
GFSK	39	1.00	≥932.50	Pass
$\pi/4$ DQPSK	39	1.00	≥863.33	Pass
8DPSK	39	1.00	≥870.00	Pass

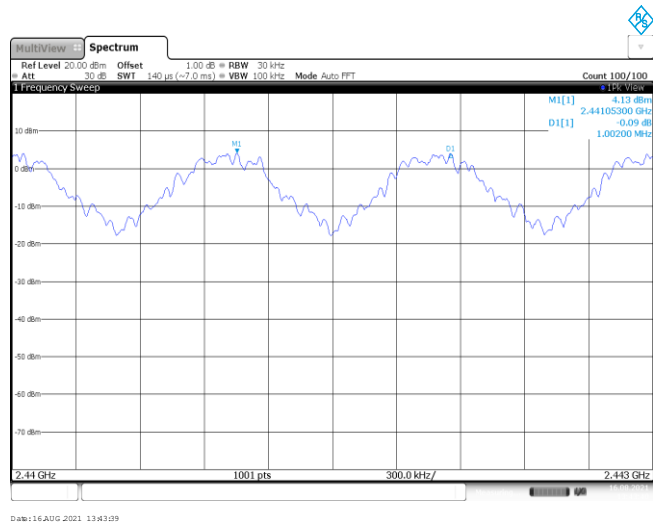
Note:

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

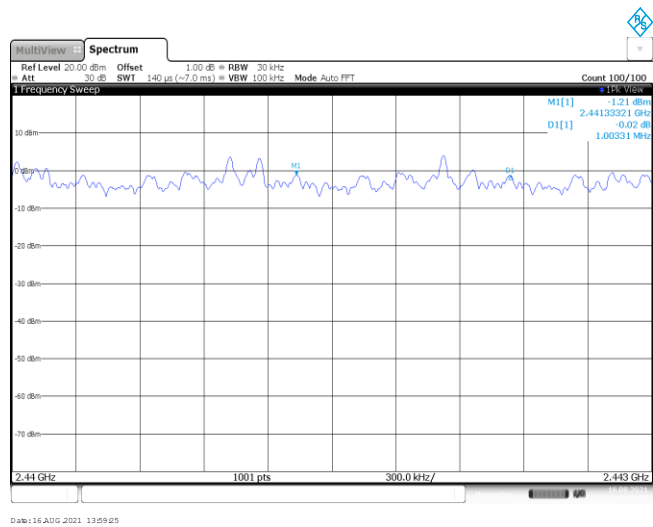
$\pi/4$ DQPSK limit = $2/3$ * The maximum 20 dB Bandwidth for $\pi/4$ DQPSK modulation on the appendix B.

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

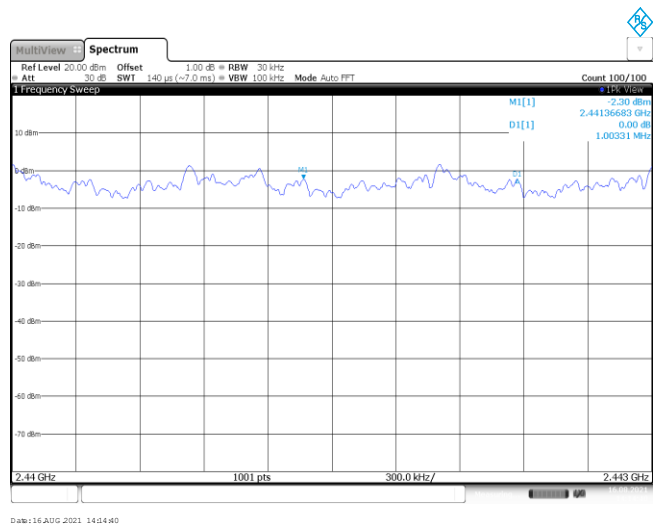
GFSK



$\pi/4$ DQPSK



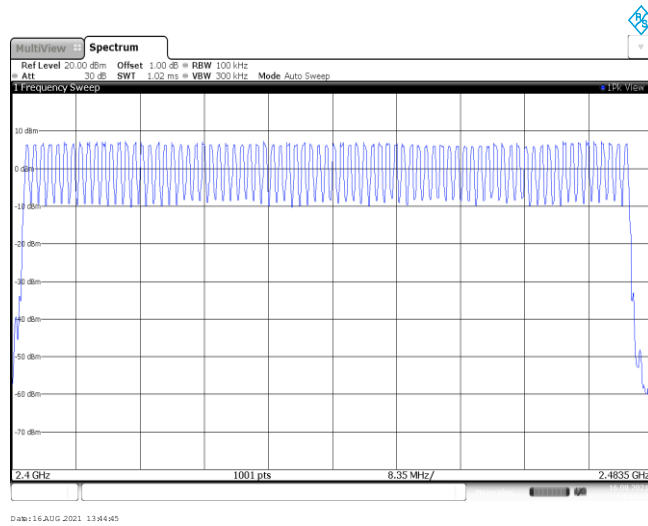
8DPSK



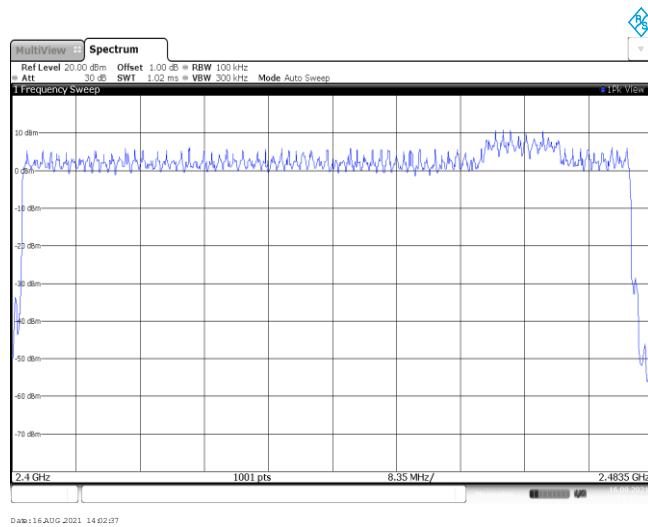
Appendix E: Hopping Channel Number

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

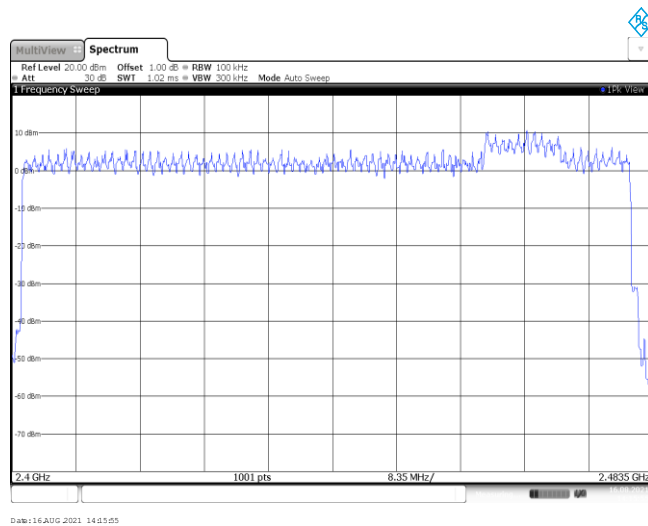
GFSK



$\pi/4$ DQPSK



8DPSK

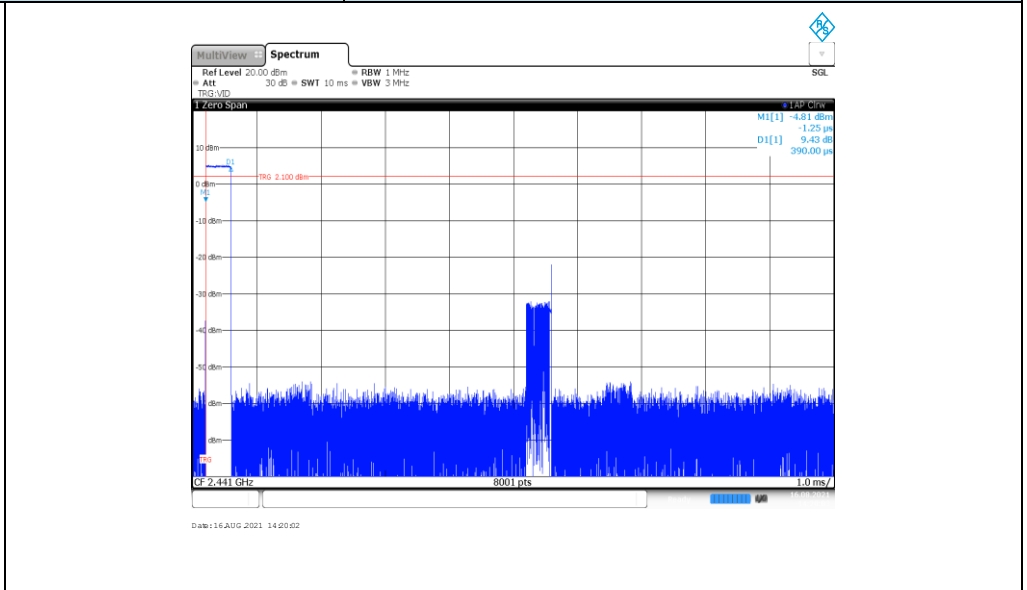


Appendix F: Dwell Time

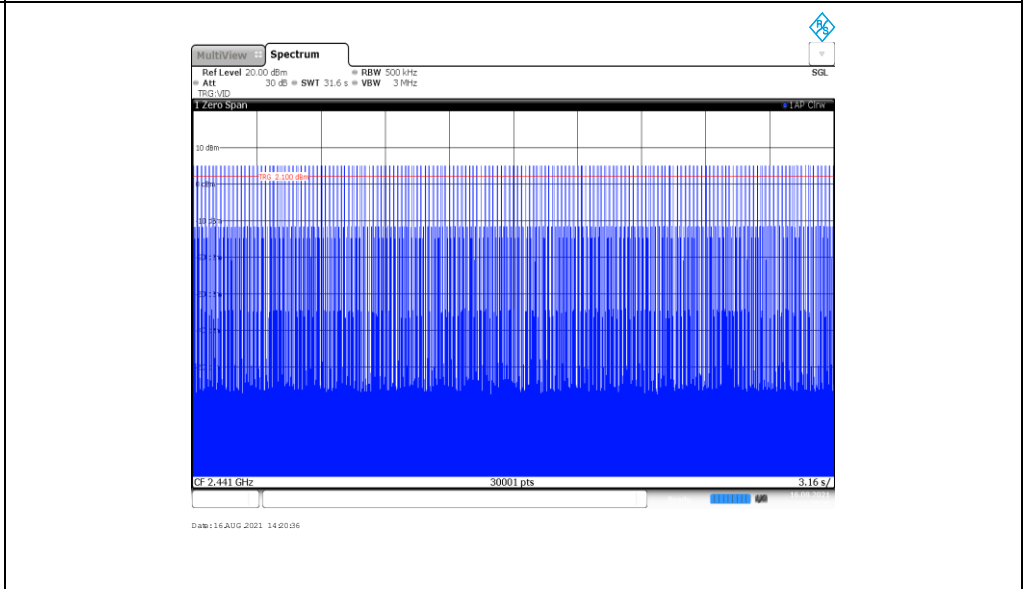
Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.39	320	0.13	≤ 0.40	Pass
	DH3	1.65	155	0.26		
	DH5	2.89	106	0.31		
π/4DQPSK	2DH1	0.38	319	0.12	≤ 0.40	Pass
	2DH3	1.64	167	0.27		
	2DH5	2.88	110	0.32		
8DPSK	3DH1	0.38	320	0.12	≤ 0.40	Pass
	3DH3	1.63	163	0.27		
	3DH5	2.88	118	0.34		

