

Prüfbericht-Nr.: Test report no.:	ULR-TC568821300000034F	Auftrags-Nr.: Order no.:	166554137 001C	Seite 1 von 143 Page 1 of 143
Kunden-Referenz-Nr.: Client reference no.:	NA	Auftragsdatum: Order date:	2021-05-18	
Auftraggeber: Client:	1.HONEYWELL INTERNATIONAL INC,Honeywell Safety and Productivity Solutions 9680 OLD BAILES RD, FORT MILL, SC 29707, USA 2. M/S Venture Corporation Limited 4, Jalan Kempas 5/2 (Block D) Tampoi, 81200 Johor Bahru DID +60 7231 2391 Main +60 7237 7201 Fax +60 7236 4146			
Prüfgegenstand: Test item:	HWB11AC-PRTM	Product Type	Wi-Fi BT Module	
Bezeichnung.: Identification .:	HWB11AC-PRT			
Auftrags-Inhalt: Order content:	Testing and issue of Test Report and Grant Certificate			
Prüfgrundlage: Test specification:	FCC Part 15 Subpart E 15.407,15.207 RSS 247 Issue 2 and RSS GEN Issue 5			
Wareneingangsdatum: Date of sample receipt:	2021-05-20			
Prüfmuster-Nr & Serien-Nr.: Test sample no & serial no.:	A003068621-001 2021061001			
Prüfzeitraum: Testing period:	2021-05-21 - 2021-06-08			
Ort der Prüfung: Place of testing:	Wireless laboratory, Bangalore			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (India) Pvt.Ltd., 27/B, 2nd Cross, Electronic City Phase1 Bangalore -560 100, India FCC Test site registration number: 496599 ISED Test site registration number: 3466E-1			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:	genehmigt von: authorized by:			
Datum: Date: 2021-06-11	Ausstellatum: Issue date: 2021-07-09			
Stellung / Position:	Likhithesh M D Engineer	Stellung / Position:	Mahammadgouse Kaladagi Assistant Manager	
Sonstiges / Other:	FCC ID: HD5-HWB11 IC: 1693B-HWB11			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend 3 = satisfactory	4 = ausreichend N/A = nicht anwendbar 4 = sufficient N/A = not applicable
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory	4 = sufficient N/A = not applicable
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

Seite 2 von 143
Page 2 of 143

TEST SUMMARY

Test Item	Applicable Standard		Result
	FCC	ISED	
Emission Bandwidth	15.407 (a) & (e)	RSS Gen Issue 5 Section 6.7 RSS 247 Issue 2 Section 6.2.4.1	Pass
Frequency Stability	15.407 (g)	RSS Gen Issue 5 Section 8.11	Pass
Maximum conducted output power	15.407 (a)	RSS 247 Issue 2 Section 6.2.1; 6.2.2; 6.2.3; & Section 6.2.4	Pass
Maximum Power spectral density	15.407 (a)	RSS 247 Issue 2 Section 6.2.1; 6.2.2; 6.2.3; & Section 6.2.4	Pass
Dynamic Frequency Selection	15.407 (h) FCC KDB Publication 905462 D02 & 905462 D03	RSS 247 Issue 2 Section 6.3	Pass
Spurious Radiated Emissions & Restricted Bands of Operation	15.407 (b) / (15.205 & 15.209)	RSS 247 Issue 2 Section 6.2.1; 6.2.2; 6.2.3; & Section 6.2.4 RSS Gen Issue 5 Section 8.9 & 8.10	Pass
Conducted AC Power Lines	15.207	RSS Gen Issue 5 Section 8.8	Pass

Product Category: Electronics Testing
Test Discipline : EMC Test Facility

Compliance statement for Part 15.203:

"THE ANTENNA WITH A SPECIAL CONNECTOR (RP-TNC) USED, WITH NO POSSIBILITY OF REPLACEMENT WITH A NON-APPROVED ANTENNA BY THE END-USER. THEREFORE, THE EUT IS CONSIDERED TO COMPLY WITH THIS PROVISION."

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

Seite 3 von 143
Page 3 of 143

REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568821300000034F	01	Initial issue of report	2021-07-01
ULR-TC568821300000034F	02	Reviewer comments updated	2021-07-09

Table of Contents

1	GENERAL REMARKS	5
1.1	Attachments	5
2	TEST SITES	6
2.1	Testing Facilities.....	6
2.2	List of Test and Measurement Instruments.....	6
3	GENERAL PRODUCT INFORMATION.....	7
3.1	Product Function and Intended Use.....	7
3.2	Ratings and System Details of Equipment under Test	7
3.3	Measurement Uncertainty:	8
4	TEST SET-UP AND OPERATION MODE.....	9
4.1	Principle of Configuration Selection	9
4.2	UUT Operation and Software	9
4.3	Special Accessories and Auxiliary Equipment	9
4.4	Simultaneous Transmission	9
4.5	Countermeasures to achieve EMC Compliance	9
4.6	List of frequencies	10
4.7	Report Reference	11
5	Operational Description	12
6	Block Diagram.....	12
7	TEST METHODOLOGY	13
7.1	Conducted Spurious Emission AC Power line Test	13
7.1.1	Test Setup Configuration	13
7.2	Radiated Emission Test	14
7.2.1	Test Setup Configuration	14
8	TEST RESULTS	18
8.1	Emission Bandwidth.....	18
8.2	Maximum Conducted Output Power	56
8.3	Maximum Power Spectral Density	76
8.4	Dynamic Frequency Selection (DFS).....	96
8.5	Spurious Radiated Emissions & Restricted Bands of Operation	106
9	Frequency Stability	137
10	Conducted Spurious Emission test on AC Power Line	139
11	LIST OF TABLES	143
12	Power level used for testing	143

1 GENERAL REMARKS

1.1 Attachments

All attachments are part of this test report and are issued in separate document

1. TEST SETUP PHOTOS
- 2: EUT EXTERNAL PHOTOS
- 3: EUT INTERNAL PHOTOS
- 4: FCC LABEL AND LABEL LOCATION
- 5: BLOCK DIAGRAM
- 6: SPECIFICATION OF EUT
- 7: SCHEMATIC DIAGRAM
- 8: BILL OF MATERIAL
- 9: USER MANUAL
- 10: MAXIMUM PERMISSIBLE EXPOSURE INFORMATION

2 TEST SITES

2.1 Testing Facilities

- | | |
|--|---|
| <p>1. TÜV Rheinland (India) Pvt.Ltd.,
27/B, 2nd Cross,
ElectronicCityPhase1
Bangalore – 560 100,
India</p> | <p>2. TUV Rheinland (India) Pvt.Ltd.,
108 , Beside ISBR Business School,
Electronic city Phase I
Bangalore - 560 100.
India</p> |
|--|---|

Radiated Measurement site type :
Fully anechoic chamber (used for above 1 GHz
measurements)

Radiated Measurement site type :
Semi anechoic chamber (used for below 1 GHz
measurements)

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Test Facility
EMI Receiver	Rohde & Schwarz	ESW 44	101732	4.73 SP5	27.01.2022	Yearly	Radiated Spurious Emission
Active loop antenna	Frankonia	FMZB 1519 B	1519B-00111	-	28.02.2022	Yearly	
Balloon and Biconical Antenna	Schwarzbeck mess-elektronik	VHBB-9124 / BBA-9106	01028	-	02.09.2021	Yearly	
Log - Periodical Antenna	Schwarzbeck mess-elektronik	VUSLP-9111B	9111B-111	-	31.08.2021	Yearly	
Horn Antenna	Frankonia	HAX-18	802	-	01.03.2022	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	Antenna-Port Conducted test
Spectrum Analyser	Agilent Technologies	E4407B	US41192 772	A.14.06	10.08.2021	Yearly	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	04.08.2021	Yearly	
LISN	Rohde & Schwarz	ENV216	100022	-	04.09.2021	Yearly	Conducted AC Power line Test

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement in SAC	EMC 32	10.60.00
2	Radiated spurious emission measurement in FAC	EMC 32	10.60.00

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

HWB11AC-PRTM is a carrier board with System on Module. The module to be used inside the Honeywell Products. The Module has Dual Band WIFI (2.4GHz & 5GHz) and BLUETOOTH radio interface. This module communicates with external host using SDIO interface for WIFI and UART for BLUETOOTH.

This Module supports 802.11a/b/g/n/ac for WIFI and Supports BT (Basic , EDR & BLE) The module will act as Access Point / Master only in NON - DFS bands. In the DFS band, the Module acts as Slave /Station device which do not have Radar detection functionality.

Powered with QCA6174A, **HWB11AC-PRTM** achieve the best possible connectivity and performance in RF Environment.

This Module will be used to provide the WIFI & BLUETOOTH wireless connectivity for Honeywell Products

3.2 Ratings and System Details of Equipment under Test

Table 3: Ratings and System Details as declared by the Client*

Radio Protocol		WI-FI 5GHz
Operating Frequency Range		UNII-1 _ 5150MHz to 5250MHz UNII-2a _ 5250MHz to 5350MHz UNII-2c _ 5470MHz to 5725MHz* UNII-3 _ 5725MHz to 5825MHz
No. of Channels		(Refer Table 5)
Channel Spacing		5 MHz
Modulation		802.11b: DSSS ; 802.11g: OFDM; 802.11n: OFDM 802.11b: 1, 2, 5.5 , 11Mbps; 802.11g: 6 to 54Mbps 802.11n: MCS0 to MCS7; 802.11a: 6Mbps & 54Mbps 802.11ac : MCS0 to MCS9
Power level setting used		Refer Clause 12
Maximum Measured Power (e.i.r.p)		19.19 dBm (5310MHz n_VHT40)
Number of antennas		1
Frequency range of Antenna Gain		3.37 dBi
Antenna Type		Omni-directional Dipole Antenna
Supply Voltage to Product		5.0V, 0.5A
Environmental Conditions	Storage	-20degC to +70degC Relative Humidity <95%
	Operating	-20degC to +60degC Relative Humidity <95%
EUT Dimension		80 x 37 x 18 mm (L x W x H)

*Band 5600 MHz to 5650 MHz is not supported for Canada

***Disclaimer:** The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

Note: Product HWB11AC-PRTM has multiple protocols. All the supported wireless protocols and their respective test results are issued in separate test reports, refer clause 4.7 Report references

3.3 Measurement Uncertainty:

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$

Table 4: Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1.5 \text{ dB}$
Power Spectral Density, conducted	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 3 \text{ dB}$
SAC, radiated measurement	$\pm 6 \text{ dB}$
FAC, radiated measurement	$\pm 6 \text{ dB}$
Temperature	$\pm 3 \text{ }^{\circ}\text{C}$
Supply Voltages	$\pm 3 \%$
Time	$\pm 5 \%$

Note: The listed uncertainties are the worst case uncertainty for the entire range of measurements and are for the reporting purpose only and are not used in determining the PASS/FAIL of the results.

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

Transmission was enabled with highest possible duty cycle on low, mid and high channels.

4.2 UUT Operation and Software

Hardware Version Identification number (HVIN) : 50180228-001
Software version : 10.17.98.0257

4.3 Special Accessories and Auxiliary Equipment

Test laptop (QRCT tool with Software Version : 3.0.296.0),
LAN cable &
Master device (Router) : FCC ID : LDK102087

4.4 Simultaneous Transmission

This product does not supports Simultaneous transmission

4.5 Countermeasures to achieve EMC Compliance

None

4.6 List of frequencies

Frequency Band	Channel No.	Frequency (MHz)
5150–5250 MHz	36	5180
	38	5190
	46	5230
	48	5240
UNII 2A (5250-5350)	52	5260
	54	5270
	56	5280
	58	5290
	60	5300
	62	5310
	64	5320
UNII 2C (5470-5725)	100	5500
	102	5510
	106	5530
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	134	5670
	136	5680
	138	5690
	140	5700
	142	5710
	144	5720
5725-5825 MHz	149	5745
	151	5755
	159	5795
	165	5825

Table 5: List of Wi-Fi center Frequencies

Channel used for Wi-Fi Testing

Channel Bandwidth (20MHz)	Channel Bandwidth (40MHz)	Channel Bandwidth (80MHz)
5180	5190	5210
5240	5230	5290
5260	5270	5530
5320	5310	5690
5500	5510	5755
5700	5590	-
5720	5670	-
5745	5710	-
5825	5755	-
-	5795	-

Note:

TUV Sample Identification number : A003068621-001– Radiated test Sample
A003068621-001– Conducted test Sample

4.7 Report Reference

Note: Product HWB11AC-PRTM has multiple protocols. All the supported wireless protocols and their respective test results are issued in separate test reports, following table lists the report numbers.

Radio Protocol	Report Number
RF test report for Wi-Fi (2.4GHz) & BLE (2.4GHz)	ULR-TC568821300000033F
RF test report for Wi-Fi (5GHz) – (This report)	ULR-TC568821300000034F
RF test report for Bluetooth (2.4GHz)	ULR-TC568821300000035F

5 Operational Description

This HWB11AC-PRTM is a WiFi/BT system on module which will be placed inside the Honeywell products like printers, barcode scanners, RFID readers etc. to enable wireless connectivity. This module includes MAC & physical layer of 802.11a/b/g/n/ac and the Bluetooth modem.

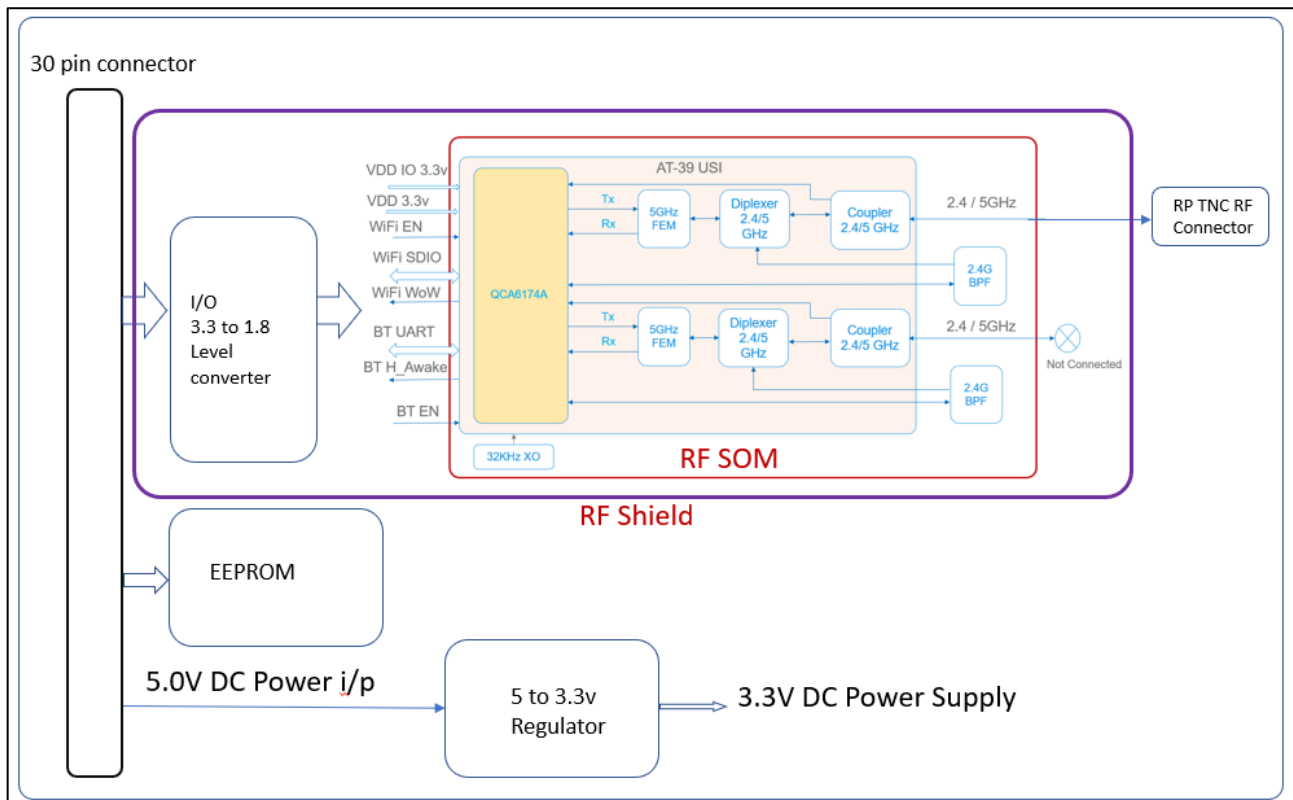
This module operates on 5.0V DC Power supply with internal on board regulation to generate 3.3v for powering ON all the circuits. The entire RF circuits is enclosed in RF shield of dimension 25mm X 25mm.

The module uses internal power amplifier and LNA for 2.4GHz frequency band and an external front end chip for 5GHz frequency band. All filters and diplexers are included in the module to ensure maximum power flatness and optimum VSWR. The module has one antenna chain for 1X1 output.

The module supports range of data rates from 1Mbps in 802.11b mode to MCS9 in 802.11ac mode. This chipset also supports concurrent operation of Bluetooth (Version 5.0) for wireless connectivity during browsing or other device applications. Along with both standard and high speed (HS) Bluetooth data rates, Bluetooth low energy modes are also supported. Hardware WAPI acceleration engine, AES, TKIP, WPA and WPA2 are supported to provide the latest security requirement on your network.

The Device communicates with HOST using SDIO interface for WIFI and UART interface for BLUETOOTH.

6 Block Diagram



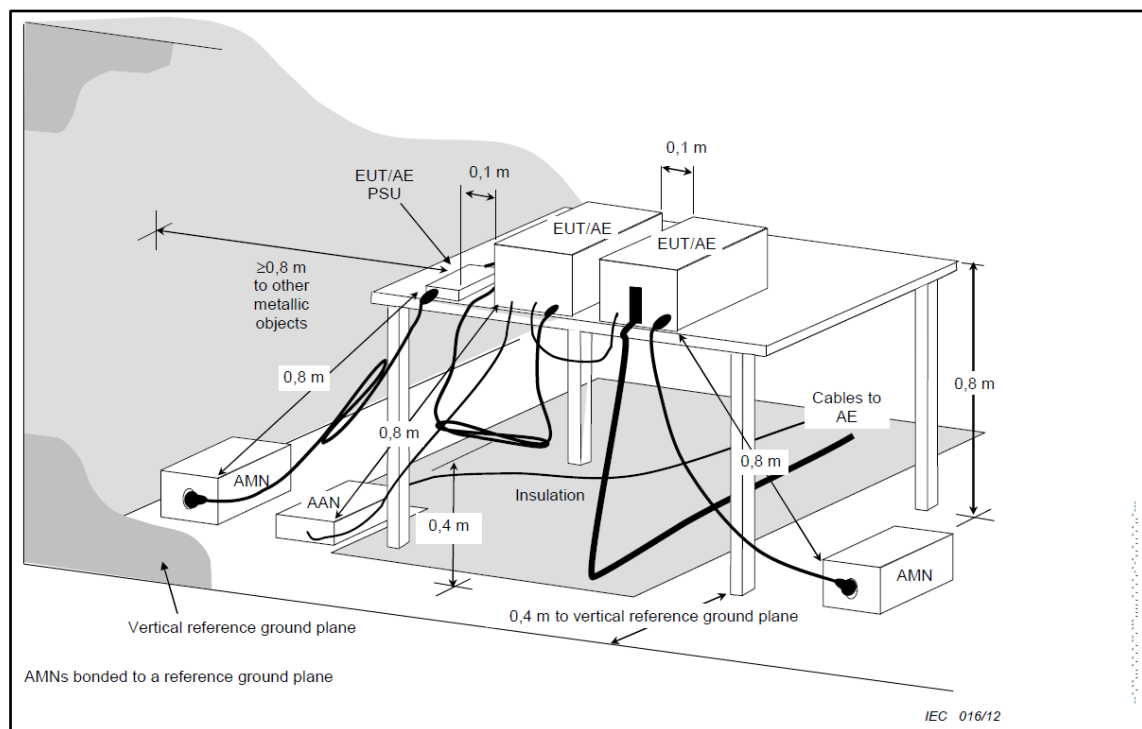
7 TEST METHODOLOGY

7.1 Conducted Spurious Emission AC Power line Test

Measured levels of ac power-line conducted emission across the 50Ω LISN port (to which the EUT is connected). All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer.

The device is placed on the test table, raised 80cm above the reference ground plane. The vertical conducting plane is located 40cm to the rear of the device. AC Conducted emission measurement is made over frequency range from 150kHz to 30MHz, this measurement was performed with EUT powered by 2 methods and both methods are tested individually, one with an AC adaptor with 110V AC 60Hz supply and second with Wireless charger with supply 110V AC 60Hz.

7.1.1 Test Setup Configuration



7.2 Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1 GHz & 1.5 m height for above 1 GHz measurement, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000 MHz was performed by horn antenna, The measurement below 30 MHz was performed by loop antenna, Measurement from 30 MHz to 200 MHz was performed by Baloon and Biconical Antenna, and measurement from 200 MHz to 1 GHz was performed by Log-Periodic Antenna.

