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Radio measurements on Radio 8843 B2 B66A equipment with FCC ID TA8AKRC161707-2

Product name: Radio 8843 B2 B66A
Product number: KRC 161 707/2 and KRC 161 707/1

RISE Research Institutes of Sweden AB Electronics - EMC

Performed by

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Summary

Standard Listed part of	Compliant
FCC CFR 47	
2.1046 RF power output	Yes
2.1049 Occupied bandwidth	Yes
2.1051 Band edge	Yes
2.1051 Spurious emission at antenna terminals	Yes
2.1053 Field strength of spurious radiation	Yes
2.1055 Frequency stability	Yes

Description of the test object

Equipment:	Radio equipment Radio 8843 B2 B66A Product number KRC 161 707/2 and KRC 161 707/1 FCC ID: TA8AKRC161707-2
Hardware revision state:	R1B (KRC 161 707/2) R2A (KRC 161 707/1)
Tested configuration:	Single RAT LTE
Frequency bands: 3GPP	B2: TX: 1930 – 1990 MHz RX: 1850 – 1910 MHz B66: TX: 2110 – 2180 MHz RX: 1710 – 1780 MHz
IBW:	B2: 60 MHz B66A: 70 MHz
Output power:	Maximum output power: B2: 40 W/ port (port A,B,C,D) 60 W/ port (port A,D) port B and C not used in this configuration B66A: 60 W/ port (port E,F,G,H) 80 W/ port (port E,H) port F and G not used in this configuration.
Antenna ports B2:	A-D: 4 TX / 4 RX ports
Antenna ports B66A:	E-H: 4 TX / 4 RX ports
Antenna:	No dedicated antenna, handled during licensing
RF configurations:	Single and multi-carrier, 1-3 carriers/ port TX Diversity, 2x2 MIMO, 4x4 MIMO, Non-Contiguous Spectrum (NCS), Contiguous Spectrum (CS), Carrier Aggregation (CA) intra-band and inter-band supported
Channel bandwidths:	5 MHz, 10 MHz 15 MHz and 20 MHz
Modulations:	QPSK, 16QAM, 64QAM and 256QAM
RF power Tolerance:	+0.6/ -2.0 dB
CPRI Speed	Up to 10.1 Gbit/s

KRC 161 707/1 and KRC 161 707/2 with the revision states above are identical according to the manufacturer. The testing were performed on KRC 161 707/2.
The information above is supplied by the manufacturer.

Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47.

Operation modes during measurements

LTE measurements were performed with the test object transmitting test models as defined in 3GPP TS 37.141. Test model E-TM1.1 was used to represent QPSK, test model E-TM3.2 to represent 16QAM, test model E-TM3.1 to represent 64QAM modulation and E-TM3.1A to represent 256QAM modulation.

In accordance with §2.947 (f) both radios were simultaneously transmitting at maximum output power during all measurements for each tested configuration. The measured configurations covers worst case settings.

Conducted measurements

The test object was supplied with -48 VDC by an external power supply. Additional connections are documented in the set-up drawings for conducted measurements.

Radiated measurements

The test object was powered with -48 VDC by an external power supply. Additional connections are documented in the set-up drawings for radiated measurements.

References

Measurements were done according to relevant parts of the following standards:

ANSI C63.4-2014

CFR 47 part 2, March 2018

CFR 47 part 24, March 2018

CFR 47 part 27, March 2018

ANSI C63.26-2015

KDB 662911 D01 Multiple Transmitter Output v02r01

KDB 971168 D01 Power Meas License Digital Systems v03r01

KDB 971168 D03 IM Emission Repeater Amp v01

3GPP TS 36 141 version 13.6.0

3GPP TS 37.141, version 13.5.0

Measurement equipment

	Calibration Due	RISE number
Test site Tesla	2019-12	503 881
R&S ESU 40	2018-07	901 385
R&S FSQ 40	2018-07	504 143
R&S FSW 43	2018-08	902 073
Control computer with R&S software EMC32 version 10.20.01	-	BX62351
Directional coupler	2019-04	901 496
RF attenuator	2019-04	902 282
High pass filter 3-18 GHz	2018-06	504 200
High pass filter 3-27 GHz	2019-03	BX40074
Coaxial cable Sucoflex 102EA	2019-04	BX50191
Coaxial cable Sucoflex 102EA	2019-04	BX50236
Coaxial cable Sucoflex 102	2019-04	900 690
ETS Lindgren BiConiLog Antenna 3142E	2019-03	BX61914
EMCO Horn Antenna 3115	2019-12	502 175
Flann Standard Gain Horn 20240-20	-	503 674
Miteq, Low Noise Amplifier	2019-01	503 278
µComp Nordic, Low Noise Amplifier	2019-01	901 545
Temperature and humidity meter, Testo 635	2018-06	504 203
Temperature and humidity meter, Testo 625	2018-06	504 188

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation "SP-QD 10885". The uncertainties are calculated with a coverage factor $k=2$ (95% level of confidence).

Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

Reservation

The test results in this report apply only to the particular test object as declared in the report.

Delivery of test object

The test object was delivered: 2018-03-05.

Manufacturer's representative

Mikael Jansson, Ericsson AB.

Test engineers

Tomas Isbring for radiated tests, RISE

Tomas Lennhager and Andreas Johnson for conducted tests, RISE.

Test participant(-s)

None.

Test frequencies used for radiated and conducted measurements

Band 2:

EARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
625	1932.5	B ₅	TX bottom frequency in 5 MHz BW configuration
650	1935.0	B ₁₀	TX bottom frequency in 10 MHz BW configuration
675	1937.5	B ₁₅	TX bottom frequency in 15 MHz BW configuration
700	1940.0	B ₂₀	TX bottom frequency in 20 MHz BW configuration
900	1960.0	M ₅₋₂₀	TX mid frequency in 5-20 MHz BW configuration
1175	1987.5	T ₅	TX top frequency in 5 MHz BW configuration
1150	1985.0	T ₁₀	TX top frequency in 10 MHz BW configuration
1125	1982.5	T ₁₅	TX top frequency in 15 MHz BW configuration
1100	1980.0	T ₂₀	TX top frequency in 20 MHz BW configuration
625 675	1932.5 1937.5	B ₂₅	2 carriers TX bottom constellation in 5 MHz BW configuration
625 675 725	1932.5 1937.5 1942.5	B ₃₅	3 carriers TX bottom constellation in 5 MHz BW configuration
875 925	1957.5 1962.5	M ₂₅	2 carriers TX mid constellation in 5 MHz BW configuration
850 900 950	1955.0 1960.0 1965.0	M ₃₅	3 carriers TX mid constellation in 5 MHz BW configuration
625 675 1175	1932.5 1937.5 1987.5	B _{im}	3 carriers TX constellation with 5 MHz BW configuration
625 1125 1175	1932.5 1982.5 1987.5	T _{im}	3 carriers TX constellation with 5 MHz BW configuration
700 900	1940.0 1960.0	C _{AB20-20}	Carrier Aggregation TX bottom 20 MHz + 20 MHz configuration
800 1000	1950.0 1970.0	C _{AM20-20}	Carrier Aggregation TX mid 20 MHz + 20 MHz configuration

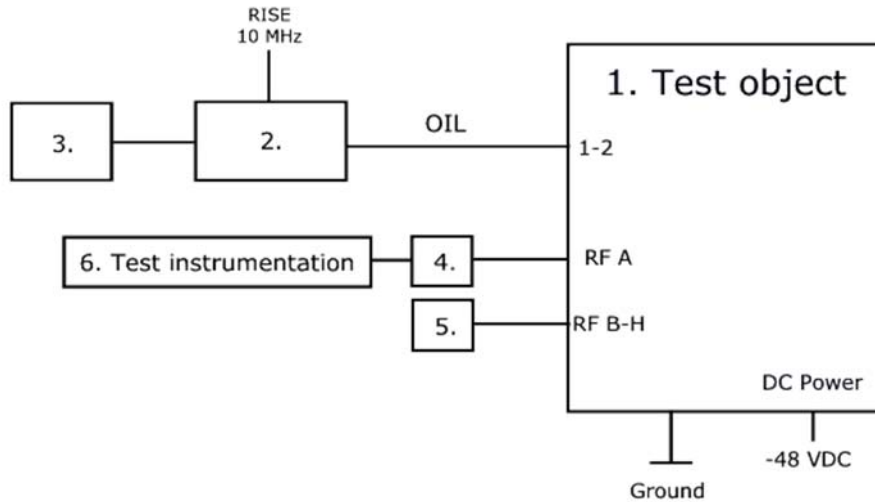
All RX frequencies were configured 80MHz below the corresponding TX frequency according the applicable duplex offset for the operating band.

Band 66A:

EARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
66461	2112.5	B ₅	TX bottom frequency in 5 MHz BW configuration
66486	2115.0	B ₁₀	TX bottom frequency in 10 MHz BW configuration
66511	2117.5	B ₁₅	TX bottom frequency in 15 MHz BW configuration
66536	2120.0	B ₂₀	TX bottom frequency in 20 MHz BW configuration
66786	2145.0	M ₅₋₂₀	TX mid frequency in 5-20 MHz configuration
67111	2177.5	T ₅	TX top frequency in 5 MHz BW configuration
67086	2175.0	T ₁₀	TX top frequency in 10 MHz BW configuration
67061	2172.5	T ₁₅	TX top frequency in 15 MHz BW configuration
67036	2170.0	T ₂₀	TX top frequency in 20 MHz BW configuration
66461 66511	2112.5 2117.5	B ₂₅	2 carriers TX bottom constellation with 5 MHz BW configuration
66461 66511 66561	2112.5 2117.5 2122.5	B ₃₅	3 carriers TX bottom constellation with 5 MHz BW configuration
66486 66586	2115.0 2125.0	B ₂₁₀	2 carriers TX bottom constellation with 10 MHz BW configuration
66486 66586 66686	2115.0 2125.0 2135.0	B ₃₁₀	3 carriers TX bottom constellation with 10 MHz BW configuration
66461 66511 67111	2112.5 2117.5 2177.5	B _{im}	3 carriers TX constellation with 5 MHz BW configuration
66461 67061 67111	2112.5 2172.5 2177.5	T _{im}	3 carriers TX constellation with 5 MHz BW configuration
66536 66736	2120.0 2140.0	CA _{B20+20}	Carrier Aggregation TX bottom 20 MHz + 20 MHz configuration
66836 67036	2150.0 2170.0	CA _{T20+20}	Carrier Aggregation TX top 20 MHz + 20 MHz configuration

All RX frequencies were configured 400MHz below the corresponding TX frequency according the applicable duplex offset for the operating band.

Test setup: conducted measurements



Test object:

1.	Radio 8843 B2 B66A, KRC 161 707/2, rev. R1B, s/n: D16X648303 With Radio Software: CXP 901 7316/7, rev. R70JK FCC ID: TA8AKRC161707-2
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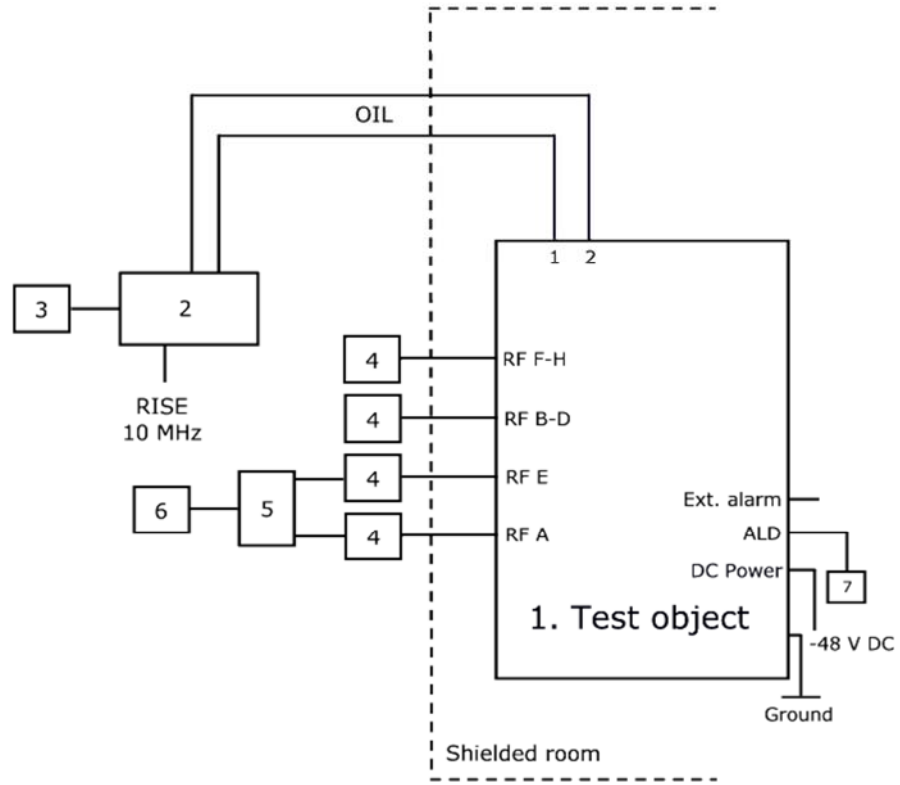
Associated equipment:

2.	Testing Equipment: CT10, LPC 102 487/1, rev. R1C, s/n: T01F375046, BAMS – 1001466800 with software CXA 104 446/1, rev. R9A
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Functional test equipment:

3.	Computer, HP EliteBook 8560w, BAMS - 1001236851
4.	RF Attenuator: SP number: 902 282
5.	50 ohm terminator on each port
6.	RISE Test Instrumentation according to measurement equipment list for each test. The signal analyzer was connected to the RISE 10 MHz reference standard during all measurements.

Test setup: radiated measurements



1.	Radio 8843 B2 B66A, KRC 161 707/2, rev. R1B, s/n: D16X648298 With Radio Software: CXP 901 7316/7, rev. R70JK. FCC ID: TA8AKRC161707-2
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Associated equipment:

2.	Testing Equipment: CT10, LPC 102 487/1, rev. R1C, s/n: T01F375047, BAMS – 1001466801 with software CXA 104 446/1, rev. R9A
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Functional test equipment:

3.	Computer, HP EliteBook 8560w, BAMS – 1001236854
4.	Attenuator
5.	2-way power splitter, Microlab D2-69FN
6.	R&S ESIB 26, RISE no: 503 292, for supervision purpose only
7.	ALD Control, Andrew, model: ATM200-A20, s/n: DESA101412073

Interfaces:

1, Power input port	DC power
2, Power input port	DC power
RF A-H, 4.3-10 connector, combined TX/RX	Antenna
1, Optical Interface Link, single mode opto fibre	Signal
2, Optical Interface Link, single mode opto fibre	Signal
ALD Control, shielded multi-wire	Signal
EXT Alarm, shielded multi-wire	Signal
Ground wire	Ground

RF power output measurements according to CFR 47 §24.232 and §27.50

Date	Temperature	Humidity
2018-03-13	23 °C ± 3 °C	16 % ± 5 %
2018-03-14	22 °C ± 3 °C	13 % ± 5 %
2018-03-15	22 °C ± 3 °C	8 % ± 5 %
2018-03-16	22 °C ± 3 °C	12 % ± 5 %
2018-03-28	22 °C ± 3 °C	7 % ± 5 %
2018-03-29	22 °C ± 3 °C	8 % ± 5 %

Test set-up and procedure

The measurements were made per definition in ANSI C63.26, 5.2.3.4. The test object was connected to a signal analyser measuring peak and RMS output power in CDF mode. A resolution bandwidth of 50 MHz was used.

Measurement equipment	RISE number
R&S FSQ 40	504 143
Directional coupler	901 496
RF attenuator	902 282
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 1.1 dB

Results

Band 2 4x 40 W + Band 66A 4x 60 W configuration:

Single carrier ETM 1.1 QPSK

Rated output power level at each RF port 1x 46 dBm/ port.

Symbolic name	Output power CCDF [RMS dBm/ PAR dB]				
	Port RF A	Port RF B	Port RF C	Port RF D	Total power ¹⁾
B ₅	46.01/ 7.12	45.94/ 7.15	46.09/ 7.12	46.07/ 7.12	52.05

Single carrier ETM 3.2 16QAM

Rated output power level at each RF port 1x 46 dBm/ port.

symbolic name	Output power CCDF [RMS dBm/ PAR dB]				
	Port RF A	Port RF B	Port RF C	Port RF D	Total power ¹⁾
B ₅	46.11/ 7.12	45.96/ 7.12	46.00/ 7.12	46.00/ 7.12	52.04

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

Single carrier ETM 3.1 64QAM

Rated output power level at each RF port 1x 46 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power ¹⁾
B ₅	46.12/ 7.12	45.85/ 7.12	46.07/ 7.12	46.12/ 7.12	52.06
B ₁₀	45.98/ 7.15	45.85/ 7.14	46.05/ 7.18	46.08/ 7.18	52.01
B ₁₅	45.92/ 7.21	45.85/ 7.21	46.05/ 7.24	46.01/ 7.24	51.98
B ₂₀	45.91/ 7.28	45.84/ 7.28	46.03/ 7.31	46.03/ 7.31	51.97
M ₅	45.80/ 7.08	45.76/ 7.09	45.92/ 7.08	45.92/ 7.08	51.87
M ₁₀	45.79/ 7.09	45.79/ 7.07	45.89/ 7.08	45.94/ 7.08	51.87
M ₁₅	45.88/ 7.09	45.79/ 7.09	45.93/ 7.12	45.91/ 7.12	51.09
M ₂₀	45.83/ 7.09	45.85/ 7.09	45.89/7.12	45.97/ 7.12	51.91
T ₅	45.69/ 7.09	45.59/ 7.12	45.71/ 7.12	45.67/ 7.12	51.69
T ₁₀	45.70/ 7.12	45.65/ 7.12	45.64/ 7.15	45.61/ 7.15	51.67
T ₁₅	45.75/ 7.16	45.60/ 7.16	45.70/ 7.18	45.69/ 7.15	51.71
T ₂₀	45.73/ 7.19	45.62/ 7.19	45.68/ 7.21	45.75/ 7.18	51.72

Single carrier ETM 3.1a 256QAM

Rated output power level at each RF port 1x 46 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power ¹⁾
B ₅	46.04/ 7.12	45.93/ 7.15	46.03/ 7.15	46.03/ 7.08	52.03

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

Multi carrier ETM 3.1 64QAM

Rated output power level at each RF port 2x 43 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power ¹⁾
B ₅	45.95/ 7.08	45.88/ 7.05	45.93/ 7.08	46.07/ 7.08	51.98

Multi carrier ETM 3.1 64QAM

Rated output power level at each RF port 3x 41.2 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power ¹⁾
B ₃₅	45.89/ 7.15	45.78/ 7.12	45.85/ 7.12	45.91/ 7.15	51.88

Multi carrier ETM 3.1 64QAM

Rated output power level at each RF port 2x 43 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power ¹⁾
CA _{B20+20}	45.69/ 7.52	45.66/ 7.50	45.71/ 7.50	45.64/ 7.54	51.70

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.
Note: The PAR value is the 0.1 % Peak to Average Ratio.

