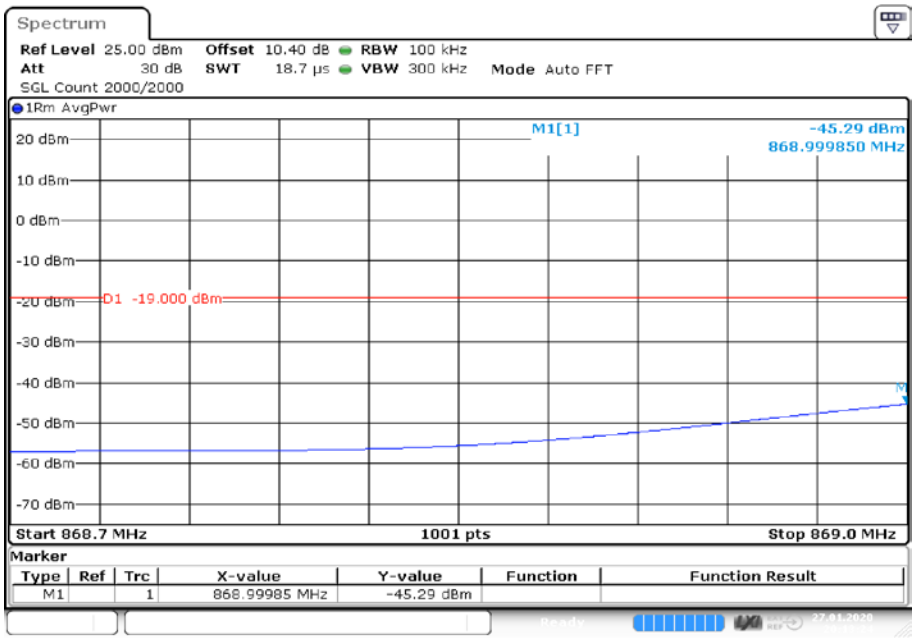
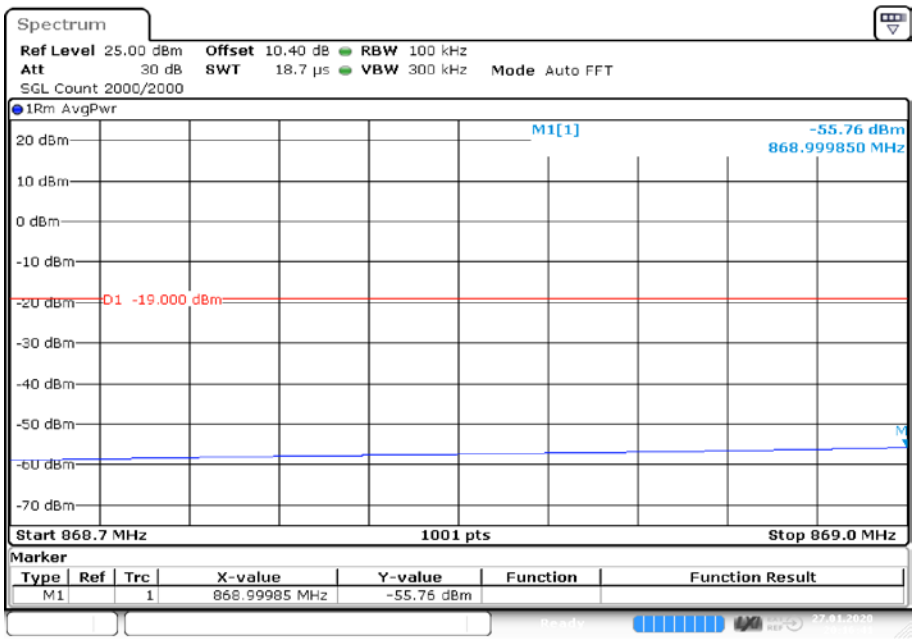
Frequency Band = Band 5, Direction = Downlink, Signal Type = LTE, Band Edge = lower (S01_AA01)



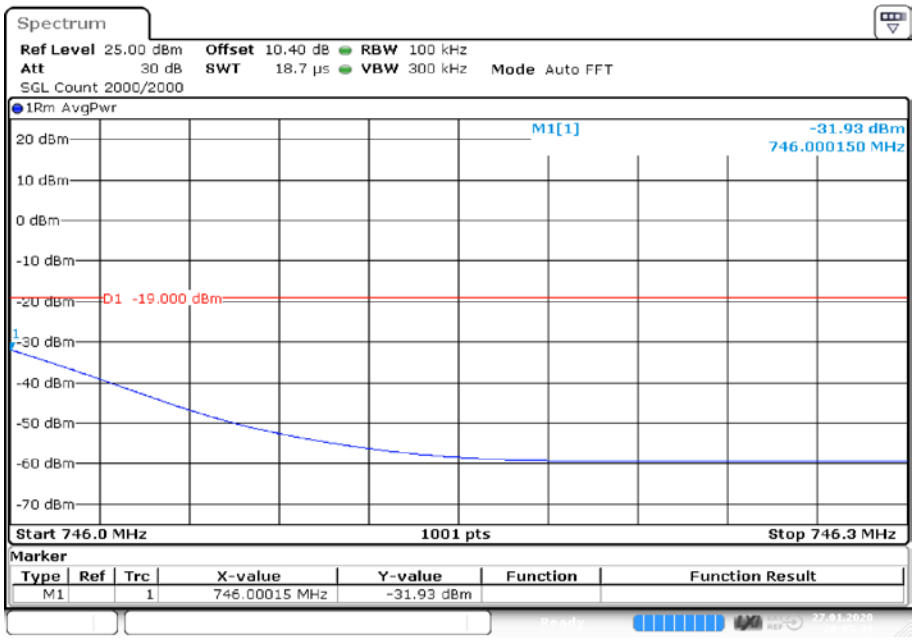
Date: 27.JAN.2020 20:13:24

Frequency Band = Band 5, Direction = Downlink, Signal Type = CDMA, Band Edge = lower (S01_AA01)



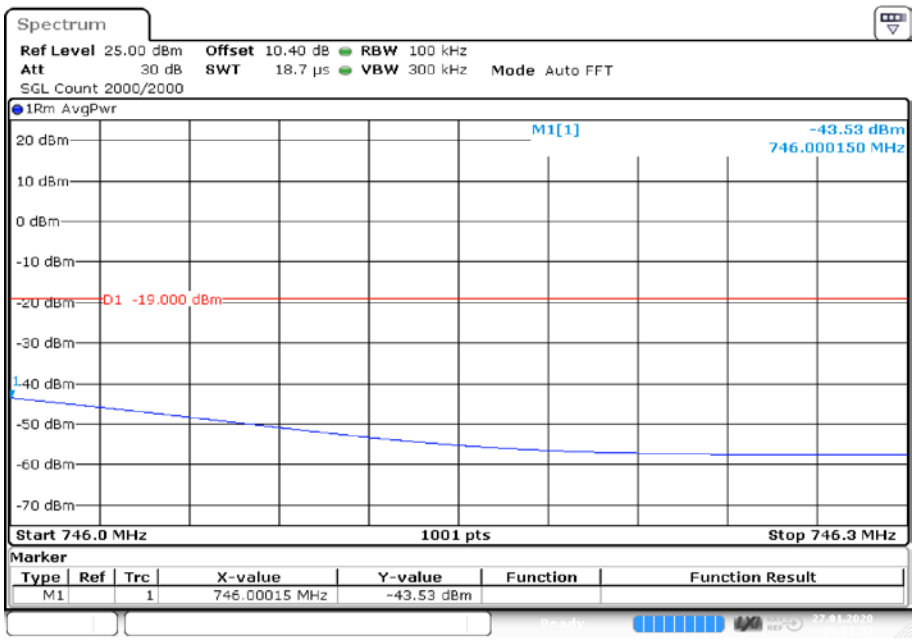
Date: 27.JAN.2020 20:16:42

Frequency Band = Band 12, Direction = Downlink, Signal Type = GSM, Band Edge = upper (S01_AA01)



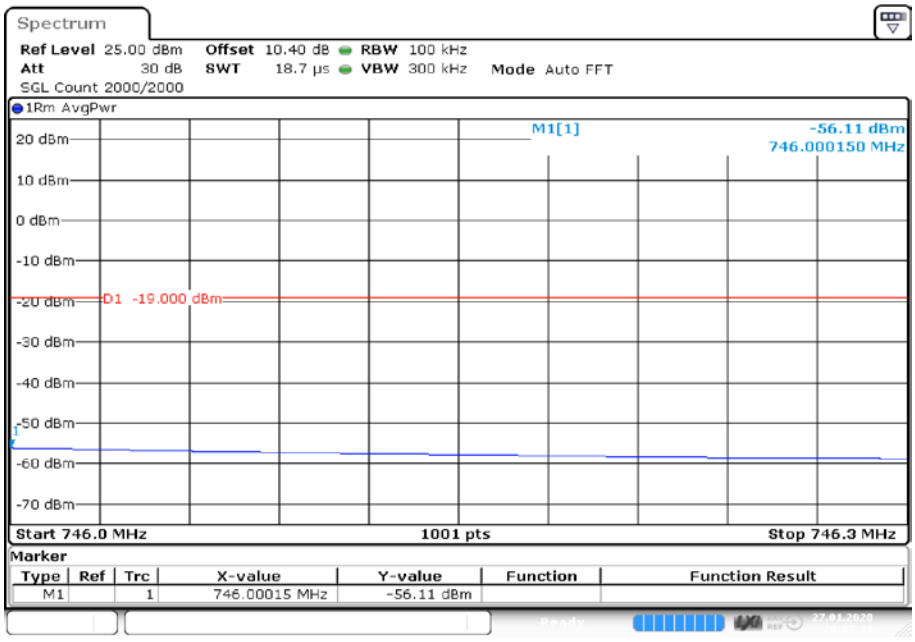
Date: 27.JAN.2020 20:05:42

Frequency Band = Band 12, Direction = Downlink, Signal Type = LTE, Band Edge = upper (S01_AA01)



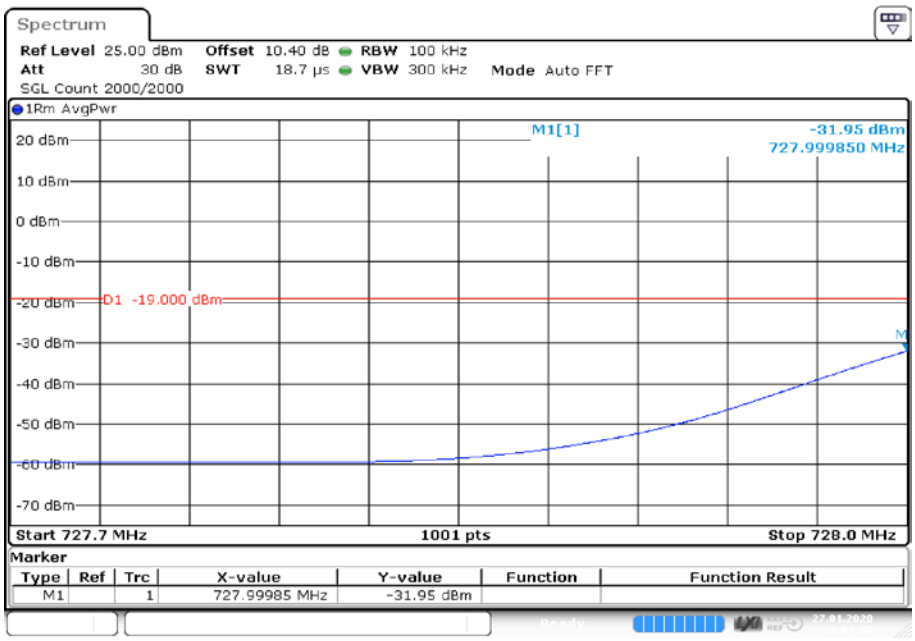
Date: 27.JAN.2020 20:08:59

Frequency Band = Band 12, Direction = Downlink, Signal Type = CDMA, Band Edge = upper (S01_AA01)



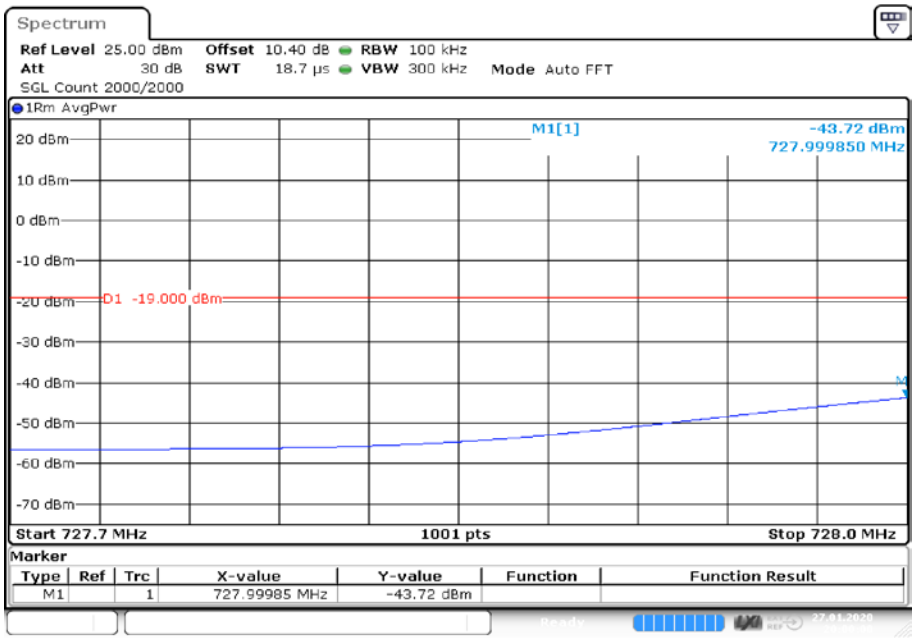
Date: 27.JAN.2020 20:07:31

Frequency Band = Band 12, Direction = Downlink, Signal Type = GSM, Band Edge = lower (S01_AA01)



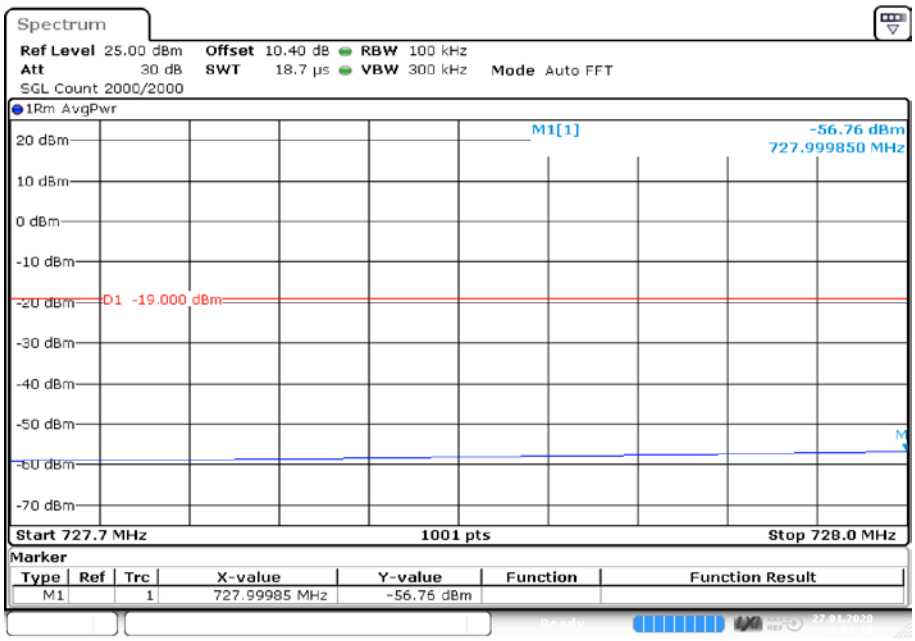
Date: 27.JAN.2020 20:03:56

Frequency Band = Band 12, Direction = Downlink, Signal Type = LTE, Band Edge = lower (S01_AA01)



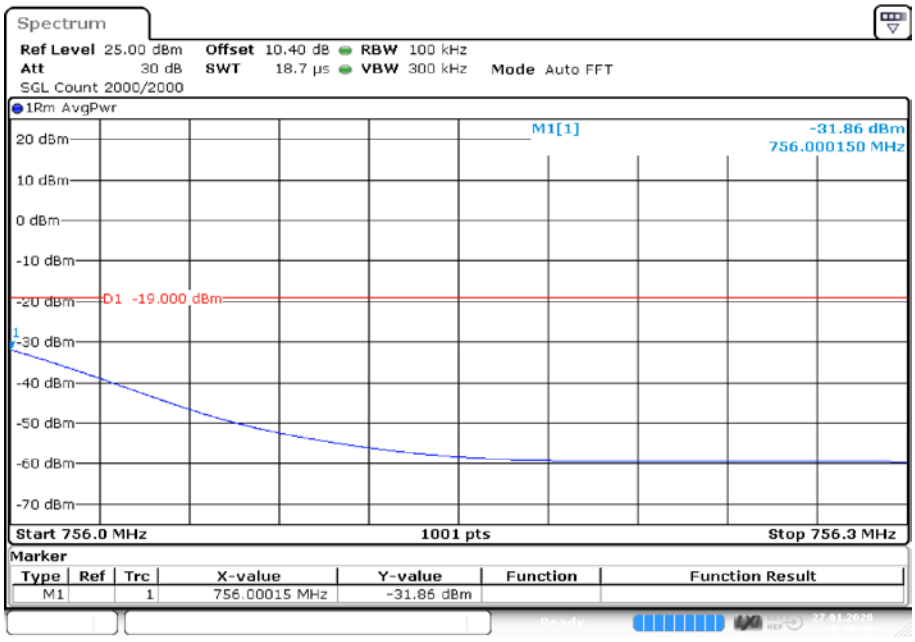
Date: 27.JAN.2020 20:00:00

Frequency Band = Band 12, Direction = Downlink, Signal Type = CDMA, Band Edge = lower (S01_AA01)



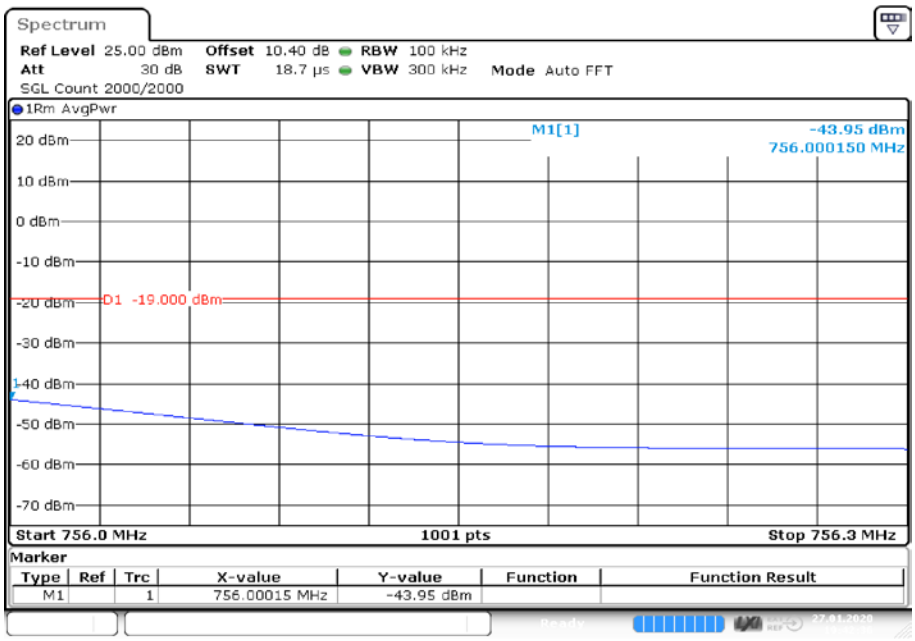
Date: 27.JAN.2020 20:02:18

Frequency Band = Band 13, Direction = Downlink, Signal Type = GSM, Band Edge = upper (S01_AA01)



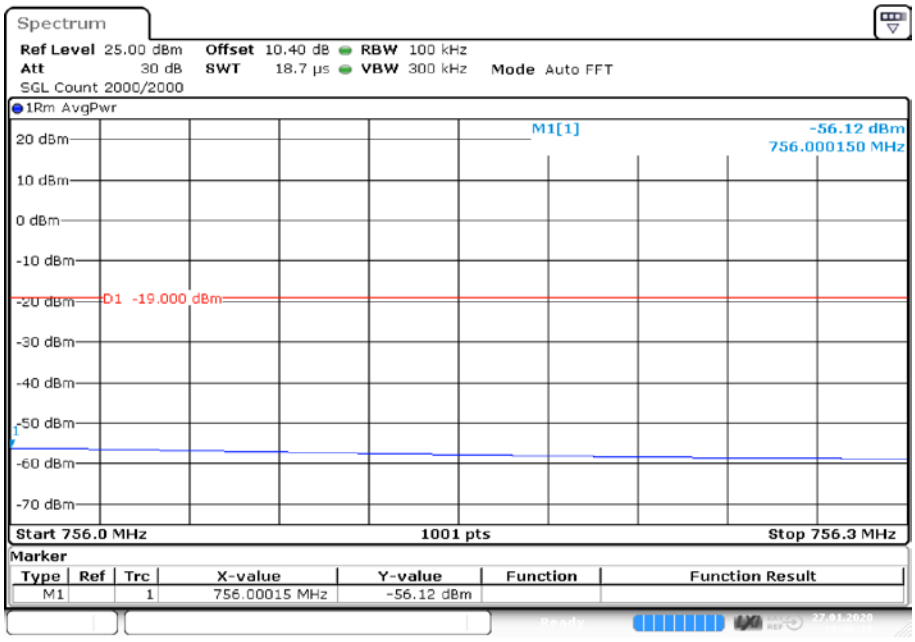
Date: 27.JAN.2020 19:48:41

Frequency Band = Band 13, Direction = Downlink, Signal Type = LTE, Band Edge = upper (S01_AA01)



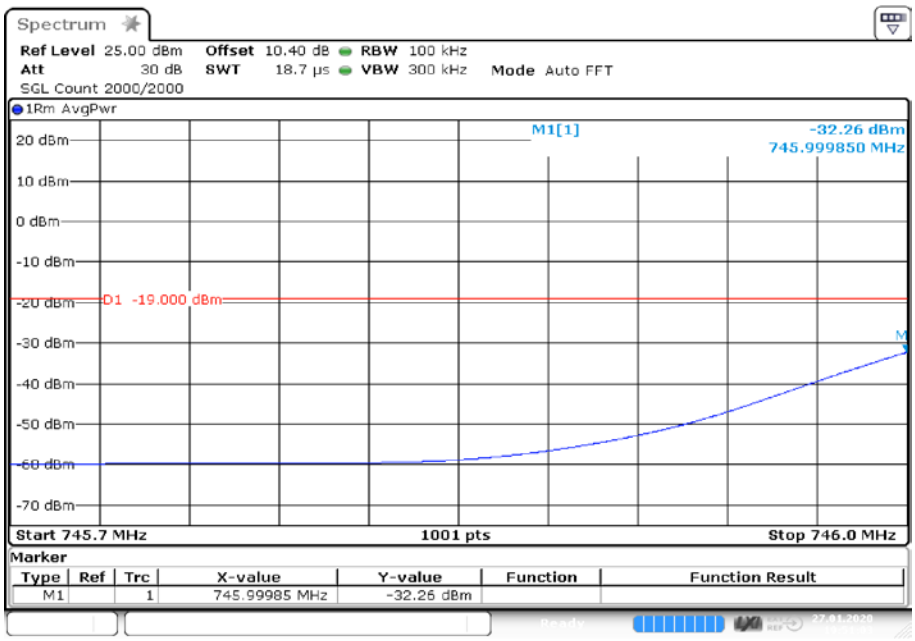
Date: 27.JAN.2020 19:42:37

Frequency Band = Band 13, Direction = Downlink, Signal Type = CDMA, Band Edge = upper (S01_AA01)



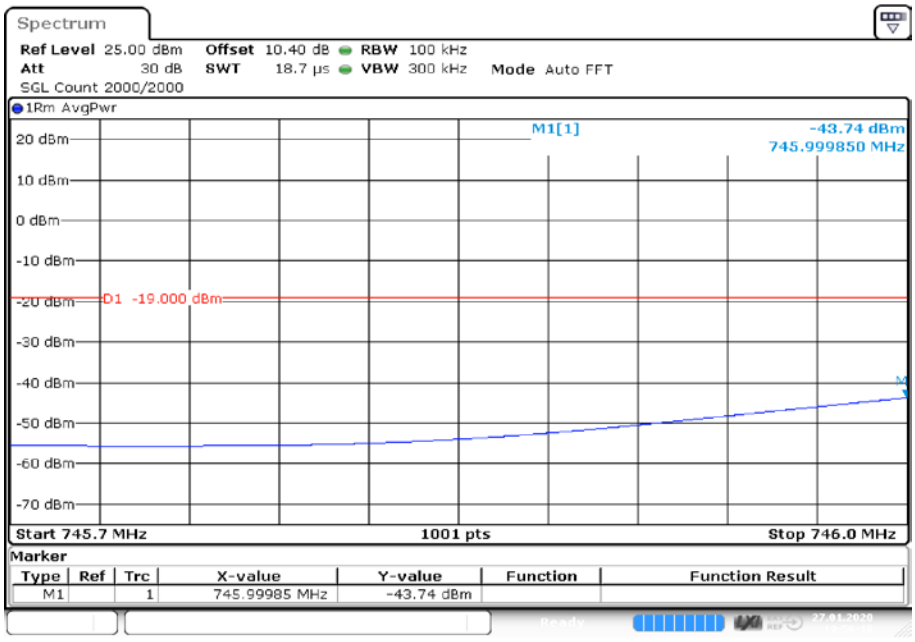
Date: 27.JAN.2020 19:46:19

Frequency Band = Band 13, Direction = Downlink, Signal Type = GSM, Band Edge = lower (S01_AA01)



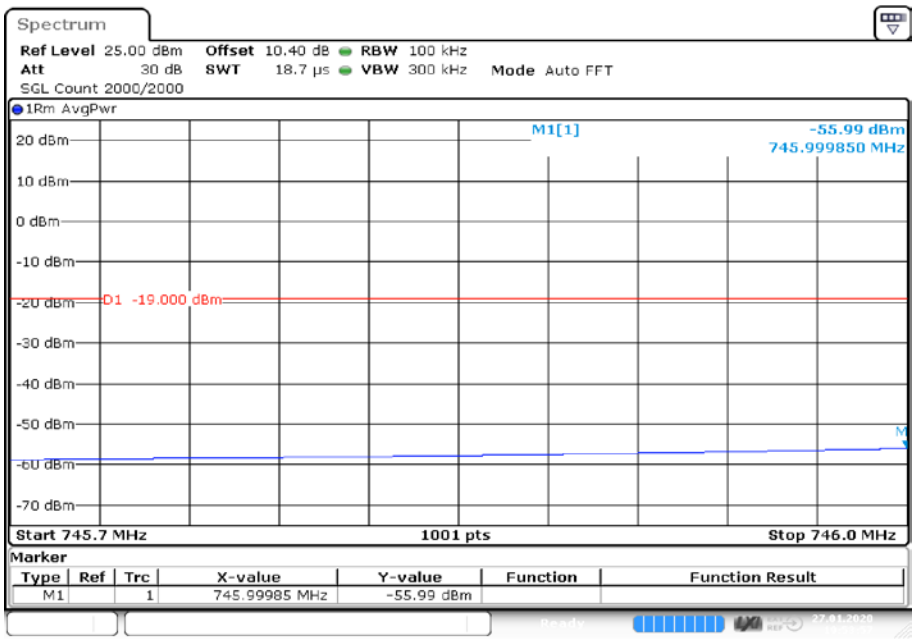
Date: 27.JAN.2020 19:51:03

Frequency Band = Band 13, Direction = Downlink, Signal Type = LTE, Band Edge = lower (S01_AA01)



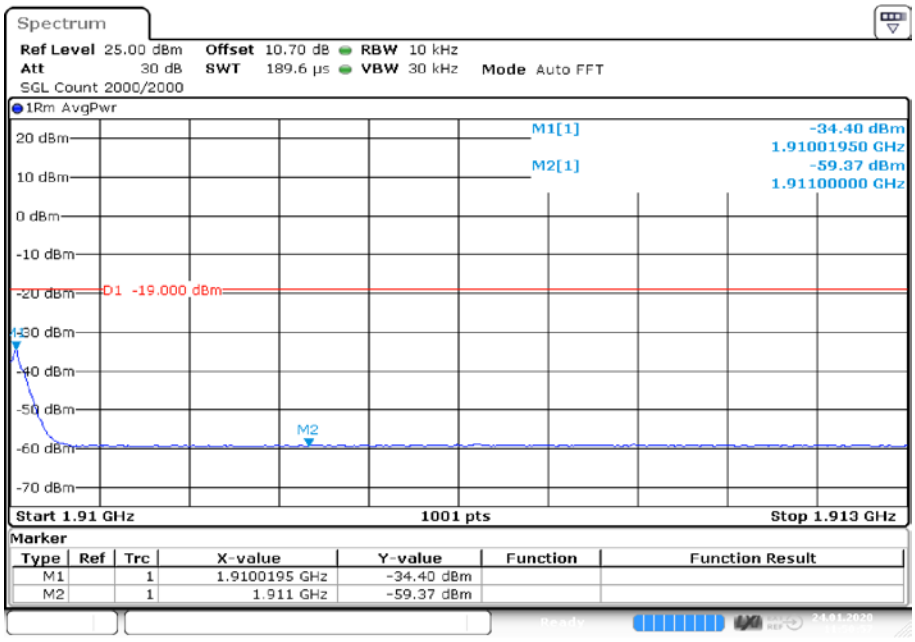
Date: 27.JAN.2020 19:56:16

Frequency Band = Band 13, Direction = Downlink, Signal Type = CDMA, Band Edge = lower (S01_AA01)



