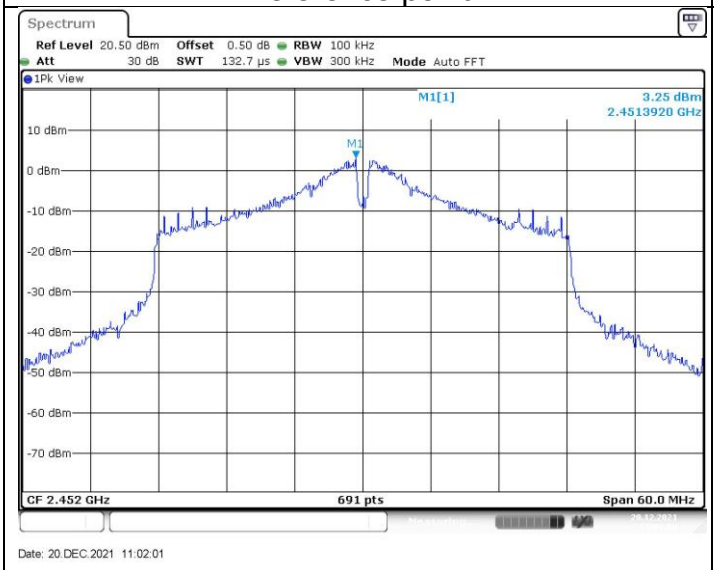
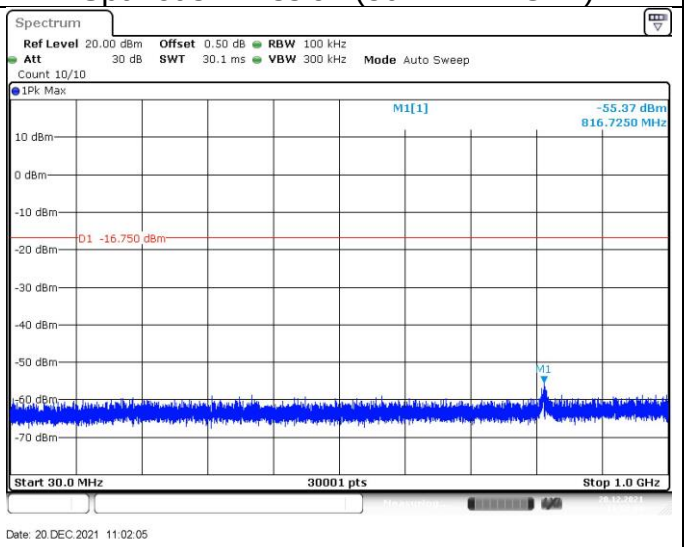
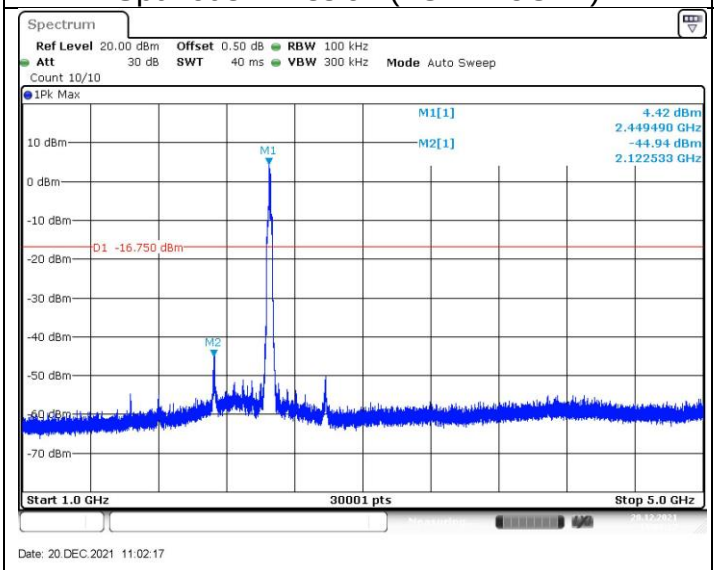
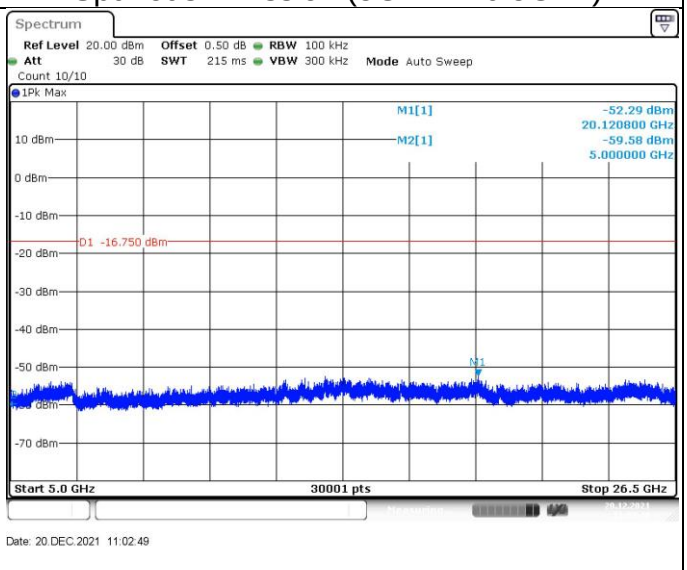
Out-of-Band Emissions	
Channel 9 (2452MHz)	
Reference point	Spurious Emission (30MHz – 1GHz)
	
Spurious Emission (1GHz –5GHz)	Spurious Emission (5GHz –26.5GHz)
	

