

## SPORTON International Inc.

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### FCC RADIO TEST REPORT

|                        |                                                          |
|------------------------|----------------------------------------------------------|
| Applicant's company    | Cambium Networks Inc.                                    |
| Applicant Address      | 3800 Golf Road, Suite 360 Rolling Meadows, IL 60008, USA |
| FCC ID                 | Z8H89FT0017                                              |
| Manufacturer's company | Cambium Networks Inc.                                    |
| Manufacturer Address   | 3800 Golf Road, Suite 360 Rolling Meadows, IL 60008, USA |

|                   |                                       |
|-------------------|---------------------------------------|
| Product Name      | Force 300                             |
| Brand Name        | Cambium Networks                      |
| Model No.         | Force 300                             |
| Test Rule Part(s) | 47 CFR FCC Part 15 Subpart E § 15.407 |
| Test Freq. Range  | 5150 ~ 5250 MHz / 5725 ~ 5850 MHz     |
| Received Date     | Nov. 16, 2017                         |
| Final Test Date   | Dec. 04, 2017                         |
| Submission Type   | Original Equipment                    |

#### Statement

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2013, 47 CFR FCC Part 15 Subpart E, KDB789033 D02 v02, KDB662911 D01 v02r01, ET Docket No. 13-49; FCC 16-24.**

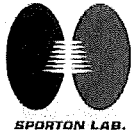
The test equipment used to perform the test is calibrated and traceable to NML/ROC.





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## History of This Test Report

| REPORT NO. | VERSION | DESCRIPTION             | ISSUED DATE   |
|------------|---------|-------------------------|---------------|
| FR7D0728   | Rev. 01 | Initial issue of report | Dec. 27, 2017 |
|            |         |                         |               |
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|            |         |                         |               |



## 1. VERIFICATION OF COMPLIANCE

Product Name : Force 300  
Brand Name : Cambium Networks  
Model No. : Force 300  
Applicant : Cambium Networks Inc.  
Test Rule Part(s) : 47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Nov. 16, 2017 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

A handwritten signature in black ink, appearing to read "Cliff Chang", is written over a horizontal line.

Cliff Chang

SPORTON INTERNATIONAL INC.

## 2. SUMMARY OF THE TEST RESULT

| Applied Standard: 47 CFR FCC Part 15 Subpart E |              |                                                    |          |
|------------------------------------------------|--------------|----------------------------------------------------|----------|
| Part                                           | Rule Section | Description of Test                                | Result   |
| 4.1                                            | 15.207       | AC Power Line Conducted Emissions                  | Complies |
| 4.2                                            | 15.407(a)    | 26dB Spectrum Bandwidth and 99% Occupied Bandwidth | Complies |
| 4.3                                            | 15.407(e)    | 6dB Spectrum Bandwidth                             | Complies |
| 4.4                                            | 15.407(a)    | Maximum Conducted Output Power                     | Complies |
| 4.5                                            | 15.407(a)    | Power Spectral Density                             | Complies |
| 4.6                                            | 15.407(b)    | Radiated Emissions                                 | Complies |
| 4.7                                            | 15.407(b)    | Band Edge Emissions                                | Complies |
| 4.8                                            | 15.407(g)    | Frequency Stability                                | Complies |
| 4.9                                            | 15.203       | Antenna Requirements                               | Complies |

### 3. GENERAL INFORMATION

#### 3.1. Product Details

| Items                   | Description                                                                                                                            |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Product Type            | 2TX, 2RX                                                                                                                               |
| Radio Type              | Intentional Transceiver                                                                                                                |
| Power Type              | From PoE                                                                                                                               |
| Modulation              | QPSK                                                                                                                                   |
| Frequency Range         | 5150 ~ 5250 MHz / 5725 ~ 5850 MHz                                                                                                      |
| Channel Number          | Band 1: 13 for 20MHz bandwidth ;<br>Band 4: 17 for 20MHz bandwidth<br>Band 1: 2 for 80MHz bandwidth ;<br>Band 4: 9 for 80MHz bandwidth |
| Channel Bandwidth (99%) | For Antenna 2<br>Band 1:<br>QPSK, 20M: 17.71 MHz<br>QPSK, 80M: 76.12 MHz<br>Band 4:<br>QPSK, 20M: 17.63 MHz<br>QPSK, 80M: 76.12MHz     |
|                         | For Antenna 3<br>Band 1:<br>QPSK, 20M: 21.62 MHz<br>QPSK, 80M: 76.12 MHz<br>Band 4:<br>QPSK, 20M: 27.61 MHz<br>QPSK, 80M: 75.83 MHz    |

|                                |                                                                                                                                     |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Maximum Conducted Output Power | For Antenna 2<br>Band 1:<br>QPSK, 20M: -4.10 dBm<br>QPSK, 80M: -8.51 dBm<br>Band 4:<br>QPSK, 20M: 2.20 dBm<br>QPSK, 80M: -1.43 dBm  |
|                                | For Antenna 3<br>Band 1:<br>QPSK, 20M: 29.81 dBm<br>QPSK, 80M: 17.68 dBm<br>Band 4:<br>QPSK, 20M: 29.99 dBm<br>QPSK, 80M: 24.41 dBm |
| Carrier Frequencies            | Please refer to section 3.4                                                                                                         |
| Antenna                        | Please refer to section 3.3                                                                                                         |

| Items                | Description                                               |                                                         |
|----------------------|-----------------------------------------------------------|---------------------------------------------------------|
| Communication Mode   | <input checked="" type="checkbox"/> IP Based (Load Based) | <input type="checkbox"/> Frame Based                    |
| Beamforming Function | <input type="checkbox"/> With beamforming                 | <input checked="" type="checkbox"/> Without beamforming |
| Operate Condition    | <input type="checkbox"/> Indoor                           | <input checked="" type="checkbox"/> Outdoor             |

#### Antenna and Bandwidth

| Antenna        | Two (TX) |        |
|----------------|----------|--------|
| Bandwidth Mode | 20 MHz   | 80 MHz |
| QPSK           | V        | V      |

### 3.2. Accessories

N/A

### 3.3. Table for Filed Antenna

| Ant. | Port | Brand | Model Name | Antenna Type    | Connector | Gain (dBi) |      |
|------|------|-------|------------|-----------------|-----------|------------|------|
|      |      |       |            |                 |           | 2.4GHz     | 5GHz |
| 1    | 1    | -     | -          | Printed Antenna | N/A       | 25         | -    |
| 2    | 1, 2 | -     | -          | Printed Antenna | N/A       | -          | 25   |
| 3    | 1, 2 | -     | -          | Printed Antenna | N/A       | -          | 2    |

Note: The EUT has three antennas.

#### For 2.4GHz function (1TX/1RX):

Only Port 1 can be used as transmitting/receiving antenna.

#### For 5GHz function (2TX/2RX):

Ant.2 and Ant.3 has been tested and recorded in the test report.

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

### 3.4. Table for Carrier Frequencies

There are two bandwidth systems.

For 20MHz bandwidth systems:

| Frequency Band          | Channel No. | Frequency | Channel No. | Frequency |
|-------------------------|-------------|-----------|-------------|-----------|
| 5150~5250 MHz<br>Band 1 | 1           | 5180 MHz  | 8           | 5215 MHz  |
|                         | 2           | 5185 MHz  | 9           | 5220 MHz  |
|                         | 3           | 5190 MHz  | 10          | 5225 MHz  |
|                         | 4           | 5195 MHz  | 11          | 5230 MHz  |
|                         | 5           | 5200 MHz  | 12          | 5235 MHz  |
|                         | 6           | 5205 MHz  | 13          | 5240 MHz  |
|                         | 7           | 5210 MHz  | -           | -         |
| 5725~5850 MHz<br>Band 4 | 1           | 5745 MHz  | 10          | 5790 MHz  |
|                         | 2           | 5750 MHz  | 11          | 5795 MHz  |
|                         | 3           | 5755 MHz  | 12          | 5800 MHz  |
|                         | 4           | 5760 MHz  | 13          | 5805 MHz  |
|                         | 5           | 5765 MHz  | 14          | 5810 MHz  |
|                         | 6           | 5770 MHz  | 15          | 5815 MHz  |
|                         | 7           | 5775 MHz  | 16          | 5820 MHz  |
|                         | 8           | 5780 MHz  | 17          | 5825 MHz  |
|                         | 9           | 5785 MHz  | -           | -         |

For 80MHz bandwidth systems:

| Frequency Band          | Channel No. | Frequency | Channel No. | Frequency |
|-------------------------|-------------|-----------|-------------|-----------|
| 5150~5250 MHz<br>Band 1 | 1           | 5200 MHz  | 2           | 5210 MHz  |
| 5725~5850 MHz<br>Band 4 | 1           | 5765 MHz  | 6           | 5790 MHz  |
|                         | 2           | 5770 MHz  | 7           | 5795 MHz  |
|                         | 3           | 5775 MHz  | 8           | 5800 MHz  |
|                         | 4           | 5780 MHz  | 9           | 5805 MHz  |
|                         | 5           | 5785 MHz  | -           | -         |

### 3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. The following table is a list of the test modes shown in this test report.

| Test Items                                                   | Mode      |        | Frequency          | Port |
|--------------------------------------------------------------|-----------|--------|--------------------|------|
| AC Power Conducted Emission                                  | CTX       |        | -                  | -    |
| Max. Conducted Output Power                                  | QPSK, 20M | Band 1 | 5180 / 5200 / 5240 | 1+2  |
|                                                              |           | Band 4 | 5745 / 5785 / 5825 | 1+2  |
|                                                              | QPSK, 80M | Band 1 | 5200 / 5210        | 1+2  |
|                                                              |           | Band 4 | 5765 / 5785 / 5805 | 1+2  |
| Power Spectral Density                                       | QPSK, 20M | Band 1 | 5180 / 5200 / 5240 | 1+2  |
|                                                              |           | Band 4 | 5745 / 5785 / 5825 | 1+2  |
|                                                              | QPSK, 80M | Band 1 | 5200 / 5210        | 1+2  |
|                                                              |           | Band 4 | 5765 / 5785 / 5805 | 1+2  |
| 26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement | QPSK, 20M | Band 1 | 5180 / 5200 / 5240 | 1+2  |
|                                                              |           | Band 4 | 5745 / 5785 / 5825 | 1+2  |
|                                                              | QPSK, 80M | Band 1 | 5200 / 5210        | 1+2  |
|                                                              |           | Band 4 | 5765 / 5785 / 5805 | 1+2  |
| 6dB Spectrum Bandwidth Measurement                           | QPSK, 20M | Band 4 | 5745 / 5785 / 5825 | 1+2  |
|                                                              | QPSK, 80M | Band 4 | 5765 / 5785 / 5805 | 1+2  |
| Radiated Emission Below 1GHz                                 | CTX       |        |                    | -    |
| Radiated Emission Above 1GHz                                 | QPSK, 20M | Band 1 | 5180 / 5200 / 5240 | 1+2  |
|                                                              |           | Band 4 | 5745 / 5785 / 5825 | 1+2  |
|                                                              | QPSK, 80M | Band 1 | 5200 / 5210        | 1+2  |
|                                                              |           | Band 4 | 5765 / 5785 / 5805 | 1+2  |
| Band Edge Emission                                           | QPSK, 20M | Band 1 | 5180 / 5200 / 5240 | 1+2  |
|                                                              |           | Band 4 | 5745 / 5785 / 5825 | 1+2  |
|                                                              | QPSK, 80M | Band 1 | 5200 / 5210        | 1+2  |
|                                                              |           | Band 4 | 5765 / 5785 / 5805 | 1+2  |
| Frequency Stability                                          | 20 MHz    | Band 1 | 5200               | 2    |
|                                                              |           | Band 4 | 5785               | 2    |
|                                                              | 80 MHz    | Band 1 | 5210               | 2    |
|                                                              |           | Band 4 | 5765               | 2    |

Note 1: The EUT can only be used at Z axis position.

Note 2: The EUT was powered by PoE, and the PoE was for measurement only, would not be marketed.

PoE information as below:

| Support Unit | Brand            | Model        |
|--------------|------------------|--------------|
| PoE          | Cambium Networks | NET-P15-30IN |

### 3.6. Table for Testing Locations

| Test Site Location |                                                                            |          |                     |             |              |
|--------------------|----------------------------------------------------------------------------|----------|---------------------|-------------|--------------|
| Address:           | No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C. |          |                     |             |              |
| TEL:               | 886-3-656-9065                                                             |          |                     |             |              |
| FAX:               | 886-3-656-9085                                                             |          |                     |             |              |
| Test Site No.      | Site Category                                                              | Location | FCC Designation No. | IC File No. | VCCI Reg. No |
| 03CH01-CB          | SAC                                                                        | Hsin Chu | TW0006              | IC 4086D    | -            |
| CO02-CB            | Conduction                                                                 | Hsin Chu | TW0006              | IC 4086D    | -            |
| TH01-CB            | OVEN Room                                                                  | Hsin Chu | -                   | -           | -            |

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC).

