

# CommScope Technologies, LLC

## TEST REPORT

**SCOPE OF WORK**

EMISSIONS TESTING – RPM-ASA11-B02

**REPORT NUMBER**

103866582BOX-010a

**ISSUE DATE**

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## EMISSIONS TEST REPORT (FULL COMPLIANCE)

**Report Number:** 103866582BOX-010a

**Project Number:** G103866582

**Report Issue Date:** 07/19/2019

**Model(s) Tested:** RPM-A5A11-B02

**Model(s) Partially Tested:** None

**Model(s) Not Tested but declared equivalent by the client:** None

**Standards:** CFR47 FCC Part 24 (04/2019)

Tested by:  
Intertek Testing Services NA, Inc.  
70 Codman Hill Road  
Boxborough, MA 01719  
USA

Client:  
CommScope Technologies LLC  
250 Apollo Drive  
Chelmsford, MA 01824  
USA

Report prepared by



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Table of Contents

<b>1</b>	<b><i>Introduction and Conclusion .....</i></b>	<b><i>4</i></b>
<b>2</b>	<b><i>Test Summary .....</i></b>	<b><i>4</i></b>
<b>3</b>	<b><i>Client Information .....</i></b>	<b><i>5</i></b>
<b>4</b>	<b><i>Description of Equipment Under Test and Variant Models .....</i></b>	<b><i>5</i></b>
<b>5</b>	<b><i>System Setup and Method .....</i></b>	<b><i>6</i></b>
<b>6</b>	<b><i>Maximum Peak Output Power and Human RF exposure.....</i></b>	<b><i>8</i></b>
<b>7</b>	<b><i>Peak-to-Average Power Ratio (PAPR) .....</i></b>	<b><i>65</i></b>
<b>8</b>	<b><i>26 dB Bandwidth and Occupied Bandwidth .....</i></b>	<b><i>119</i></b>
<b>9</b>	<b><i>Band Edge Compliance.....</i></b>	<b><i>173</i></b>
<b>10</b>	<b><i>Frequency Stability .....</i></b>	<b><i>210</i></b>
<b>11</b>	<b><i>Transmitter spurious emissions.....</i></b>	<b><i>239</i></b>
<b>12</b>	<b><i>Revision History .....</i></b>	<b><i>285</i></b>

## 1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

## 2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test and Variant Models	--
5	System Setup and Method	--
6	Maximum Peak Output Power and Human RF exposure CFR47 FCC Parts 2.1046 and 24.232(a-b)	Pass
7	Peak-to-Average Power Ratio (PAPR) CFR47 FCC Part 24.232(d)	Pass
8	26 dB Bandwidth and Occupied Bandwidth CFR47 FCC Parts 2.1049 and 24.238(b)	Pass
9	Band Edge Compliance CFR47 FCC Parts 2.1051, 2.1053, and 24.238(a-b)	Pass
10	Frequency Stability CFR47 FCC Parts 2.1055 and 24.235	Pass
11	Transmitter Spurious Emissions CFR47 FCC Parts 2.1051, 2.1053, 2.1057 and 24.238(a-b)	Pass
12	Revision History	--

### 3 Client Information

This EUT was tested at the request of:

**Client:** CommScope Technologies LLC  
250 Apollo Drive  
Chelmsford, MA 01824  
USA

**Contact:** Mr. Kevin Craig  
**Telephone:** (978) 250-2678  
**Fax:** None  
**Email:** kevin.craig@commscope.com

### 4 Description of Equipment Under Test and Variant Models

**Manufacturer:** CommScope Telecommunications (China) Ltd.  
68 Su Hong Xi Lu, Suzhou Industrial Park.  
Suzhou, Jiangsu, 215021, China

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Band 2 Radio Module	CommScope Technologies LLC	RPM-A5A11-B02	18503000031

Receive Date:	04/23/2019
Received Condition:	Good
Type:	Production

#### Description of Equipment Under Test (provided by client)

The Radio Module is band specific using the Analog devices RF Agile Transceiver IC, AD936x. The device combines an RF front end with a flexible mixed-signal baseband section and integrated frequency synthesizers providing a configurable digital interface to the processor. The Radio Module also contains a band specific front end, band specific antenna and required power rails. All power rails required are derived from the 12 VDC bus supplied by the Baseband card. The reference frequency for the radio IC is 38.4 MHz is derived from the from an OCXO which is disciplined from a 1588 reference clock.

It supports bandwidths of 5, 10, 15, and 20 MHz with four modulations; TM1.1-QPSK, TM3.2-16QAM, TM3.1-64QAM, and TM3.1a-256QAM. The radio is fixed.

#### Description of Radio Host (provided by client)

The OneCell® RP5100 family is factory configurable with 2 – 4 Radios Modules mounted to a Baseband card. The same PCB's will be used in both indoor and outdoor version of the radio point. The device is fixed.

The baseband card is the host for the modular radios. It contains a two ethernet PHY's with one supporting 100M/1G/2.5G/5G/10G ethernet and the other supporting 100M/1G. The main processor is Zynix Ultrascale+ MPSoC with 2 GB DDR3 and 4 GB Flash memory. The baseband PCBA converts POE power to +12 VDC bus voltage require as input to the radio modules.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
48 VDC	0.960 mA per pair max	DC	N/A

**Operating modes of the EUT:**

No.	Descriptions of EUT Exercising
1	Pre-programmed to transmit at Low, Mid, and High channels at four different modulations, TM1.1-QPSK, TM3.2-16QAM, TM3.1-64QAM, and TM3.1a-256QAM.

**Software used by the EUT:**

No.	Descriptions of EUT Exercising
1	RP5100 Diagnostics Ver 1009

Radio/Receiver Characteristics	
Frequency Band(s)	1930-1990 MHz
Modulation Type(s)	TM1.1-QPSK, TM3.2-16QAM, TM3.1-64 QAM, TM3.1a-256QAM
Maximum Output Power (conducted):	24.23 dBm (Conducted)
Test Channels	Low, Middle, High Channels of 5 MHz, 10 MHz, 15 MHz, and 20 MHz Bandwidths, Single Channel operation only
Occupied Bandwidth	17.9 MHz (Worst-case)
MIMO Information (# of Transmit and Receive antenna ports)	2x2 MIMO using cross polarized antennas and uncorrelated data streams
Equipment Type	Module in a host
Antenna Type and Gain	Detachable Antenna: +4 dBi (as provided by the client. Intertek takes no responsibility for the accuracy of this information. Actual antenna gain will be determined at the time of licensing)

**Variant Models:**

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

None

**5 System Setup and Method**

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
--	LAN (POE Power Cable)	2.58	Shielded	None	POE P/S
--	LAN (Communication)	9.00	Shielded	None	Laptop

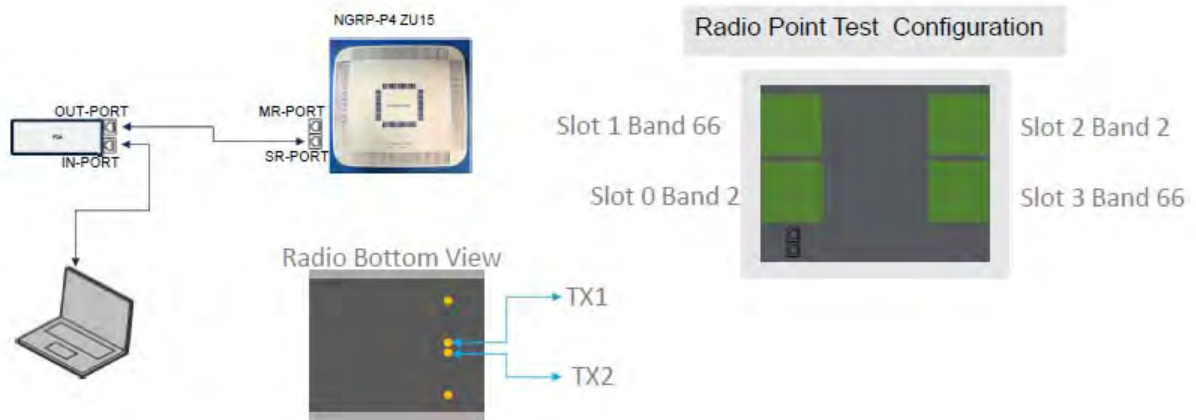
Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	Dell	LATITUDE	None
Power Device Analyzer	Sifos Technologies	PDA-604A	604A0033
OneCell® RP5100*	CommScope Technologies LLC	RP-A51xxi	None

\*Radio host used for testing

## 5.1 Method:

Configuration as required by ANSI C63.26-2015, KDB 662911, and CFR47 FCC Part 24 (04/2019).

## 5.2 EUT Block Diagram:



## 6 Maximum Peak Output Power and Human RF exposure

### 6.1 Method

Tests are performed in accordance with CFR47 FCC Parts 2.1046 and 24, KDB662911, and ANSI C63.26 Section 5.2.4.4.

**TEST SITE:** EMC Lab

**The EMC Lab** has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

### 6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
CEN001'	DC-40GHz attenuator 20dB	Centric RF	C411-20	CEN001	02/01/2019	02/01/2020
CBLHF2012-2M-1'	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/01/2019	02/01/2020
ROS005-1'	Signal and Spectrum Analyzer	Rohde & Schwarz	FSW43	100646	10/15/2018	10/15/2019
DS40'	Temp, humidity, pressure gauge	Digi Sense	68000-49	181717625	11/06/2018	11/06/2019

#### Software Utilized:

Name	Manufacturer	Version
None	--	--

### 6.3 Results:

The maximum conducted output power was measured to be 24.23 dBm, which is much less than the EIRP limit of 24.232(a-b). The sample tested was found to Comply. Antenna gain limitations will depend on geographical locations and Height Above Average Terrain (HAAT). Output power from the two antenna ports was not summed since the data streams are uncorrelated and the antennas are cross polarized.

## §24.232(a-b):

(a)(1) Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; see Tables 1 and 2 of this section.

(4) The service area boundary limit and microwave protection criteria specified in §§24.236 and 24.237 apply.

**TABLE 1—REDUCED POWER FOR BASE STATION ANTENNA HEIGHTS OVER 300 METERS, WITH EMISSION BANDWIDTH OF 1 MHz OR LESS**

HAAT in meters	Maximum EIRP watts
≤300	1640
≤500	1070
≤1000	490
≤1500	270
≤2000	160

**TABLE 2—REDUCED POWER FOR BASE STATION ANTENNA HEIGHTS OVER 300 METERS, WITH EMISSION BANDWIDTH GREATER THAN 1 MHz**

HAAT in meters	Maximum EIRP watts/MHz
≤300	1640
≤500	1070
≤1000	490
≤1500	270
≤2000	160

(b)(1) Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth of 1 MHz or less are limited to 3280 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

(2) Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth greater than 1 MHz are limited to 3280 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; see Tables 3 and 4 of this section.

(4) The service area boundary limit and microwave protection criteria specified in §§24.236 and 24.237 apply.

(5) Operation under this paragraph (b) at power limits greater than permitted under paragraph (a) of this section must be coordinated in advance with all broadband PCS licensees authorized to operate on adjacent frequency blocks within 120 kilometers (75 miles) of the base station and is limited to base stations located more than 120 kilometers (75 miles) from the Canadian border and more than 75 kilometers (45 miles) from the Mexican border.

**TABLE 3—REDUCED POWER FOR BASE STATION ANTENNA HEIGHTS OVER 300 METERS, WITH EMISSION BANDWIDTH OF 1 MHz OR LESS**

HAAT in meters	Maximum EIRP watts
≤300	3280
≤500	2140
≤1000	980
≤1500	540
≤2000	320

**TABLE 4—REDUCED POWER FOR BASE STATION ANTENNA HEIGHTS OVER 300 METERS, WITH EMISSION BANDWIDTH GREATER THAN 1 MHz**

HAAT in meters	Maximum EIRP watts/MHz
≤300	3280
≤500	2140
≤1000	980
≤1500	540
≤2000	320

# Intertek

Report Number: 103866582BOX-010a

Issued: 07/19/2019

## Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1932.50	ANT0	23.22
		ANT1	23.16
Mid	1960.00	ANT0	24.15
		ANT1	24.16
High	1987.50	ANT0	23.87
		ANT1	23.97

## Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1935.00	ANT0	23.93
		ANT1	23.97
Mid	1960.00	ANT0	23.89
		ANT1	23.94
High	1985.00	ANT0	24.08
		ANT1	24.22

## Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1937.50	ANT0	24.06
		ANT1	24.19
Mid	1960.00	ANT0	23.92
		ANT1	24.00
High	1982.50	ANT0	24.10
		ANT1	23.97

## Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	190.00	ANT0	24.07
		ANT1	24.00
Mid	1960.00	ANT0	23.96
		ANT1	23.99
High	1980.00	ANT0	23.77
		ANT1	23.94

## Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1932.50	ANT0	23.73
		ANT1	23.73
Mid	1960.00	ANT0	23.92
		ANT1	24.06
High	1987.50	ANT0	23.72
		ANT1	23.84

## Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1935.00	ANT0	23.95
		ANT1	23.92
Mid	1960.00	ANT0	23.88
		ANT1	23.95
High	1985.00	ANT0	23.90
		ANT1	23.96

# Intertek

Report Number: 103866582BOX-010a

Issued: 07/19/2019

## Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1937.50	ANT0	23.69
		ANT1	24.00
Mid	1960.00	ANT0	23.94
		ANT1	23.92
High	1982.50	ANT0	23.76
		ANT1	23.92

## Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1940.00	ANT0	23.96
		ANT1	23.87
Mid	1960.00	ANT0	23.85
		ANT1	23.93
High	1980.00	ANT0	23.83
		ANT1	23.84

## Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1932.50	ANT0	23.95
		ANT1	24.06
Mid	1960.00	ANT0	24.04
		ANT1	24.06
High	1987.50	ANT0	23.97
		ANT1	24.11

## Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1935.00	ANT0	23.81
		ANT1	23.86
Mid	1960.00	ANT0	24.02
		ANT1	24.02
High	1985.00	ANT0	24.02
		ANT1	24.14

## Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1937.50	ANT0	23.81
		ANT1	23.91
Mid	1960.00	ANT0	24.01
		ANT1	24.04
High	1982.50	ANT0	24.11
		ANT1	24.23

## Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1940.00	ANT0	23.88
		ANT1	24.06
Mid	1960.00	ANT0	23.90
		ANT1	23.95
High	1980.00	ANT0	24.05
		ANT1	24.17

**Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.1a-256QAM**

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1932.50	ANT0	24.03
		ANT1	23.92
Mid	1960.00	ANT0	23.94
		ANT1	23.92
High	1987.50	ANT0	23.98
		ANT1	24.09

**Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.1a-256QAM**

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1935.00	ANT0	23.85
		ANT1	23.89
Mid	1960.00	ANT0	23.95
		ANT1	23.94
High	1985.00	ANT0	24.09
		ANT1	23.82

**Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.1a-256QAM**

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1937.500	ANT0	23.87
		ANT1	23.96
Mid	1960.00	ANT0	24.04
		ANT1	24.06
High	1982.50	ANT0	23.71
		ANT1	23.80

**Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.1a-256QAM**

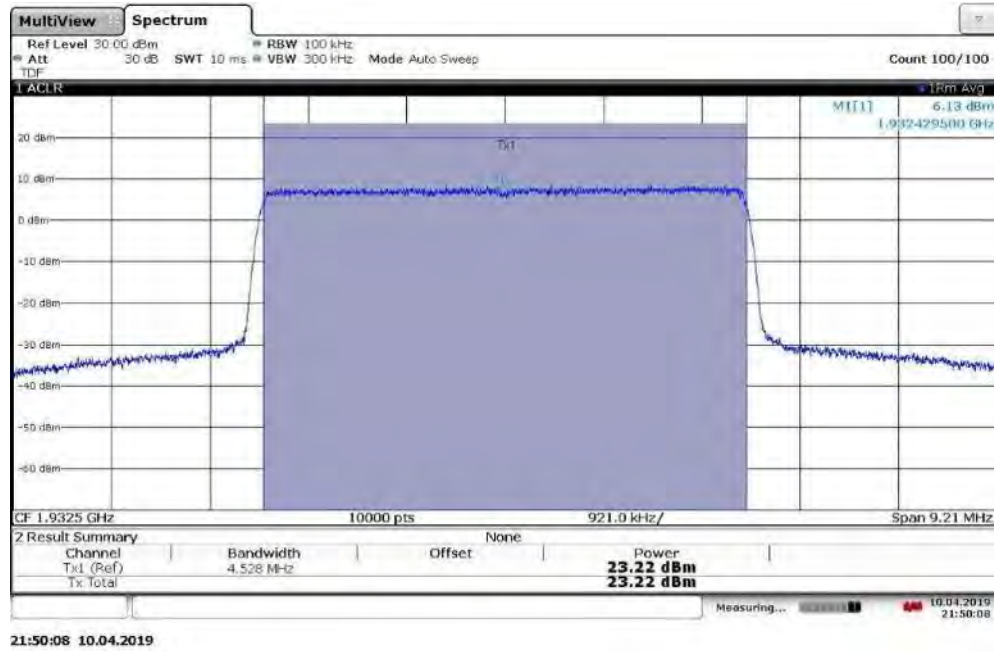
Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)
Low	1940	ANT0	24.04
		ANT1	24.14
Mid	1960	ANT0	23.98
		ANT1	23.95
High	1980	ANT0	23.84
		ANT1	23.84

#### 6.4 Setup Photograph:

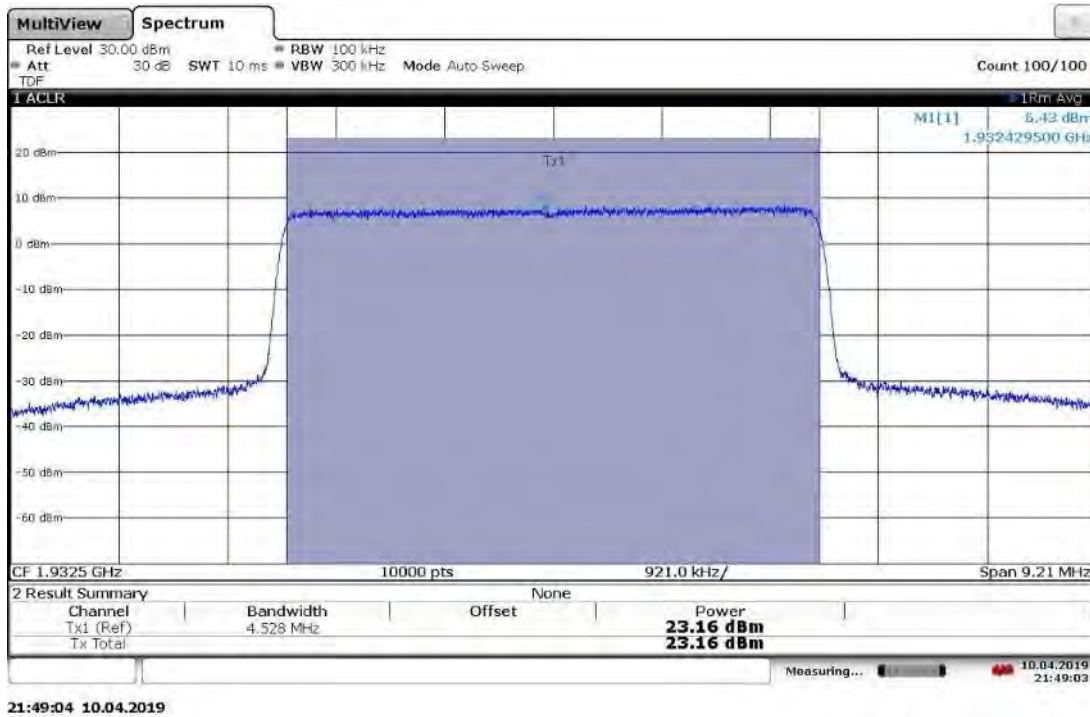


## 6.5 Plots/Data:

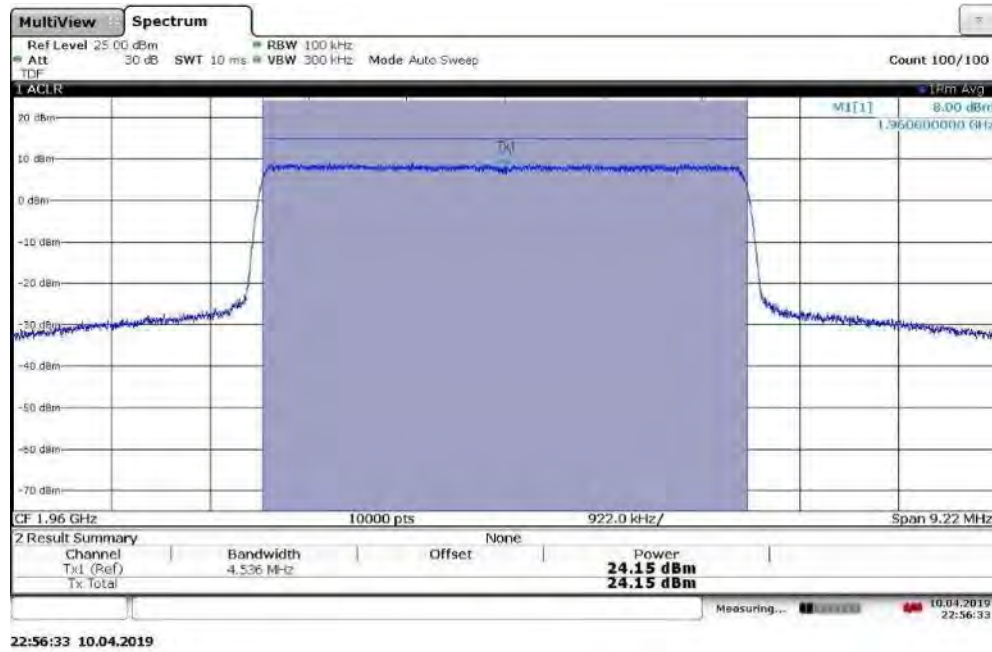
**TM1.1-QPSK\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1932.5 MHz, Output Power = 23.22 dBm**



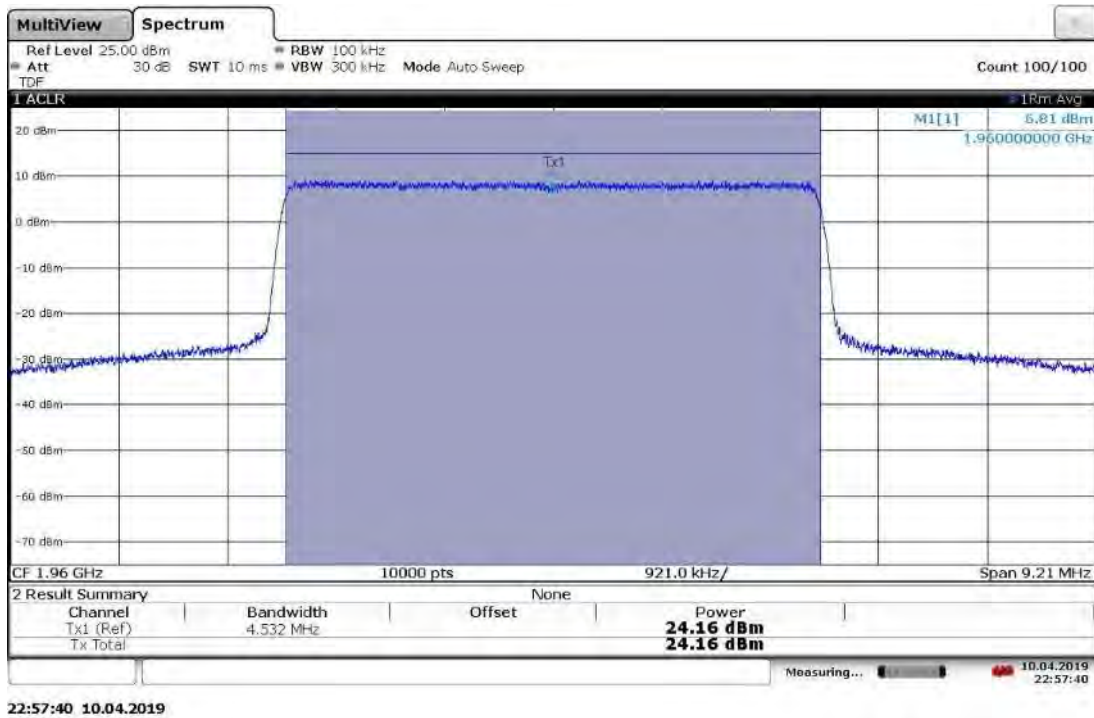
**TM1.1-QPSK\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1932.5 MHz, Output Power = 23.16 dBm**



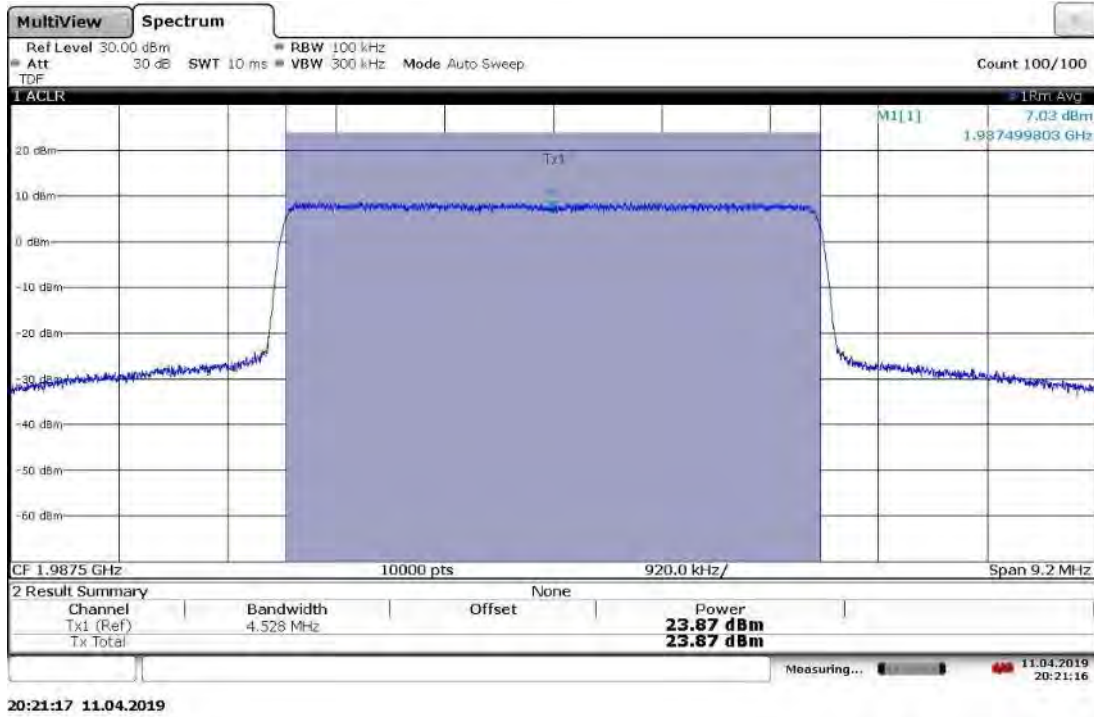
**TM1.1-QPSK\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 24.15 dBm**



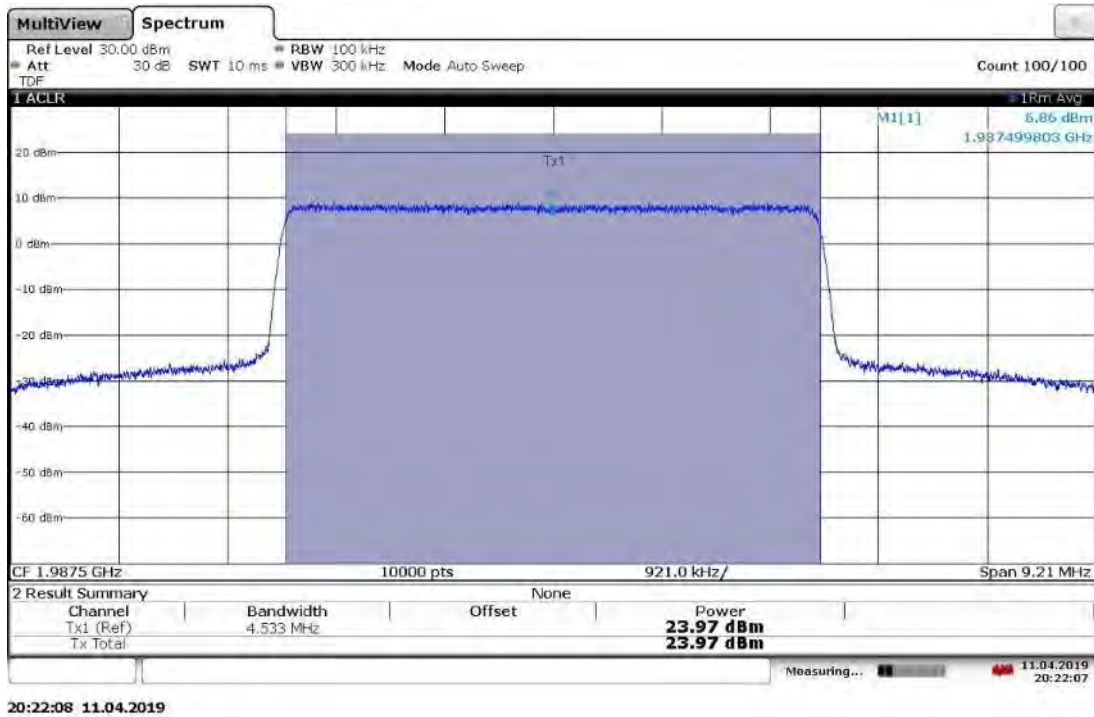
**TM1.1-QPSK\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 24.16 dBm**



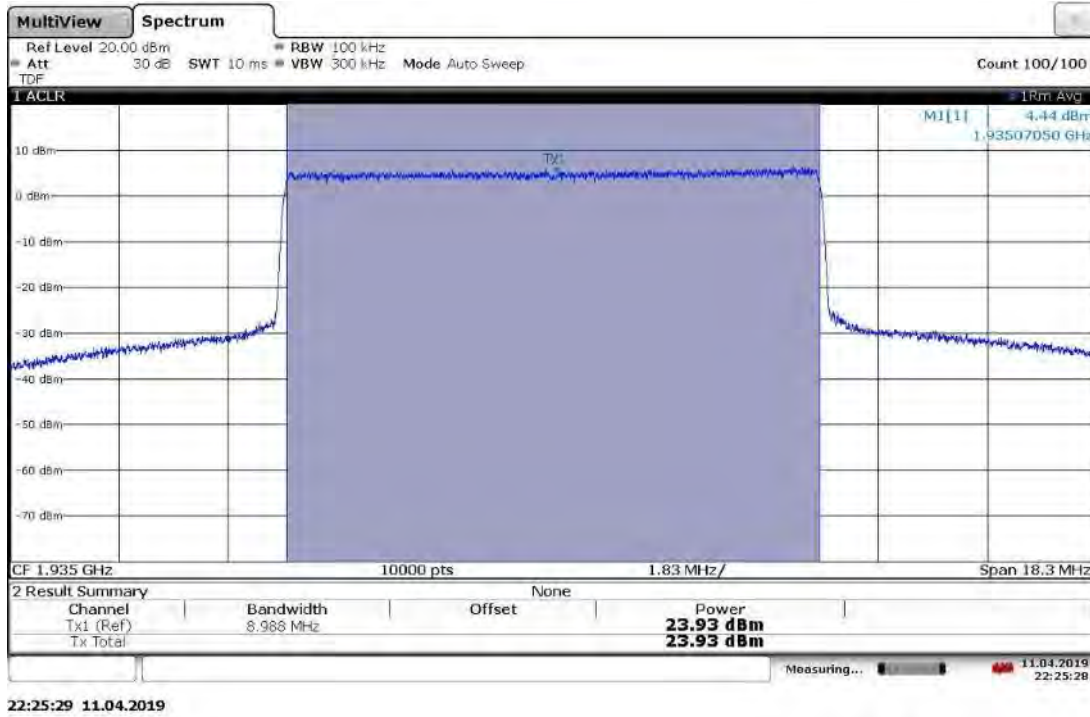
**TM1.1-QPSK\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1987.5 MHz, Output Power = 23.87 dBm**



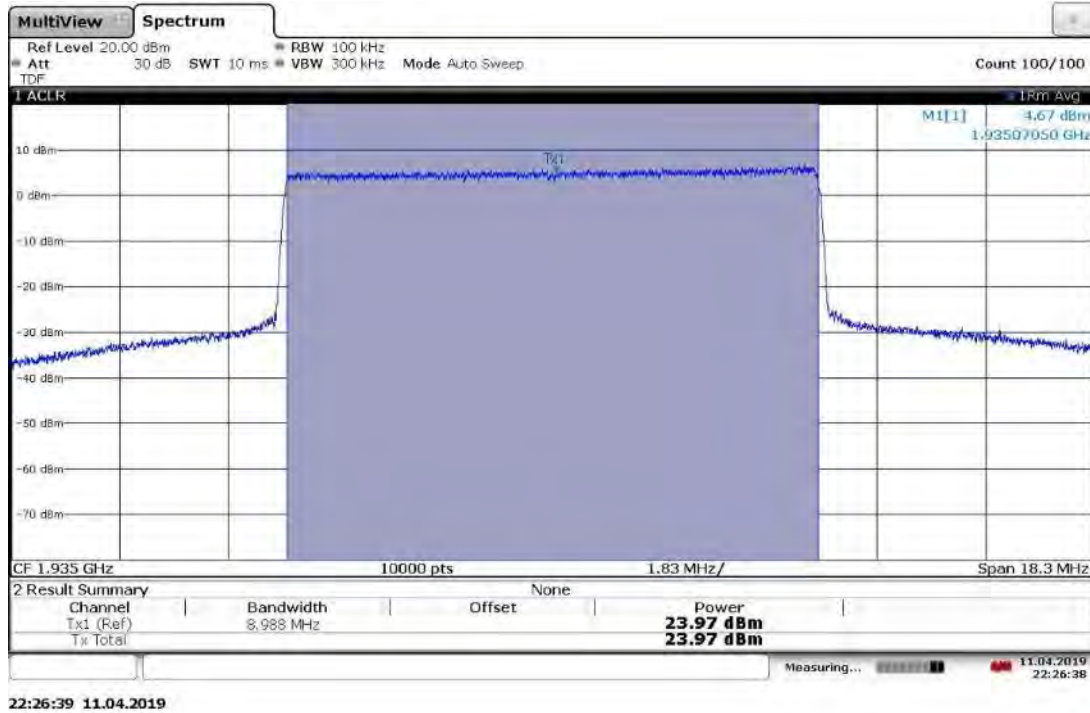
**TM1.1-QPSK\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1987.5 MHz, Output Power = 23.97 dBm**



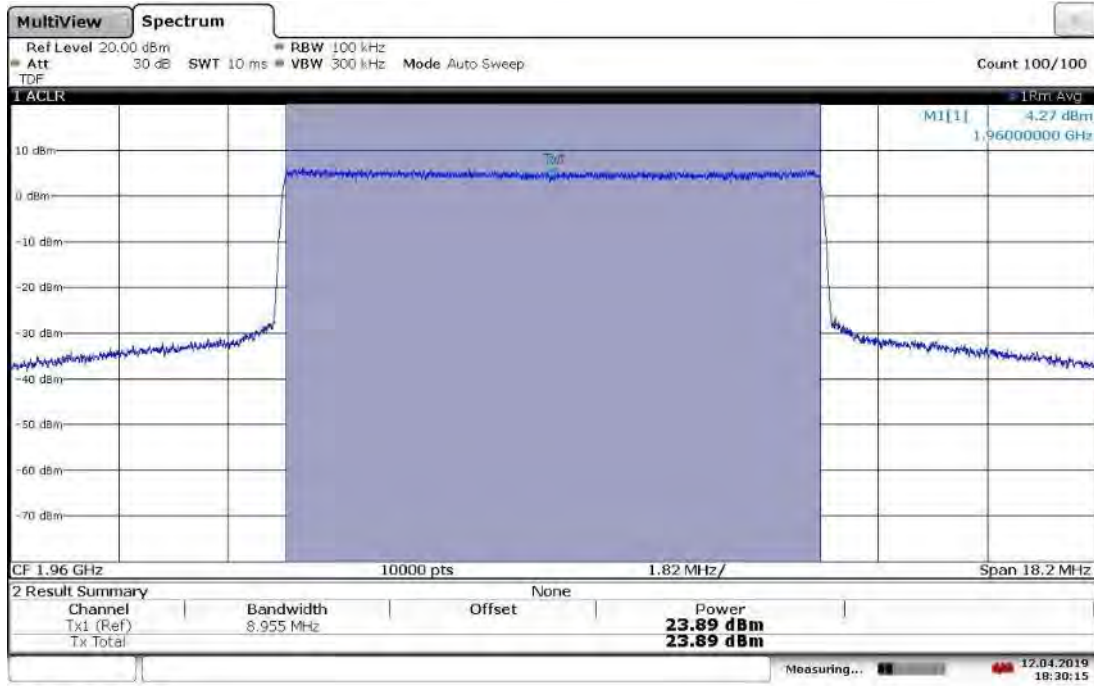
**TM1.1-QPSK\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1935 MHz, Output Power = 23.93 dBm**



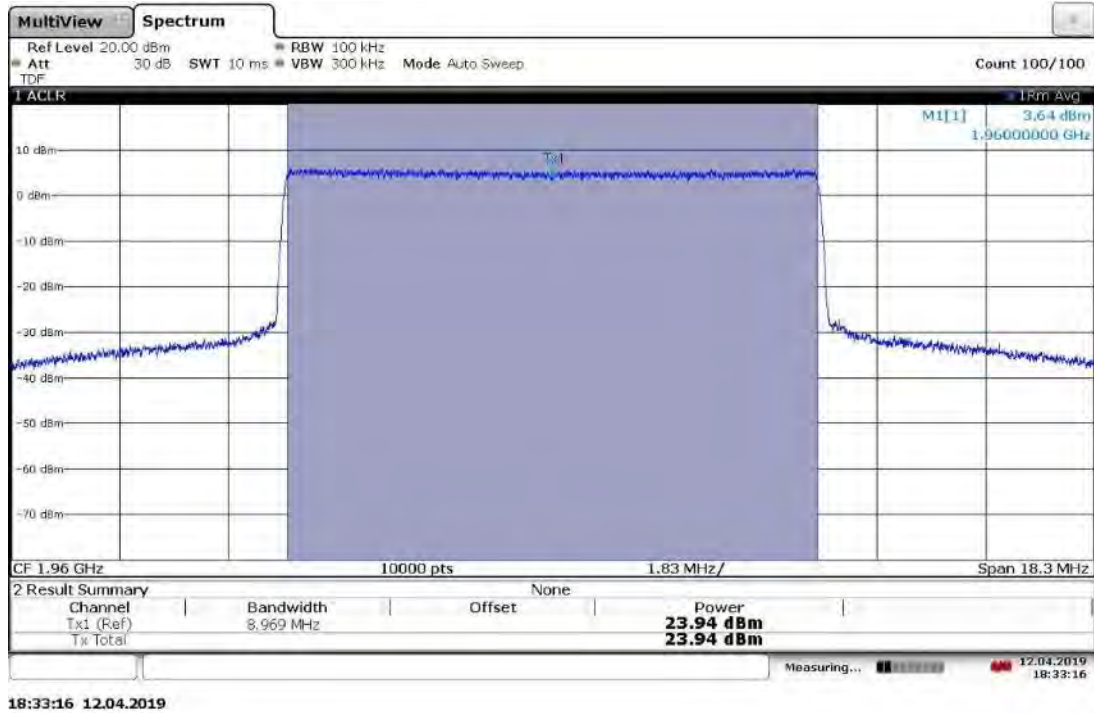
**TM1.1-QPSK\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1935 MHz, Output Power = 23.97 dBm**



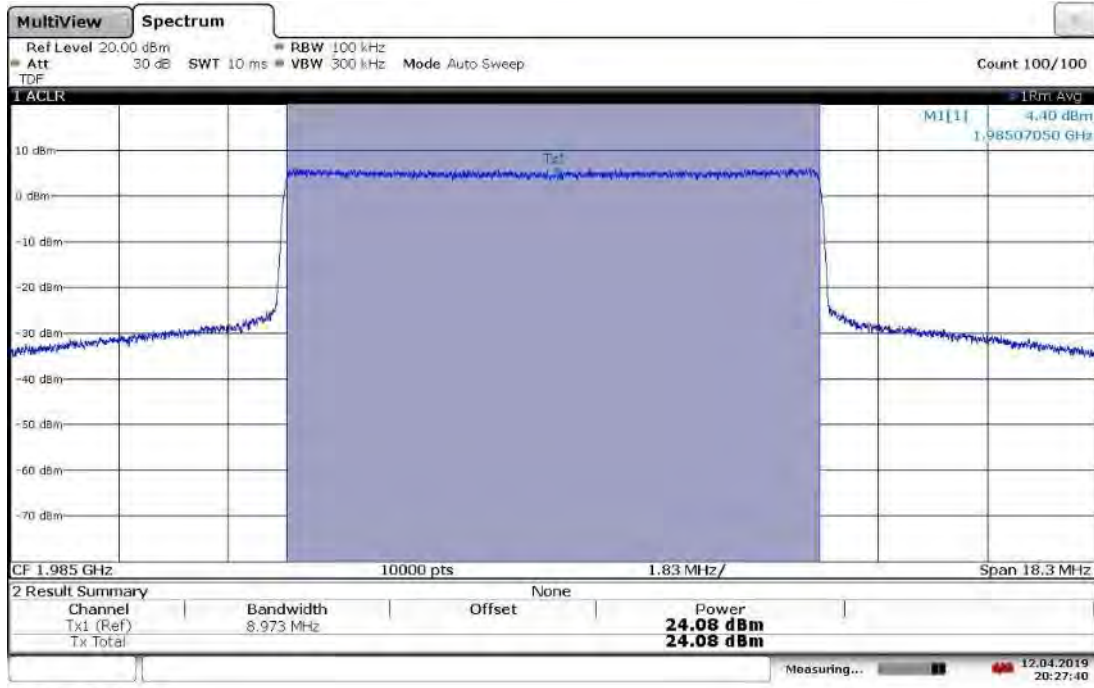
**TM1.1-QPSK\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 23.89 dBm**



**TM1.1-QPSK\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 23.94 dBm**

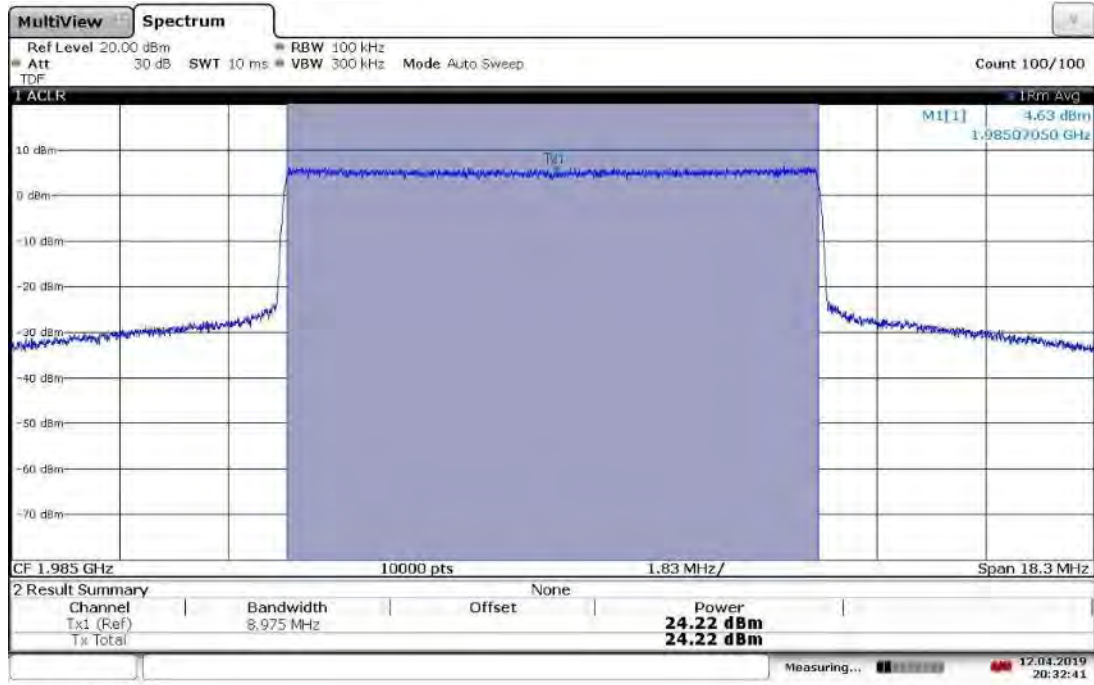


**TM1.1-QPSK\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1985 MHz, Output Power = 24.08 dBm**



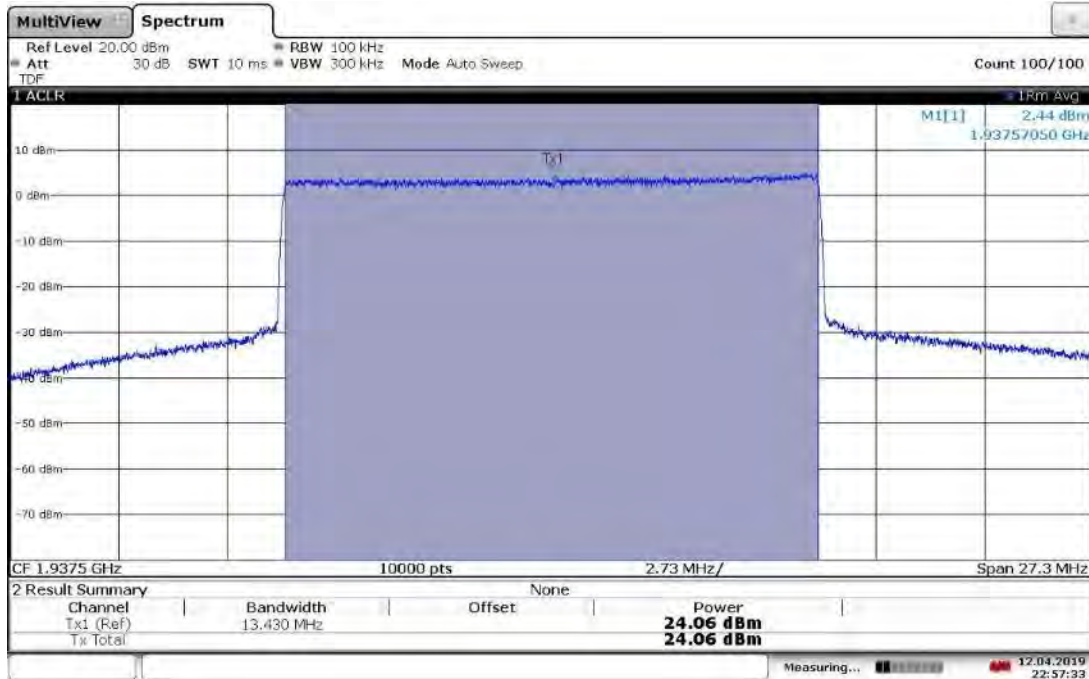
20:27:41 12.04.2019

**TM1.1-QPSK\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1985 MHz, Output Power = 24.22 dBm**



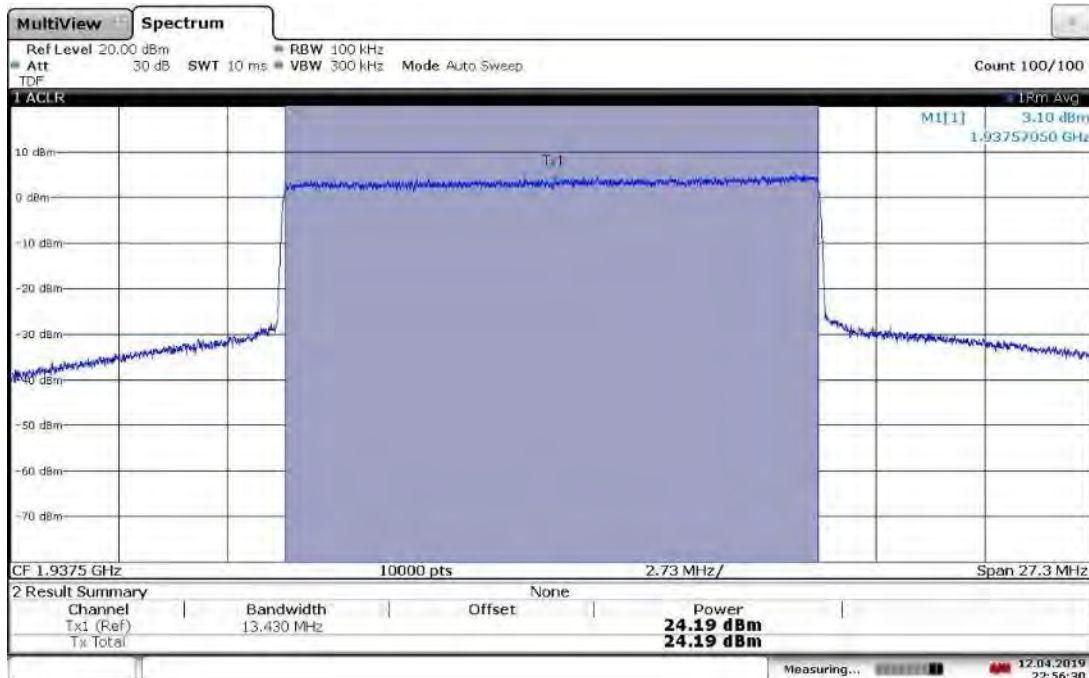
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**TM1.1-QPSK\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1937.5 MHz, Output Power = 24.06 dBm**



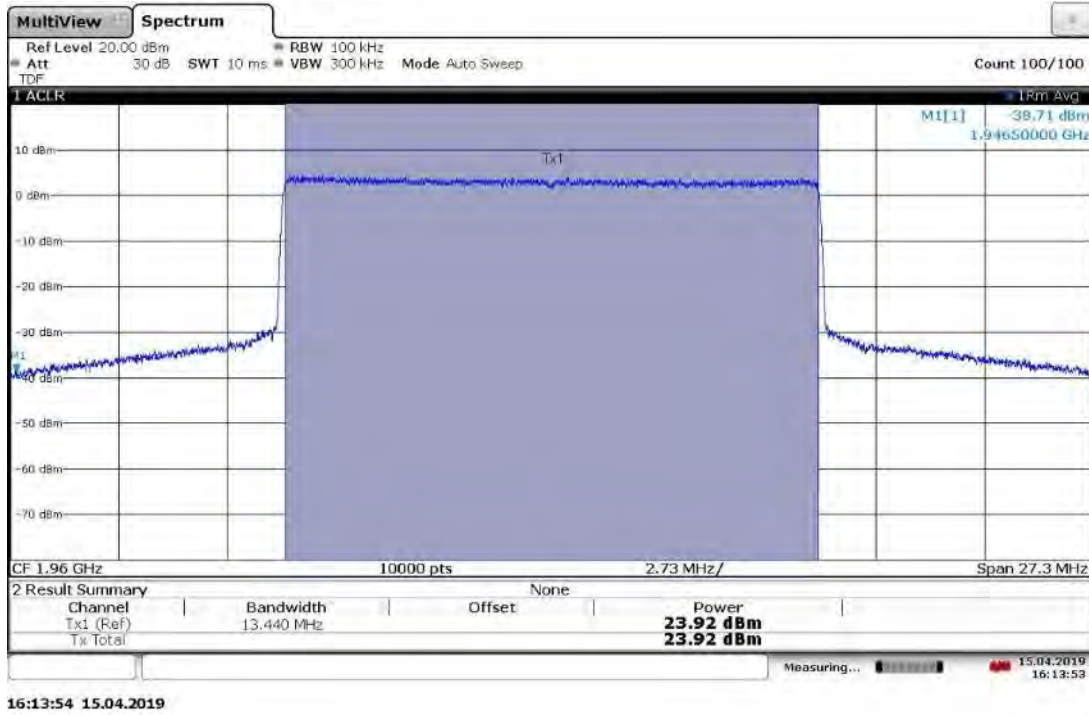
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**TM1.1-QPSK\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1937.5 MHz, Output Power = 24.19 dBm**

