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Appendix B:
802.11ax
Test Plot

FCC ID
A3LSMS926U

REVISION HISTORY

The revision history for this document is shown in table.

Revision No.	Date of Issue	Description
0	October 16, 2023	Initial Release
1	November 01, 2023	Added the CBP Plot on page 58-68

Note:

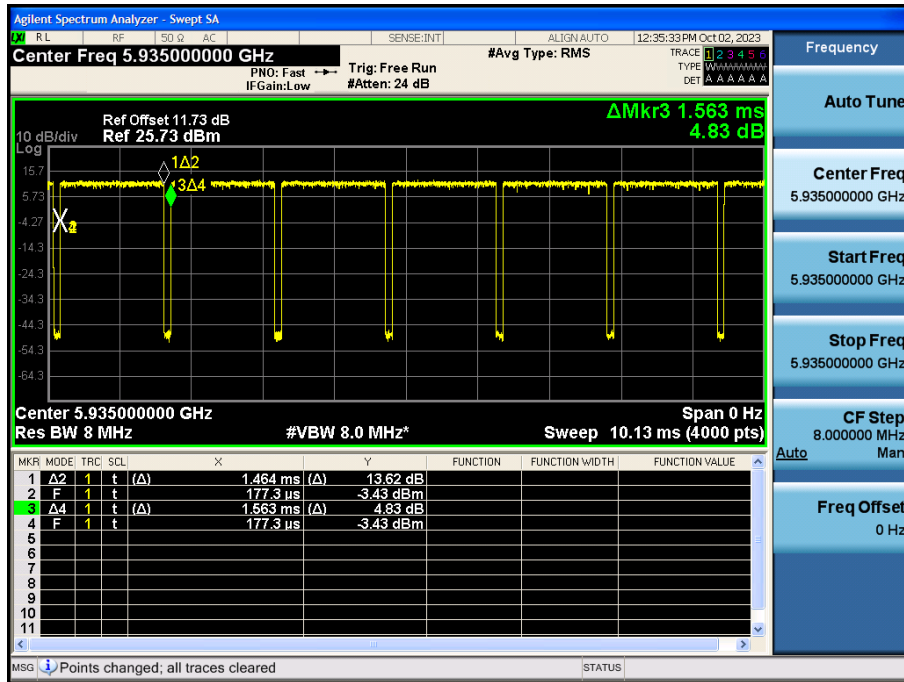
In order to simplify the report, attached plots were only the most lowest datarate.

1. Duty Cycle

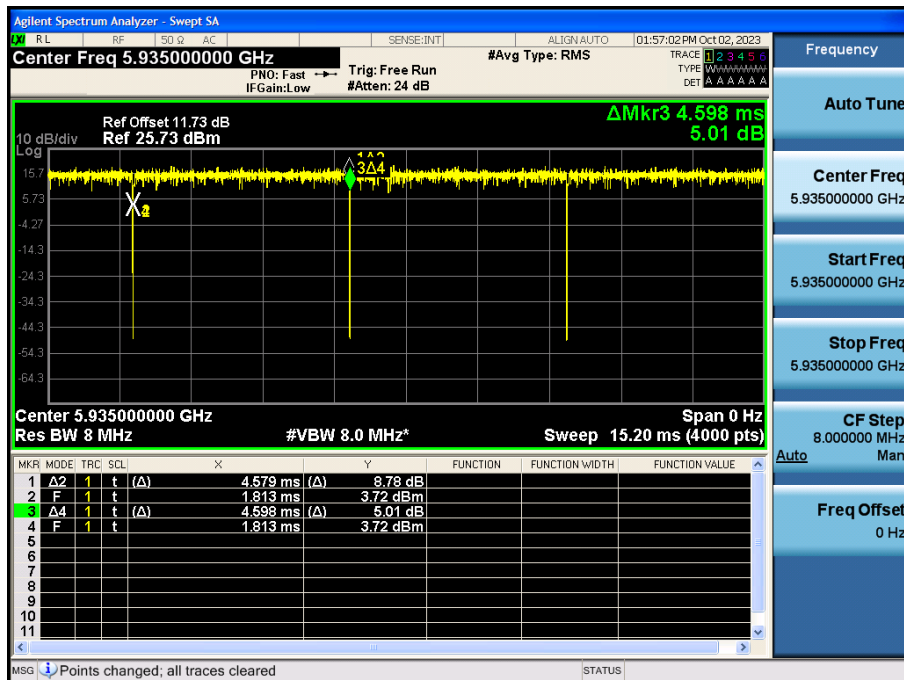
Note:

1. In order to simplify the report, attached plots were only the most lowest datarate.

802.11a Ch.2(5935 MHz) 6 Mbps



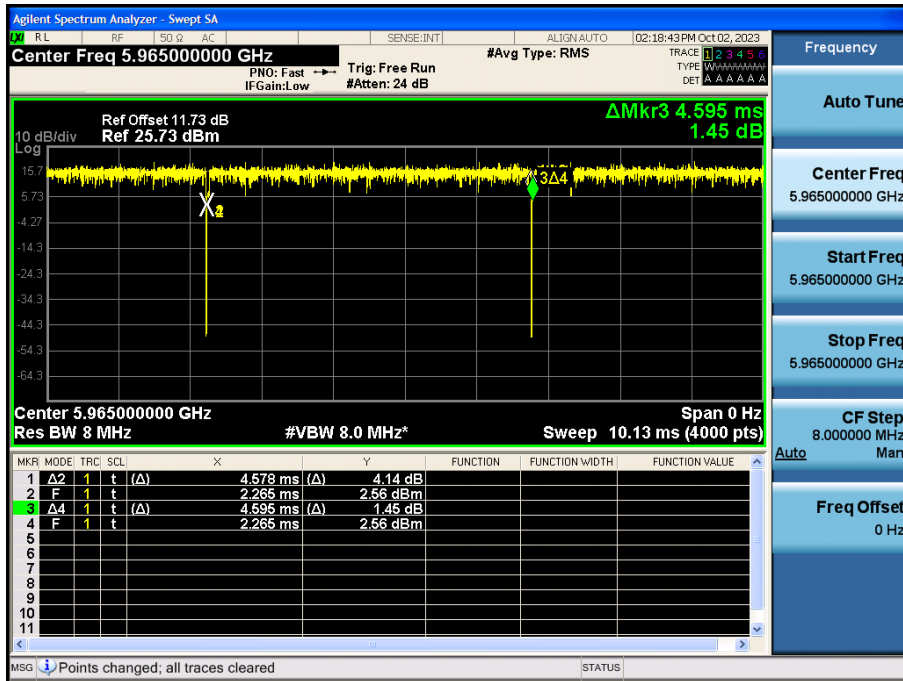
802.11ax HE 20 Ch.2(5935 MHz) 26 Tones MCS0



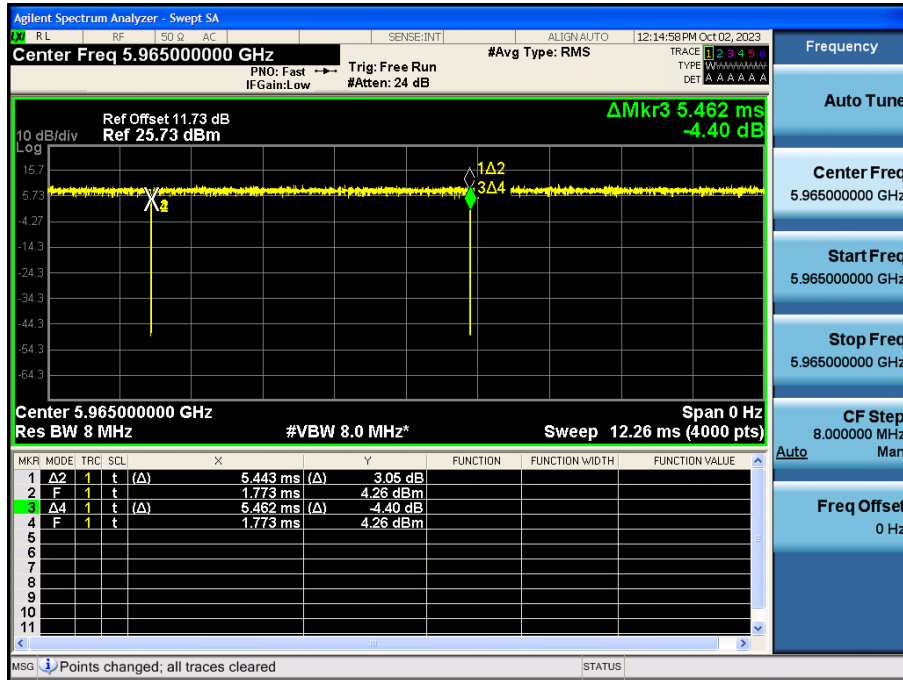
802.11ax HE 20 Ch.2(5935 MHz) SU MCS0



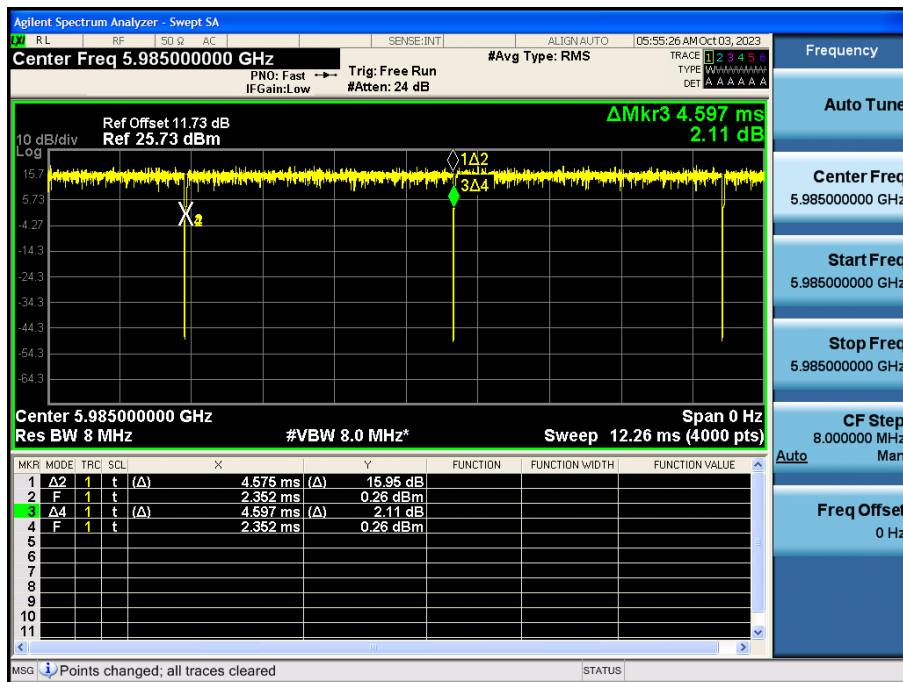
802.11ax HE 40 Ch.3(5965 MHz) 26 Tones MCS0



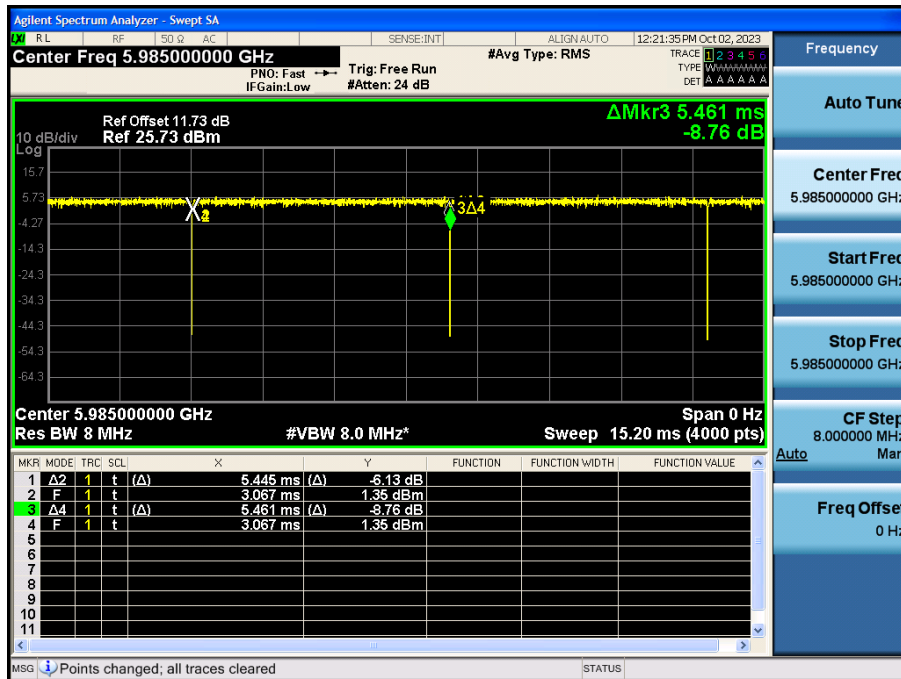
802.11ax HE 40 Ch.3(5965 MHz) SU MCS0



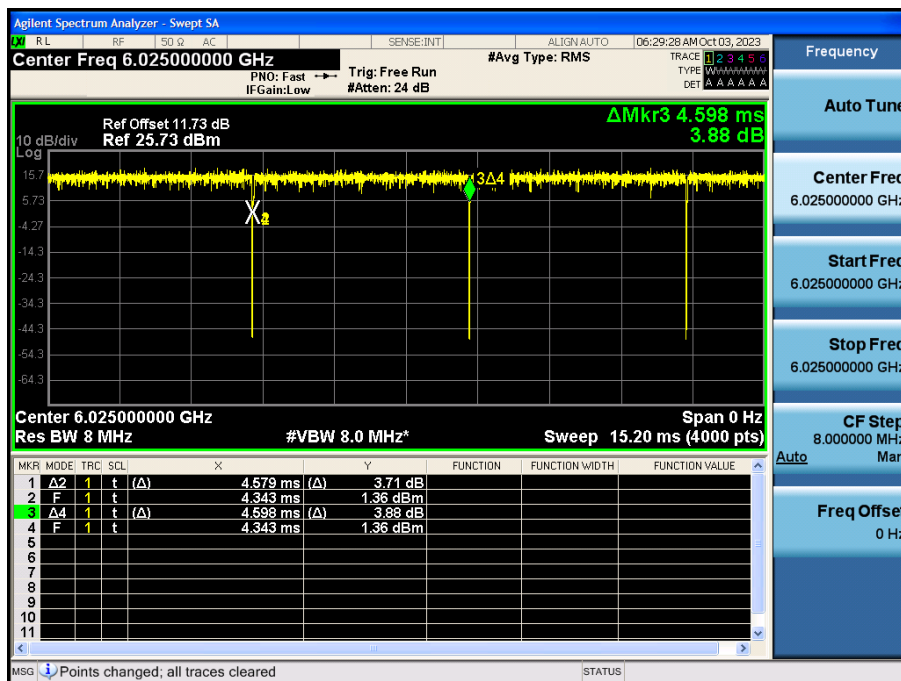
802.11ax HE 80 Ch.7(5985 MHz) 26 Tones MCS0



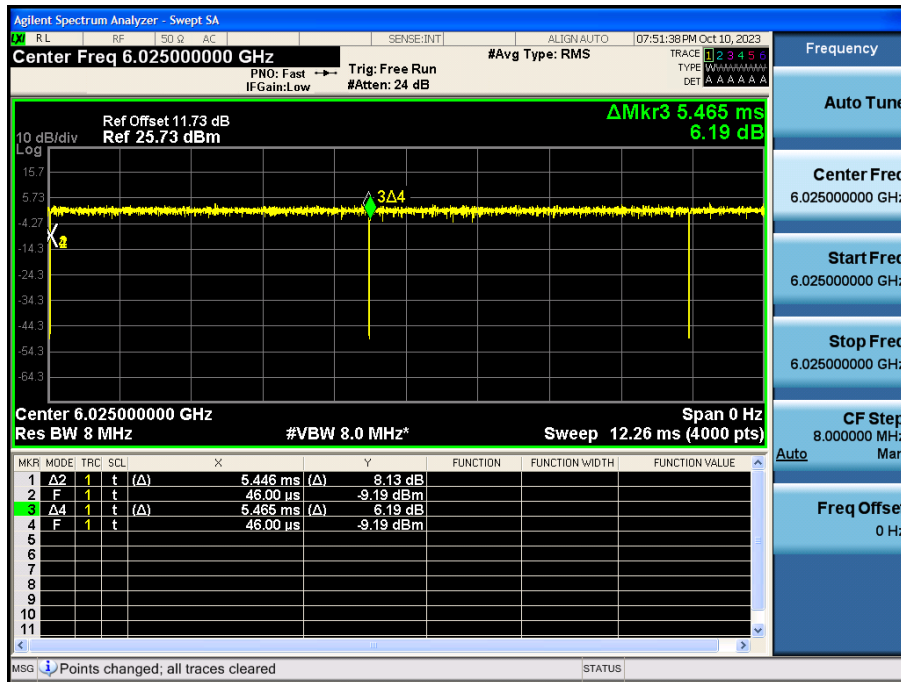
802.11ax HE 80 Ch.7(5985 MHz) SU MCS0



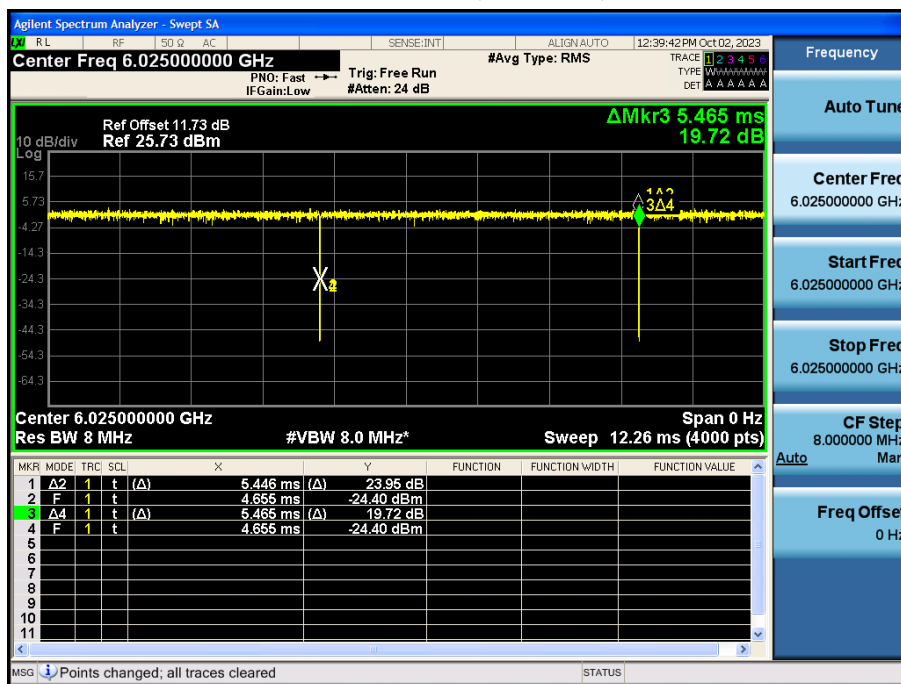
802.11ax HE 160 Ch.15(6025 MHz) 26 Tones MCS0



802.11ax HE 160 Ch.15(6025 MHz) 2x996T MCS0



802.11ax HE 160 Ch.15(6025 MHz) SU MCS0



2. 26dB Bandwidth

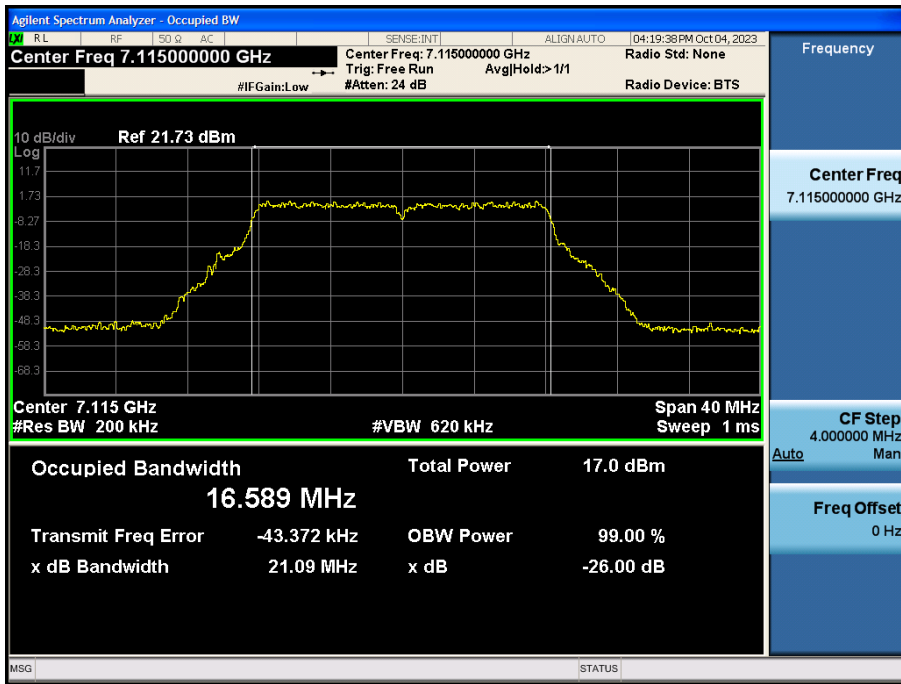
2.1 Indoor client

Note:

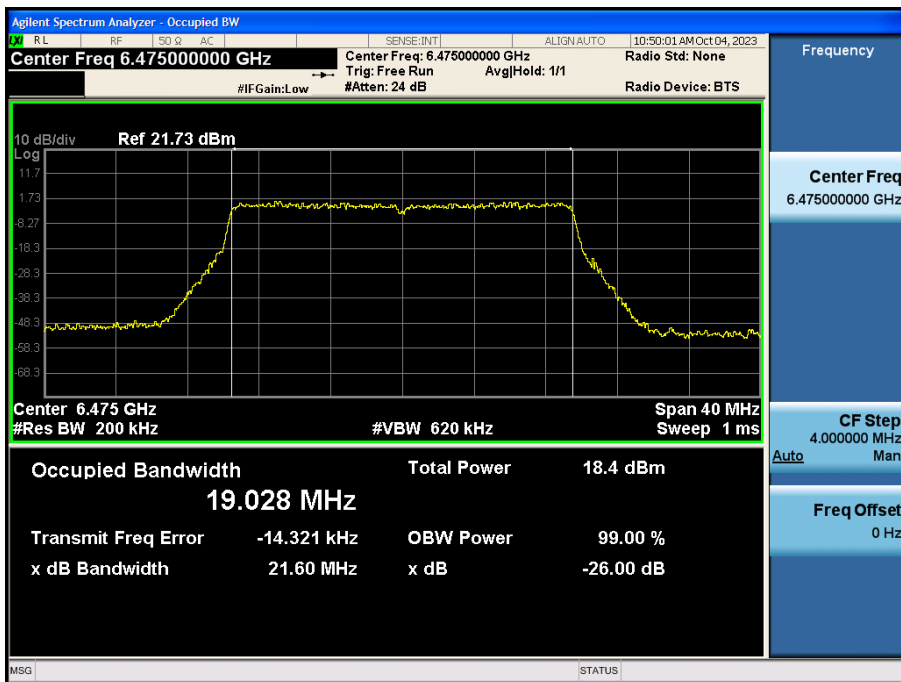
1. In order to simplify the report, attached plots were only the most wide channel.

