



Certificate No. : 4271.01



Certificate No. : TC- 5688



TÜVRheinland®

Prüfbericht – Produkte

Test Report - Products

Prüfbericht-Nr.: Test report no.:	ULR-TC568821300000110F	Auftrags-Nr.: Order no.:	146600935 0010	Seite 1 von 99 Page 1 of 99
Kunden-Referenz-Nr.: Client reference no.:	2133653	Auftragsdatum: Order date:	2021-09-02	
Auftraggeber: Client:	ZOLL Medical Corporation 269 Mill Road Chelmsford, MA 01824, USA.			
Prüfgegenstand: Test item:	ZOLL Mobile Hotspot	Product Type	Mobile Hotspot	
Bezeichnung.: Identification .:	8016-000117-01			
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:	2021-09-07			
Prüfmuster-Nr & Serien-Nr.: Test sample no & serial no.:	A003124554-001 A003124554-011 ZMCHUS20000001			
Prüfzeitraum: Testing period:	2021-09-14 - 2021-09-30			
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:	 Shrivas Naikar	genehmigt von: authorized by:	 Lokesh Ramu	
Datum: Date:	2021-10-08	Ausstellatum: Issue date:	2022-03-22	
Stellung / Position:	Engineer	Stellung / Position:	Manager	
Sonstiges / Other:	FCC ID: ZKP-ZOLLMCH0001 IC: 9702A-ZOLLMCH0001			
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 F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	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>				

V05

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 2 von 99
Page 2 of 99

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	*NA
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

***Note:**

1. NA: products channels nominal bandwidth falls completely within the band 5150 MHz to 5250 MHz and 5725MHz to 5850MHz.

Product Category: Electronics Testing
Test Discipline : EMC Test Facility

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 3 von 99
Page 3 of 99

Compliance statement for Part 15.203:

“THE PRODUCT USES INTERNAL PCB CHIP ANTENNA, WITH NO POSSIBILITY OF REPLACEMENT WITH A NON-APPROVED ANTENNA BY THE END-USER. THEREFORE, THE EUT IS CONSIDERED TO COMPLY WITH THIS PROVISION.”

REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568821300000110F	01	Initial issue of report	2021-12-09
ULR-TC568821300000110F	02	Reveiwier Comment updated	2022-02-23
ULR-TC568821300000110F	03	Module name updated	2022-03-22

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	9
4.7	Report Reference	10
5	Operational Description	10
6	Block Diagram.....	11
7	TEST METHODOLOGY	12
7.1	Conducted Spurious Emission AC Power line Test	12
7.1.1	Test Setup Configuration	12
7.2	Radiated Emission Test	13
7.2.1	Test Setup Configuration	13
8	TEST RESULTS	17
8.1	Emission Bandwidth	17
8.2	Maximum Conducted Output Power	41
8.3	Maximum Power Spectral Density	46
8.4	Spurious Radiated Emissions & Restricted Bands of Operation	59
8.4.1	RSE Test Results of Simultaneous Operation with Cellular and Non-Cellular:	89
9	Frequency Stability	93
10	Conducted Spurious Emission test on AC Power Line	95
11	LIST OF TABLES	99
12	Power level used for testing	99

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

1. TÜV Rheinland (India) Pvt.Ltd.,
27/B, 2nd Cross,
ElectronicCityPhase1
Bangalore – 560 100,
India

2. TUV Rheinland (India) Pvt.Ltd.,
108 , Beside ISBR Business School,
Electronic city Phase I
Bangalore - 560 100.
India

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
Loop Antenna	Schwarzbeck	FMZB 1519 B	1519B-00111	-	27.04.2022	Yearly	
Baloon and Biorical Antenna	Schwarzbeck	BBA 9106+VH BB 9124	9124-1117	-	03.03.2022	Yearly	
Log-Periodic Antenna	Schwarzbeck	VUSLP 9111B	9111B-324	-	04.03.2022	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1944	-	11.05.2022	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-0904	-	06.05.2022	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
Radio Communication tester	Rohde & Schwarz	CMW 500	1201.0002 K50	-	24.08.2022	Yearly	Antenna-Port Conducted test
Signal Analyser	Rohde & Schwarz	FSV7	101644	FW 3.40	15.01.2022	Yearly	
OSP	Rohde & Schwarz	OSP120 Incl. B157	OSP120-101323 & B157-100894	-	03.11.2021	Yearly	
Signal Generator	Rohde & Schwarz	SMB100 A	108788	-	13.01.2022	Yearly	
Vector Signal Generator	Rohde & Schwarz	SMBV10 0	260789	-	13.01.2022	Yearly	
Signal Analyser	Anritsu Corporation	MS2830 A	626198395 3	-	03.09.2022	Yearly	
Spectrum Analyzer	Agilent	E4407B	US411927 72	A.14.06	15.12.2022	Yearly	
USB Peak Power Sensor	AIMIL Ltd	55006	10231	-	27/03/2022	Yearly	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	29.07.2022	Yearly	Conducted AC Power line Test
LISN	Rohde & Schwarz	ENV216	100022	-	10.07.2022	Yearly	

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 7 von 99
Page 7 of 99

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

ZOLL Mobile Hotspot devices are used to connect portable Defibrillator and ventilator devices to the cloud via Wi-Fi, and then send real-time data to the cloud for processing via cellular network.
It use for relay LTE over Wi-Fi.

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-3 _ 5725MHz to 5850MHz
No. of Channels		(Refer Table 5)
Channel Spacing		NA
Modulation		802.11a: OFDM /64-QAM, 16-QAM, QPSK, BPSK (6 to 56Mbps) 802.11n: OFDM /64-QAM, 16-QAM, QPSK, BPSK (20MHZ and 40MHZ: MCS0 to MCS7) 802.11ac:OFDM /256-QAM, OFDM /64-QAM, 16-QAM,QPSK, BPSK(20MHZ, 40MHZ and 80MHZ: MCS0 to MCS9)
Power level setting used		Refer Clause 12
Maximum Measured Power (e.i.r.p)		19.68dBm (MCS0 5180MHz)
Number of antennas		1
Antenna Gain		5.2 dBi
Antenna Type		Internal PCB Chip Antenna
Supply Voltage to Product		5V DC, 0.5A Battery and USB Type C Port Powered 1. Primary - Battery (3.7V, 4000mAh) 2. Secondary - USB Type C (5V, 0.5A)
Environmental Conditions	Storage	-20° C to 60° C
	Operating	-10° C to 50° C
EUT Dimension		134.2mm x 80.7mm x 27.9mm (LxWxH)

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 8 von 99
Page 8 of 99

***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.

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) : Rev2.0
Software version : v1.0.3

4.3 Special Accessories and Auxiliary Equipment

-None

4.4 Simultaneous Transmission

Combinations of Simultaneous Operations performed	WiFi-LTE
	WiFi- WCDMA

Note: Simultaneous Operation was performed with the above mentioned combination and worst case test results are mentionrd in this report.

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
5725-5825 MHz	149	5745
	151	5755
	155	5775
	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	5775
5745	5755	-
5825	5795	-

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 10 von 99
Page 10 of 99

Note:

TUV Sample Identification number : A003124554-001– Radiated test Sample
A003124554-011– Conducted test Sample

4.7 Report Reference

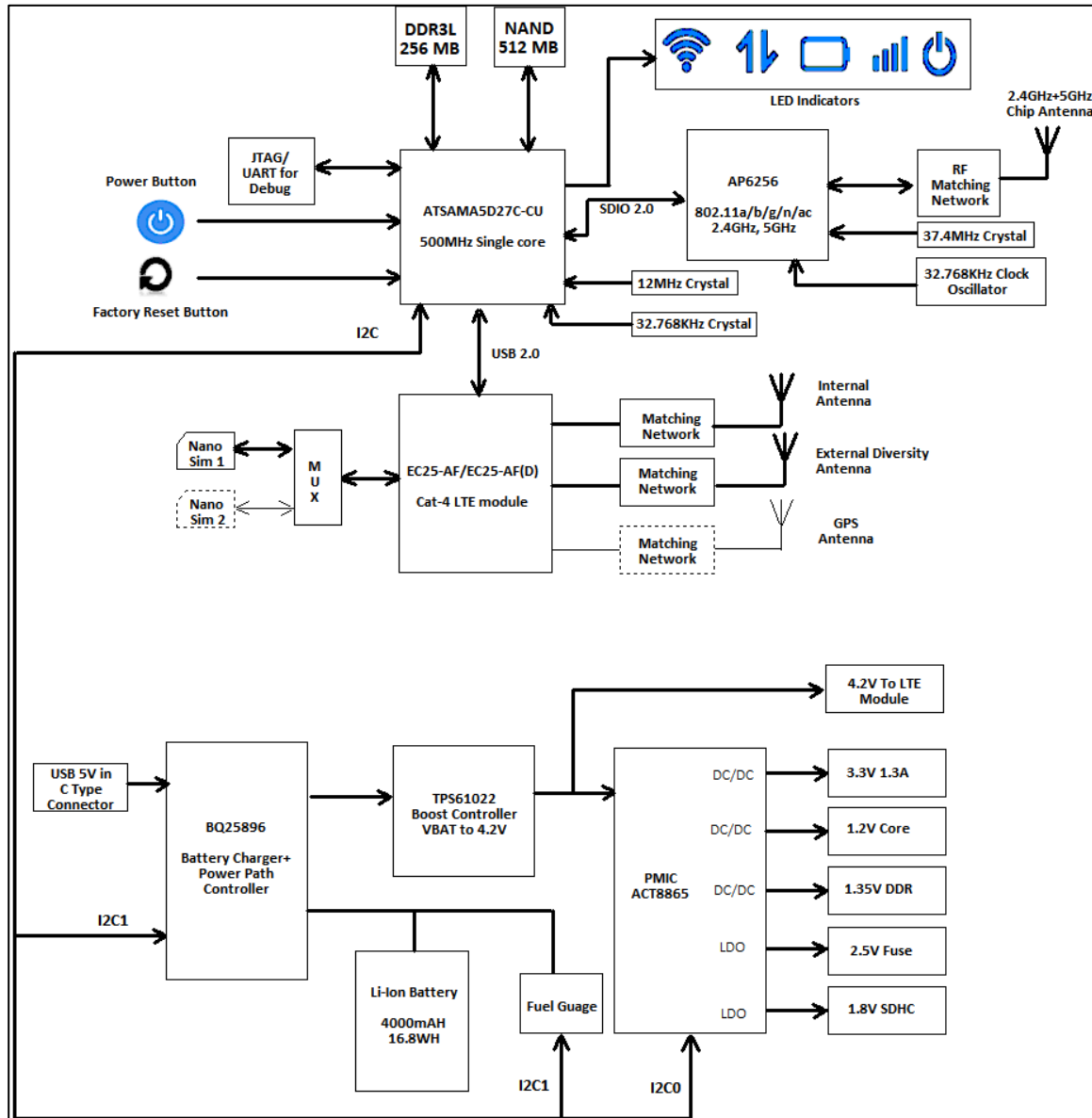
Note: ZOLL Mobile Hotspot has multiple protocols. All the supported wireless protocols and their respective test results are issued in separate test reports, following table lists the report numbers.

Radio Protocol	Report Number
RF test report for Wi-Fi (2.4GHz)	ULR-TC568821300000109F
RF test report for Wi-Fi (5GHz) – (This report)	ULR-TC568821300000110F
RF test report for FCC Part 22	ULR-TC568821300000111F
RF test report for FCC Part 24	ULR-TC568821300000112F
RF test report for FCC Part 27	ULR-TC568821300000113F
RF test report for FCC Part 90	ULR-TC568821300000114F

5 Operational Description

ZOLL Mobile Hotspot design based on Micrchip's ATSAMA5D27C processor. The ZOLL Mobile Hotspot device features a 256 MB of DDR3L RAM and 512 MB of NAND Flash to store the data files and configurations. The ATSAMA5D27C CPU is powered using the OpenWRT Linux distribution. The " EC25-AF/EC25-AF(D) CAT 4 LTE Module" will be connected to ATSAMA5D27C CPU over the USB 2.0 interface to support the cellular connectivity. The EC25-AF/EC25-AF(D) is Cat4 LTE module supporting AT&T, T-Mobile, Verizon and FirstNet networks. It supports all major US bands. The EC25-AF/EC25-AF(D) module has 2 Antenna connections including external diversity antenna. Here internal antenna is chip antenna and a u.FL connector is on board for an External diversity Antenna. The LTE module also supports GPS and it is optional in current design. ZOLL Mobile Hotspot have dual SIM supports. The system also have Wi-Fi module AP6256 which is interfaced with the processor using SDIO 3.0 interface. Wi-Fi will be used to connect portable Defibrillator and ventilator devices to cloud. It supports 2.4GHz and 5GHz bands. The modem device is battery operated, and the main processor ATSAMA5D27C will be connected to the fuel gauge to monitor the battery status and power consumption of the entire system. The power management section is also responsible for moderating the power drawn from the defibrillator device and comply with the requirement (that the power consumption over USB must not exceed 0.5A at the peak time). Additionally, the power management section is also responsible for generating the necessary input power for several sections of the modem device. The BQ25896 is a Battery Charger with Boost converter to provide constant power to the system with the efficiency greater than 80%. The 4.2V from TPS61022 is given to PMIC which generates 3.3V, 1.25V, 1.8V, 2.5V and 1.35V for Processor, NAND Flash and Wi-Fi module, Core voltage of processor, Fuse voltage and DDR3L power supply.

6 Block Diagram



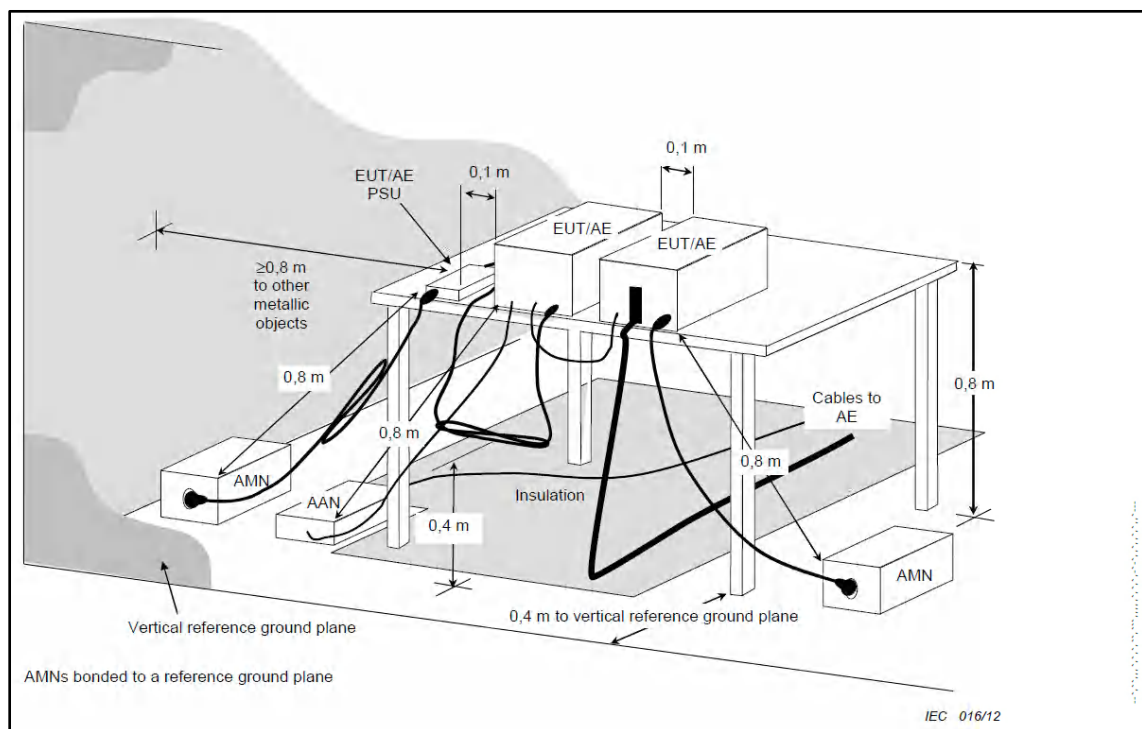
7 TEST METHODOLOGY

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 method 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

