

APPENDIX REPORT

Project No.	SHT2205032403EW	Radio Specification	Bluetooth EDR
Test sample No.	YPHT22050324006	Model No.	P60
Start test date	2022-05-26	Finish date	2022-05-27
Temperature	24.7°C	Humidity	37%
Test Engineer	Xiaoqin Li	Auditor	Xiaodong Zhu

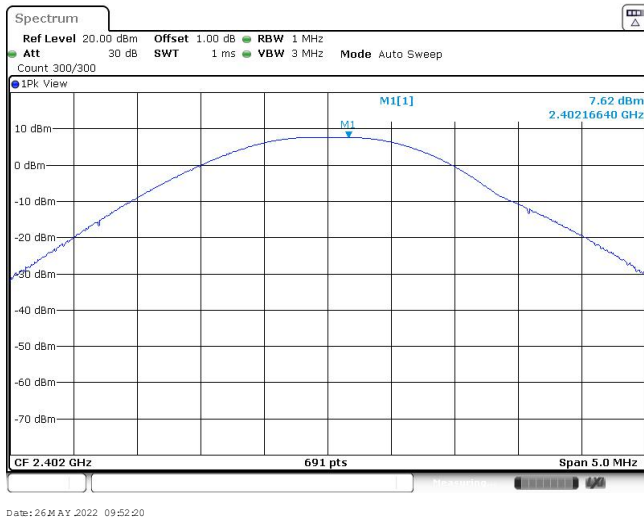
Appendix clause	Test item	Result
A	Peak Output Power	PASS
B	20 dB Bandwidth	PASS
C	99% Occupied Bandwidth	PASS
D	Carrier Frequencies Separation	PASS
E	Hopping Channel Number	PASS
F	Dwell Time	PASS
G	Duty Cycle Correction Factor (DCCF)	PASS
H	Band edge and Spurious Emissions(coducted)	PASS

Appendix A: Peak Output Power

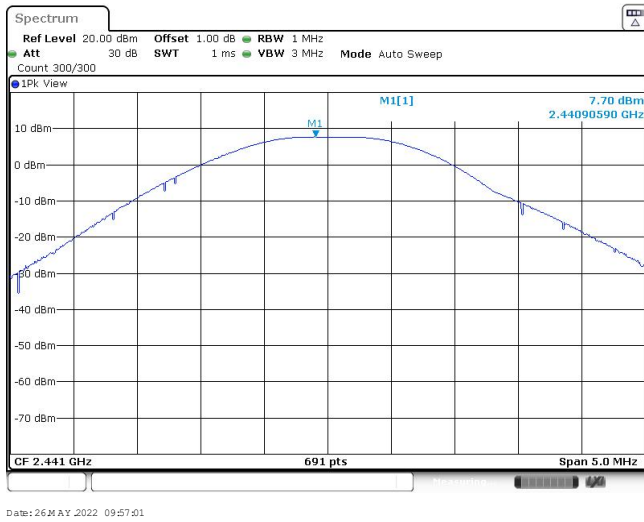
Modulation type	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	00	7.62	7.61	≤ 30.00	Pass
	39	7.70	7.65		
	78	7.08	7.01		
π/4DQPSK	00	8.36	6.96	≤ 21.00	Pass
	39	8.94	7.28		
	78	8.43	7.07		
8DPSK	00	8.84	7.16	≤ 21.00	Pass
	39	9.37	7.30		
	78	8.88	7.20		

Modulation Type: GFSK

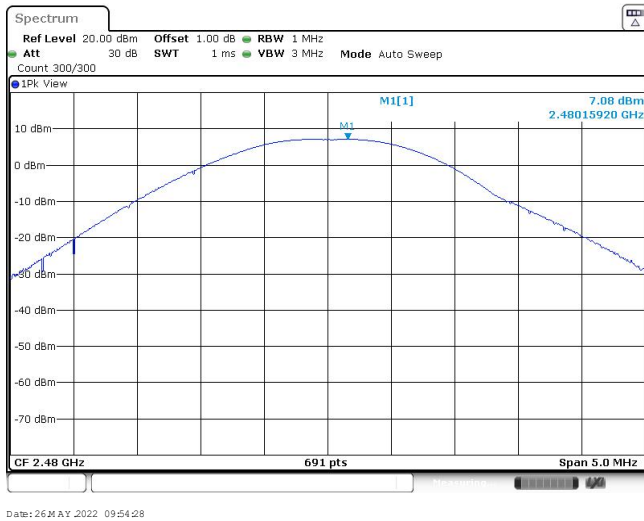
CH00



CH39



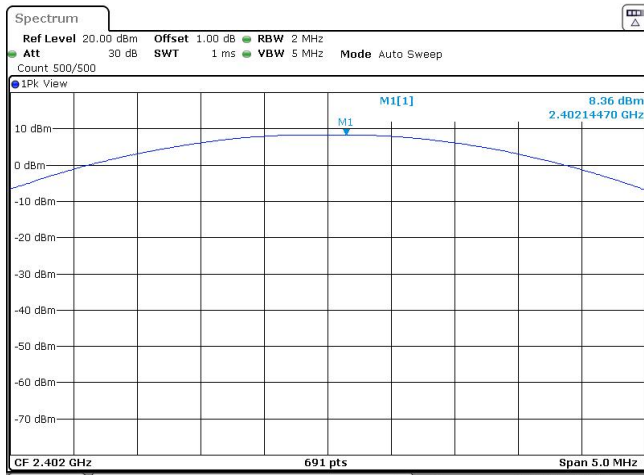
CH78



Modulation Type:

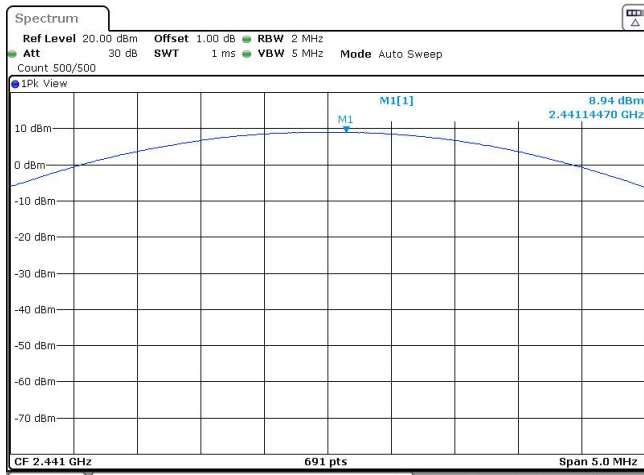
$\pi/4$ DQPSK

CH00



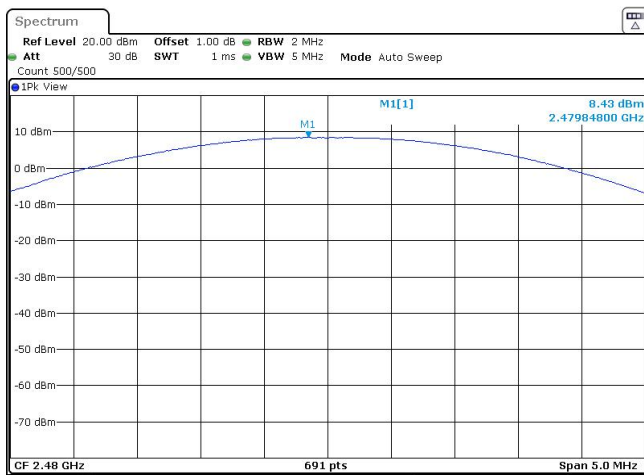
Date: 26 MAY 2022 10:05:02

CH39



Date: 26 MAY 2022 10:09:06

CH78

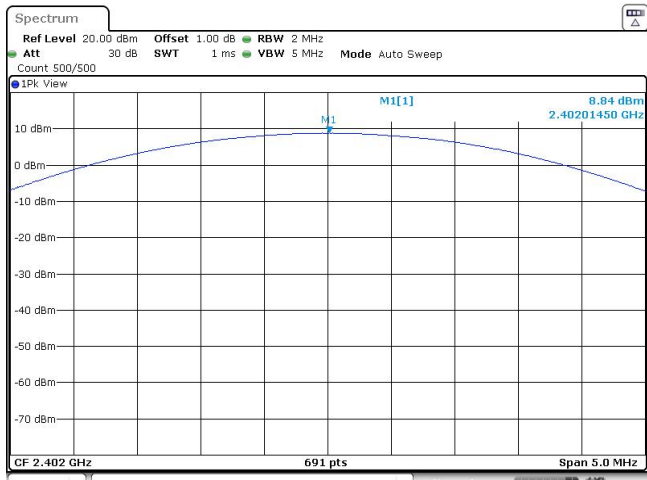


Date: 26 MAY 2022 10:07:06

Modulation Type:

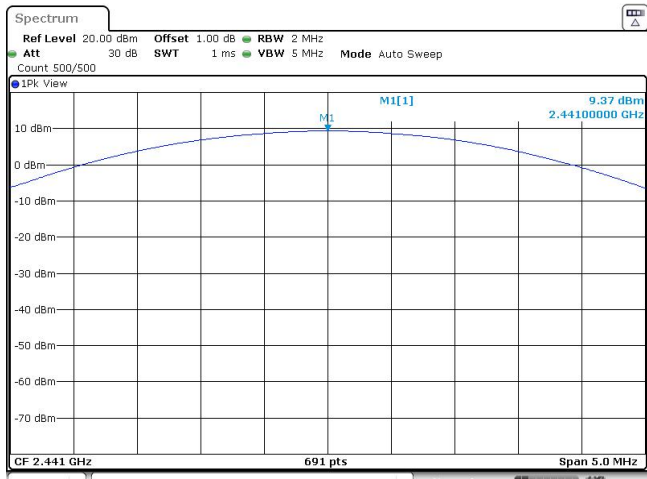
8DPSK

CH00



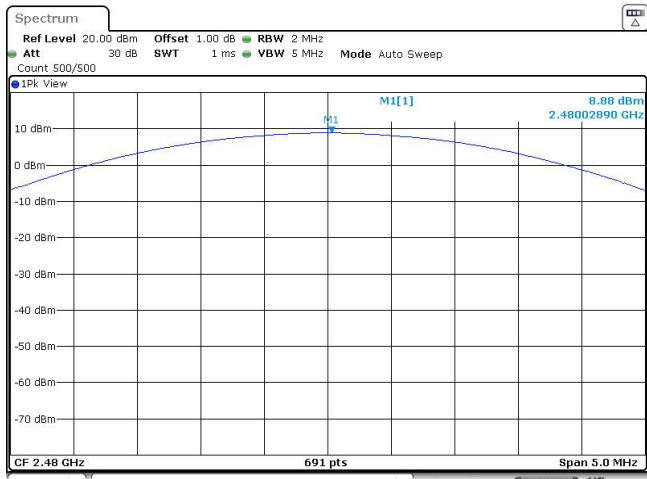
Date: 26 MAY 2022 10:14:33

CH39



Date: 26 MAY 2022 10:18:37

CH78



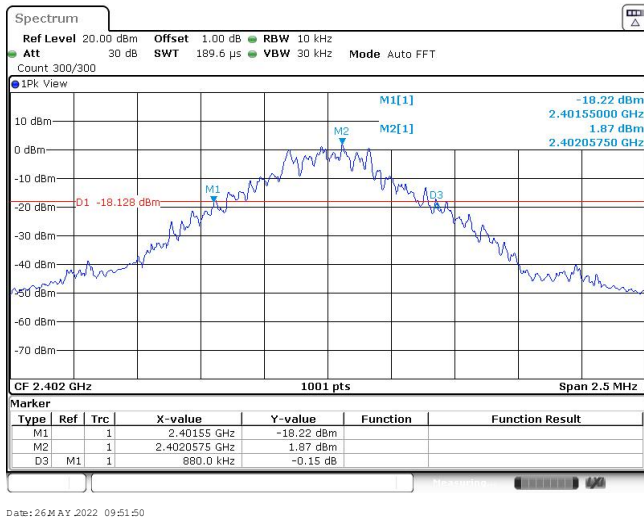
Date: 26 MAY 2022 10:16:38

Appendix B : 20 dB Bandwidth

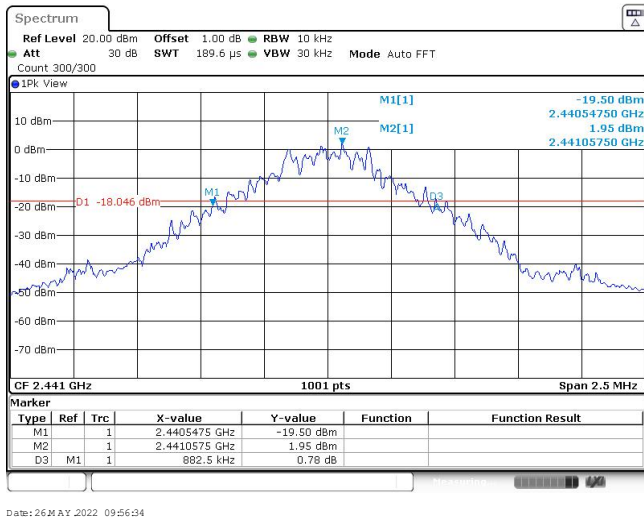
Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	880.00	-	Pass
	39	882.50		
	78	922.50		
$\pi/4$ DQPSK	00	1292.50	-	Pass
	39	1292.50		
	78	1292.50		
8DPSK	00	1297.50	-	Pass
	39	1297.50		
	78	1297.50		

