



Test Report for Hayward Industries, Inc. Report No. EX0020-1 Issue 4

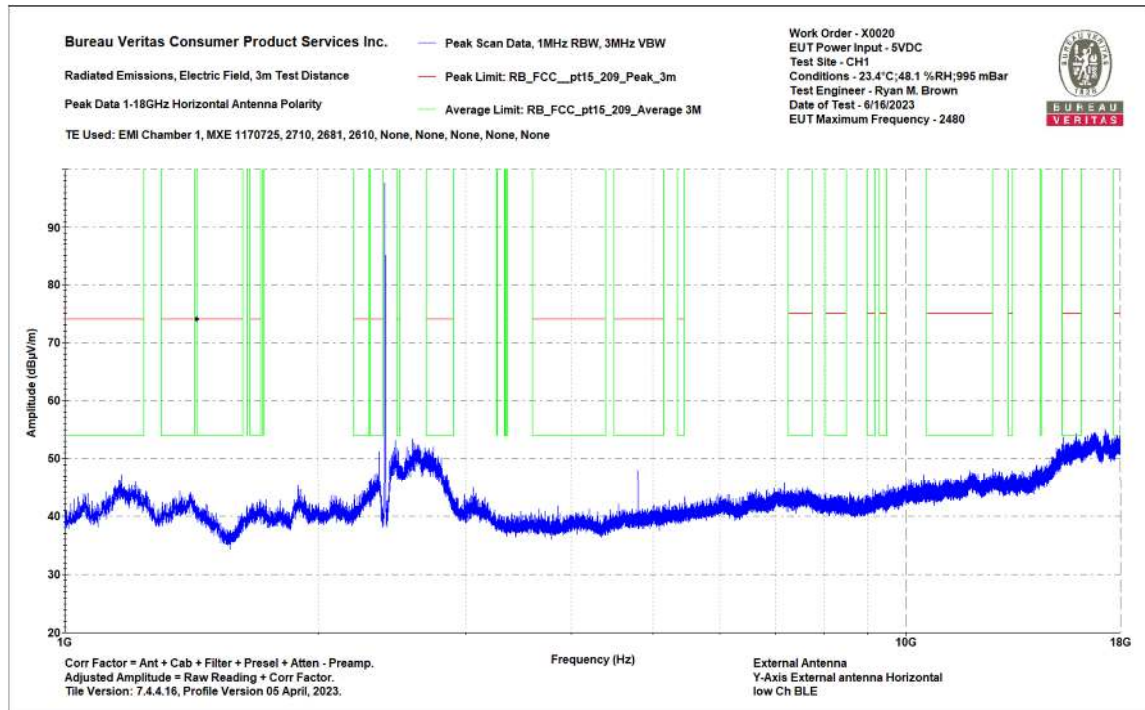


Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
1-18GHz Horizontal Data
Notes:
External Antenna
Y-Axis External antenna Horizontal
low Ch BLE

Work Order - X0020
EUT Power Input - 5VDC
Test Site - CH1
Conditions - 23.4°C;48.1 %RH;995 mBar
Test Engineer - Ryan M. Brown
Date of Test - 6/16/2023

Frequency (MHz)	Raw Peak (dBµV)	Raw RMS Average (dBµV)	Correction Factor (dB/m)	Adjusted Peak (dBµV/m)	Adjusted RMS Average (dBµV/m)	Peak Limit FCC 15.209 (dBµV/m)	Peak Margin (dB)	Peak Result (Pass/Fail)	Peak Worst Margin (dB)	Average Limit FCC 15.209 (dBµV/m)	Average Margin (dB)	Average Result (Pass/Fail)	Average Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1170	44.05	44.05	0.5	44.55	44.55	74	-29.45	PASS	-	54	-9.45	PASS	-	175	281
2365	37.6	37.6	7	44.6	44.6	74	-29.4	PASS	-	54	-9.4	PASS	-	199	46
4804.4	36.99	36.99	9.9	46.89	46.89	74	-27.11	PASS	-	54	-7.11	PASS	-7.11	168	120
15983	29.81	20.22	21.4	51.21	41.62	74	-22.79	PASS	-	54	-12.38	PASS	-	169	94
17854.9	30.22	19.89	22.5	52.72	42.39	74	-21.28	PASS	-21.28	54	-11.61	PASS	-	150	41