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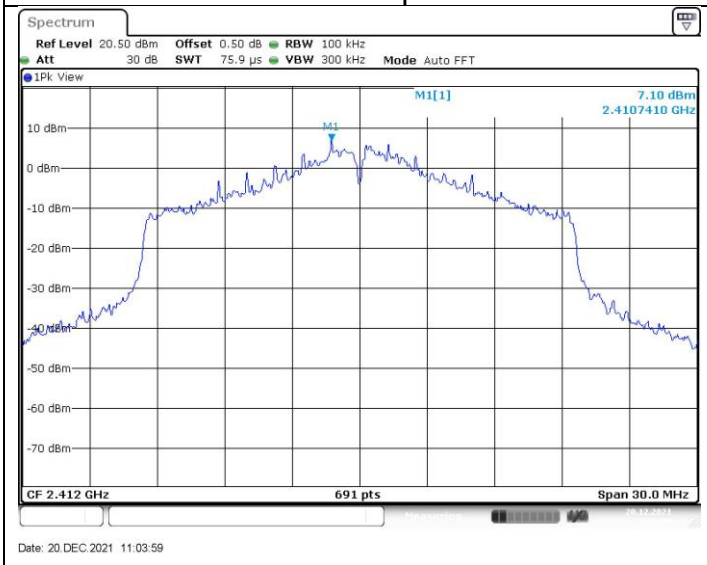
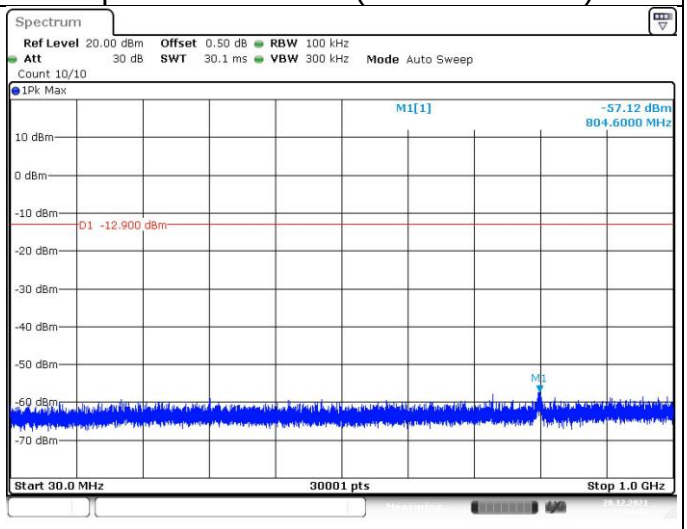
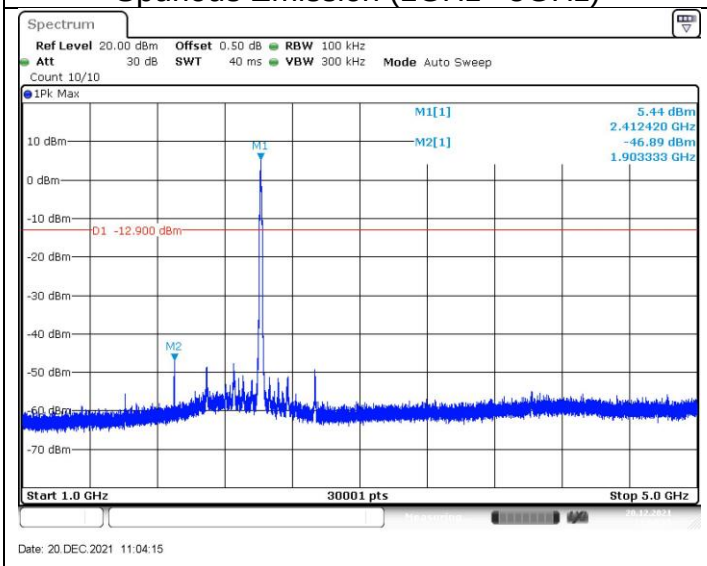
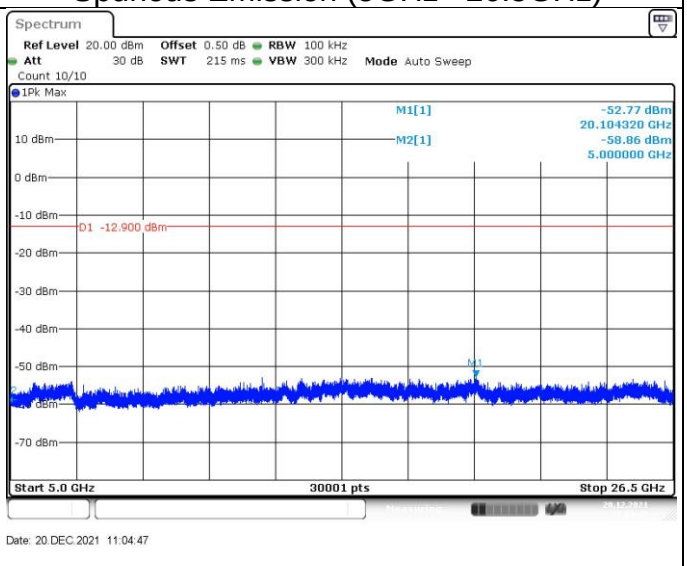
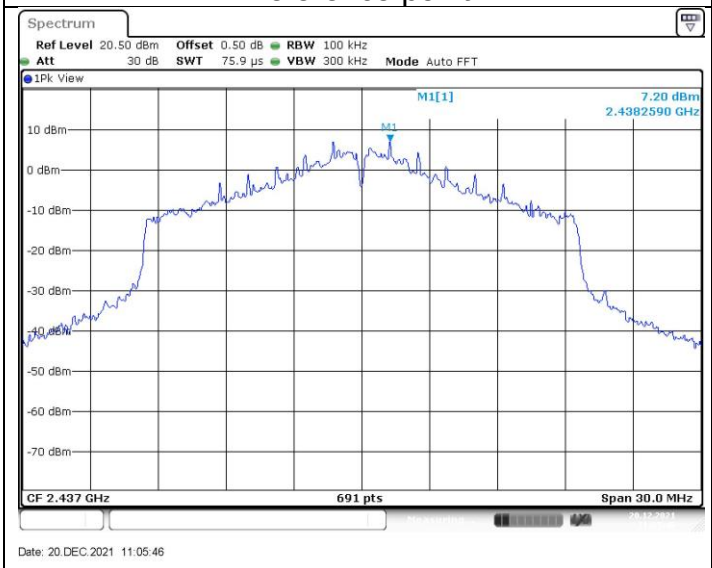
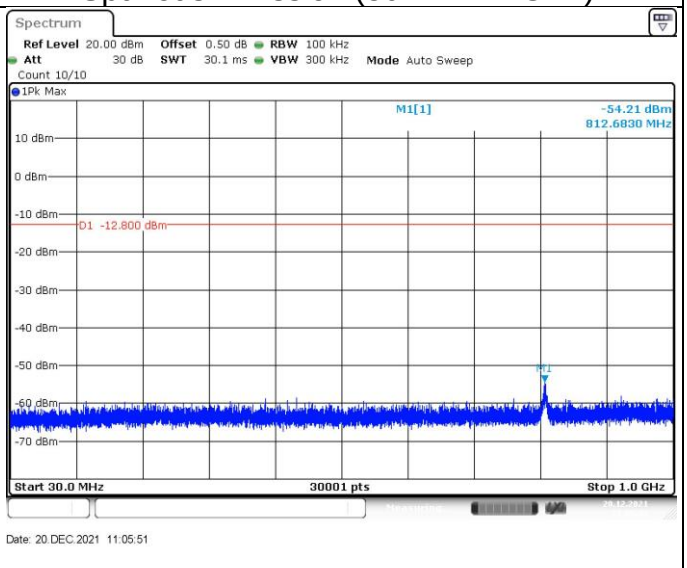
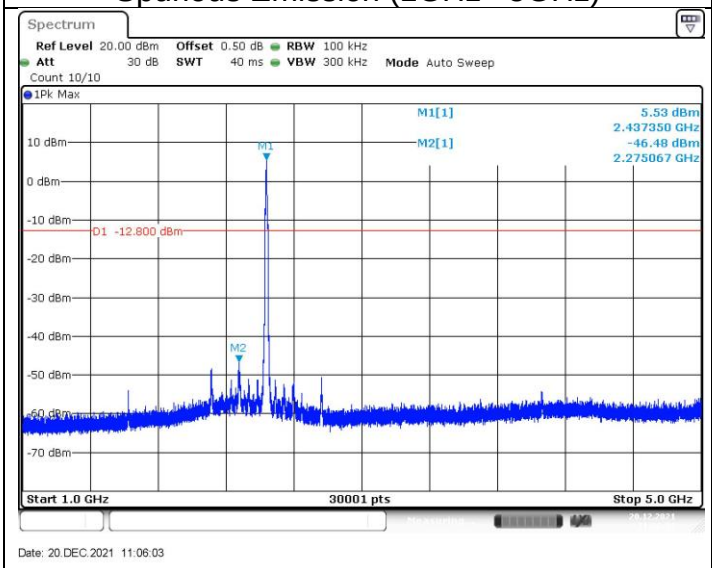
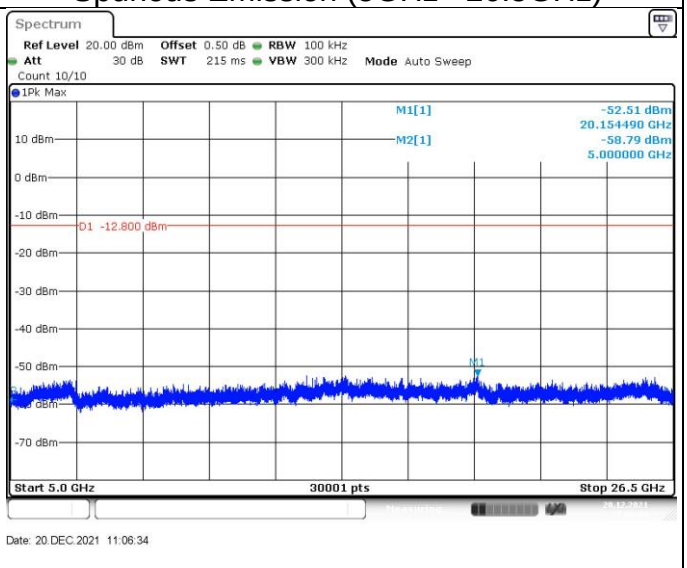
802.11ax(HE20)