Modulation Type: GFSK

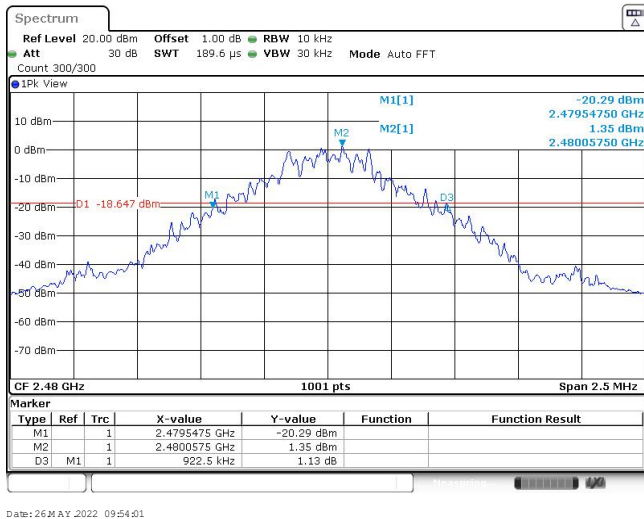
CH00



CH39

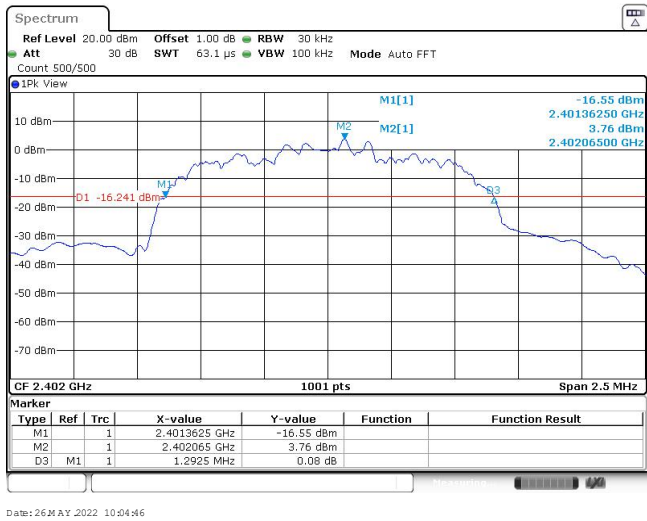


CH78



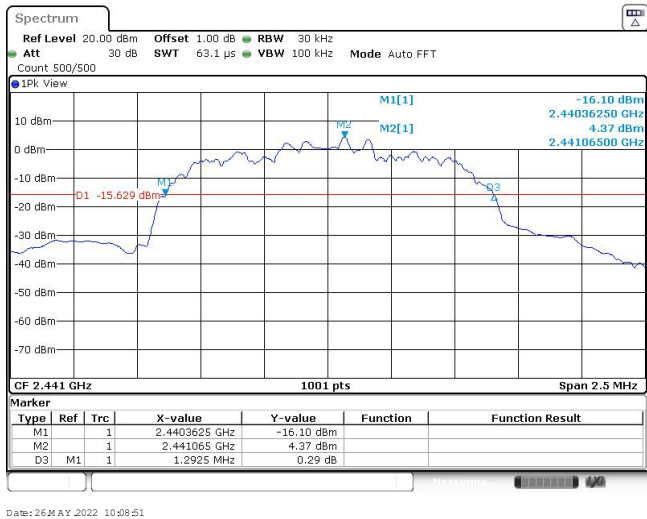
Modulation Type: **$\pi/4$ DQPSK**

CH00



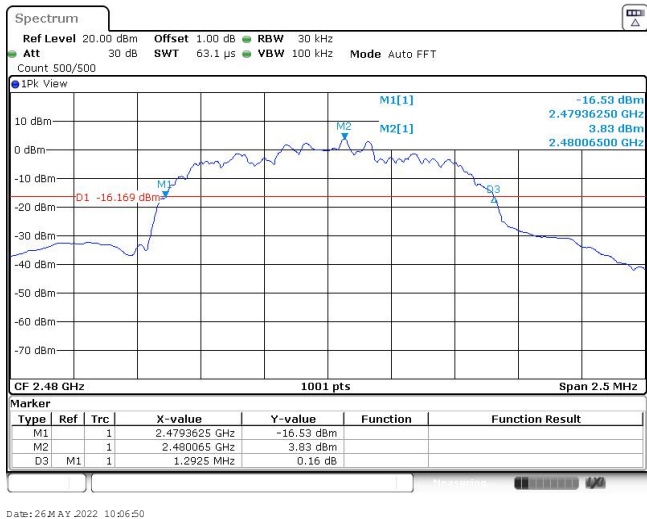
Date: 26 MAY 2022 10:04:36

CH39



Date: 26 MAY 2022 10:08:51

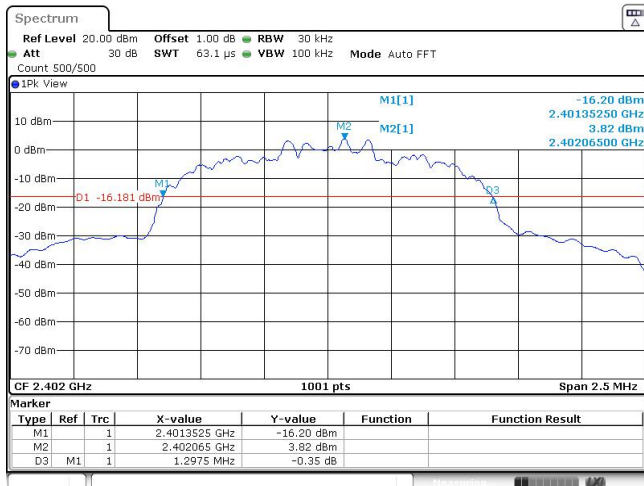
CH78



Date: 26 MAY 2022 10:06:50

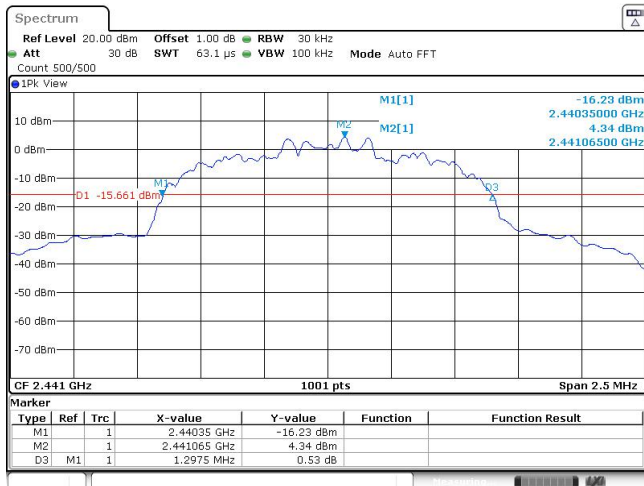
Modulation Type: 8DPSK

CH00



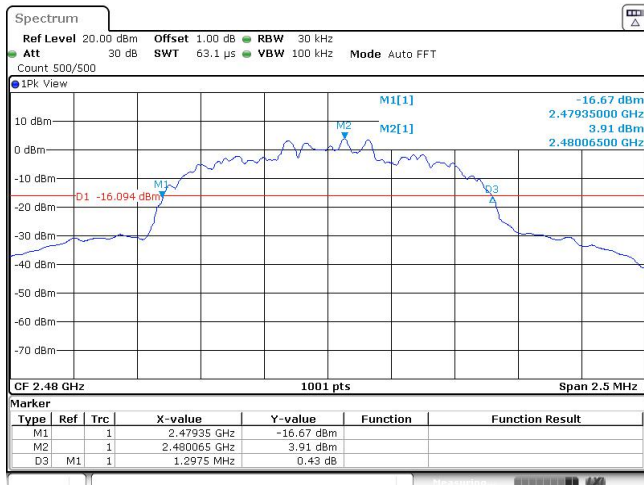
Date: 26 MAY 2022 10:14:17

CH39



Date: 26 MAY 2022 10:18:21

CH78



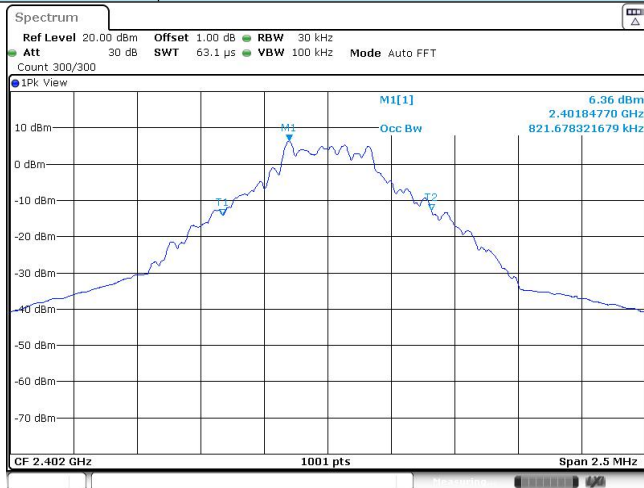
Date: 26 MAY 2022 10:16:22

Appendix C: 99% Occupied Bandwidth

Modulation type	Channel	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.82	-	Pass
	39	0.82		
	78	0.82		
$\pi/4$ DQPSK	00	1.18	-	Pass
	39	1.18		
	78	1.18		
8DPSK	00	1.17	-	Pass
	39	1.18		
	78	1.17		

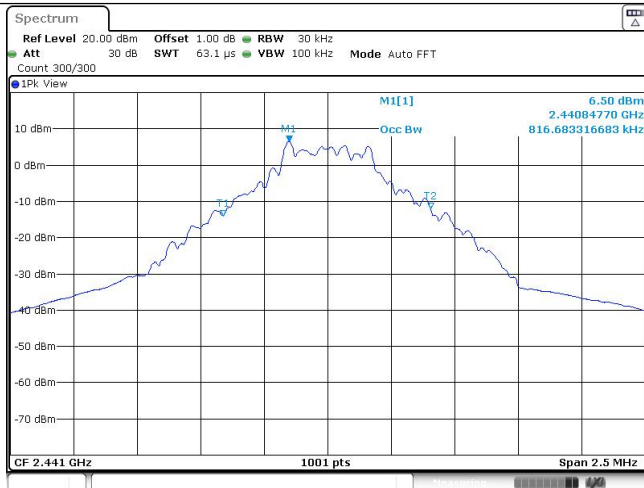
Modulation Type: GFSK

CH00



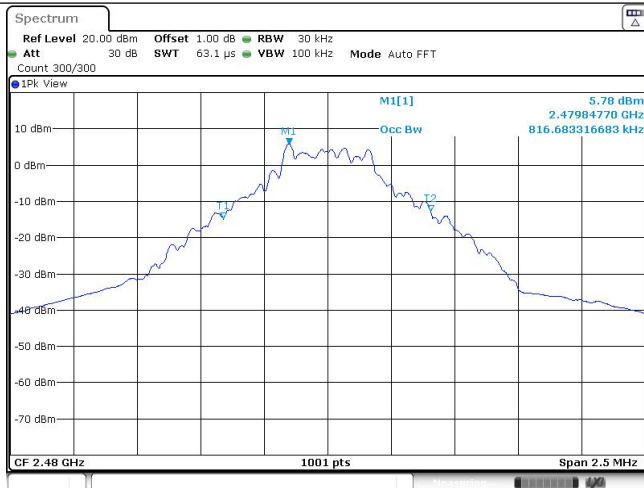
Date: 26 MAY 2022 09:51:58

CH39



Date: 26 MAY 2022 09:56:11

CH78



Date: 26 MAY 2022 09:54:09

Modulation Type: $\pi/4$ DQPSK	
CH00	<p>Date: 26 MAY 2022 10:04:53</p>
CH39	<p>Date: 26 MAY 2022 10:08:58</p>
CH78	<p>Date: 26 MAY 2022 10:06:58</p>

Modulation Type:		8DPSK
CH00	<p> Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 30 kHz Att 30 dB SWT 63.1 μs VBW 100 kHz Mode Auto FFT Count 500/500 1Pk View 10 dBm 3.80 dBm 0 dBm 2.40206490 GHz -10 dBm 1.173826174 MHz -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm CF 2.402 GHz 1001 pts Span 2.5 MHz Date: 26 MAY 2022 10:14:25 </p>	
CH39	<p> Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 30 kHz Att 30 dB SWT 63.1 μs VBW 100 kHz Mode Auto FFT Count 500/500 1Pk View 10 dBm 4.39 dBm 0 dBm 2.44106490 GHz -10 dBm 1.176323676 MHz -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm CF 2.441 GHz 1001 pts Span 2.5 MHz Date: 26 MAY 2022 10:18:29 </p>	
CH78	<p> Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 30 kHz Att 30 dB SWT 63.1 μs VBW 100 kHz Mode Auto FFT Count 500/500 1Pk View 10 dBm 3.89 dBm 0 dBm 2.48006490 GHz -10 dBm 1.173826174 MHz -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm CF 2.48 GHz 1001 pts Span 2.5 MHz Date: 26 MAY 2022 10:16:29 </p>	