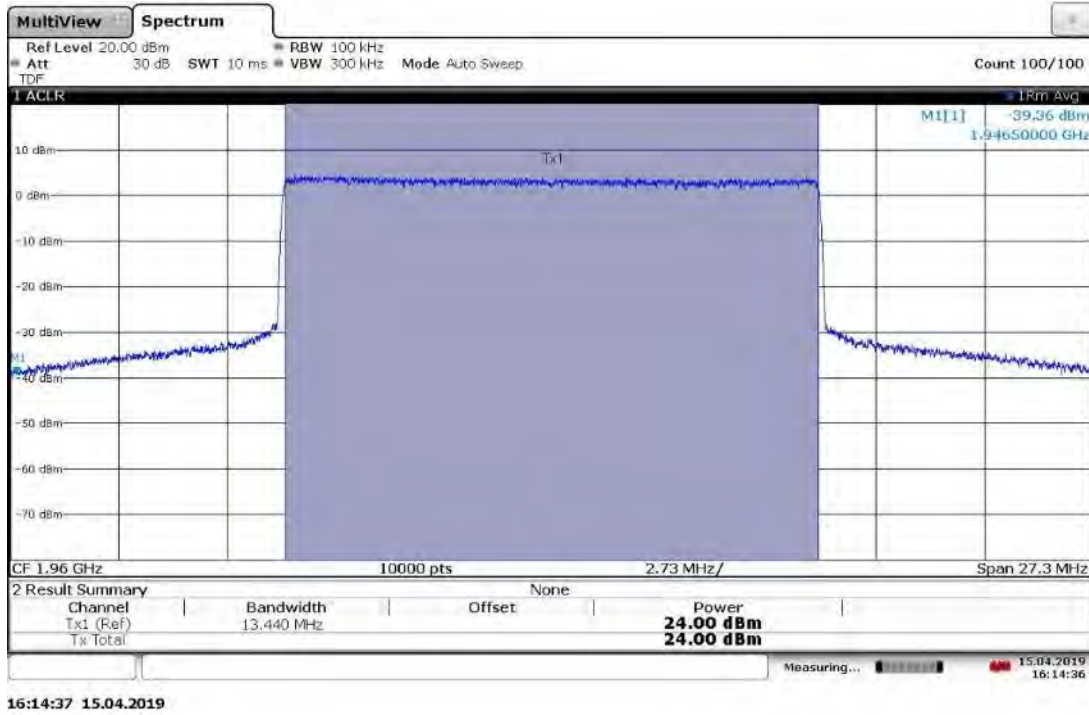


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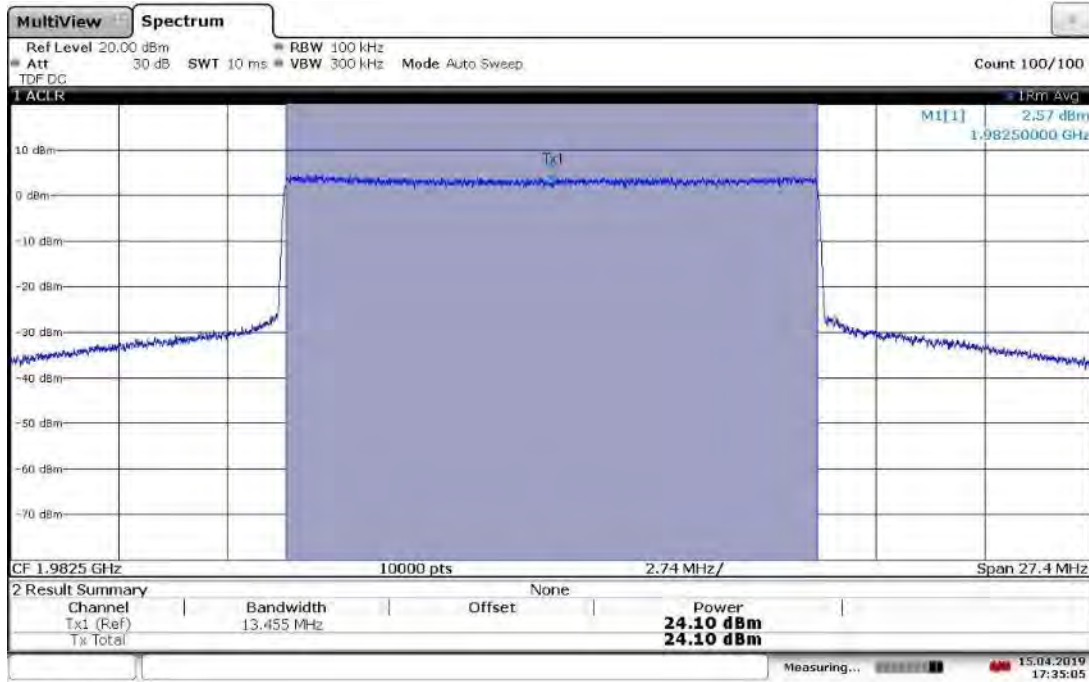
**TM1.1-QPSK\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 23.92 dBm**



**TM1.1-QPSK\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 24.00 dBm**

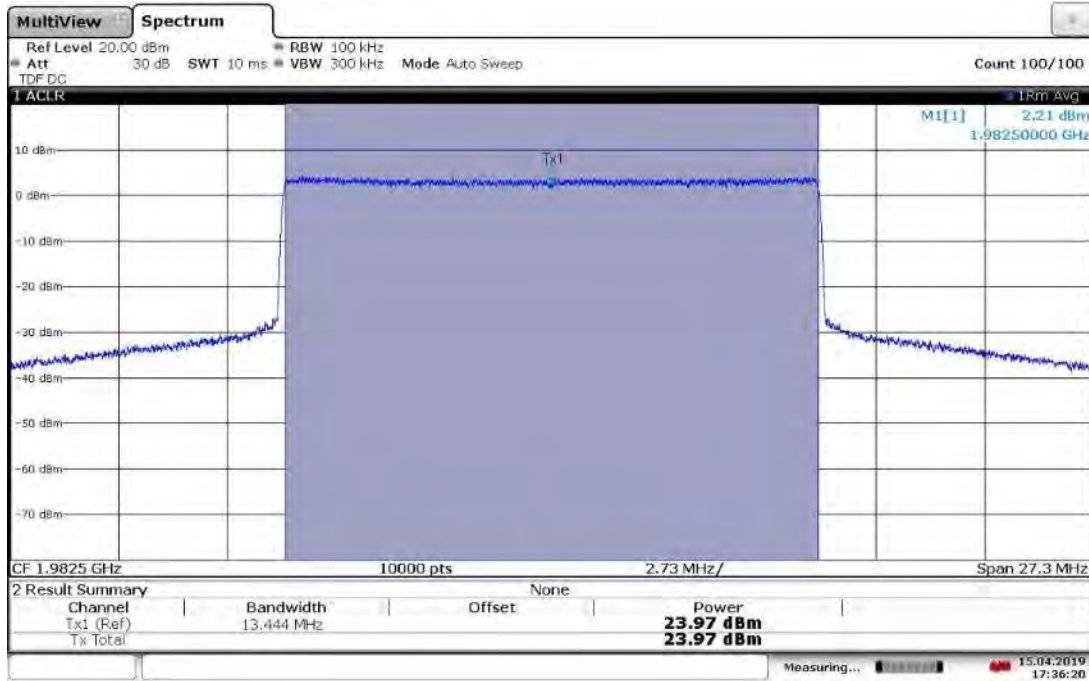


**TM1.1-QPSK\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1982.5 MHz, Output Power = 24.10 dBm**



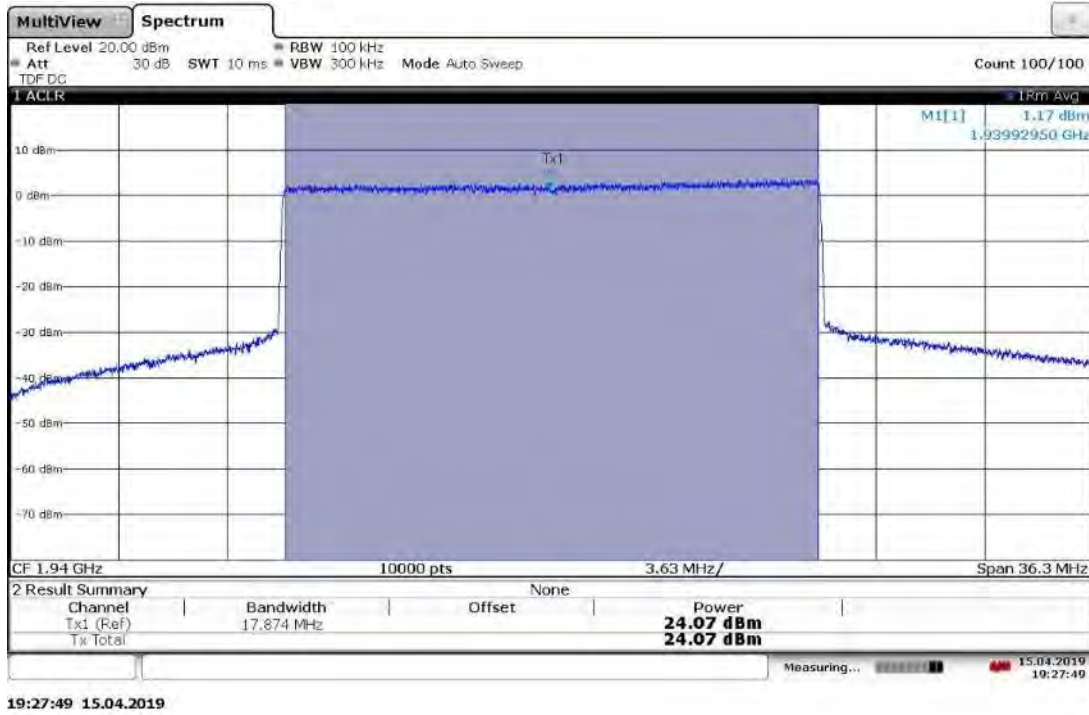
17:35:06 15.04.2019

**TM1.1-QPSK\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1982.5 MHz, Output Power = 23.97 dBm**

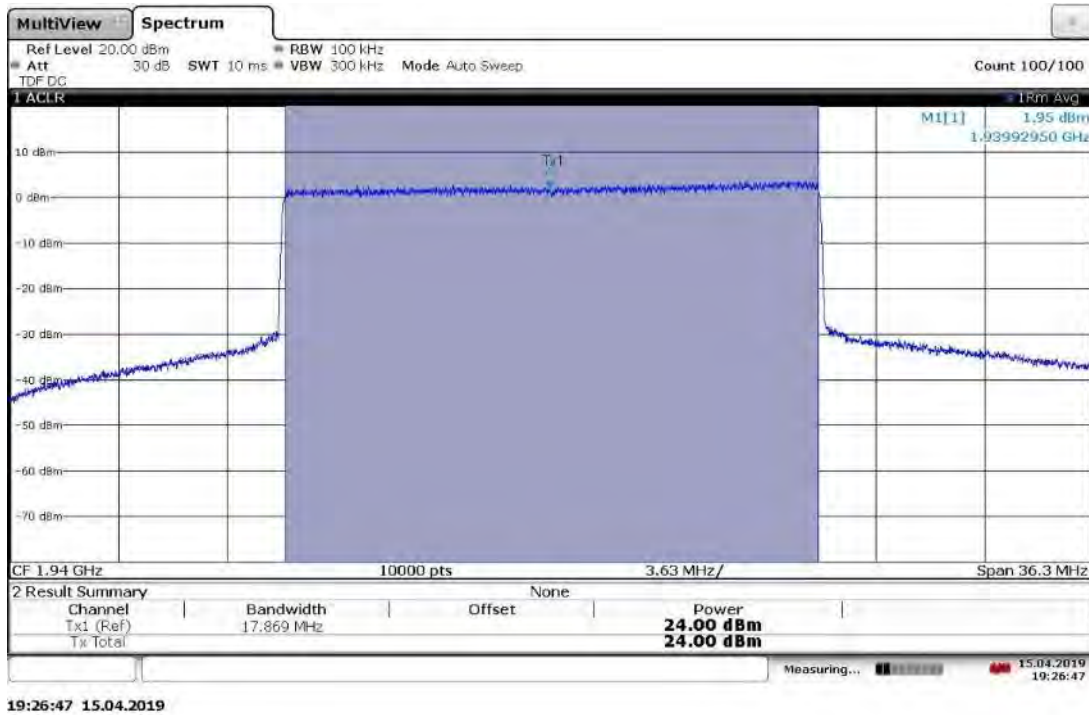


17:36:21 15.04.2019

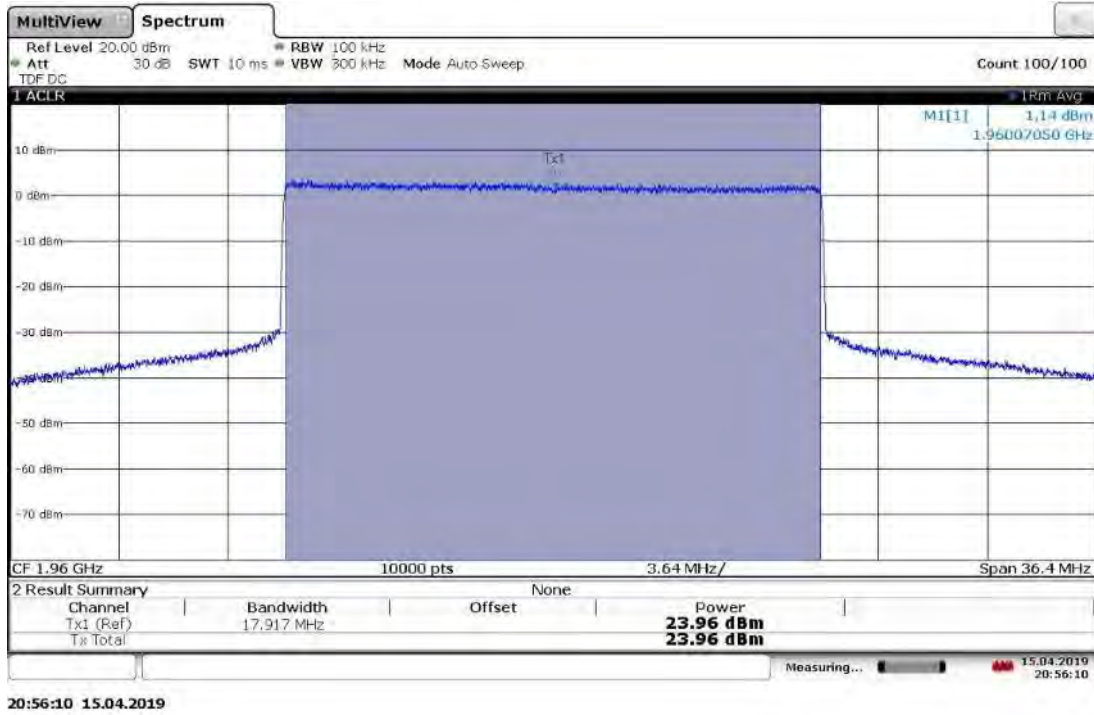
**TM1.1-QPSK\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1940 MHz, Output Power = 24.07 dBm**



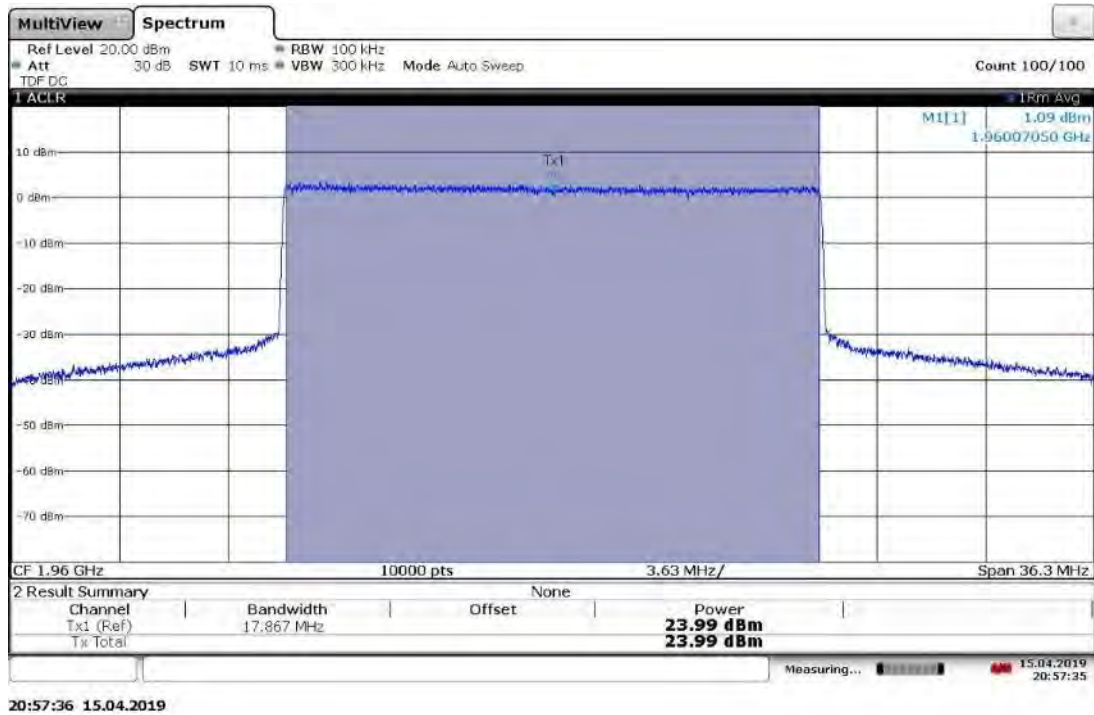
**TM1.1-QPSK\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1940 MHz, Output Power = 24.00 dBm**



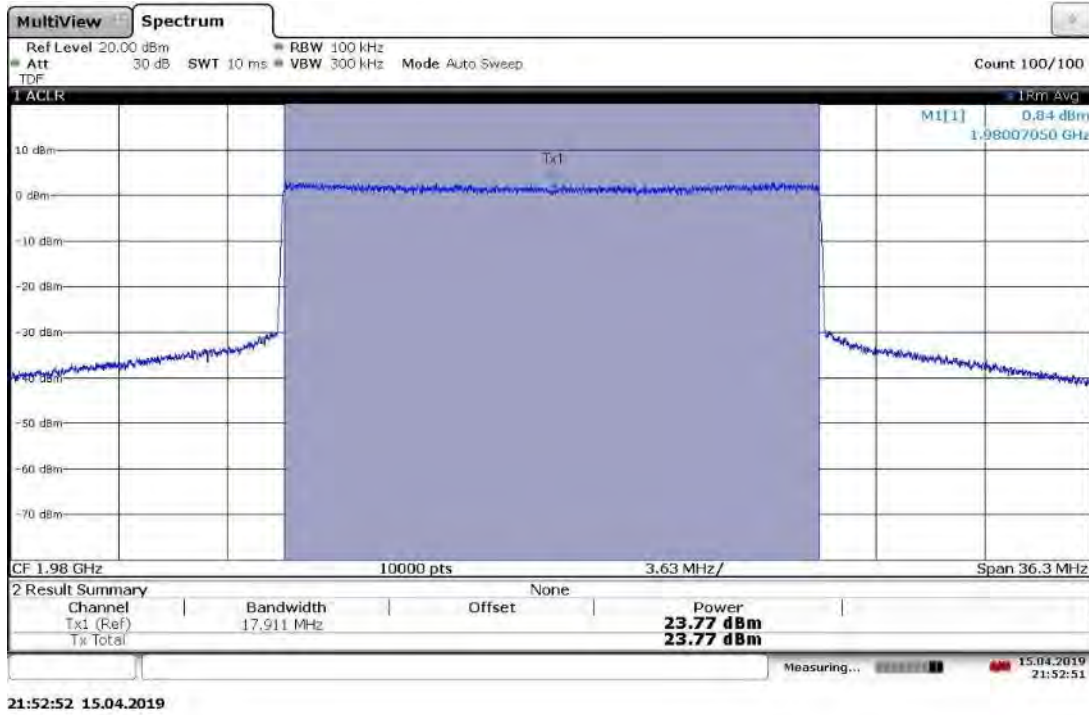
**TM1.1-QPSK\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 23.96 dBm**



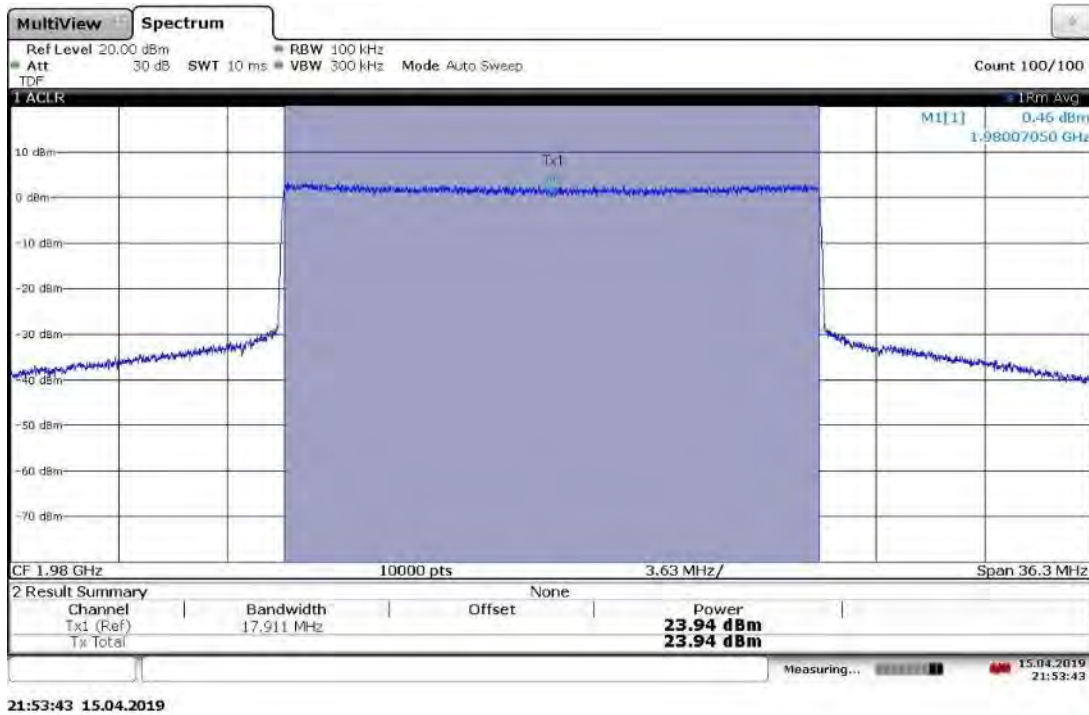
**TM1.1-QPSK\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 23.99 dBm**



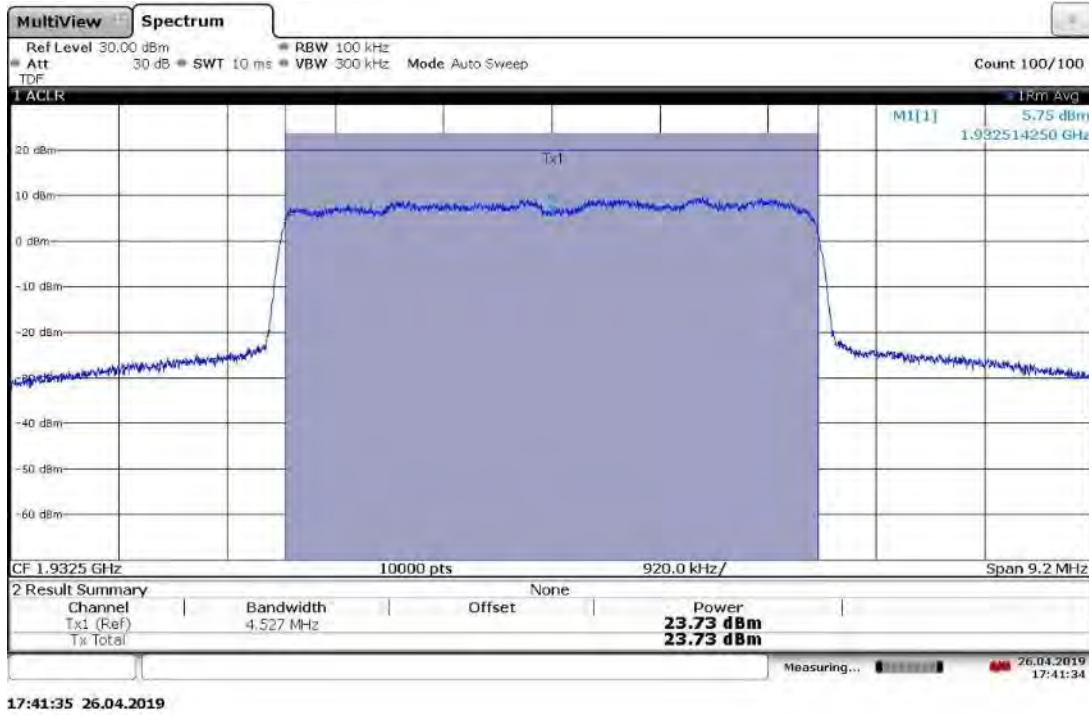
**TM1.1-QPSK\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1980 MHz, Output Power = 23.77 dBm**



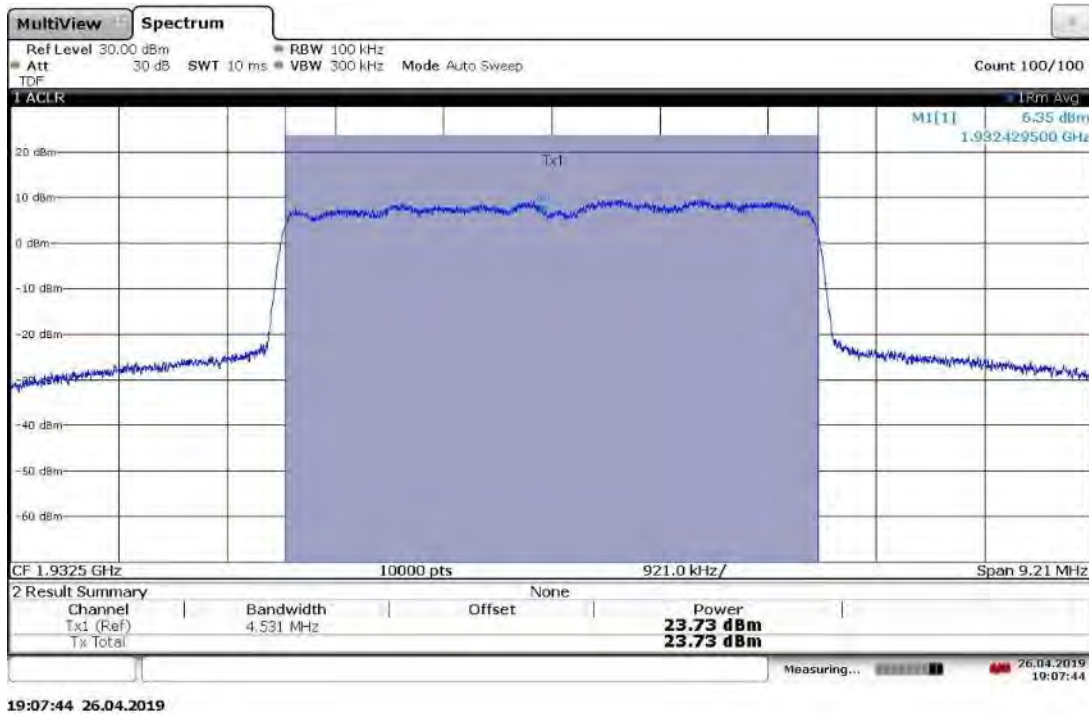
**TM1.1-QPSK\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1980 MHz, Output Power = 23.94 dBm**



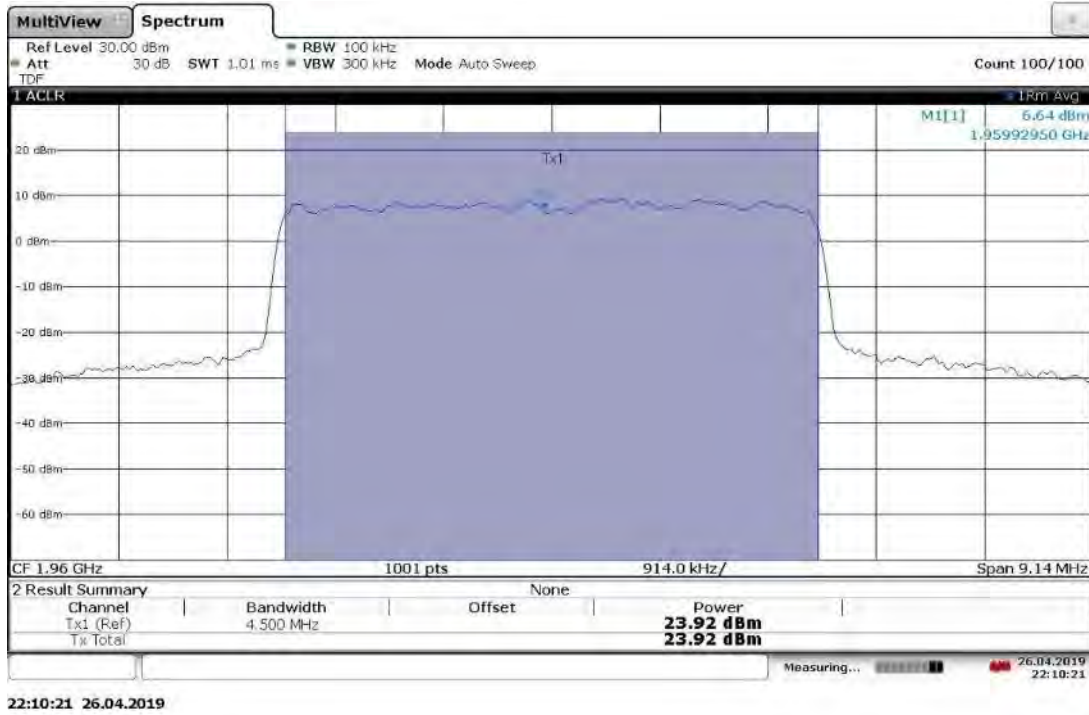
**TM3.2-16QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1932.5 MHz, Output Power = 23.73 dBm**



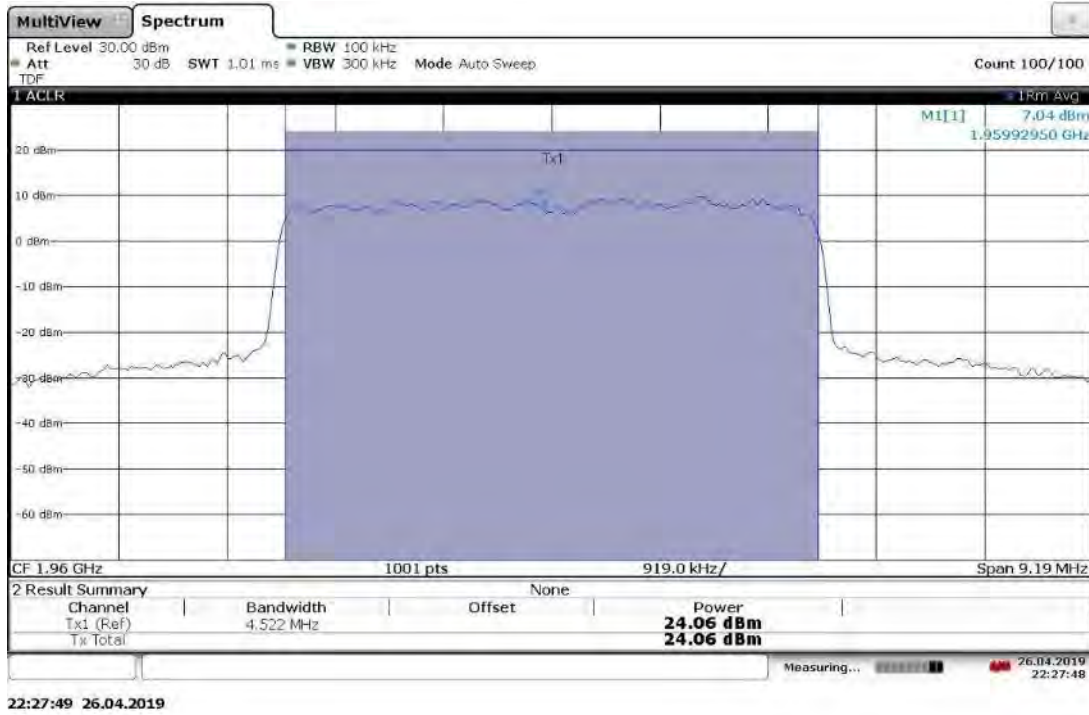
**TM3.2-16QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1932.5 MHz, Output Power = 23.73 dBm**



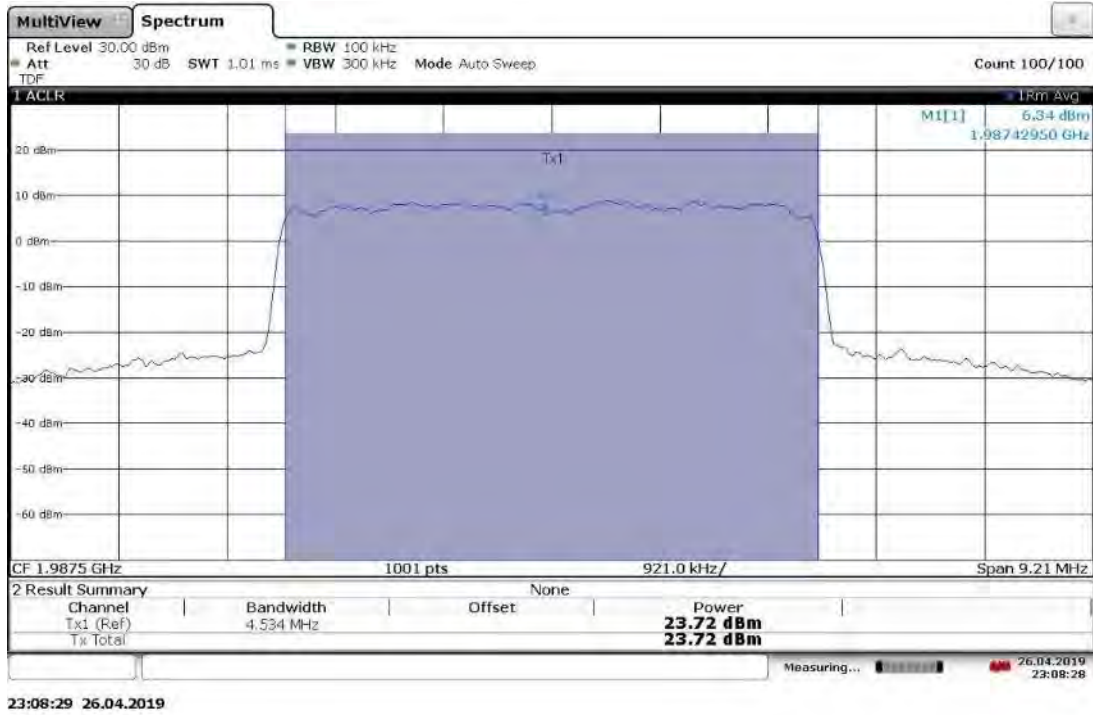
**TM3.2-16QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 23.92 dBm**



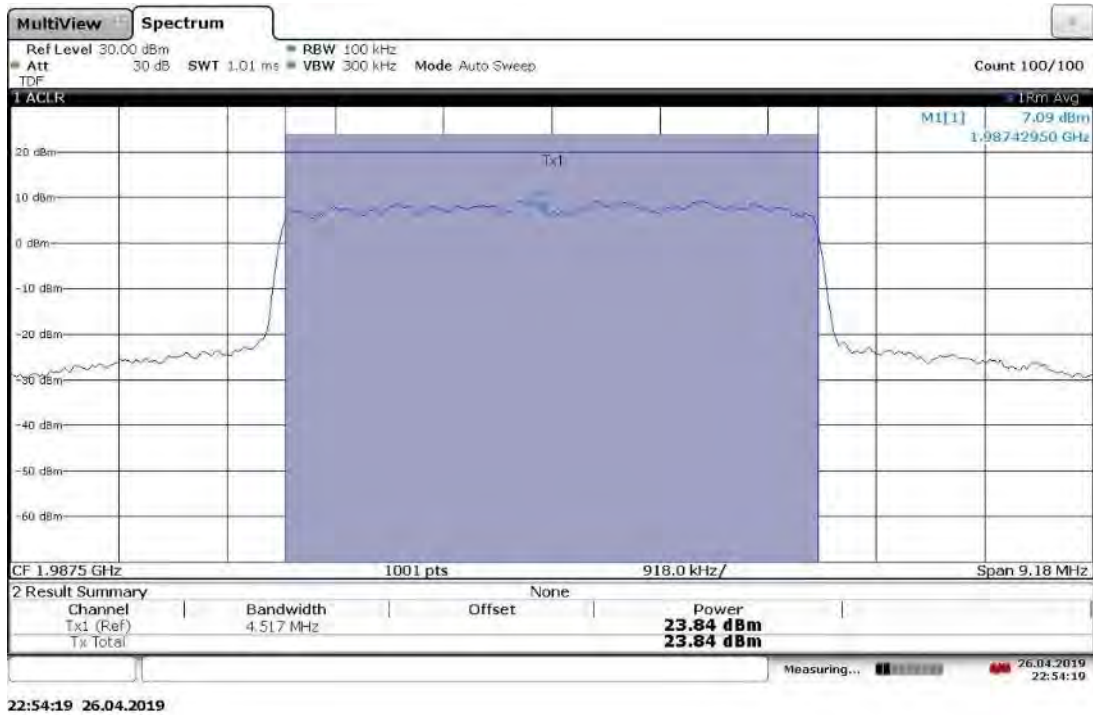
**TM3.2-16QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 24.06 dBm**



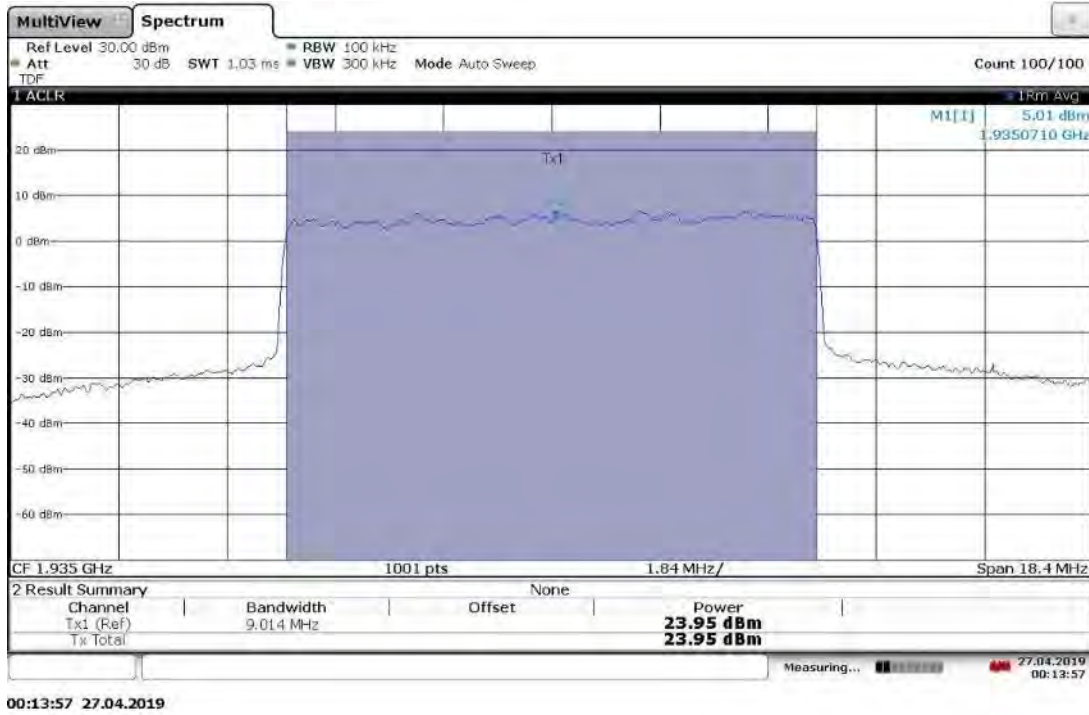
**TM3.2-16QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1987.5 MHz, Output Power = 23.72 dBm**



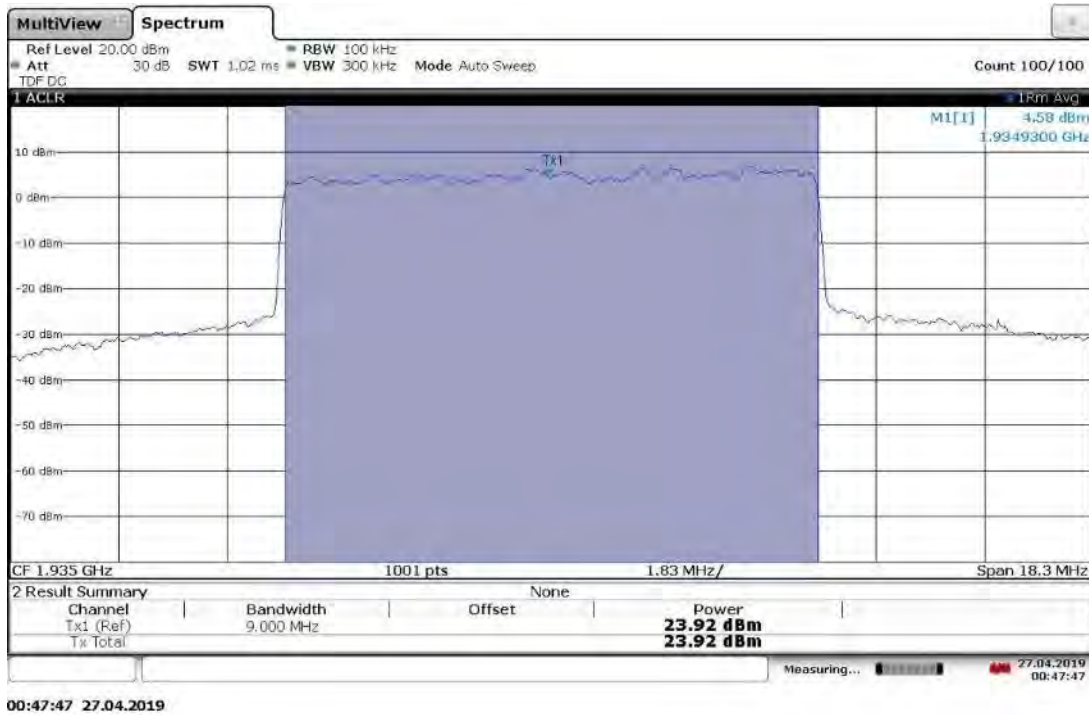
**TM3.2-16QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1987.5MHz, Output Power = 23.84 dBm**



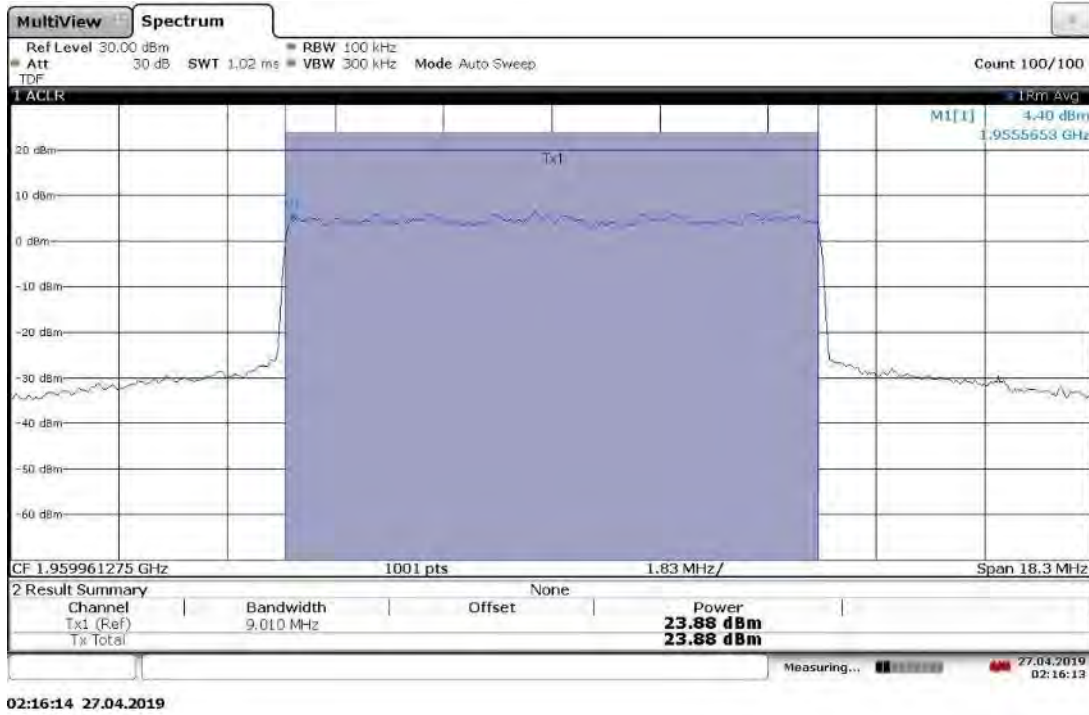
**TM3.2-16QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1935 MHz, Output Power = 23.95 dBm**



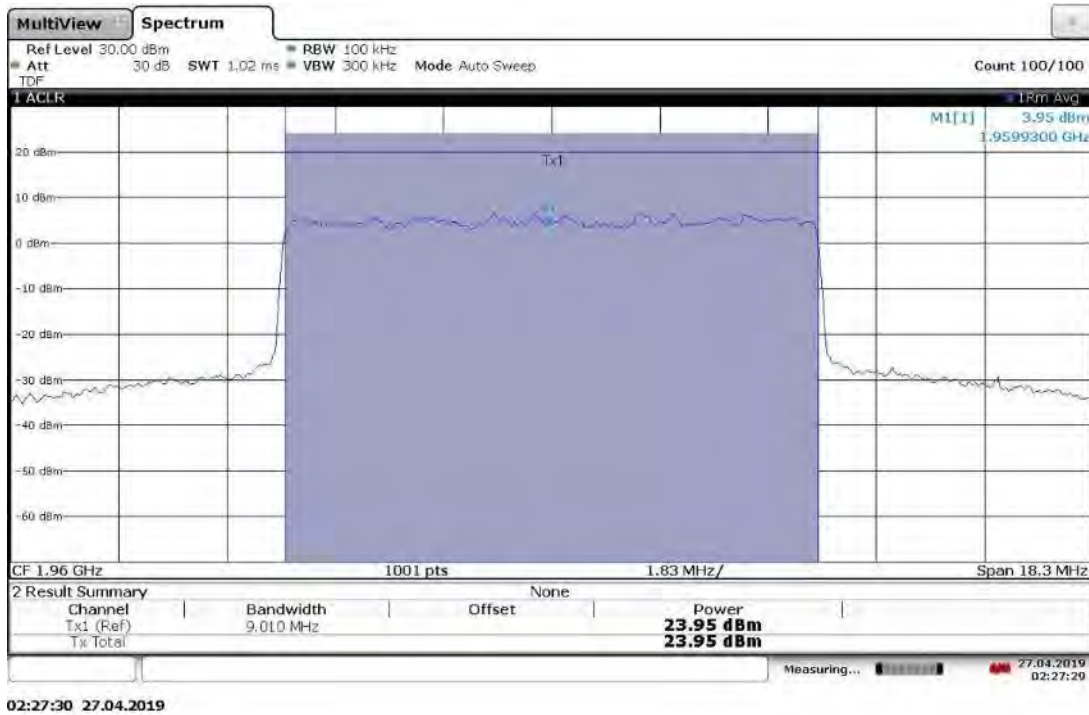
**TM3.2-16QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1935 MHz, Output Power = 23.92 dBm**



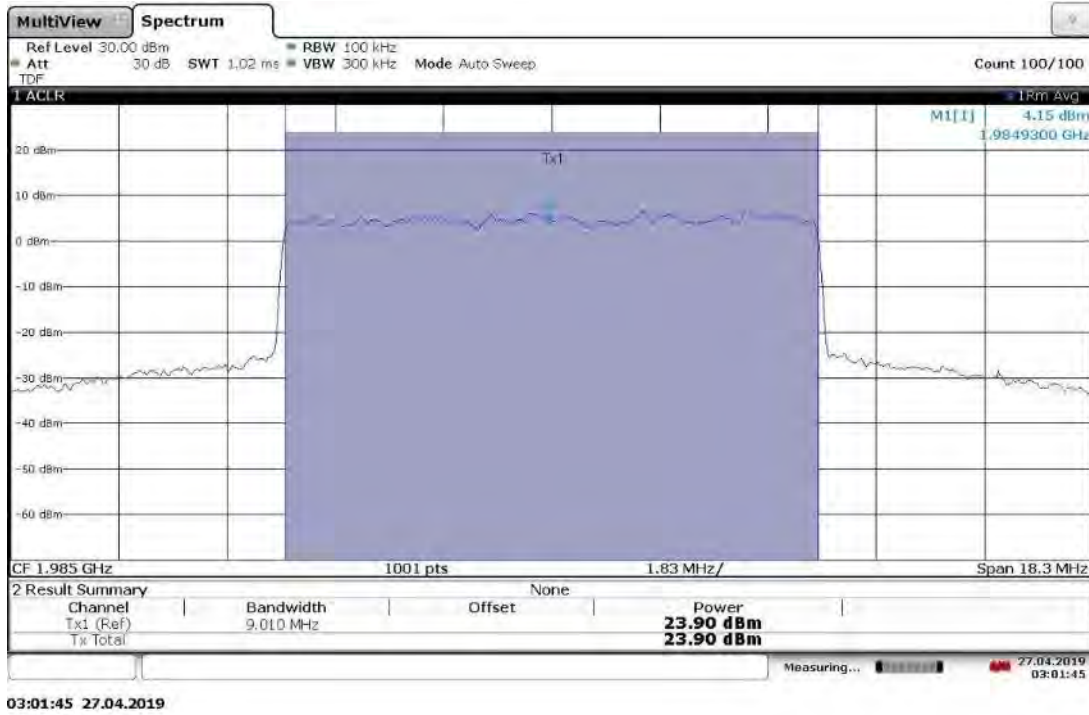
**TM3.2-16QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 23.88 dBm**



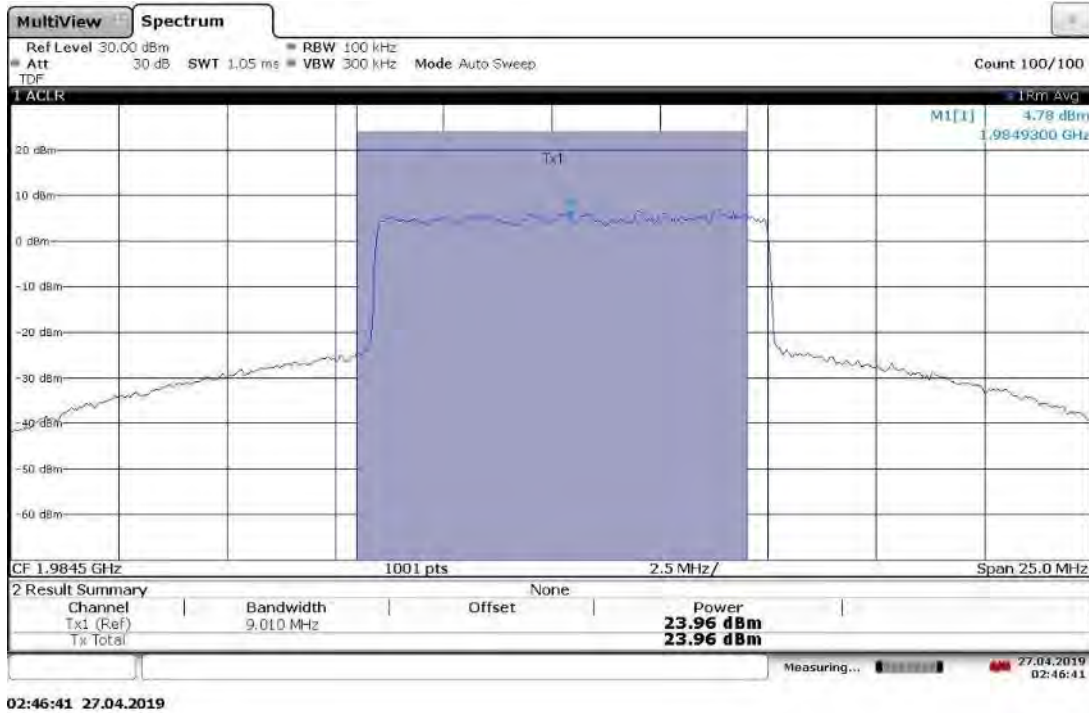
**TM3.2-16QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 23.95 dBm**