Out-of-Band Emissions	
Channel 3 (2412MHz)	
Reference point	Spurious Emission (30MHz – 1GHz)
	
Spurious Emission (1GHz –5GHz)	Spurious Emission (5GHz –26.5GHz)
	

Out-of-Band Emissions	
Channel 6 (2437MHz)	
Reference point	Spurious Emission (30MHz – 1GHz)
	
Spurious Emission (1GHz –5GHz)	Spurious Emission (5GHz –26.5GHz)
	

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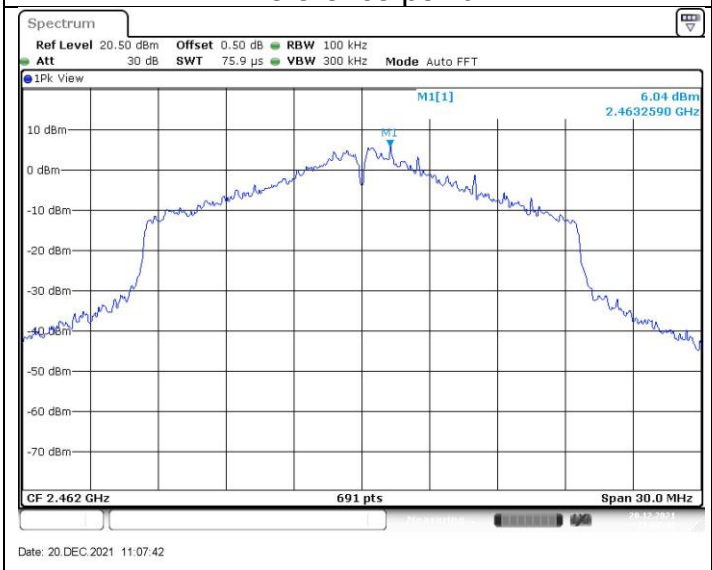
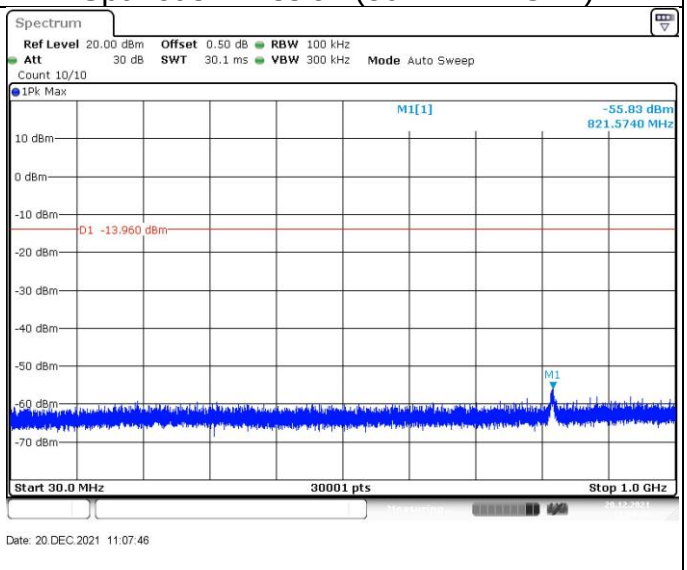
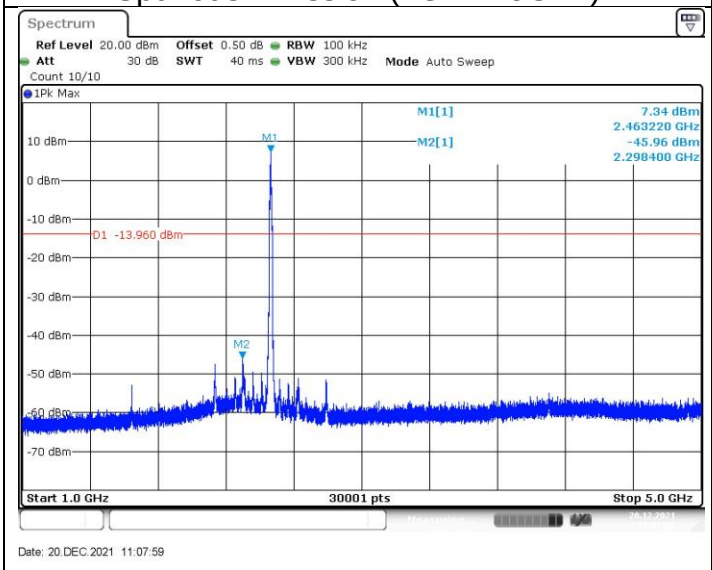
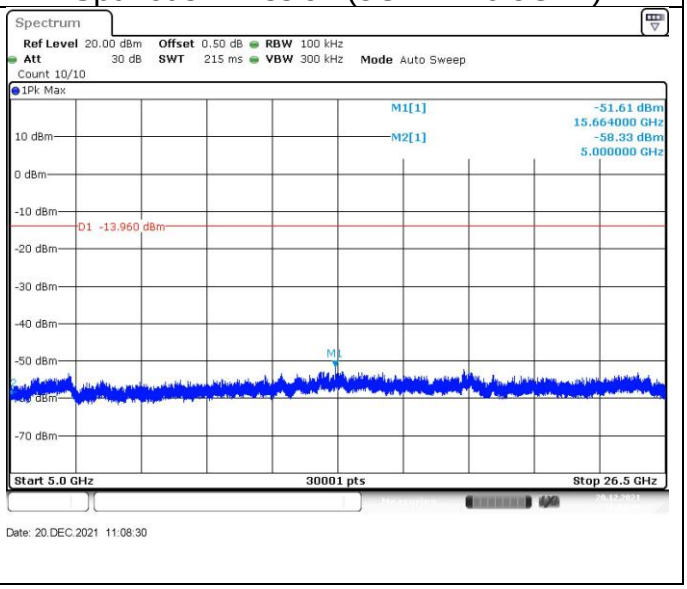
Out-of-Band Emissions	
Channel 9 (2462MHz)	
Reference point	Spurious Emission (30MHz – 1GHz)
	
Spurious Emission (1GHz –5GHz)	Spurious Emission (5GHz –26.5GHz)
	

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9.6 Band edge

Test Method

1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold.
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section.

Limit

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen8.10, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.

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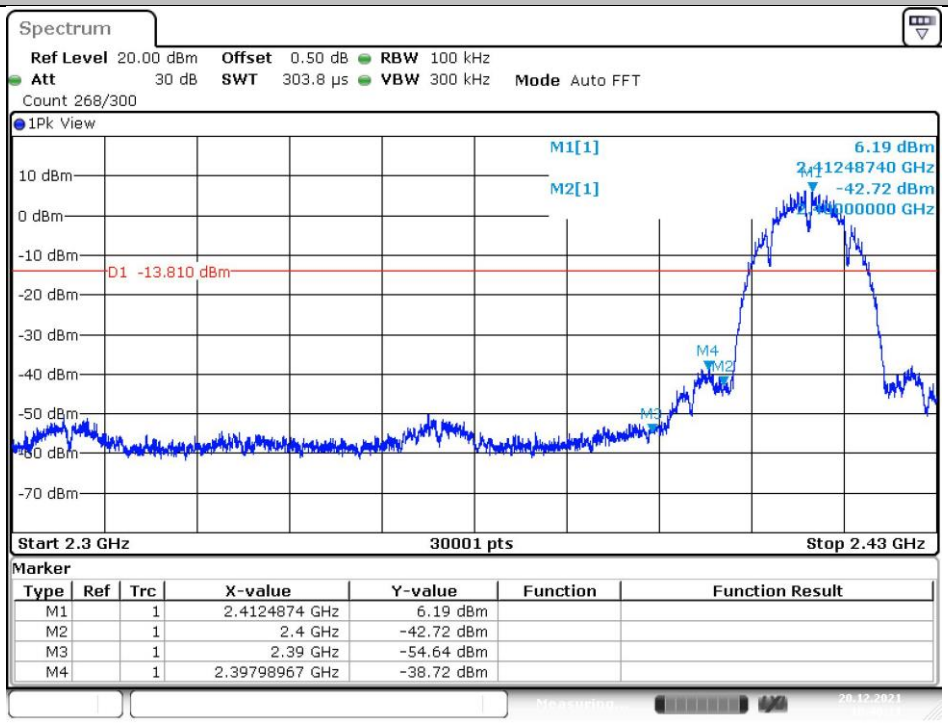
Test result

