

APPENDIX REPORT

Project No.	SHT2010054201EW	Radio Specification	Bluetooth EDR
Test sample No.	YPHT20100542002	Model No.	A5+
Start test date	2020/10/23	Finish date	2020/10/23
Temperature	25°C	Humidity	50%
Test Engineer	Hailey Chen	Auditor	Xiaodong Zhe

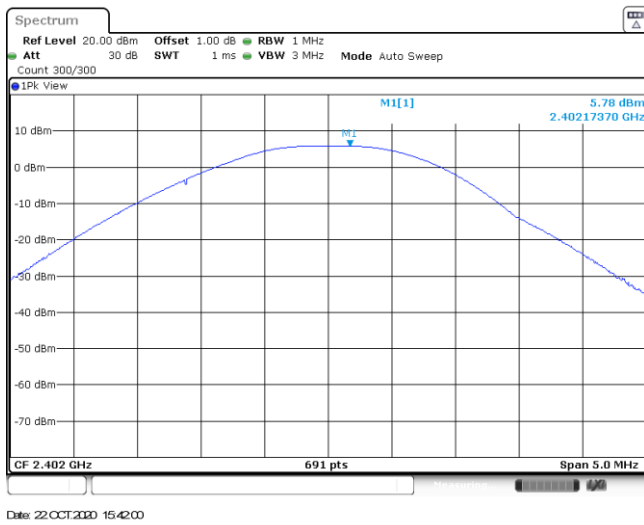
Appendix clause	Test item	Result
A	Peak Output Power	PASS
B	20 dB Bandwidth	PASS
C	99% Occupied Bandwidth	PASS
D	Carrier Frequencies Separation	PASS
E	Hopping Channel Number	PASS
F	Dwell Time	PASS
G	Duty Cycle Correction Factor (DCCF)	PASS
H	Band edge and Spurious Emissions(ducted)	PASS

Appendix A: Peak Output Power

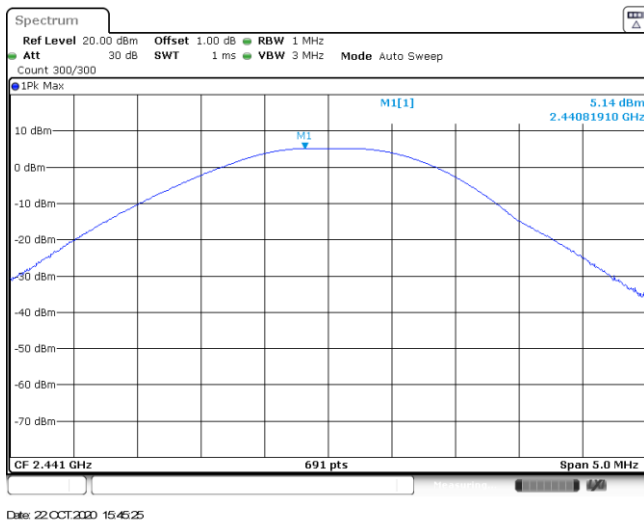
Modulation type	Channel	Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	00	5.78	5.76	≤ 30.00	Pass
	39	5.14	5.13		
	78	4.20	4.19		
π/4DQPSK	00	7.80	5.74	≤ 21.00	Pass
	39	7.22	5.45		
	78	6.40	4.20		
8DPSK	00	8.05	5.86	≤ 21.00	Pass
	39	7.53	5.40		
	78	6.69	4.13		