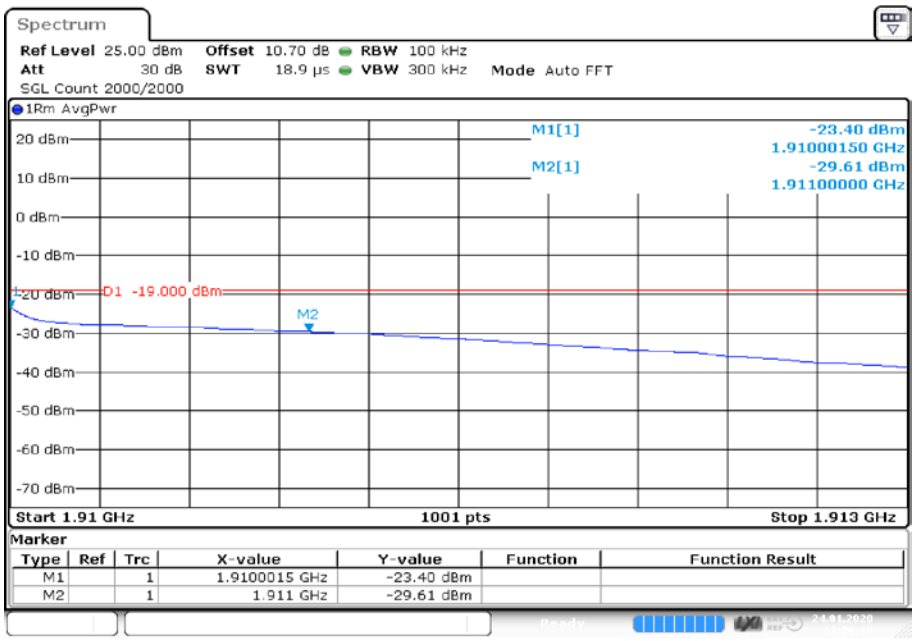
Date: 27.JAN.2020 19:53:57

Frequency Band = Band 2, Direction = Uplink, Signal Type = GSM, Band Edge = upper (S01_AA01)



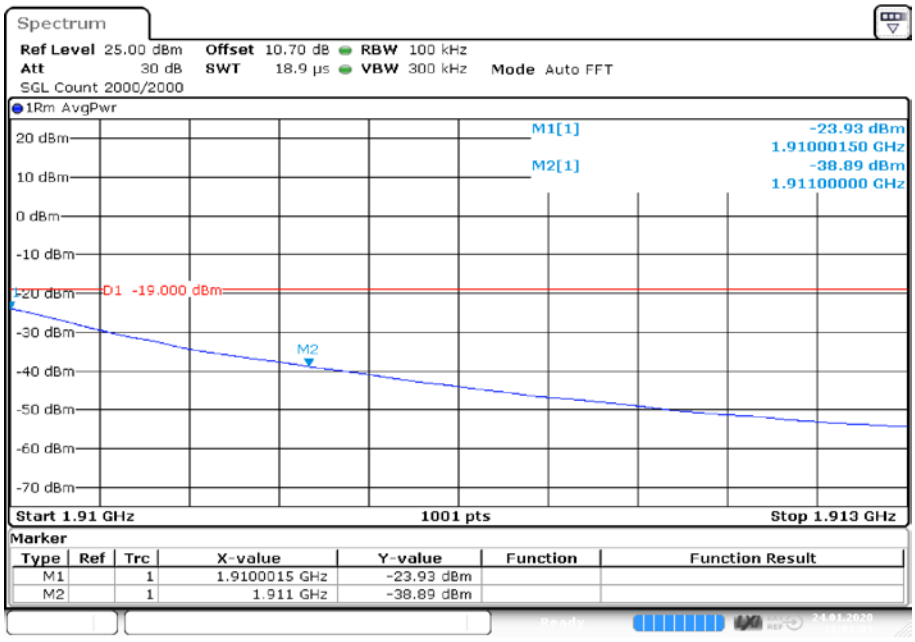
Date: 24.JAN.2020 11:50:57

Frequency Band = Band 2, Direction = Uplink, Signal Type = LTE, Band Edge = upper (S01_AA01)



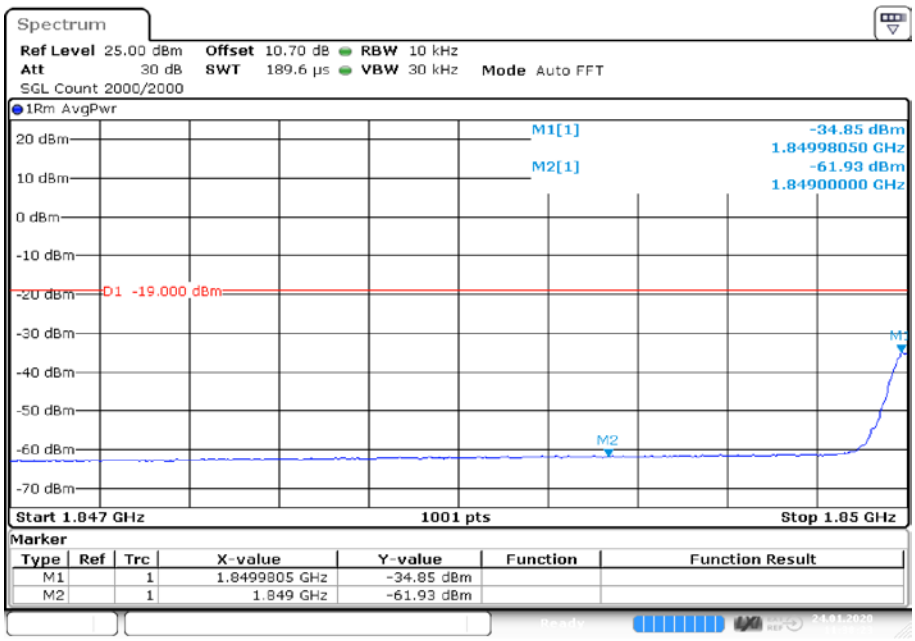
Date: 24.JAN.2020 12:06:16

Frequency Band = Band 2, Direction = Uplink, Signal Type = CDMA, Band Edge = upper (S01_AA01)



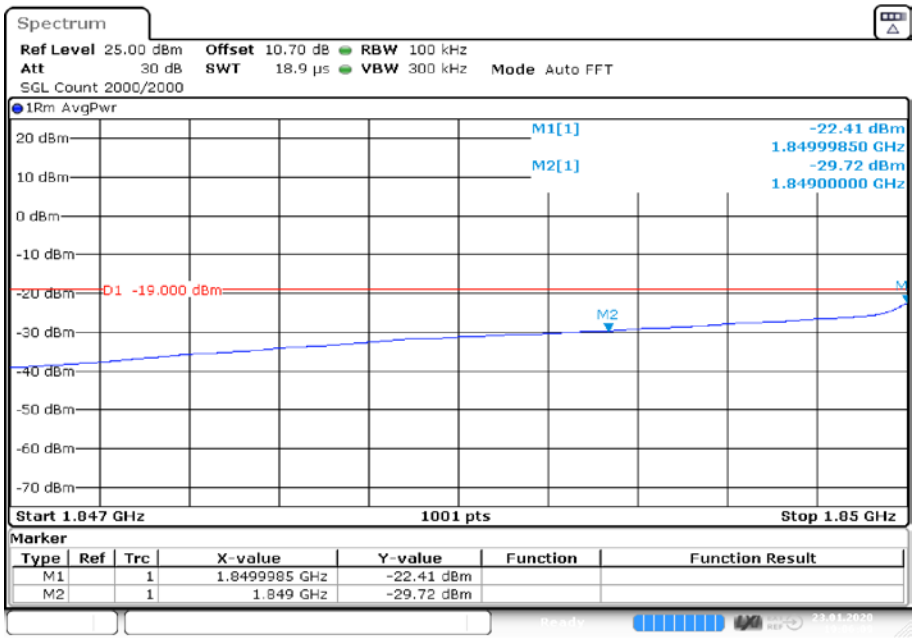
Date: 24.JAN.2020 12:01:03

Frequency Band = Band 2, Direction = Uplink, Signal Type = GSM, Band Edge = lower (S01_AA01)



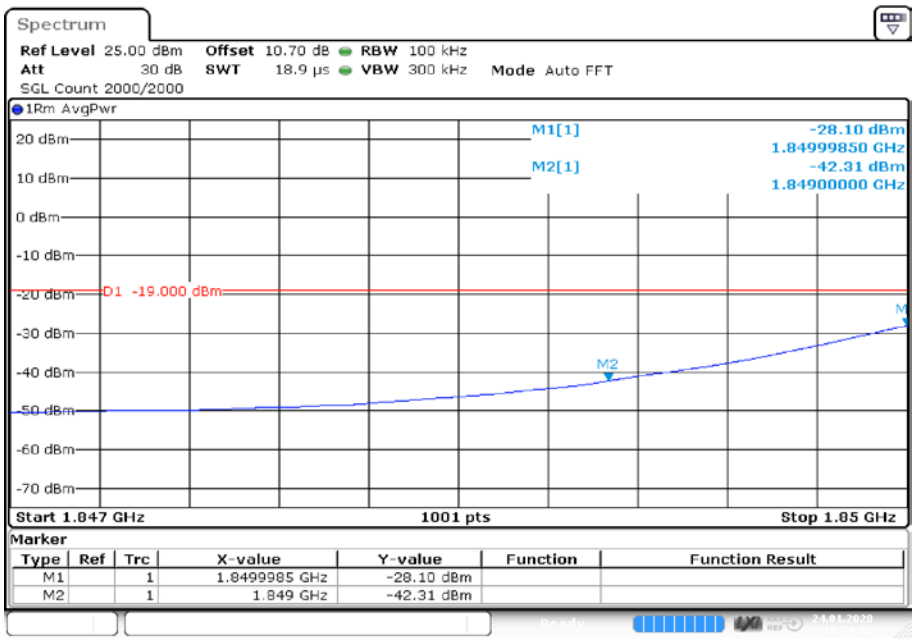
Date: 24.JAN.2020 11:38:22

Frequency Band = Band 2, Direction = Uplink, Signal Type = LTE, Band Edge = lower (S01_AA01)



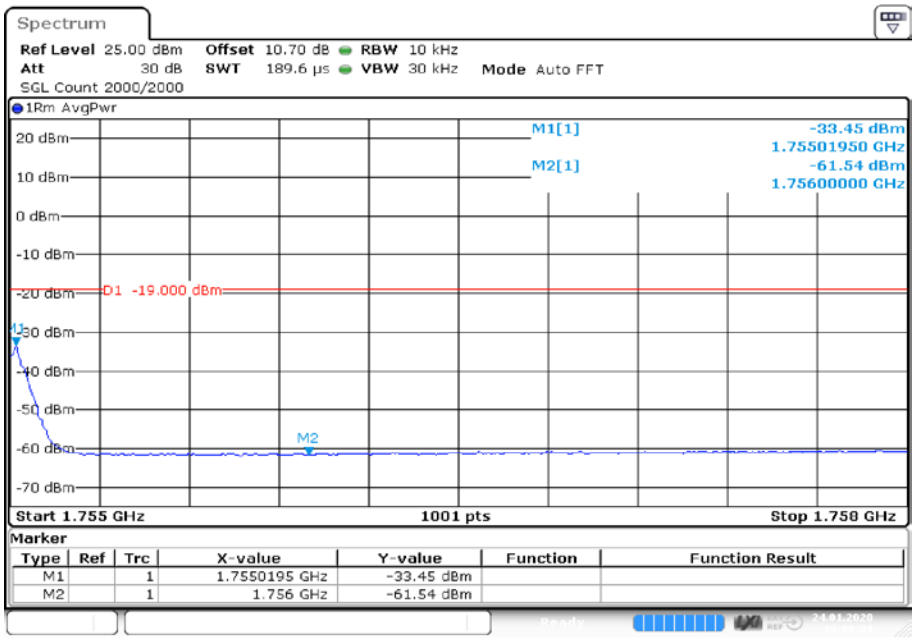
Date: 23.JAN.2020 19:06:10

Frequency Band = Band 2, Direction = Uplink, Signal Type = CDMA, Band Edge = lower (S01_AA01)



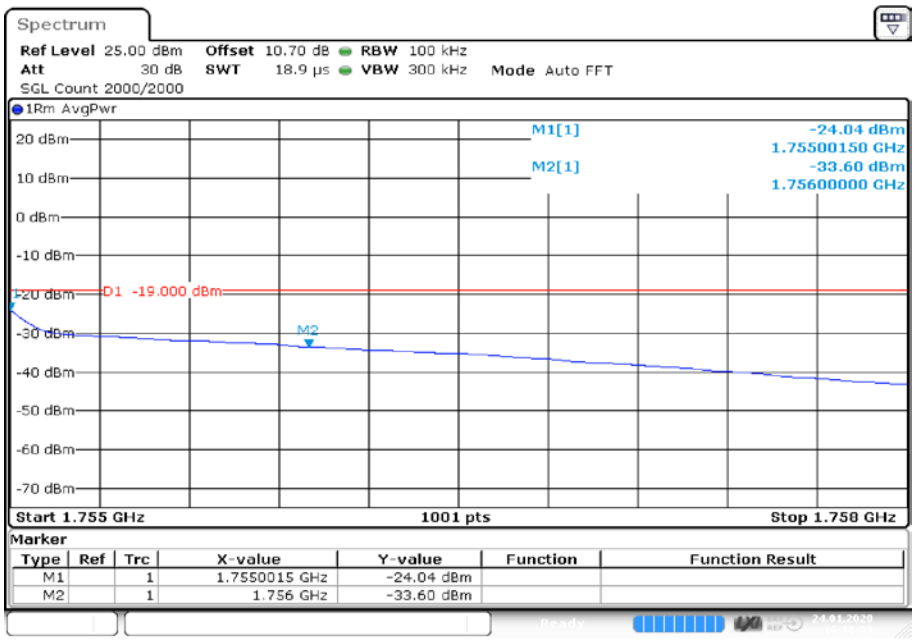
Date: 24.JAN.2020 10:54:23

Frequency Band = Band 4, Direction = Uplink, Signal Type = GSM, Band Edge = upper (S01_AA01)



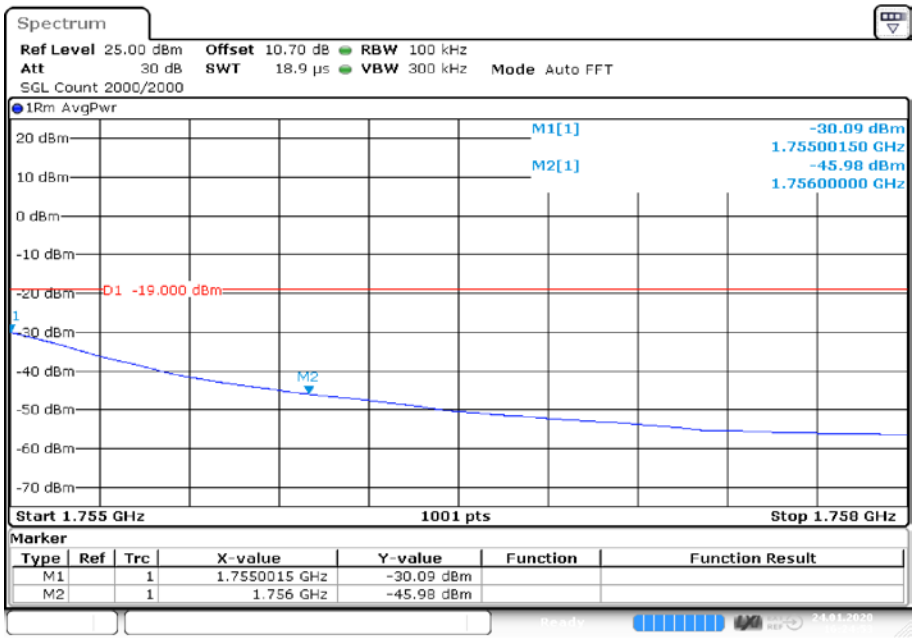
Date: 24.JAN.2020 16:08:01

Frequency Band = Band 4, Direction = Uplink, Signal Type = LTE, Band Edge = upper (S01_AA01)



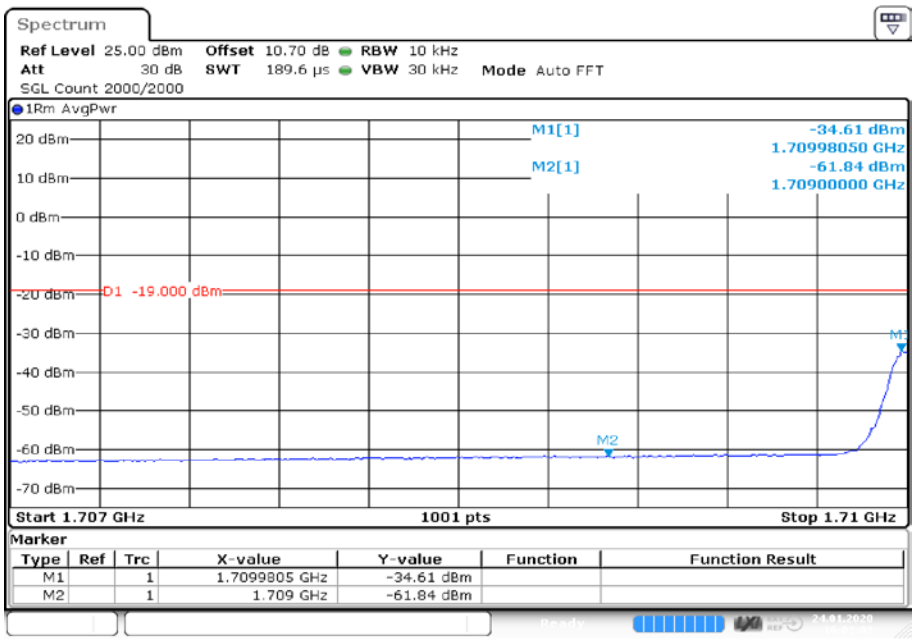
Date: 24.JAN.2020 16:19:00

Frequency Band = Band 4, Direction = Uplink, Signal Type = CDMA, Band Edge = upper (S01_AA01)



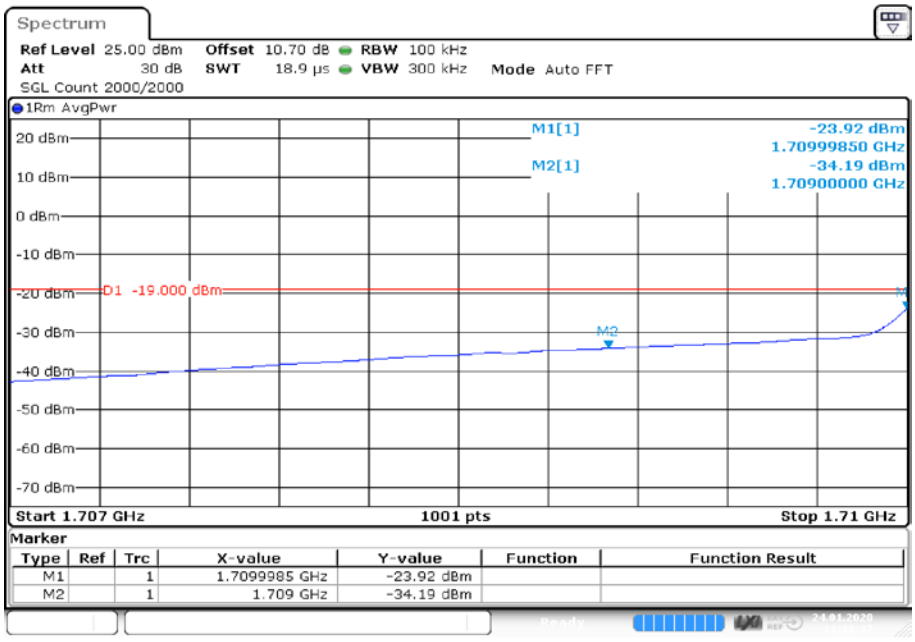
Date: 24.JAN.2020 16:24:54

Frequency Band = Band 4, Direction = Uplink, Signal Type = GSM, Band Edge = lower (S01_AA01)



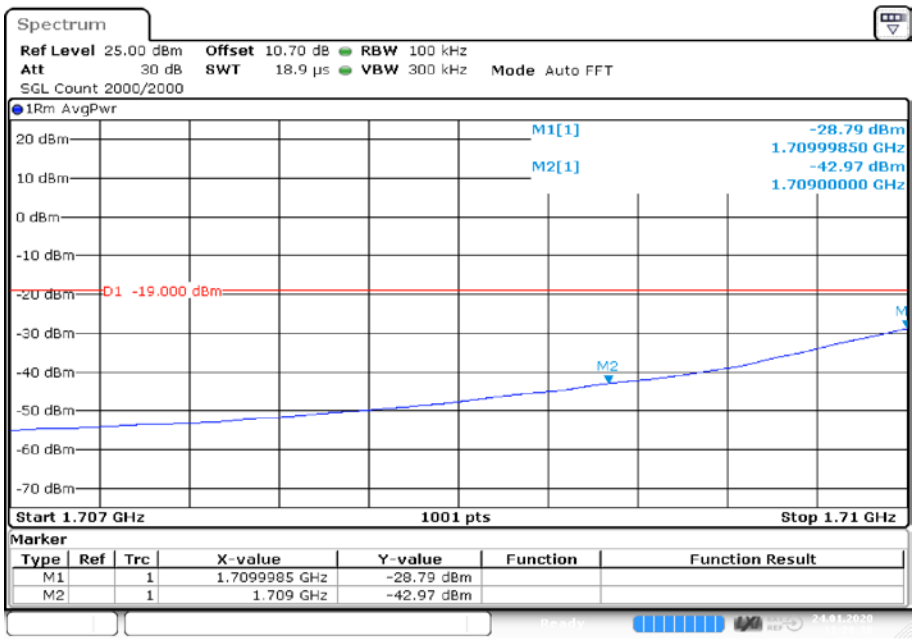
Date: 24.JAN.2020 16:02:03

Frequency Band = Band 4, Direction = Uplink, Signal Type = LTE, Band Edge = lower (S01_AA01)



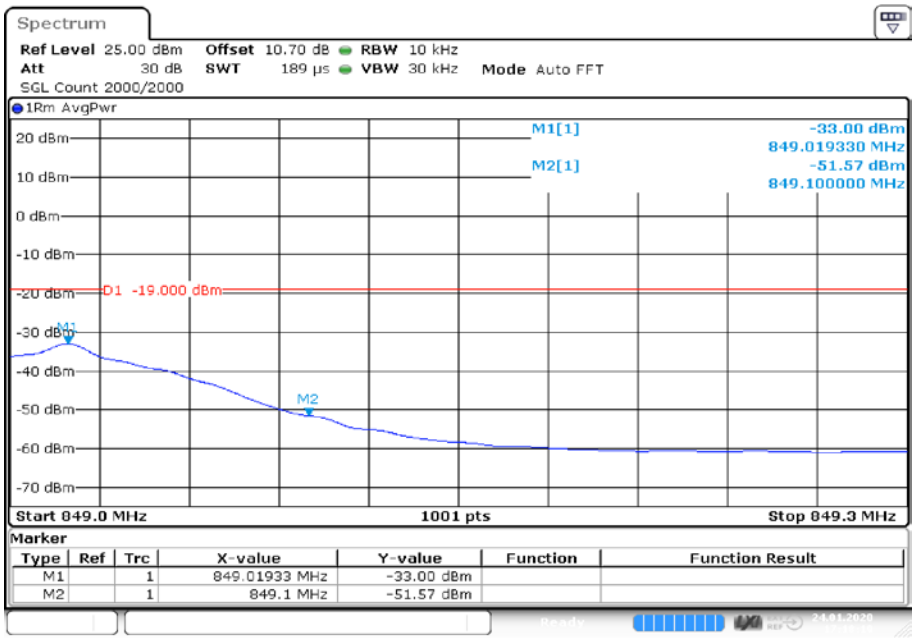
Date: 24.JAN.2020 12:22:37

Frequency Band = Band 4, Direction = Uplink, Signal Type = CDMA, Band Edge = lower (S01_AA01)



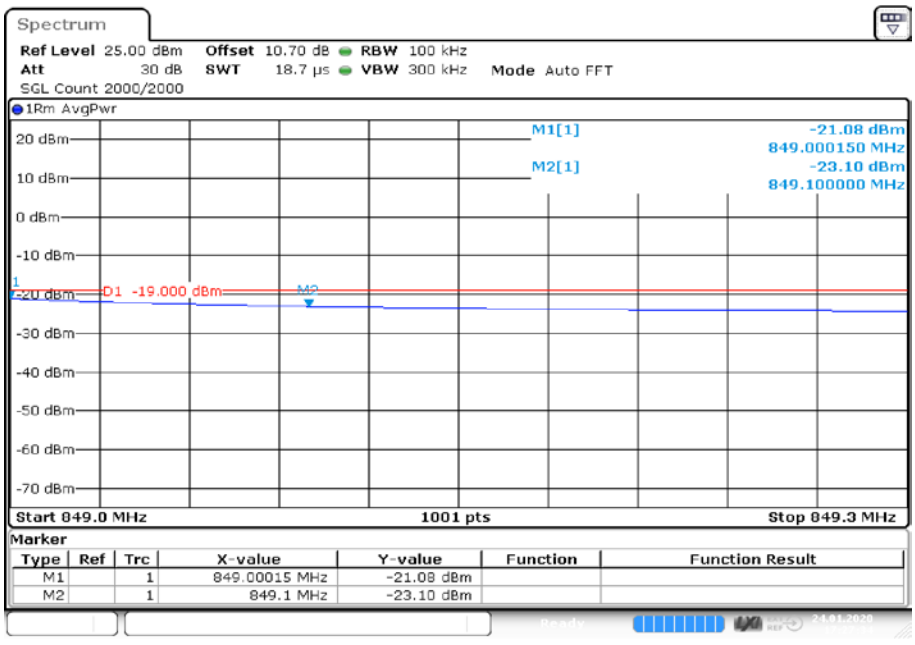
Date: 24.JAN.2020 12:28:30

Frequency Band = Band 5, Direction = Uplink, Signal Type = GSM, Band Edge = upper (S01_AA01)



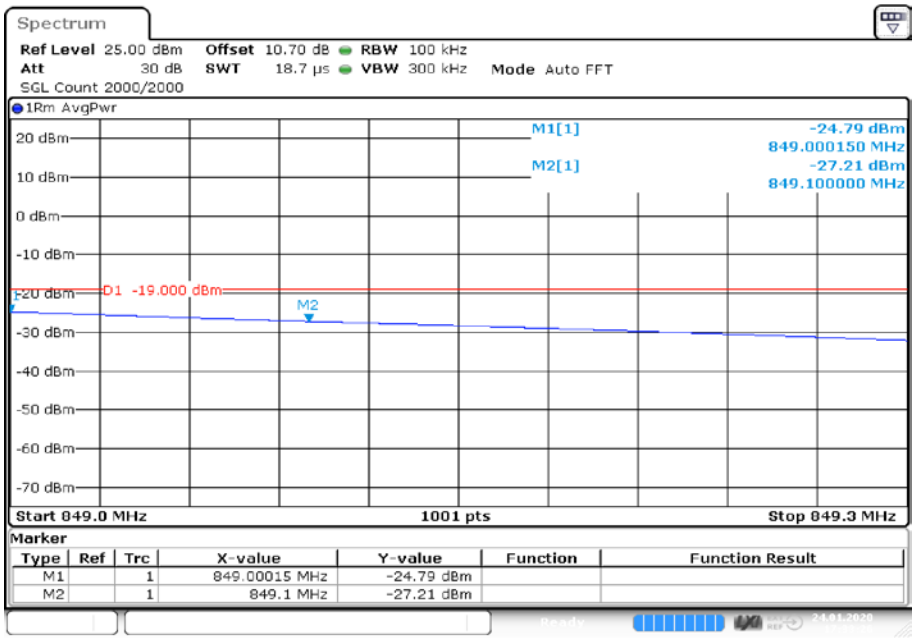
Note: Wrong offset, actual value is 0.3 dB lower

Frequency Band = Band 5, Direction = Uplink, Signal Type = LTE, Band Edge = upper (S01_AA01)



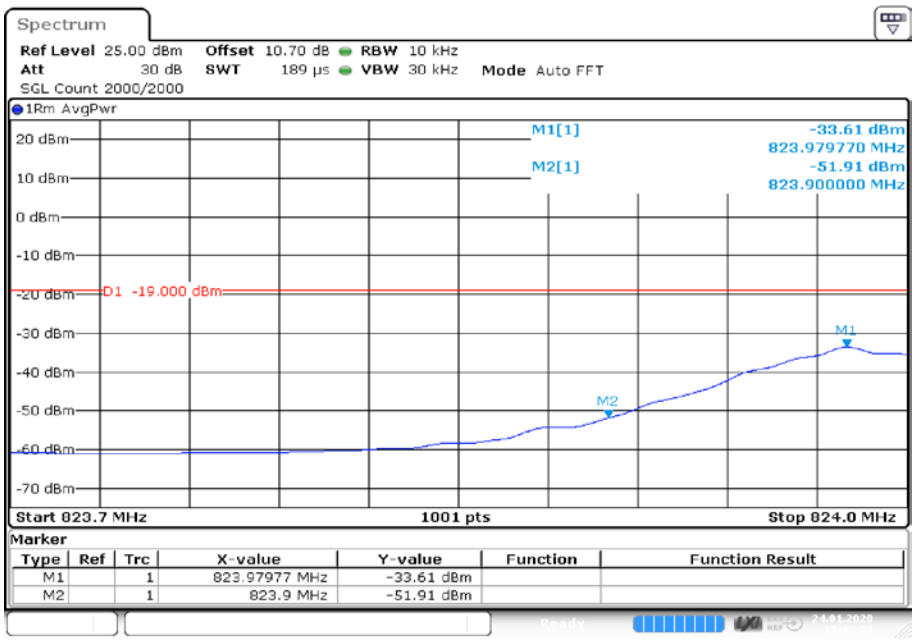
Note: Wrong offset, actual value is 0.3 dB lower

Frequency Band = Band 5, Direction = Uplink, Signal Type = CDMA, Band Edge = upper (S01_AA01)



