

# Appendix

## 2.4G WLAN

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## 1 Equipment List

| Conducted Emission   |                                    |                  |               |              |              |
|----------------------|------------------------------------|------------------|---------------|--------------|--------------|
| Test Equipment       | Manufacturer                       | Model No.        | Inventory No. | Cal. date    | Cal.Duedate  |
|                      |                                    |                  |               | (yyyy-mm-dd) | (yyyy-mm-dd) |
| Shielding Room       | ZhongYu Electron                   | GB-88            | SEM001-06     | 2017/5/10    | 2020/5/9     |
| LISN                 | Rohde & Schwarz                    | ENV216           | SEM007-01     | 2018/9/2     | 2019/9/2     |
| LISN                 | ETS-LINDGREN                       | Feb-16           | SEM007-02     | 2018/4/2     | 2019/4/1     |
|                      |                                    |                  |               | 2019/4/1     | 2020/3/31    |
| Measurement Software | AUDIX                              | e3 V5.4.1221d    | N/A           | N/A          | N/A          |
| Coaxial Cable        | SGS                                | N/A              | SEM024-01     | 2018/7/12    | 2019/7/11    |
| 2 Line ISN           | Fischer Custom Communications Inc. | FCC-TLISN-T2-02  | EMC0122       | 2019/2/11    | 2020/2/10    |
| EMI Test Receiver    | Rohde & Schwarz                    | ESCI             | SEM004-02     | 2019/3/2     | 2020/3/1     |
| RF conducted test    |                                    |                  |               |              |              |
| Test Equipment       | Manufacturer                       | Model No.        | Inventory No. | Cal. date    | Cal.Duedate  |
|                      |                                    |                  |               | (yyyy-mm-dd) | (yyyy-mm-dd) |
| DC Power Supply      | Agilent Technologies Inc           | 66311B           | W009-09       | 2018/9/15    | 2019/9/15    |
| Signal Analyzer      | Rohde & Schwarz                    | FSV              | W025-05       | 2019/1/13    | 2020/1/12    |
| Coaxial Cable        | SGS                                | N/A              | SEM031-01     | 2018/7/13    | 2019/7/12    |
| Attenuator           | Weinschel Associates               | WA41             | SEM021-09     | N/A          | N/A          |
| Signal Generator     | KEYSIGHT                           | N5173B           | SEM006-05     | 2018/9/2     | 2019/9/2     |
| Temperature Chamber  | GIANT FORCE                        | ICT-150-40-CP-AR | W027-03       | 2018/11/27   | 2019/11/27   |
| Power Meter          | Rohde & Schwarz                    | NRVS             | SEM014-02     | 2018/9/2     | 2019/9/2     |

## 2 Measurement Uncertainty (95% confidence levels, k=2)

| No. | Item                          | Measurement Uncertainty |
|-----|-------------------------------|-------------------------|
| 1   | Total RF power, conducted     | ±0.75dB                 |
| 2   | RF power density, conducted   | ±2.84dB                 |
| 3   | Spurious emissions, conducted | ±0.75dB                 |
| 4   | Conduct emission test         | ±3.12 dB (9KHz- 30MHz)  |

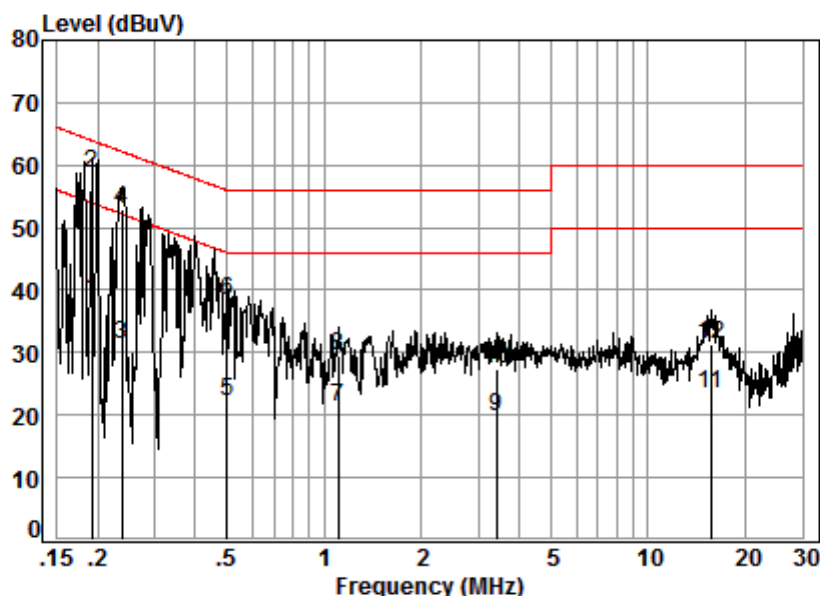
### 3 AC Power Line Conducted Emissions

#### Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

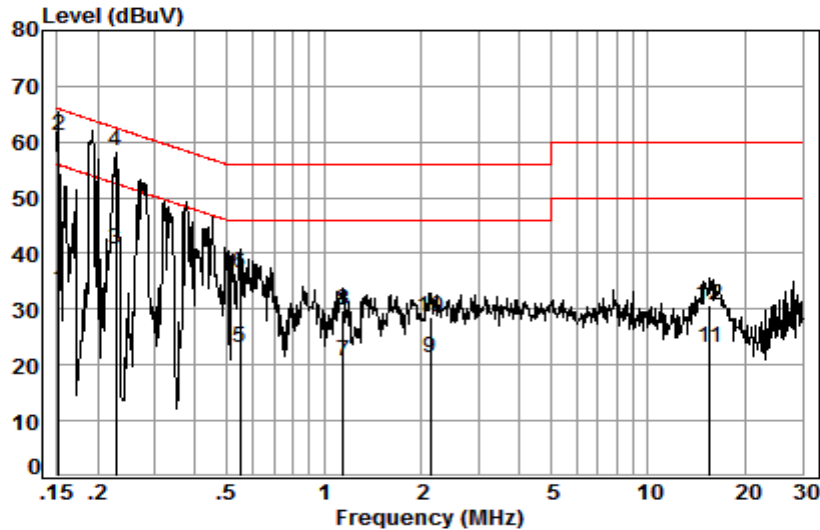
Live Line:



Site : Shielding Room  
 Condition: Line  
 Job No. : 11707CR  
 Test mode: c

|    | Freq  | Cable Loss | LISN Factor | Read Level | Level | Limit Line | Over Limit | Remark  |
|----|-------|------------|-------------|------------|-------|------------|------------|---------|
|    | MHz   | dB         | dB          | dBuV       | dBuV  | dBuV       | dB         |         |
| 1  | 0.19  | 0.02       | 9.66        | 28.79      | 38.47 | 53.98      | -15.51     | Average |
| 2  | 0.19  | 0.02       | 9.66        | 49.13      | 58.81 | 63.98      | -5.17      | QP      |
| 3  | 0.24  | 0.03       | 9.67        | 21.77      | 31.47 | 52.17      | -20.70     | Average |
| 4  | 0.24  | 0.03       | 9.67        | 43.13      | 52.83 | 62.17      | -9.34      | QP      |
| 5  | 0.50  | 0.06       | 9.67        | 12.34      | 22.07 | 46.00      | -23.93     | Average |
| 6  | 0.50  | 0.06       | 9.67        | 28.50      | 38.23 | 56.00      | -17.77     | QP      |
| 7  | 1.11  | 0.10       | 9.73        | 11.32      | 21.15 | 46.00      | -24.85     | Average |
| 8  | 1.11  | 0.10       | 9.73        | 19.72      | 29.55 | 56.00      | -26.45     | QP      |
| 9  | 3.40  | 0.16       | 9.71        | 9.79       | 19.66 | 46.00      | -26.34     | Average |
| 10 | 3.40  | 0.16       | 9.71        | 17.45      | 27.32 | 56.00      | -28.68     | QP      |
| 11 | 15.63 | 0.21       | 10.31       | 12.99      | 23.51 | 50.00      | -26.49     | Average |
| 12 | 15.63 | 0.21       | 10.31       | 20.67      | 31.19 | 60.00      | -28.81     | QP      |

Neutral Line:



Site : Shielding Room

Condition: Neutral

Job No. : 11707CR

Test mode: c

|    | Freq  | Cable Loss | LISN Factor | Read Level | Level | Limit Line | Over Limit | Remark  |
|----|-------|------------|-------------|------------|-------|------------|------------|---------|
|    | MHz   | dB         | dB          | dBuV       | dBuV  | dBuV       | dB         |         |
| 1  | 0.15  | 0.01       | 9.63        | 23.89      | 33.53 | 55.91      | -22.38     | Average |
| 2  | 0.15  | 0.01       | 9.63        | 51.37      | 61.01 | 65.91      | -4.90      | QP      |
| 3  | 0.23  | 0.03       | 9.64        | 31.00      | 40.67 | 52.52      | -11.85     | Average |
| 4  | 0.23  | 0.03       | 9.64        | 48.80      | 58.47 | 62.52      | -4.05      | QP      |
| 5  | 0.55  | 0.06       | 9.64        | 13.36      | 23.06 | 46.00      | -22.94     | Average |
| 6  | 0.55  | 0.06       | 9.64        | 26.70      | 36.40 | 56.00      | -19.60     | QP      |
| 7  | 1.15  | 0.10       | 9.70        | 10.94      | 20.74 | 46.00      | -25.26     | Average |
| 8  | 1.15  | 0.10       | 9.70        | 20.02      | 29.82 | 56.00      | -26.18     | QP      |
| 9  | 2.13  | 0.16       | 9.69        | 11.43      | 21.28 | 46.00      | -24.72     | Average |
| 10 | 2.13  | 0.16       | 9.69        | 18.72      | 28.57 | 56.00      | -27.43     | QP      |
| 11 | 15.55 | 0.21       | 10.34       | 12.69      | 23.24 | 50.00      | -26.76     | Average |
| 12 | 15.55 | 0.21       | 10.34       | 20.12      | 30.67 | 60.00      | -29.33     | QP      |