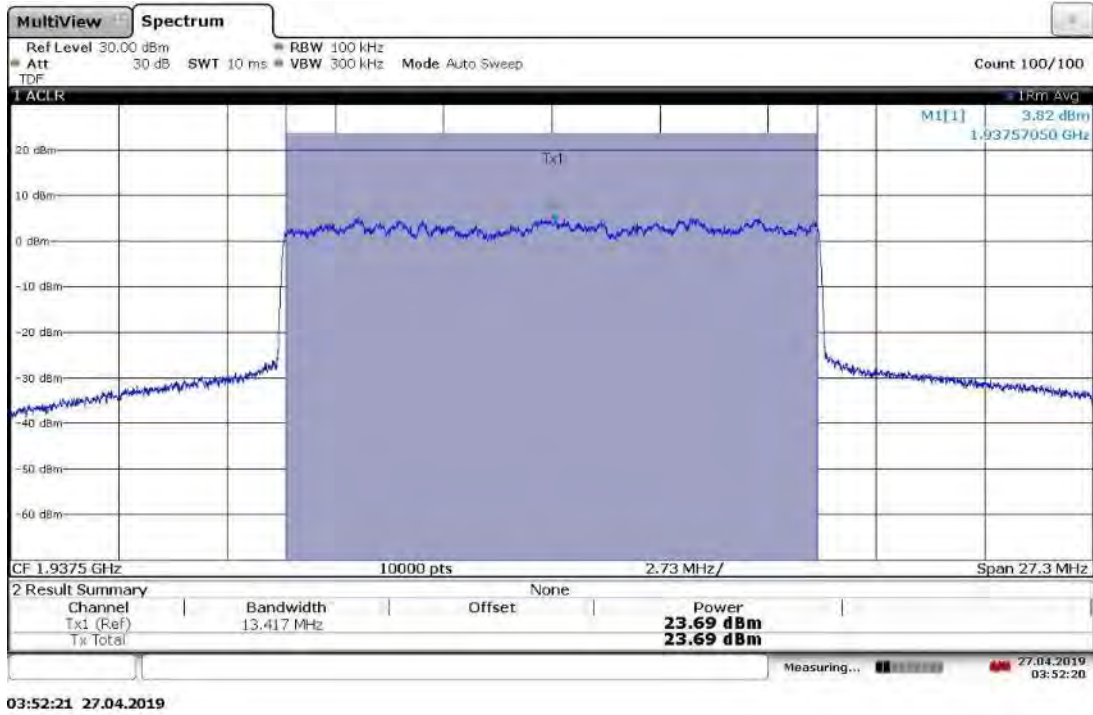
**TM3.2-16QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1985 MHz, Output Power = 23.90 dBm**



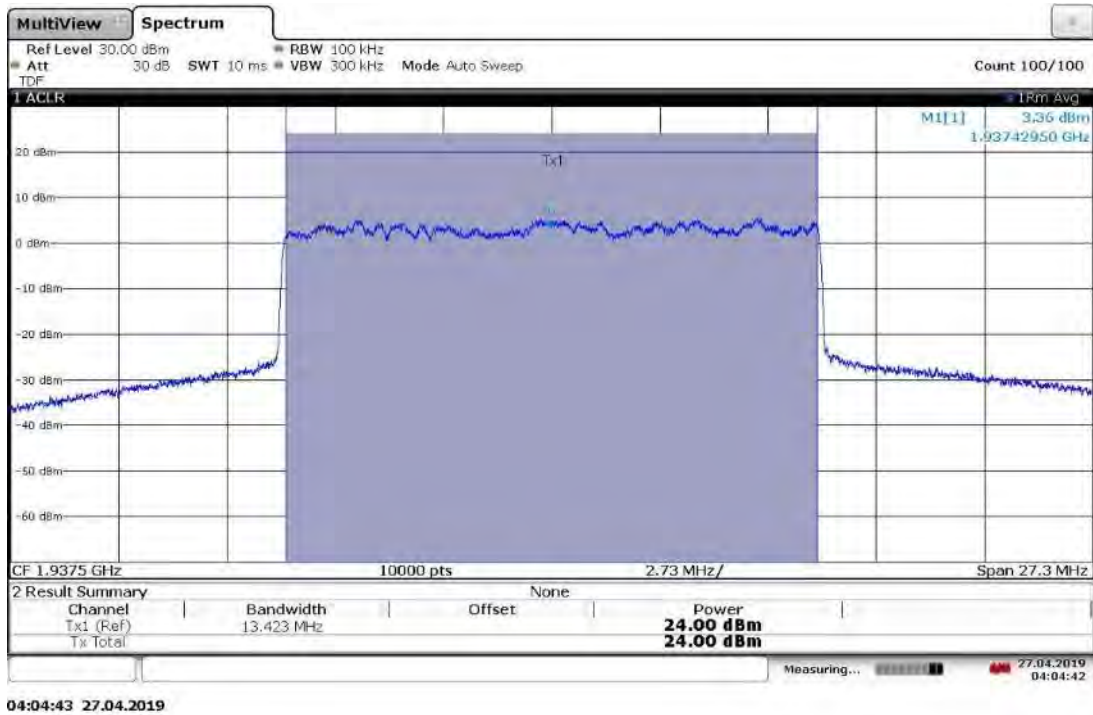
**TM3.2-16QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1985 MHz, Output Power =23.96 dBm**



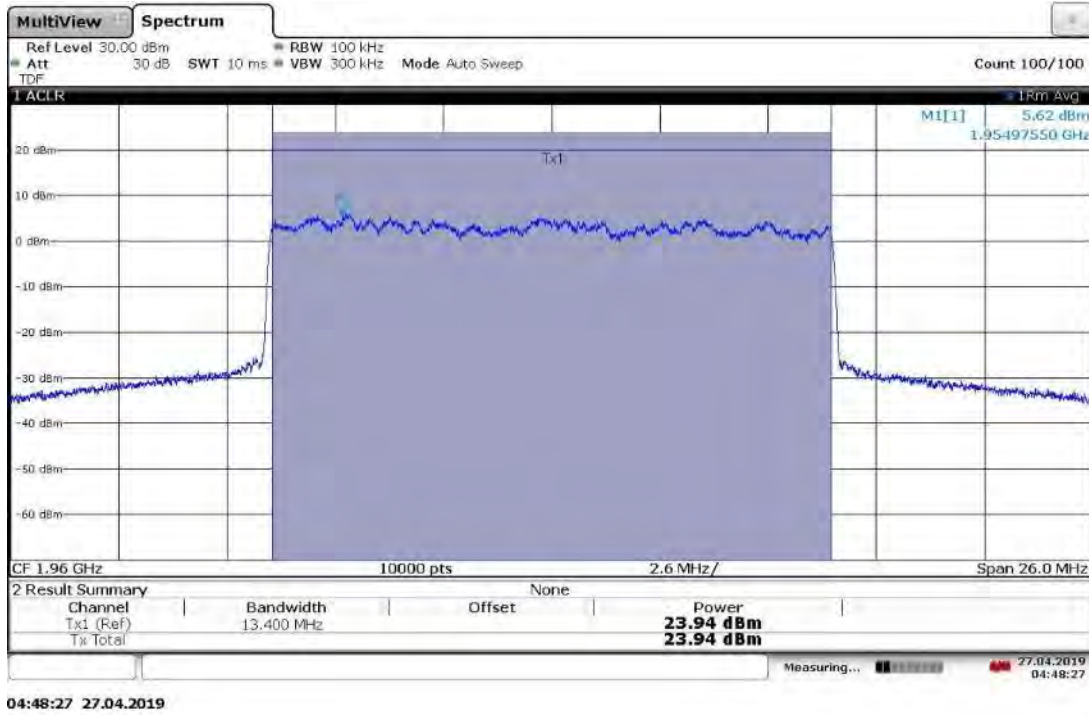
**TM3.2-16QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1937.5 MHz, Output Power = 23.69 dBm**



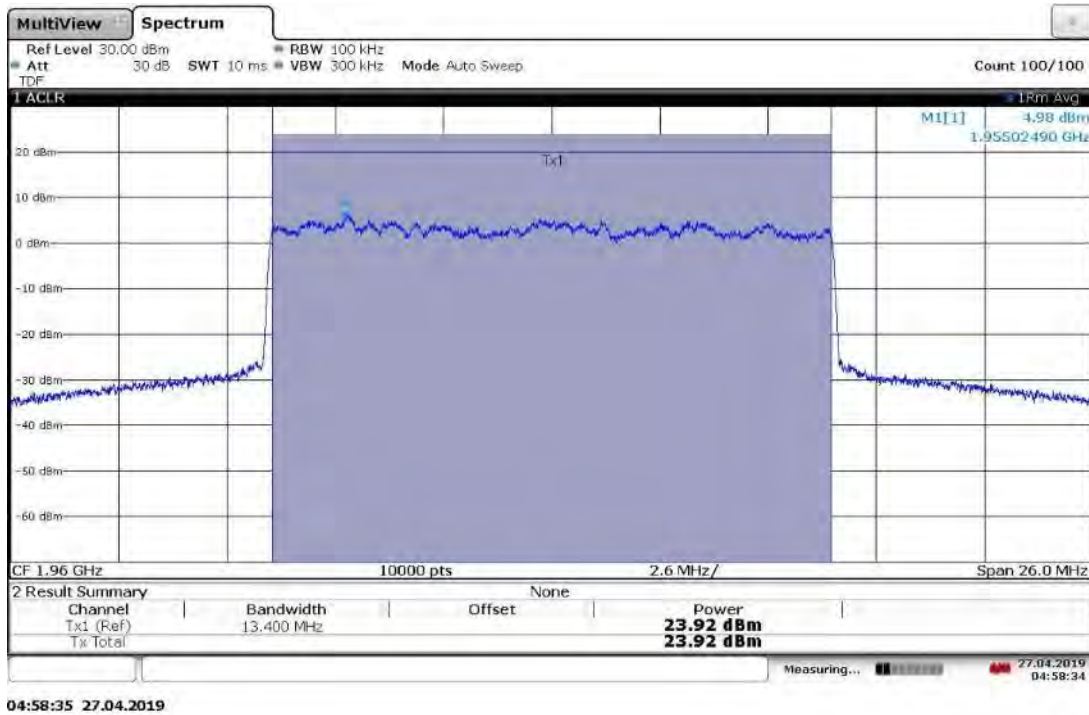
**TM3.2-16QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1937.5 MHz, Output Power = 24.00 dBm**



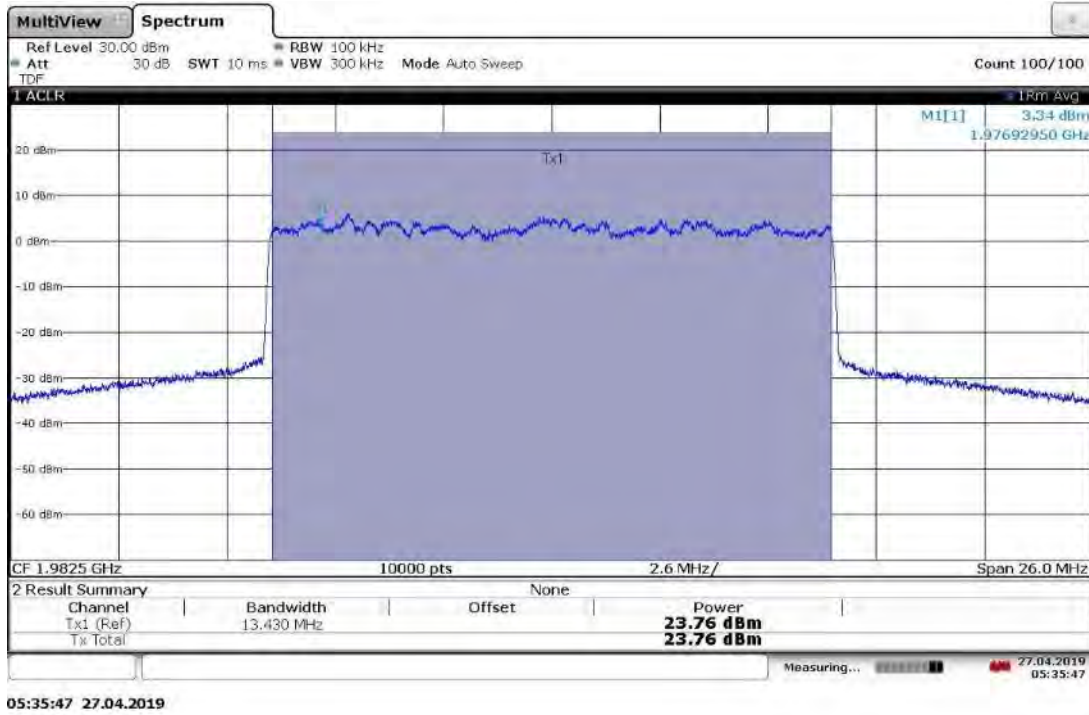
**TM3.2-16QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 23.94 dBm**



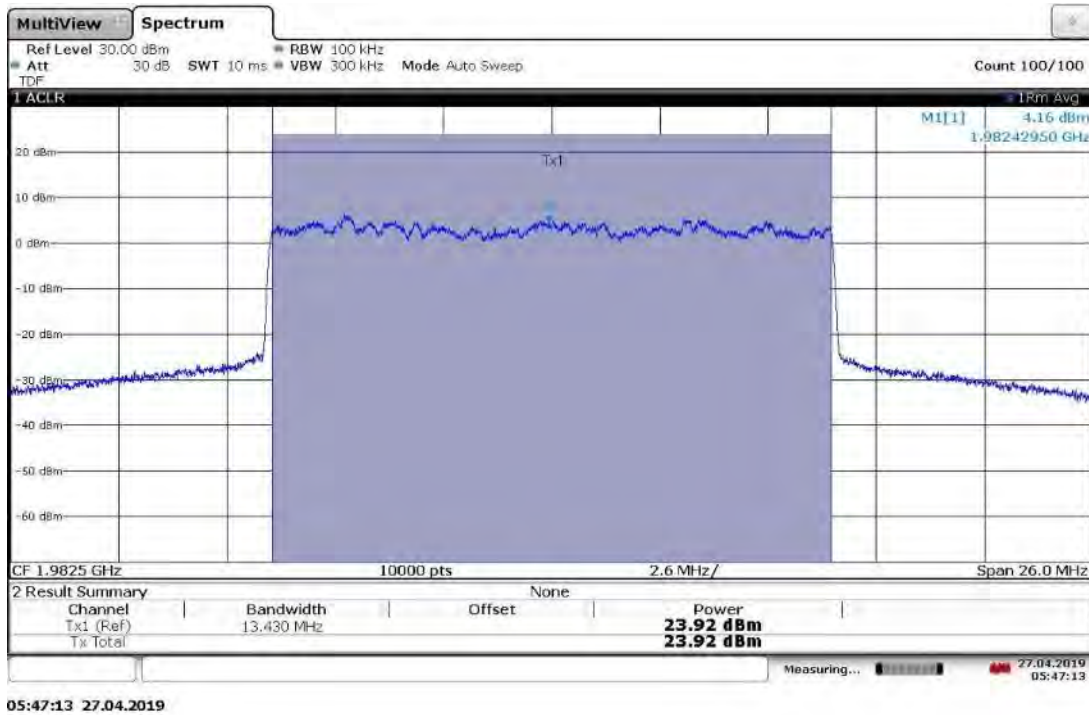
**TM3.2-16QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 23.92 dBm**



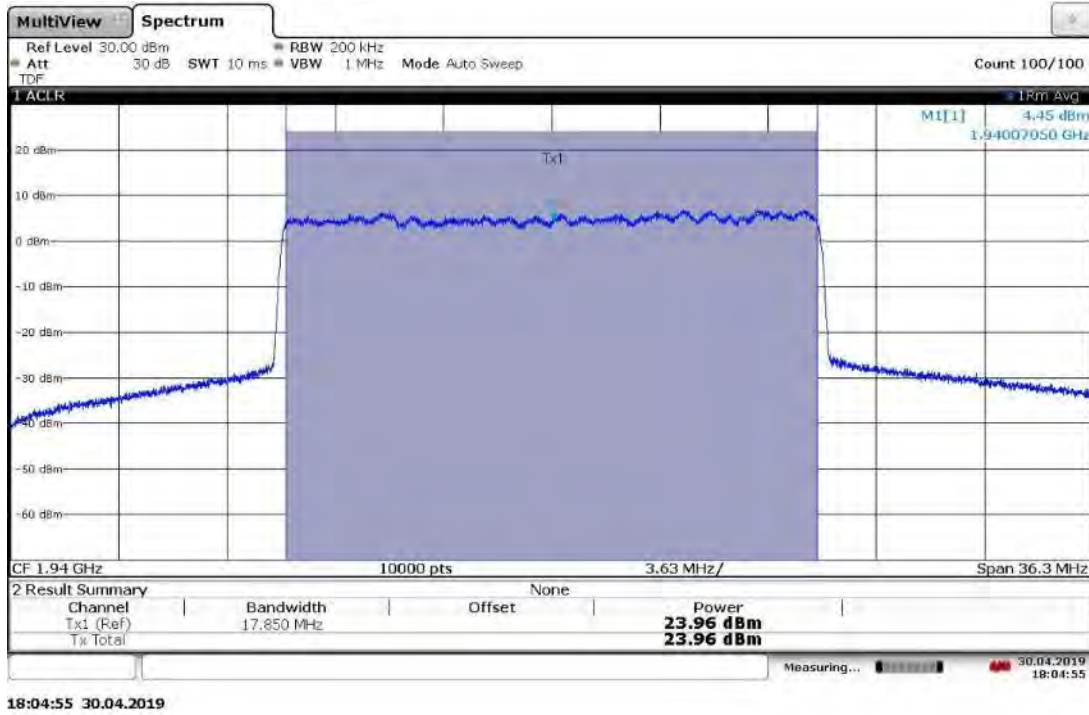
**TM3.2-16QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1982 MHz, Output Power =23.76 dBm**



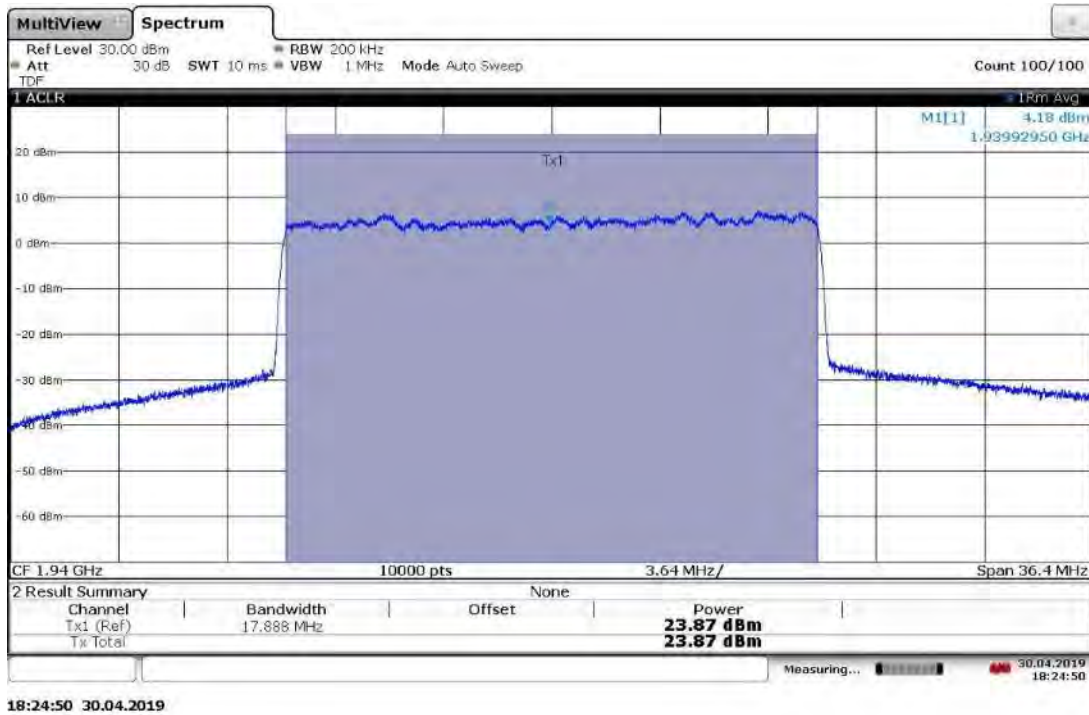
**TM3.2-16QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1982.5 MHz, Output Power = 23.92 dBm**



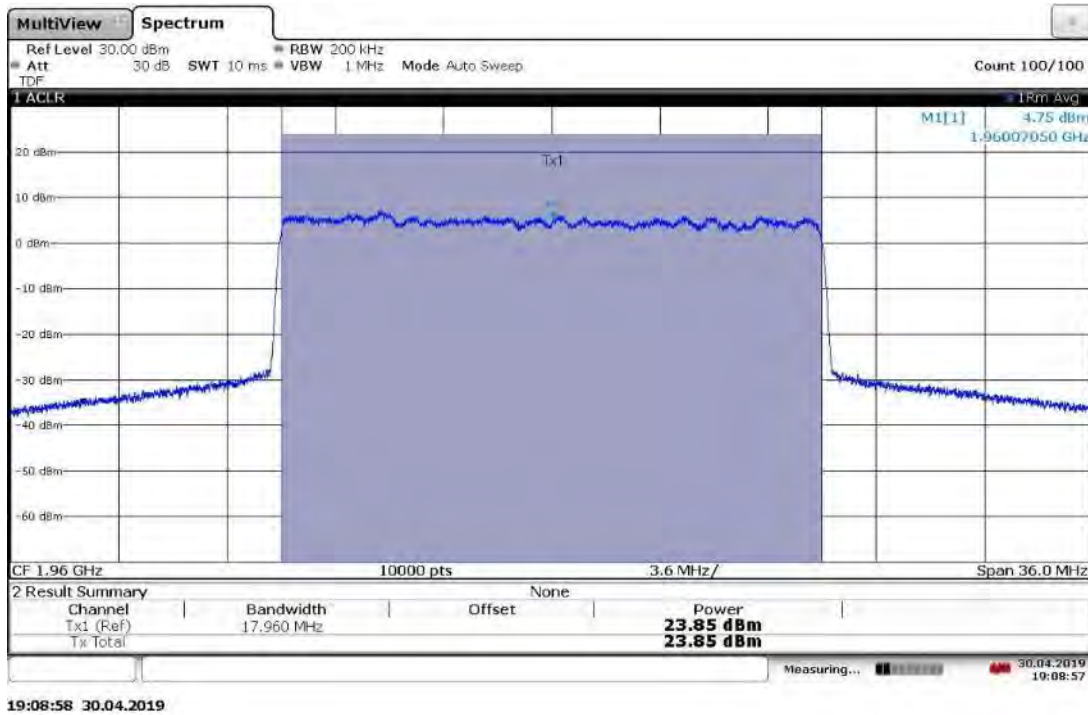
**TM3.2-16QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1940 MHz, Output Power = 23.96 dBm**



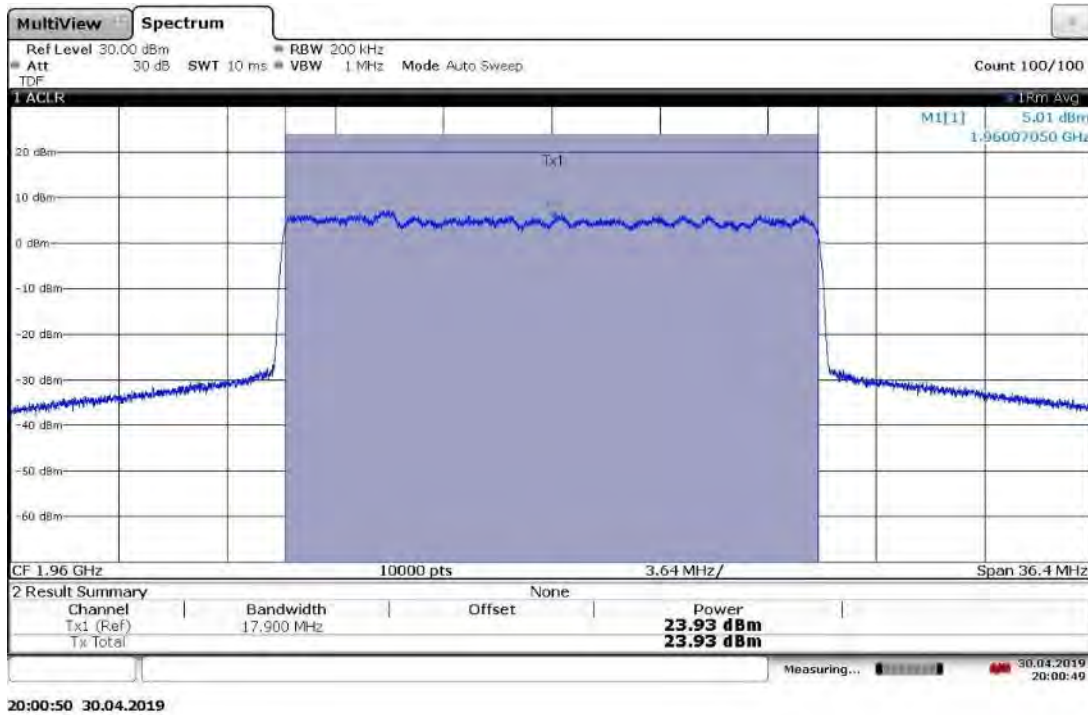
**TM3.2-16QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1940 MHz, Output Power = 23.87 dBm**



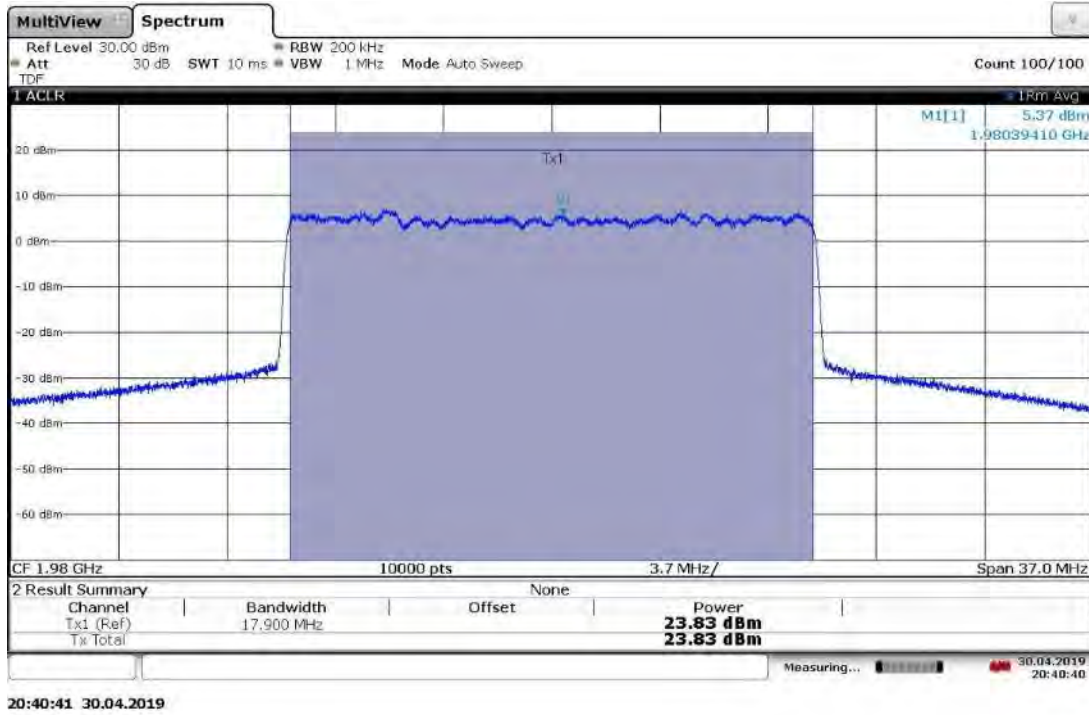
**TM3.2-16QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 23.85 dBm**



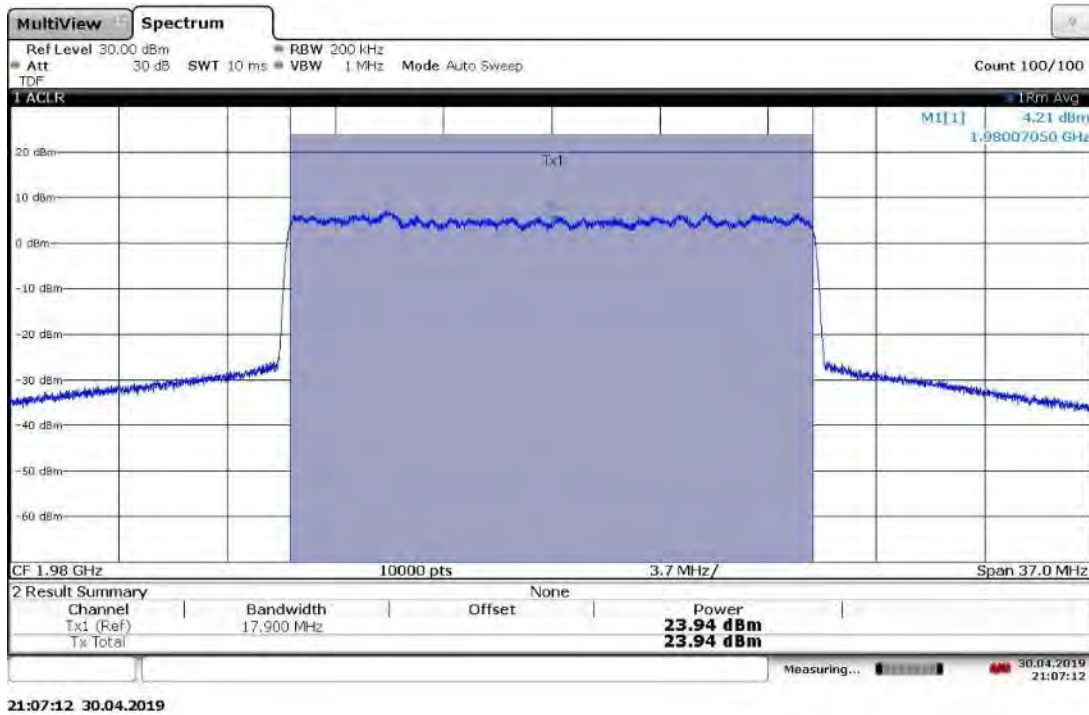
**TM3.2-16QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 23.93 dBm**



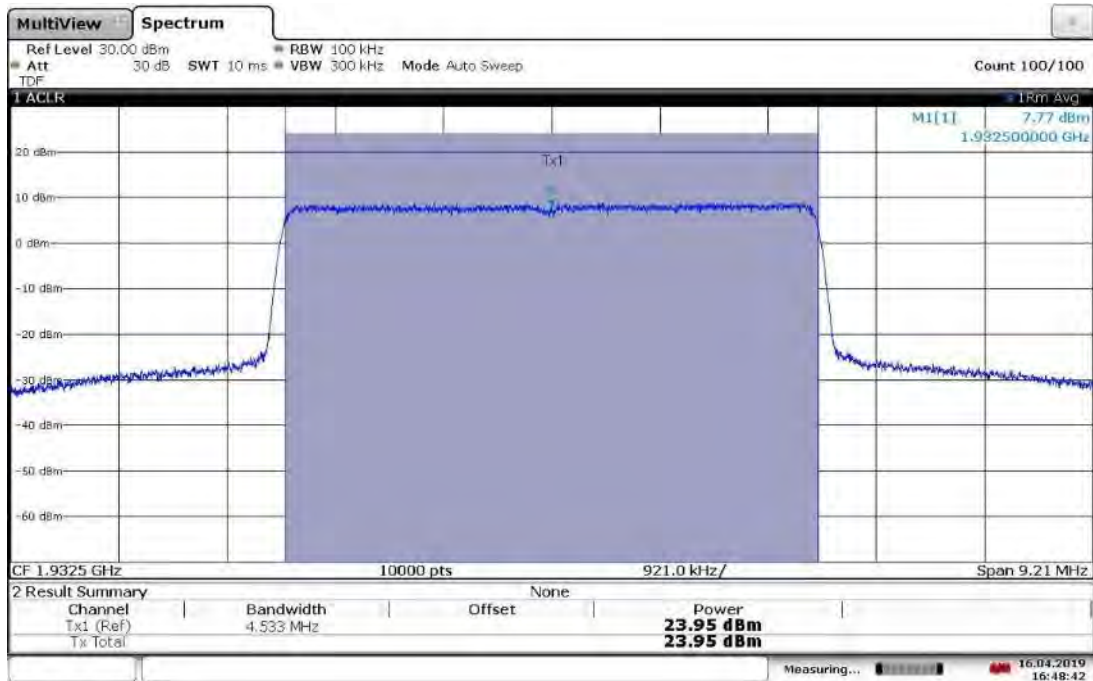
**TM3.2-16QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1980 MHz, Output Power = 23.83 dBm**



**TM3.2-16QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1980 MHz, Output Power = 23.84 dBm**

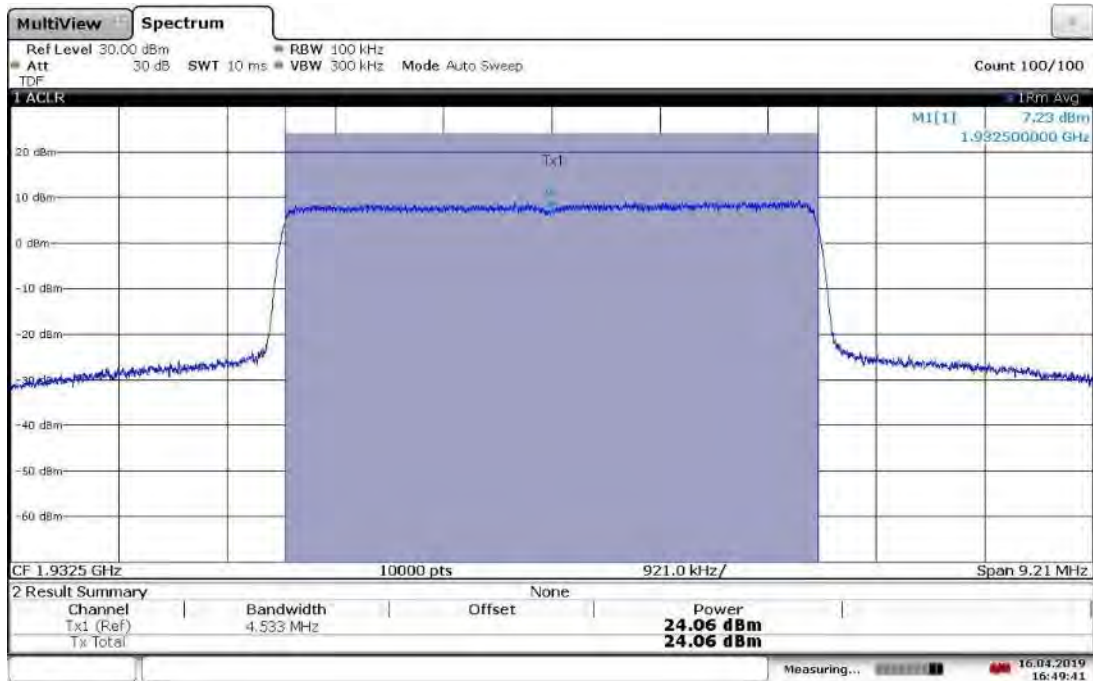


**TM3.1-64QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1932.5 MHz, Output Power = 23.95 dBm**



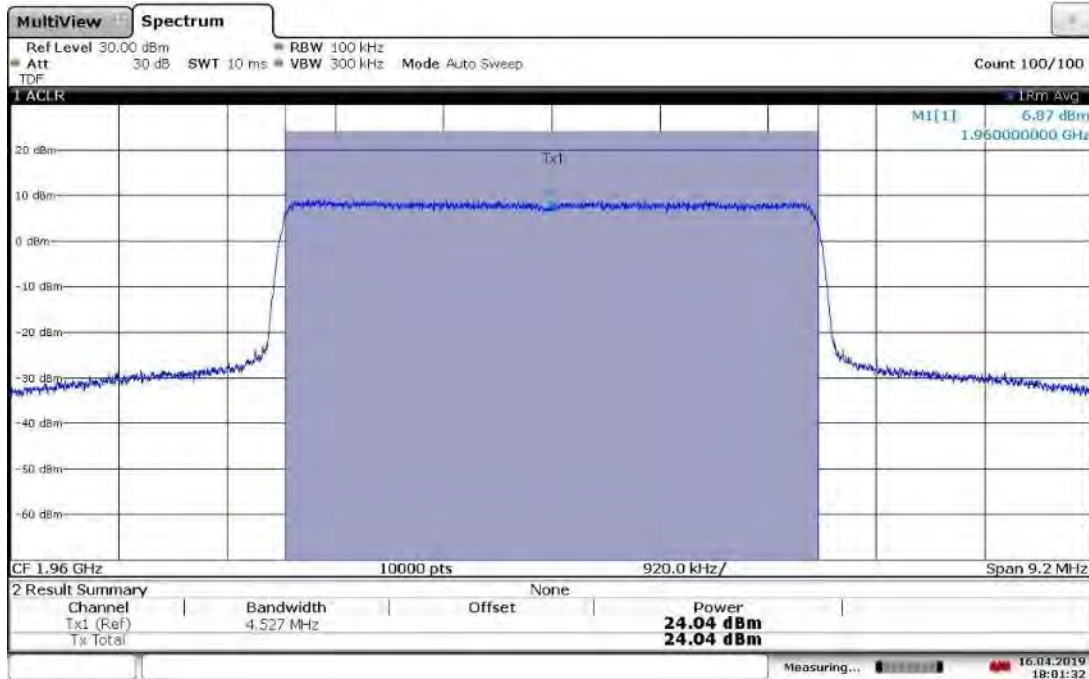
16:48:42 16.04.2019

**TM3.1-64QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1932.5 MHz, Output Power = 24.06 dBm**



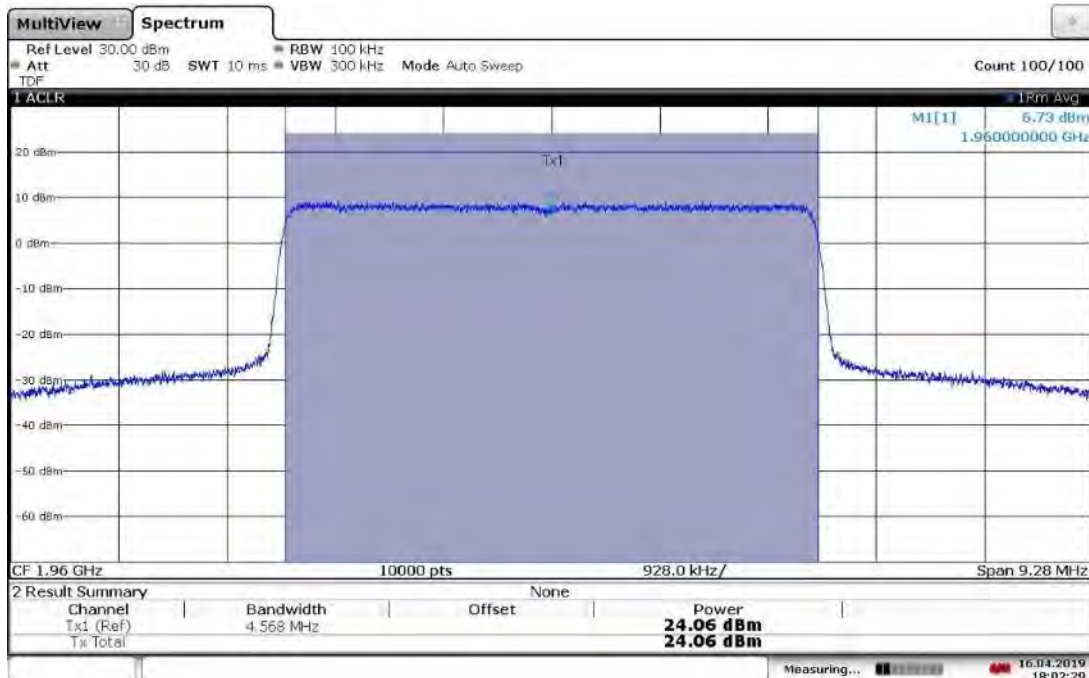
16:49:42 16.04.2019

**TM3.1-64QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 24.04 dBm**



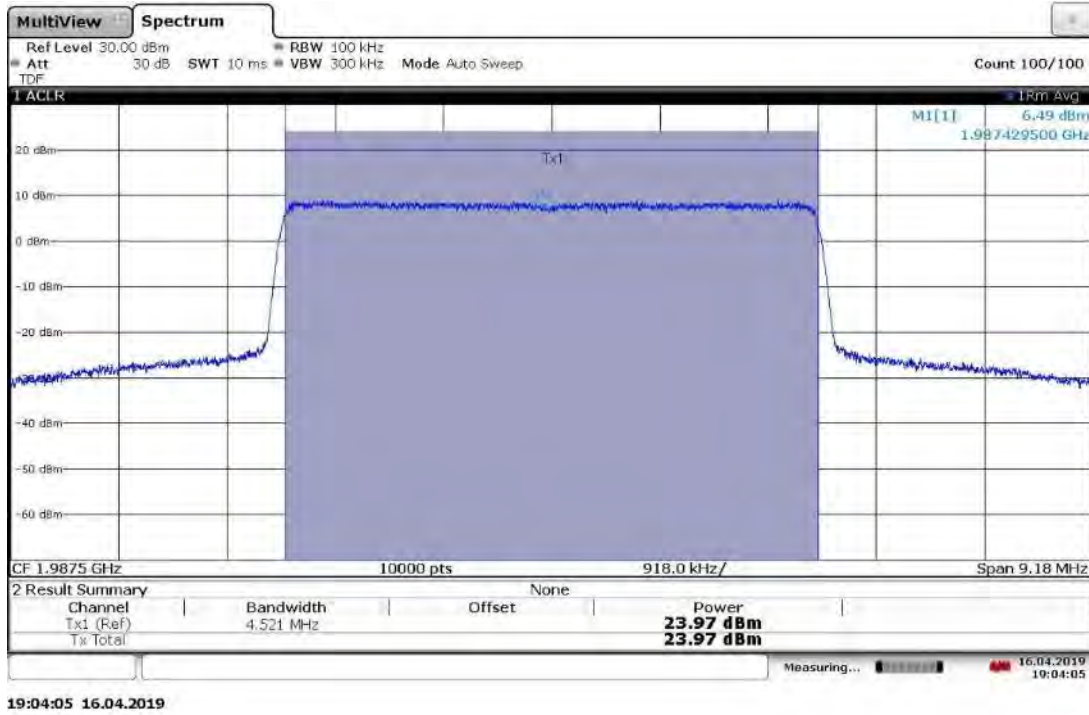
18:01:33 16.04.2019

**TM3.1-64QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 24.06 dBm**

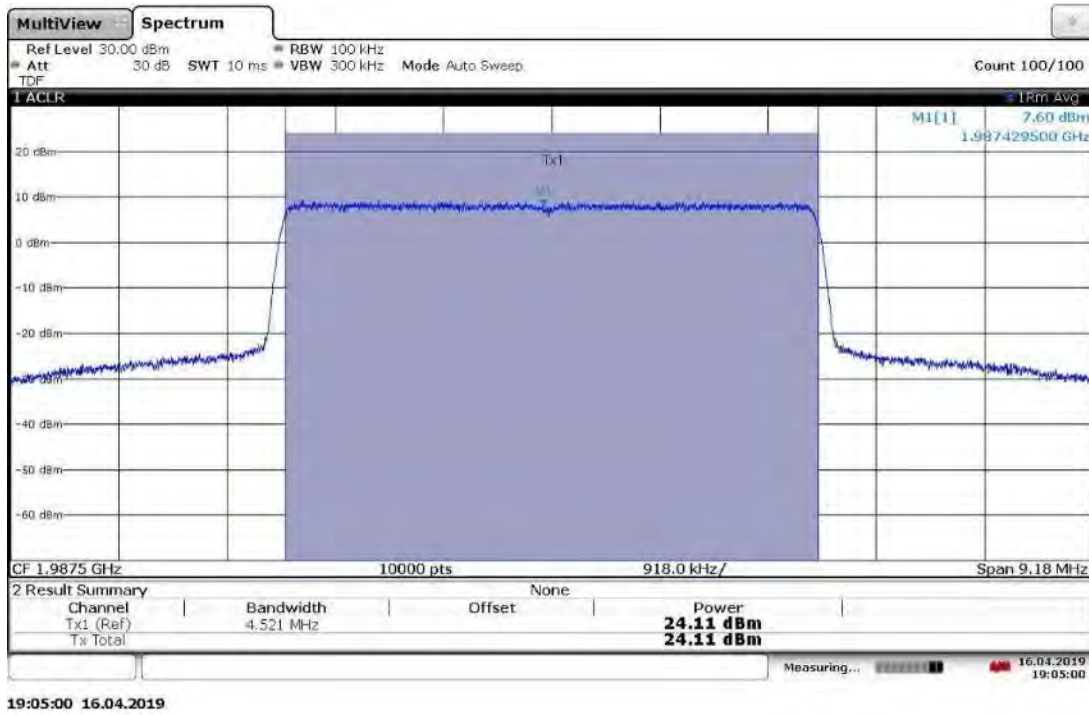


18:02:29 16.04.2019

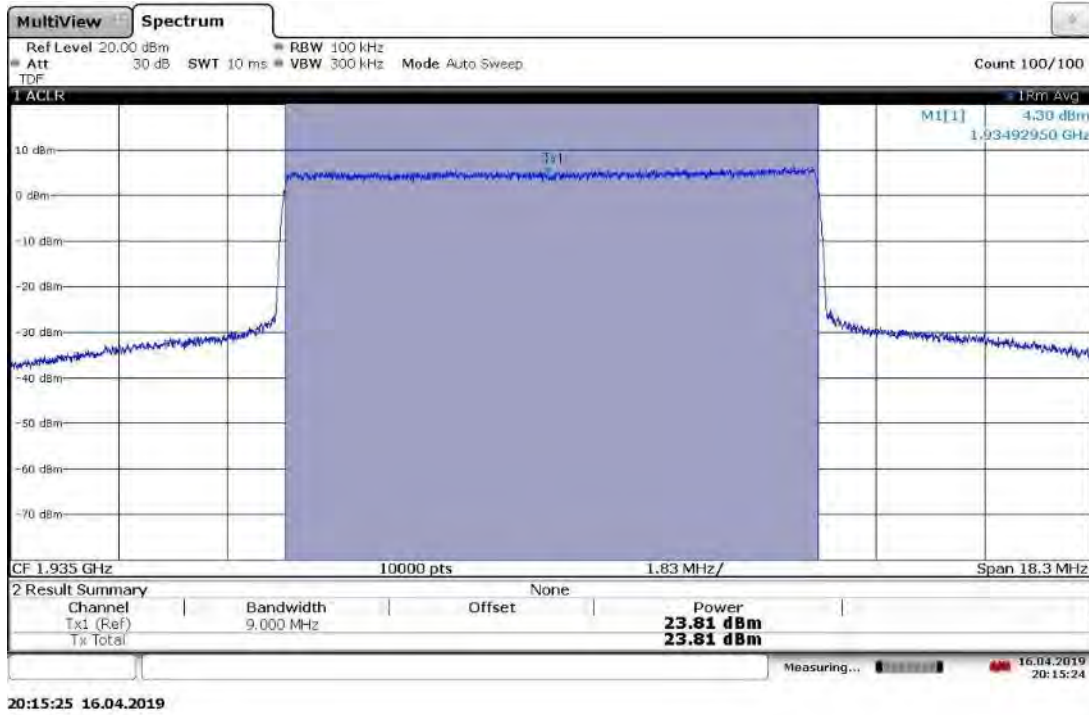
**TM3.1-64QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1987.5 MHz, Output Power = 23.97 dBm**



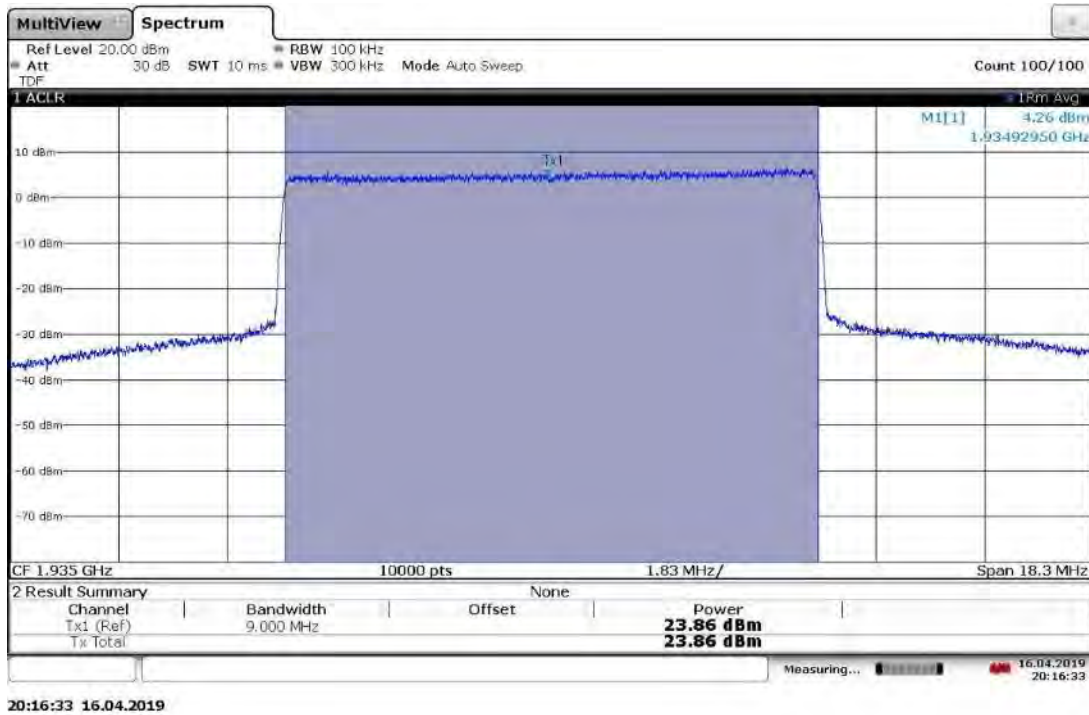
**TM3.1-64QAM\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1987.5 MHz, Output Power = 24.11 dBm**



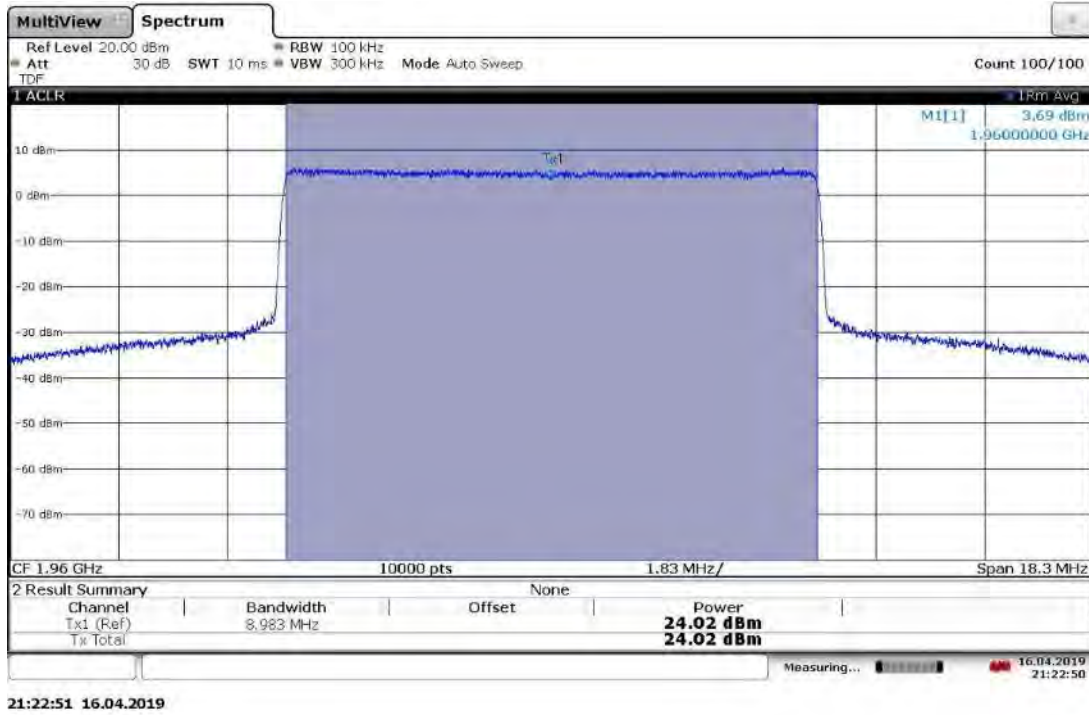
**TM3.1-64QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1935 MHz, Output Power = 23.81 dBm**