The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded

7.2.1 Test Setup Configuration

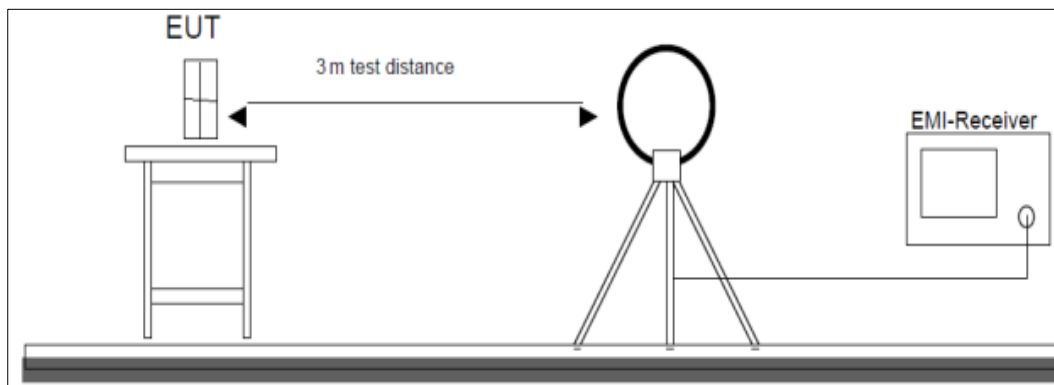


Figure 1: Frequency Range 9 kHz- 30 MHz

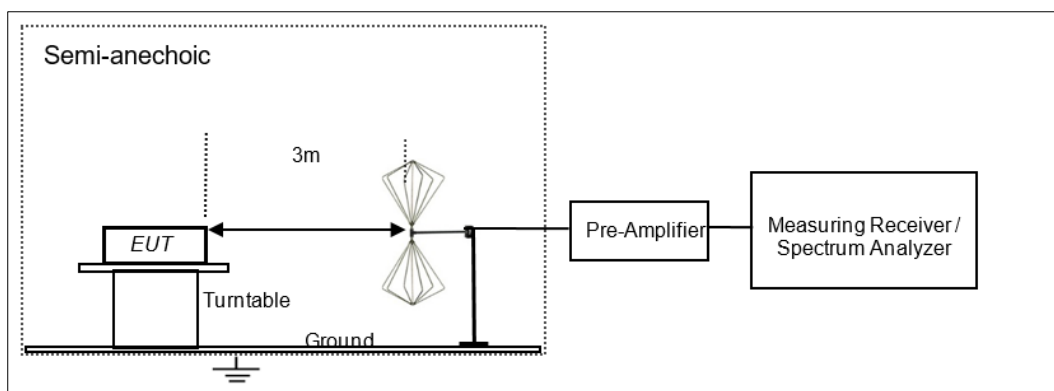


Figure 2: Frequency Range 30 MHz – 200 MHz

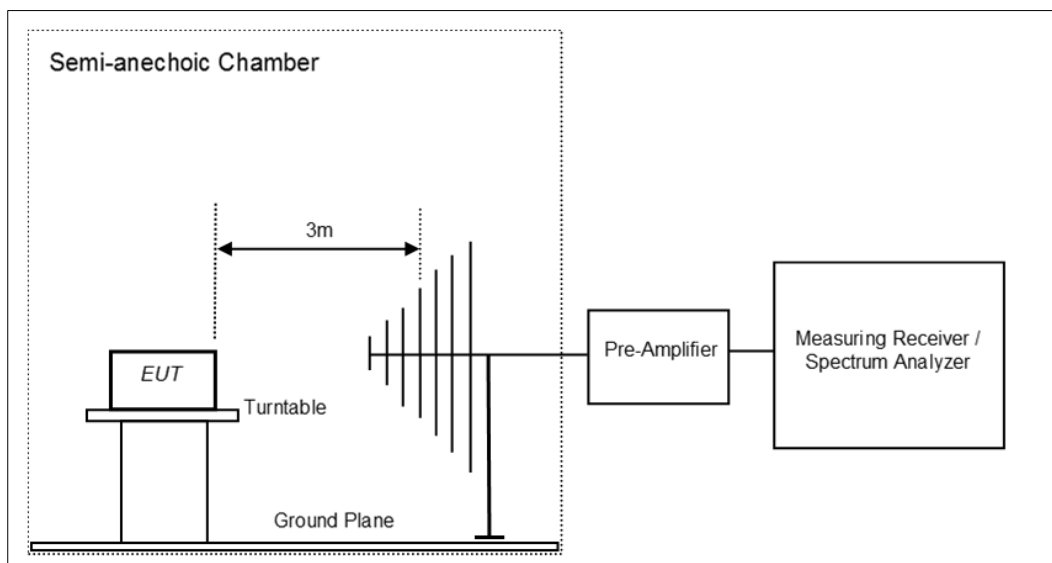


Figure 3: Frequency Range 200 MHz - 1GHz

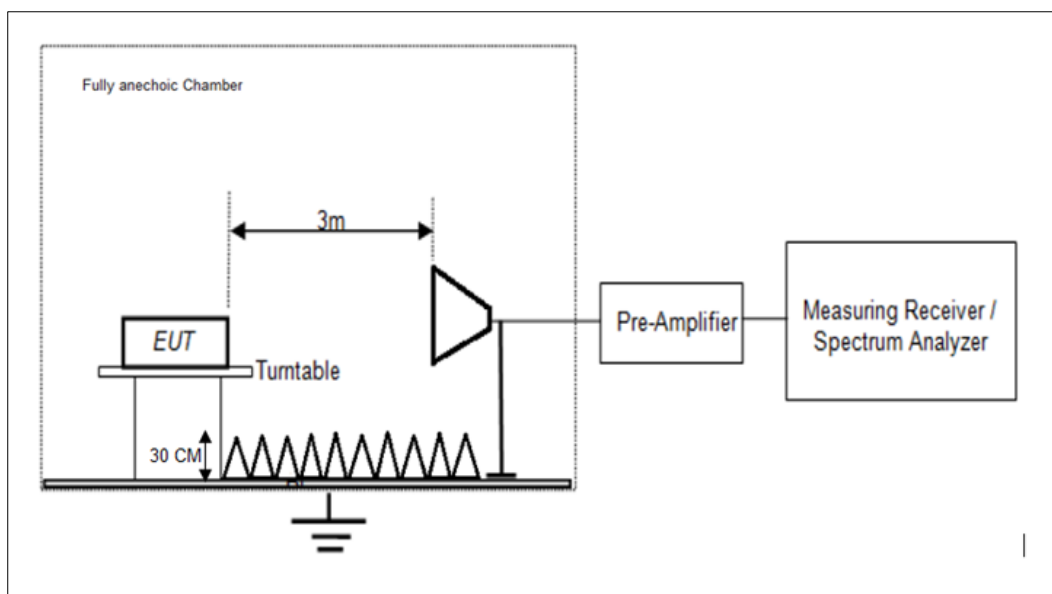


Figure 4: Frequency Range above 1 GHz

Frequency Range 30MHz to 10th harmonics of the highest fundamental frequency

Test performed as per ANSI C63.10-2013

Radiated spurious emission test are performed as below.

All the radiated emission measurements are performed in accordance with common requirement specified in 5.2 followed by substitution measurement as listed below

The equipment under test is placed on non-conductive table at 3m away from the receive antenna in accordance with above mentioned standard. Turn table is rotated through 360 degree, and receiver antenna height is varied in order to determine the level of maximum emission. The maximum emission level and position of the maximized emission is recorded with use of spectrum analyzer.

EUT power measured in a radiated test configuration using the signal (antenna) substitution techniques as per ANSI C63.10-2013 clause G.5.3

The ERP/EIRP may be determined from the power setting of a signal generator used in the signal (antenna) substitution test configuration as follows in Equation

$$\text{ERP EIRP} = \text{PT} + \text{GT} - \text{LC}$$

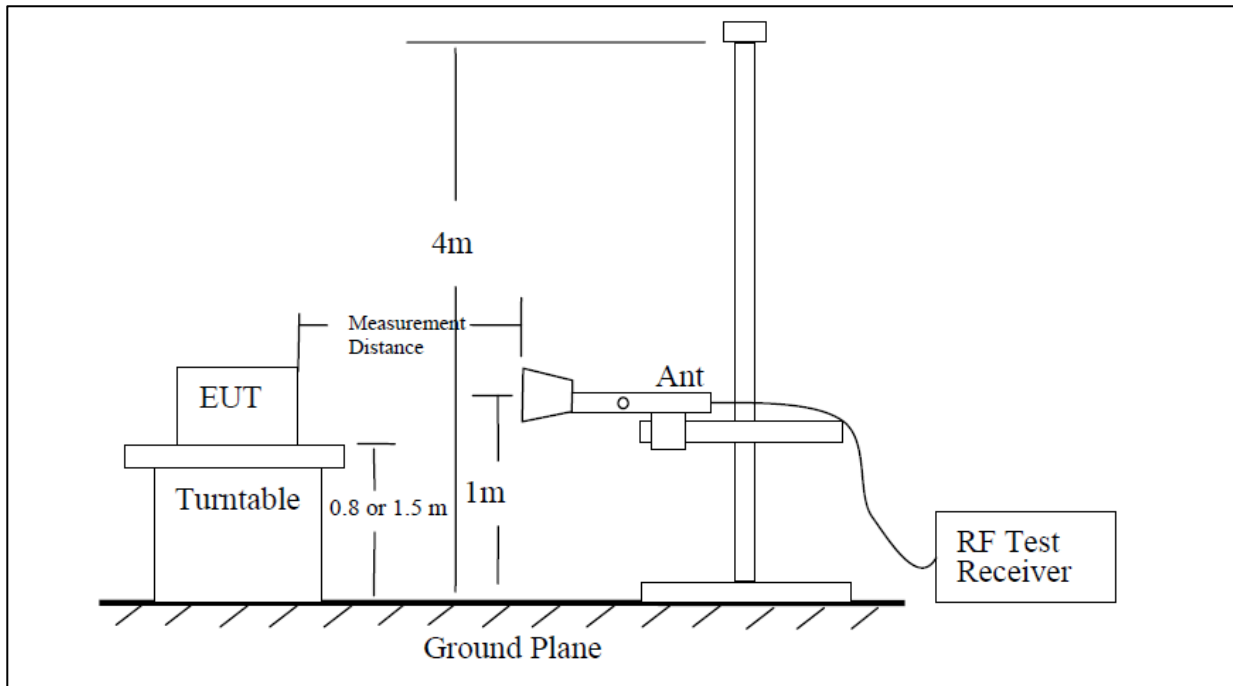
where

PSG is the power setting of the signal generator that produces the same received power reading as the DUT, in dBm, dBW, or psd

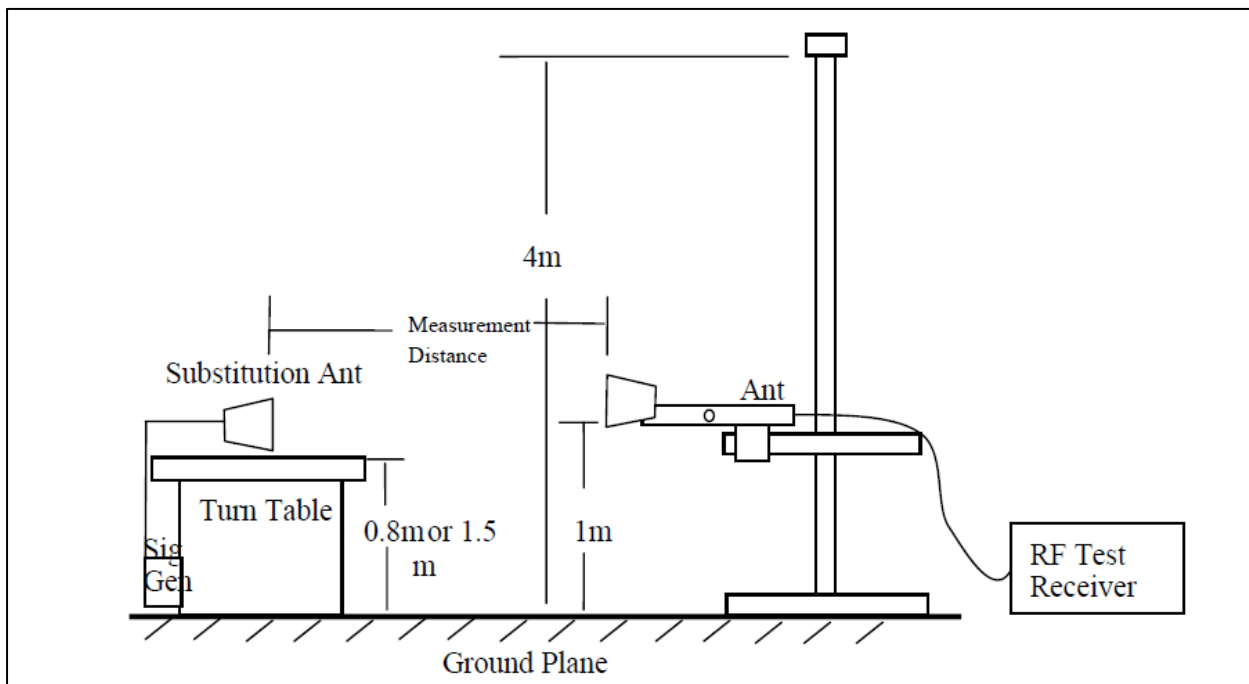
GT is the gain of the substitute antenna, in dBd (i.e., ERP) or dBi (i.e., EIRP)

LC is the signal loss in the cable connecting the signal generator to the substitute antenna, in dB

Test site-up for radiated measurements



Substitution method set-up for radiated emission



8 TEST RESULTS

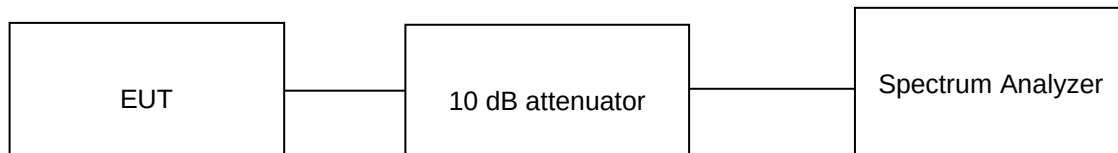
8.1 Emission Bandwidth

Result

Pass

Test Specification	FCC part 15 Subpart C 15.407 (a) & (e) / RSS 247 Issue 2, Section 6.2.4.1 & RSS Gen Issue 5, Section 6.7
Test Method	Subclause 6.9.2 of ANSI C63.10
Measurement Bandwidth	Refer Test Method below
Detector	Refer Test Method below
Port of testing	Antenna port
Requirement	1. 99% emission band width measurement for reporting purpose only in the band 5150-5250 MHz 2. 99% emission band width measurement for reporting purpose only in the band 5250-5350 MHz 3. 99% emission band width measurement for reporting purpose only in the band 5470-5725 MHz 2. For equipment operating in the band 5725-5850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz

Test Method:



The following procedure shall be used for measuring (99%) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency
2. Set span = 1.5 times to 5.0 times the OBW
3. Set RBW = 1% to 5% of the OBW
4. Set VBW $\geq 3 \times$ RBW
5. Use the 99% power bandwidth function of the instrument
6. Use sample detector with single sweep mode, or use Peak detector and Max Hold mode (until the trace is stabilized)

The following procedure shall be used for measuring 6dB or 26dB emission bandwidth:

1. Set center frequency to the nominal EUT channel center frequency
2. Set span = 1.5 times to 5.0 times the OBW
3. Set RBW = 1% to 5% of the OBW (for 26 dB BW) & 100 kHz (for 6dB BW)
4. Set VBW $\geq 3 \times$ RBW
5. Determine the “-xx dB down amplitude” using [(reference value) - xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument.

Note : All the steps in measurement method of KDB 789033 D02, ANSI C63.10 section 6.9.2 & 6.9.3, RSS GEN section 6.9 are followed

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

Seite 19 von 143
Page 19 of 143

Test Condition:

Normal Test Condition:

Temperature (Norm) = + 25 °C

Voltage = 5.0 V DC

Relative humidity: 62 %

KDB Guidelines applied:

Measurements were made as per section C & D in KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Test results:

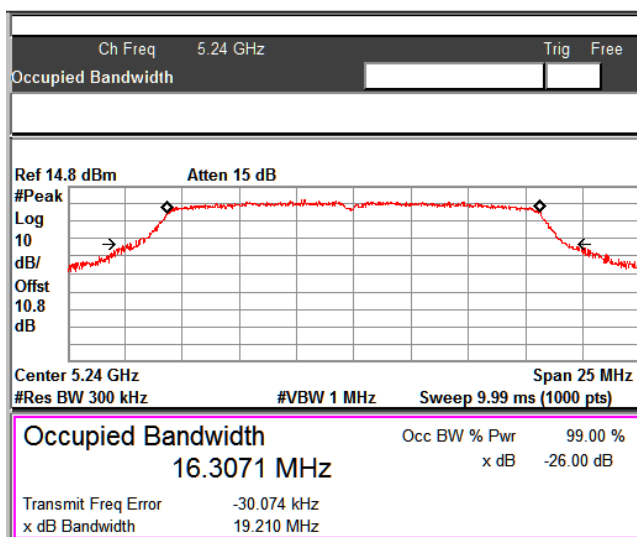
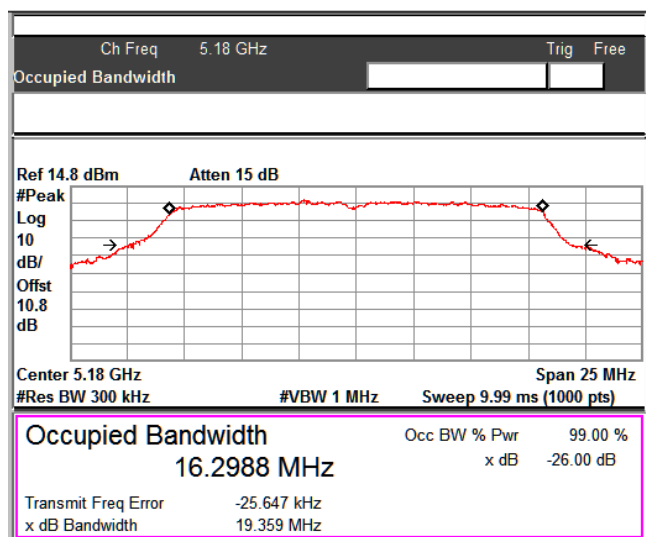
Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
10 dB attenuator + 0.8 dB Cable loss = 10.8 dB total offset

Modulation: 802.11a : UNII 1

Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
6	5180	19.36	16.30
	5240	19.21	16.30
54	5180	22.19	16.79
	5240	22.02	16.79

Data rate: 6Mbps

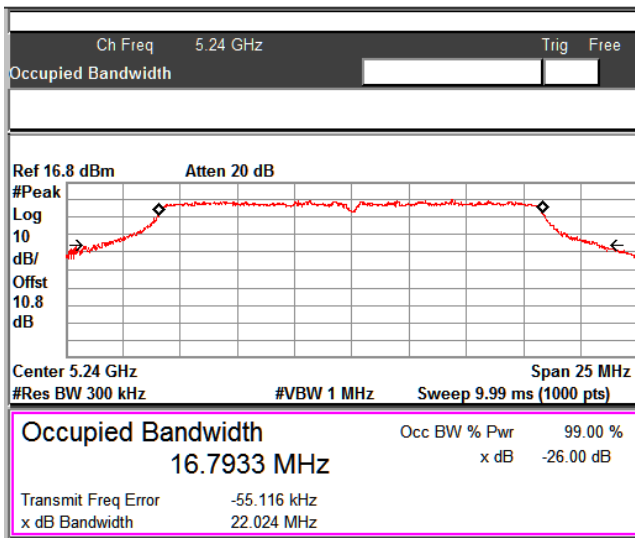
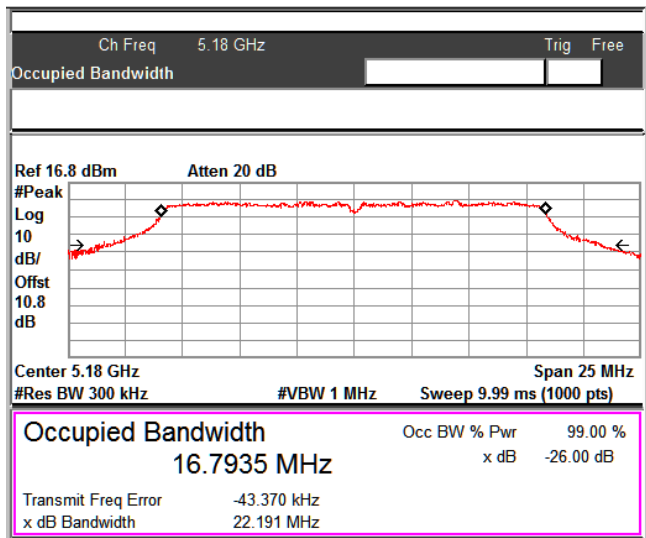


Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

Seite 20 von 143
Page 20 of 143

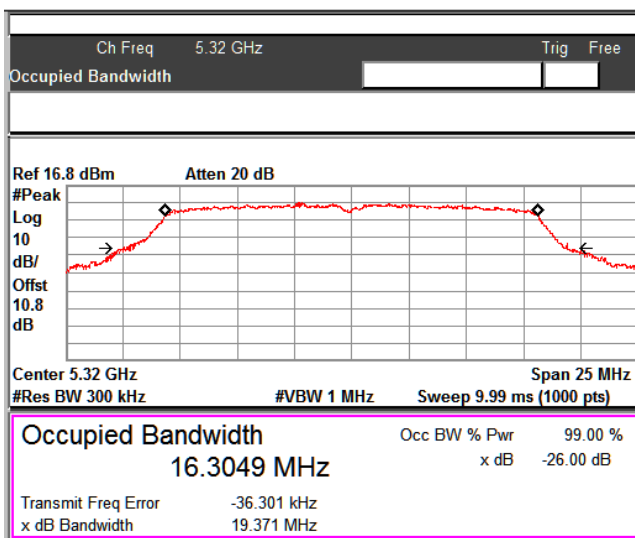
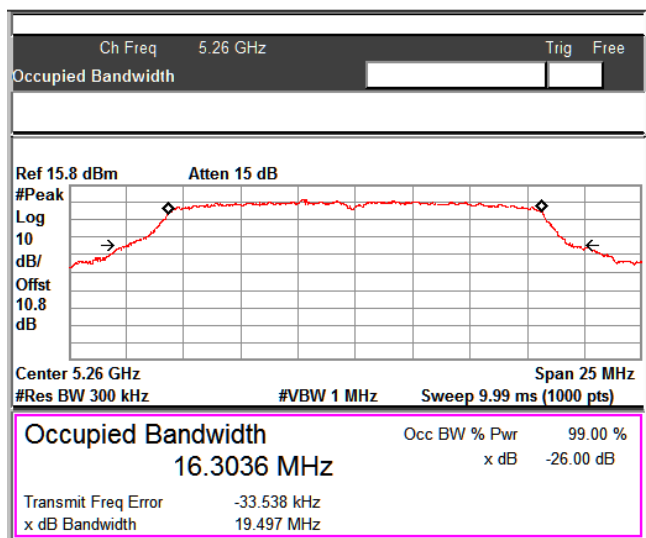
Data rate: 54Mbps



Modulation: 802.11a : UNII 2a

Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
6	5260	19.50	16.30
	5320	19.37	16.30
54	5260	22.18	16.79
	5320	22.32	16.81

Data rate: 6Mbps

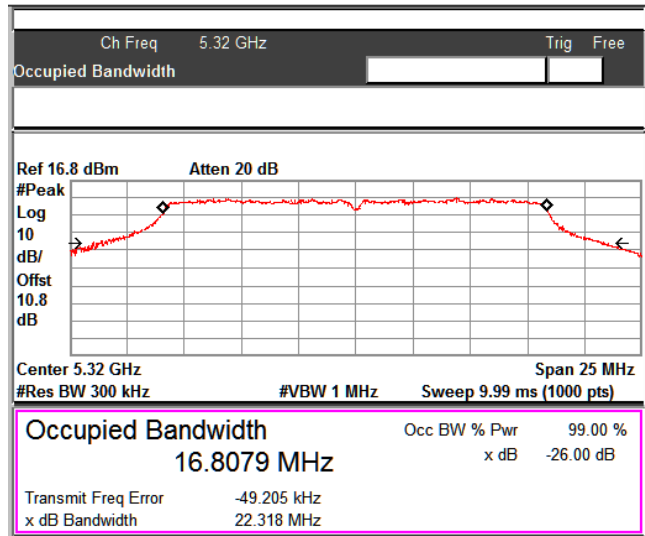
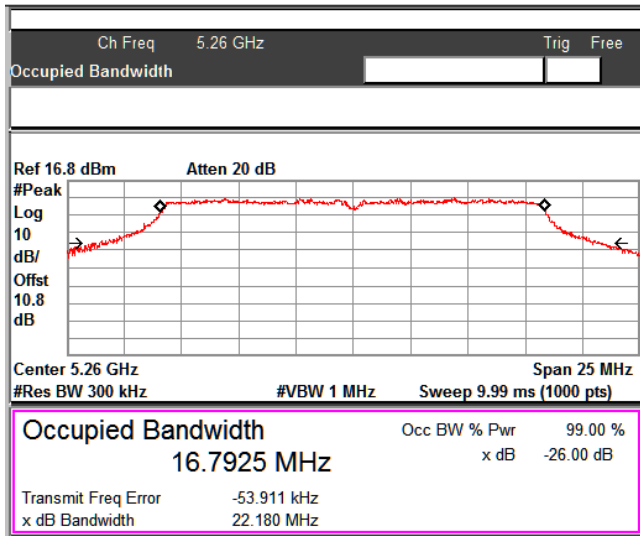


Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

Seite 21 von 143
Page 21 of 143

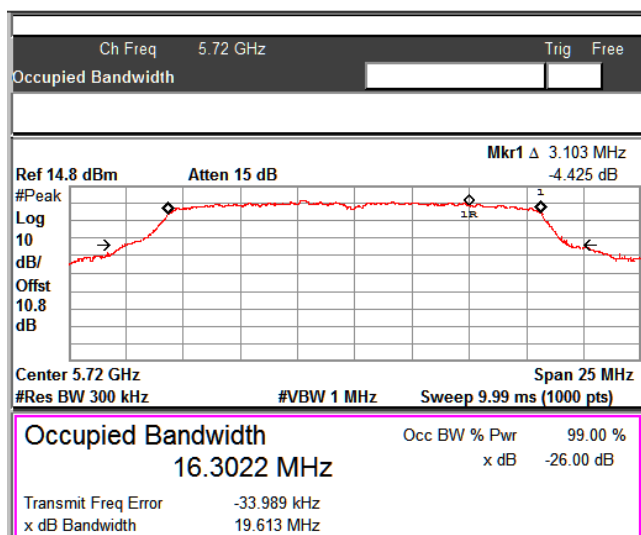
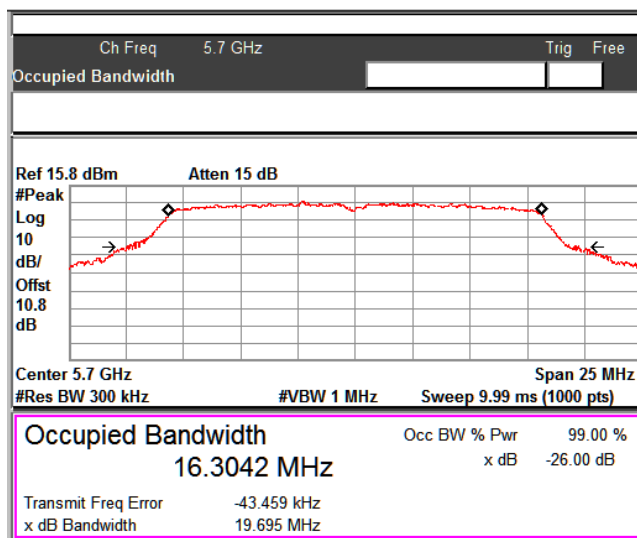
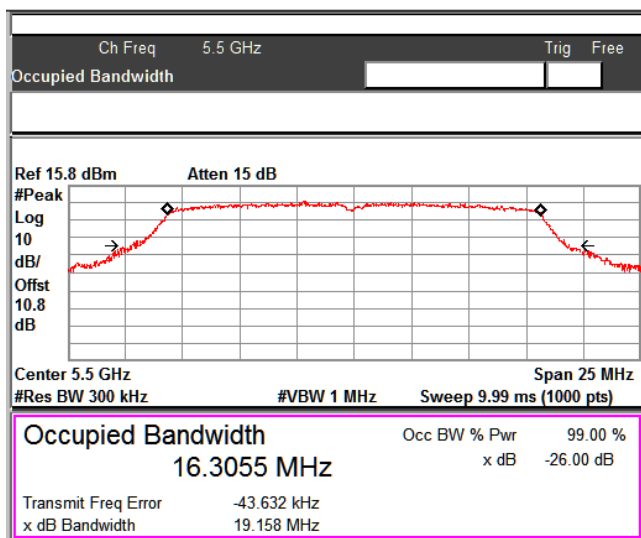
Data rate: 54Mbps



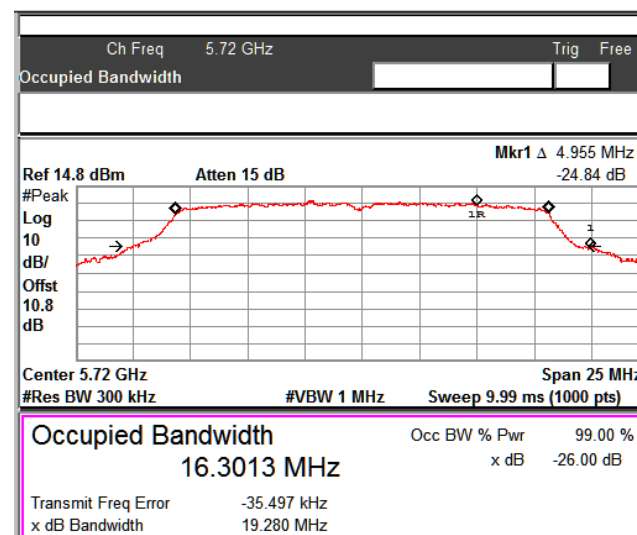
Modulation: 802.11a : UNII 2c

Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
6	5500	19.16	16.30
	5700	19.69	16.30
	5720	19.28 14.33 –UNII 2C 4.95- UNII 3	16.30 13.20 – UNII 2C 3.10 – UNII 3
54	5500	21.90	16.82
	5700	22.67	16.81
	5720	22.68 15.95 –UNII 2C 6.73- UNII 3	16.79 13.44 – UNII 2C 3.35 – UNII 3

Data rate: 6Mbps



99% Bandwidth



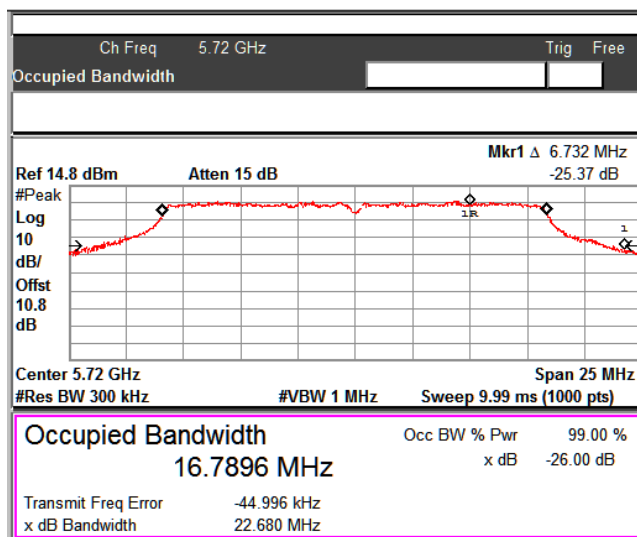
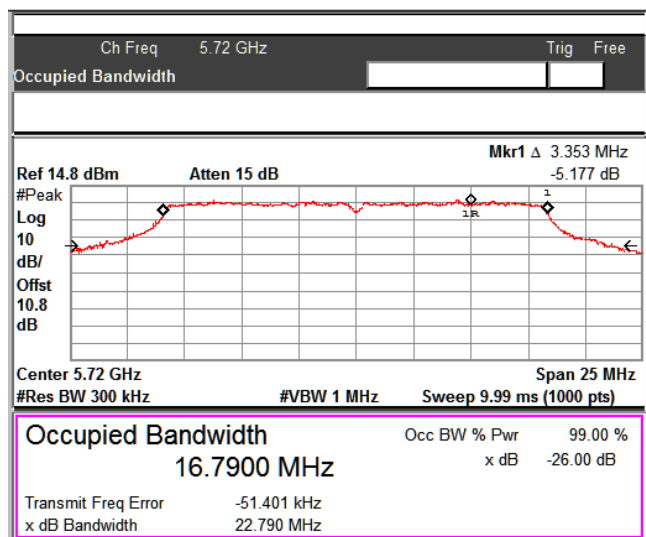
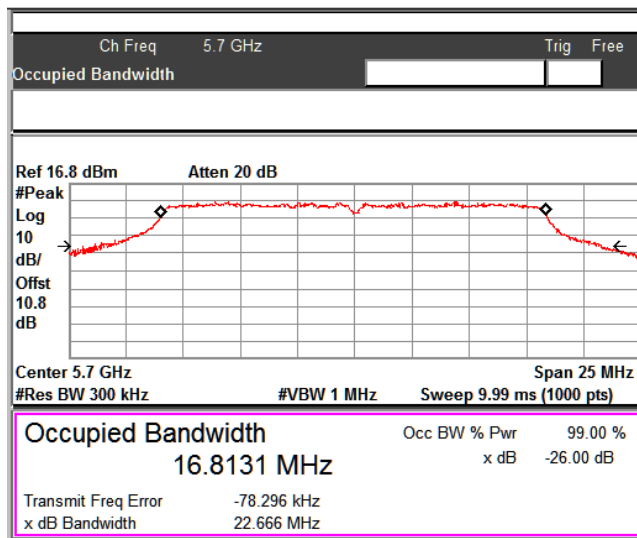
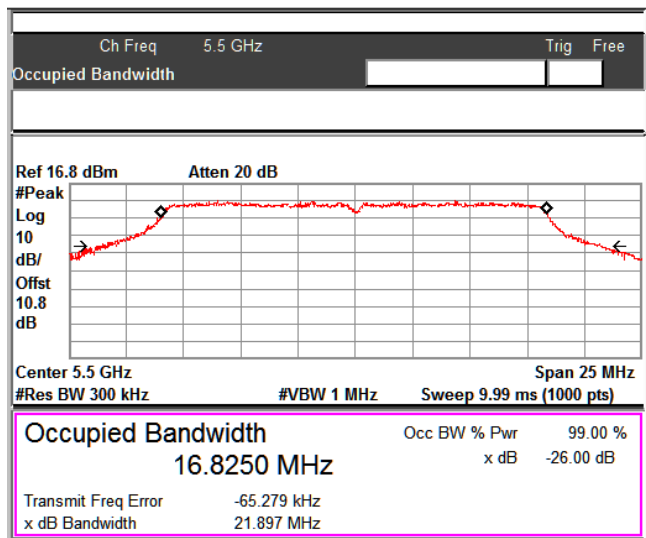
26 Bandwidth

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

Seite 23 von 143
Page 23 of 143

Data rate: 54Mbps



99% Bandwidth

26 Bandwidth

Modulation: 802.11a : UNII 3

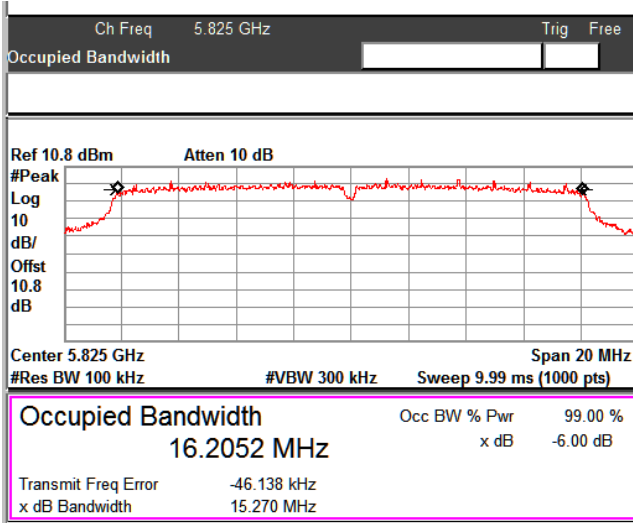
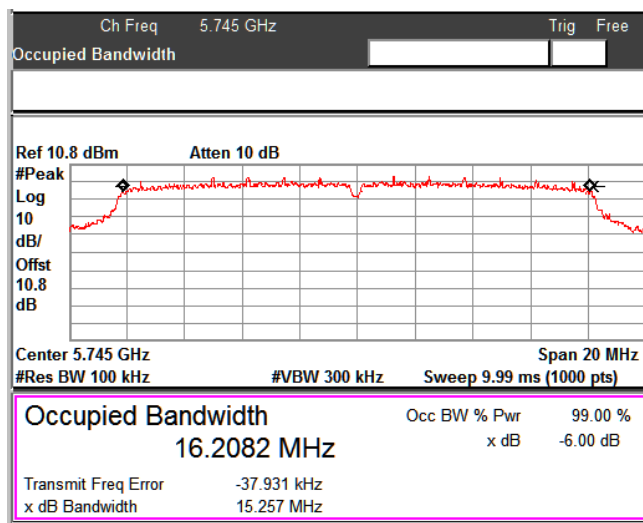
Data rate (Mbps)	Measured Frequency (MHz)	6 dB emission bandwidth (MHz)	Minimum Limit (MHz)
6	5745	15.25	0.5
	5825	15.27	0.5
54	5745	16.44	0.5
	5825	16.44	0.5

Prüfbericht - Nr.:
Test Report No.:

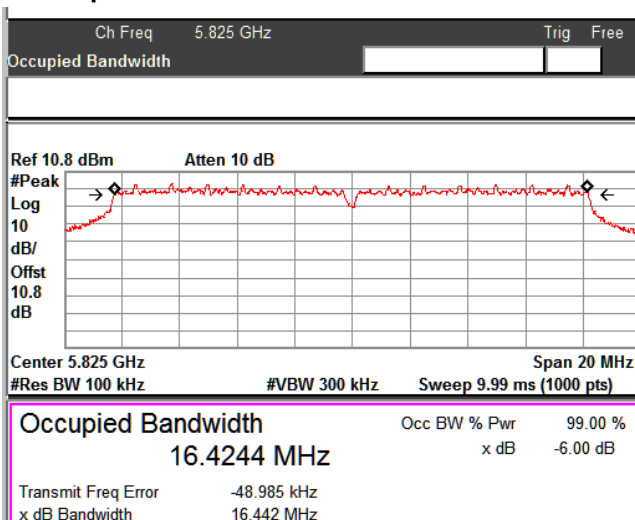
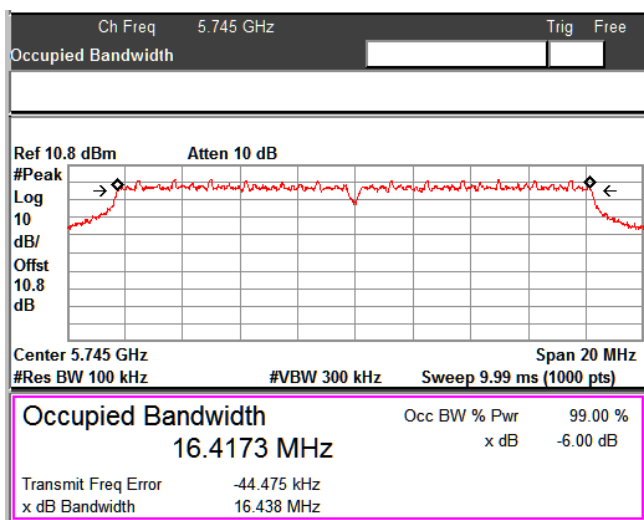
ULR-TC568821300000034F

Seite 24 von 143
Page 24 of 143

Data Rate 6 Mbps



Data Rate: 54Mbps



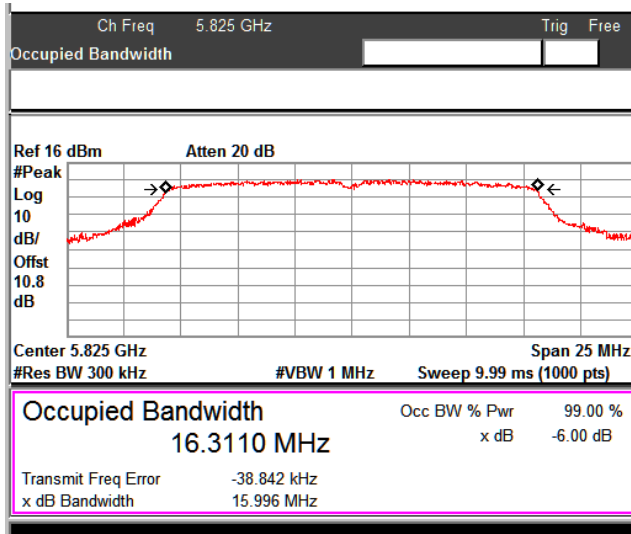
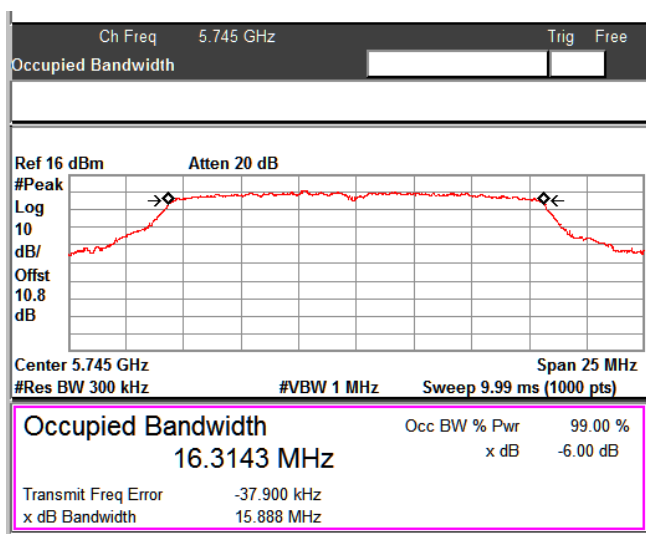
Data rate (Mbps)	Measured Frequency (MHz)	99% Occupied Bandwidth (MHz)
6	5745	16.31
	5825	16.31
54	5745	16.80
	5825	16.78

