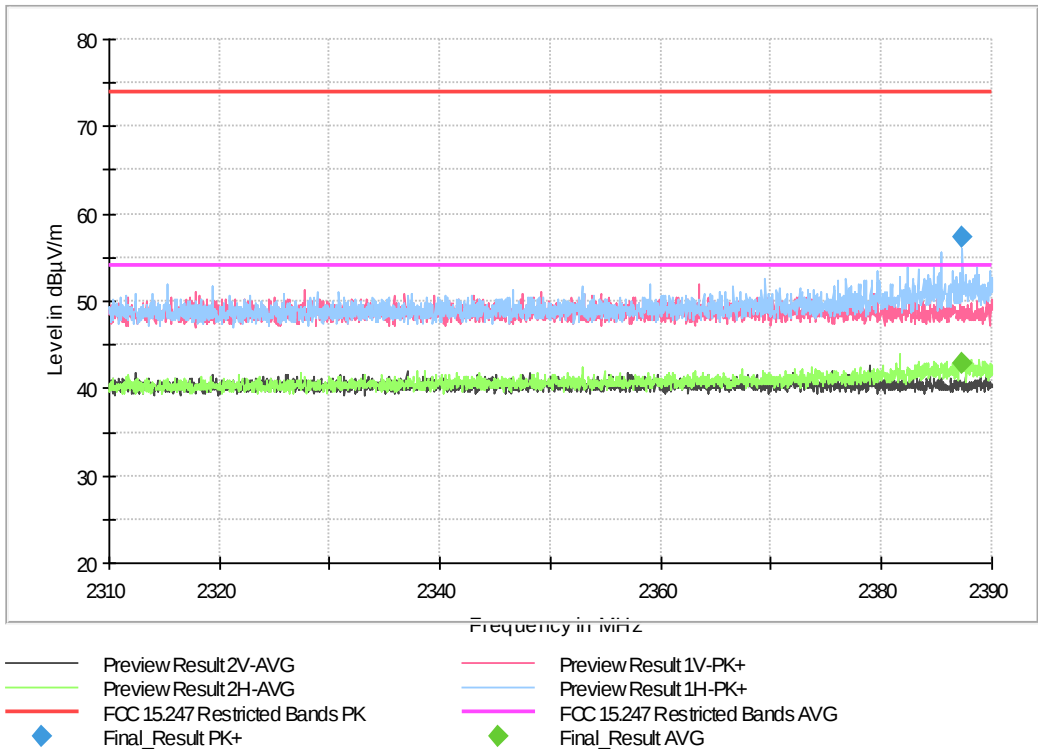
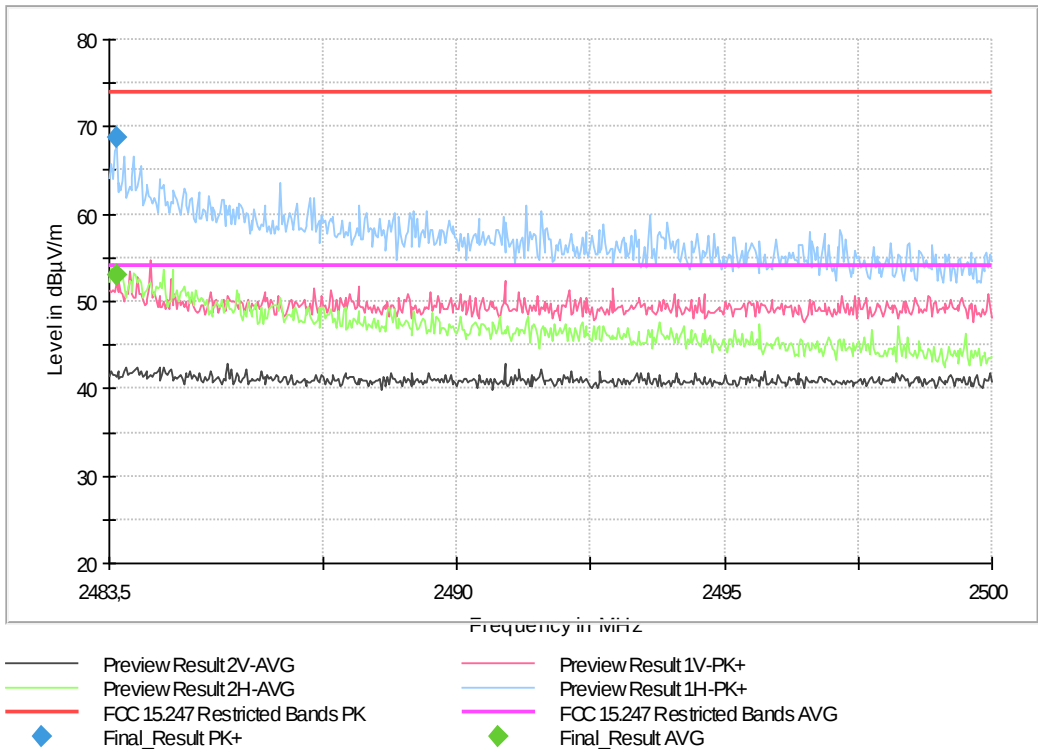


Full Spectrum

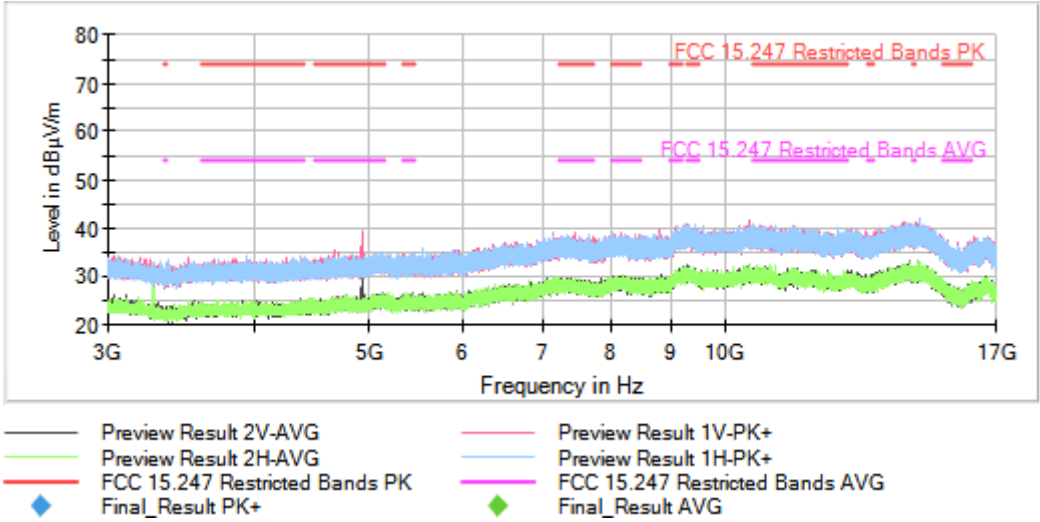


Full Spectrum



Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = 802.11g (OFDM 6 Mbit/s) Frequency MHz = 2462.00000
MIMO Mode = SISO Active Port = 1

Images:



Tables:

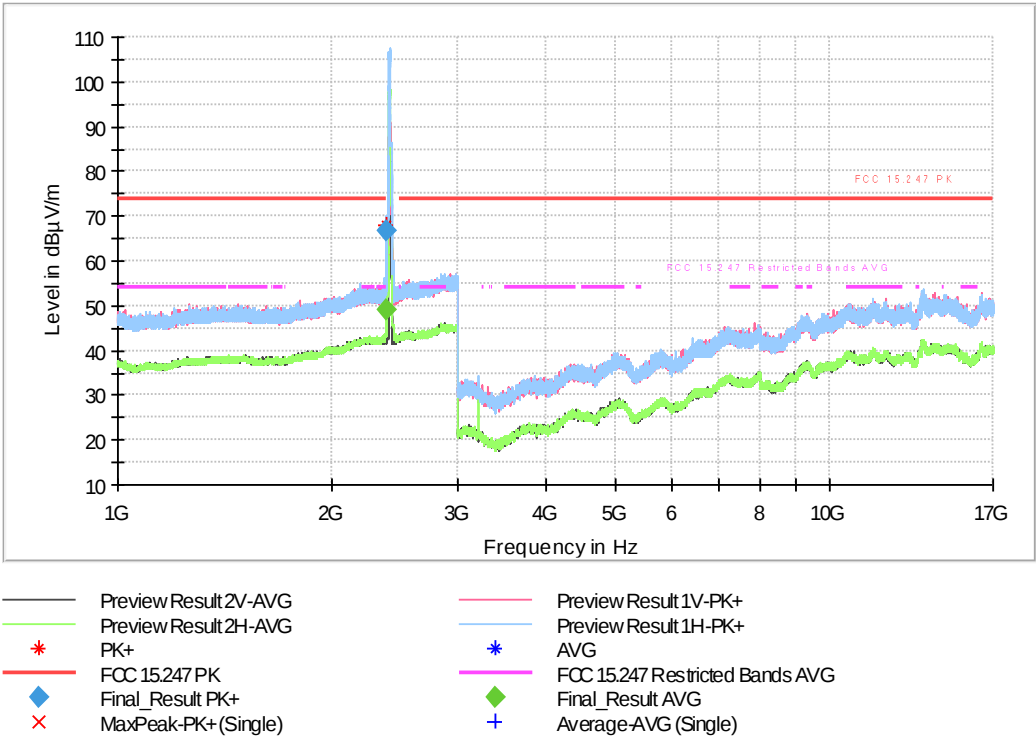
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	3 GHz - 17 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	30 dB

Results

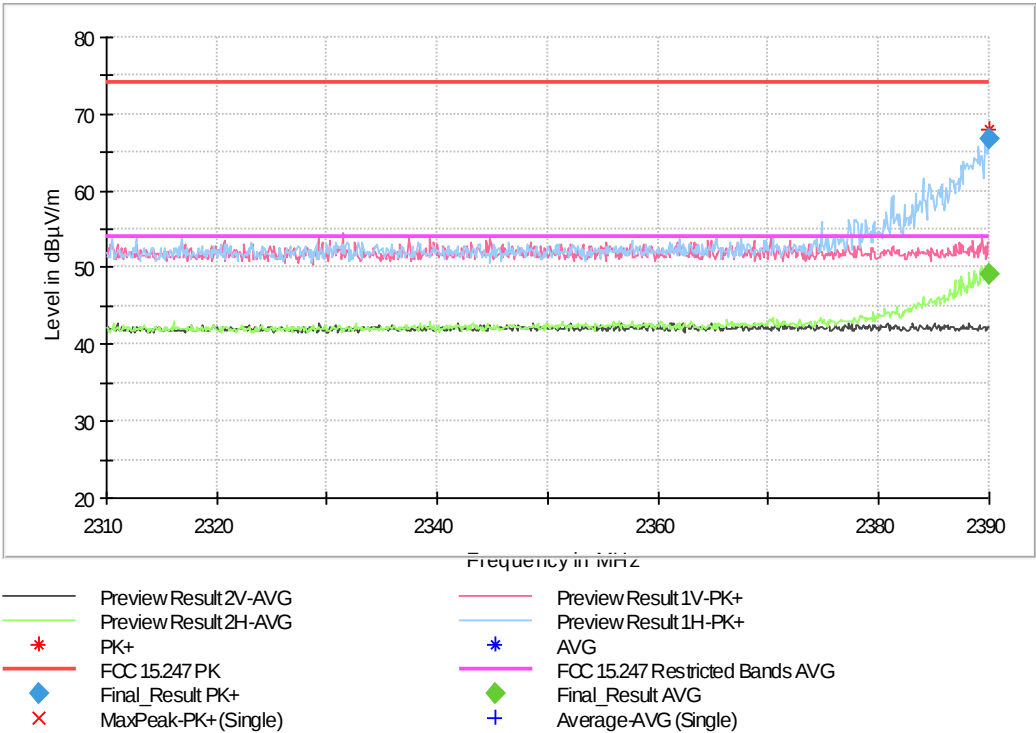
Modulation: 802.11n HT20 (OFDM MCS0)
MIMO Mode: SISO
Frequency Range GHz = [1, 17]
Equipment Type = Digital Transmission System (DTS)
Modulation = 802.11n HT20 (OFDM MCS0)
Frequency MHz = 2412.00000
MIMO Mode = SISO
Active Port = 1

Full Spectrum

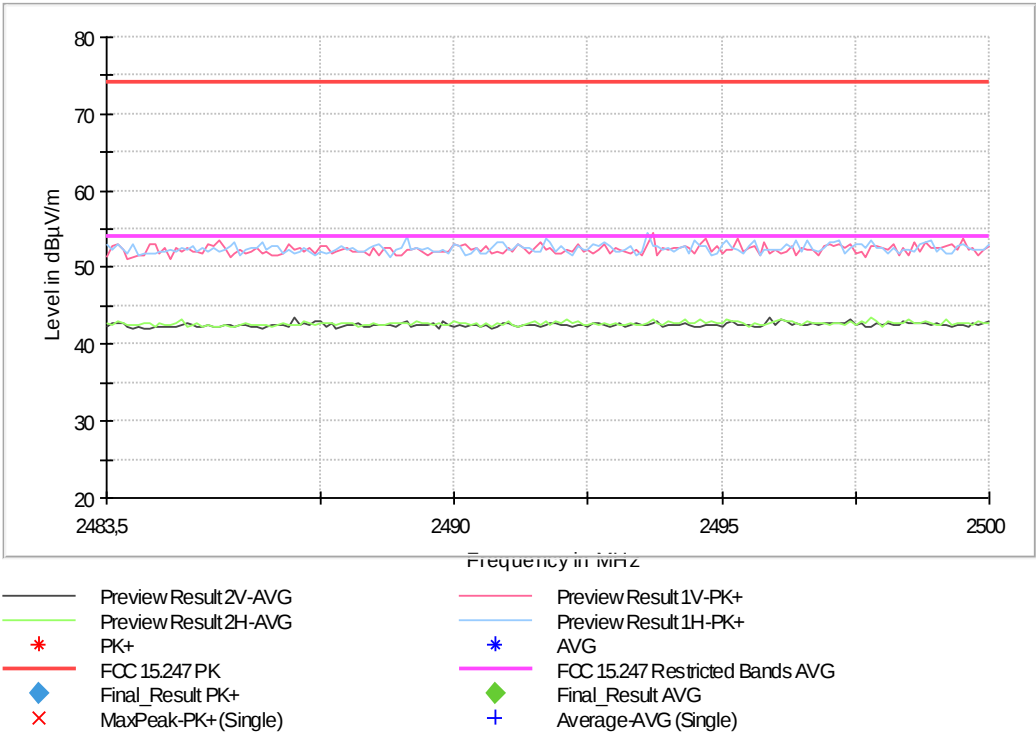


Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2390.000000	---	49.24	54.00	4.76	1000.000	236.0	H	2.0
2390.000000	66.71	---	74.00	7.29	1000.000	236.0	H	2.0

Full Spectrum

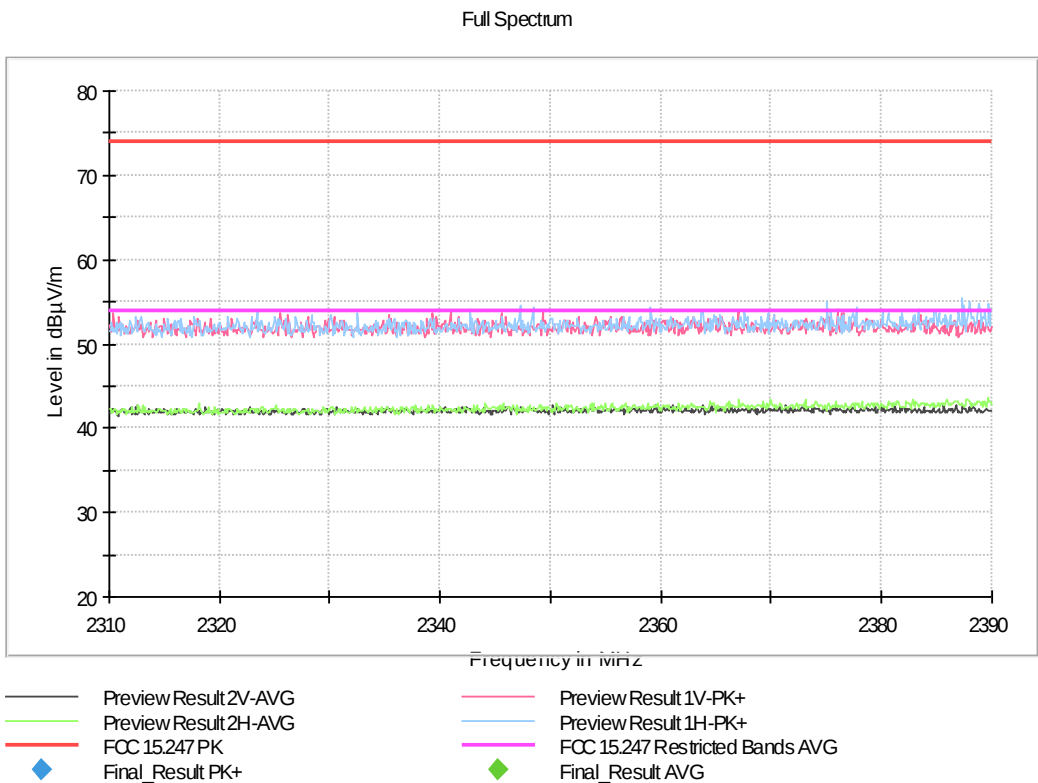
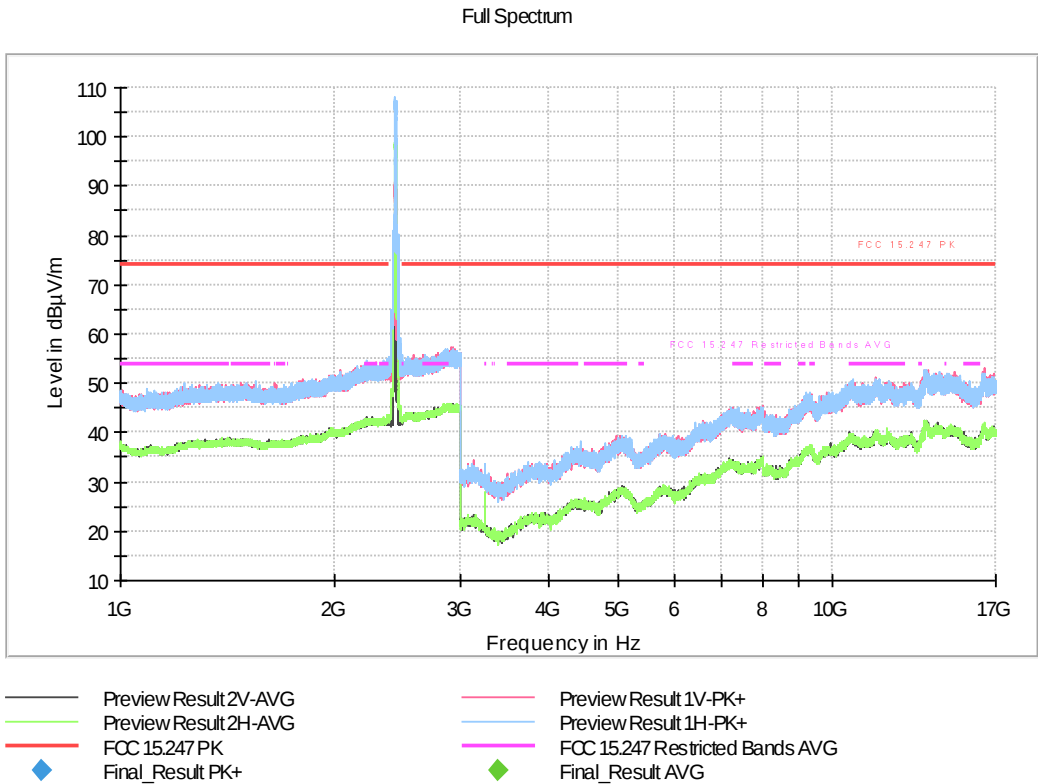


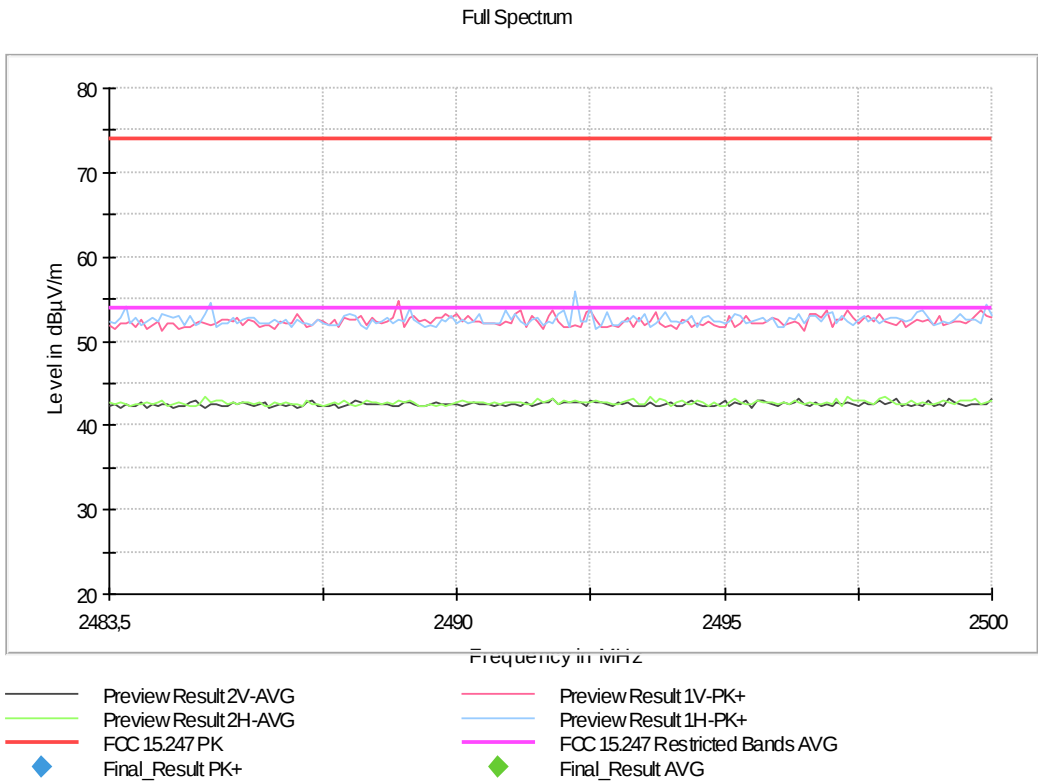
Full Spectrum



Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
Modulation = 802.11n HT20 (OFDM MCS0) Frequency MHz = 2437.00000
MIMO Mode = SISO Active Port = 1