Modulation Type: GFSK

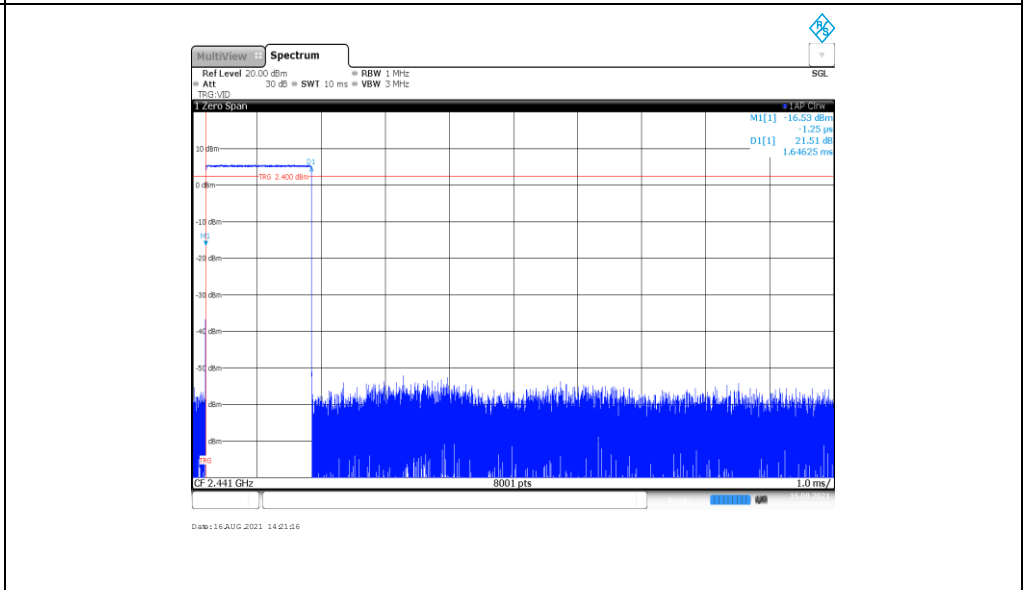
DH1
Burst width



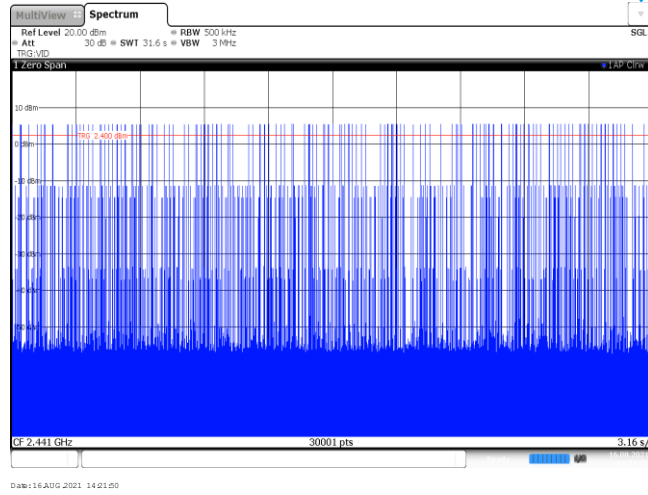
DH1
Burst number



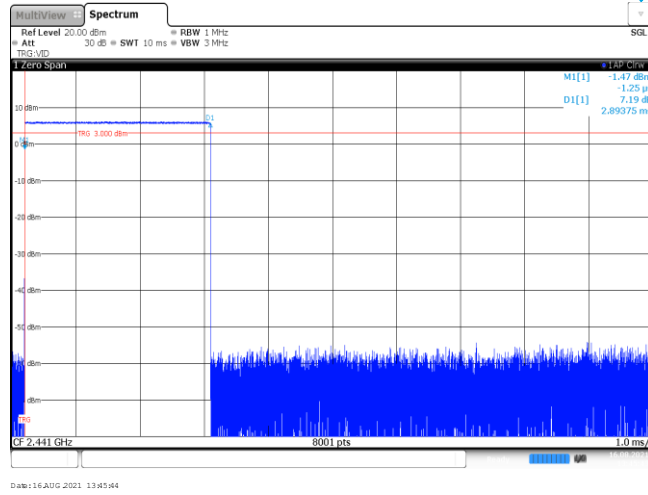
DH3
Burst width



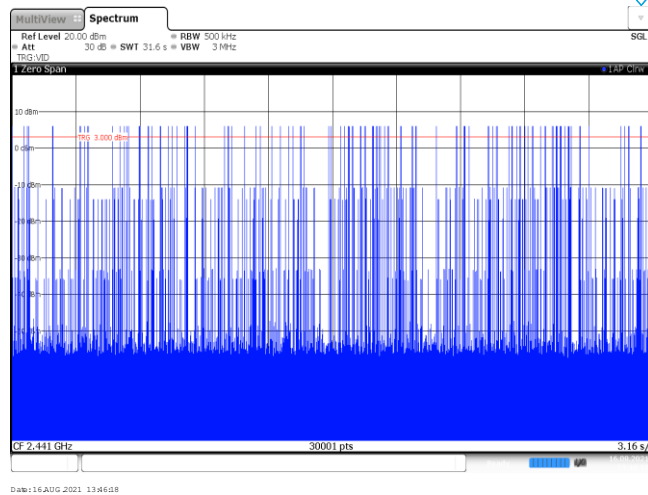
DH3
Burst number



DH5
Burst width

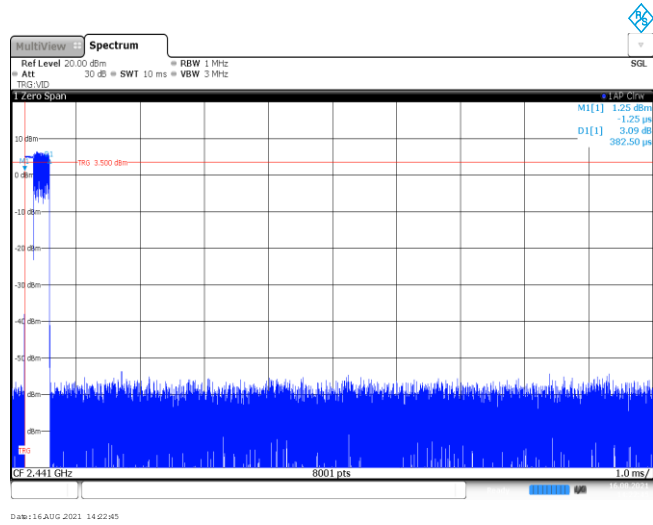


DH5
Burst number

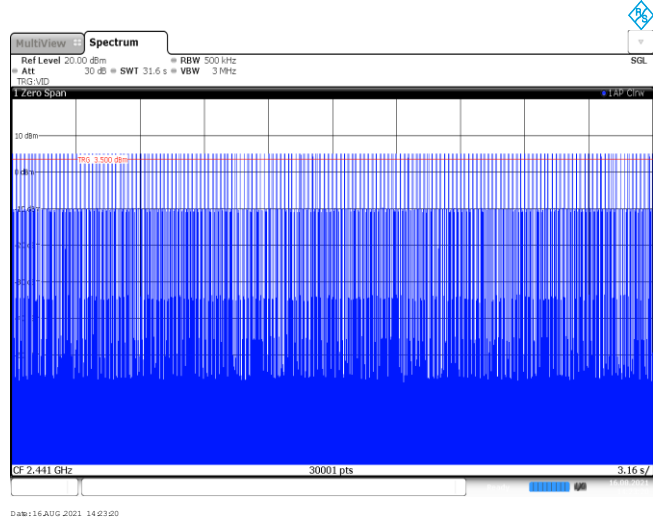


Modulation Type: $\pi/4$ DQPSK

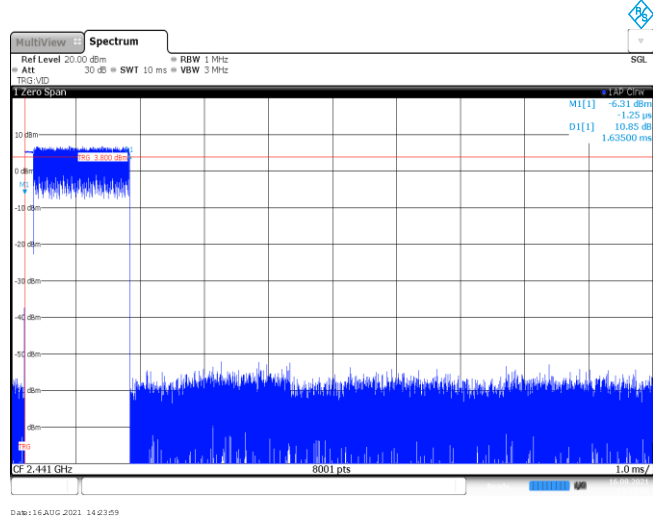
2DH1
Burst width



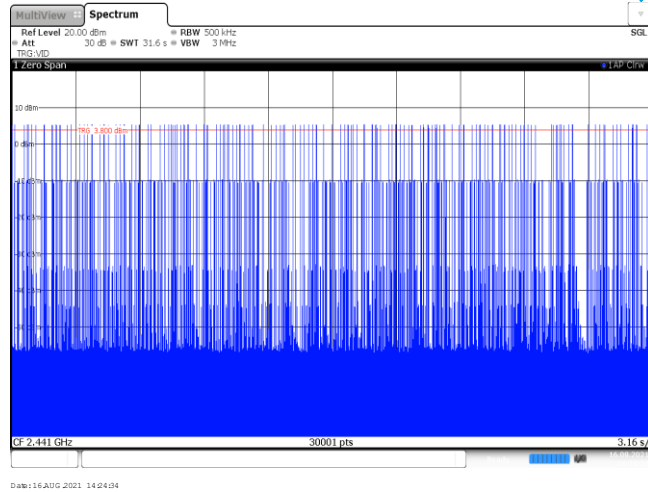
2DH1
Burst number



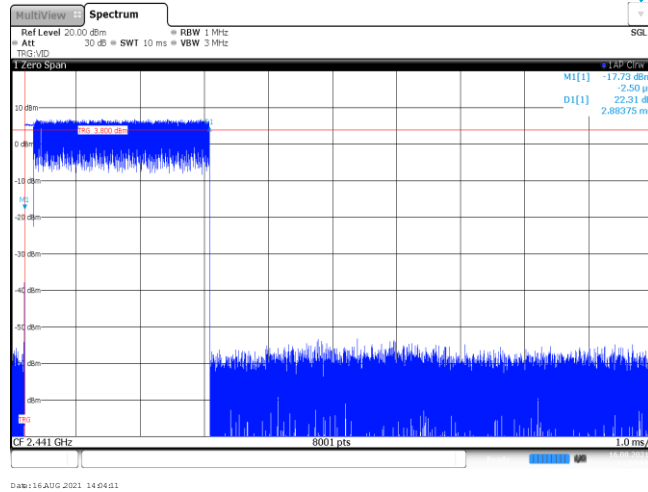
2DH3