Remarks:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

## 4 Duty Cycle

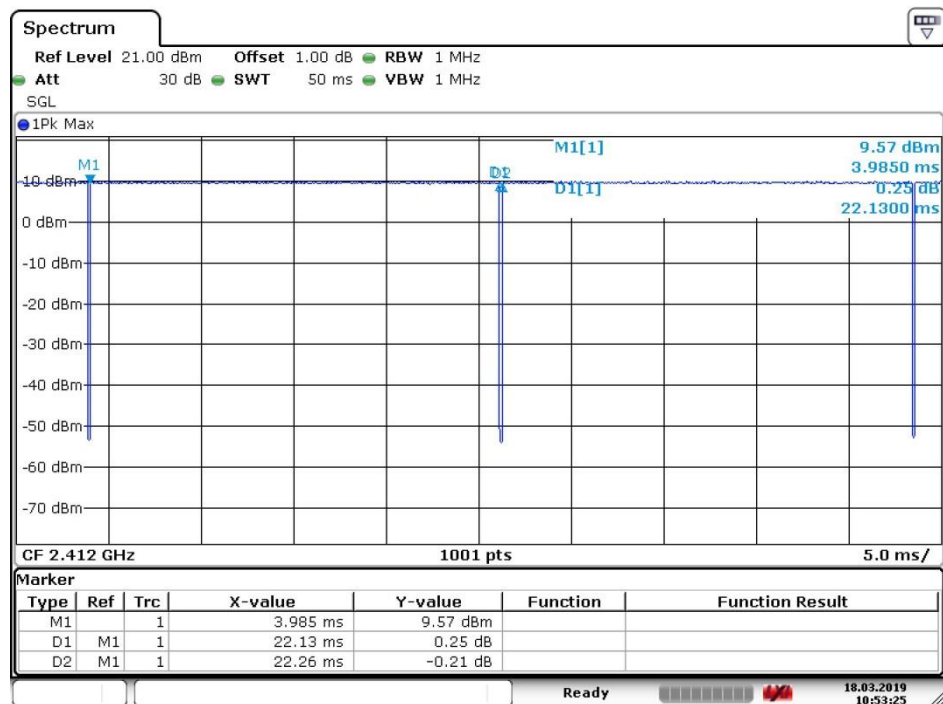
### 4.1 Test Results

| Test Mode | TX Freq. [MHz] | Duty cycle [%] |
|-----------|----------------|----------------|
| 11B       | Ant 1: CH1     | 99.42          |
| 11G       | Ant 1: CH1     | 95.34          |
| 11N20     | Ant 1: CH1     | 99.25          |
| 11N40     | Ant 1: CH3     | 97.59          |

### 4.2 Test Plots

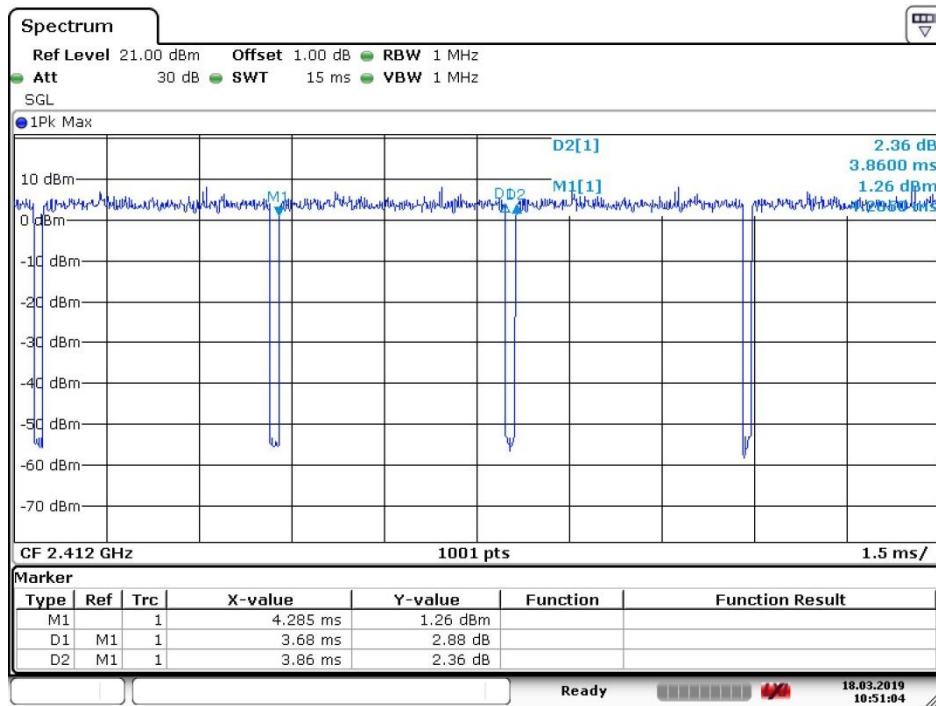
ANT1

11B



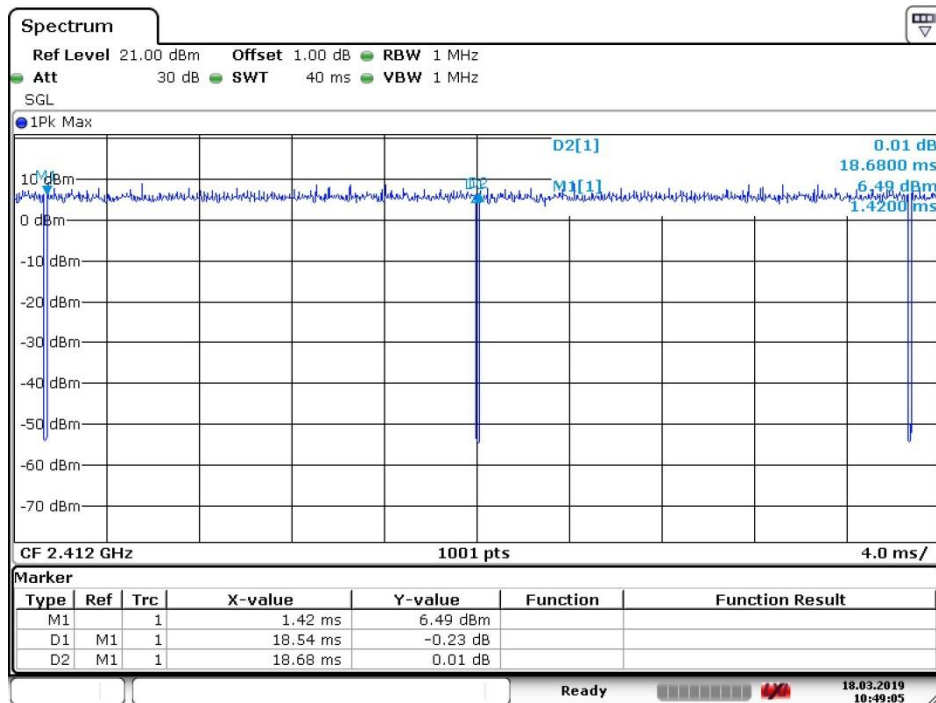
Date: 18.MAR.2019 10:53:26

11G



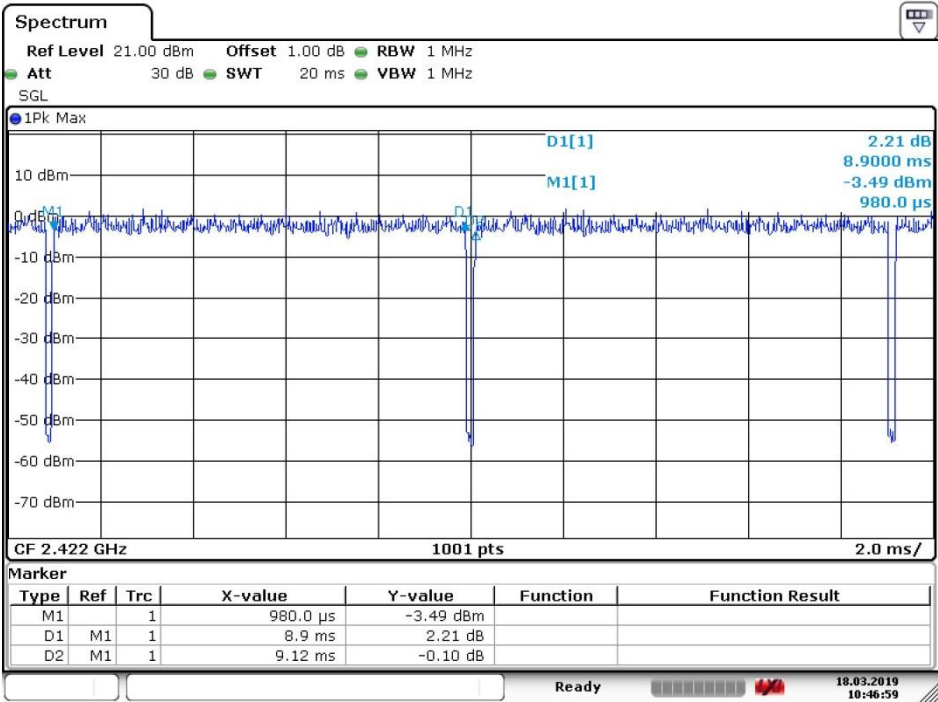
Date: 18.MAR.2019 10:51:04

11N20



Date: 18.MAR.2019 10:49:05

11N40



Date: 18.MAR.2019 10:46:59

## 5 Conducted Output Power

### 5.1 Test Results

Measurement Data of Peak Power:

| Mode      | Test Channel | Peak Output Power (dBm) | Limit (dBm) | Result |
|-----------|--------------|-------------------------|-------------|--------|
| 802.11B   | Lowest       | 19.80                   | 30.00       | Pass   |
|           | Middle       | 19.94                   | 30.00       | Pass   |
|           | Highest      | 20.27                   | 30.00       | Pass   |
| 802.11G   | Lowest       | 21.46                   | 30.00       | Pass   |
|           | Middle       | 21.43                   | 30.00       | Pass   |
|           | Highest      | 21.74                   | 30.00       | Pass   |
| 802.11N20 | Lowest       | 20.53                   | 30.00       | Pass   |
|           | Middle       | 20.66                   | 30.00       | Pass   |
|           | Highest      | 20.83                   | 30.00       | Pass   |
| 802.11N40 | Lowest       | 19.61                   | 30.00       | Pass   |
|           | Middle       | 19.69                   | 30.00       | Pass   |
|           | Highest      | 19.88                   | 30.00       | Pass   |

## 6 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

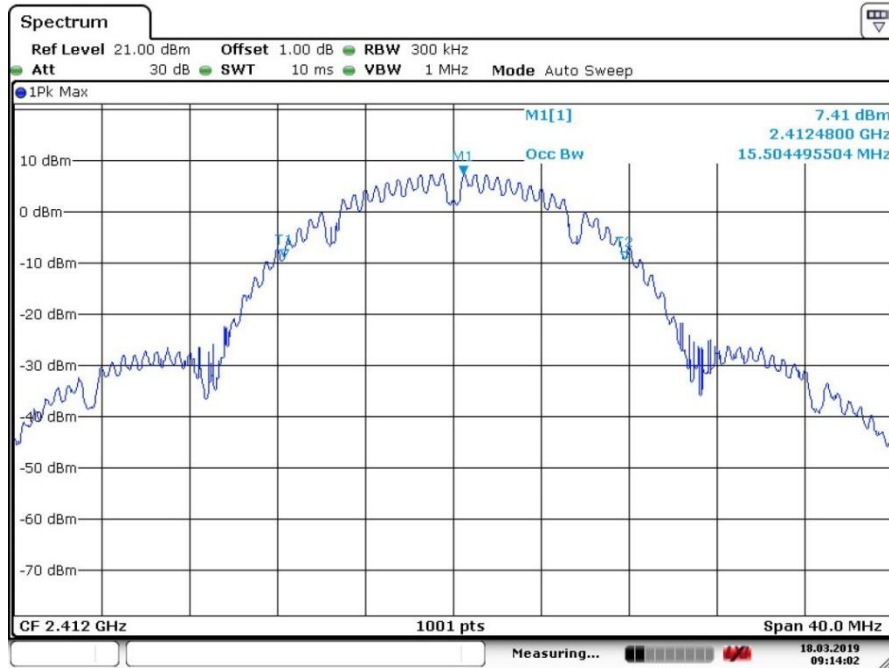
### 6.1 Test Results

| Mode      | Test Channel | Occupied Bandwidth (MHz) | 6dB Emission Bandwidth (MHz) | Limit (kHz) | Result |
|-----------|--------------|--------------------------|------------------------------|-------------|--------|
| 802.11B   | Lowest       | 15.50                    | 10.07                        | ≥500        | Pass   |
|           | Middle       | 15.50                    | 10.11                        | ≥500        | Pass   |
|           | Highest      | 16.02                    | 10.07                        | ≥500        | Pass   |
| 802.11G   | Lowest       | 17.06                    | 16.34                        | ≥500        | Pass   |
|           | Middle       | 16.98                    | 16.42                        | ≥500        | Pass   |
|           | Highest      | 17.06                    | 16.42                        | ≥500        | Pass   |
| 802.11N20 | Lowest       | 18.10                    | 17.38                        | ≥500        | Pass   |
|           | Middle       | 18.10                    | 17.38                        | ≥500        | Pass   |
|           | Highest      | 18.10                    | 17.46                        | ≥500        | Pass   |
| 802.11N40 | Lowest       | 36.36                    | 36.04                        | ≥500        | Pass   |
|           | Middle       | 36.36                    | 35.88                        | ≥500        | Pass   |
|           | Highest      | 36.36                    | 35.96                        | ≥500        | Pass   |

