

CommScope Technologies, LLC

TEST REPORT

SCOPE OF WORK

EMISSIONS TESTING – RP5000 20MHz SSA 2x2 Radio Module B30, Model: RPM-A5A11-B30

REPORT NUMBER

104326151MPK-005

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TEST REPORT
(FULL COMPLIANCE)**Report Number: 104326151MPK-005**
Project Number: G104326151**Report Issue Date: November 18, 2020****Product Designation: RP5000 20MHz SSA 2x2 Radio Module B30**
Model Tested: RPM-A5A11-B30**Standards: CFR47 FCC Part 27****FCC ID: QHYRPM-A5A11-B30****Tested by:**

Intertek Testing Services NA, Inc.
1365 Adams Court
Menlo Park, CA 94025
USA

Client:

CommScope Technologies LLC
250 Apollo Drive
Chelmsford, MA 01824
USA

Report prepared by**Minh Ly / EMC Project Engineer****Report reviewed by****Krishna Vemuri/ EMC Manager**

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Table of Contents

<i>CommScope Technologies, LLC</i>	1
1 <i>Introduction and Conclusion</i>	4
2 <i>Test Summary</i>	4
3 <i>Client Information</i>	5
4 <i>Description of Equipment Under Test and Variant Models</i>	5
5 <i>System Setup and Method</i>	7
6 <i>Equivalent Isotropically Radiated Power (EIRP)</i>	9
7 <i>Peak-to-Average Power Ratio (PAPR)</i>	29
8 <i>26 dB Bandwidth and Occupied Bandwidth</i>	49
9 <i>Band Edge Compliance</i>	85
10 <i>Frequency Stability</i>	119
11 <i>Transmitter spurious emissions</i>	124
12 <i>List of Test Equipment</i>	137
13 <i>Revision History</i>	138

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	Equivalent Isotropically Radiated Power CFR47 FCC Parts 2.1046 and 27.50	Pass
7	Peak-to-Average Power Ratio (PARR) CFR47 FCC 27.50	Pass
8	26 dB Bandwidth and Occupied Bandwidth CFR47 FCC Parts 2.1049 and 27.53	Pass
9	Band Edge Compliance CFR47 FCC 27.53	Pass
10	Frequency Stability CFR47 FCC Parts 2.1055 and 27.54	Pass
11	Transmitter Spurious Emissions CFR47 Parts 2.1051, 2.1053, 2.1057, and 27.53	Pass
12	List of Test Equipment	-
13	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: Elowra Khan
Telephone: (972) 952-9846
Fax: None
Email: Elowra.khan@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
RP5000 20MHz SSA 2x2 Radio Module B30	CommScope Technologies LLC	RPM-A5A11-B30	20303000036

Received Date:	11/02/2020	Test Started:	11/02/2020
Received Condition:	Good	Test Completed:	11/09/2020
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 an OCXO which is disciplined from a 1588 reference clock.

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

Per manufacturer, the lowest clock frequency generated in the equipment is 30.72MHz.

Description of Radio Host (provided by client)

The OneCell® RP5000 family is a 2x2 MIMO, Single band radio operating in LTE Band 30. The RP5000 supports bandwidths of 5 MHz & 10 MHz. The frequencies supported are shown in the table below:

LTE Band	Downlink	Uplink	Bandwidth DL/UL MHz	Duplex Spacing MHz	Band Gap MHz
30	2350-2360	2305-2315	10	45	35

The lowest clock frequency generated in the host is 33.33MHz.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
56 VDC	0.8 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.

Radio/Receiver Characteristics	
Frequency Band(s)	2350 - 2360 MHz
Modulation Type(s)	TM1.1-QPSK, TM3.2-16QAM, TM3.1-64 QAM, TM3.1a-256QAM
Maximum Output Power (conducted)	20.99 dBm (Conducted) 25.99 dBd (EIRP)
Test Channels	Low, Middle, High Channels of 5 MHz and 10 MHz Bandwidths, Single Channel operation only
Occupied Bandwidth	9.95 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: +5 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)	3.0	Unshielded	None	POE P/S
--	LAN (Communication)	3.0	Unshielded	None	Laptop

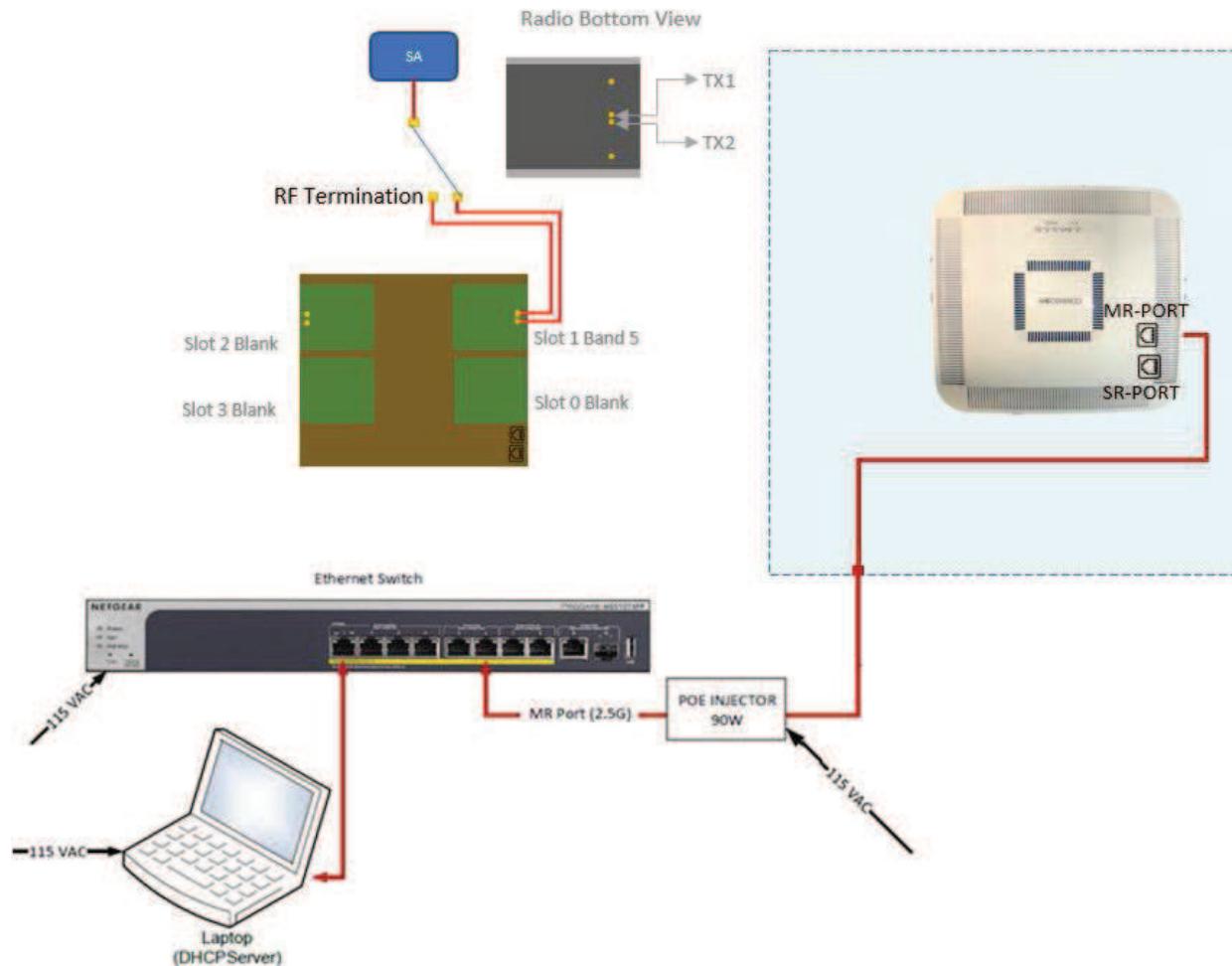
Support Equipment				
Description	Manufacturer	Model Number	Serial Number	
POE Injector	Phihong	POE90U-18T	N/A	
Laptop	Dell	LATITUDE E6440	None	
Smart switch	Netgear	ProSafe MS510TX	50A17A7H8024A	
Power Device Analyzer	Sifos Technologies	PDA-604A	604A0033	
OneCell® RP5000*	CommScope Technologies LLC	RP-A51xxi	None	

*Radio host used for testing

5.1 Method:

Configuration as required by ANSI C63.26-2015, and CFR47 FCC Part 27.

5.2 EUT Block Diagram:



6 Equivalent Isotropically Radiated Power (EIRP)

6.1 Requirement:

§27.50(a) The EIRP of base stations transmitting in the 2305-2315 MHz band or the 2350 – 2360 MHz band must not exceed:

- 400 watts within any 1 megahertz of authorized bandwidth.
- 2000 watts within any 5 megahertz of authorized bandwidth.

6.2 Procedure:

The procedure described in FCC Publication 971168 D01 Power Meas License Digital Systems v03r01 was used. Tests are performed in accordance with ANSI C63.26 Section 5.2.4.4.1 and CFR47 FCC Parts 2.1046.

A spectrum analyzer was connected to the antenna port of the transmitter and the average power was measured using the average power function. Output power from the two antenna ports was not summed since the data streams are uncorrelated and the antennas are cross polarized.

EIRP = Conducted Output Power (dBm) + Antenna gain (dBi)

6.3 Results:

The maximum conducted output power was measured to be 20.99 dBm, which is much less than the ERP limit. The sample tested was found to Comply.

Band 30, Bandwidth: 5 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)	EIRP (dBm)
Low	2352.5	ANT0	20.78	25.78
		ANT1	20.10	25.10
Mid	2355.0	ANT0	20.79	25.79
		ANT1	20.52	25.52
High	2357.5	ANT0	20.99	25.99
		ANT1	20.39	25.39

Band 30, Bandwidth: 5 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)	EIRP (dBm)
Low	2352.5	ANT0	20.64	25.64
		ANT1	20.13	25.13
Mid	2355.0	ANT0	20.77	25.77
		ANT1	20.15	25.15
High	2357.5	ANT0	20.59	25.59
		ANT1	20.24	25.24

Band 30, Bandwidth: 5 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)	EIRP (dBm)
Low	2352.5	ANT0	20.84	25.84
		ANT1	20.04	25.04
Mid	2355.0	ANT0	20.74	25.74
		ANT1	20.19	25.19
High	2357.5	ANT0	20.83	25.83
		ANT1	20.31	25.31

Band 30, Bandwidth: 5 MHz, Modulation: TM3.1a-256QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)	EIRP (dBm)
Low	2352.5	ANT0	20.58	25.58
		ANT1	19.93	24.93
Mid	2355.0	ANT0	20.99	25.99
		ANT1	20.35	25.35
High	2357.5	ANT0	20.83	25.83
		ANT1	20.37	25.37

*Worst case E.R.P (highest level) = 20.99 + 5.0 = 25.99 dBm

Band 30, Bandwidth: 10 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)	ERP (dBm)
--	2355.0	ANT0	20.84	25.84
		ANT1	20.26	25.26

Band 30, Bandwidth: 10 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)	ERP (dBm)
--	2355.0	ANT0	20.74	25.74
		ANT1	20.23	25.23

Band 30, Bandwidth: 10 MHz, Modulation: TM3.1-64QAM

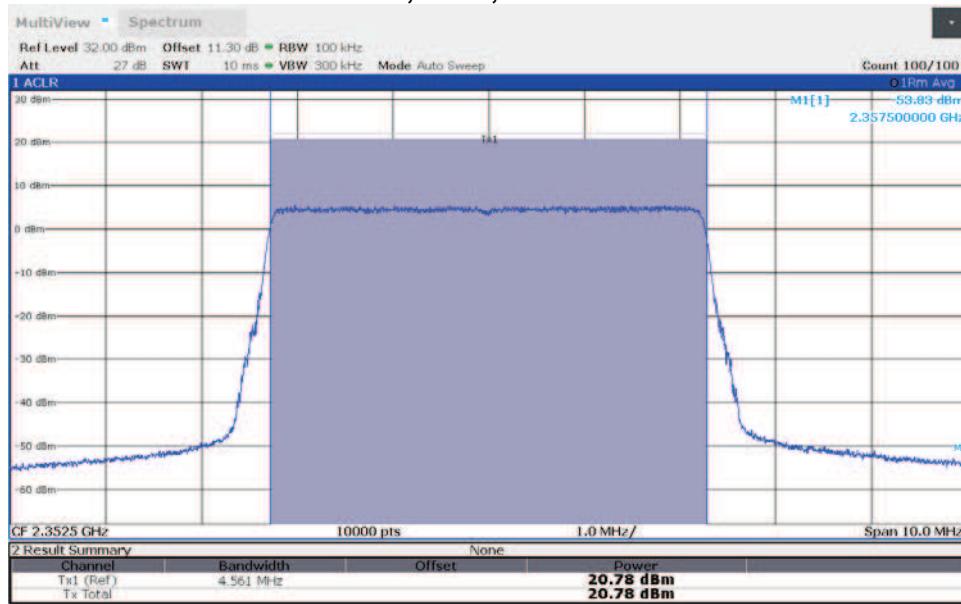
Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)	ERP (dBm)
--	2355.0	ANT0	20.74	25.74
		ANT1	20.40	25.40

Band 30, Bandwidth: 10 MHz, Modulation: TM3.1a-256QAM

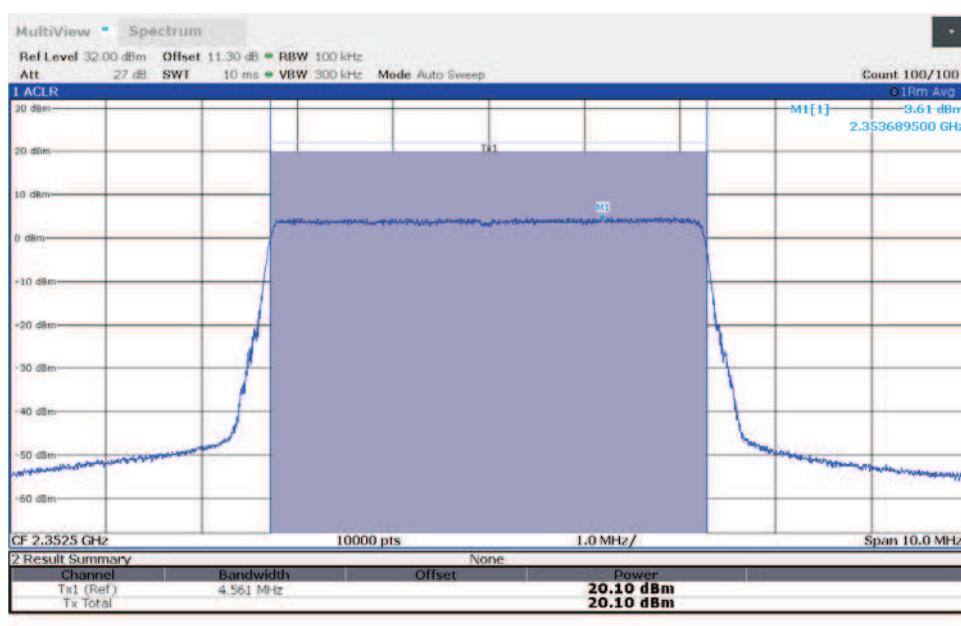
Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)	ERP (dBm)
--	2355.0	ANT0	20.81	25.81
		ANT1	20.27	25.27

*Worst case E.R.P (highest level) = 20.84 + 5.0 = 25.84 dBm

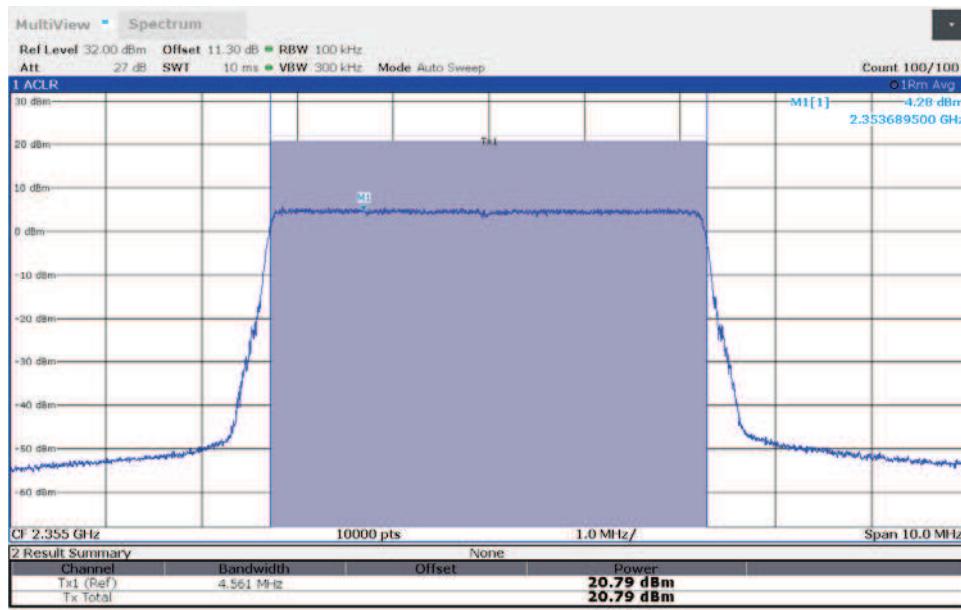
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Band 30, ANT0, Low Channel**