Burst width



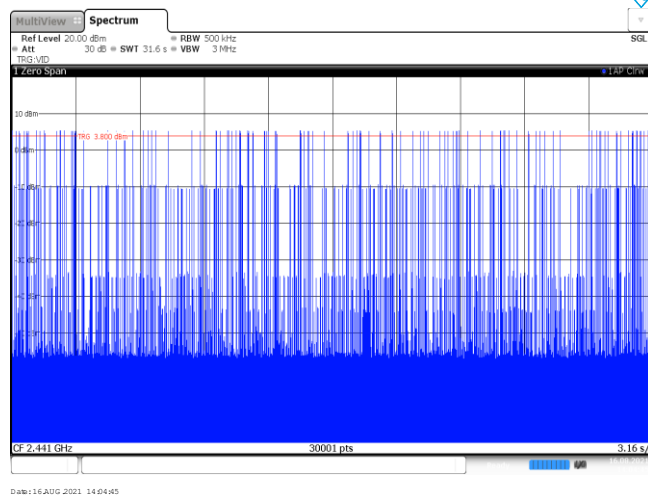
2DH3
Burst number



2DH5
Burst width

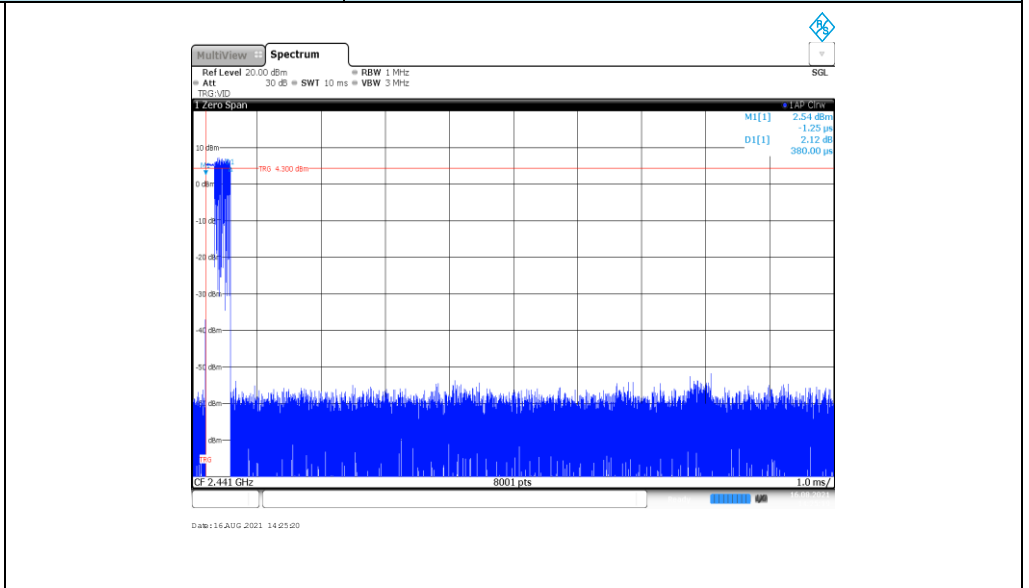


2DH5
Burst number

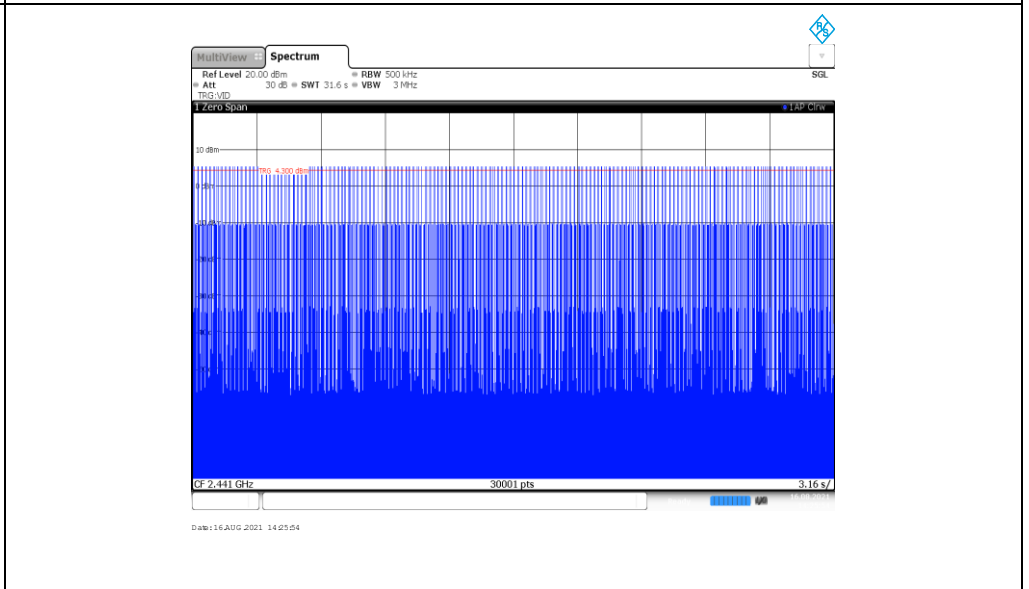


Modulation Type: 8DPSK

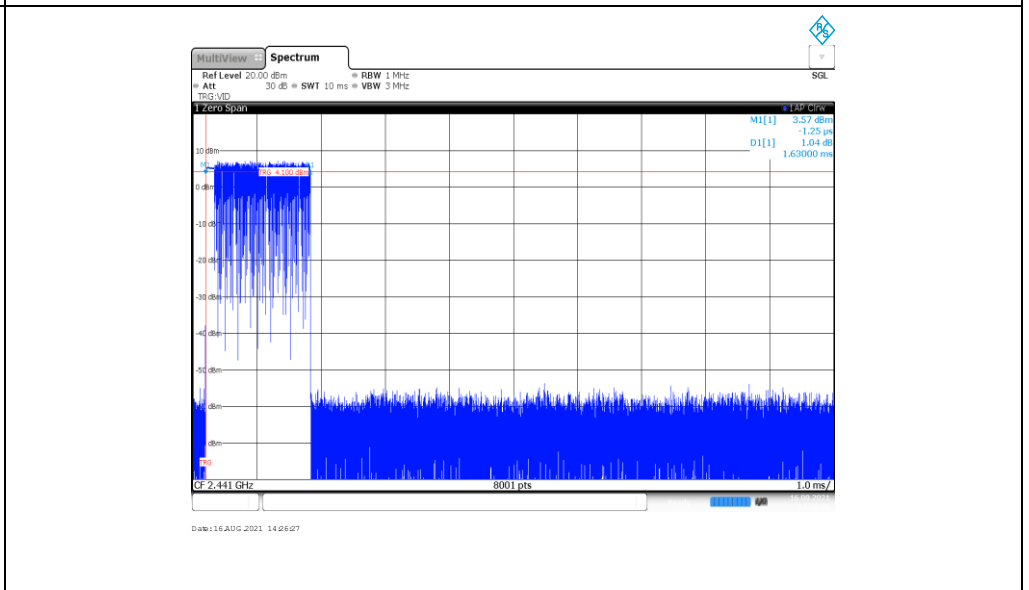
3DH1
Burst width



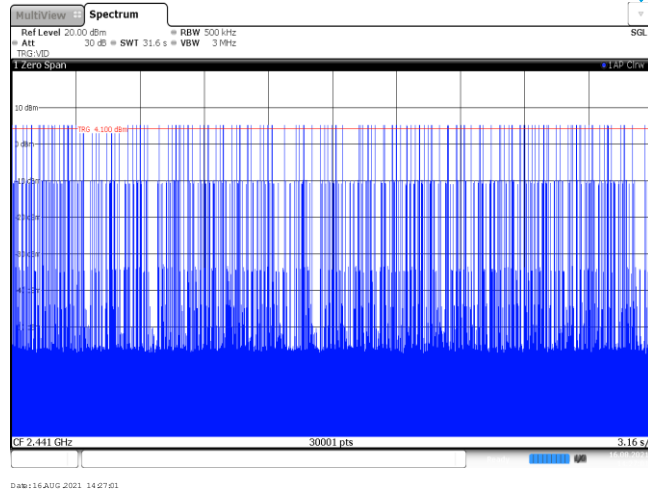
3DH1
Burst number



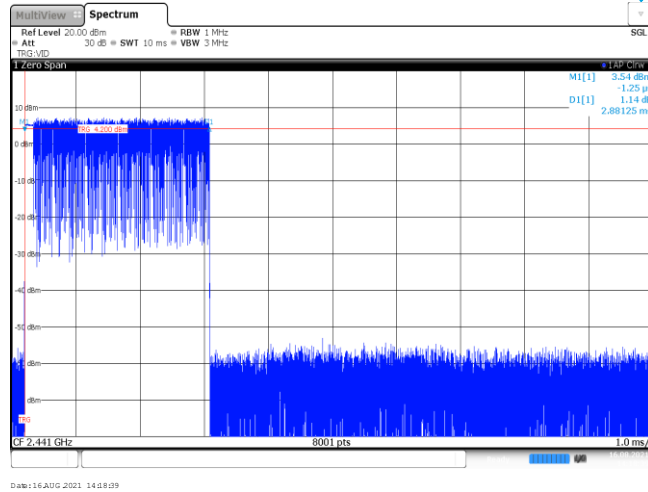
3DH3
Burst width



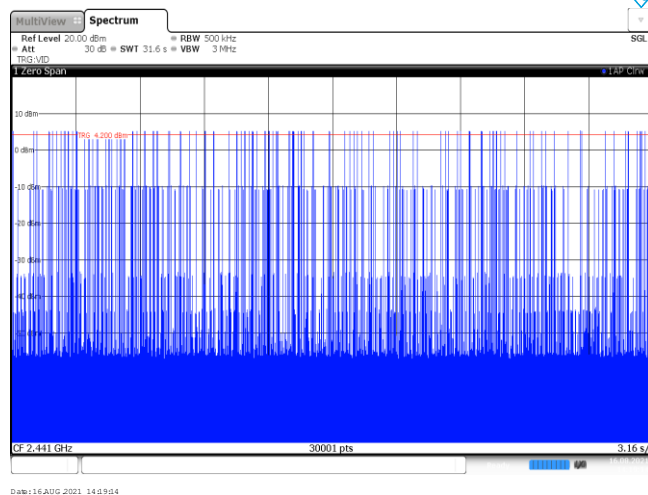
3DH3
Burst number



3DH5
Burst width



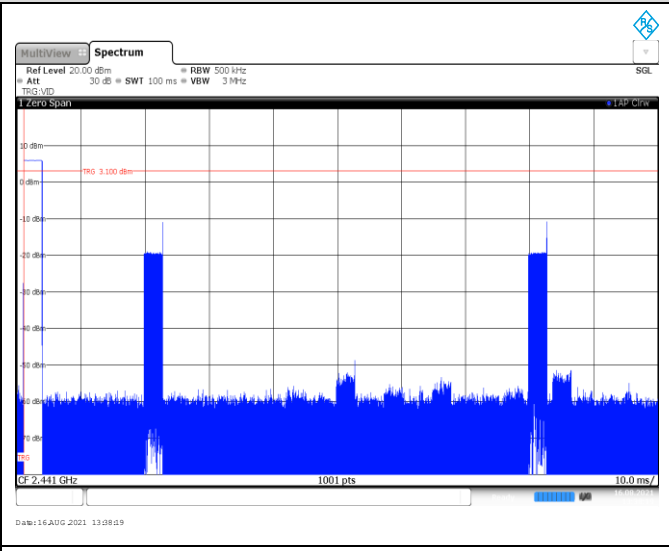
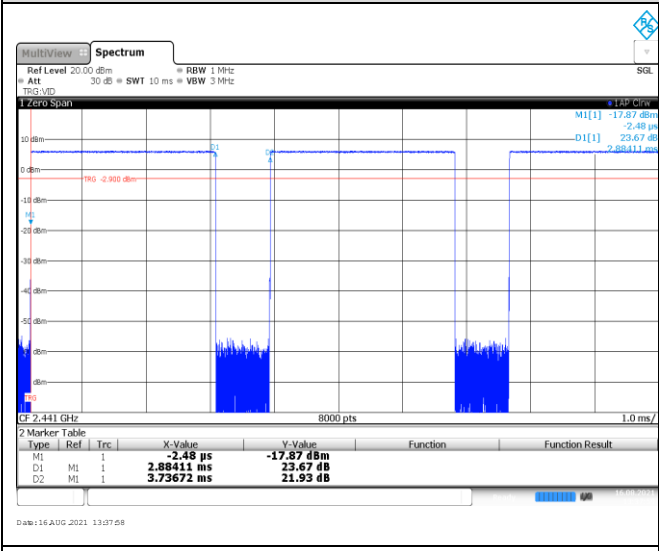
3DH5
Burst number