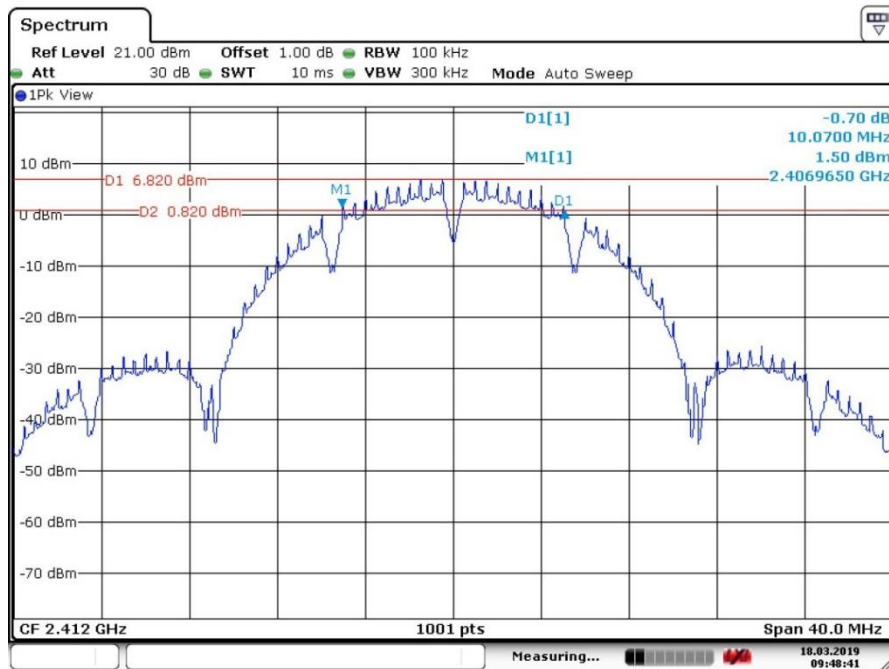
## 6.2 Test plots

ANT1

802.11B\_Lowest Channel

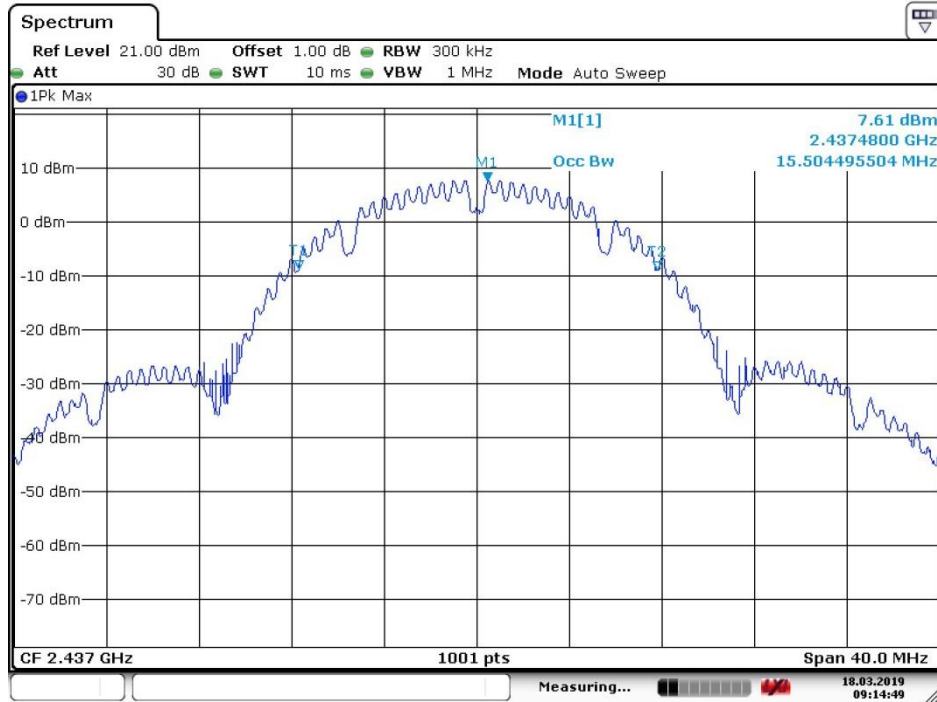


Date: 18.MAR.2019 09:14:02

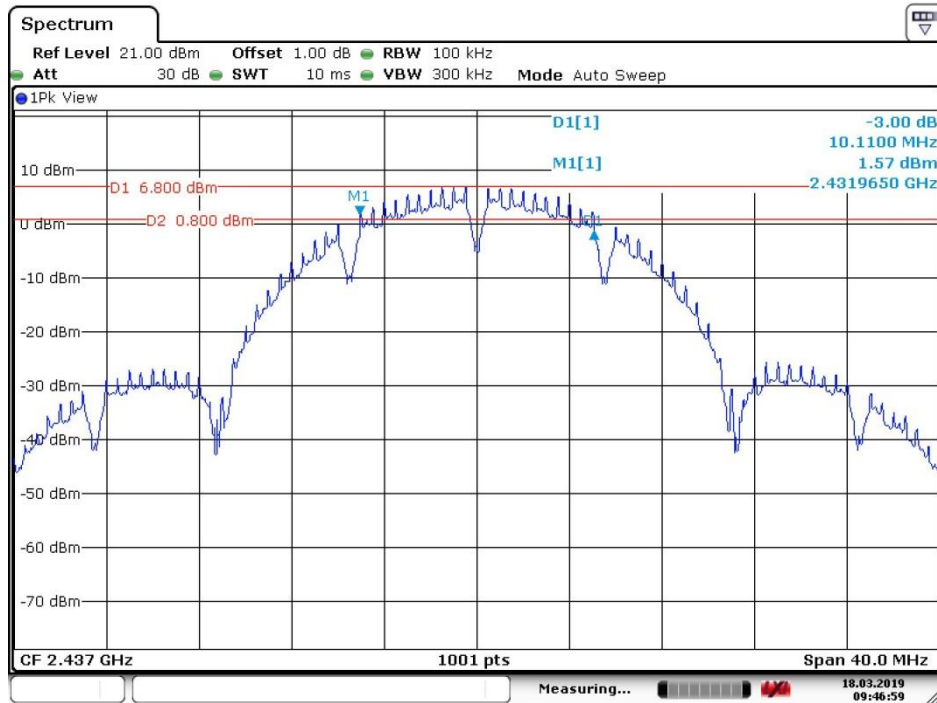


Date: 18.MAR.2019 09:48:41

## 802.11B\_Middle Channel

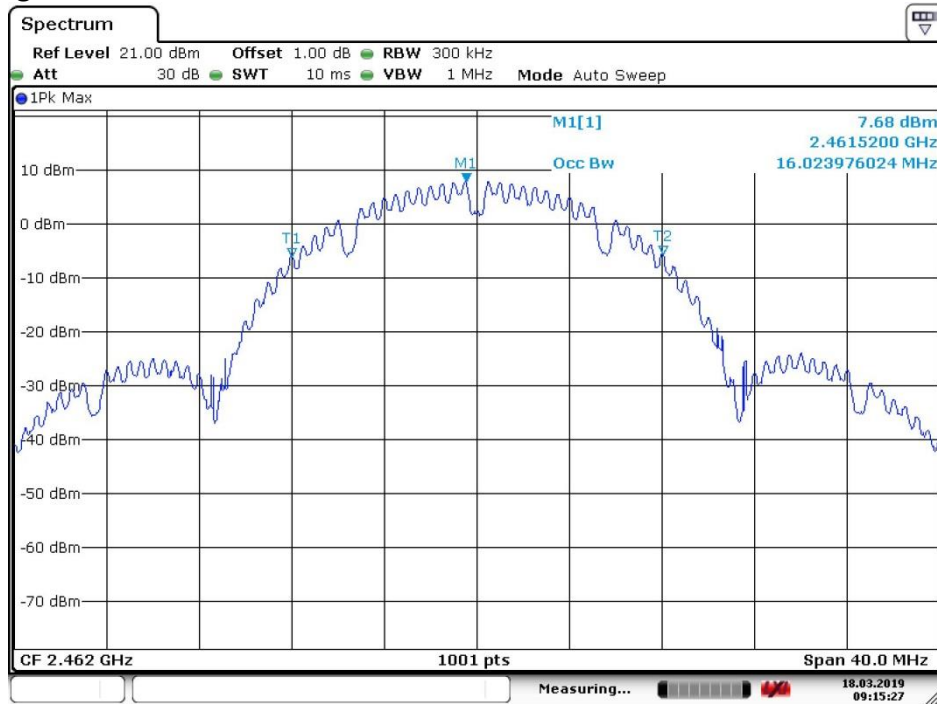


Date: 18.MAR.2019 09:14:49

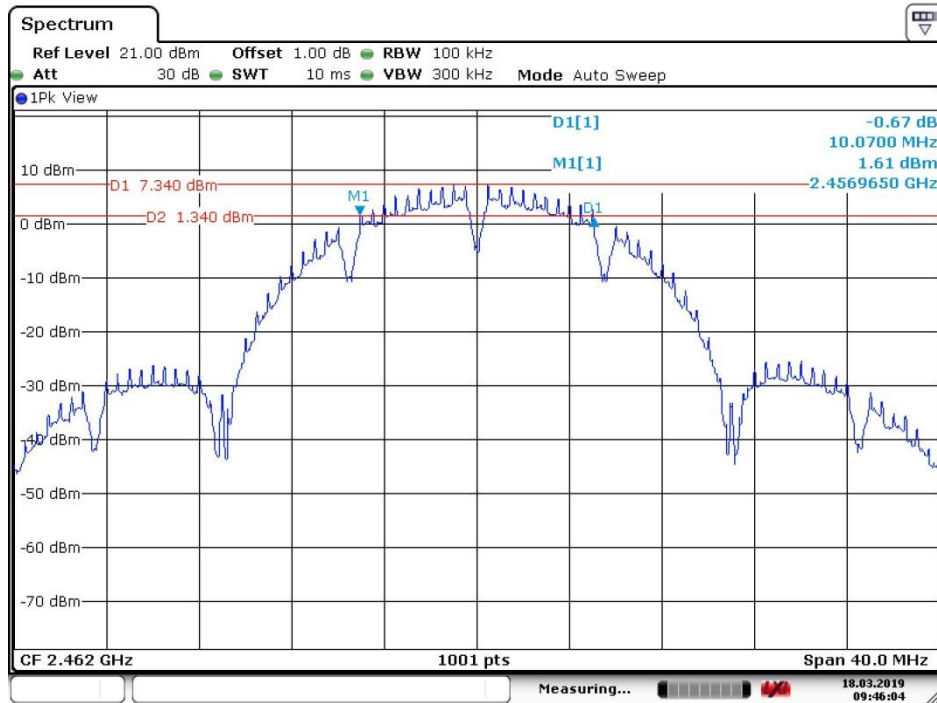


Date: 18.MAR.2019 09:47:00