1-18GHz Horizontal Data Table



1-18GHz Horizontal Plot



Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4

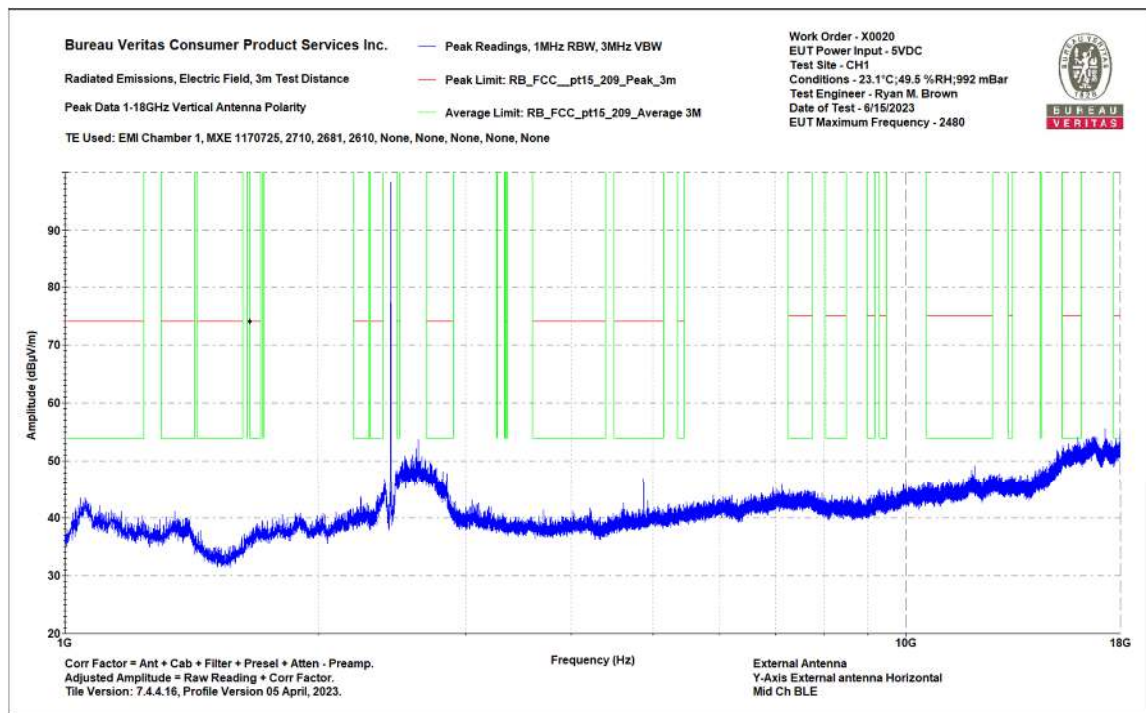


Results for BLE 1Mbps GFSK Channel 19

Bureau Veritas Consumer Product Services Inc.		Work Order - X0020	
Radiated Emissions Electric Field 3m Distance		EUT Power Input - 5VDC	
1-18GHz Vertical Data		Test Site - CH1	
Notes:		Conditions - 23.1°C; 49.5 %RH; 992 mBar	
External Antenna		Test Engineer - Ryan M. Brown	
Y-Axis External antenna Horizontal		Date of Test - 6/15/2023	
Mid Ch BLE			

Frequency (MHz)	Raw Peak (dBuV)	Raw RMS Average (dBuV)	Correction Factor (dB/m)	Adjusted Peak (dBuV/m)	Adjusted RMS Average (dBuV/m)	Peak Limit FCC 15.209 (dBuV/m)	Peak Margin (dB)	Peak Result (Pass/Fail)	Peak Worst Margin (dB)	Average Limit FCC 15.209 (dBuV/m)	Average Margin (dB)	Average Result (Pass/Fail)	Average Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
4880.5	36.96	36.2	10	46.96	46.2	74	-27.04	PASS	--	54	-7.8	PASS	--	200	268
9163.8	27.73	26.8	13.3	41.03	40.1	74	-32.97	PASS	--	54	-13.9	PASS	--	200	326
16039.8	29.95	19.96	21.4	51.35	41.36	74	-22.65	PASS	-22.65	54	-12.64	PASS	--	154	343
17988.4	28.69	24.4	22.6	51.29	47	74	-22.71	PASS	--	54	-7	PASS	-7	172	126