Single carrier ETM 3.1 64QAM

Rated output power level at RF connector 1x 46 dBm/ port.

	Output power per 1 MHz [RMS dBm]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power ¹⁾
B ₅	40.40	40.14	40.23	40.26	46.40
B ₁₀	37.47	37.22	37.32	37.39	43.47
B ₁₅	35.66	35.38	35.55	35.57	38.66
B ₂₀	34.37	34.15	34.33	34.33	37.37

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.

Band 2 2x 60 W + Band 66A 2x 80 W configuration:

Single carrier ETM 3.1 64QAM

Rated output power level at each RF port 1x 47.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
Symbolic name	Port RF A	Port RF D	Total power ¹⁾
M ₅	47.29/ 7.08	47.33/ 7.08	50.32

Single carrier ETM 3.2 16QAM

Rated output power level at each RF port 1x 47.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
Symbolic name	Port RF A	Port RF D	Total power ¹⁾
M ₅	47.33/ 7.06	47.33/ 7.08	50.34

Single carrier ETM 1.1 QPSK

Rated output power level at each RF port 1x 47.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
symbolic name	Port RF A	Port RF D	Total power ¹⁾
B ₅	47.50/ 7.10	47.50/ 7.12	50.51
B ₁₀	47.43/ 7.14	47.53/ 7.16	50.49
B ₁₅	47.42/ 7.22	47.47/ 7.26	50.46
B ₂₀	47.44/ 7.30	47.42/ 7.32	50.44
M ₅	47.58/ 7.06	47.35/ 7.08	50.48
M ₁₀	47.51/ 7.06	47.40/ 7.08	50.47
M ₁₅	47.55/ 7.08	47.35/ 7.10	50.46
M ₂₀	47.55/ 7.10	47.30/ 7.08	50.44
T ₅	47.17/ 7.10	47.11/ 7.12	50.15
T ₁₀	47.31/ 7.12	47.14/ 7.12	50.24
T ₁₅	47.29/ 7.16	47.12/ 7.16	50.22
T ₂₀	47.36/ 7.18	47.12/ 7.18	50.25

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.
Note: The PAR value is the 0.1 % Peak to Average Ratio.

Single carrier ETM 3.1a 256QAM

Rated output power level at each RF port 1x 47.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
symbolic name	Port RF A	Port RF D	Total power ¹⁾
M ₅	47.32/ 7.08	47.29/ 7.08	50.32

Multi carrier ETM 1.1 QPSK

Rated output power level at each RF port 2x 44.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
Symbolic name	Port RF A	Port RF D	Total power ¹⁾
M ₂₅	47.52/ 6.96	47.44/ 6.98	50.49

Multi carrier ETM 1.1 QPSK

Rated output power level at each RF port 3x 43 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
Symbolic name	Port RF A	Port RF D	Total power ¹⁾
M ₃₅	47.49/ 6.94	47.45/ 6.94	50.48

Multi carrier ETM 1.1 QPSK

Rated output power level at each RF port 2x 44.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
Symbolic name	Port RF A	Port RF D	Total power ¹⁾
CA _{M20+20}	47.62/ 7.10	47.54/ 7.10	50.59

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

Single carrier ETM 1.1 QPSK

Rated output power level at RF connector 1x 47.8 dBm/ port.

Symbolic name	Output power per 1 MHz [RMS dBm]		
	Port RF A	Port RF D	Total power ¹⁾
M ₅	41.20	41.16	44.20
M ₁₀	38.30	38.23	41.30
M ₁₅	36.64	36.50	39.64
M ₂₀	35.35	35.39	38.39

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.

Band 2 4x 40 W + Band 66A 4x 60 W configuration:

Single carrier ETM 3.1 64QAM

Rated output power level at each RF port 1x 47.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF E	Port RF F	Port RF G	Port RF H	Total power ¹⁾
B ₅	47.74/ 7.12	47.65/ 7.12	47.55/ 7.12	47.66/ 7.12	53.67

Single carrier ETM 3.2 16QAM

Rated output power level at each RF port 1x 47.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
symbolic name	Port RF E	Port RF F	Port RF G	Port RF H	Total power ¹⁾
B ₅	47.71/ 7.12	47.66/ 7.12	47.62/ 7.08	47.65/ 7.12	53.68

Single carrier ETM 1.1 QPSK

Rated output power level at each RF port 1x 47.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
symbolic name	Port RF E	Port RF F	Port RF G	Port RF H	Total power ¹⁾
B ₅	47.80/ 7.12	47.71/ 7.12	47.69/ 7.12	47.74/ 7.12	53.76
B ₁₀	47.59/ 7.12	47.65/ 7.12	47.64/ 7.12	47.72/ 7.12	53.67
B ₁₅	47.57/ 7.15	47.64/ 7.15	47.57/ 7.15	47.70/ 7.15	53.64
B ₂₀	47.55/ 7.15	47.62/ 7.15	47.54/ 7.15	47.66/ 7.15	53.61
M ₅	47.57/ 7.12	47.67/ 7.12	47.60/ 7.12	47.76/ 7.12	53.67
M ₁₀	47.63/ 7.12	47.69/ 7.12	47.58/ 7.12	47.80/ 7.12	53.70
M ₁₅	47.57/ 7.12	47.67/ 7.12	47.59/ 7.12	47.82/ 7.12	53.68
M ₂₀	47.61/ 7.12	47.69/ 7.12	47.62/ 7.12	47.71/ 7.12	53.68
T ₅	47.50/ 7.12	47.42/ 7.12	47.47/ 7.12	47.57/ 7.12	53.51
T ₁₀	47.55/ 7.12	47.46/ 7.15	47.49/ 7.12	47.60/ 7.12	53.55
T ₁₅	47.53/ 7.18	47.55/ 7.18	47.46/ 7.18	47.62/ 7.18	53.56
T ₂₀	47.56/ 7.21	47.57/ 7.21	47.49/ 7.21	47.65/ 7.18	53.59

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.
Note: The PAR value is the 0.1 % Peak to Average Ratio.

Single carrier ETM 3.1a 256QAM

Rated output power level at each RF port 1x 47.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
symbolic name	Port RF E	Port RF F	Port RF G	Port RF H	Total power ¹⁾
B ₅	47.75/ 7.15	47.62/ 7.15	47.60/ 7.08	47.66/ 7.08	53.68

Multi carrier ETM 1.1 QPSK

Rated output power level at each RF port 2x 44.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF E	Port RF F	Port RF G	Port RF H	Total power ¹⁾
B ₂₅	47.54/ 7.02	47.52/ 7.02	47.56/ 7.02	47.53/ 7.02	53.56

Multi carrier ETM 1.1 QPSK

Rated output power level at each RF port 3x 43 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF E	Port RF F	Port RF G	Port RF H	Total power ¹⁾
B ₃₅	47.48/ 6.99	47.41/ 6.99	47.35/ 6.99	47.46/ 6.99	53.45

Multi carrier ETM 1.1 QPSK

Rated output power level at each RF port 2x 44.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF E	Port RF F	Port RF G	Port RF H	Total power ¹⁾
CA ₂₀₊₂₀	47.29/ 7.14	47.29/ 7.14	47.17/ 7.12	47.27/ 7.12	58.40

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.
Note: The PAR value is the 0.1 % Peak to Average Ratio.

Single carrier ETM 1.1 QPSK

Rated output power level at RF connector 1x 47.8 dBm/ port.

Symbolic name	Output power per 1 MHz [RMS dBm]				
	Port RF E	Port RF F	Port RF G	Port RF H	Total power ¹⁾
B ₅	41.74	41.71	41.65	41.57	47.74
B ₁₀	38.82	38.76	38.70	38.70	44.82
B ₁₅	37.05	37.02	36.88	36.95	43.05
B ₂₀	35.80	35.65	35.63	35.64	41.80

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.

Band 2 2x 60 W + Band 66A 2x 80 W configuration:

Single carrier ETM 3.1 64QAM

Rated output power level at each RF port 1x 49 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
Symbolic name	Port RF E	Port RF H	Total power ¹⁾
B ₁₀	48.47/ 7.12	48.19/ 7.12	51.34

Single carrier ETM 3.2 16QAM

Rated output power level at each RF port 1x 49 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
Symbolic name	Port RF E	Port RF H	Total power ¹⁾
B ₁₀	48.41 7.12	48.32/ 7.12	51.38

Single carrier ETM 1.1 QPSK

Rated output power level at each RF port 1x 49 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
symbolic name	Port RF E	Port RF H	Total power ¹⁾
B ₅	48.30/ 7.10	48.08/ 7.10	51.20
B ₁₀	48.71/ 7.12	48.22/ 7.12	51.48
B ₁₅	48.63/ 7.14	48.30/ 7.16	51.48
B ₂₀	48.59/ 7.14	48.25/ 7.16	51.43
M ₅	48.50/ 7.10	48.59/ 7.10	51.56
M ₁₀	48.48/ 7.10	48.50/ 7.10	51.50
M ₁₅	48.53/ 7.10	48.59/ 7.12	51.57
M ₂₀	48.56/ 7.10	48.61/ 7.10	51.60
T ₅	48.00/ 7.10	48.05/ 7.10	51.04
T ₁₀	48.19/ 7.12	48.17/ 7.12	51.19
T ₁₅	48.35/ 7.16	48.34/ 7.18	51.36
T ₂₀	48.29/ 7.20	48.48/ 7.20	51.40

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

Single carrier ETM 3.1a 256QAM

Rated output power level at each RF port 1x 47.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
symbolic name	Port RF E	Port RF H	Total power ¹⁾
B ₁₀	48.45/ 7.12	48.27/ 7.14	51.37

Multi carrier ETM 1.1 QPSK

Rated output power level at each RF port 2x 46 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
Symbolic name	Port RF E	Port RF H	Total power ¹⁾
B ₂₁₀	48.48/ 7.06	48.66/ 7.06	51.58

Multi carrier ETM 1.1 QPSK

Rated output power level at each RF port 3x 44.2 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
Symbolic name	Port RF E	Port RF H	Total power ¹⁾
B ₃₁₀	48.49/ 7.12	48.64/ 7.16	51.58

Multi carrier ETM 1.1 QPSK

Rated output power level at each RF port 2x 46 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]		
Symbolic name	Port RF E	Port RF H	Total power ¹⁾
C _{AB20+20}	48.48/ 7.12	48.52/ 7.16	51.51

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

Single carrier ETM 1.1 QPSK

Rated output power level at RF connector 1x 49 dBm/ port.

Symbolic name	Output power per 1 MHz [RMS dBm]		
	Port RF E	Port RF H	Total power ¹⁾
B ₅	42.08	42.00	45.08
B ₁₀	39.22	39.18	42.22
B ₁₅	37.62	37.65	40.65
B ₂₀	36.36	36.31	39.36

¹⁾: summed output power according to ANSI C63.26 5.2.5.3 and 6.4.3.2.3.

Remark

This unit is tested without antenna. ERP/EIRP compliance is addressed at the time of licensing, as required by the responsible FCC/IC Bureau(s). Licensee's are required to take into account maximum allowed antenna gain used in combination with above power settings to prevent the radiated output power to exceed the limits.

Limits

§24.232

The maximum output power may not exceed 3280 W/MHz (EIRP).
In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

§27.50 (d)

The maximum output power may not exceed 3280 W/MHz (EIRP).
In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Complies?	Yes
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Occupied bandwidth measurements according to CFR47 §2.1049

Date	Temperature	Humidity
2018-03-20	22 °C ± 3 °C	11 % ± 5 %
2018-03-21	22 °C ± 3 °C	9 % ± 5 %
2018-04-03	19 °C ± 3 °C	8 % ± 5 %

Test set-up and procedure

The measurements were made per definition in ANSI C63.26, 5.4.4. The output was connected to a signal analyzer with the Peak detector activated in max hold.

Measurement equipment	RISE number
R&S FSW 43	902 073
Directional coupler	901 496
RF attenuator	902 282
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Band 2 4x 40 W + Band 66A 4x 60 W configuration:

Single carrier ETM 1.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
1	M ₅	RF C	4.501

Single carrier ETM 3.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
2	M ₅	RF A	4.495
3	M ₅	RF B	4.484
4	B ₅	RF C	4.506
5	B ₂₀	RF C	17.886
6	M ₅	RF C	4.506
7	M ₁₀	RF C	8.956
8	M ₁₅	RF C	13.438
9	M ₂₀	RF C	17.888
10	T ₅	RF C	4.503
11	T ₂₀	RF C	17.884
12	M ₅	RF D	4.495

Single carrier ETM 3.1a

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
13	M ₅	RF C	4.490

Single carrier ETM 3.2

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
14	M ₅	RF C	4.494

Carrier Aggregation ETM 3.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
15	CA ₂₀₋₂₀	RF C	37.727

Band 2 2x 60 W + Band 66A 2x 80 W configuration:

Single carrier ETM 1.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
16	M ₅	RF A	4.501

Single carrier ETM 3.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
17	B ₅	RF A	4.503
18	B ₂₀	RF A	17.886
19	M ₅	RF A	4.505
20	M ₁₀	RF A	8.956
21	M ₁₅	RF A	13.438
22	M ₂₀	RF A	17.899
23	T ₅	RF A	4.503
24	T ₂₀	RF A	17.897
25	M ₅	RF D	4.495

Single carrier ETM 3.1a

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
26	M ₅	RF A	4.491

Single carrier ETM 3.2

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
27	M ₅	RF A	4.492

Carrier Aggregation ETM 3.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
28	CA _{M20-20}	RF A	37.724

Band 2 4x 40 W + Band 66A 4x 60 W configuration:

Single carrier ETM 1.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
29	M ₅	RF F	4.485

Single carrier ETM 3.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
30	M ₅	RF E	4.485
31	B ₅	RF F	4.506
32	B ₂₀	RF F	17.890
33	M ₅	RF F	4.507
34	M ₁₀	RF F	8.961
35	M ₁₅	RF F	13.451
36	M ₂₀	RF F	17.892
37	T ₅	RF F	4.506
38	T ₂₀	RF F	17.888
39	M ₅	RF G	4.486
40	M ₅	RF H	4.485

Single carrier ETM 3.1a

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
41	M ₅	RF F	4.484

Single carrier ETM 3.2

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
42	M ₅	RF F	4.478

Carrier Aggregation ETM 3.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
43	CA ₂₀₋₂₀	RF F	37.810

Band 2 x 60 W + Band 66A 2x 80 W configuration:

Single carrier ETM 1.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
44	T ₅	RF E	4.500

Single carrier ETM 3.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
45	B ₅	RF E	4.503
46	B ₂₀	RF E	17.900
47	M ₅	RF E	4.503
48	M ₂₀	RF E	17.905
49	T ₅	RF E	4.506
50	T ₁₀	RF E	8.955
51	T ₁₅	RF E	13.472
52	T ₂₀	RF E	17.898
53	T ₅	RF H	4.494

Single carrier ETM 3.1a

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
54	T ₅	RF E	4.490

Single carrier ETM 3.2

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
55	T ₅	RF E	4.493

Carrier Aggregation ETM 3.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
56	CA _{T20-20}	RF E	37.729

Diagram 1:

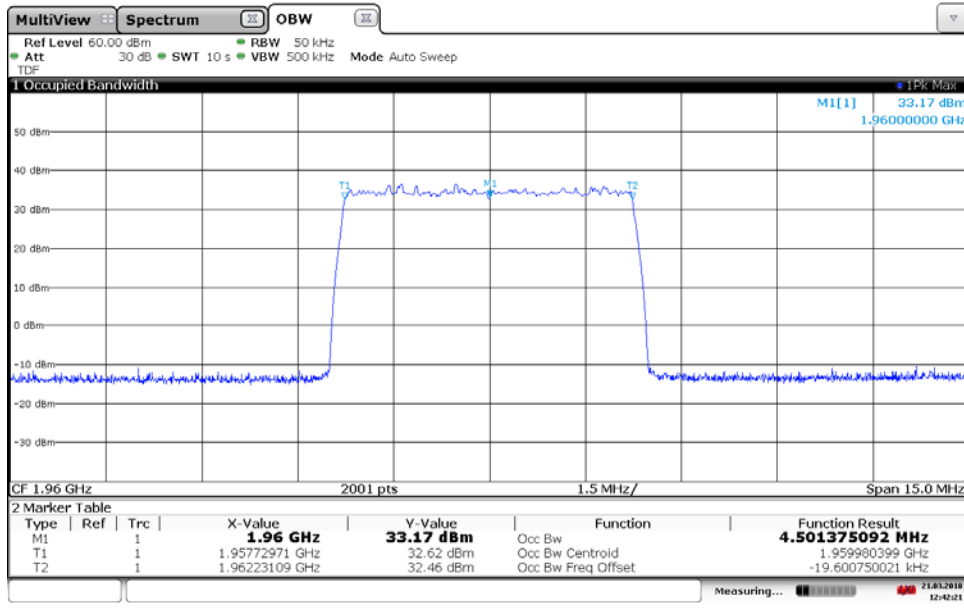


Diagram 2:

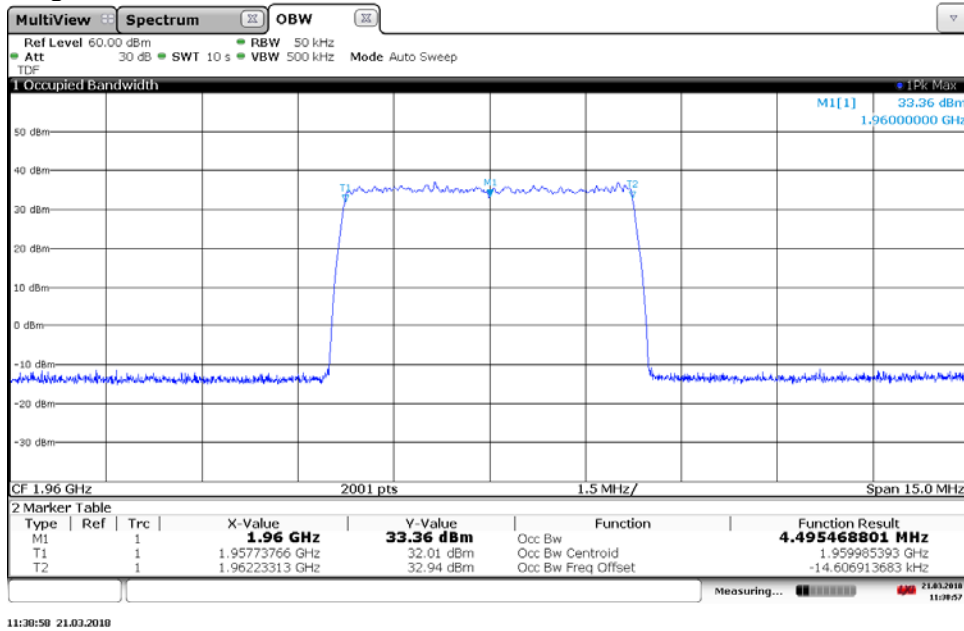
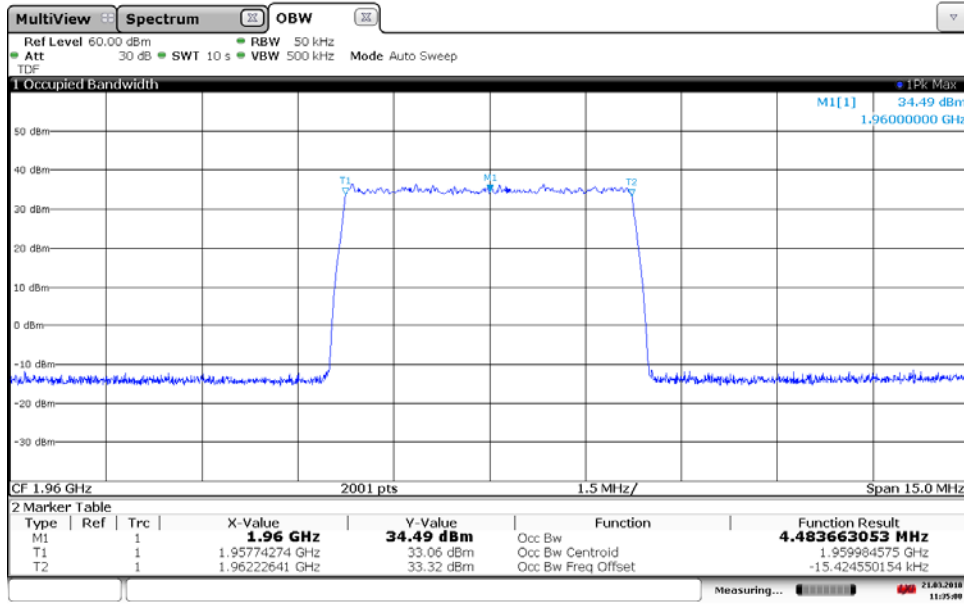
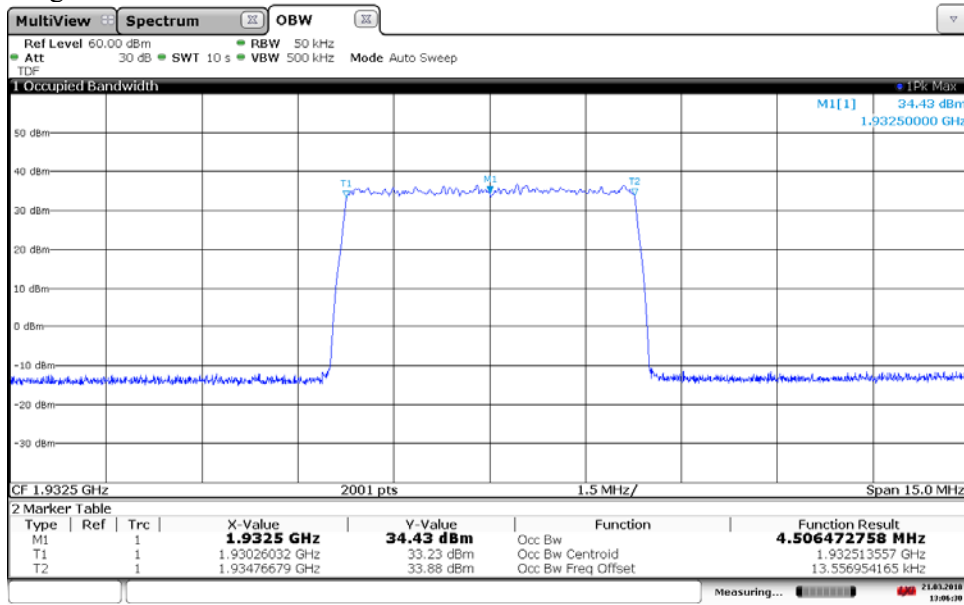


Diagram 3:



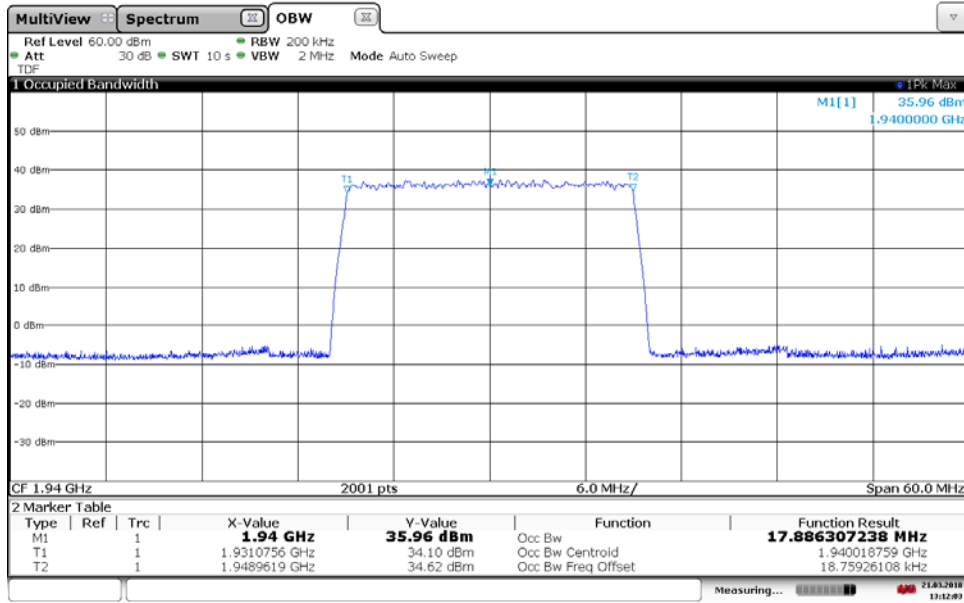
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Diagram 4:



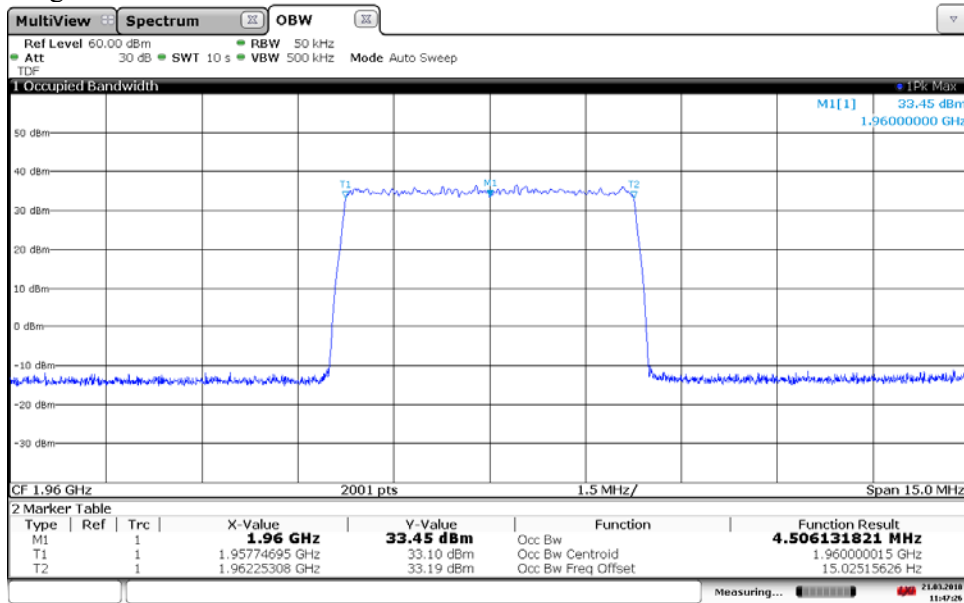
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Diagram 5:



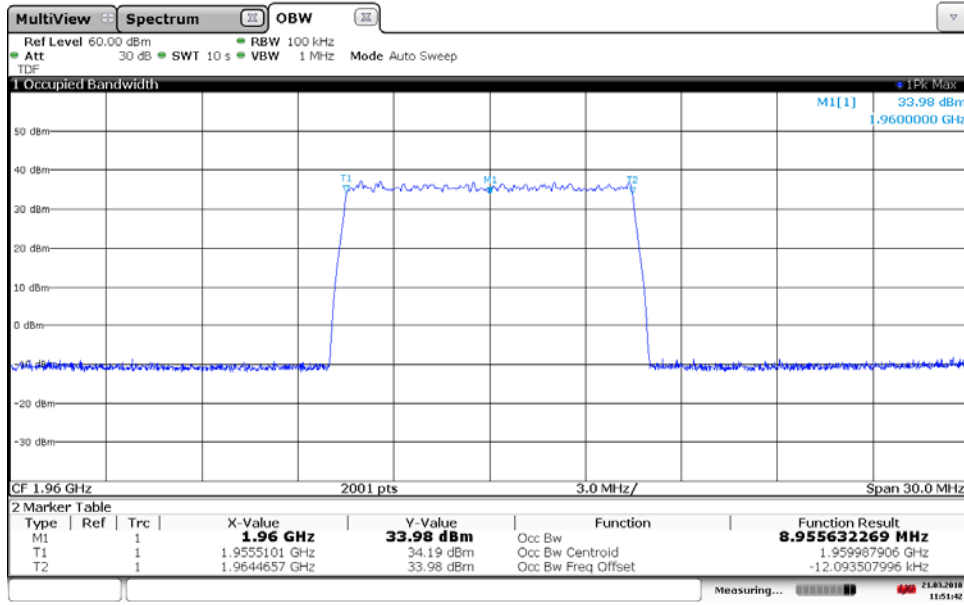
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Diagram 6:



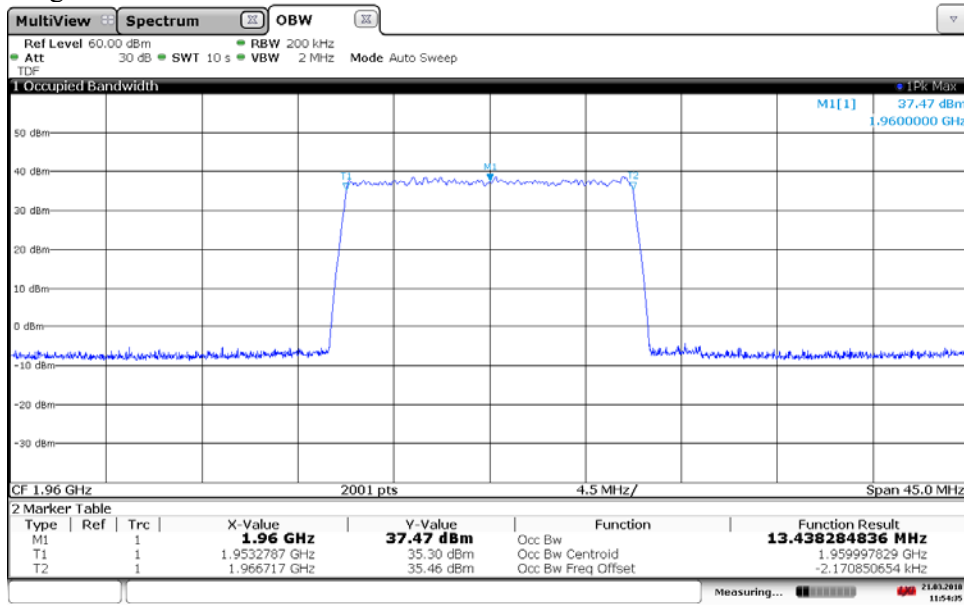
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Diagram 7:



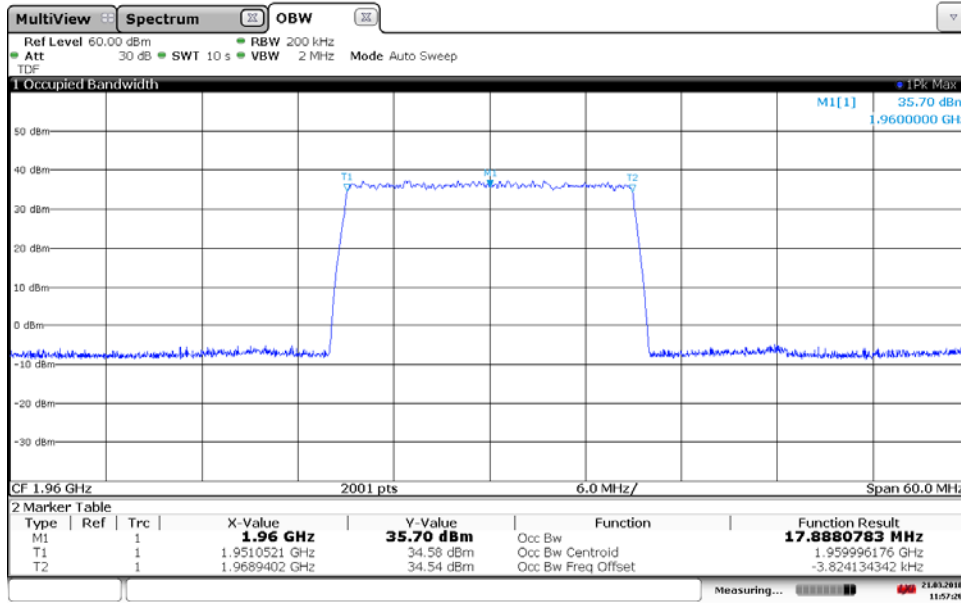
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Diagram 8:



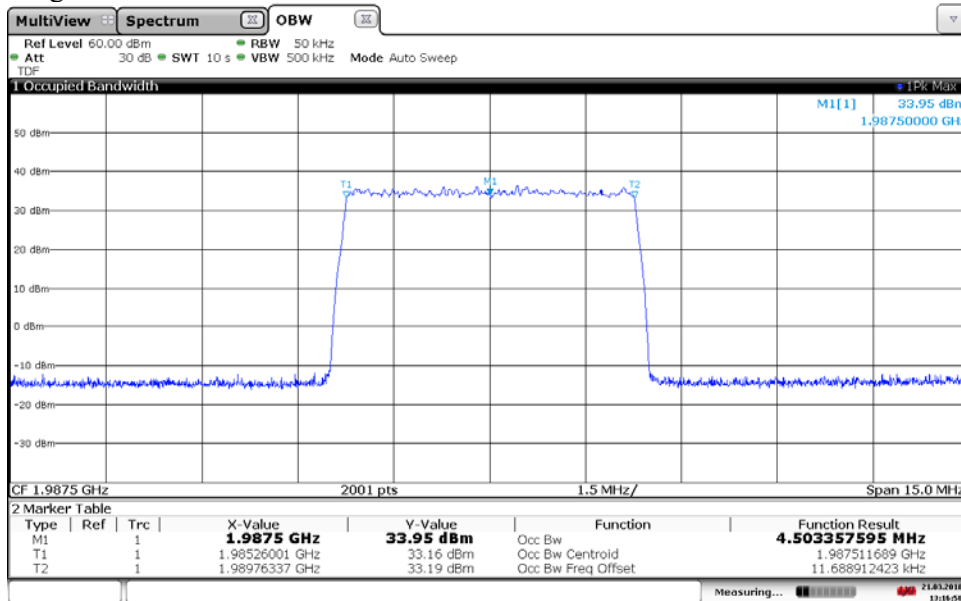
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Diagram 9:



11:57:27 21.03.2018

Diagram 10:



13:16:58 21.03.2018

Diagram 11:

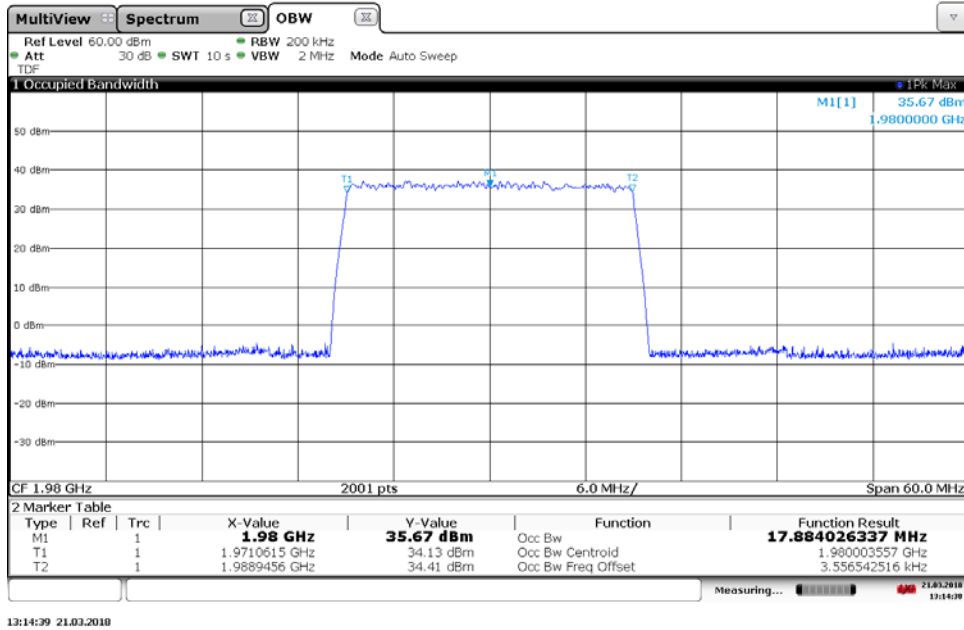


Diagram 12:

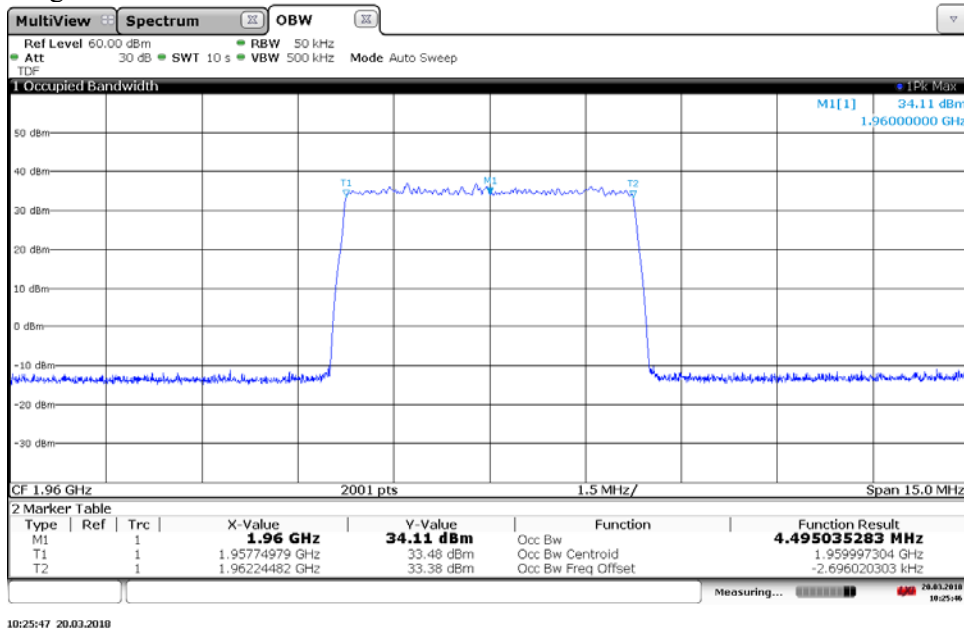
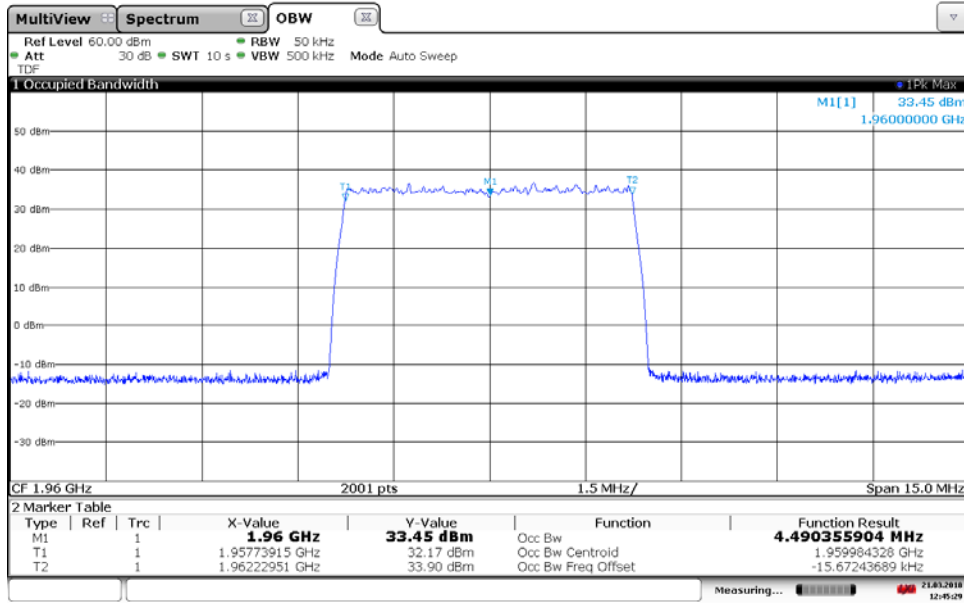
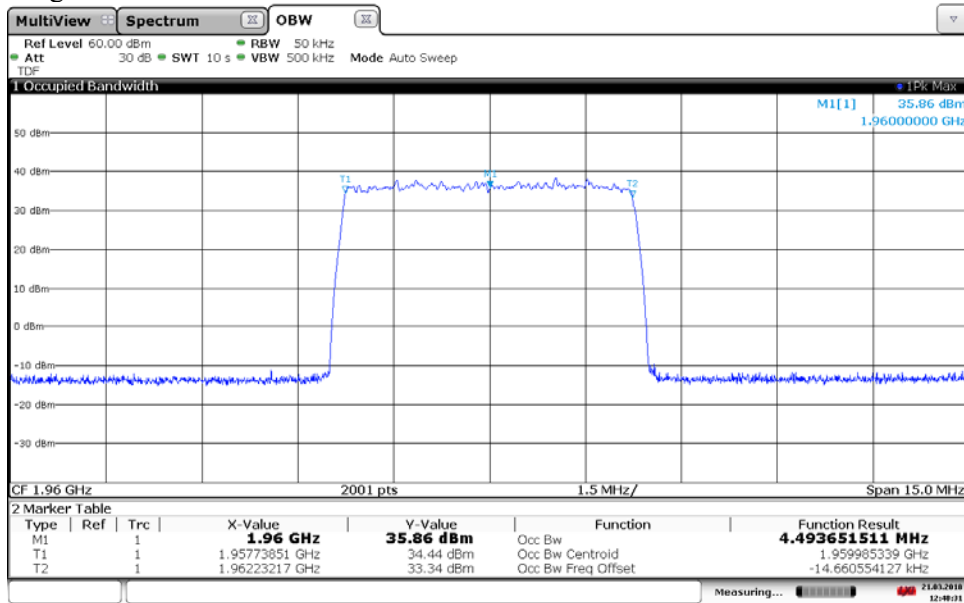


Diagram 13:



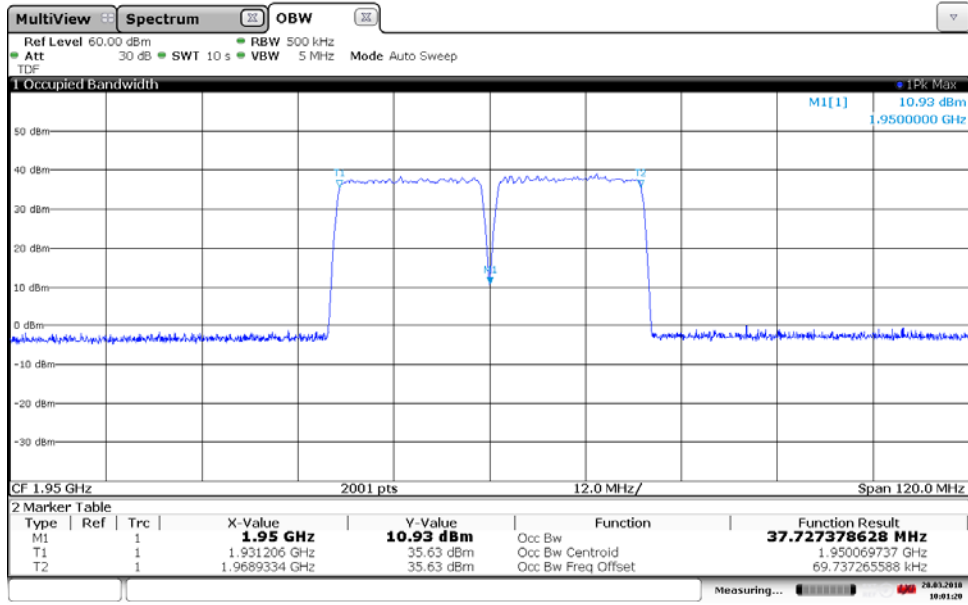
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Diagram 14:



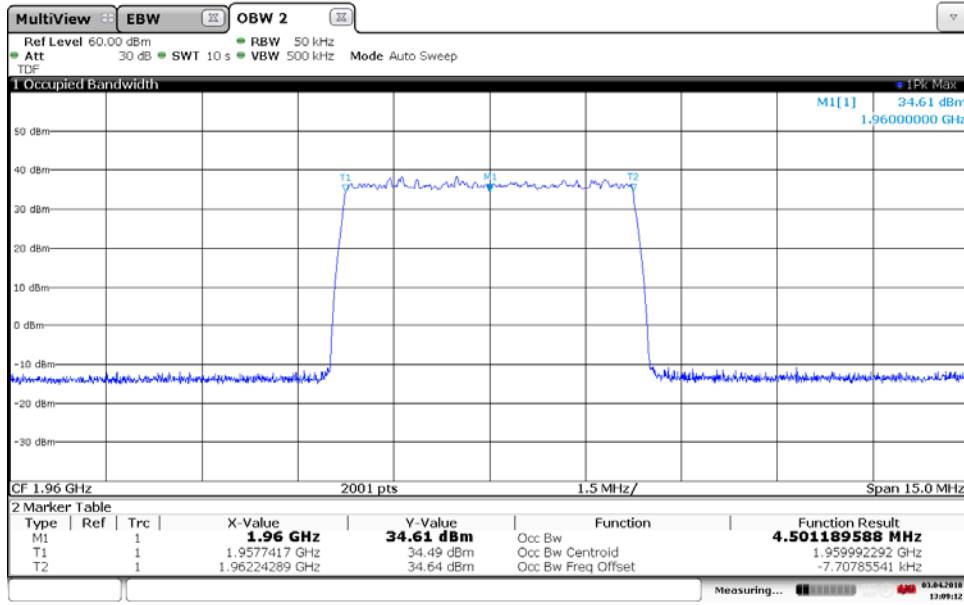
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Diagram 15:



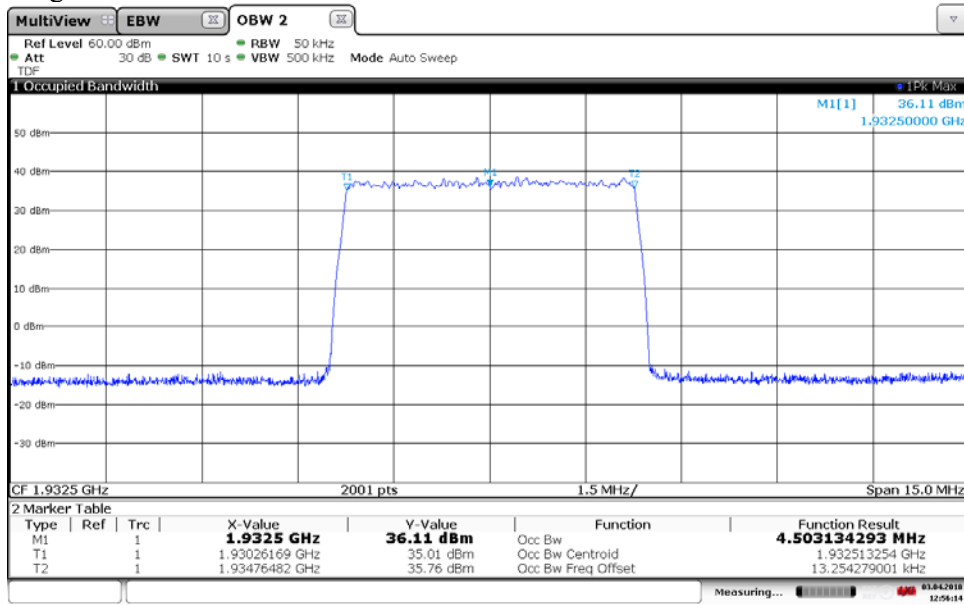
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Diagram 16:



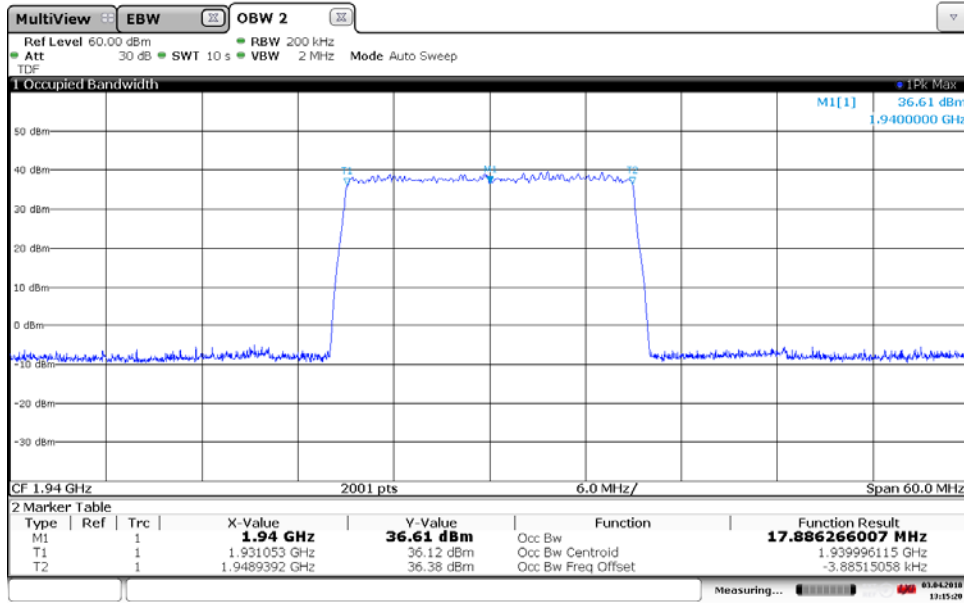
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Diagram 17:



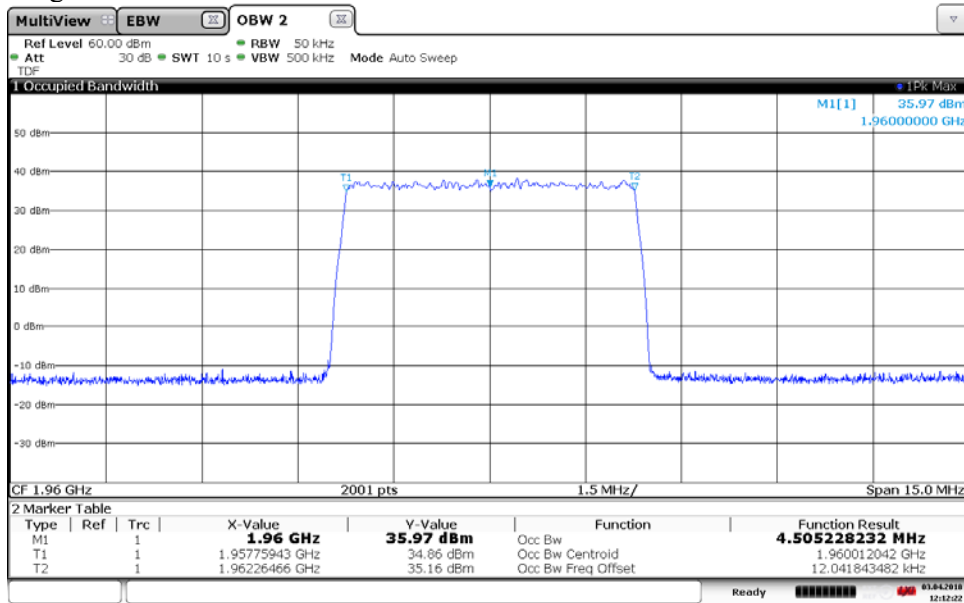
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Diagram 18:



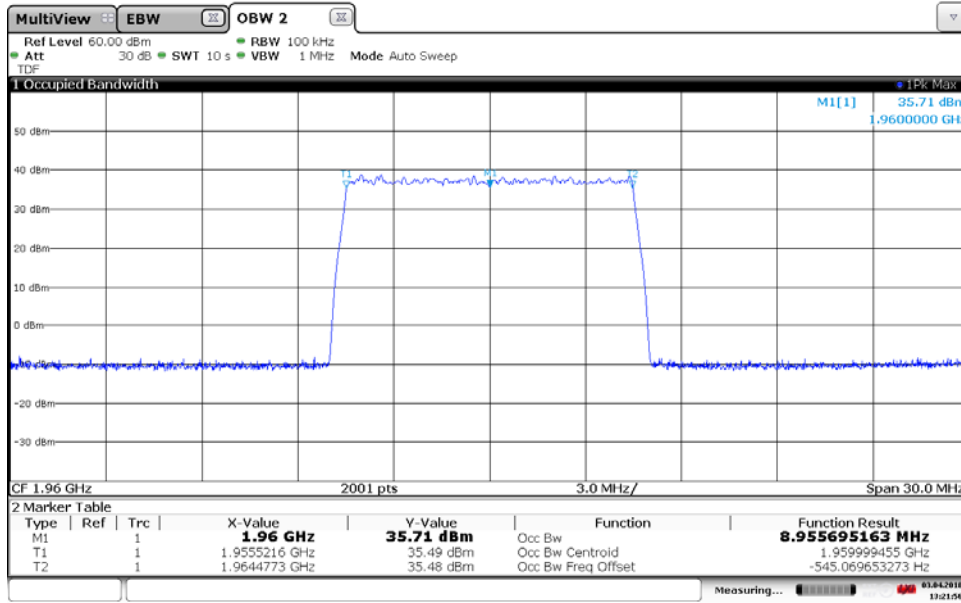
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Diagram 19:



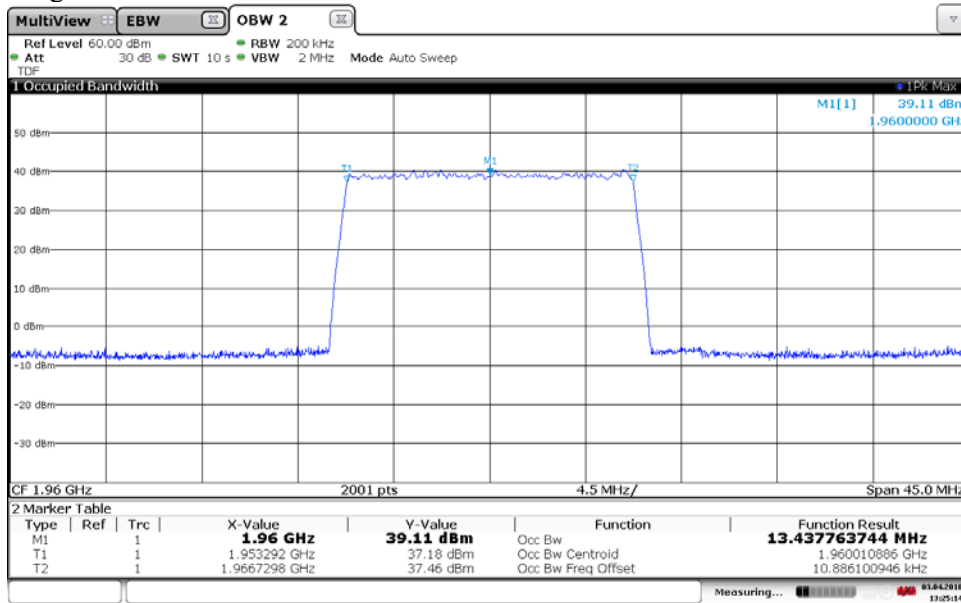
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Diagram 20:



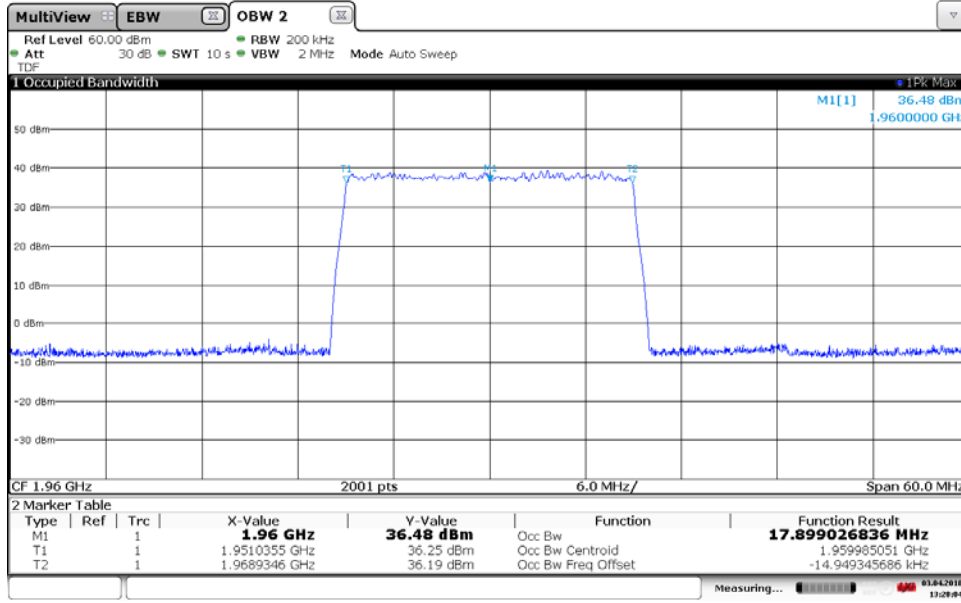
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Diagram 21:



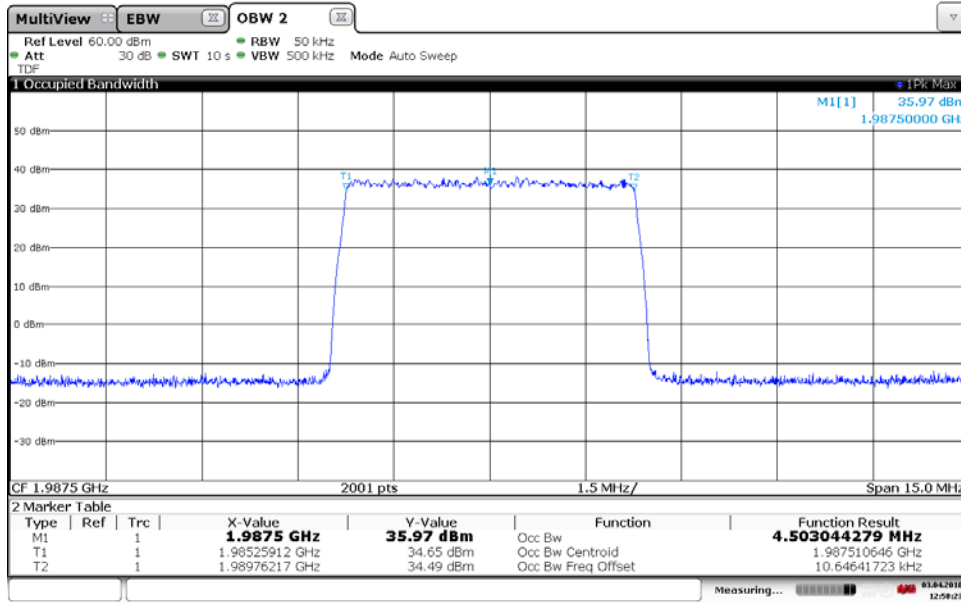
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Diagram 22:



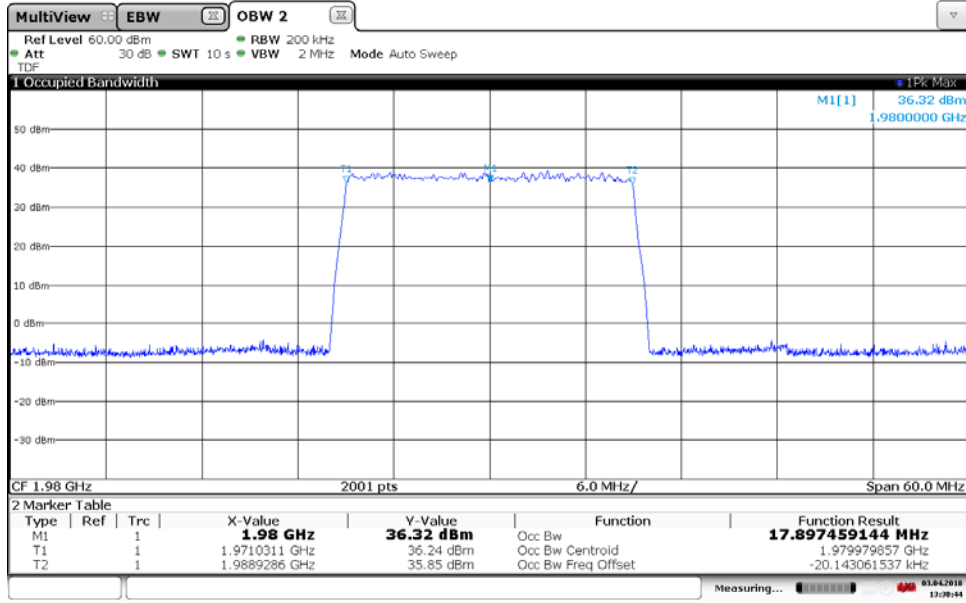
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Diagram 23:



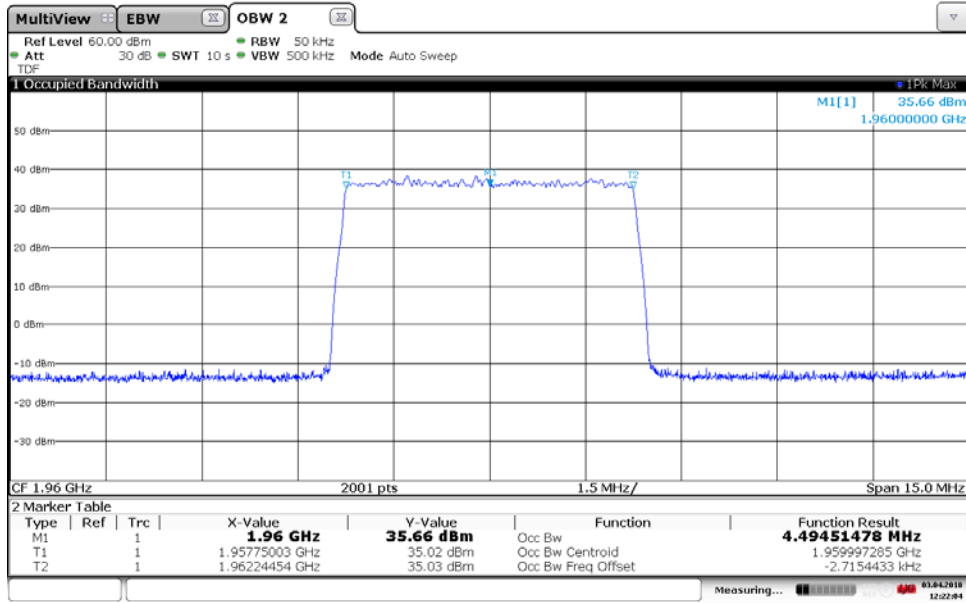
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Diagram 24:



13:30:45 03.04.2018

Diagram 25:



12:22:04 03.04.2018

Diagram 26:

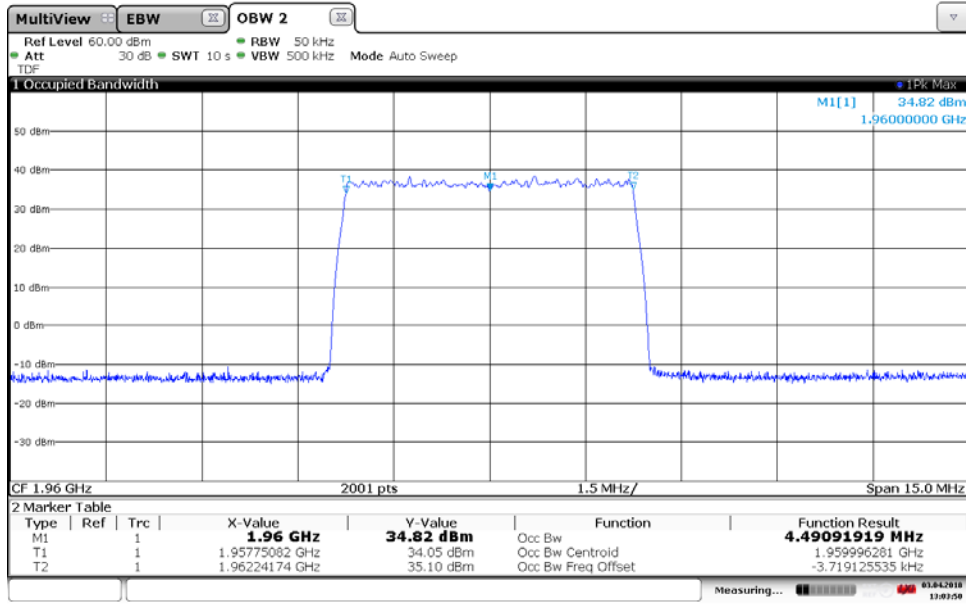


Diagram 27:

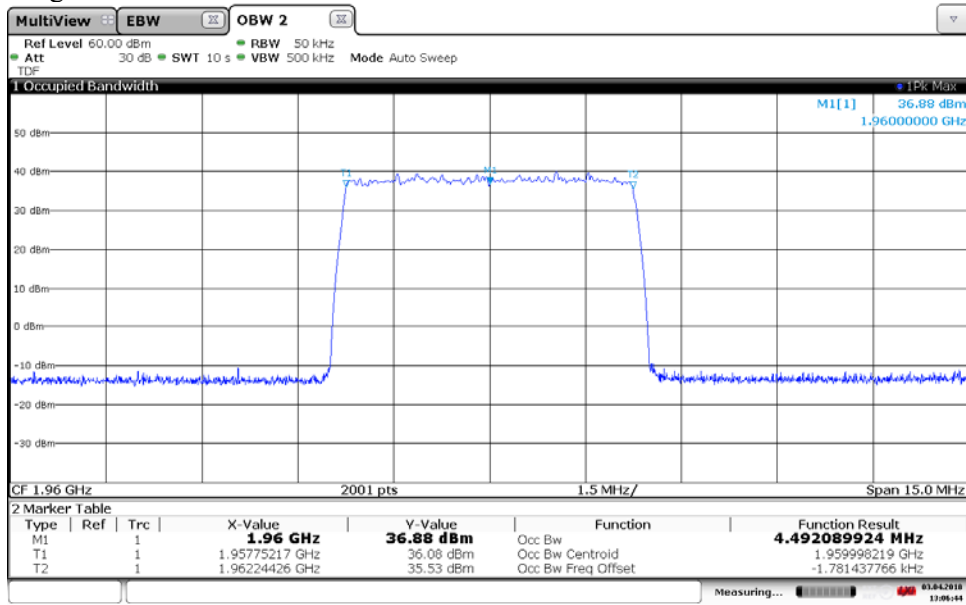
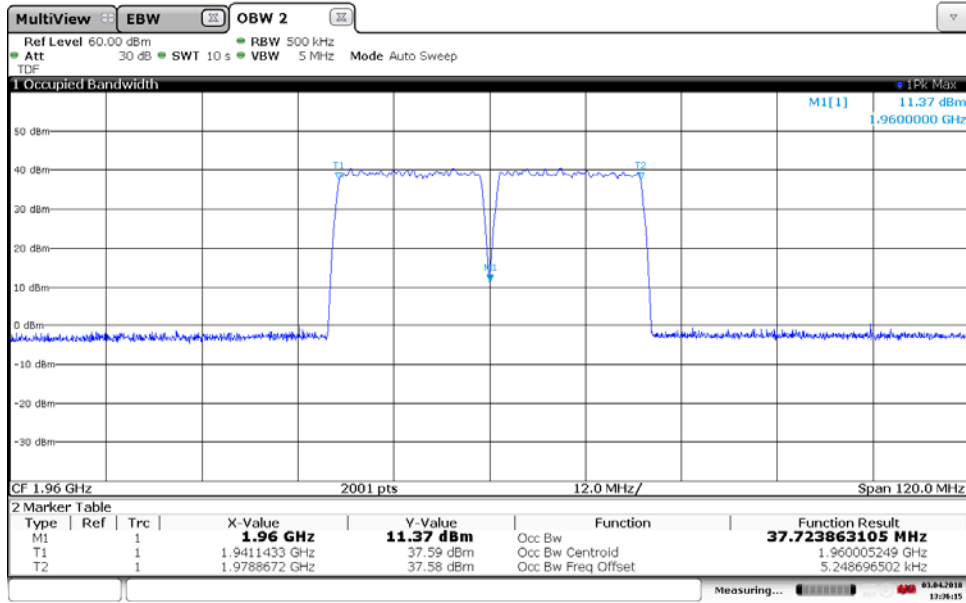
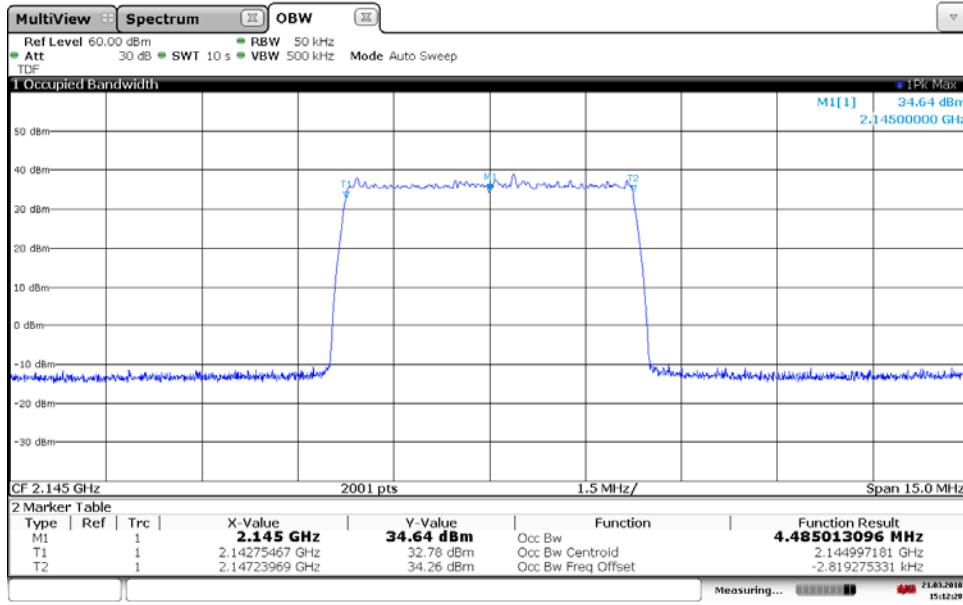