## 802.11B\_Highest Channel

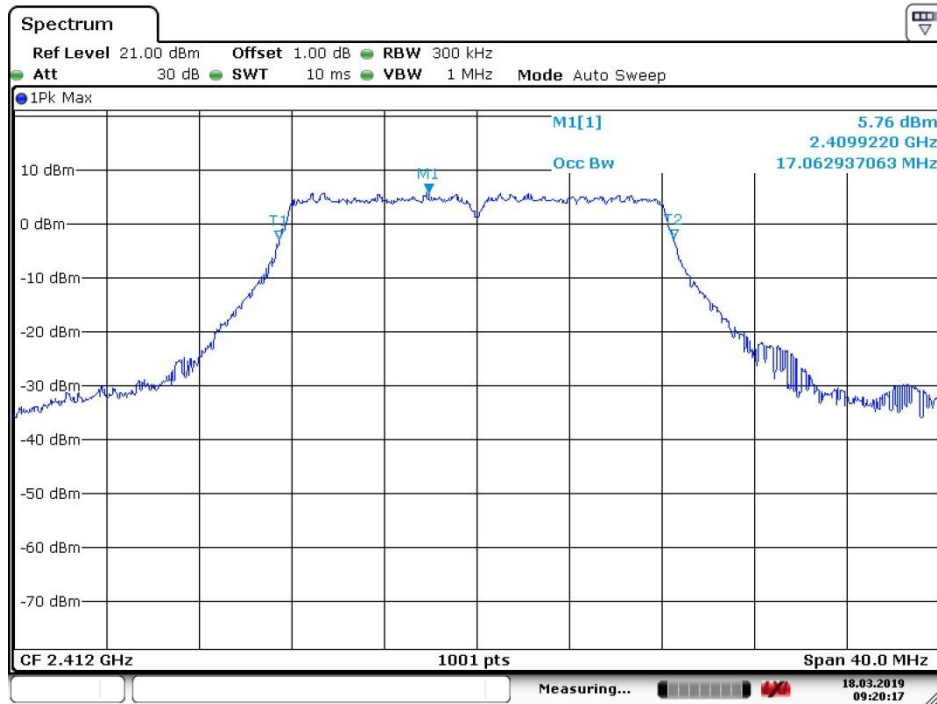


Date: 18.MAR.2019 09:15:27

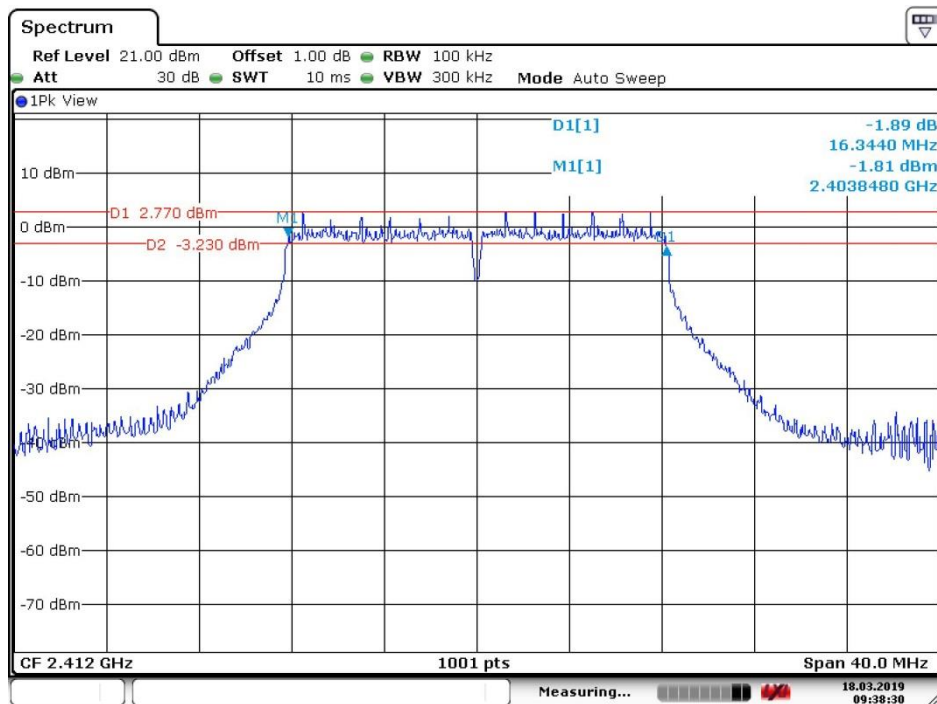


Date: 18.MAR.2019 09:46:04

## 802.11G\_Lowest Channel

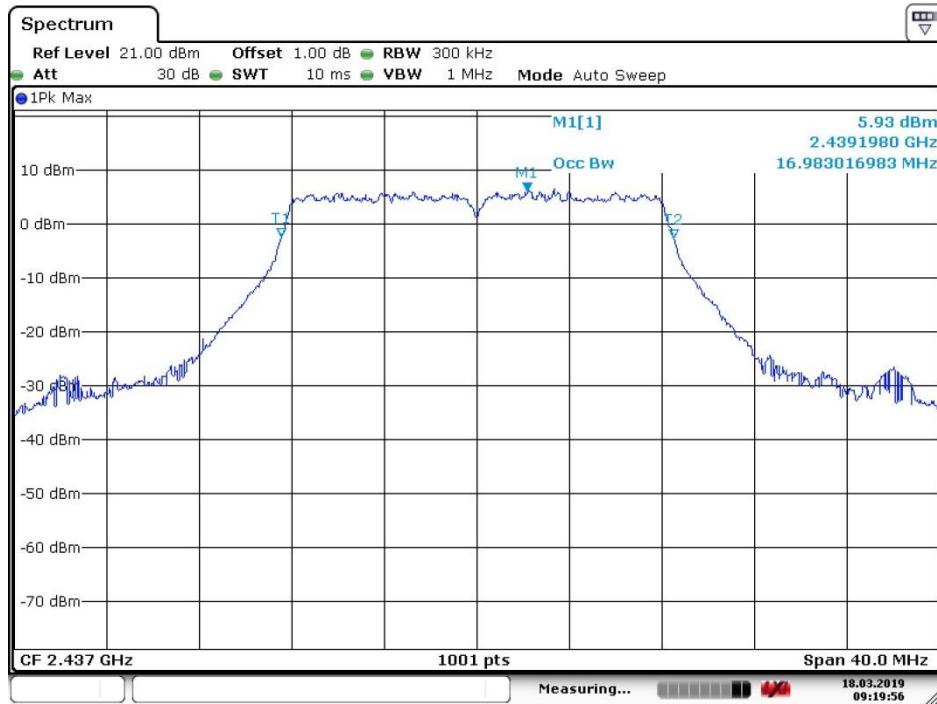


Date: 18.MAR.2019 09:20:17

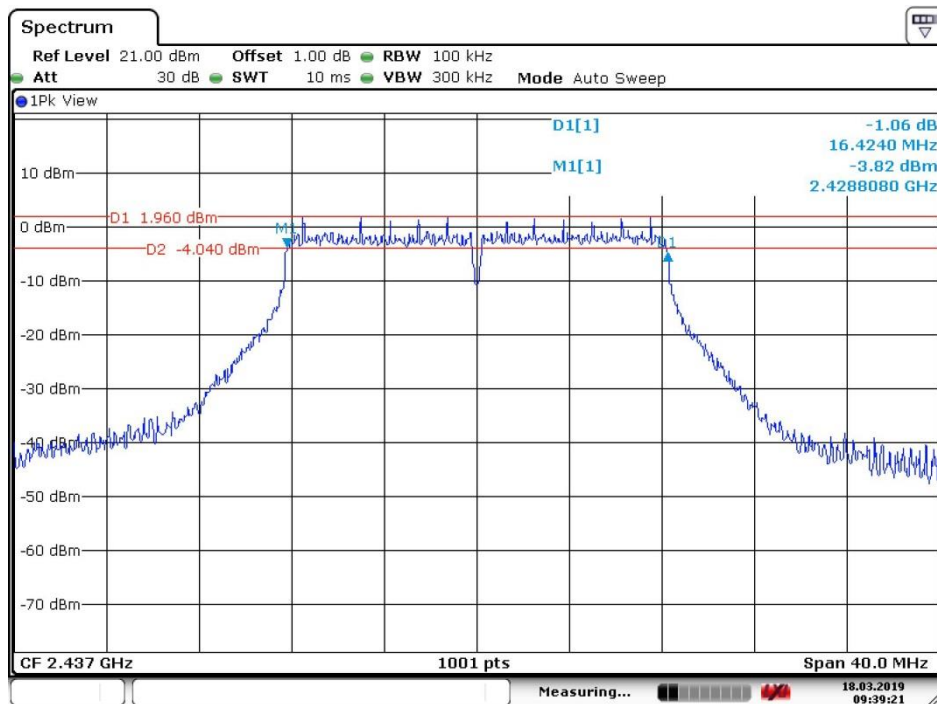


Date: 18.MAR.2019 09:38:31

## 802.11G\_Middle Channel

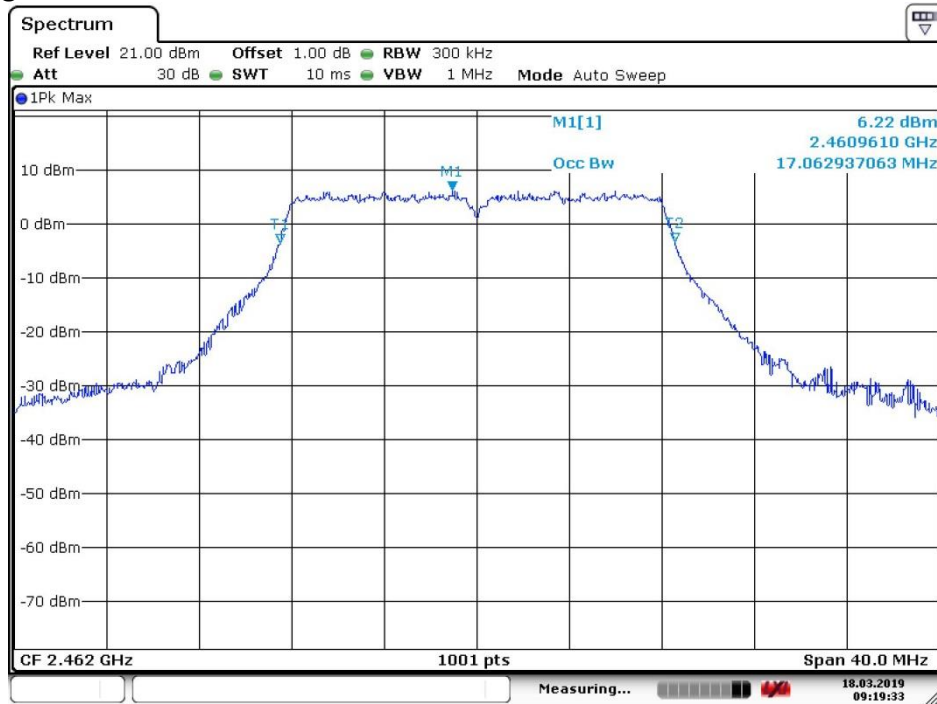