### 3.7. Table for Supporting Units

For Test Site No: CO02-CB

| Support Unit | Brand            | Model        | FCC ID |
|--------------|------------------|--------------|--------|
| NB           | DELL             | E6430        | DoC    |
| PoE          | Cambium Networks | NET-P15-30IN | DoC    |

For Test Site No: 03CH01-CB / TH01-CB

| Support Unit | Brand            | Model        | FCC ID |
|--------------|------------------|--------------|--------|
| NB           | DELL             | E4300        | DoC    |
| PoE          | Cambium Networks | NET-P15-30IN | DoC    |

### 3.8. Table for Parameters of Test Software Setting

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

For Antenna 2:

| Test Software Version | QRCT Version3.0.250.0 |          |          |          |          |          |
|-----------------------|-----------------------|----------|----------|----------|----------|----------|
| Mode                  | Test Frequency (MHz)  |          |          |          |          |          |
|                       | 5180 MHz              | 5200 MHz | 5240 MHz | 5745 MHz | 5785 MHz | 5825 MHz |
| 20M                   | 0                     | 5        | 5        | 10       | 9.5      | 9.5      |
| Mode                  | 5200 MHz              | 5210 MHz | 5765 MHz | 5785 MHz | 5805 MHz | -        |
| 80M                   | 0                     | 0        | 6        | 6        | 5.5      | -        |

For Antenna 3:

| Test Software Version | QRCT Version3.0.250.0 |          |          |          |          |          |
|-----------------------|-----------------------|----------|----------|----------|----------|----------|
| Mode                  | Test Frequency (MHz)  |          |          |          |          |          |
|                       | 5180 MHz              | 5200 MHz | 5240 MHz | 5745 MHz | 5785 MHz | 5825 MHz |
| 20M                   | 18.5                  | 25       | 30       | 30       | 30       | 30       |
| Mode                  | 5200 MHz              | 5210 MHz | 5765 MHz | 5785 MHz | 5805 MHz | -        |
| 80M                   | 12.5                  | 13       | 20.5     | 20.5     | 19.5     | -        |

### 3.9. EUT Operation during Test

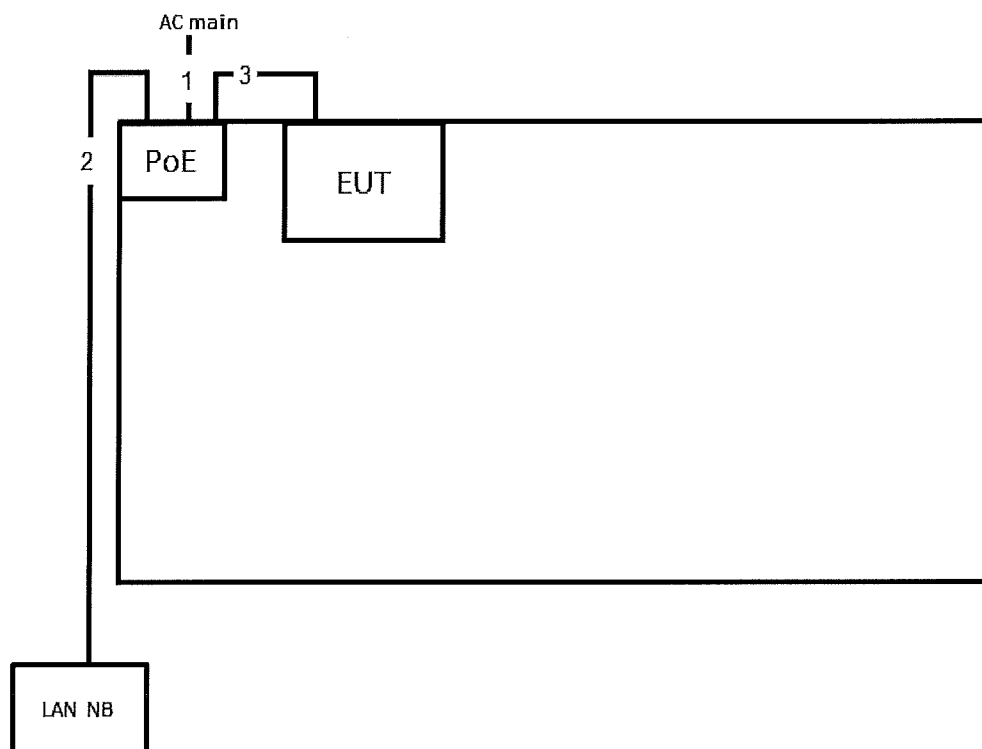
The EUT was programmed to be in continuously transmitting mode.

### 3.10. Duty Cycle

| Mode | On Time (ms) | On+Off Time (ms) | Duty Cycle (%) | Duty Factor (dB) | 1/T Minimum VBW (kHz) |
|------|--------------|------------------|----------------|------------------|-----------------------|
| 20M  | 4.983        | 5.070            | 98.28%         | 0.08             | 0.01                  |
| 80M  | 1.123        | 1.217            | 92.28%         | 0.35             | 0.89                  |

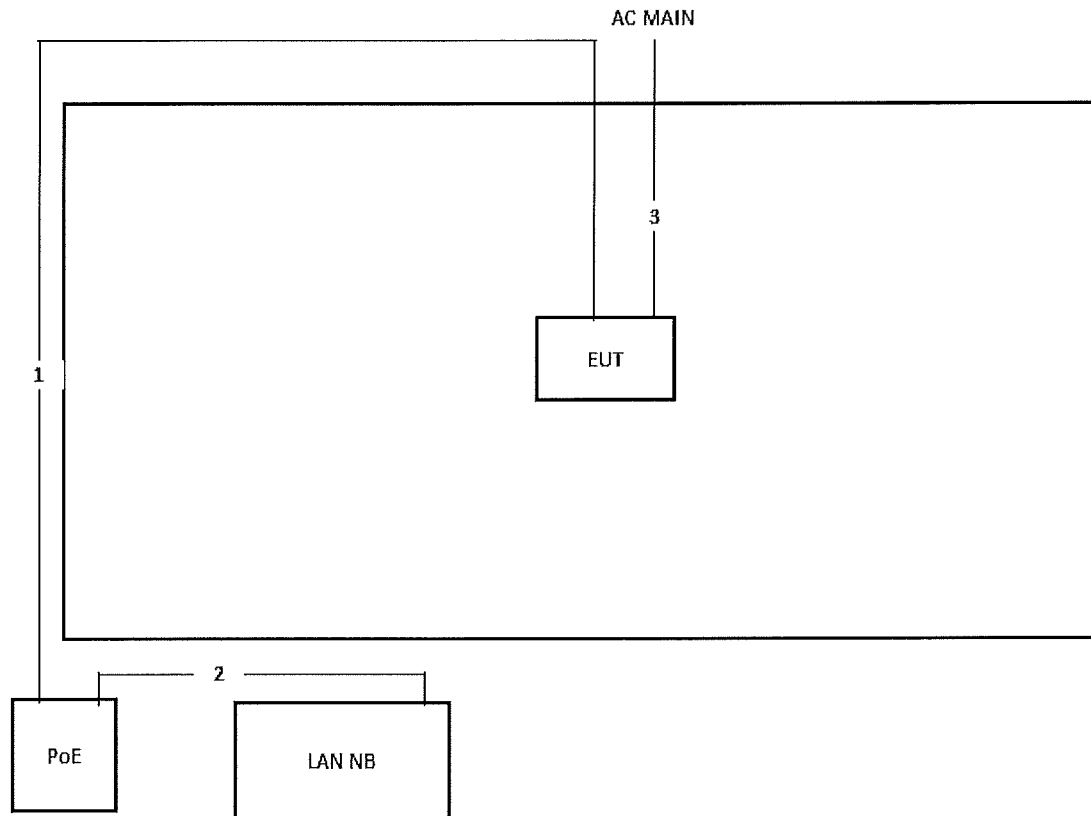
### 3.11. Test Configurations

#### 3.11.1. AC Power Line Conduction Emissions Test Configuration



| Item | Connection  | Shielded | Length |
|------|-------------|----------|--------|
| 1    | Power cable | No       | 0.7m   |
| 2    | RJ-45 cable | No       | 10m    |
| 3    | RJ-45 cable | No       | 1.5m   |

### 3.11.2. Radiation Emissions Test Configuration



| Item | Connection  | Shielded | Length |
|------|-------------|----------|--------|
| 1    | RJ-45 cable | No       | 10m    |
| 2    | RJ-45 cable | No       | 1.5m   |
| 3    | Power cable | No       | 1.5m   |

## 4. TEST RESULT

### 4.1. AC Power Line Conducted Emissions Measurement

#### 4.1.1. Limit

For this product that is designed to connect to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

| Frequency (MHz) | QP Limit (dBuV) | AV Limit (dBuV) |
|-----------------|-----------------|-----------------|
| 0.15~0.5        | 66~56           | 56~46           |
| 0.5~5           | 56              | 46              |
| 5~30            | 60              | 50              |

#### 4.1.2. Measuring Instruments and Setting

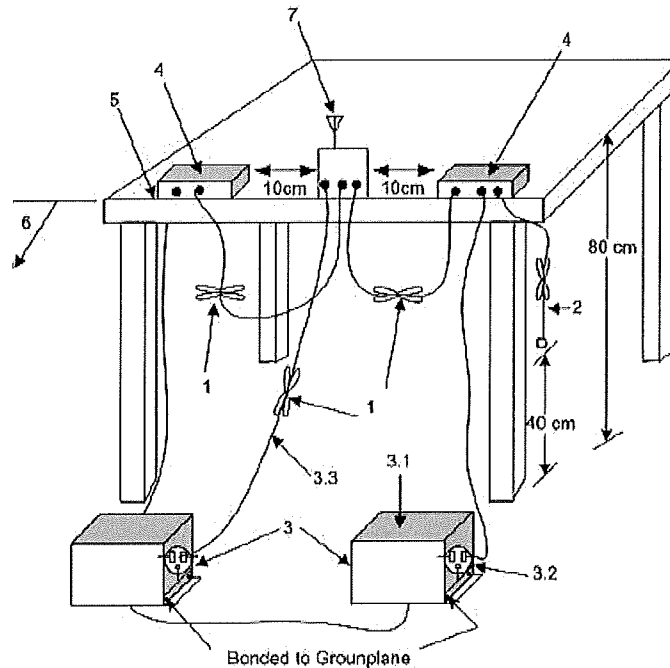
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

| Receiver Parameters | Setting  |
|---------------------|----------|
| Attenuation         | 10 dB    |
| Start Frequency     | 0.15 MHz |
| Stop Frequency      | 30 MHz   |
| IF Bandwidth        | 9 kHz    |

#### 4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

#### 4.1.4. Test Setup Layout



- 1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
- 2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- 3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
- 3.1—All other equipment powered from additional LISN(s).
- 3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
- 3.3—LISN at least 80 cm from nearest part of EUT chassis.
- 4—Non-EUT components of EUT system being tested.
- 5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
- 6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
- 7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

#### 4.1.5. Test Deviation

There is no deviation with the original standard.

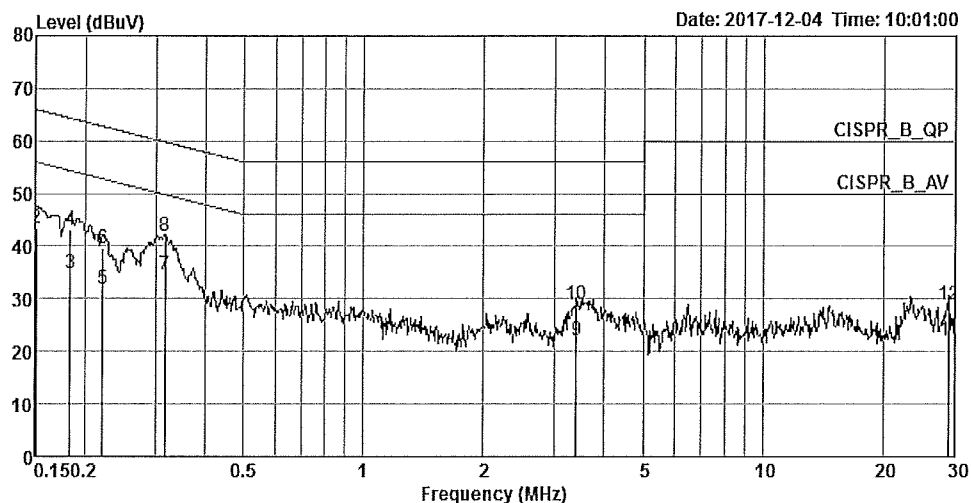
#### 4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.



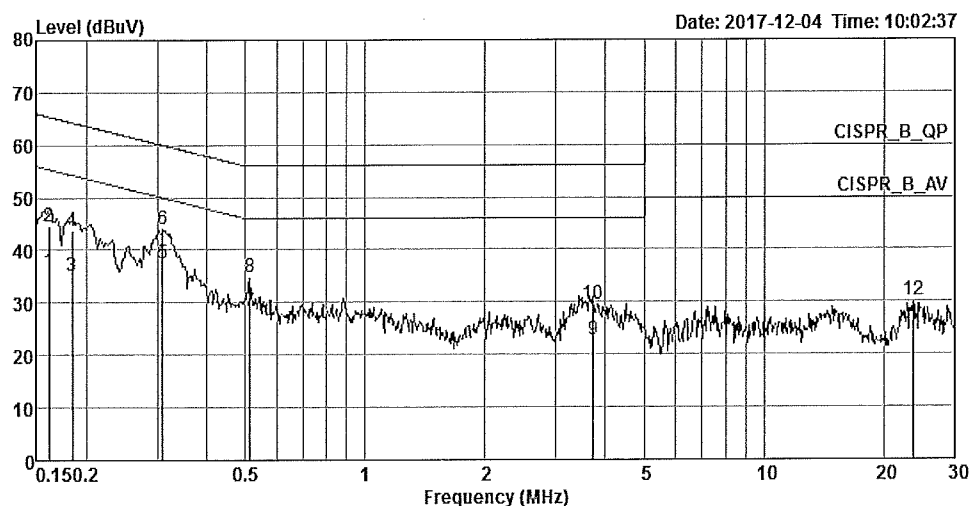
#### 4.1.7. Results of AC Power Line Conducted Emissions Measurement

|               |        |          |      |
|---------------|--------|----------|------|
| Temperature   | 22°C   | Humidity | 59%  |
| Test Engineer | GN Hou | Phase    | Line |
| Configuration | CTX    |          |      |



