



Issue Date:

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FCC TEST REPORT

Manufacturer: SAMSUNG Electronics Co., Ltd.

Model: SM-T377A

FCC ID: A3LSMT377A

Application Type: Certification

EUT Type: Portable Tablet

All measurements reported here are in accordance with FCC Rules,
47CFR Part2, Part22 and Part24.

Prepared By Date
Jooha Bek
Test Engineer

Authorized By Date
WT Jang
Technical Manager



Revision History

Rev. #	Issue Date	Revisions	Revised By
1	2015.08.27	▪ Initial issue	Jooha Bek
1/2	2015.09.24	▪ Revised FCC Classification, PCE to PCB. ▪ Revised test note #2 on page 10.	Jooha Bek
1/3		▪ Revised Extended Band Edge Plots	Jooha Bek

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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 Co., Ltd.
TEST SITE ADDRESS:	129 Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
FCC RULE PART(S):	§2, §22, §24.
TEST PROCEDURE(S):	ANSI/TIA603-C-2004, KDB971168 v02r02
BASE MODEL:	SM-T377A
FCC ID:	A3LSMT377A
FCC CLASSIFICATION:	PCS Licensed Transmitter (PCB)
MODE:	LTE
EMISSION DESIGNATOR:	See Table 0-1
TX FREQUENCY BLOCK	1850 – 1910MHz (Band 2) 824 – 849MHz (Band 5)
RX FREQUENCY BLOCK	1930 – 1990MHz (Band 2) 869 – 894MHz (Band 5)
MAX POWER RATING:	0.420 W EIRP LTE Band 2 (26.23 dBm) 0.140 W ERP LTE Band 5 (21.46 dBm)
TEST DEVICE SERIAL NO.:	FCM-024-A , FCM-024-B
DATE(S) OF TEST:	July 30 – August 17, 2015 (issue 1) July 30 – September 30, 2015 (issue1/3)



Issue Date:

Mode	Tx Frequency (MHz)	Emission Designator	Modulation	ERP/EIRP	
				Max. Power (Watt)	Max. Power (dBm)
LTE Band 2	1850.7 – 1909.3	1M09G7D	QPSK	0.420	26.23
LTE Band 2	1850.7 – 1909.3	1M10W7D	16QAM	0.344	25.36
LTE Band 2	1851.5 – 1908.5	2M69G7D	QPSK	0.405	26.08
LTE Band 2	1851.5 – 1908.5	2M69W7D	16QAM	0.369	25.67
LTE Band 2	1852.5 – 1907.5	4M49G7D	QPSK	0.389	25.90
LTE Band 2	1852.5 – 1907.5	4M50W7D	16QAM	0.340	25.32
LTE Band 2	1855.0 – 1905.0	8M95G7D	QPSK	0.394	25.96
LTE Band 2	1855.0 – 1905.0	8M95W7D	16QAM	0.326	25.14
LTE Band 2	1857.5 – 1902.5	13M4G7D	QPSK	0.411	26.14
LTE Band 2	1857.5 – 1902.5	13M4W7D	16QAM	0.323	25.09
LTE Band 2	1860.0 – 1900.0	17M9G7D	QPSK	0.394	25.95
LTE Band 2	1860.0 – 1900.0	17M9W7D	16QAM	0.292	24.65
LTE Band 5	824.7 – 848.3	1M09G7D	QPSK	0.140	21.46
LTE Band 5	824.7 – 848.3	1M09W7D	16QAM	0.115	20.62
LTE Band 5	825.5 – 847.5	2M69G7D	QPSK	0.125	20.97
LTE Band 5	825.5 – 847.5	2M70W7D	16QAM	0.098	19.91
LTE Band 5	826.5 – 846.5	4M50G7D	QPSK	0.115	20.61
LTE Band 5	826.5 – 846.5	4M49W7D	16QAM	0.093	19.70
LTE Band 5	829.0 – 844.0	8M95G7D	QPSK	0.115	20.61
LTE Band 5	829.0 – 844.0	8M95W7D	16QAM	0.092	19.63

Table 0-1. Emission Designator

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1. INTRODUCTION

1.1. General

These measurement tests were conducted at SAMSUNG ELECTRONICS CO., LTD. (SUWON). 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 Tablet FCC ID: A3LSMT377A. 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:

850/1900 WCDMA/HSPA, Multi-band LTE, 802.11a/b/g/n WLAN, Bluetooth (1x, EDR, LE, HS), ANT+.

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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-C-2004) 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 Tablet FCC ID: A3LSMT377A.

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.

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-C-2004.

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	2014-10-28	2015-10-28
Wideband Radio Communication Tester	CMW500	100697	R&S	2014-11-03	2015-11-03
Signal & Spectrum Analyzer	FSW	100656	R&S	2014-11-04	2015-11-04
PXA Signal Analyzer	N9030A	MY52350977	Agilent	2014-10-24	2015-10-24
PSG Analog Signal Generator	E8257D	MY51501209	Agilent	2014-11-07	2015-11-07
EPM Series Power Meter	E4419B	GB41293846	Agilent	2015-09-22	2016-09-22
POWER SENSOR	E9300H	MY41495838	Agilent	2015-09-18	2016-09-18
DC Power Supply	E3642A	MY40022438	Agilent	2015-02-23	2016-02-23
Temperature Humidity Chamber	SH-641	92009178	Espec	2015-03-19	2016-03-19
Loop Antenna	HFH2-Z2	100276	R&S	2014-05-19	2016-05-19
DIPOLE ANTENNA	UHA 9105	9105-2412	Schwarzbeck	2013-10-16	2015-10-16
LOG PERIODIC DIPOLE ANTENNA	HL040	353255/020	R&S	2014-10-15	2016-10-15
HORN Antenna	3115	00156245	ETS LINDGREN	2015-05-07	2017-05-07
HORN Antenna	BBHA 9120	9120D-636	Schwarzbeck	2015-01-30	2017-01-30
HORN Antenna & Pre-amplifier assembly	HAP18-26N	216250	Flann	2014-01-09	2016-01-09
HORN Antenna & Pre-amplifier assembly	HAP18-26N	216251	Flann	2015-04-30	2017-04-30
PRE-AMPLIFIER	8449B	3008A00691	Agilent	2014-11-25	2015-11-25
RF Power Amplifier	5S1G4	304866	AR	2015-02-09	2016-02-09
Hygrothermograph Data Logger	SK-L200TH2a	005077	SATO	2014-10-31	2015-10-31
Hygrothermograph Data Logger	SK-L200TH2a	005078	SATO	2014-10-31	2015-10-31
Hygrothermograph Data Logger	SK-L200TH2a	005110	SATO	2014-10-31	2015-10-31
Power Divider	11636B	58456	Agilent	2015-04-27	2016-04-27
Highpass Filter	WHVX1.0/15G-10SS	39	Wainwright	2015-01-07	2016-01-07
Highpass Filter	WHKX3.0/18G-10SS	206	Wainwright	2015-01-07	2016-01-07
Attenuator 10dB	8491B	MY39264180	Agilent	2015-06-23	2016-06-23
Attenuator 20dB	8493C	74158	Agilent	2014-08-21	2015-08-21

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 25.50dBm - (-24.80) = 50.3dBc.

– End of this page –



6. TEST RESULTS

6.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
TRANSMITTER MODE (TX)					
2.1046	Transmitter Conducted Output Power	N/A	CONDUCTED	PASS	See SAR Report
2.1049	Occupied Bandwidth	N/A		PASS	Section 6.2
2.1051 22.917(a) 24.238(a)	Conducted Band Edge / Spurious Emissions	$> 43 + 10\log_{10}(P[\text{Watts}])$ at Band Edge and for all out-of-band emissions		PASS	Sections 6.3, 6.4
24.232(d)	Peak-Average Ratio	$< 13 \text{ dB}$		PASS	Section 6.5
2.1055 22.355 24.235	Frequency Stability	$< 2.5 \text{ ppm}$ (Part 22) Emission must remain in band (Part 24)		PASS	Section 6.6
24.232(c)	Effective Isotropic Radiated Power	$< 2 \text{ Watts max. EIRP}$	RADIATED	PASS	Section 6.7
22.913(a.2)	Effective Radiated Power	$< 7 \text{ Watts max. ERP}$		PASS	Section 6.7
2.1053 22.917(a) 24.238(a)	Radiated Spurious Emissions	$> 43 + 10\log_{10}(P[\text{Watts}])$ for all out-of-band emissions		PASS	Section 6.8

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 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. The 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.

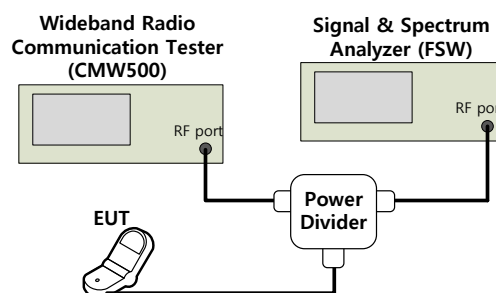
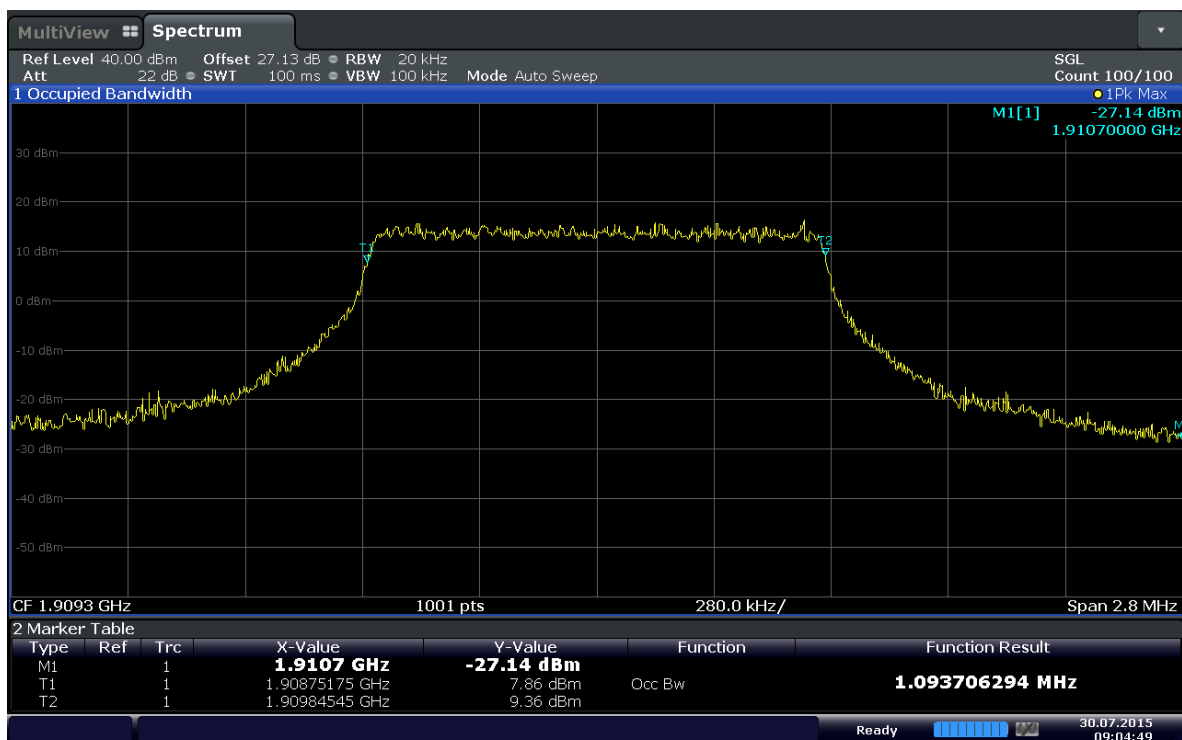


Figure 6-1. Test Instruments & Measurement Setup

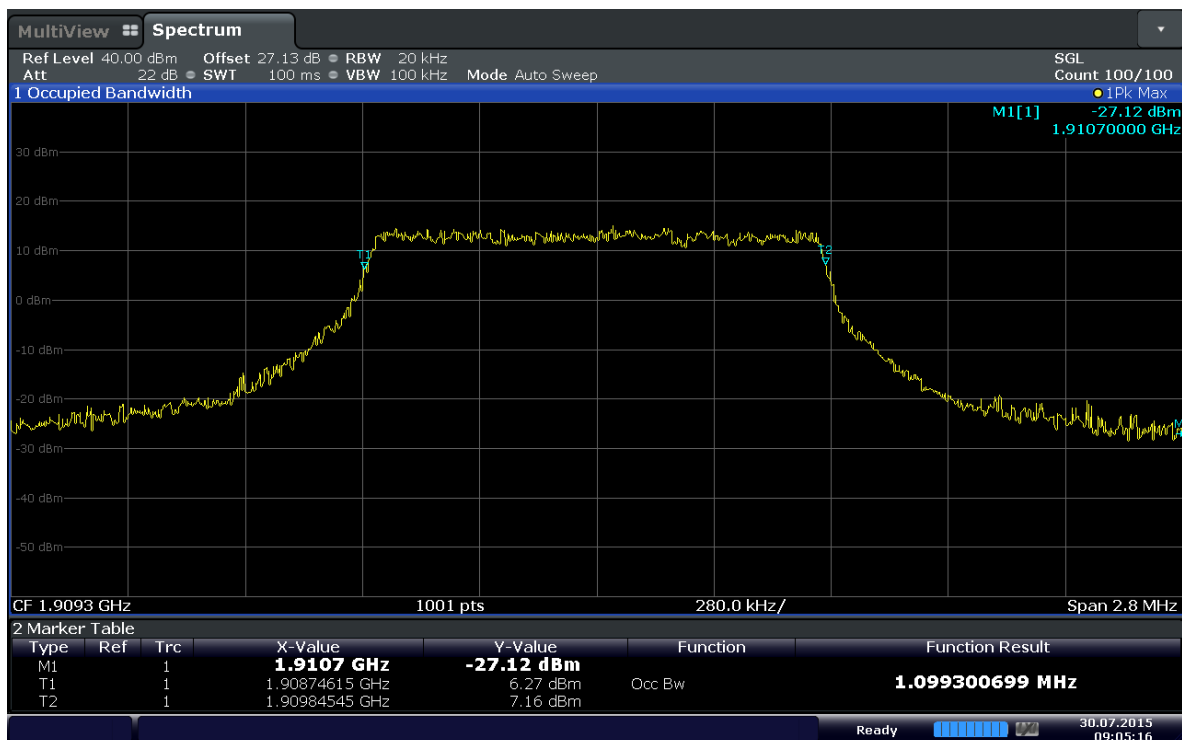


Issue Date:

Test Plots

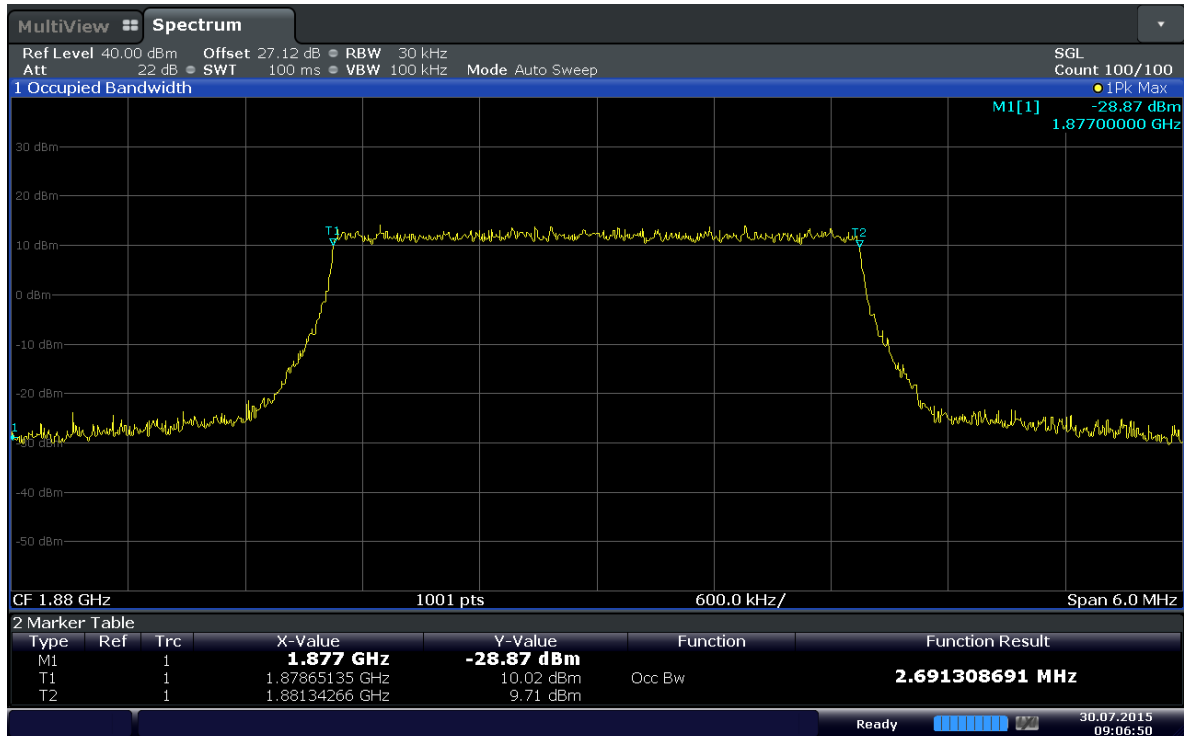
Date: 30.JUL.2015 09:04:49

Plot 6-1. Occupied Bandwidth Plot (Band 2 – 1.4MHz – QPSK – RB Size 6)



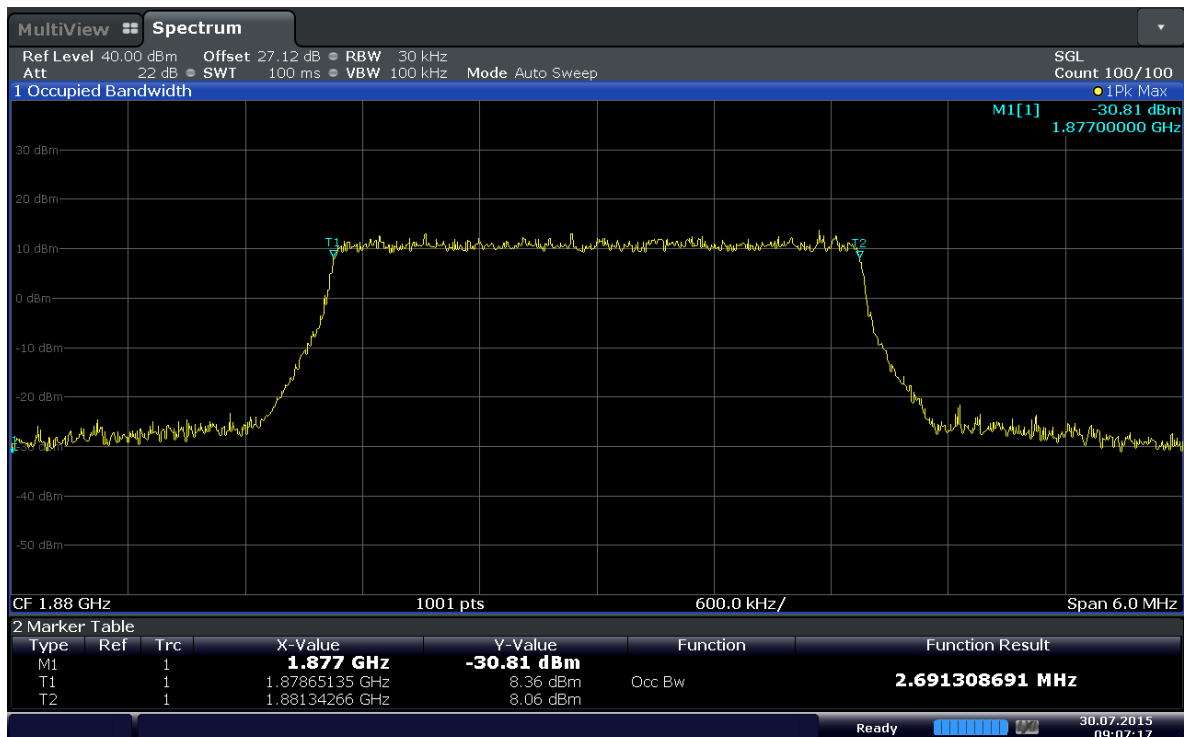
Date: 30.JUL.2015 09:05:16

Plot 6-2. Occupied Bandwidth Plot (Band 2 – 1.4MHz – 16QAM – RB Size 6)



Date: 30.JUL.2015 09:06:51

Plot 6-3. Occupied Bandwidth Plot (Band 2 – 3.0MHz – QPSK – RB Size 15)

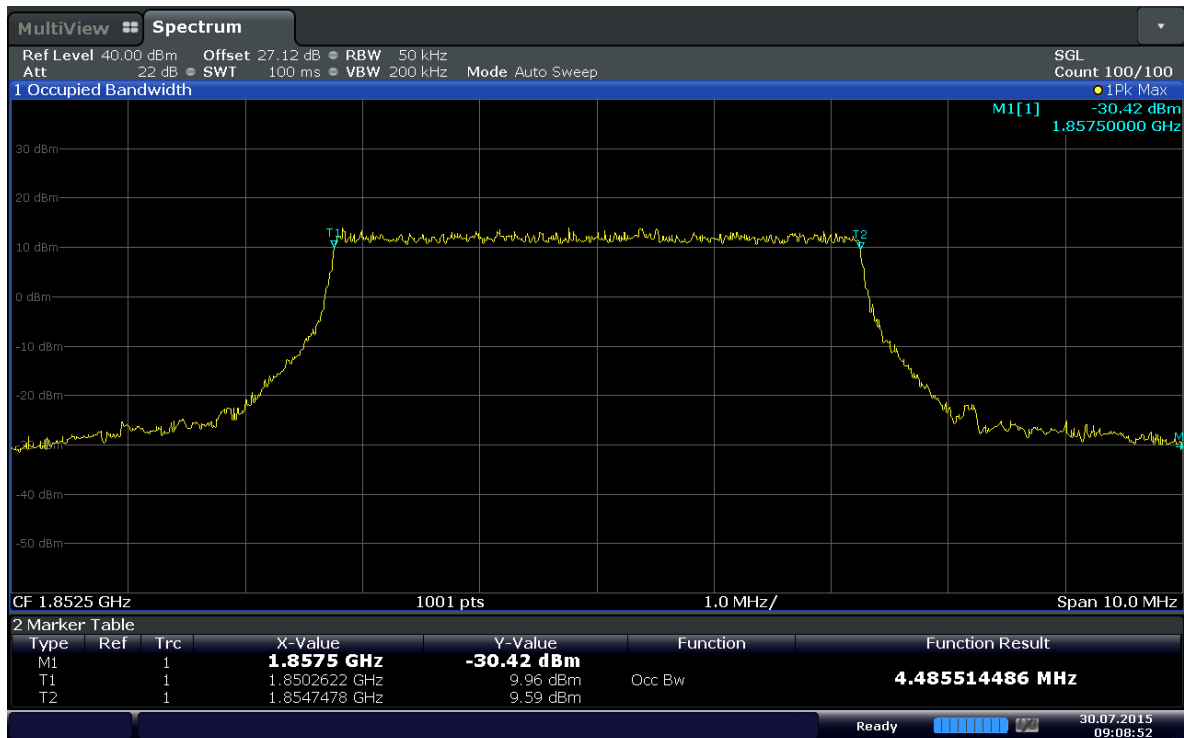


Date: 30.JUL.2015 09:07:17

Plot 6-4. Occupied Bandwidth Plot (Band 2 – 3.0MHz – 16QAM – RB Size 15)

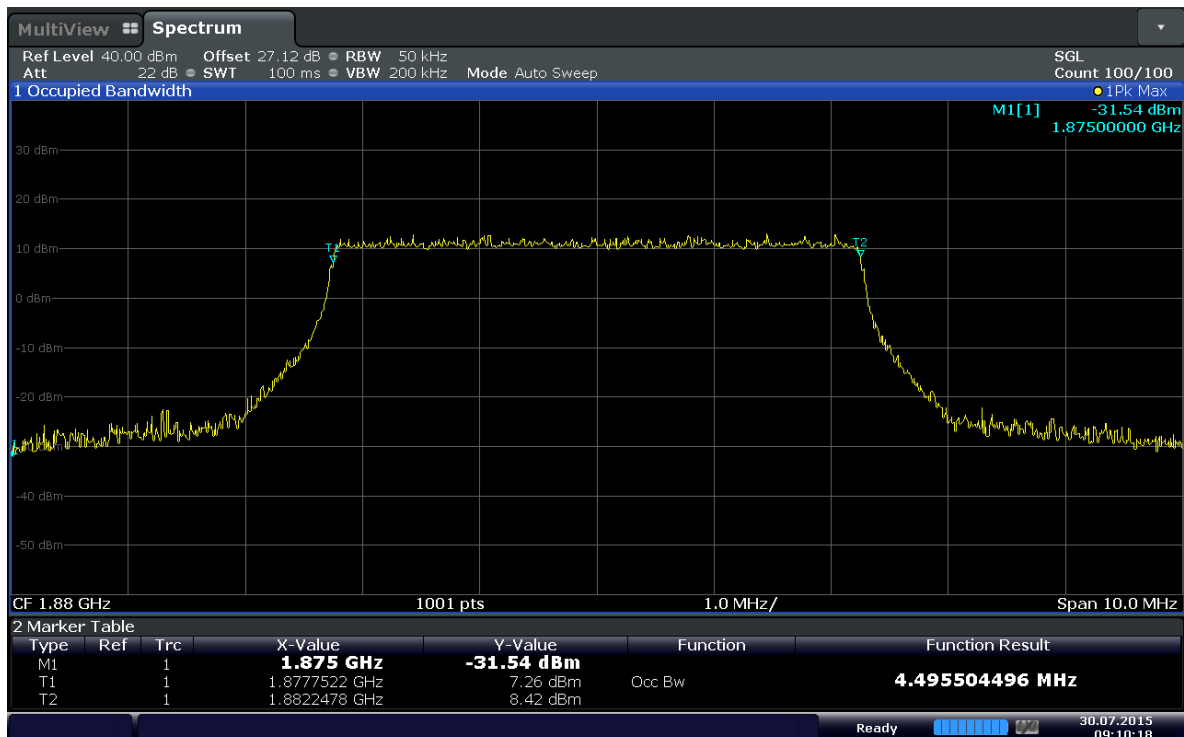


Issue Date:



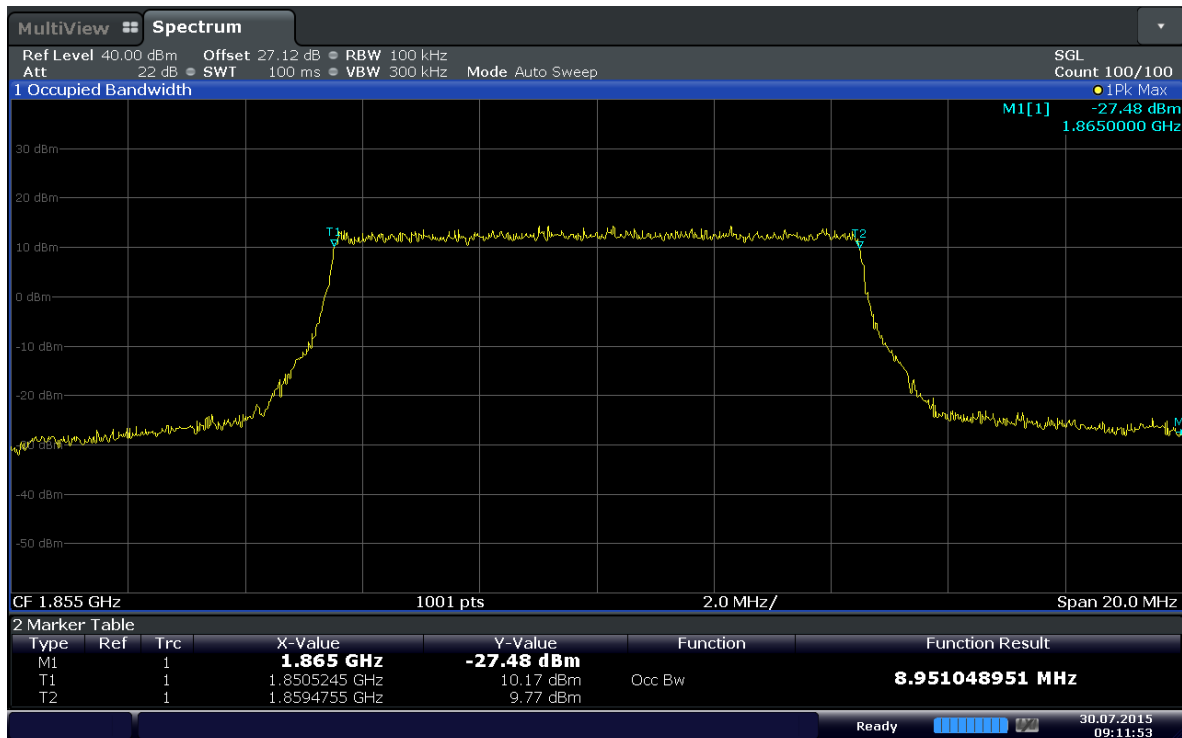
Date: 30.JUL.2015 09:08:52

Plot 6-5. Occupied Bandwidth Plot (Band 2 – 5.0MHz – QPSK – RB Size 25)



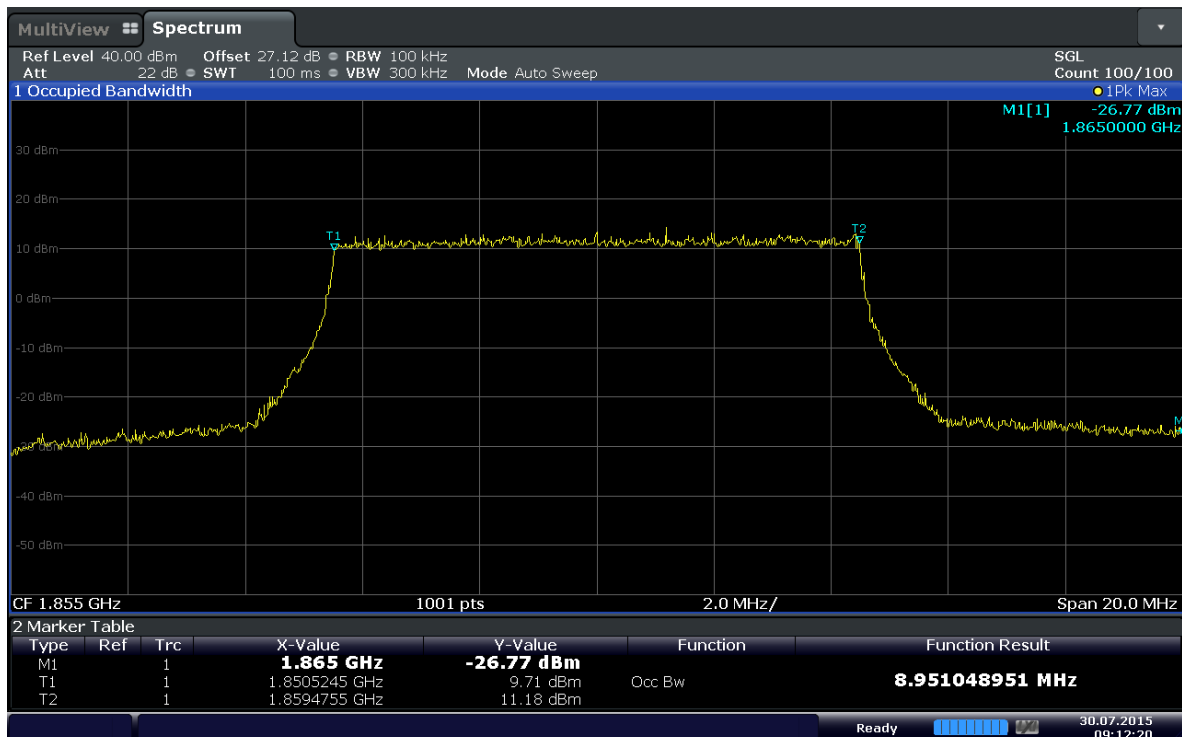
Date: 30.JUL.2015 09:10:18

Plot 6-6. Occupied Bandwidth Plot (Band 2 – 5.0MHz – 16QAM – RB Size 25)



Date: 30.JUL.2015 09:11:53

Plot 6-7. Occupied Bandwidth Plot (Band 2 - 10.0MHz – QPSK – RB Size 50)

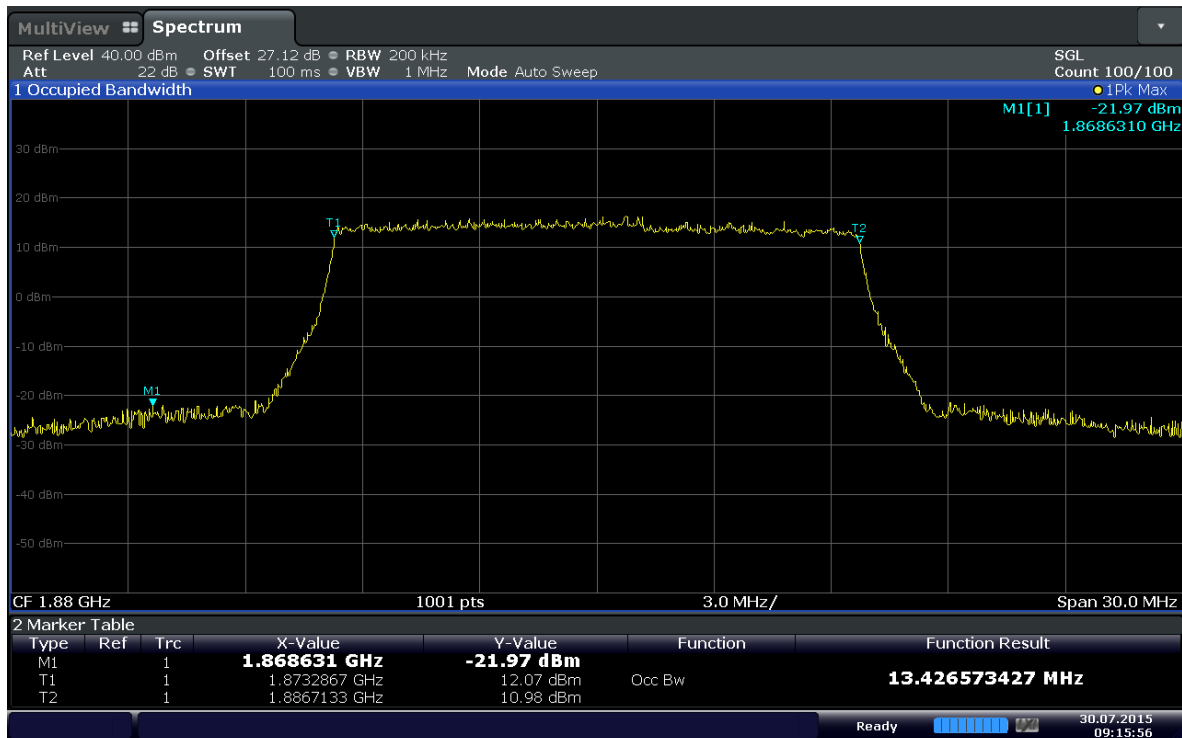


Date: 30.JUL.2015 09:12:20

Plot 6-8. Occupied Bandwidth Plot (Band 2 – 10.0MHz – 16QAM – RB Size 50)

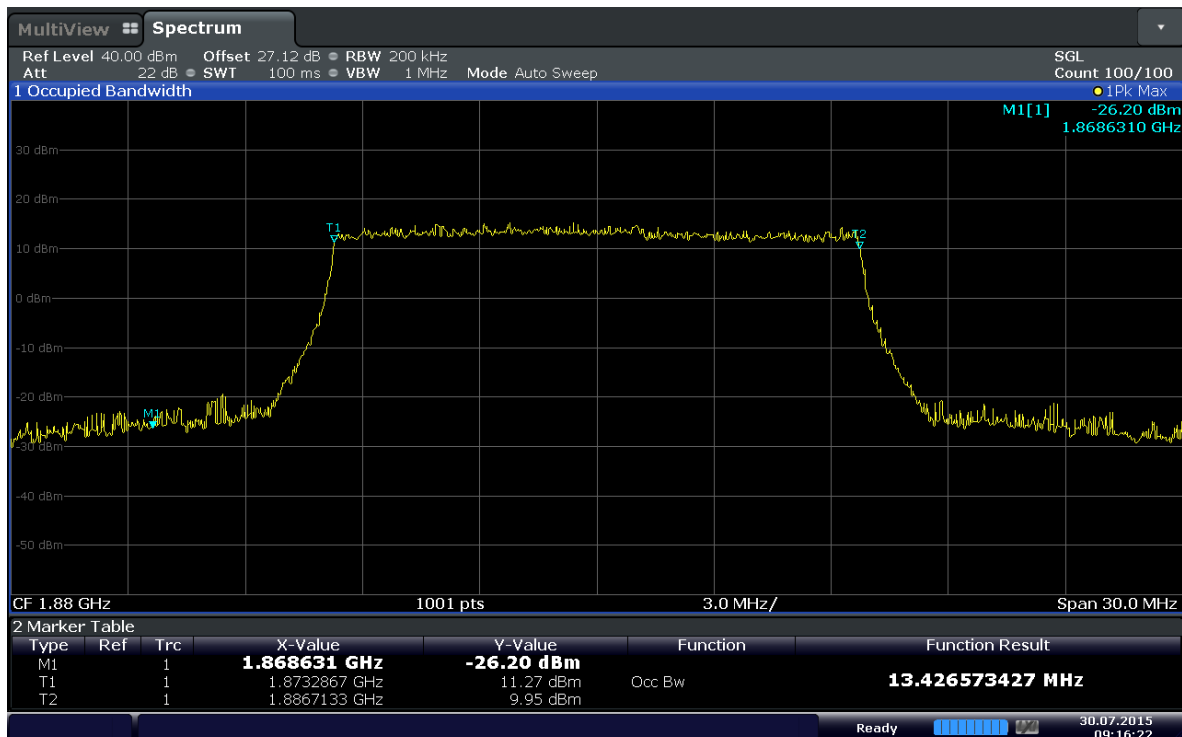


Issue Date:



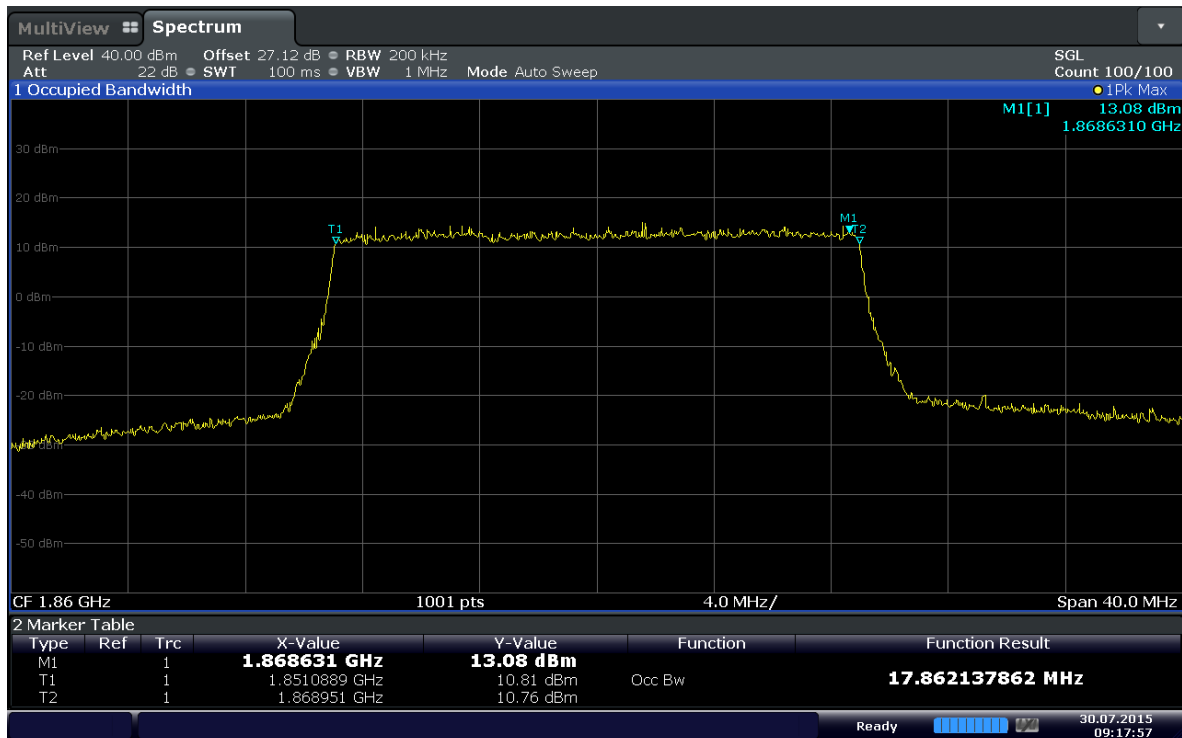
Date: 30.JUL.2015 09:15:56

Plot 6-9. Occupied Bandwidth Plot (Band 2 – 15.0MHz – QPSK – RB Size 75)



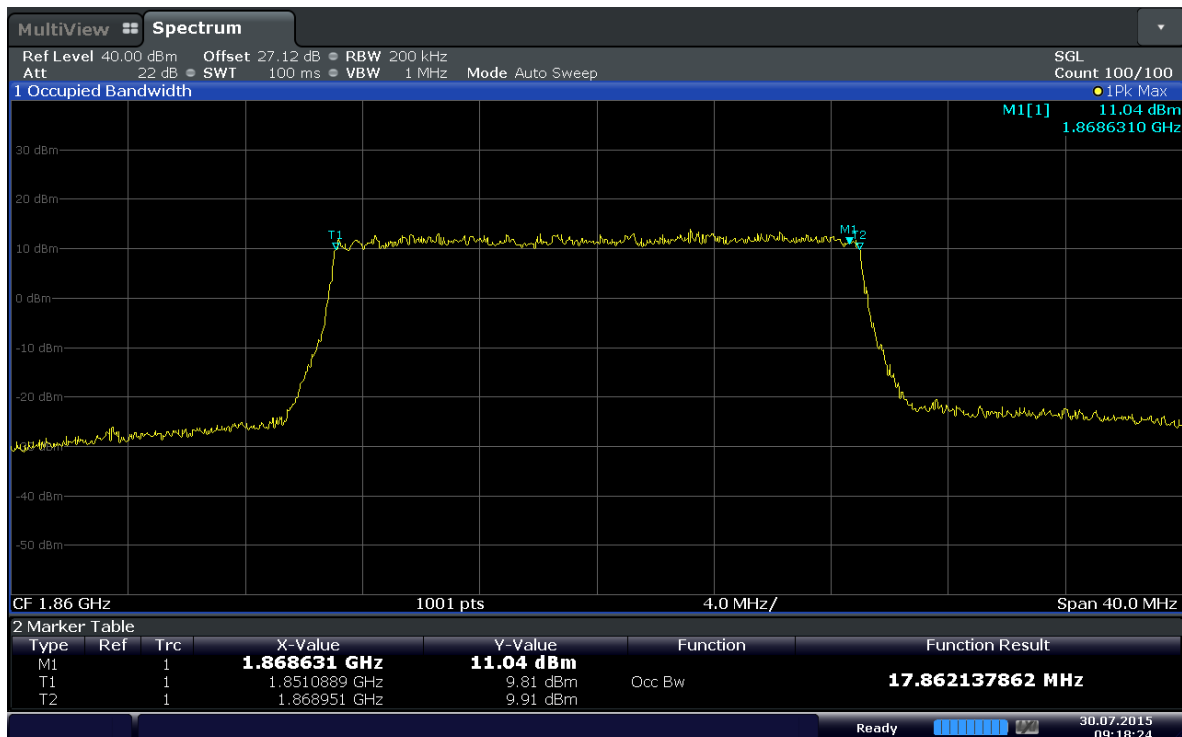
Date: 30.JUL.2015 09:16:22

Plot 6-10. Occupied Bandwidth Plot (Band 2 – 15.0MHz – 16QAM – RB Size 75)



Date: 30.JUL.2015 09:17:57

Plot 6-11. Occupied Bandwidth Plot (Band 2 – 20.0MHz – QPSK – RB Size 100)

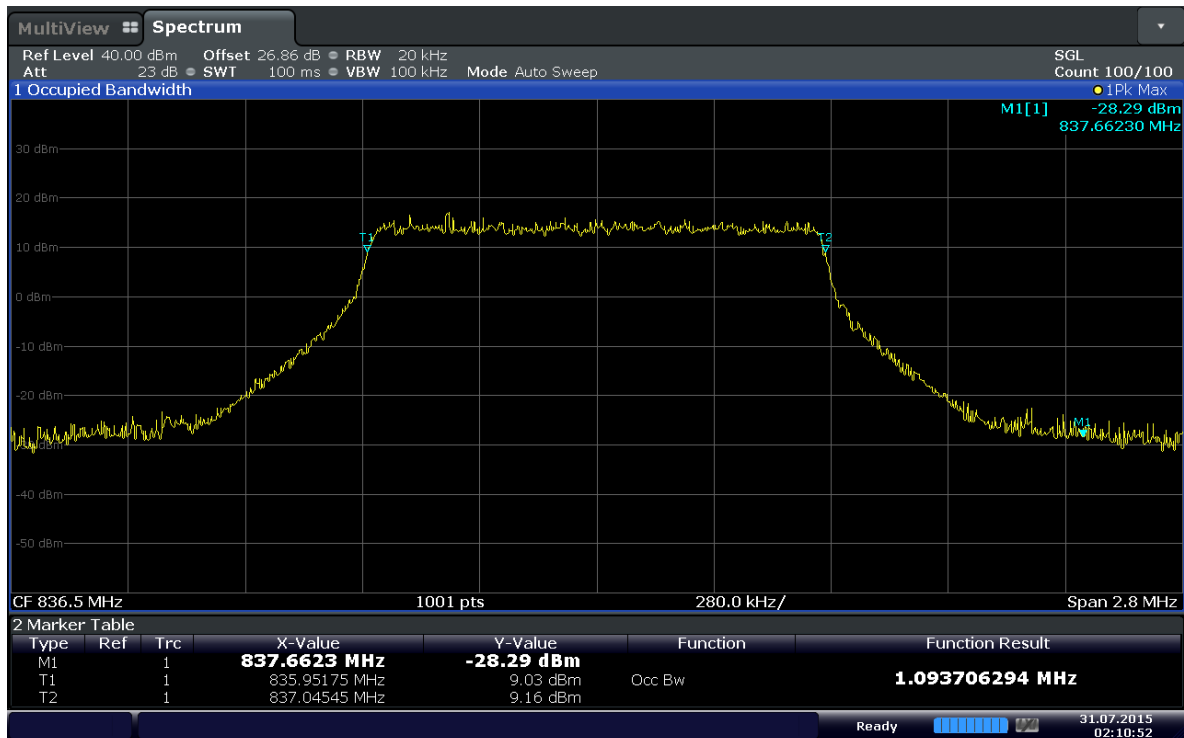


Date: 30.JUL.2015 09:18:24

Plot 6-12. Occupied Bandwidth Plot (Band 2 – 20.0MHz – 16QAM – RB Size 100)