Prüfbericht - Nr.:
Test Report No.:

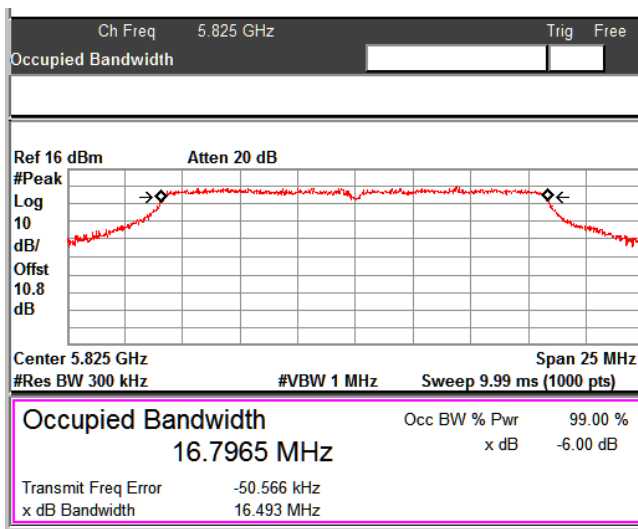
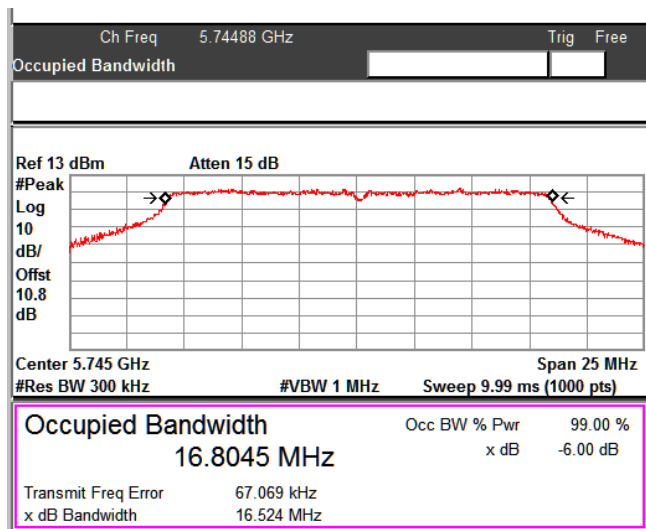
ULR-TC568821300000034F

Seite 25 von 143
Page 25 of 143

Data Rate: 6Mbps



Data Rate: 54 Mbps



Modulation: 802.11n-20MHz : UNII 1

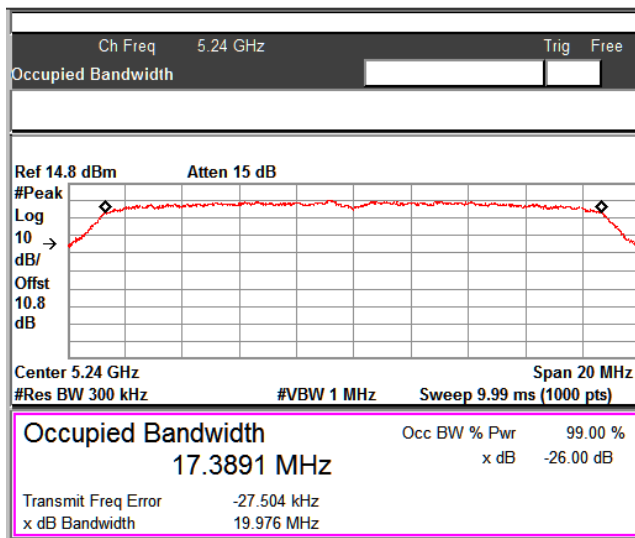
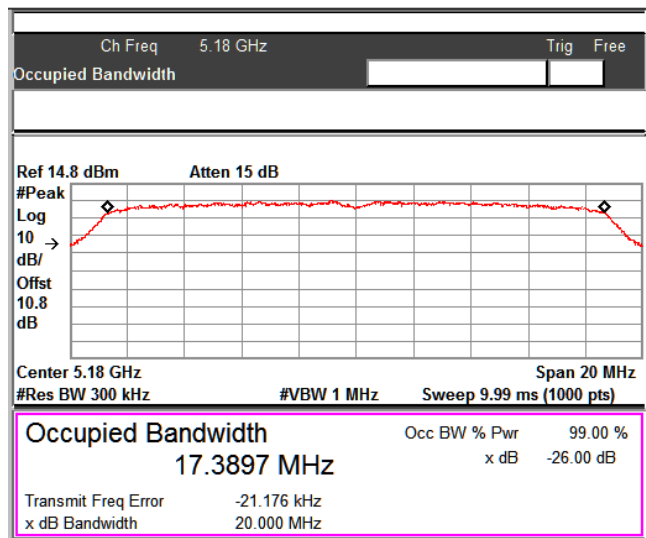
Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5180	20.00	17.39
	5240	19.98	17.39
MCS7	5180	20.00	17.84
	5240	20.00	17.85

Prüfbericht - Nr.:
Test Report No.:

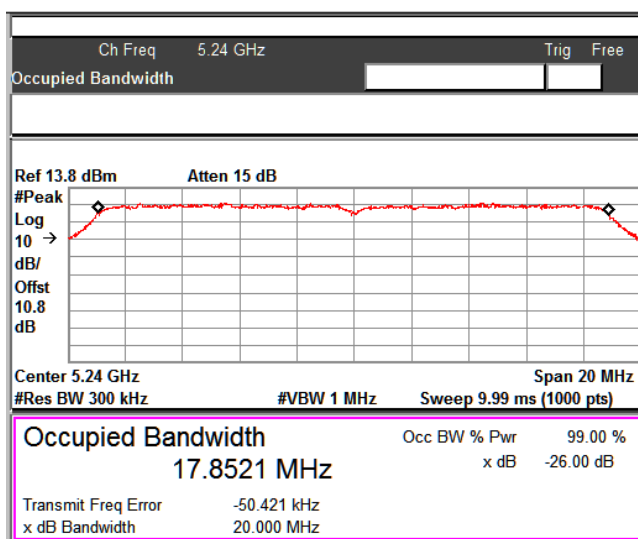
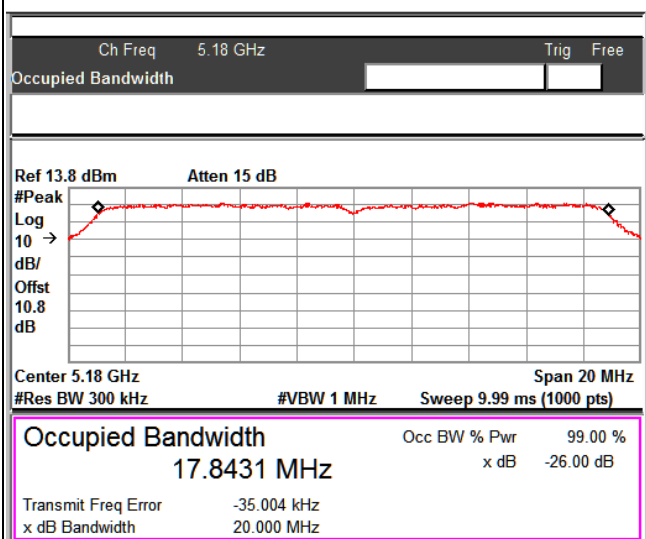
ULR-TC568821300000034F

Seite 26 von 143
Page 26 of 143

Data Rate: MCS0



Data Rate: MCS7



Modulation: 802.11n-20MHz : UNII 2a

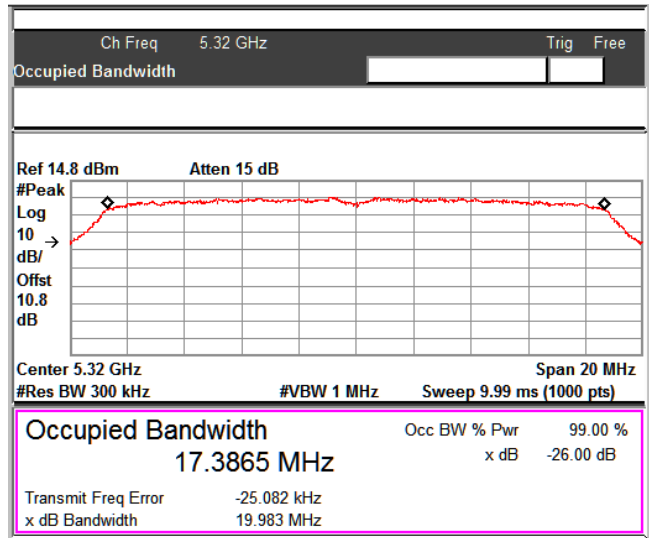
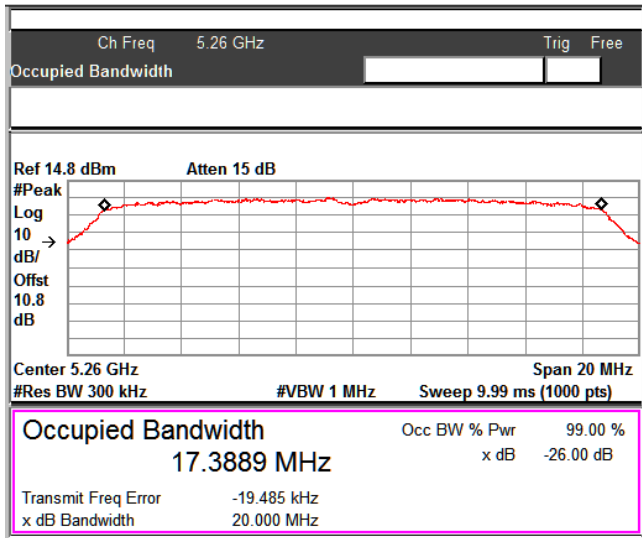
Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5260	20.00	17.39
	5320	17.38	19.98
MCS7	5260	20.00	17.86
	5320	20.00	17.83

Prüfbericht - Nr.:
Test Report No.:

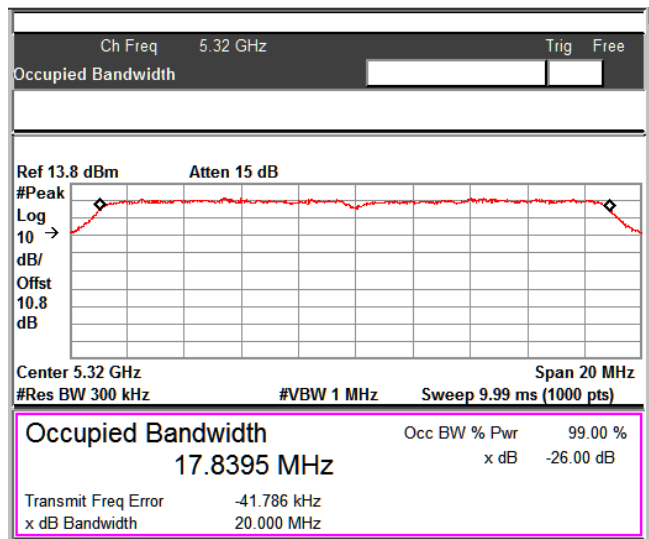
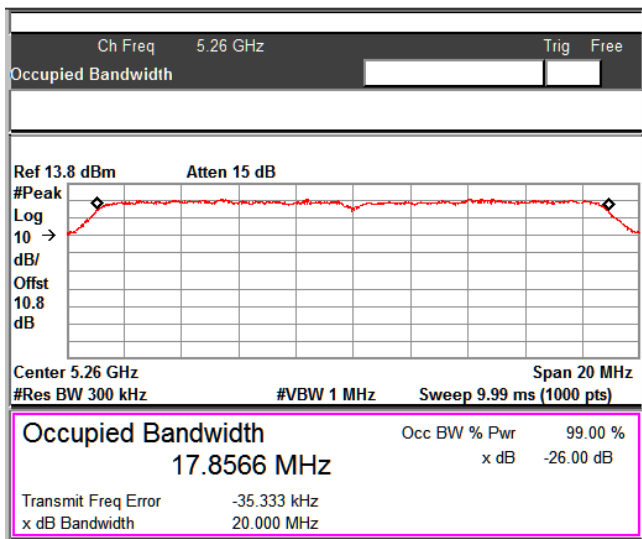
ULR-TC568821300000034F

Seite 27 von 143
Page 27 of 143

Data Rate: MCS0



Data Rate: MSC7



Prüfbericht - Nr.:
Test Report No.:

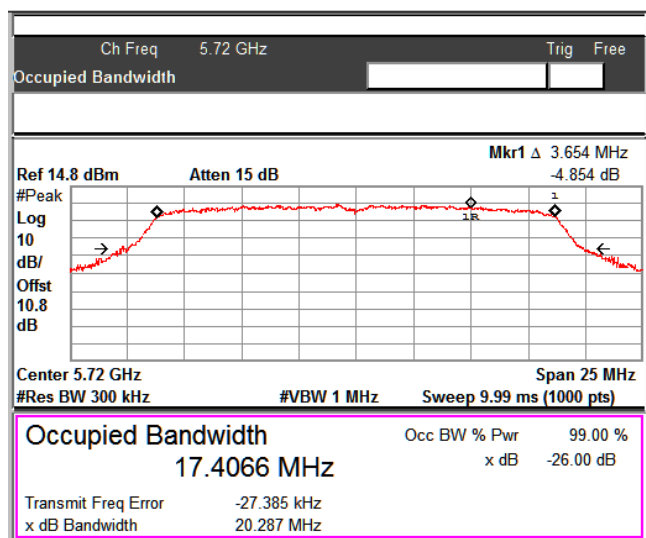
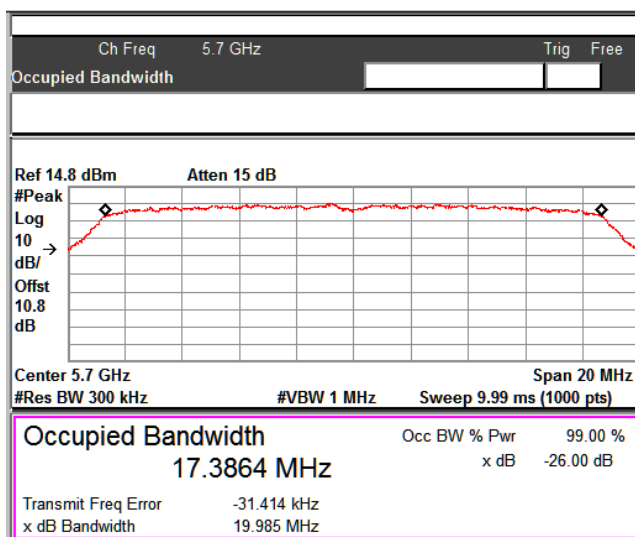
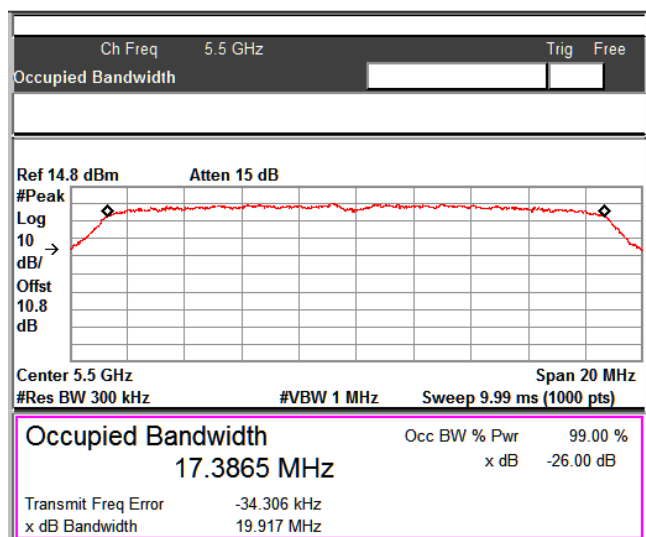
ULR-TC568821300000034F

Seite 28 von 143
Page 28 of 143

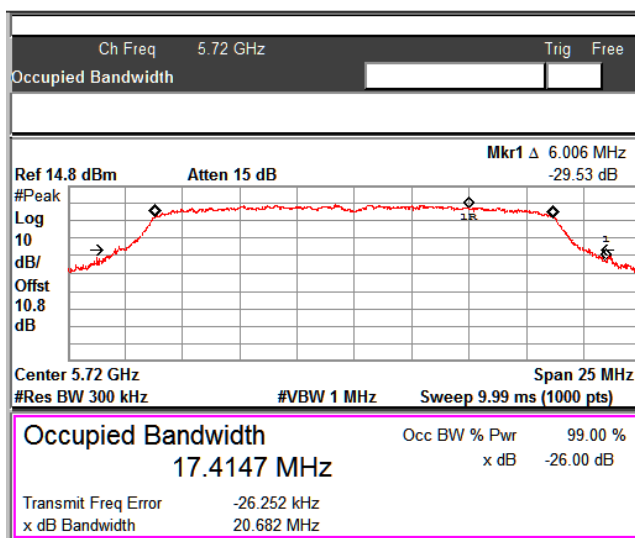
Modulation: 802.11n-20MHz : UNII 2c

Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5500	19.91	17.39
	5700	19.99	17.39
	5720	20.68 14.68 – UNII 2C 6.00- UNII 3	17.40 13.75 – UNII 2C 3.65 – UNII 3
MCS7	5500	20.00	17.84
	5700	20.00	17.82
	5720	22.53 15.63 – UNII 2C 6.90- UNII 3	17.90 13.98 – UNII 2C 3.92 – UNII 3

Data Rate: MCS0



99% Bandwidth



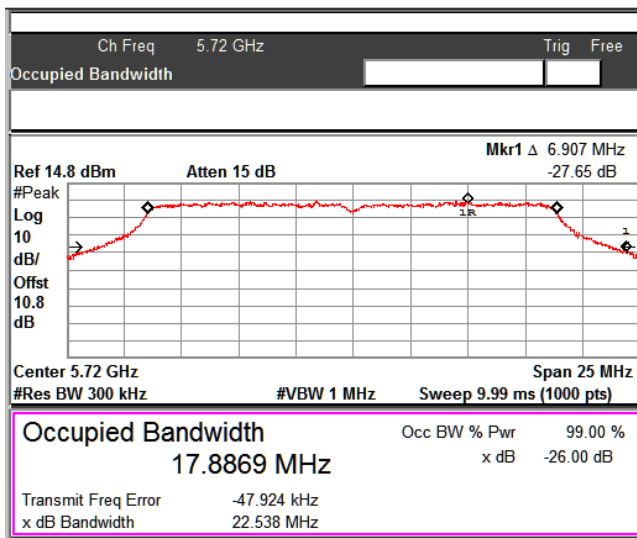
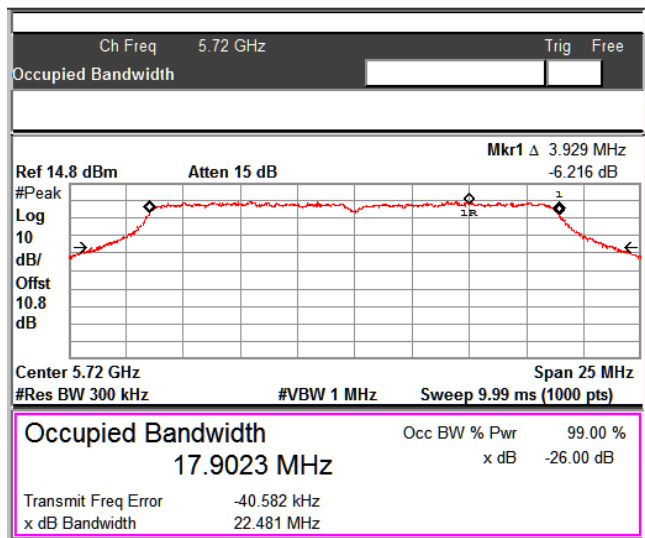
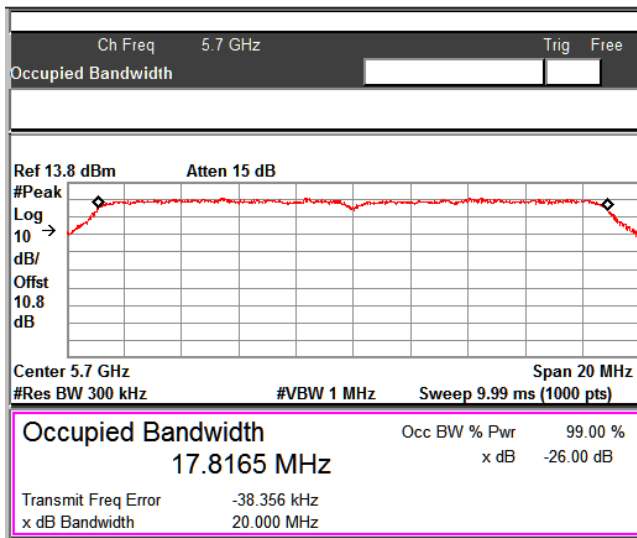
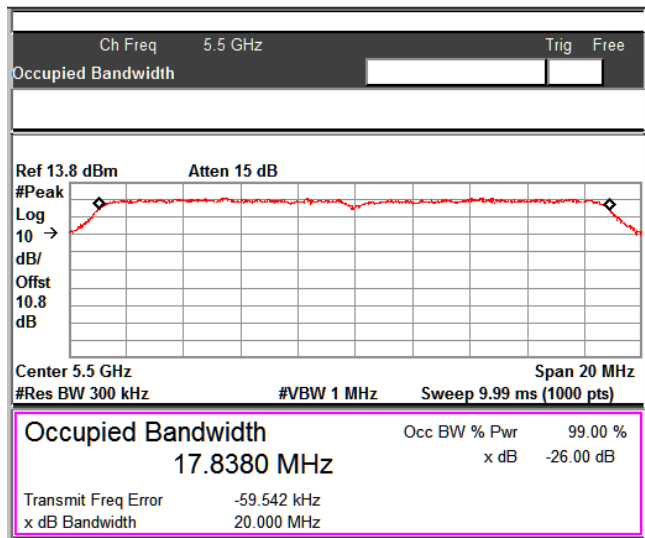
26dB Bandwidth

