FCC Test Report (WLAN 2.4GHz)

Report No.:	RF191209E01
FCC ID:	RSE-FGA5330
Equipment Name:	Gateway
Trade Name:	Technicolor
Model Number:	FGA5330
Product Code:	FGA5330TCH2
Received Date:	Dec. 09, 2020
Test Date:	Jan. 25 to Feb. 25, 2020
Issued Date:	Apr. 17, 2020
Applicant:	Technicolor Delivery Technologies Belgium
Address:	Prins Boudewinnlaan 47 Edegem B-2650 Belgium
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number:	723255 / TW2022

Testing Laboratory
2022

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF191209E01	Original release.	Apr. 17, 2020

1 Certificate of Conformity

Equipment Name:	Gateway
Trade Name:	Technicolor
Test Model:	FGA5330
Product Code:	FGA5330TCH2
Sample Status:	Engineering sample
Applicant:	Technicolor Delivery Technologies Belgium
Test Date:	Jan. 25 to Feb. 25, 2020
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF EMI characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Apr. 17, 2020

Claire Kuan / Specialist

Approved by : _____ , **Date:** Apr. 17, 2020

Clark Lin / Technical Manager

2 Summary of Test Results

Applied Standard: 47 CFR FCC Part 15 Subpart C					
Section	**Ref. Std. Clause**	**Description**	**Measured**	**Limit**	**Result**
3.9	15.203	Antenna Requirements	-	-	PASS
4.1	15.207	AC Power Conducted Emissions	Margin is -27.09dB at 0.35703MHz.	15.207	PASS
4.2	15.247(b)(3)	Maximum Conducted Output Power	Power [dBm]: 11b: 23.95 dBm 11ax(20M): 27.75 dBm 11ax(40M): 25.37 dBm	30 dBm	PASS
4.3	15.247(e)	Power Spectral Density	PSD [dBm]: 11b: -9.48 dBm/3kHz 11ax(20M): -6.92 dBm/3kHz 11ax(40M): -11.41 dBm/3kHz	8dBm/3kHz	PASS
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Bandwidth [MHz]: 11b: 7.11 MHz 11ax(20M): 19.16 MHz 11ax(40M): 37.88 MHz	≥500kHz	PASS
4.5	-	Occupied Bandwidth	Bandwidth [MHz]: 11b: 11.52 MHz 11ax(20M): 19.44 MHz 11ax(40M): 38.43 MHz	-	-
4.6	15.247(d)	Radiated Emissions	Margin is -3.3dB at 48.04MHz	-	PASS
4.7	15.247(a)(2)	Band Edge Emissions	Margin is -0.1dB at 2390.00MHz, 2483.50MHz and 2486.00MHz.	-	PASS

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.8 dB
Conducted Emissions	-	3.1 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.0 dB
	30MHz ~ 1GHz	5.1 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.1 dB
	6GHz ~ 18GHz	5.0 dB
	18GHz ~ 40GHz	5.2 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Basic Description of Equipment Under Test (WLAN 2.4GHz)

Items	Description			
Equipment Name	Gateway			
Trade Name	Technicolor			
Model Number	FGA5330			
Product Code	FGA5330TCH2			
FCC ID	RSE-FGA5330			
Power Type	From power adapter			
Antenna	Refer section 3.10			
EUT Stage	■	Product Unit	□	Pre-Sample
Operating Band and Conducted Output Power	2400~2483.5MHz		■	IEEE 802.11b: 23.95 dBm
			■	IEEE 802.11ax (20MHz): 27.75 dBm
			■	IEEE 802.11ax (40MHz): 25.37 dBm
Product Type	For IEEE 802.11b: WLAN(1TX, 4RX) For IEEE 802.11g: WLAN(4TX, 4RX) For IEEE 802.11n: WLAN(4TX, 4RX) For IEEE 802.11ac: WLAN(4TX, 4RX) For IEEE 802.11ax: WLAN(4TX, 4RX)			
Nominal Bandwidth	20MHz / 40MHz			
Modulation	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g: OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM) See the below table 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM) See the below table 802.11ax: OFDMA (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM) See the below table			
Data Rate (Mbps)	802.11b mode :DSSS (1/2/5.5/11) 802.11g: OFDM (6 / 12 / 24 / 48) 802.11n(20MHz) mode(MCS0~MCS31); 802.11n(40MHz) mode(MCS0~MCS31) See the below table 802.11ac(20MHz) mode(NSS1MCS0~NSS4MCS9); 802.11ac(40MHz) mode(NSS1MCS0~NSS4MCS9) See the below table 802.11ax(20MHz) mode(NSS1MCS0~NSS4MCS11); 802.11ax(40MHz) mode(NSS1MCS0~NSS4MCS11) See the below table			
I/O Ports	LAN 1G Port x 3 LAN 10G Port x 1 WAN Port x 1 USB 3.0 Port x 1 SFP Port x1 FXS Port x 1			
Hardware Version	LAB2A			
Software Version	19.4.0146-2809002-20191218052751-4850d0484027485160796c5b1652d62267f14fc9			

802.11an Data Rate spec

Standard	Index	Data Rate (Mbps)		Standard	Index	Data Rate (Mbps)	
		LGI (800ns)	SGI (400ns)			LGI (800ns)	SGI (400ns)
11an 20MHz 1 stream	MCS0	6.5	7.2	11an 40MHz 1 stream	MCS0	13.5	15
	MCS1	13	14.4		MCS1	27	30
	MCS2	19.5	21.7		MCS2	40.5	45
	MCS3	26	28.9		MCS3	54	60
	MCS4	39	43.3		MCS4	81	90
	MCS5	52	57.8		MCS5	108	120
	MCS6	58.5	65		MCS6	121.5	135
	MCS7	65	72.2		MCS7	135	150
11an 20MHz 2 stream	MCS8	13	14.4	11an 40MHz 2 stream	MCS8	27	30
	MCS9	26	28.9		MCS9	54	60
	MCS10	39	43.3		MCS10	81	90
	MCS11	52	57.8		MCS11	108	120
	MCS12	78	86.7		MCS12	162	180
	MCS13	104	115.6		MCS13	216	240
	MCS14	117	130		MCS14	243	270
	MCS15	130	144.4		MCS15	270	300
11an 20MHz 3 stream	MCS16	19.5	21.7	11an 40MHz 3 stream	MCS16	40.5	45
	MCS17	39	43.3		MCS17	81	90
	MCS18	58.5	65		MCS18	121.5	135
	MCS19	78	86.7		MCS19	162	180
	MCS20	117	130		MCS20	243	270
	MCS21	156	173.3		MCS21	324	360
	MCS22	175.5	195		MCS22	364.5	405
	MCS23	195	216.7		MCS23	405	450
11an 20MHz 4 stream	MCS24	26	28.9	11an 40MHz 4 stream	MCS24	54	60
	MCS25	52	57.8		MCS25	108	120
	MCS26	78	86.7		MCS26	162	180
	MCS27	104	115.6		MCS27	216	240
	MCS28	156	173.3		MCS28	324	360
	MCS29	208	231.1		MCS29	432	480
	MCS30	234	260		MCS30	486	540
	MCS31	260	288.9		MCS31	540	600

802.11ac Data Rate spec

Standard	Index	Data Rate (Mbps)		Standard	Index	Data Rate (Mbps)		Standard	Index	Data Rate (Mbps)	
		LGI (800ns)	SGI (400ns)			LGI (800ns)	SGI (400ns)			LGI (800ns)	SGI (400ns)
11ac 20MHz NSS = 1	MCS0	6.5	7.2	11ac 40MHz NSS = 1	MCS0	13.5	15.0	11ac 80MHz NSS = 1	MCS0	29.3	32.5
	MCS1	13.0	14.4		MCS1	27	30.0		MCS1	58.5	65.0
	MCS2	19.5	21.7		MCS2	40.5	45.0		MCS2	87.8	97.5
	MCS3	26	28.9		MCS3	54	60.0		MCS3	117.0	130.0
	MCS4	39	43.3		MCS4	81	90.0		MCS4	175.5	195.0
	MCS5	52	57.8		MCS5	108	120.0		MCS5	234.0	260.0
	MCS6	58.5	65		MCS6	121.5	135.0		MCS6	263.3	292.5
	MCS7	65	72.2		MCS7	135.0	150.0		MCS7	292.5	325.0
	MCS8	78	86.7		MCS8	162.0	180.0		MCS8	351.0	390.0
	MCS9	Note	Note		MCS9	180.0	200.0		MCS9	390.0	433.3
Note: MCS 9 is invalid due to mod(NCBPS/NES, DR) not being equal to 0.											

Standard	Index	Data Rate (Mbps)		Standard	Index	Data Rate (Mbps)		Standard	Index	Data Rate (Mbps)	
		LGI (800ns)	SGI (400ns)			LGI (800ns)	SGI (400ns)			LGI (800ns)	SGI (400ns)
11ac 20MHz NSS = 2	MCS0	13.0	14.4	11ac 40MHz NSS = 2	MCS0	27.0	30.0	11ac 80MHz NSS = 2	MCS0	58.5	65.0
	MCS1	26.0	28.9		MCS1	54.0	60.0		MCS1	117.0	130.0
	MCS2	39.0	43.3		MCS2	81.0	90.0		MCS2	175.5	195.0
	MCS3	52.0	57.8		MCS3	108.-0	120.0		MCS3	234.0	260.0
	MCS4	78.0	86.7		MCS4	162.0	180.0		MCS4	351.0	390.0
	MCS5	104.0	115.6		MCS5	216.0	240.0		MCS5	468.0	520.0
	MCS6	117.0	130.0		MCS6	243.0	270.0		MCS6	526.5	585.0
	MCS7	130.0	144.4		MCS7	270.0	300.0		MCS7	585.0	650.0
	MCS8	156.0	173.3		MCS8	324.0	360.0		MCS8	702.0	780.0
	MCS9	Note	Note		MCS9	360.0	400.0		MCS9	780.0	866.7
Note: MCS 9 is invalid due to mod(NCBPS/NES, DR) not being equal to 0.											

Standard	Index	Data Rate (Mbps)		Standard	Index	Data Rate (Mbps)		Standard	Index	Data Rate (Mbps)	
		LGI (800ns)	SGI (400ns)			LGI (800ns)	SGI (400ns)			LGI (800ns)	SGI (400ns)
11ac 20MHz NSS = 3	MCS0	19.5	21.7	11ac 40MHz NSS = 3	MCS0	40.5	45.0	11ac 80MHz NSS = 3	MCS0	87.8	97.5
	MCS1	39.0	43.3		MCS1	81.0	90.0		MCS1	175.5	195.0
	MCS2	58.5	65.0		MCS2	121.5	135.0		MCS2	263.3	292.5
	MCS3	78.0	86.7		MCS3	162.0	180.0		MCS3	351.0	190.0
	MCS4	117.0	130		MCS4	243.0	270.0		MCS4	526.5	585.0
	MCS5	156.0	173.3		MCS5	324.0	360.0		MCS5	702.0	780.0
	MCS6	175.5	195.0		MCS6	364.5	405.0		MCS6	Note	Note
	MCS7	195.0	216.7		MCS7	405.0	450.0		MCS7	877.5	975.0
	MCS8	234.0	260.0		MCS8	486.0	540.0		MCS8	1053.0	1170.0
	MCS9	260.0	228.9		MCS9	540.0	600.0		MCS9	1170.0	1300.0

Note: MCS 9 is invalid due to mod(NCBPS/NES, DR) not being equal to 0.

Standard	Index	Data Rate (Mbps)		Standard	Index	Data Rate (Mbps)	
		LGI (800ns)	SGI (400ns)			LGI (800ns)	SGI (400ns)
11ac 20MHz NSS = 4	MCS0	26.0	28.9	11ac 40MHz NSS = 4	MCS0	54.0	60.0
	MCS1	52.0	57.8		MCS1	108.0	120.0
	MCS2	78.0	86.7		MCS2	162.0	180.0
	MCS3	104.0	115.6		MCS3	216.0	240.0
	MCS4	156.0	173.3		MCS4	324.0	360.0
	MCS5	208.0	231.1		MCS5	432.0	480.0
	MCS6	234.0	260.0		MCS6	486.0	540.0
	MCS7	260.0	288.9		MCS7	540.0	600.0
	MCS8	312.0	346.7		MCS8	648.0	720.0
	MCS9	Note	Note		MCS9	720.0	800.0

NOTE: MCS 9 is invalid due to mod(NCBPS/NES, DR) not being equal to 0.

802.11ax Data Rate spec

Standard	Index	Data Rate (Mbps)			Standard	Index	Data Rate (Mbps)		
		SGI (0.8us)	MGI (1.6us)	LGI (3.2us)			SGI (0.8us)	MGI (1.6us)	LGI (3.2us)
11ax 20MHz NSS = 1	MCS0	8.6	8.1	7.3	11ax 40MHz NSS = 1	MCS0	17.2	16.3	14.6
	MCS1	17.2	16.3	14.6		MCS1	34.4	32.5	29.3
	MCS2	25.8	24.4	21.9		MCS2	51.6	48.8	43.9
	MCS3	34.4	32.5	29.3		MCS3	68.8	65	58.5
	MCS4	51.6	48.8	43.9		MCS4	103.2	97.5	87.8
	MCS5	68.8	65	58.5		MCS5	137.6	130	117
	MCS6	77.4	73.1	65.8		MCS6	154.9	146.3	131.6
	MCS7	86	81.3	73.1		MCS7	172.1	162.5	146.3
	MCS8	103.2	97.5	87.8		MCS8	206.5	195	175.5
	MCS9	114.7	108.3	97.5		MCS9	229.4	216.7	195
	MCS10	129	121.9	109.7		MCS10	258.1	243.8	219.4
	MCS11	143.4	135.4	121.9		MCS11	286.8	270.8	243.8
Standard	Index	Data Rate (Mbps)			Standard	Index	Data Rate (Mbps)		
		SGI (0.8us)	MGI (1.6us)	LGI (3.2us)			SGI (0.8us)	MGI (1.6us)	LGI (3.2us)
11ax 20MHz NSS = 2	MCS0	17.2	16.3	14.6	11ax 40MHz NSS = 2	MCS0	34.4	32.5	29.3
	MCS1	34.4	32.5	29.3		MCS1	68.8	65	58.5
	MCS2	51.6	48.8	43.9		MCS2	103.2	97.5	87.8
	MCS3	68.8	65	58.5		MCS3	137.6	130	117
	MCS4	103.2	97.5	87.8		MCS4	206.5	195	175.5
	MCS5	137.6	130	117		MCS5	275.3	260	234
	MCS6	154.9	146.3	131.6		MCS6	309.7	292.5	263.3
	MCS7	172.1	162.5	146.3		MCS7	344.1	325	292.5
	MCS8	206.5	195	175.5		MCS8	412.9	390	351
	MCS9	229.4	216.7	195		MCS9	458.8	433.3	390
	MCS10	258.1	243.8	219.4		MCS10	516.2	487.5	438.8
	MCS11	286.8	270.8	243.8		MCS11	573.5	541.7	487.5
Standard	Index	Data Rate (Mbps)			Standard	Index	Data Rate (Mbps)		
		SGI (0.8us)	MGI (1.6us)	LGI (3.2us)			SGI (0.8us)	MGI (1.6us)	LGI (3.2us)
11ax 20MHz NSS =3	MCS0	25.8	24.4	21.9	11ax 40MHz NSS = 3	MCS0	51.6	48.8	43.9
	MCS1	51.6	48.8	43.9		MCS1	103.2	97.5	87.8
	MCS2	77.4	73.1	65.8		MCS2	154.9	146.3	131.6
	MCS3	103.2	97.5	87.8		MCS3	206.5	195	175.5
	MCS4	154.9	146.3	131.6		MCS4	309.7	292.5	263.3
	MCS5	206.5	195	175.5		MCS5	412.9	390	351
	MCS6	232.3	219.4	197.4		MCS6	464.6	438.8	394.9
	MCS7	258.1	243.8	219.4		MCS7	516.2	487.5	438.8
	MCS8	309.7	292.5	263.3		MCS8	619.4	585	526.5
	MCS9	344.1	325	292.5		MCS9	688.2	650	585
	MCS10	387.1	365.6	329.1		MCS10	774.3	731.3	658.1
	MCS11	430.1	406.3	365.6		MCS11	860.3	812.5	731.3

Standard	Index	Data Rate (Mbps)			Standard	Index	Data Rate (Mbps)		
		SGI (0.8us)	MGI (1.6us)	LGI (3.2us)			SGI (0.8us)	MGI (1.6us)	LGI (3.2us)
11ax 20MHz NSS =4	MCS0	34.4	32.5	29.3	11ax 40MHz NSS = 4	MCS0	68.8	65	58.5
	MCS1	68.8	65	58.5		MCS1	137.6	130	117
	MCS2	103.2	97.5	87.8		MCS2	206.5	195	175.5
	MCS3	137.6	130	117		MCS3	275.3	260	234
	MCS4	206.5	195	175.5		MCS4	412.9	390	351
	MCS5	275.3	260	234		MCS5	550.6	520	468
	MCS6	309.7	292.5	263.3		MCS6	619.4	585	526.5
	MCS7	344.1	325	292.5		MCS7	688.2	650	585
	MCS8	412.9	390	351		MCS8	825.9	780	702
	MCS9	458.8	433.3	390		MCS9	917.6	866.7	780
	MCS10	516.2	487.5	438.8		MCS10	1032.4	975	877.5
	MCS11	573.5	541.7	487.5		MCS11	1147.1	1083.3	975

3.2 Accessories

Power supply:

Brand	HONOR
Model	ADS-36FKJ-12 12036EPCU
ID	01
P/N	6261489A
Input Power	100-240Vac, 50/60Hz, Max.1.0A
Output Power	12Vdc, 3.0A
Power Line	1.8m power cable without core attached on adapter

3.3 Feature of Equipment under Test

Please refer to user manual.

3.4 Information Provided by the Manufacturer

Interface Availability:

Interface / Model	DC Power	Ethernet LAN 10Gbps	Ethernet LAN 1000Mbps	Ethernet WAN 1000Mbps	SFP 10Gbps	USB 3. 0	FXS	WLAN IEEE 802.11ax (2.4G+5G Hz)4X4
FGA5330	12Vdc 3A	●(1 port)	●(3 port)	●(1 port)	●(1 port)	●(1 port)	●(1 port)	●

●: Equipped
○: Not Equipped

3.5 General Description of Applied Standards and references

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test standard:

FCC Part 15, Subpart C (15.247)
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02, 04/02/2019
KDB 662911 D01 Multiple Transmitter Output v02r01, 10/31/2013

All test items have been performed as a reference to the above KDB test guidance.

3.6 Cabling Attached to the Equipment

Cable and Interconnection

Interface	Cable type	Cable length delivered with the modem	"Real life" Cable length that can be attached to this type of interface	Cable length to be used for testing	Internal/ external connection
LAN1, WAN	UTP Cat 5	2 meter	> 10 meter	Two 10 meter cables;	Internal
10G-LAN	UTP Cat 6	2 meter	> 10 meter	10 meter cables;	Internal
SFP	Optical	2 meter	> 10 meter	10 meter cables;	External
FXS	UTP Cat 3	2 meter	> 10 meter	1 meter flat cable	Internal
USB	STP	NA	NA	NA	Internal
AC power	UTP	1.8 meter	>10 meter	1.8 meter	External

3.7 Transmit Operating Mode

Transmit Operating Mode							Transmit Muitiple Antennas					
■	Operating mode 1 (single antenna)						■	1TX				
■	Operating mode 2 (muitiple antenna, no beam forming)						■	2TX	■	3TX	■	4TX
■	Operating mode 3 (muitiple antenna, with beam forming)						■	2TX	■	3TX	■	4TX
■	802.11b	Operating mode	■	1TX	□	2TX	□	3TX	□	4TX		
■	802.11g	Operating mode	■	1TX	■	2TX	■	3TX	■	4TX		
■	802.11n 20MHz	Operating mode	■	1TX	■	2TX	■	3TX	■	4TX		
■	802.11n 40MHz	Operating mode	■	1TX	■	2TX	■	3TX	■	4TX		
■	802.11ax(20MHz)	Operating mode	■	1TX	■	2TX	■	3TX	■	4TX		
■	802.11ax(40MHz)	Operating mode	■	1TX	■	2TX	■	3TX	■	4TX		

Note:
For IEEE802.11b, 1Mbps~11Mbps: 1TX
For IEEE802.11g, 6Mbps~54Mbps: 4TX
For IEEE802.11n,
MCS0~MCS7: 1 Stream 1TX, 1 Stream 2TX, 1 Stream 3TX, 1 Stream 4TX
MCS8~MCS15: 2 Stream 2TX; 2 Stream 3TX; 2 Stream 4TX
MCS16~MCS23: 3 Stream 3TX; 3 Stream 4TX
MCS24~MCS31: 4 Stream 4TX;
For IEEE802.11ac 20MHz,
Nss1MCS0~Nss1MCS8: 1 Stream 1TX, 1 Stream 2TX, 1 Stream 3TX, 1 Stream 4TX
Nss2MCS0~Nss2MCS8: 2 Stream 2TX; 2 Stream 3TX; 2 Stream 4TX
Nss3MCS0~Nss3MCS9: 3 Stream 3TX; 3 Stream 4TX
Nss4MCS0~Nss4MCS8: 4 Stream 4TX
For IEEE802.11ac 40MHz,
Nss1MCS0~Nss1MCS9: 1 Stream 1TX, 1 Stream 2TX, 1 Stream 3TX, 1 Stream 4TX
Nss2MCS0~Nss2MCS9: 2 Stream 2TX; 2 Stream 3TX; 2 Stream 4TX
Nss3MCS0~Nss3MCS9: 3 Stream 3TX; 3 Stream 4TX
Nss4MCS0~Nss4MCS9: 4 Stream 4TX
For IEEE802.11ax 20MHz/ 40MHz,
Nss1MCS0~Nss1MCS11: 1 Stream 1TX, 1 Stream 2TX, 1 Stream 3TX, 1 Stream 4TX
Nss2MCS0~Nss2MCS11: 2 Stream 2TX; 2 Stream 3TX; 2 Stream 4TX
Nss3MCS0~Nss3MCS11: 3 Stream 3TX; 3 Stream 4TX
Nss4MCS0~Nss4MCS11: 4 Stream 4TX

3.8 Antenna Requirements

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

3.9 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector
2G-1	WHA YU	C107-511586-A	PCB PIFA	I-pex
2G-2	WHA YU	C107-511589-A	PCB PIFA	I-pex
2G-3	WHA YU	C107-511587-A	PCB PIFA	I-pex
2G-4	WHA YU	C107-511588-A	PCB PIFA	I-pex
5G-1	WHA YU	C107-511590-A	PCB Loop	I-pex
5G-2	WHA YU	C107-511591-A	PCB Dipole	I-pex
5G-3	WHA YU	C107-511592-A	PCB Dipole	I-pex
5G-4	WHA YU	C107-511593-A	PCB Dipole	I-pex

Antenna & Bandwidth for 2400~2483.5MHz

Number of Transmit Antennas	1TX		2TX		3TX		4TX	
Bandwidth Mode	20 MHz	40 MHz	20 MHz	40 MHz	20 MHz	40 MHz	20 MHz	40 MHz
802.11b	V	X	X	X	X	X	X	X
802.11g	V	X	V	X	V	X	V	X
802.11n	V	V	V	V	V	V	V	V
802.11ac	V	V	V	V	V	V	V	V
802.11ax	V	V	V	V	V	V	V	V

For 2400~2483.5MHz

Frequency	Max Gain (dBi) For SISO mode							
	Ant. 1		Ant. 2		Ant. 3		Ant. 4	
	20 MHz	40 MHz	20 MHz	40 MHz	20 MHz	40 MHz	20 MHz	40 MHz
2412MHz	1.83	-	1.89	-	1.36	-	1.42	-
2422MHz	-	1.30	-	1.92	-	1.89	-	1.49
2437MHz	1.02	1.02	2.02	2.02	1.65	1.65	1.22	1.22
2452MHz	-	0.89	-	1.92	-	1.23	-	0.87
2462MHz	0.66	-	1.76	-	0.86	-	0.91	-

Frequency	Maximum Gain (dBi) for CDD mode			
	CDD mode (1 Stream 4 TX) for Power Gain (KDB 662911 Option 2)		CDD mode (1 Stream 4 TX) for PSD Gain (KDB 662911 Option 2)	
	20 MHz	40 MHz	20 MHz	40 MHz
2412MHz	1.89	-	5.68	-
2422MHz	-	1.92	-	5.74
2437MHz	2.02	2.02	5.83	5.83
2452MHz	-	1.92	-	5.53
2462MHz	1.76	-	5.64	-

Frequency	Maximum Gain (dBi) for TxBF mode	
	TxBF mode (1 Stream 4 TX) for Power & PSD Gain (KDB 662911 Option 2)	
	20 MHz	40 MHz
2412MHz	5.68	-
2422MHz	-	5.74
2437MHz	5.83	5.83
2452MHz	-	5.53
2462MHz	5.64	-

Frequency	Maximum Gain (dBi) for TxBF mode	
	TxBF mode (2 Stream 4 TX) for Power & PSD Gain (KDB 662911 Option 2)	
	20 MHz	40 MHz
2412MHz	3.95	-
2422MHz	-	4.02
2437MHz	4.12	4.12
2452MHz	-	3.83
2462MHz	3.83	-

Frequency	Maximum Gain (dBi) for TxBF mode	
	TxBF mode (3 Stream 4 TX) for Power & PSD Gain (KDB 662911 Option 2)	
	20 MHz	40 MHz
2412MHz	1.87	-
2422MHz	-	1.93
2437MHz	1.83	1.83
2452MHz	-	1.67
2462MHz	1.62	-

Note:

1. Antenna Gain refer to “FGA5330_Antenna Test Report V1.18.pdf” files
2. Maximum Correlated Directional Gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi
3. Maximum Uncorrelated Directional Gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \ldots + 10^{GN/10}) / N_{ANT}]$ dBi

3.10 Table for Carrier Frequency

Eleven channels are provided for Bandwidth 20MHz:

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400MHz ~ 2483.5 MHz	1	2412 MHz	7	2442MHz
	2	2417MHz	8	2447MHz
	3	2422MHz	9	2452MHz
	4	2427MHz	10	2457MHz
	5	2432MHz	11	2462MHz
	6	2437MHz		

Seven channels are provided for Bandwidth 40MHz:

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400MHz ~ 2483.5 MHz	3	2422 MHz	7	2442MHz
	4	2427MHz	8	2447MHz
	5	2432MHz	9	2452MHz
	6	2437MHz		

3.11 Table for Test Modes

Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Note	Channel	Data Rate	Antenna
AC Power Line Conducted Emissions	802.11ax (20MHz)	OFDM/BPSK	6	-	1+2+3+4
Maximum Average Output Power	802.11b	DSSS/DBPSK	1/6/11	1 Mbps	1
	802.11ax(20MHz)	OFDM/BPSK	1/6/11	Nss1 MCS0 1S4T CDD	1+2+3+4
				Nss1 MCS0 1S4T TxBF	1+2+3+4
				Nss2 MCS0 2S4T TxBF	1+2+3+4
				Nss3 MCS0 3S4T TxBF	1+2+3+4
	802.11ax(40MHz)		3/6/9	Nss1 MCS0 1S4T CDD	1+2+3+4
				Nss1 MCS0 1S4T TxBF	1+2+3+4
				Nss2 MCS0 2S4T TxBF	1+2+3+4
				Nss3 MCS0 3S4T TxBF	1+2+3+4
Power Spectral Density	802.11b	DSSS/DBPSK	1/6/11	1 Mbps	1
	802.11ax(20MHz)	OFDM/BPSK	1/6/11	Nss1 MCS0 1S4T CDD	1+2+3+4
				Nss1 MCS0 1S4T TxBF	1+2+3+4
				Nss2 MCS0 2S4T TxBF	1+2+3+4
				Nss3 MCS0 3S4T TxBF	1+2+3+4
	802.11ax(40MHz)		3/6/9	Nss1 MCS0 1S4T CDD	1+2+3+4
				Nss1 MCS0 1S4T TxBF	1+2+3+4
				Nss2 MCS0 2S4T TxBF	1+2+3+4
				Nss3 MCS0 3S4T TxBF	1+2+3+4

Test Items	Mode	Note	Channel	Data Rate	Antenna
6dB Spectrum Bandwidth	802.11b	DSSS/DBPSK	1/6/11	1 Mbps	1
	802.11ax(20MHz)	OFDM/BPSK	1/6/11	Nss1 MCS0 1S4T CDD	1+2+3+4
				Nss1 MCS0 1S4T TxBF	1+2+3+4
				Nss2 MCS0 2S4T TxBF	1+2+3+4
				Nss3 MCS0 3S4T TxBF	1+2+3+4
	802.11ax(40MHz)		3/6/9	Nss1 MCS0 1S4T CDD	1+2+3+4
				Nss1 MCS0 1S4T TxBF	1+2+3+4
				Nss2 MCS0 2S4T TxBF	1+2+3+4
				Nss3 MCS0 3S4T TxBF	1+2+3+4
Band Edge Emissions (Radiated)	802.11b	DSSS/DBPSK	1/6/11	1 Mbps	1
	802.11ax(20MHz)	OFDM/BPSK	1/6/11	Nss1 MCS0 1S4T CDD	1+2+3+4
				Nss1 MCS0 1S4T TxBF	1+2+3+4
				Nss2 MCS0 2S4T TxBF	1+2+3+4
				Nss3 MCS0 3S4T TxBF	1+2+3+4
	802.11ax(40MHz)		3/6/9	Nss1 MCS0 1S4T CDD	1+2+3+4
				Nss1 MCS0 1S4T TxBF	1+2+3+4
				Nss2 MCS0 2S4T TxBF	1+2+3+4
				Nss3 MCS0 3S4T TxBF	1+2+3+4
Radiated Emissions Above 1GHz(Radiated)	802.11b	DSSS/DBPSK	1/6/11	1 Mbps	1
	802.11ax(20MHz)	OFDM/BPSK	1/6/11	Nss1 MCS0 1S4T CDD	1+2+3+4
				Nss1 MCS0 1S4T TxBF	1+2+3+4
				Nss2 MCS0 2S4T TxBF	1+2+3+4
				Nss3 MCS0 3S4T TxBF	1+2+3+4
	802.11ax(40MHz)		3/6/9	Nss1 MCS0 1S4T CDD	1+2+3+4
				Nss1 MCS0 1S4T TxBF	1+2+3+4
				Nss2 MCS0 2S4T TxBF	1+2+3+4
				Nss3 MCS0 3S4T TxBF	1+2+3+4
Radiated Emissions Below 1GHz(Radiated)	802.11ax (20MHz)	OFDM/BPSK	6	-	1+2+3+4

Note:

1. The device with multiple operating mode, measurements on the middle channel were tested to determine the worst case mode. (Each modulation family were tested in band edge, spurious emission and in band PSD after investigate worst case mode)
2. Base on txcore command, the 11b default mode is 1S1T SISO Ant1, the 802.11g mode is 1S4T CDD mode, the 802.11ax 20MHz/40MHz default mode are 1S4T CDD,1S4T TXBF,2S4T TXBF,3S4T TXBF; the SDM mode covered by the CDD mode with the same setting
   wl -i wl0 txcore
   txcore enabled bitmap (Nsts {4..1}) 0x0f 0x0f 0x0f 0x0f
   txcore mask OFDM 0x0f CCK 0x01

3.12 Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

The Power Setting Parameter					
Test Software Version	19.4.0146-2809002-20191218052751-4850d0484027485160796c5b1652d62267f14fc9				
Worst Modulation Mode	**Number of Transmit Chains (NTX)**	**Frequency (MHz)**	**Maximum Output Power (dBm)**	**Power Setting**	**Data Rate / MCS**
802.11b, Ant. 1	1Stream 1TX	2412	23.95	22.5	1Mbps
802.11b, Ant. 1	1Stream 1TX	2437	23.64	22.5	1Mbps
802.11b, Ant. 1	1Stream 1TX	2462	23.46	22.5	1Mbps
802.11ax 20MHz, Ant. 1+2+3+4 (CDD)	1Stream 4TX	2412	26.29	19.5	Nss1MCS0 (8.6)
802.11ax 20MHz, Ant. 1+2+3+4 (CDD)	1Stream 4TX	2437	27.75	21.5	Nss1MCS0 (8.6)
802.11ax 20MHz, Ant. 1+2+3+4 (CDD)	1Stream 4TX	2462	23.31	16.75	Nss1MCS0 (8.6)
802.11ax 20MHz, Ant. 1+2+3+4 (TxBF)	1Stream 4TX	2412	24.49	17.75	Nss1MCS0 (8.6)
802.11ax 20MHz, Ant. 1+2+3+4 (TxBF)	1Stream 4TX	2437	27.62	21.5	Nss1MCS0 (8.6)
802.11ax 20MHz, Ant. 1+2+3+4 (TxBF)	1Stream 4TX	2462	25.00	18.5	Nss1MCS0 (8.6)
802.11ax 20MHz, Ant. 1+2+3+4 (TxBF)	2Stream 4TX	2412	24.27	17.5	Nss2MCS0 (17.2)
802.11ax 20MHz, Ant. 1+2+3+4 (TxBF)	2Stream 4TX	2437	27.70	21.5	Nss2MCS0 (17.2)
802.11ax 20MHz, Ant. 1+2+3+4 (TxBF)	2Stream 4TX	2462	24.90	18.5	Nss2MCS0 (17.2)
802.11ax 20MHz, Ant. 1+2+3+4 (TxBF)	3Stream 4TX	2412	26.00	19.25	Nss3MCS0 (25.8)
802.11ax 20MHz, Ant. 1+2+3+4 (TxBF)	3Stream 4TX	2437	27.65	21.5	Nss3MCS0 (25.8)
802.11ax 20MHz, Ant. 1+2+3+4 (TxBF)	3Stream 4TX	2462	24.77	18.5	Nss3MCS0 (25.8)
802.11ax 40MHz, Ant. 1+2+3+4 (CDD)	1Stream 4TX	2422	24.85	18.25	Nss1MCS0 (17.2)
802.11ax 40MHz, Ant. 1+2+3+4 (CDD)	1Stream 4TX	2437	25.37	19	Nss1MCS0 (17.2)
802.11ax 40MHz, Ant. 1+2+3+4 (CDD)	1Stream 4TX	2452	23.15	16.75	Nss1MCS0 (17.2)
802.11ax 40MHz, Ant. 1+2+3+4 (TxBF)	1Stream 4TX	2422	24.15	17.5	Nss1MCS0 (17.2)
802.11ax 40MHz, Ant. 1+2+3+4 (TxBF)	1Stream 4TX	2437	24.19	17.75	Nss1MCS0 (17.2)
802.11ax 40MHz, Ant. 1+2+3+4 (TxBF)	1Stream 4TX	2452	23.30	17	Nss1MCS0 (17.2)
802.11ax 40MHz, Ant. 1+2+3+4 (TxBF)	2Stream 4TX	2422	23.78	17.25	Nss2MCS0 (34.4)
802.11ax 40MHz, Ant. 1+2+3+4 (TxBF)	2Stream 4TX	2437	24.78	18.5	Nss2MCS0 (34.4)
802.11ax 40MHz, Ant. 1+2+3+4 (TxBF)	2Stream 4TX	2452	23.36	17	Nss2MCS0 (34.4)
802.11ax 40MHz, Ant. 1+2+3+4 (TxBF)	3Stream 4TX	2422	24.50	18	Nss3MCS0 (51.6)
802.11ax 40MHz, Ant. 1+2+3+4 (TxBF)	3Stream 4TX	2437	25.28	19	Nss3MCS0 (51.6)
802.11ax 40MHz, Ant. 1+2+3+4 (TxBF)	3Stream 4TX	2452	23.29	17	Nss3MCS0 (51.6)

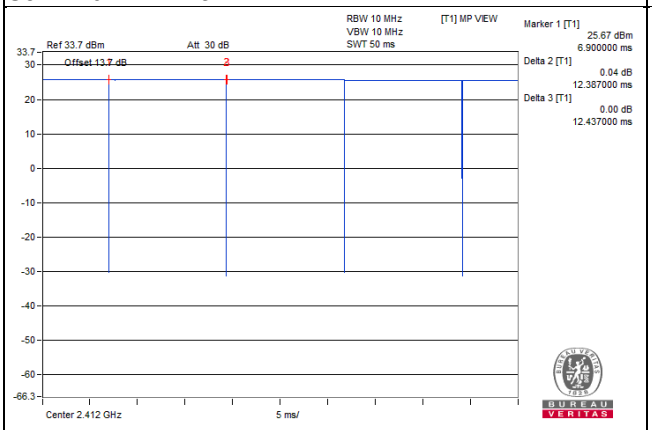
Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

3.13 On Time and Duty Cycle

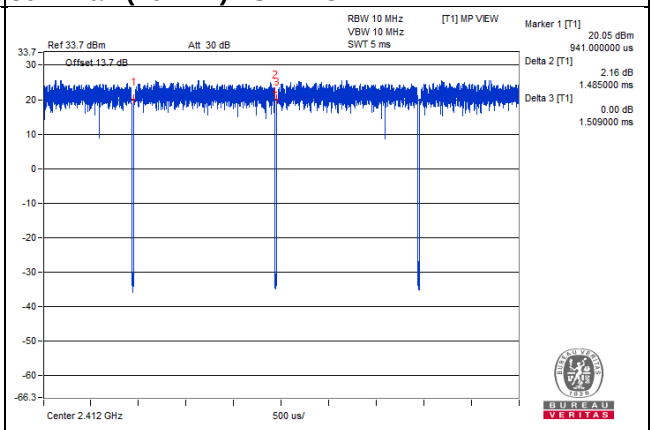
Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
802.11b 1Tx Ant1	12.387	12.437	99.6	0	0.01
802.11ax (20MHz) 1S4Tx CDD	1.485	1.509	98.4	0	0.01
802.11ax (20MHz) 1S4Tx TxBF	1.483	1.509	98.3	0	0.01
802.11ax (20MHz) 2S4Tx TxBF	0.777	0.8	97.1	0.13	3
802.11ax (20MHz) 3S4Tx TxBF	0.553	0.579	95.5	0.2	3
802.11ax (40MHz) 1S4Tx CDD	0.77	0.794	97	0.13	3
802.11ax (40MHz) 1S4Tx TxBF	0.772	0.795	97.1	0.13	3
802.11ax (40MHz) 2S4Tx TxBF	0.418	0.445	93.9	0.27	3
802.11ax (40MHz) 3S4Tx TxBF	0.314	0.344	91.3	0.4	10

Note: Power measurement using sweep trigger and gating of the power meter, duty factor is not required.