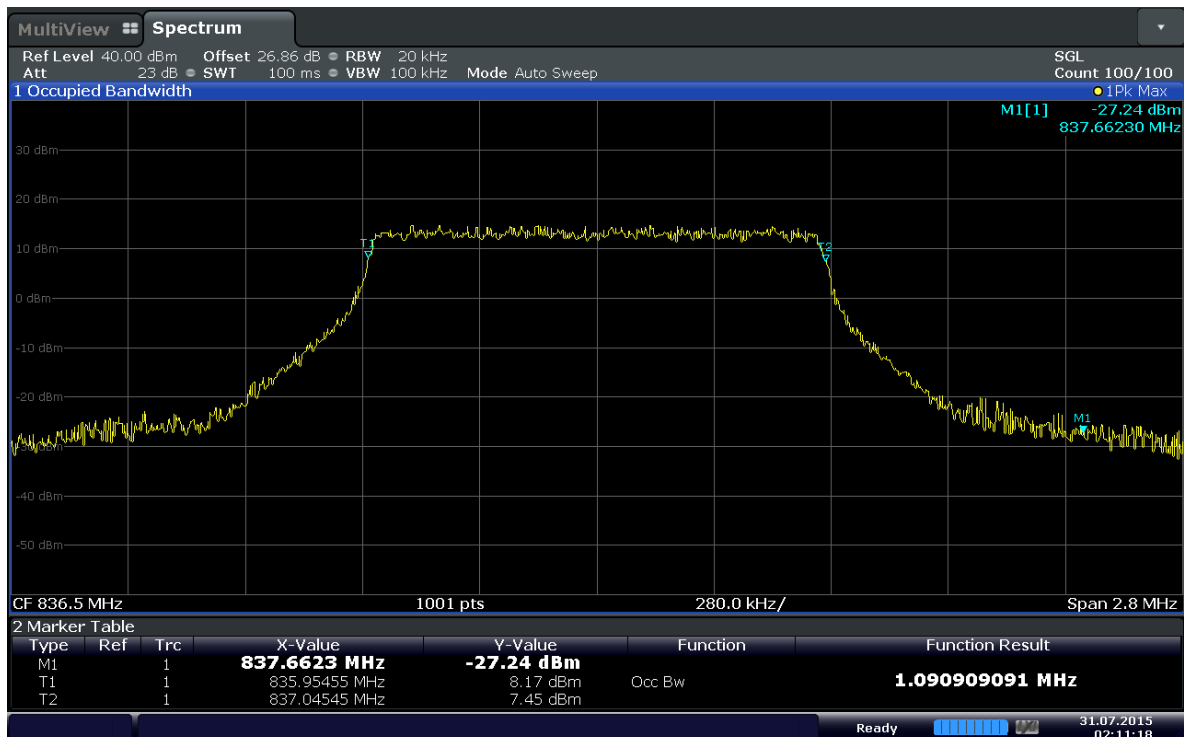


Issue Date:



Date: 31.JUL.2015 02:10:52

Plot 6-13. Occupied Bandwidth Plot (Band 5 – 1.4MHz – QPSK – RB Size 6)

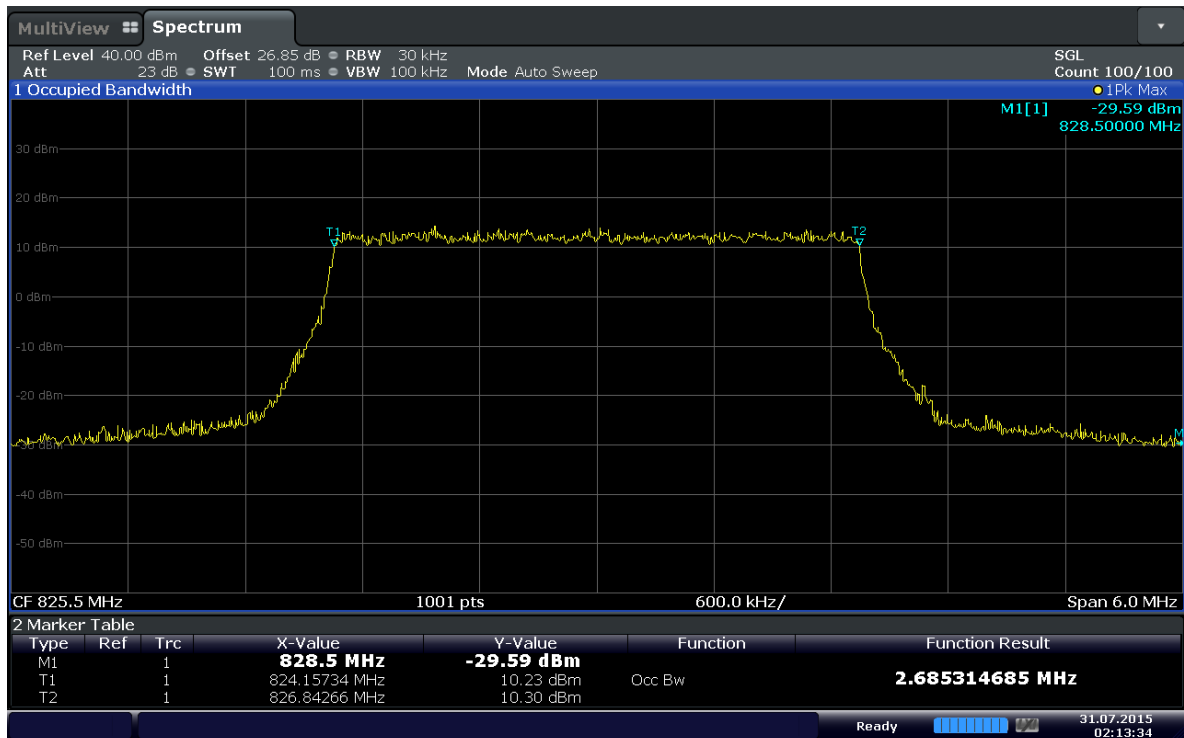


Date: 31.JUL.2015 02:11:19

Plot 6-14. Occupied Bandwidth Plot (Band 5 – 1.4MHz – 16QAM – RB Size 6)

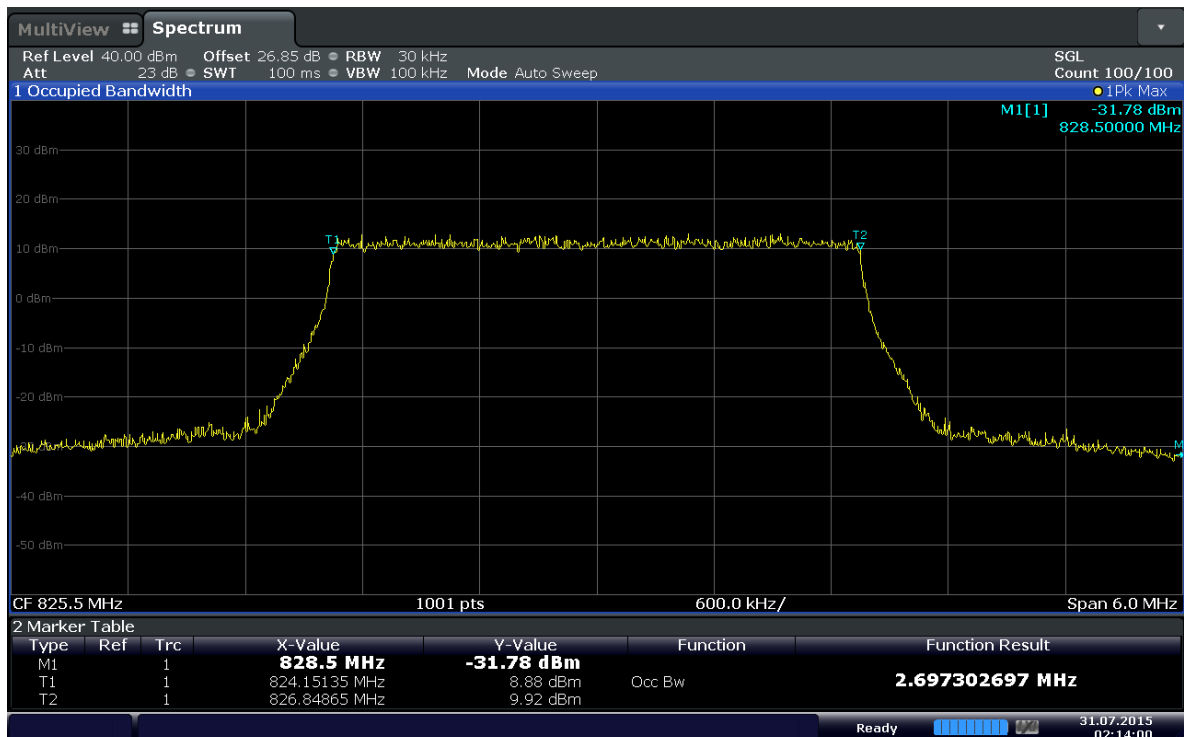


Issue Date:



Date: 31.JUL.2015 02:13:35

Plot 6-15. Occupied Bandwidth Plot (Band 5 – 3.0MHz – QPSK – RB Size 15)

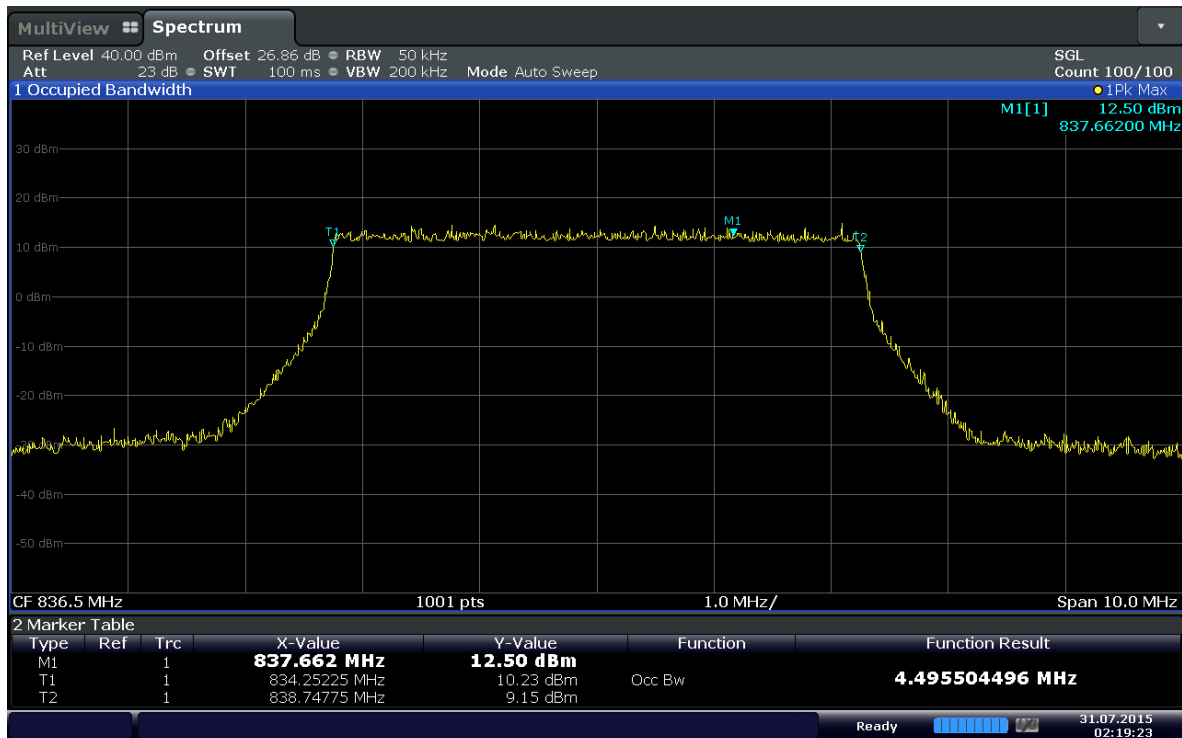


Date: 31.JUL.2015 02:14:01

Plot 6-16. Occupied Bandwidth Plot (Band 5 – 3.0MHz – 16QAM – RB Size 15)

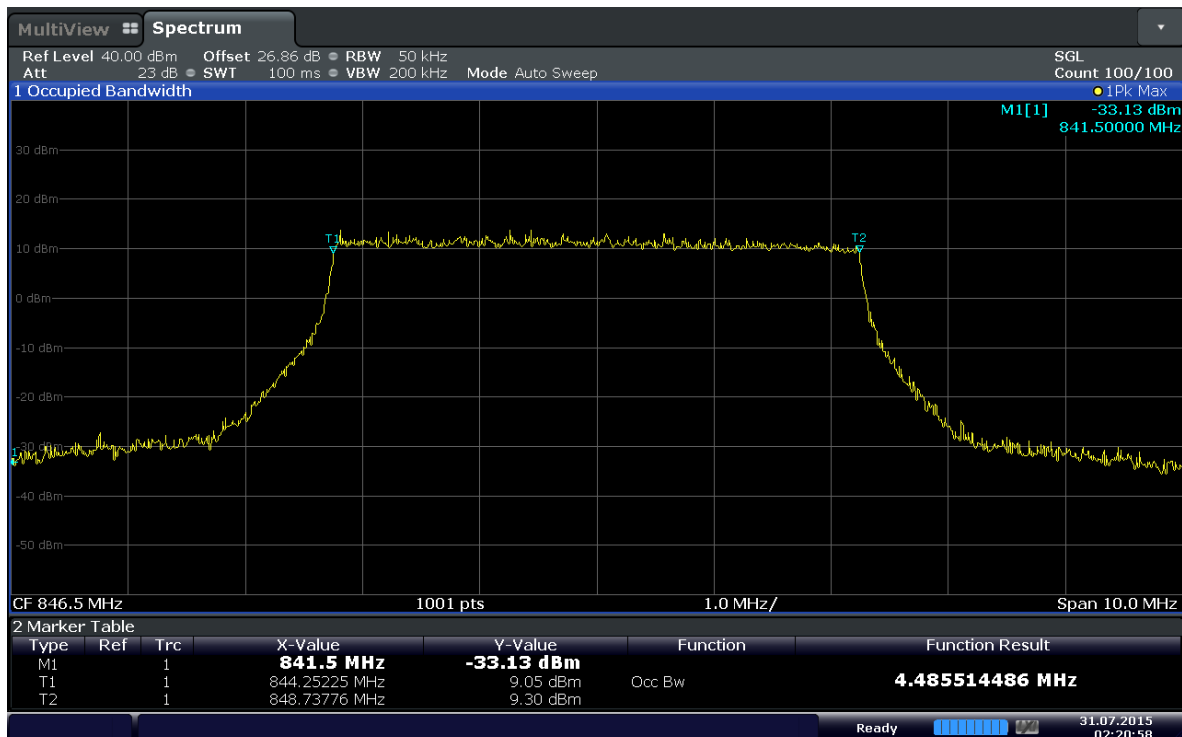


Issue Date:



Date: 31.JUL.2015 02:19:24

Plot 6-17. Occupied Bandwidth Plot (Band 5 – 5.0MHz – QPSK – RB Size 25)

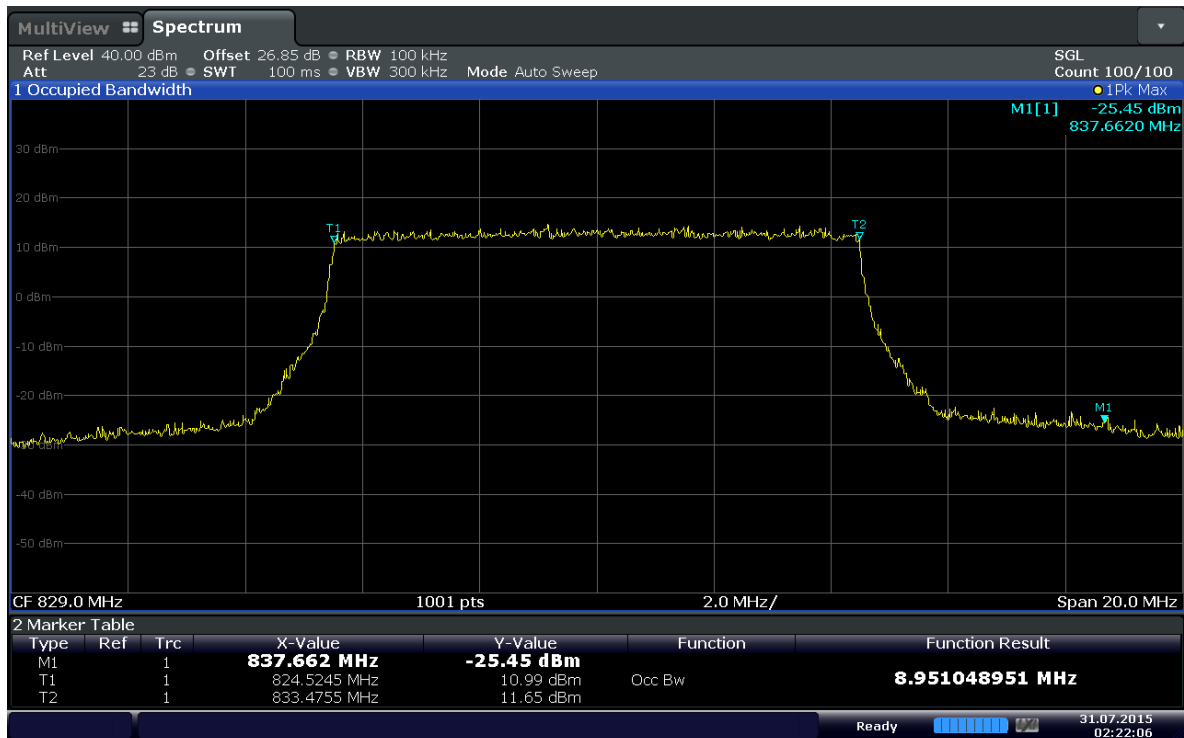


Date: 31.JUL.2015 02:20:59

Plot 6-18. Occupied Bandwidth Plot (Band 5 – 5.0MHz – 16QAM – RB Size 25)

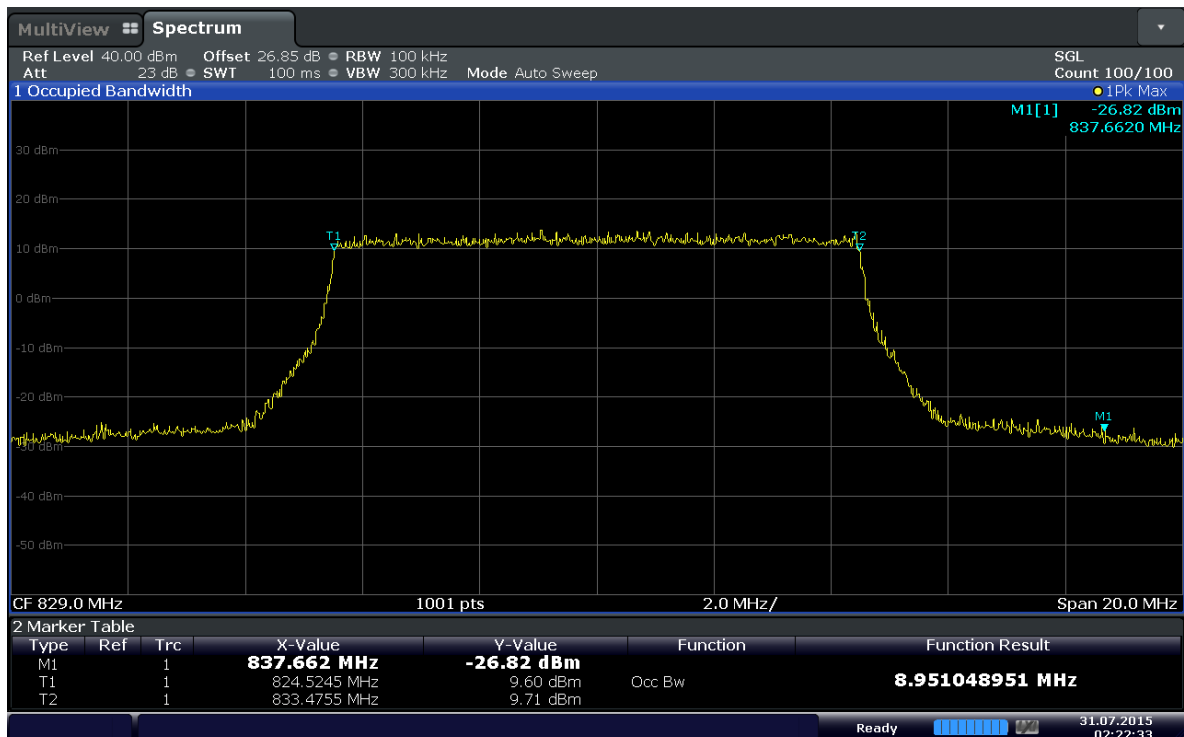


Issue Date:



Date: 31.JUL.2015 02:22:06

Plot 6-19. Occupied Bandwidth Plot (Band 5 – 10.0MHz – QPSK – RB Size 50)



Date: 31.JUL.2015 02:22:32

Plot 6-20. Occupied Bandwidth Plot (Band 5 – 10.0MHz – 16QAM – RB Size 50)



6.3. Spurious and Harmonic Emissions at Antenna Terminal §2.1051 §22.917(a) §24.238(a)

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 $43 + 10 \log_{10}(P_{\text{[Watts]}})$, where P is the transmitter power in Watts. Limit equivalent to -13dBm, calculation shown below.

$$\begin{aligned}43 + 10 \log_{10}(1.567\text{W}) &= 44.95 \text{ dB} \\1.567\text{W} &= 31.95 \text{ dBm} \\31.95 \text{ dBm} - 44.95 \text{ dB} &= -13 \text{ dBm}\end{aligned}$$

Test Procedure Used

KDB 971168 v02r02 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 10GHz for Cell, 20GHz for PCS (separated into at least two plots per channel)
2. RBW $\geq$ 1MHz
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.

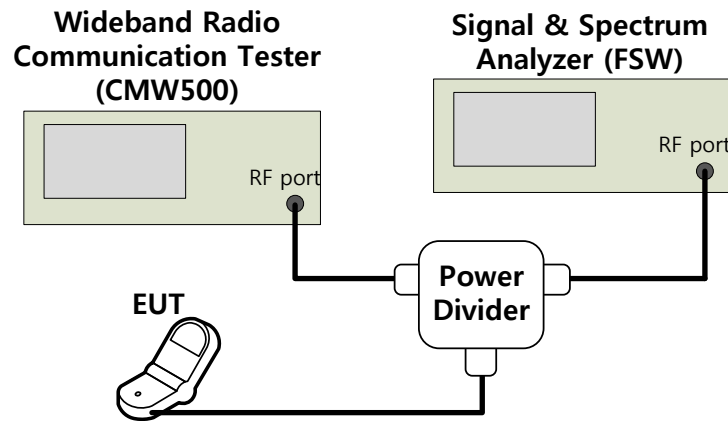
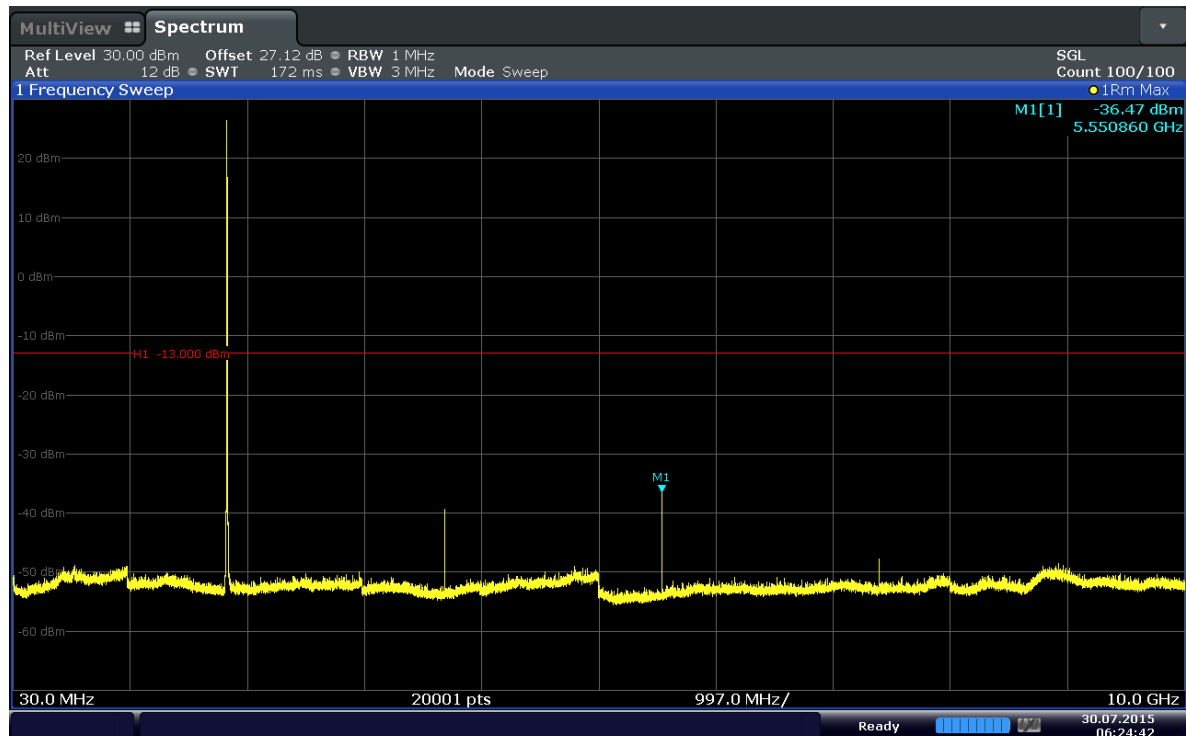


Figure 6-2. Test Instruments & Measurement Setup

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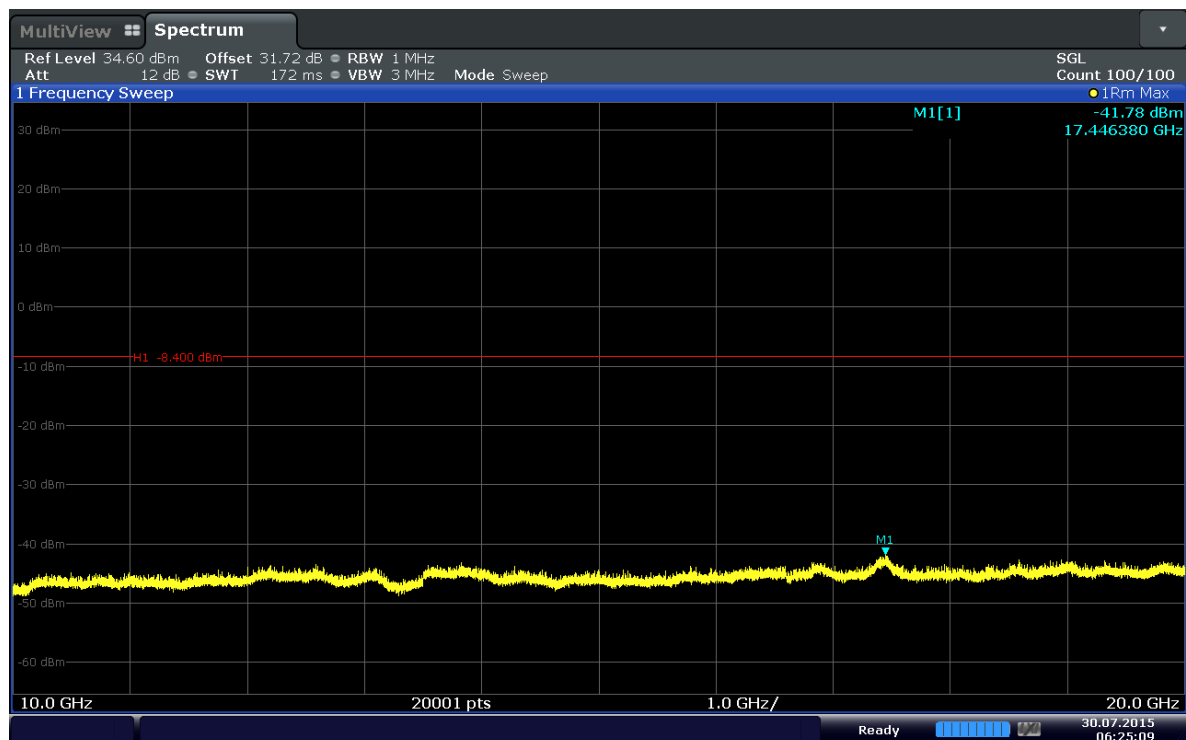


Issue Date:

Test Plots

Date: 30.JUL.2015 06:24:42

Plot 6-21. Conducted Spurious Plot (Band 2–1.4MHz–QPSK–RB Size 1–RB Offset 0–Ch.18607)

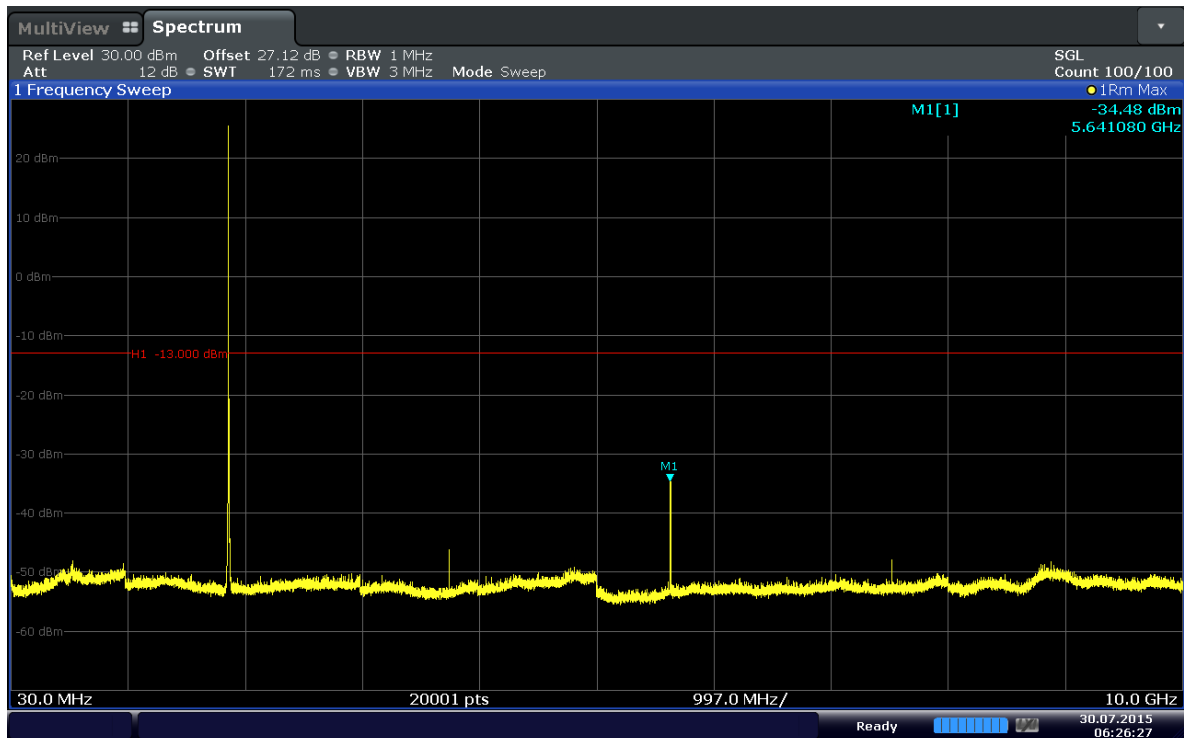


Date: 30.JUL.2015 06:25:10

Plot 6-22. Conducted Spurious Plot (Band 2–1.4MHz–QPSK–RB Size 1–RB Offset 0–Ch.18607)

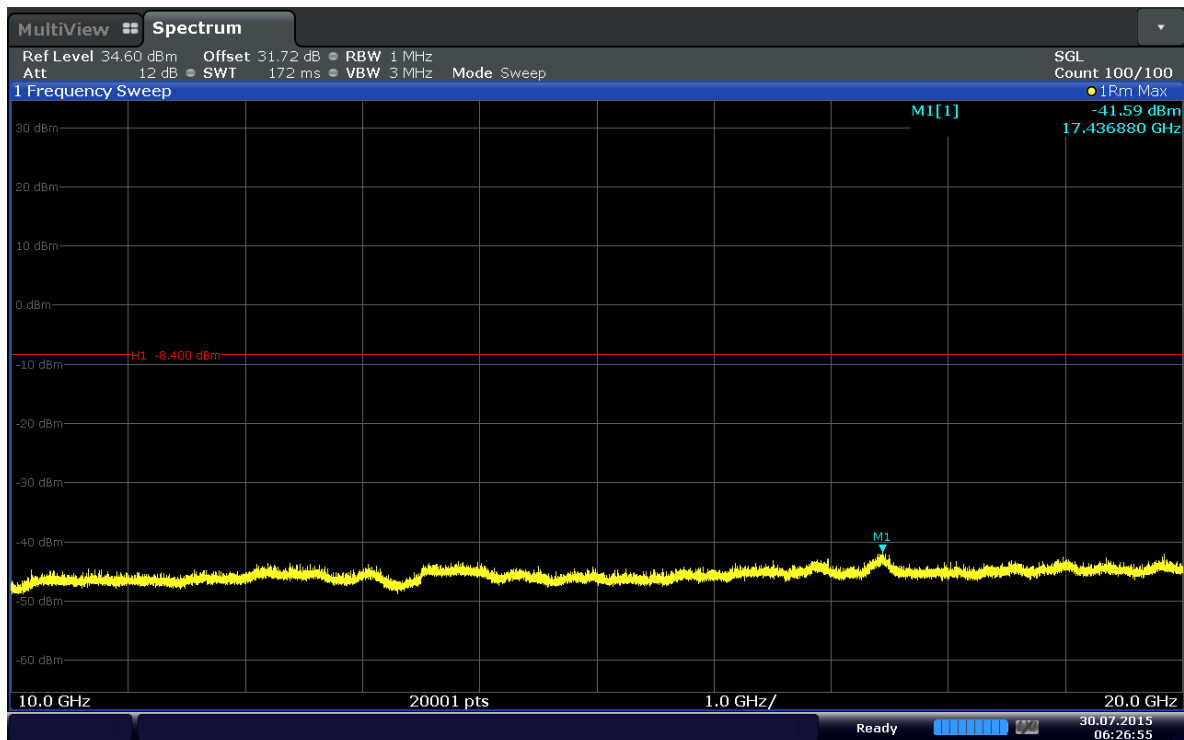


Issue Date:



Date: 30.JUL.2015 06:26:27

Plot 6-23. Conducted Spurious Plot (Band 2–1.4MHz–QPSK–RB Size 1–RB Offset 5–Ch.18900)

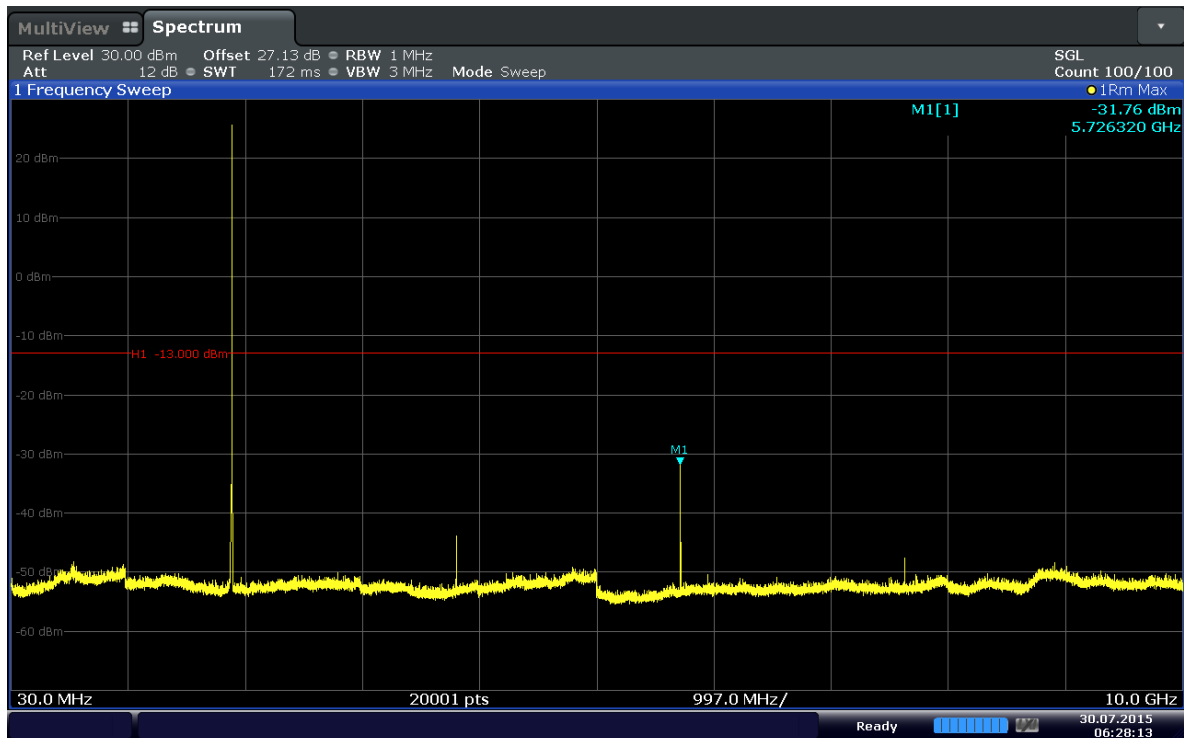


Date: 30.JUL.2015 06:26:55

Plot 6-24. Conducted Spurious Plot (Band 2–1.4MHz–QPSK–RB Size 1–RB Offset 5–Ch.18900)

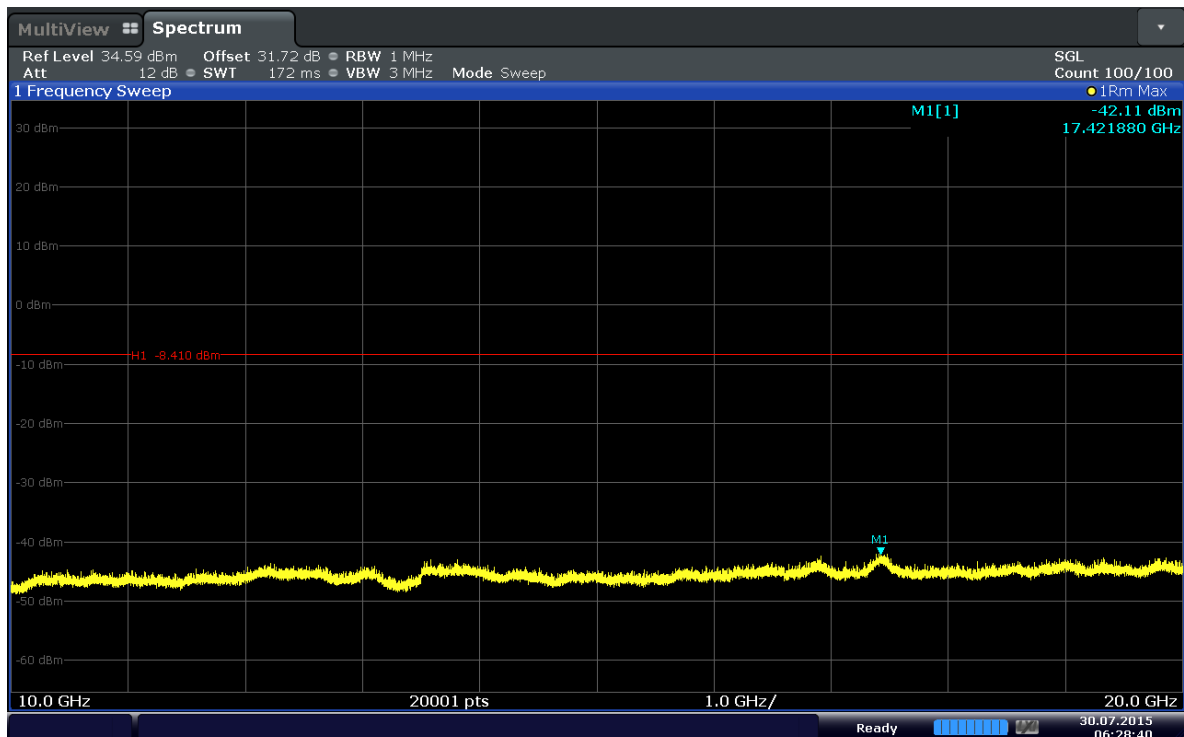


Issue Date:



Date: 30.JUL.2015 06:28:13

Plot 6-25. Conducted Spurious Plot (Band 2–1.4MHz–QPSK–RB Size 1–RB Offset 0–Ch.19193)

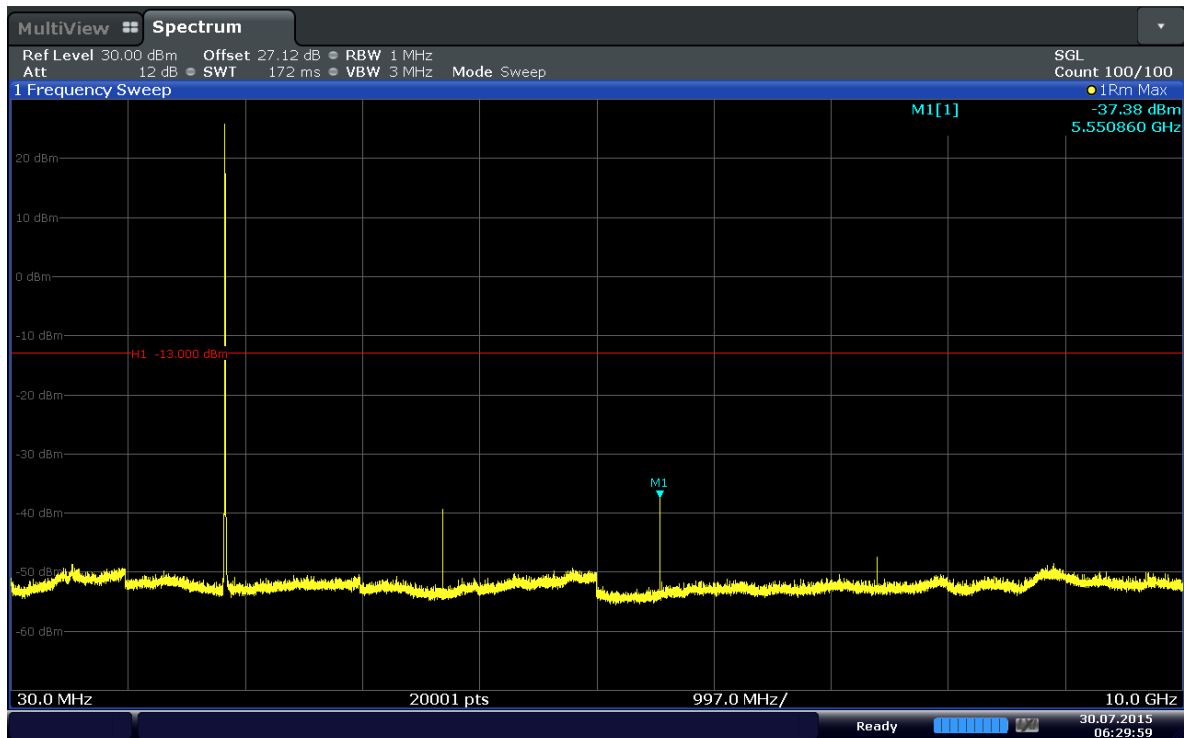


Date: 30.JUL.2015 06:28:41

Plot 6-26. Conducted Spurious Plot (Band 2–1.4MHz–QPSK–RB Size 1–RB Offset 0–Ch.19193)

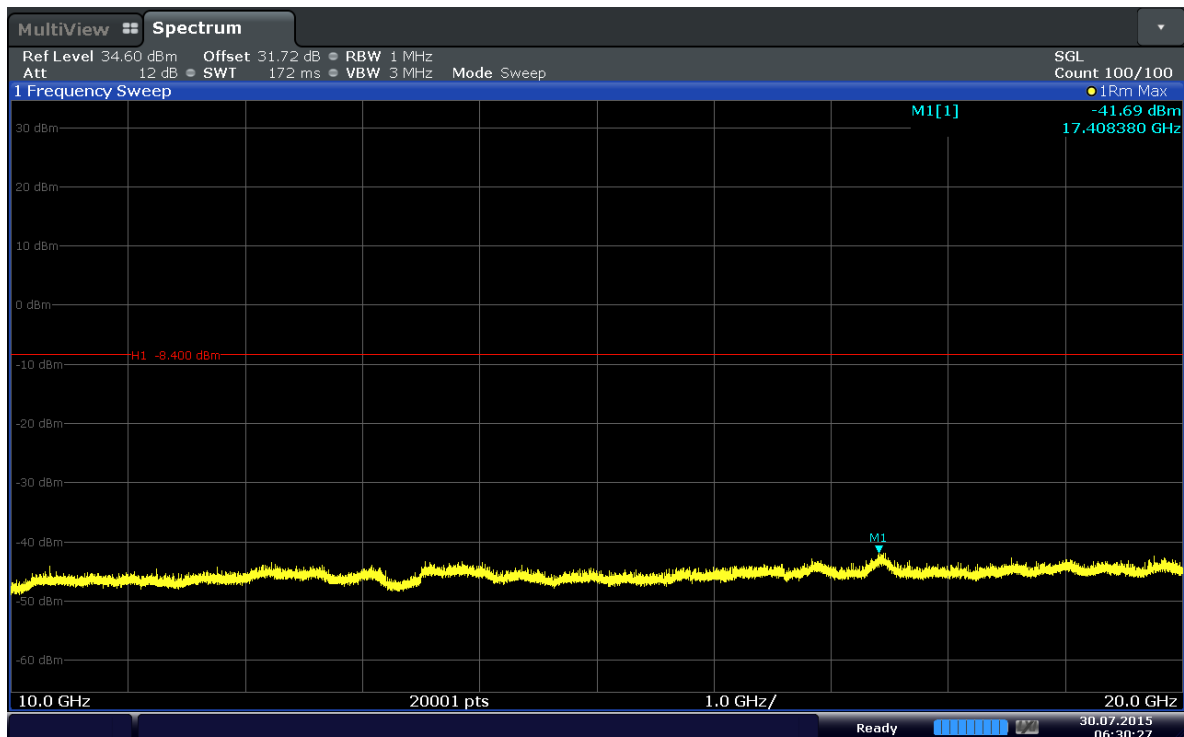


Issue Date:



Date: 30.JUL.2015 06:29:59

Plot 6-27. Conducted Spurious Plot (Band 2–3.0MHz–QPSK–RB Size 1–RB Offset 0–Ch.18615)

