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# FCC TEST REPORT

**Manufacturer: SAMSUNG Electronics Co., Ltd.**

**Model: SM-C900F/DS**

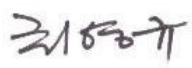
**FCC ID: A3LSMC900F**

**Application Type: Certification**

**EUT Type: Portable Handset**

All measurements reported here are in accordance with FCC Rules,  
47CFR Part2 and Part27.

Prepared By .....  Date ..... 2017.01.10  
DH Ju  
Test Engineer

Checked and Authorized By .....  Date ..... 2017.01.10  
YG Choi  
Technical Manager



## Revision History

| Rev. # | Issue Date | Revisions       | Revised By |
|--------|------------|-----------------|------------|
| 1      | 2017.01.10 | ▪ Initial issue | DH Ju      |

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**§2.1033 General Information**

**APPLICANT:** Samsung Electronics Co., Ltd.

**APPLICANT ADDRESS:** 129 Samsung-ro,  
Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

**TEST SITE:** SAMSUNG Electronics QA Laboratory

**TEST SITE ADDRESS:** 129 Samsung-ro,  
Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

**FCC RULE PART(S):** §2, §27

**TEST PROCEDURE(S):** ANSI/TIA603-D-2010, KDB971168 v02r02

**BASE MODEL:** SM-C900F/DS

**FCC ID:** A3LSMC900F

**FCC CLASSIFICATION:** PCS Licensed Transmitter Held to Ear (PCE)

**MODE:** LTE

**EMISSION DESIGNATOR:** See Table 0-1

**TX FREQUENCY BLOCK** 2496 – 2690MHz (LTE Band 41)

**RX FREQUENCY BLOCK** 2496 – 2690MHz (LTE Band 41)

**MAX POWER RATING:** 0.265 W EIRP LTE Band 41 (24.23 dBm)

**TEST DEVICE SERIAL NO.:** FCN-012-A , FCN-012-B

**DATE(S) OF TEST:** December 16, 2016 – January 06, 2017

| Mode        | Tx Frequency (MHz) | Emission Designator | Modulation | EIRP              |                  |
|-------------|--------------------|---------------------|------------|-------------------|------------------|
|             |                    |                     |            | Max. Power (Watt) | Max. Power (dBm) |
| LTE Band 41 | 2498.5 – 2687.5    | 4M45G7D             | QPSK       | 0.261             | 24.16            |
| LTE Band 41 | 2498.5 – 2687.5    | 4M46W7D             | 16QAM      | 0.201             | 23.04            |
| LTE Band 41 | 2501.0 – 2685.0    | 8M91G7D             | QPSK       | 0.264             | 24.22            |
| LTE Band 41 | 2501.0 – 2685.0    | 8M93W7D             | 16QAM      | 0.156             | 21.94            |
| LTE Band 41 | 2503.5 – 2682.5    | 13M4G7D             | QPSK       | 0.260             | 24.15            |
| LTE Band 41 | 2503.5 – 2682.5    | 13M3W7D             | 16QAM      | 0.191             | 22.82            |
| LTE Band 41 | 2506.0 – 2680.0    | 17M8G7D             | QPSK       | 0.265             | 24.23            |
| LTE Band 41 | 2506.0 – 2680.0    | 17M8W7D             | 16QAM      | 0.231             | 23.63            |

Table 0-1. Emission Designator



## **1. INTRODUCTION**

### **1.1. General**

These measurement tests were conducted at SAMSUNG Electronics QA Laboratory.  
The site address is 129 Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea.

## **2. PRODUCT INFORMATION**

### **2.1. Equipment Description**

The Equipment Under Test (EUT) is the Samsung Portable Handset FCC ID: A3LSMC900F. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

### **2.2. Device Capabilities**

This device contains the following capabilities:

850 GSM/GPRS/EDGE, 850/1900 WCDMA/HSPA, Multi-band LTE, 802.11 b/g/n/a/ac WLAN, Bluetooth (1x, LE), ANT+, NFC

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### 3. DESCRIPTION OF TESTS

#### 3.1. Evaluation Procedure

The measurement procedures described in the document titled “Land Mobile FM or PM - Communications Equipment- Measurements and Performance Standards” (ANSI/TIA-603-D-2010) and “Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1MHz) Digital Transmission System” (KDB 971168) were used in the measurement of the Samsung Portable Handset FCC ID: A3LSMC900F.

#### 3.2. Measurement Procedure for Radiated Power and Radiated Spurious Emissions

The radiated and spurious measurements were made at the full anechoic chamber. The equipment under test was placed on the Turn Device at the same height and a distance of 3-meters from the measuring antenna.

The turn device is designed for mobile device measurements. Different sized devices can be mounted on the mounting bracket made of Rohacell.

The turn device is mounted onto a turntable to have both 360° vertical and horizontal rotation. The measurement was made for each horizontal/vertical position in combination with horizontally and vertically polarized measuring antenna at Fully-anechoic chamber, it is equivalent to test in 3-orthogonal planes.

The substitution antenna will replace the EUT antenna at the same position. The frequency of the signal generator shall be set to the frequencies that were measured on the EUT. The output level of the signal generator shall be adjusted until an equal or a known related level that was measured from the EUT. This level was recorded. For emissions above 1 GHz, the above procedure is repeated by using horn antennas and dBi gain is taken into consideration.

The power of the emission is calculated using the following formula:

$$P_{d[dBm]} = P_{g[dBm]} - \text{cable loss}_{[dB]} + \text{antenna gain}_{[dBd, dBi]}$$

Where  $P_d$  is the dipole equivalent power,  $P_g$  is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole(dBd) or an isotropic source(dBi). The cable connects the generator to the substitute antenna.

Radiated power levels and radiated spurious emissions levels are investigated per ANSI/TIA-603-D-2010.

#### 3.3. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

#### 4. TEST EQUIPMENT LIST

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

| Description                           | Model            | Serial No. | Manufacturer | Cal. Date  | Cal. Due   |
|---------------------------------------|------------------|------------|--------------|------------|------------|
| Wideband Radio Communication Tester   | CMW500           | 140748     | R&S          | 2016-10-28 | 2017-10-28 |
| Wideband Radio Communication Tester   | CMW500           | 140697     | R&S          | 2016-02-19 | 2017-02-19 |
| Signal & Spectrum Analyzer            | FSW              | 103775     | R&S          | 2016-12-19 | 2017-12-19 |
| MXE EMI RECEIVER                      | N9038A           | MY52260190 | Agilent      | 2016-03-24 | 2017-03-24 |
| PSG Analog Signal Generator           | E8257D           | MY51501209 | Agilent      | 2016-11-29 | 2017-11-29 |
| EPM Series Power Meter                | E4419B           | GB41293846 | Agilent      | 2016-09-23 | 2017-09-23 |
| POWER SENSOR                          | E9300H           | MY41495838 | Agilent      | 2016-09-23 | 2017-09-23 |
| DC Power Supply                       | E3642A           | MY40022438 | Agilent      | 2016-02-22 | 2017-02-22 |
| Temperature Humidity Chamber          | SH-241           | 92000548   | Espec        | 2016-11-10 | 2017-11-10 |
| Loop Antenna                          | HFH2-Z2          | 100275     | R&S          | 2015-06-04 | 2017-06-04 |
| Loop Antenna                          | HFH2-Z2          | 100276     | R&S          | 2016-05-23 | 2018-05-23 |
| DIPOLE ANTENNA                        | UHA 9105         | 9105-2412  | Schwarzbeck  | 2015-09-08 | 2017-09-08 |
| DIPOLE ANTENNA                        | UHA 9105         | 9105-2413  | Schwarzbeck  | 2015-09-08 | 2017-09-08 |
| LOG PERIODIC DIPOLE ANTENNA           | HL040            | 353255/019 | R&S          | 2015-08-28 | 2017-08-28 |
| LOG PERIODIC DIPOLE ANTENNA           | HL040            | 353255/020 | R&S          | 2016-11-11 | 2018-11-11 |
| HORN Antenna                          | 3115             | 156307     | ETS LINDGREN | 2015-05-07 | 2017-05-07 |
| HORN Antenna                          | 3115             | 156245     | ETS LINDGREN | 2015-05-07 | 2017-05-07 |
| HORN Antenna & Pre-amplifier assembly | HAP18-26N        | 216249     | Flann        | 2015-12-02 | 2017-12-02 |
| HORN Antenna & Pre-amplifier assembly | HAP26-40N        | 216252     | Flann        | 2015-04-30 | 2017-04-30 |
| PRE-AMPLIFIER                         | 8449B            | 3008A00691 | Agilent      | 2016-11-22 | 2017-11-22 |
| RF Power Amplifier                    | 5S1G4            | 304866     | AR           | 2016-02-12 | 2017-02-12 |
| Hygrothermograph Data Logger          | SK-L200TH2a      | 1373       | SATO         | 2016-06-09 | 2017-06-09 |
| Hygrothermograph Data Logger          | SK-L200TH2a      | 5077       | SATO         | 2016-11-15 | 2017-11-15 |
| Hygrothermograph Data Logger          | SK-L200TH2a      | 5110       | SATO         | 2016-10-31 | 2017-10-31 |
| Power Divider                         | 11636B           | 58456      | Agilent      | 2016-04-21 | 2017-04-21 |
| Highpass Filter                       | WHVX1.0/15G-10SS | 1          | Wainwright   | 2016-04-14 | 2017-04-14 |
| Highpass Filter                       | WHKX3.0/18G-10SS | 186        | Wainwright   | 2016-10-26 | 2017-10-26 |
| Attenuator 10dB                       | 8491B            | MY39264180 | Agilent      | 2016-06-28 | 2017-06-28 |
| Attenuator 20dB                       | 8493C            | 74158      | Agilent      | 2016-08-19 | 2017-08-19 |

Table 4-1. Test Equipment



## 5. SAMPLE CALCULATIONS

### 5.1. QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission

### 5.2. 16QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulation

7 = Quantized/Digital Info

D = Data transmission

### 5.3. Spurious Radiated Emission

Example: Spurious emission at 3700.40MHz

The receive spectrum analyzer reading at 3 meters with the EUT on the turn device was -81.0dBm. The gain of the substituted antenna is 8.1dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0dB at 3700.40MHz. So 6.1dB is added to the signal generator reading of -30.9dBm yielding -24.80dBm. The fundamental EIRP was 25.50dBm so this harmonic was  $25.50\text{dBm} - (-24.80) = 50.3\text{dBc}$ .

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## 6. TEST RESULTS

### 6.1. Summary

| FCC Part Section(s)   | Test Description                         | Test Limit                                                                                                                                                                                                                                                                                                                                                             | Test Condition | Test Result | Reference         |
|-----------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------|-------------------|
| TRANSMITTER MODE (TX) |                                          |                                                                                                                                                                                                                                                                                                                                                                        |                |             |                   |
| 2.1049                | Occupied Bandwidth                       | N/A                                                                                                                                                                                                                                                                                                                                                                    | CONDUCTED      | PASS        | Section 6.2       |
| 2.1051<br>27.53(m)    | Conducted Band Edge / Spurious Emissions | > $40+10\log_{10}$ (P[Watts]) between channel edge and 5 MHz from the channel edge,<br>> $43+10\log_{10}$ (P[Watts]) between 5 MHz and X MHz from the channel edge, or between 2490.5 MHz and 2496 MHz,<br>> $55+10\log_{10}$ (P[Watts]) more than X MHz from the channel edge, or below 2490.5 MHz, where X is the greater of 6 MHz or the actual emission bandwidth. |                | PASS        | Sections 6.3, 6.4 |
| 2.1046                | Transmitter Conducted Output Power       | N/A                                                                                                                                                                                                                                                                                                                                                                    |                | PASS        | See SAR Report    |
| 2.1055<br>27.54       | Frequency Stability                      | Fundamental emissions stay within authorized frequency block                                                                                                                                                                                                                                                                                                           |                | PASS        | Section 6.5       |
| 27.50(h.2)            | Equivalent Isotropic Radiated Power      | < 2 Watts max. EIRP                                                                                                                                                                                                                                                                                                                                                    | RADIATED       | PASS        | Section 6.6       |
| 2.1053<br>27.53(m)    | Radiated Spurious Emissions              | > $40+10\log_{10}$ (P[Watts]) between channel edge and 5 MHz from the channel edge,<br>> $43+10\log_{10}$ (P[Watts]) between 5 MHz and X MHz from the channel edge, or between 2490.5 MHz and 2496 MHz,<br>> $55+10\log_{10}$ (P[Watts]) more than X MHz from the channel edge, or below 2490.5 MHz, where X is the greater of 6 MHz or the actual emission bandwidth. |                | PASS        | Section 6.7       |

Table 6-1. Summary of Test Results

#### Notes:

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. The analyzer plots shown in this section were all taken with a correction value loaded into the analyzer. The correction value was used to account for the losses of the cables, couplers, and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3. All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and couplers.
4. For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Rohde & Schwarz and SAMSUNG Electronics "CMWrun", Version 1.8.1.

## 6.2. Occupied Bandwidth

### §2.1049

#### Test Overview

The Occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

#### Test Procedure Used

KDB 971168 v02r02 – Section 4.2

#### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% Occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2.  $RBW = 1 - 5\%$  of the expected OBW
3.  $VBW \geq 3 \times RBW$
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

#### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

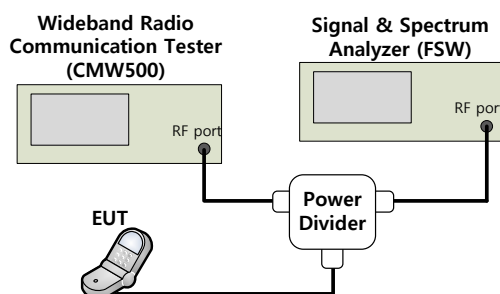
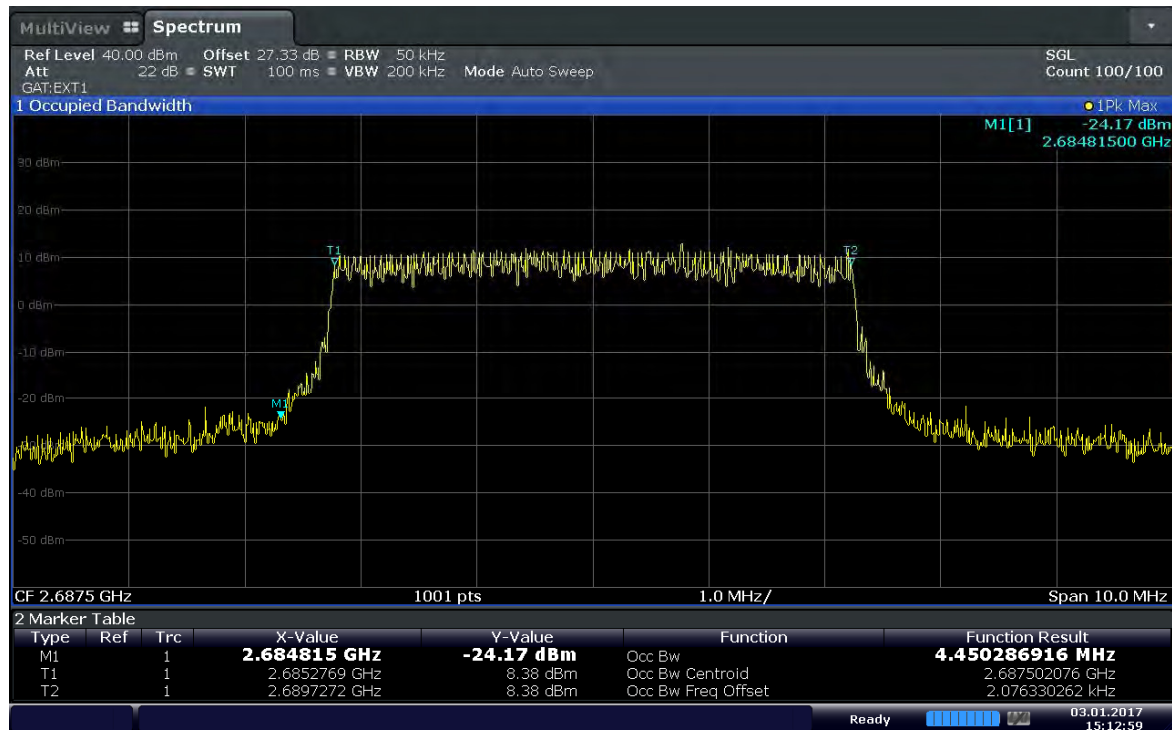


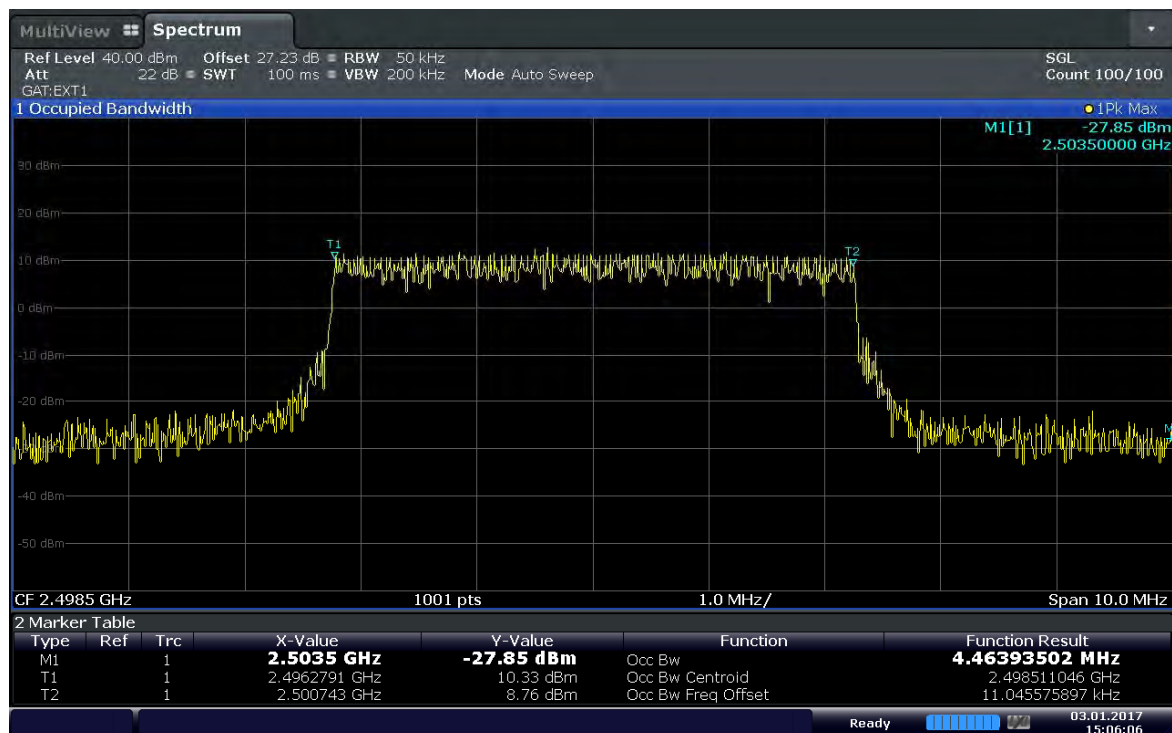
Figure 6-1. Test Instruments & Measurement Setup

## Test Plots



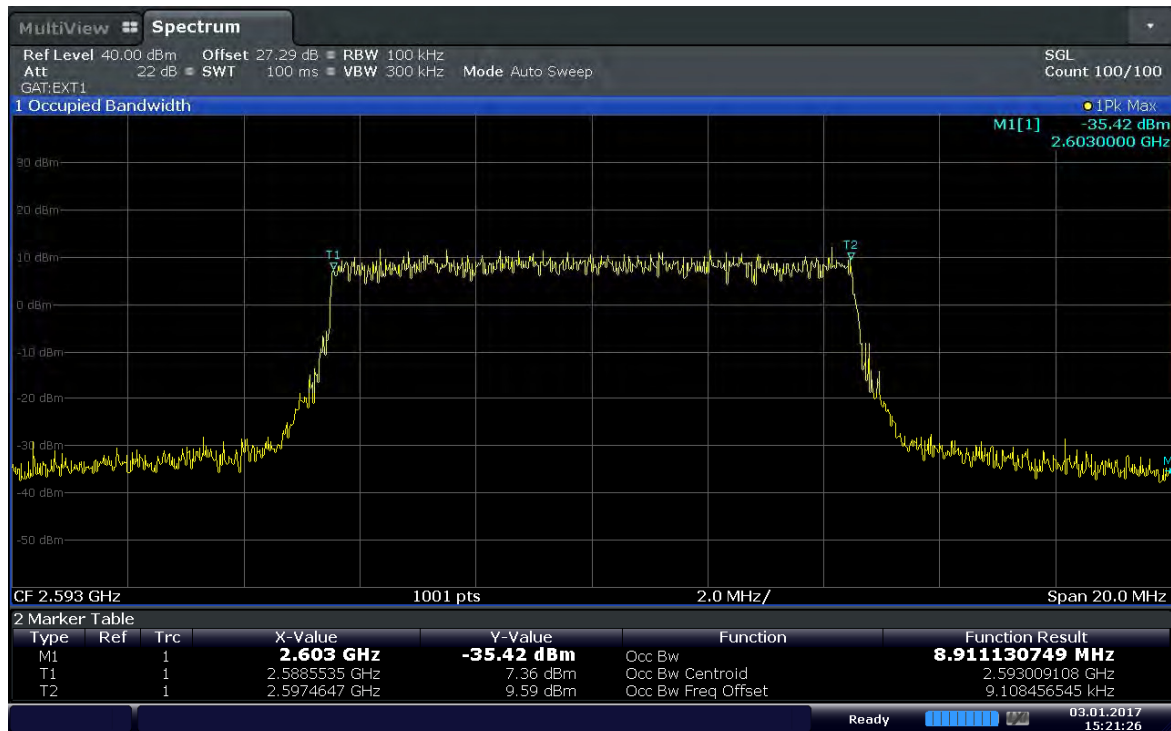
15:12:59 03.01.2017

Plot 6-1. Occupied Bandwidth Plot (Band 41 – 5MHz QPSK - RB Size 25)