|    | Freq    | Level | Over<br>Limit | Limit<br>Line | Read<br>Level | LISN<br>Factor | Cable<br>Loss | Remark  | Pol/Phase |
|----|---------|-------|---------------|---------------|---------------|----------------|---------------|---------|-----------|
|    | MHz     | dBuV  | dB            | dBuV          | dBuV          | dB             | dB            |         |           |
| 1  | 0.1500  | 34.89 | -21.11        | 56.00         | 24.88         | 10.00          | 0.01          | Average | LINE      |
| 2  | 0.1500  | 43.35 | -22.65        | 66.00         | 33.34         | 10.00          | 0.01          | QP      | LINE      |
| 3  | 0.1835  | 34.81 | -19.52        | 54.33         | 24.87         | 9.93           | 0.01          | Average | LINE      |
| 4  | 0.1835  | 43.16 | -21.17        | 64.33         | 33.22         | 9.93           | 0.01          | QP      | LINE      |
| 5  | 0.2208  | 31.82 | -20.97        | 52.79         | 21.91         | 9.90           | 0.01          | Average | LINE      |
| 6  | 0.2208  | 39.44 | -23.35        | 62.79         | 29.53         | 9.90           | 0.01          | QP      | LINE      |
| 7  | 0.3166  | 34.40 | -15.40        | 49.80         | 24.50         | 9.88           | 0.02          | Average | LINE      |
| 8  | 0.3166  | 41.85 | -17.95        | 59.80         | 31.95         | 9.88           | 0.02          | QP      | LINE      |
| 9  | 3.3994  | 22.07 | -23.93        | 46.00         | 12.06         | 9.95           | 0.06          | Average | LINE      |
| 10 | 3.3994  | 28.94 | -27.06        | 56.00         | 18.93         | 9.95           | 0.06          | QP      | LINE      |
| 11 | 29.2157 | 22.06 | -27.94        | 50.00         | 11.48         | 10.35          | 0.23          | Average | LINE      |
| 12 | 29.2157 | 28.91 | -31.09        | 60.00         | 18.33         | 10.35          | 0.23          | QP      | LINE      |

|               |        |          |         |
|---------------|--------|----------|---------|
| Temperature   | 22°C   | Humidity | 59%     |
| Test Engineer | GN Hou | Phase    | Neutral |
| Configuration | CTX    |          |         |



|    | Freq    | Level | Over   | Limit | Read  | LISN   | Cable | Remark  | Pol/Phase |
|----|---------|-------|--------|-------|-------|--------|-------|---------|-----------|
|    | MHz     | dBuV  | Limit  | Line  | Level | Factor | Loss  |         |           |
|    |         |       | dB     | dBuV  | dBuV  | dB     | dB    |         |           |
| 1  | 0.1616  | 36.06 | -19.32 | 55.38 | 26.03 | 10.02  | 0.01  | Average | NEUTRAL   |
| 2  | 0.1616  | 44.68 | -20.70 | 65.38 | 34.65 | 10.02  | 0.01  | QP      | NEUTRAL   |
| 3  | 0.1844  | 35.05 | -19.23 | 54.28 | 25.06 | 9.98   | 0.01  | Average | NEUTRAL   |
| 4  | 0.1844  | 43.70 | -20.58 | 64.28 | 33.71 | 9.98   | 0.01  | QP      | NEUTRAL   |
| 5  | 0.3100  | 37.46 | -12.51 | 49.97 | 27.49 | 9.95   | 0.02  | Average | NEUTRAL   |
| 6  | 0.3100  | 44.02 | -15.95 | 59.97 | 34.05 | 9.95   | 0.02  | QP      | NEUTRAL   |
| 7  | 0.5128  | 28.21 | -17.79 | 46.00 | 18.23 | 9.95   | 0.03  | Average | NEUTRAL   |
| 8  | 0.5128  | 34.92 | -21.08 | 56.00 | 24.94 | 9.95   | 0.03  | QP      | NEUTRAL   |
| 9  | 3.7198  | 22.64 | -23.36 | 46.00 | 12.52 | 10.05  | 0.07  | Average | NEUTRAL   |
| 10 | 3.7198  | 29.57 | -26.43 | 56.00 | 19.45 | 10.05  | 0.07  | QP      | NEUTRAL   |
| 11 | 23.6361 | 23.57 | -26.43 | 50.00 | 13.09 | 10.30  | 0.18  | Average | NEUTRAL   |
| 12 | 23.6361 | 30.00 | -30.00 | 60.00 | 19.52 | 10.30  | 0.18  | QP      | NEUTRAL   |

Note:

Level = Read Level + LISN Factor + Cable Loss.

## 4.2. 26dB Bandwidth and 99% Occupied Bandwidth Measurement

### 4.2.1. Limit

No restriction limits.

### 4.2.2. Measuring Instruments and Setting

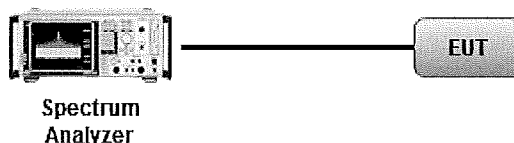
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

| 26dB Bandwidth         |                                            |
|------------------------|--------------------------------------------|
| Spectrum Parameters    | Setting                                    |
| Attenuation            | Auto                                       |
| Span Frequency         | > 26dB Bandwidth                           |
| RBW                    | Approximately 1% of the emission bandwidth |
| VBW                    | VBW > RBW                                  |
| Detector               | Peak                                       |
| Trace                  | Max Hold                                   |
| Sweep Time             | Auto                                       |
| 99% Occupied Bandwidth |                                            |
| Spectrum Parameters    | Setting                                    |
| Span                   | 1.5 times to 5.0 times the OBW             |
| RBW                    | 1 % to 5 % of the OBW                      |
| VBW                    | $\geq 3 \times \text{RBW}$                 |
| Detector               | Peak                                       |
| Trace                  | Max Hold                                   |

### 4.2.3. Test Procedures

| Test Method                                                                         |                                                                             |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <p>For the emission bandwidth shall be measured using one of the options below:</p> |                                                                             |
| <input checked="" type="checkbox"/>                                                 | Refer as FCC KDB 789033, clause C for EBW and clause D for OBW measurement. |
| <input type="checkbox"/>                                                            | Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.          |
| <input checked="" type="checkbox"/>                                                 | Refer as IC RSS-Gen, clause 4.6 for bandwidth testing.                      |

### 4.2.4. Test Setup Layout



#### **4.2.5. Test Deviation**

There is no deviation with the original standard.

#### **4.2.6. EUT Operation during Test**

The EUT was programmed to be in continuously transmitting mode.

#### 4.2.7. Test Result of 26dB Bandwidth and 99% Occupied Bandwidth

|               |                                                 |          |     |
|---------------|-------------------------------------------------|----------|-----|
| Temperature   | 22°C                                            | Humidity | 54% |
| Test Engineer | Ron Huang / Lucke Hsieh / Brian Sun / Serway Li |          |     |

For Antenna 2:

| Mode | Frequency | 26dB/99% Bandwidth (MHz) |       | 26dB/99% Occupied Bandwidth (MHz) |       |
|------|-----------|--------------------------|-------|-----------------------------------|-------|
|      |           | Port 1                   |       | Port 2                            |       |
| 20M  | 5180 MHz  | 20.26                    | 17.71 | 20.35                             | 17.63 |
|      | 5200 MHz  | 20.26                    | 17.71 | 20.44                             | 17.71 |
|      | 5240 MHz  | 20.26                    | 17.71 | 20.35                             | 17.71 |
|      | 5745 MHz  | 20.26                    | 17.63 | 20.26                             | 17.63 |
|      | 5785 MHz  | 20.44                    | 17.63 | 20.26                             | 17.63 |
|      | 5825 MHz  | 20.44                    | 17.63 | 20.35                             | 17.63 |
| 80M  | 5200 MHz  | 83.48                    | 76.12 | 84.35                             | 76.12 |
|      | 5210 MHz  | 82.32                    | 76.12 | 84.35                             | 76.12 |
|      | 5765 MHz  | 83.77                    | 75.83 | 83.19                             | 75.83 |
|      | 5785 MHz  | 83.48                    | 75.83 | 83.77                             | 75.83 |
|      | 5805 MHz  | 84.06                    | 76.12 | 83.48                             | 75.83 |

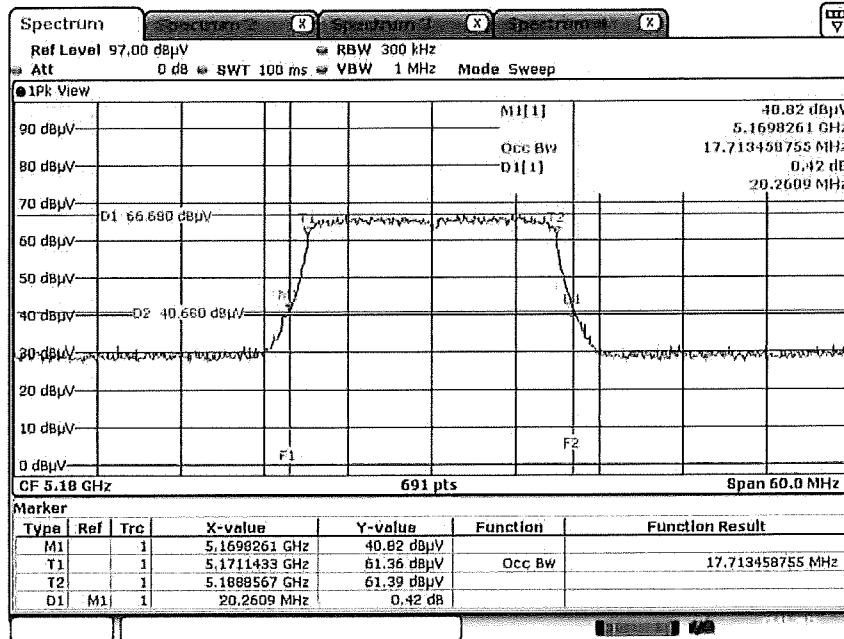
For Antenna 3:

| Mode | Frequency | 26dB/99% Bandwidth (MHz) |       | 26dB/99% Occupied Bandwidth (MHz) |       |
|------|-----------|--------------------------|-------|-----------------------------------|-------|
|      |           | Port 1                   |       | Port 2                            |       |
| 20M  | 5180 MHz  | 20.35                    | 17.63 | 20.35                             | 17.63 |
|      | 5200 MHz  | 24.17                    | 17.71 | 32.52                             | 17.97 |
|      | 5240 MHz  | 33.22                    | 18.15 | 41.57                             | 21.62 |
|      | 5745 MHz  | 42.61                    | 24.14 | 39.13                             | 20.49 |
|      | 5785 MHz  | 41.57                    | 24.66 | 44.44                             | 27.27 |
|      | 5825 MHz  | 44.52                    | 27.61 | 42.96                             | 25.44 |
| 80M  | 5200 MHz  | 83.48                    | 75.83 | 83.77                             | 76.12 |
|      | 5210 MHz  | 82.90                    | 75.83 | 83.48                             | 76.12 |
|      | 5765 MHz  | 82.90                    | 75.83 | 83.48                             | 75.83 |
|      | 5785 MHz  | 84.06                    | 75.83 | 83.48                             | 75.83 |
|      | 5805 MHz  | 83.77                    | 75.83 | 82.90                             | 75.83 |



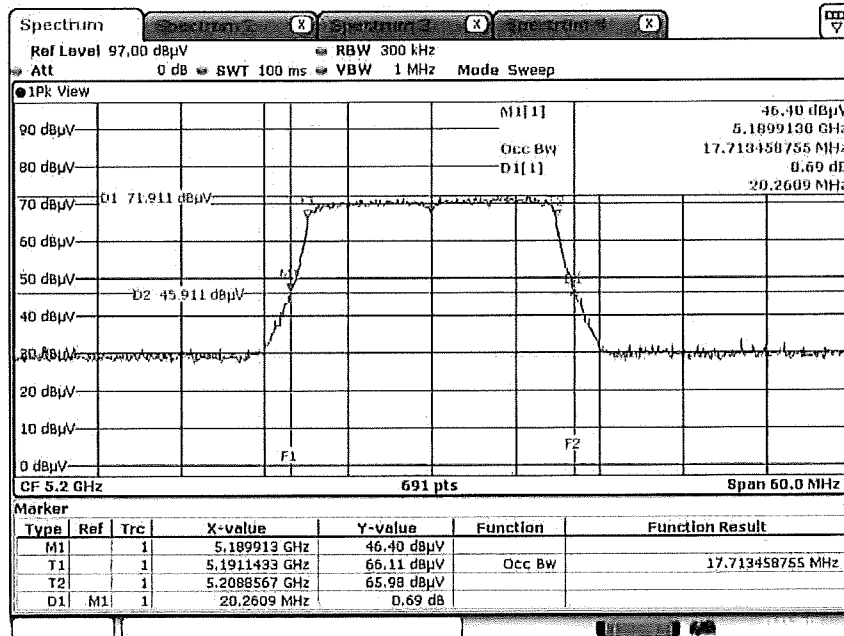
For Antenna 2:

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 1 / 5180 MHz



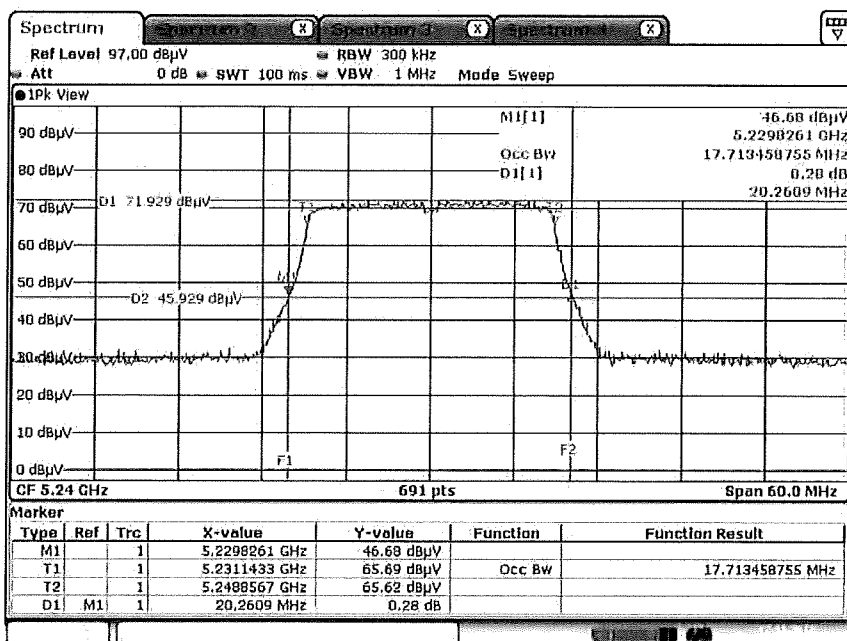
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26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 1 / 5200 MHz