Appendix G: Duty Cycle Correction Factor (DCCF)

DCCF Calculate Formula					
DCCF=20 * Log(duty cycle) = 20 * Log($T_{on\ time} / T_{period}$)					
Modulation type	Test Frequency (MHz)	$T_{on\ time}$ for single burst [ms]	T_{period} [ms]	Burst Quantity	DCCF [dB]
GFSK	2441	2.88	100	2	-24.79
$\pi/4$ DQPSK	2441	2.87	100	2	-24.82
8DPSK	2441	2.87	100	2	-24.82

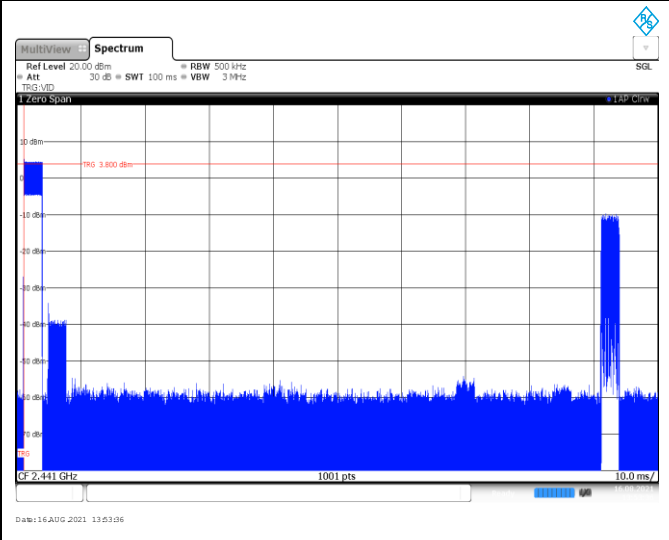
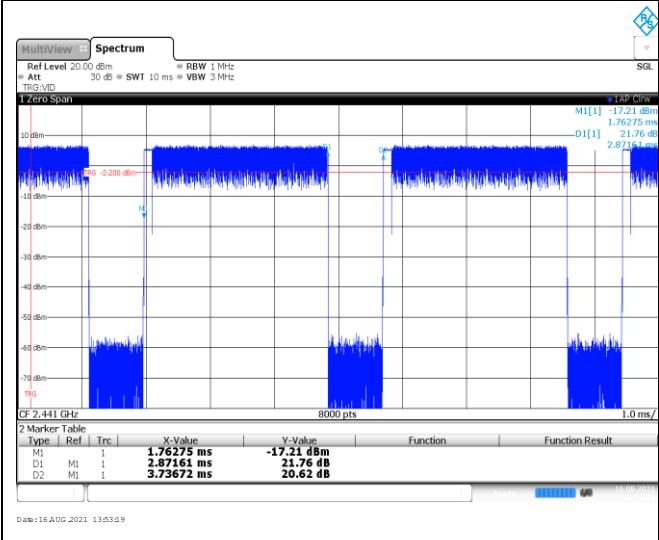
GFSK



T_{on} time for single burst

Burst Quantity

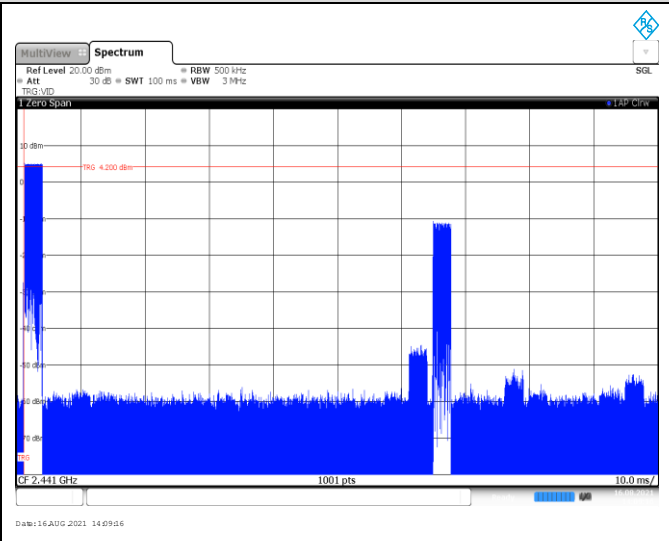
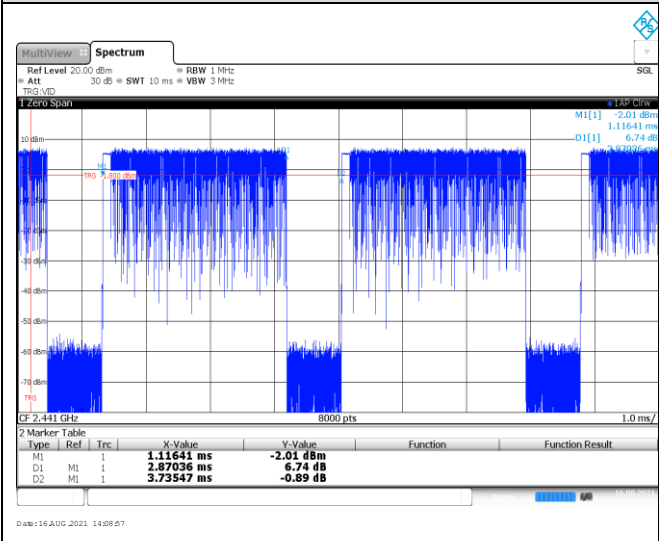
$\pi/4$ DQPSK