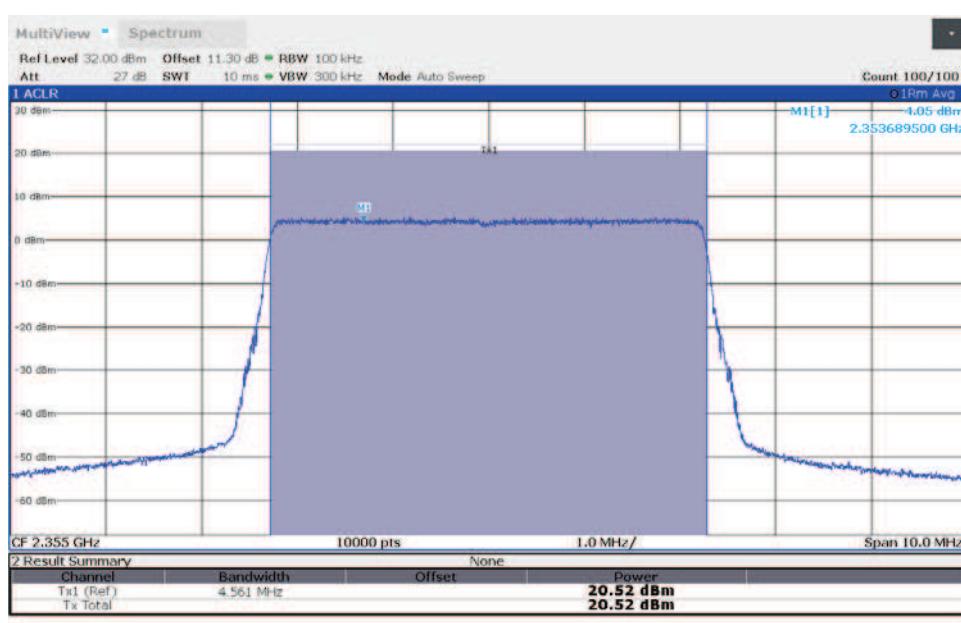
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Band 30, ANT1, Low Channel**



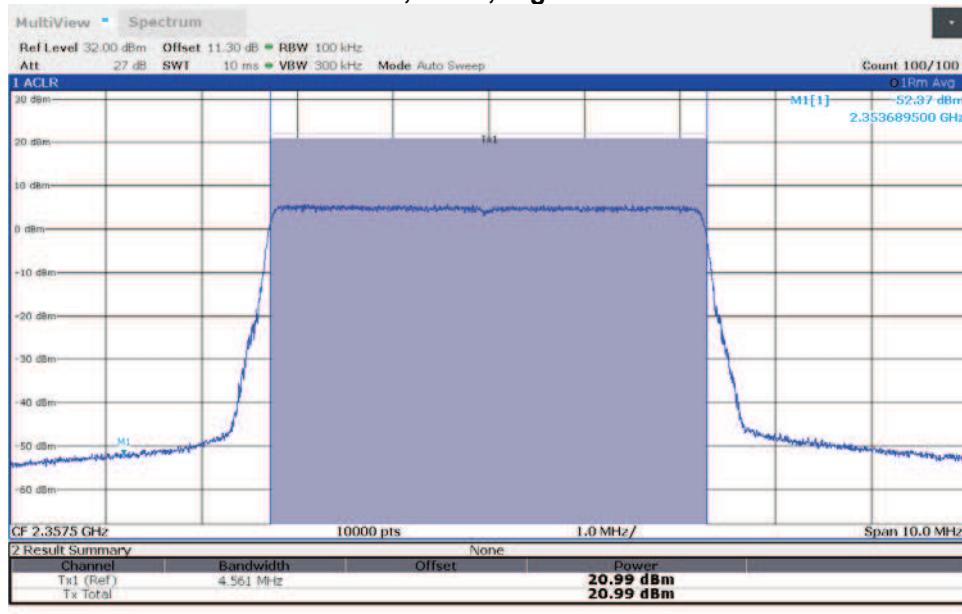
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Band 30, ANT0, Mid Channel**



**TM1.1-QPSK_5 MHz Bandwidth
Band 30, ANT1, Mid Channel**

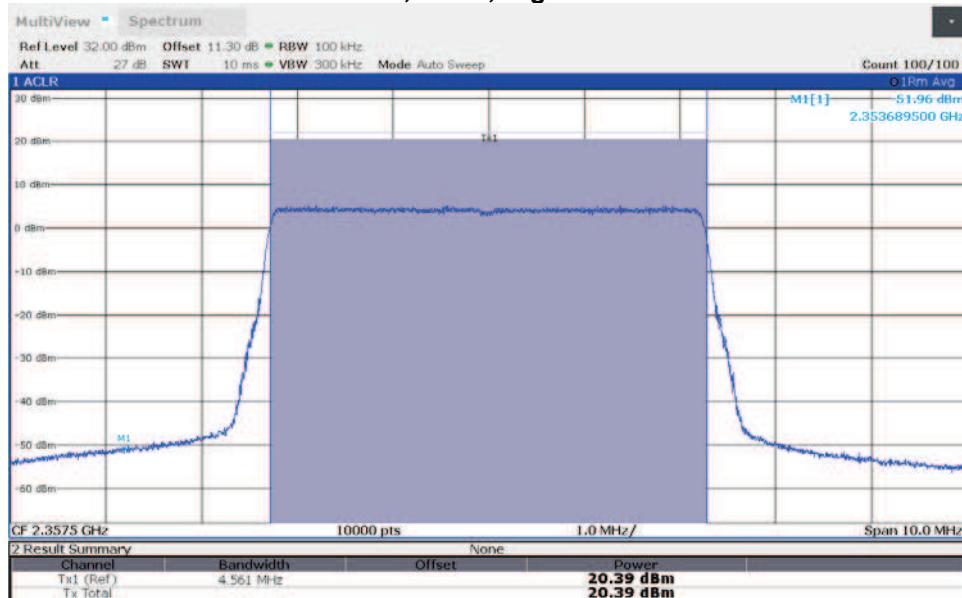


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Band 30, ANT0, High Channel**



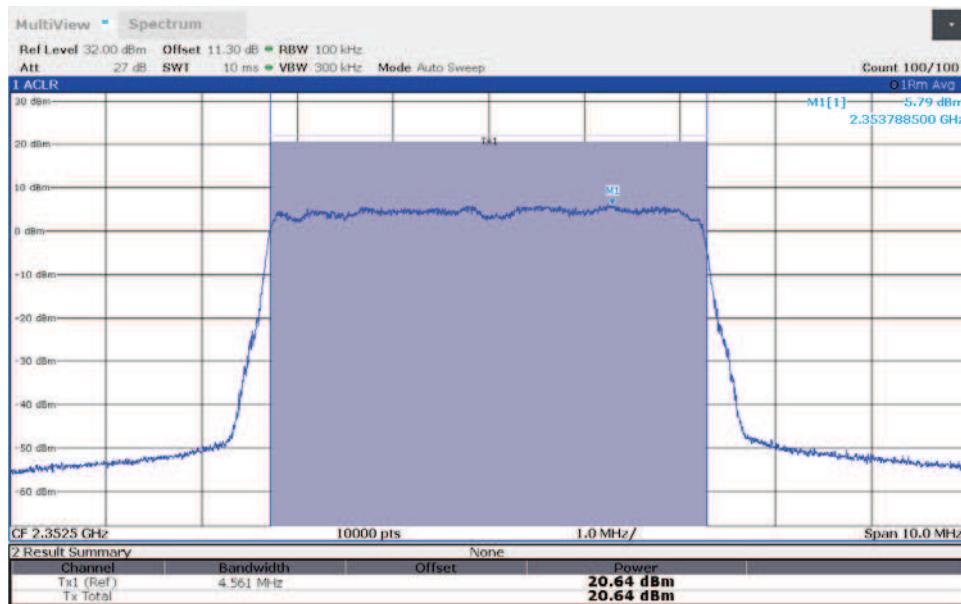
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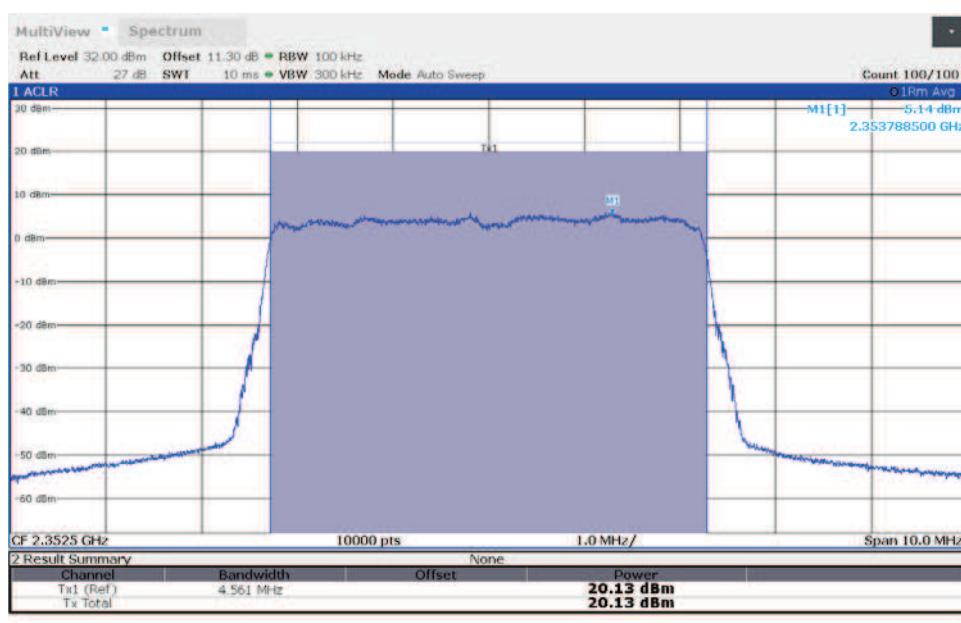


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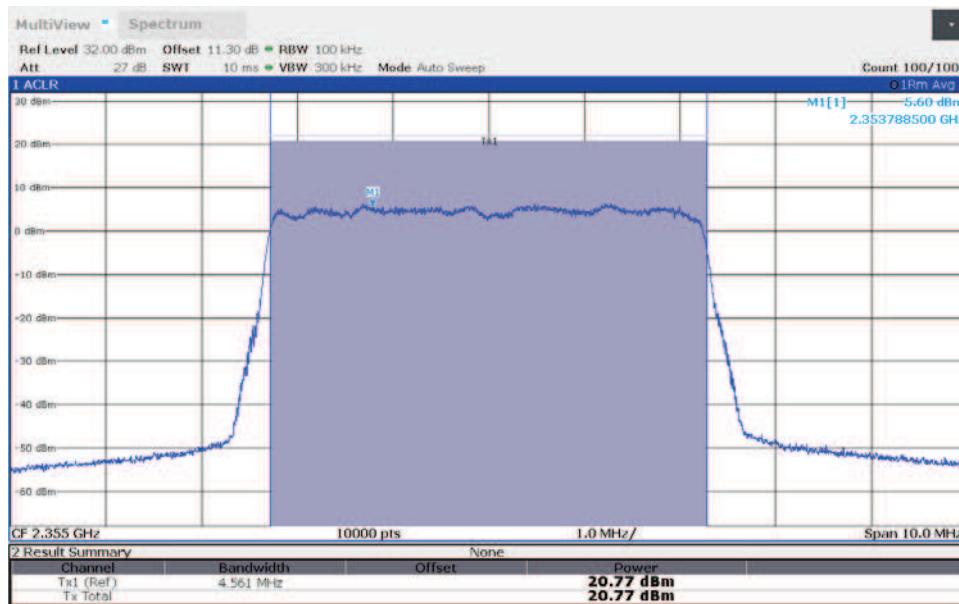
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Band 30, ANT0, Low Channel**



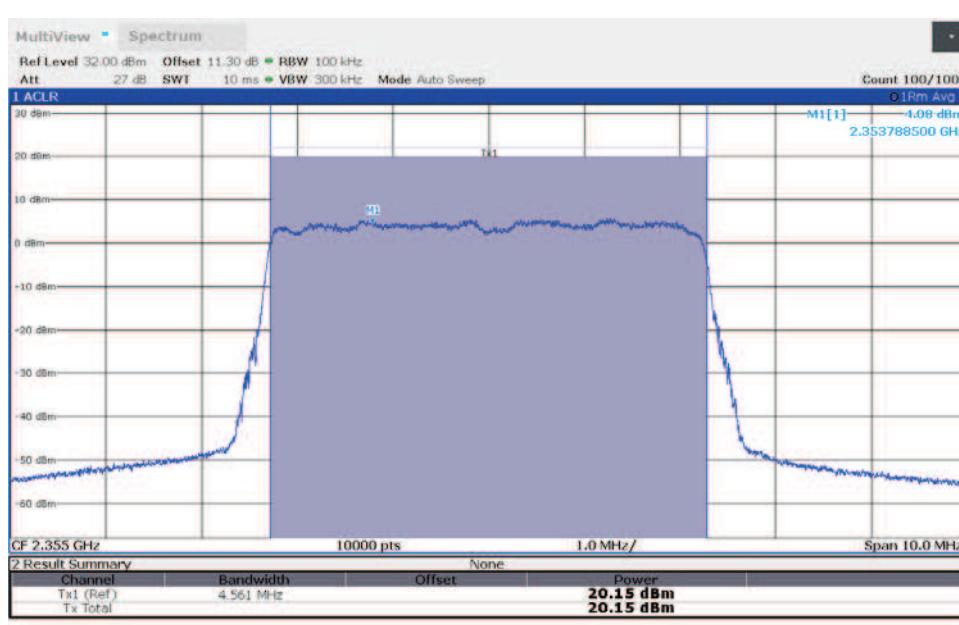
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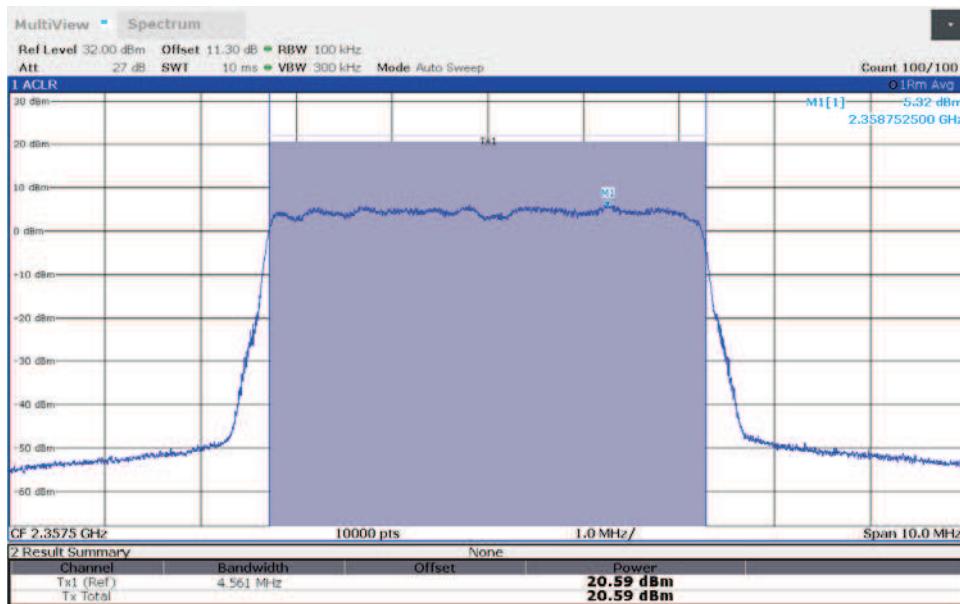
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Band 30, ANT0, Mid Channel**



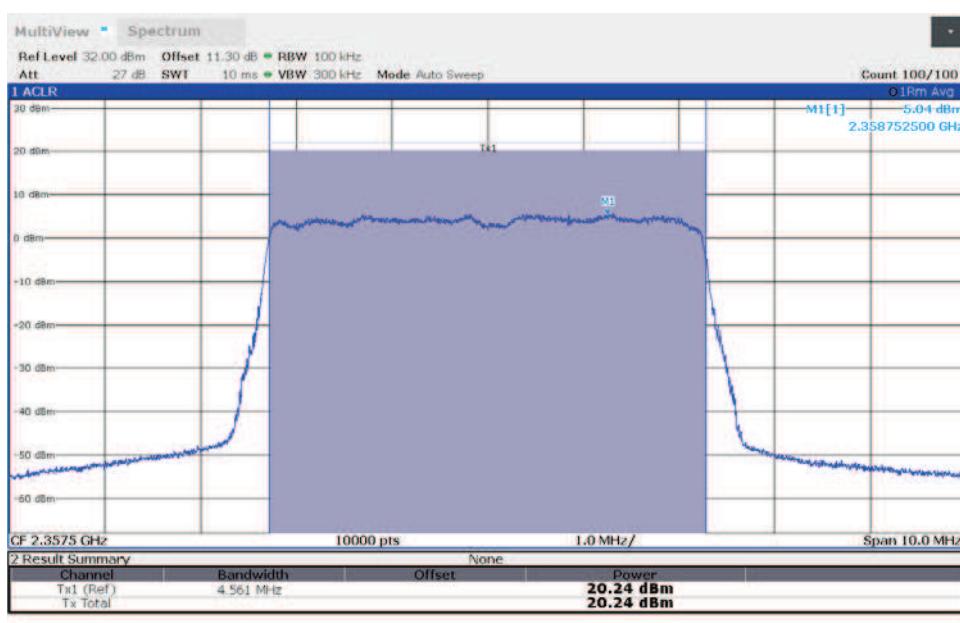
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Band 30, ANT1, Mid Channel**



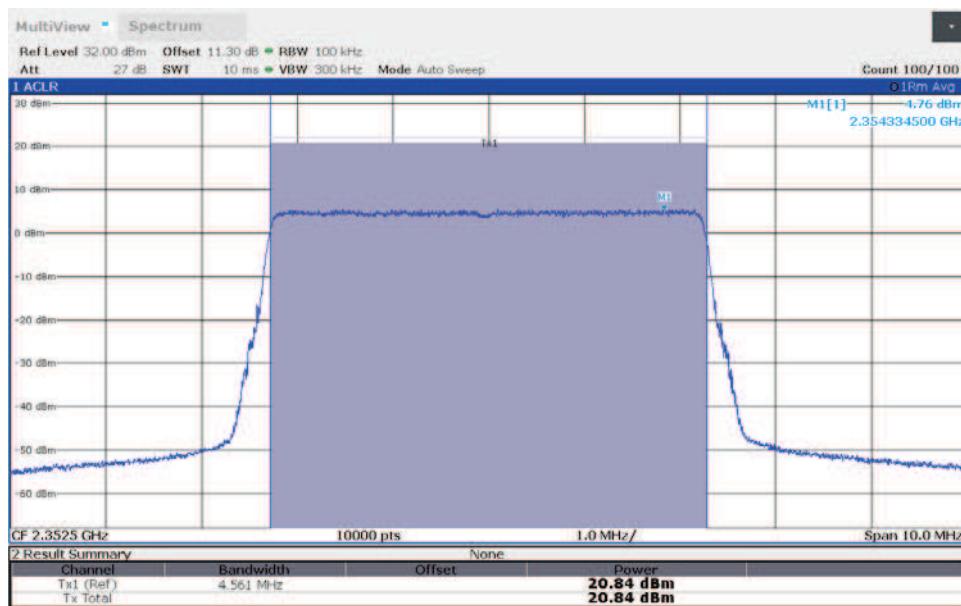
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Band 30, ANT0, High Channel**