802.11b

2412



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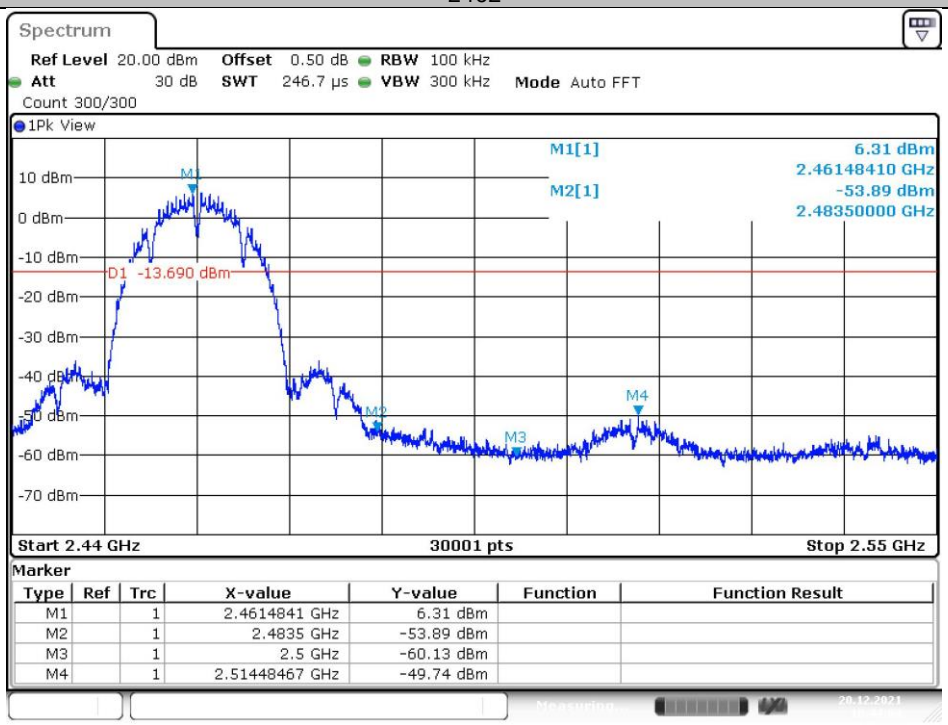
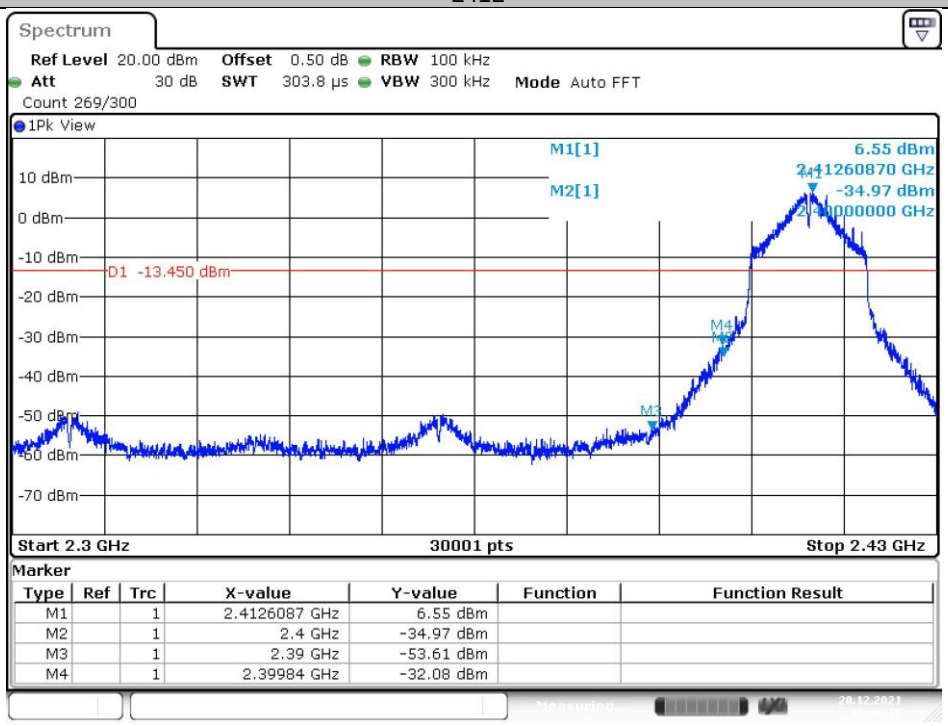
2462



Date: 20.DEC.2021 10:44:04

802.11g

2412

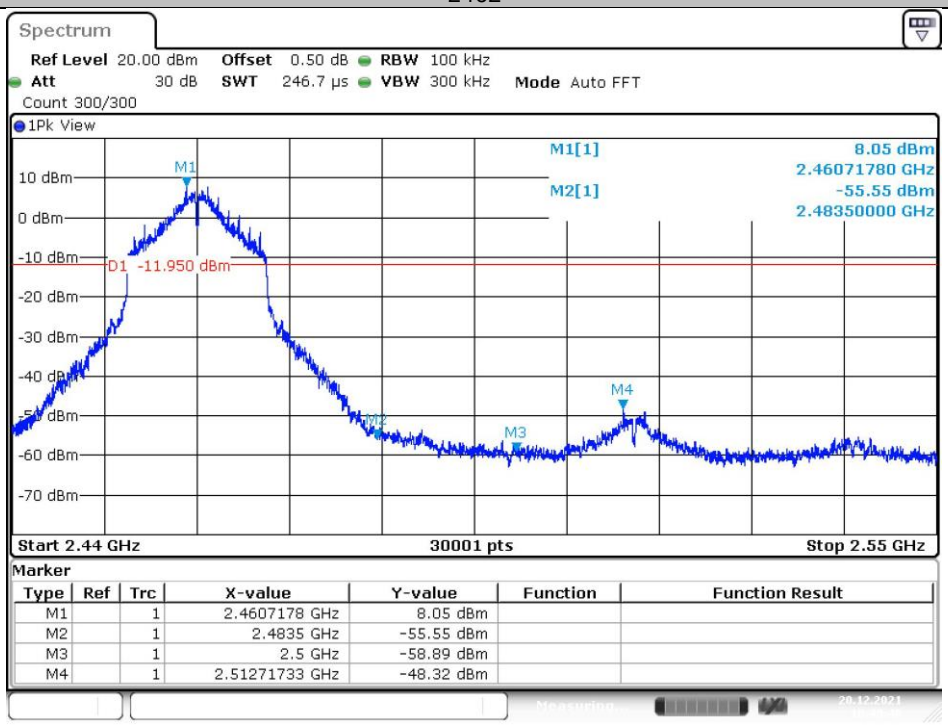


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4126087 GHz	6.55 dBm		
M2		1	2.4 GHz	-34.97 dBm		
M3		1	2.39 GHz	-53.61 dBm		
M4		1	2.39984 GHz	-32.08 dBm		

Date: 20.DEC.2021 10:46:18

2462



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4607178 GHz	8.05 dBm		
M2		1	2.4835 GHz	-55.55 dBm		
M3		1	2.5 GHz	-58.89 dBm		
M4		1	2.51271733 GHz	-48.32 dBm		

