

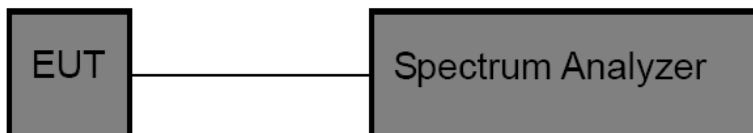


3.4. Band edge and Spurious Emissions (Conducted)

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

Test Configuration



Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
RBW = 100 kHz, VBW ≥ RBW, scan up through 10th harmonic.
Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

Test Mode

Please refer to the clause 2.4.

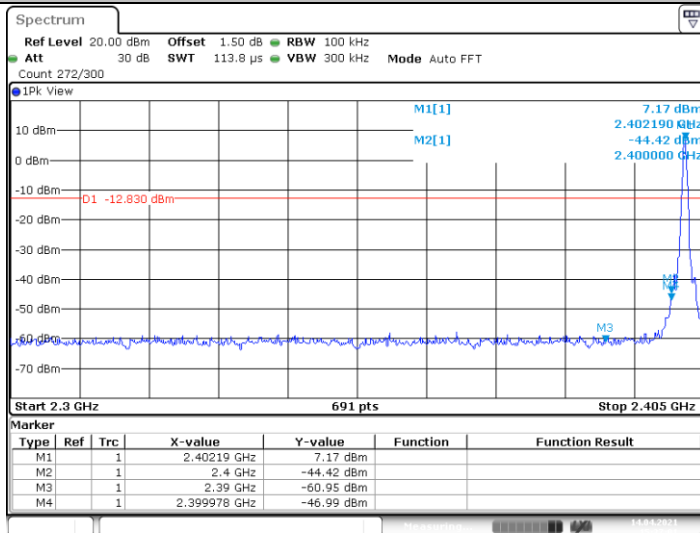
Test Result

(1) Band edge Conducted Test

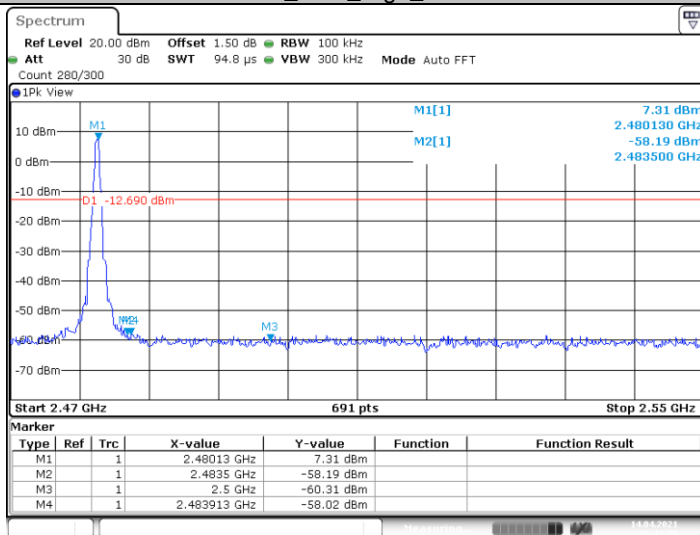
Test Mode	Ch Name	Frequency (MHz)	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
GFSK	Low	2402	7.17	-46.99	<=-12.83	PASS
	High	2480	7.31	-58.02	<=-12.69	PASS
	Low	Hop_2402	6.81	-57.55	-13.19	PASS
	High	Hop_2480	6.80	-57.54	-13.20	PASS
π/4-DQPSK	Low	2402	2.36	-56.15	<=-17.64	PASS
	High	2480	3.19	-58.29	<=-16.81	PASS
	Low	Hop_2402	6.98	-56.63	-13.02	PASS
	High	Hop_2480	6.37	-56.97	-13.63	PASS
8-DPSK	Low	2402	3.97	-50.71	<=-16.03	PASS
	High	2480	3.58	-56.75	<=-16.42	PASS
	Low	Hop_2402	6.24	-57.83	-13.76	PASS
	High	Hop_2480	7.02	-56.42	-12.98	PASS



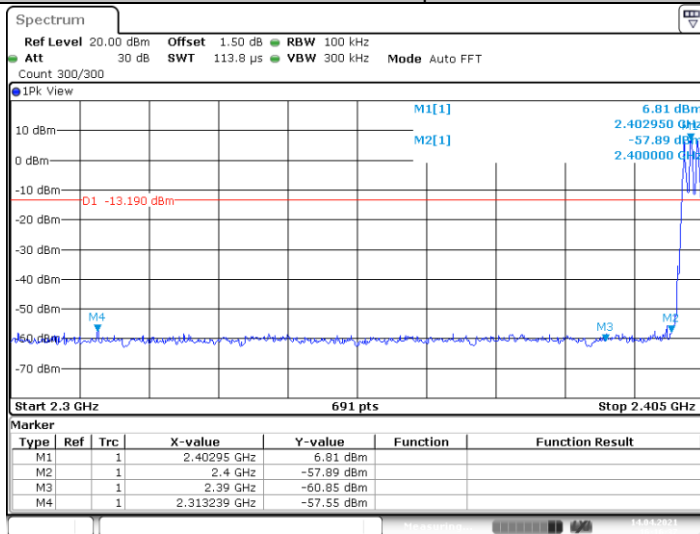
DH5_Ant1_Low_2402



DH5_Ant1_High_2480



DH5_Ant1_Low_Hop_2402



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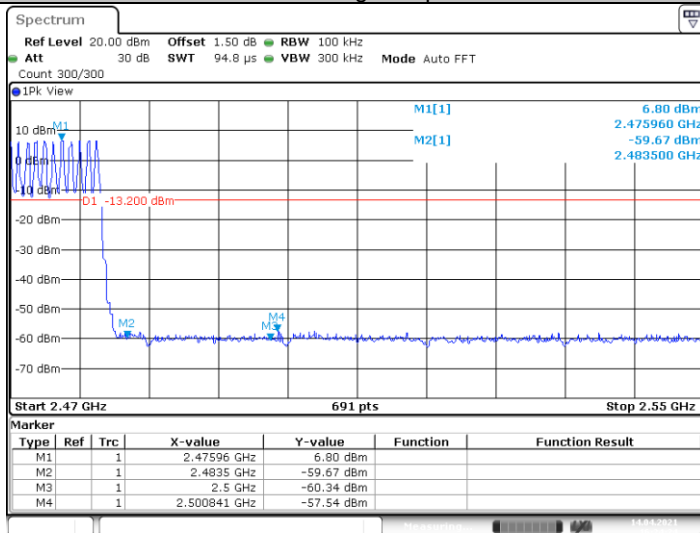
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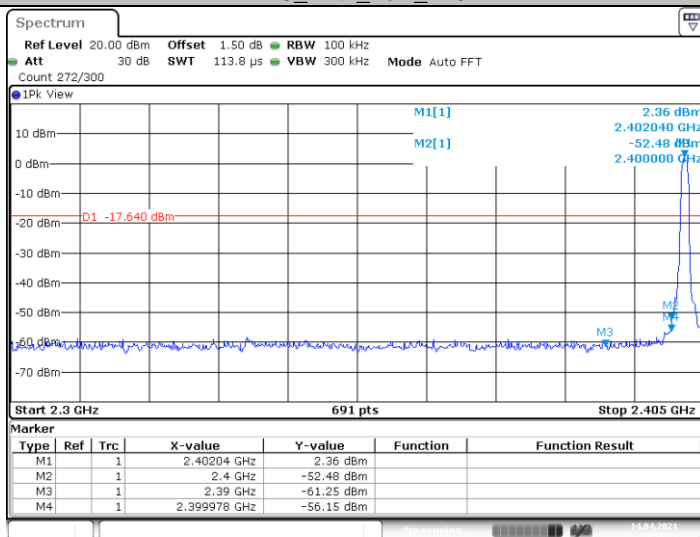


DH5_Ant1_High_Hop_2480



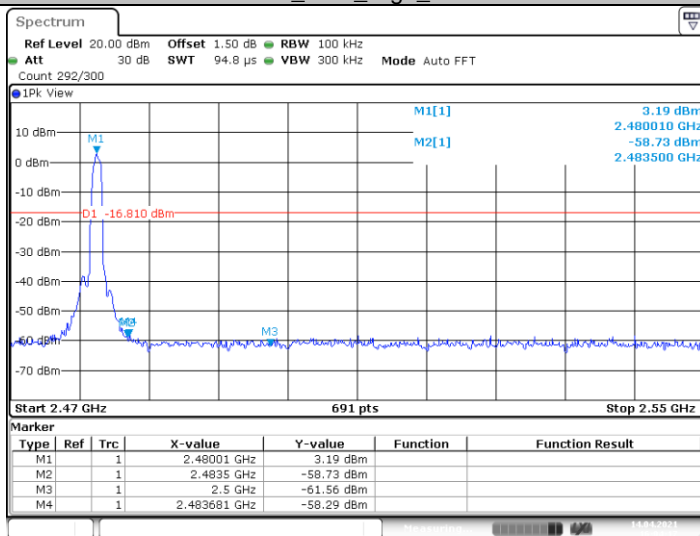
Date: 14.APR.2021 16:24:24

2DH5_Ant1_Low_2402



Date: 14.APR.2021 15:59:35

2DH5_Ant1_High_2480



Date: 14.APR.2021 16:04:18

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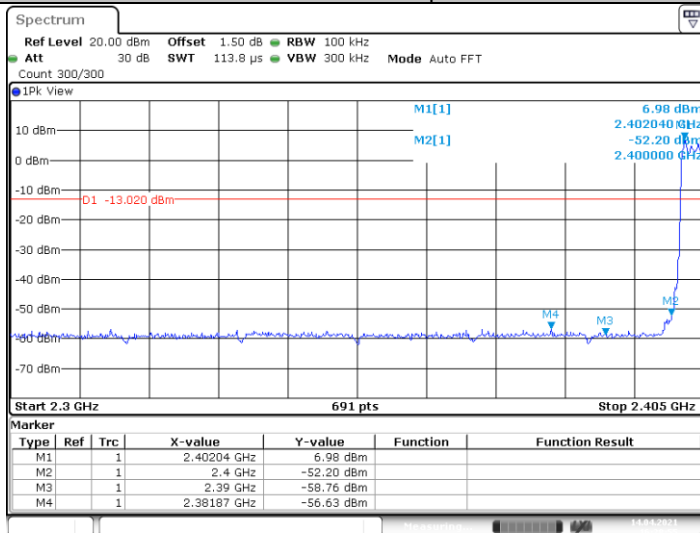
Fax: (86)755-27521011

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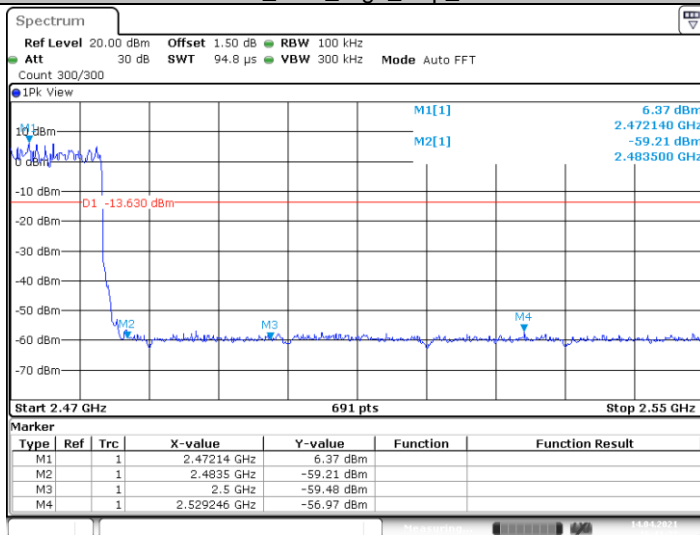
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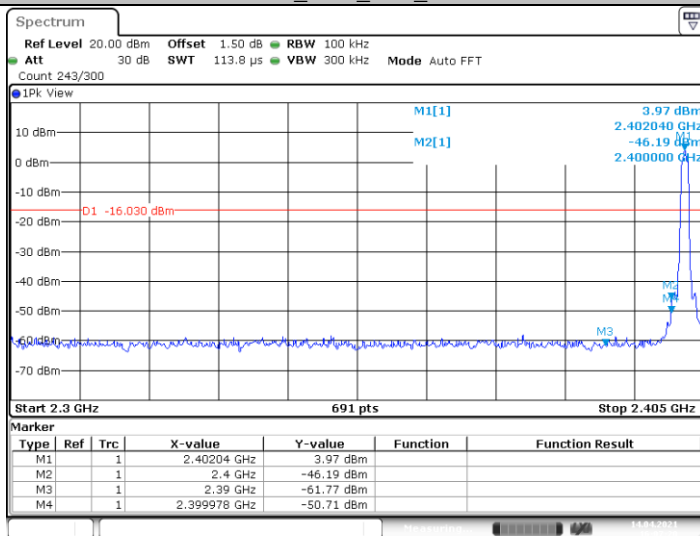
2DH5_Ant1_Low_Hop_2402



2DH5_Ant1_High_Hop_2480



3DH5_Ant1_Low_2402



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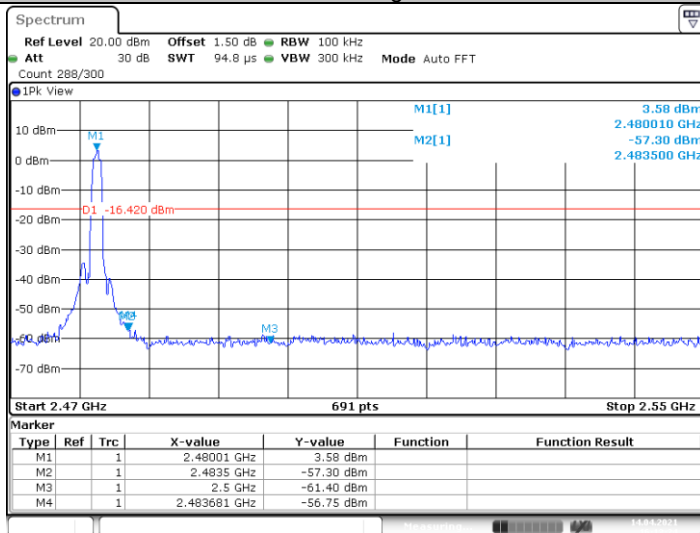
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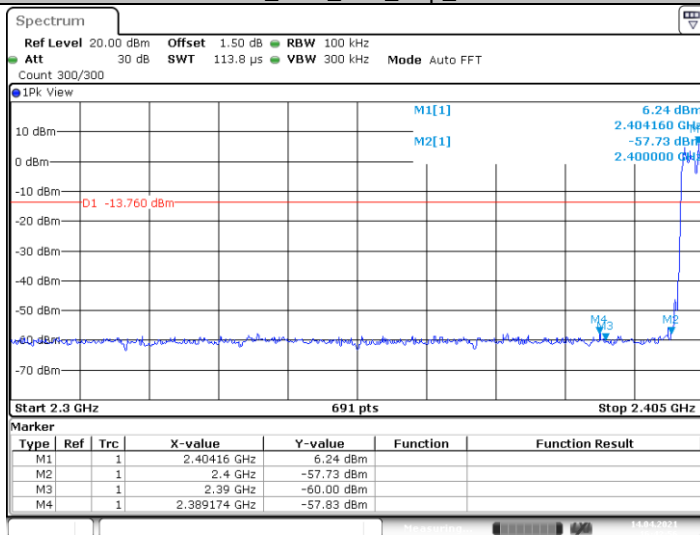