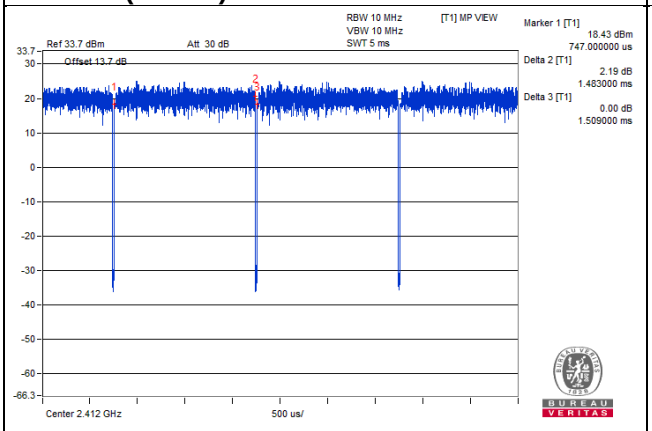
802.11b 1Tx Ant1



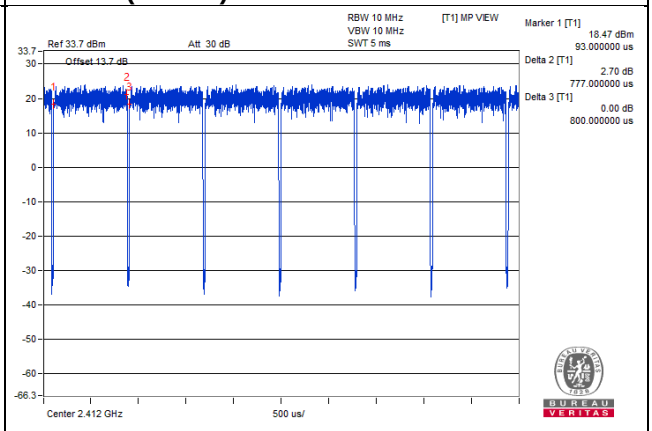
802.11ax (20MHz) 1S4Tx CDD



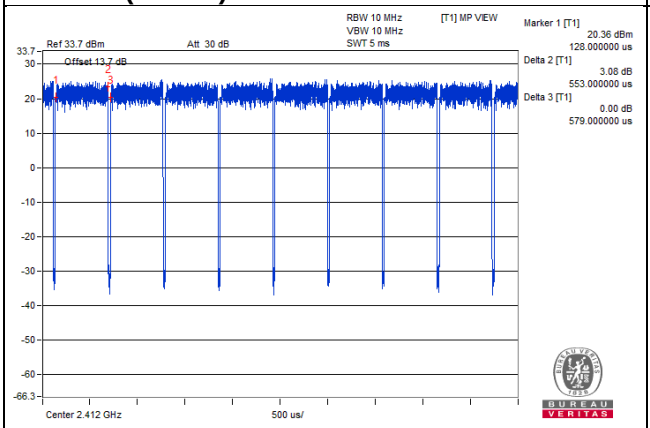
802.11ax (20MHz) 1S4Tx TxBF



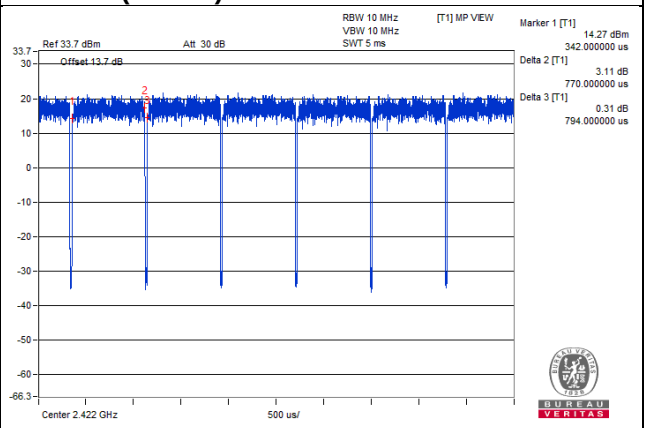
802.11ax (20MHz) 2S4Tx TxBF



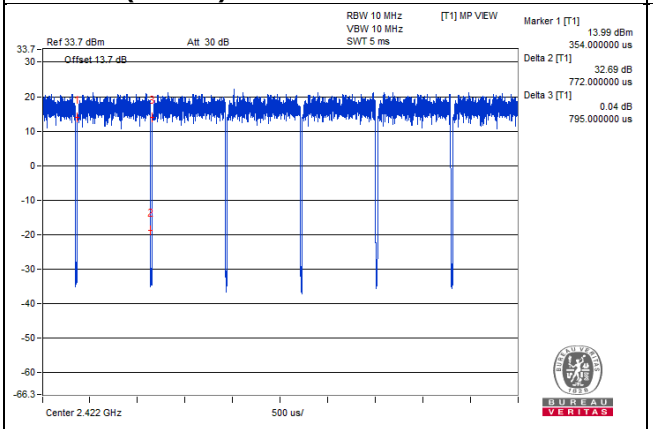
802.11ax (20MHz) 3S4Tx TxBF



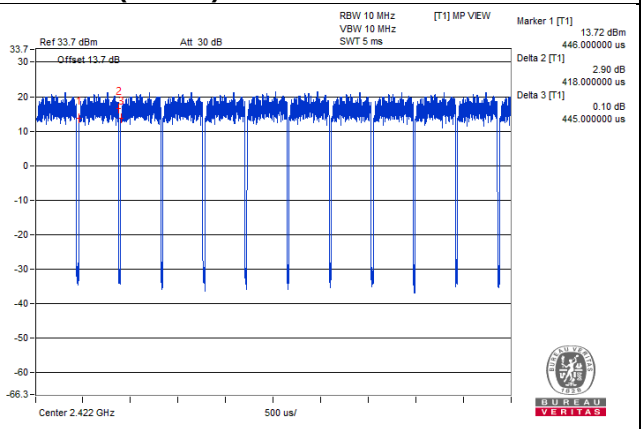
802.11ax (40MHz) 1S4Tx CDD



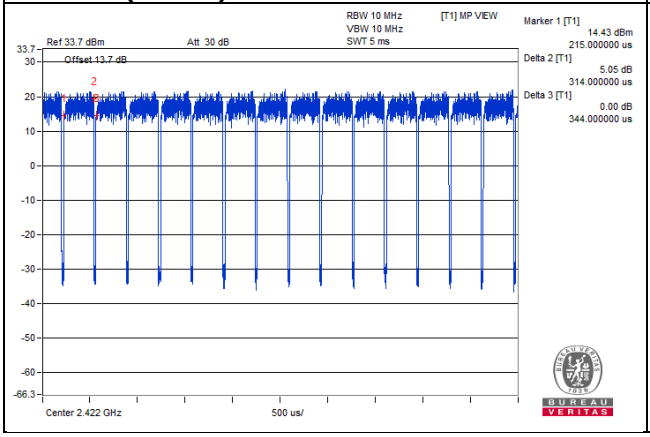
802.11ax (40MHz) 1S4Tx TxBF



802.11ax (40MHz) 2S4Tx TxBF



802.11ax (40MHz) 3S4Tx TxBF



3.14 Testing Location Information

Test Site Location				
Address	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.			
TEL	886-3-6668565			
FAX	886-3-6668323			
Test Site No.	**Site Category**	**Location**	**IC Reg. No.**	**VCCI Reg. No**
Conduction 1	Conduction	Hsinchu	-	-
Chamber 3	966 Chamber	Hsinchu	-	-
Oven 2	Oven	Hsinchu	-	-

3.15 EUT Diagram and Support Equipment

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

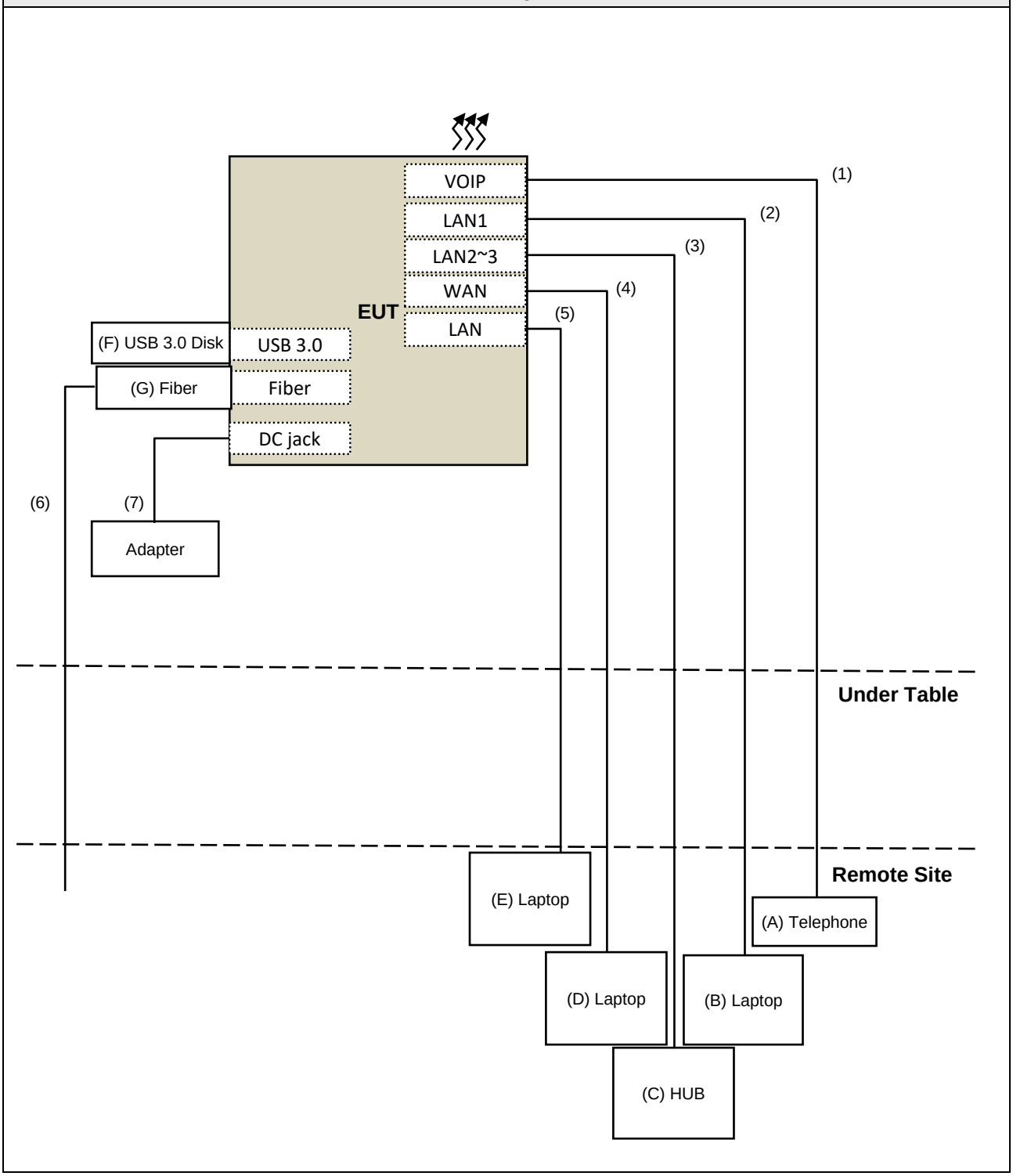
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Telephone	Romeo	TE-812	97280903	NA	Provided by Lab
B.	Laptop	DELL	PP27L	7YLB32S	FCC DoC	Provided by Lab
C.	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC	Provided by Lab
D.	Laptop	DELL	E5430	GM1SKV1	FCC DoC	Provided by Lab
E.	Laptop	DELL	E5430	DM1SKV1	FCC DoC	Provided by Lab
F.	USB Disk	Sandisk	NA	NA	NA	Provided by Lab
G.	Fiber	RoHS	GFLT210	JHCG94200152	NA	Supplied by client

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ-11 Cable	1	10	No	0	Provided by Lab
2.	RJ-45 Cable	1	10	No	0	Provided by Lab (for RF Setup)
3.	RJ-45 Cable	2	10	No	0	Provided by Lab
4.	RJ-45 Cable	1	10	No	0	Provided by Lab
5.	RJ-45 Cable	1	10	No	0	Provided by Lab
6.	Fiber cable	1	10	No	0	Provided by Lab
7.	DC Cable	1	1.8	No	0	Supplied by client

EUT Diagram


VOIP
LAN1
LAN2~3
WAN
LAN
EUT
USB 3.0
Fiber
DC jack
(F) USB 3.0 Disk
(G) Fiber
Adapter
(1)
(2)
(3)
(4)
(5)
(6)
(7)
Under Table
Remote Site
(E) Laptop
(A) Telephone
(D) Laptop
(B) Laptop
(C) HUB

4 Test Types and Results

4.1 AC Power Conducted Emissions Measurement

4.1.1 Limit

For this product which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

4.1.2 Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver

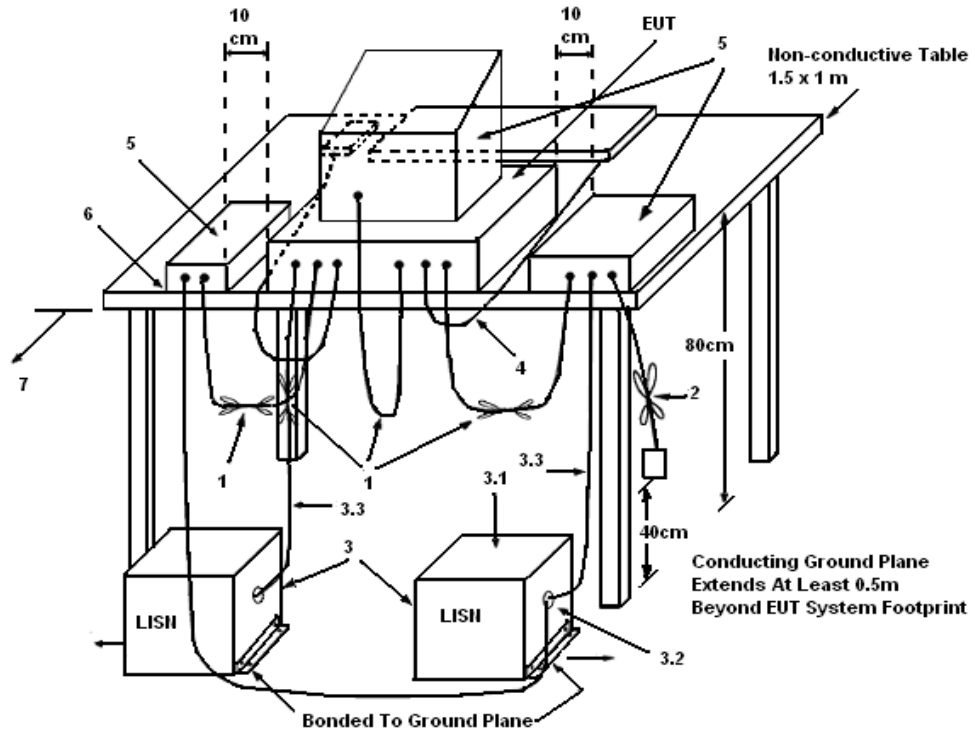
Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

4.1.3 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

4.1.4 Test Setup Layout

Test Setup



1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
2. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
3. EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.
4. All other equipment powered from additional LISN(s).
5. Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
6. LISN at least 80 cm from nearest part of EUT chassis.
7. Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
8. Non-EUT components of EUT system being tested.
9. Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
10. Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

4.1.5 Test Deviation

There are no deviations with the original standard.

4.1.6 EUT Operating during Test

The EUT was programmed to be in continuously transmitting mode.

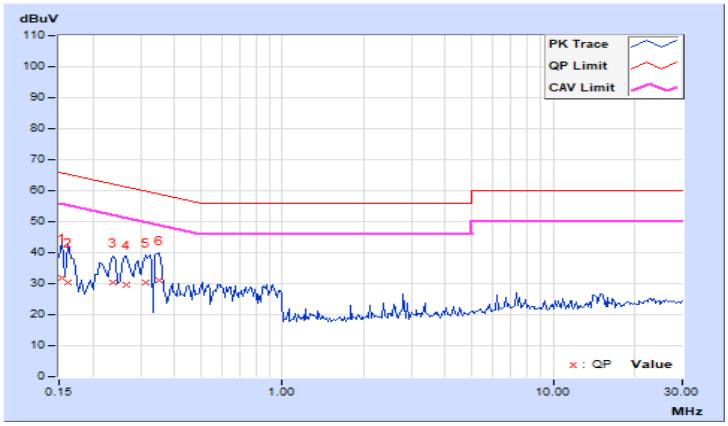
4.1.7 Test Results of AC Power Conducted Emissions

Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	25℃, 75%RH
Tested by	Kevin Ko		

Phase Of Power : Line (L)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.15391	9.99	21.99	1.22	31.98	11.21	65.79	55.79	-33.81	-44.58
2	0.16172	9.99	20.24	-5.08	30.23	4.91	65.38	55.38	-35.15	-50.47
3	0.23594	9.99	20.46	-6.99	30.45	3.00	62.24	52.24	-31.79	-49.24
4	0.26719	9.99	19.67	-7.66	29.66	2.33	61.20	51.20	-31.54	-48.87
5	0.31406	10.00	20.44	-6.15	30.44	3.85	59.86	49.86	-29.42	-46.01
6	0.34922	10.00	20.97	-7.28	30.97	2.72	58.98	48.98	-28.01	-46.26

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

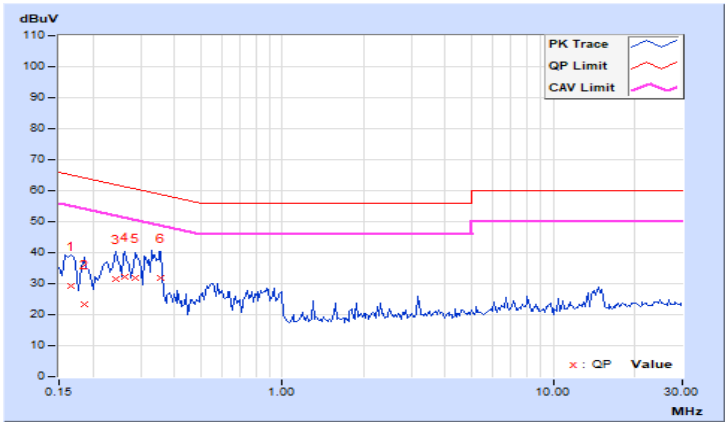


Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	25℃, 75%RH
Tested by	Kevin Ko		

Phase Of Power : Neutral (N)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.16562	9.99	19.33	-9.14	29.32	0.85	65.18	55.18	-35.86	-54.33
2	0.18516	9.99	13.17	-10.65	23.16	-0.66	64.25	54.25	-41.09	-54.91
3	0.24375	9.99	21.57	-6.55	31.56	3.44	61.97	51.97	-30.41	-48.53
4	0.26328	10.00	22.12	-5.31	32.12	4.69	61.33	51.33	-29.21	-46.64
5	0.28672	10.00	21.71	-6.63	31.71	3.37	60.62	50.62	-28.91	-47.25
6	**0.35703**	**10.01**	**21.70**	**-6.58**	**31.71**	**3.43**	**58.80**	**48.80**	**-27.09**	**-45.37**

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



4.2 Maximum Conducted Output Power Measurement

4.2.1 Limit

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm).The limited has to be reduced by the amount in dB that the gain of the antenna exceed 6dBi. For of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

4.2.2 Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Power Measurement	Auto
Rise Time	8ns
Sensor Model	MA2411B

4.2.3 Test Procedures

1 Test was performed in accordance with Measurement of Digital Transmission Systems Operating under 558074 D01 15.247 Meas Guidance v05r02, in section “Maximum conducted output power Method AVGPM-G”, 04/02/2019

2 The average power sensor was used on the output port of the EUT. A power meter was used to read the response of the average power sensor and enable the trigger function to get the all on time transmission. Record the average power level.

3 When measuring maximum conducted output power with multiple antenna systems, add every result of the values by mathematic formula.

4.2.4 Test Setup Layout

Setup


4.2.5 Test Deviation

There are no deviations with the original standard.

4.2.6 EUT Operating Conditions

The EUT was programmed to be in continuously transmitting mode.

4.2.7 Test Results of Maximum Conducted Output Power

Temperature	25°C	Humidity	60%
Test Engineer	Jyunchun Lin		

FOR AVERAGE POWER

1S4T CDD

802.11b 1Tx Ant1

Channel	Frequency (MHz)	Conducted Power (dBm)	Directional Gain (dBi)	Max. Limit (dBm)	Result
1	2412	23.95	1.83	30	PASS
6	2437	23.64	1.02	30	PASS
11	2462	23.46	0.66	30	PASS

802.11ax (20MHz) 4Tx

Channel	Frequency (MHz)	Conducted Power (dBm)					Directional Gain (dBi)	Max. Limit (dBm)	Result
		Ant 1	Ant 2	Ant 3	Ant 4	Total			
1	2412	20.88	20.50	19.65	19.96	26.29	1.89	30	PASS
6	2437	21.84	21.85	21.68	21.53	27.75	2.02	30	PASS
11	2462	17.85	17.34	17.05	16.86	23.31	1.76	30	PASS

Note:
1. Total Conducted Power =
   Conducted Power [TX 1(unit in W) + TX 2(unit in W) + TX 3(unit in W) + TX 4(unit in W)](unit in dBm)
2. Directional Gain <6dBi, so the limit doesn't reduce.

802.11ax (40MHz) 4Tx

Channel	Frequency (MHz)	Conducted Power (dBm)					Directional Gain (dBi)	Max. Limit (dBm)	Result
		Ant 1	Ant 2	Ant 3	Ant 4	Total			
3	2422	19.16	19.24	18.60	18.26	24.85	1.92	30	PASS
6	2437	19.67	19.65	18.97	19.08	25.37	2.02	30	PASS
9	2462	17.57	17.48	16.81	16.58	23.15	1.92	30	PASS

Note:
1. Total Conducted Power =
   Conducted Power [TX 1(unit in W) + TX 2(unit in W) + TX 3(unit in W) + TX 4(unit in W)](unit in dBm)
2. Directional Gain <6dBi, so the limit doesn't reduce.

1S4T TxBF

802.11ax (20MHz) 4Tx

Channel	Frequency (MHz)	Conducted Power (dBm)					Directional Gain (dBi)	Max. Limit (dBm)	Result
		Ant 1	Ant 2	Ant 3	Ant 4	Total			
1	2412	18.89	18.67	18.16	18.09	24.49	5.68	30	PASS
6	2437	21.94	21.87	21.15	21.37	27.62	5.83	30	PASS
11	2462	19.49	19.13	18.71	18.53	25.00	5.64	30	PASS

Note:
1. Total Conducted Power =
   Conducted Power [TX 1(unit in W) + TX 2(unit in W) + TX 3(unit in W) + TX 4(unit in W)](unit in dBm)
2. Directional Gain <6dBi, so the limit doesn't reduce.

802.11ax (40MHz) 4Tx

Channel	Frequency (MHz)	Conducted Power (dBm)					Directional Gain (dBi)	Max. Limit (dBm)	Result
		Ant 1	Ant 2	Ant 3	Ant 4	Total			
3	2422	18.51	18.37	17.84	17.75	24.15	5.74	30	PASS
6	2437	18.56	18.45	17.85	17.76	24.19	5.83	30	PASS
9	2462	17.56	17.65	16.95	16.89	23.30	5.53	30	PASS

Note:
1. Total Conducted Power =
   Conducted Power [TX 1(unit in W) + TX 2(unit in W) + TX 3(unit in W) + TX 4(unit in W)](unit in dBm)
2. Directional Gain <6dBi, so the limit doesn't reduce.

2S4T TxBF

802.11ax (20MHz) 4Tx

Channel	Frequency (MHz)	Conducted Power (dBm)					Directional Gain (dBi)	Max. Limit (dBm)	Result
		Ant 1	Ant 2	Ant 3	Ant 4	Total			
1	2412	18.63	18.41	18.13	17.80	24.27	3.95	30.00	PASS
6	2437	22.07	21.94	21.42	21.21	27.70	4.12	30.00	PASS
11	2462	19.14	19.05	18.72	18.60	24.90	3.83	30.00	PASS

Note:
1. Total Conducted Power =
   Conducted Power [TX 1(unit in W) + TX 2(unit in W) + TX 3(unit in W) + TX 4(unit in W)](unit in dBm)
2. Directional Gain <6dBi, so the limit doesn't reduce.

802.11ax (40MHz) 4Tx

Channel	Frequency (MHz)	Conducted Power (dBm)					Directional Gain (dBi)	Max. Limit (dBm)	Result
		Ant 1	Ant 2	Ant 3	Ant 4	Total			
3	2422	18.16	17.94	17.54	17.35	23.78	4.02	30.00	PASS
6	2437	19.08	19.10	18.48	18.34	24.78	4.12	30.00	PASS
9	2462	17.57	17.63	17.09	17.02	23.36	3.83	30.00	PASS

Note:
1. Total Conducted Power =
   Conducted Power [TX 1(unit in W) + TX 2(unit in W) + TX 3(unit in W) + TX 4(unit in W)](unit in dBm)
2. Directional Gain <6dBi, so the limit doesn't reduce.

3S4T TxBF

802.11ax (20MHz) 4Tx

Channel	Frequency (MHz)	Conducted Power (dBm)					Directional Gain (dBi)	Max. Limit (dBm)	Result
		Ant 1	Ant 2	Ant 3	Ant 4	Total			
1	2412	20.23	20.44	19.63	19.55	26.00	1.87	30	PASS
6	2437	22.03	21.91	21.11	21.41	27.65	1.83	30	PASS
11	2462	19.17	18.93	18.58	18.25	24.77	1.62	30	PASS

Note:
1. Total Conducted Power =
   Conducted Power [TX 1(unit in W) + TX 2(unit in W) + TX 3(unit in W) + TX 4(unit in W)](unit in dBm)
2. Directional Gain <6dBi, so the limit doesn't reduce.

802.11ax (40MHz) 4Tx

Channel	Frequency (MHz)	Conducted Power (dBm)					Directional Gain (dBi)	Max. Limit (dBm)	Result
		Ant 1	Ant 2	Ant 3	Ant 4	Total			
3	2422	18.74	18.80	18.31	18.04	24.50	1.93	30	PASS
6	2437	19.40	19.50	19.32	18.78	25.28	1.83	30	PASS
9	2462	17.30	17.71	17.08	16.95	23.29	1.67	30	PASS

Note:
1. Total Conducted Power =
   Conducted Power [TX 1(unit in W) + TX 2(unit in W) + TX 3(unit in W) + TX 4(unit in W)](unit in dBm)
2. Directional Gain <6dBi, so the limit doesn't reduce.

4.3 Power Spectral Density Measurement

4.3.1 Limit

For digitally modulated systems, the conductive measured power spectral density(PSD) shall not be greater than 8 dBm in any 3 kHz bandwidth during any time interval of continuous transmission.

4.3.2 Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Set the span to 1.5 times the DTS channel bandwidth.
RBW	Set the RBW ≥ 3 kHz
VBW	Set the VBW ≥ 3 x RBW
Detector	RMS
Trace	Average sweep count 100
Sweep Time	Auto couple

4.3.3 Test Procedures

1 The transmitter output (antenna port) was connected to the spectrum analyzer.

2 Test was performed in accordance with Measurement of Digital Transmission Systems Operating under 558074 D01 15.247 Meas Guidance v05r02, in section “Maximum power spectral density level in the fundamental emissions Method AVGPSD-1”, 04/05/2019.

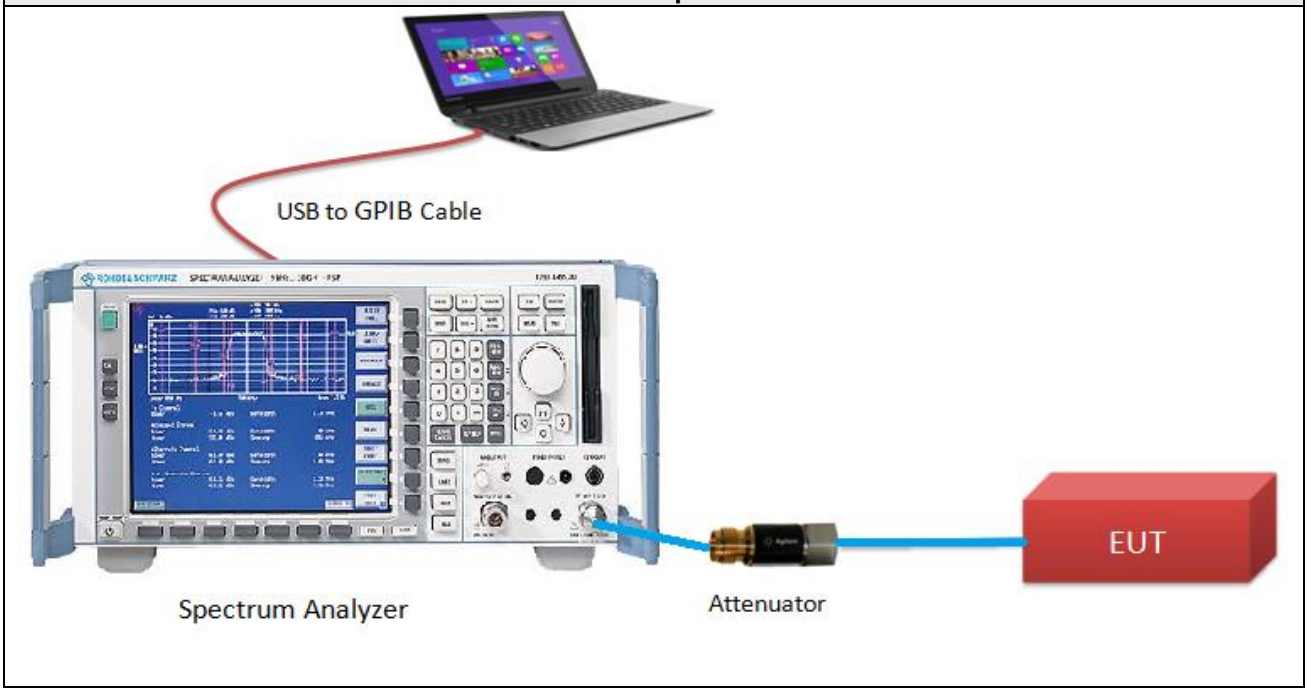
3 Multiple antenna systems was performed in accordance KDB 662911 D01 v02r01 in-Band Power Spectral Density (PSD) Measurements (a) Measure and sum the spectra across the outputs (bin-by-bin summing).

4 This procedure may be used when the maximum (average) conducted output power was used to demonstrate compliance to the output power limit. The EUT must be configured to transmit continuously (duty cycle ≥ 98%) to ensure that measurements are made only when the EUT is transmitting at its maximum power control level (no transmitter off time is to be considered).

5 Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW (use of a greater number of measurement points than this minimum requirement is recommended).

6 When measuring first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and so on up to the Nth output to obtain the value for the first frequency bin of the summed spectrum. The summed spectrum value for each of the other frequency bins is computed in the same way.

4.3.4 Test Setup Layout

Setup


4.3.5 Test Deviation

There are no deviations with the original standard.

4.3.6 EUT Operating Conditions

The EUT was programmed to be in continuously transmitting mode.

4.3.7 Test Results of Power Spectral Density

Temperature	25°C	Humidity	60%
Test Engineer	Jyunchun Lin		

1S4T CDD

802.11b 1Tx Ant1

Channel	Frequency (MHz)	Power Density (dBm/3kHz)	Directional Gain (dBi)	Limit (dBm/3kHz)	Result
1	2412	-9.48	1.83	8	PASS
6	2437	-10.34	1.02	8	PASS
11	2462	-9.96	0.66	8	PASS
Note: Directional Gain <6dBi, so the limit doesn't reduce.					

802.11ax (20MHz)

Channel	Frequency (MHz)	Power Density (dBm/3kHz)	Directional Gain (dBi)	Limit (dBm/3kHz)	Result
1	2412	-9.34	1.89	8	PASS
6	2437	-6.92	2.02	8	PASS
11	2462	-12.80	1.76	8	PASS
Note: Directional Gain <6dBi, so the limit doesn't reduce.					

802.11ax (40MHz)

Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	Duty Factor (dB)	PSD With Duty Factor (dBm/3kHz)	Directional Gain (dBi)	Limit (dBm/3kHz)	Result
3	2422	-13.48	0.13	-13.35	1.92	8	PASS
6	2437	-12.46	0.13	-12.33	2.02	8	PASS
9	2452	-15.00	0.13	-14.87	1.92	8	PASS
Note: Directional Gain <6dBi, so the limit doesn't reduce.							

Note: Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

1S4T TxBF

802.11ax (20MHz)

Channel	Frequency (MHz)	Power Density (dBm/3kHz)	Directional Gain (dBi)	Limit (dBm/3kHz)	Result
1	2412	-10.40	5.68	8	PASS
6	2437	-7.06	5.83	8	PASS
11	2462	-9.41	5.64	8	PASS
Note: Directional Gain <6dBi, so the limit doesn't reduce.					

802.11ax (40MHz)

Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	Duty Factor (dB)	PSD With Duty Factor (dBm/3kHz)	Directional Gain (dBi)	Limit (dBm/3kHz)	Result
3	2422	-14.03	**0.13**	-13.90	5.74	8	PASS
6	2437	-12.55	**0.13**	-12.42	5.83	8	PASS
9	2452	-14.67	**0.13**	-14.54	5.53	8	PASS
Note: Directional Gain <6dBi, so the limit doesn't reduce.							

Note: Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

2S4T TxBF

802.11ax (20MHz)

Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	Duty Factor (dB)	PSD With Duty Factor (dBm/3kHz)	Directional Gain (dBi)	Limit (dBm/3kHz)	Result
3	2422	**-10.59**	**0.13**	-10.46	3.95	8	PASS
6	2437	**-7.11**	**0.13**	-6.98	4.12	8	PASS
9	2452	**-10.34**	**0.13**	-10.21	3.83	8	PASS
Note: Directional Gain <6dBi, so the limit doesn't reduce.							

802.11ax (40MHz)

Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	Duty Factor (dB)	PSD With Duty Factor (dBm/3kHz)	Directional Gain (dBi)	Limit (dBm/3kHz)	Result
3	2422	-13.59	0.27	-13.32	4.02	8	PASS
6	2437	-12.75	0.27	-12.48	4.12	8	PASS
9	2452	-14.17	0.27	-13.90	3.83	8	PASS
Note: Directional Gain <6dBi, so the limit doesn't reduce.							

Note: Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

3S4T TxBF

802.11ax (20MHz)

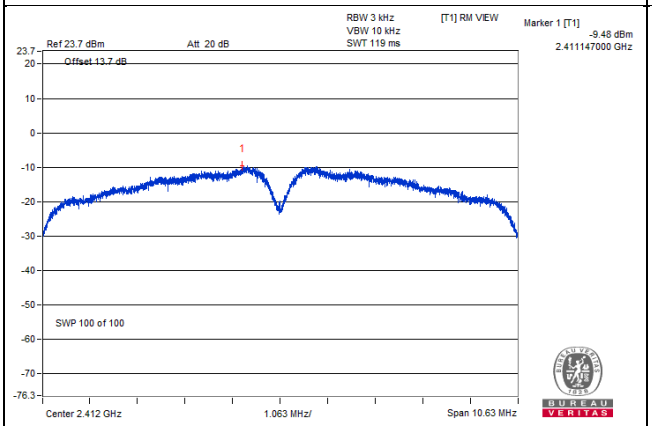
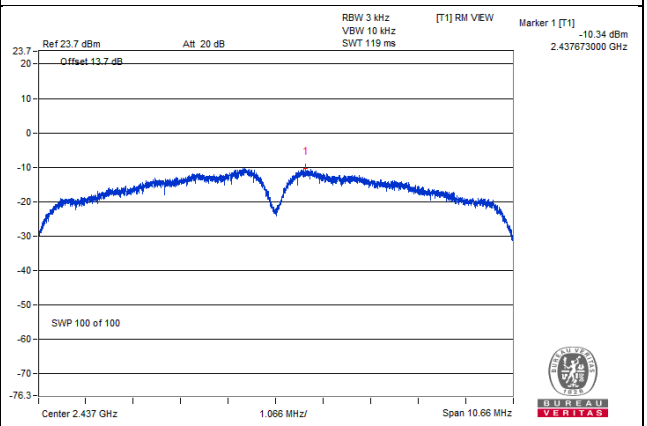
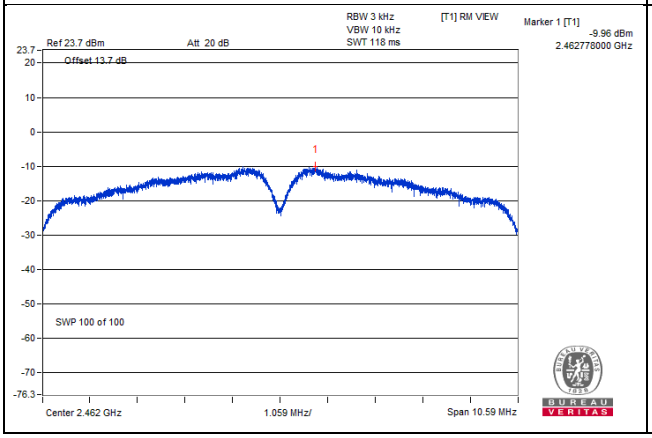
Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	Duty Factor (dB)	PSD With Duty Factor (dBm/3kHz)	Directional Gain (dBi)	Limit (dBm/3kHz)	Result
3	2422	-9.09	0.20	-8.89	1.87	8	PASS
6	2437	-7.52	0.20	-7.32	1.83	8	PASS
9	2452	-9.76	0.20	-9.56	1.62	8	PASS
Note: Directional Gain <6dBi, so the limit doesn't reduce.							