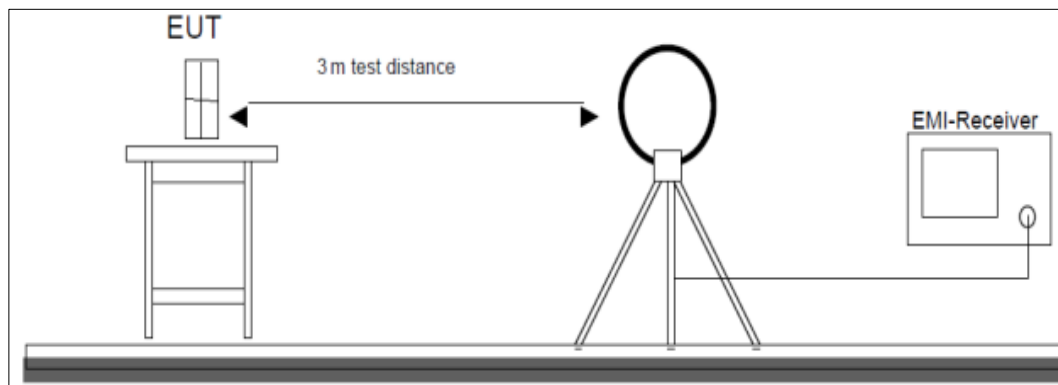


Figure 1: Frequency Range 9 kHz- 30 MHz

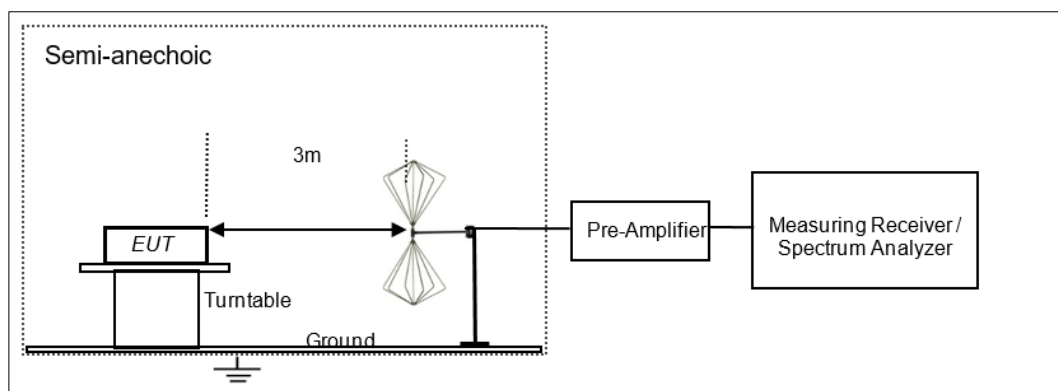


Figure 2: Frequency Range 30 MHz – 200 MHz

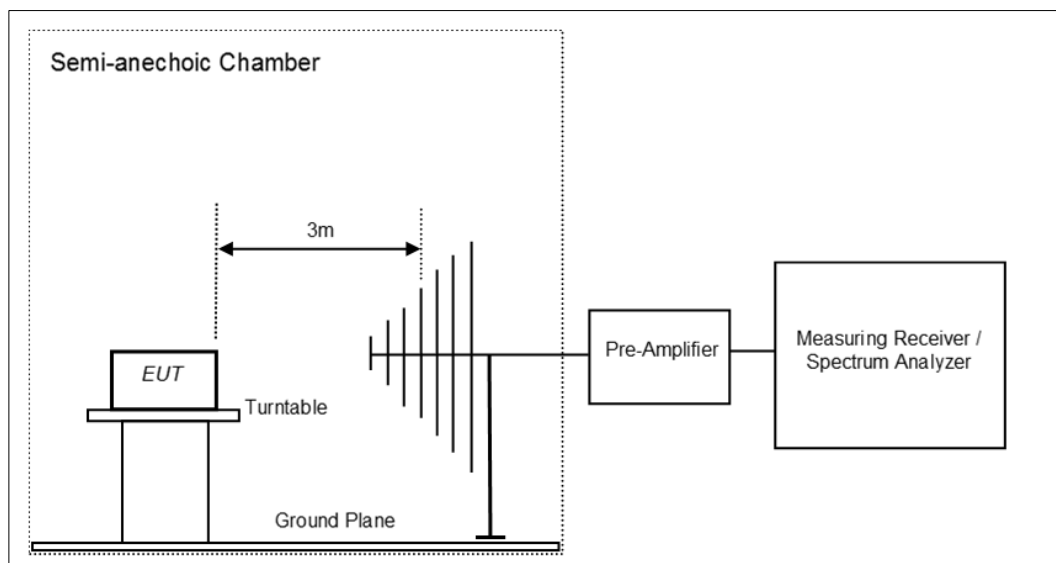


Figure 3: Frequency Range 200 MHz - 1GHz

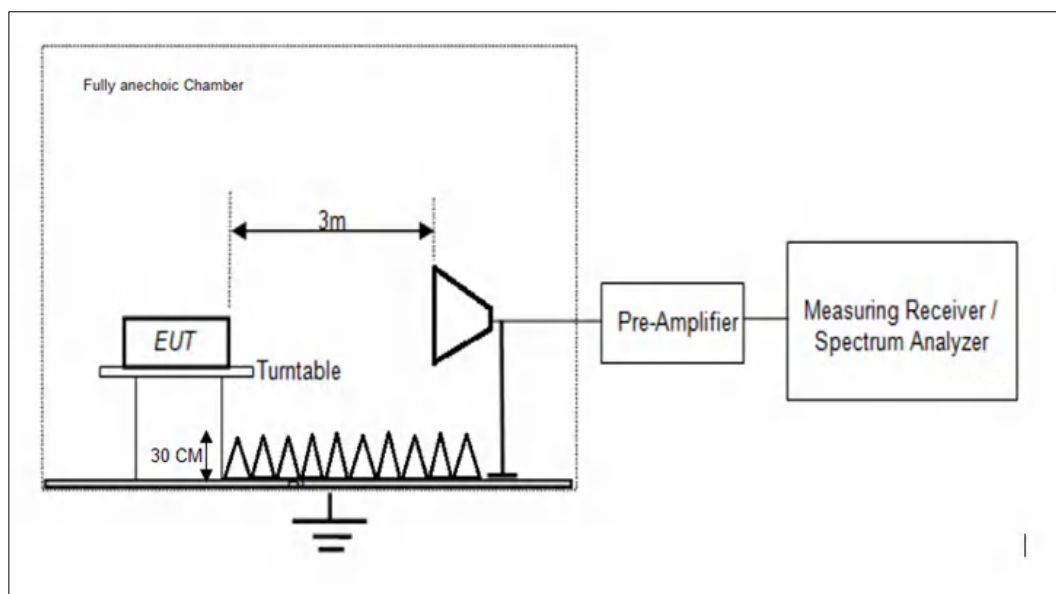


Figure 4: Frequency Range above 1 GHz

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

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

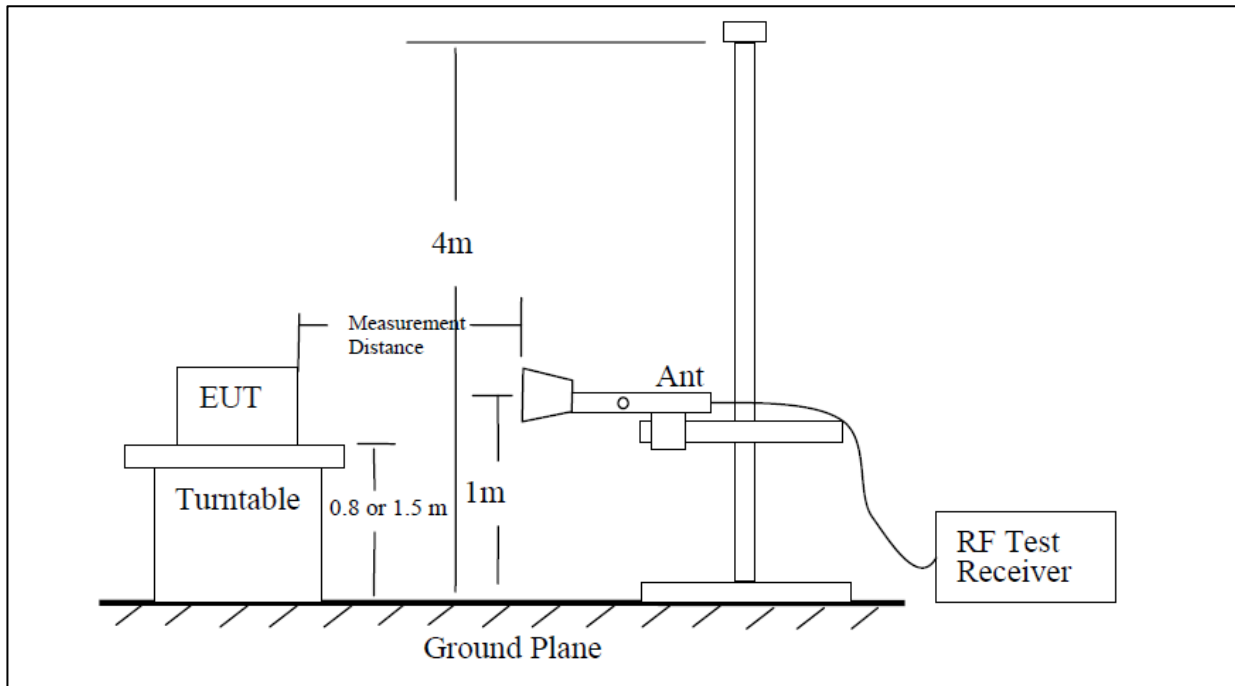
where

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

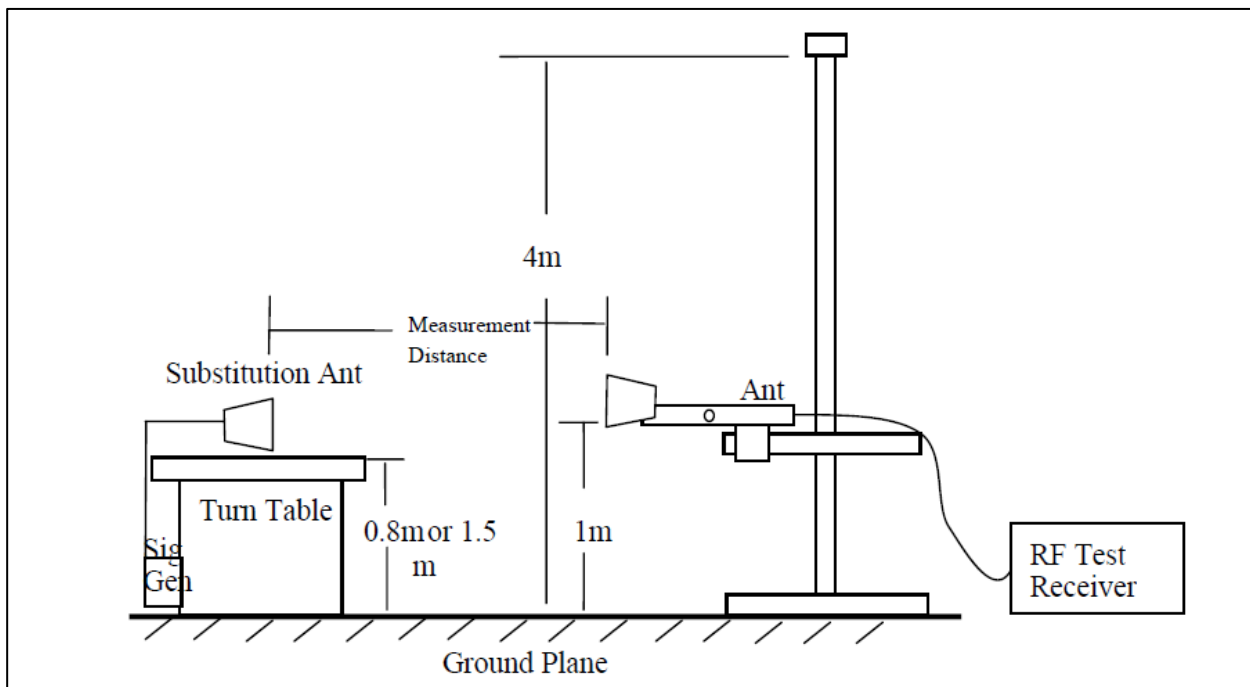
GT is the gain of the substitute antenna, in dBd (i.e., ERP) or dBi (i.e., EIRP)

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

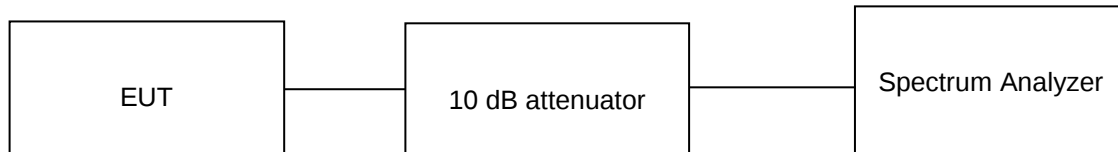
8.1 Emission Bandwidth

Result

Pass

Test Specification	FCC part 15 Subpart C 15.407 (a) & (e), Part 2.202 / RSS GEN, RSS 247 Issue 2, Section 6.2.4.1 & RSS Gen Issue 5, Section 6.7
Test Method	Subclause 11.8.1 & 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. 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-TC568821300000110F

Seite 18 von 99
Page 18 of 99

Test Condition:

Normal Test Condition:

Temperature (Norm) = + 24.5 °C Voltage = Internal Battery + 5.0 V DC Relative humidity: 63%

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 + 0.5 dB Cable loss = 10.5 dB total offset

Modulation: 802.11a : UNII 1

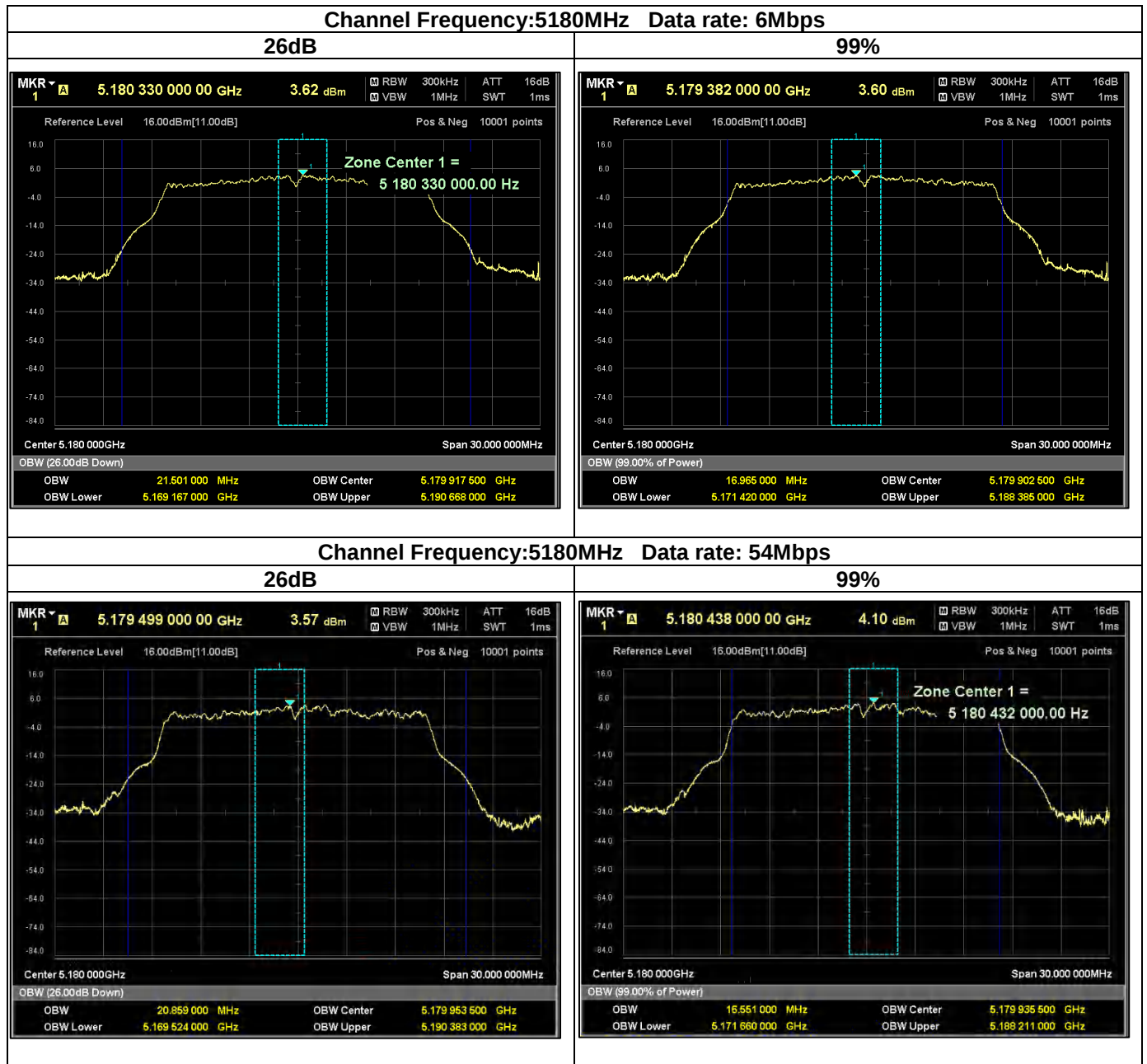
Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
6	5180.00	21.50	16.96
	5240.00	21.50	16.92
54	5180.00	20.85	16.55
	5240.00	20.73	16.53

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 19 von 99
Page 19 of 99

Test Plots:



Prüfbericht - Nr.:
Test Report No.:

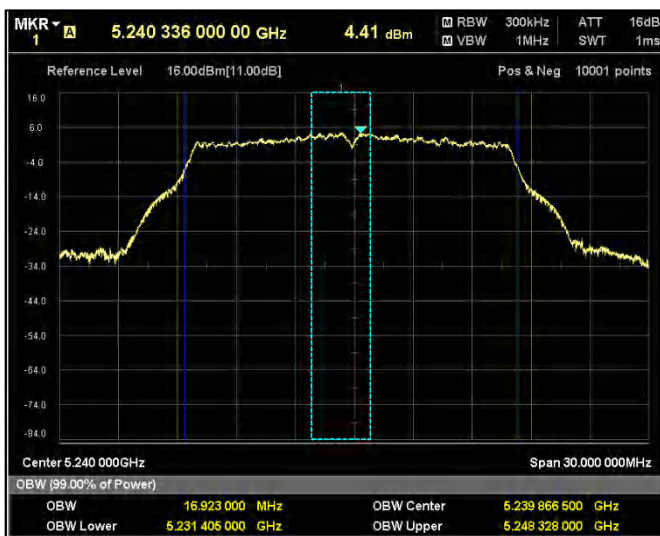
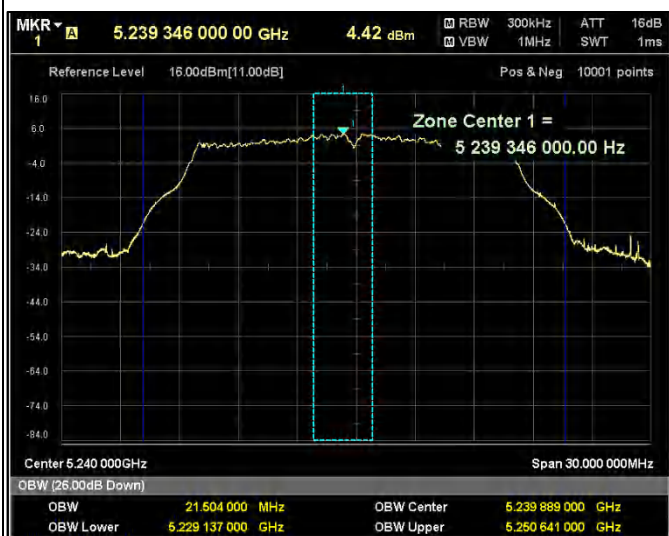
ULR-TC568821300000110F