3DH5_Ant1_High_2480



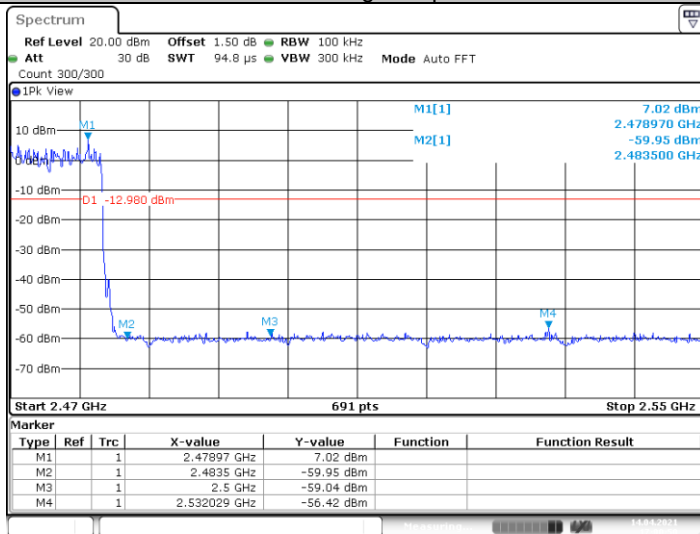
Date: 14.APR.2021 16:13:24

3DH5_Ant1_Low_Hop_2402



Date: 14.APR.2021 16:42:55

3DH5_Ant1_High_Hop_2480



Date: 14.APR.2021 17:00:49

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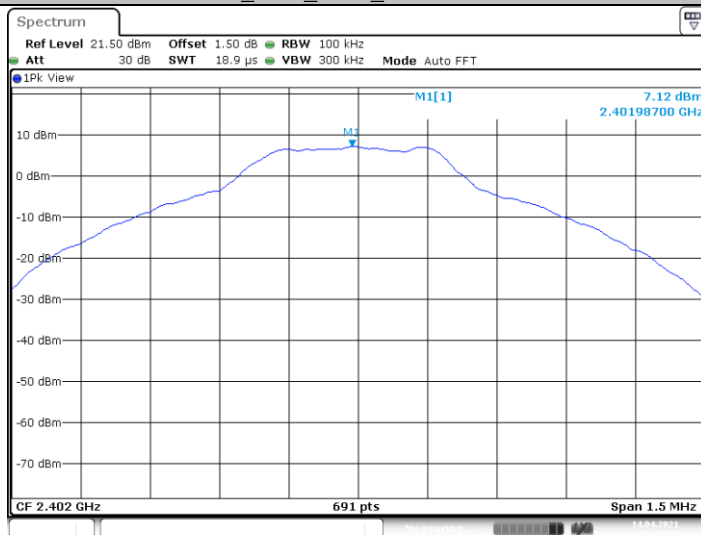


(2) Conducted Spurious Emissions Test

Test Mode	Frequency (MHz)	Freq Range [MHz]	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
GFSK	2402	Reference	7.12	7.12	---	PASS
		30~1000	30~1000	-46.46	<=-12.88	PASS
		1000~26500	1000~26500	-39.02	<=-12.88	PASS
	2441	Reference	7.33	7.33	---	PASS
		30~1000	30~1000	-45.13	<=-12.67	PASS
		1000~26500	1000~26500	-39.89	<=-12.67	PASS
	2480	Reference	7.42	7.42	---	PASS
		30~1000	30~1000	-44.39	<=-12.58	PASS
		1000~26500	1000~26500	-41.15	<=-12.58	PASS
$\pi/4$ -DQPSK	2402	Reference	3.82	3.82	---	PASS
		30~1000	30~1000	-50.87	<=-16.18	PASS
		1000~26500	1000~26500	-40.14	<=-16.18	PASS
	2441	Reference	4.06	4.06	---	PASS
		30~1000	30~1000	-50.15	<=-15.94	PASS
		1000~26500	1000~26500	-40.68	<=-15.94	PASS
	2480	Reference	4.15	4.15	---	PASS
		30~1000	30~1000	-49.88	<=-15.85	PASS
		1000~26500	1000~26500	-41.91	<=-15.85	PASS
8-DPSK	2402	Reference	4.00	4.00	---	PASS
		30~1000	30~1000	-49.69	<=-16.00	PASS
		1000~26500	1000~26500	-40.26	<=-16.00	PASS
	2441	Reference	4.04	4.04	---	PASS
		30~1000	30~1000	-50.87	<=-15.96	PASS
		1000~26500	1000~26500	-40.72	<=-15.96	PASS
	2480	Reference	3.79	3.79	---	PASS
		30~1000	30~1000	-51.15	<=-16.21	PASS
		1000~26500	1000~26500	-42.01	<=-16.21	PASS

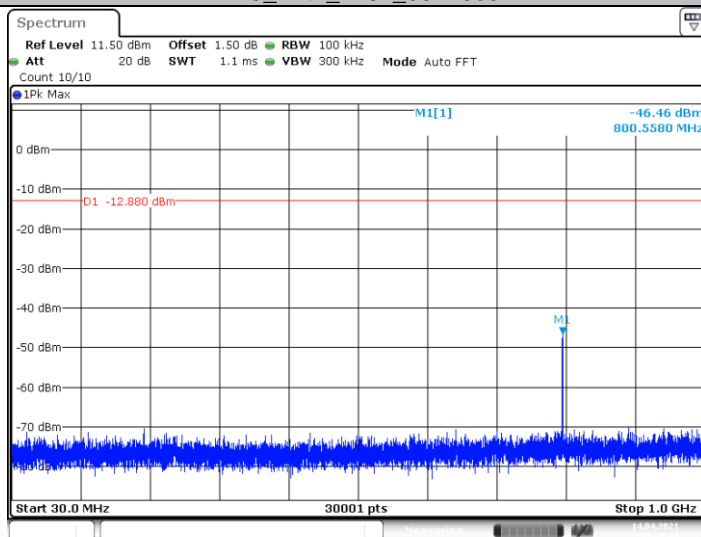


DH5_Ant1_2402_0~Reference



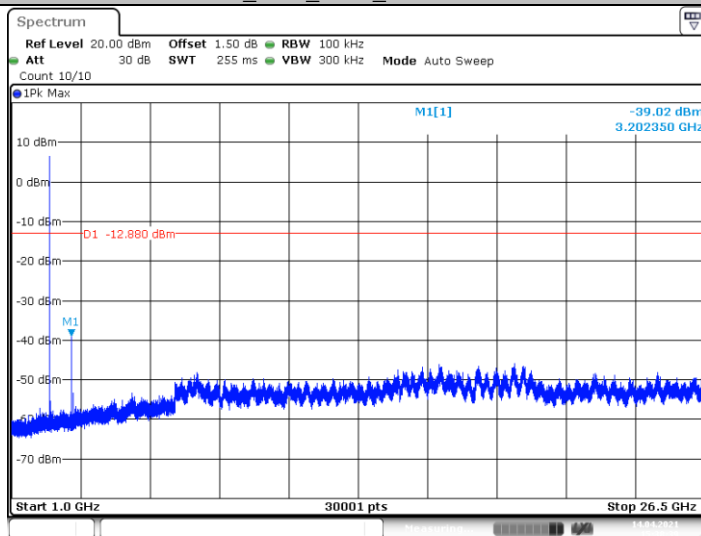
Date: 14.APR.2021 15:38:02

DH5_Ant1_2402_30~1000



Date: 14.APR.2021 15:38:12

DH5_Ant1_2402_1000~26500



Date: 14.APR.2021 15:38:39

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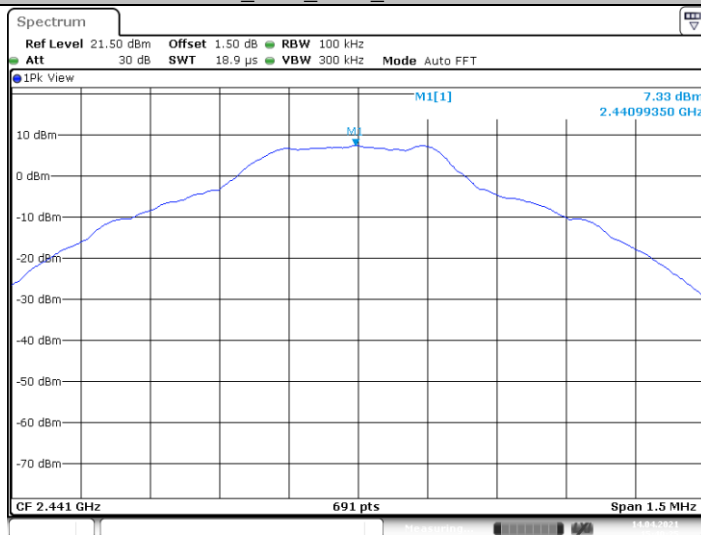
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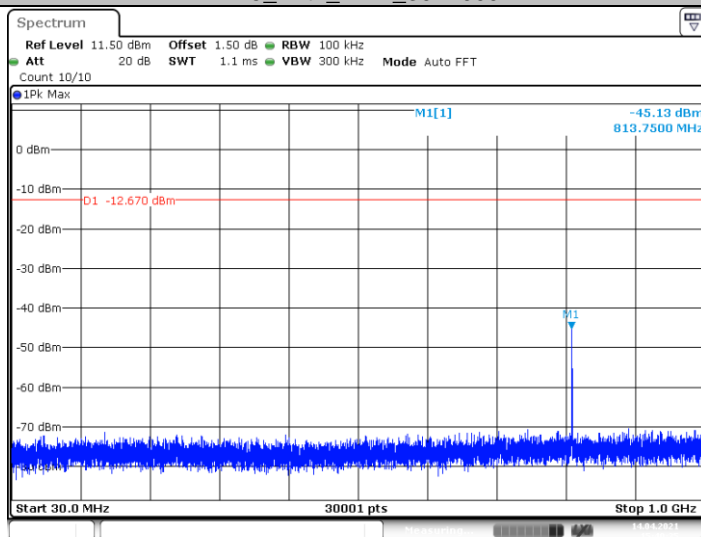


DH5_Ant1_2441_0~Reference



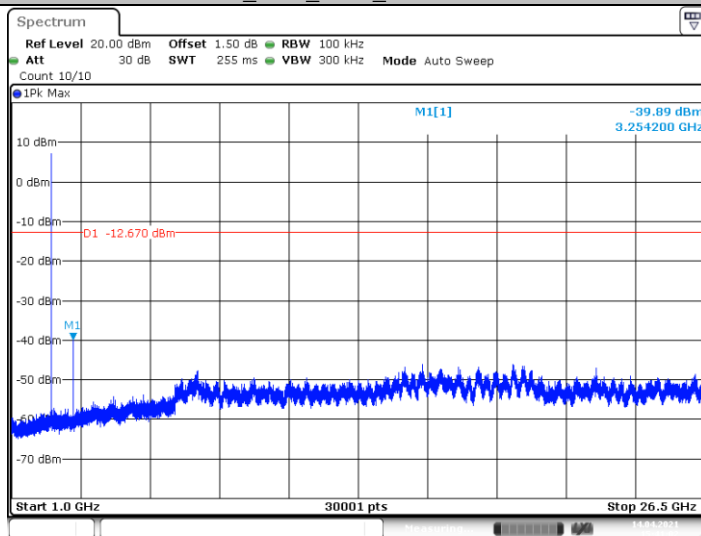
Date: 14.APR.2021 15:40:25

DH5_Ant1_2441_30~1000



Date: 14.APR.2021 15:40:34

DH5_Ant1_2441_1000~26500



Date: 14.APR.2021 15:41:02

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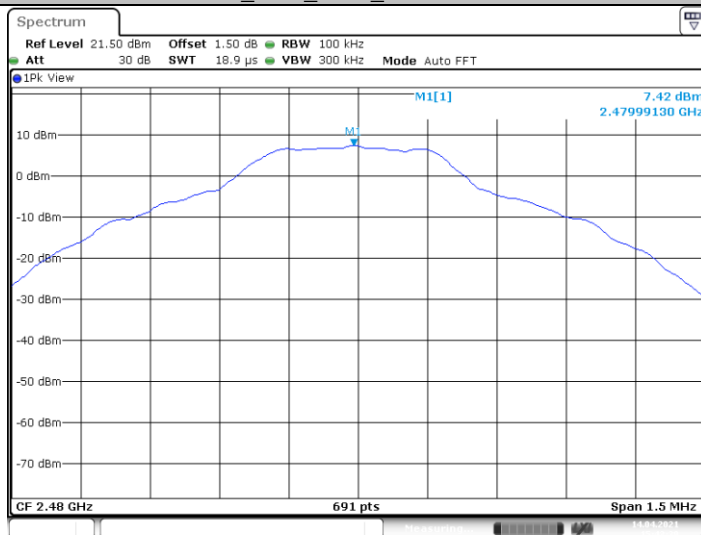
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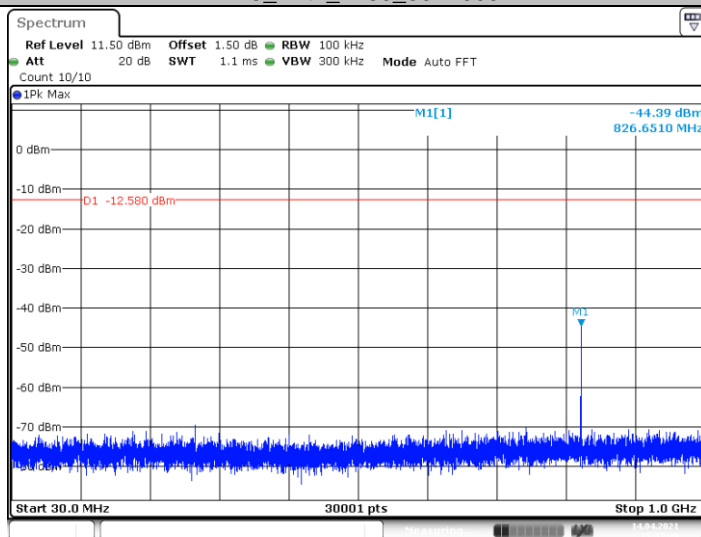