1-18GHz Vertical Data Table



1-18GHz Vertical Plot



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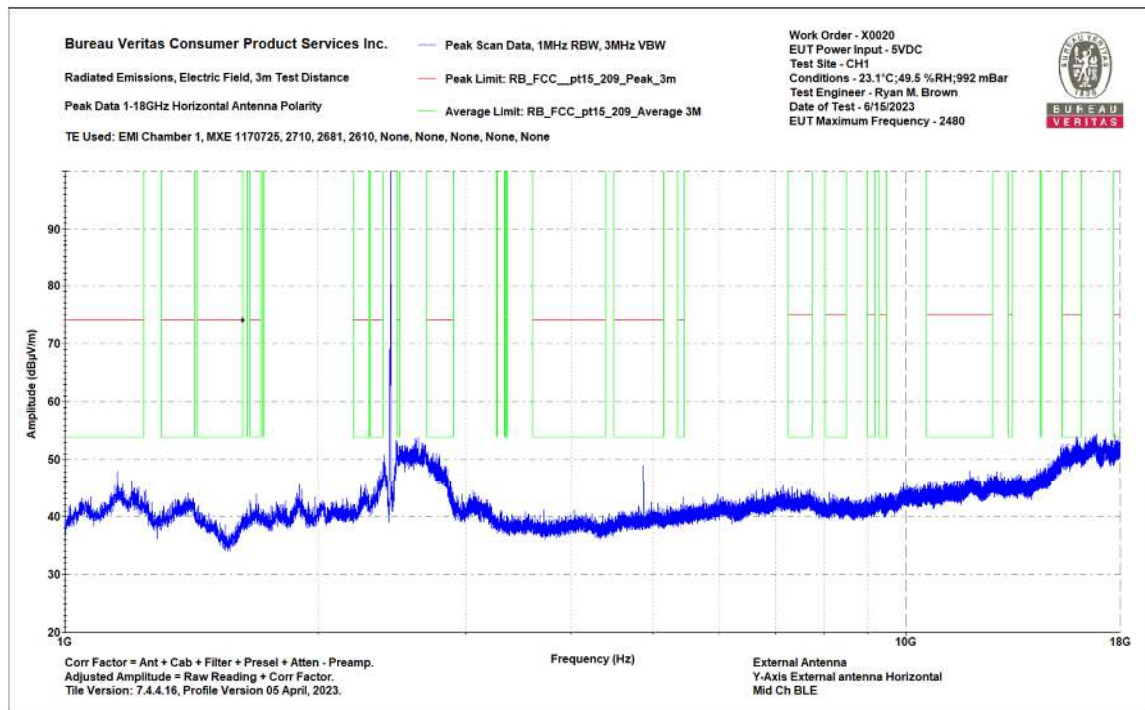


Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
1-18GHz Horizontal Data
Notes:
External Antenna
Y-Axis External antenna Horizontal
Mid Ch BLE

Work Order - X0020
EUT Power Input - 5VDC
Test Site - CH1
Conditions - 23.1°C;49.5 %RH;992 mBar
Test Engineer - Ryan M. Brown
Date of Test - 6/15/2023

Frequency (MHz)	Raw Peak (dBµV)	Raw RMS Average (dBµV)	Correction Factor (dB/m)	Adjusted Peak (dBµV/m)	Adjusted RMS Average (dBµV/m)	Peak Limit FCC 15.209 (dBµV/m)	Peak Margin (dB)	Peak Result (Pass/Fail)	Peak Worst Margin (dB)	Average Limit FCC 15.209 (dBµV/m)	Average Margin (dB)	Average Result (Pass/Fail)	Average Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1155.9	44.01	44.01	0.4	44.41	44.41	74	-29.59	PASS	--	54	-9.59	PASS	--	147	298
2275.7	37.67	37.67	6.6	44.27	44.27	74	-29.73	PASS	--	54	-9.73	PASS	--	200	49
4880.5	38.29	35.49	10	48.29	45.49	74	-25.71	PASS	--	54	-8.51	PASS	-8.51	118	316
17745.7	30.83	19.1	22.2	53.03	41.3	74	-20.97	PASS	--	54	-12.7	PASS	--	112	330
17997.7	29.41	20.36	22.6	52.01	42.96	74	-21.99	PASS	--	54	-11.04	PASS	--	100	107

1-18GHz Horizontal Data Table



1-18GHz Horizontal Plot



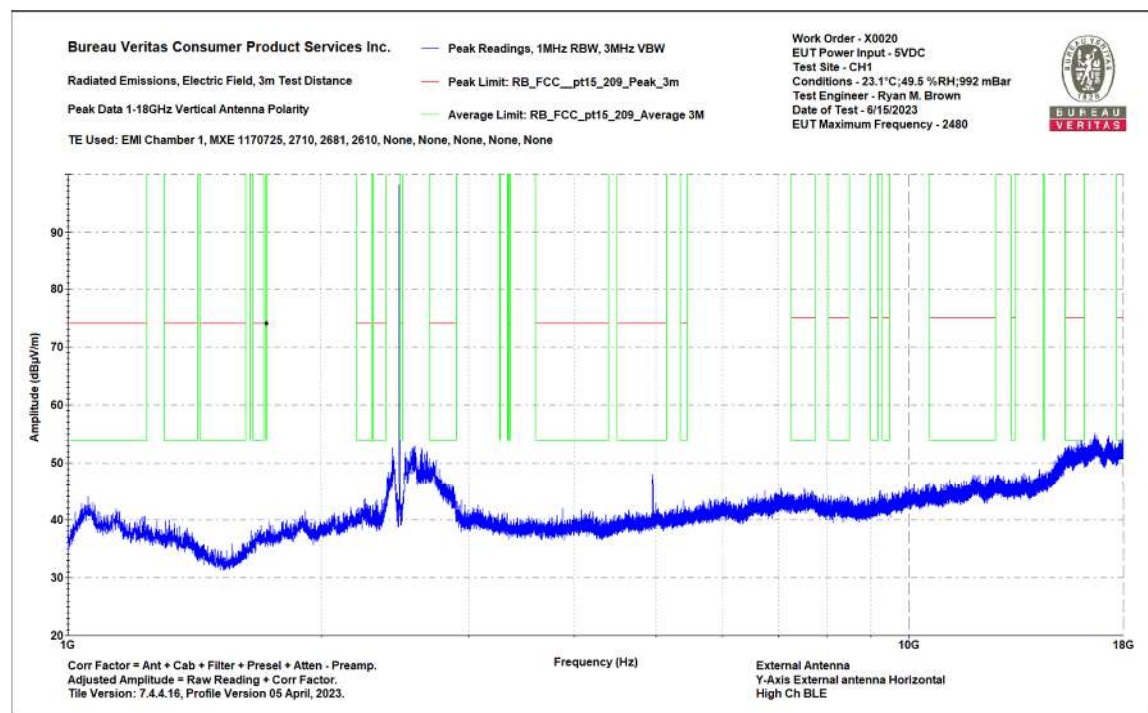
Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4