Images:





Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	1 GHz - 3 GHz	30,769 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Frequency Range GHz = [1, 17]

Equipment Type = Digital Transmission System (DTS)

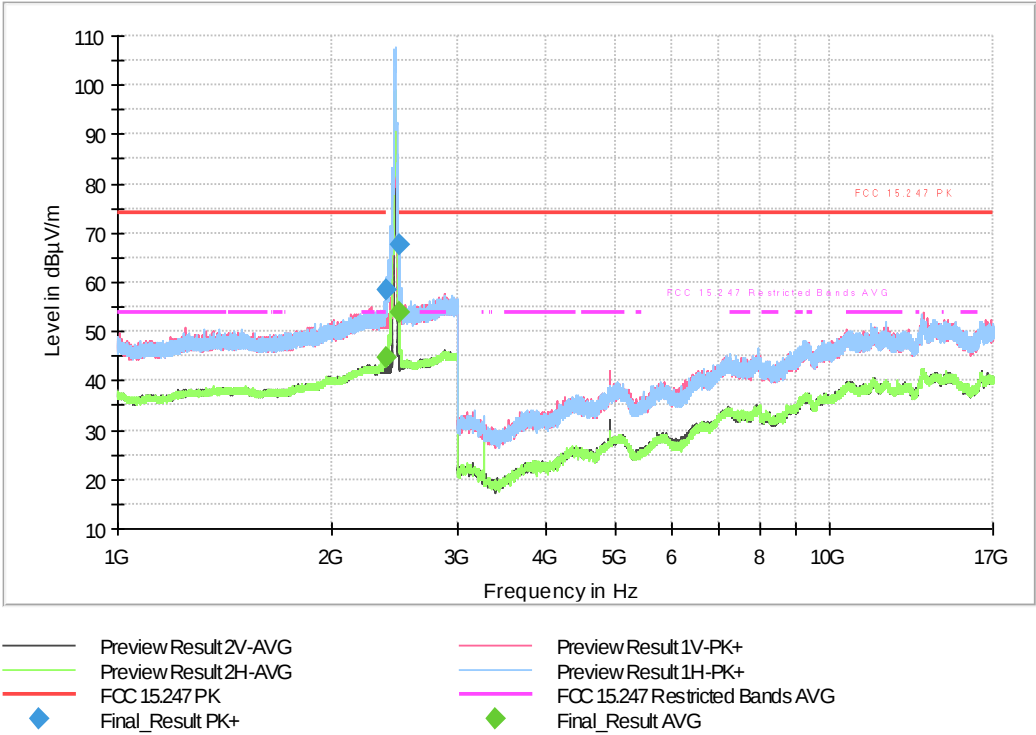
Modulation = 802.11n HT20 (OFDM MCS0)

Frequency MHz = 2457.00000

MIMO Mode = SISO

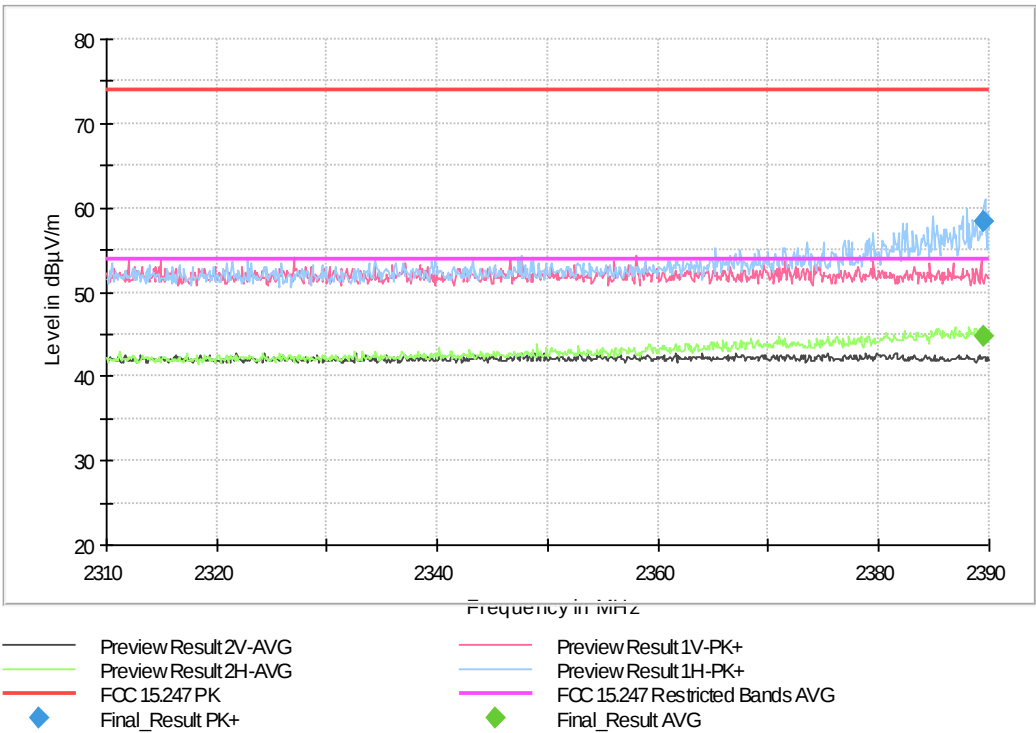
Active Port = 1

Full Spectrum

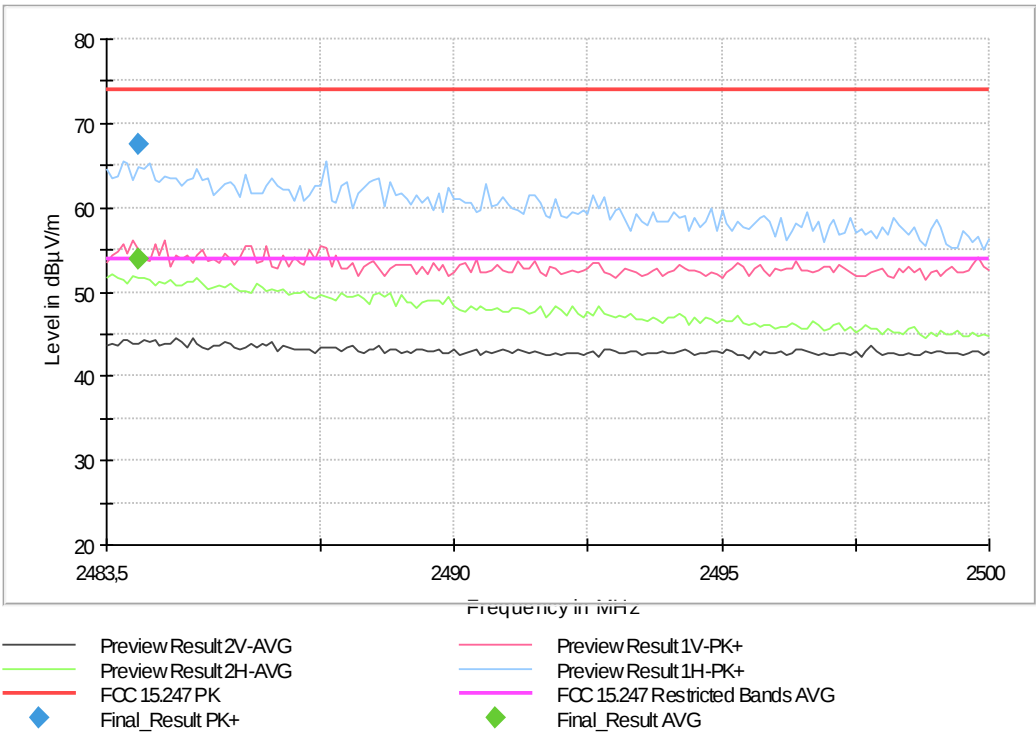


Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2389.500000	---	44.73	54.00	9.27	1000.000	200.0	H	344.0
2389.500000	58.36	---	74.00	15.64	1000.000	200.0	H	344.0
2484.100000	---	53.98	54.00	0.02	1000.000	193.0	H	352.0
2484.100000	67.61	---	74.00	6.39	1000.000	193.0	H	352.0

Full Spectrum



Full Spectrum



Frequency Range GHz = [1, 3]

Modulation = 802.11n HT20 (OFDM MCS0)

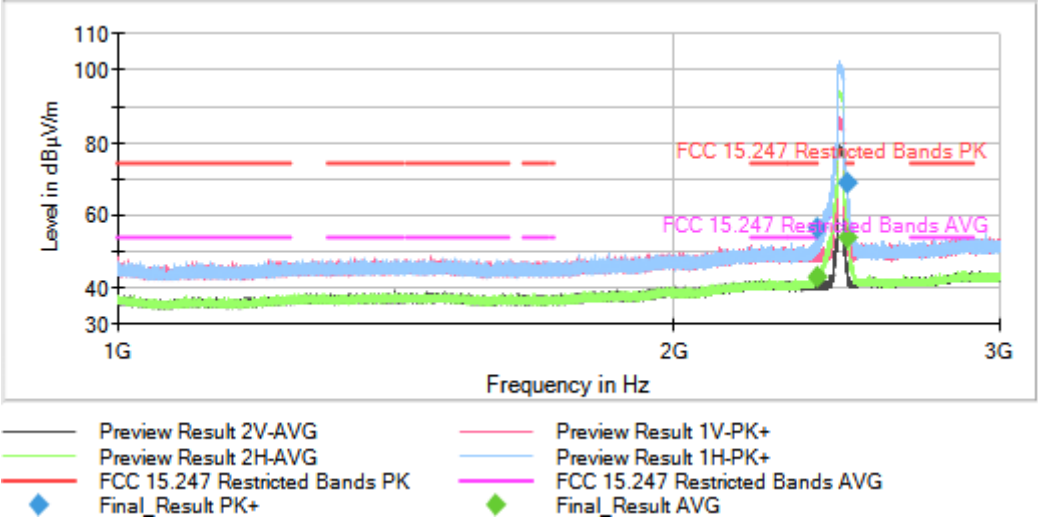
MIMO Mode = SISO

Equipment Type = Digital Transmission System (DTS)

Frequency MHz = 2462.00000

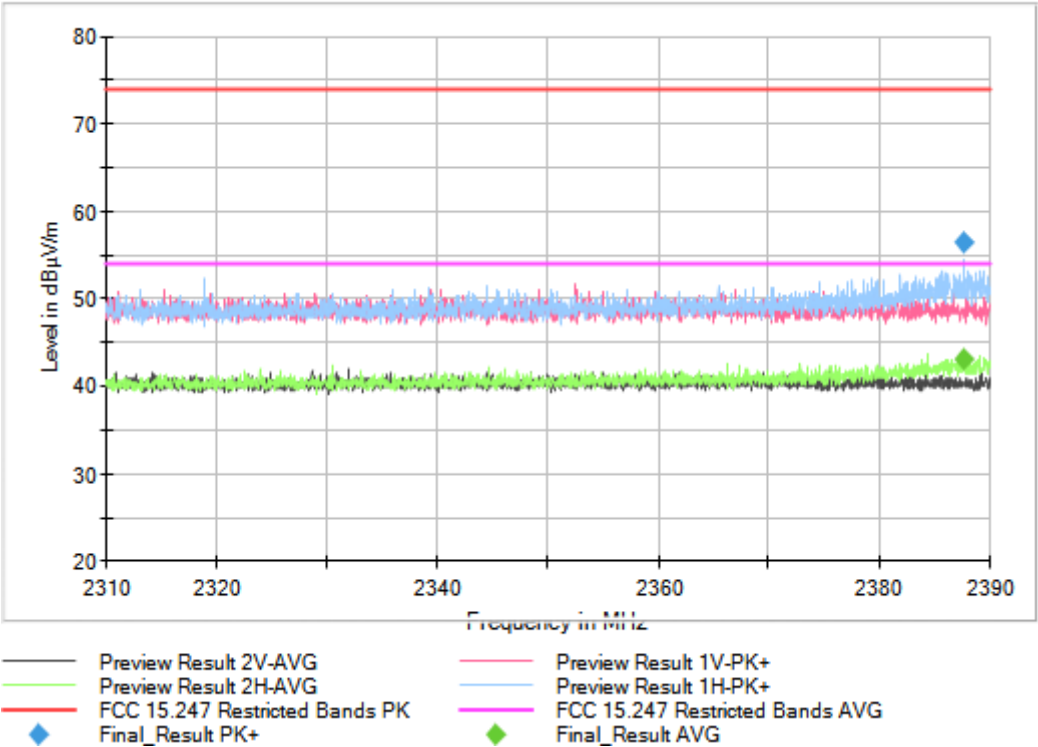
Active Port = 1

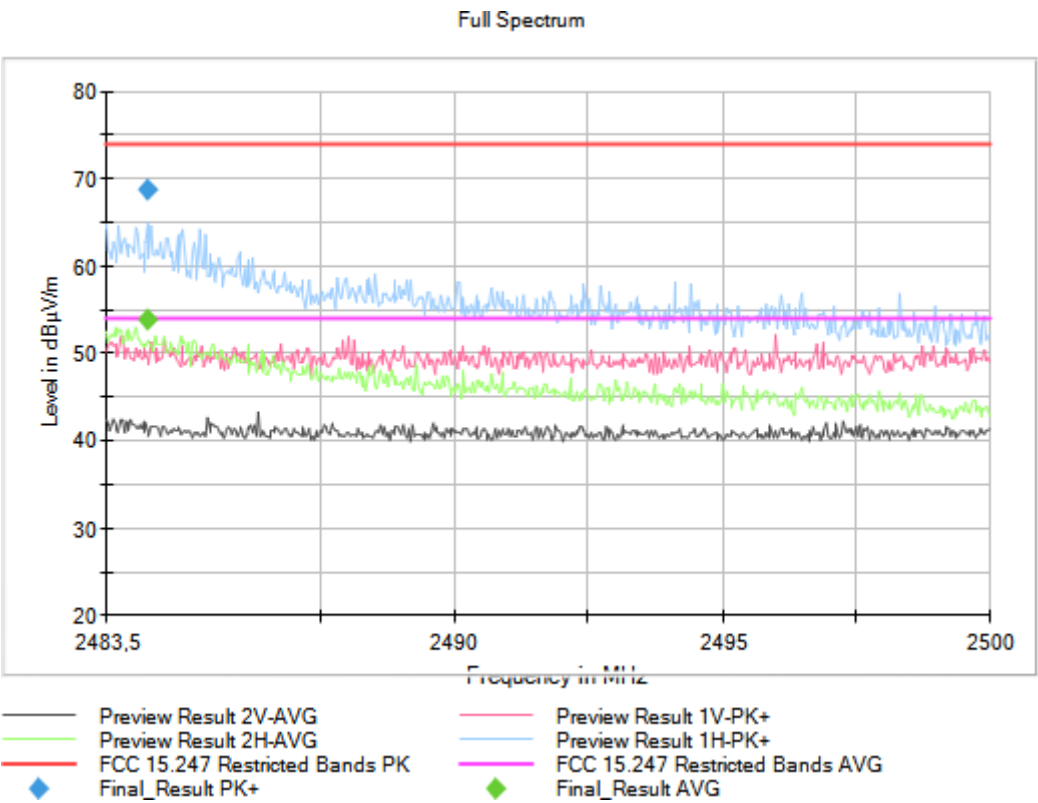
Images:



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Azimuth (deg)
2387.569231	56.54	---	74.00	17.46	H	358.0
2387.569231	---	43.02	54.00	10.98	H	358.0
2484.276923	68.74	---	74.00	5.26	H	21.0
2484.276923	---	53.91	54.00	0.09	H	21.0

Full Spectrum



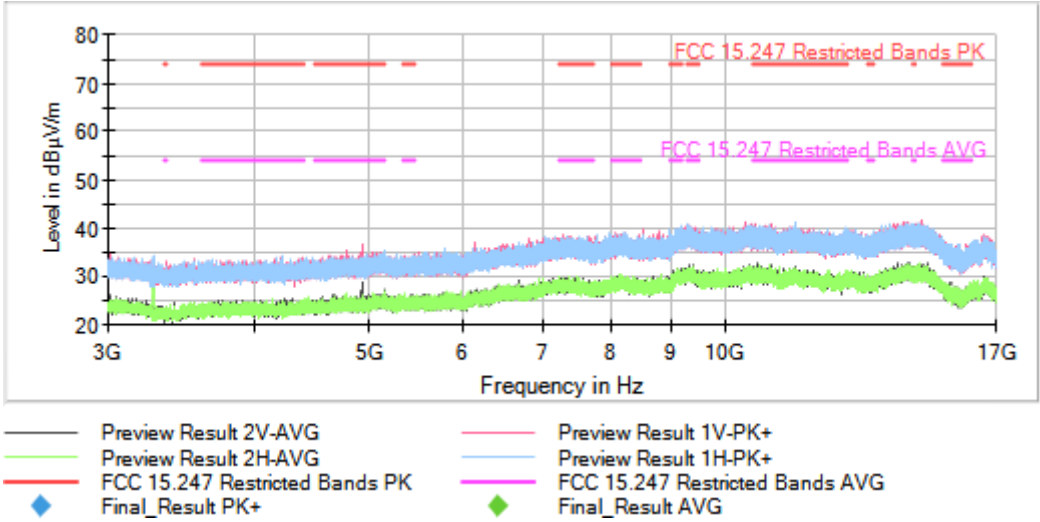


Tables:
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	1 GHz - 3 GHz	30,769 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = 802.11n HT20 (OFDM MCS0) Frequency MHz = 2462.00000
MIMO Mode = SISO Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	3 GHz - 17 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	30 dB