Diagram 28:



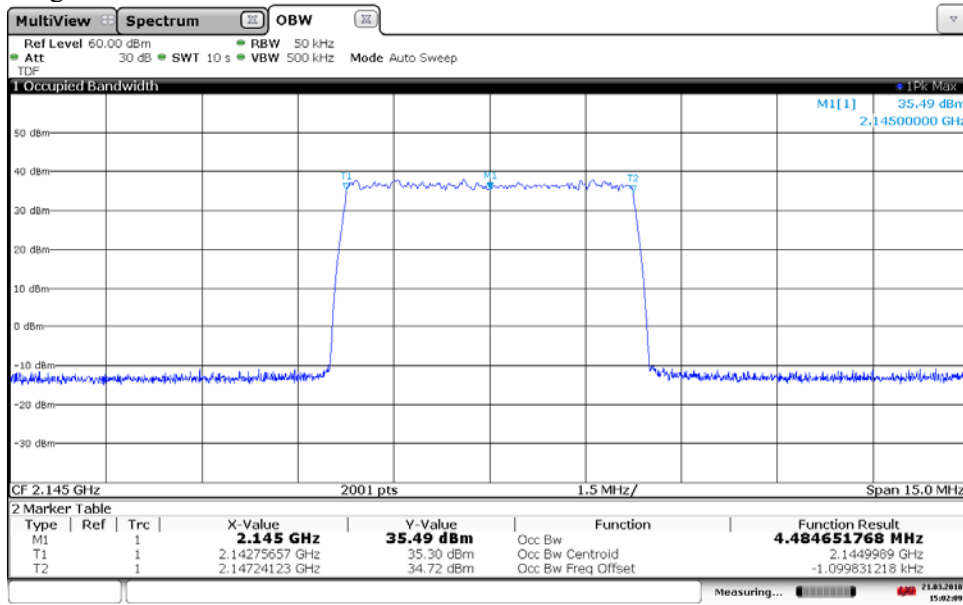
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Diagram 29:



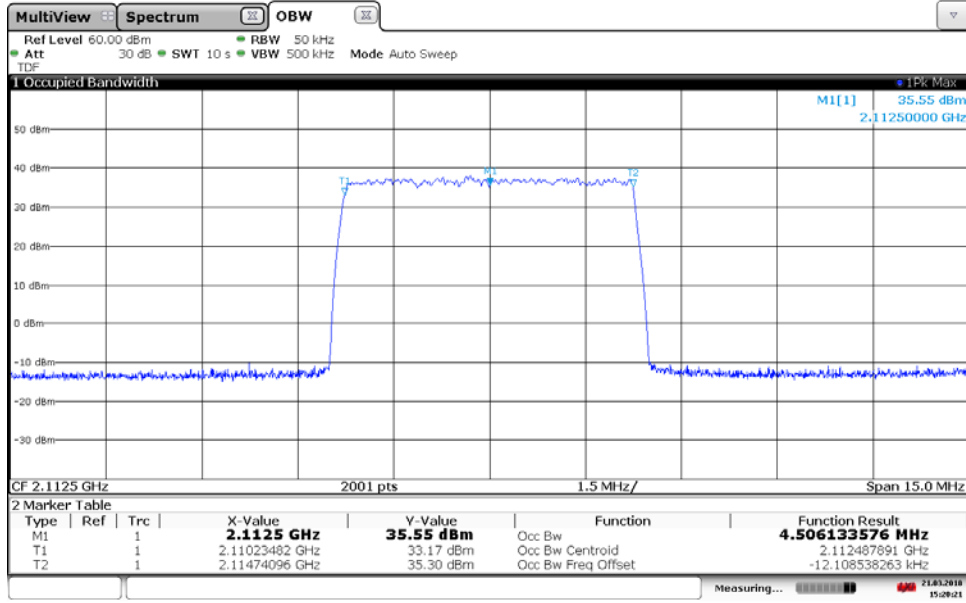
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Diagram 30:



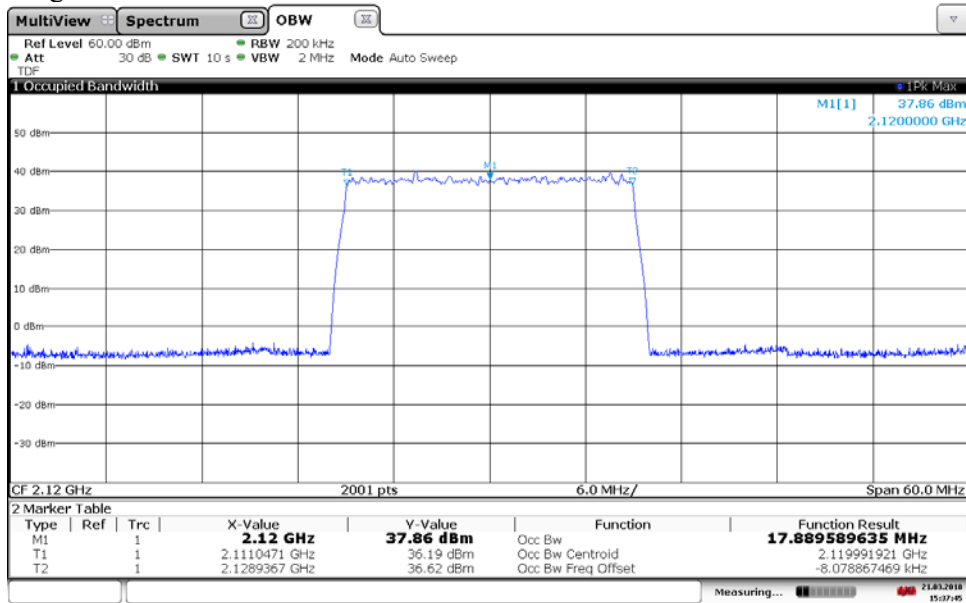
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Diagram 31:



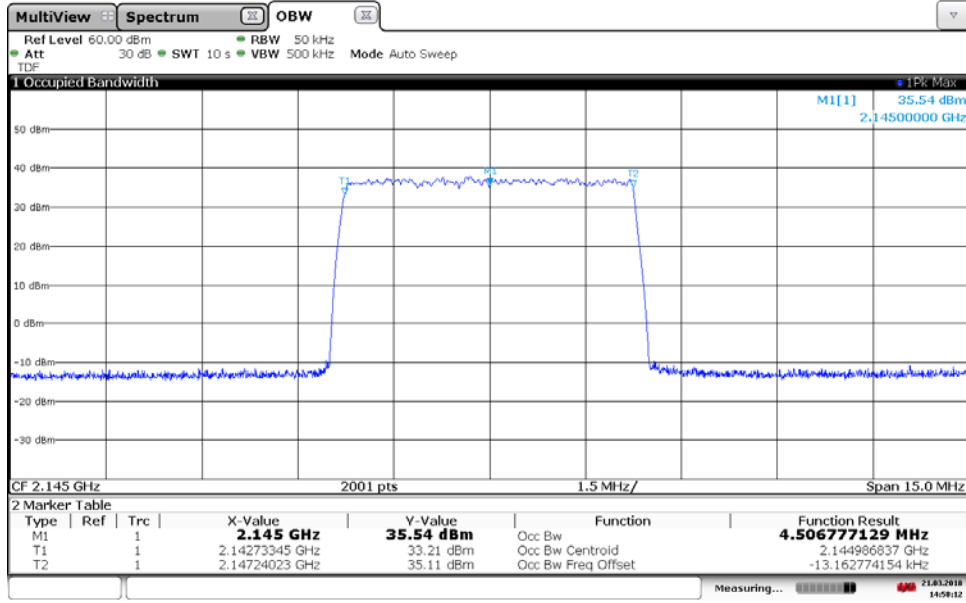
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Diagram 32:



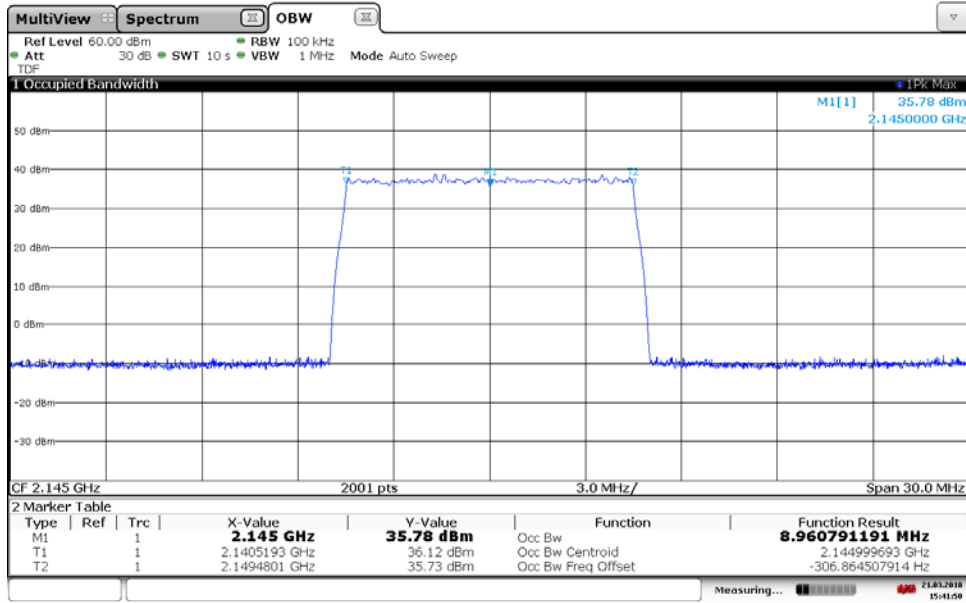
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Diagram 33:



14:58:12 21.03.2018

Diagram 34:



15:41:51 21.03.2018

Diagram 35:

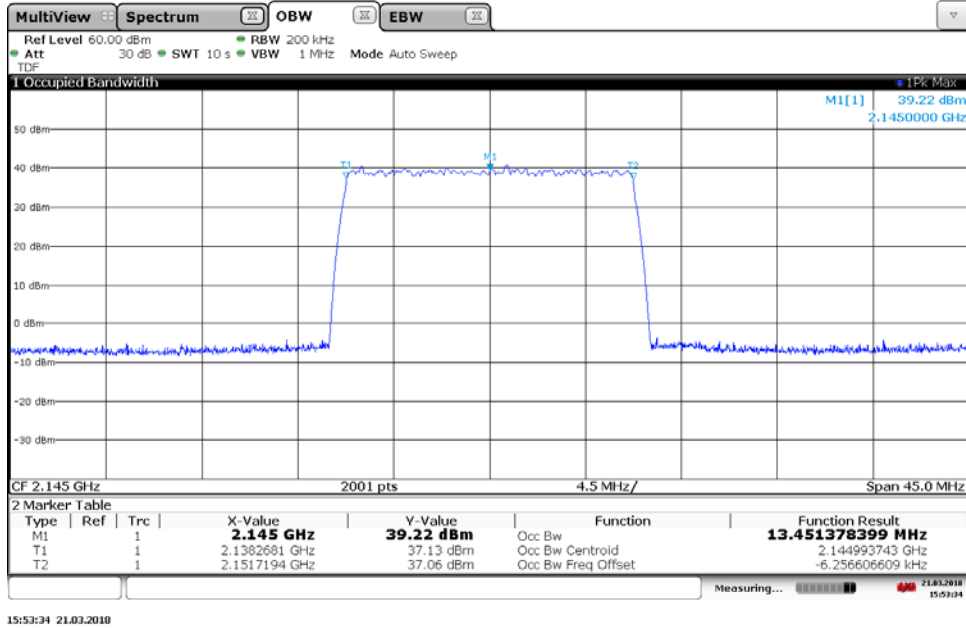


Diagram 36:

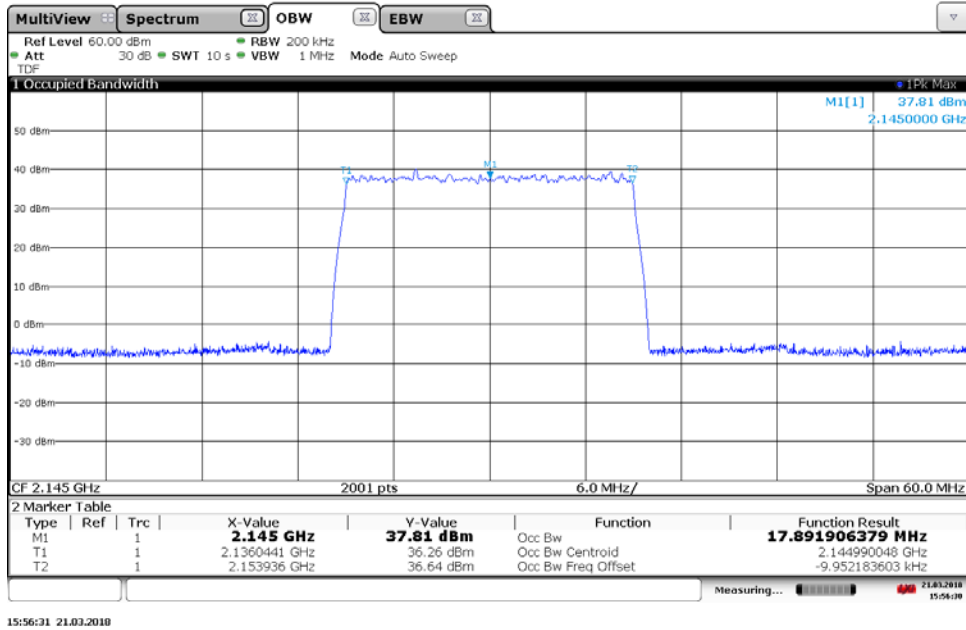
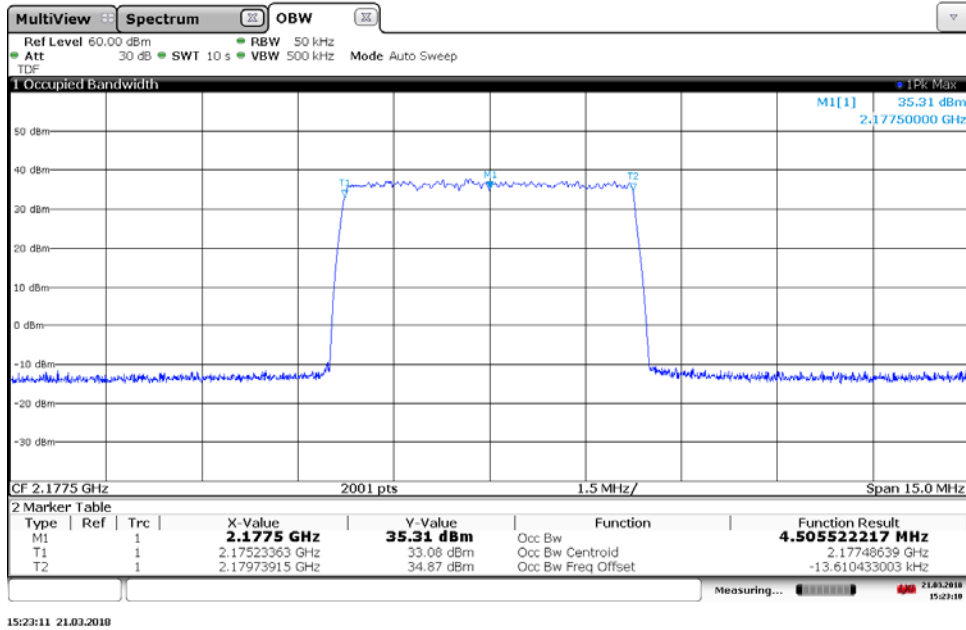
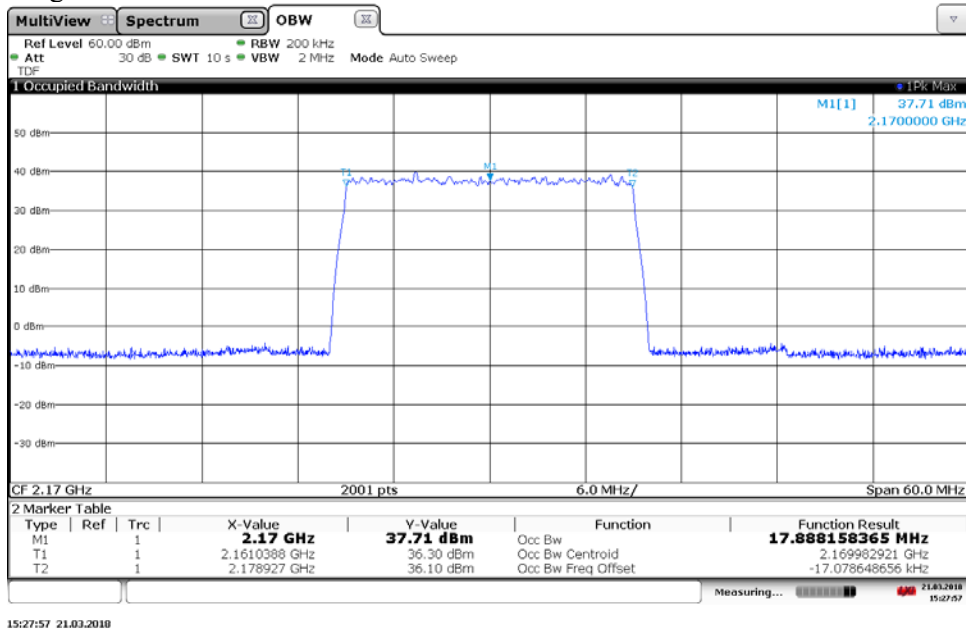