T_{on} time for single burst

Burst Quantity

8DPSK



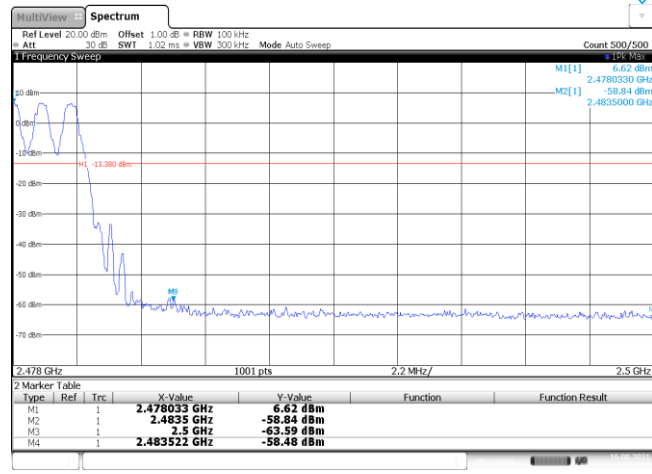
T_{on} time for single burst

Burst Quantity

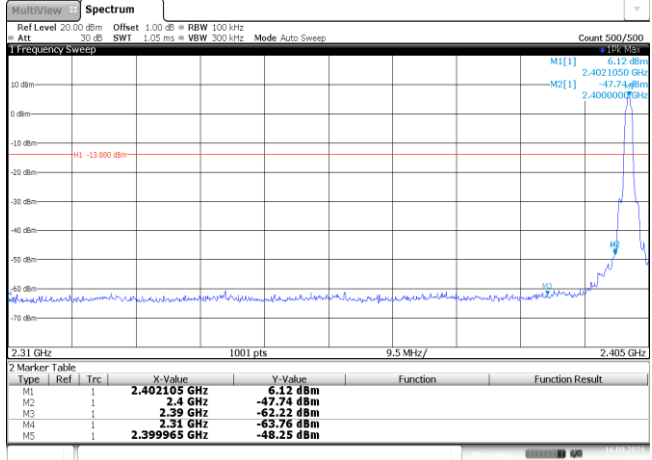
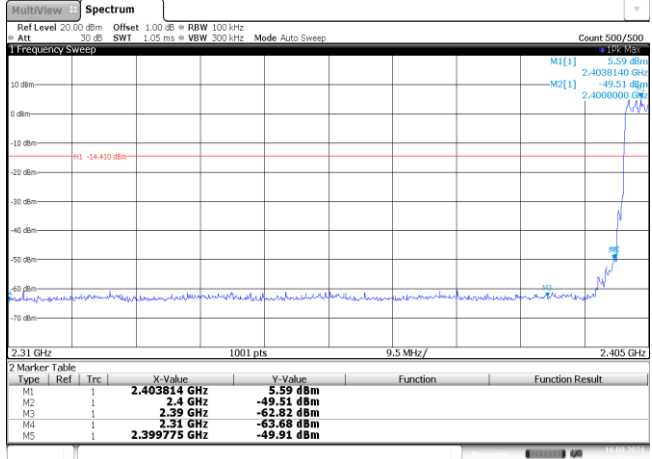
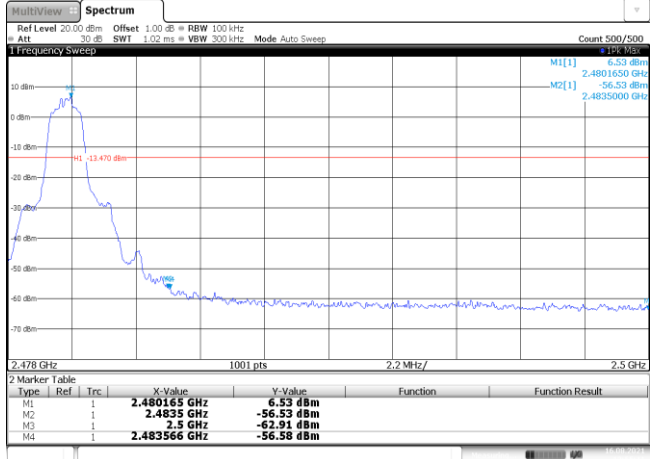
Appendix H: Band edge and Spurious Emissions (conducted)

Test Item:	Band edge	Modulation type:	GFSK																																										
<p>CH00 No hopping mode</p>	<table border="1"> <thead> <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> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.401821 GHz</td> <td>7.10 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4 GHz</td> <td>-50.11 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.39 GHz</td> <td>-61.70 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>2.39987 GHz</td> <td>-50.55 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 16.AUG.2021 13:05:28</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.401821 GHz	7.10 dBm			M2	1		2.4 GHz	-50.11 dBm			M3	1		2.39 GHz	-61.70 dBm			M4	1		2.31 GHz	-64.35 dBm			M5	1		2.39987 GHz	-50.55 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.401821 GHz	7.10 dBm																																									
M2	1		2.4 GHz	-50.11 dBm																																									
M3	1		2.39 GHz	-61.70 dBm																																									
M4	1		2.31 GHz	-64.35 dBm																																									
M5	1		2.39987 GHz	-50.55 dBm																																									
<p>CH00 Hopping mode</p>	<table border="1"> <thead> <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> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.404003 GHz</td> <td>6.37 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4 GHz</td> <td>-56.09 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.39 GHz</td> <td>-63.73 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.31 GHz</td> <td>-63.23 dBm</td> <td></td> <td></td> </tr> <tr> <td>M5</td> <td>1</td> <td></td> <td>2.399395 GHz</td> <td>-56.91 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 16.AUG.2021 13:44:09</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.404003 GHz	6.37 dBm			M2	1		2.4 GHz	-56.09 dBm			M3	1		2.39 GHz	-63.73 dBm			M4	1		2.31 GHz	-63.23 dBm			M5	1		2.399395 GHz	-56.91 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.404003 GHz	6.37 dBm																																									
M2	1		2.4 GHz	-56.09 dBm																																									
M3	1		2.39 GHz	-63.73 dBm																																									
M4	1		2.31 GHz	-63.23 dBm																																									
M5	1		2.399395 GHz	-56.91 dBm																																									
<p>CH78 No hopping mode</p>	<table border="1"> <thead> <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> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.479835 GHz</td> <td>7.21 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.479835 GHz</td> <td>-58.38 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.3 GHz</td> <td>-63.18 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.483918 GHz</td> <td>-58.18 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 16.AUG.2021 13:41:33</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.479835 GHz	7.21 dBm			M2	1		2.479835 GHz	-58.38 dBm			M3	1		2.3 GHz	-63.18 dBm			M4	1		2.483918 GHz	-58.18 dBm									
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.479835 GHz	7.21 dBm																																									
M2	1		2.479835 GHz	-58.38 dBm																																									
M3	1		2.3 GHz	-63.18 dBm																																									
M4	1		2.483918 GHz	-58.18 dBm																																									

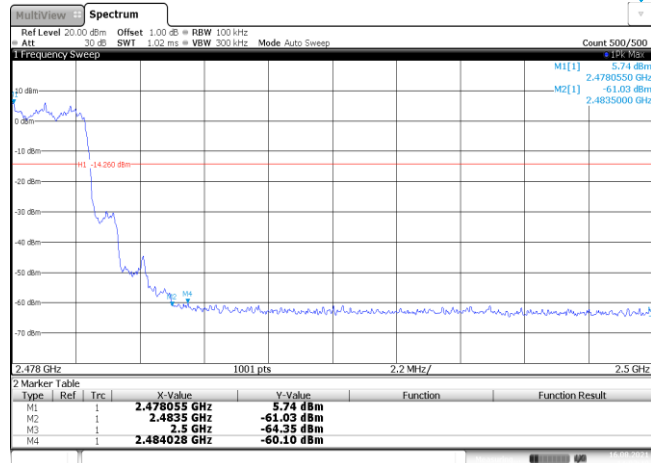
CH78
Hopping mode



Date: 16.AUG.2021 13:45:14

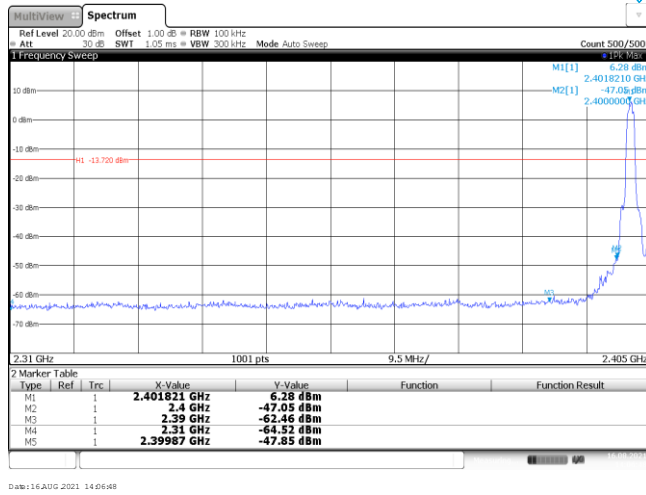
Test Item:	Band edge	Modulation type:	$\pi/4$ DQPSK																																										
<p>CH00 No hopping mode</p>	 <p>2 Marker Table</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.402105 GHz</td> <td>6.12 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4 GHz</td> <td>-47.74 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.39 GHz</td> <td>-62.22 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.31 GHz</td> <td>-63.76 dBm</td> <td></td> <td></td> </tr> <tr> <td>M5</td> <td>1</td> <td></td> <td>2.399965 GHz</td> <td>-48.25 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 16 AUG 2021 13:50:50</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.402105 GHz	6.12 dBm			M2	1		2.4 GHz	-47.74 dBm			M3	1		2.39 GHz	-62.22 dBm			M4	1		2.31 GHz	-63.76 dBm			M5	1		2.399965 GHz	-48.25 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.402105 GHz	6.12 dBm																																									
M2	1		2.4 GHz	-47.74 dBm																																									
M3	1		2.39 GHz	-62.22 dBm																																									
M4	1		2.31 GHz	-63.76 dBm																																									
M5	1		2.399965 GHz	-48.25 dBm																																									
<p>CH00 Hopping mode</p>	 <p>2 Marker Table</p> <table border="1"> <thead> <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> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.403814 GHz</td> <td>5.59 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4 GHz</td> <td>-49.51 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.39 GHz</td> <td>-62.82 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.31 GHz</td> <td>-63.68 dBm</td> <td></td> <td></td> </tr> <tr> <td>M5</td> <td>1</td> <td></td> <td>2.399775 GHz</td> <td>-49.91 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 16 AUG 2021 14:03:18</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.403814 GHz	5.59 dBm			M2	1		2.4 GHz	-49.51 dBm			M3	1		2.39 GHz	-62.82 dBm			M4	1		2.31 GHz	-63.68 dBm			M5	1		2.399775 GHz	-49.91 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.403814 GHz	5.59 dBm																																									
M2	1		2.4 GHz	-49.51 dBm																																									
M3	1		2.39 GHz	-62.82 dBm																																									
M4	1		2.31 GHz	-63.68 dBm																																									
M5	1		2.399775 GHz	-49.91 dBm																																									
<p>CH78 No hopping mode</p>	 <p>2 Marker Table</p> <table border="1"> <thead> <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> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.480165 GHz</td> <td>6.53 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.48335 GHz</td> <td>-56.53 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.5 GHz</td> <td>-62.91 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.483566 GHz</td> <td>-56.58 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 16 AUG 2021 13:55:41</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.480165 GHz	6.53 dBm			M2	1		2.48335 GHz	-56.53 dBm			M3	1		2.5 GHz	-62.91 dBm			M4	1		2.483566 GHz	-56.58 dBm									
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.480165 GHz	6.53 dBm																																									
M2	1		2.48335 GHz	-56.53 dBm																																									
M3	1		2.5 GHz	-62.91 dBm																																									
M4	1		2.483566 GHz	-56.58 dBm																																									

CH78
Hopping mode

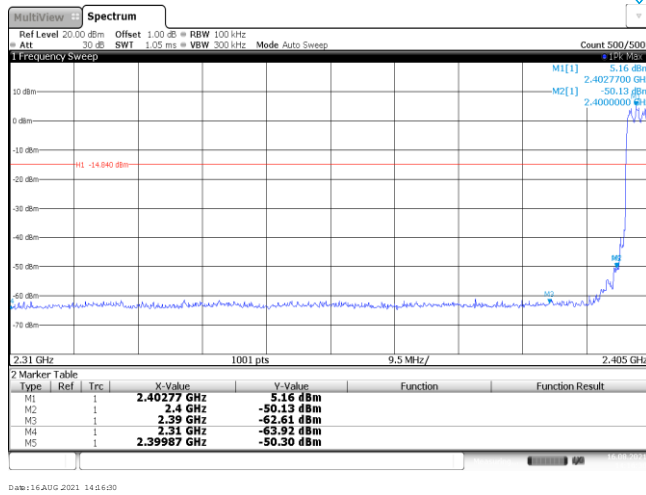


Test Item:	Band edge	Modulation type:	8DPSK
-------------------	------------------	-------------------------	--------------