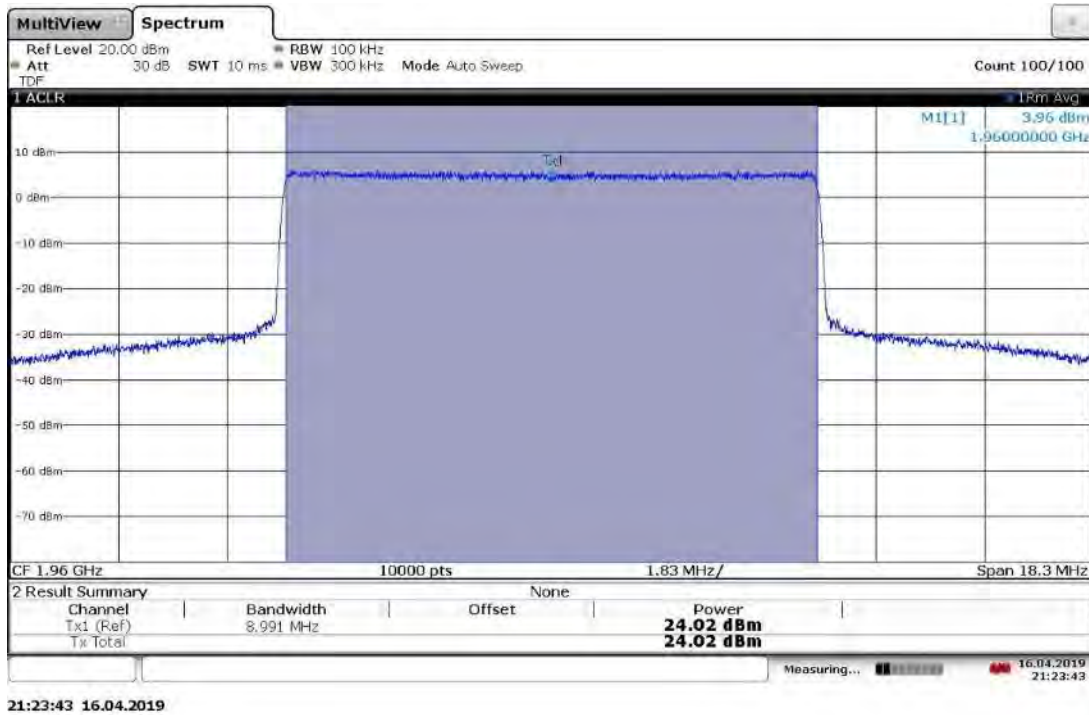
**TM3.1-64QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1935 MHz, Output Power = 23.86 dBm**



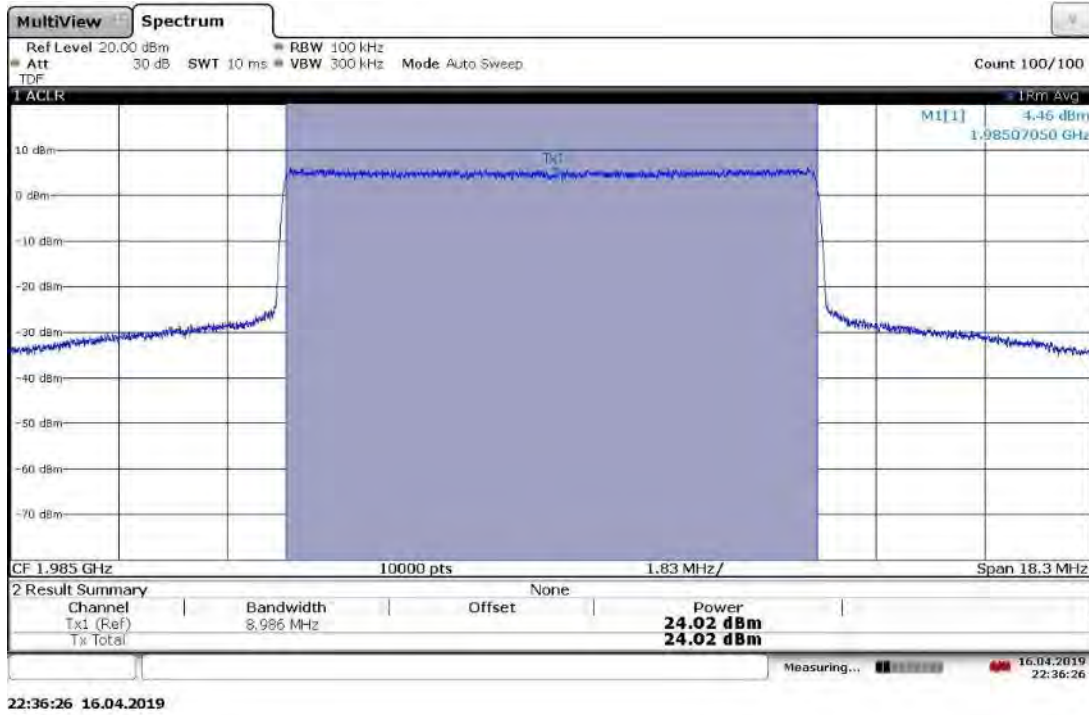
**TM3.1-64QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 24.02 dBm**



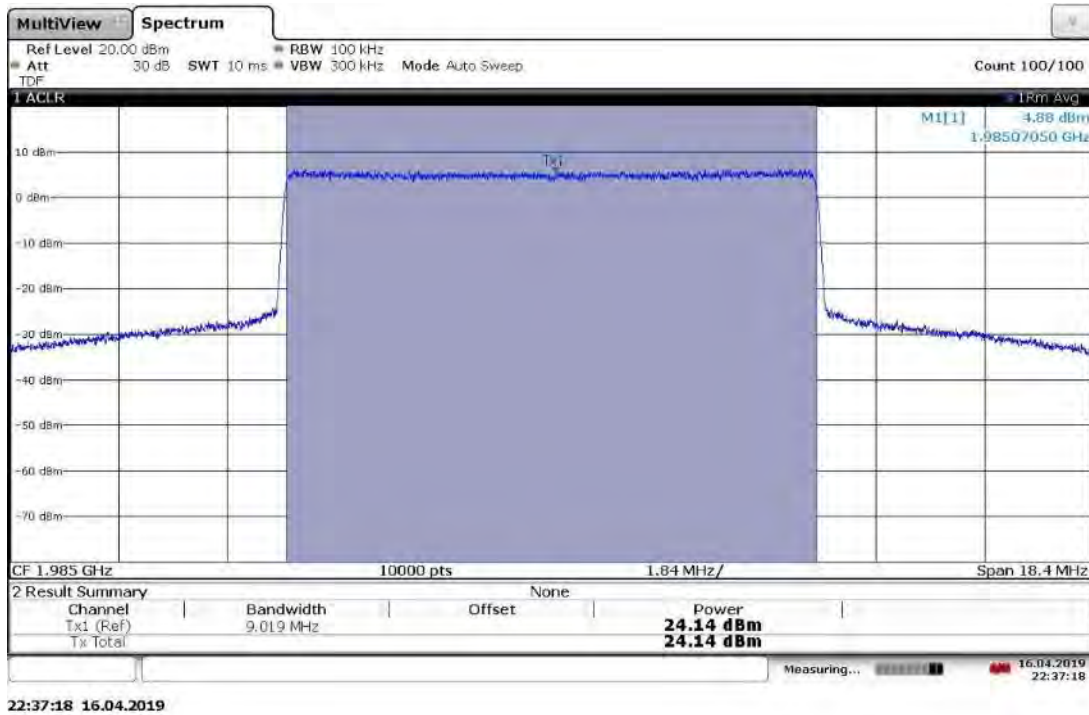
**TM3.1-64QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 24.02 dBm**



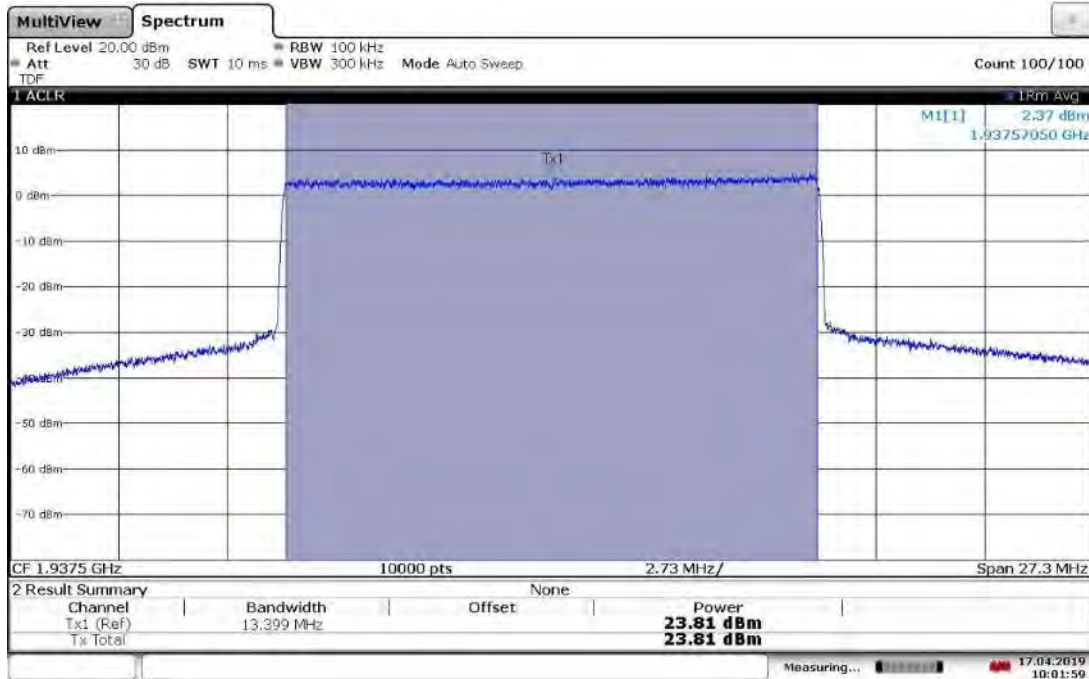
**TM3.1-64QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1985 MHz, Output Power = 24.02 dBm**



**TM3.1-64QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1985 MHz, Output Power = 24.14 dBm**

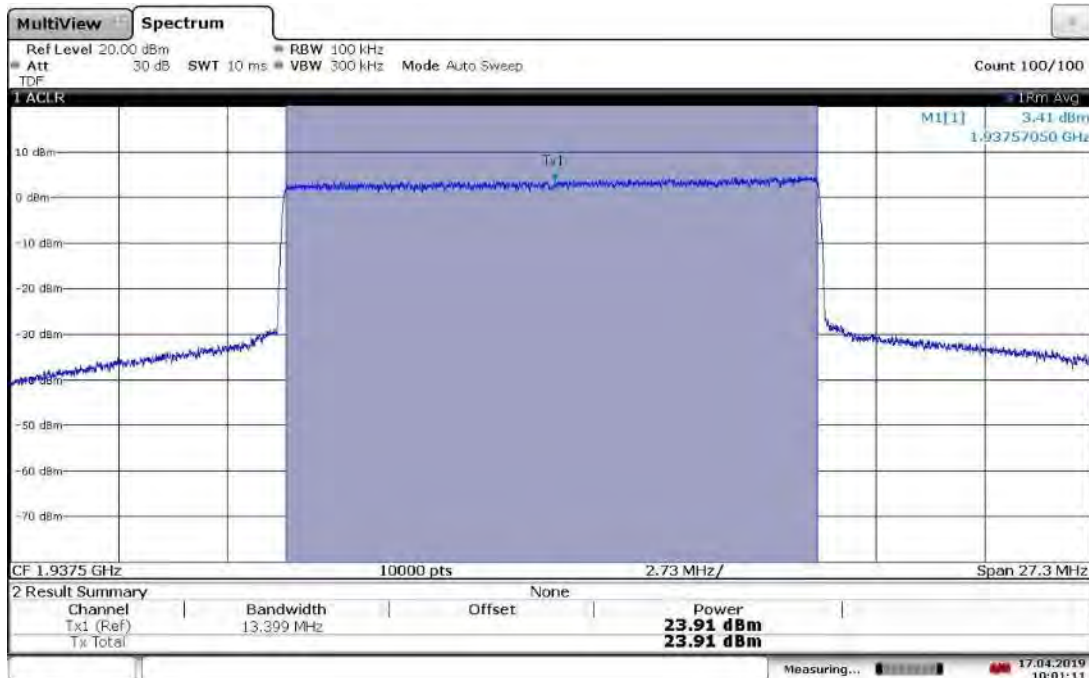


**TM3.1-64QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1937.5 MHz, Output Power = 23.81 dBm**



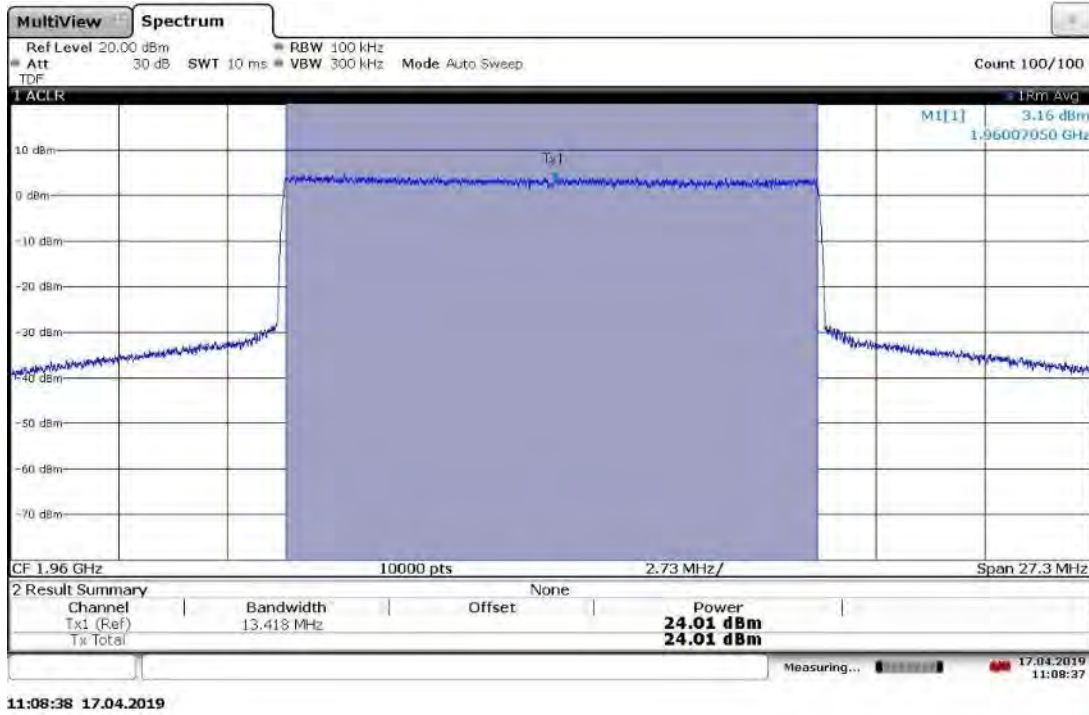
10:01:59 17.04.2019

**TM3.1-64QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1937.5 MHz, Output Power = 23.91 dBm**

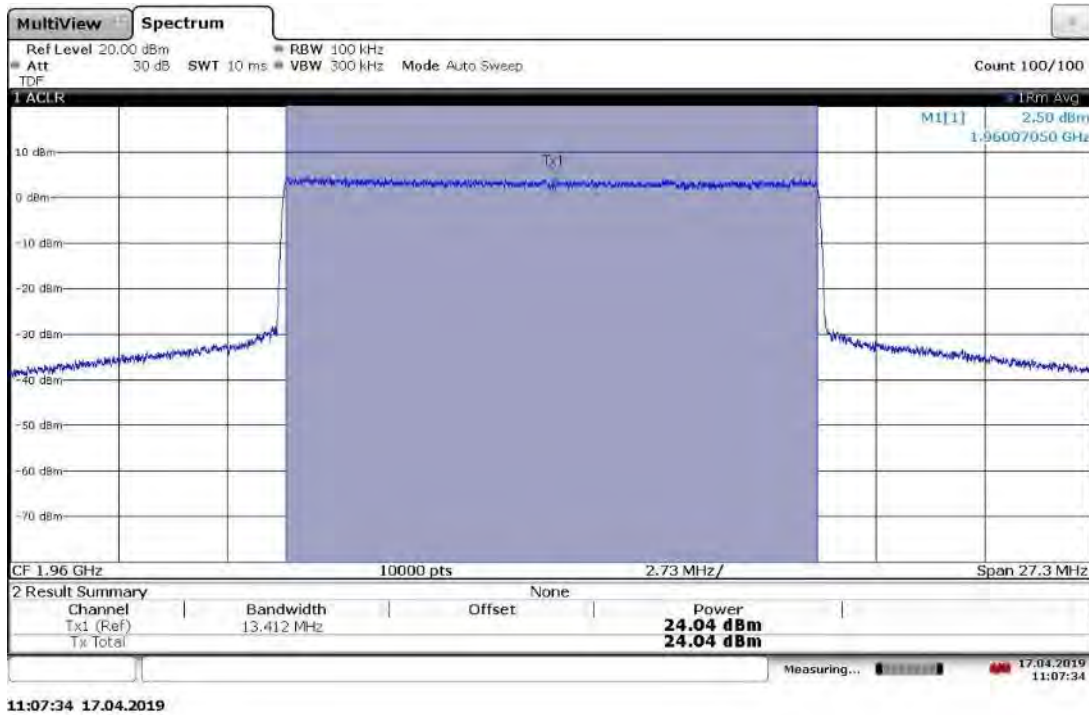


10:01:12 17.04.2019

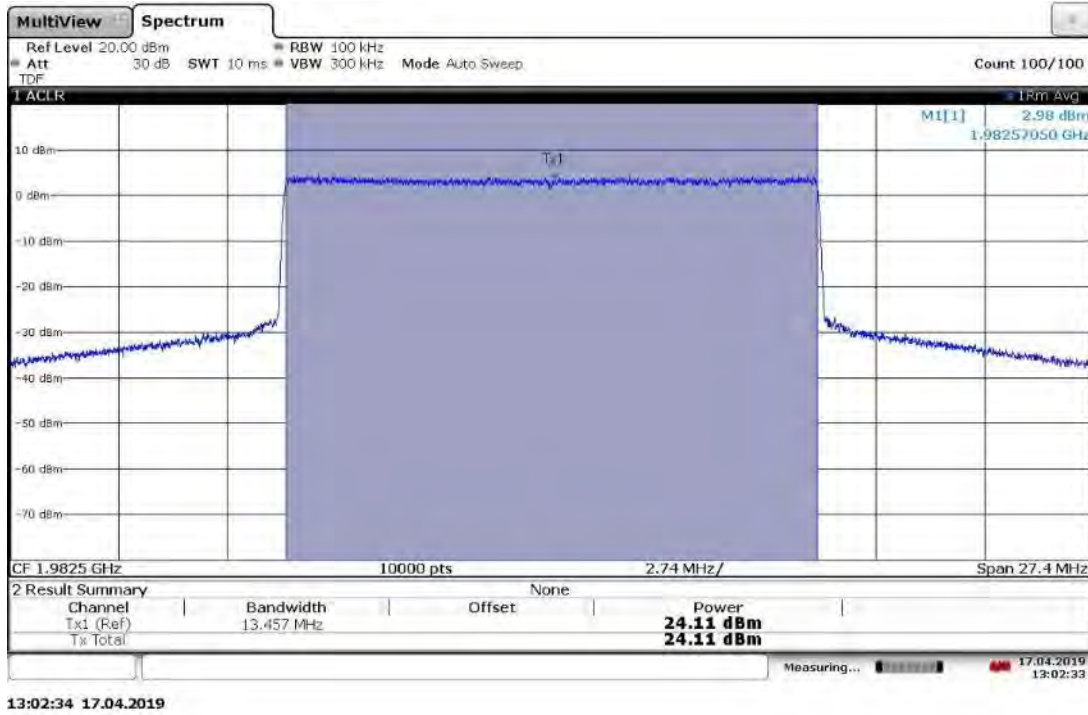
**TM3.1-64QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 24.01 dBm**



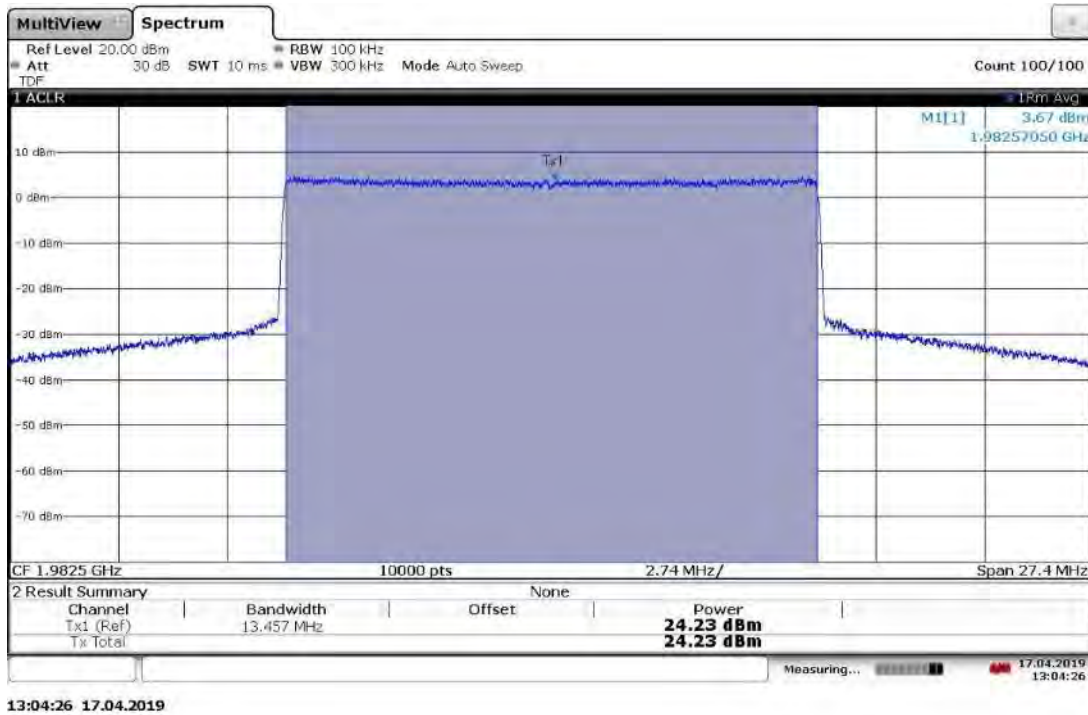
**TM3.1-64QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 24.04 dBm**



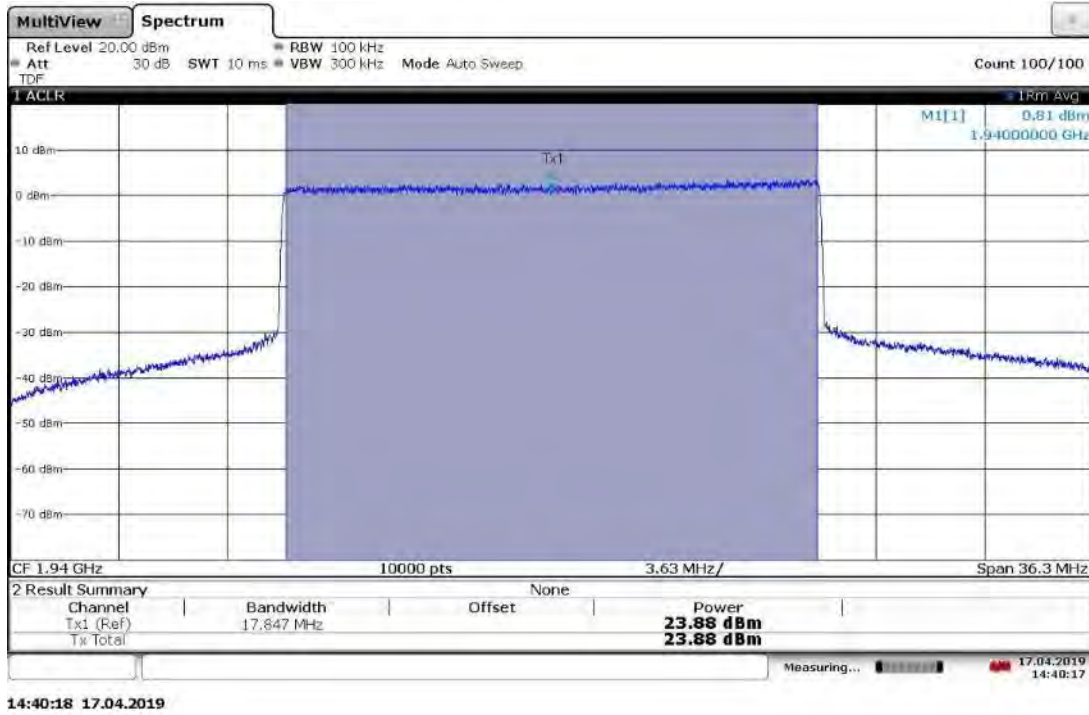
**TM3.1-64QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1982.5 MHz, Output Power = 24.11 dBm**



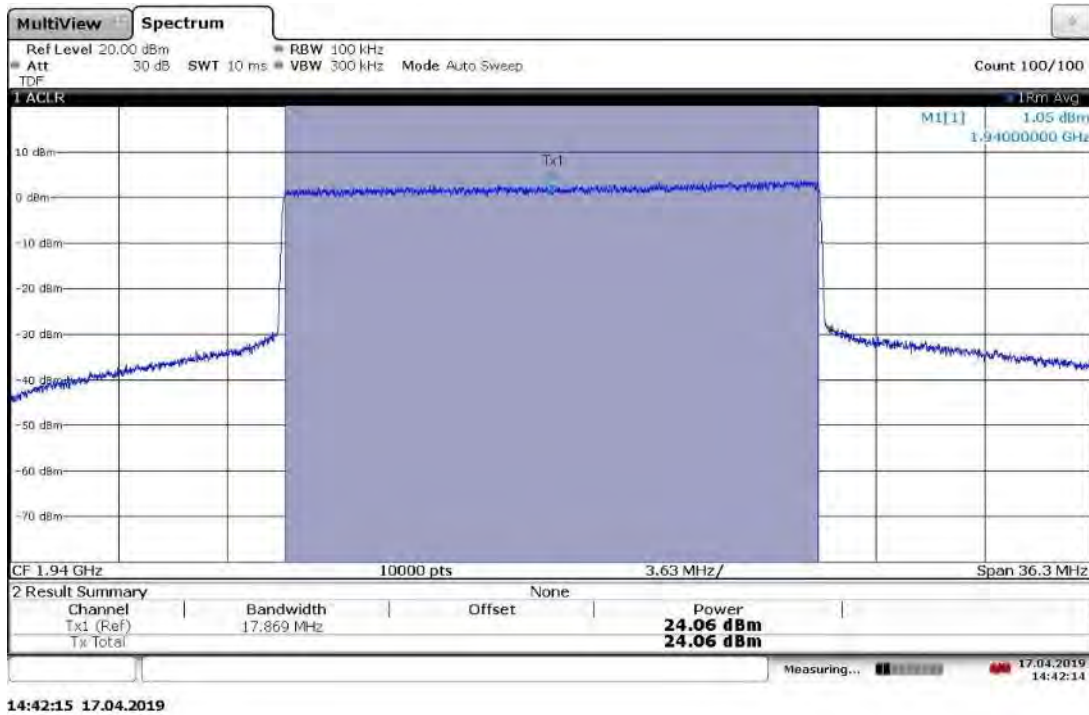
**TM3.1-64QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1982.5 MHz, Output Power = 24.23 dBm**



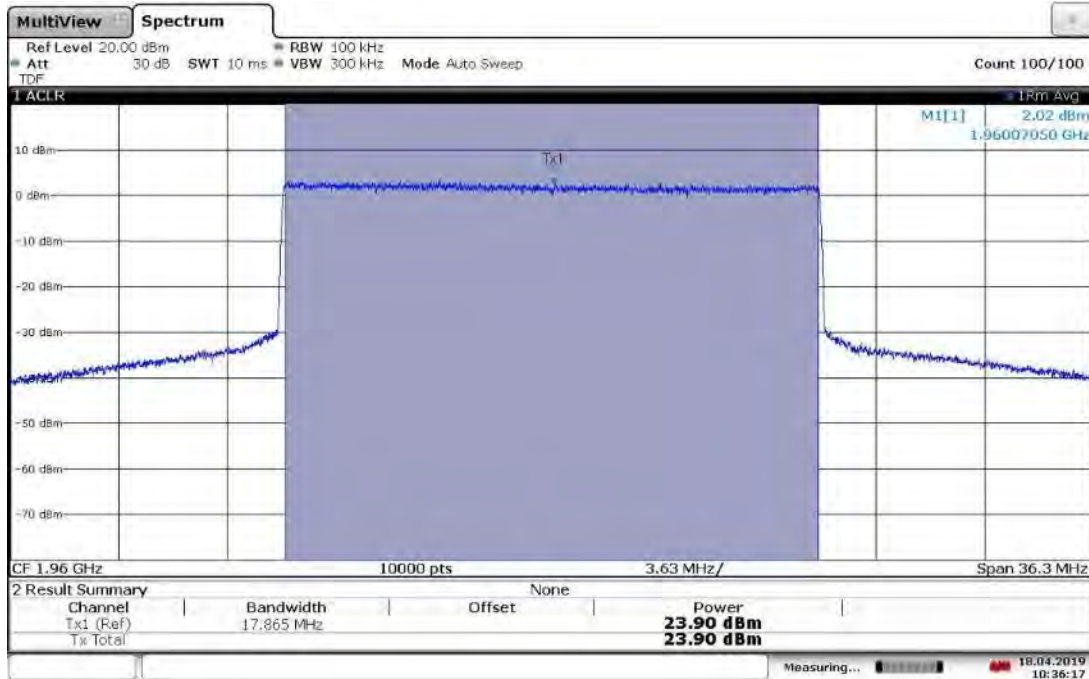
**TM3.1-64QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1940 MHz, Output Power = 23.88 dBm**



**TM3.1-64QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1940 MHz, Output Power = 24.06 dBm**

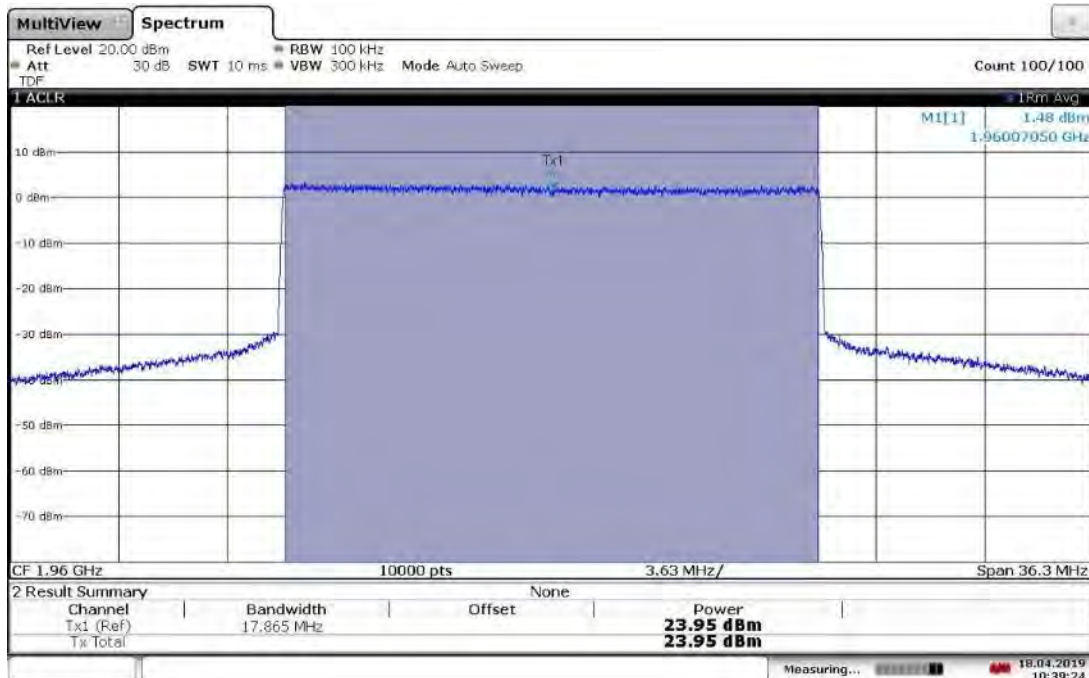


**TM3.1-64QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 23.90 dBm**



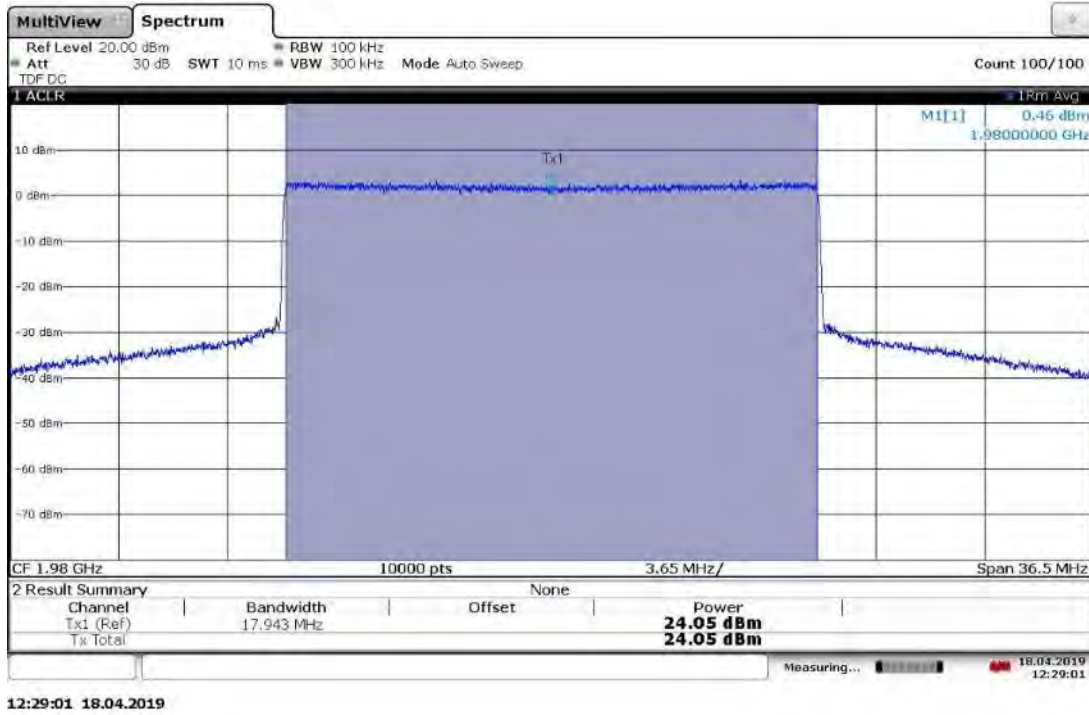
10:36:17 18.04.2019

**TM3.1-64QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 23.95 dBm**

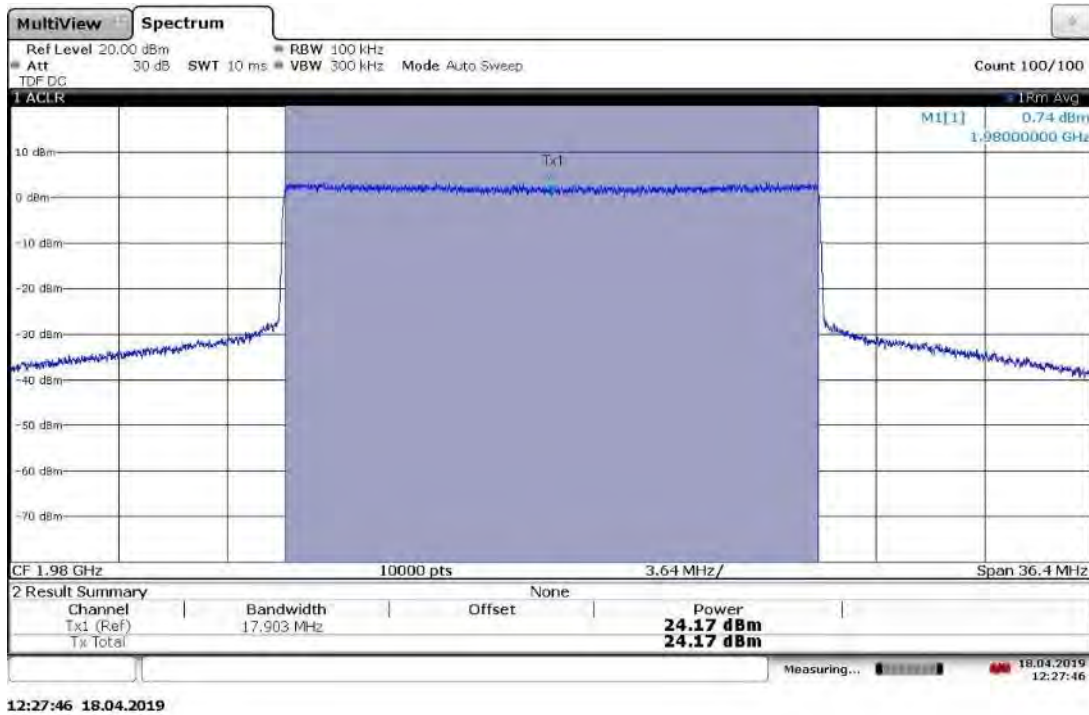


10:39:24 18.04.2019

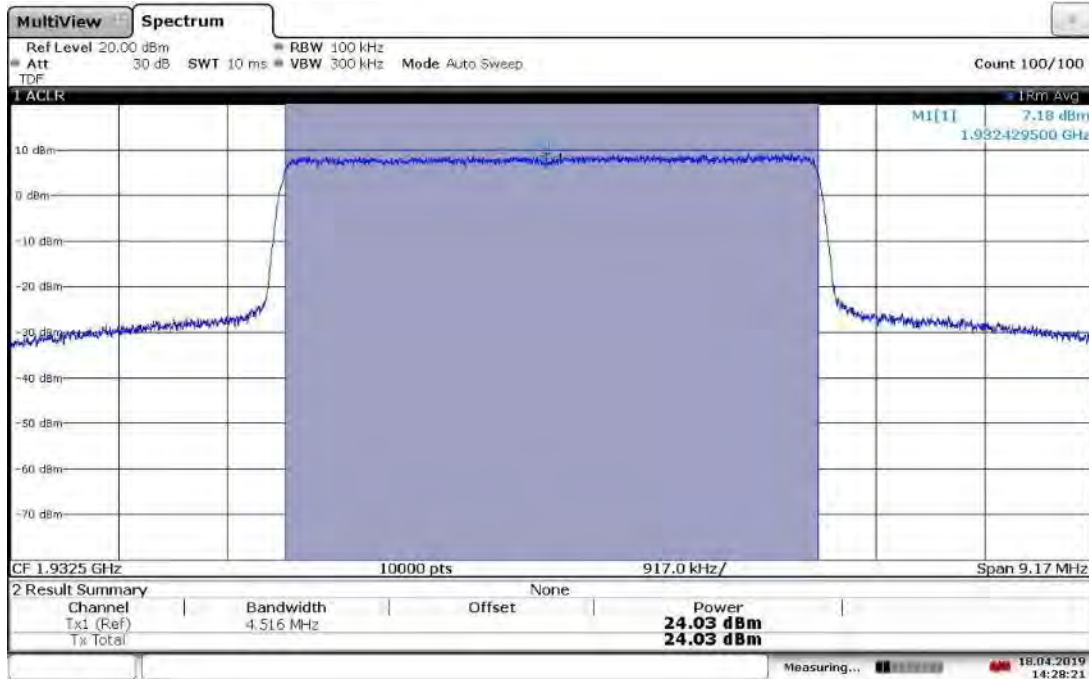
**TM3.1-64QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1980 MHz, Output Power = 24.05 dBm**



**TM3.1-64QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1980 MHz, Output Power = 24.17 dBm**

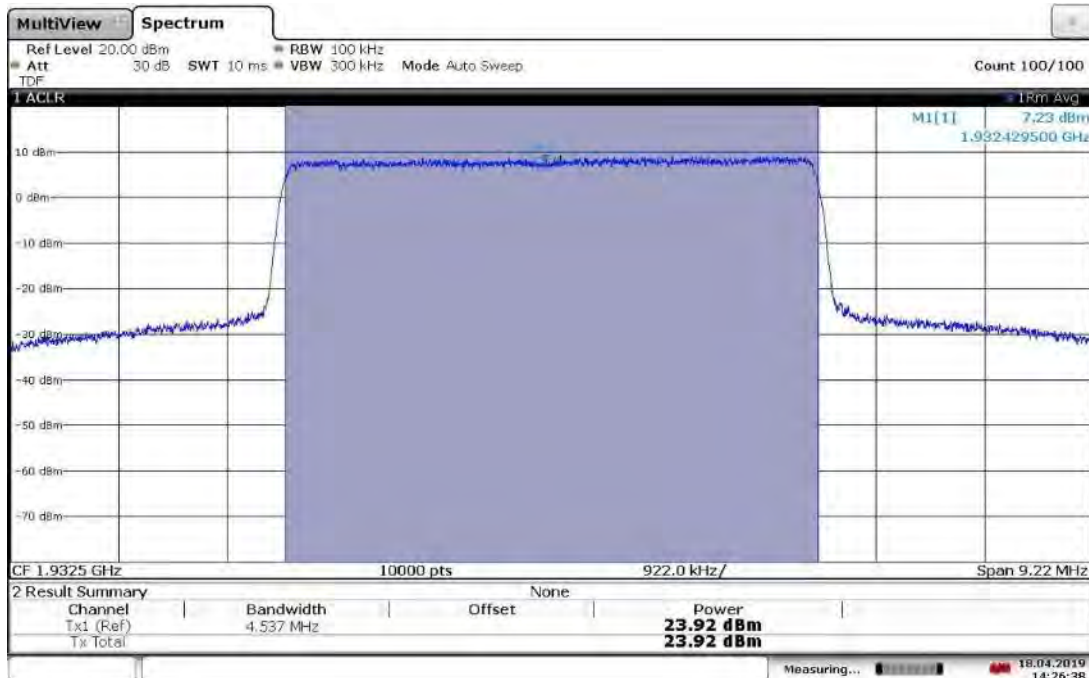


**TM3.1a-256QAM \_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1932.5 MHz, Output Power = 24.03 dBm**



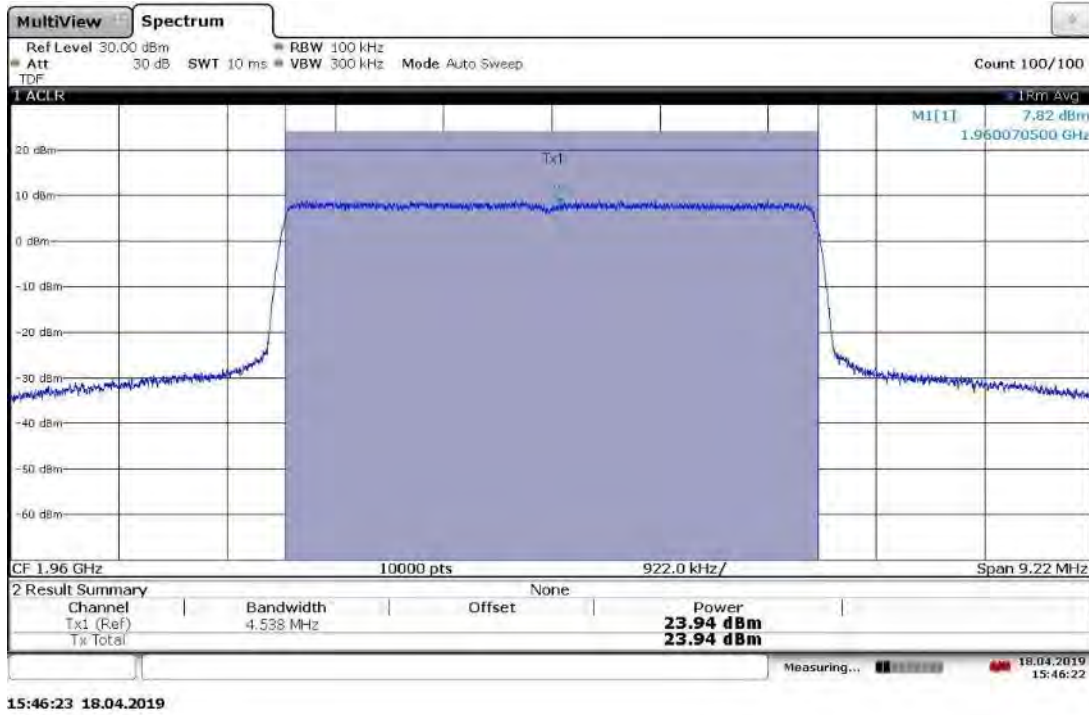
14:28:21 18.04.2019

**TM3.1a-256QAM \_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1932.5 MHz, Output Power = 23.92 dBm**

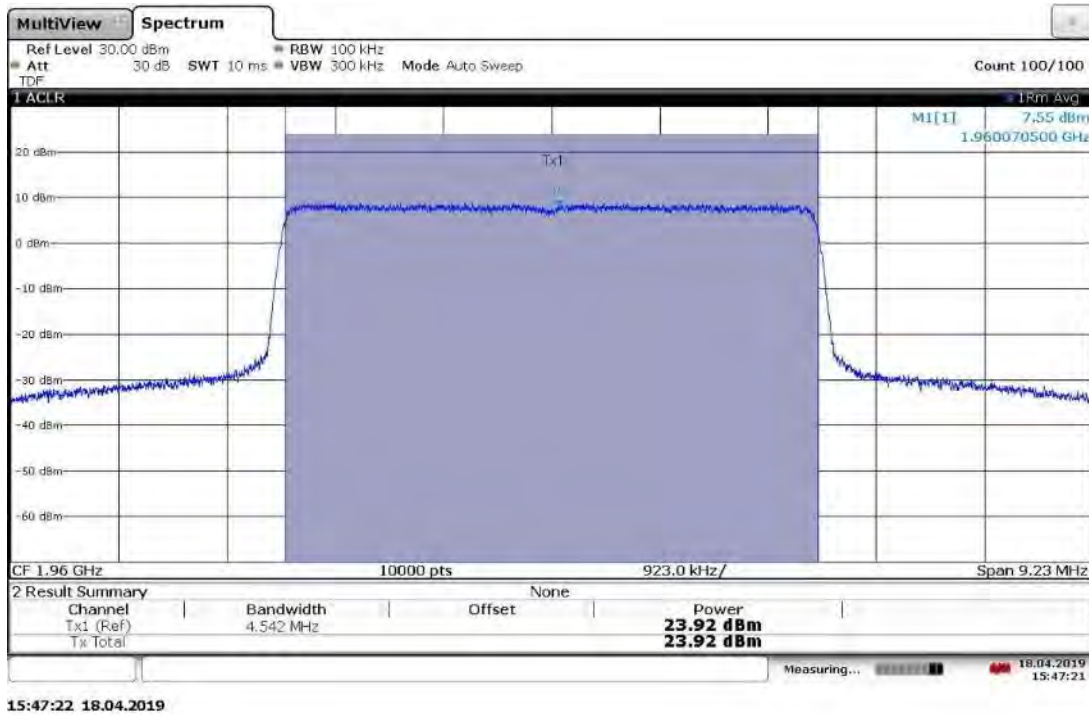


14:26:39 18.04.2019

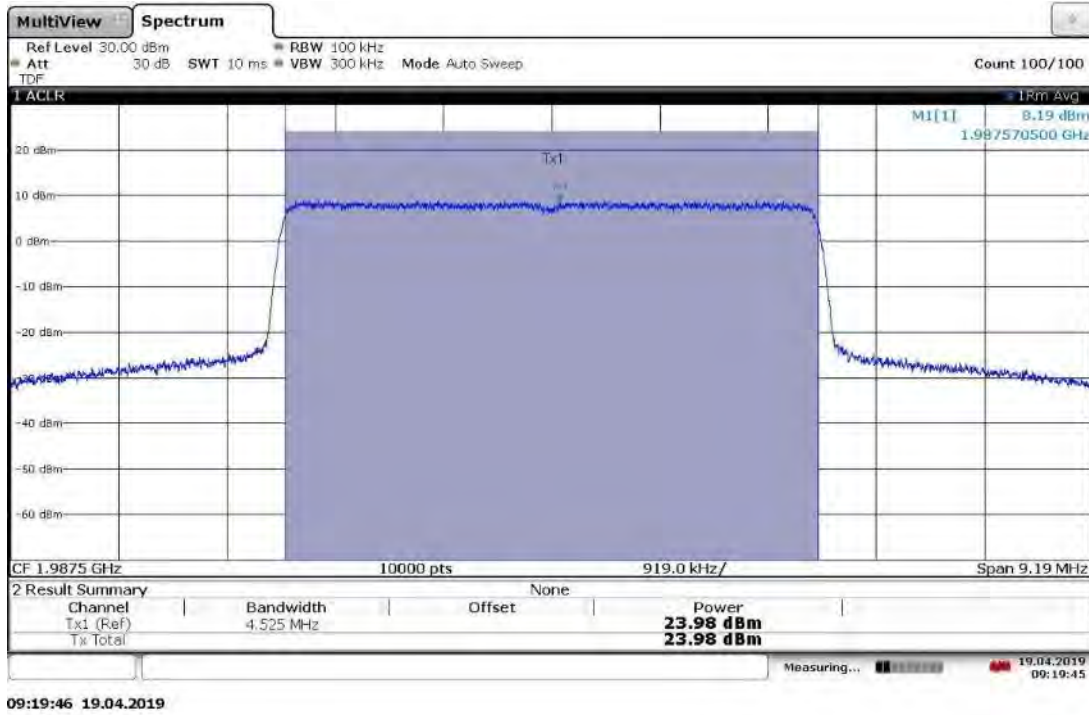
**TM3.1a-256QAM \_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 23.94 dBm**



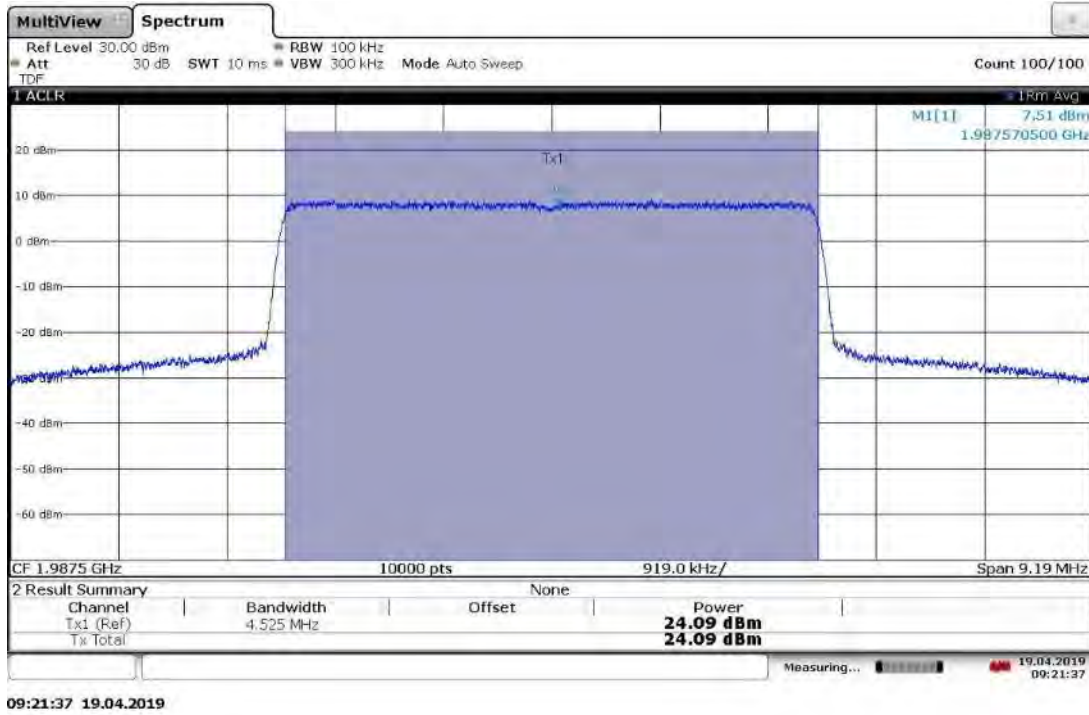
**TM3.1a-256QAM \_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 23.92 dBm**