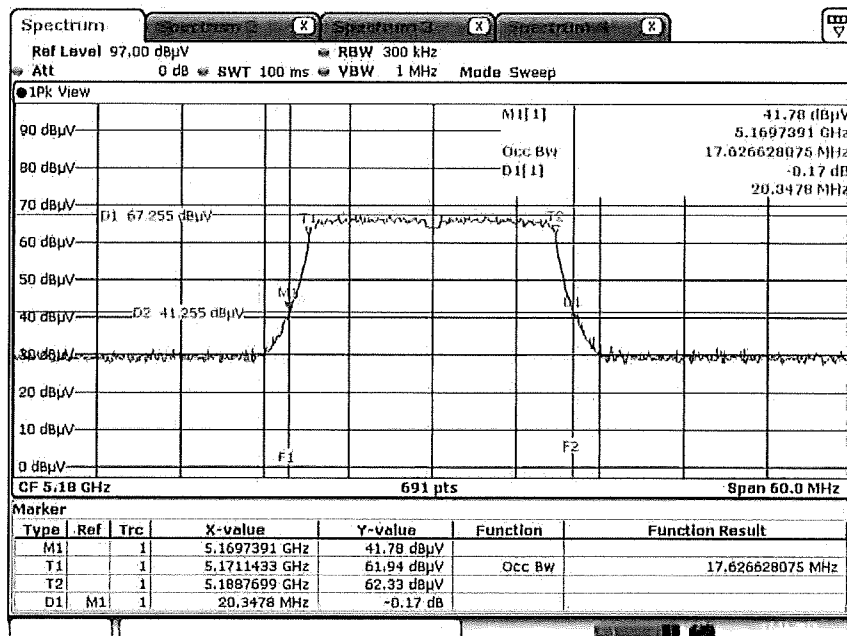
Date: 22 NOV.2017 17:39:42

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 1 / 5240 MHz

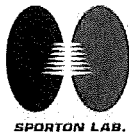


Date: 22 NOV. 2017 17:40:07

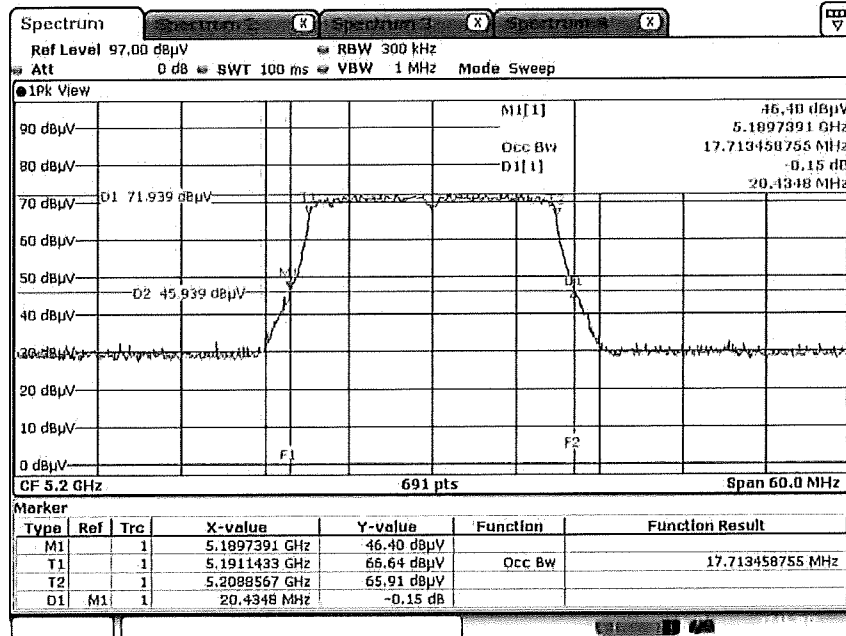
### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5180 MHz



Date: 22 NOV. 2017 17:58:22

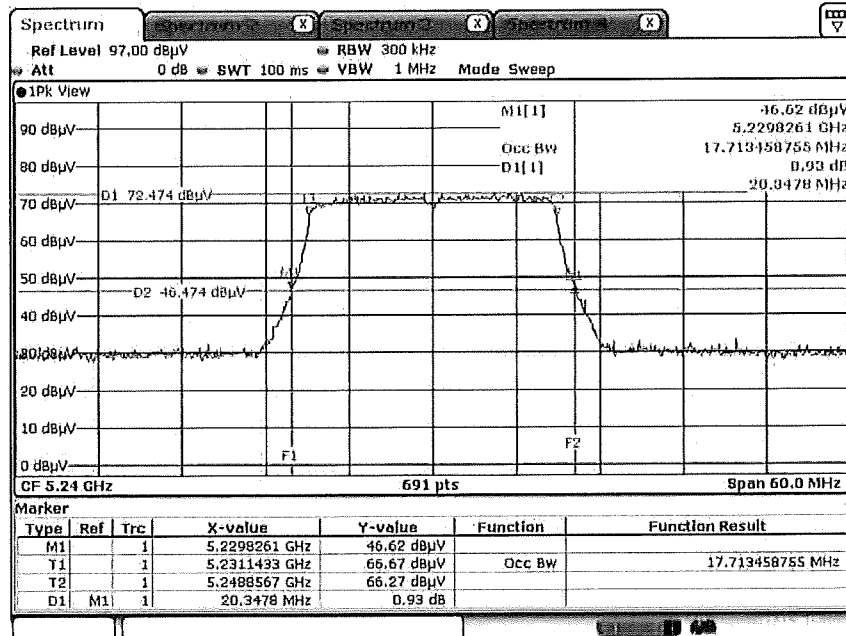


## 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5200 MHz



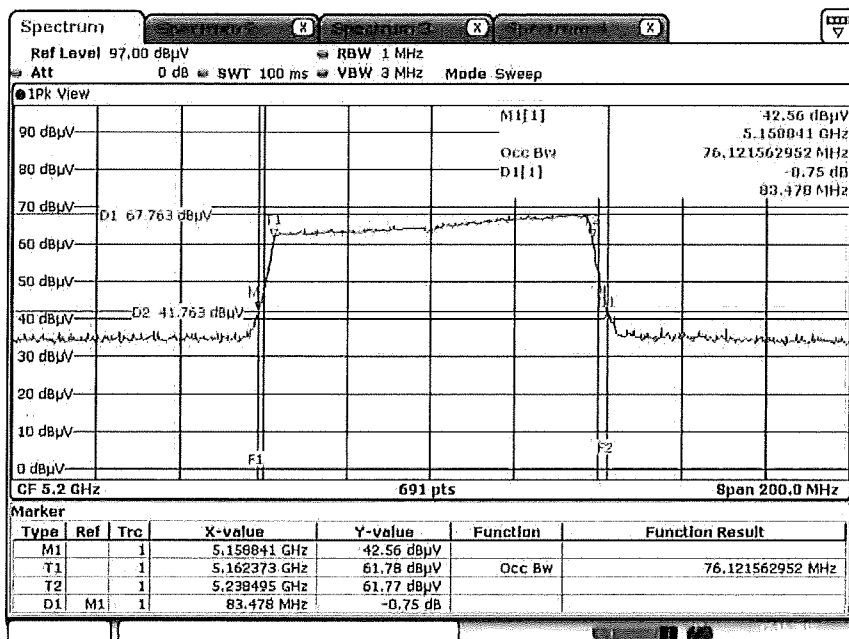
Date: 22 NOV. 2017 17:58:52

## 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5240 MHz



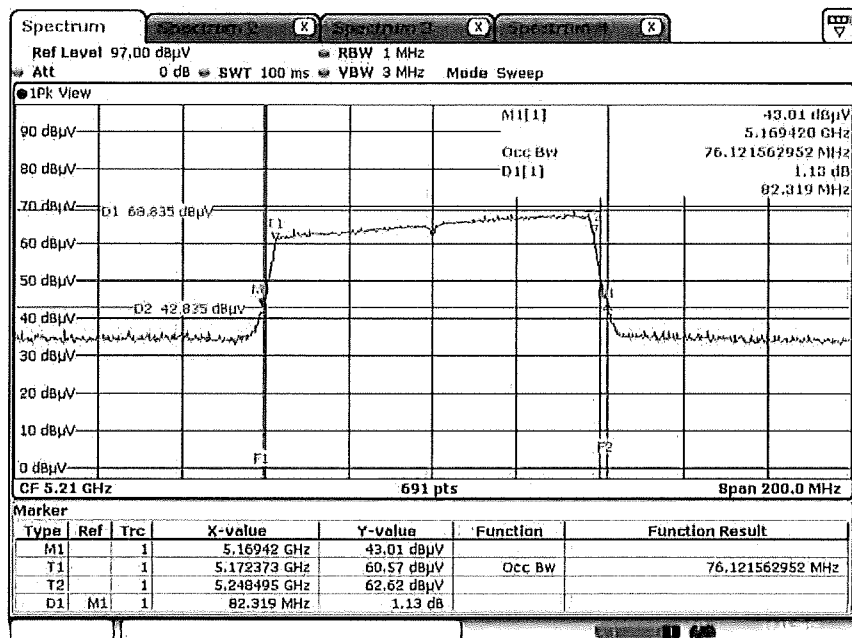
Date: 22 NOV. 2017 17:59:16

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 1 / 5200 MHz



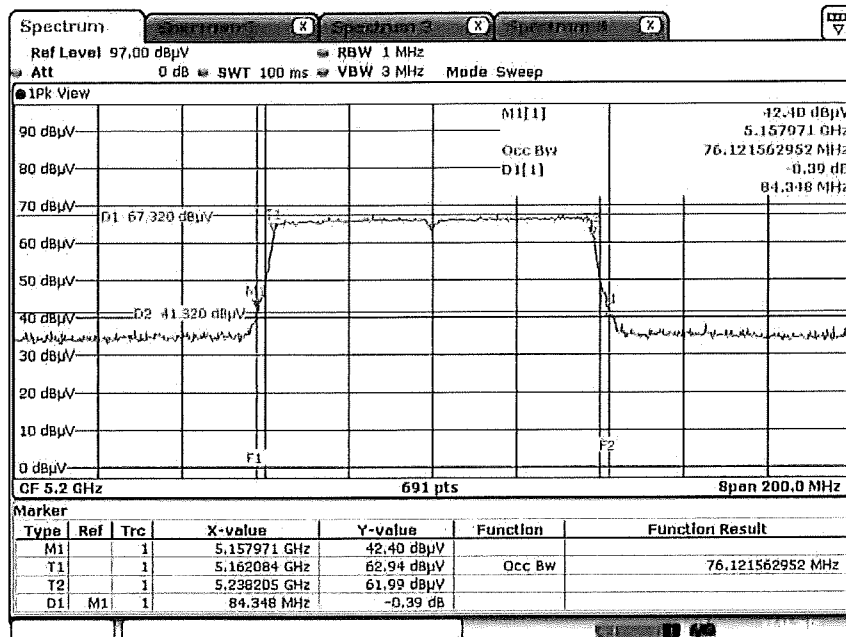
Date: 22 NOV.2017 18:07:57

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 1 / 5210 MHz



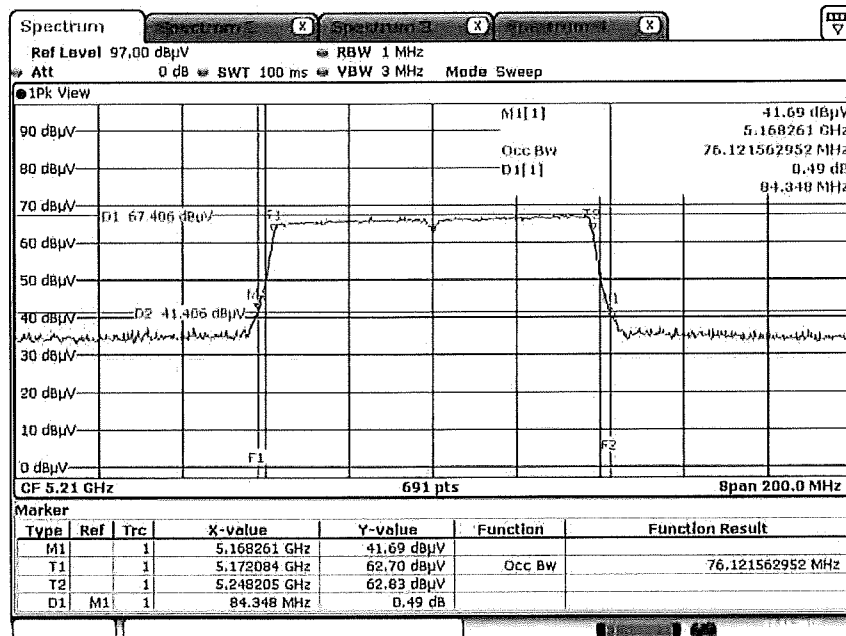
Date: 22 NOV.2017 18:08:31

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 2 / 5200 MHz

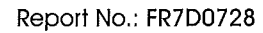


Date: 22 NOV. 2017 18:00:22

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 2 / 5210 MHz



Date: 22 NOV. 2017 18:00:50



Spectrum

Ref Level 97.00 dBμV RBW 300 kHz

Att 0 dB SWT 100 ms VBW 1 MHz Mode Sweep

● 1Pk View

90 dBμV 51.60 dBμV

80 dBμV 5.734913 GHz

70 dBμV 17.626628075 MHz

60 dBμV -0.39 dB

50 dBμV 20.2609 MHz

40 dBμV

30 dBμV

20 dBμV

10 dBμV

0 dBμV

CF 5.745 GHz 691 pts Span 60.0 MHz

Marker

| Type | Ref | Trc | X-value       | Y-value    | Function | Function Result  |
|------|-----|-----|---------------|------------|----------|------------------|
| M1   |     | 1   | 5.734913 GHz  | 51.60 dBμV |          |                  |
| T1   |     | 1   | 5.7361433 GHz | 70.84 dBμV | Occ BW   | 17.626628075 MHz |
| T2   |     | 1   | 5.7537699 GHz | 72.52 dBμV |          |                  |
| D1   | M1  | 1   | 20.2609 MHz   | -0.39 dB   |          |                  |