Results for BLE 1Mbps GFSK Channel 39

Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 3m Distance 1-18GHz Vertical Data Notes: External Antenna Y-Axis External antenna Horizontal High Ch BLE						Work Order - X0020 EUT Power Input - 5VDC Test Site - CH1 Conditions - 23.1°C;49.5 %RH;992 mBar Test Engineer - Ryan M. Brown Date of Test - 6/15/2023									
Frequency (MHz)	Raw Peak (dBµV)	Raw RMS Average (dBµV)	Correction Factor (dB/m)	Adjusted Peak (dBµV/m)	Adjusted RMS Average (dBµV/m)	Peak Limit FCC 15.209 (dBµV/m)	Peak Margin (dB)	Peak Result (Pass/Fail)	Peak Worst Margin (dB)	Average Limit FCC 15.209 (dBµV/m)	Average Margin (dB)	Average Result (Pass/Fail)	Average Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1053.8	43.3	43.3	-0.9	42.4	42.4	74	-31.6	PASS	--	54	-11.6	PASS	--	116	94
4960.6	37.89	37.89	10.1	47.99	47.99	74	-26.01	PASS	--	54	-6.01	PASS	-6.01	182	207
17880.2	29.12	19	22.5	51.62	41.5	74	-22.38	PASS	--	54	-12.5	PASS	--	197	167
17961.2	30.24	19.1	22.5	52.74	41.6	74	-21.26	PASS	-21.26	54	-12.4	PASS	--	114	31
17999.6	29.76	19.1	22.6	52.36	41.7	74	-21.64	PASS	--	54	-12.3	PASS	--	191	58

1-18GHz Vertical Data Table



1-18GHz Vertical Plot



Test Report for Hayward Industries, Inc. Report No. EX0020-1 Issue 4

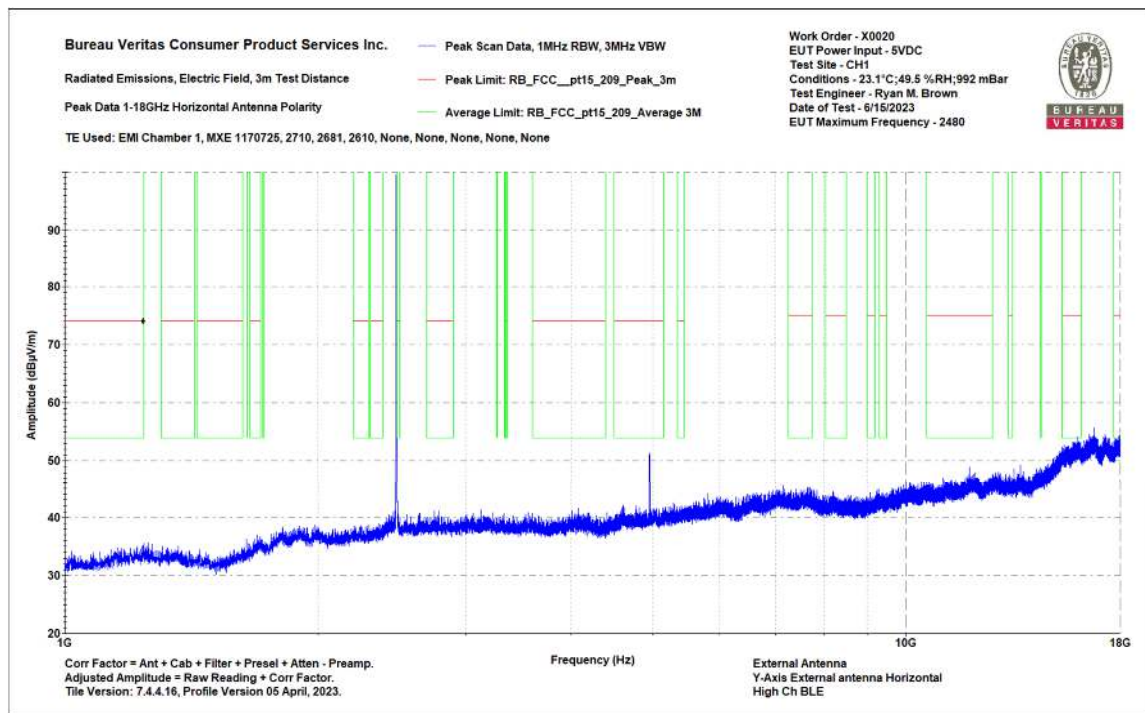


Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
1-18GHz Horizontal Data
Notes:
External Antenna
Y-Axis External antenna Horizontal
High Ch BLE