Date: 18.MAR.2019 09:19:56

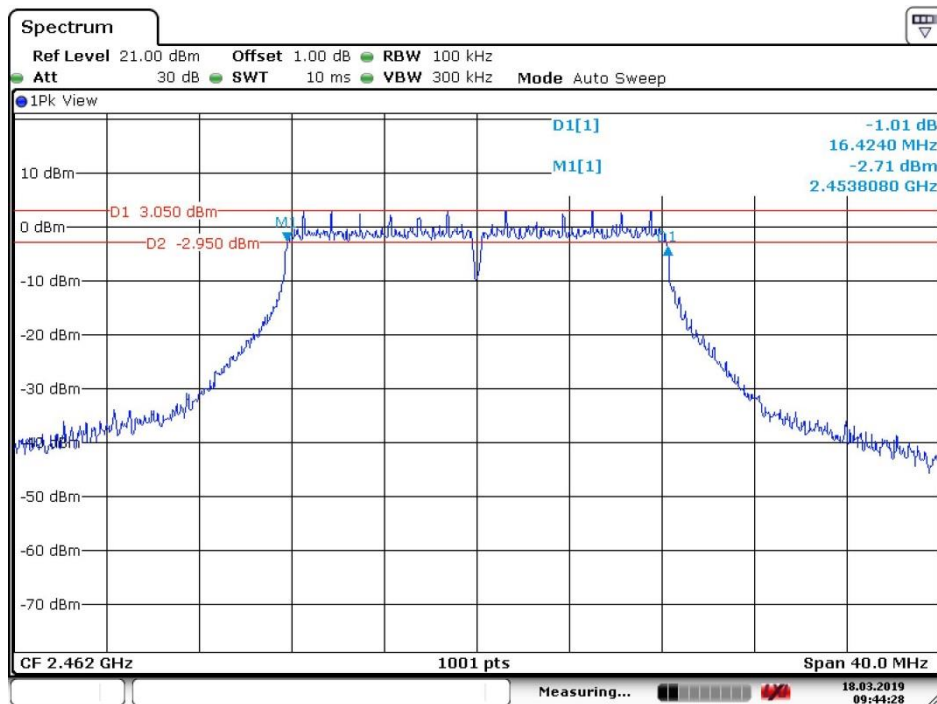


Date: 18.MAR.2019 09:39:22

## 802.11G\_Highest Channel

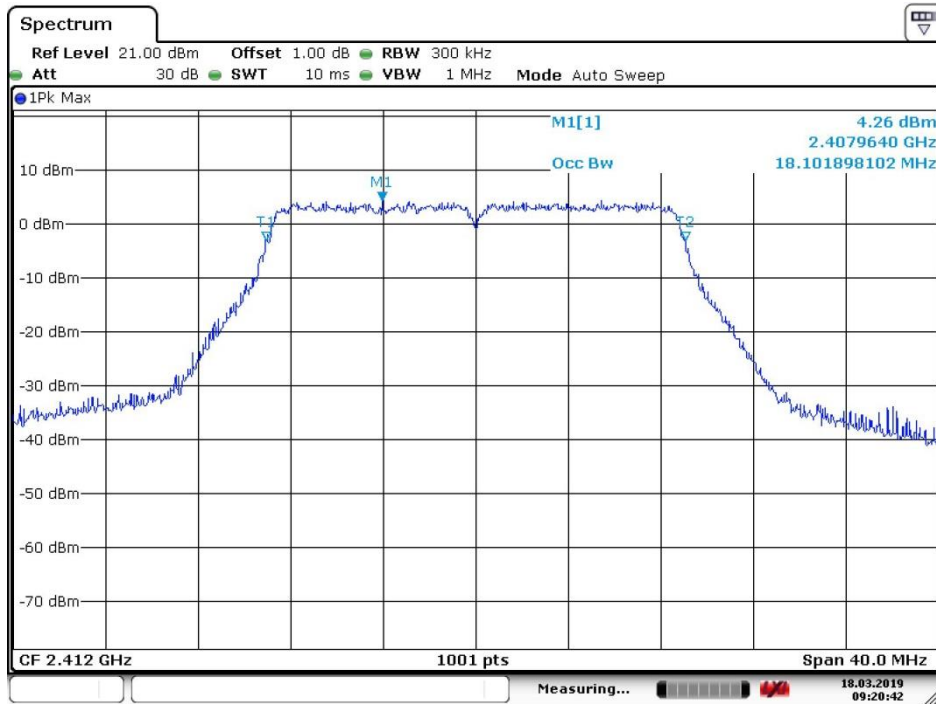


Date: 18.MAR.2019 09:19:33

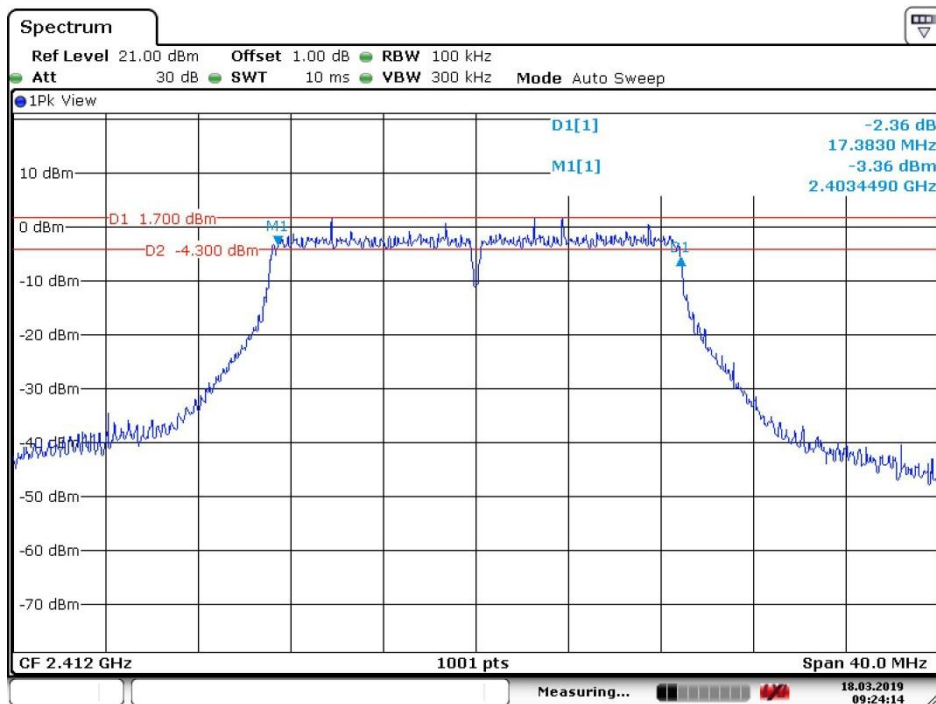


Date: 18.MAR.2019 09:44:28

## 802.11N20\_Lowest Channel

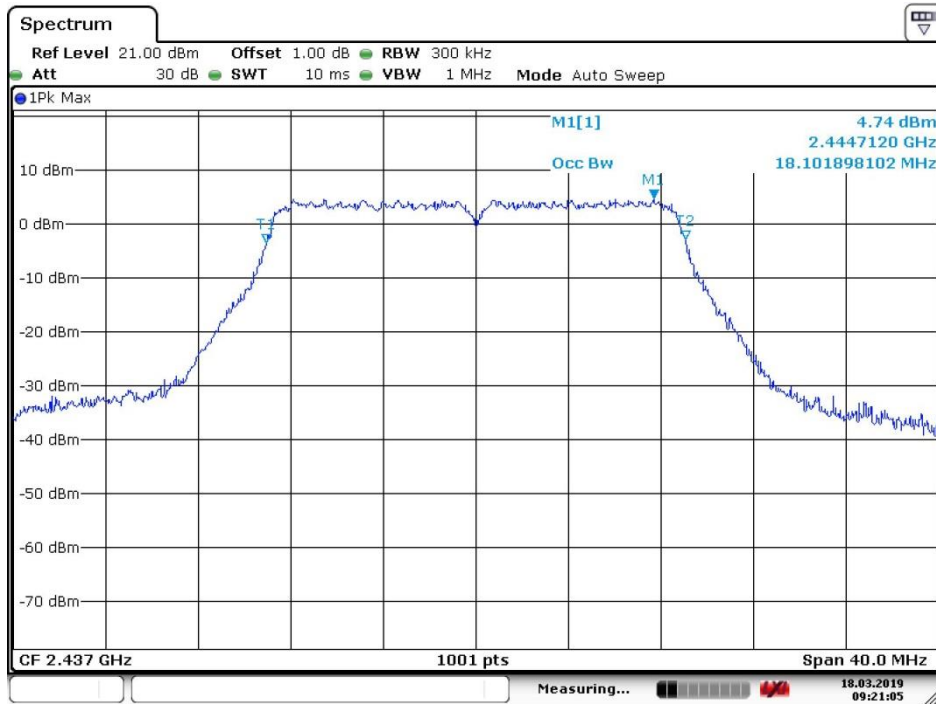


Date: 18.MAR.2019 09:20:42

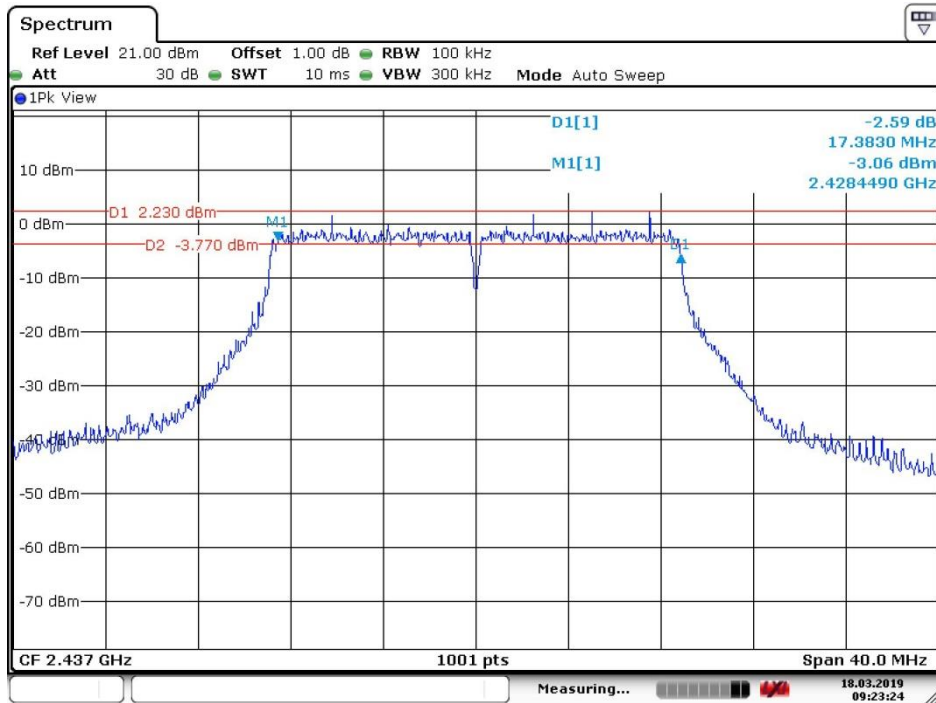