Spectrum

Ref Level 97.00 dBμV RBW 300 kHz

Att 0 dB SWT 100 ms VBW 1 MHz Mode Sweep

● 1Pk View

90 dBμV

80 dBμV

70 dBμV

60 dBμV

50 dBμV

40 dBμV

30 dBμV

20 dBμV

10 dBμV

0 dBμV

D1 76.748 dBμV

D2 50.748 dBμV

M1[1]

Occ Bw

D1[1]

51.46 dBμV

5.7748261 GHz

17.626628075 MHz

-0.36 dB

20.4348 MHz

F1

F2

CF 5.785 GHz

691 pts

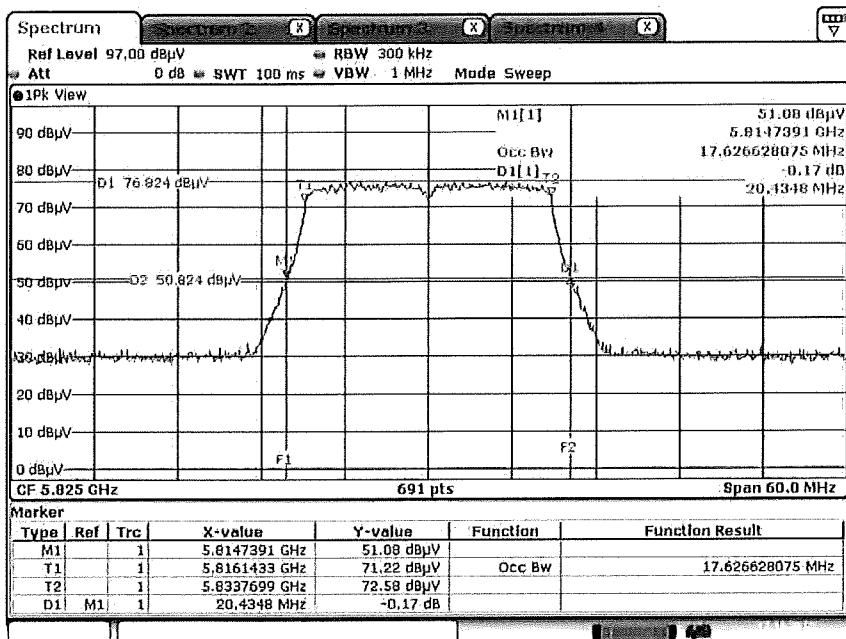
Span 50.0 MHz

Marker

| Type | Ref | Trc | X-value       | Y-value    | Function | Function Result  |
|------|-----|-----|---------------|------------|----------|------------------|
| M1   |     | 1   | 5.7748261 GHz | 51.46 dBμV |          |                  |
| T1   |     | 1   | 5.7761433 GHz | 71.19 dBμV | Occ Bw   | 17.626628075 MHz |
| T2   |     | 1   | 5.7937699 GHz | 71.33 dBμV |          |                  |
| D1   | M1  | 1   | 20.4348 MHz   | -0.36 dB   |          |                  |

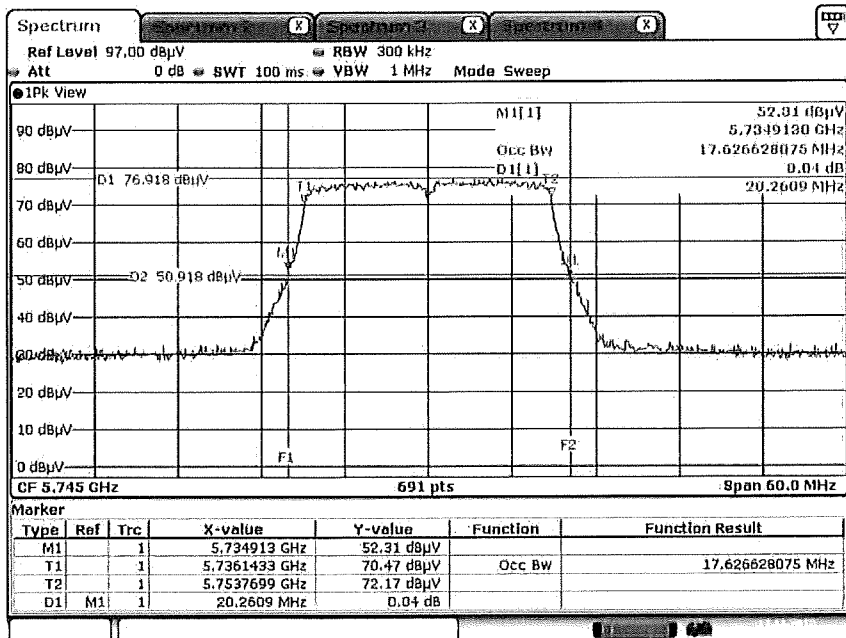
Issued Date : Dec. 27, 2017

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 1 / 5825 MHz



Date: 22.NOV.2017 17:46:58

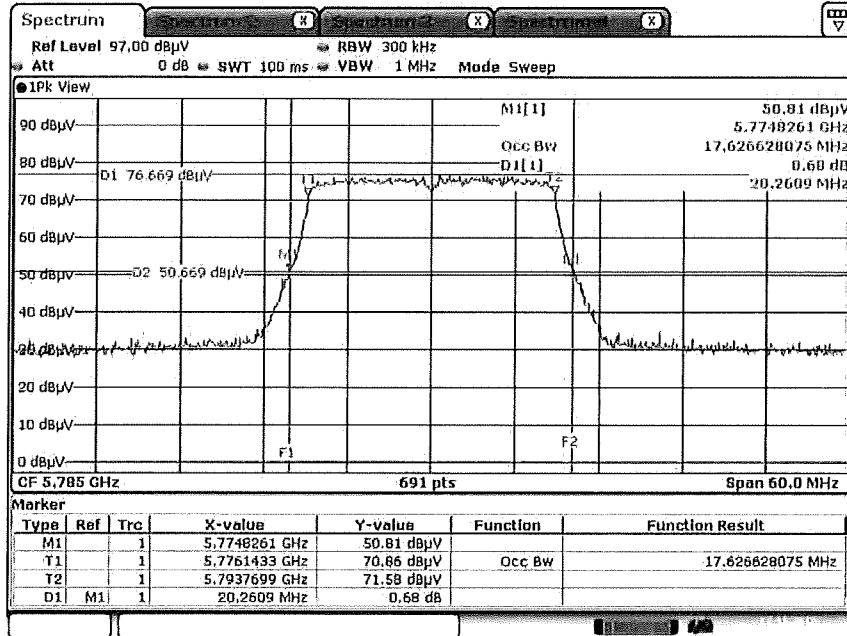
### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5745 MHz