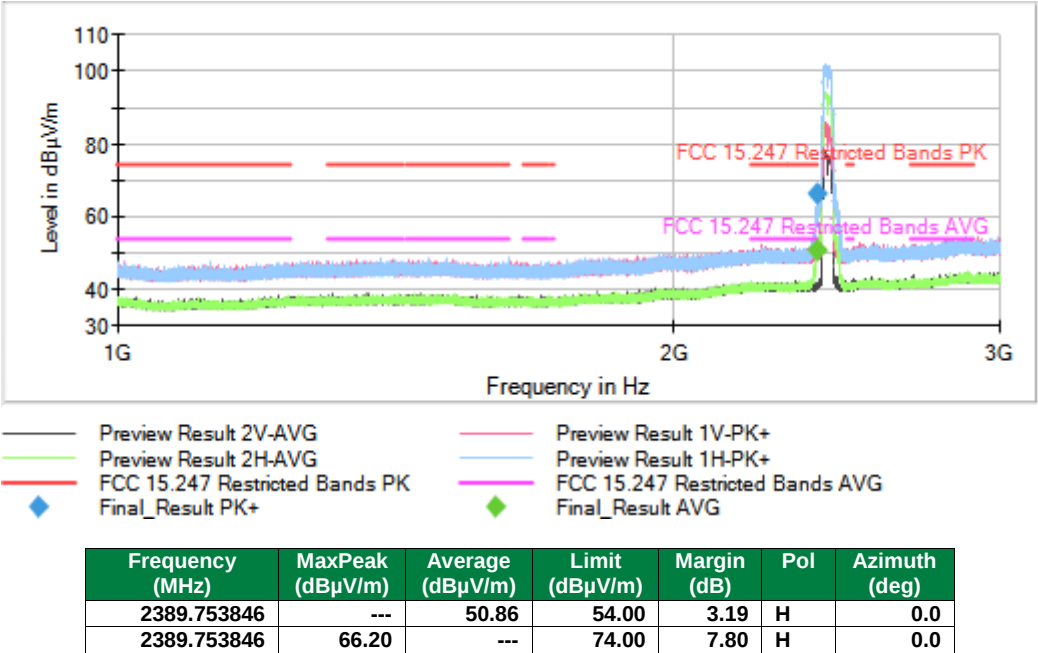
Results

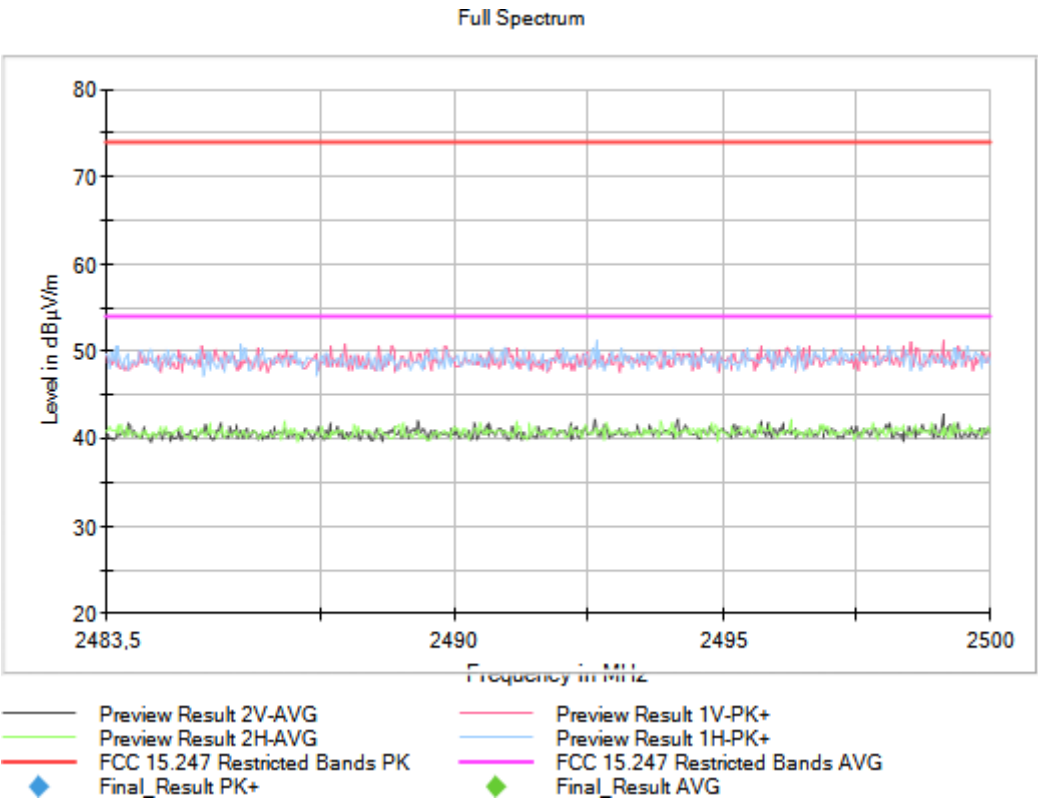
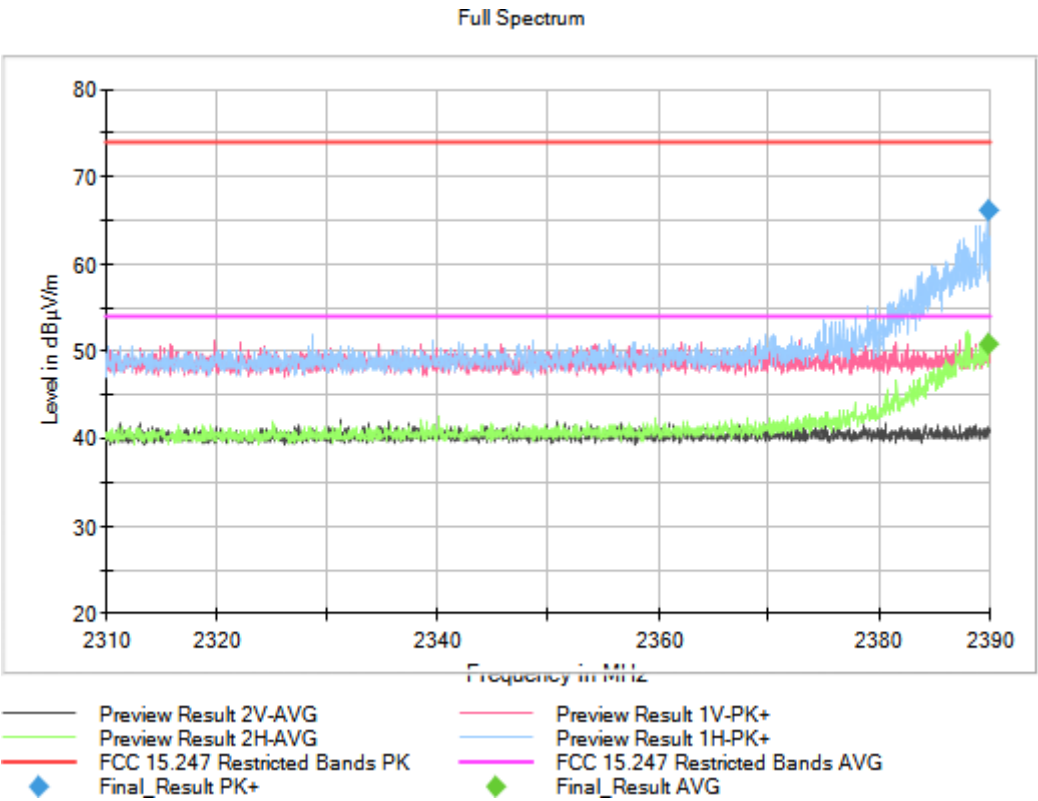
Modulation: 802.11n HT40 (OFDM MCS0)
MIMO Mode: SISO

Attachments

Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
Modulation = 802.11n HT40 (OFDM MCS0) Frequency MHz = 2422.00000
MIMO Mode = SISO Active Port = 1

Images:





Tables:
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	1 GHz - 3 GHz	30,769 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Frequency Range GHz = [1, 3]

Modulation = 802.11n HT40 (OFDM MCS0)

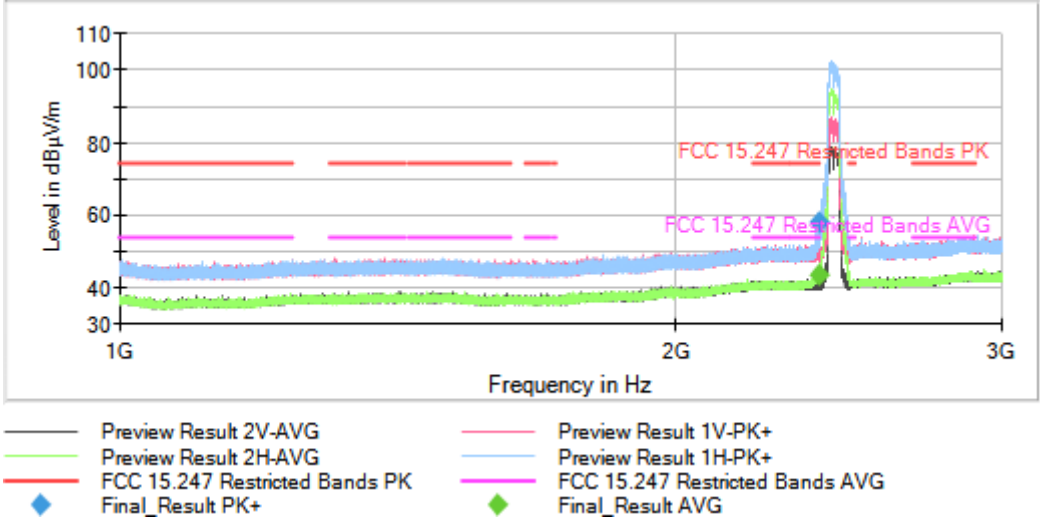
MIMO Mode = SISO

Equipment Type = Digital Transmission System (DTS)

Frequency MHz = 2437.00000

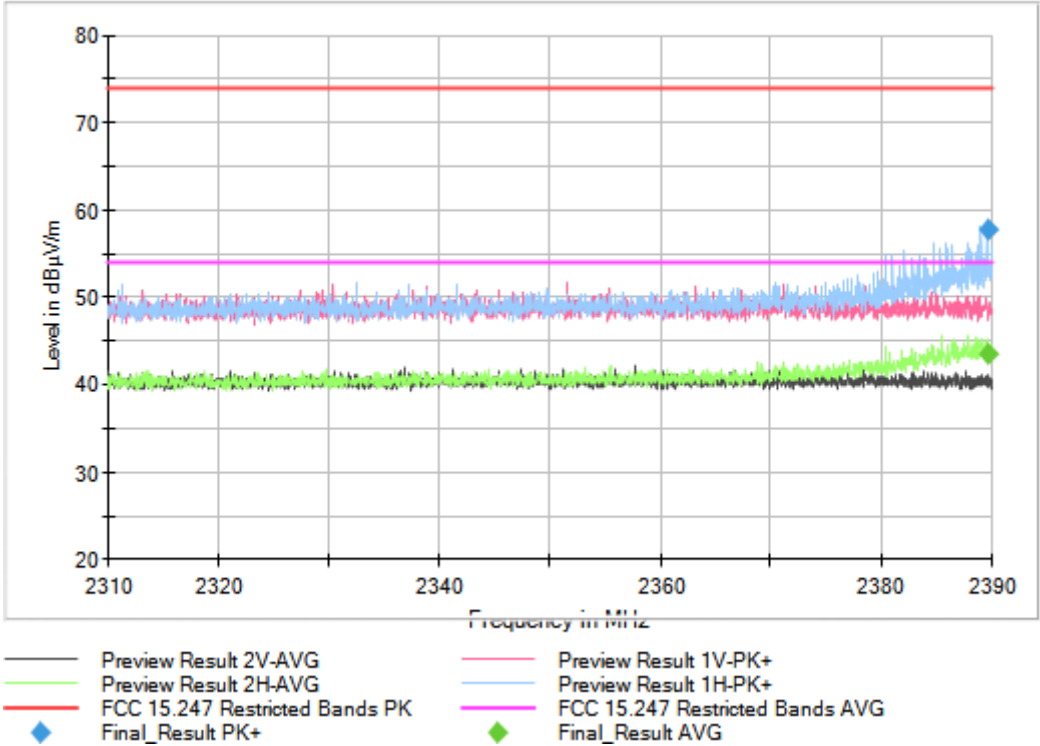
Active Port = 1

Images:



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Azimuth (deg)	Comment
2389.600000	---	43.60	54.00	10.40	H	0.0	
2389.600000	57.80	---	74.00	16.20	H	0.0	

Full Spectrum



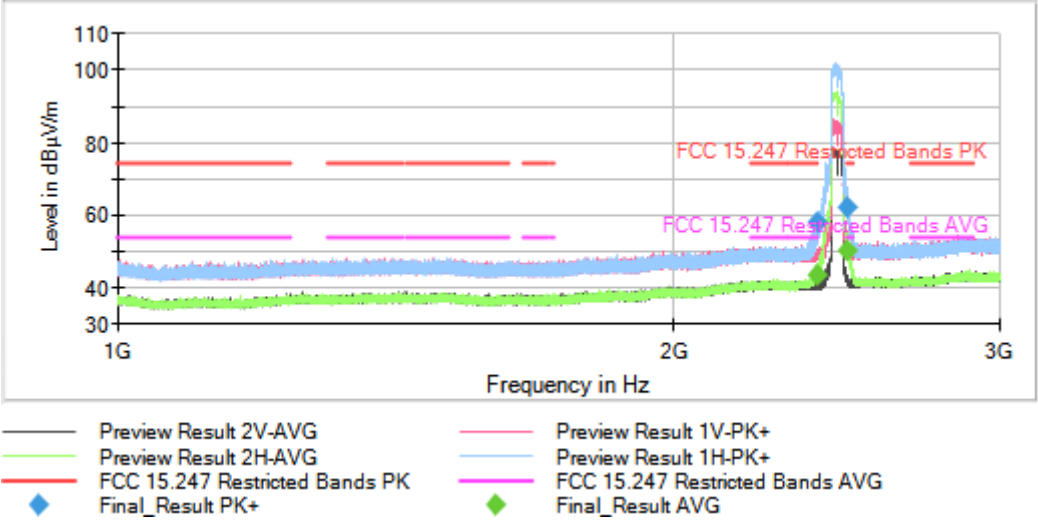


Tables:
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	1 GHz - 3 GHz	30,769 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

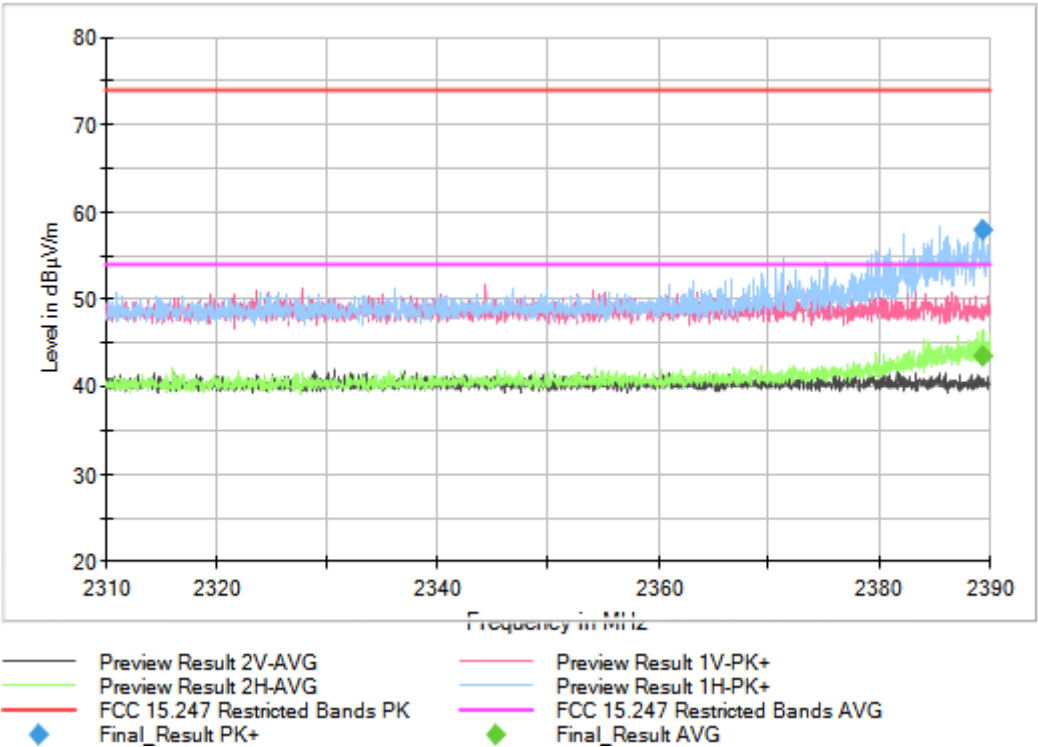
Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
Modulation = 802.11n HT40 (OFDM MCS0) Frequency MHz = 2452.00000
MIMO Mode = SISO Active Port = 1

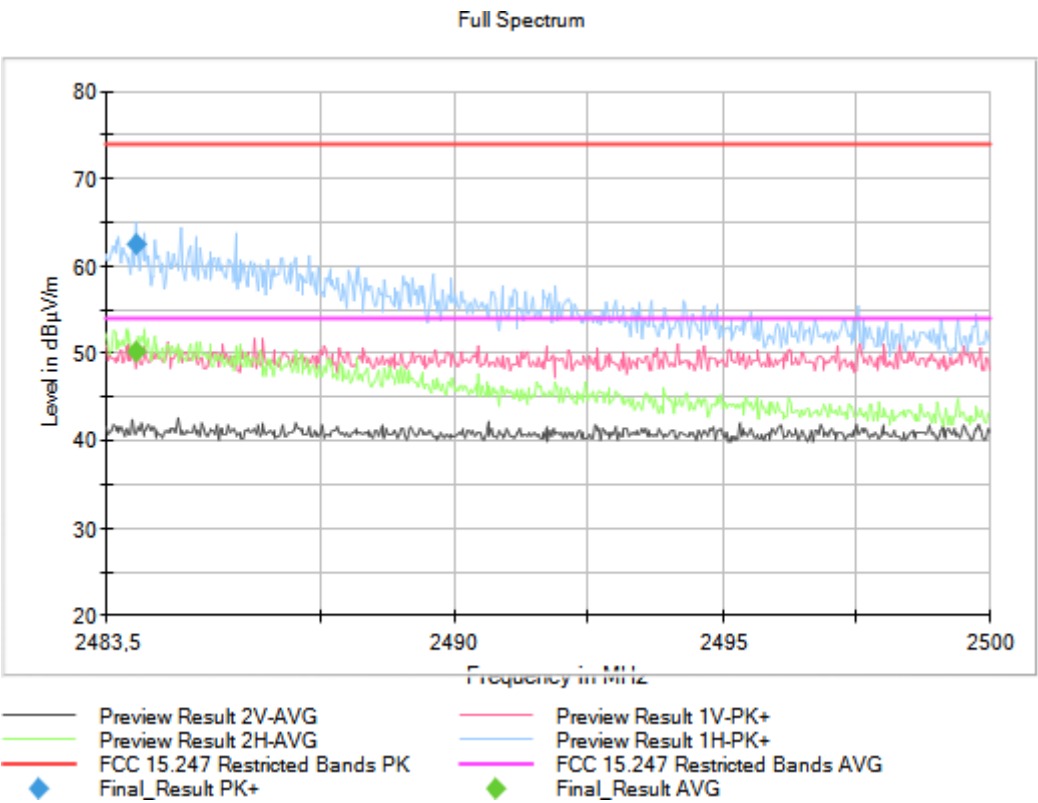
Images:



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Azimuth (deg)	Comment
2389.384615	---	43.62	54.00	10.38	H	0.0	
2389.384615	58.06	---	74.00	15.94	H	0.0	
2484.061539	---	50.16	54.00	3.84	H	0.0	
2484.061539	62.44	---	74.00	11.56	H	0.0	

Full Spectrum





Tables:
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	1 GHz - 3 GHz	30,769 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Frequency Range GHz = [3, 17]

Equipment Type = Digital Transmission System (DTS)

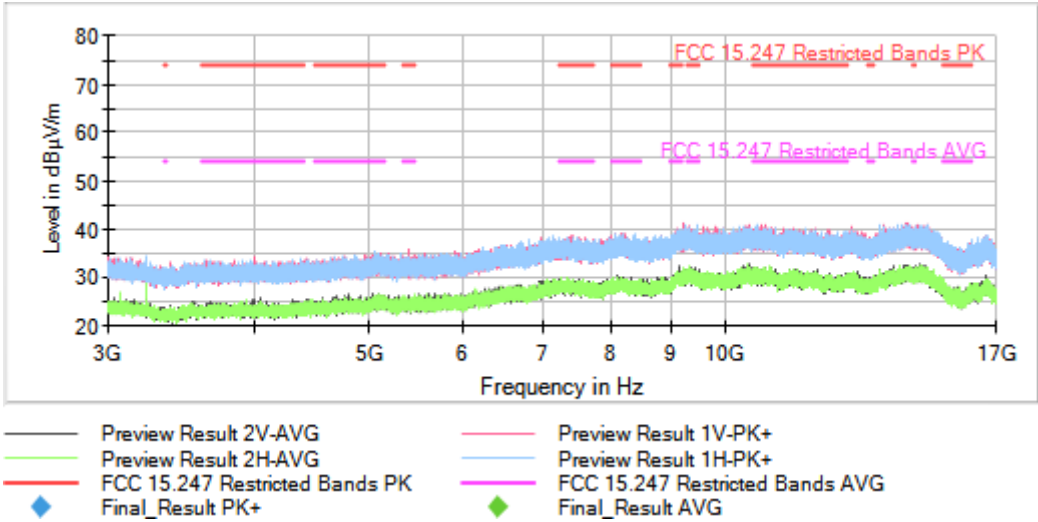
Modulation = 802.11n HT40 (OFDM MCS0)

Frequency MHz = 2422.00000

MIMO Mode = SISO

Active Port = 1

Images:



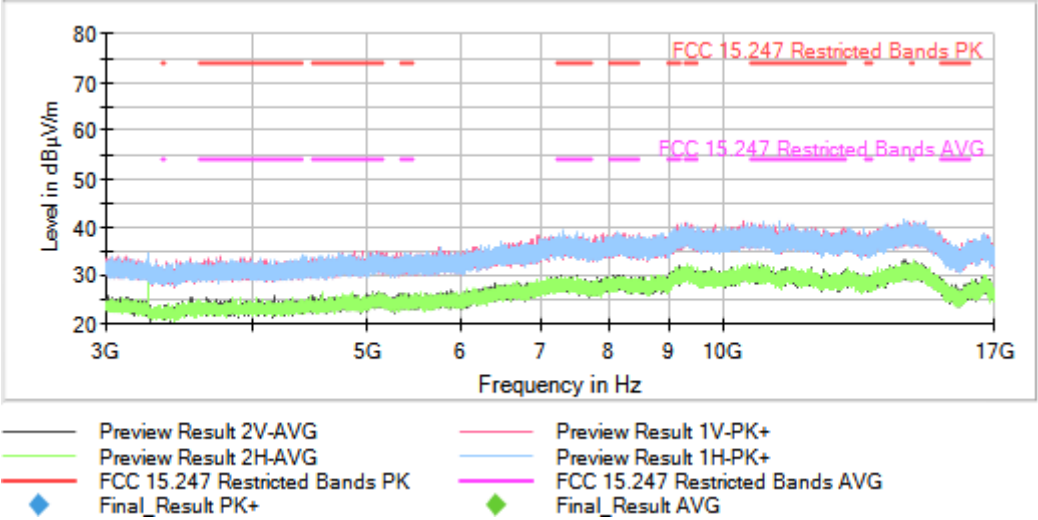
Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	3 GHz - 17 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	30 dB

Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = 802.11n HT40 (OFDM MCS0) Frequency MHz = 2437.00000
MIMO Mode = SISO Active Port = 1

Images:



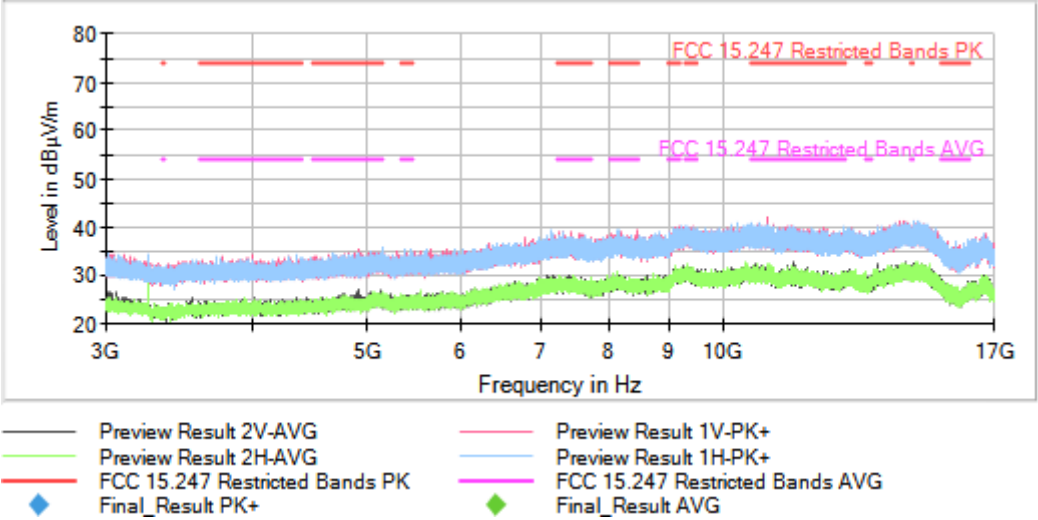
Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	3 GHz - 17 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	30 dB

Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = 802.11n HT40 (OFDM MCS0) Frequency MHz = 2452.00000
MIMO Mode = SISO Active Port = 1

Images:



Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	3 GHz - 17 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	30 dB

Results

Modulation: RU26: 802.11ax HE20 (OFDMA MCS0)

MIMO Mode: SISO

Frequency Range GHz = [1, 17]

Equipment Type = Digital Transmission System (DTS)

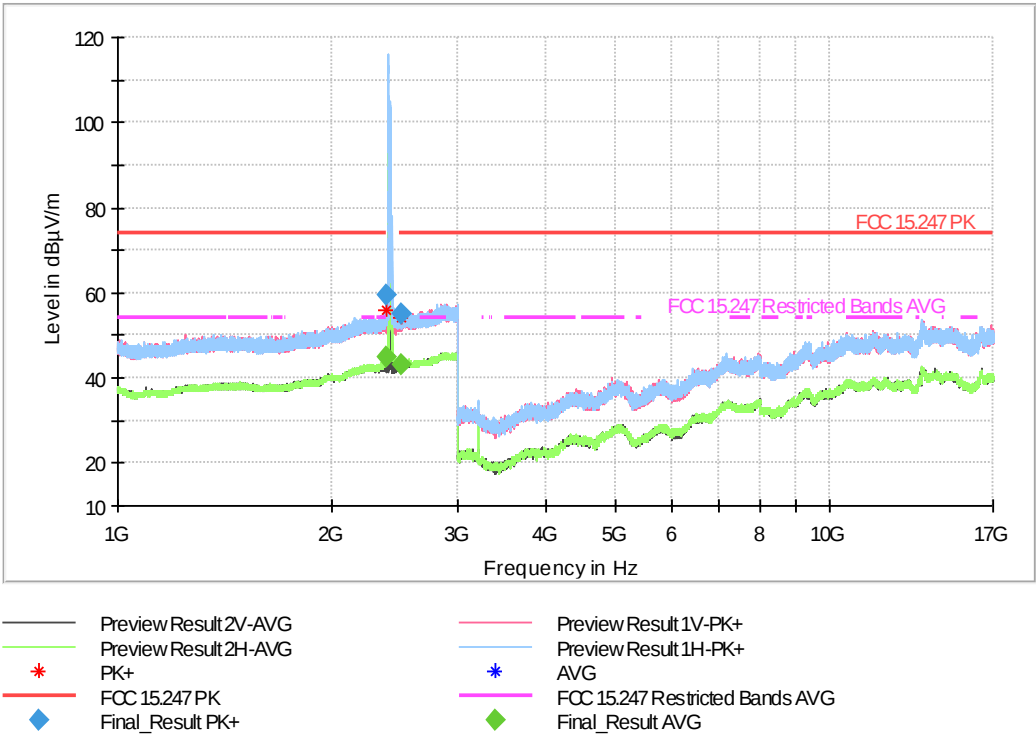
Modulation =RU26: 802.11ax HE20 (OFDMA MCS0)

Frequency MHz = 2412.00000

MIMO Mode = SISO

Active Port = 1

Full Spectrum

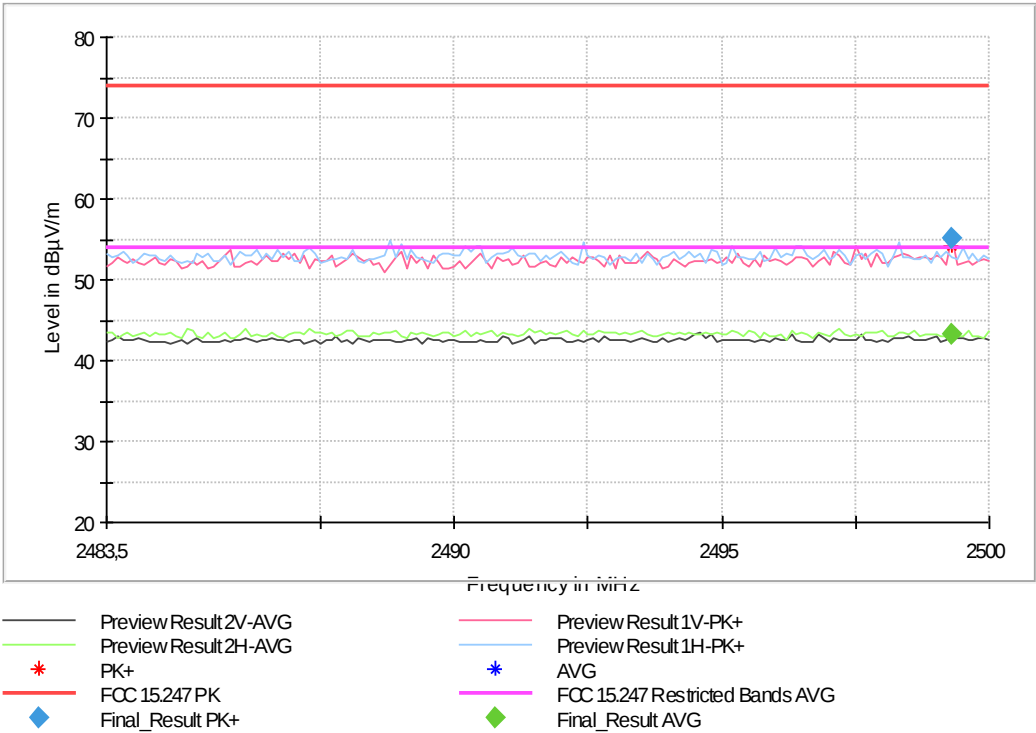


Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
2387.100000	59.64	---	74.00	14.36	170.0	H	358.0
2387.100000	---	44.76	54.00	9.24	170.0	H	358.0
2499.300000	55.14	---	74.00	18.86	400.0	V	97.0
2499.300000	---	43.31	54.00	10.69	400.0	V	97.0

Full Spectrum



Full Spectrum



Frequency Range GHz = [1, 17]

Modulation =RU26: 802.11ax HE20 (OFDMA MCS0)

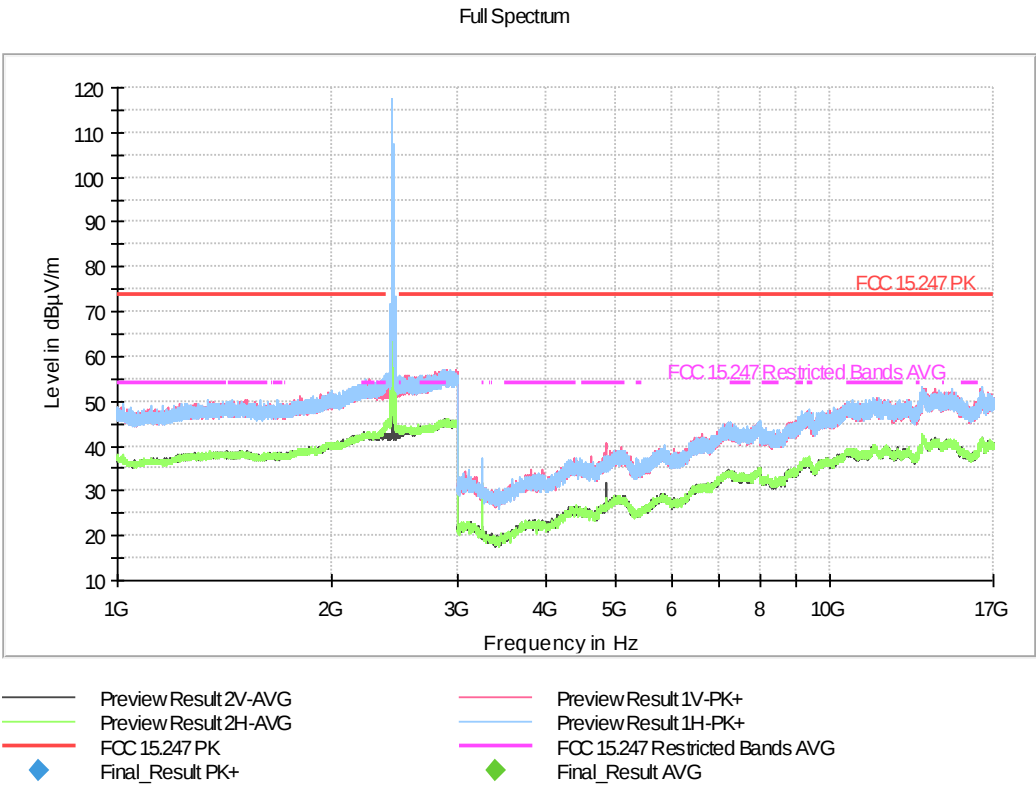
MIMO Mode = SISO

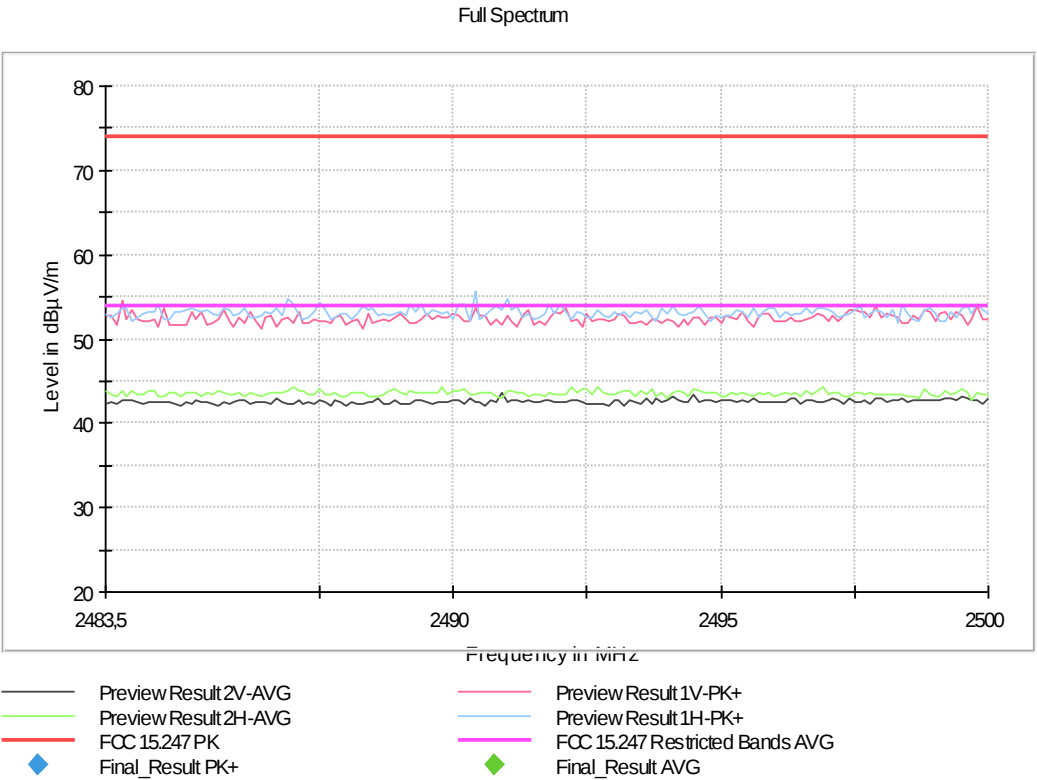
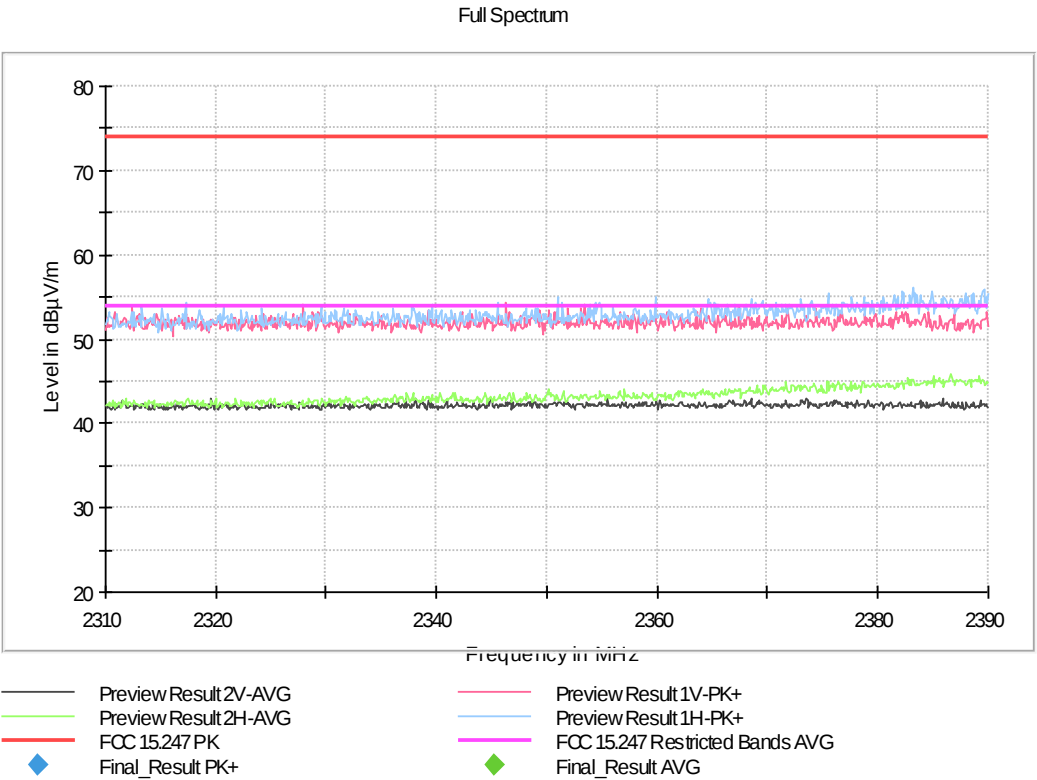
Equipment Type = Digital Transmission System (DTS)

Frequency MHz = 2437.00000

Active Port = 1

Images:





Tables:
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	3 GHz - 17 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	30 dB

Frequency Range GHz = [1, 17]

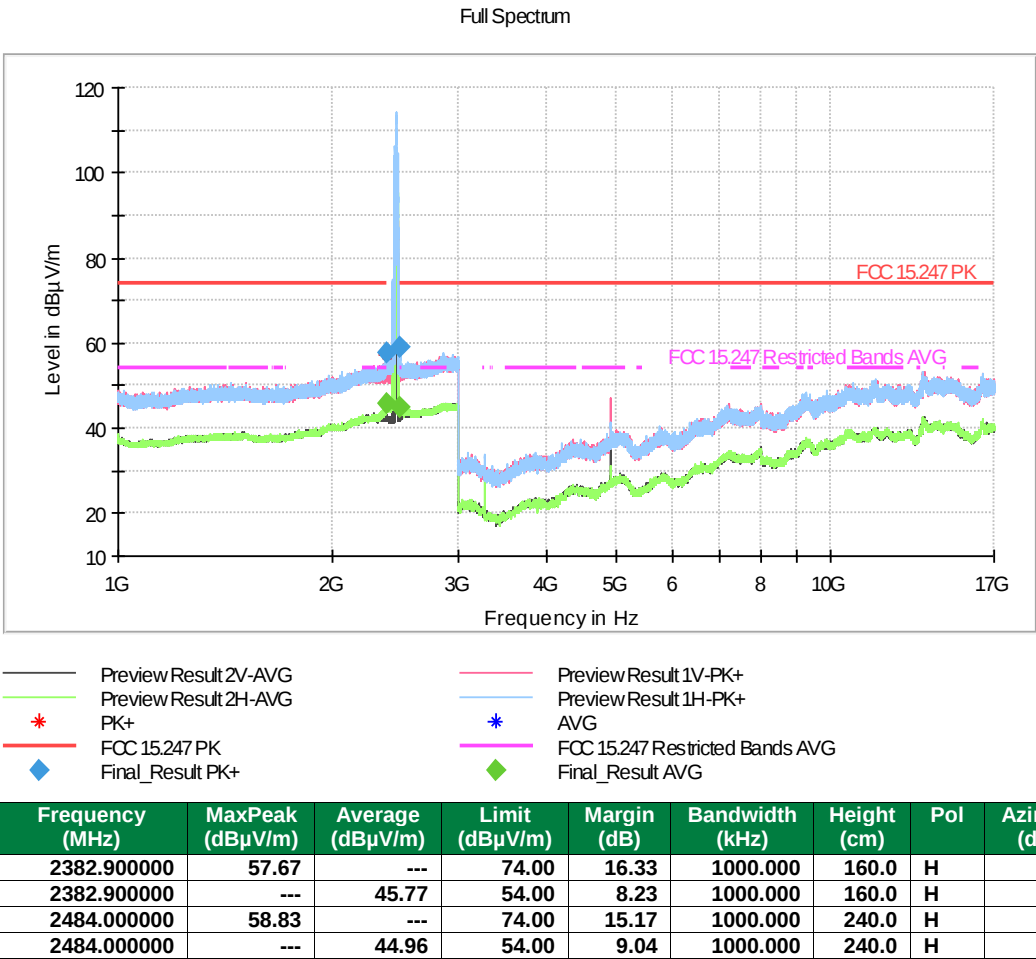
Modulation =RU26: 802.11ax HE20 (OFDMA MCS0)

MIMO Mode = SISO

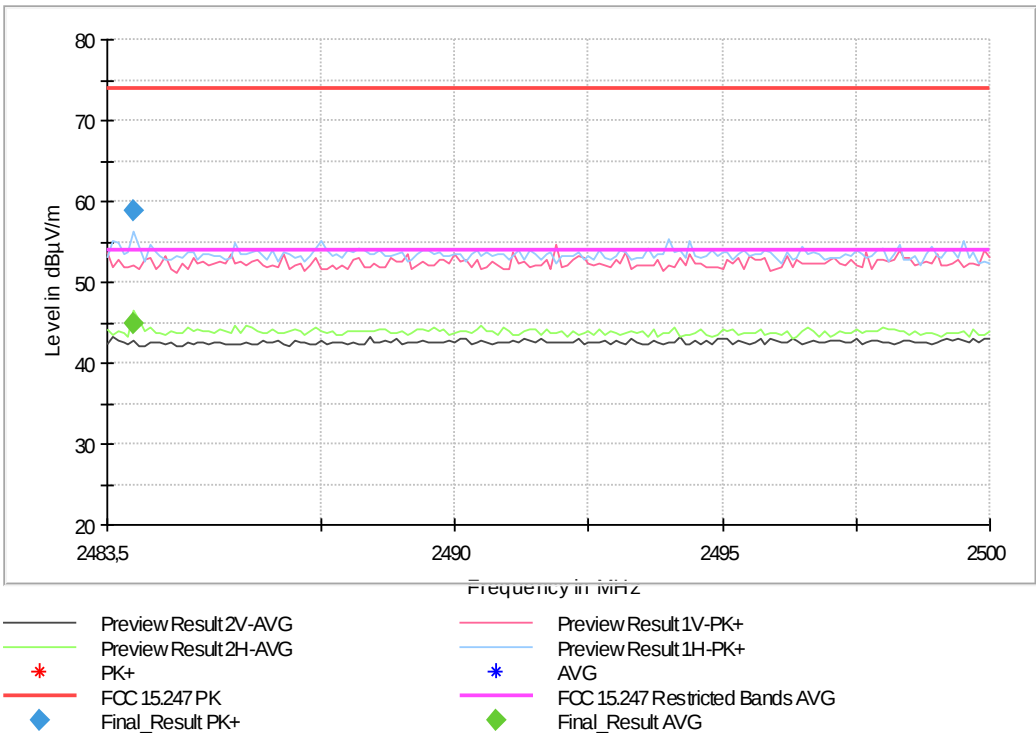
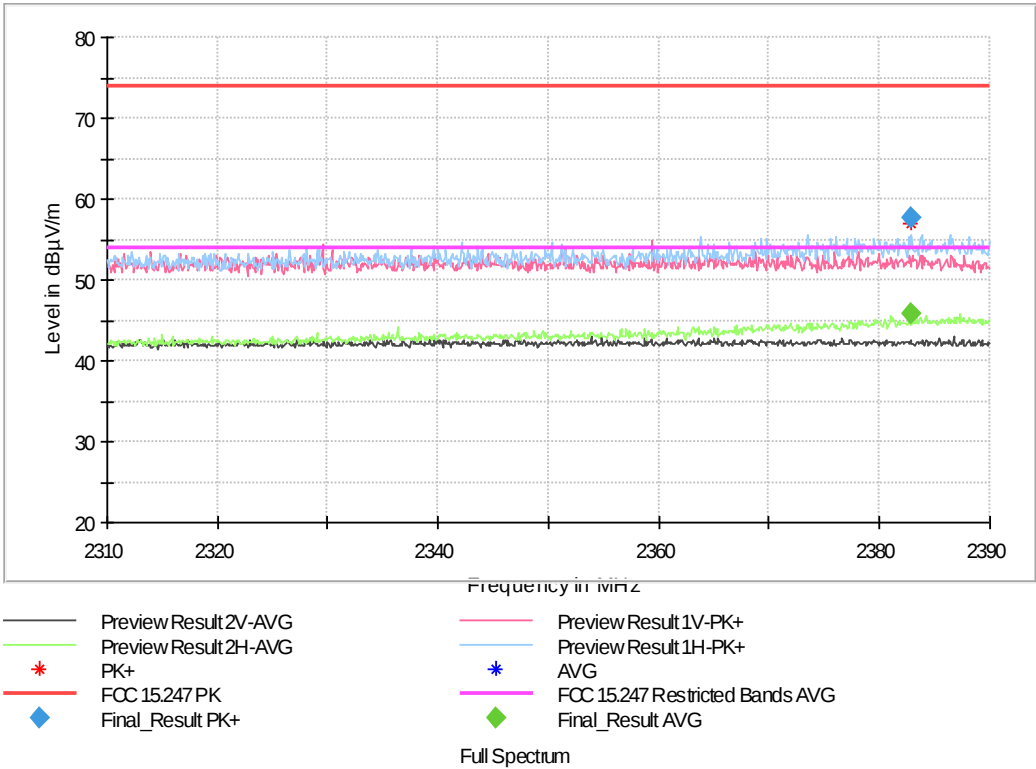
Equipment Type = Digital Transmission System (DTS)