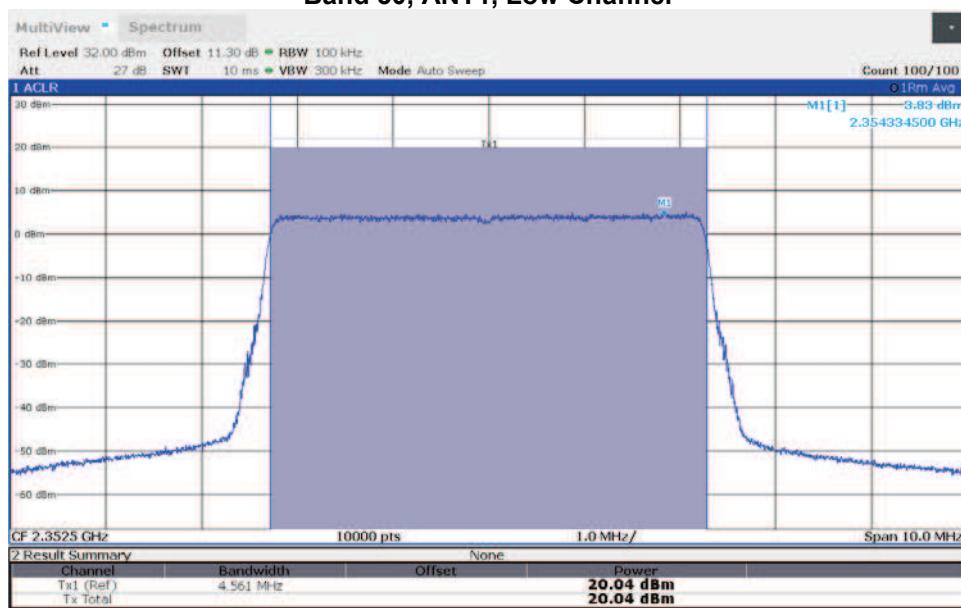
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Band 30, ANT1, High Channel**



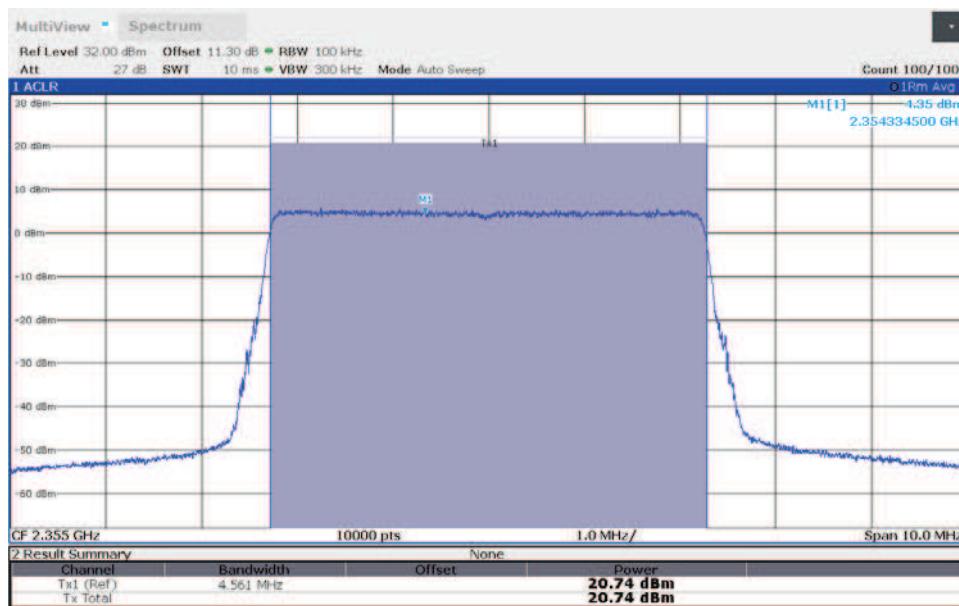
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Band 30, ANT0, Low Channel**



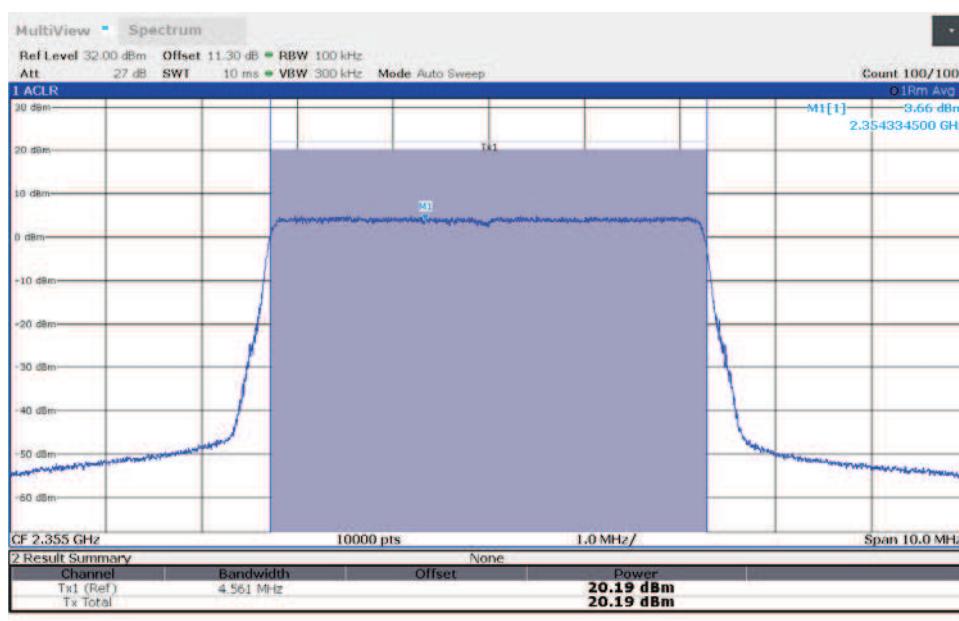
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Band 30, ANT1, Low Channel**



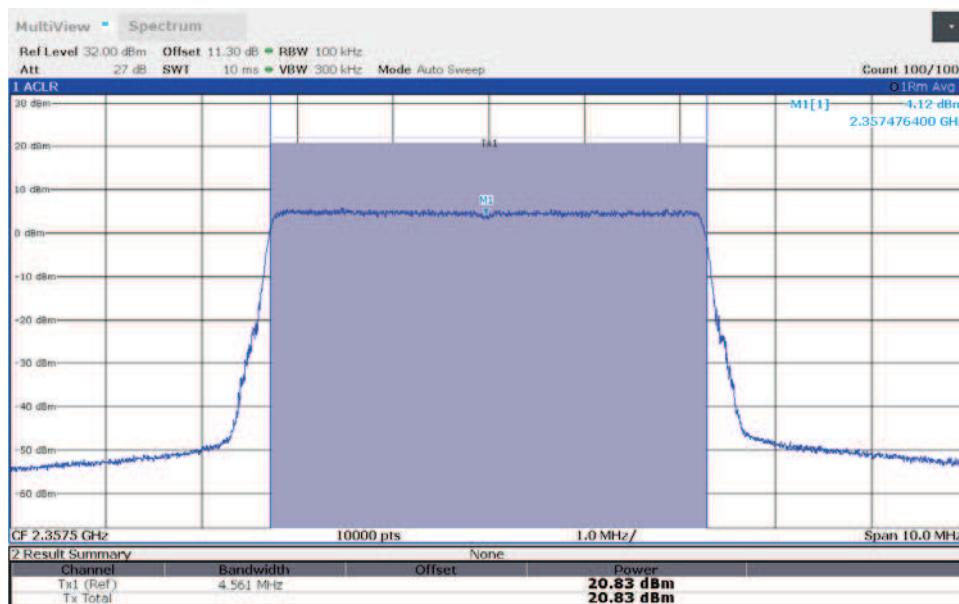
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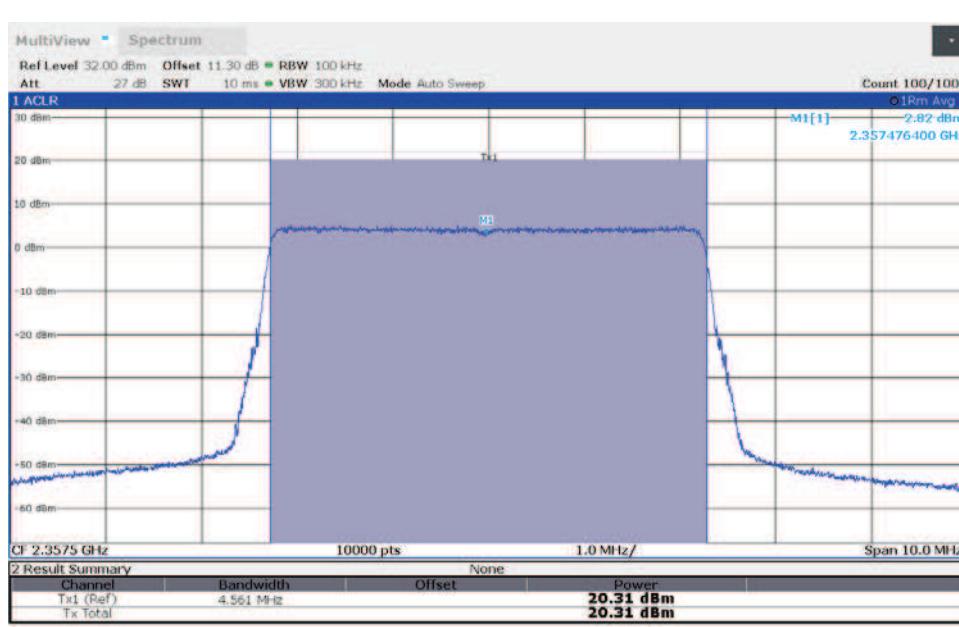
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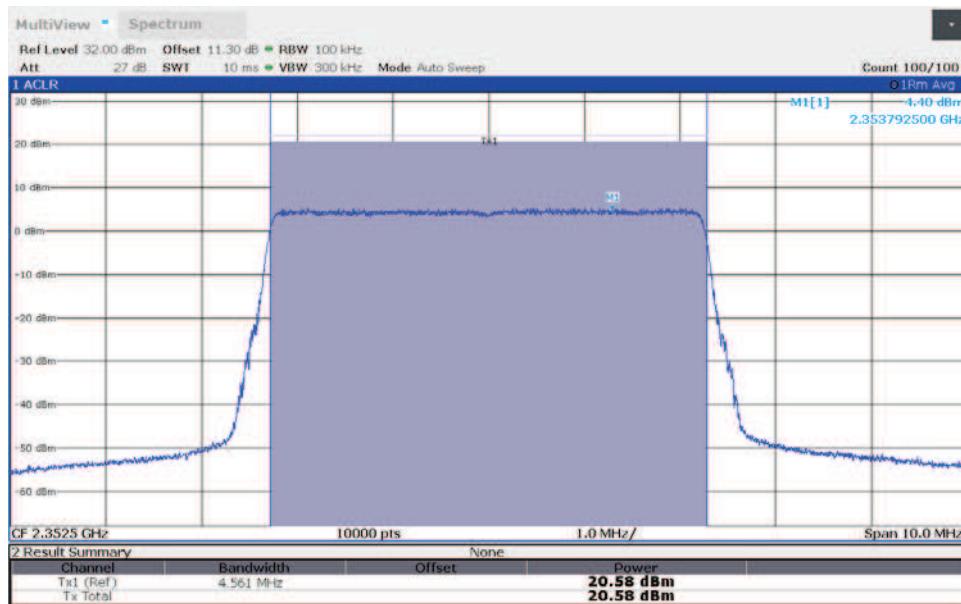
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Band 30, ANT0, High Channel**



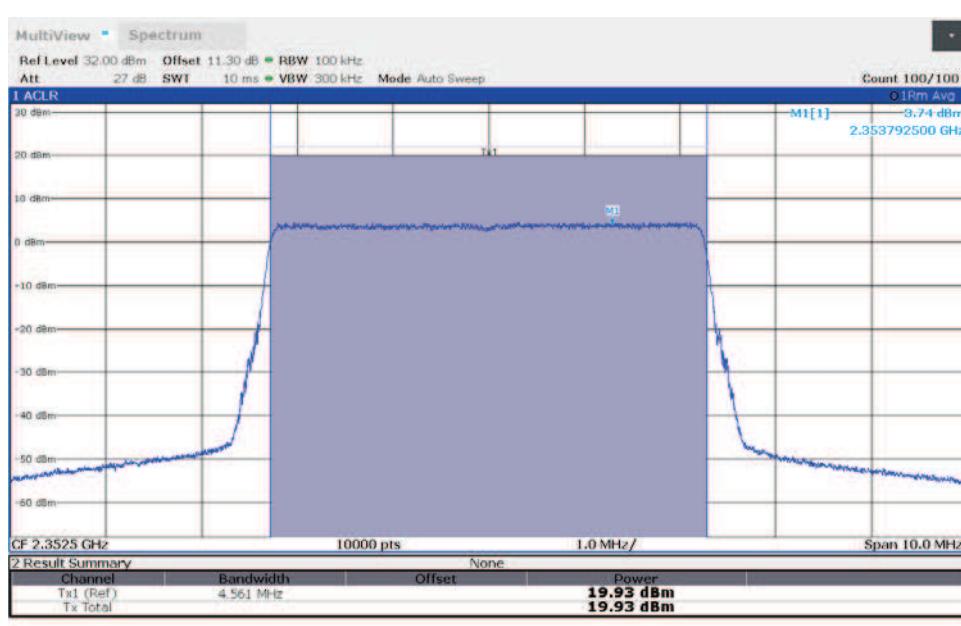
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Band 30, ANT1, High Channel**



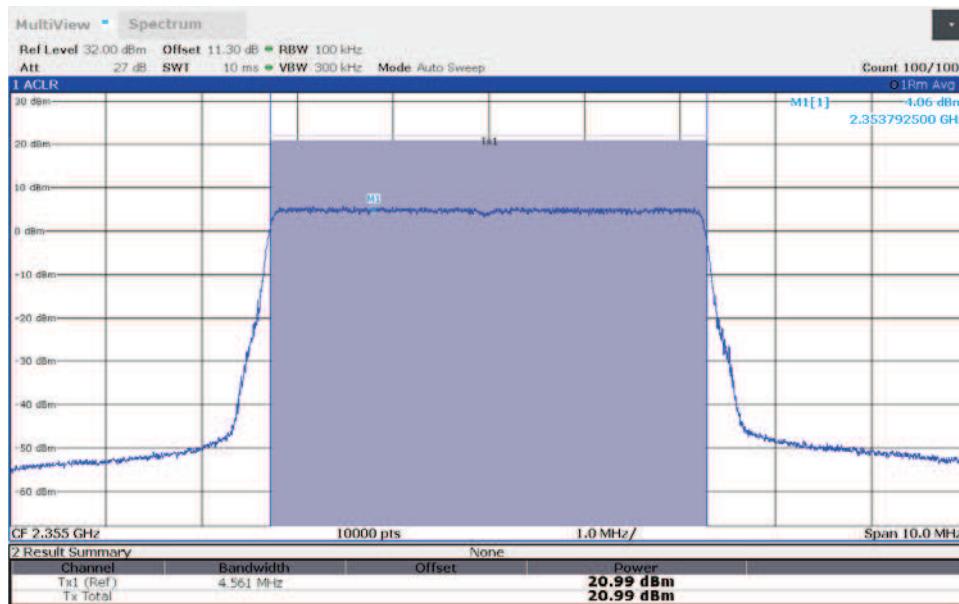
**TM3.1a-256QAM_5 MHz Bandwidth
Band 30, ANT0, Low Channel**



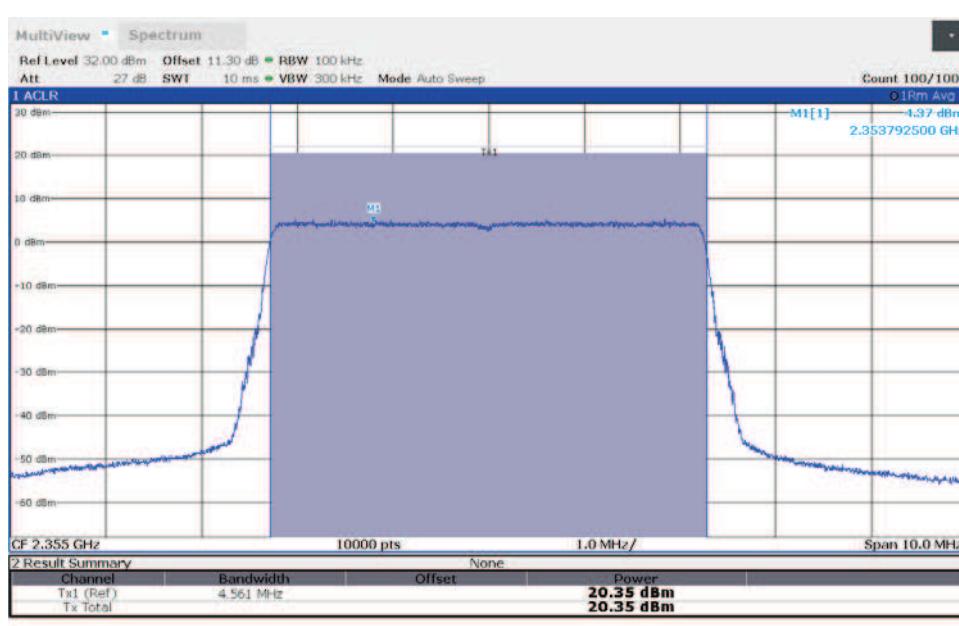
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Band 30, ANT1, Low Channel**