Ant.1

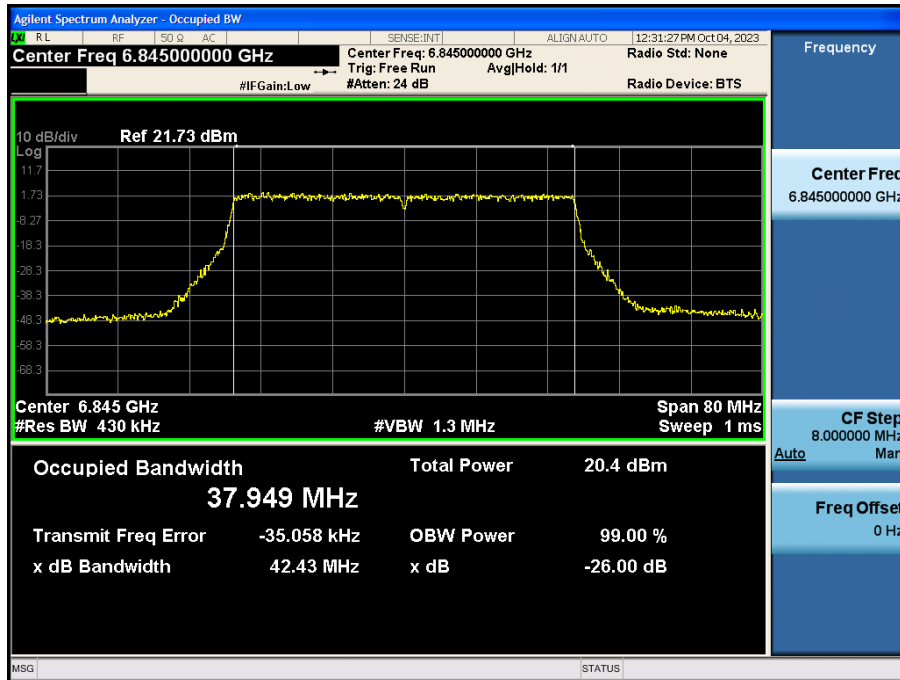
802.11a Ch.233(7115 MHz)



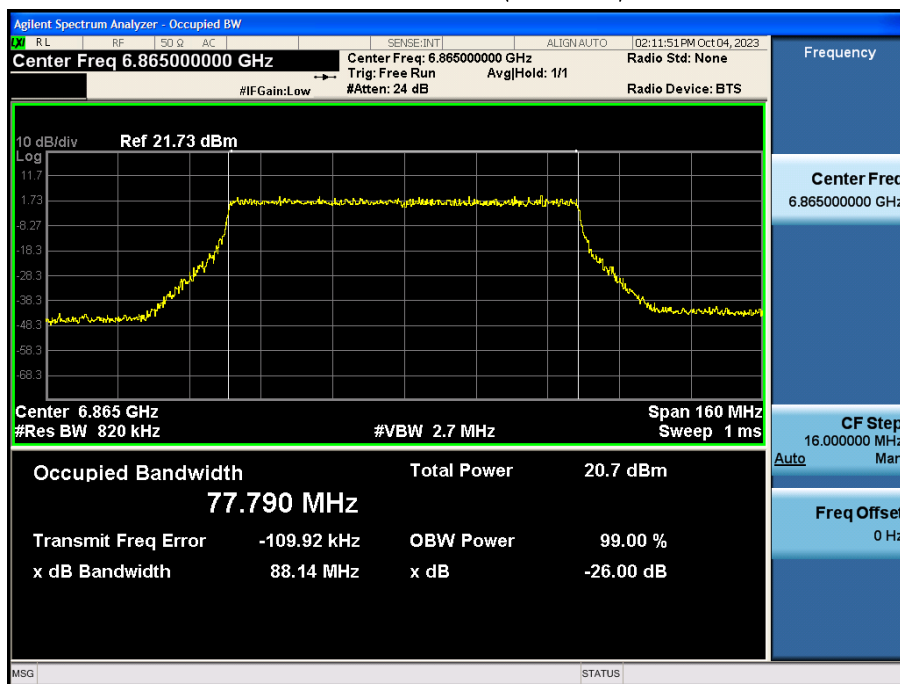
802.11ax HE20 Ch.105(6475 MHz) SU



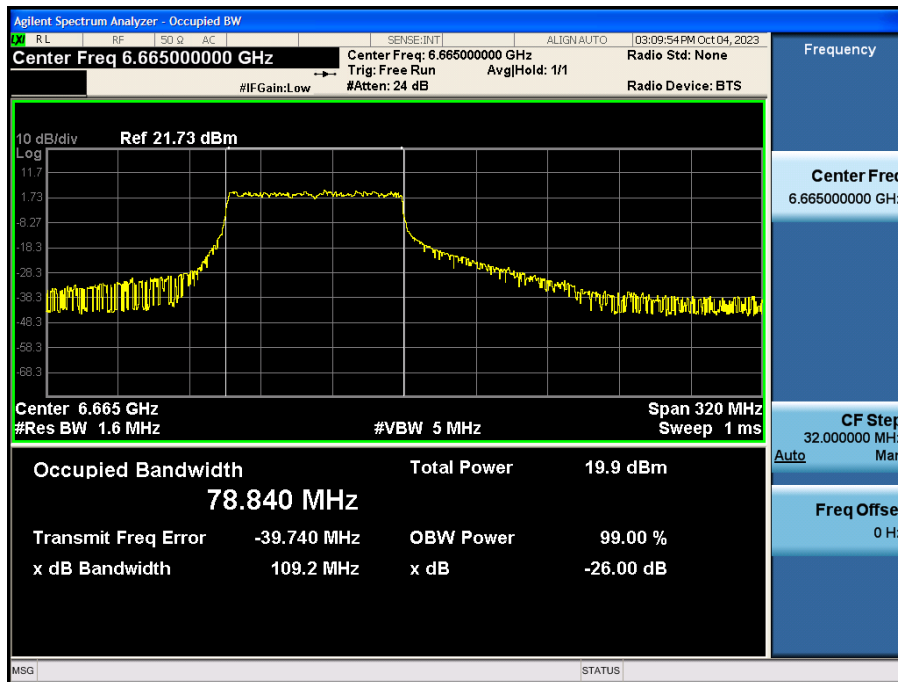
802.11ax HE40 Ch.179(6845 MHz) SU



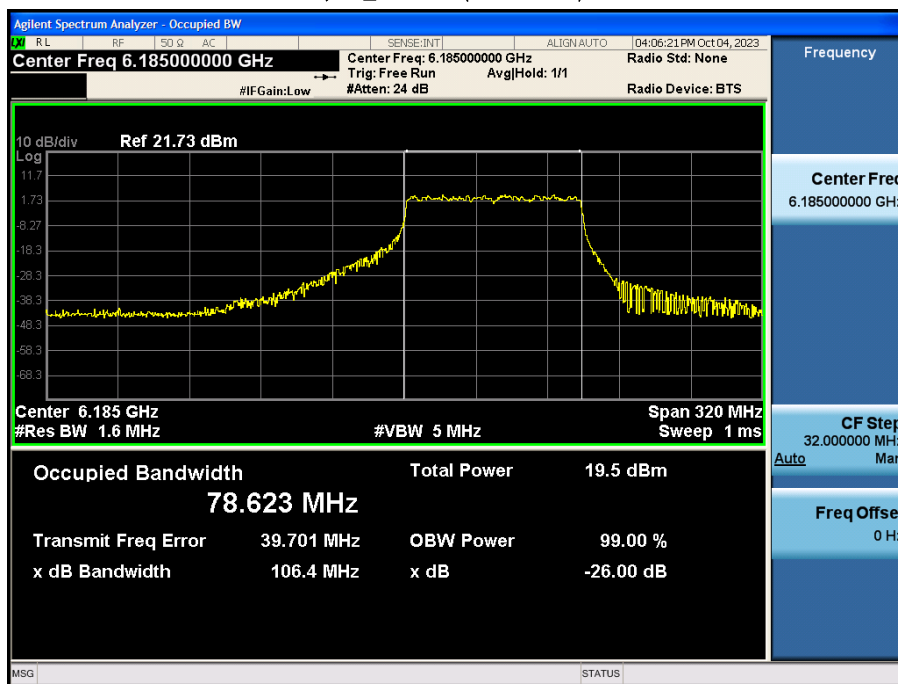
802.11ax HE80 Ch.183(6865 MHz) SU



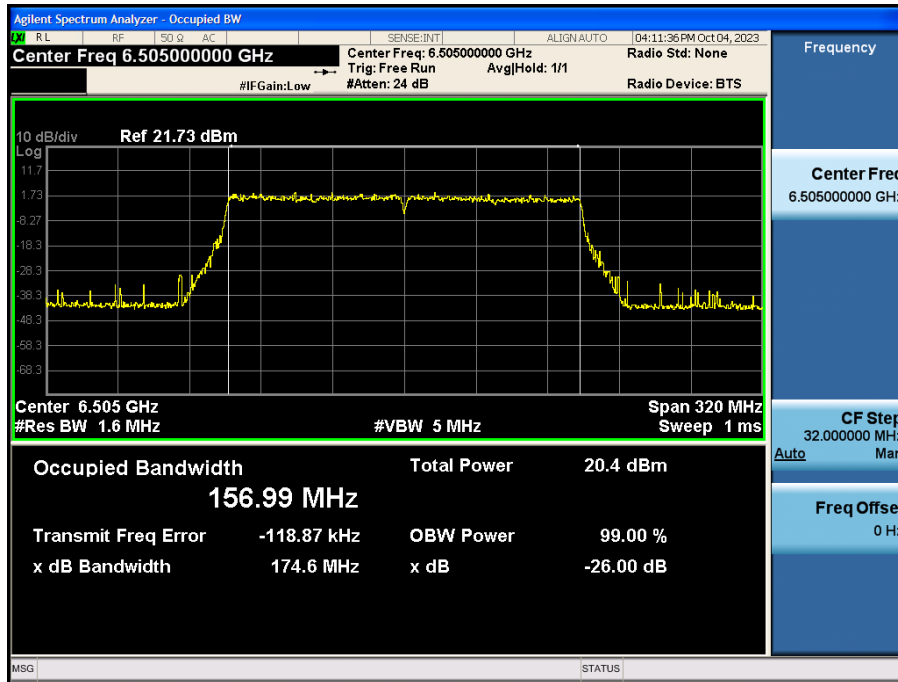
802.11ax HE160, 80_L Ch.143(6665 MHz) 996 Tones 67 RU



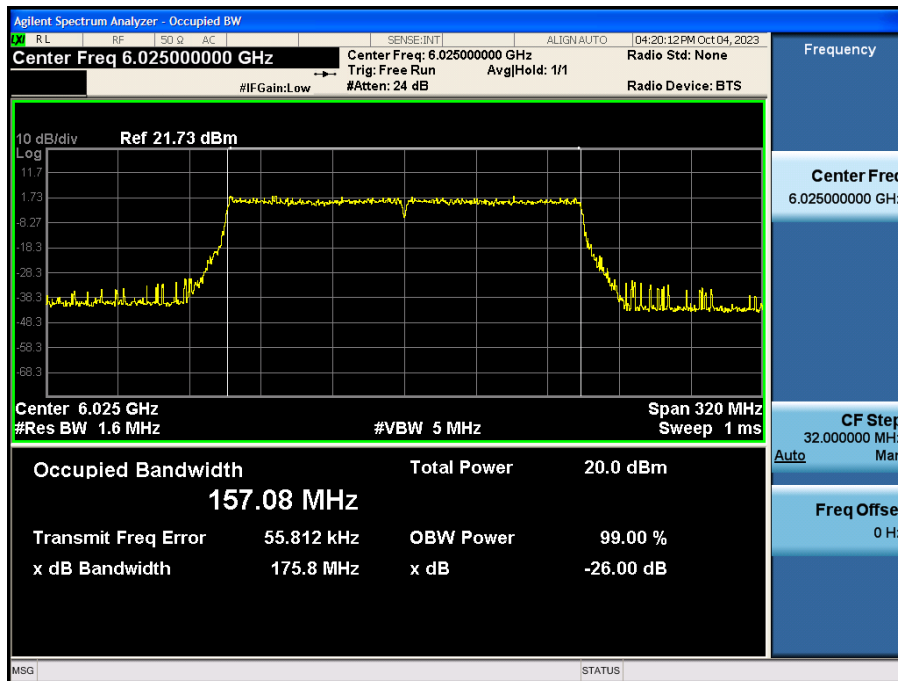
802.11ax HE160, 80_U Ch.47(6185 MHz) 996 Tones 67 RU



Bandwidth 160M, SU Ch. 111(6505 MHz)

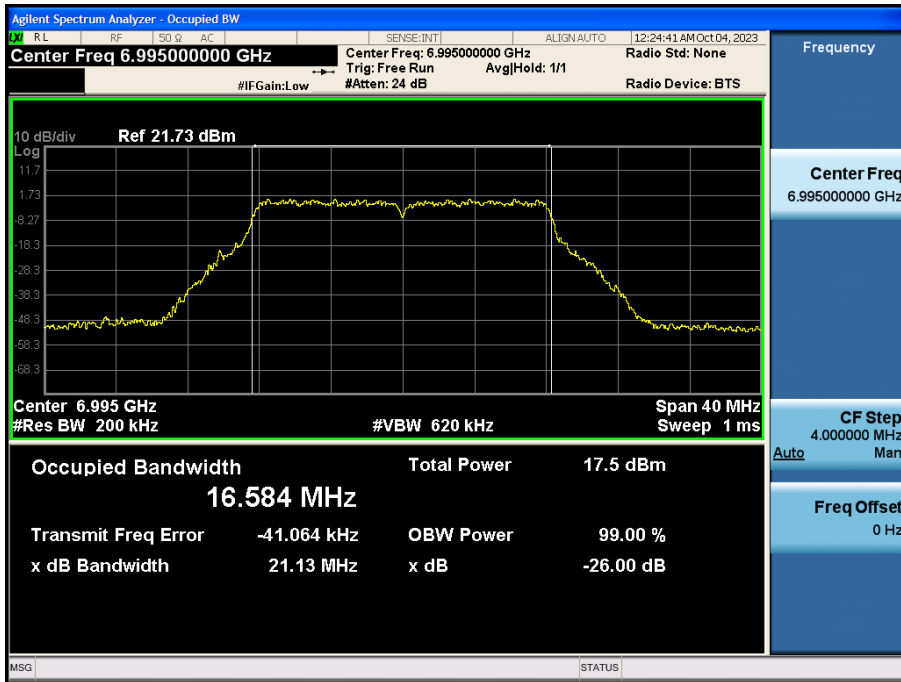


Bandwidth 160M, Ch. 15(6025 MHz) 2x996 Tones 68 RU

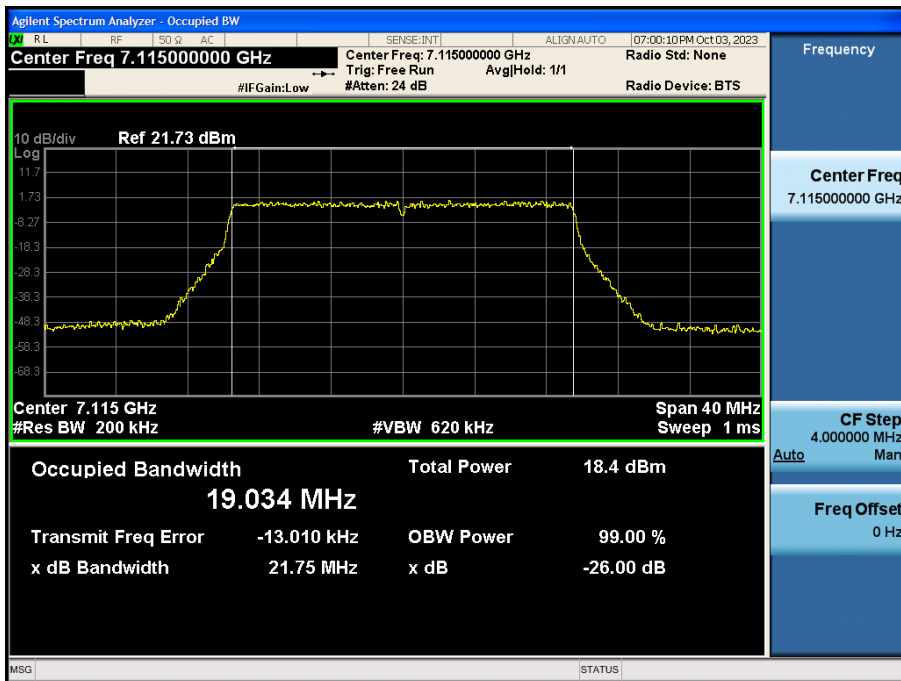


Ant.2

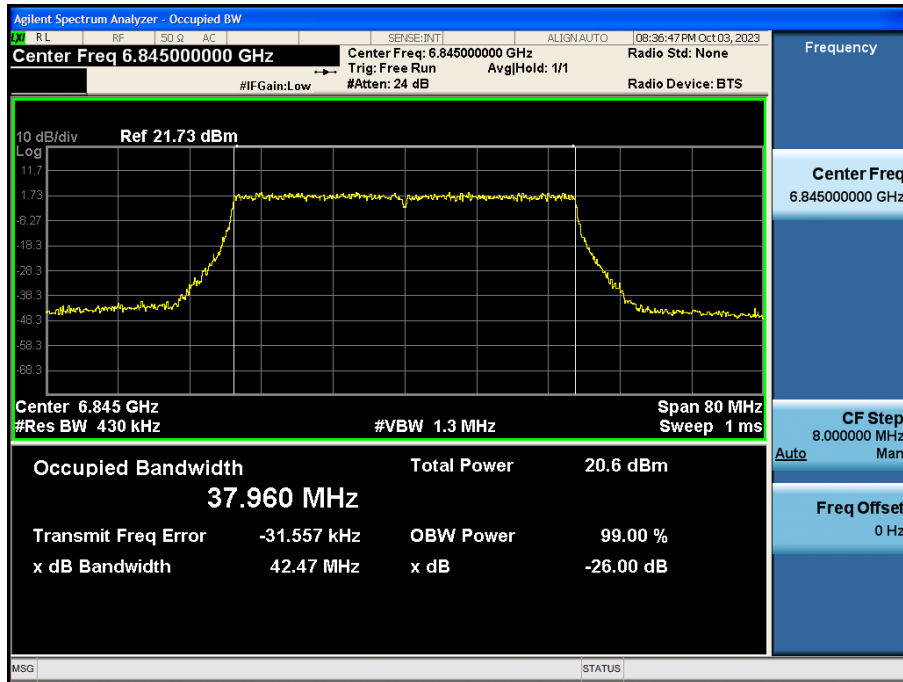
802.11a Ch.209(6995 MHz)