Frequency MHz = 2457.00000

Active Port = 1



Full Spectrum



Frequency Range GHz = [1, 17]

Modulation =RU26: 802.11ax HE20 (OFDMA MCS0)

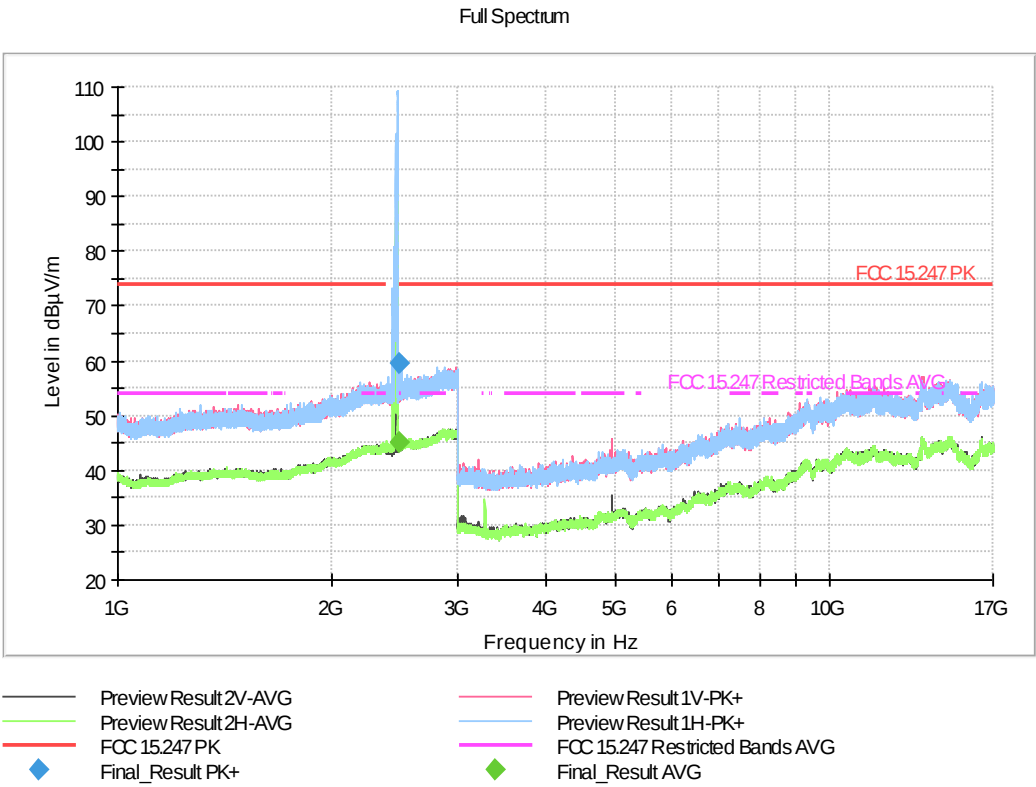
MIMO Mode = SISO

Equipment Type = Digital Transmission System (DTS)

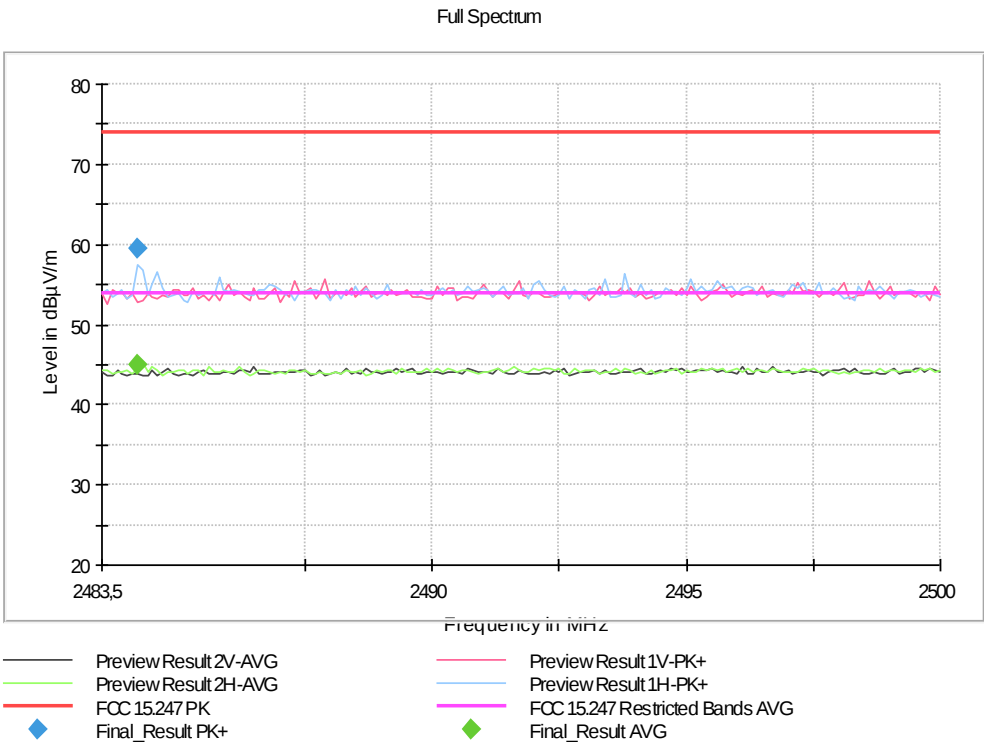
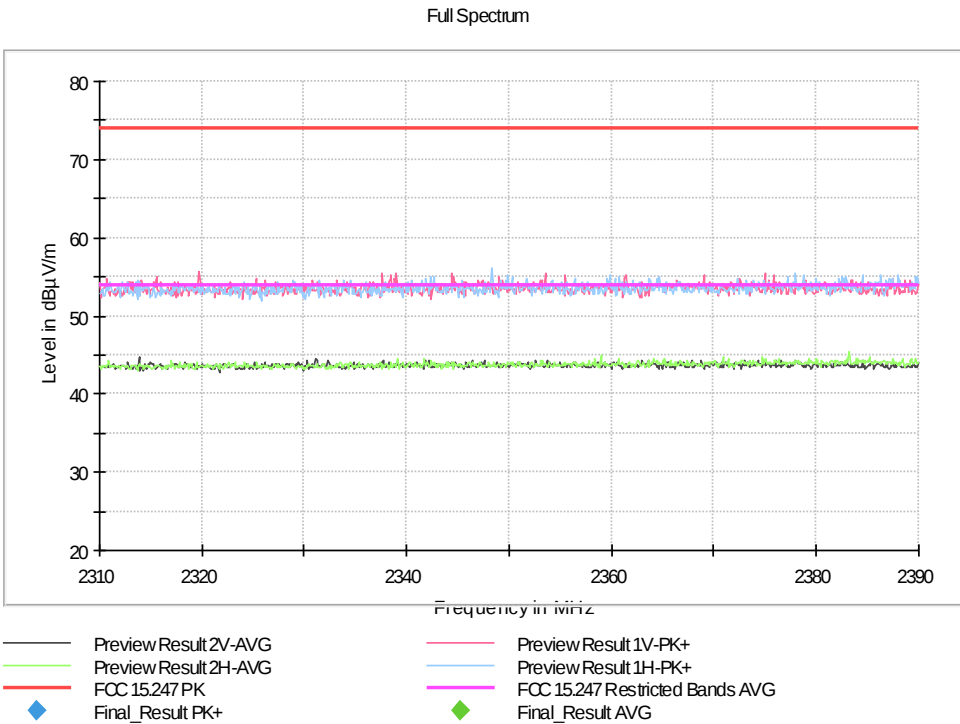
Frequency MHz = 2462.00000

Active Port = 1

Images:



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2484.200000	---	44.98	54.00	9.02	1000.000	192.0	H	356.0
2484.200000	59.57	---	74.00	14.43	1000.000	192.0	H	356.0



Tables:
Spectrum Analyzer Parameters

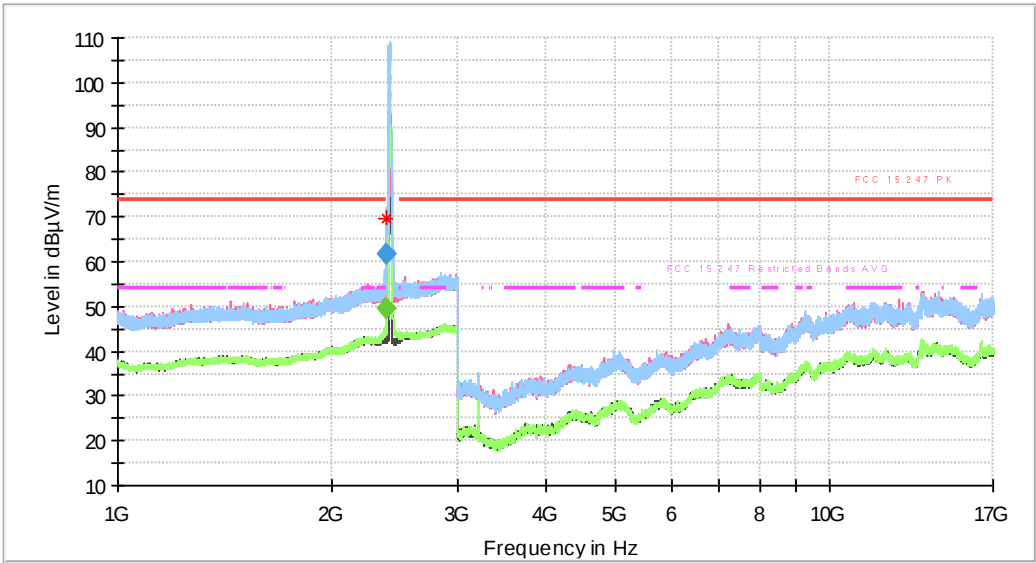
	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	3 GHz - 17 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	30 dB

Modulation: SU: 802.11ax HE20 (OFDMA MCS0)

MIMO Mode: SISO

Frequency Range GHz = [1, 17] Equipment Type = Digital Transmission System (DTS)
Modulation =SU: 802.11ax HE20 (OFDMA MCS0) Frequency MHz = 2412.00000
MIMO Mode = SISO Active Port = 1

Full Spectrum



- Preview Result 2V-AVG
- Preview Result 2H-AVG
- *

PK+
- FCC 15.247 PK
- ◆

Final_Result PK+
- ×

MaxPeak-PK+ (Single)

—

Preview Result 1V-PK+

—

Preview Result 1H-PK+

*

AVG

—

FCC 15.247 Restricted Bands AVG

◆

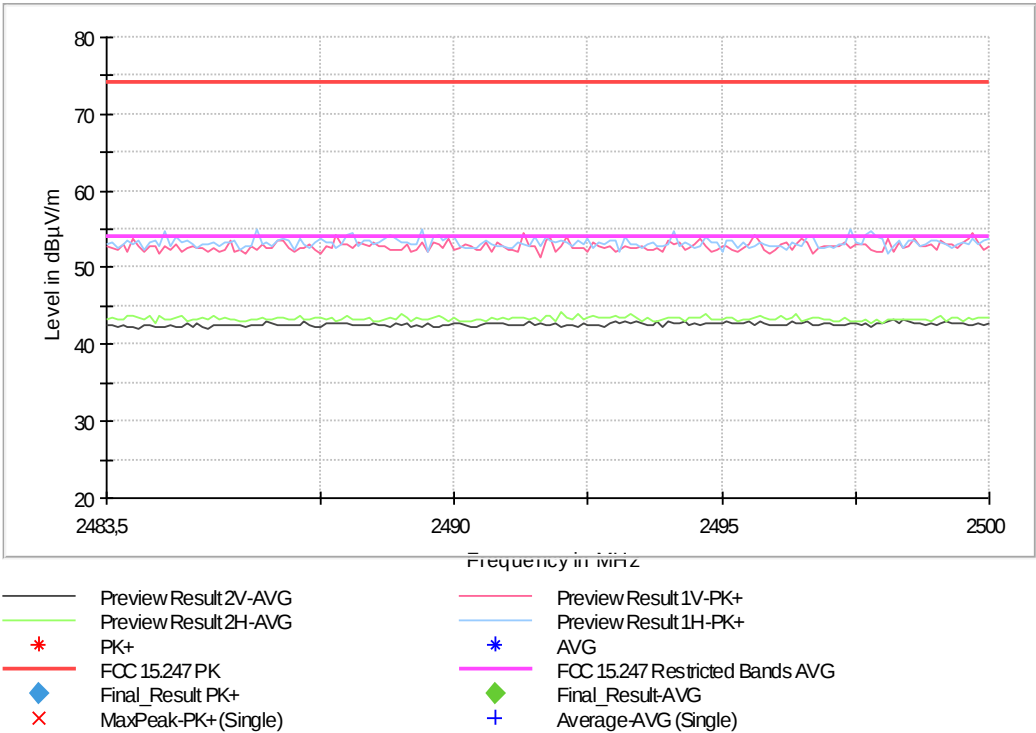
Final_Result-AVG

+

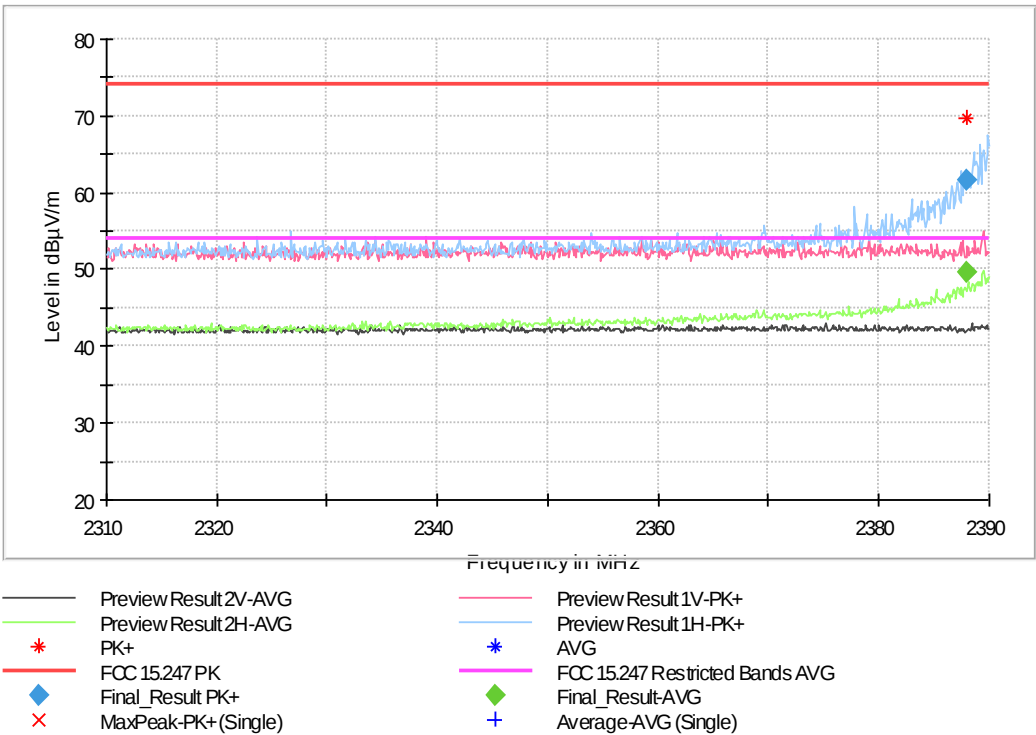
Average-AVG (Single)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
2387.900000	---	49.65	54.00	4.36	215.0	H	23.0
2387.900000	61.64	---	74.00	12.36	215.0	H	23.0

Full Spectrum



Full Spectrum



Frequency Range GHz = [1, 17]

Modulation =SU: 802.11ax HE20 (OFDMA MCS0)

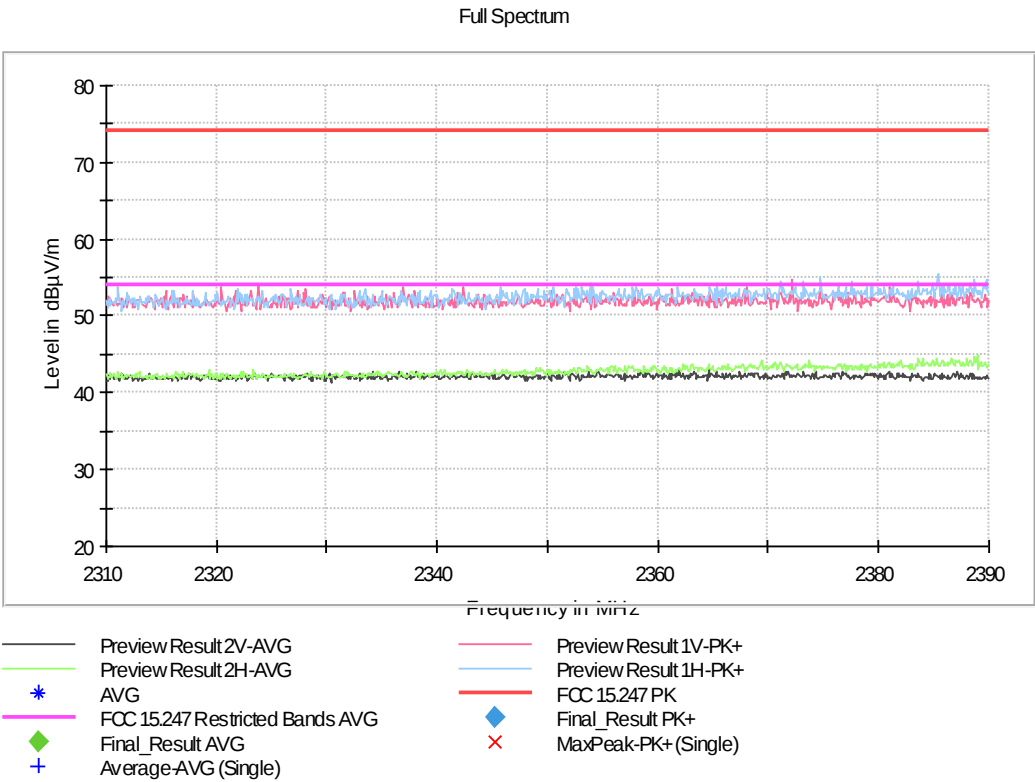
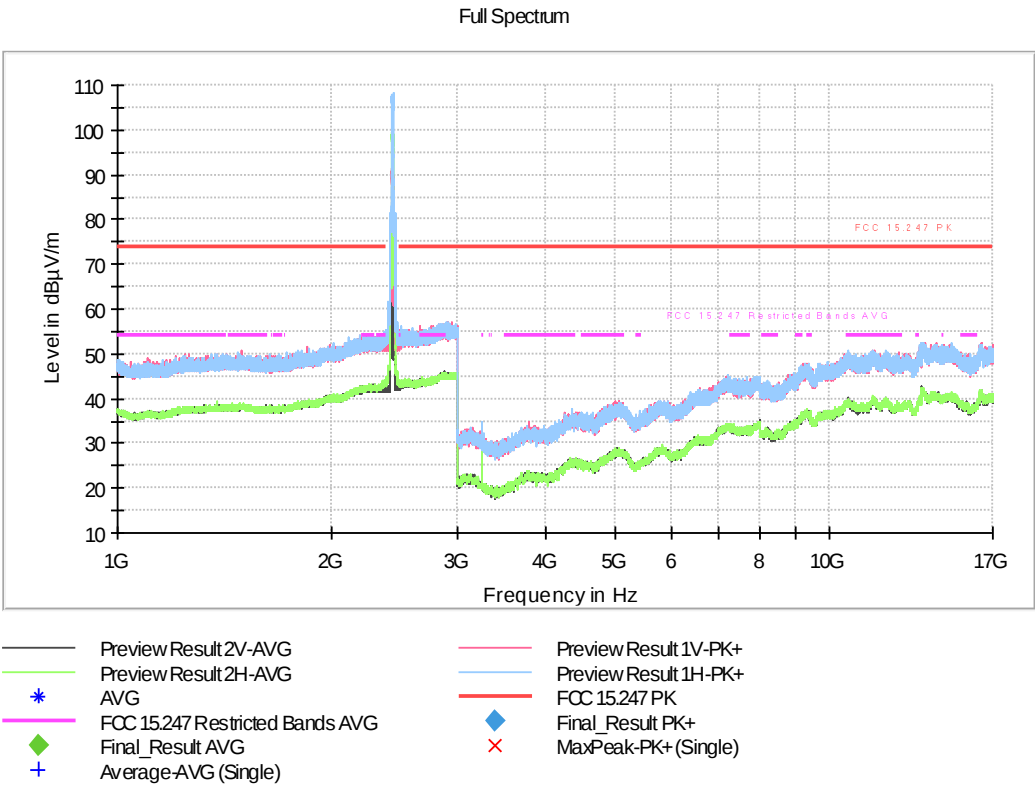
MIMO Mode = SISO