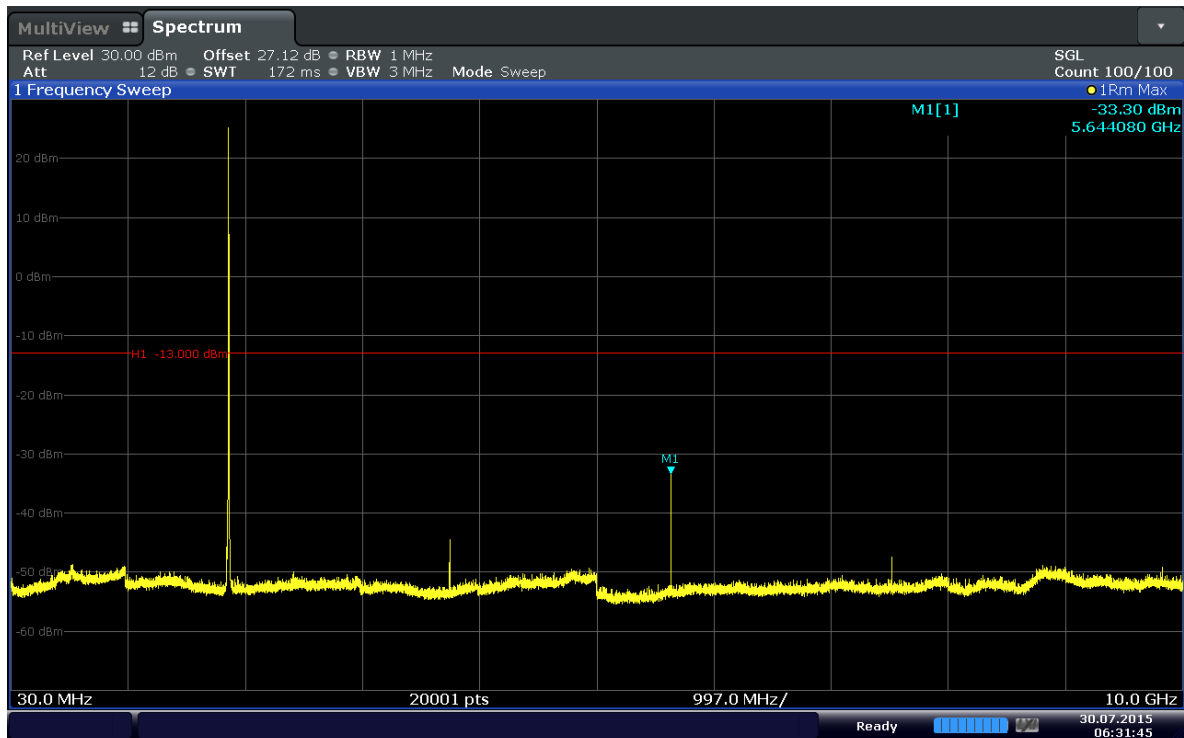


Date: 30.JUL.2015 06:30:27

Plot 6-28. Conducted Spurious Plot (Band 2–3.0MHz–QPSK–RB Size 1–RB Offset 0–Ch.18615)

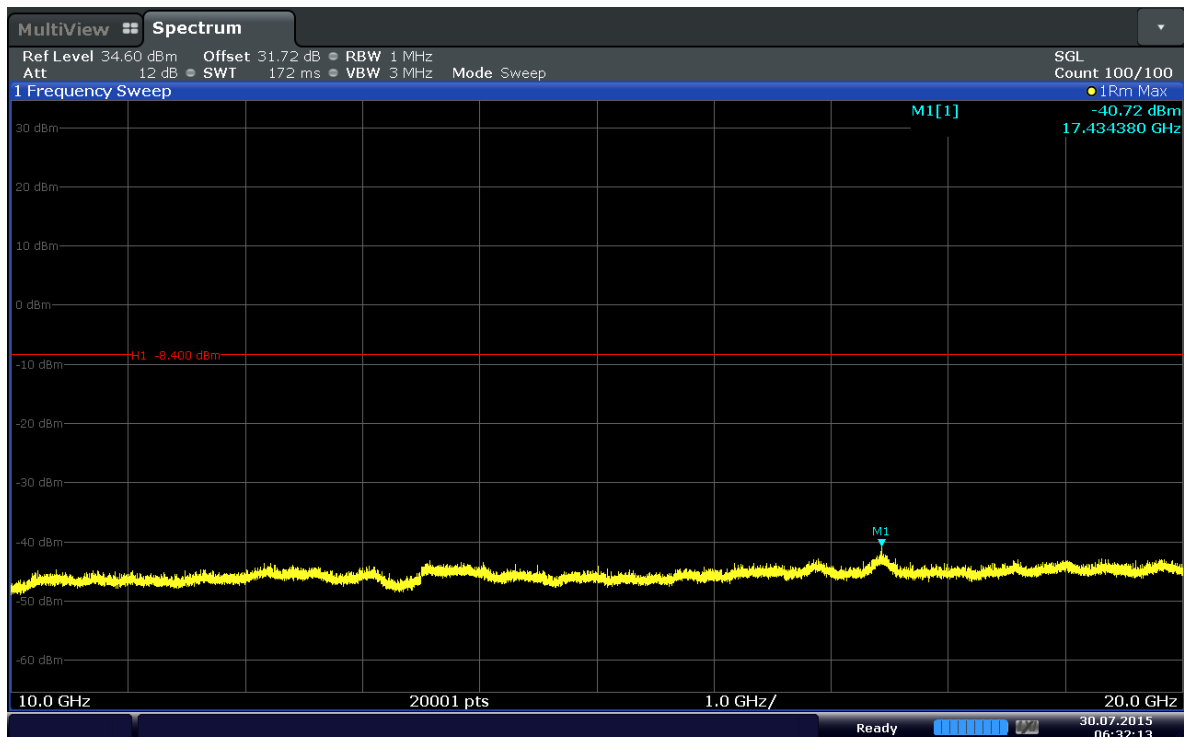


Issue Date:



Date: 30.JUL.2015 06:31:45

Plot 6-29. Conducted Spurious Plot (Band 2–3.0MHz–QPSK–RB Size 1–RB Offset 14–Ch.18900)

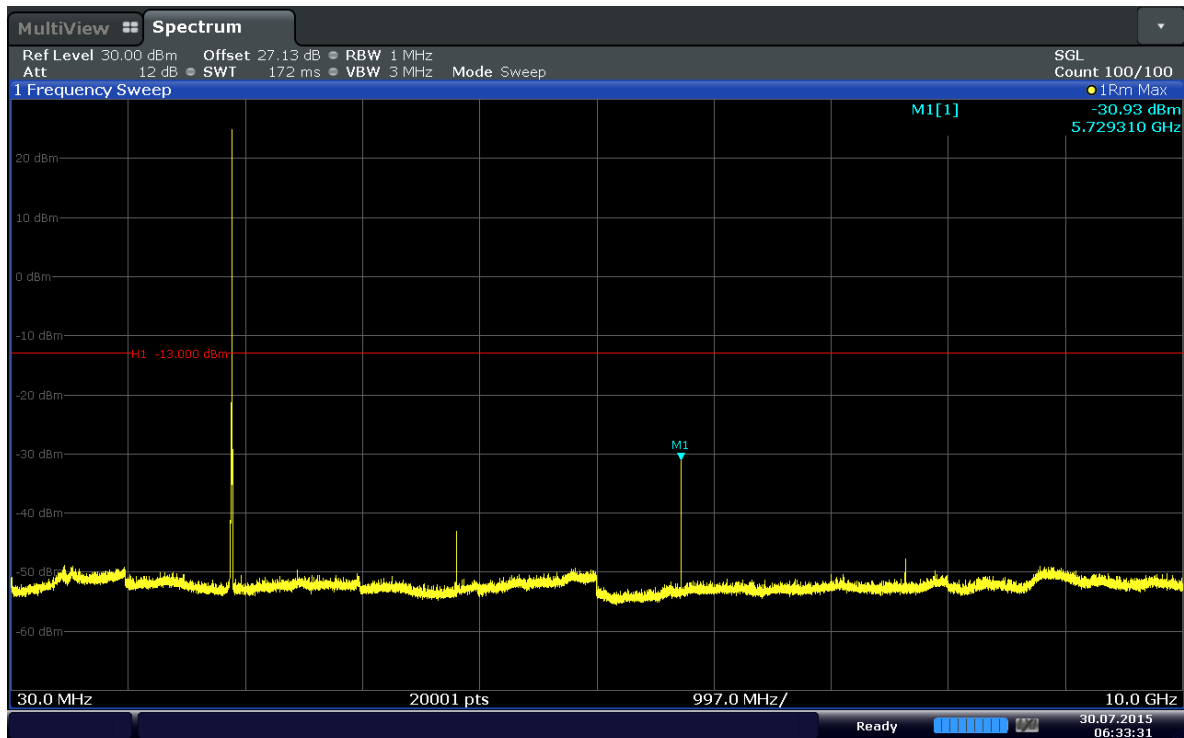


Date: 30.JUL.2015 06:32:13

Plot 6-30. Conducted Spurious Plot (Band 2–3.0MHz–QPSK–RB Size 1–RB Offset 14–Ch.18900)

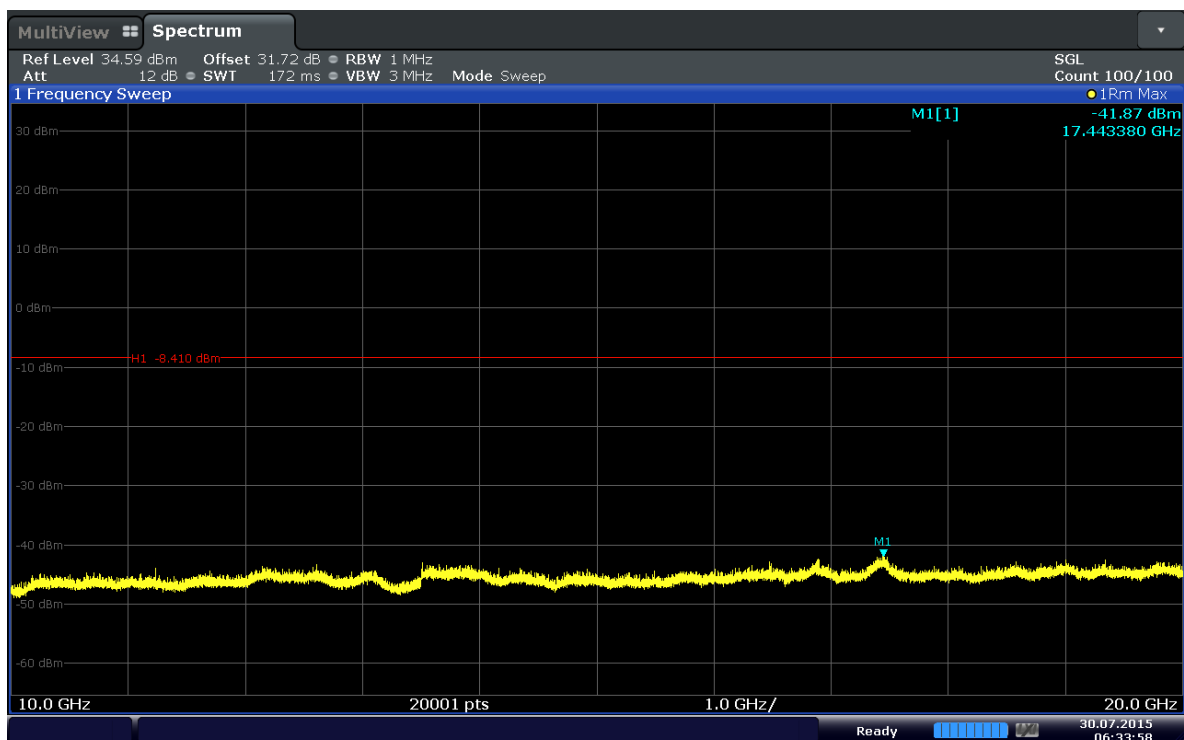


Issue Date:



Date: 30.JUL.2015 06:33:31

Plot 6-31. Conducted Spurious Plot (Band 2–3.0MHz–QPSK–RB Size 1–RB Offset 14–Ch.19185)

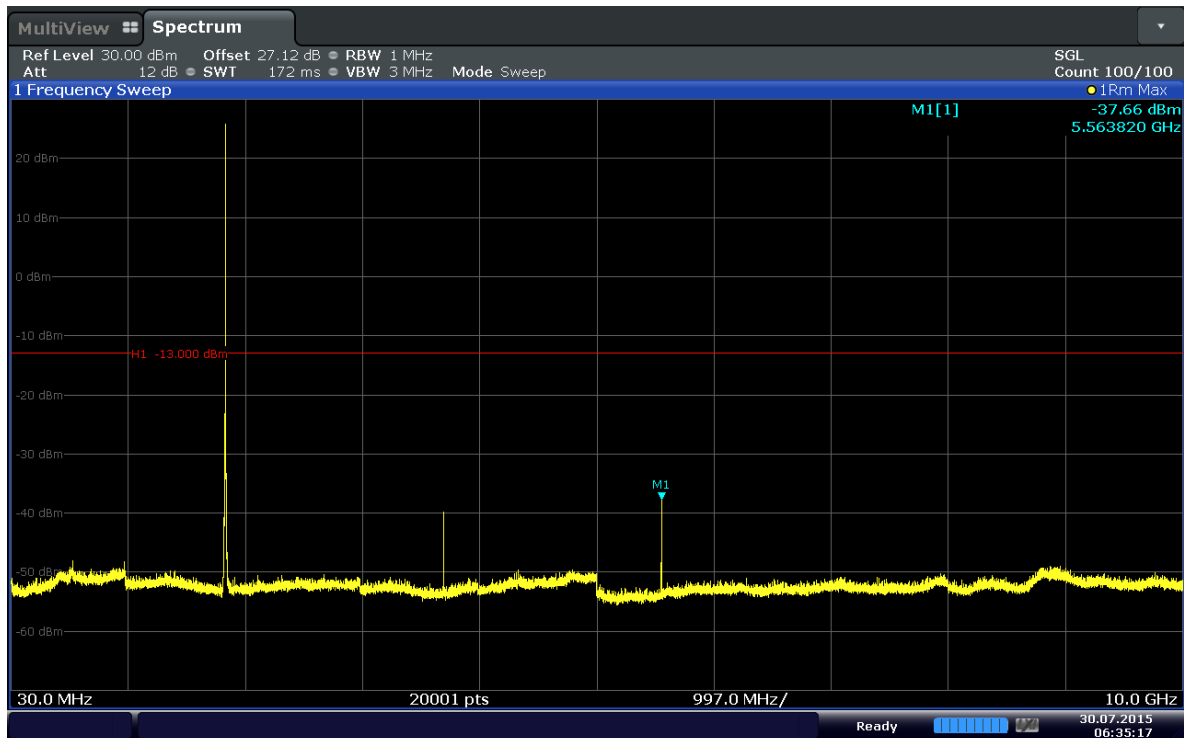


Date: 30.JUL.2015 06:33:59

Plot 6-32. Conducted Spurious Plot (Band 2–3.0MHz–QPSK–RB Size 1–RB Offset 14–Ch.19185)

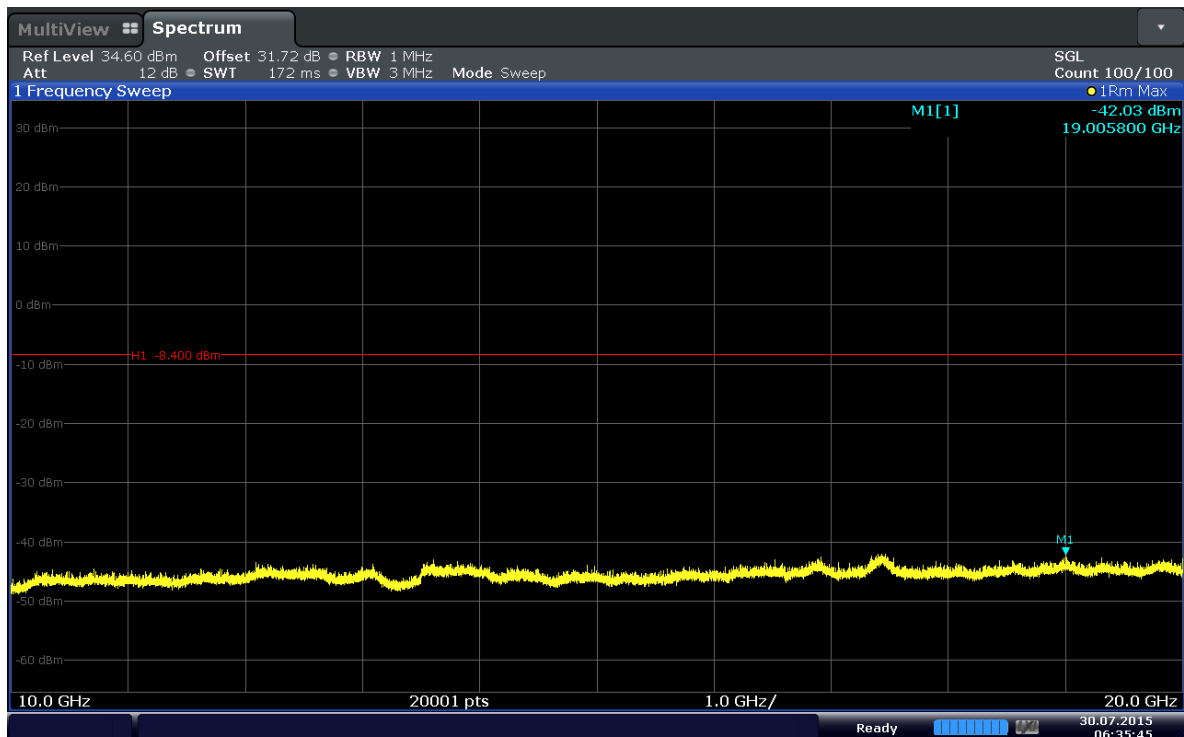


Issue Date:



Date: 30.JUL.2015 06:35:17

Plot 6-33. Conducted Spurious Plot (Band 2–5.0MHz–QPSK–RB Size 1–RB Offset 24–Ch.18625)

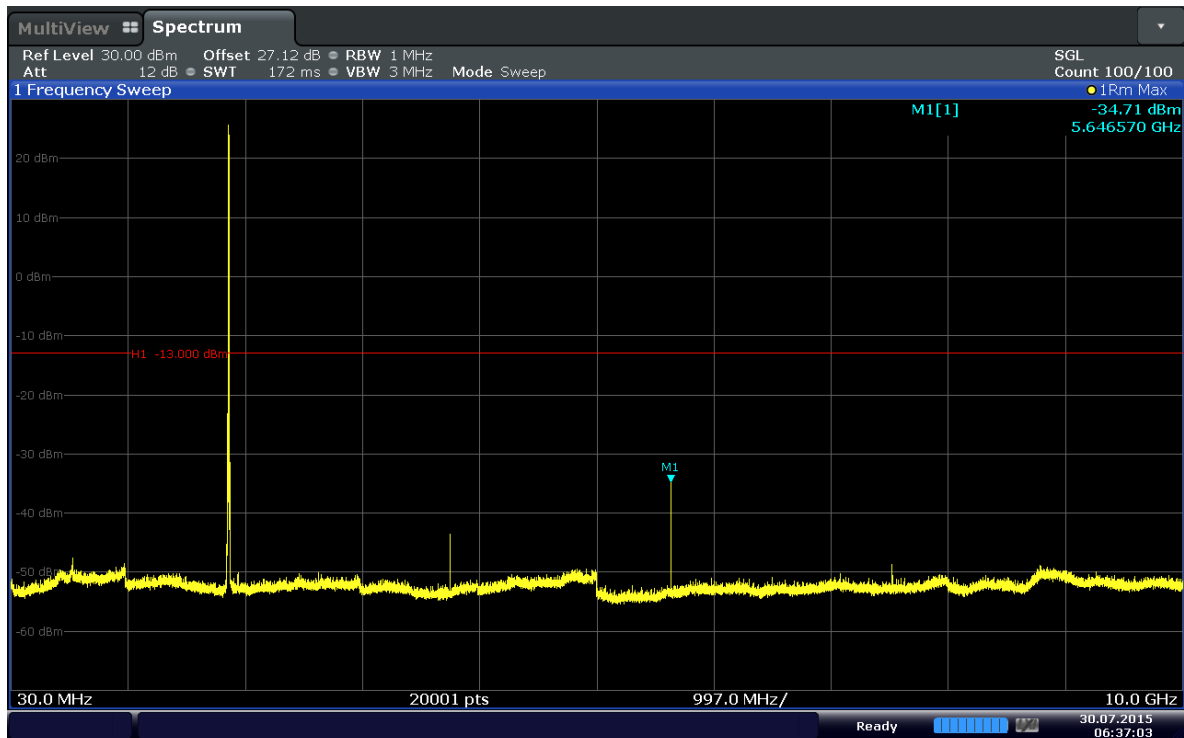


Date: 30.JUL.2015 06:35:45

Plot 6-34. Conducted Spurious Plot (Band 2–5.0MHz–QPSK–RB Size 1–RB Offset 24–Ch.18625)

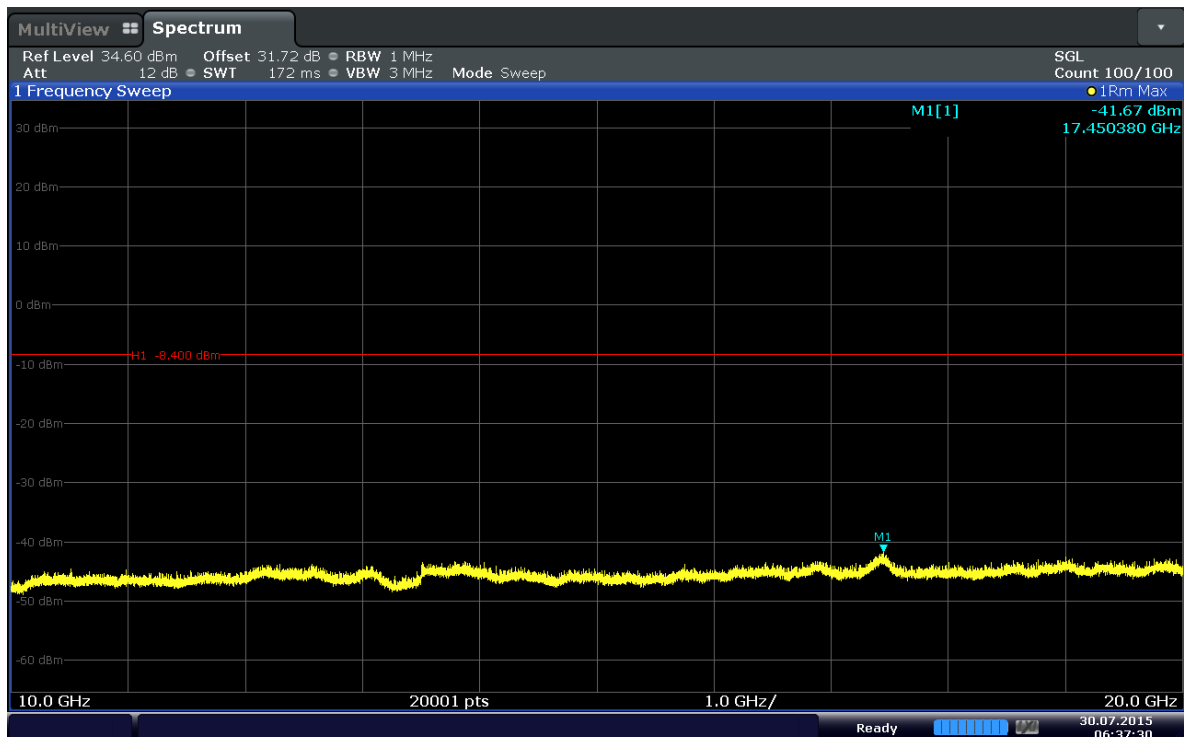


Issue Date:



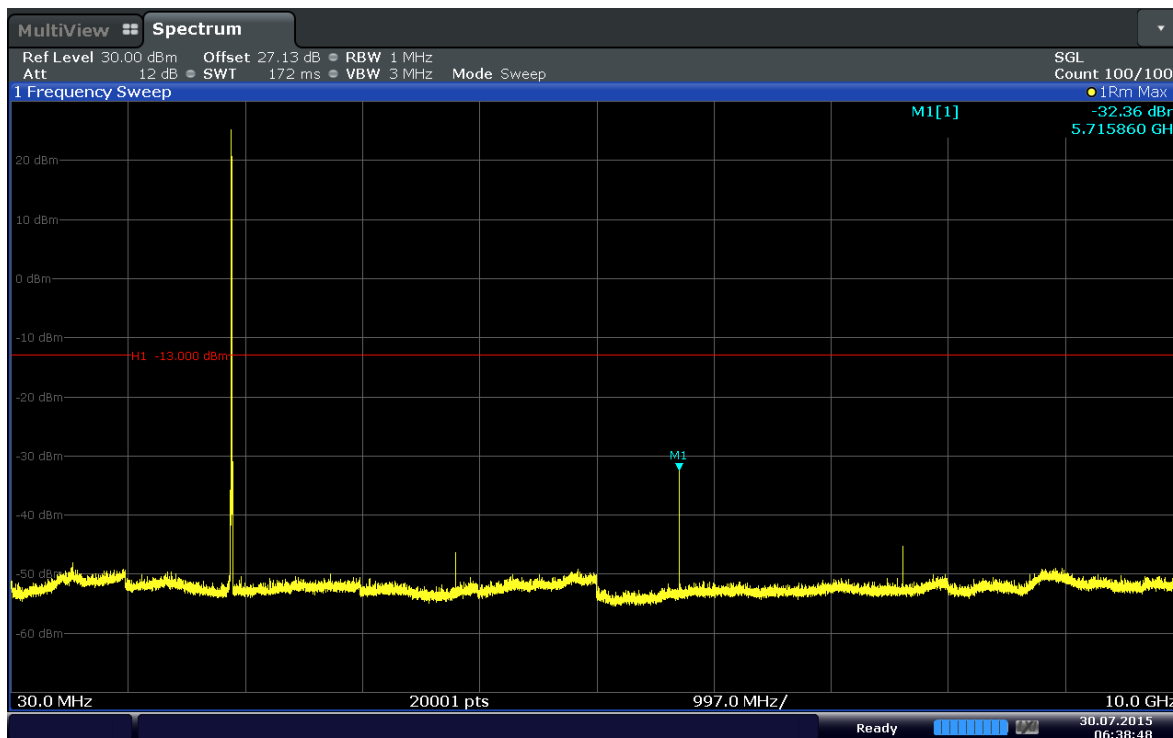
Date: 30.JUL.2015 06:37:03

Plot 6-35. Conducted Spurious Plot (Band 2–5.0MHz–QPSK–RB Size 1–RB Offset 24–Ch.18900)



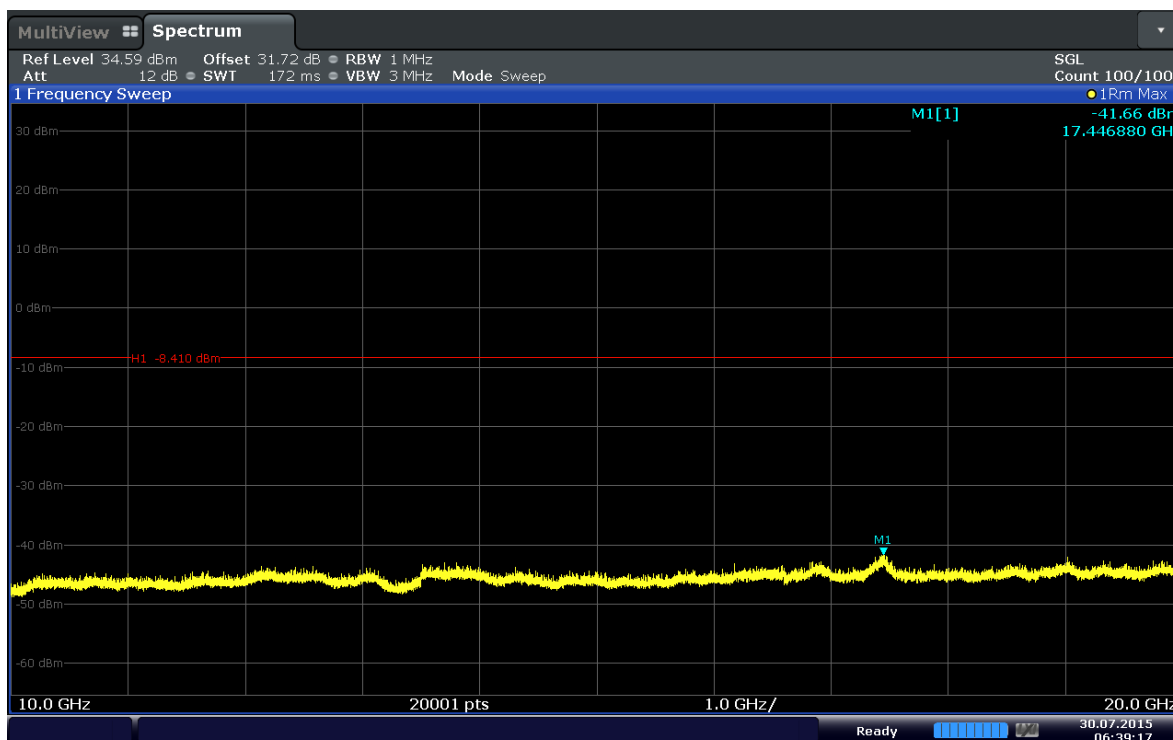
Date: 30.JUL.2015 06:37:31

Plot 6-36. Conducted Spurious Plot (Band 2–5.0MHz–QPSK–RB Size 1–RB Offset 24–Ch.18900)



Date: 30.JUL.2015 06:38:49

Plot 6-37. Conducted Spurious Plot (Band 2–5.0MHz–QPSK–RB Size 1–RB Offset 0–Ch.19175)

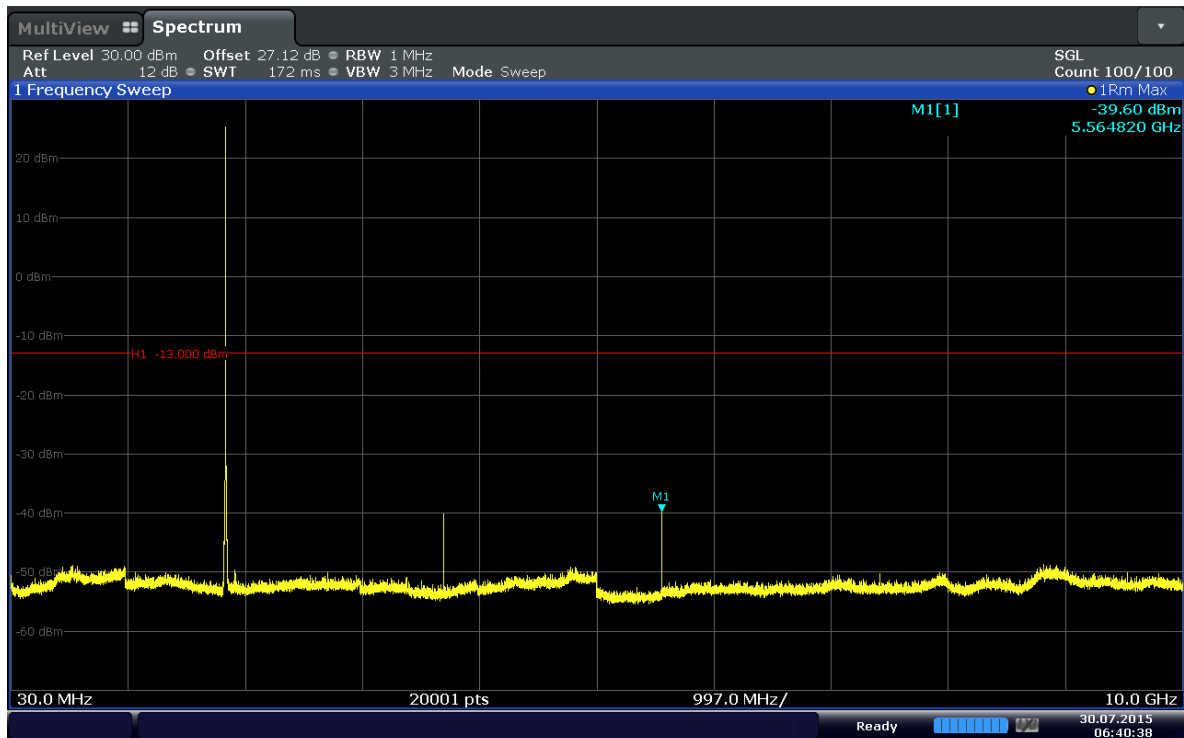


Date: 30.JUL.2015 06:39:17

Plot 6-38. Conducted Spurious Plot (Band 2–5.0MHz–QPSK–RB Size 1–RB Offset 0–Ch.19175)

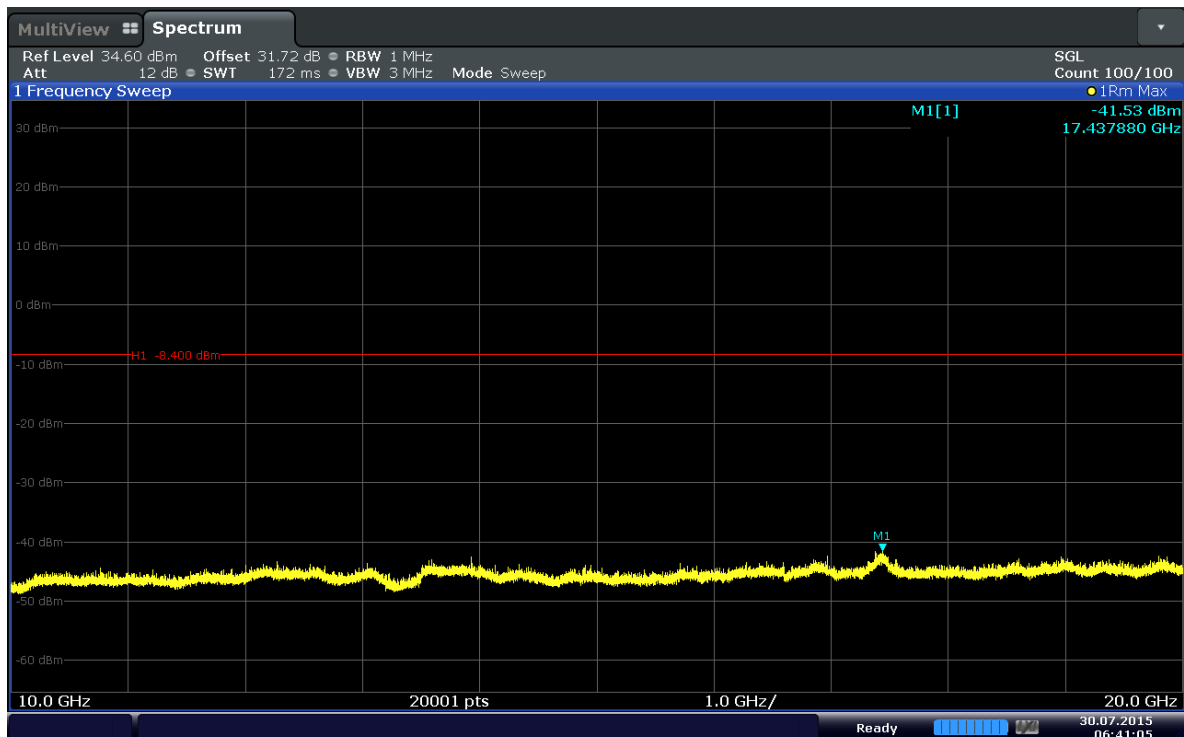


Issue Date:



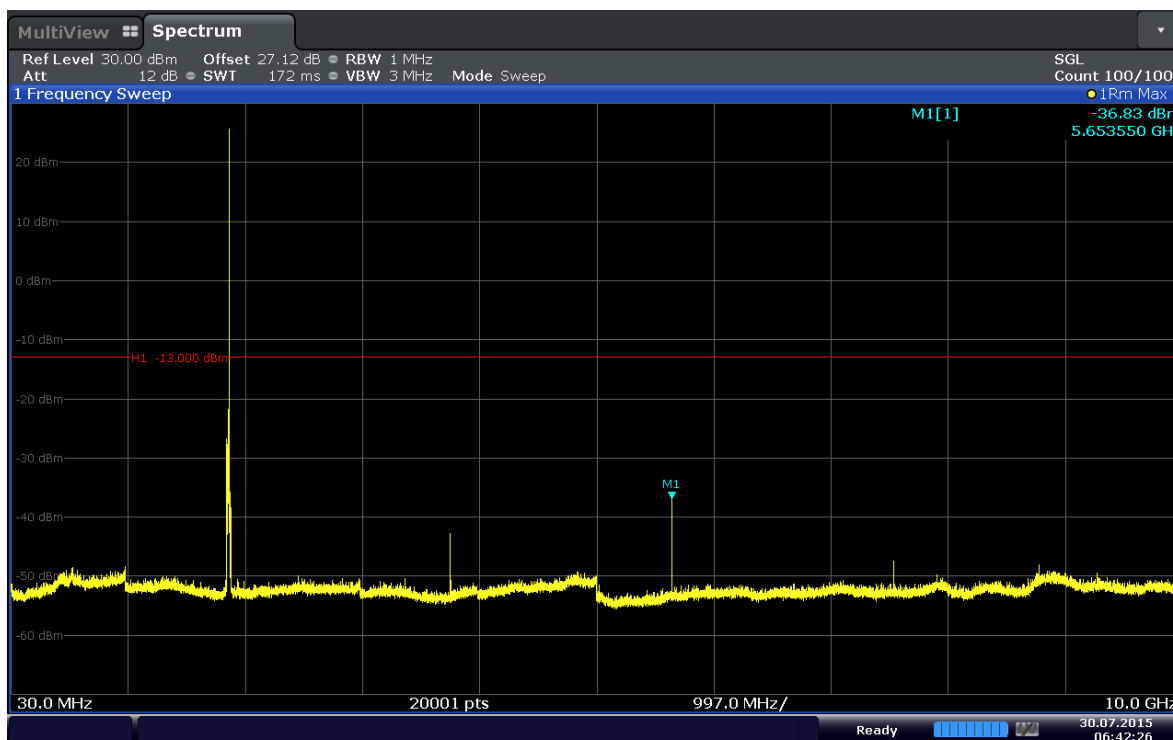
Date: 30.JUL.2015 06:40:38

Plot 6-39. Conducted Spurious Plot (Band 2–10.0MHz–QPSK–RB Size 1–RB Offset 24–Ch.18650)



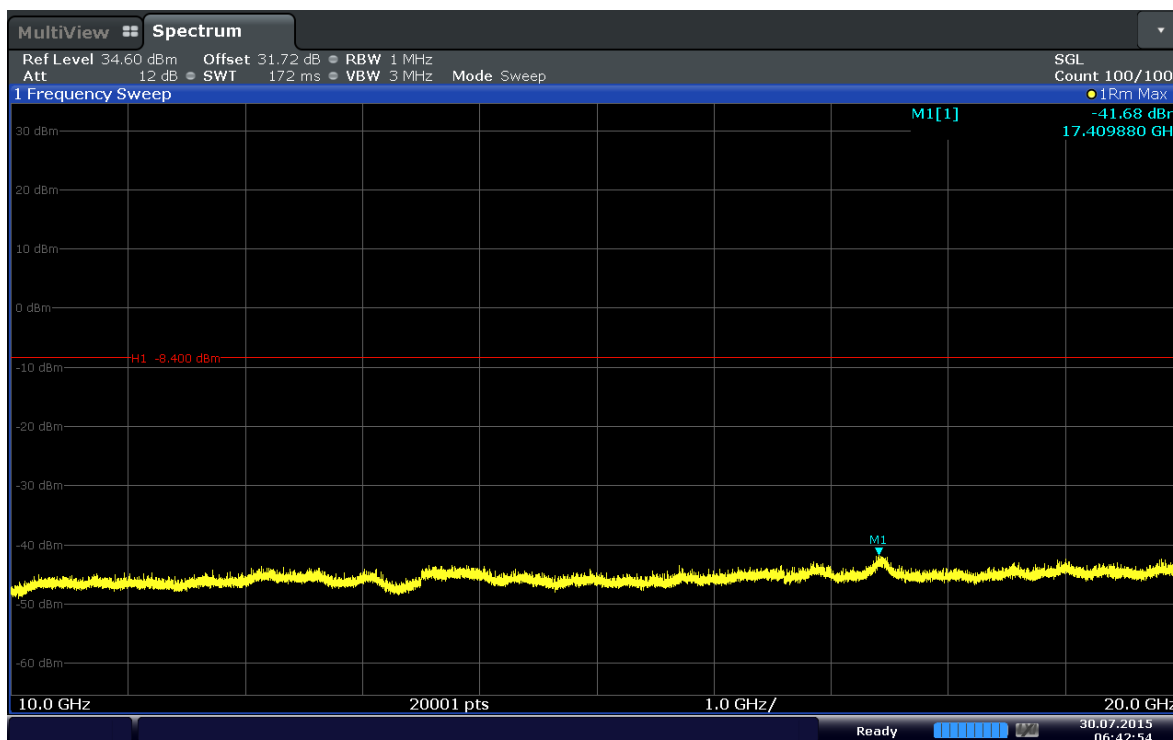
Date: 30.JUL.2015 06:41:06

Plot 6-40. Conducted Spurious Plot (Band 2–10.0MHz–QPSK–RB Size 1–RB Offset 24–Ch.18650)



Date: 30.JUL.2015 06:42:26

Plot 6-41. Conducted Spurious Plot (Band 2–10.0MHz–QPSK–RB Size 1–RB Offset 49–Ch.18900)

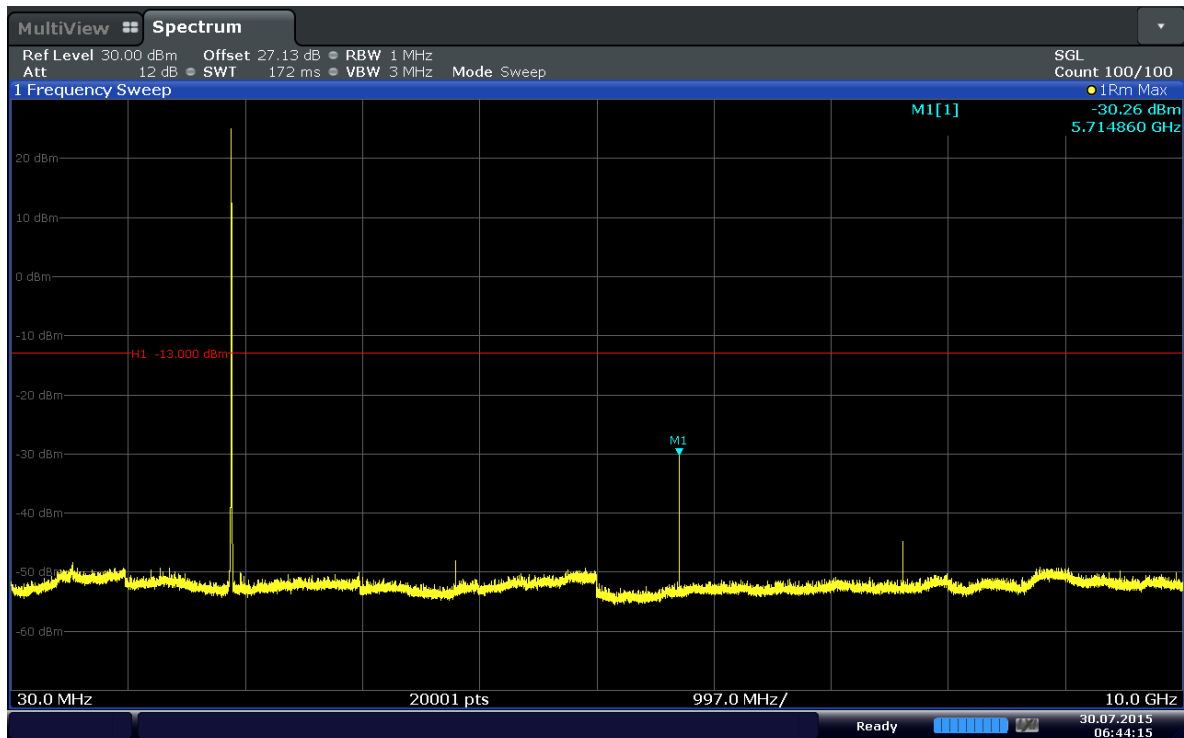


Date: 30.JUL.2015 06:42:54

Plot 6-42. Conducted Spurious Plot (Band 2–10.0MHz–QPSK–RB Size 1–RB Offset 49–Ch.18900)

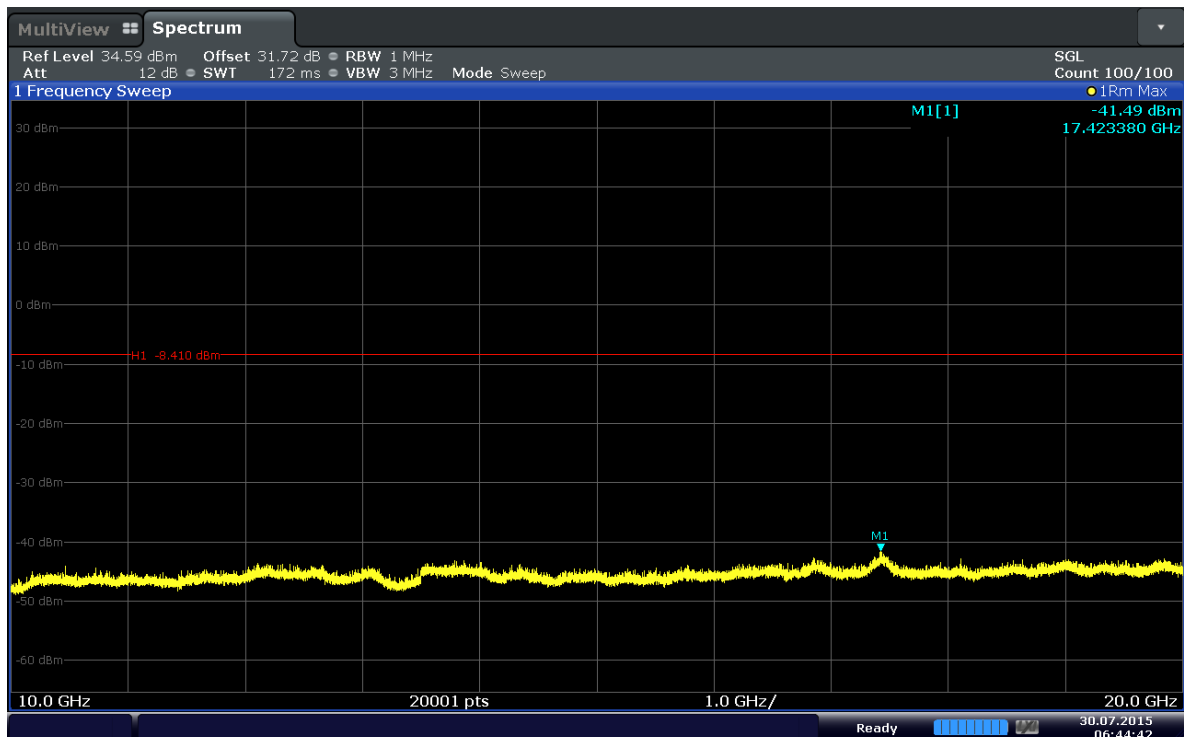


Issue Date:



Date: 30.JUL.2015 06:44:15

Plot 6-43. Conducted Spurious Plot (Band 2–10.0MHz–QPSK–RB Size 1–RB Offset 24–Ch.19150)