Work Order - X0020
EUT Power Input - 5VDC
Test Site - CH1
Conditions - 23.1°C;49.5 %RH;992 mBar
Test Engineer - Ryan M. Brown
Date of Test - 6/15/2023
EUT Maximum Frequency - 2480

Frequency (MHz)	Raw Peak (dBμV)	Raw RMS Average (dBμV)	Correction Factor (dB/m)	Adjusted Peak (dBμV/m)	Adjusted RMS Average (dBμV/m)	Peak Limit FCC 15.209 (dBμV/m)	Peak Margin (dB)	Peak Result (Pass/Fail)	Peak Worst Margin (dB)	Average Limit FCC 15.209 (dBμV/m)	Average Margin (dB)	Average Result (Pass/Fail)	Average Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
4076.4	29.08	29.08	8.9	37.98	37.98	74	-36.02	PASS	—	54	-16.02	PASS	—	112	23
4959.5	40.9	33.21	10.1	51	43.31	74	-23	PASS	—	54	-10.69	PASS	-10.69	125	109
9066.3	27.73	27.73	13.2	40.93	40.93	74	-33.07	PASS	—	54	-13.07	PASS	—	125	44
16030.5	32.84	20.1	21.4	54.24	41.5	74	-19.76	PASS	-19.76	54	-12.5	PASS	—	109	18
17932.3	30.01	19.74	22.5	52.51	42.24	74	-21.49	PASS	—	54	-11.76	PASS	—	122	181
17970.8	29.89	19.59	22.5	52.39	42.09	74	-21.61	PASS	—	54	-11.91	PASS	—	200	206

1-18GHz Horizontal Data Table



1-18GHz Horizontal Plot

Bureau Veritas Consumer Product
Services Inc.

One Distribution Center Circle, #1
Littleton, MA

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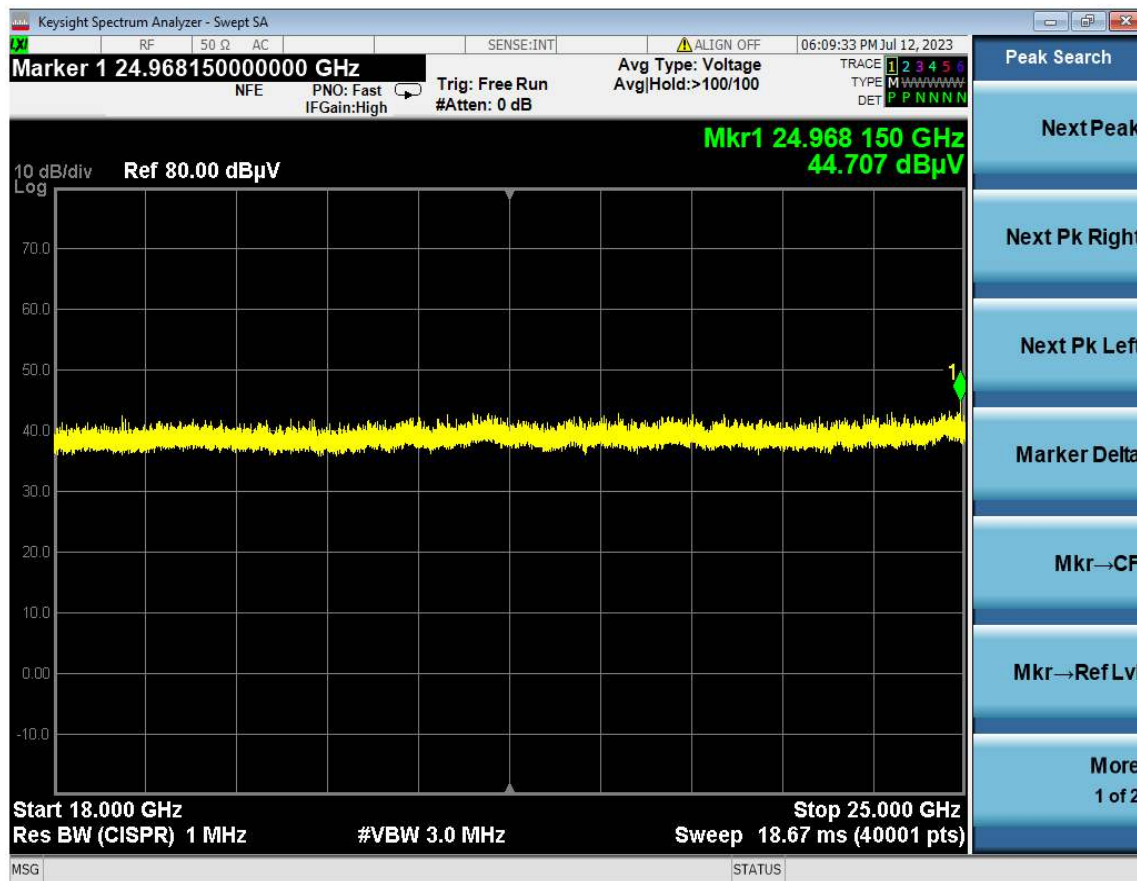
Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4