802.11ax (40MHz)

Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/3kHz)	Duty Factor (dB)	PSD With Duty Factor (dBm/3kHz)	Directional Gain (dBi)	Limit (dBm/3kHz)	Result
3	2422	-12.58	0.40	-12.18	1.93	8	PASS
6	2437	-11.81	0.40	-11.41	1.83	8	PASS
9	2452	-13.95	0.40	-13.55	1.67	8	PASS
Note: Directional Gain <6dBi, so the limit doesn't reduce.							

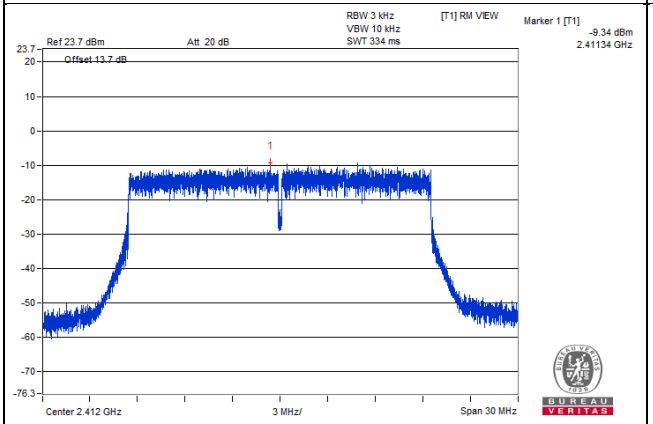
Note: Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

1S1T SISO

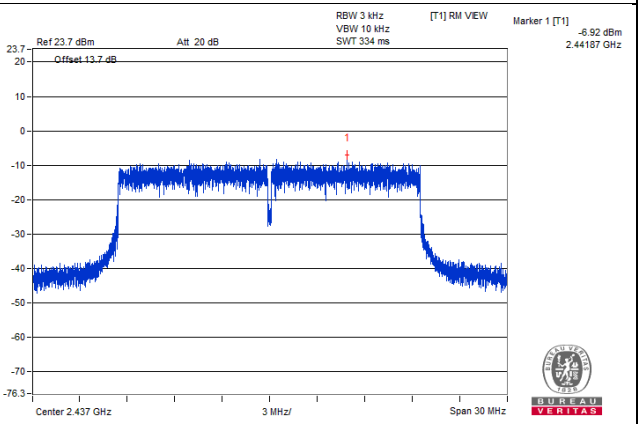
SPECTRUM PLOT	
802.11b Ant1 2412 MHz	**802.11b Ant1 2437 MHz**
	
802.11b Ant1 2462 MHz	
	

SPECTRUM PLOT

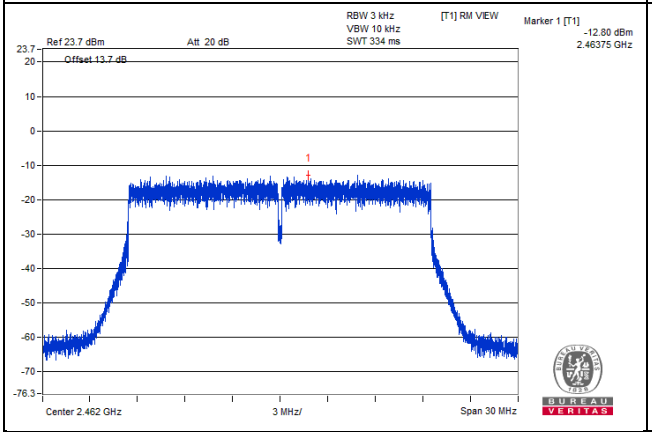
802.11ax (20MHz) 2412 MHz



802.11ax (20MHz) 2437 MHz

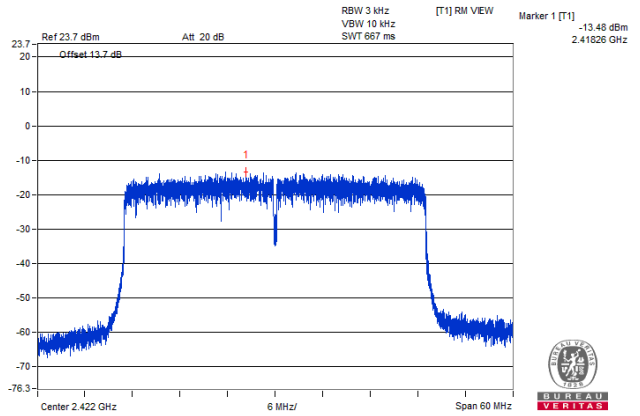


802.11ax (20MHz) 2462 MHz

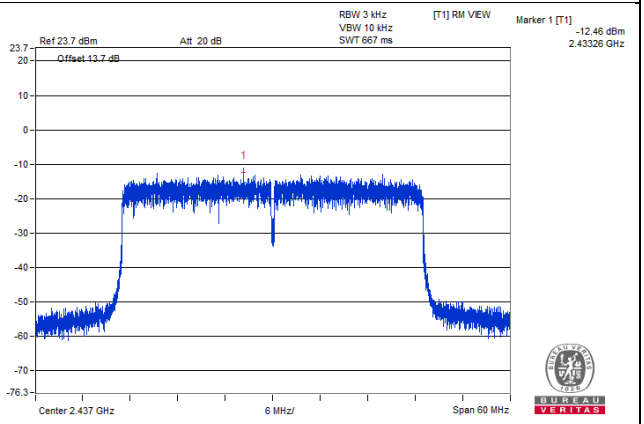


SPECTRUM PLOT

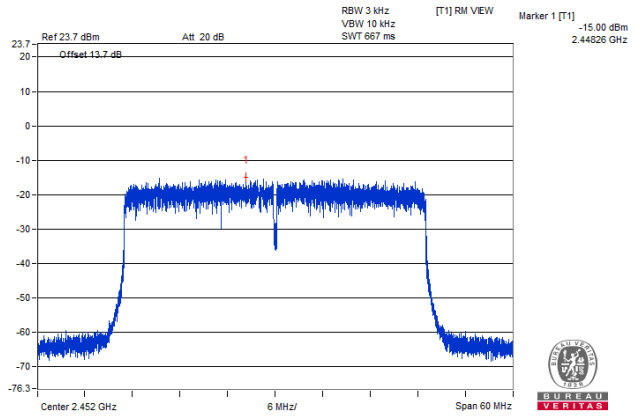
802.11ax (40MHz) 2422 MHz



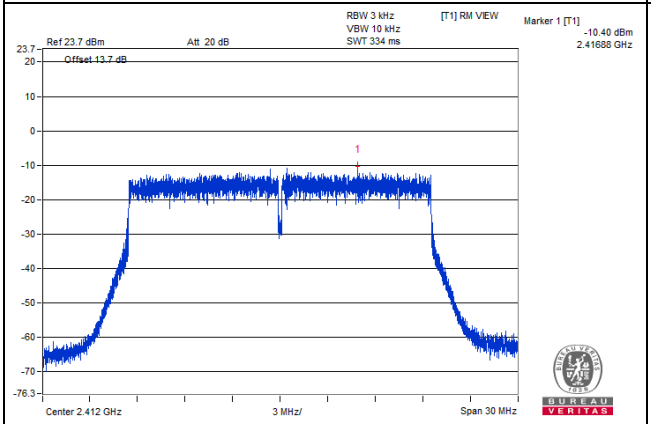
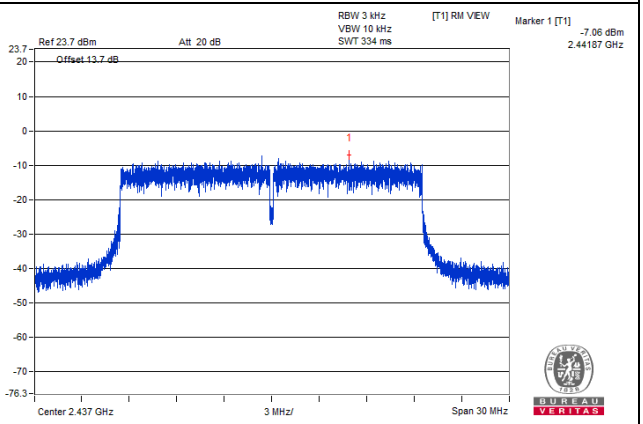
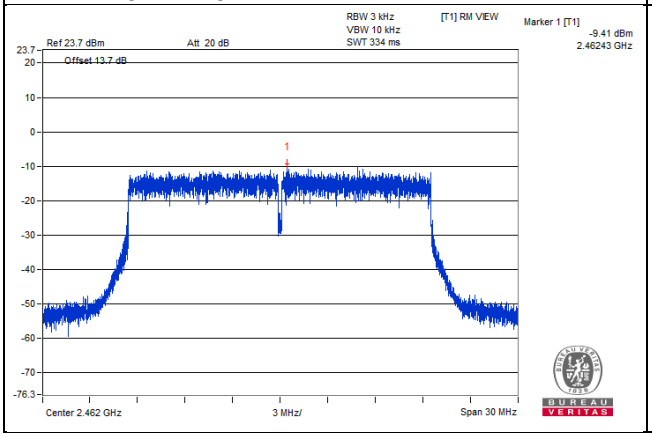
802.11ax (40MHz) 2437 MHz



802.11ax (40MHz) 2452 MHz

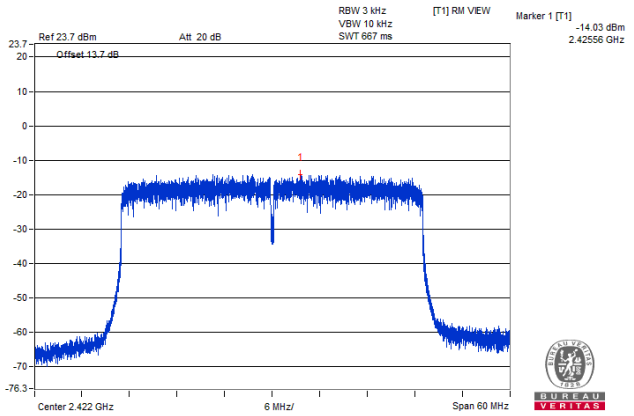


1S4T TxBF

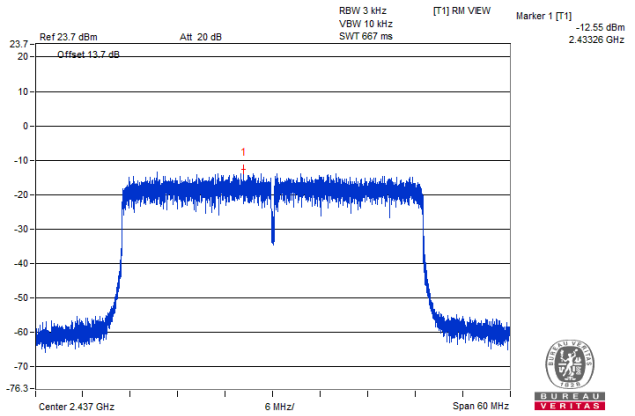
SPECTRUM PLOT	
802.11ax (20MHz) 2412 MHz	**802.11ax (20MHz) 2437 MHz**
	
802.11ax (20MHz) 2462 MHz	
	

SPECTRUM PLOT

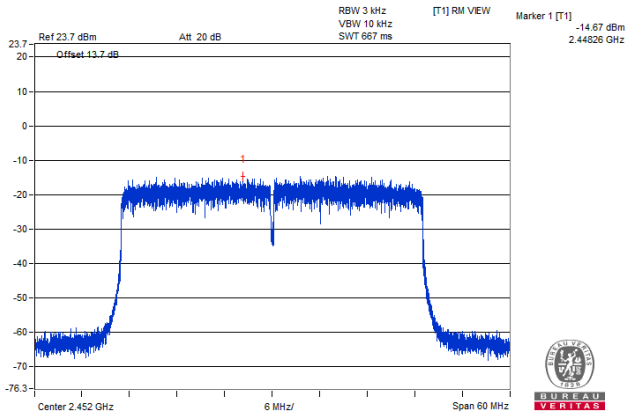
802.11ax (40MHz) 2422 MHz



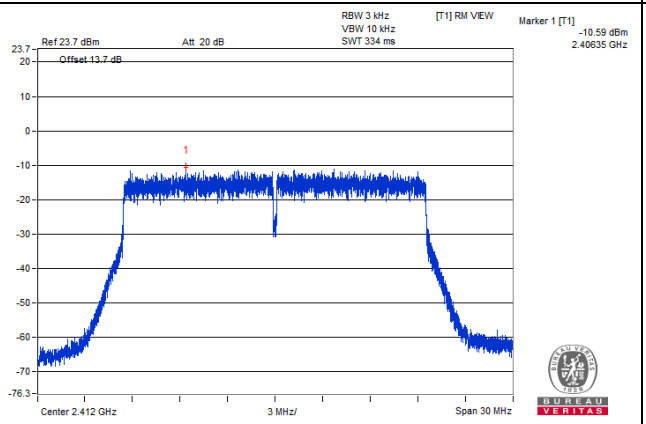
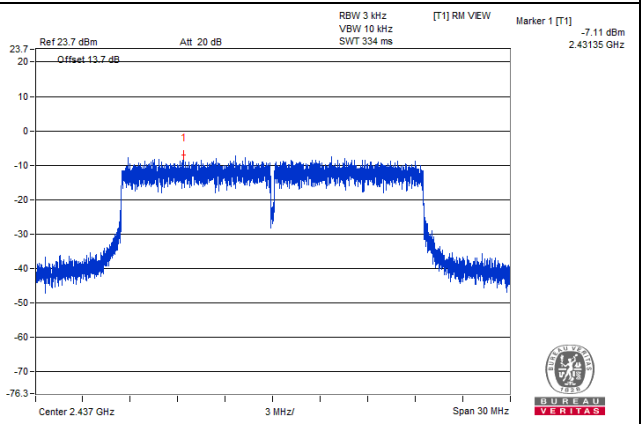
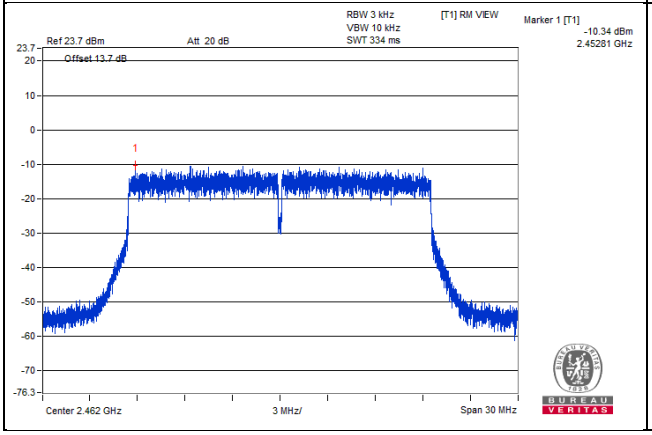
802.11ax (40MHz) 2437 MHz



802.11ax (40MHz) 2452 MHz

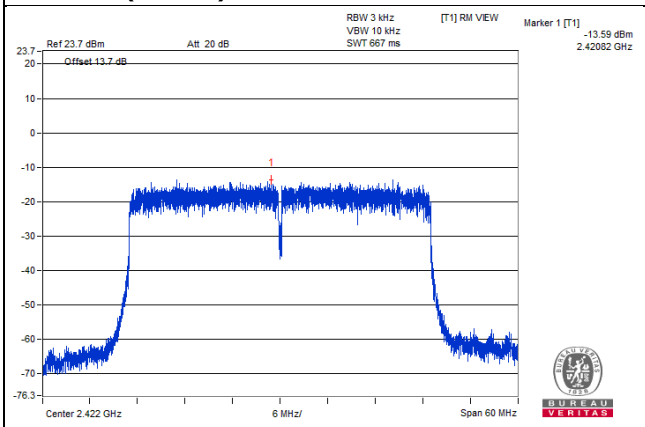


2S4T TxBF

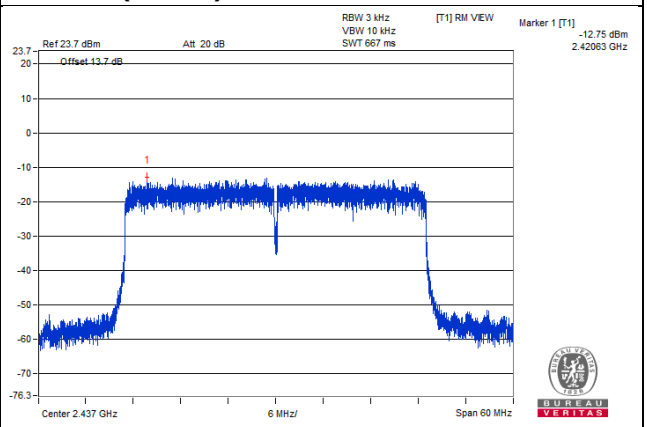
SPECTRUM PLOT	
802.11ax (20MHz) 2412 MHz	**802.11ax (20MHz) 2437 MHz**
	
802.11ax (20MHz) 2462 MHz	
	

SPECTRUM PLOT

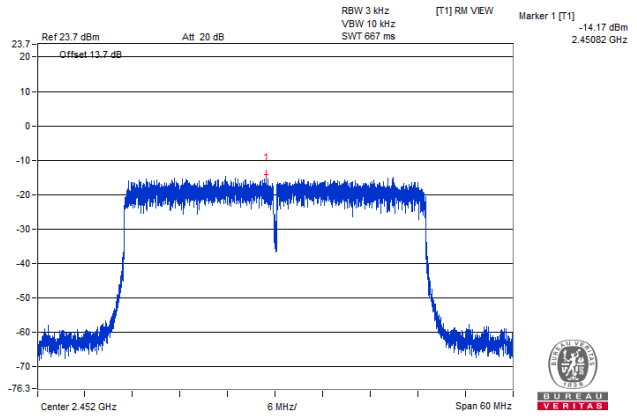
802.11ax (40MHz) 2422 MHz



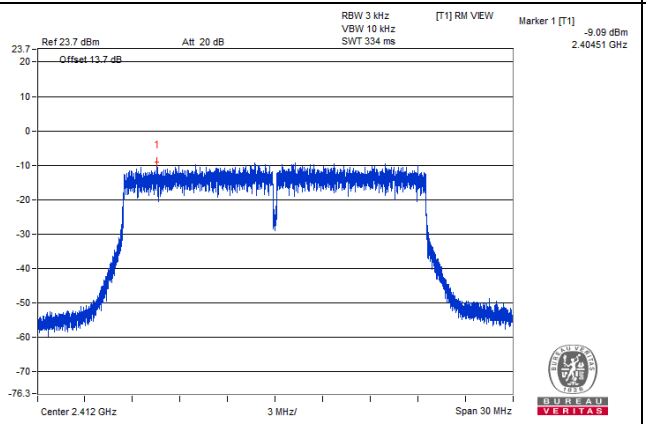
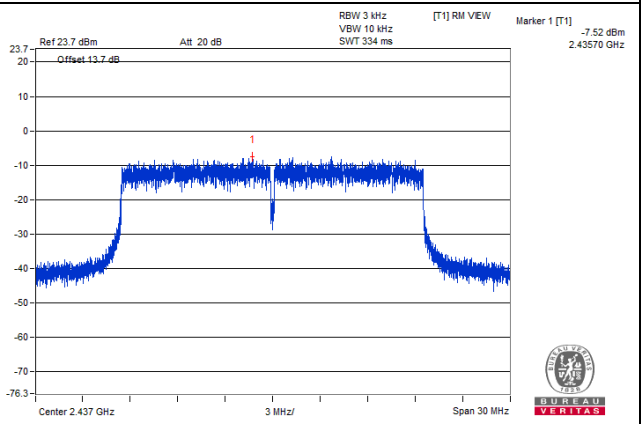
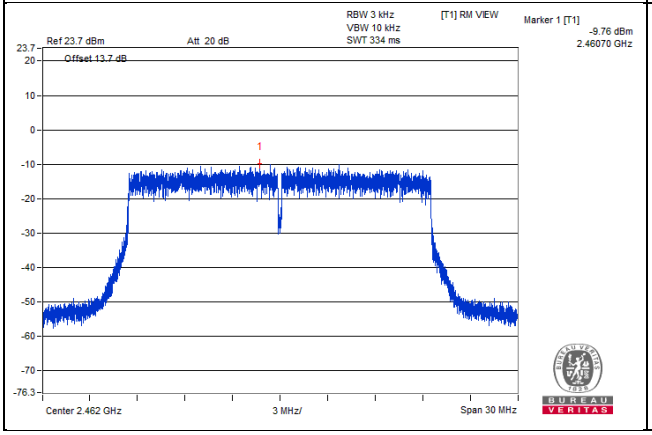
802.11ax (40MHz) 2437 MHz



802.11ax (40MHz) 2452 MHz

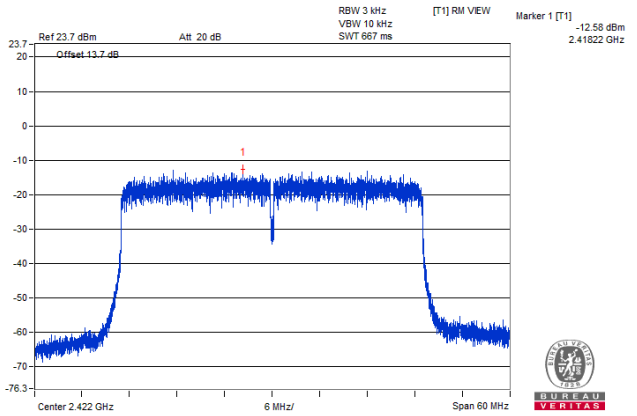


3S4T TxBF

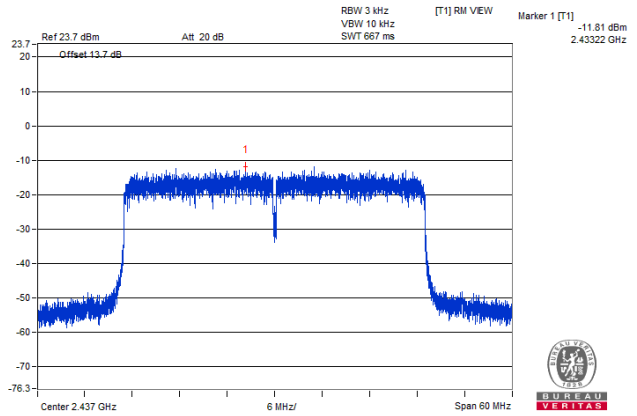
SPECTRUM PLOT	
802.11ax (20MHz) 2412 MHz	**802.11ax (20MHz) 2437 MHz**
	
802.11ax (20MHz) 2462 MHz	
	

SPECTRUM PLOT

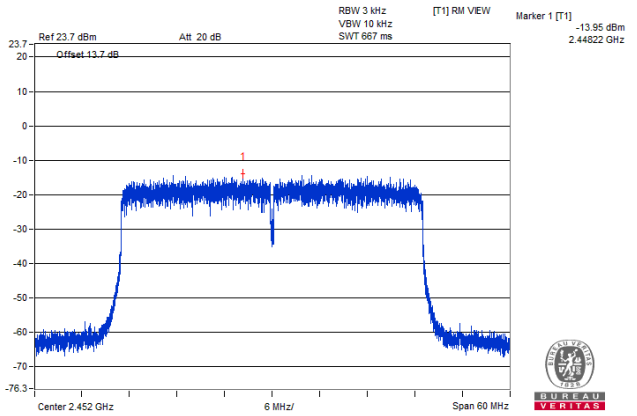
802.11ax (40MHz) 2422 MHz



802.11ax (40MHz) 2437 MHz



802.11ax (40MHz) 2452 MHz



4.4 6dB Bandwidth Measurement

4.4.1 Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz

4.4.2 Measuring Instruments and Setting

The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RBW	100 kHz.
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto couple

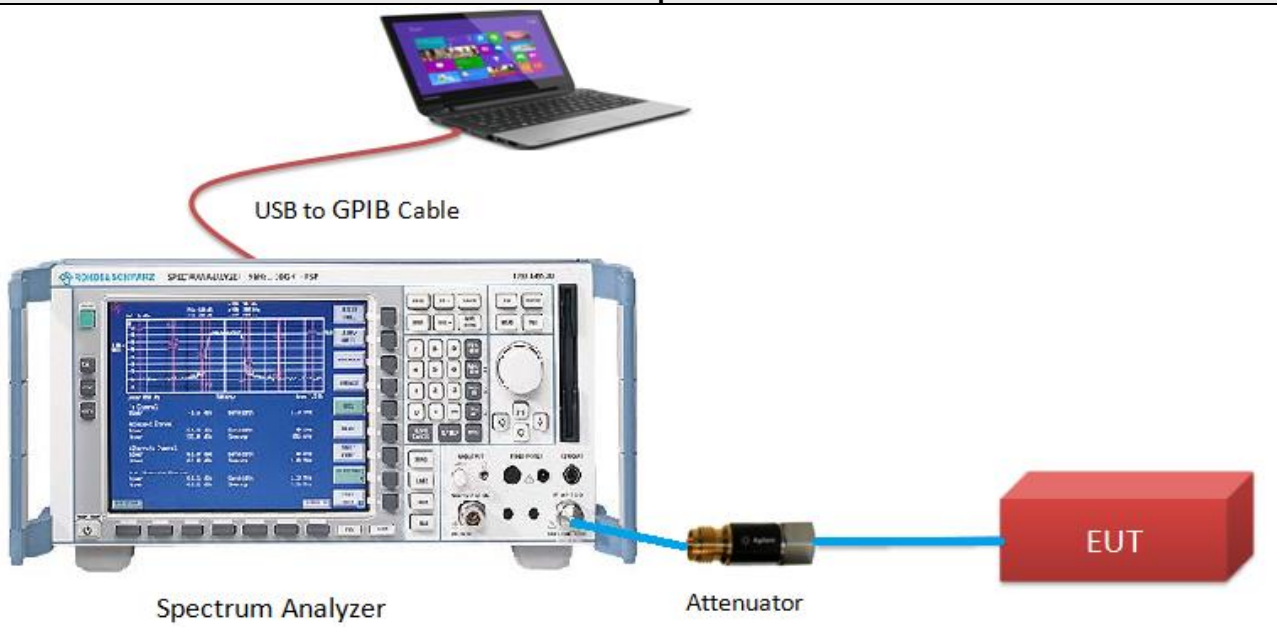
4.4.3 Test Procedures

1 The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.

2 For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier frequency. A peak reading was taken; two markers were set 6 dB below the maximum level on the right and the left side of the emissions.

3 The 6dB bandwidth is the frequency difference between the two markers.

4.4.4 Test Setup Layout

Setup


4.4.5 Test Deviation

There are no deviations with the original standard.

4.4.6 EUT Operating Conditions

The EUT was programmed to be in continuously transmitting mode.

4.4.7 Test Results of 6dB Bandwidth

Temperature	25°C	Humidity	60%
Test Engineer	Jyunchun Lin		

1S4T CDD

802.11b 1Tx Ant1

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	7.09	0.5	PASS
6	2437	7.11	0.5	PASS
11	2462	7.06	0.5	PASS

802.11ax (20MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)				MINIMUM LIMIT (MHz)	PASS / FAIL
		ANT 1	ANT 2	ANT 3	ANT 4		
1	2412	19.04	19	18.92	19.04	0.5	PASS
6	2437	19.05	19.03	18.99	19.01	0.5	PASS
11	2462	19.07	19.08	19.04	19.08	0.5	PASS

802.11ax (40MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)				MINIMUM LIMIT (MHz)	PASS / FAIL
		ANT 1	ANT 2	ANT 3	ANT 4		
3	2422	37.42	36.99	37.64	37.38	0.5	PASS
6	2437	37.69	37.33	37.67	37.59	0.5	PASS
9	2452	37.5	37.34	37.65	37.48	0.5	PASS

1S4T TxBF

802.11ax (20MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)				MINIMUM LIMIT (MHz)	PASS / FAIL
		ANT 1	ANT 2	ANT 3	ANT 4		
1	2412	19.02	19.03	18.96	19.1	0.5	PASS
6	2437	19.06	19.03	18.96	19.03	0.5	PASS
11	2462	19.01	19.05	19.06	19.09	0.5	PASS

802.11ax (40MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)				MINIMUM LIMIT (MHz)	PASS / FAIL
		ANT 1	ANT 2	ANT 3	ANT 4		
3	2422	37.58	37.28	37.76	36.76	0.5	PASS
6	2437	37.69	37.47	37.78	37.46	0.5	PASS
9	2452	37.5	37.62	37.77	37.59	0.5	PASS

2S4T TxBF

802.11ax (20MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)				MINIMUM LIMIT (MHz)	PASS / FAIL
		ANT 1	ANT 2	ANT 3	ANT 4		
1	2412	19.07	18.95	18.99	18.93	0.5	PASS
6	2437	19.07	18.95	19	18.87	0.5	PASS
11	2462	19.03	19.05	19.08	18.94	0.5	PASS

802.11ax (40MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)				MINIMUM LIMIT (MHz)	PASS / FAIL
		ANT 1	ANT 2	ANT 3	ANT 4		
3	2422	37.52	37.44	37.75	37.11	0.5	PASS
6	2437	37.75	37.54	37.74	37.23	0.5	PASS
9	2452	37.56	37.27	37.79	37.14	0.5	PASS

3S4T TxBF

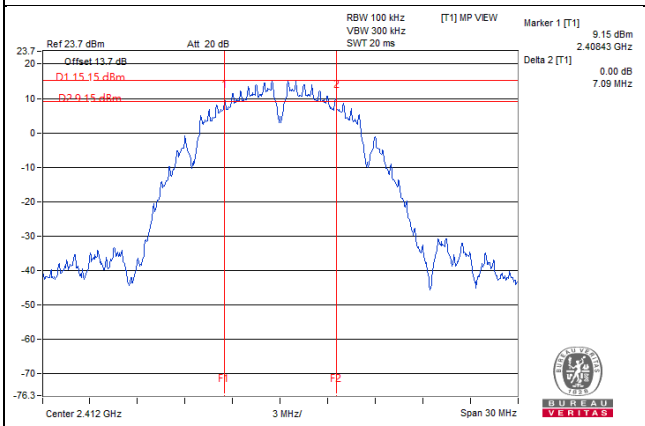
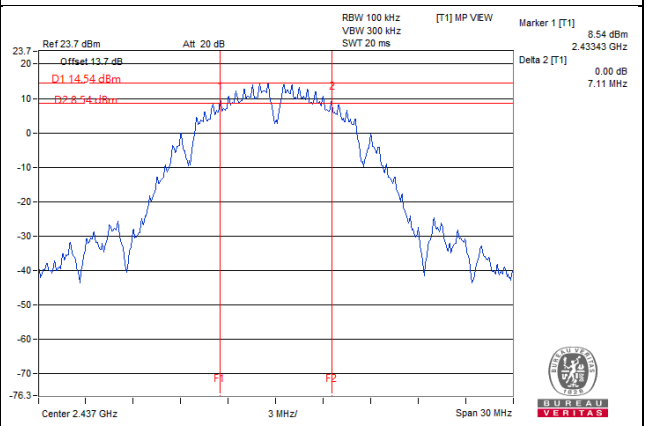
802.11ax (20MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)				MINIMUM LIMIT (MHz)	PASS / FAIL
		ANT 1	ANT 2	ANT 3	ANT 4		
1	2412	19.09	18.88	19.07	19.1	0.5	PASS
6	2437	19.11	18.91	19.11	19.09	0.5	PASS
11	2462	19.14	19.03	19.16	19.15	0.5	PASS

802.11ax (40MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)				MINIMUM LIMIT (MHz)	PASS / FAIL
		ANT 1	ANT 2	ANT 3	ANT 4		
3	2422	37.8	37.56	37.75	37.74	0.5	PASS
6	2437	37.88	37.58	37.68	37.73	0.5	PASS
9	2452	37.78	37.52	37.68	37.71	0.5	PASS

1S1T SISO

SPECTRUM PLOT	
802.11b 1Tx Ant1 CH1	**802.11b 1Tx Ant1 CH6**
	
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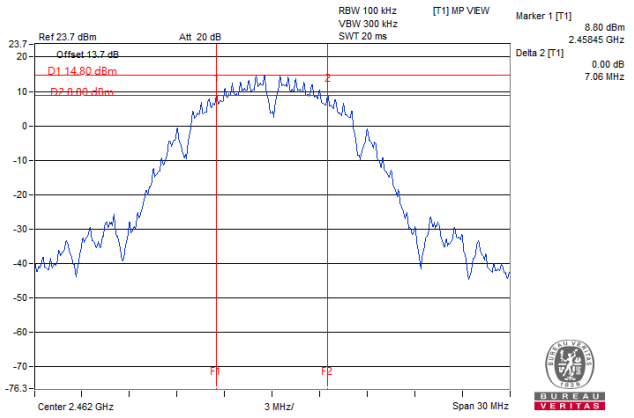
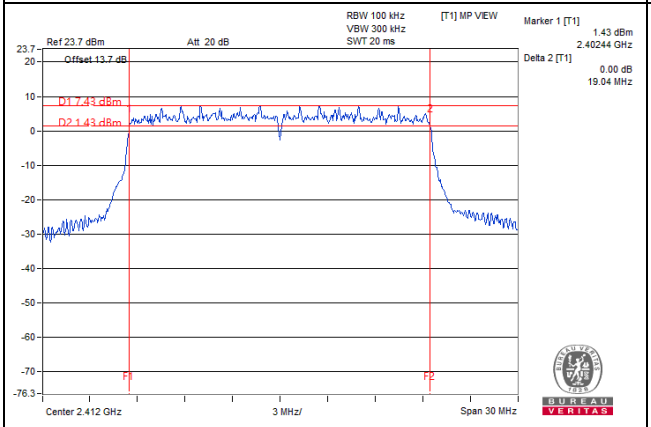
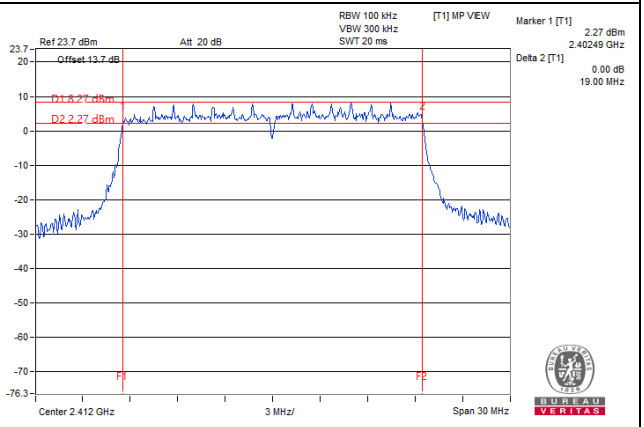
	

1S4T CDD

SPECTRUM PLOT	
802.11ax (20MHz) Ant1 CH1	**802.11ax (20MHz) Ant2 CH1**
	
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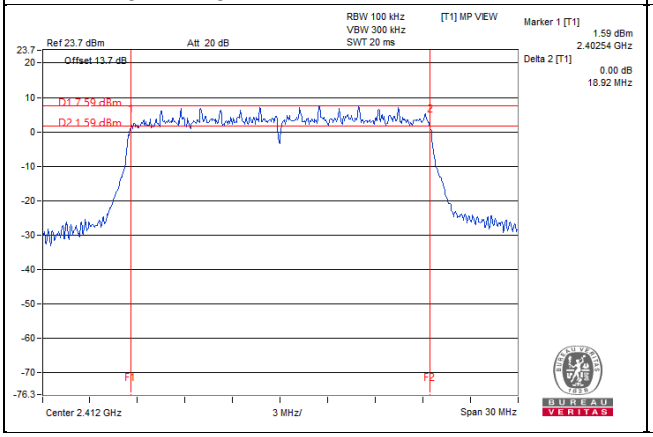	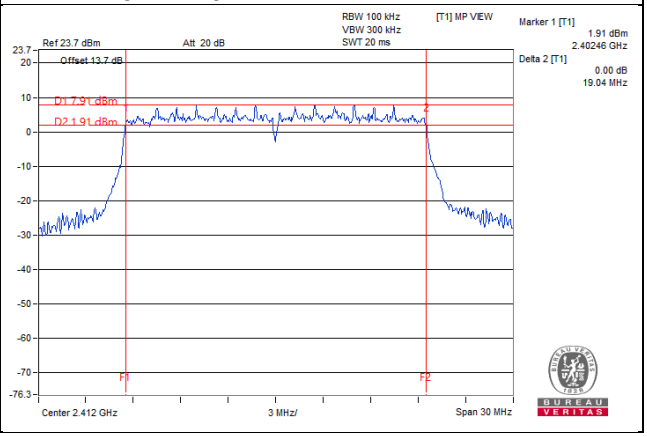