Modulation Type: GFSK

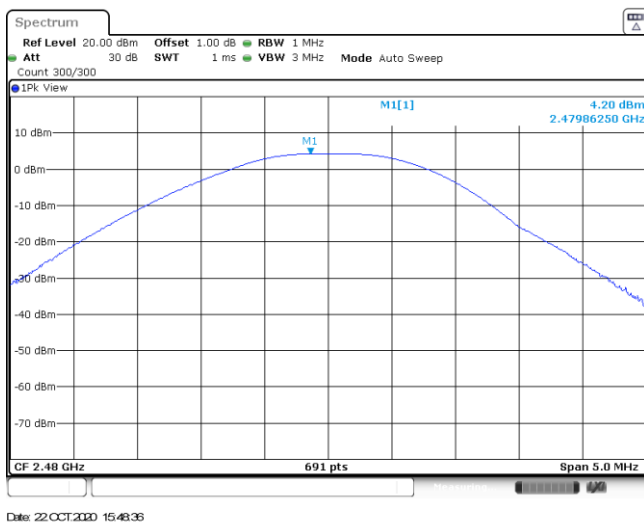
CH00



CH39

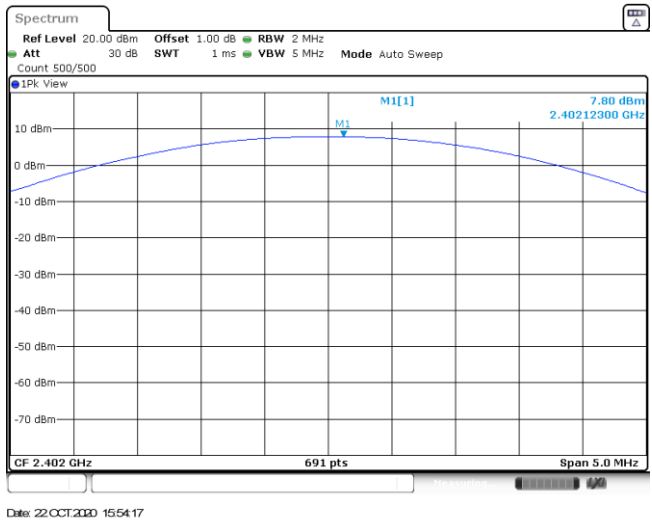


CH78

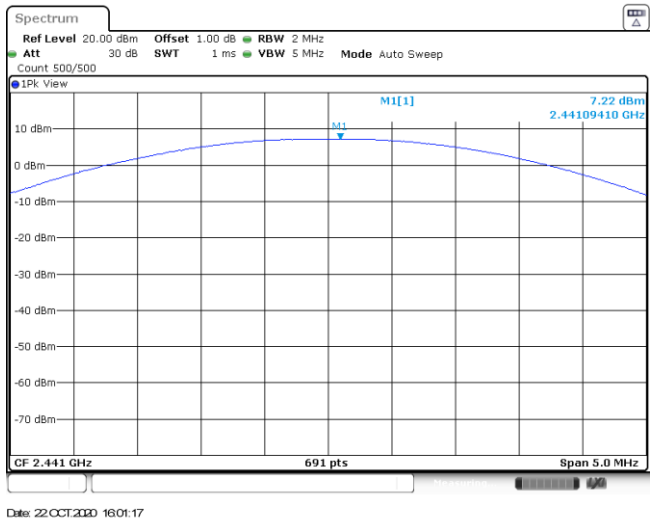


Modulation Type: $\pi/4$ DQPSK

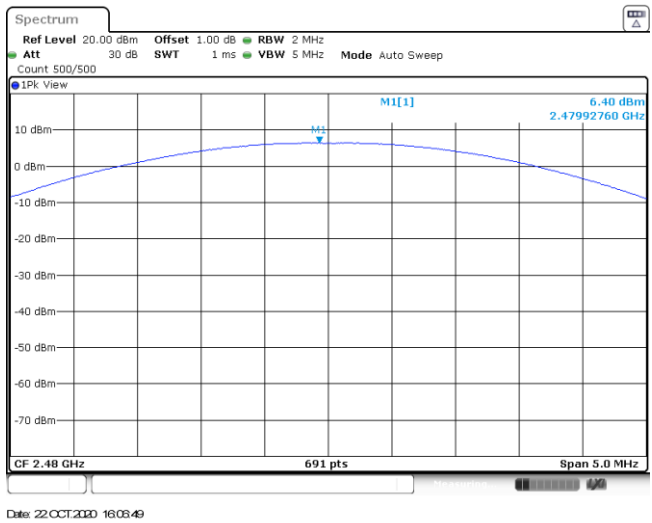
CH00



CH39

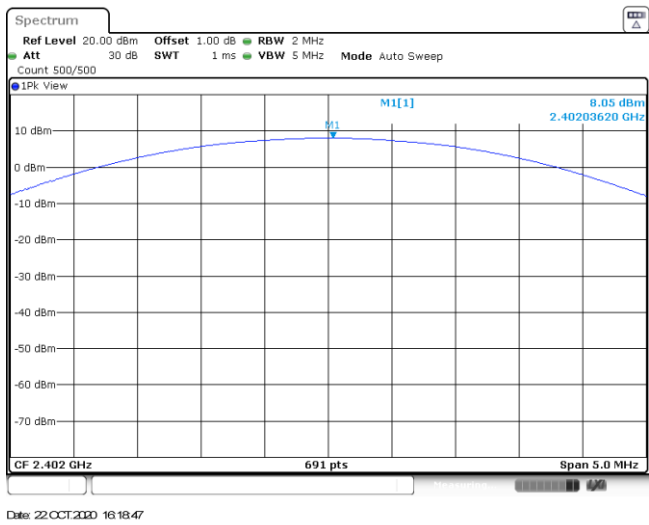


CH78

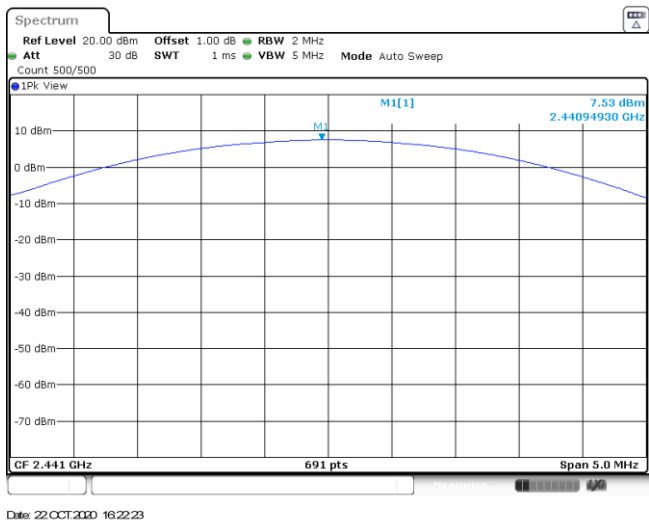


Modulation Type: 8DPSK

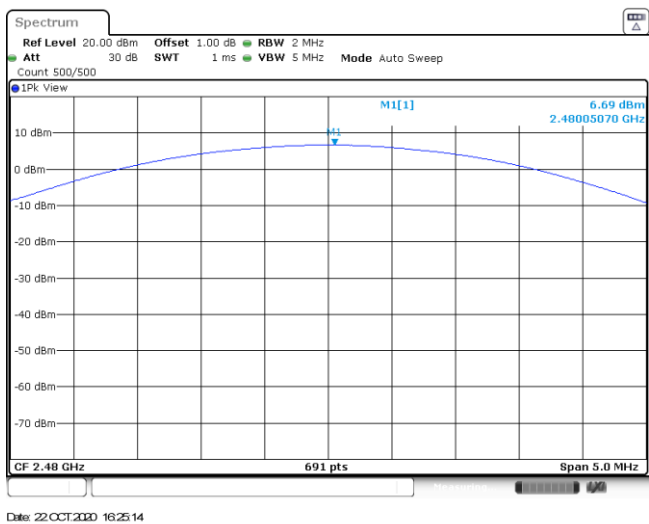
CH00



CH39



CH78

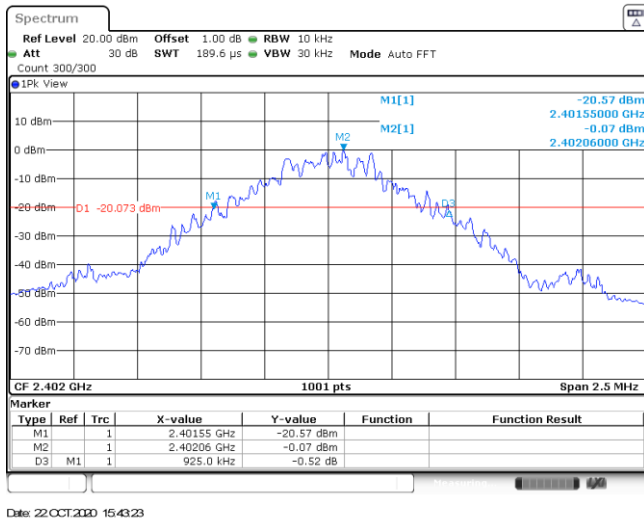


Appendix B : 20 dB Bandwidth

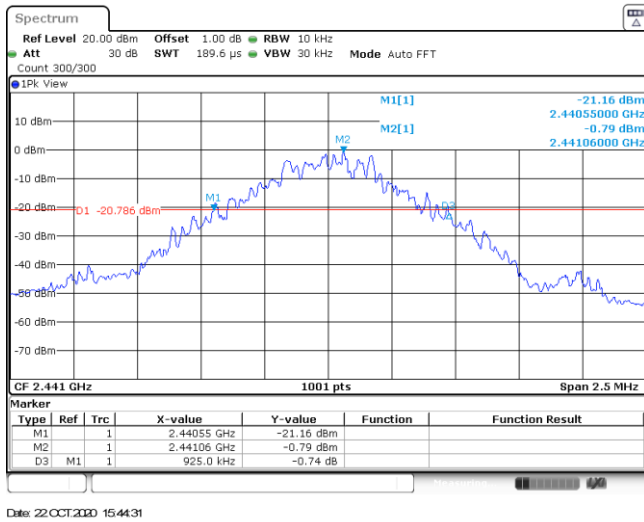
Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	925.00	-	Pass
	39	925.00		
	78	925.00		
$\pi/4$ DQPSK	00	1287.50	-	Pass
	39	1290.00		
	78	1292.50		
8DPSK	00	1292.50	-	Pass
	39	1292.50		
	78	1295.00		

Modulation Type: GFSK

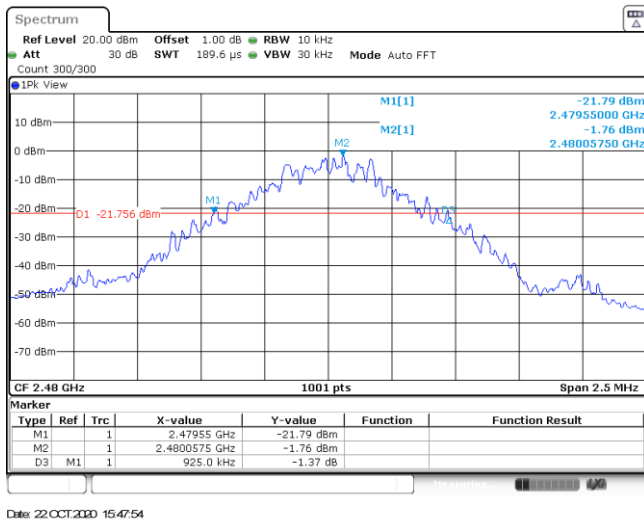
CH00



CH39

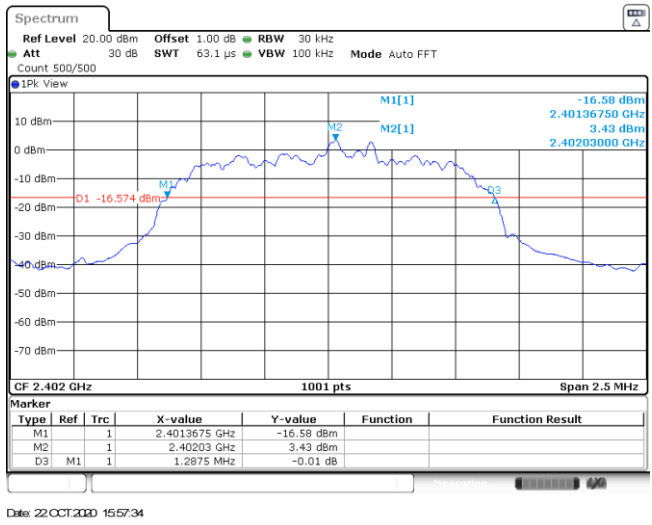


CH78

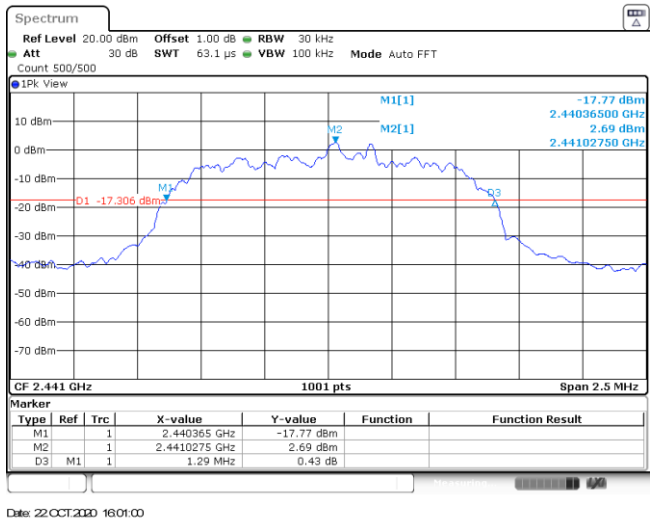


Modulation Type: $\pi/4$ DQPSK

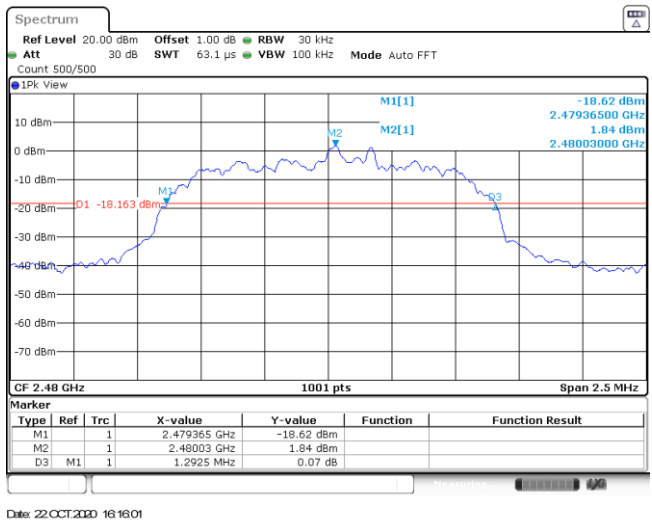
CH00



CH39

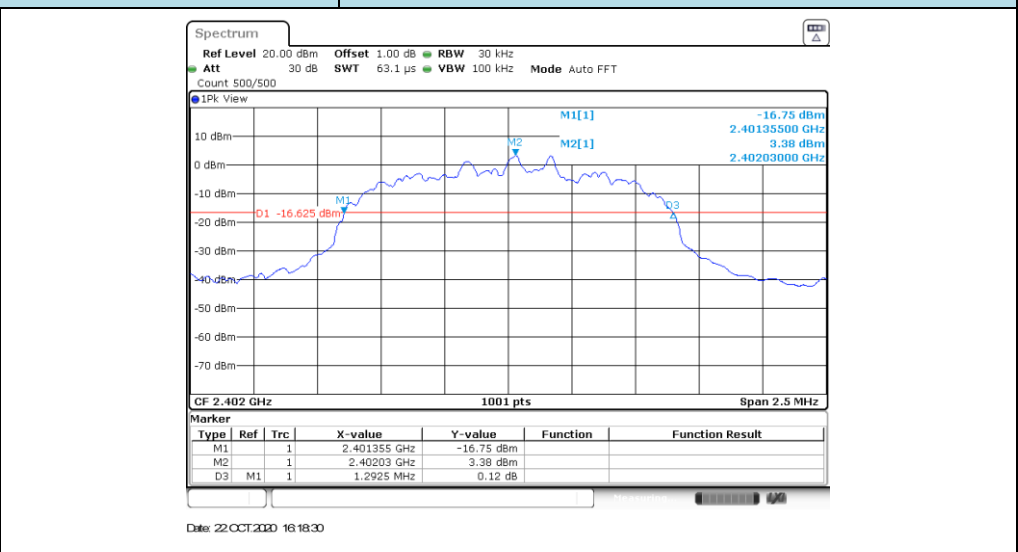


CH78

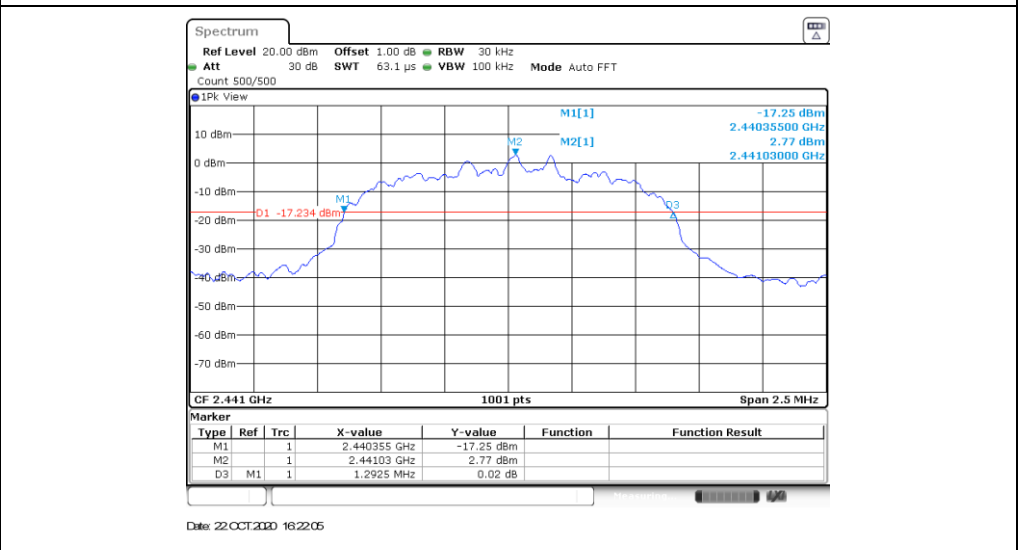


Modulation Type: 8DPSK

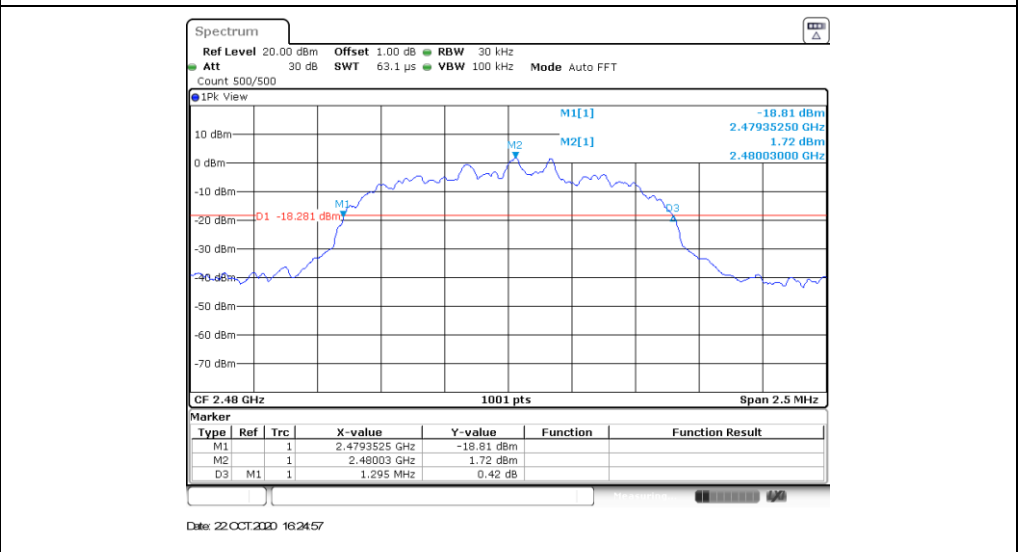
CH00



CH39



CH78



Appendix C: 99% Occupied Bandwidth

Modulation type	Channel	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.86	-	Pass
	39	0.86		
	78	0.86		
$\pi/4$ DQPSK	00	1.18	-	Pass
	39	1.18		
	78	1.18		
8DPSK	00	1.18	-	Pass
	39	1.18		
	78	1.18		