Appendix D: Carrier Frequencies Separation

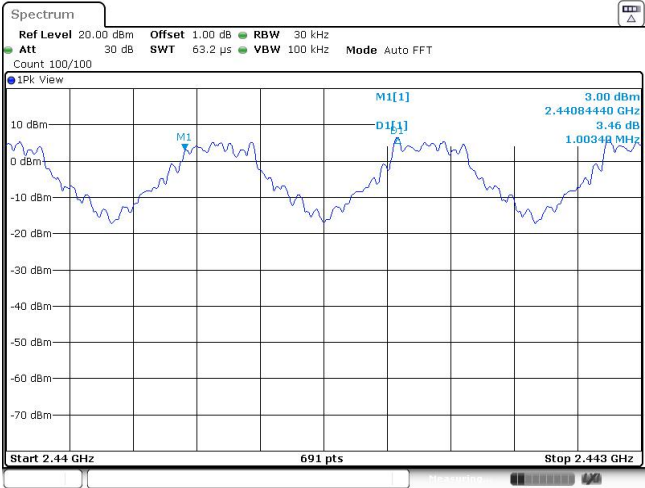
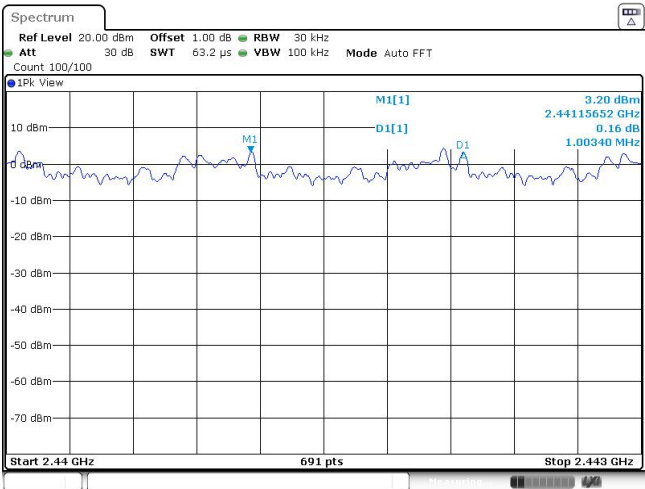
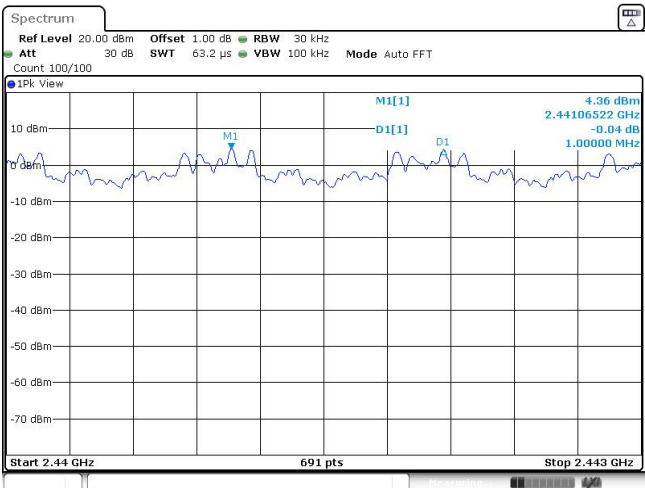
Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (kHz) *	Result
GFSK	39	1.00	≥922.50	Pass
π/4DQPSK	39	1.00	≥861.67	Pass
8DPSK	39	1.00	≥865.00	Pass

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.

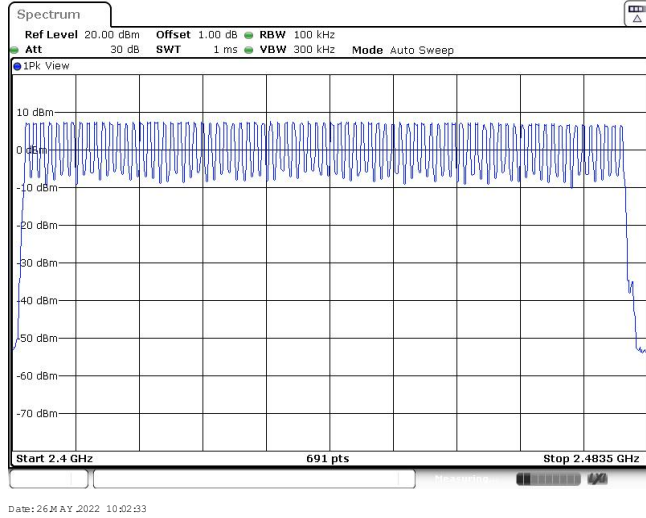
8DPSK limit = 2/3 * The maximum 20 dB Bandwidth for 8DPSK modulation on the appendix B

<p style="text-align: center;">GFSK</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 30 kHz Att 30 dB SWT 63.2 μs VBW 100 kHz Mode Auto FFT Count 100/100 1PK View M1[1] 3.00 dBm 2.44084440 GHz D1[1] 3.46 dB 1.00348 MHz Start 2.44 GHz 691 pts Stop 2.443 GHz Date: 26 MAY 2022 10:01:23</p>
<p style="text-align: center;">$\pi/4$DQPSK</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 30 kHz Att 30 dB SWT 63.2 μs VBW 100 kHz Mode Auto FFT Count 100/100 1PK View M1[1] 3.20 dBm 2.44115652 GHz D1[1] 0.16 dB 1.00340 MHz Start 2.44 GHz 691 pts Stop 2.443 GHz Date: 26 MAY 2022 10:11:51</p>
<p style="text-align: center;">8DPSK</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 30 kHz Att 30 dB SWT 63.2 μs VBW 100 kHz Mode Auto FFT Count 100/100 1PK View M1[1] 4.36 dBm 2.44106522 GHz D1[1] -0.04 dB 1.00000 MHz Start 2.44 GHz 691 pts Stop 2.443 GHz Date: 26 MAY 2022 10:21:44</p>