Date: 20.DEC.2021 10:49:48

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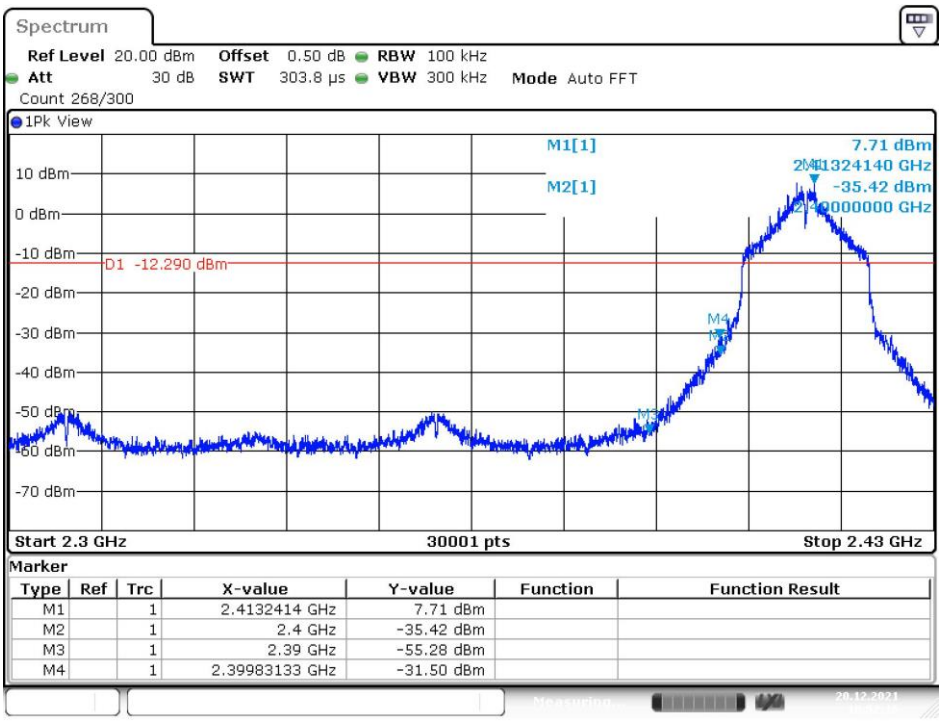
802.11n(HT20)

2412



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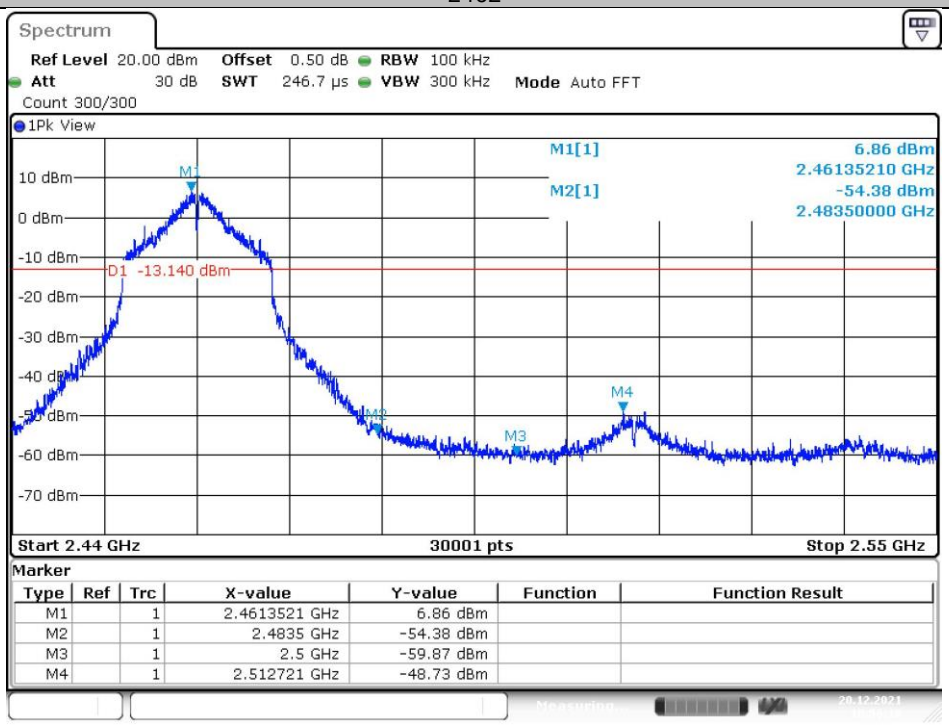
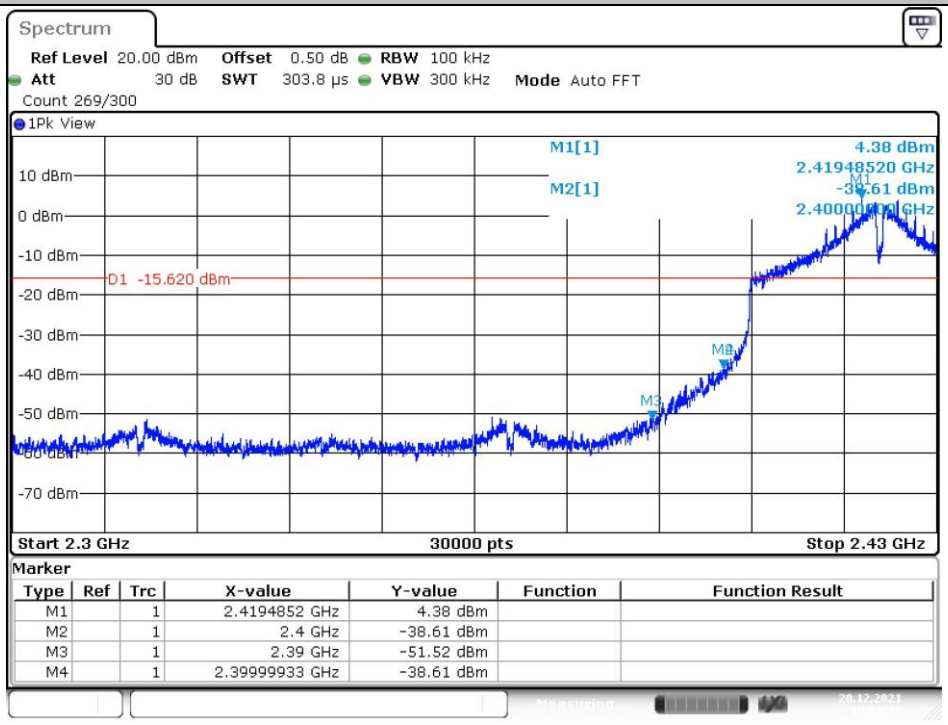
2462



Date: 20.DEC.2021 10:56:18

802.11n(HT40)