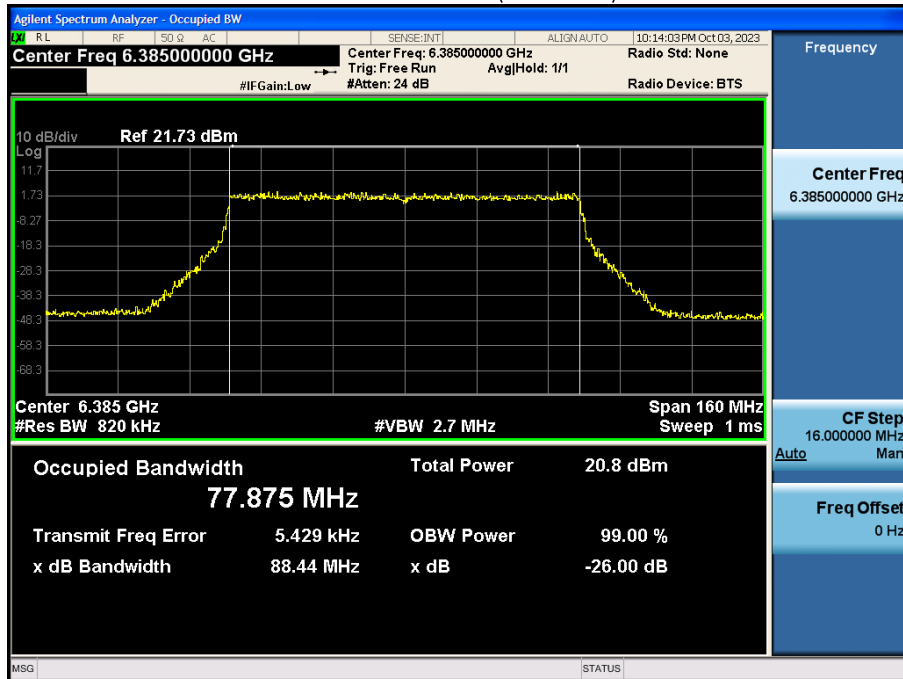
802.11ax HE20 Ch.233(7115 MHz) SU



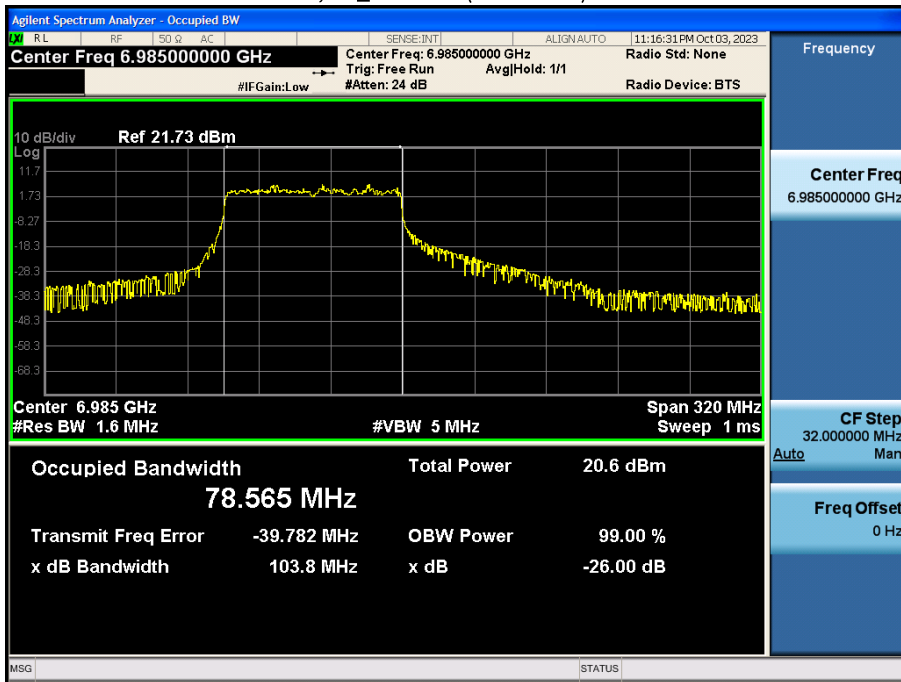
802.11ax HE40 Ch.179(6845 MHz) SU



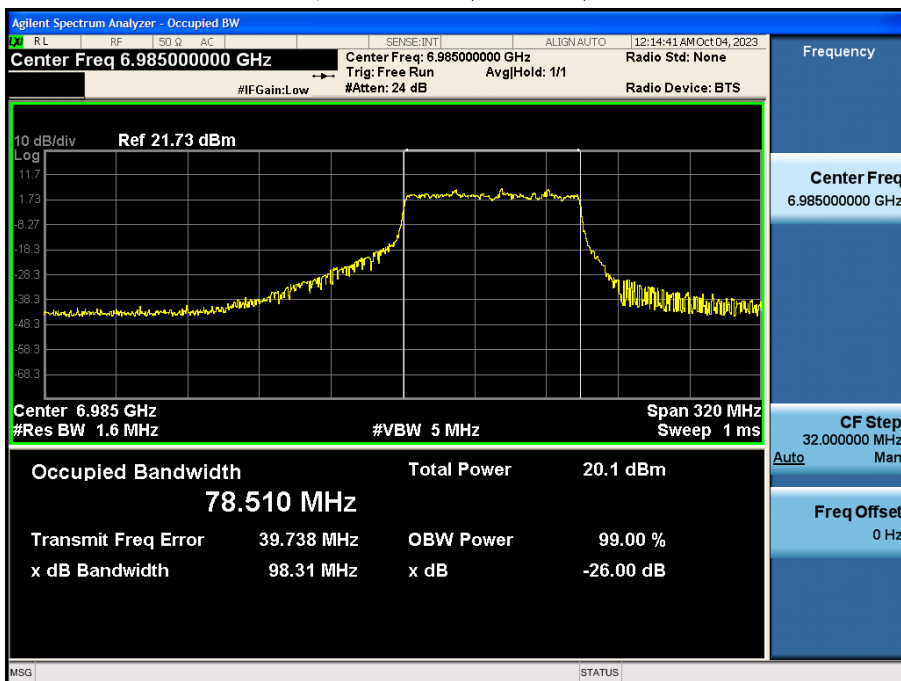
802.11ax HE80 Ch.87(6385 MHz) SU



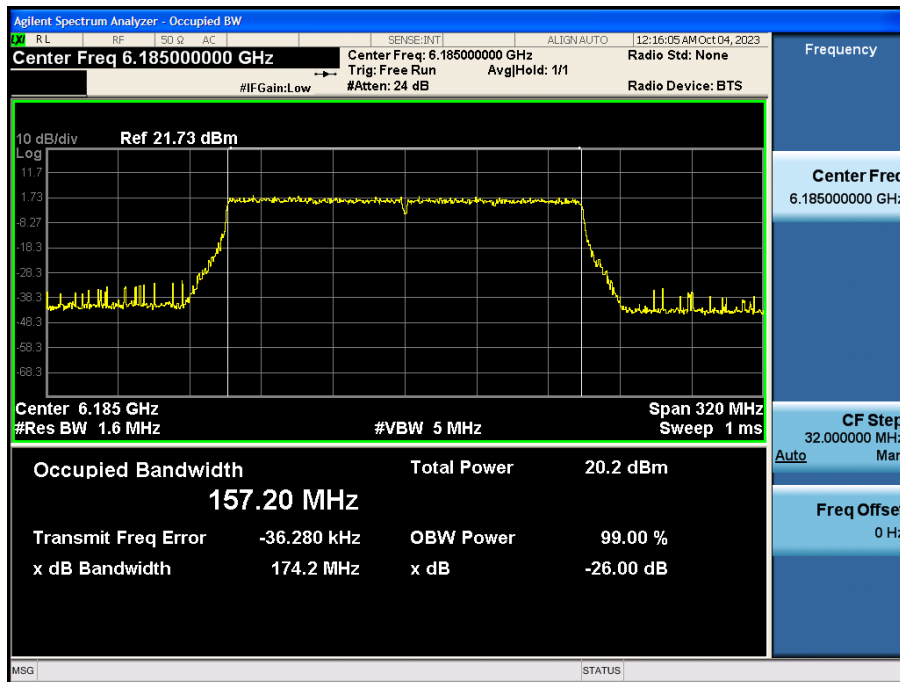
802.11ax HE160, 80_L Ch.207(6985 MHz) 996 Tones 67 RU



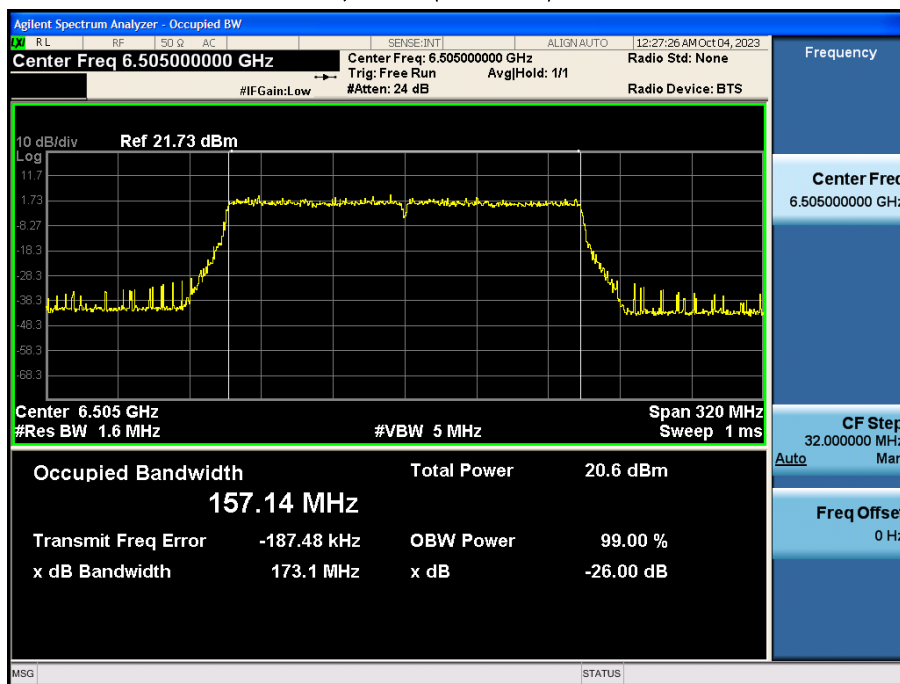
802.11ax HE160, 80_U Ch.207(6985 MHz) 996 Tones 67 RU



Bandwidth 160M, SU Ch.47(6185 MHz) SU



Bandwidth 160M, Ch.111(6505 MHz) 2x996 Tones 68 RU



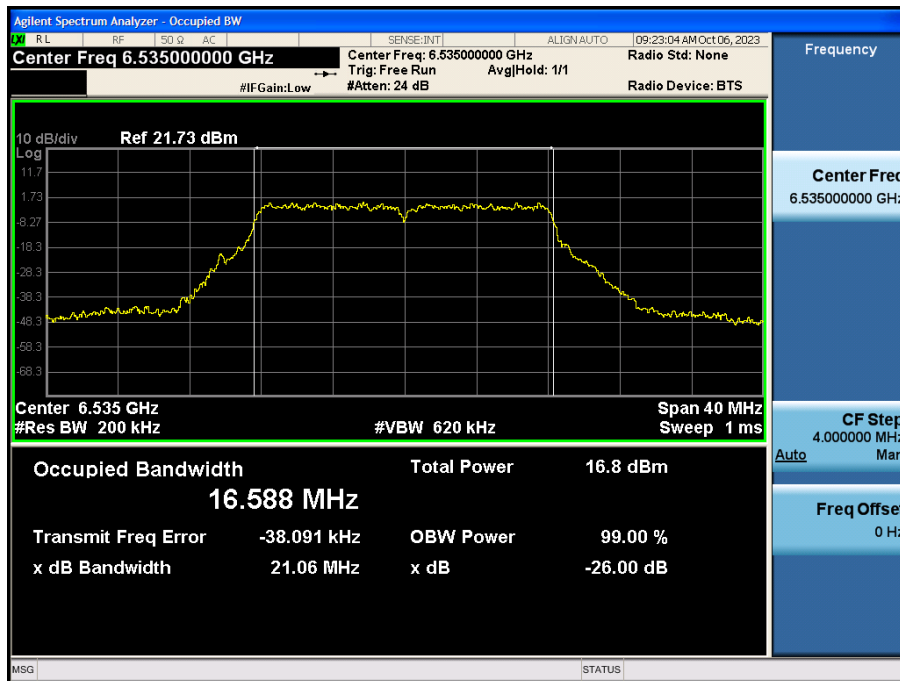
2.2 Standard client

Note:

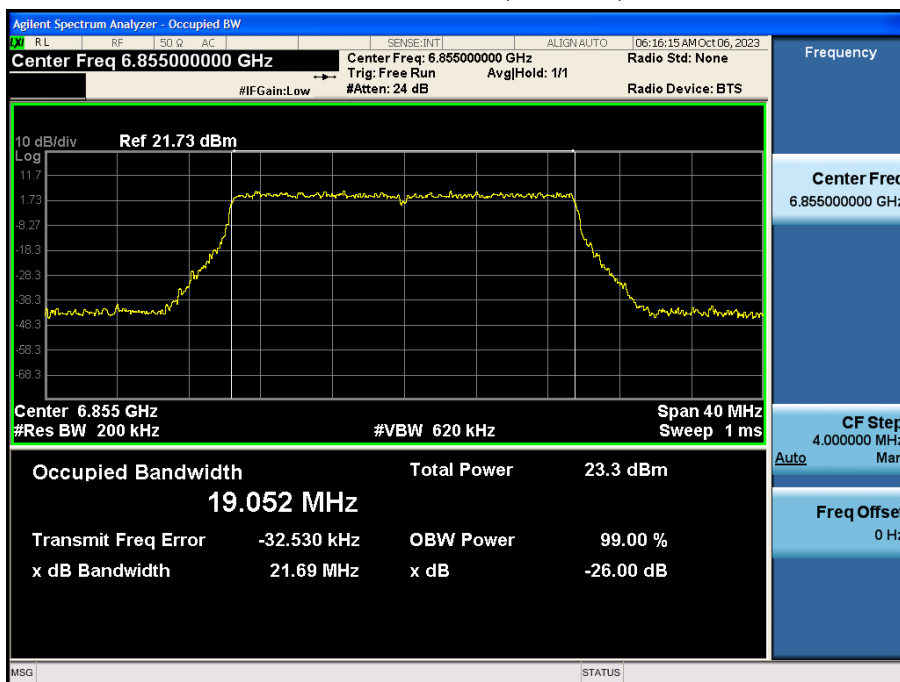
1. In order to simplify the report, attached plots were only the most wide channel.

Ant.1

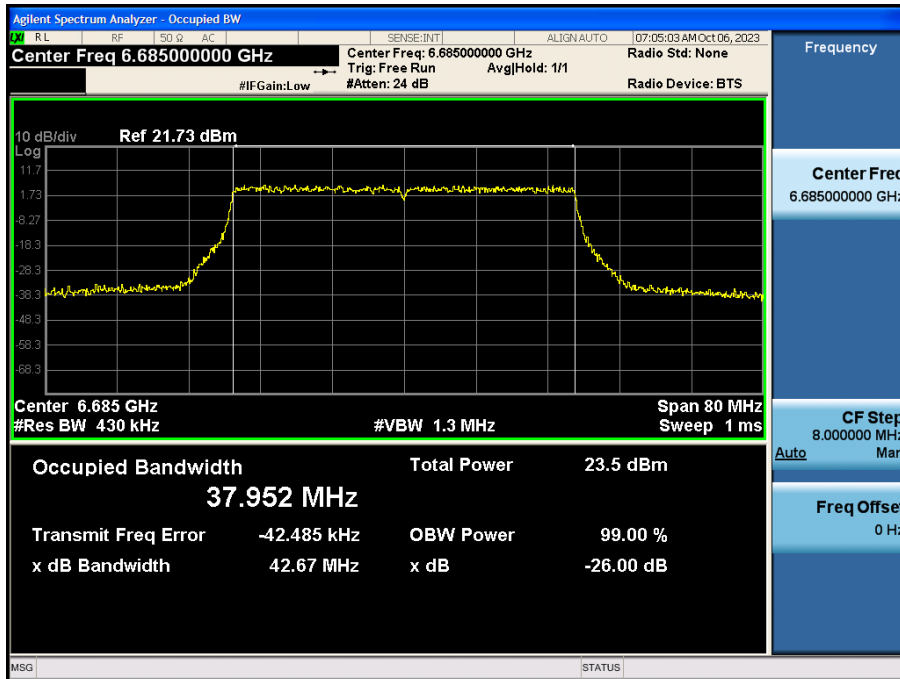
802.11a Ch.117(6535 MHz)