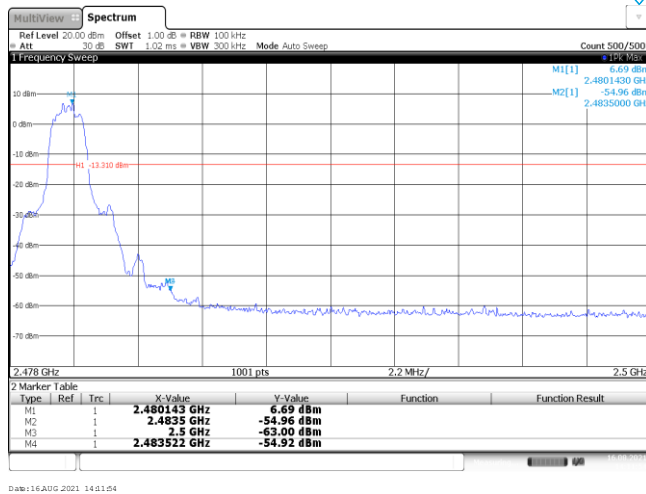
CH00
No hopping mode



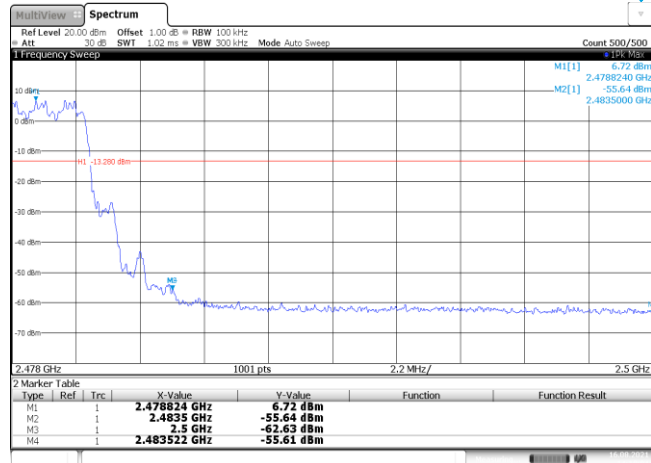
CH00
Hopping mode



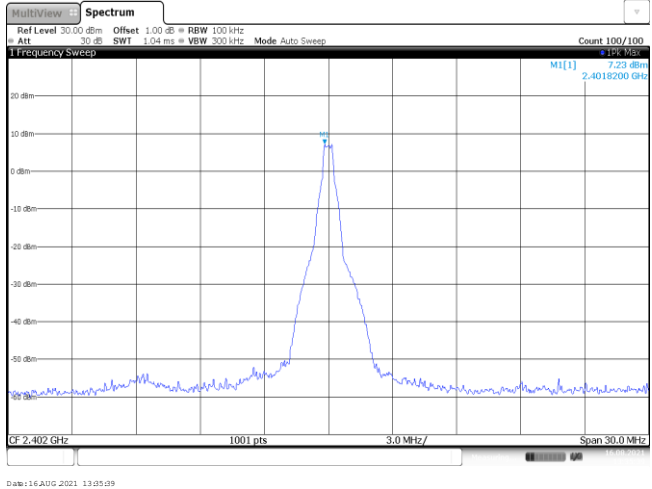
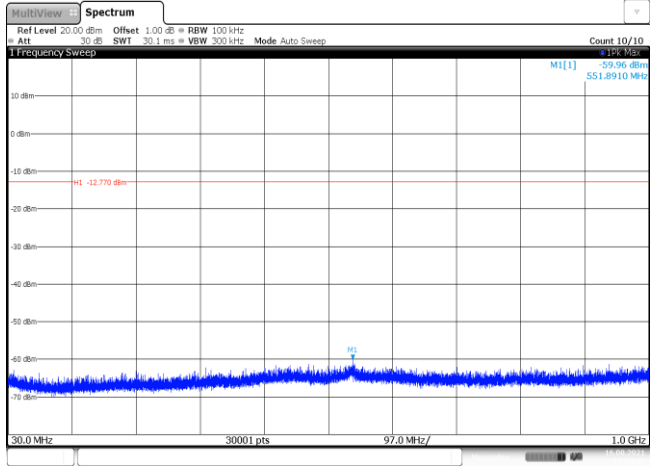
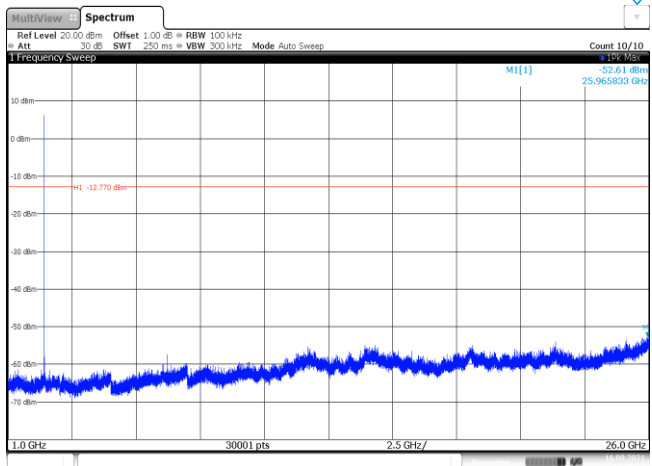
CH78
No hopping mode