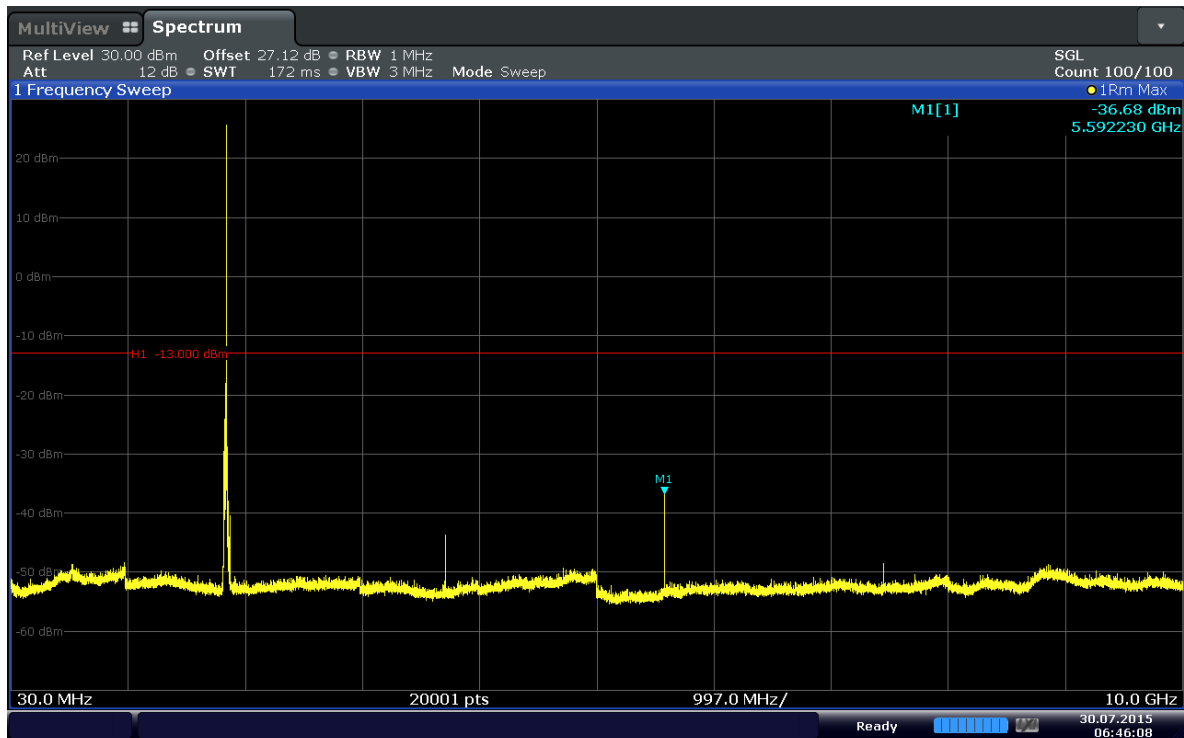


Date: 30.JUL.2015 06:44:43

Plot 6-44. Conducted Spurious Plot (Band 2–10.0MHz–QPSK–RB Size 1–RB Offset 24–Ch.19150)

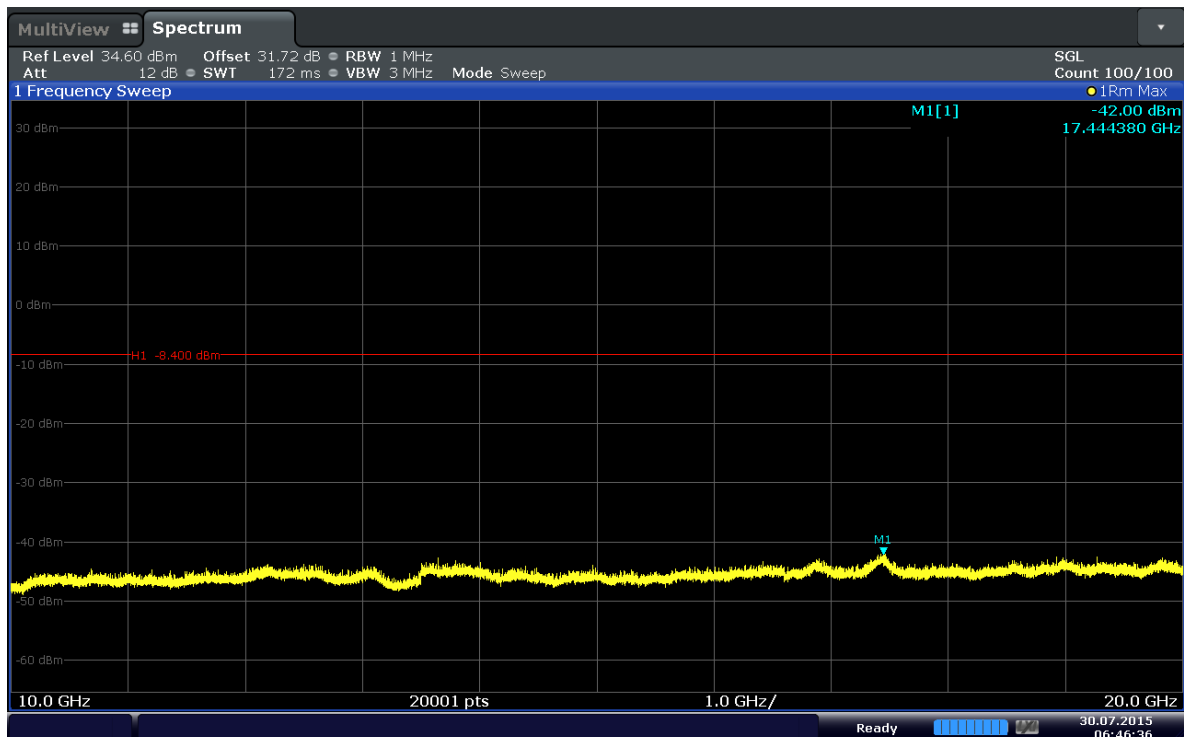


Issue Date:



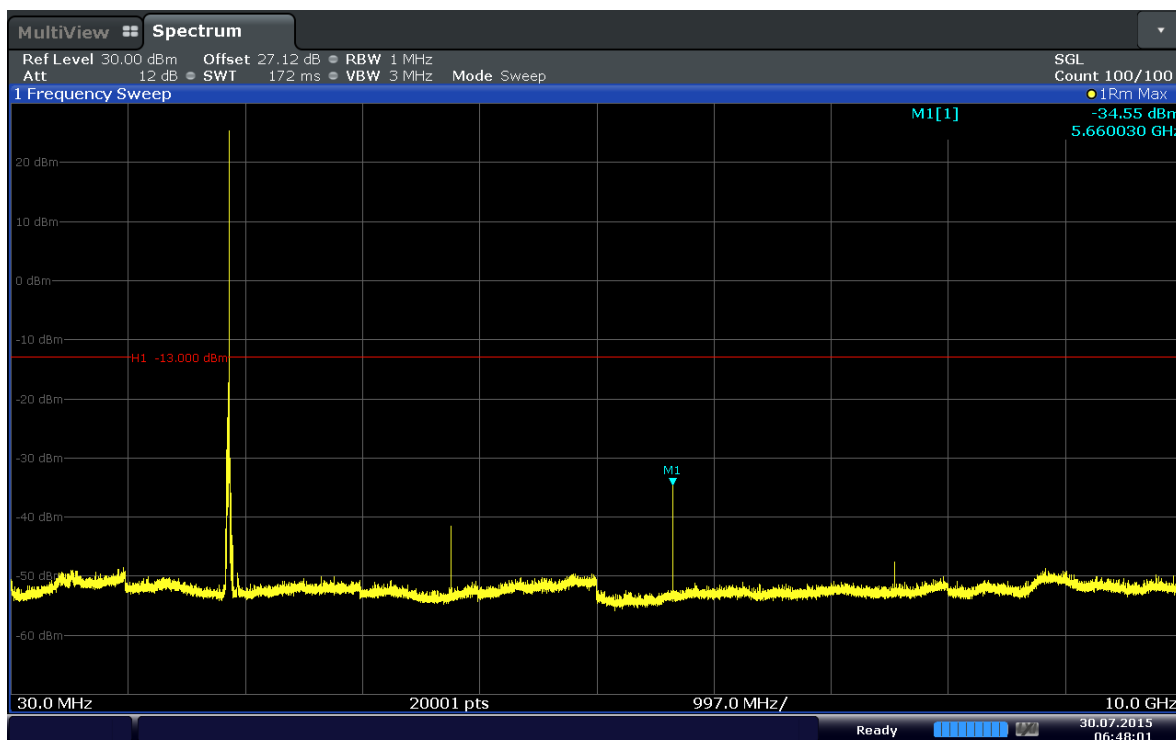
Date: 30.JUL.2015 06:46:08

Plot 6-45. Conducted Spurious Plot (Band 2–15.0MHz–QPSK–RB Size 1–RB Offset 74–Ch.18675)



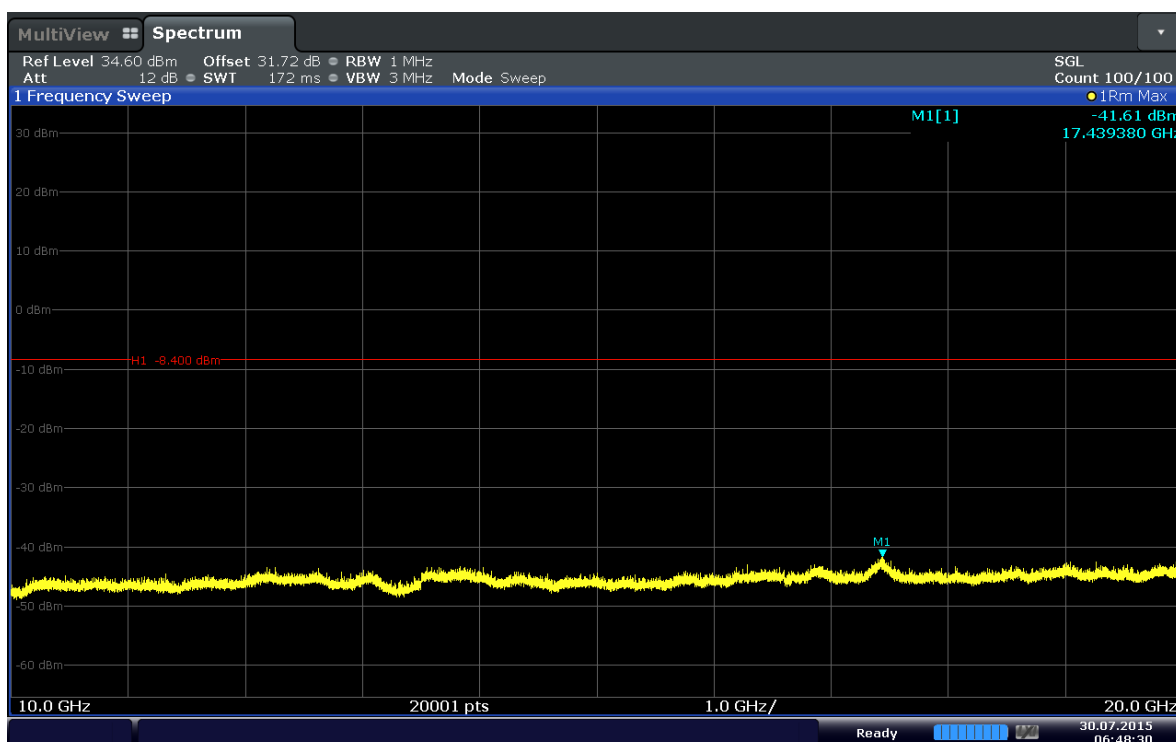
Date: 30.JUL.2015 06:46:36

Plot 6-46. Conducted Spurious Plot (Band 2–15.0MHz–QPSK–RB Size 1–RB Offset 74–Ch.18675)



Date: 30.JUL.2015 06:48:02

Plot 6-47. Conducted Spurious Plot (Band 2–15.0MHz–QPSK–RB Size 1–RB Offset 74–Ch.18900)

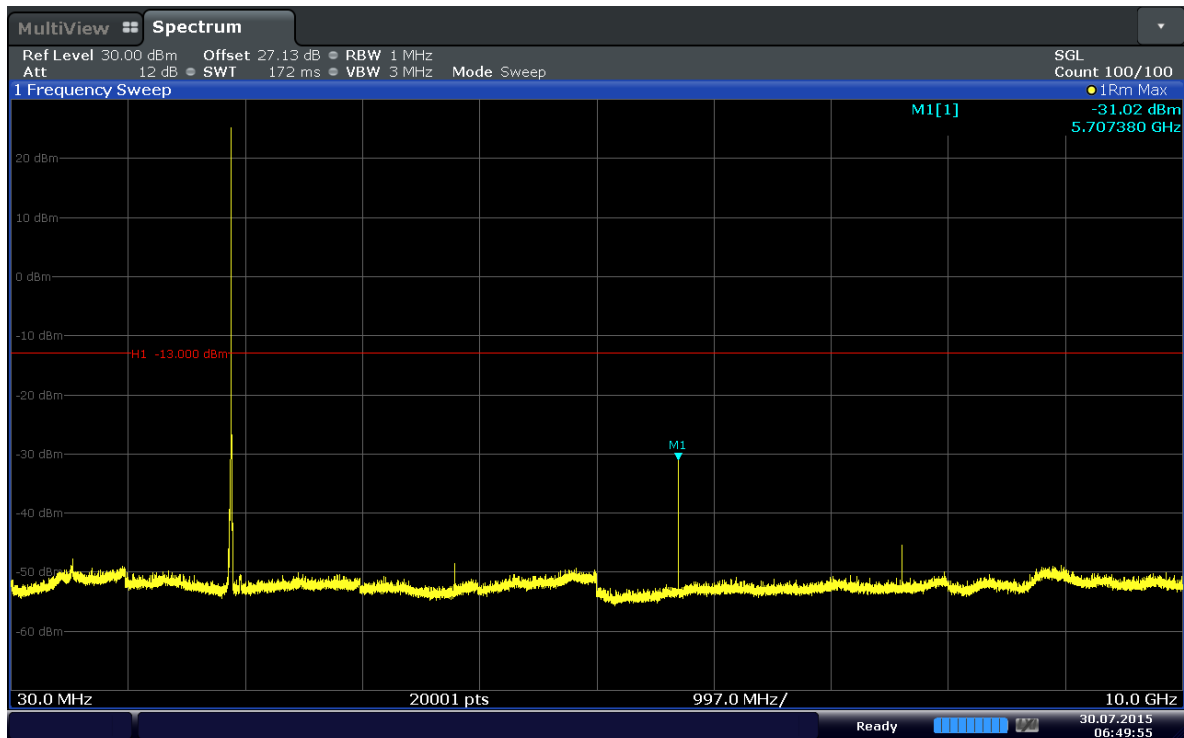


Date: 30.JUL.2015 06:48:29

Plot 6-48. Conducted Spurious Plot (Band 2–15.0MHz–QPSK–RB Size 1–RB Offset 74–Ch.18900)

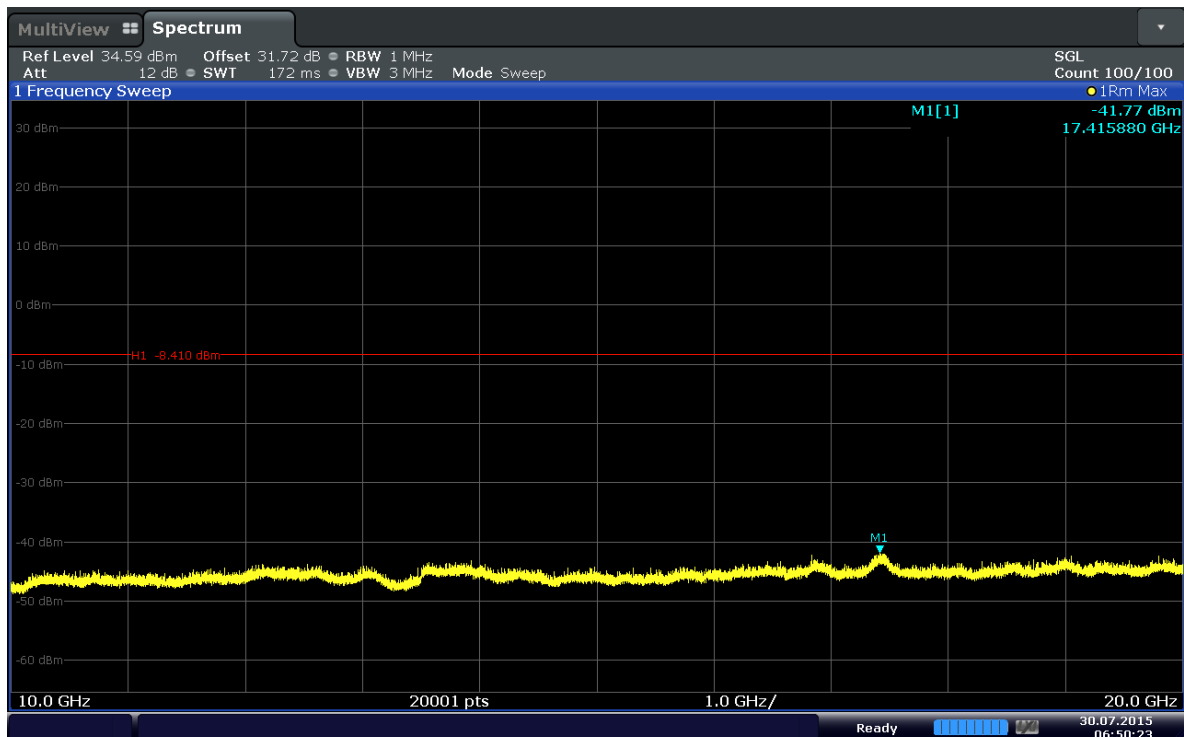


Issue Date:



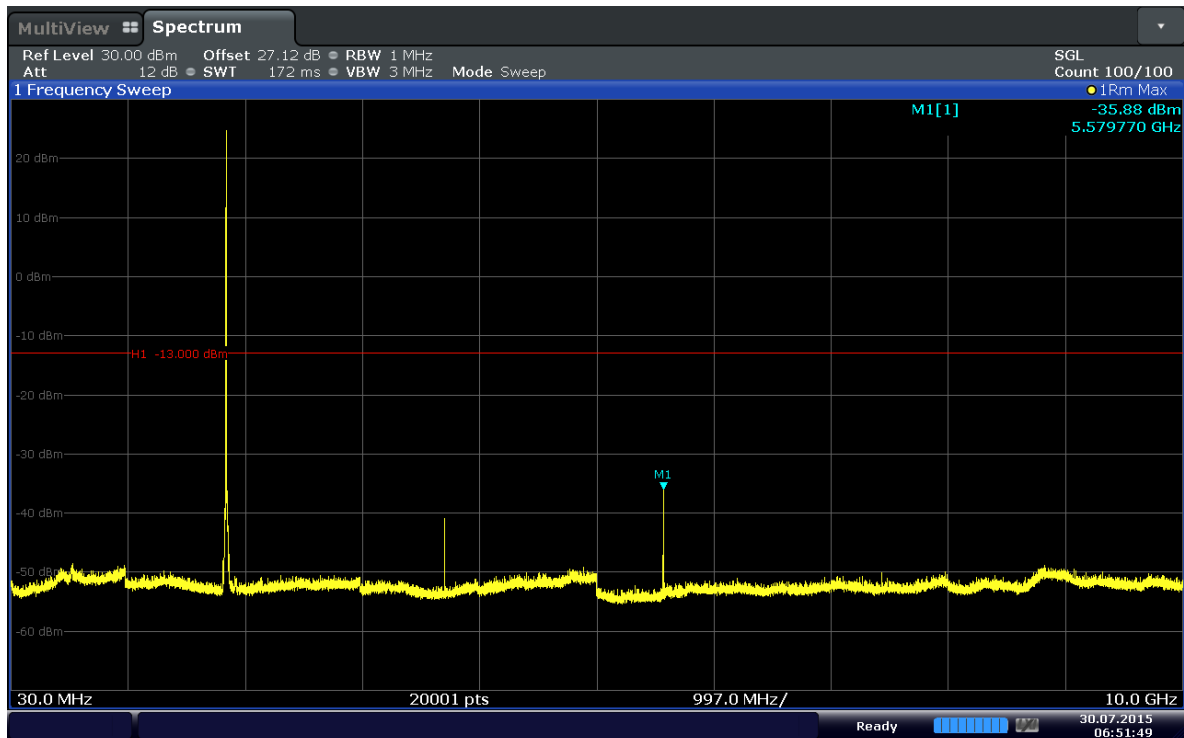
Date: 30.JUL.2015 06:49:55

Plot 6-49. Conducted Spurious Plot (Band 2–15.0MHz–QPSK–RB Size 1–RB Offset 37–Ch.19125)



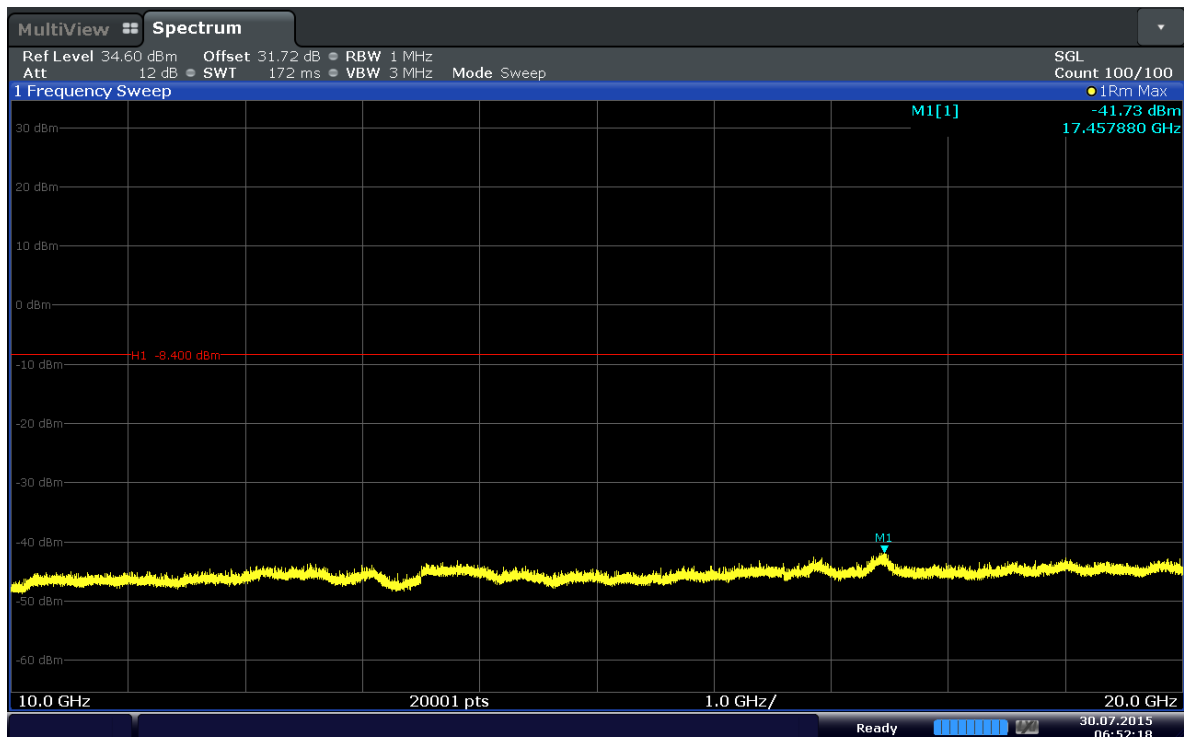
Date: 30.JUL.2015 06:50:23

Plot 6-50. Conducted Spurious Plot (Band 2–15.0MHz–QPSK–RB Size 1–RB Offset 37–Ch.19125)



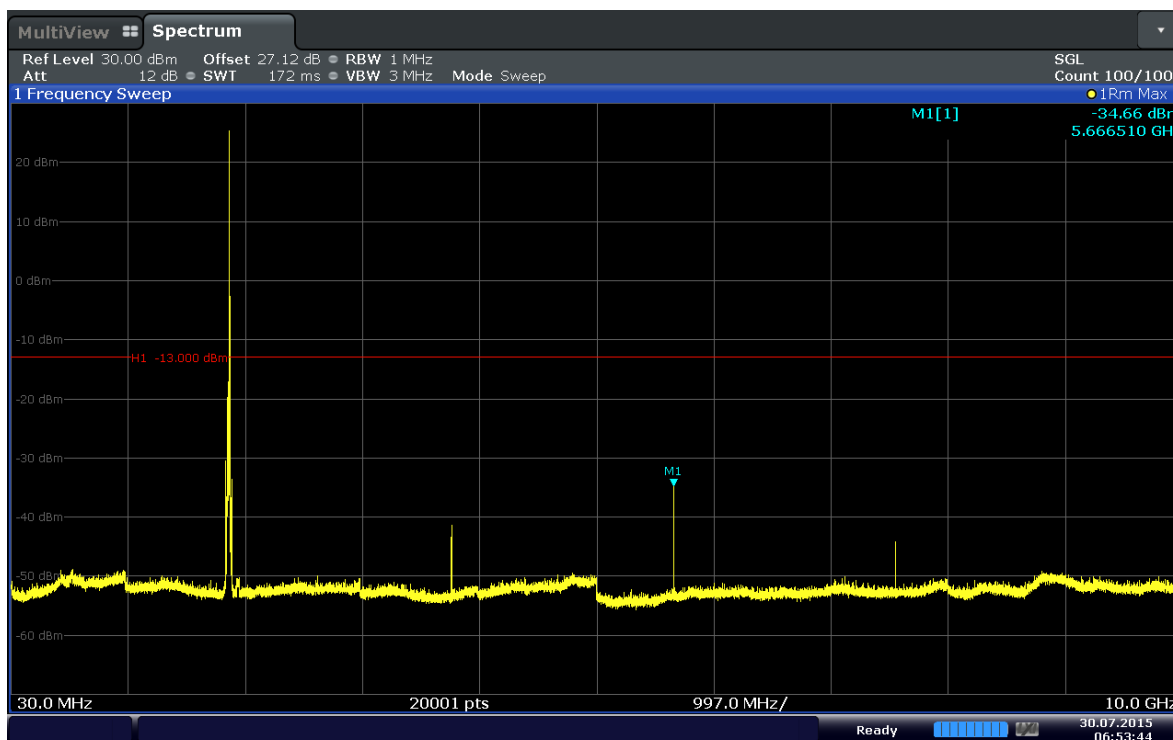
Date: 30.JUL.2015 06:51:50

Plot 6-51. Conducted Spurious Plot (Band 2–20.0MHz–QPSK–RB Size 1–RB Offset 49–Ch.18700)



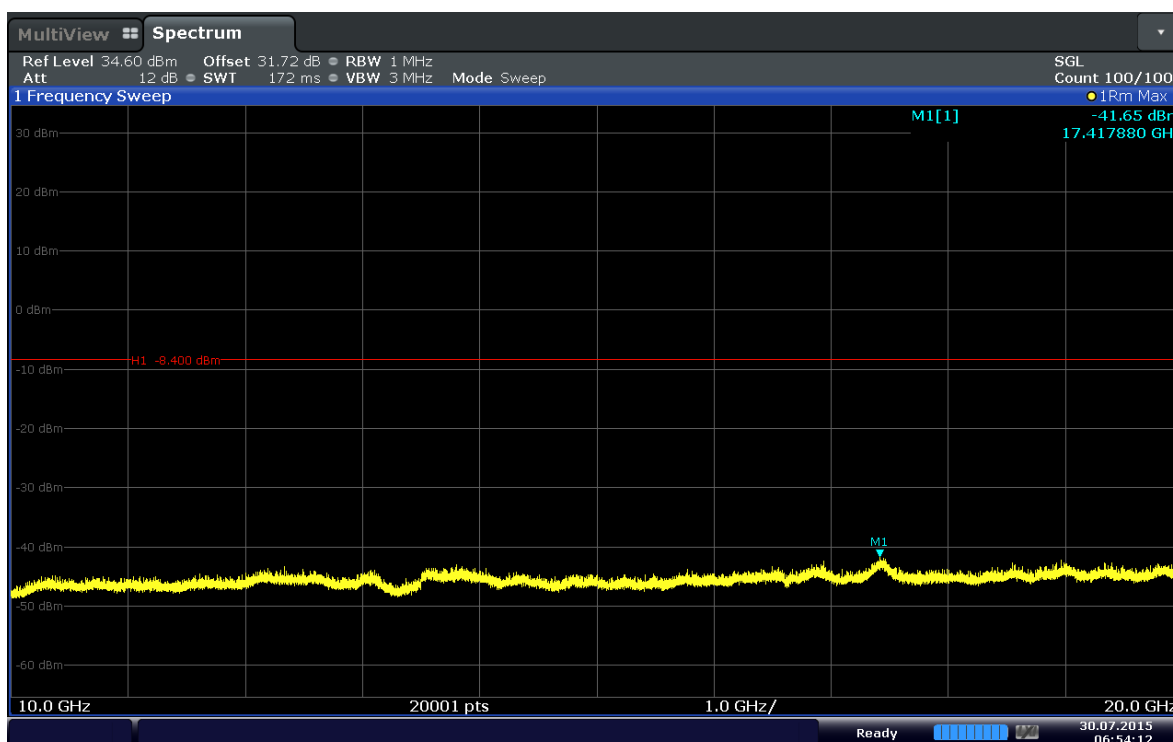
Date: 30.JUL.2015 06:52:18

Plot 6-52. Conducted Spurious Plot (Band 2–20.0MHz–QPSK–RB Size 1–RB Offset 49–Ch.18700)



Date: 30.JUL.2015 06:53:44

Plot 6-53. Conducted Spurious Plot (Band 2–20.0MHz–QPSK–RB Size 1–RB Offset 99–Ch.18900)

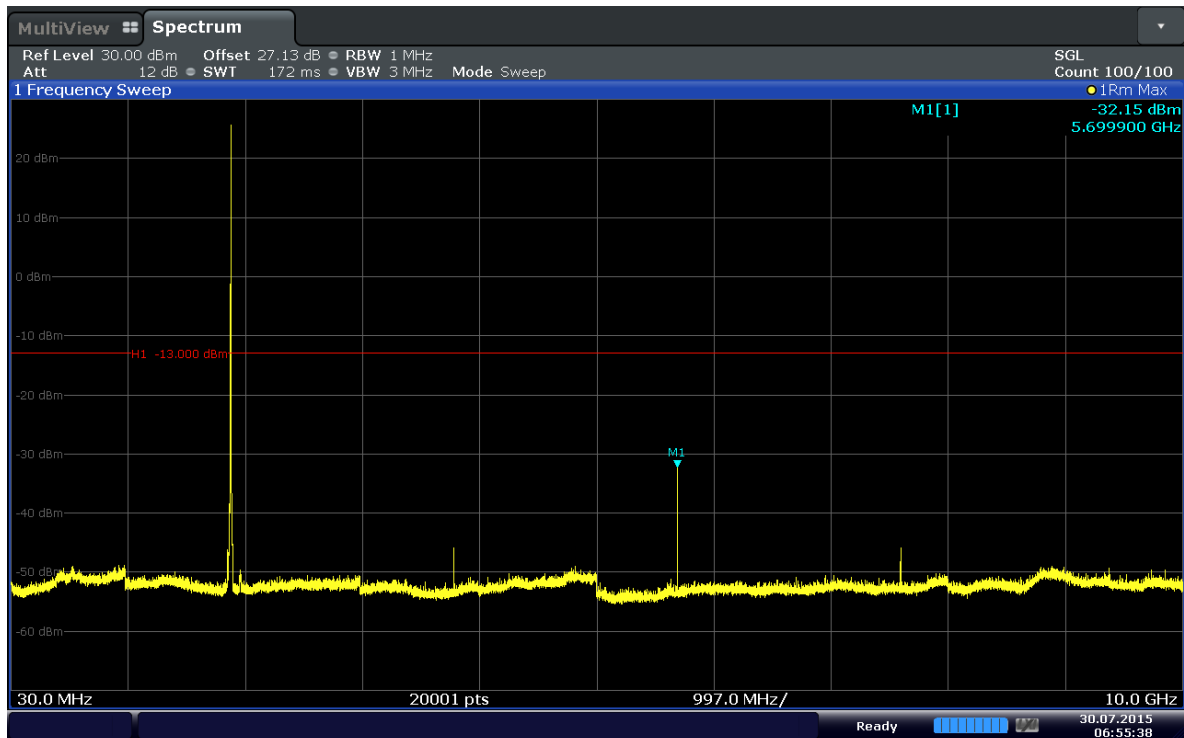


Date: 30.JUL.2015 06:54:12

Plot 6-54. Conducted Spurious Plot (Band 2–20.0MHz–QPSK–RB Size 1–RB Offset 99–Ch.18900)

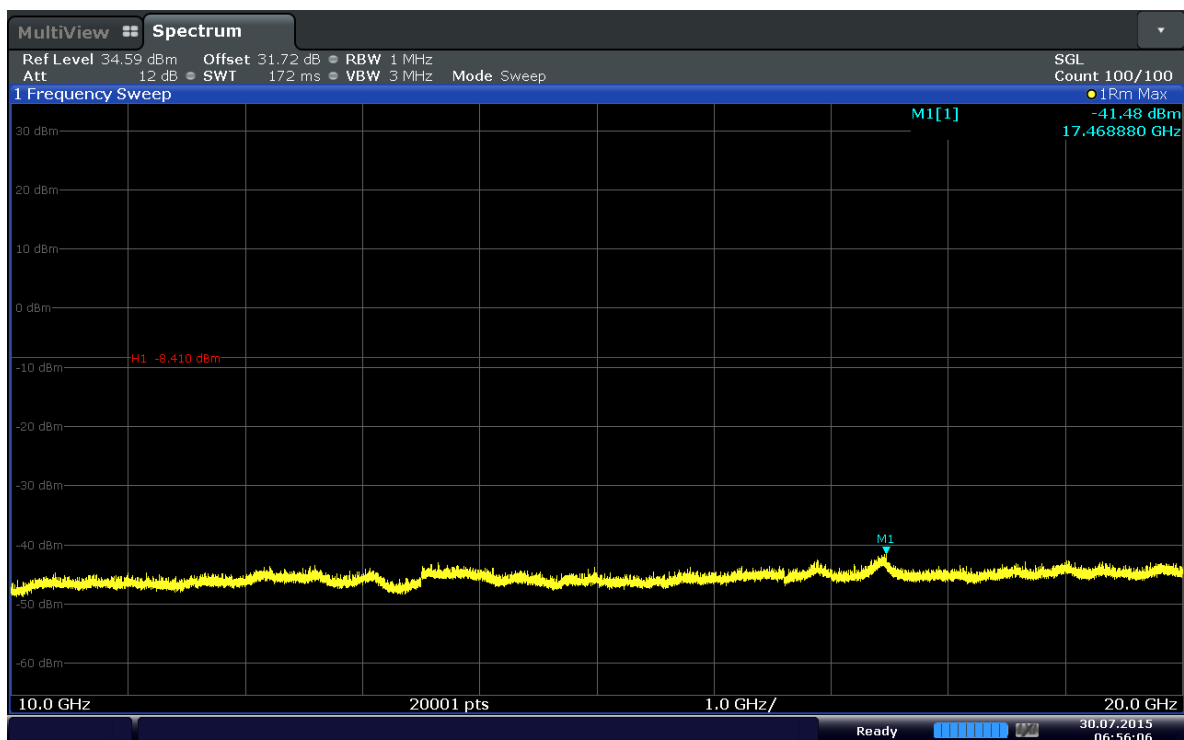


Issue Date:



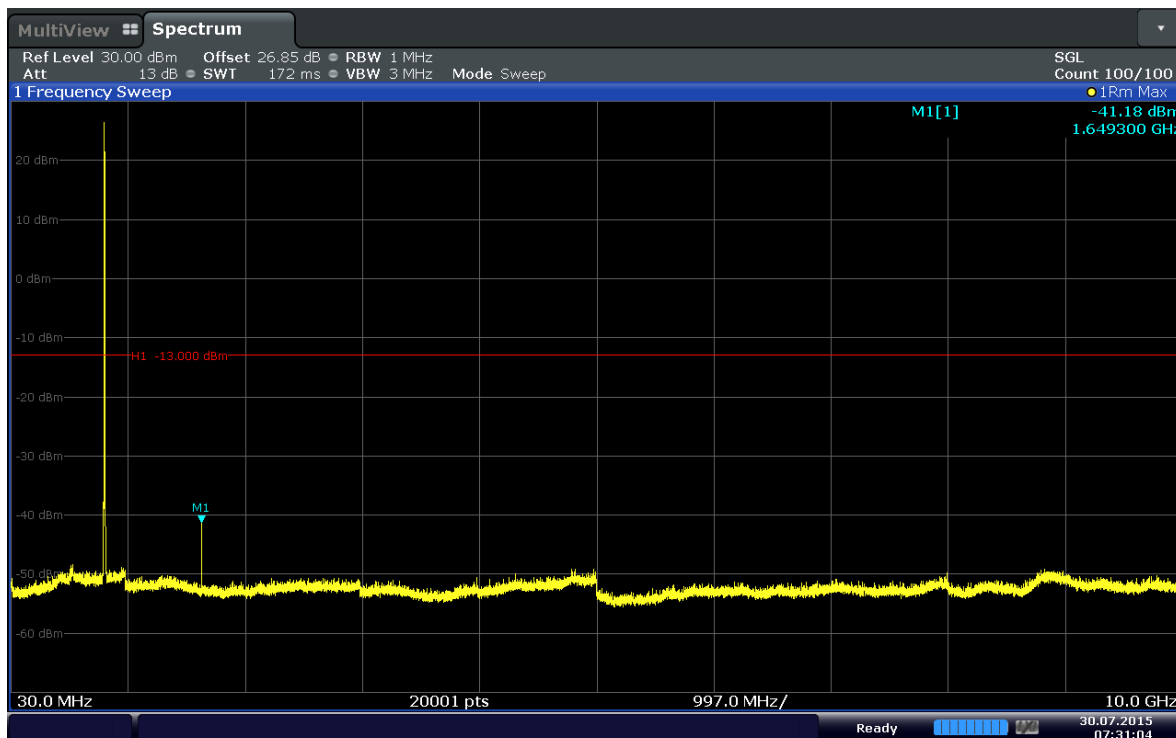
Date: 30.JUL.2015 06:55:38

Plot 6-55. Conducted Spurious Plot (Band 2–20.0MHz–QPSK–RB Size 1–RB Offset 49–Ch.19100)



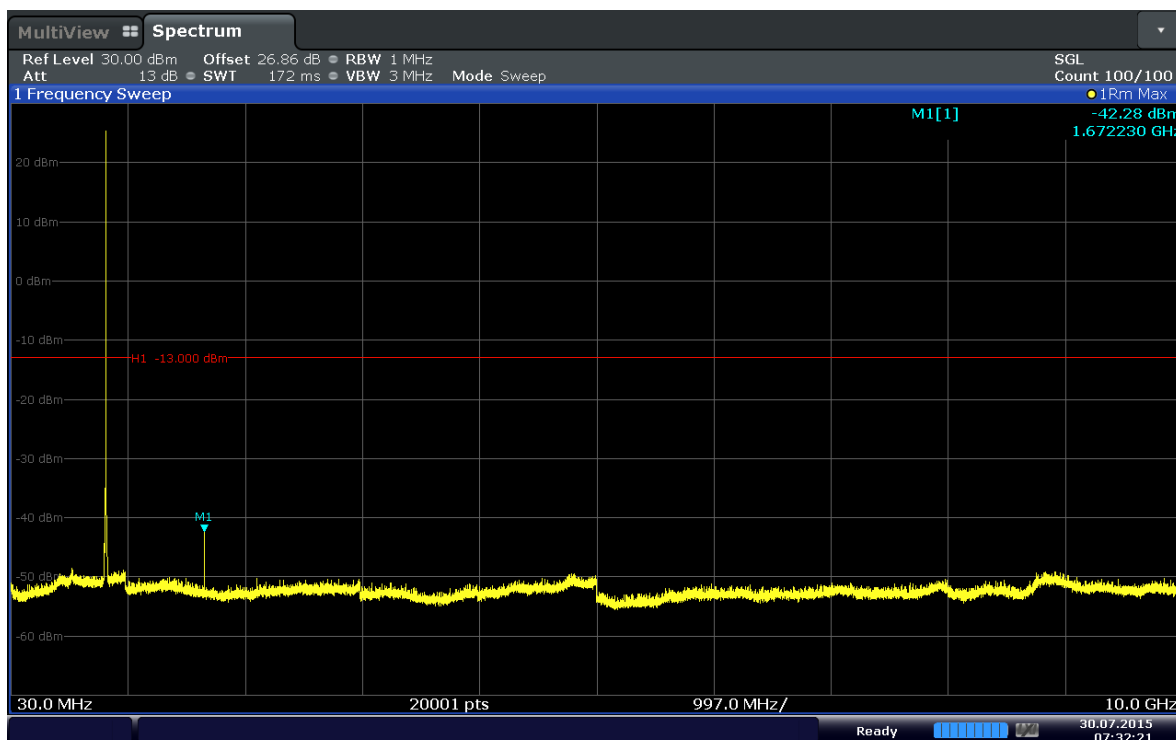
Date: 30.JUL.2015 06:56:06

Plot 6-56. Conducted Spurious Plot (Band 2–20.0MHz–QPSK–RB Size 1–RB Offset 49–Ch.19100)



Date: 30.JUL.2015 07:31:04

Plot 6-57. Conducted Spurious Plot (Band 5–1.4MHz–QPSK–RB Size 1–RB Offset 2–Ch.20407)

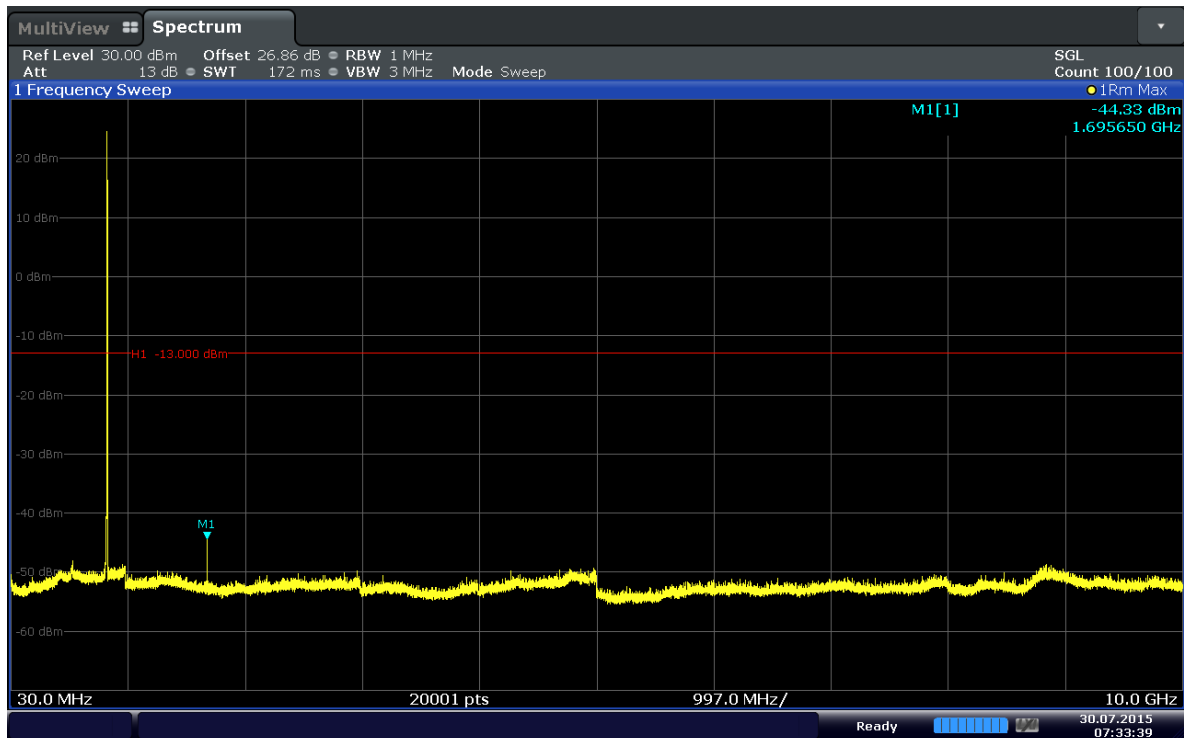


Date: 30.JUL.2015 07:32:22

Plot 6-58. Conducted Spurious Plot (Band 5–1.4MHz–QPSK–RB Size 1–RB Offset 0–Ch.20525)

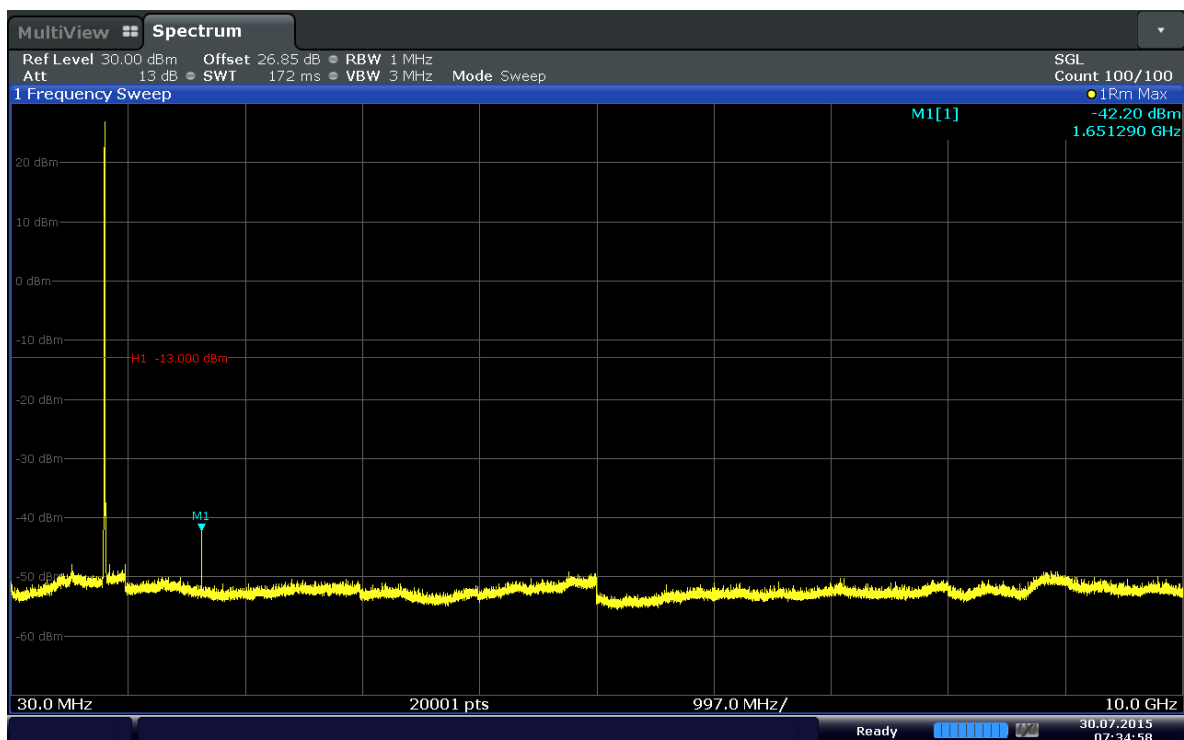


Issue Date:



Date: 30.JUL.2015 07:33:39

Plot 6-59. Conducted Spurious Plot (Band 5–1.4MHz–QPSK–RB Size 1–RB Offset 0–Ch.20643)