Seite 20 von 99
Page 20 of 99

Channel Frequency: 5240MHz Data rate: 6Mbps

26dB

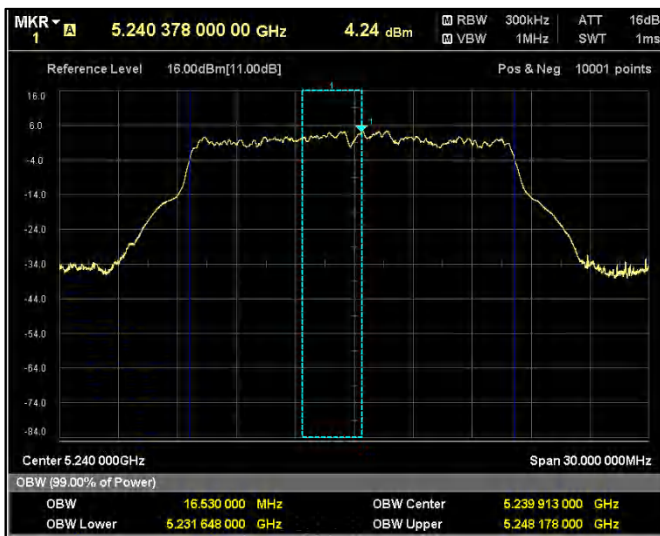
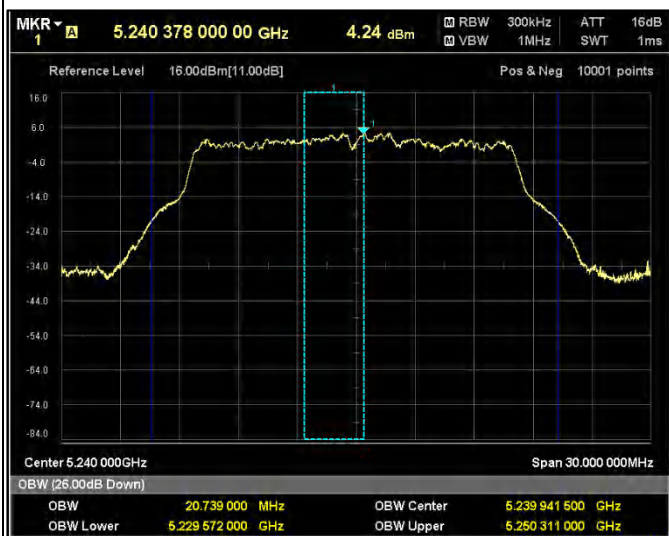
99%



Channel Frequency: 5240MHz Data rate: 54Mbps

26dB

99%



Modulation: 802.11a : UNII 3

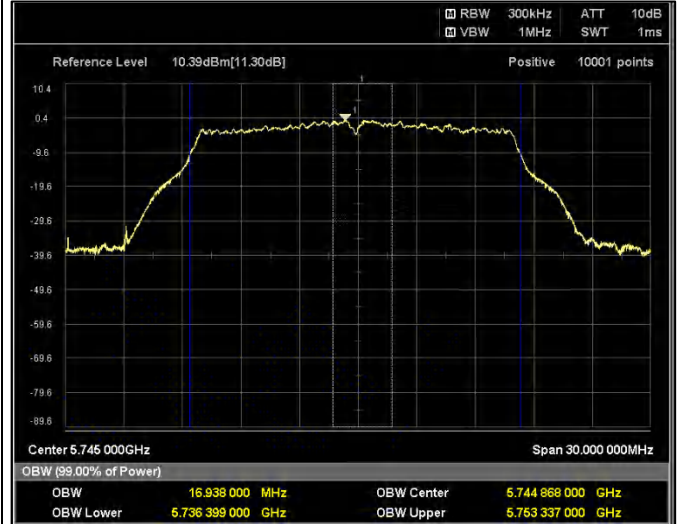
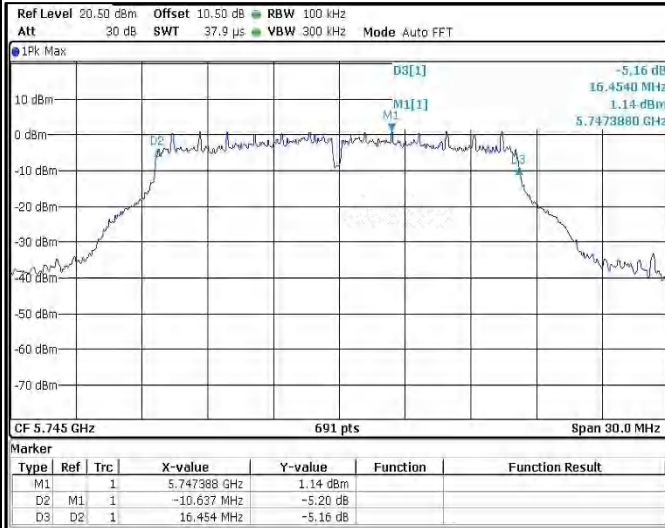
Data rate (Mbps)	Measured Frequency (MHz)	6 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Minimum Limit (MHz)
6	5745.00	16.45	16.93	0.5
	5825.00	16.32	16.89	0.5
54	5745.00	16.36	16.53	0.5
	5825.00	16.32	16.54	0.5

Test Plots:

Channel Frequency: 5745 MHz Data rate: 6Mbps

6dB

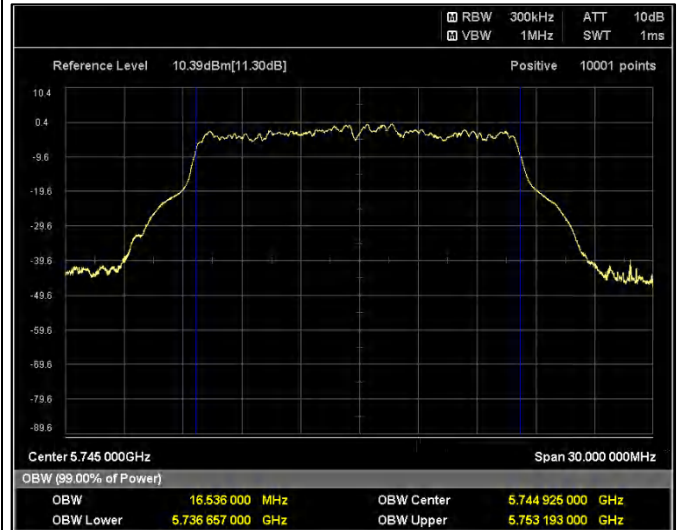
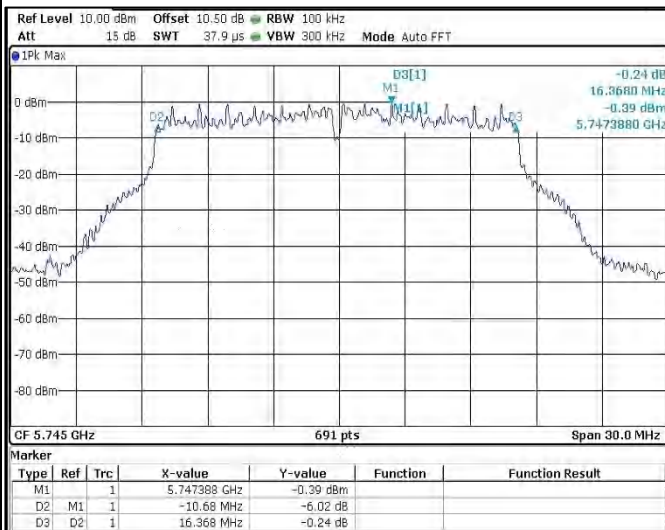
99%



Channel Frequency: 5745 MHz Data rate: 54Mbps

6dB

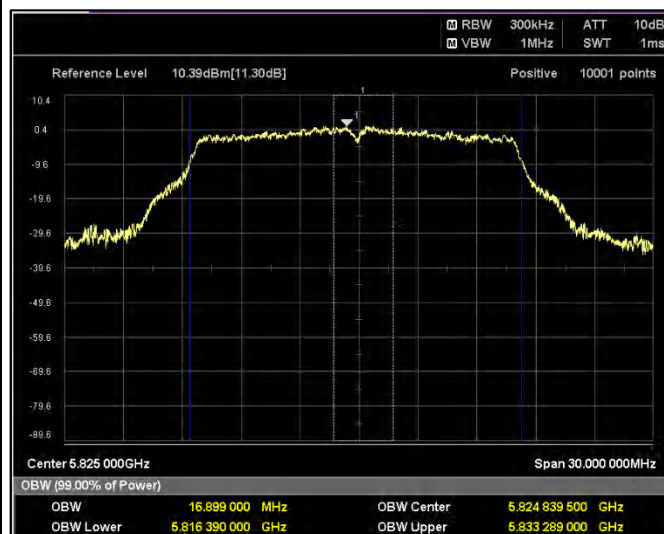
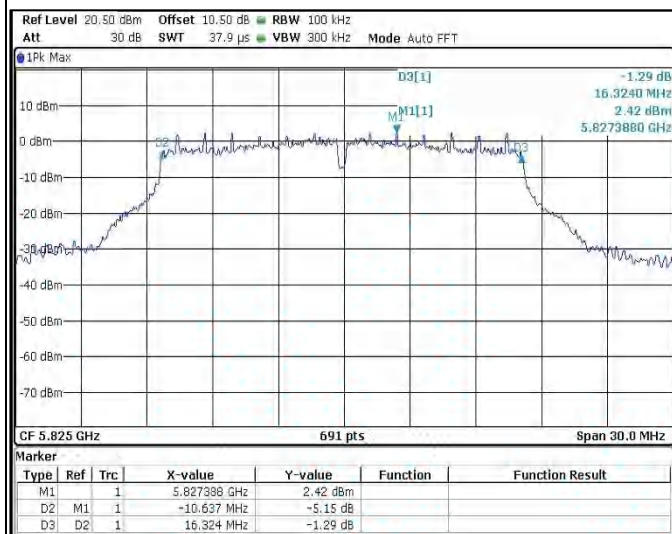
99%



Channel Frequency: 5825 MHz Data rate: 6 Mbps

6dB

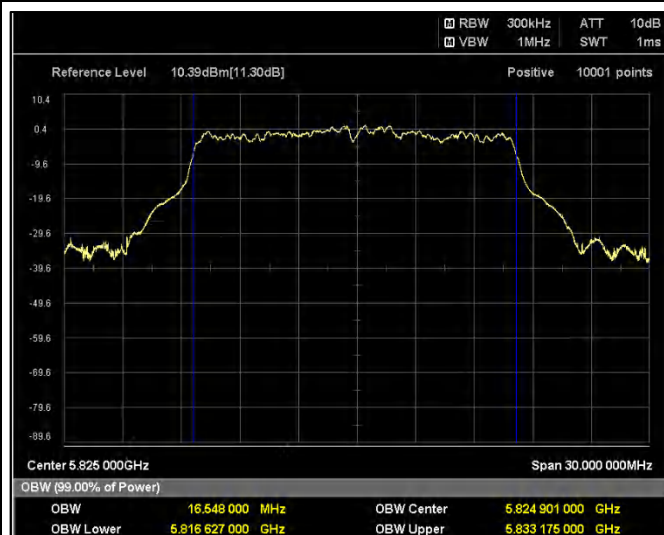
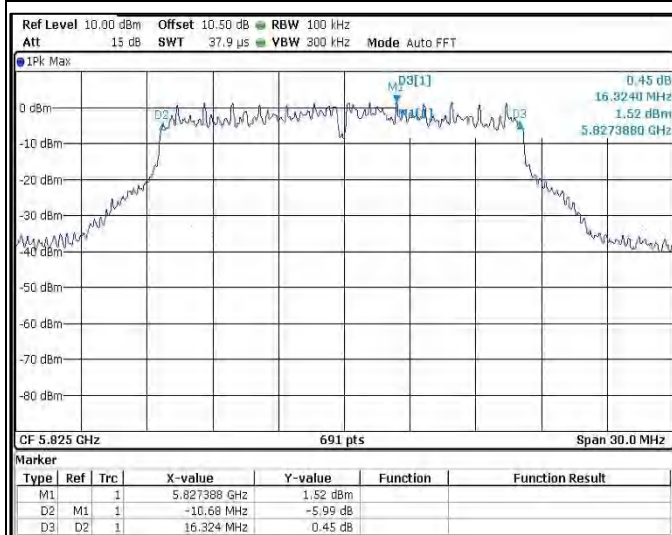
99%



Channel Frequency: 5825 MHz Data rate: 54 Mbps

6dB

99%



Modulation: 802.11n-20MHz : UNII 1

Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5180.00	21.58	18.04
	5240.00	21.84	18.05
MCS7	5180.00	21.09	17.83
	5240.00	21.11	17.85

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

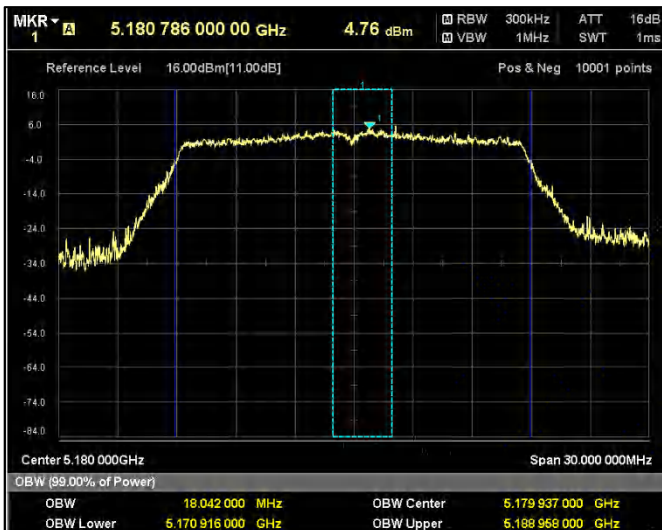
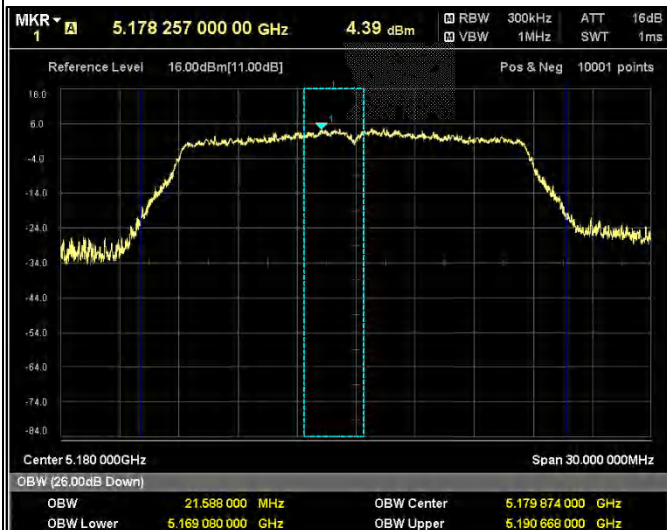
Seite 23 von 99
Page 23 of 99

Test Plots:

Channel Frequency:5180MHz Data rate: MCS0

26dB

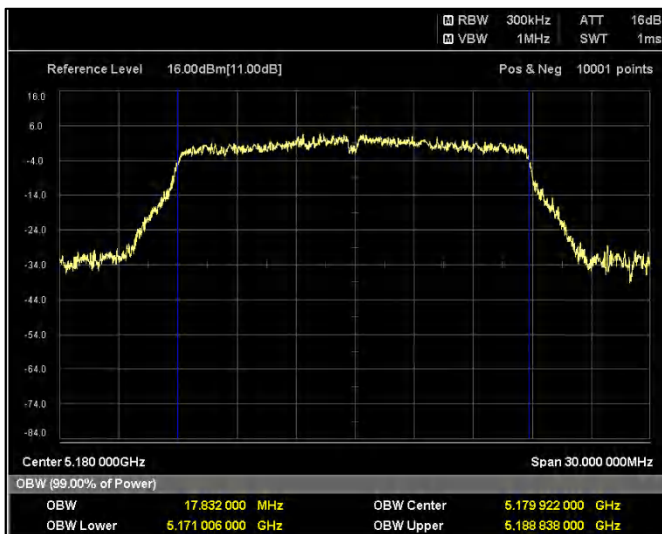
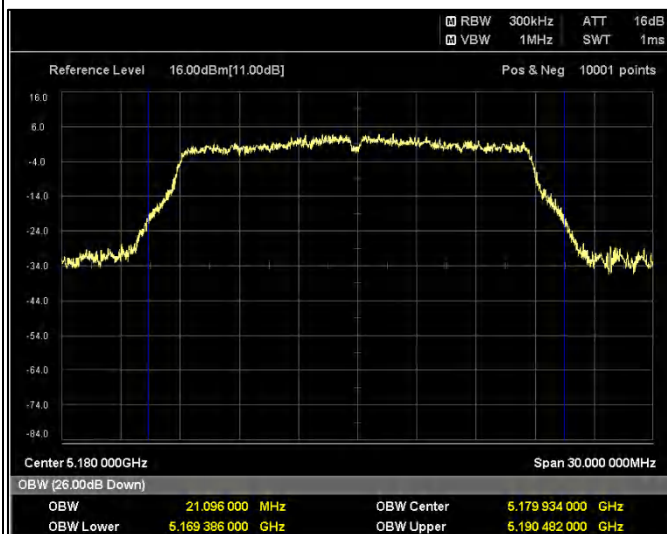
99%