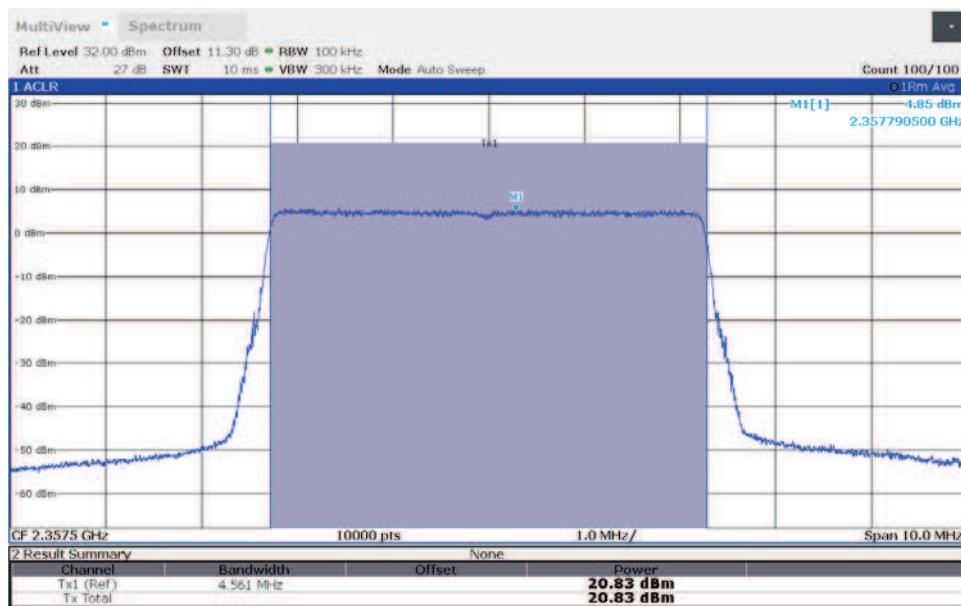
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Band 30, ANT0, Mid Channel**



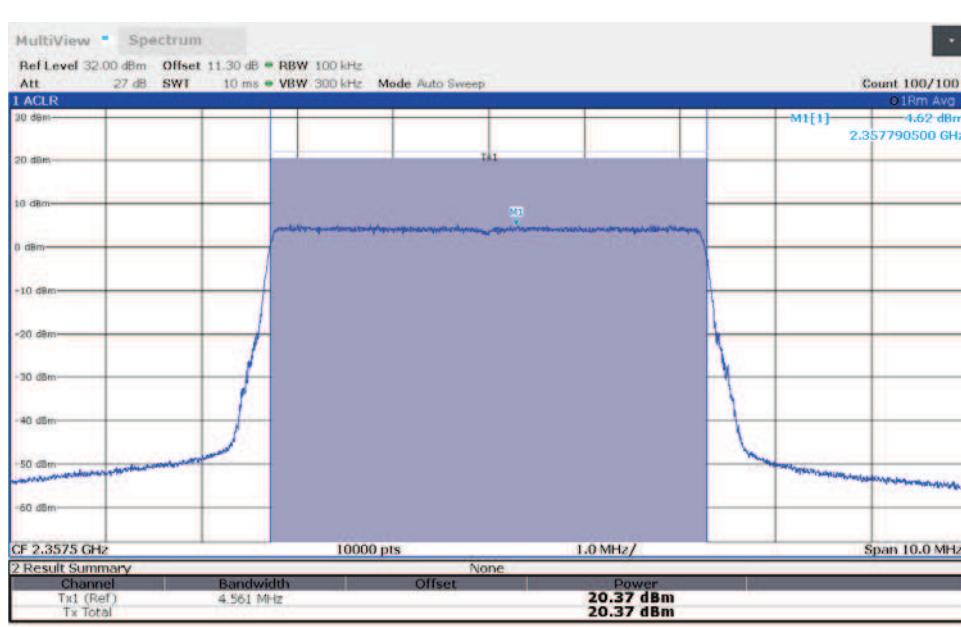
**TM3.1a-256QAM_5 MHz Bandwidth
Band 30, ANT1, Mid Channel**



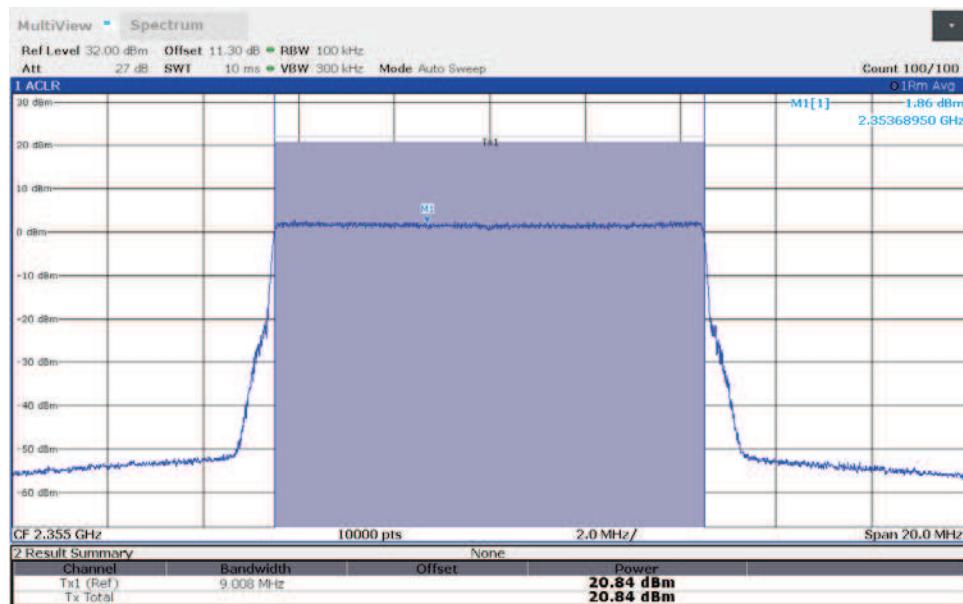
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Band 30, ANT0, High Channel**



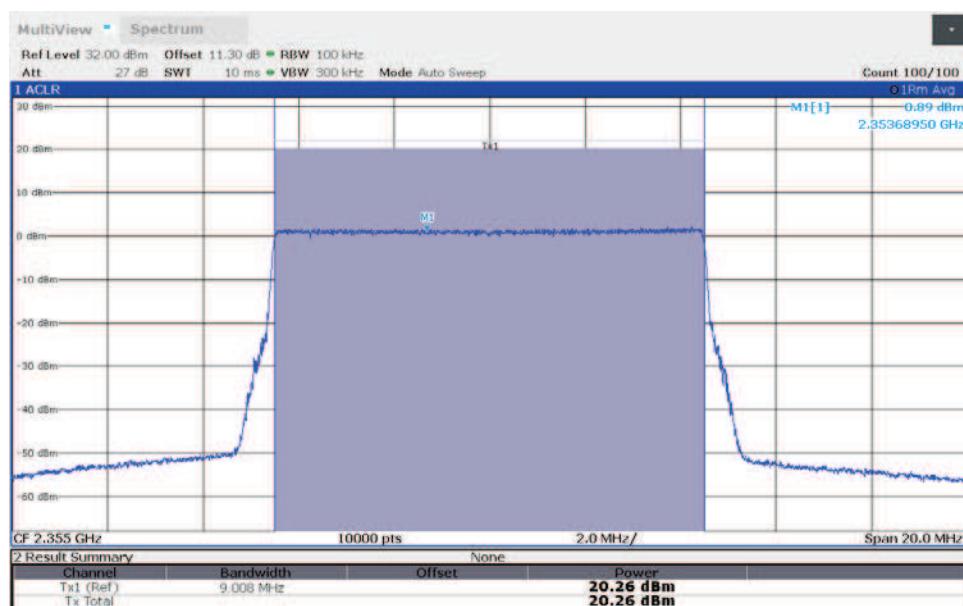
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Band 30, ANT1, High Channel**



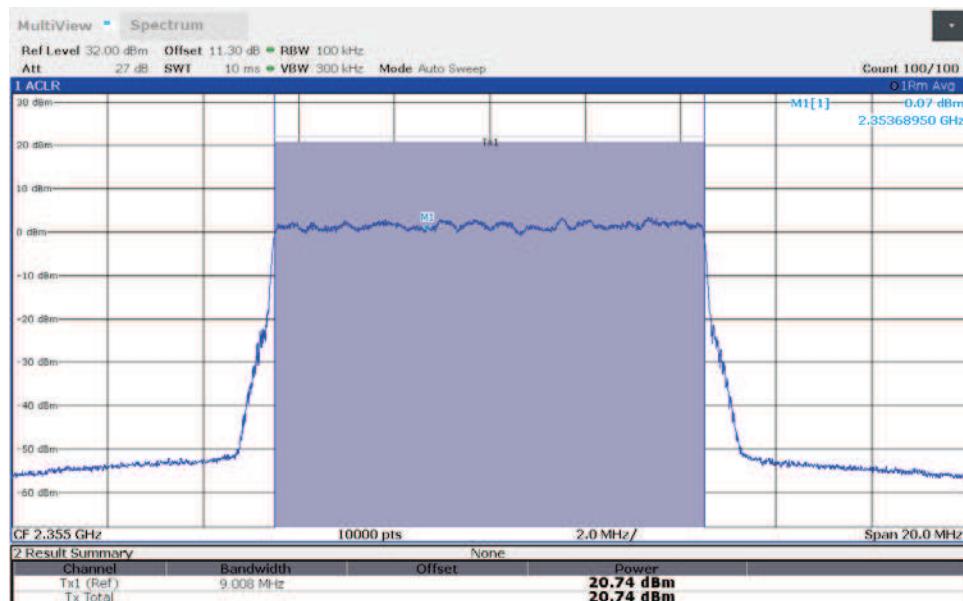
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Band 30, ANT0**



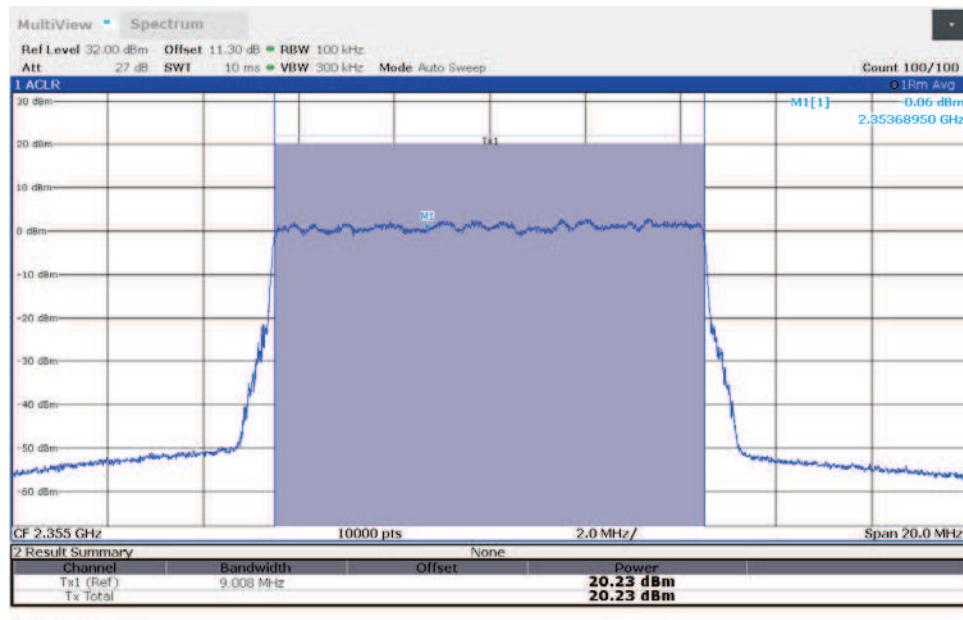
**TM1.1-QPSK_10 MHz Bandwidth
Band 30, ANT1**



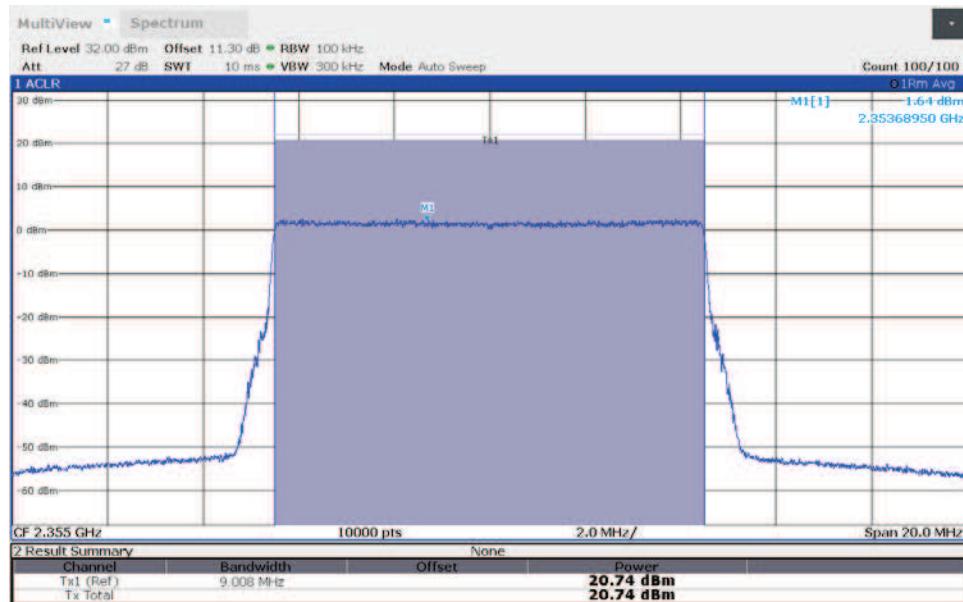
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Band 30, ANT0**



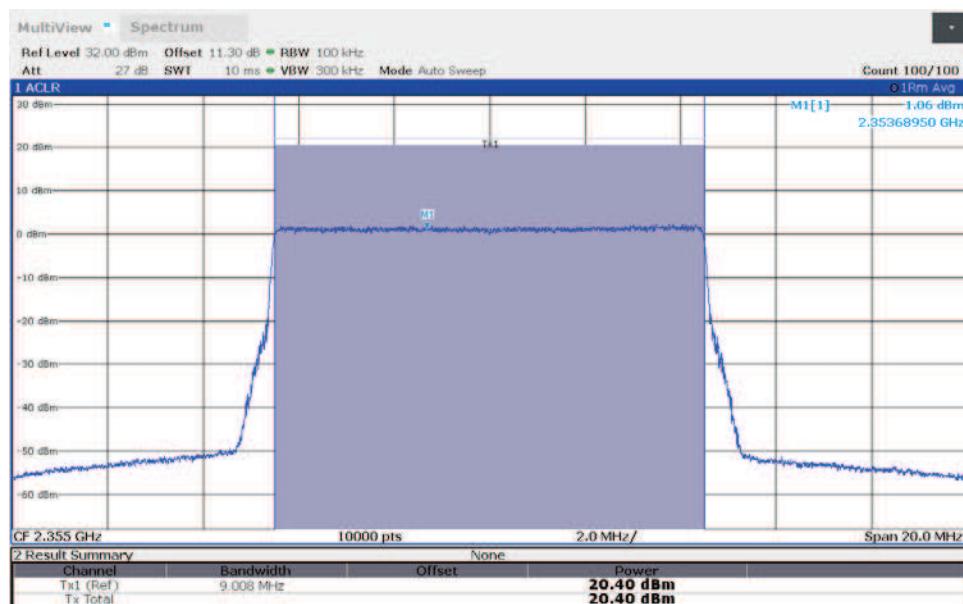
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Band 30, ANT1**



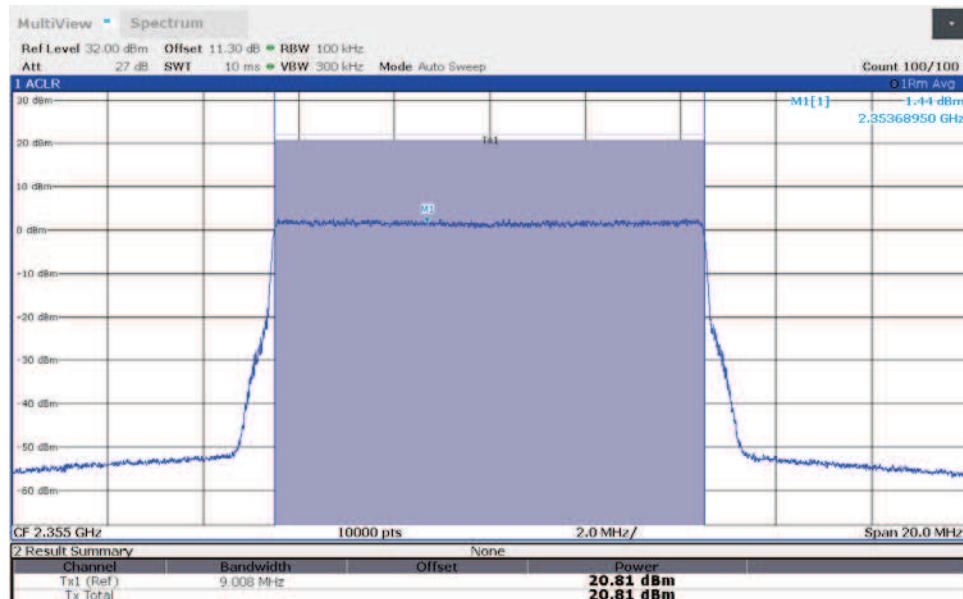
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Band 30, ANT0**



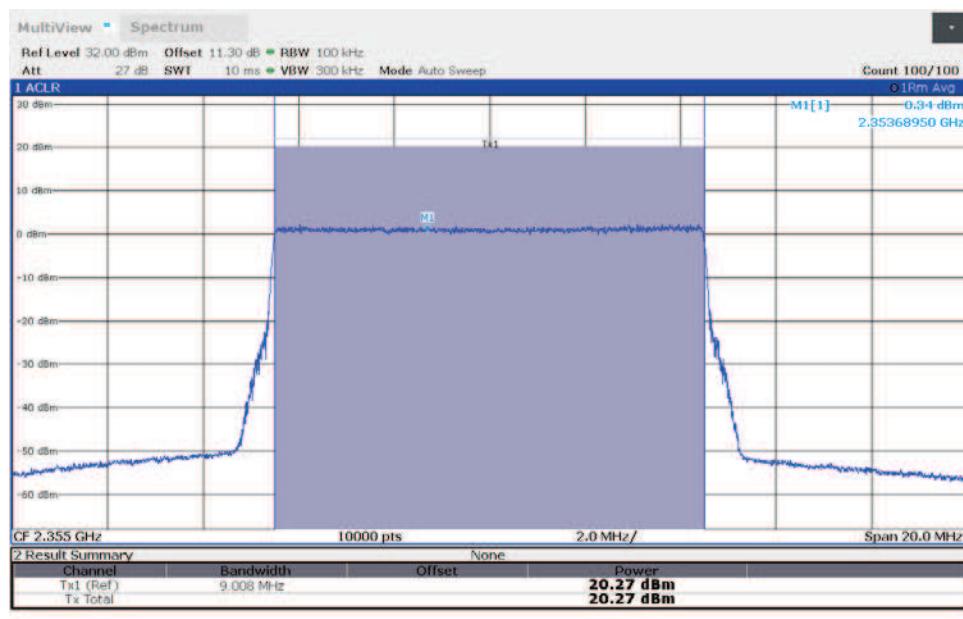
**TM3.1-64QAM_10 MHz Bandwidth
Band 30, ANT1**



**TM3.1a-256QAM_10 MHz Bandwidth
Band 30, ANT0**



**TM3.1a-256QAM_10 MHz Bandwidth
Band 30, ANT1**



Test Personnel: Minh Ly
Supervising/Reviewing
Engineer:
(Where Applicable) _____

Test Date: 11/02/2020

Product Standard: FCC Part 27
Input Voltage: 56 VDC (POE)

Limit Applied: See report section 6.1

Pretest Verification w/
Ambient Signals or
BB Source: N/A

Ambient Temperature: 25 °C

Relative Humidity: 40%

Atmospheric Pressure: 30 in Hg

Deviations, Additions, or Exclusions: None

7 Peak-to-Average Power Ratio (PAPR)

7.1 Requirement:

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

7.2 Procedure:

The procedure described in FCC Publication 971168 D01 Power Meas License Digital Systems v03r01 was used. Tests are performed in accordance with ANSI C63.26 Section 5.2.3.4.