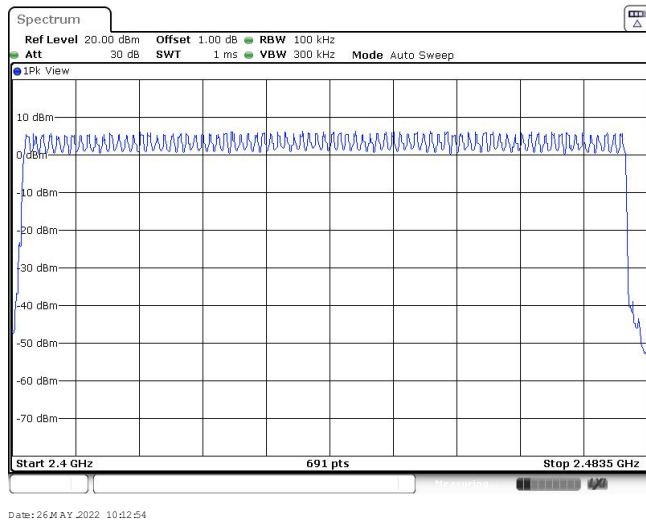
Appendix E: Hopping Channel Number

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

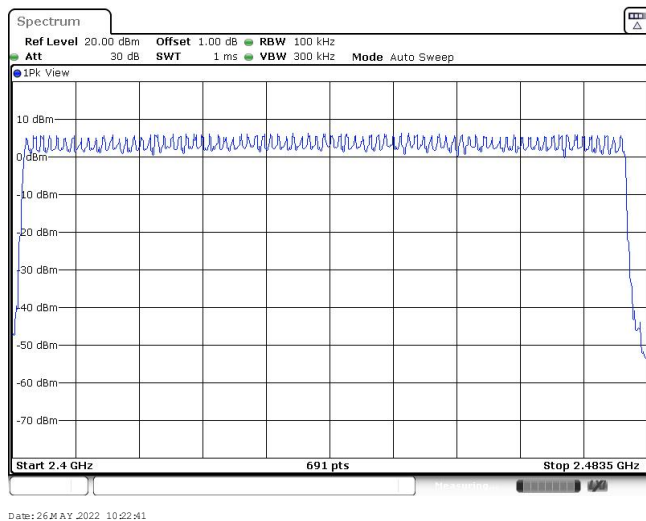
GFSK



$\pi/4$ DQPSK



8DPSK

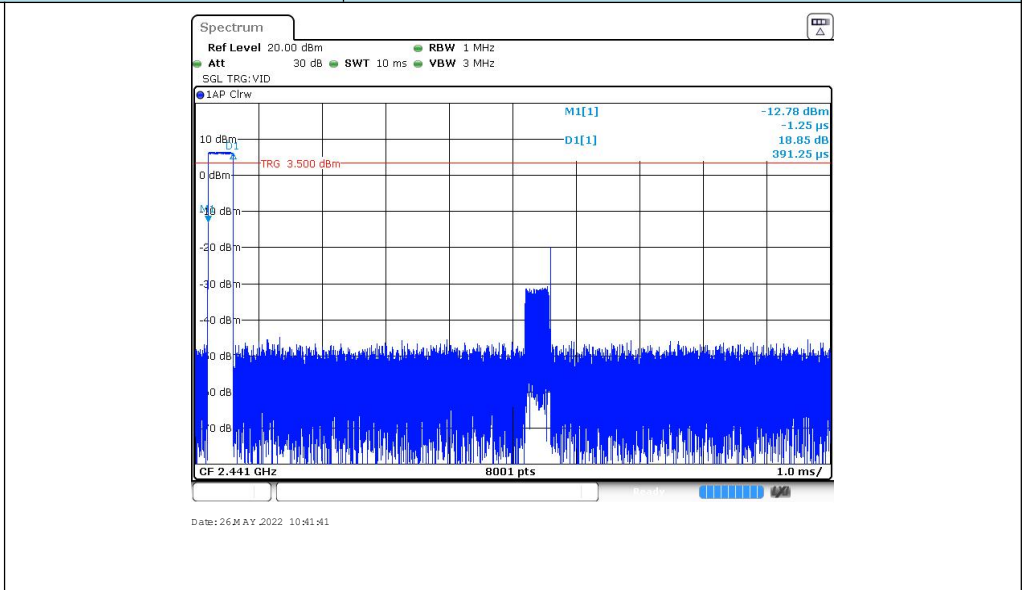


Appendix F: Dwell Time

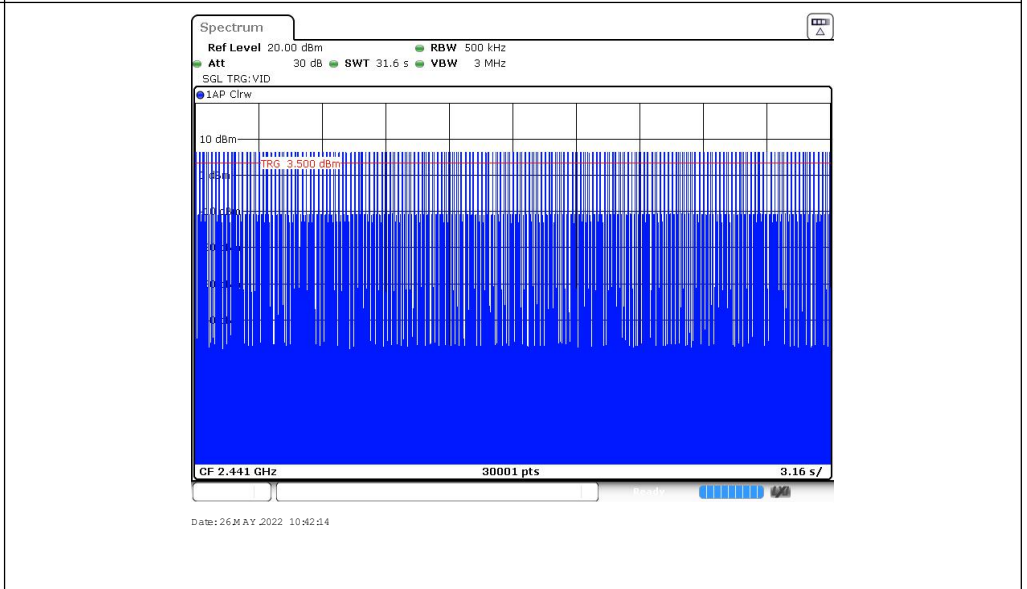
Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.39	321	0.13	≤ 0.40	Pass
	DH3	1.65	171	0.28		
	DH5	2.89	100	0.29		
π/4DQPSK	2DH1	0.38	321	0.12	≤ 0.40	Pass
	2DH3	1.64	165	0.27		
	2DH5	2.88	111	0.32		
8DPSK	3DH1	0.38	320	0.12	≤ 0.40	Pass
	3DH3	1.63	159	0.26		
	3DH5	2.88	93	0.27		