Channel Frequency:5180MHz Data rate: MCS7

26dB

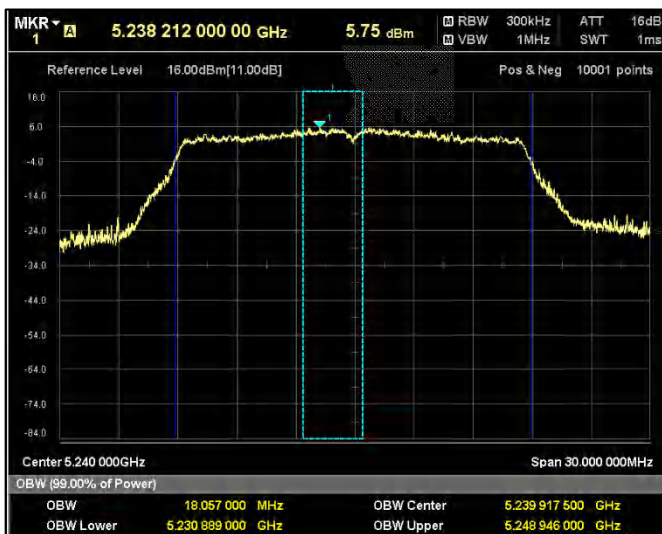
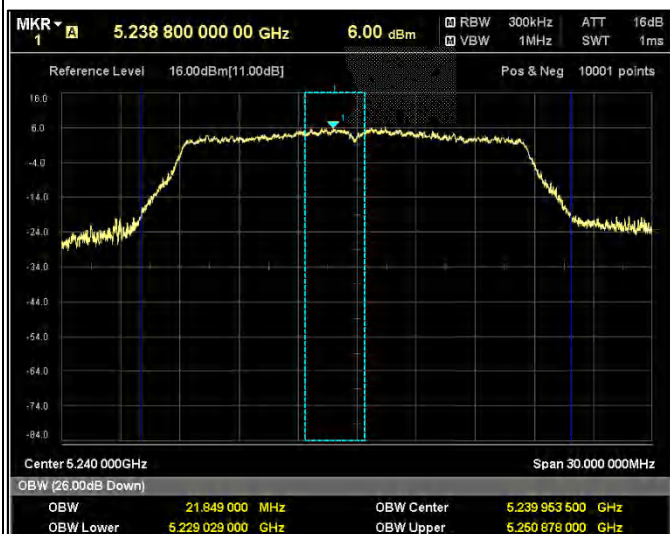
99%



Channel Frequency:5240MHz Data rate: MCS0

26dB

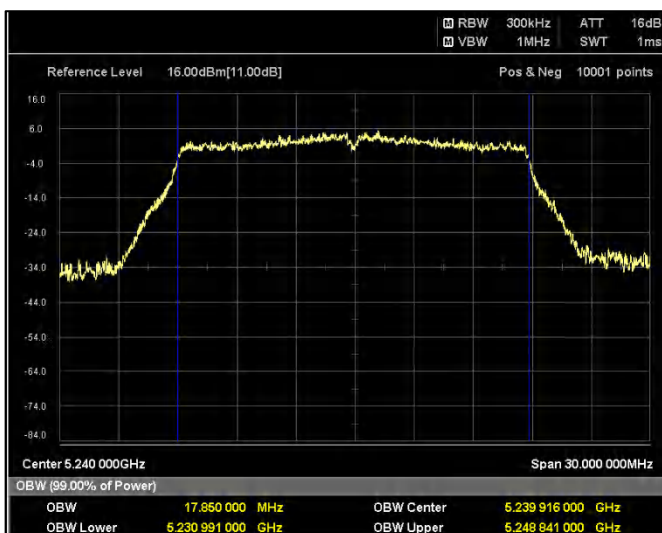
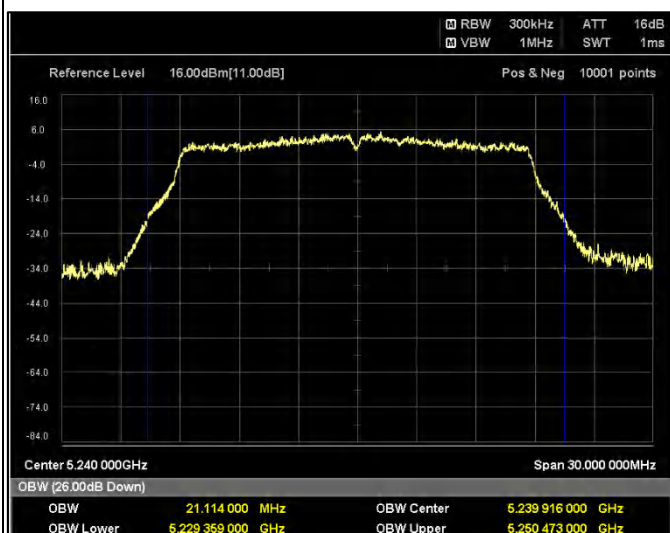
99%



Channel Frequency:5240MHz Data rate: MCS7

26dB

99%



Modulation: 802.11n-20MHz : UNII 3

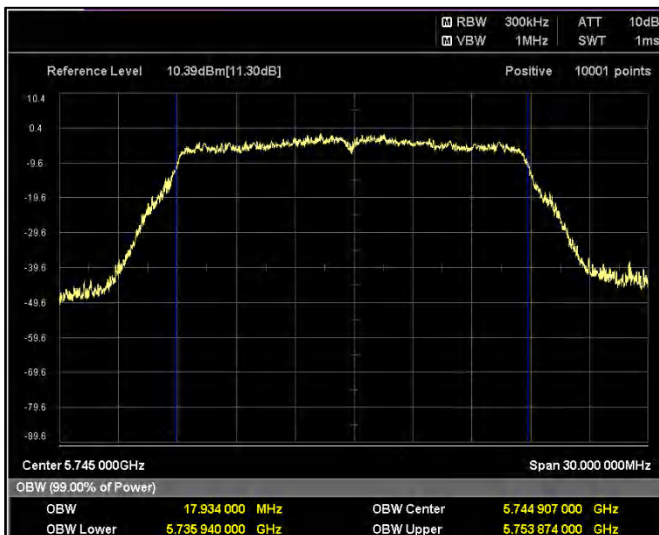
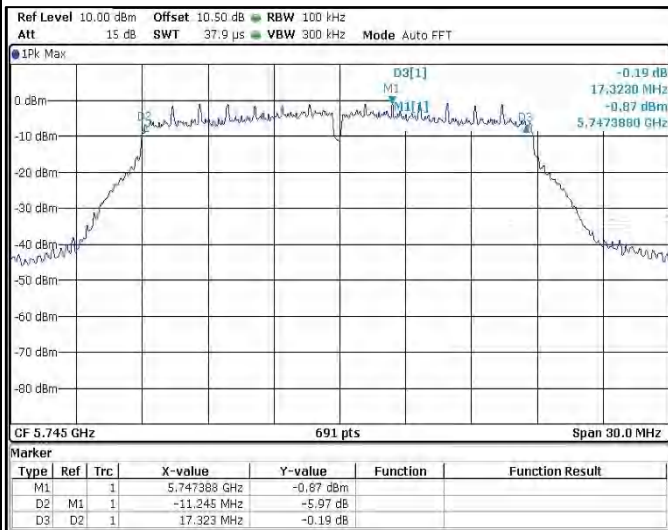
Data rate (Mbps)	Measured Frequency (MHz)	6 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Minimum Limit (MHz)
MCS0	5745.00	17.32	17.93	0.5
	5825.00	17.58	18.02	0.5
MCS7	5745.00	17.71	17.87	0.5
	5825.00	17.71	17.87	0.5

Test Plots:

Channel Frequency:5745MHz Data rate: MCS0

6dB

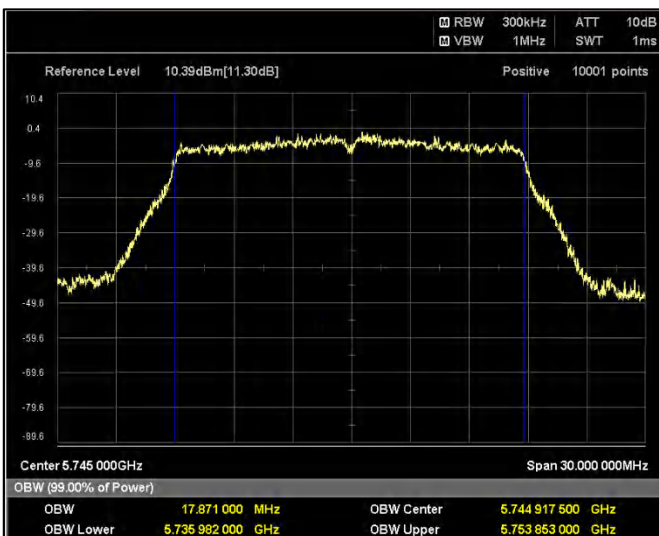
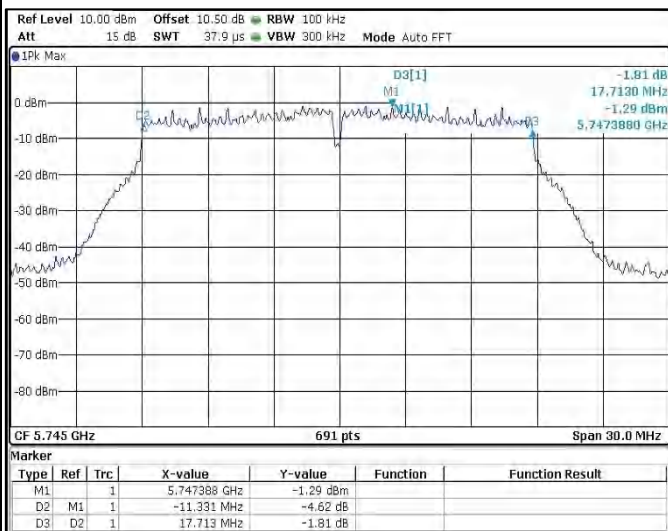
99%



Channel Frequency:5745MHz Data rate: MCS7

6dB

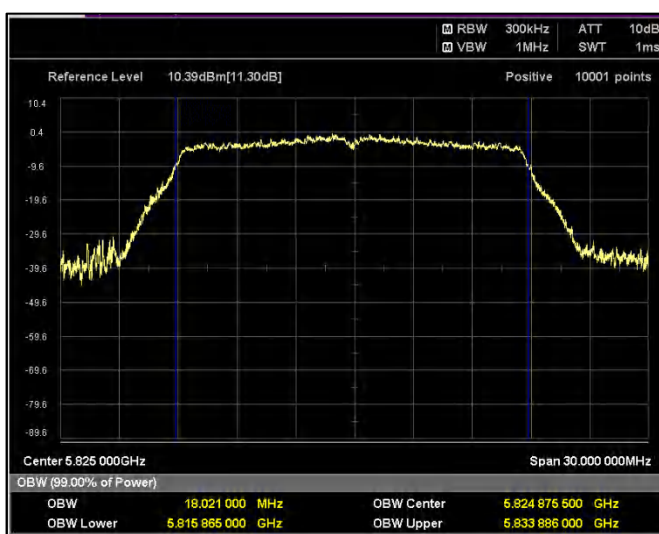
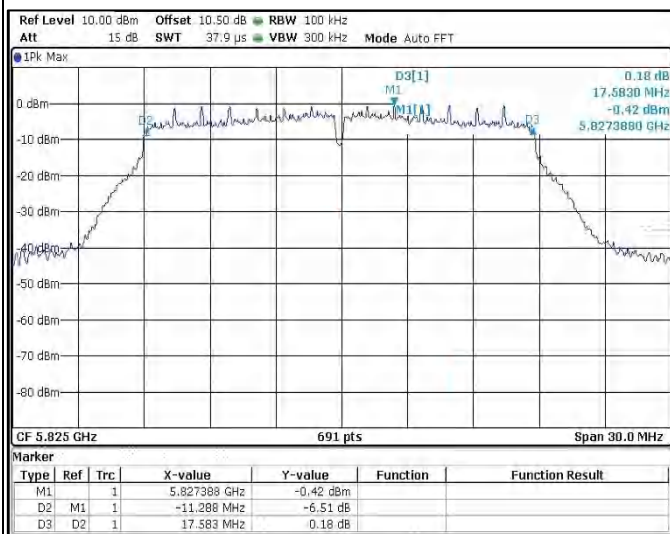
99%



Channel Frequency:5825MHz Data rate: MCS0

6dB

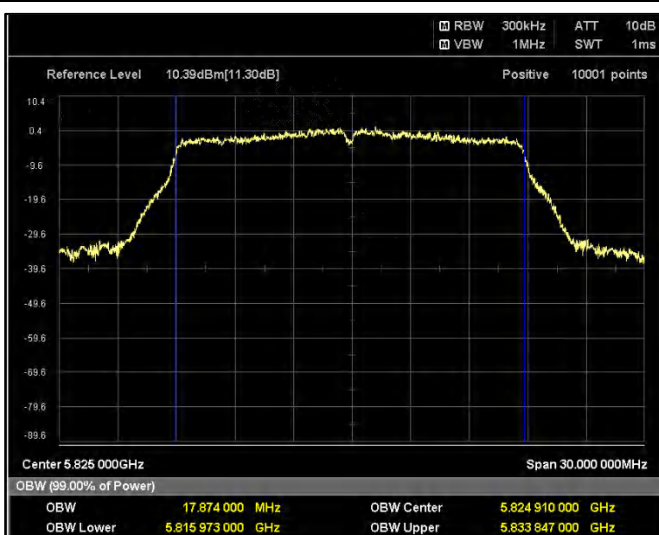
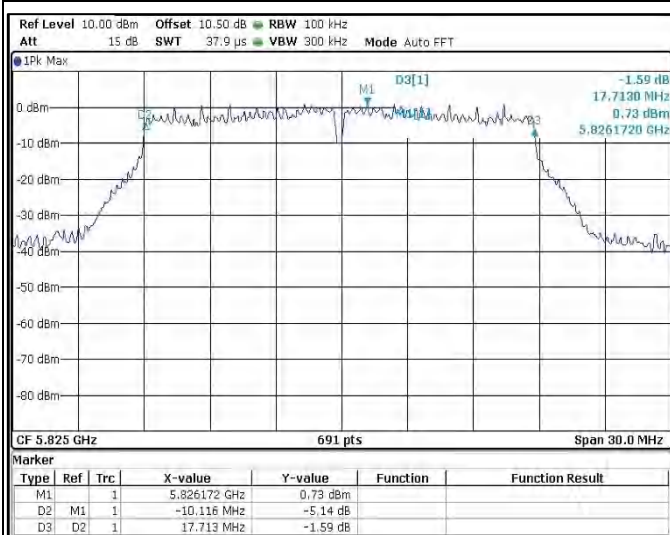
99%



Channel Frequency:5825MHz Data rate: MCS7

6dB

99%



Modulation: 802.11n-HT40MHz: UNII 1

Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5190.00	40.64	36.62
	5230.00	40.41	36.53
MCS7	5190.00	39.97	36.43
	5230.00	40.06	36.43

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

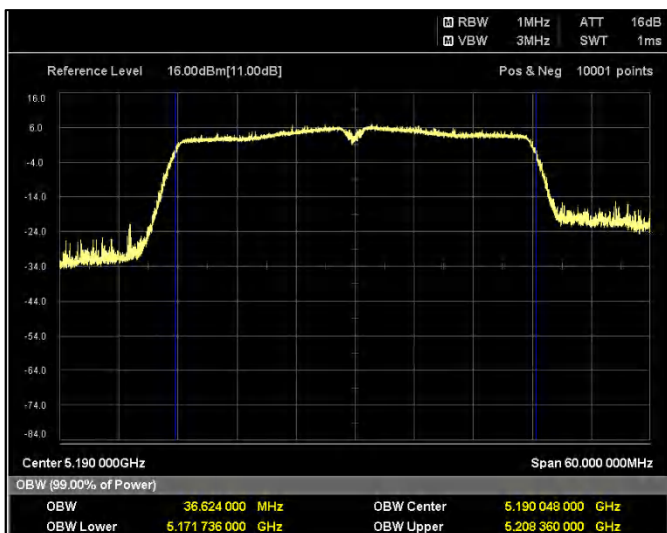
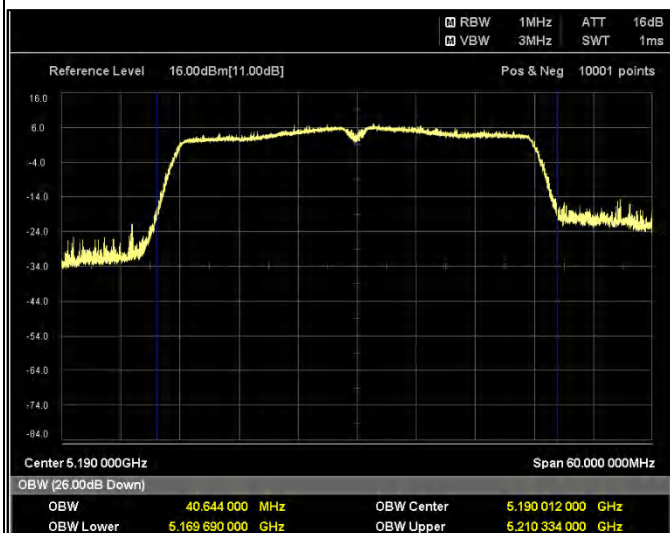
Seite 27 von 99
Page 27 of 99

Test Plots:

Channel Frequency:5190MHz Data rate: MCS0

26dB

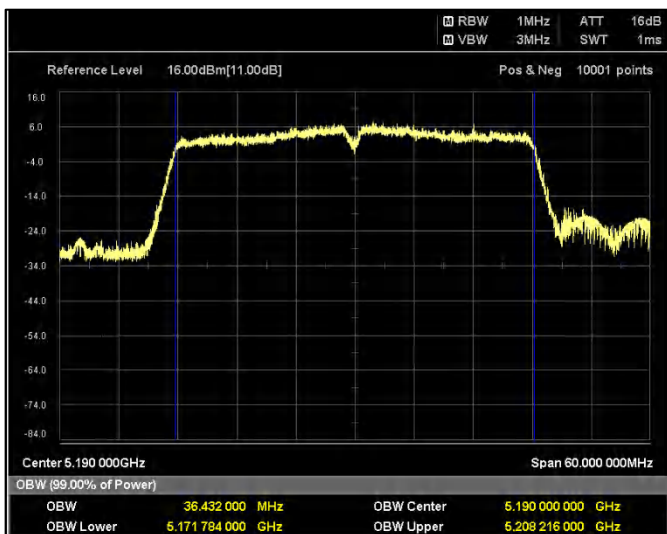
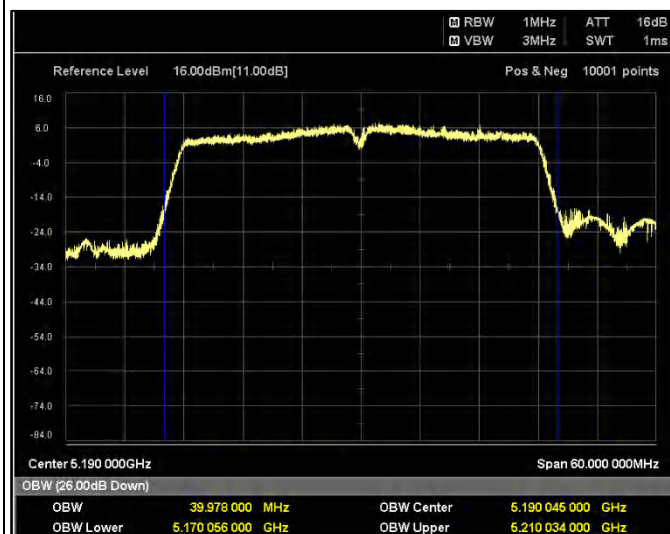
99%