2422



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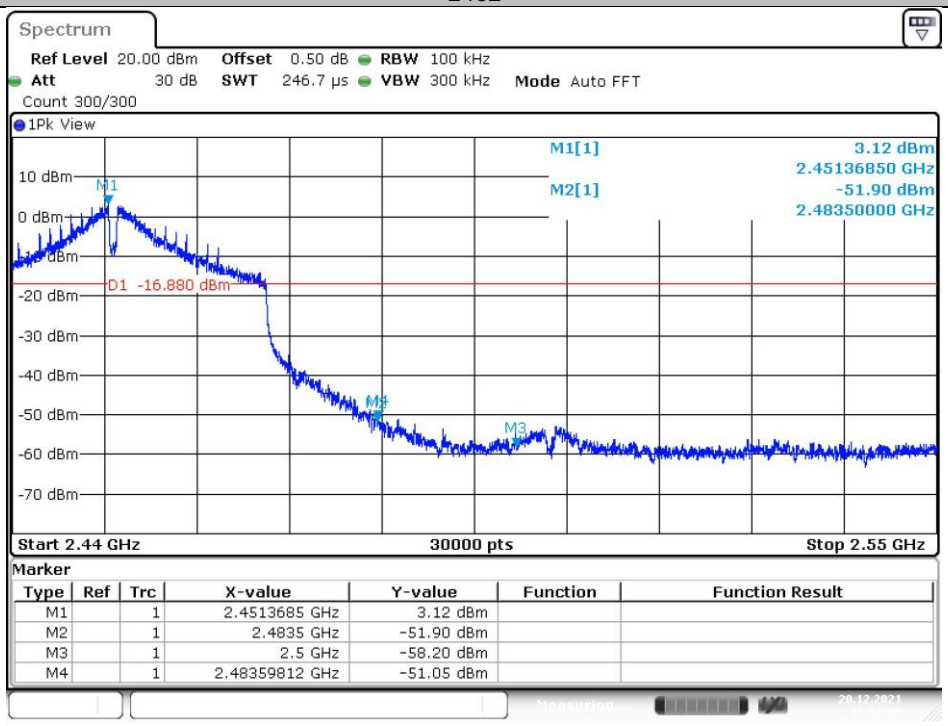
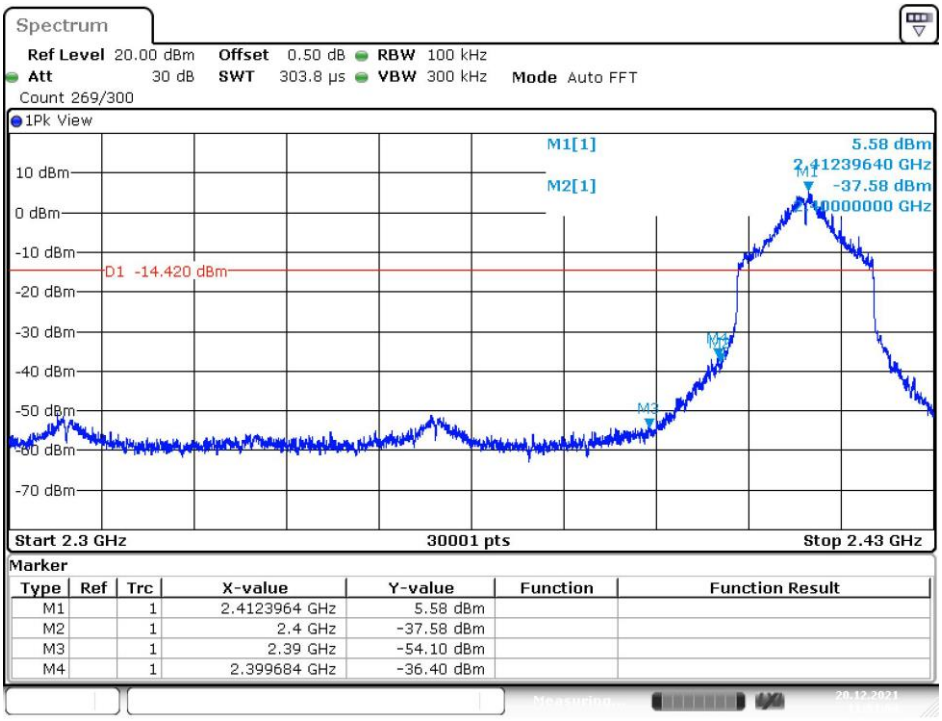


Date: 20.DEC.2021 11:01:56

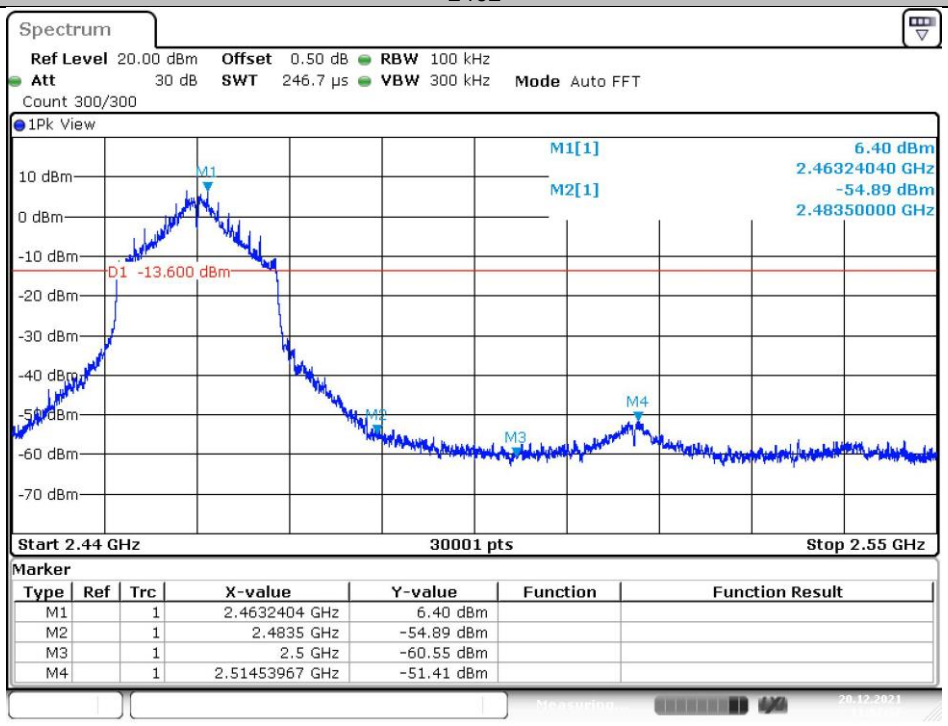
802.11ax(HE20)

2412



Date: 20.DEC.2021 11:03:54

2462



Date: 20.DEC.2021 11:07:37

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9.7 Spurious radiated emissions for transmitter

Test Method

1. The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. Use the following spectrum analyzer settings According to C63.10:

For Below 1GHz

Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 kHz to 120 kHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

a) RBW = 1MHz.
b) VBW ≥ [3 × RBW].
c) Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
e) Sweep time = auto.
f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the

emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section15.205 and RSS-GEN 8.10 must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Measured Distance Meters
0.009~0.490	2400/F (kHz)	300
0.490~1.705	24000/F (kHz)	30
1.705~30	30	30

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

Pre-scan with three orthogonal axis and worst case as X axis listed below table

Test mode:802.11B (2412MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2249.50	46.69	74.00	27.31	PK	Hoirznotal
2378.87	49.29	74.00	24.71	PK	Hoirznotal
4825.56	41.91	74.00	32.09	PK	Hoirznotal
2366.49	49.57	74.00	24.43	PK	Vertical
4823.86	41.72	74.00	32.28	PK	Vertical

Test mode:802.11B (2437MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
4874.96	41.57	74.00	32.43	PK	Hoirznotal
4873.73	41.56	74.00	32.44	PK	Vertical

Test mode:802.11B (2462MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2483.60	46.49	74.00	27.51	PK	Hoirznotal
4923.60	41.44	74.00	32.56	PK	Hoirznotal
2496.69	47.57	74.00	26.43	PK	Vertical
4923.03	42.11	74.00	31.89	PK	Vertical

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Test mode:802.11g (2412MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2250.06	49.84	74.00	24.16	PK	Hoirznotal
2389.37	53.81	74.00	20.19	PK	Hoirznotal
2389.37	39.70	54.00	14.30	AV	Hoirznotal
4823.86	41.62	74.00	32.38	PK	Hoirznotal
2250.06	48.94	74.00	25.06	PK	Vertical
2389.95	51.60	74.00	22.40	PK	Vertical
4823.00	43.58	74.00	30.42	PK	Vertical

Test mode:802.11g (2437MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2275.00	50.62	74.00	23.38	PK	Hoirznotal
4875.43	42.62	74.00	31.38	PK	Hoirznotal
2275.56	48.96	74.00	25.04	PK	Vertical
4872.60	44.93	74.00	29.07	PK	Vertical