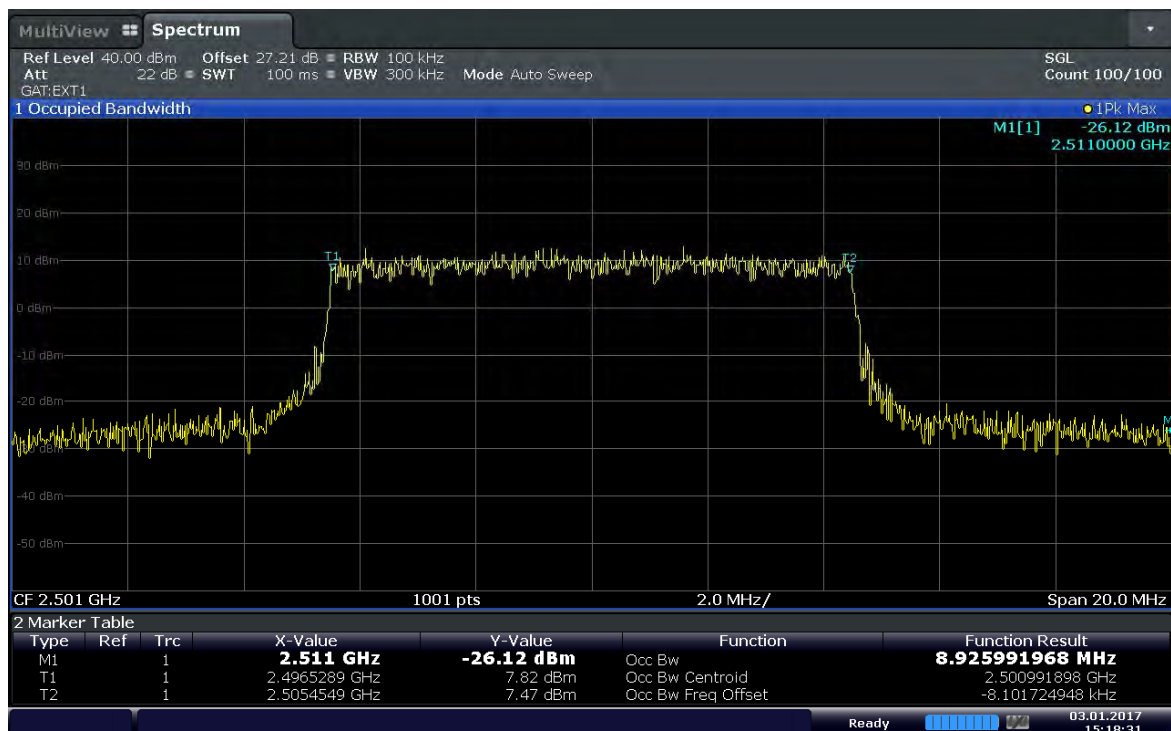
15:06:06 03.01.2017

Plot 6-2. Occupied Bandwidth Plot (Band 41 – 5MHz 16QAM - RB Size 25)



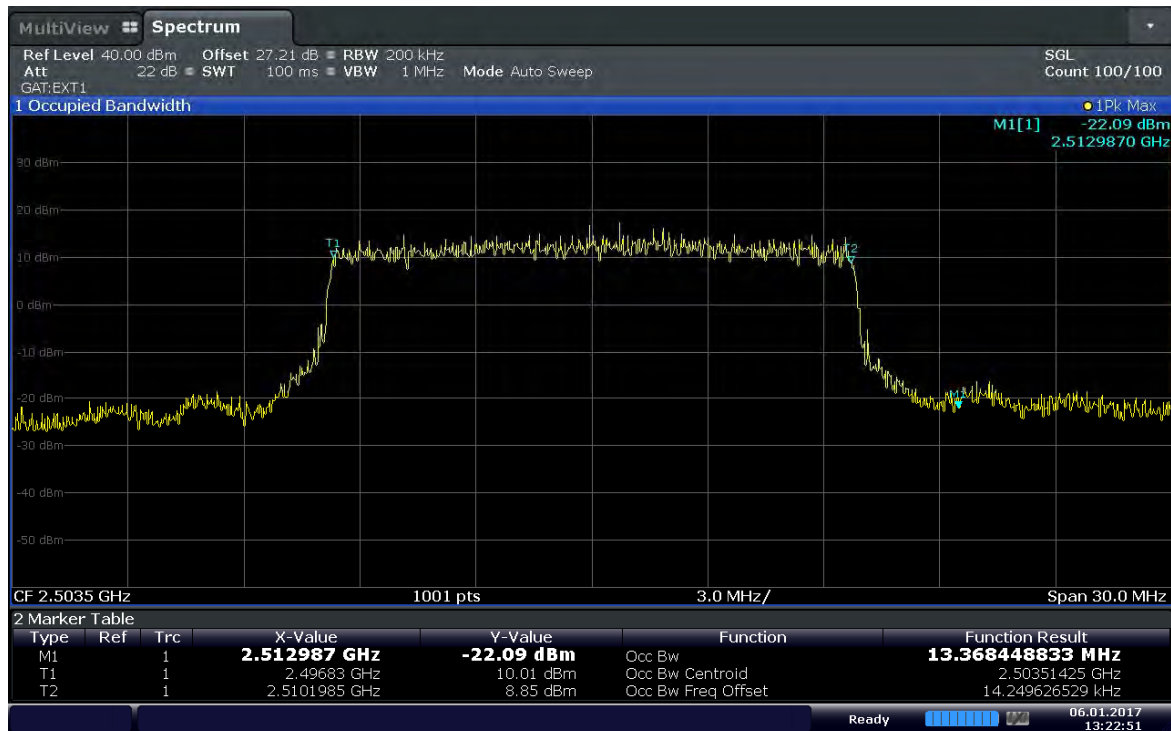
15:21:26 03.01.2017

Plot 6-3. Occupied Bandwidth Plot (Band 41 – 10MHz QPSK - RB Size 50)



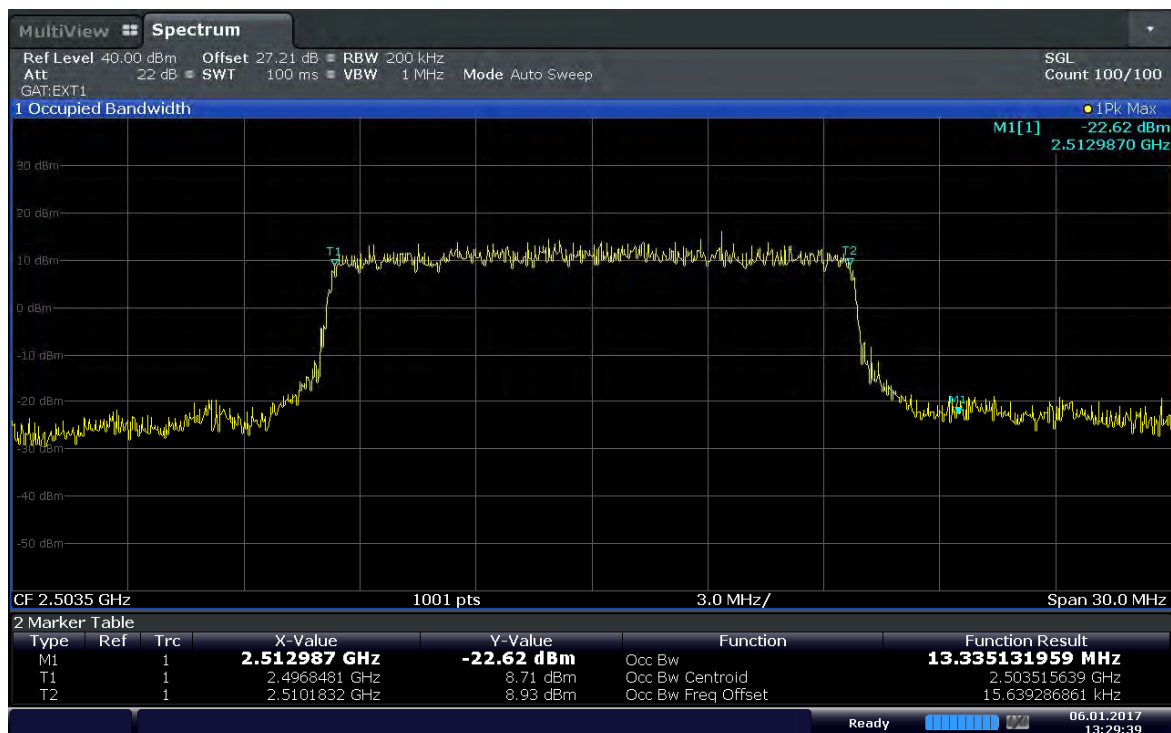
15:18:32 03.01.2017

Plot 6-4. Occupied Bandwidth Plot (Band 41 – 10MHz 16QAM - RB Size 50)



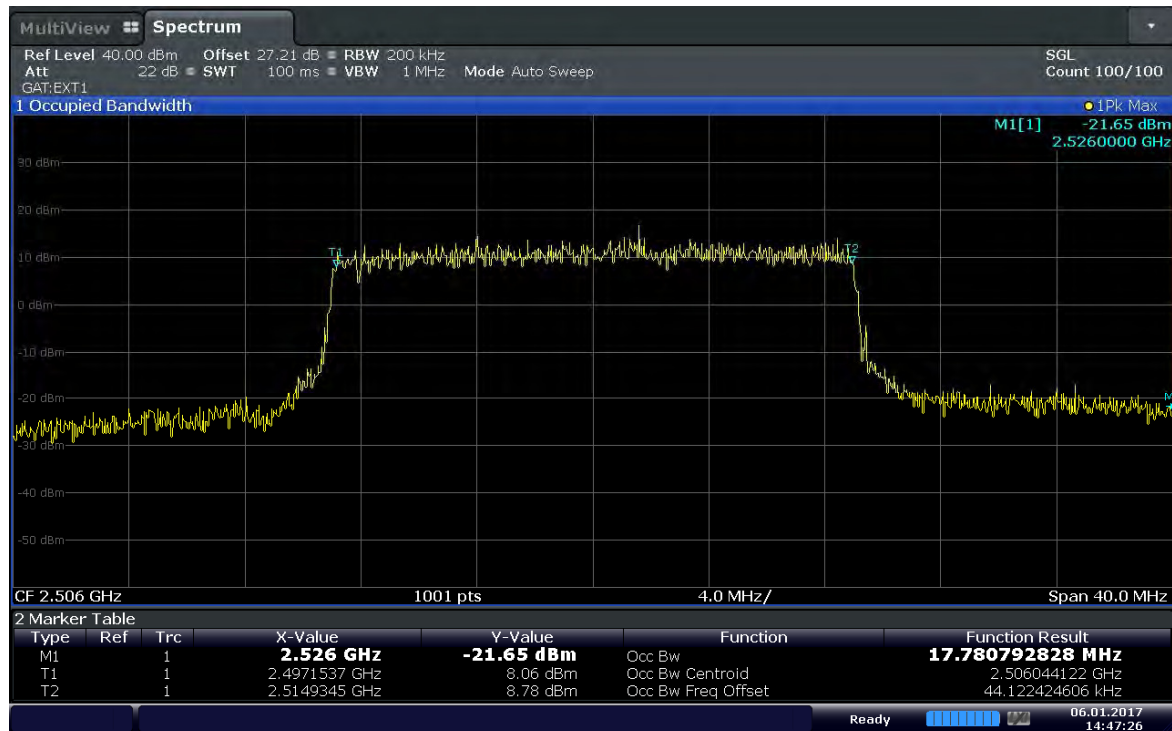
13:22:52 06.01.2017

Plot 6-5. Occupied Bandwidth Plot (Band 41 - 15MHz QPSK - RB Size 75)



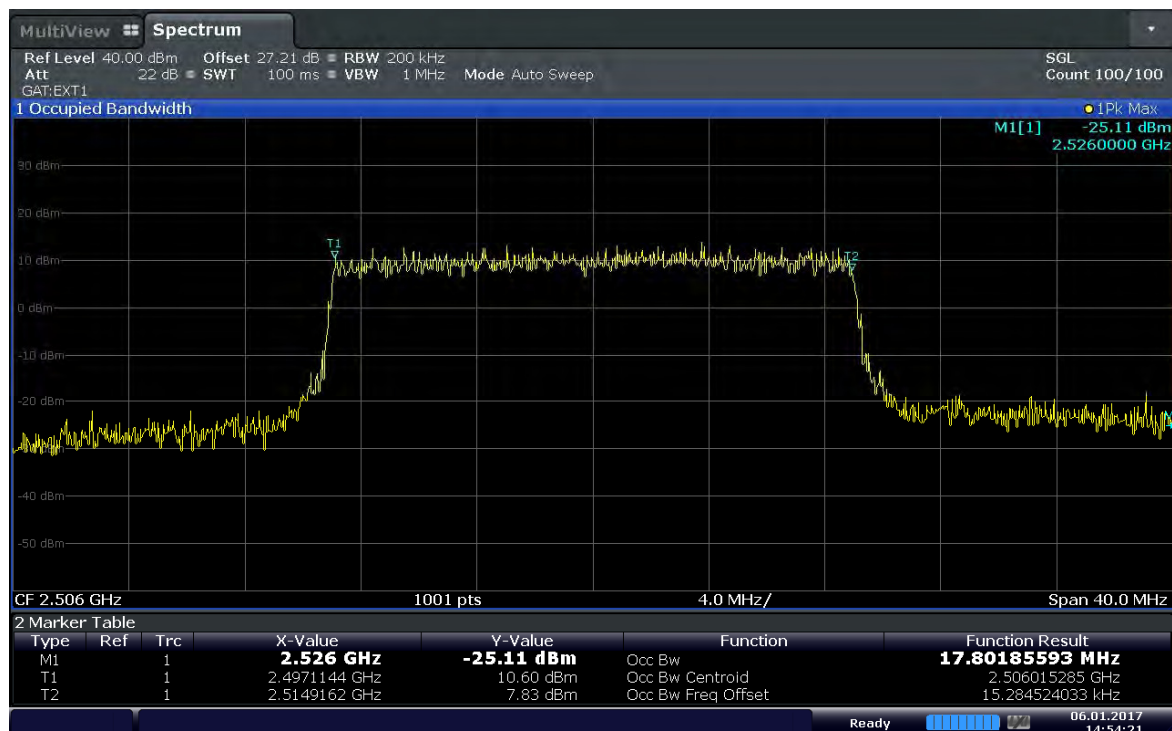
13:29:40 06.01.2017

Plot 6-6. Occupied Bandwidth Plot (Band 41 - 15MHz 16QAM - RB Size 75)



14:47:26 06.01.2017

Plot 6-7. Occupied Bandwidth Plot (Band 41 - 20MHz QPSK - RB Size 100)



14:54:21 06.01.2017

Plot 6-8. Occupied Bandwidth Plot (Band 41 - 20MHz 16QAM - RB Size 100)

### 6.3. Spurious and Harmonic Emissions at Antenna Terminal §2.1051 §27.53(m)

#### Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is  $55 + 10\log_{10}(P_{\text{[Watts]}})$ , where P is the transmitter power in Watts. Limit equivalent to -25dBm, calculation shown below.

$$\begin{aligned}55 + 10\log_{10}(1.567\text{W}) &= 56.95 \text{ dB} \\1.567\text{W} &= 31.95 \text{ dBm} \\31.95 \text{ dBm} - 56.95 \text{ dB} &= -25 \text{ dBm}\end{aligned}$$

#### Test Procedure Used

KDB 971168 v02r02 – Section 6.0

#### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 26GHz (separated into four plots per channel)
2. RBW  $\geq$  1 MHz
3. VBW  $\geq$  3 x RBW
4. Detector = RMS
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

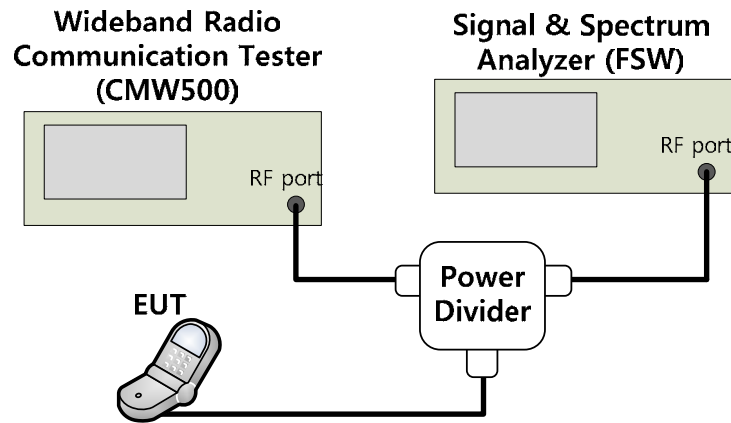
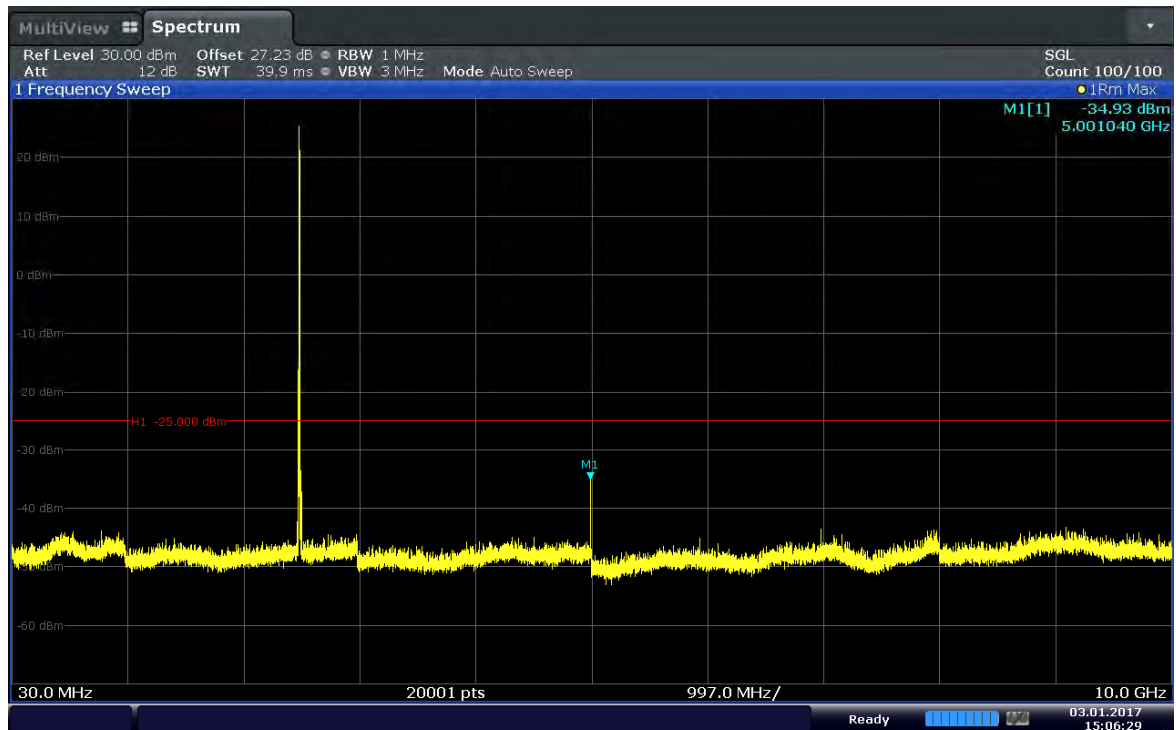