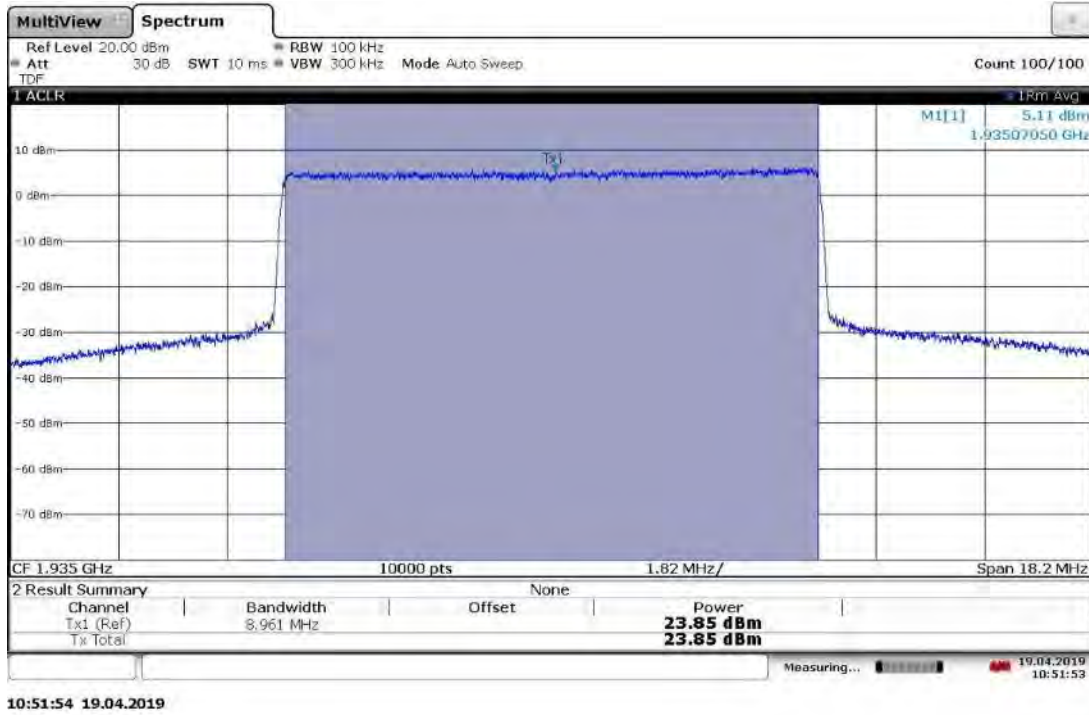
**TM3.1a-256QAM \_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1987.5 MHz, Output Power = 23.98 dBm**



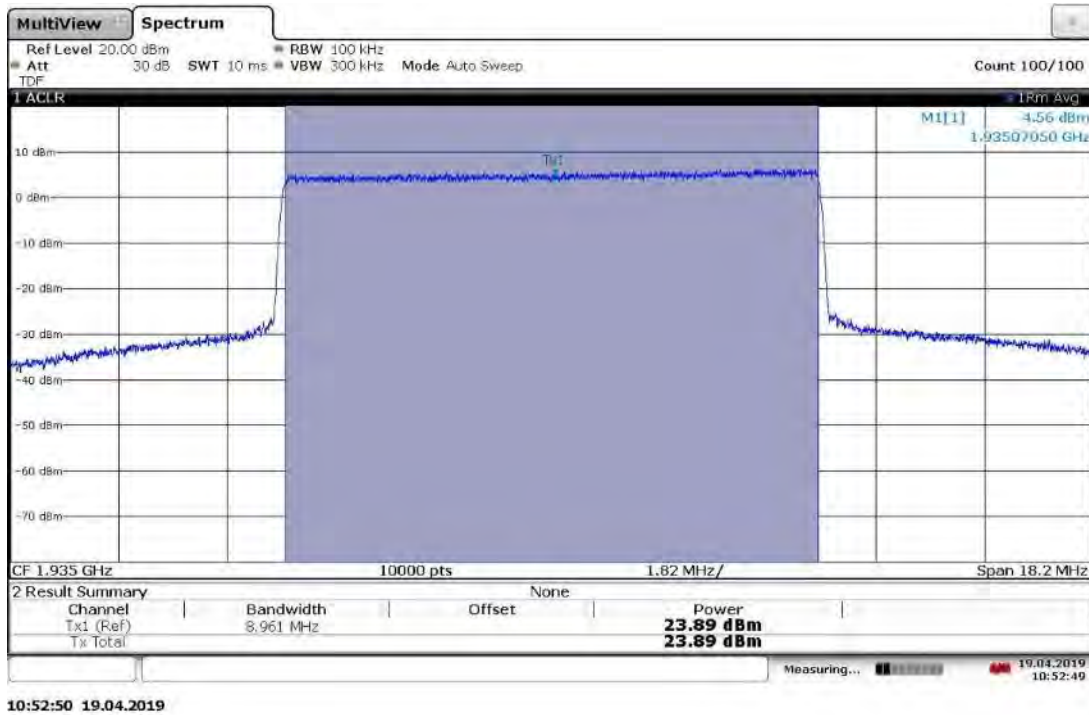
**TM3.1a-256QAM \_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1987.5 MHz, Output Power = 24.09 dBm**



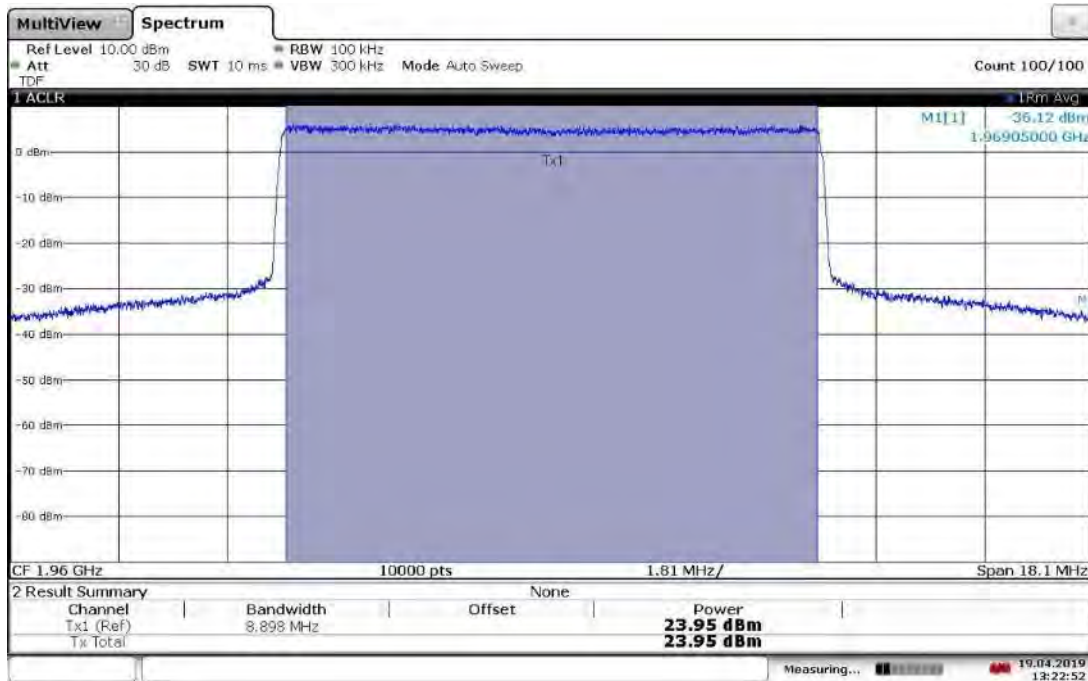
**TM3.1a-256QAM \_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1935 MHz, Output Power = 23.85 dBm**



**TM3.1a-256QAM \_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1935 MHz, Output Power = 23.89 dBm**

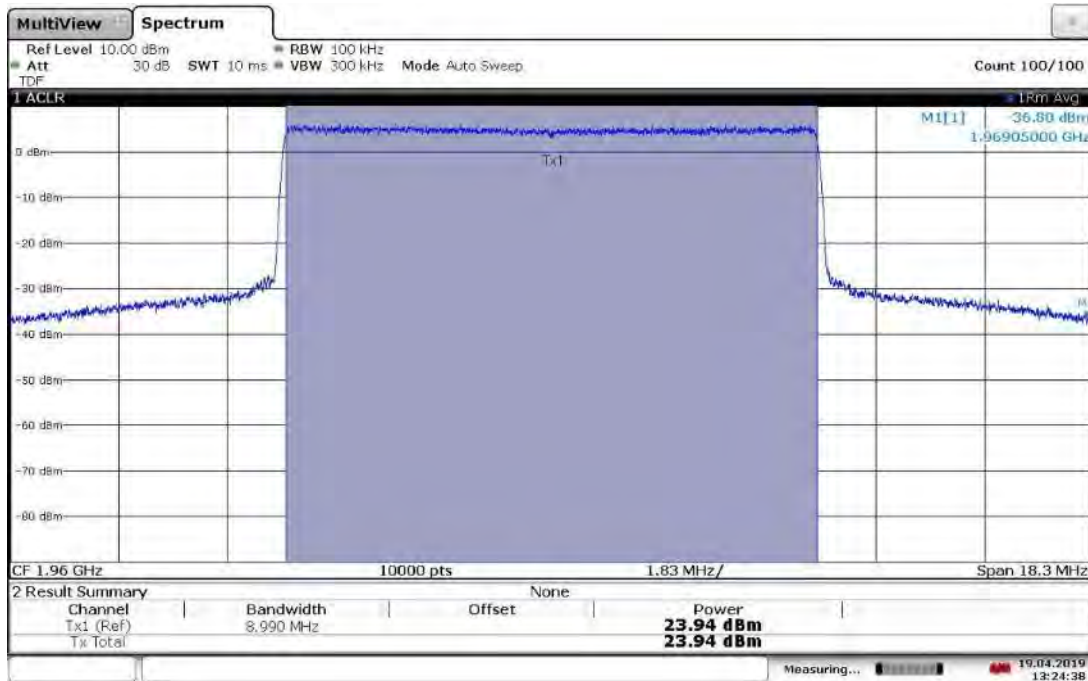


**TM3.1a-256QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 23.95 dBm**



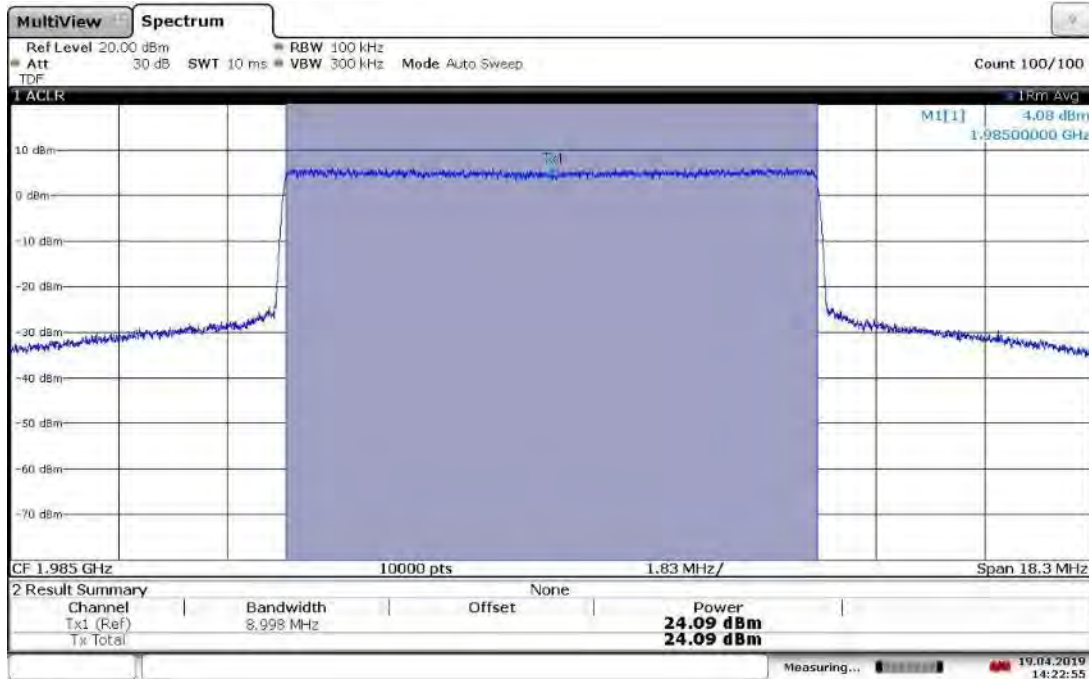
13:22:52 19.04.2019

**TM3.1a-256QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 23.94 dBm**



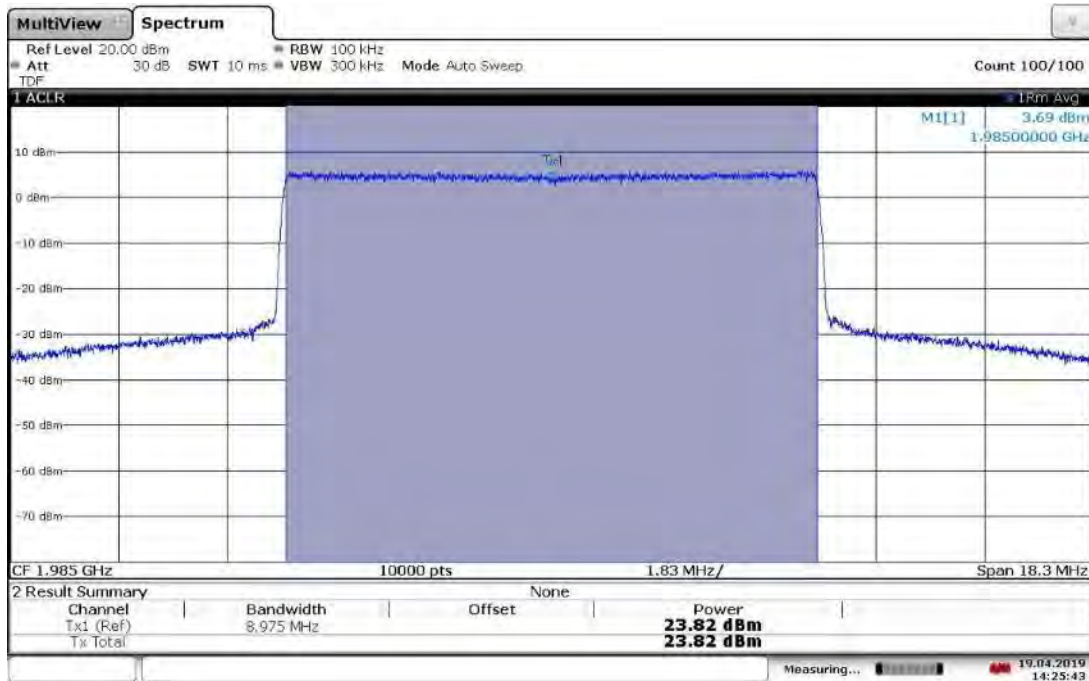
13:24:39 19.04.2019

**TM3.1a-256QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1985 MHz, Output Power = 24.09 dBm**



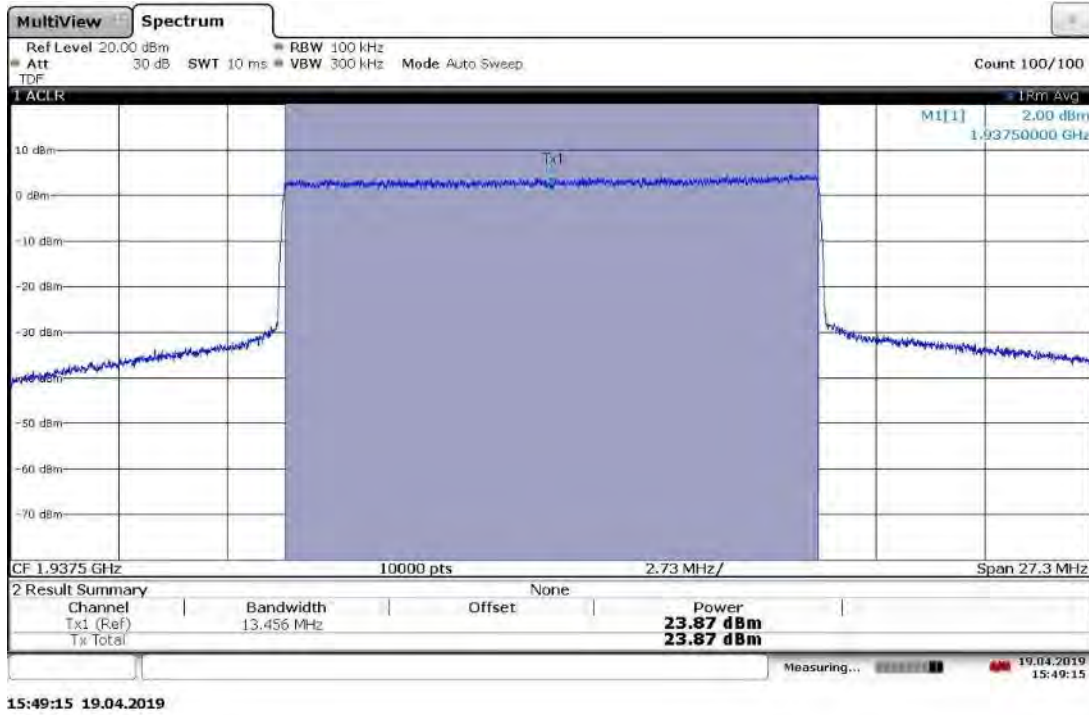
14:22:56 19.04.2019

**TM3.1a-256QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1985 MHz, Output Power = 23.82 dBm**

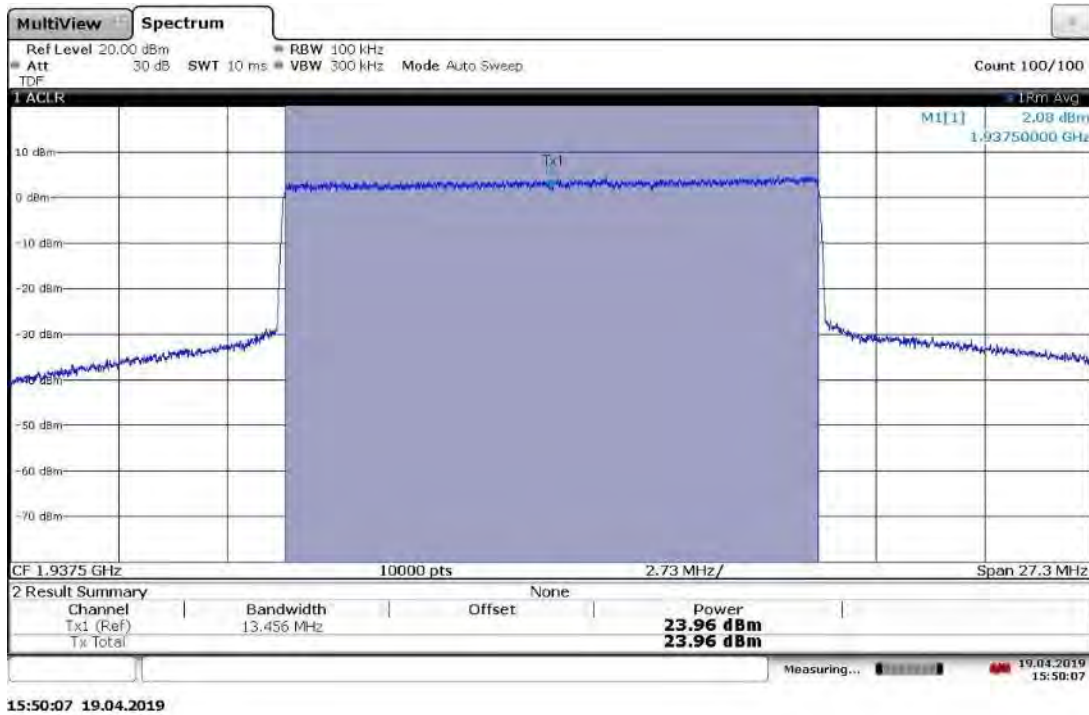


14:25:43 19.04.2019

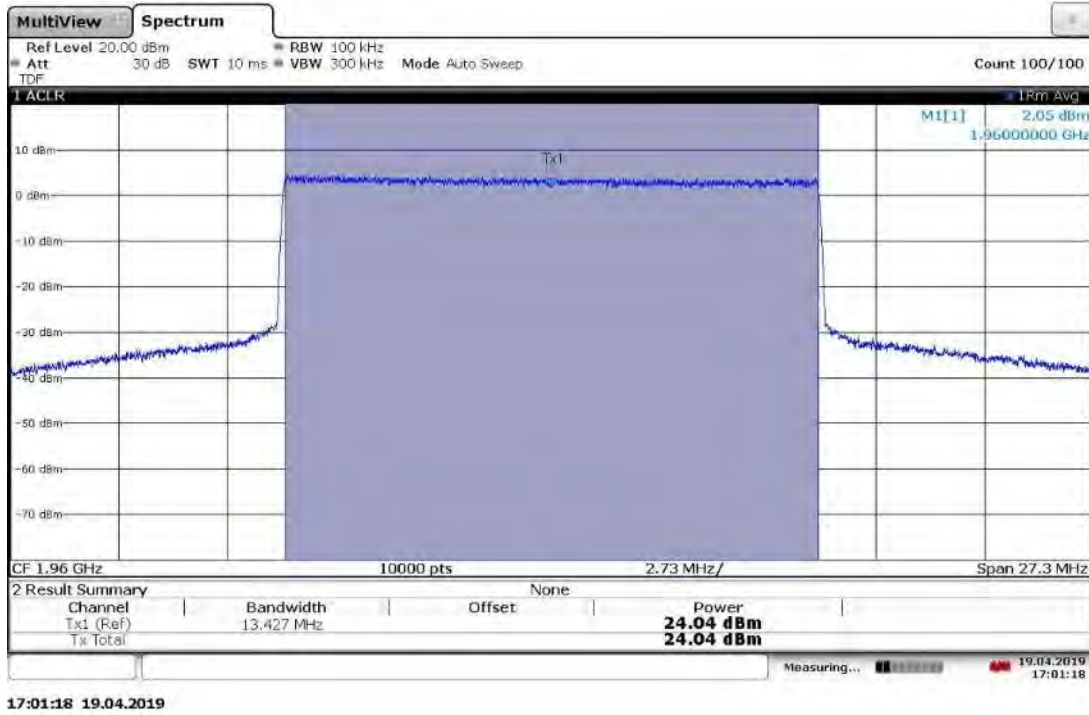
**TM3.1a-256QAM \_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1937.5 MHz, Output Power = 23.87 dBm**



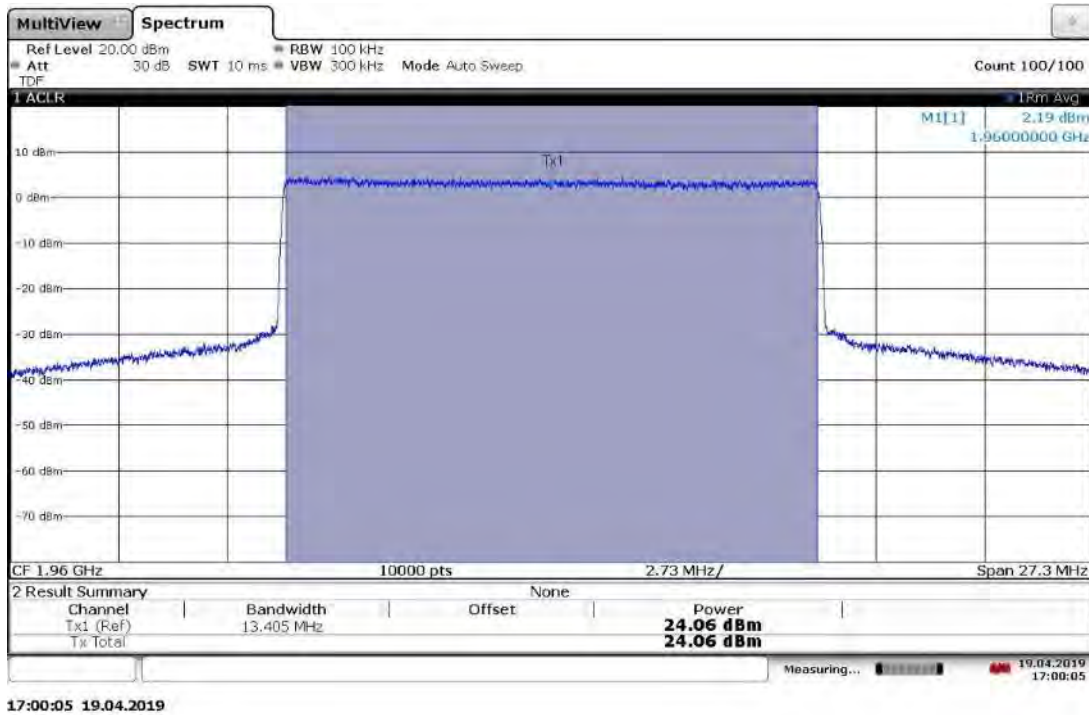
**TM3.1a-256QAM \_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1937.5 MHz, Output Power = 23.96 dBm**



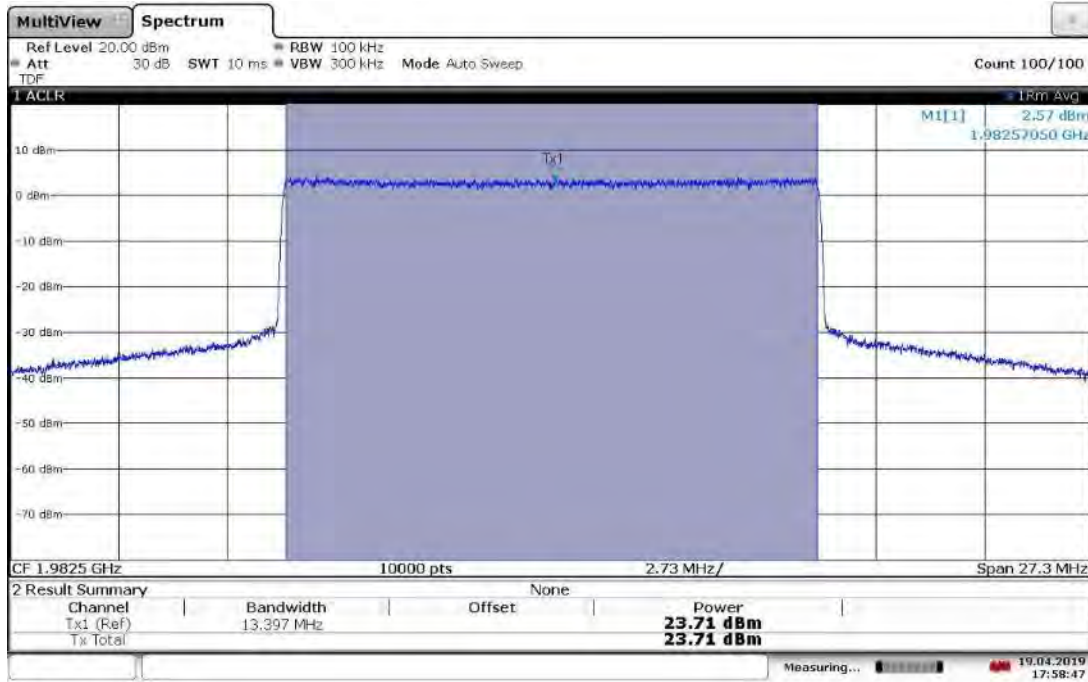
**TM3.1a-256QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 24.04 dBm**



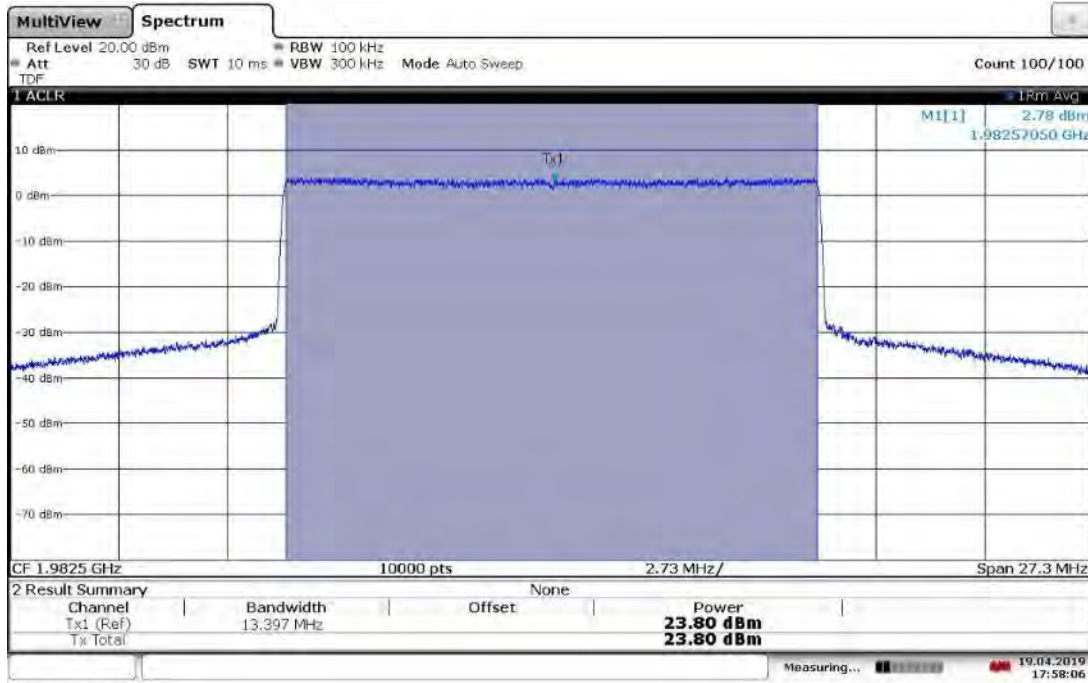
**TM3.1a-256QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 24.06 dBm**



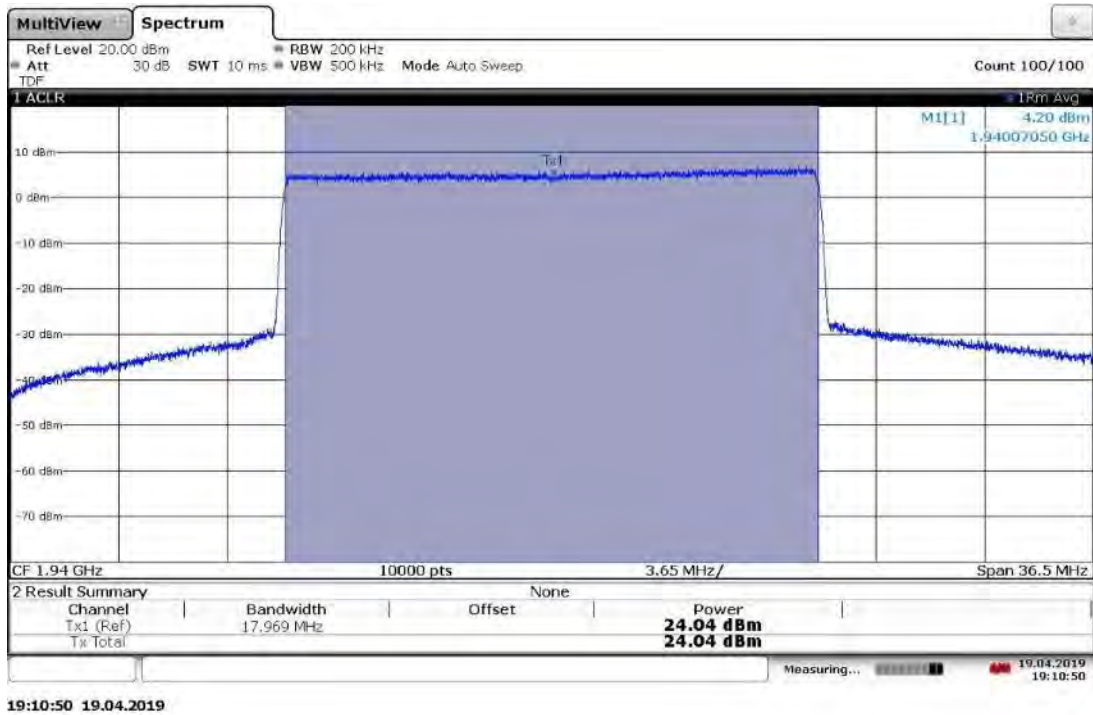
**TM3.1a-256QAM \_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1932.5 MHz, Output Power = 23.71 dBm**



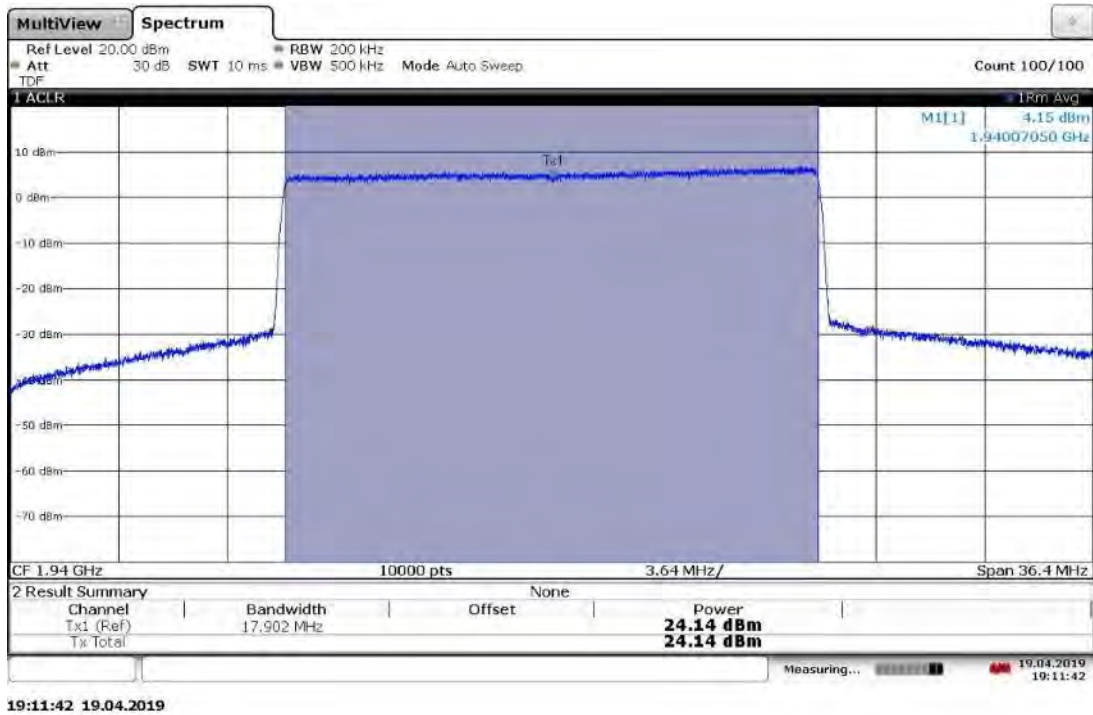
**TM3.1a-256QAM \_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1982.5 MHz, Output Power = 23.80 dBm**



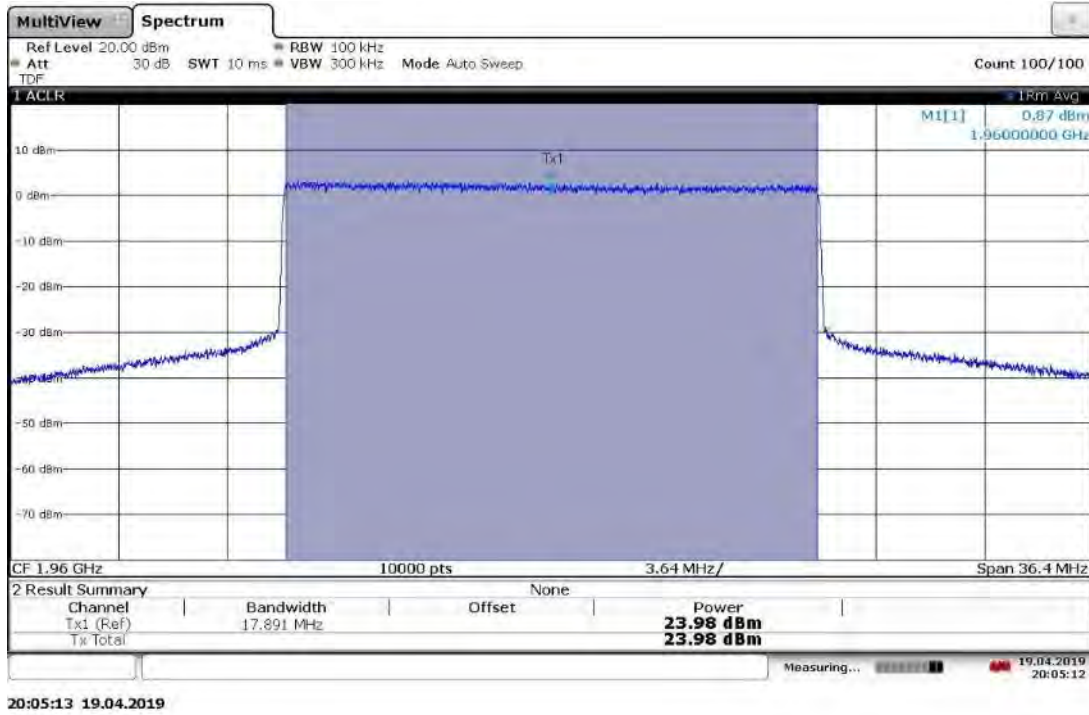
**TM3.1a-256QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1940 MHz, Output Power = 24.04dBm**



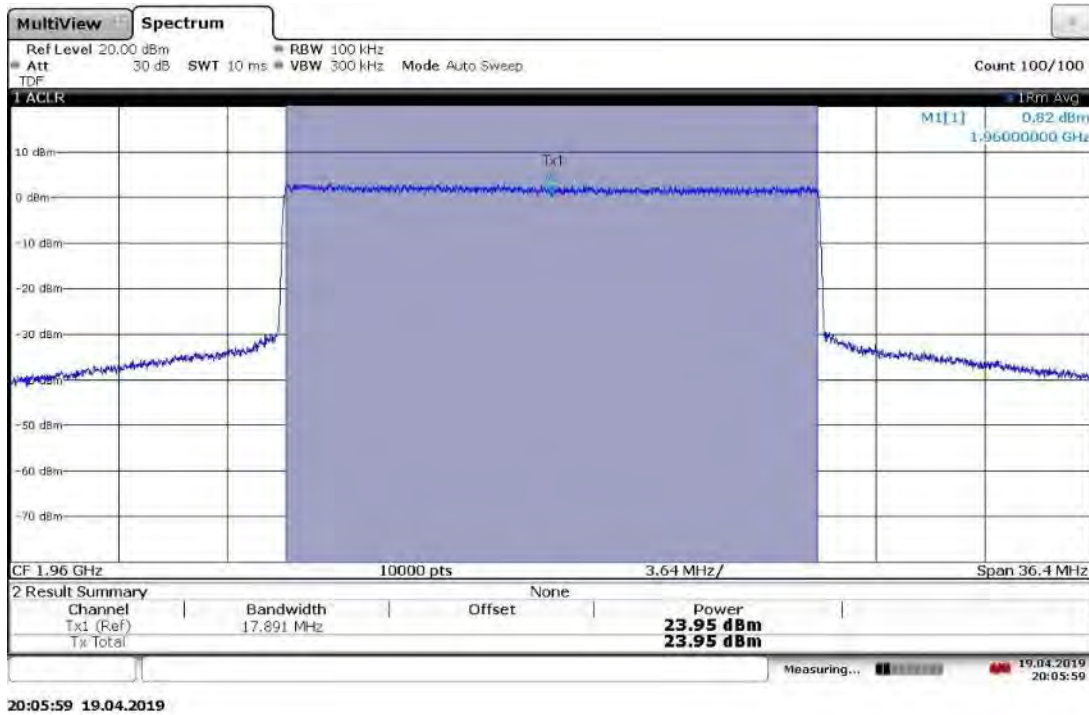
**TM3.1a-256QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1940 MHz, Output Power = 24.14 dBm**



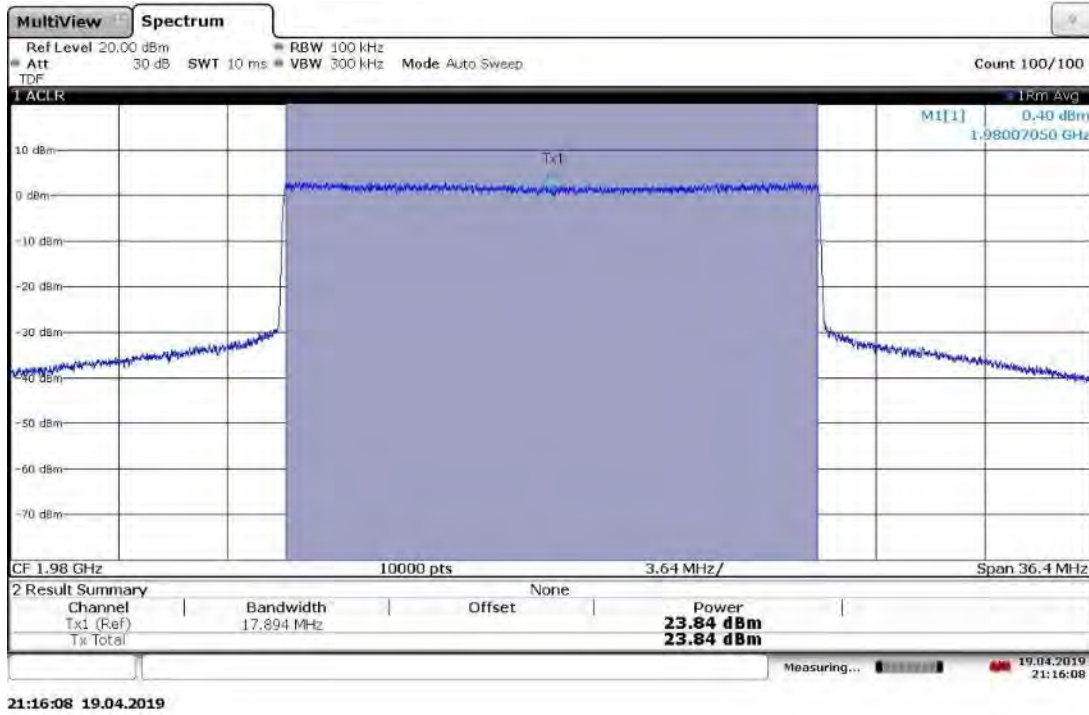
**TM3.1a-256QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, Output Power = 23.98 dBm**



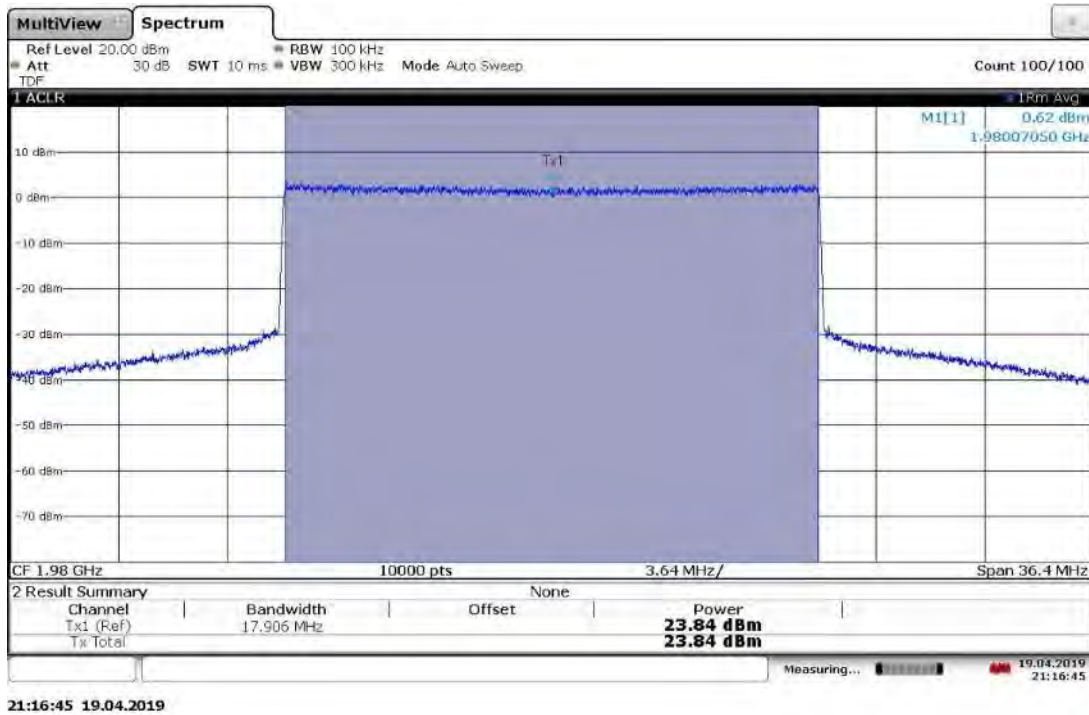
**TM3.1a-256QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 23.95 dBm**



**TM3.1a-256QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1980 MHz, Output Power = 23.84 dBm**



**TM3.1a-256QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1980 MHz, Output Power = 23.84 dBm**



**Limit for Maximum Permissible Exposure (MPE)****FCC Human RF Exposure Limits:**

The FCC §1.1310 The criteria listed in table 1 was used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices shall be evaluated according to the provisions of §2.1093 of this chapter.

Part §1.1310 Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f <sup>2</sup>	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f <sup>2</sup>	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz \* = Plane-wave equivalent power density

(1) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when a person is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. The phrase *fully aware* in the context of applying these exposure limits means that an exposed person has received written and/or verbal information fully explaining the potential for RF exposure resulting from his or her employment. With the exception of *transient* persons, this phrase also means that an exposed person has received appropriate training regarding work practices relating to controlling or mitigating his or her exposure. Such training is not required for *transient* persons, but they must receive written and/or verbal information and notification (for example, using signs) concerning their exposure potential and appropriate means available to mitigate their exposure. The phrase *exercise control* means that an exposed person is allowed to and knows how to reduce or avoid exposure by administrative or engineering controls and work practices, such as use of personal protective equipment or time averaging of exposure.

(2) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

**Test Procedure**

RF exposure for licensed transmitter is handled at the time of licensing, however, an MPE calculation was performed in order to show the distance at which the device is compliant with the limits of §1.1310, assuming antenna gains of 0 dBi and 4 dBi. The highest measured conducted output power was used, adjusted by +3dB to account for two antenna MIMO operation.

FCC Limit For General Population/Uncontrolled Exposure at 1.985 GHz = 1 mW/cm<sup>2</sup>

$$\text{Power Density} = [\text{EIRP}] / [4\pi \times (D_{\text{cm}})^2]$$

Where EIRP is in milliwatts and D is in centimeters. Setting the power density equal to the limit of 1 mW/cm<sup>2</sup> and solving for D<sub>cm</sub> yields the following results.

**Results:**

EUT EIRP = Conducted power + Array Gain + Antenna gain in dBi

$$\text{Power Density Limit} = [\text{EIRP}] / [4\pi \times (D_{\text{cm}})^2]$$

$$1 \text{ mW/cm}^2 = [\text{EIRP}] / [4\pi \times (D_{\text{cm}})^2]$$

$$D_{\text{cm}} = ([\text{EIRP}] / [4\pi])^{1/2}$$

For Gain = 0 dBi,

$$\text{EIRP} = 24.23 \text{ dBm} + 10 \cdot \text{LOG}(2) + 0 \text{ dBi} = 24.23 \text{ dBm} + 3 \text{ dB} + 0 \text{ dBi}$$

$$\text{EIRP} = 27.23 \text{ dBm or } 528.4 \text{ mW}$$

Therefore, the minimum safe distance D<sub>cm</sub> is  $D_{\text{cm}} = ([528.4] / [4\pi])^{1/2}$

$$D_{\text{cm}} = 6.48 \text{ cm at } 0 \text{ dBi gain two antenna MIMO}$$

For Gain = 4 dBi,

$$\text{EIRP} = 24.23 \text{ dBm} + 10 \cdot \text{LOG}(2) + 4 \text{ dBi} = 24.23 \text{ dBm} + 3 \text{ dB} + 4 \text{ dBi}$$

$$\text{EIRP} = 31.23 \text{ dBm or } 1327 \text{ mW}$$

Therefore, the minimum safe distance D<sub>cm</sub> is  $D_{\text{cm}} = ([1327] / [4\pi])^{1/2}$

$$D_{\text{cm}} = 10.28 \text{ cm at } 4 \text{ dBi gain two antenna MIMO}$$

For Gain = X dBi,

$$\text{EIRP} = 24.23 \text{ dBm} + 10 \cdot \text{LOG}(2) + X \text{ dBi} = 24.23 \text{ dBm} + 3 \text{ dB} + X \text{ dBi}$$

$$\text{EIRP} = 27.23 + X \text{ dBm or } 528.4 + 10^{(X/10)} \text{ mW}$$

Therefore, the minimum safe distance D<sub>cm</sub> is  $D_{\text{cm}} = ([528.4 + 10^{(X/10)}] / [4\pi])^{1/2}$

$$D_{\text{cm}} = 0.282 \cdot (528.4 + 10^{(X/10)})^{1/2} \text{ cm at } X \text{ dBi gain two antenna MIMO}$$

Test Personnel: Kouma Sinn <i>KS</i>		Test Date: 04/10/2019, 04/11/2019, 04/12/2019, 04/15/2019, 04/16/2019, 04/17/2019, 04/18/2019, 04/19/2019, 04/26/2019, 04/30/2019	
Supervising/Reviewing Engineer:			
(Where Applicable)	N/A		
Product Standard:	FCC Part 24	Limit Applied:	See report section 6.3
Input Voltage:	48 VDC (POE)		
Pretest Verification w/ Ambient Signals or BB Source:	N/A	Ambient Temperature:	22, 23, 23, 23, 23, 22, 22, 22, 20, 22 °C
		Relative Humidity:	21, 15, 26, 47, 20, 22, 23, 47, 42, 35 %
		Atmospheric Pressure:	1004, 1013, 1004, 980, 1001, 1011, 1014, 1000, 996, 1017 mbars

Deviations, Additions, or Exclusions: None

## 7 Peak-to-Average Power Ratio (PAPR)

### 7.1 Method

Tests are performed in accordance with CFR47 FCC Part 24 and ANSI C63.26:2015.

**TEST SITE:** EMC Lab

**The EMC Lab** has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

### 7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
CEN001'	DC-40GHz attenuator 20dB	Centric RF	C411-20	CEN001	02/01/2019	02/01/2020
CBLHF2012-2M-1'	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/01/2019	02/01/2020
ROS005-1'	Signal and Spectrum Analyzer	Rohde & Schwarz	FSW43	100646	10/15/2018	10/15/2019
DS40'	Temp, humidity, pressure gauge	Digi Sense	68000-49	181717625	11/06/2018	11/06/2019

#### Software Utilized:

Name	Manufacturer	Version
None	--	--

### 7.3 Results:

The sample tested was found to Comply.