Modulation Type: GFSK

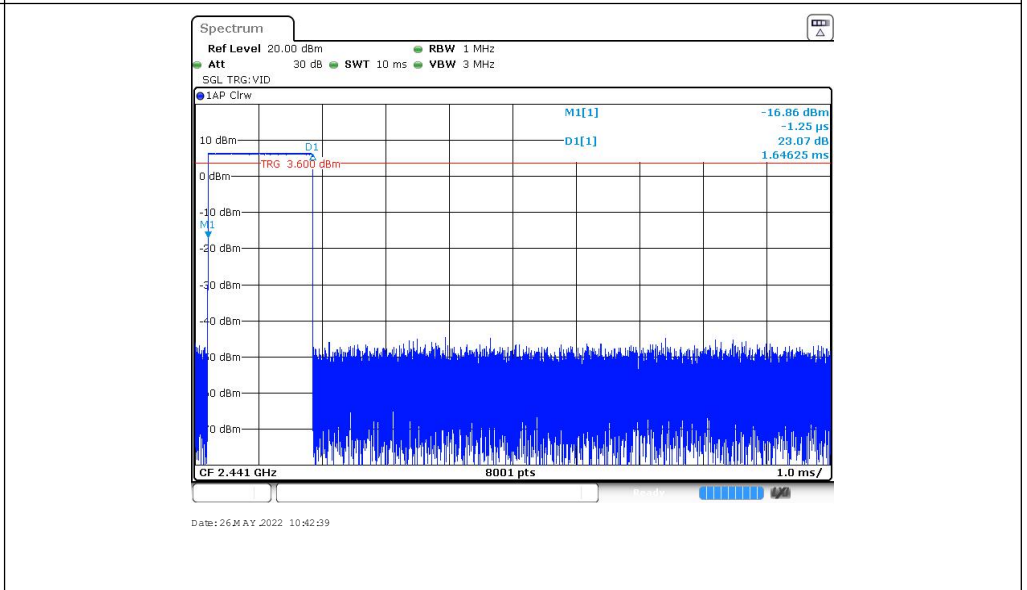
DH1
Burst width



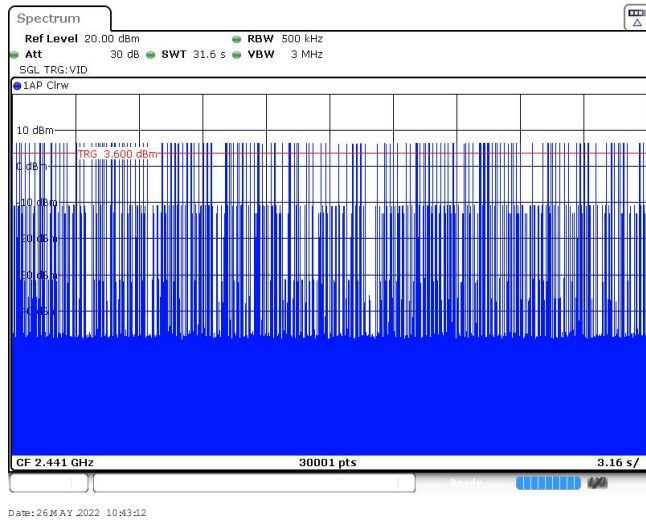
DH1
Burst number



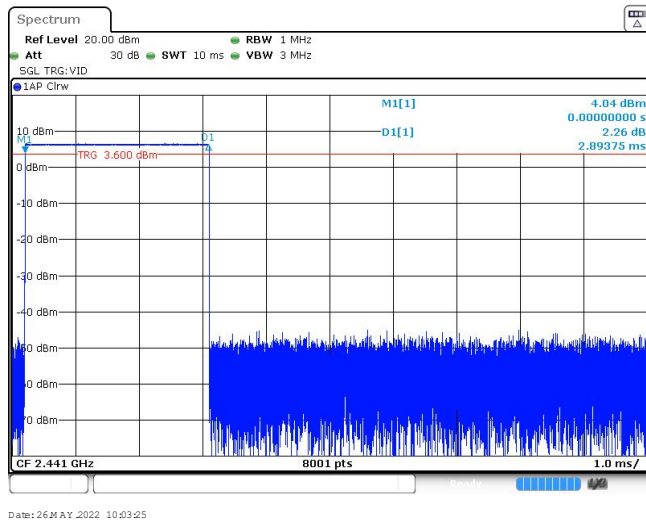
DH3
Burst width



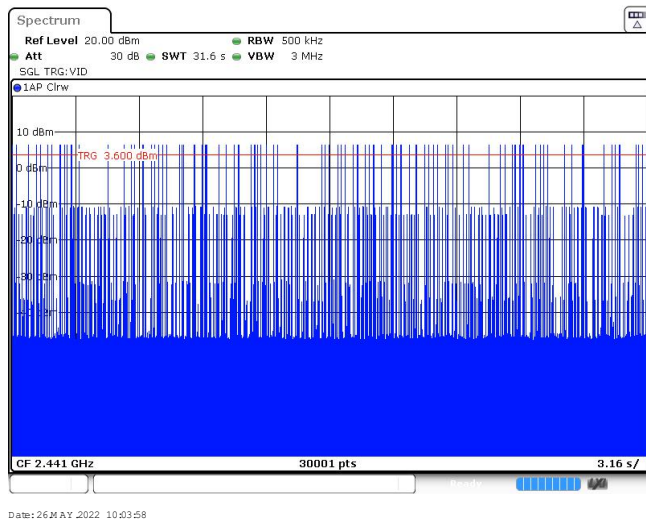
DH3
Burst number



DH5
Burst width

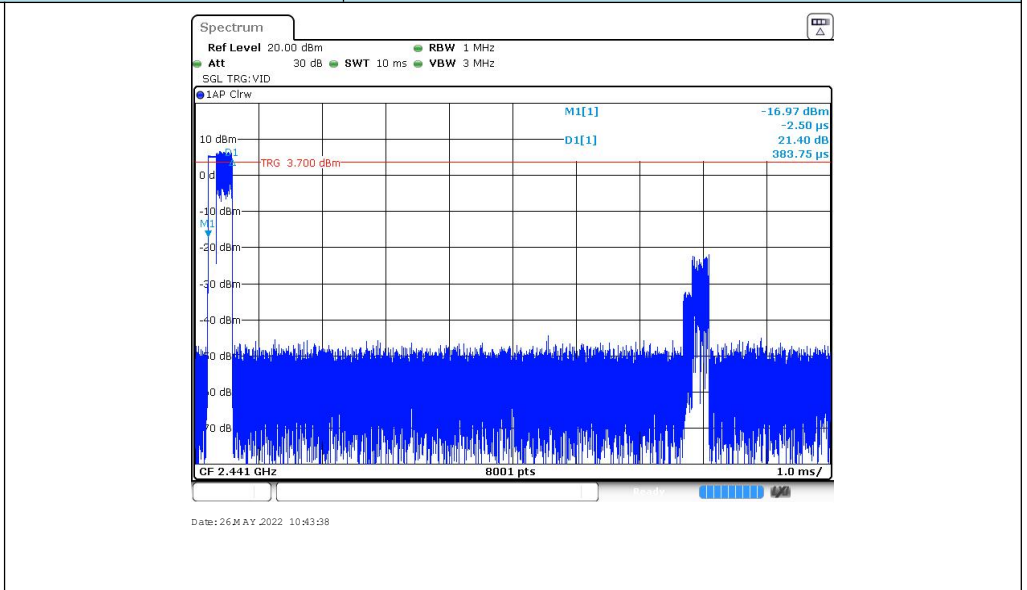


DH5
Burst number

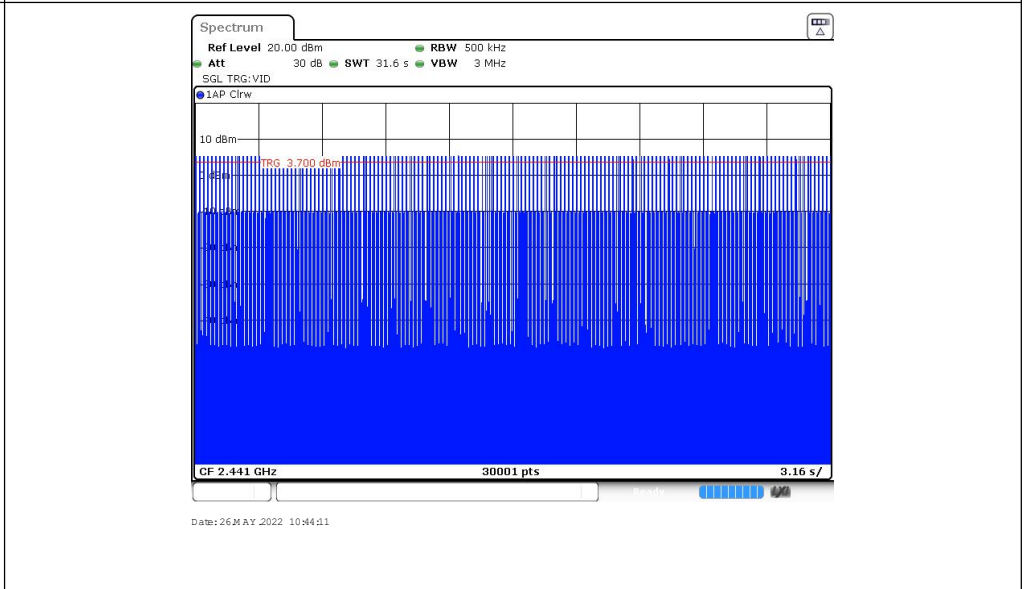


Modulation Type: $\pi/4$ DQPSK

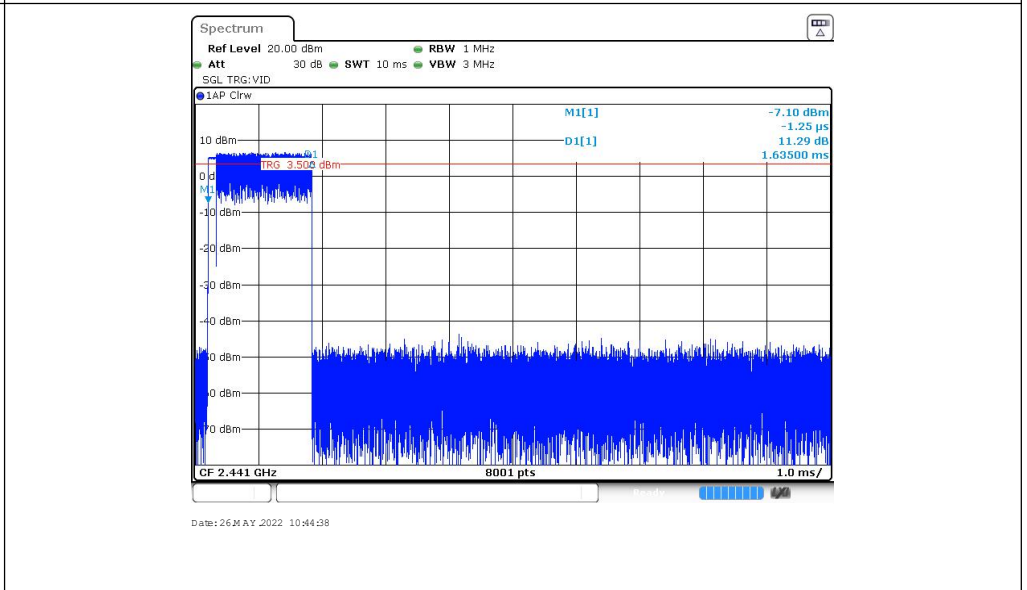
2DH1
Burst width



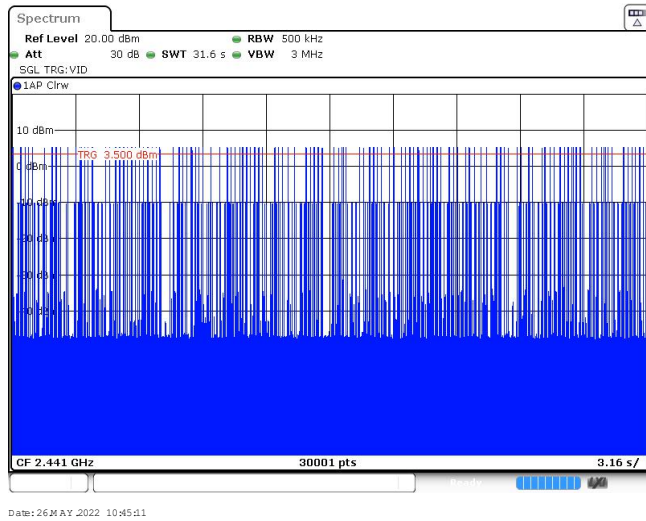
2DH1
Burst number



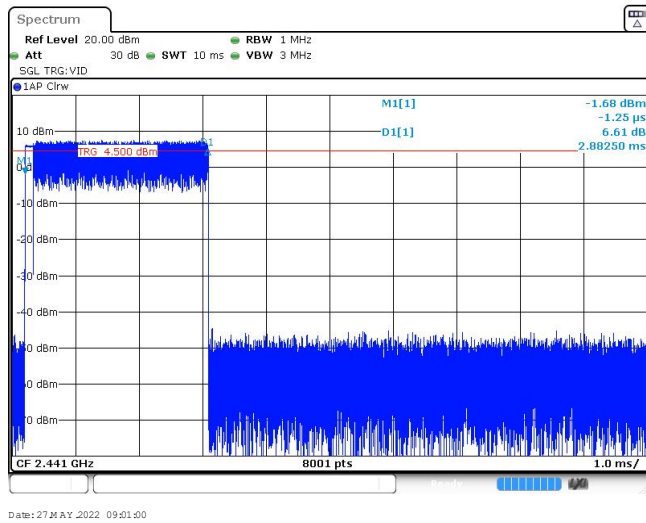
2DH3