Figure 6-2. Test Instruments & Measurement Setup

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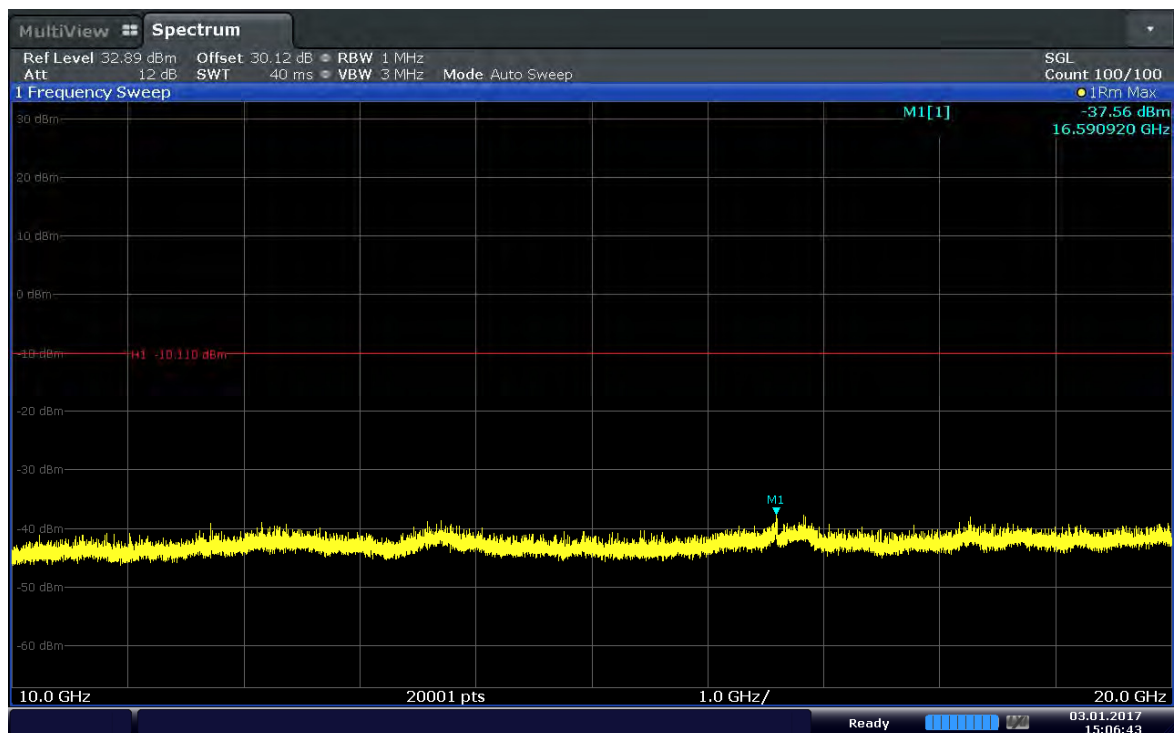


## Test Plots



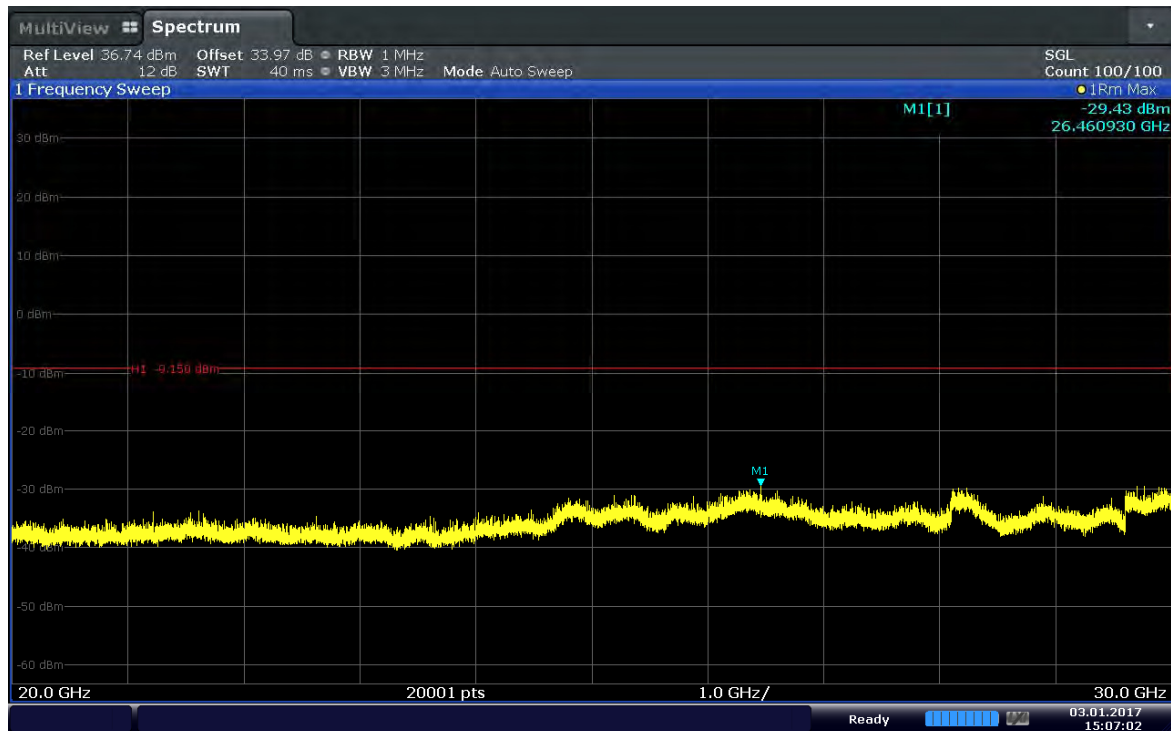
15:06:30 03.01.2017

Plot 6-9. Conducted Spurious Plot (Band 41–5MHz–QPSK–RB Size 1–RB Offset 24–Ch.39675)



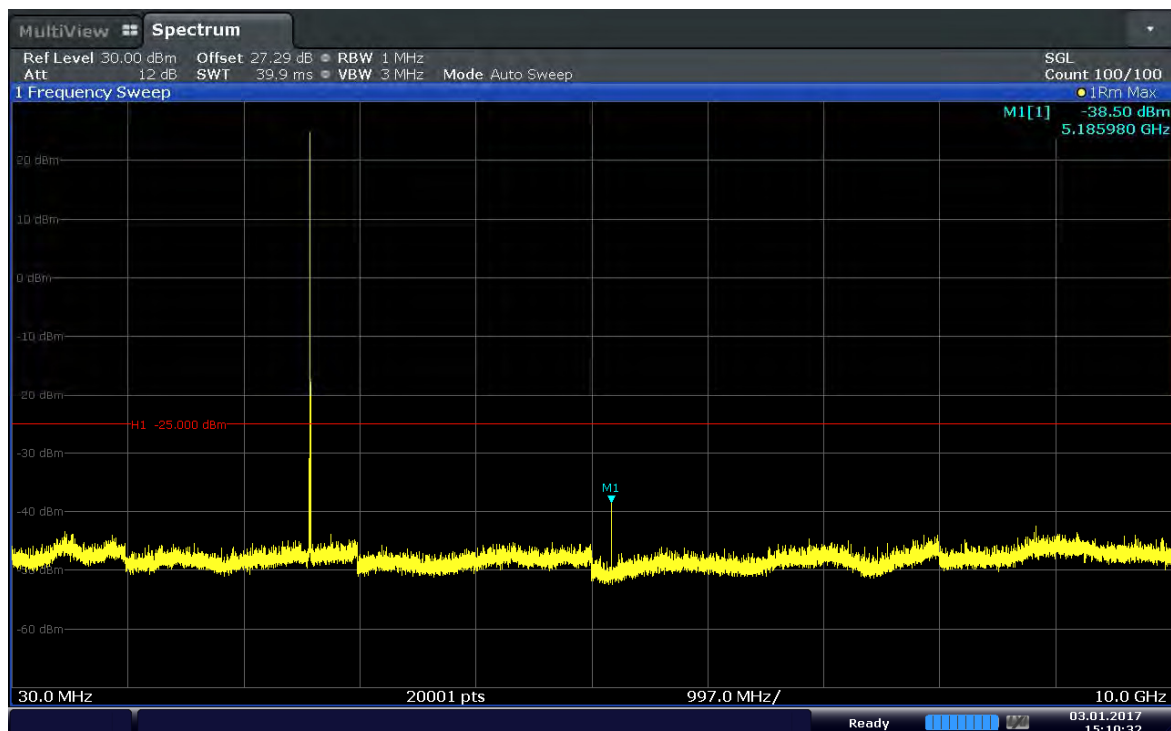
15:06:44 03.01.2017

Plot 6-10. Conducted Spurious Plot (Band 41–5MHz–QPSK–RB Size 1–RB Offset 24–Ch.39675)



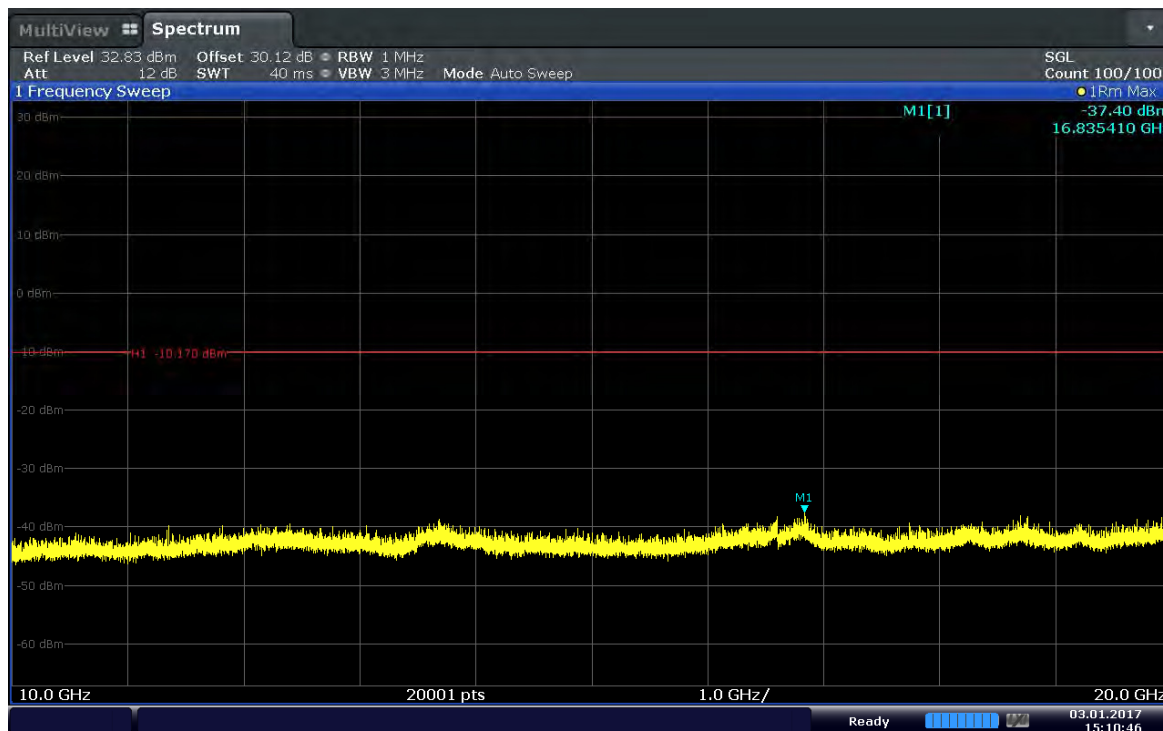
15:07:02 03.01.2017

Plot 6-11. Conducted Spurious Plot (Band 41–5MHz–QPSK–RB Size 1–RB Offset 24–Ch.39675)



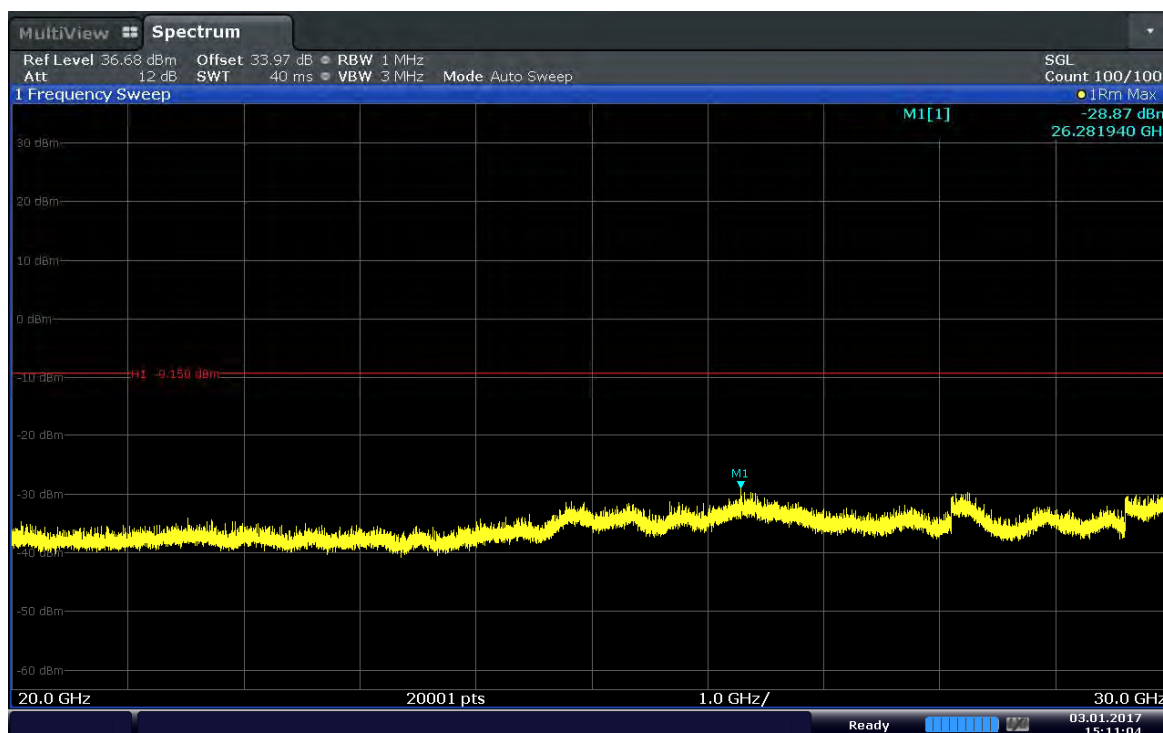
15:10:32 03.01.2017

Plot 6-12. Conducted Spurious Plot (Band 41–5MHz–QPSK–RB Size 1–RB Offset 12–Ch.40620)



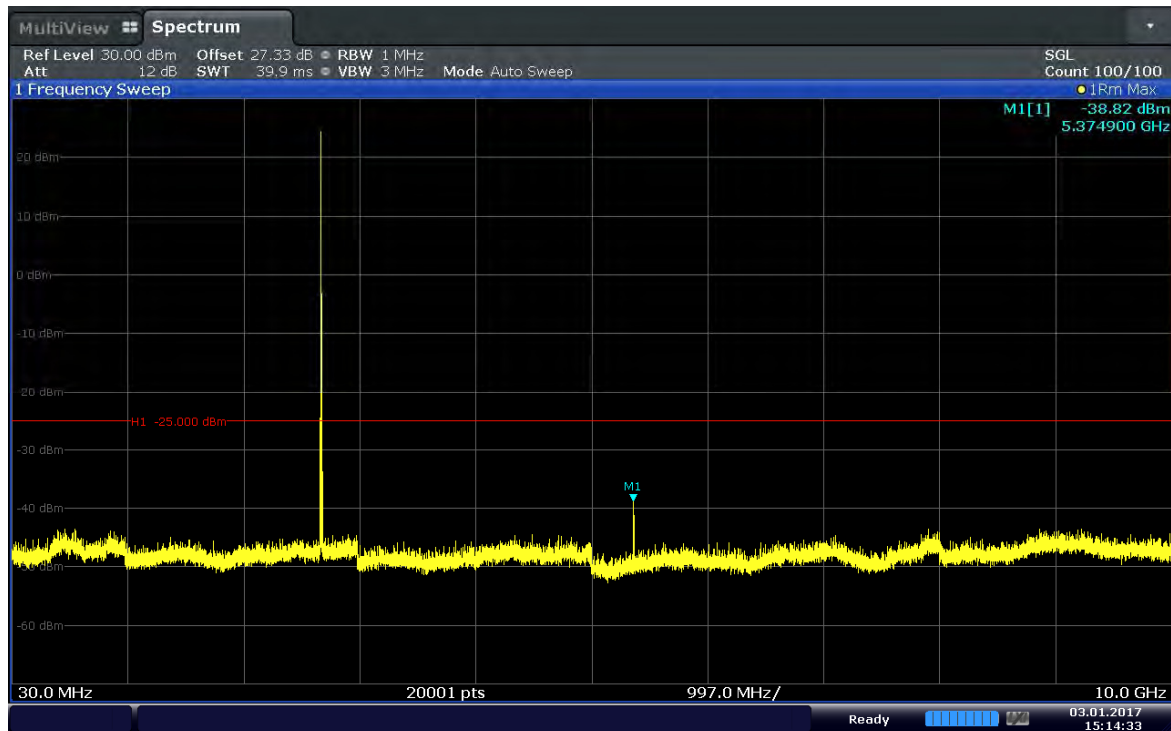
15:10:47 03.01.2017

Plot 6-13. Conducted Spurious Plot (Band 41–5MHz–QPSK–RB Size 1–RB Offset 12–Ch.40620)



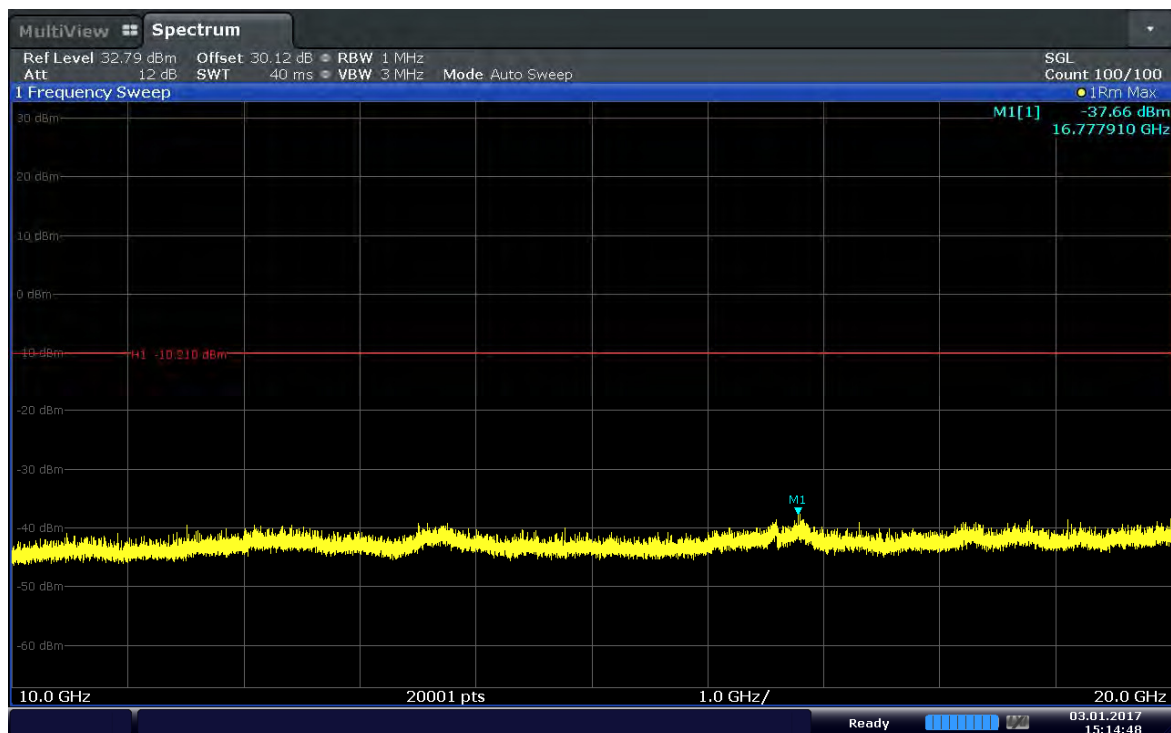
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Plot 6-14. Conducted Spurious Plot (Band 41–5MHz–QPSK– RB Size 1–RB Offset 12–Ch.40620)



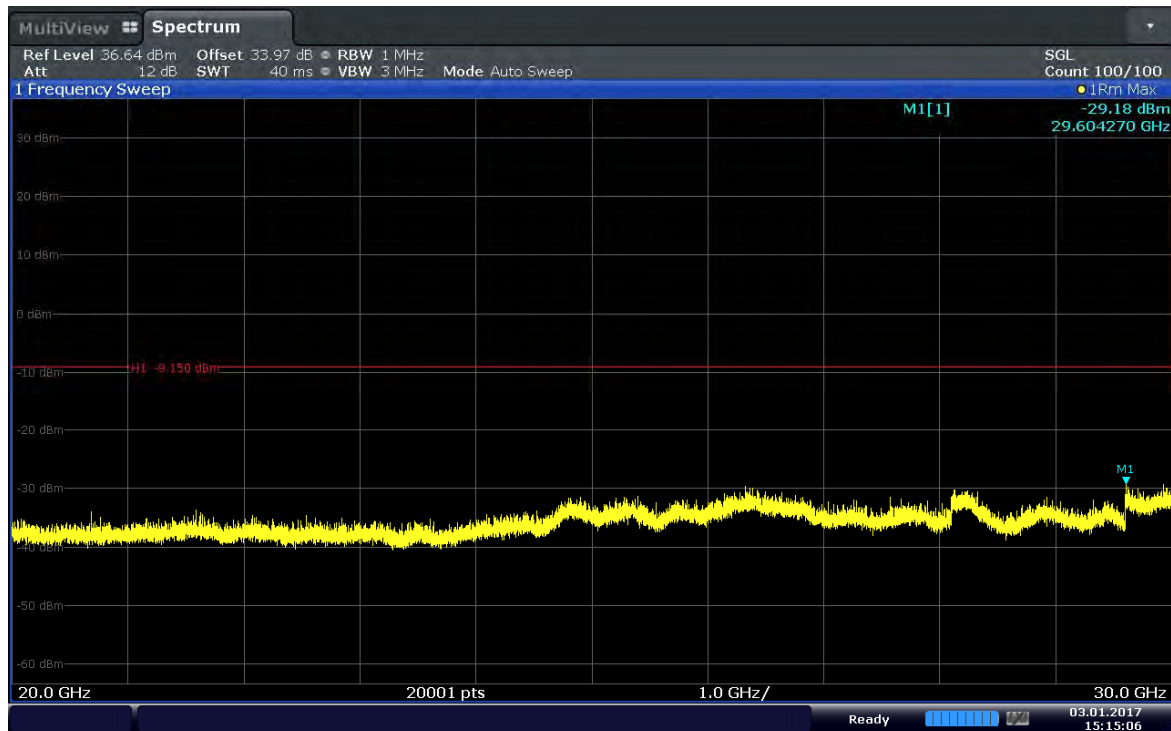
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Plot 6-15. Conducted Spurious Plot (Band 41–5MHz–QPSK–RB Size 1–RB Offset 12–Ch.41565)