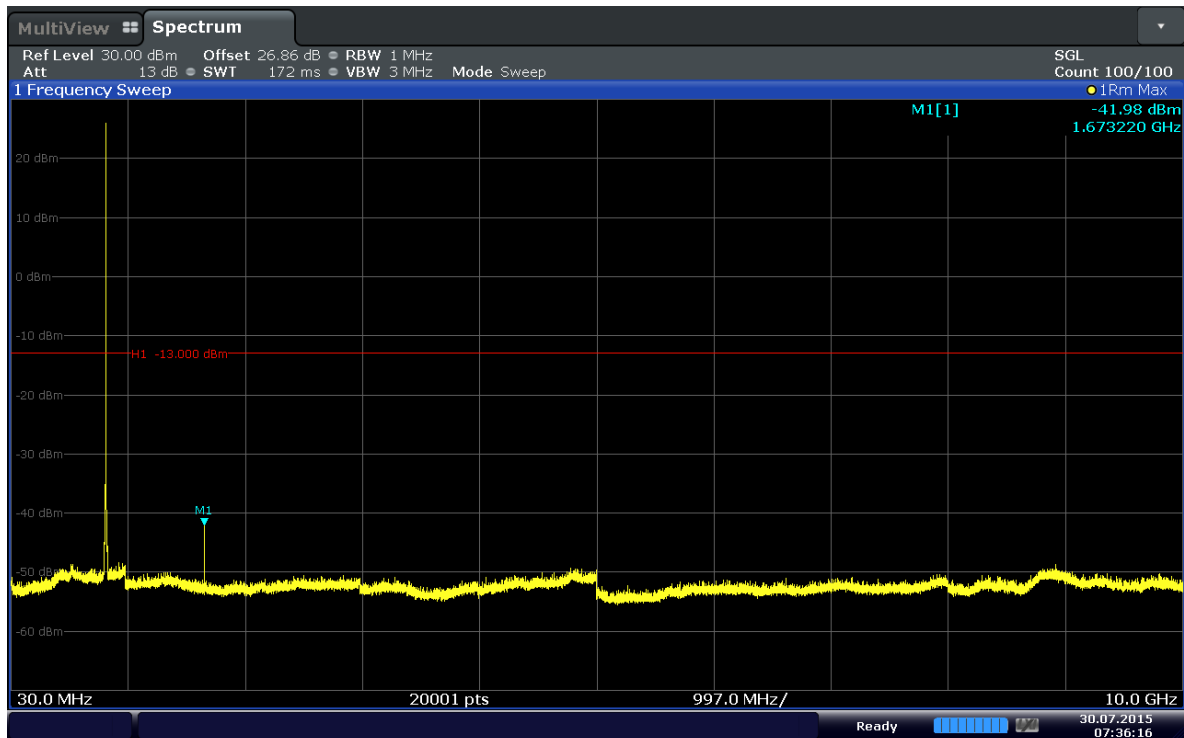


Date: 30.JUL.2015 07:34:58

Plot 6-60. Conducted Spurious Plot (Band 5–3.0MHz–QPSK–RB Size 1–RB Offset 7–Ch.20415)

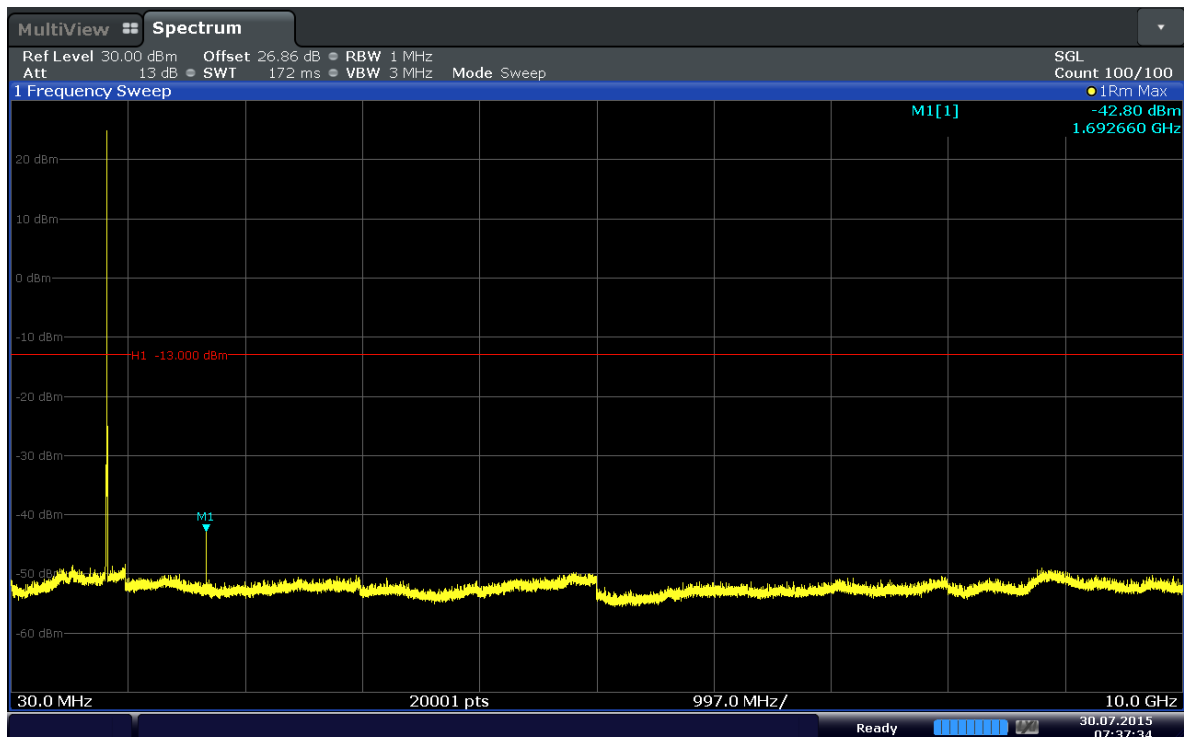


Issue Date:



Date: 30.JUL.2015 07:36:16

Plot 6-61. Conducted Spurious Plot (Band 5–3.0MHz–QPSK–RB Size 1–RB Offset 7–Ch.20525)

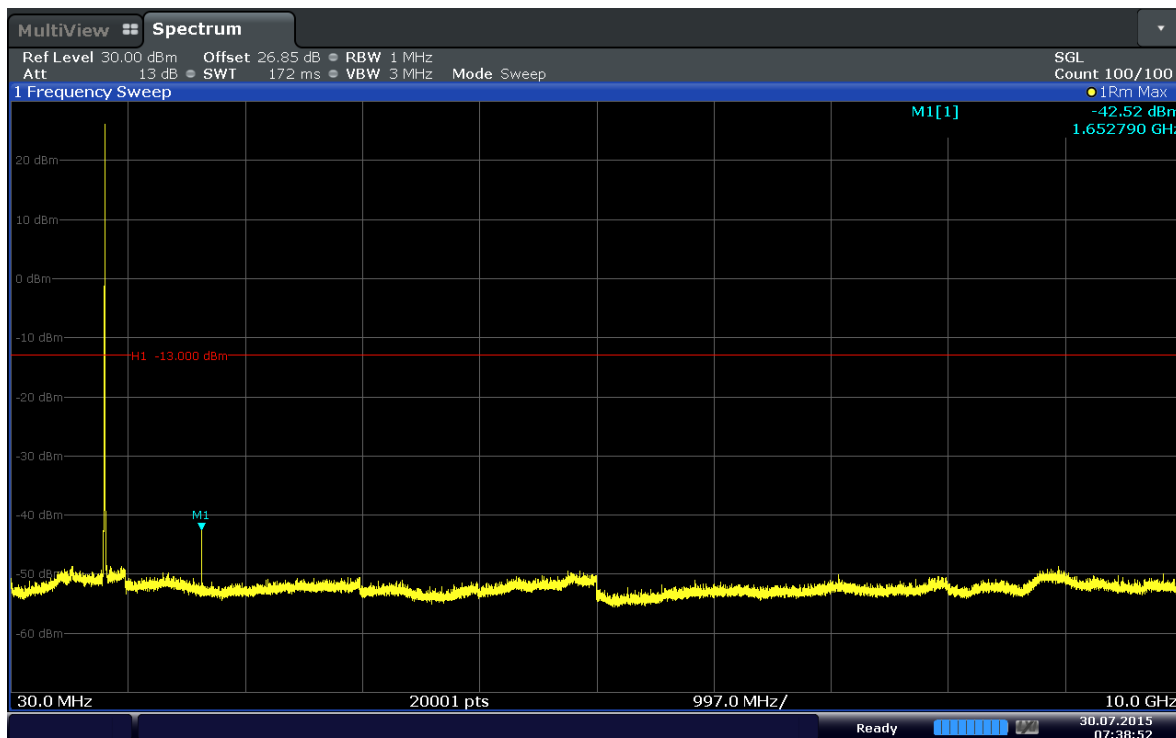


Date: 30.JUL.2015 07:37:34

Plot 6-62. Conducted Spurious Plot (Band 5–3.0MHz–QPSK–RB Size 1–RB Offset 0–Ch.20635)

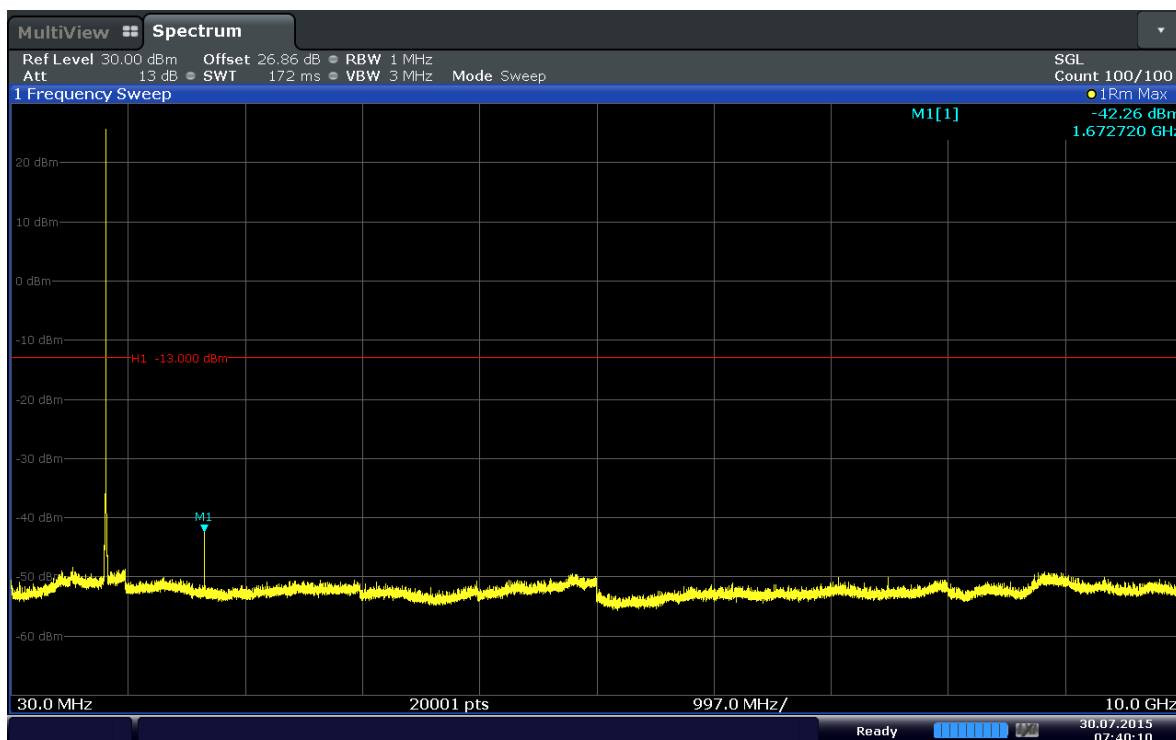


Issue Date:



Date: 30.JUL.2015 07:38:52

Plot 6-63. Conducted Spurious Plot (Band 5–5.0MHz–QPSK–RB Size 1–RB Offset 12–Ch.20425)

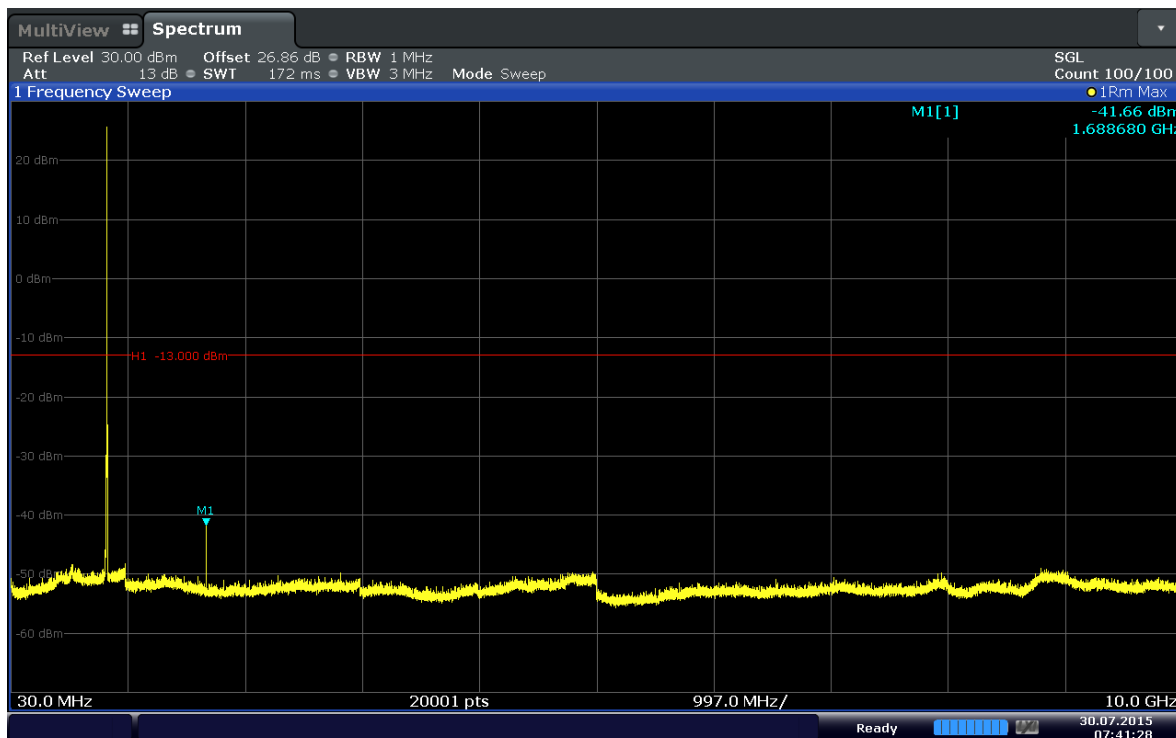


Date: 30.JUL.2015 07:40:11

Plot 6-64. Conducted Spurious Plot (Band 5–5.0MHz–QPSK–RB Size 1–RB Offset 12–Ch.20525)

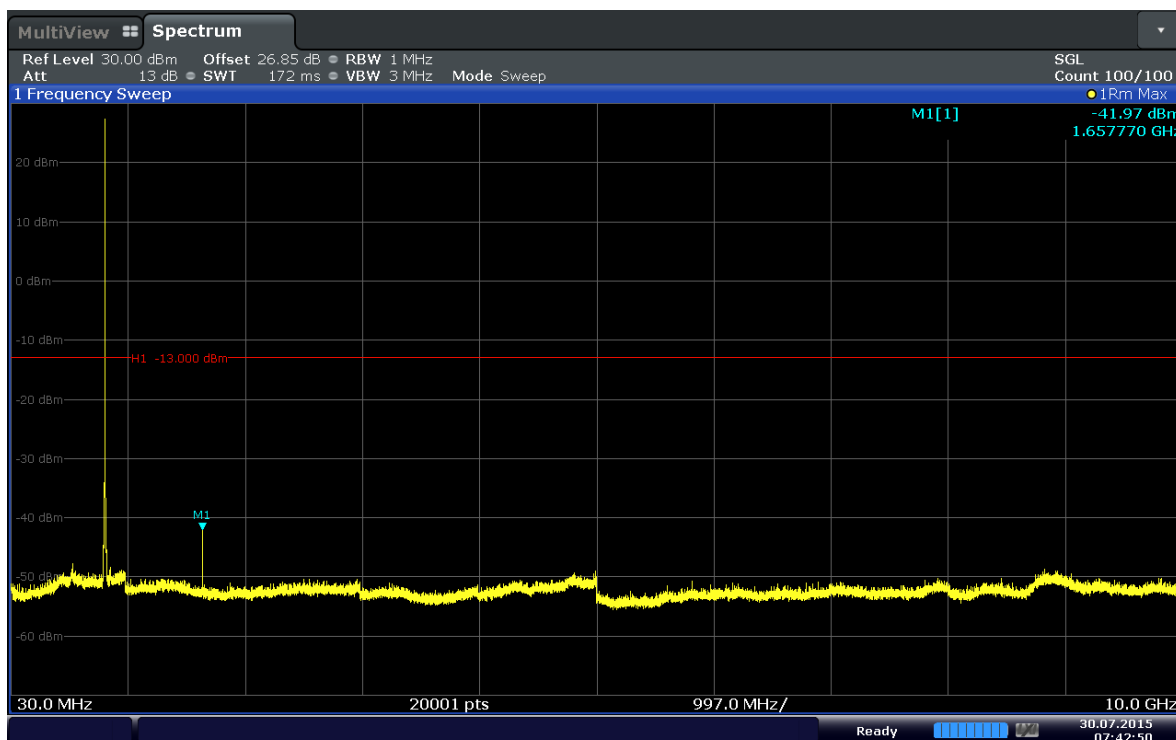


Issue Date:



Date: 30.JUL.2015 07:41:29

Plot 6-65. Conducted Spurious Plot (Band 5–5.0MHz–QPSK–RB Size 1–RB Offset 0–Ch.20625)

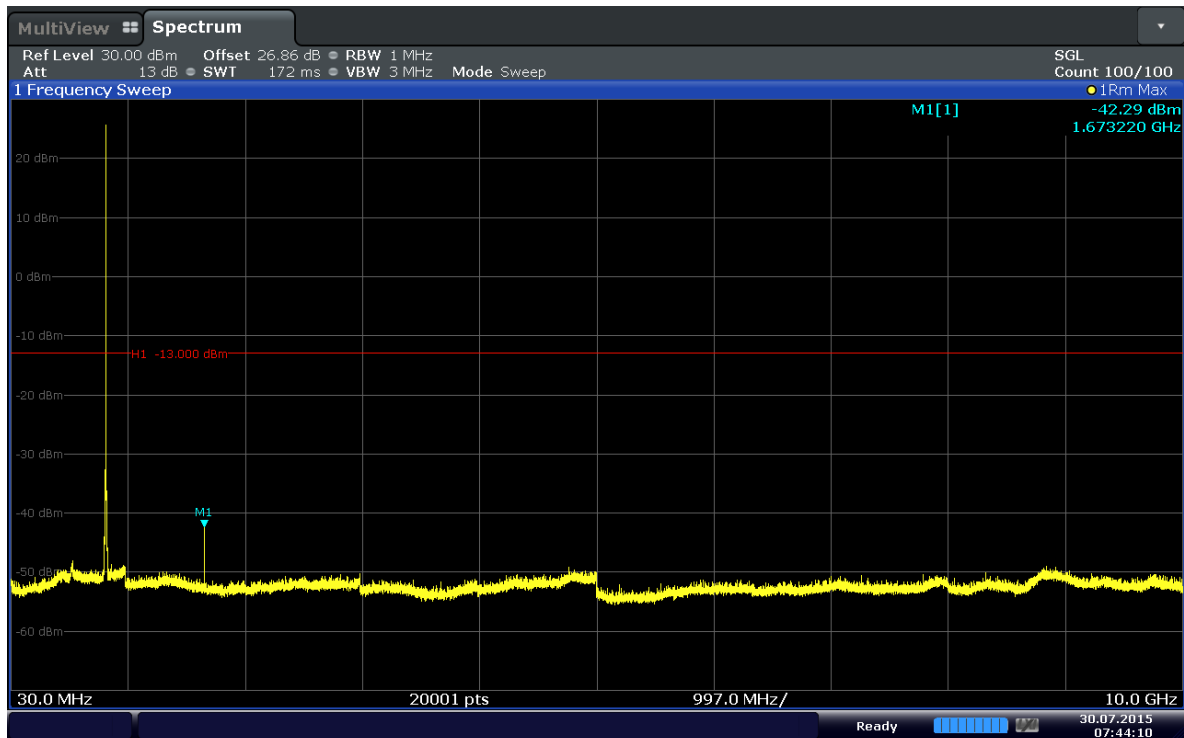


Date: 30.JUL.2015 07:42:50

Plot 6-66. Conducted Spurious Plot (Band 5–10.0MHz–QPSK–RB Size 1–RB Offset 24–Ch.20450)

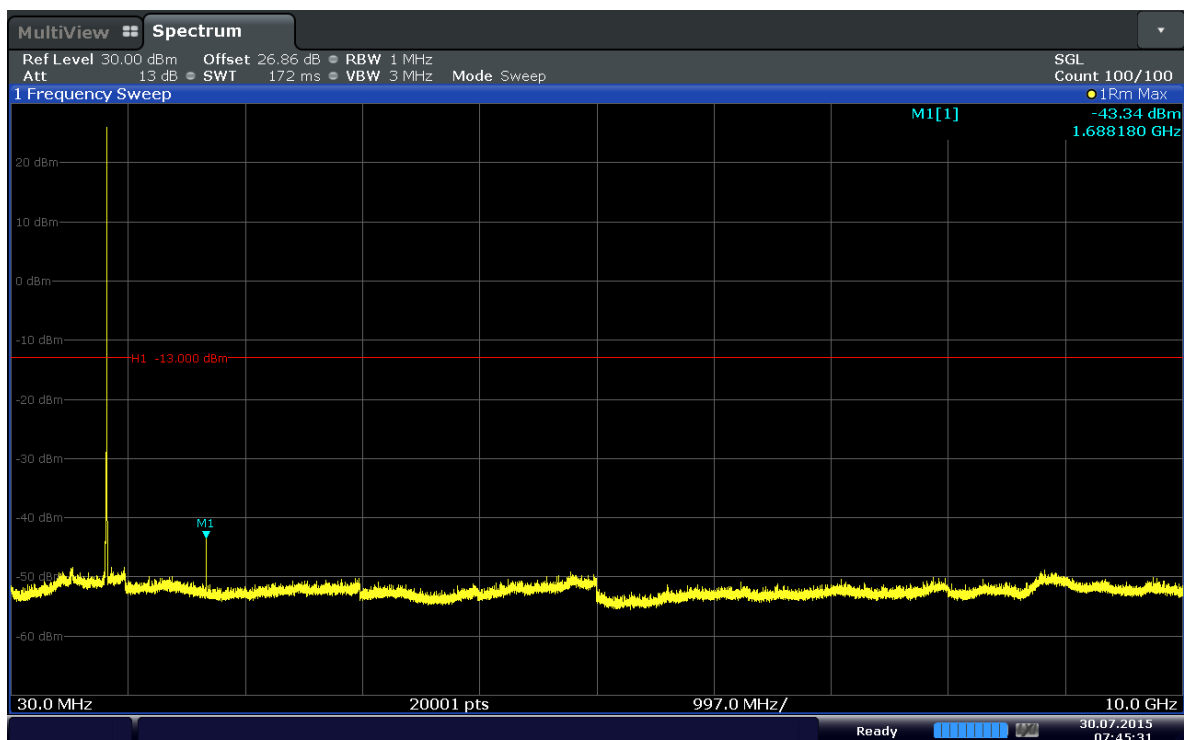


Issue Date:



Date: 30.JUL.2015 07:44:10

Plot 6-67. Conducted Spurious Plot (Band 5–10.0MHz–QPSK–RB Size 1–RB Offset 24–Ch.20525)



Date: 30.JUL.2015 07:45:31

Plot 6-68. Conducted Spurious Plot (Band 5–10.0MHz–QPSK–RB Size 1–RB Offset 24–Ch.20600)



6.4. Band Edge Emissions at Antenna Terminal §2.1051 §22.917(a) §24.238(a)

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 of any spurious emission is $43 + \log_{10}(P_{\text{[Watts]}})$, where P is the transmitter power in Watts. Limit equivalent to -13dBm, calculation shown below.

$$\begin{aligned}43 + 10 \log_{10}(1.567\text{W}) &= 44.95 \text{ dB} \\1.567\text{W} &= 31.95 \text{ dBm} \\31.95 \text{ dBm} - 44.95 \text{ dB} &= -13 \text{ dBm}\end{aligned}$$

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. RBW $\geq$ 1% of the emission bandwidth
4. VBW $\geq$ 3 x RBW
5. Detector = RMS
6. Number of sweep points $\geq$ 2 x Span/RBW
7. Trace mode = max hold
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.

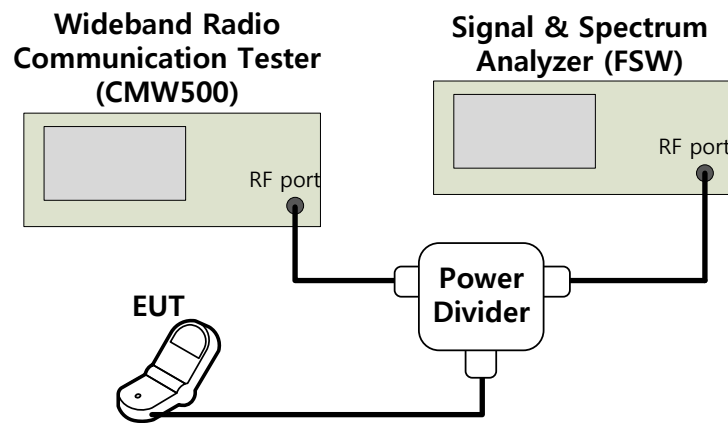


Figure 6-3. Test Instruments & Measurement Setup

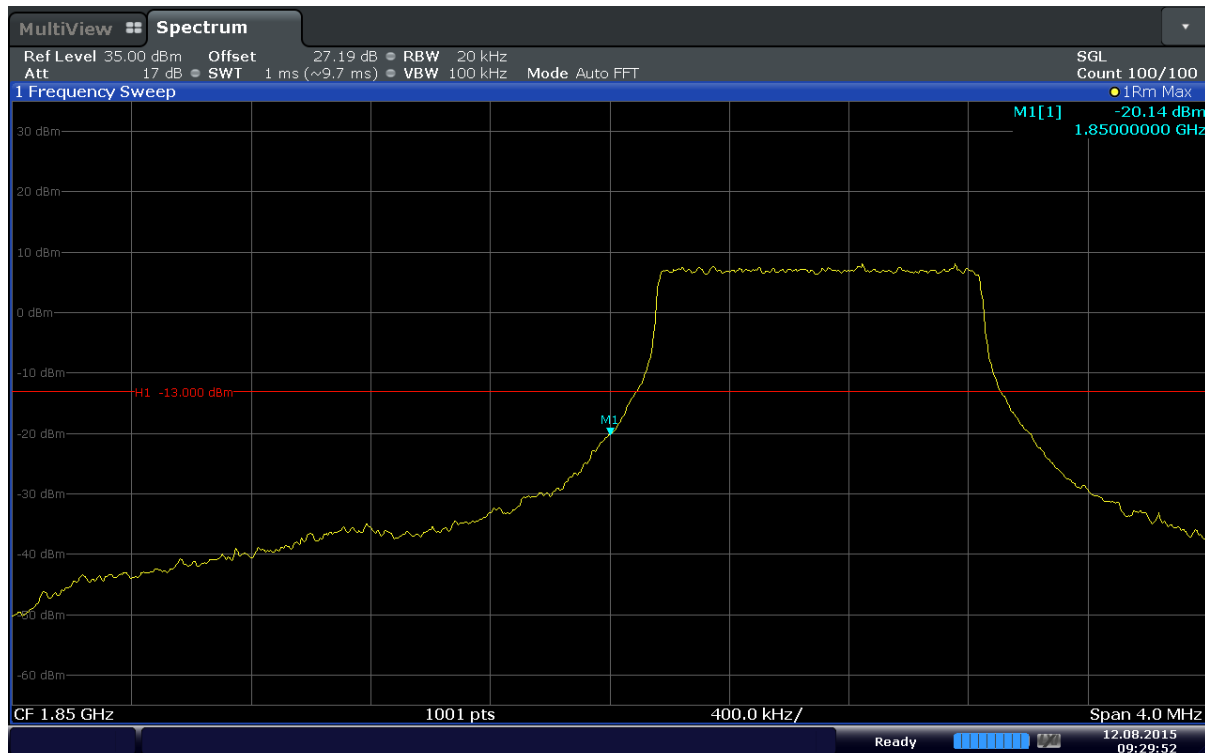
Test Notes

1. Per 22.917(b) and 24.238(b), 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 to demonstrate compliance with the out-of-band emissions limit.

– End of this page –

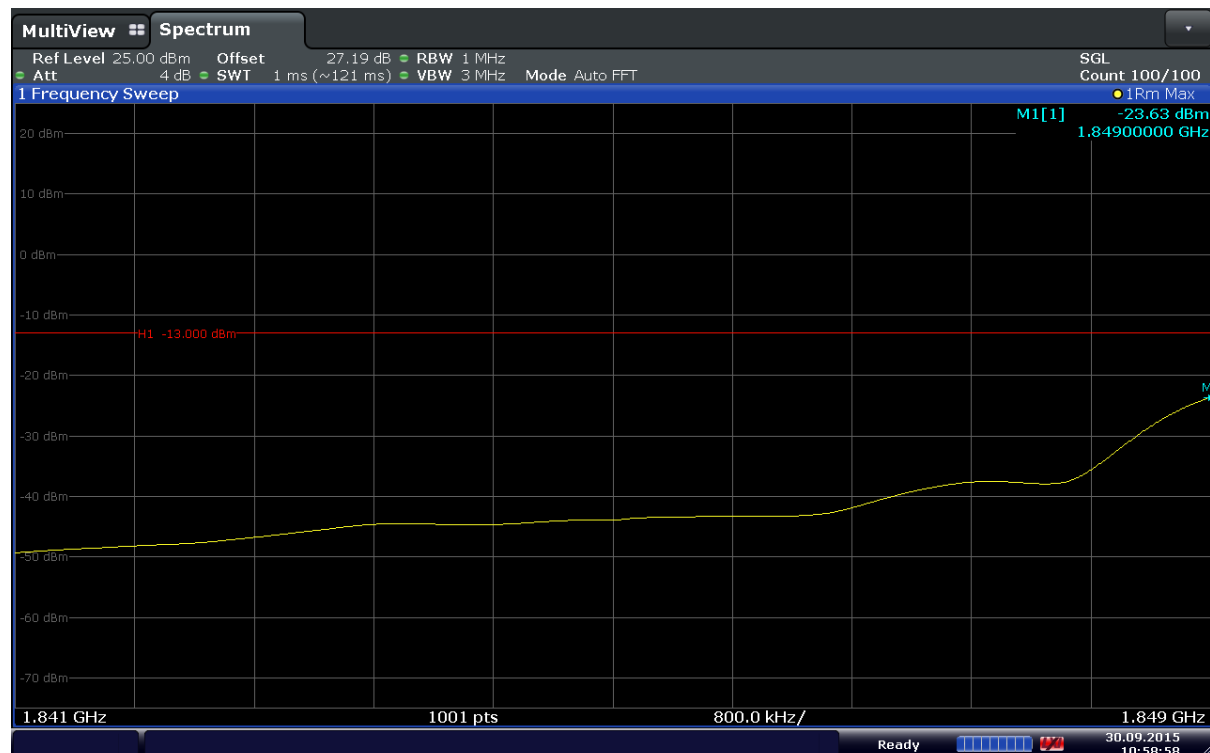


Issue Date:

Test Plots

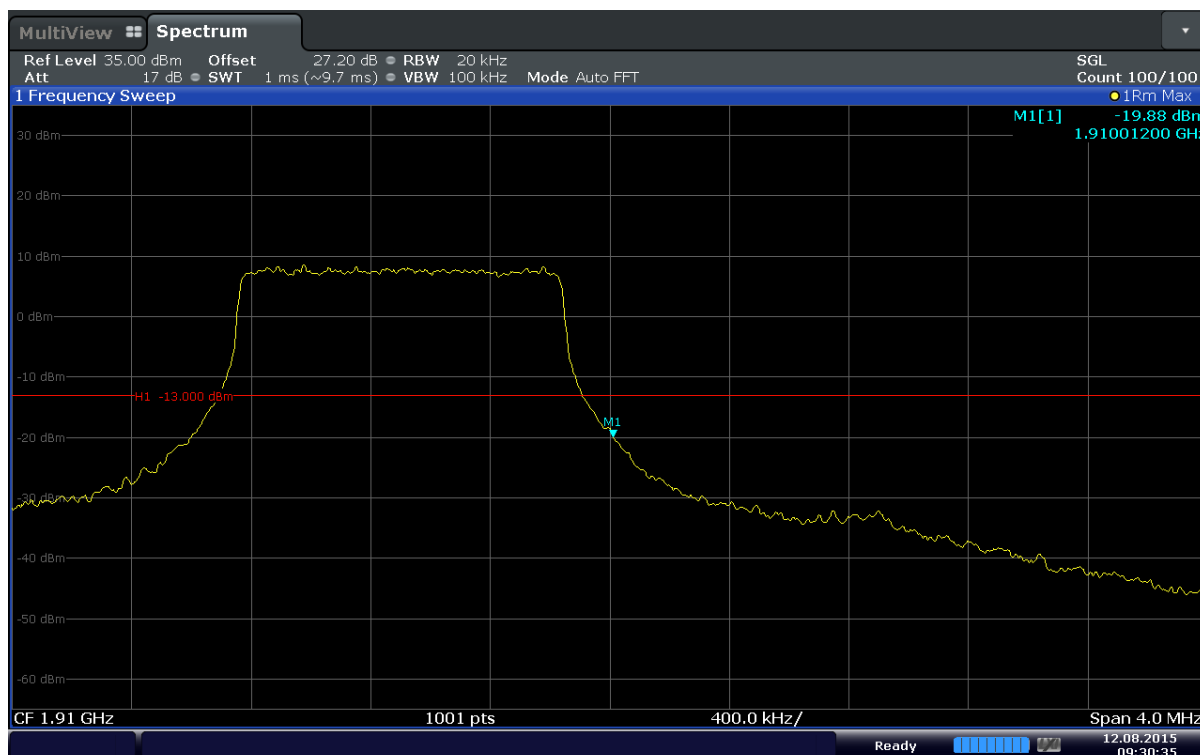
Date: 12.AUG.2015 09:29:53

Plot 6-69. Lower Band Edge Plot (Band2 – 1.4MHz – QPSK – RB Size 6)



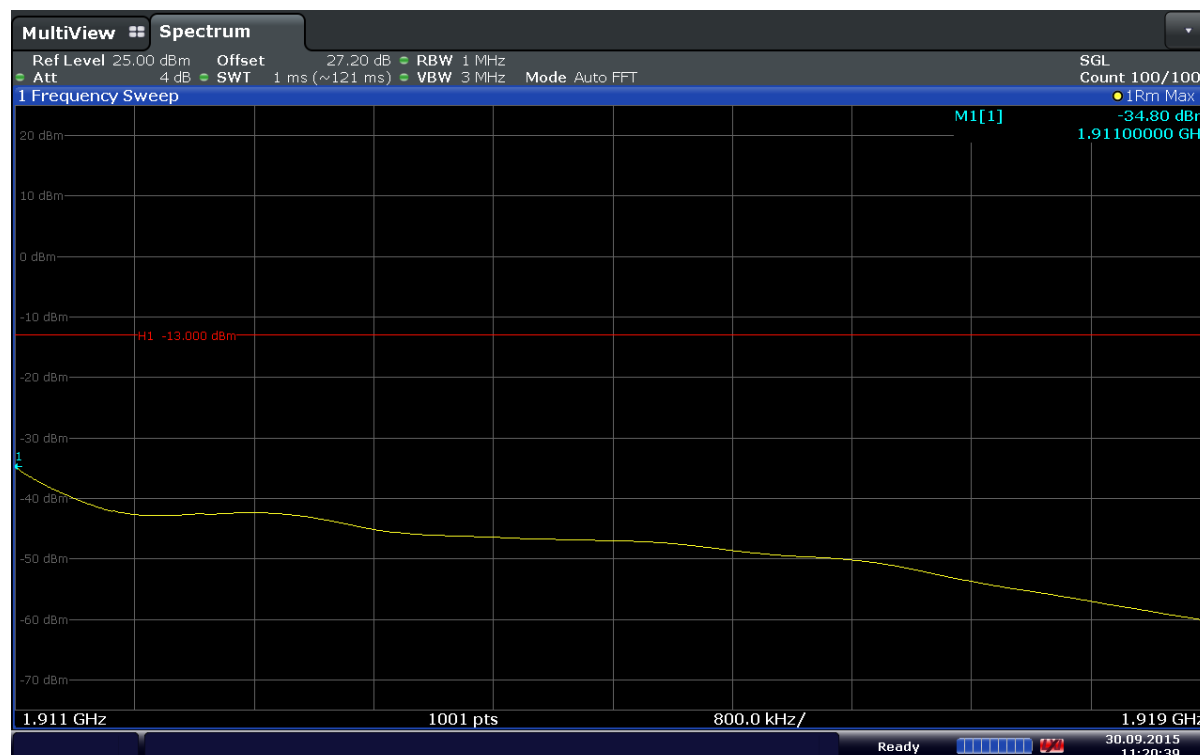
Date: 30.SEP.2015 10:58:58

Plot 6-70. Extended Lower Band Edge Plot (Band2 – 1.4MHz – QPSK – RB Size 6)



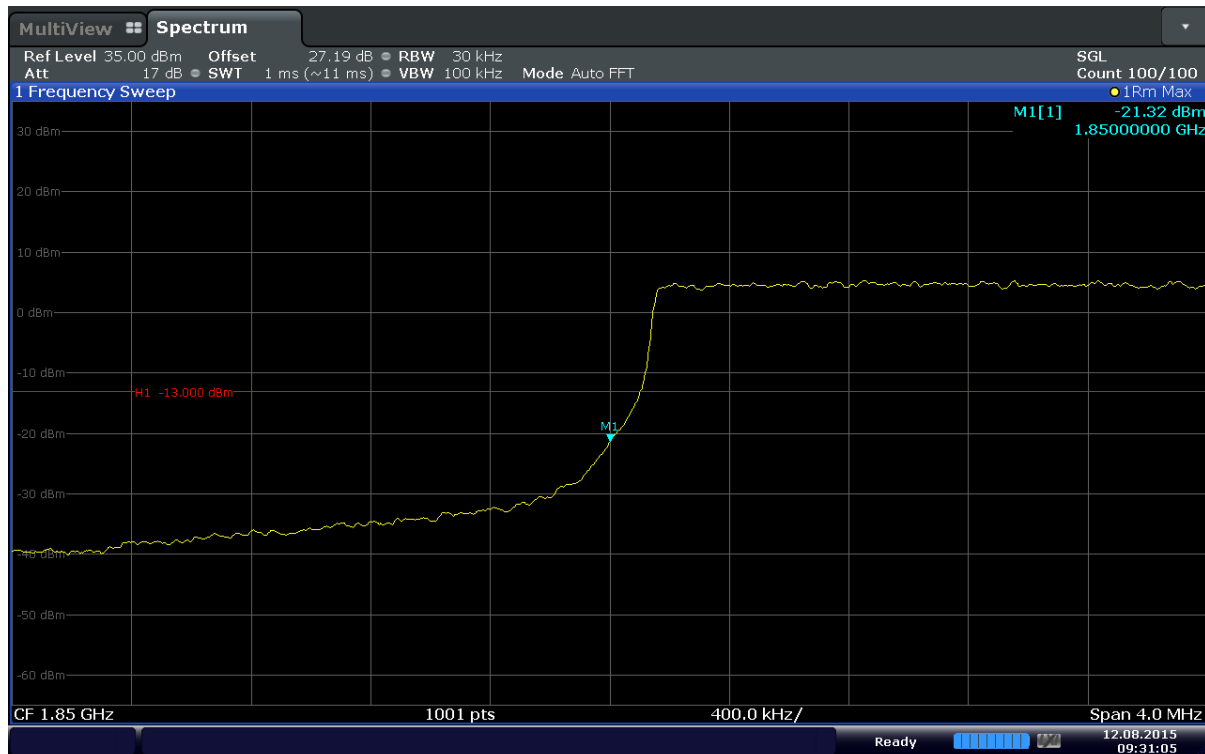
Date: 12.AUG.2015 09:30:35

Plot 6-71. Upper Band Edge Plot (Band2 – 1.4MHz – QPSK – RB Size 6)



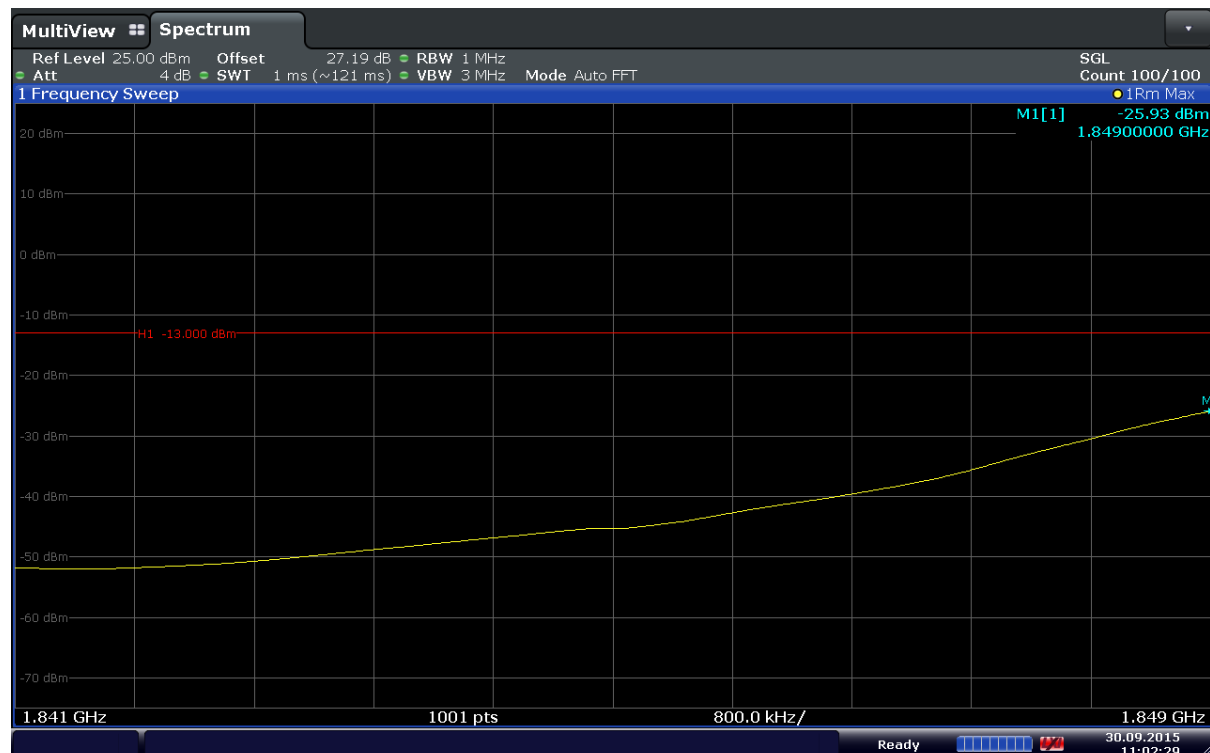
Date: 30.SEP.2015 11:20:40

Plot 6-72. Extended Upper Band Edge Plot (Band2 – 1.4MHz – QPSK – RB Size 6)



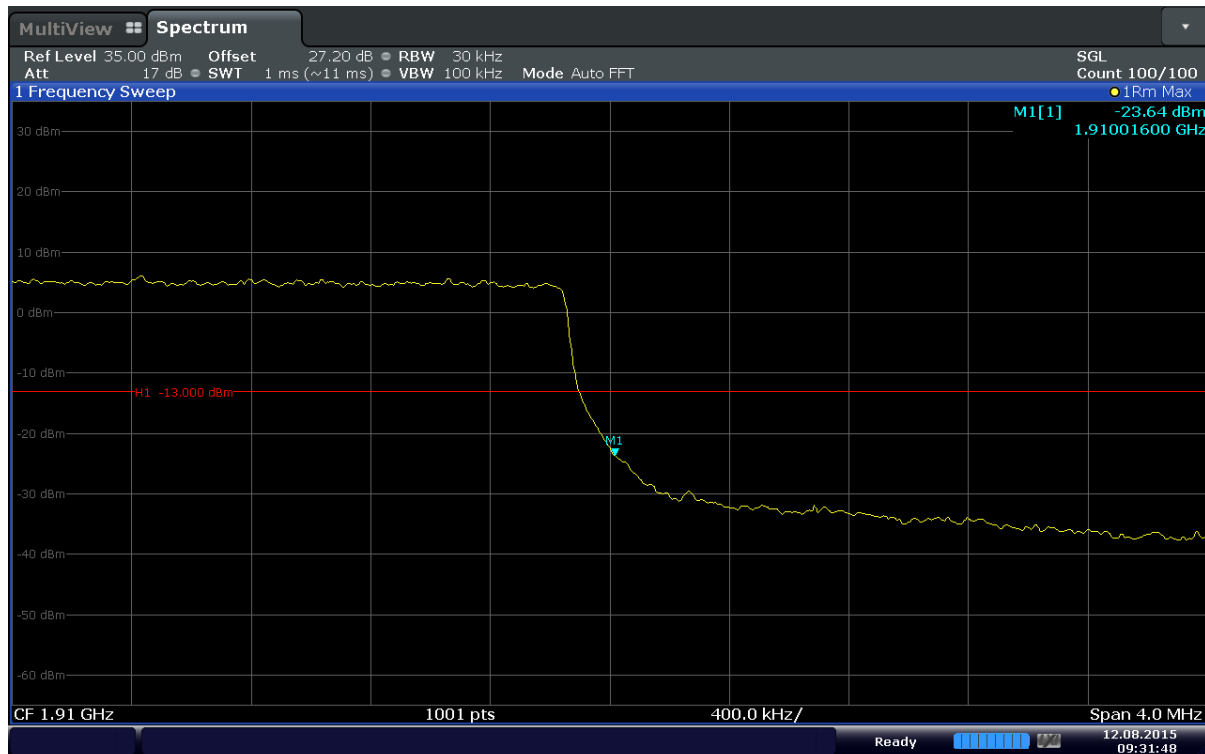
Date: 12.AUG.2015 09:31:06

Plot 6-73. Lower Band Edge Plot (Band2 – 3.0MHz – QPSK – RB Size 15)