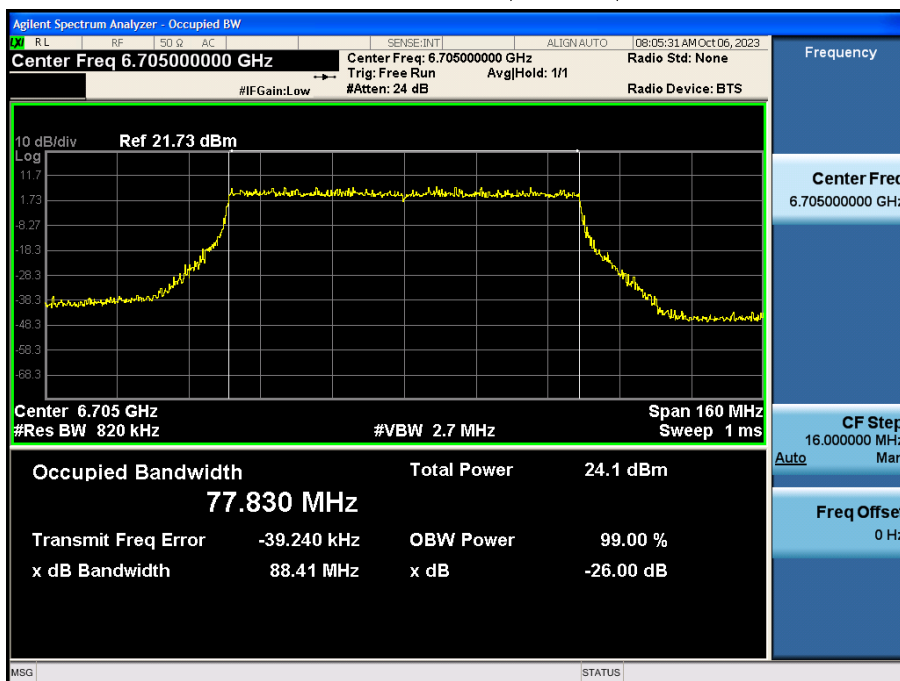
802.11ax HE20 Ch.181(6855 MHz) SU



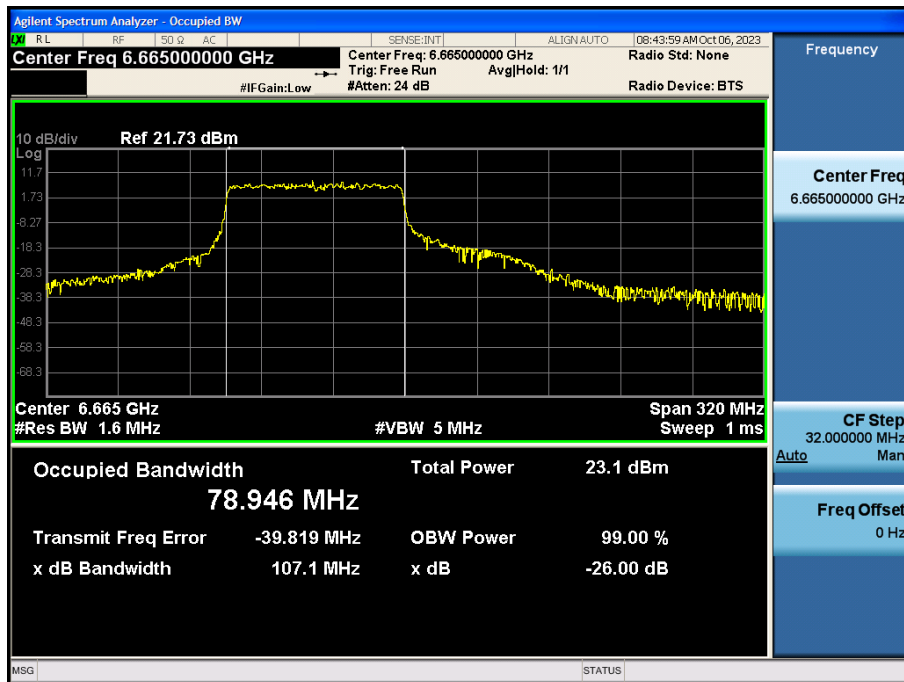
802.11ax HE40 Ch.147(6685MHz) SU



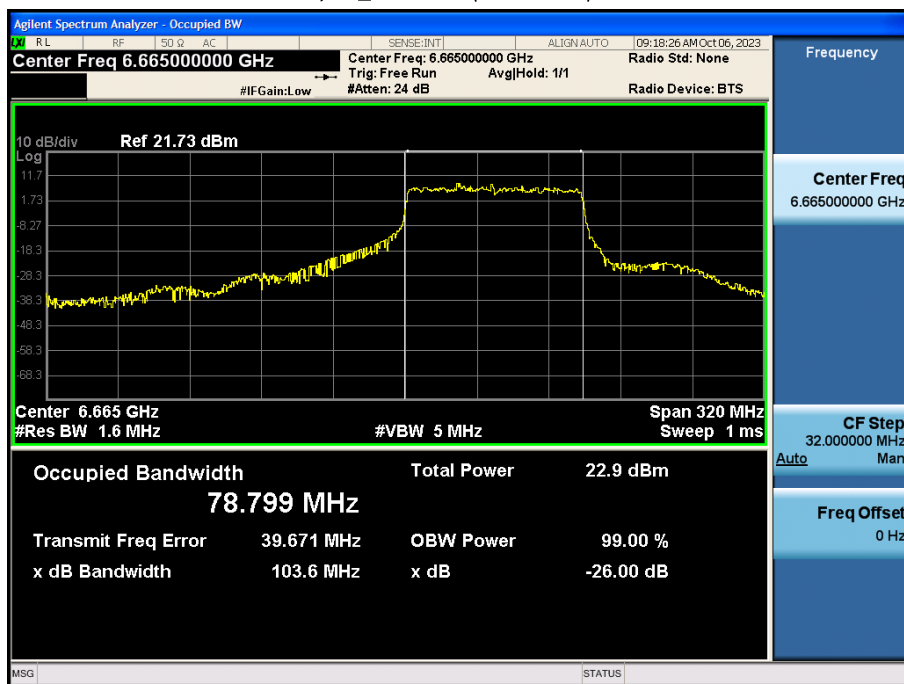
802.11ax HE80 Ch.151(6705MHz) SU



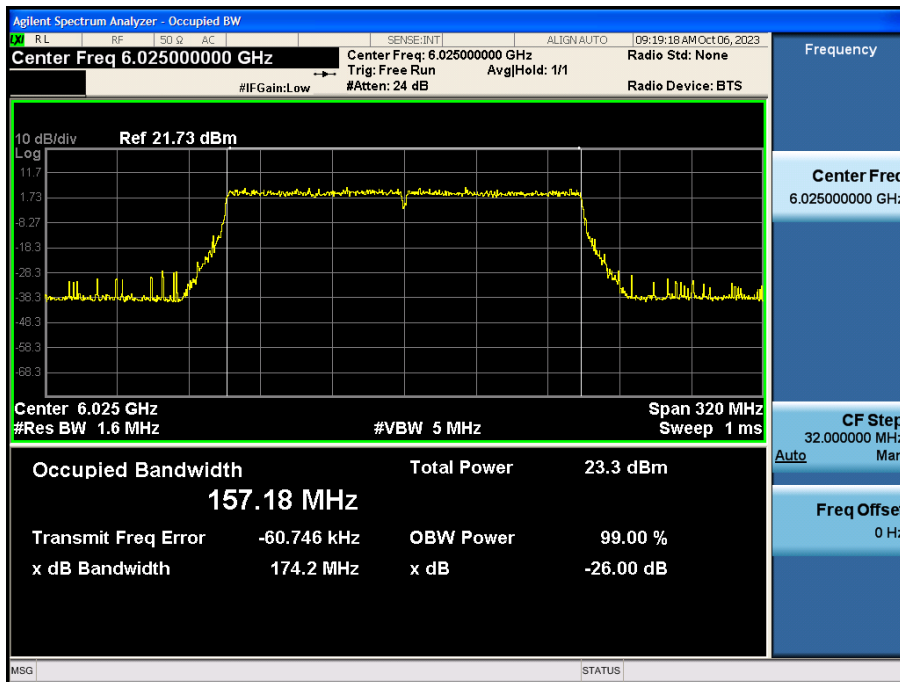
802.11ax HE160, 80_L Ch.143(6665 MHz) 996 Tones 67 RU



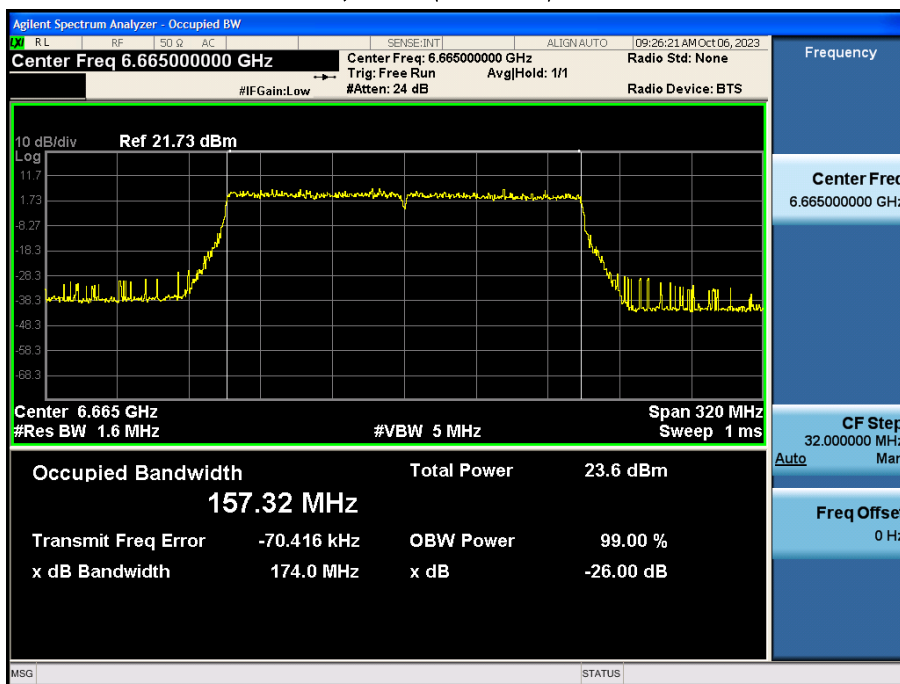
802.11ax HE160, 80_U Ch.143(6665 MHz) 996 Tones 67 RU



Bandwidth 160M, SU Ch. 15(6025 MHz)

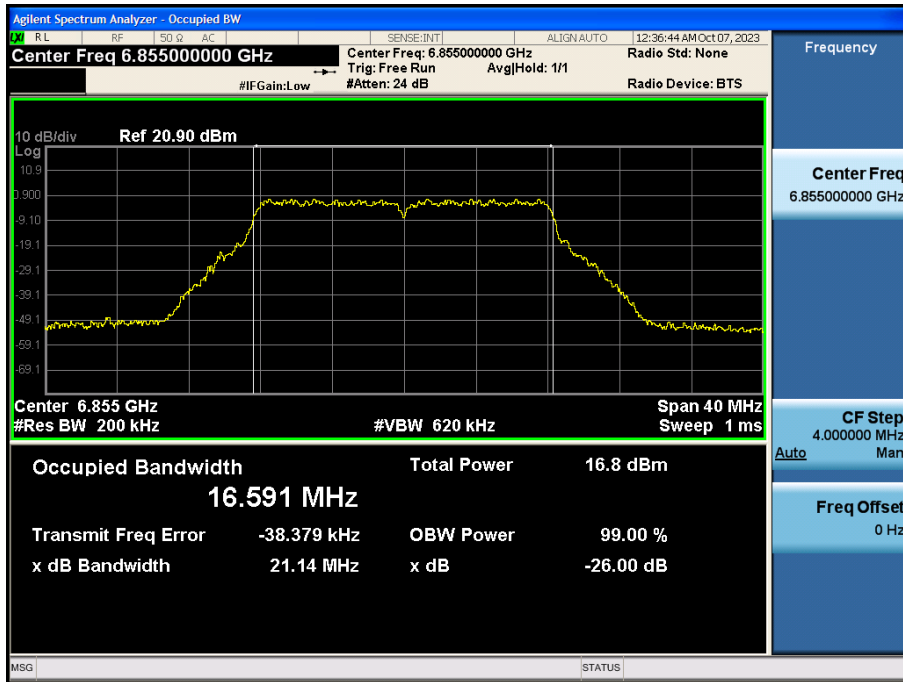


Bandwidth 160M, Ch.143(6665 MHz) 2x996 Tones 68 RU

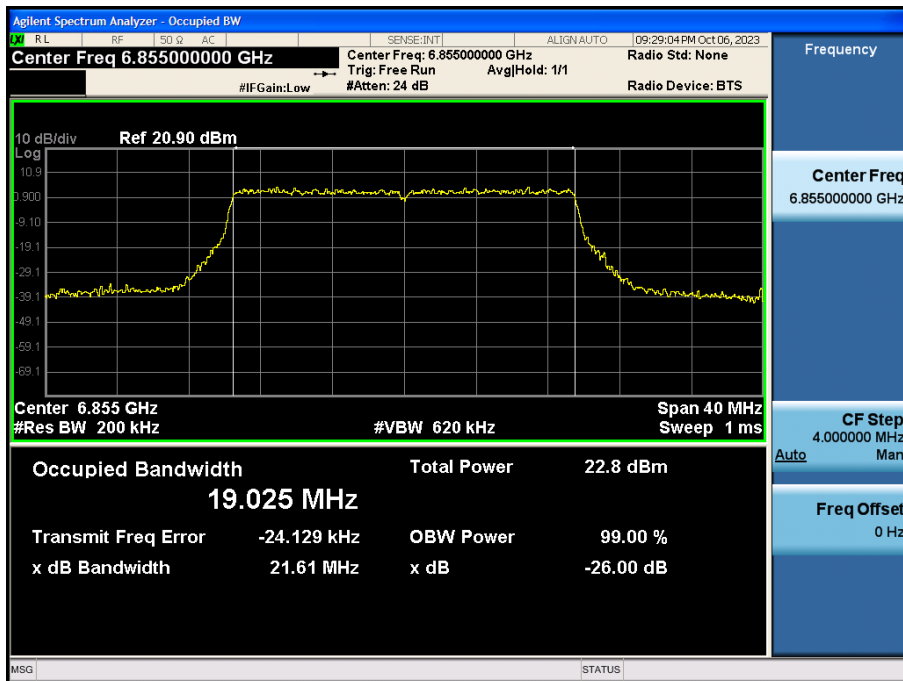


Ant.2

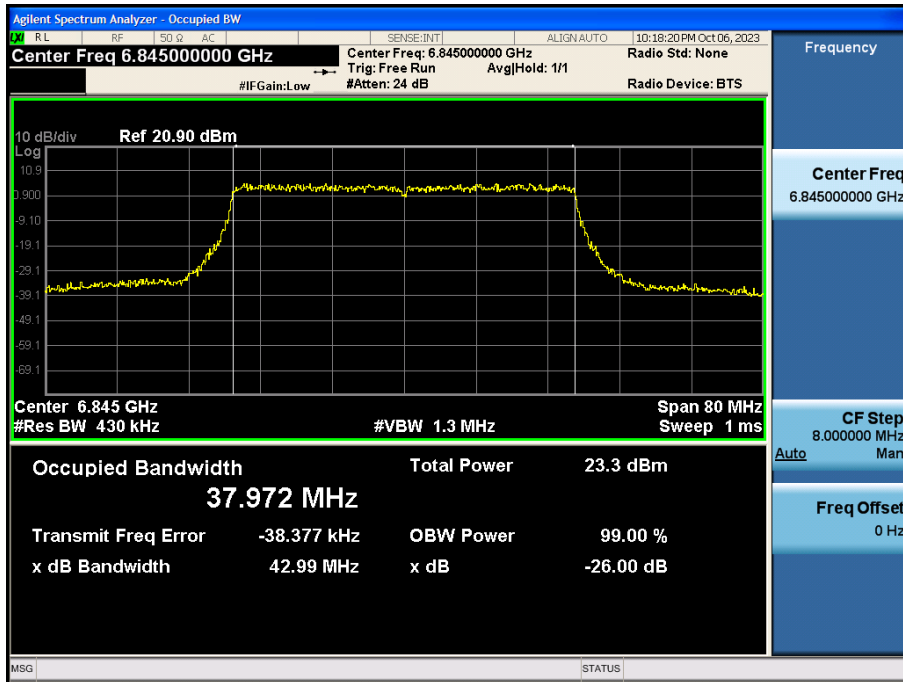
802.11a Ch.181(6855 MHz)



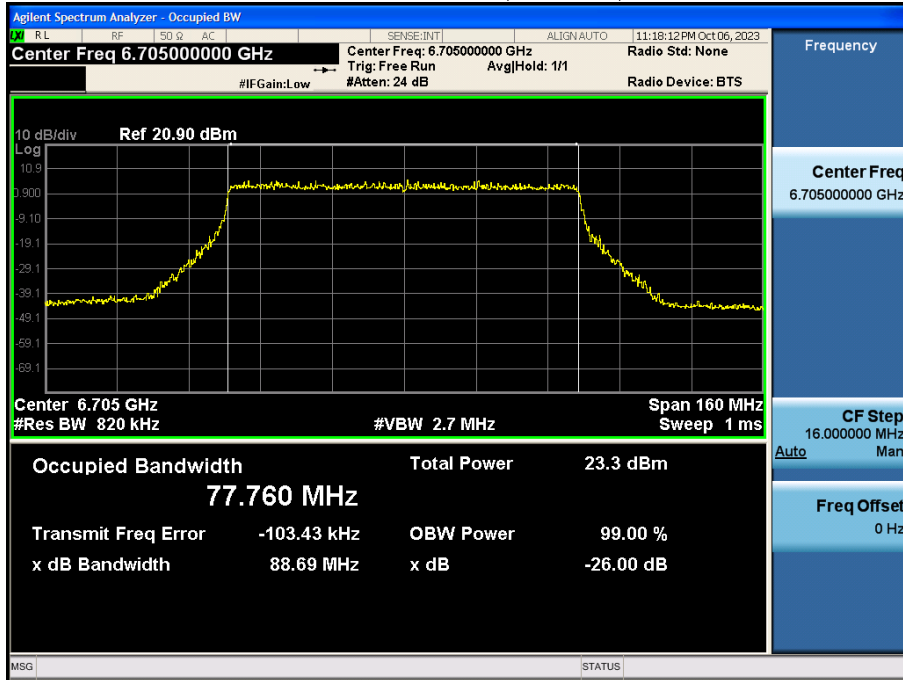
802.11ax HE20 Ch.181(6855 MHz) SU



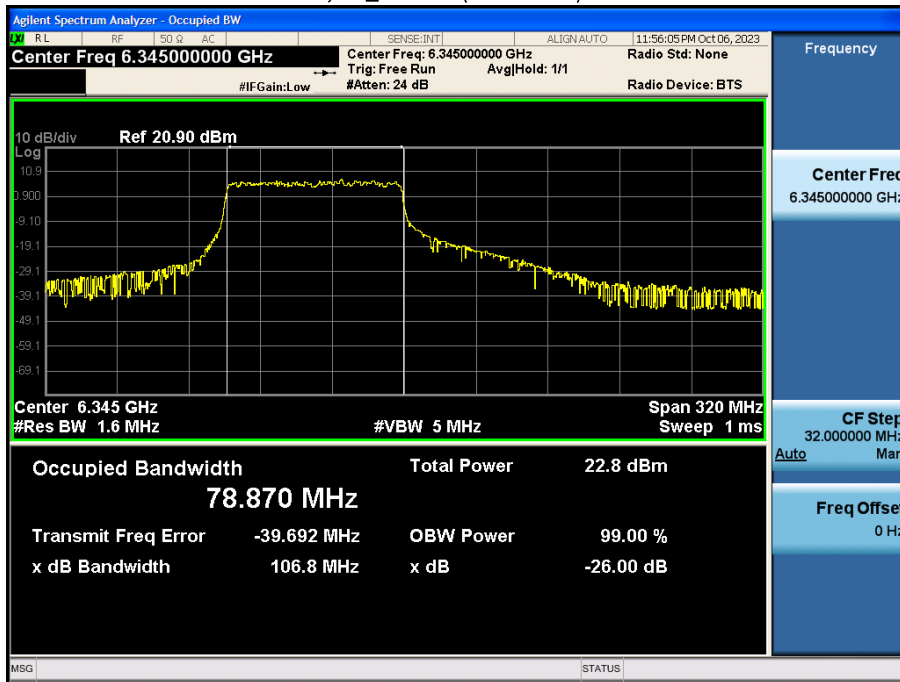
802.11ax HE40 Ch.179(6845 MHz) SU



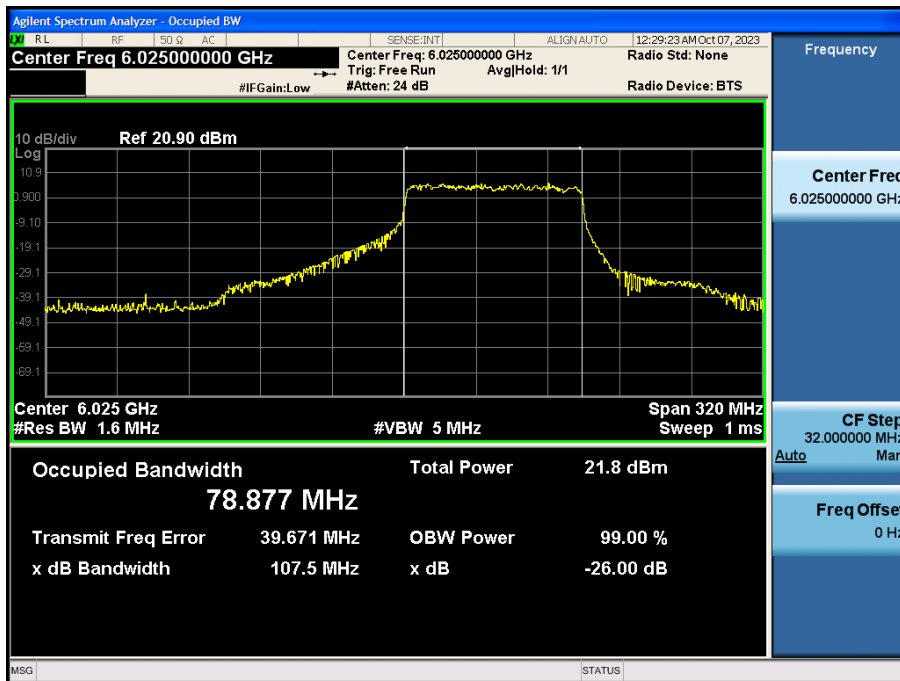
802.11ax HE80 Ch.151(6705 MHz) SU



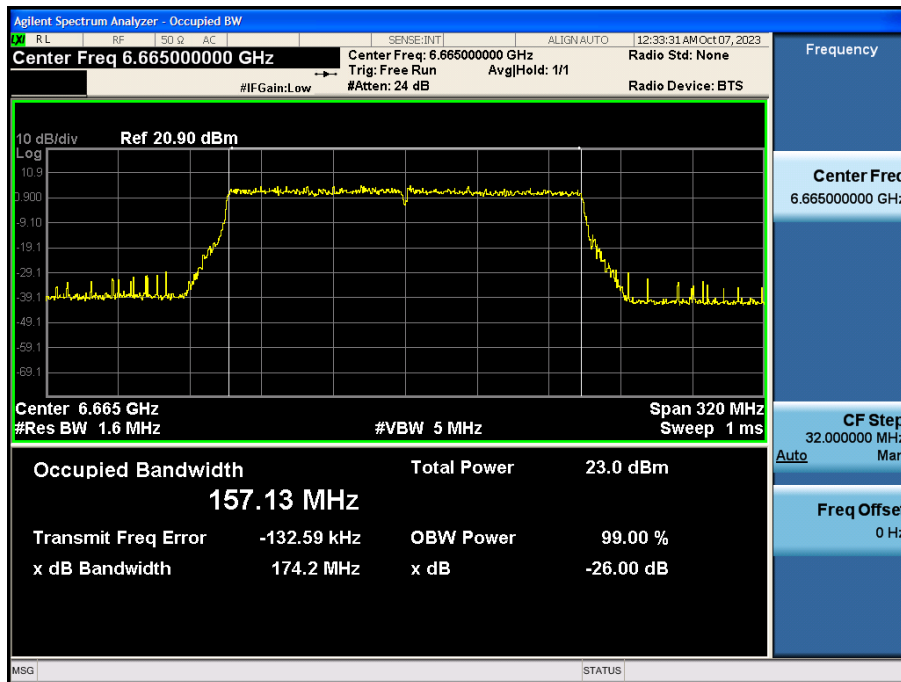
802.11ax HE160, 80_L Ch.79(6345 MHz) 996 Tones 67 RU