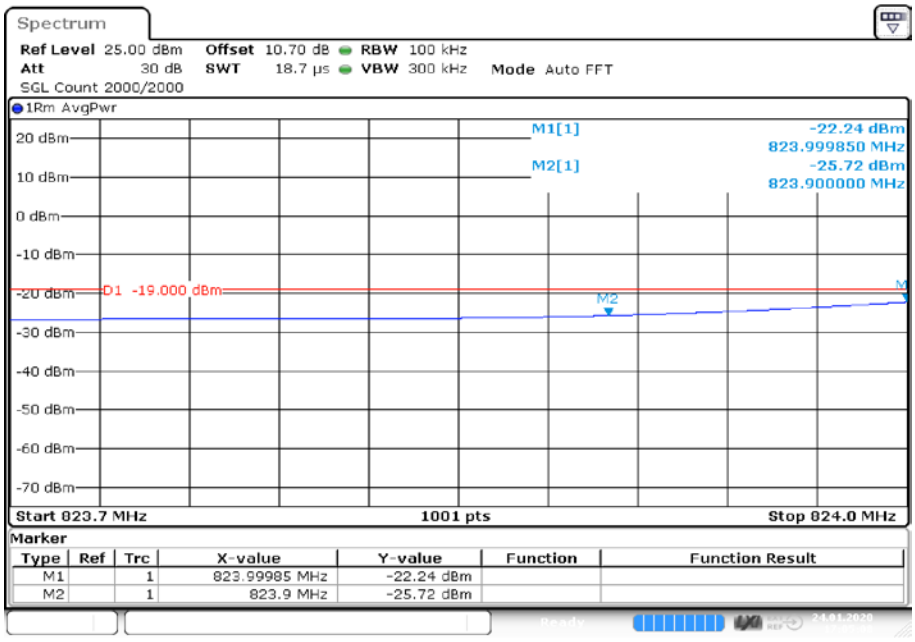
Note: Wrong offset, actual value is 0.3 dB lower

Frequency Band = Band 5, Direction = Uplink, Signal Type = GSM, Band Edge = lower (S01_AA01)



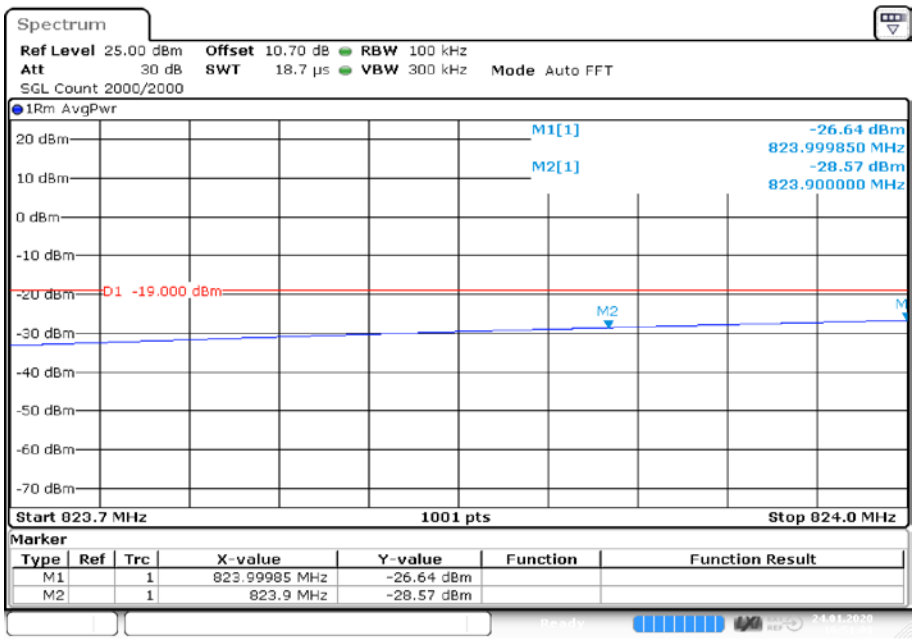
Note: Wrong offset, actual value is 0.3 dB lower

Frequency Band = Band 5, Direction = Uplink, Signal Type = LTE, Band Edge = lower (S01_AA01)



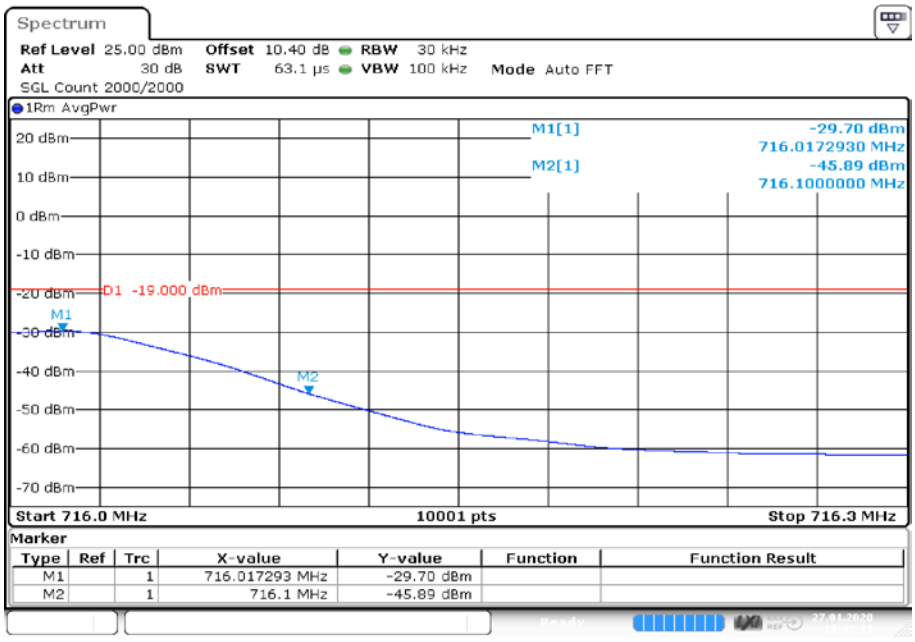
Date: 24.JAN.2020 17:05:08

Frequency Band = Band 5, Direction = Uplink, Signal Type = CDMA, Band Edge = lower (S01_AA01)



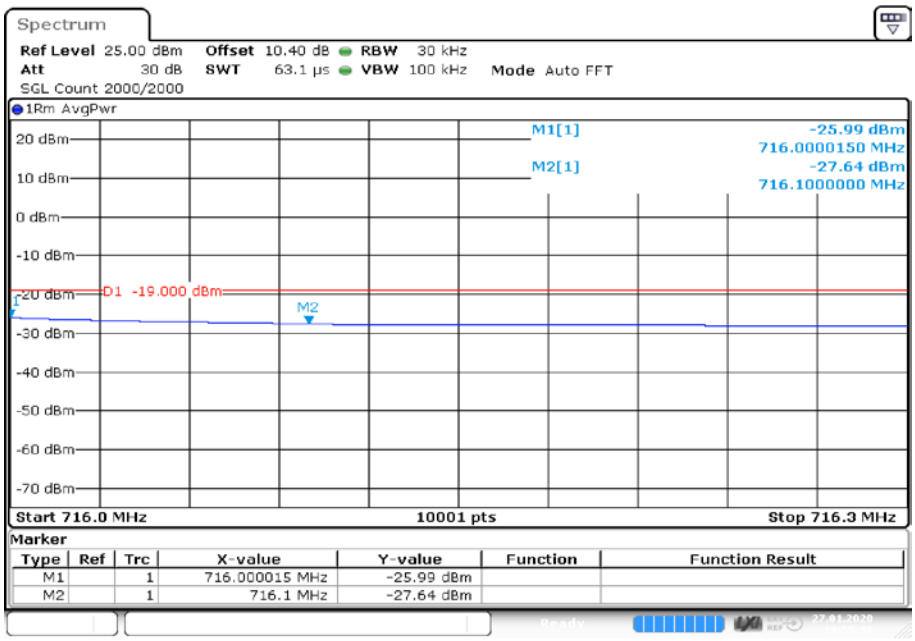
Date: 24.JAN.2020 16:51:09

Frequency Band = Band 12, Direction = Uplink, Signal Type = GSM, Band Edge = upper (S01_AA01)



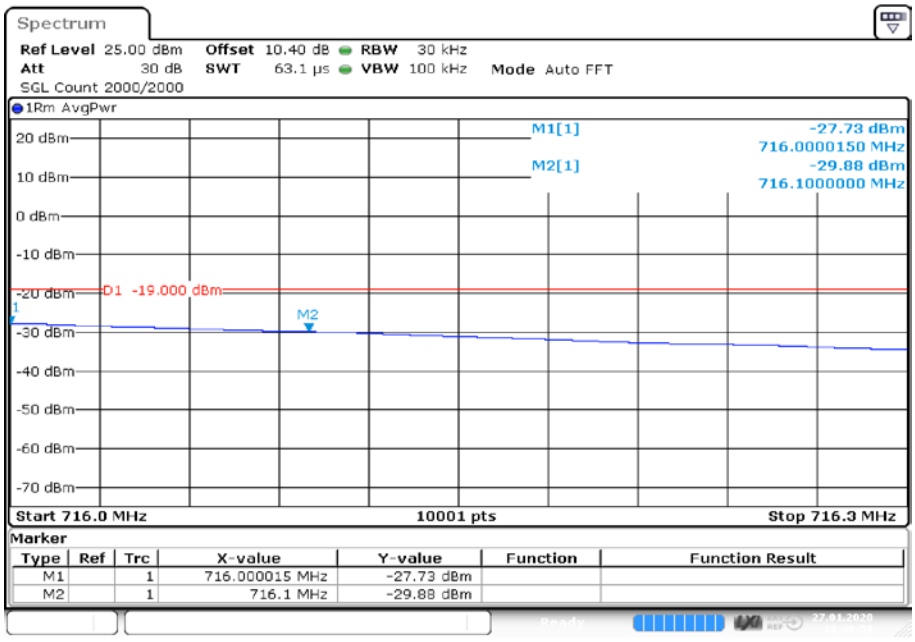
Date: 27.JAN.2020 18:43:21

Frequency Band = Band 12, Direction = Uplink, Signal Type = LTE, Band Edge = upper (S01_AA01)



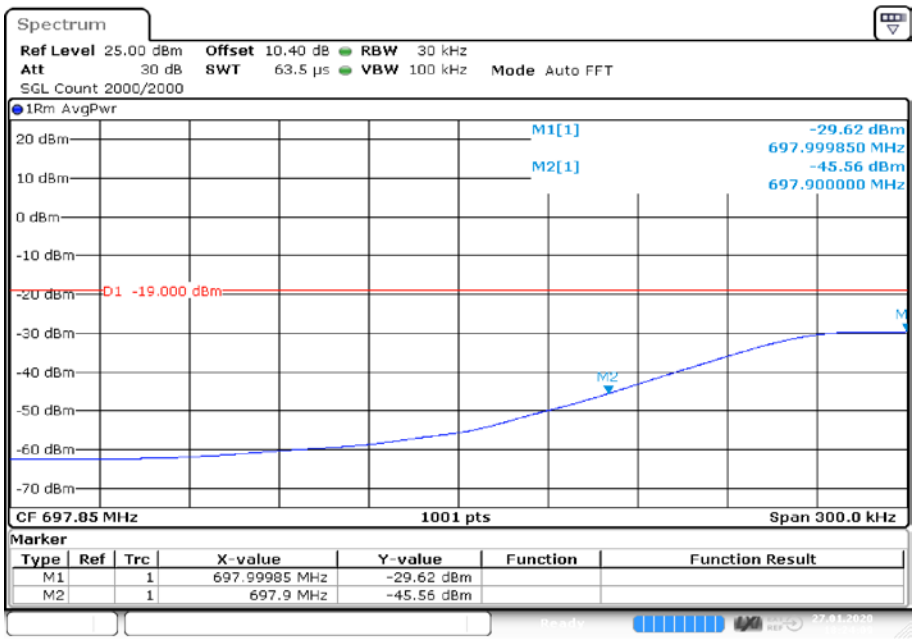
Date: 27.JAN.2020 18:55:36

Frequency Band = Band 12, Direction = Uplink, Signal Type = CDMA, Band Edge = upper (S01_AA01)



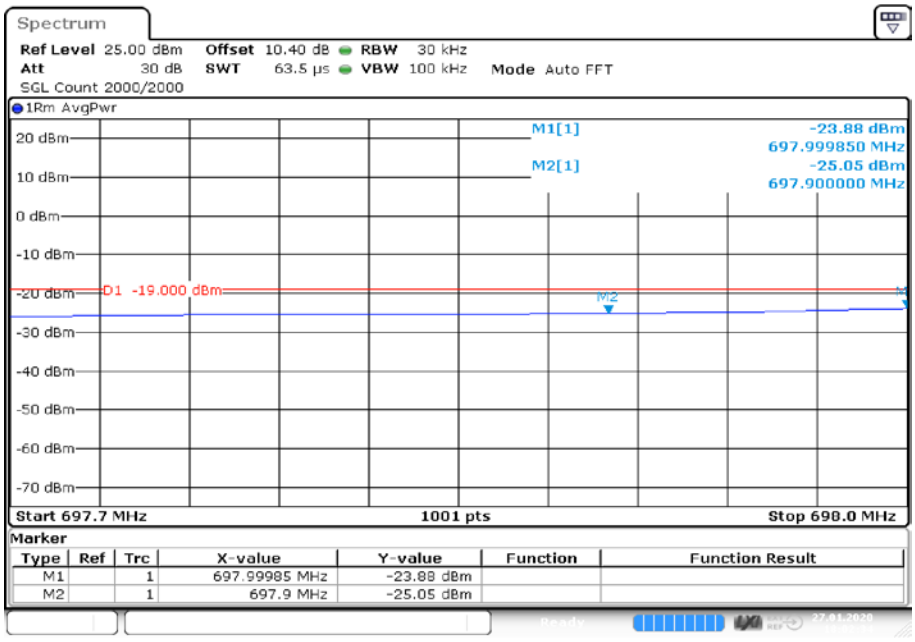
Date: 27.JAN.2020 18:48:59

Frequency Band = Band 12, Direction = Uplink, Signal Type = GSM, Band Edge = lower (S01_AA01)



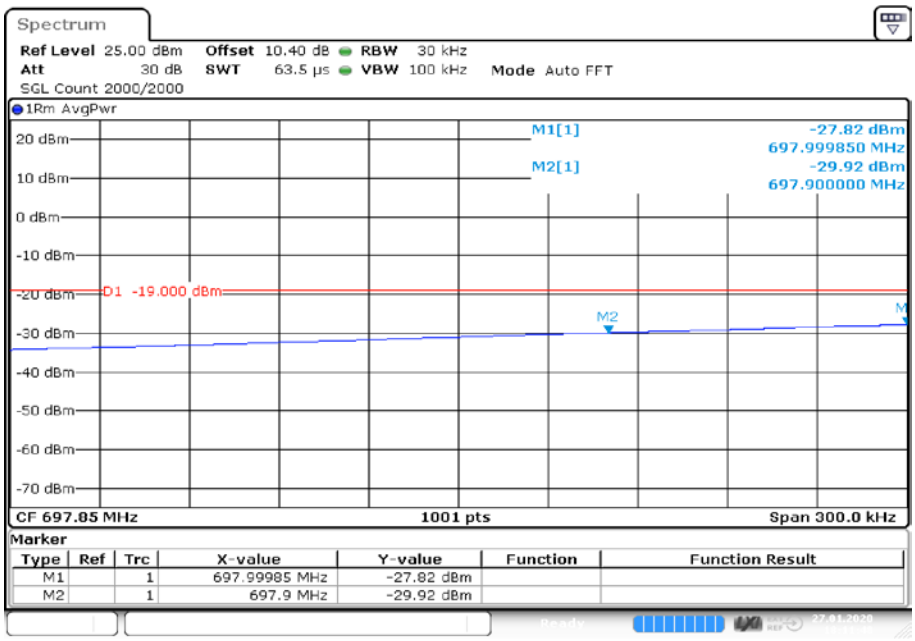
Date: 27.JAN.2020 18:24:09

Frequency Band = Band 12, Direction = Uplink, Signal Type = LTE, Band Edge = lower (S01_AA01)



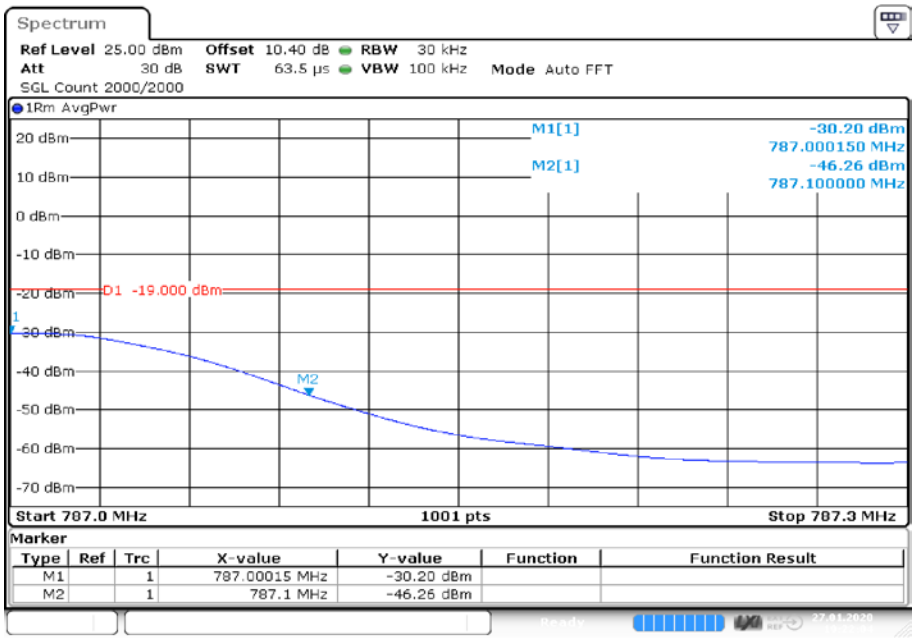
Date: 27.JAN.2020 18:02:34

Frequency Band = Band 12, Direction = Uplink, Signal Type = CDMA, Band Edge = lower (S01_AA01)



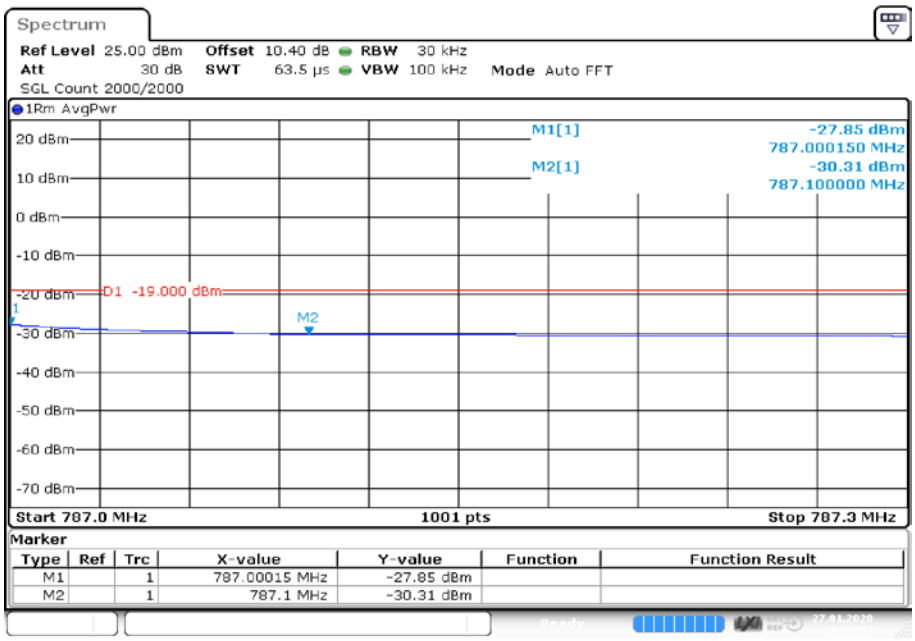
Date: 27.JAN.2020 18:11:48

Frequency Band = Band 13, Direction = Uplink, Signal Type = GSM, Band Edge = upper (S01_AA01)



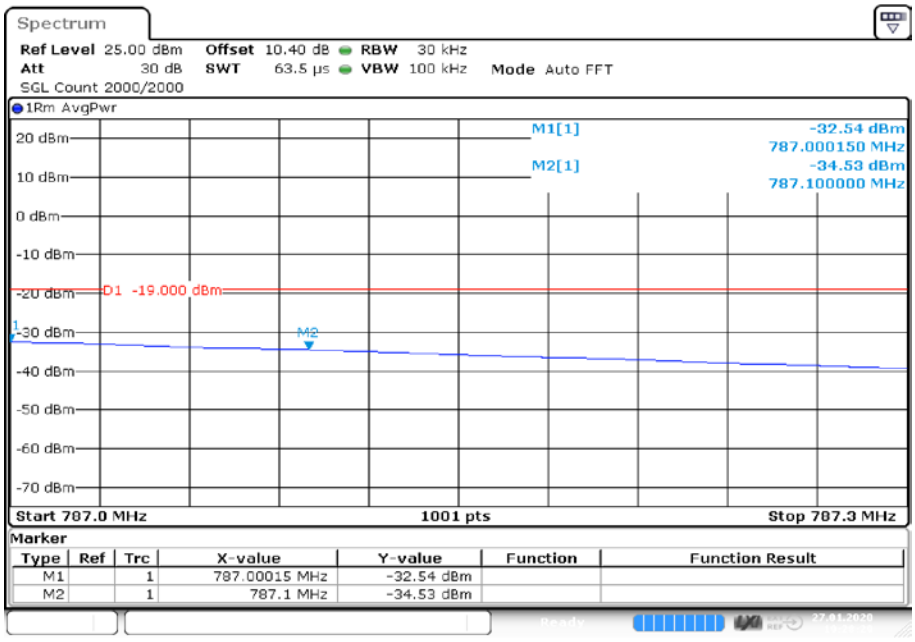
Date: 27.JAN.2020 19:22:04

Frequency Band = Band 13, Direction = Uplink, Signal Type = LTE, Band Edge = upper (S01_AA01)



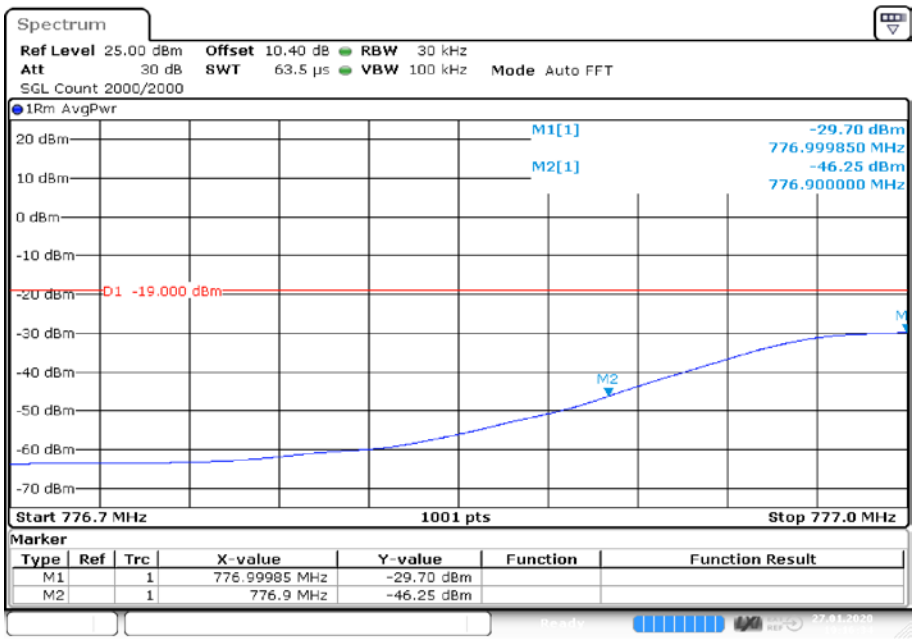
Date: 27.JAN.2020 19:33:57

Frequency Band = Band 13, Direction = Uplink, Signal Type = CDMA, Band Edge = upper (S01_AA01)



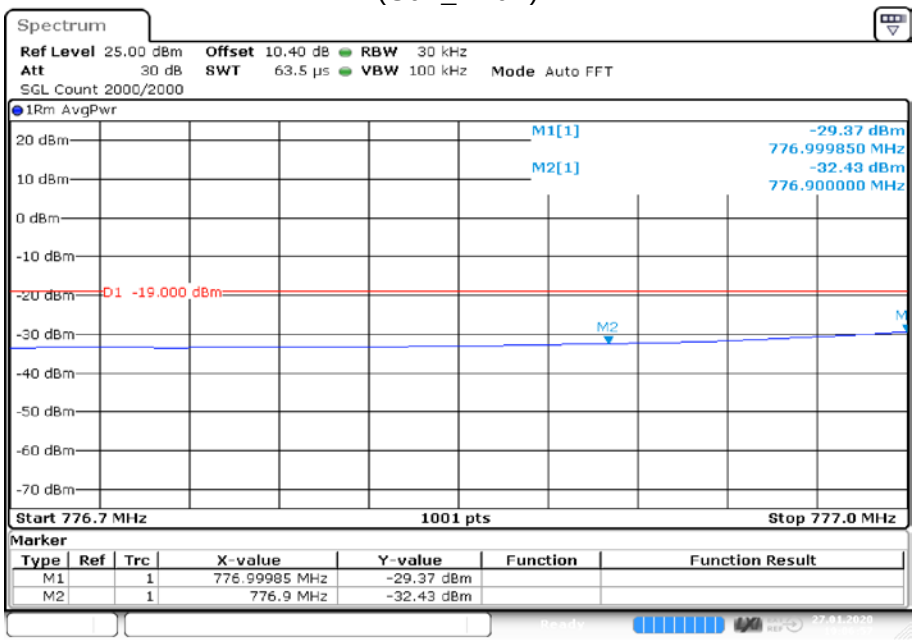
Date: 27.JAN.2020 19:28:29

Frequency Band = Band 13, Direction = Uplink, Signal Type = GSM, Band Edge = lower (S01_AA01)



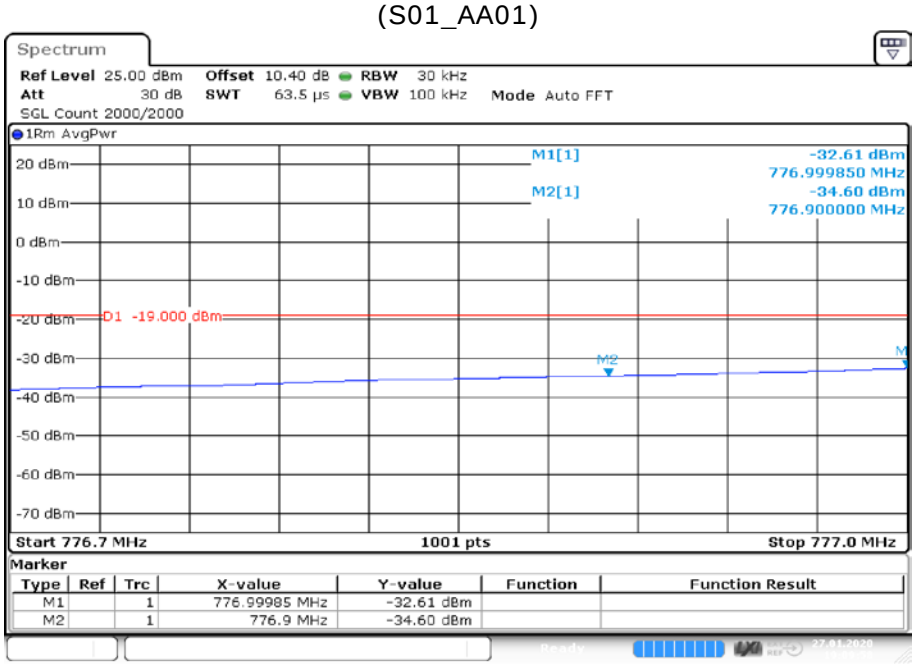
Date: 27.JAN.2020 19:16:33

Frequency Band = Band 13, Direction = Uplink, Signal Type = LTE, Band Edge = lower (S01_AA01)



Date: 27.JAN.2020 19:06:57

Frequency Band = Band 13, Direction = Uplink, Signal Type = CDMA, Band Edge = lower (S01_AA01)



Date: 27.JAN.2020 19:09:58

5.5.5 TEST EQUIPMENT USED

- R&S TS8997

5.6 CONDUCTED SPURIOUS EMISSIONS

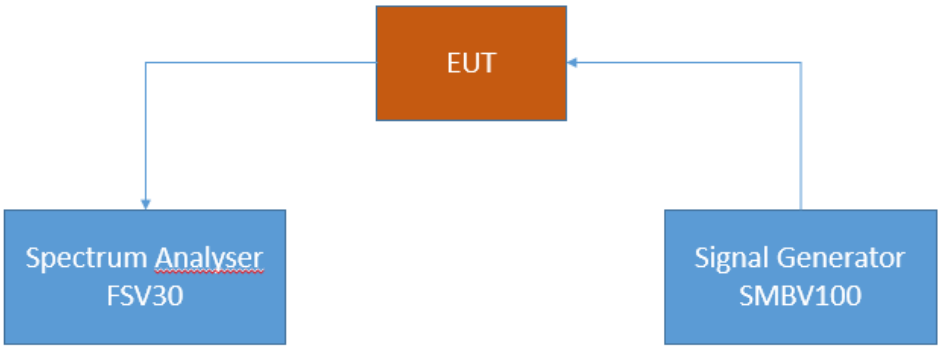
Standard

The test was performed according to:
KDB 935210 D03

5.6.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the applicable conducted spurious emission limits per § 2.1051

The EUT was connected to the test setup according to the following diagram:



FCC Part 20.21; Consumer Signal Booster – Test Setup 7.6; Conducted Spurious Emissions

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.6.2 TEST REQUIREMENTS / LIMITS

FCC Part 2.1051; Measurement required: Spurious emissions at antenna terminal:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

FCC Part 20, § 20.21(e)(8)(i)(E)

Out of Band Emission Limits. Booster out of band emissions (OOBE) shall be at least 6 dB below the FCC's mobile emission limits for the supported bands of operation. Compliance to OOBE limits will utilize high peak-to-average CMRS signal types.