SPECTRUM PLOT	
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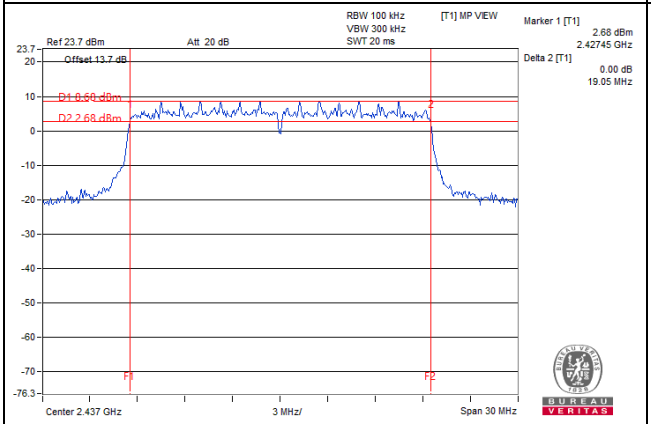	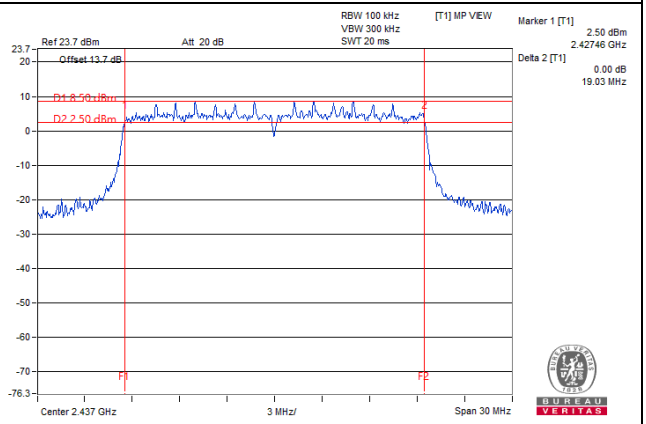
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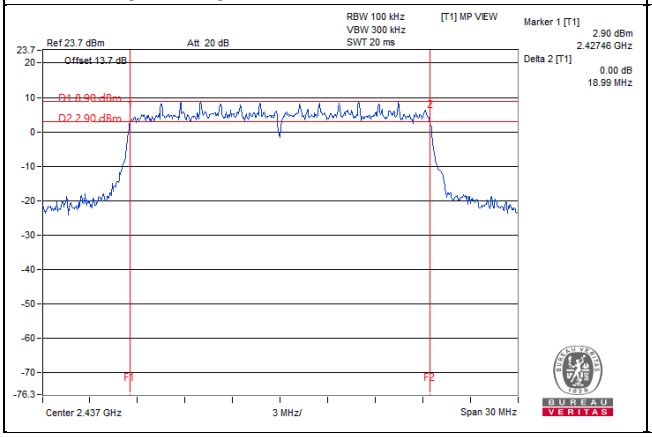
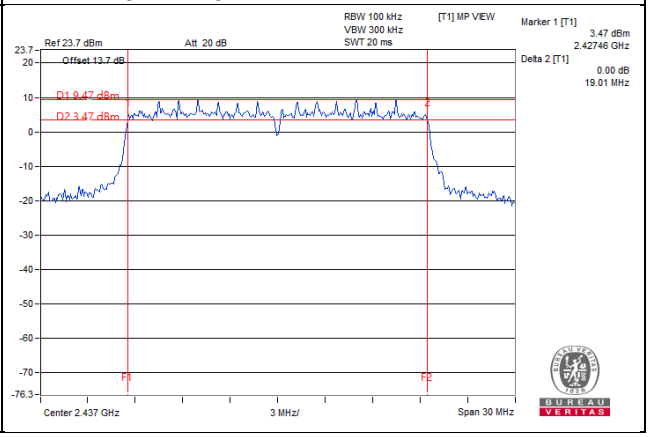
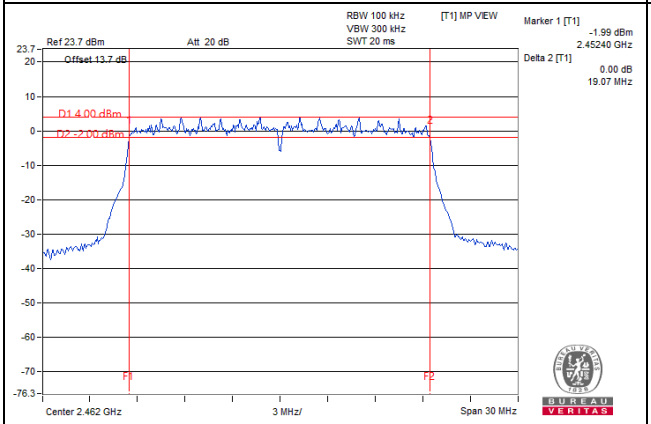
	

SPECTRUM PLOT

802.11ax (20MHz) Ant1 CH11



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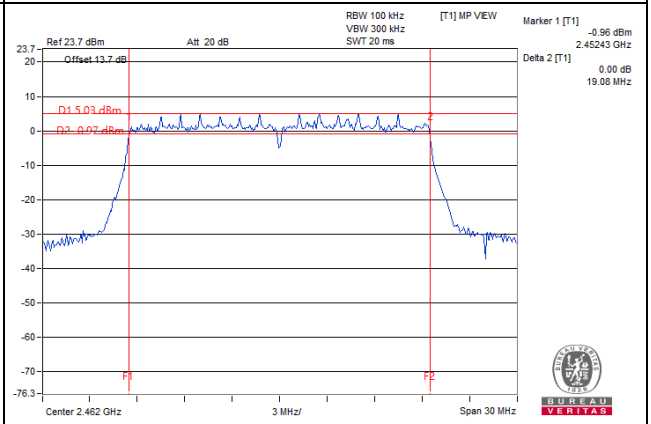
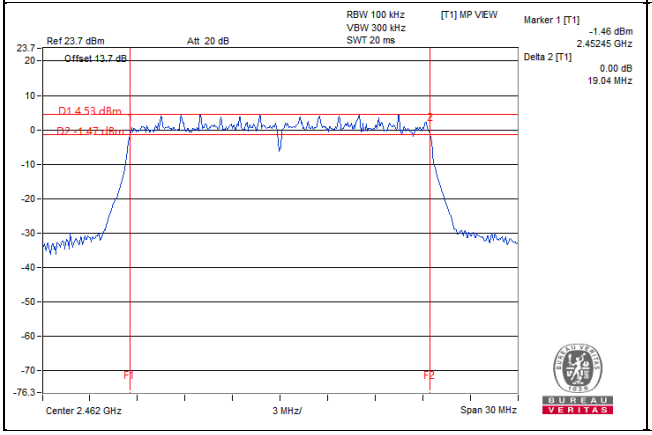
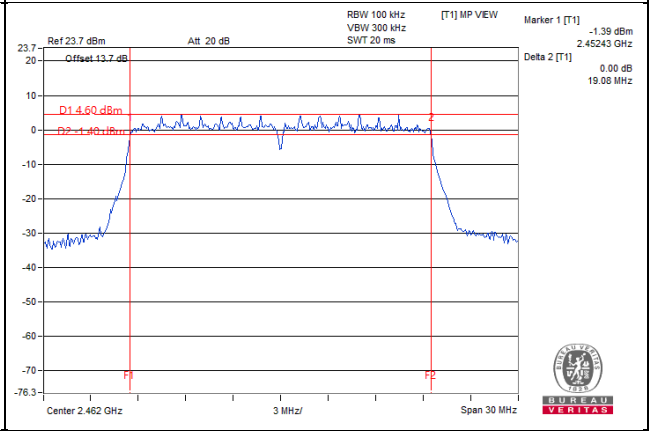


802.11ax (20MHz) Ant3 CH11

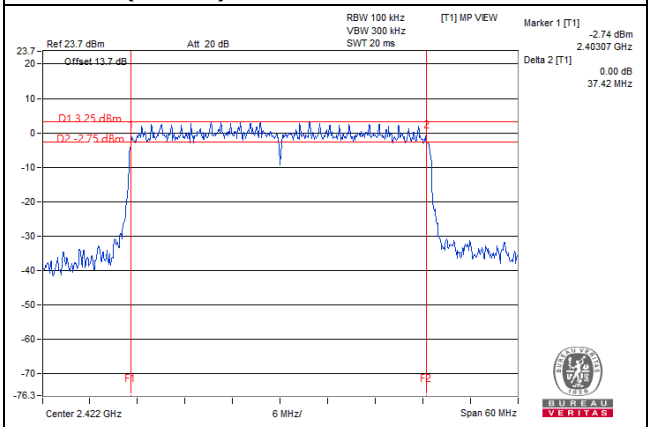


802.11ax (20MHz) Ant4 CH11



SPECTRUM PLOT

802.11ax (40MHz) Ant1 CH3



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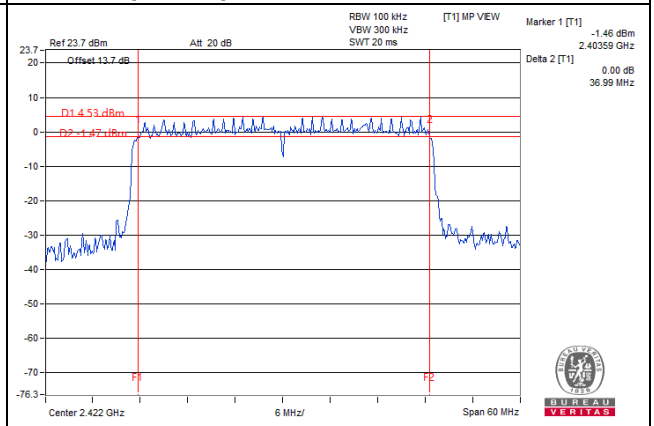
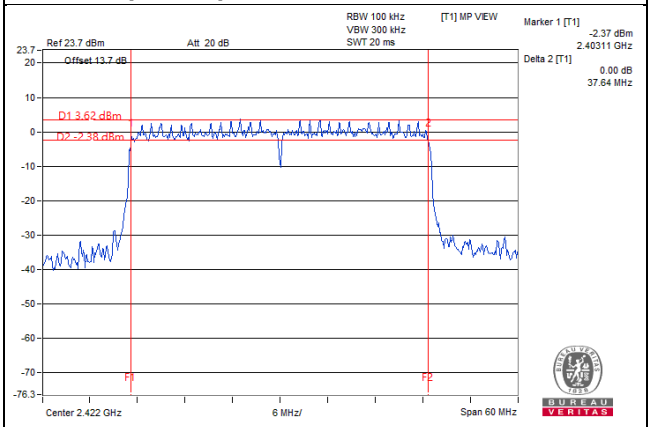
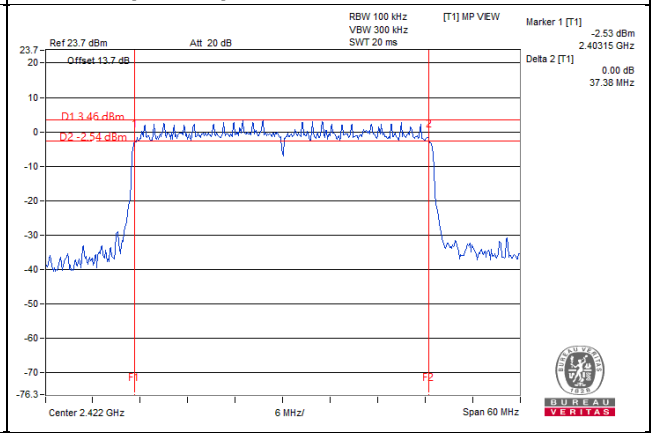


802.11ax (40MHz) Ant3 CH3

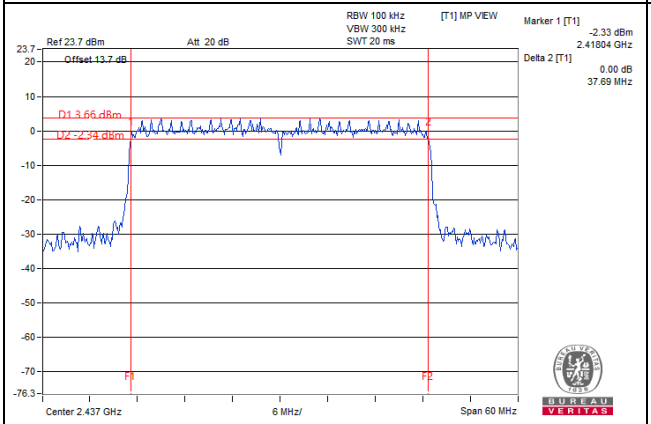


802.11ax (40MHz) Ant4 CH3

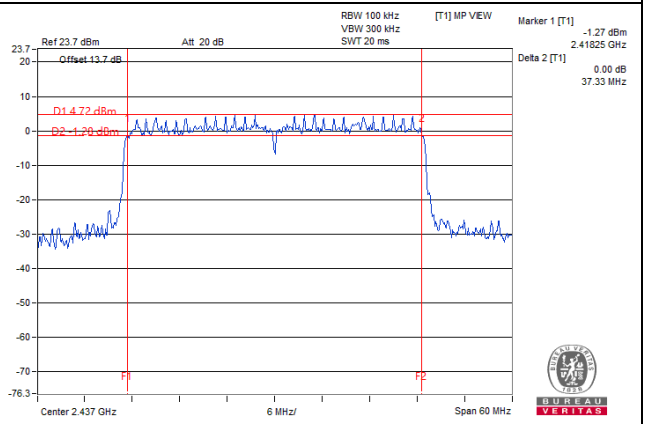


SPECTRUM PLOT

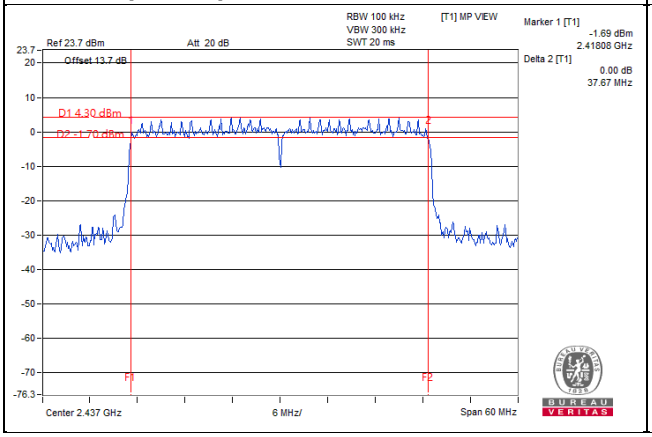
802.11ax (40MHz) Ant1 CH6



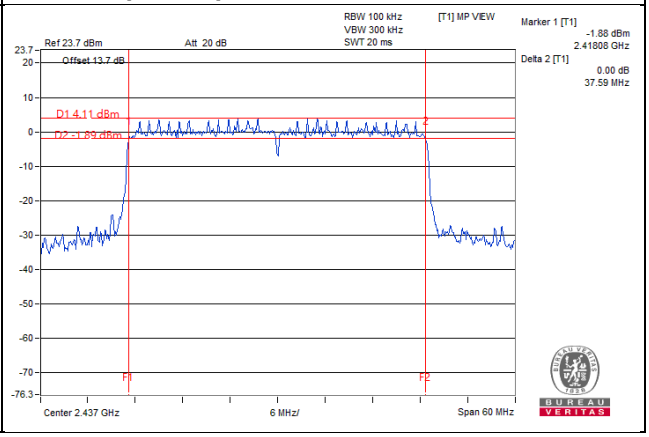
802.11ax (40MHz) Ant2 CH6



802.11ax (40MHz) Ant3 CH6

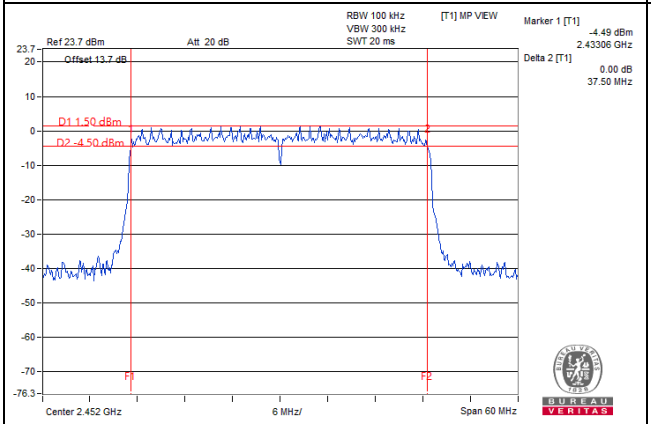


802.11ax (40MHz) Ant4 CH6

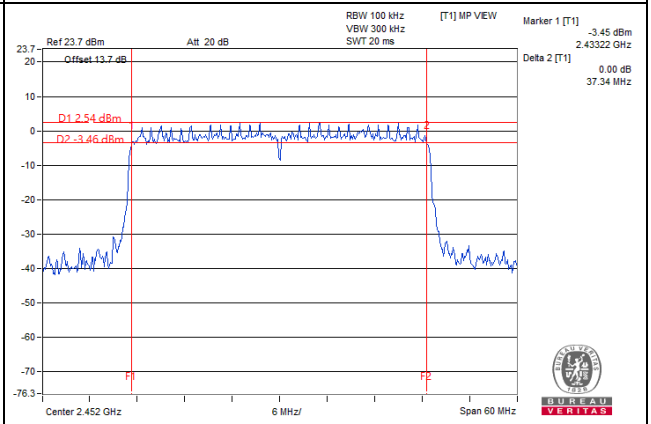


SPECTRUM PLOT

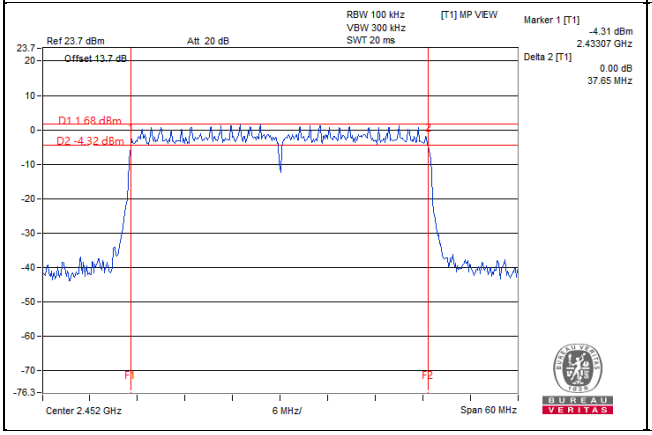
802.11ax (40MHz) Ant1 CH9



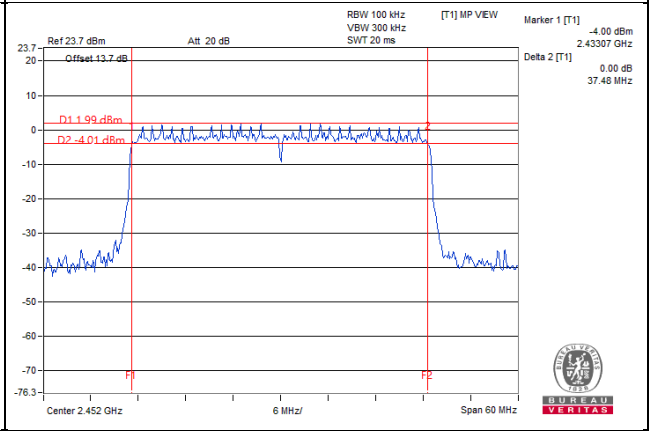
802.11ax (40MHz) Ant2 CH9



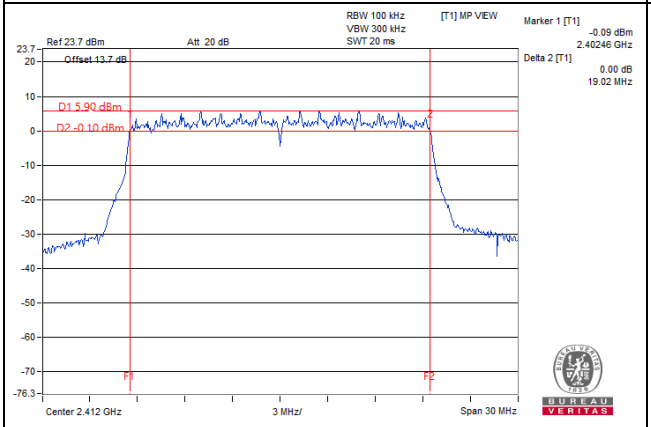
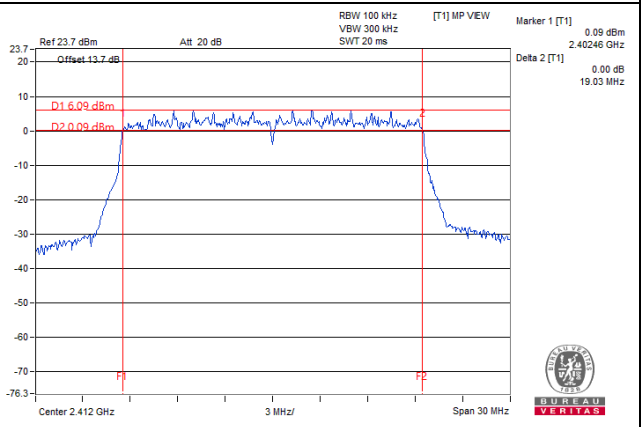
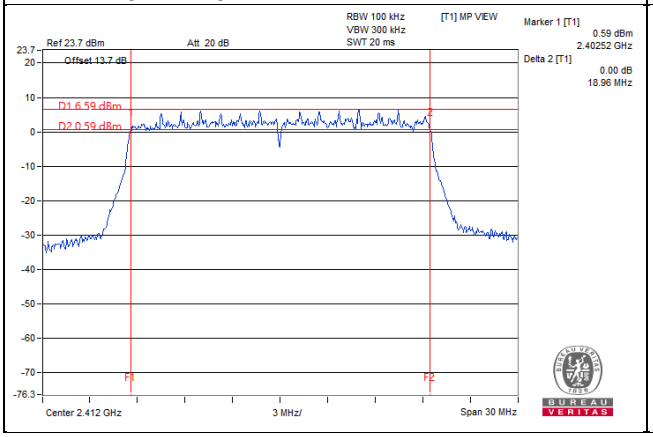
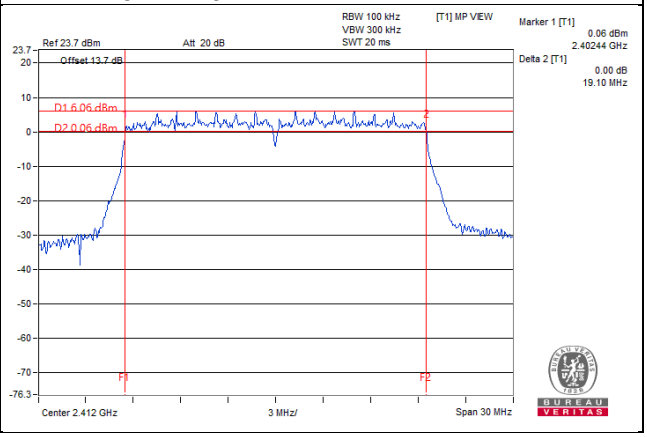
802.11ax (40MHz) Ant3 CH9



802.11ax (40MHz) Ant4 CH9

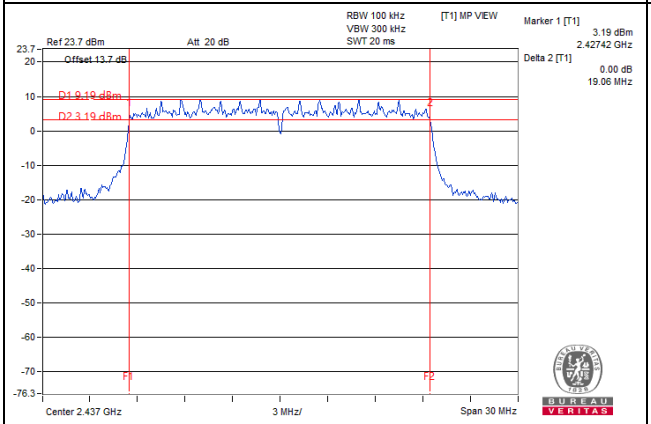


1S4T TxBF

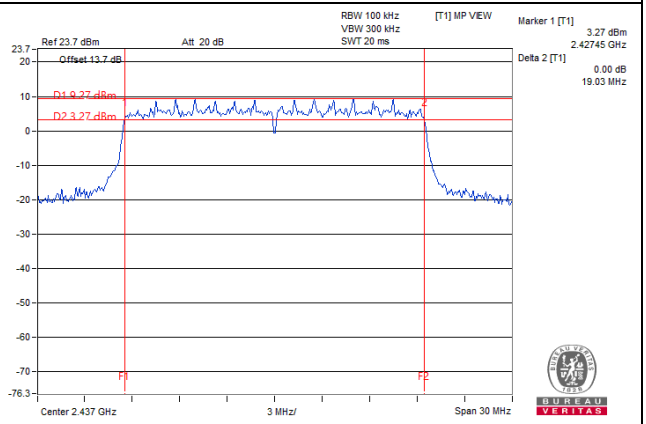
SPECTRUM PLOT	
802.11ax (20MHz) Ant1 CH1	**802.11ax (20MHz) Ant2 CH1**
	