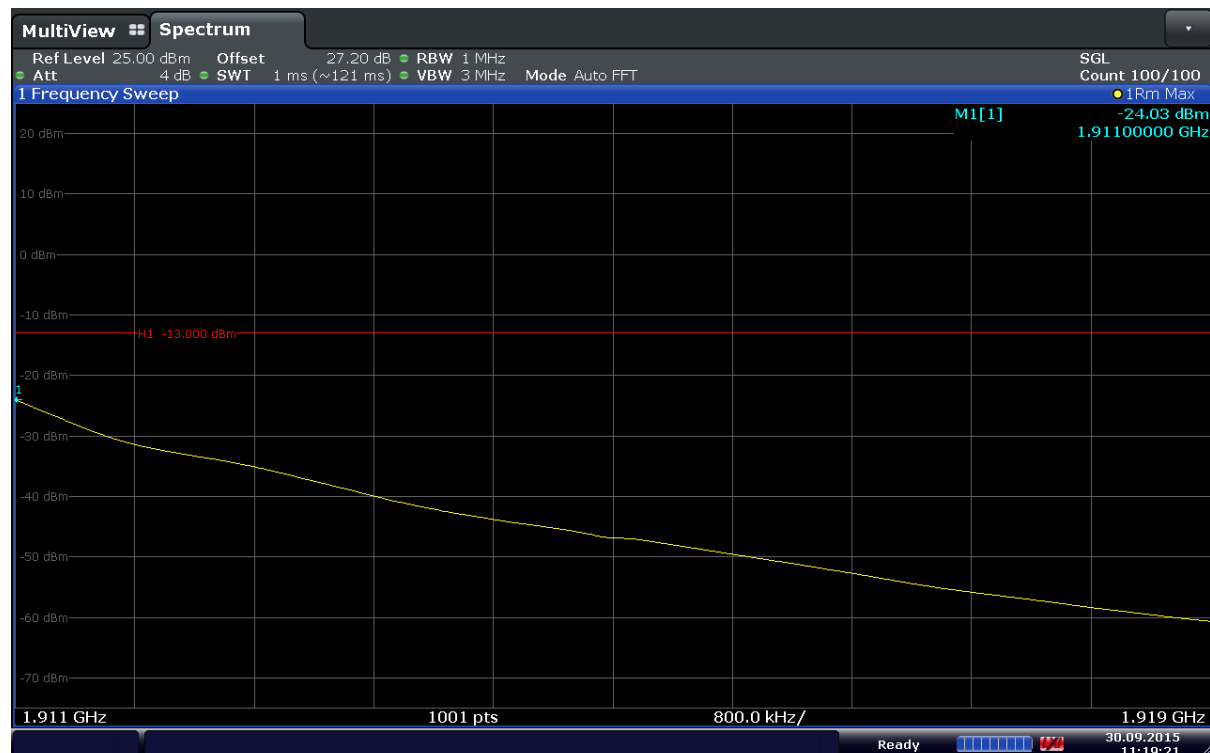
Date: 30.SEP.2015 11:02:29

Plot 6-74. Extended Lower Band Edge Plot (Band2 – 3.0MHz – QPSK – RB Size 15)



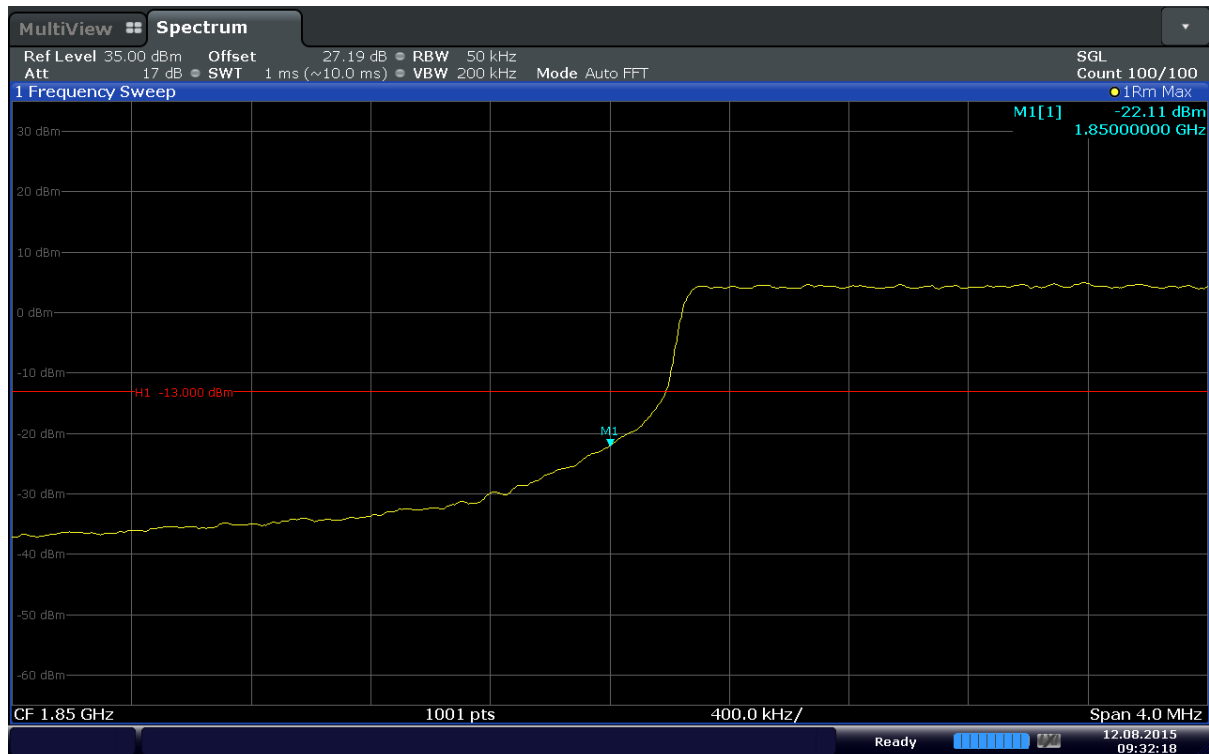
Date: 12.AUG.2015 09:31:48

Plot 6-75. Upper Band Edge Plot (Band2 – 3.0MHz – QPSK – RB Size 15)



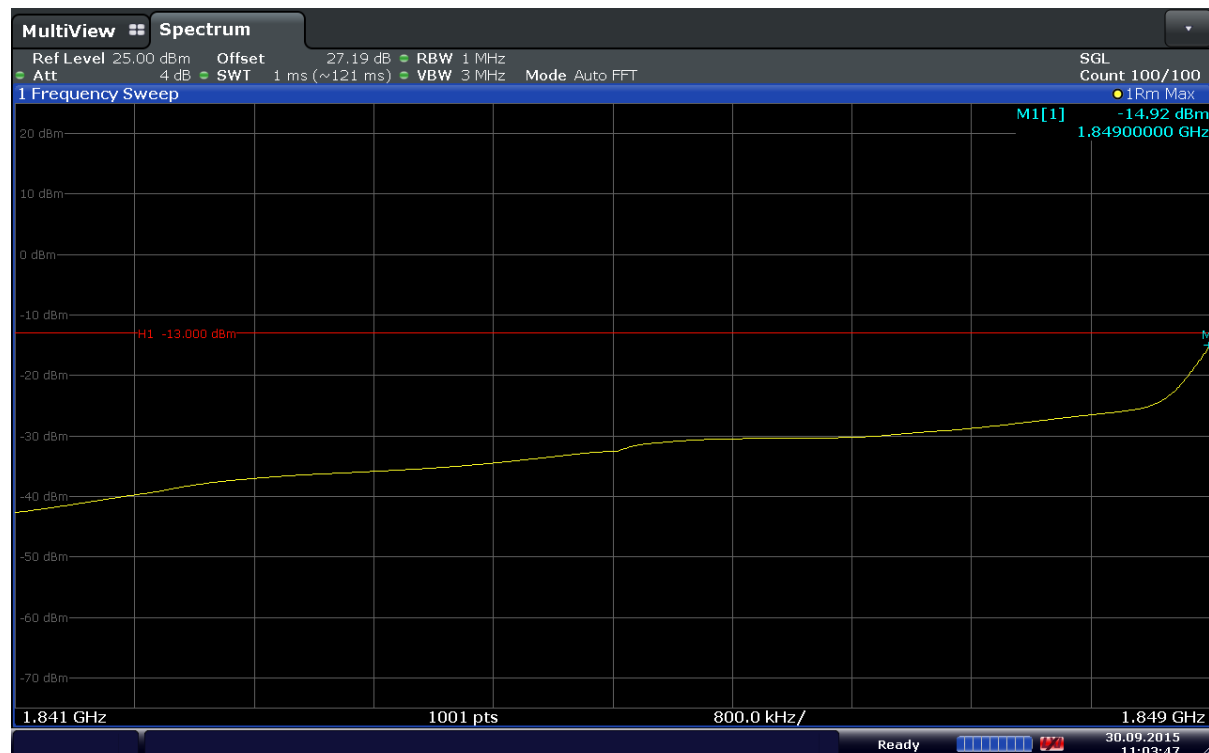
Date: 30.SEP.2015 11:19:22

Plot 6-76. Extended Upper Band Edge Plot (Band2 – 3.0MHz – QPSK – RB Size 15)



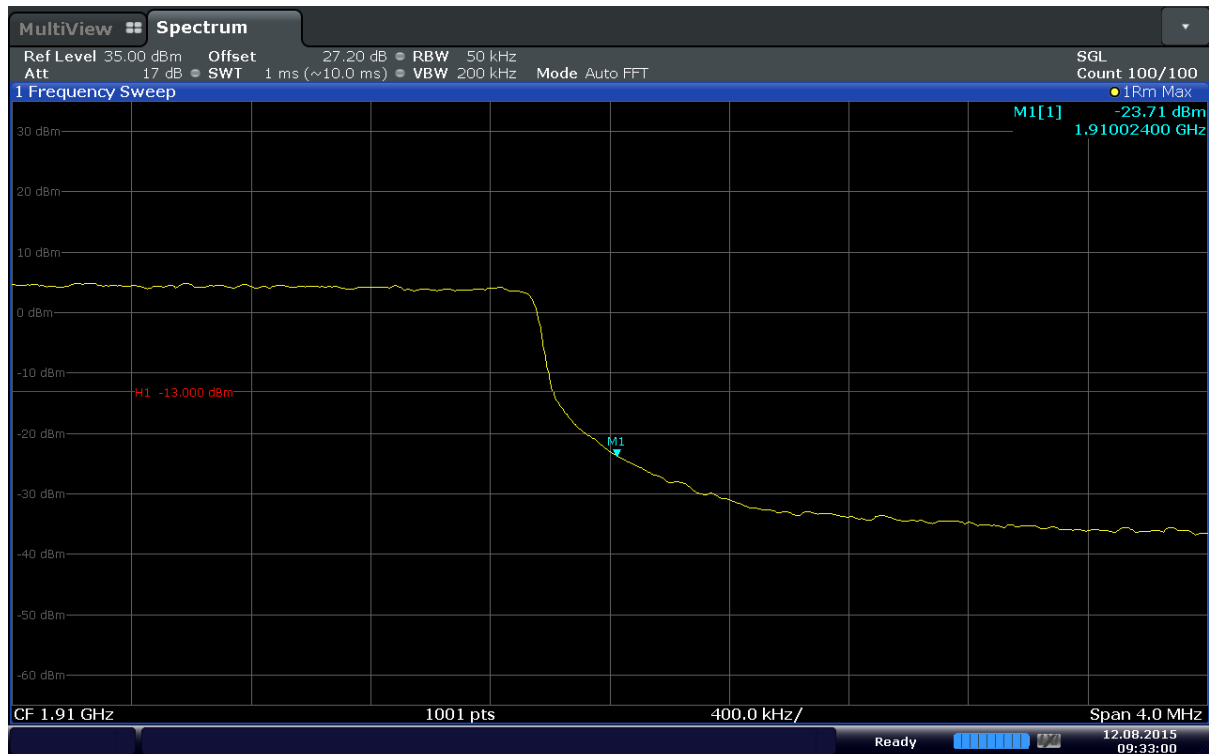
Date: 12.AUG.2015 09:32:18

Plot 6-77. Lower Band Edge Plot (Band2 – 5.0MHz – QPSK – RB Size 25)



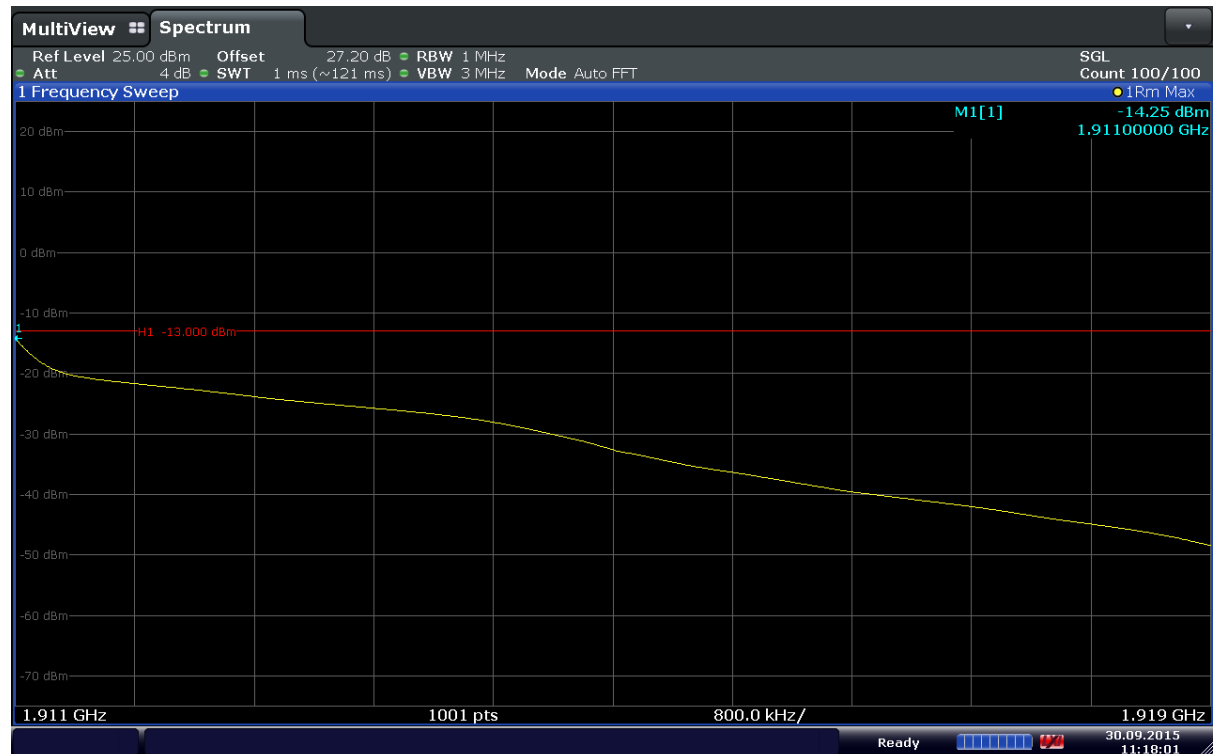
Date: 30.SEP.2015 11:03:47

Plot 6-78. Extended Lower Band Edge Plot (Band2 – 5.0MHz – QPSK – RB Size 25)



Date: 12.AUG.2015 09:33:01

Plot 6-79. Upper Band Edge Plot (Band2 – 5.0MHz – QPSK – RB Size 25)

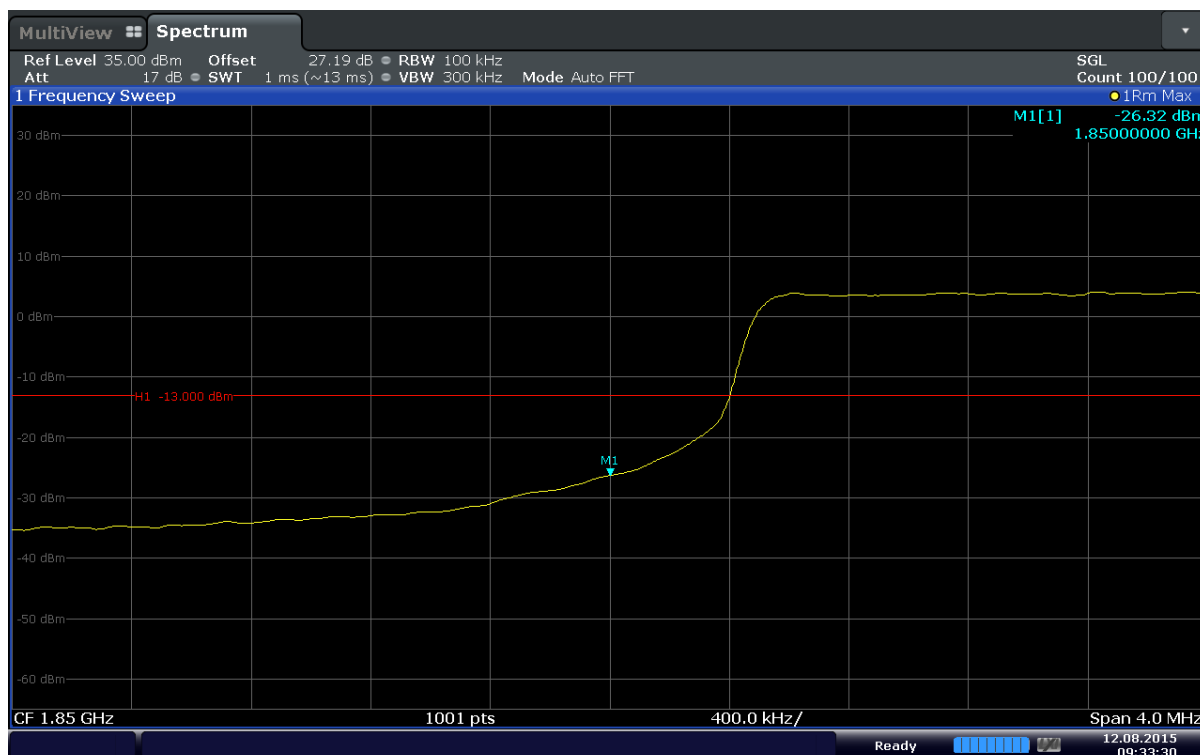


Date: 30.SEP.2015 11:18:01

Plot 6-80. Extended Upper Band Edge Plot (Band2 – 5.0MHz – QPSK – RB Size 25)

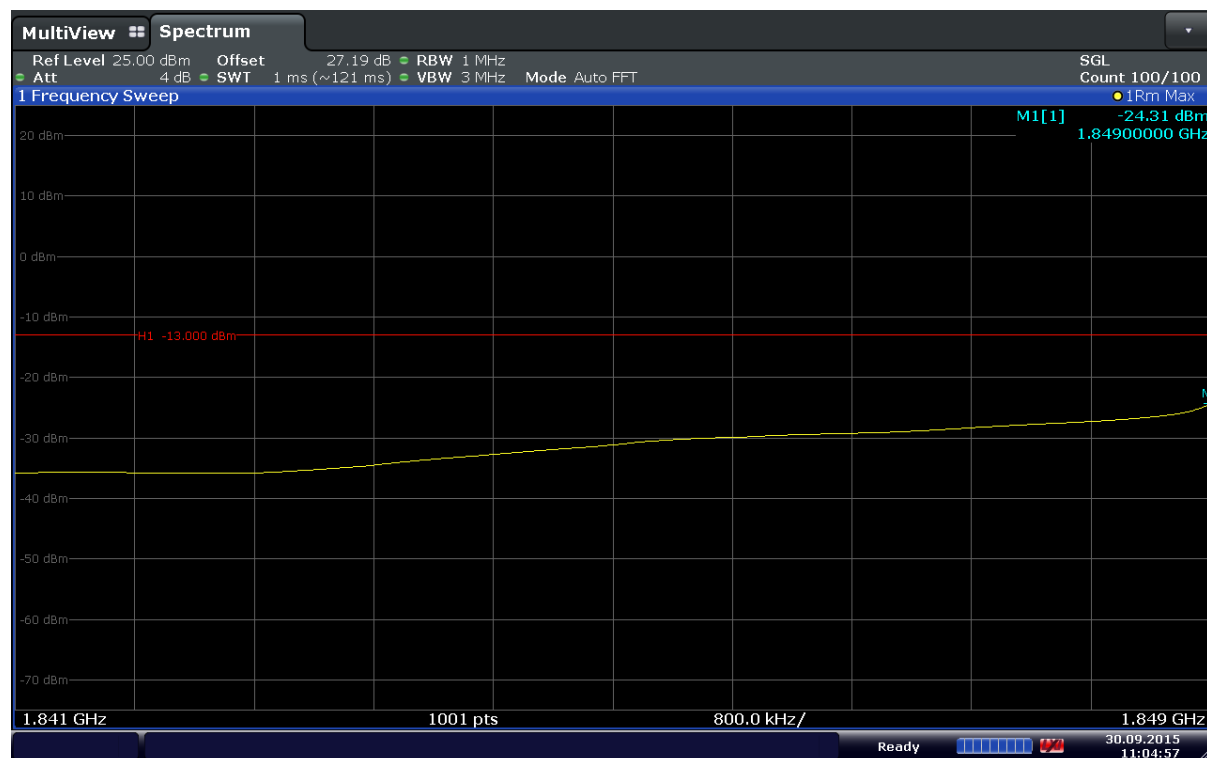


Issue Date:



Date: 12.AUG.2015 09:33:31

Plot 6-81. Lower Band Edge Plot (Band2 – 10.0MHz – QPSK – RB Size 50)

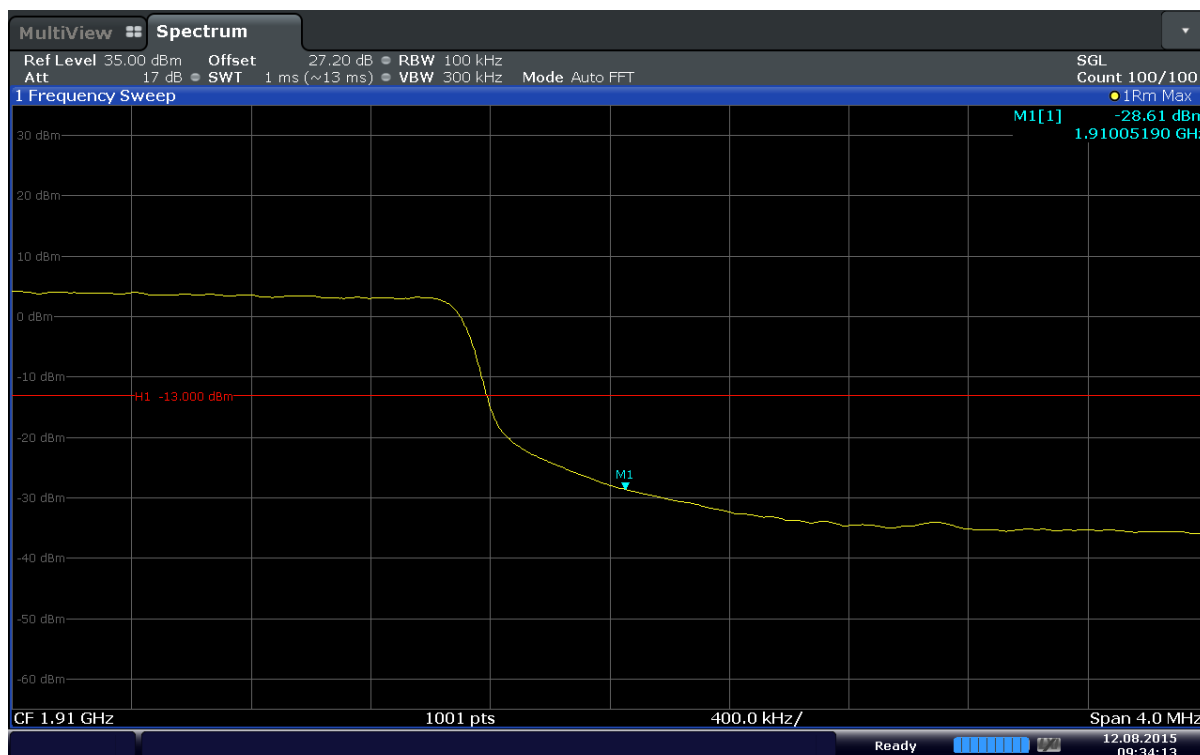


Date: 30.SEP.2015 11:04:57

Plot 6-82. Extended Lower Band Edge Plot (Band2 – 10.0MHz – QPSK – RB Size 50)

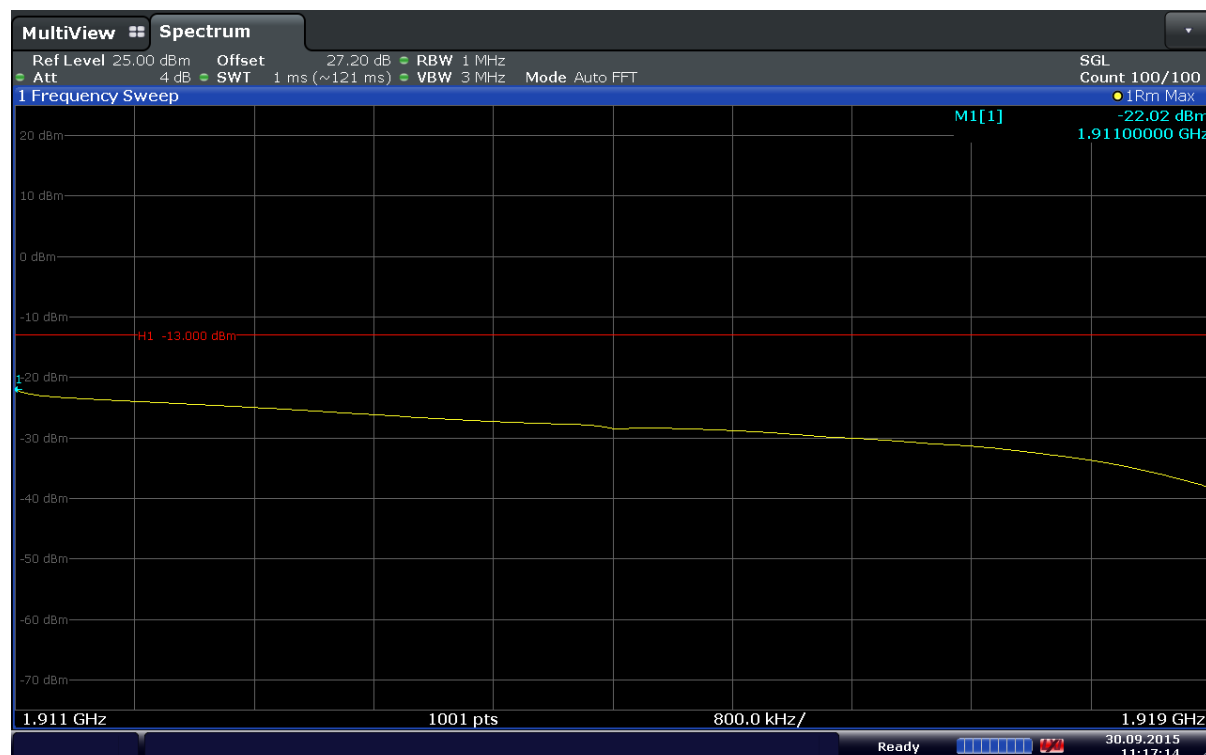


Issue Date:



Date: 12.AUG.2015 09:34:14

Plot 6-83. Upper Band Edge Plot (Band2 – 10.0MHz – QPSK – RB Size 50)

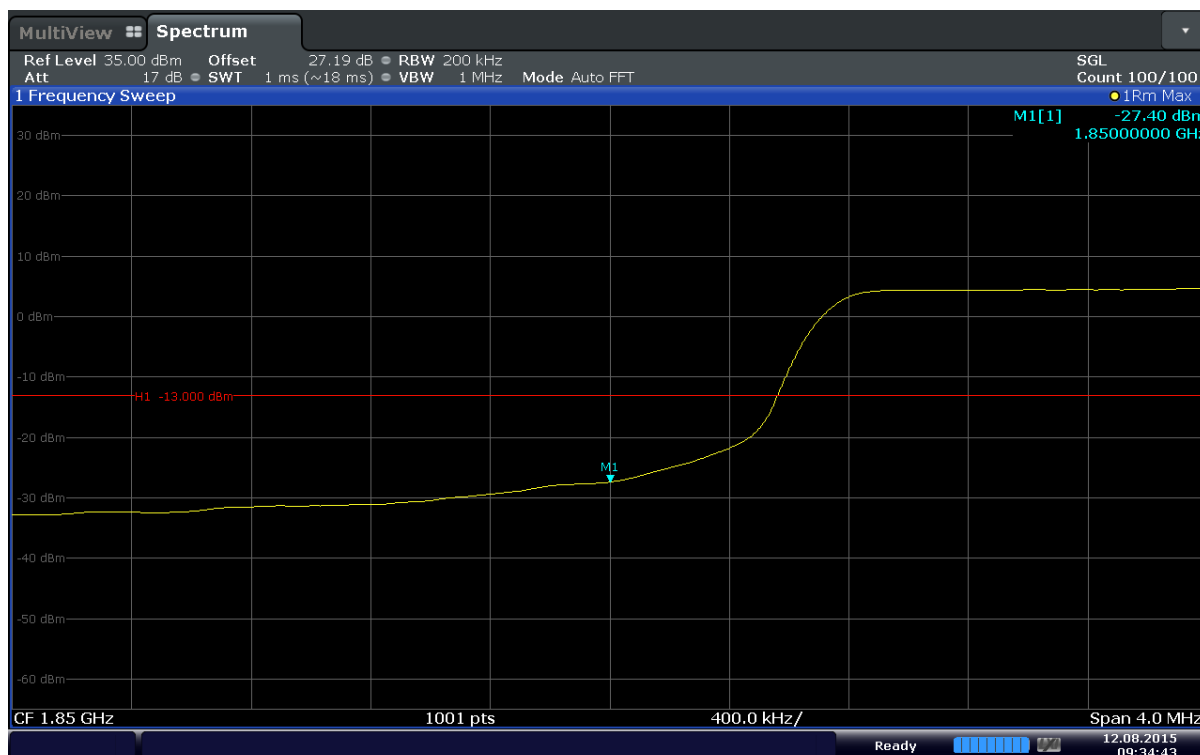


Date: 30.SEP.2015 11:17:15

Plot 6-84. Extended Upper Band Edge Plot (Band2 – 10.0MHz – QPSK – RB Size 50)

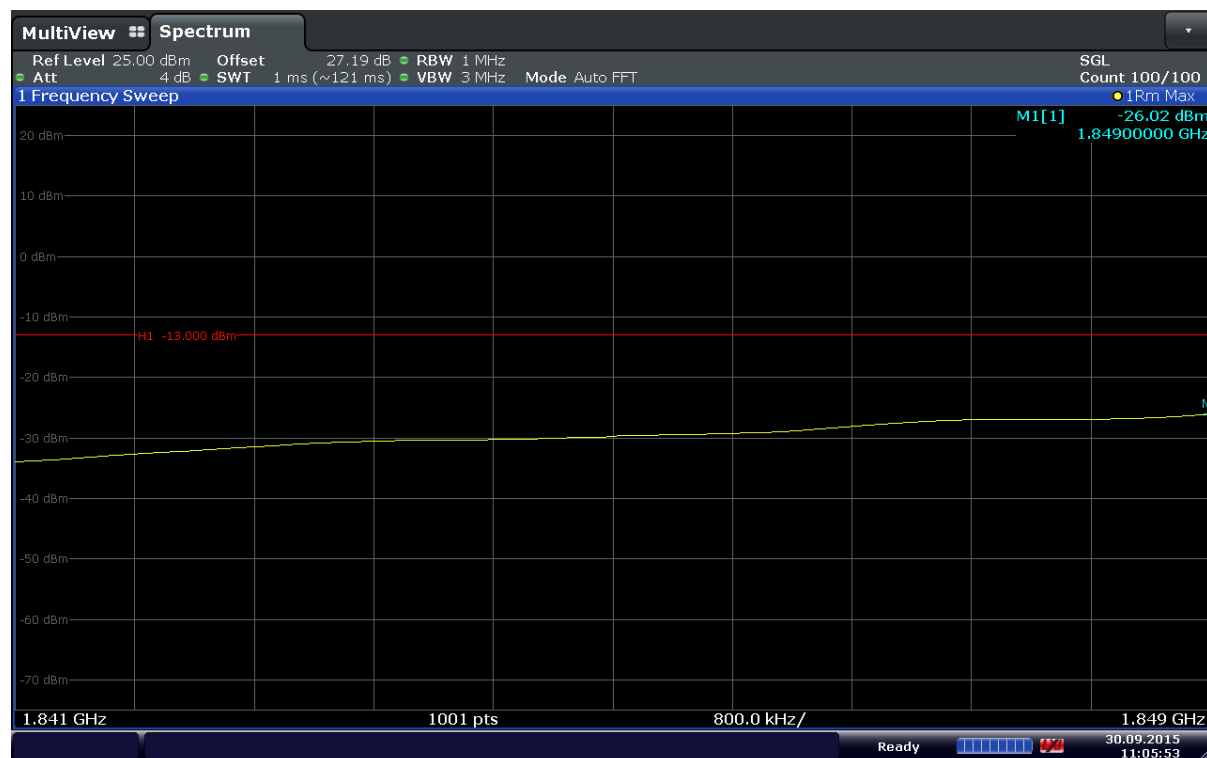


Issue Date:



Date: 12.AUG.2015 09:34:44

Plot 6-85. Lower Band Edge Plot (Band2 – 15.0MHz – QPSK – RB Size 75)

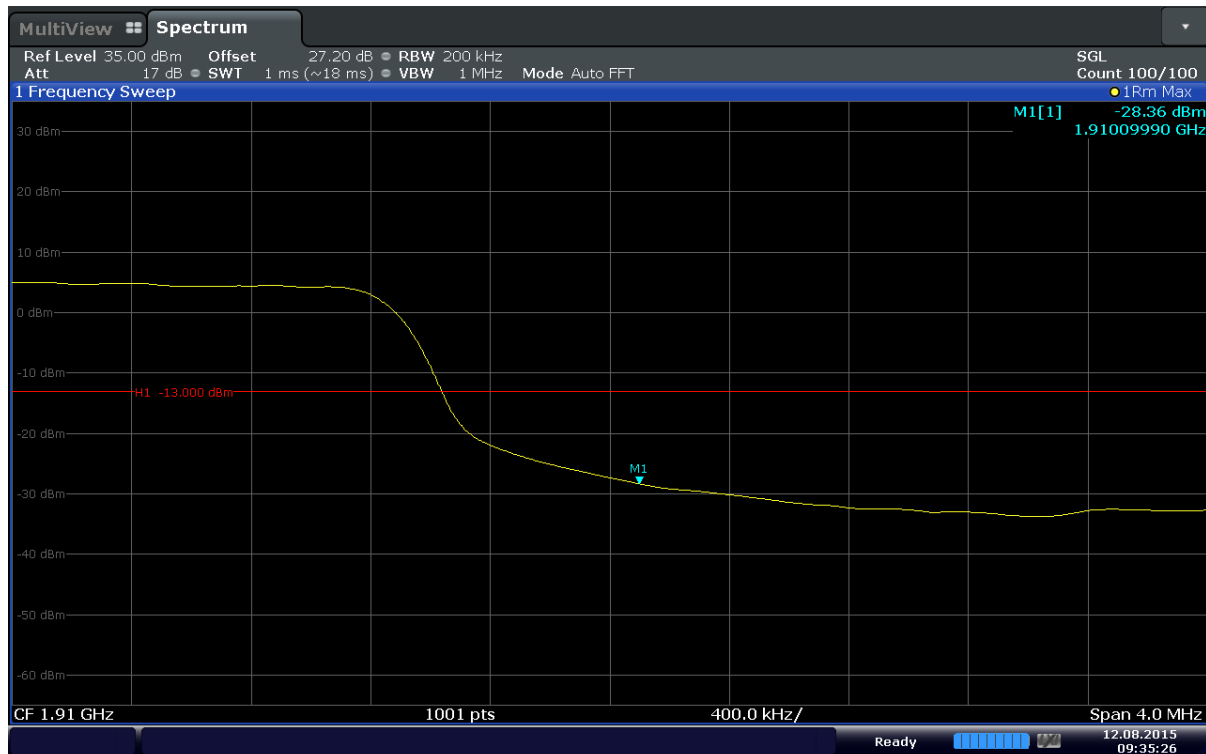


Date: 30.SEP.2015 11:05:53

Plot 6-86. Extended Lower Band Edge Plot (Band2 – 15.0MHz – QPSK – RB Size 75)

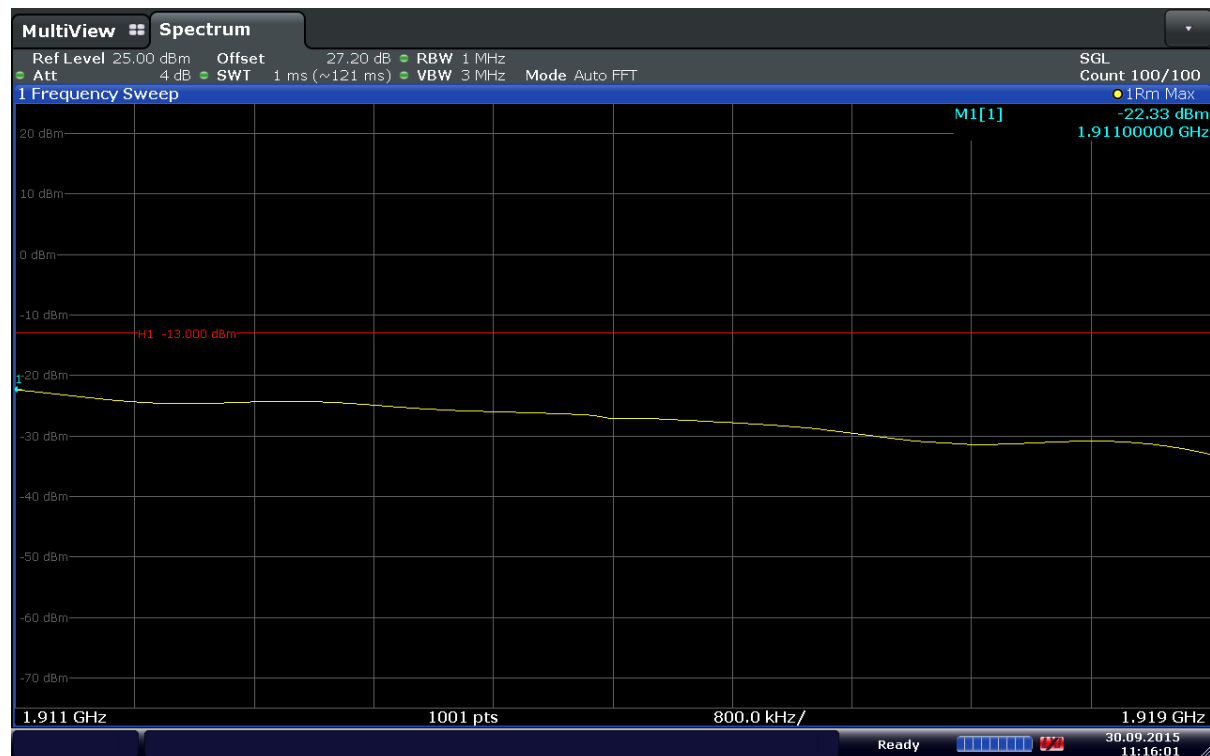


Issue Date:



Date: 12.AUG.2015 09:35:26

Plot 6-87. Upper Band Edge Plot (Band2 – 15.0MHz – QPSK – RB Size 75)

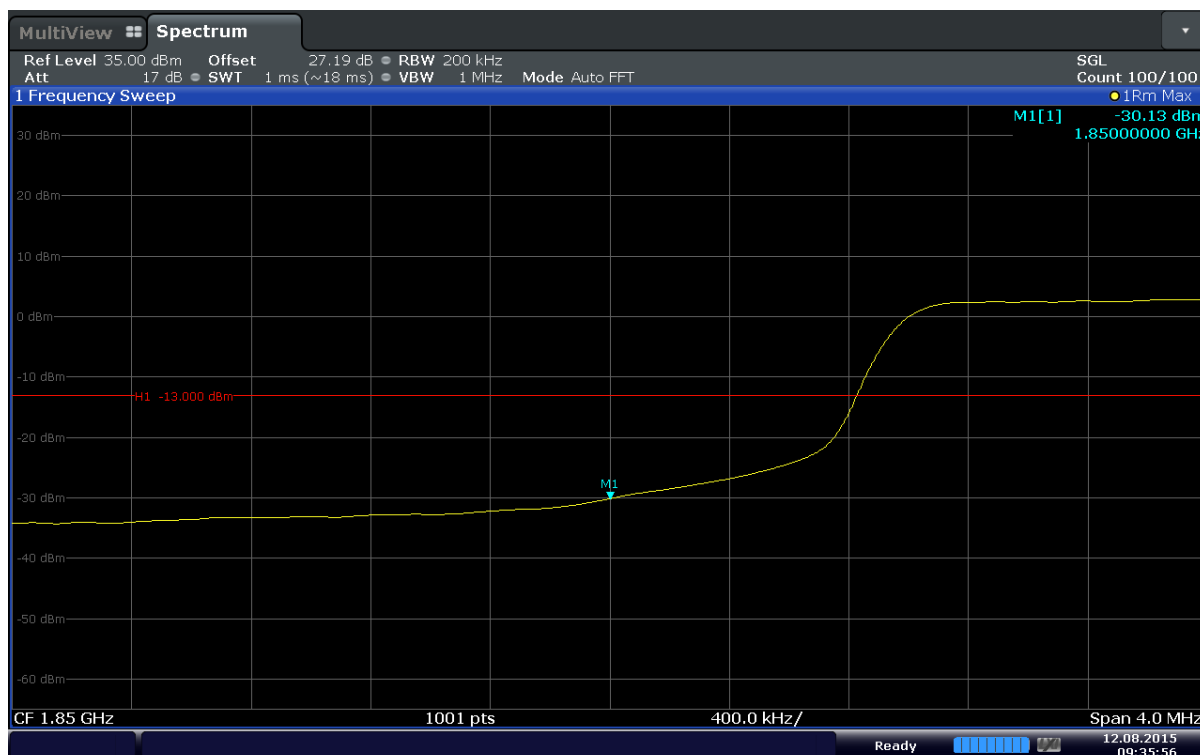


Date: 30.SEP.2015 11:16:02

Plot 6-88. Extended Upper Band Edge Plot (Band2 – 15.0MHz – QPSK – RB Size 75)

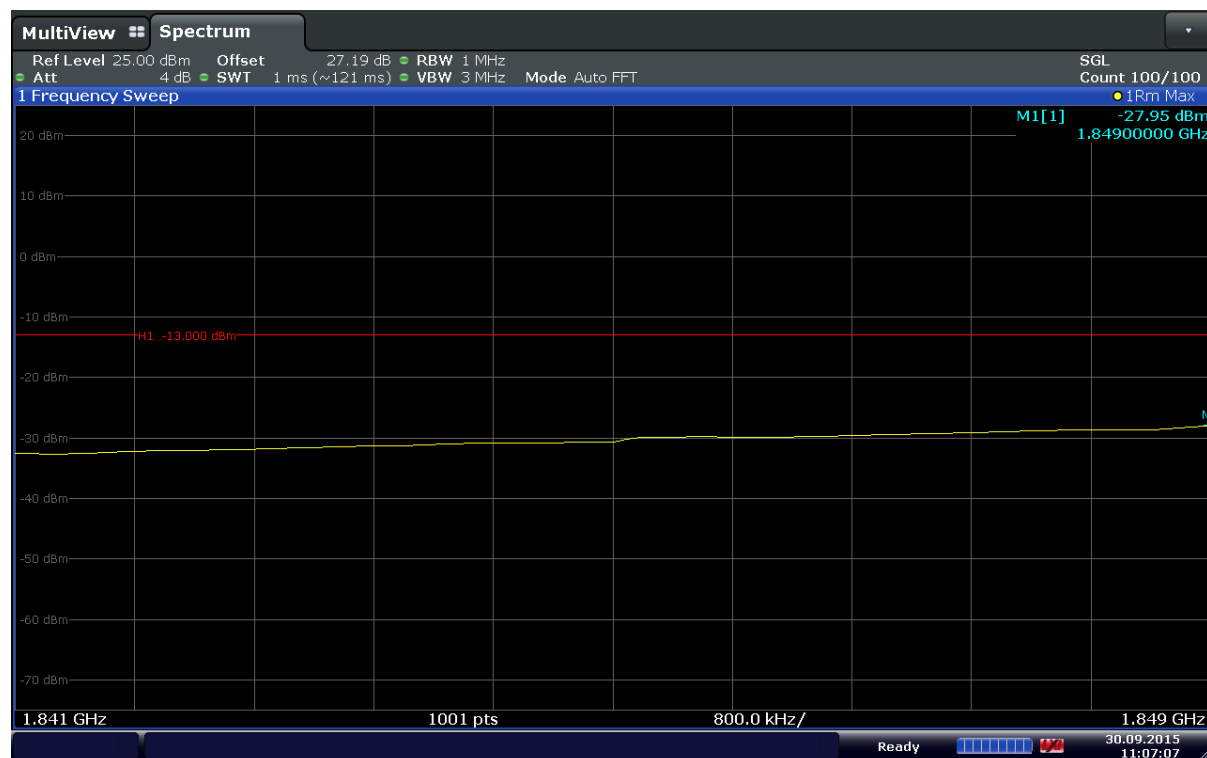


Issue Date:



Date: 12.AUG.2015 09:35:57

Plot 6-89. Lower Band Edge Plot (Band2 – 20.0MHz – QPSK – RB Size 100)

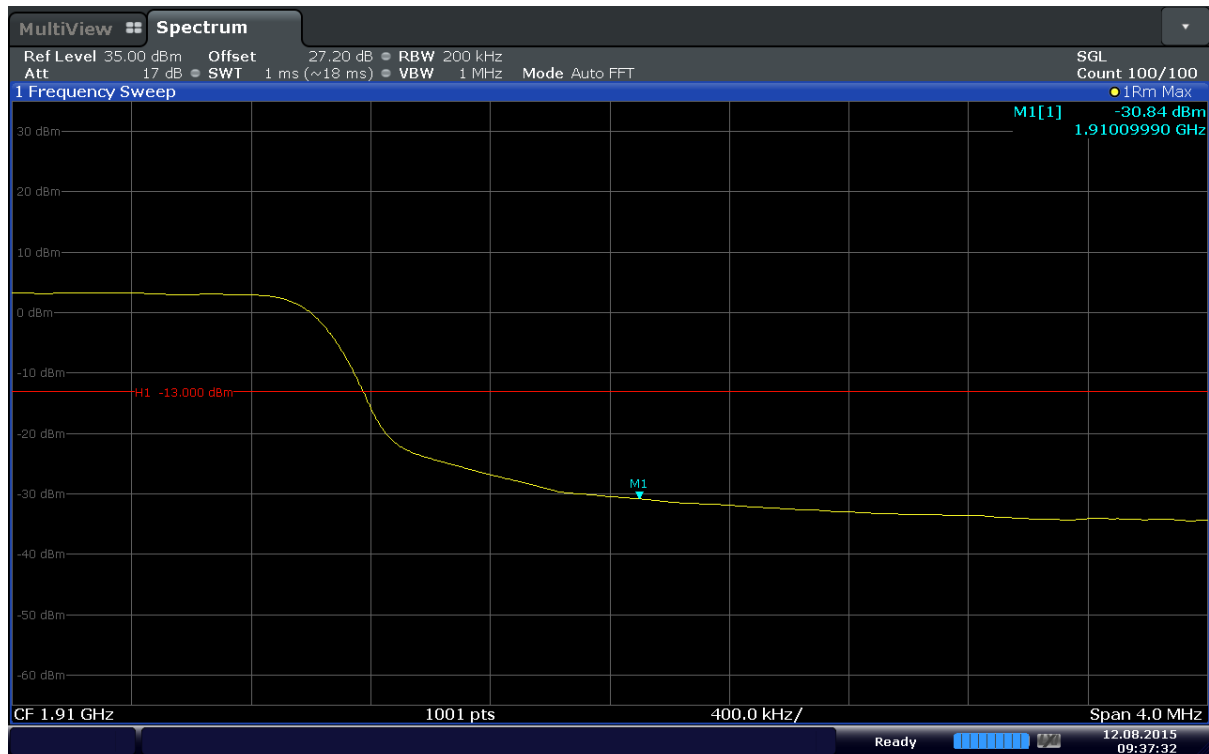


Date: 30.SEP.2015 11:07:06

Plot 6-90. Extended Lower Band Edge Plot (Band2 – 20.0MHz – QPSK – RB Size 100)