Date: 22.NOV.2017 17:57:13

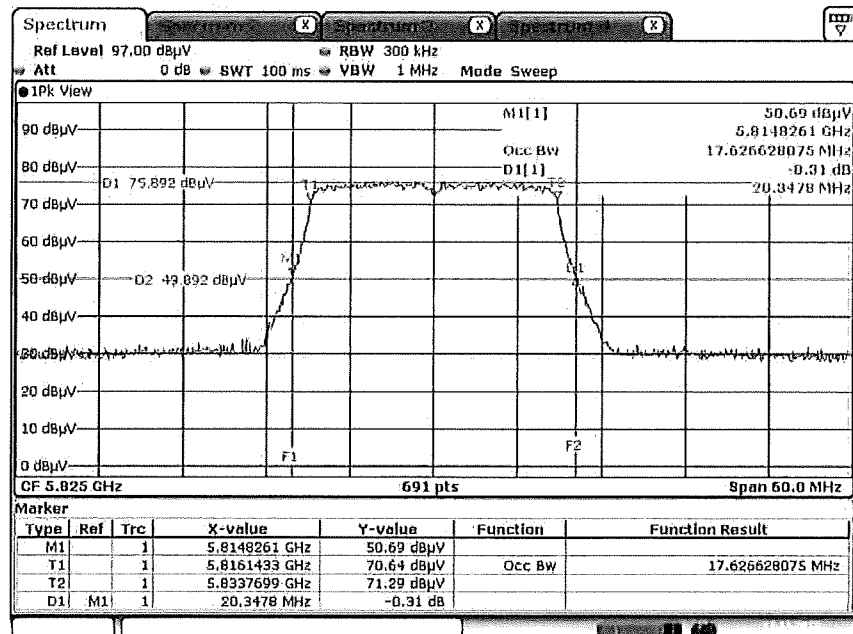


## 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5785 MHz



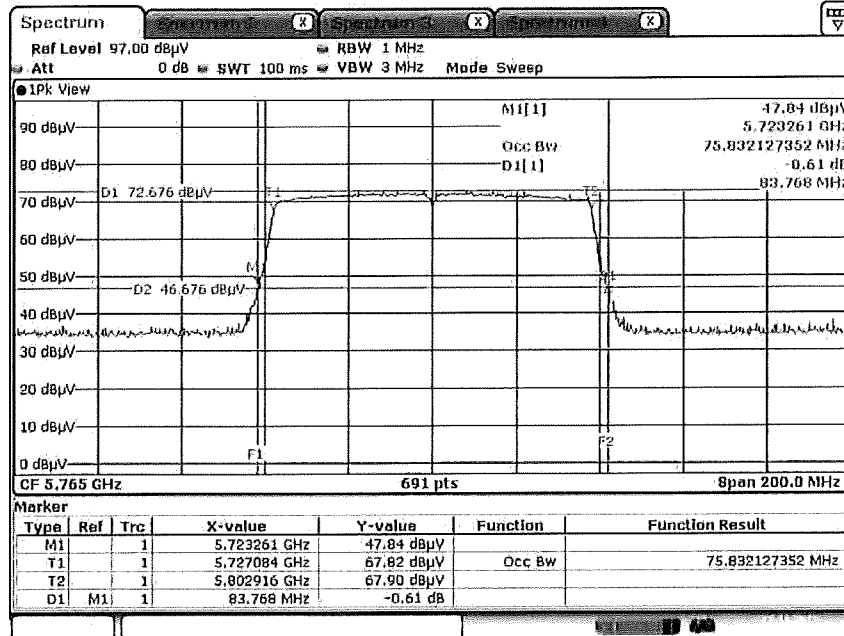
Date: 22 NOV.2017 17:56:43

## 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5825 MHz



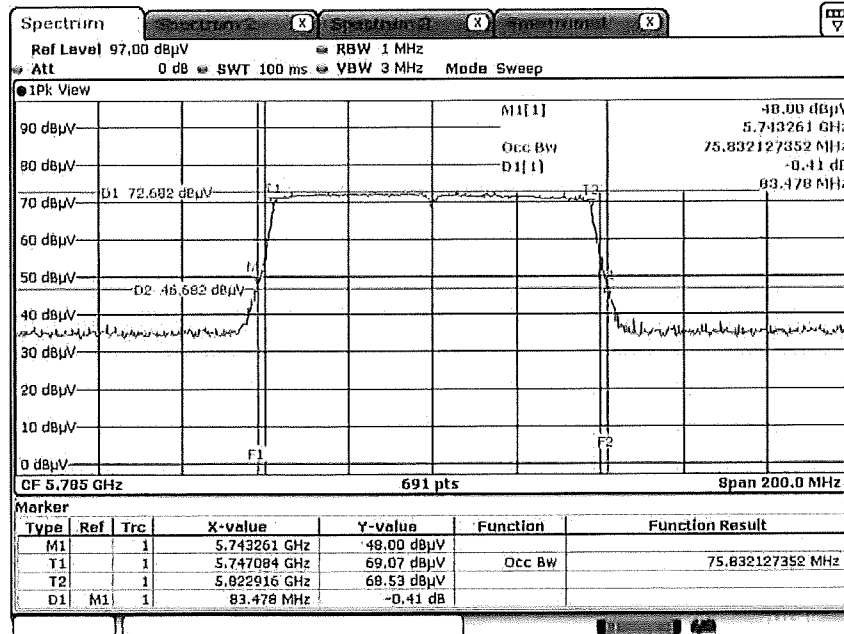
Date: 22 NOV.2017 17:58:12

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 1 / 5765 MHz



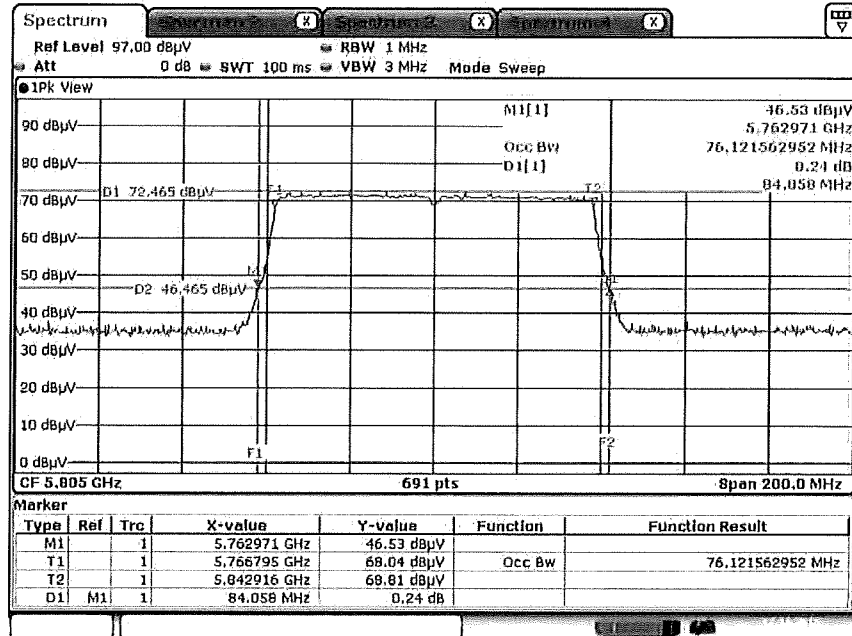
Date: 22 NOV 2017 18:07:20

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 1 / 5785 MHz



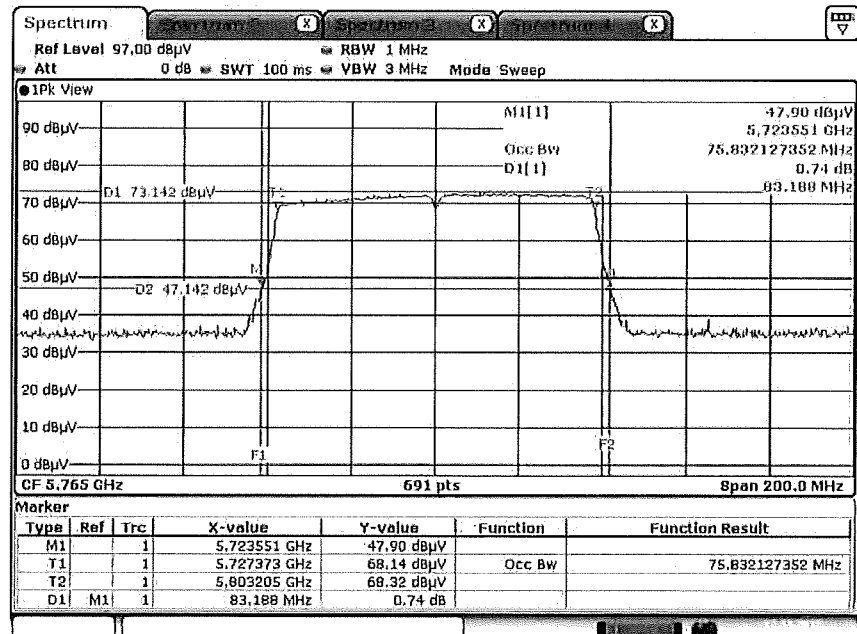
Date: 22 NOV 2017 18:07:00

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 1 / 5805MHz



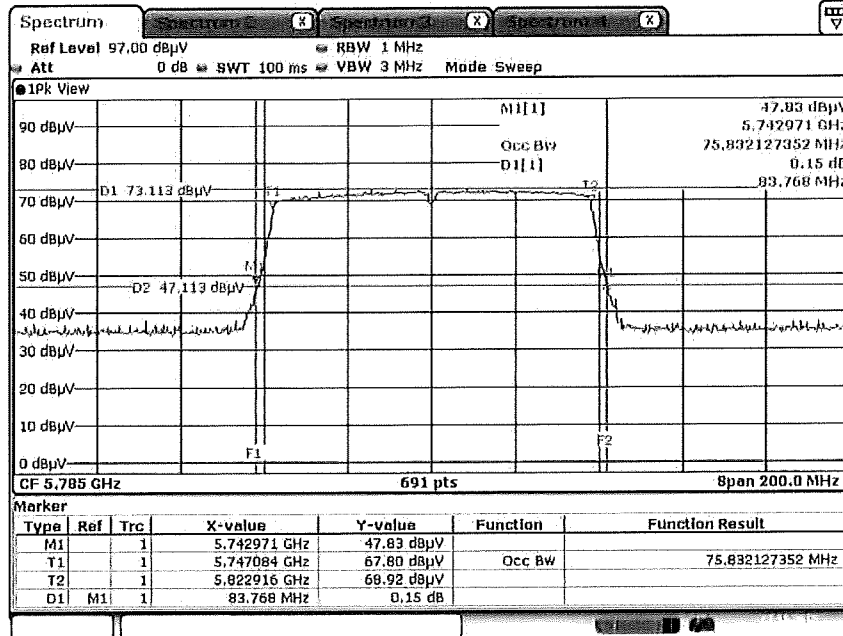
Date: 22.NOV.2017 18:06:42

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 2 / 5765 MHz



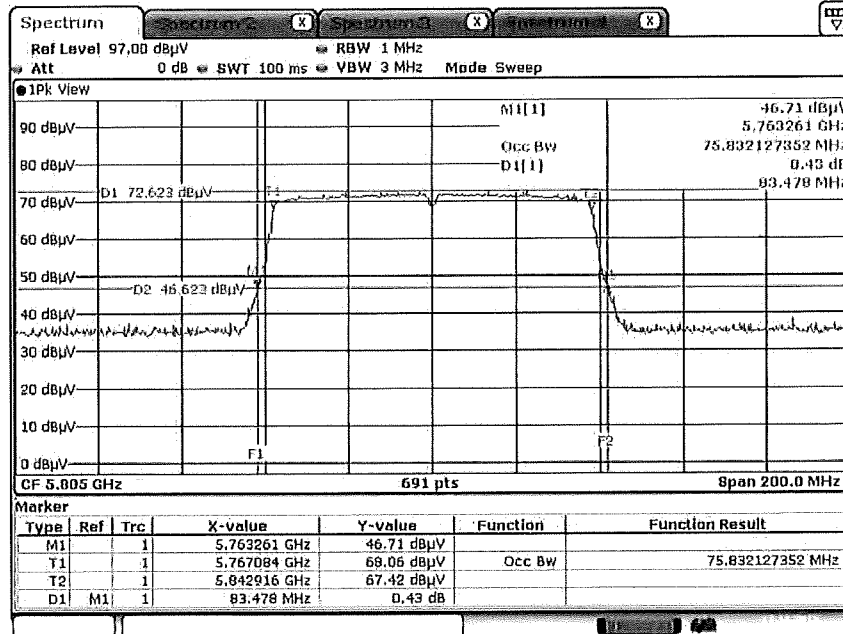
Date: 22.NOV.2017 18:01:30

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 2 / 5785MHz



Date: 22 NOV. 2017 18:01:50

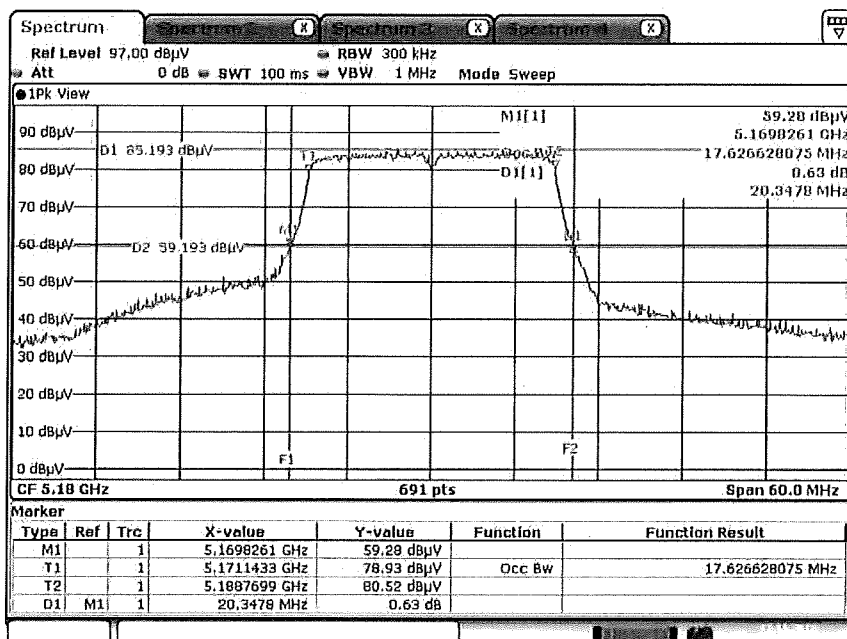
### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 2 / 5805MHz



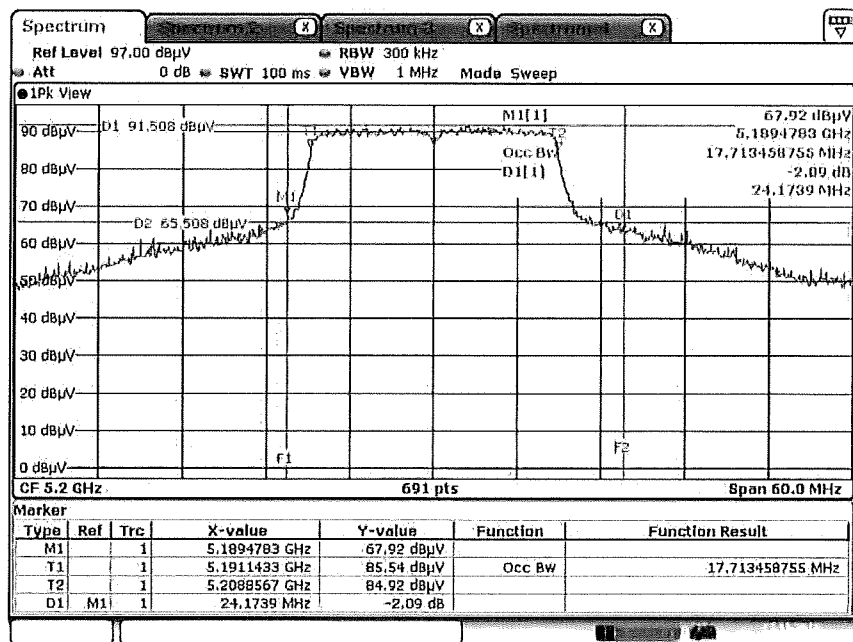
Date: 22 NOV. 2017 18:02:10

For Antenna 3:

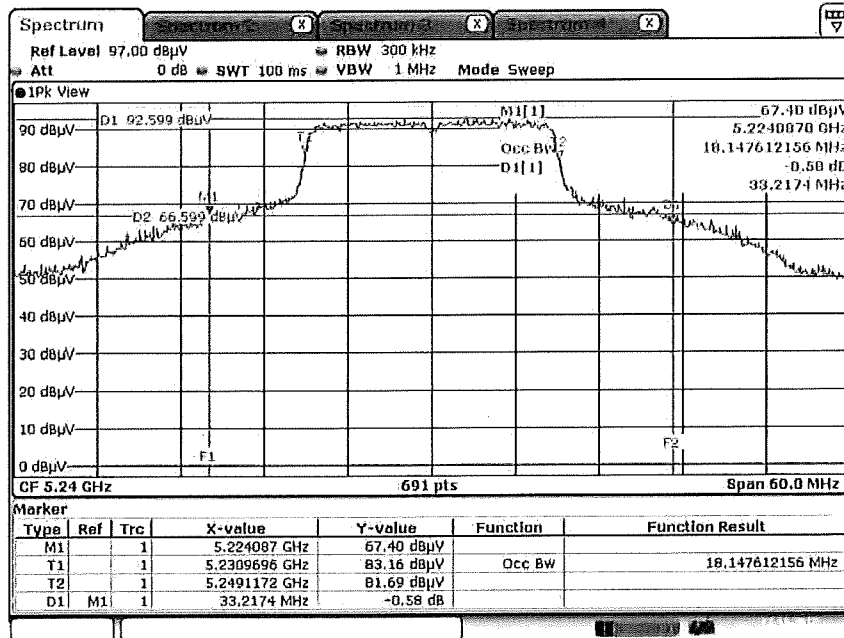
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 1 / 5180 MHz



26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 1 / 5200 MHz

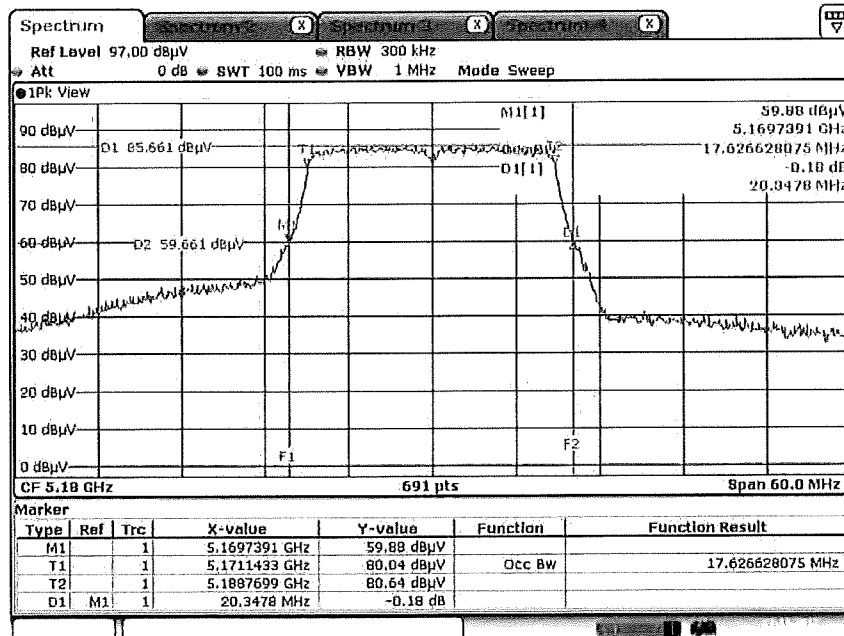


### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 1 / 5240 MHz



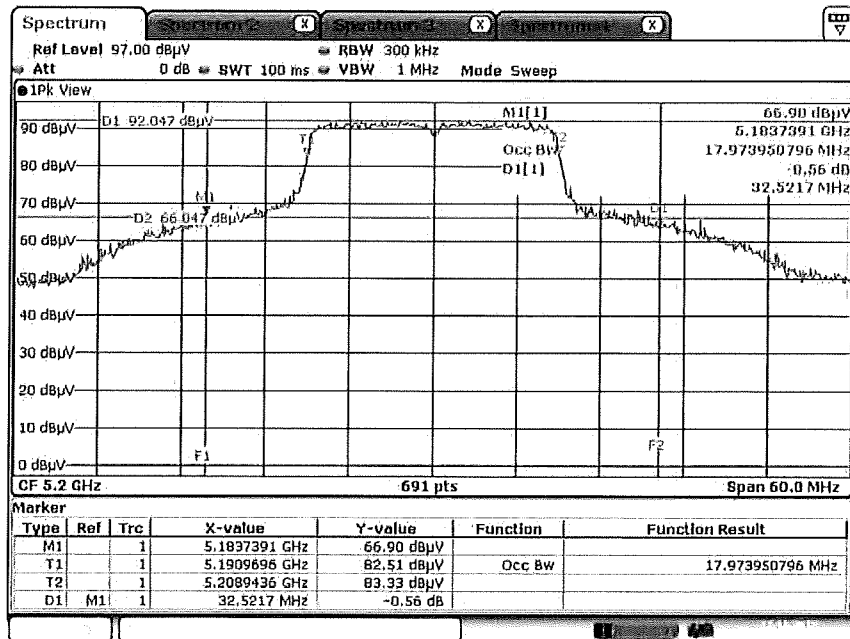
Date: 22.NOV.2017 16:18:28

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5180 MHz



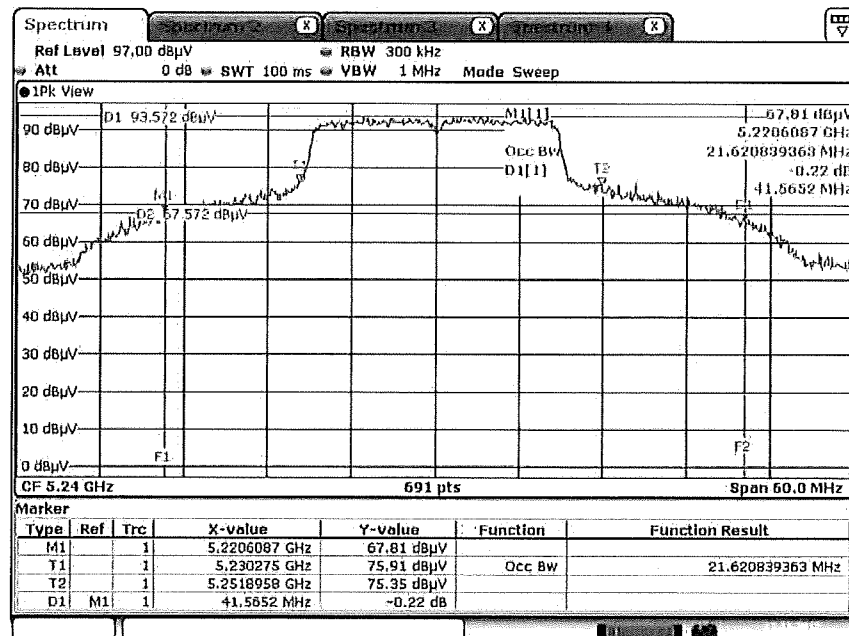
Date: 22.NOV.2017 16:08:15

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5200 MHz



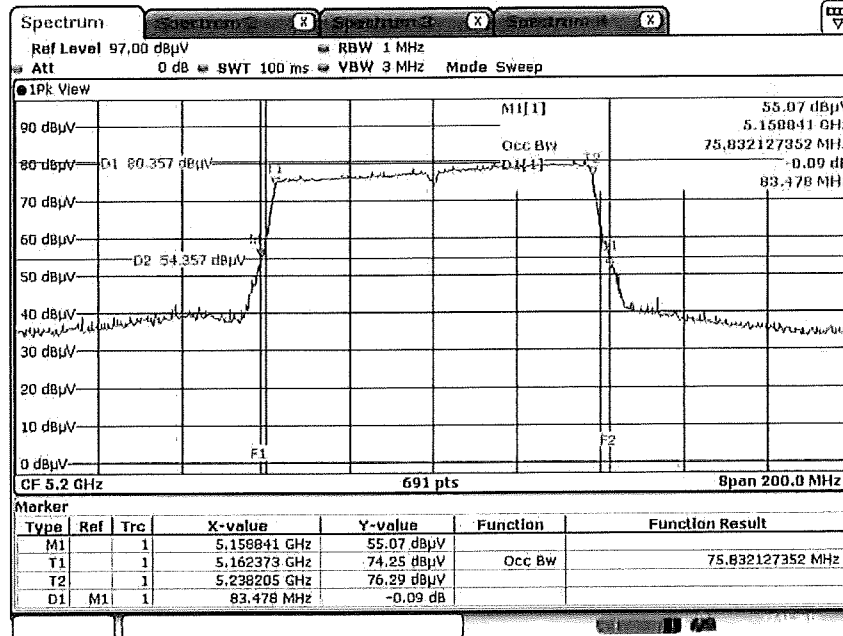
Date: 22 NOV.2017 16:07:00

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5240 MHz

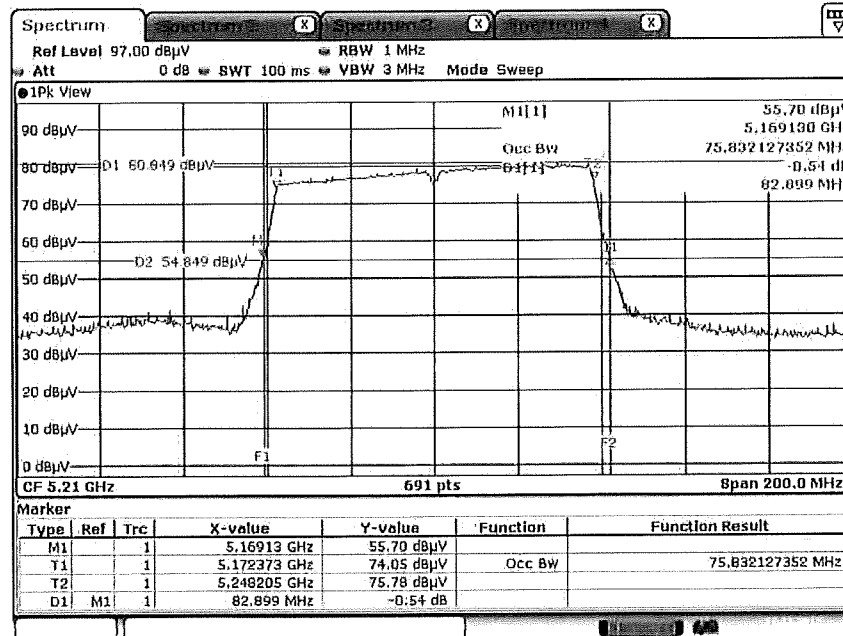


Date: 22 NOV.2017 16:07:46

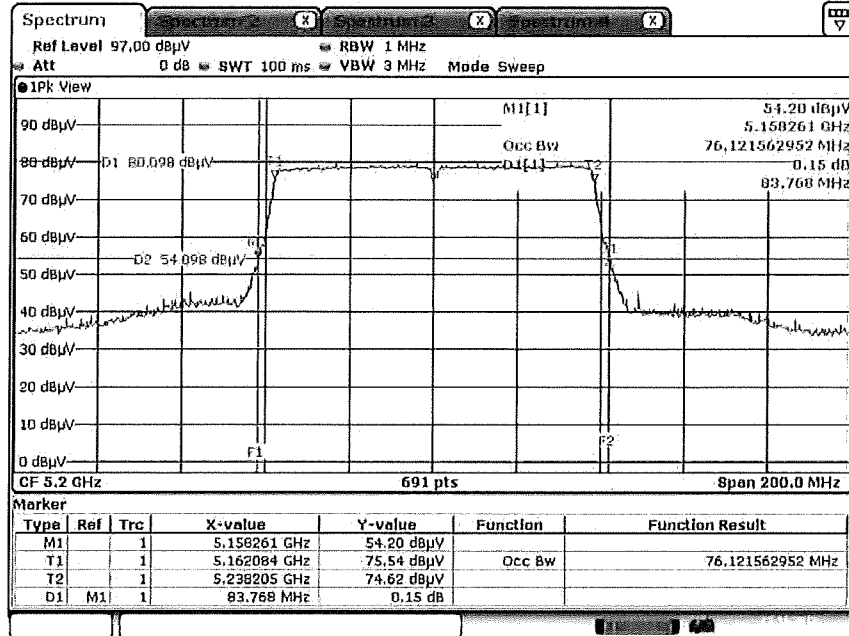
### 26dB Bandwidth and 99% Occupied Bandwidth Plot on QPSK, 80M / Port 1 / 5200 MHz



### 26dB Bandwidth and 99% Occupied Bandwidth Plot on QPSK, 80M / Port 1 / 5210 MHz

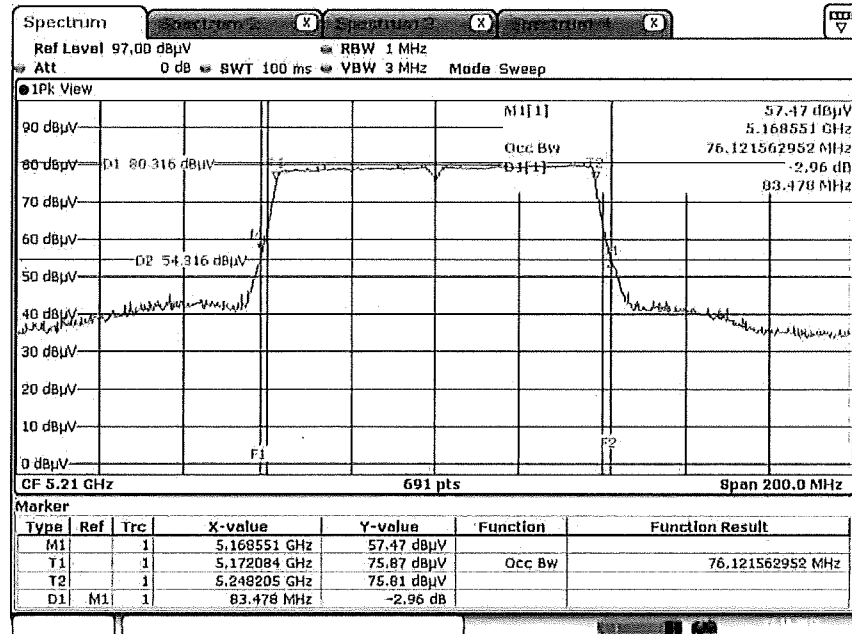


### 26dB Bandwidth and 99% Occupied Bandwidth Plot on QPSK, 80M / Port 2 / 5200 MHz



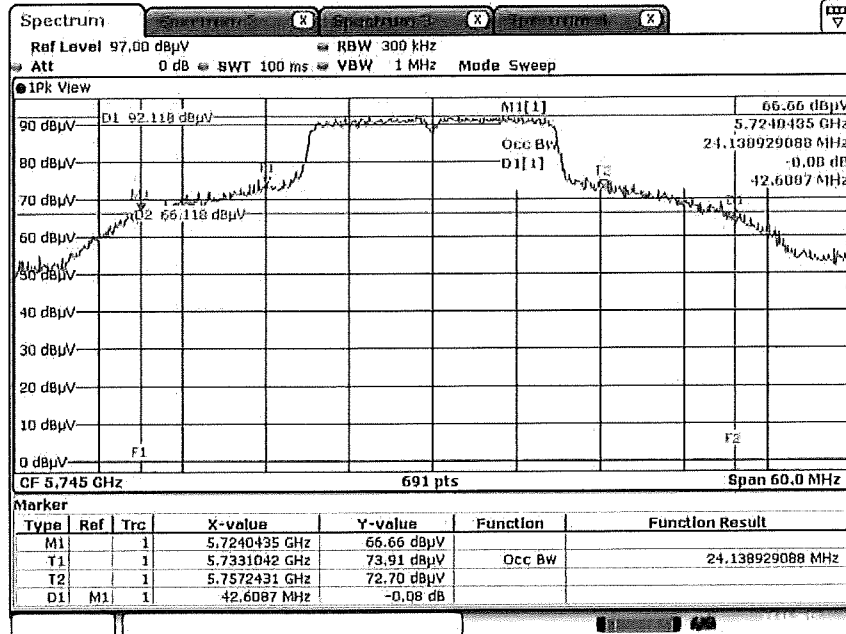
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### 26dB Bandwidth and 99% Occupied Bandwidth Plot on QPSK, 80M / Port 2 / 5210 MHz