Burst width



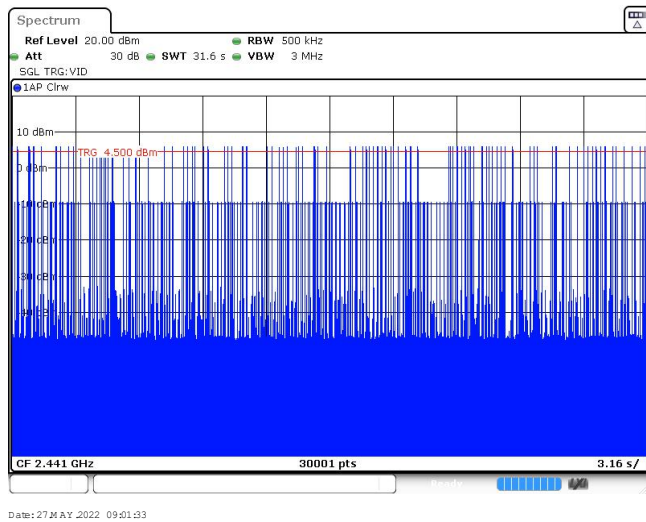
2DH3
Burst number



2DH5
Burst width

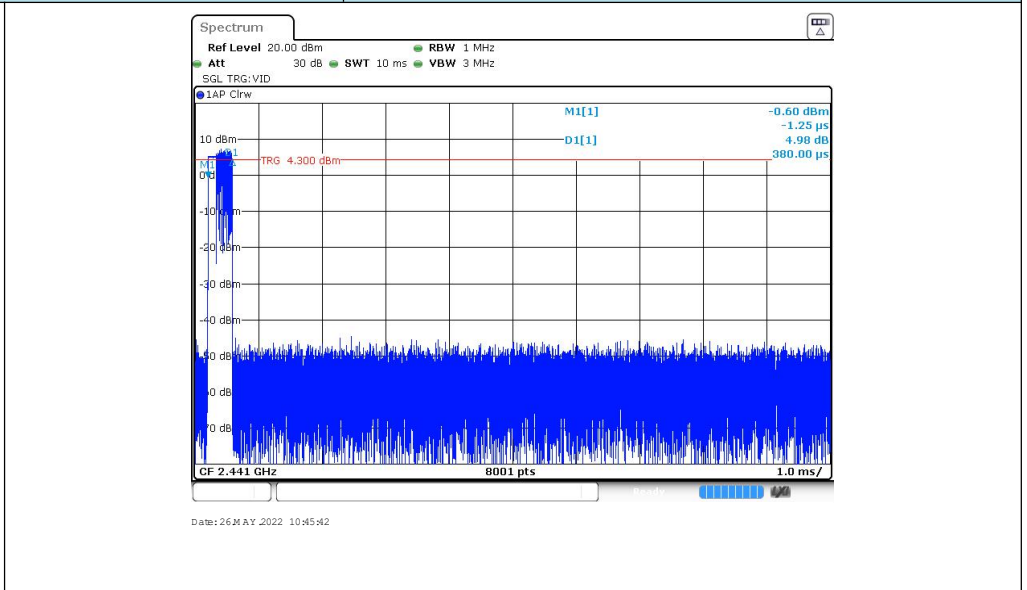


2DH5
Burst number

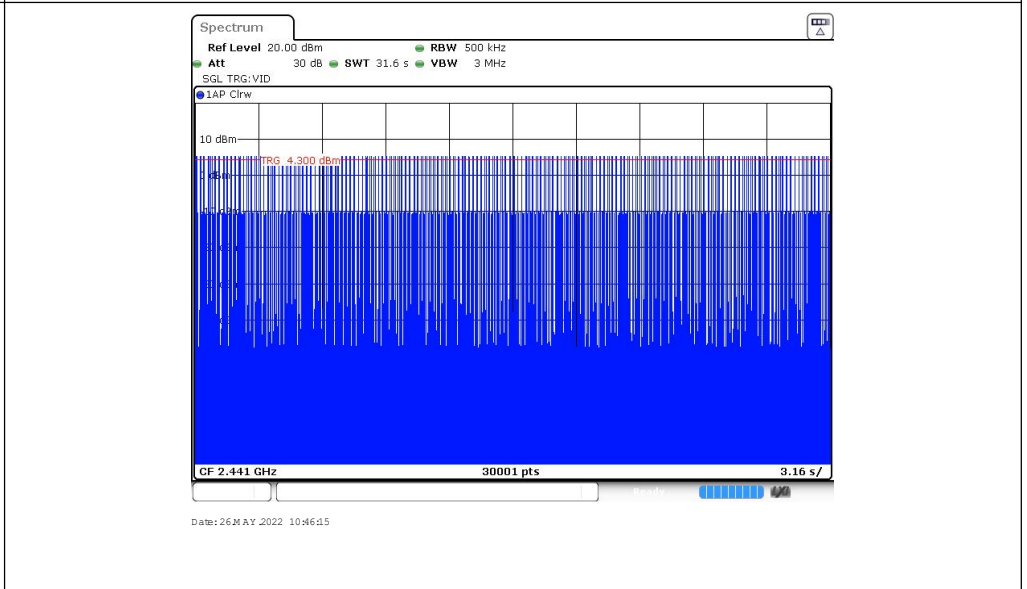


Modulation Type: 8DPSK

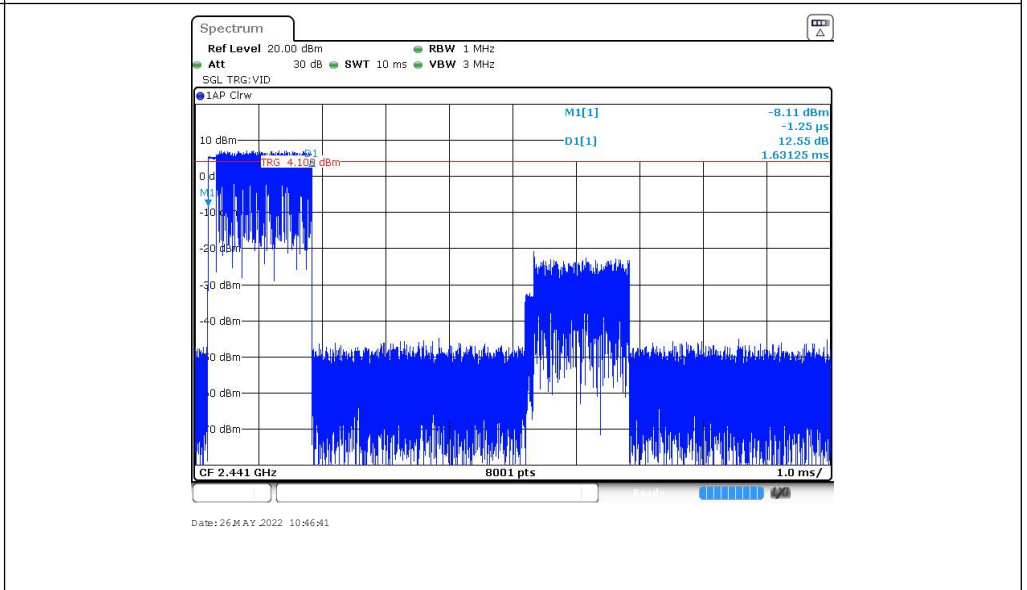
3DH1
Burst width



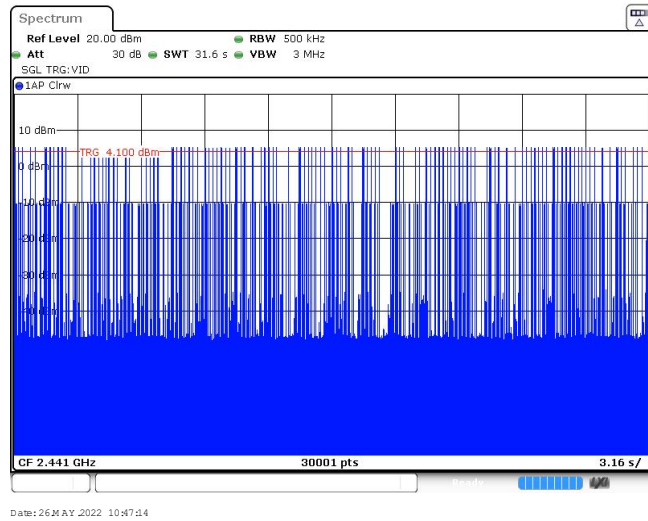
3DH1
Burst number



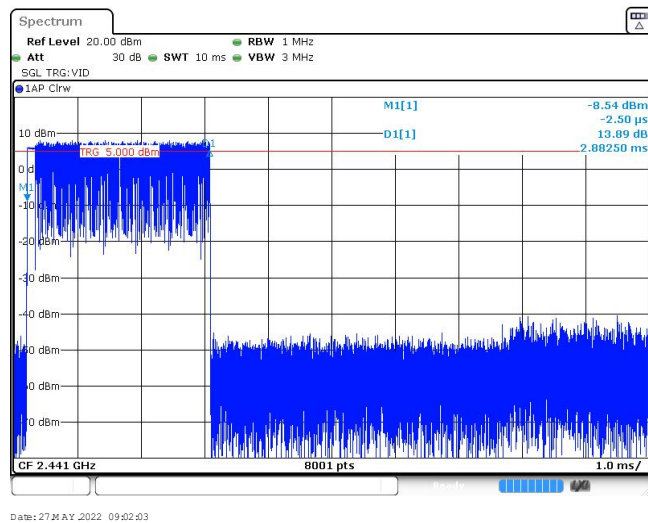
3DH3
Burst width



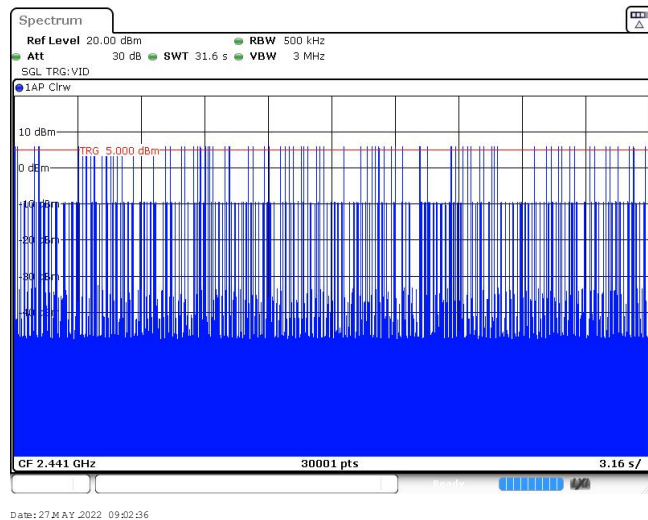
3DH3
Burst number



3DH5
Burst width



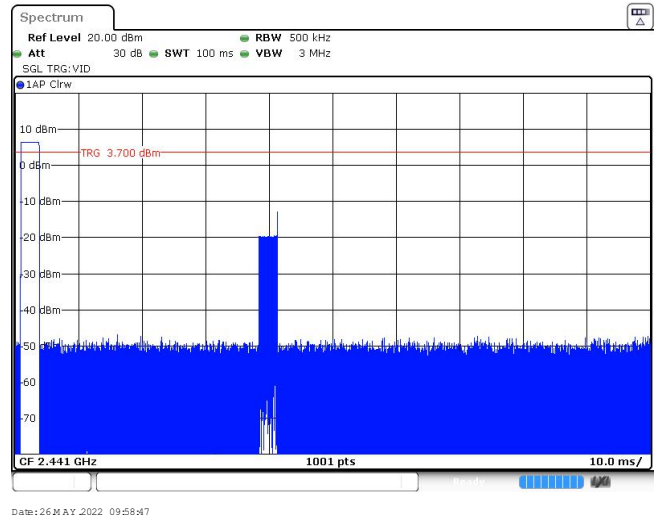
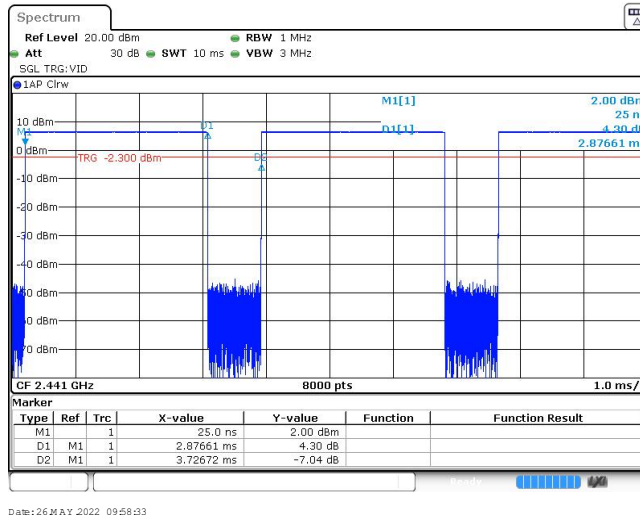
3DH5
Burst number