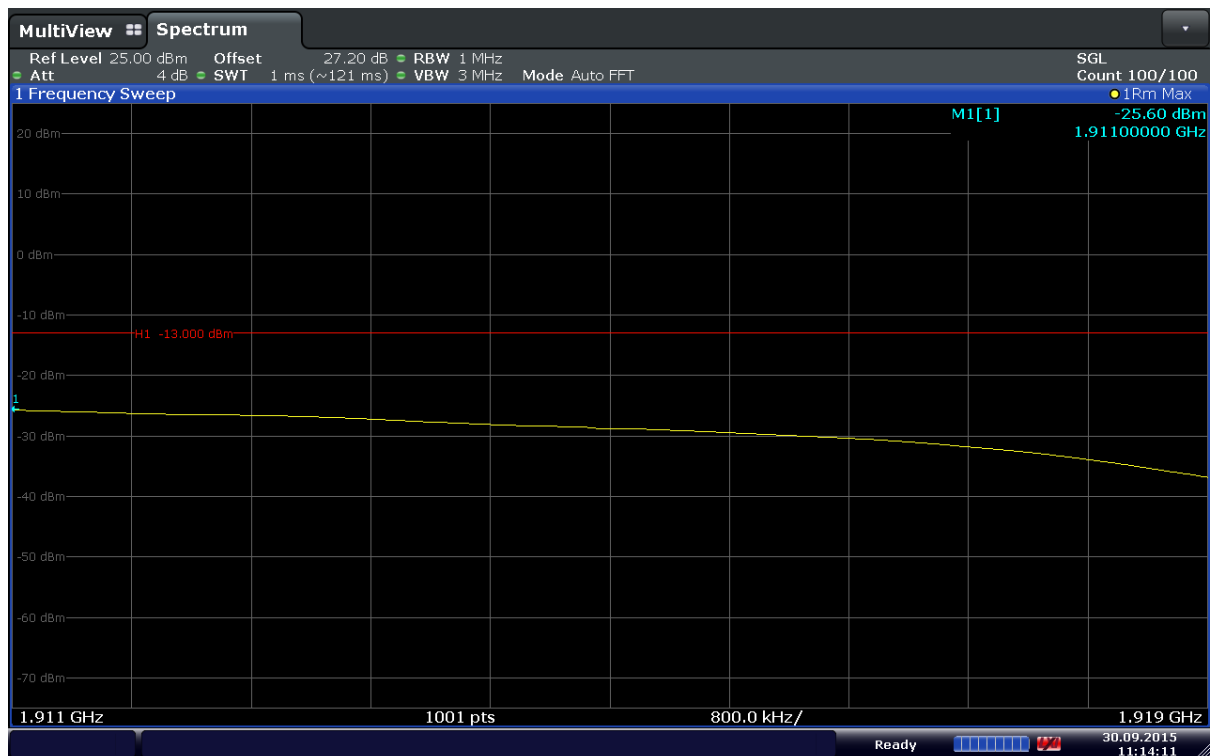


Issue Date:



Date: 12.AUG.2015 09:37:32

Plot 6-91. Upper Band Edge Plot (Band2 – 20.0MHz – QPSK – RB Size 100)

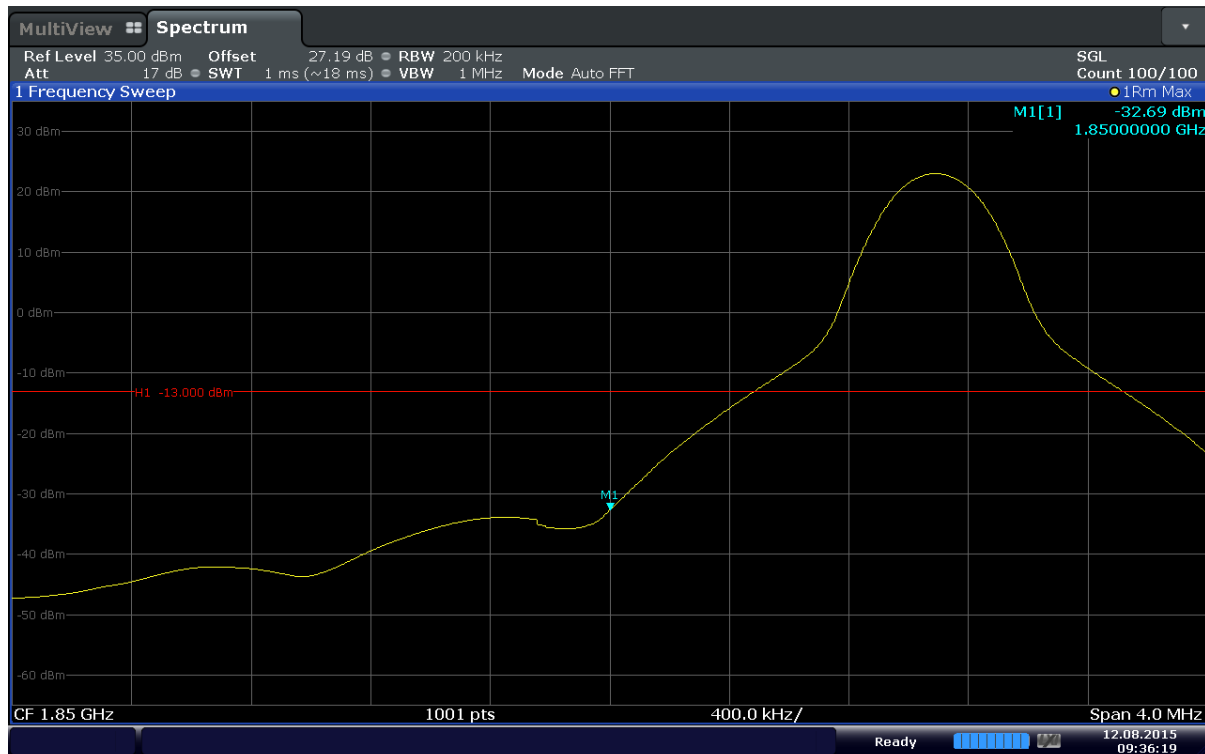


Date: 30.SEP.2015 11:14:11

Plot 6-92. Extended Upper Band Edge Plot (Band2 – 20.0MHz – QPSK – RB Size 100)

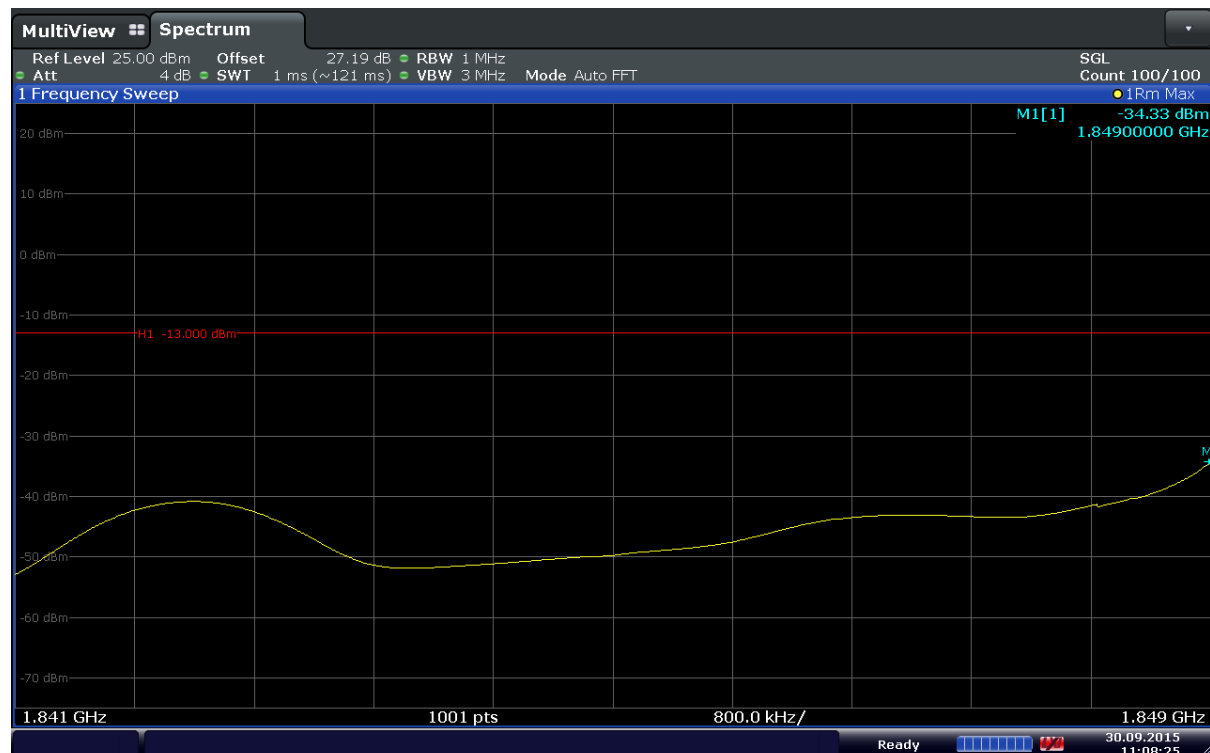


Issue Date:



Date: 12.AUG.2015 09:36:19

Plot 6-93. Lower Band Edge Plot (Band2 – 20.0MHz – QPSK – RB Size 1 – RB Offset 0)

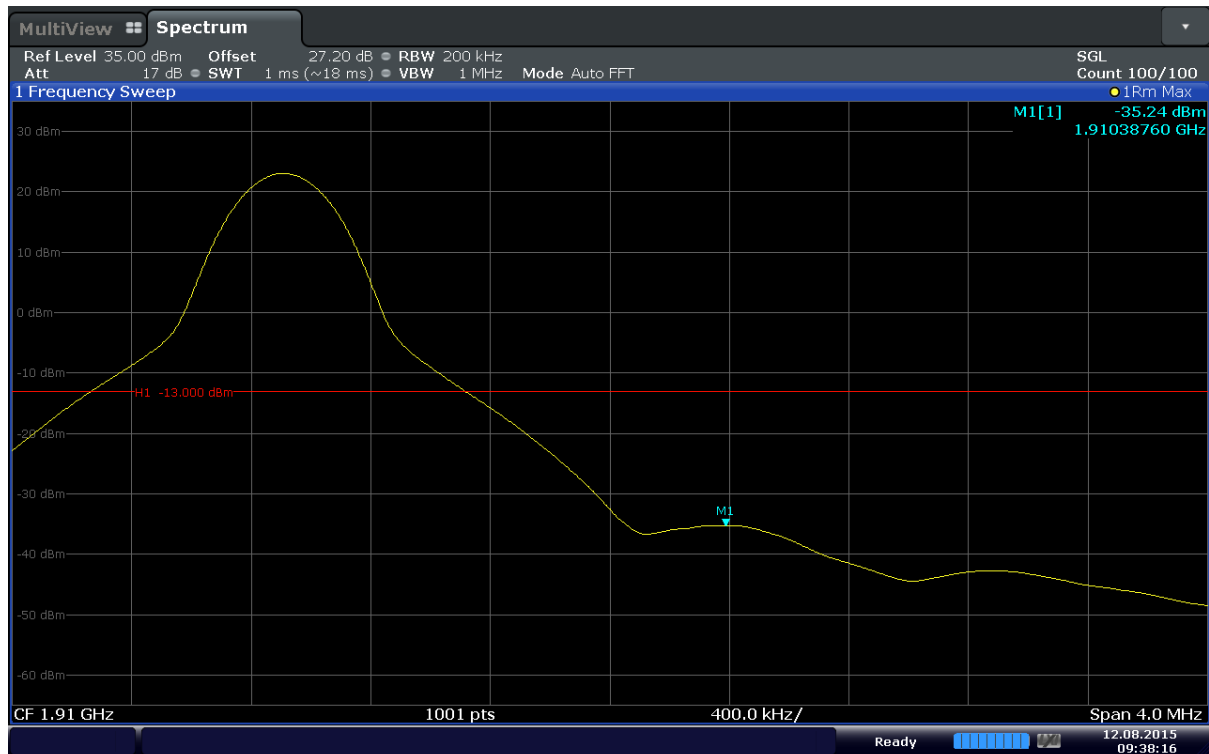


Date: 30.SEP.2015 11:08:25

Plot 6-94. Extended Lower Band Edge Plot (Band2 – 20.0MHz – QPSK – RB Size 1 – RB Offset 0)

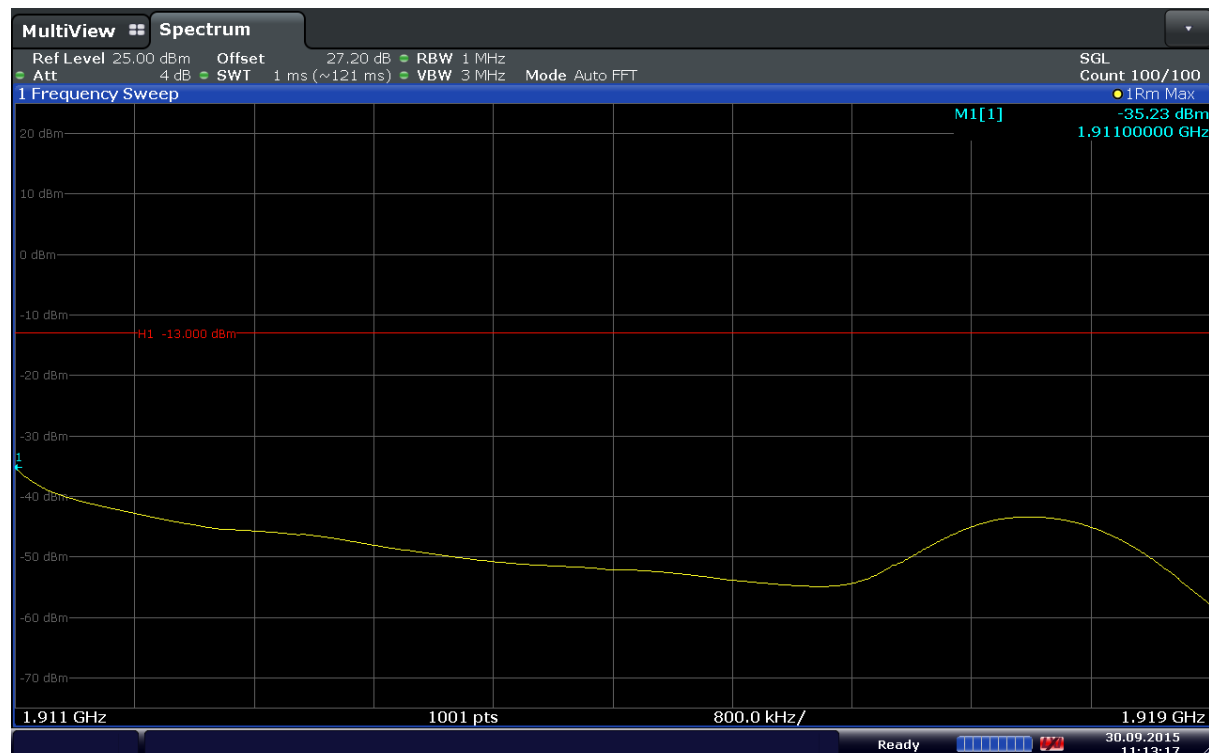


Issue Date:



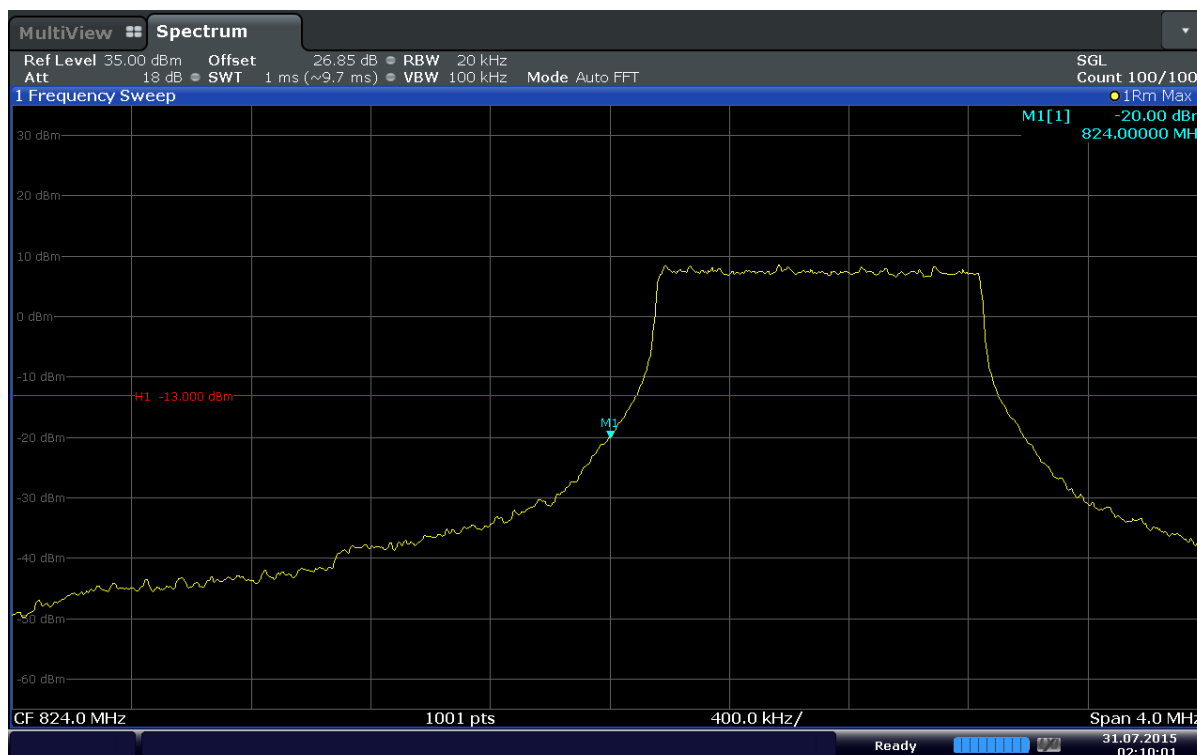
Date: 12.AUG.2015 09:38:16

Plot 6-95. Upper Band Edge Plot (Band2 – 20.0MHz – QPSK – RB Size 1 – RB Offset 99)



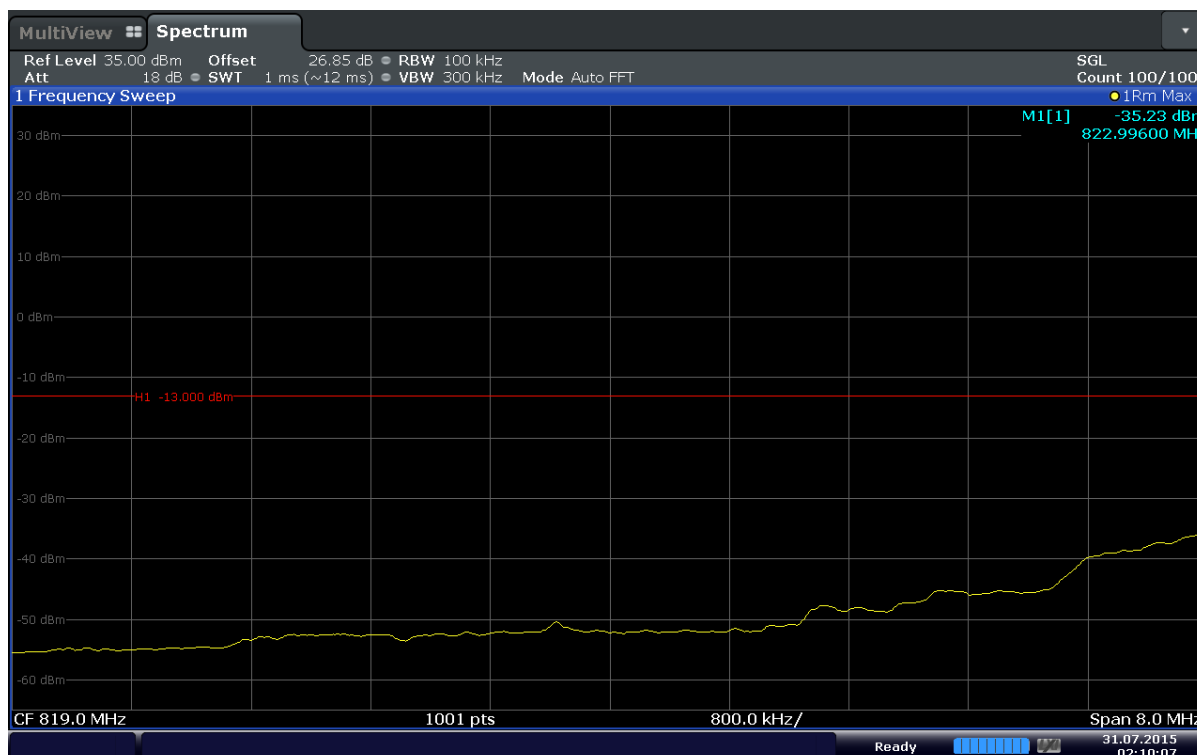
Date: 30.SEP.2015 11:13:18

Plot 6-96. Extended Upper Band Edge Plot (Band2 – 20.0MHz – QPSK – RB Size 1 – RB Offset 99)



Date: 31.JUL.2015 02:10:01

Plot 6-97. Lower Band Edge Plot (Band 5 – 1.4MHz – QPSK – RB Size 6)

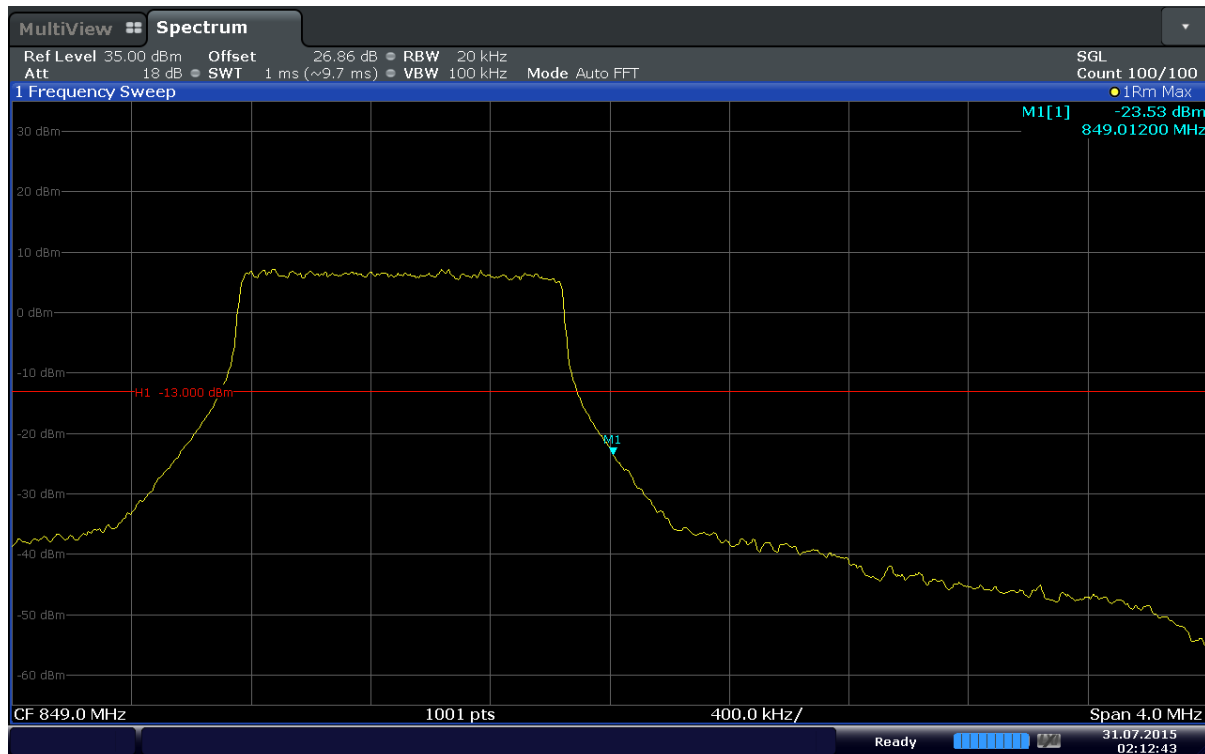


Date: 31.JUL.2015 02:10:07

Plot 6-98. Extended Lower Band Edge Plot (Band 5 – 1.4MHz – QPSK – RB Size 6)

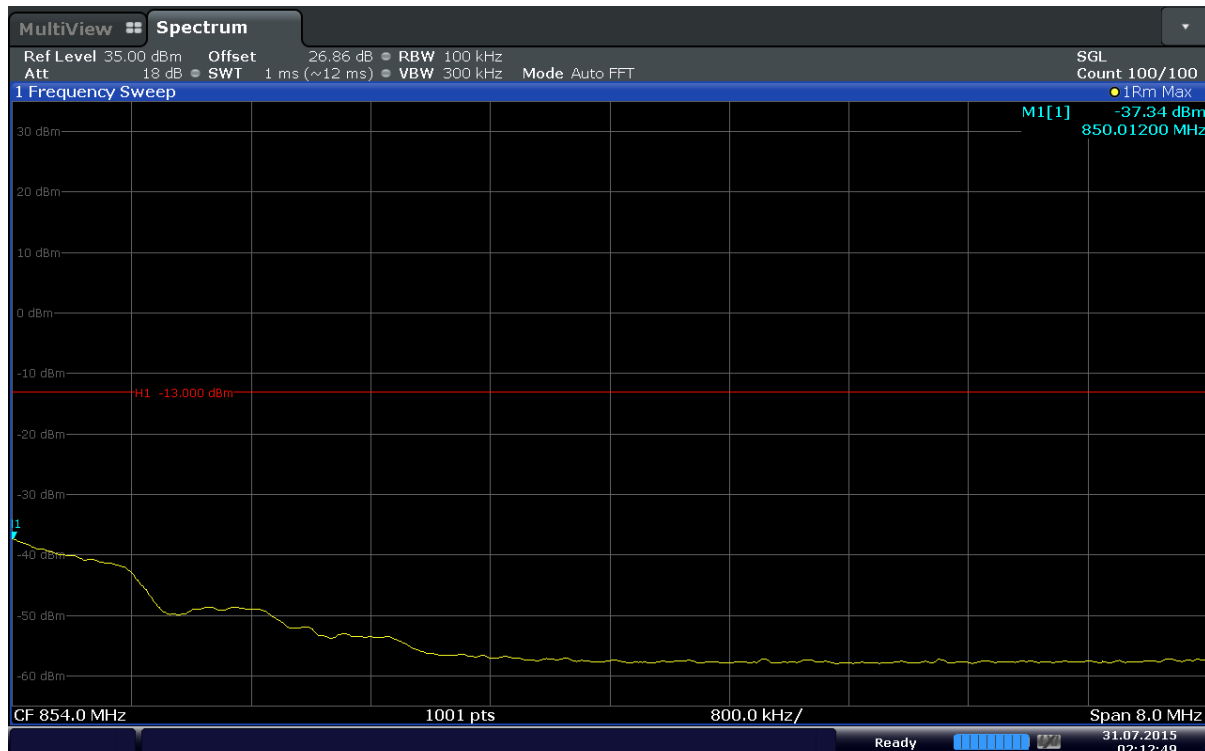


Issue Date:



Date: 31.JUL.2015 02:12:43

Plot 6-99. Upper Band Edge Plot (Band 5 – 1.4MHz – QPSK – RB Size 6)

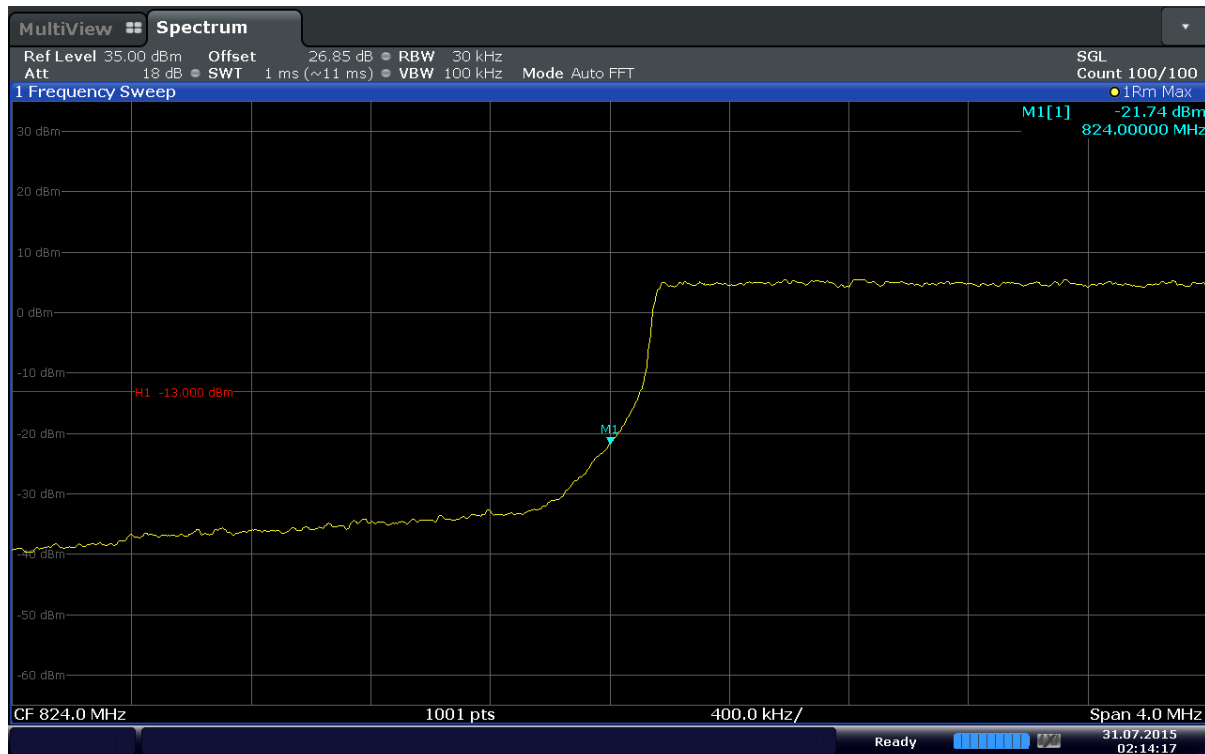


Date: 31.JUL.2015 02:12:49

Plot 6-100. Extended Upper Band Edge Plot (Band 5 – 1.4MHz – QPSK – RB Size 6)

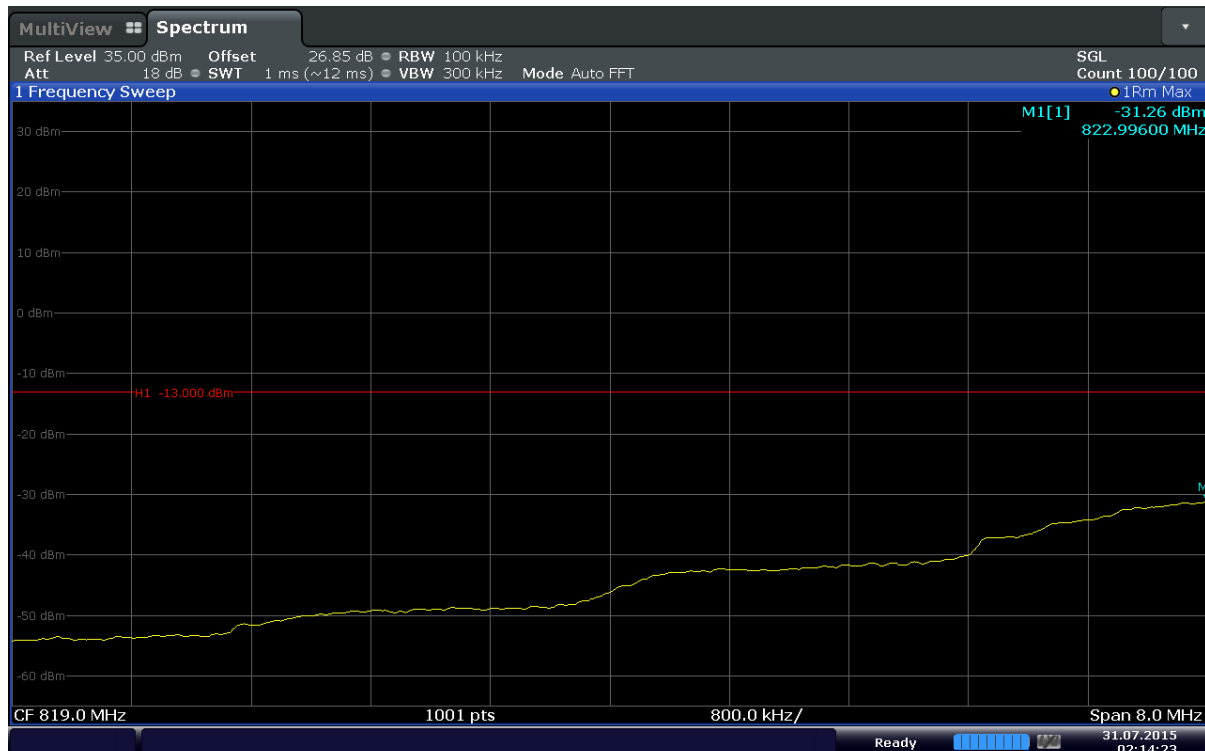


Issue Date:



Date: 31.JUL.2015 02:14:17

Plot 6-101. Lower Band Edge Plot (Band 5 – 3.0MHz – QPSK – RB Size 15)

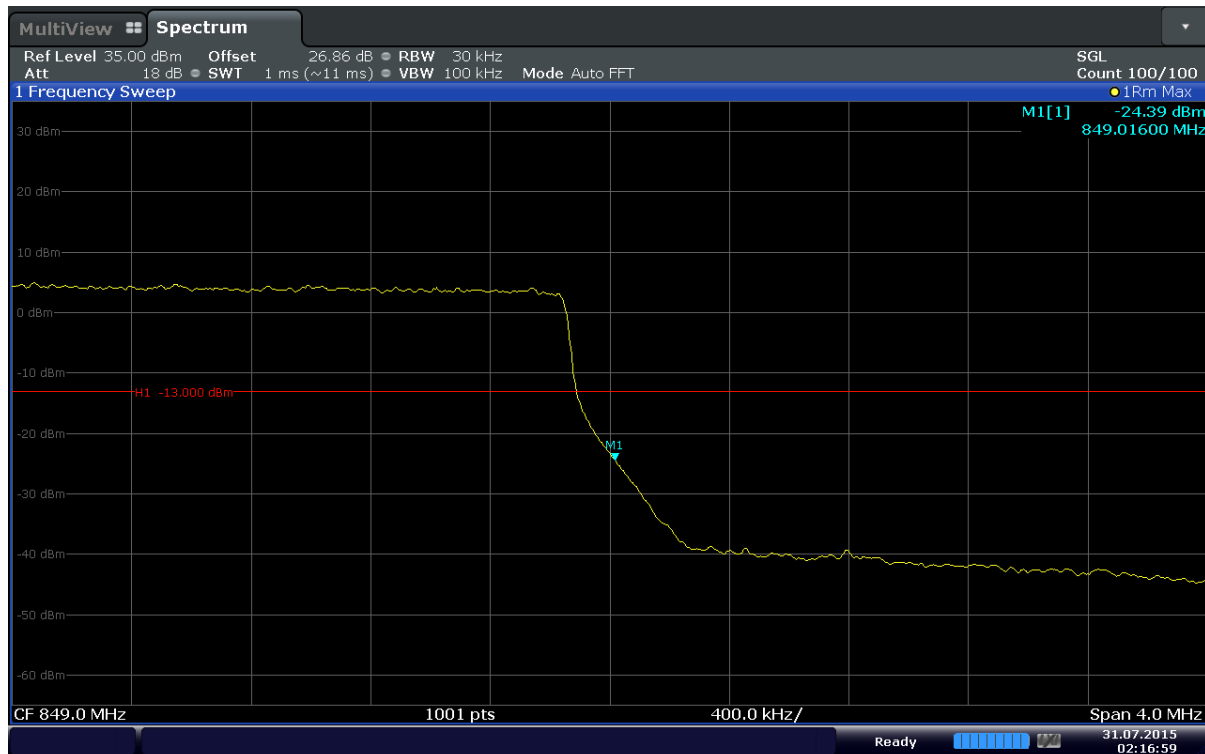


Date: 31.JUL.2015 02:14:23

Plot 6-102. Extended Lower Band Edge Plot (Band 5 – 3.0MHz – QPSK – RB Size 15)

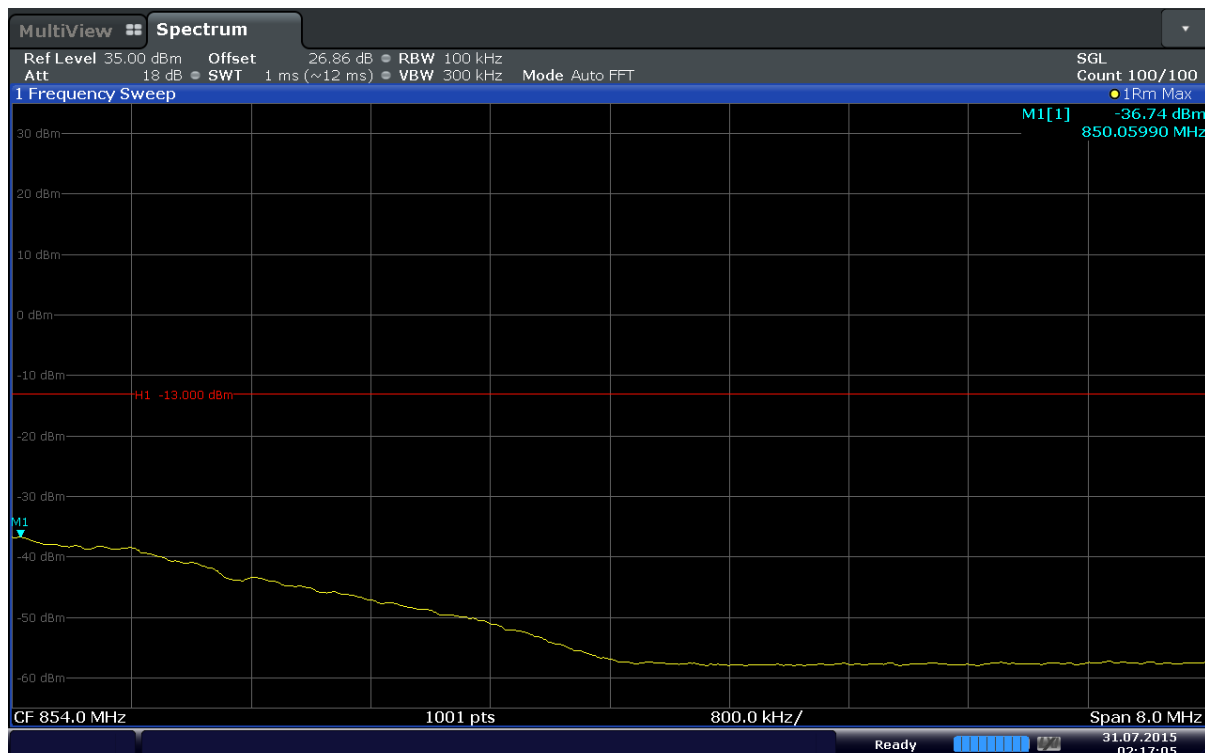


Issue Date:



Date: 31.JUL.2015 02:16:59

Plot 6-103. Upper Band Edge Plot (Band 5 – 3.0MHz – QPSK – RB Size 15)

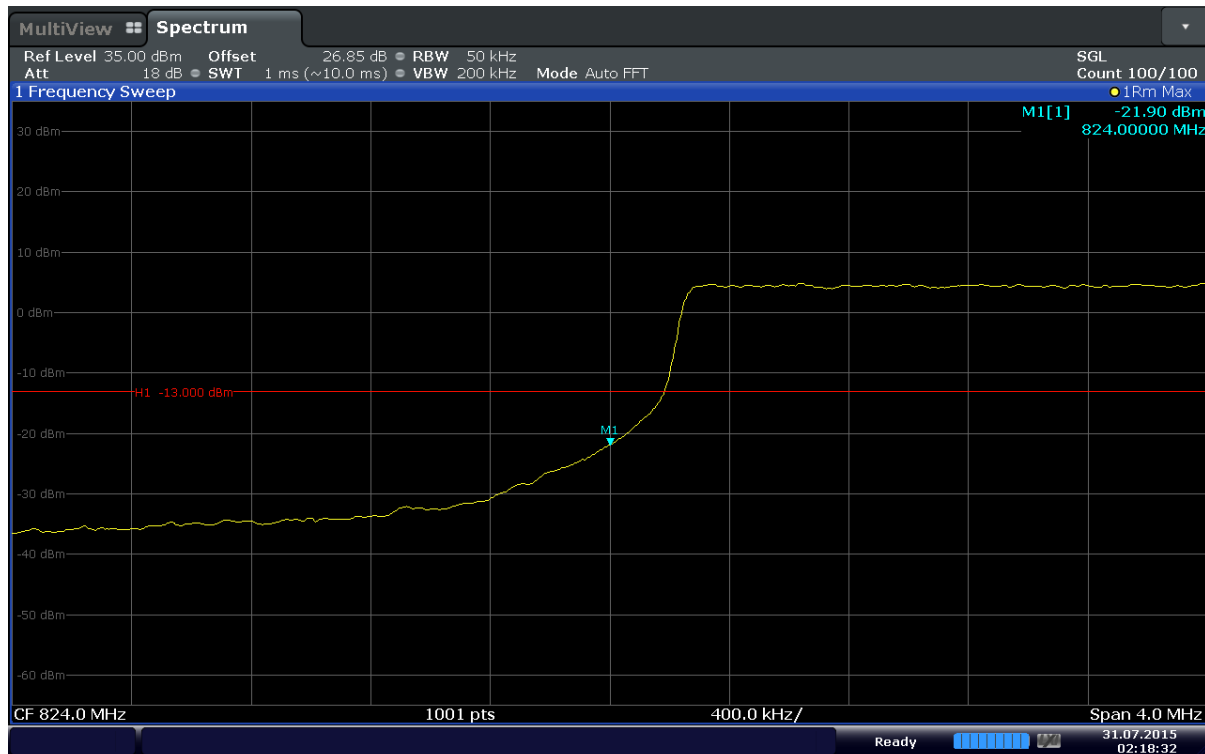


Date: 31.JUL.2015 02:17:05

Plot 6-104. Extended Upper Band Edge Plot (Band 5 – 3.0MHz – QPSK – RB Size 15)

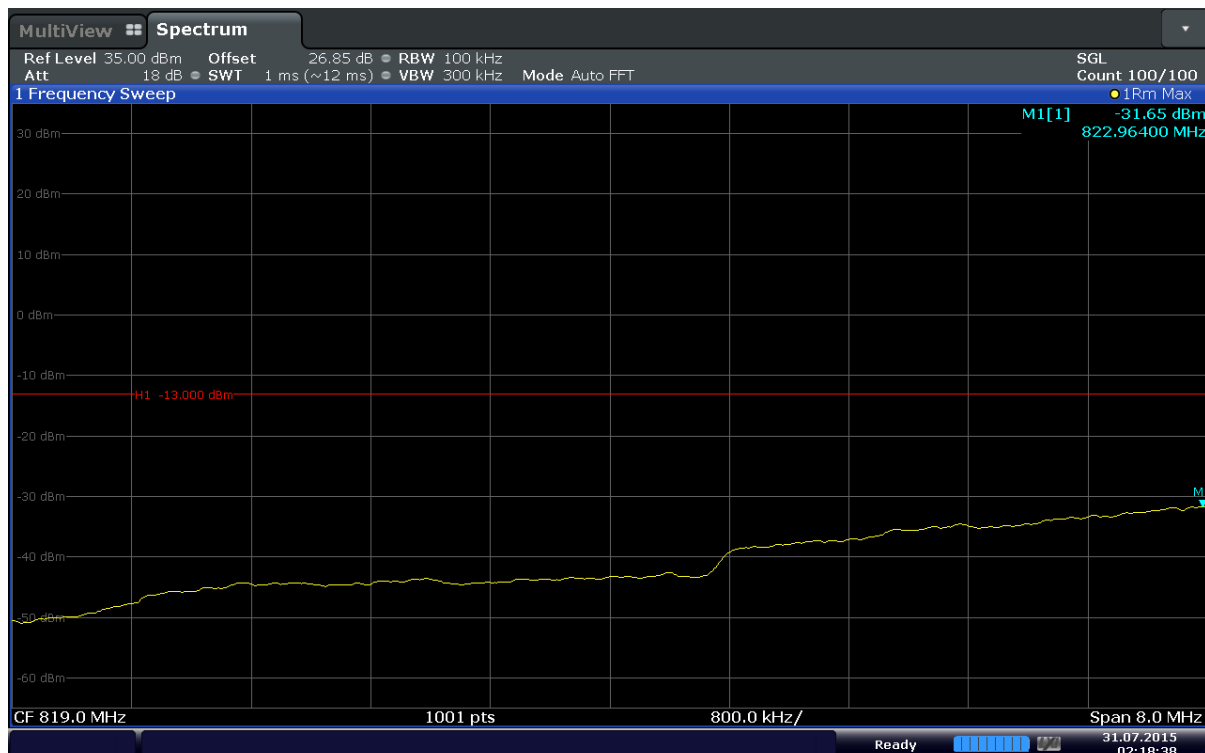


Issue Date:



Date: 31. JUL. 2015 02:18:32

Plot 6-105. Lower Band Edge Plot (Band 5 – 5.0MHz – QPSK – RB Size 25)

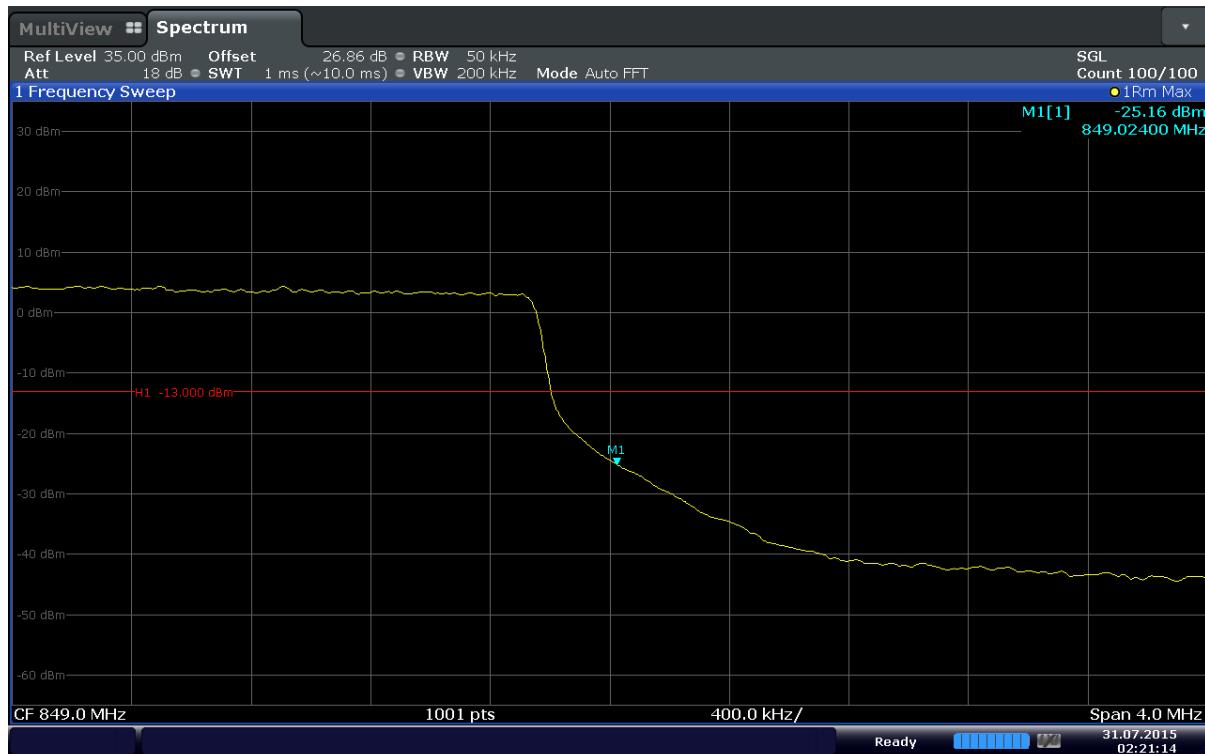


Date: 31. JUL. 2015 02:18:38

Plot 6-106. Extended Lower Band Edge Plot (Band 5 – 5.0MHz – QPSK – RB Size 25)