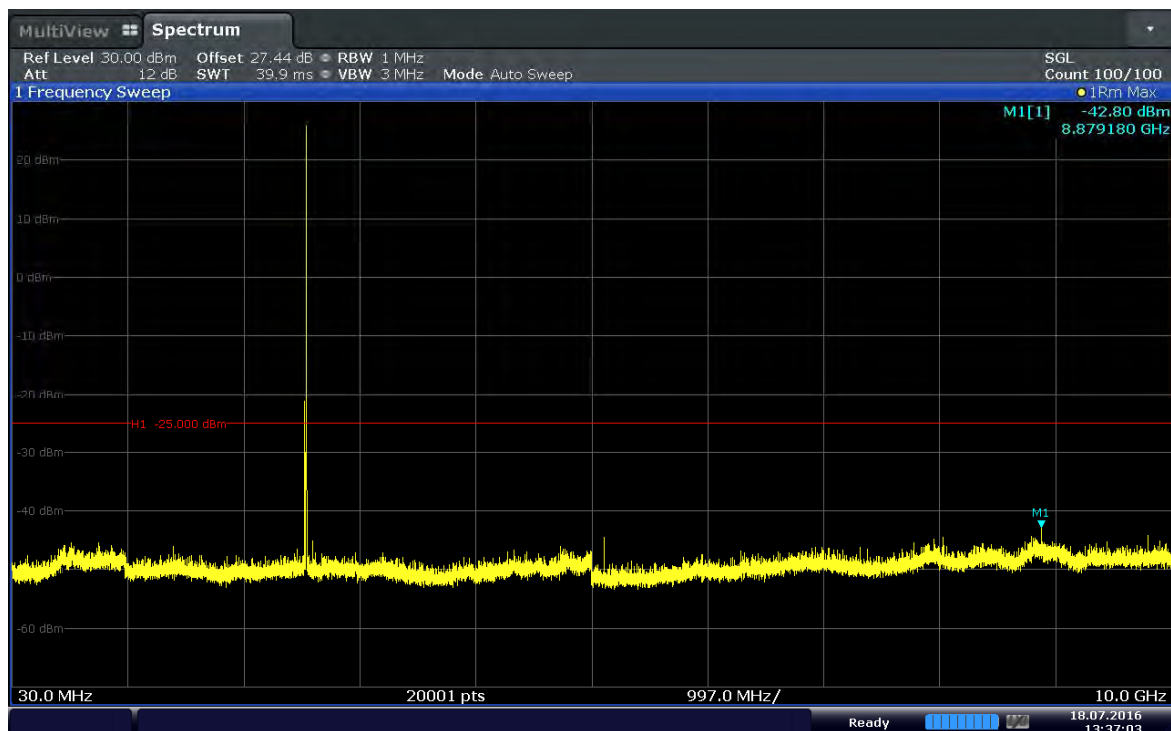
15:14:49 03.01.2017

Plot 6-16. Conducted Spurious Plot (Band 41–5MHz–QPSK–RB Size 1–RB Offset 12–Ch.41565)



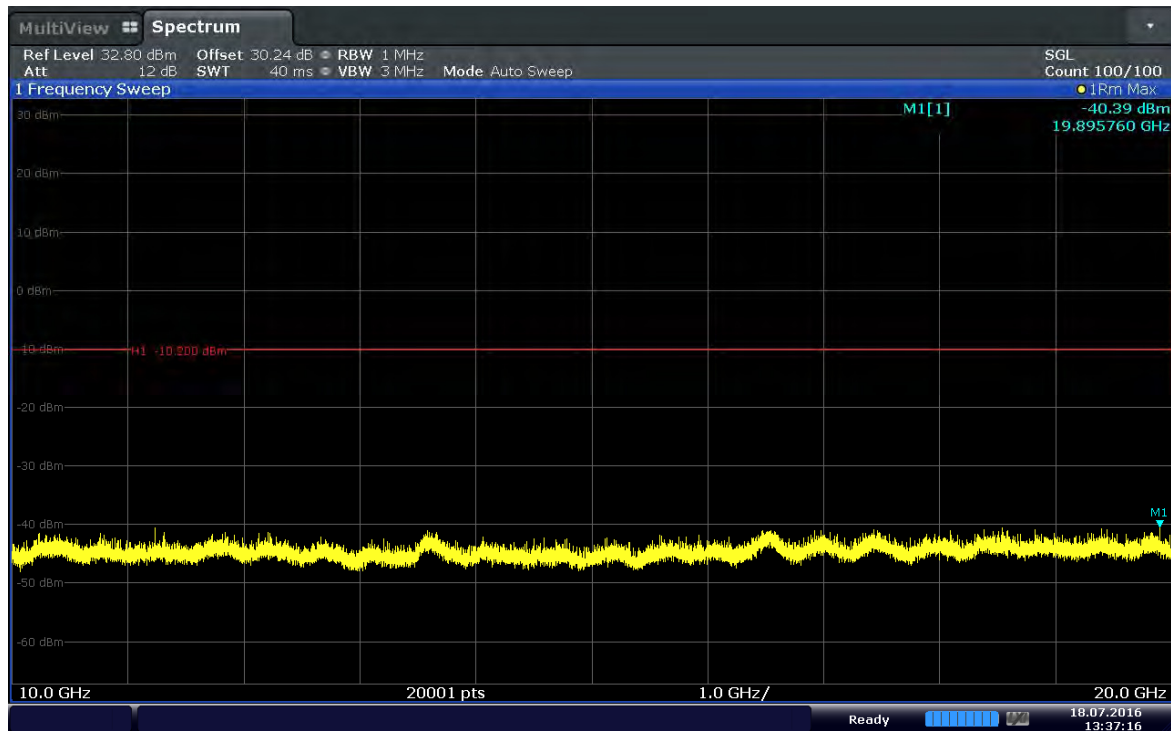
15:15:07 03.01.2017

Plot 6-17. Conducted Spurious Plot (Band 41-5MHz-QPSK- RB Size 1-RB Offset 12-Ch.41565)



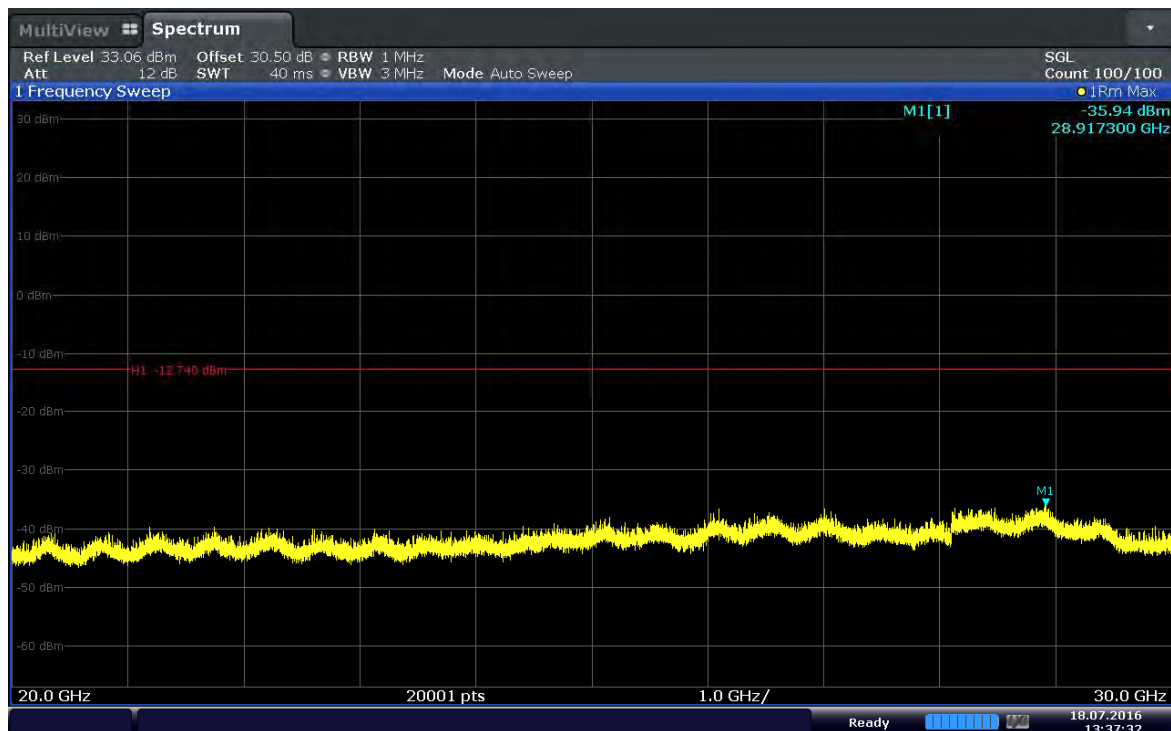
Date: 18.JUL.2016 13:37:02

Plot 6-18. Conducted Spurious Plot (Band 41-10MHz-QPSK-RB Size 1-RB Offset 49-Ch.39700)



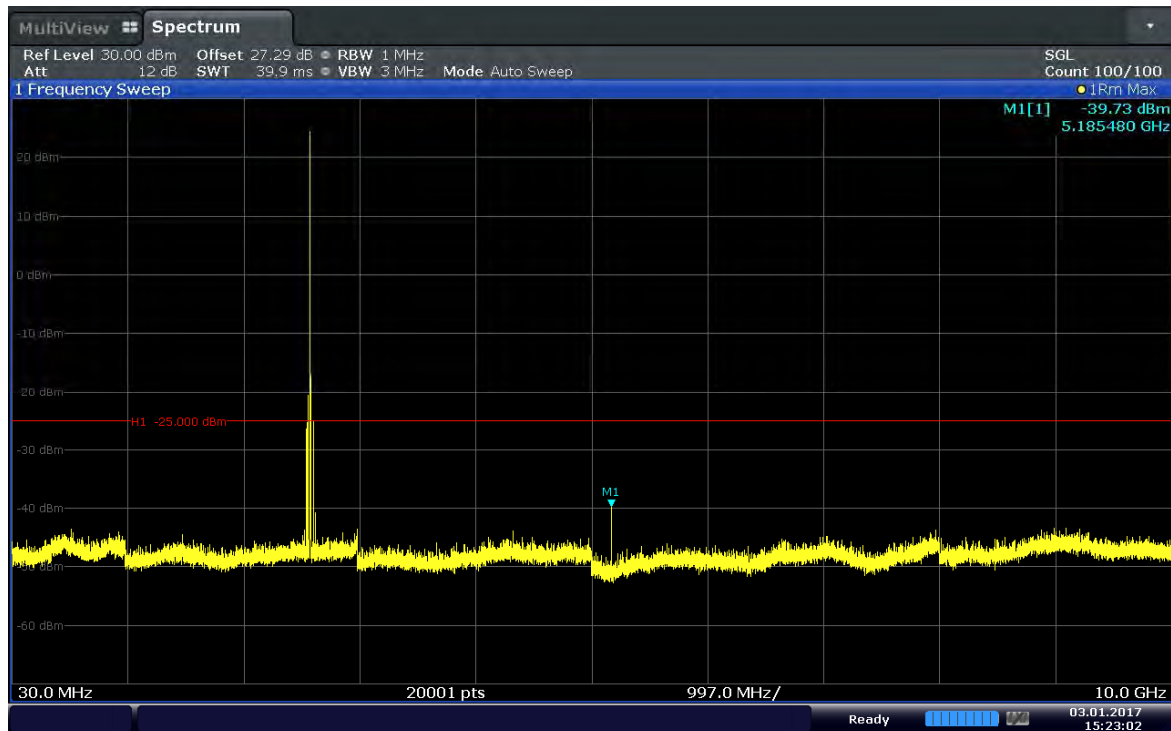
Date: 18.JUL.2016 13:37:16

Plot 6-19. Conducted Spurious Plot (Band 41–10MHz–QPSK– RB Size 1–RB Offset 49–Ch.39700)



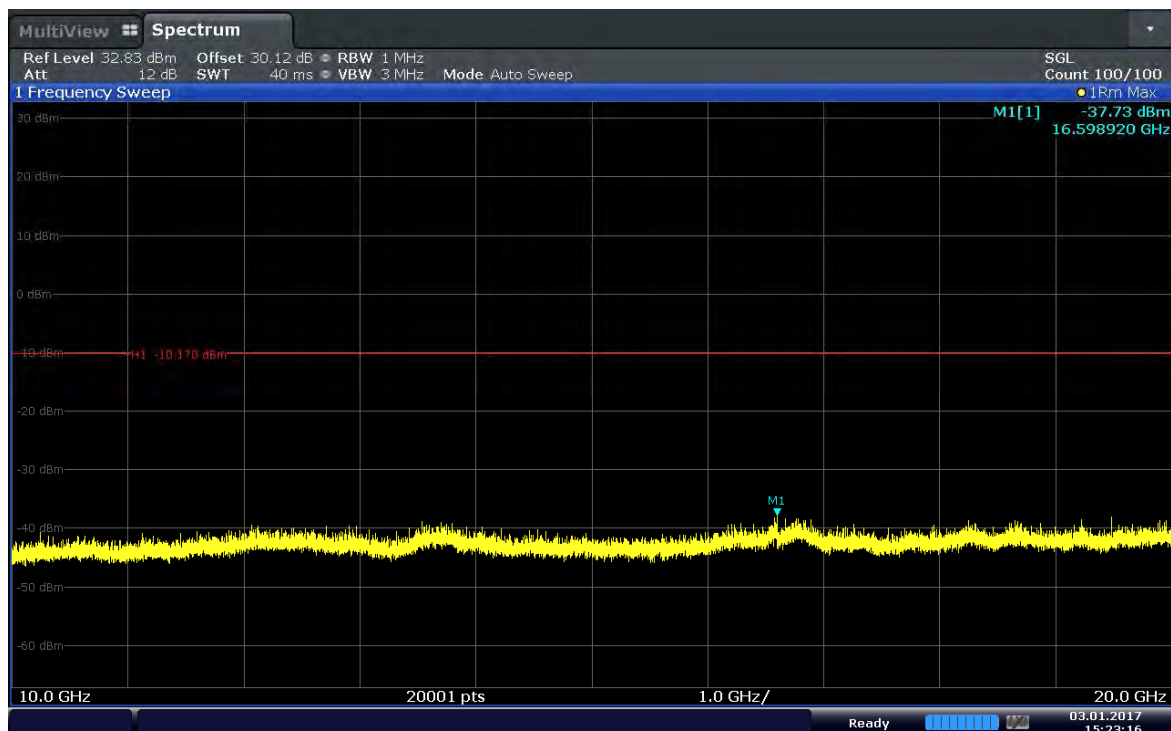
Date: 18.JUL.2016 13:37:33

Plot 6-20. Conducted Spurious Plot (Band 41–10MHz–QPSK– RB Size 1–RB Offset 49–Ch.39700)



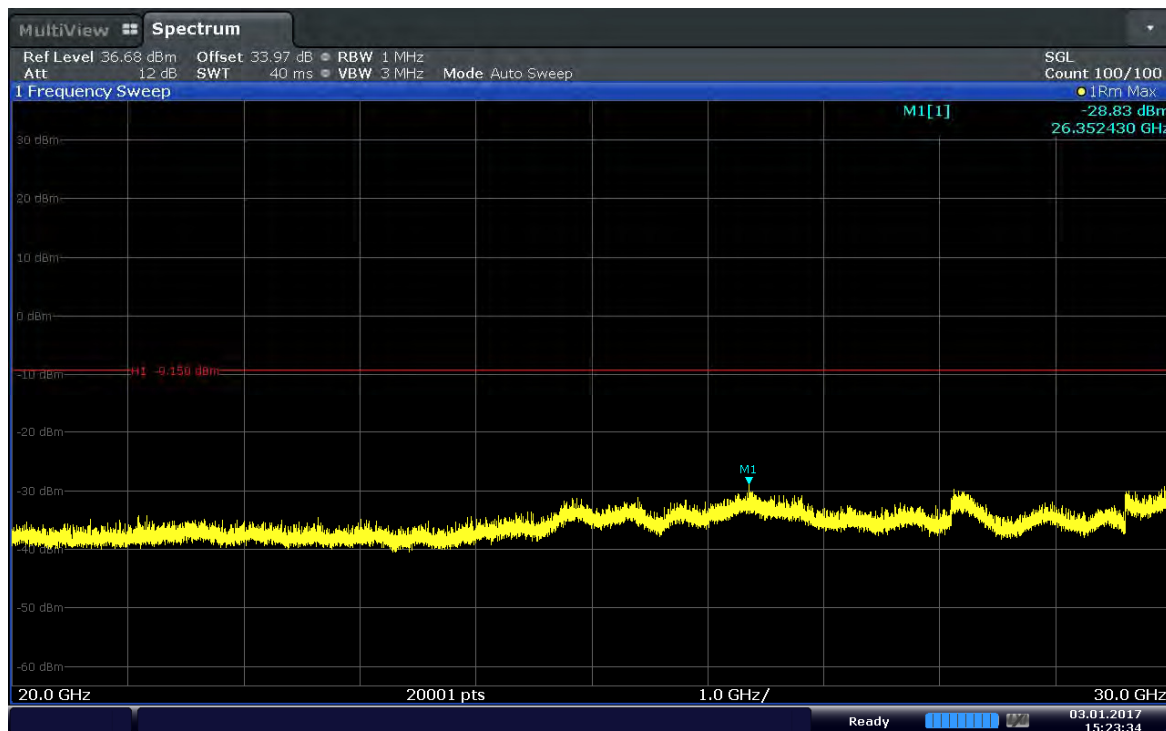
15:23:02 03.01.2017

Plot 6-21. Conducted Spurious Plot (Band 41–10MHz–QPSK–RB Size 1–RB Offset 24–Ch.40620)



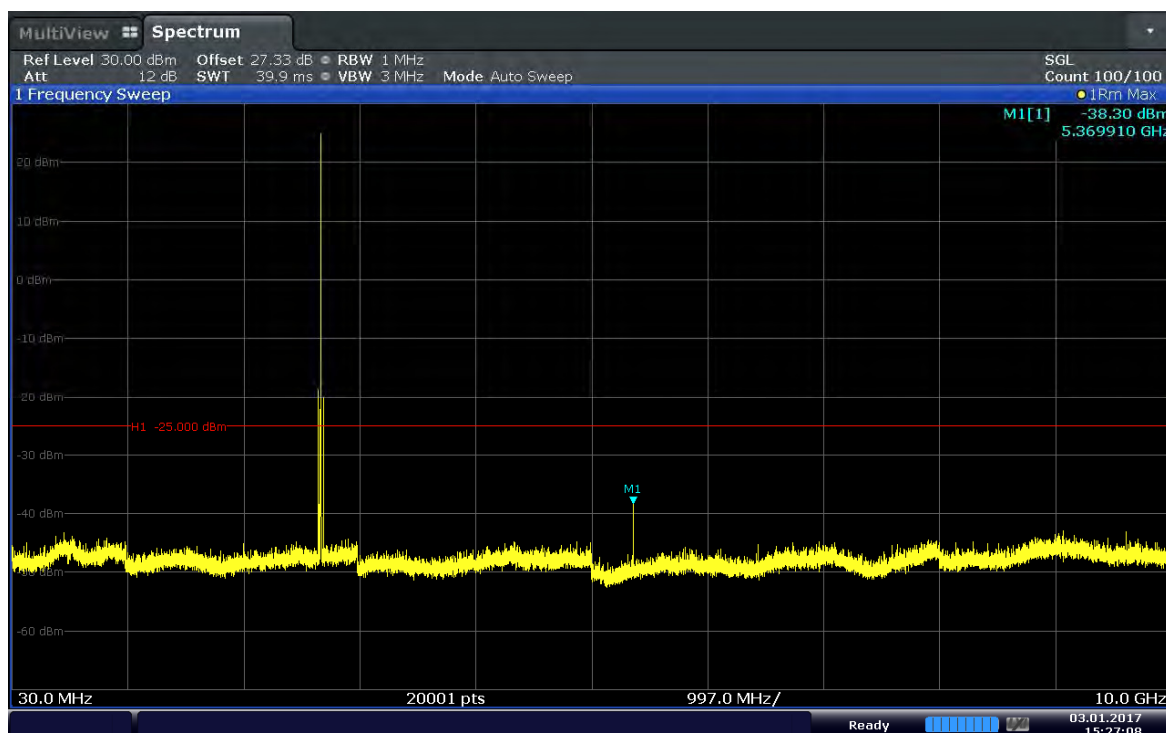
15:23:17 03.01.2017

Plot 6-22. Conducted Spurious Plot (Band 41–10MHz–QPSK– RB Size 1–RB Offset 24–Ch.40620)



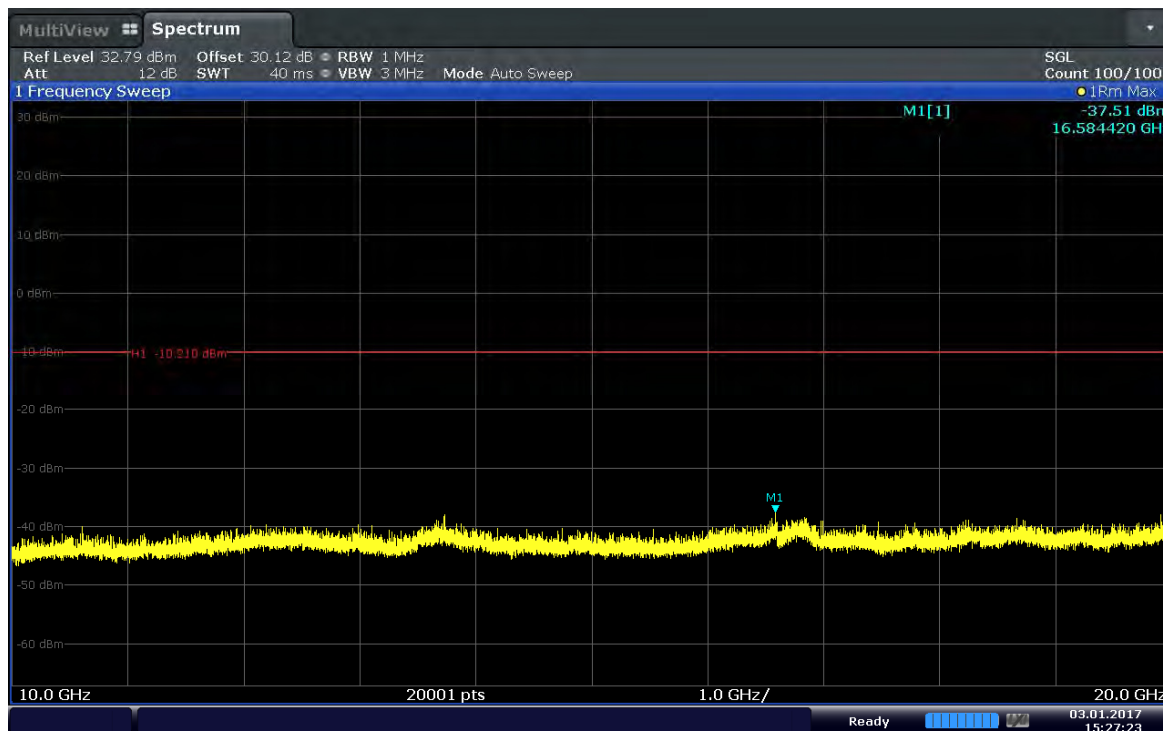
15:23:35 03.01.2017

Plot 6-23. Conducted Spurious Plot (Band 41–10MHz–QPSK– RB Size 1–RB Offset 24–Ch.40620)



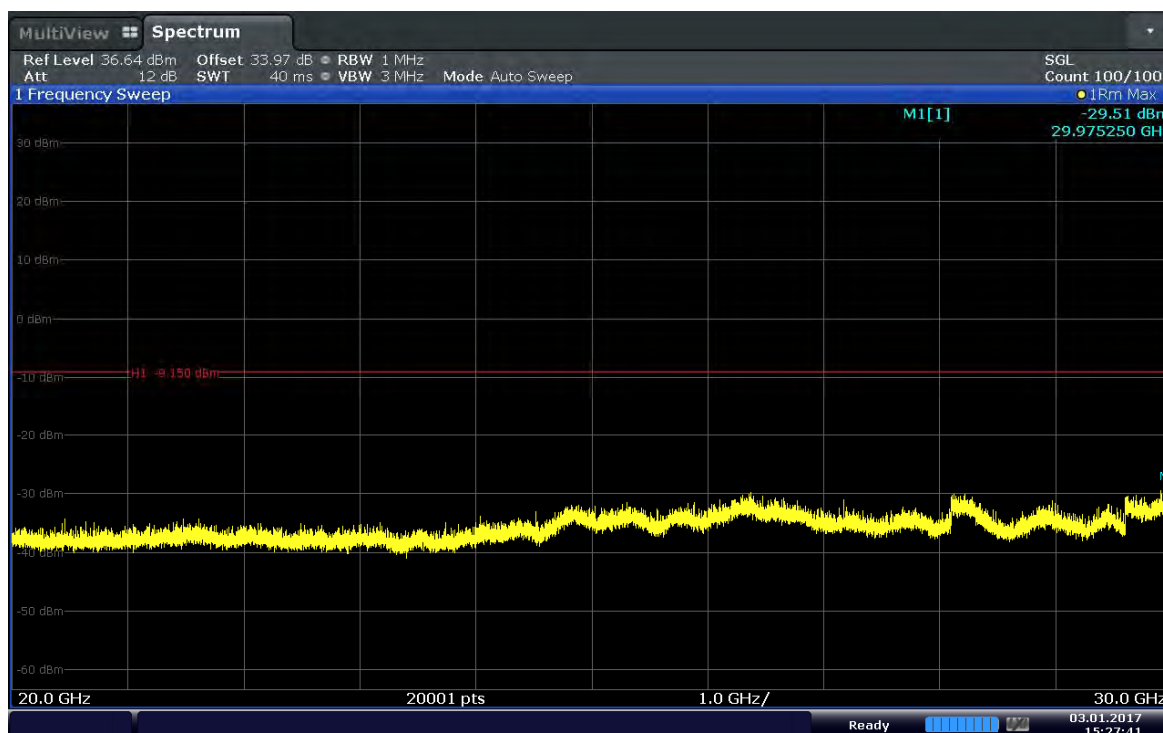
15:27:09 03.01.2017

Plot 6-24. Conducted Spurious Plot (Band 41–10MHz–QPSK–RB Size 1–RB Offset 24–Ch.41540)



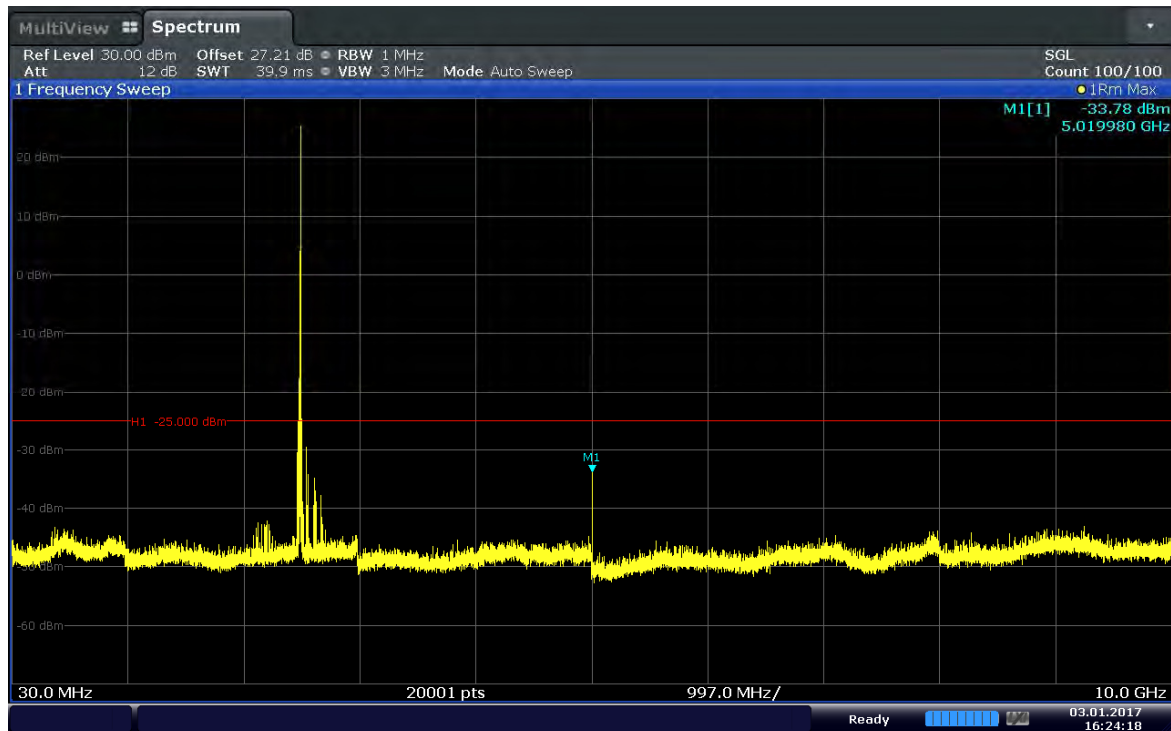
15:27:24 03.01.2017

Plot 6-25. Conducted Spurious Plot (Band 41–10MHz–QPSK– RB Size 1–RB Offset 24–Ch.41540)



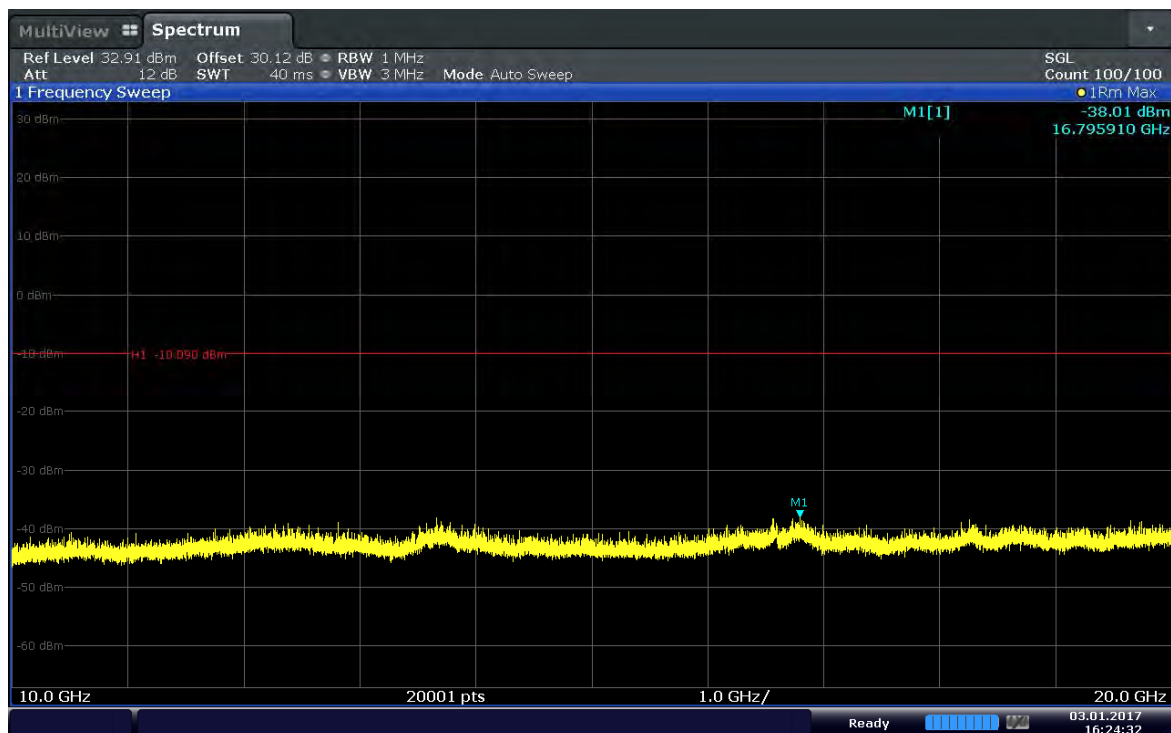
15:27:42 03.01.2017

Plot 6-26. Conducted Spurious Plot (Band 41–10MHz–QPSK– RB Size 1–RB Offset 24–Ch.41540)



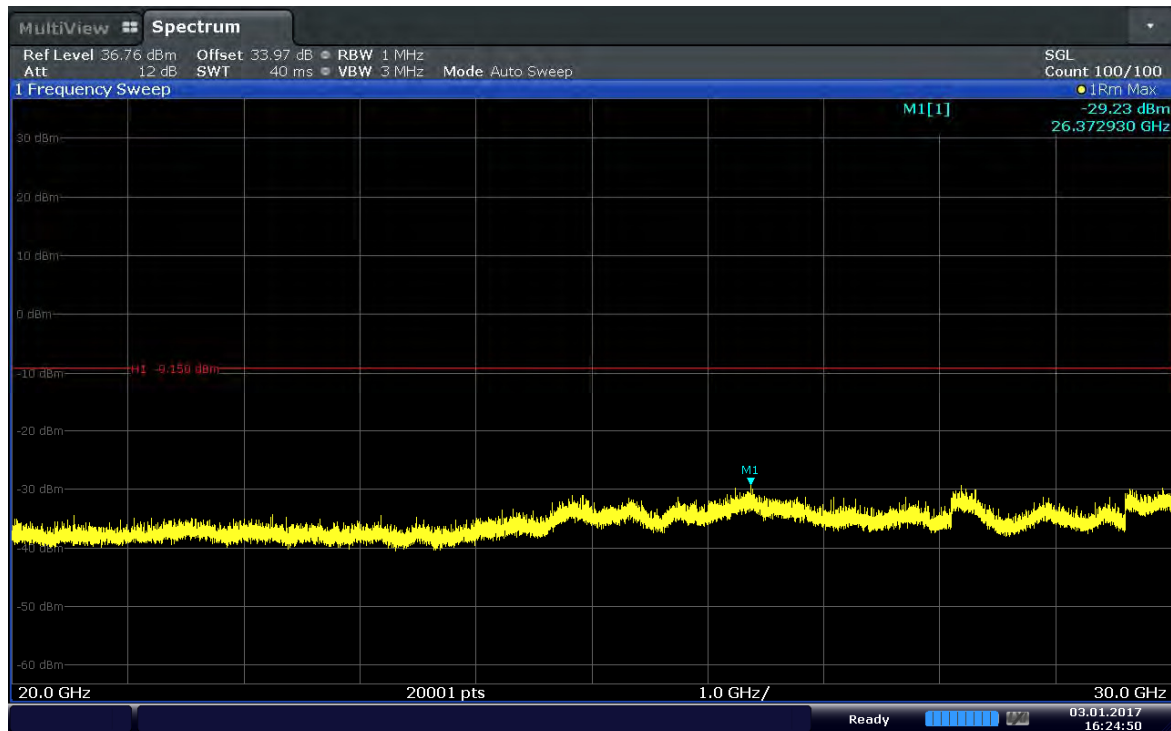
16:24:18 03.01.2017

Plot 6-27. Conducted Spurious Plot (Band 41–15MHz–QPSK–RB Size 1–RB Offset 74–Ch.39725)



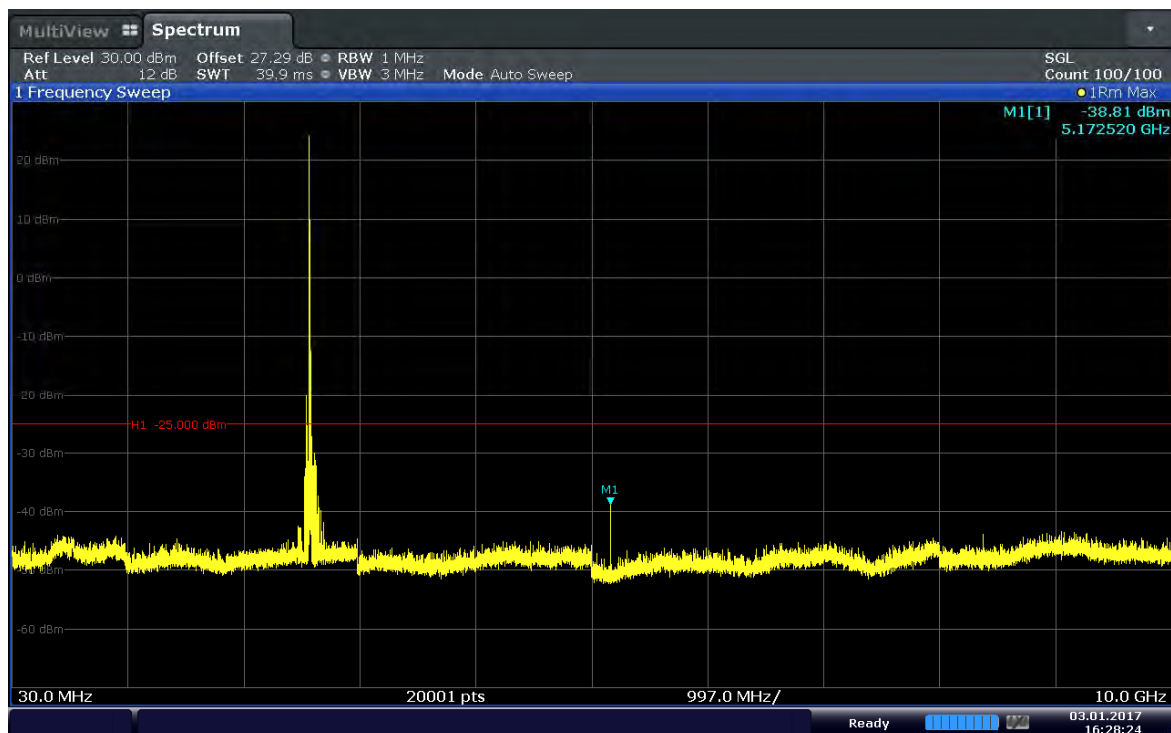
16:24:33 03.01.2017

Plot 6-28. Conducted Spurious Plot (Band 41–15MHz–QPSK–RB Size 1–RB Offset 74–Ch.39725)



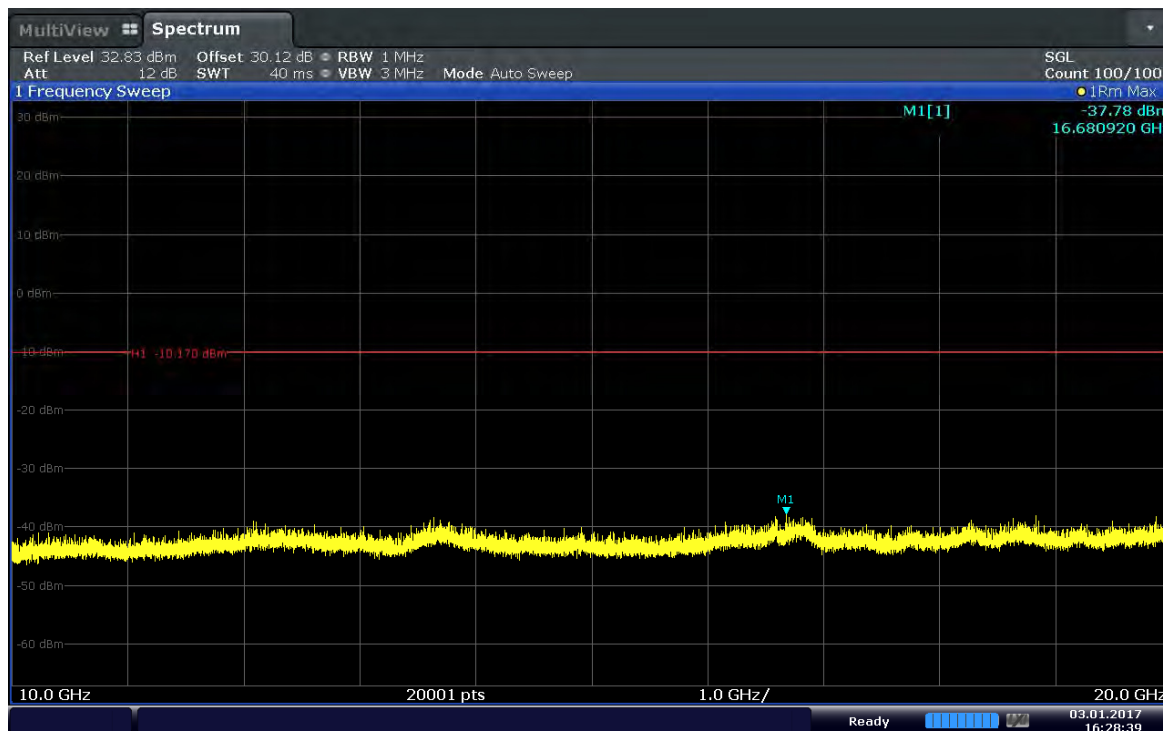
16:24:51 03.01.2017

Plot 6-29. Conducted Spurious Plot (Band 41–15MHz–QPSK–RB Size 1–RB Offset 74–Ch.39725)



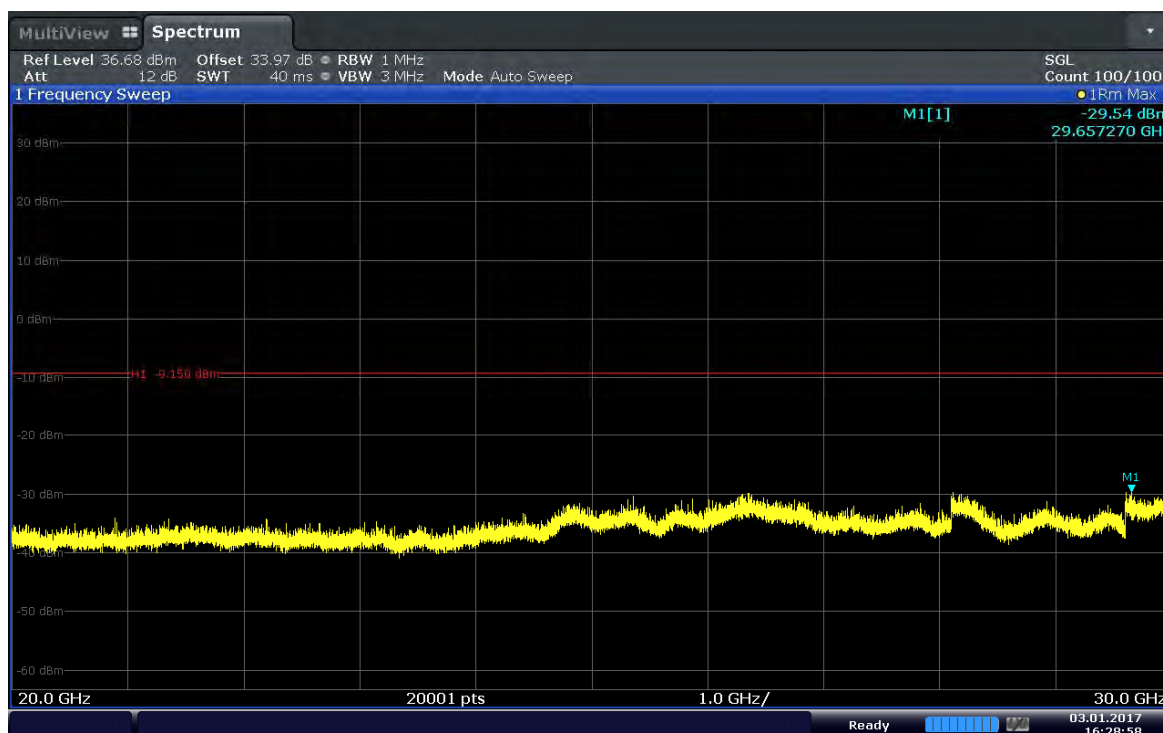
16:28:25 03.01.2017

Plot 6-30. Conducted Spurious Plot (Band 41–15MHz–QPSK–RB Size 1–RB Offset 0–Ch.40620)



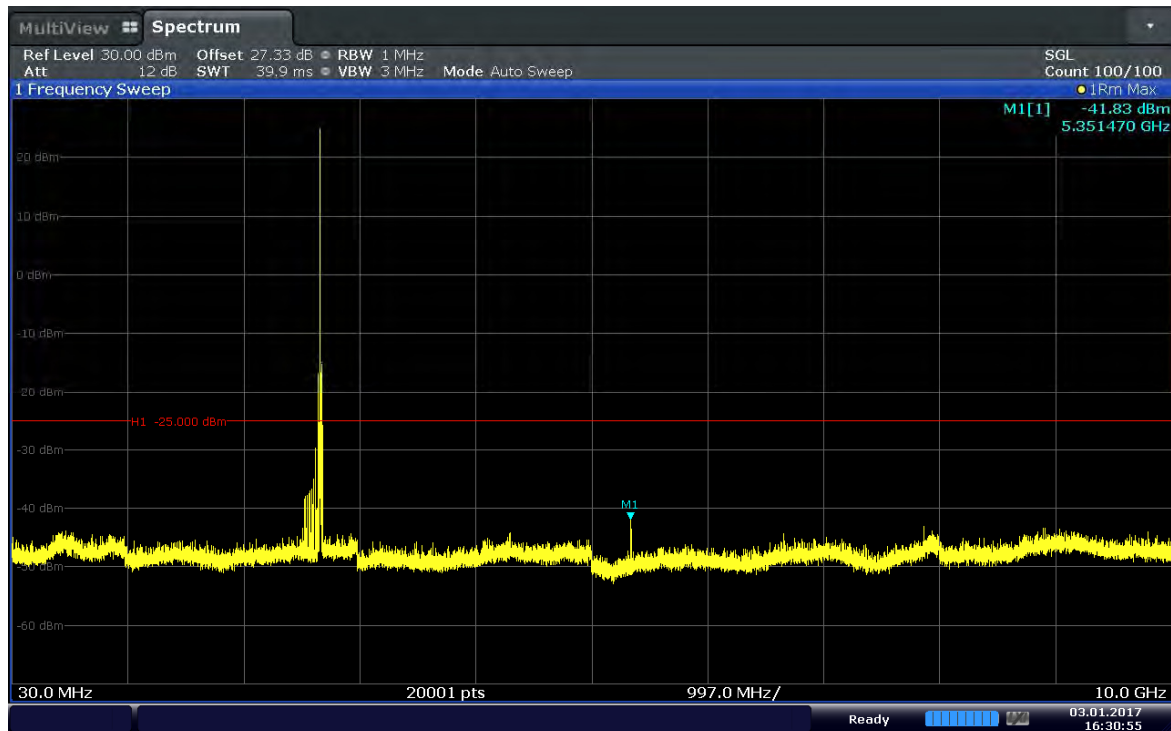
16:28:40 03.01.2017

Plot 6-31. Conducted Spurious Plot (Band 41–15MHz–QPSK–RB Size 1–RB Offset 0–Ch.40620)



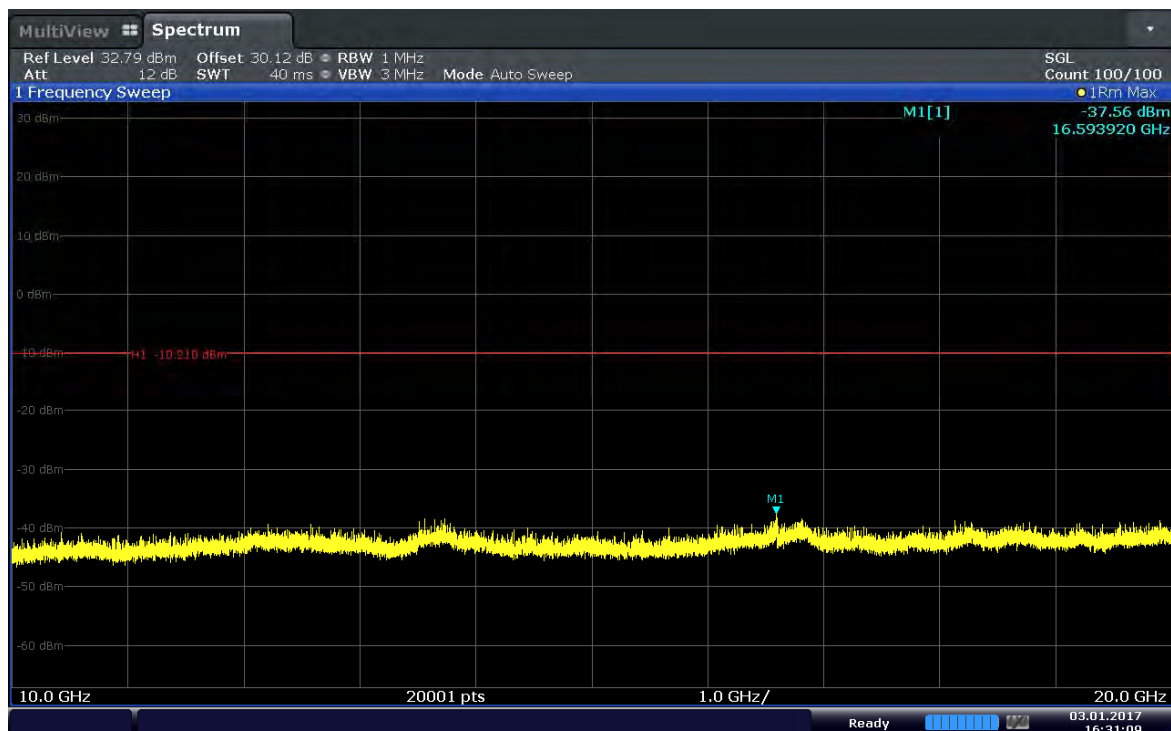
16:28:58 03.01.2017

Plot 6-32. Conducted Spurious Plot (Band 41–15MHz–QPSK–RB Size 1–RB Offset 0–Ch.40620)



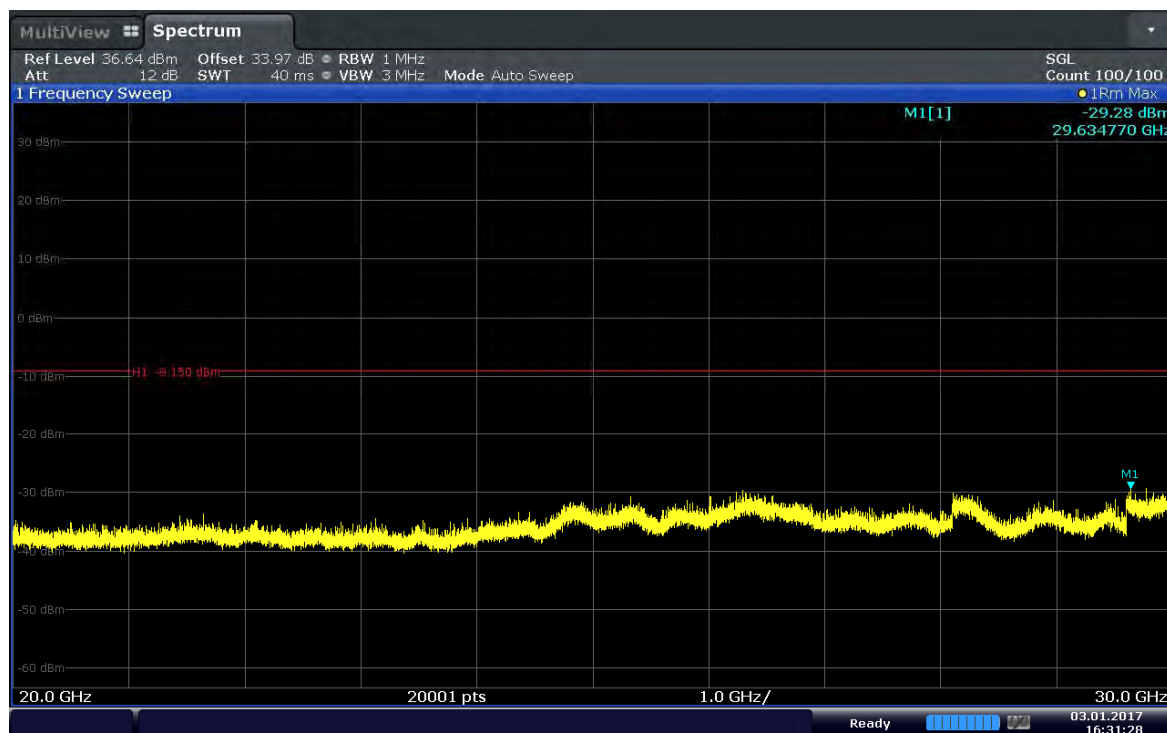
16:30:56 03.01.2017

Plot 6-33. Conducted Spurious Plot (Band 41–15MHz–QPSK–RB Size 1–RB Offset 0–Ch.41515)



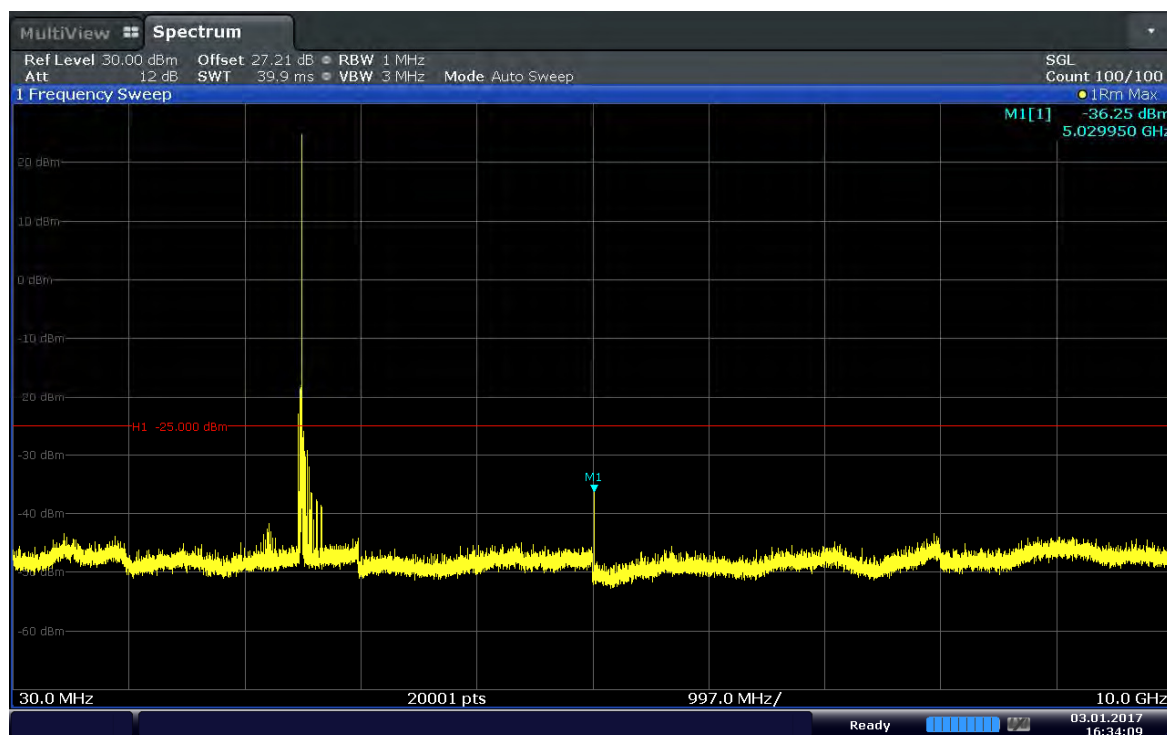
16:31:10 03.01.2017

Plot 6-34. Conducted Spurious Plot (Band 41–15MHz–QPSK–RB Size 1–RB Offset 0–Ch.41515)



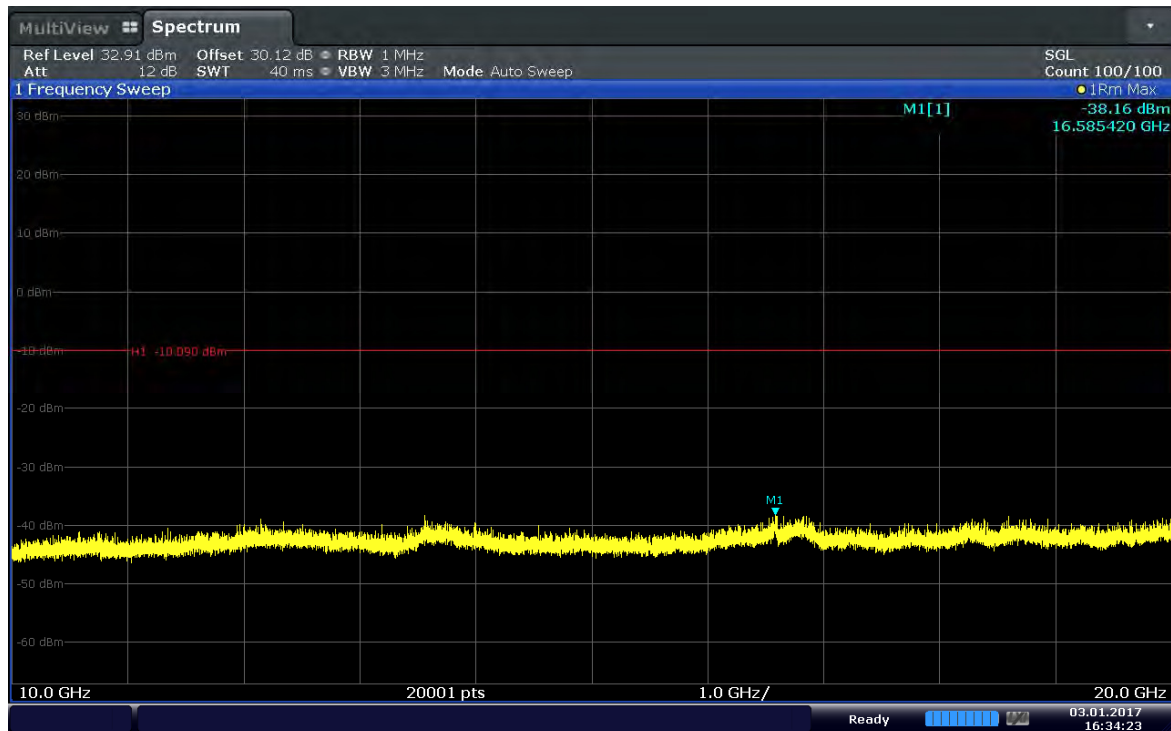
16:31:29 03.01.2017

Plot 6-35. Conducted Spurious Plot (Band 41–15MHz–QPSK–RB Size 1– RB Offset 0–Ch.41515)



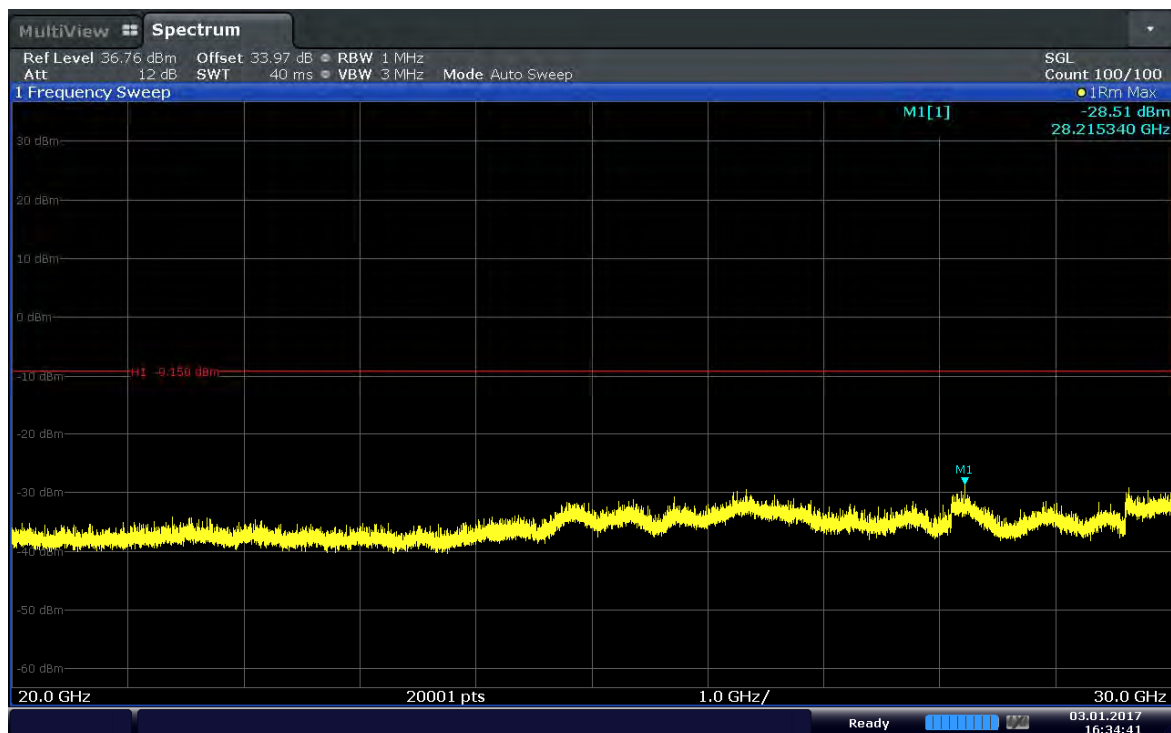
16:34:09 03.01.2017

Plot 6-36. Conducted Spurious Plot (Band 41–20MHz–QPSK–RB Size 1–RB Offset 99–Ch.39750)



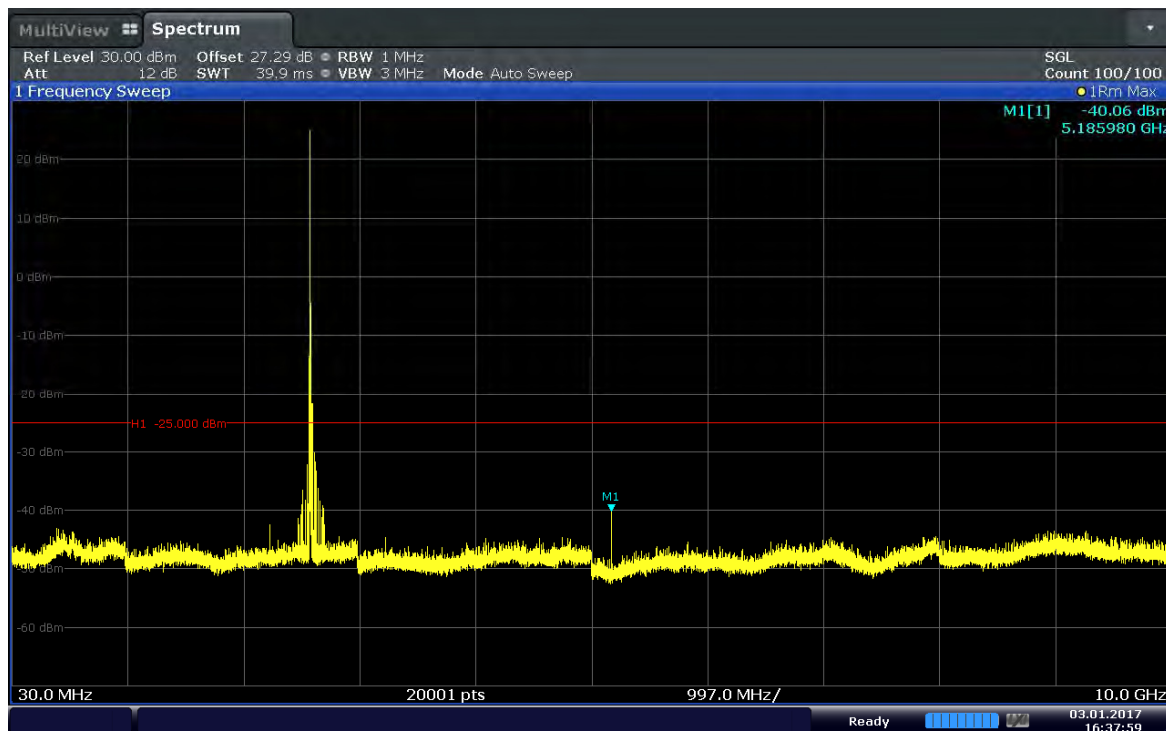
16:34:24 03.01.2017

Plot 6-37. Conducted Spurious Plot (Band 41–20MHz–QPSK–RB Size 1– RB Offset 99–Ch.39750)