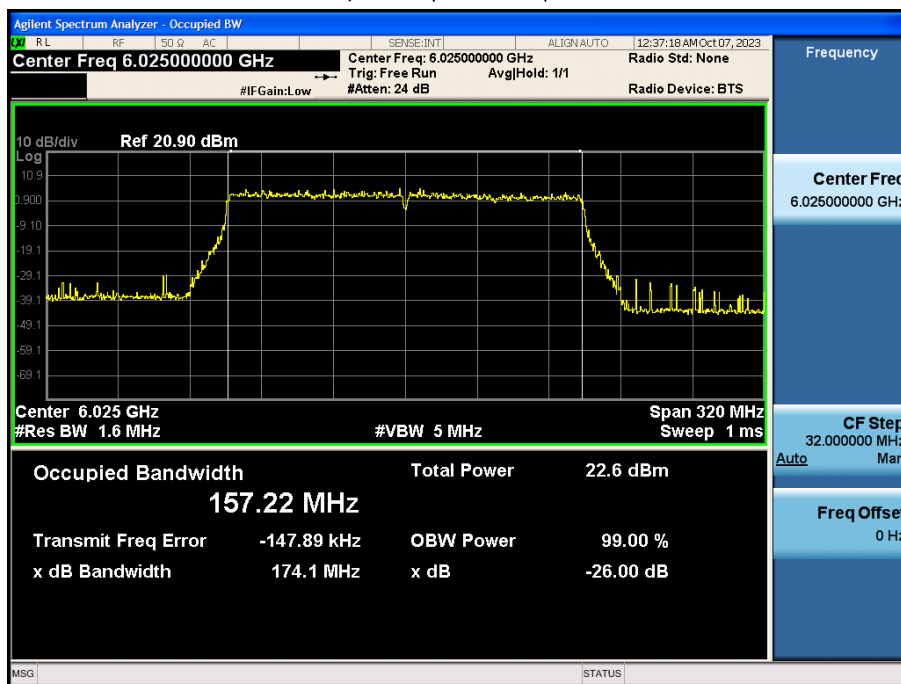
802.11ax HE160, 80_U Ch.15(6025 MHz) 996 Tones 67 RU



Bandwidth 160M, SU Ch. 143(6665 MHz) SU



Bandwidth 160M, Ch. 15(6025 MHz) 2x996 Tones 68 RU



3. In-Band Emission (Emission Mask)

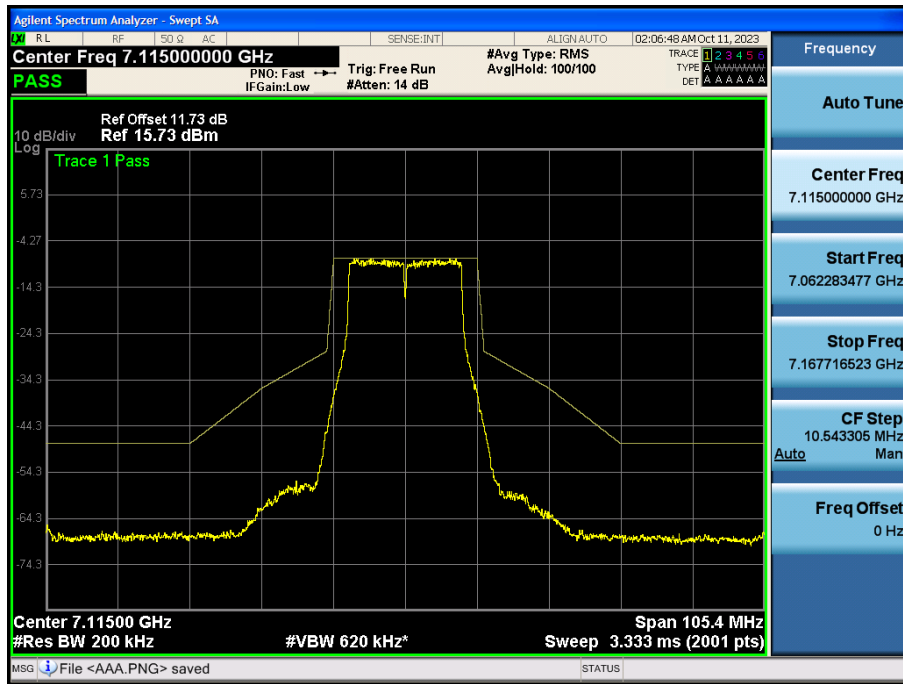
3.1 Indoor client

Note:

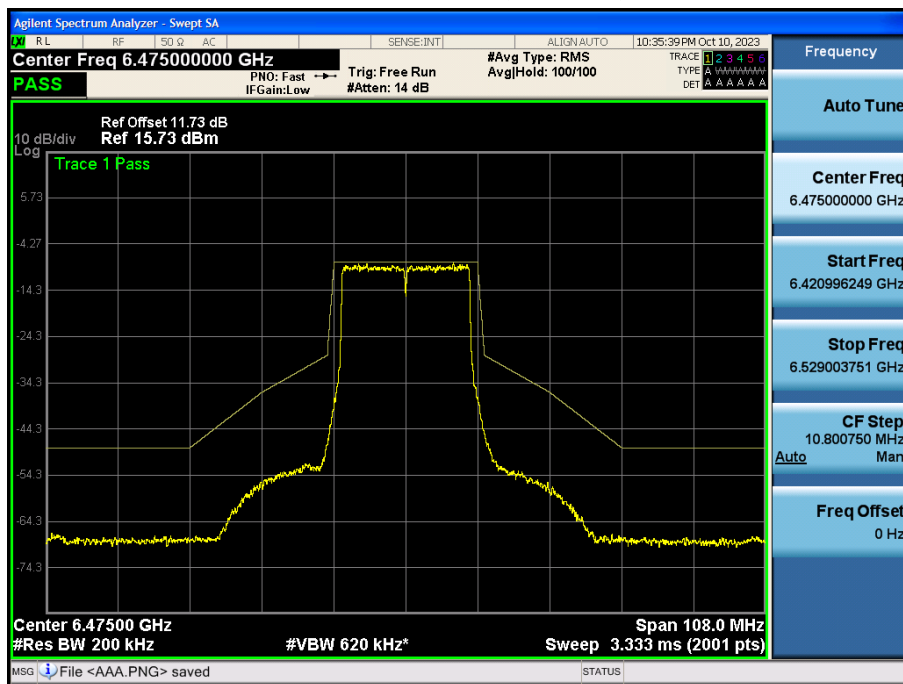
1. In order to simplify the report, attached plots were only the most wide channel.

Ant.1

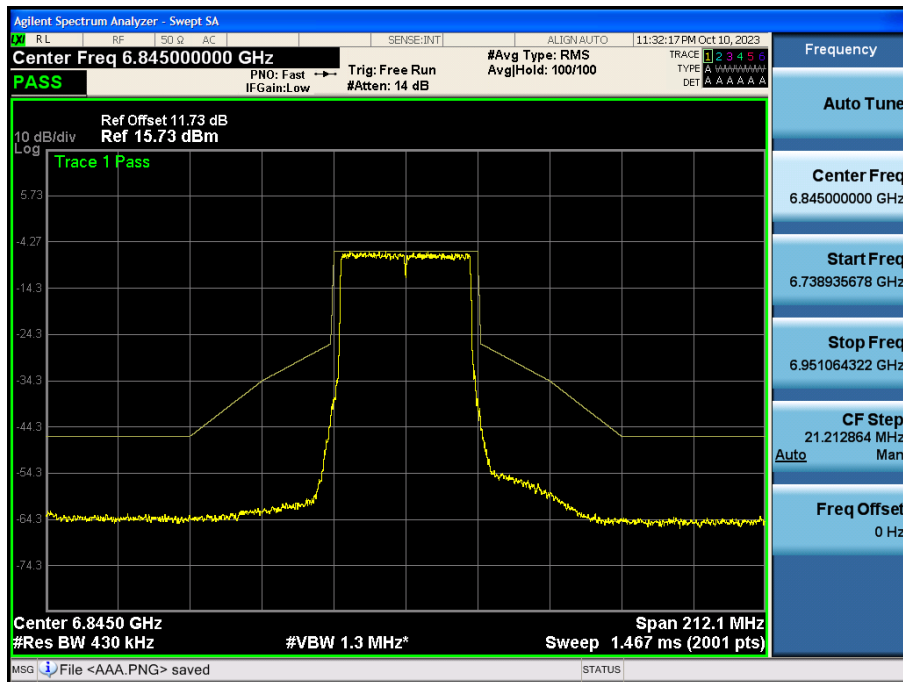
802.11a Ch.233(7115 MHz)



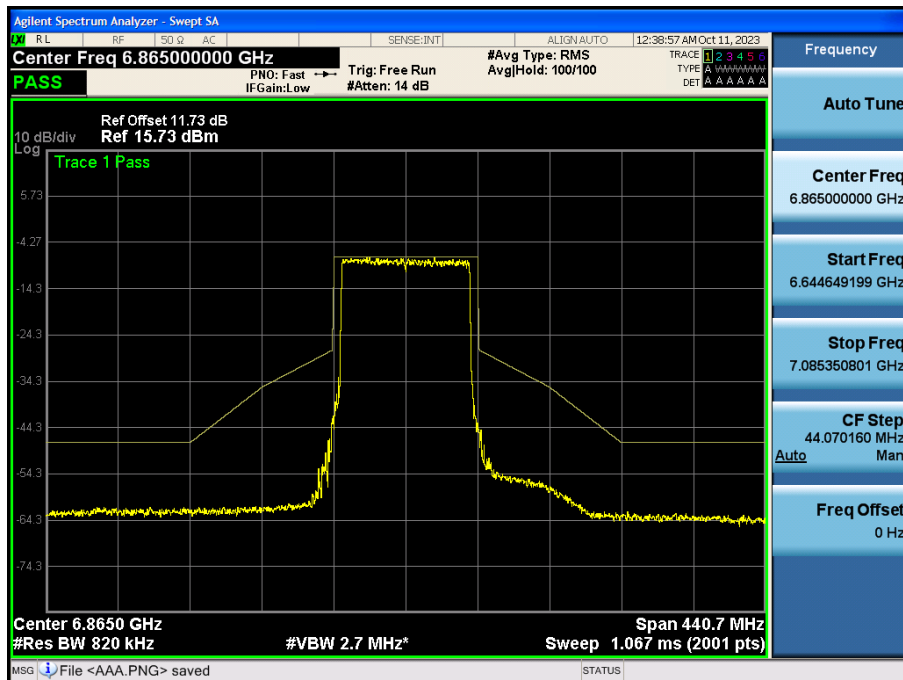
802.11ax HE20 Ch.105(6475 MHz) SU



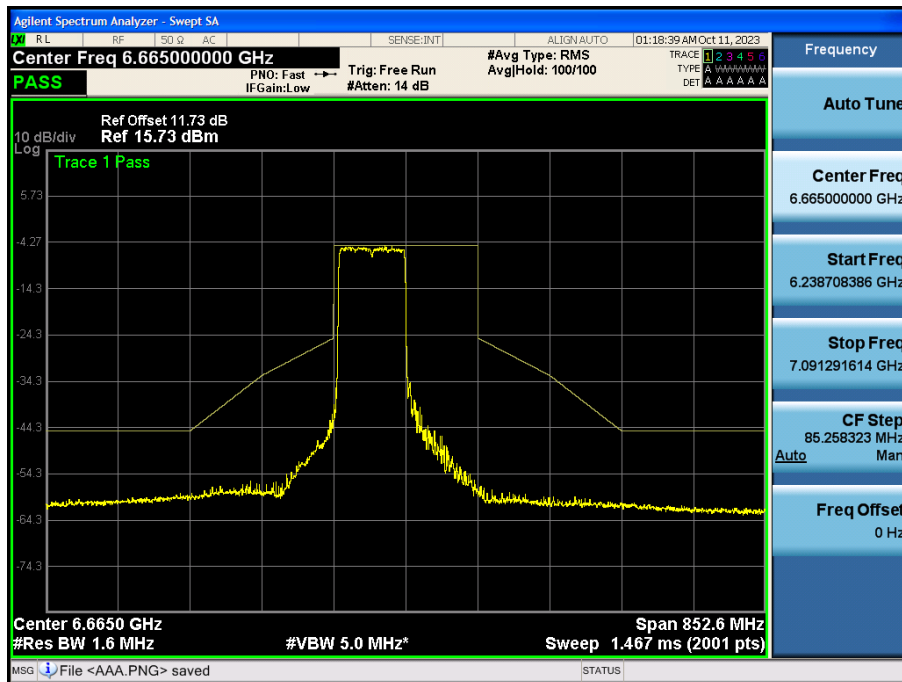
802.11ax HE40 Ch.179(6845 MHz) SU



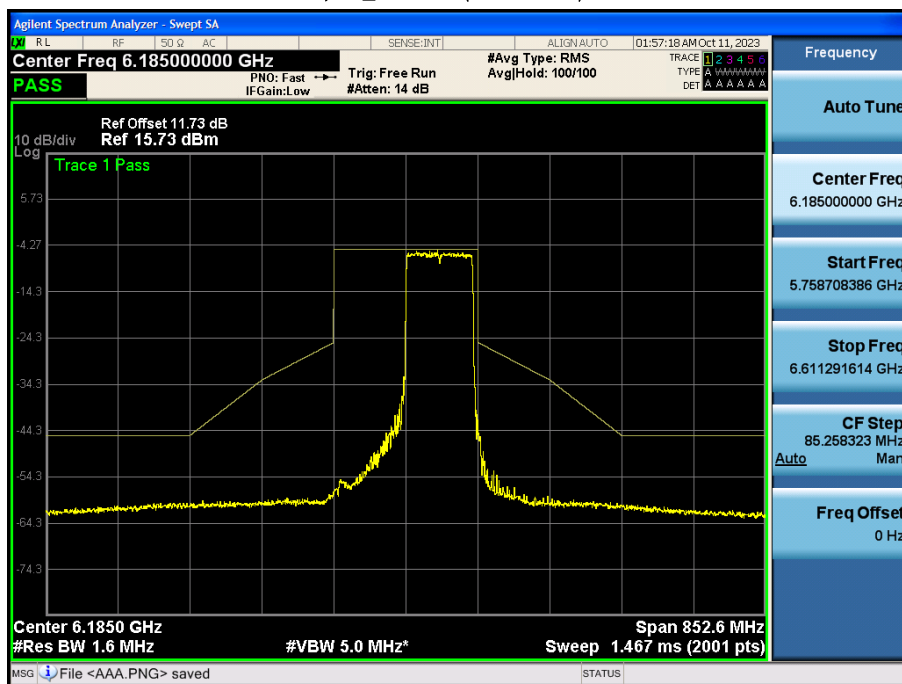
802.11ax HE80 Ch.183(6865 MHz) SU



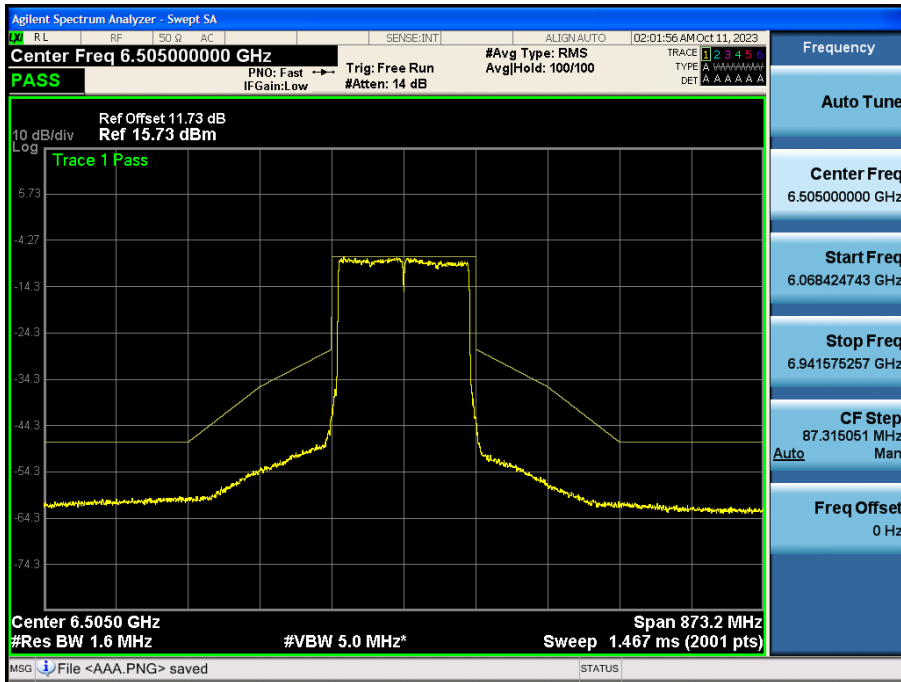
802.11ax HE160, 80_L Ch.143(6665 MHz) 996 Tones 67 RU



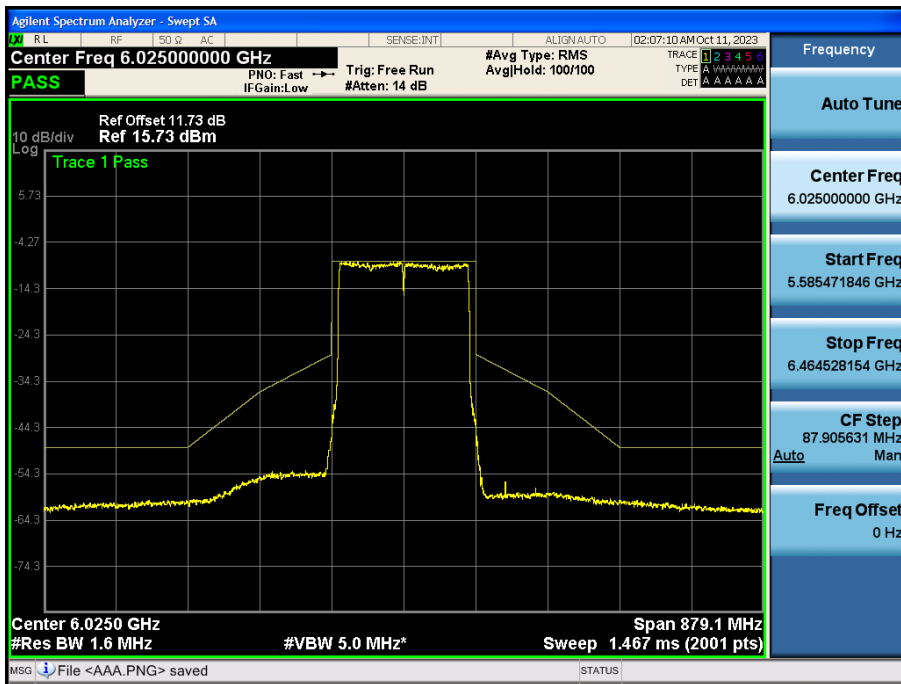
802.11ax HE160, 80_U Ch.47(6185 MHz) 996 Tones 67 RU



Bandwidth 160M, SU Ch. 111(6505 MHz)