802.11ax (20MHz) Ant3 CH1	**802.11ax (20MHz) Ant4 CH1**
	

SPECTRUM PLOT

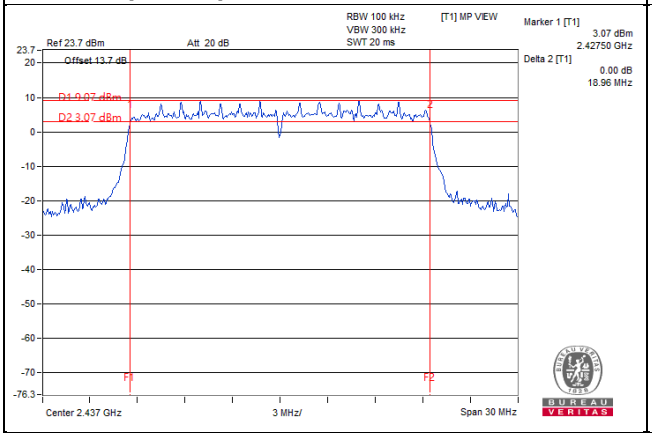
802.11ax (20MHz) Ant1 CH6



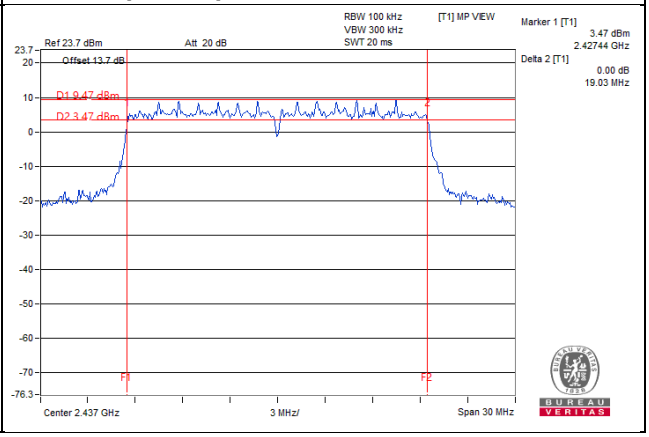
802.11ax (20MHz) Ant2 CH6



802.11ax (20MHz) Ant3 CH6

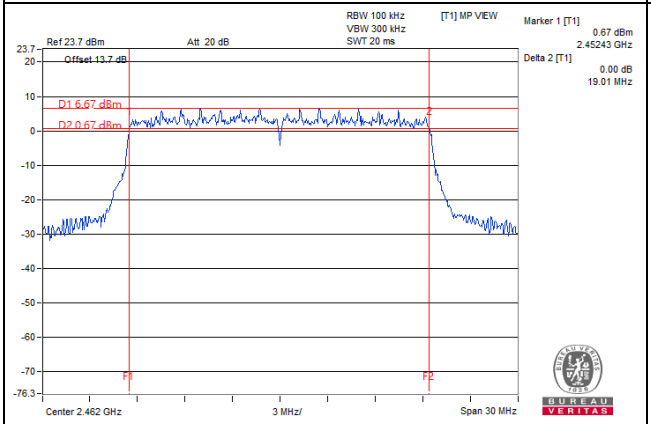


802.11ax (20MHz) Ant4 CH6

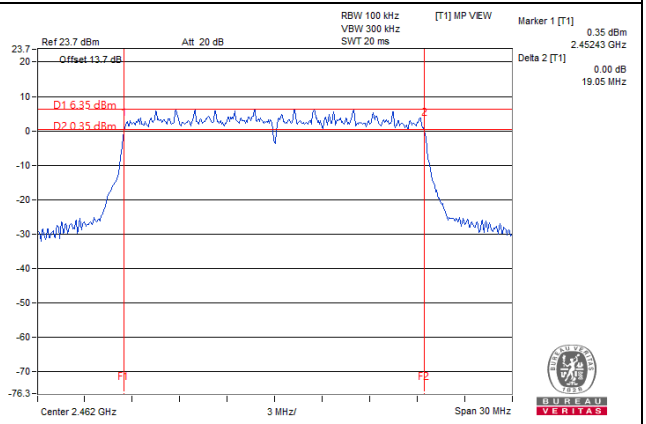


SPECTRUM PLOT

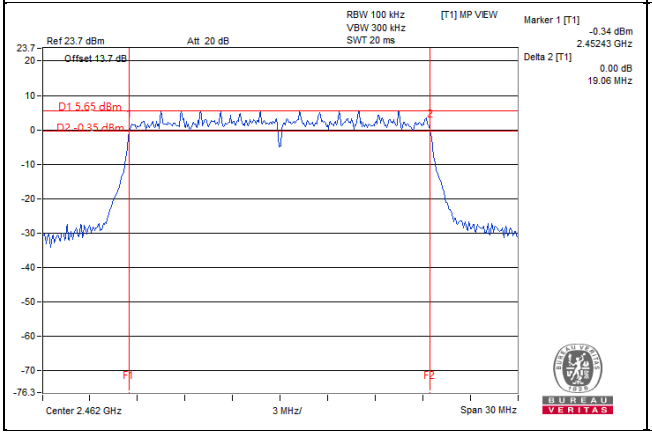
802.11ax (20MHz) Ant1 CH11



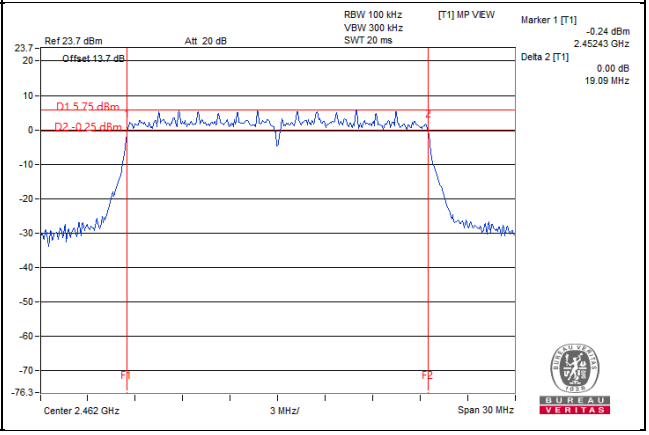
802.11ax (20MHz) Ant2 CH11



802.11ax (20MHz) Ant3 CH11

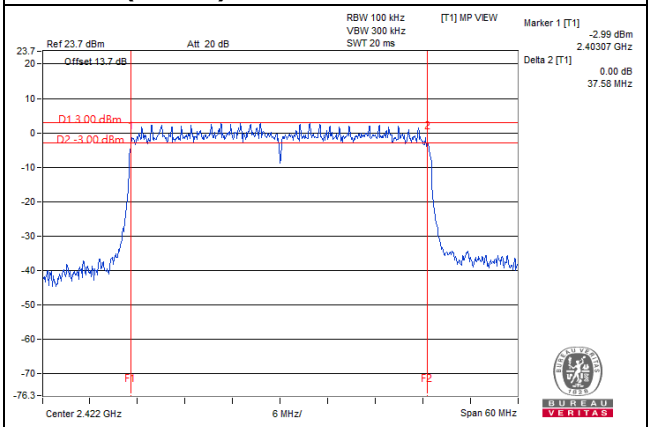


802.11ax (20MHz) Ant4 CH11

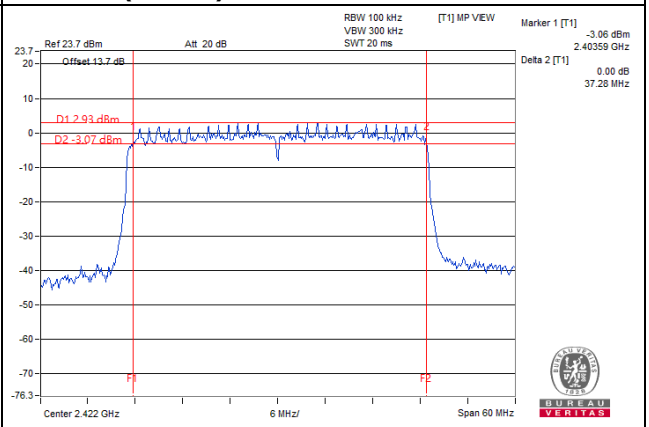


SPECTRUM PLOT

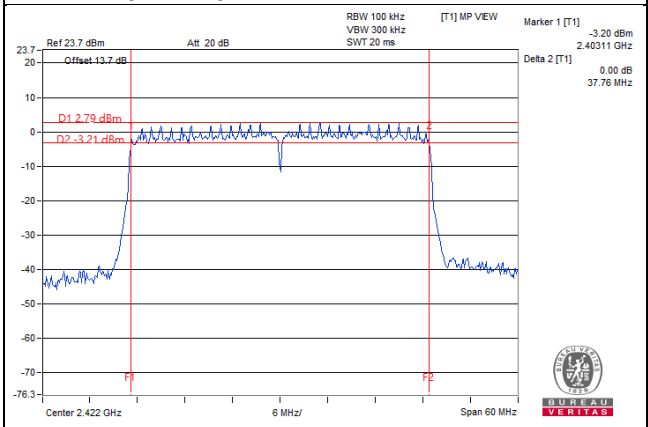
802.11ax (40MHz) Ant1 CH3



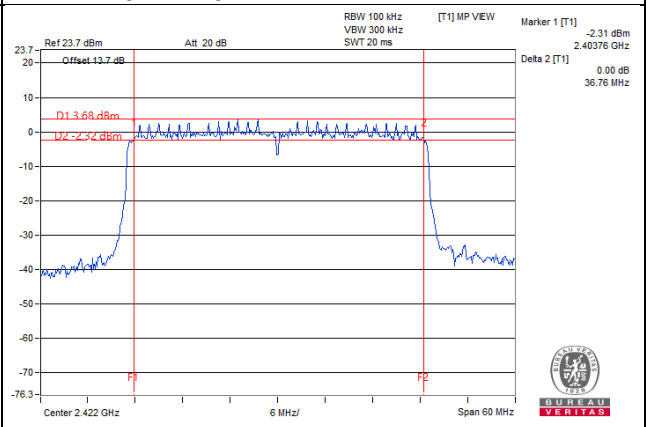
802.11ax (40MHz) Ant2 CH3



802.11ax (40MHz) Ant3 CH3

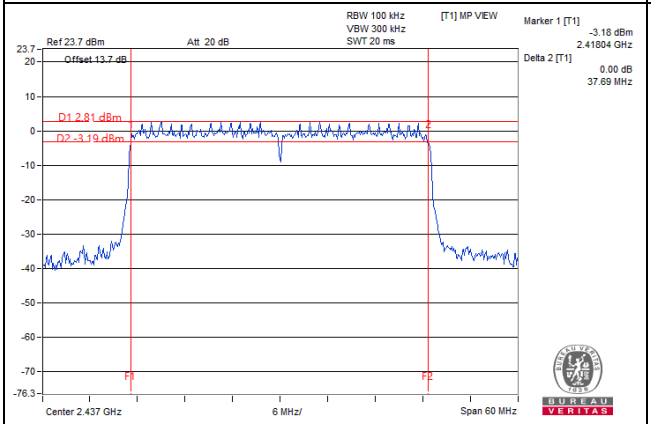


802.11ax (40MHz) Ant4 CH3

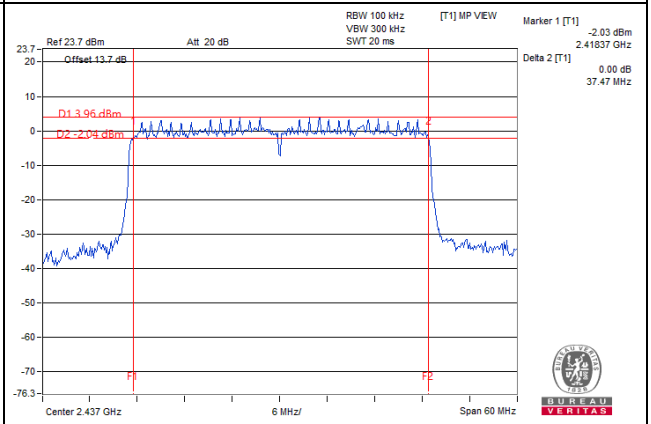


SPECTRUM PLOT

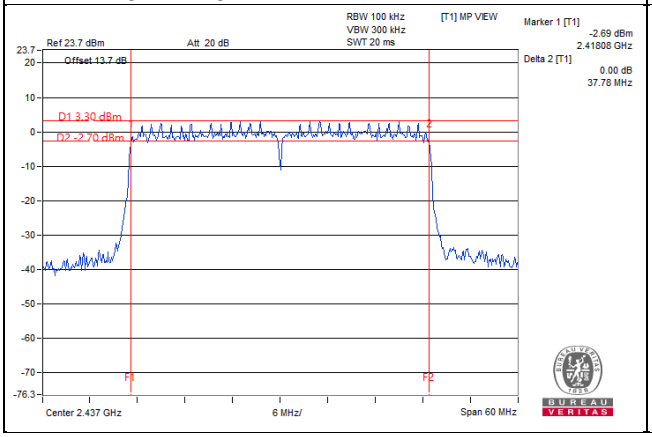
802.11ax (40MHz) Ant1 CH6



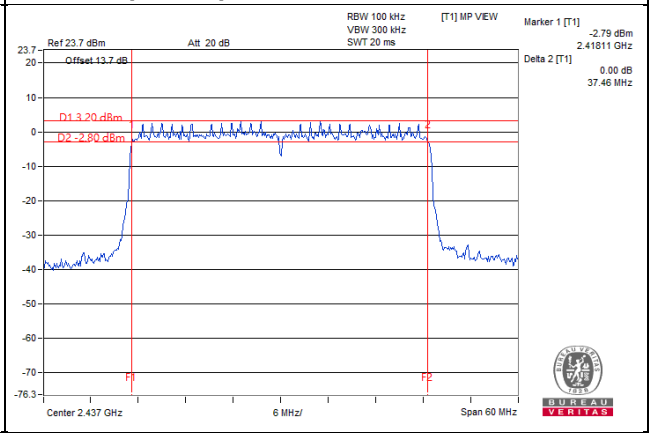
802.11ax (40MHz) Ant2 CH6



802.11ax (40MHz) Ant3 CH6

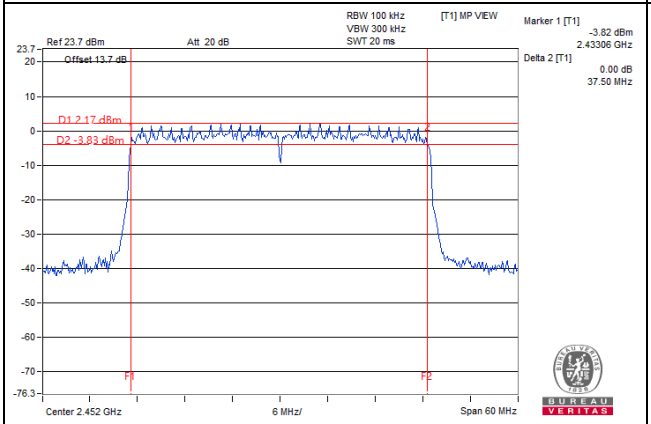


802.11ax (40MHz) Ant4 CH6

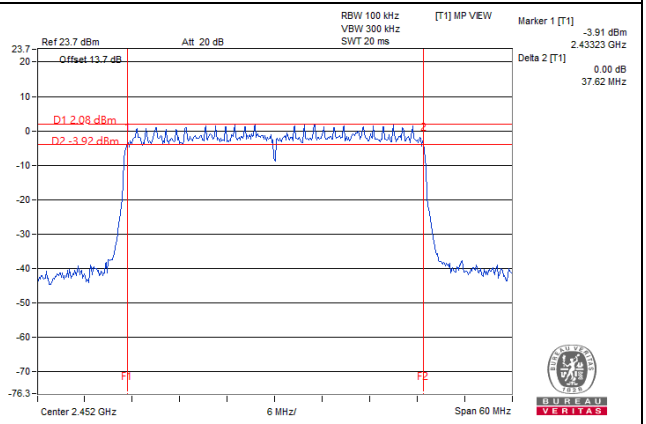


SPECTRUM PLOT

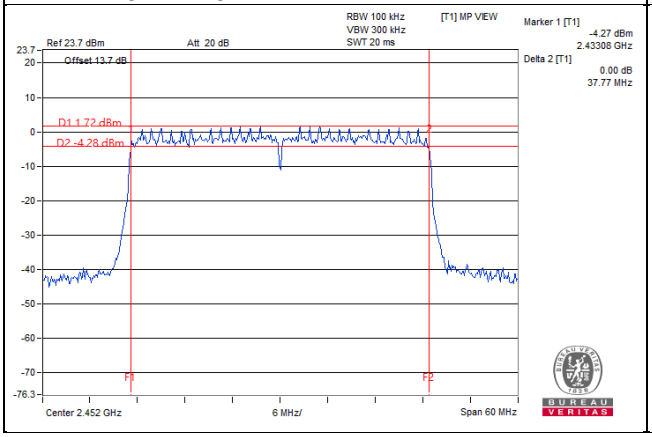
802.11ax (40MHz) Ant1 CH9



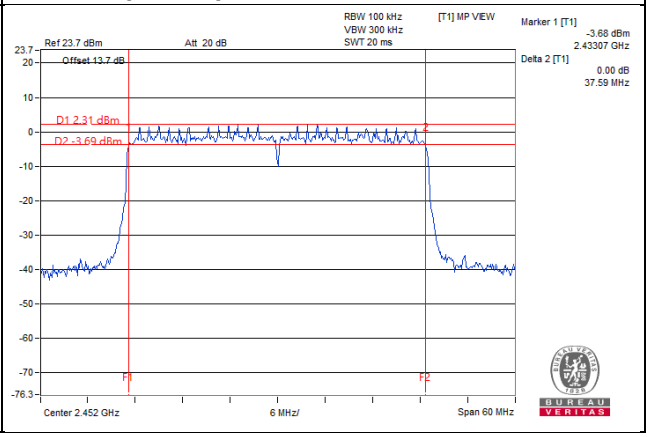
802.11ax (40MHz) Ant2 CH9



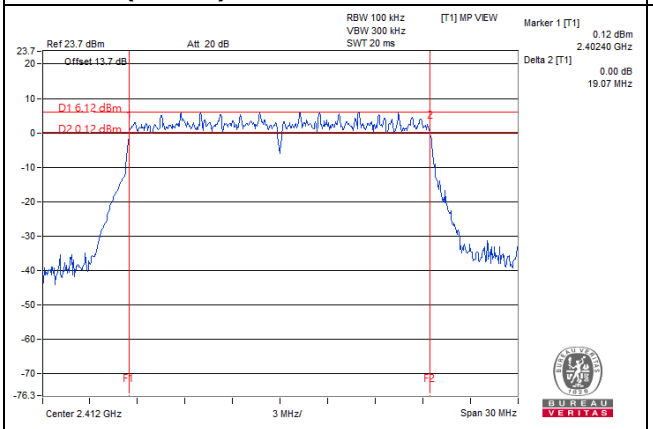
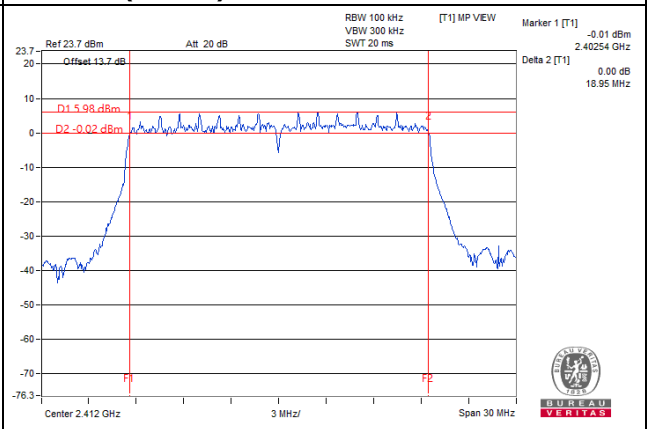
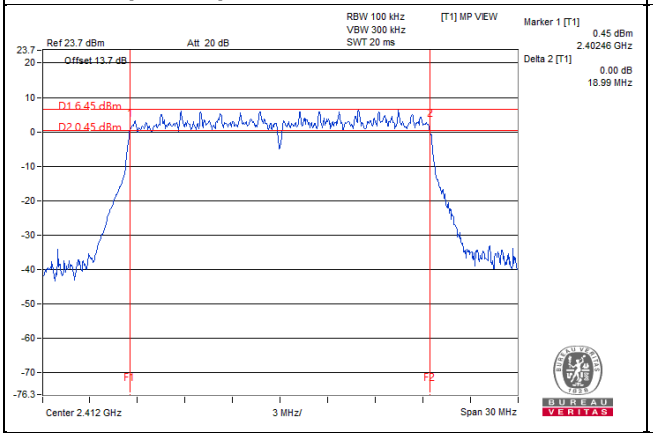
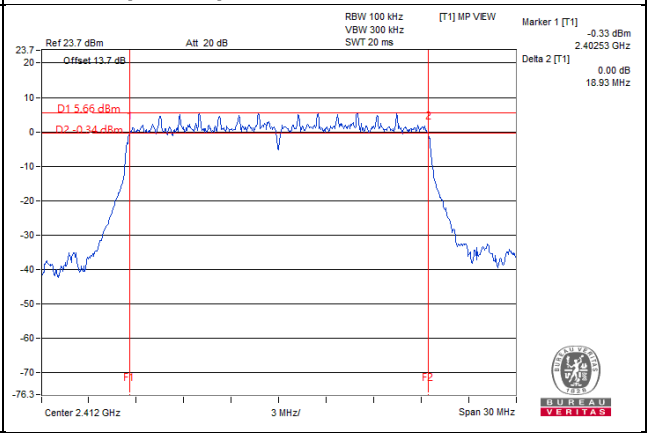
802.11ax (40MHz) Ant3 CH9



802.11ax (40MHz) Ant4 CH9

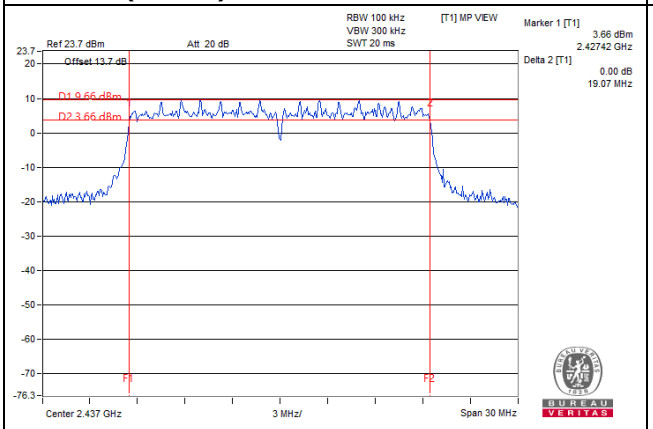


2S4T TxBF

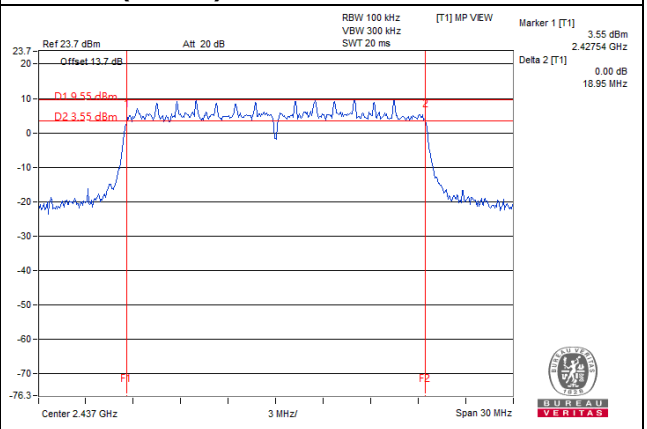
SPECTRUM PLOT	
802.11ax (20MHz) Ant1 CH1	**802.11ax (20MHz) Ant2 CH1**
	
802.11ax (20MHz) Ant3 CH1	**802.11ax (20MHz) Ant4 CH1**
	

SPECTRUM PLOT

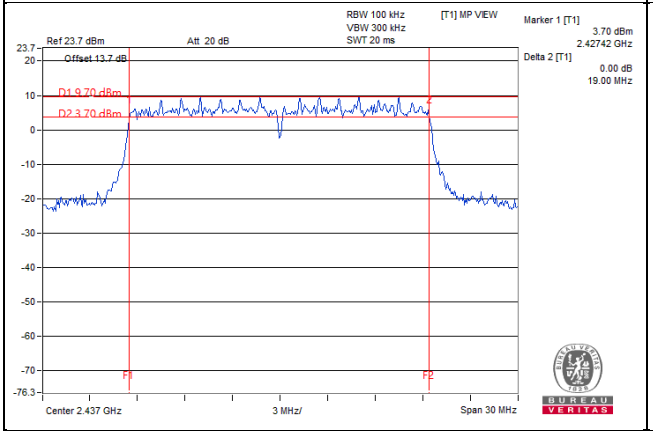
802.11ax (20MHz) Ant1 CH6



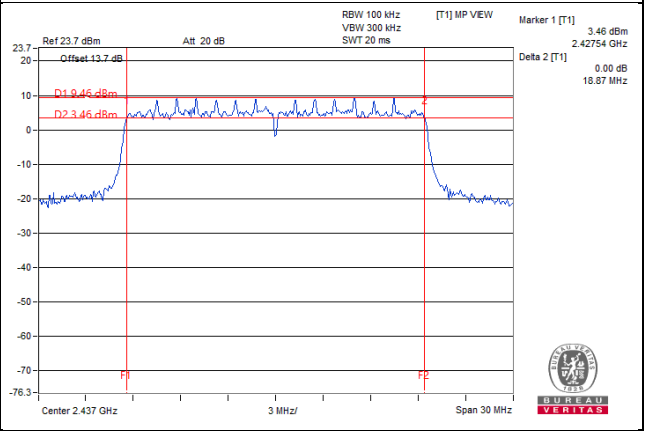
802.11ax (20MHz) Ant2 CH6

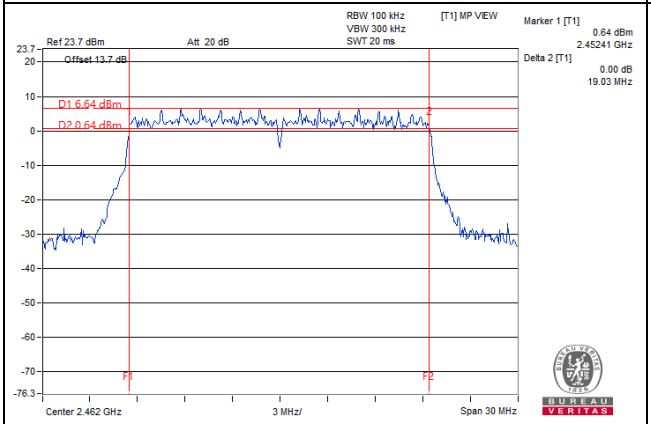
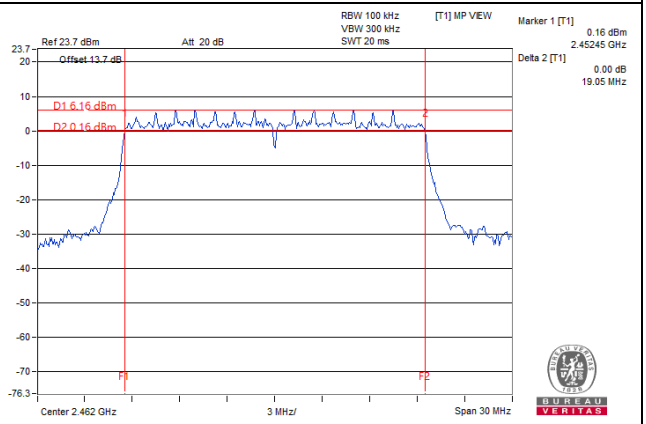
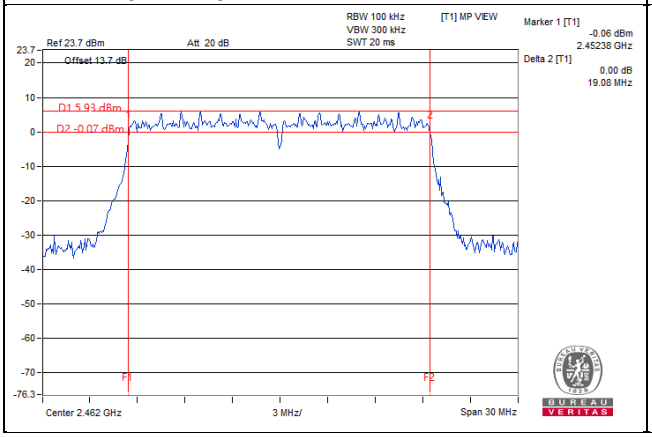
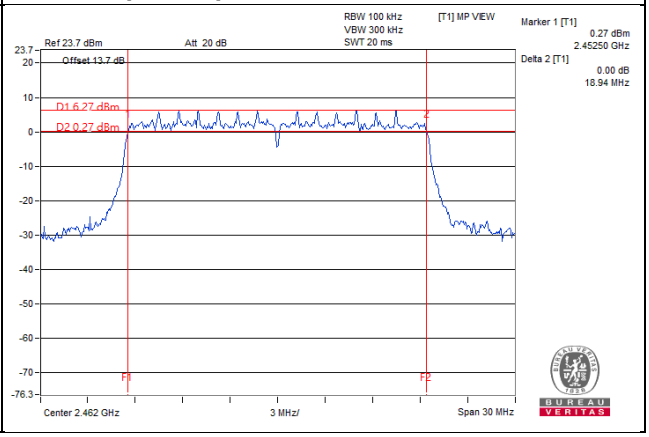


802.11ax (20MHz) Ant3 CH6



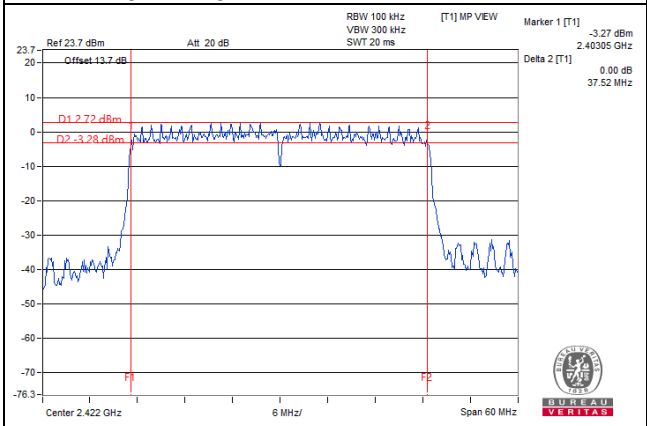
802.11ax (20MHz) Ant4 CH6



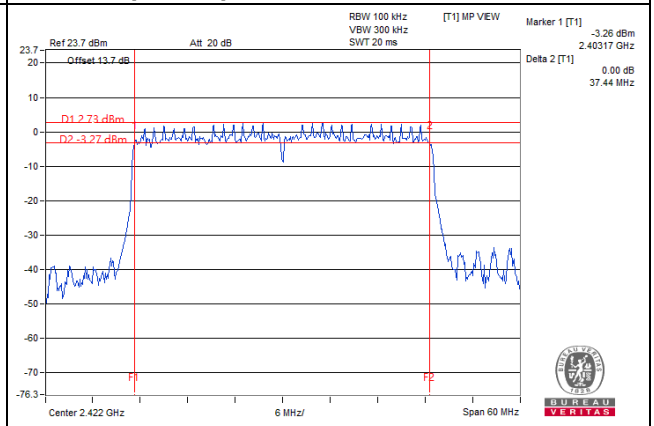
SPECTRUM PLOT	
802.11ax (20MHz) Ant1 CH11	**802.11ax (20MHz) Ant2 CH11**
	
802.11ax (20MHz) Ant3 CH11	**802.11ax (20MHz) Ant4 CH11**
	

SPECTRUM PLOT

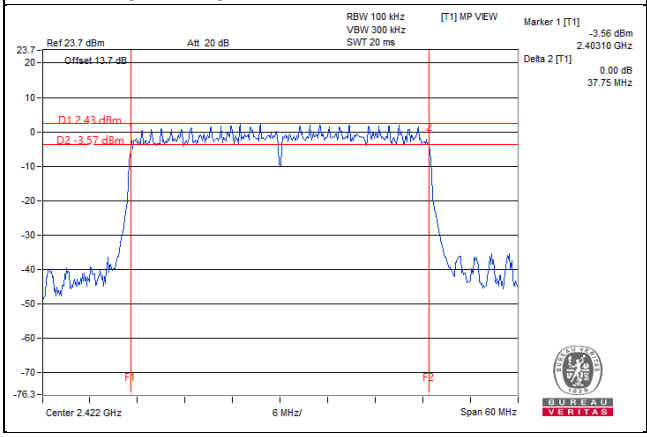
802.11ax (40MHz) Ant1 CH3



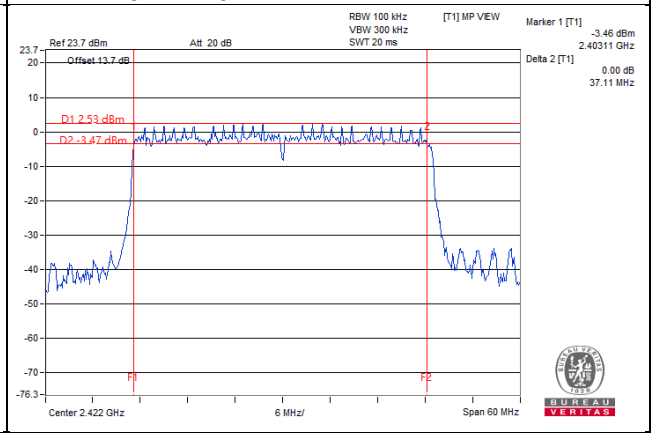
802.11ax (40MHz) Ant2 CH3



802.11ax (40MHz) Ant3 CH3

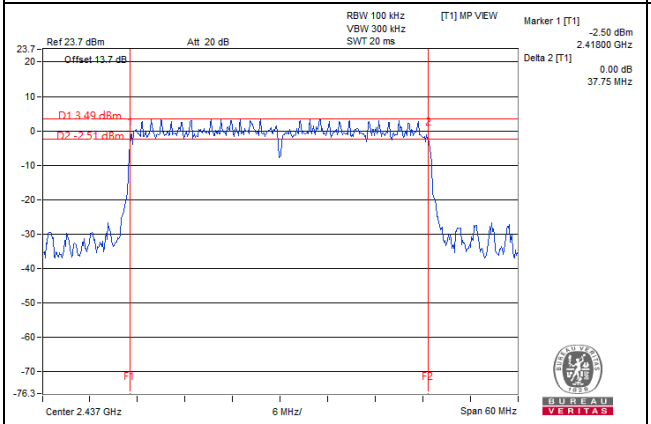


802.11ax (40MHz) Ant4 CH3

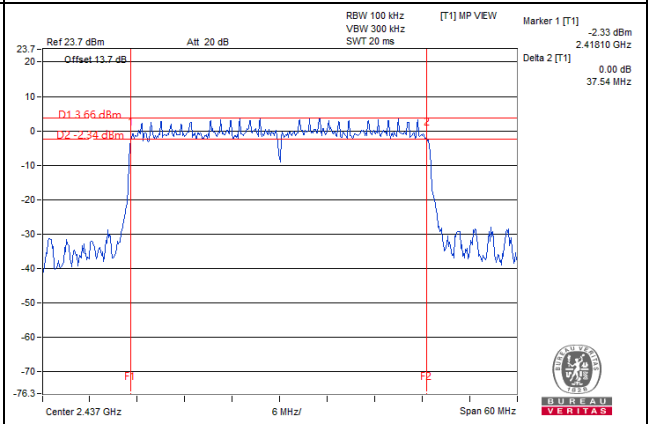


SPECTRUM PLOT

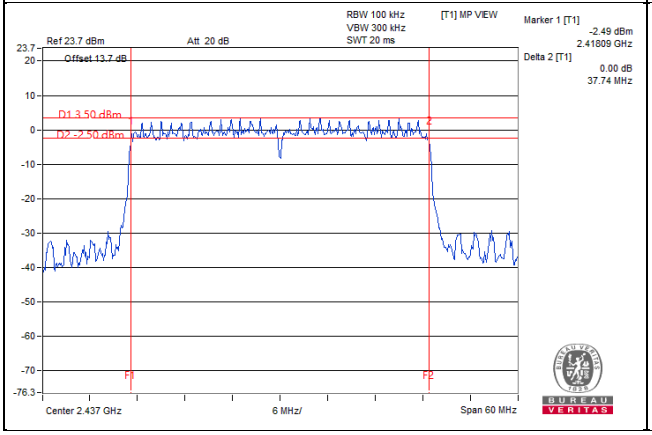
802.11ax (40MHz) Ant1 CH6



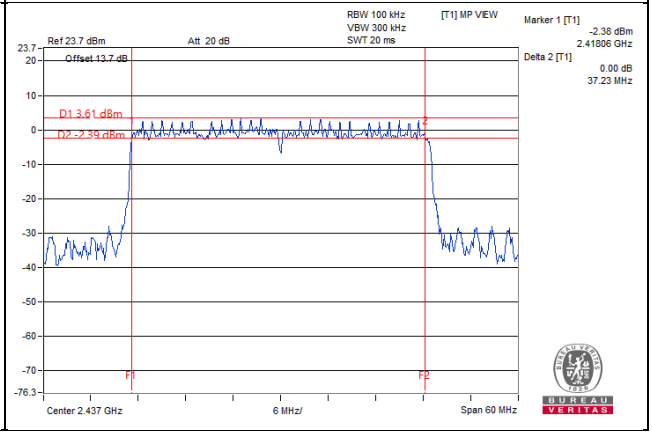
802.11ax (40MHz) Ant2 CH6



802.11ax (40MHz) Ant3 CH6

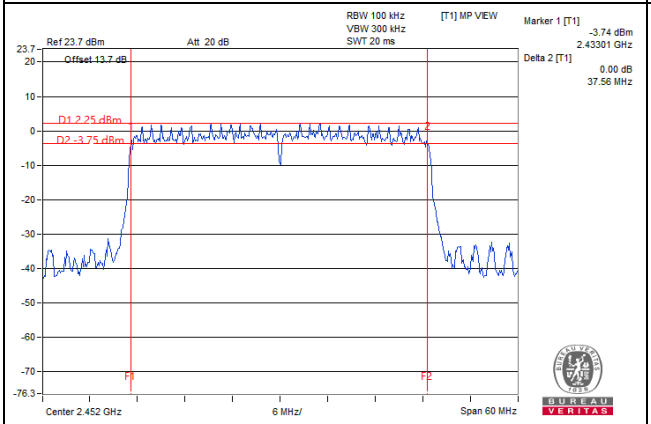


802.11ax (40MHz) Ant4 CH6

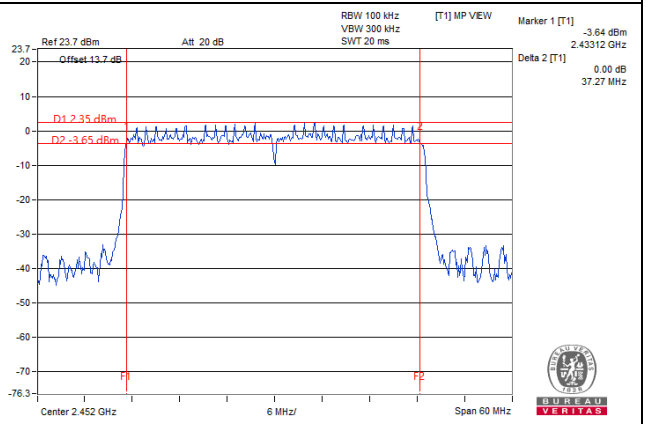


SPECTRUM PLOT

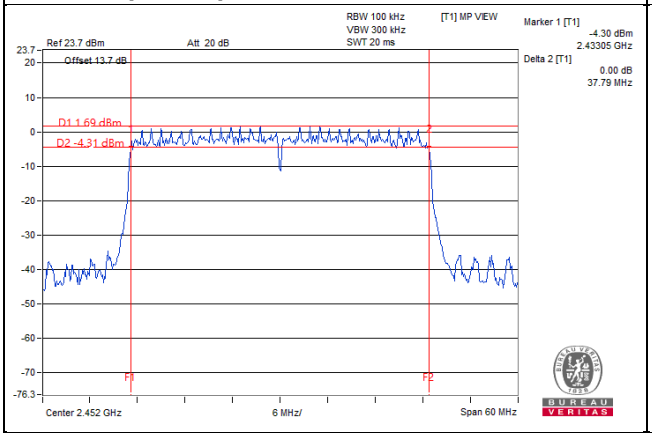
802.11ax (40MHz) Ant1 CH9



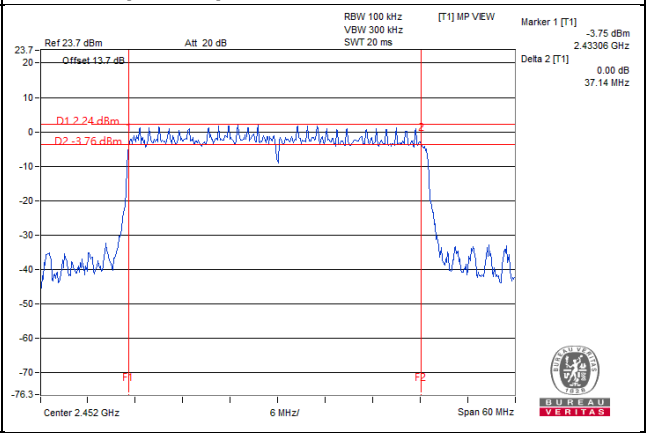
802.11ax (40MHz) Ant2 CH9



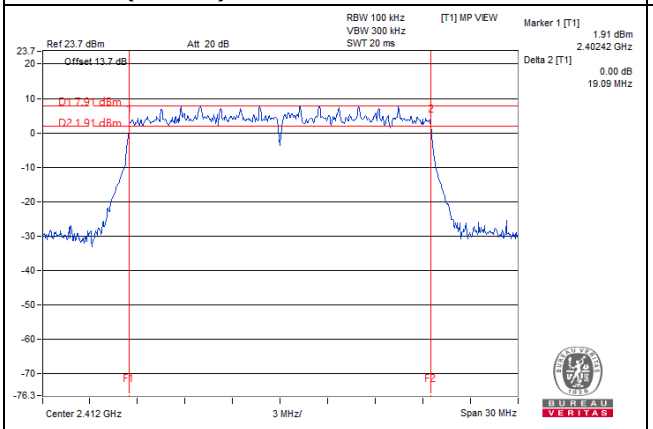
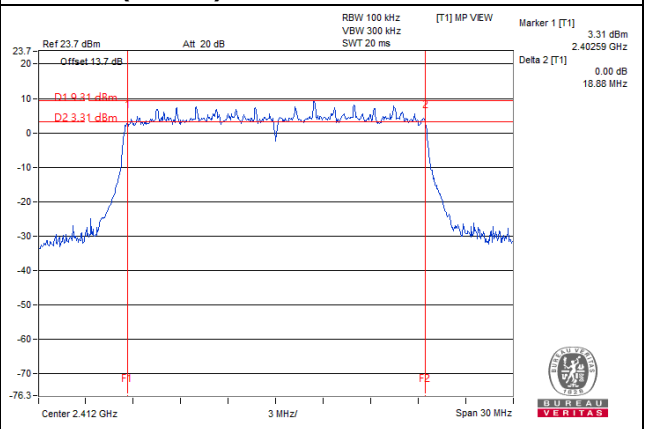
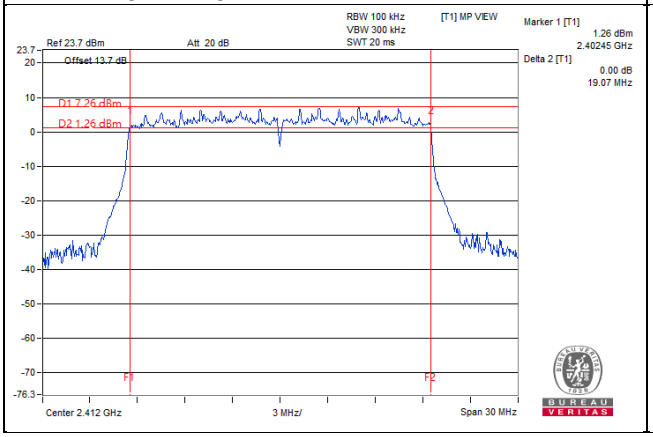
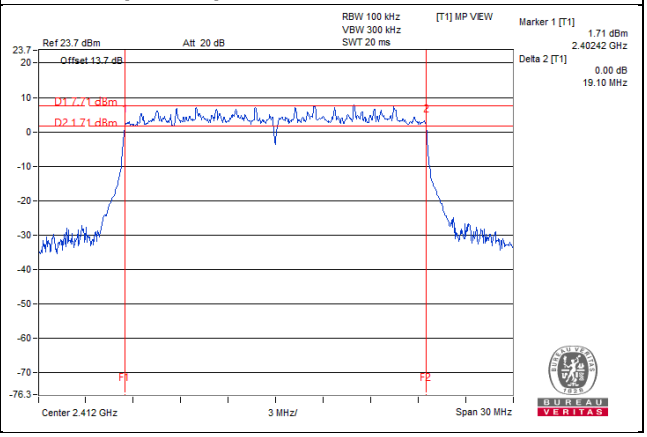
802.11ax (40MHz) Ant3 CH9



802.11ax (40MHz) Ant4 CH9

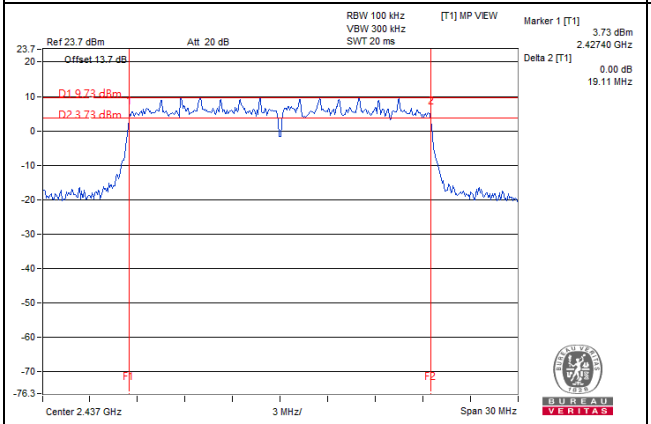


3S4T TxBF

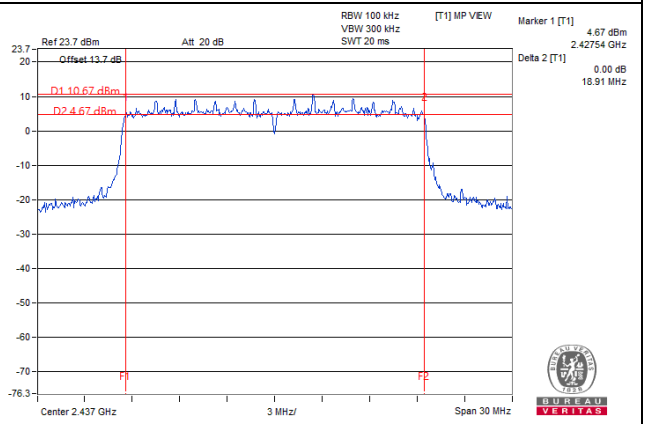
SPECTRUM PLOT	
802.11ax (20MHz) Ant1 CH1	**802.11ax (20MHz) Ant2 CH1**
	