Radiated Emissions Table

Date: 12-Jul-23		Company: Hayward		Work Order: X0020									
Engineer: Yunus Faziloglu		EUT Desc: BT and 900 Wireless Module 2023		EUT Operating Voltage/Frequency: 3.3VDC									
Temp: 23.7C		Humidity: 55%		Pressure: 1003mbar									
Frequency Range: 18-25GHz				Measurement Distance: 1 m									
Notes: External antenna (Both positions: upright and 90deg bent) and 3 orthogonal planes of the module (X,Y,Z) No emissions detected. Peak measurement. Worst case noise floor recorded below. Measurement antenna H/V polarity showed no significant difference in noise floor.				EUT Max Freq: 2480MHz									
Antenna Polarization (H/V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Antenna & Preamp Factor (dB)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC 15.209 - Peak			FCC 15.209- Average		
								Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
Highest Noise Floor	24968.0	44.7	44.7	4.8	3.7	53.2	53.2	83.5	-30.3	Pass	63.5	-10.3	Pass
Table Result:				Pass by -10.3 dB		Worst Freq: 24968.0 MHz							
Test Site: EMI Chamber 1				Cable: Asset #2596									
Analyzer: 1274541				18-40GHz Horn with PreAmp: Asset #2709									
CSsoft Radiated Emissions Calculator v 1.017.225													
Adjusted Reading = Reading + Antenna & Preamp Factor + Cable Factor													
								Copyright Curtis-Straus LLC 200					

18-25GHz Data Table



18-25GHz Plot



Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4



Internal Antenna

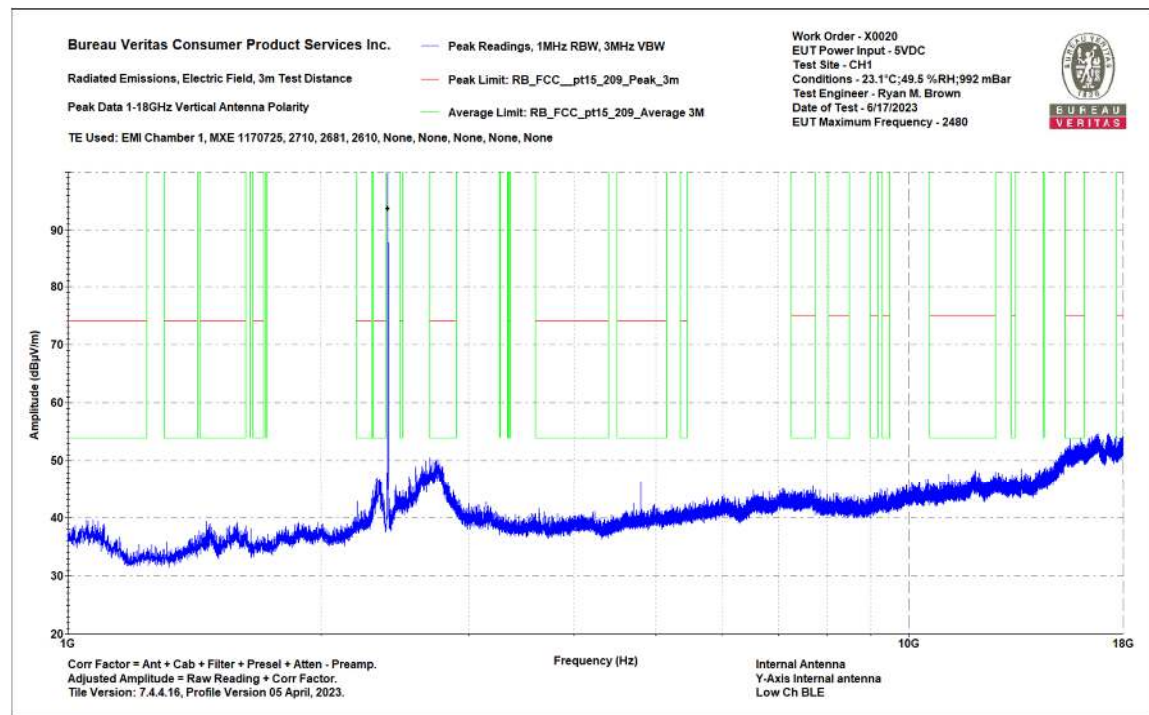
Results for BLE 1Mbps GFSK Channel 0

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
1-18GHz Vertical Data
Notes:
Internal Antenna
Y-Axis Internal antenna
Low Ch BLE

Work Order - X0020
EUT Power Input - 5VDC
Test Site - CH1
Conditions - 23.1°C;49.5 %RH;992 mBar
Test Engineer - Ryan M. Brown
Date of Test - 6/17/2023