Test mode:802.11g (2462MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2483.75	53.85	74.00	20.15	PK	Hoirznotal
2483.75	43.10	54.00	10.90	AV	Hoirznotal
4924.16	44.04	74.00	29.96	PK	Hoirznotal
2132.20	47.84	74.00	26.16	PK	Vertical
2483.54	54.42	74.00	19.58	PK	Vertical
2483.54	40.40	54.00	13.60	AV	Vertical
4922.46	46.74	74.00	27.26	PK	Vertical

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Test mode:802.11n20 (2412MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2251.76	50.00	74.00	24.00	PK	Hoirznotal
2388.02	54.24	74.00	19.76	PK	Hoirznotal
2388.02	38.90	54.00	15.10	AV	Hoirznotal
4824.43	41.94	74.00	32.06	PK	Hoirznotal
2251.76	48.61	74.00	25.39	PK	Vertical
2386.42	53.19	74.00	20.81	PK	Vertical
2386.42	41.01	54.00	12.99	AV	Vertical
4826.13	42.77	74.00	31.23	PK	Vertical

Test mode:802.11n20 (2437MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2112.23	48.75	74.00	25.25	PK	Hoirznotal
4874.30	43.86	74.00	30.14	PK	Hoirznotal
2273.86	48.33	74.00	25.67	PK	Vertical
4872.60	44.70	74.00	29.30	PK	Vertical

Test mode:802.11n20 (2462MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2134.46	51.11	74.00	22.89	PK	Hoirznotal
2484.78	51.50	74.00	22.50	PK	Hoirznotal
4923.60	45.29	74.00	28.71	PK	Hoirznotal
2133.90	48.34	74.00	25.66	PK	Vertical
2483.66	55.27	74.00	18.73	PK	Vertical
2483.66	42.00	54.00	12.00	AV	Vertical
4926.43	46.95	74.00	27.05	PK	Vertical

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Test mode:802.11 ax20 (2412MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2088.00	48.30	74.00	25.70	PK	Hoirznotal
2387.68	58.84	74.00	15.16	PK	Hoirznotal
2387.68	46.40	54.00	7.60	AV	Hoirznotal
4823.86	42.07	74.00	31.93	PK	Hoirznotal
2246.10	48.72	74.00	25.28	PK	Vertical
2387.05	54.40	74.00	19.60	PK	Vertical
2387.05	42.90	54.00	11.10	AV	Vertical
4823.30	42.43	74.00	31.57	PK	Vertical

Test mode:802.11ax20 (2437MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2116.90	49.43	74.00	24.57	PK	Hoirznotal
4874.30	43.36	74.00	30.64	PK	Hoirznotal
2275.00	49.77	74.00	24.23	PK	Vertical
4872.03	43.32	74.00	30.68	PK	Vertical

Test mode:802.11ax20 (2462MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2135.03	50.79	74.00	23.21	PK	Hoirznotal
2483.68	60.57	74.00	13.43	PK	Hoirznotal
2483.68	48.10	54.00	5.90	AV	Hoirznotal
4922.46	42.93	74.00	31.07	PK	Hoirznotal
2135.03	48.83	74.00	25.17	PK	Vertical
2483.55	60.87	74.00	13.13	PK	Vertical
2483.55	48.30	54.00	5.70	AV	Vertical
4924.16	45.12	74.00	28.88	PK	Vertical

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Test mode:802.11n40 (2422MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2097.63	46.19	74.00	27.81	PK	Hoirznotal
2388.41	49.79	74.00	24.21	PK	Hoirznotal
4845.96	42.24	74.00	31.76	PK	Hoirznotal
2387.99	48.15	74.00	25.85	PK	Vertical
4843.70	42.85	74.00	31.15	PK	Vertical

Test mode:802.11n40 (2437MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2112.93	46.91	74.00	27.09	PK	Hoirznotal
4874.30	42.19	74.00	31.81	PK	Hoirznotal
2112.93	44.26	74.00	29.74	PK	Vertical
4874.30	42.96	74.00	31.04	PK	Vertical

Test mode:802.11n40 (2452MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2123.70	46.88	74.00	27.12	PK	Hoirznotal
2483.38	50.45	74.00	23.55	PK	Hoirznotal
4913.96	43.75	74.00	30.25	PK	Hoirznotal
2123.70	47.63	74.00	26.37	PK	Vertical
2483.80	50.75	74.00	23.25	PK	Vertical
4912.26	42.79	74.00	31.21	PK	Vertical

Remark:

(1) Emission level= Original Receiver Reading + Correct Factor
(2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
(3) Margin = limit – Corrected Reading

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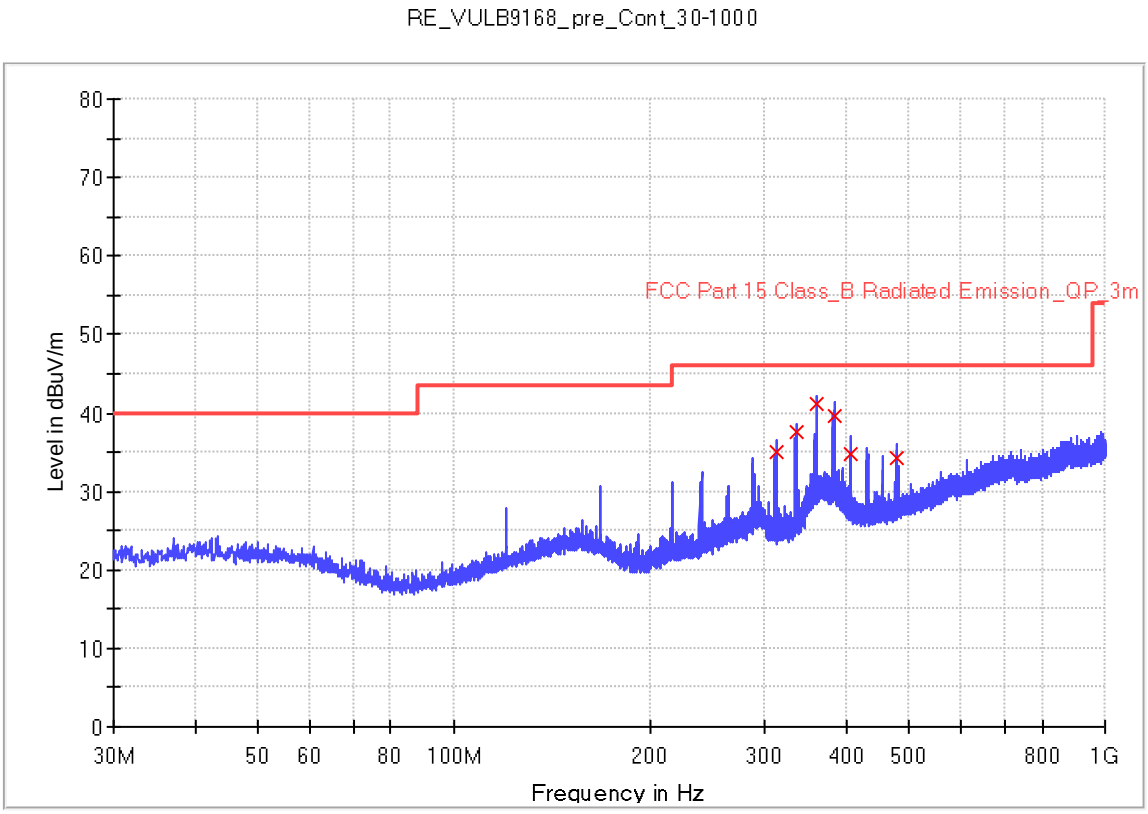
The worst case of Radiated Emission below 1GHz:

Site: 3-meter chamber	Time: 2021/12/17 - 16:58
Limit: FCC_Part15.109_RE(3m) ClassB	Engineer: Cheng Huali
Probe: VULB9168	Polarity: Horizontal
EUT: Wi-Fi and Bluetooth module, Model no: AXYU	Power: DC 3.3V by debug board for EUT,
Note: Transmit by 802.11n20 at channel 2412MHz. Note: Pre-scan with three orthogonal axis and worst case as X axis.	