Appendix G: Duty Cycle Correction Factor (DCCF)

DCCF Calculate Formula					
DCCF=20 * Log(duty cycle) = 20 * Log($T_{\text{on time}} / T_{\text{period}}$)					
Modulation type	Test Frequency (MHz)	$T_{\text{on time}}$ for single burst [ms]	T_{period} [ms]	Burst Quantity	DCCF [dB]
GFSK	2441	2.88	100	1	-30.81
$\pi/4$ DQPSK	2441	2.87	100	1	-30.84
8DPSK	2441	2.86	100	1	-30.87

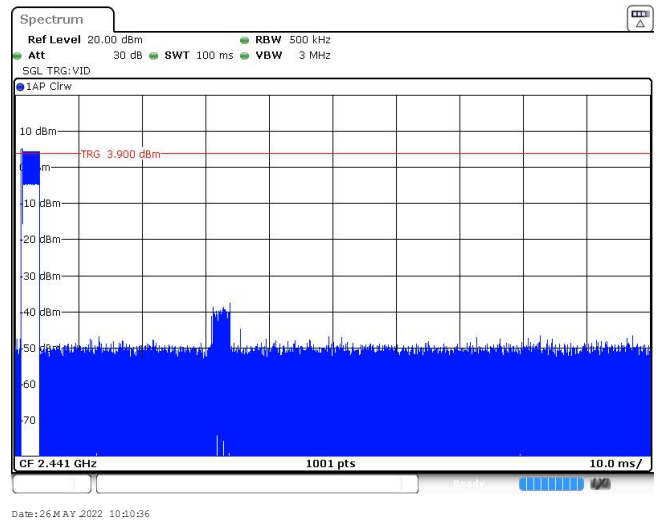
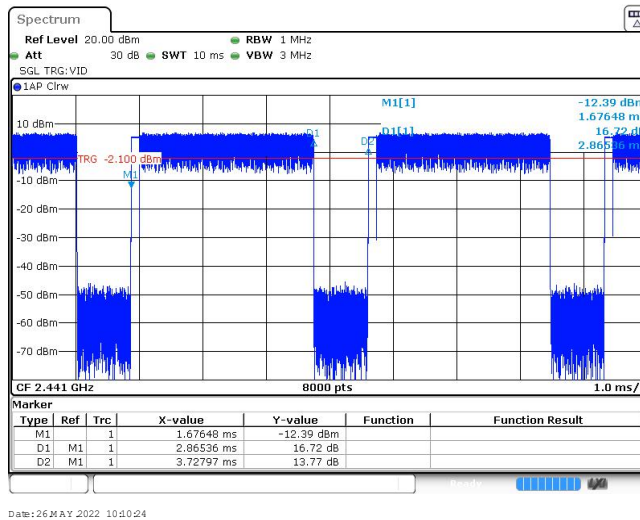
GFSK



Ton time for single burst

Burst Quantity

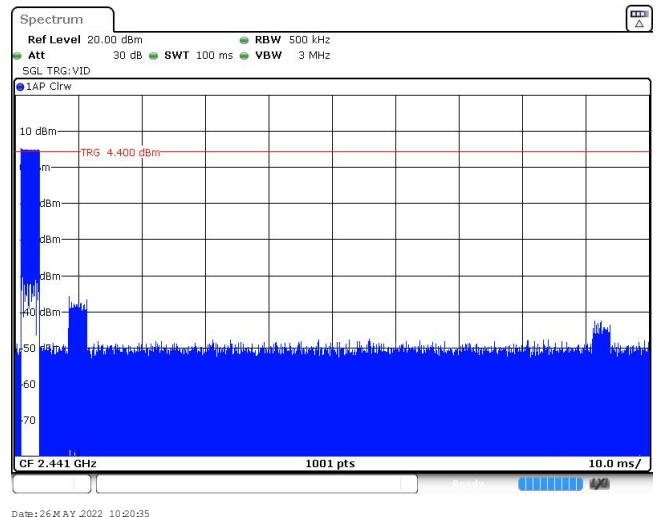
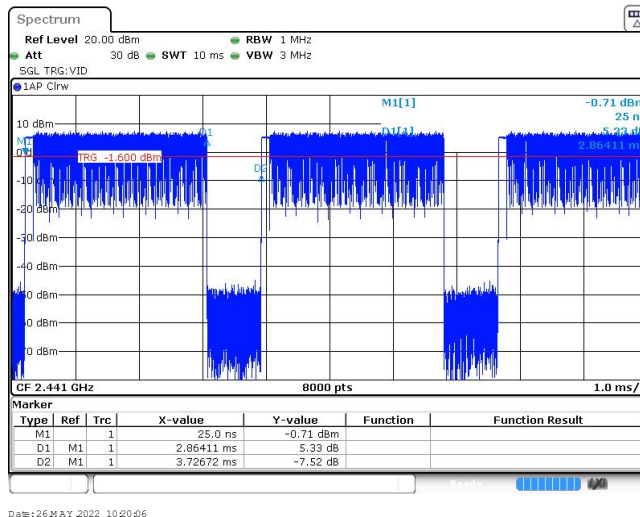
$\pi/4$ DQPSK



Ton time for single burst

Burst Quantity

8DPSK



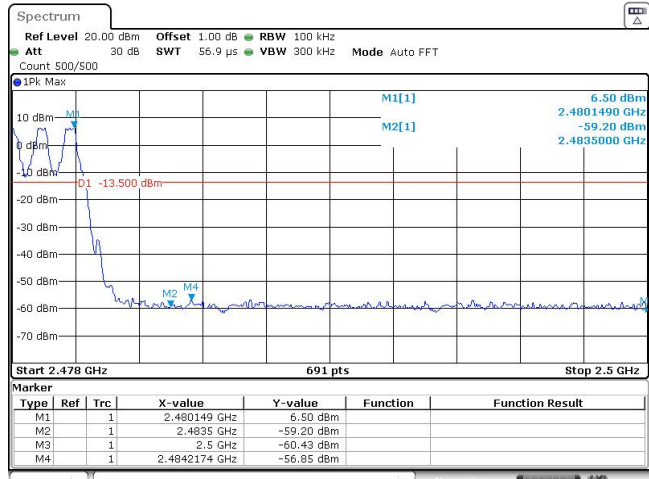
Ton time for single burst

Burst Quantity

Appendix H: Band edge and Spurious Emissions (conducted)

Test Item:	Band edge	Modulation type:	GFSK																																										
<p>CH00 No hopping mode</p>	<p>1PK Max</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>2.40191 GHz</td> <td>-52.61 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4 GHz</td> <td>-52.61 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.39 GHz</td> <td>-54.74 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.31 GHz</td> <td>-53.98 dBm</td> <td></td> <td></td> </tr> <tr> <td>M5</td> <td>1</td> <td></td> <td>2.399906 GHz</td> <td>-52.14 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 26 MAY 2022 09:52:49</p>			Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.40191 GHz	-52.61 dBm			M2	1		2.4 GHz	-52.61 dBm			M3	1		2.39 GHz	-54.74 dBm			M4	1		2.31 GHz	-53.98 dBm			M5	1		2.399906 GHz	-52.14 dBm		
Type	Ref	Trc	X-value	Y-value	Function	Function Result																																							
M1	1		2.40191 GHz	-52.61 dBm																																									
M2	1		2.4 GHz	-52.61 dBm																																									
M3	1		2.39 GHz	-54.74 dBm																																									
M4	1		2.31 GHz	-53.98 dBm																																									
M5	1		2.399906 GHz	-52.14 dBm																																									
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CH78
Hopping mode



Date: 26 MAY 2022 10:02:59

Test Item:	Band edge	Modulation type:	π/4DQPSK																																										
<p>CH00 No hopping mode</p>	<p>1PK Max</p> <p>10 dBm</p> <p>0 dBm</p> <p>-10 dBm</p> <p>-20 dBm</p> <p>-30 dBm</p> <p>-40 dBm</p> <p>-50 dBm</p> <p>-60 dBm</p> <p>-70 dBm</p> <p>Start 2.31 GHz 691 pts Stop 2.405 GHz</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>1</td> <td>2.40218 GHz</td> <td>5.25 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td>1</td> <td>2.4 GHz</td> <td>-46.35 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td>1</td> <td>2.39 GHz</td> <td>-53.48 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td>1</td> <td>2.31 GHz</td> <td>-52.51 dBm</td> <td></td> <td></td> </tr> <tr> <td>M5</td> <td>1</td> <td>1</td> <td>2.39963 GHz</td> <td>-45.39 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 26 MAY 2022 10:05:34</p>			Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1	1	2.40218 GHz	5.25 dBm			M2	1	1	2.4 GHz	-46.35 dBm			M3	1	1	2.39 GHz	-53.48 dBm			M4	1	1	2.31 GHz	-52.51 dBm			M5	1	1	2.39963 GHz	-45.39 dBm		
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