DH5_Ant1_2480_0~Reference



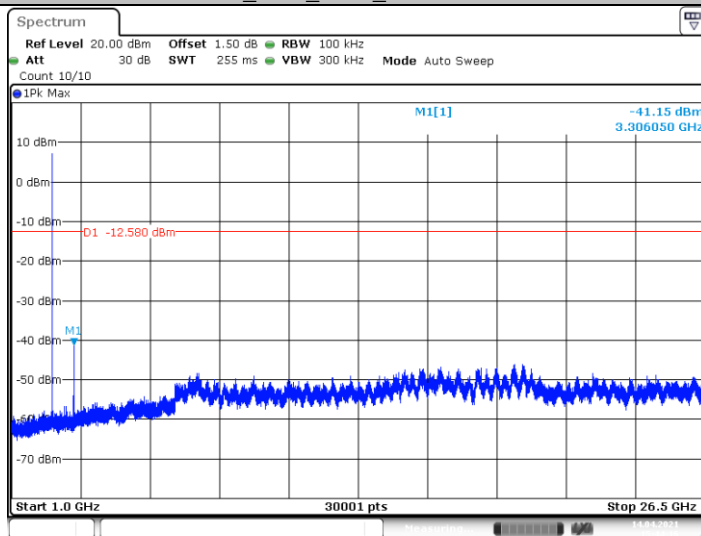
Date: 14.APR.2021 15:43:39

DH5_Ant1_2480_30~1000



Date: 14.APR.2021 15:43:46

DH5_Ant1_2480_1000~26500



Date: 14.APR.2021 15:44:16

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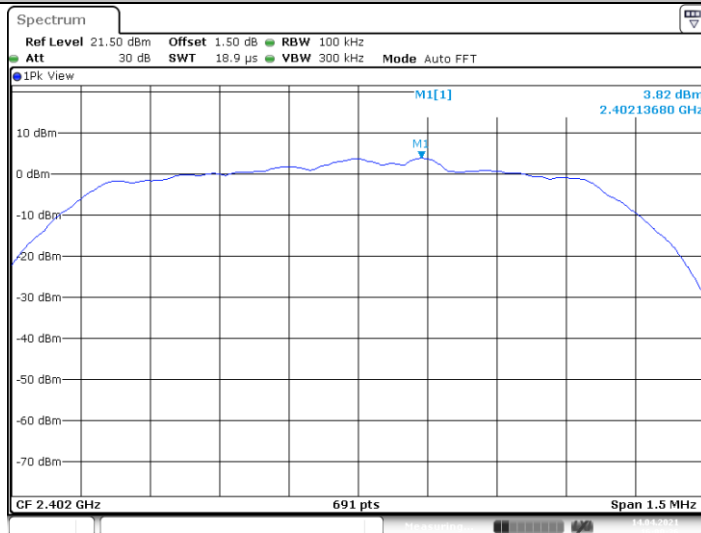
Fax: (86)755-27521011

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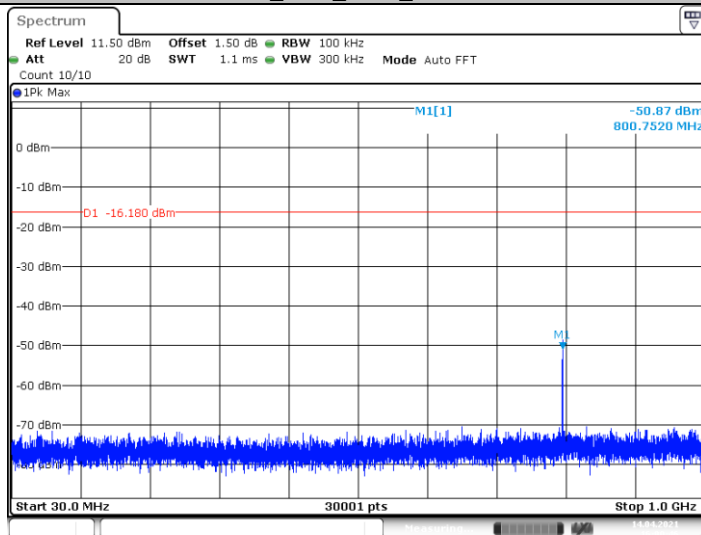


2DH5_Ant1_2402_0~Reference



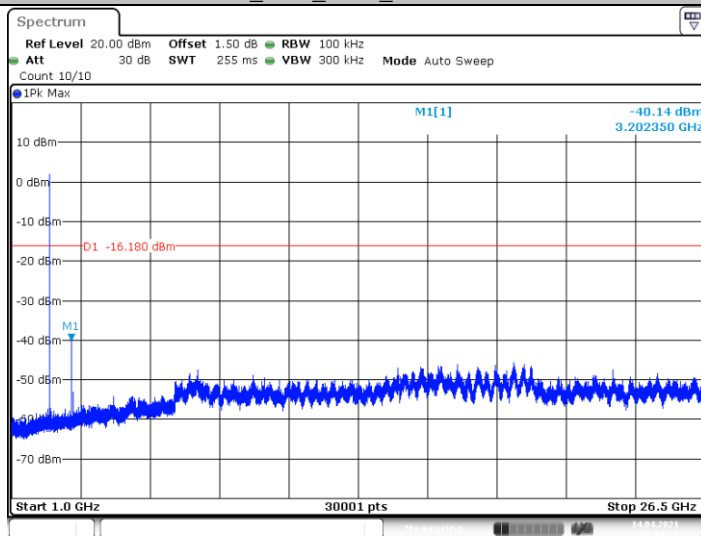
Date: 14.APR.2021 16:00:36

2DH5_Ant1_2402_30~1000



Date: 14.APR.2021 16:00:45

2DH5_Ant1_2402_1000~26500



Date: 14.APR.2021 16:01:13

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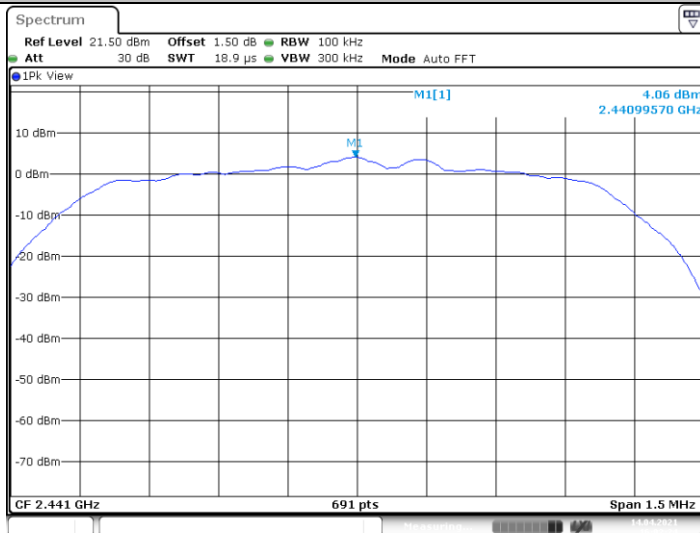
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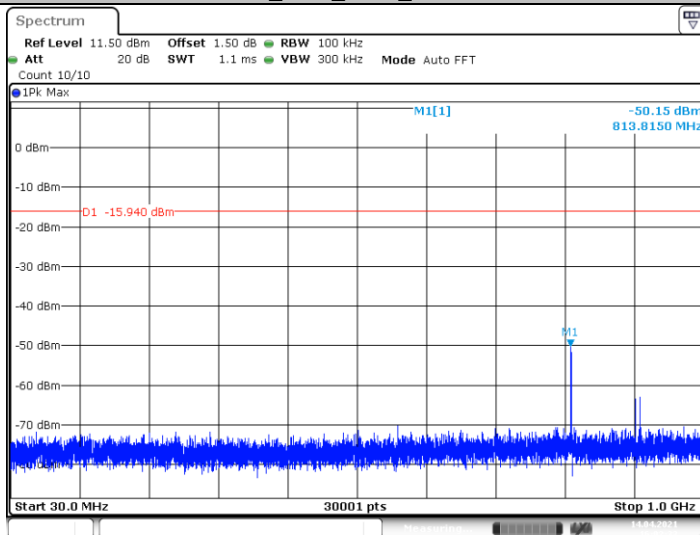


2DH5_Ant1_2441_0~Reference



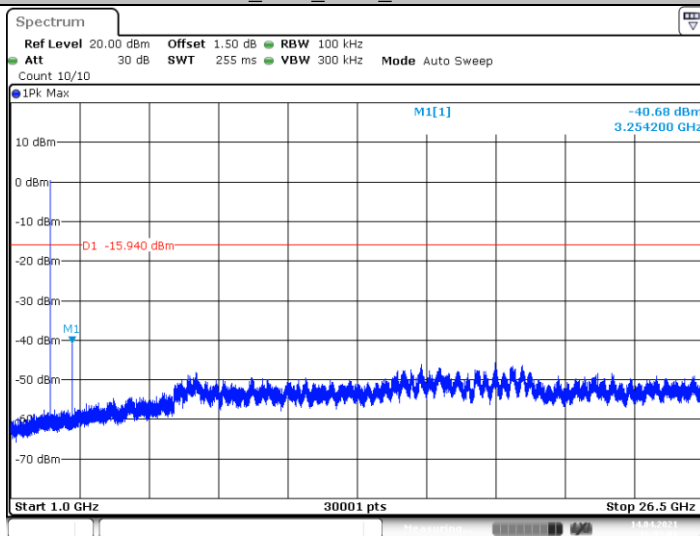
Date: 14.APR.2021 16:02:24

2DH5_Ant1_2441_30~1000



Date: 14.APR.2021 16:02:33

2DH5_Ant1_2441_1000~26500



Date: 14.APR.2021 16:03:01

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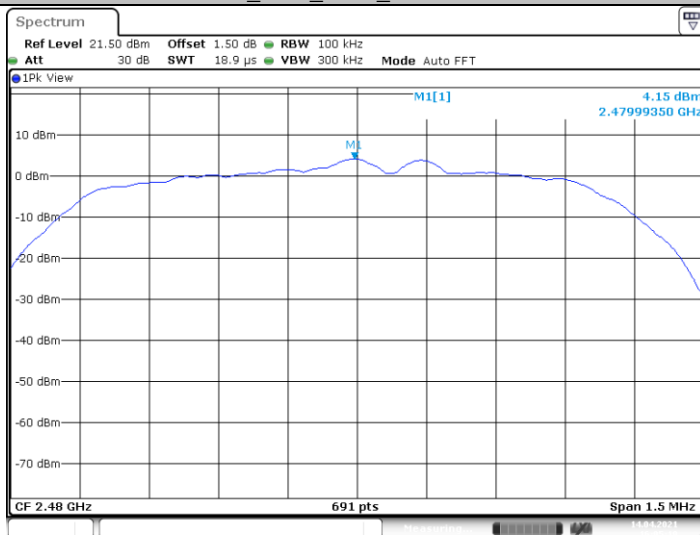
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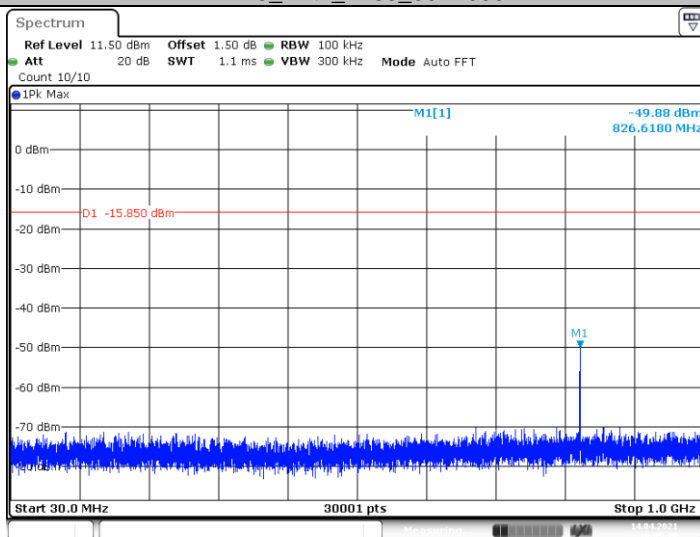


2DH5_Ant1_2480_0~Reference



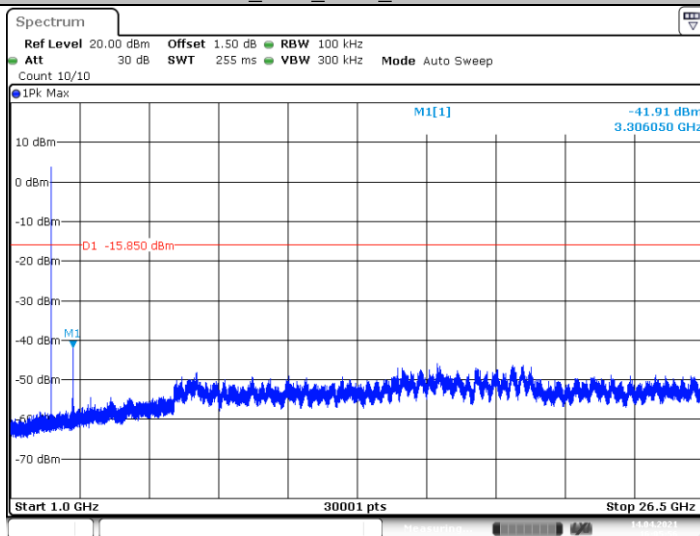
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2DH5_Ant1_2480_30~1000



Date: 14.APR.2021 16:05:20

2DH5_Ant1_2480_1000~26500



Date: 14.APR.2021 16:05:56

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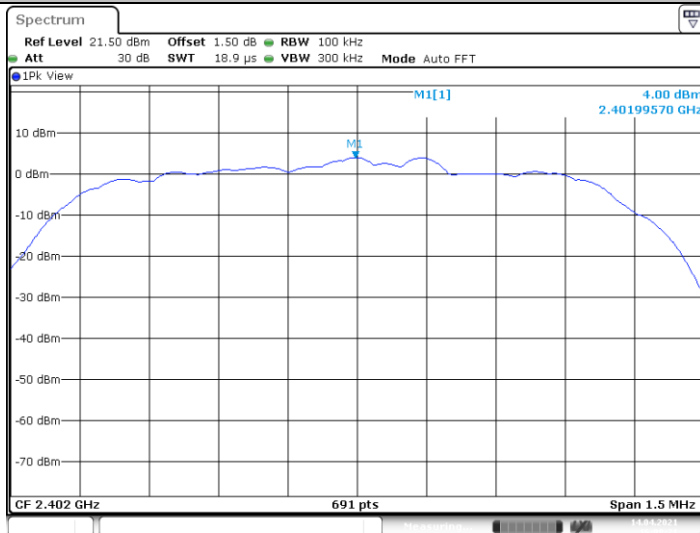
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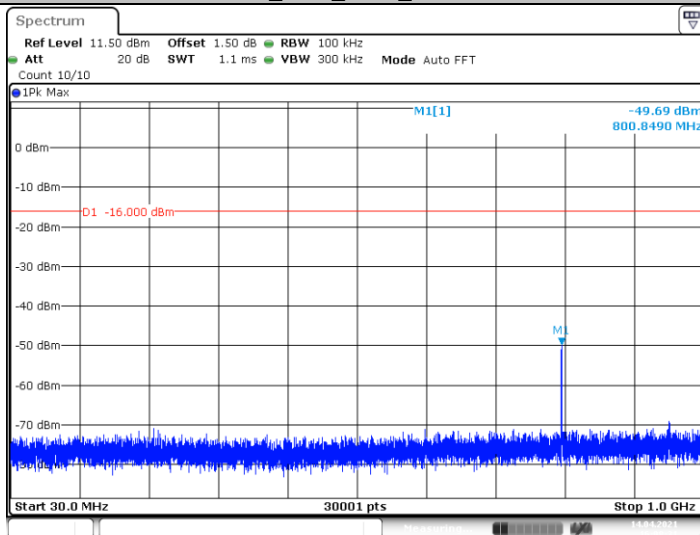