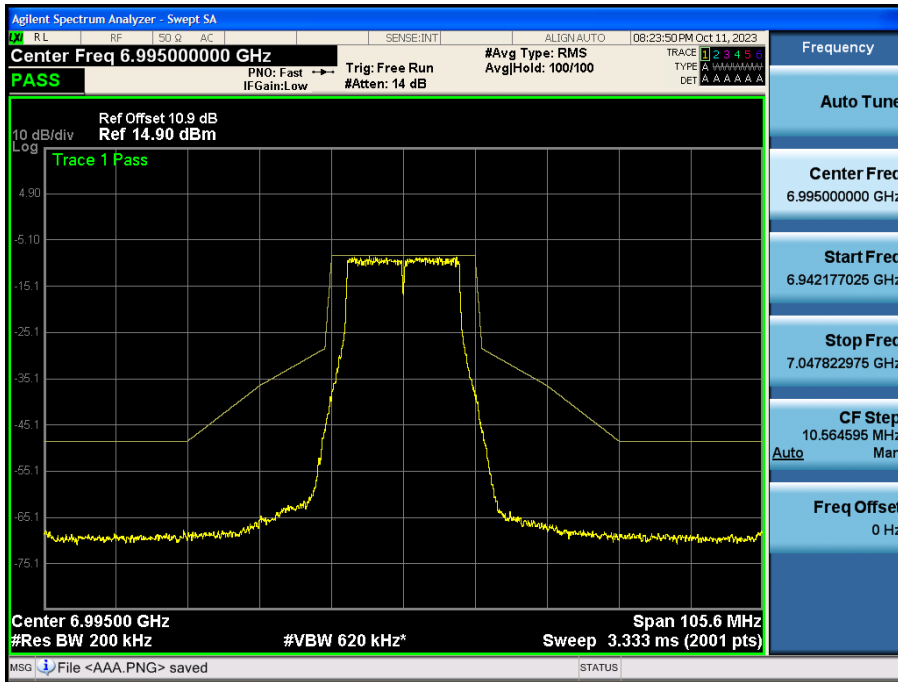


Bandwidth 160M, Ch. 15(6025 MHz) 2x996 Tones 68 RU

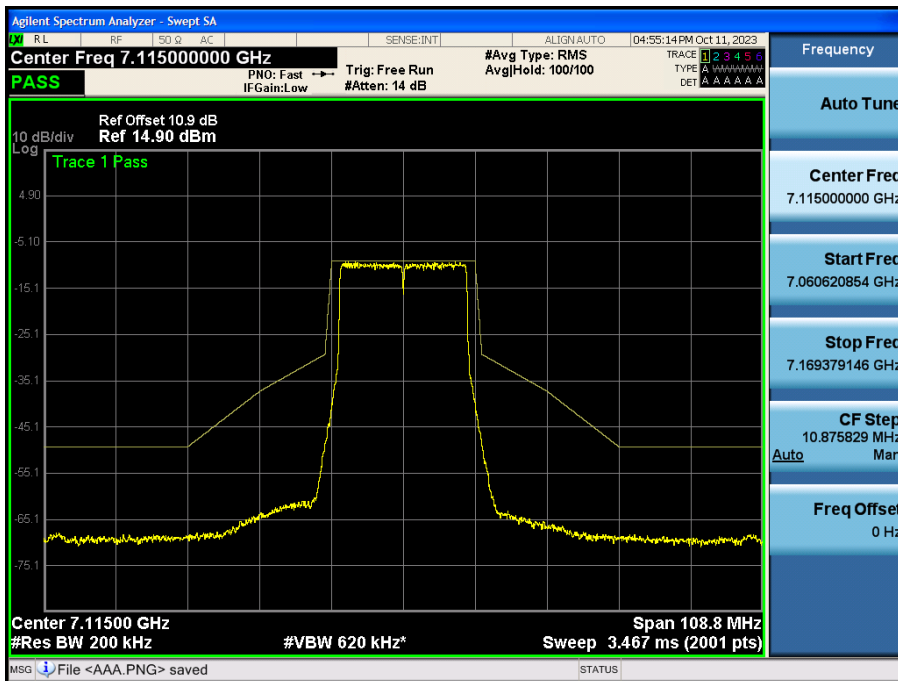


Ant.2

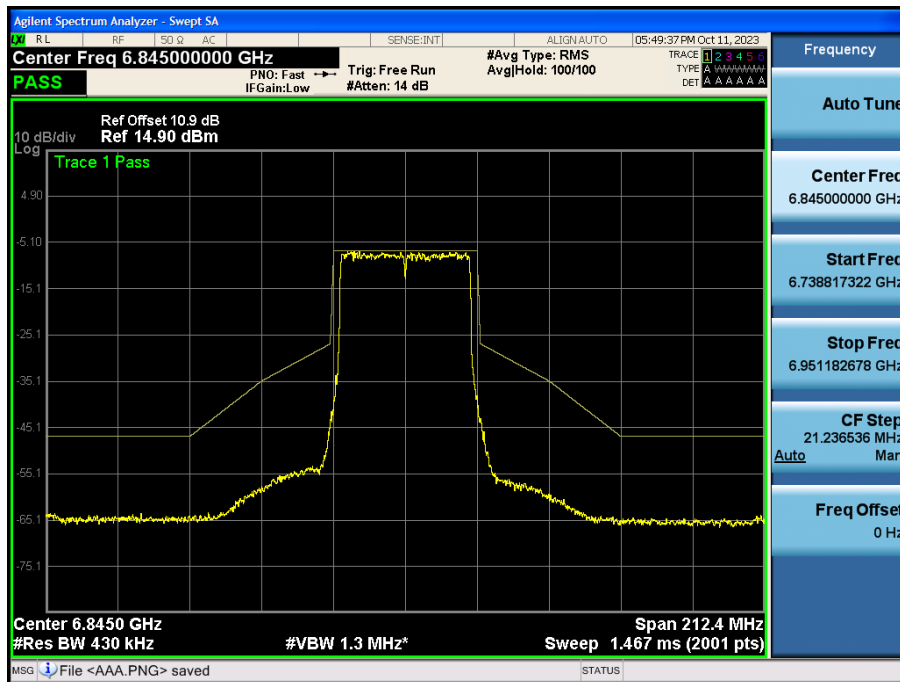
802.11a Ch.209(6995 MHz)



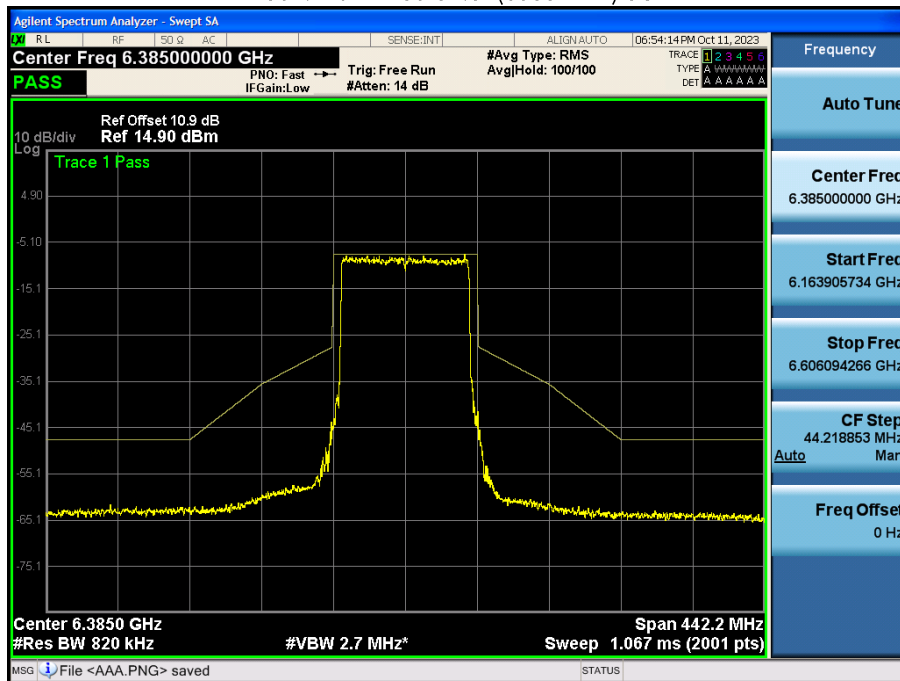
802.11ax HE20 Ch.233(7115 MHz) SU



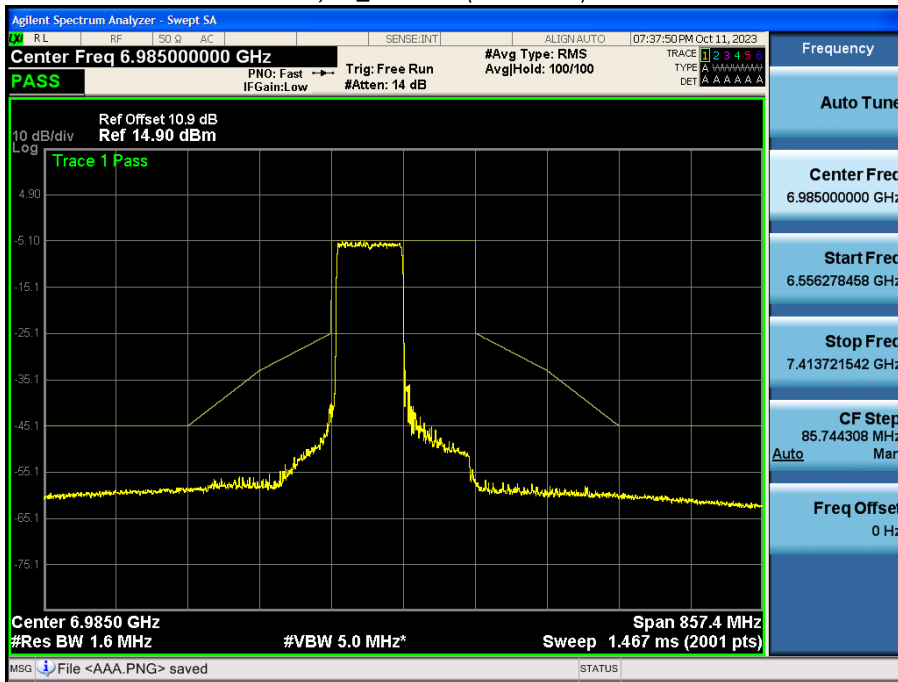
802.11ax HE40 Ch.179(6845 MHz) SU



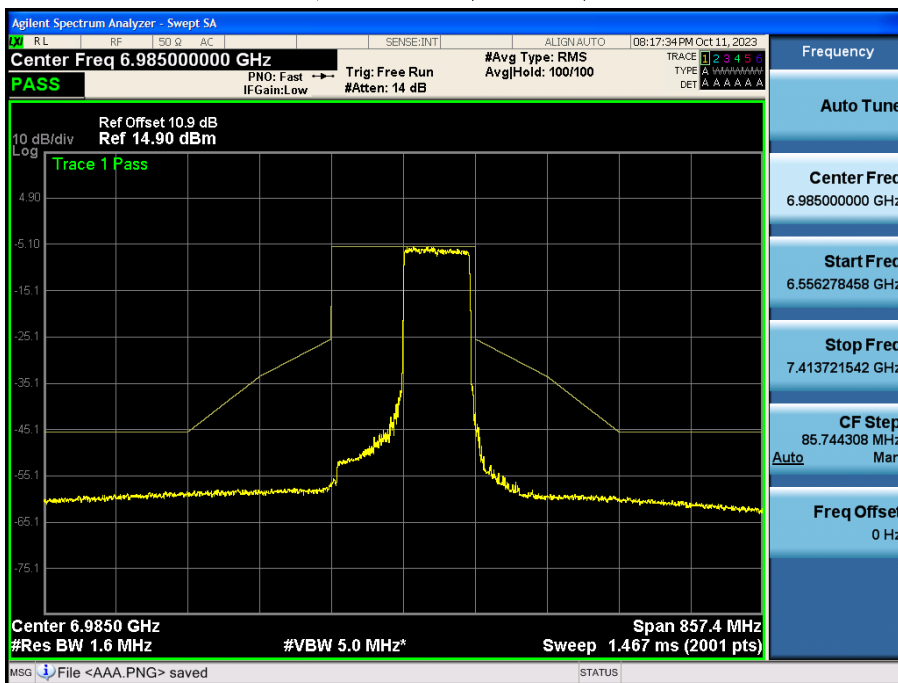
802.11ax HE80 Ch.87(6385 MHz) SU



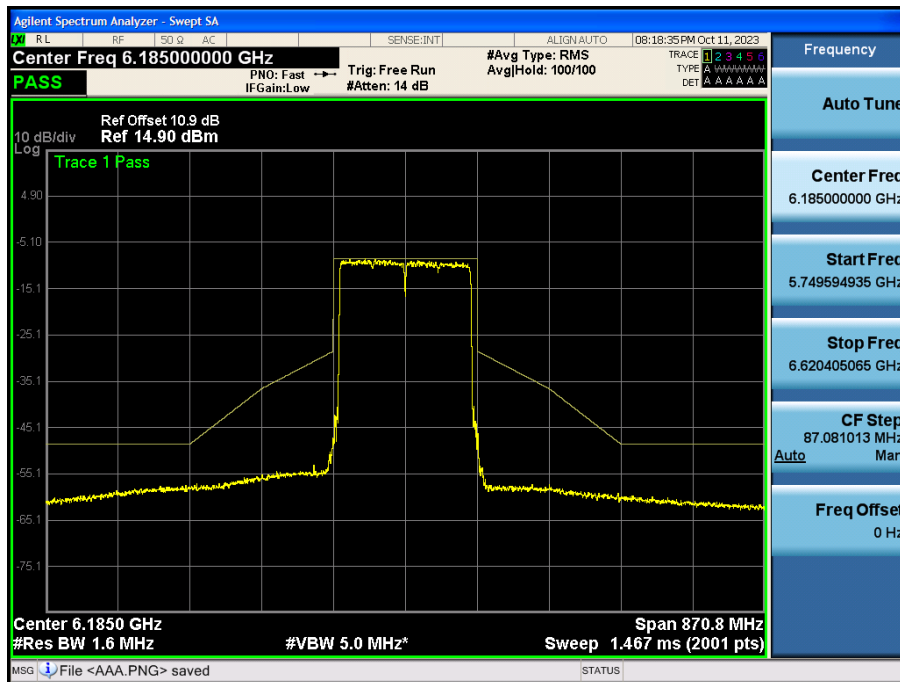
802.11ax HE160, 80_L Ch.207(6985 MHz) 996 Tones 67 RU



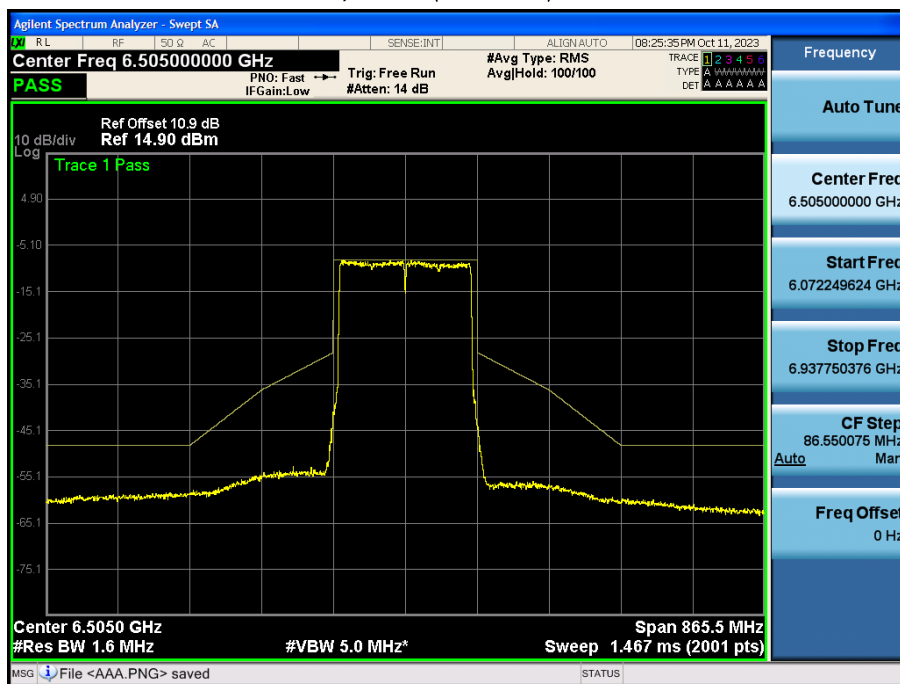
802.11ax HE160, 80_U Ch.207(6985 MHz) 996 Tones 67 RU



Bandwidth 160M, SU Ch.47(6185 MHz) SU



Bandwidth 160M, Ch.11(6505 MHz) 2x996 Tones 68 RU



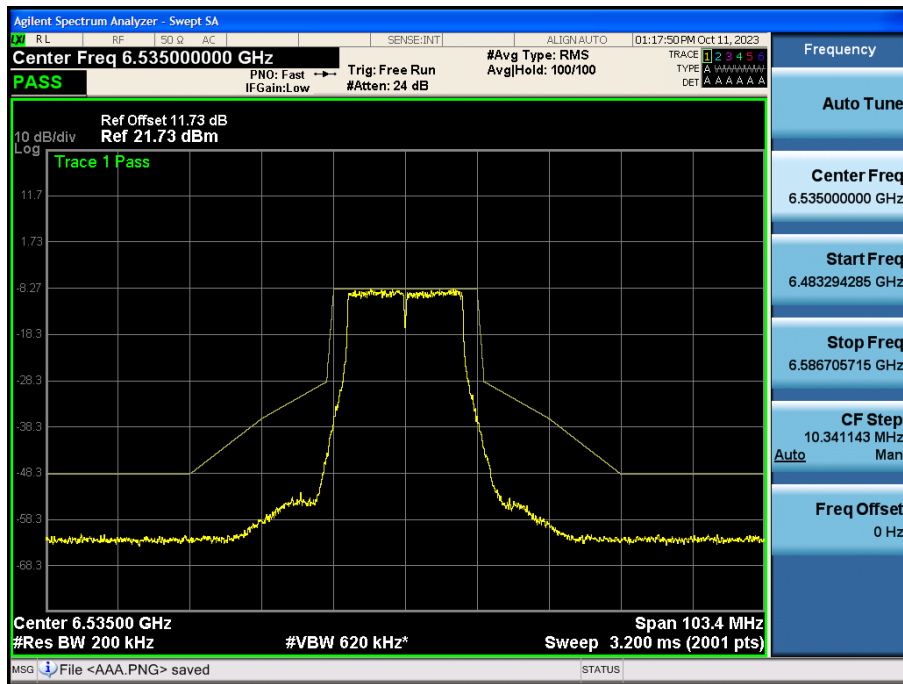
3.2 Standard client

Note:

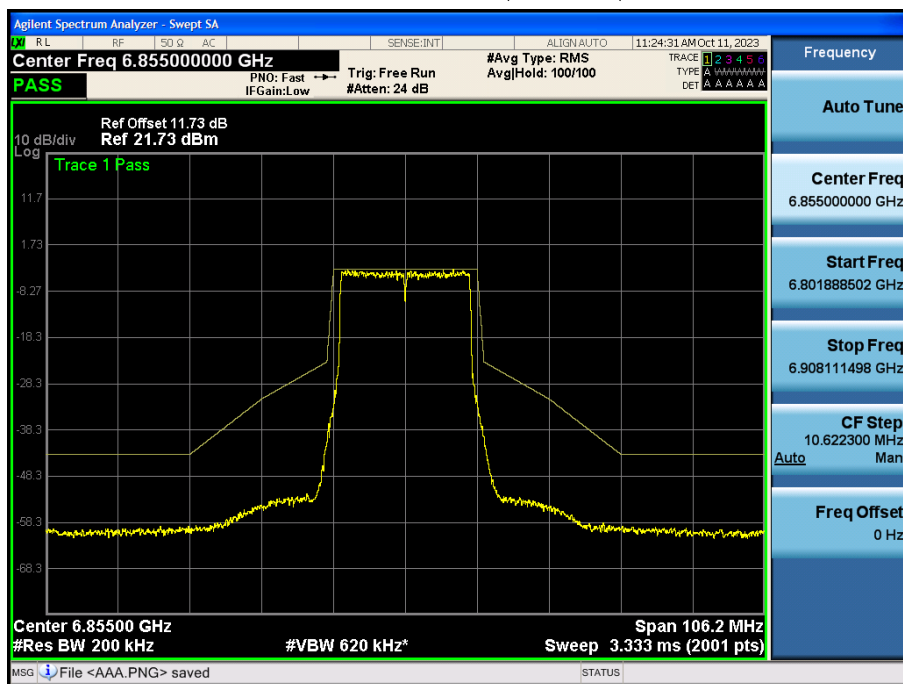
1. In order to simplify the report, attached plots were only the most wide channel.