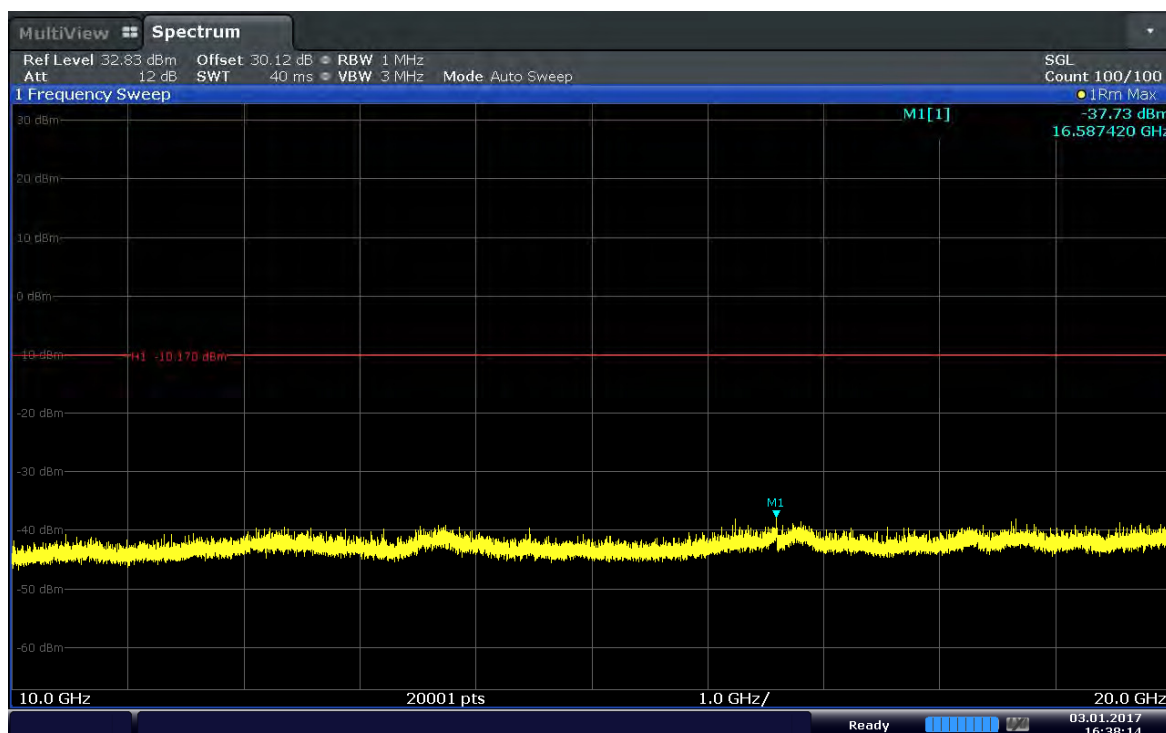
16:34:42 03.01.2017

Plot 6-38. Conducted Spurious Plot (Band 41–20MHz–QPSK–RB Size 1– RB Offset 99–Ch.39750)



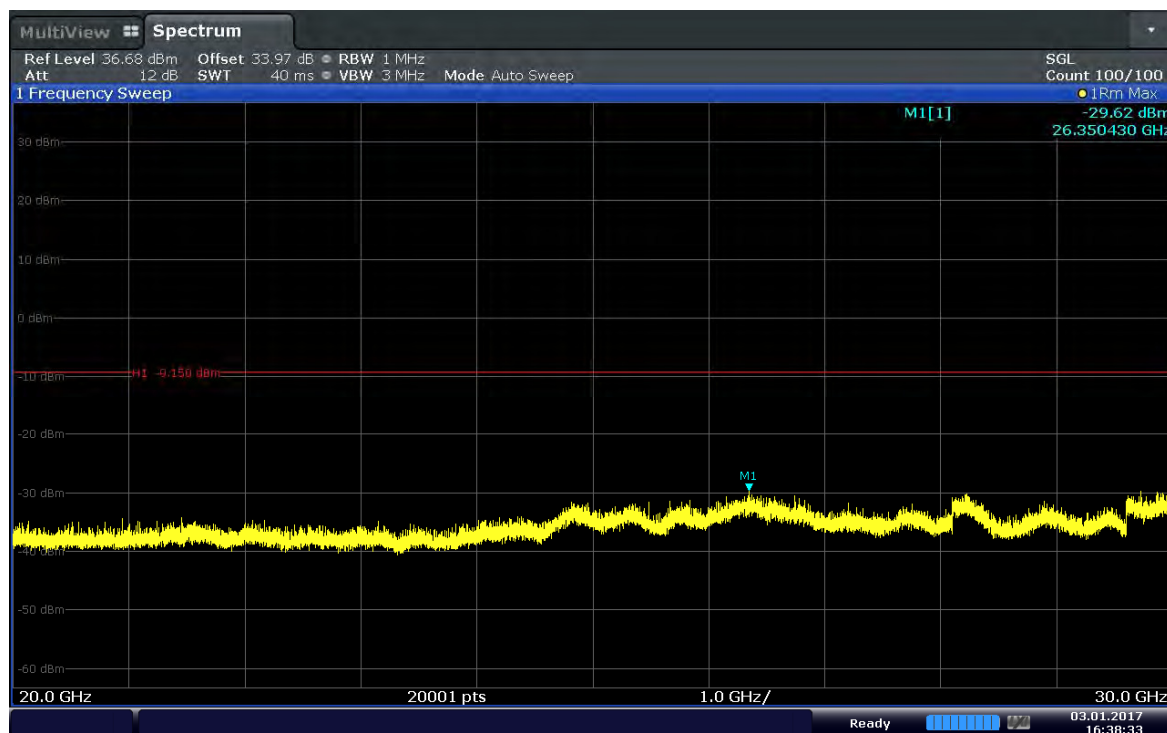
16:38:00 03.01.2017

Plot 6-39. Conducted Spurious Plot (Band 41–20MHz–QPSK–RB Size 1–RB Offset 49–Ch.40620)



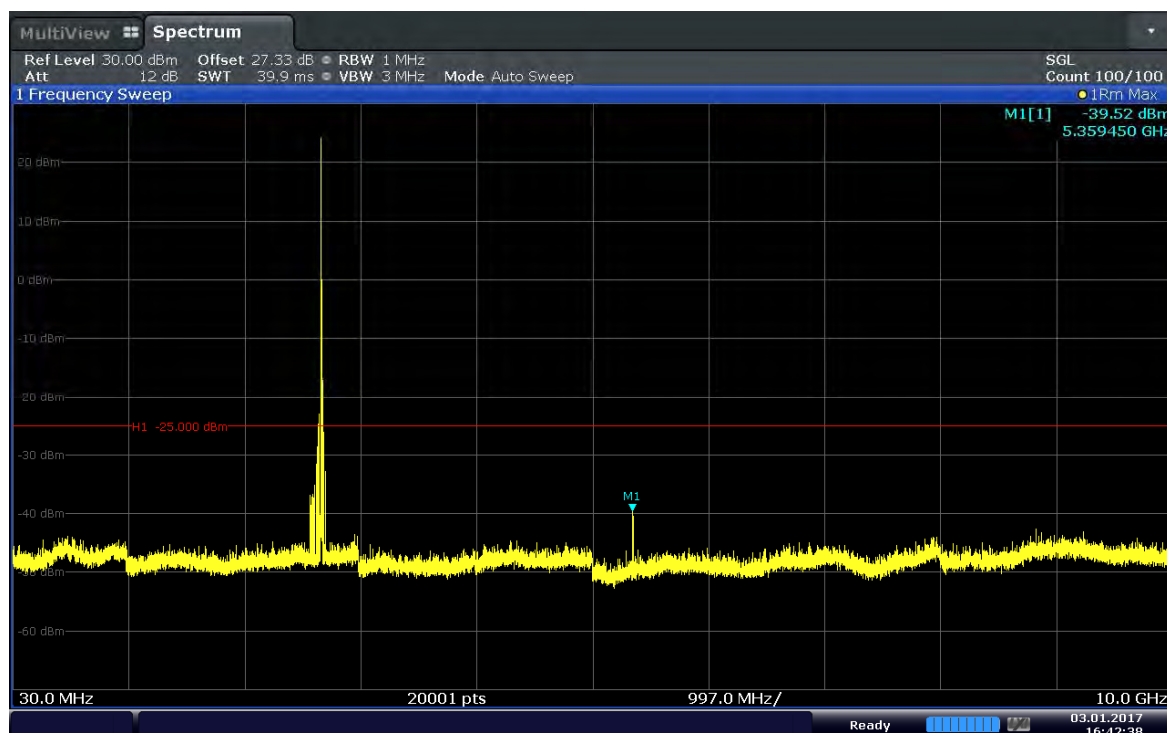
16:38:15 03.01.2017

Plot 6-40. Conducted Spurious Plot (Band 41–20MHz–QPSK–RB Size 1–RB Offset 49–Ch.40620)



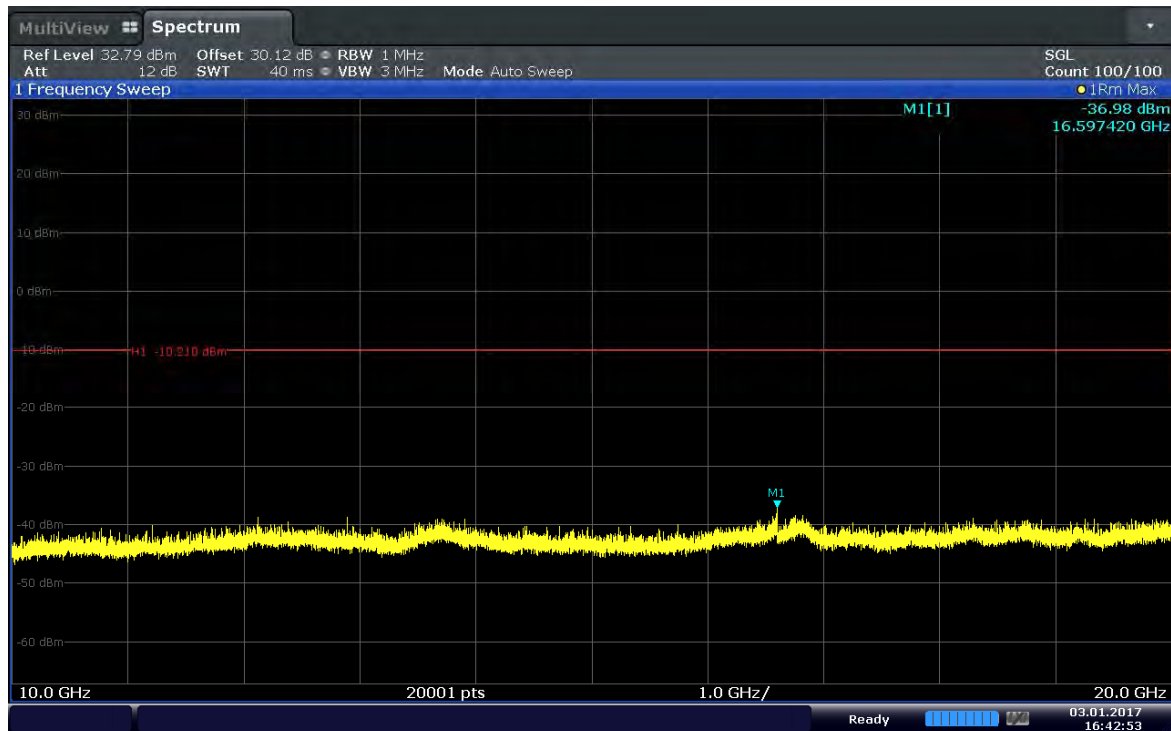
16:38:33 03.01.2017

Plot 6-41. Conducted Spurious Plot (Band 41–20MHz–QPSK–RB Size 1–RB Offset 49–Ch.40620)



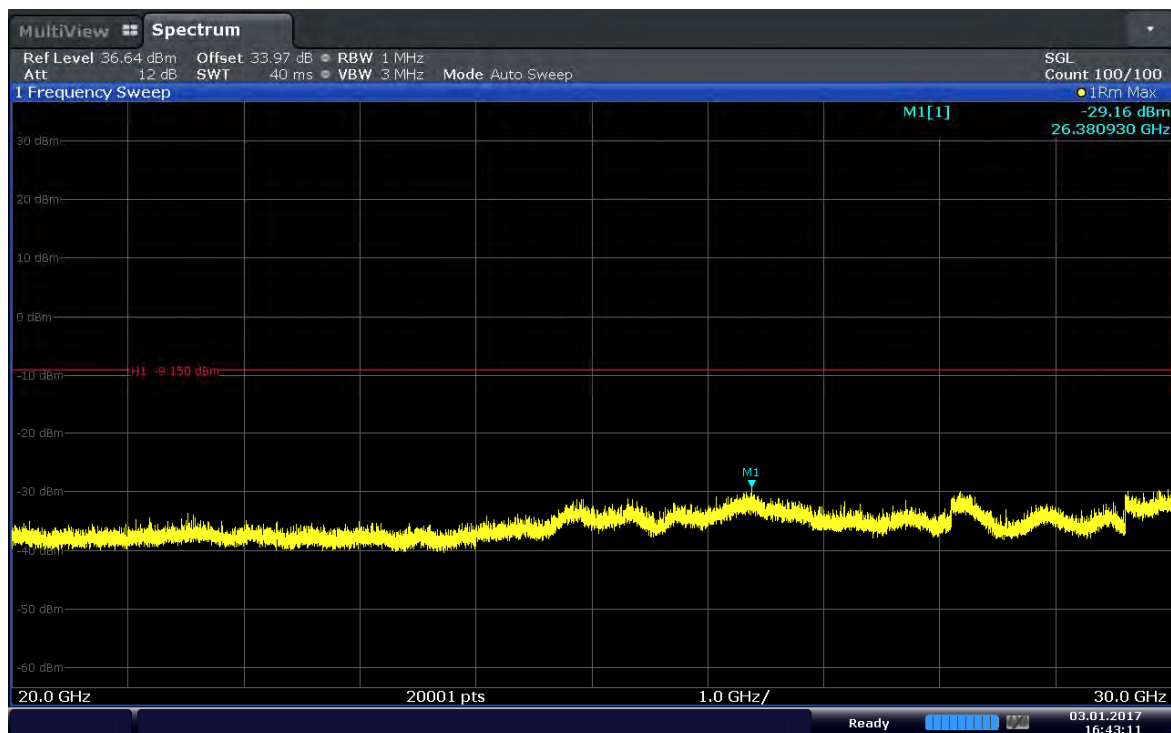
16:42:39 03.01.2017

Plot 6-42. Conducted Spurious Plot (Band 41–20MHz–QPSK–RB Size 1–RB Offset 49–Ch.41490)



16:42:53 03.01.2017

Plot 6-43. Conducted Spurious Plot (Band 41–20MHz–QPSK–RB Size 1– RB Offset 49–Ch.41490)



16:43:12 03.01.2017

Plot 6-44. Conducted Spurious Plot (Band 41–20MHz–QPSK–RB Size 1– RB Offset 49–Ch.41490)

#### 6.4. Band Edge Emissions at Antenna Terminal §2.1051 §27.53(m)

##### Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level is  $> 40 + 10\log_{10}(P[\text{Watts}])$  between channel edge and 5 MHz from the channel edge,  $> 43 + 10\log_{10}(P[\text{Watts}])$  between 5 MHz and X MHz from the channel edge, or between 2490.5 MHz and 2496 MHz, and  $> 55 + 10\log_{10}(P[\text{Watts}])$  more than X MHz from the channel edge, or below 2490.5 MHz, where X is the greater of 6 MHz or the actual emission bandwidth.

##### Test Procedure Used

KDB 971168 v02r02 – Section 6.0

##### Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot.
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. Please see test note below for RBW settings
4.  $VBW \geq 3 \times RBW$
5. Detector = RMS
6. Number of sweep points  $\geq 2 \times \text{Span}/RBW$
7. Trace mode = average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

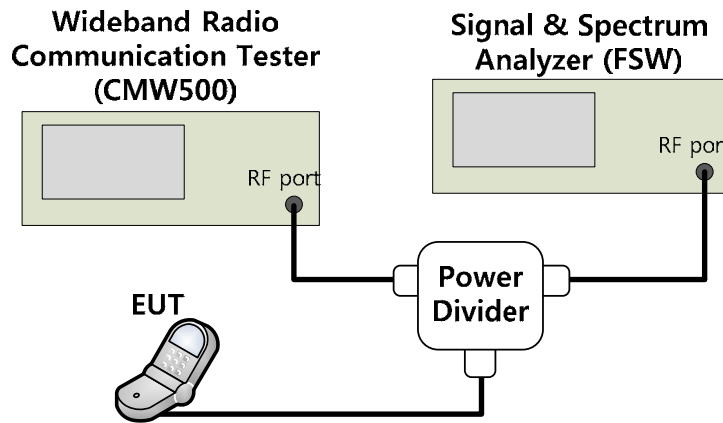


Figure 6-3. Test Instruments & Measurement Setup

### Test Note

1. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed.

## Test Plots



16:11:48 04.01.2017

Plot 6-45. Lower Band Edge Plot (Band41 – 5MHz – QPSK – RB Size 25 – Ch.39675)



16:59:34 04.01.2017

Plot 6-46. Upper Band Edge Plot (Band41 – 5MHz – QPSK – RB Size 25 – Ch.41565)



16:05:59 04.01.2017

Plot 6-47. Lower Band Edge Plot (Band41 – 10MHz – QPSK – RB Size 50 – Ch.39700)



17:00:54 04.01.2017

Plot 6-48. Upper Band Edge Plot (Band41 – 10MHz – QPSK – RB Size 50 – Ch.41540)



16:13:30 04.01.2017

Plot 6-49. Lower Band Edge Plot (Band41 – 15MHz – QPSK – RB Size 75 – Ch.39725)



17:03:11 04.01.2017

Plot 6-50. Upper Band Edge Plot (Band41 – 15MHz – QPSK – RB Size 75 – Ch.41515)



16:15:16 04.01.2017

Plot 6-51. Lower Band Edge Plot (Band41 – 20MHz – QPSK – RB Size 100 – Ch.39750)



17:03:54 04.01.2017

Plot 6-52. Upper Band Edge Plot (Band41 – 20MHz – QPSK – RB Size 100 – Ch.41490)



16:17:27 04.01.2017

Plot 6-53. Lower Band Edge Plot (Band41 – 20MHz – QPSK – RB Size 1 – RB Offset 0 – Ch.39750)



17:04:32 04.01.2017

Plot 6-54. Upper Band Edge Plot (Band41 – 20MHz – QPSK – RB Size 1 – RB Offset 99 – Ch.41490)



6.5. Frequency Stability / Temperature Variation  
§2.1055 §27.54

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-D-2010. The frequency stability of the transmitter is measured by:

1. Temperature: The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
2. Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the nominal value for other than hand carried battery equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point(=Batt.End) which shall be specified by the manufacturer.

For part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-D-2010

Test Settings

1. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
2. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of time sufficient to stabilize EUT at each temperature level shall be allowed prior to frequency measurement.