3DH5_Ant1_2402_0~Reference



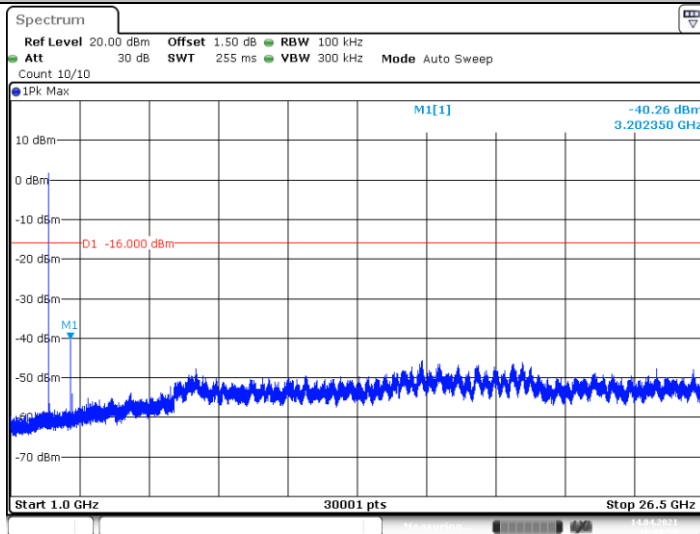
Date: 14.APR.2021 16:08:21

3DH5_Ant1_2402_30~1000



Date: 14.APR.2021 16:08:31

3DH5_Ant1_2402_1000~26500



Date: 14.APR.2021 16:08:58

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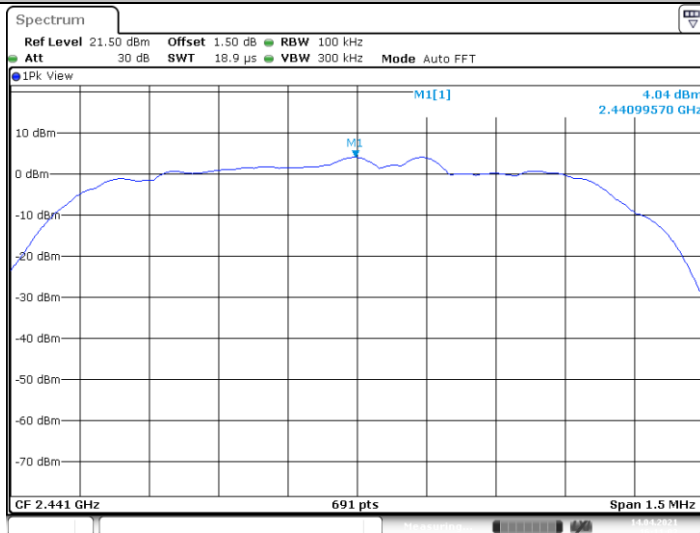
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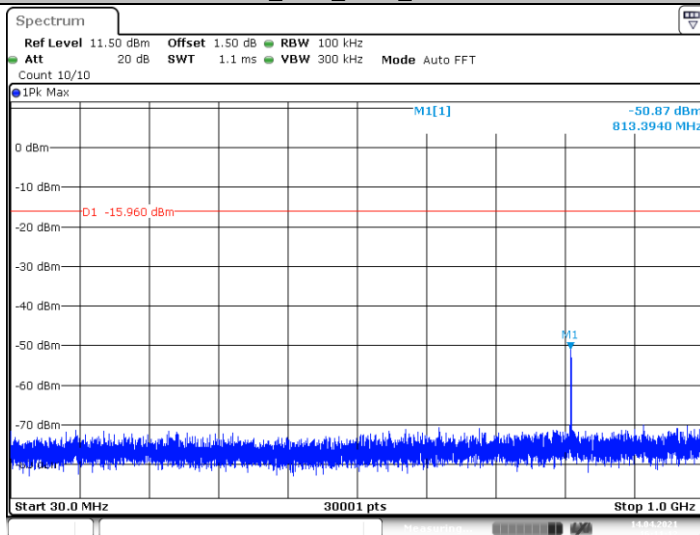


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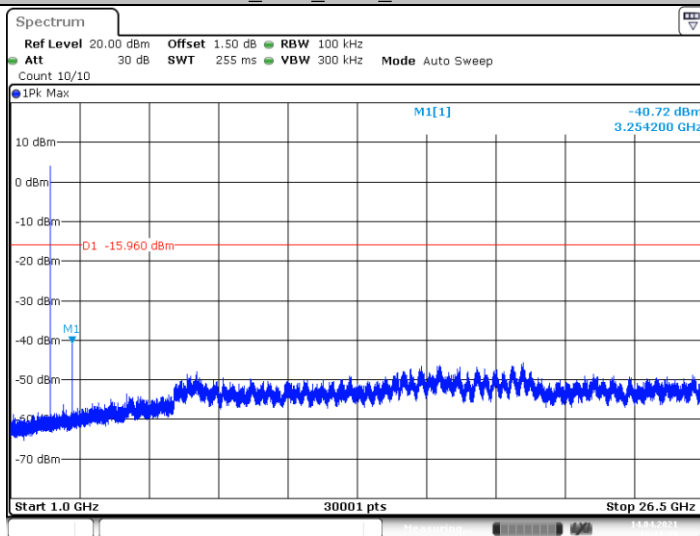
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3DH5_Ant1_2441_30~1000



Date: 14.APR.2021 16:11:12

3DH5_Ant1_2441_1000~26500



Date: 14.APR.2021 16:11:39

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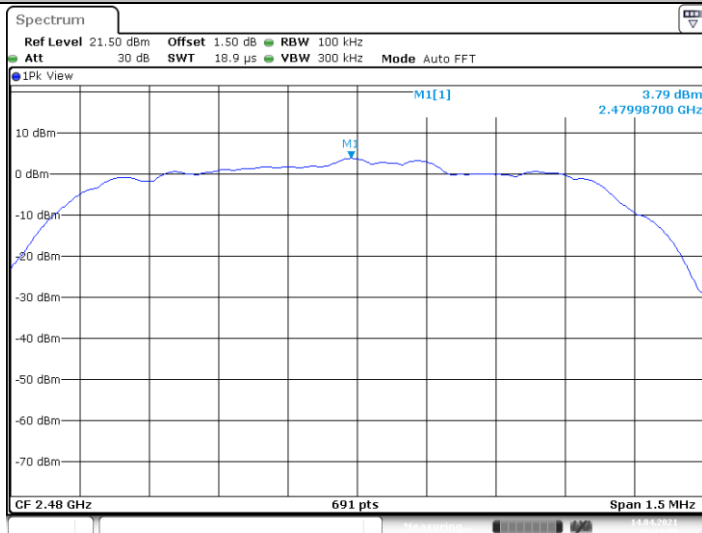
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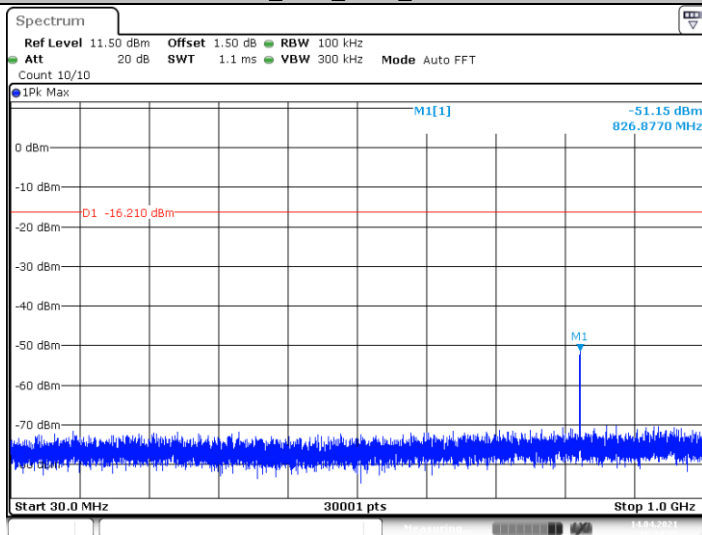


3DH5_Ant1_2480_0~Reference



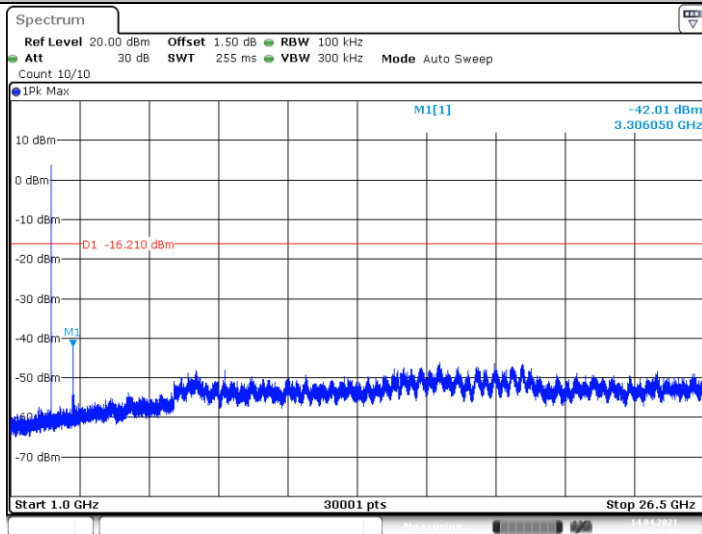
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3DH5_Ant1_2480_30~1000



Date: 14.APR.2021 16:14:34

3DH5_Ant1_2480_1000~26500



Date: 14.APR.2021 16:15:02

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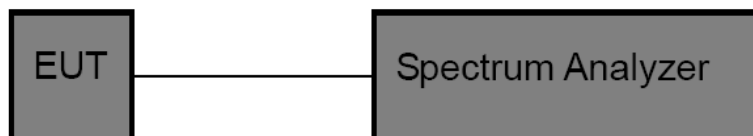


3.5. Bandwidth

Limit

N/A

Test Configuration



Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
2. OCB and 20dB Spectrum Setting:
 - (1) Set RBW = 1% ~ 5% occupied bandwidth.
 - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.

Note: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

Test Mode

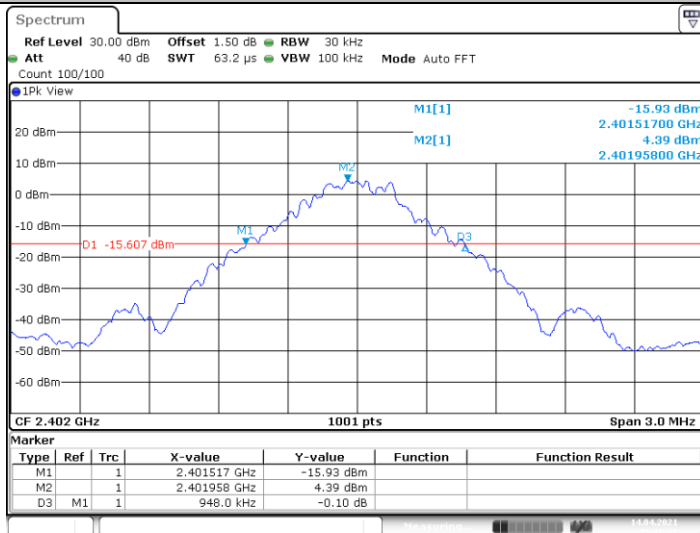
Please refer to the clause 2.4.

Test Results

Test Mode	Frequency (MHz)	20dB EBW[MHz]	FL[MHz]	FH[MHz]	20dB Bandwidth *2/3 (kHz)	Verdict
GFSK	2402	0.948	2401.517	2402.465	632.00	PASS
	2441	0.945	2440.517	2441.462	630.00	PASS
	2480	0.945	2479.517	2480.462	630.00	PASS
$\pi/4$ -DQPSK	2402	1.326	2401.319	2402.645	884.00	PASS
	2441	1.323	2440.322	2441.645	882.00	PASS
	2480	1.323	2479.322	2480.645	882.00	PASS
8-DPSK	2402	1.308	2401.331	2402.639	872.00	PASS
	2441	1.308	2440.331	2441.639	872.00	PASS
	2480	1.308	2479.331	2480.639	872.00	PASS

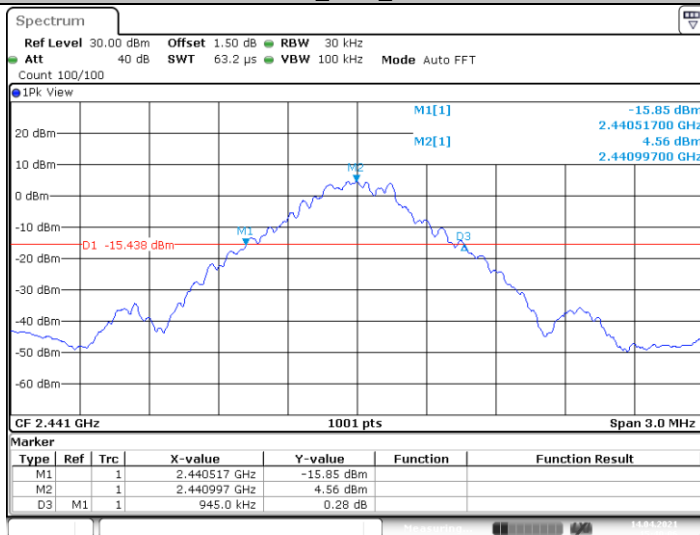


DH5_Ant1_2402



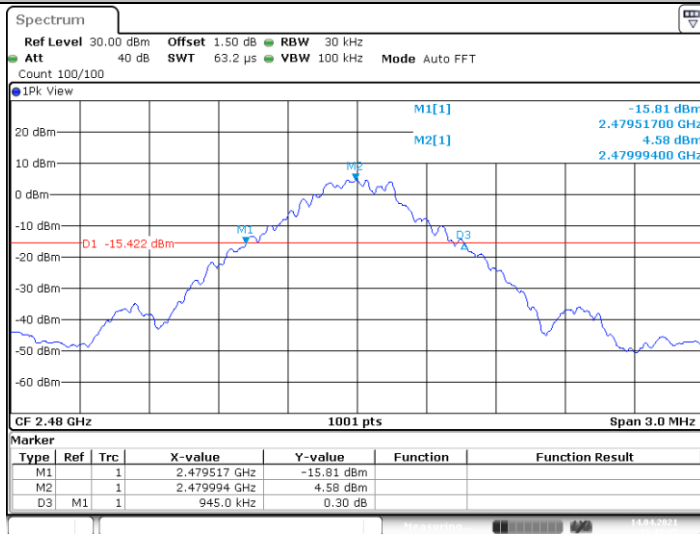
Date: 14.APR.2021 15:36:38

DH5_Ant1_2441



Date: 14.APR.2021 15:40:06

DH5_Ant1_2480



Date: 14.APR.2021 15:42:15

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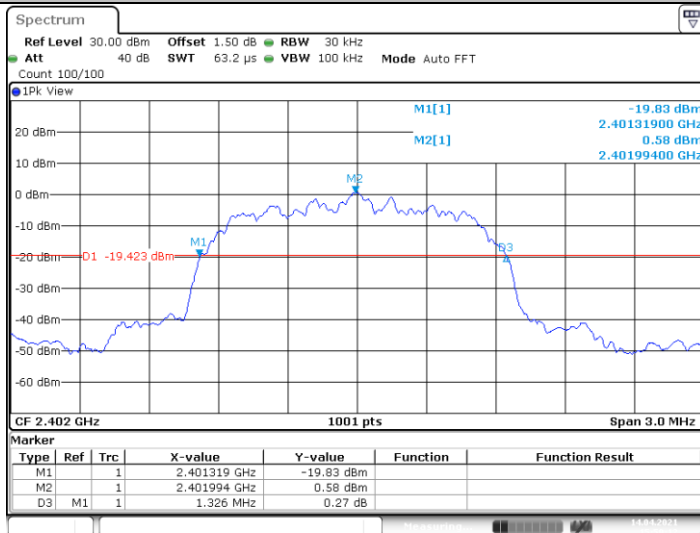
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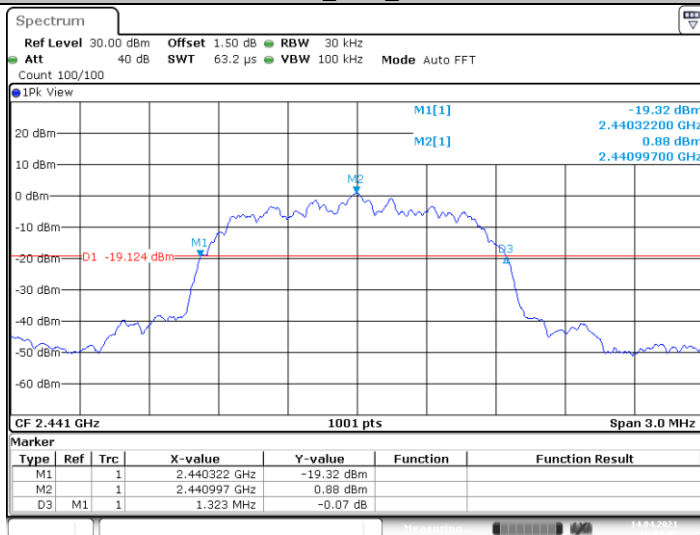


2DH5_Ant1_2402



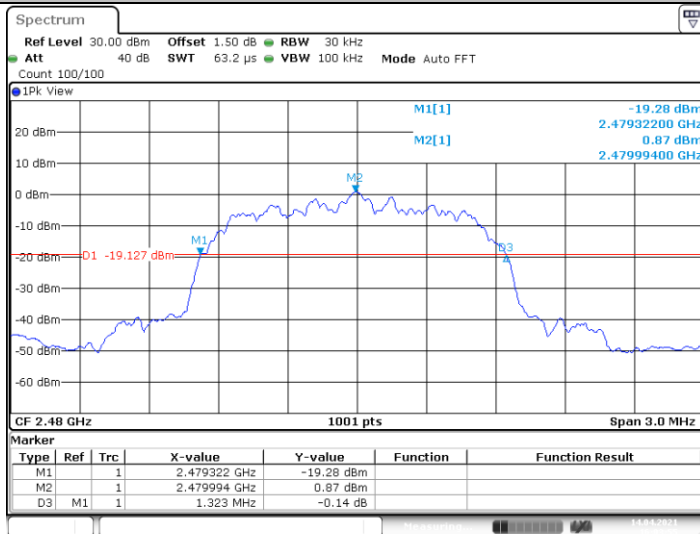
Date: 14.APR.2021 15:59:12

2DH5_Ant1_2441



Date: 14.APR.2021 16:02:05

2DH5_Ant1_2480



Date: 14.APR.2021 16:03:55

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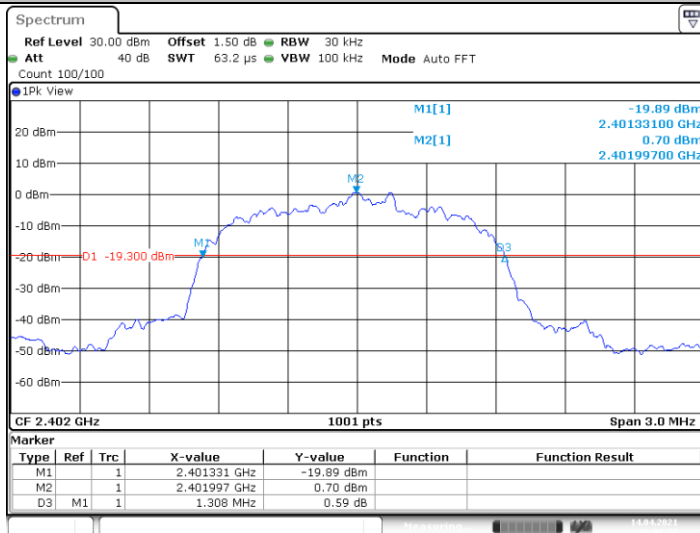
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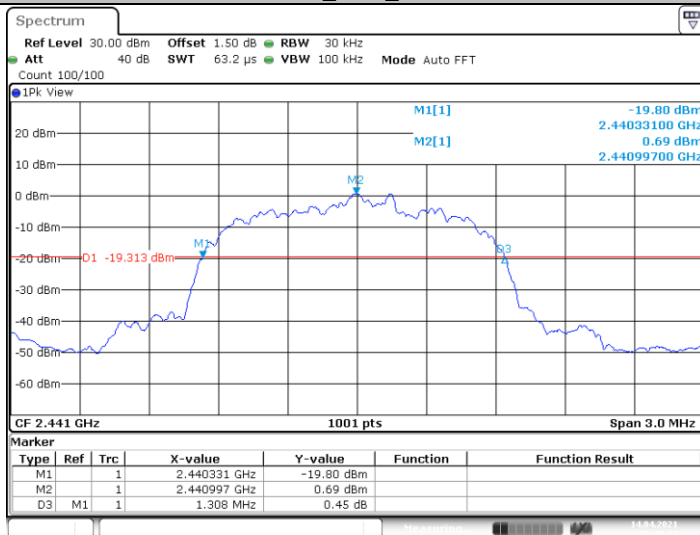


3DH5_Ant1_2402



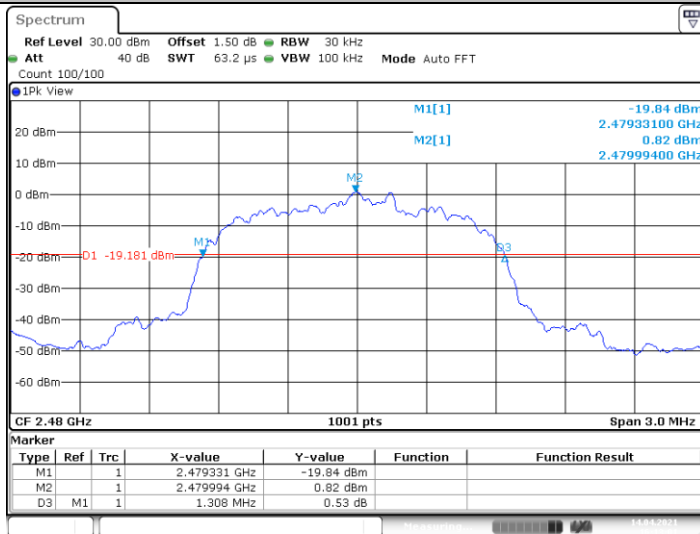
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3DH5_Ant1_2441



Date: 14.APR.2021 16:10:43

3DH5_Ant1_2480



Date: 14.APR.2021 16:13:01

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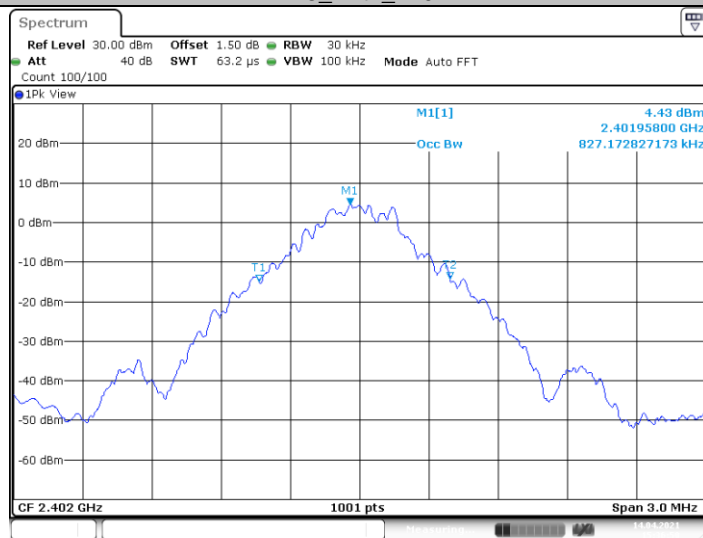
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**Test Result**

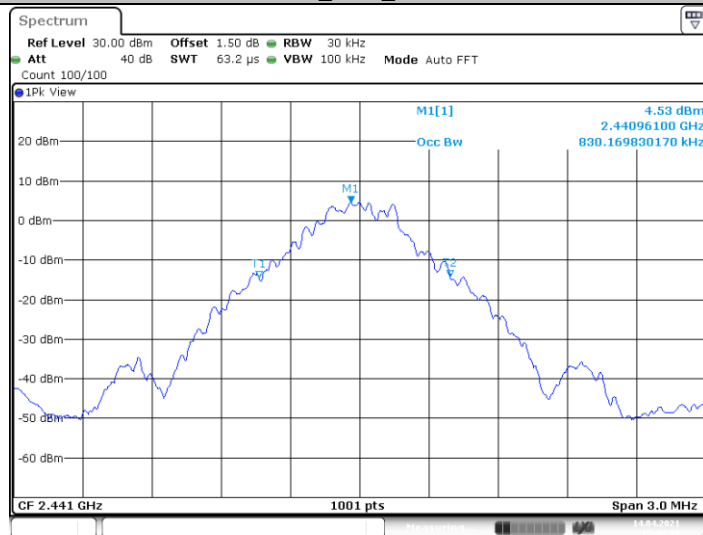
Test Mode	Antenna	Frequency (MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
DH5	Ant1	2402	0.827	2401.565	2402.393	PASS
		2441	0.830	2440.562	2441.393	PASS
		2480	0.830	2479.562	2480.393	PASS
2DH5	Ant1	2402	1.175	2401.395	2402.569	PASS
		2441	1.175	2440.395	2441.569	PASS
		2480	1.178	2479.395	2480.572	PASS
3DH5	Ant1	2402	1.175	2401.398	2402.572	PASS
		2441	1.175	2440.398	2441.572	PASS
		2480	1.175	2479.398	2480.572	PASS

DH5_Ant1_2402



Date: 14.APR.2021 15:36:50

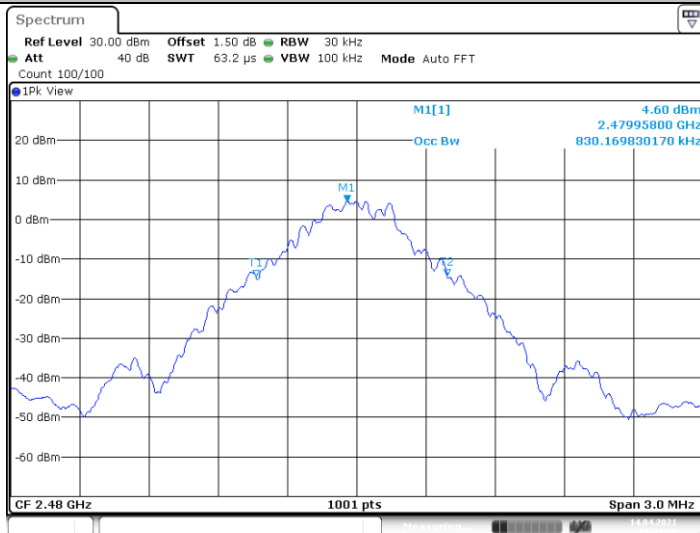
DH5_Ant1_2441



Date: 14.APR.2021 15:40:18

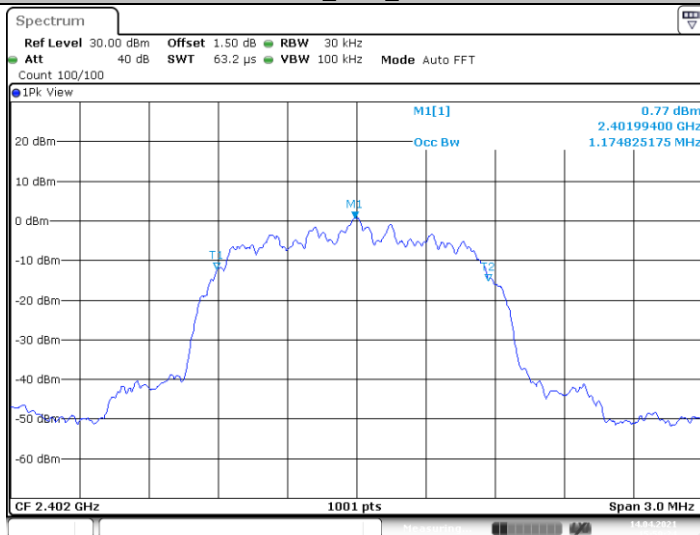


DH5_Ant1_2480



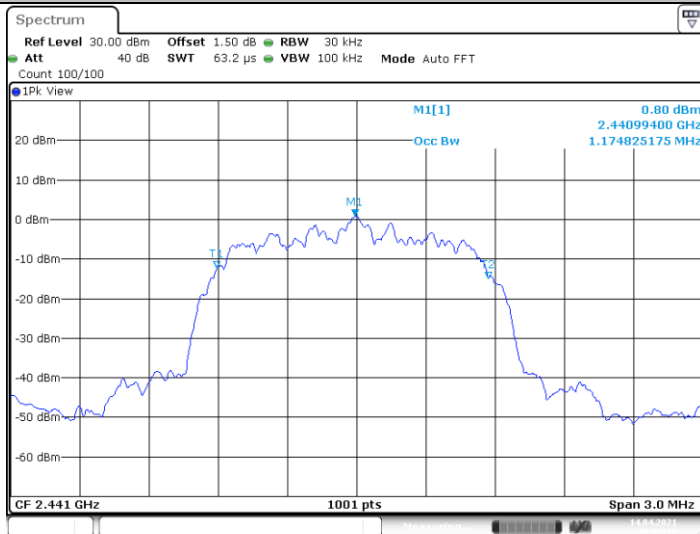
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2DH5_Ant1_2402



Date: 14.APR.2021 15:59:24

2DH5_Ant1_2441



Date: 14.APR.2021 16:02:17

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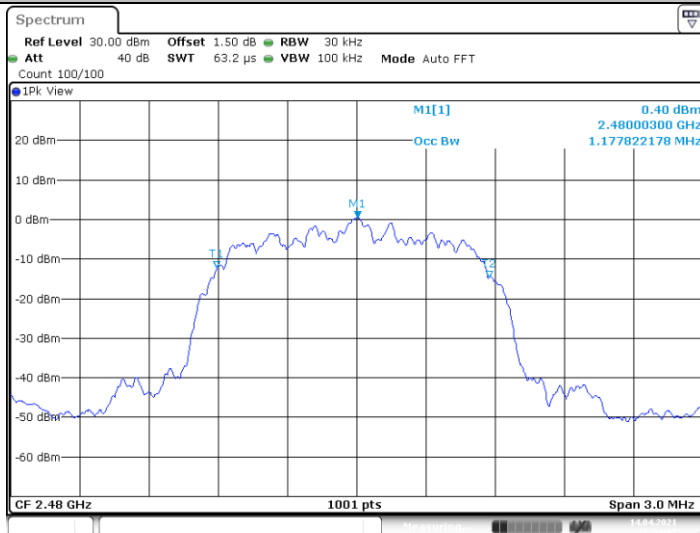
Fax: (86)755-27521011

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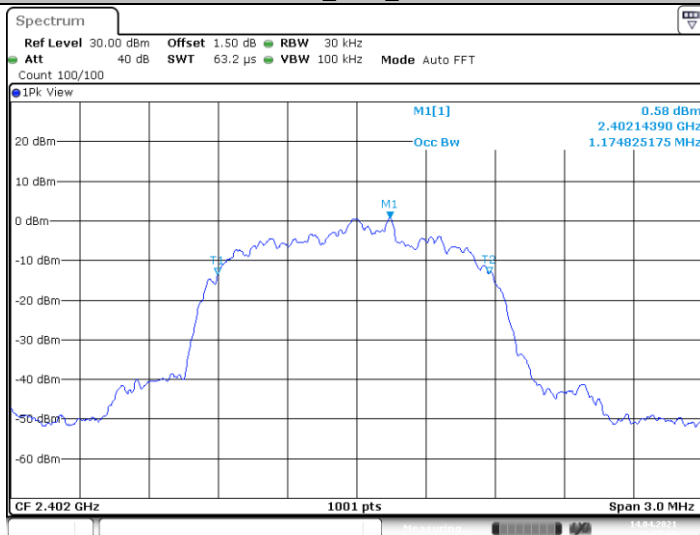


2DH5_Ant1_2480



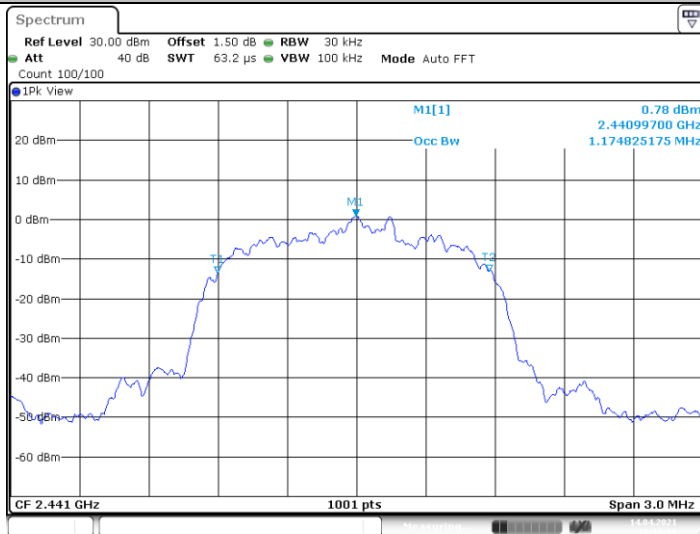
Date: 14.APR.2021 16:04:07

3DH5_Ant1_2402



Date: 14.APR.2021 16:07:09

3DH5_Ant1_2441



Date: 14.APR.2021 16:10:55

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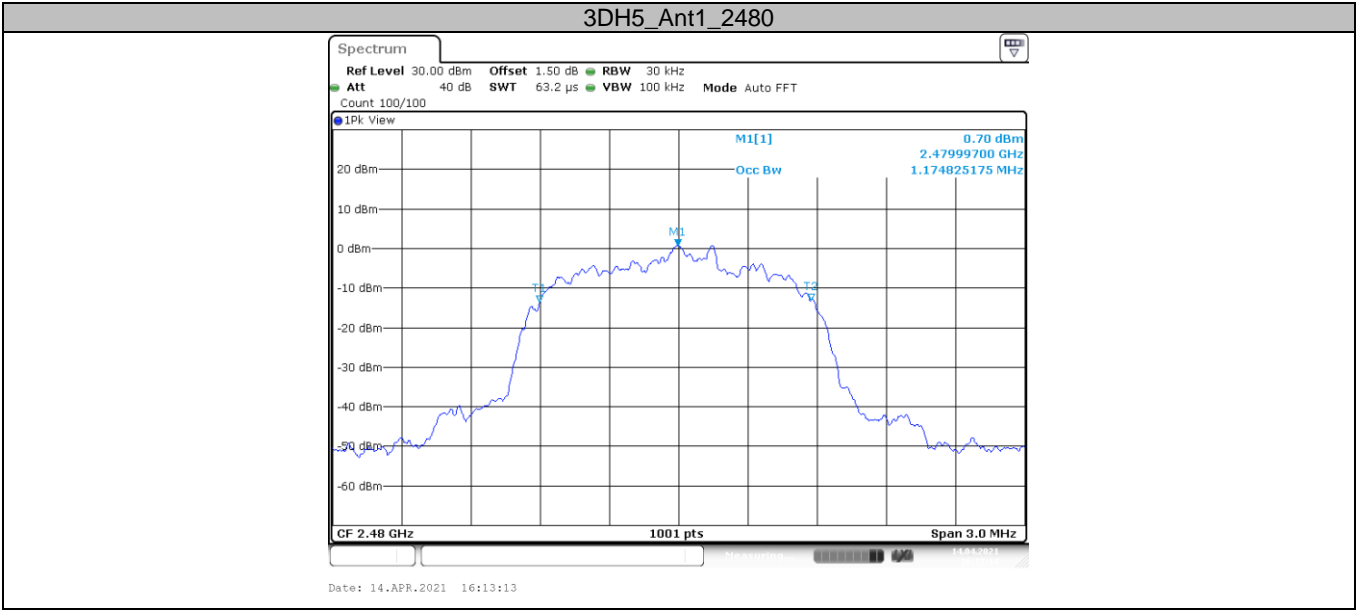
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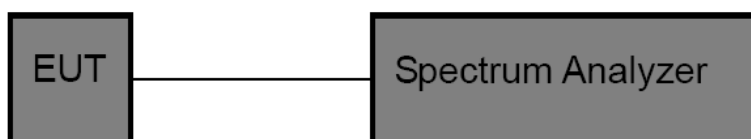
3.6. Channel Separation

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1)/ RSS-247 5.1 b :

Test Item	Limit	Frequency Range(MHz)
Channel Separation	>25KHz or >two-thirds of the 20 dB bandwidth Which is greater	2400~2483.5

Test Configuration



Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
2. Spectrum Setting:
 - (1) Set RBW = 100 kHz.
 - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.

Test Mode

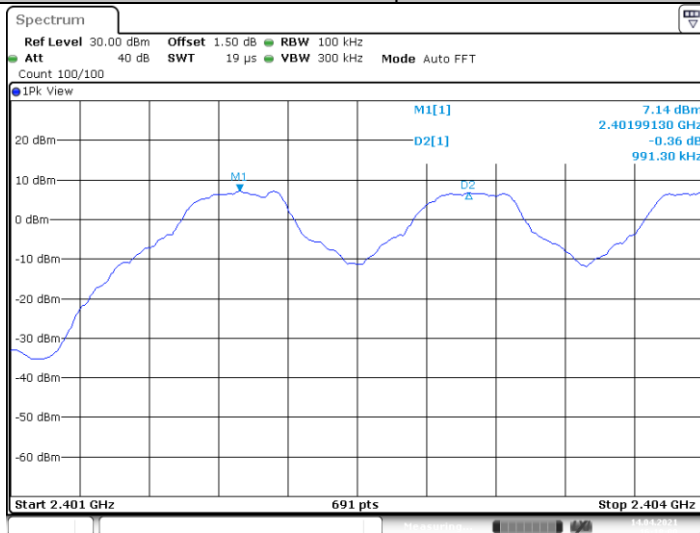
Please refer to the clause 2.4.

Test Result

Test Mode	Frequency(MHz)	Result[MHz]	Limit[MHz]	Verdict
GFSK	Hop_2402	0.991	≥ 632.00	PASS
	Hop_2441	1.022	≥ 630.00	PASS
	Hop_2480	1.047	≥ 630.00	PASS
$\pi/4$ -DQPSK	Hop_2402	1.004	≥ 884.00	PASS
	Hop_2441	1.004	≥ 882.00	PASS
	Hop_2480	1.004	≥ 882.00	PASS
8-DPSK	Hop_2402	1.009	≥ 872.00	PASS
	Hop_2441	1.009	≥ 872.00	PASS
	Hop_2480	1.004	≥ 872.00	PASS

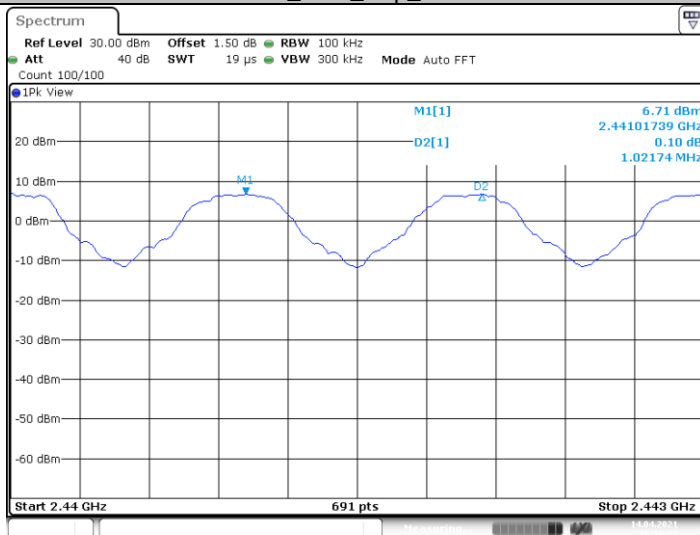


DH5_Ant1_Hop_2402



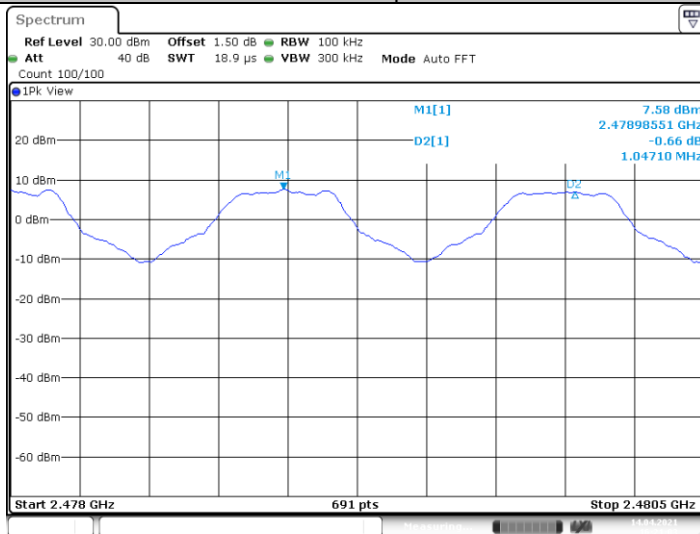
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DH5_Ant1_Hop_2441



Date: 14.APR.2021 16:19:23

DH5_Ant1_Hop_2480



Date: 14.APR.2021 16:21:02

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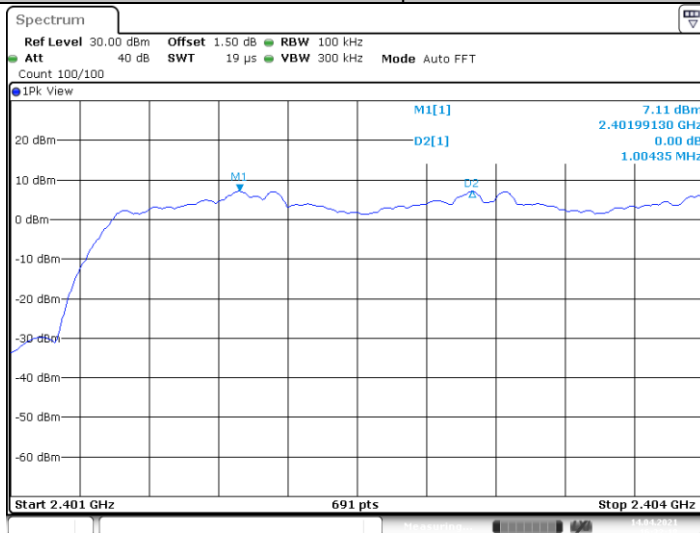
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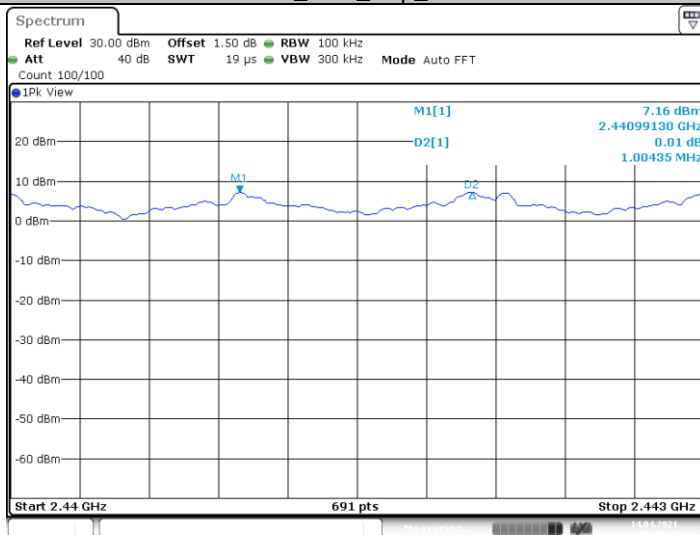


2DH5_Ant1_Hop_2402



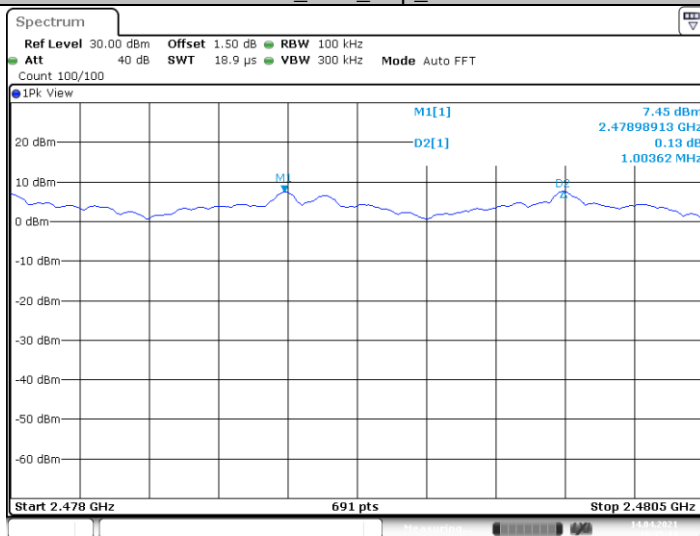
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2DH5_Ant1_Hop_2441



Date: 14.APR.2021 16:34:16

2DH5_Ant1_Hop_2480



Date: 14.APR.2021 16:35:14

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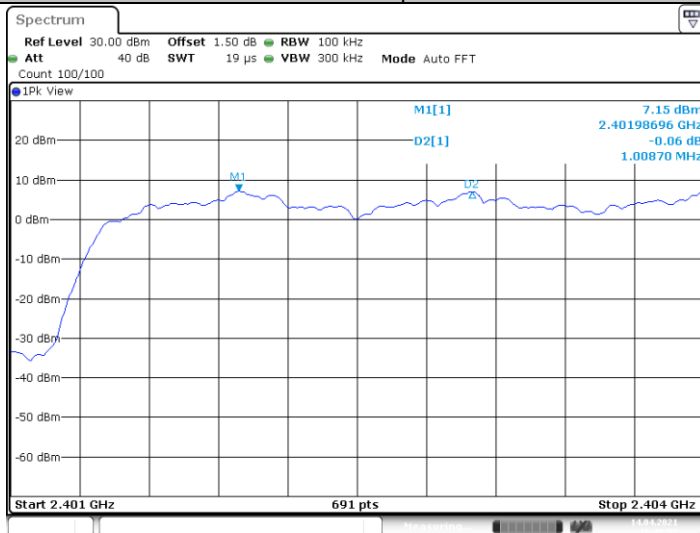
Fax: (86)755-27521011