Part 22, Subpart H – Cellular Radiotelephone Service; Band 5 (Cellular)

§ 22 917 – Emission limitations for cellular equipment

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

Part 24 E – Personal Communication Services

§ 24.238 – Emission limitations for Broadband PCS equipment; Band 2 (Broadband PCS)

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

Part 27 – Miscellaneous Wireless Communication Services;

Band 4 (AWS-1)
§ 27.53 (h) – Emission limits

(1) *General protection levels.* Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.
(2) *Additional protection levels.* Notwithstanding the foregoing paragraph (h)(1) of this section:
(i) Operations in the 2180-2200 MHz band are subject to the out-of-band emission requirements set forth in §27.1134 for the protection of federal government operations operating in the 2200-2290 MHz band.
(ii) For operations in the 2000-2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 $\log_{10}$(P) dB.
(iii) For operations in the 1915-1920 MHz band, the power of any emission between 1930-1995 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 $\log_{10}$(P) dB.
(iv) For operations in the 1995-2000 MHz band, the power of any emission between 2005-2020 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 $\log_{10}$(P) dB.
Band 12 (Lower 700 MHz)
§ 27.53 (g) – Emission limits

For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed

Band 13 (Upper 700 MHz)
§ 27.53 (c), (f) – Emission limits

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

5.6.3 TEST PROTOCOL

Ambient temperature: 23 °C
Air Pressure: 1030 hPa
Humidity: 34 %

Band 2, downlink; Center frequency: 1960.00 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]	
0.027	-70.7	-23	PEAK	2	-46	24.7	
477.7	-34.8	-23	PEAK	1000	-19	15.8	
5902.1	-29.4	-23	PEAK	1000	-19	10.4	
6950.3	-28.8	-23	PEAK	1000	-19	9.8	
19706.3	-30.7	-23	PEAK	1000	-19	11.7	

Band 4, downlink; Center frequency: 2132.50 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]	
0.014	-67.8	-23.9	PEAK	2	-46	21.8	
203.5	-35.6	-23.9	PEAK	1000	-19	16.6	
961.7	-34.3	-23.9	PEAK	1000	-19	15.3	
5830.4	-29.6	-23.9	PEAK	1000	-19	10.6	
6996.7	-28.3	-23.9	PEAK	1000	-19	9.3	
19665.3	-30.2	-23.9	PEAK	1000	-19	11.2	

Band 5, downlink; Center frequency: 881.5.0 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]	
0.009	-68.8	-23.4	PEAK	2	-36	32.8	
116.4	-46.2	-23.4	PEAK	100	-19	27.2	
193.1	-45.8	-23.4	PEAK	100	-19	26.8	
397.1	-44.9	-23.4	PEAK	100	-19	25.9	
908.3	-44.1	-23.4	PEAK	100	-19	25.1	
6960.5	-38.1	-23.4	PEAK	100	-19	19.1	

Band 12, downlink; Center frequency: 737.00 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]	
0.009	-68.2	-21.7	PEAK	2	-36	32.2	
13.1	-58.9	-21.7	PEAK	100	-19	39.9	
658.9	-44.6	-21.7	PEAK	100	-19	25.6	
890.6	-43.7	-21.7	PEAK	100	-19	24.7	
6934.3	-38.2	-21.7	PEAK	100	-19	19.2	

Band 13, downlink; Center frequency: 751.00 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]	
0.009	-83.4	-22.2	PEAK	2	-36	47.4	
322.5	-60.1	-22.2	PEAK	100	-19	41.1	
764.4	-69.7	-22.2	PEAK	10	-41	28.7	
794.5	-71.0	-22.2	PEAK	10	-41	30.0	
1598.5	-63.0	-22.2	PEAK	100	-56	7.0	1)
1807.3	-61.2	-22.2	PEAK	100	-19	42.2	
6924.4	-54.4	-22.2	PEAK	100	-19	35.4	

Band 2, uplink; Center frequency: 1880.00 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]	
0.010	-66.9	-1.9	PEAK	2	-46	20.9	
883.7	-34.5	-1.9	PEAK	1000	-19	15.5	
5635.7	-29.0	-1.9	PEAK	1000	-19	10.0	
6937.8	-29.3	-1.9	PEAK	1000	-19	10.3	
19756.6	-30.5	-1.9	PEAK	1000	-19	11.5	

Band 4, uplink; Center frequency: 1732.50 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
0.030	-68.5	-2.1	PEAK	2	-46	22.5
21.7	-37.2	-2.1	PEAK	1000	-19	18.2
947.8	-34.2	-2.1	PEAK	1000	-19	15.2
6971.6	-28.5	-2.1	PEAK	1000	-19	9.5
19675.0	-30.3	-2.1	PEAK	1000	-19	11.3

Band 5, uplink; Center frequency: 836.50 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
0.023	-65.7	-1.3	PEAK	2	-36	29.7
115.7	-45.4	-1.3	PEAK	100	-19	26.4
850.3	-44.4	-1.3	PEAK	100	-19	25.4
933.3	-43.9	-1.3	PEAK	100	-19	24.9
2508.5	-43.0	-1.3	PEAK	100	-19	24.0
6920.8	-37.9	-1.3	PEAK	100	-19	18.9
9426.9	-44.0	-1.3	PEAK	100	-19	25.0

Band 12, uplink; Center frequency: 707.00 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
0.033	-67.1	-1.8	PEAK	2	-36	31.1
1.7	-54.3	-1.8	PEAK	100	-19	35.3
716.1	-40.3	-1.8	PEAK	100	-19	21.3
737.4	-45.5	-1.8	PEAK	100	-19	26.5
6982.7	-38.0	-1.8	PEAK	100	-19	19.0

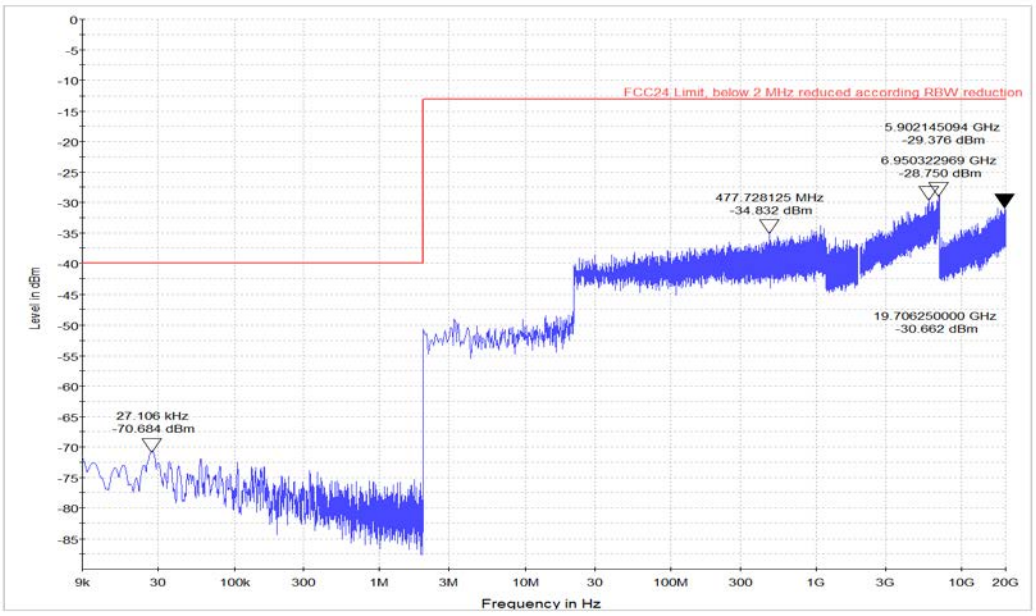
Band 13, uplink; Center frequency: 782.00 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]	
0.012	-67.3	-2.4	PEAK	2	-36	31.3	
1.2	-53.9	-2.4	PEAK	100	-19	34.9	
774.9	-45.8	-2.4	PEAK	10	-41	4.8	
775.8	-29.7	-2.4	PEAK	100	-19	10.7	
787.1	-25.9	-2.4	PEAK	100	-19	6.9	
794.3	-54.2	-2.4	PEAK	10	-41	13.2	
1576.7	-58.9	-2.4	RMS	100	-56	2.9	1)
6945.9	-37.5	-2.4	PEAK	100	-19	18.5	

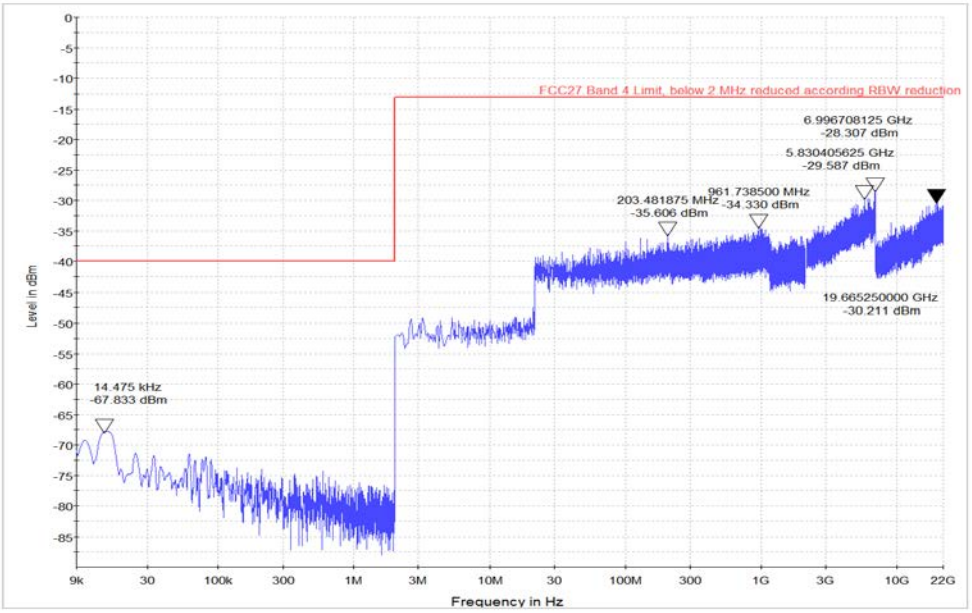
Remark: Please see next sub-clause for the measurement plot.
Plots show regular mobile emission limit. Limit in table is the 6 dB reduced booster limit.
1) The given Spurious Level is the conducted level without antenna gain. The given limit is the limit for E.I.R.P. narrow band emissions (< 700 Hz, wide band limit is 10 dB higher) emitted by the antenna. While this limit is not applicable to conducted values (actual limit is -19 dBm), the margin to limit gives a rough estimate on possible antenna gain margin.

5.6.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, “WORST CASE”)

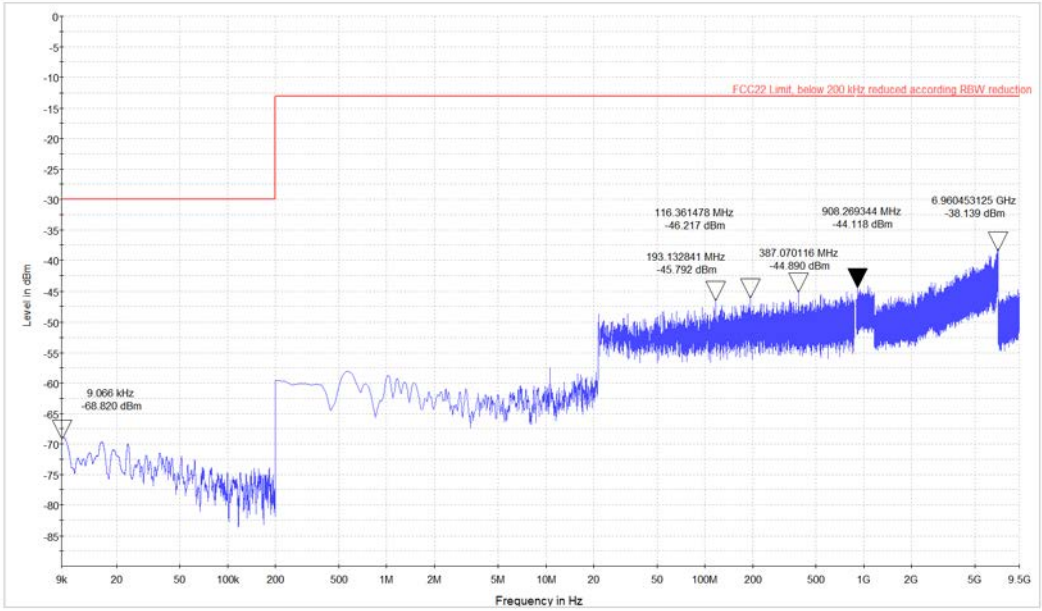
Frequency Band = Band 2, Direction = Downlink
(S01_AA01)



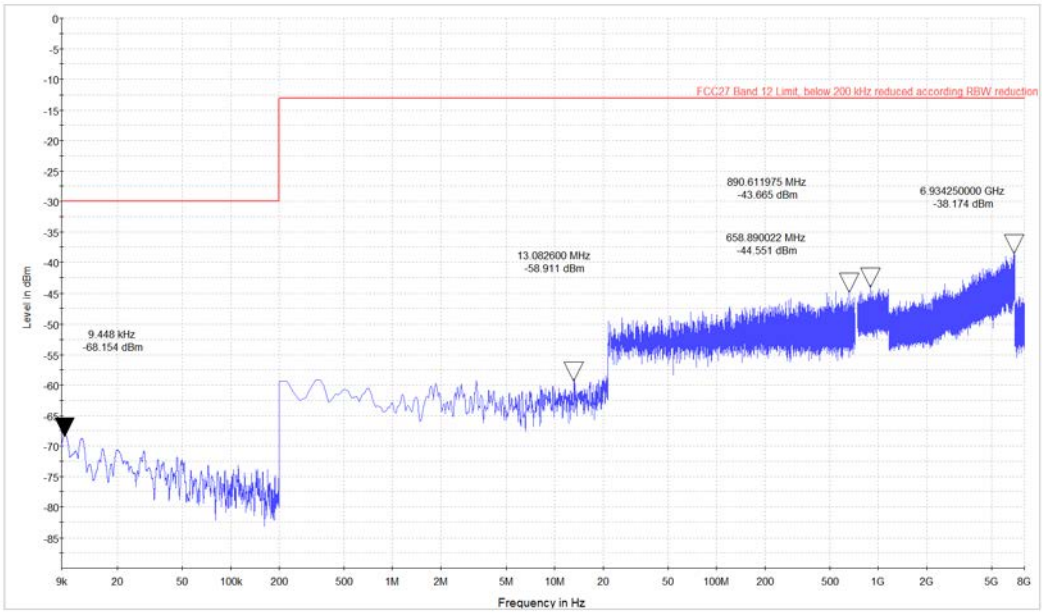
Frequency Band = Band 4, Direction = Downlink
(S01_AA01)



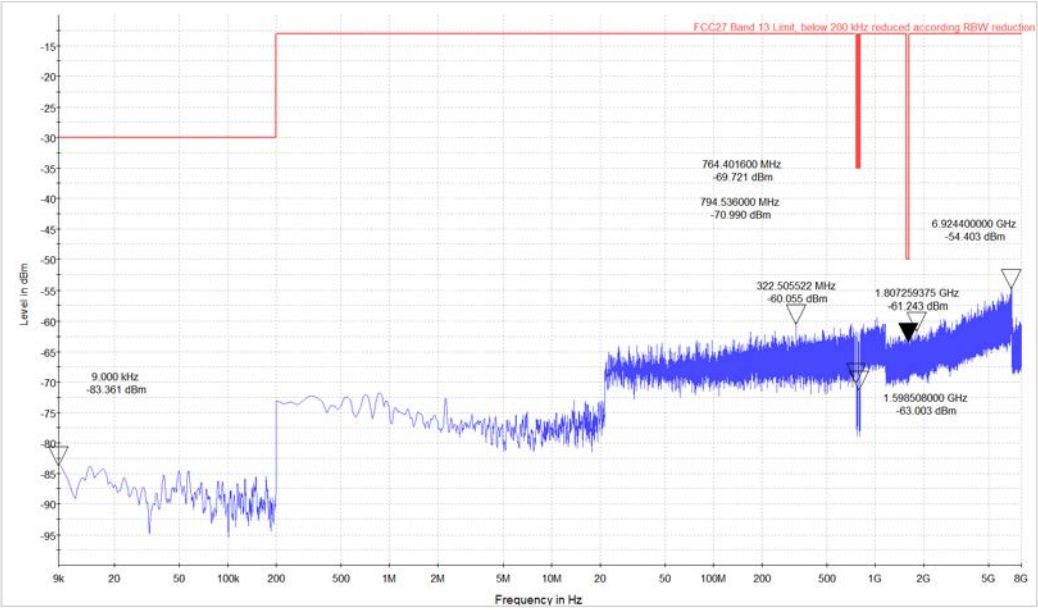
Frequency Band = Band 5, Direction = Downlink
(S01_AA01)



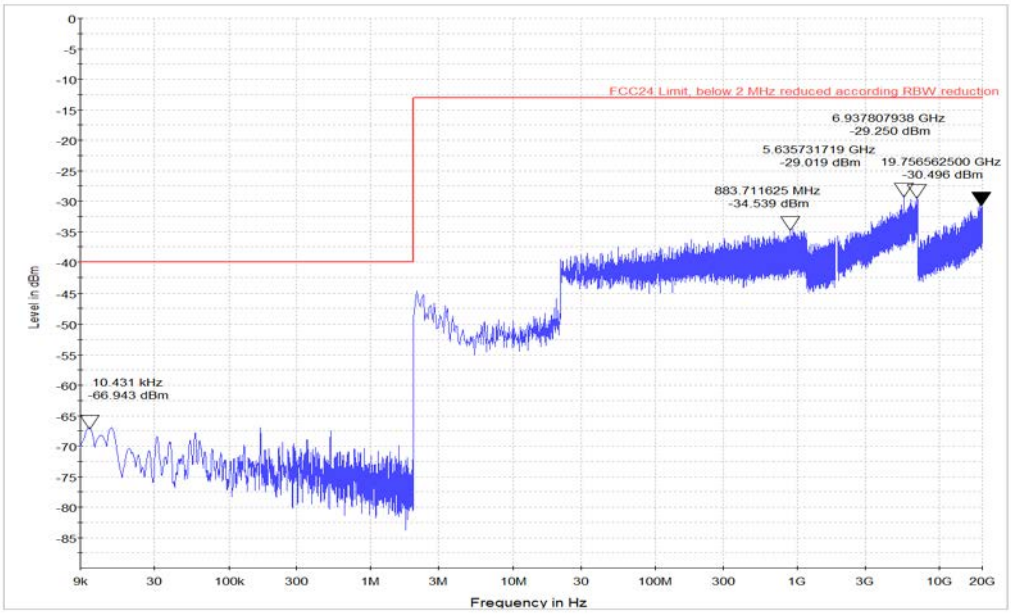
Frequency Band = Band 12, Direction = Downlink
(S01_AA01)



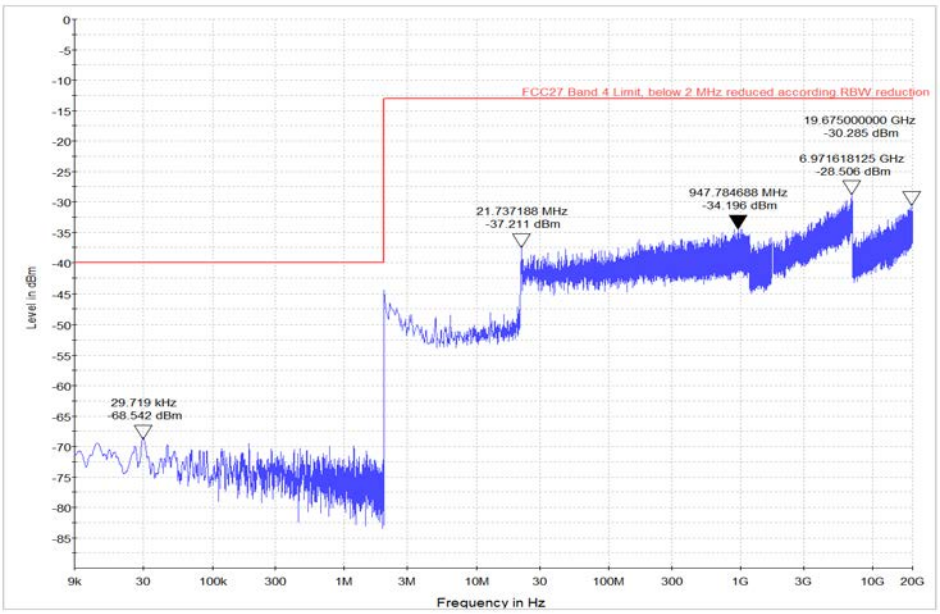
Frequency Band = Band 13, Direction = Downlink
(S01_AA01)



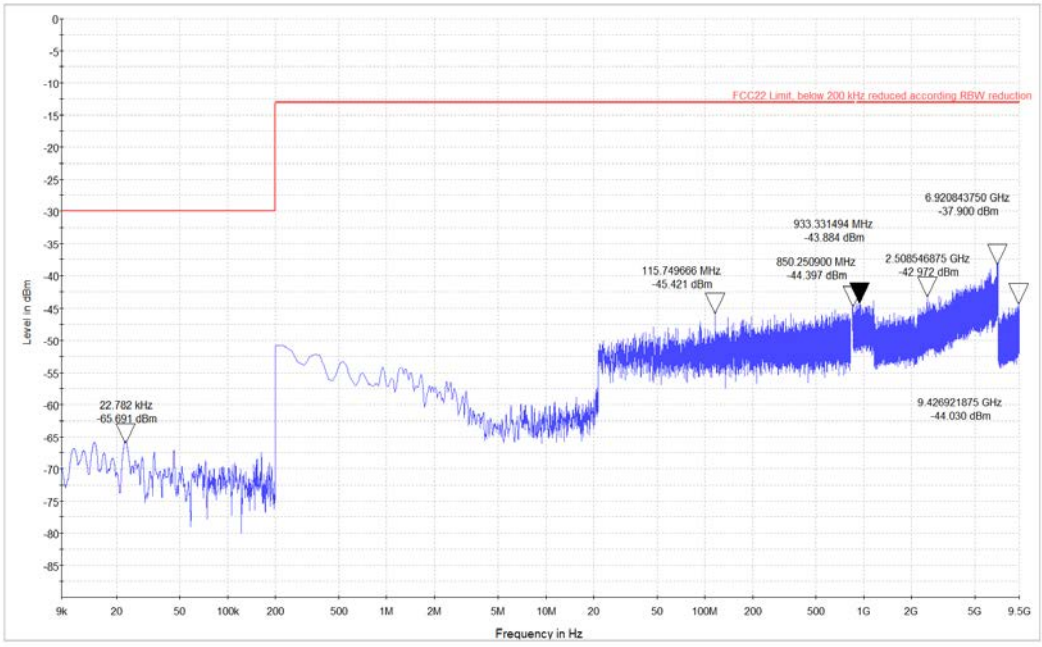
Frequency Band = Band 2, Direction = Uplink
(S01_AA01)



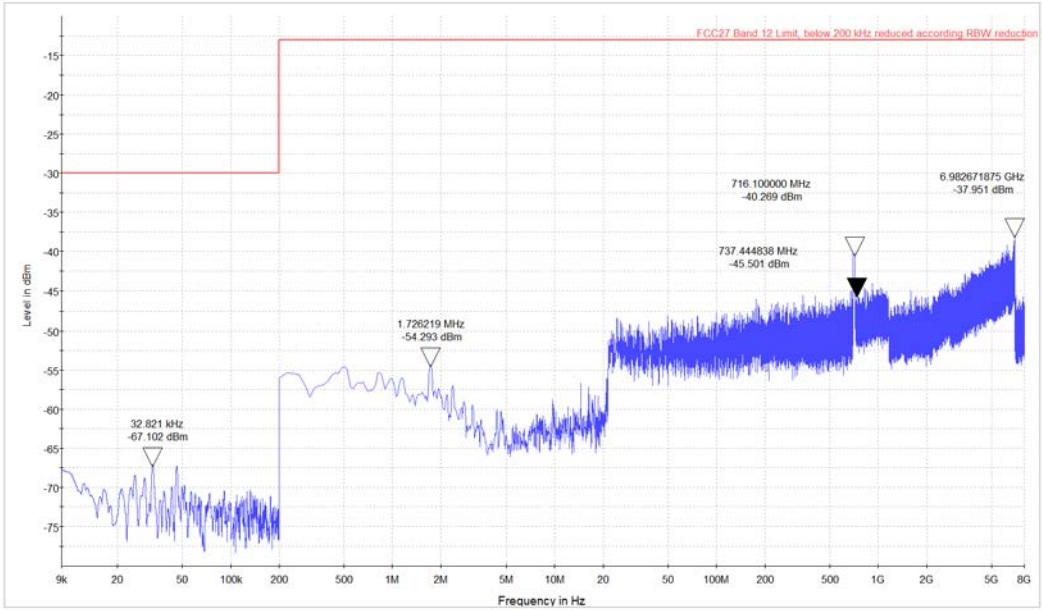
Frequency Band = Band 4, Direction = Uplink
(S01_AA01)



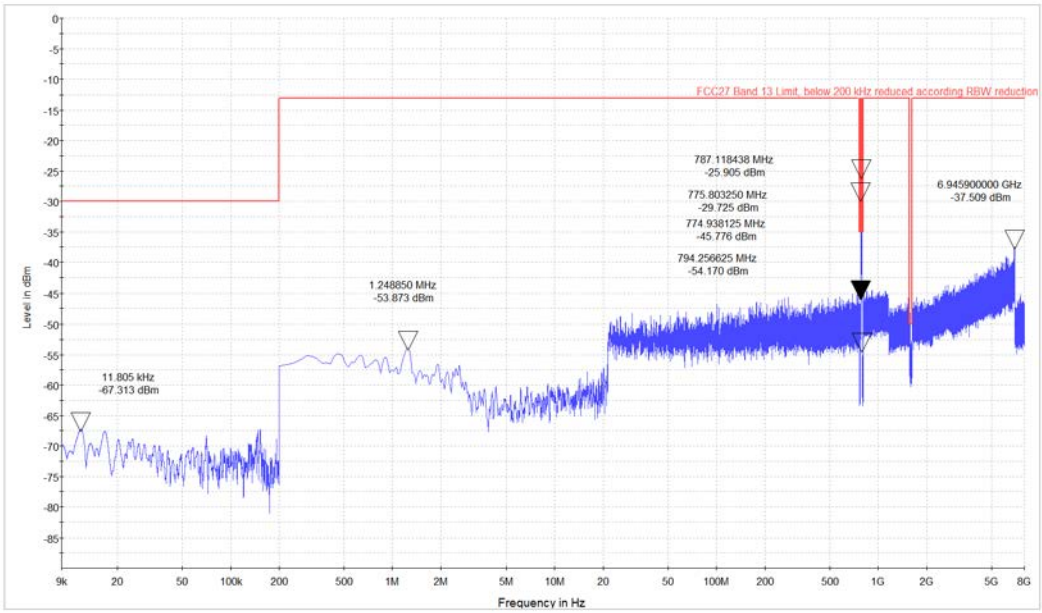
Frequency Band = Band 5, Direction = Uplink
(S01_AA01)

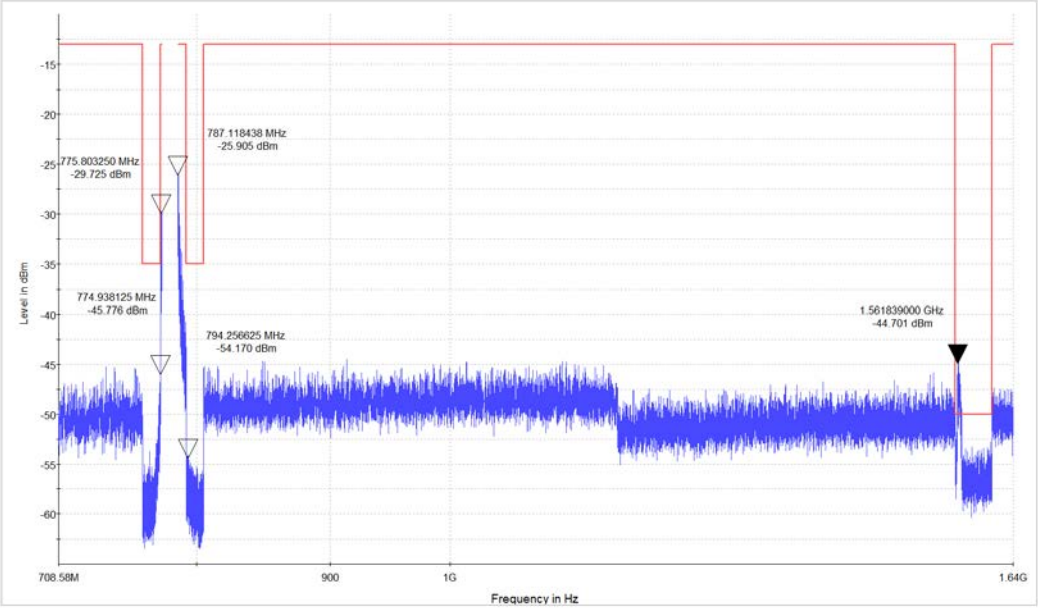


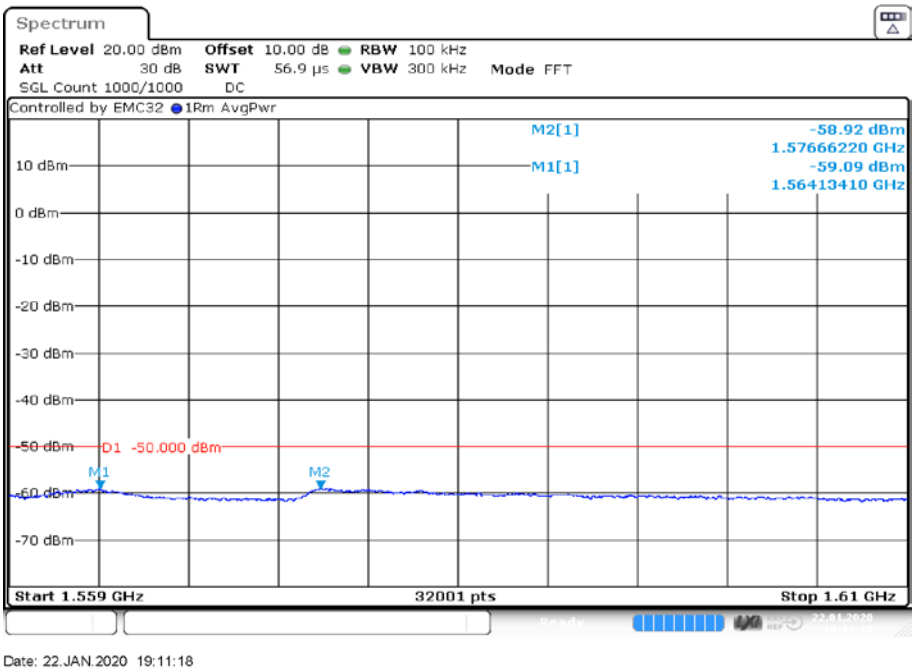
Frequency Band = Band 12, Direction = Uplink
(S01_AA01)



Frequency Band = Band 13, Direction = Uplink
(S01_AA01)







Date: 22.JAN.2020 19:11:18

5.6.5 TEST EQUIPMENT USED

- R&S TS8997

5.7 MAXIMUM TRANSMITTER NOISE POWER

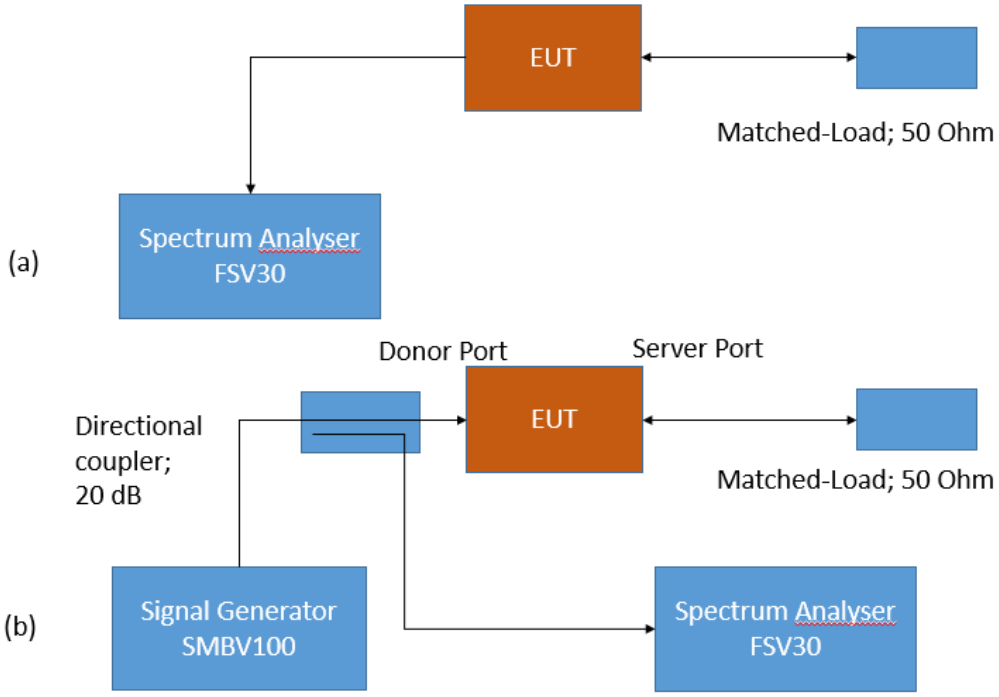
Standard

The test was performed according to:
KDB 935210 D03

5.7.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the noise limits (uplink) and Transmitter Power Off Mode limits (uplink and downlink noise power) according § 20.21(e)(8)(i)(A) and § 20.21 €(8)(i)(H) for wideband consumer signal boosters.