Tests are performed using the CCDF function of the spectrum analyzer.

- Set the analyzer bandwidth \geq occupied bandwidth.
- Set the count enough to stabilize the curve.
- The crest factor is recorded

7.3 Test Result:

The sample tested was found to Comply.

Band 30, Bandwidth: 5 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	2352.5	ANT0	10.65
		ANT1	10.48
Mid	2355.0	ANT0	10.36
		ANT1	10.46
High	2357.5	ANT0	10.37
		ANT1	10.68

Band 30, Bandwidth: 5 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	2352.5	ANT0	10.36
		ANT1	10.47
Mid	2355.0	ANT0	10.55
		ANT1	10.44
High	2357.5	ANT0	10.38
		ANT1	10.41

Band 30, Bandwidth: 5 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	2352.5	ANT0	10.37
		ANT1	10.49
Mid	2355.0	ANT0	10.51
		ANT1	10.45
High	2357.5	ANT0	10.37
		ANT1	10.49

Band 30, Bandwidth: 5 MHz, Modulation: TM3.1a-256QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
Low	2352.5	ANT0	10.50
		ANT1	10.50
Mid	2355.0	ANT0	10.38
		ANT1	10.62
High	2357.5	ANT0	10.37
		ANT1	10.44

Band 30, Bandwidth: 10 MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
--	2355.0	ANT0	10.38
		ANT1	10.49

Band 30, Bandwidth: 10 MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
--	2355.0	ANT0	10.67
		ANT1	10.57

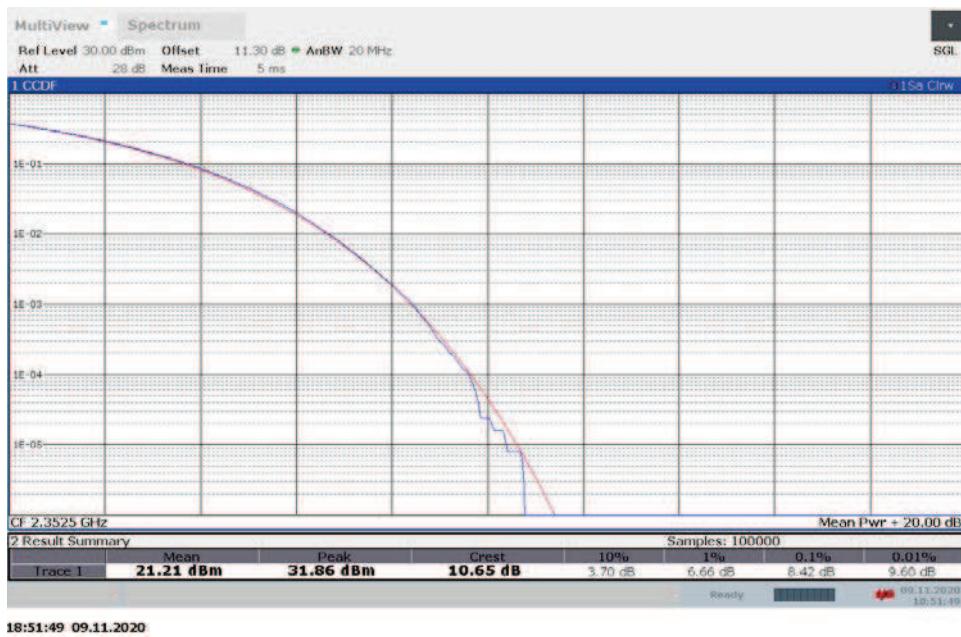
Band 30, Bandwidth: 10 MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
--	2355.0	ANT0	10.64
		ANT1	10.42

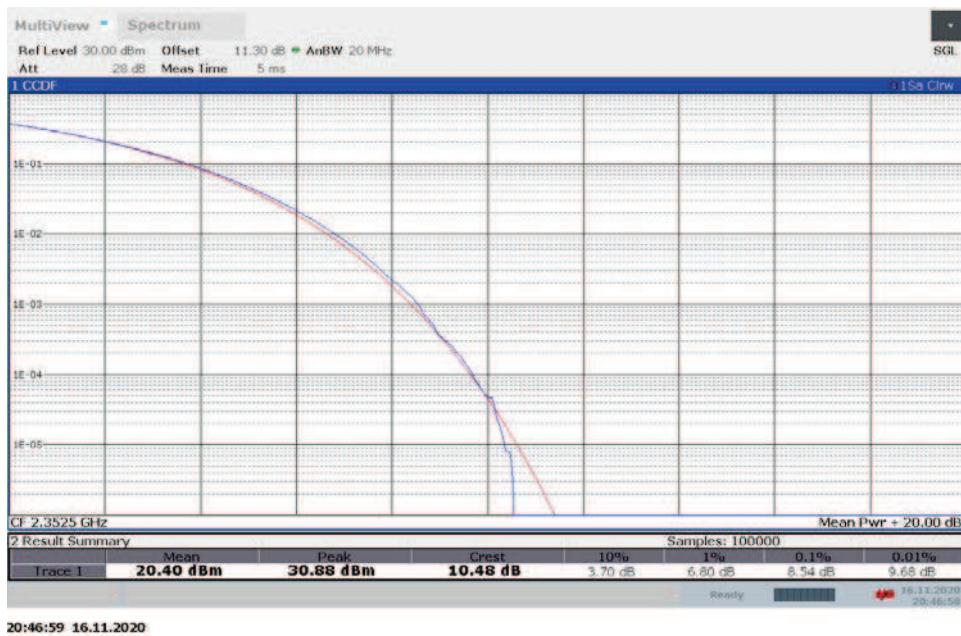
Band 30, Bandwidth: 10 MHz, Modulation: TM3.1a-256QAM

Channel	Frequency (MHz)	Antenna Port	PAPR (dB)
--	2355.0	ANT0	10.49
		ANT1	10.25

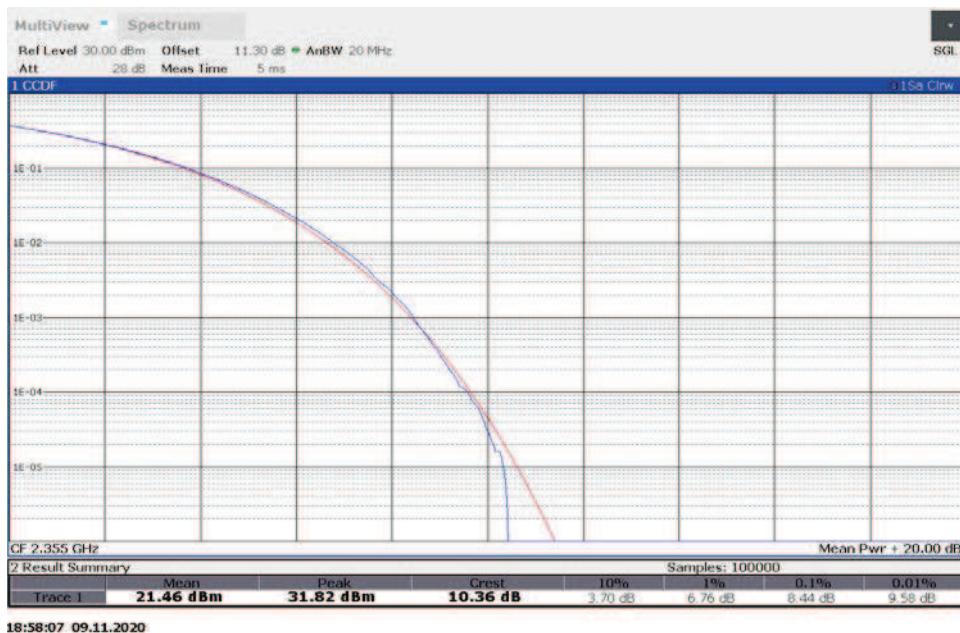
**TM1.1-QPSK_5 MHz Bandwidth
Band 30, ANT0, Low Channel**



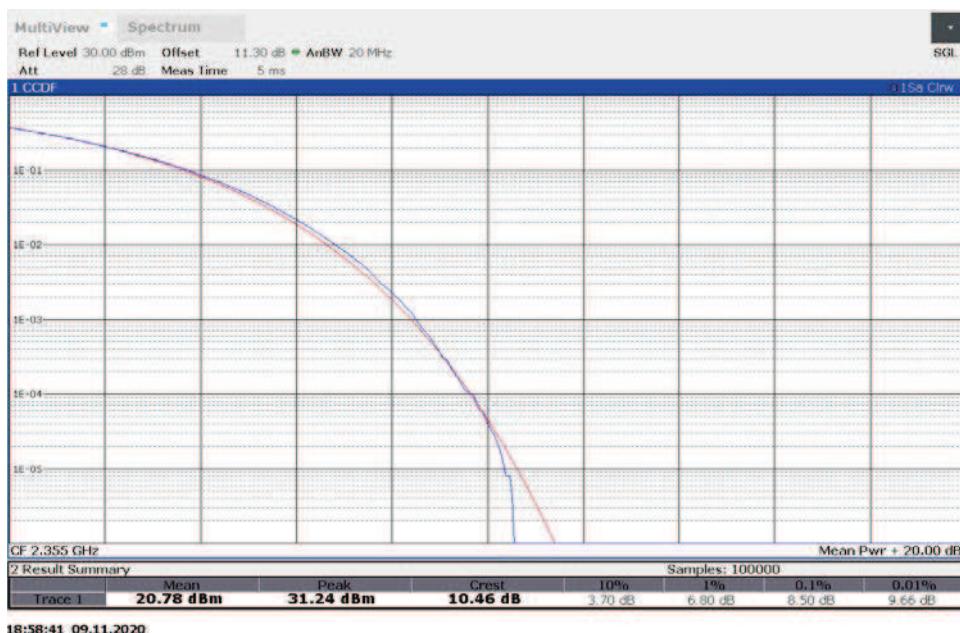
**TM1.1-QPSK_5 MHz Bandwidth
Band 30, ANT1, Low Channel**



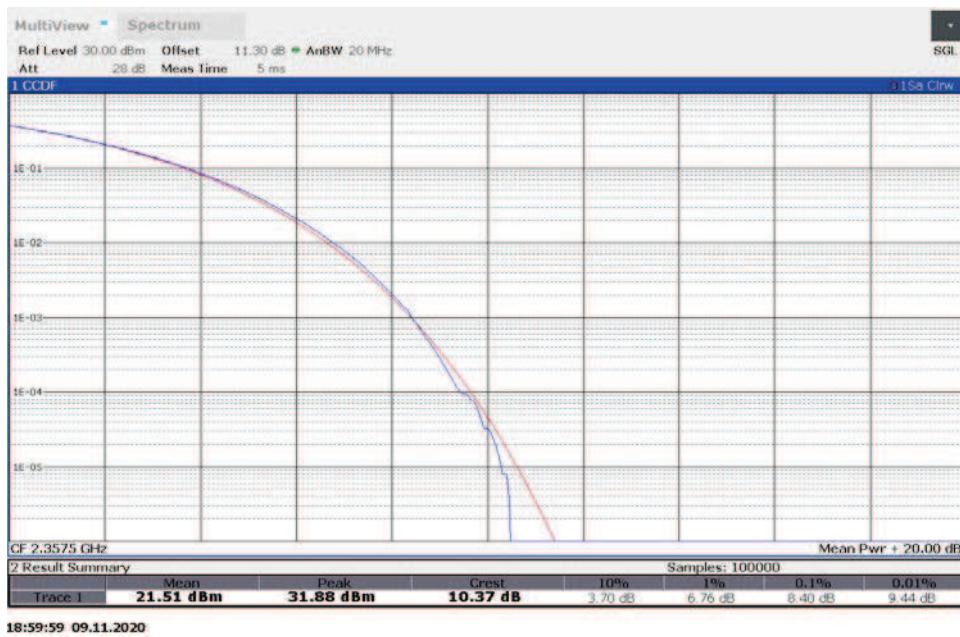
**TM1.1-QPSK_5 MHz Bandwidth
Band 30, ANT0, Mid Channel**



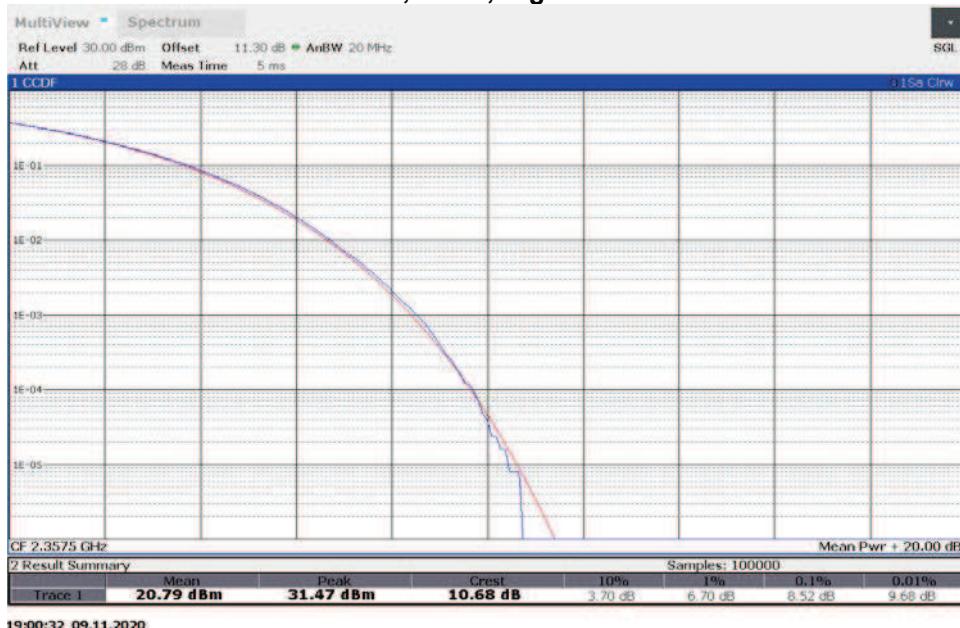
**TM1.1-QPSK_5 MHz Bandwidth
Band 30, ANT1, Mid Channel**



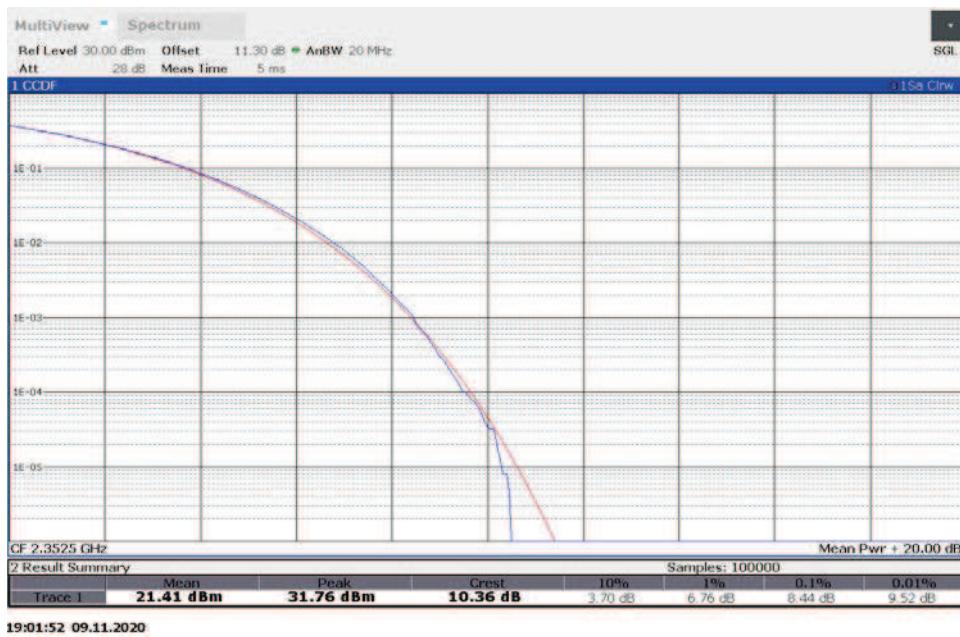
**TM1.1-QPSK_5 MHz Bandwidth
Band 30, ANT0, High Channel**