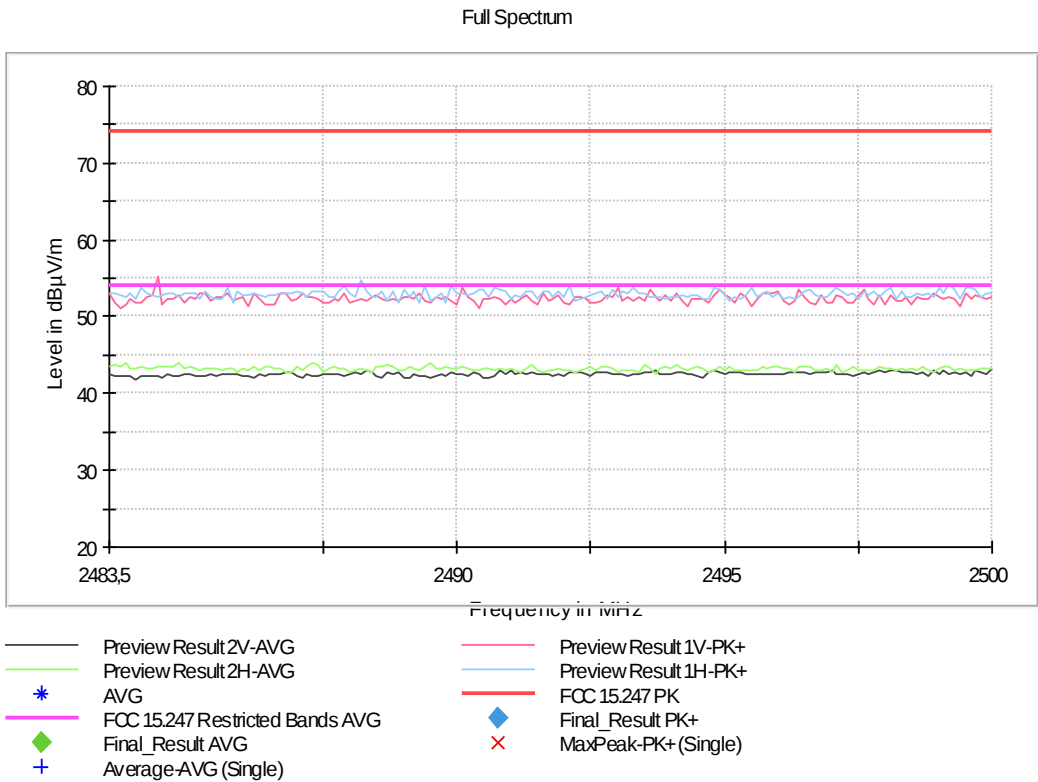
Equipment Type = Digital Transmission System (DTS)

Frequency MHz = 2437.00000

Active Port = 1

Images:





Tables:

Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	3 GHz - 17 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	30 dB

Frequency Range GHz = [1, 17]

Equipment Type = Digital Transmission System (DTS)

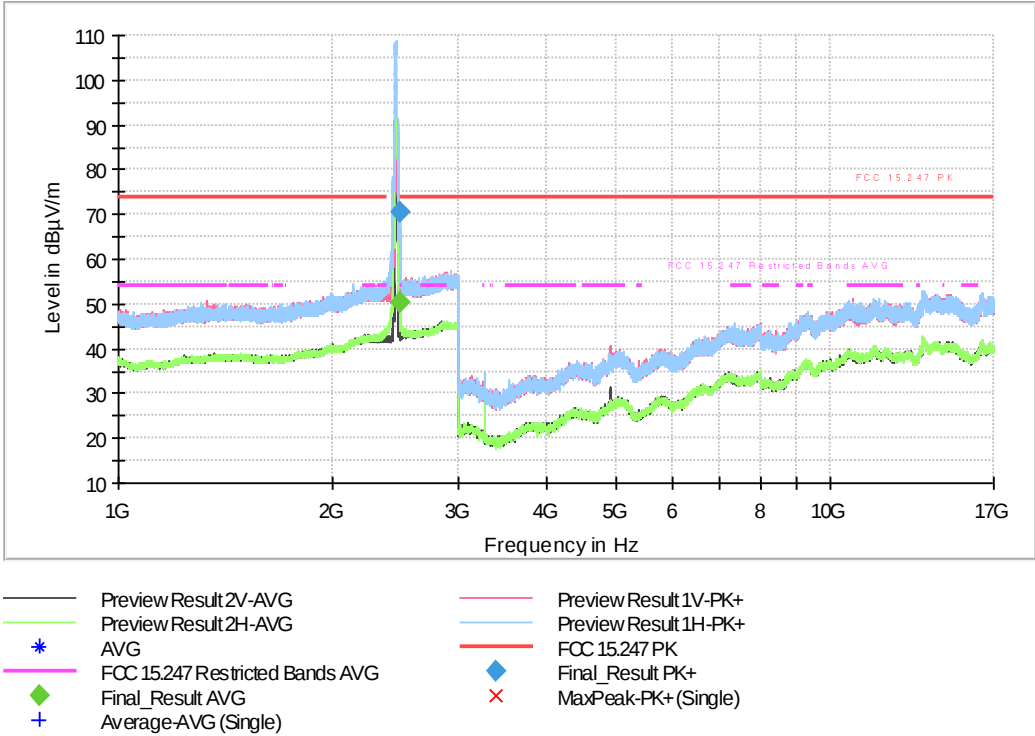
Modulation =SU: 802.11ax HE20 (OFDMA MCS0)

Frequency MHz = 2457.00000

MIMO Mode = SISO

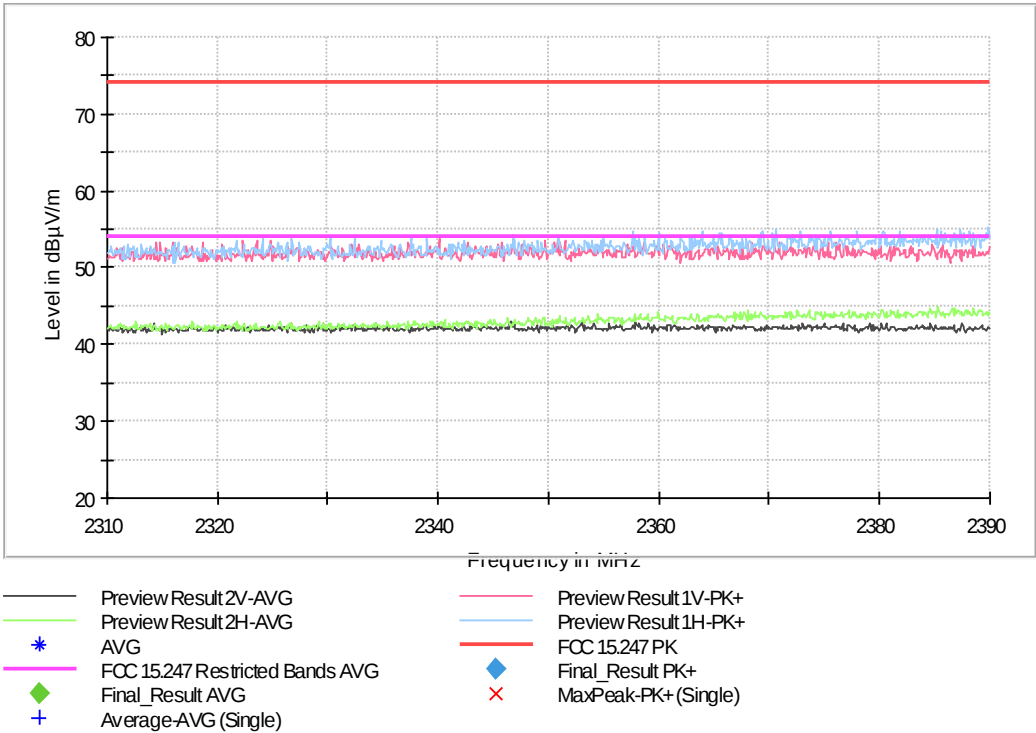
Active Port = 1

Full Spectrum

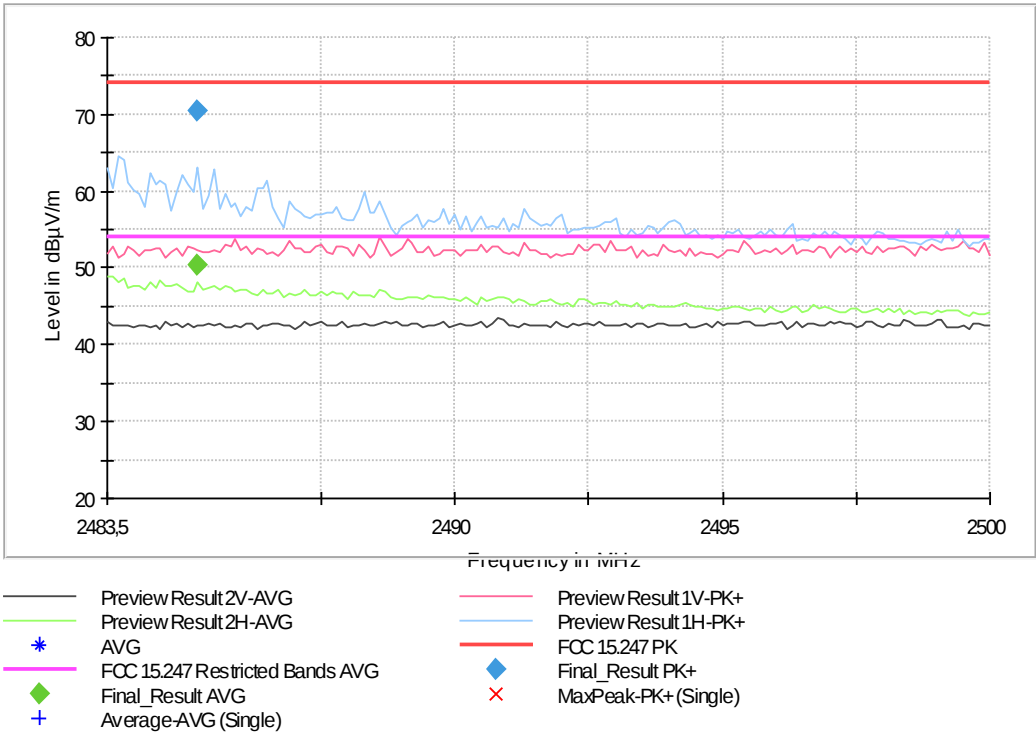


Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
2485.200000	70.42	---	74.00	3.58	185.0	H	0.0
2485.200000	---	50.44	54.00	3.56	185.0	H	0.0

Full Spectrum



Full Spectrum



Frequency Range GHz = [1, 17]

Equipment Type = Digital Transmission System (DTS)

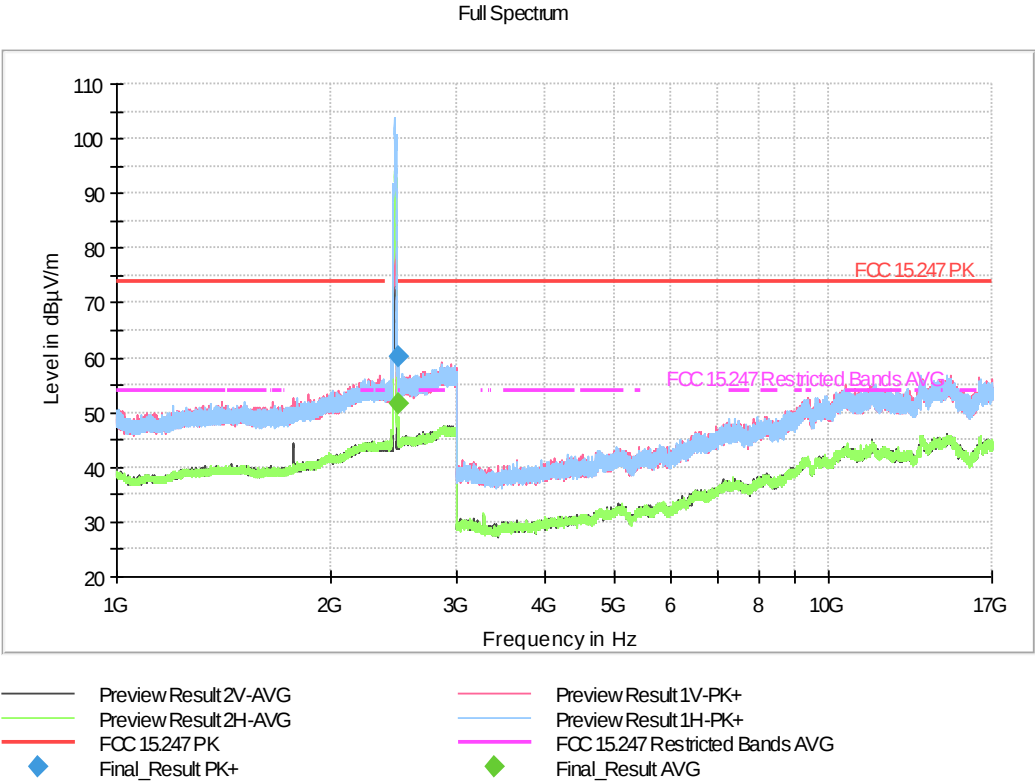
Modulation =SU: 802.11ax HE20 (OFDMA MCS0)

Frequency MHz = 2462.00000

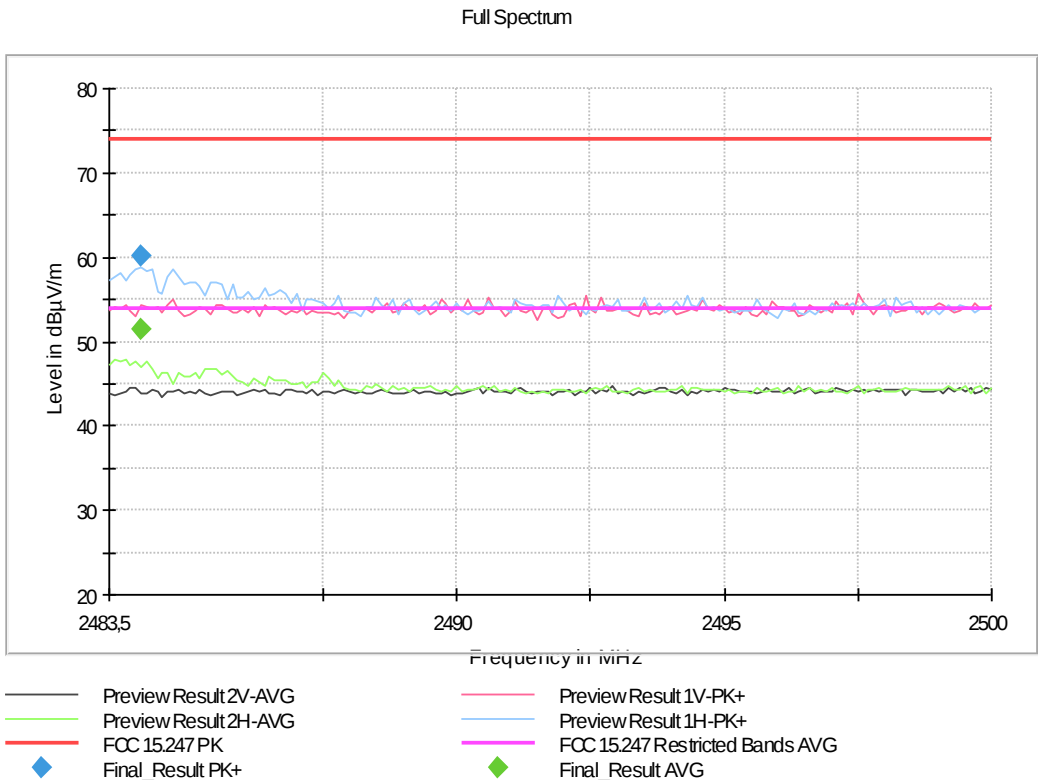
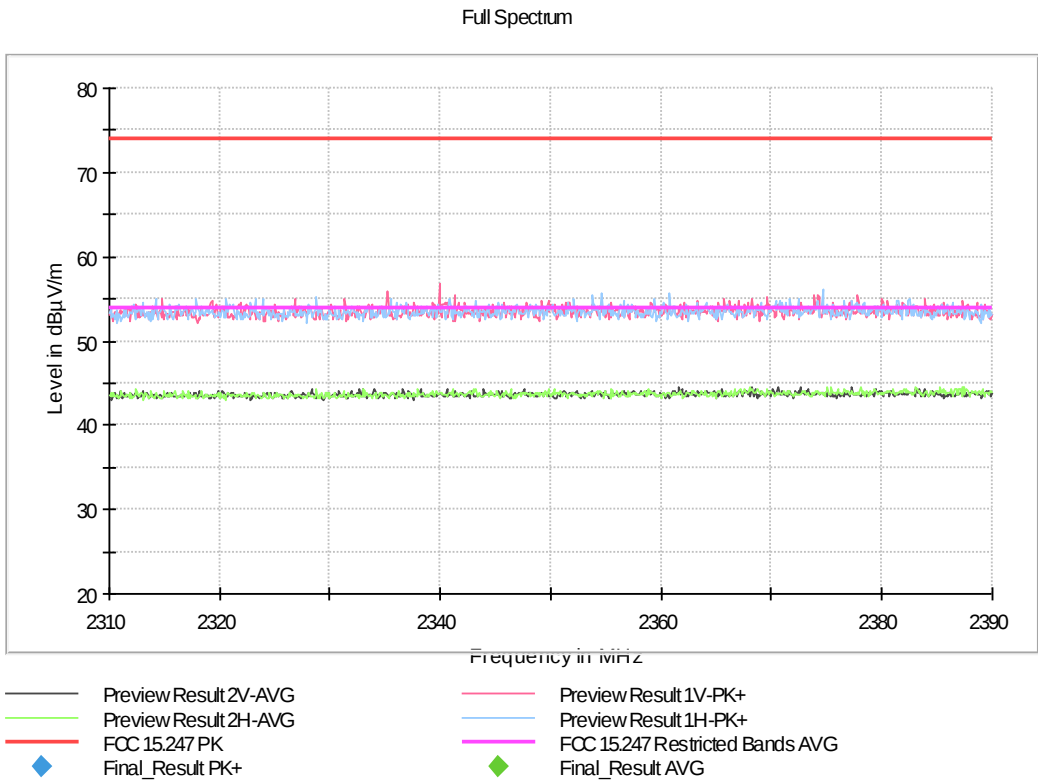
MIMO Mode = SISO

Active Port = 1

Images:



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2484.100000	---	51.52	54.00	2.48	1000.000	272.0	H	10.0
2484.100000	60.26	---	74.00	13.75	1000.000	272.0	H	10.0



Tables:
Spectrum Analyzer Parameters

	Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
	Receiver: [ESW 44]					
	3 GHz - 17 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	30 dB

Appendix C: Test results. ZigBee 2.4 GHz

INDEX

TEST CONDITIONS	100
TEST CASES DETAILS	103
<i>RSS-247 5.5 / FCC 15.247 (d) [RSE] Emission limitations radiated (Transmitter)</i>	<i>103</i>

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal: 3.3 V
Type of Power Supply: DC internal.

ANTENNA (*):

Type of Antenna: u-blox PCB antenna (internal)
Maximum Declared Antenna Gain: 3 dBi

TEST FREQUENCIES (*):

Modulation	Data rates	Low Channel:	Power adjustment	Middle Channel	Power adjustment	High Channel (1)	Power adjustment	High Channel (2)	Power adjustment
ZIGBEE O-QPSK	250 kbps	2405 MHz	15	2445 MHz	15	2475 MHz	15	2480 MHz	14

During transmitter test the EUT was controlled by a SW tool provided by the client to operate in a continuous transmit mode on the modulation schemes and test channels as required. Power adjustment correspond to the parameter value configured in the SW tool.