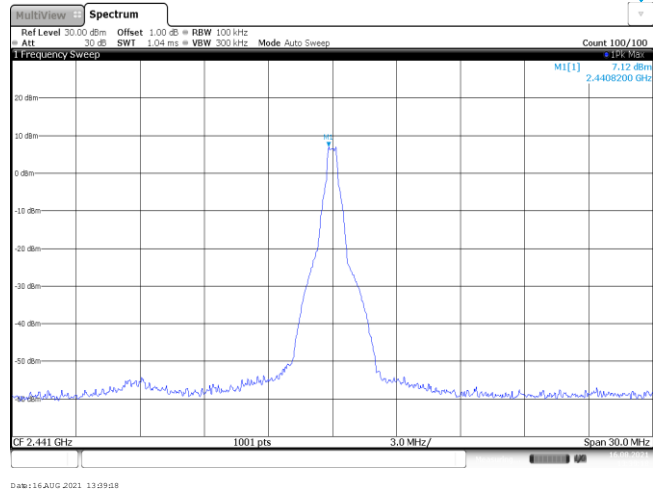
CH78
Hoppig mode



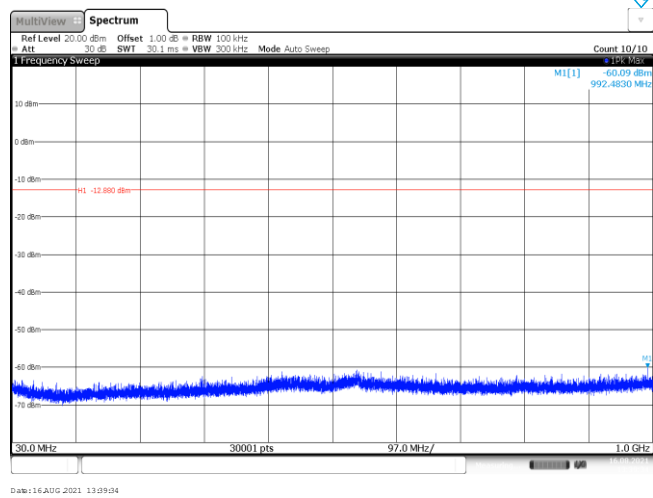
Date: 16.AUG.2021 14:18:24

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

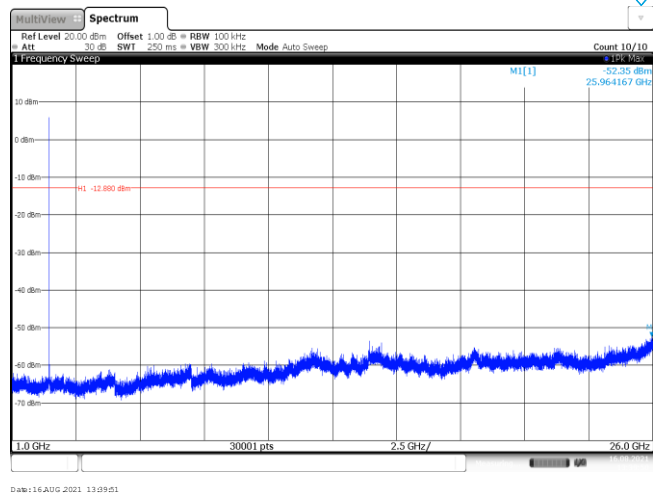
CH39
Reference level



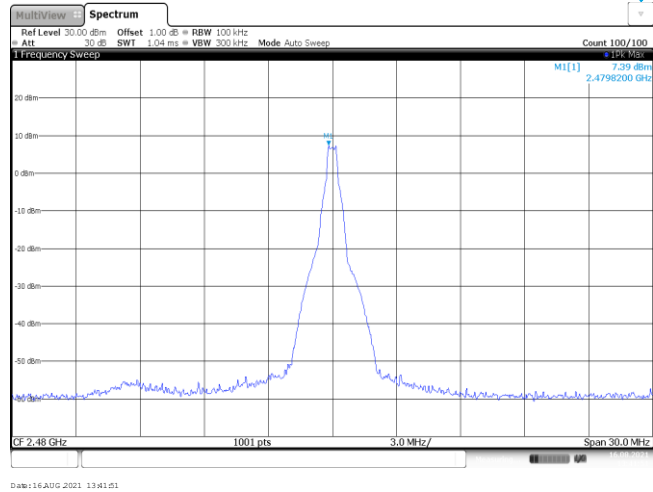
CH39
30MHz~1000MHz



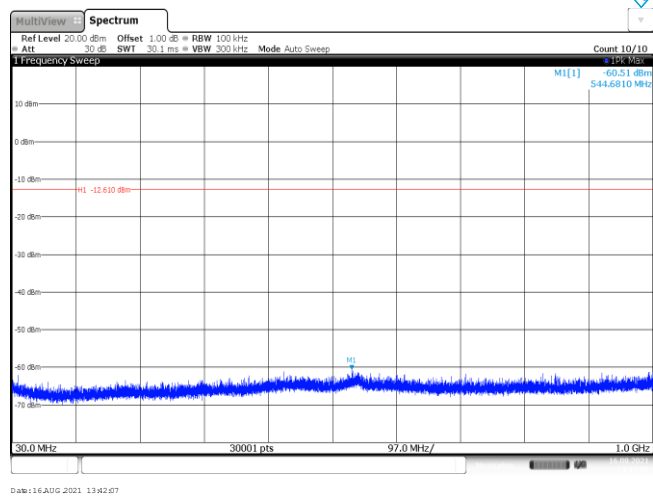
CH39
1GHz~26GHz



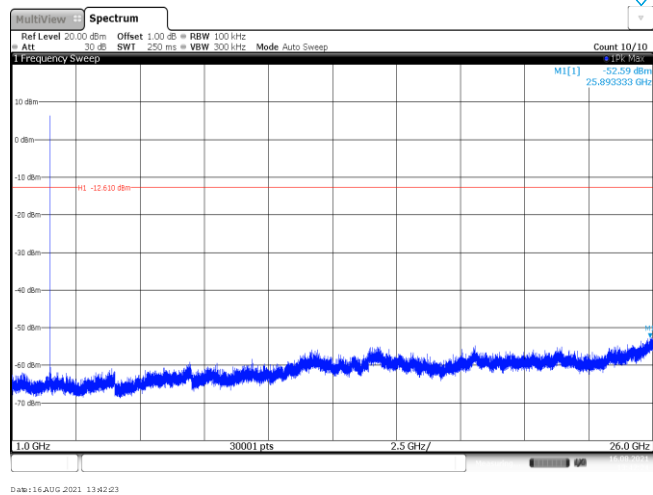
CH78
Reference level

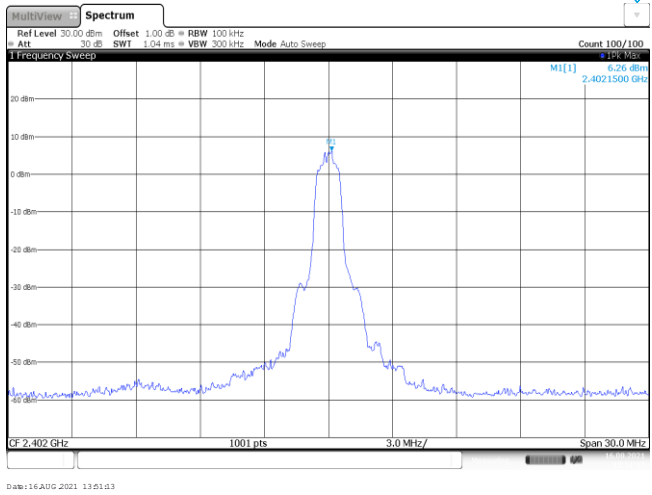
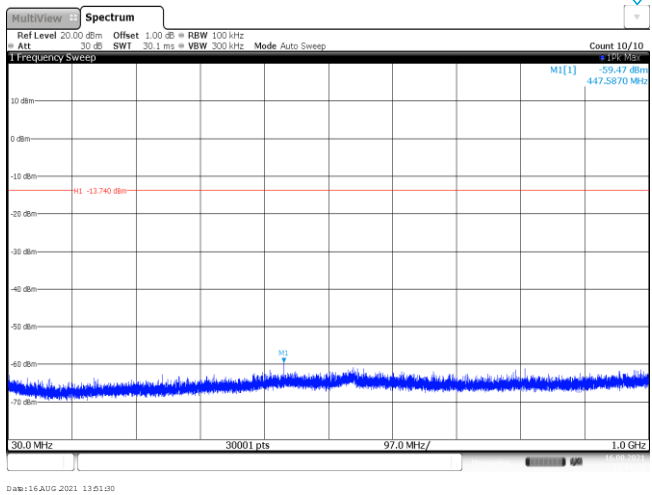
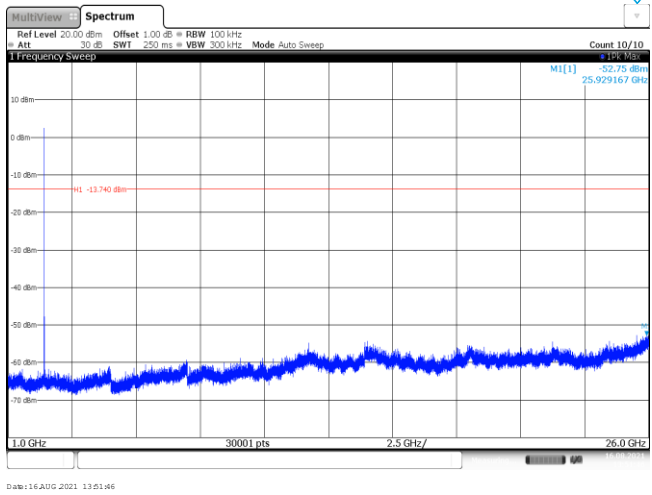


CH78
30MHz~1000MHz

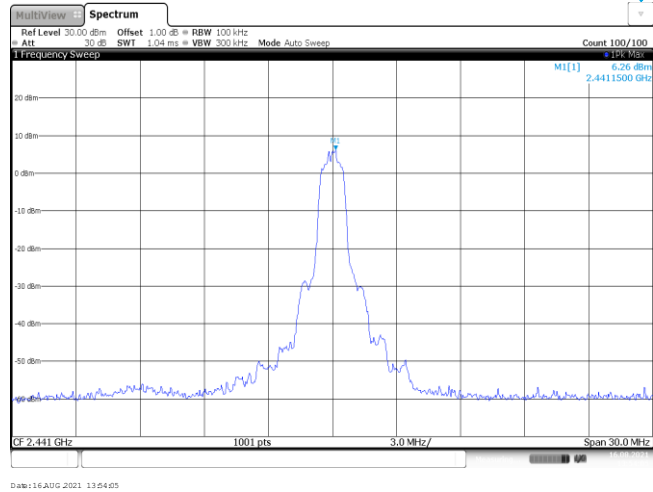


CH78
1GHz~26GHz

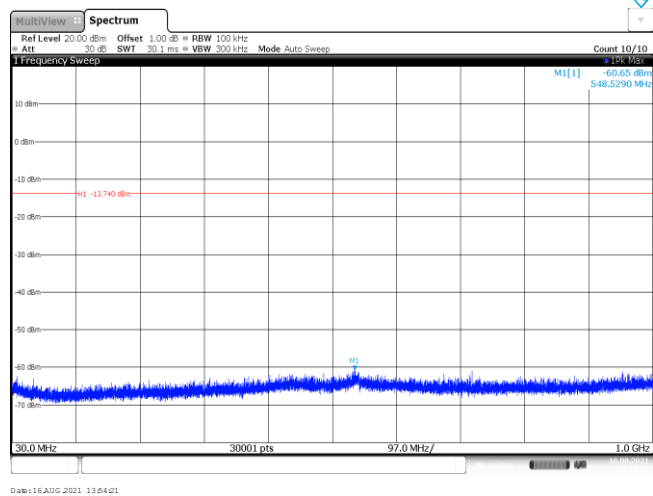


Test Item:	Spurious Emission	Modulation type:	$\pi/4$ DQPSK
<p>CH00 Reference level</p>			
<p>CH00 30MHz~1000MHz</p>			
<p>CH00 1GHz~26GHz</p>			