Modulation Type: GFSK	
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 300/300 1Pk View 4.15 dBm 2.40183770 GHz 856.649356643 kHz M1 Occ Bw T1 T2 CF 2.402 GHz 1001 pts Span 2.5 MHz Date: 22 OCT 2020 15:43:31 </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 300/300 1Pk View 9.48 dBm 2.44083770 GHz 856.649356643 kHz M1 Occ Bw T1 T2 CF 2.441 GHz 1001 pts Span 2.5 MHz Date: 22 OCT 2020 15:44:39 </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 300/300 1Pk View 2.51 dBm 2.47983770 GHz 859.140859141 kHz M1 Occ Bw T1 T2 CF 2.48 GHz 1001 pts Span 2.5 MHz Date: 22 OCT 2020 15:48:02 </p>

Modulation Type: $\pi/4$ DQPSK	
CH00	<p>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</p> <p>1Pk View</p> <p>9.40 dBm 2.40203000 GHz 1.181318681 MHz</p> <p>CF 2.402 GHz 1001 pts Span 2.5 MHz</p> <p>Date: 22 OCT 2020 15:57:42</p>
CH39	<p>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</p> <p>1Pk View</p> <p>2.73 dBm 2.44103000 GHz 1.181318681 MHz</p> <p>CF 2.441 GHz 1001 pts Span 2.5 MHz</p> <p>Date: 22 OCT 2020 16:01:08</p>
CH78	<p>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</p> <p>1Pk View</p> <p>1.81 dBm 2.48003000 GHz 1.181318681 MHz</p> <p>CF 2.48 GHz 1001 pts Span 2.5 MHz</p> <p>Date: 22 OCT 2020 16:16:09</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 3.39 dBm 2.40203000 GHz 1.176323676 MHz M1[1] Occ Bw T1 T2 CF 2.402 GHz 1001 pts Span 2.5 MHz Date: 22 OCT 2020 16:18:36 </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 2.78 dBm 2.44103000 GHz 1.176323676 MHz M1[1] Occ Bw T1 T2 CF 2.441 GHz 1001 pts Span 2.5 MHz Date: 22 OCT 2020 16:22:14 </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 1.77 dBm 2.48002750 GHz 1.176323676 MHz M1[1] Occ Bw T1 T2 CF 2.48 GHz 1001 pts Span 2.5 MHz Date: 22 OCT 2020 16:25:05 </p>

Appendix D: Carrier Frequencies Separation

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (kHz) *	Result
GFSK	39	1.00	≥925.00	Pass
$\pi/4$ DQPSK	78	1.00	≥861.67	Pass
8DPSK	78	1.00	≥863.33	Pass

Note:

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

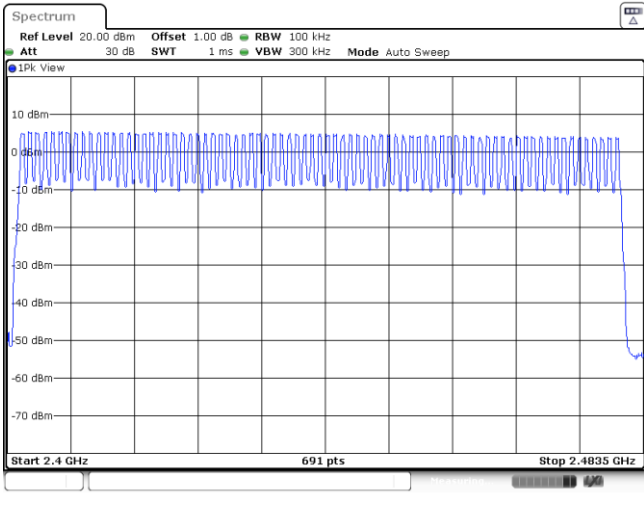
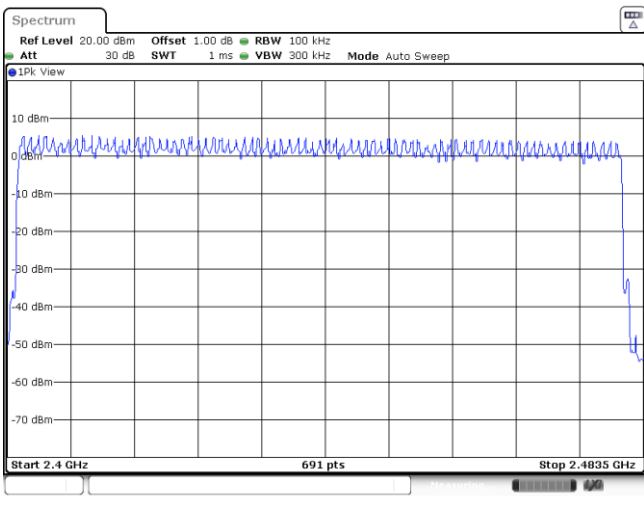
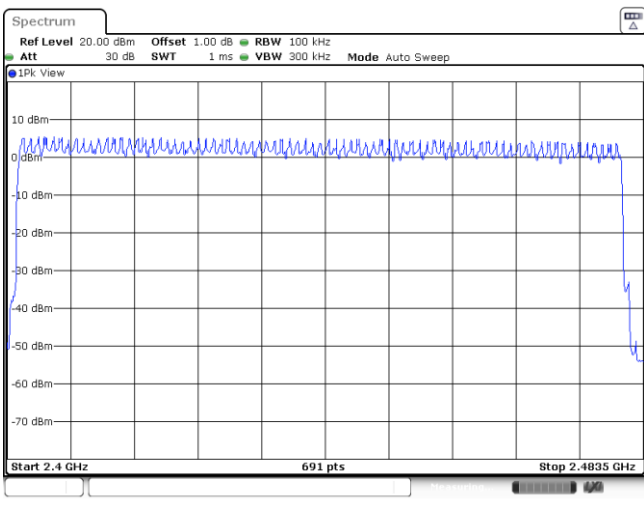
$\pi/4$ DQPSK limit = $2/3$ * The maximum 20 dB Bandwidth for $\pi/4$ DQPSK modulation on the appendix B.

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

<p style="text-align: center;">GFSK</p>	<p style="text-align: center;">Date: 22 OCT 2020 15:50:54</p>
<p style="text-align: center;">$\pi/4$DQPSK</p>	<p style="text-align: center;">Date: 22 OCT 2020 16:12:08</p>
<p style="text-align: center;">8DPSK</p>	<p style="text-align: center;">Date: 22 OCT 2020 16:30:34</p>

Appendix E: Hopping Channel Number

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

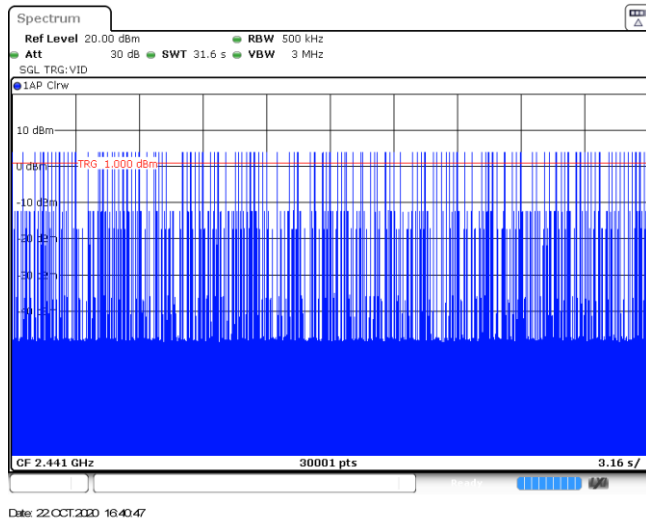
<p>GFSK</p>	 <p>Spectrum</p> <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep</p> <p>1Pk View</p> <p>10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm</p> <p>Start 2.4 GHz 691 pts Stop 2.4835 GHz</p> <p>Date: 22 OCT 2020 16:34:34</p>
<p>$\pi/4$DQPSK</p>	 <p>Spectrum</p> <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep</p> <p>1Pk View</p> <p>10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm</p> <p>Start 2.4 GHz 691 pts Stop 2.4835 GHz</p> <p>Date: 22 OCT 2020 16:37:09</p>
<p>8DPSK</p>	 <p>Spectrum</p> <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep</p> <p>1Pk View</p> <p>10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm</p> <p>Start 2.4 GHz 691 pts Stop 2.4835 GHz</p> <p>Date: 22 OCT 2020 16:31:40</p>

Appendix F: Dwell Time

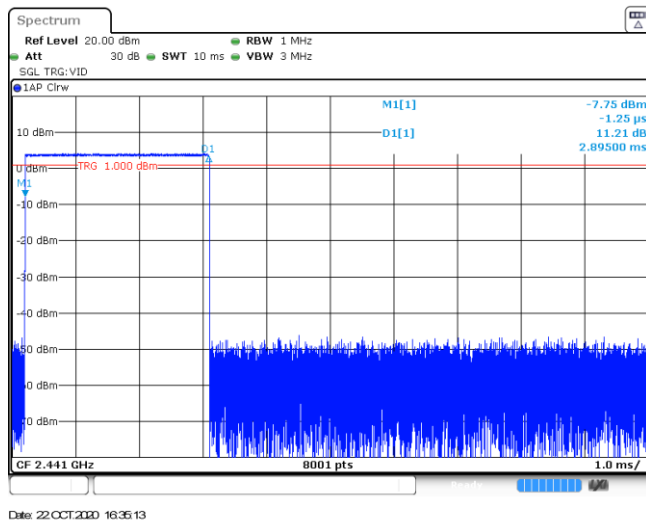
Modulation type	Packet	Burst Width [ms]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.39	317	0.12	≤ 0.40	Pass
	DH3	1.65	160	0.26		
	DH5	2.90	116	0.34		
π/4DQPSK	2DH1	0.38	319	0.12	≤ 0.40	Pass
	2DH3	1.64	155	0.25		
	2DH5	1.97	108	0.21		
8DPSK	3DH1	0.38	320	0.12	≤ 0.40	Pass
	3DH3	1.63	148	0.24		
	3DH5	2.88	120	0.35		

Modulation Type: GFSK	
DH1 Burst width	<p> Spectrum Ref Level 20.00 dBm RBW 1 MHz Att 30 dB SWT 10 ms VBW 3 MHz SGL TRG:VID 1AP Cirw M1[1] -2.00 dBm D1[1] -1.25 μs 5.74 dB 390.00 μs TRG 1.000 dBm CF 2.441 GHz 8001 pts 1.0 ms/ Date: 22 OCT 2020 16:39:08 </p>
DH1 Burst number	<p> Spectrum Ref Level 20.00 dBm RBW 500 kHz Att 30 dB SWT 31.6 s VBW 3 MHz SGL TRG:VID 1AP Cirw TRG 1.000 dBm CF 2.441 GHz 30001 pts 3.16 s/ Date: 22 OCT 2020 16:39:42 </p>
DH3 Burst width	<p> Spectrum Ref Level 20.00 dBm RBW 1 MHz Att 30 dB SWT 10 ms VBW 3 MHz SGL TRG:VID 1AP Cirw M1[1] -1.02 dBm D1[1] -1.25 μs 4.70 dB 1.64625 ms TRG 1.000 dBm CF 2.441 GHz 8001 pts 1.0 ms/ Date: 22 OCT 2020 16:40:14 </p>