Ant.1

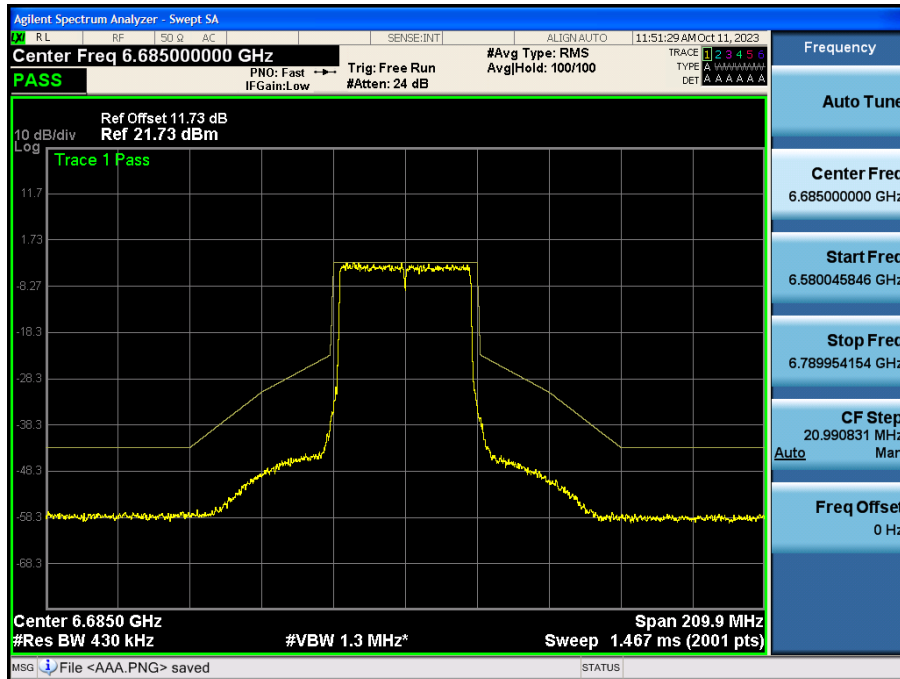
802.11a Ch.117(6535 MHz)



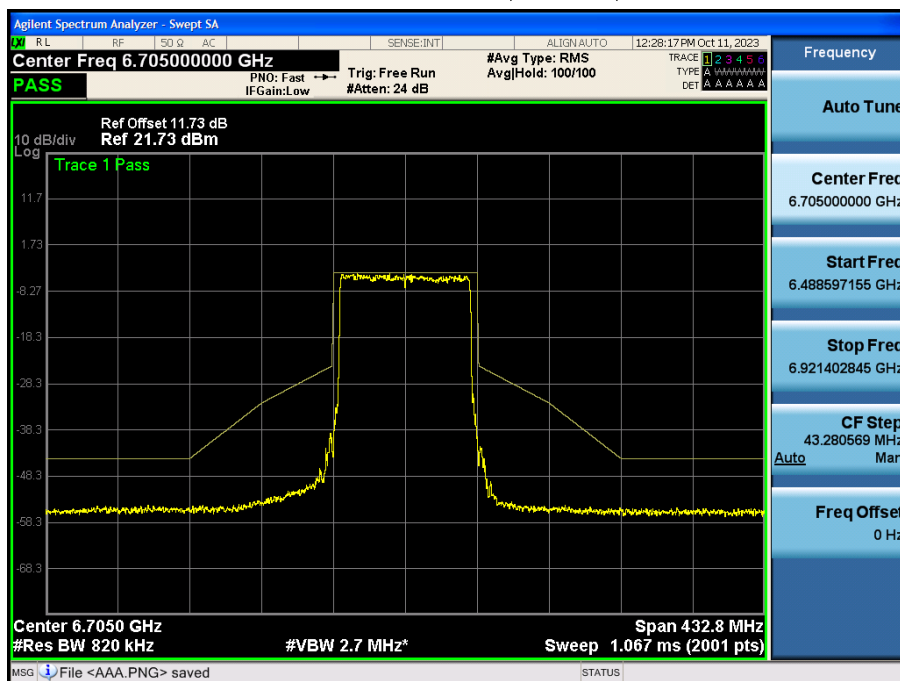
802.11ax HE20 Ch.181(6855 MHz) SU



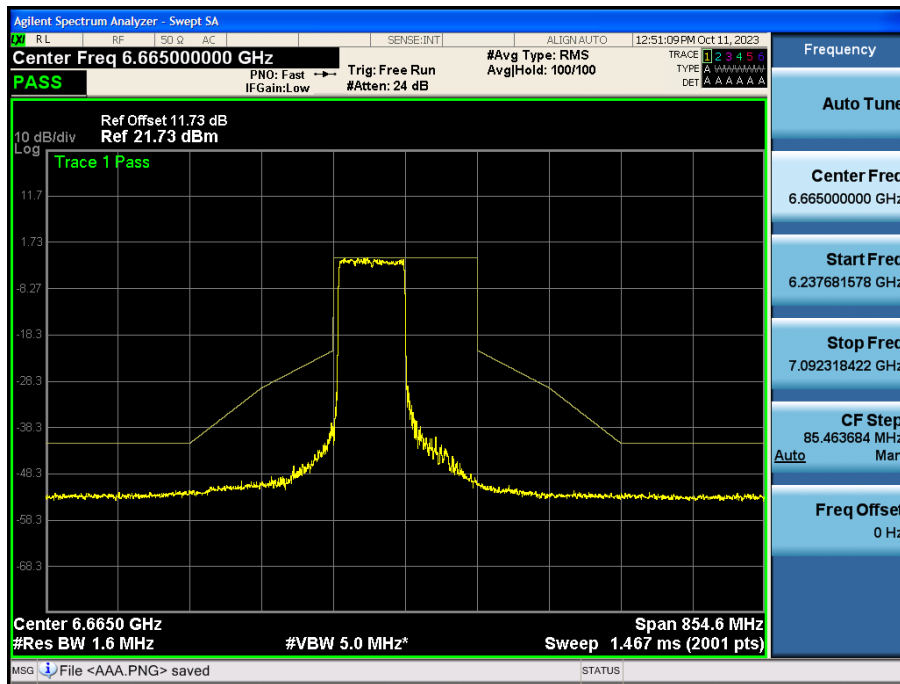
802.11ax HE40 Ch.147(6685MHz) SU



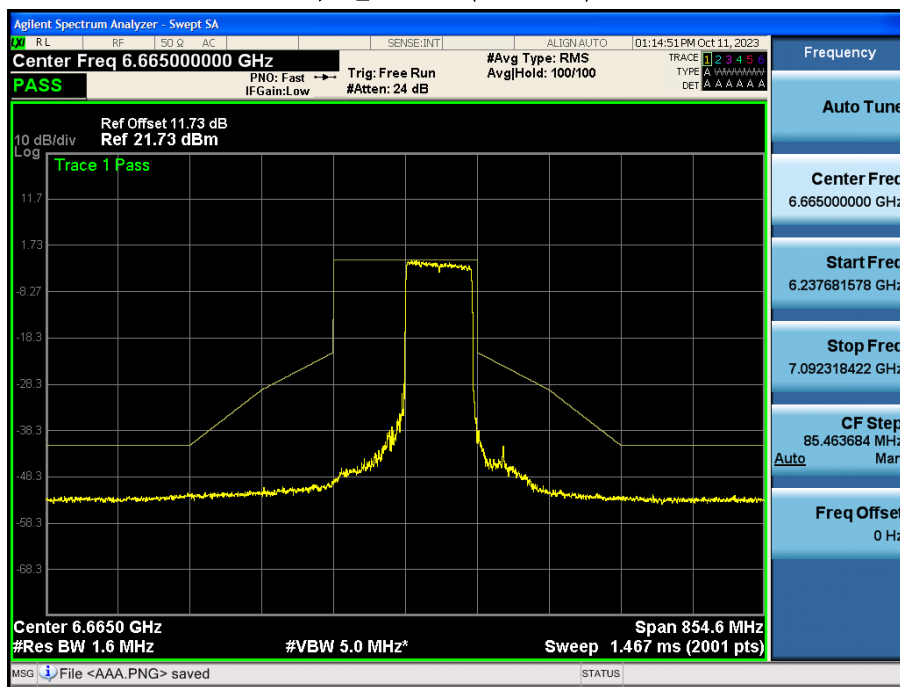
802.11ax HE80 Ch.151(6705MHz) SU



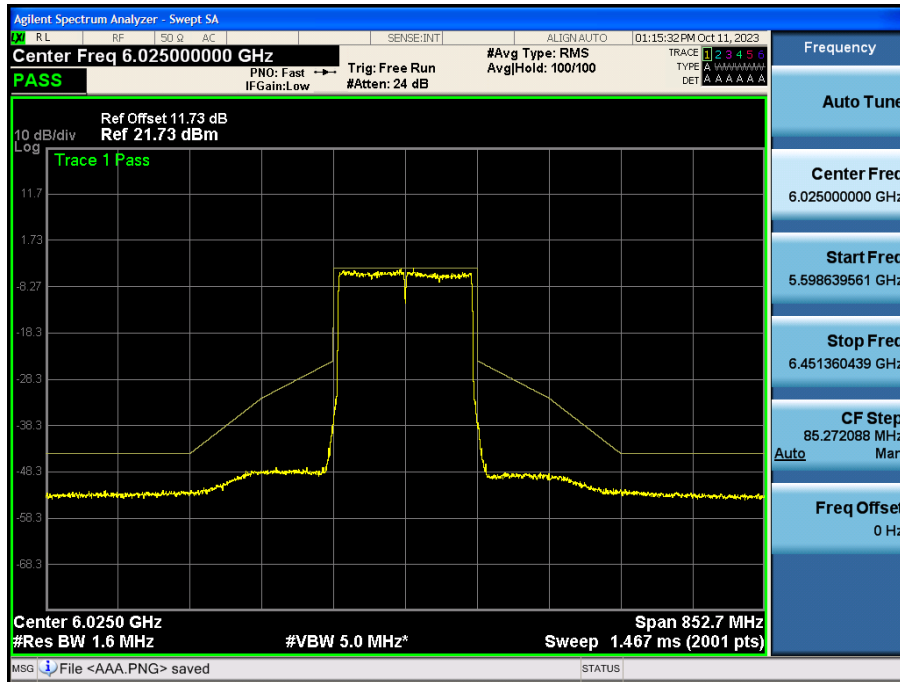
802.11ax HE160, 80_L Ch.143(6665 MHz) 996 Tones 67 RU



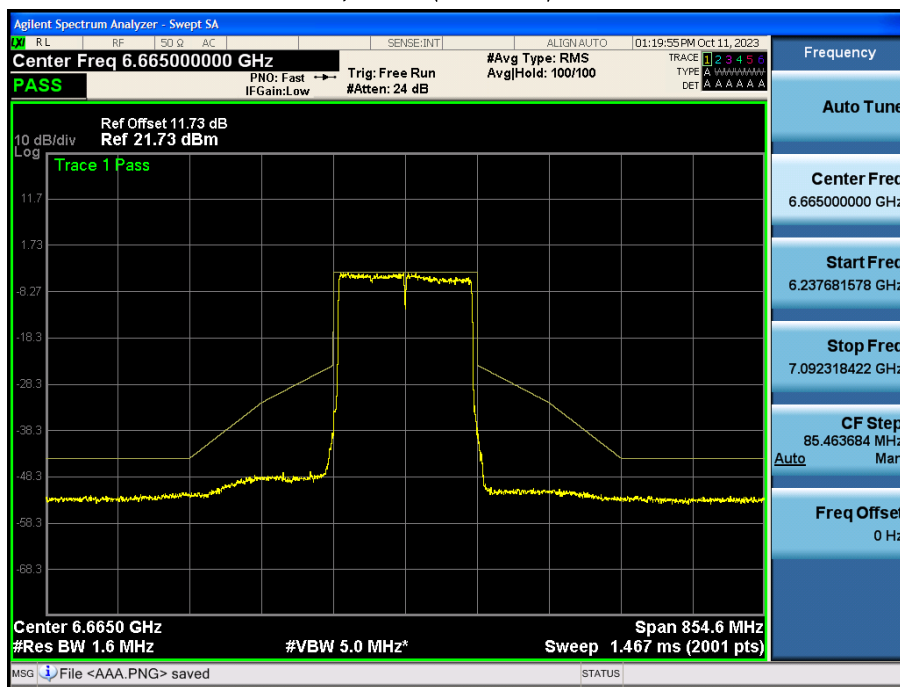
802.11ax HE160, 80_U Ch.143(6665 MHz) 996 Tones 67 RU



Bandwidth 160M, SU Ch. 15(6025 MHz)

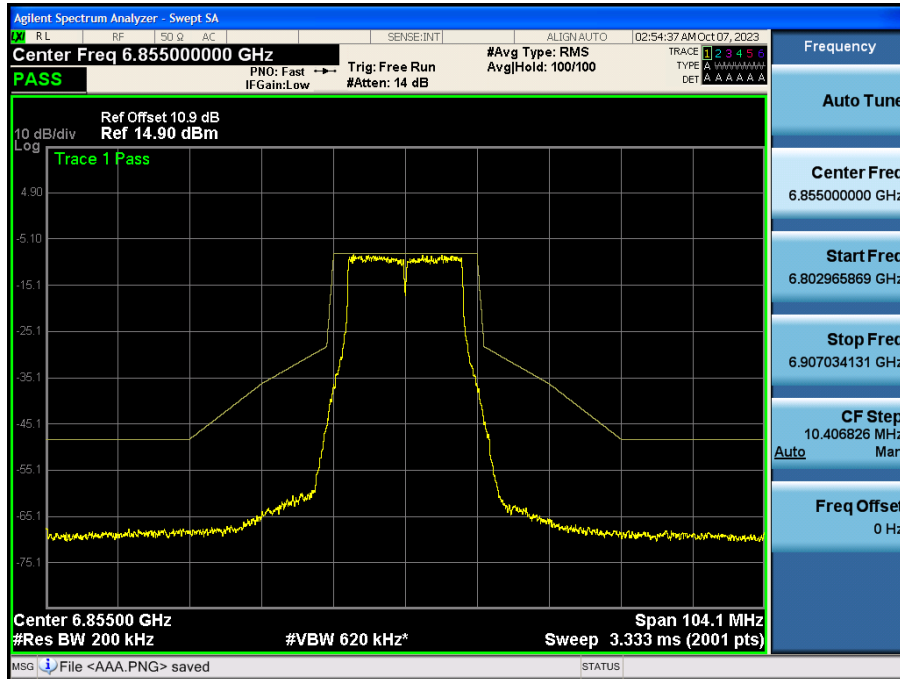


Bandwidth 160M, Ch.143(6665 MHz) 2x996 Tones 68 RU

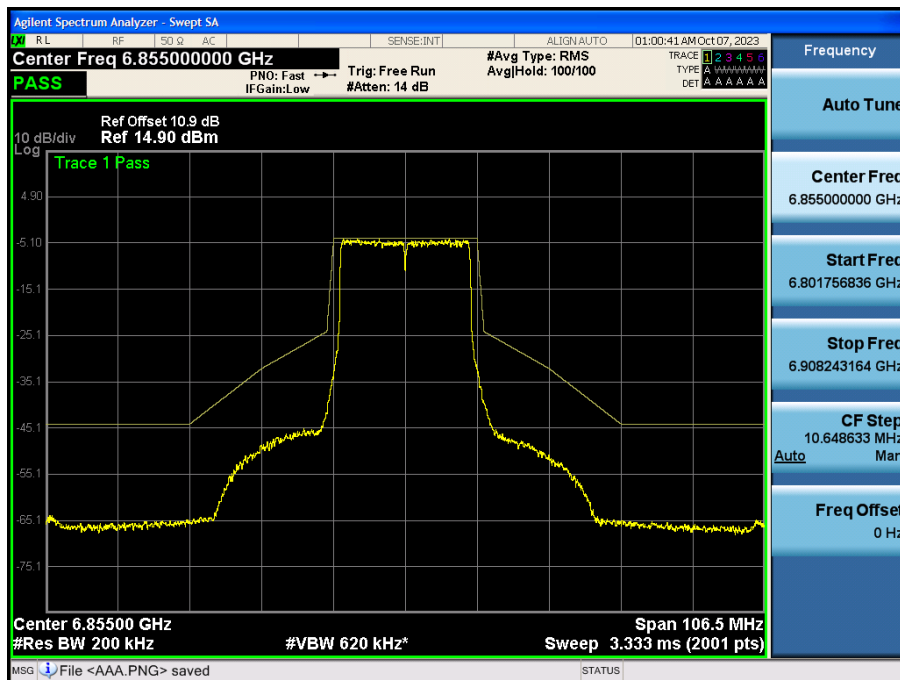


Ant.2

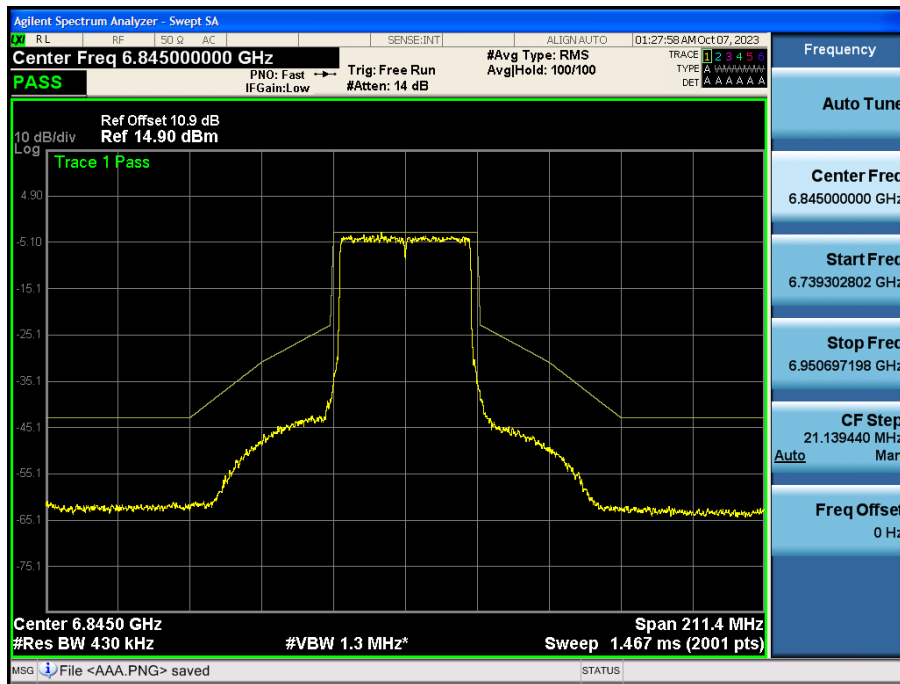
802.11a Ch.181(6855 MHz)