802.11ax (20MHz) Ant3 CH1	**802.11ax (20MHz) Ant4 CH1**
	

SPECTRUM PLOT

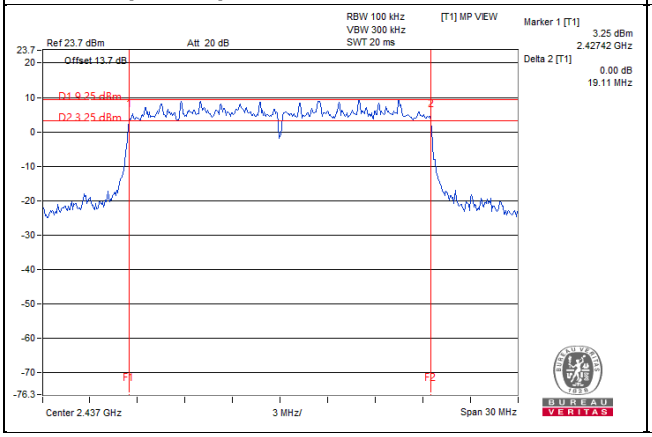
802.11ax (20MHz) Ant1 CH6



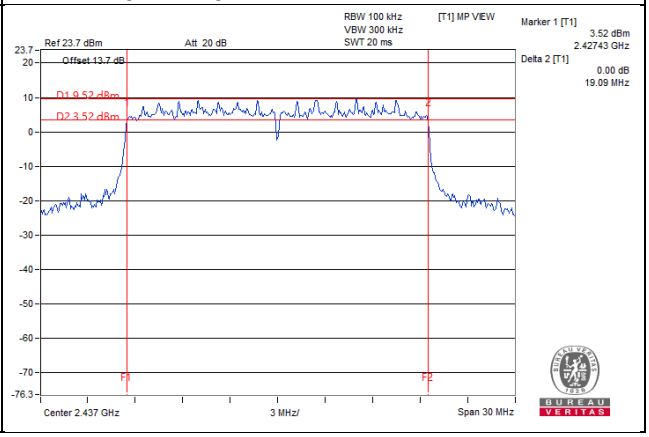
802.11ax (20MHz) Ant2 CH6



802.11ax (20MHz) Ant3 CH6

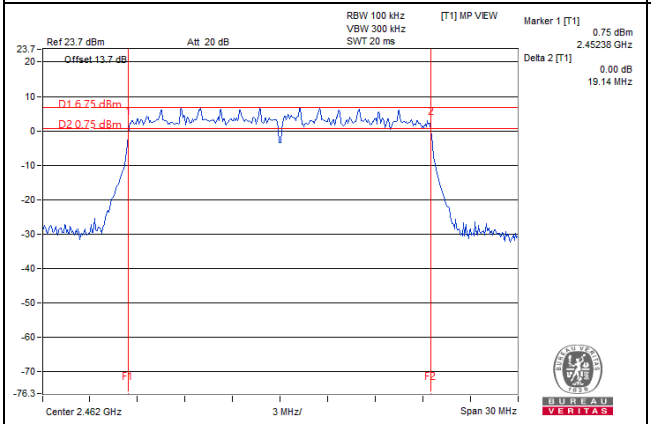


802.11ax (20MHz) Ant4 CH6

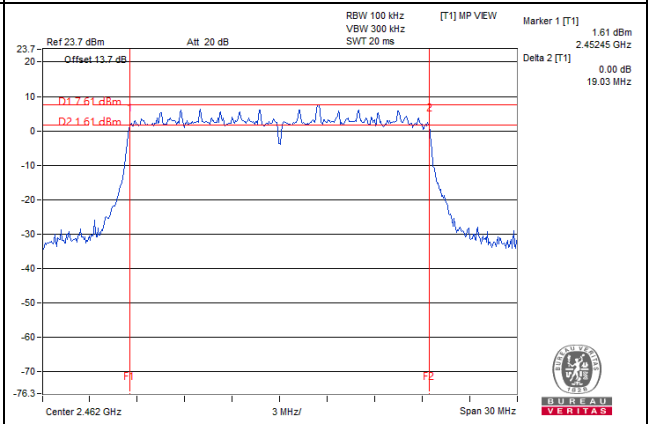


SPECTRUM PLOT

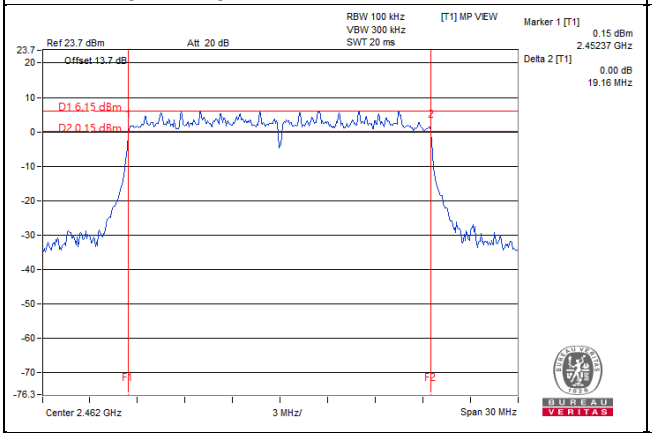
802.11ax (20MHz) Ant1 CH11



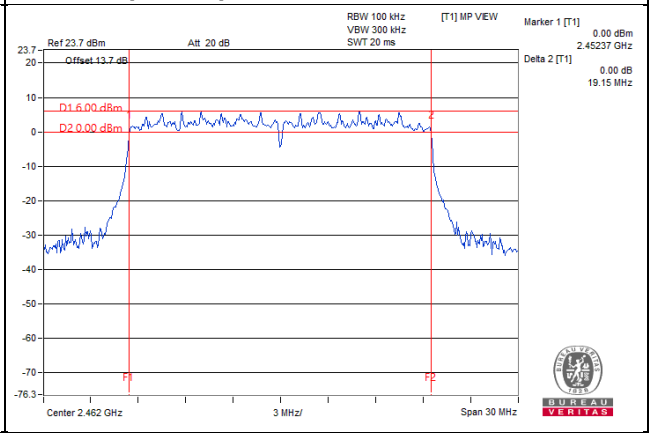
802.11ax (20MHz) Ant2 CH11



802.11ax (20MHz) Ant3 CH11

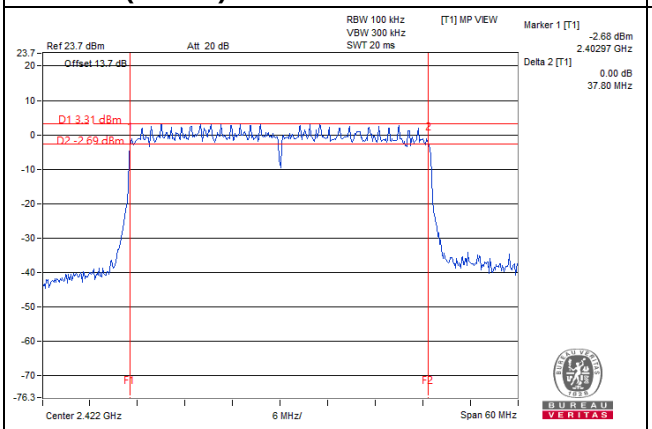


802.11ax (20MHz) Ant4 CH11

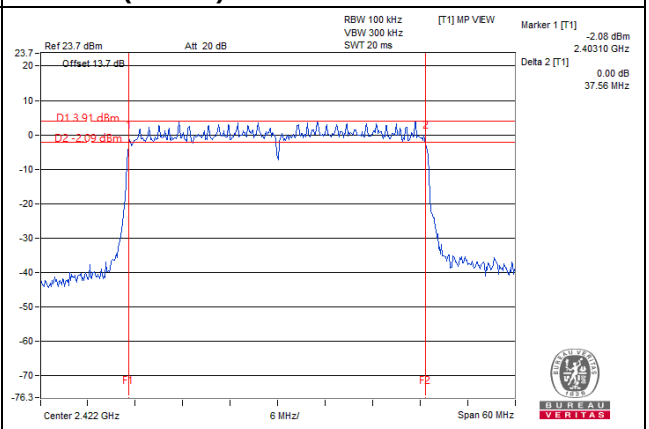


SPECTRUM PLOT

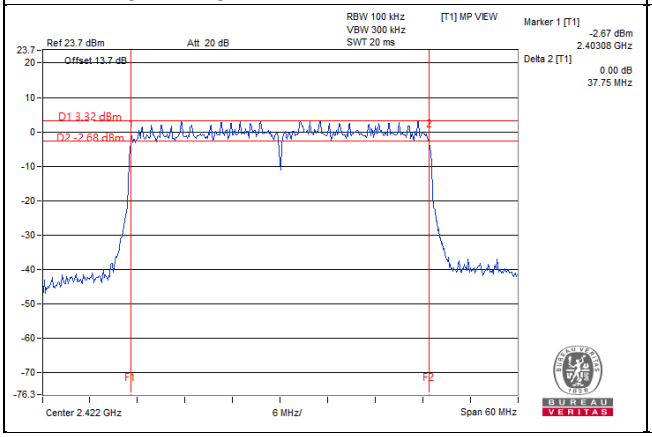
802.11ax (40MHz) Ant1 CH3



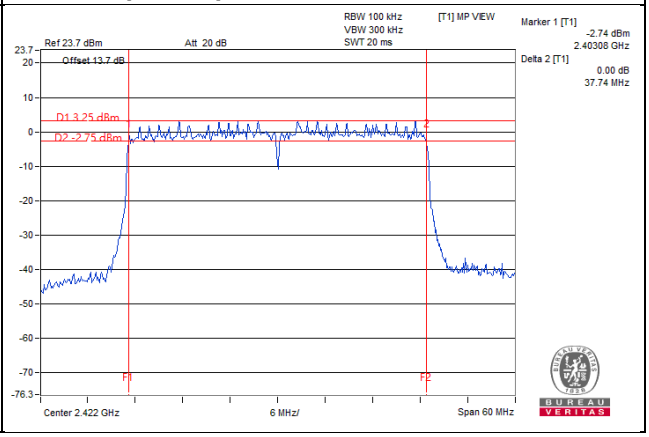
802.11ax (40MHz) Ant2 CH3



802.11ax (40MHz) Ant3 CH3

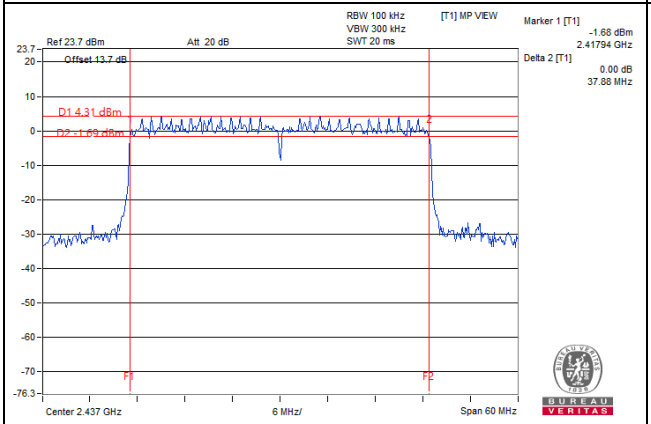


802.11ax (40MHz) Ant4 CH3

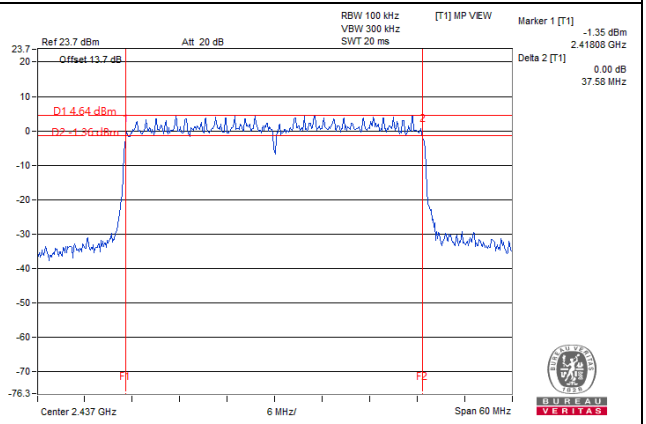


SPECTRUM PLOT

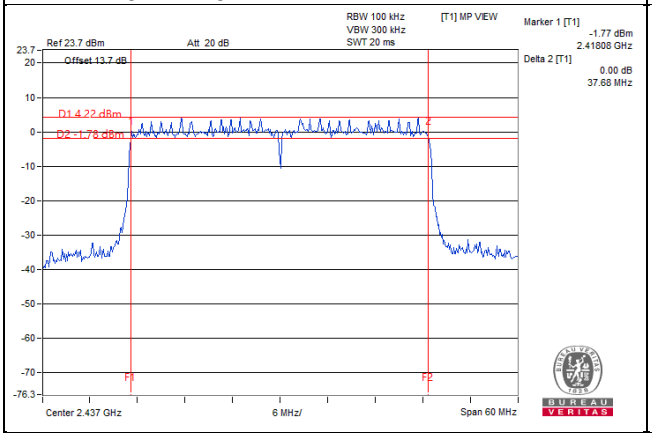
802.11ax (40MHz) Ant1 CH6



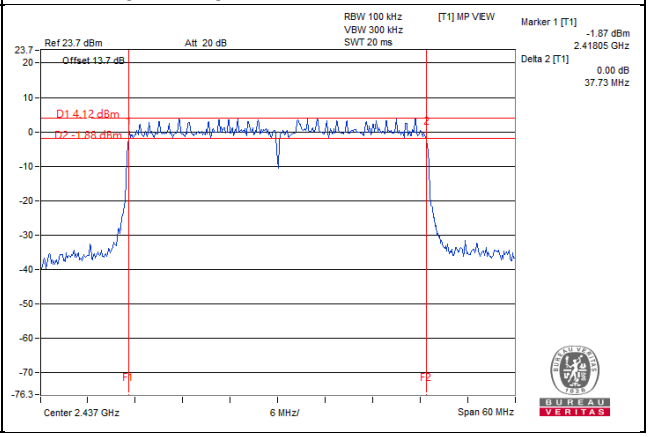
802.11ax (40MHz) Ant2 CH6



802.11ax (40MHz) Ant3 CH6

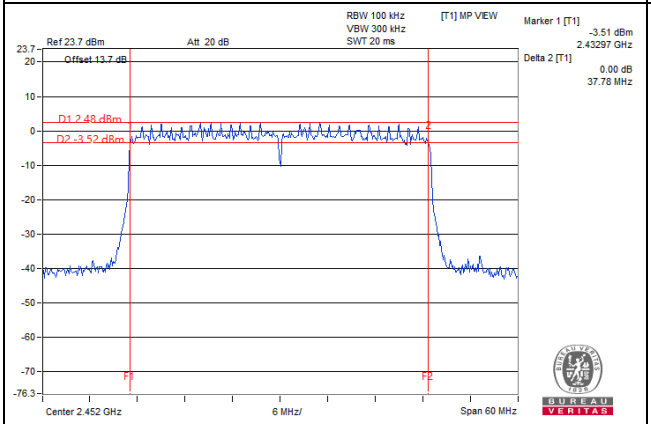


802.11ax (40MHz) Ant4 CH6

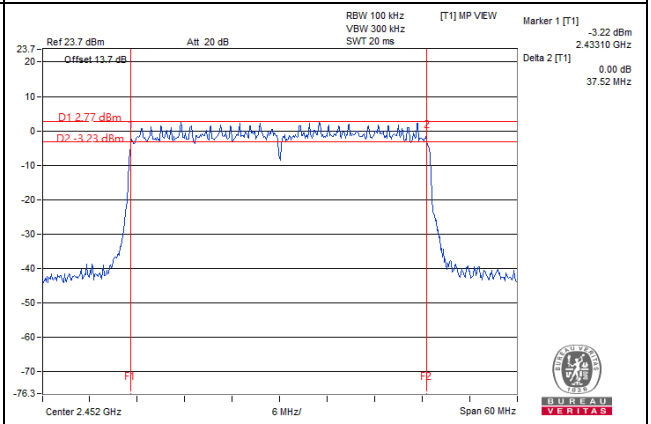


SPECTRUM PLOT

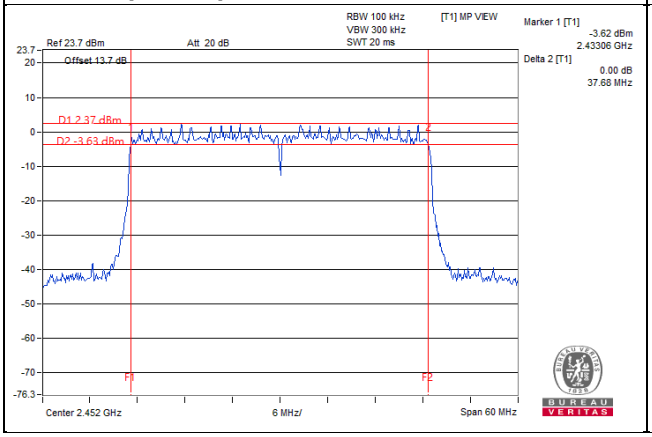
802.11ax (40MHz) Ant1 CH9



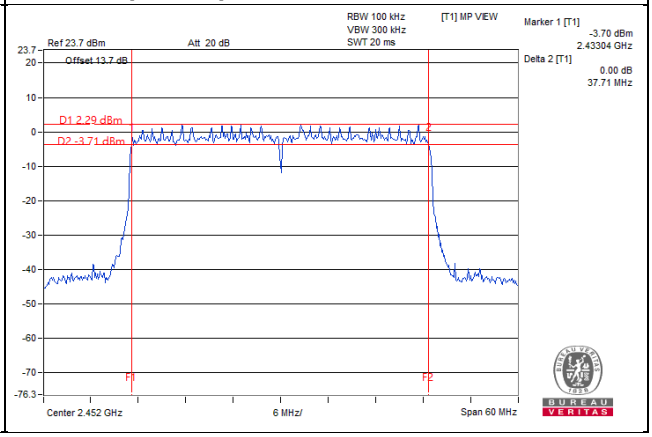
802.11ax (40MHz) Ant2 CH9



802.11ax (40MHz) Ant3 CH9



802.11ax (40MHz) Ant4 CH9



4.5 Occupied Bandwidth Measurement

4.5.1 Measuring Instruments and Setting

The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
RBW	1% to 5% of the anticipated emission bandwidth
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto couple

4.5.2 Test Procedure

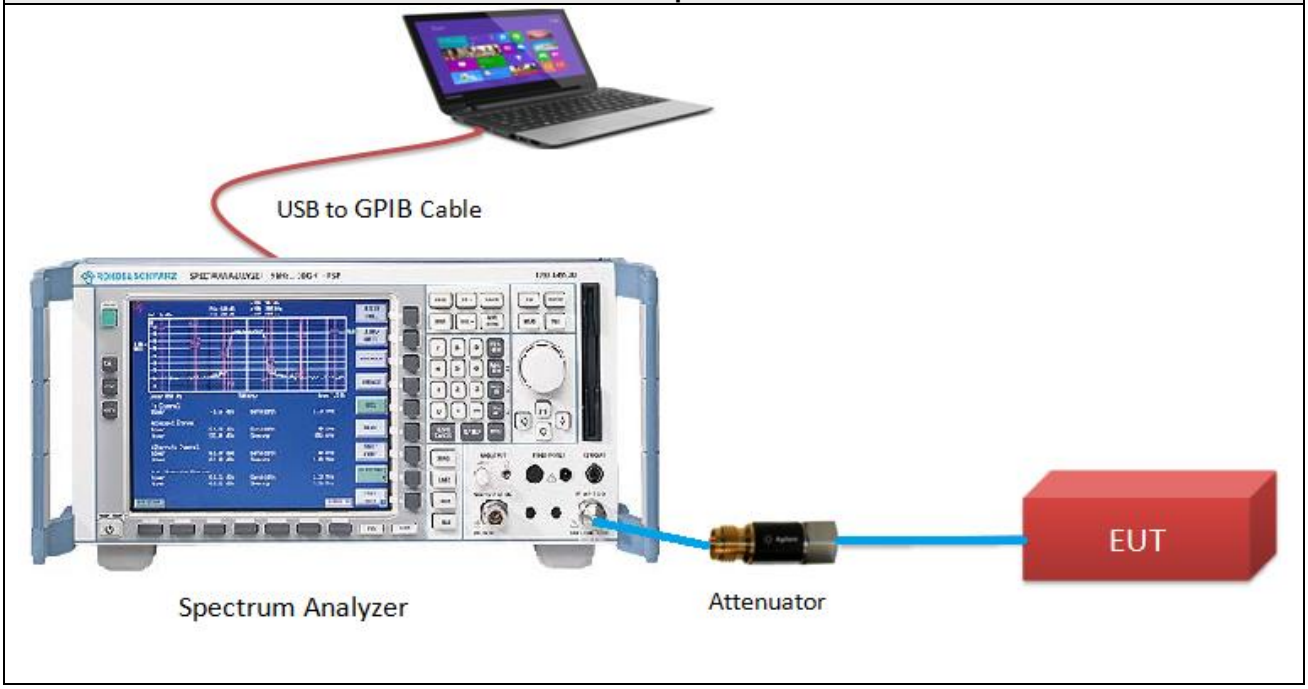
1 The transmitter output (antenna port) was connected to the spectrum analyzer in peak, Max hold mode.

2 For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier frequency. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to peak.

3 The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

4.5.3 Test Setup Layout

Setup



4.5.4 Test Deviation

There are no deviations with the original standard.

4.5.5 EUT Operating Conditions

The EUT was programmed to be in continuously transmitting mode.

4.5.6 Test Results of Occupied Bandwidth

Temperature	25°C	Humidity	60%
Test Engineer	Jyunchun Lin		

1S4T CDD

802.11b 1Tx Ant1

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)
1	2412	10.69
6	2437	11.52
11	2462	11.28

802.11ax (20MHz)

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)			
		ANT 1	ANT 2	ANT 3	ANT 4
1	2412	19.14	19.22	19.22	19.22
6	2437	19.32	19.3	19.3	19.44
11	2462	19.08	19.32	19.2	19.32

802.11ax (40MHz)

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)			
		ANT 1	ANT 2	ANT 3	ANT 4
3	2422	38.43	37.92	37.68	37.68
6	2437	37.68	37.92	37.68	37.68
9	2452	37.68	37.68	37.68	37.68

1S4T TxBF

802.11ax (20MHz)

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)			
		ANT 1	ANT 2	ANT 3	ANT 4
1	2412	19.05	19.05	19.14	19.22
6	2437	19.32	19.32	19.2	19.44
11	2462	19.22	19.2	19.2	19.2

802.11ax (40MHz)

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)			
		ANT 1	ANT 2	ANT 3	ANT 4
3	2422	37.74	37.68	37.68	37.68
6	2437	37.68	37.68	37.68	37.92
9	2452	37.92	37.68	37.68	37.68

2S4T TxBF

802.11ax (20MHz)

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)			
		ANT 1	ANT 2	ANT 3	ANT 4
1	2412	19.05	19.05	19.05	19.14
6	2437	19.32	19.2	19.32	19.2
11	2462	19.13	19.2	19.08	19.08

802.11ax (40MHz)

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)			
		ANT 1	ANT 2	ANT 3	ANT 4
3	2422	37.92	37.92	37.92	37.68
6	2437	37.92	37.92	37.92	37.68
9	2452	37.92	37.92	37.92	37.68

3S4T TxBF

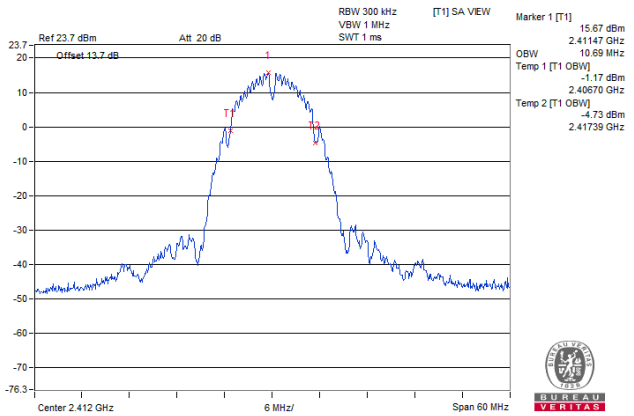
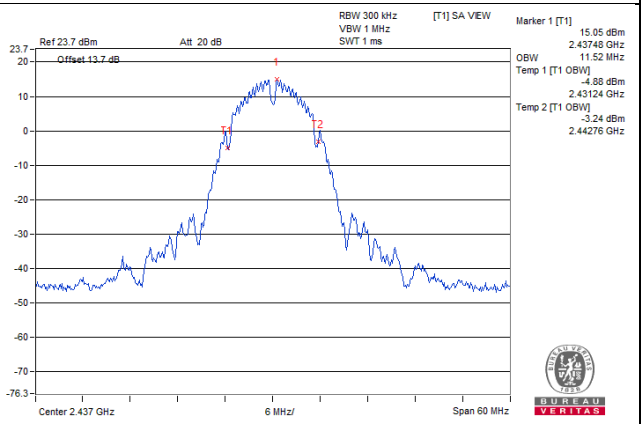
802.11ax (20MHz)

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)			
		ANT 1	ANT 2	ANT 3	ANT 4
1	2412	19.22	19.05	19.13	19.13
6	2437	19.32	19.13	19.2	19.2
11	2462	19.2	19.08	19.2	19.2

802.11ax (40MHz)

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)			
		ANT 1	ANT 2	ANT 3	ANT 4
3	2422	37.68	37.68	37.92	37.92
6	2437	37.68	37.44	37.92	37.92
9	2452	37.68	37.68	37.92	37.92

1S1T SISO

SPECTRUM PLOT	
802.11b 1Tx Ant1 CH1	**802.11b 1Tx Ant1 CH6**
	
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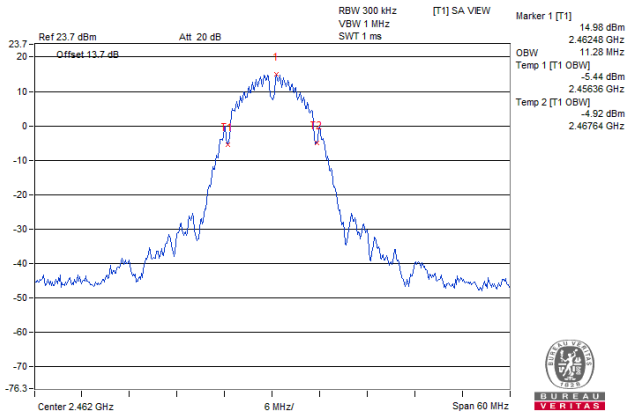
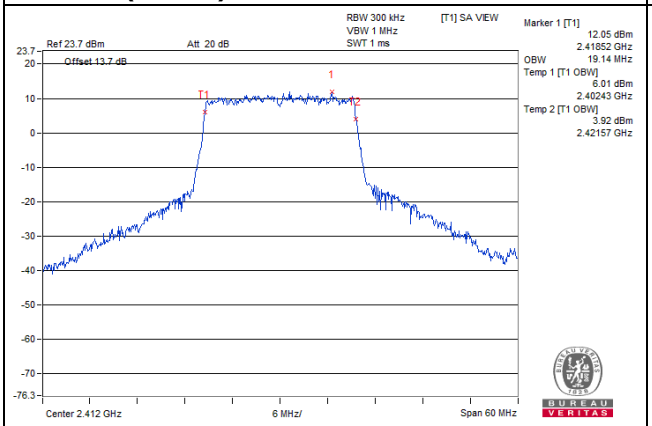
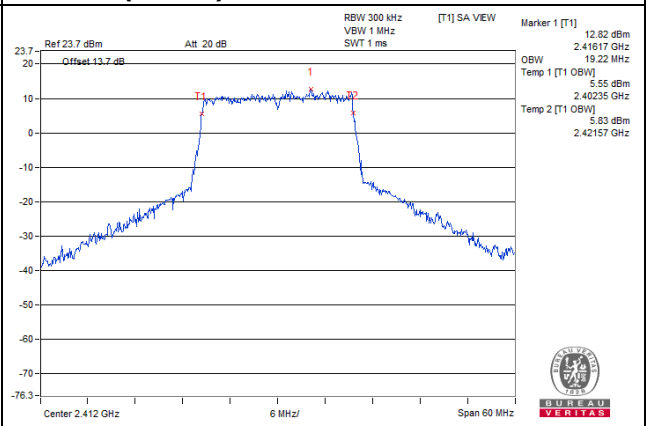
	

1S4T CDD

SPECTRUM PLOT	
802.11ax (20MHz) Ant1 CH1	**802.11ax (20MHz) Ant2 CH1**
	
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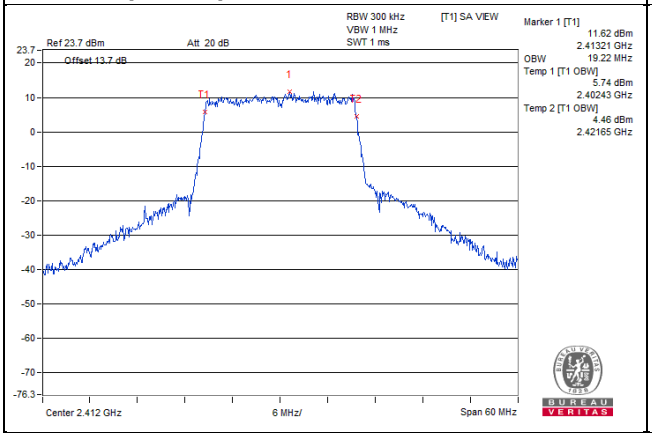
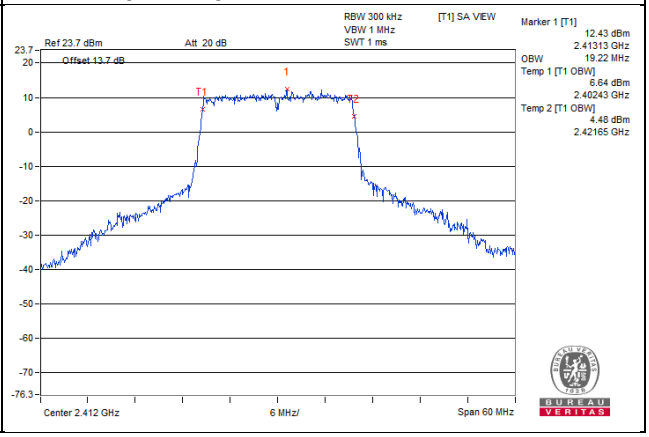
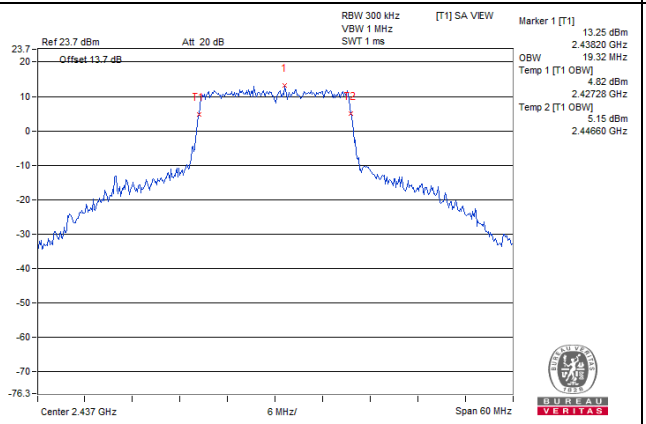
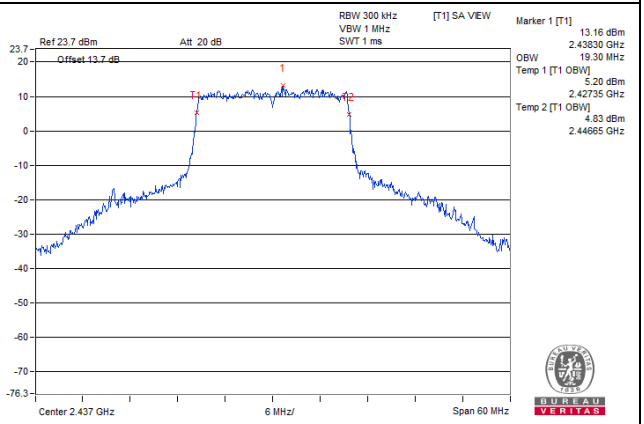
	

SPECTRUM PLOT	
802.11ax (20MHz) Ant1 CH6	**802.11ax (20MHz) Ant2 CH6**
	
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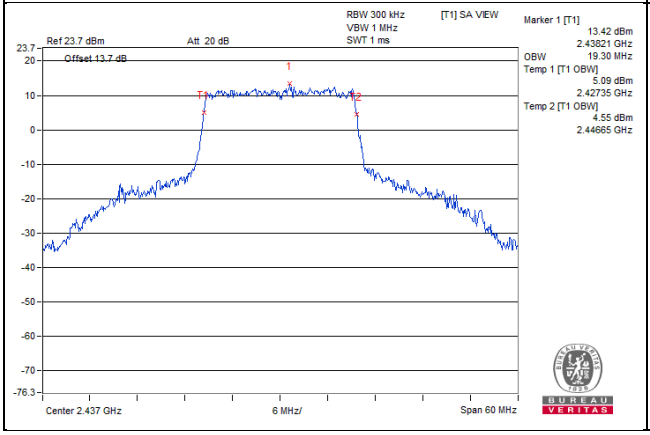	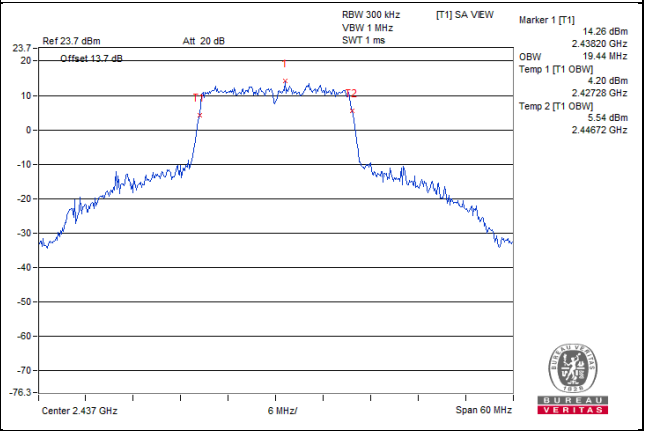

SPECTRUM PLOT

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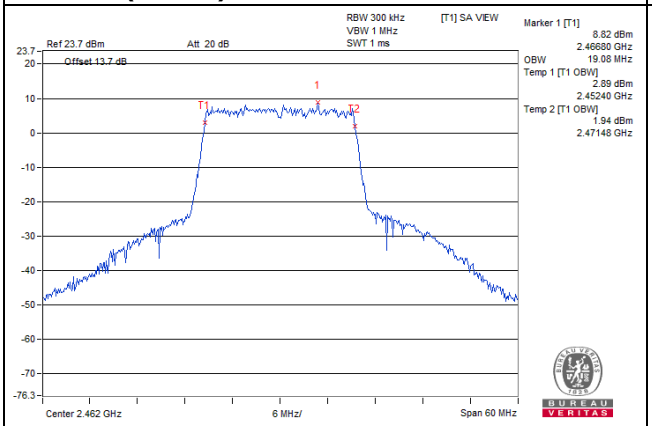

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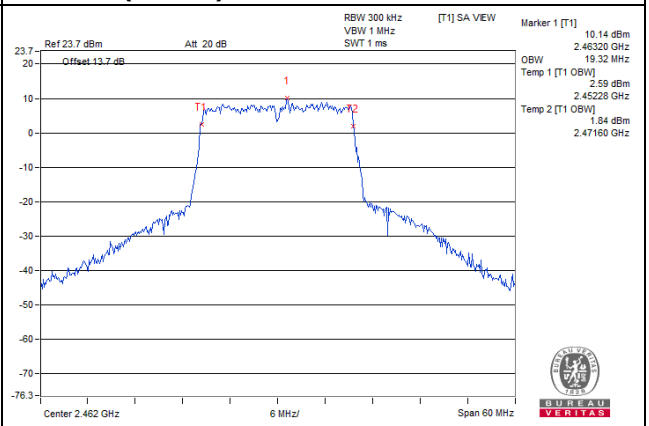

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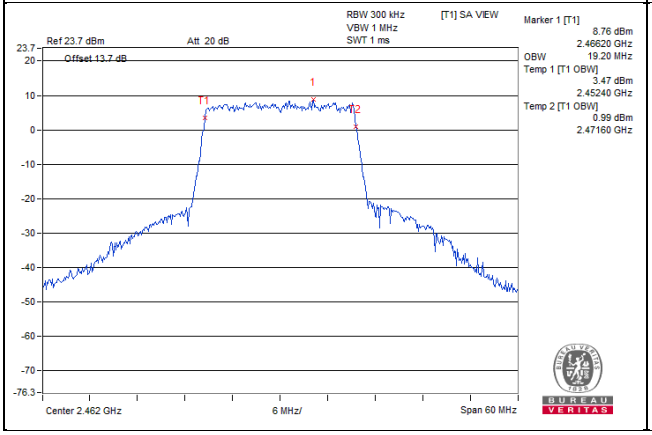
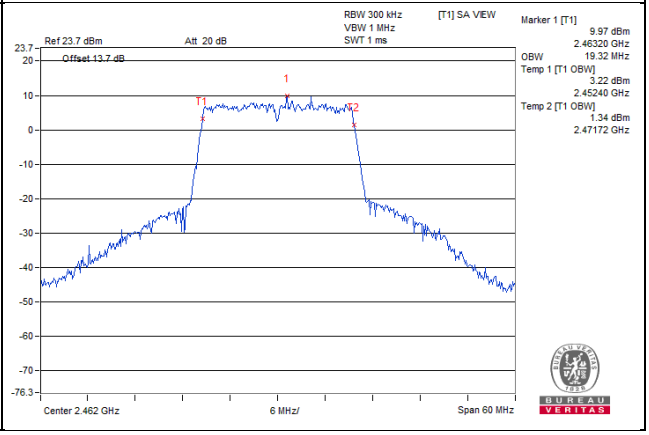
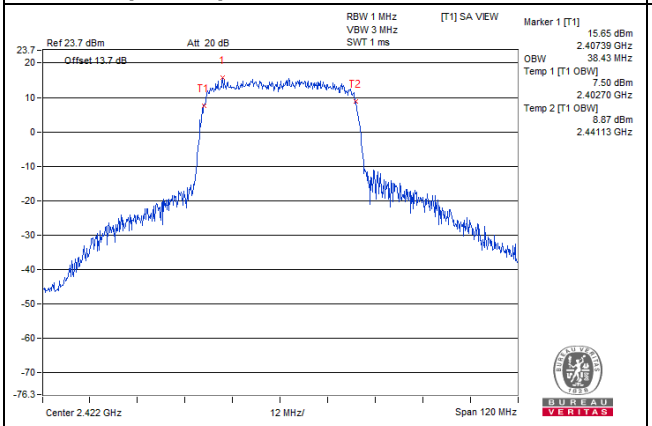