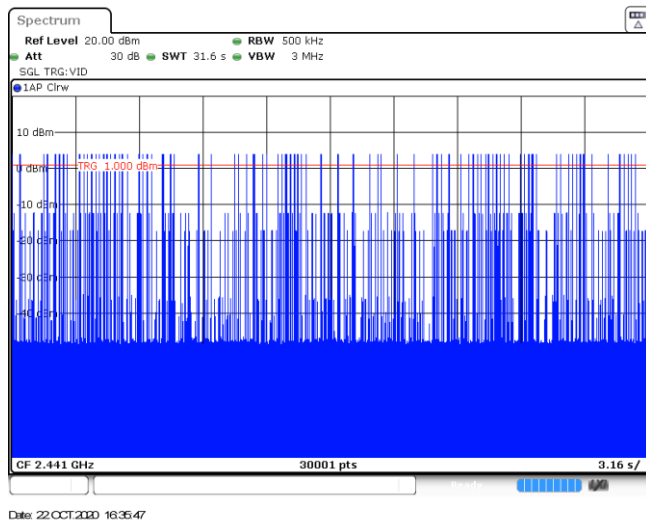
DH3
Burst number



DH5
Burst width

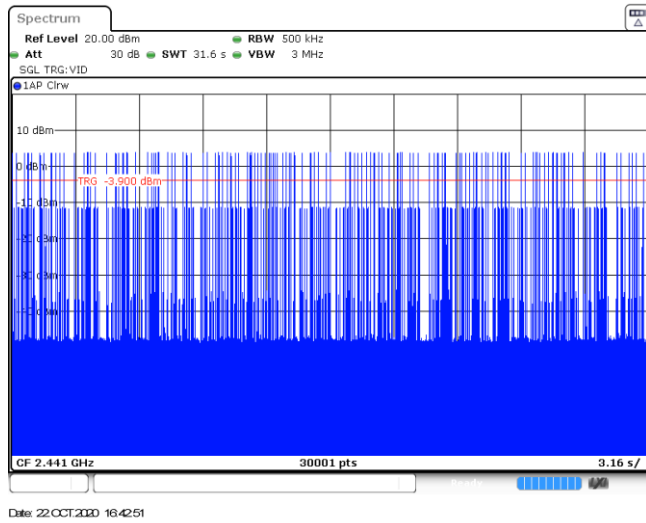


DH5
Burst number

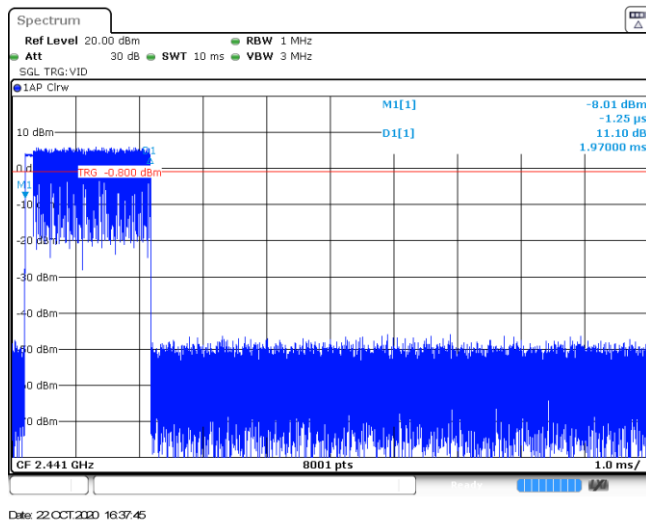


Modulation Type: $\pi/4$ DQPSK	
2DH1 Burst width	<p>CF 2.441 GHz 8001 pts 1.0 ms/</p> <p>Date: 22 OCT 2020 16:41:17</p>
2DH1 Burst number	<p>CF 2.441 GHz 30001 pts 3.16 s/</p> <p>Date: 22 OCT 2020 16:41:51</p>
2DH3 Burst width	<p>CF 2.441 GHz 8001 pts 1.0 ms/</p> <p>Date: 22 OCT 2020 16:42:17</p>

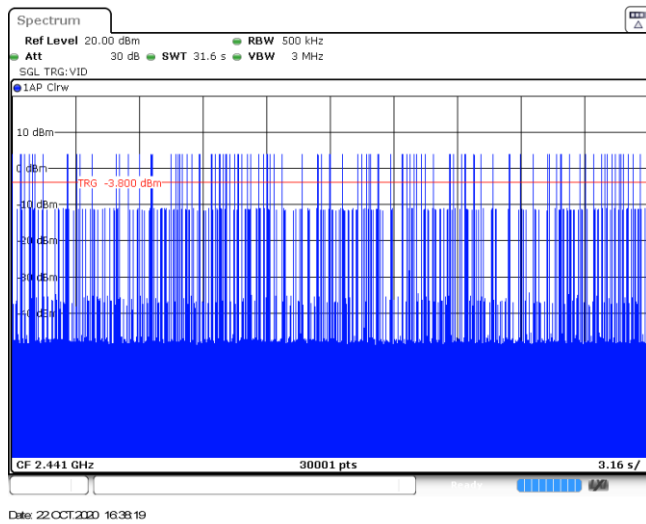
2DH3
Burst number



2DH5
Burst width

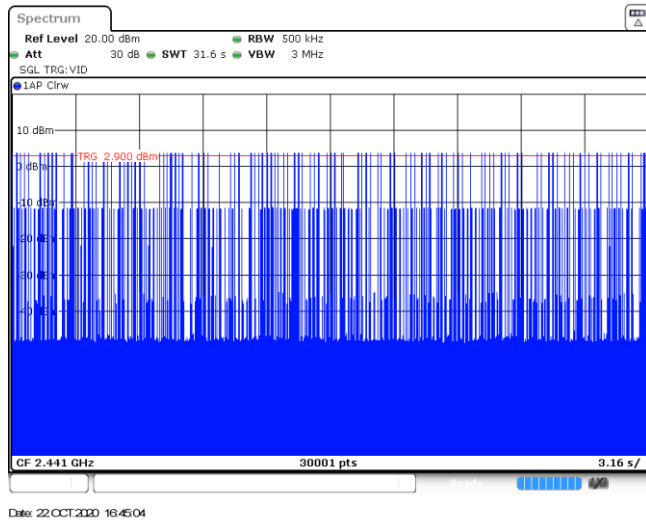


2DH5
Burst number

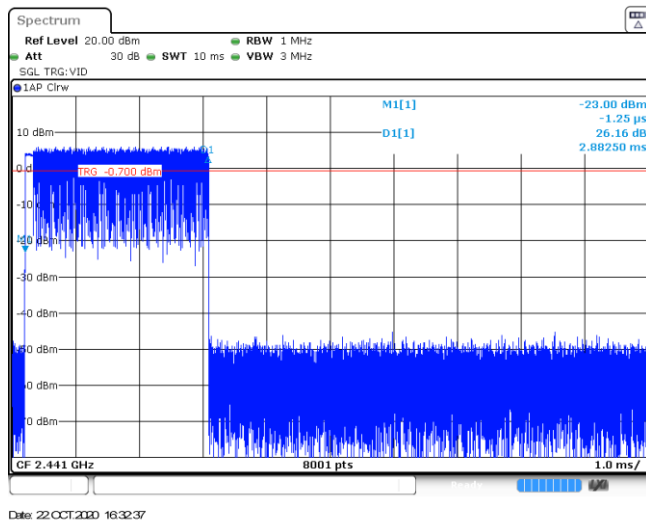


Modulation Type: 8DPSK	
3DH1 Burst width	<p>Date: 22 OCT 2020 16:43:22</p>
3DH1 Burst number	<p>Date: 22 OCT 2020 16:43:56</p>
3DH3 Burst width	<p>Date: 22 OCT 2020 16:44:30</p>

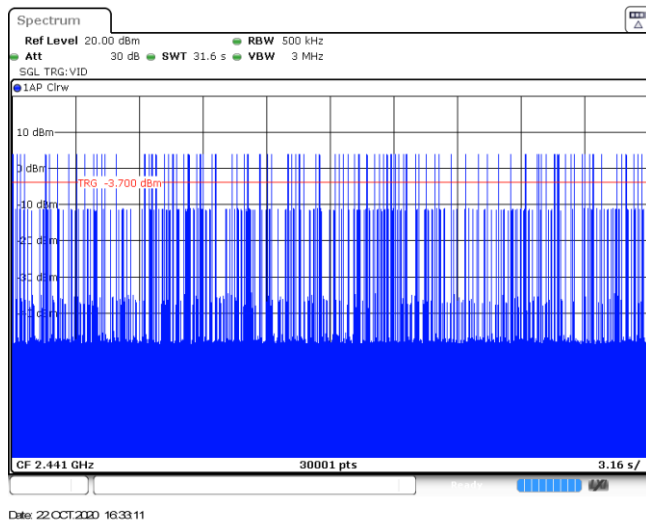
3DH3
Burst number



3DH5
Burst width



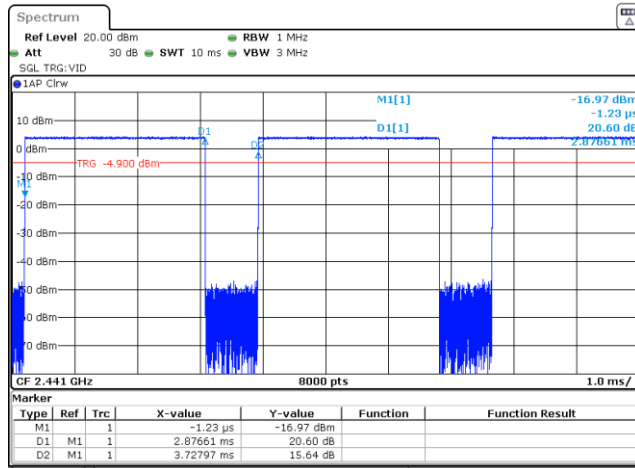
3DH5
Burst number



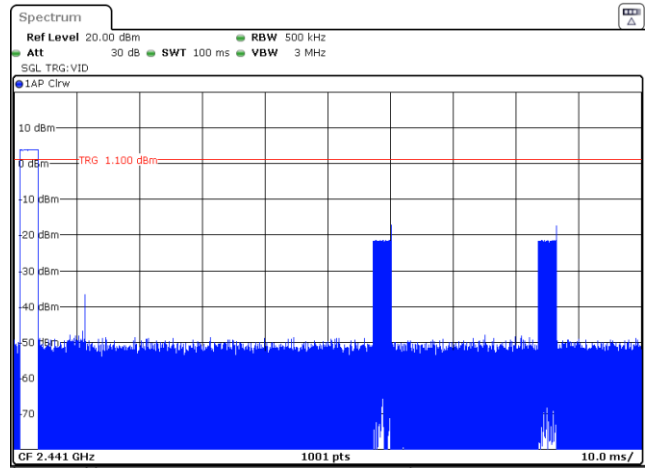
Appendix G: Duty Cycle Correction Factor (DCCF)

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	3.00	-21.27
$\pi/4$ DQPSK	2441	2.87	100	2.00	-24.82
8DPSK	2441	2.86	100	2.00	-24.85