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

Seite 29 von 143
Page 29 of 143

Data Rate: MSC7



99% Bandwidth

26dB Bandwidth

Modulation: 802.11n-20MHz : UNII 3

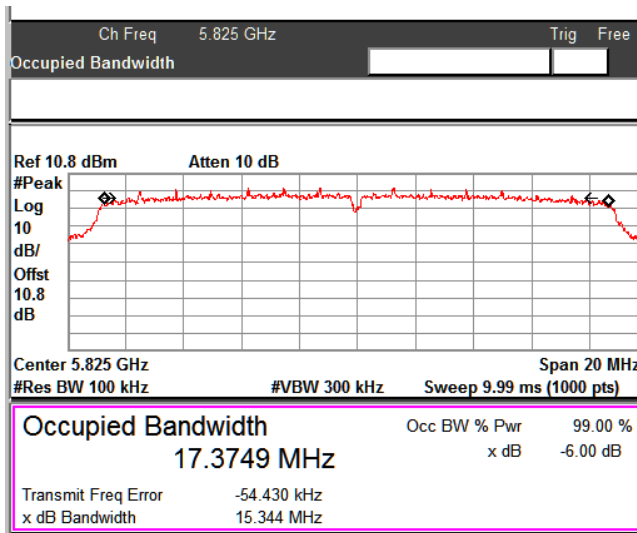
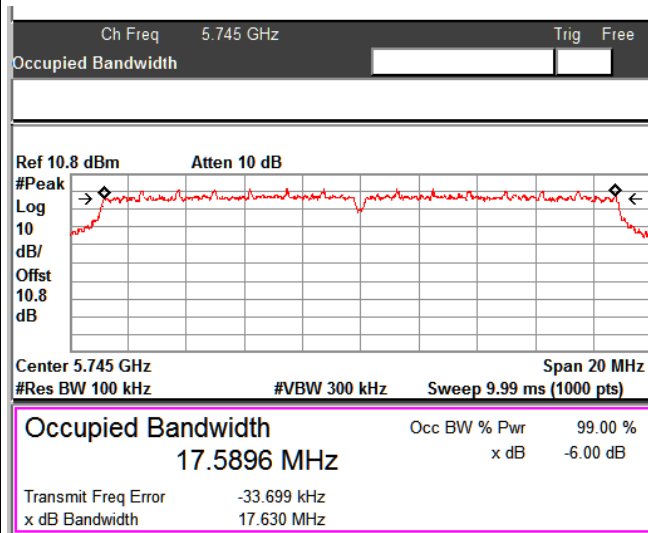
Data rate (Mbps)	Measured Frequency (MHz)	6 dB emission bandwidth (MHz)	Minimum Limit (MHz)
MCS0	5745	17.63	0.5
	5825	15.34	0.5
MCS7	5745	17.63	0.5
	5825	17.61	0.5

Prüfbericht - Nr.:
Test Report No.:

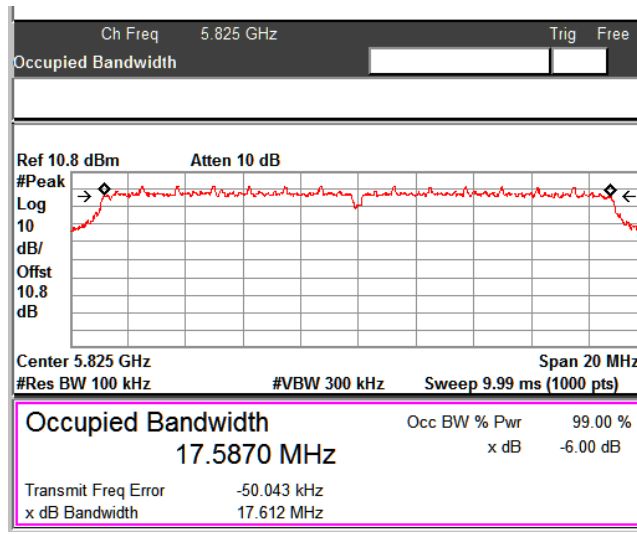
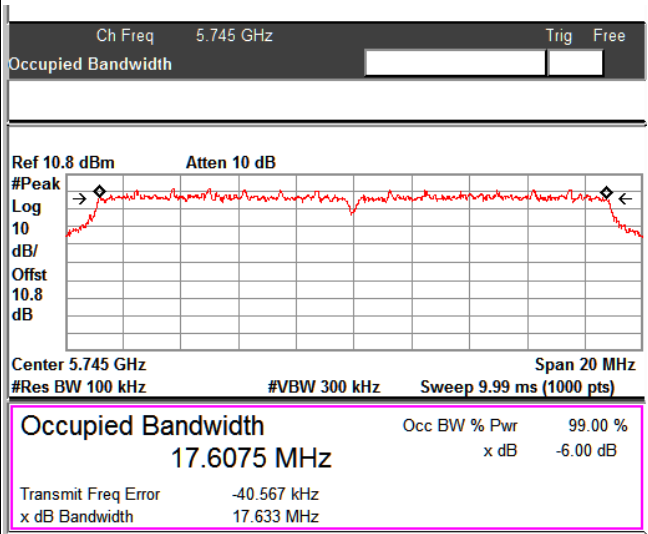
ULR-TC568821300000034F

Seite 30 von 143
Page 30 of 143

Data Rate: MCS 0



Data Rate: MCS 7



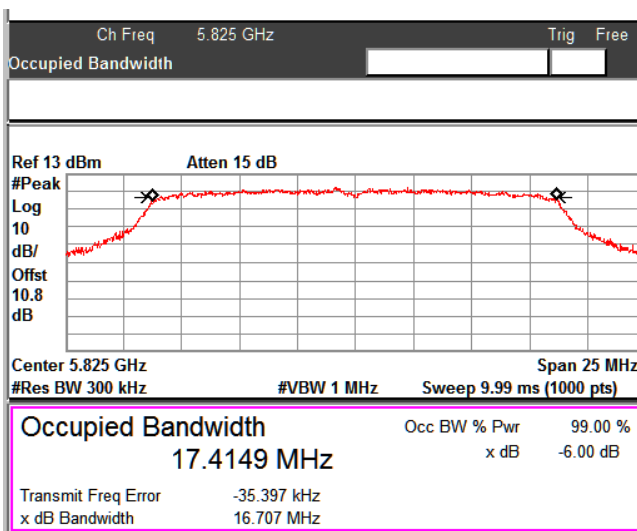
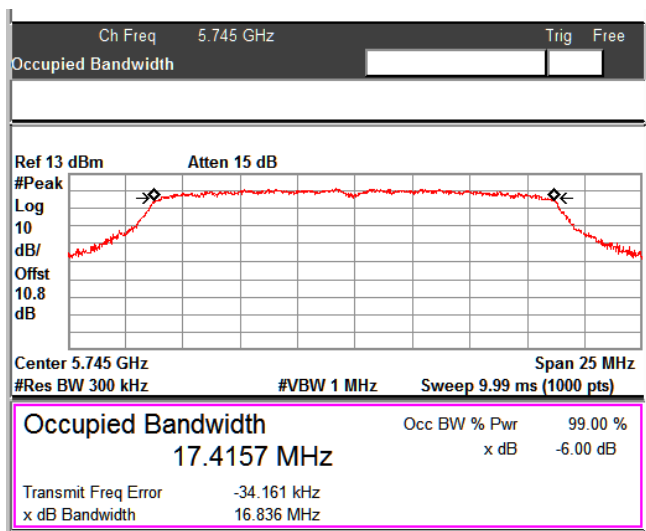
Data rate (Mbps)	Measured Frequency (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5745	17.42
	5825	17.41
MCS7	5745	17.92
	5825	17.85

Prüfbericht - Nr.:
Test Report No.:

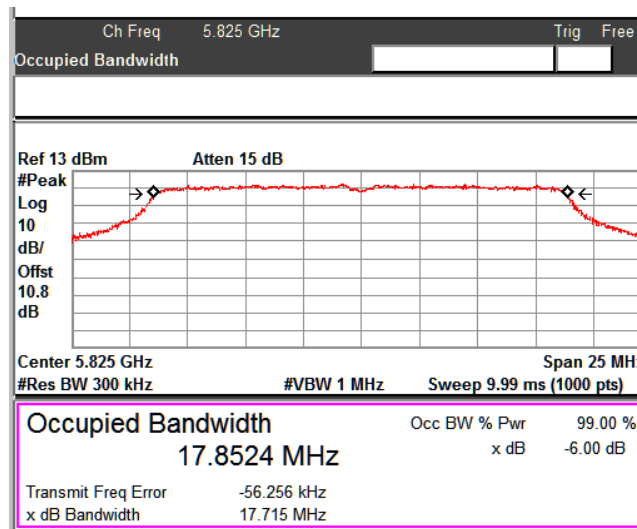
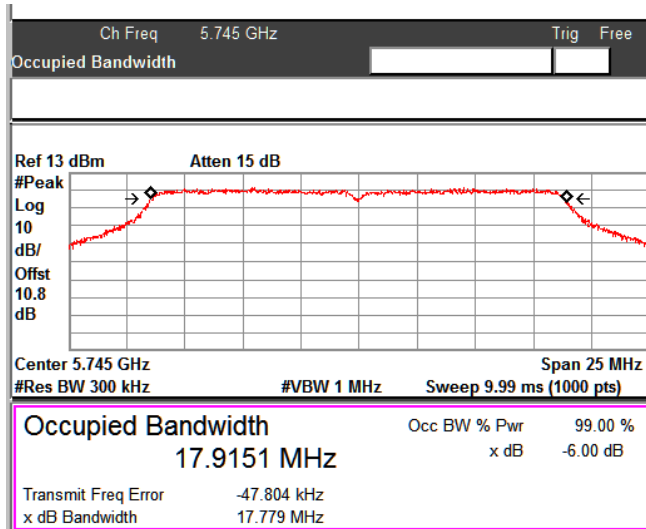
ULR-TC568821300000034F

Seite 31 von 143
Page 31 of 143

Data Rate: MCS 0



Data Rate: MCS 7



Modulation: 802.11n-HT40MHz: UNII 1

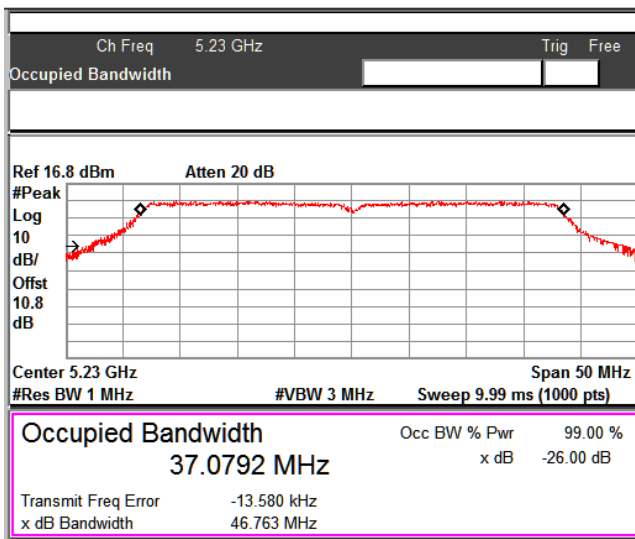
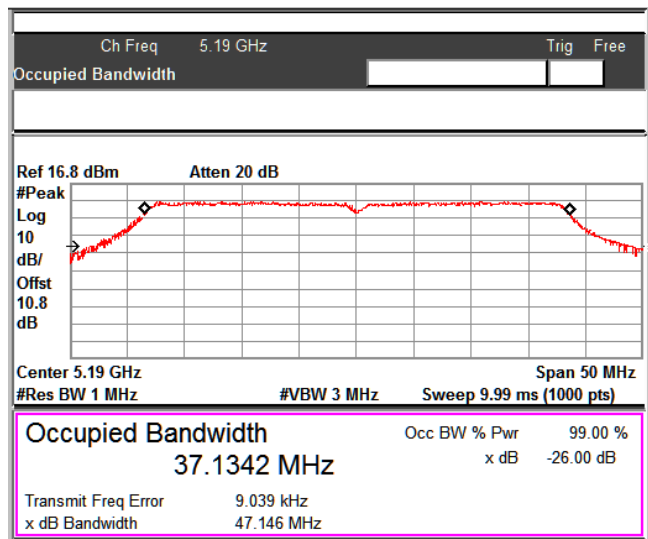
Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5190	41.72	36.02
	5230	43.90	36.00
MCS7	5190	47.14	37.13
	5230	46.76	37.07

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

Seite 32 von 143
Page 32 of 143

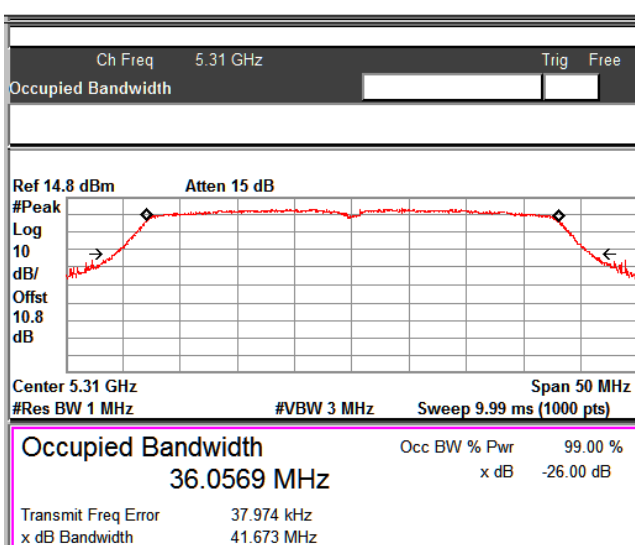
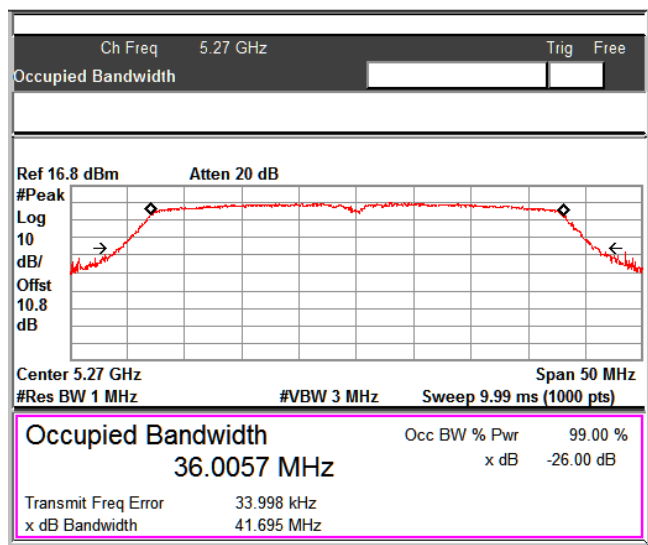
Data Rate : MCS 7



Modulation: 802.11n-HT40MHz: UNII 2a

Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5270	41.70	36.00
	5310	41.67	36.06
MCS7	5270	43.04	36.37
	5310	46.86	37.23

Data Rate: MCS 0

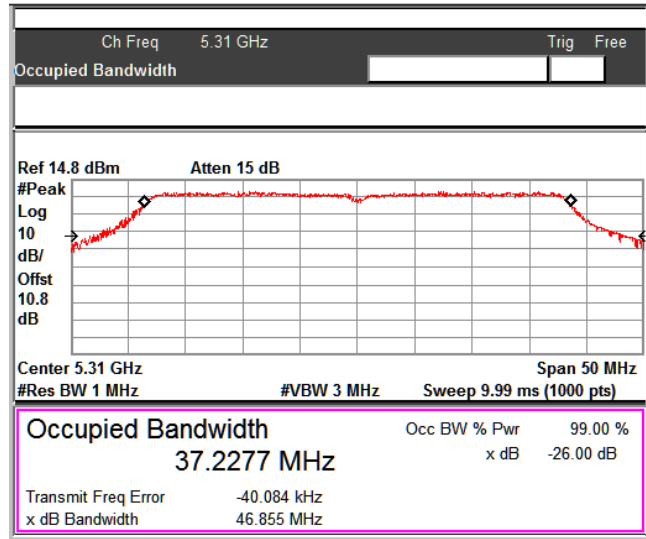
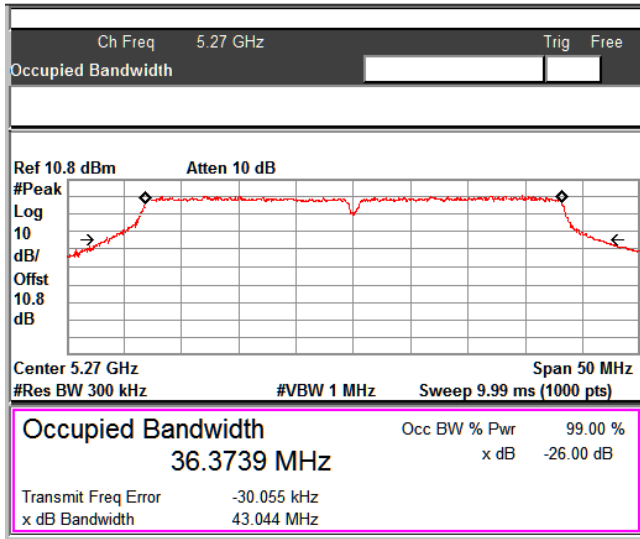


Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

Seite 33 von 143
Page 33 of 143

Data Rate: MCS 7



Modulation: 802.11n-HT40MHz: UNII 2c

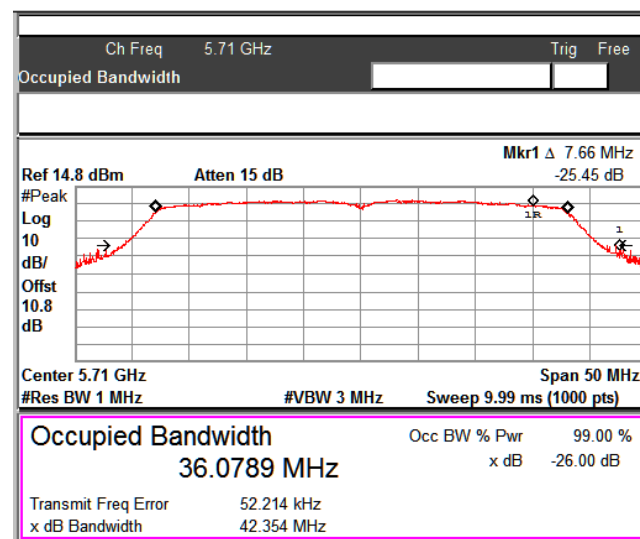
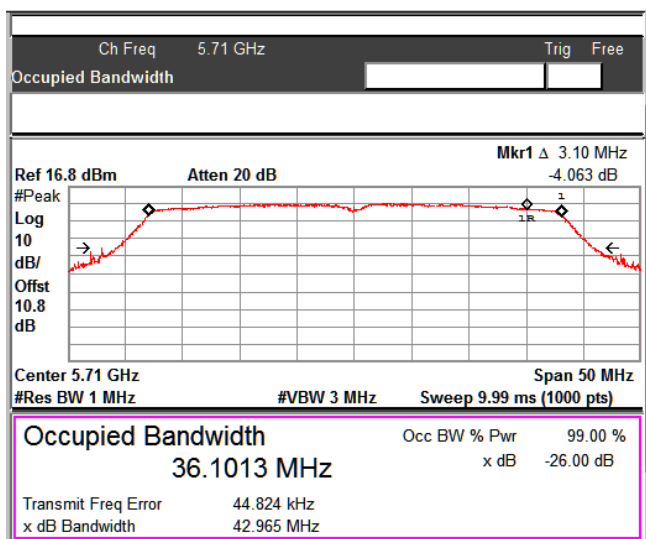
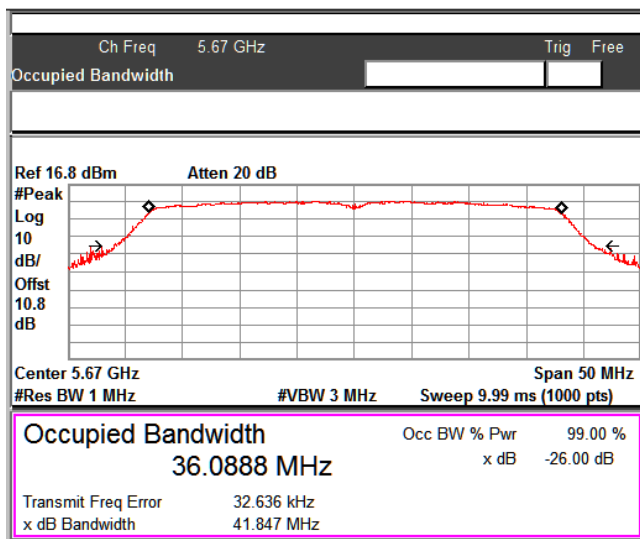
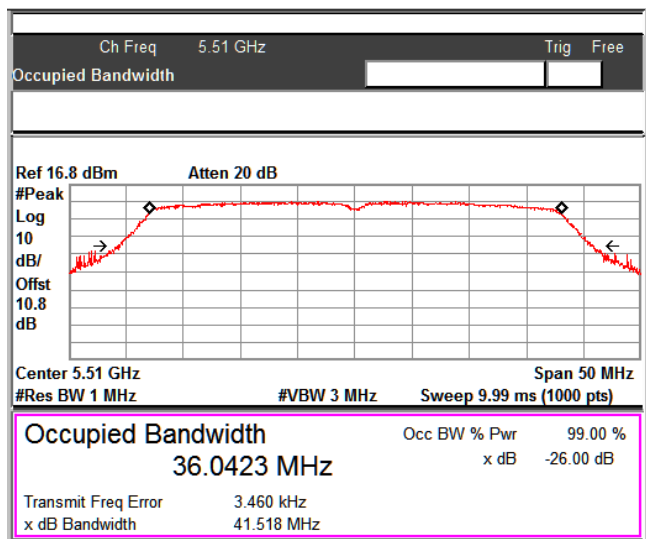
Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5510	41.51	36.04
	5590	43.40	36.09
	5670	41.85	36.08
	5710	42.35 34.69 – UNII 2C 7.66- UNII 3	36.10 33.00 – UNII 2C 3.10 – UNII 3
MCS7	5510	46.86	37.29
	5590	46.59	37.22
	5670	46.60	37.19
	5710	47.39 37.15 – UNII 2C 10.24- UNII 3	37.30 33.67 – UNII 2C 3.63 – UNII 3

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

Seite 34 von 143
Page 34 of 143

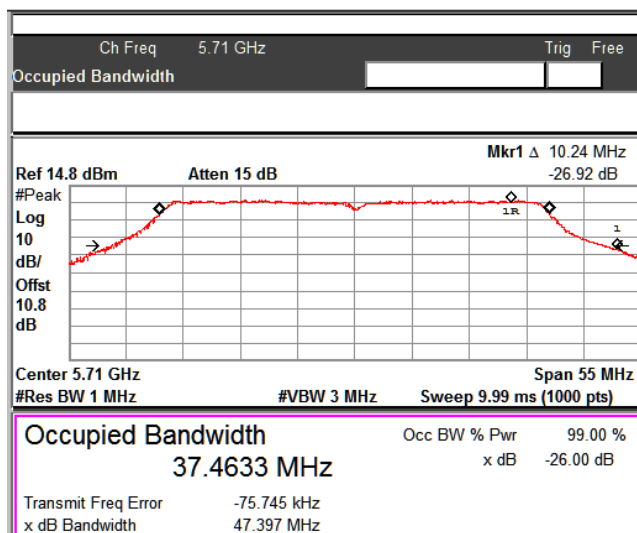
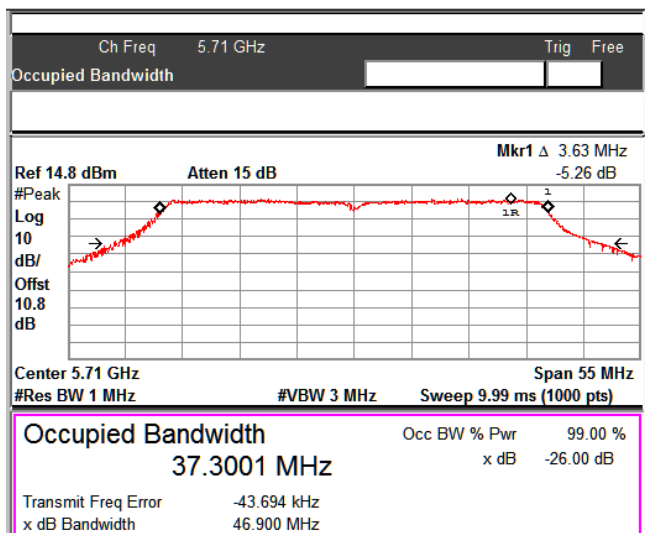
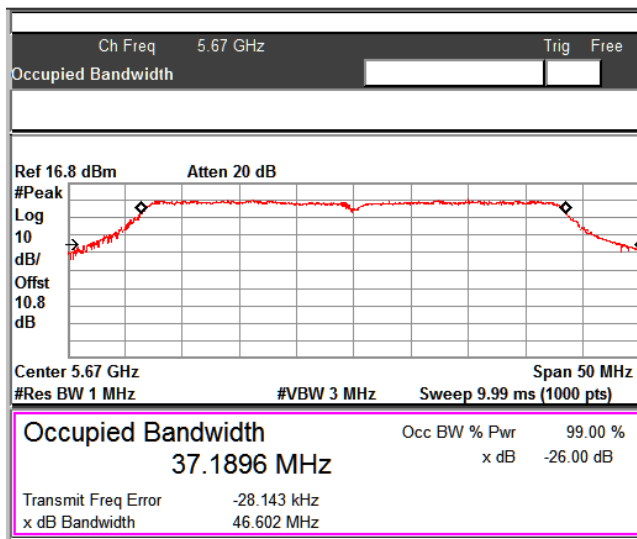
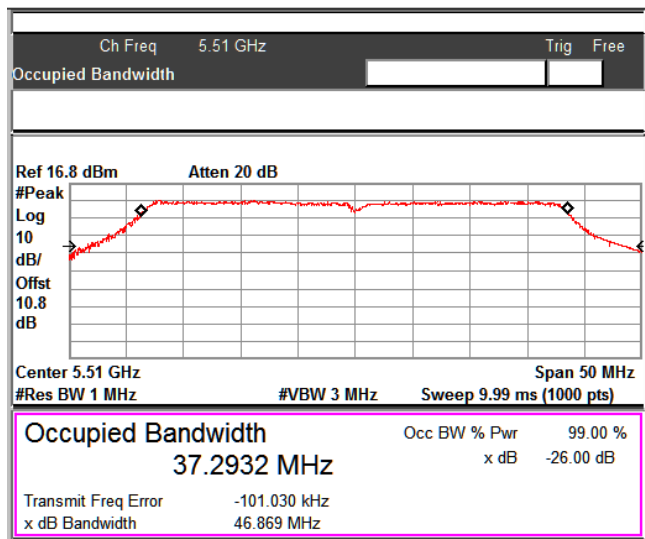
Data Rate: MCS 0



99%Bandwidth

26dB bandwidth

Data Rate: MCS 7



99% Bandwidth

26dB Bandwidth

Modulation: 802.11n-HT40MHz: UNII 3

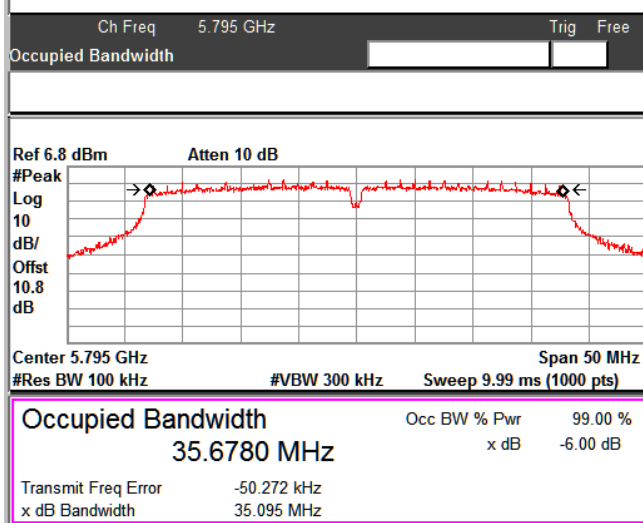
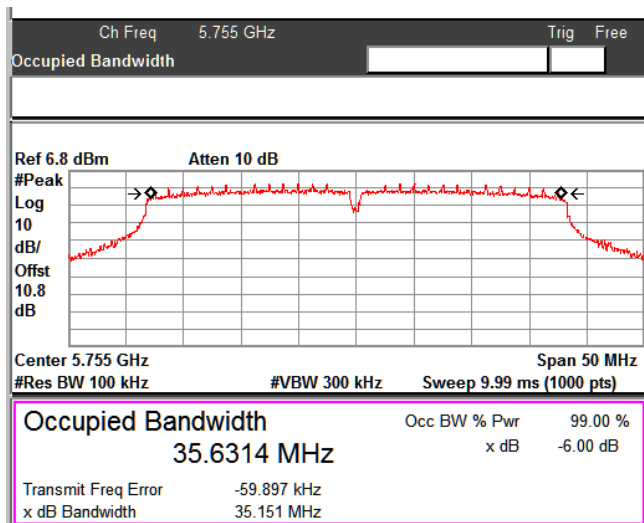
Data rate (Mbps)	Measured Frequency (MHz)	6 dB emission bandwidth (MHz)	Minimum Limit (MHz)
MCS0	5755	35.15	0.5
	5795	35.09	0.5
MCS7	5755	36.49	0.5
	5795	36.40	0.5

Prüfbericht - Nr.:
Test Report No.:

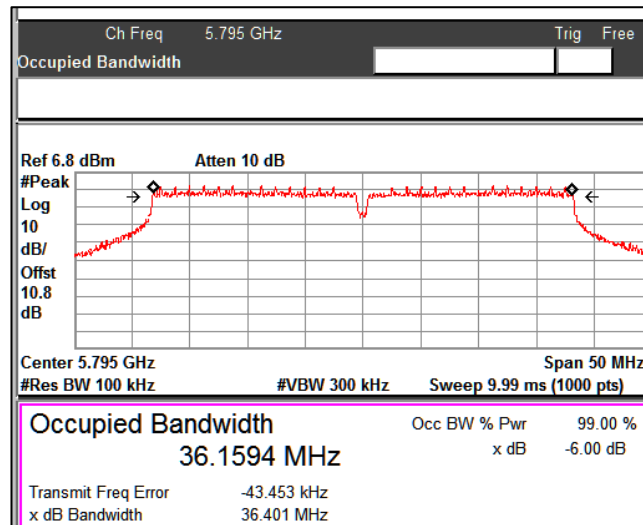
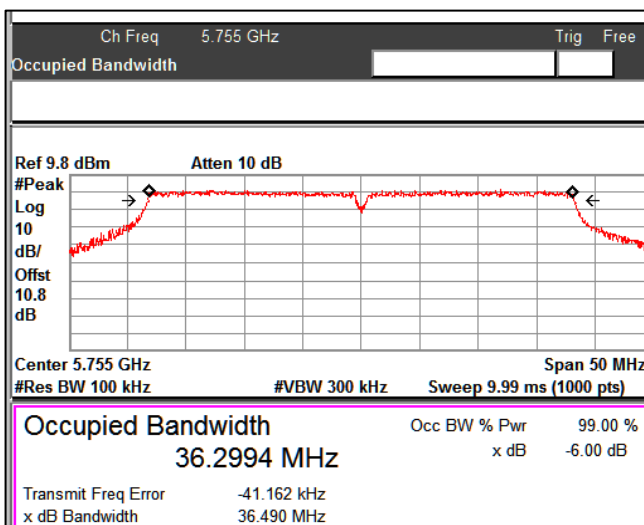
ULR-TC568821300000034F

Seite 36 von 143
Page 36 of 143

Data Rate: MCS0



Data Rate: MCS7



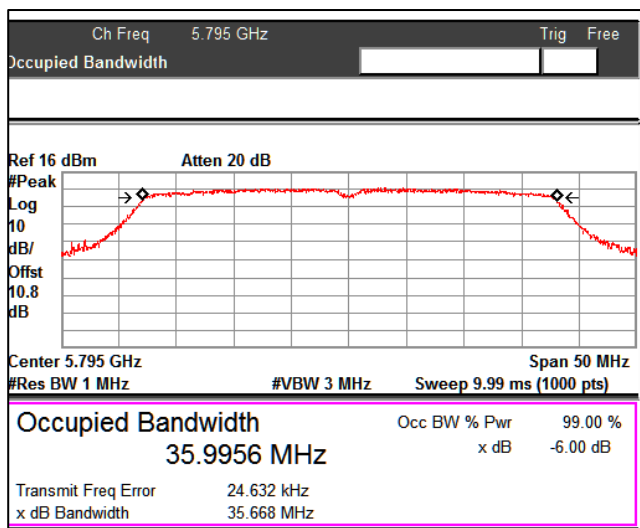
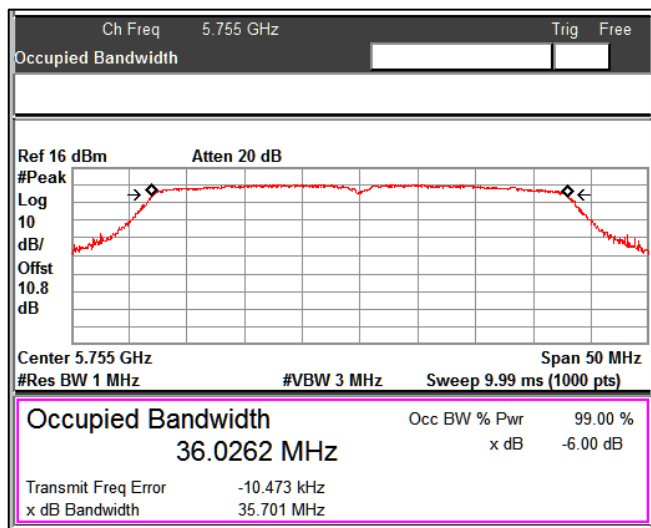
Data rate (Mbps)	Measured Frequency (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5755	36.03
	5795	36.00
MCS7	5755	37.07
	5795	36.96

Prüfbericht - Nr.:
Test Report No.:

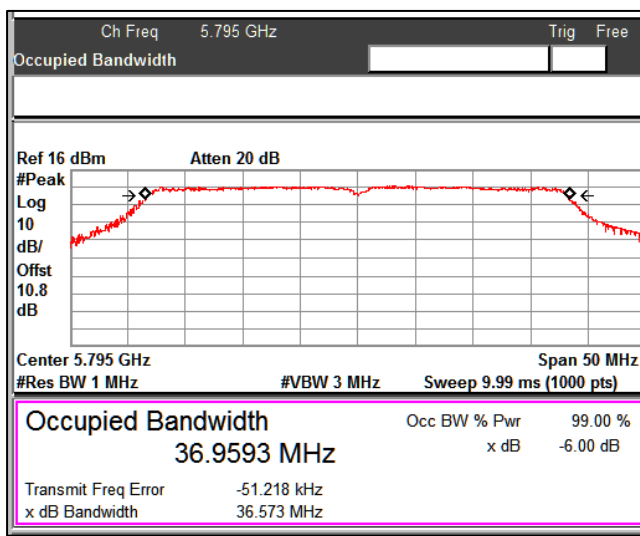
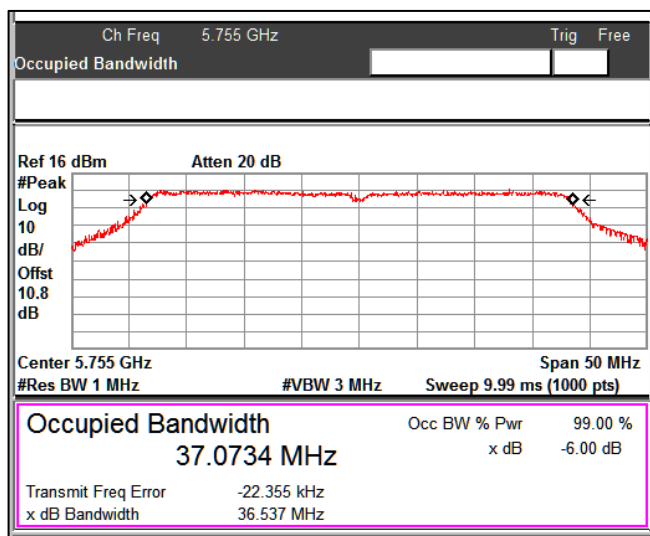
ULR-TC568821300000034F

Seite 37 von 143
Page 37 of 143

Data Rate: MCS 0



Data Rate: MCS 7



Modulation: 802.11n-VHT40MHz: UNII 1

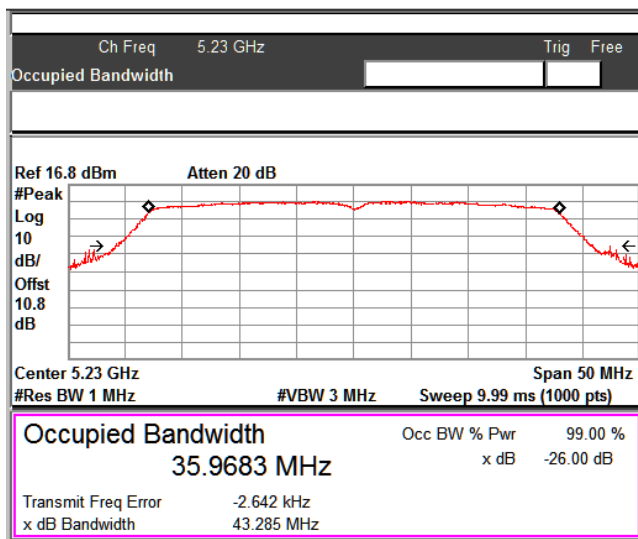
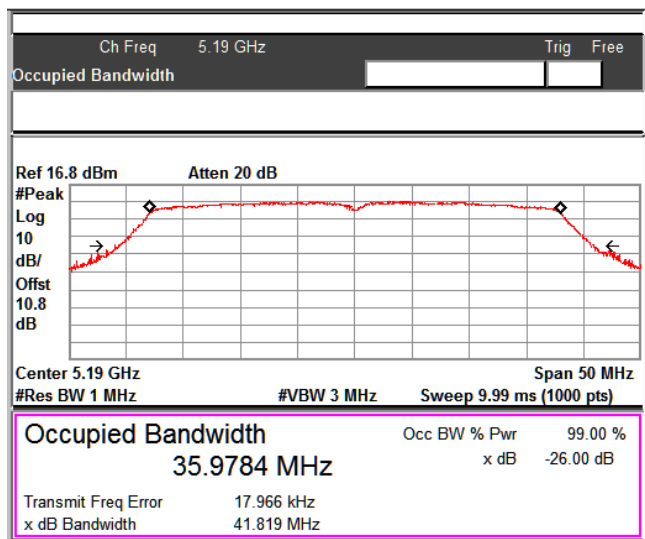
Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5190	41.81	35.98
	5230	43.28	35.97
MCS9	5190	47.42	37.25
	5230	47.79	37.18

Prüfbericht - Nr.:
Test Report No.:

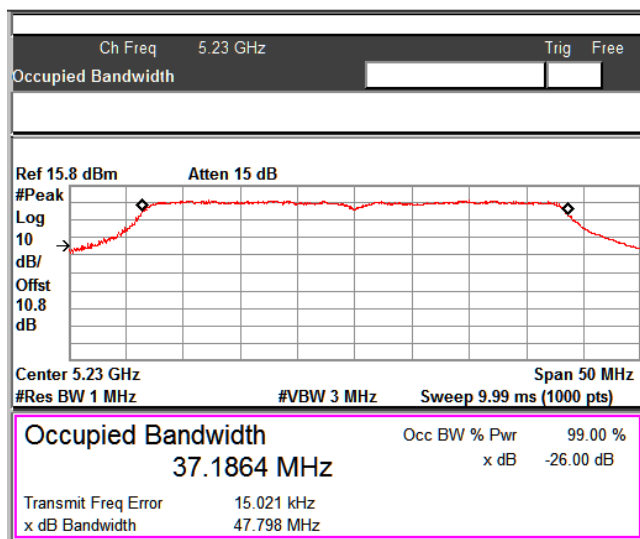
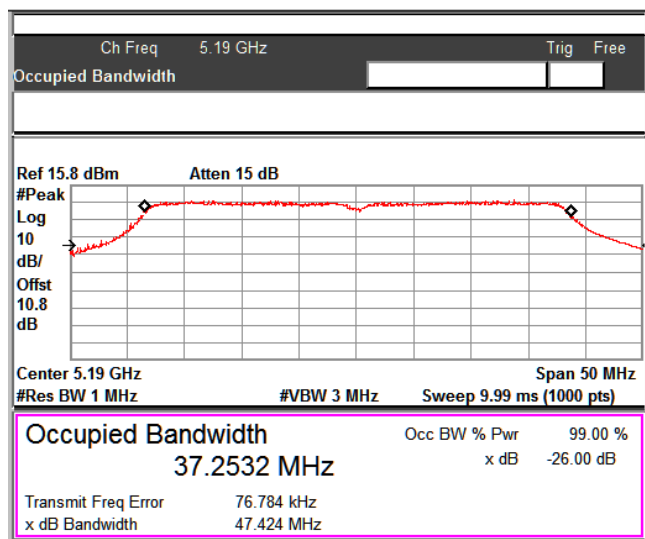
ULR-TC568821300000034F

Seite 38 von 143
Page 38 of 143

Data Rate: MCS 0



Data Rate : MCS 9



Prüfbericht - Nr.:
Test Report No.:

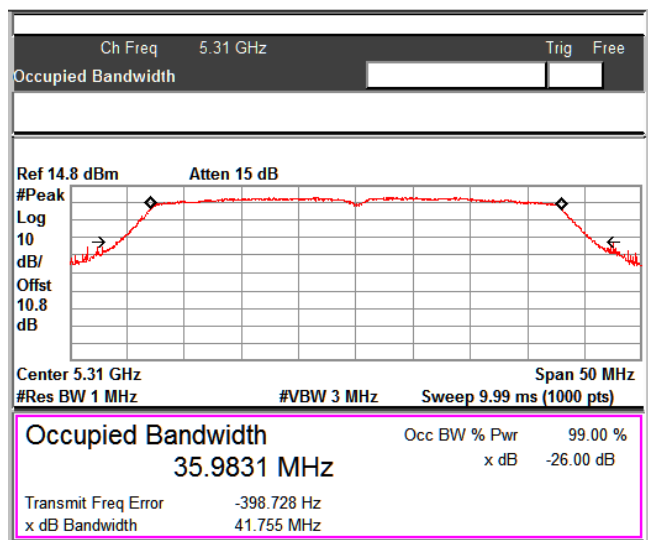
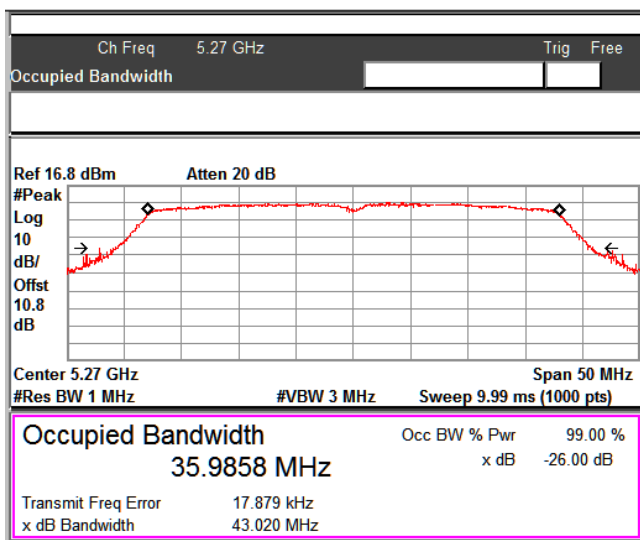
ULR-TC568821300000034F

Seite 39 von 143
Page 39 of 143

Modulation: 802.11n-VHT40MHz: UNII 2a

Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5270	43.02	35.98
	5310	41.76	36.00
MCS9	5270	47.33	37.19
	5310	46.66	37.22

Data Rate: MCS 0

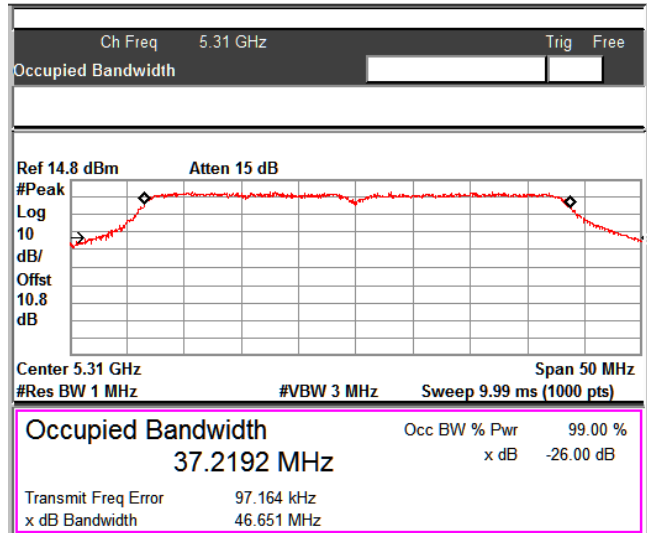
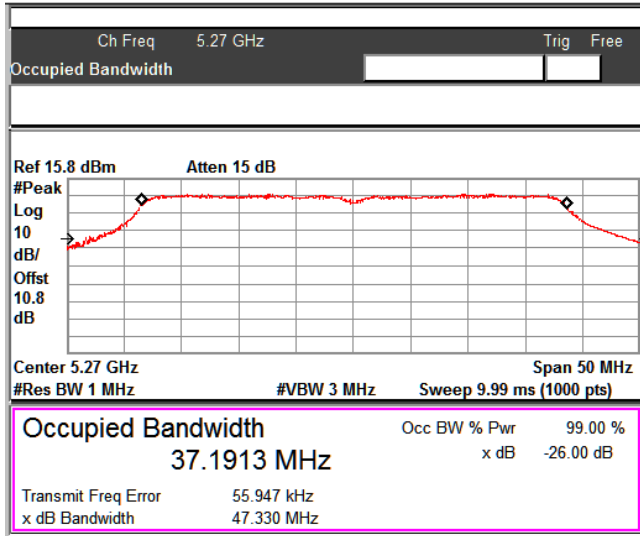


Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

Seite 40 von 143
Page 40 of 143

Data Rate: MCS 9



Modulation: 802.11n-VHT40MHz: UNII 2c

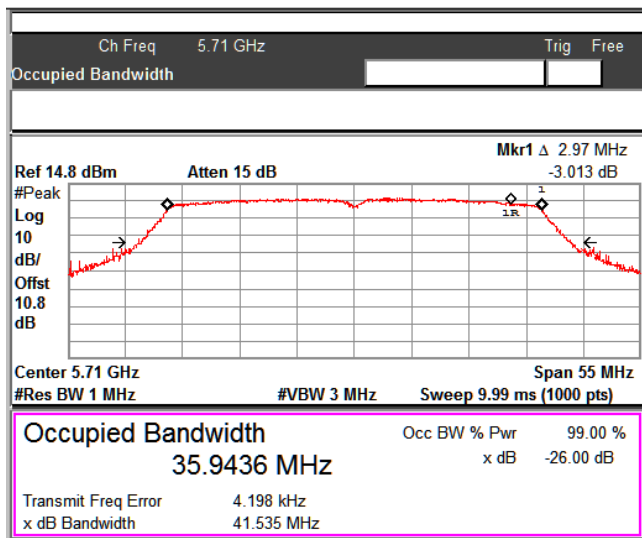
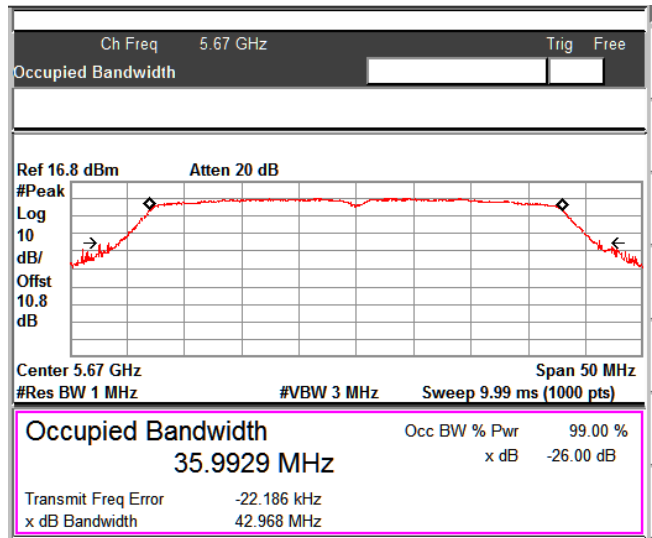
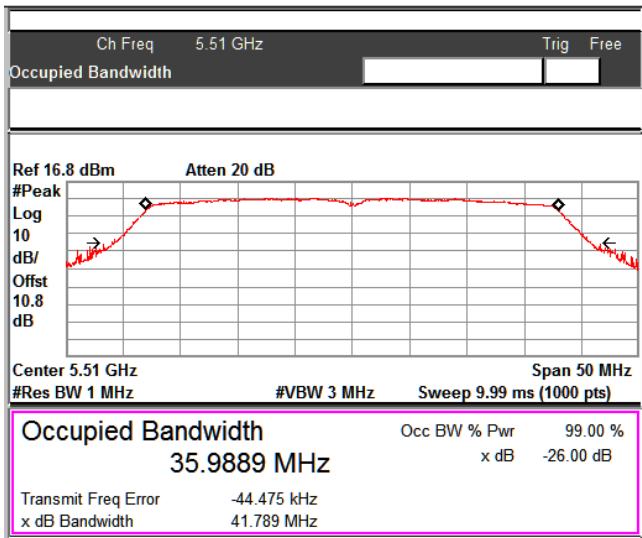
Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5510	41.78	35.98
	5590	41.63	35.95
	5670	42.96	35.99
	5710	43.00 34.30 – UNII 2C 8.70- UNII 3	35.94 32.97 – UNII 2C 2.97 – UNII 3
MCS9	5510	46.62	37.14
	5590	46.33	37.14
	5670	47.36	37.22
	5710	46.87 36.41 – UNII 2C 10.46- UNII 3	37.23 33.60 – UNII 2C 3.63 – UNII 3

Prüfbericht - Nr.:
Test Report No.:

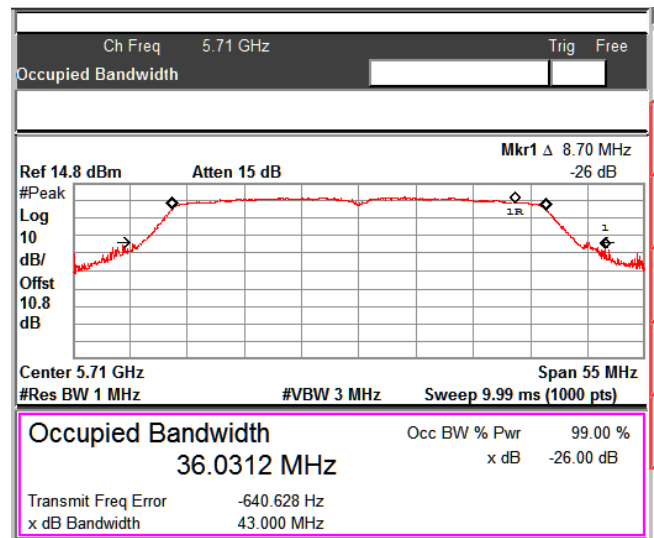
ULR-TC568821300000034F

Seite 41 von 143
Page 41 of 143

Data Rate: MCS 0



99% Bandwidth



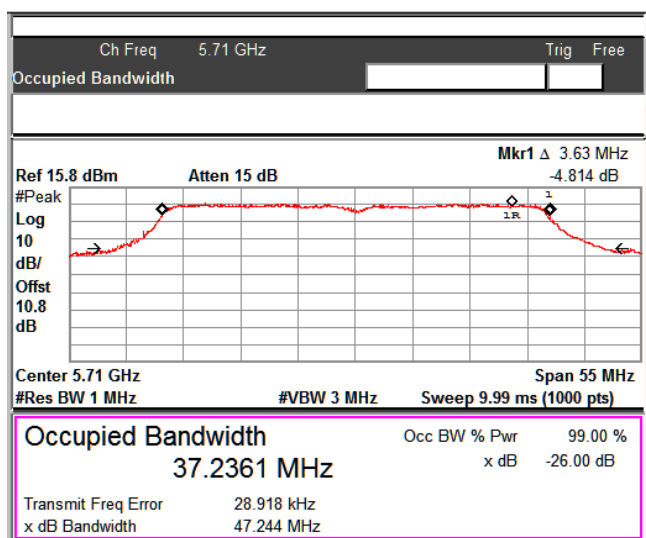
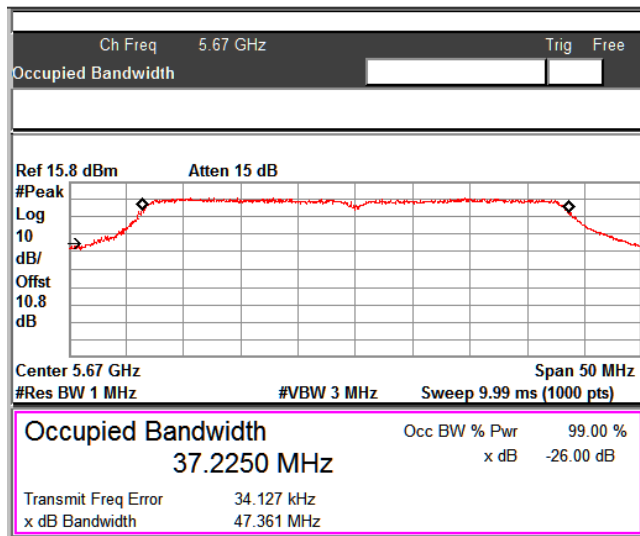
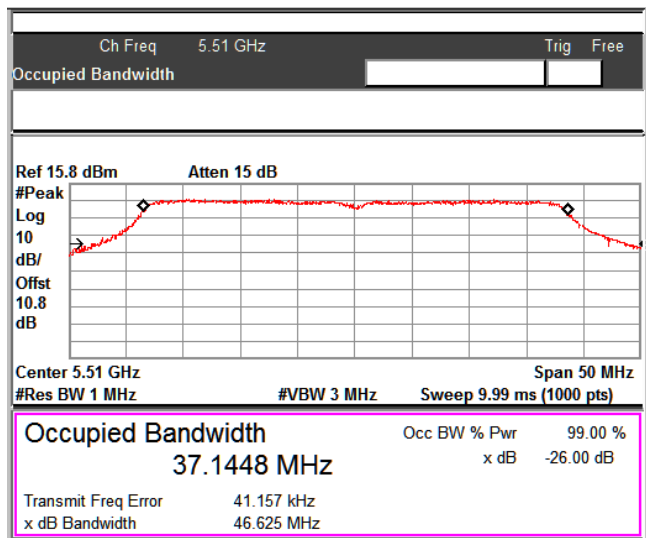
26dB Bandwidth

Prüfbericht - Nr.:
Test Report No.:

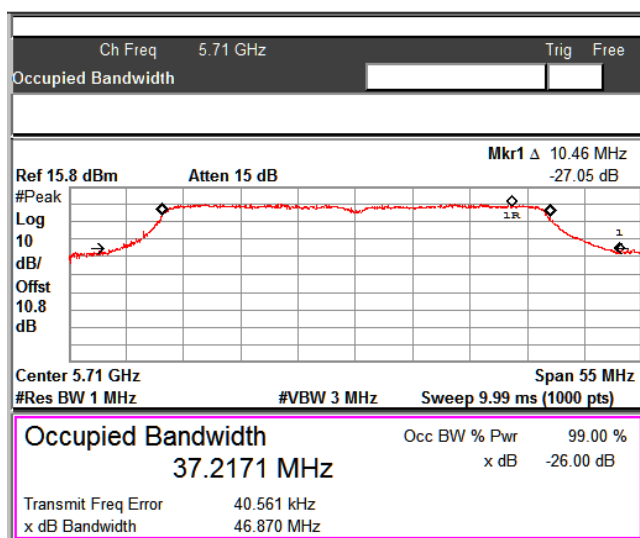
ULR-TC568821300000034F

Seite 42 von 143
Page 42 of 143

Data Rate: MCS 9



99% Bandwidth



26dB Bandwidth

Prüfbericht - Nr.:
Test Report No.:

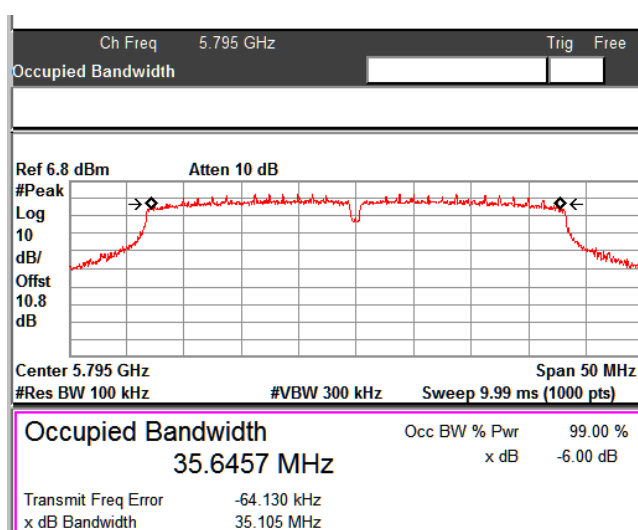
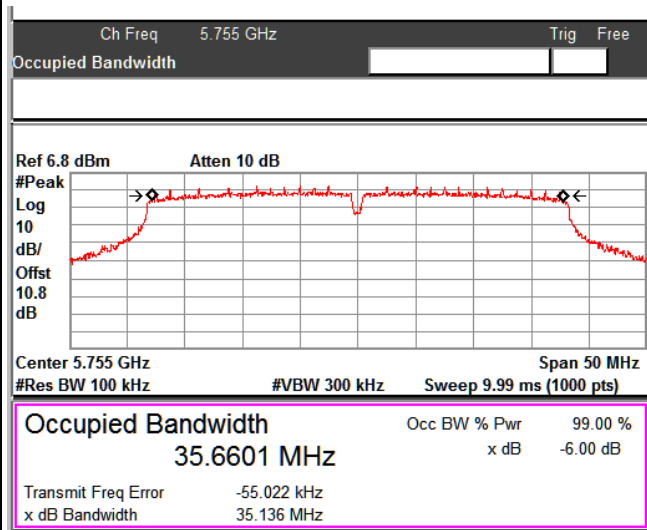
ULR-TC568821300000034F

Seite 43 von 143
Page 43 of 143

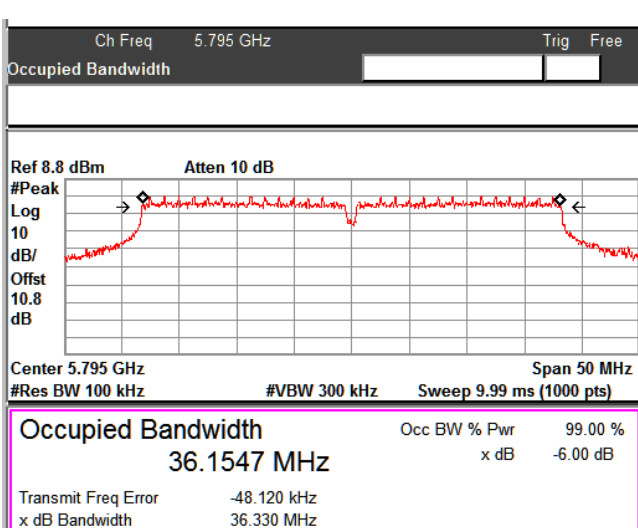
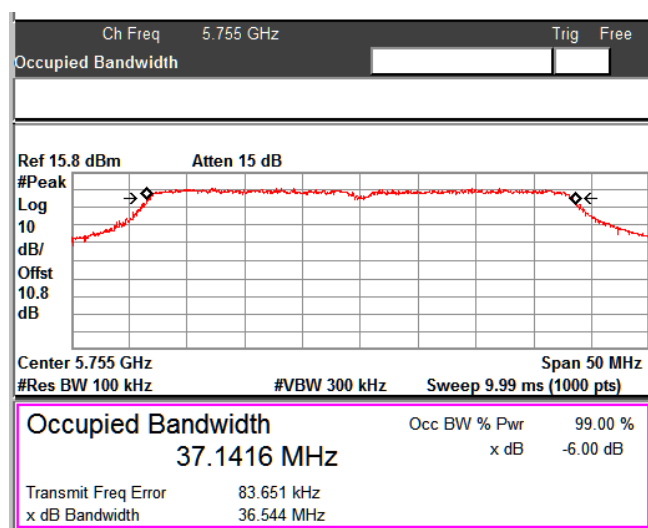
Modulation: 802.11n-VHT40MHz: UNII 3