The EUT was connected to the test setups according to the following diagrams:



FCC Part 20.21; Consumer Signal Booster – Test Setup 7.7.1; Maximum Transmitter Noise Power Level

Setup (a); Downlink/uplink noise without presence of an input signal
Setup (b); Uplink noise in presence of an input signal

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.7.2 TEST REQUIREMENTS / LIMITS

FCC Part 20, § 20.21(e)(8)(i)(A)

Noise Limits. (1) The transmitted noise power in dBm/MHz of consumer boosters at their uplink port shall not exceed −103 dBm/MHz—RSSI. RSSI (received signal strength indication expressed in negative dB units relative to 1 mW) is the downlink composite received signal power in dBm at the booster donor port for all base stations in the band of operation.

(2) The transmitted maximum noise power in dBm/MHz of consumer boosters at their uplink and downlink ports shall not exceed the following limits:

(i) Fixed booster maximum noise power shall not exceed −102.5 dBm/MHz + 20 Log_{10} (Frequency), where Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.

(ii) Mobile booster maximum noise power shall not exceed−59 dBm/MHz.

(iii) Compliance with Noise limits will use instrumentation calibrated in terms of RMS equivalent voltage, and with booster input ports terminated or without input signals applied within the band of measurement.

FCC Part 20, § 20.21(e)(8)(i)(H)

Transmit Power Off Mode. When the consumer booster cannot otherwise meet the noise and gain limits defined herein it must operate in “Transmit Power Off Mode.” In this mode of operation, the uplink and downlink noise power shall not exceed −70 dBm/MHz and both uplink and downlink gain shall not exceed the lesser of 23 dB or MSCL.

5.7.3 TEST PROTOCOL

Ambient temperature: 25 °C
Air Pressure: 992 hPa
Humidity: 33 %

Band 2, downlink

Input Signal	DL AWGN Signal [MHz]	Input Power [dBm]	Maximum Noise Power [dBm]	Noise Limit [dBm]	Margin to Limit [dB]
None	-	-	-79.2	-59.0	20.2

Band 4, downlink

Input Signal	DL AWGN Signal [MHz]	Input Power [dBm]	Maximum Noise Power [dBm]	Noise Limit [dBm]	Margin to Limit [dB]
None	-	-	-78.6	-59.0	19.6

Band 5, downlink

Input Signal	DL AWGN Signal [MHz]	Input Power [dBm]	Maximum Noise Power [dBm]	Noise Limit [dBm]	Margin to Limit [dB]
None	-	-	-77.9	-59.0	18.9

Band 12, downlink

Input Signal	DL AWGN Signal [MHz]	Input Power [dBm]	Maximum Noise Power [dBm]	Noise Limit [dBm]	Margin to Limit [dB]
None	-	-	-77.3	-59.0	18.3

Band 13, downlink

Input Signal	DL AWGN Signal [MHz]	Input Power [dBm]	Maximum Noise Power [dBm]	Noise Limit [dBm]	Margin to Limit [dB]
None	-	-	-78.4	-59.0	19.4

Band 2, uplink

Input Signal	DL AWGN Signal [MHz]	Input Power [dBm]	Maximum Noise Power [dBm]	Noise Limit [dBm]	Margin to Limit [dB]
None	-	-	-71.5	-59.0	12.5
AWGN DL	1960.0	-36.0	-71.7	-67.0	4.7
AWGN DL	1960.0	-35.0	-71.6	-68.0	3.6
AWGN DL	1960.0	-34.0	-71.6	-69.0	2.6
AWGN DL	1960.0	-33.0	-71.9	-70.0	1.9
AWGN DL	1960.0	-30.0	-71.9	-70.0	1.9
AWGN DL	1960.0	-20.0	-71.9	-70.0	1.9

Band 4, uplink

Input Power	DL AWGN Signal [MHz]	Input Power [dBm]	Maximum Noise Power [dBm]	Noise Limit [dBm]	Margin to Limit [dB]
None	-	-	-73.1	-59.0	14.1
AWGN DL	2132.5	-36.0	-73.5	-67.0	6.5
AWGN DL	2132.5	-35.0	-72.6	-68.0	4.6
AWGN DL	2132.5	-34.0	-73.1	-69.0	4.1
AWGN DL	2132.5	-33.0	-71.7	-70.0	1.7
AWGN DL	2132.5	-30.0	-73.2	-70.0	3.2
AWGN DL	2132.5	-20.0	-73.1	-70.0	3.1

Band 5, uplink

Input Power	DL AWGN Signal [MHz]	Input Power [dBm]	Maximum Noise Power [dBm]	Noise Limit [dBm]	Margin to Limit [dB]
None	-	-	-73.9	-59.0	14.9
AWGN DL	881.5	-36.0	-73.8	-67.0	6.8
AWGN DL	881.5	-35.0	-73.9	-68.0	5.9
AWGN DL	881.5	-34.0	-73.8	-69.0	4.8
AWGN DL	881.5	-33.0	-74.0	-70.0	4.0
AWGN DL	881.5	-30.0	-73.9	-70.0	3.9
AWGN DL	881.5	-20.0	-73.9	-70.0	3.9

Band 12, uplink

Input Power	DL AWGN Signal [MHz]	Input Power [dBm]	Maximum Noise Power [dBm]	Noise Limit [dBm]	Margin to Limit [dB]
None	-	-	-73.9	-59.0	14.9
AWGN DL	737.0	-36.0	-74.0	-67.0	7.0
AWGN DL	737.0	-35.0	-74.4	-68.0	6.4
AWGN DL	737.0	-34.0	-74.2	-69.0	5.2
AWGN DL	737.0	-33.0	-74.2	-70.0	4.2
AWGN DL	737.0	-30.0	-74.4	-70.0	4.4
AWGN DL	737.0	-20.0	-74.0	-70.0	4.0

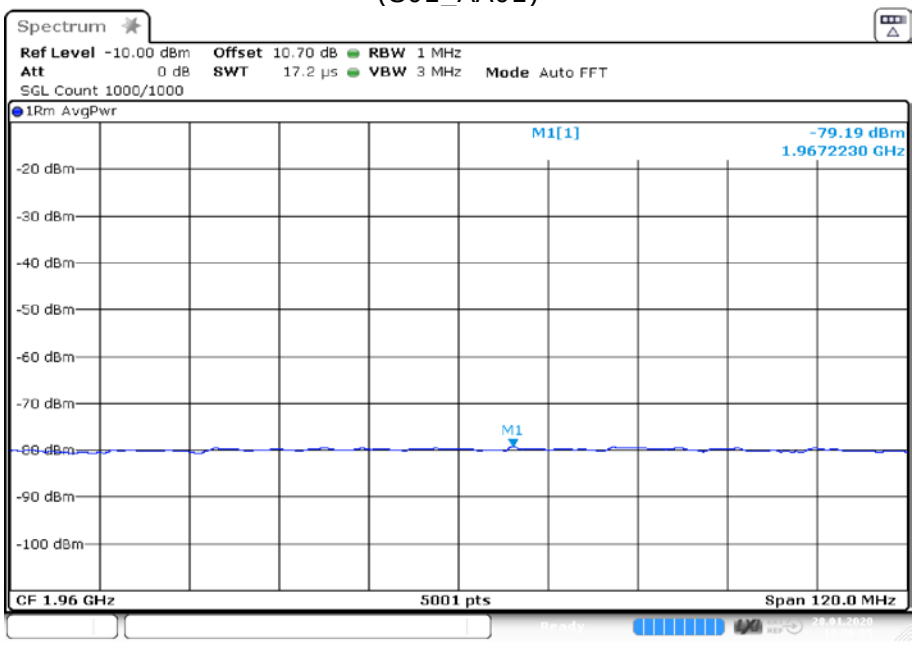
Band 13, uplink

Input Power	DL AWGN Signal [MHz]	Input Power [dBm]	Maximum Noise Power [dBm]	Noise Limit [dBm]	Margin to Limit [dB]
None	-	-	-73.3	-59.0	14.3
AWGN DL	751.0	-36.0	-73.2	-67.0	6.2
AWGN DL	751.0	-35.0	-73.3	-68.0	5.3
AWGN DL	751.0	-34.0	-73.0	-69.0	4.0
AWGN DL	751.0	-33.0	-73.2	-70.0	3.2
AWGN DL	751.0	-30.0	-73.4	-70.0	3.3
AWGN DL	751.0	-20.0	-73.0	-70.0	3.0

Remark: Please see next sub-clause for the measurement plot.

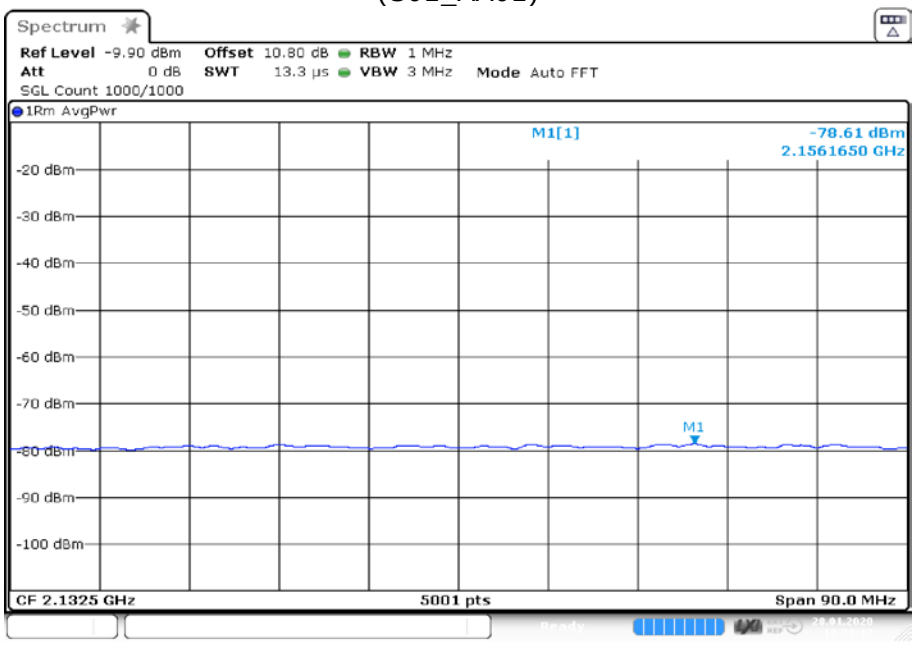
5.7.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, “WORST CASE”)

Frequency Band = Band 2, Direction = Downlink, Signal Type = None (S01_AA01)



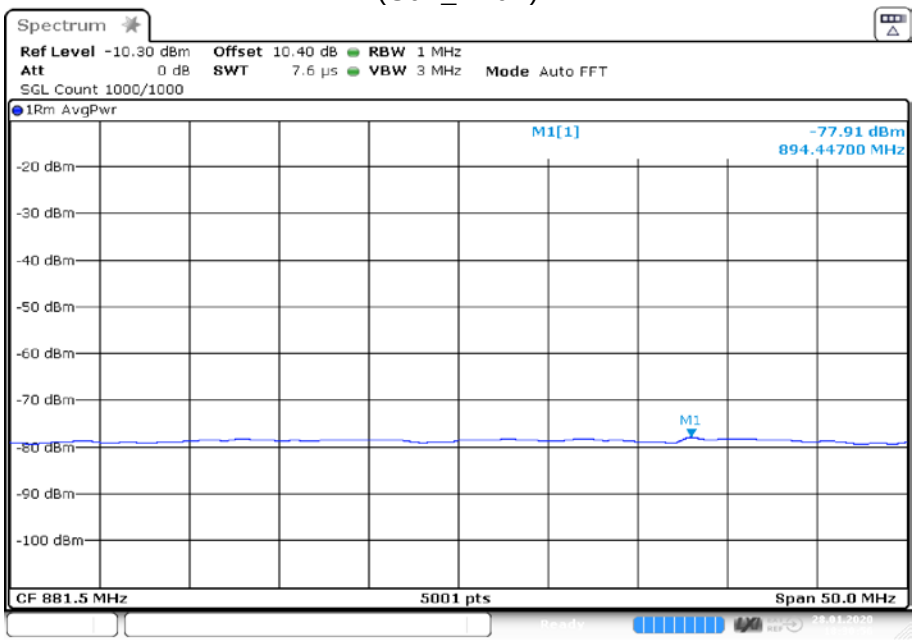
Date: 28.JAN.2020 18:36:25

Frequency Band = Band 4, Direction = Downlink, Signal Type = None (S01_AA01)



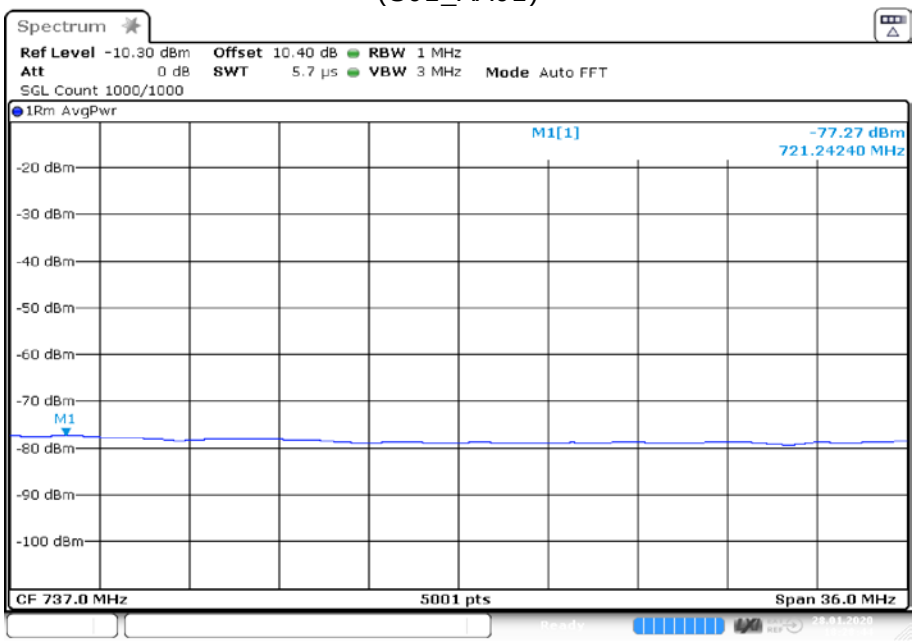
Date: 28.JAN.2020 18:32:12

Frequency Band = Band 5, Direction = Downlink, Signal Type = None (S01_AA01)



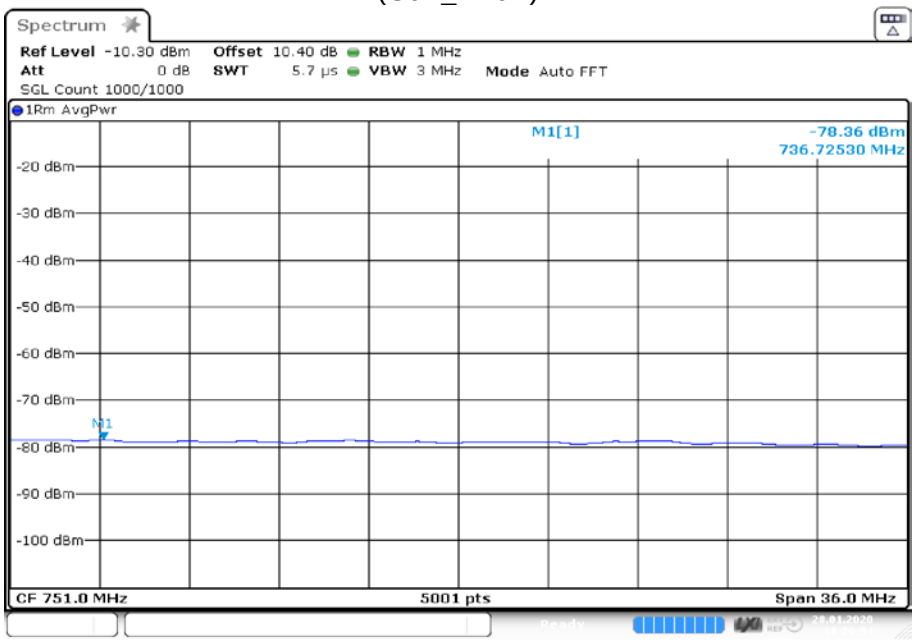
Date: 28.JAN.2020 18:30:56

Frequency Band = Band 12, Direction = Downlink, Signal Type = None (S01_AA01)



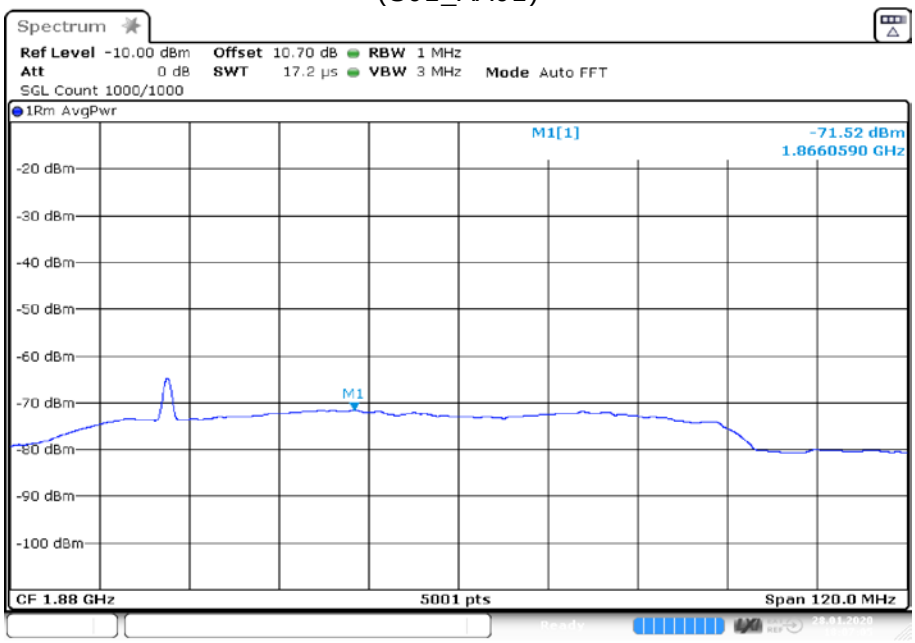
Date: 28.JAN.2020 18:28:44

Frequency Band = Band 13, Direction = Downlink, Signal Type = None (S01_AA01)



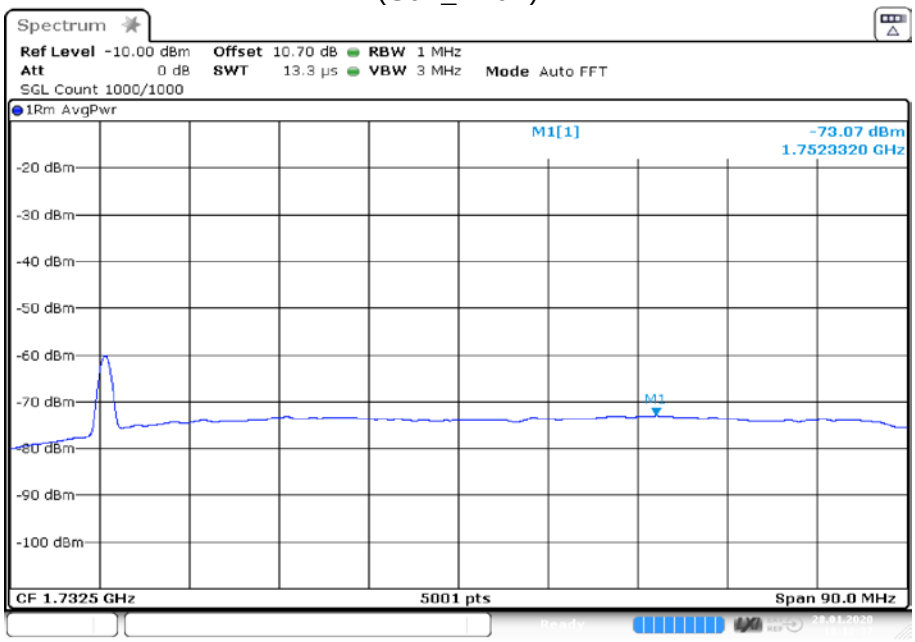
Date: 28.JAN.2020 18:26:55

Frequency Band = Band 2, Direction = Uplink, Signal Type = None (S01_AA01)



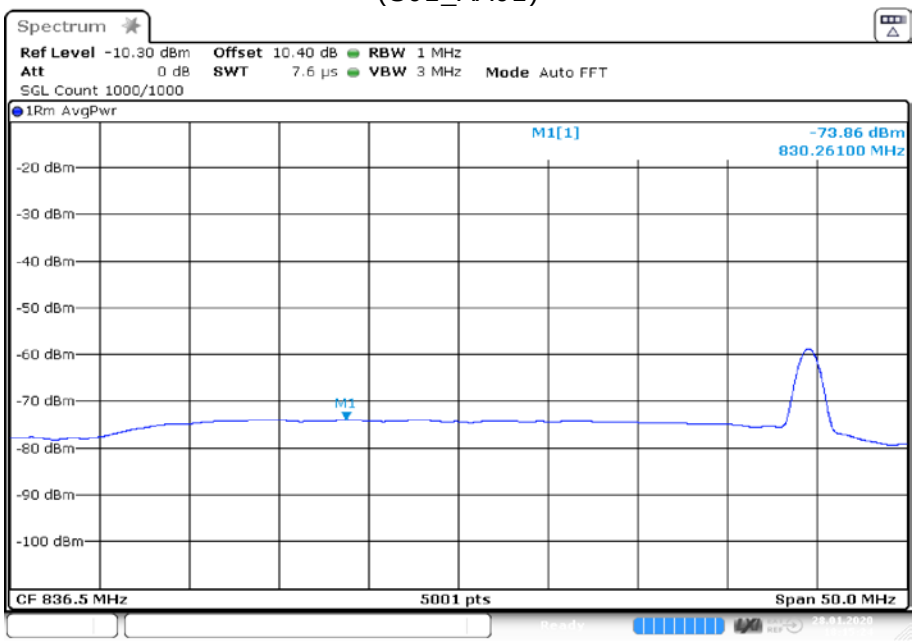
Date: 28.JAN.2020 18:07:05

Frequency Band = Band 4, Direction = Uplink, Signal Type = None (S01_AA01)



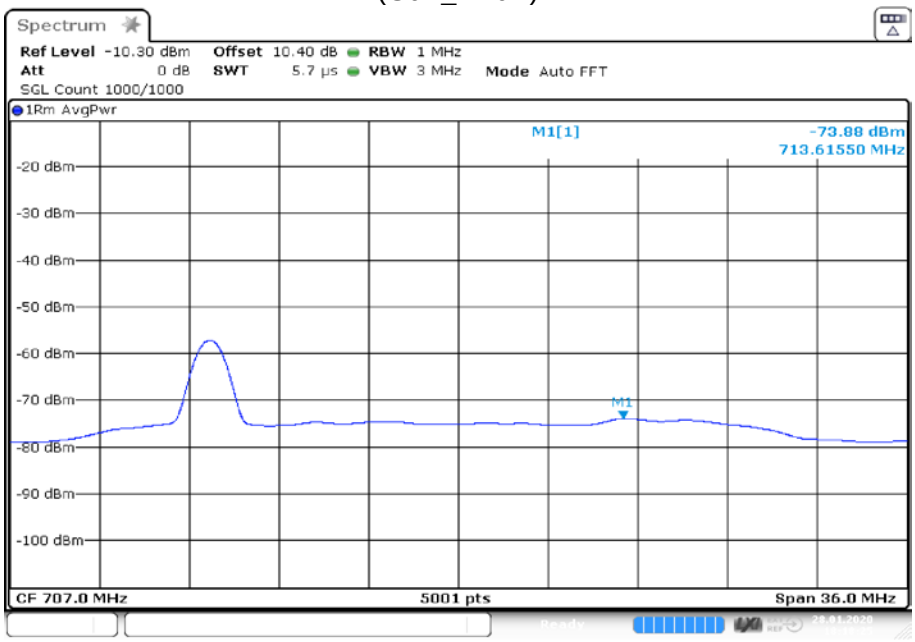
Date: 28.JAN.2020 18:12:37

Frequency Band = Band 5, Direction = Uplink, Signal Type = None (S01_AA01)



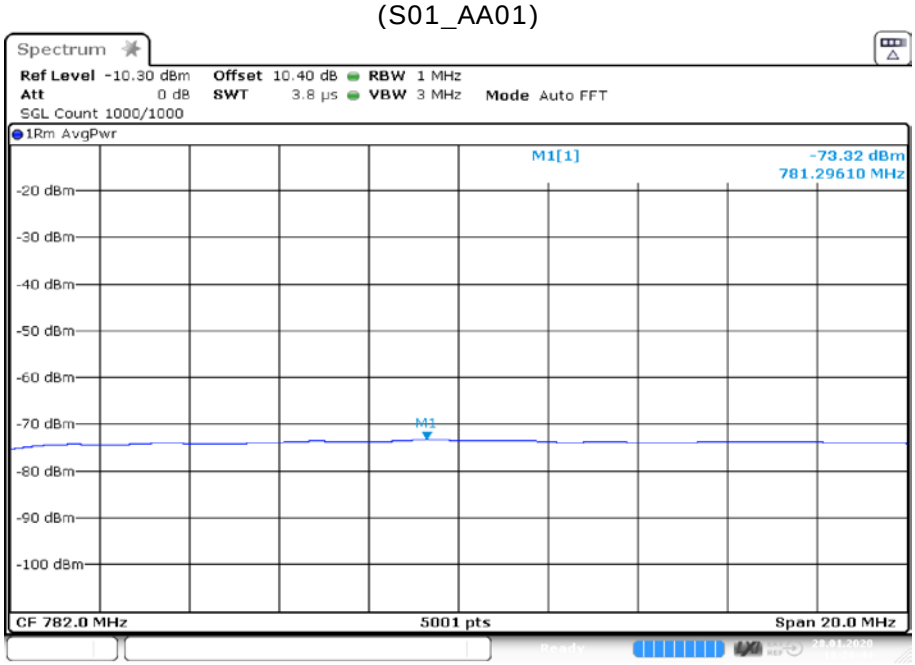
Date: 28.JAN.2020 18:15:24

Frequency Band = Band 12, Direction = Uplink, Signal Type = None (S01_AA01)



Date: 28.JAN.2020 18:18:25

Frequency Band = Band 13, Direction = Uplink, Signal Type = None (S01_AA01)



Date: 28.JAN.2020 18:20:44

5.7.5 TEST EQUIPMENT USED

- R&S TS8997

5.8 VARIABLE UPLINK NOISE TIMING

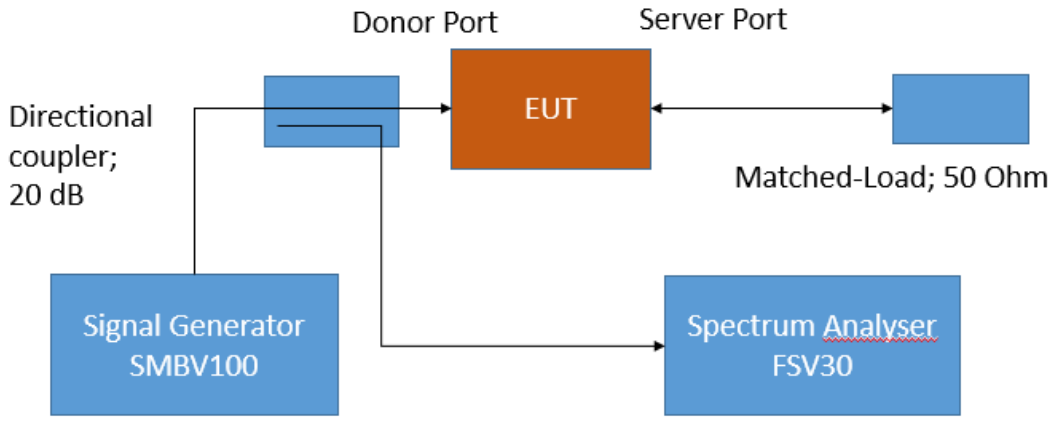
Standard

The test was performed according to:
KDB 935210 D03

5.8.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the noise limits (uplink) and Transmitter Power Off Mode limits (uplink and downlink noise power) according § 20.21(e)(8)(i)(A) and § 20.21 €(8)(i)(H) for wideband consumer signal boosters.