GFSK



Date: 22.OCT.2020 15:45:38

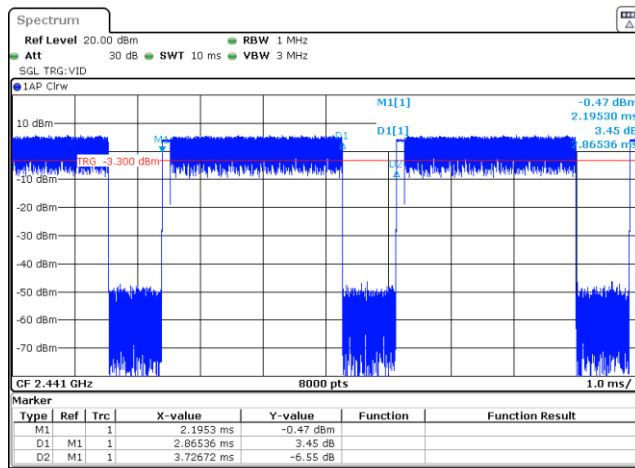


Date: 22.OCT.2020 15:45:59

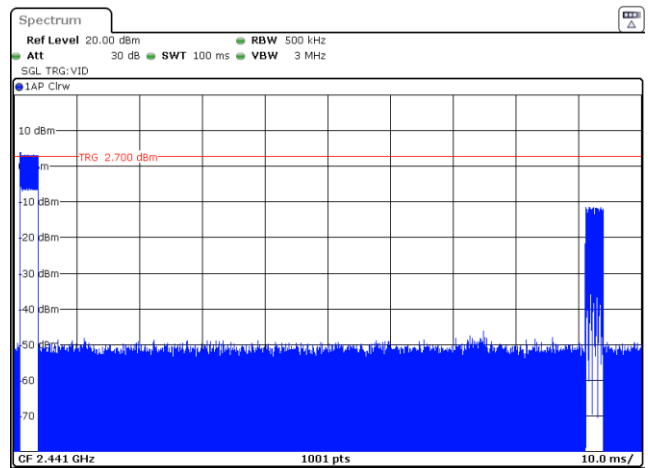
T_{on} time for single burst

Burst Quantity

$\pi/4$ DQPSK



Date: 22.OCT.2020 16:03:17

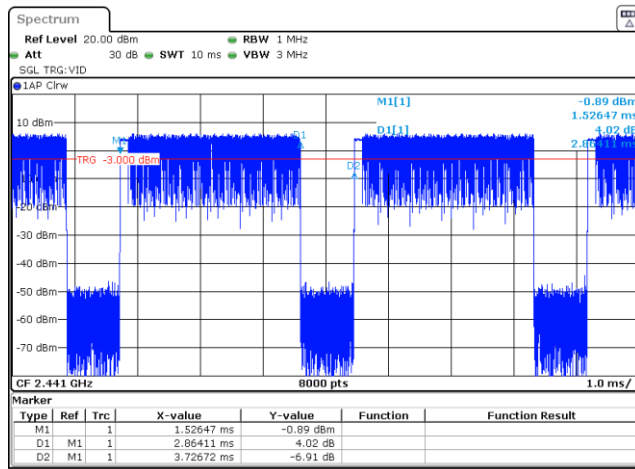


Date: 22.OCT.2020 16:03:45

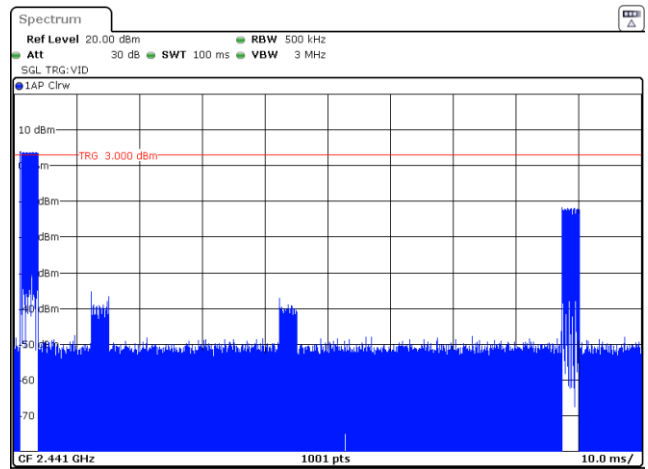
T_{on} time for single burst

Burst Quantity

8DPSK



Date: 22.OCT.2020 16:22:58

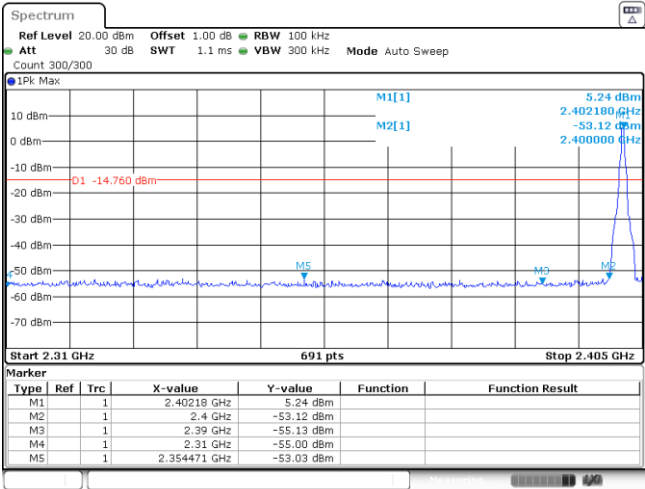
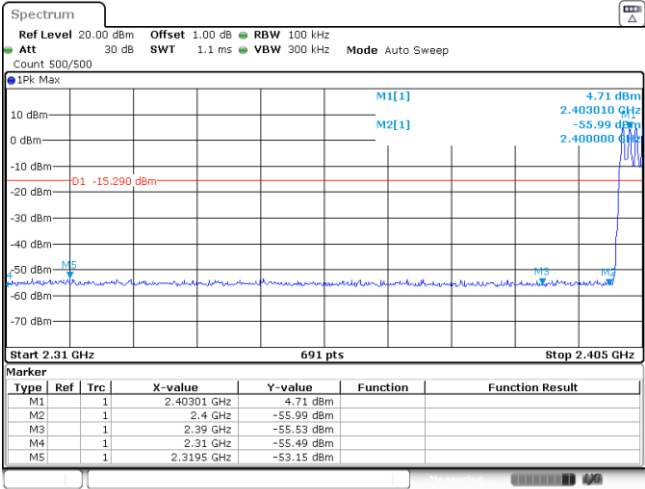
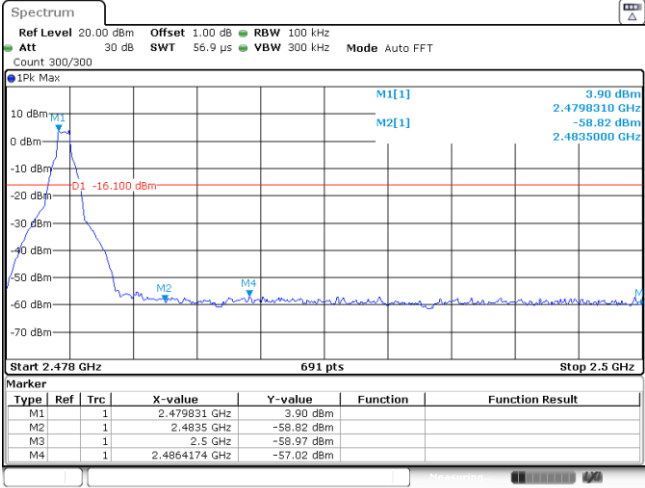


Date: 22.OCT.2020 16:23:24

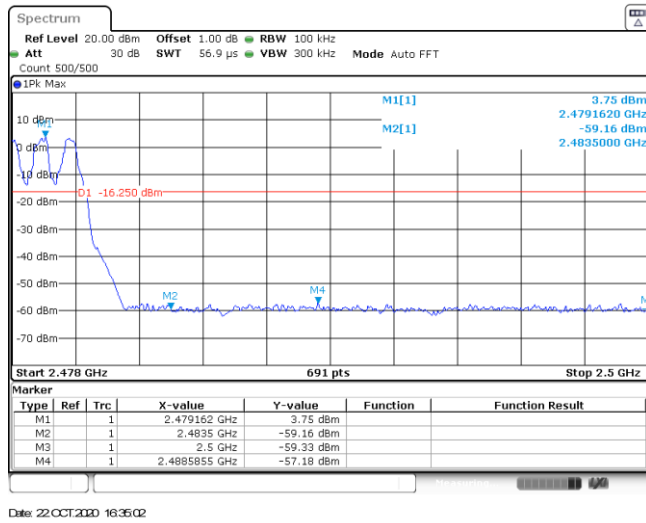
T_{on} time for single burst

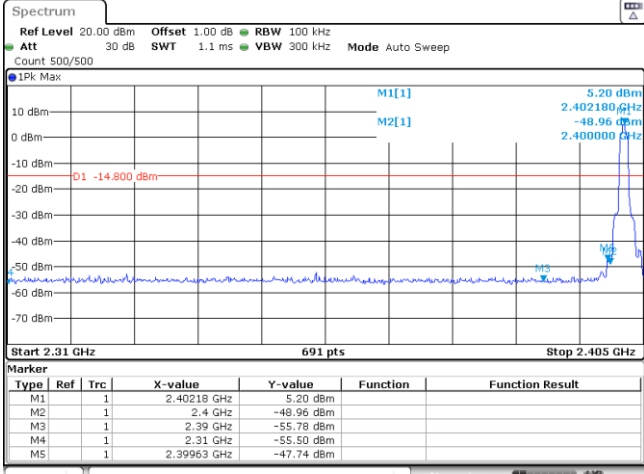
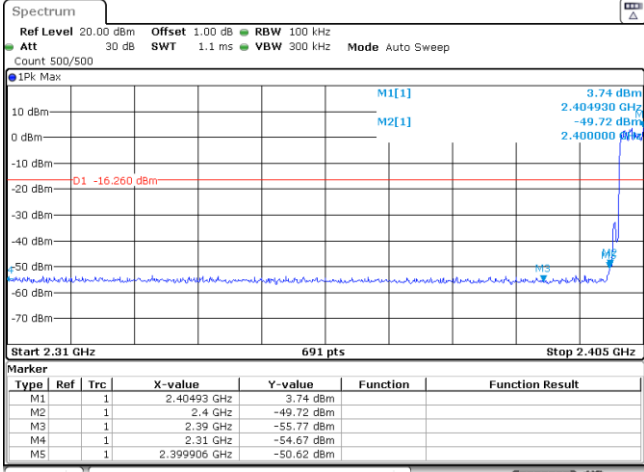
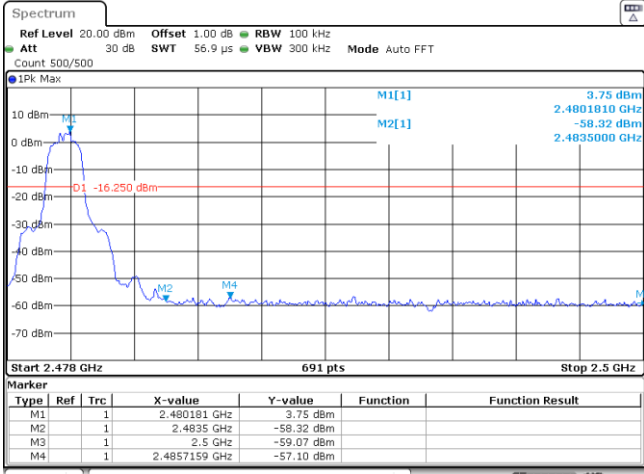
Burst Quantity

Appendix H: Band edge and Spurious Emissions (conducted)