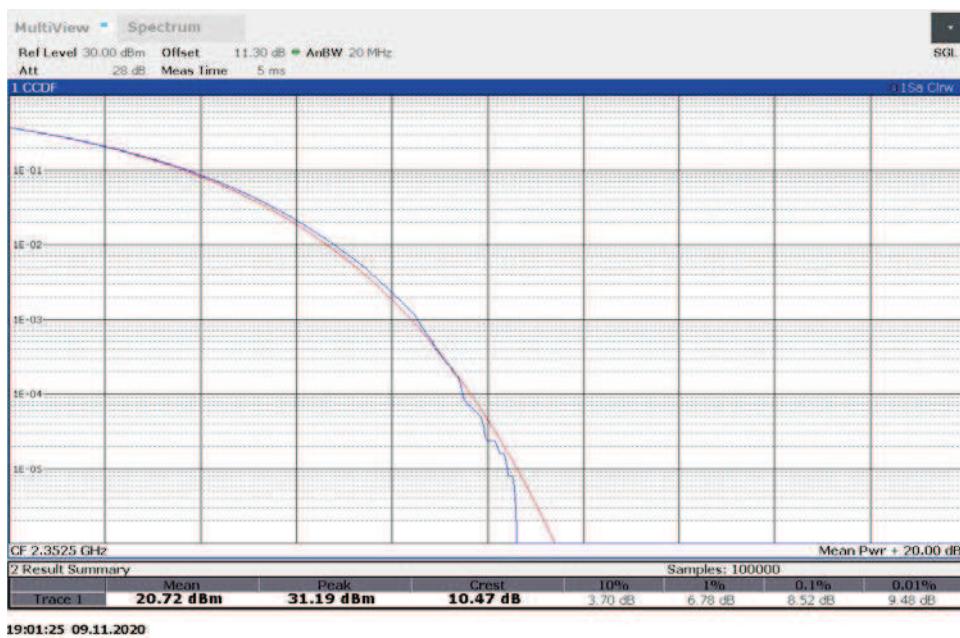
**TM1.1-QPSK_5 MHz Bandwidth
Band 30, ANT1, High Channel**



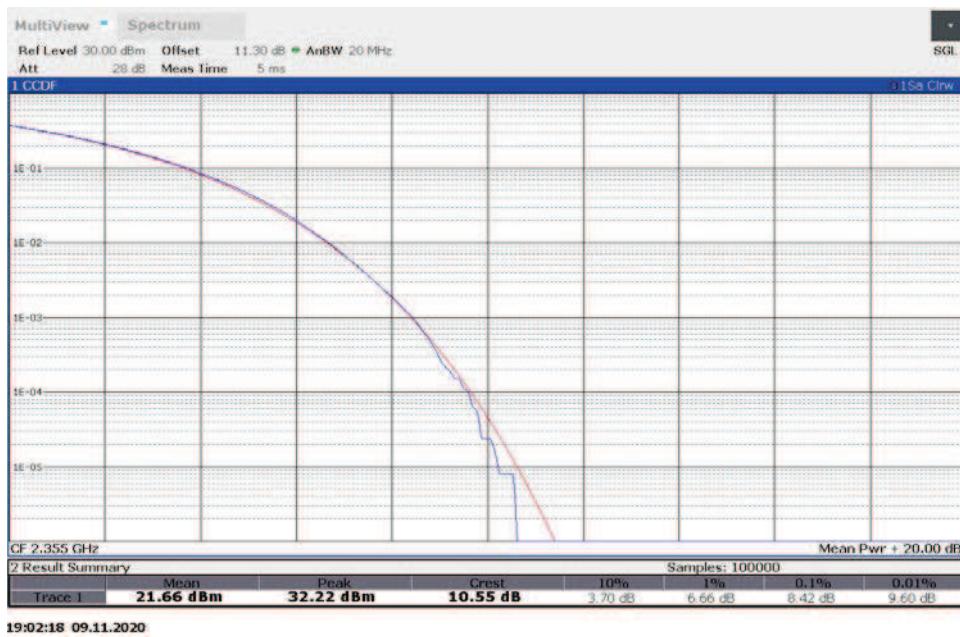
**TM3.2-16QAM_5 MHz Bandwidth
Band 30, ANT0, Low Channel**



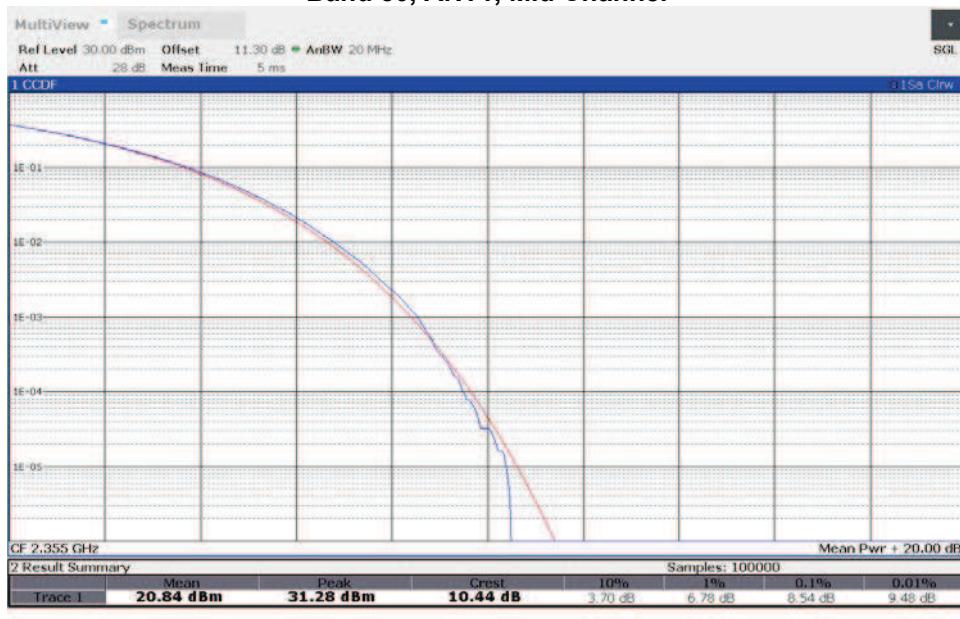
**TM3.2-16QAM_5 MHz Bandwidth
Band 30, ANT1, Low Channel**



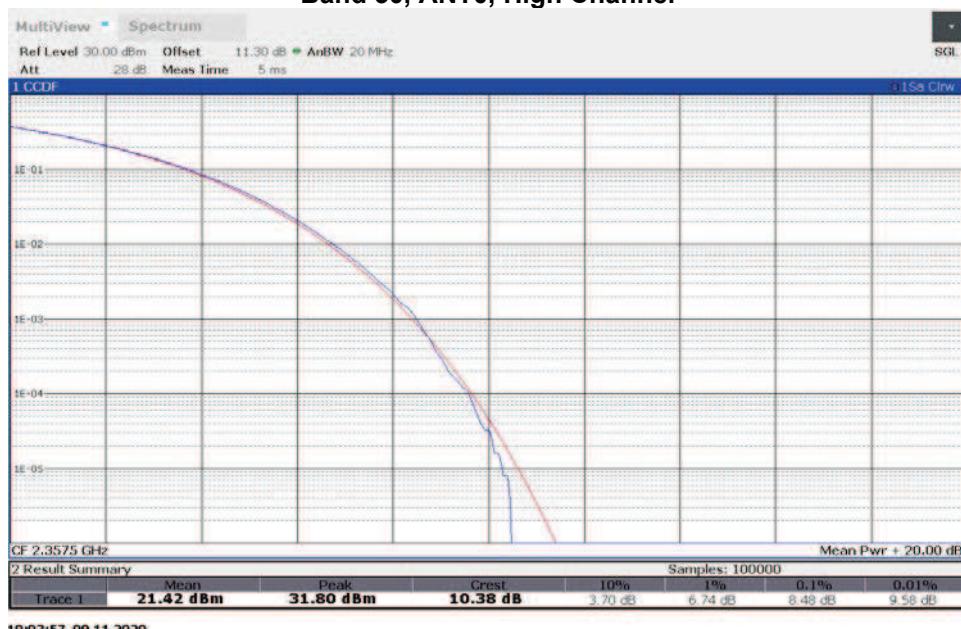
**TM3.2-16QAM_5 MHz Bandwidth
Band 30, ANT0, Mid Channel**



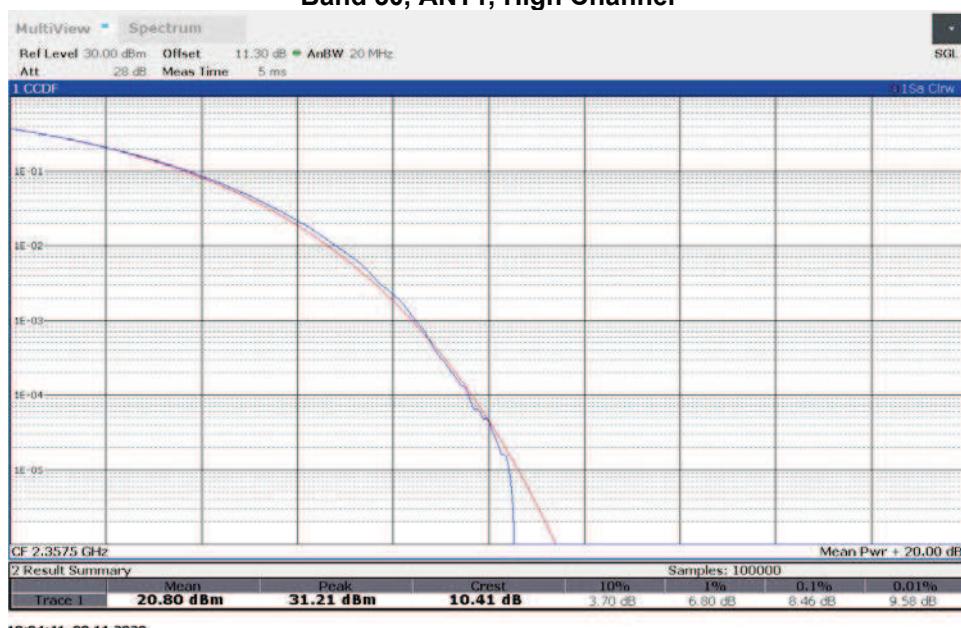
**TM3.2-16QAM_5 MHz Bandwidth
Band 30, ANT1, Mid Channel**



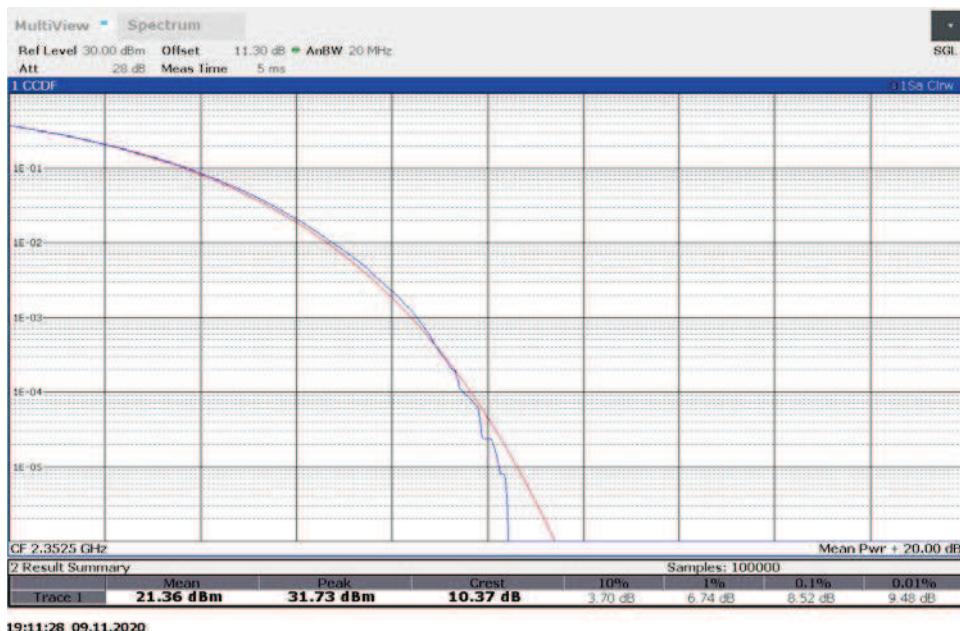
**TM3.2-16QAM_5 MHz Bandwidth
Band 30, ANT0, High Channel**



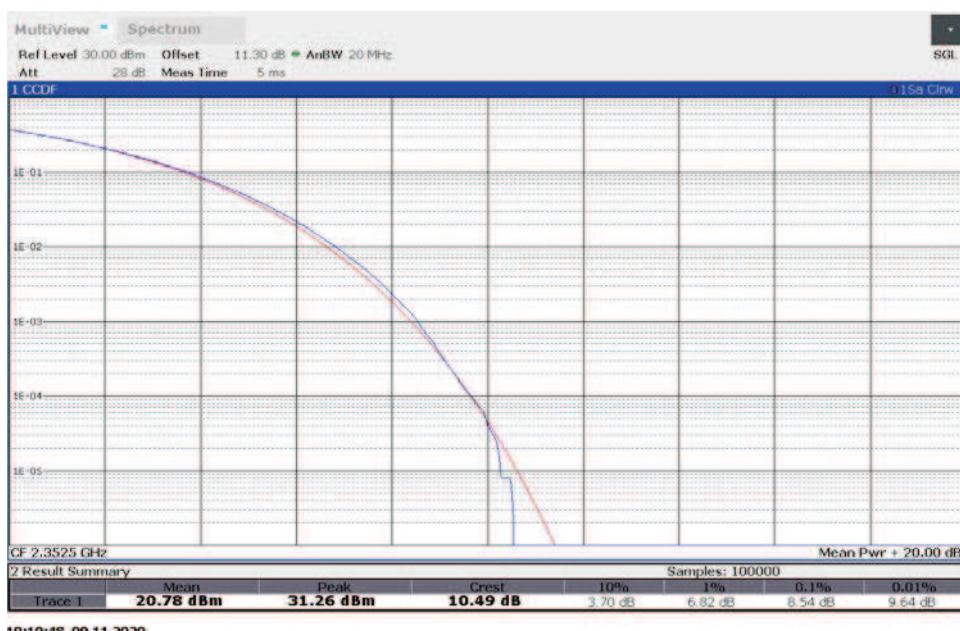
**TM3.2-16QAM_5 MHz Bandwidth
Band 30, ANT1, High Channel**



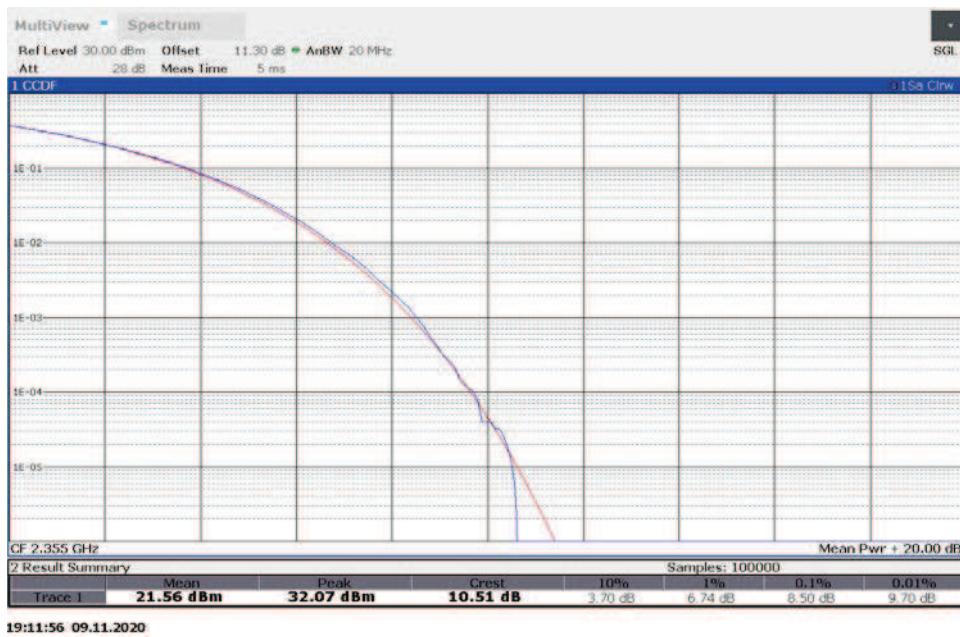
**TM3.1-64QAM_5 MHz Bandwidth
Band 30, ANT0, Low Channel**



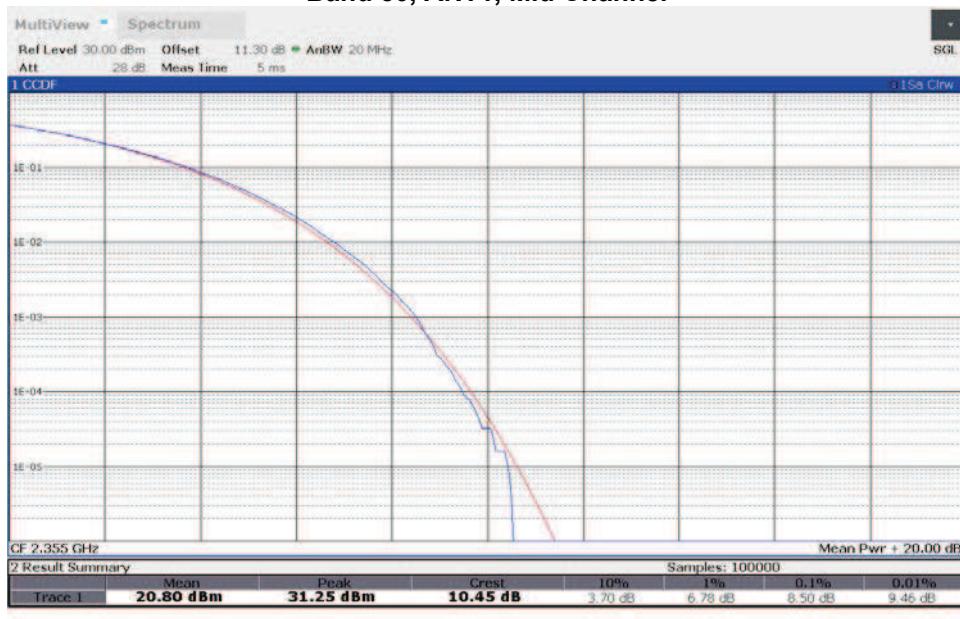
**TM3.1-64QAM_5 MHz Bandwidth
Band 30, ANT1, Low Channel**