§24.232(d) The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

# Intertek

Report Number: 103866582BOX-010a

Issued: 07/19/2019

## Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1932.50	ANT0	7.82
		ANT1	7.73
Mid	1960.00	ANT0	7.43
		ANT1	7.40
High	1987.50	ANT0	7.25
		ANT1	7.08

## Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1935.00	ANT0	7.32
		ANT1	7.18
Mid	1960.00	ANT0	7.62
		ANT1	7.55
High	1985.00	ANT0	7.20
		ANT1	6.96

## Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1937.50	ANT0	7.75
		ANT1	7.66
Mid	1960.00	ANT0	8.07
		ANT1	7.99
High	1982.50	ANT0	7.86
		ANT1	7.64

## Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1940.00	ANT0	7.82
		ANT1	7.90
Mid	1960.00	ANT0	8.12
		ANT1	7.98
High	1980.00	ANT0	8.08
		ANT1	8.05

## Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1932.50	ANT0	6.81
		ANT1	6.76
Mid	1960.00	ANT0	7.11
		ANT1	6.98
High	1987.50	ANT0	6.98
		ANT1	6.68

## Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1935.00	ANT0	6.87
		ANT1	6.88
Mid	1960.00	ANT0	7.10
		ANT1	6.88
High	1985.00	ANT0	6.83
		ANT1	6.67

# Intertek

Report Number: 103866582BOX-010a

Issued: 07/19/2019

## Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1937.50	ANT0	7.70
		ANT1	7.26
Mid	1960.00	ANT0	7.61
		ANT1	7.42
High	1982.50	ANT0	7.73
		ANT1	7.15

## Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1940.00	ANT0	7.68
		ANT1	7.94
Mid	1960.00	ANT0	7.87
		ANT1	7.90
High	1980.00	ANT0	8.03
		ANT1	7.69

## Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1932.50	ANT0	7.09
		ANT1	6.86
Mid	1960.00	ANT0	7.36
		ANT1	7.29
High	1987.50	ANT0	6.33
		ANT1	7.69

## Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1935.00	ANT0	7.46
		ANT1	7.29
Mid	1960.00	ANT0	7.55
		ANT1	7.42
High	1985.00	ANT0	7.25
		ANT1	7.05

## Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1937.50	ANT0	7.96
		ANT1	7.72
Mid	1960.00	ANT0	7.97
		ANT1	8.00
High	1982.50	ANT0	7.58
		ANT1	5.58

## Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1940.00	ANT0	7.92
		ANT1	7.77
Mid	1960.00	ANT0	8.09
		ANT1	7.80
High	1980.00	ANT0	8.09
		ANT1	8.01

**Slot 0 (Band 2), Bandwidth: 5 MHz, Modulation: TM3.1a-256QAM**

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1932.50	ANT0	7.15
		ANT1	7.09
Mid	1960.00	ANT0	7.54
		ANT1	7.55
High	1987.50	ANT0	7.03
		ANT1	6.84

**Slot 0 (Band 2), Bandwidth: 10 MHz, Modulation: TM3.1a-256QAM**

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1935.00	ANT0	7.29
		ANT1	7.37
Mid	1960.00	ANT0	7.65
		ANT1	7.69
High	1985.00	ANT0	7.13
		ANT1	7.40

**Slot 0 (Band 2), Bandwidth: 15 MHz, Modulation: TM3.1a-256QAM**

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1937.500	ANT0	7.98
		ANT1	7.88
Mid	1960.00	ANT0	7.97
		ANT1	7.93
High	1982.50	ANT0	8.11
		ANT1	7.83

**Slot 0 (Band 2), Bandwidth: 20 MHz, Modulation: TM3.1a-256QAM**

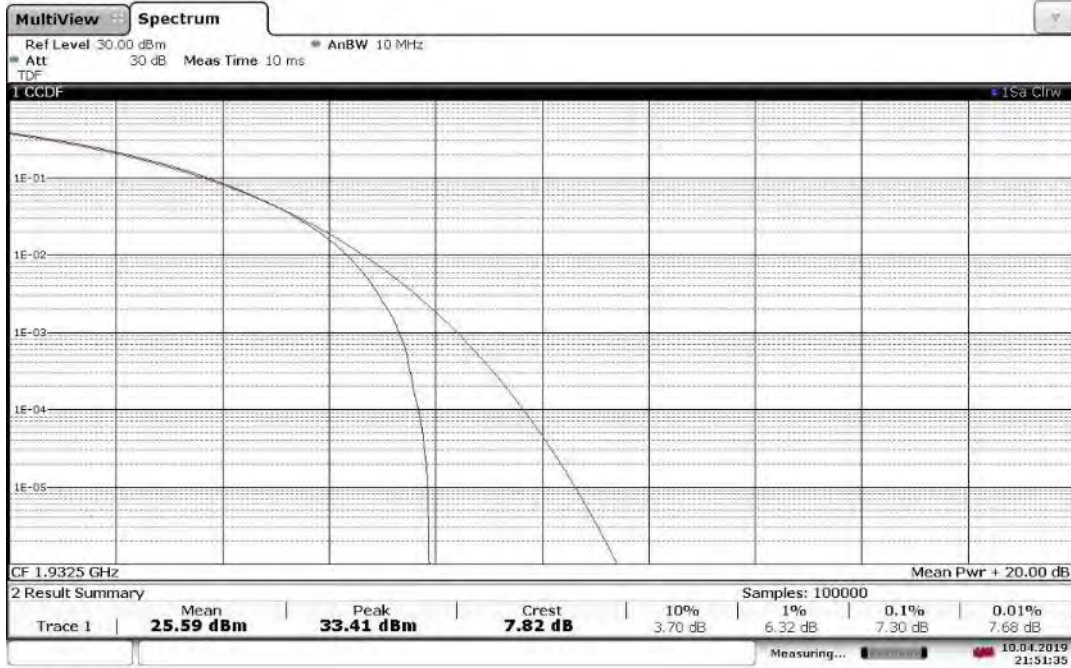
Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	1940	ANT0	8.13
		ANT1	8.06
Mid	1960	ANT0	8.13
		ANT1	8.12
High	1980	ANT0	7.98
		ANT1	7.91

#### 7.4 Setup Photograph:



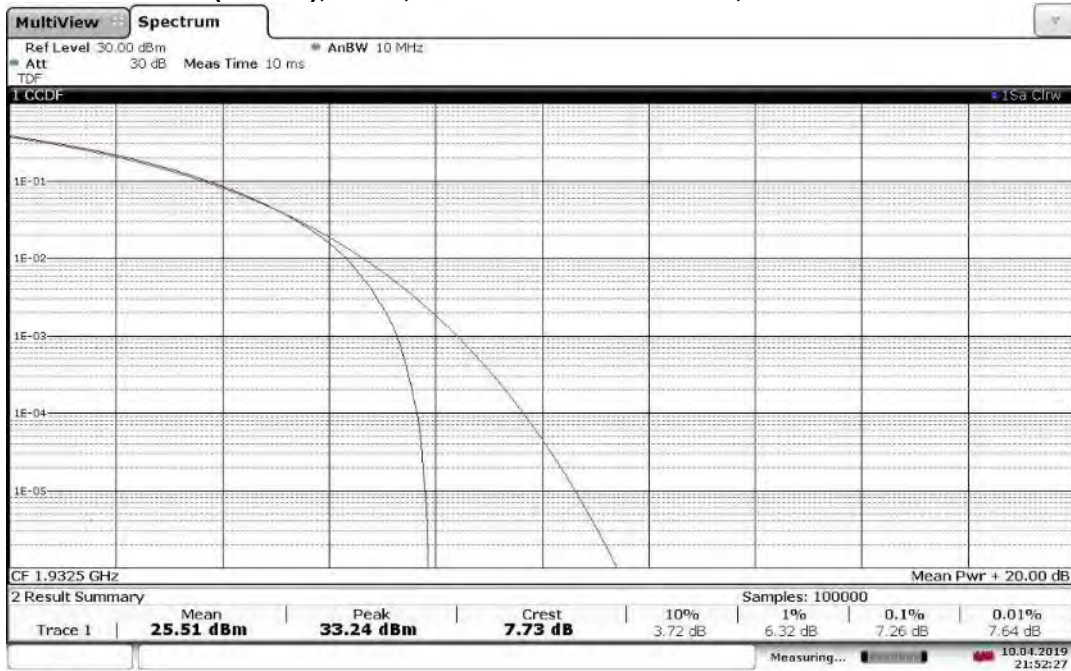
## 7.5 Plots/Data:

**TM1.1-QPSK 5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1932.5 MHz, PAPR = 7.82 dB**



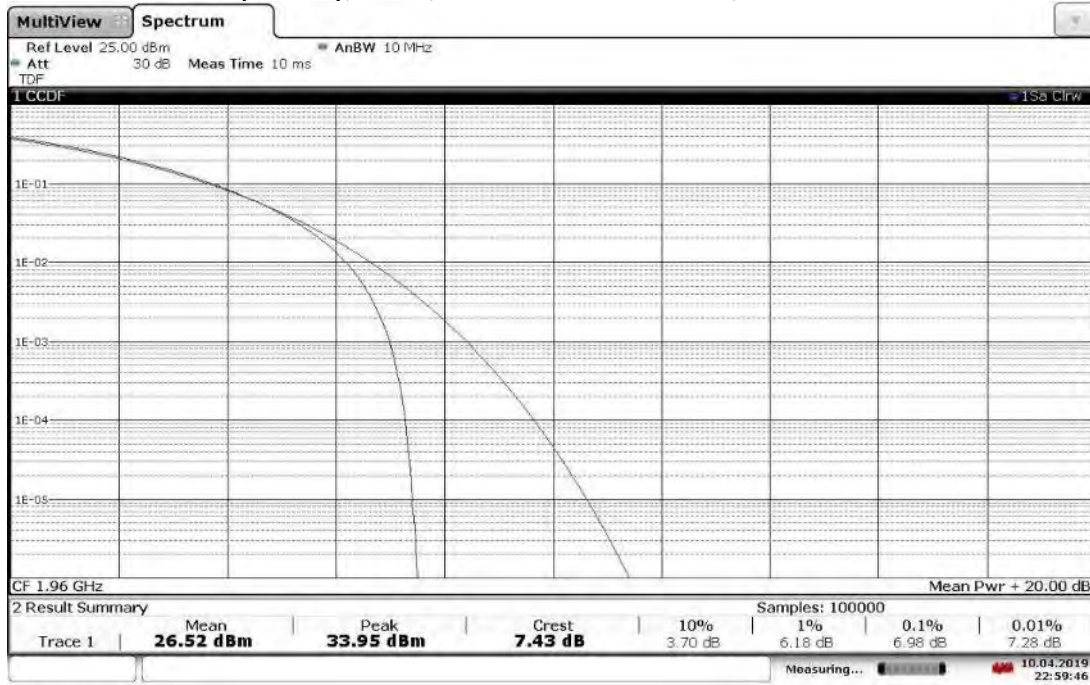
21:51:36 10.04.2019

**TM1.1-QPSK\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1932.5 MHz, PAPR = 7.73 dB**



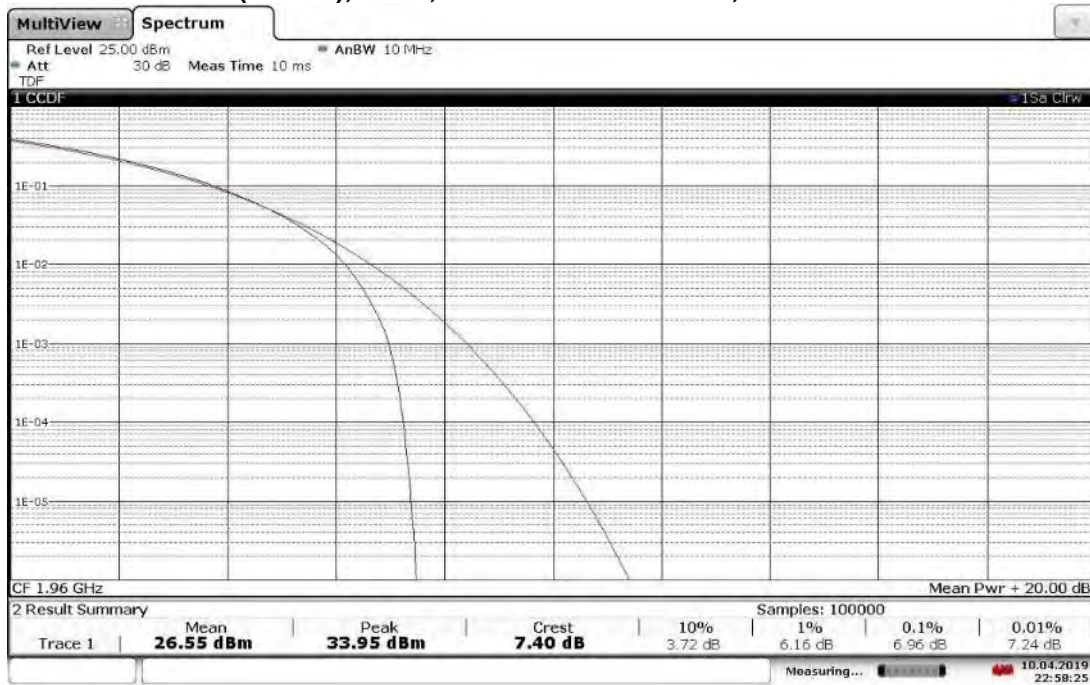
21:52:27 10.04.2019

**TM1.1-QPSK\_5 MHz Bandwidth  
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, PAPR = 7.43 dB**



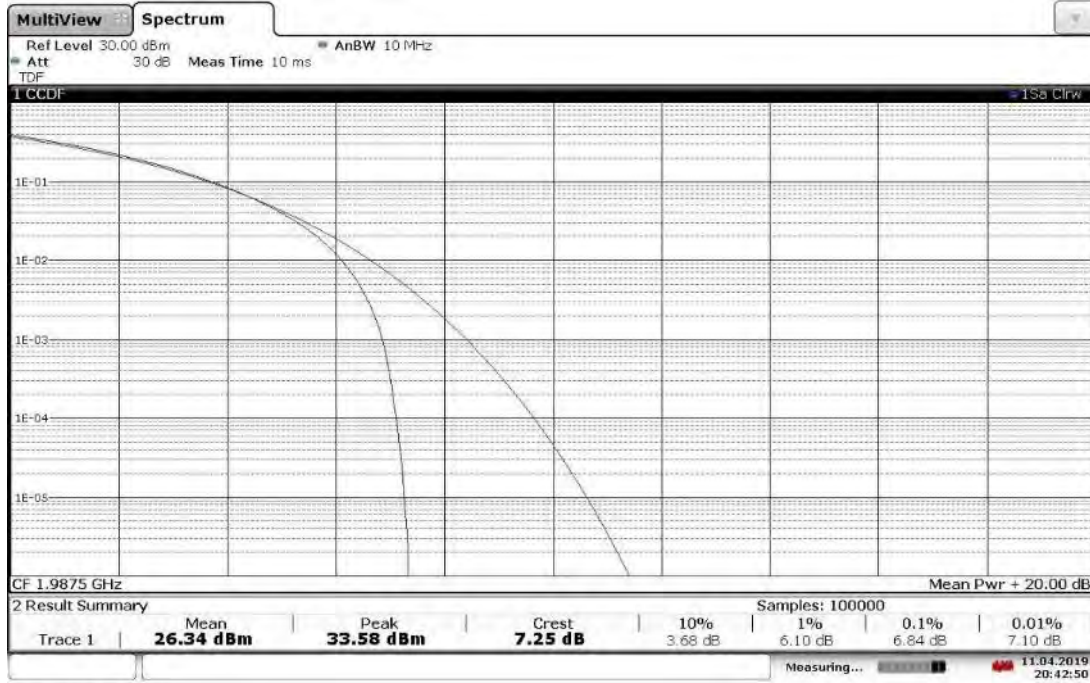
22:59:46 10.04.2019

**TM1.1-QPSK\_5 MHz Bandwidth  
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, PAPR = 7.40 dB**



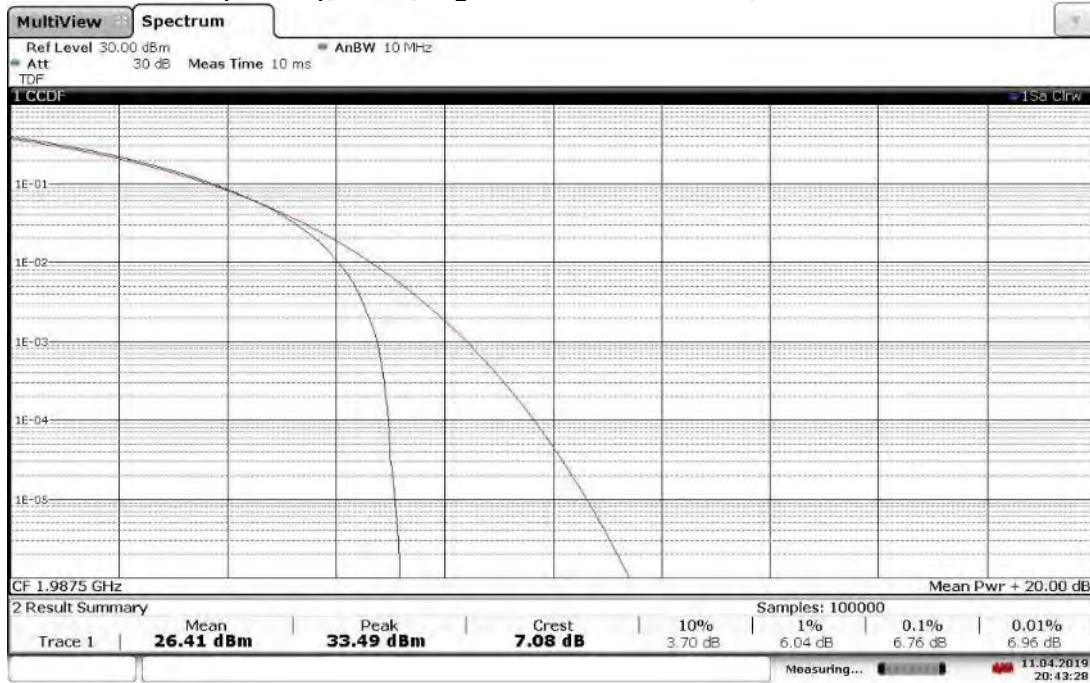
22:58:26 10.04.2019

**TM1.1-QPSK\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1987.5 MHz, PAPR = 7.25 dB**



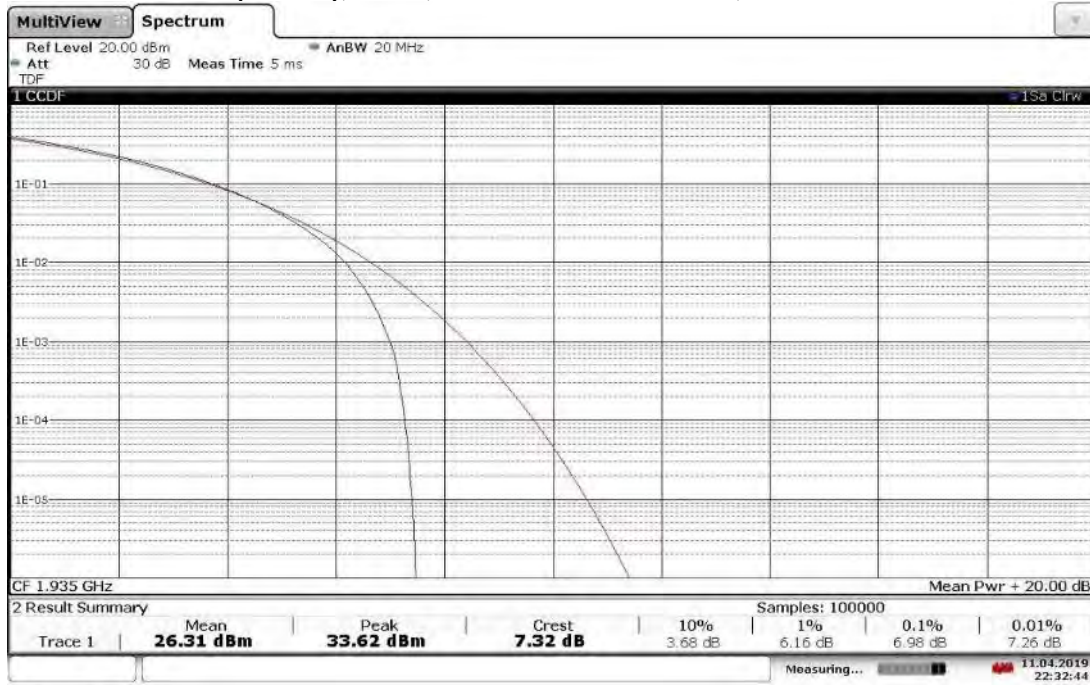
20:42:50 11.04.2019

**TM1.1-QPSK\_5 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1987.5 MHz, PAPR = 7.08 dB**



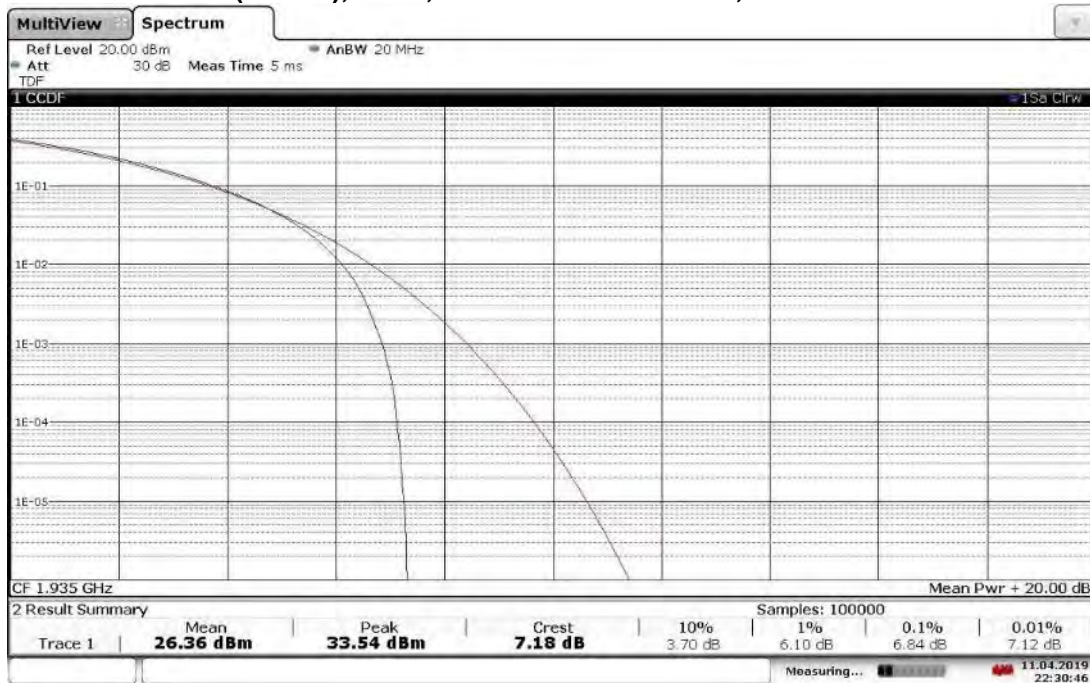
20:43:28 11.04.2019

**TM1.1-QPSK\_10 MHz Bandwidth  
Slot 0 (Band 2), ANT0, Low Channel 1935 MHz, PAPR = 7.32 dB**



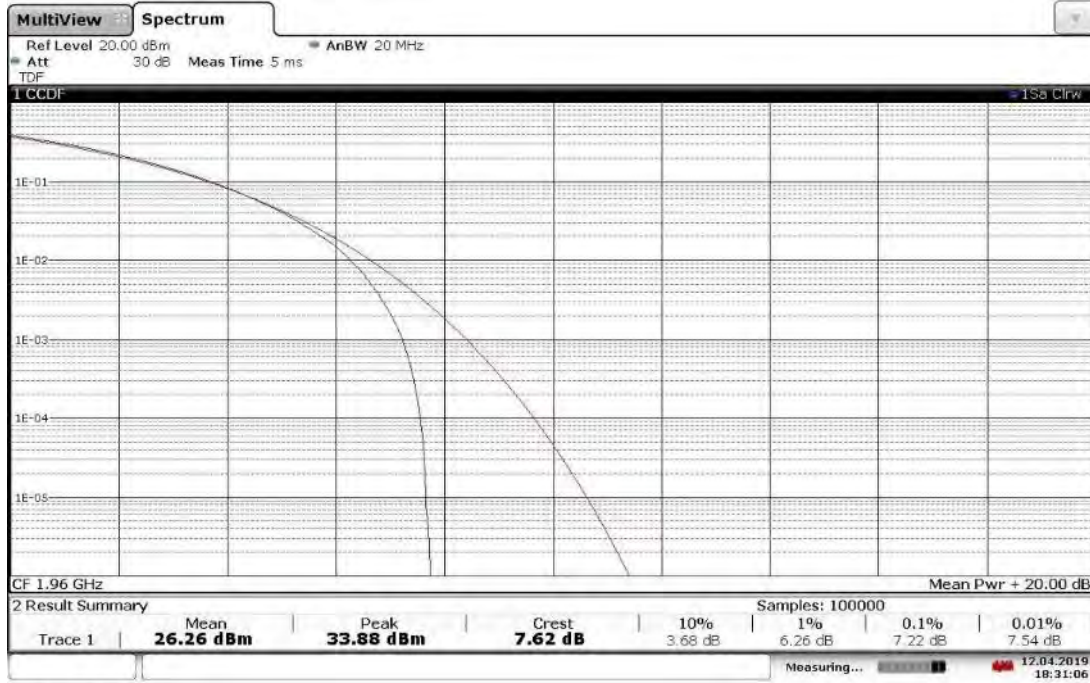
22:32:44 11.04.2019

**TM1.1-QPSK\_10 MHz Bandwidth  
Slot 0 (Band 2), ANT1, Low Channel 1935 MHz, PAPR = 7.18 dB**



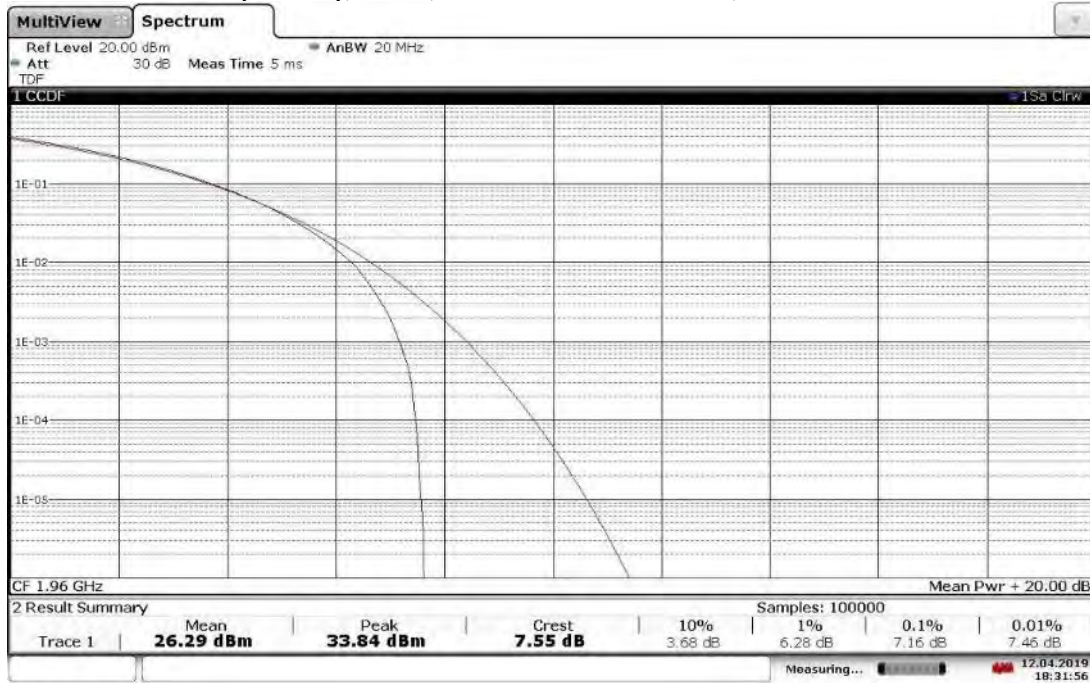
22:30:46 11.04.2019

**TM1.1-QPSK\_10 MHz Bandwidth  
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, PAPR = 7.62 dB**



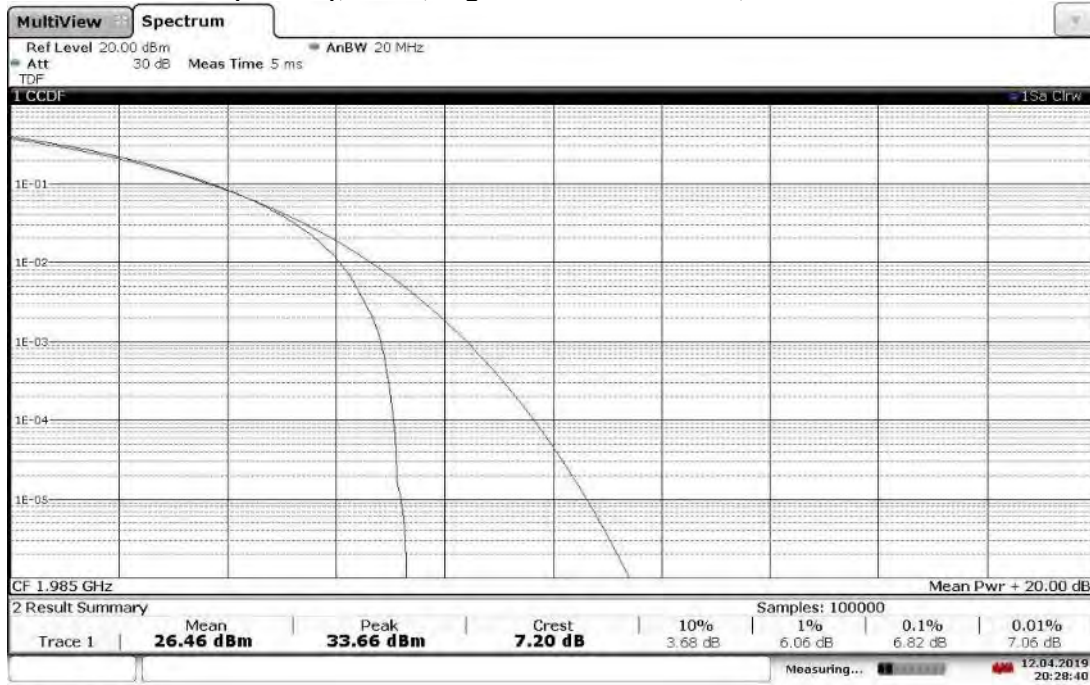
18:31:07 12.04.2019

**TM1.1-QPSK\_10 MHz Bandwidth  
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, PAPR = 7.55 dB**



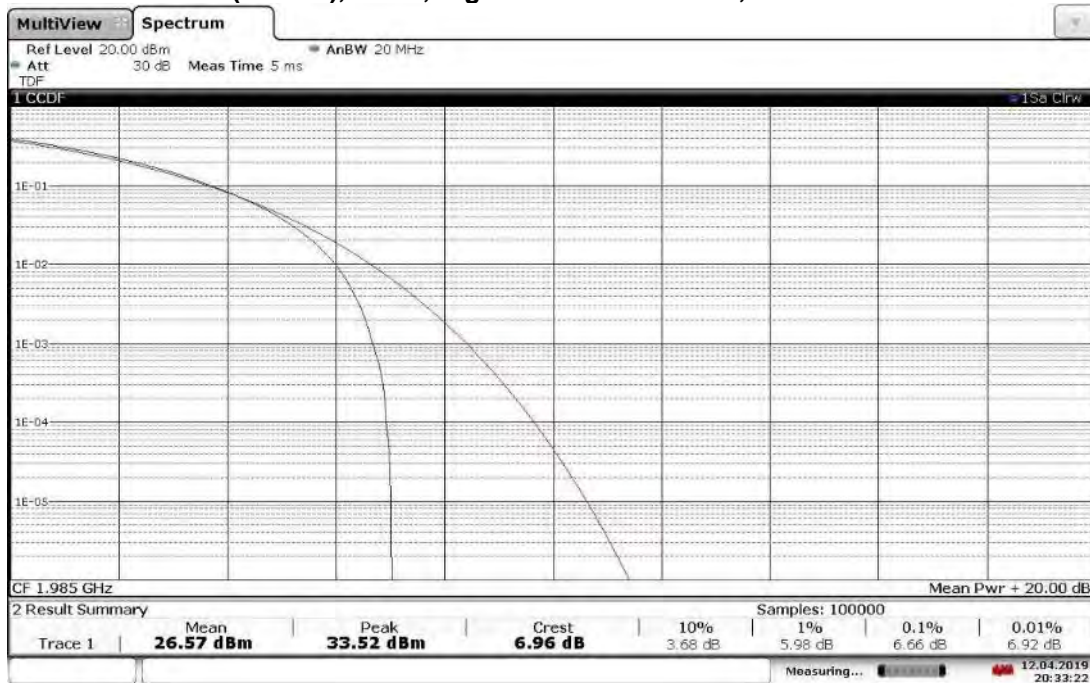
18:31:57 12.04.2019

**TM1.1-QPSK\_10 MHz Bandwidth  
Slot 0 (Band 2), ANT0, High Channel 1985 MHz, PAPR = 7.20 dB**



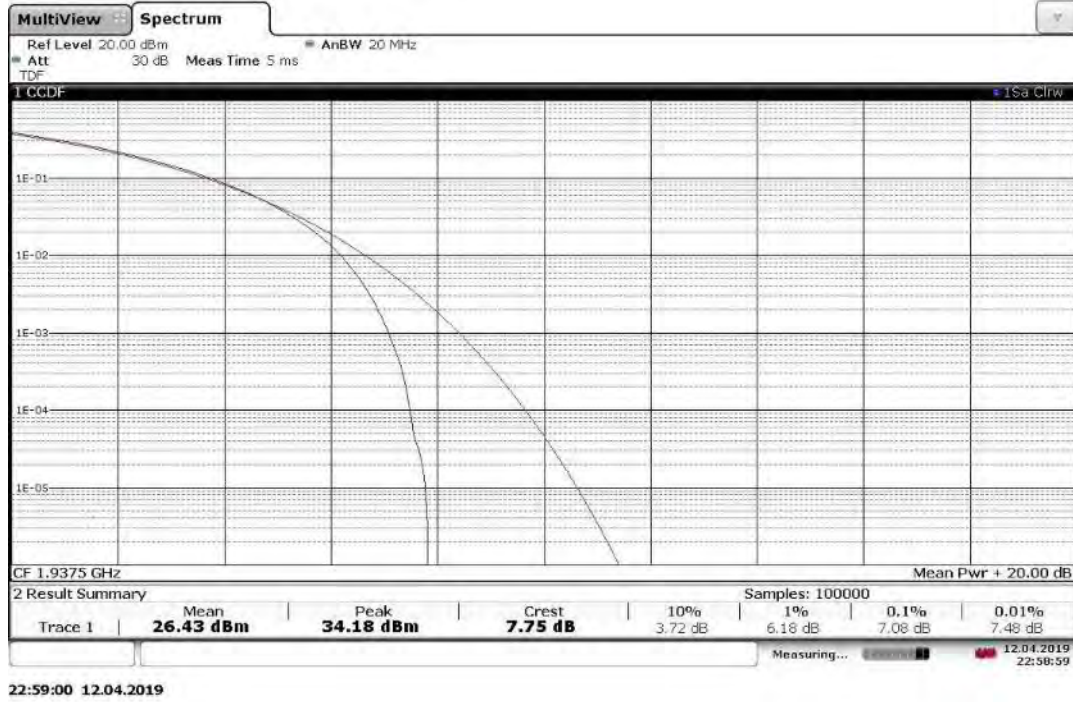
20:28:40 12.04.2019

**TM1.1-QPSK\_10 MHz Bandwidth  
Slot 0 (Band 2), ANT1, High Channel 1985 MHz, PAPR = 6.96 dB**

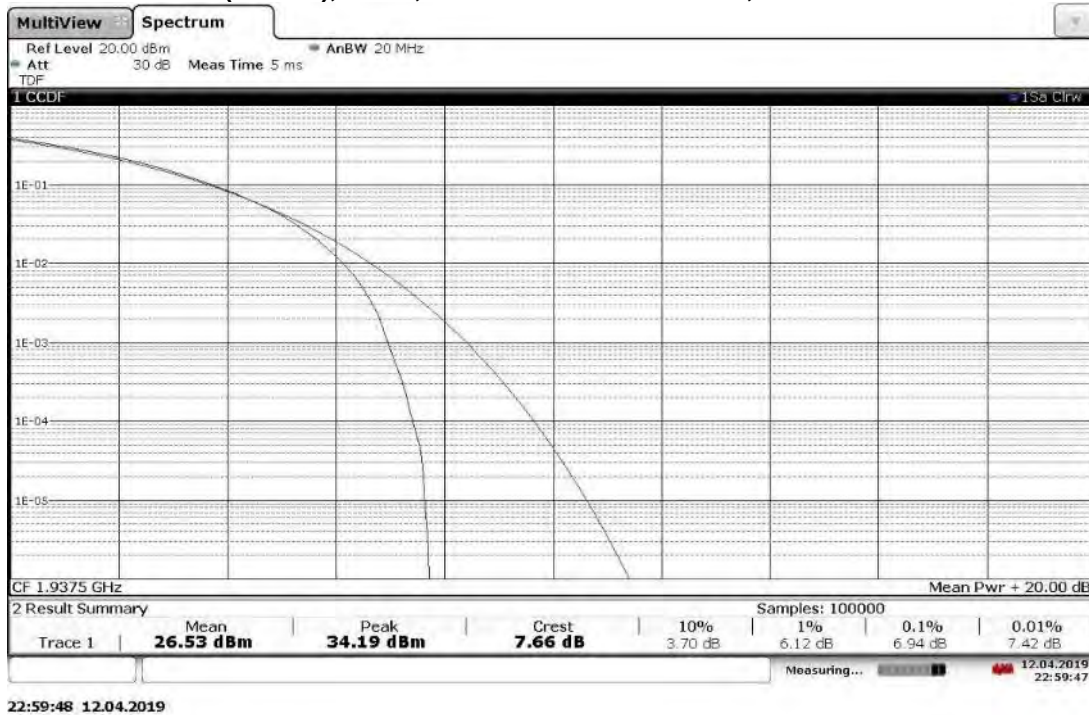


20:33:23 12.04.2019

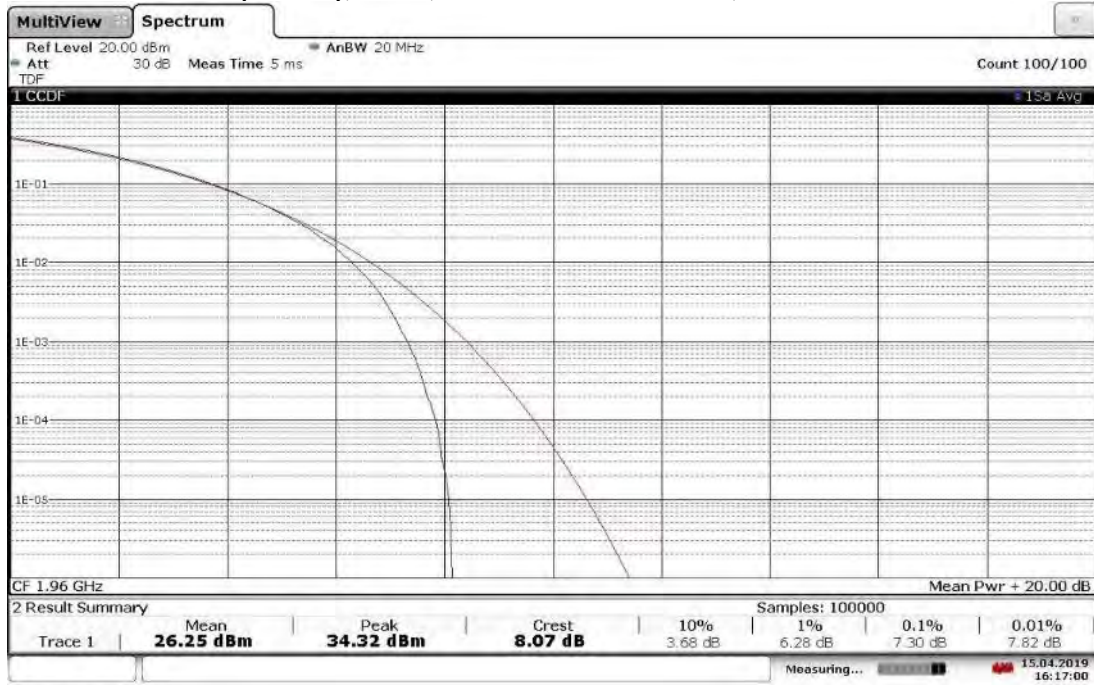
**TM1.1-QPSK\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1937.5 MHz, PAPR = 7.75 dB**