Frequency (MHz)	Raw Peak (dBμV)	Raw RMS Average (dBμV)	Correction Factor (dB/m)	Adjusted Peak (dBμV/m)	Adjusted RMS Average (dBμV/m)	Peak Limit FCC 15.209 (dBμV/m)	Peak Margin (dB)	Peak Result (Pass/Fail)	Peak Worst Margin (dB)	Average Limit FCC 15.209 (dBμV/m)	Average Margin (dB)	Average Result (Pass/Fail)	Average Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
2694.2	39.7	39.7	7.7	47.4	47.4	74	-26.6	PASS	--	54	-6.6	PASS	-6.6	133	83
4804.7	36.1	36.1	9.9	46	46	74	-28	PASS	--	54	-8	PASS	--	200	234
9108.7	29.7	29.7	13.2	42.9	42.9	74	-31.1	PASS	--	54	-11.1	PASS	--	117	67
17960.2	29.35	20.5	22.5	51.85	43	74	-22.15	PASS	-22.15	54	-11	PASS	--	200	300
17988	29.18	19.87	22.6	51.78	42.47	74	-22.22	PASS	--	54	-11.53	PASS	--	153	153

1-18GHz Vertical Data Table



1-18GHz Vertical Plot

Bureau Veritas Consumer Product
Services Inc.

One Distribution Center Circle, #1
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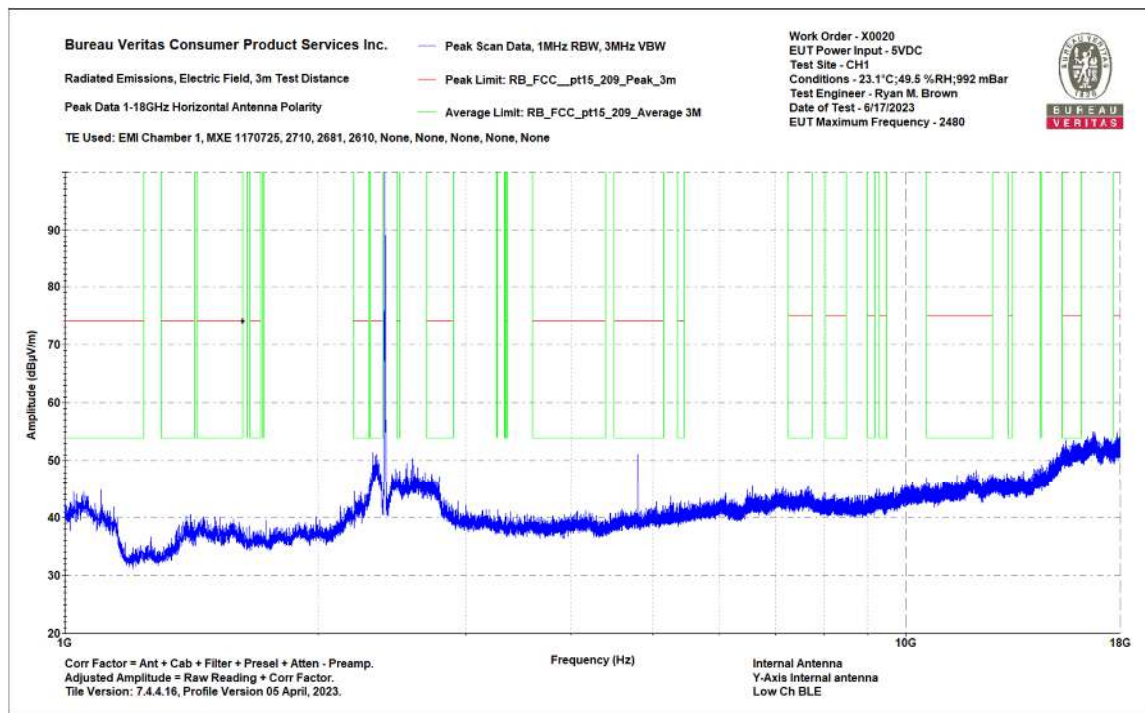


Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
1-18GHz Horizontal Data
Notes:
Internal Antenna
Y-Axis Internal antenna
Low Ch BLE

Work Order - X0020
EUT Power Input - 5VDC
Test Site - CH1
Conditions - 23.1°C;49.5 %RH;992 mBar
Test Engineer - Ryan M. Brown
Date of Test - 6/17/2023

Frequency (MHz)	Raw Peak (dBμV)	Raw RMS Average (dBμV)	Correction Factor (dB/m)	Adjusted Peak (dBμV/m)	Adjusted RMS Average (dBμV/m)	Peak Limit FCC 15.209 (dBμV/m)	Peak Margin (dB)	Peak Result (Pass/Fail)	Peak Worst Margin (dB)	Average Limit FCC 15.209 (dBμV/m)	Average Margin (dB)	Average Result (Pass/Fail)	Average Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1103.9	45.35	43.5	-0.6	44.75	42.9	74	-29.25	PASS	—	54	-11.1	PASS	—	147	224
4803.6	41.22	33.8	9.9	51.12	43.7	74	-22.88	PASS	—	54	-10.3	PASS	-10.3	150	210
17813.8	29.26	20.02	22.5	51.76	42.52	74	-22.24	PASS	—	54	-11.48	PASS	—	135	225
17859.6	29.18	19.84	22.5	51.68	42.34	74	-22.32	PASS	—	54	-11.66	PASS	—	101	58
17878.1	31.76	19.91	22.5	54.26	42.41	74	-19.74	PASS	-19.74	54	-11.59	PASS	—	175	84
17951.3	28.42	20.13	22.5	50.92	42.63	74	-23.08	PASS	—	54	-11.37	PASS	—	150	41