All channels with frequencies avobe High Channel (1) will be configured at the same power adjustment as high Channel (2)

RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz and 1 GHz-17 GHz Double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1.5 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

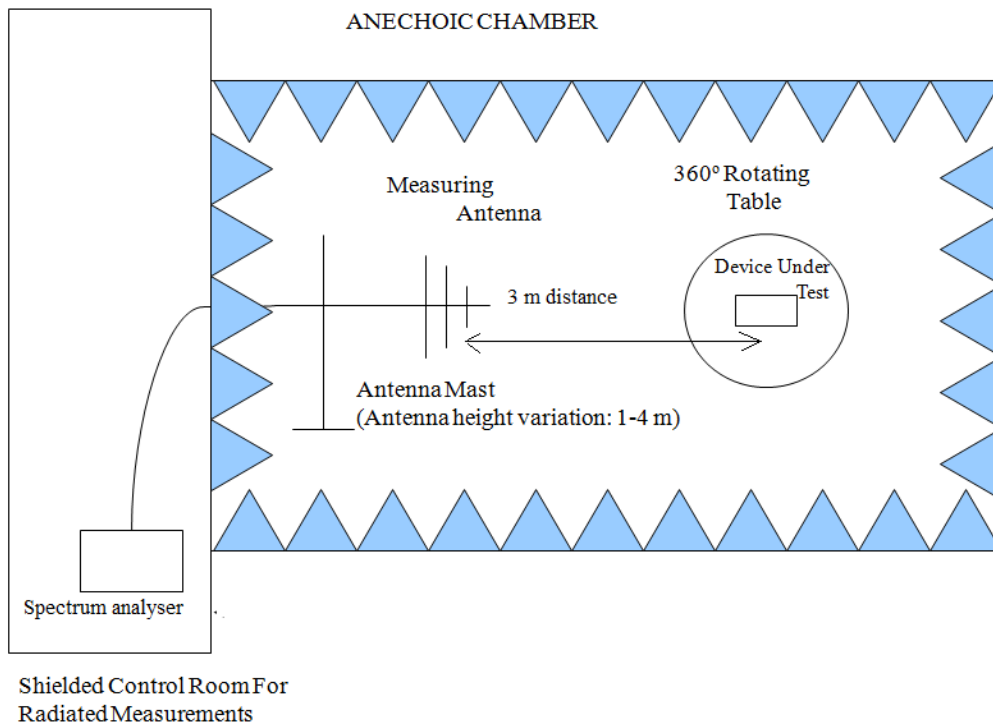
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

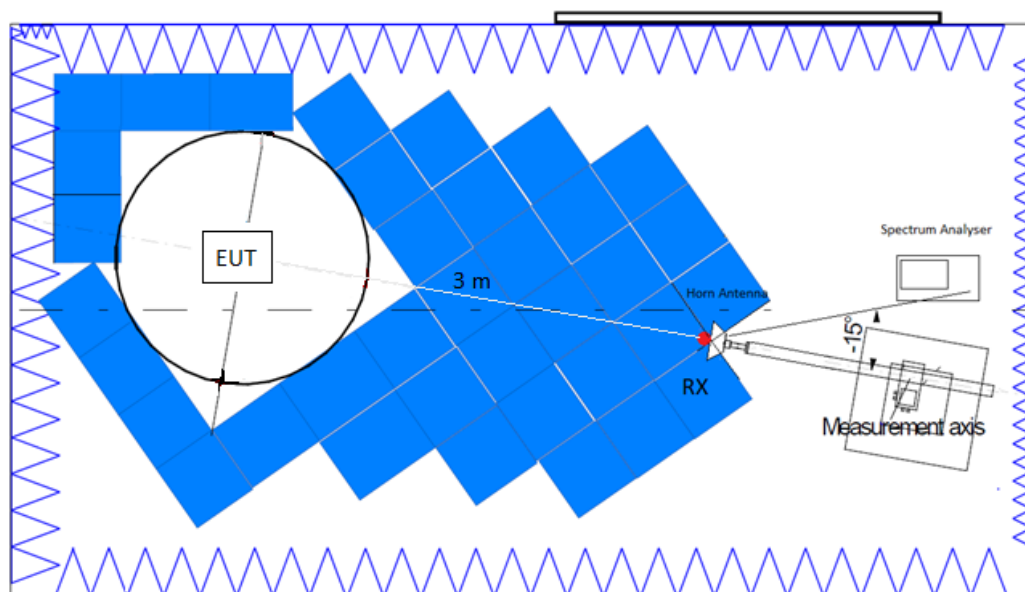
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth/video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

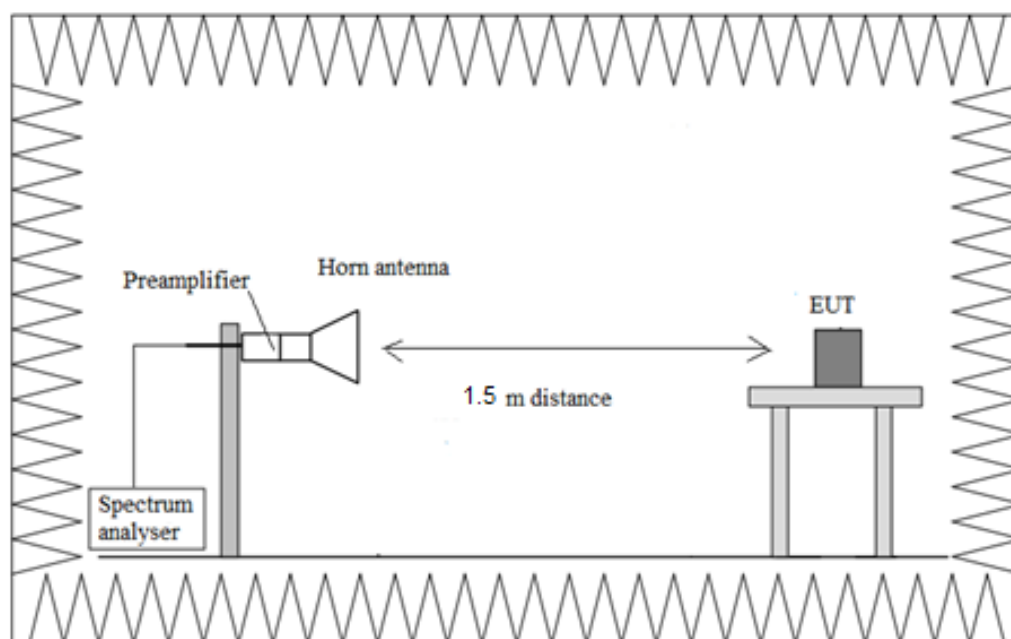
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



TEST CASES DETAILS

RSS-247 5.5 / FCC 15.247 (d) [RSE] Emission limitations radiated (Transmitter)

Limits

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c) / RSS-Gen):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	-	300
0.490 - 1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table, specified when measuring with peak detector function.

RSS-247:

Attenuation below the general field strength limits specified in RSS-Gen is not required.

Frequency range tested for Radiated emissions:

Start frequency: no radiofrequency signal generated in the device found below 10th sub-harmonic, no further investigation required.

Stop frequency: it has been performed the radiated spurious emissions until 10th harmonic.

Verdict

Pass

Attachments

Spectrum analyzer parameter:

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44]					
30 MHz - 1 GHz	9,7 kHz	PK+	100 kHz	1 s	0 dB
1 GHz - 3 GHz	20 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
3 GHz - 17 GHz	140 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
17 GHz - 26 GHz	300 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

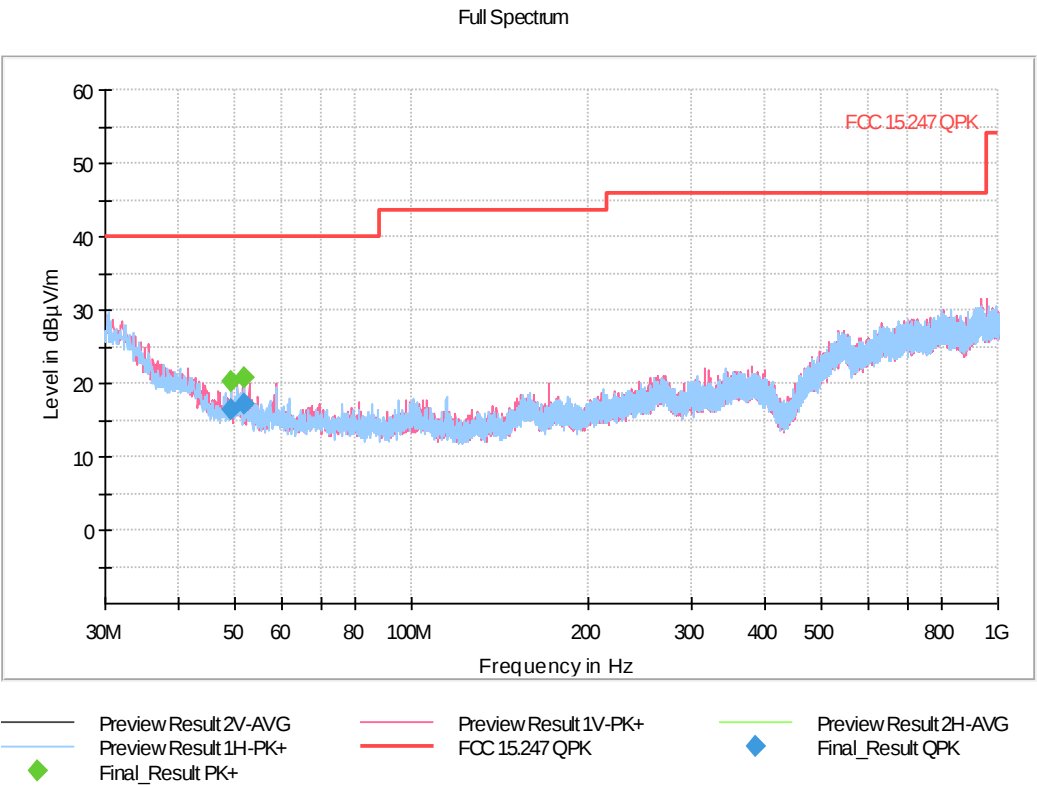
Frequency Range GHz = [0.03, 1] Equipment Type = Digital Transmission System (DTS)

The spurious frequencies detected do not depend on the transmission channel or the Modulation

MIMO Mode = SISO

Active Port = 1

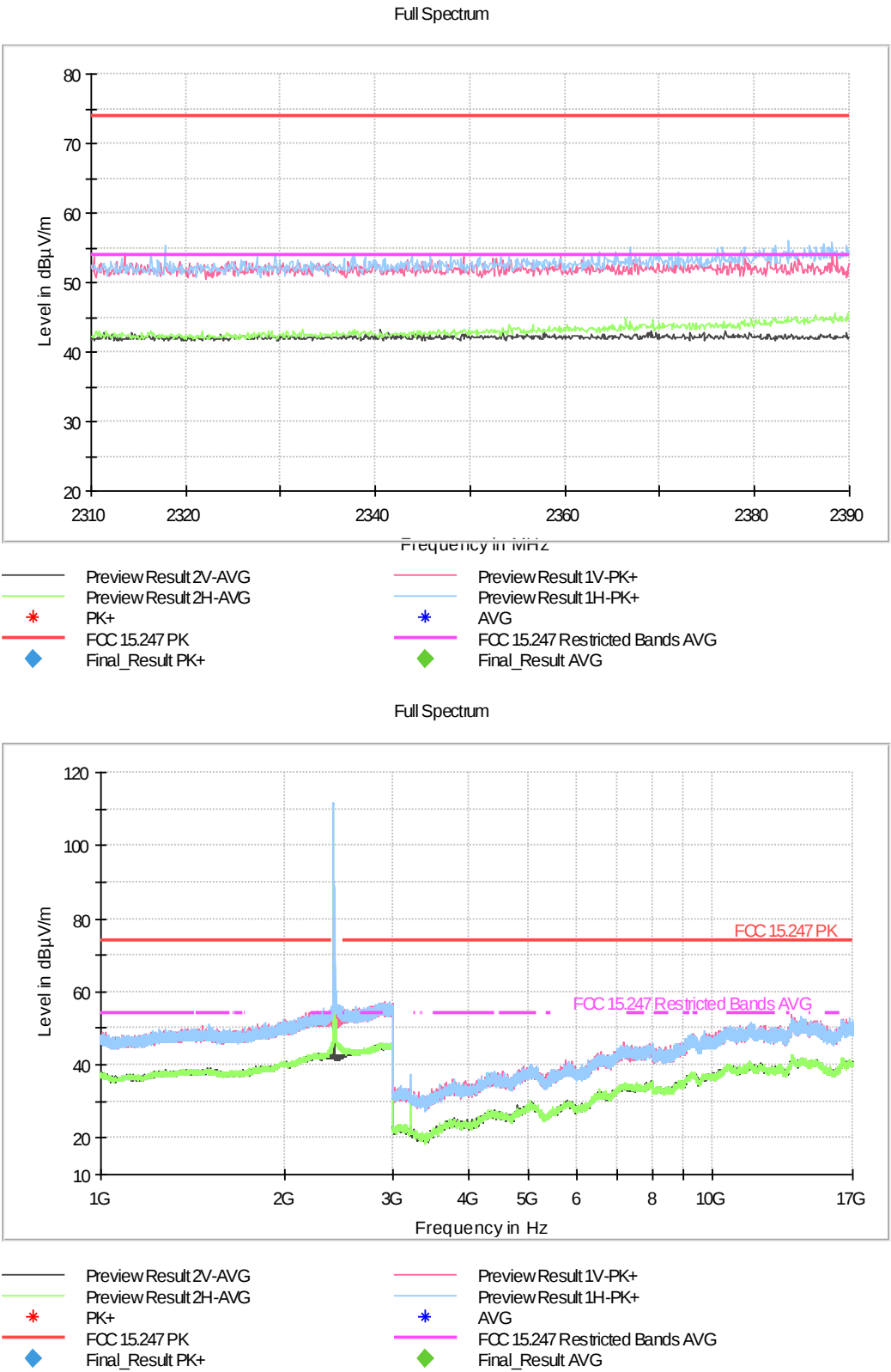
Images:



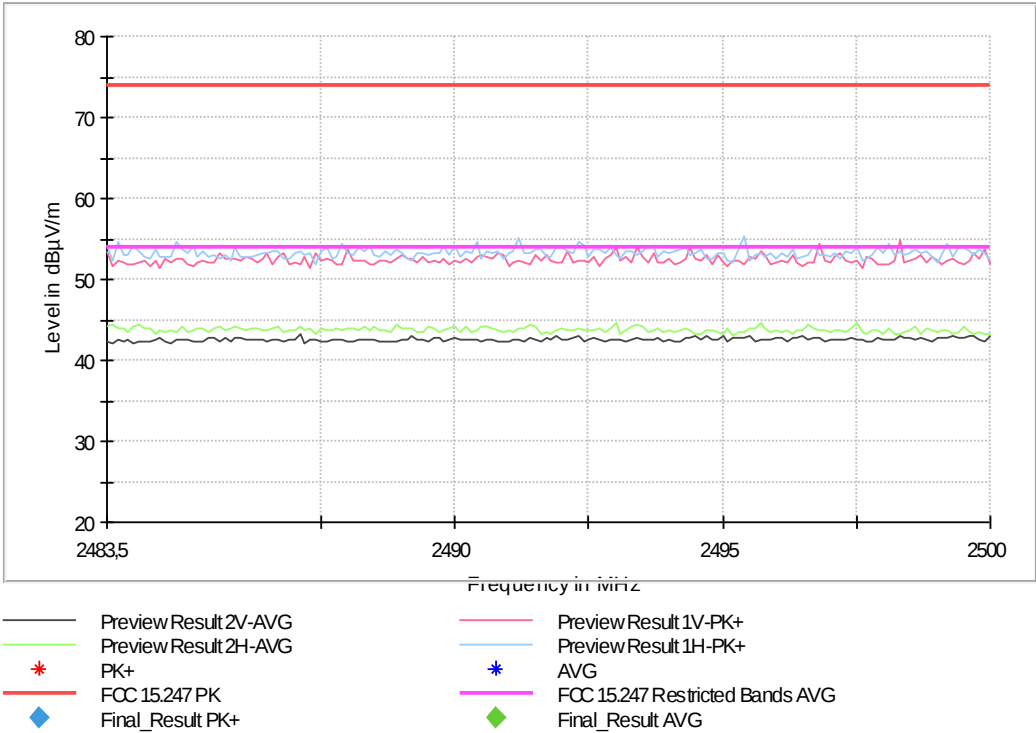
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
49.303000	16.47	---	40.00	23.53	194.0	V	34.0
49.303000	---	20.30	---	---	194.0	V	34.0
51.631000	17.10	---	40.00	22.90	202.0	V	76.0
51.631000	---	20.80	---	---	202.0	V	76.0

Frequency Range GHz = [1, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = ZigBee Frequency MHz = 2405.00000
MIMO Mode = SISO Active Port = 1

Images:

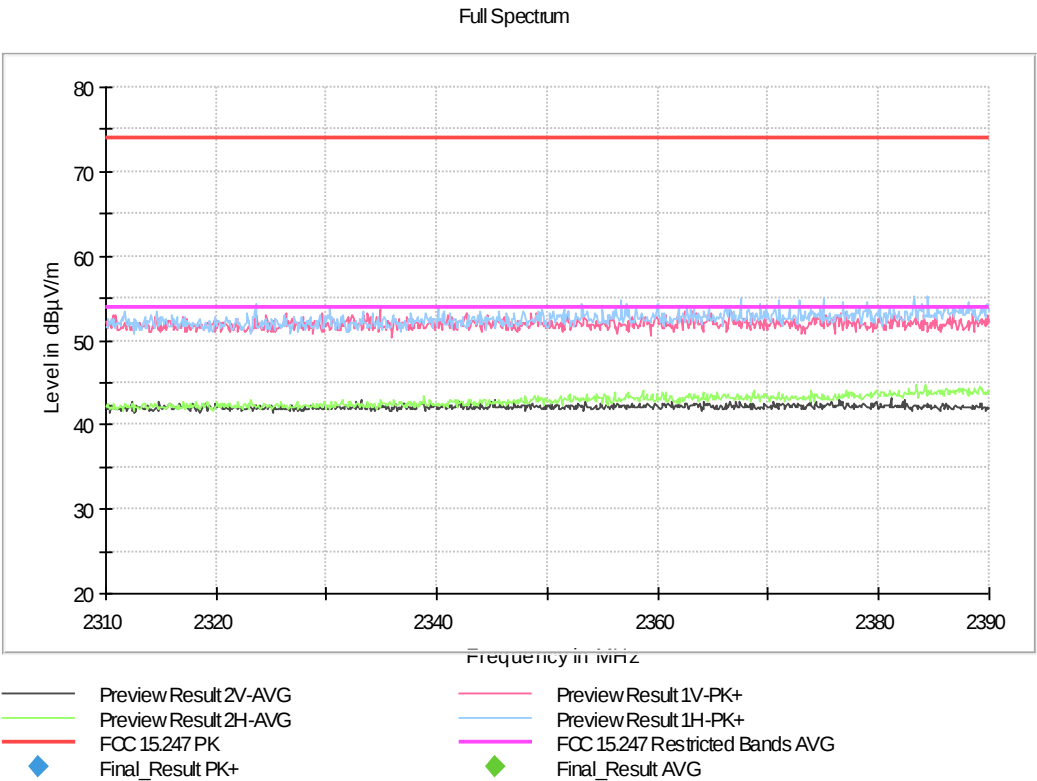
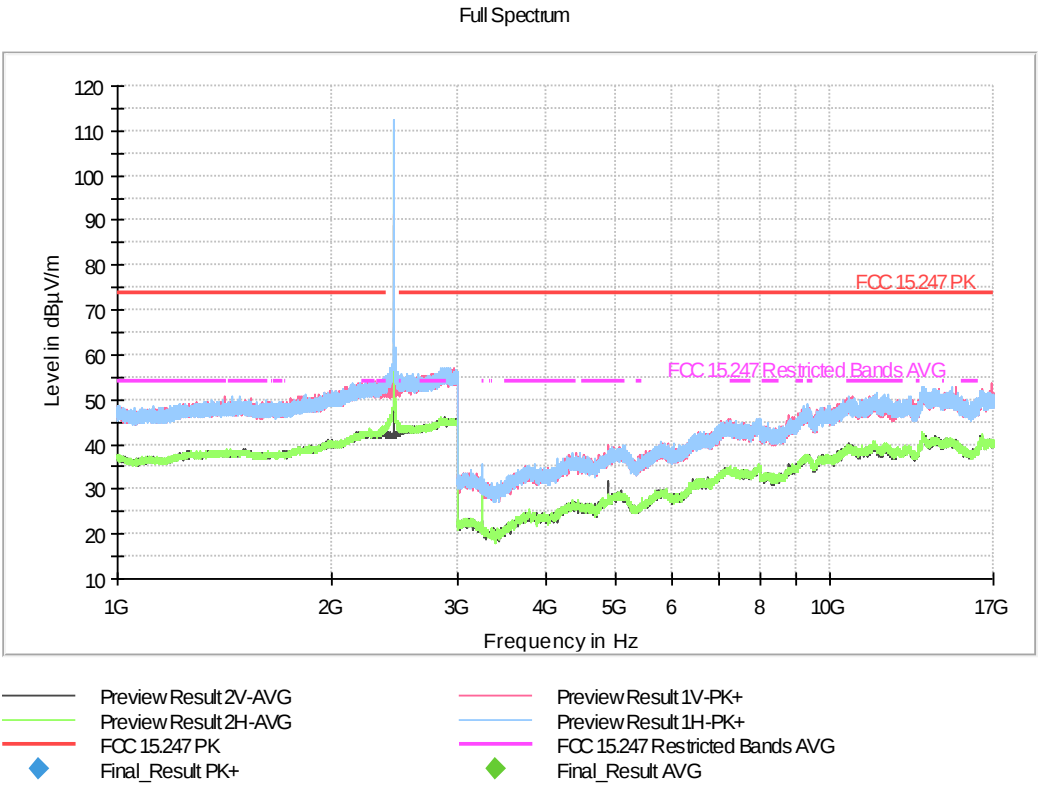