**TM1.1-QPSK\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1937.5 MHz, PAPR = 7.66 dB**

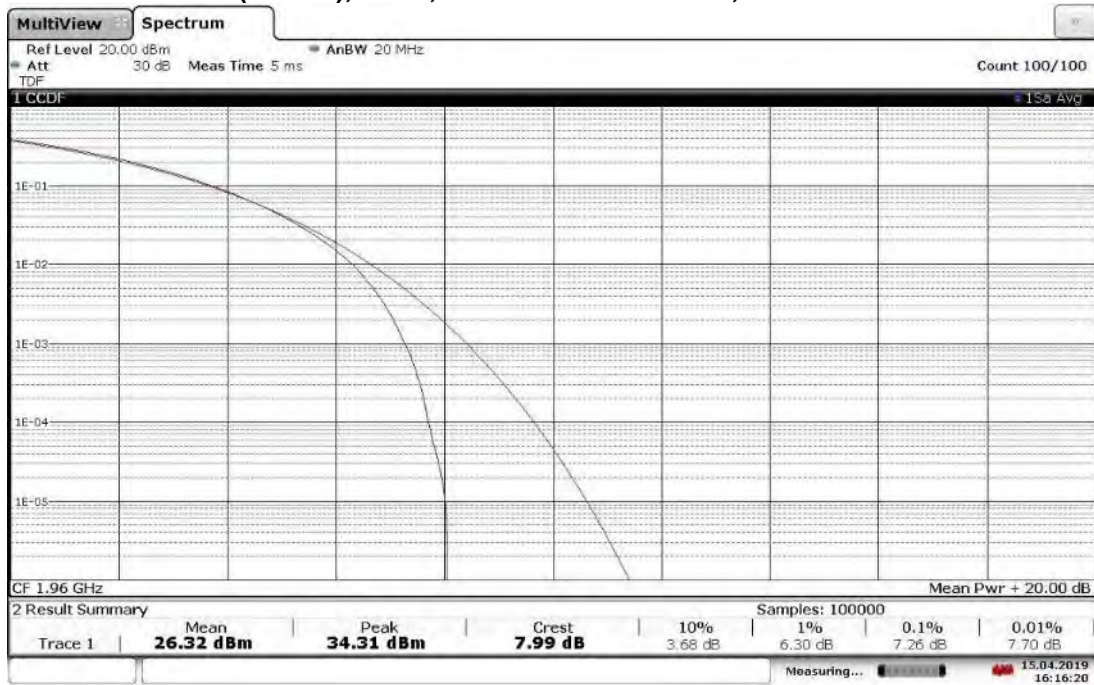


**TM1.1-QPSK\_15 MHz Bandwidth  
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, PAPR = 8.07 dB**



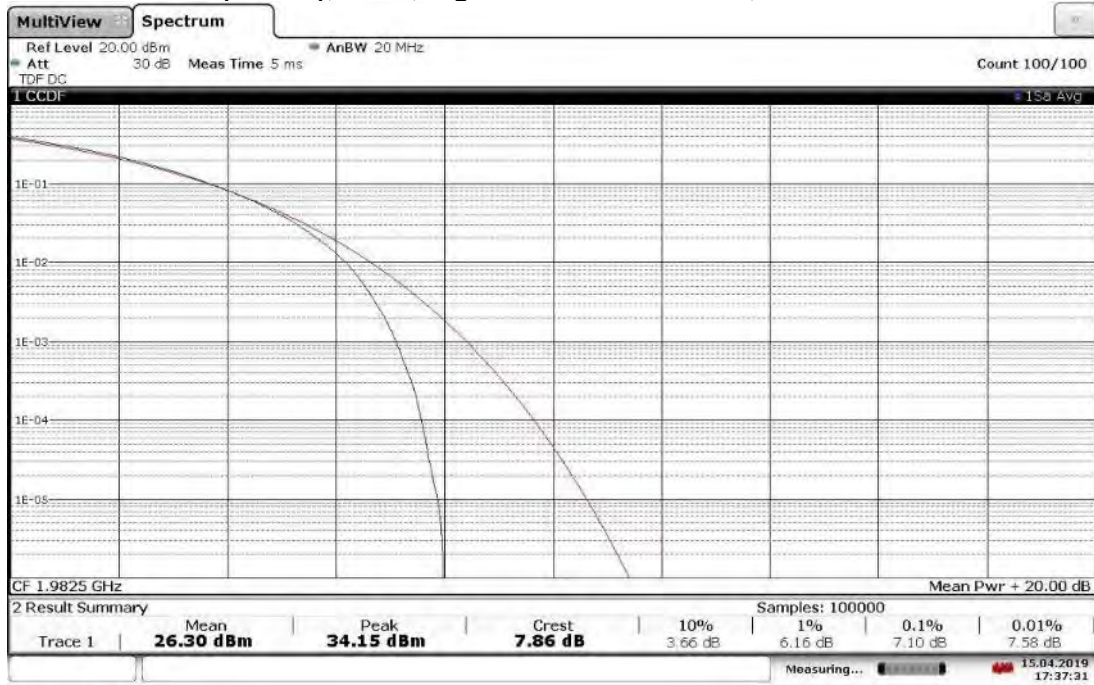
16:17:00 15.04.2019

**TM1.1-QPSK\_15 MHz Bandwidth  
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, PAPR = 7.99 dB**



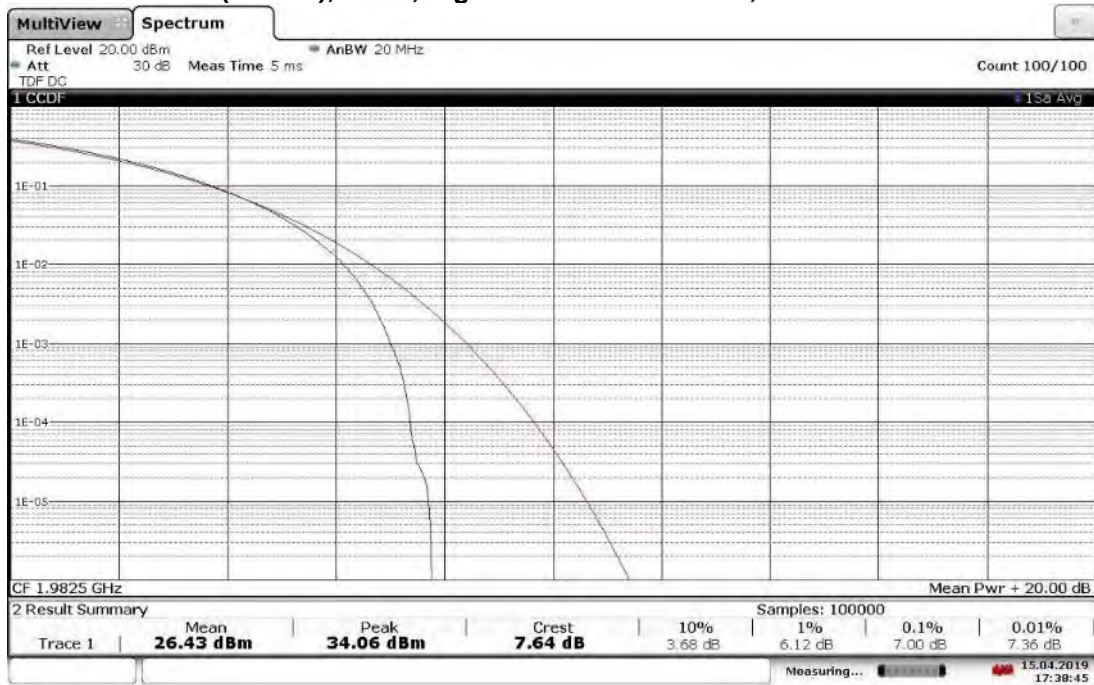
16:16:21 15.04.2019

**TM1.1-QPSK\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1982.5 MHz, PAPR = 7.86 dB**



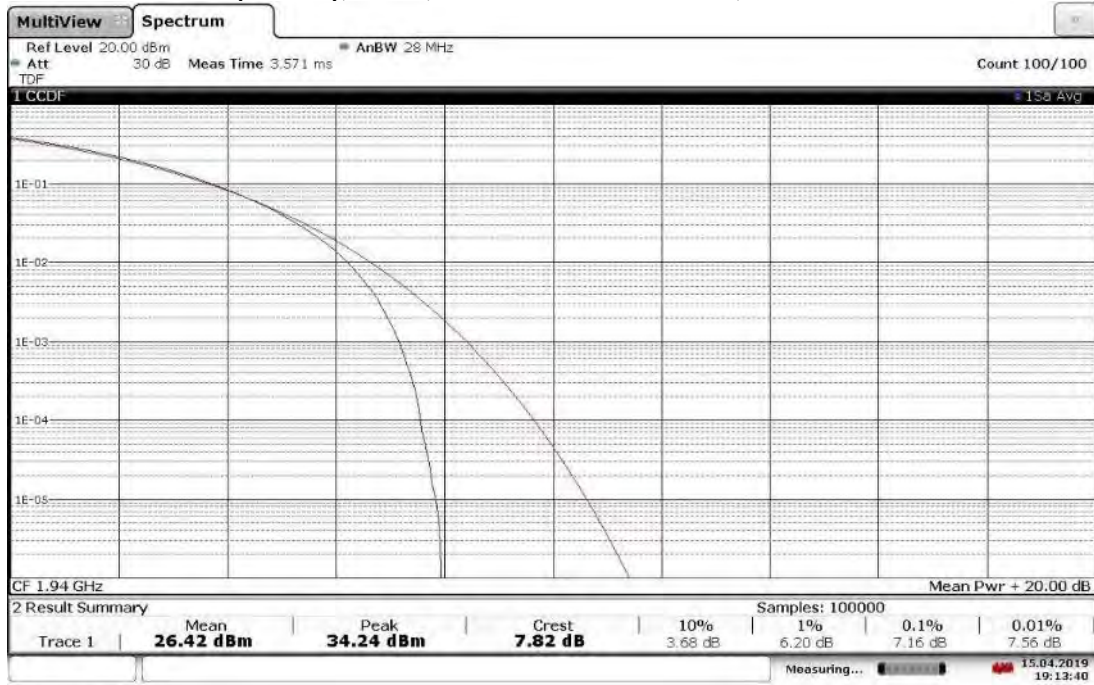
17:37:32 15.04.2019

**TM1.1-QPSK\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1982.5 MHz, PAPR = 7.64 dB**



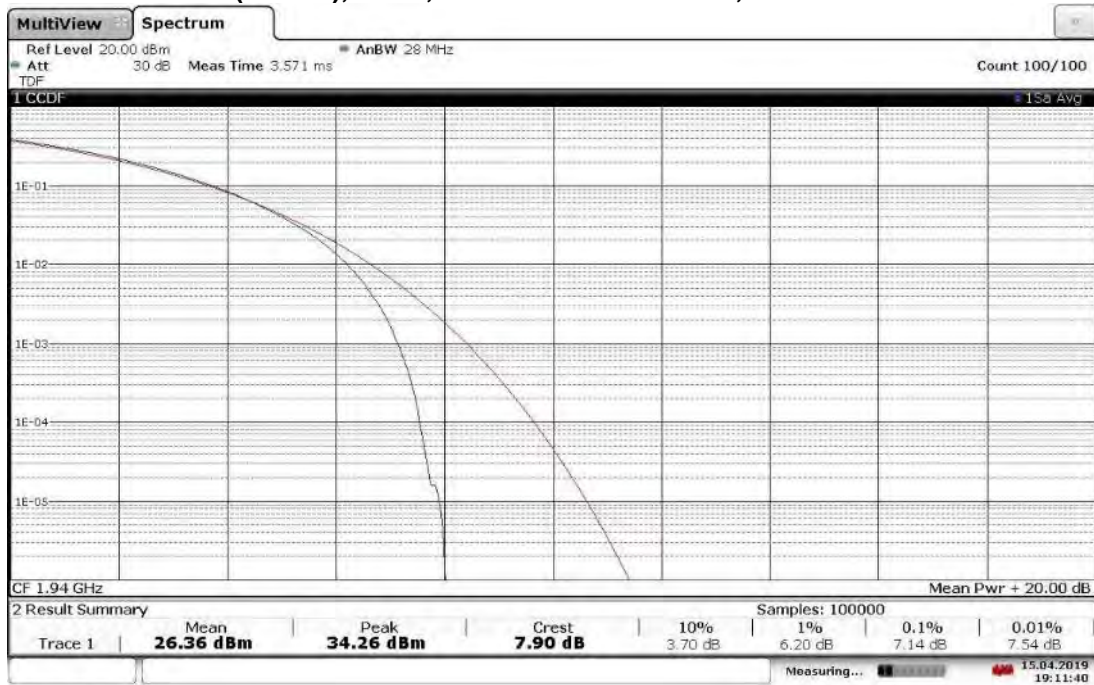
17:38:47 15.04.2019

**TM1.1-QPSK\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1940 MHz, PAPR = 7.82 dB**



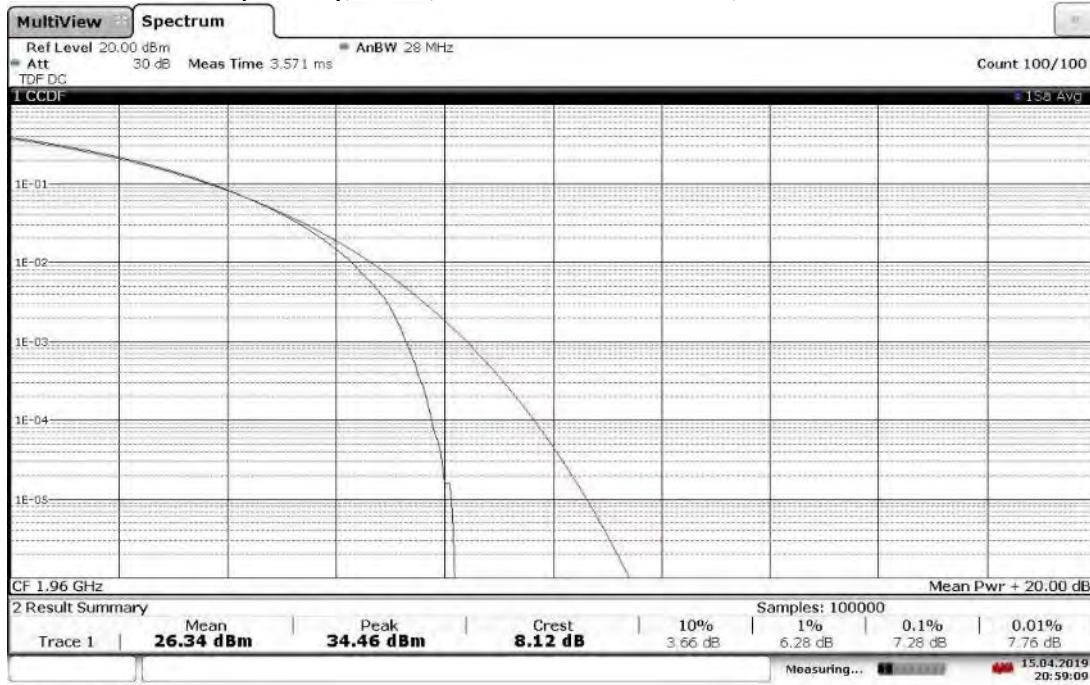
19:13:40 15.04.2019

**TM1.1-QPSK\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1940 MHz, PAPR = 7.90 dB**



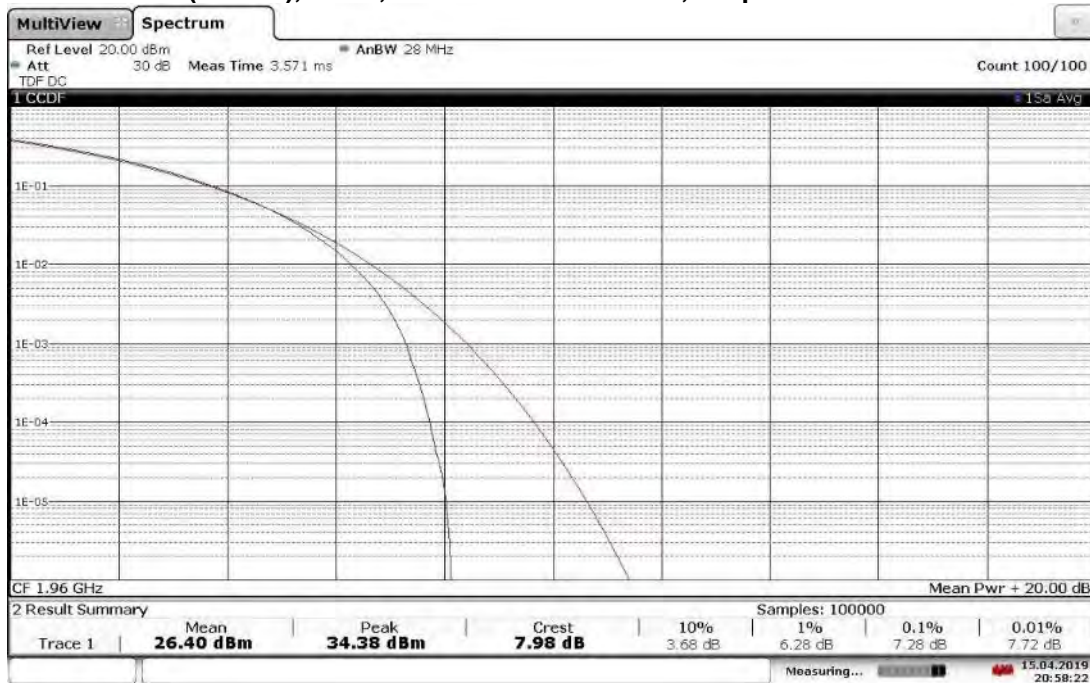
19:11:41 15.04.2019

**TM1.1-QPSK\_20 MHz Bandwidth  
Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, PAPR = 8.12 dB**



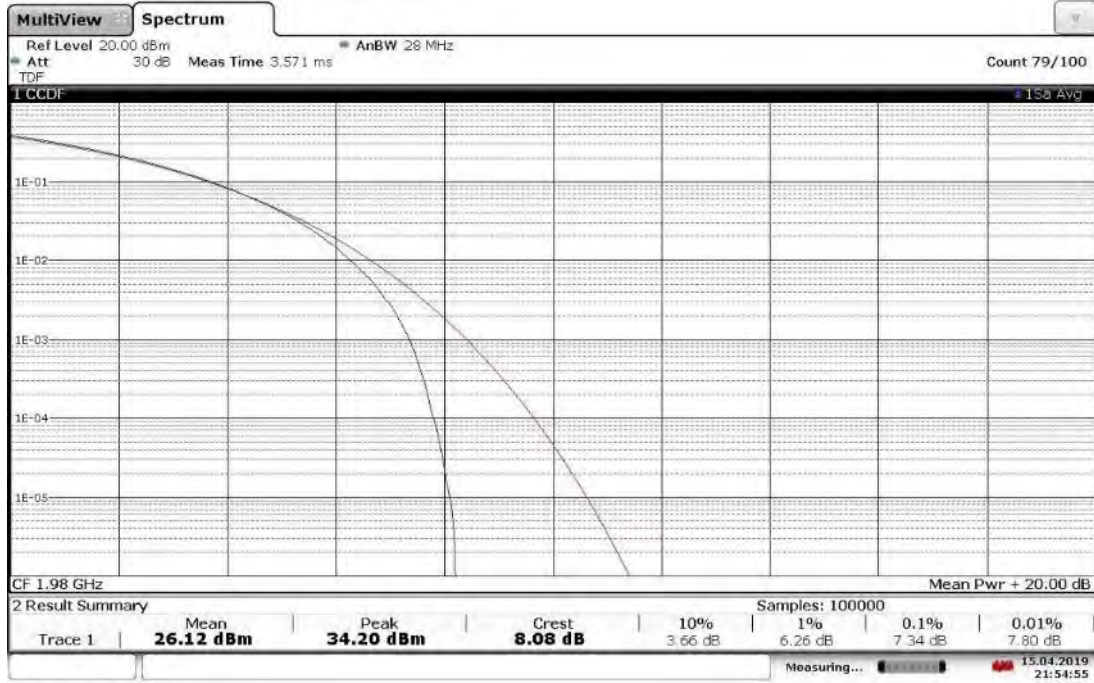
20:59:09 15.04.2019

**TM1.1-QPSK\_20 MHz Bandwidth  
Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, Output Power = 7.98 dB**



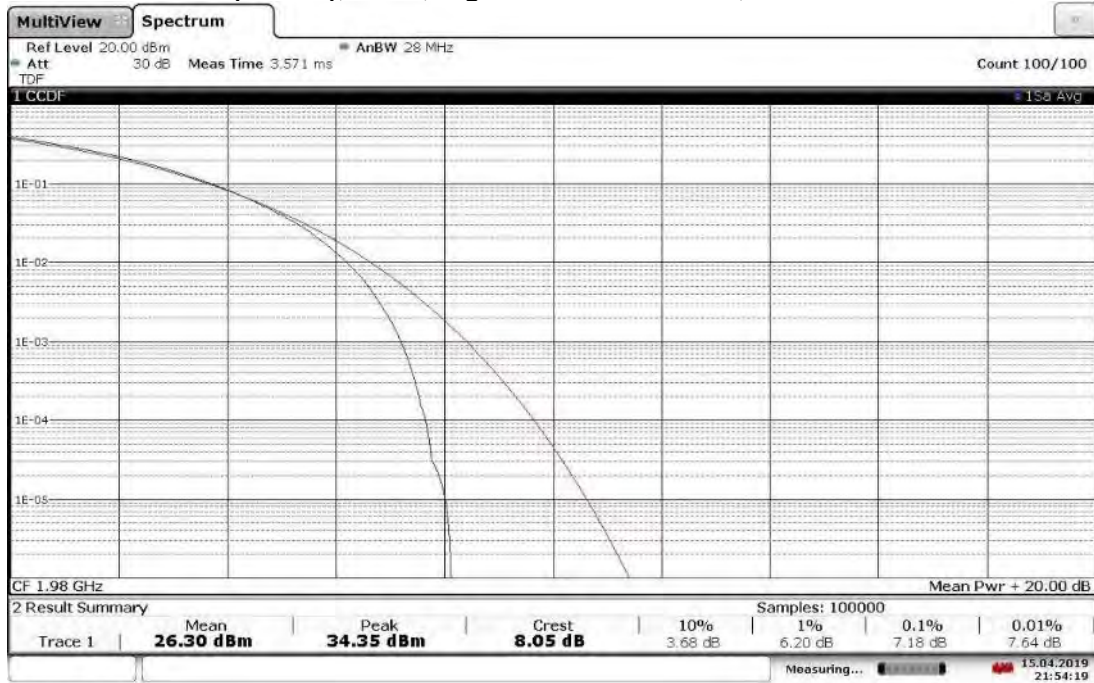
20:58:22 15.04.2019

**TM1.1-QPSK\_20 MHz Bandwidth  
Slot 0 (Band 2), ANT0, High Channel 1980 MHz, PAPR = 8.08 dB**



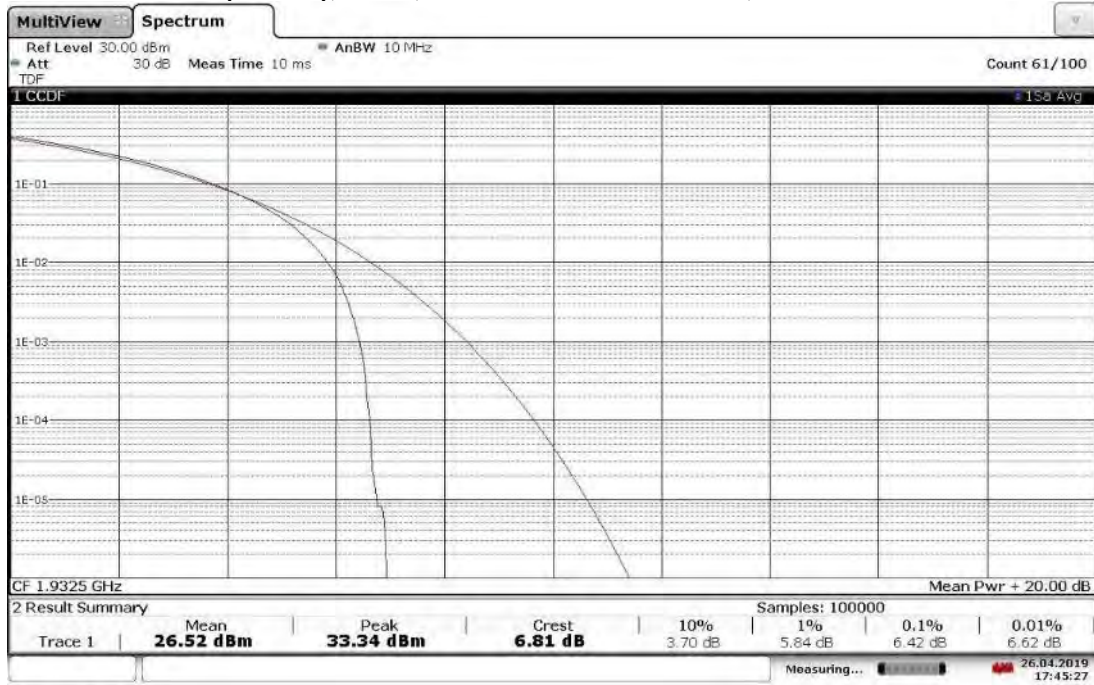
21:54:56 15.04.2019

**TM1.1-QPSK\_20 MHz Bandwidth  
Slot 0 (Band 2), ANT1, High Channel 1980 MHz, PAPR = 8.05 dB**



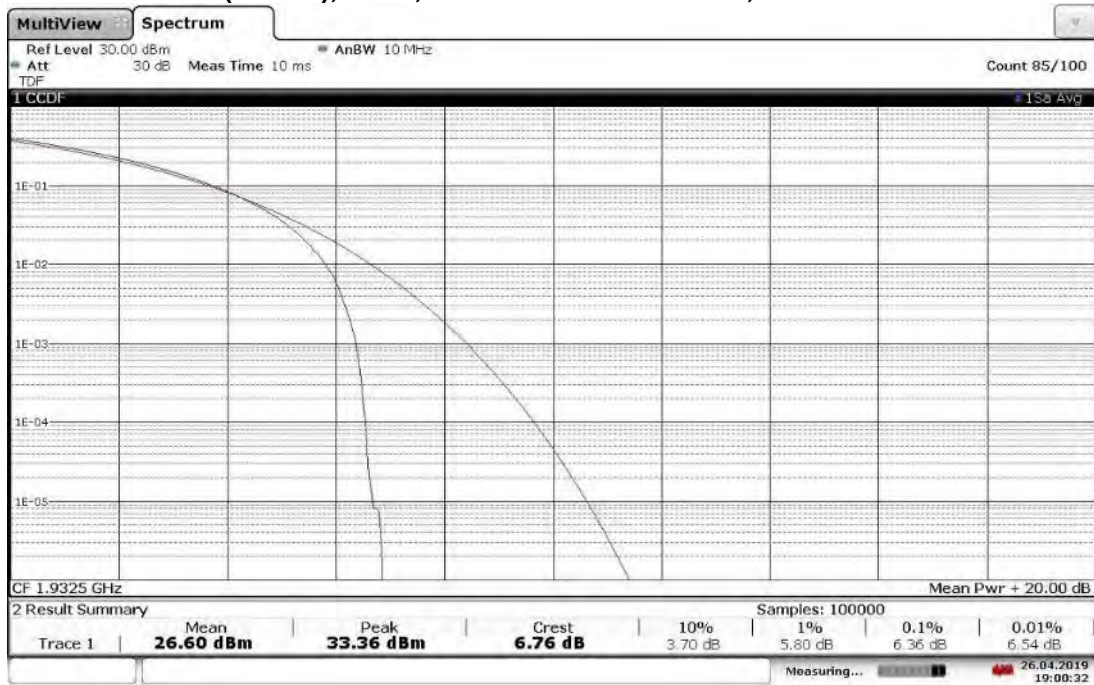
21:54:19 15.04.2019

**TM3.2 - 16QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1932.5 MHz, PAPR = 6.81 dB**



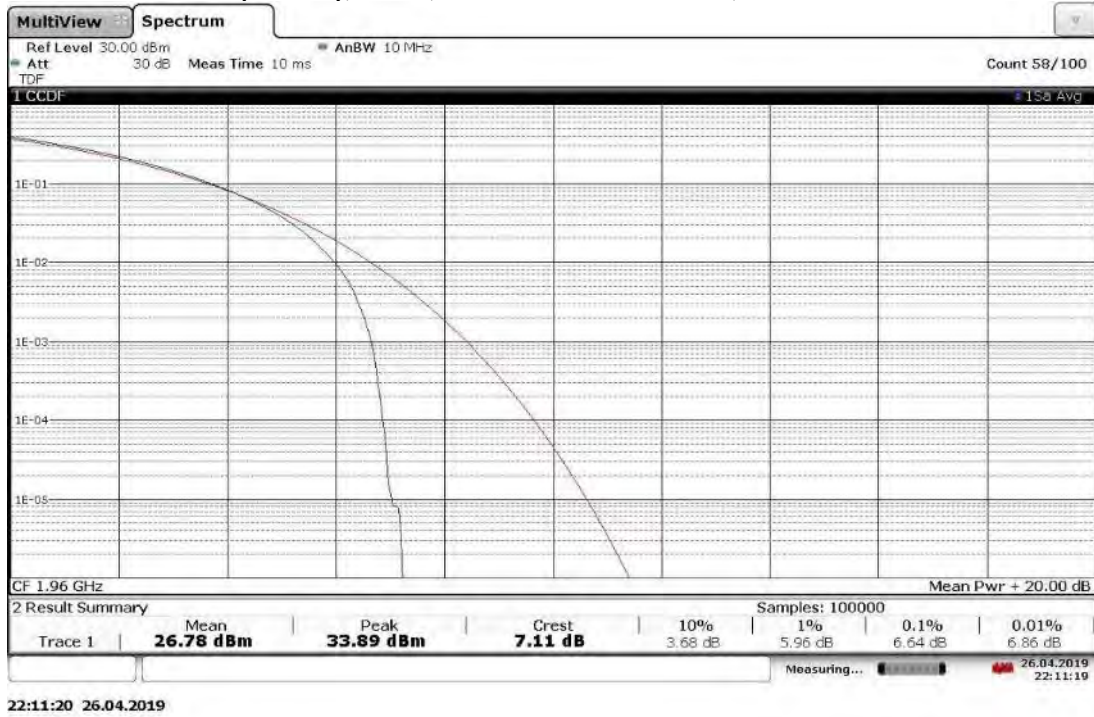
17:45:28 26.04.2019

**TM3.2 - 16QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1932.5 MHz, PAPR = 6.76 dB**

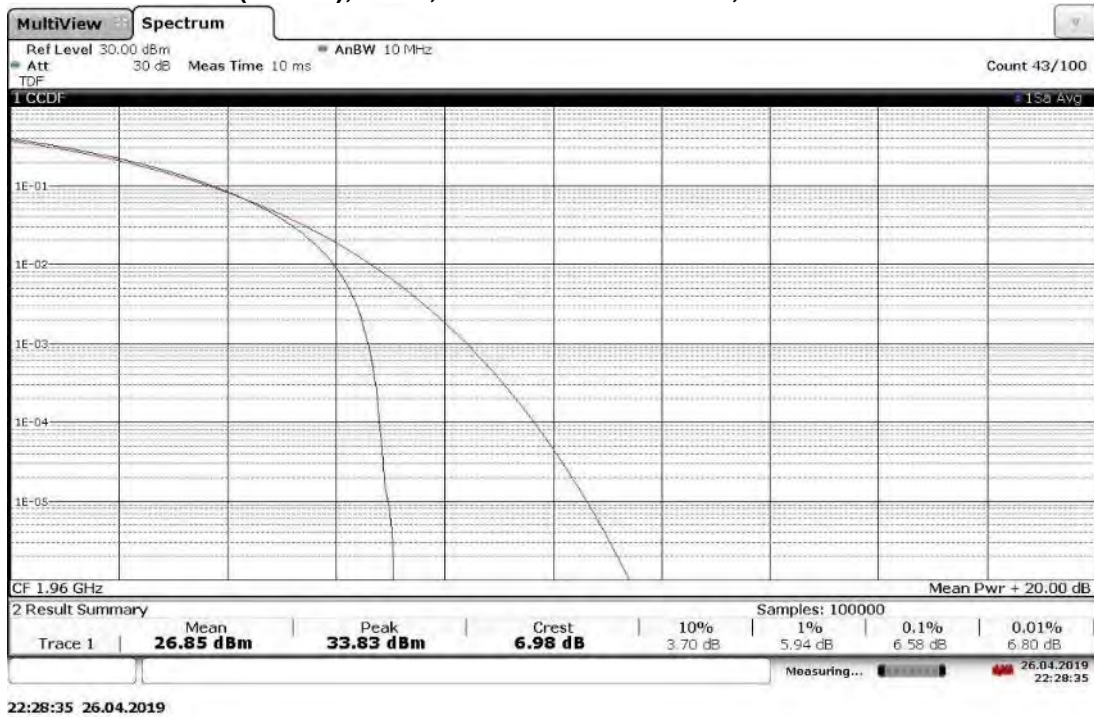


19:00:33 26.04.2019

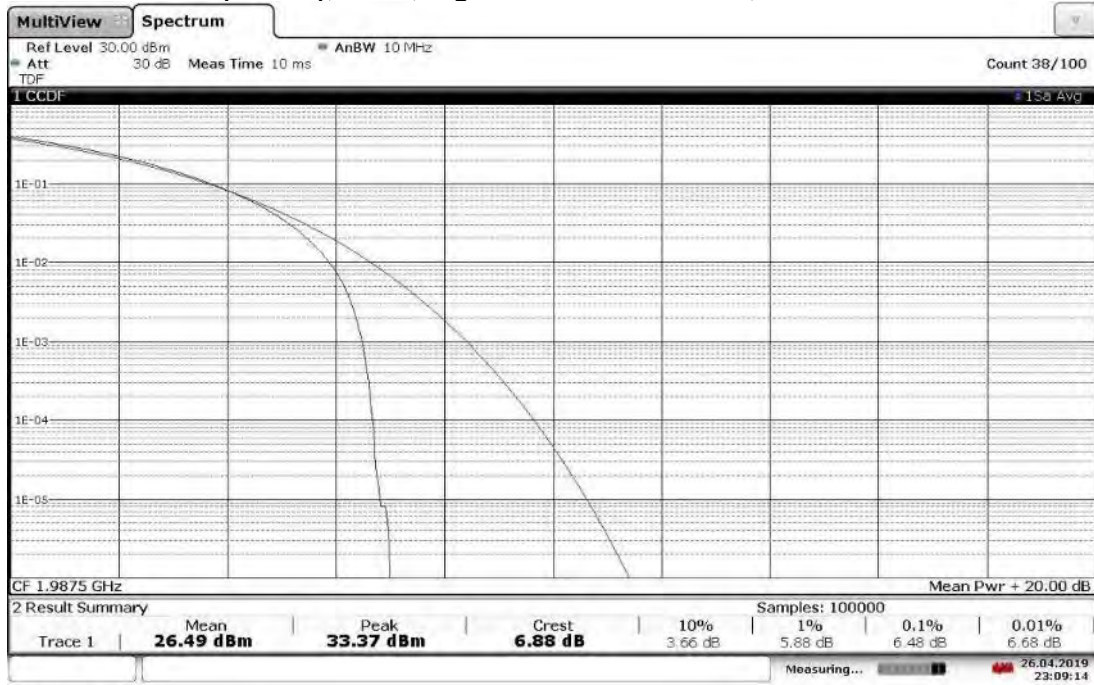
**TM3.2 - 16QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, PAPR = 7.11 dB**



**TM3.2 - 16QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, PAPR = 6.98 dB**

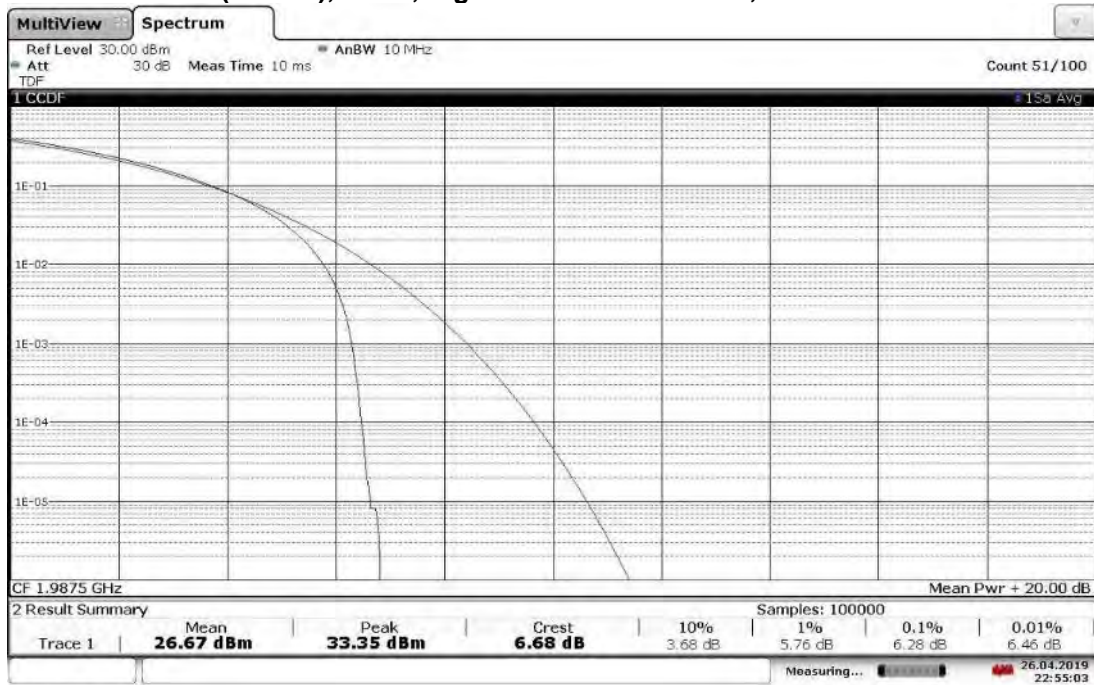


**TM3.2 - 16QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1987.5 MHz, PAPR = 6.98 dB**



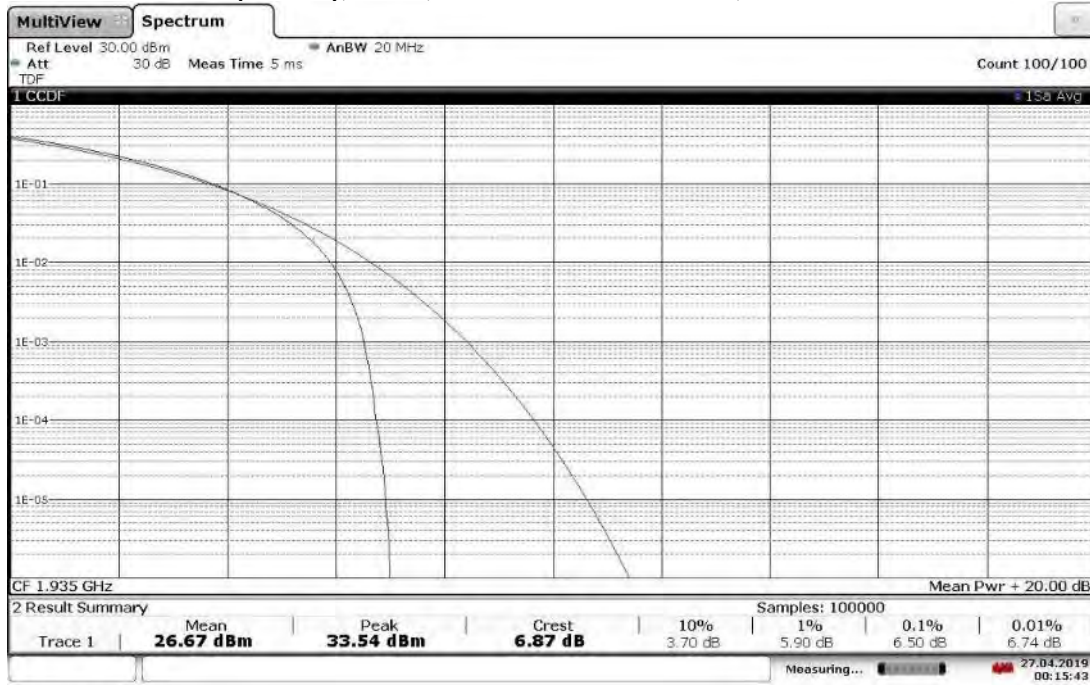
23:09:14 26.04.2019

**TM3.2 - 16QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1987.5 MHz, PAPR = 6.68 dB**



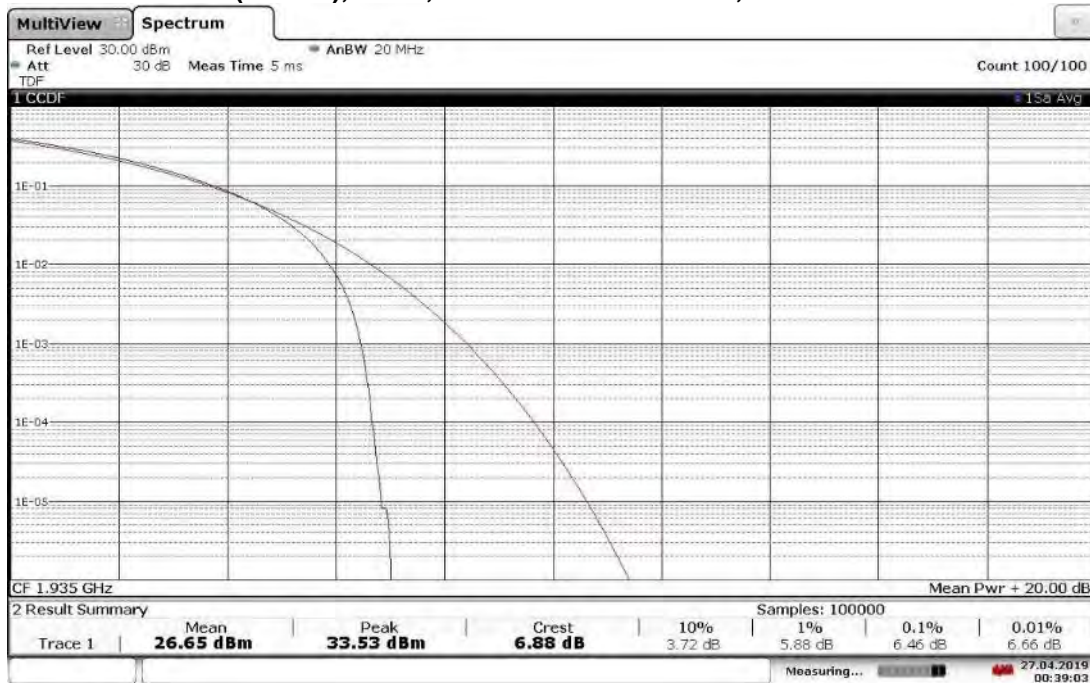
22:55:04 26.04.2019

**TM3.2 - 16QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1935 MHz, PAPR = 6.87 dB**



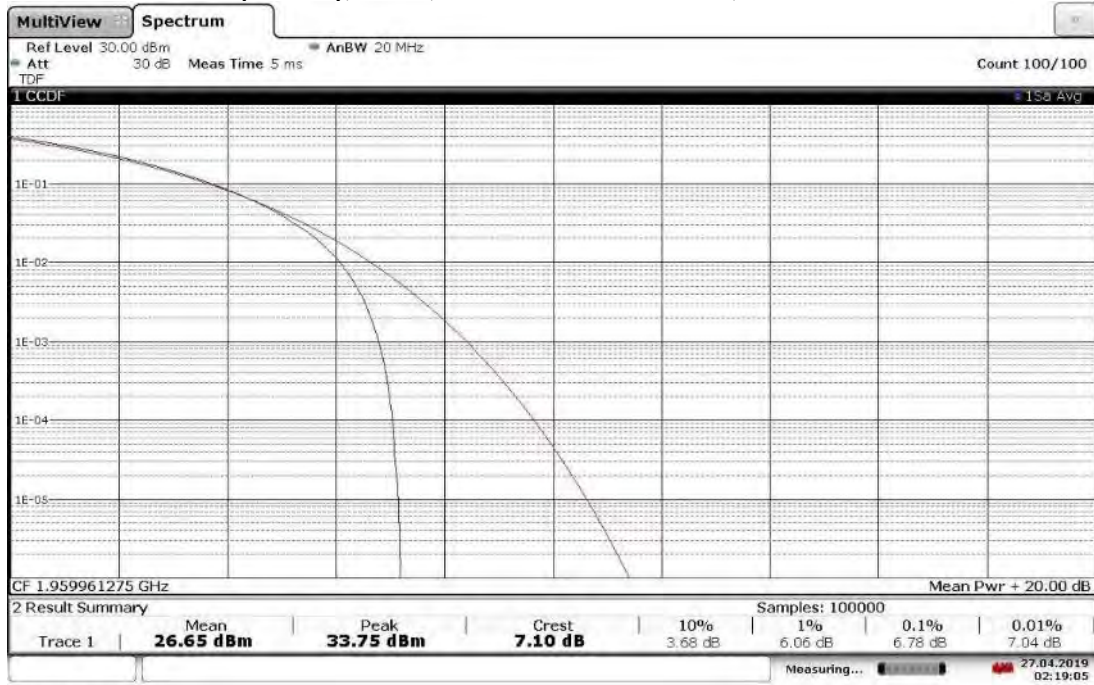
00:15:43 27.04.2019

**TM3.2 - 16QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1935 MHz, PAPR = 6.88 dB**



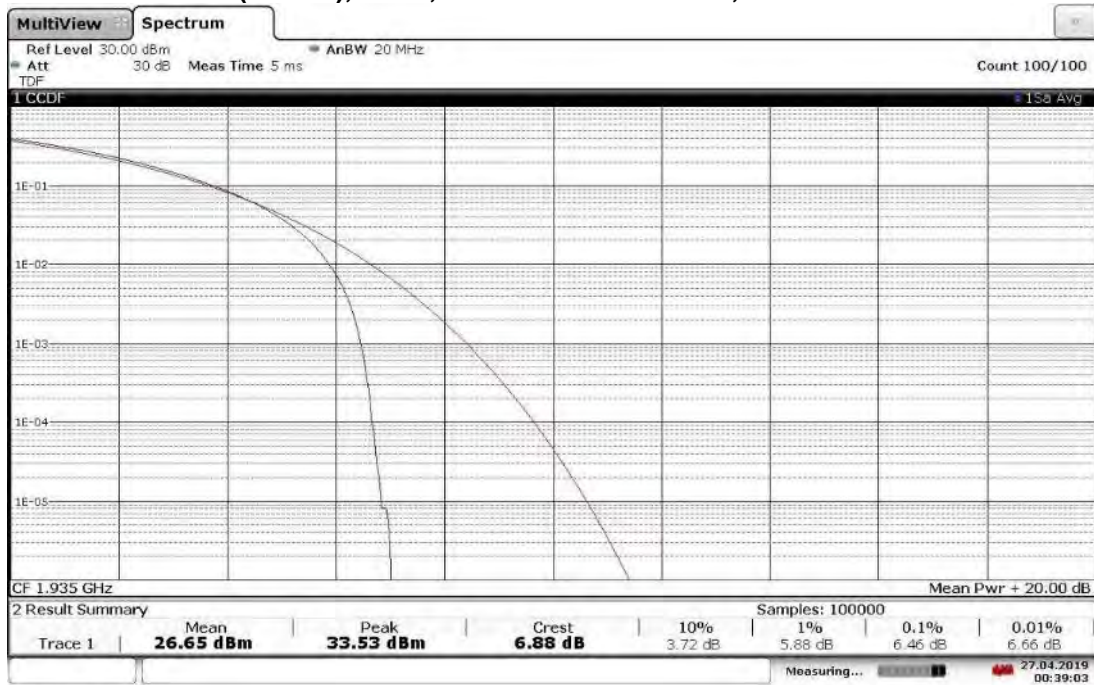
00:39:04 27.04.2019

**TM3.2 - 16QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, PAPR = 7.10 dB**



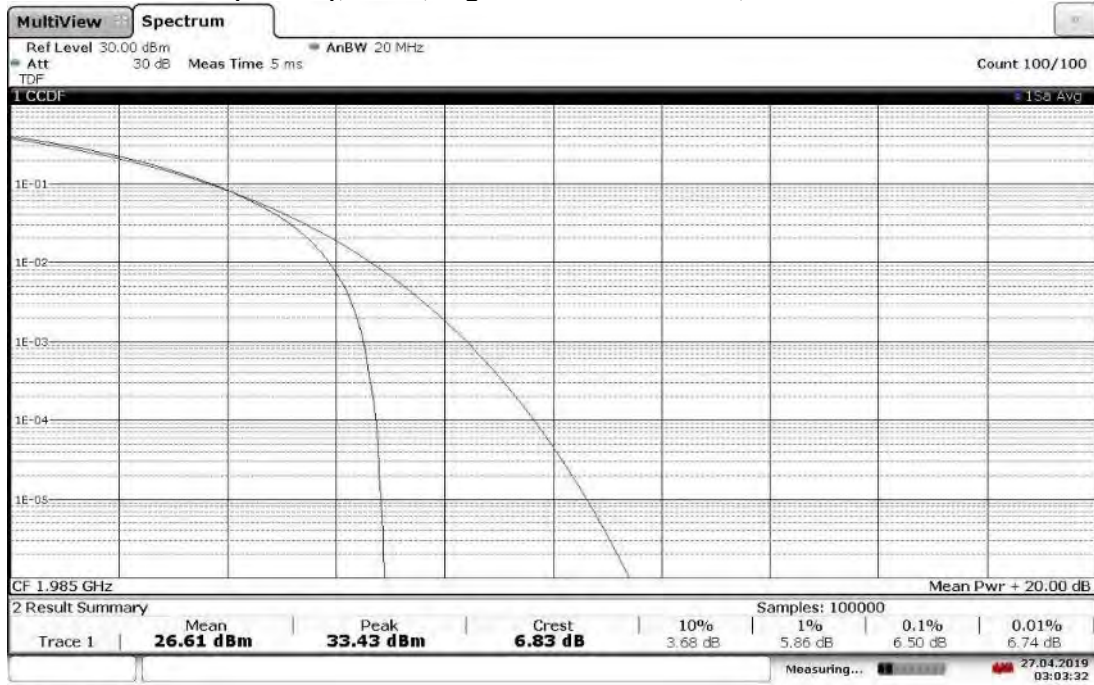
02:19:06 27.04.2019

**TM3.2 - 16QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1935 MHz, PAPR = 6.88 dB**



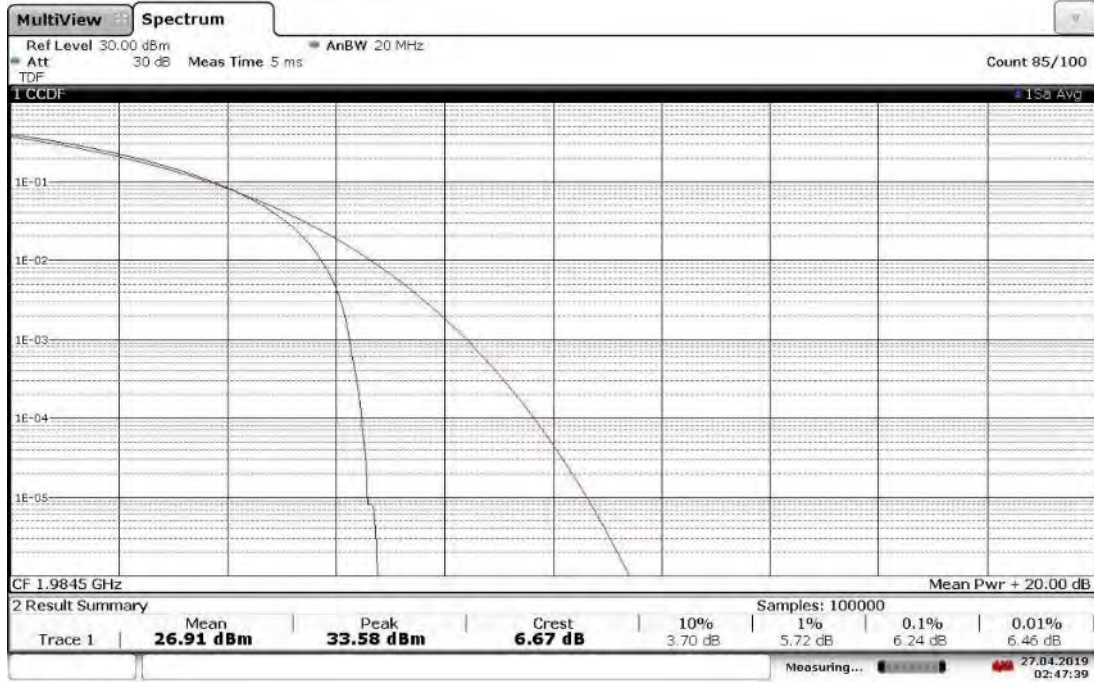
00:39:04 27.04.2019

**TM3.2 - 16QAM\_10 MHz Bandwidth  
Slot 0 (Band 2), ANT0, High Channel 1985 MHz, PAPR = 6.83 dB**



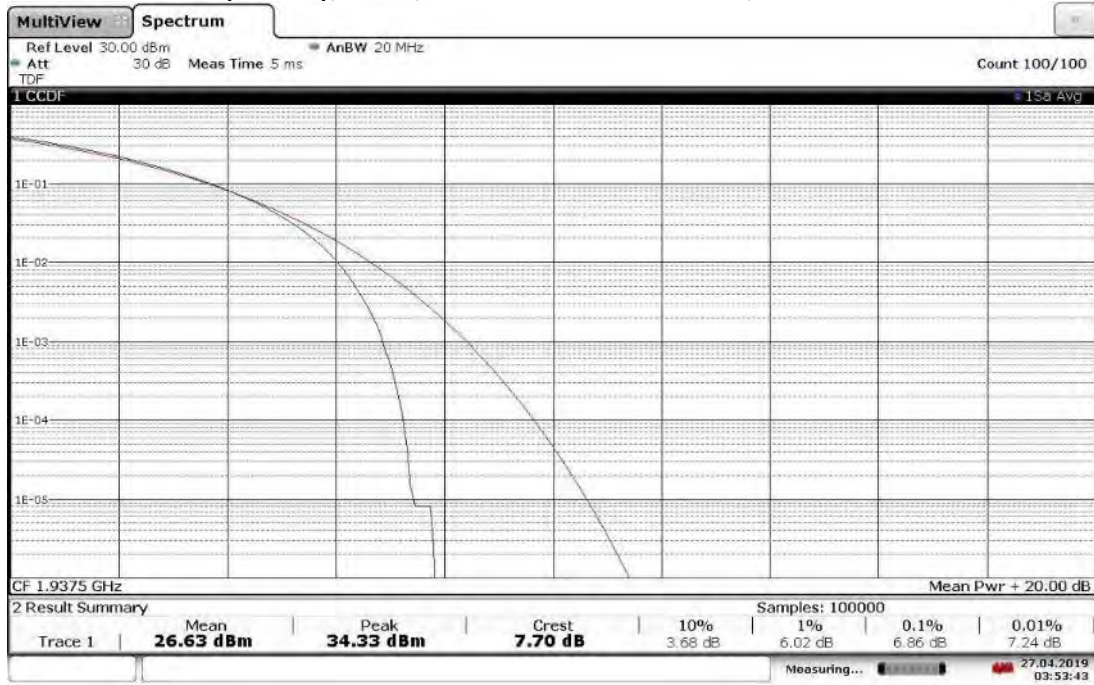
03:03:32 27.04.2019

**TM3.2 - 16QAM\_10 MHz Bandwidth  
Slot 0 (Band 2), ANT1, High Channel 1985 MHz, PAPR = 6.67 dB**



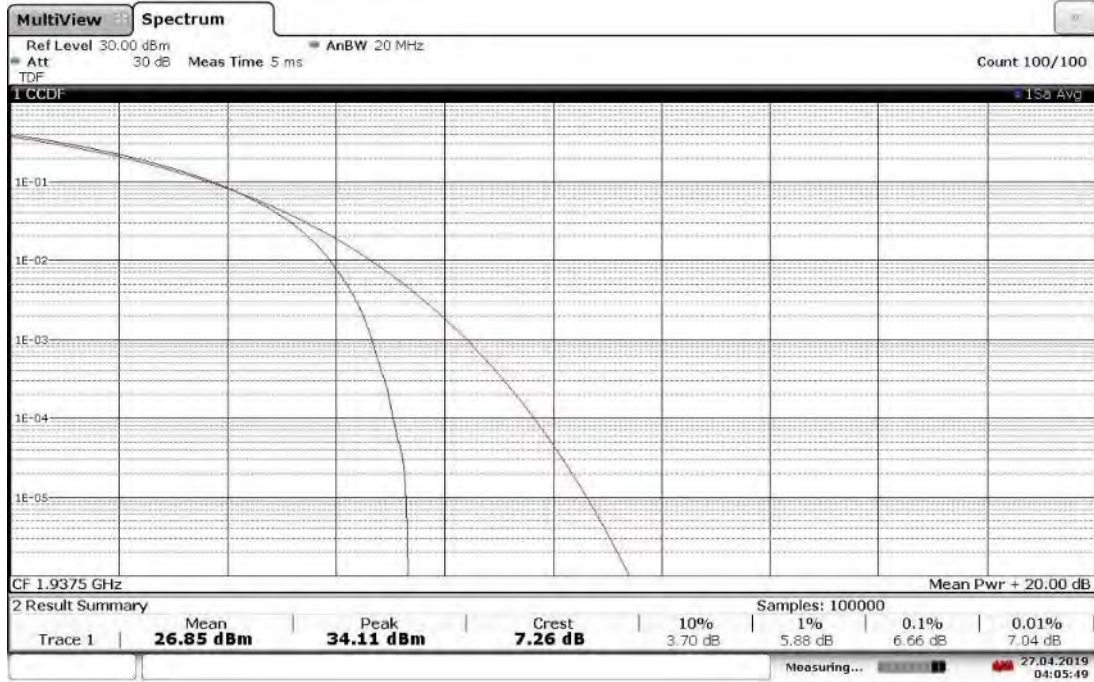
02:47:40 27.04.2019

TM3.2 - 16QAM\_15 MHz Bandwidth  
Slot 0 (Band 2), ANT0, Low Channel 1937.5 MHz, PAPR = 7.70 dB



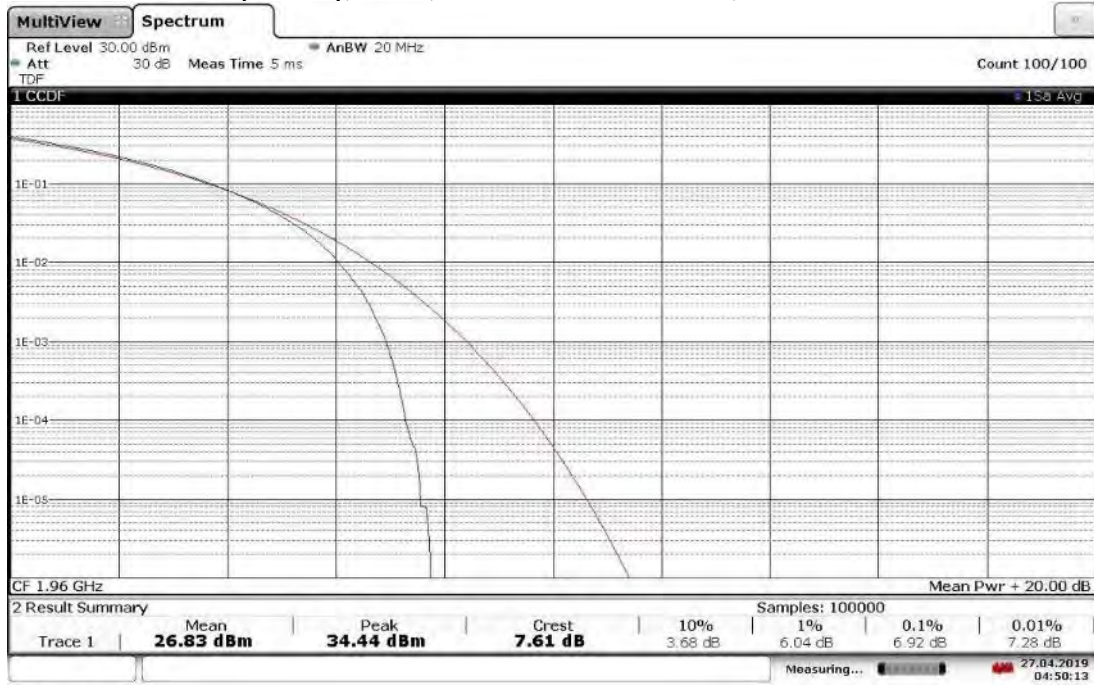
03:53:43 27.04.2019

TM3.2 - 16QAM\_15 MHz Bandwidth  
Slot 0 (Band 2), ANT1, Low Channel 1937.5 MHz, PAPR = 7.26 dB