The EUT was connected to the test setup(s) according to the following diagram:



FCC Part 20.21; Consumer Signal Booster – Test Setup 7.7.2; Variable Uplink noise Timing

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.8.2 TEST REQUIREMENTS / LIMITS

FCC Part 20, § 20.21(e)(8)(i)(A)

Noise Limits. (1) The transmitted noise power in dBm/MHz of consumer boosters at their uplink port shall not exceed −103 dBm/MHz—RSSI. RSSI (received signal strength indication expressed in negative dB units relative to 1 mW) is the downlink composite received signal power in dBm at the booster donor port for all base stations in the band of operation.

(2) The transmitted maximum noise power in dBm/MHz of consumer boosters at their uplink and downlink ports shall not exceed the following limits:

(i) Fixed booster maximum noise power shall not exceed −102.5 dBm/MHz + 20 Log_{10} (Frequency), where Frequency is the uplink mid-band frequency of the supported spectrum

bands in MHz.

(ii) Mobile booster maximum noise power shall not exceed−59 dBm/MHz.

(iii) Compliance with Noise limits will use instrumentation calibrated in terms of RMS equivalent voltage, and with booster input ports terminated or without input signals applied within the band of measurement.

FCC Part 20, § 20.21(e)(8)(i)(H)

Transmit Power Off Mode. When the consumer booster cannot otherwise meet the noise and gain limits defined herein it must operate in “Transmit Power Off Mode.” In this mode of operation, the uplink and downlink noise power shall not exceed −70 dBm/MHz and both uplink and downlink gain shall not exceed the lesser of 23 dB or MSCL.

KDB 935210 D03 7.7.2 e)

Confirm that the uplink noise decreases to the specified level within 1 second for mobile devices, and within 3 seconds for fixed devices[1]

[1]The time response requirements are provisional and are as determined by the ANSI ASC C63® task group in collaboration and consultation with FCC OET Laboratory Division staff.

5.8.3 TEST PROTOCOL

Ambient temperature: 25 °C
Air Pressure: 992 hPa
Humidity: 33 %

Band 2, uplink

Center Frequency [MHz]	Input DL Power [dBm]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
1880.0	-34.0	0.0	1000.0	1000.0

Band 4, uplink

Center Frequency [MHz]	Input DL Power [dBm]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
1732.5	-34.0	0.0	1000.0	1000.0

Band 5, uplink

Center Frequency [MHz]	Input DL Power [dBm]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
836.5	-34.0	0.0	1000.0	1000.0

Band 12, uplink

Center Frequency [MHz]	Input DL Power [dBm]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
707.0	-34.0	0.0	1000.0	1000.0

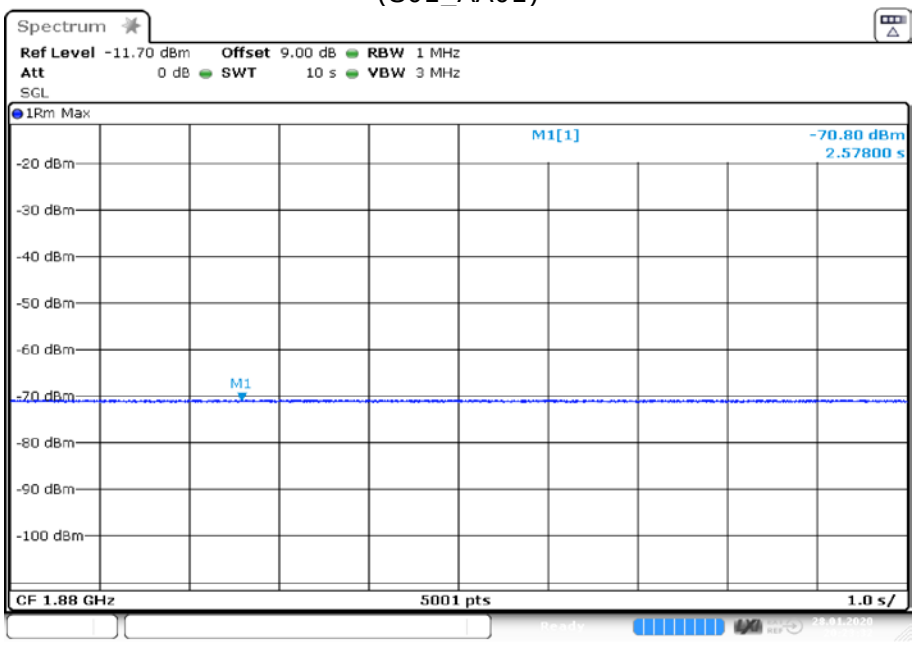
Band 13, uplink

Center Frequency [MHz]	Input DL Power [dBm]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
782.0	-34.0	0.0	1000.0	1000.0

Remark: Please see next sub-clause for the measurement plot.

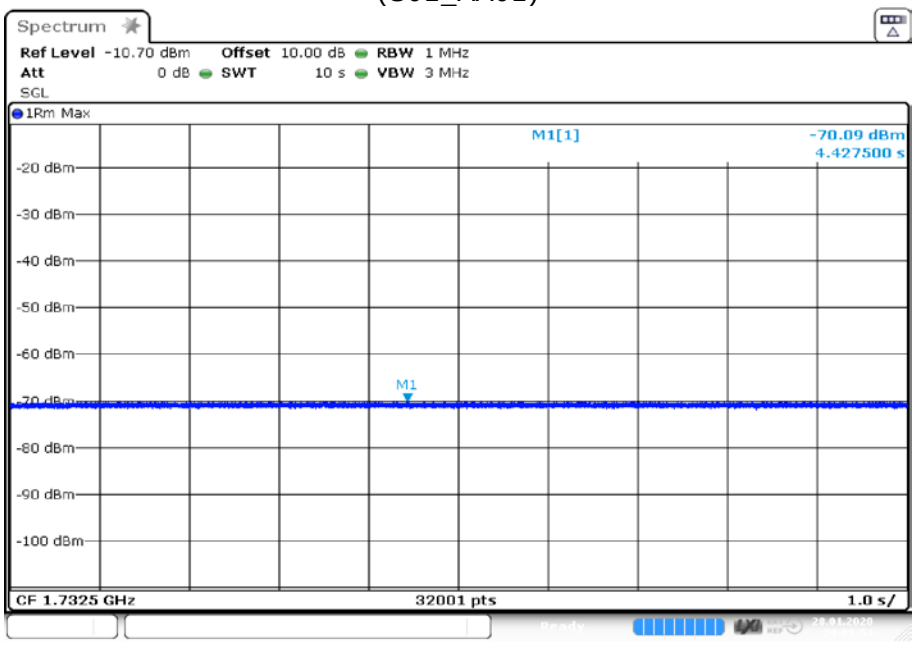
5.8.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, “WORST CASE”)

Frequency Band = Band 2, Direction = Uplink
(S01_AA01)



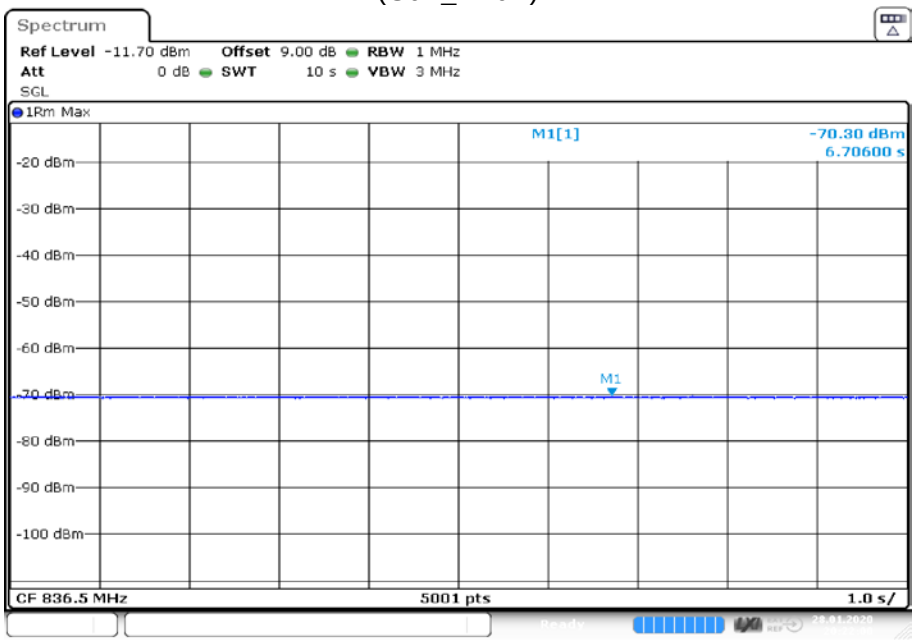
Date: 28.JAN.2020 20:23:33

Frequency Band = Band 4, Direction = Uplink
(S01_AA01)



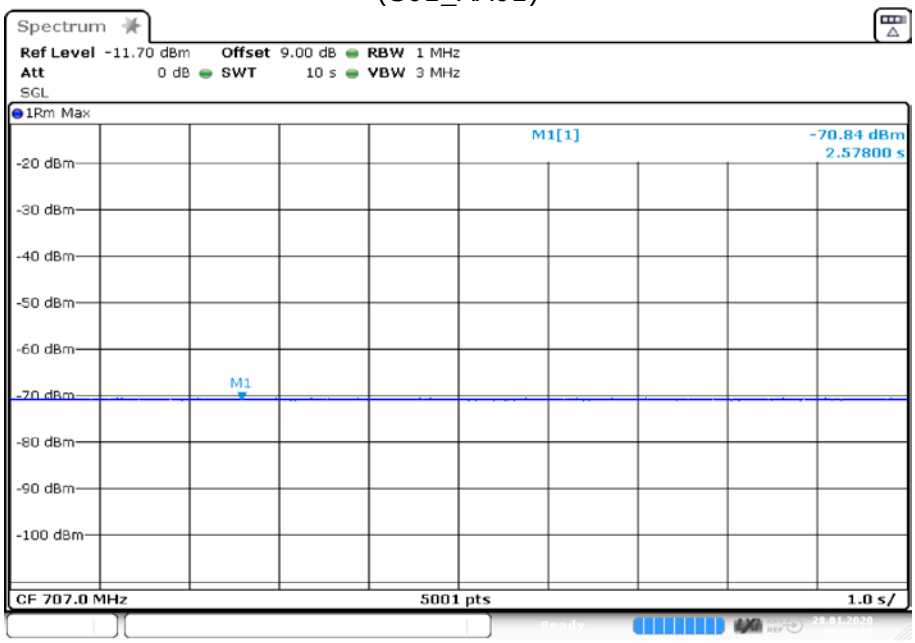
Date: 28.JAN.2020 20:08:54

Frequency Band = Band 5, Direction = Uplink
(S01_AA01)



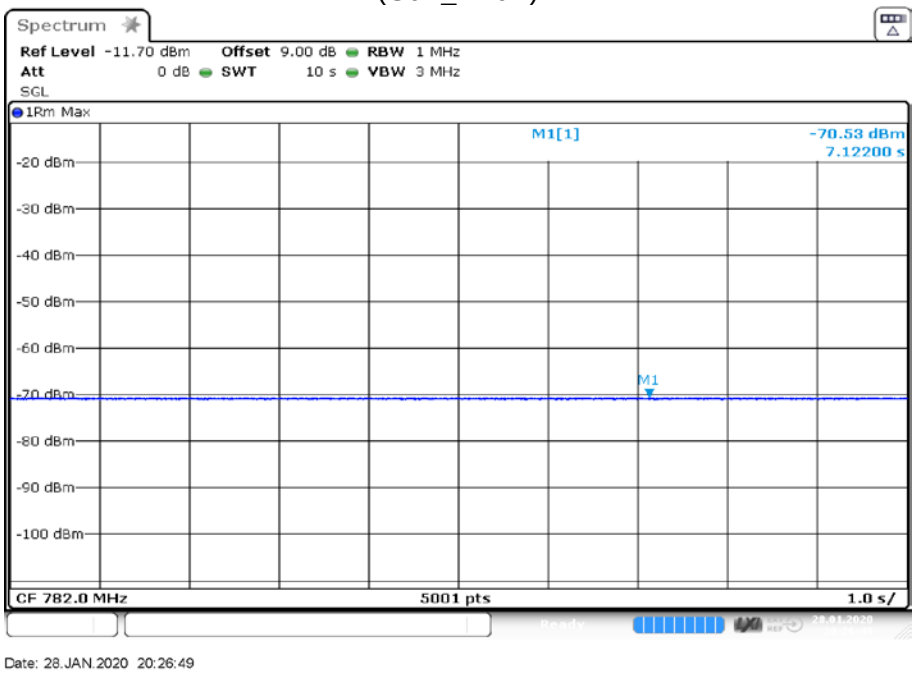
Date: 28.JAN.2020 20:22:00

Frequency Band = Band 12, Direction = Uplink
(S01_AA01)



Date: 28.JAN.2020 20:25:18

Frequency Band = Band 13, Direction = Uplink
(S01_AA01)



5.8.5 TEST EQUIPMENT USED

- R&S TS8997

5.9 UPLINK INACTIVITY

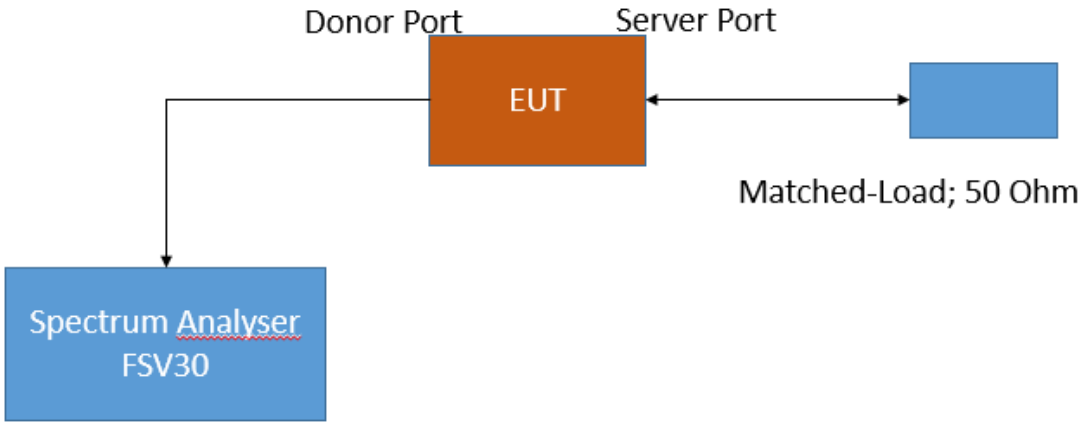
Standard

The test was performed according to:
KDB 935210 D03

5.9.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the Uplink Inactivity limit according § 20.21(e)(8)(i)(I) for wideband consumer signal boosters.

The EUT was connected to the test setup according to the following diagram:



FCC Part 20.21; Consumer Signal Booster – Test Setup 7.8; Uplink Inactivity

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.9.2 TEST REQUIREMENTS / LIMITS

FCC Part 20, § 20.21(e)(8)(i)(I)

Uplink Inactivity. When a consumer booster is not serving an active device connection after 5 minutes the uplink noise power shall not exceed −70 dBm/MHz.

5.9.3 TEST PROTOCOL

Ambient temperature: 25 °C
Air Pressure: 992 hPa
Humidity: 33 %

Band 2, uplink

Center Frequency [MHz]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
1880.0	134.1	1000.0	865.9

Band 4, uplink

Center Frequency [MHz]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
1732.5	154.7	1000.0	845.3

Band 5, uplink

Center Frequency [MHz]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
836.5	144.4	1000.0	855.6

Band 12, uplink

Center Frequency [MHz]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
707.0	154.7	1000.0	845.3

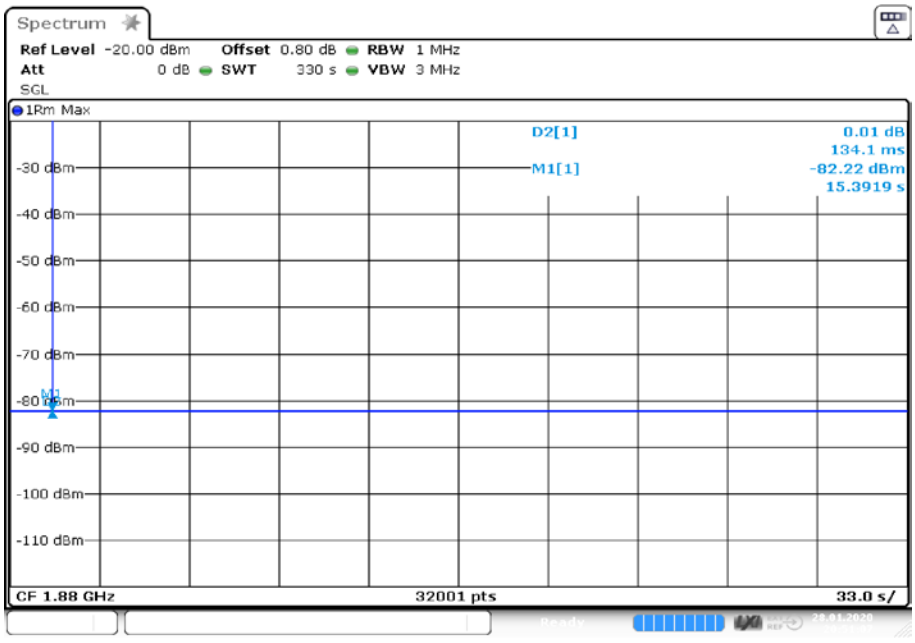
Band 13, uplink

Center Frequency [MHz]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
782.0	165.0	1000.0	835.0

Remark: Please see next sub-clause for the measurement plot.

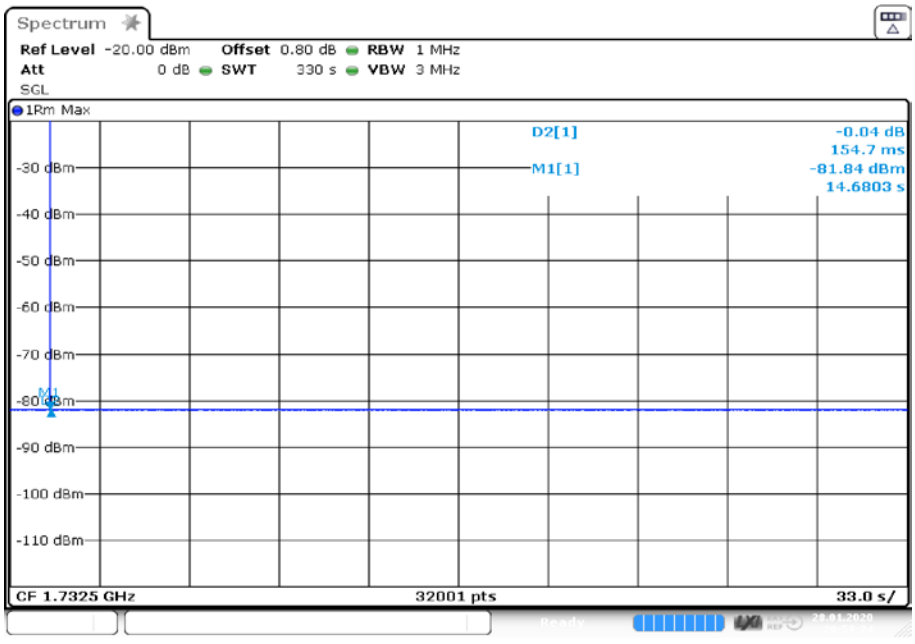
5.9.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, “WORST CASE”)

Frequency Band = Band 2, Direction = Uplink
(S01_AA01)



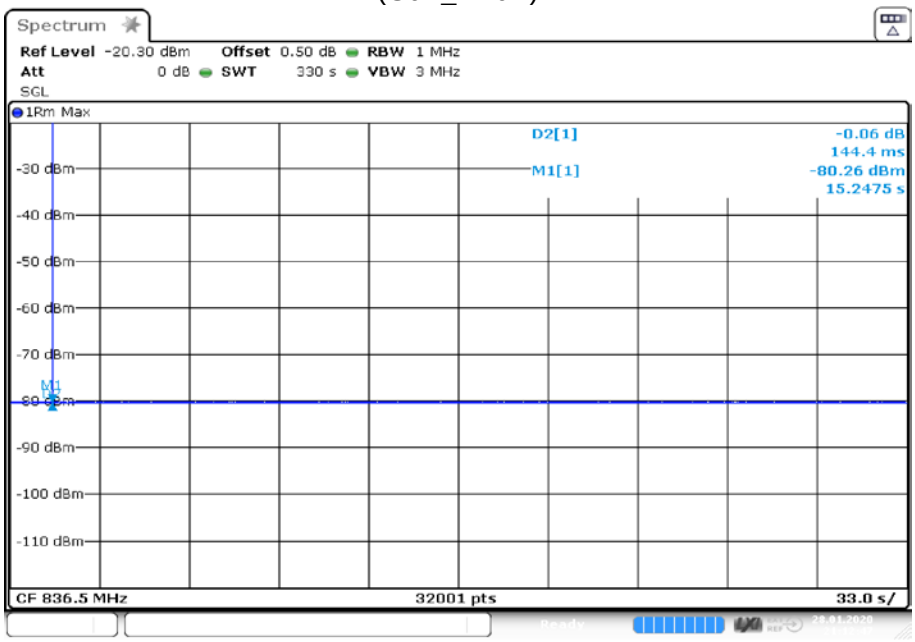
Date: 28.JAN.2020 20:51:07

Frequency Band = Band 4, Direction = Uplink
(S01_AA01)



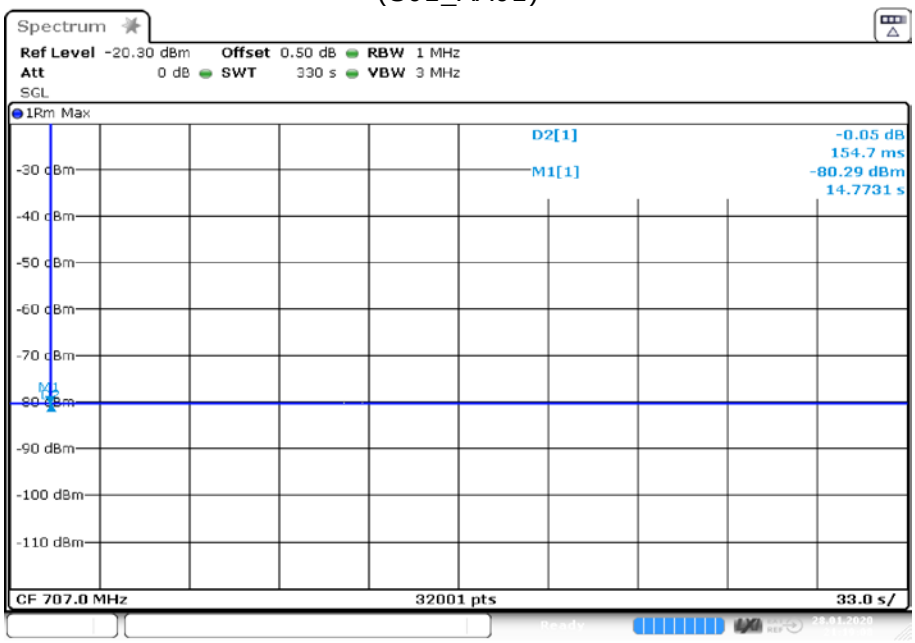
Date: 28.JAN.2020 20:59:25

Frequency Band = Band 5, Direction = Uplink
(S01_AA01)



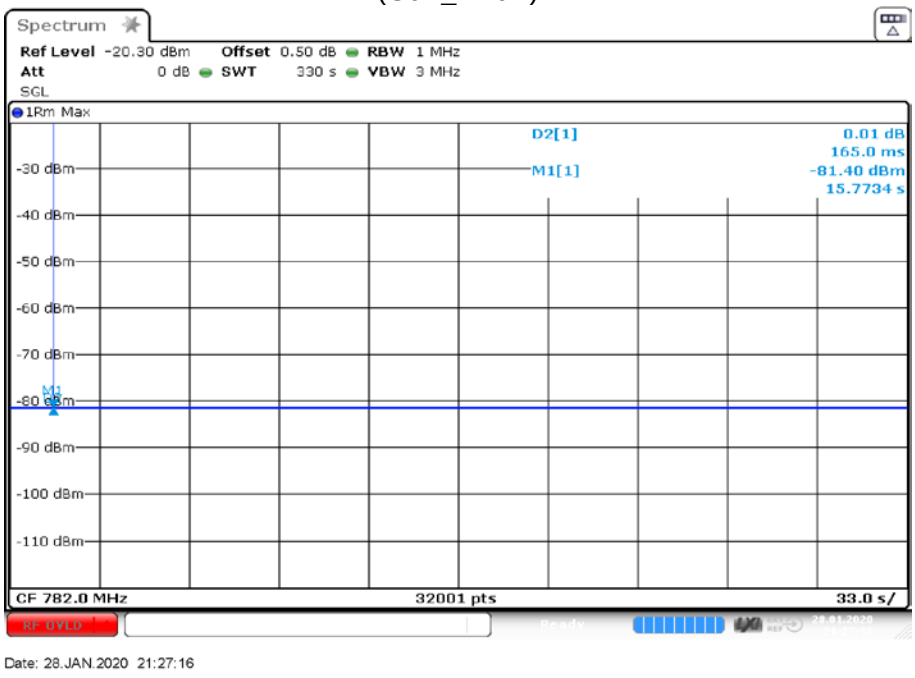
Date: 28.JAN.2020 21:12:47

Frequency Band = Band 12, Direction = Uplink
(S01_AA01)



Date: 28.JAN.2020 21:19:08

Frequency Band = Band 13, Direction = Uplink
(S01_AA01)



5.9.5 TEST EQUIPMENT USED

- R&S TS8997

5.10 VARIABLE BOOSTER GAIN

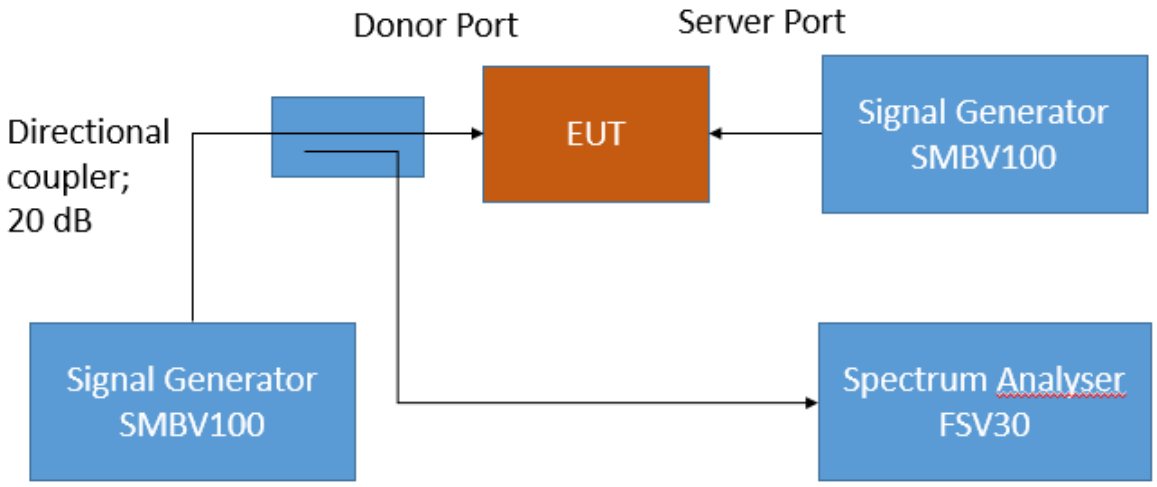
Standard

The test was performed according to:
KDB 935210 D03

5.10.1TEST DESCRIPTION

This test case is intended to demonstrate compliance to the Booster Gain limit according § 20.21(e)(8)(i)(C)(1) or Transmit Power Off Mode according § 20.21 €(8)(i)(H) for wideband consumer signal boosters.