Full Spectrum

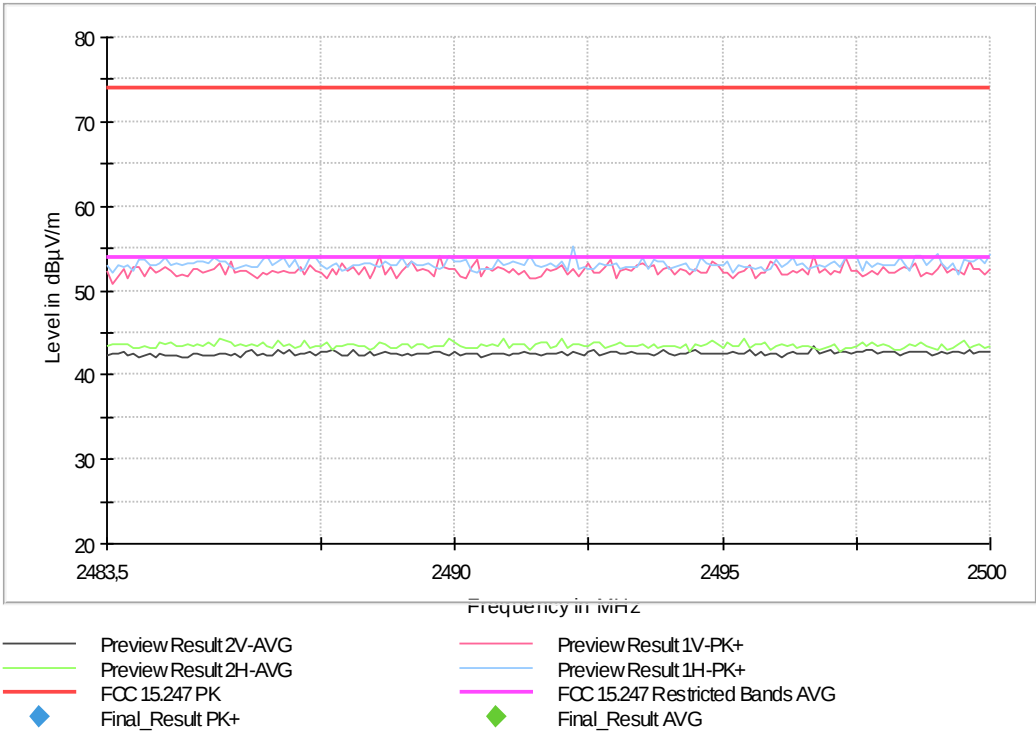


Frequency Range GHz = [1, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = ZigBee Frequency MHz = 2445.00000
MIMO Mode = SISO Active Port = 1

Images:

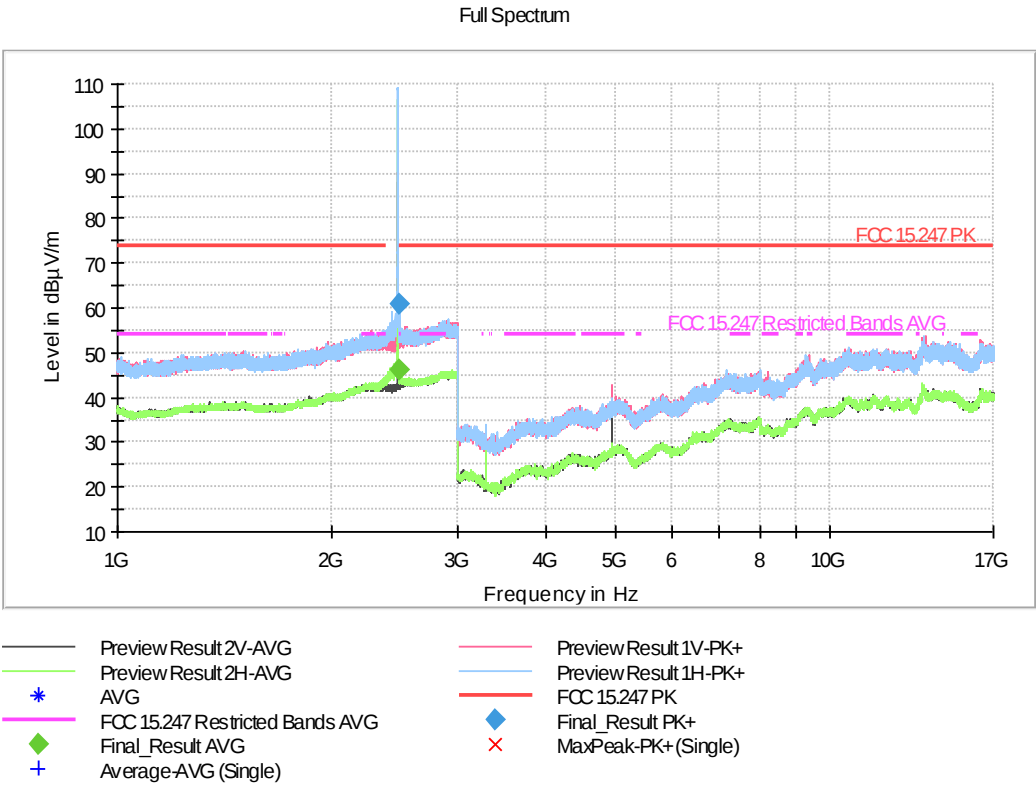


Full Spectrum

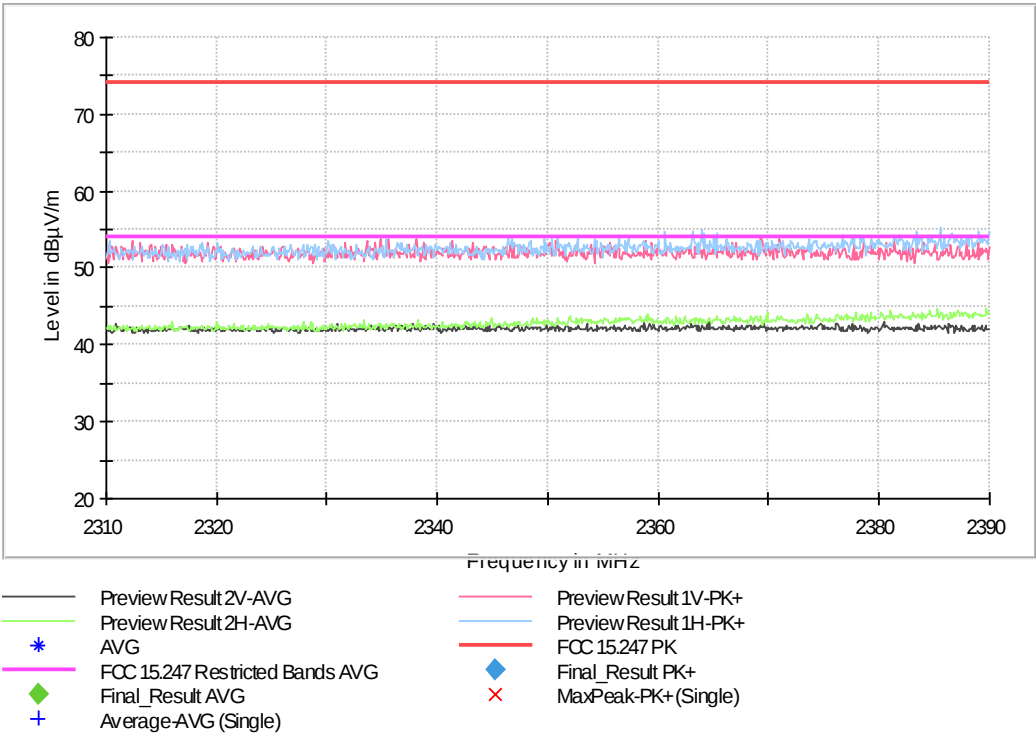


Frequency Range GHz = [1, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = ZigBee Frequency MHz = 2475.00000
MIMO Mode = SISO Active Port = 1

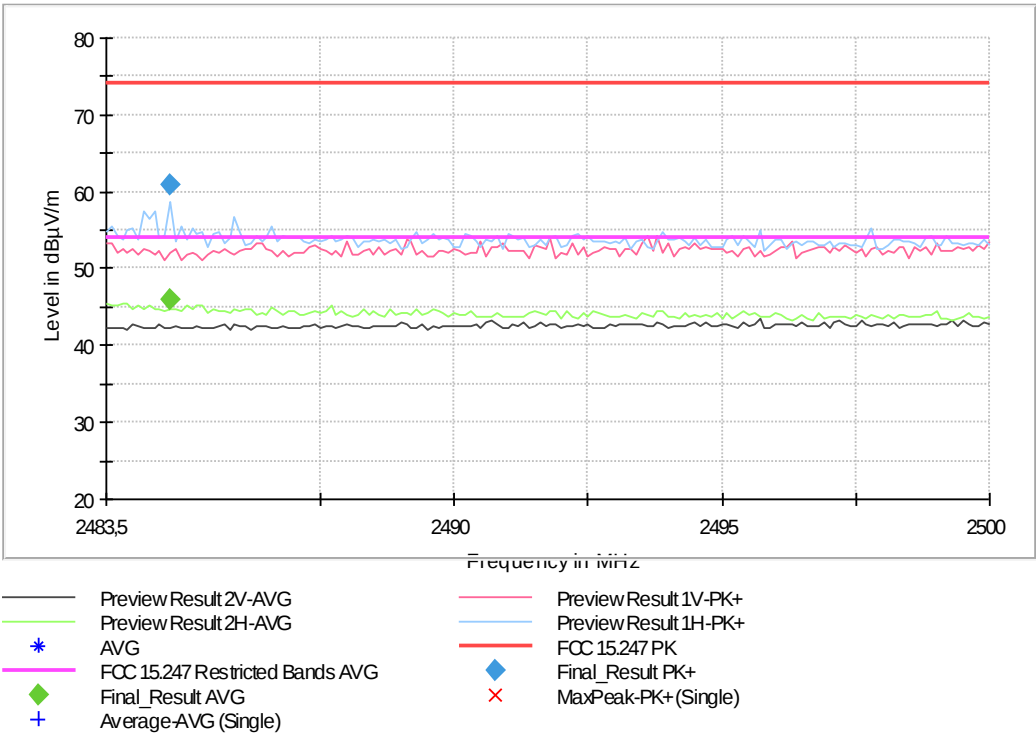
Images:



Full Spectrum

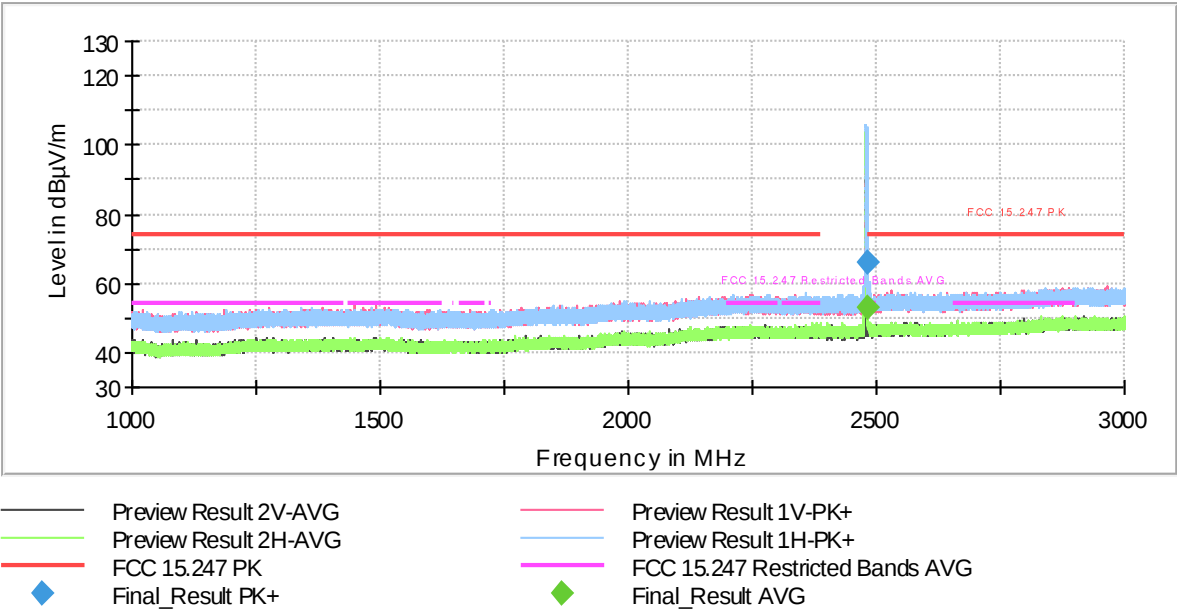


Full Spectrum

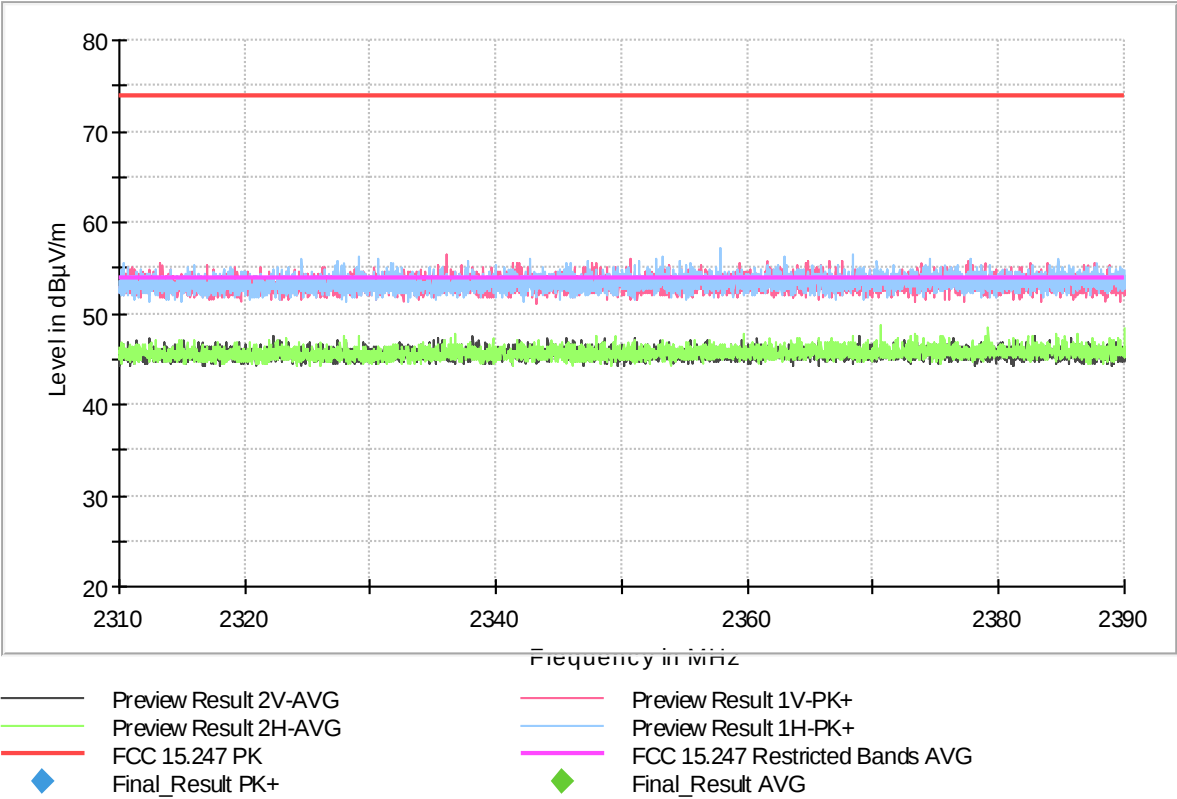


Frequency Range GHz = [1, 3] Equipment Type = Digital Transmission System (DTS)
Modulation = ZigBee Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

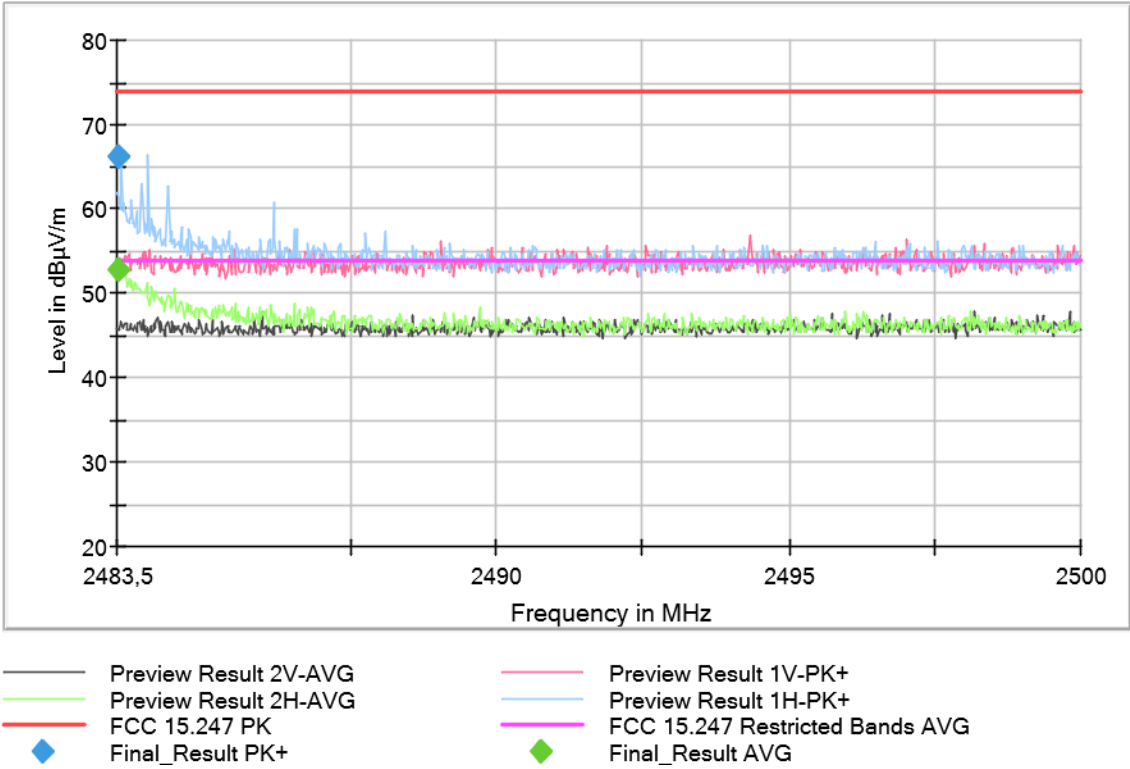
Images:



Full Spectrum

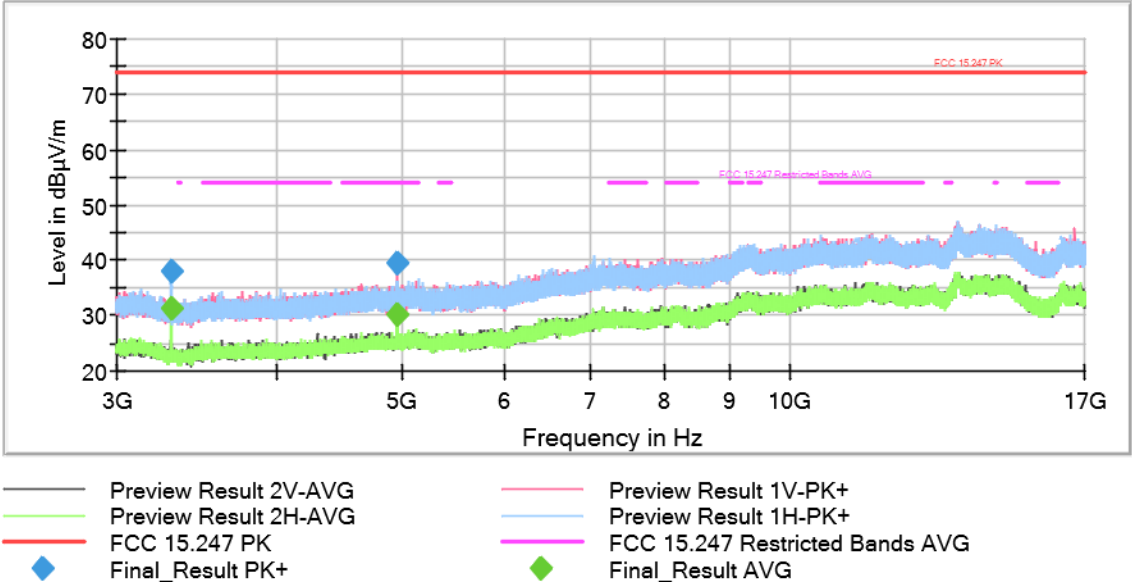


Full Spectrum



Frequency Range GHz = [3, 17] Equipment Type = Digital Transmission System (DTS)
Modulation = ZigBee Frequency MHz = 2480.00000
MIMO Mode = SISO Active Port = 1

Images:



Frequency Range GHz = [17, 26] Equipment Type = Digital Transmission System (DTS)
The spurious frequencies detected do not depend on the transmission channel or the Modulation
MIMO Mode = SISO Active Port = 1

Images:

