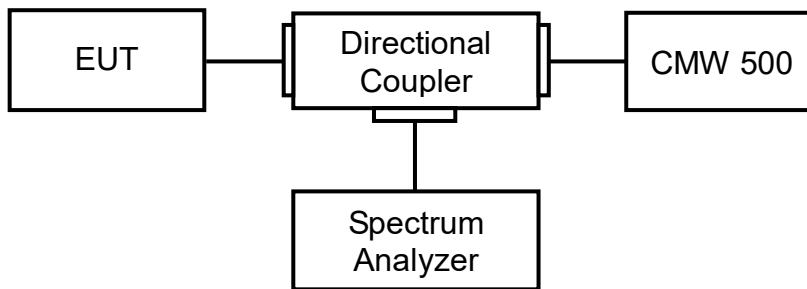


7. Spurious Emissions at Antenna Terminals

7.1. Test Setup



7.2. Test Procedure

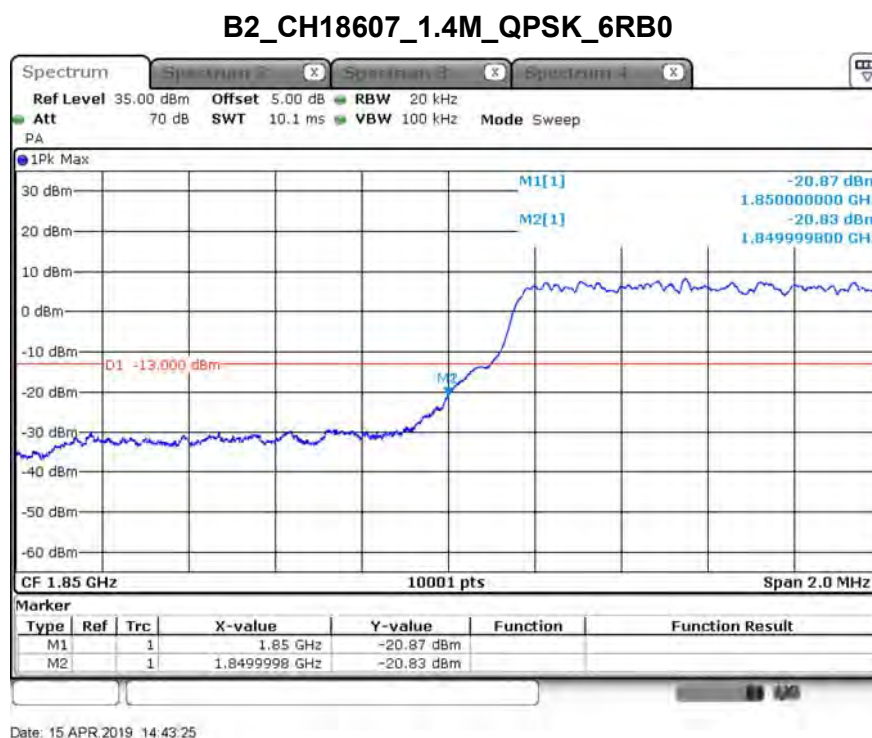
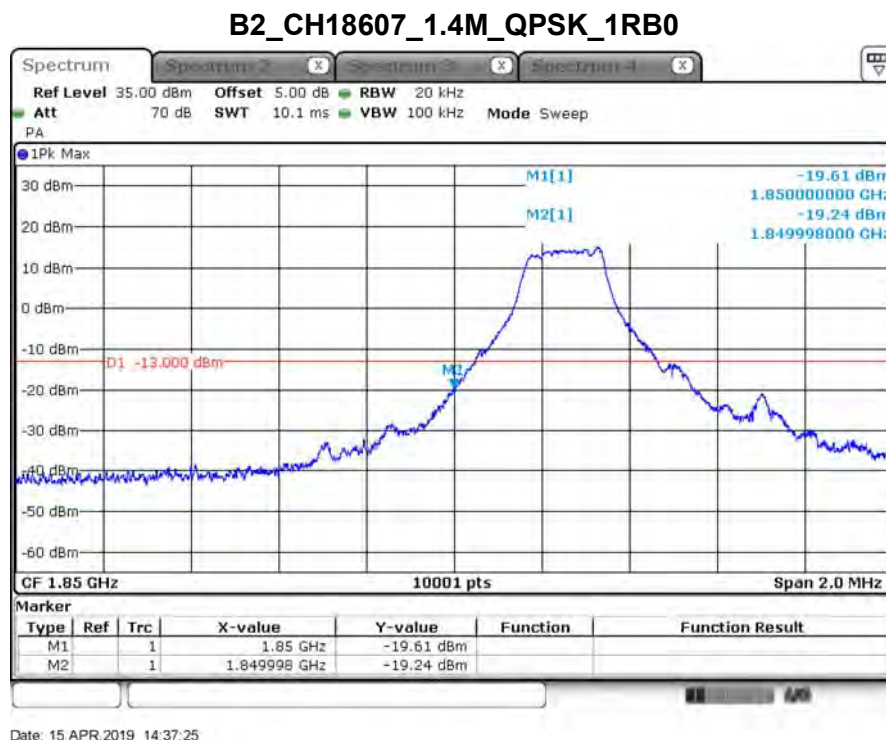
- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
- EUT Communicate with CMW500, then select a channel for testing.
- Add a correction factor to the display of spectrum, and then test.
- The resolution bandwidth of the spectrum analyzer was set at 1 MHz, sufficient scans were taken to show the out of band Emission if any up to 10th harmonic.

7.3. Test Method

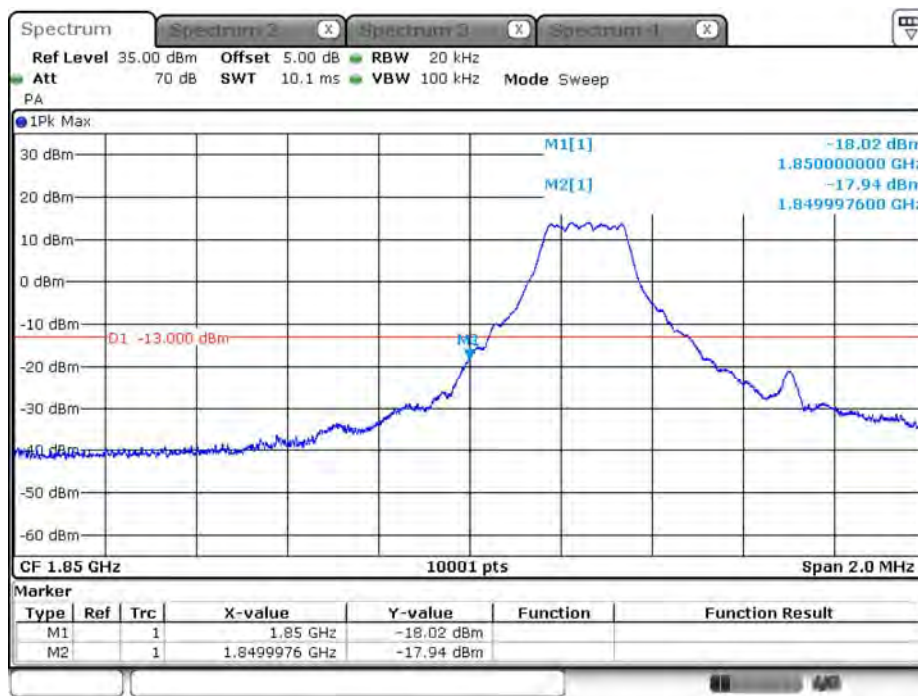
KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 6.1
ANSI C63.26: 2015 Sub-clause 5.7

7.4. Test Result

Product	Module		
Test Item	Spurious Emissions at Antenna Terminals		
Test Mode	Mode 1: LTE Band 2		
Date of Test	2019/04/15	Test Site	SR10-H

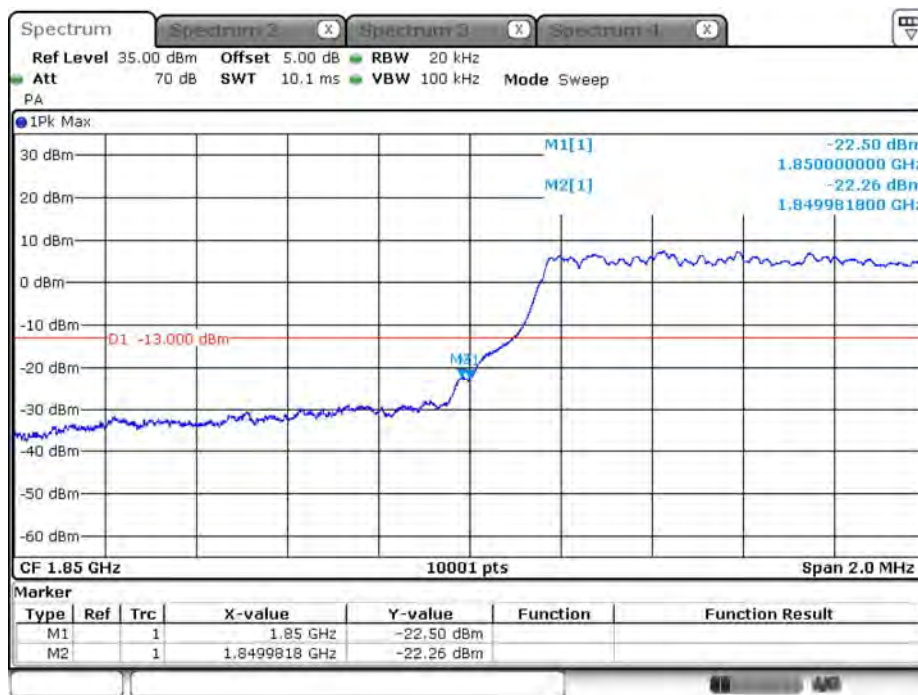


B2_CH18607_1.4M_16-QAM_1RB0

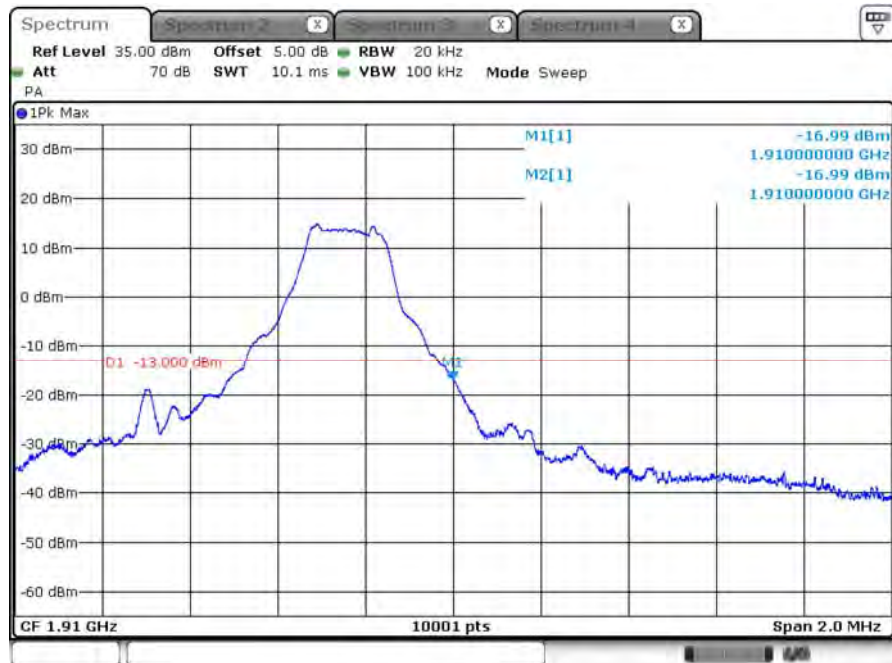


Date: 15 APR 2019 14:52:47

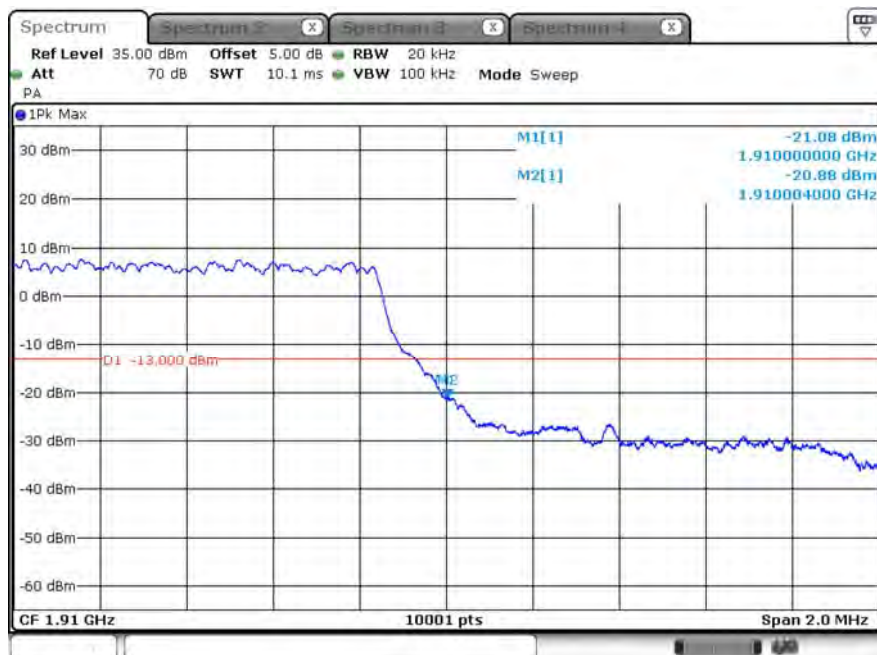
B2_CH18607_1.4M_16-QAM_6RB0



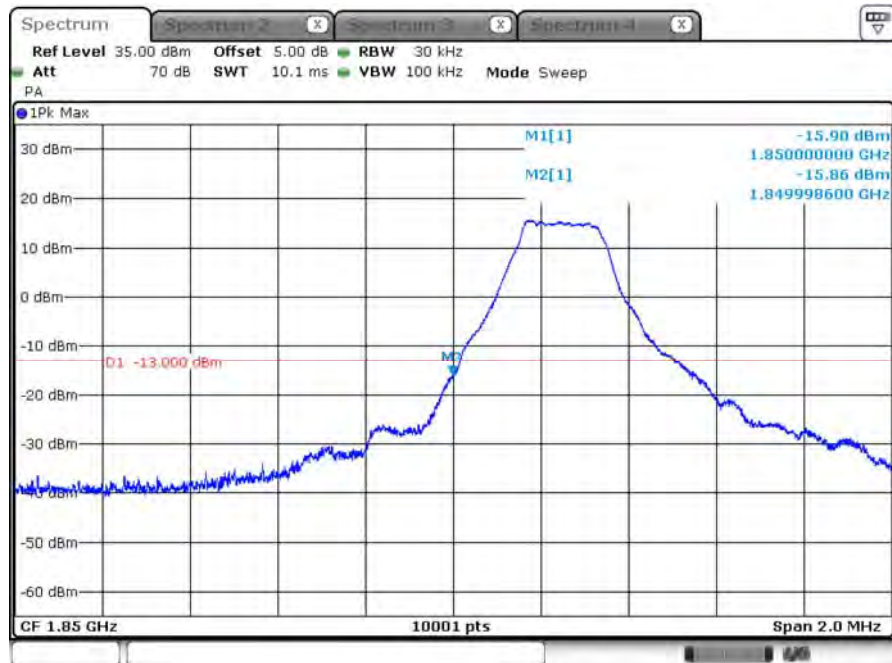
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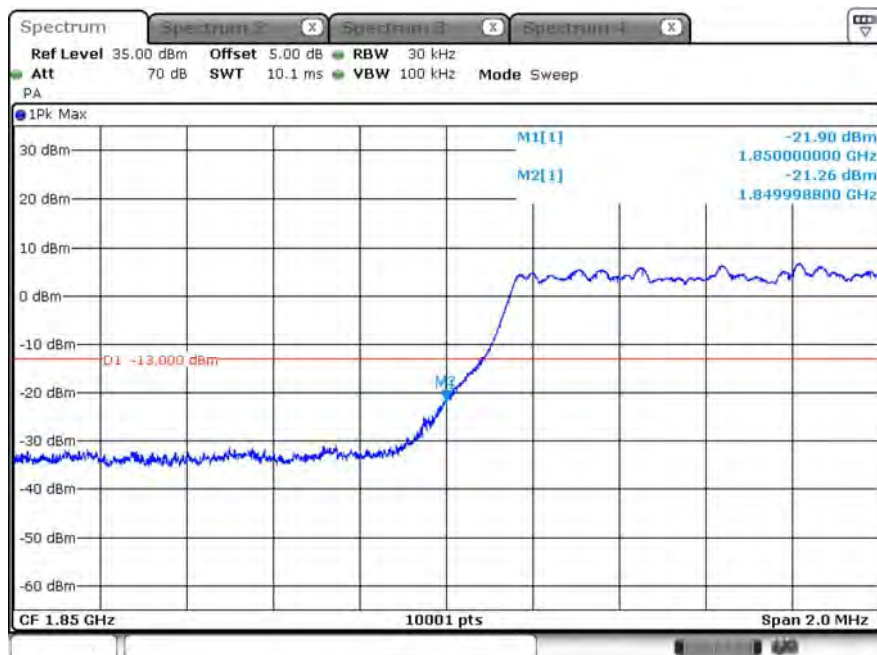
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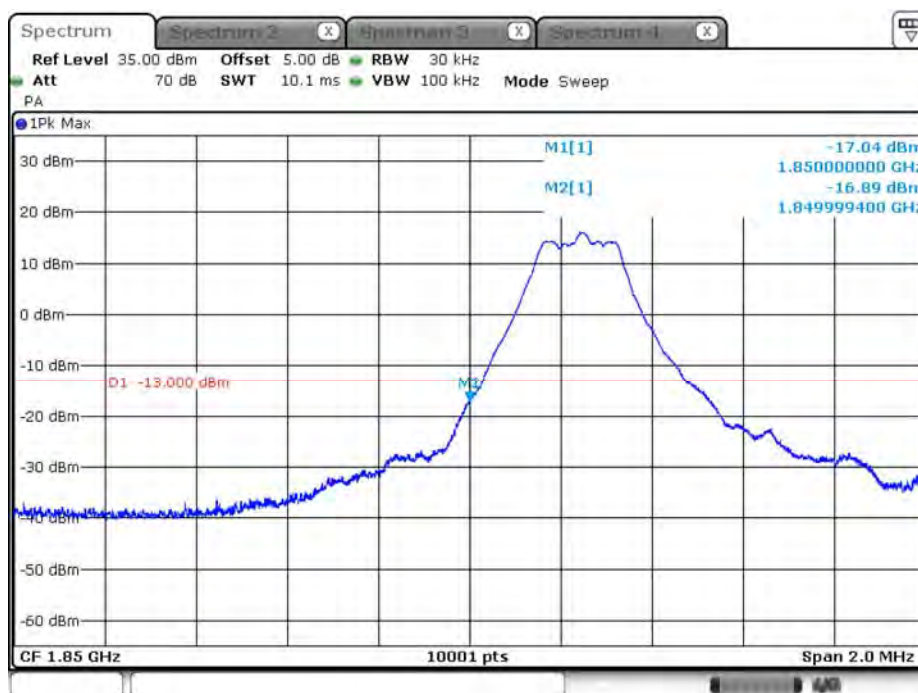
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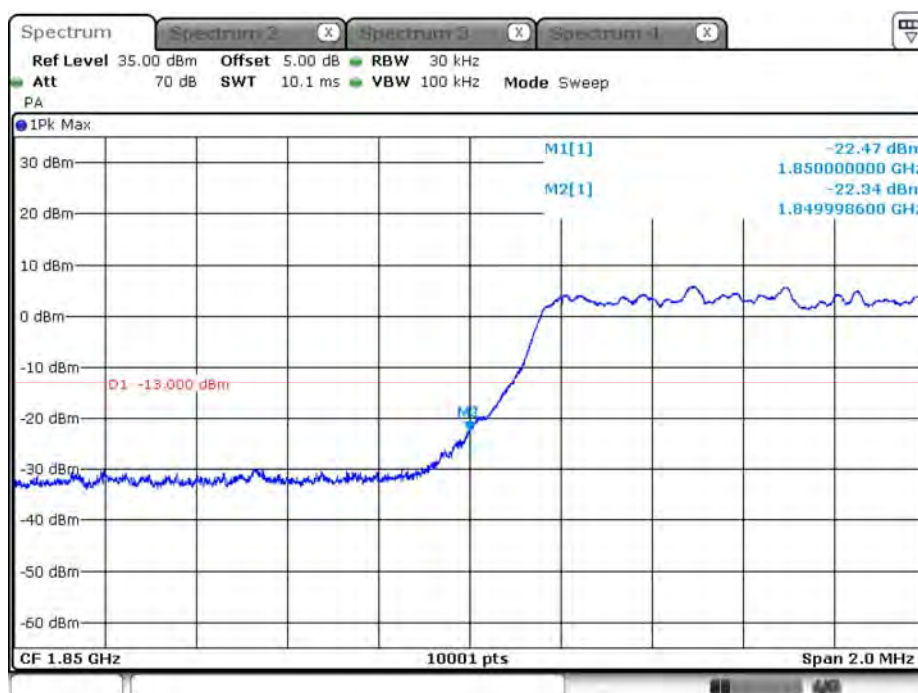
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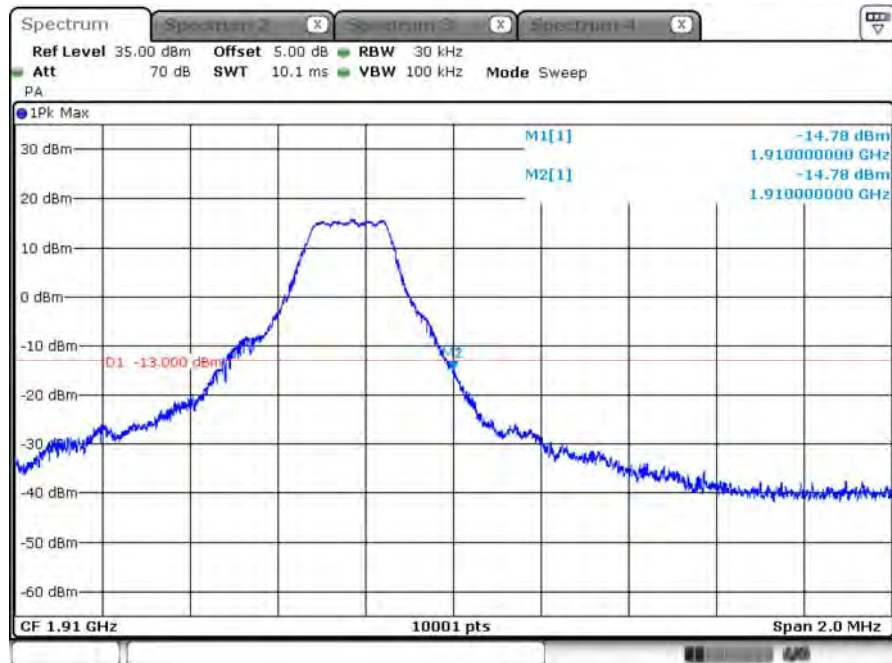
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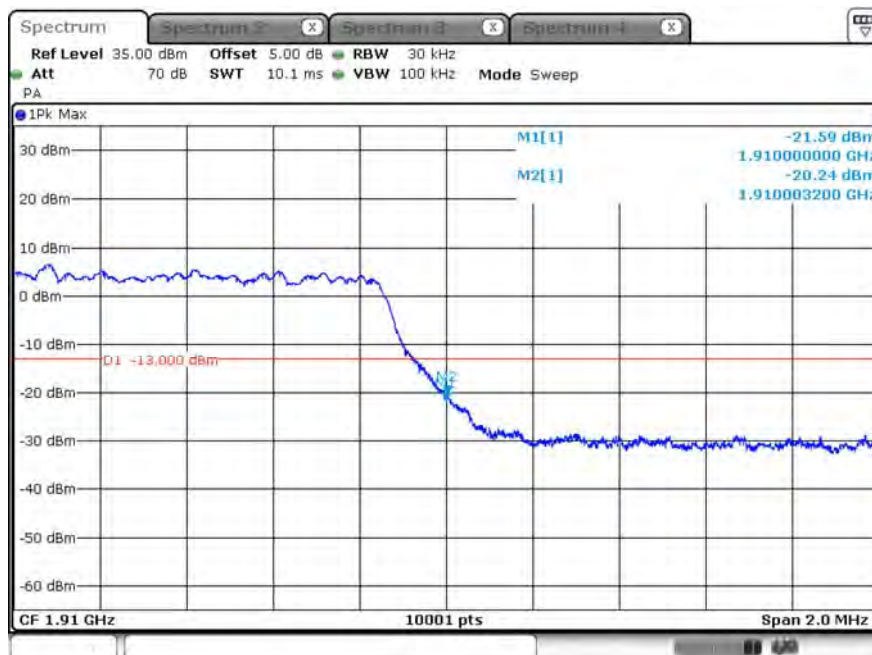
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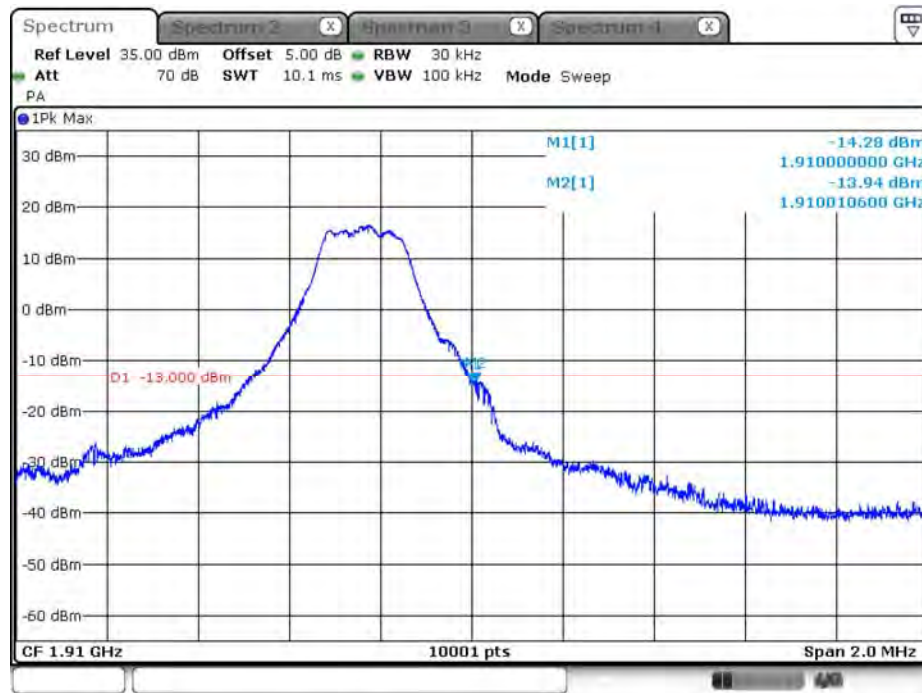
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B2_CH19185_3M_QPSK_1RB14

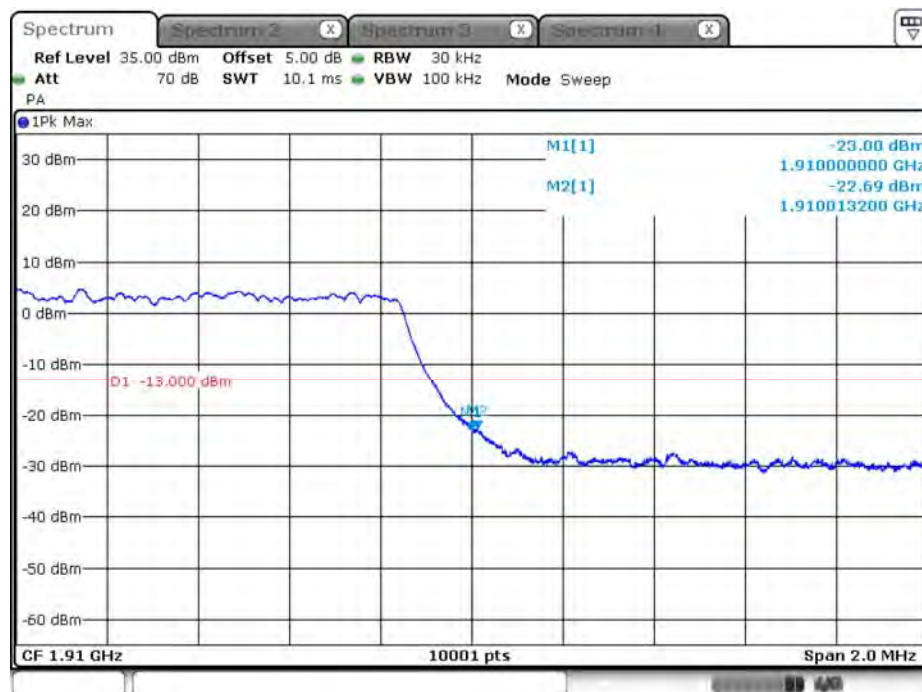
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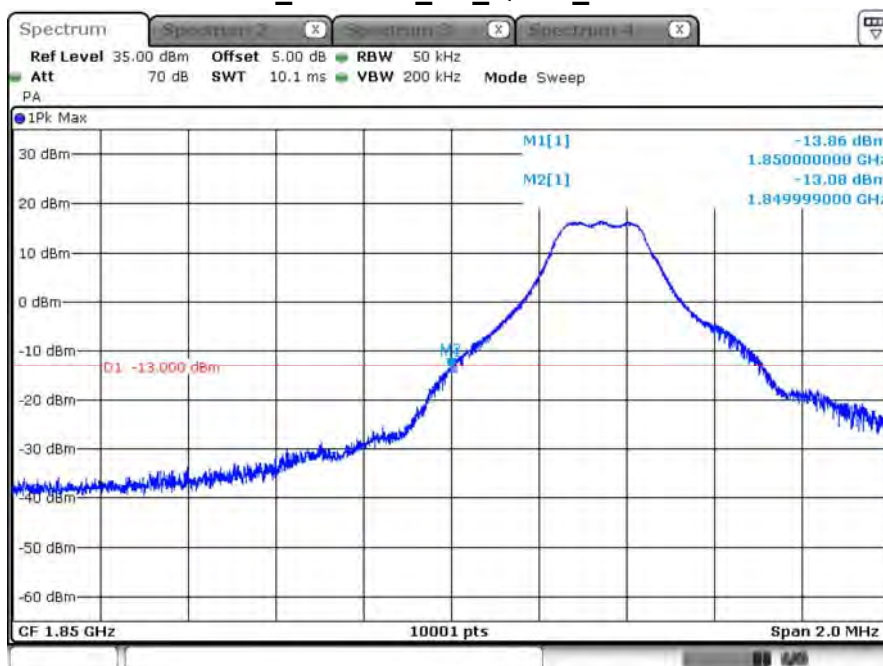
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B2_CH19185_3M_16-QAM_1RB14

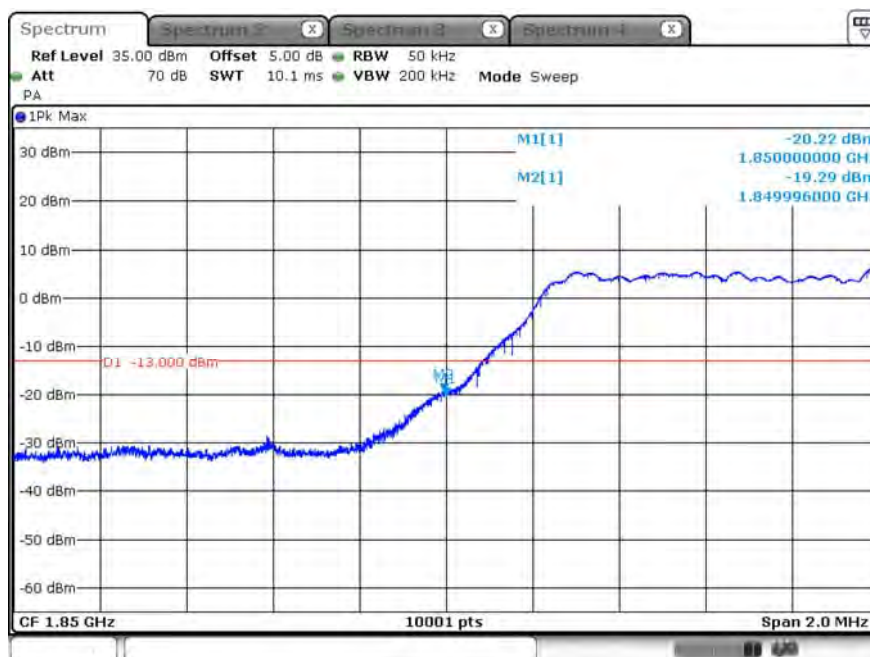
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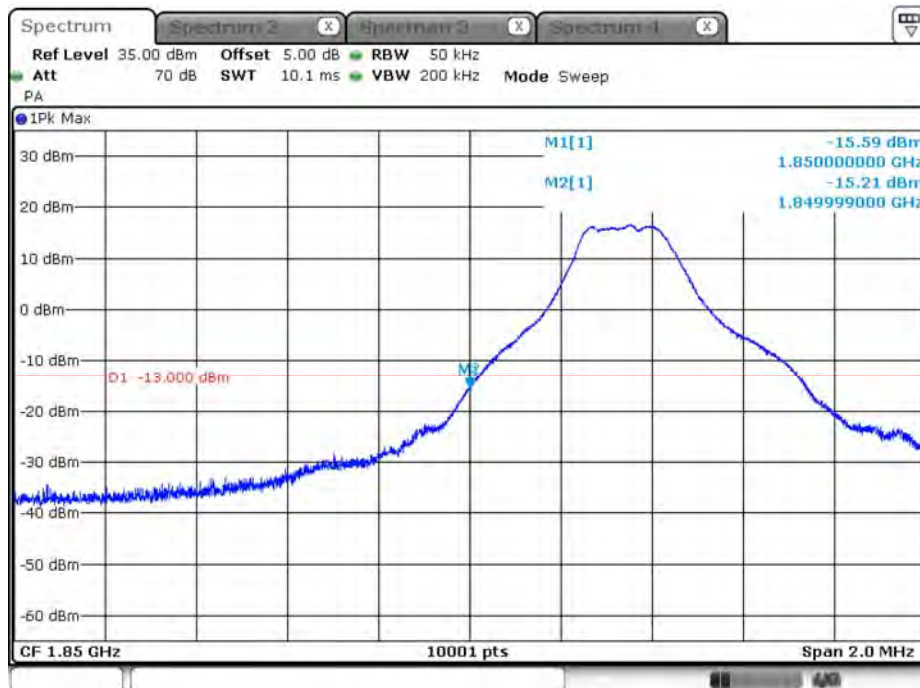
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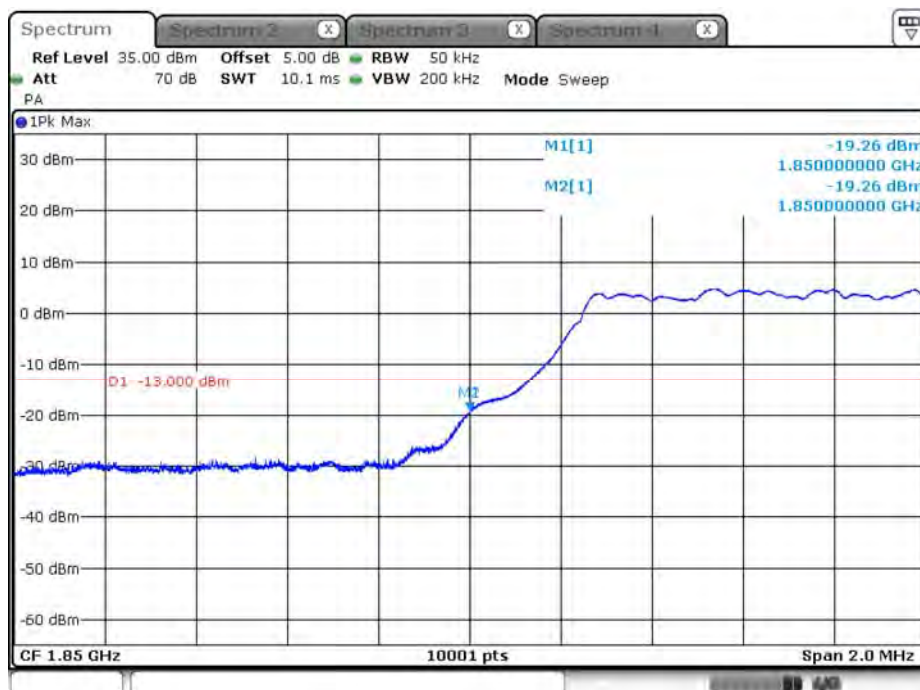
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B2_CH18625_5M_QPSK_25RB0

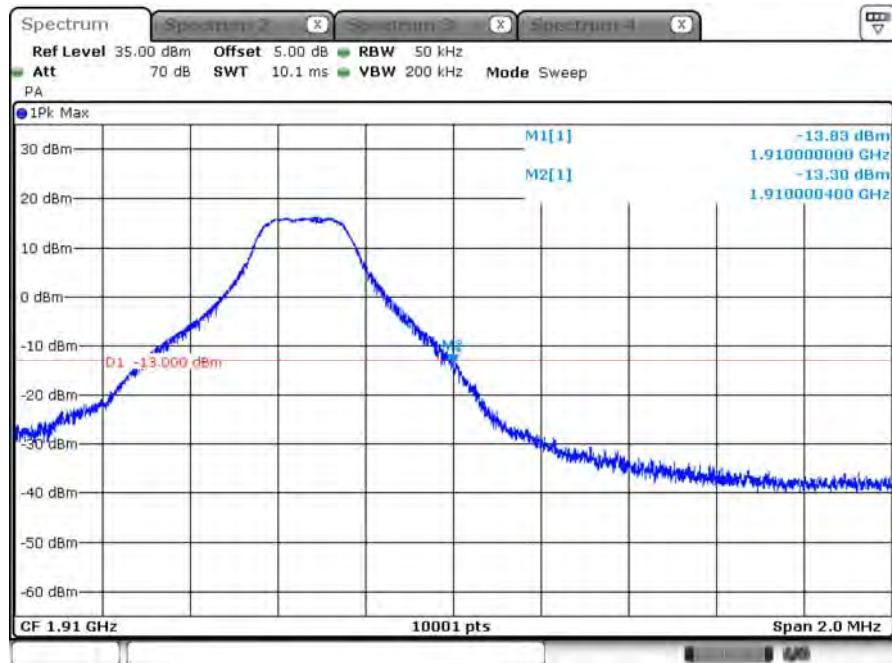
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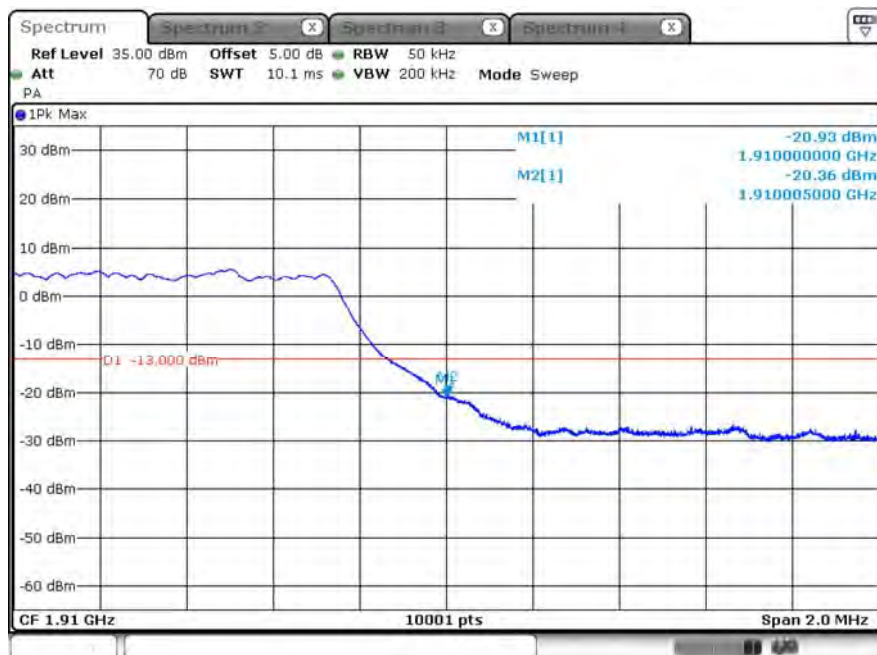
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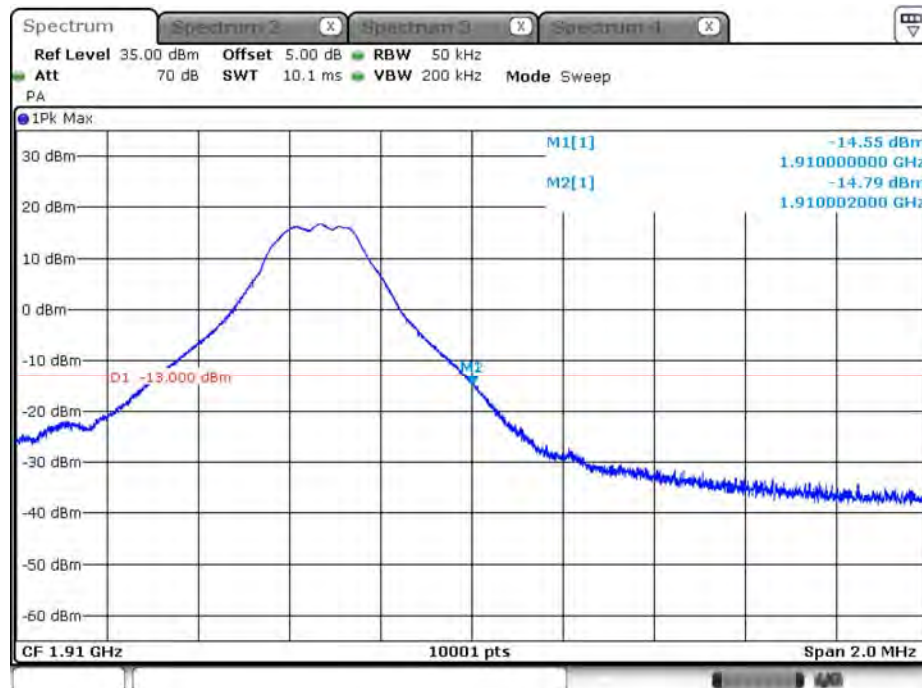
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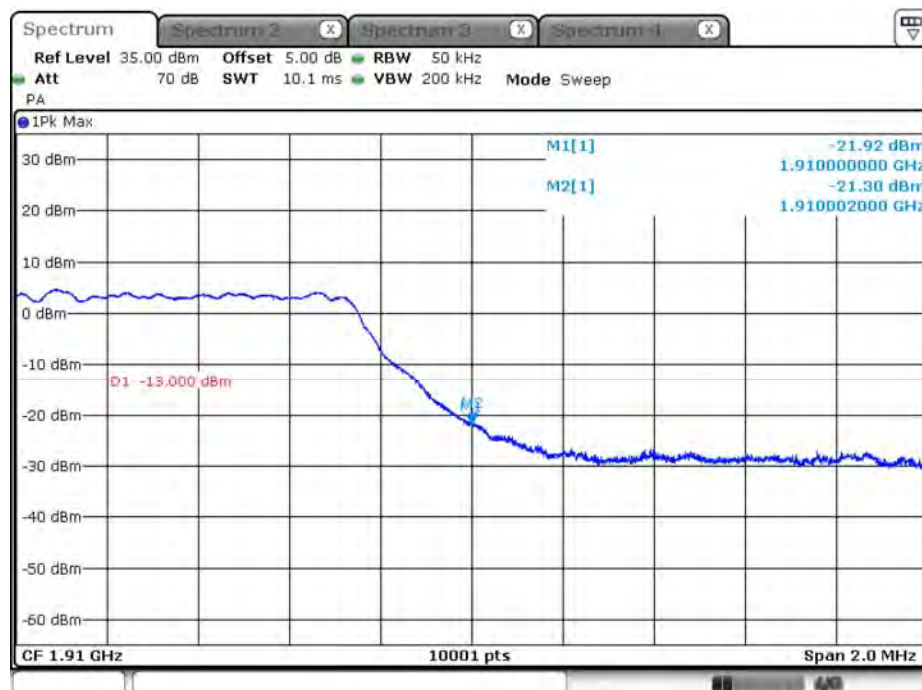
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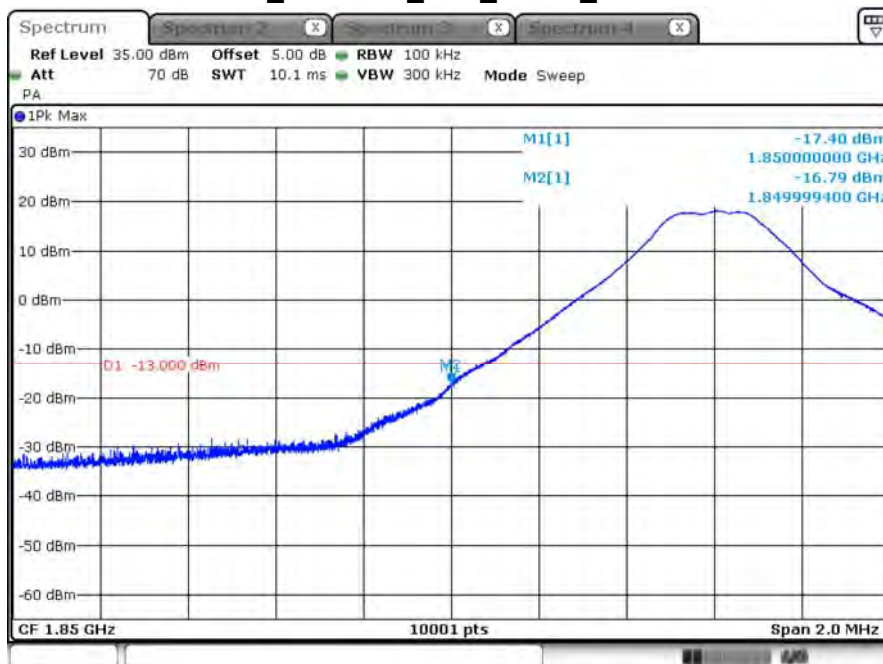
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B2_CH19175_5M_16-QAM_25RB0

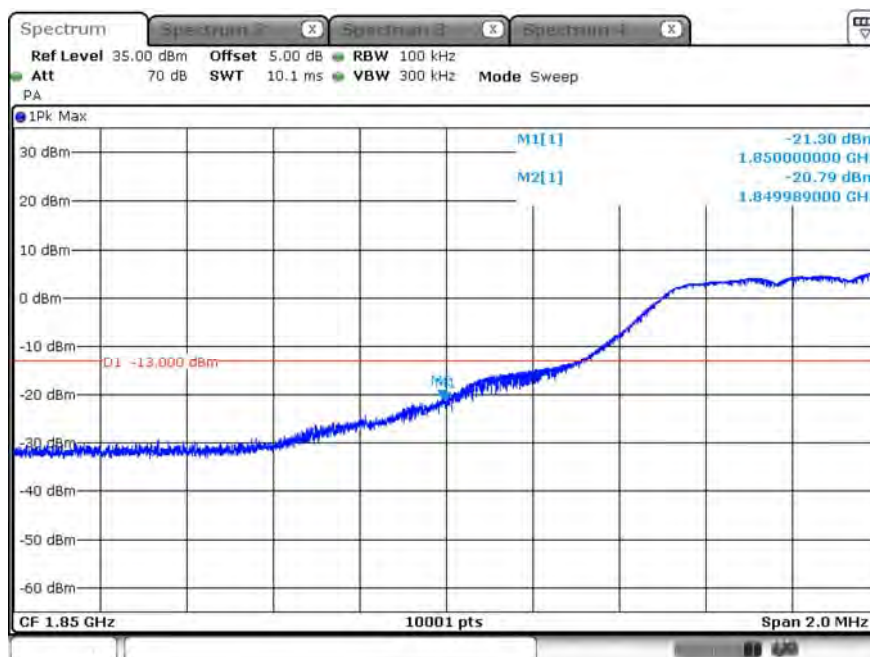
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Date: 15.APR.2019 17:01:15

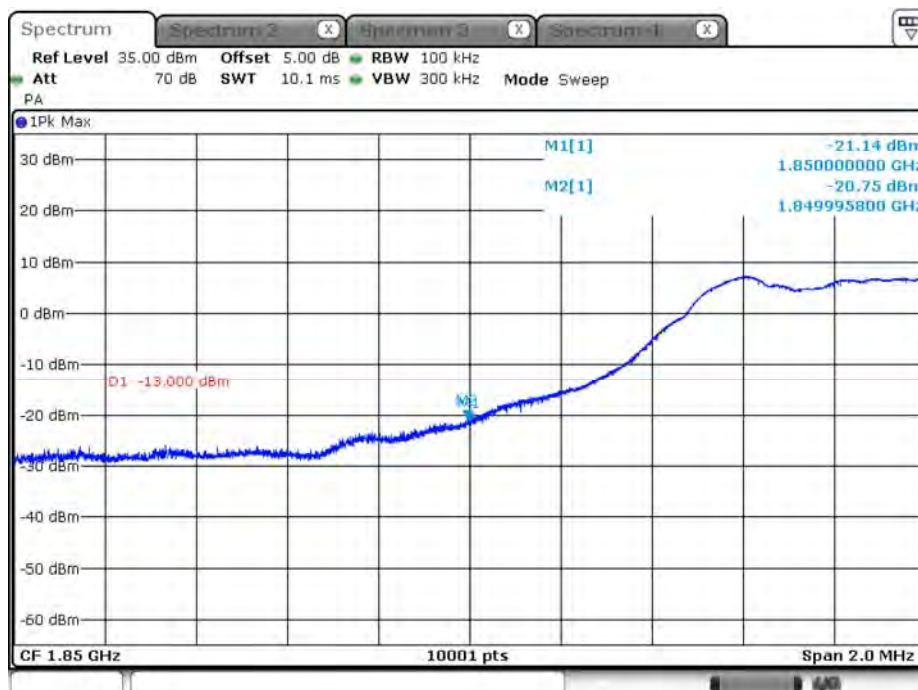
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Date: 15.APR.2019 17:33:23

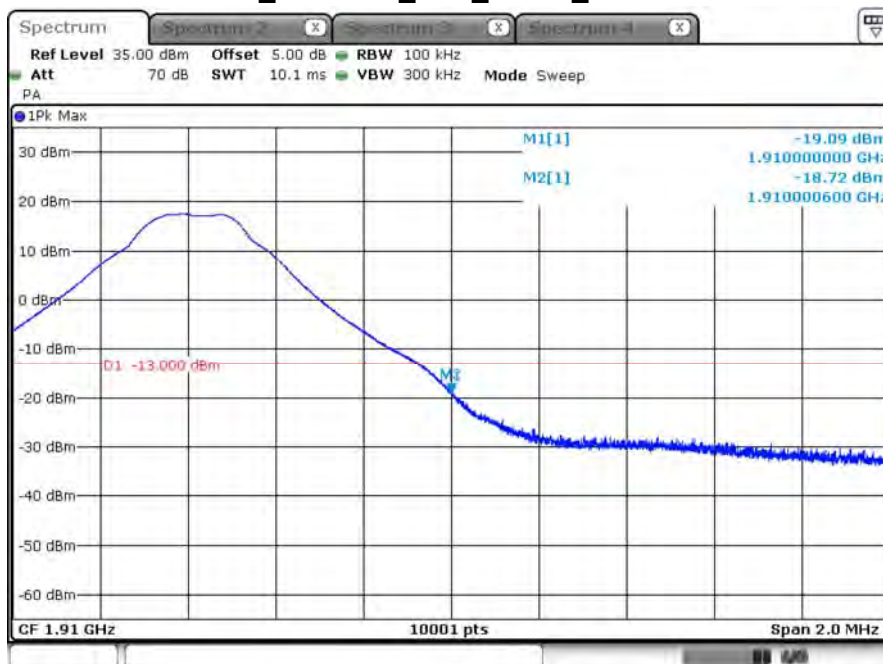
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Date: 15 APR.2019 17:24:16

B2_CH18650_10M_16-QAM_27RB0

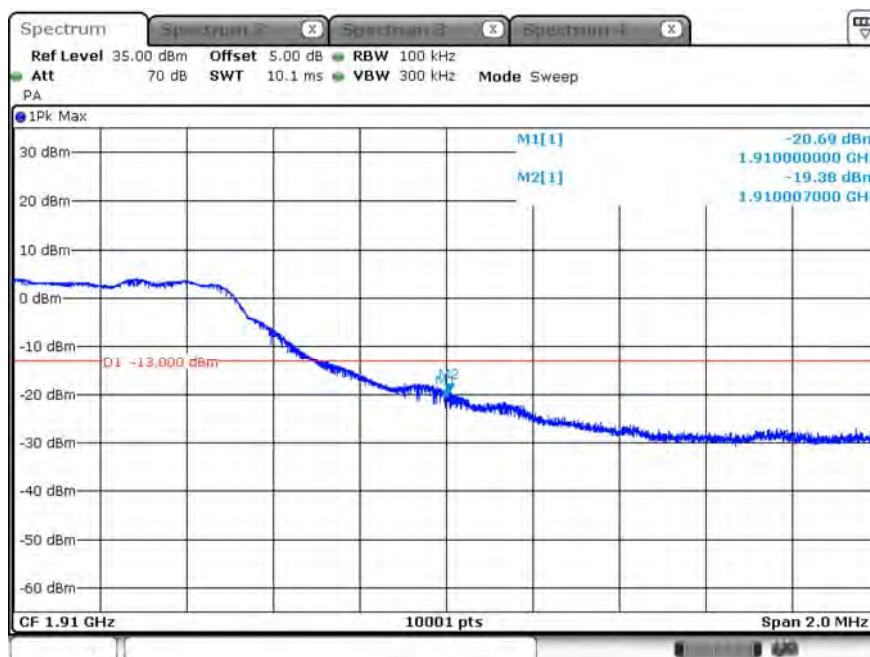
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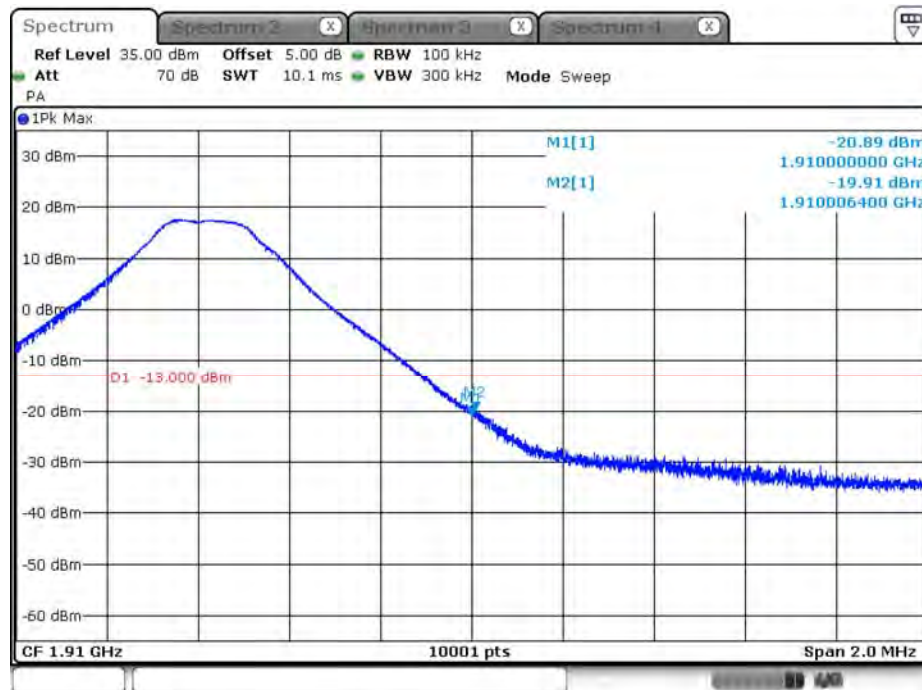


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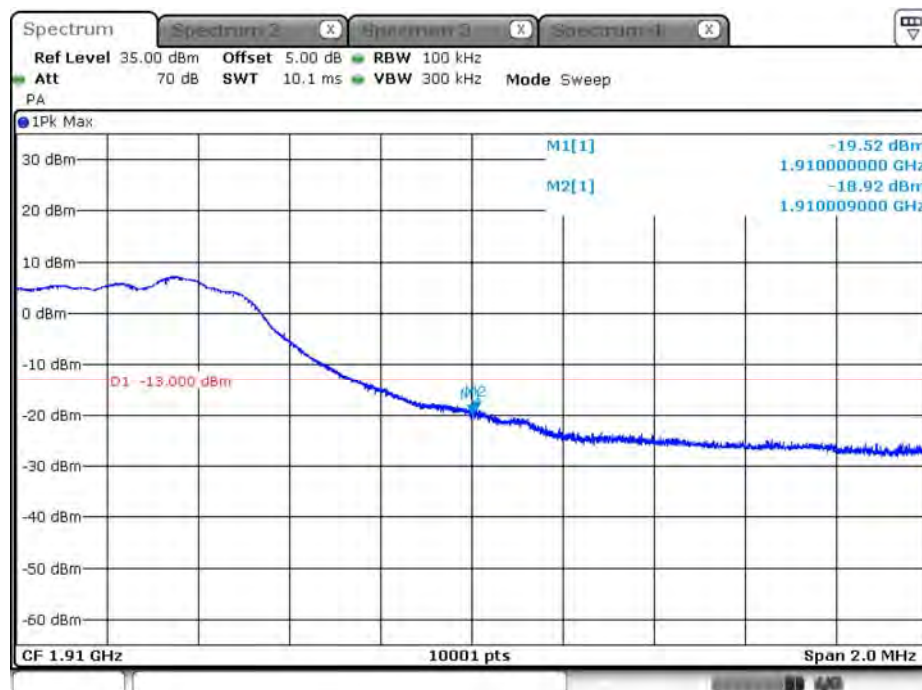
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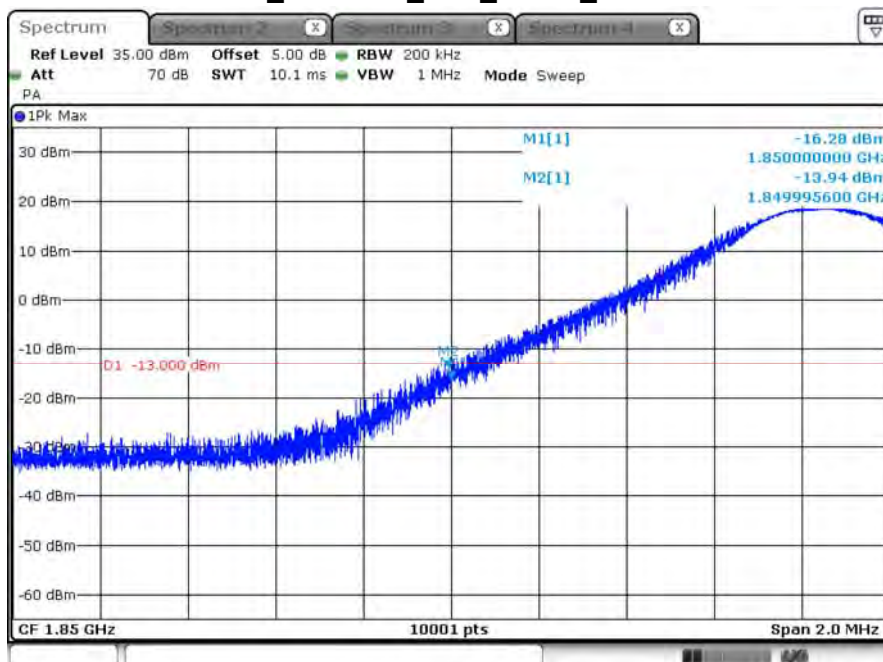
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B2_CH19150_10M_16-QAM_27RB23

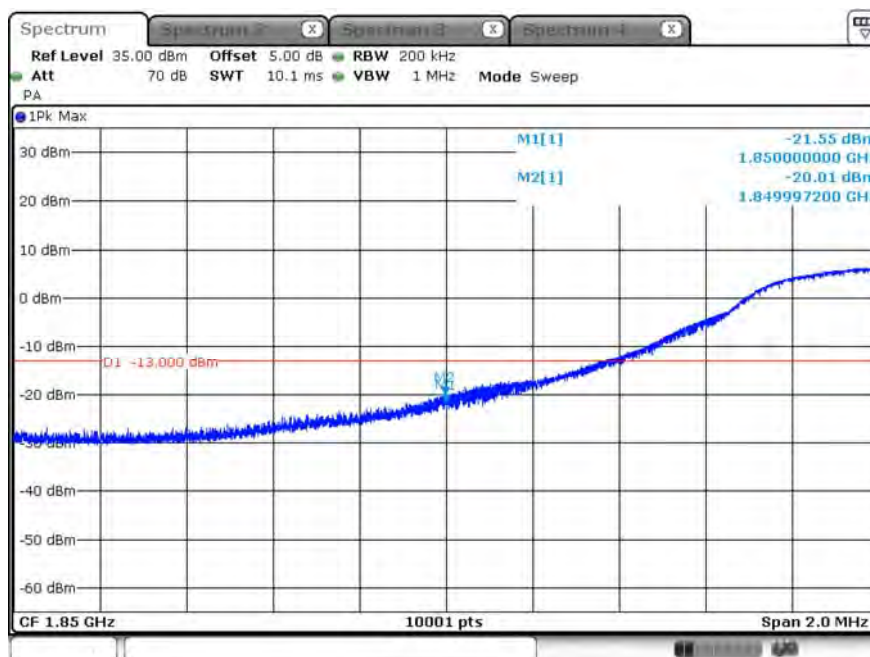
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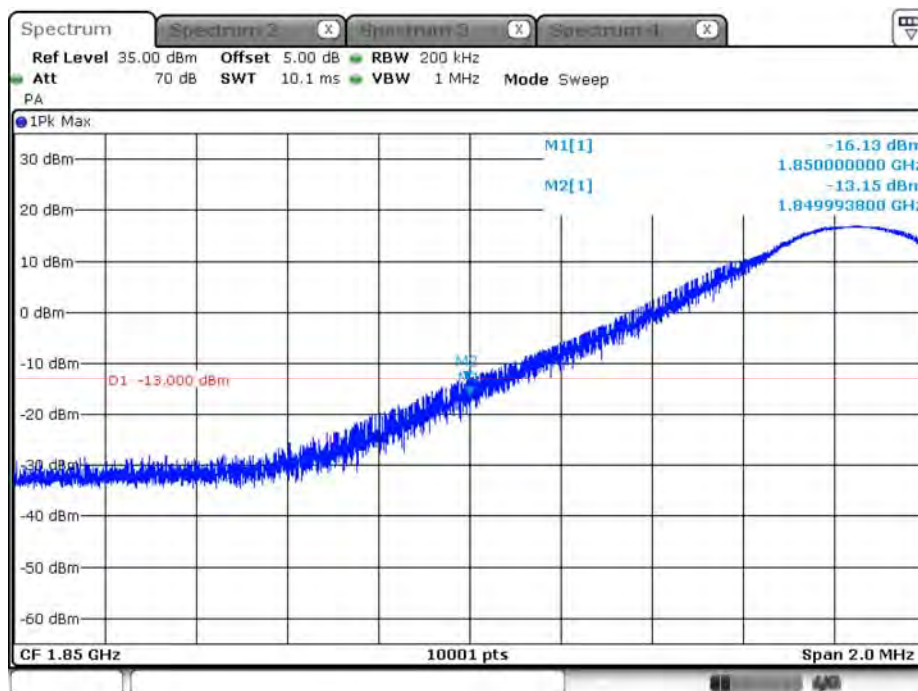


Date: 15.APR.2019 18:25:08

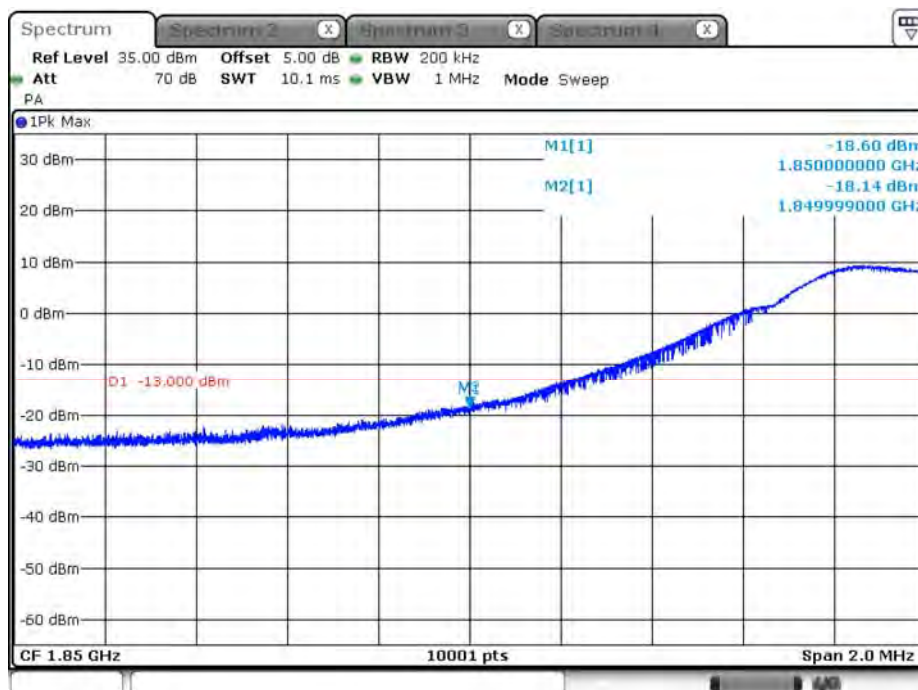
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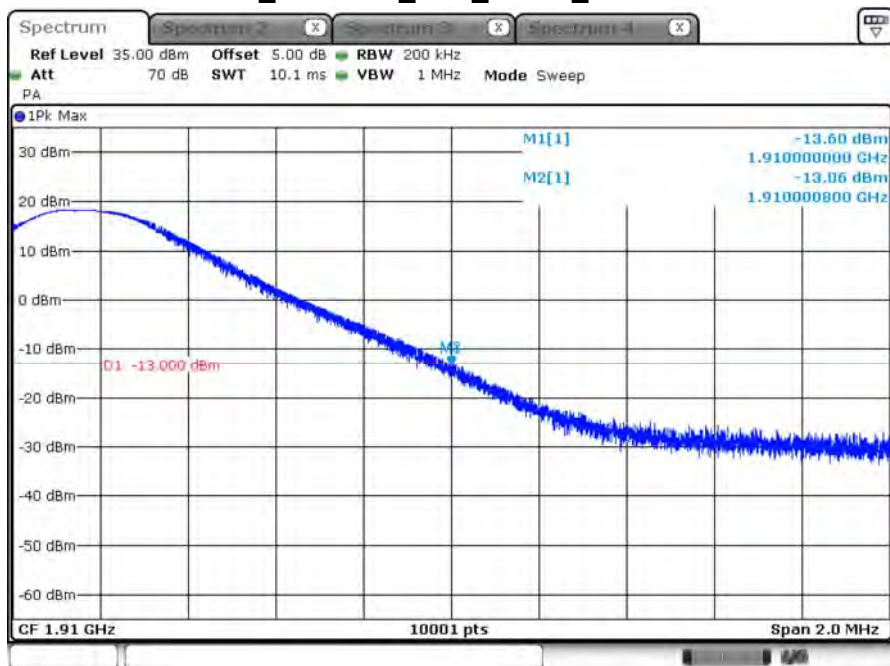
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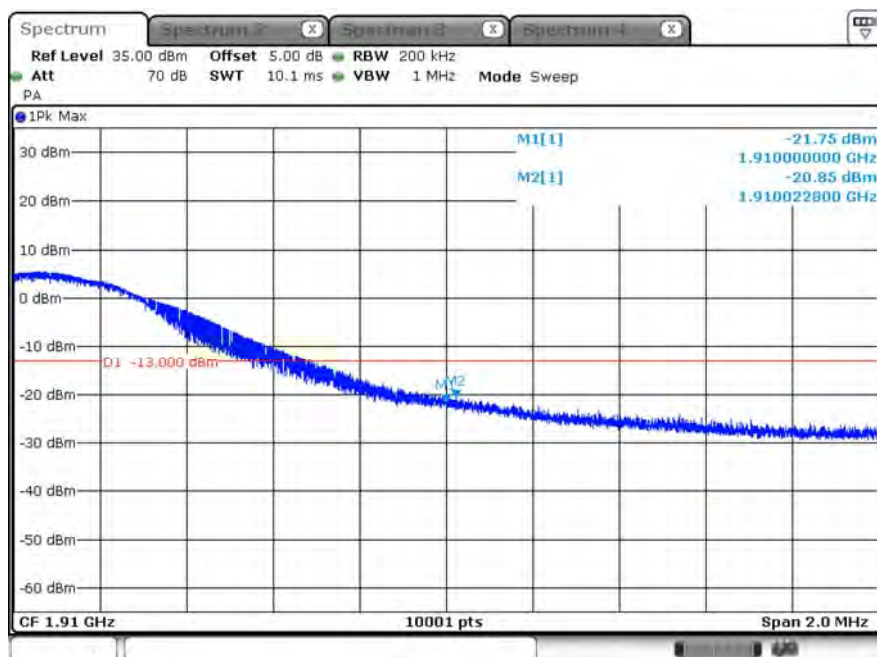
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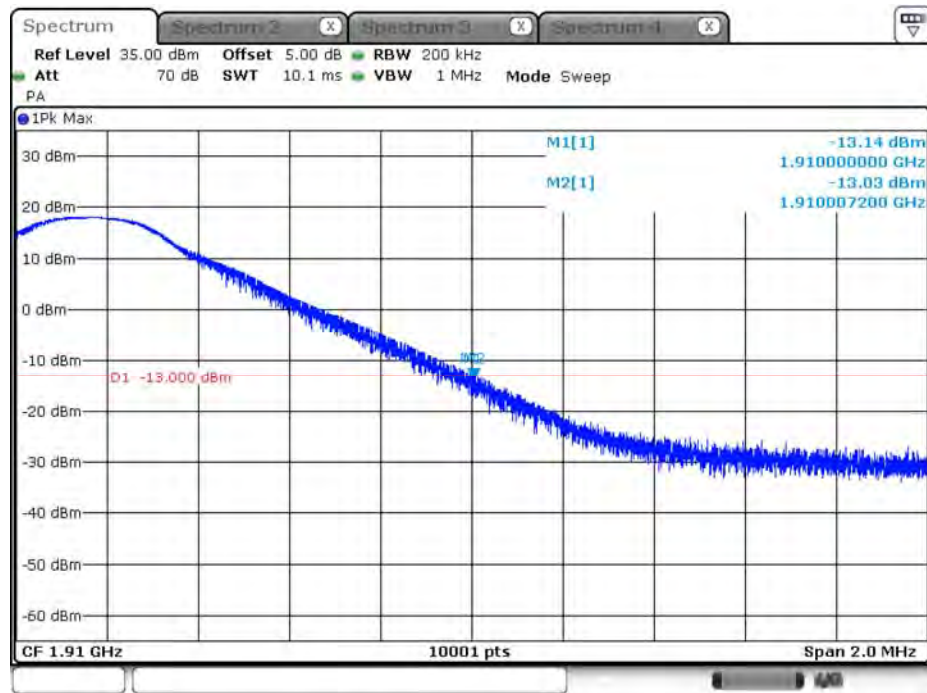
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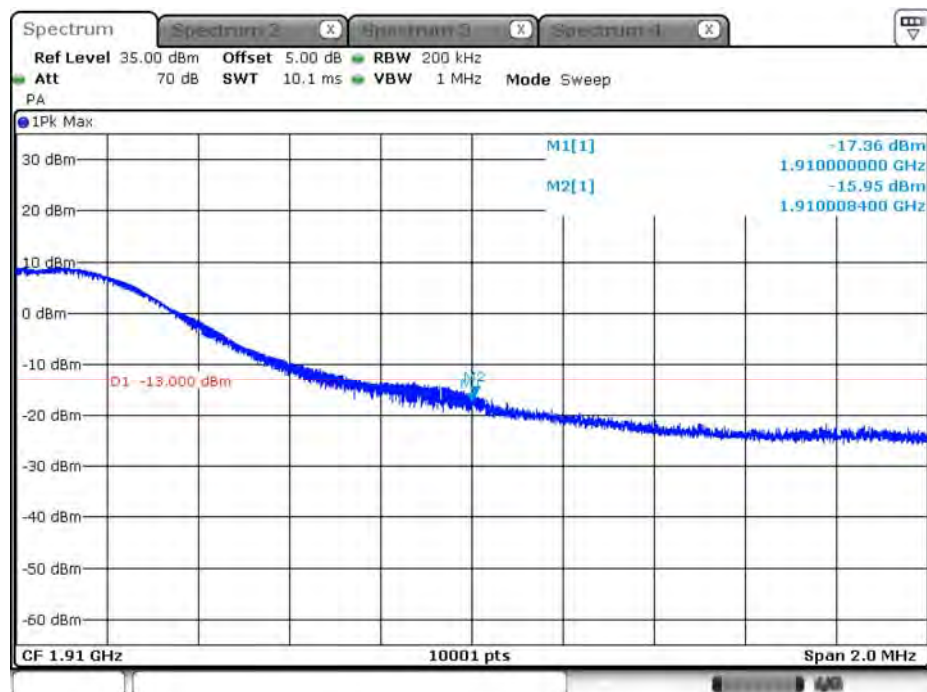
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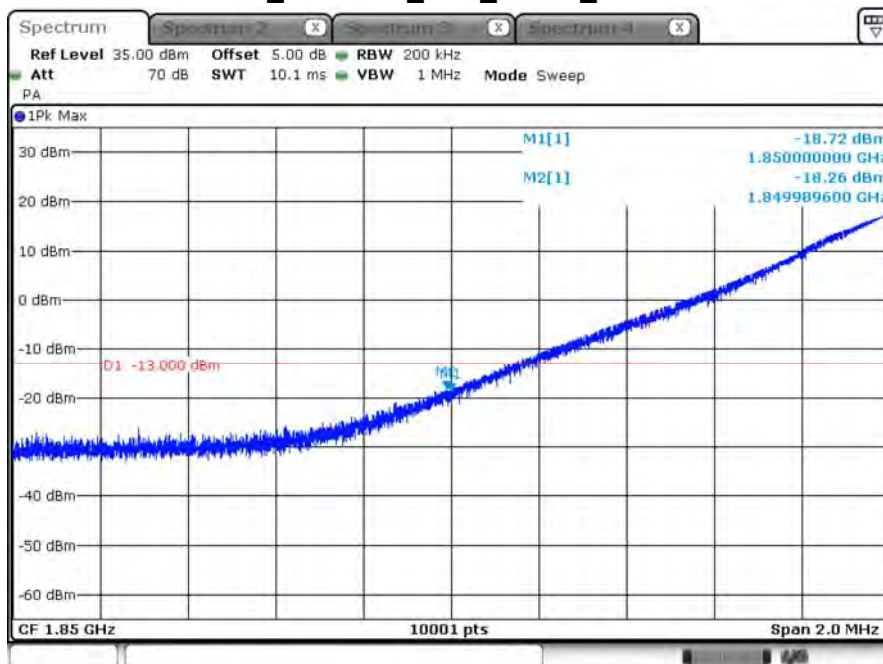
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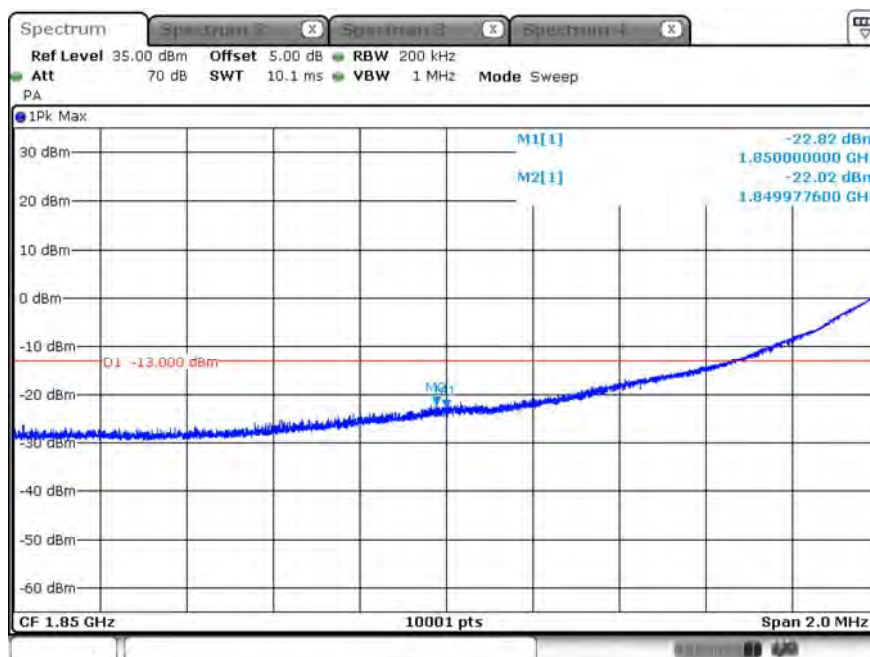
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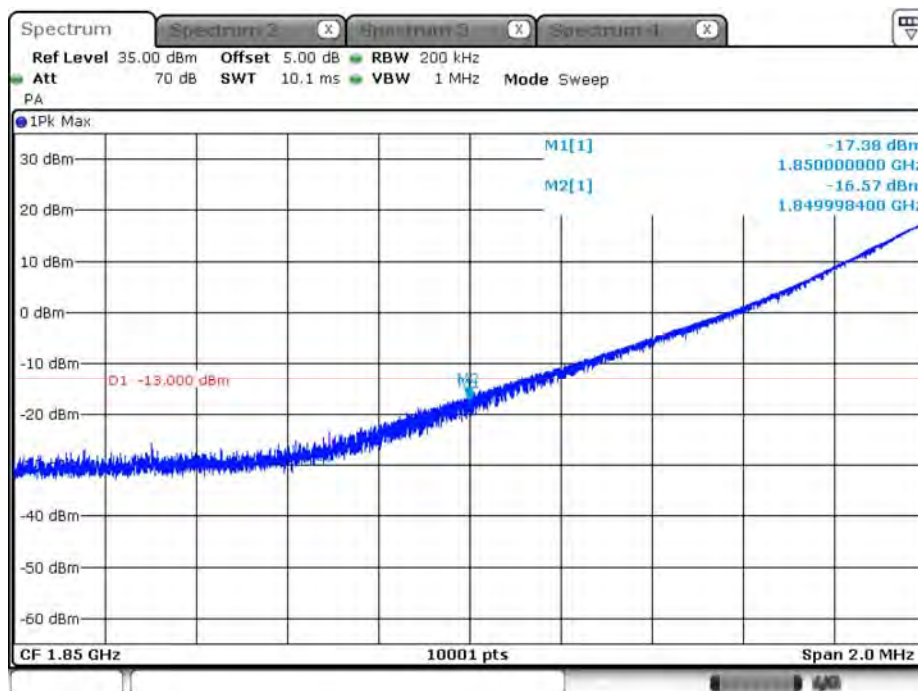
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B2_CH18700_20M_QPSK_1RB0

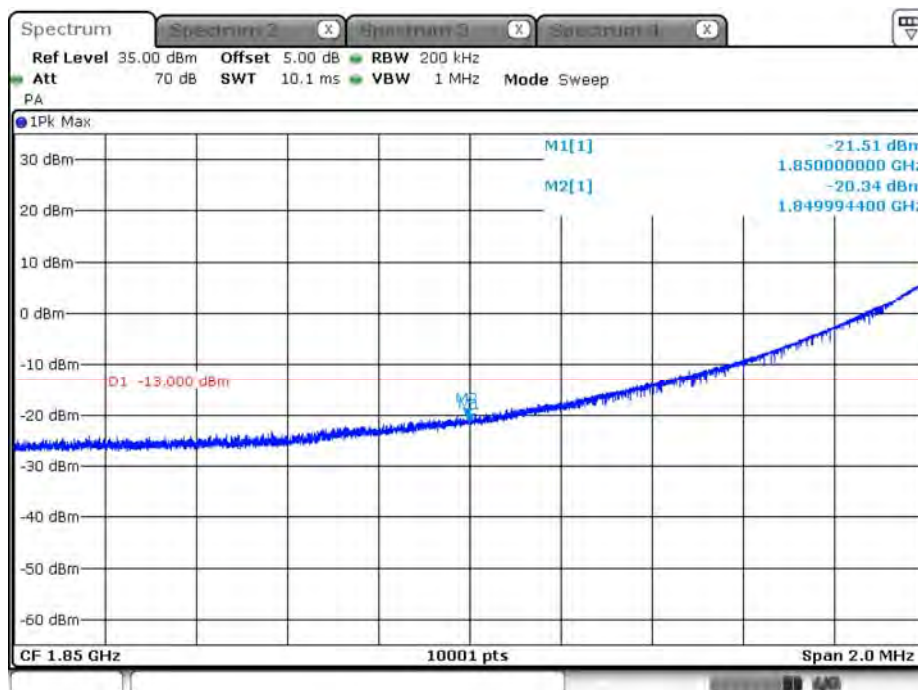
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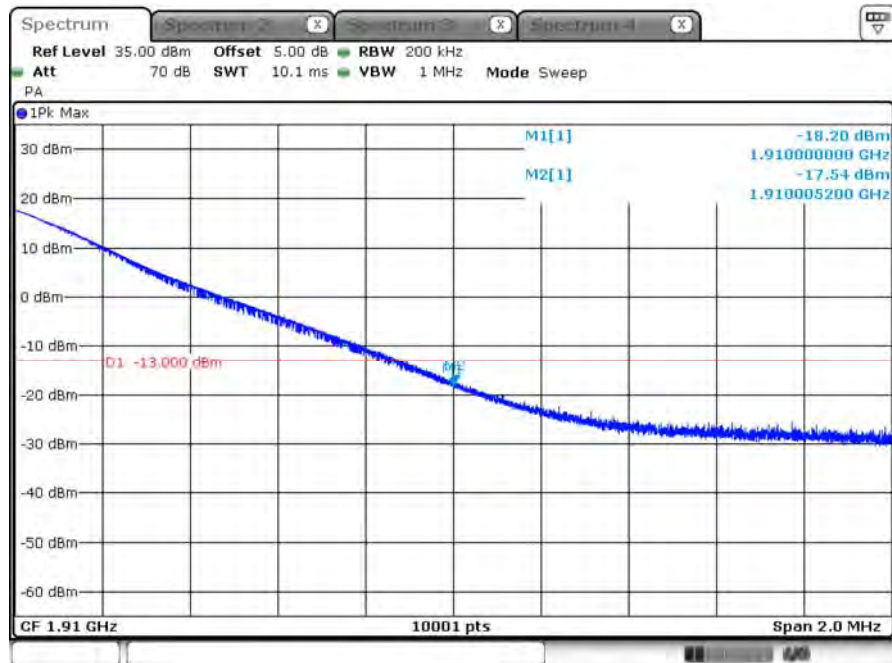
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B2_CH18700_20M_16-QAM_1RB0

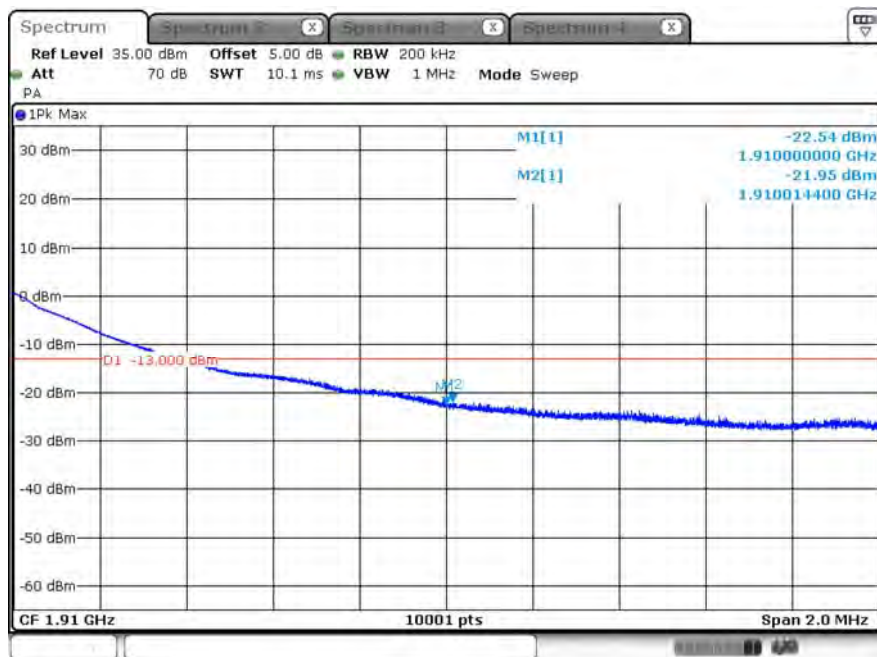
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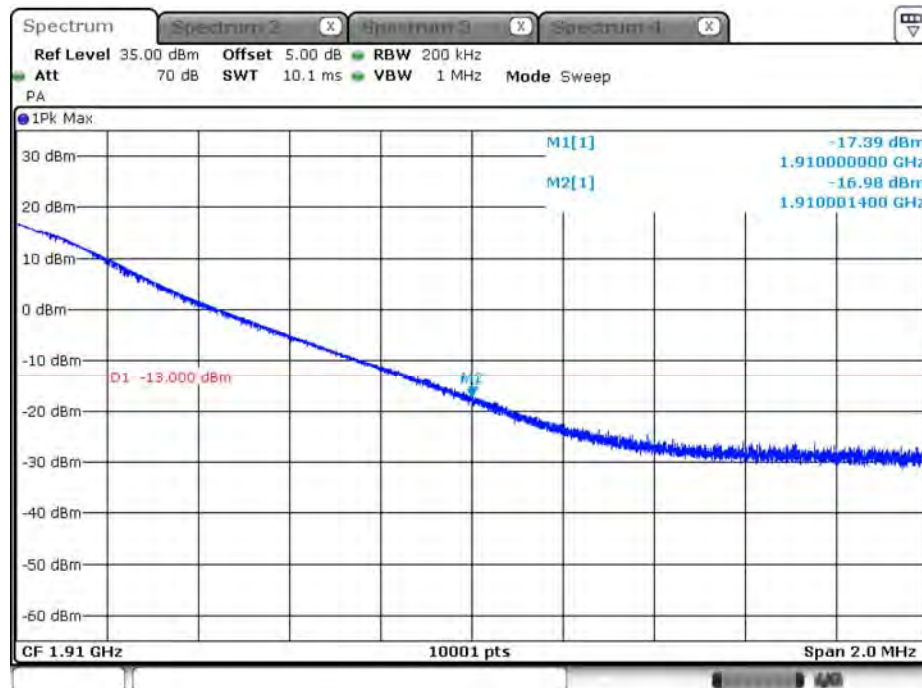
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B2_CH19100_20M_QPSK_1RB99

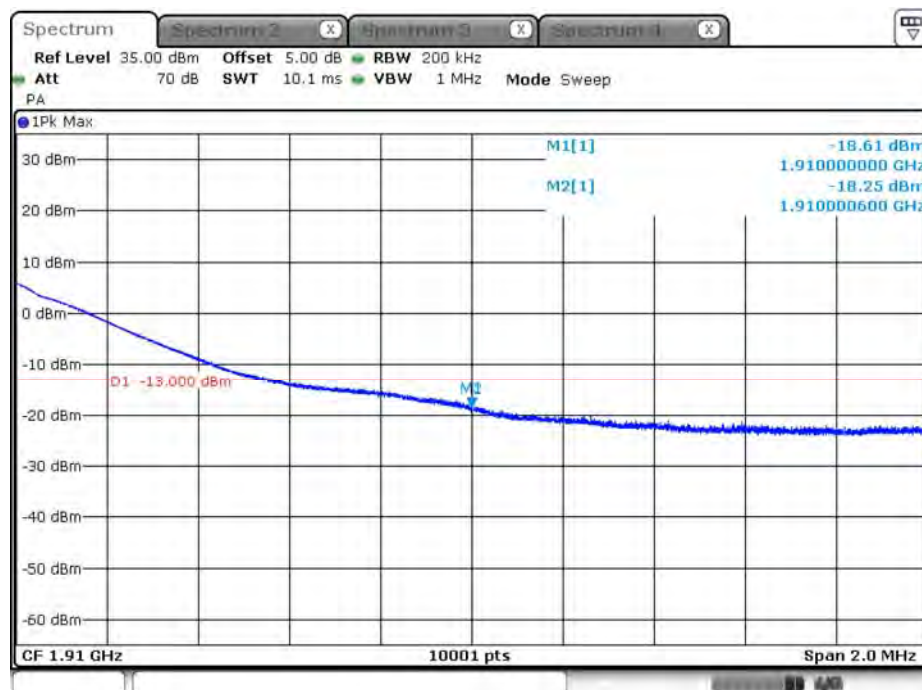
Date: 15.APR.2019 20:17:16

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Date: 15.APR.2019 19:55:20

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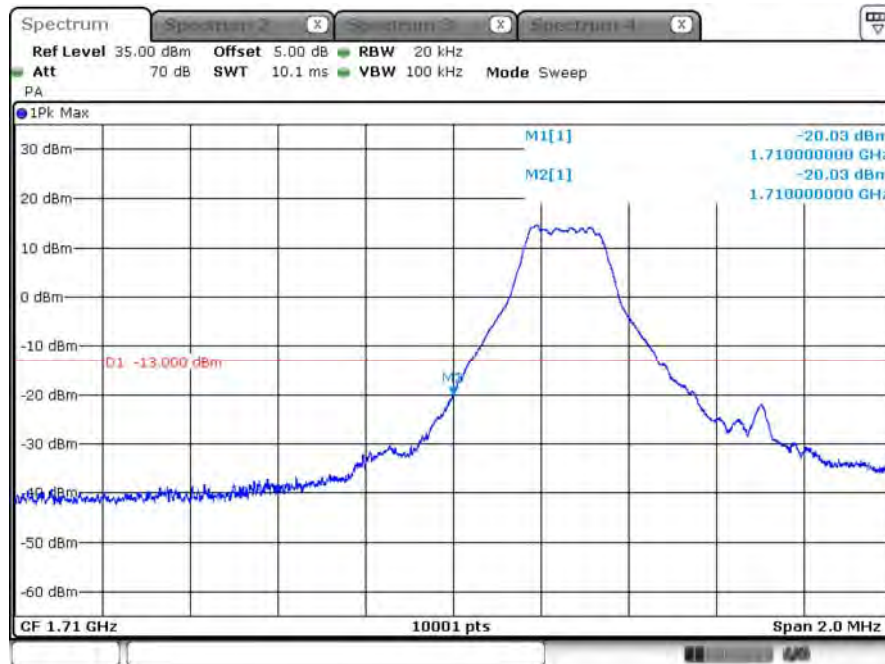
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B2_CH19100_20M_16-QAM_27RB73

Date: 15 APR 2019 20:09:48

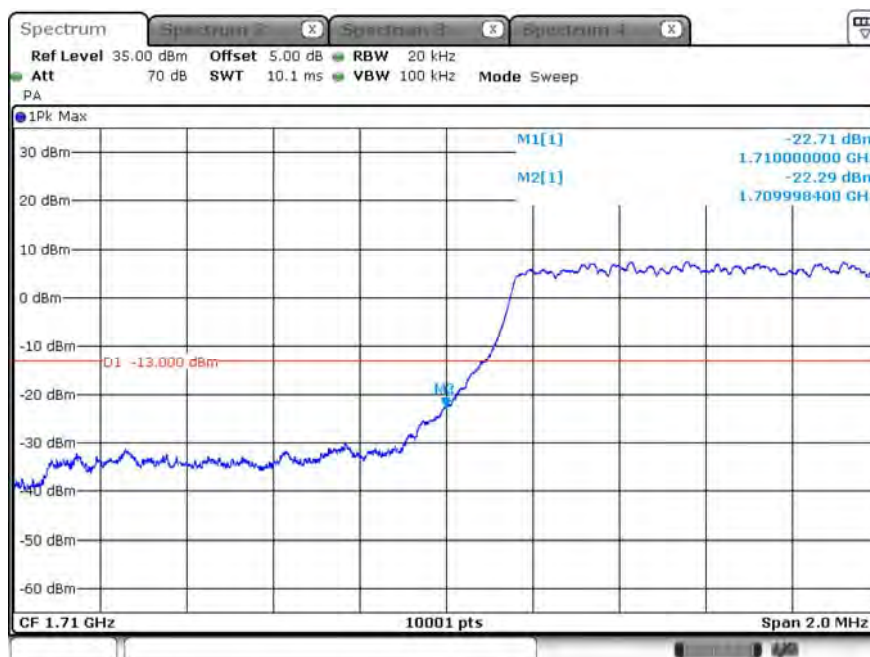
Product	Module		
Test Item	Spurious Emissions at Antenna Terminals		
Test Mode	Mode 2: LTE Band 4		
Date of Test	2019/04/16	Test Site	SR10-H

B4_CH19957_1.4M_QPSK_1RB0

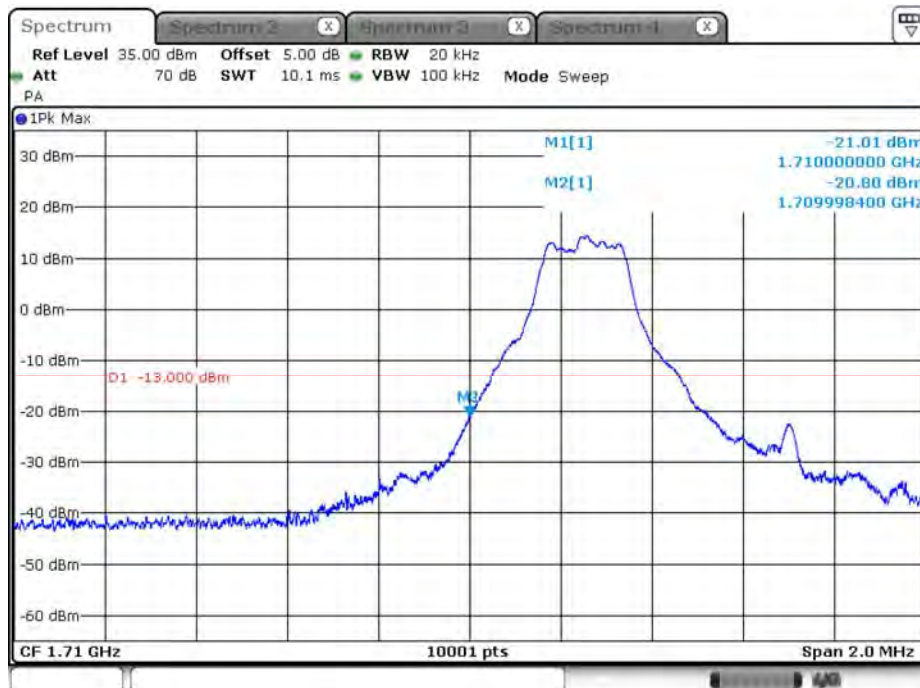


Date: 15 APR 2019 20:25:43

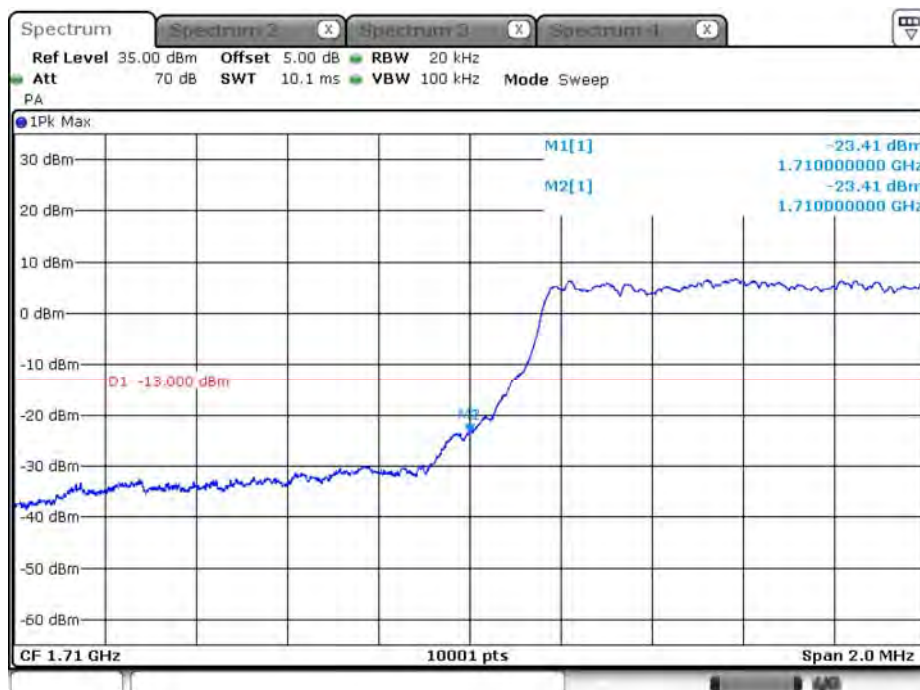
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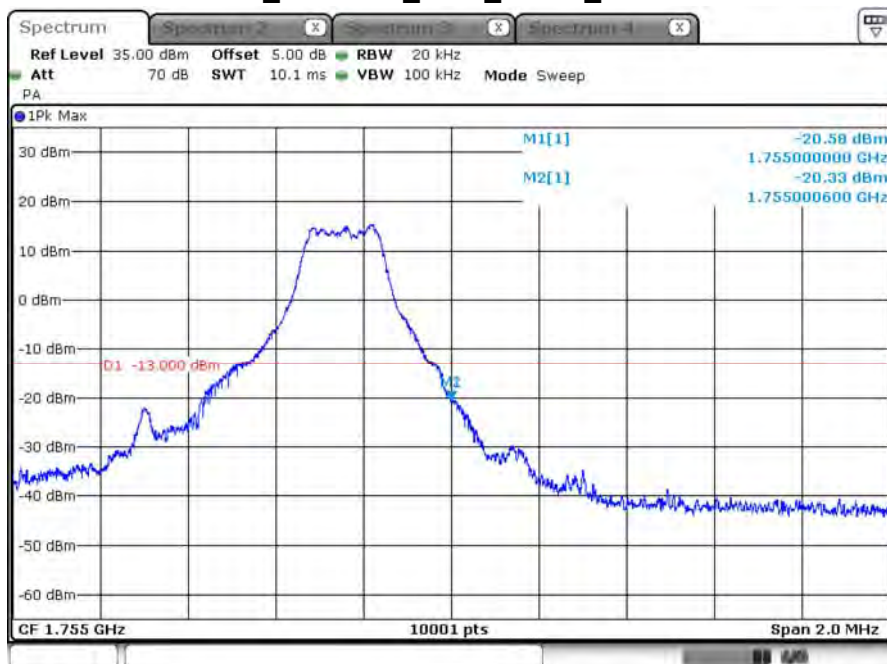
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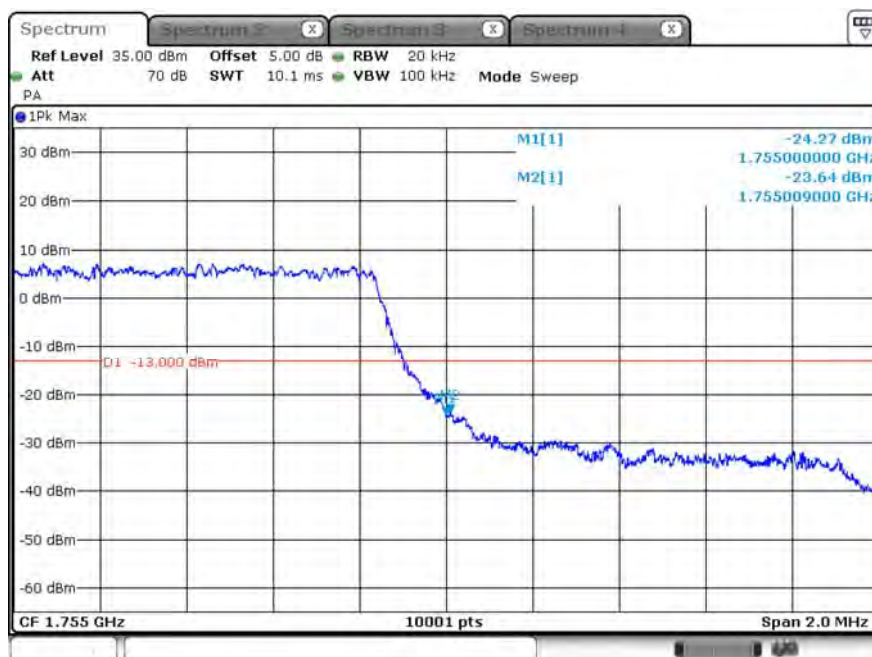
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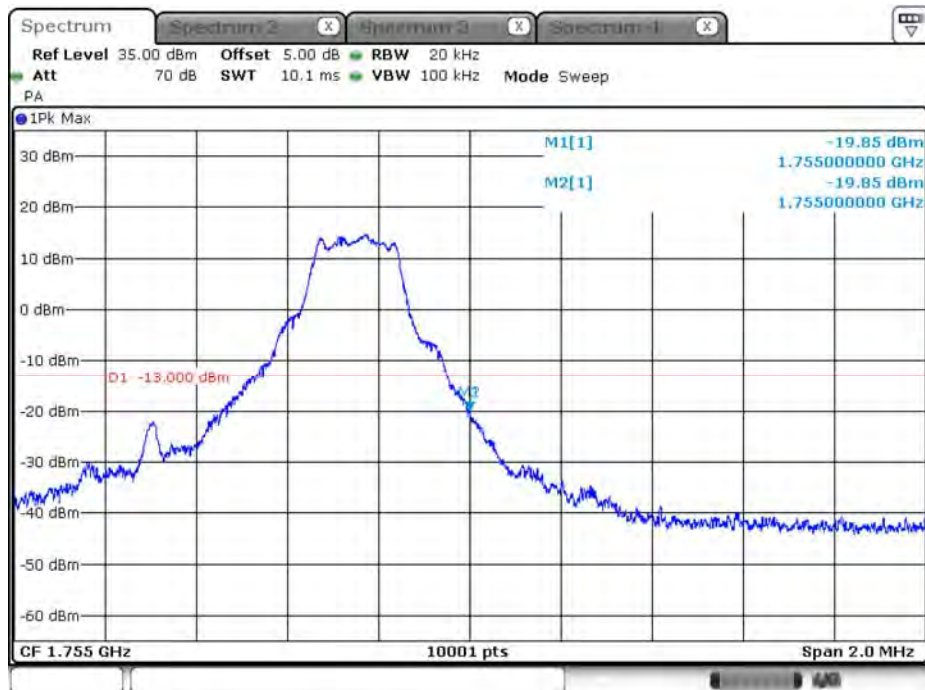
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B4_CH20393_1.4M_QPSK_1RB5

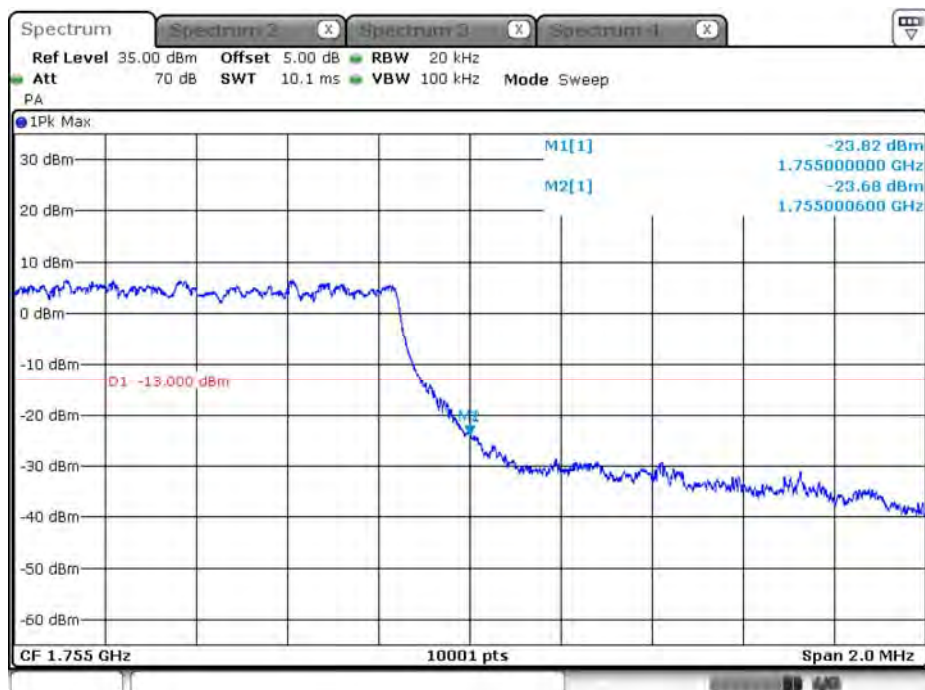
Date: 15 APR 2019 20:46:48

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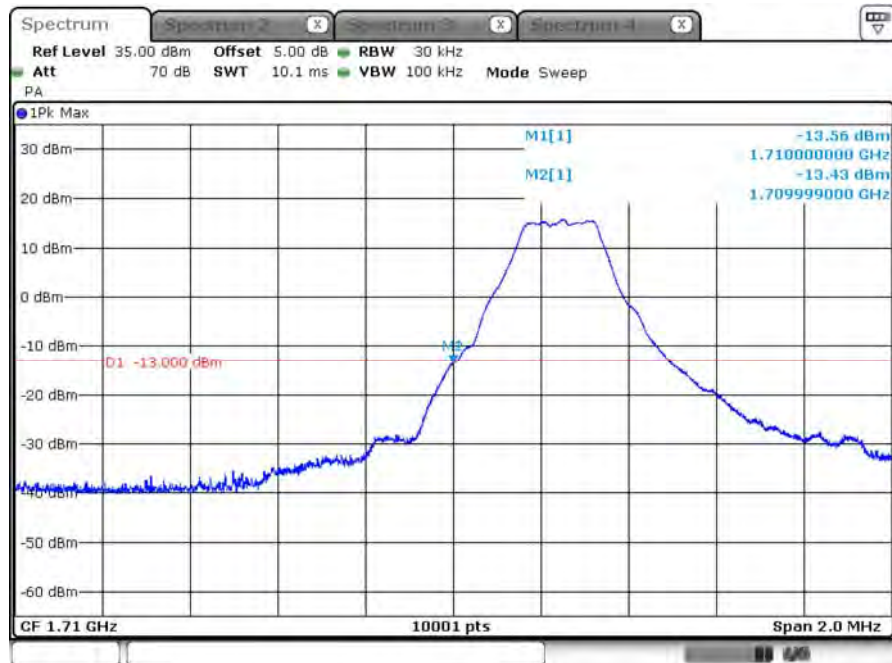
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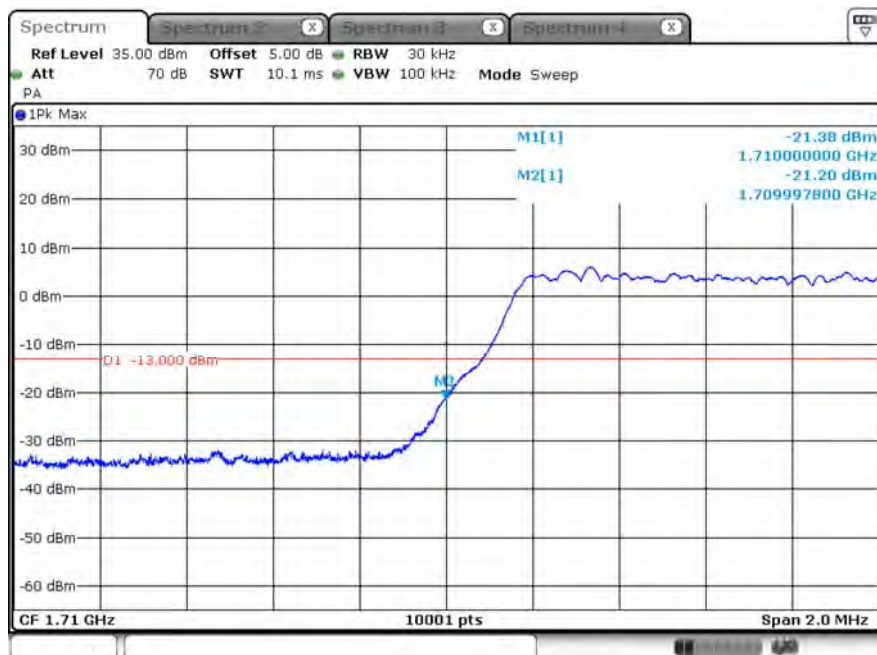
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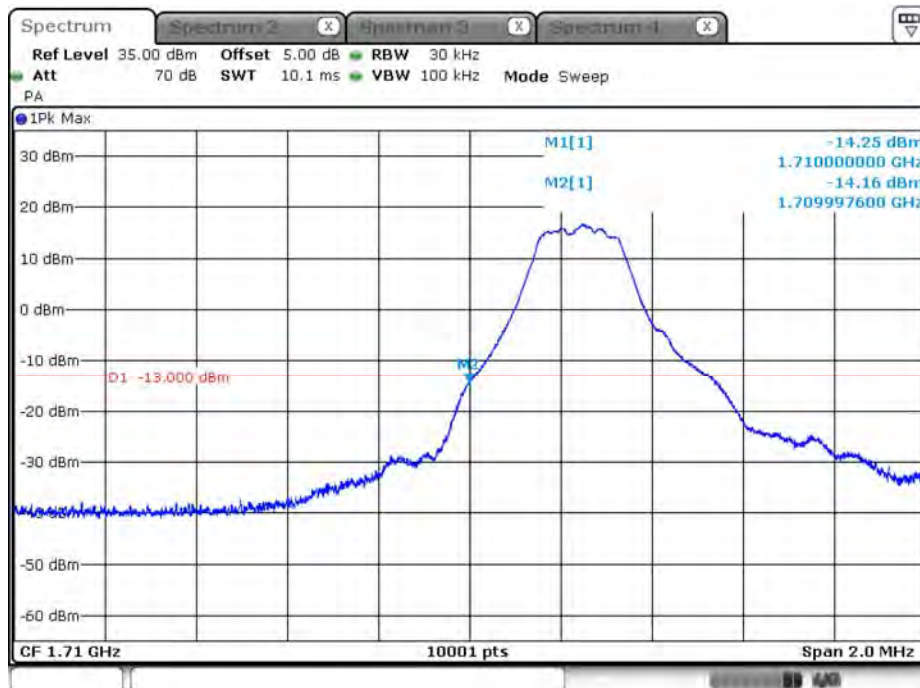
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B4_CH19965_3M_QPSK_1RB0

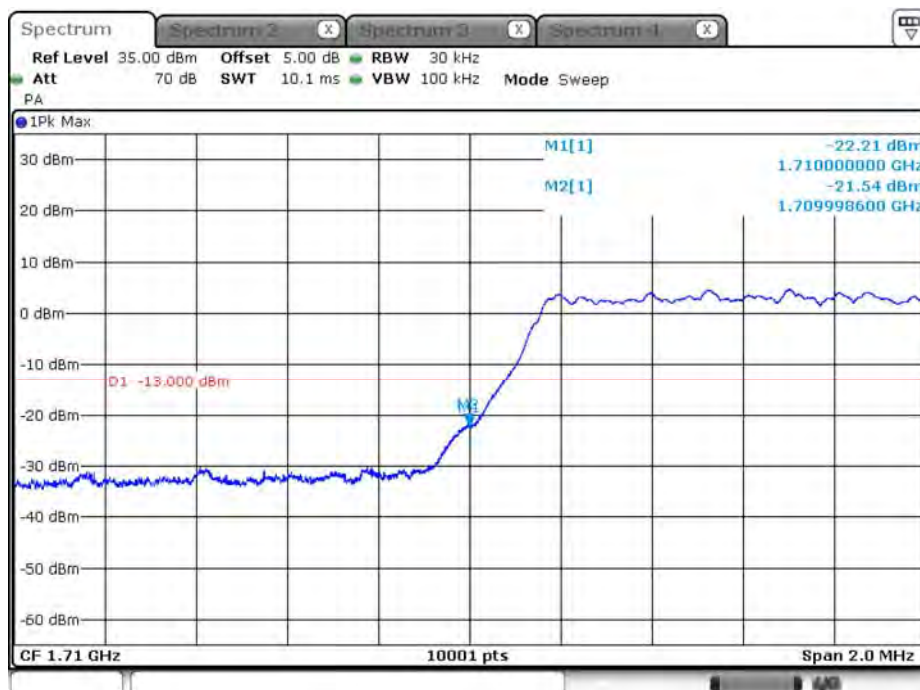
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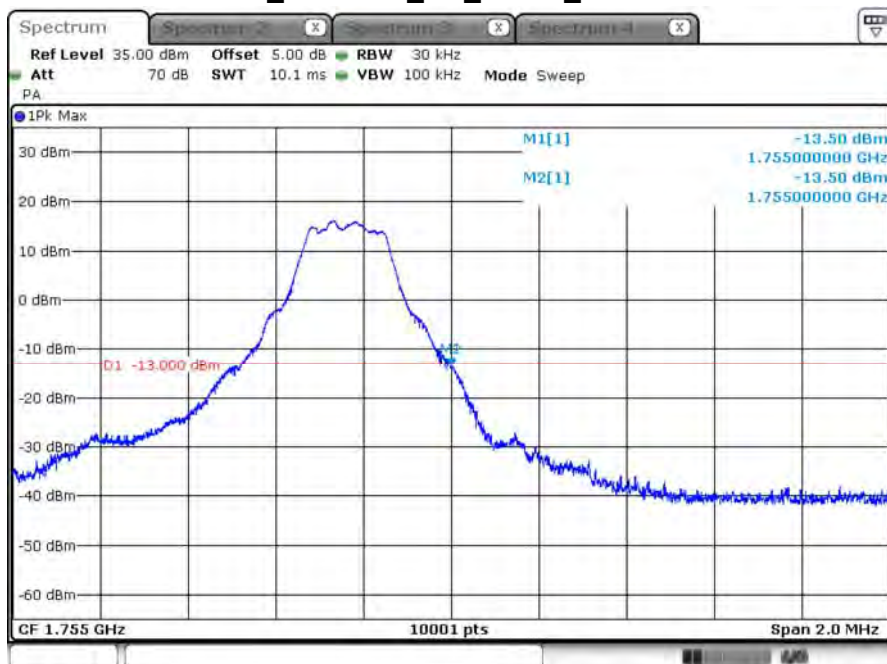
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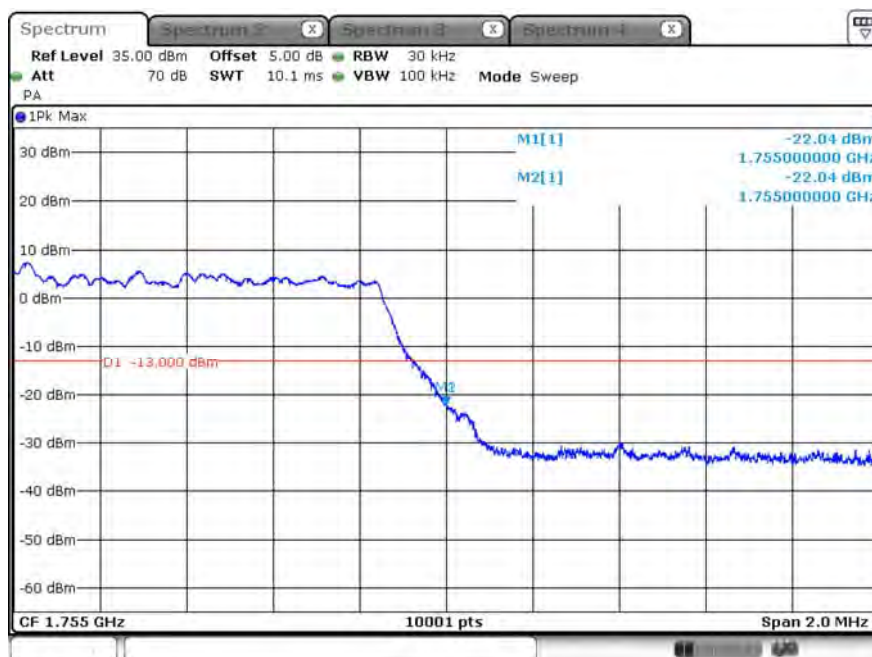
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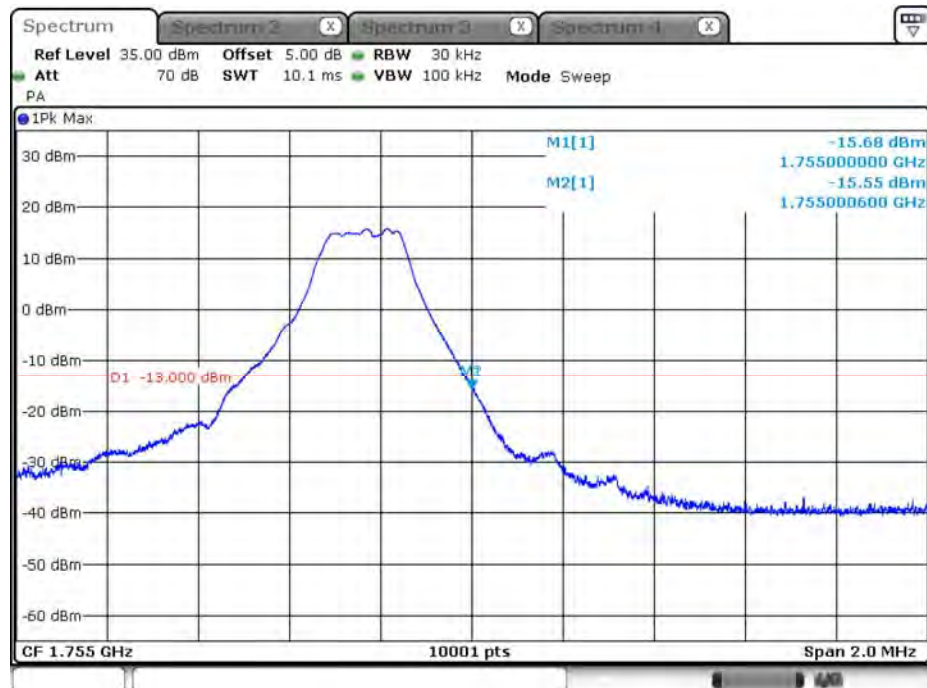
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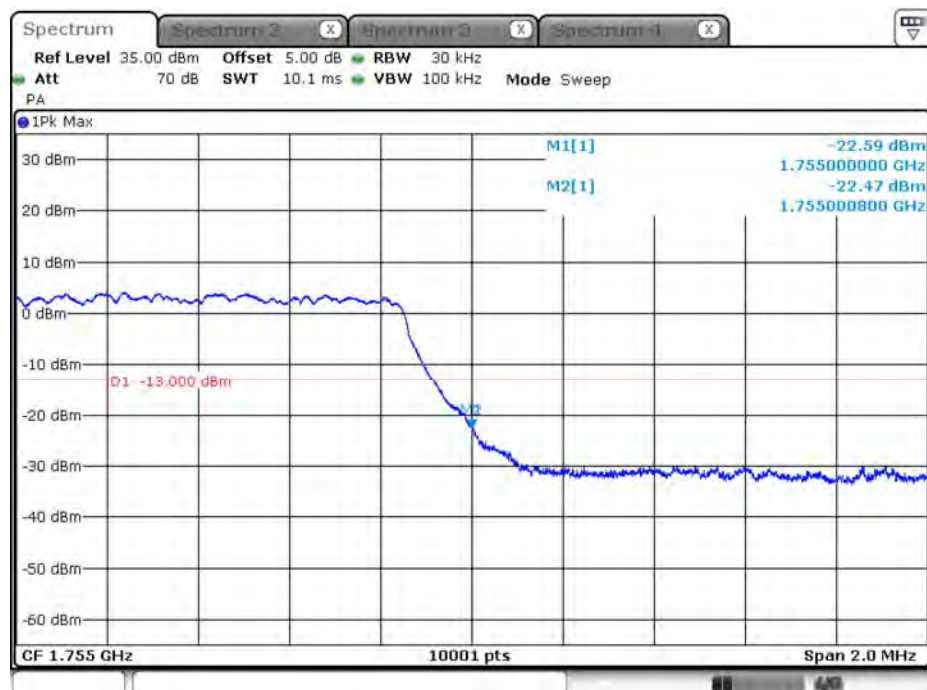
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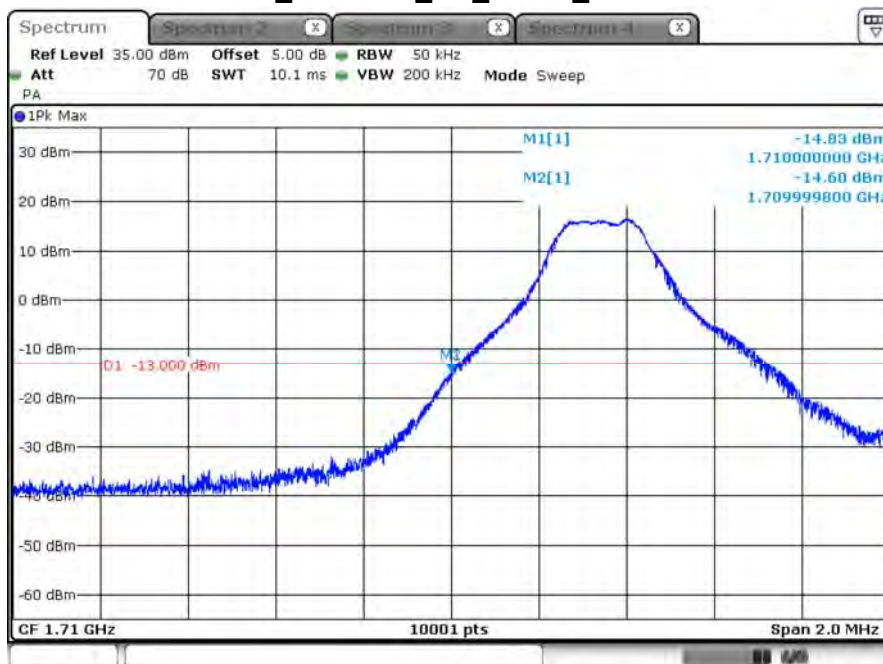
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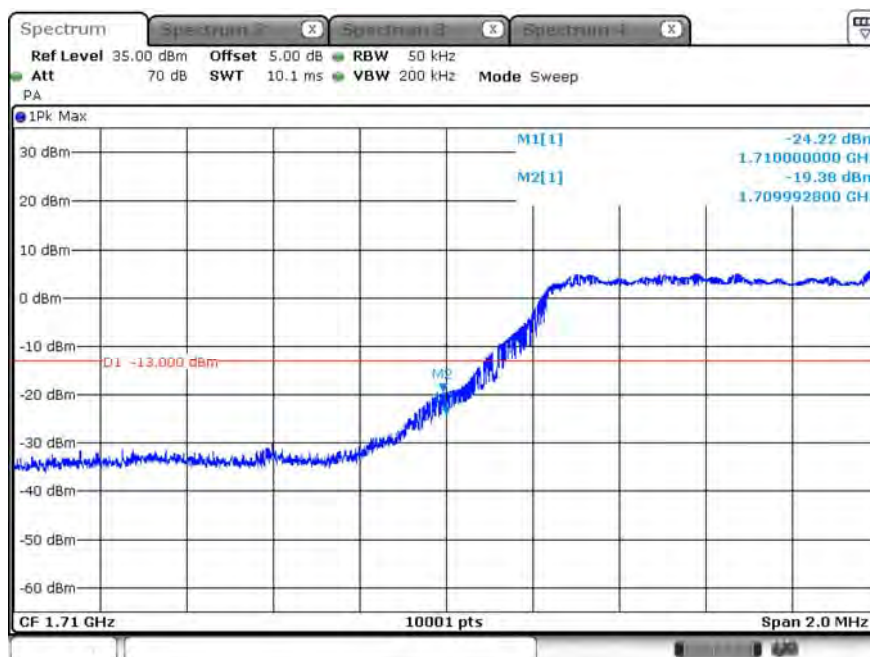
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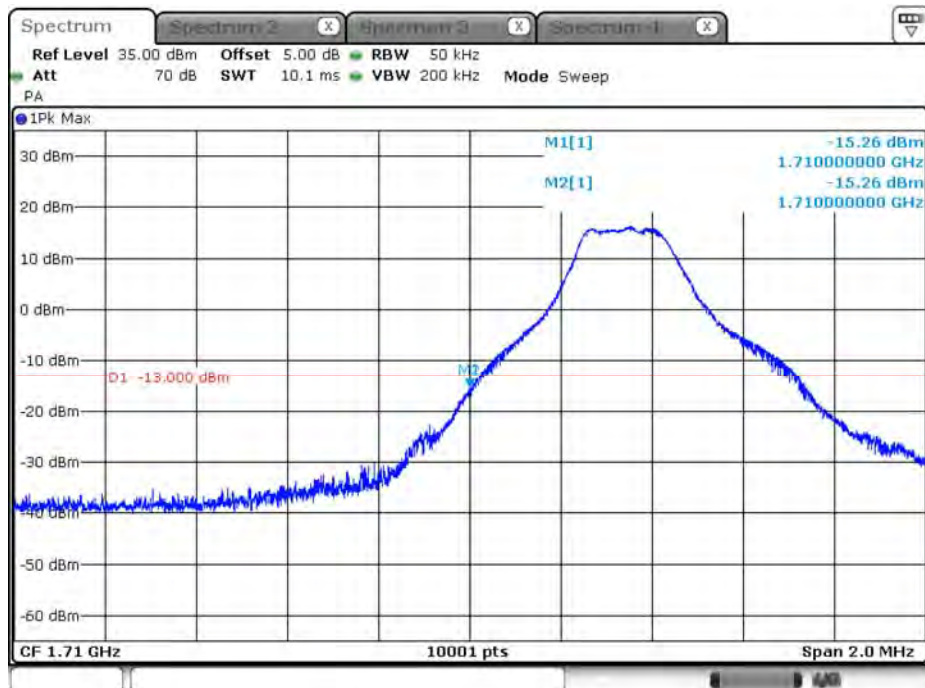
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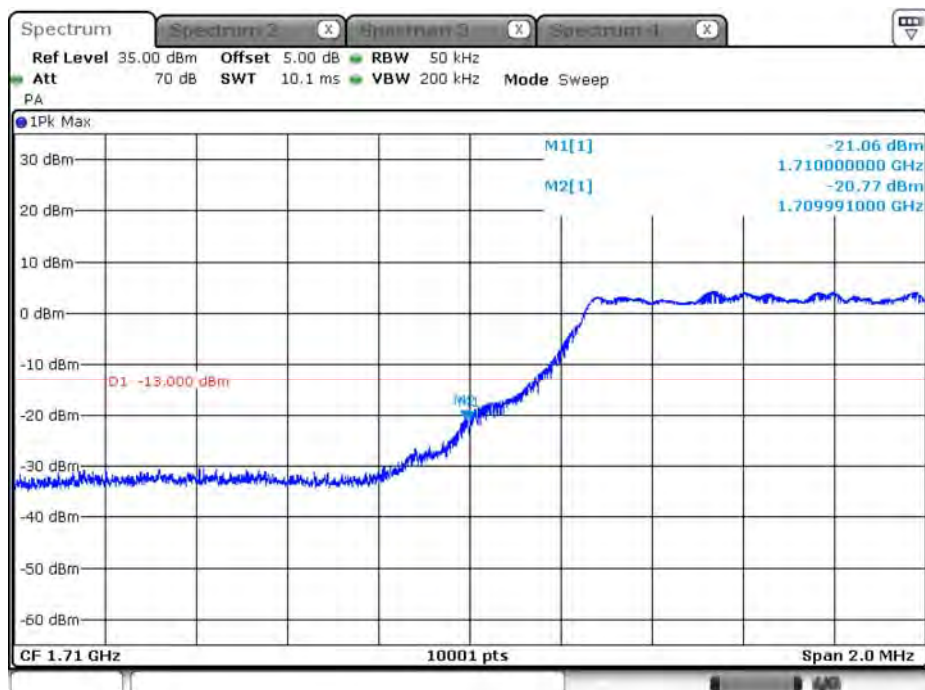
Date: 16 APR 2019 12:47:18

B4_CH19975_5M_QPSK_25RB0

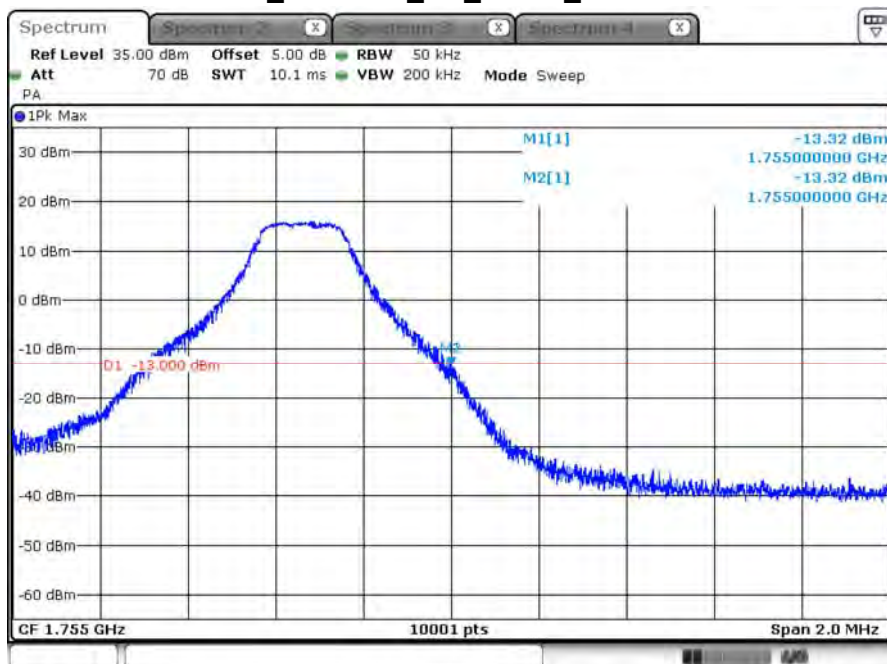
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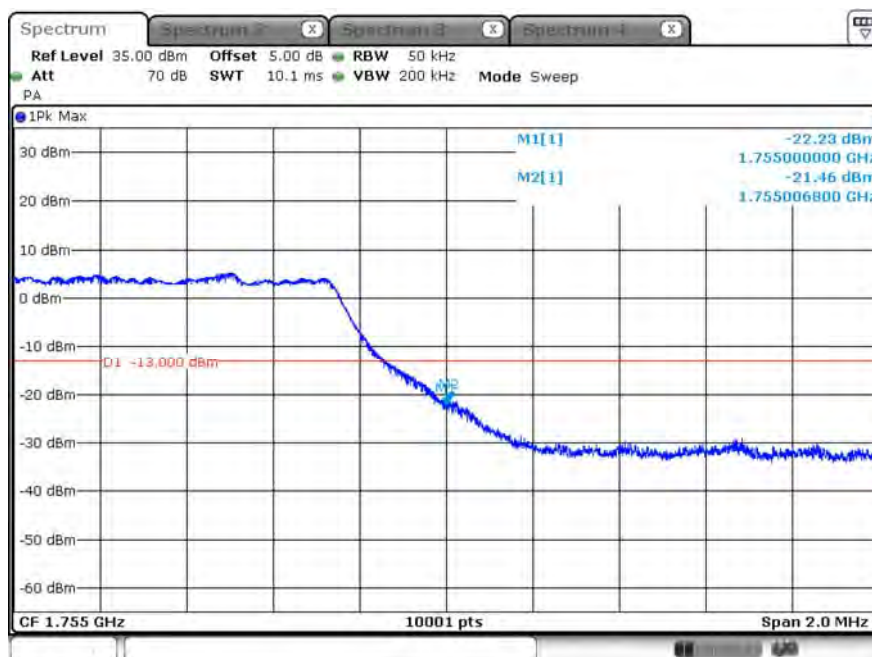
Date: 16.APR.2019 12:46:50

B4_CH19975_5M_16-QAM_25RB0

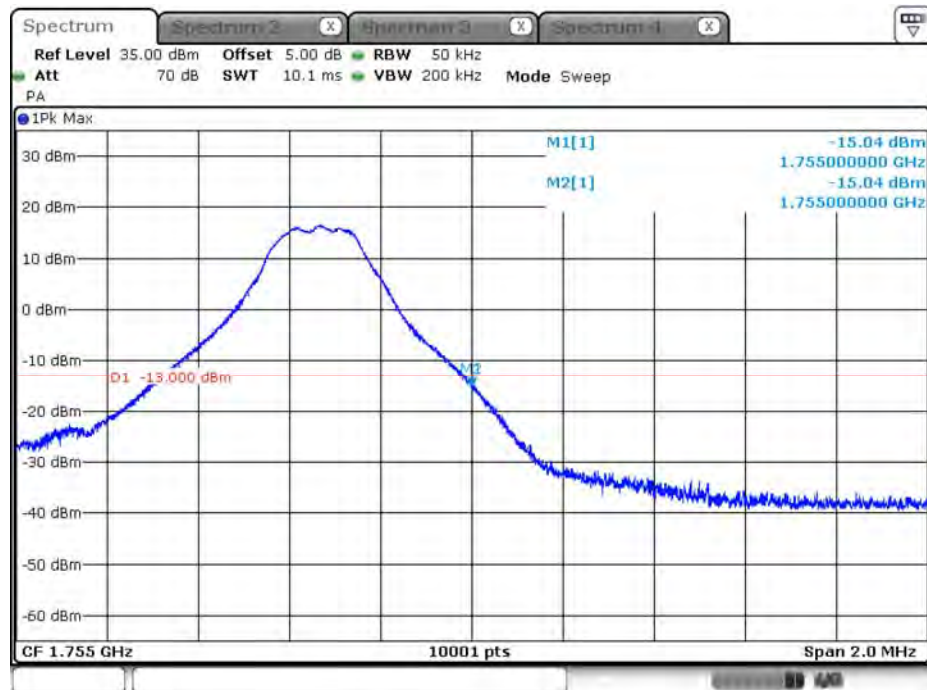
Date: 16.APR.2019 12:46:00

B4_CH20375_5M_QPSK_1RB24

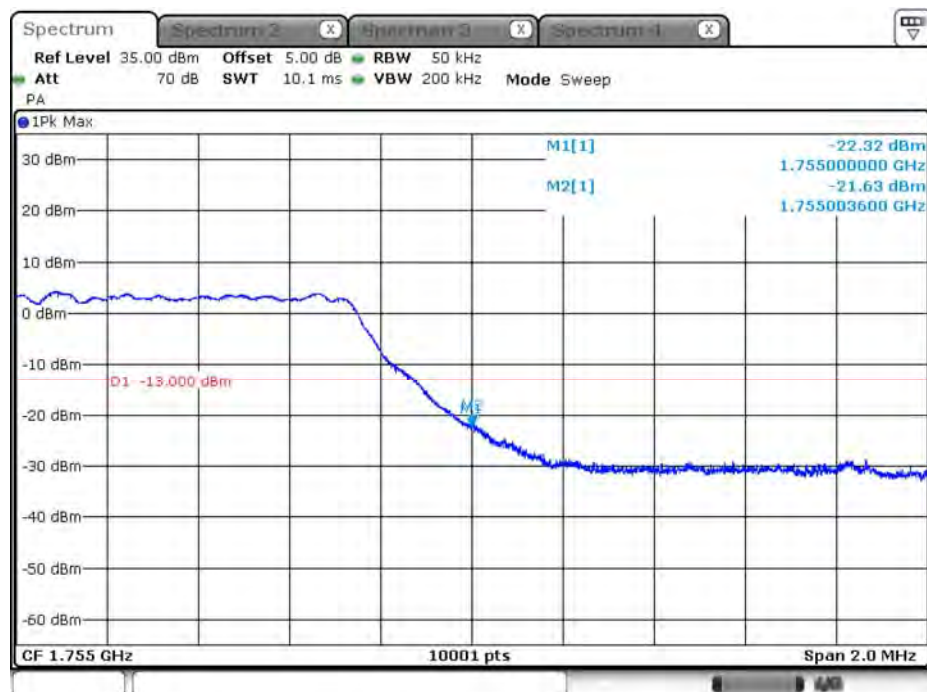
Date: 16 APR 2019 15:32:53

B4_CH20375_5M_QPSK_25RB0

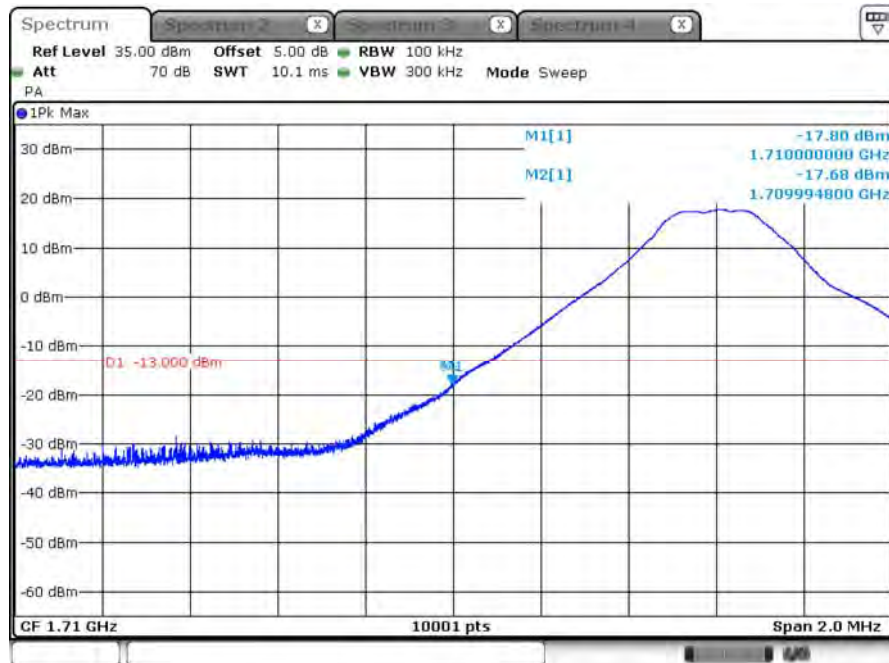
Date: 16 APR 2019 15:39:59

B4_CH20375_5M_16-QAM_1RB24

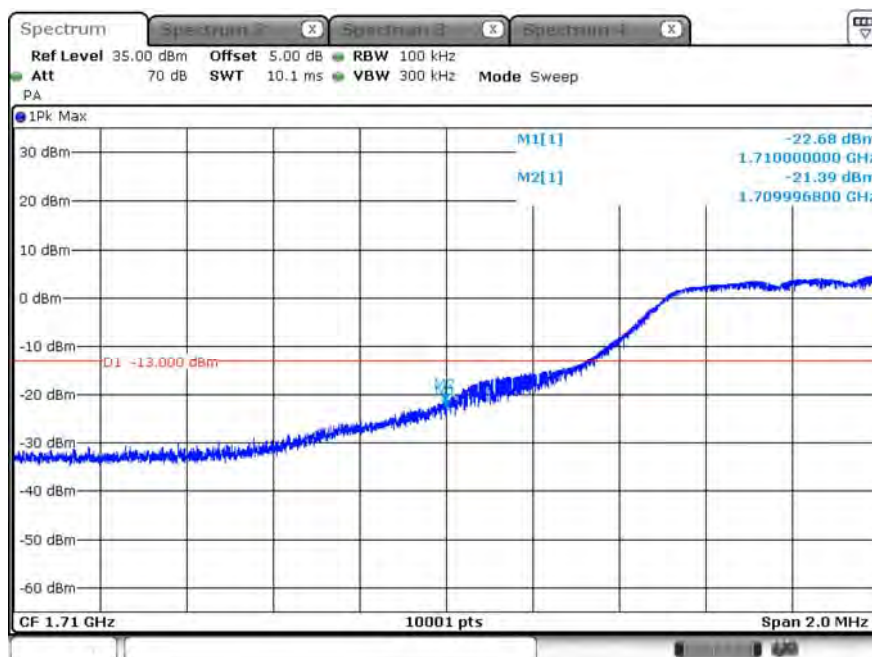
Date: 16.APR.2019 15:34:40

B4_CH20375_5M_16-QAM_25RB0

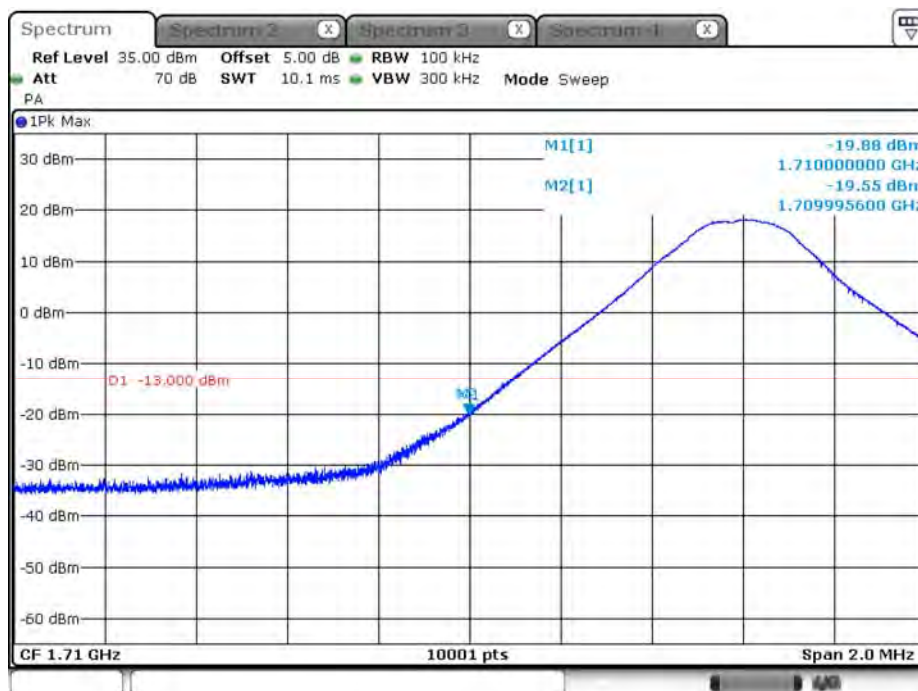
Date: 16.APR.2019 15:39:16

B4_CH20000_10M_QPSK_1RB0

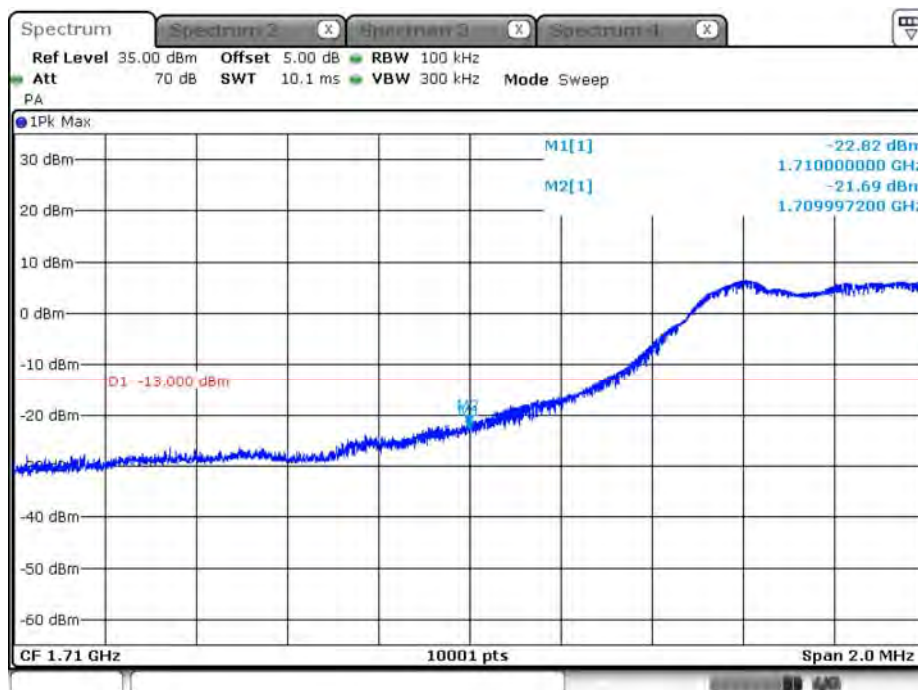
Date: 16 APR 2019 16:56:07

B4_CH20000_10M_QPSK_50RB0

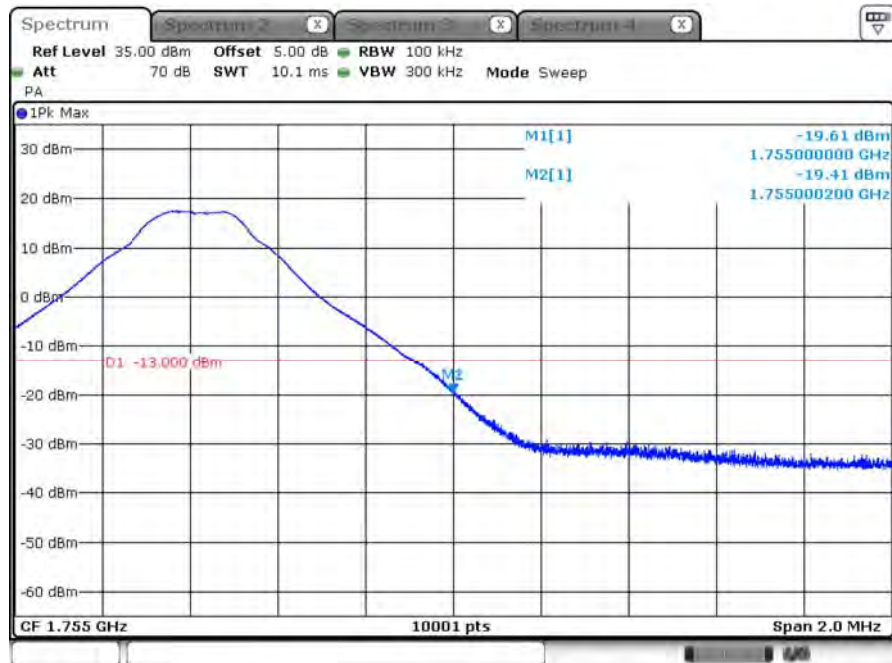
Date: 16 APR 2019 17:54:03

B4_CH20000_10M_16-QAM_1RB0

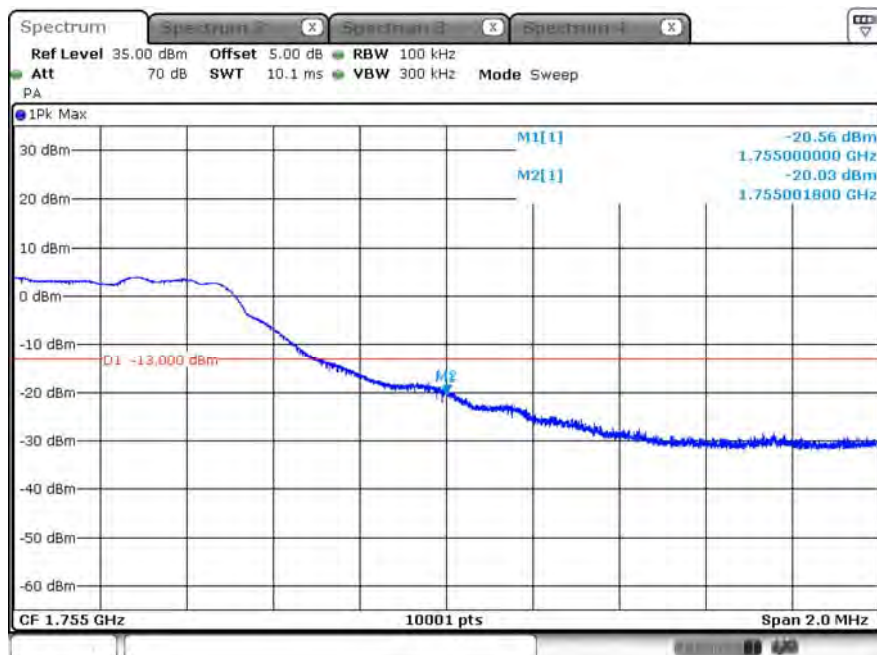
Date: 16.APR.2019 17:50:30

B4_CH20000_10M_16-QAM_27RB0

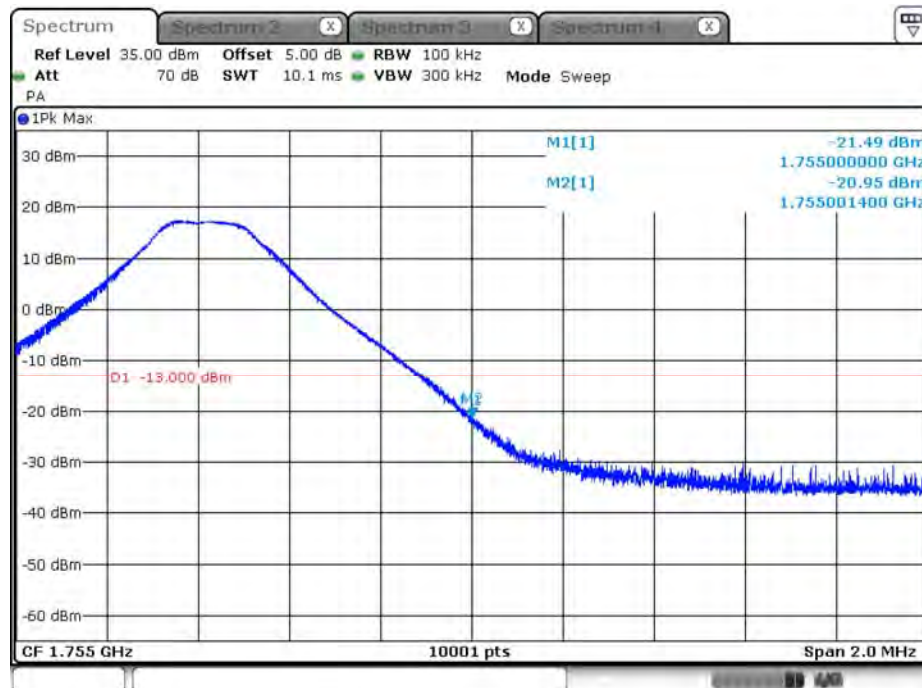
Date: 16.APR.2019 17:51:36

B4_CH20350_10M_QPSK_1RB49

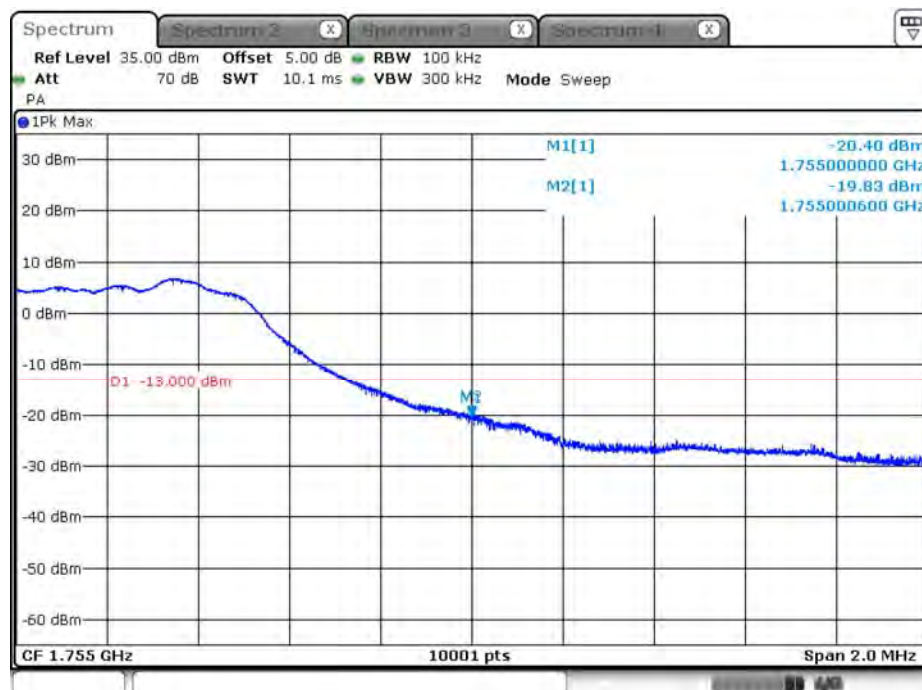
Date: 16 APR 2019 18:32:38

B4_CH20350_10M_QPSK_50RB0

Date: 16 APR 2019 18:51:20

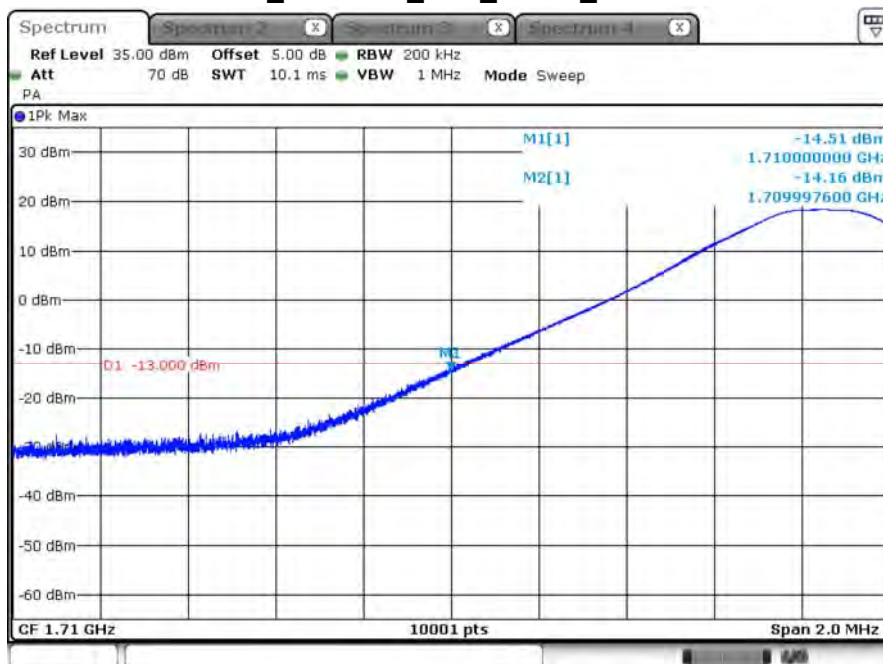
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Date: 16 APR 2019 18:34:09

B4_CH20350_10M_16-QAM_27RB23

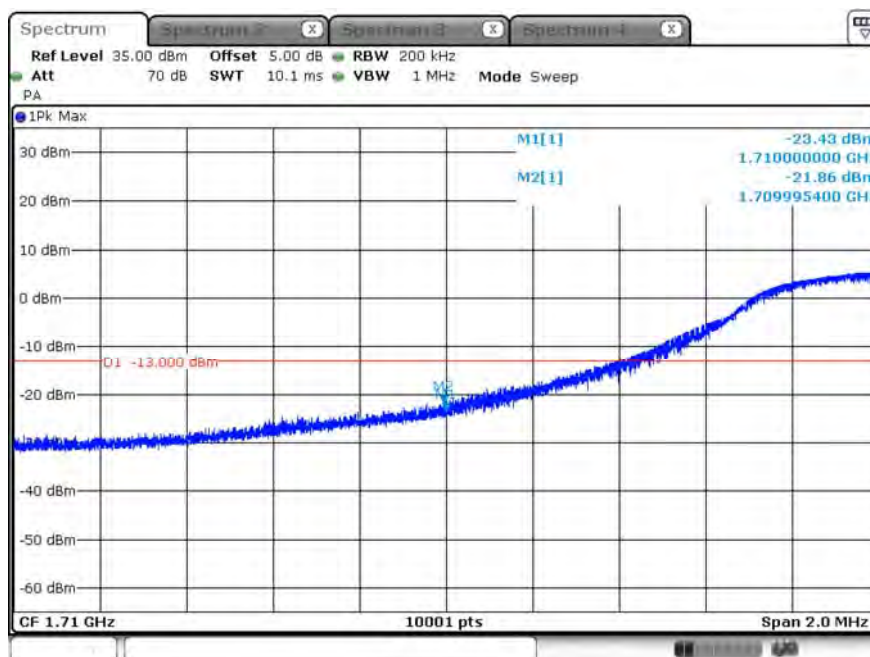
Date: 16 APR 2019 18:37:28

B4_CH20025_15M_QPSK_1RB0

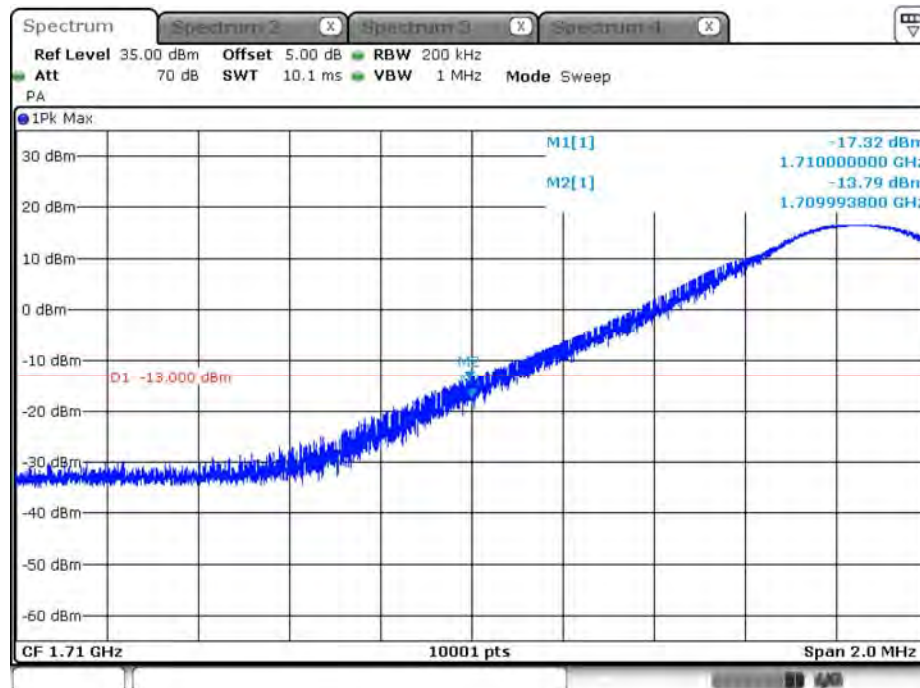


Date: 16 APR.2019 19:13:35

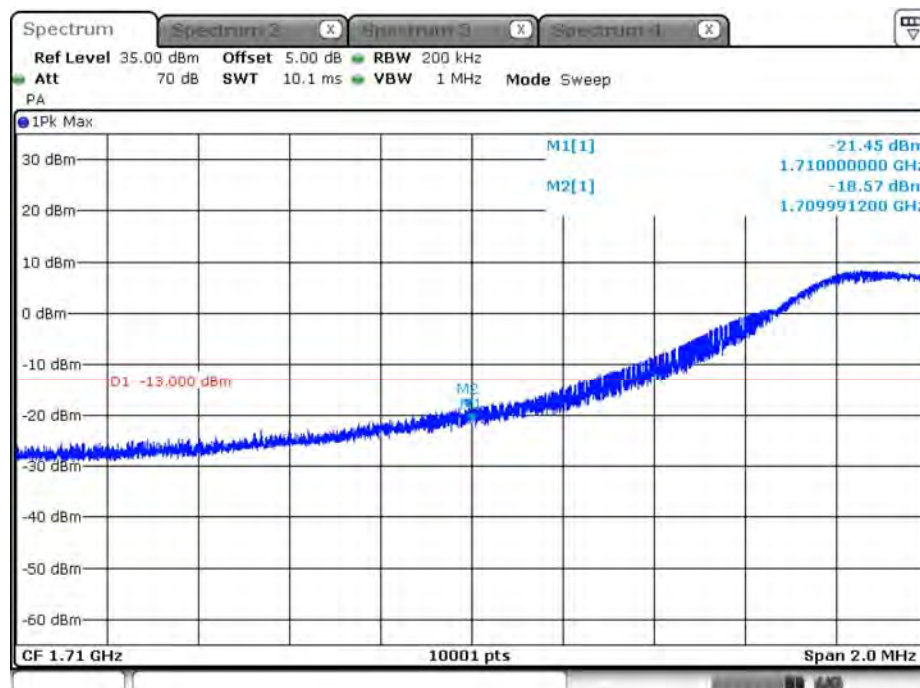
B4_CH20025_15M_QPSK_75RB0



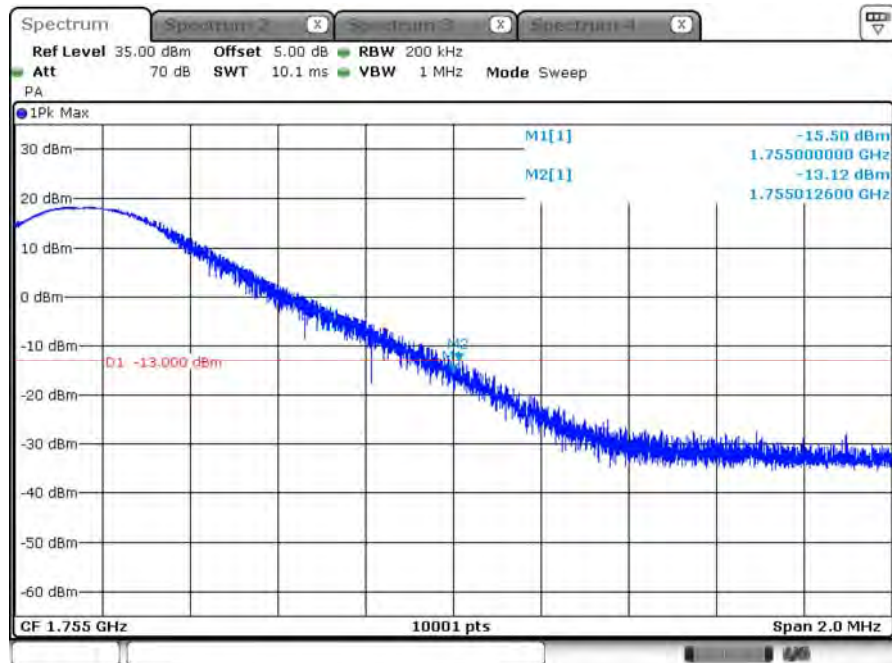
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B4_CH20025_15M_16-QAM_1RB0

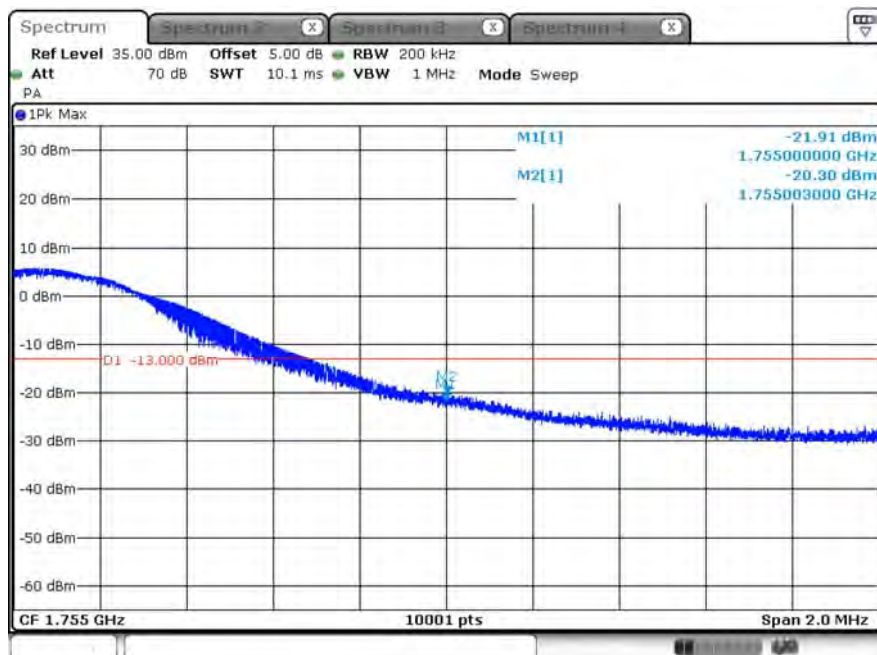
Date: 16.APR.2019 19:14:56

B4_CH20025_15M_16-QAM_27RB0

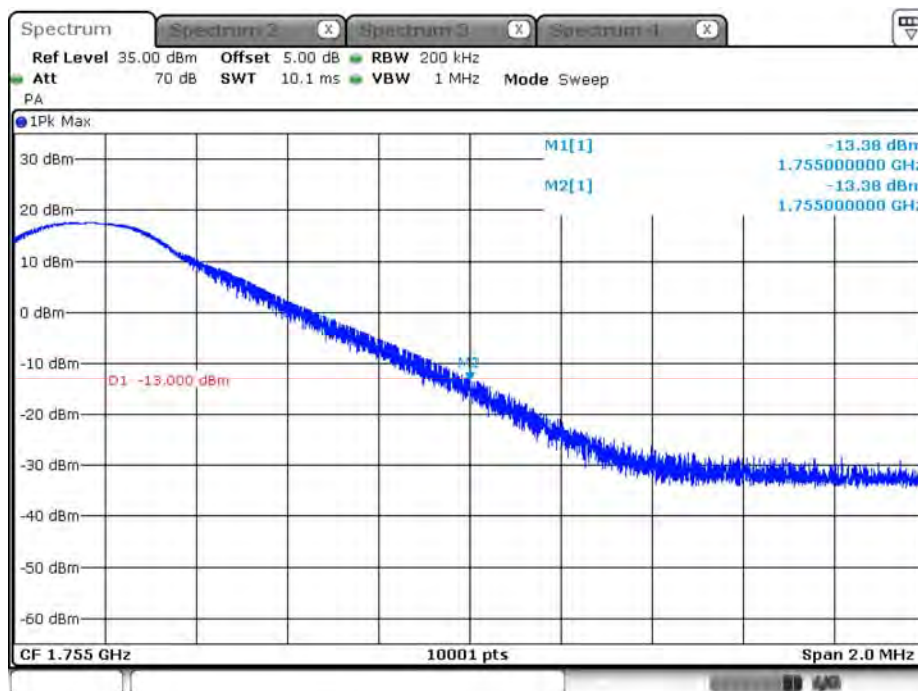
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B4_CH20325_15M_QPSK_1RB74

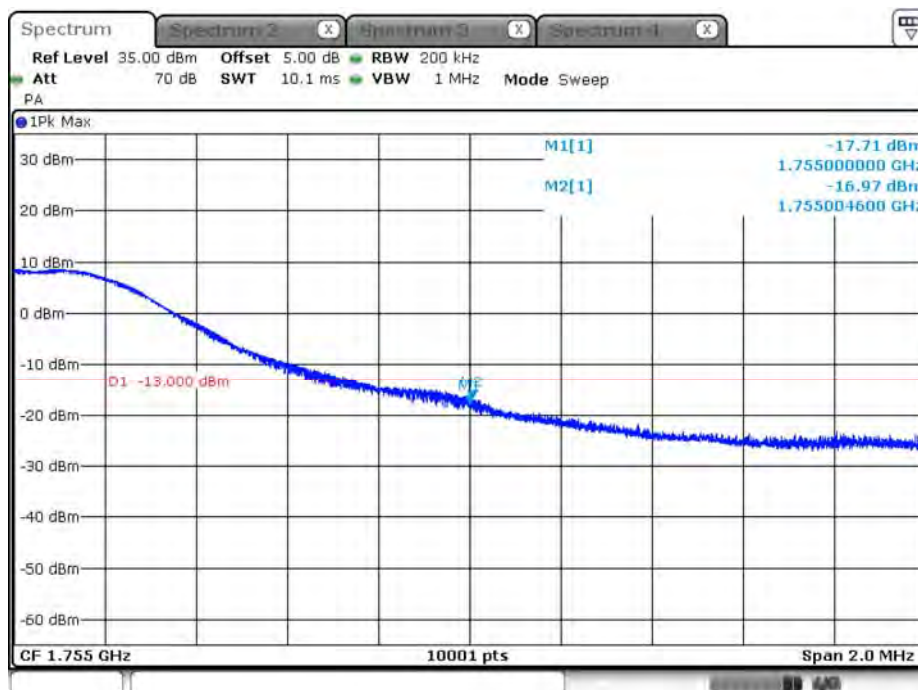
Date: 16 APR 2019 19:22:16

B4_CH20325_15M_QPSK_75RB0

Date: 16 APR 2019 19:26:00

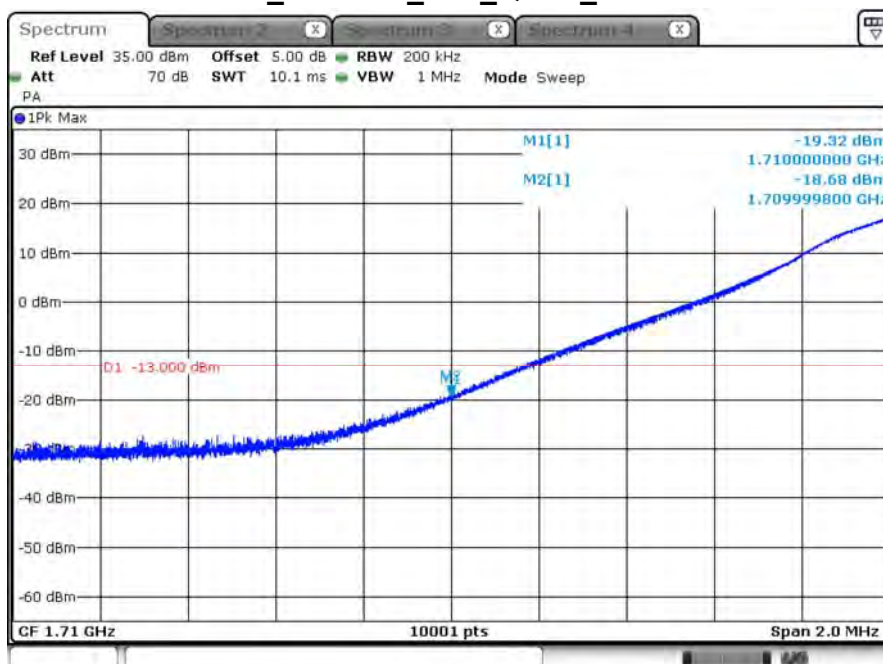
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Date: 16.APR.2019 19:22:54

B4_CH20325_15M_16-QAM_27RB48

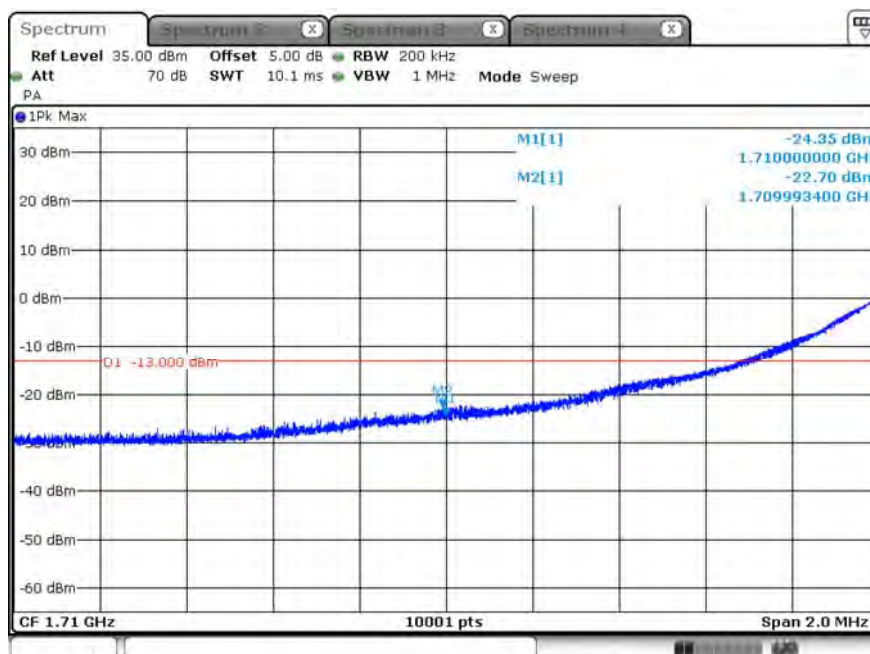
Date: 16.APR.2019 19:24:52

B4_CH20050_20M_QPSK_1RB0

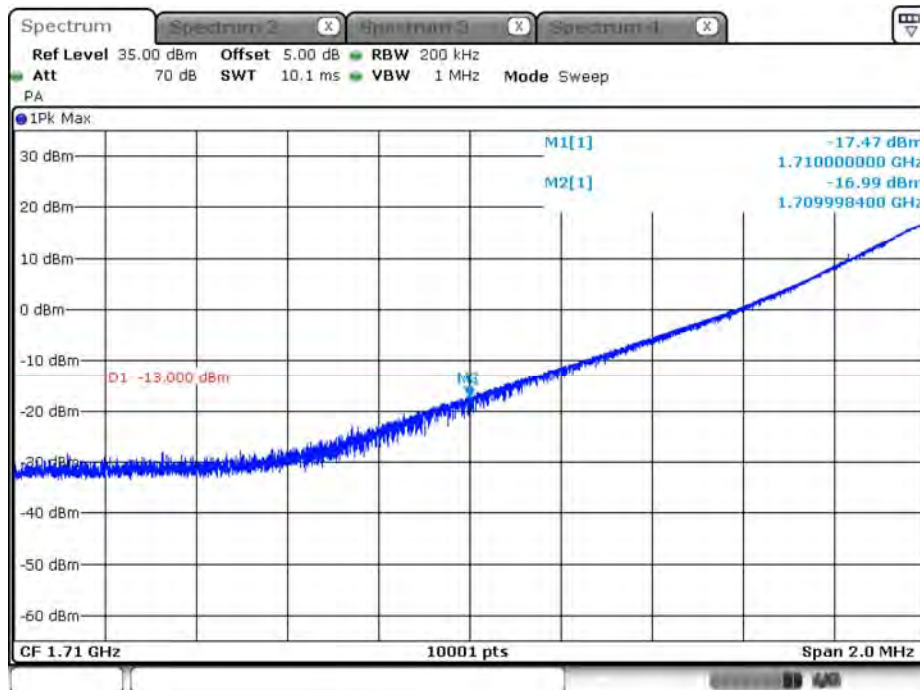


Date: 16 APR 2019 19:30:02

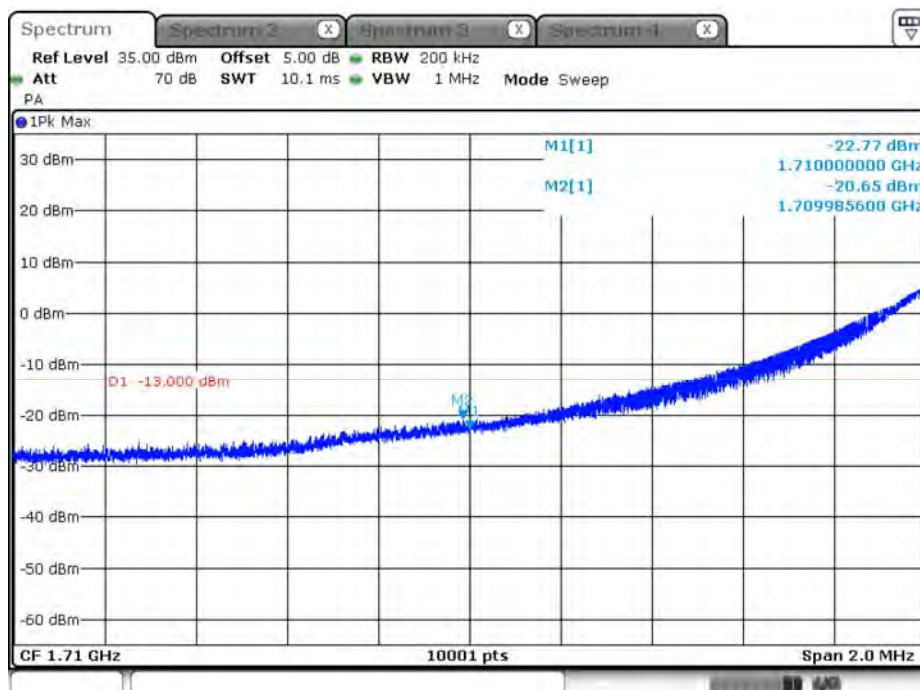
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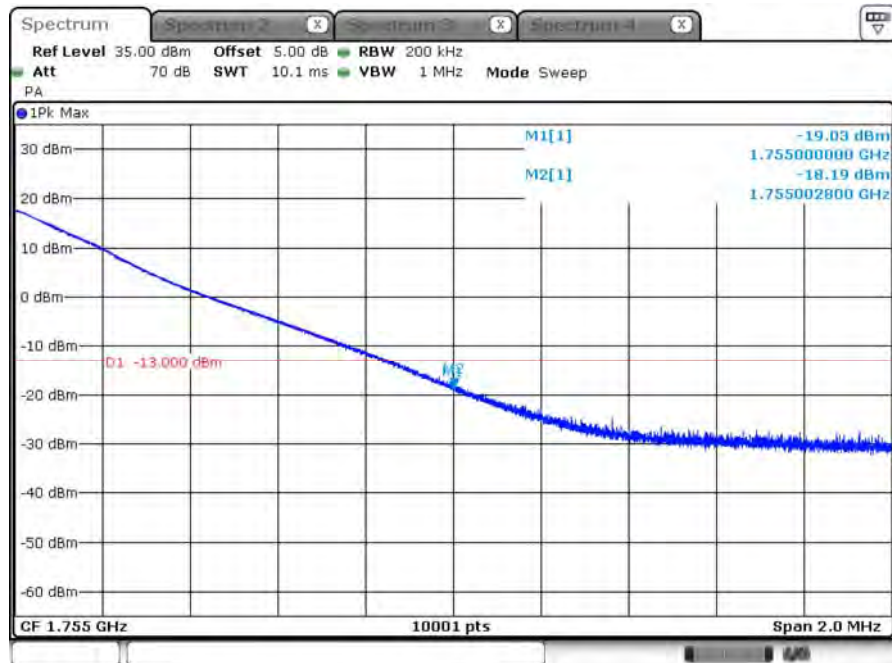
Date: 16 APR 2019 19:33:43

B4_CH20050_20M_16-QAM_1RB0

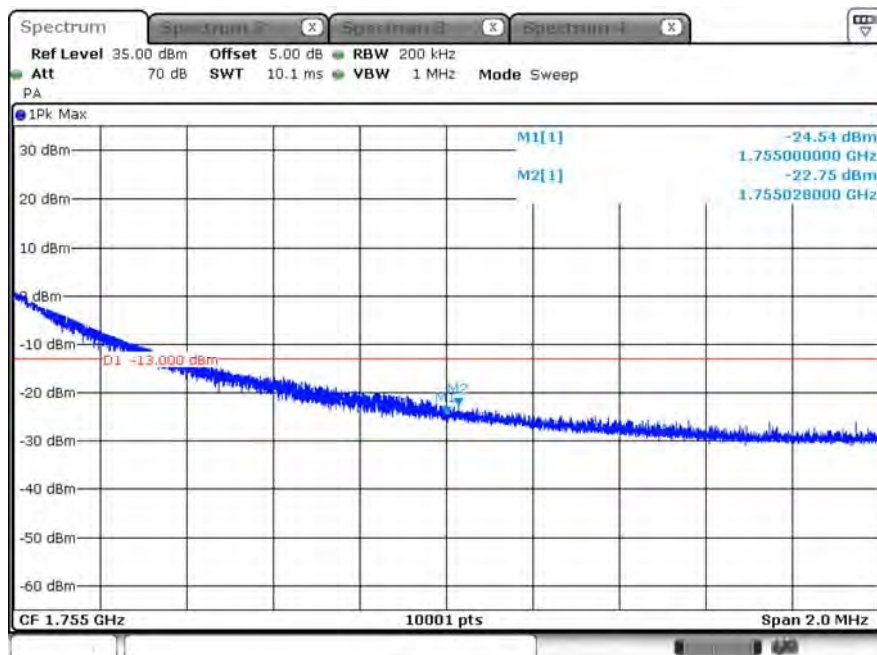
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B4_CH20050_20M_16-QAM_27RB0

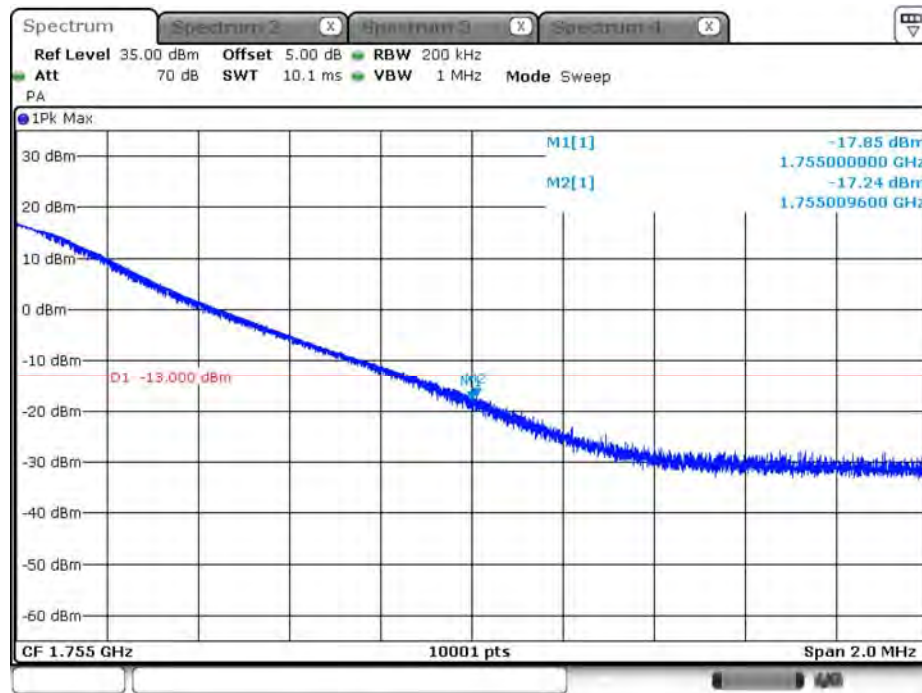
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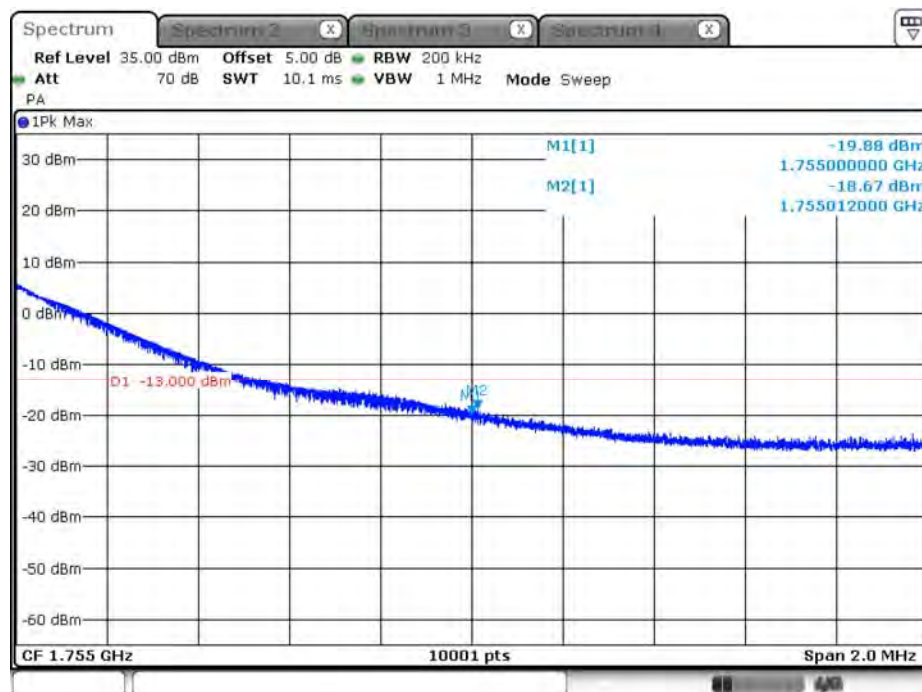
Date: 16 APR 2019 19:38:30

B4_CH20300_20M_QPSK_100RB0

Date: 16 APR 2019 19:46:37

B4_CH20300_20M_16-QAM_1RB99

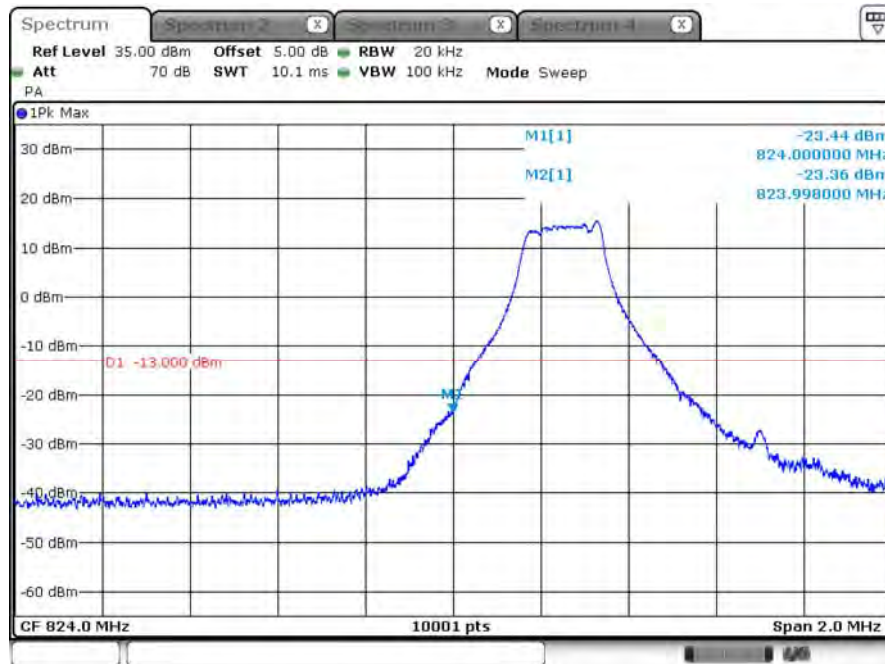
Date: 16.APR.2019 19:43:51

B4_CH20300_20M_16-QAM_27RB73

Date: 16.APR.2019 19:45:45

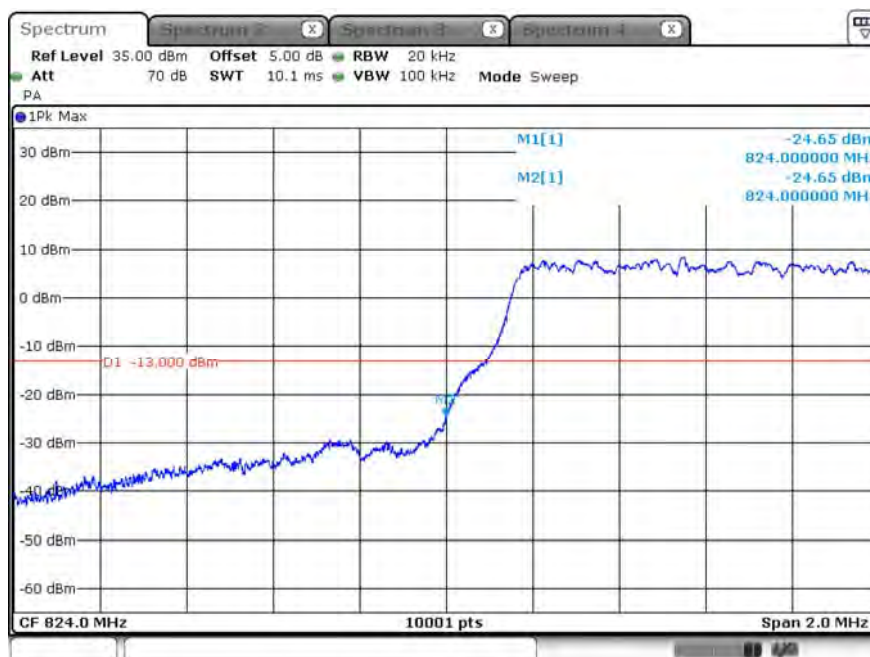
Product	Module		
Test Item	Spurious Emissions at Antenna Terminals		
Test Mode	Mode 3: LTE Band 5		
Date of Test	2019/04/17	Test Site	SR10-H

B5_CH20407_1.4M_QPSK_1RB0

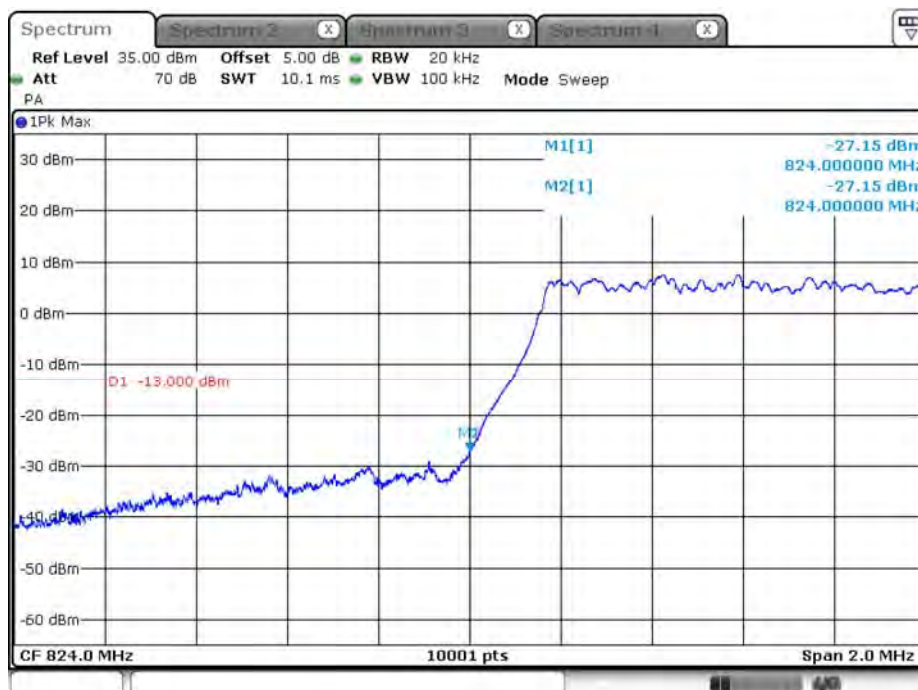
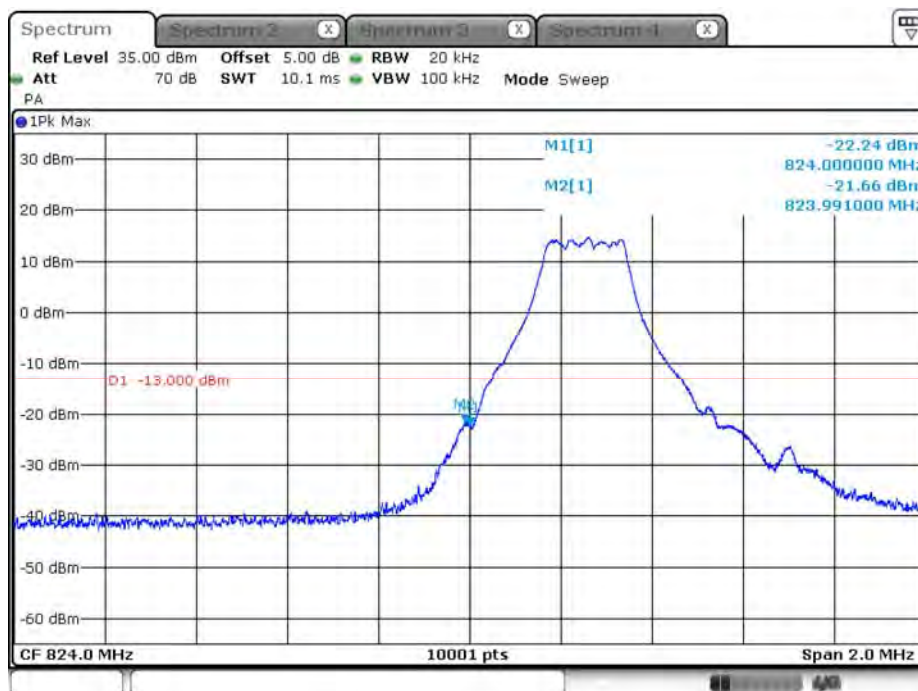


Date: 16 APR.2019 19:54:47

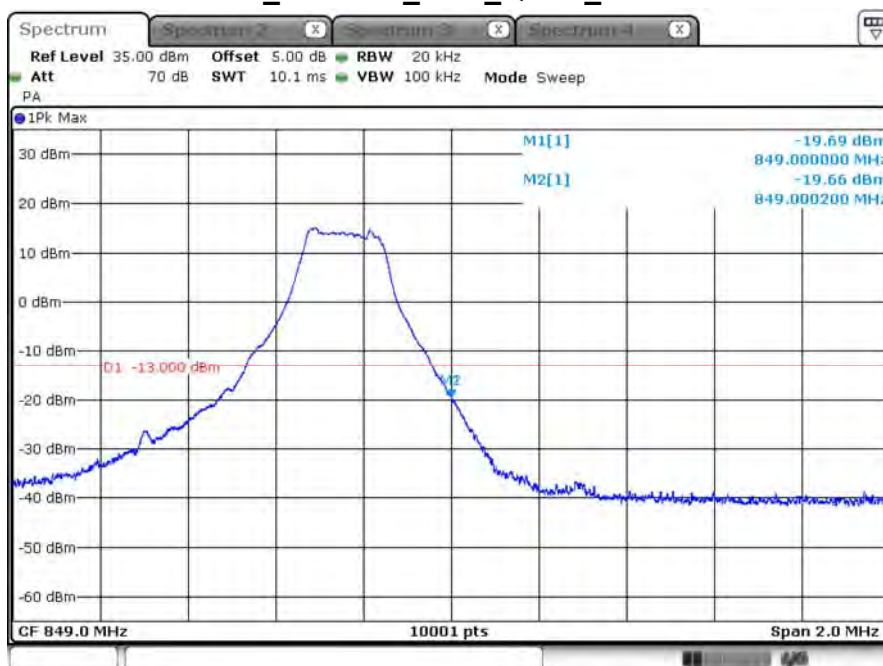
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Date: 16 APR.2019 20:07:46

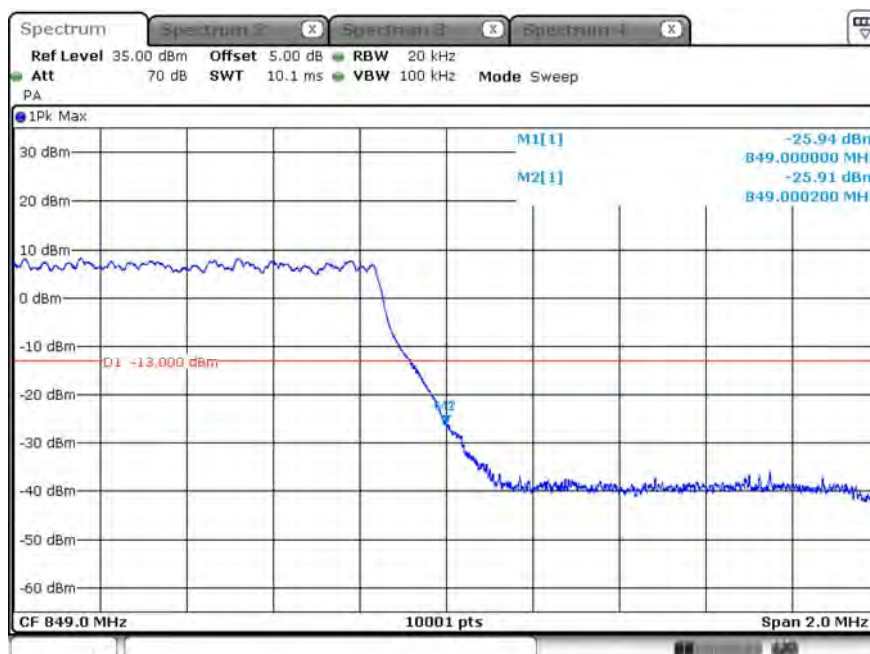


B5_CH20643_1.4M_QPSK_1RB5

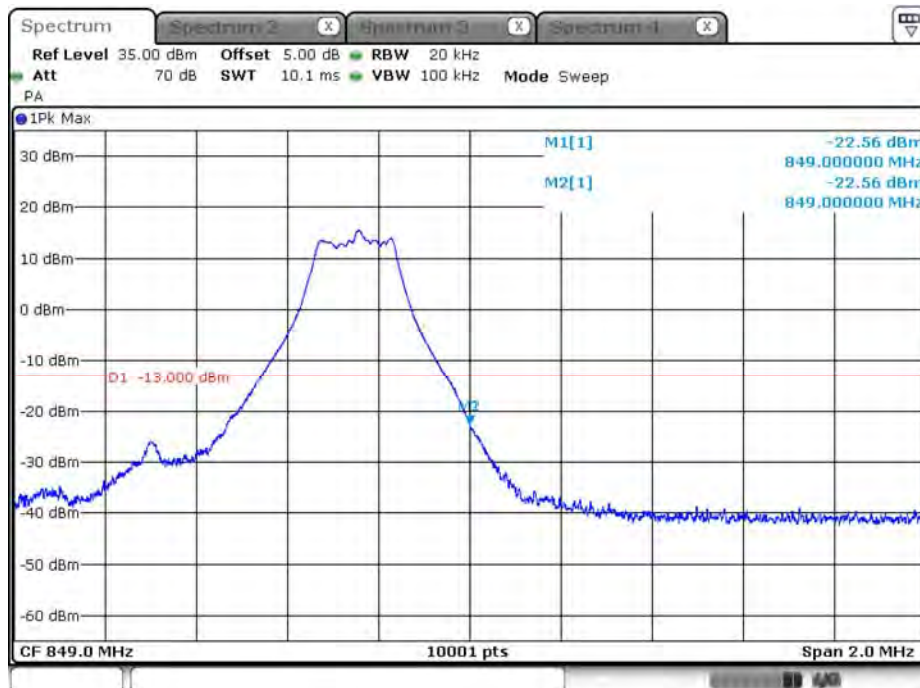


Date: 16 APR 2019 20:15:49

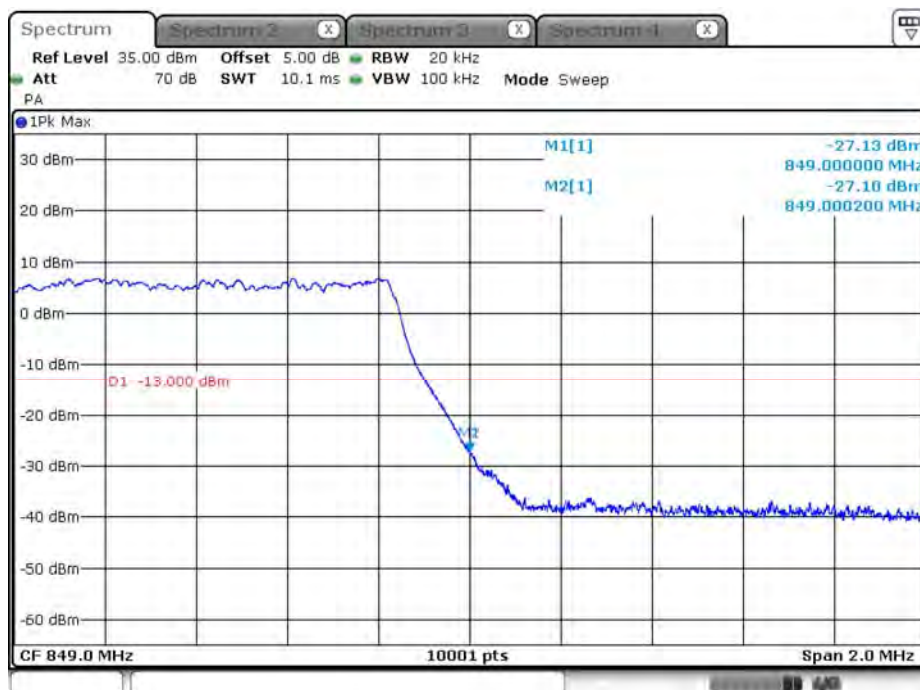
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Date: 16 APR 2019 20:46:13

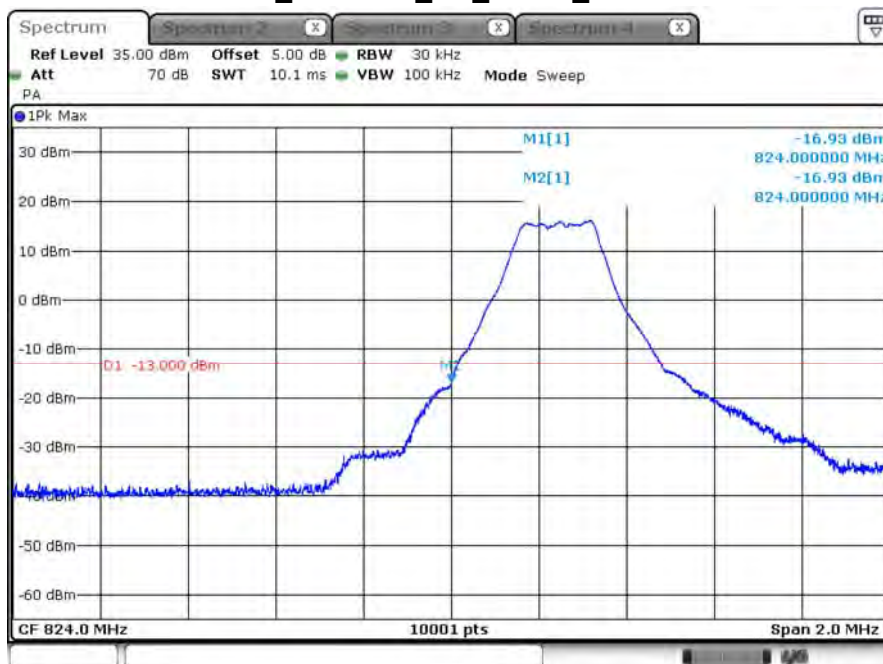
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Date: 16.APR.2019 20:18:45

B5_CH20643_1.4M_16-QAM_6RB0

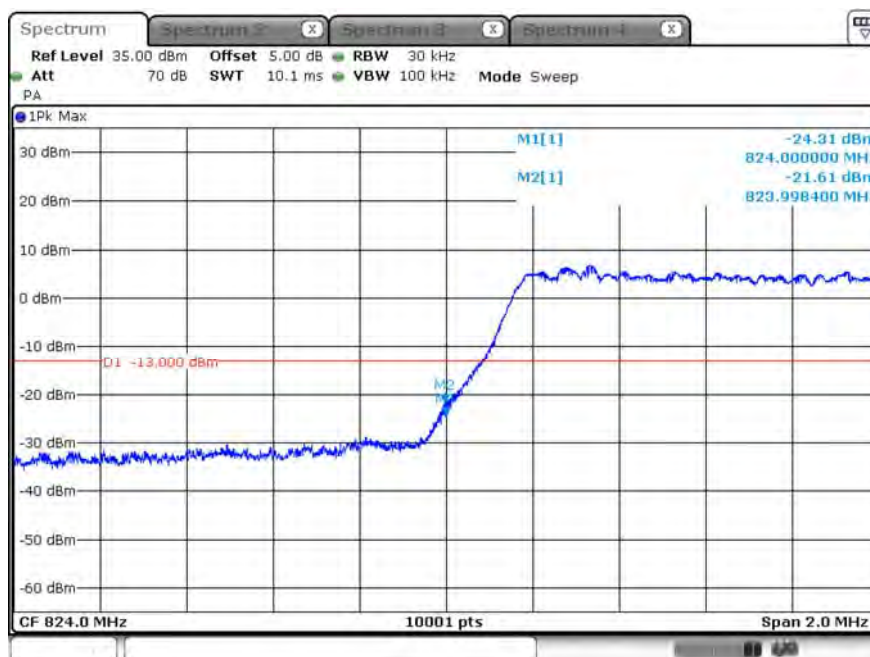
Date: 16.APR.2019 20:42:30

B5_CH20415_3M_QPSK_1RB0

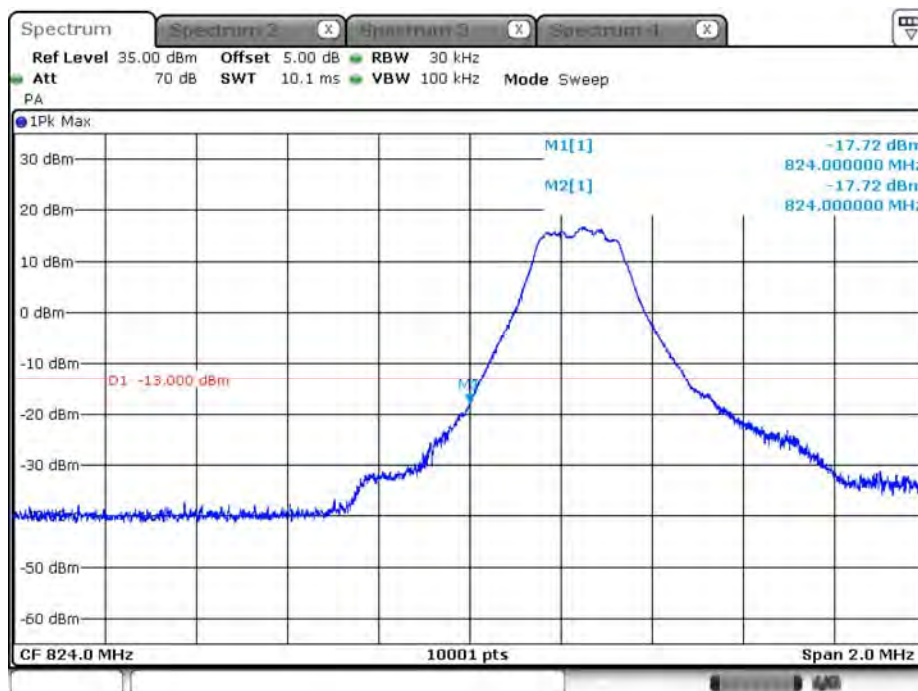


Date: 16 APR 2019 20:49:59

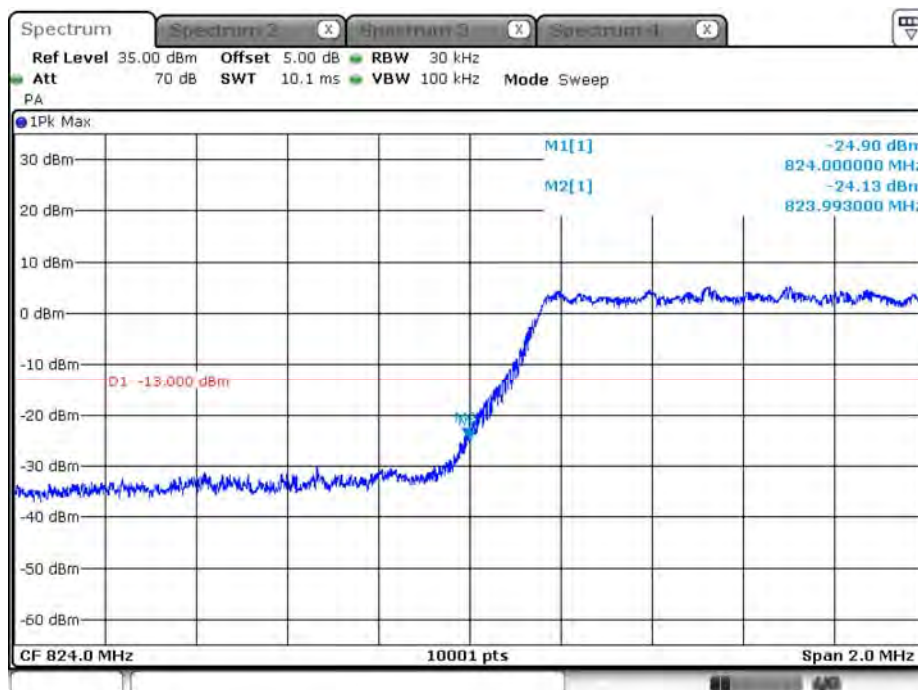
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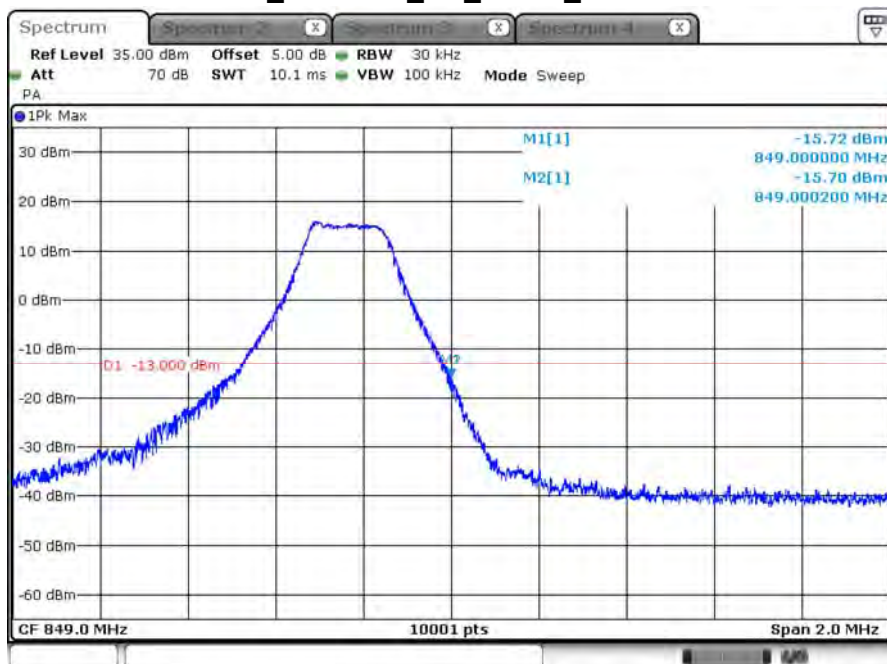
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B5_CH20415_3M_16-QAM_1RB0

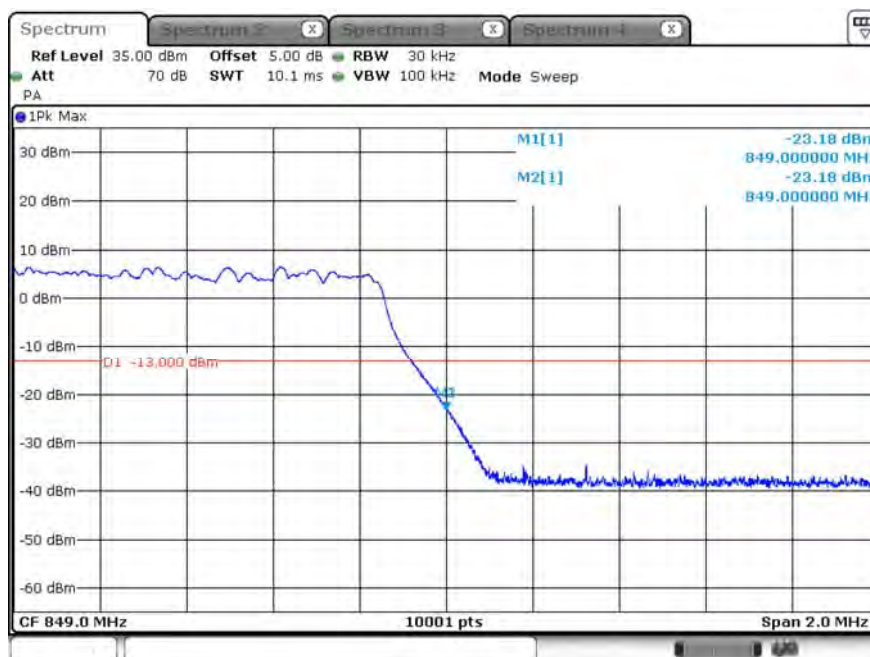
Date: 16 APR 2019 20:51:15

B5_CH20415_3M_16-QAM_15RB0

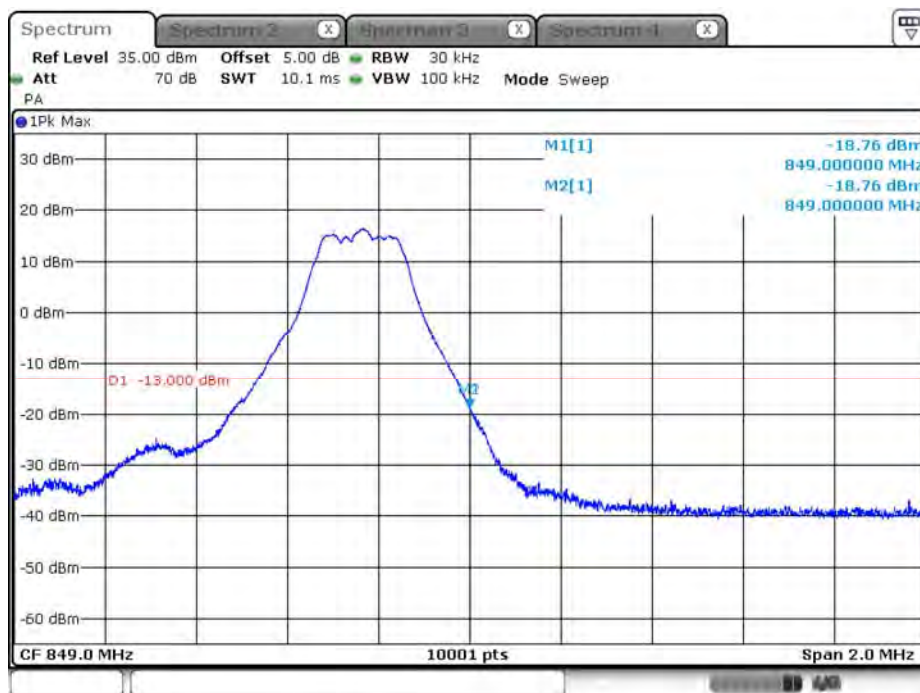
Date: 16 APR 2019 20:53:31

B5_CH20635_3M_QPSK_1RB14

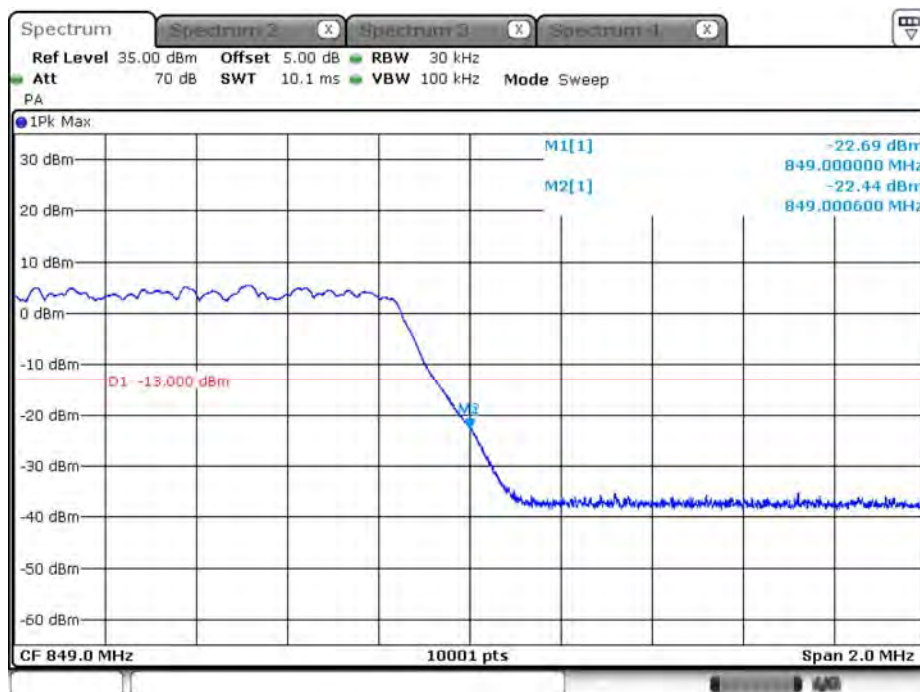
Date: 16 APR 2019 20:55:03

B5_CH20635_3M_QPSK_15RB0

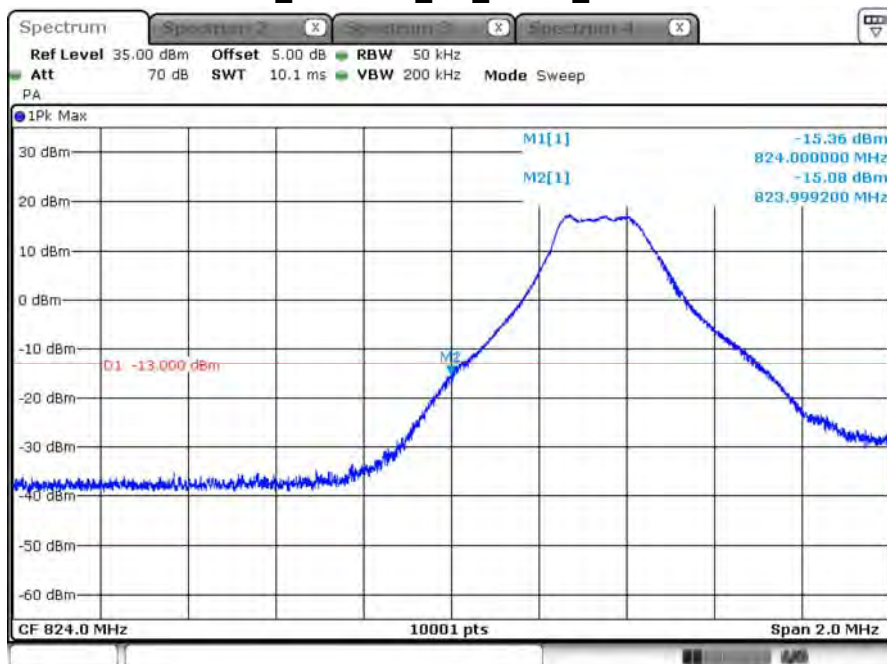
Date: 16 APR 2019 21:14:44

B5_CH20635_3M_16-QAM_1RB14

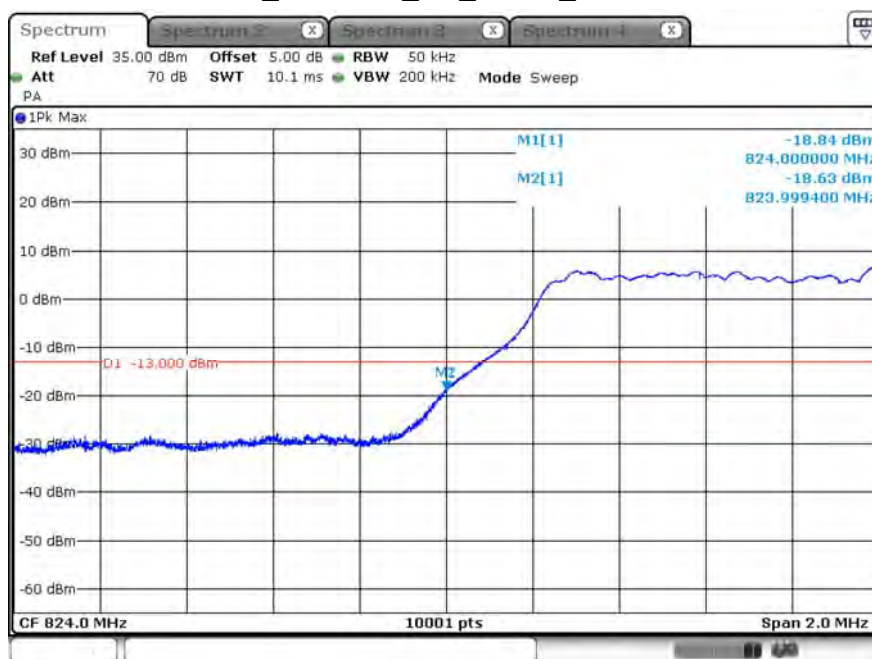
Date: 16 APR 2019 20:58:09

B5_CH20635_3M_16-QAM_15RB0

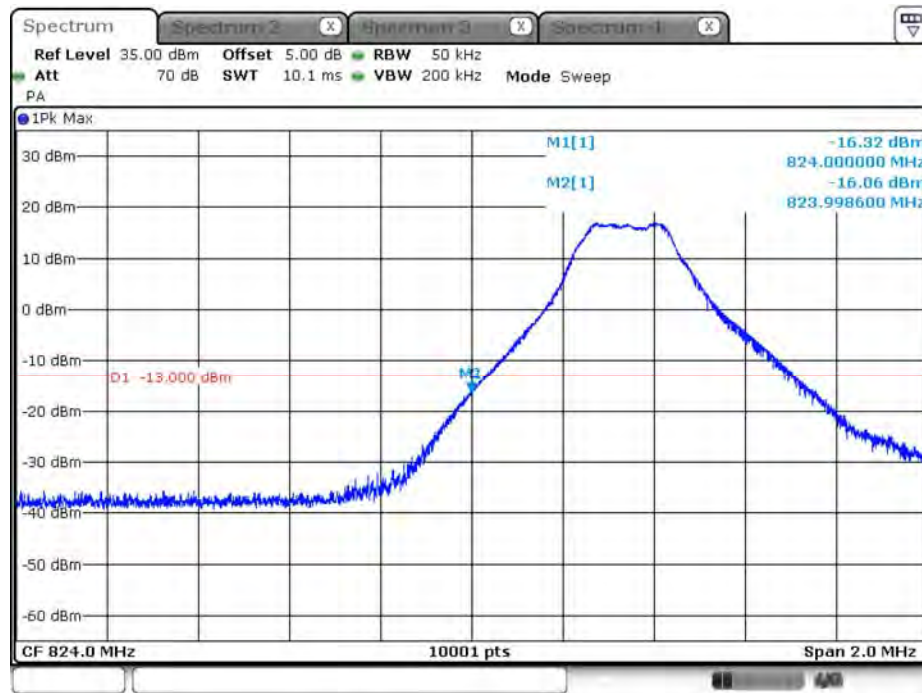
Date: 16 APR 2019 21:07:55

B5_CH20425_5M_QPSK_1RB0

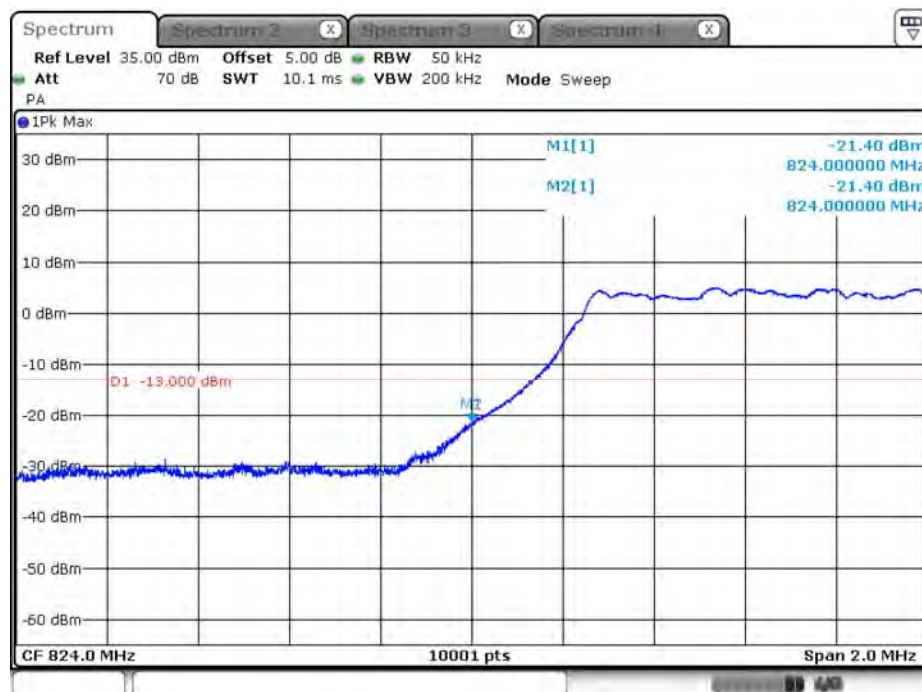
Date: 17.APR.2019 19:48:41

B5_CH20425_5M_QPSK_25RB0

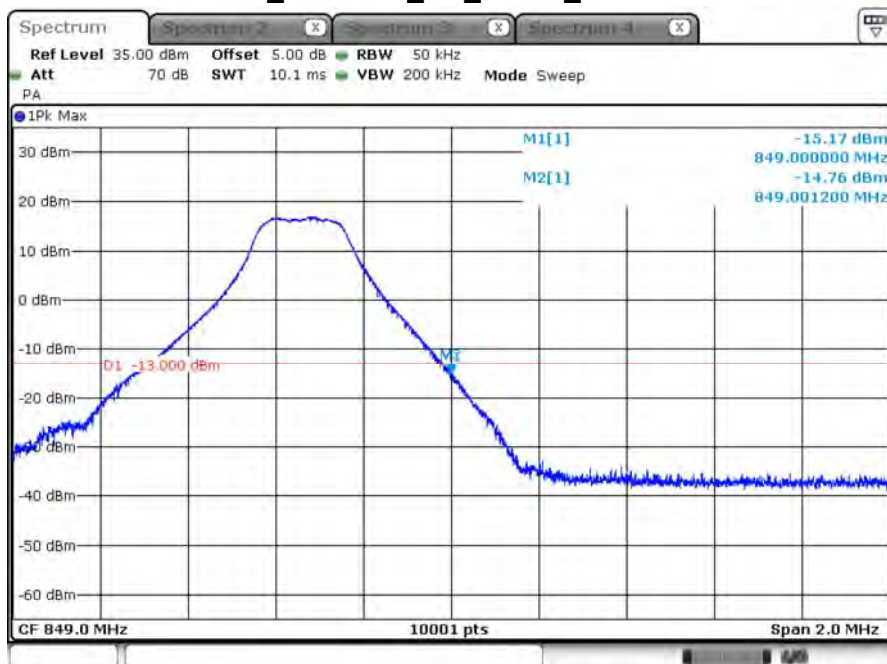
Date: 17.APR.2019 19:54:00

B5_CH20425_5M_16-QAM_1RB0

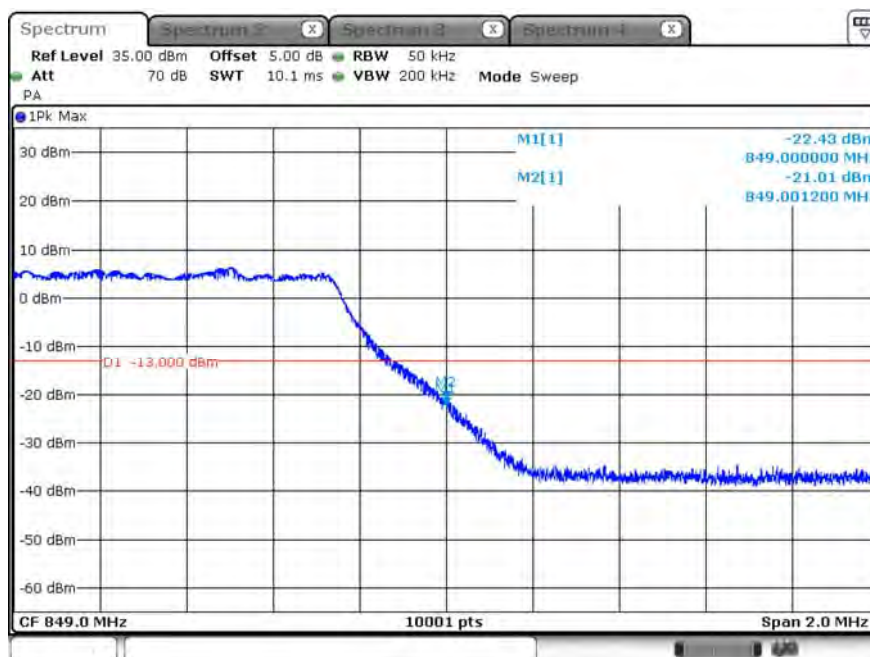
Date: 17.APR.2019 19:47:35

B5_CH20425_5M_16-QAM_25RB0

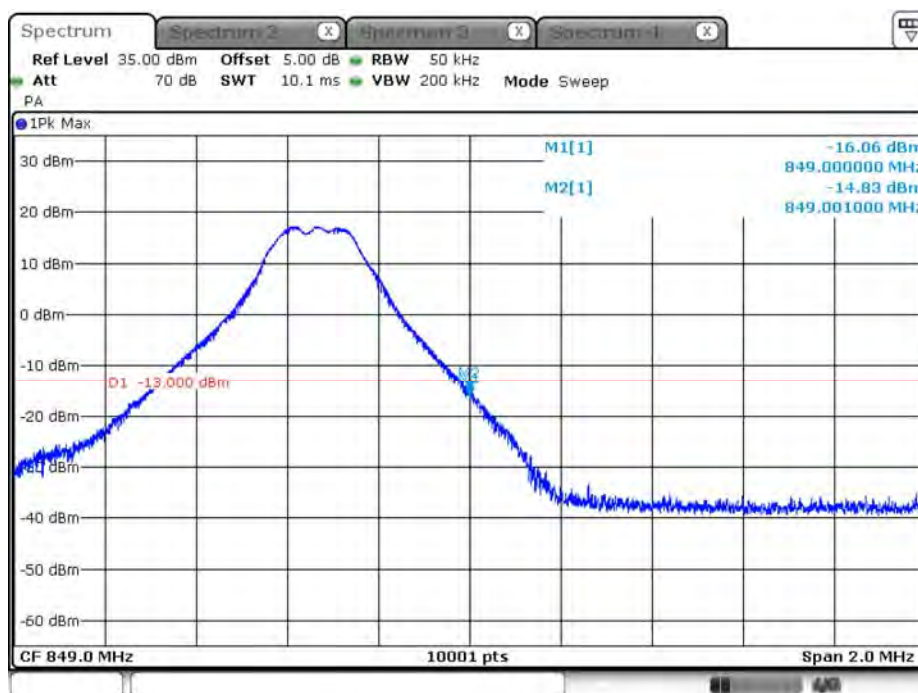
Date: 17.APR.2019 19:51:23

B5_CH20625_5M_QPSK_1RB24

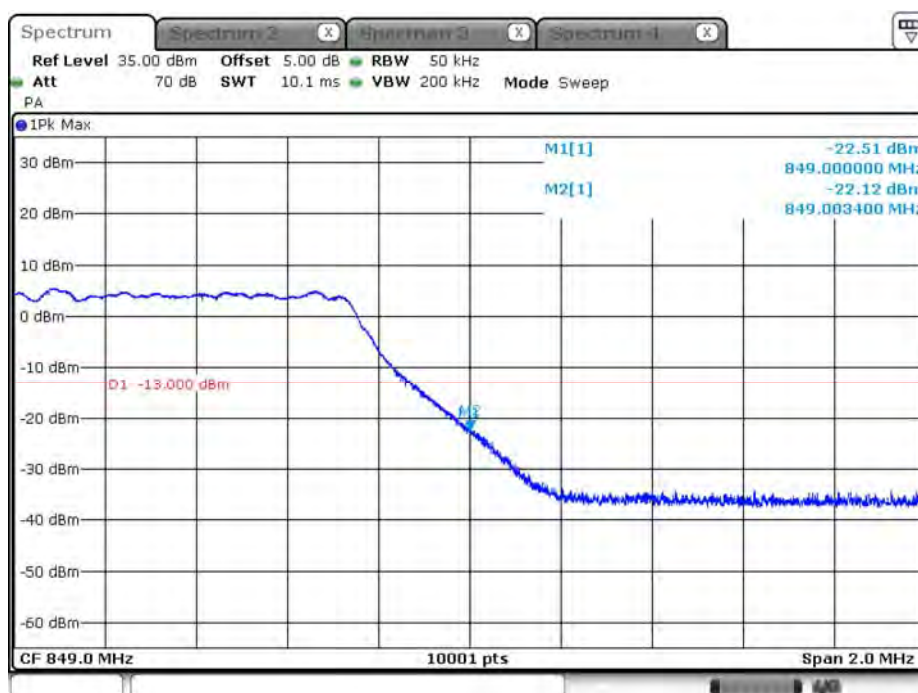
Date: 17 APR 2019 19:55:50

B5_CH20625_5M_QPSK_25RB0

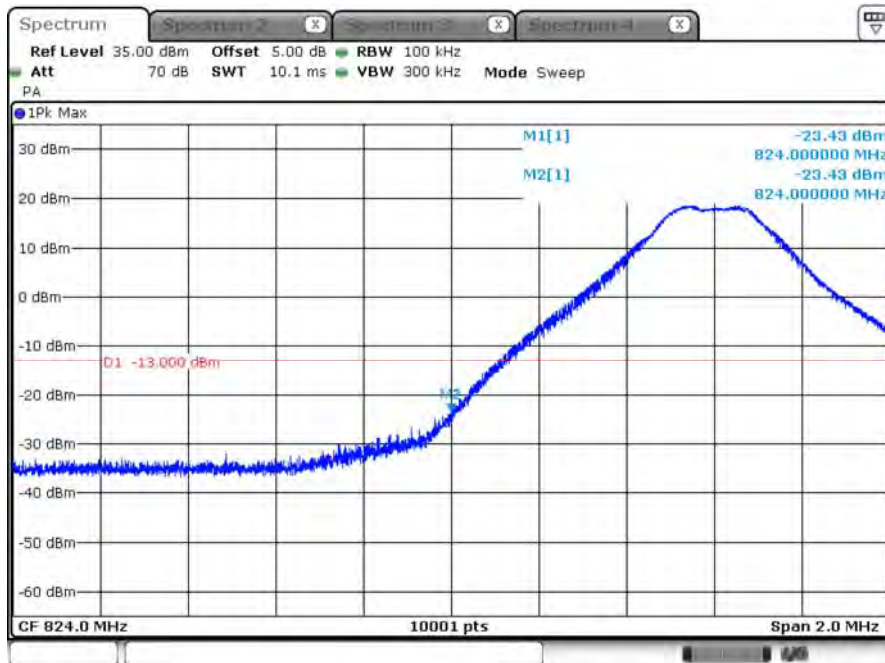
Date: 17 APR 2019 20:24:10

B5_CH20625_5M_16-QAM_1RB24

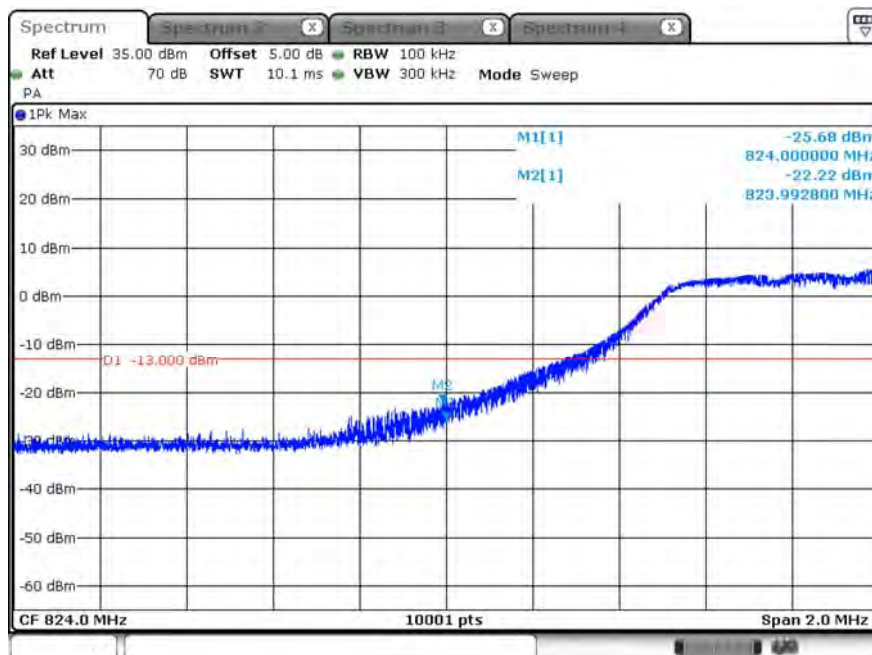
Date: 17.APR.2019 19:56:31

B5_CH20625_5M_16-QAM_25RB0

Date: 17.APR.2019 20:26:40

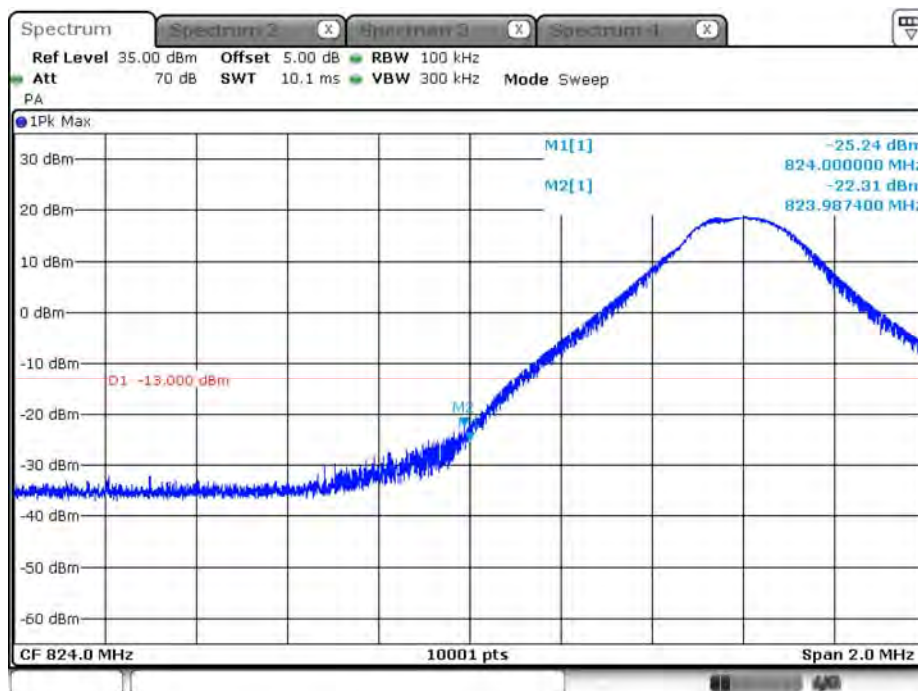
B5_CH20450_10M_QPSK_1RB0

Date: 17.APR.2019 20:14:23

B5_CH20450_10M_QPSK_50RB0

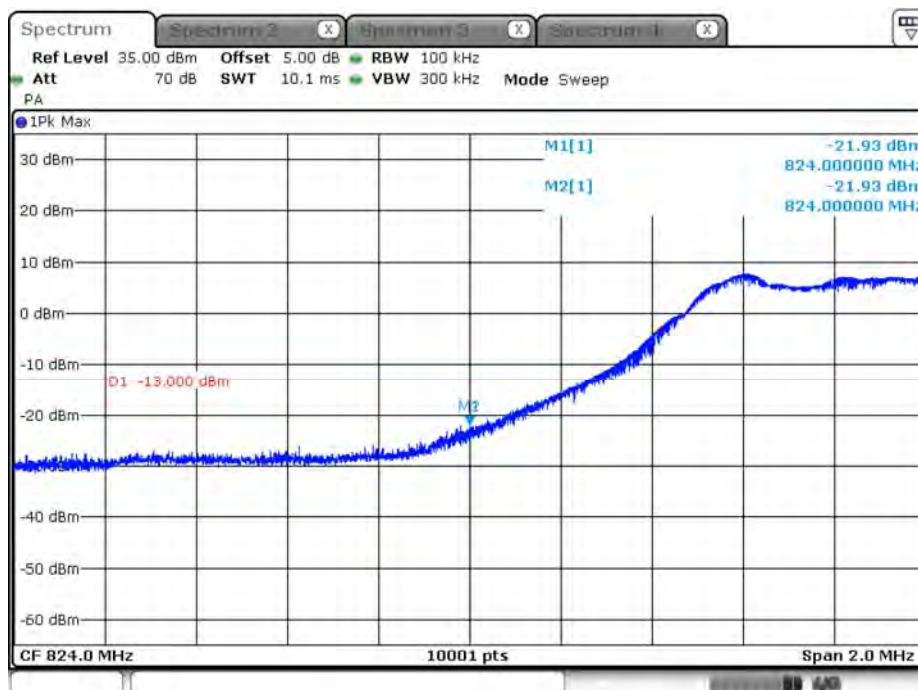
Date: 17.APR.2019 20:13:48

B5_CH20450_10M_16-QAM_1RB0

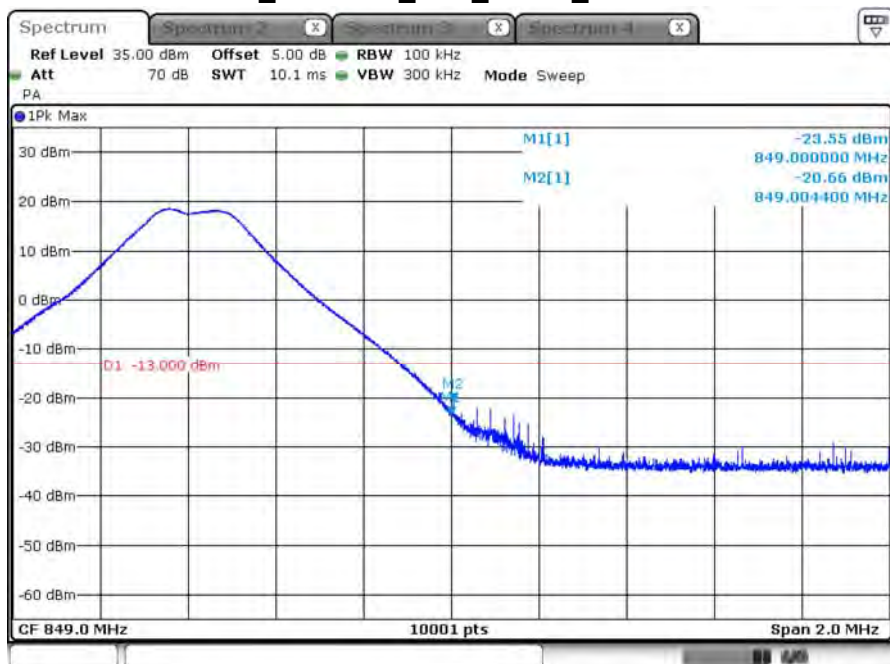


Date: 17.APR.2019 20:14:56

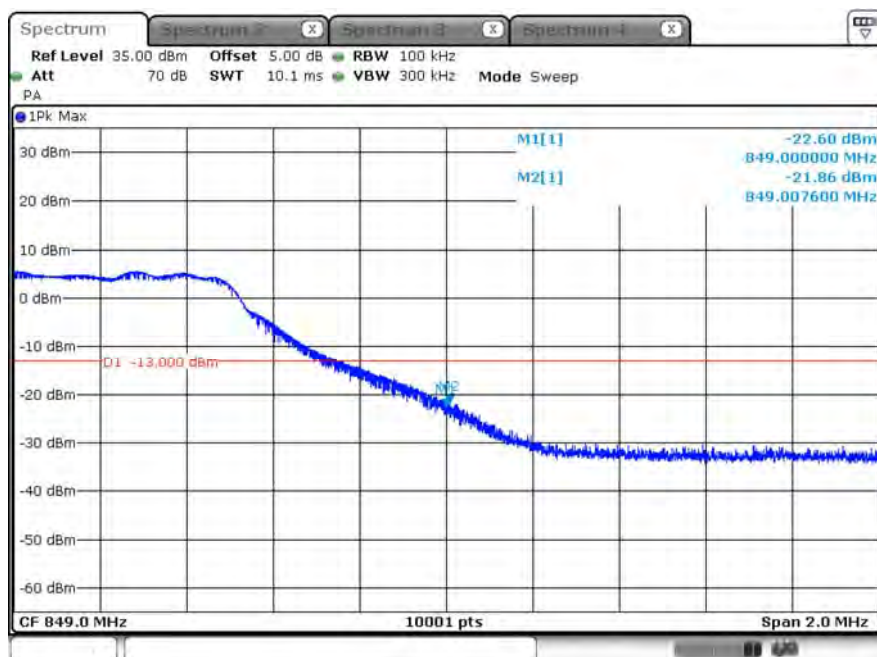
B5_CH20450_10M_16-QAM_27RB0



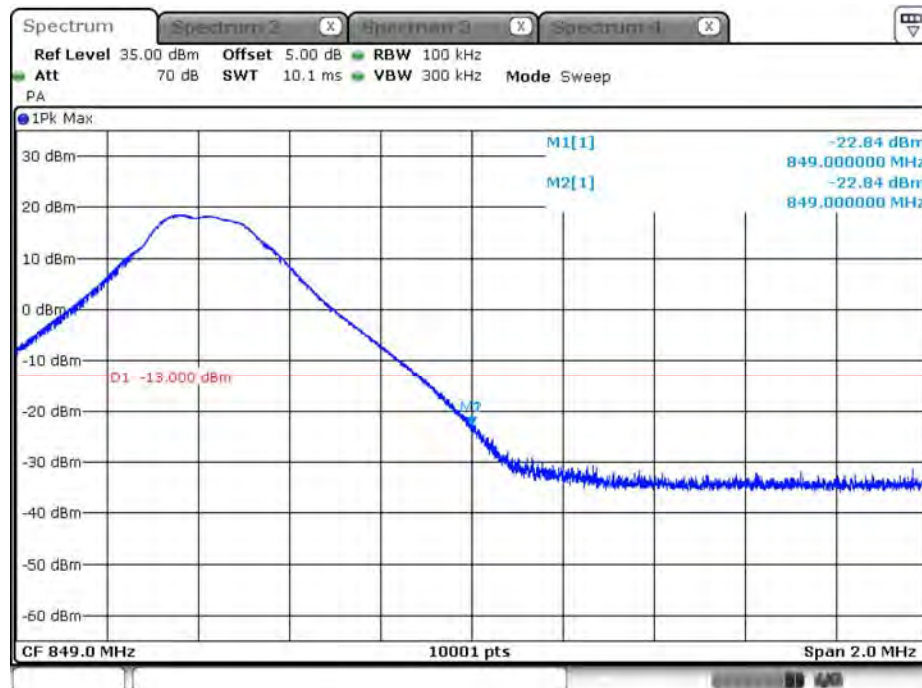
Date: 17.APR.2019 20:12:19

B5_CH20600_10M_QPSK_1RB49

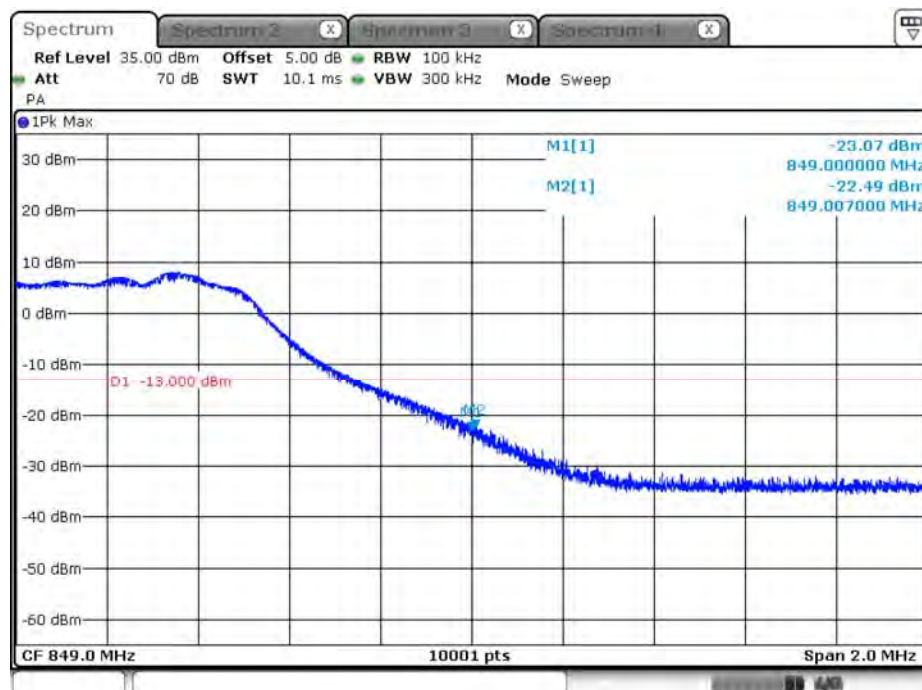
Date: 17 APR 2019 20:18:43

B5_CH20600_10M_QPSK_50RB0

Date: 17 APR 2019 20:22:07

B5_CH20600_10M_16-QAM_1RB49

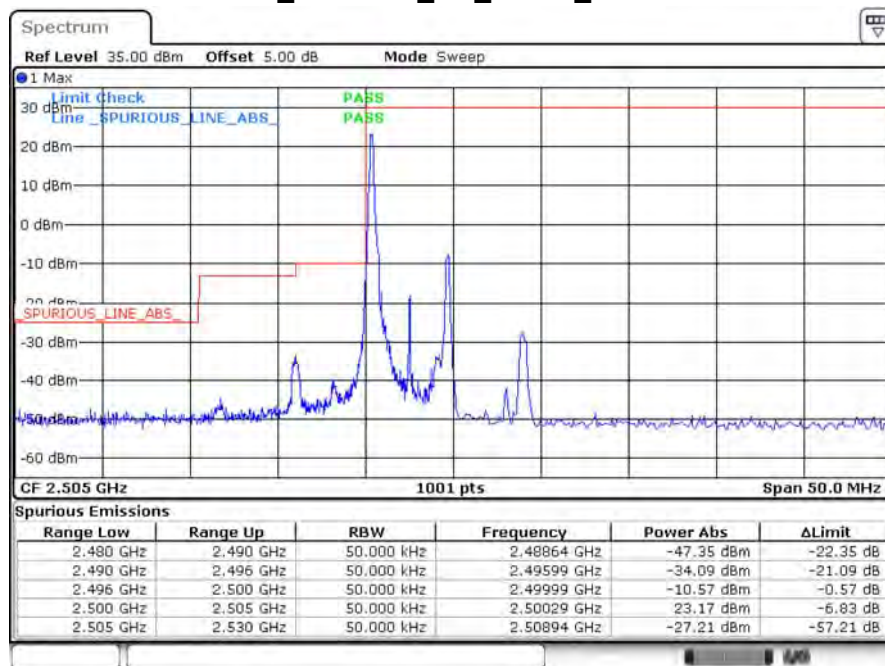
Date: 17.APR.2019 20:20:02

B5_CH20600_10M_16-QAM_27RB23

Date: 17.APR.2019 20:20:55

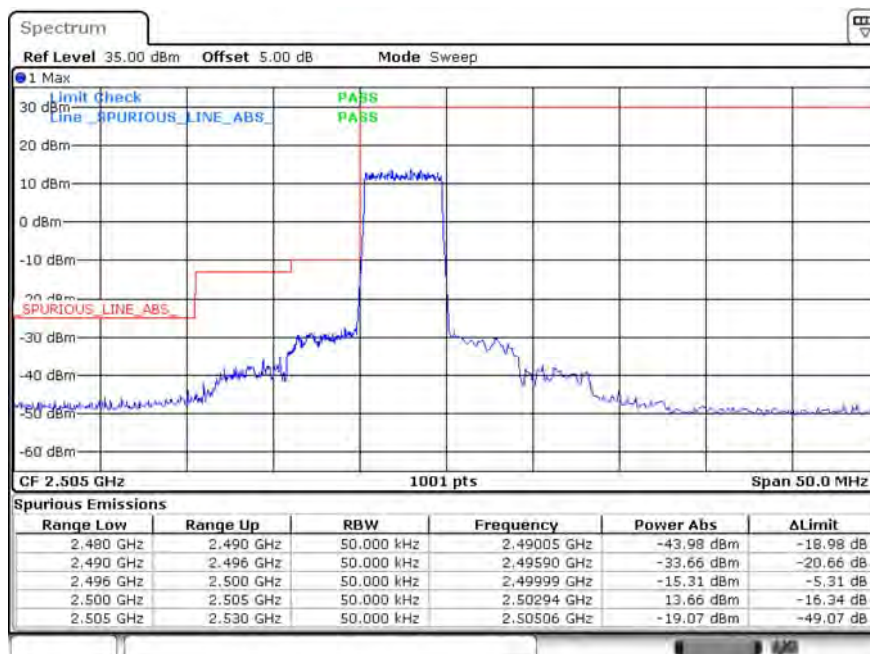
Product	Module		
Test Item	Spurious Emissions at Antenna Terminals		
Test Mode	Mode 4: LTE Band 7		
Date of Test	2019/06/05	Test Site	SR10-H

B7_CH20775_5M_QPSK_1RB0



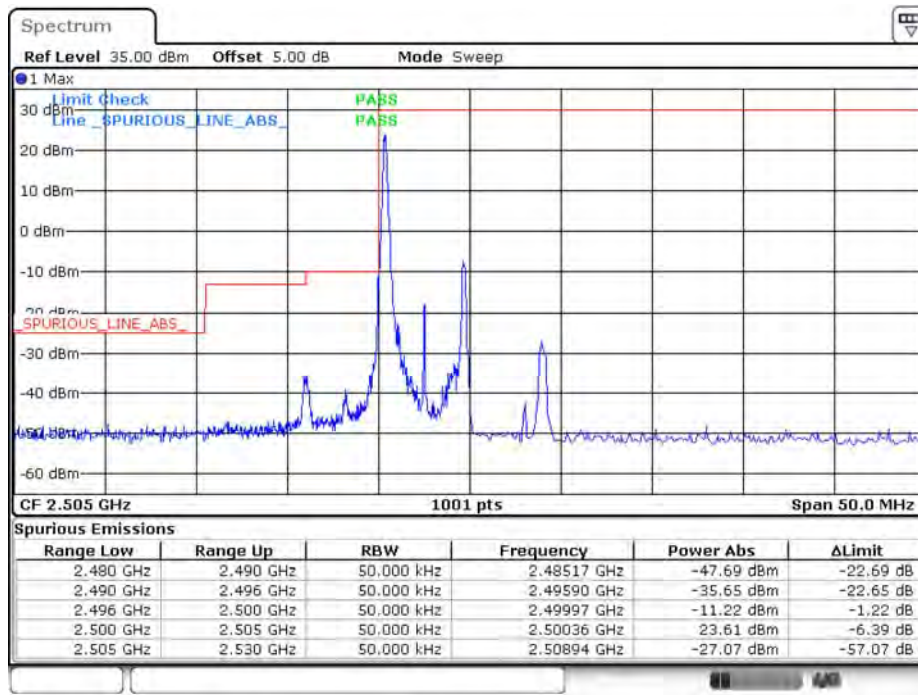
Date: 5 JUN 2019 11:40:11

B7_CH20775_5M_QPSK_25RB0



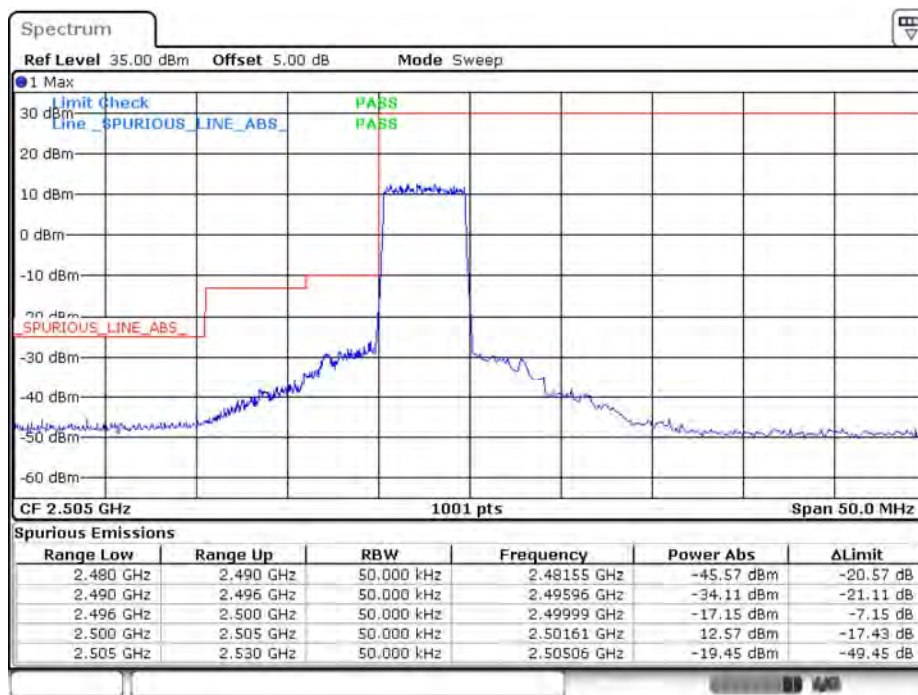
Date: 5 JUN 2019 11:49:57

B7_CH20775_5M_16-QAM_1RB0



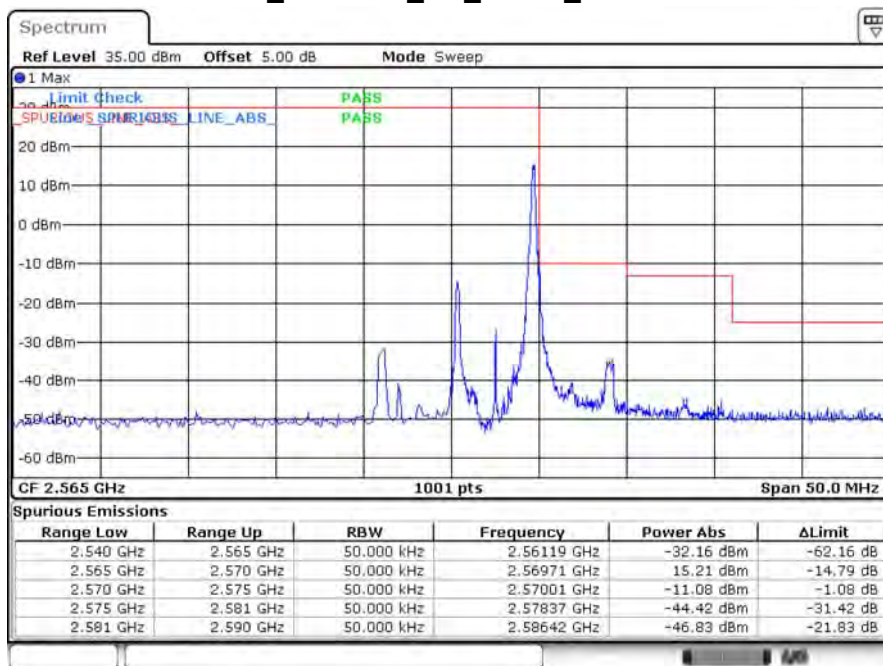
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B7_CH20775_5M_16-QAM_25RB0



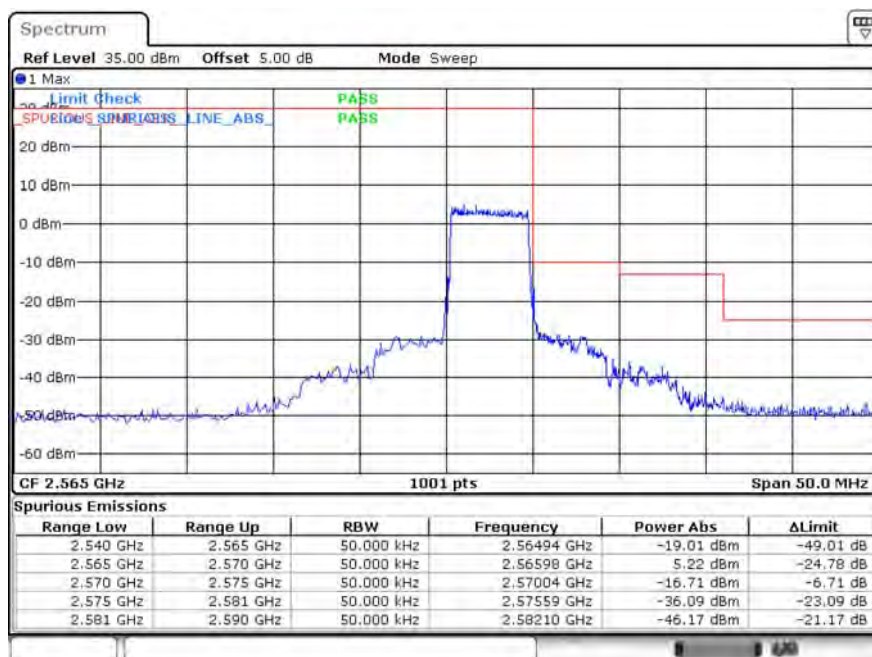
Date: 5 JUN.2019 11:45:54

B7_CH21425_5M_QPSK_1RB24



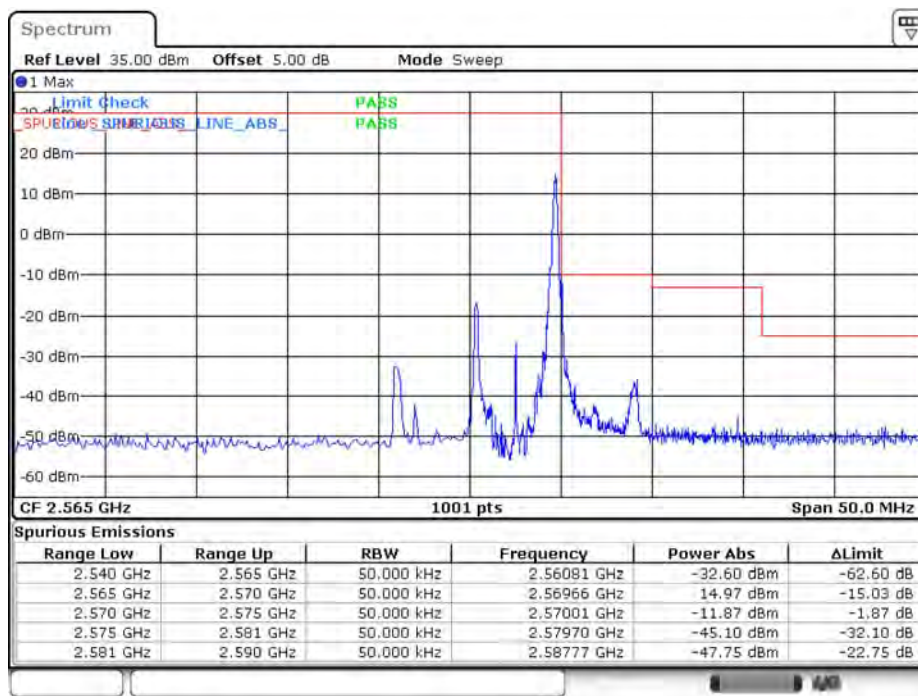
Date: 5 JUN 2019 11:36:18

B7_CH21425_5M_QPSK_25RB0



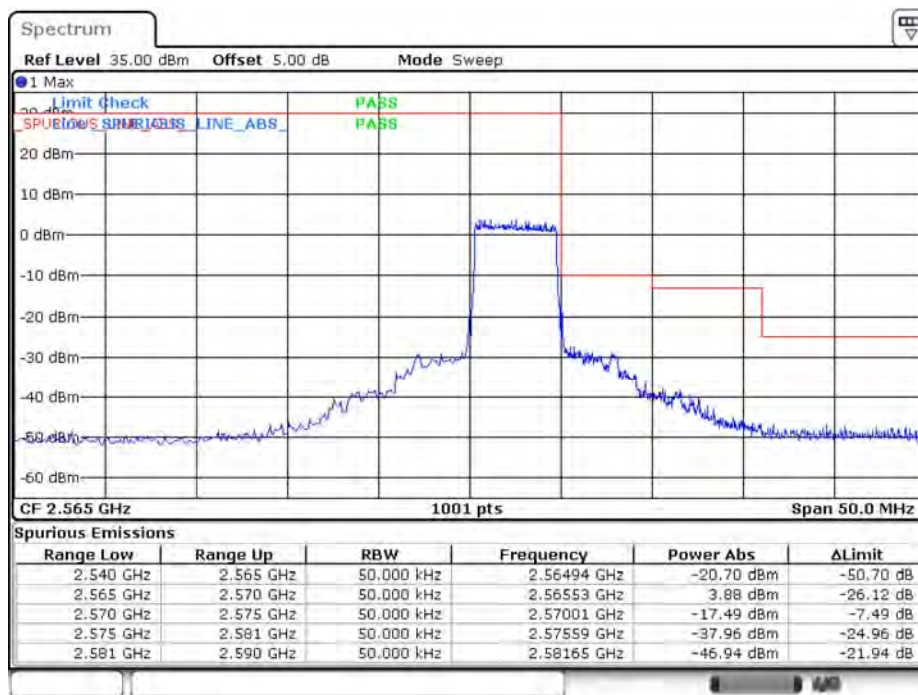
Date: 5 JUN 2019 11:34:59

B7_CH21425_5M_16-QAM_1RB24



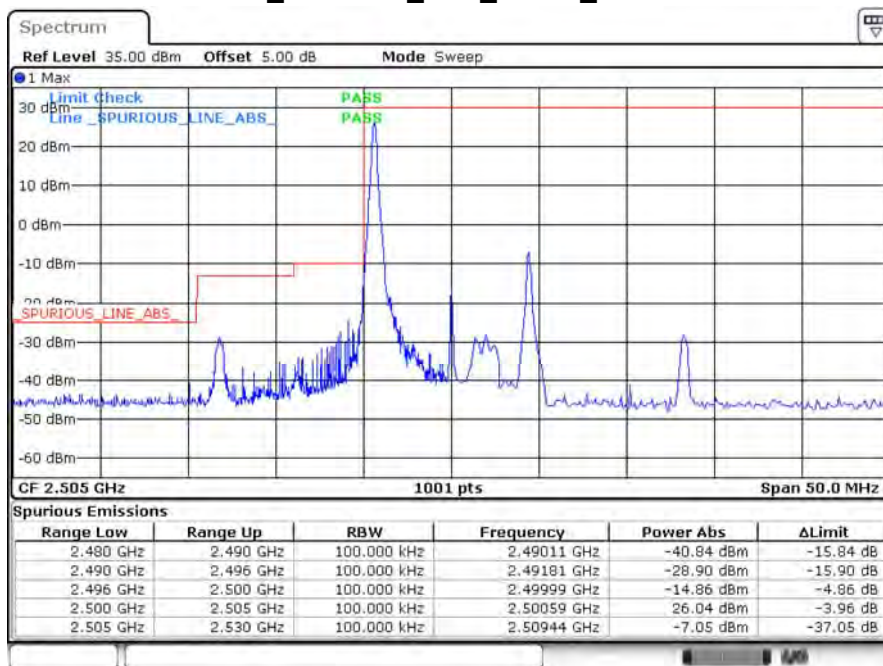
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B7_CH21425_5M_16-QAM_25RB0



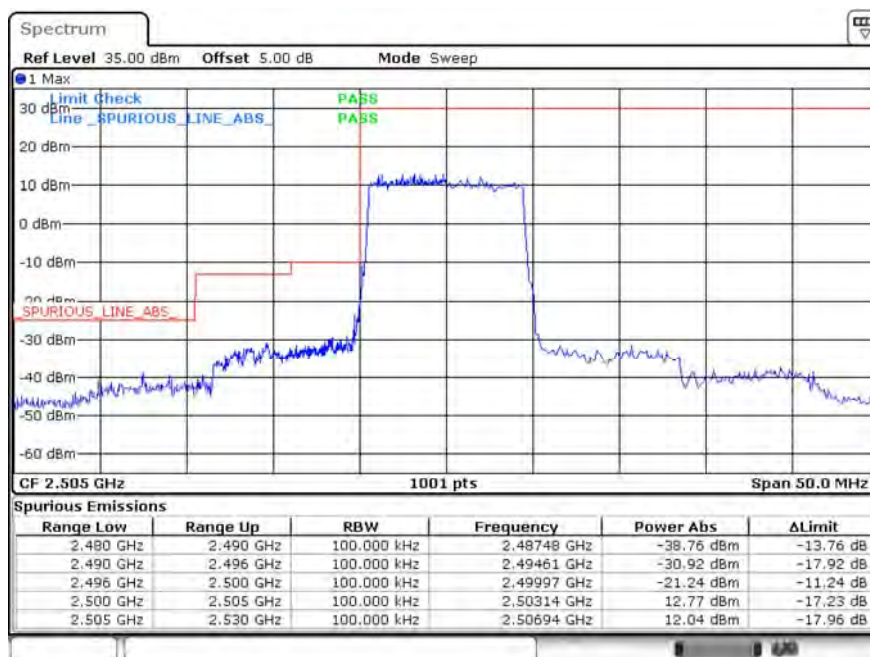
Date: 5 JUN.2019 11:38:05

B7_CH20800_10M_QPSK_1RB0



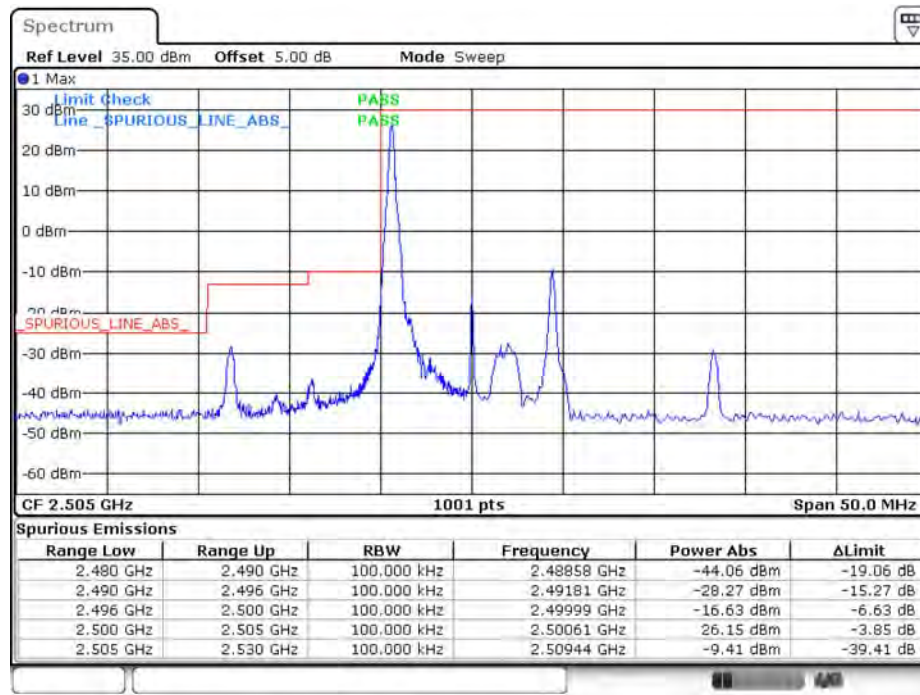
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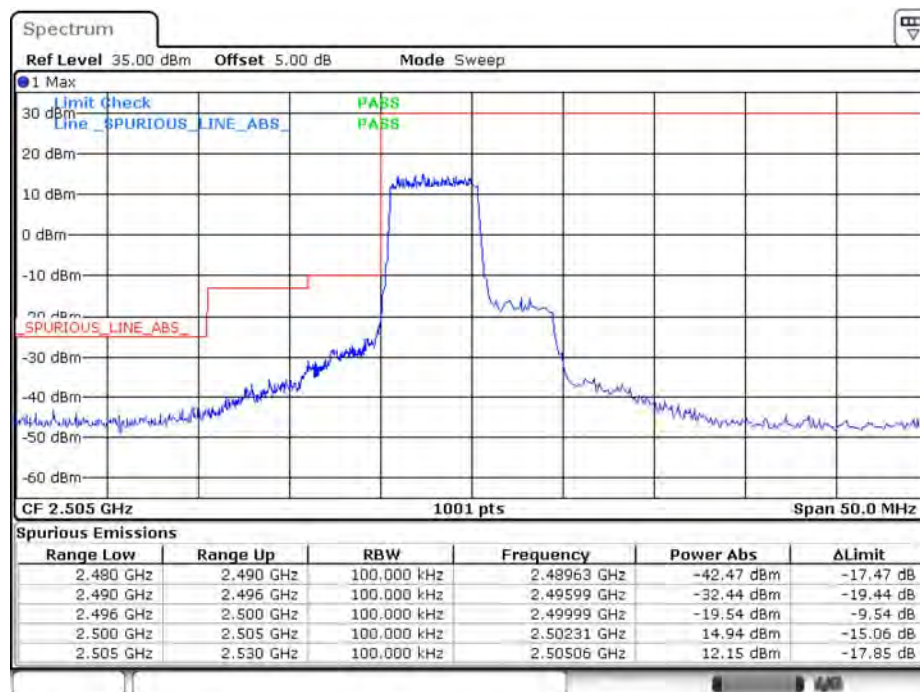
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B7_CH20800_10M_16-QAM_1RB0



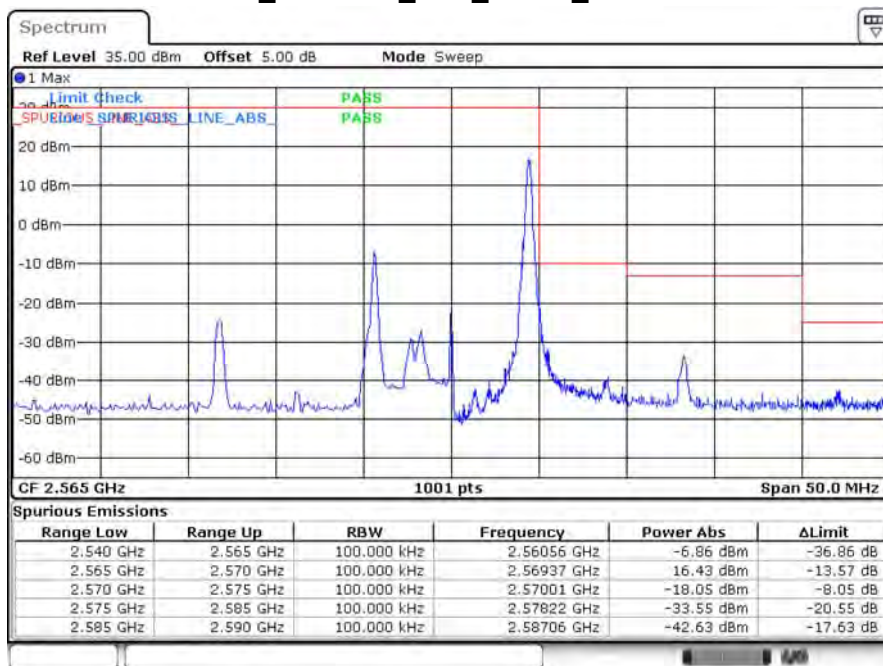
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B7_CH20800_10M_16-QAM_27RB0



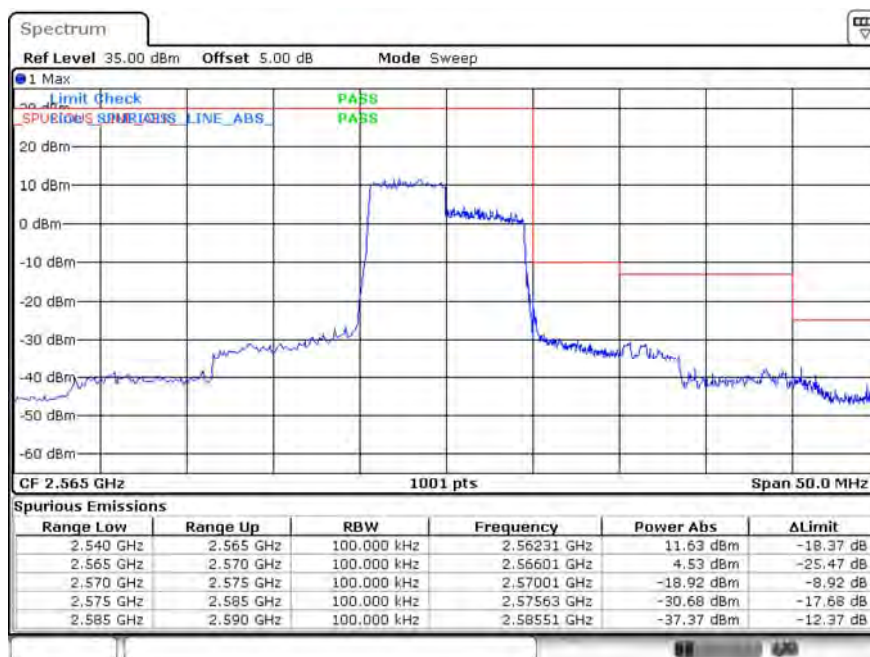
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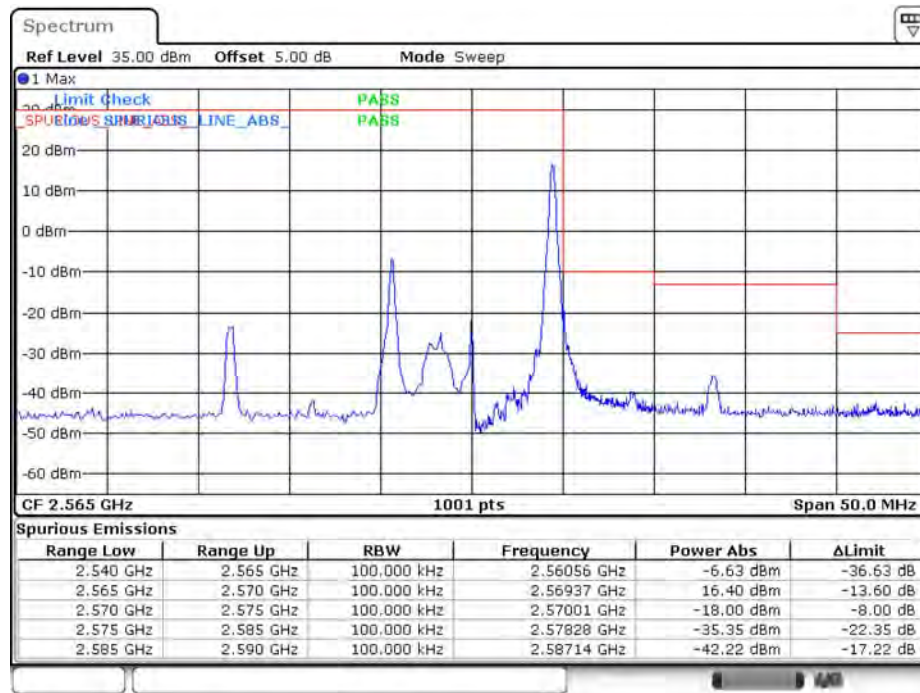
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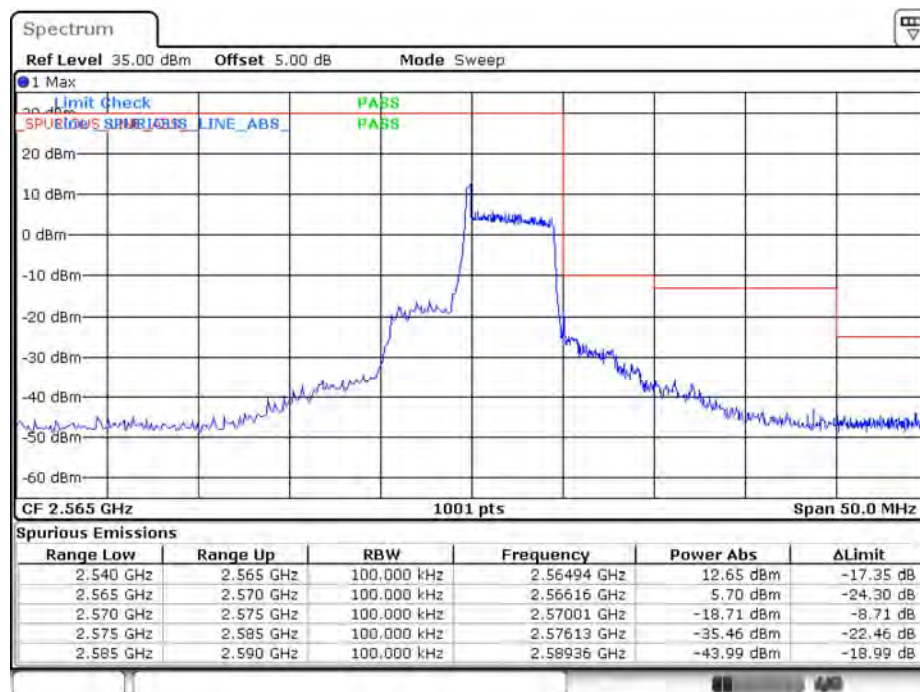
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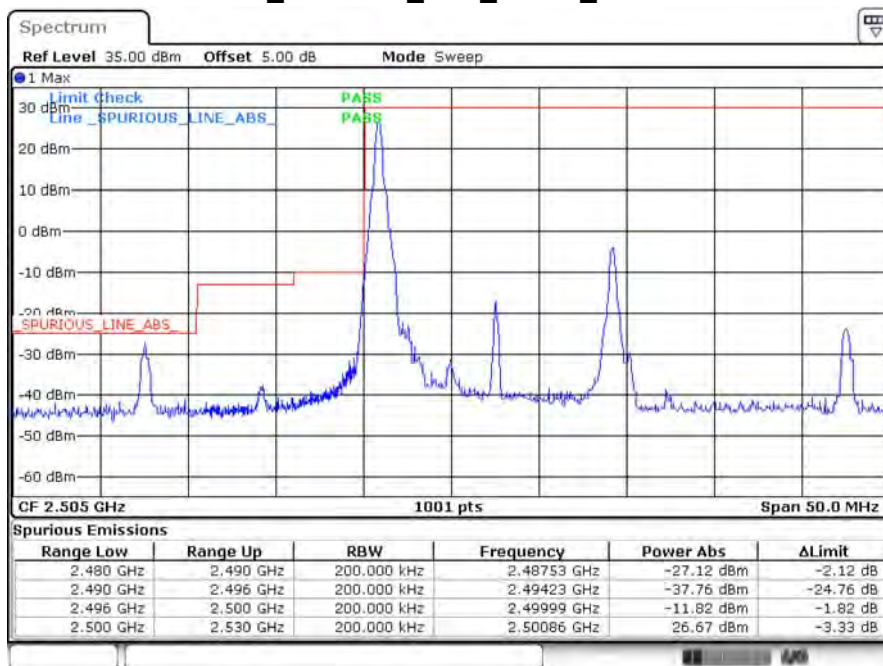
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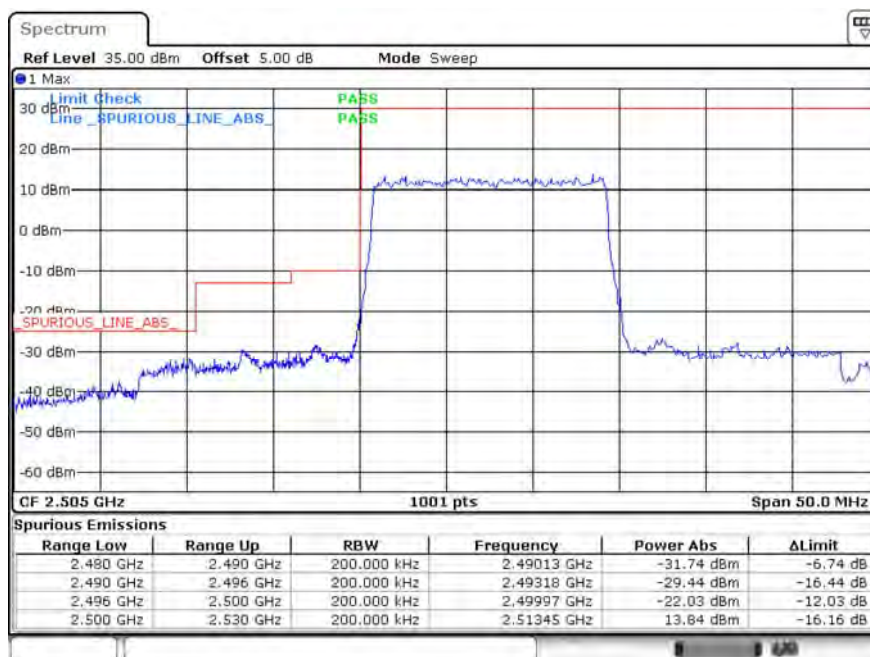
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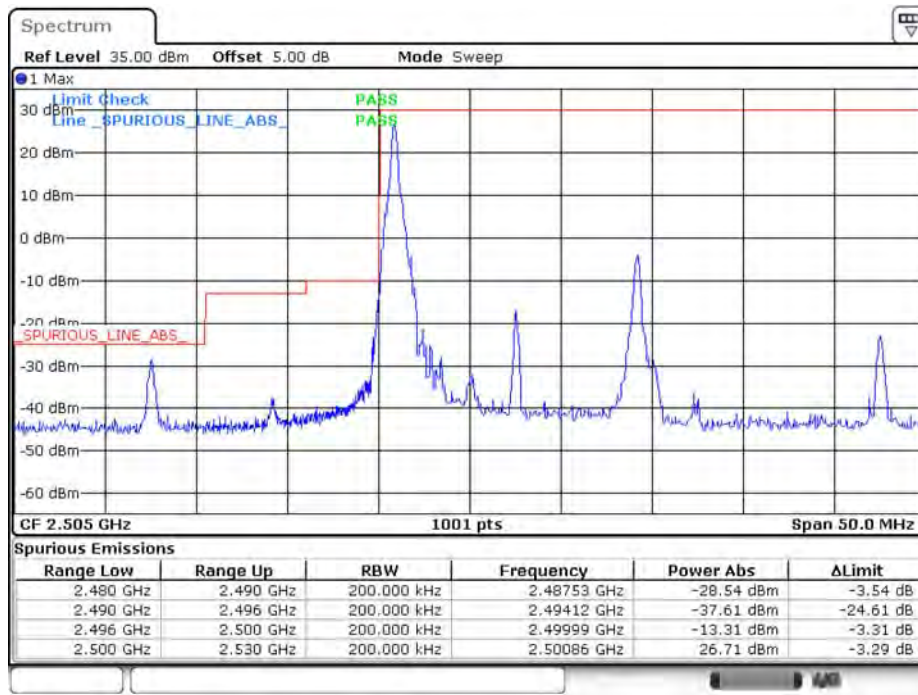
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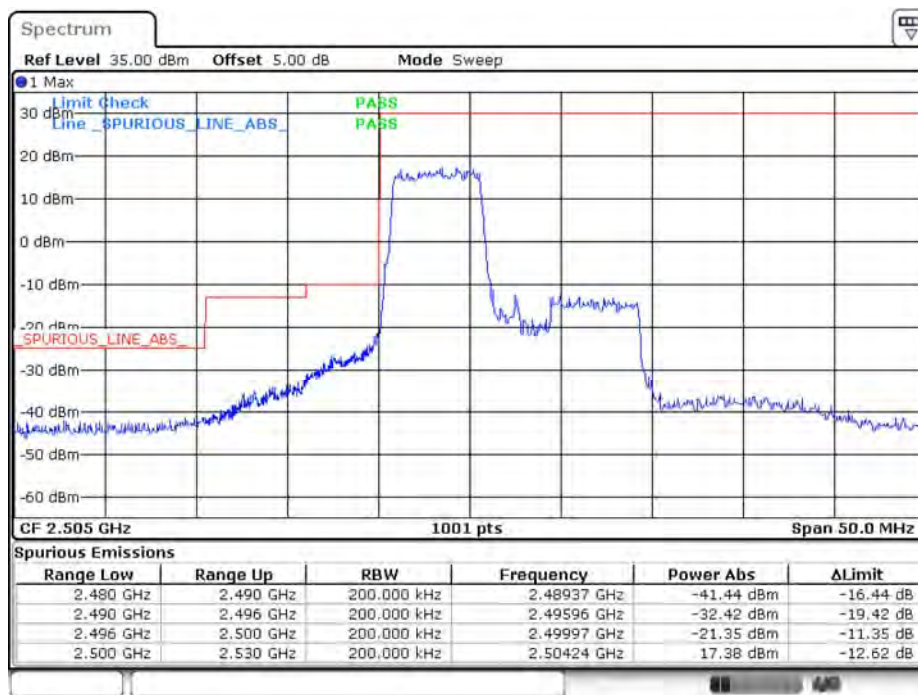
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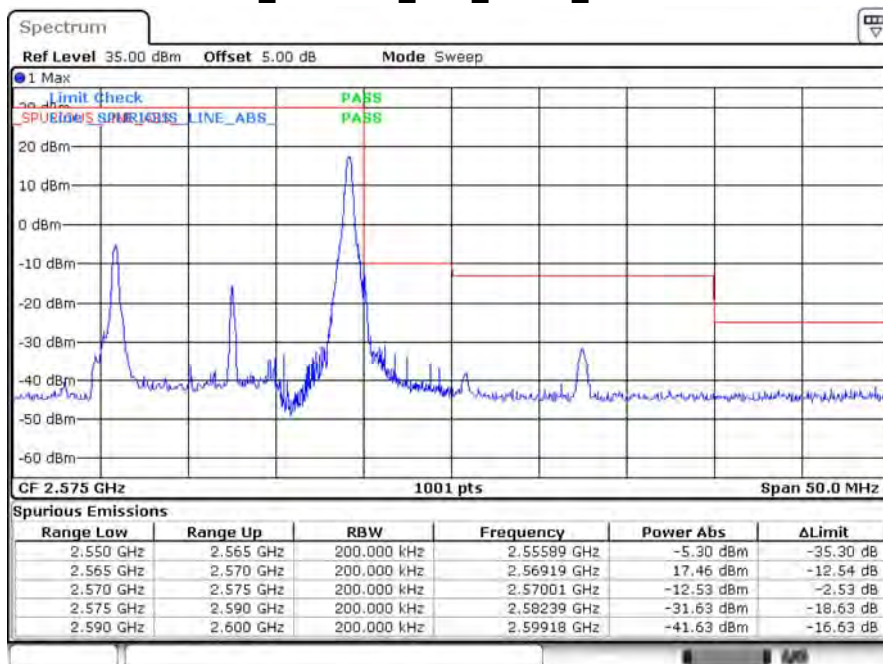
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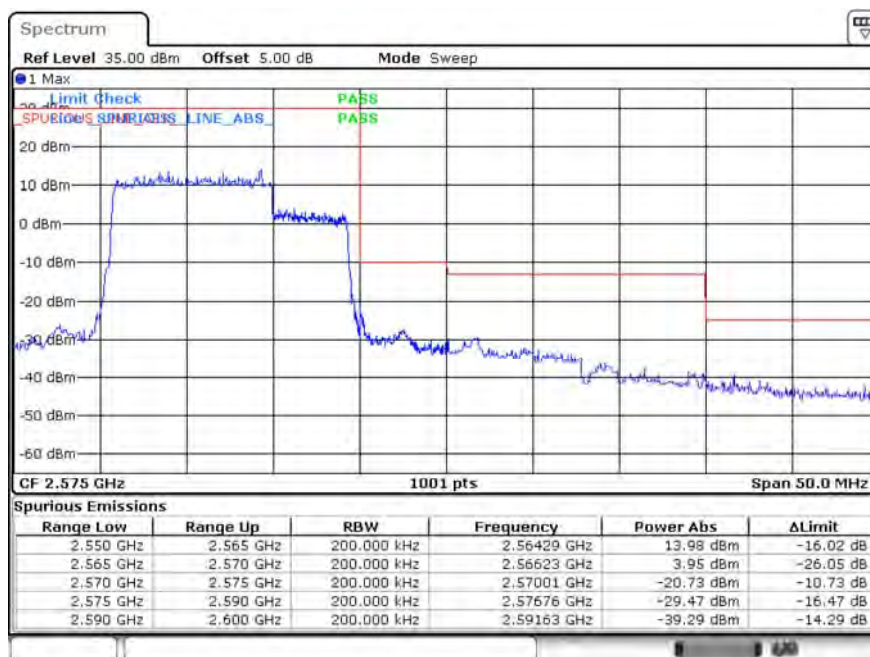
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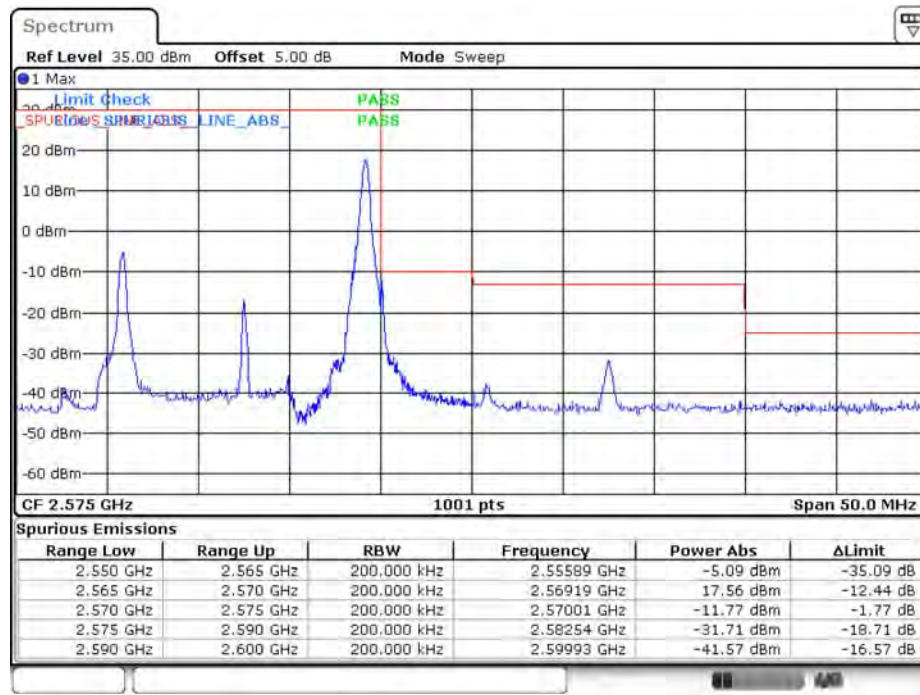
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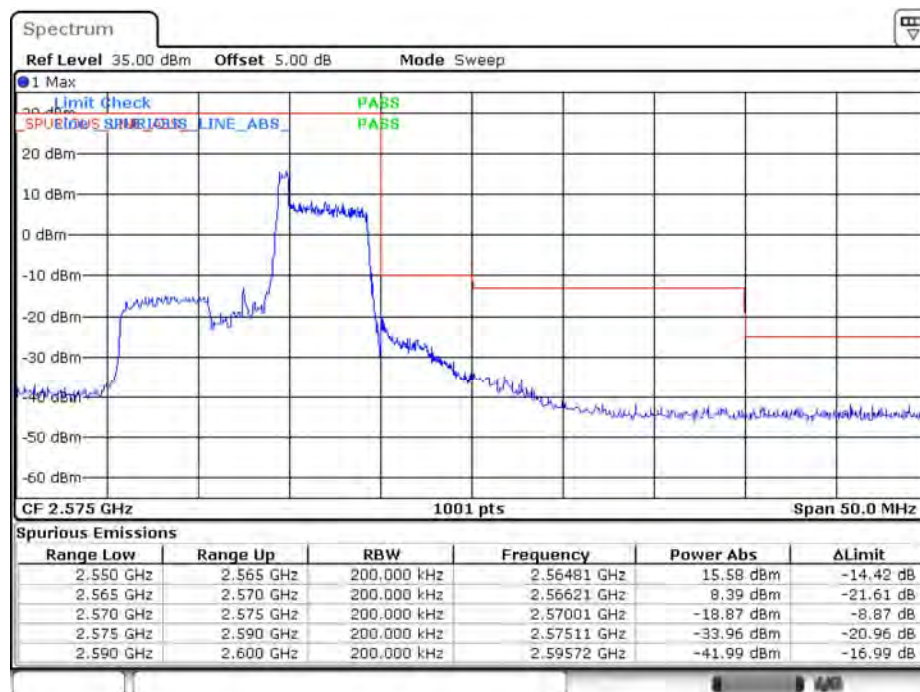
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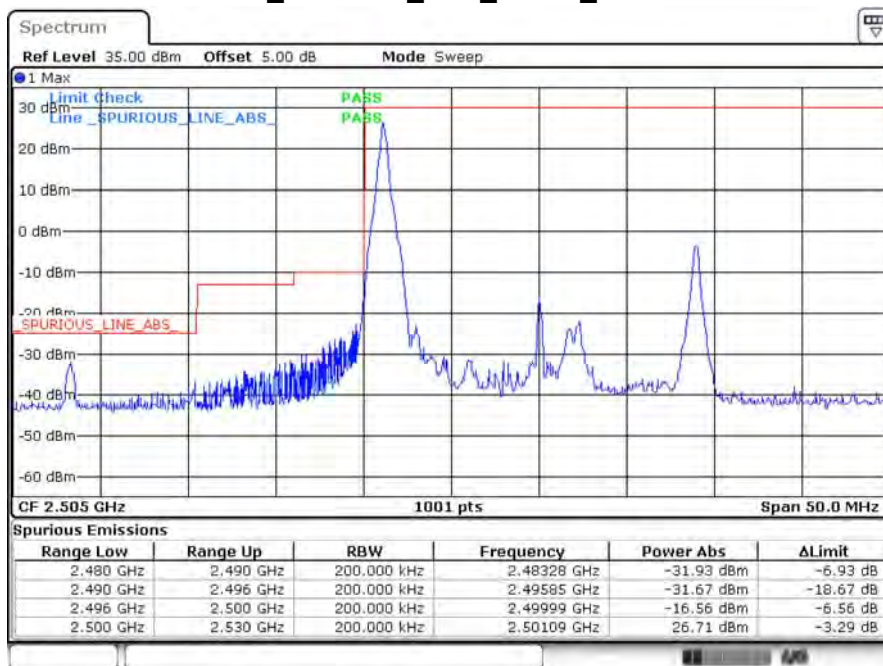
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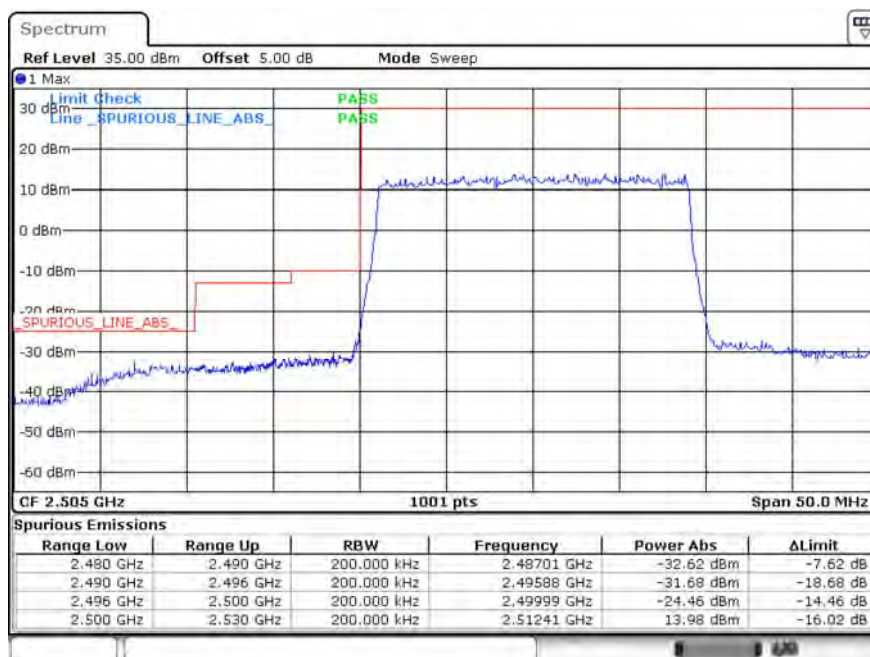
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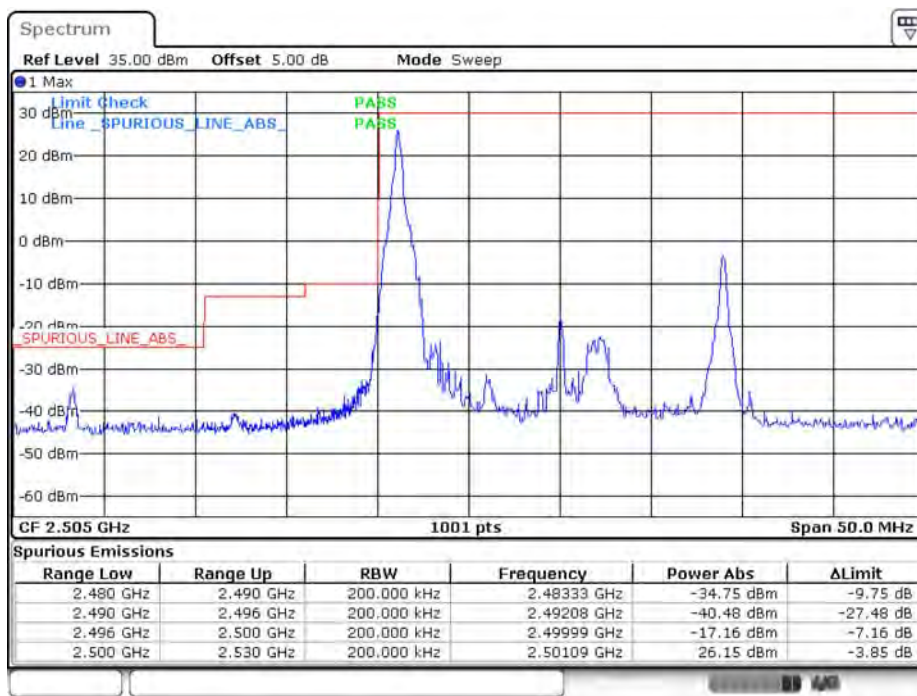
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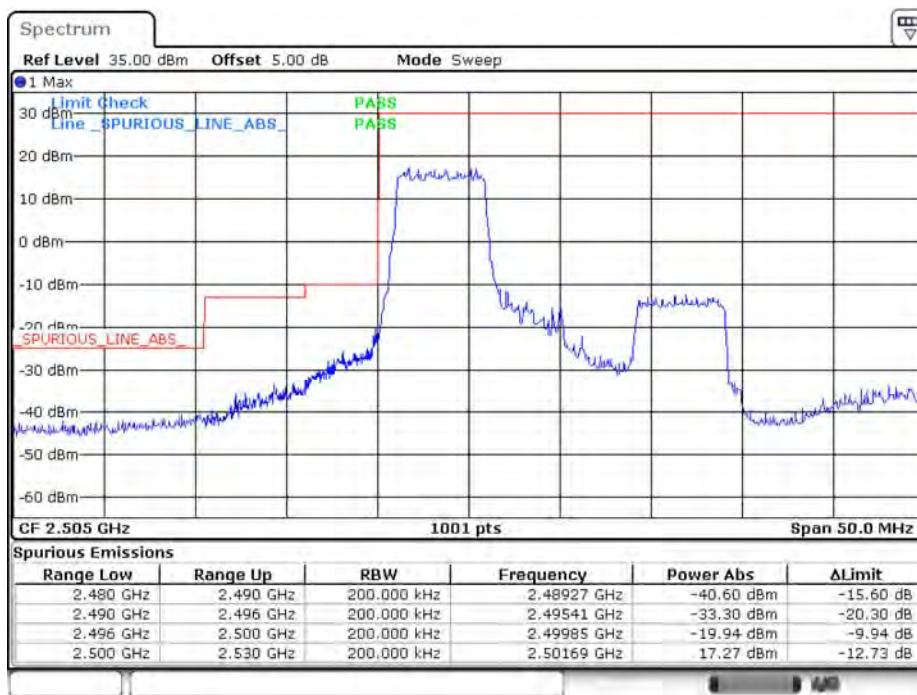
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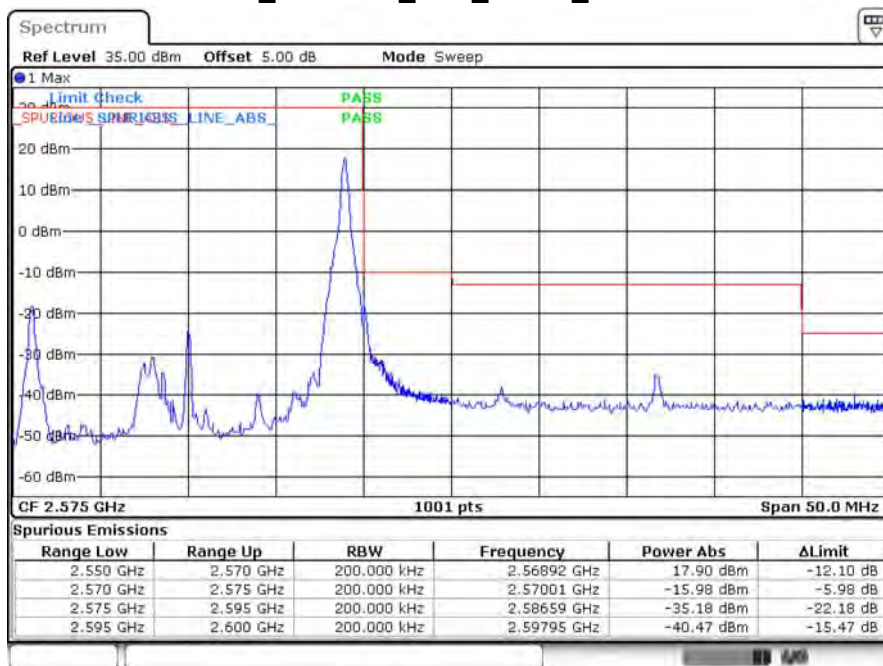
Date: 5 JUN.2019 13:02:25

B7_CH20850_20M_16-QAM_27RB0



Date: 5 JUN.2019 13:03:06

B7_CH21350_20M_QPSK_1RB99



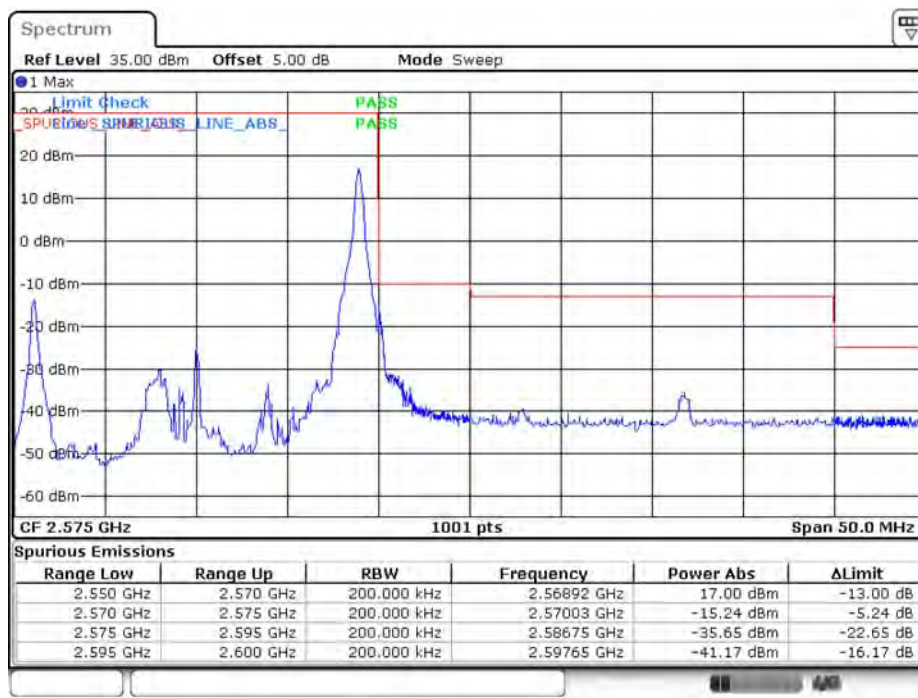
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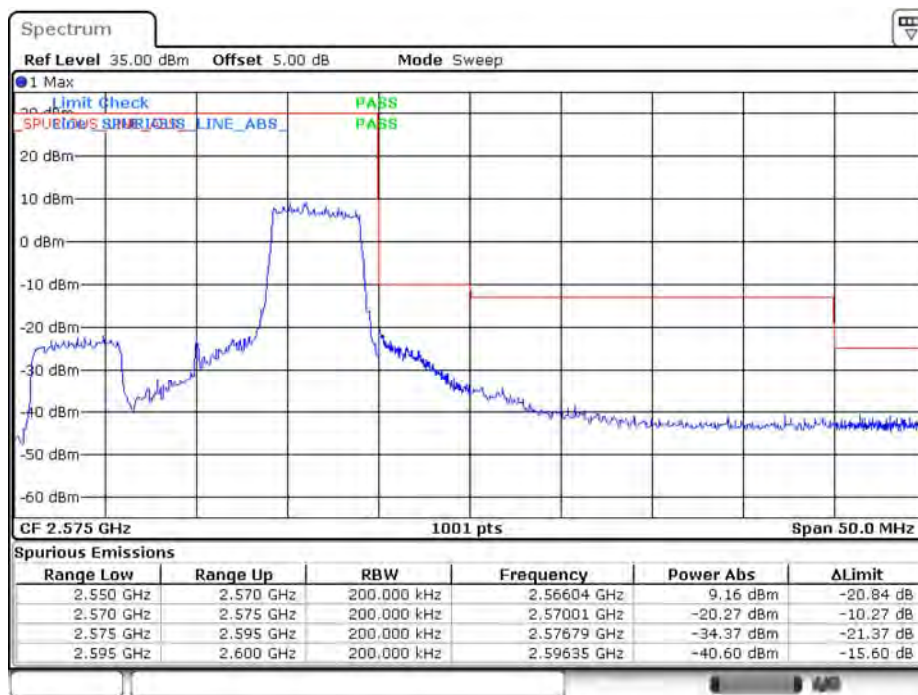
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B7_CH21350_20M_16-QAM_1RB99



Date: 5 JUN.2019 13:20:29

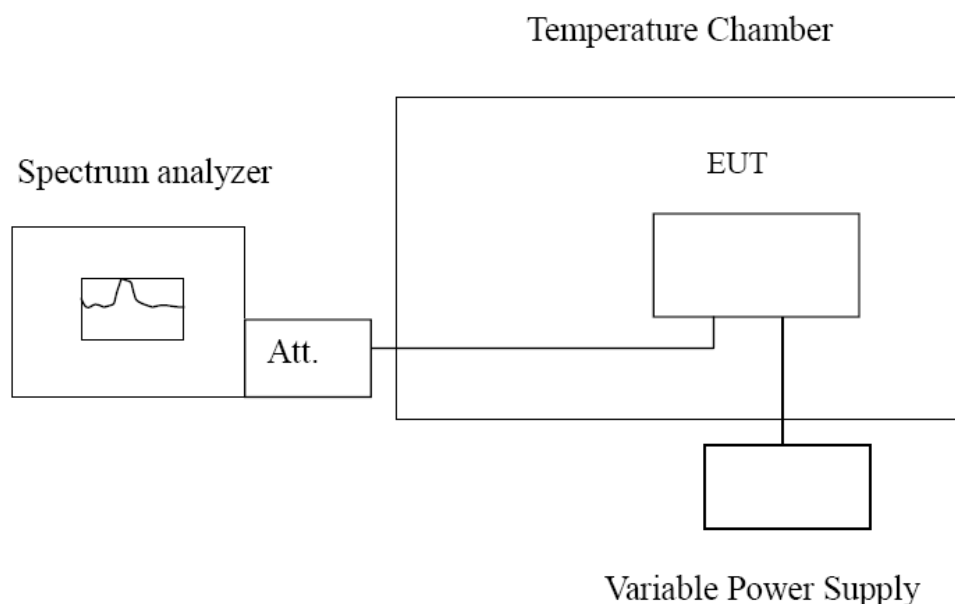
B7_CH21350_20M_16-QAM_27RB73



Date: 5 JUN.2019 13:21:24

8. Frequency Stability

8.1. Test Setup



8.2. Test Procedure

Frequency Stability Under Temperature Variations:

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. Reduce the input voltage to specify extreme voltage variation ($\pm 15\%$) and endpoint, record the maximum frequency change.

8.3. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 9
ANSI C63.26: 2015 Sub-clause 5.6

8.4. Test Result

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 1: LTE Band 2		
Date of Test	2019/04/01	Test Site	SR10-H

1860MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	3.38	-0.0018
3.8	2.87	-0.0015
3.4	3.09	-0.0017

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	3.27	-0.0018
-20	2.99	-0.0016
-10	3.19	-0.0017
0	3.30	-0.0018
10	2.48	-0.0013
20	3.35	-0.0018
30	2.35	-0.0013
40	3.10	-0.0017
50	2.69	-0.0014

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 1: LTE Band 2		
Date of Test	2019/04/01	Test Site	SR10-H

1880MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	1.06	-0.0006
3.8	1.26	-0.0007
3.4	1.49	-0.0008

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	1.83	-0.0010
-20	0.47	-0.0003
-10	1.51	-0.0008
0	0.72	-0.0004
10	1.80	-0.0010
20	1.31	-0.0007
30	1.30	-0.0007
40	0.79	-0.0004
50	1.40	-0.0007

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 1: LTE Band 2		
Date of Test	2019/04/01	Test Site	SR10-H

1900MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	2.54	-0.0013
3.8	2.54	-0.0013
3.4	2.77	-0.0015

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.16	-0.0011
-20	2.19	-0.0012
-10	2.36	-0.0012
0	2.42	-0.0013
10	3.37	-0.0018
20	2.70	-0.0014
30	3.18	-0.0017
40	2.03	-0.0011
50	3.18	-0.0017

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 2: LTE Band 4		
Date of Test	2019/04/01	Test Site	SR10-H

1720MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	1.90	-0.0011
3.8	1.33	-0.0008
3.4	1.54	-0.0009

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	0.71	-0.0004
-20	1.12	-0.0007
-10	0.63	-0.0004
0	1.40	-0.0008
10	2.20	-0.0013
20	1.23	-0.0007
30	1.75	-0.0010
40	1.37	-0.0008
50	1.62	-0.0009

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 2: LTE Band 4		
Date of Test	2019/04/01	Test Site	SR10-H

1732.5MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	2.93	-0.0017
3.8	2.96	-0.0017
3.4	2.47	-0.0014

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.63	-0.0015
-20	3.62	-0.0021
-10	3.03	-0.0017
0	2.84	-0.0016
10	3.50	-0.0020
20	2.73	-0.0016
30	3.59	-0.0021
40	2.57	-0.0015
50	3.24	-0.0019

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 2: LTE Band 4		
Date of Test	2019/04/01	Test Site	SR10-H

1745MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	0.99	-0.0006
3.8	1.25	-0.0007
3.4	0.95	-0.0005

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	1.40	-0.0008
-20	0.79	-0.0005
-10	2.12	-0.0012
0	1.11	-0.0006
10	0.73	-0.0004
20	0.94	-0.0005
30	1.25	-0.0007
40	0.92	-0.0005
50	1.84	-0.0011

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 3: LTE Band 5		
Date of Test	2019/04/01	Test Site	SR10-H

829MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	2.22	-0.0027
3.8	3.02	-0.0036
3.4	2.35	-0.0028

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.35	-0.0028
-20	2.55	-0.0031
-10	2.87	-0.0035
0	3.13	-0.0038
10	2.86	-0.0034
20	2.82	-0.0034
30	3.70	-0.0045
40	2.60	-0.0031
50	3.22	-0.0039

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 3: LTE Band 5		
Date of Test	2019/04/01	Test Site	SR10-H

836.5MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	3.12	-0.0037
3.8	1.59	-0.0019
3.4	3.50	-0.0042

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	3.22	-0.0038
-20	2.73	-0.0033
-10	2.49	-0.0030
0	3.00	-0.0036
10	2.78	-0.0033
20	2.69	-0.0032
30	3.70	-0.0044
40	2.67	-0.0032
50	3.22	-0.0038

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 3: LTE Band 5		
Date of Test	2019/04/01	Test Site	SR10-H

844MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	3.51	-0.0042
3.8	2.57	-0.0030
3.4	3.66	-0.0043

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	3.08	-0.0036
-20	3.85	-0.0046
-10	3.10	-0.0037
0	2.65	-0.0031
10	3.50	-0.0041
20	2.74	-0.0032
30	2.38	-0.0028
40	3.05	-0.0036
50	3.14	-0.0037

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 4: LTE Band 7		
Date of Test	2019/04/01	Test Site	SR10-H

2510MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	2.22	-0.0009
3.8	3.02	-0.0012
3.4	2.35	-0.0009

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.35	-0.0009
-20	2.55	-0.0010
-10	2.87	-0.0011
0	3.13	-0.0012
10	2.86	-0.0011
20	2.82	-0.0011
30	3.70	-0.0015
40	2.60	-0.0010
50	3.22	-0.0013

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 4: LTE Band 7		
Date of Test	2019/04/01	Test Site	SR10-H

2535MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	3.12	-0.0012
3.8	1.59	-0.0006
3.4	3.50	-0.0014

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	3.22	-0.0013
-20	2.73	-0.0011
-10	2.49	-0.0010
0	3.00	-0.0012
10	2.78	-0.0011
20	2.69	-0.0011
30	3.70	-0.0015
40	2.67	-0.0011
50	3.22	-0.0013

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 4: LTE Band 7		
Date of Test	2019/04/01	Test Site	SR10-H

2560MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	3.51	-0.0014
3.8	2.57	-0.0010
3.4	3.66	-0.0014

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	3.08	-0.0012
-20	3.85	-0.0015
-10	3.10	-0.0012
0	2.65	-0.0010
10	3.50	-0.0014
20	2.74	-0.0011
30	2.38	-0.0009
40	3.05	-0.0012
50	3.14	-0.0012