802.11ax (20MHz) Ant4 CH11

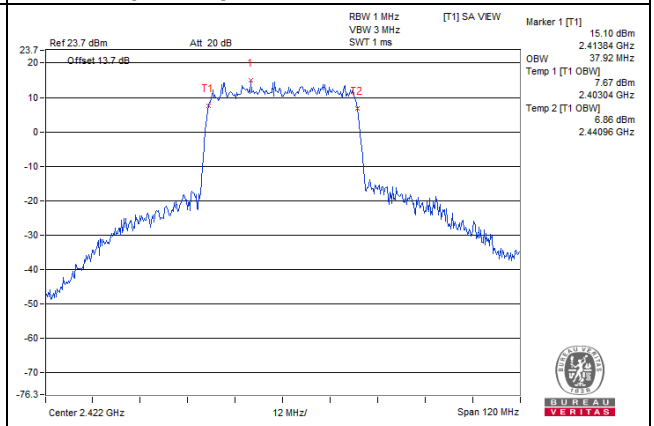


SPECTRUM PLOT

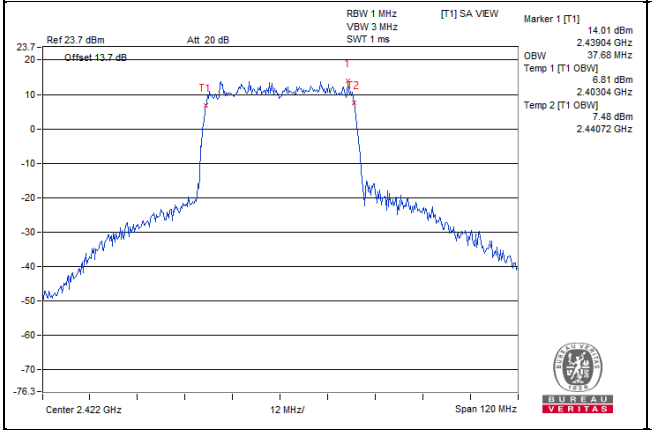
802.11ax (40MHz) Ant1 CH3



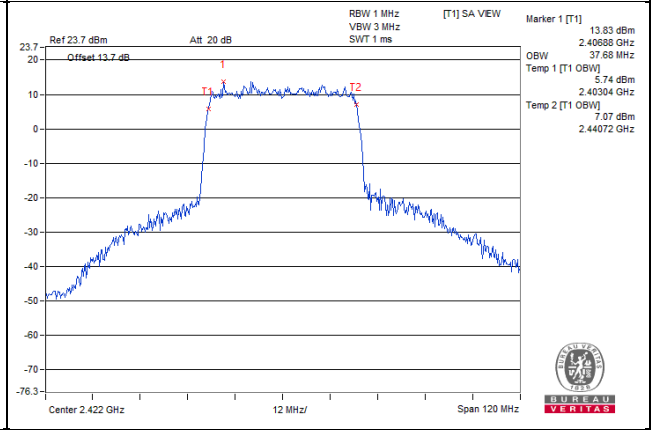
802.11ax (40MHz) Ant2 CH3



802.11ax (40MHz) Ant3 CH3

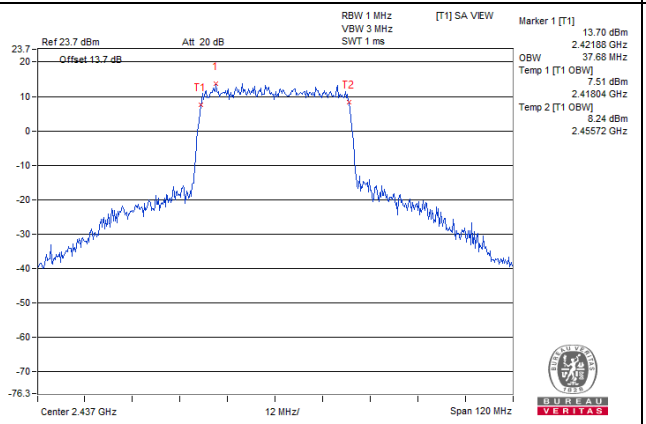


802.11ax (40MHz) Ant4 CH3

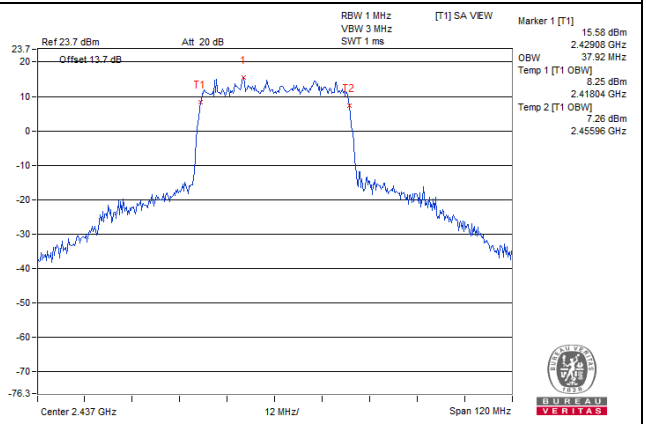


SPECTRUM PLOT

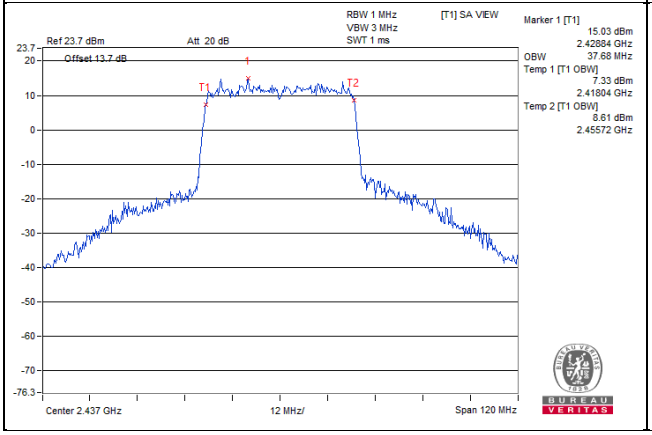
802.11ax (40MHz) Ant1 CH6



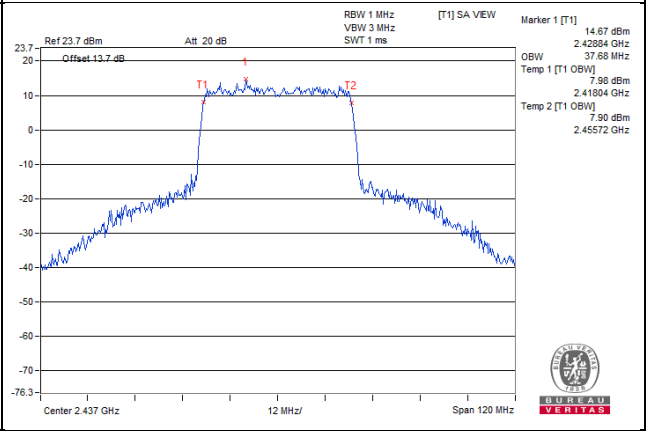
802.11ax (40MHz) Ant2 CH6



802.11ax (40MHz) Ant3 CH6

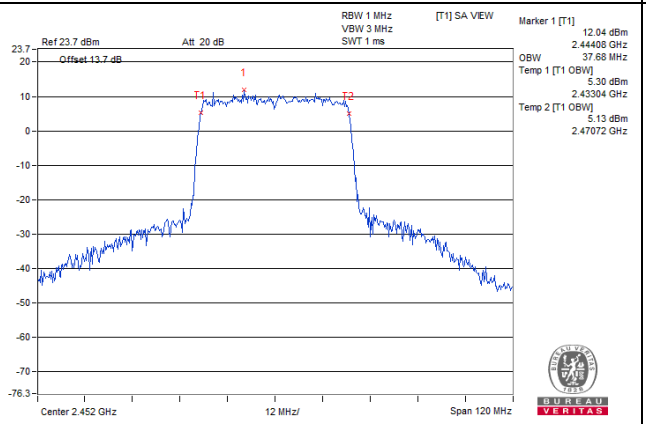


802.11ax (40MHz) Ant4 CH6

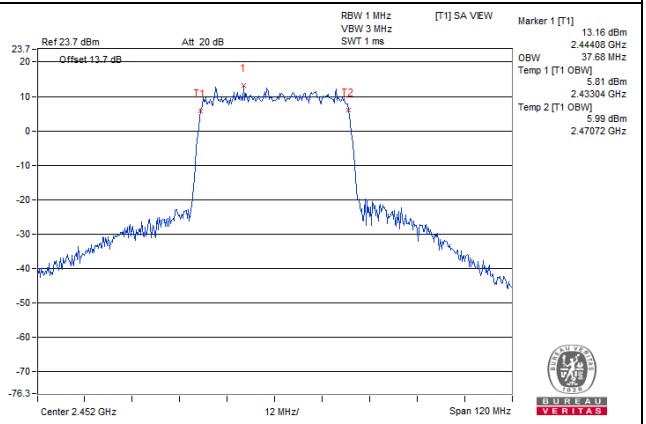


SPECTRUM PLOT

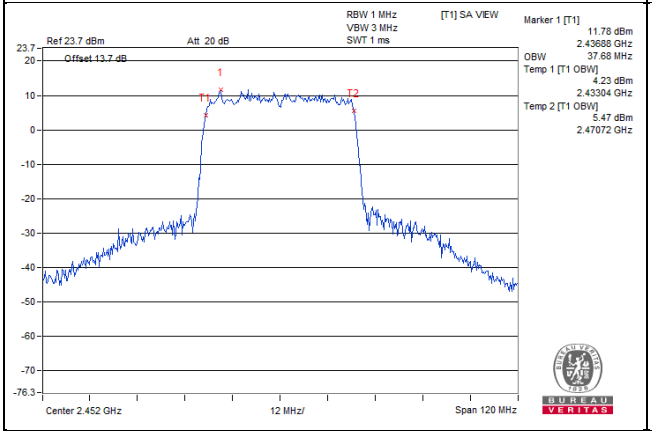
802.11ax (40MHz) Ant1 CH9



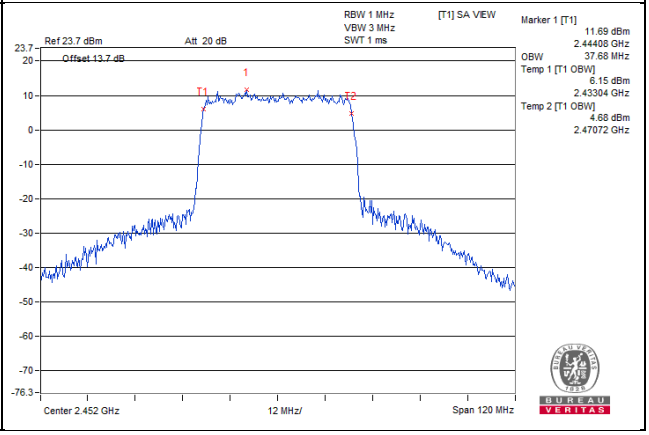
802.11ax (40MHz) Ant2 CH9



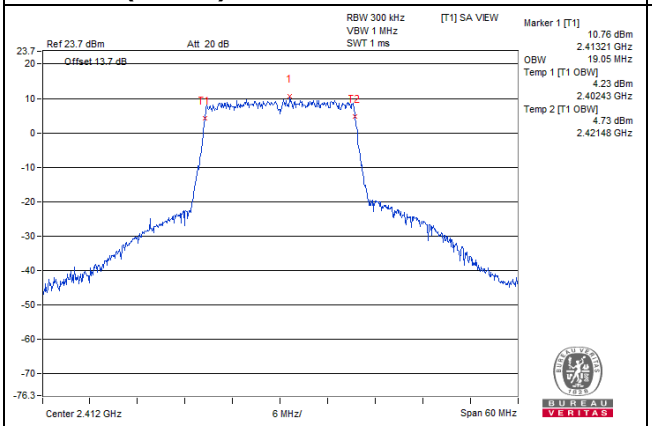
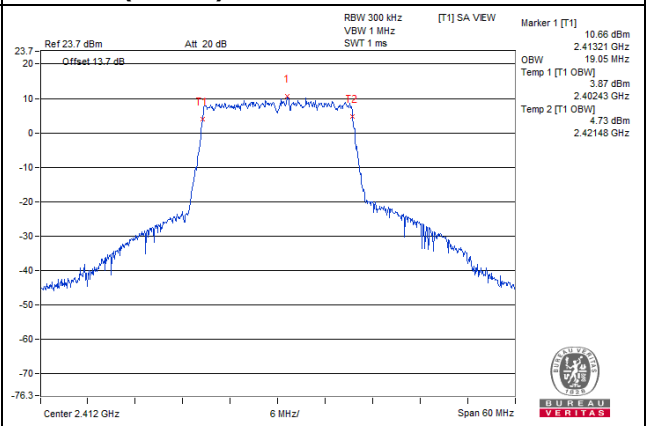
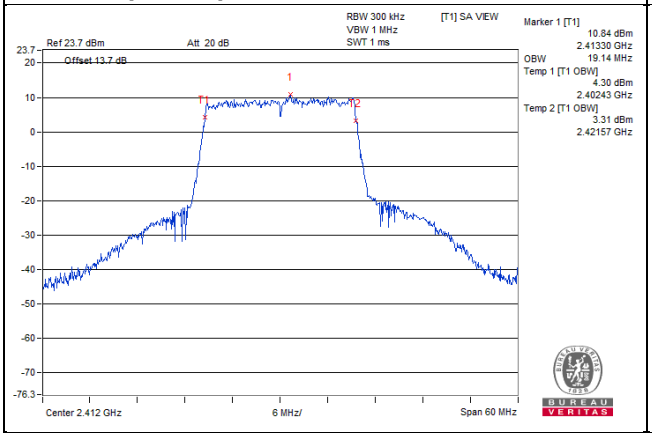
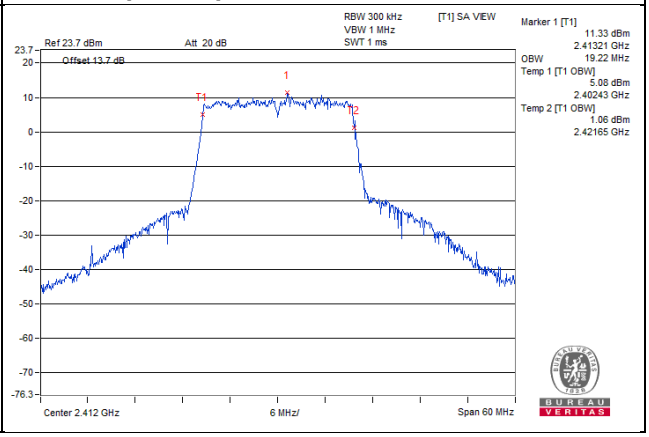
802.11ax (40MHz) Ant3 CH9



802.11ax (40MHz) Ant4 CH9

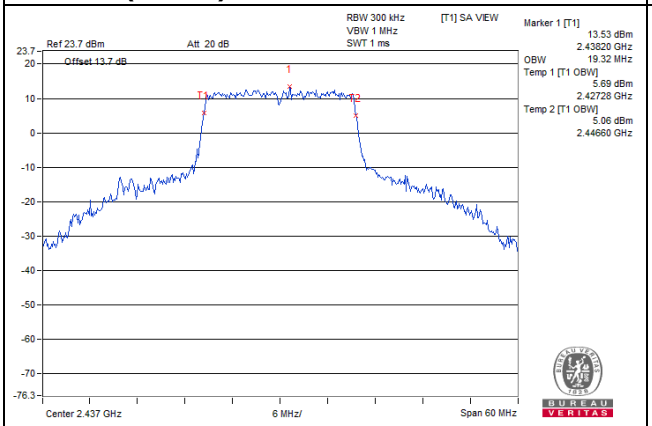


1S4T TxBF

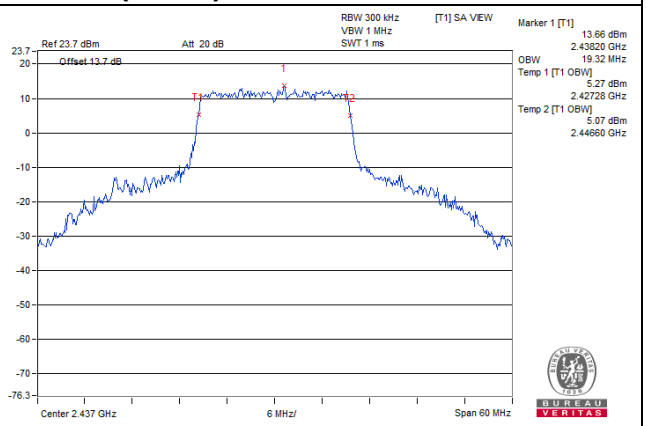
SPECTRUM PLOT	
802.11ax (20MHz) Ant1 CH1	**802.11ax (20MHz) Ant2 CH1**
	
802.11ax (20MHz) Ant3 CH1	**802.11ax (20MHz) Ant4 CH1**
	

SPECTRUM PLOT

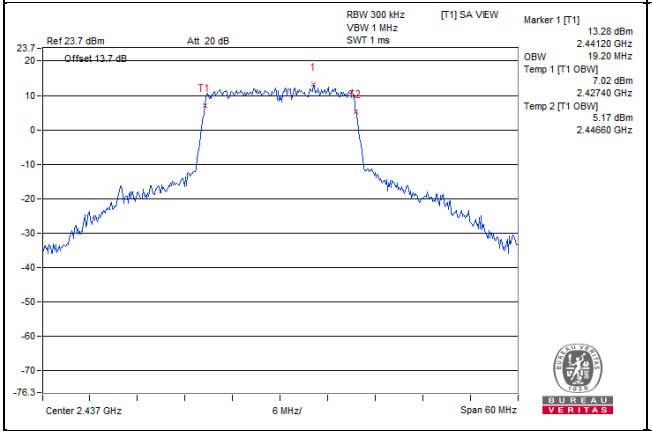
802.11ax (20MHz) Ant1 CH6



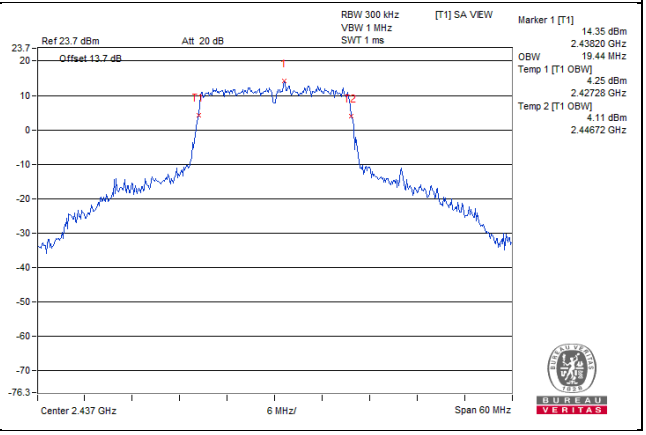
802.11ax (20MHz) Ant2 CH6



802.11ax (20MHz) Ant3 CH6

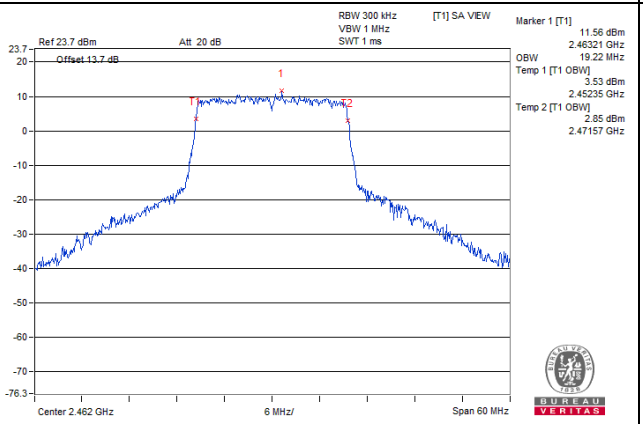


802.11ax (20MHz) Ant4 CH6

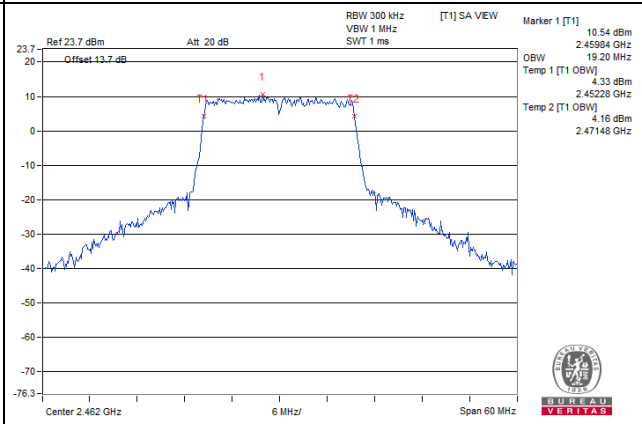


SPECTRUM PLOT

802.11ax (20MHz) Ant1 CH11



802.11ax (20MHz) Ant2 CH11



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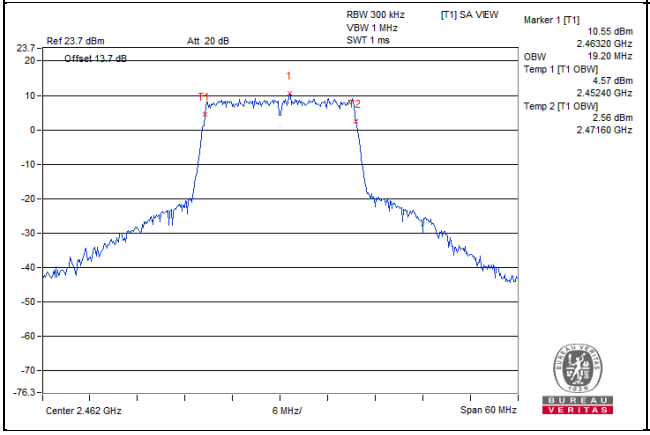
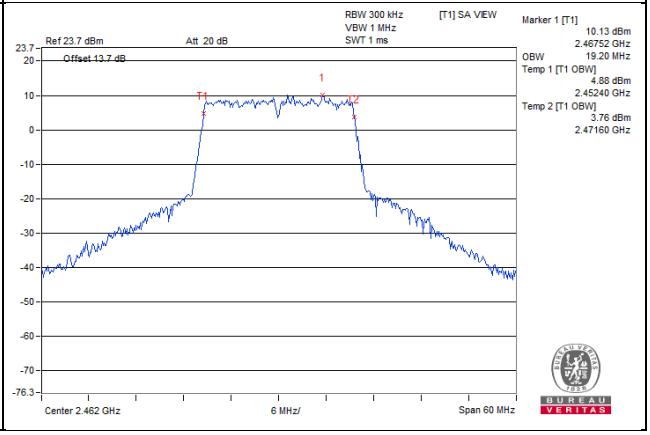
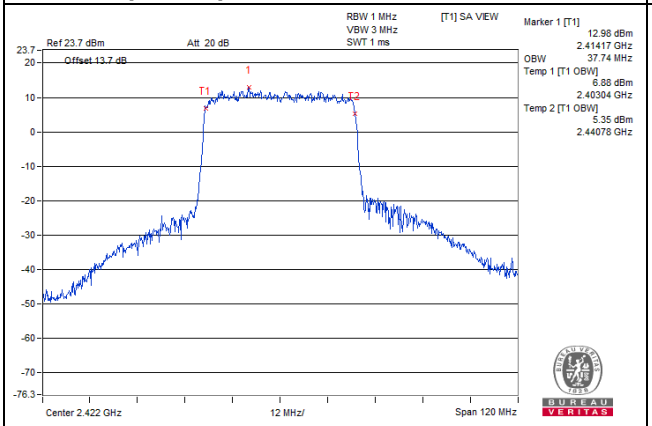


802.11ax (20MHz) Ant4 CH11

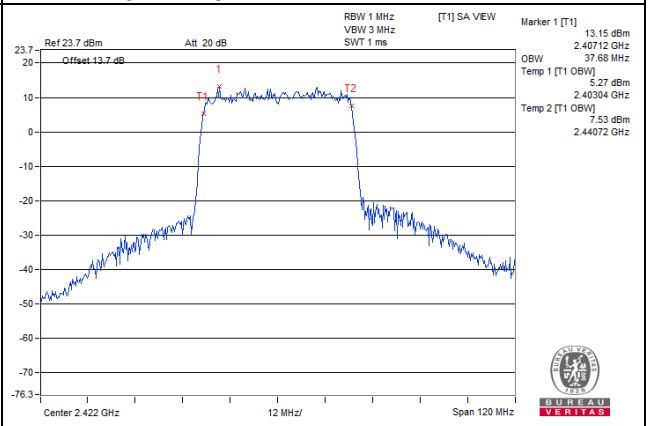


SPECTRUM PLOT

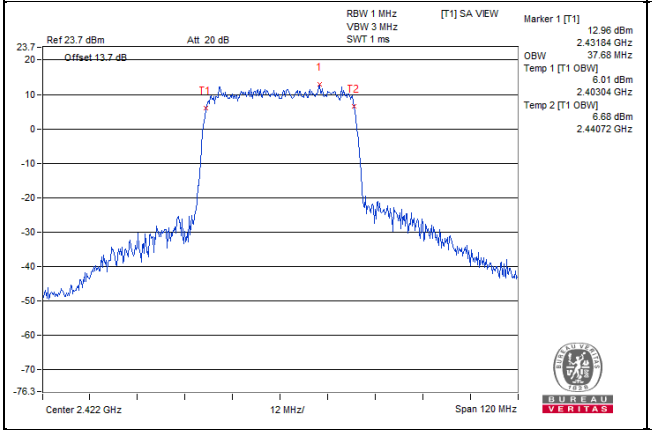
802.11ax (40MHz) Ant1 CH3



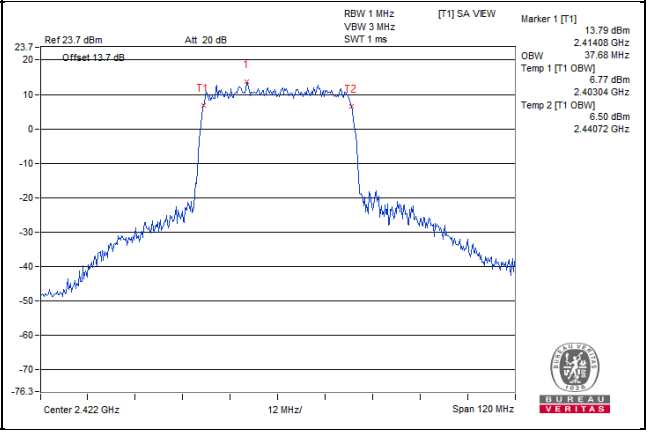
802.11ax (40MHz) Ant2 CH3



802.11ax (40MHz) Ant3 CH3

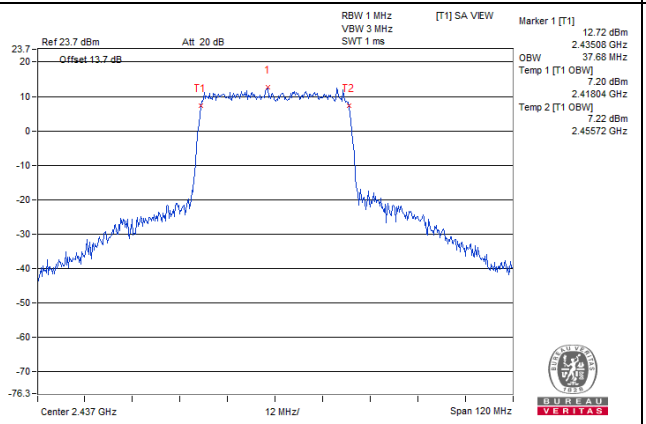


802.11ax (40MHz) Ant4 CH3

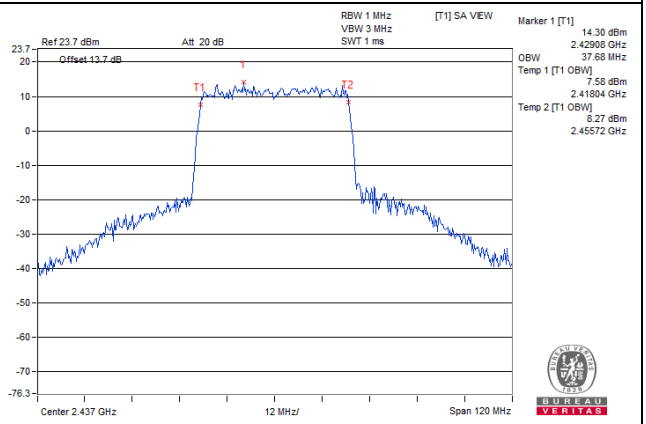


SPECTRUM PLOT

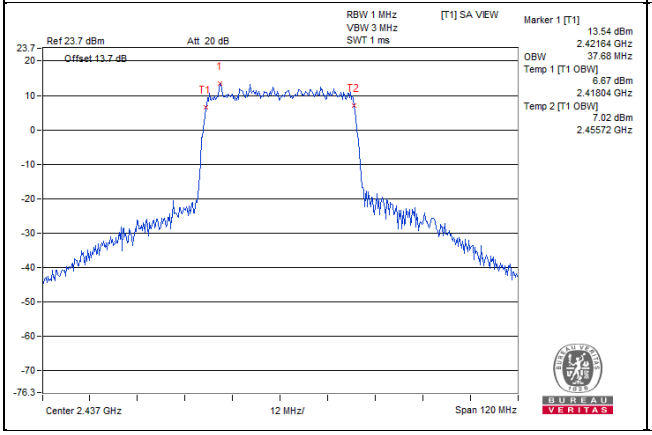
802.11ax (40MHz) Ant1 CH6



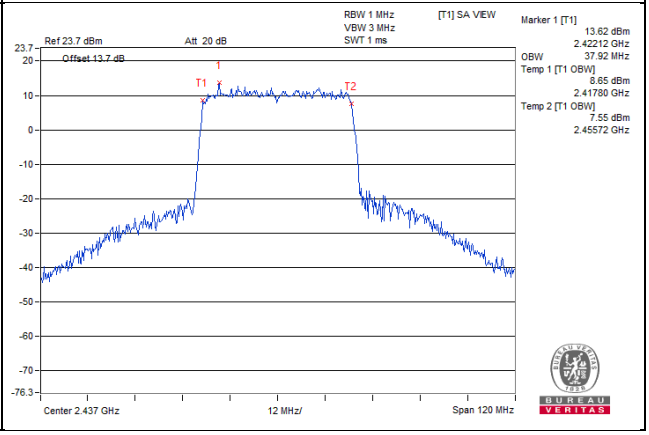
802.11ax (40MHz) Ant2 CH6



802.11ax (40MHz) Ant3 CH6

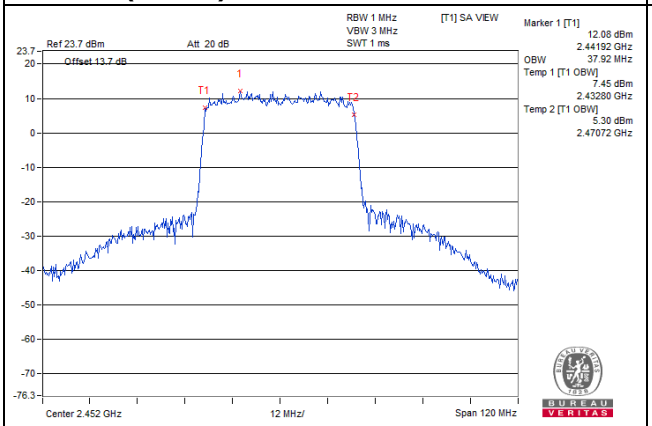


802.11ax (40MHz) Ant4 CH6

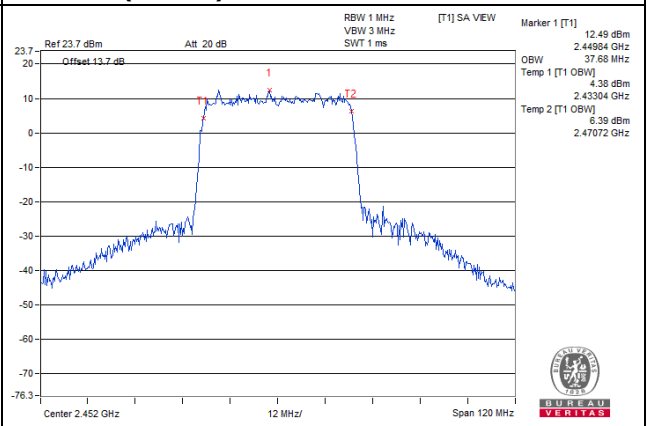


SPECTRUM PLOT

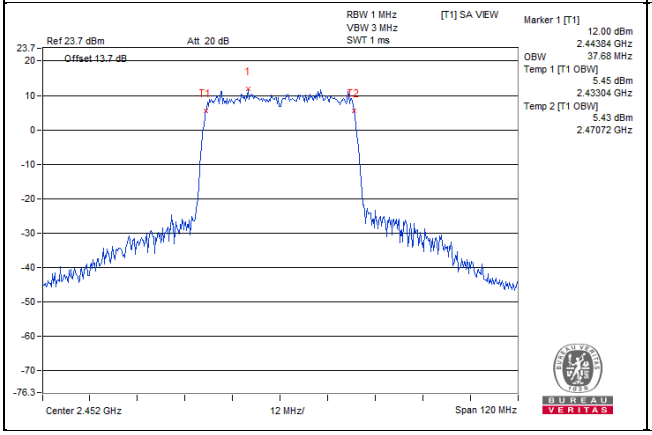
802.11ax (40MHz) Ant1 CH9



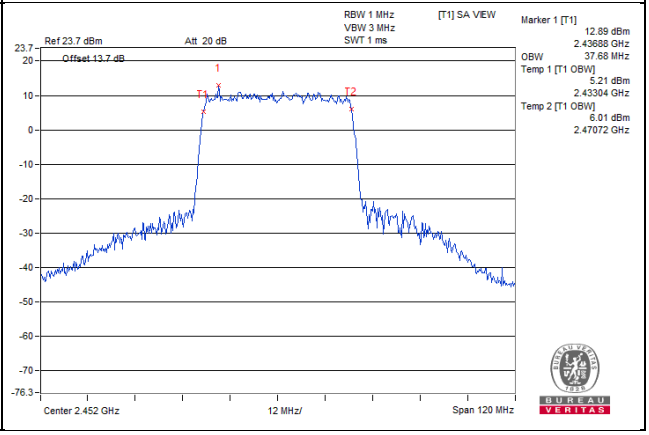
802.11ax (40MHz) Ant2 CH9



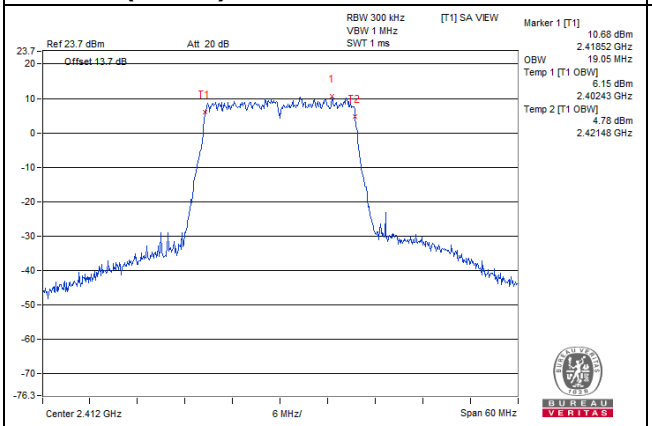
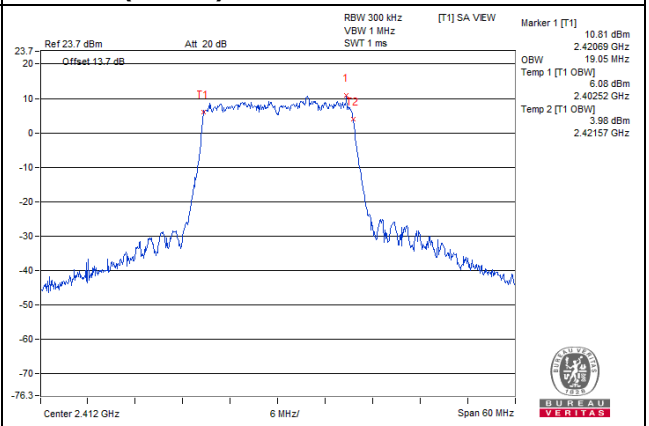
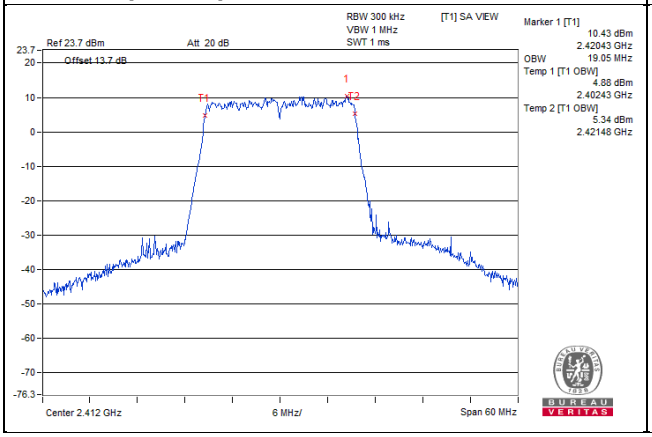
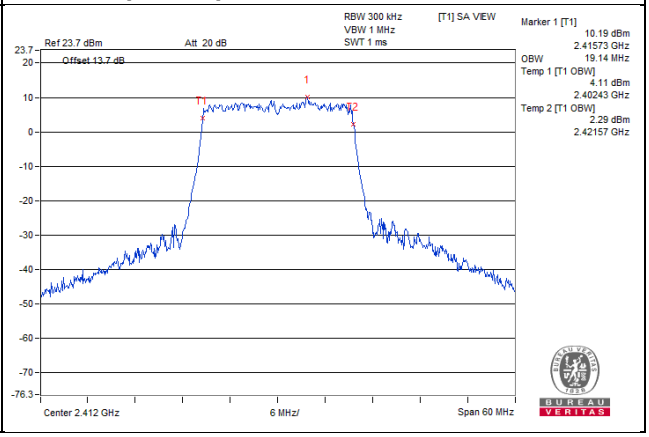
802.11ax (40MHz) Ant3 CH9



802.11ax (40MHz) Ant4 CH9

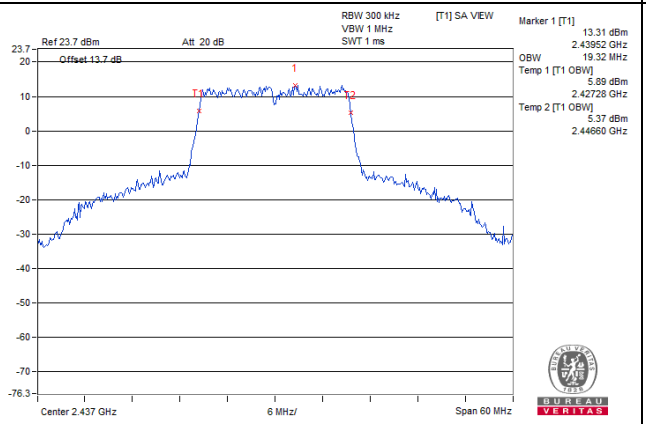


2S4T TxBF

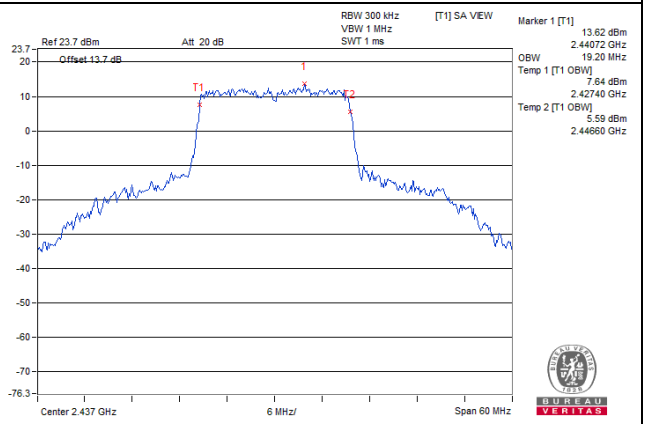
SPECTRUM PLOT	
802.11ax (20MHz) Ant1 CH1	**802.11ax (20MHz) Ant2 CH1**
	