The EUT was connected to the test setup according to the following diagram:



FCC Part 20.21; Consumer Signal Booster – Test Setup 7.9.1; Variable Gain

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.10.2TEST REQUIREMENTS / LIMITS

FCC Part 20, § 20.21(e)(8)(C)(1)

Booster Gain Limits. (1) The uplink gain in dB of a consumer booster referenced to its input and output ports shall not exceed −34 dB—RSSI + MSCL.

(i) Where RSSI is the downlink composite received signal power in dBm at the booster donor port for all base stations in the band of operation. RSSI is expressed in negative dB units relative to 1 mW.

(ii) Where MSCL (Mobile Station Coupling Loss) is the minimum coupling loss in dB between the wireless device and input port of the consumer booster. MSCL must be calculated or measured for each band of operation and provided in compliance test reports.

FCC Part 20, § 20.21(e)(8)(i)(H)

Transmit Power Off Mode. When the consumer booster cannot otherwise meet the noise and gain limits defined herein it must operate in “Transmit Power Off Mode.” In this mode of operation, the uplink and downlink noise power shall not exceed −70 dBm/MHz and both uplink and downlink gain shall not exceed the lesser of 23 dB or MSCL.

5.10.3TEST PROTOCOL

Ambient temperature: 24 °C
Air Pressure: 1005 hPa
Humidity: 34 %

Band 2, uplink

UL AWGN Signal [MHz]	DL AWGN Signal [MHz]	Input Power UL [dBm]	Input Power DL [dBm]	Output Power UL [dBm]	Maximum UL Gain [dB]	Gain Limit [dBm]	Margin to Limit [dB]
1880.0	1960.0	-6.9	-90.0	14.8	21.7	23.0	1.3
1880.0	1960.0	-6.9	-49.0	14.5	21.4	22.0	0.6
1880.0	1960.0	-6.9	-48.0	13.2	20.1	21.0	0.9
1880.0	1960.0	-6.9	-47.0	11.9	18.8	20.0	1.2
1880.0	1960.0	-6.9	-35.0	0.0	6.9	8.0	1.1
1880.0	1960.0	-6.9	-34.0	-0.5	6.4	7.0	0.6

Band 4, uplink

UL AWGN Signal [MHz]	DL AWGN Signal [MHz]	Input Power UL [dBm]	Input Power DL [dBm]	Output Power UL [dBm]	Maximum UL Gain [dB]	Gain Limit [dBm]	Margin to Limit [dB]
1732.5	2132.5	-7.1	-90.0	14.4	21.5	23.0	1.5
1732.5	2132.5	-7.1	-80.0	14.3	21.4	23.0	1.6
1732.5	2132.5	-7.1	-70.0	14.3	21.4	23.0	1.6
1732.5	2132.5	-7.1	-49.0	14.1	21.2	22.0	0.8
1732.5	2132.5	-7.1	-48.0	12.7	19.8	21.0	1.2
1732.5	2132.5	-7.1	-47.0	11.3	18.4	20.0	1.6

Band 5, uplink

UL AWGN Signal [MHz]	DL AWGN Signal [MHz]	Input Power UL [dBm]	Input Power DL [dBm]	Output Power UL [dBm]	Maximum UL Gain [dB]	Gain Limit [dBm]	Margin to Limit [dB]
836.5	881.5	-6.3	-48.0	13.9	20.2	21.0	0.8
836.5	881.5	-6.3	-47.0	12.9	19.2	20.0	0.8
836.5	881.5	-6.3	-46.0	12.0	18.3	19.0	0.7
836.5	881.5	-6.3	-45.0	10.8	17.1	18.0	0.9
836.5	881.5	-6.3	-44.0	9.9	16.2	17.0	0.8
836.5	881.5	-6.3	-43.0	8.8	15.1	16.0	0.9

Band 12, uplink

UL AWGN Signal [MHz]	DL AWGN Signal [MHz]	Input Power UL [dBm]	Input Power DL [dBm]	Output Power UL [dBm]	Maximum UL Gain [dB]	Gain Limit [dBm]	Margin to Limit [dB]
707.0	737.0	-6.8	-45.0	10.3	17.1	18.0	0.9
707.0	737.0	-6.8	-43.0	8.3	15.1	16.0	0.9
707.0	737.0	-6.8	-42.0	7.4	14.2	15.0	0.8
707.0	737.0	-6.8	-36.0	1.3	8.1	9.0	0.9
707.0	737.0	-6.8	-35.0	0.4	7.2	8.0	0.8
707.0	737.0	-6.8	-34.0	-0.6	6.2	7.0	0.8

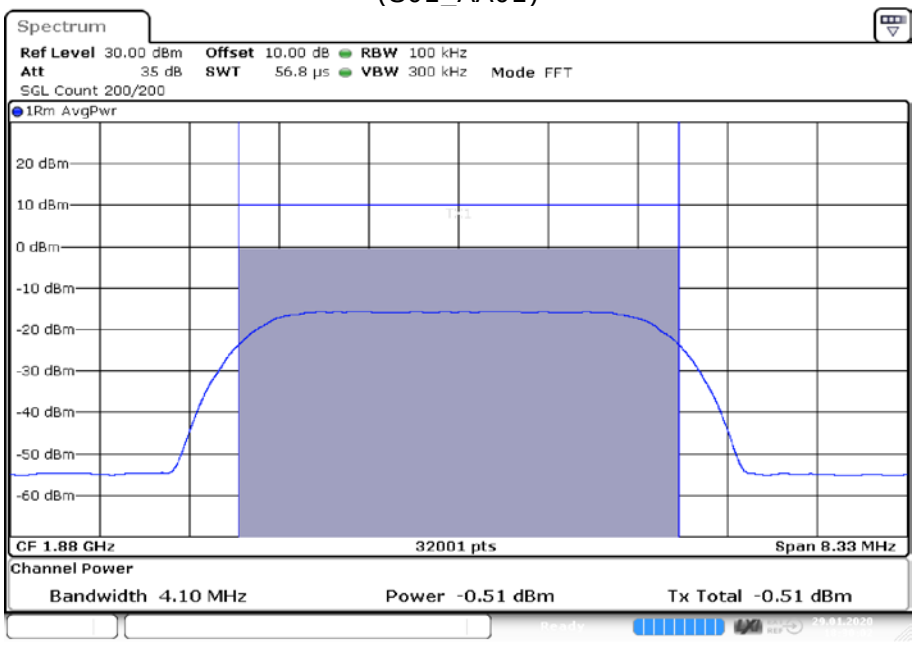
Band 13, uplink

UL AWGN Signal [MHz]	DL AWGN Signal [MHz]	Input Power UL [dBm]	Input Power DL [dBm]	Output Power UL [dBm]	Maximum UL Gain [dB]	Gain Limit [dBm]	Margin to Limit [dB]
782.0	751.0	-7.4	-43.0	7.5	14.9	16.0	1.2
782.0	751.0	-7.4	-42.0	6.5	13.9	15.0	1.1
782.0	751.0	-7.4	-38.0	2.5	9.9	11.0	1.1
782.0	751.0	-7.4	-36.0	0.5	7.9	9.0	1.1
782.0	751.0	-7.4	-35.0	-0.5	6.9	8.0	1.1
782.0	751.0	-7.4	-34.0	-1.5	6.0	7.0	1.1

Remark: Please see next sub-clause for the measurement plot.

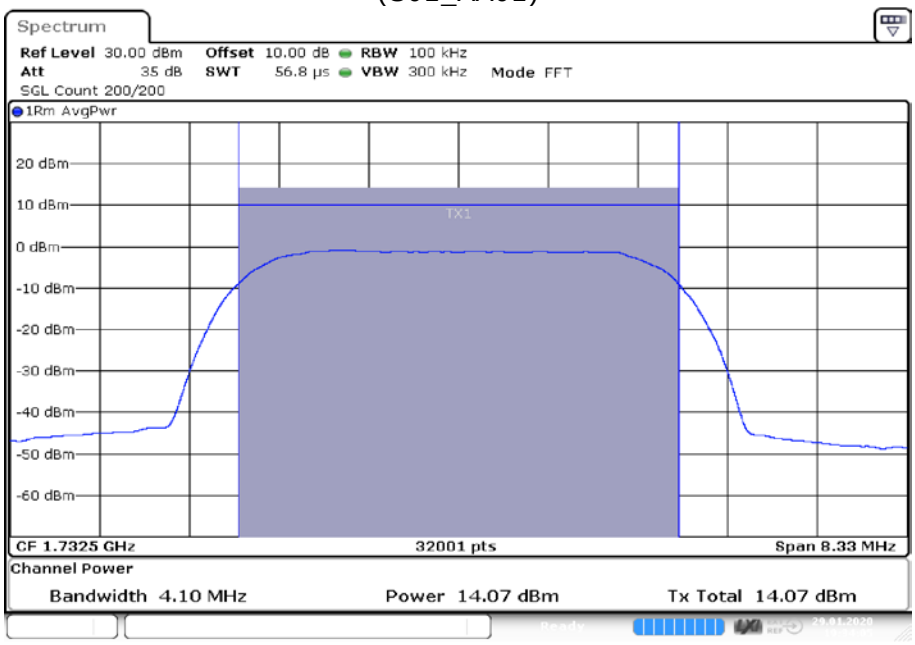
5.10.4MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, “WORST CASE”)

Frequency Band = Band 2, Direction = Uplink
(S01_AA01)



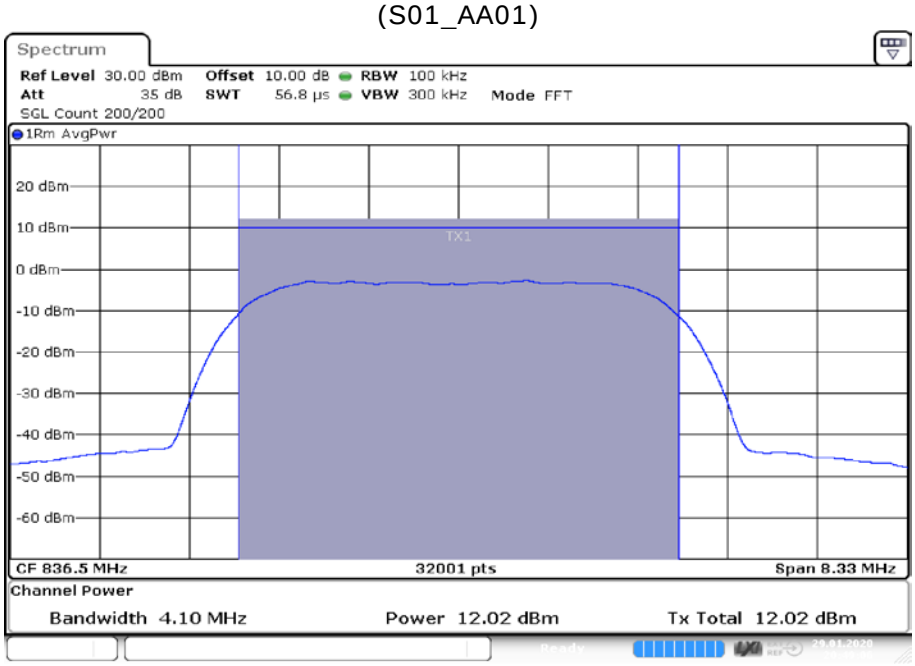
Date: 29.JAN.2020 18:30:02

Frequency Band = Band 4, Direction = Uplink
(S01_AA01)



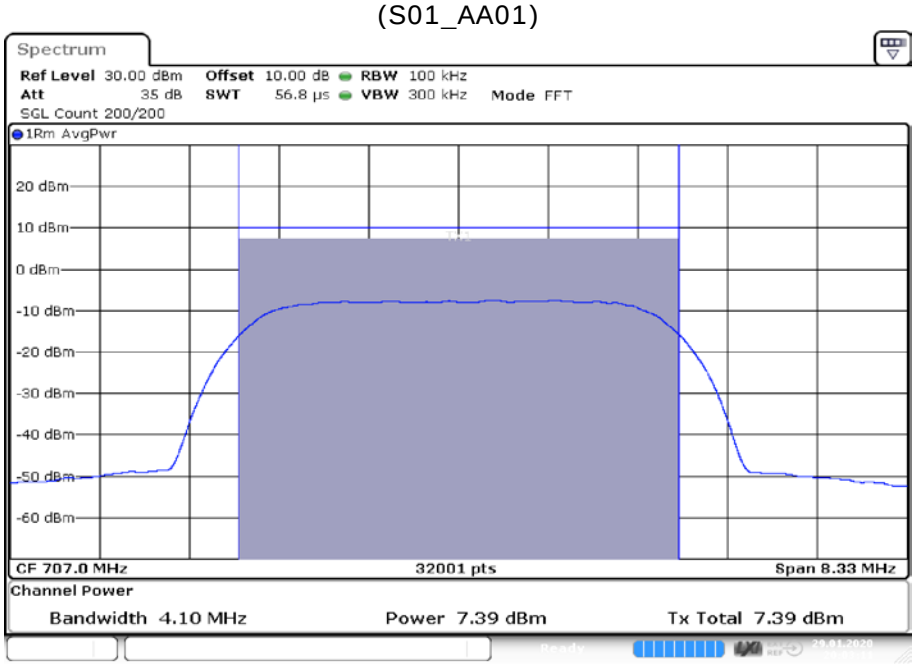
Date: 29.JAN.2020 19:34:06

Frequency Band = Band 5, Direction = Uplink
(S01_AA01)



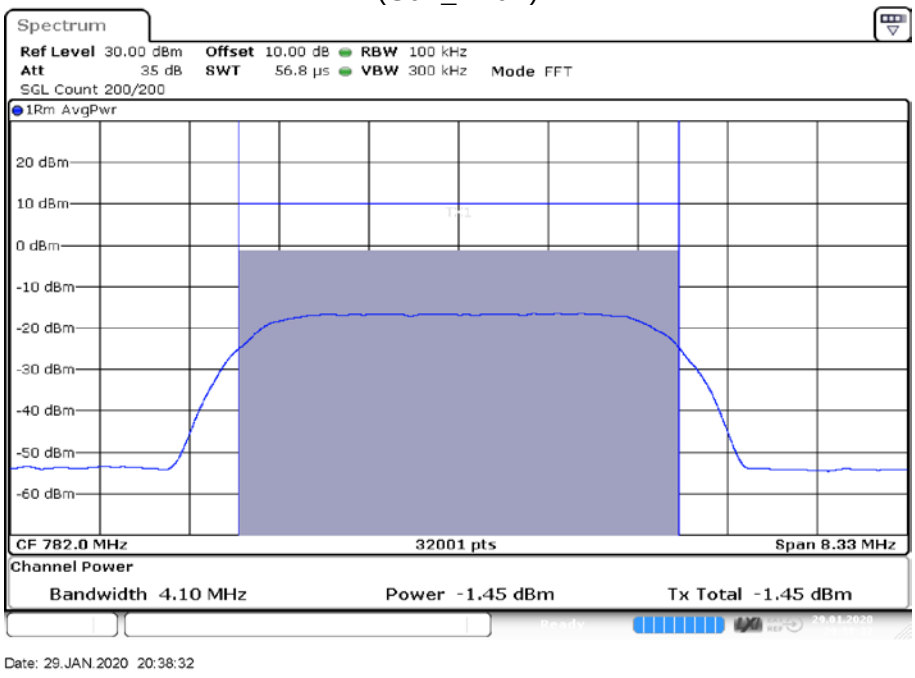
Date: 29.JAN.2020 20:49:06

Frequency Band = Band 12, Direction = Uplink
(S01_AA01)



Date: 29.JAN.2020 20:03:12

Frequency Band = Band 13, Direction = Uplink
(S01_AA01)



5.10.5TEST EQUIPMENT USED

- R&S TS8997

5.11 VARIABLE UPLINK GAIN TIMING

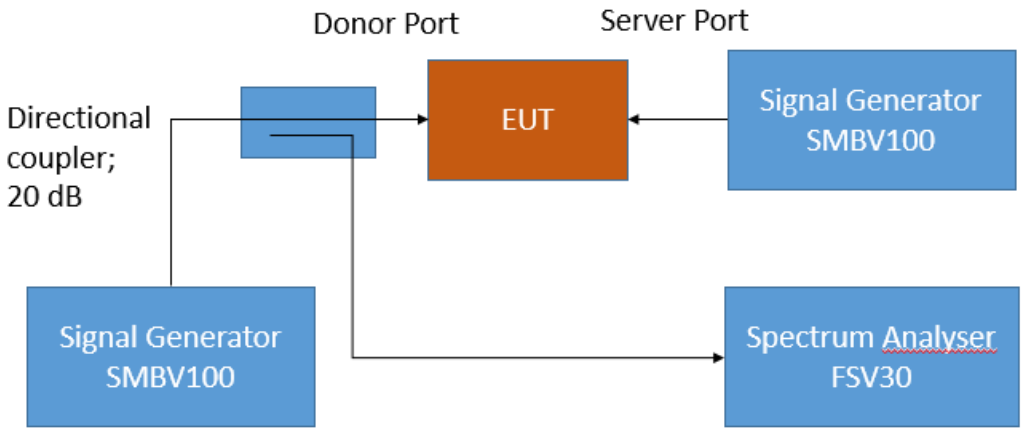
Standard

The test was performed according to:
KDB 935210 D03

5.11.1TEST DESCRIPTION

This test case is intended to demonstrate compliance to the Booster Gain limit according § 20.21(e)(8)(i)(C)(1) or Transmit Power Off Mode according § 20.21 €(8)(i)(H) for wideband consumer signal boosters.

The EUT was connected to the test setup according to the following diagram:



FCC Part 20.21; Consumer Signal Booster – Test Setup 7.9.2; Variable Uplink Gain Timing

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.11.2TEST REQUIREMENTS / LIMITS

FCC Part 20, § 20.21(e)(8)(C)(1)

Booster Gain Limits. (1) The uplink gain in dB of a consumer booster referenced to its input and output ports shall not exceed −34 dB—RSSI + MSCL.

(i) Where RSSI is the downlink composite received signal power in dBm at the booster donor port for all base stations in the band of operation. RSSI is expressed in negative dB units relative to 1 mW.

(ii) Where MSCL (Mobile Station Coupling Loss) is the minimum coupling loss in dB between the wireless device and input port of the consumer booster. MSCL must be calculated or measured for each band of operation and provided in compliance test reports.

FCC Part 20, § 20.21(e)(8)(i)(H)

Transmit Power Off Mode. When the consumer booster cannot otherwise meet the noise and gain limits defined herein it must operate in "Transmit Power Off Mode." In this mode of operation, the uplink and downlink noise power shall not exceed −70 dBm/MHz and both uplink and downlink gain shall not exceed the lesser of 23 dB or MSCL.

KDB 935210 D03 7.9.2 e)

Confirm that the uplink noise decreases to the specified level within 1 second for mobile devices, and within 3 seconds for fixed devices[1]

[1]The time response requirements are provisional and are as determined by the ANSI ASC C63® task group in collaboration and consultation with FCC OET Laboratory Division staff.

5.11.3TEST PROTOCOL

Ambient temperature: 24 °C
Air Pressure: 1005 hPa
Humidity: 34 %

Band 2, uplink

Center Frequency [MHz]	Input DL Power [dBm]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
1960.0	-50.0	420.6	1000.0	579.4

Band 4, uplink

Center Frequency [MHz]	Input DL Power [dBm]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
2132.5	-50.0	468.4	1000.0	531.6

Band 5, uplink

Center Frequency [MHz]	Input DL Power [dBm]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
881.5	-50.0	333.5	1000.0	666.5

Band 12, uplink

Center Frequency [MHz]	Input DL Power [dBm]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
737.0	-50.0	380.0	1000.0	620.0

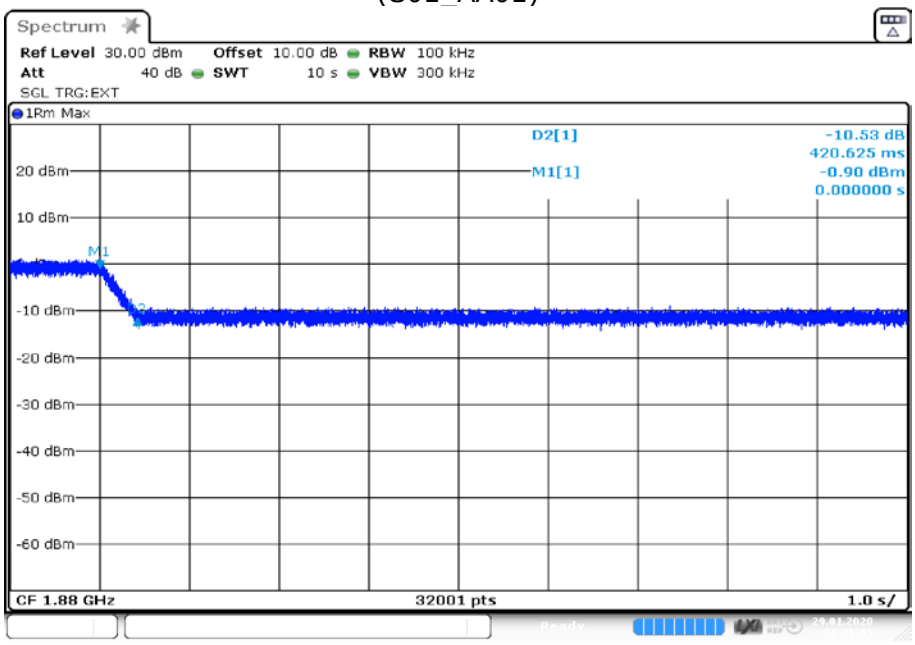
Band 13, uplink

Center Frequency [MHz]	Input DL Power [dBm]	Noise Decrease Time [ms]	Noise Decrease Time Limit [ms]	Margin to Limit [ms]
751.0	-50.0	363.1	1000.0	636.9

Remark: Please see next sub-clause for the measurement plot.

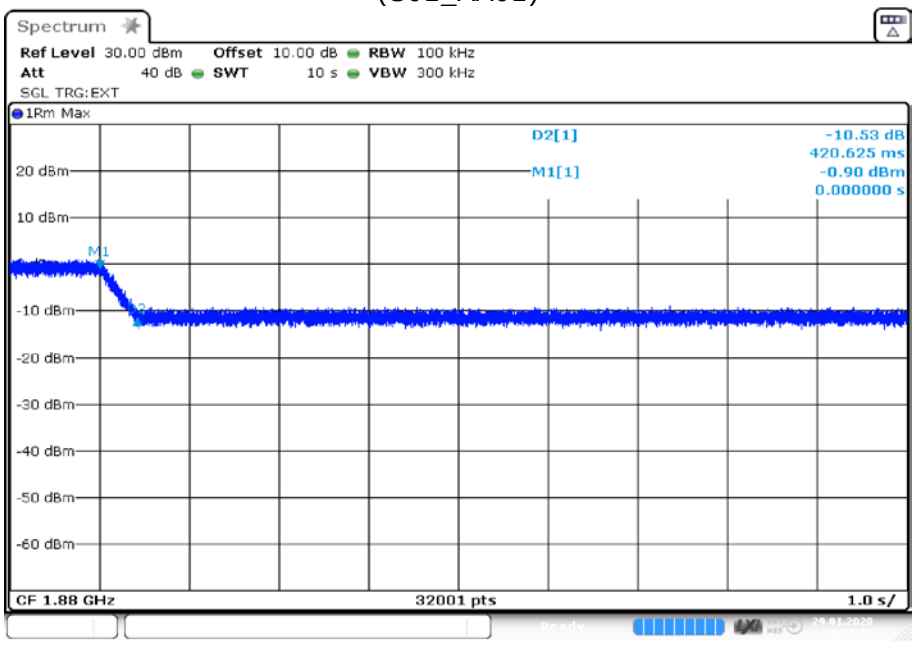
5.11.4MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, “WORST CASE”)

Frequency Band = Band 2, Direction = Uplink
(S01_AA01)



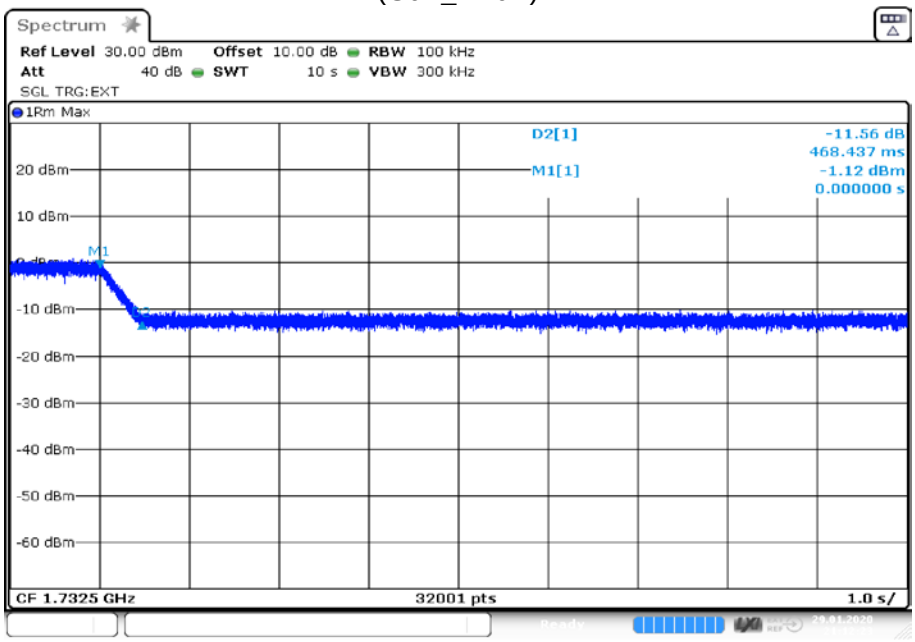
Date: 29.JAN.2020 21:16:05

Frequency Band = Band 2, Direction = Uplink
(S01_AA01)



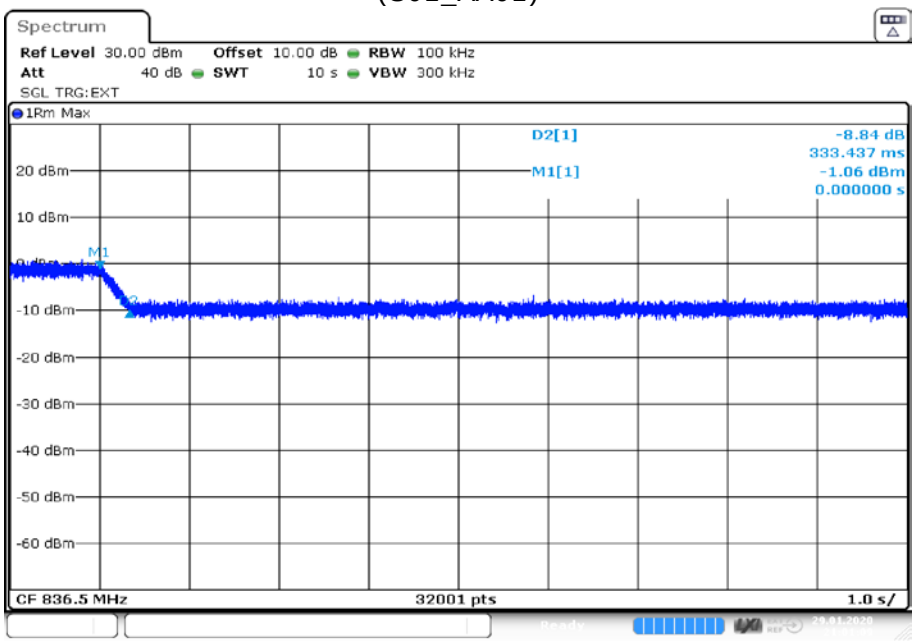
Date: 29.JAN.2020 21:16:05

Frequency Band = Band 4, Direction = Uplink
(S01_AA01)



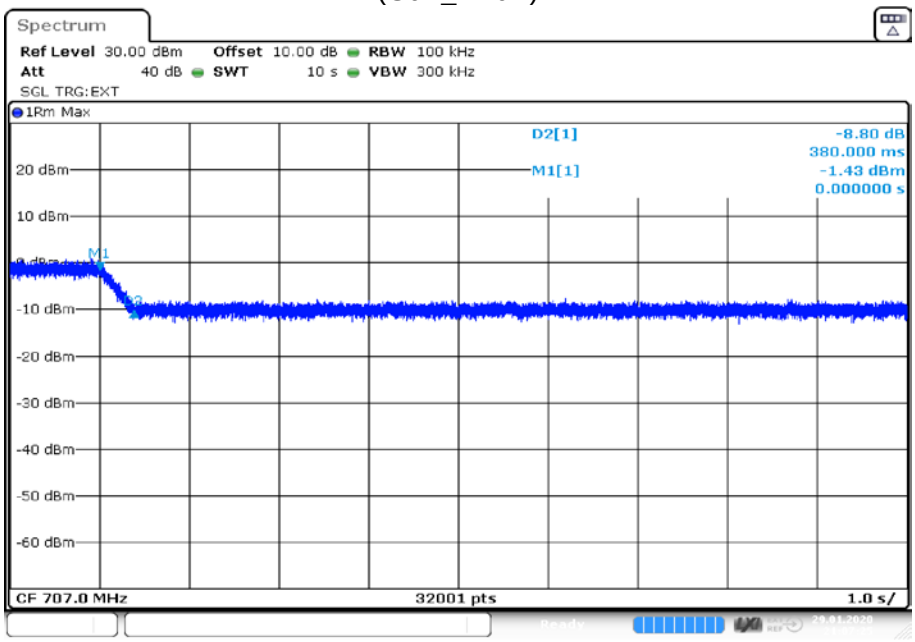
Date: 29.JAN.2020 21:12:23

Frequency Band = Band 5, Direction = Uplink
(S01_AA01)