Channel Frequency:5190MHz Data rate: MCS7

26dB

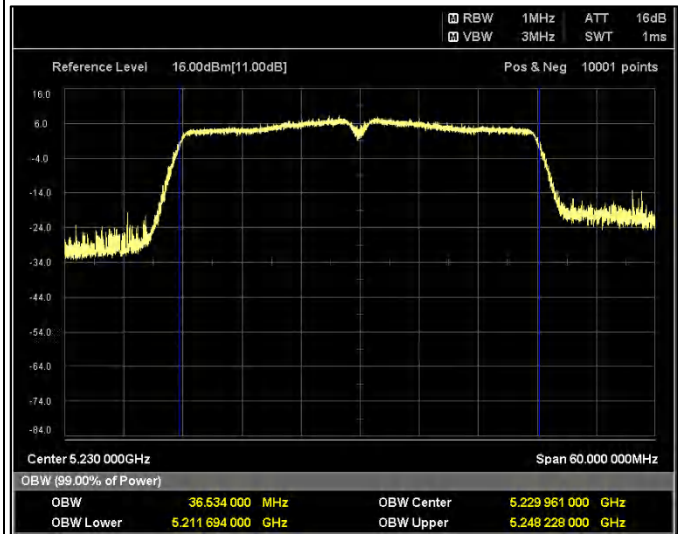
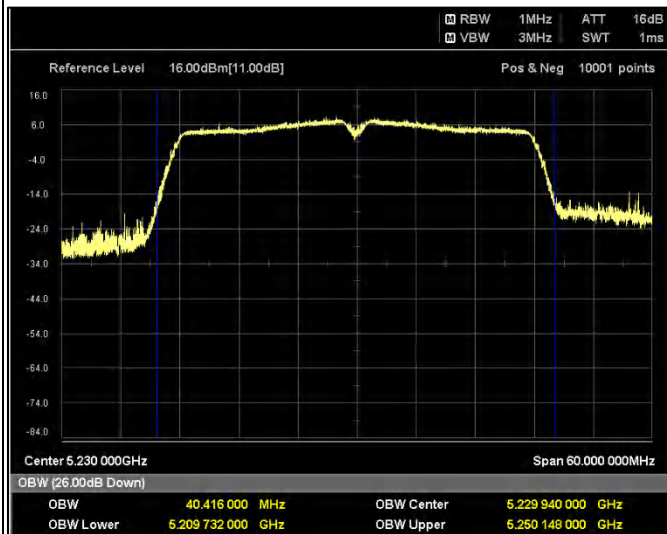
99%



Channel Frequency:5230MHz Data rate: MCS0

26dB

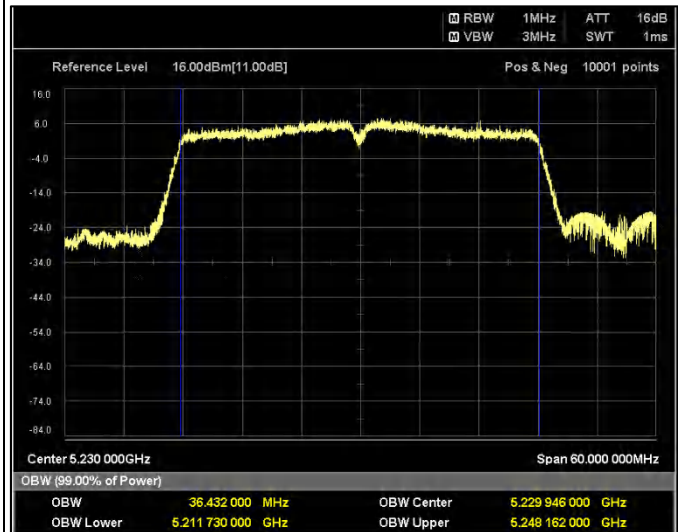
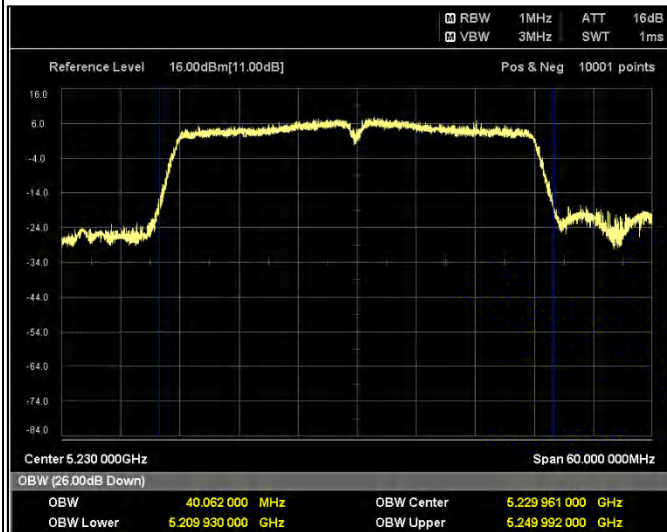
99%



Channel Frequency:5230MHz Data rate: MCS7

26dB

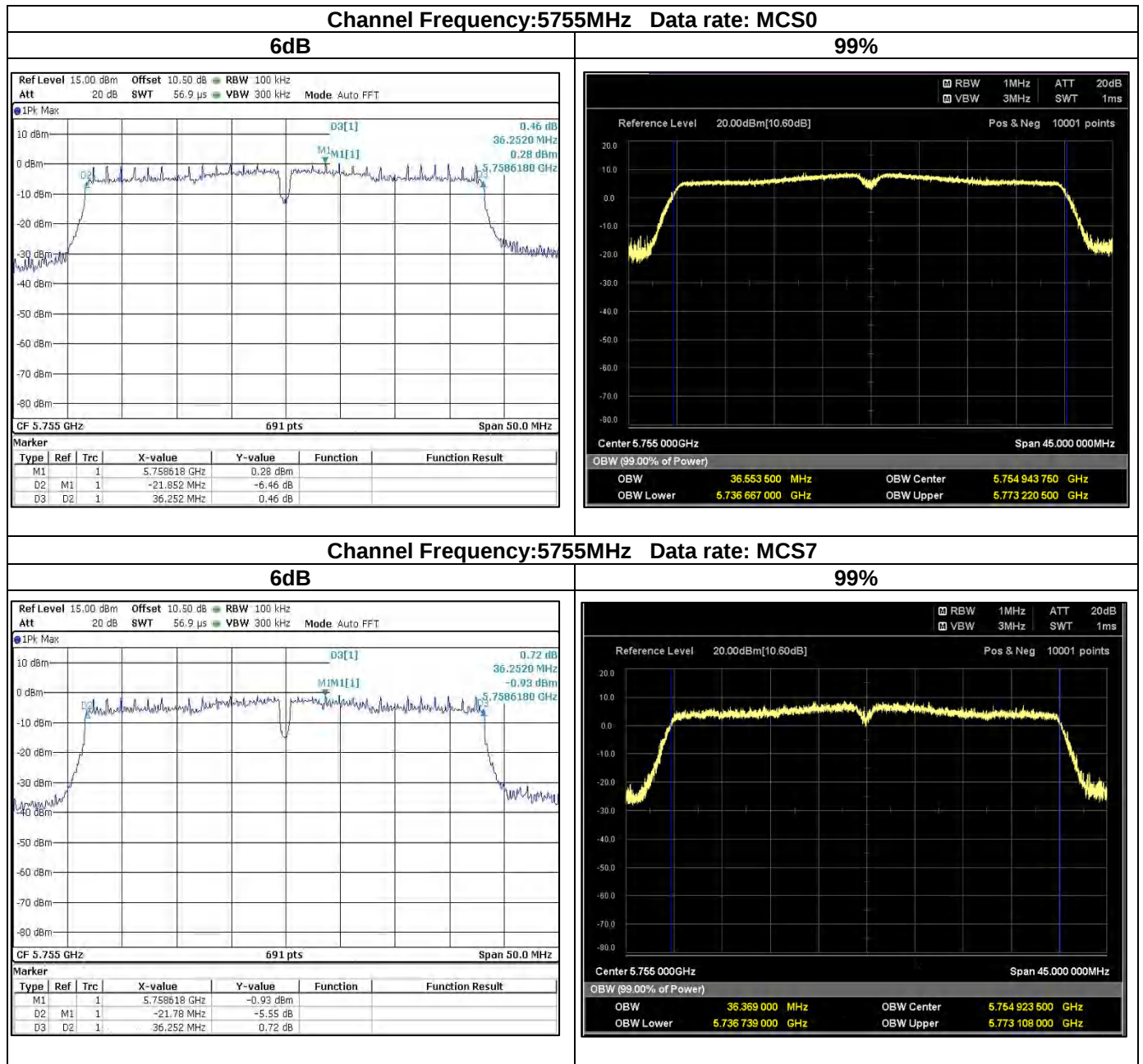
99%



Modulation: 802.11n-HT40MHz: UNII 3

Data rate (Mbps)	Measured Frequency (MHz)	6 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Minimum Limit (MHz)
MCS0	5755.00	36.25	36.55	0.5
	5795.00	36.03	36.43	0.5
MCS7	5755.00	36.25	36.36	0.5
	5795.00	36.39	36.45	0.5

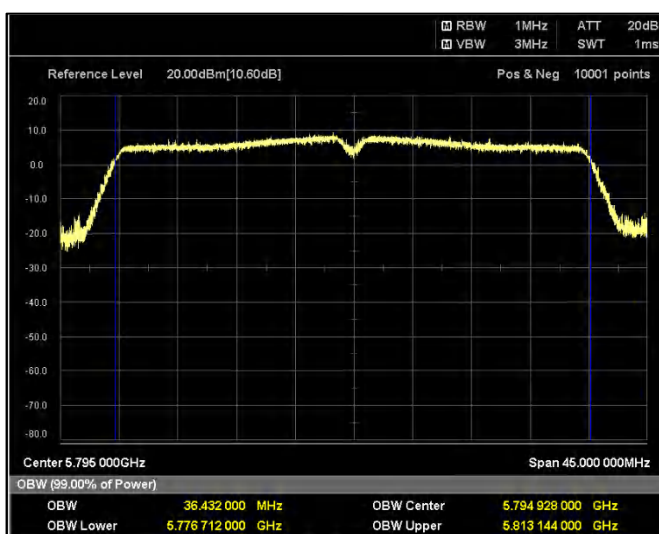
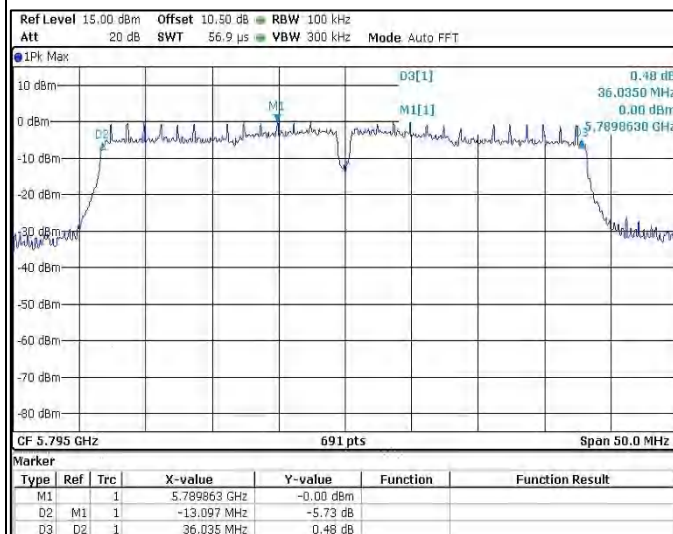
Test Plots:



Channel Frequency:5795MHz Data rate: MCS0

6dB

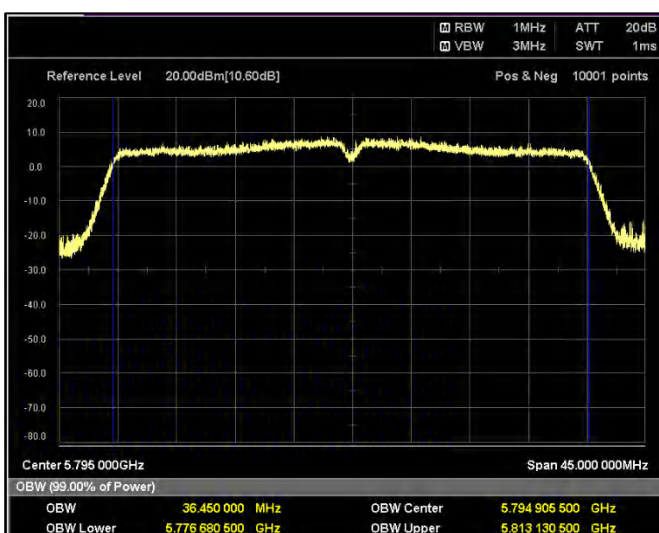
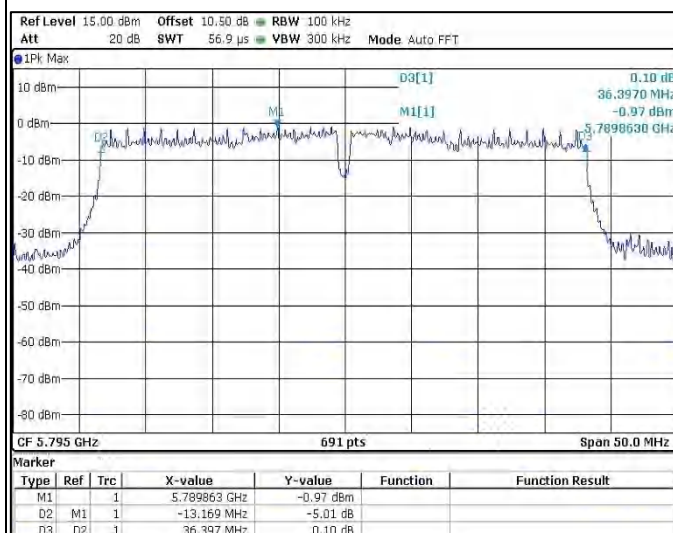
99%



Channel Frequency:5795MHz Data rate: MCS7

6dB

99%



Modulation: 802.11ac-VHT20MHz: UNII 1

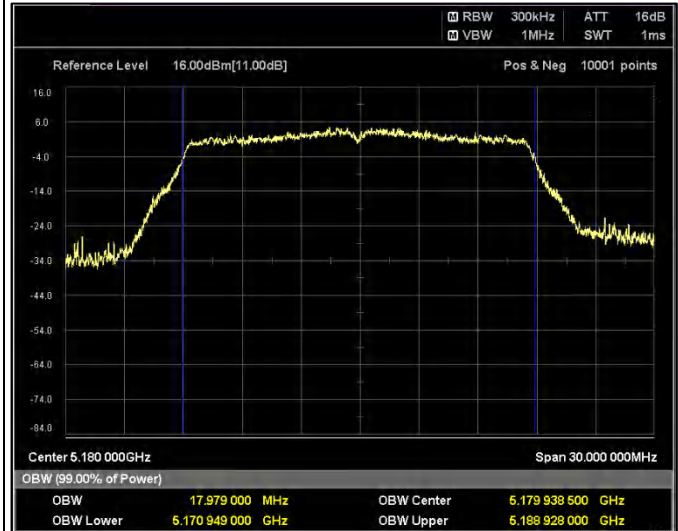
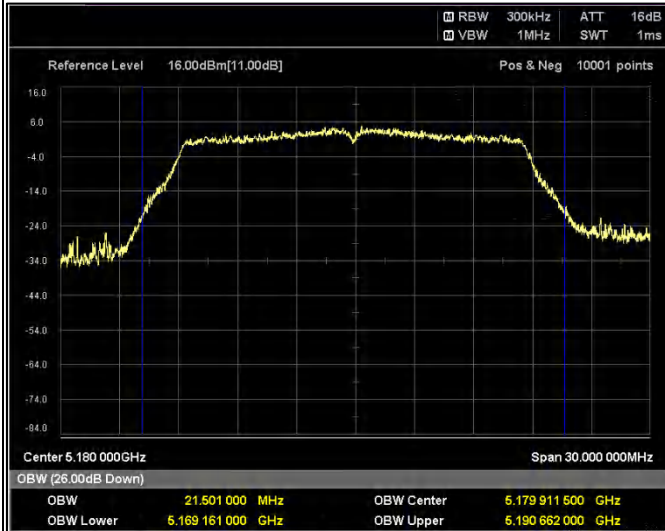
Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5180.00	21.5	17.97
	5240.00	21.62	18.01
MCS8	5180.00	21.09	17.87
	5240.00	21.22	17.89

Test Plots:

Channel Frequency:5180MHz Data rate: MCS0

26dB

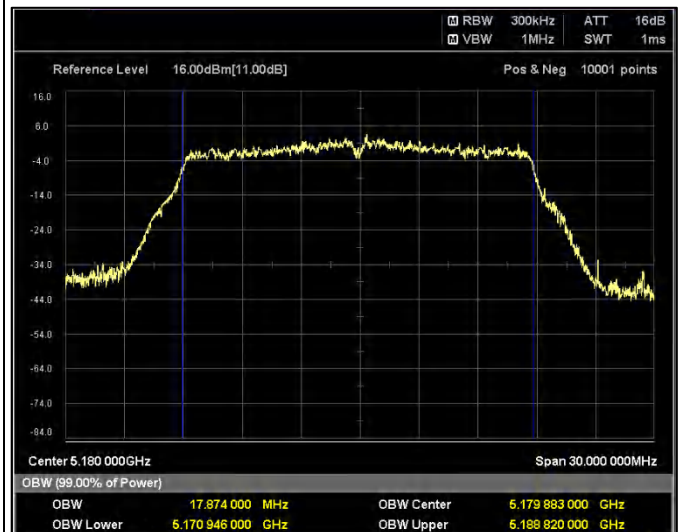
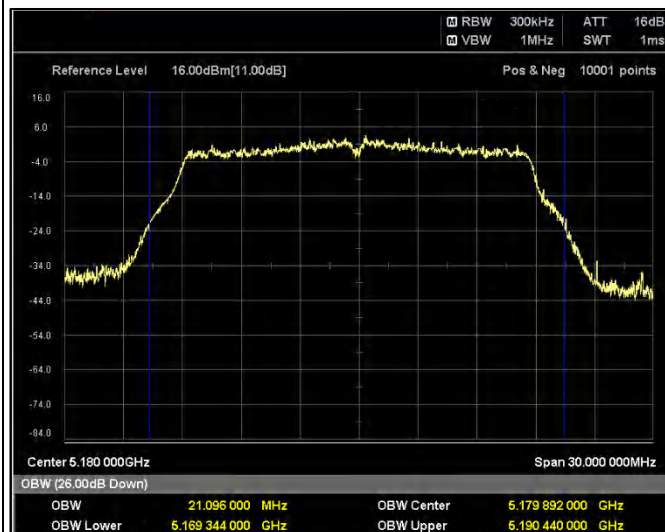
99%



Channel Frequency:5180MHz Data rate: MCS8

26dB

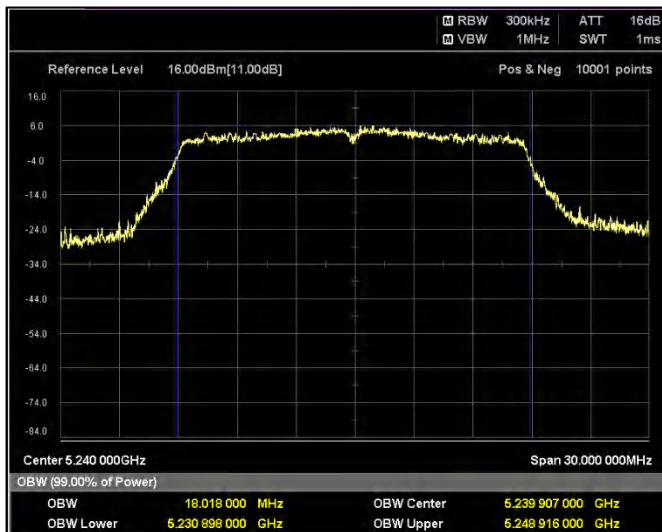
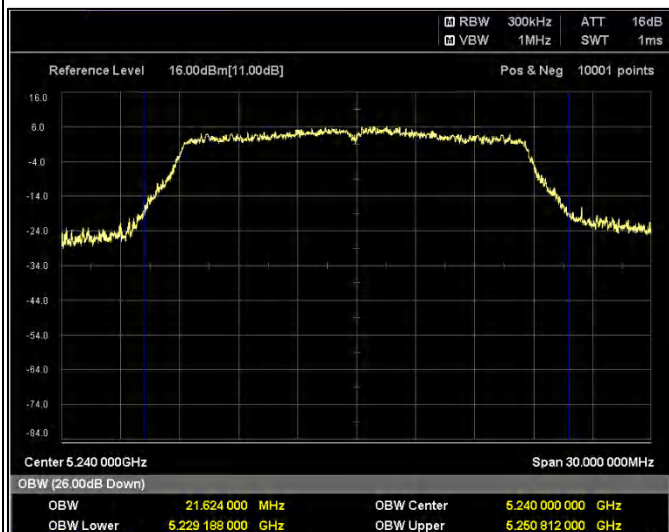
99%



Channel Frequency:5240MHz Data rate: MCS0

26dB

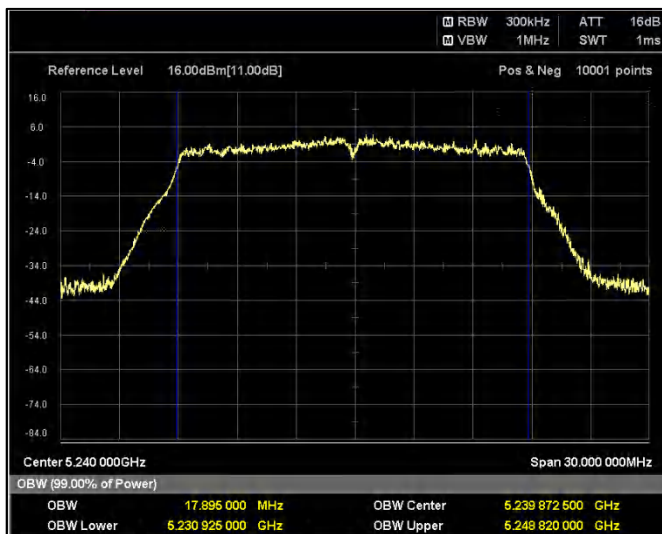
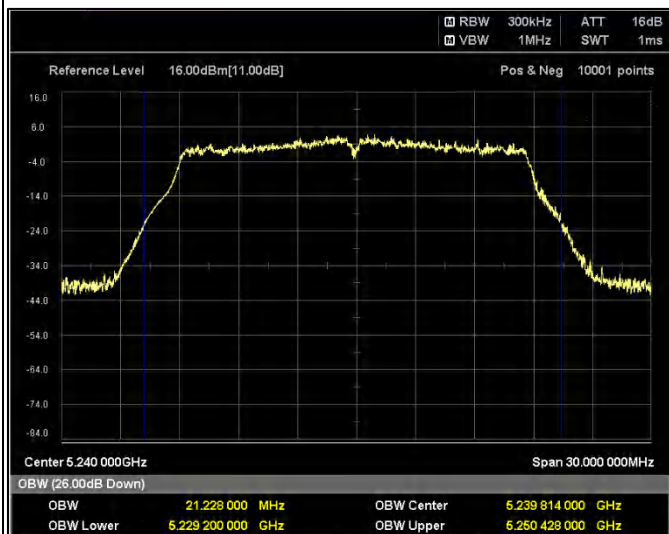
99%



Channel Frequency:5240MHz Data rate: MCS8

26dB

99%



Modulation: 802.11ac-VHT20MHz: UNII 3

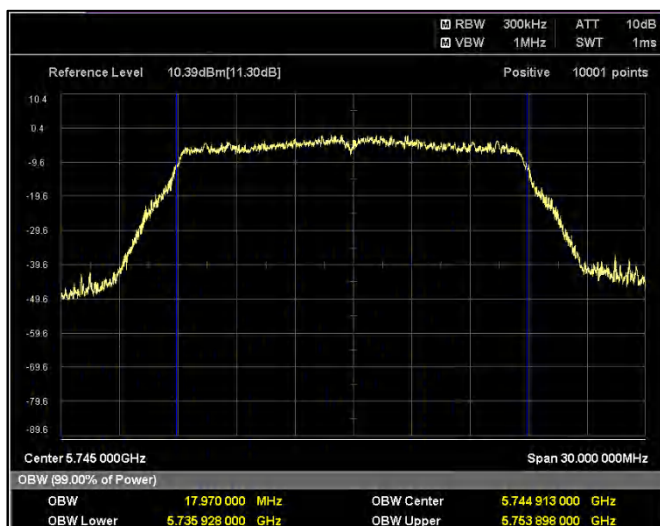
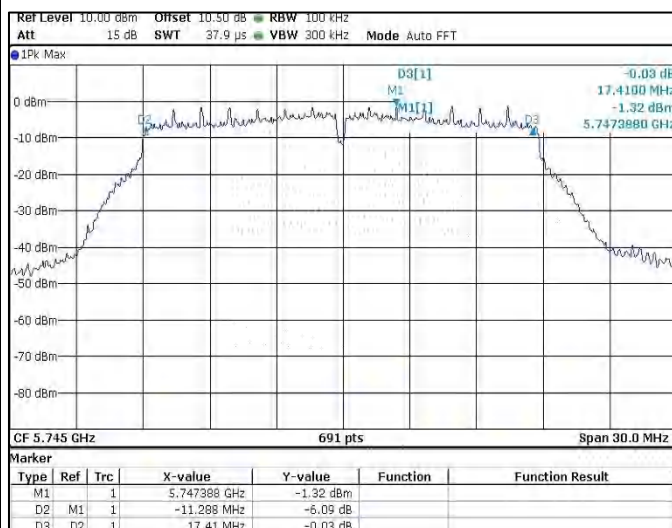
Data rate (Mbps)	Measured Frequency (MHz)	6 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Minimum Limit (MHz)
MCS0	5745.00	17.41	17.97	0.5
	5825.00	17.54	18.06	0.5
MCS8	5745.00	17.67	17.86	0.5
	5825.00	17.67	17.86	0.5

Test Plots:

Channel Frequency:5745MHz Data rate: MCS0

6dB

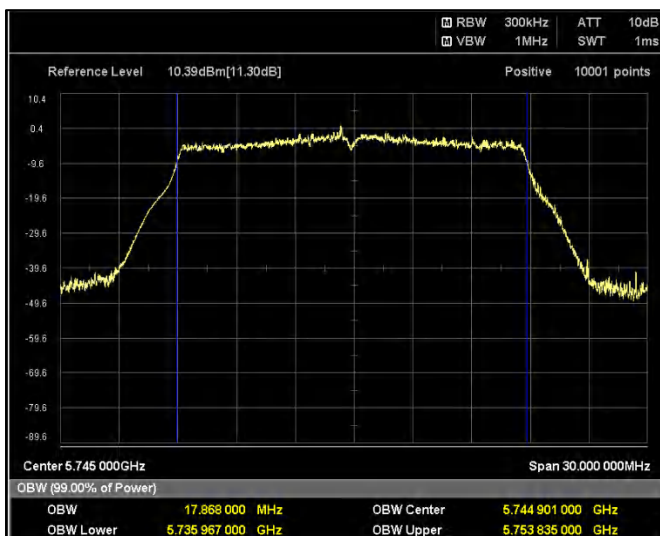
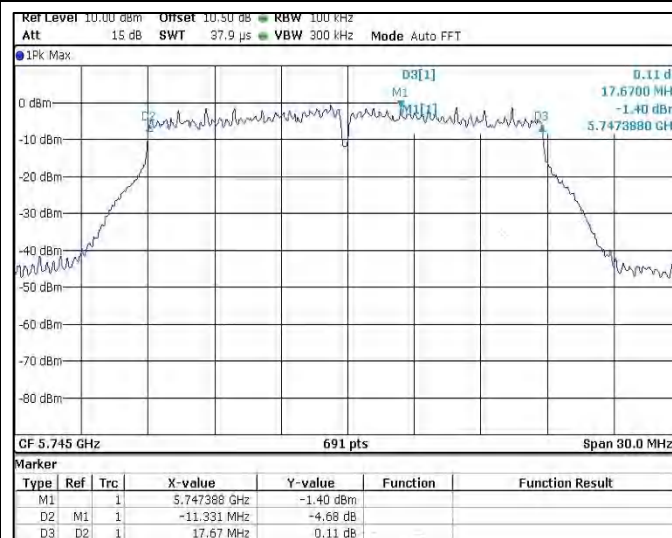
99%



Channel Frequency:5745MHz Data rate: MCS8

6dB

99%



Prüfbericht - Nr.:
Test Report No.:

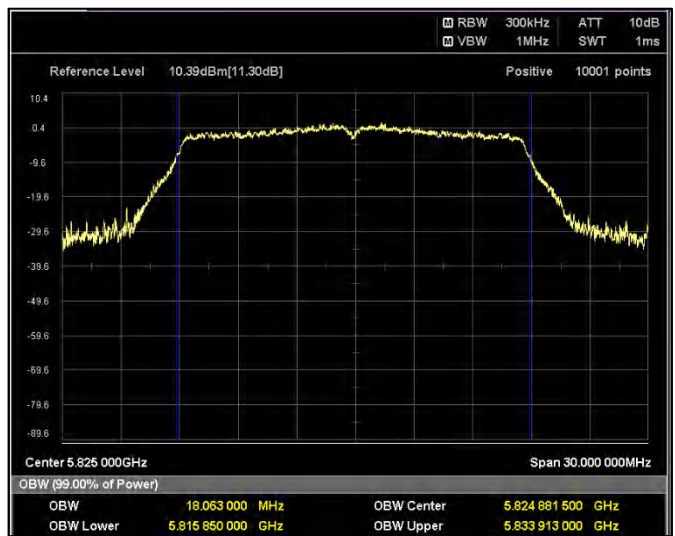
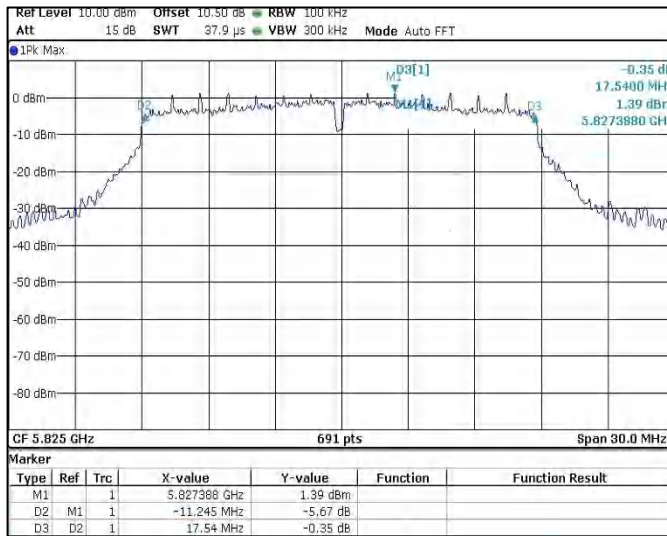
ULR-TC568821300000110F

Seite 34 von 99
Page 34 of 99

Channel Frequency:5825MHz Data rate: MCS0

6dB

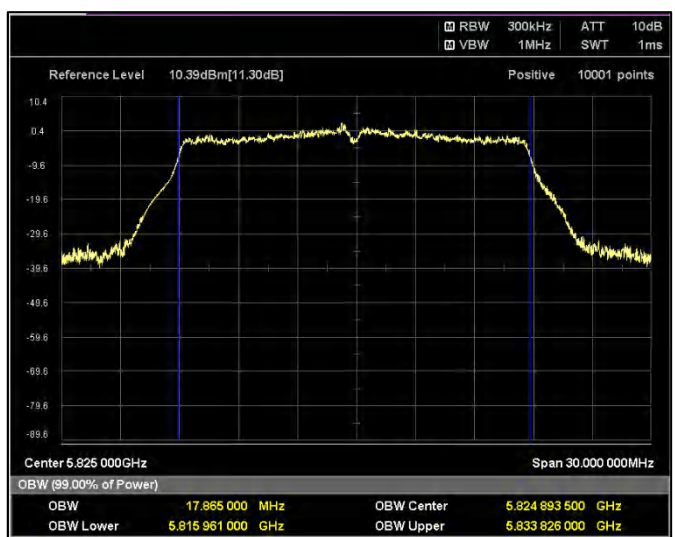
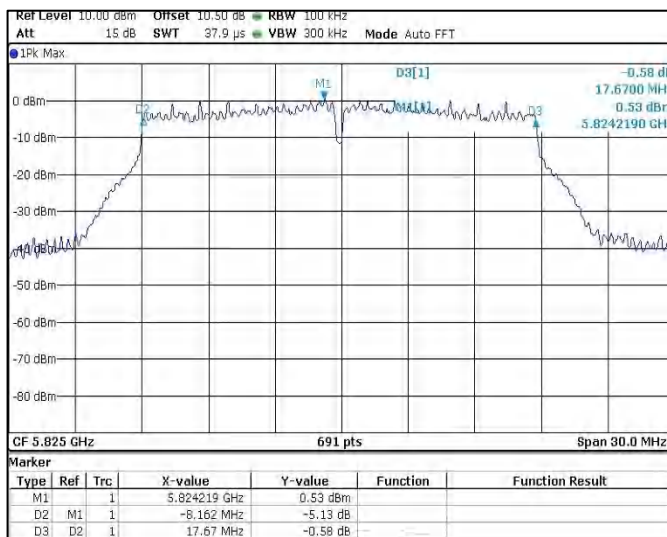
99%



Channel Frequency:5825MHz Data rate: MCS8

6dB

99%



Modulation: 802.11ac-VHT40MHz: UNII 1

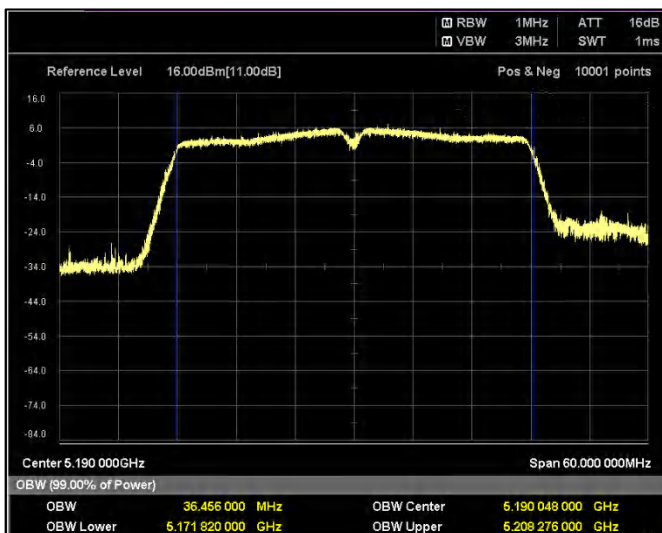
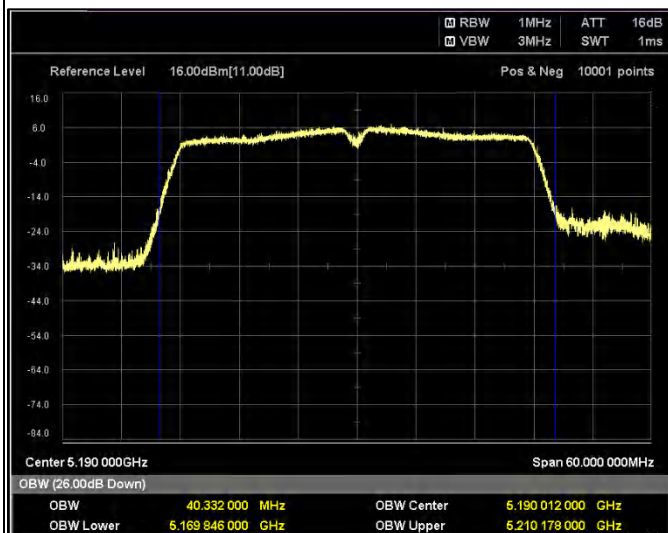
Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5190.00	40.33	36.45
	5230.00	40.65	36.55
MCS9	5190.00	40.66	36.73
	5230.00	40.33	36.67