Date: 18.MAR.2019 09:24:15

## 802.11 N20\_ Middle Channel

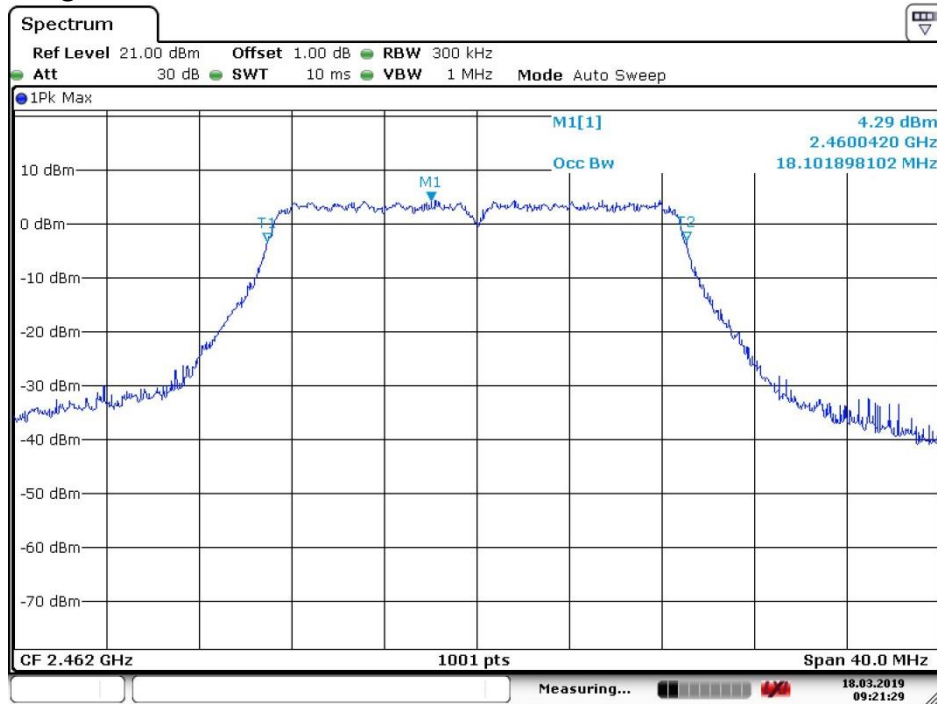


Date: 18.MAR.2019 09:21:05

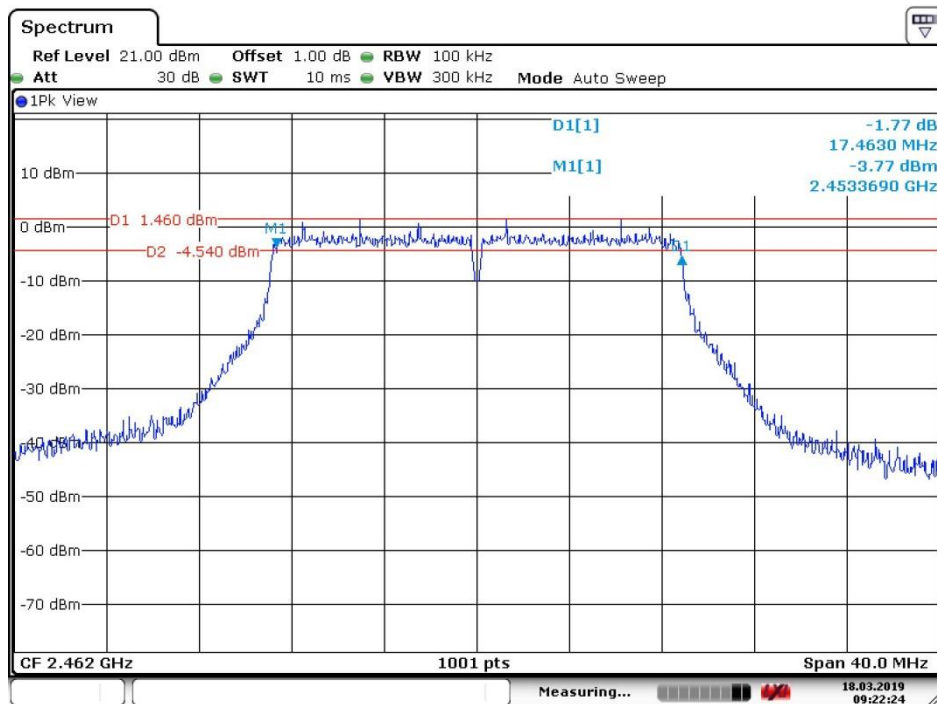


Date: 18.MAR.2019 09:23:24

## 802.11 N20\_ Highest Channel

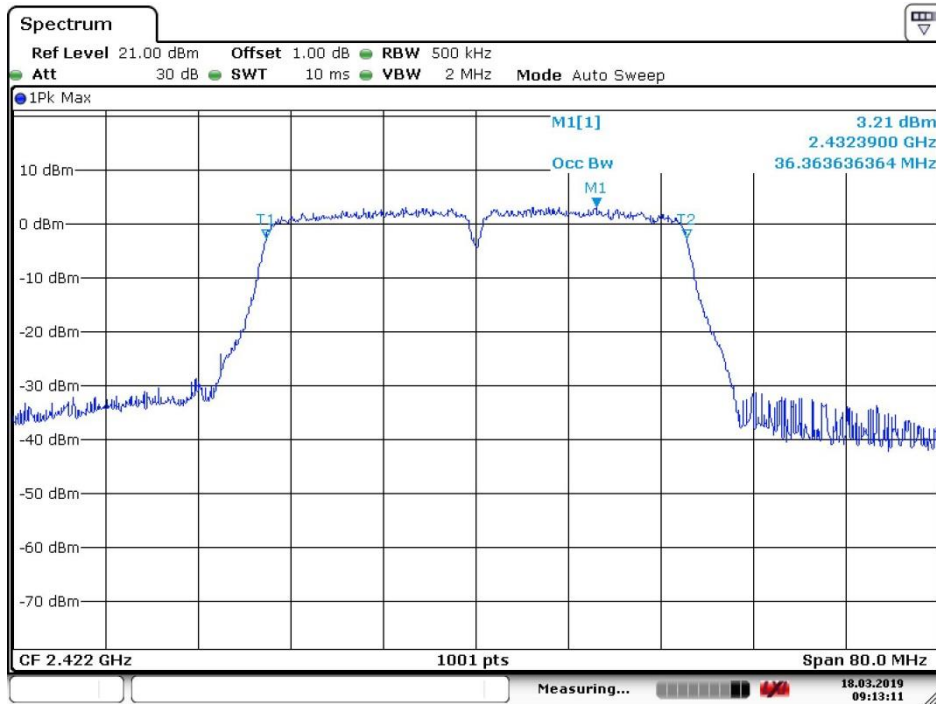


Date: 18.MAR.2019 09:21:29

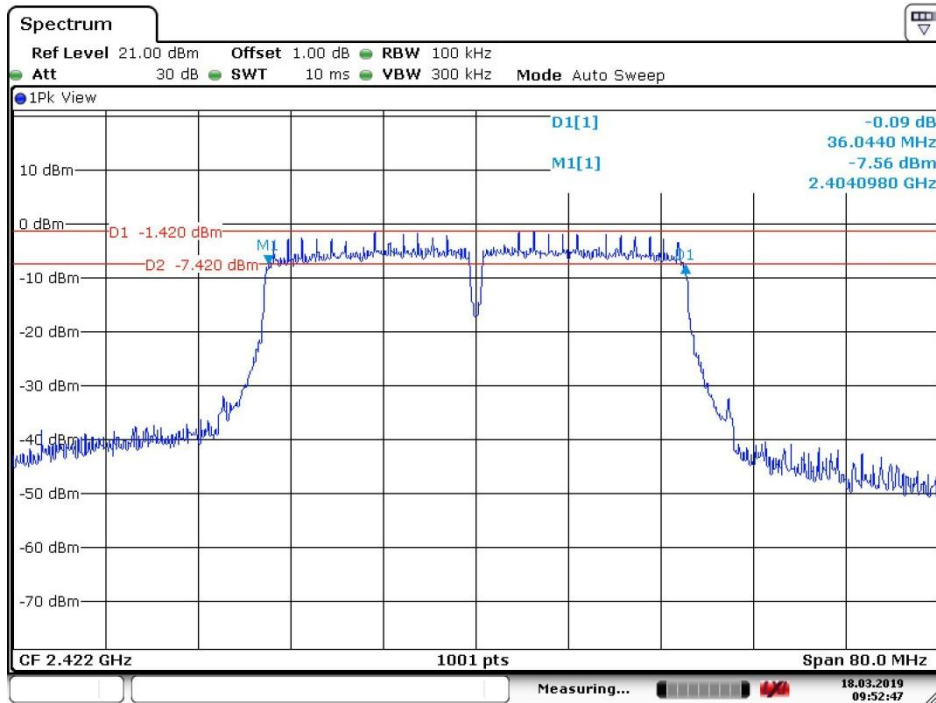


Date: 18.MAR.2019 09:22:25