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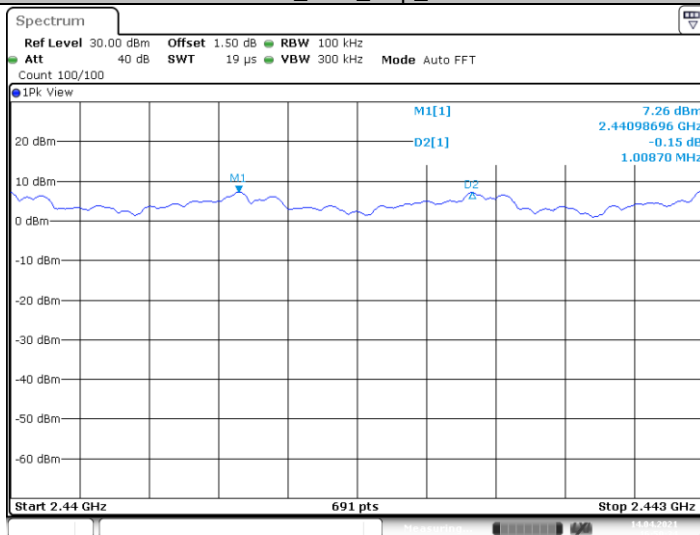


3DH5_Ant1_Hop_2402



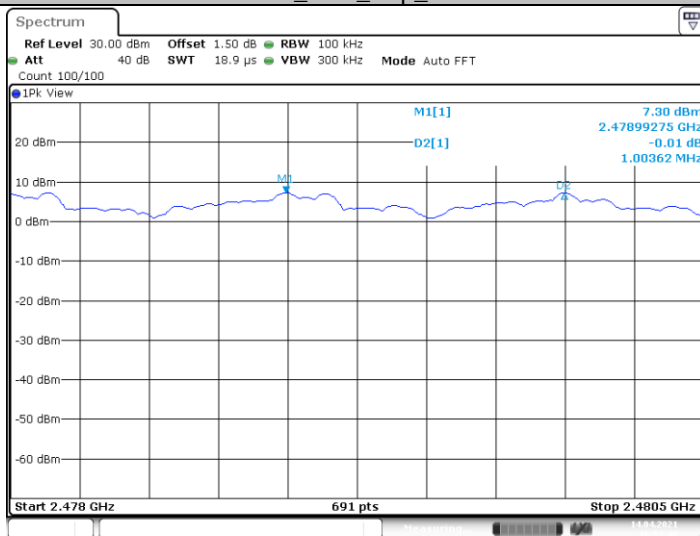
Date: 14.APR.2021 16:48:52

3DH5_Ant1_Hop_2441



Date: 14.APR.2021 16:50:34

3DH5_Ant1_Hop_2480



Date: 14.APR.2021 16:52:40

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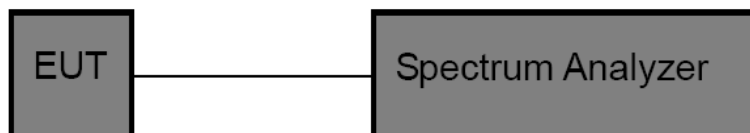
3.7. Number of Hopping Channel

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(iii)/ RSS-247 5.1 d:

Section	Test Item	Limit
15.247 (a)(iii)/ RSS-247 5.1 d:	Number of Hopping Channel	>15

Test Configuration



Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
2. Spectrum Setting:
 - (1) Peak Detector: RBW=100 kHz, VBW \geq RBW, Sweep time= Auto.

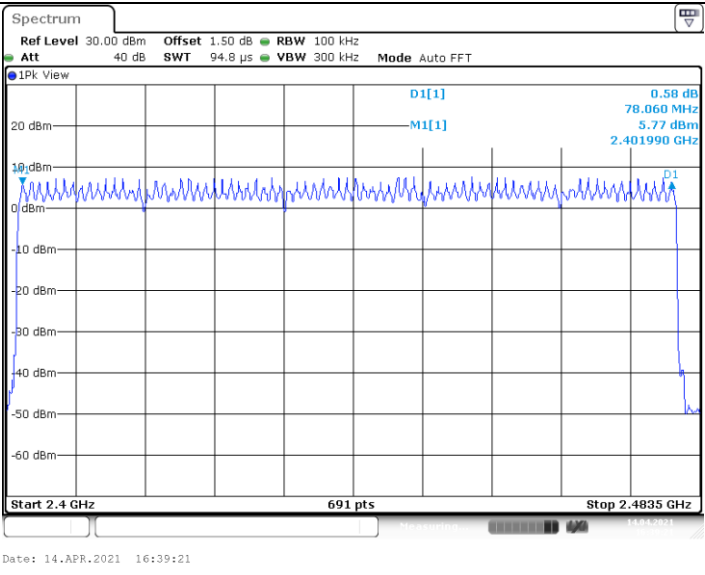
Test Mode

Please refer to the clause 2.4.

Test Result

Modulation type	Channel number	Limit	Result
GFSK	79	≥ 15.00	Pass
$\pi/4$ -DQPSK	79		
8DPSK	79		



<p>GFSK</p>	
<p>$\pi/4$-DQPSK</p>	
<p>8-DPSK</p>	

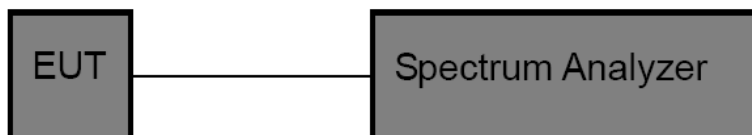


3.8. Dwell Time

Limit

Section	Test Item	Limit
15.247(a)(iii)/ RSS-247 5.1 d	Average Time of Occupancy	0.4 sec

Test Configuration



Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
2. Spectrum Setting:
 - (1) Spectrum Setting: RBW=1MHz, VBW≥RBW.
 - (2) Use video trigger with the trigger level set to enable triggering only on full pulses.
 - (3) Sweep Time is more than once pulse time.
 - (4) Set the center frequency on any frequency would be measure and set the frequency span to zero.
 - (5) Measure the maximum time duration of one single pulse.
 - (6) Set the EUT for packet transmitting.

Test Mode

Please refer to the clause 2.4.

**Test Result**

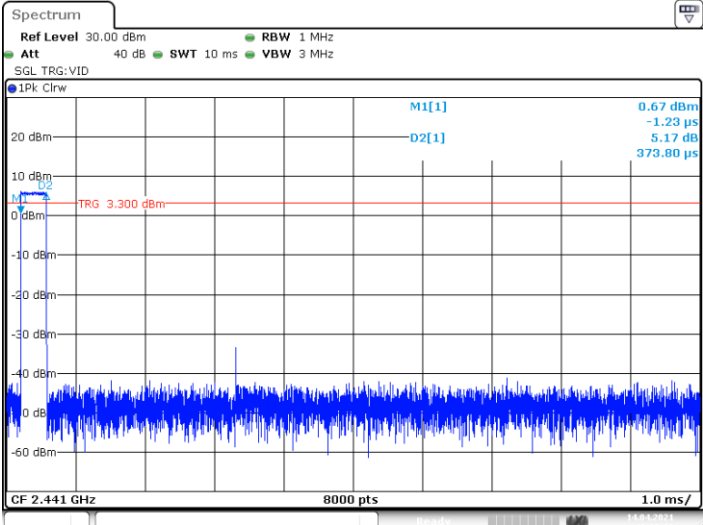
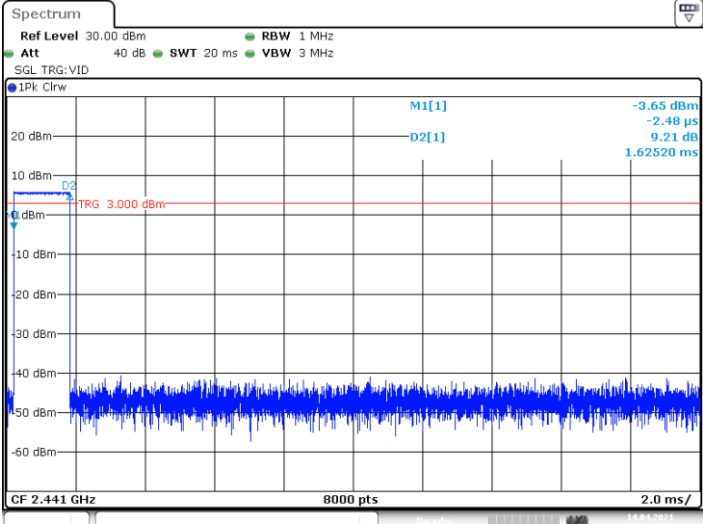
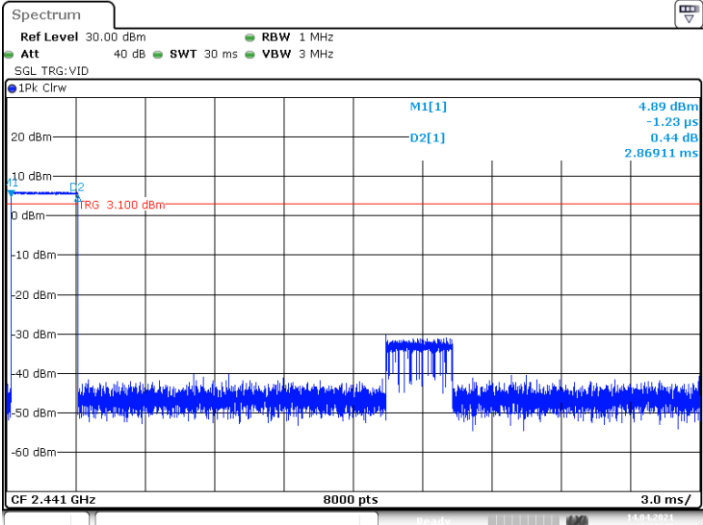
Modulation type	Channel	Frequency (MHz)	Pulse Time (ms)	Total of Dwell (ms)	Period Time (ms)	Limit (Second)	Result
GFSK	DH1	2441	0.37	118.40	31.60	≤ 0.40	Pass
	DH3	2441	1.63	260.80	31.60		
	DH5	2441	2.87	306.13	31.60		
$\pi/4$ -DQPSK	2DH1	2441	0.39	124.80	31.60	≤ 0.40	Pass
	2DH3	2441	1.63	260.80	31.60		
	2DH5	2441	2.88	307.20	31.60		
8-DPSK	3DH1	2441	0.39	124.80	31.60	≤ 0.40	Pass
	3DH3	2441	1.63	260.80	31.60		
	3DH5	2441	2.88	307.20	31.60		

Note: 1DH1/2DH1/3DH1 Total of Dwell= Pulse Time*(1600/2)*31.6/79

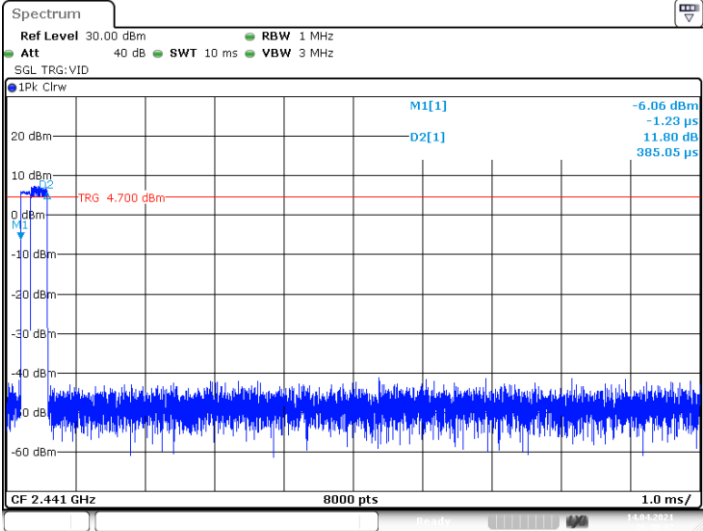
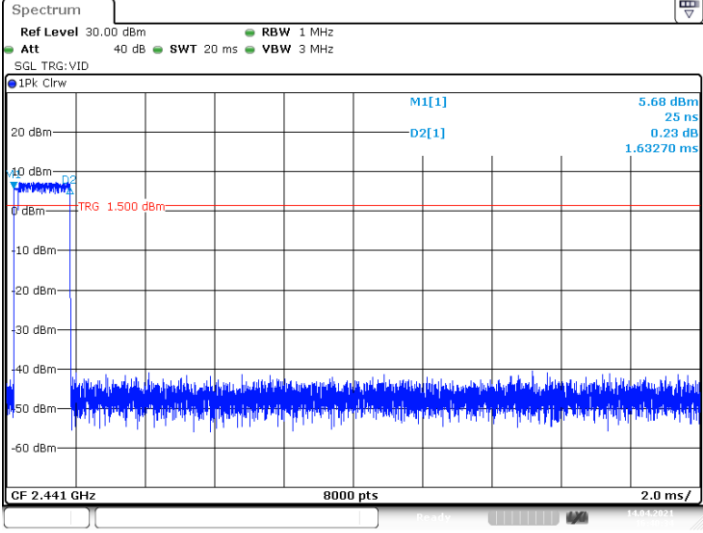
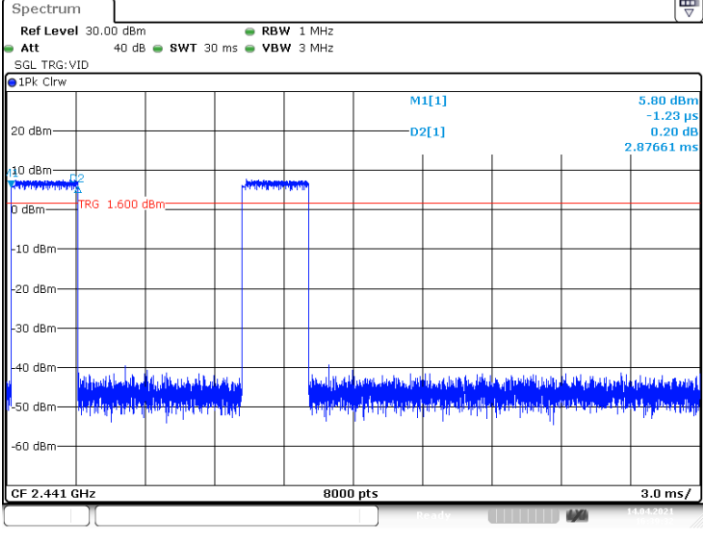
1DH3/2DH3/3DH3 Total of Dwell= Pulse Time*(1600/4)*31.6/79

1DH5/2DH5/3DH5 Total of Dwell= Pulse Time*(1600/6)*31.6/79



Modulation Type:	GFSK
DH1	 <p>Date: 14.APR.2021 16:23:20</p>
DH3	 <p>Date: 14.APR.2021 16:23:47</p>
DH5	 <p>Date: 14.APR.2021 16:22:46</p>



Modulation Type:	$\pi/4$ -DQPSK
2DH1	 <p>Spectrum Ref Level 30.00 dBm RBW 1 MHz Att 40 dB SWT 10 ms VBW 3 MHz SGL TRG:VID IPk Clrw</p> <p>M1[1] -6.06 dBm -1.23 μs D2[1] 11.80 dB 385.05 μs</p> <p>TRG 4.700 dBm</p> <p>CF 2.441 GHz 8000 pts 1.0 ms/</p> <p>Date: 14.APR.2021 16:40:12</p>
2DH3	 <p>Spectrum Ref Level 30.00 dBm RBW 1 MHz Att 40 dB SWT 20 ms VBW 3 MHz SGL TRG:VID IPk Clrw</p> <p>M1[1] 5.68 dBm 25 ns D2[1] 0.23 dB 1.63270 ms</p> <p>TRG 1.500 dBm</p> <p>CF 2.441 GHz 8000 pts 2.0 ms/</p> <p>Date: 14.APR.2021 16:40:34</p>
2DH5	 <p>Spectrum Ref Level 30.00 dBm RBW 1 MHz Att 40 dB SWT 30 ms VBW 3 MHz SGL TRG:VID IPk Clrw</p> <p>M1[1] 5.80 dBm -1.23 μs D2[1] 0.20 dB 2.87661 ms</p> <p>TRG 1.600 dBm</p> <p>CF 2.441 GHz 8000 pts 3.0 ms/</p> <p>Date: 14.APR.2021 16:39:32</p>



Modulation Type:	8-DPSK
3DH1	
3DH3	
3DH5	



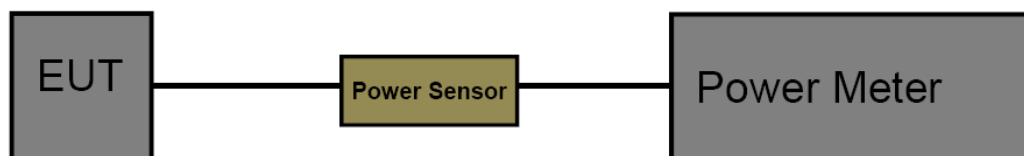
3.9. Peak Output Power

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(1) / RSS-247 5.4 b:

Test Item	Limit	Frequency Range(MHz)
Peak Output Power	Hopping Channels>75 Power<1W(30dBm) Other <125mW(21dBm)	2400~2483.5

Test Configuration



Test Procedure

1. The maximum conducted output power may be measured using a broadband Peak RF power meter.
2. Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor.
3. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.
4. Record the measurement data.