Test Plots:

Channel Frequency:5190MHz Data rate: MCS0

26dB

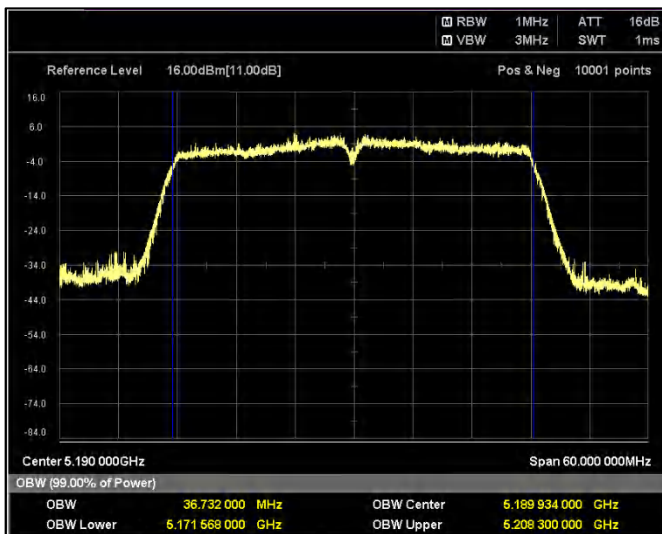
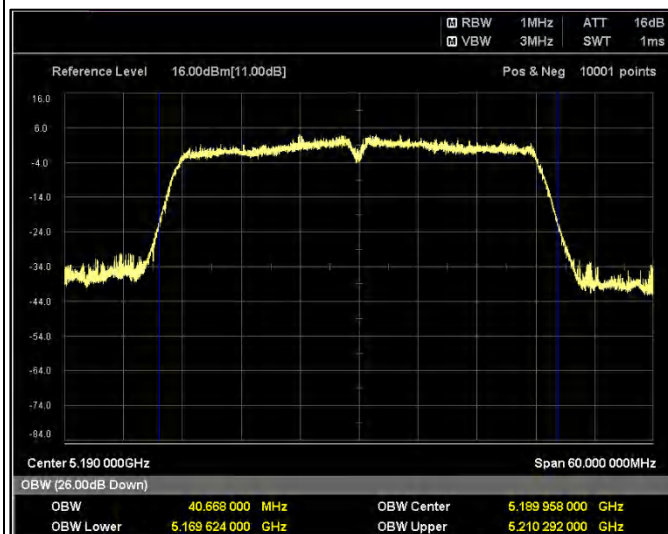
99%



Channel Frequency:5190MHz Data rate: MCS9

26dB

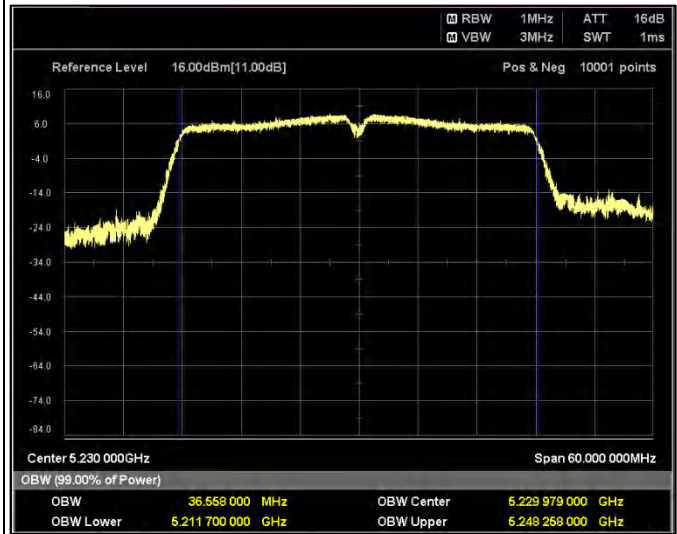
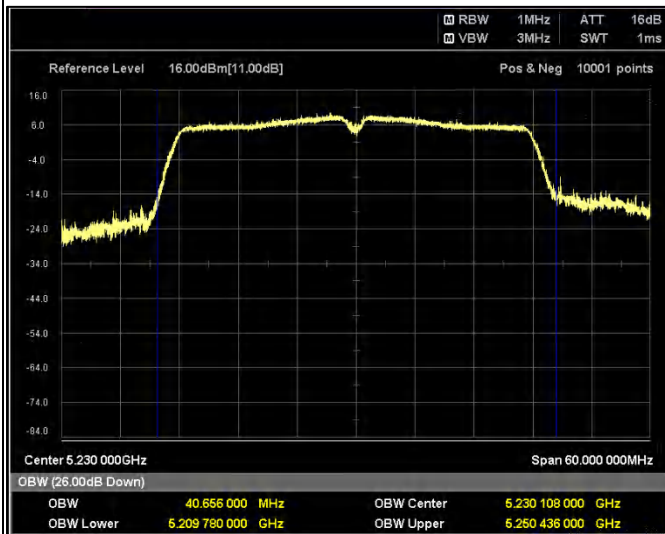
99%



Channel Frequency:5230MHz Data rate: MCS0

26dB

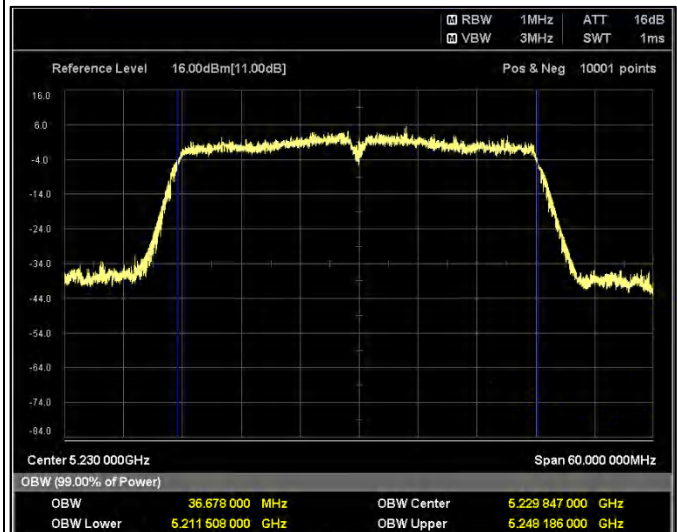
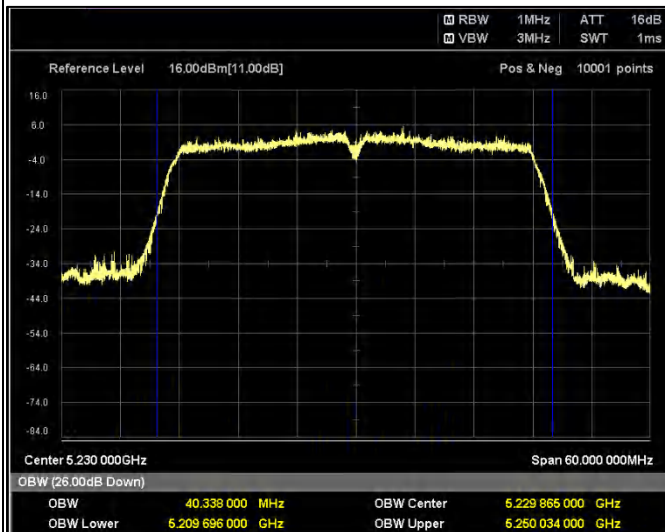
99%



Channel Frequency:5230MHz Data rate: MCS9

26dB

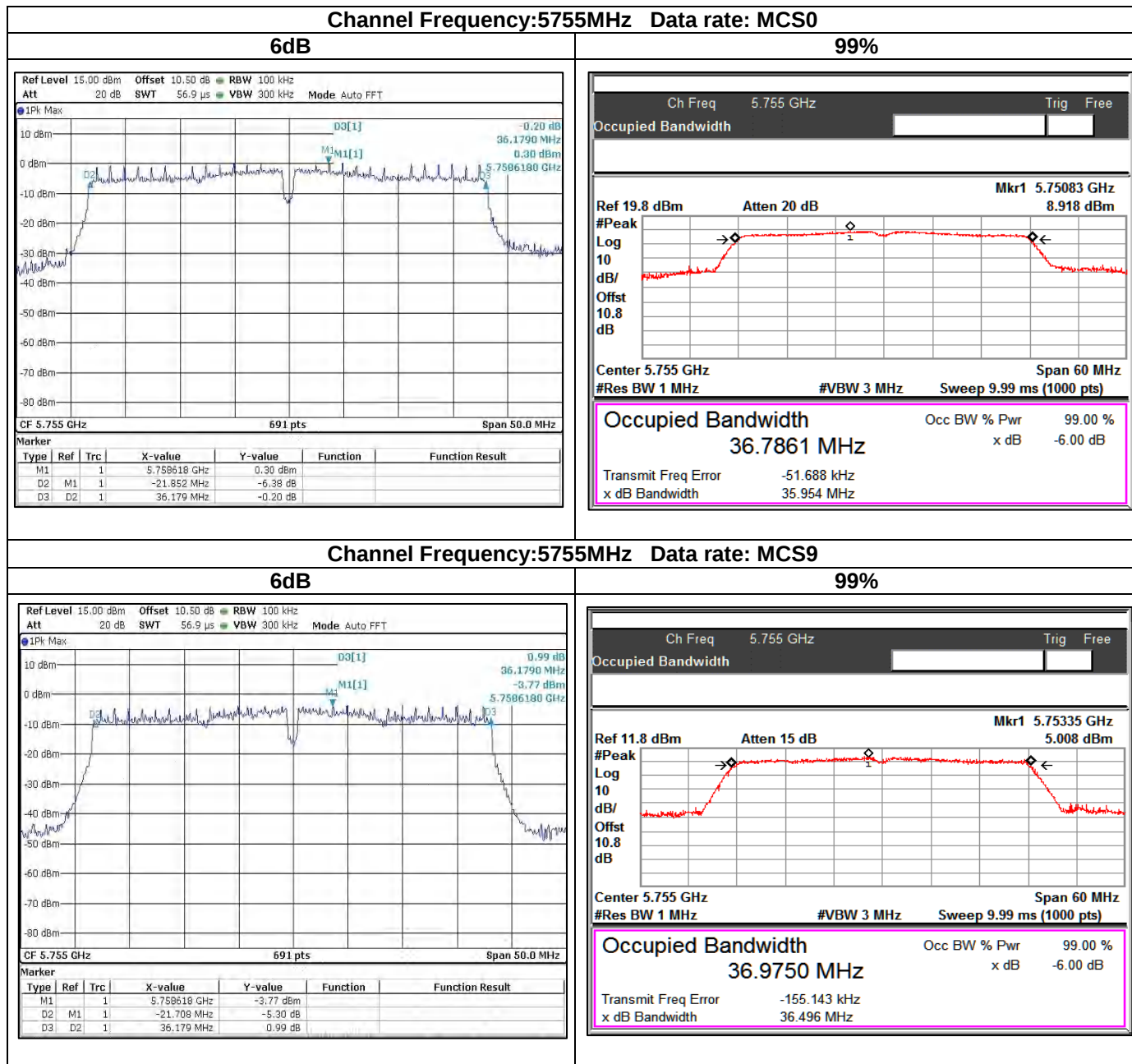
99%



Modulation: 802.11ac-VHT40MHz: UNII 3

Data rate (Mbps)	Measured Frequency (MHz)	6 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Minimum Limit (MHz)
MCS0	5755.00	36.17	36.78	0.5
	5795.00	35.96	36.66	0.5
MCS9	5755.00	36.17	36.97	0.5
	5795.00	36.39	36.80	0.5

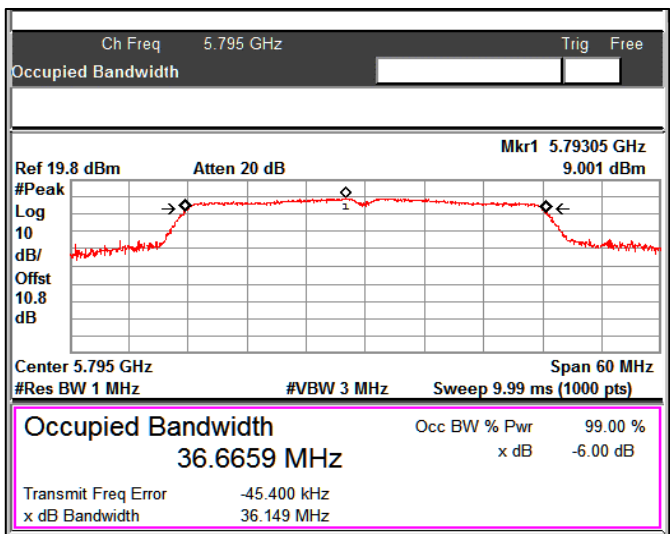
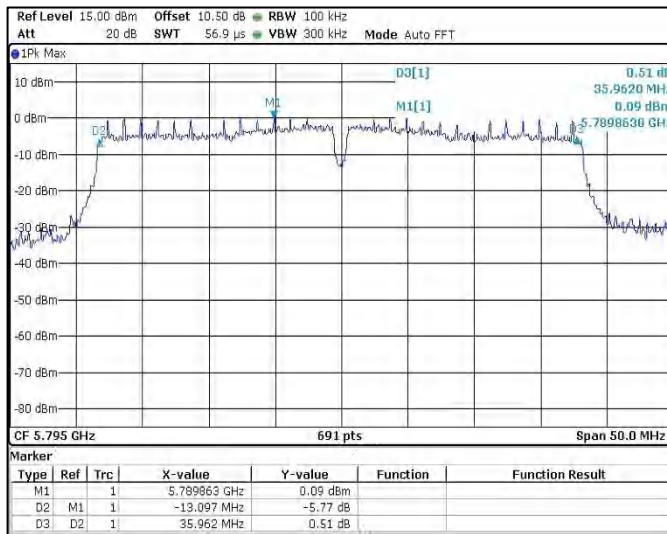
Test Plots:



Channel Frequency: 5795 MHz Data rate: MCS0

6dB

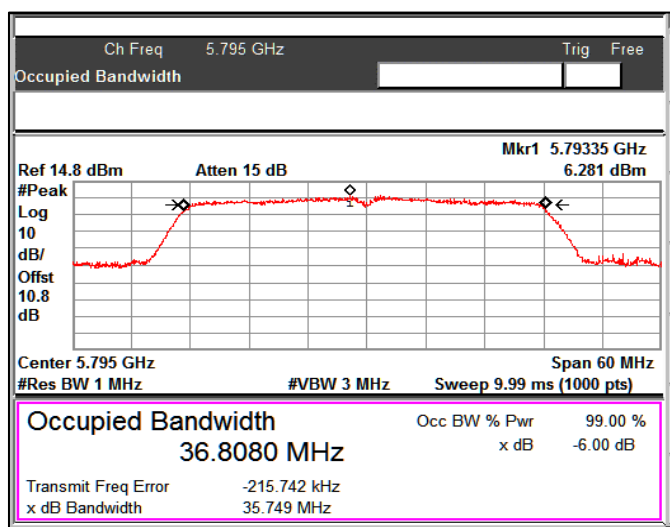
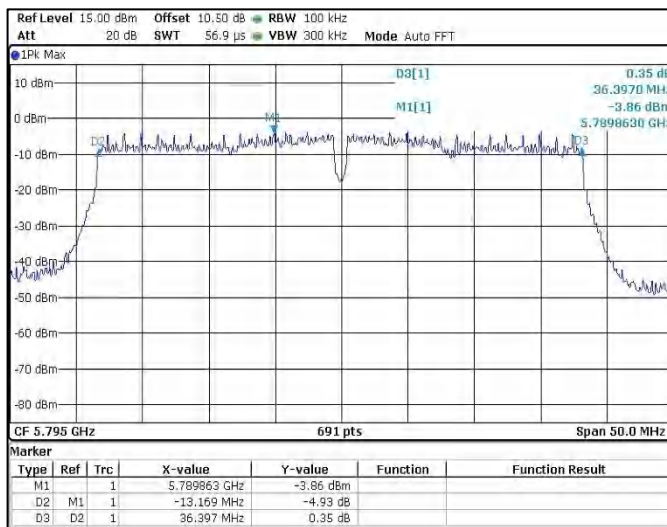
99%