802.11ax (20MHz) Ant3 CH1	**802.11ax (20MHz) Ant4 CH1**
	

SPECTRUM PLOT

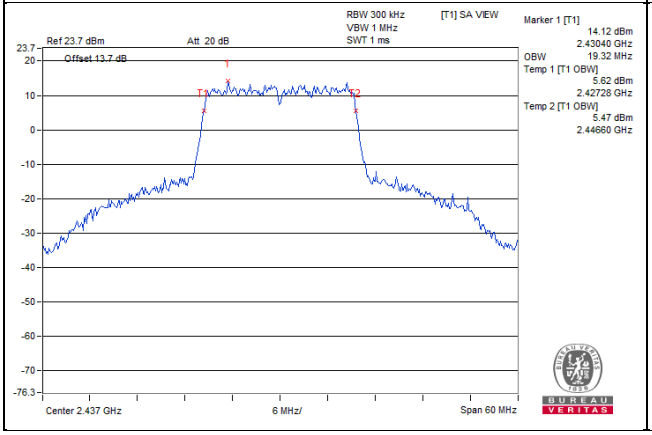
802.11ax (20MHz) Ant1 CH6



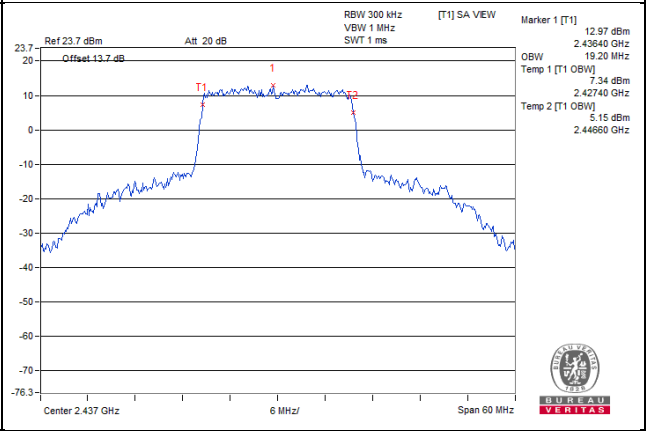
802.11ax (20MHz) Ant2 CH6



802.11ax (20MHz) Ant3 CH6

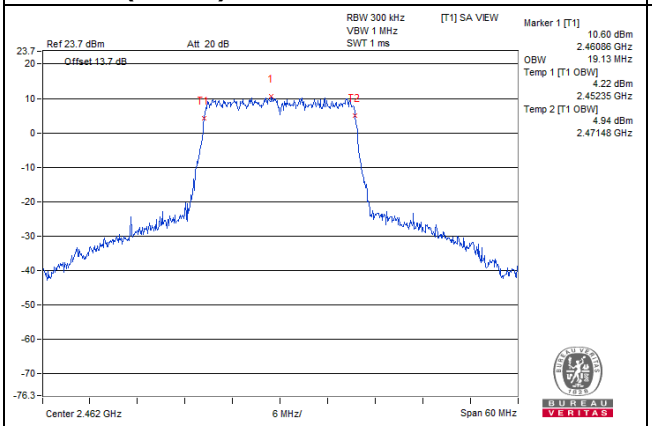


802.11ax (20MHz) Ant4 CH6

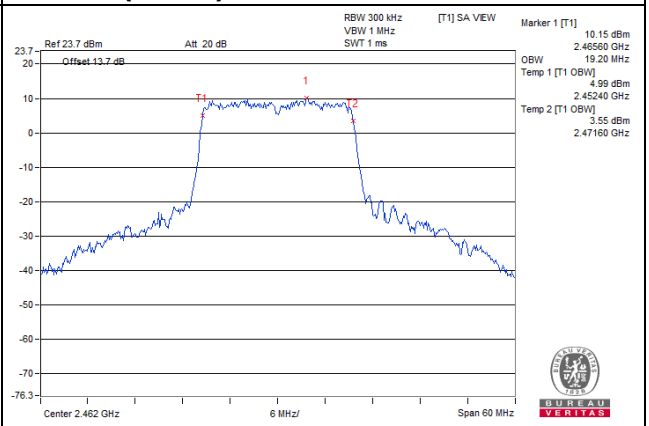


SPECTRUM PLOT

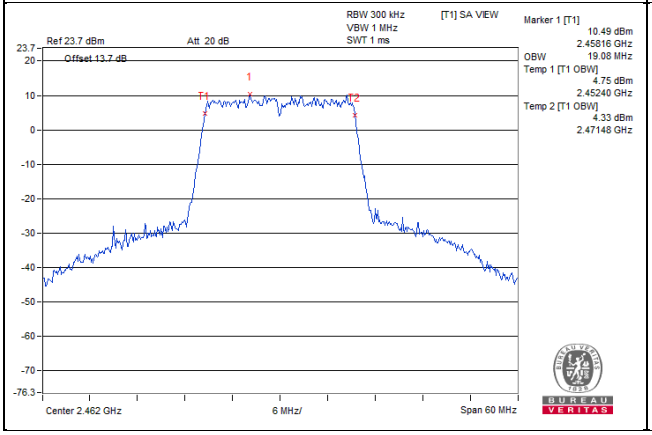
802.11ax (20MHz) Ant1 CH11



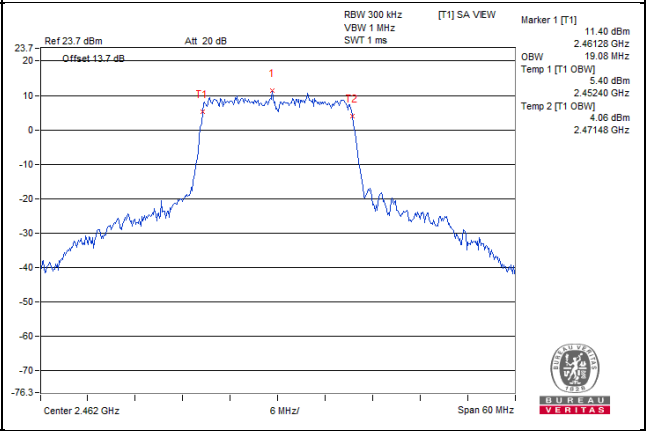
802.11ax (20MHz) Ant2 CH11



802.11ax (20MHz) Ant3 CH11

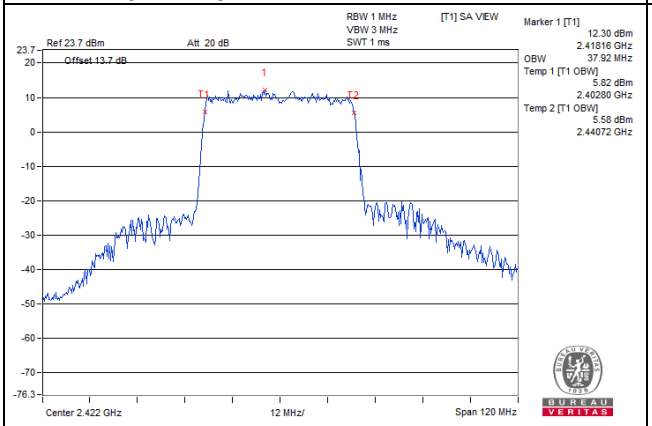


802.11ax (20MHz) Ant4 CH11

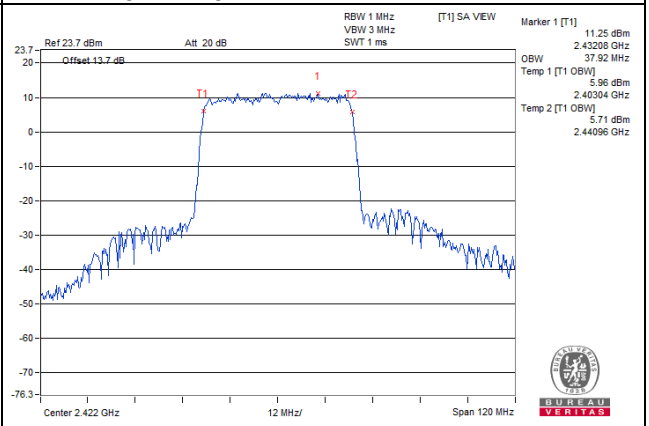


SPECTRUM PLOT

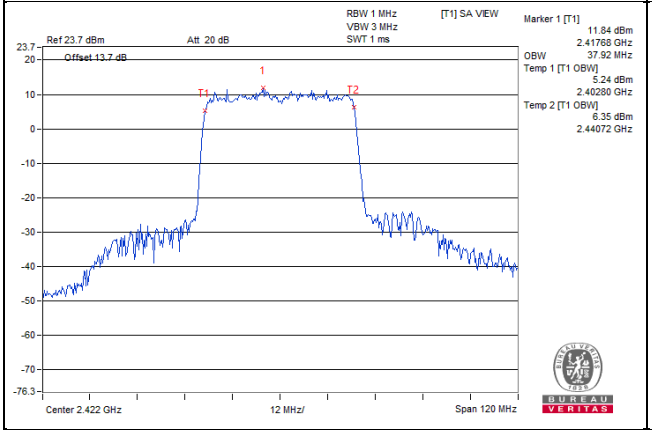
802.11ax (40MHz) Ant1 CH3



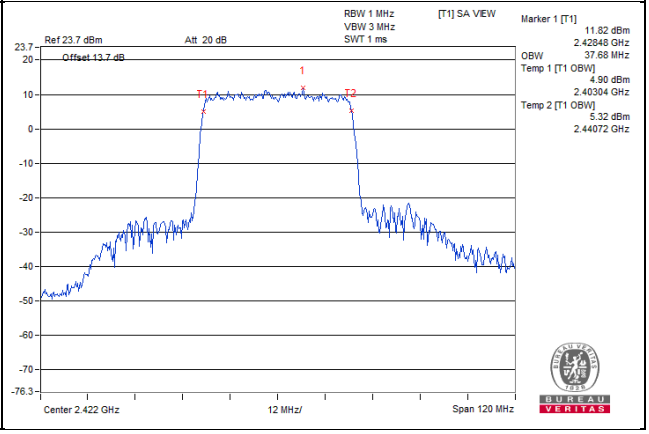
802.11ax (40MHz) Ant2 CH3



802.11ax (40MHz) Ant3 CH3

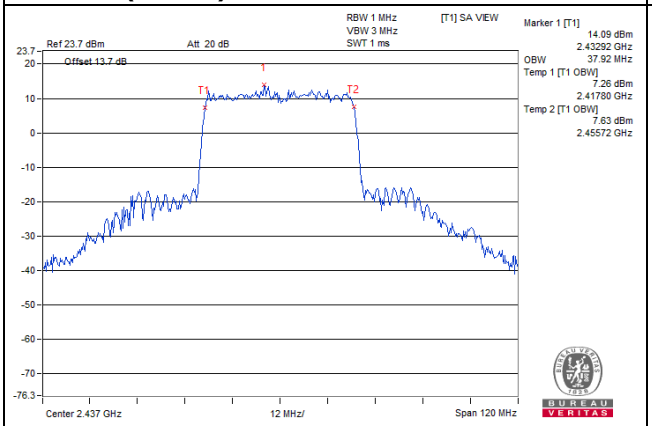


802.11ax (40MHz) Ant4 CH3

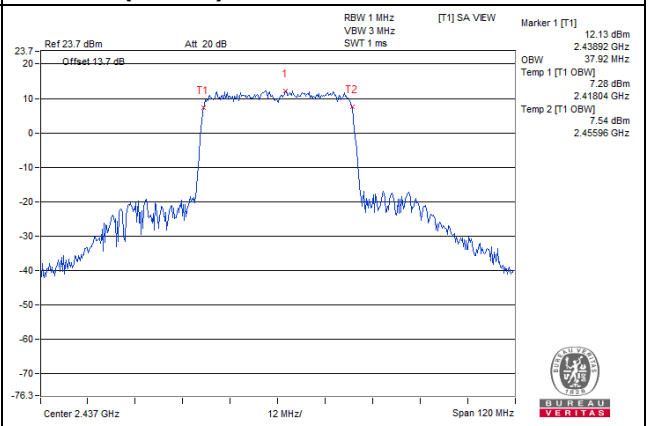


SPECTRUM PLOT

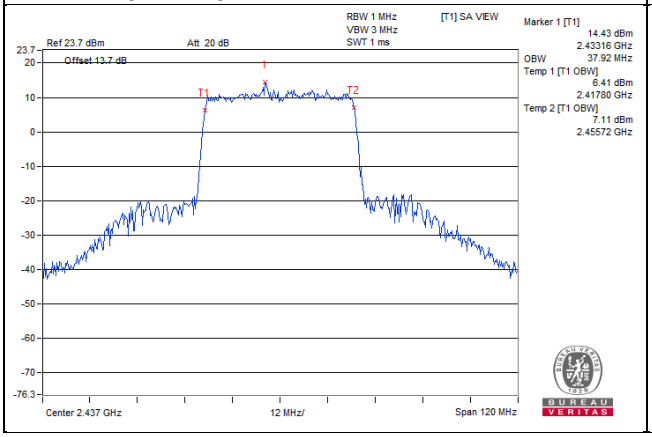
802.11ax (40MHz) Ant1 CH6



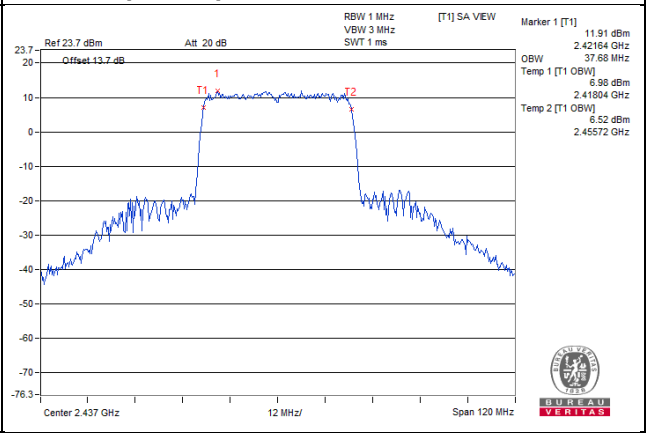
802.11ax (40MHz) Ant2 CH6



802.11ax (40MHz) Ant3 CH6

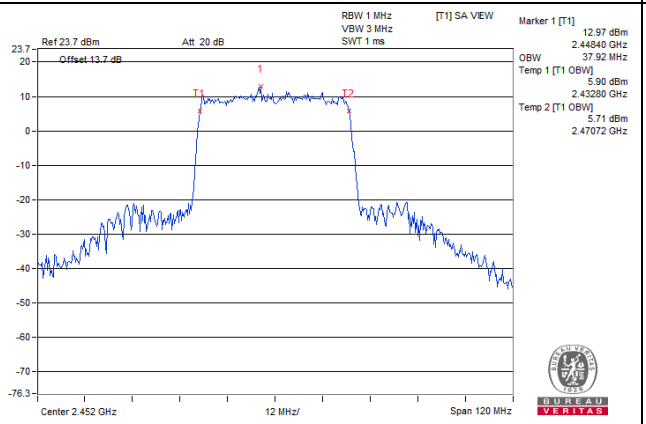


802.11ax (40MHz) Ant4 CH6

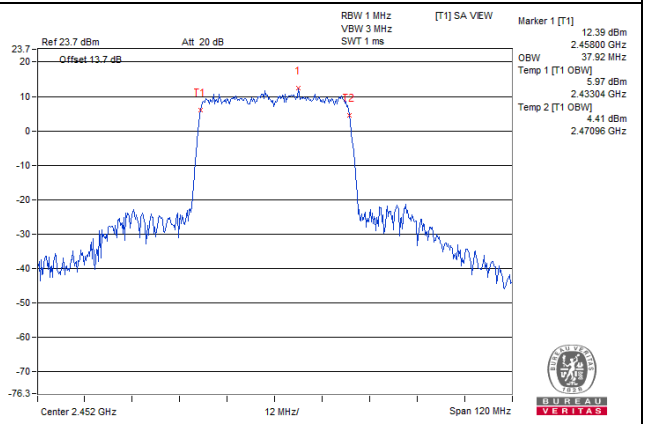


SPECTRUM PLOT

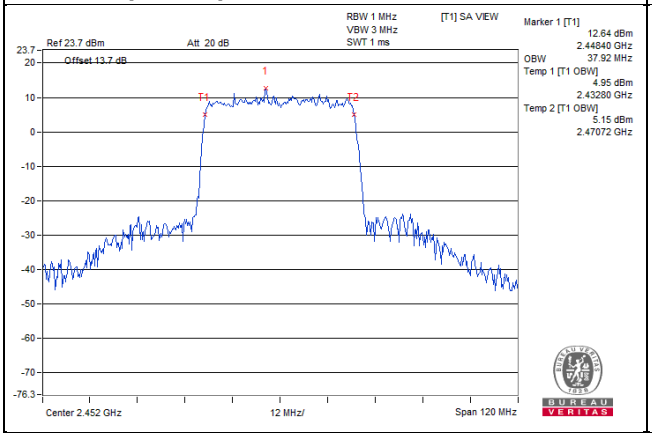
802.11ax (40MHz) Ant1 CH9



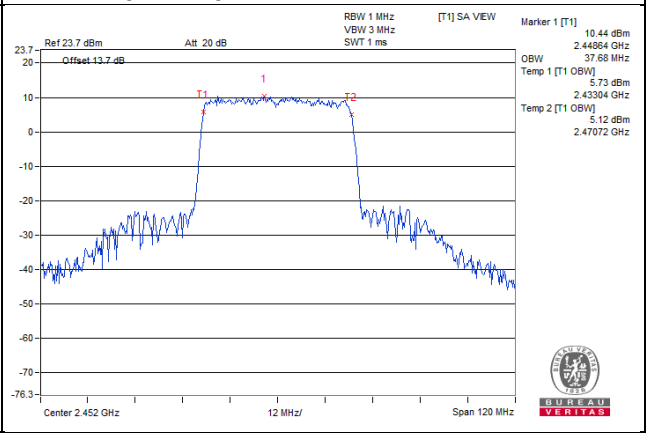
802.11ax (40MHz) Ant2 CH9



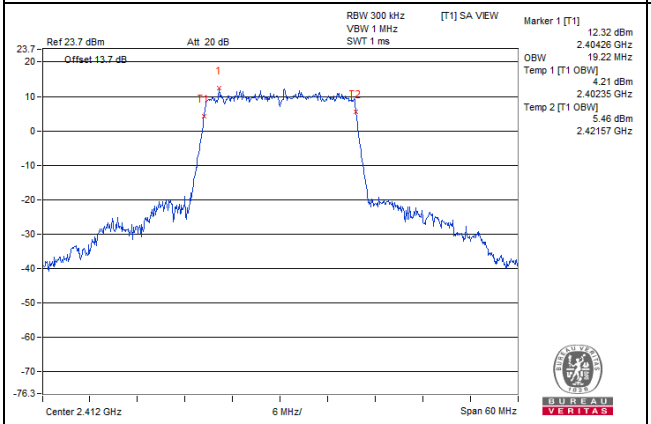
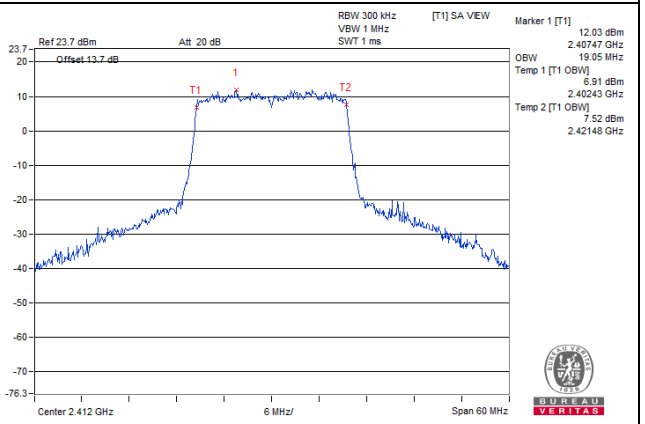
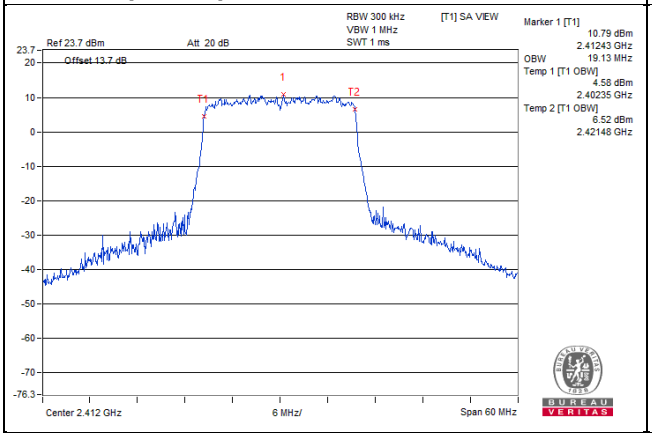
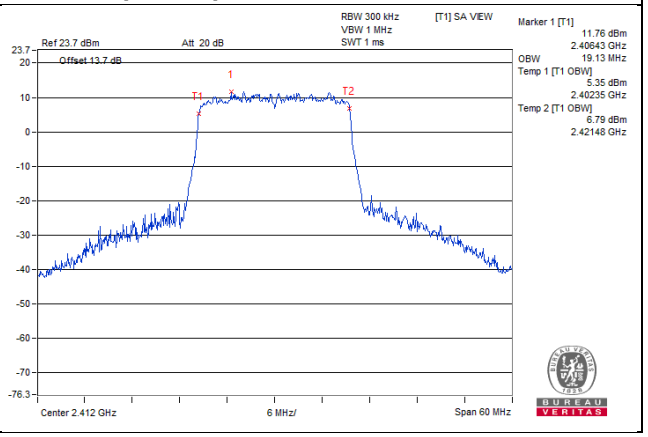
802.11ax (40MHz) Ant3 CH9



802.11ax (40MHz) Ant4 CH9

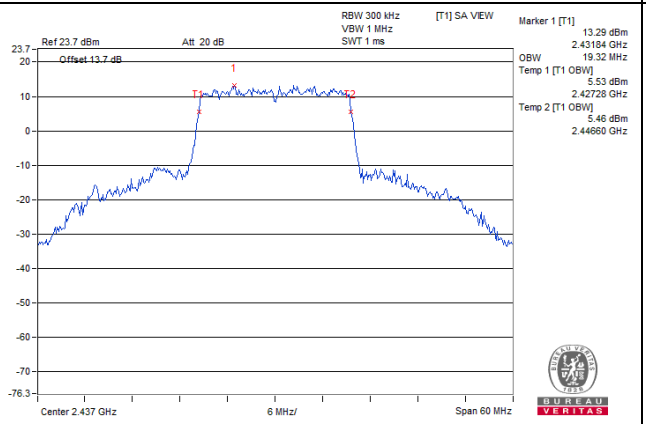


3S4T TxBF

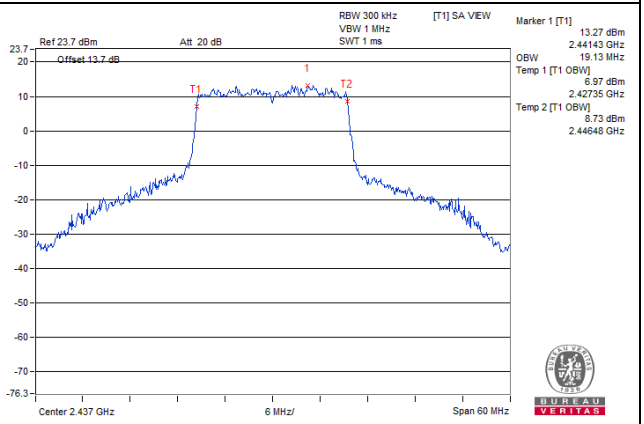
SPECTRUM PLOT	
802.11ax (20MHz) Ant1 CH1	**802.11ax (20MHz) Ant2 CH1**
	
802.11ax (20MHz) Ant3 CH1	**802.11ax (20MHz) Ant4 CH1**
	

SPECTRUM PLOT

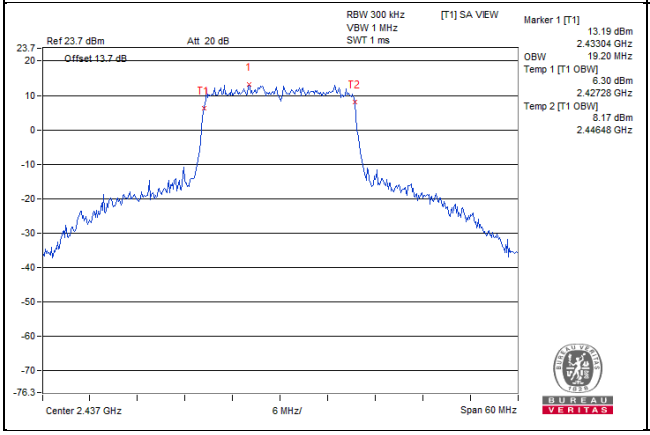
802.11ax (20MHz) Ant1 CH6



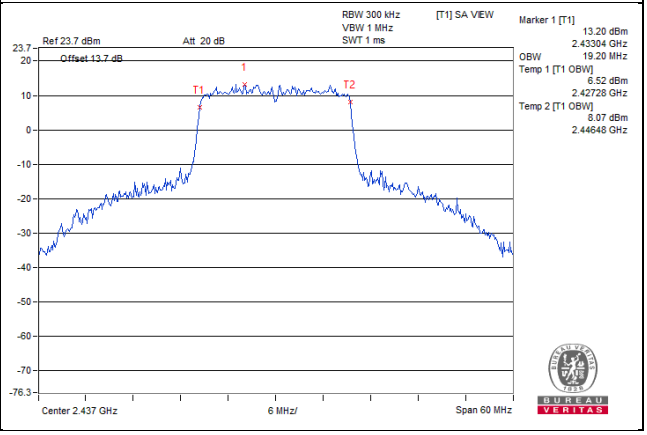
802.11ax (20MHz) Ant2 CH6



802.11ax (20MHz) Ant3 CH6

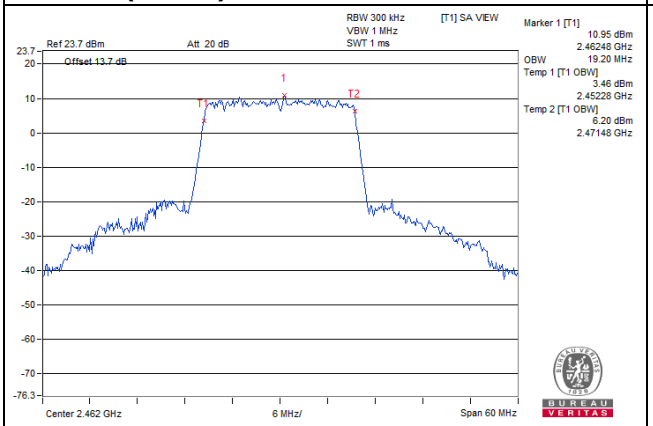


802.11ax (20MHz) Ant4 CH6

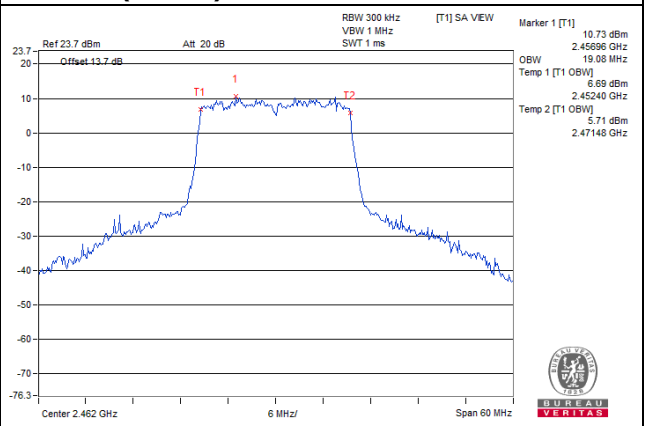


SPECTRUM PLOT

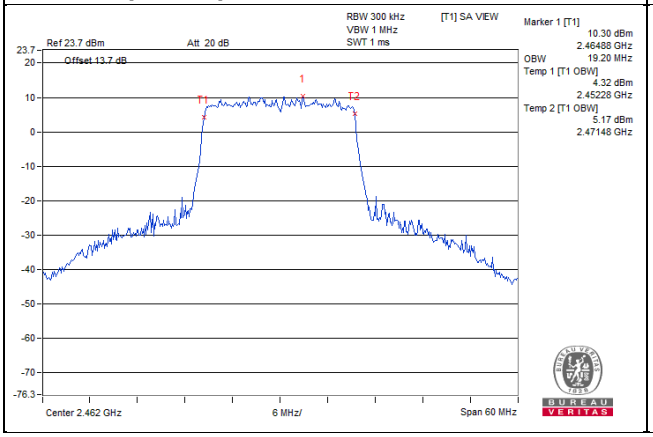
802.11ax (20MHz) Ant1 CH11



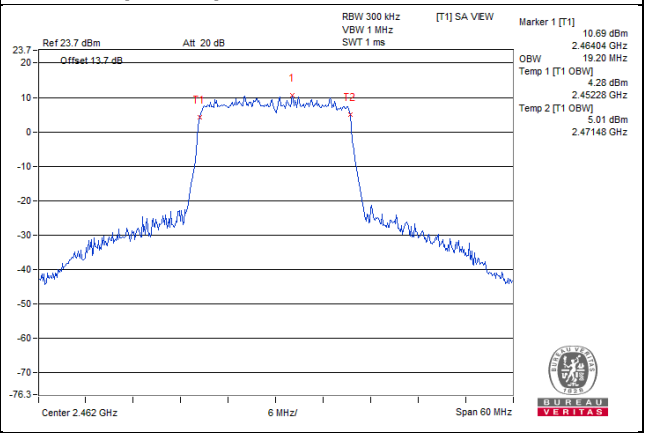
802.11ax (20MHz) Ant2 CH11



802.11ax (20MHz) Ant3 CH11

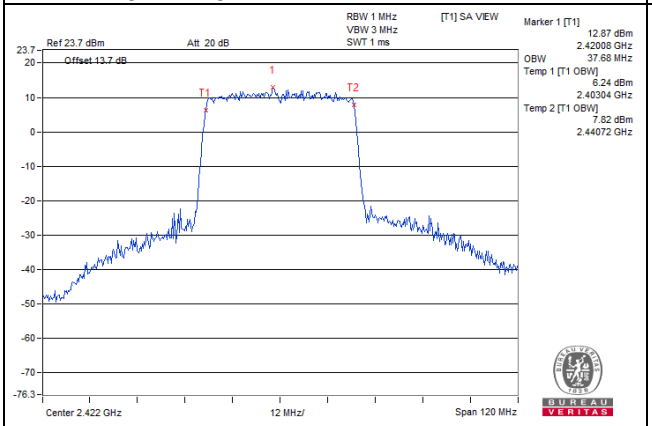


802.11ax (20MHz) Ant4 CH11

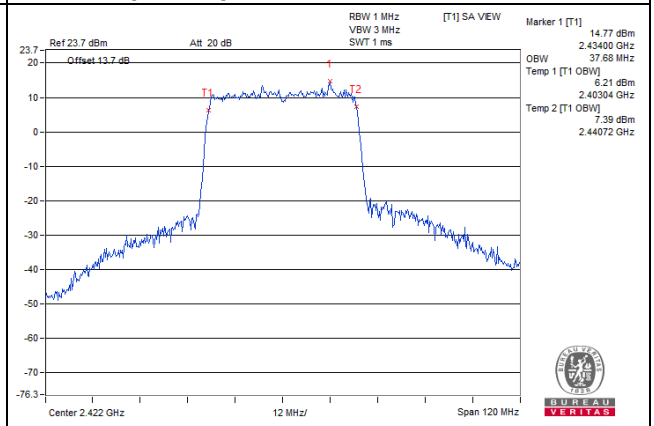


SPECTRUM PLOT

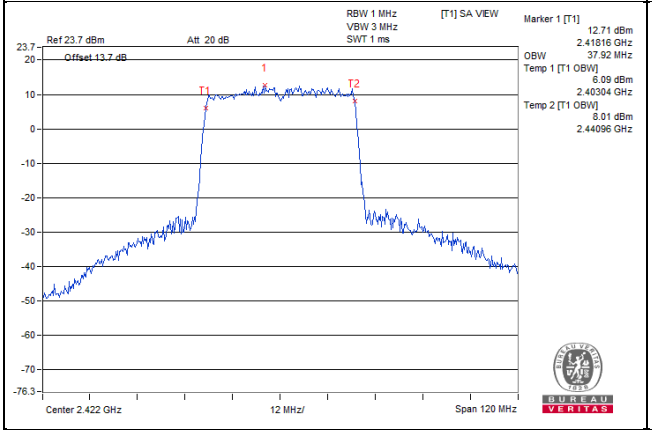
802.11ax (40MHz) Ant1 CH3



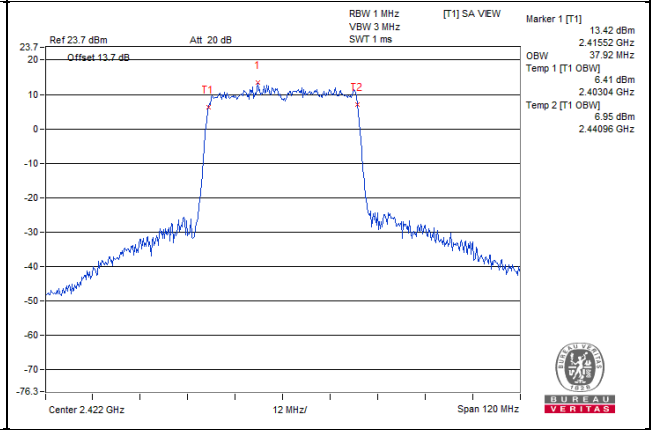
802.11ax (40MHz) Ant2 CH3



802.11ax (40MHz) Ant3 CH3

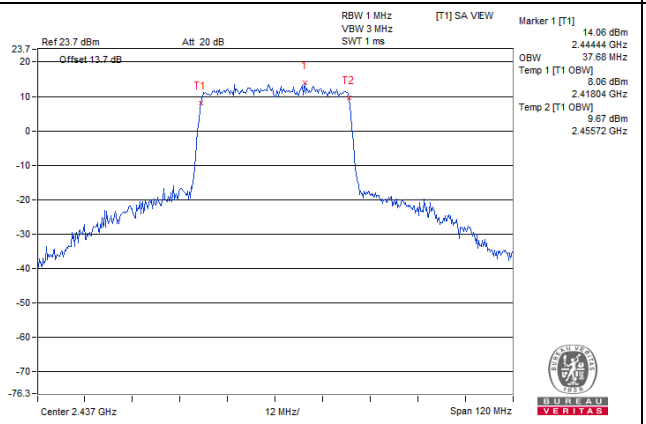


802.11ax (40MHz) Ant4 CH3

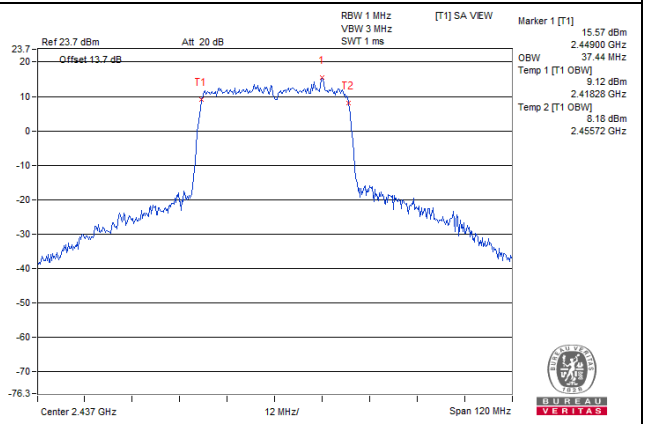


SPECTRUM PLOT

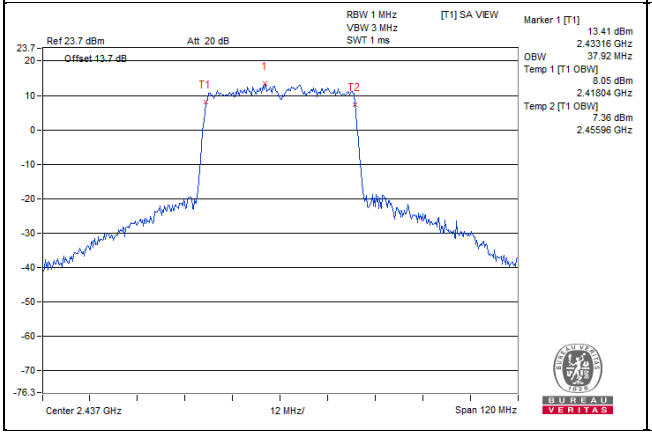
802.11ax (40MHz) Ant1 CH6



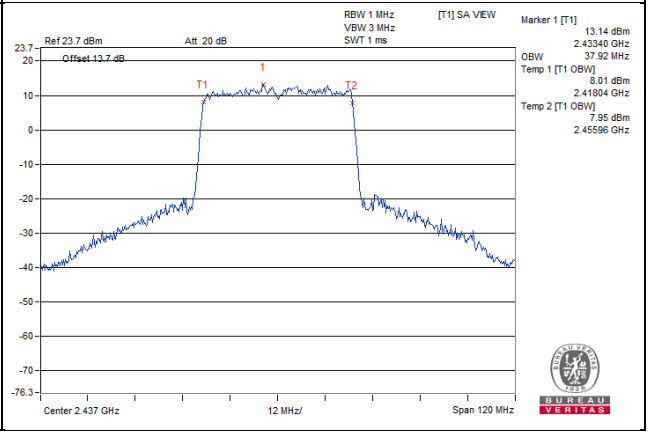
802.11ax (40MHz) Ant2 CH6



802.11ax (40MHz) Ant3 CH6

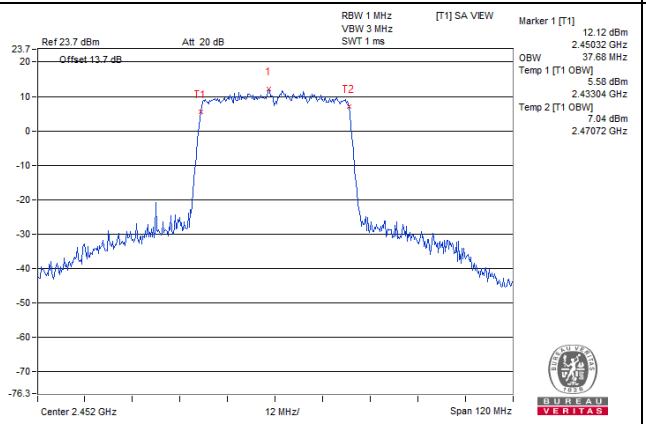


802.11ax (40MHz) Ant4 CH6

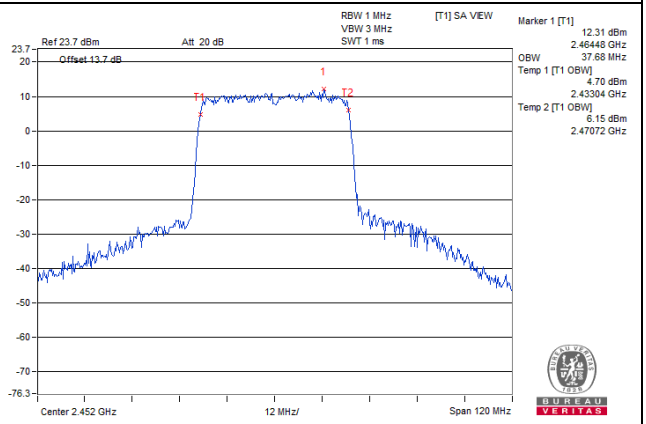


SPECTRUM PLOT

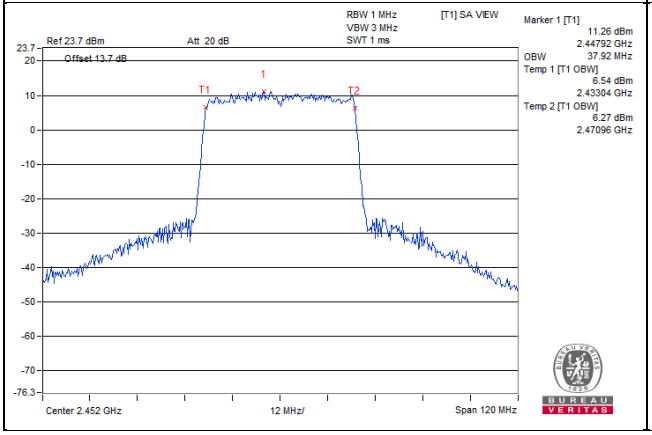
802.11ax (40MHz) Ant1 CH9



802.11ax (40MHz) Ant2 CH9



802.11ax (40MHz) Ant3 CH9



802.11ax (40MHz) Ant4 CH9