Data rate (Mbps)	Measured Frequency (MHz)	6 dB emission bandwidth (MHz)	Minimum Limit (MHz)
MCS0	5755	35.14	0.5
	5795	35.10	0.5
MCS9	5755	36.54	0.5
	5795	36.33	0.5

Data Rate: MCS 0



Data Rate: MCS9



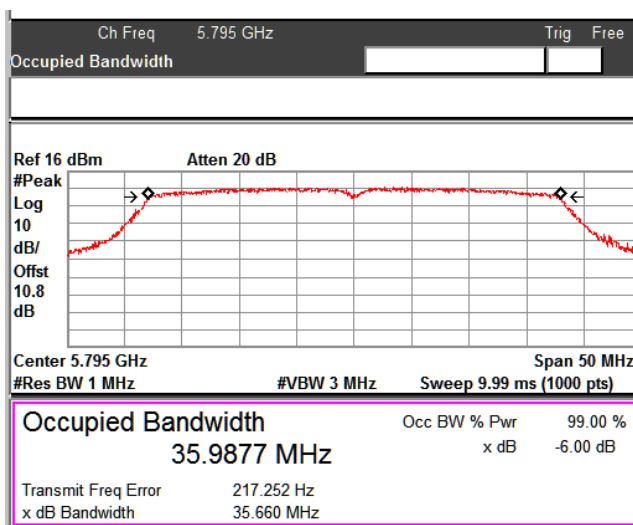
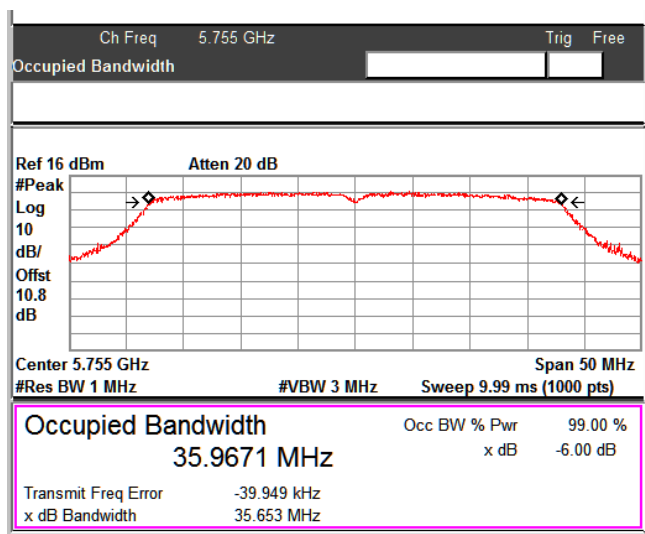
Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000034F

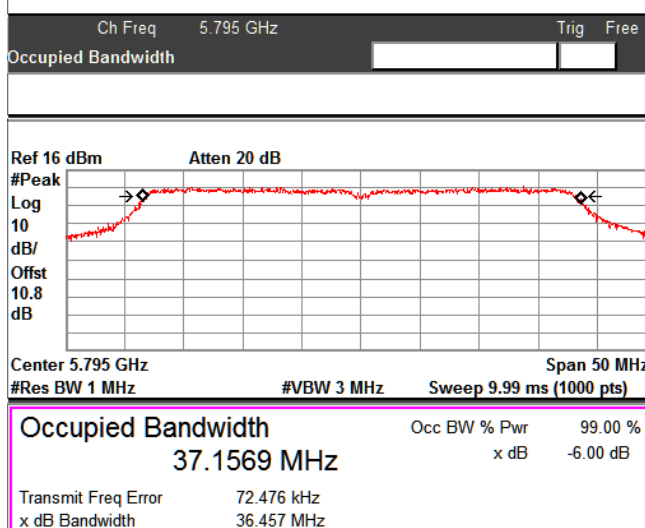
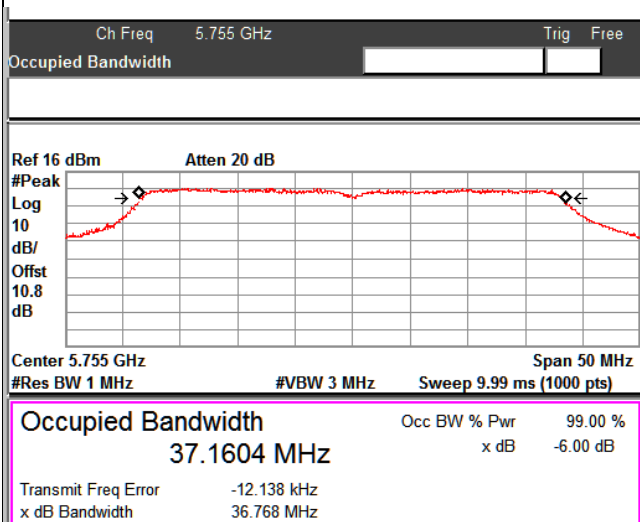
Seite 44 von 143
Page 44 of 143

Data rate (Mbps)	Measured Frequency (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5755	35.97
	5795	35.99
MCS9	5755	37.16
	5795	37.16

Data Rate: MCS 0



Data Rate: MCS 9



Prüfbericht - Nr.:
Test Report No.:

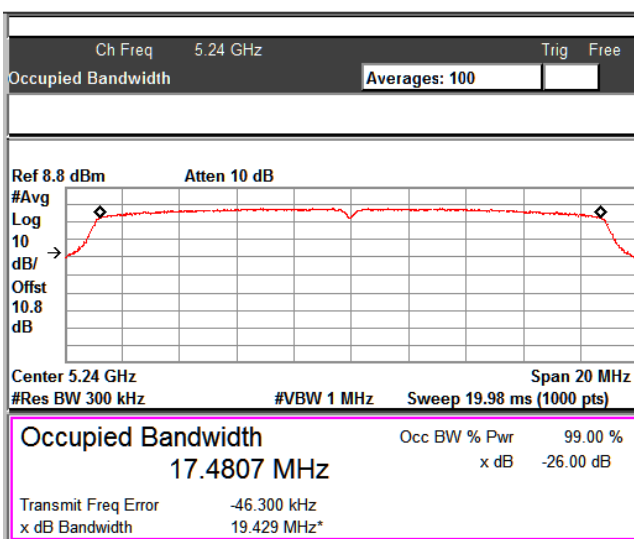
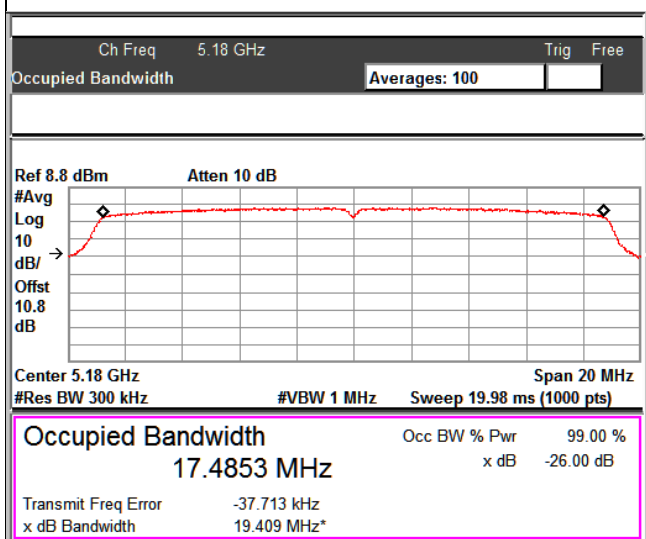
ULR-TC568821300000034F

Seite 45 von 143
Page 45 of 143

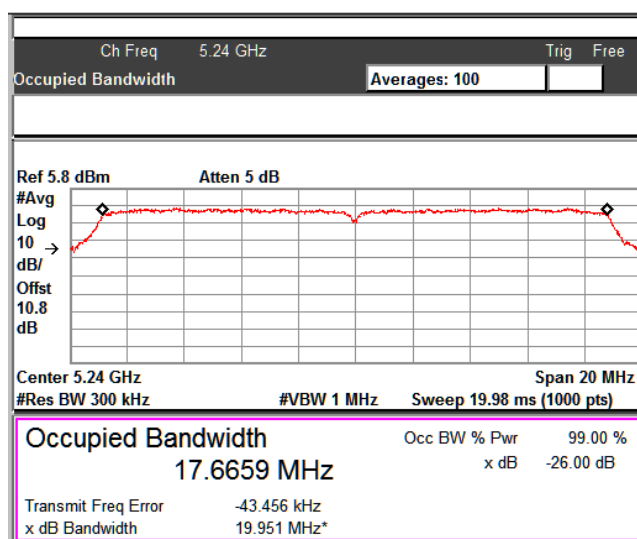
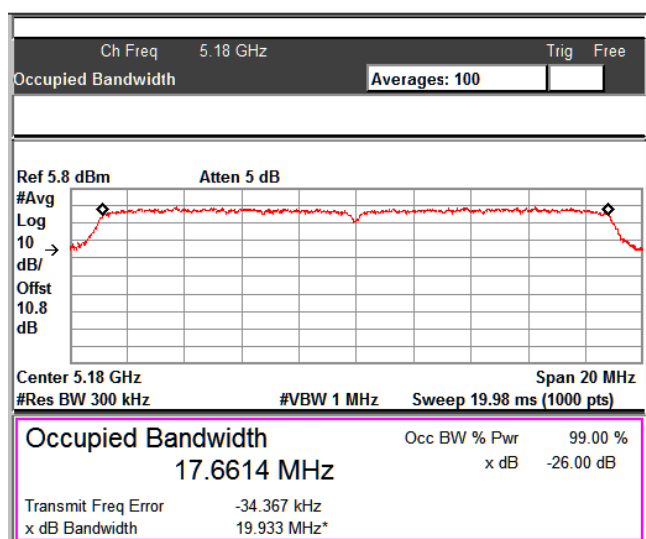
Modulation: 802.11ac-VHT20MHz: UNII 1

Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5180	19.41	17.48
	5240	19.42	17.48
MCS8	5180	19.93	17.66
	5240	19.95	17.66

Data Rate: MCS 0



Data Rate : MCS 8



Prüfbericht - Nr.:
Test Report No.:

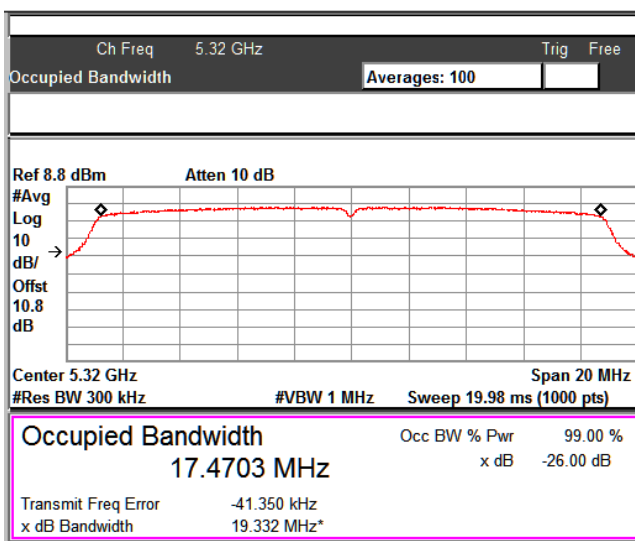
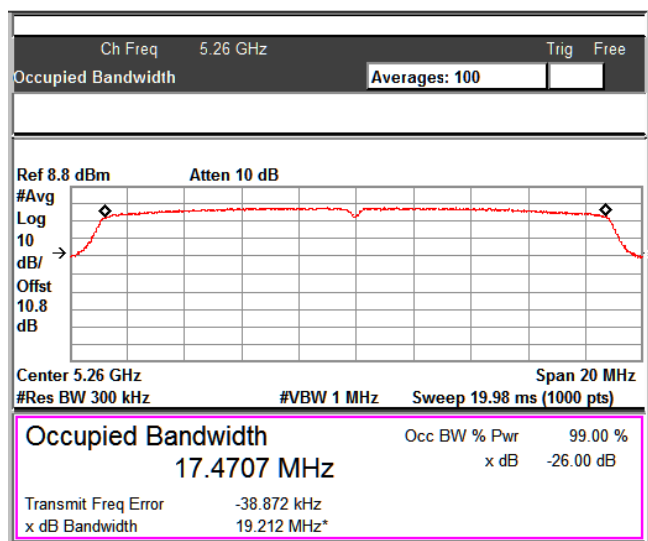
ULR-TC568821300000034F

Seite 46 von 143
Page 46 of 143

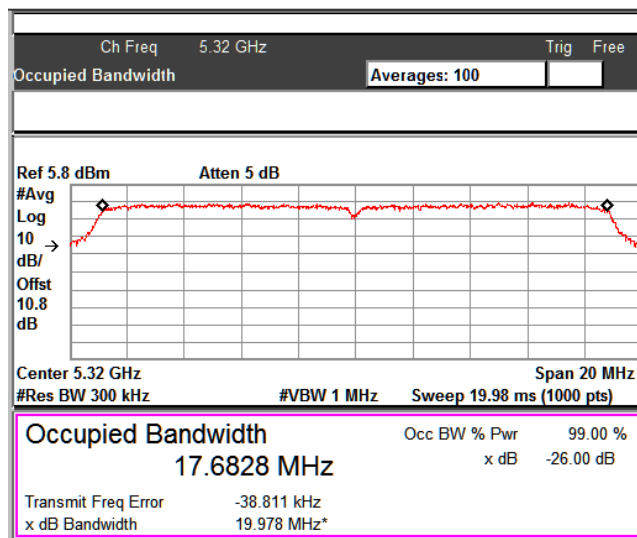
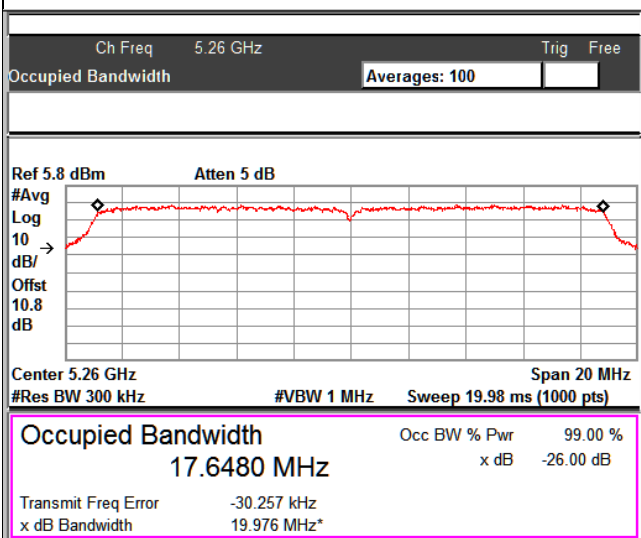
Modulation: 802.11ac-VHT20MHz: UNII 2a

Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5260	19.21	17.47
	5320	19.33	17.47
MCS8	5260	19.97	17.64
	5320	19.98	17.68

Data Rate: MCS 0



Data Rate: MCS 8



Prüfbericht - Nr.:
Test Report No.:

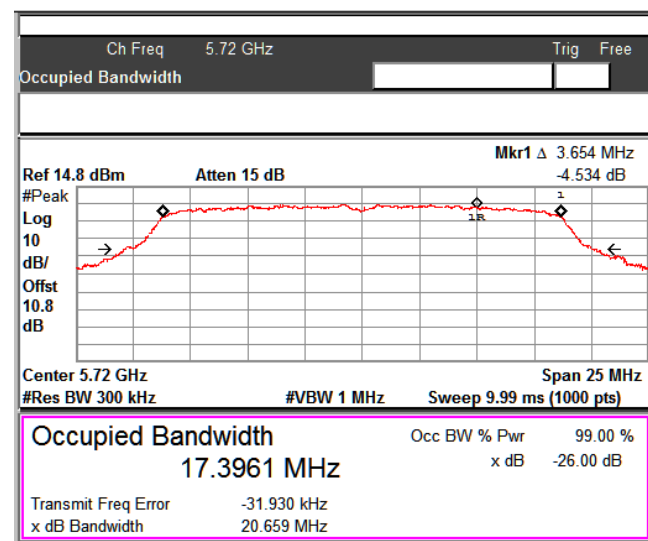
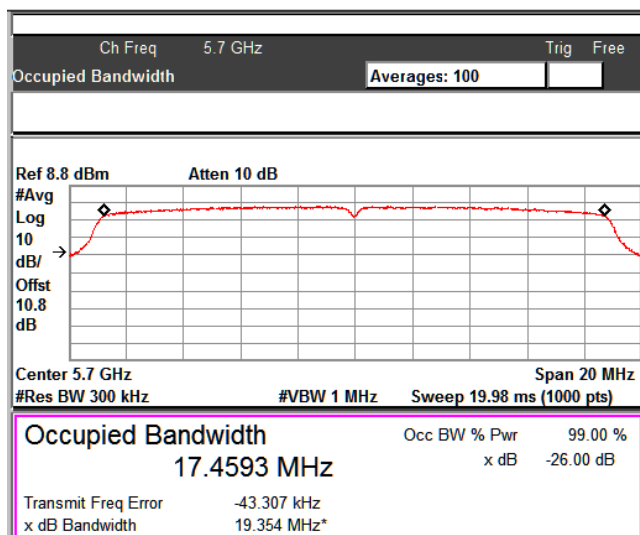
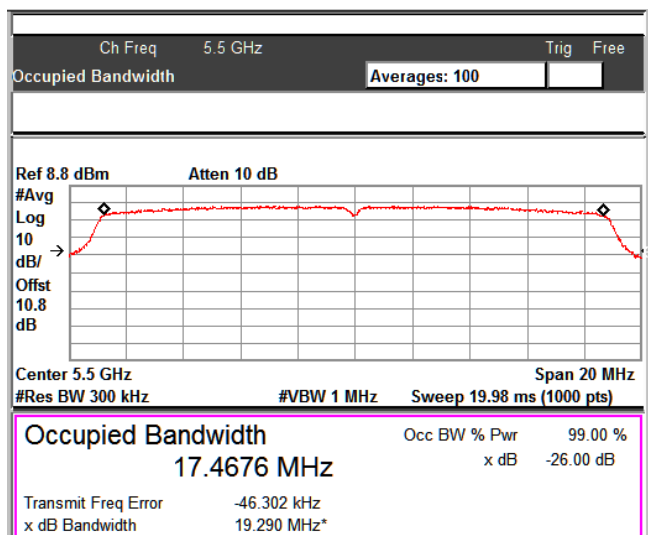
ULR-TC568821300000034F

Seite 47 von 143
Page 47 of 143

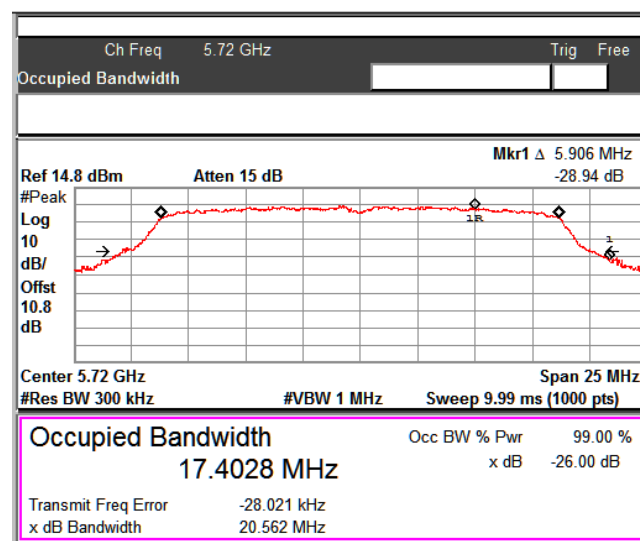
Modulation: 802.11ac-VHT20MHz: UNII 2c

Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5500	19.29	17.46
	5700	19.35	17.45
	5720	20.56 14.66 – UNII 2C 5.90- UNII 3	17.39 13.74 – UNII 2C 3.65 – UNII 3
MCS8	5500	19.95	17.67
	5700	19.98	17.67
	5720	22.33 15.55 – UNII 2C 6.78- UNII 3	17.93 13.98 – UNII 2C 3.95 – UNII 3

Data Rate MCS0



99% Bandwidth



26dB Bandwidth