Channel Frequency: 5795 MHz Data rate: MCS9

6dB

99%



Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 39 von 99
Page 39 of 99

Modulation: 802.11ac-VHT80MHz: UNII 1

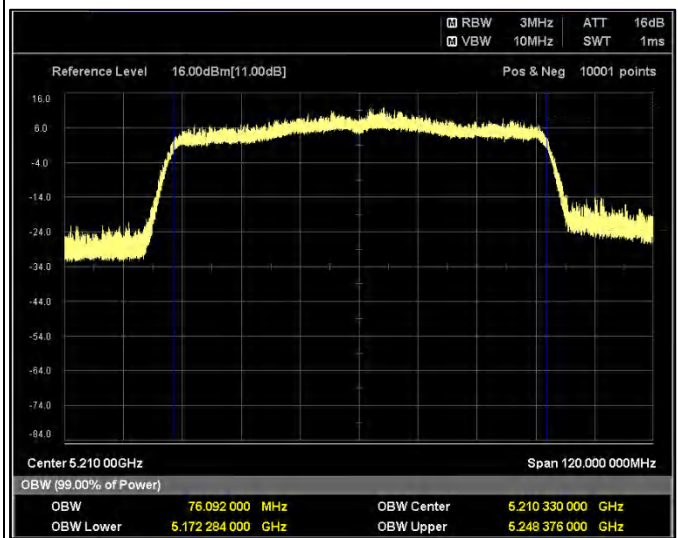
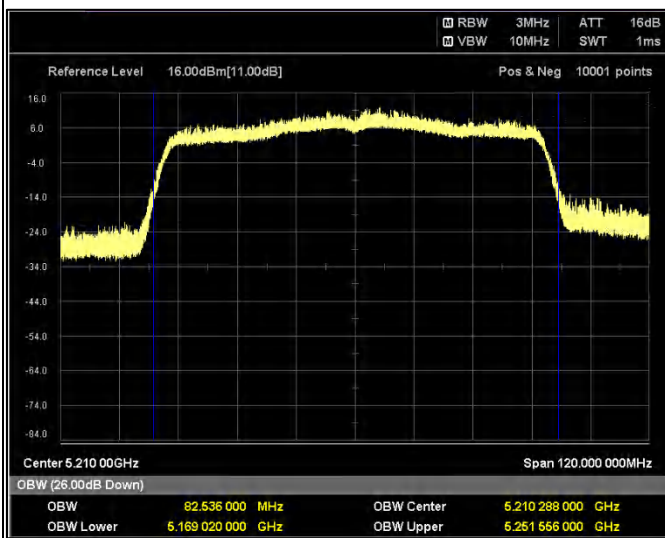
Data rate (Mbps)	Measured Frequency (MHz)	26 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)
MCS0	5210.00	82.53	76.09
MCS9	5210.00	83.26	75.90

Test Plots:

Channel Frequency:5210MHz Data rate: MCS0

26dB

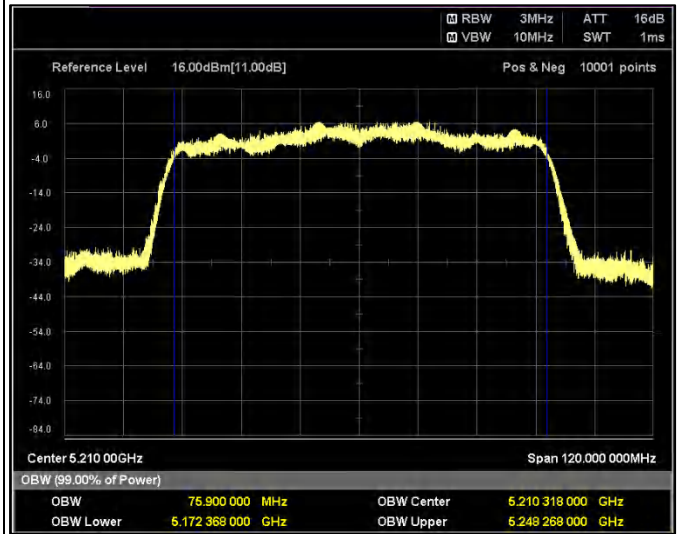
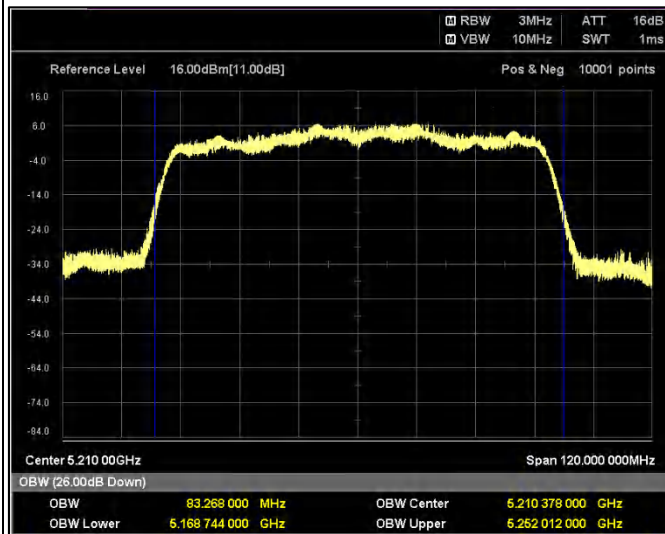
99%



Channel Frequency:5210MHz Data rate: MCS9

26dB

99%



Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 40 von 99
Page 40 of 99

Modulation: 802.11ac-VHT80MHz: UNII 3

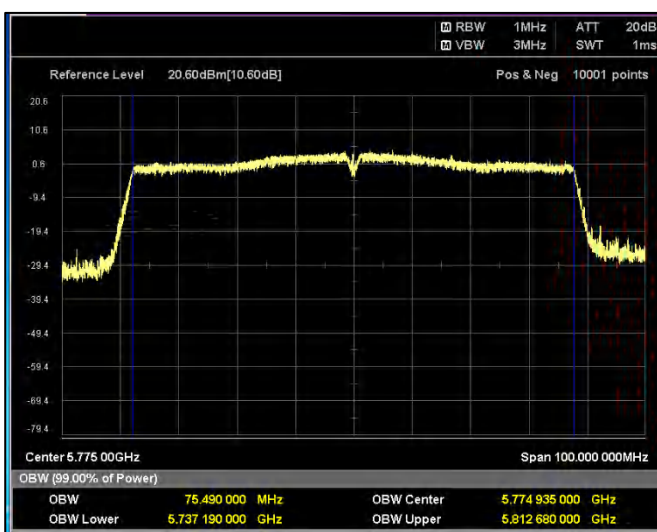
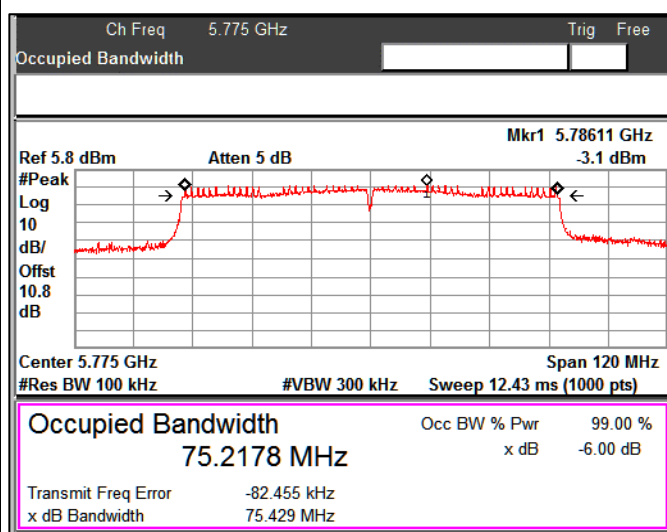
Data rate (Mbps)	Measured Frequency (MHz)	6 dB emission bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Minimum Limit (MHz)
MCS0	5775.00	75.42	75.49	0.5
MCS9	5775.00	75.89	75.50	0.5

Test Plots:

Channel Frequency: 5755MHz Data rate: MCS0

6dB

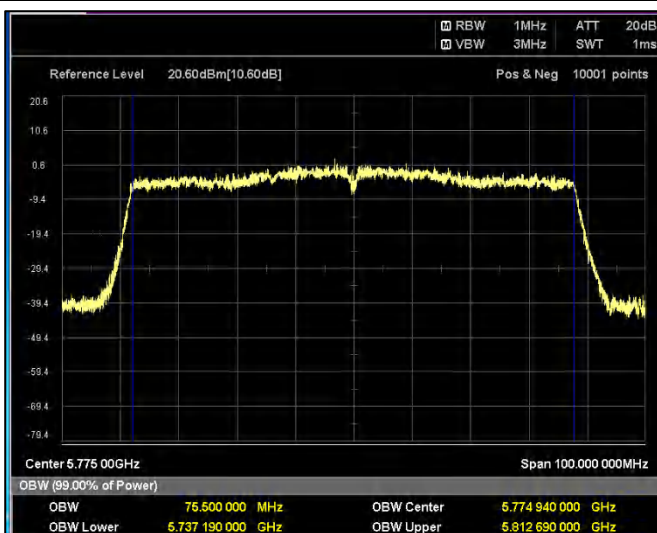
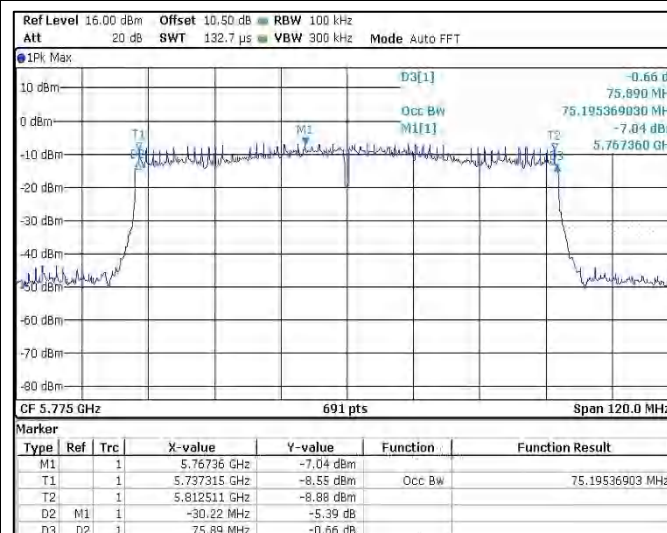
99%



Channel Frequency: 5755MHz Data rate: MCS9

6dB

99%



Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 41 von 99
Page 41 of 99

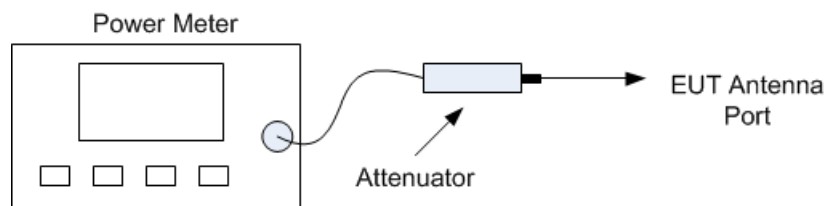
8.2 Maximum Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.407 (a) / RSS 247 Issue 2 Section 6.2.1 & Section 6.2.4
Test Method	Subclause 11.9.2.3 of ANSI C63.10
Measurement Bandwidth	-
Detector	Average (Gated RMS)
Port of testing	Antenna port
Requirement for FCC	1. For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW 2. For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W
Requirement for IC	1. For the band 5.15-5.25 GHz, the maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10}(B)$, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz 2. For the band 5.725-5.85 GHz, The maximum conducted output power shall not exceed 1 W

Test Method



Test Condition:

Normal Test Condition:

Temperature (Norm) = + 24.5 °C

Voltage = Internal Battery + 5.0 V DC

Relative humidity: 63%

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 42 von 99
Page 42 of 99

KDB Guidelines applied:

Measurements were made as per section E (3) sub-section (b) 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 + 1.5 dB Cable loss = 11.5 dB total offset
2. Duty cycle correction factor is considered in Final Average power
Duty cycle Correction factor = $10 \cdot \log(1/X)$ Where X is Duty Cycle
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is (5.2 dBi)
4. e.i.r.p = Maximum Average output power (dBm) + Antenna gain in dBi

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568821300000110F

Seite 43 von 99

Page 43 of 99

Modulation: 802.11a-20MHz

Data rate (Mbps)	Measured Frequency (MHz)	Measured Average Power (dBm)	Duty Cycle X %	Duty cycle correction factor (dB)	Maximum Average output power (dBm)	e.i.r.p (dBm)	FCC Power Limit (dBm)	IC power Limit (dBm)	IC e.i.r.p Limit (dBm)
a_mode-6Mbps	5180.00	12.76	97.12	0.13	12.89	18.09	24.00	-	22.29
	5240.00	12.13	97.12	0.13	12.26	17.46	24.00	-	22.28
	5745.00	11.35	99.03	0.04	11.39	16.59	30.00	30.00	-
	5825.00	12.76	99.03	0.04	12.80	18.00	30.00	30.00	-
a_mode-54Mbps	5180.00	11.10	88.17	0.55	11.65	16.85	24.00	-	22.19
	5240.00	10.24	88.17	0.55	10.79	15.99	24.00	-	22.18
	5745.00	10.89	92.14	0.36	11.25	16.45	30.00	30.00	-
	5825.00	12.47	92.14	0.36	12.83	18.03	30.00	30.00	-

Modulation: 802.11n-20MHz

Data rate (Mbps)	Measured Frequency (MHz)	Measured Average Power (dBm)	Duty Cycle X %	Duty cycle correction factor (dB)	Maximum Average output power (dBm)	e.i.r.p (dBm)	FCC Power Limit (dBm)	IC power Limit (dBm)	IC e.i.r.p Limit (dBm)
n_mode-HT20MHz-MCS0	5180.00	14.09	91.48	0.39	14.48	19.68	24.00	-	22.56
	5240.00	12.42	91.48	0.39	12.81	18.01	24.00	-	22.56
	5745.00	9.64	98.96	0.05	9.69	14.89	30.00	30.00	-
	5825.00	10.53	98.96	0.05	10.58	15.78	30.00	30.00	-
n_mode-HT20MHz-MCS7	5180.00	10.69	57.74	2.39	13.08	18.28	24.00	-	22.51
	5240.00	9.88	57.74	2.39	12.27	17.47	24.00	-	22.52
	5745.00	9.59	91.34	0.39	9.98	15.18	30.00	30.00	-
	5825.00	11.25	91.34	0.39	11.64	16.84	30.00	30.00	-

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 44 von 99
Page 44 of 99

Modulation: 802.11n-40MHz

Data rate (Mbps)	Measured Frequency (MHz)	Measured Average Power (dBm)	Duty Cycle X %	Duty cycle correction factor (dB)	Maximum Average output power (dBm)	e.i.r.p (dBm)	FCC Power Limit (dBm)	IC power (dBm)	IC e.i.r.p Limit (dBm)
n_mode-HT40MHz_MCS0	5190.00	12.10	83.49	0.78	12.88	18.08	24.00	-	23.01
	5230.00	12.39	83.49	0.78	13.17	18.37	24.00	-	23.01
	5755.00	11.55	70.68	1.51	13.06	18.26	30.00	30.00	-
	5795.00	11.17	70.68	1.51	12.68	17.88	30.00	30.00	-
n_mode-HT40MHz_MCS7	5190.00	9.61	46.64	3.31	12.92	18.12	24.00	-	23.01
	5230.00	9.10	46.64	3.31	12.41	17.61	24.00	-	23.01
	5755.00	10.23	56.09	2.51	12.74	17.94	30.00	30.00	-
	5795.00	10.07	56.09	2.51	12.58	17.78	30.00	30.00	-

Modulation: 802.11ac-VHT20MHz

Data rate (Mbps)	Measured Frequency (MHz)	Measured Average Power (dBm)	Duty Cycle X %	Duty cycle correction factor (dB)	Maximum Average output power (dBm)	e.i.r.p (dBm)	FCC Power Limit (dBm)	IC power (dBm)	IC e.i.r.p Limit (dBm)
ac_mode-VHT20MHz-MCS0	5180.00	13.07	91.48	0.39	13.46	18.66	24.00	-	22.55
	5240.00	13.41	91.48	0.39	13.80	19.00	24.00	-	22.56
	5745.00	9.56	98.96	0.05	9.61	14.81	30.00	30.00	-
	5825.00	12.45	98.96	0.05	12.50	17.70	30.00	30.00	-
ac_mode-VHT20MHz-MCS8	5180.00	9.08	55.38	2.57	11.65	16.85	24.00	-	22.52
	5240.00	8.19	55.38	2.57	10.76	15.96	24.00	-	22.53
	5745.00	9.57	90.27	0.44	10.01	15.21	30.00	30.00	-
	5825.00	12.12	90.27	0.44	12.56	17.76	30.00	30.00	-

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568821300000110F

Seite 45 von 99
Page 45 of 99

Modulation: 802.11ac-VHT40MHz

Data rate (Mbps)	Measured Frequency (MHz)	Measured Average Power (dBm)	Duty Cycle X %	Duty cycle correction factor (dB)	Maximum Average output power (dBm)	e.i.r.p (dBm)	FCC Power Limit (dBm)	IC power (dBm)	IC e.i.r.p Limit (dBm)
n_mode_VHT40MHz_MCS0	5190.00	12.10	85.46	0.68	12.78	17.98	24.00	-	23.01
	5230.00	13.33	85.46	0.68	14.01	19.21	24.00	-	23.01
	5755.00	11.48	69.88	1.56	13.04	18.24	30.00	30.00	-
	5795.00	11.19	69.88	1.56	12.75	17.95	30.00	30.00	-
n_mode_VHT40MHz_MCS9	5190.00	6.05	42.46	3.72	9.77	14.97	24.00	-	23.01
	5230.00	5.45	42.46	3.72	9.17	14.37	24.00	-	23.01
	5755.00	9.00	56.09	2.51	11.51	16.71	30.00	30.00	-
	5795.00	8.87	56.09	2.51	11.38	16.58	30.00	30.00	-

Modulation: 802.11ac-VHT80MHz

Data rate (Mbps)	Measured Frequency (MHz)	Measured Average Power (dBm)	Duty Cycle X %	Duty cycle correction factor (dB)	Maximum Average output power (dBm)	e.i.r.p (dBm)	FCC Power Limit (dBm)	IC power (dBm)	IC e.i.r.p Limit (dBm)
ac_mode-VHT80MHz_MCS0	5210.00	4.53	83.61	0.78	5.31	10.51	24.00	-	23.01
	5755.00	12.78	69.51	1.58	14.36	19.56	30.00	30.00	23.00
ac_mode-VHT80MHz_MCS9	5210.00	4.56	43.40	3.63	8.19	13.39	24.00	-	23.01
	5755.00	8.48	56.20	2.50	10.98	16.18	30.00	30.00	23.00