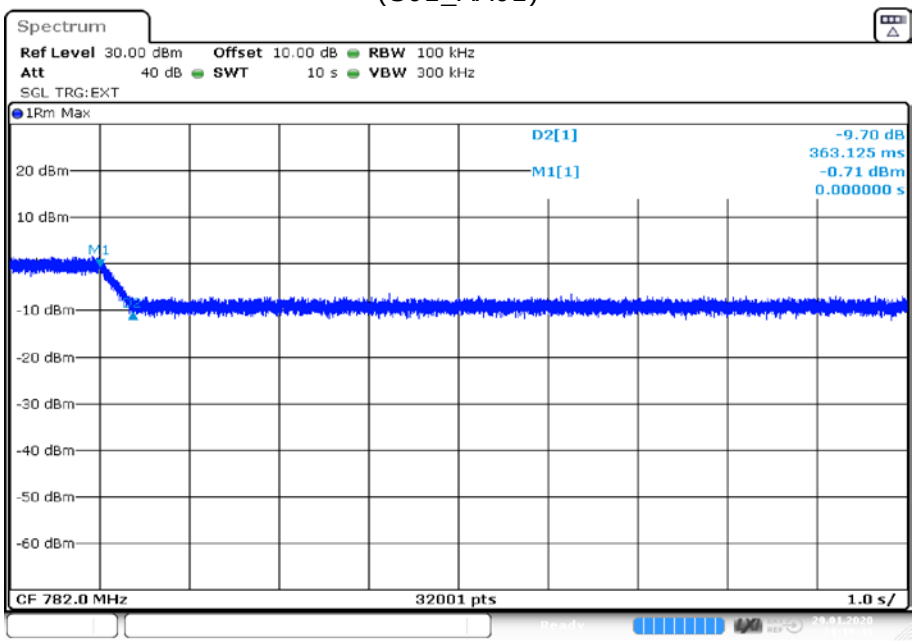
Date: 29.JAN.2020 21:01:10

Frequency Band = Band 12, Direction = Uplink
(S01_AA01)



Date: 29.JAN.2020 21:07:25

Frequency Band = Band 13, Direction = Uplink
(S01_AA01)



Date: 29.JAN.2020 21:10:42

5.11.5TEST EQUIPMENT USED

- R&S TS8997

5.12 OCCUPIED BANDWIDTH

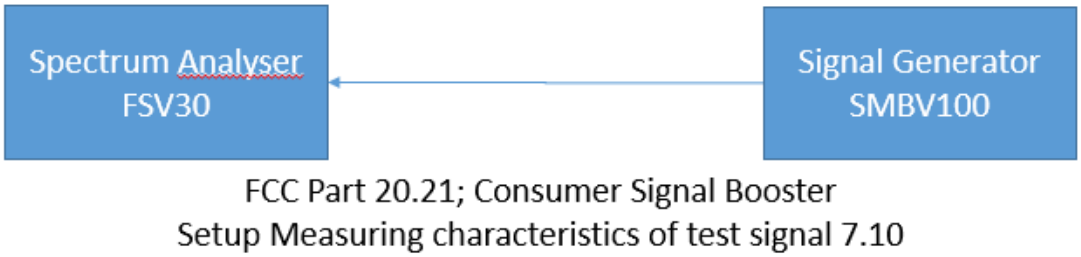
Standard

The test was performed according to:
KDB 935210 D03

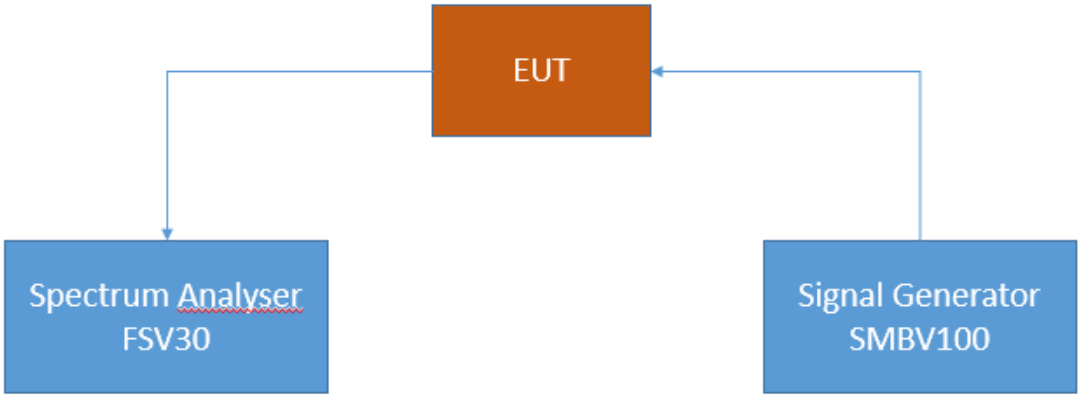
5.12.1TEST DESCRIPTION

This test case is intended to demonstrate compliance to the applicable conducted spurious emission limits per § 2.1051

The EUT was connected to the test setups according to the following diagram:



FCC Part 20.21; Consumer Signal Booster
Setup Measuring characteristics of test signal 7.10



FCC Part 20.21; Consumer Signal Booster – Test Setup 7.10; Occupied Bandwidth

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.12.2TEST REQUIREMENTS / LIMITS

FCC Part 2.1049; Occupied Bandwidth:

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 under the following conditions as applicable:

(h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

(i) Transmitters designed for other types of modulation—when modulated by an appropriate signal of sufficient amplitude to be representative of the type of service in which used. A description of the input signal should be supplied.

5.12.3TEST PROTOCOL

Ambient temperature: 25 °C
Air Pressure: 997 hPa
Humidity: 33 %

Band 2, downlink

Signal Type	Signal Frequency [MHz]	Occupied Bandwidth SG [kHz]	Occupied Bandwidth Booster [kHz]	Delta Occupied Bandwidth [kHz]	Delta Limit Occupied Bandwidth [kHz]	Margin to Limit [kHz]
GSM	1960.00	247.1	246.6	-0.5	200.0	200.5
LTE	1960.00	4115.5	4130.8	15.3	200.0	184.7
CDMA	1960.00	1259.0	1261.9	2.9	200.0	197.1

Band 4, downlink

Signal Type	Signal Frequency [MHz]	Occupied Bandwidth SG [kHz]	Occupied Bandwidth Booster [kHz]	Delta Occupied Bandwidth [kHz]	Delta Limit Occupied Bandwidth [kHz]	Margin to Limit [kHz]
GSM	2132.50	246.2	248.6	2.4	200.0	197.6
LTE	2132.50	4143.0	4127.4	-15.6	200.0	215.6
CDMA	2132.50	1260.1	1260.1	0.1	200.0	199.9

Band 5, downlink

Signal Type	Signal Frequency [MHz]	Occupied Bandwidth SG [kHz]	Occupied Bandwidth Booster [kHz]	Delta Occupied Bandwidth [kHz]	Delta Limit Occupied Bandwidth [kHz]	Margin to Limit [kHz]
GSM	881.50	248.7	247.7	-1.0	200.0	201.0
LTE	881.50	4110.5	4127.1	16.6	200.0	183.4
CDMA	881.50	1261.1	1260.5	-0.6	200.0	200.6

Band 12, downlink

Signal Type	Signal Frequency [MHz]	Occupied Bandwidth SG [kHz]	Occupied Bandwidth Booster [kHz]	Delta Occupied Bandwidth [kHz]	Delta Limit Occupied Bandwidth [kHz]	Margin to Limit [kHz]
GSM	737.00	247.4	245.1	-2.2	200.0	202.2
LTE	737.00	4131.4	4132.4	0.9	200.0	199.1
CDMA	737.00	1261.8	1259.2	-2.6	200.0	202.6

Band 13, downlink

Signal Type	Signal Frequency [MHz]	Occupied Bandwidth SG [kHz]	Occupied Bandwidth Booster [kHz]	Delta Occupied Bandwidth [kHz]	Delta Limit Occupied Bandwidth [kHz]	Margin to Limit [kHz]
GSM	751.00	247.4	246.6	-0.8	200.0	200.8
LTE	751.00	4115.5	4115.5	0.0	200.0	200.0
CDMA	751.00	1261.5	1262.5	1.0	200.0	199.0

Band 2, uplink

Signal Type	Signal Frequency [MHz]	Occupied Bandwidth SG [kHz]	Occupied Bandwidth Booster [kHz]	Delta Occupied Bandwidth [kHz]	Delta Limit Occupied Bandwidth [kHz]	Margin to Limit [kHz]
GSM	1880.00	247.7	245.1	-2.7	200.0	202.7
LTE	1880.00	4129.6	4150.2	20.6	200.0	179.4
CDMA	1880.00	1259.9	1261.6	1.7	200.0	198.3

Band 4, uplink

Signal Type	Signal Frequency [MHz]	Occupied Bandwidth SG [kHz]	Occupied Bandwidth Booster [kHz]	Delta Occupied Bandwidth [kHz]	Delta Limit Occupied Bandwidth [kHz]	Margin to Limit [kHz]
GSM	1732.50	245.6	247.3	1.7	200.0	198.3
LTE	1732.50	4124.2	4119.6	-4.7	200.0	204.7
CDMA	1732.50	1259.6	1261.1	1.5	200.0	198.5

Band 5, uplink

Signal Type	Signal Frequency [MHz]	Occupied Bandwidth SG [kHz]	Occupied Bandwidth Booster [kHz]	Delta Occupied Bandwidth [kHz]	Delta Limit Occupied Bandwidth [kHz]	Margin to Limit [kHz]
GSM	836.50	247.0	246.8	-0.2	200.0	200.2
LTE	836.50	4126.1	4166.1	40.0	200.0	160.0
CDMA	836.50	1258.8	1262.0	3.2	200.0	196.8

Band 12, uplink

Signal Type	Signal Frequency [MHz]	Occupied Bandwidth SG [kHz]	Occupied Bandwidth Booster [kHz]	Delta Occupied Bandwidth [kHz]	Delta Limit Occupied Bandwidth [kHz]	Margin to Limit [kHz]
GSM	707.00	245.9	246.4	0.5	200.0	199.5
LTE	707.00	4112.4	4175.2	62.8	200.0	137.2
CDMA	707.00	1261.4	1262.8	1.4	200.0	198.6

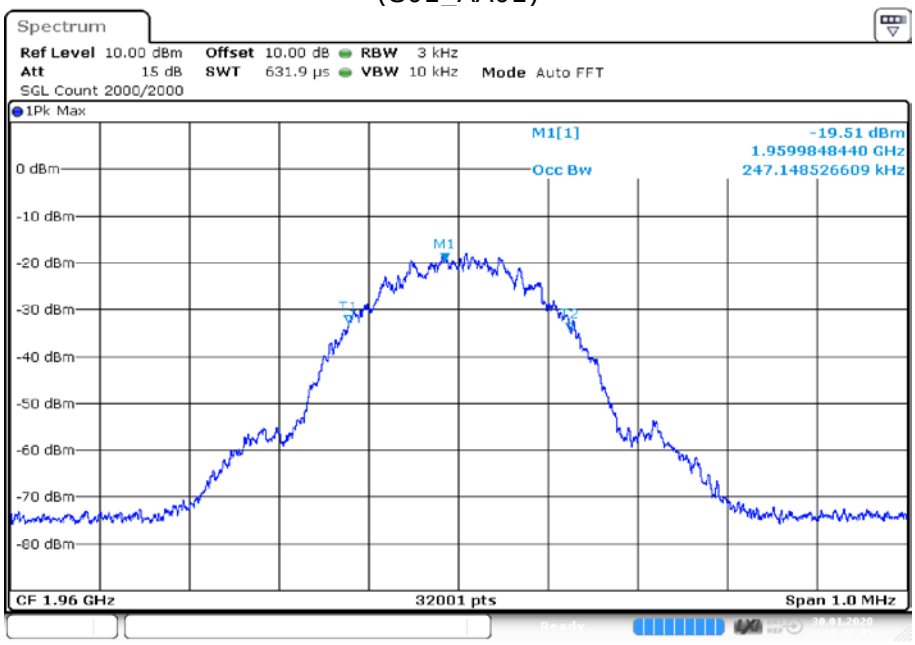
Band 13, uplink

Signal Type	Signal Frequency [MHz]	Occupied Bandwidth SG [kHz]	Occupied Bandwidth Booster [kHz]	Delta Occupied Bandwidth [kHz]	Delta Limit Occupied Bandwidth [kHz]	Margin to Limit [kHz]
GSM	782.00	246.1	247.4	1.2	200.0	198.8
LTE	782.00	4119.6	4164.2	44.7	200.0	155.3
CDMA	782.00	1260.9	1259.5	-1.4	200.0	201.4

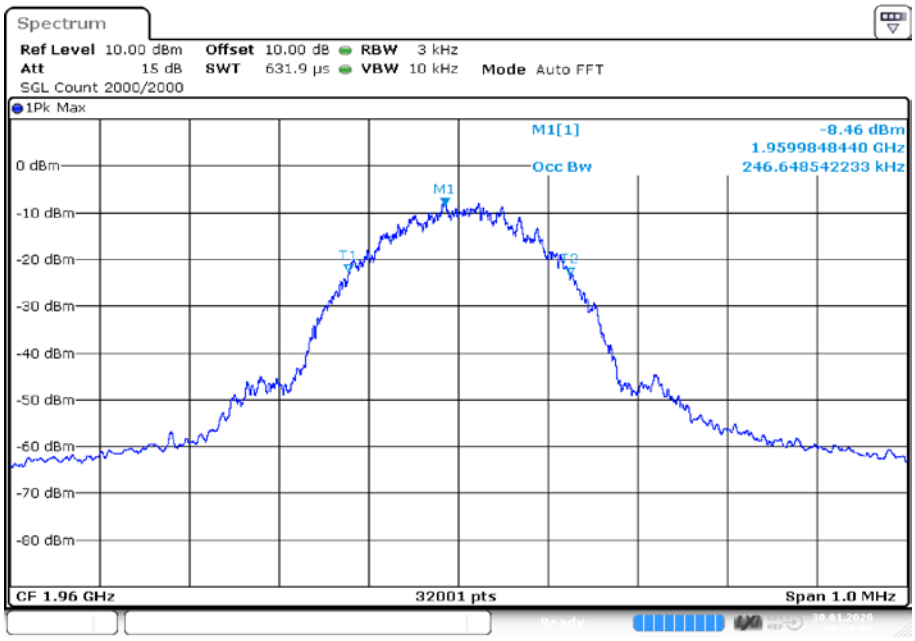
Remark: Please see next sub-clause for the measurement plot.

5.12.4MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, “WORST CASE”)

Frequency Band = Band 2, Direction = Downlink, Signal Type = GSM (S01_AA01)

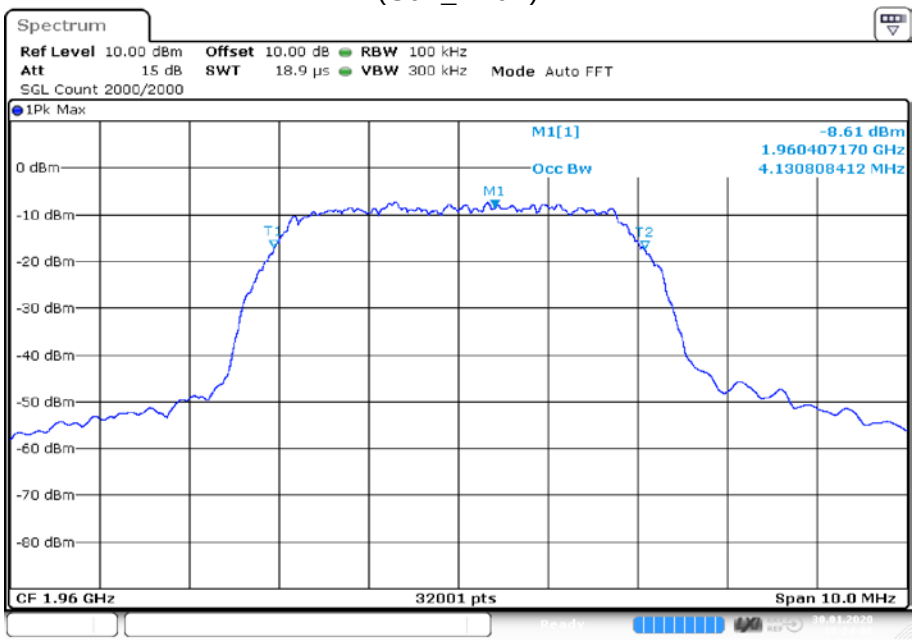


Date: 30.JAN.2020 18:42:05

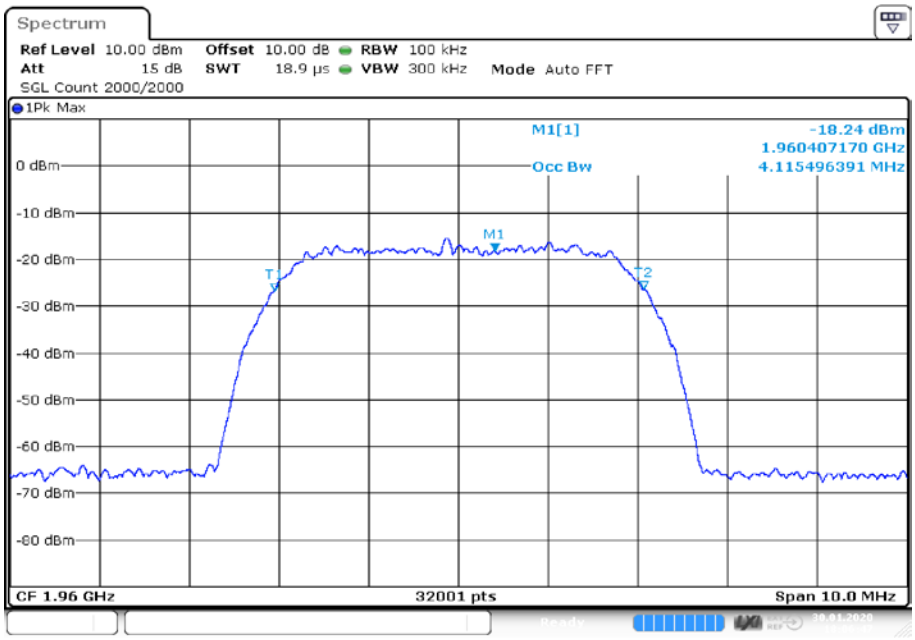


Date: 30.JAN.2020 18:56:05

Frequency Band = Band 2, Direction = Downlink, Signal Type = LTE (S01_AA01)

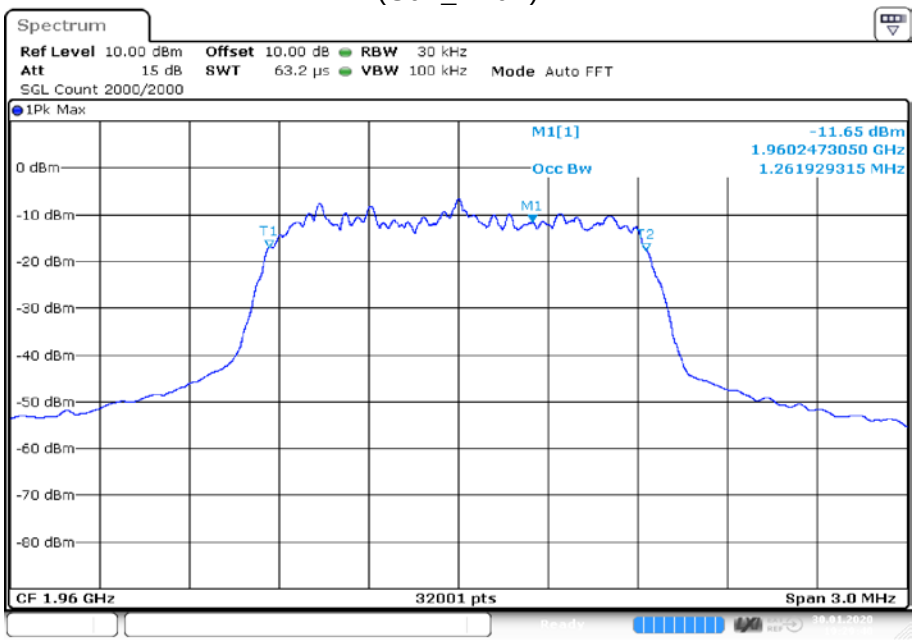


Date: 30.JAN.2020 18:24:07

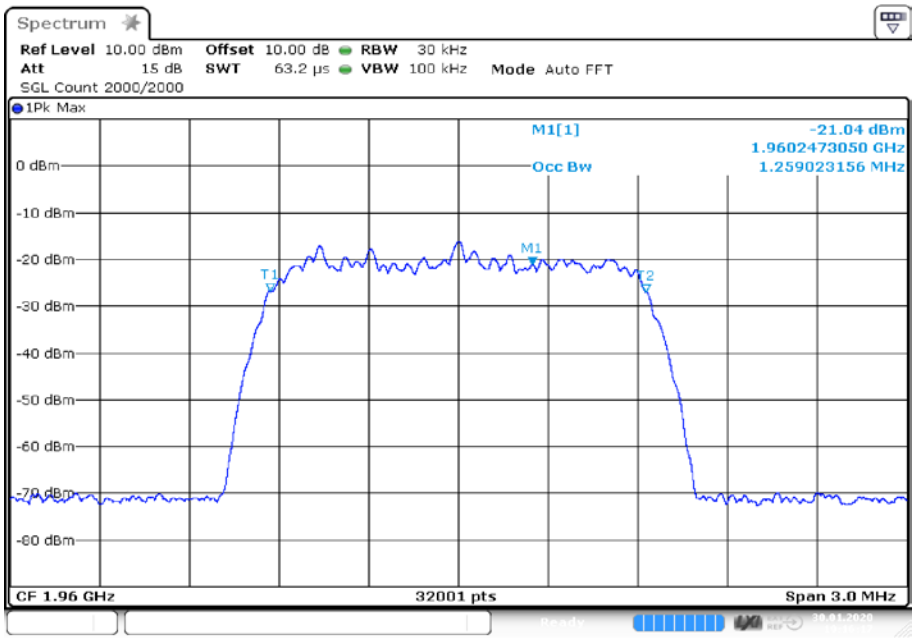


Date: 30.JAN.2020 18:06:48

Frequency Band = Band 2, Direction = Downlink, Signal Type = CDMA (S01_AA01)

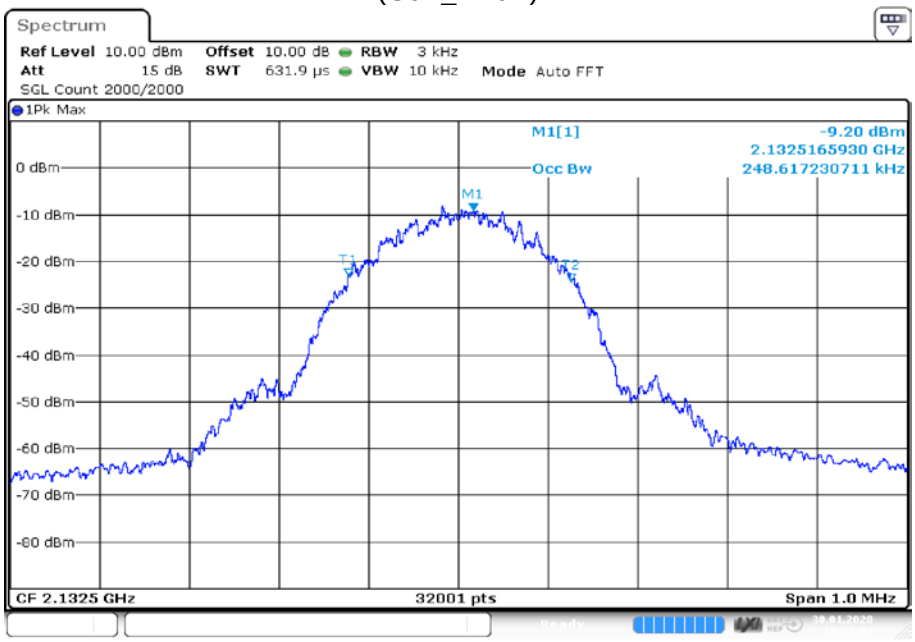


Date: 30.JAN.2020 19:29:41

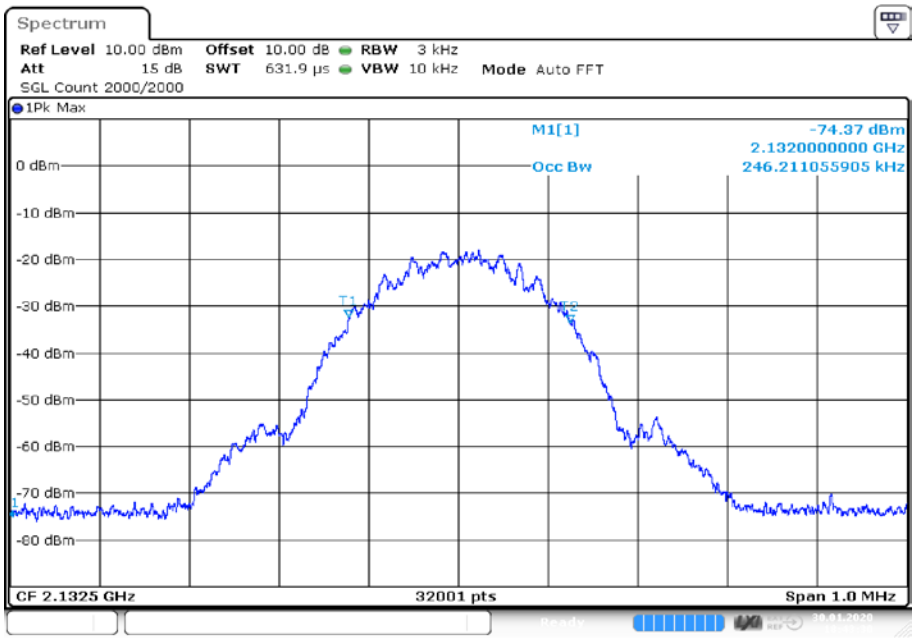


Date: 30.JAN.2020 19:16:17

Frequency Band = Band 4, Direction = Downlink, Signal Type = GSM (S01_AA01)

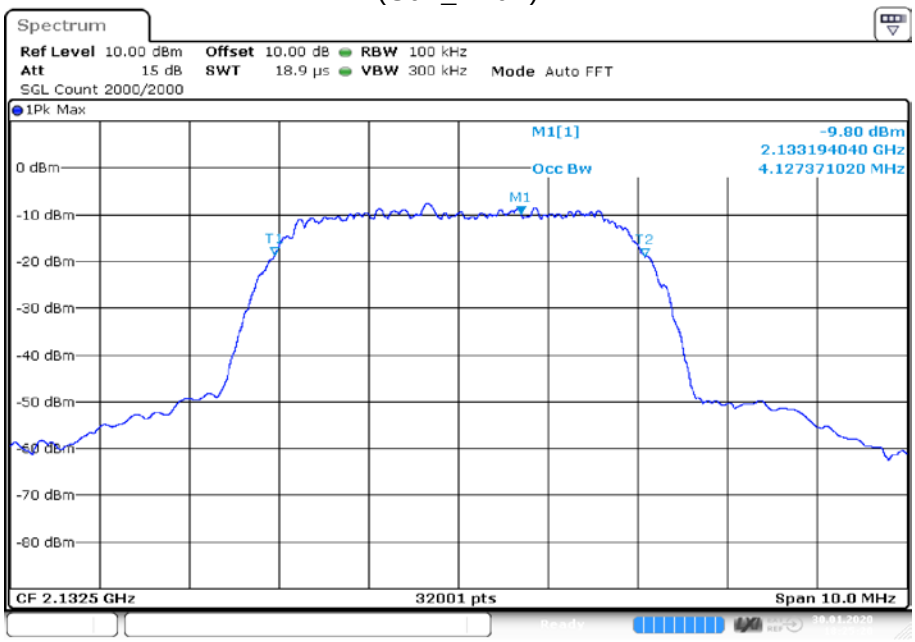


Date: 30.JAN.2020 18:55:02

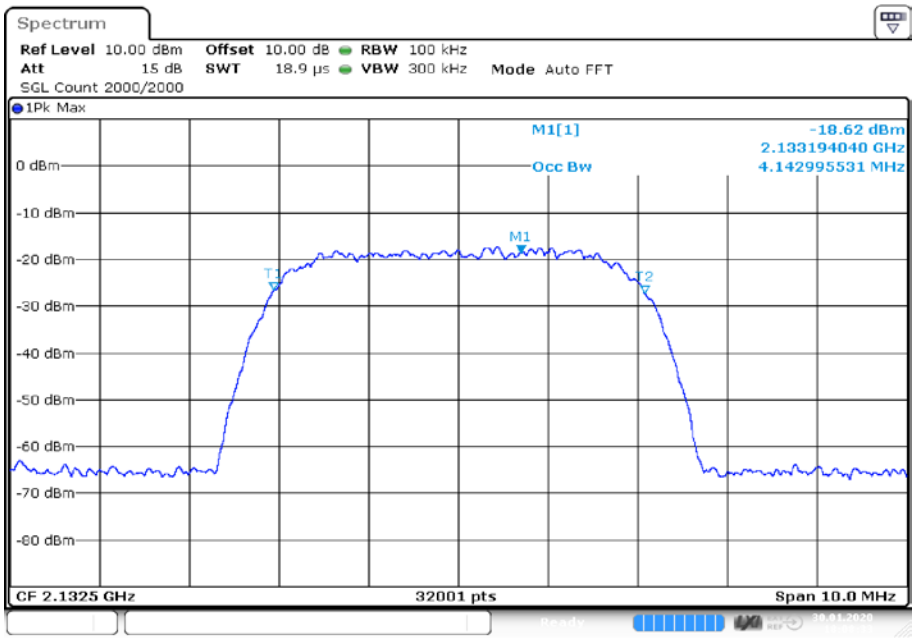


Date: 30.JAN.2020 18:43:30

Frequency Band = Band 4, Direction = Downlink, Signal Type = LTE (S01_AA01)



Date: 30.JAN.2020 18:25:21



Date: 30.JAN.2020 18:08:34