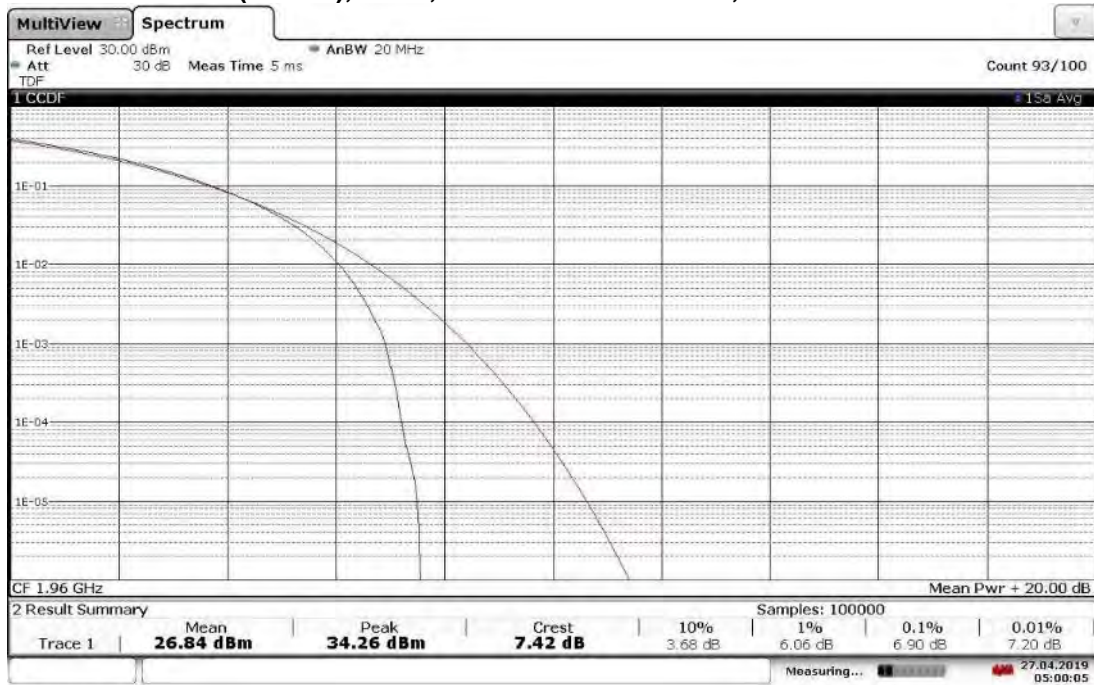
04:05:49 27.04.2019

**TM3.2 - 16QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, PAPR = 7.61 dB**



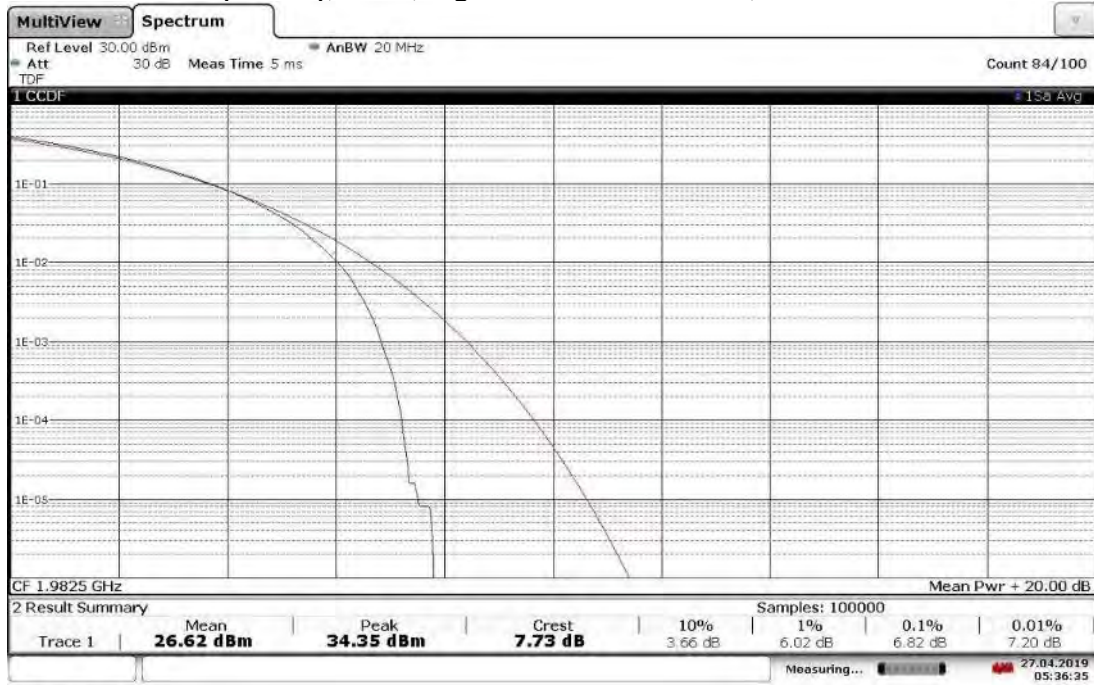
04:50:13 27.04.2019

**TM3.2 - 16QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, PAPR = 7.42 dB**



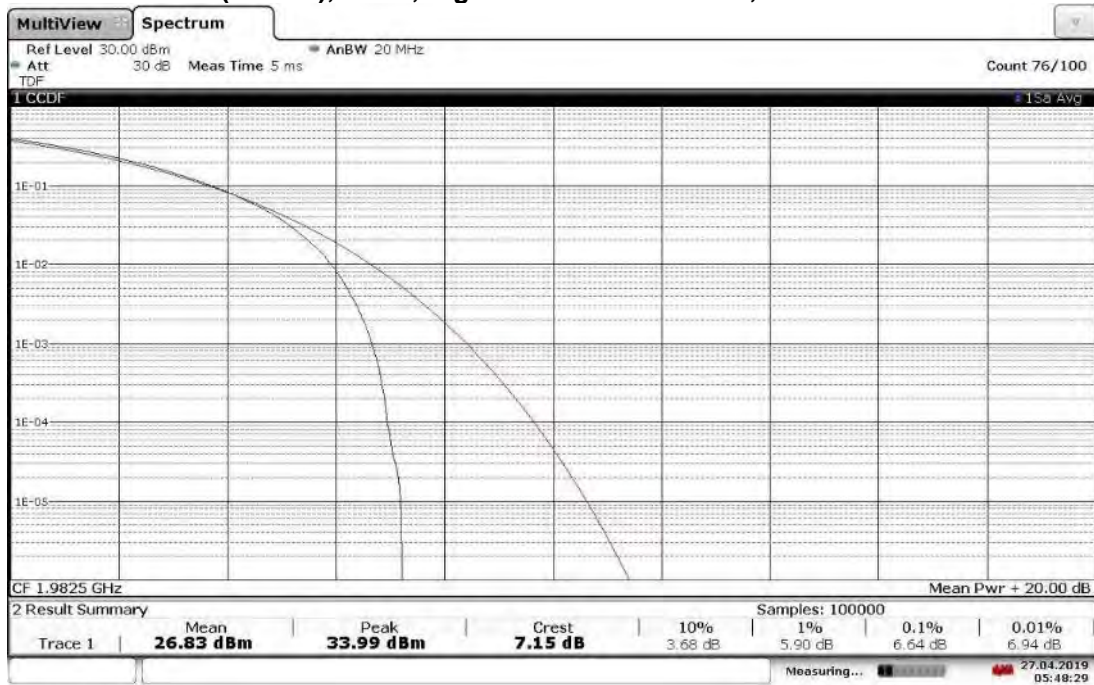
05:00:05 27.04.2019

**TM3.2 - 16QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1982.5 MHz, PAPR = 7.73 dB**



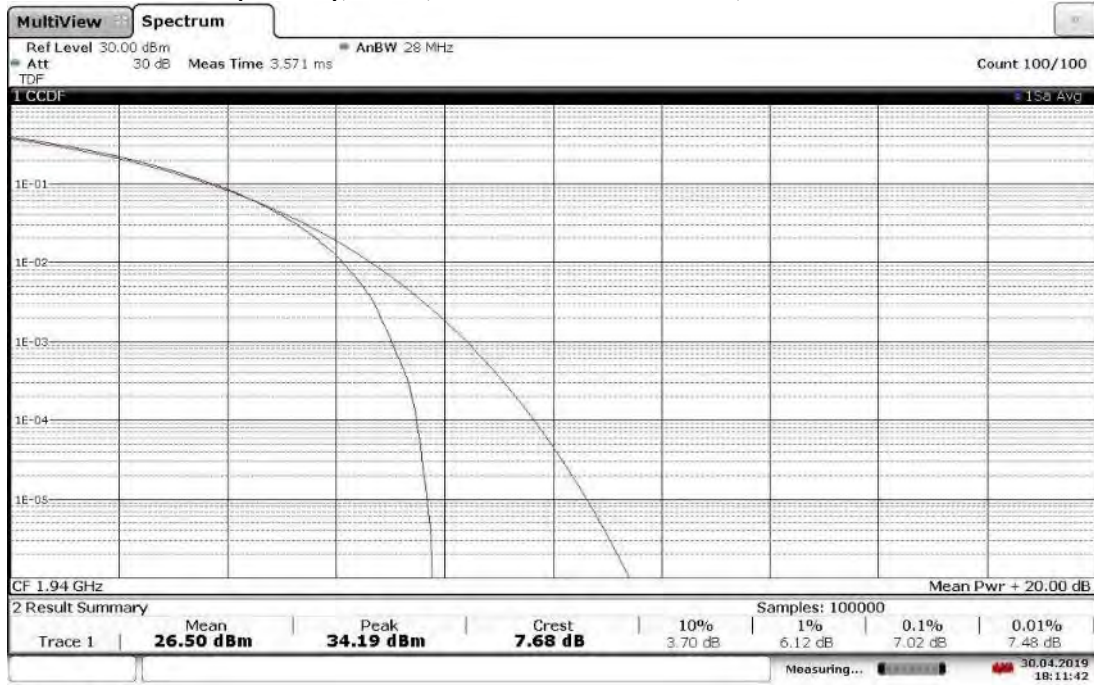
05:36:36 27.04.2019

**TM3.2 - 16QAM\_15 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1982.5 MHz, PAPR = 7.15 dB**



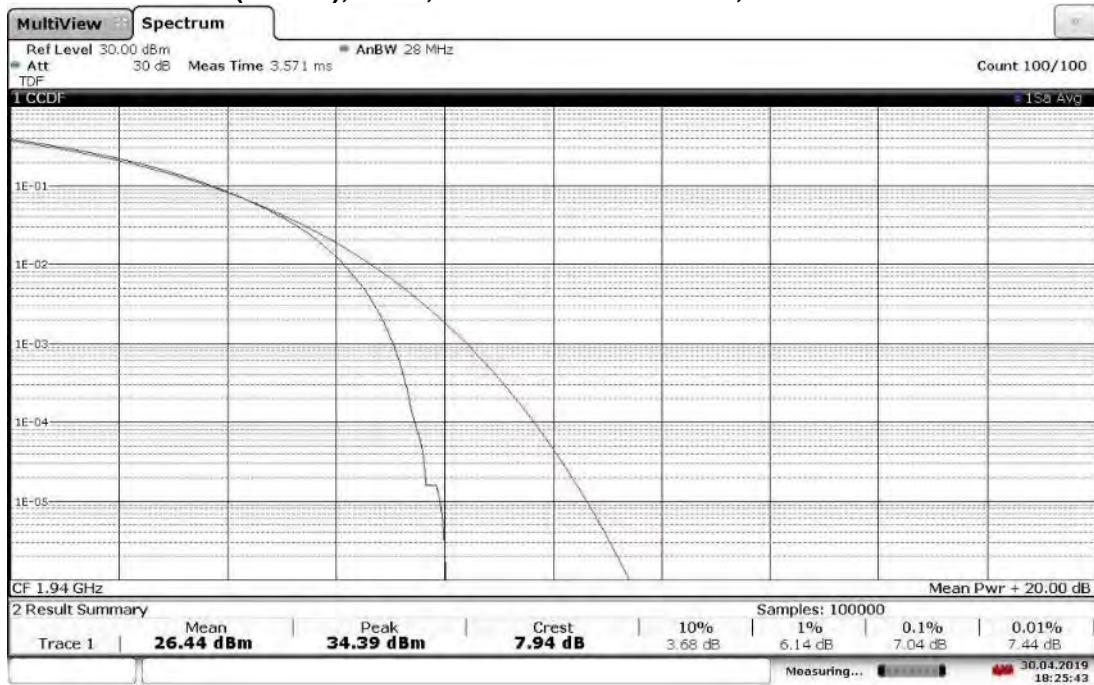
05:48:29 27.04.2019

**TM3.2 - 16QAM\_20 MHz Bandwidth  
Slot 0 (Band 2), ANT0, Low Channel 1940 MHz, PAPR = 7.68 dB**



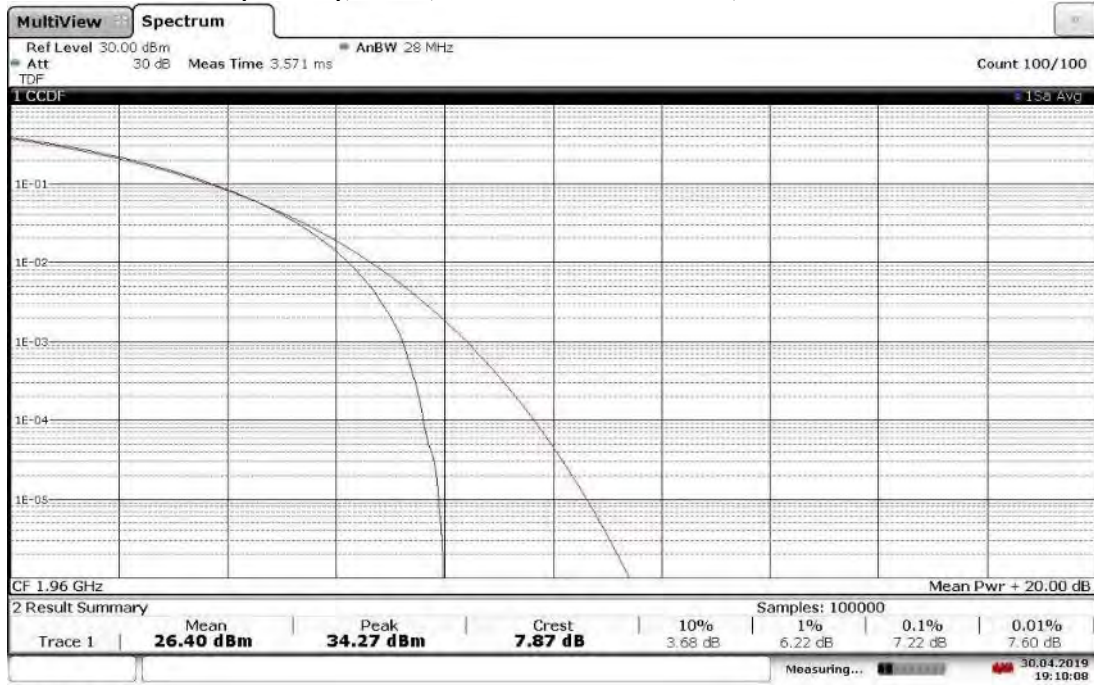
18:11:43 30.04.2019

**TM3.2 - 16QAM\_20 MHz Bandwidth  
Slot 0 (Band 2), ANT1, Low Channel 1940 MHz, PAPR = 7.94 dB**



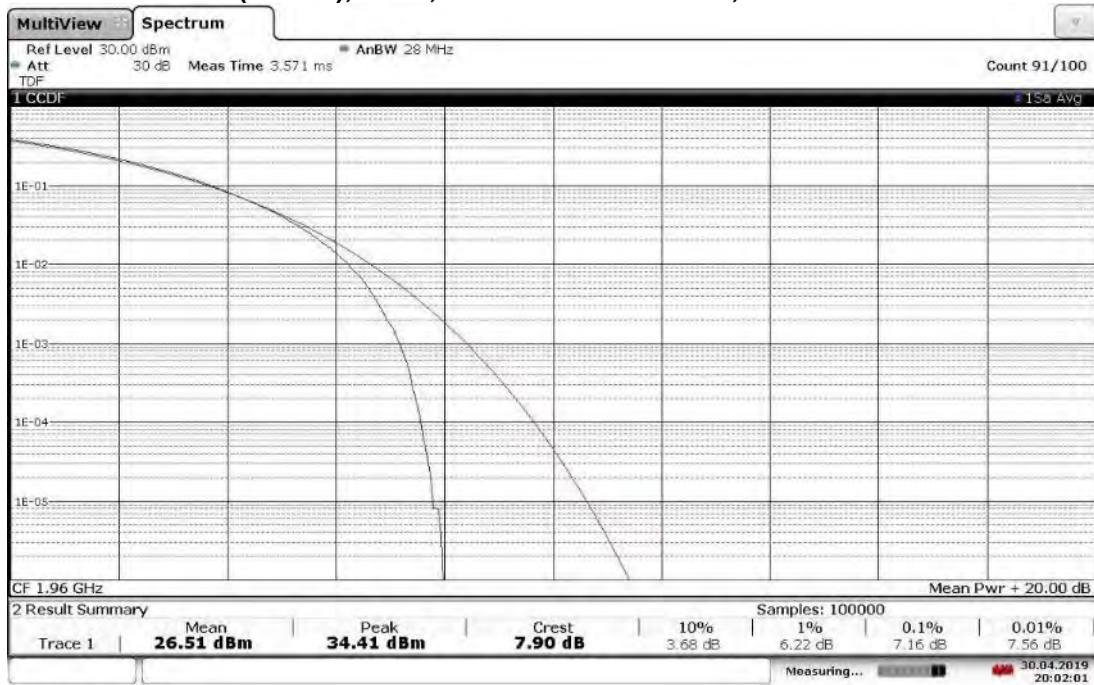
18:25:44 30.04.2019

**TM3.2 - 16QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, PAPR = 7.87 dB**



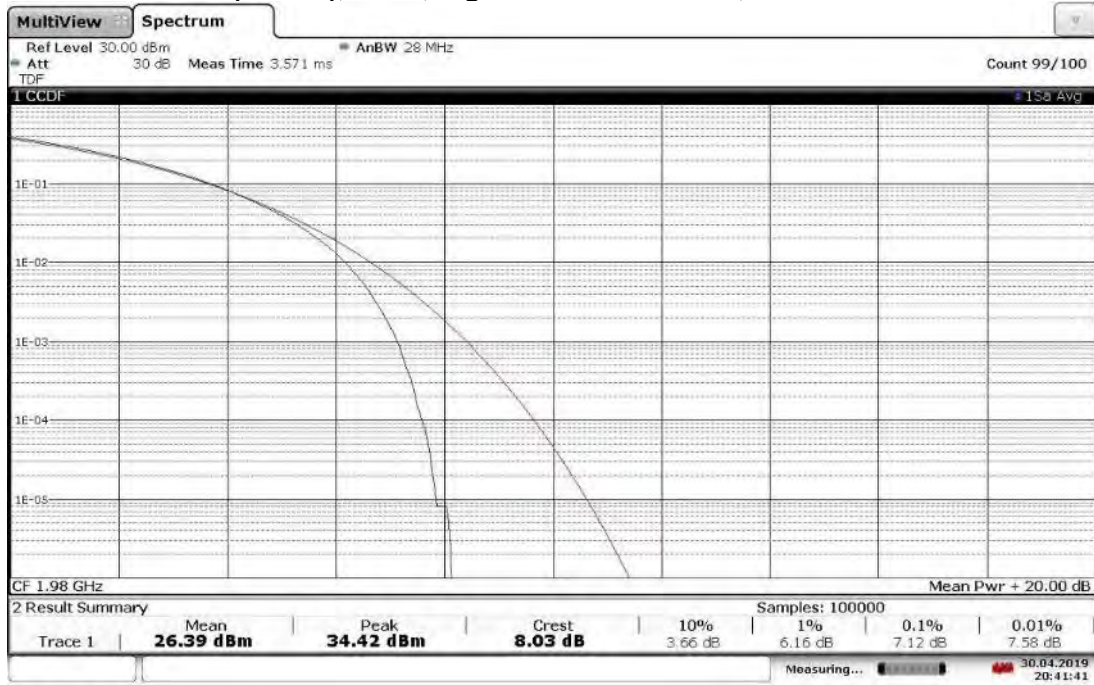
19:10:08 30.04.2019

**TM3.2 - 16QAM\_20 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, PAPR = 7.90 dB**



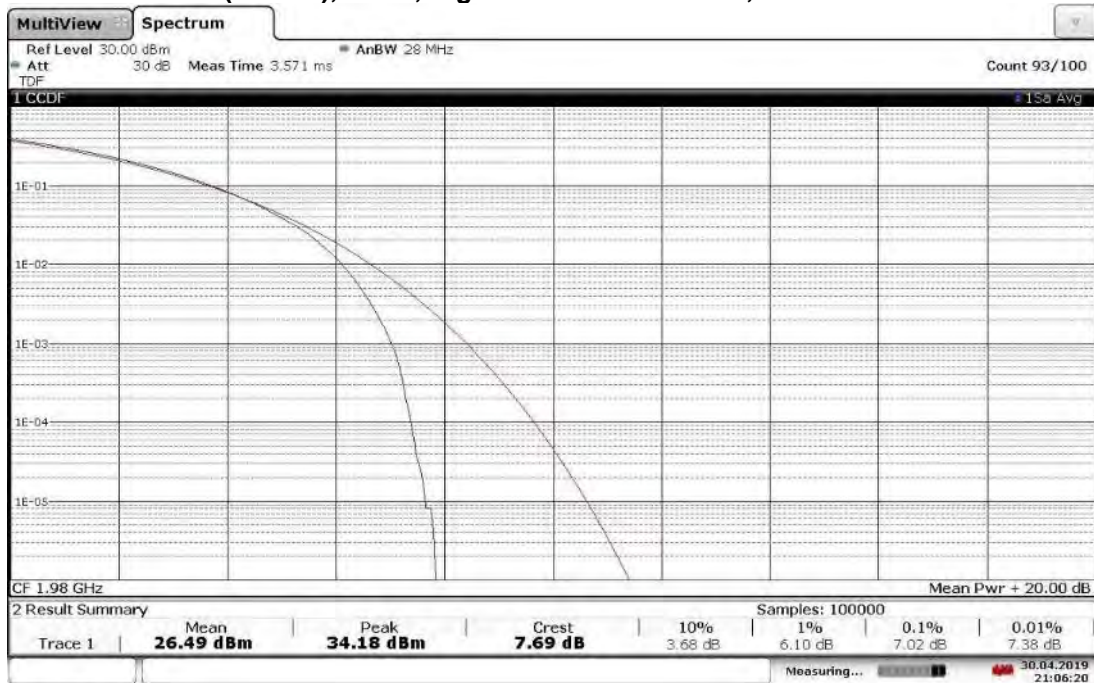
20:02:02 30.04.2019

**TM3.2 - 16QAM\_20 MHz Bandwidth  
Slot 0 (Band 2), ANT0, High Channel 1980 MHz, PAPR = 8.03 dB**



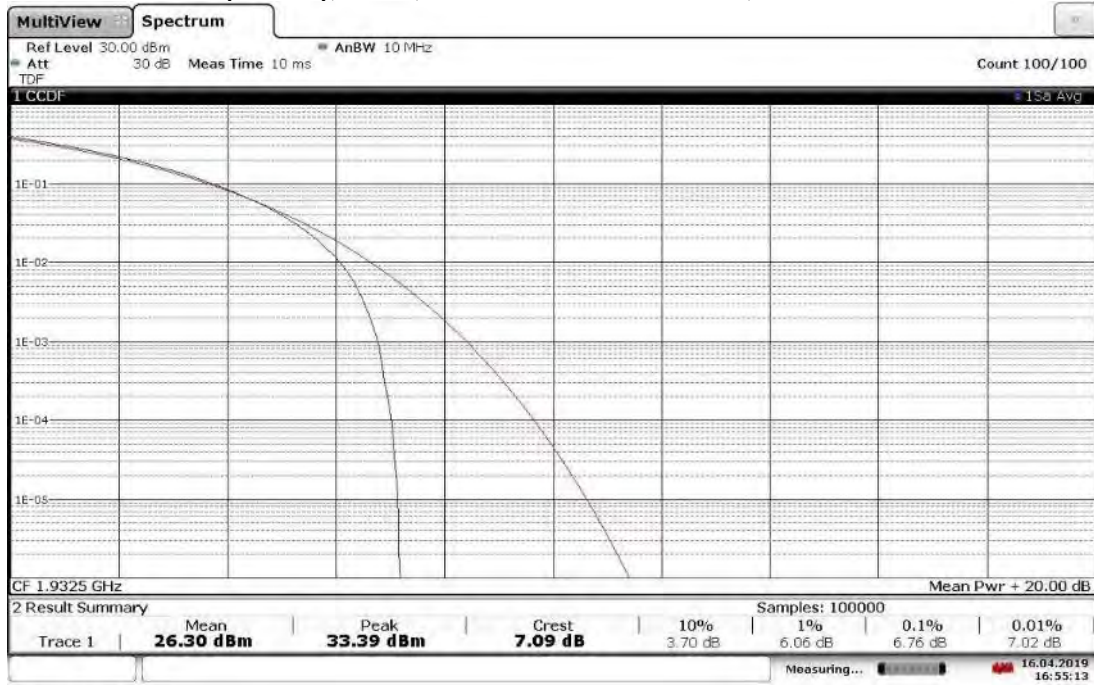
20:41:41 30.04.2019

**TM3.2 - 16QAM\_20 MHz Bandwidth  
Slot 0 (Band 2), ANT1, High Channel 1980mMHz, PAPR = 7.69 dB**



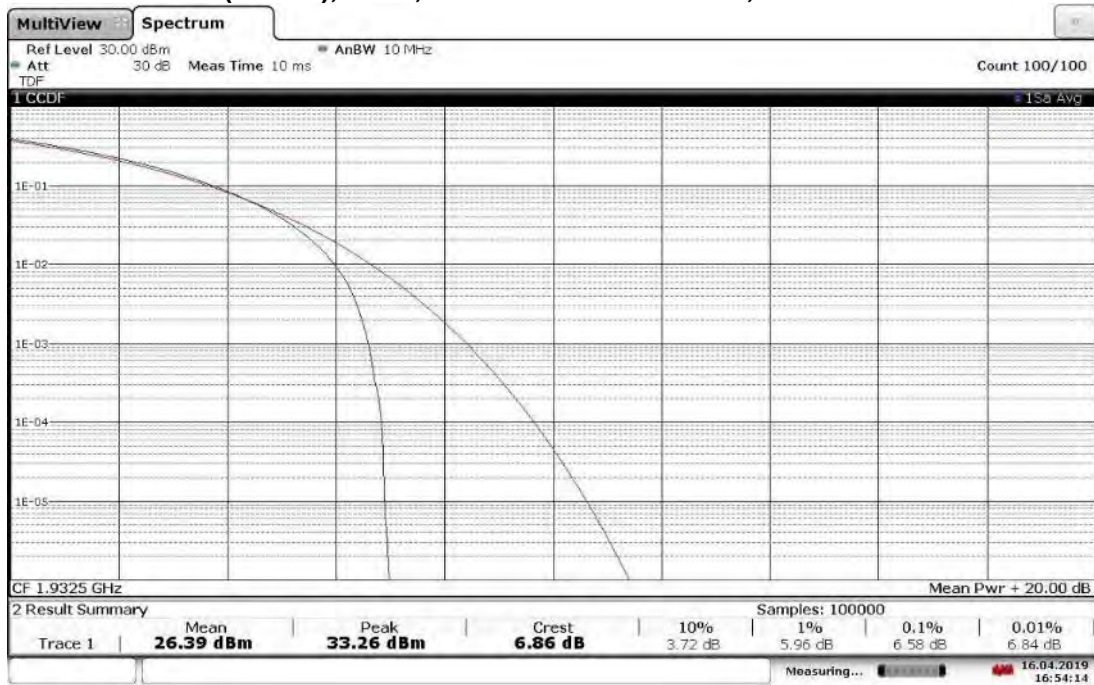
21:06:21 30.04.2019

**TM3.1-64QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1932.5 MHz, PAPR = 7.09 dB**



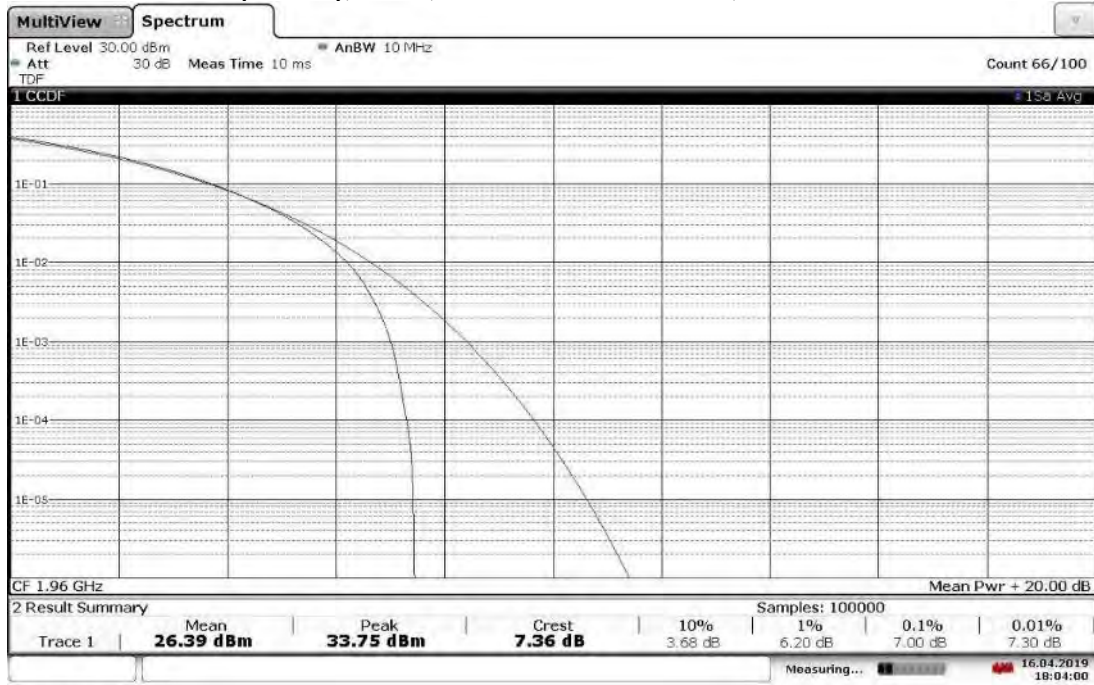
16:55:14 16.04.2019

**TM3.1-64QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1932.5 MHz, PAPR = 6.86 dB**



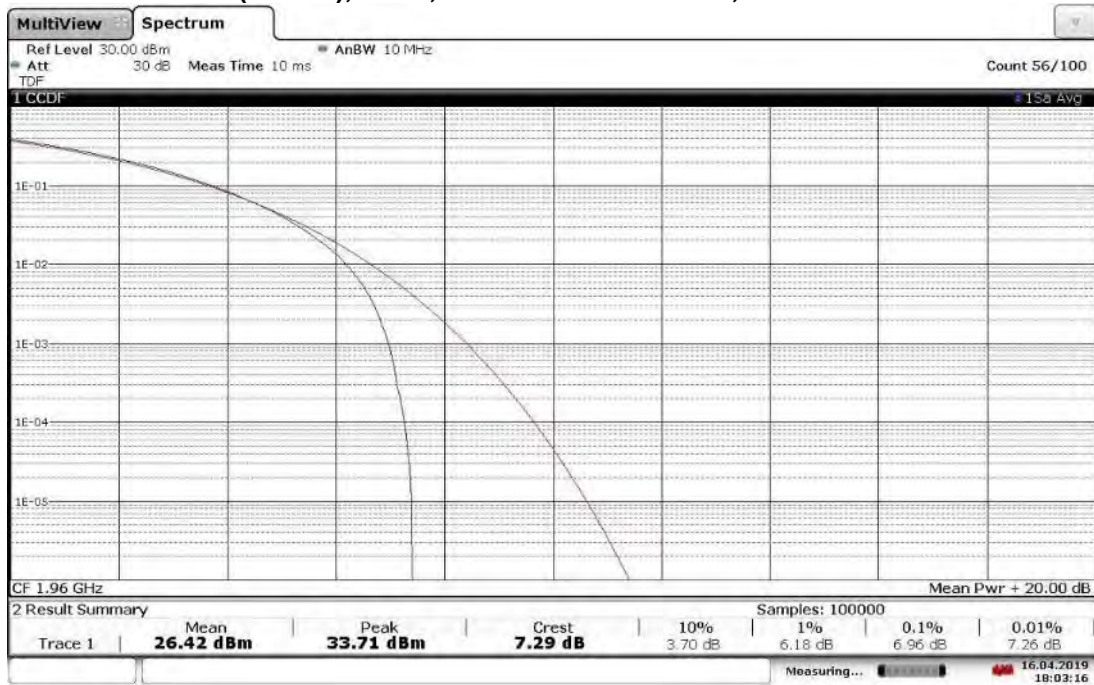
16:54:15 16.04.2019

**TM3.1-64QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, PAPR = 7.36 dB**



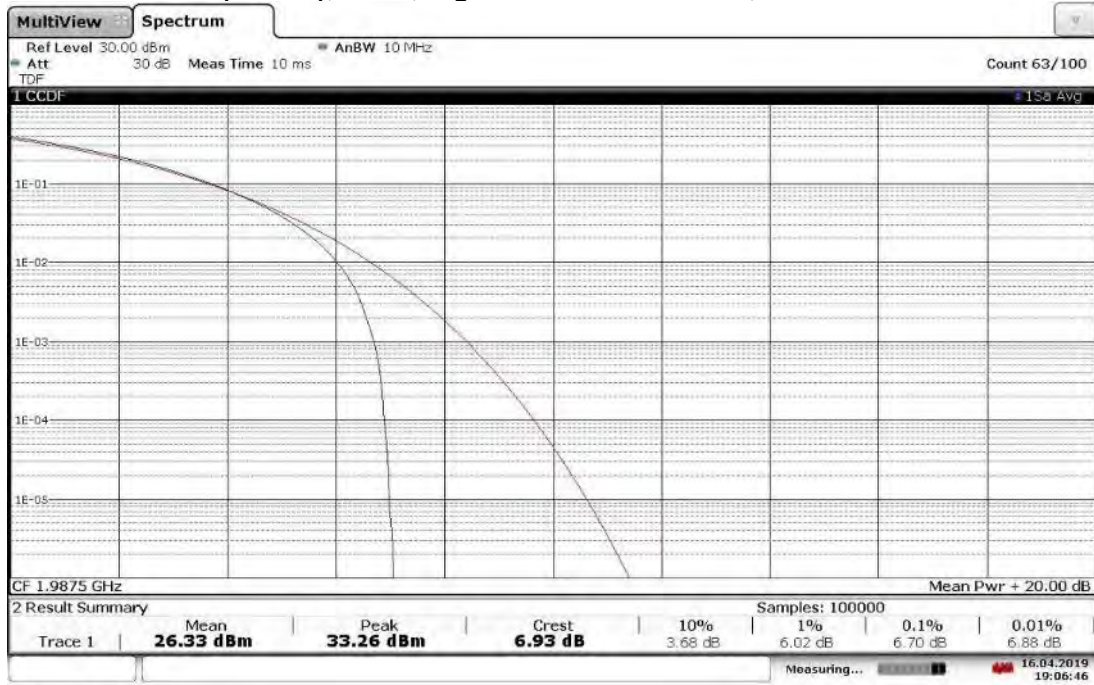
18:04:00 16.04.2019

**TM3.1-64QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, PAPR = 7.29 dB**



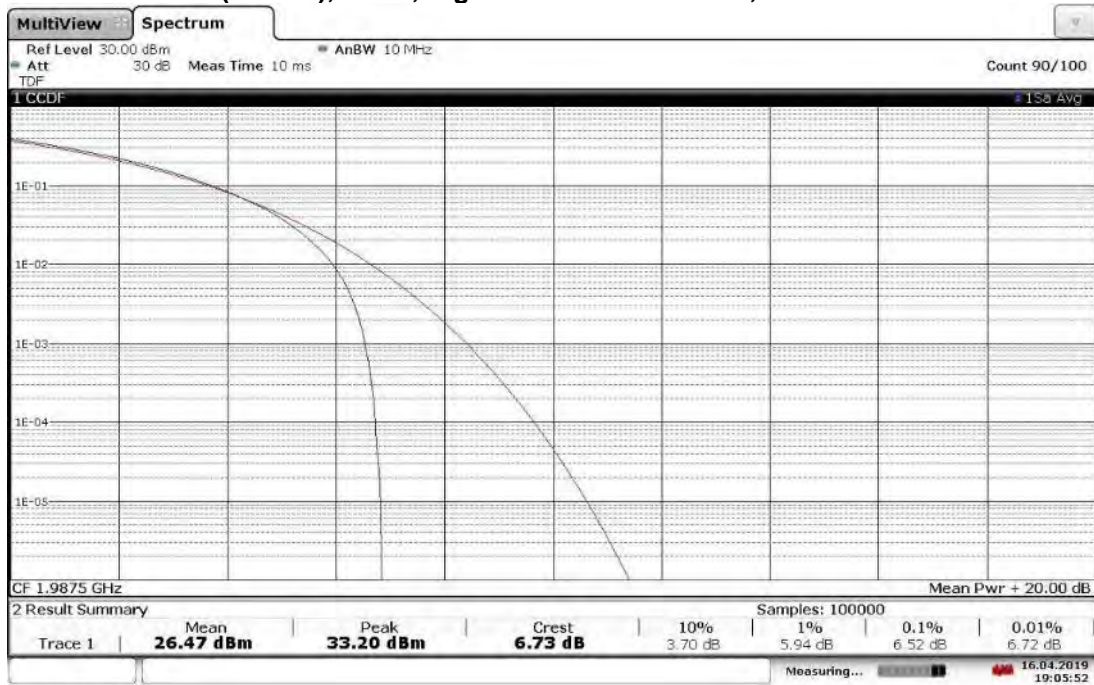
18:03:17 16.04.2019

**TM3.1-64QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, High Channel 1987.5 MHz, PAPR = 6.33 dB**



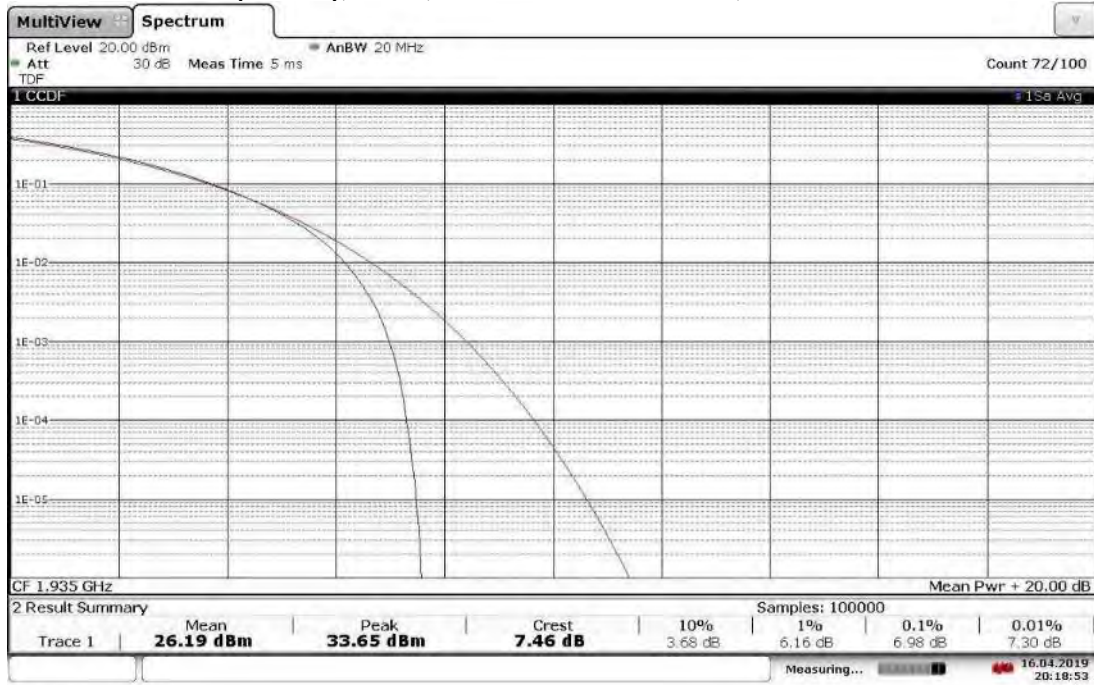
19:06:47 16.04.2019

**TM3.1-64QAM\_5MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, High Channel 1987.5 MHz, PAPR = 6.73 dB**



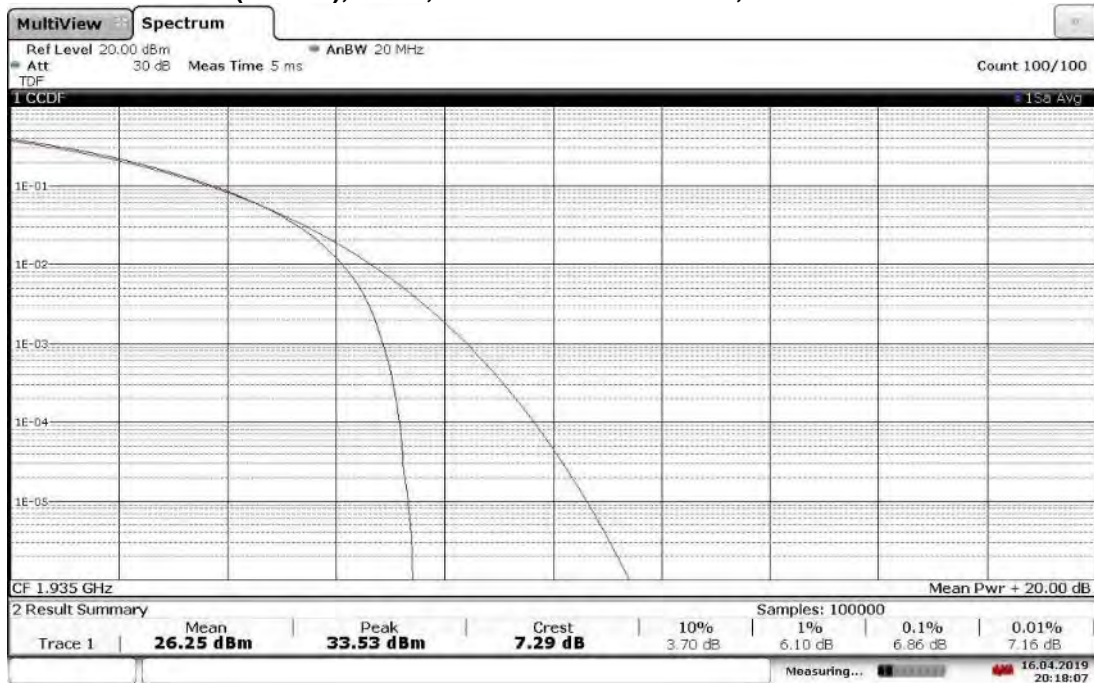
19:05:53 16.04.2019

**TM3.1-64QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Low Channel 1935 MHz, PAPR = 7.46 dB**



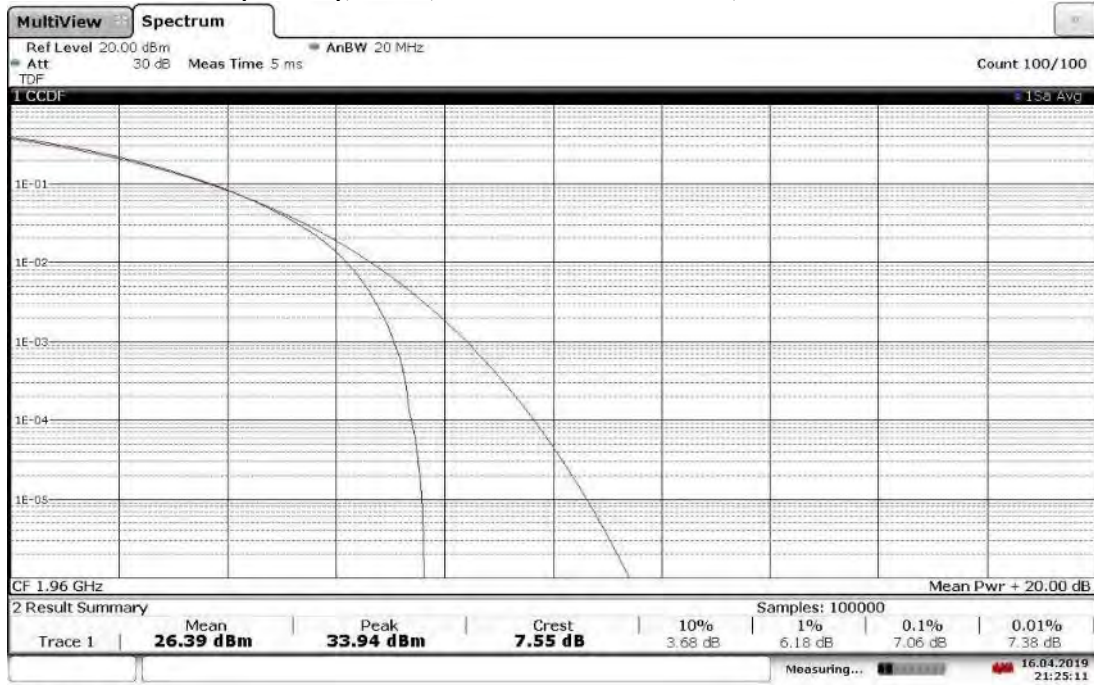
20:18:54 16.04.2019

**TM3.1-64QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Low Channel 1935 MHz, PAPR = 7.29 dB**



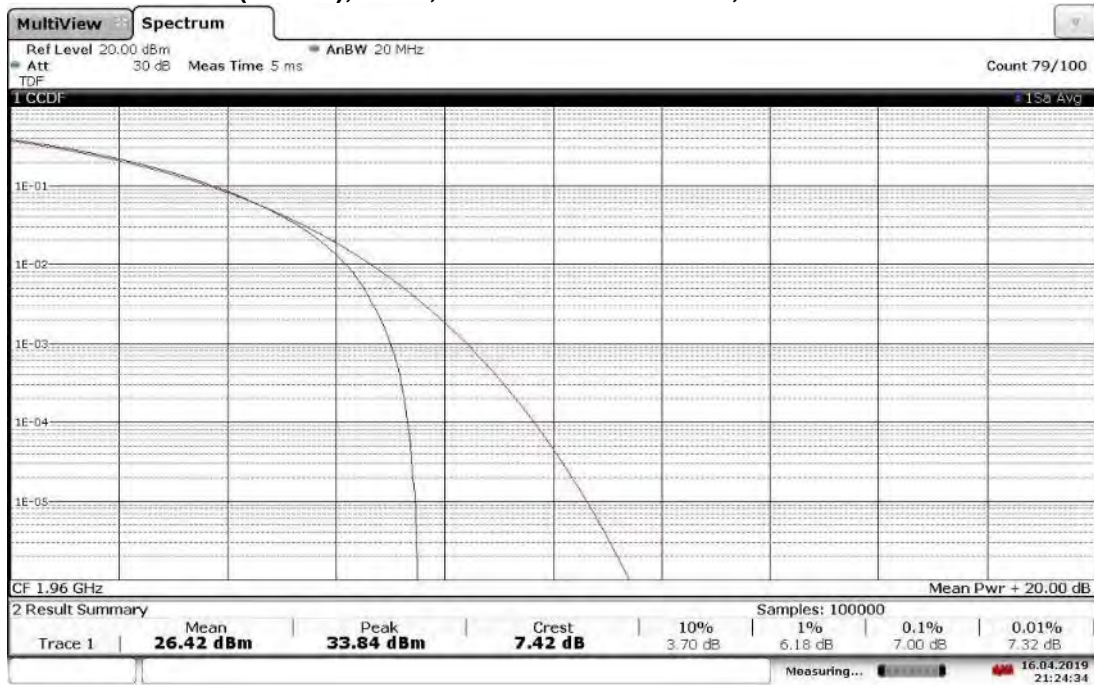
20:18:07 16.04.2019

**TM3.1-64QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT0, Mid Channel 1960 MHz, PAPR = 7.55 dB**



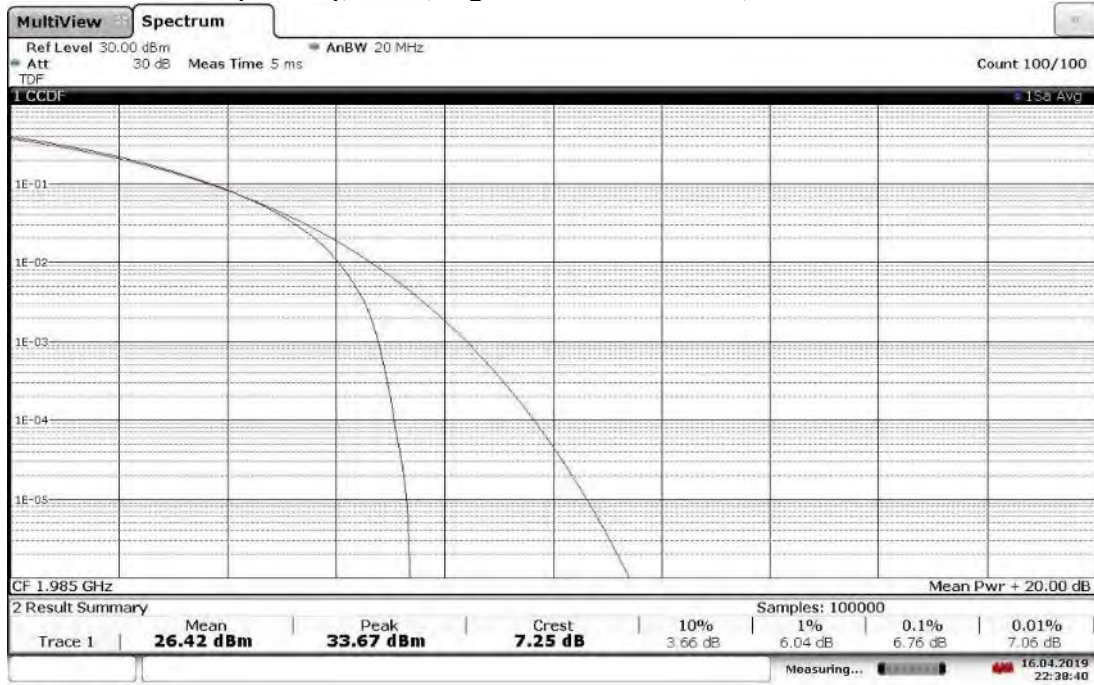
21:25:12 16.04.2019

**TM3.1-64QAM\_10 MHz Bandwidth**  
**Slot 0 (Band 2), ANT1, Mid Channel 1960 MHz, PAPR = 7.42 dB**



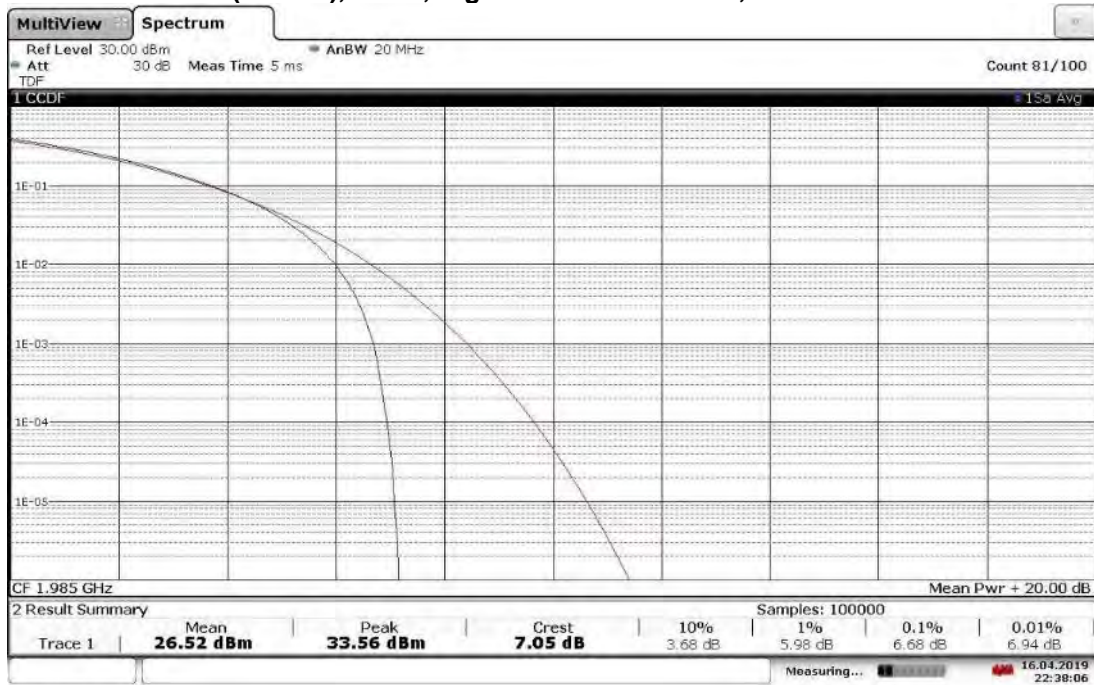
21:24:35 16.04.2019

**TM3.1-64QAM\_10 MHz Bandwidth  
Slot 0 (Band 2), ANT0, High Channel 1985 MHz, PAPR =7.25 dB**



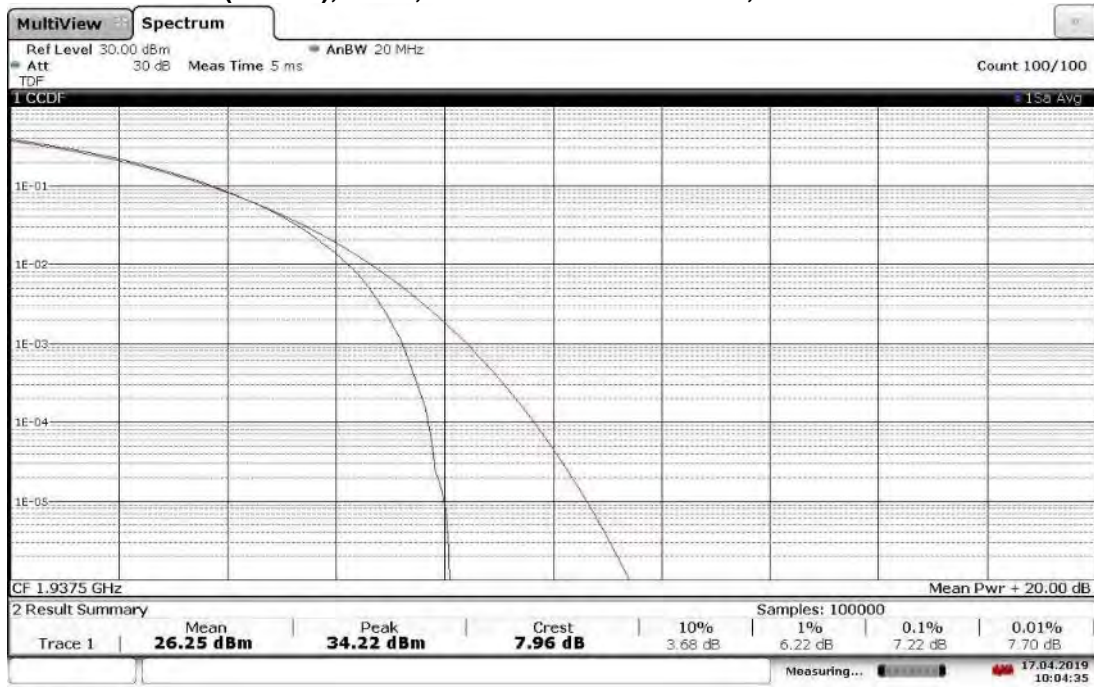
22:38:41 16.04.2019

**TM3.1-64QAM\_10 MHz Bandwidth  
Slot 0 (Band 2), ANT1, High Channel 1985 MHz, PAPR = 7.05 dB**



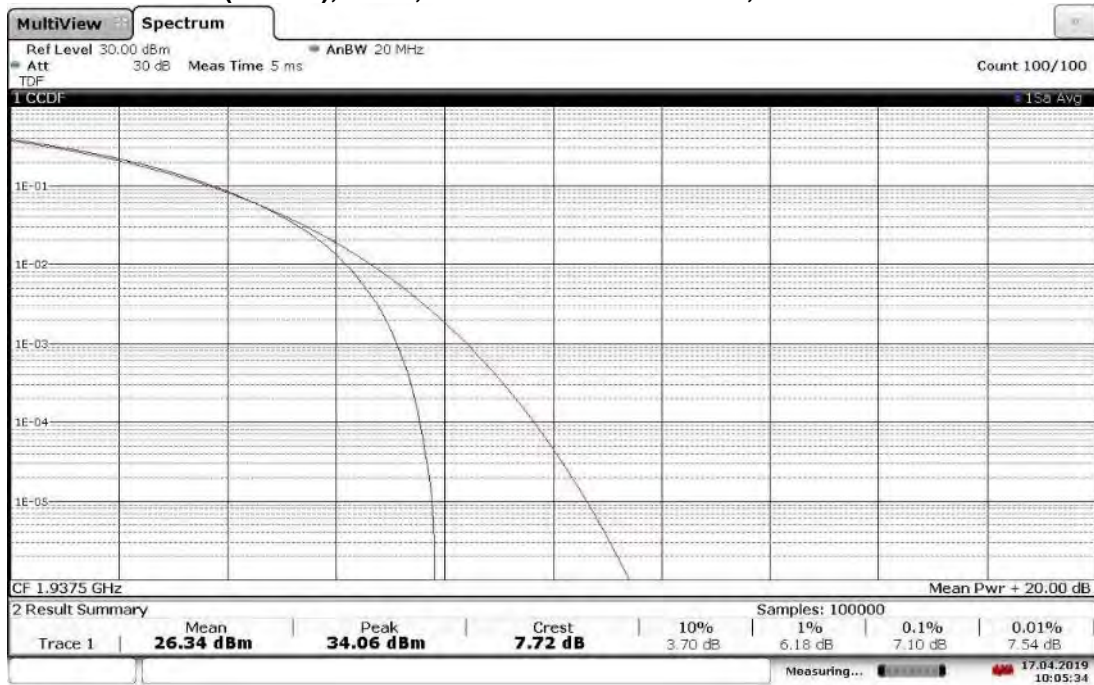
22:38:07 16.04.2019

TM3.1-64QAM\_15 MHz Bandwidth  
Slot 0 (Band 2), ANT0, Low Channel 1987.5 MHz, PAPR = 7.96 dB



10:04:36 17.04.2019

TM3.1-64QAM\_15 MHz Bandwidth  
Slot 0 (Band 2), ANT1, Low Channel 1937.5 MHz, PAPR = 7.72 dB



10:05:35 17.04.2019