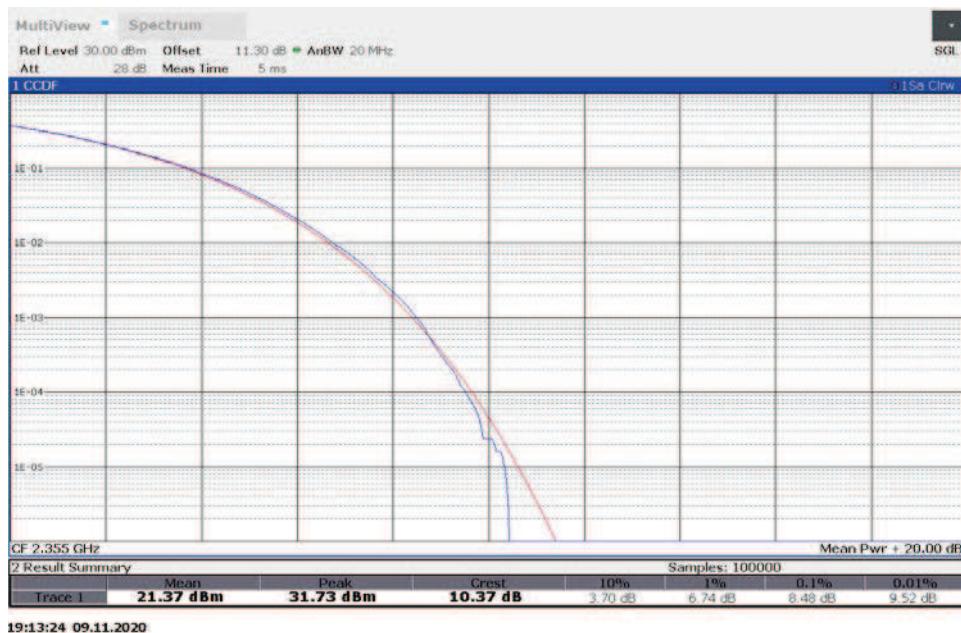
**TM3.1-64QAM_5 MHz Bandwidth
Band 30, ANT0, Mid Channel**



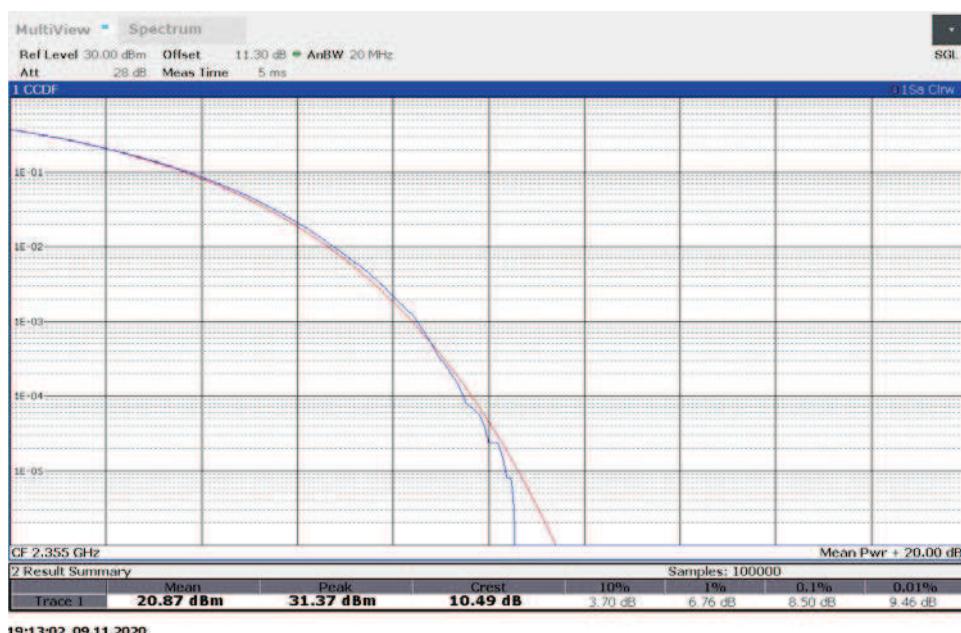
**TM3.1-64QAM_5 MHz Bandwidth
Band 30, ANT1, Mid Channel**



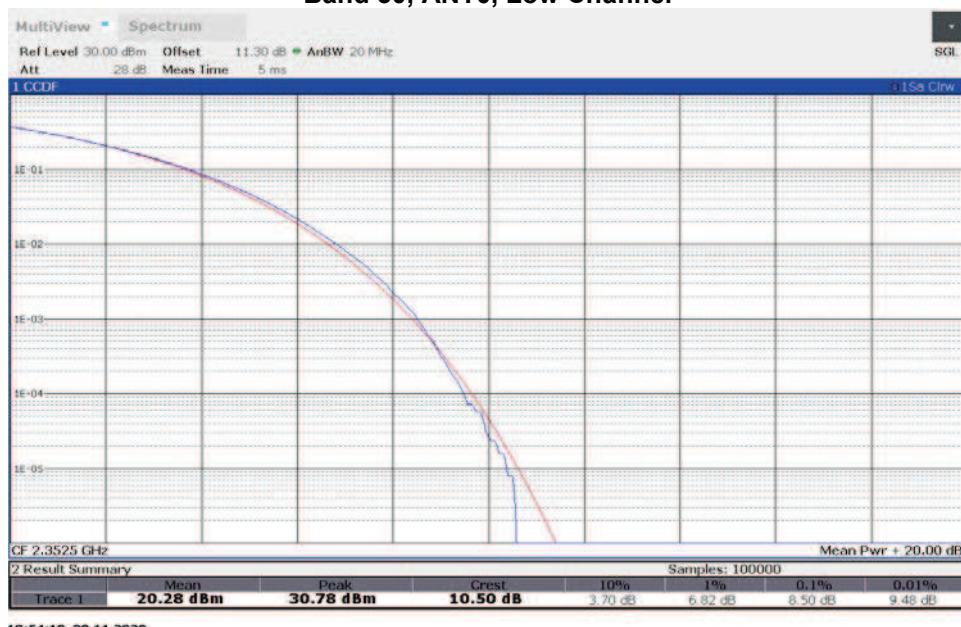
**TM3.1-64QAM_5 MHz Bandwidth
Band 30, ANT0, High Channel**



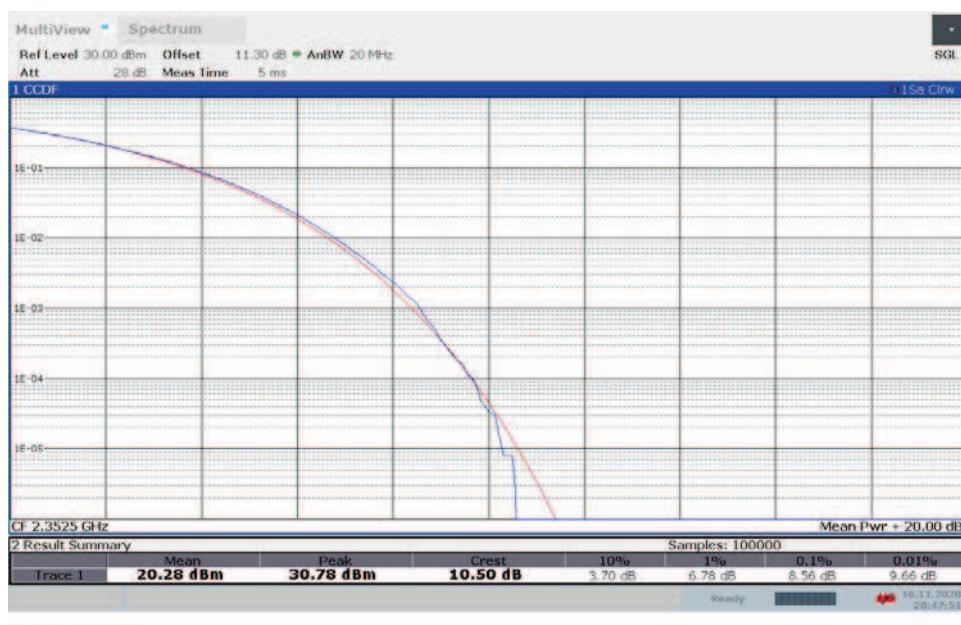
**TM3.1-64QAM_5 MHz Bandwidth
Band 30, ANT1, High Channel**



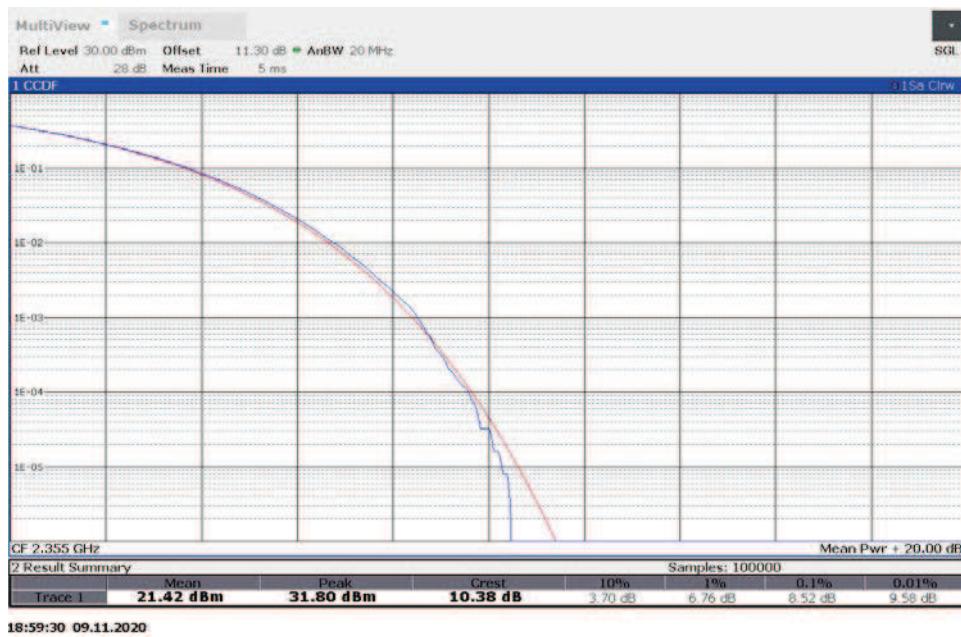
**TM3.1a-256QAM_5 MHz Bandwidth
Band 30, ANT0, Low Channel**



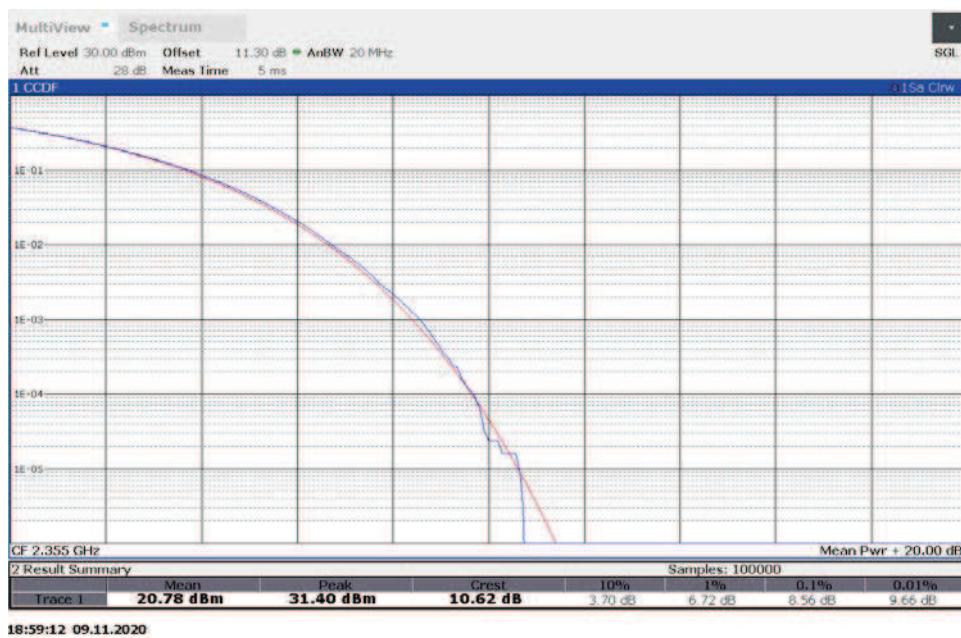
**TM3.1a-256QAM_5 MHz Bandwidth
Band 30, ANT1, Low Channel**



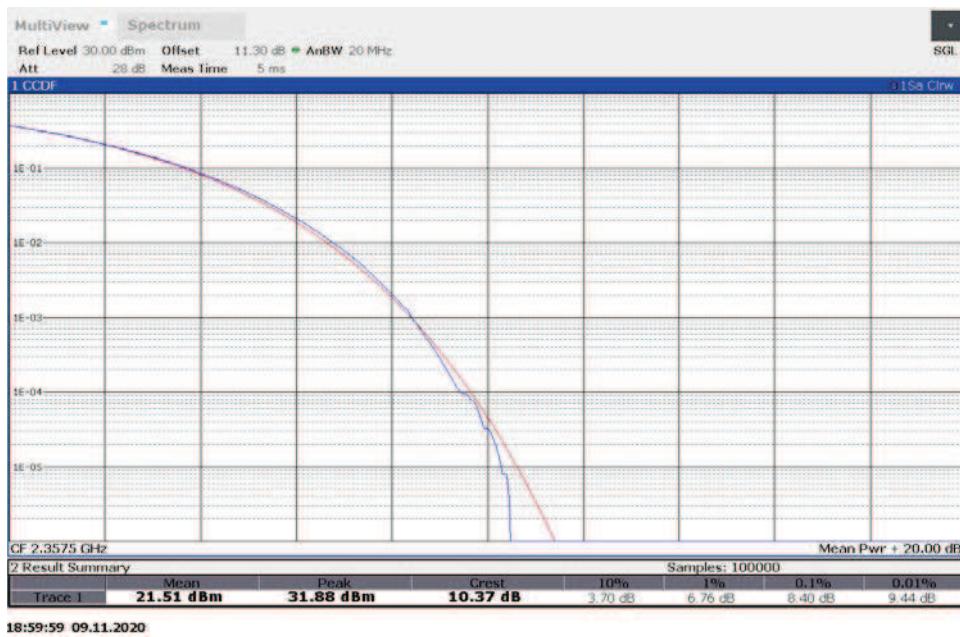
**TM3.1a-256QAM_5 MHz Bandwidth
Band 30, ANT0, Mid Channel**



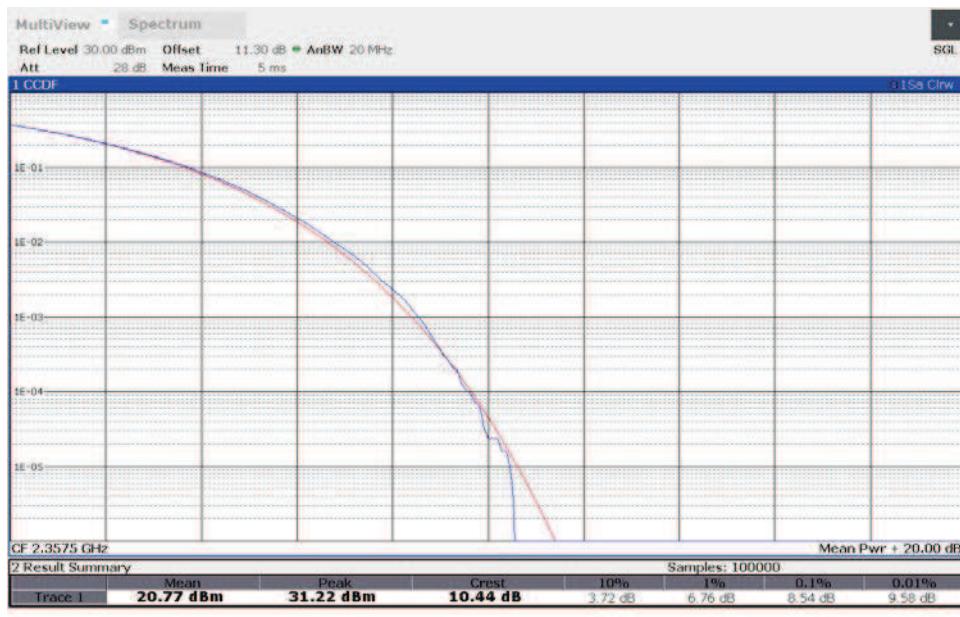
**TM3.1a-256QAM_5 MHz Bandwidth
Band 30, ANT1, Mid Channel**



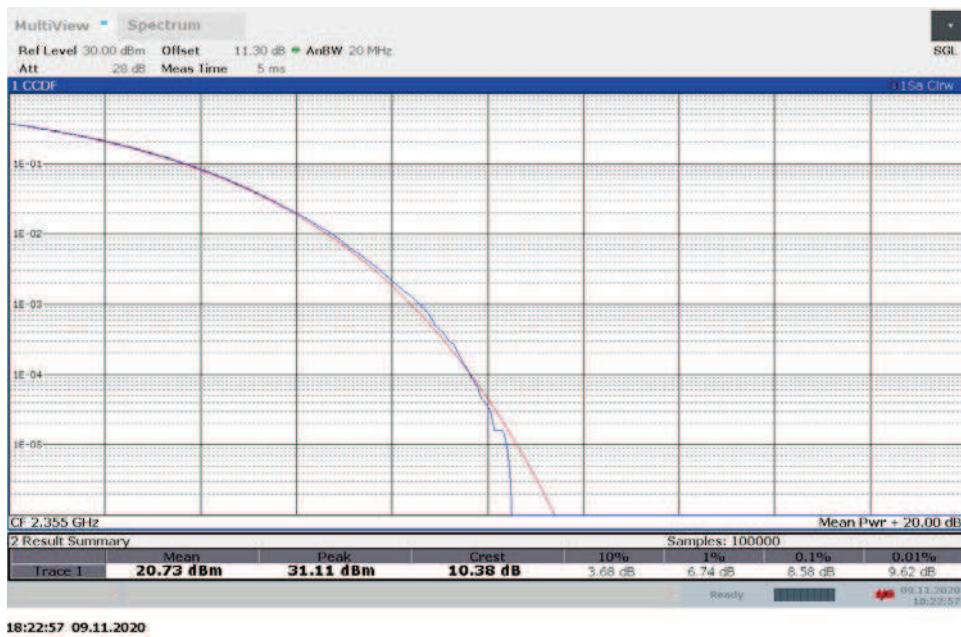
**TM3.1a-256QAM_5 MHz Bandwidth
Band 30, ANT0, High Channel**