Test Mode

Please refer to the clause 2.4.

Test Result

Test Mode	Frequency (MHz)	Result[dBm]	Limit[dBm]	Verdict
GFSK	2402	7.45	<=21	PASS
	2441	7.59	<=21	PASS
	2480	7.65	<=21	PASS
$\pi/4$ -DQPSK	2402	6.04	<=21	PASS
	2441	6.23	<=21	PASS
	2480	6.42	<=21	PASS
8-DPSK	2402	6.64	<=21	PASS
	2441	6.62	<=21	PASS
	2480	6.83	<=21	PASS

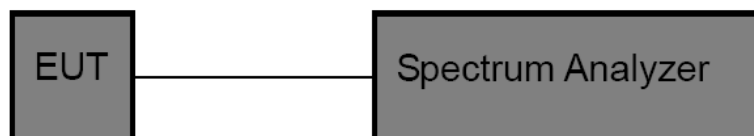


3.10. Duty Cycle

Limit

None, for report purposes only.

Test Configuration



Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.
3. Spectrum Setting:
Set analyzer center frequency to test channel center frequency.
Set the span to 0Hz
Set the RBW to 10MHz
Set the VBW to 10MHz
Detector: Peak
Sweep time: Auto
Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

Test Mode

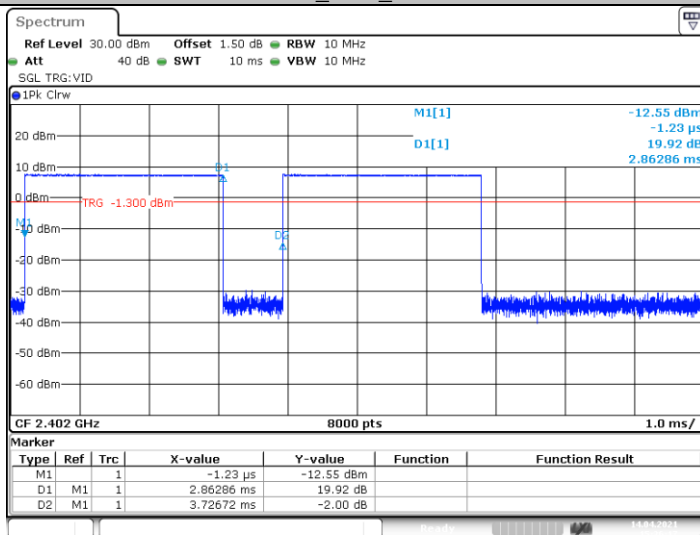
Please refer to the clause 2.4.

Test Result

Test Mode	Frequency (MHz)	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
GFSK	2402	2.86	3.73	76.82	0.35	1
	2441	2.86	3.73	76.79	0.35	1
	2480	2.86	3.73	76.79	0.35	1
$\pi/4$ -DQPSK	2402	2.86	3.74	76.47	0.35	1
	2441	2.86	3.74	76.47	0.35	1
	2480	2.86	3.74	76.47	0.35	1
8-DPSK	2402	2.87	3.74	76.74	0.35	1
	2441	2.87	3.75	76.53	0.35	1
	2480	2.87	3.75	76.53	0.35	1

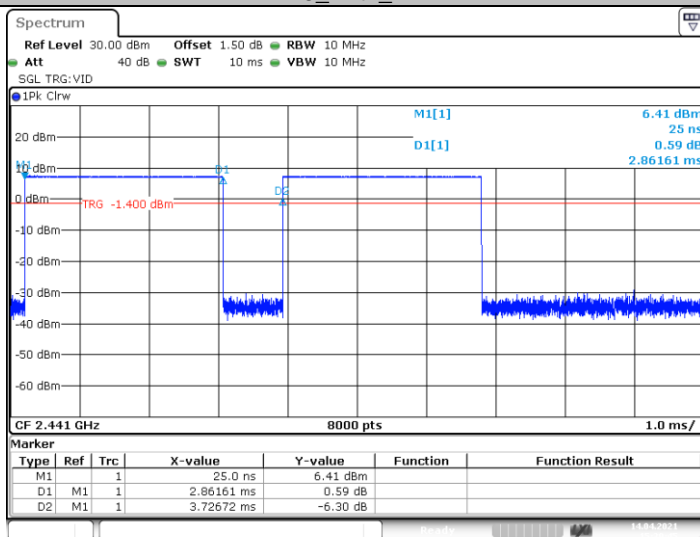


DH5_Ant1_2402



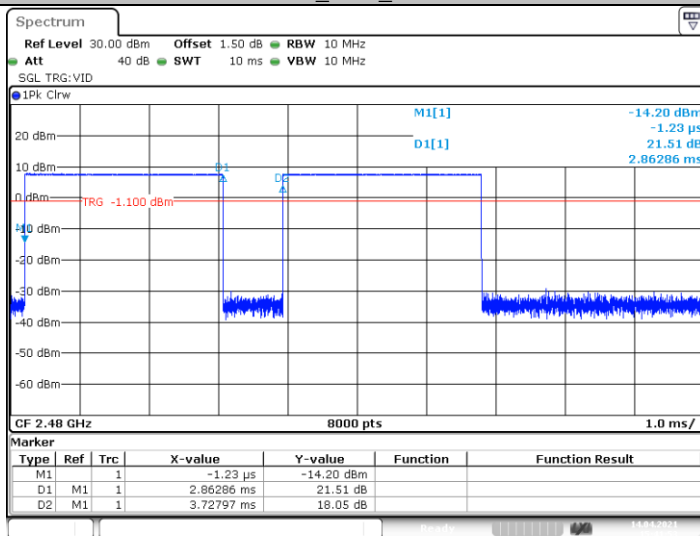
Date: 14.APR.2021 15:36:16

DH5_Ant1_2441



Date: 14.APR.2021 15:39:44

DH5_Ant1_2480



Date: 14.APR.2021 15:41:53

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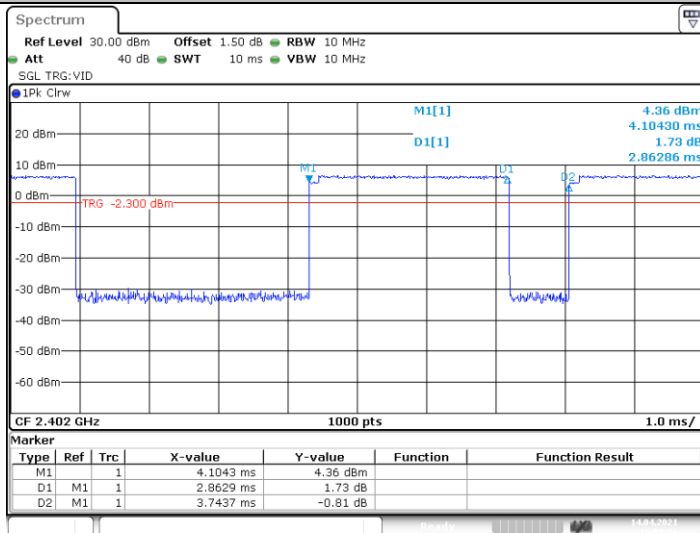
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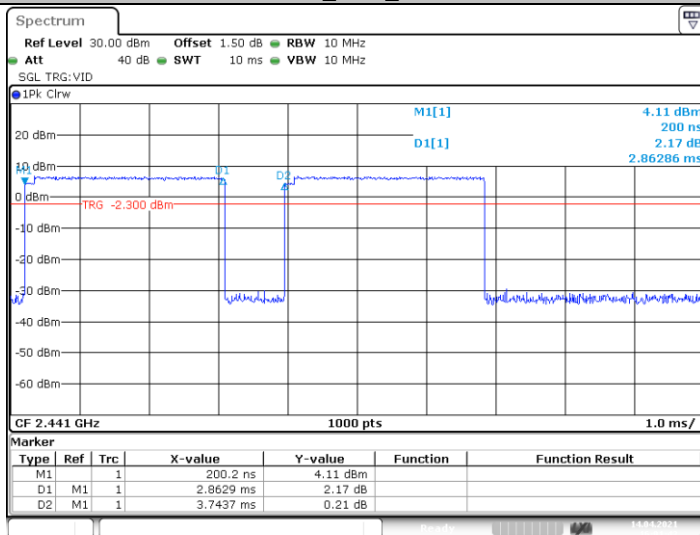


2DH5_Ant1_2402



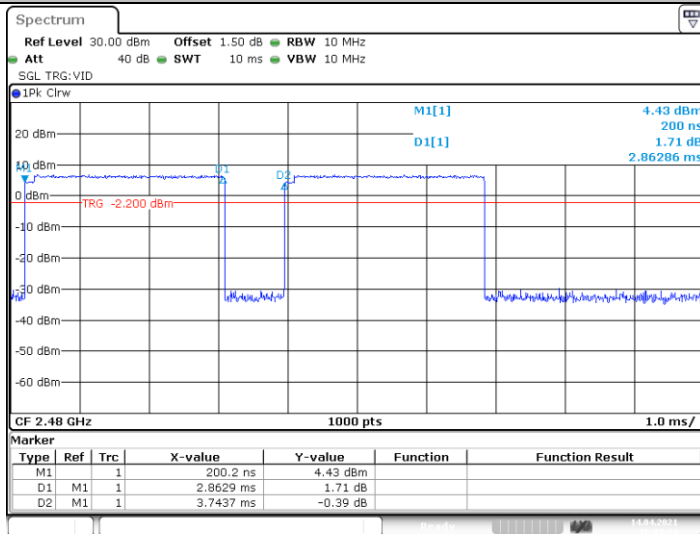
Date: 14.APR.2021 15:58:50

2DH5_Ant1_2441



Date: 14.APR.2021 16:01:43

2DH5_Ant1_2480



Date: 14.APR.2021 16:03:33

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1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

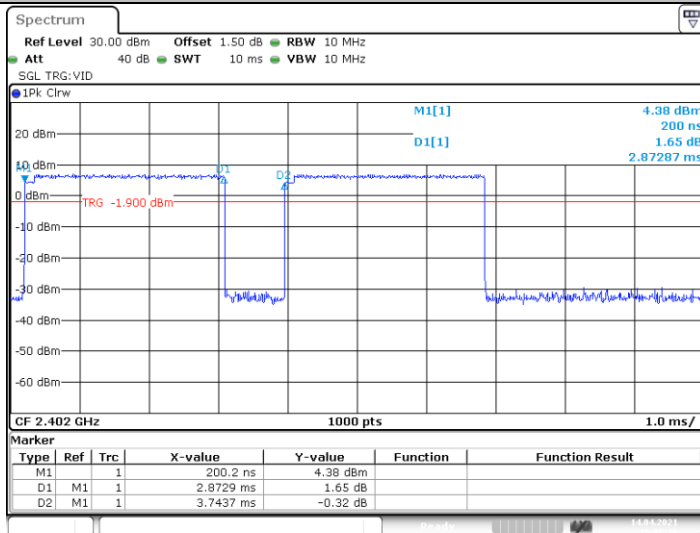
Fax: (86)755-27521011

Http://www.sz-ctc.org.cn

For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : yz.cnca.cn

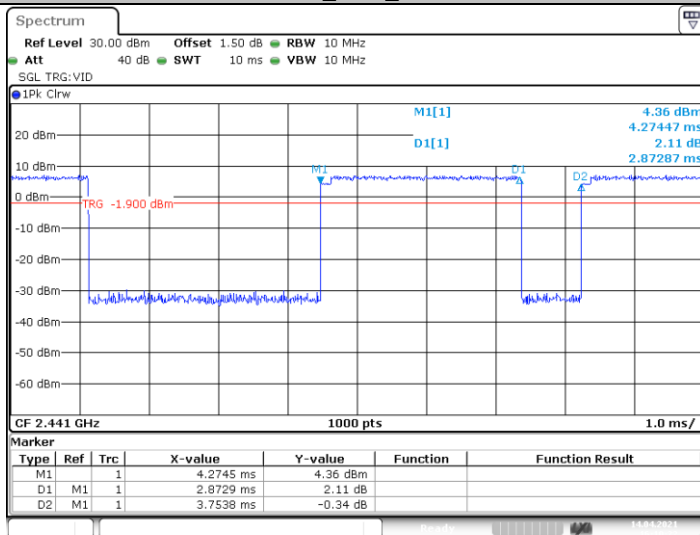


3DH5_Ant1_2402



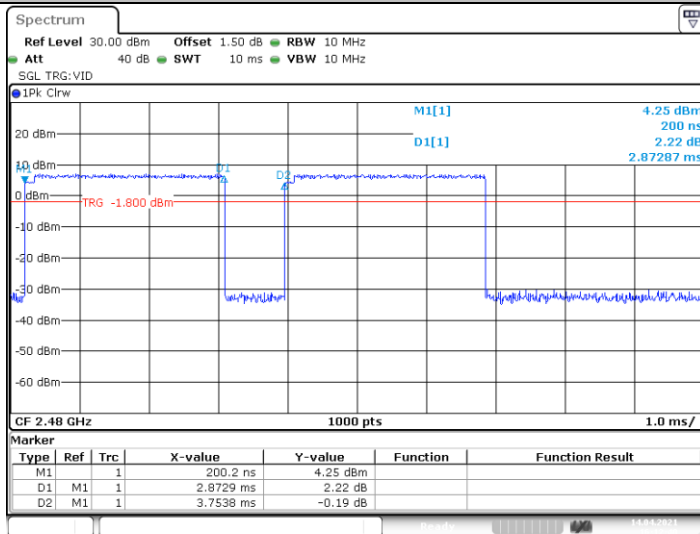
Date: 14.APR.2021 16:06:36

3DH5_Ant1_2441



Date: 14.APR.2021 16:10:22

3DH5_Ant1_2480



Date: 14.APR.2021 16:12:40

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

Fax: (86)755-27521011

Http://www.sz-ctc.org.cn

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3.11. Antenna Requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Test Result

The test result is PASS, because the directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.

*****THE END*****