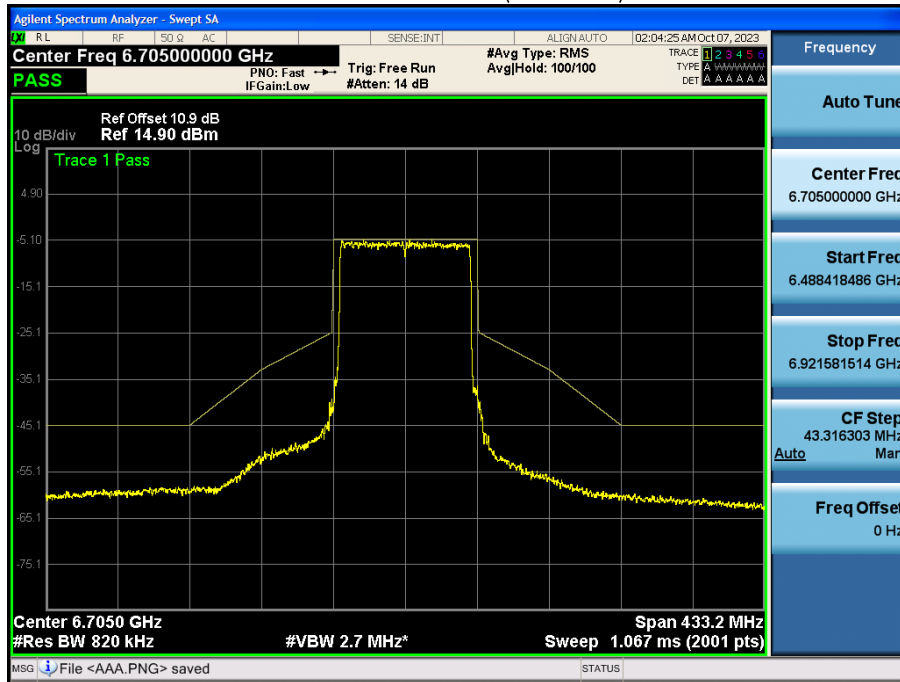
802.11ax HE20 Ch.181(6855 MHz) SU



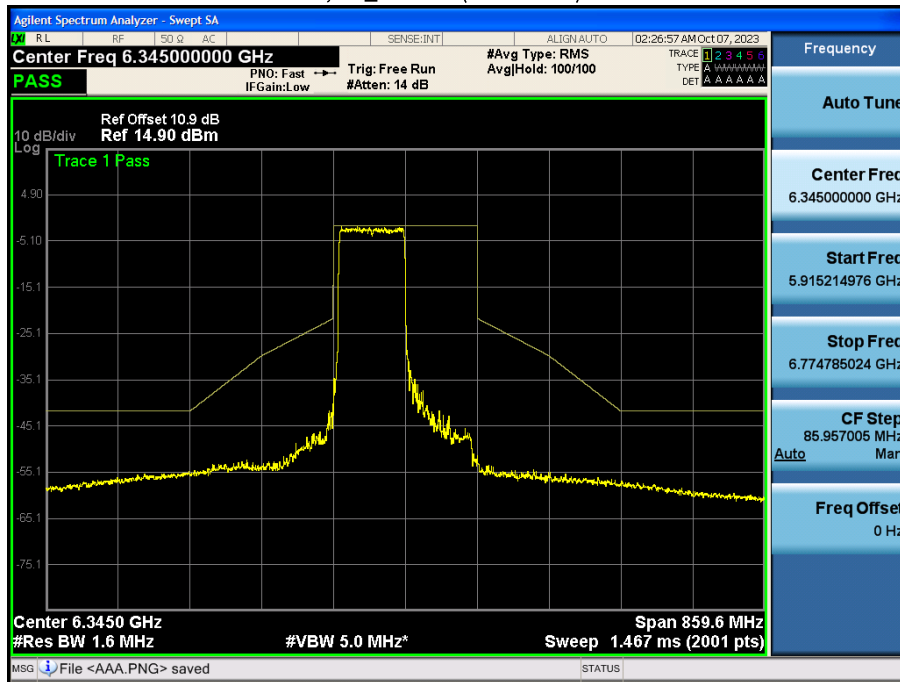
802.11ax HE40 Ch.179(6845 MHz) SU



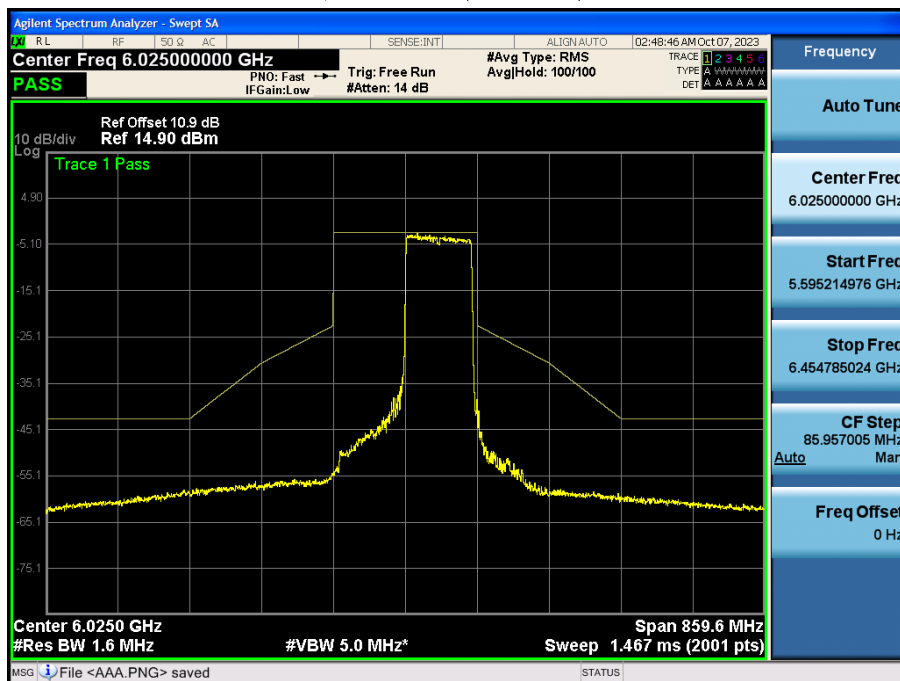
802.11ax HE80 Ch.151(6705 MHz) SU



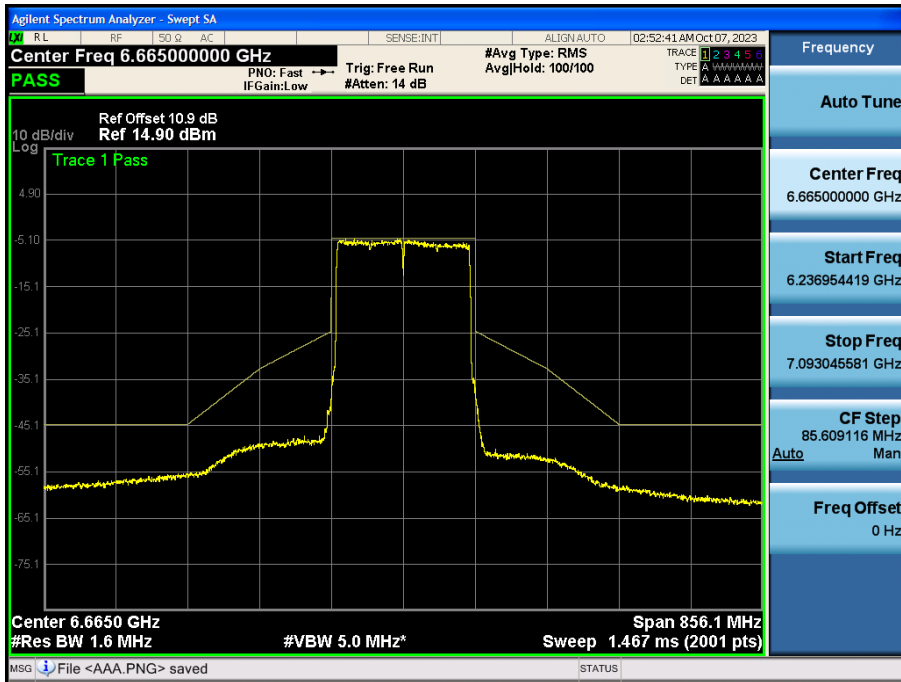
802.11ax HE160, 80_L Ch.79(6345 MHz) 996 Tones 67 RU



802.11ax HE160, 80_U Ch.15(6025 MHz) 996 Tones 67 RU



Bandwidth 160M, SU Ch. 143(6665 MHz) SU



Bandwidth 160M, Ch. 15(6025 MHz) 2x996 Tones 68 RU



4. Power Spectral Density

Note:

1. In order to simplify the report, attached plots were only channel of highest EIRP PSD.
2. According to KDB 662911 D01 Multiple Transmitter Output v02r01 F) 2) f) (ii)

$$\text{Directional Gain(CDD)} = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} (\sum_{k=1}^{N_{ANT}} g_{j,k})^2}{N_{ANT}} \right]$$

$$\text{Directional gain(SDM)} = G_{\max} + 10 \cdot \text{LOG}(N_{ANT}/ N_{SS})$$

Band	Ant Gain (dBi)		N _{ANT} / N _{SS}	Directional Gain (dBi)	
	ANT1	ANT2		CDD	SDM
UNII 5	-7.70	-7.22	2 / 2	-4.45	-7.22
UNII 6	-7.65	-7.54		-4.58	-7.54
UNII 7	-7.65	-7.88		-4.75	-7.65
UNII 8	-9.61	-7.44		-5.45	-7.44

Note

According to Ansi C63.10-2013 section 14.4.3, the directional gain is calculated using the formula, where GN is the gain of the nth antenna and NANT is the total number of antennas used.

$$\text{Directional Gain} = 10 \cdot \log \left(\frac{(10^{(ANT1 \text{ Gain}/20)} + 10^{(ANT2 \text{ Gain}/20)})^2}{2} \right) \text{ dBi}$$

Sample Calculation (Conducted Power, MIMO):

Ex) Ant 1 : 11.58 dBm Ant 2 : 12.08 dBm

$$\text{Ant1} + \text{Ant 2} = \text{MIMO}$$

$$(11.58 \text{ dBm} + 12.08 \text{ dBm}) = (14.387 \text{ mW} + 16.143 \text{ mW}) = 30.53 \text{ mW} = 14.88 \text{ dBm}$$

Sample Calculation (E.I.R.P & E.I.R.P Spectral Density, MIMO):

Ex) ANT1 : 15.35 dBm , ANT2 : 15.12 dBm, Directional Gain : 3 dBi

$$\text{Conducted Power} = (15.35 \text{ dBm} + 15.12 \text{ dBm}) = (34.276 \text{ mW} + 32.508 \text{ mW}) = 66.784 \text{ mW} = 18.25 \text{ dBm}$$

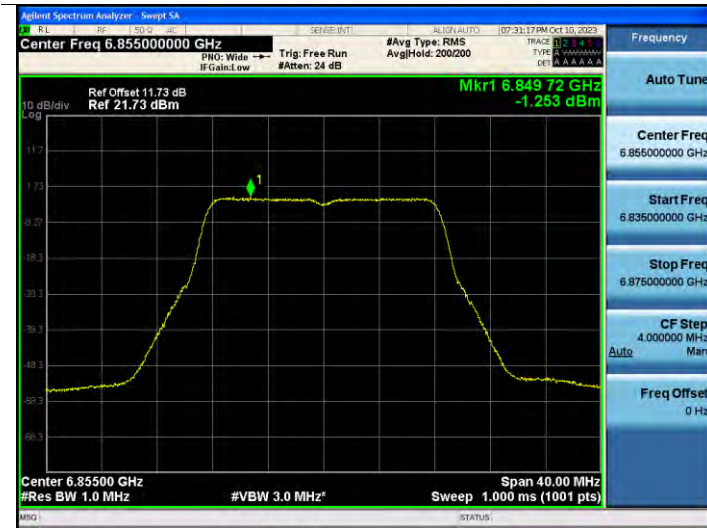
$$\text{E.I.R.P} = 18.25 \text{ dBm} + 3 \text{ dBi} = 21.25 \text{ dBm}$$

4.1 Indoor client

MIMO_CDD(Ant1+Ant2)

802.11a Ch.181(6855MHz)

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
1.377	0.284	1.660	-3.090

Note:

$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$

802.11ax HE20 Ch.181(6855 MHz) 106 Tones RU 53

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
2.196	0.035	2.232	-2.518

Note:

$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$

802.11ax HE40 Ch.179(6845 MHz) 106 Tones RU 53

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
2.166	0.031	2.197	-2.553

Note:

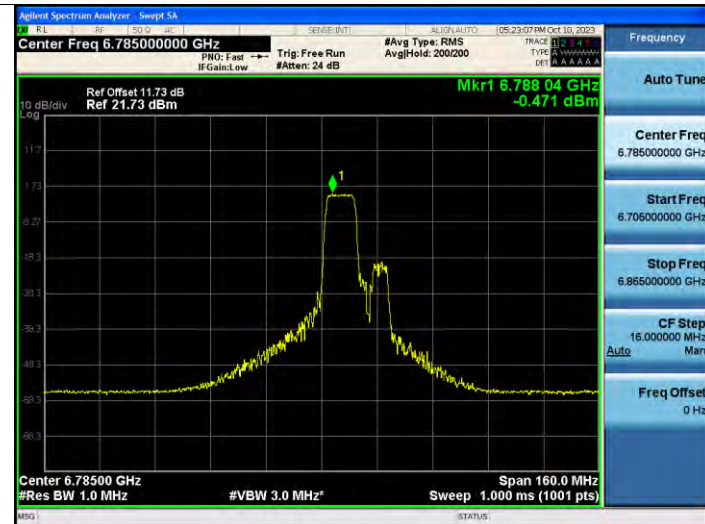
$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$

802.11ax HE80 Ch.167(6785 MHz) 106 Tones RU 57

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
2.233	0.031	2.264	-2.486

Note:

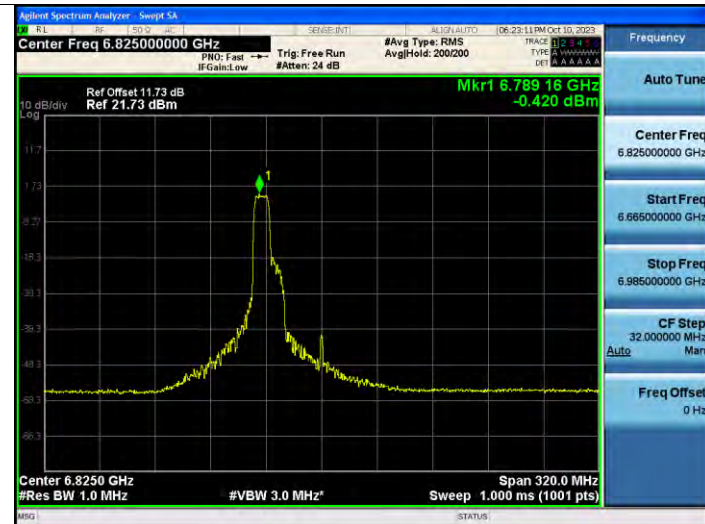
$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$

802.11ax HE160 80_L Ch.175(6825 MHz) 106 Tones RU 57

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
2.149	0.031	2.180	-3.270

Note:

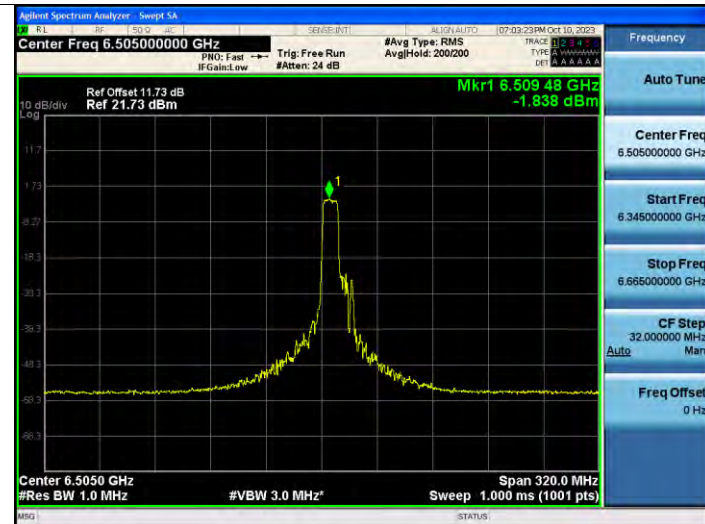
$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

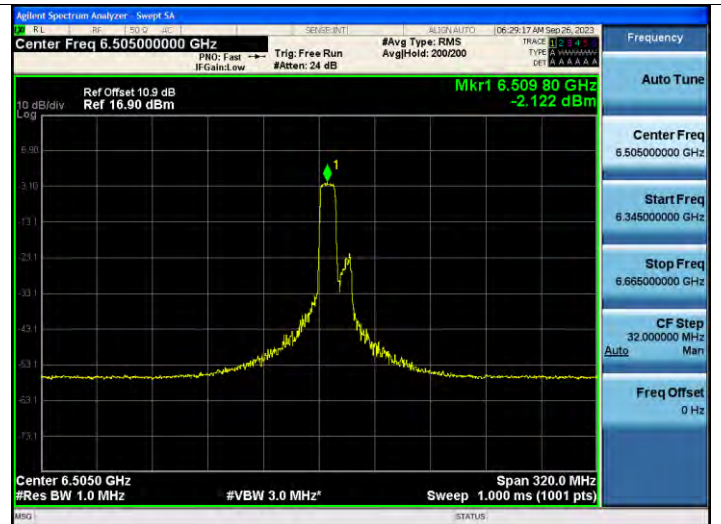
$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$

802.11ax HE160 80_U Ch.111(6505 MHz) 106 Tones RU 53

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
1.033	0.031	1.063	-3.517

Note:

$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$

802.11ax HE160 Ch.79(6345 MHz) SU

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
-7.138	0.015	-7.123	-11.573

Note:

$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$

802.11ax HE160 Ch.79(6345 MHz) 2x996 Tones RU 68

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
-7.132	0.015	-7.118	-11.568

Note:

SUM PSD(dBm/MHz) = 10log(((10^(Ant 1 PSD/10))+10^(Ant 2 PSD/10))) (dBm/MHz)

Total PSD (dBm/MHz) = SUM PSD(dBm/MHz) + Duty Cycle Factor (dB)

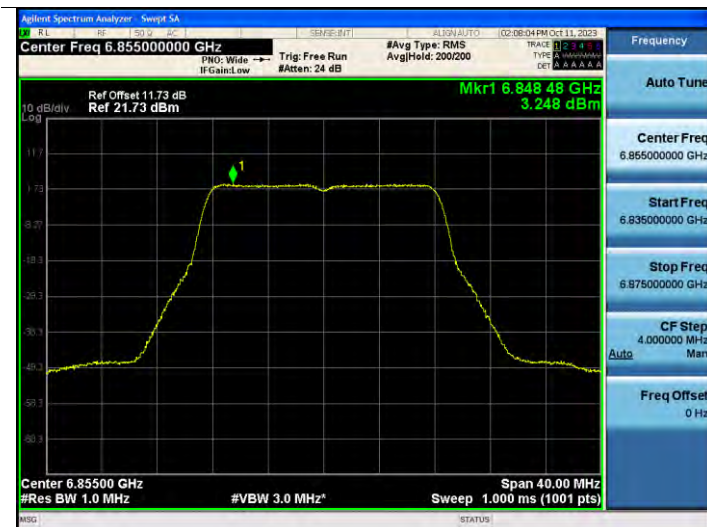
EIRP PSD(dBm/MHz) = Total PSD (dBm/MHz) + Directional Gain(dBi)

4.2 Standard client

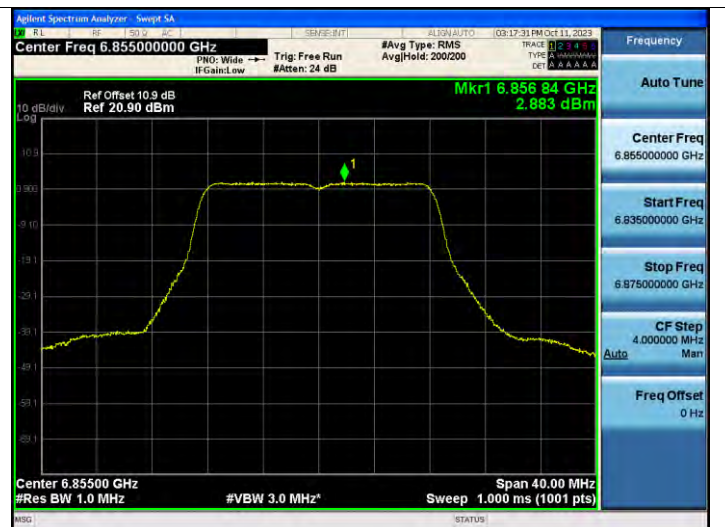
MIMO_CDD(Ant1+Ant2)

802.11a Ch.181(6855 MHz)

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
6.080	0.284	6.363	1.613

Note:

$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$

802.11ax HE20 Ch.93(6415 MHz) 26 Tones RU 8

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
9.808	0.018	9.826	5.376

Note:

$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$

802.11ax HE40 Ch.3(5965 MHz) 26 Tones RU 17

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
9.932	0.017	9.949	5.499

Note:

$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$

802.11ax HE80 Ch.39(6145 MHz) 26 Tones RU 0

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
9.953	0.020	9.973	5.523

Note:

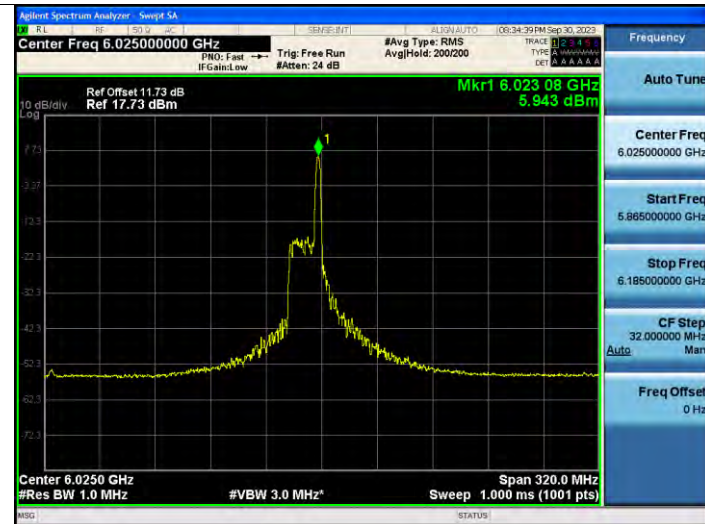
$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$

802.11ax HE160 80_L Ch.15(6025 MHz) 26 Tones RU 36

Ant1



Ant2



SUM PSD (dBm/MHz)	Duty Cycle Factor (dB)	Total PSD (dBm/MHz)	EIRP PSD (dBm/MHz)
8.659	0.018	8.677	4.227

Note:

$$\text{SUM PSD(dBm/MHz)} = 10\log(((10^{(\text{Ant 1 PSD}/10)} + 10^{(\text{Ant 2 PSD}/10)})) \text{ (dBm/MHz)}$$

$$\text{Total PSD (dBm/MHz)} = \text{SUM PSD(dBm/MHz)} + \text{Duty Cycle Factor (dB)}$$

$$\text{EIRP PSD(dBm/MHz)} = \text{Total PSD (dBm/MHz)} + \text{Directional Gain(dBi)}$$