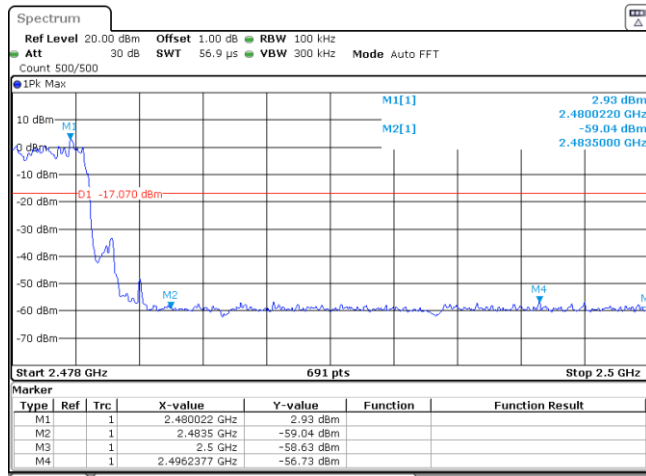
Test Item:	Band edge	Modulation type:	GFSK																																																
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<p>CH78 No hopping mode</p>	 <table border="1" data-bbox="687 1832 1334 1937"> <thead> <tr> <th>Marker</th> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-value</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></td> <td>2.479831 GHz</td> <td>3.90 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td></td> <td>2.4835 GHz</td> <td>-58.82 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td></td> <td>2.5 GHz</td> <td>-58.97 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td></td> <td>2.4864174 GHz</td> <td>-57.02 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 22 OCT 2020 15:48:49</p>			Marker	Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1			2.479831 GHz	3.90 dBm			M2	1			2.4835 GHz	-58.82 dBm			M3	1			2.5 GHz	-58.97 dBm			M4	1			2.4864174 GHz	-57.02 dBm										
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CH78
Hopping mode



Test Item:	Band edge	Modulation type:	π/4DQPSK																																										
<p>CH00 No hopping mode</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 1.1 ms VBW 300 kHz Mode Auto Sweep Count 500/500</p> <p>1Pk Max</p> <p>10 dBm M1[1] 5.20 dBm 2.402180 GHz 0 dBm M2[1] -48.96 dBm 2.400000 GHz -10 dBm D1 -14.800 dBm -20 dBm -30 dBm -40 dBm -50 dBm M3 -60 dBm M4 -70 dBm M5</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>5.20 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td>1</td> <td>2.4 GHz</td> <td>-48.96 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td>1</td> <td>2.39 GHz</td> <td>-55.78 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td>1</td> <td>2.31 GHz</td> <td>-55.50 dBm</td> <td></td> <td></td> </tr> <tr> <td>M5</td> <td>1</td> <td>1</td> <td>2.39963 GHz</td> <td>-47.74 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 22 OCT 2020 15:58:05</p>			Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1	1	2.40218 GHz	5.20 dBm			M2	1	1	2.4 GHz	-48.96 dBm			M3	1	1	2.39 GHz	-55.78 dBm			M4	1	1	2.31 GHz	-55.50 dBm			M5	1	1	2.39963 GHz	-47.74 dBm		
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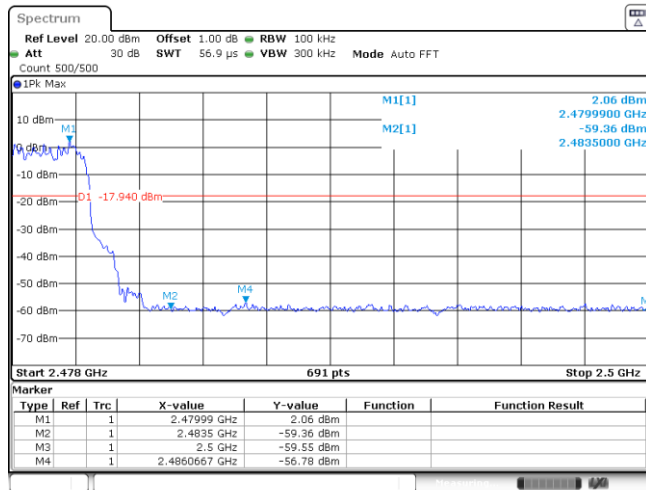
CH78
Hopping mode



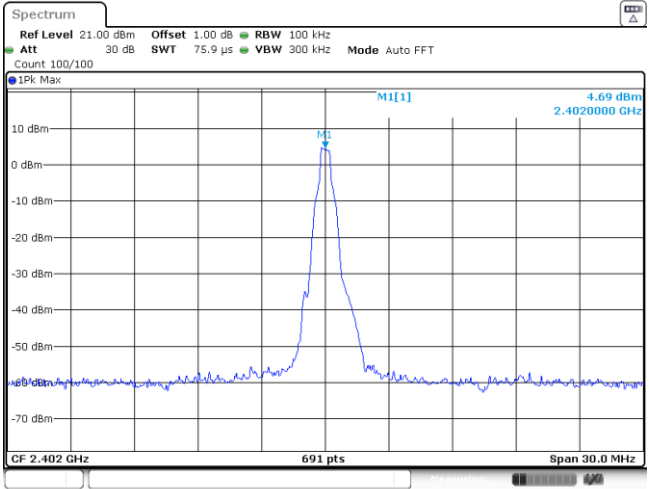
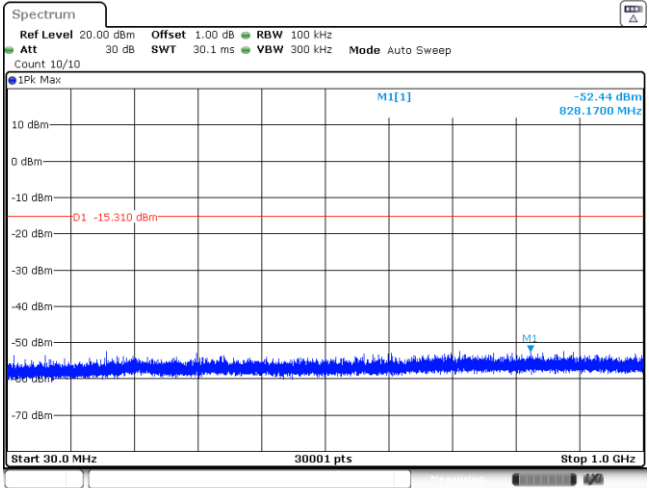
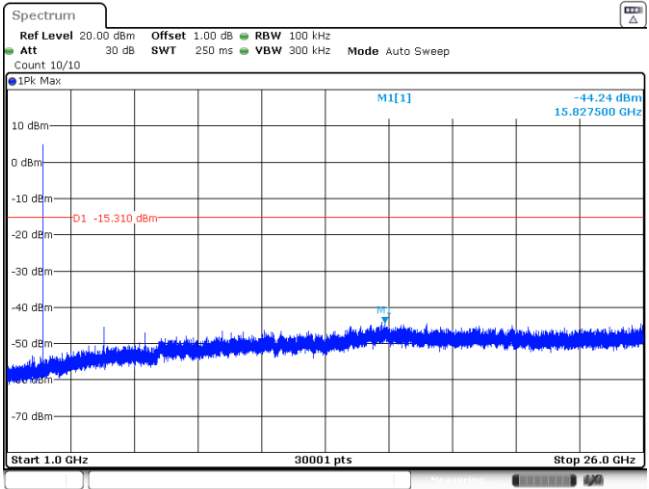
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Test Item:	Band edge	Modulation type:	8DPSK																																																
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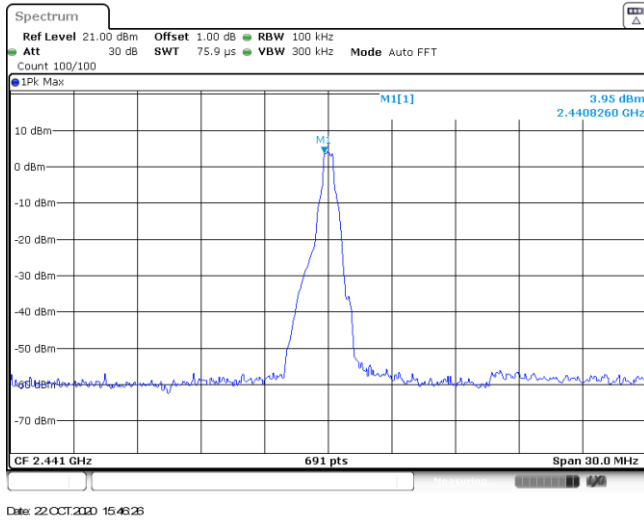
CH78
Hoppig mode



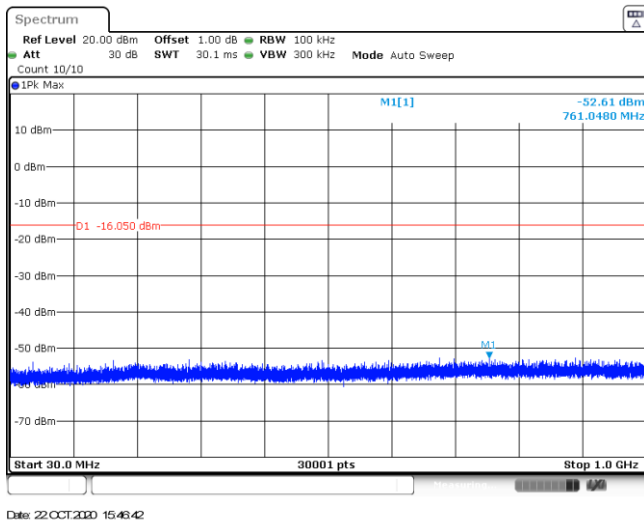
Date: 22 OCT 2020 16:32:08

Test Item:	Spurious Emission	Modulation type:	GFSK
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<p>CH00 1GHz~26GHz</p>			

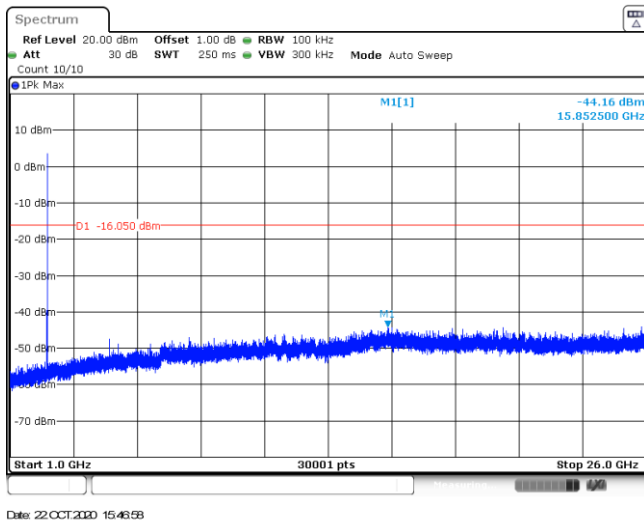
CH39
Reference level

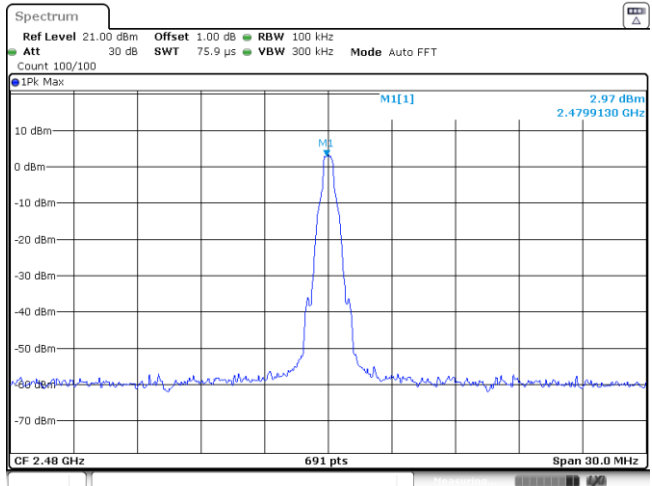
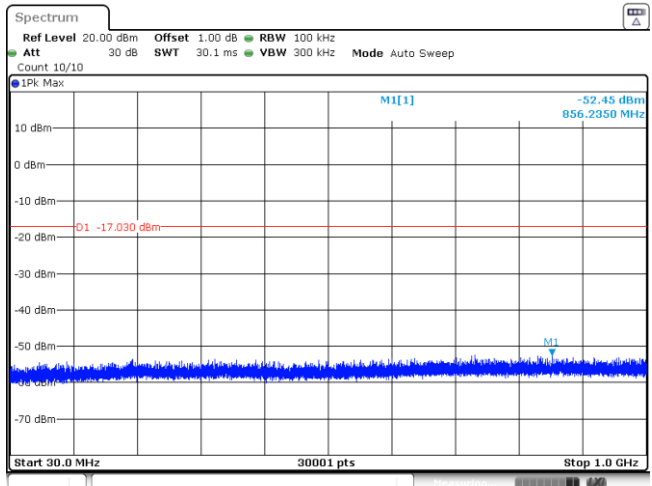
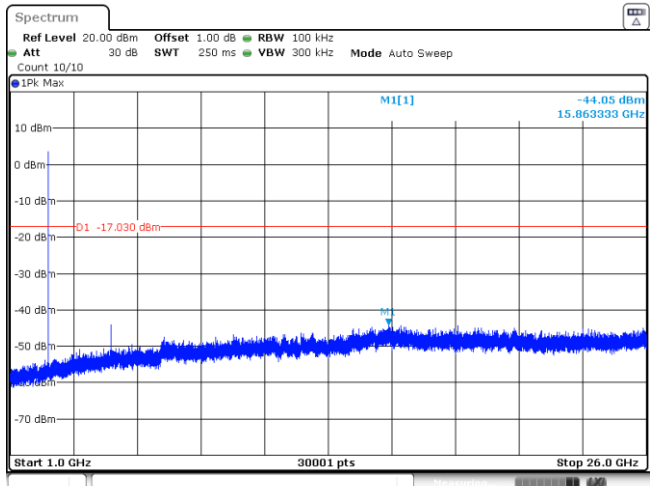