Diagram 37:



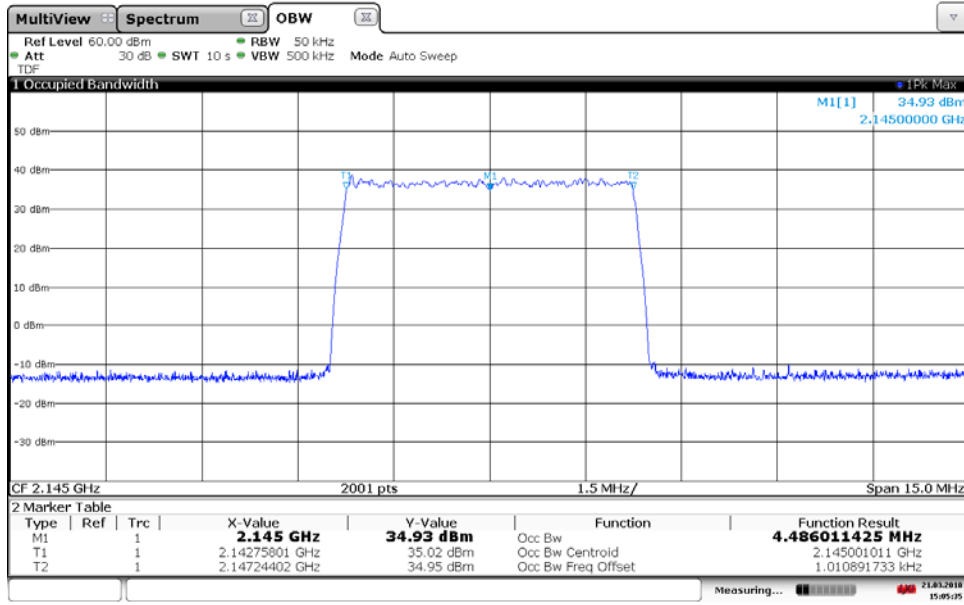
15:23:11 21.03.2018

Diagram 38:



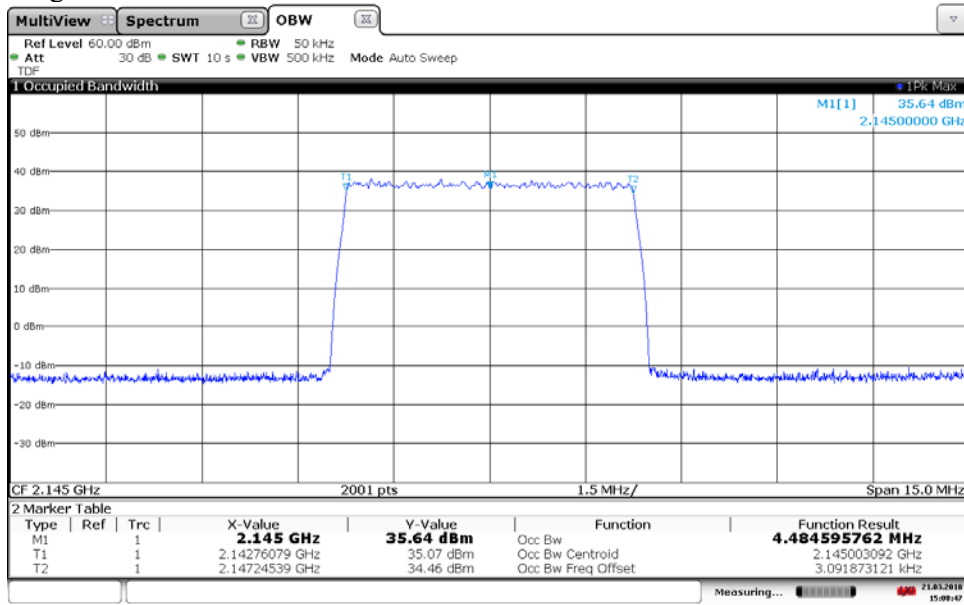
15:27:57 21.03.2018

Diagram 39:



15:05:35 21.03.2018

Diagram 40:



15:06:40 21.03.2018

Diagram 41:

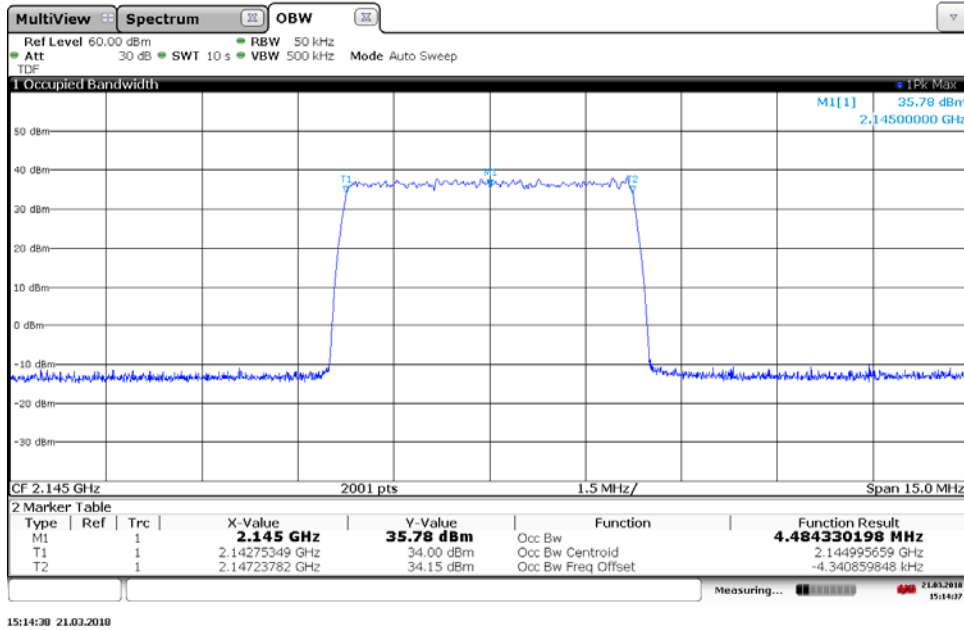


Diagram 42:

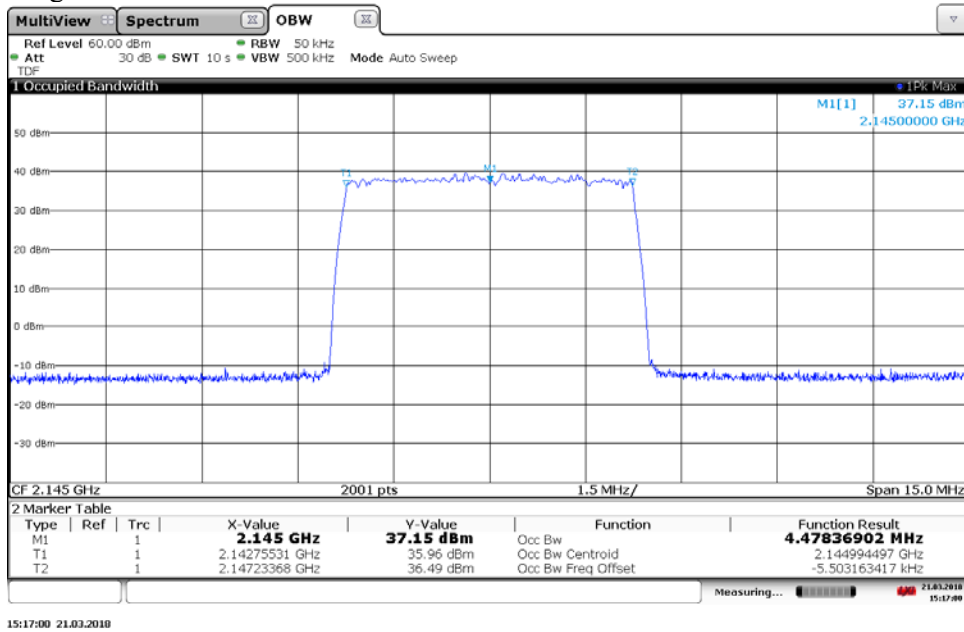
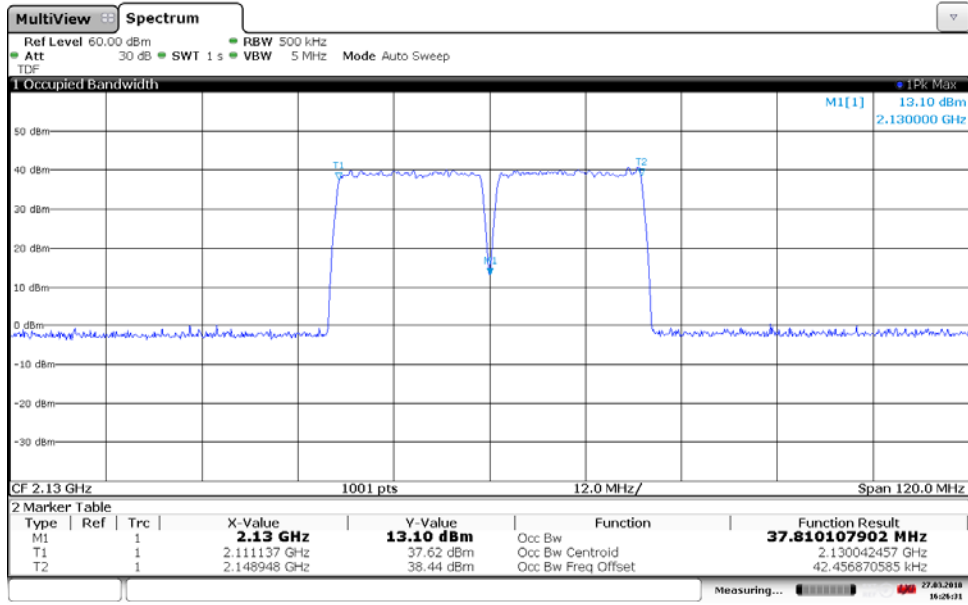
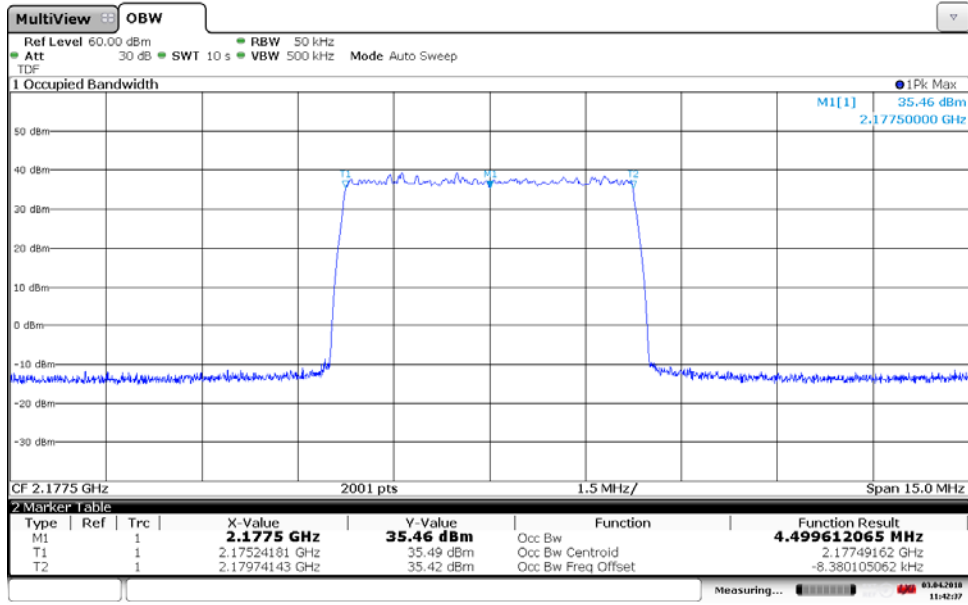


Diagram 43:



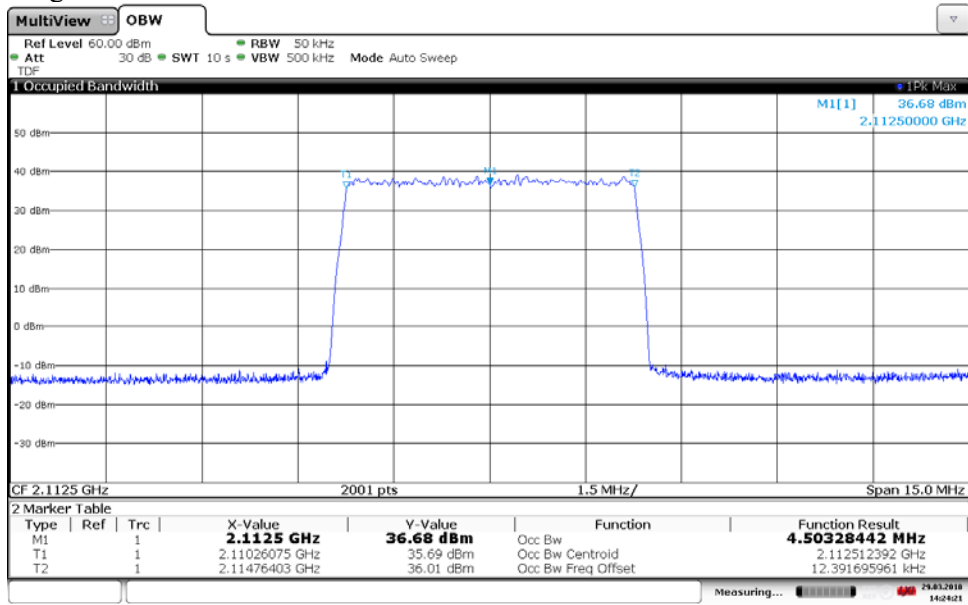
16:26:31 27.03.2018

Diagram 44:



11:42:37 03.04.2018

Diagram 45:



14:24:22 29.03.2018

Diagram 46:

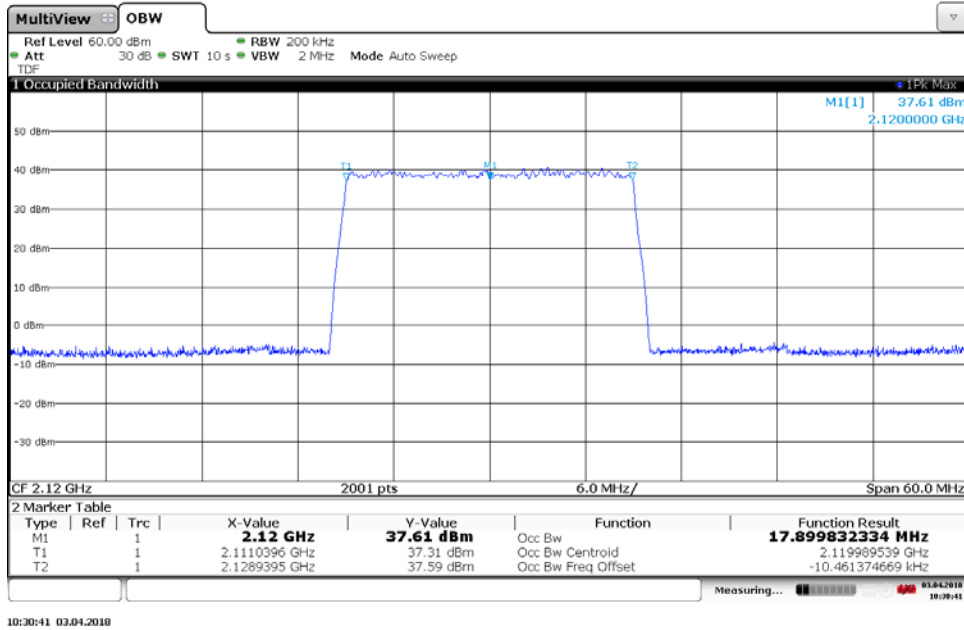


Diagram 47:

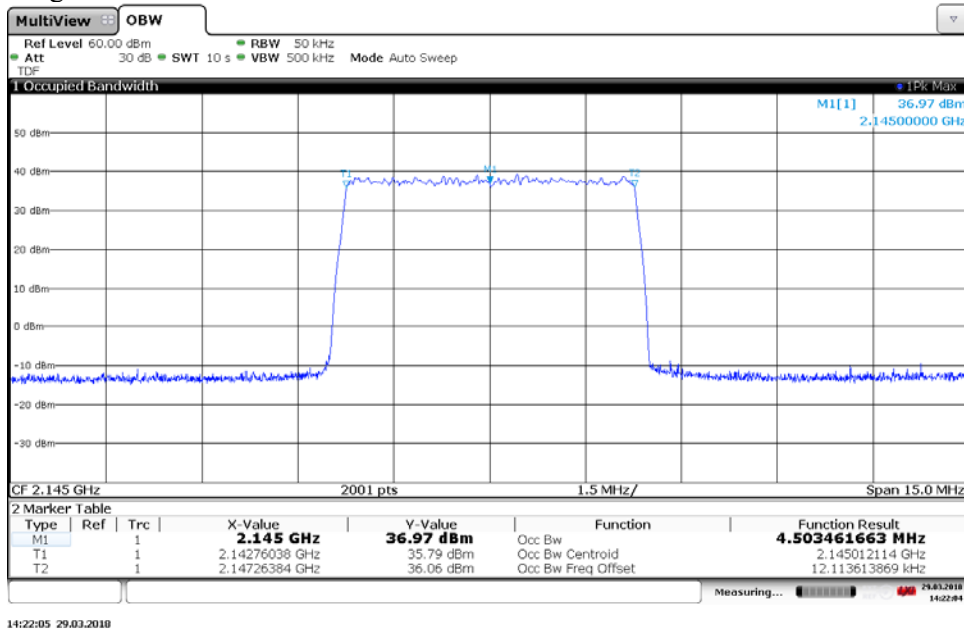


Diagram 48:

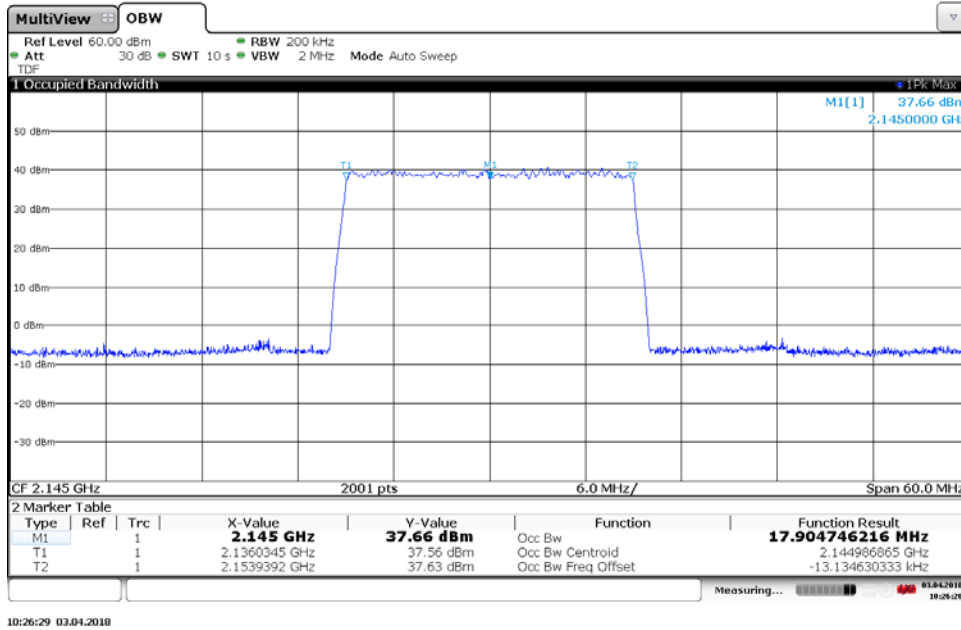


Diagram 49:

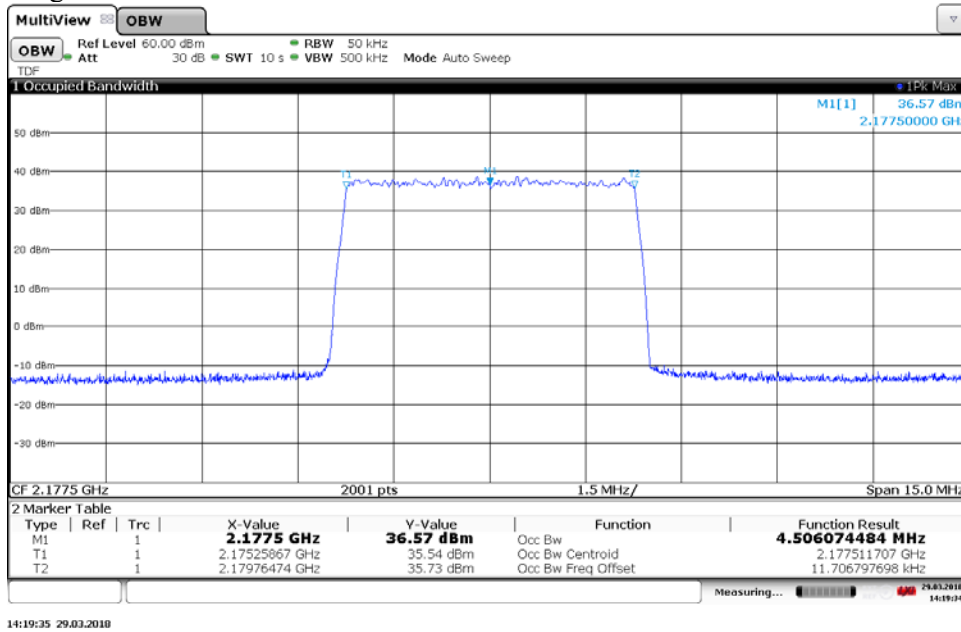


Diagram 50:

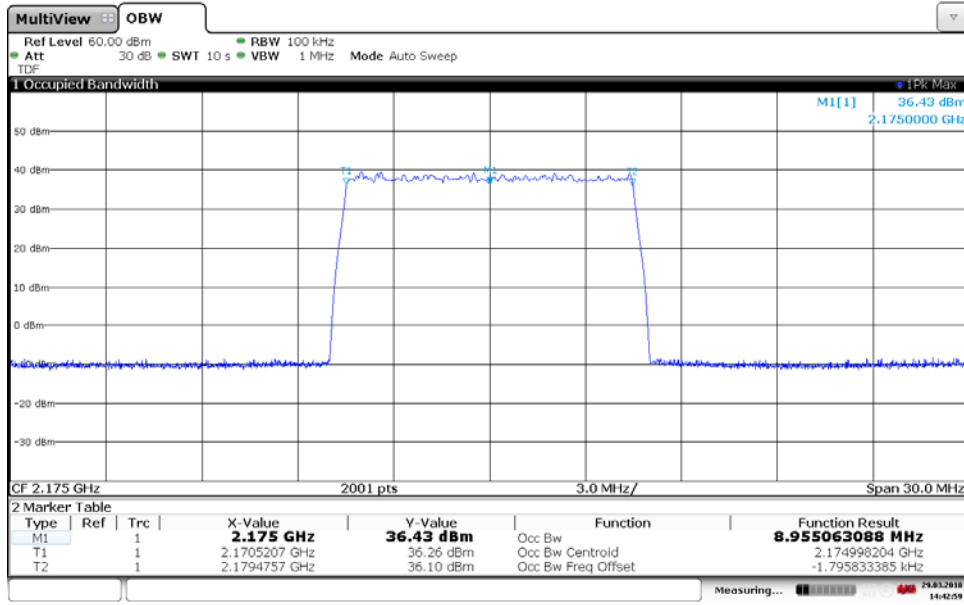


Diagram 51:

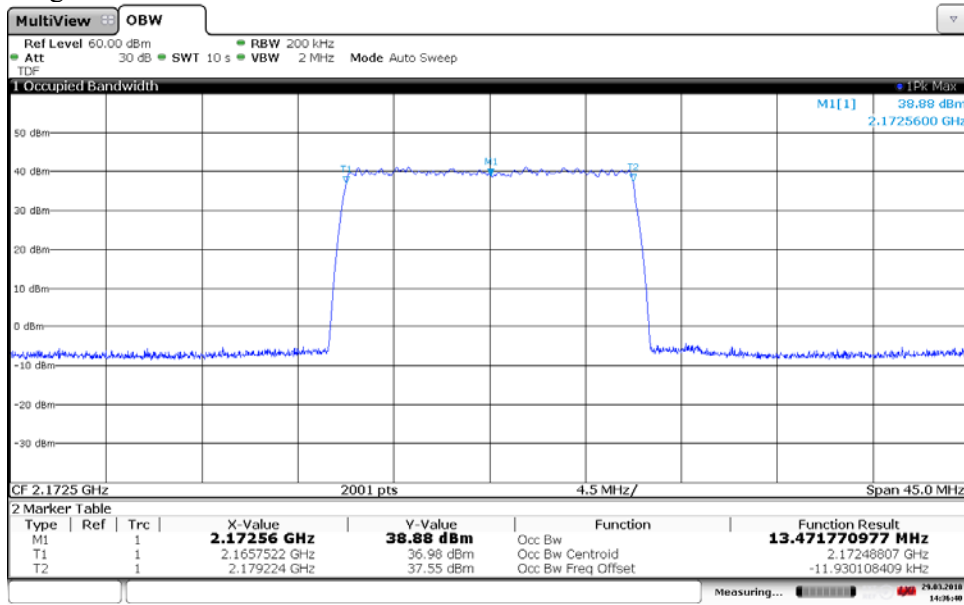


Diagram 52:

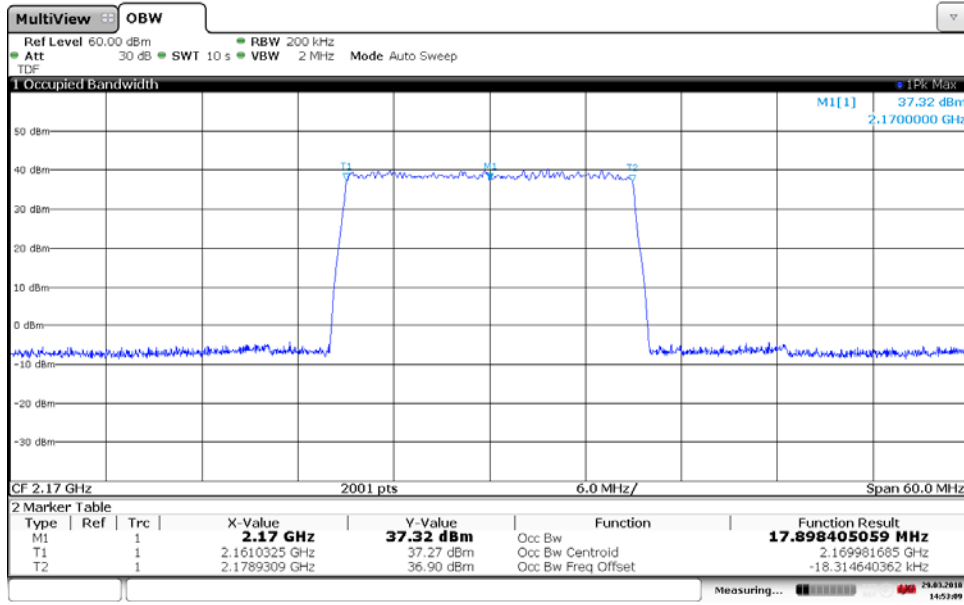


Diagram 53:

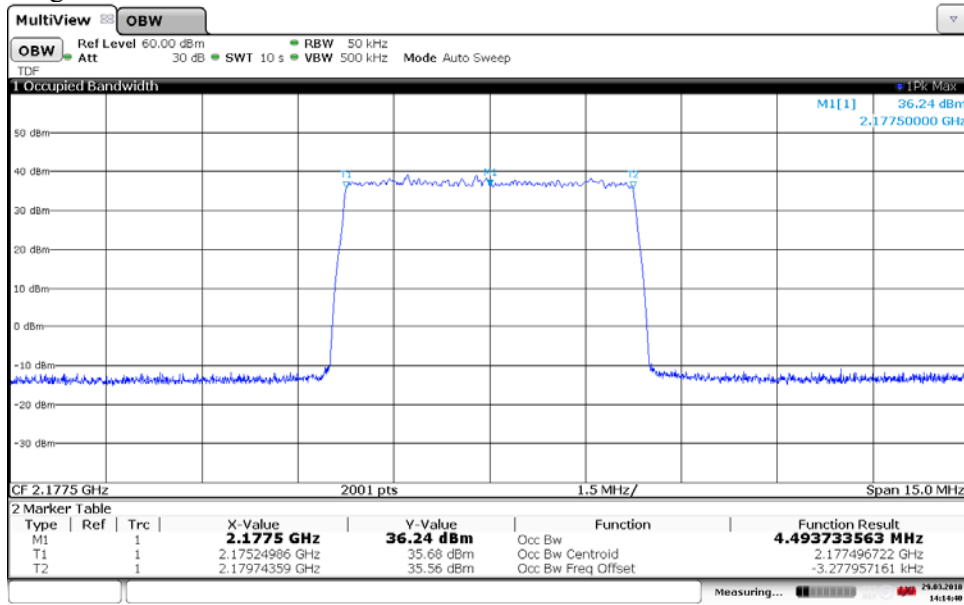
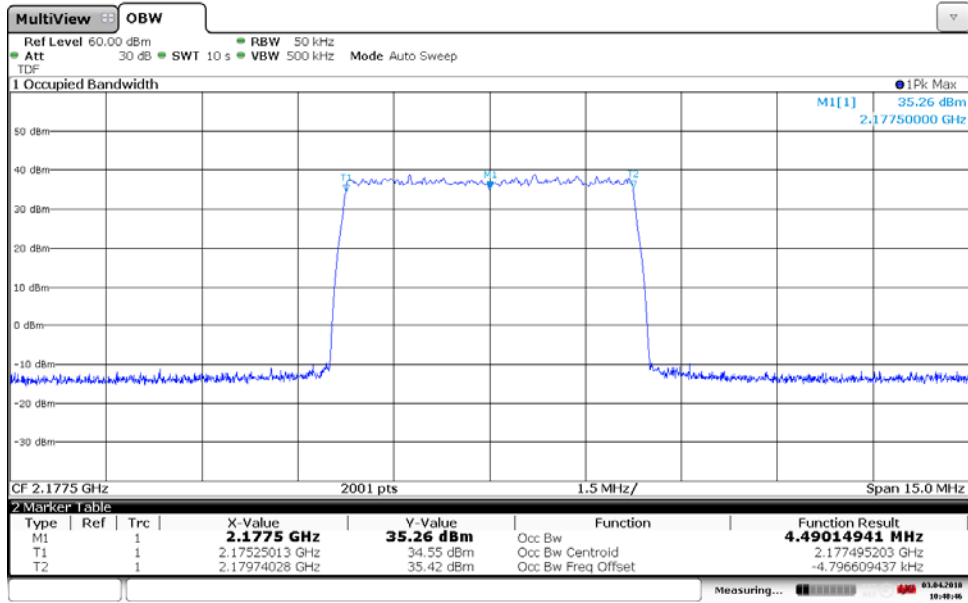
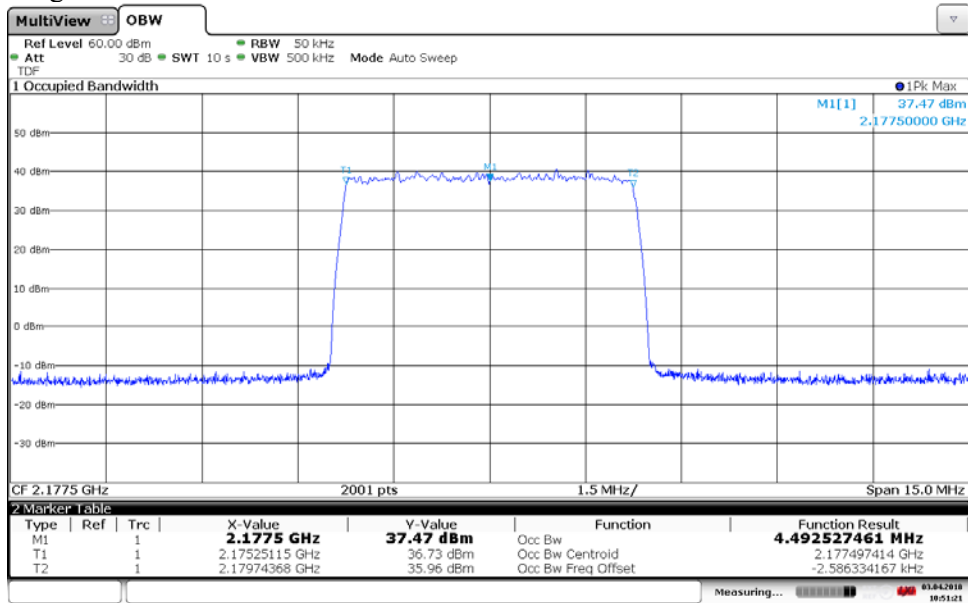


Diagram 54:



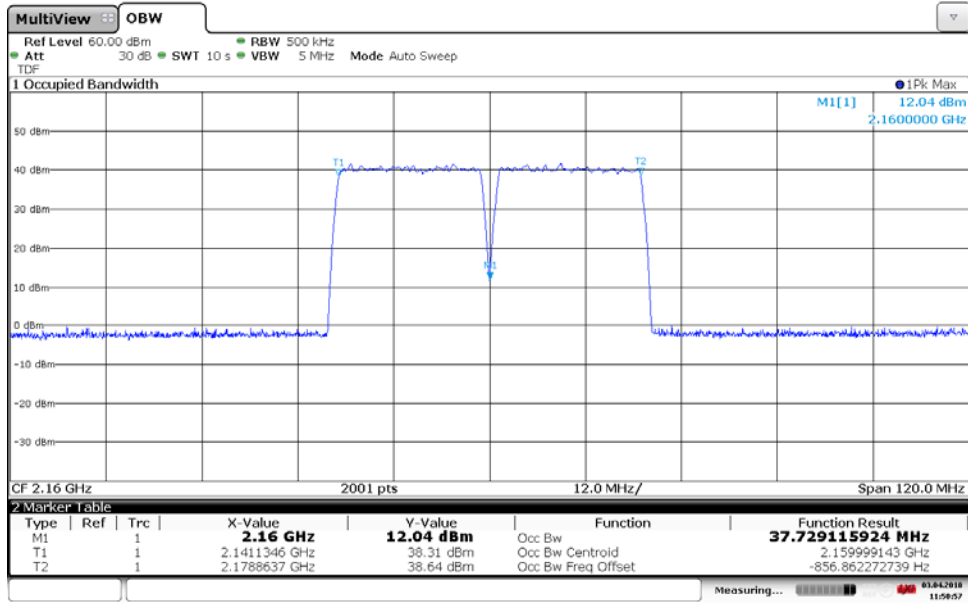
10:40:16 03.04.2018

Diagram 55:



10:51:21 03.04.2018

Diagram 56:



11:50:57 03.04.2018