## 802.11N40\_Lowest Channel

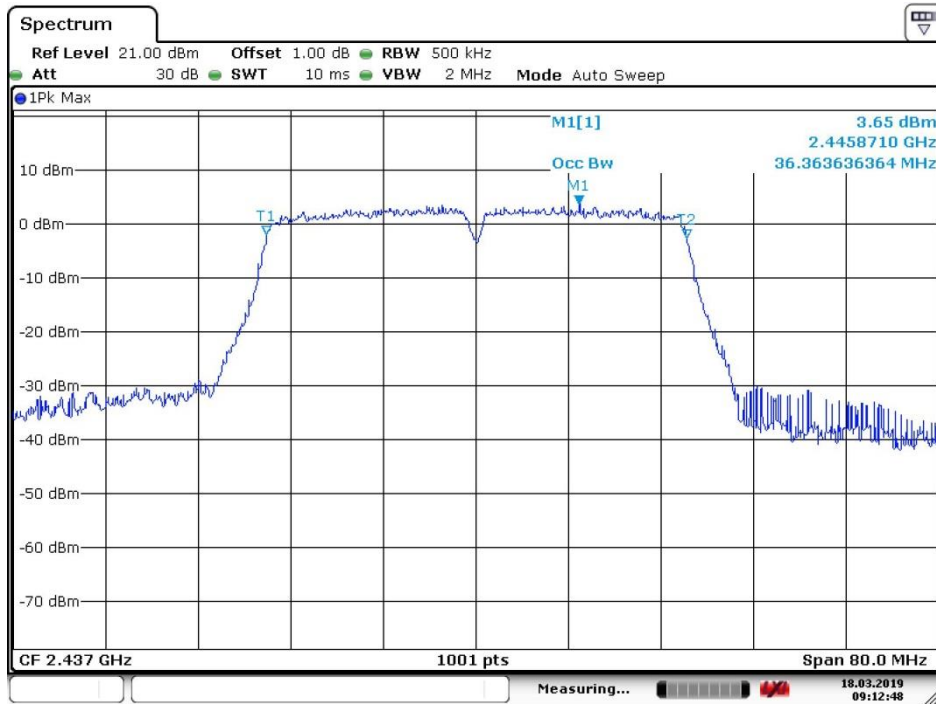


Date: 18.MAR.2019 09:13:12

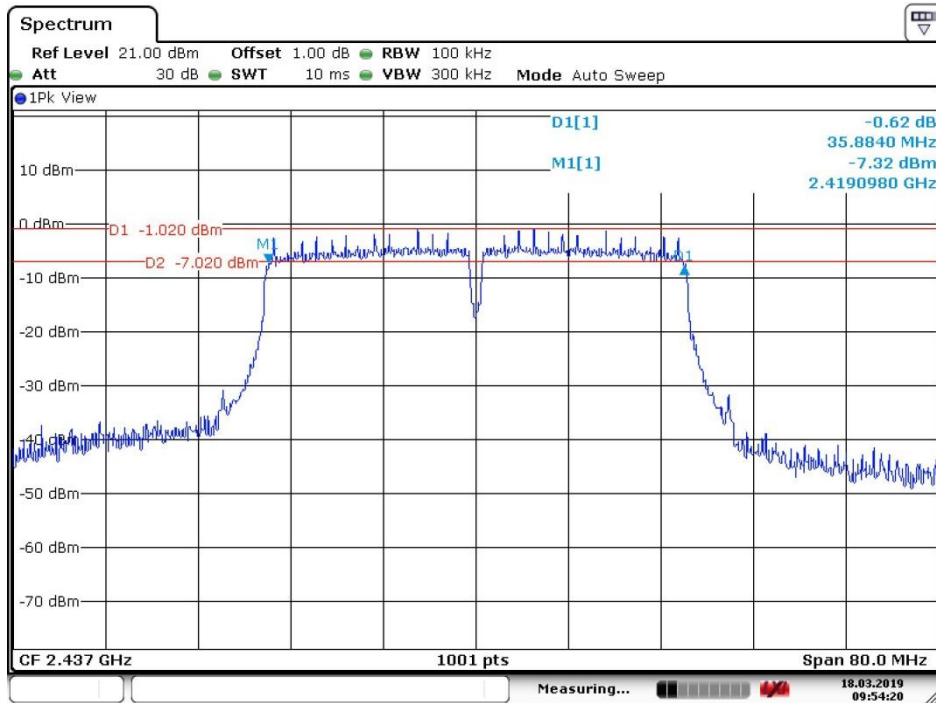


Date: 18.MAR.2019 09:52:48

## 802.11 N40\_ Middle Channel

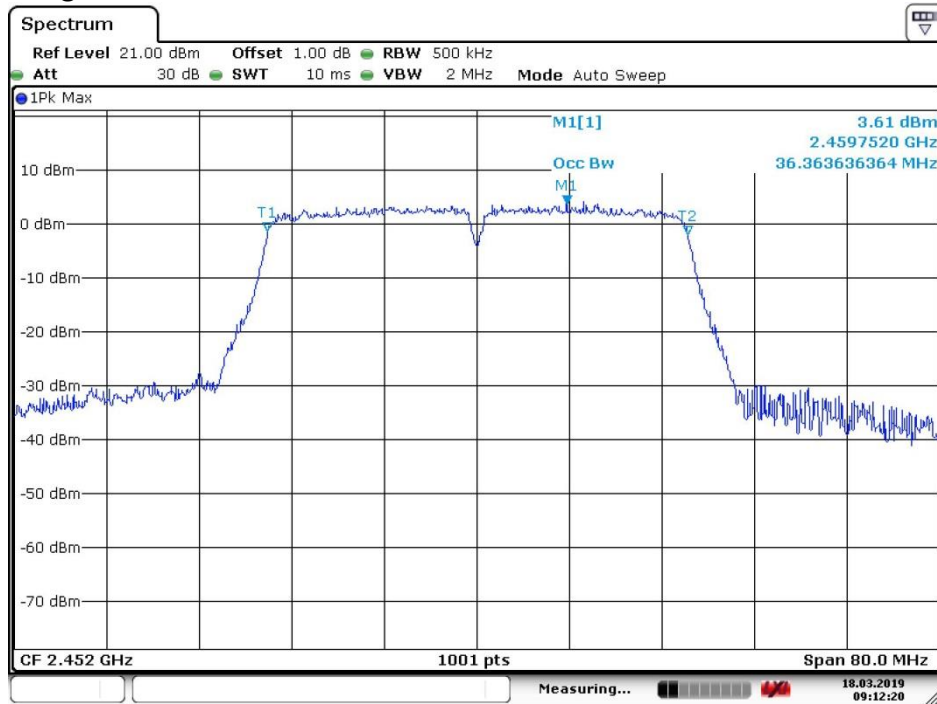


Date: 18.MAR.2019 09:12:49

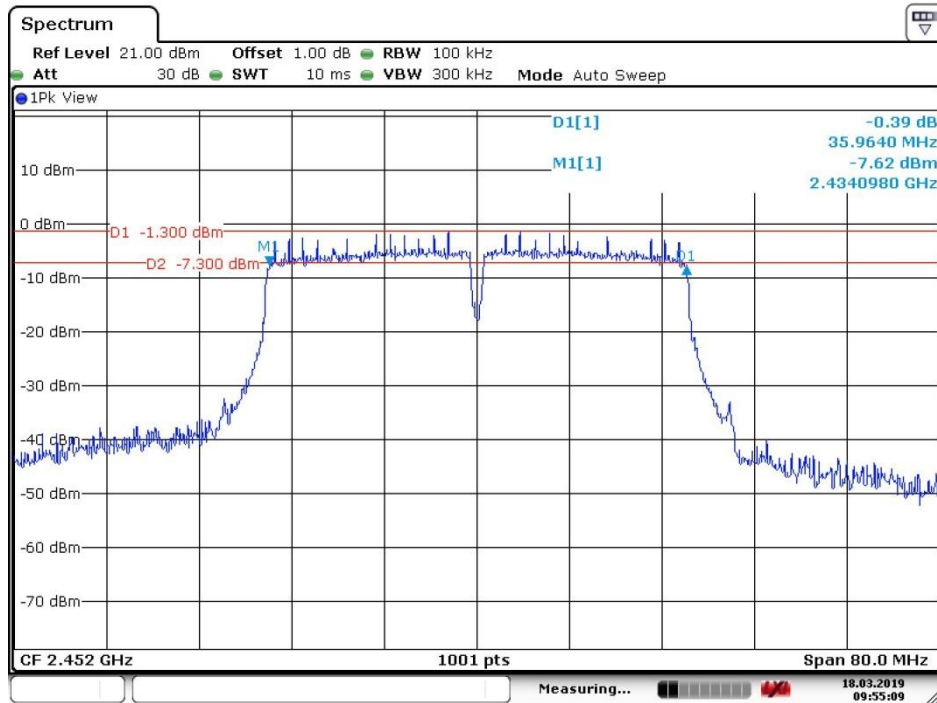


Date: 18.MAR.2019 09:54:20

## 802.11 N40\_Highest Channel



Date: 18.MAR.2019 09:12:19



Date: 18.MAR.2019 09:55:10