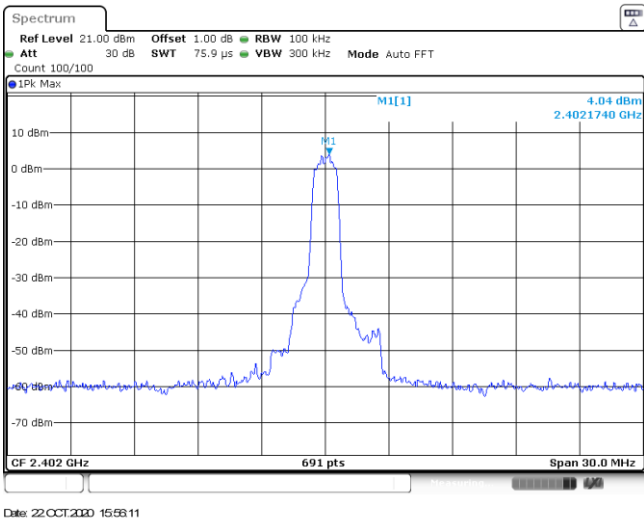
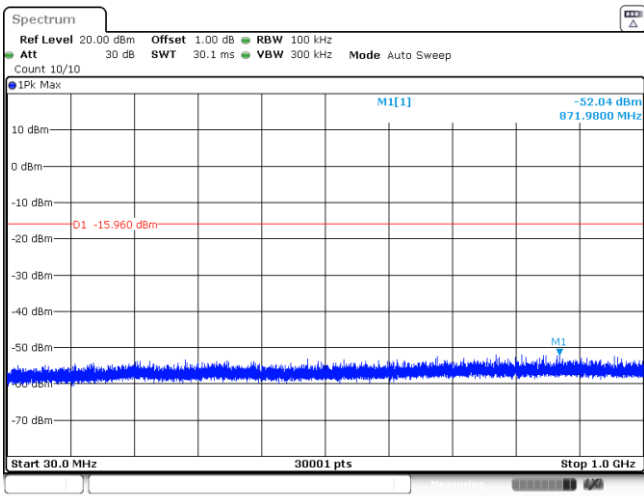
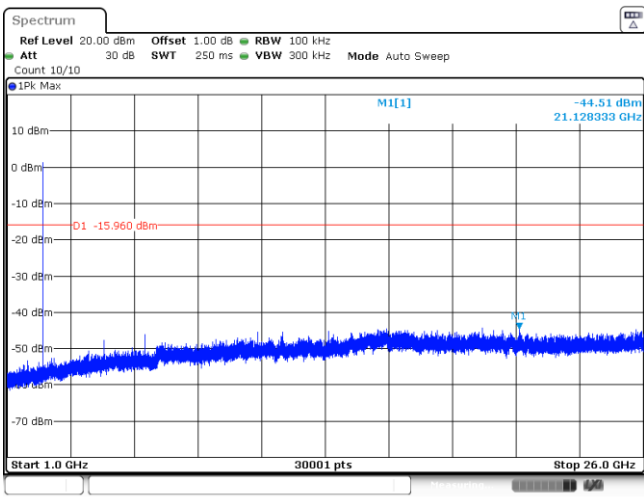
CH39
30MHz~1000MHz



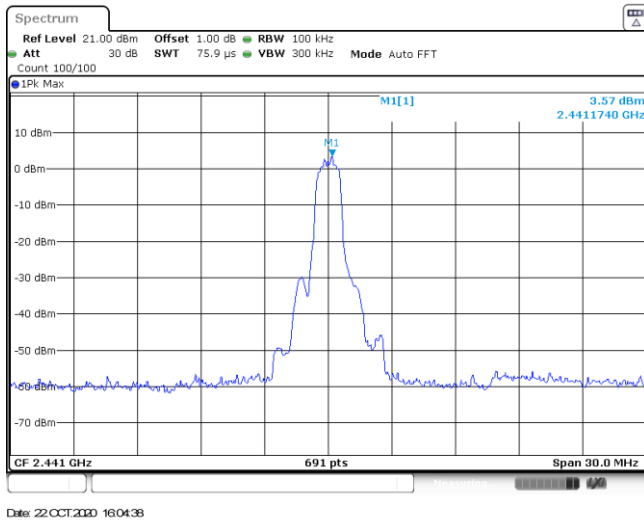
CH39
1GHz~26GHz



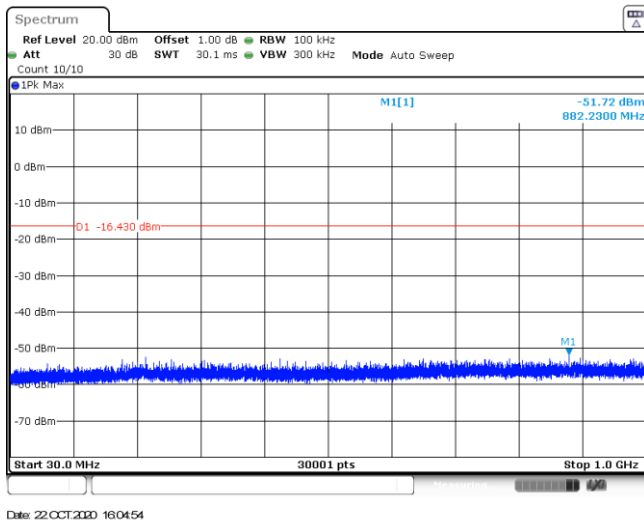
<p>CH78 Reference level</p>	 <p>Spectrum Ref Level 21.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 75.9 μs VBW 300 kHz Mode Auto FFT Count 100/100 IPK Max M1[1] 2.97 dBm 2.4799130 GHz CF 2.48 GHz 691 pts Span 30.0 MHz Date: 22 OCT 2020 15:48:55</p>
<p>CH78 30MHz~1000MHz</p>	 <p>Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 IPK Max M1[1] -52.45 dBm 856.2350 MHz D1 -17.030 dBm Start 30.0 MHz 30001 pts Stop 1.0 GHz Date: 22 OCT 2020 15:49:12</p>
<p>CH78 1GHz~26GHz</p>	 <p>Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 IPK Max M1[1] -44.05 dBm 15.863333 GHz D1 -17.030 dBm Start 1.0 GHz 30001 pts Stop 26.0 GHz Date: 22 OCT 2020 15:49:26</p>

Test Item:	Spurious Emission	Modulation type:	$\pi/4$ DQPSK
<p>CH00 Reference level</p>	 <p>Spectrum Ref Level 21.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 75.9 μs VBW 300 kHz Mode Auto FFT Count 100/100 1Pk Max M1[1] 4.04 dBm 2.4021740 GHz CF 2.402 GHz 691 pts Span 30.0 MHz Date: 22 OCT 2020 15:58:11</p>		
<p>CH00 30MHz~1000MHz</p>	 <p>Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 1Pk Max M1[1] -52.04 dBm 871.9800 MHz D1 -15.960 dBm Start 30.0 MHz 30001 pts Stop 1.0 GHz Date: 22 OCT 2020 15:58:27</p>		
<p>CH00 1GHz~26GHz</p>	 <p>Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 1Pk Max M1[1] -44.51 dBm 21.128933 GHz D1 -15.960 dBm Start 1.0 GHz 30001 pts Stop 26.0 GHz Date: 22 OCT 2020 15:58:43</p>		