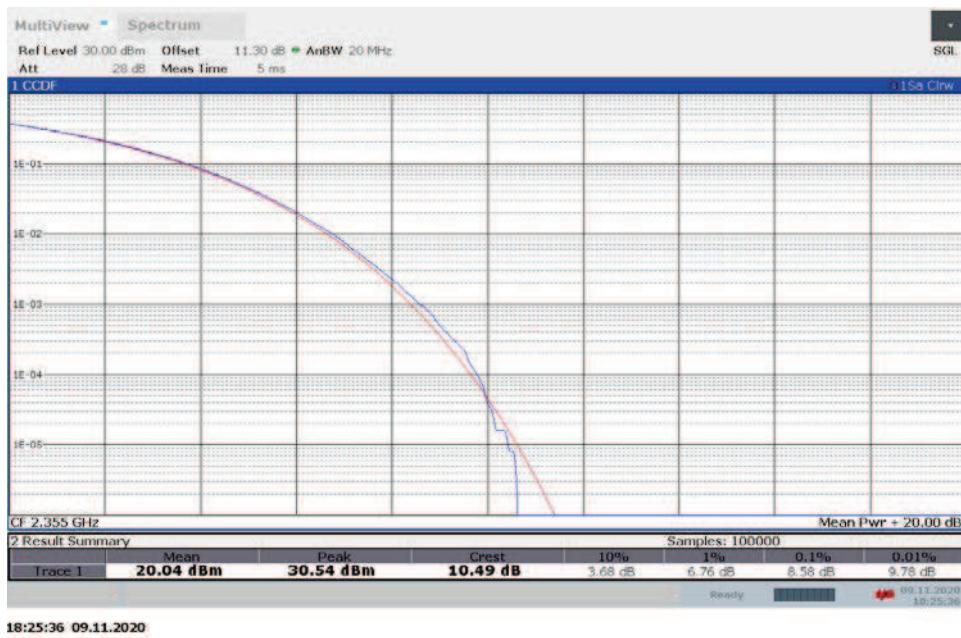
**TM3.1a-256QAM_5 MHz Bandwidth
Band 30, ANT1, High Channel**



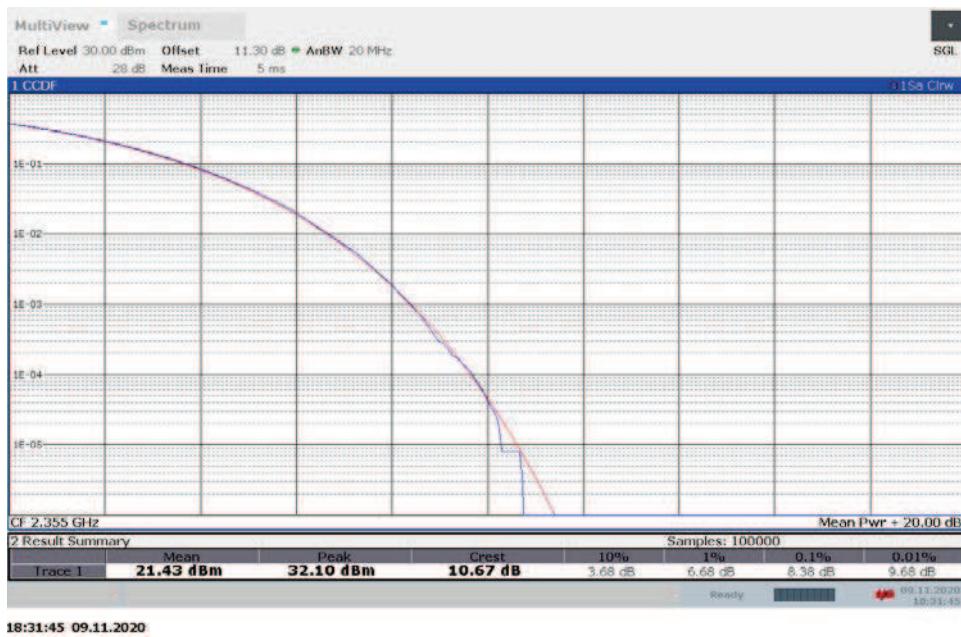
**TM1.1-QPSK_10 MHz Bandwidth
Band 30, ANT0**



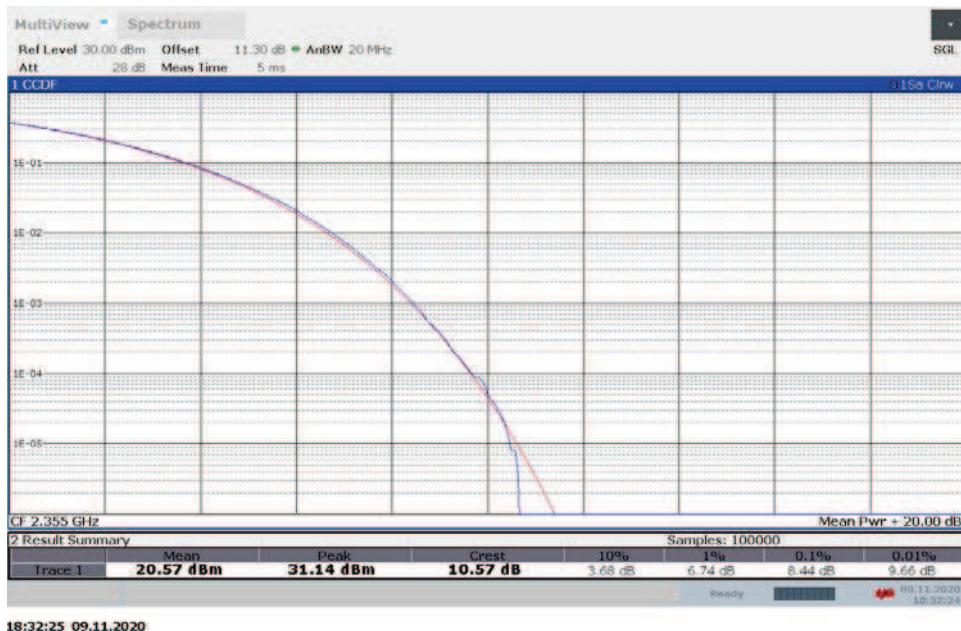
**TM1.1-QPSK_10 MHz Bandwidth
Band 30, ANT1**



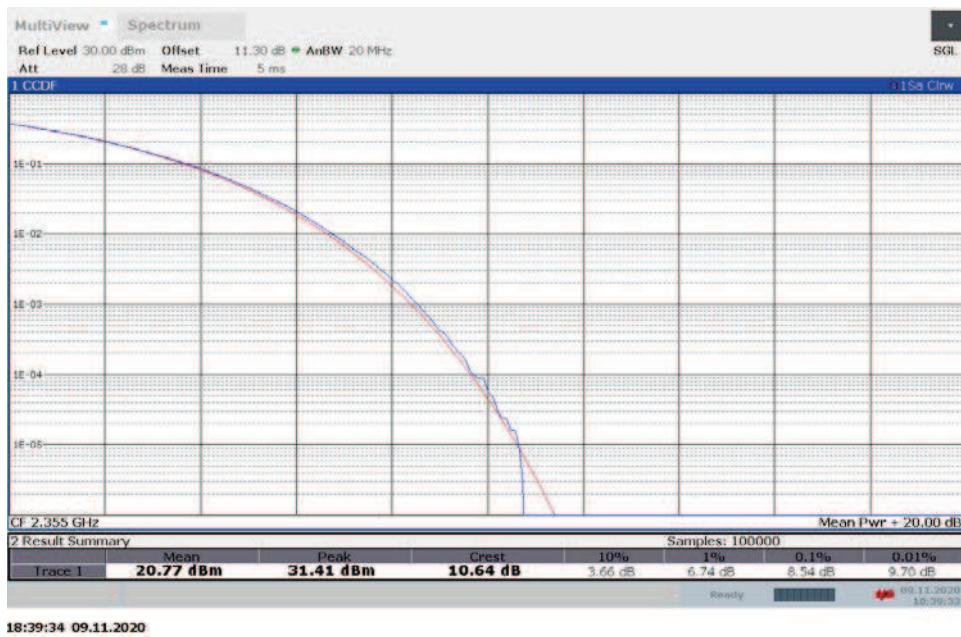
**TM3.2-16QAM_10 MHz Bandwidth
Band 30, ANTO**



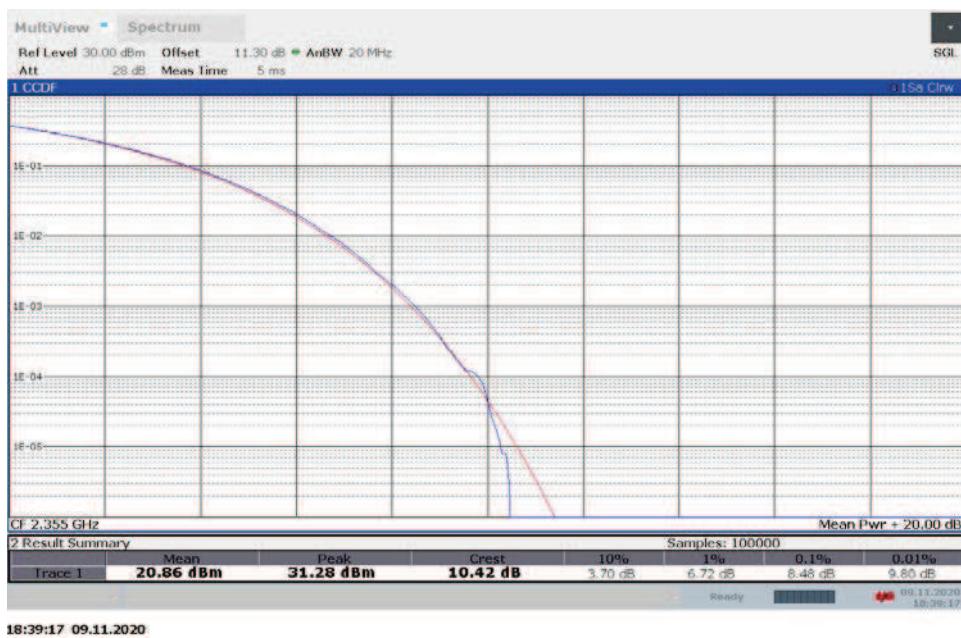
**TM3.2-16QAM_10 MHz Bandwidth
Band 30, ANT1**



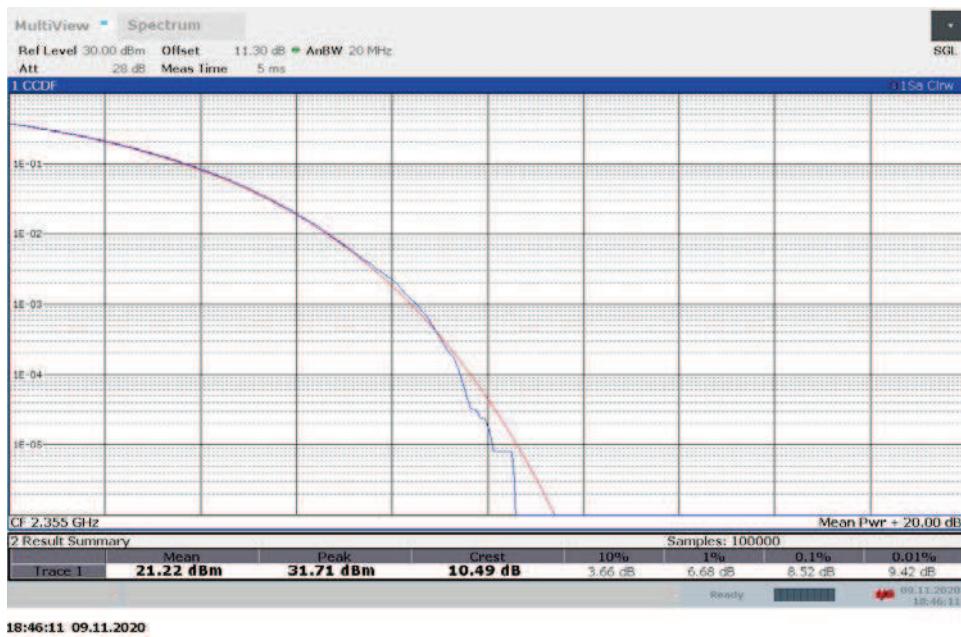
**TM3.1-64QAM_10 MHz Bandwidth
Band 30, ANT0**



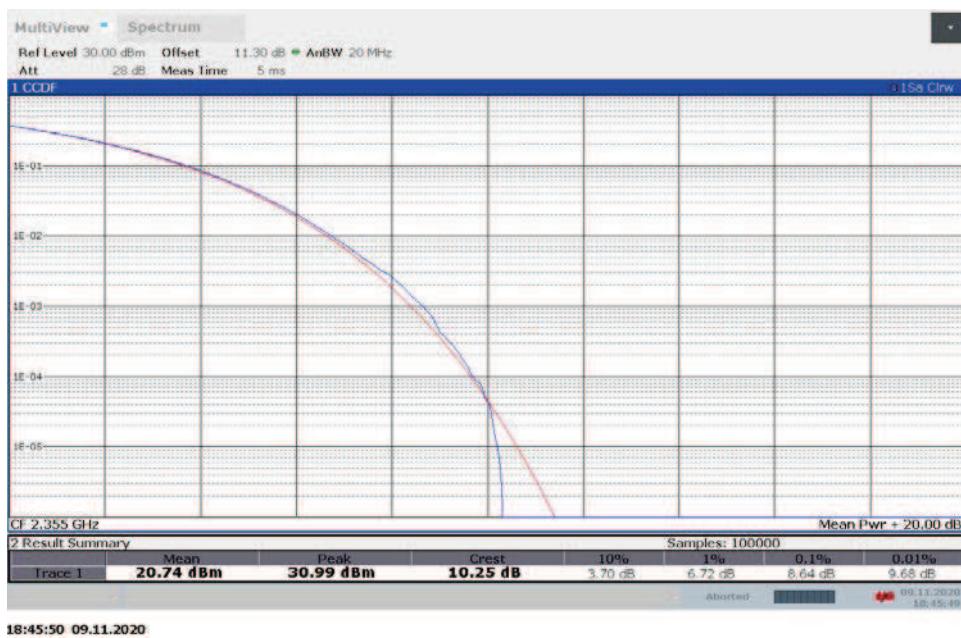
**TM3.1-64QAM_10 MHz Bandwidth
Band 30, ANT1**



**TM3.1a-256QAM_10 MHz Bandwidth
Band 30, ANT0**



**TM3.1a-256QAM_10 MHz Bandwidth
Band 30, ANT1**



Test Personnel: Minh Ly
Supervising/Reviewing
Engineer:
(Where Applicable) _____

Test Date: 11/09/2020

Product Standard: FCC Part 27
Input Voltage: 56 VDC (POE)

Limit Applied: See report section 6.1

Pretest Verification w/
Ambient Signals or
BB Source: N/A

Ambient Temperature: 24 °CRelative Humidity: 39 %Atmospheric Pressure: 29.9 in Hg

Deviations, Additions, or Exclusions: None

8 26 dB Bandwidth and Occupied Bandwidth

8.1 Requirement:

Tests are performed in accordance with ANSI C63.26 and CFR47 FCC Parts 2.1049.

§2.1049: The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

8.2 Procedure:

The procedure described in FCC Publication 971168 D01 Power Meas License Digital Systems v03r01 was used. Tests are performed in accordance with ANSI C63.26 Section 5.4.3 and 5.4.4.

For 26dB bandwidth measurement, the bandwidth was determined by using the built-in xdB bandwidth function of the spectrum analyzer.

For 99% power bandwidth measurement, the bandwidth was determined by using the built-in 99% occupied bandwidth function of the spectrum analyzer. The resolution bandwidth is set to 1% of the selected span as is without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

8.3 Results:

The sample tested was found to Comply.

Band 30, Bandwidth: 5MHz, Modulation: TM1.1-QPSK

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)	26dB BW (MHz)
Low	871.5	ANT0	4.511	5.04
		ANT1	4.509	5.04
Mid	881.5	ANT0	4.510	5.04
		ANT1	4.513	5.04
High	891.5	ANT0	4.515	5.04
		ANT1	4.509	5.04

Band 30, Bandwidth: 5MHz, Modulation: TM3.2-16QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)	26dB BW (MHz)
Low	871.5	ANT0	4.501	5.00
		ANT1	4.505	4.99
Mid	881.5	ANT0	4.507	4.99
		ANT1	4.504	4.99
High	891.5	ANT0	4.508	5.00
		ANT1	4.505	5.00

Band 30, Bandwidth: 5MHz, Modulation: TM3.1-64QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)	26dB BW (MHz)
Low	871.5	ANT0	4.561	5.05
		ANT1	4.558	5.04
Mid	881.5	ANT0	4.551	5.04
		ANT1	4.556	5.04
High	891.5	ANT0	4.560	5.04
		ANT1	4.558	5.04

Band 30, Bandwidth: 5MHz, Modulation: TM3.1a-256QAM

Channel	Frequency (MHz)	Antenna Port	Occupied BW (MHz)	26dB BW (MHz)
Low	871.5	ANT0	4.532	5.04
		ANT1	4.531	5.04
Mid	881.5	ANT0	4.533	5.04
		ANT1	4.532	5.04
High	891.5	ANT0	4.534	5.04
		ANT1	4.531	5.03