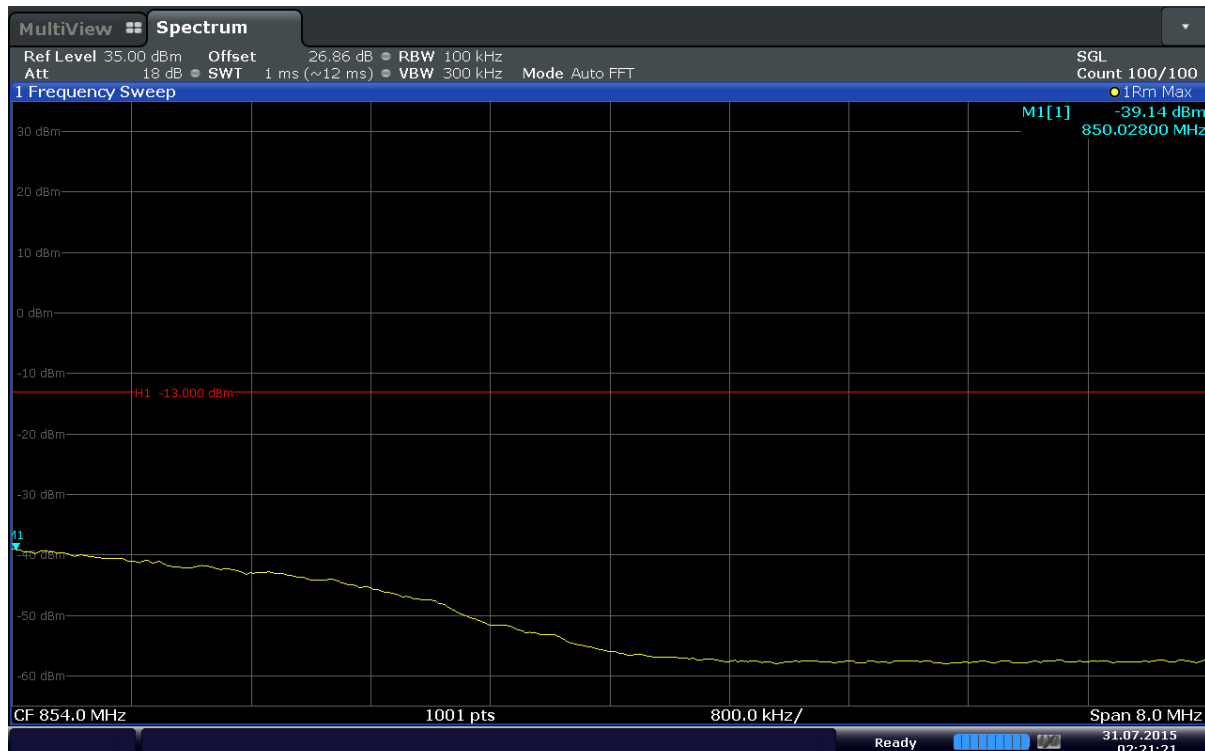


Issue Date:



Date: 31.JUL.2015 02:21:15

Plot 6-107. Upper Band Edge Plot (Band 5 – 5.0MHz – QPSK – RB Size 25)

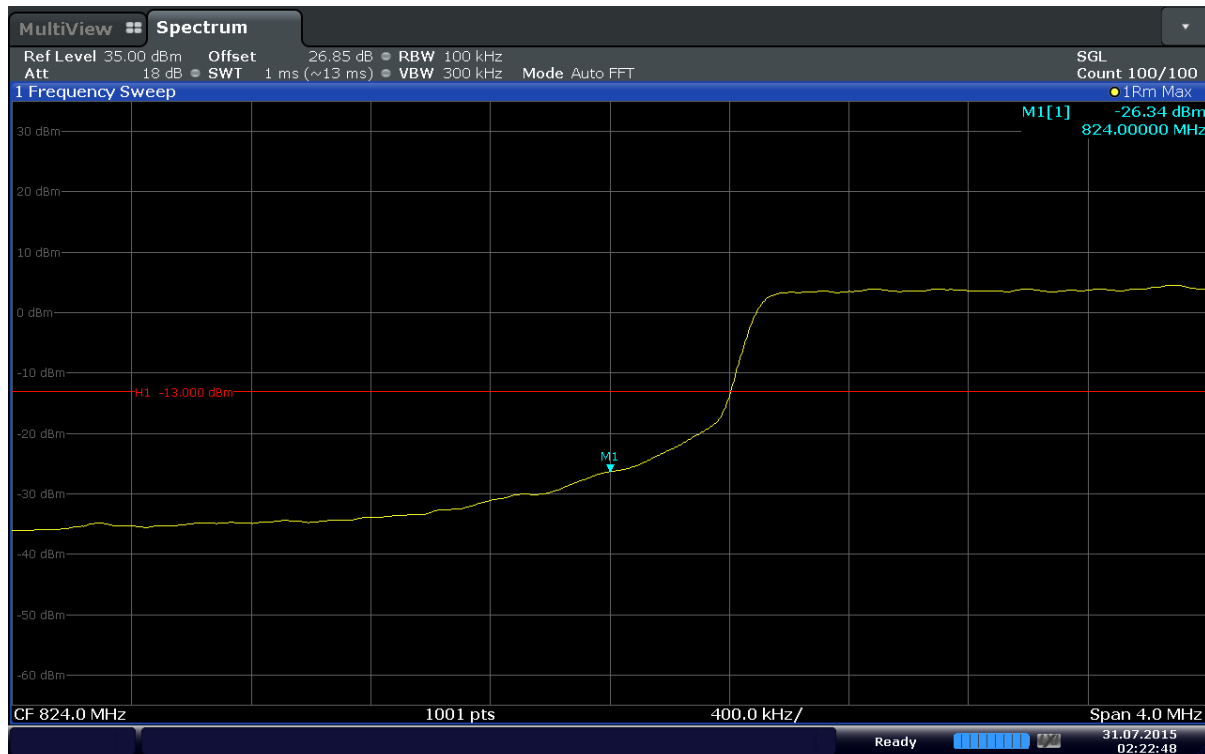


Date: 31.JUL.2015 02:21:21

Plot 6-108. Extended Upper Band Edge Plot (Band 5 – 5.0MHz – QPSK – RB Size 25)

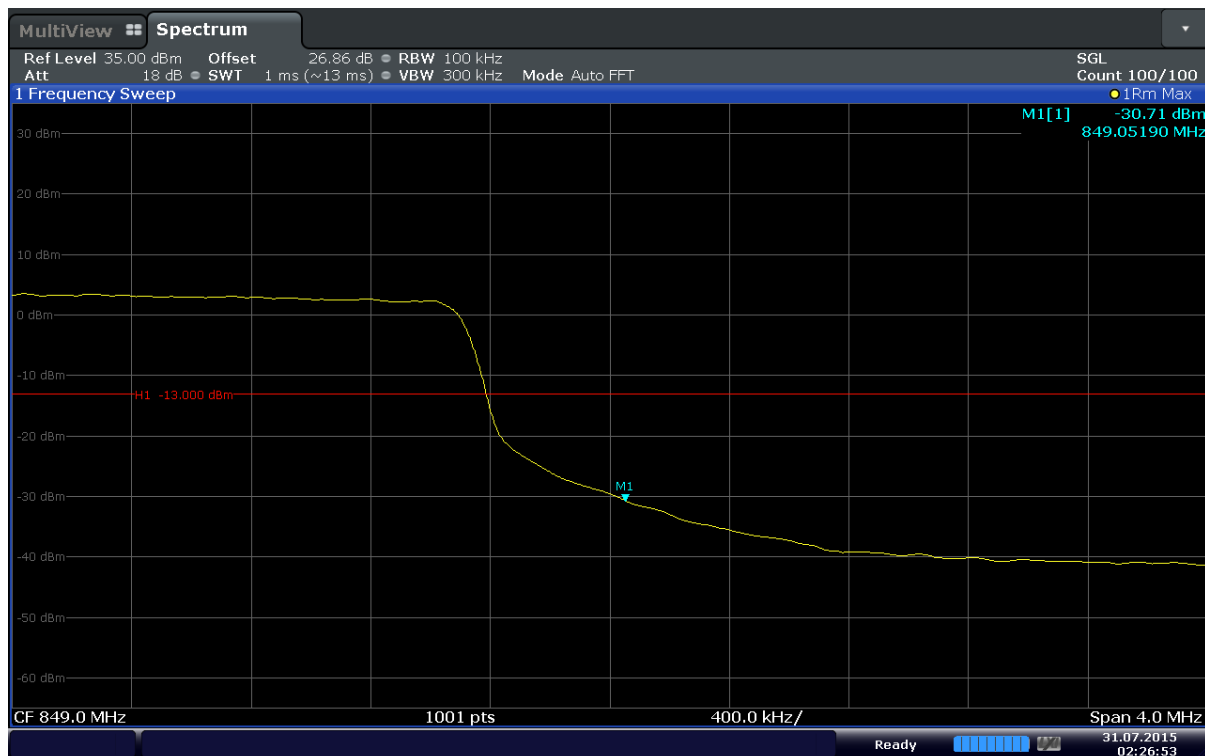


Issue Date:



Date: 31.JUL.2015 02:22:48

Plot 6-109. Lower Band Edge Plot (Band 5 – 10.0MHz – QPSK – RB Size 50)

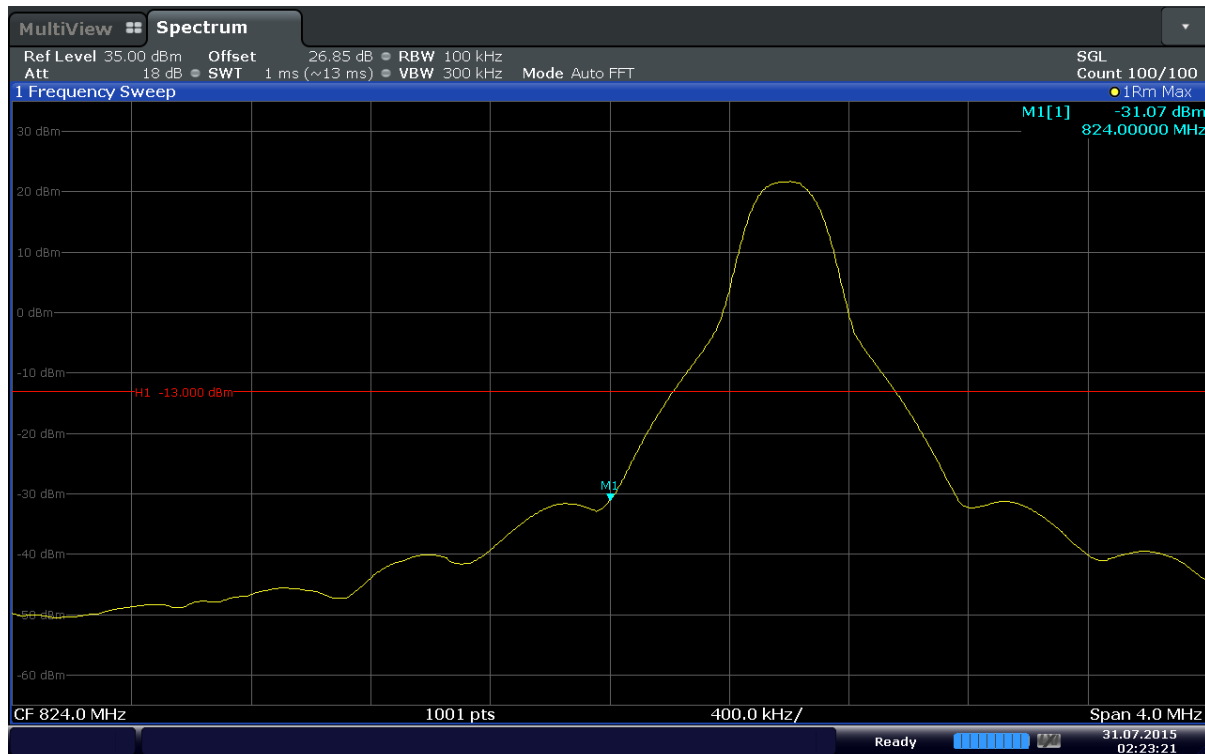


Date: 31.JUL.2015 02:26:53

Plot 6-110. Upper Band Edge Plot (Band 5 – 10.0MHz – QPSK – RB Size 50)

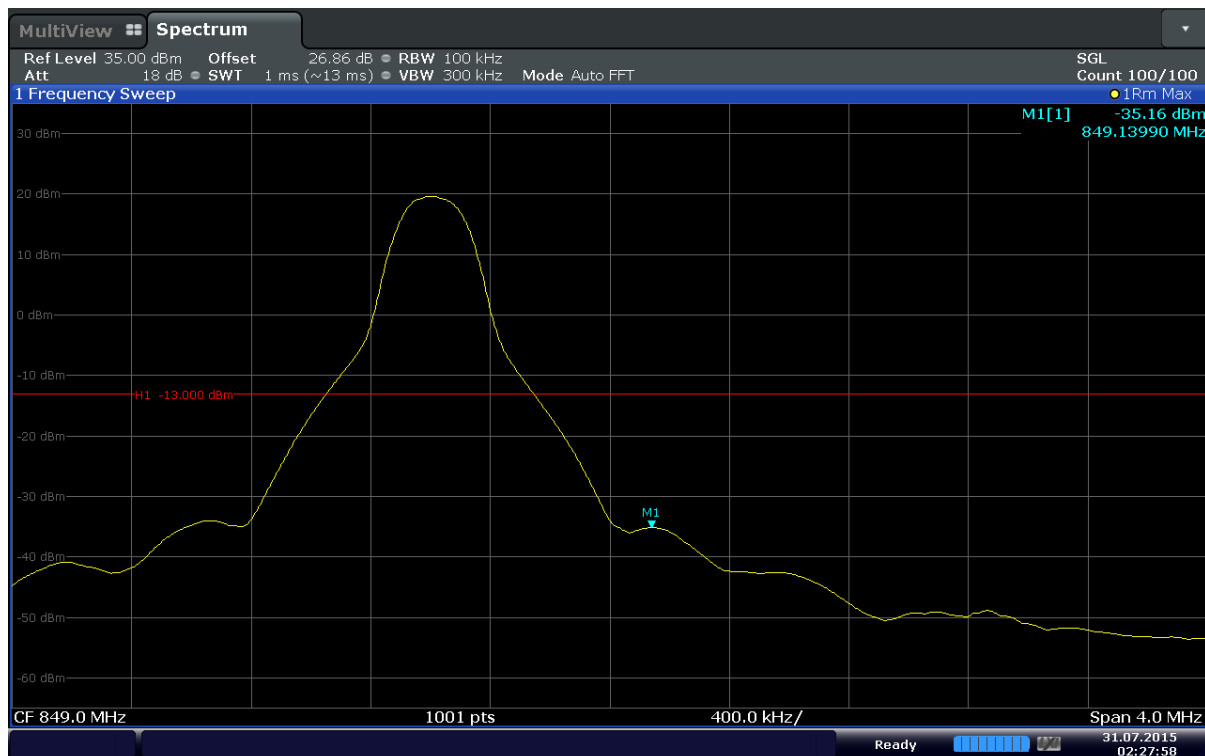


Issue Date:



Date: 31.JUL.2015 02:23:21

Plot 6-111. Lower Band Edge Plot (Band 5 – 10.0MHz – QPSK – RB Size 1 – RB Offset 0)



Date: 31.JUL.2015 02:27:59

Plot 6-112. Upper Band Edge Plot (Band 5 – 10.0MHz – QPSK – RB Size 1 – RB Offset 49)

6.5. Peak-Average Ratio §24.232(d)

Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

Test Procedure Used

KDB 971168 v02r02 – Section 5.7.1

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect 1 million samples to generate the CCDF curve

Test Setup

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

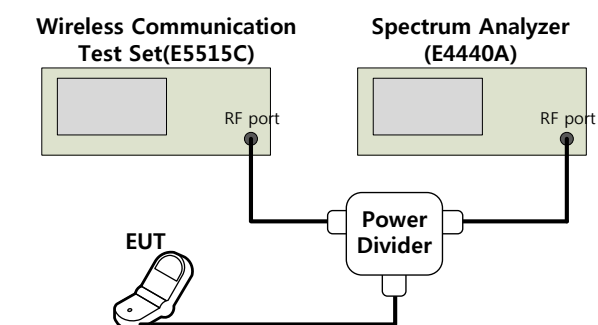


Figure 6-4. Test Instruments & Measurement Setup

Test Plots



Date: 31.JUL.2015 01:42:28

Plot 6-113. Peak-Average Ratio Plot (Band 2 – 1.4MHz QPSK - RB Size 6)



Date: 31.JUL.2015 01:42:35

Plot 6-114. Peak-Average Ratio Plot (Band 2 – 1.4MHz 16QAM - RB Size 6)



Date: 31.JUL.2015 01:43:53

Plot 6-115. Peak-Average Ratio Plot (Band 2 – 3.0MHz QPSK - RB Size 15)



Date: 31.JUL.2015 01:43:59

Plot 6-116. Peak-Average Ratio Plot (Band 2 – 3.0MHz 16QAM - RB Size 15)



Date: 31.JUL.2015 01:45:16

Plot 6-117. Peak-Average Ratio Plot (Band 2 – 5.0MHz QPSK - RB Size 25)



Date: 31.JUL.2015 01:45:22

Plot 6-118. Peak-Average Ratio Plot (Band 2 – 5.0MHz 16QAM - RB Size 25)



Date: 31.JUL.2015 01:46:38

Plot 6-119. Peak-Average Ratio Plot (Band 2 – 10.0MHz QPSK - RB Size 50)



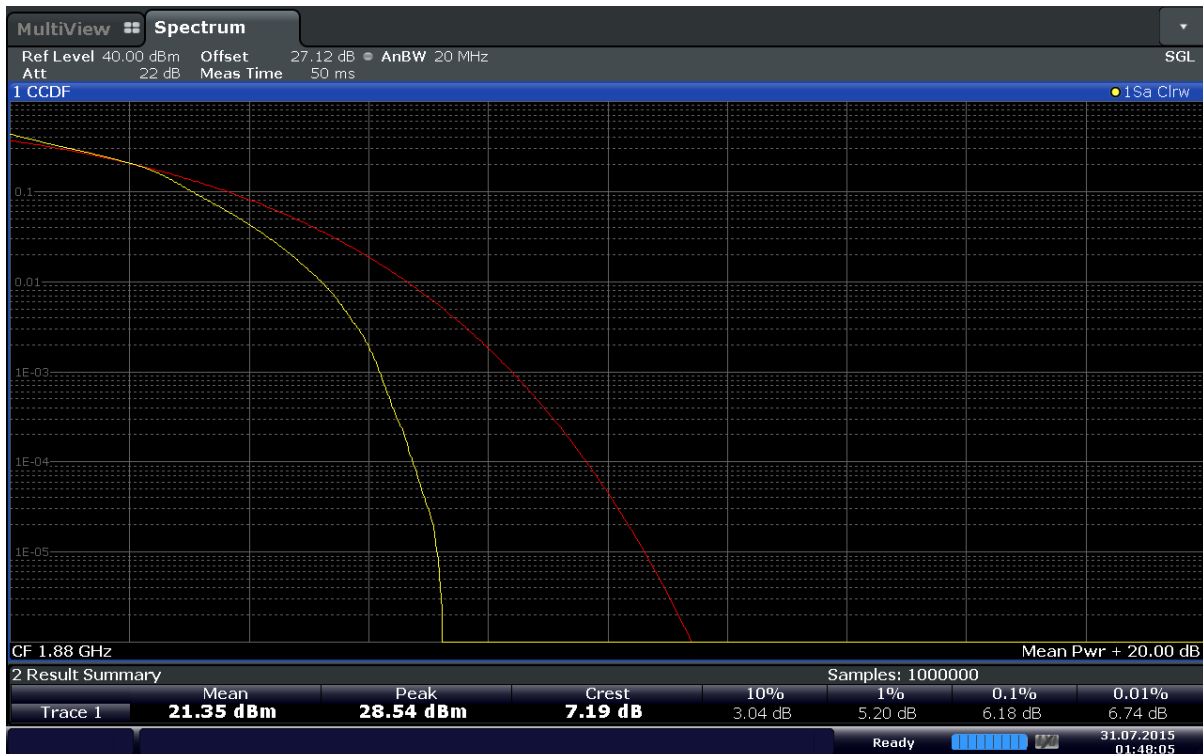
Date: 31.JUL.2015 01:46:44

Plot 6-120. Peak-Average Ratio Plot (Band 2 – 10.0MHz 16QAM - RB Size 50)



Date: 31.JUL.2015 01:48:00

Plot 6-121. Peak-Average Ratio Plot (Band 2 – 15.0MHz QPSK - RB Size 75)



Date: 31.JUL.2015 01:48:05

Plot 6-122. Peak-Average Ratio Plot (Band 2 – 15.0MHz 16QAM - RB Size 75)



Date: 31.JUL.2015 01:49:22

Plot 6-123. Peak-Average Ratio Plot (Band 2 – 20.0MHz QPSK - RB Size 100)



Date: 31.JUL.2015 01:49:28

Plot 6-124. Peak-Average Ratio Plot (Band 2 – 20.0MHz 16QAM - RB Size 100)



6.6. Frequency Stability / Temperature Variation

§2.1055 §22.355 §24.235

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-C-2004. The frequency stability of the transmitter is measured by:

1. Temperature: The temperature is varied from -30°C to $+50^{\circ}\text{C}$ 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 22, the frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency. For part 24, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-C-2004

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 $+50^{\circ}\text{C}$. 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.

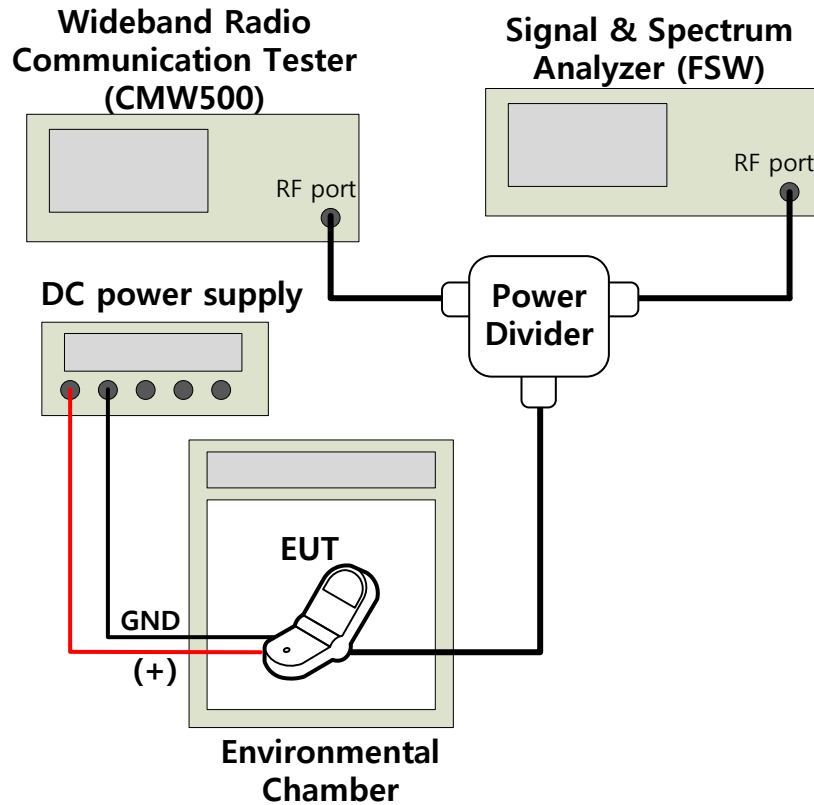


Figure 6-5. Test Instruments & Measurement Setup

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 24, 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.

Issue Date:

Mode : LTE Band 2
Channel : 18900
Operating Frequency : 1880 MHz
Reference Voltage : 3.8 VDC

Voltage [%]	Power [VDC]	Temp [°C]	ACF [MHz]	MCF [MHz]	Freq. Dev. [Hz]	ppm error
100 %	3.8	-30	1880.0	1,800.000146	145.51	0.081
		-20	1880.0	1,800.000141	141.25	0.078
		-10	1880.0	1,800.000141	141.02	0.078
		0	1880.0	1,800.000129	128.92	0.072
		+10	1880.0	1,799.999861	-138.77	-0.077
		+20	1880.0	1,800.000122	121.87	0.068
		+30	1880.0	1,800.000119	118.59	0.066
		+40	1880.0	1,800.000114	114.01	0.063
		+50	1880.0	1,800.000106	105.86	0.059
Batt.End	3.40	+20	1880.0	1,799.999873	-127.30	-0.071

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

Mode : LTE Band 5
Channel : 20415
Operating Frequency : 825.5 MHz
Reference Voltage : 3.8 VDC

Voltage [%]	Power [VDC]	Temp [°C]	ACF [MHz]	MCF [MHz]	Freq. Dev. [Hz]	ppm error	Limit [ppm]
100 %	3.8	-30	825.5	825.500007	6.82	0.008	±2.5
		-20	825.5	825.500006	5.99	0.007	
		-10	825.5	825.499994	-6.45	-0.008	
		0	825.5	825.499995	-5.41	-0.007	
		+10	825.5	825.499993	-6.59	-0.008	
		+20	825.5	825.500006	5.51	0.007	
		+30	825.5	825.499994	-6.25	-0.008	
		+40	825.5	825.499993	-6.57	-0.008	
		+50	825.5	825.499993	-7.25	-0.009	
Batt.End	3.40	+20	825.5	825.499917	-82.78	-0.100	

Table 6-3. Frequency Stability Data (LTE Band 5)



6.7. Radiated Power (ERP/EIRP)
§24.232(c) §22.913(a.2)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 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 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-C-2004 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
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 "free run" for signals with continuous operation with the sweep times set to "auto"
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
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.

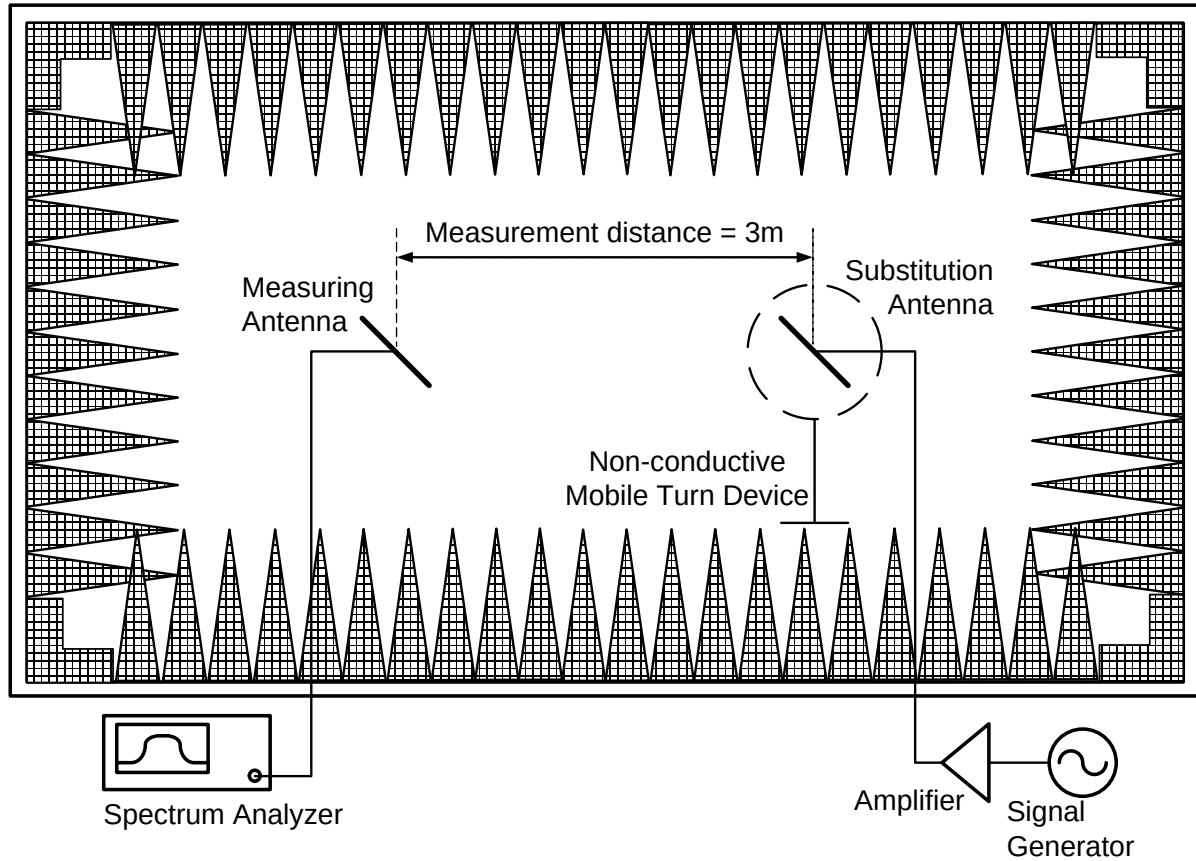


Figure 6-7. Test Instruments & Measurement Setup

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.



Issue Date:

Test Results

Channel	Channel BW [MHz]	Mod.	RB Size /Offset	Ant Pol (H/V)	EUT POL [degree]		S/A Reading [dBm]	S/G Level [dBm]	Tx C/L [dB]	Ant. Gain [dBi]	EIRP [dBm]	Margin [dB]
					Azimuth	Elevation						
18607	1.4	QPSK	1 / 0	H	315	360	-19.84	21.61	4.97	9.59	26.23	6.78
18607	1.4	16QAM	1 / 0	H	319	360	-20.71	20.74	4.97	9.59	25.36	7.65
18900	1.4	QPSK	1 / 0	H	314	360	-19.86	21.33	5.01	9.45	25.77	7.24
18900	1.4	16QAM	1 / 5	H	316	360	-20.87	20.32	5.01	9.45	24.76	8.25
19193	1.4	QPSK	1 / 0	H	326	360	-20.71	20.53	5.05	9.20	24.69	8.32
19193	1.4	16QAM	1 / 2	H	319	360	-21.44	19.80	5.05	9.20	23.96	9.05
18615	3	QPSK	1 / 0	H	310	360	-19.98	21.46	4.97	9.59	26.08	6.93
18615	3	16QAM	1 / 14	H	309	360	-20.80	20.64	4.97	9.59	25.26	7.75
18900	3	QPSK	1 / 14	H	309	360	-19.84	21.35	5.01	9.45	25.79	7.22
18900	3	16QAM	1 / 7	H	313	360	-19.96	21.23	5.01	9.45	25.67	7.34
19185	3	QPSK	1 / 14	H	317	6	-20.82	20.40	5.05	9.22	24.57	8.44
19185	3	16QAM	1 / 14	H	317	12	-21.37	19.85	5.05	9.22	24.02	8.99
18625	5	QPSK	1 / 24	H	316	360	-20.15	21.28	4.97	9.59	25.90	7.11
18625	5	16QAM	1 / 0	H	318	360	-20.73	20.70	4.97	9.59	25.32	7.69
18900	5	QPSK	1 / 24	H	309	12	-20.35	20.84	5.01	9.45	25.28	7.73
18900	5	16QAM	1 / 24	H	311	360	-21.46	19.73	5.01	9.45	24.17	8.84
19175	5	QPSK	1 / 0	H	318	7	-20.32	20.88	5.04	9.23	25.07	7.94
19175	5	16QAM	1 / 0	H	320	360	-21.25	19.95	5.04	9.23	24.14	8.87
18675	10	QPSK	1 / 24	H	319	360	-20.05	21.36	4.98	9.57	25.96	7.05
18675	10	16QAM	1 / 49	H	316	10	-20.87	20.54	4.98	9.57	25.14	7.87
18900	10	QPSK	1 / 49	H	318	360	-19.91	21.28	5.01	9.45	25.72	7.29
18900	10	16QAM	1 / 0	H	320	360	-20.80	20.39	5.01	9.45	24.83	8.18
19150	10	QPSK	1 / 24	H	319	5	-20.21	20.93	5.04	9.27	25.16	7.85
19150	10	16QAM	1 / 0	H	324	360	-21.38	19.76	5.04	9.27	23.99	9.02
18675	15	QPSK	1 / 74	H	318	360	-19.83	21.56	4.98	9.56	26.14	6.87
18675	15	16QAM	1 / 37	H	320	360	-20.88	20.51	4.98	9.56	25.09	7.92
18900	15	QPSK	1 / 74	H	318	360	-20.01	21.18	5.01	9.45	25.62	7.39
18900	15	16QAM	1 / 37	H	314	360	-21.10	20.09	5.01	9.45	24.53	8.48
19125	15	QPSK	1 / 37	H	321	360	-20.35	20.72	5.03	9.31	25.00	8.01
19125	15	16QAM	1 / 37	H	315	360	-21.52	19.55	5.03	9.31	23.83	9.18
18700	20	QPSK	1 / 49	H	316	360	-19.98	21.39	4.98	9.55	25.95	7.06
18700	20	16QAM	1 / 0	H	316	360	-21.28	20.09	4.98	9.55	24.65	8.36
18900	20	QPSK	1 / 99	H	323	360	-20.08	21.11	5.01	9.45	25.55	7.46
18900	20	16QAM	1 / 99	H	315	17	-21.16	20.03	5.01	9.45	24.47	8.54
19100	20	QPSK	1 / 49	H	321	360	-19.91	21.10	5.03	9.35	25.42	7.59
19100	20	16QAM	1 / 49	H	317	360	-20.82	20.19	5.03	9.35	24.51	8.50

Table 6-4. EIRP Data (LTE Band 2)



Channel	Channel BW [MHz]	Mod.	RB Size /Offset	Ant Pol (H/V)	EUT POL [degree]		S/A Reading [dBm]	S/G Level [dBm]	Tx C/L [dB]	Ant. Gain [dBd]	ERP [dBm]	Margin [dB]
					Azimuth	Elevation						
20407	1.4	QPSK	1 / 2	H	282	35	-13.67	25.56	3.35	-0.75	21.46	16.99
20407	1.4	16QAM	1 / 0	H	281	31	-14.51	24.72	3.35	-0.75	20.62	17.83
20525	1.4	QPSK	1 / 0	V	204	96	-14.58	24.19	3.37	-0.77	20.05	18.40
20525	1.4	16QAM	1 / 2	V	204	96	-15.53	23.24	3.37	-0.77	19.10	19.35
20643	1.4	QPSK	1 / 0	H	95	0	-18.08	21.07	3.39	-0.80	16.88	21.57
20643	1.4	16QAM	1 / 2	H	95	0	-19.13	20.02	3.39	-0.80	15.83	22.62
20415	3	QPSK	1 / 7	H	105	327	-14.16	25.06	3.35	-0.75	20.97	17.48
20415	3	16QAM	1 / 0	H	105	327	-15.22	24.00	3.35	-0.75	19.91	18.54
20525	3	QPSK	1 / 7	V	199	90	-14.68	24.09	3.37	-0.77	19.95	18.50
20525	3	16QAM	1 / 0	H	94	0	-15.89	23.30	3.37	-0.77	19.16	19.29
20635	3	QPSK	1 / 0	V	208	96	-16.66	22.26	3.39	-0.80	18.07	20.38
20635	3	16QAM	1 / 0	V	208	96	-17.60	21.32	3.39	-0.80	17.13	21.32
20425	5	QPSK	1 / 12	H	104	320	-14.51	24.71	3.35	-0.75	20.61	17.84
20425	5	16QAM	1 / 12	H	104	320	-15.42	23.80	3.35	-0.75	19.70	18.75
20525	5	QPSK	1 / 12	H	108	322	-14.97	24.22	3.37	-0.77	20.08	18.37
20525	5	16QAM	1 / 0	H	108	322	-15.54	23.65	3.37	-0.77	19.51	18.94
20625	5	QPSK	1 / 0	V	202	89	-14.56	24.35	3.39	-0.80	20.16	18.29
20625	5	16QAM	1 / 0	V	202	89	-15.45	23.46	3.39	-0.80	19.27	19.18
20450	10	QPSK	1 / 24	H	117	330	-14.49	24.72	3.36	-0.76	20.61	17.84
20450	10	16QAM	1 / 24	H	117	330	-15.47	23.74	3.36	-0.76	19.63	18.82
20525	10	QPSK	1 / 24	H	99	360	-15.32	23.87	3.37	-0.77	19.73	18.72
20525	10	16QAM	1 / 24	H	99	360	-16.26	22.93	3.37	-0.77	18.79	19.66
20600	10	QPSK	1 / 24	V	197	95	-16.18	22.69	3.38	-0.79	18.52	19.93
20600	10	16QAM	1 / 24	V	197	95	-16.96	21.91	3.38	-0.79	17.74	20.71

Table 6-5. ERP Data (LTE Band 5)

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6.8. Radiated Spurious Emissions Measurements
§2.1051 §22.917(a) §24.238(a)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 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-C-2004 – 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. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = Max Peak
6. Trace mode = max hold
7. 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.

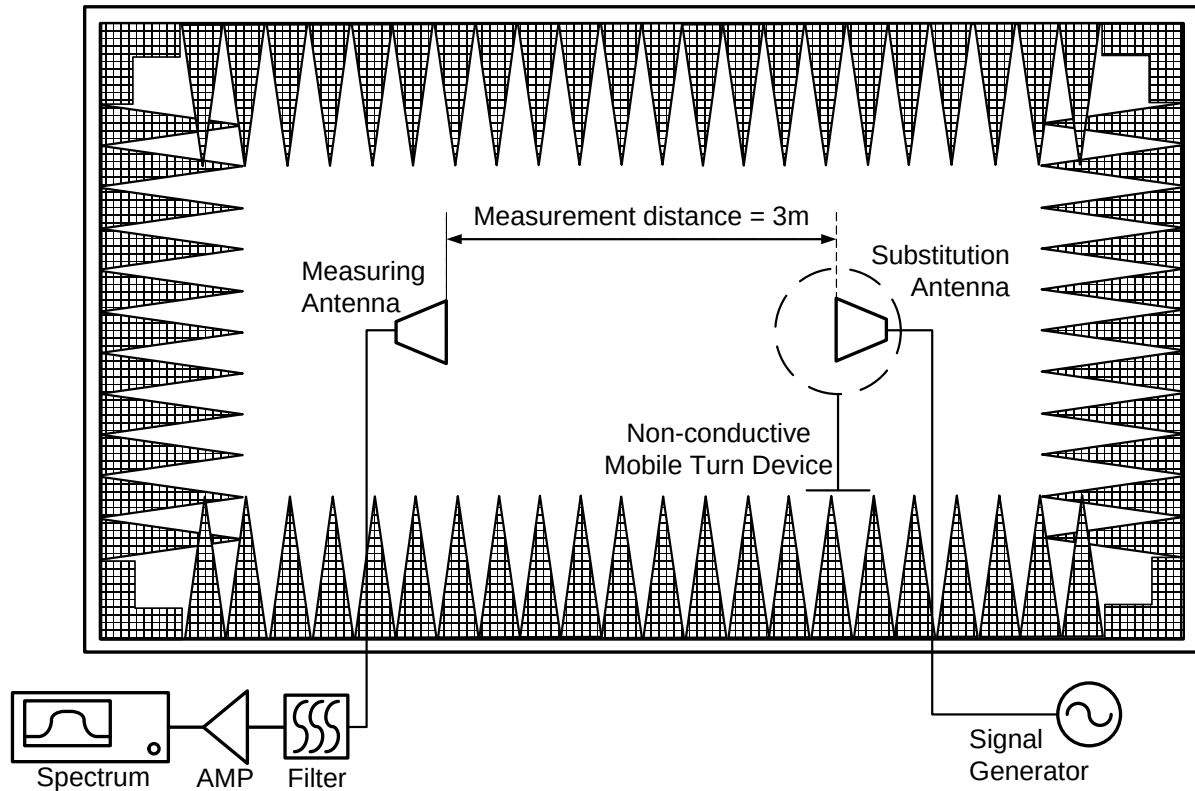


Figure 6-8. Test Instruments & Measurement Setup

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 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

Test Results

Operating Frequency : 1850.7 MHz
 Channel : 18607
 Measured Output Power : 26.23 dBm = 0.420 Watt
 Modulation Signal : QPSK
 Band Width : 1.4 MHz
 RB Size / Offset : 1 / 0
 Distance : 3 Meters
 Limit : $43 + 10 \log_{10}(W)$ = 39.23 dBc
 RSE Limit : -13 dBm

Freq. [MHz]	Ant Pol (H/V)	EUT Pol [degree]		S/A reading [dBm]	S/G Level [dBm]	Tx C/L [dB]	Ant. Gain [dBi]	RSE Level [dBm]
		Azimuth	Elevation					
3700.5	H	216	360	-57.30	-47.86	7.13	10.50	-44.49
5550.8	H	314	3	-59.00	-42.85	8.97	11.15	-40.67
7402.8	V	330	115	-63.89	-40.35	10.41	9.94	-40.83
9253.5	H	75	360	-68.24	-41.57	11.75	11.59	-41.72

Table 6-6. Radiated Spurious Data (LTE Band 2 – Low Channel)

Operating Frequency : 1880.0 MHz
 Channel : 18900
 Measured Output Power : 25.79 dBm = 0.379 Watt
 Modulation Signal : QPSK
 Band Width : 3 MHz
 RB Size / Offset : 1 / 14
 Distance : 3 Meters
 Limit : $43 + 10 \log_{10}(W)$ = 38.79 dBc
 RSE Limit : -13 dBm

Freq. [MHz]	Ant Pol (H/V)	EUT Pol [degree]		S/A reading [dBm]	S/G Level [dBm]	Tx C/L [dB]	Ant. Gain [dBi]	RSE Level [dBm]
		Azimuth	Elevation					
3760.2	V	315	20	-60.36	-50.21	7.21	10.27	-47.15
5640.4	H	330	40	-62.47	-45.94	9.01	11.14	-43.81
7520.5	V	290	330	-68.33	-44.29	10.46	10.30	-44.45
9400.6	V	Noise floor		-71.21	-44.31	11.95	11.86	-44.40

Table 6-7. Radiated Spurious Data (LTE Band 2 – Mid Channel)

Operating Frequency : 1900.0 MHz
 Channel : 19100
 Measured Output Power : 25.42 dBm = 0.348 Watt
 Modulation Signal : QPSK
 Band Width : 20 MHz
 RB Size / Offset : 1 / 49
 Distance : 3 Meters
 Limit : $43 + 10 \log_{10}(W)$ = 38.42 dBc
 RSE Limit : -13 dBm

Freq. [MHz]	Ant Pol (H/V)	EUT Pol [degree]		S/A reading [dBm]	S/G Level [dBm]	Tx C/L [dB]	Ant. Gain [dBi]	RSE Level [dBm]
		Azimuth	Elevation					
3801.4	H	20	350	-62.24	-51.77	7.26	10.12	-48.91
5702.1	H	64	310	-64.46	-47.49	9.04	11.15	-45.38
7602.8	H	180	20	-68.69	-44.71	10.57	10.24	-45.04
9503.5	V	265	360	-68.83	-41.53	11.97	12.02	-41.48

Table 6-8. Radiated Spurious Data (LTE Band 2 – High Channel)

Operating Frequency : 824.7 MHz
 Channel : 20407
 Measured Output Power : 21.46 dBm = 0.140 Watt
 Modulation Signal : QPSK
 Band Width : 1.4 MHz
 RB Size / Offset : 1 / 2
 Distance : 3 Meters
 Limit : $43 + 10 \log_{10}(W)$ = 34.46 dBc
 RSE Limit : -13 dBm

Freq. [MHz]	Ant Pol (H/V)	EUT Pol [degree]		S/A reading [dBm]	S/G Level [dBm]	Tx C/L [dB]	Ant. Gain [dBd]	RSE Level [dBm]
		Azimuth	Elevation					
1649.4	H	100	360	-54.77	-55.28	4.76	7.17	-52.88
2474.1	H	160	324	-60.66	-57.55	5.79	8.37	-54.98
3298.8	H	135	333	-64.62	-55.79	5.34	6.03	-55.10
4123.5	V	324	20	-68.96	-56.66	7.56	8.27	-55.96

Table 6-9. Radiated Spurious Data (LTE Band 5 – Low Channel)

Operating Frequency : 836.5 MHz
 Channel : 20525
 Measured Output Power : 20.08 dBm = 0.102 Watt
 Modulation Signal : QPSK
 Band Width : 5 MHz
 RB Size / Offset : 1 / 12
 Distance : 3 Meters
 Limit : $43 + 10 \log_{10}(W)$ = 33.08 dBc
 RSE Limit : -13 dBm

Freq. [MHz]	Ant Pol (H/V)	EUT Pol [degree]		S/A reading [dBm]	S/G Level [dBm]	Tx C/L [dB]	Ant. Gain [dBd]	RSE Level [dBm]
		Azimuth	Elevation					
1673.0	H	275	360	-60.33	-60.87	4.79	7.29	-58.37
2509.5	V	320	180	-62.25	-58.70	5.83	8.35	-56.18
3346.0	V	330	170	-67.08	-58.54	6.82	8.25	-57.11
4182.5	H	Noise floor		-70.13	-58.08	7.67	8.37	-57.37

Table 6-10. Radiated Spurious Data (LTE Band 5 – Mid Channel)

Operating Frequency : 846.5 MHz
 Channel : 20625
 Measured Output Power : 20.16 dBm = 0.104 Watt
 Modulation Signal : QPSK
 Band Width : 5 MHz
 RB Size / Offset : 1 / 0
 Distance : 3 Meters
 Limit : $43 + 10 \log_{10}(W)$ = 33.16 dBc
 RSE Limit : -13 dBm

Freq. [MHz]	Ant Pol (H/V)	EUT Pol [degree]		S/A reading [dBm]	S/G Level [dBm]	Tx C/L [dB]	Ant. Gain [dBd]	RSE Level [dBm]
		Azimuth	Elevation					
1693.0	V	316	360	-62.24	-62.79	4.82	7.40	-60.21
2539.5	V	320	45	-64.09	-60.03	5.87	8.24	-57.66
3386.0	H	310	345	-68.83	-60.25	6.85	8.30	-58.79
4232.5	H	Noise floor		-72.24	-60.28	7.72	8.54	-59.45

Table 6-11. Radiated Spurious Data (LTE Band 5 – High Channel)



7. CONCLUSION

The data collected relate only the item(s) tested and show that the Samsung Portable Tablet FCC ID: A3LSMT377A compliance with all the requirements of Parts 2, 22 and 24 of the FCC rules.

– End of this report –