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
311.960000	35.0	1000.0	120.000	100.0	H	0.0	15.3	11.0	46.0
335.920000	37.7	1000.0	120.000	100.0	H	170.0	16.0	8.4	46.0
360.040000	41.2	1000.0	120.000	100.0	H	78.0	16.5	4.8	46.0
384.040000	39.5	1000.0	120.000	100.0	H	106.0	17.0	6.5	46.0
408.000000	34.7	1000.0	120.000	100.0	H	210.0	17.5	11.3	46.0
480.000000	34.2	1000.0	120.000	100.0	H	270.0	19.1	11.8	46.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

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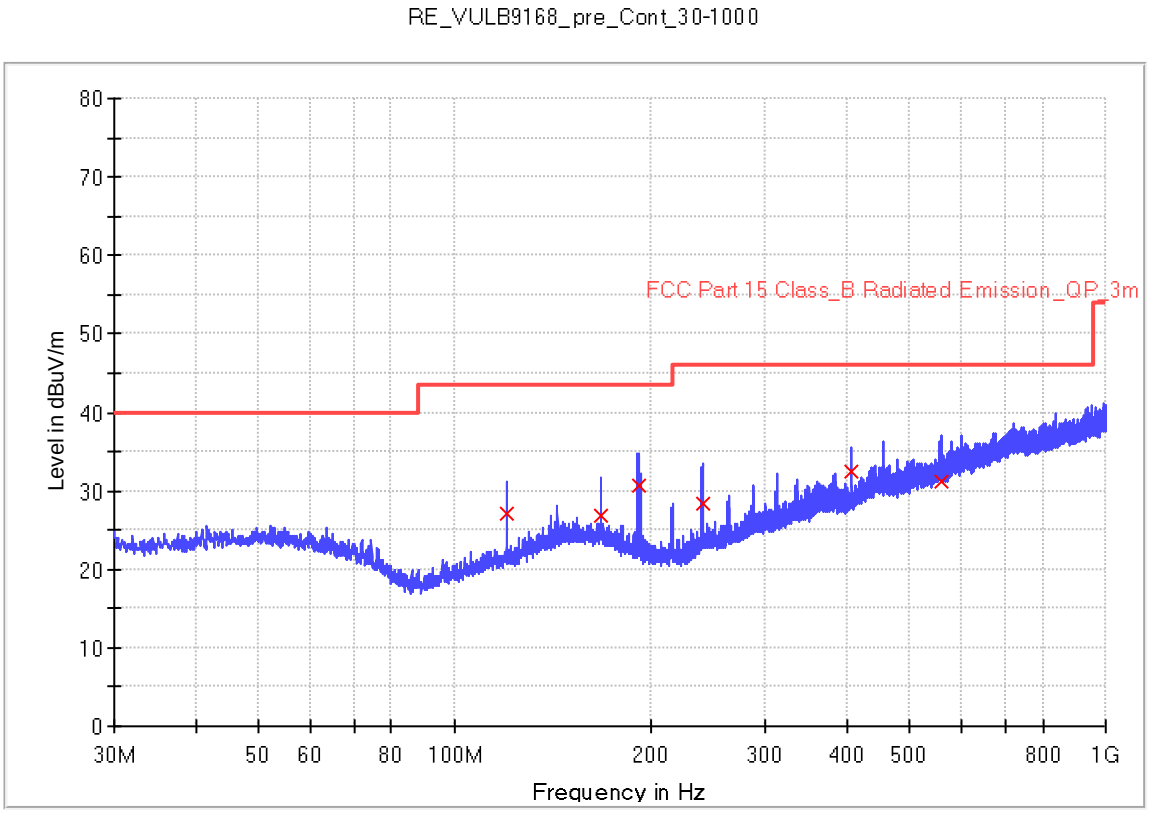
Site: 3-meter chamber	Time: 2021/12/17 - 16:24
Limit: FCC_Part15.109_RE(3m) ClassB	Engineer: Cheng Huali
Probe: VULB9168	Polarity: Horizontal
EUT: Wi-Fi and Bluetooth module, Model no: AXYU	Power: DC 3.3V by debug board for EUT,
Note: Transmit by 802.11n20 at channel 2412MHz. Note: Pre-scan with three orthogonal axis and worst case as X axis.	



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
120.000000	27.0	1000.0	120.000	100.0	V	1.0	18.1	16.5	43.5
168.000000	26.9	1000.0	120.000	100.0	V	1.0	20.4	16.6	43.5
191.600000	30.7	1000.0	120.000	100.0	V	1.0	18.4	12.8	43.5
239.960000	28.4	1000.0	120.000	100.0	V	1.0	19.6	17.6	46.0
407.960000	32.4	1000.0	120.000	100.0	V	1.0	24.2	13.6	46.0
557.520000	31.3	1000.0	120.000	100.0	V	1.0	27.6	14.8	46.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

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10 Test Equipment List

List of Test Instruments
Test Site1

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
C	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2021-8-2	2022-8-1
	Wideband power sensor	Rohde & Schwarz	NRP-Z81	105903	2021-03-19	2022-3-18
RE	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2021-8-2	2022-8-1
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2021-8-2	2022-8-1
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	961	2019-3-16	2022-3-15
	Double-ridged waveguide horn antenna	Rohde & Schwarz	HF907	102868	2021-3-15	2024-3-14
	Pre-amplifier	Rohde & Schwarz	SCU-18D	19006451	2021-8-2	2022-8-1
	Loop antenna	Rohde & Schwarz	HFH2-Z2E	100933	2021-5-21	2022-5-20
	DOUBLE-RIDGED WAVEGUIDE HORN WITH PRE-AMPLIFIER (18 GHZ - 40 GHZ)	ETS-Lindgren	3116C-PA	002222727	2020-9-23	2023-9-22
	3m Semi-anechoic chamber	TDK	9X6X6	----	2021-5-8	2024-5-7
CE	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2021-8-2	2022-8-1
	LISN	Rohde & Schwarz	ENV216	101924	2021-8-2	2022-8-1

RE	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2023-8-1	2024-7-31
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2023-8-1	2024-7-31
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	961	2021-9-23	2024-9-22
	Horn Antenna	Rohde & Schwarz	HF907	102393	2021-3-15	2024-3-14
	Pre-amplifier	Rohde & Schwarz	SCU-18D	19006451	2023-8-1	2024-7-31
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2023-6-15	2024-6-14
	DOUBLE-RIDGED WAVEGUIDE HORN WITH PRE-AMPLIFIER (18 GHZ - 40 GHZ)	ETS-Lindgren	3116C-PA	002222727	2020-9-23	2023-9-22
	3m Semi-anechoic chamber	TDK	9X6X6	----	2021-5-8	2024-5-7
CE	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2023-8-1	2024-7-31
	LISN	Rohde & Schwarz	ENV216	101924	2023-8-1	2024-7-31

Measurement Software Information			
Test Item	Software	Manufacturer	Version
C	Bluetooth and WiFi Test System	Shenzhen JS tonscend co.,ltd	2.6.77.0518
RE	EMC 32	Rohde & Schwarz	V9.15.00
CE	EMC 32	Rohde & Schwarz	V9.15.03

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density*
- Spurious RF conducted emissions
- Band edge

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Items	Extended Uncertainty
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, 3.16dB
Radiated Disturbance	9kHz to 30MHz, 3.52dB 30MHz to 1GHz, 5.03dB (Horizontal) 5.12dB (Vertical) 1GHz to 18GHz, 5.49dB 18GHz to 40GHz, 5.63dB
RF Conducted Measurement	Power related： 1.16dB Frequency related： 6.00×10^{-8}

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.

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12 Photographs of Test Set-ups

Refer to the < Test Setup photos >.

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13 Photographs of EUT

Refer to the < External Photos > & < Internal Photos >.

----------End of Test Report----------

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