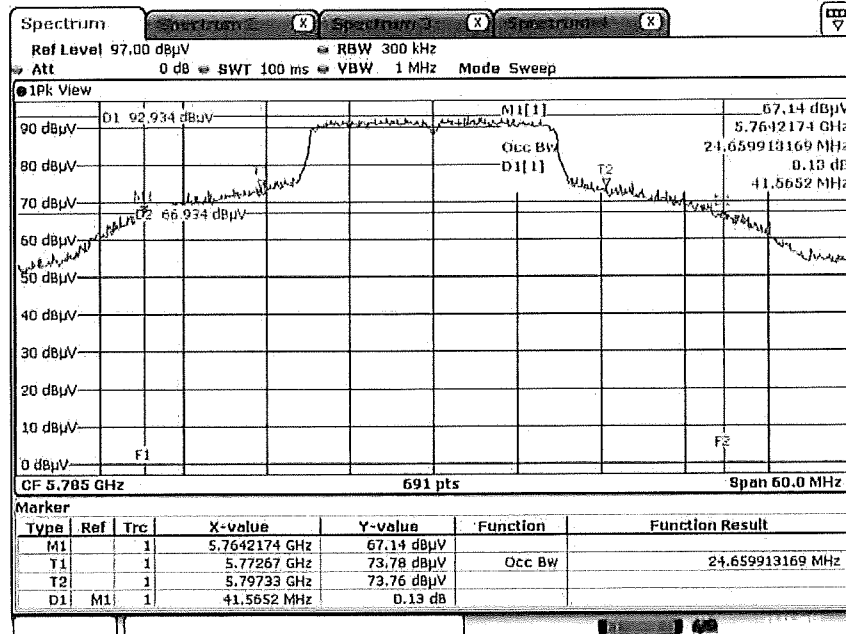
Date: 22.NOV.2017 17:12:51

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 1 / 5745 MHz



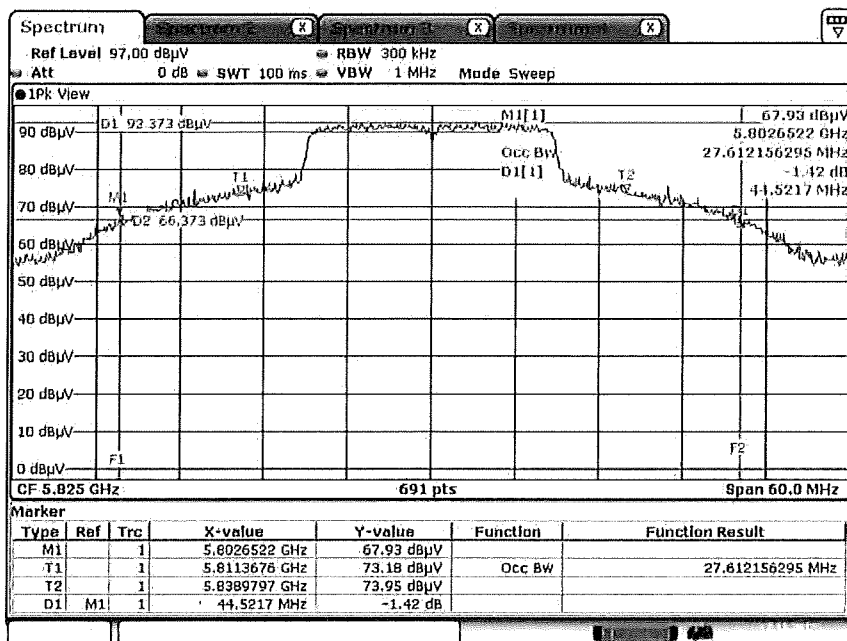
Date: 22 NOV 2017 18:15:31

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 1 / 5785MHz



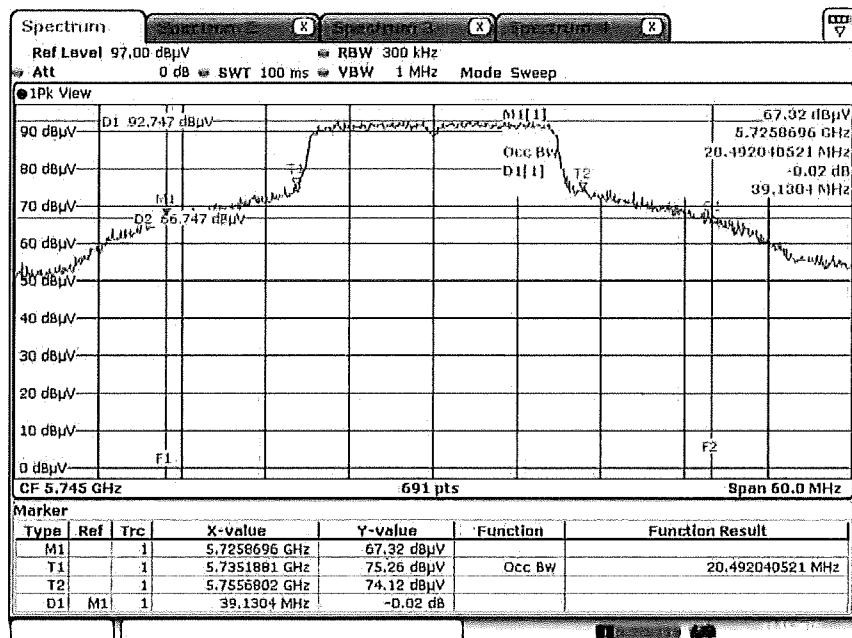
Date: 22 NOV 2017 18:15:58

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 1 / 5825 MHz



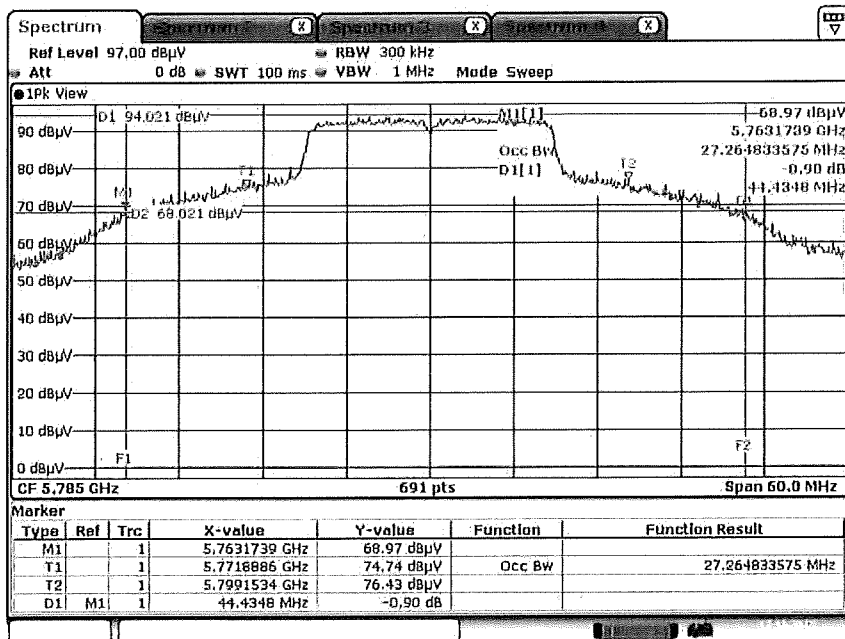
Date: 22 NOV.2017 16:16:29

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5745 MHz



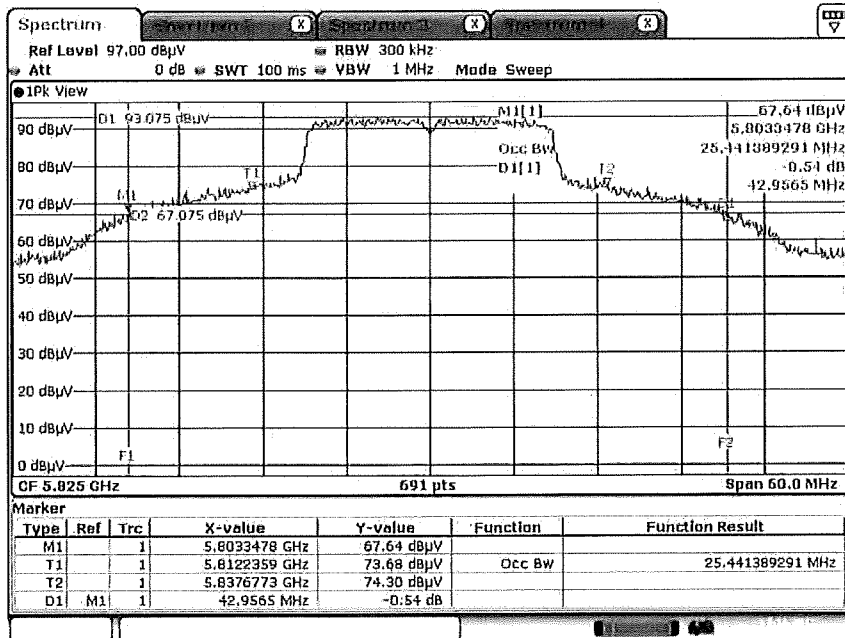
Date: 22 NOV.2017 16:08:59

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5785 MHz



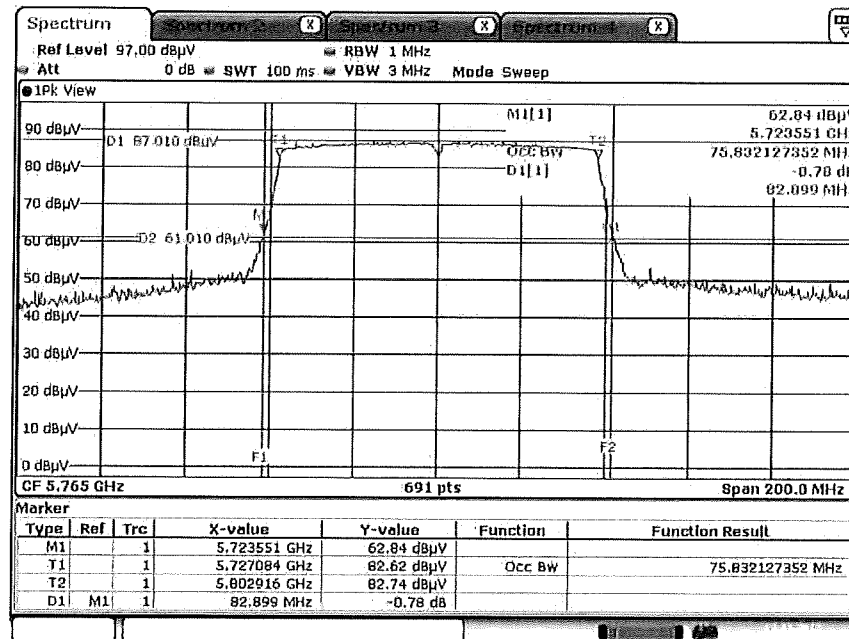
Date: 22 NOV.2017 16:09:29

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 20M / Port 2 / 5825 MHz



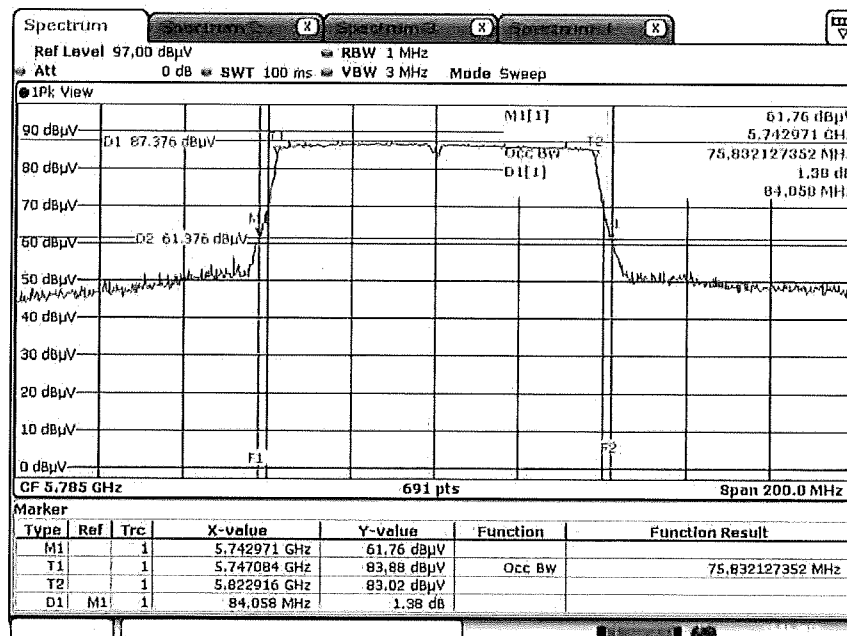
Date: 22 NOV.2017 16:10:06

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 1 / 5765 MHz



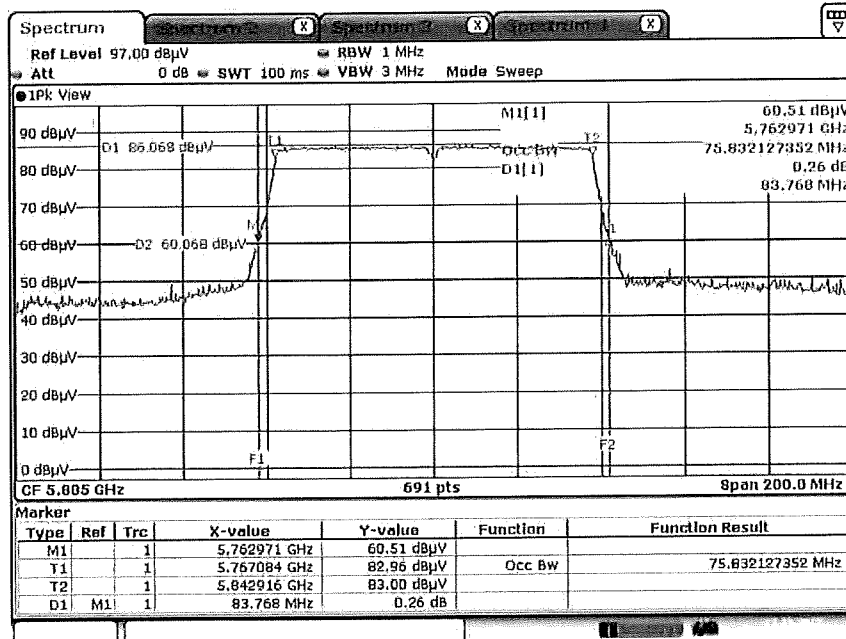
Date: 22.NOV.2017 17:01:25

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 1 / 5785 MHz



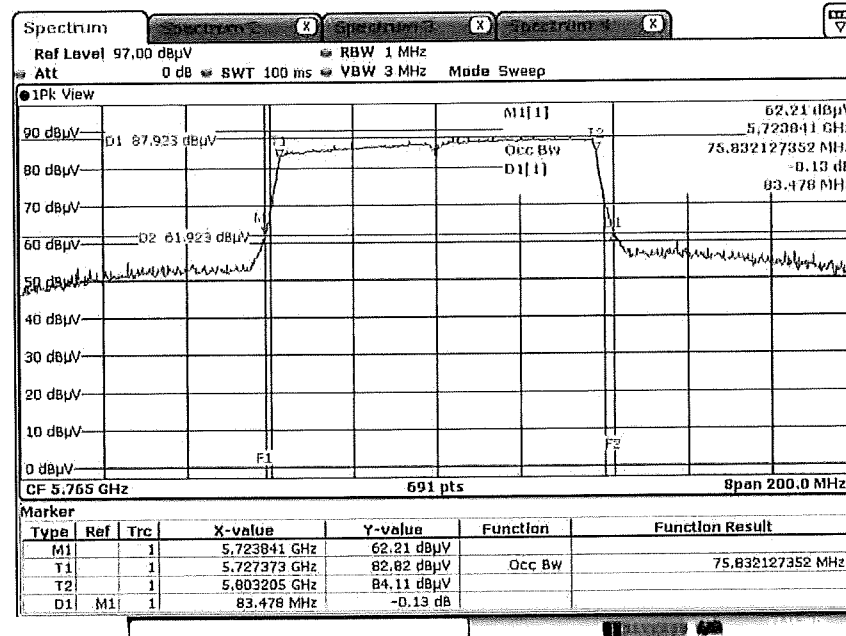
Date: 22.NOV.2017 17:02:31

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 1 / 5805MHz



Date: 22 NOV 2017 17:03:29

### 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration QPSK, 80M / Port 2 / 5765 MHz



Date: 22 NOV 2017 17:17:41