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

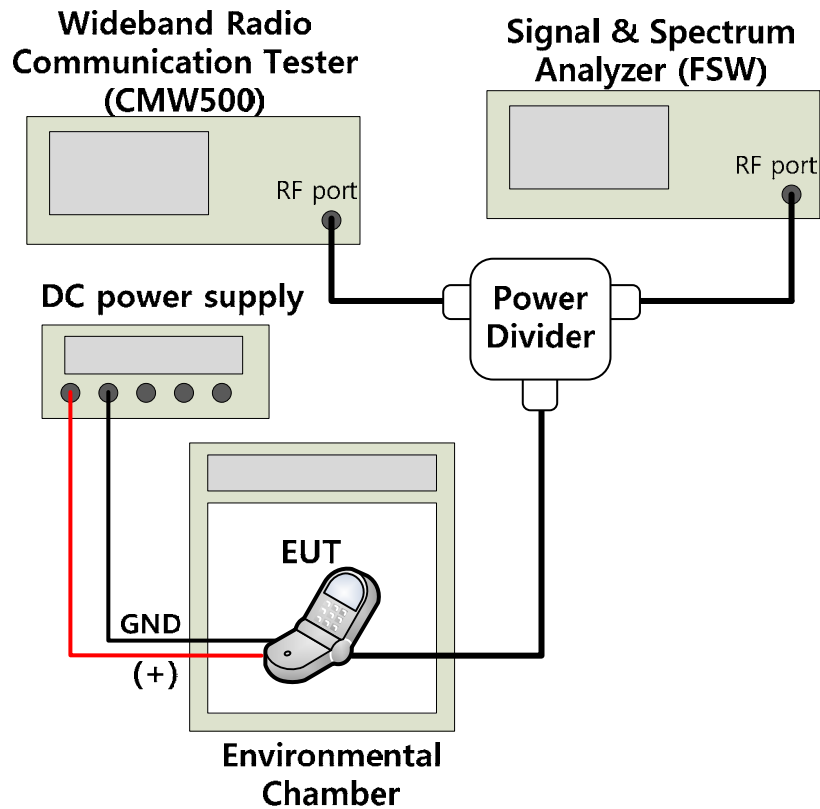


Figure 6-4. Test Instruments & Measurement Setup

### Test Notes

1. MCF is the Measured Carrier Frequency  
ACF is the Assigned Carrier Frequency
2. Calculate the ppm frequency error by the following:

$$\text{ppm error} = \left( \frac{\text{MCF}_{[\text{MHz}]} - \text{ACF}_{[\text{MHz}]}}{\text{ACF}_{[\text{MHz}]}} \right) \times 10^6$$

3. For part 27, the fundamental emission should stay within the authorized frequency block. But, based on the results of the frequency stability test at the center channel, the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Mode : LTE Band 41  
Channel : 41565  
Operating Frequency : 2687.5 MHz  
Reference Voltage : 3.85 VDC

| Voltage [%] | Power [VDC] | Temp [°C] | ACF [MHz] | MCF [MHz]    | Freq. Dev. [Hz] | ppm error |
|-------------|-------------|-----------|-----------|--------------|-----------------|-----------|
| 100 %       | 3.85        | -30       | 2687.5    | 2,687.499984 | -16.26          | -0.006    |
|             |             | -20       | 2687.5    | 2,687.500019 | 19.25           | 0.007     |
|             |             | -10       | 2687.5    | 2,687.500070 | 70.12           | 0.026     |
|             |             | 0         | 2687.5    | 2,687.499980 | -19.57          | -0.007    |
|             |             | +10       | 2687.5    | 2,687.499925 | -74.77          | -0.028    |
|             |             | +20       | 2687.5    | 2,687.500066 | 65.67           | 0.024     |
|             |             | +30       | 2687.5    | 2,687.500070 | 69.79           | 0.026     |
|             |             | +40       | 2687.5    | 2,687.500047 | 46.68           | 0.017     |
|             |             | +50       | 2687.5    | 2,687.500035 | 35.19           | 0.013     |
| Batt.End    | 3.40        | +20       | 2687.5    | 2,687.500069 | 68.81           | 0.026     |

Table 6-2. Frequency Stability Data (LTE Band 41)

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## 6.6. Radiated Power (EIRP) §27.50(h.2)

### Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 with the EUT transmitting into an integral antenna. Measurements on signals operating above 1GHz are performed using horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### Test Procedure Used

KDB 971168 v02r02 – Section 5.2.1

ANSI/TIA-603-D-2010 – Section 2.2.17

### Test Settings

1. Radiated power measurements are performed using the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW  $\geq 3 \times$  RBW
4. Span = 1.5 times the OBW
5. No. of sweep points  $\geq 2 \times$  span / RBW
6. Detector = RMS
7. Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

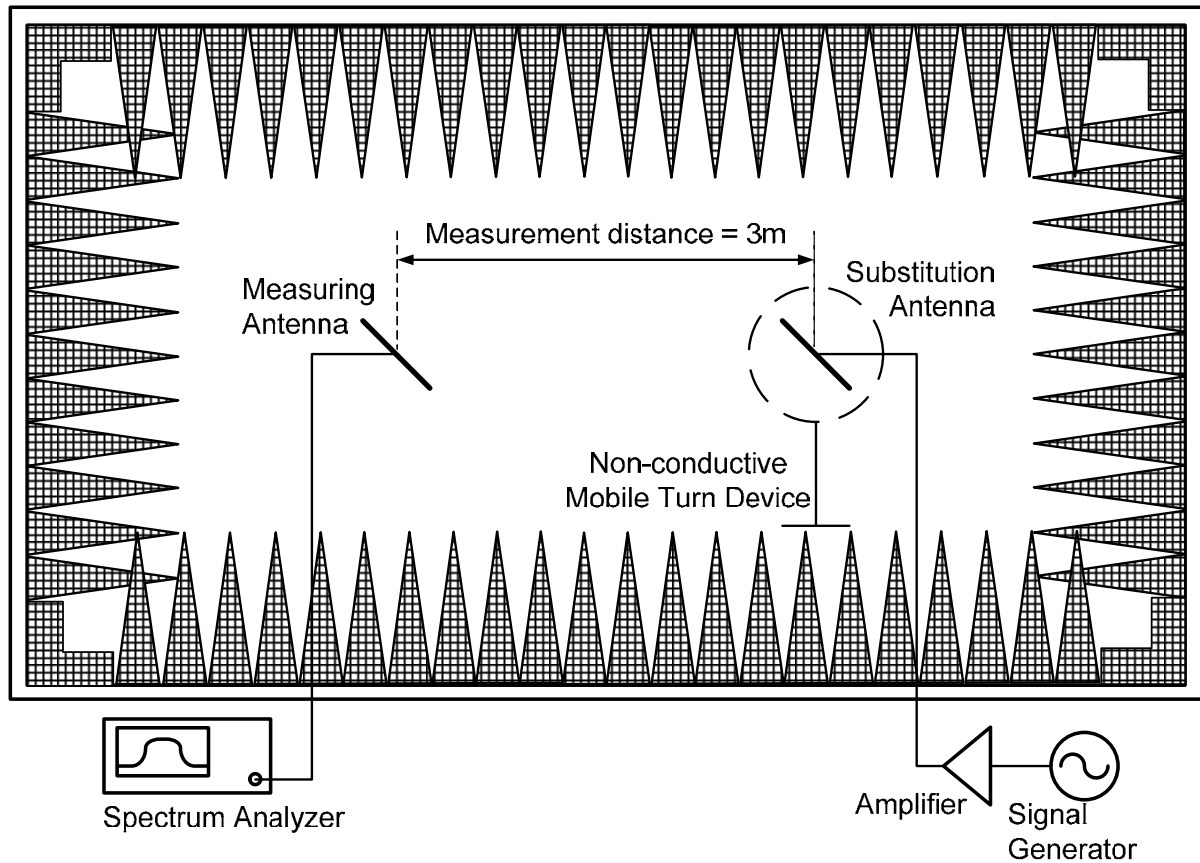


Figure 6-7. Test Instruments & Measurement Setup

### Test Notes

1. The EUT was tested with Turn Device and the worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
2. This unit was tested with its embedded battery.

Test Results

| Channel | Freq.<br>[MHz] | Channel<br>BW<br>[MHz] | Mod.  | RB<br>Size<br>/Offset | Ant Pol<br>(H/V) | EUT POL<br>[degree] |           | S/A<br>Reading<br>[dBm] | S/G<br>Level<br>[dBm] | Tx<br>C/L<br>[dB] | Ant.<br>Gain<br>[dBi] | EIRP<br>[dBm] | Limit<br>[dBm] | Margin<br>[dB] |
|---------|----------------|------------------------|-------|-----------------------|------------------|---------------------|-----------|-------------------------|-----------------------|-------------------|-----------------------|---------------|----------------|----------------|
|         |                |                        |       |                       |                  | Azimuth             | Elevation |                         |                       |                   |                       |               |                |                |
| 39675   | 2498.5         | 5                      | QPSK  | 1/24                  | H                | 229                 | 354       | -23.86                  | 18.92                 | 4.82              | 9.89                  | 23.99         | 33.01          | 9.02           |
| 39675   | 2498.5         | 5                      | 16QAM | 1/24                  | H                | 229                 | 354       | -24.81                  | 17.97                 | 4.82              | 9.89                  | 23.04         | 33.01          | 9.97           |
| 40620   | 2593           | 5                      | QPSK  | 1/12                  | H                | 230                 | 350       | -23.85                  | 19.63                 | 4.98              | 9.51                  | 24.16         | 33.01          | 8.85           |
| 40620   | 2593           | 5                      | 16QAM | 1/12                  | H                | 230                 | 350       | -25.28                  | 18.20                 | 4.98              | 9.51                  | 22.73         | 33.01          | 10.28          |
| 41565   | 2687.5         | 5                      | QPSK  | 1/12                  | H                | 231                 | 349       | -24.89                  | 19.16                 | 4.92              | 8.99                  | 23.23         | 33.01          | 9.78           |
| 41565   | 2687.5         | 5                      | 16QAM | 1/12                  | H                | 231                 | 349       | -26.50                  | 17.55                 | 4.92              | 8.99                  | 21.62         | 33.01          | 11.39          |
| 39700   | 2501           | 10                     | QPSK  | 1/49                  | H                | 232                 | 355       | -23.68                  | 19.10                 | 4.82              | 9.89                  | 24.17         | 33.01          | 8.84           |
| 39700   | 2501           | 10                     | 16QAM | 1/49                  | H                | 232                 | 355       | -26.40                  | 16.38                 | 4.82              | 9.89                  | 21.45         | 33.01          | 11.56          |
| 40620   | 2593           | 10                     | QPSK  | 1/24                  | H                | 230                 | 350       | -23.79                  | 19.69                 | 4.98              | 9.51                  | 24.22         | 33.01          | 8.79           |
| 40620   | 2593           | 10                     | 16QAM | 1/24                  | H                | 230                 | 350       | -26.07                  | 17.41                 | 4.98              | 9.51                  | 21.94         | 33.01          | 11.07          |
| 41540   | 2685           | 10                     | QPSK  | 1/24                  | H                | 230                 | 350       | -24.47                  | 19.58                 | 4.92              | 8.99                  | 23.65         | 33.01          | 9.36           |
| 41540   | 2685           | 10                     | 16QAM | 1/24                  | H                | 230                 | 350       | -28.99                  | 15.06                 | 4.92              | 8.99                  | 19.13         | 33.01          | 13.88          |
| 39725   | 2503.5         | 15                     | QPSK  | 1/74                  | H                | 230                 | 350       | -24.09                  | 18.69                 | 4.82              | 9.89                  | 23.76         | 33.01          | 9.25           |
| 39725   | 2503.5         | 15                     | 16QAM | 1/74                  | H                | 230                 | 350       | -25.89                  | 16.89                 | 4.82              | 9.89                  | 21.96         | 33.01          | 11.05          |
| 40620   | 2593           | 15                     | QPSK  | 1/0                   | H                | 233                 | 348       | -23.86                  | 19.62                 | 4.98              | 9.51                  | 24.15         | 33.01          | 8.86           |
| 40620   | 2593           | 15                     | 16QAM | 1/0                   | H                | 233                 | 348       | -25.19                  | 18.29                 | 4.98              | 9.51                  | 22.82         | 33.01          | 10.19          |
| 41515   | 2682.5         | 15                     | QPSK  | 1/0                   | H                | 230                 | 350       | -24.46                  | 19.41                 | 5.04              | 9.04                  | 23.41         | 33.01          | 9.60           |
| 41515   | 2682.5         | 15                     | 16QAM | 1/0                   | H                | 230                 | 350       | -25.82                  | 18.05                 | 5.04              | 9.04                  | 22.05         | 33.01          | 10.96          |
| 39750   | 2506           | 20                     | QPSK  | 1/99                  | H                | 230                 | 350       | -23.73                  | 19.23                 | 4.84              | 9.84                  | 24.23         | 33.01          | 8.78           |
| 39750   | 2506           | 20                     | 16QAM | 1/99                  | H                | 230                 | 350       | -25.35                  | 17.61                 | 4.84              | 9.84                  | 22.61         | 33.01          | 10.40          |
| 40620   | 2593           | 20                     | QPSK  | 1/49                  | H                | 230                 | 350       | -23.81                  | 19.67                 | 4.98              | 9.51                  | 24.20         | 33.01          | 8.81           |
| 40620   | 2593           | 20                     | 16QAM | 1/49                  | H                | 230                 | 350       | -24.38                  | 19.10                 | 4.98              | 9.51                  | 23.63         | 33.01          | 9.38           |
| 41490   | 2680           | 20                     | QPSK  | 1/49                  | H                | 230                 | 350       | -24.70                  | 19.17                 | 5.04              | 9.04                  | 23.17         | 33.01          | 9.84           |
| 41490   | 2680           | 20                     | 16QAM | 1/49                  | H                | 230                 | 350       | -25.25                  | 18.62                 | 5.04              | 9.04                  | 22.62         | 33.01          | 10.39          |
| 39750   | 2506           | 20                     | QPSK  | 1/99                  | V                | 235                 | 240       | -27.38                  | 15.63                 | 4.84              | 9.84                  | 20.63         | 33.01          | 12.38          |

Table 6-3. EIRP (LTE Band 41)

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## 6.7. Radiated Spurious Emissions Measurements §2.1053 §27.53(m)

### Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using dipole antennas. Measurements on signals operating above 1GHz are performed using broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### Test Procedure Used

KDB 971168 v02r02 – Section 5.8

ANSI/TIA-603-D-2010 – Section 2.2.12

### Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq 3 \times$  RBW
3. No. of sweep points  $\geq$  Span / RBW
4. Detector = RMS
5. Trace mode = trace averaging (RMS) over 100 sweeps
6. The trace was allowed to stabilize

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### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

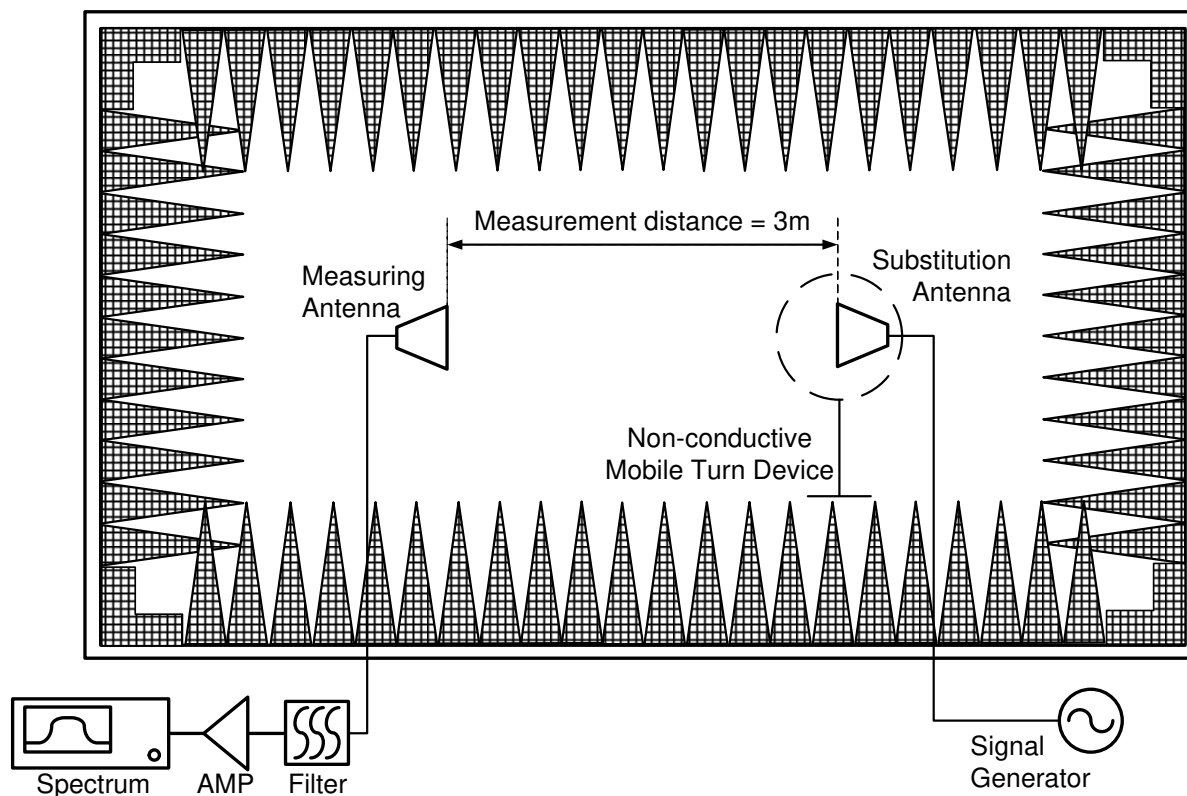


Figure 6-8. Test Instruments & Measurement Setup

### Test Notes

1. The EUT was tested with Turn Device and the worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
2. This unit was tested with its embedded battery.
3. The spectrum is measured from 9kHz to the 10<sup>th</sup> harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

## Test Results

Operating Frequency : 2506.0 MHz  
 Channel : 39750  
 Measured Output Power : 24.23 dBm = 0.265 Watt  
 Modulation Signal : QPSK  
 Band Width : 20 MHz  
 RB Size / Offset : 1 / 99  
 Distance : 3 Meters  
 Limit :  $55 + 10 \log_{10}(W)$  = 49.23 dBc  
 RSE Limit : -25 dBm

| Freq.<br>[MHz] | Ant<br>Pol<br>(H/V) | EUT Pol<br>[degree] |           | S/A<br>reading<br>[dBm] | S/G<br>Lev.<br>[dBm] | Tx<br>C/L<br>[dB] | Ant.<br>Gain<br>[dBi] | RSE<br>Level<br>[dBm] |
|----------------|---------------------|---------------------|-----------|-------------------------|----------------------|-------------------|-----------------------|-----------------------|
|                |                     | Azimuth             | Elevation |                         |                      |                   |                       |                       |
| 5012.2         | H                   | 240                 | 240       | -73.21                  | -60.72               | 5.97              | 11.24                 | -55.45                |
| 7518.0         | V                   | Noise floor         |           | -75.46                  | -54.30               | 7.27              | 9.73                  | -51.84                |
| 10024.0        | V                   |                     |           | -77.82                  | -52.58               | 8.81              | 11.96                 | -49.43                |

Table 6-4. Radiated Spurious Data (LTE Band 41 – Low Channel)

Operating Frequency : 2593.0 MHz  
 Channel : 40620  
 Measured Output Power : 24.22 dBm = 0.264 Watt  
 Modulation Signal : QPSK  
 Band Width : 10 MHz  
 RB Size / Offset : 1 / 24  
 Distance : 3 meters  
 Limit :  $55 + 10 \log_{10}(W)$  = 49.22 dBc  
 RSE Limit : -25 dBm

| Freq.<br>[MHz] | Ant<br>Pol<br>(H/V) | EUT Pol<br>[degree] |           | S/A<br>reading<br>[dBm] | S/G<br>Lev.<br>[dBm] | Tx<br>C/L<br>[dB] | Ant.<br>Gain<br>[dBi] | RSE<br>Level<br>[dBm] |
|----------------|---------------------|---------------------|-----------|-------------------------|----------------------|-------------------|-----------------------|-----------------------|
|                |                     | Azimuth             | Elevation |                         |                      |                   |                       |                       |
| 5186.4         | V                   | 270                 | 240       | -72.89                  | -60.92               | 6.01              | 11.57                 | -55.36                |
| 7779.0         | V                   | Noise floor         |           | -75.79                  | -55.26               | 7.49              | 10.21                 | -52.54                |
| 10372.0        | V                   |                     |           | -75.93                  | -51.50               | 8.64              | 11.87                 | -48.27                |

Table 6-5. Radiated Spurious Data (LTE Band 41 – Mid Channel)

Operating Frequency : 2685.0 MHz  
 Channel : 41540  
 Measured Output Power : 23.65 dBm = 0.232 Watt  
 Modulation Signal : QPSK  
 Band Width : 10 MHz  
 RB Size / Offset : 1 / 24  
 Distance : 3 meters  
 Limit :  $55 + 10 \log_{10}(W)$  = 48.65 dBc  
 RSE Limit : -25 dBm

| Freq.<br>[MHz] | Ant<br>Pol<br>(H/V) | EUT Pol<br>[degree] |           | S/A<br>reading<br>[dBm] | S/G<br>Lev.<br>[dBm] | Tx<br>C/L<br>[dB] | Ant.<br>Gain<br>[dBi] | RSE<br>Level<br>[dBm] |
|----------------|---------------------|---------------------|-----------|-------------------------|----------------------|-------------------|-----------------------|-----------------------|
|                |                     | Azimuth             | Elevation |                         |                      |                   |                       |                       |
| 5369.9         | H                   | 120                 | 90        | -72.63                  | -59.79               | 6.11              | 11.52                 | -54.38                |
| 8055.0         | V                   | Noise floor         |           | -76.60                  | -54.75               | 7.54              | 10.79                 | -51.50                |
| 10740.0        | H                   |                     |           | -75.70                  | -50.98               | 8.83              | 12.26                 | -47.55                |

Table 6-6. Radiated Spurious Data (LTE Band 41 – High Channel)

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## **7. CONCLUSION**

The data collected relate only the item(s) tested and show that the Samsung Portable Handset FCC ID: A3LSMC900F compliance with all the requirements of Parts 2, 27 of the FCC rules.

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