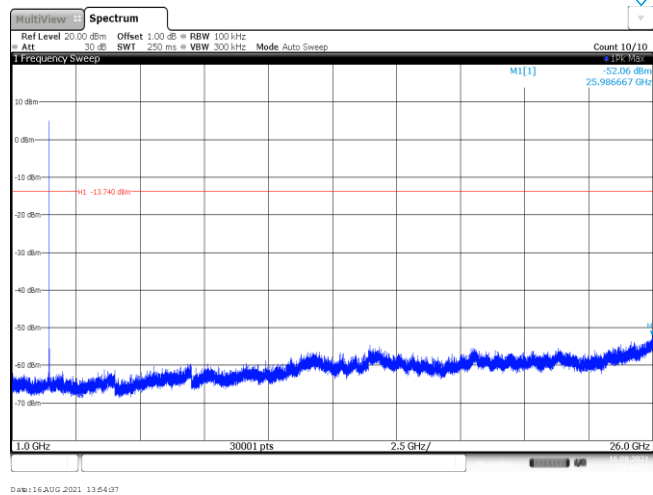
CH39
Reference level



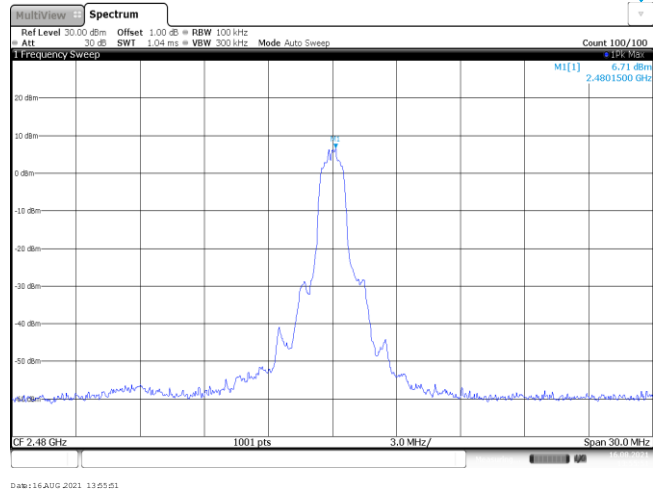
CH39
30MHz~1000MHz



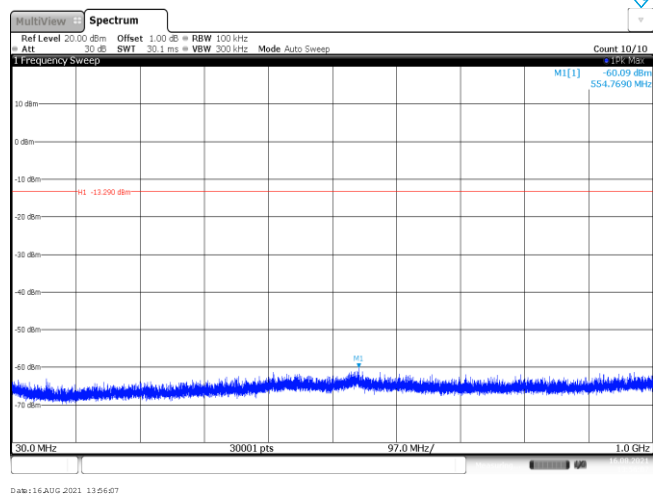
CH39
1GHz~26GHz



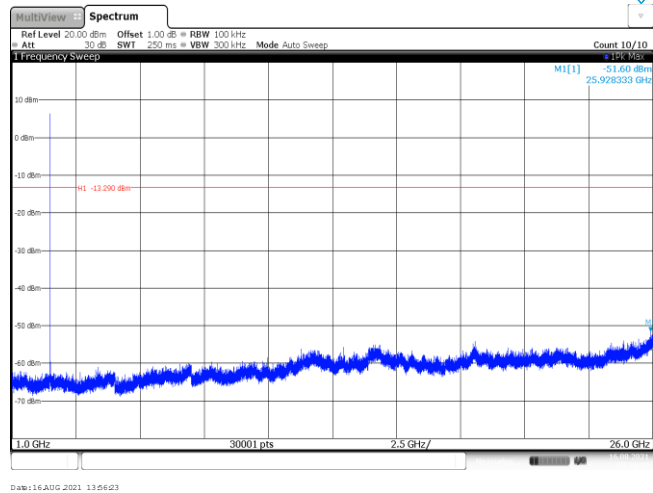
CH78
Reference level

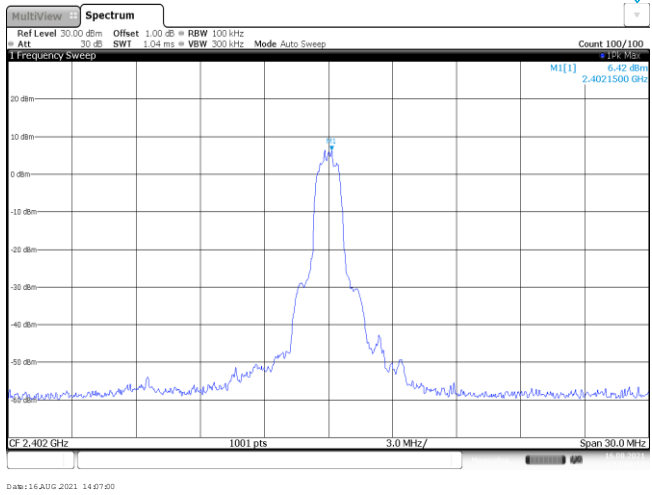
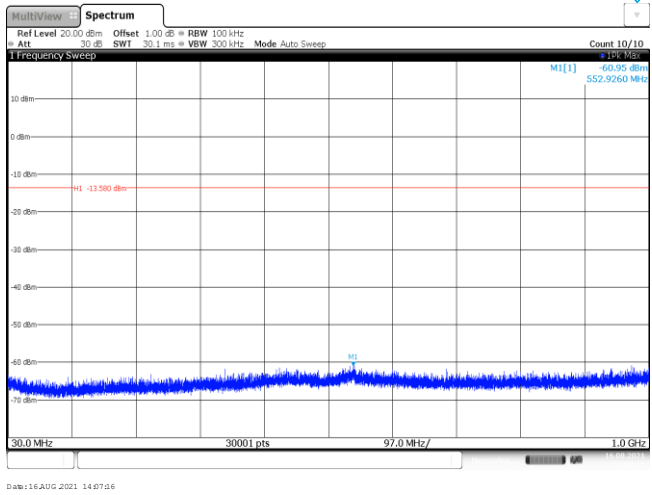
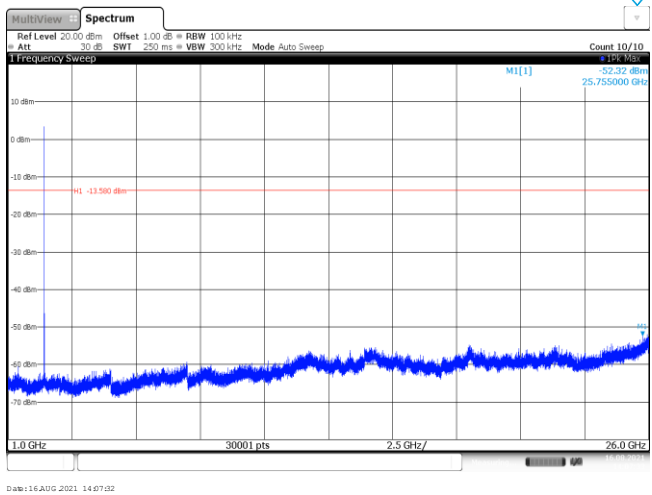


CH78
30MHz~1000MHz

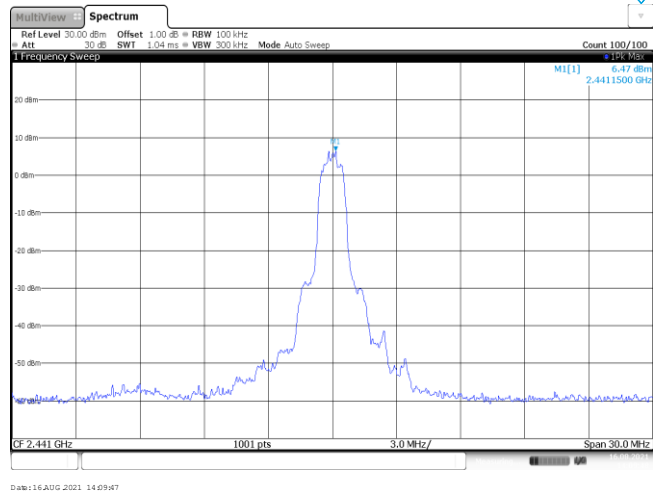


CH78
1GHz~26GHz

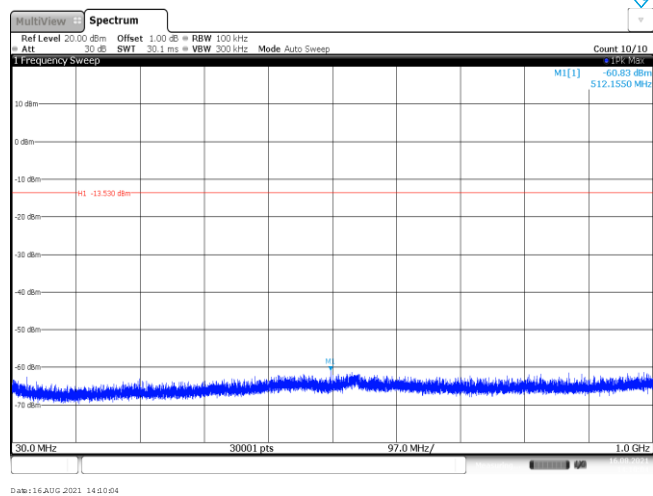


Test Item:	Spurious Emission	Modulation type:	8DPSK
<p>CH00 Reference level</p>	 <p>MultiView Spectrum Ref Level 30.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 1.04 ms VBW 300 kHz Mode Auto Sweep Count 100/100 Frequency Sweep M1[1] 6.42 dBm 2.4021500 GHz CF 2.402 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 16 AUG 2021 14:07:00</p>		
<p>CH00 30MHz~1000MHz</p>	 <p>MultiView Spectrum 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 Frequency Sweep M1[1] -60.95 dBm S32.9260 MHz M1 -13.980 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 16 AUG 2021 14:07:56</p>		
<p>CH00 1GHz~26GHz</p>	 <p>MultiView Spectrum 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 Frequency Sweep M1[1] -52.22 dBm 25.755000 GHz M1 -13.980 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 16 AUG 2021 14:07:52</p>		

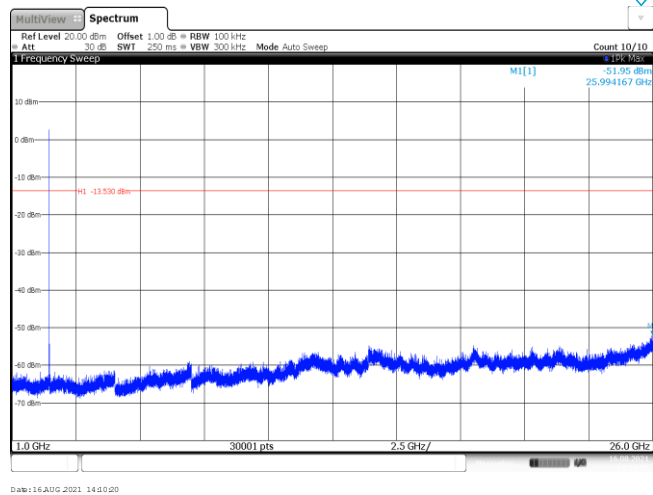
CH39
Reference level



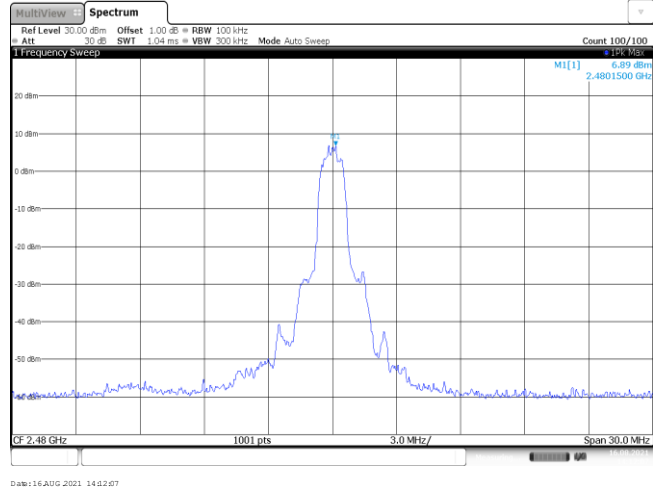
CH39
30MHz~1000MHz



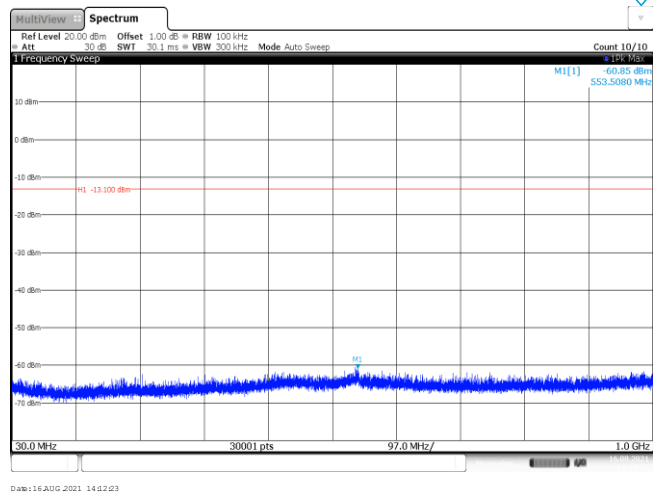
CH39
1GHz~26GHz



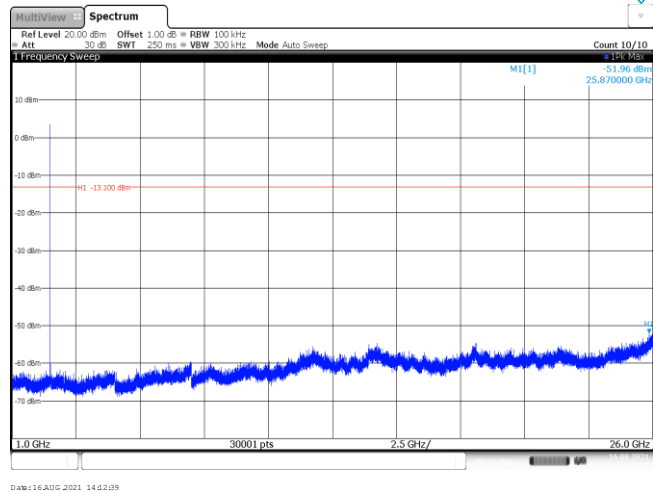
CH78
Reference level



CH78
30MHz~1000MHz



CH78
1GHz~26GHz



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