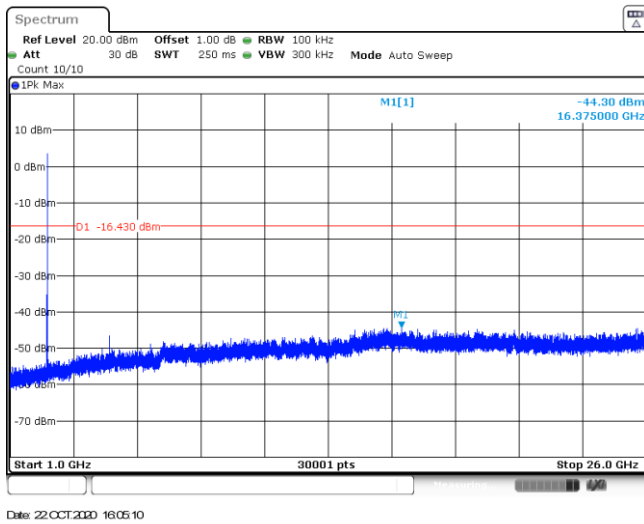
CH39
Reference level



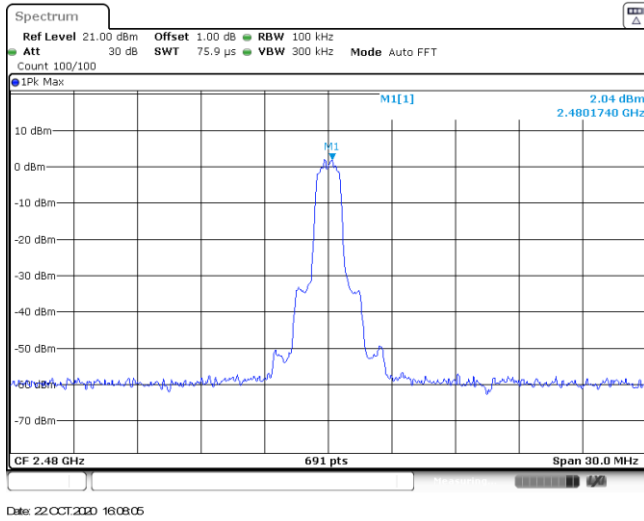
CH39
30MHz~1000MHz



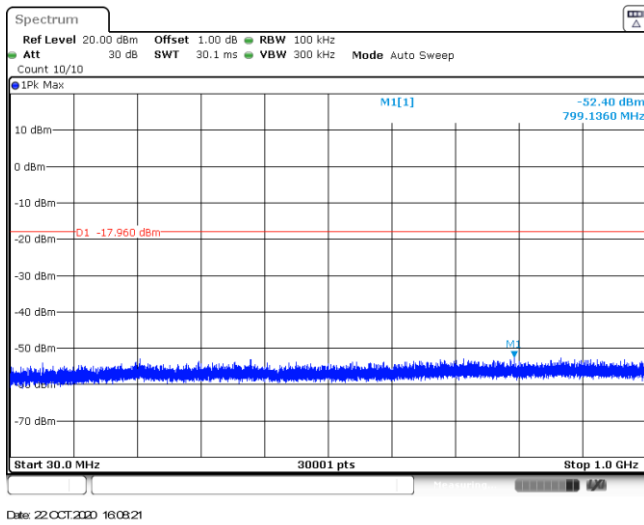
CH39
1GHz~26GHz



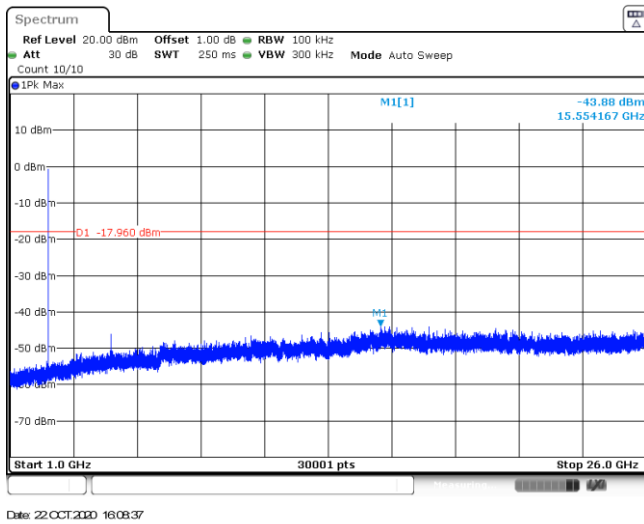
CH78
Reference level

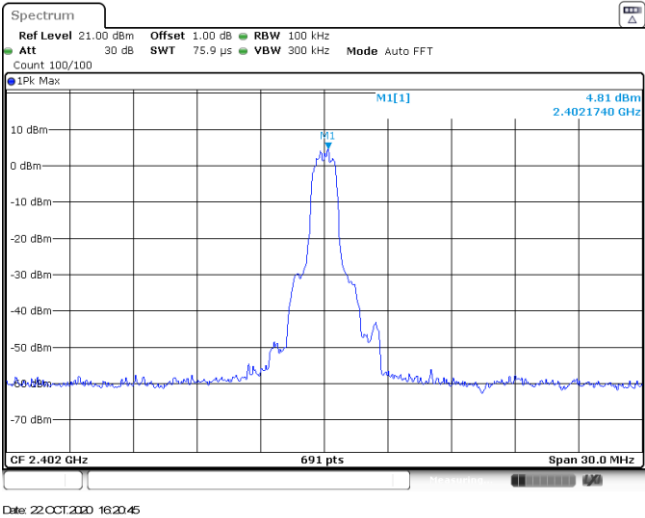
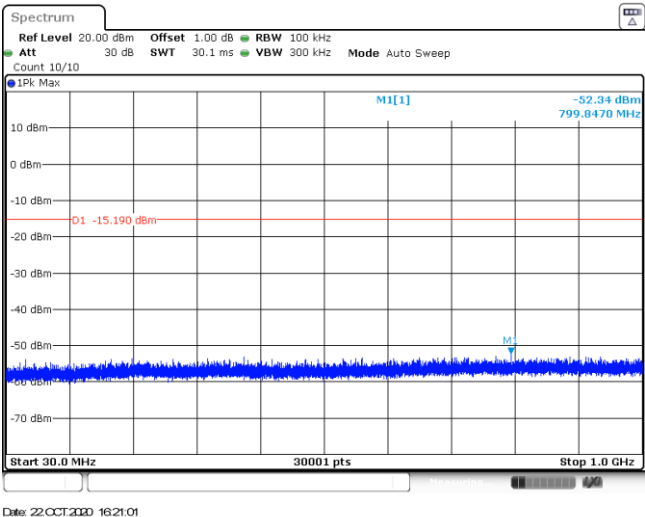
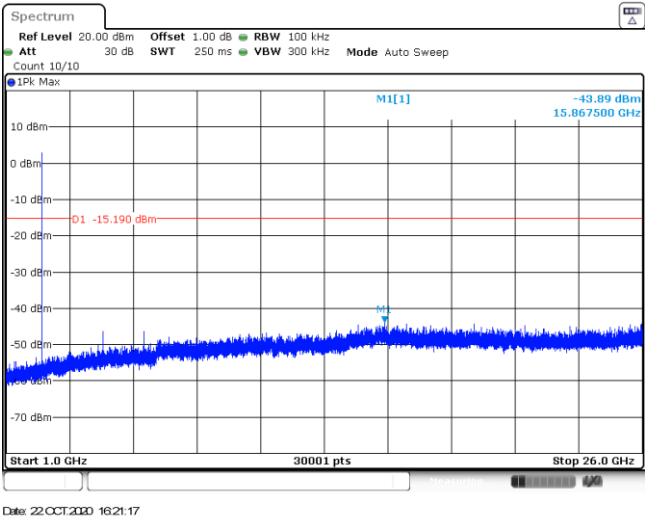


CH78
30MHz~1000MHz

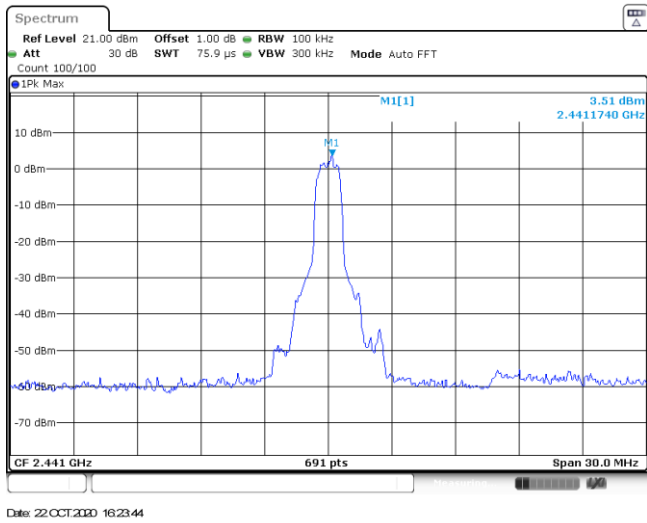


CH78
1GHz~26GHz

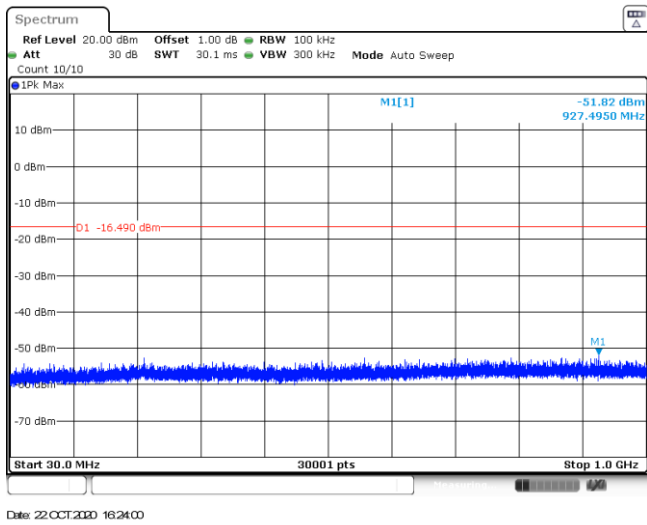


Test Item:	Spurious Emission	Modulation type:	8DPSK
<p>CH00 Reference level</p>			
<p>CH00 30MHz~1000MHz</p>			
<p>CH00 1GHz~26GHz</p>			

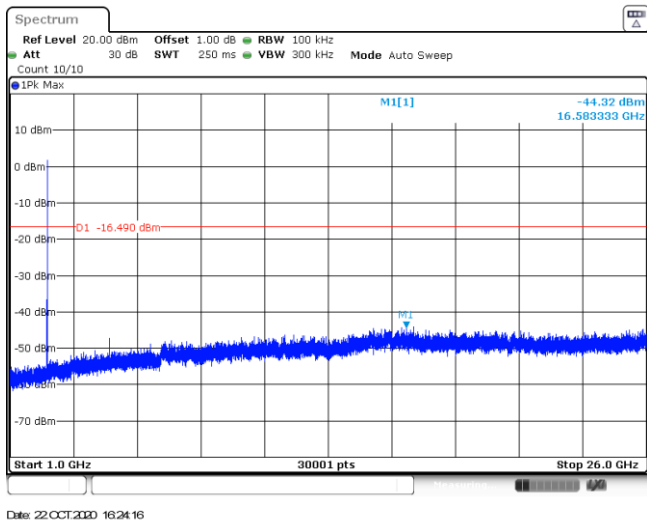
CH39
Reference level



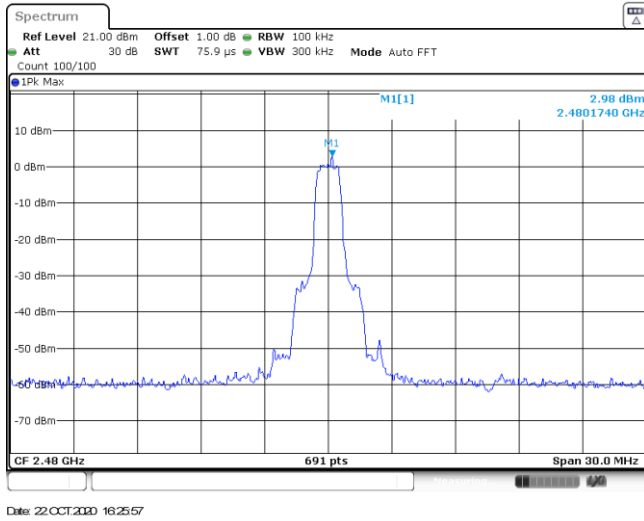
CH39
30MHz~1000MHz



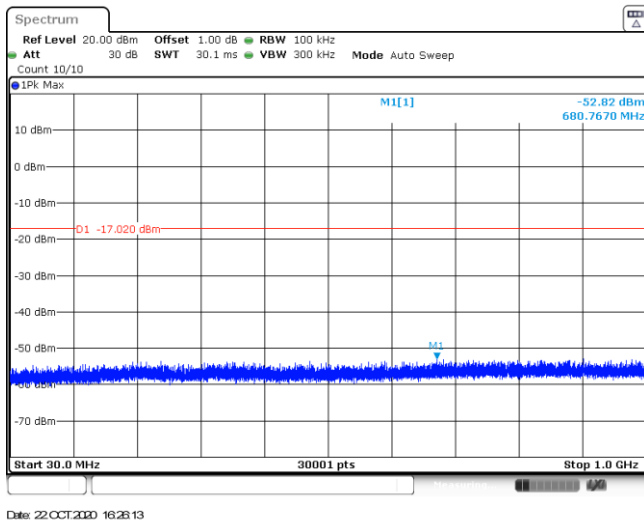
CH39
1GHz~26GHz



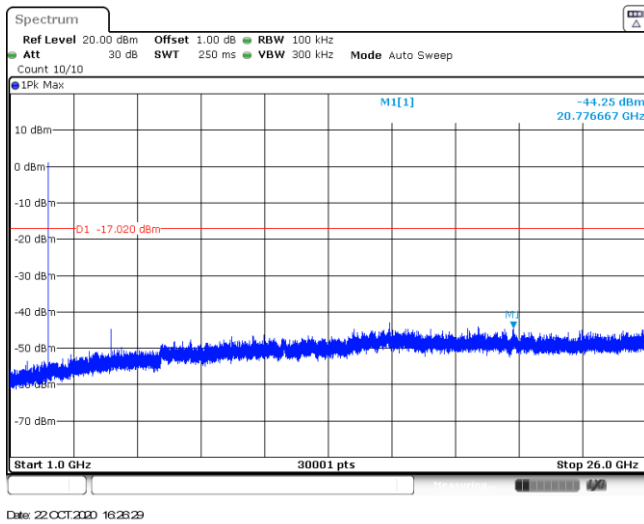
CH78
Reference level



CH78
30MHz~1000MHz



CH78
1GHz~26GHz



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