1-18GHz Horizontal Data Table



1-18GHz Horizontal Plot

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Test Report for Hayward Industries, Inc.
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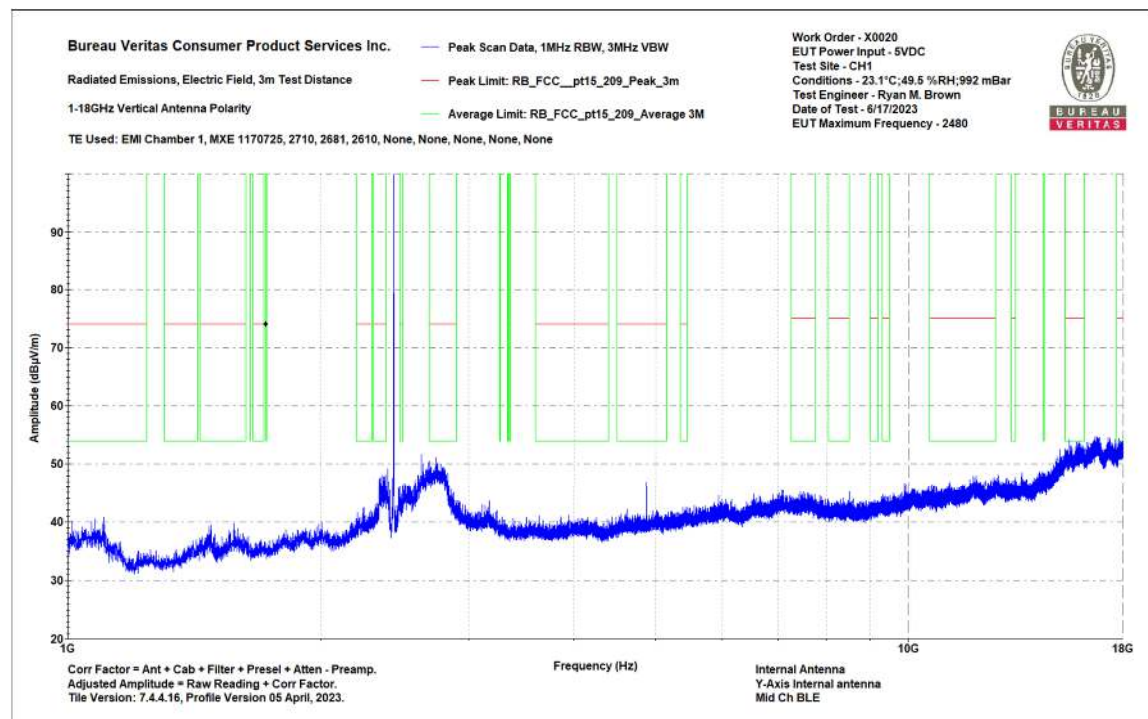


Results for BLE 1Mbps GFSK Channel 19

Bureau Veritas Consumer Product Services Inc.						Work Order - X0020					
Radiated Emissions Electric Field 3m Distance						EUT Power Input - 5VDC					
1-18GHz Vertical Data						Test Site - CH1					
Notes:						Conditions - 23.1°C; 49.5 %RH; 992 mBar					
Internal Antenna						Test Engineer - Ryan M. Brown					
Y-Axis Internal antenna						Date of Test - 6/17/2023					
Mid Ch BLE											

Frequency (MHz)	Raw Peak (dBμV)	Raw RMS Average (dBμV)	Correction Factor (dB/m)	Adjusted Peak (dBμV/m)	Adjusted RMS Average (dBμV/m)	Peak Limit FCC 15.209 (dBμV/m)	Peak Margin (dB)	Peak Result (Pass/Fail)	Peak Worst Margin (dB)	Average Limit FCC 15.209 (dBμV/m)	Average Margin (dB)	Average Result (Pass/Fail)	Average Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
2248.4	35.76	35.76	6.6	42.36	42.36	74	-31.64	PASS	--	54	-11.64	PASS	--	200	237
4880.6	34.94	34.94	10	44.94	44.94	74	-29.06	PASS	--	54	-9.06	PASS	-9.06	100	6
15544.5	29.44	20.04	21.2	50.64	41.24	74	-23.36	PASS	--	54	-12.76	PASS	--	200	31
16197.2	29.42	20.22	21	50.42	41.22	74	-23.58	PASS	--	54	-12.78	PASS	--	100	9
17805.3	31.85	20.15	22.5	54.35	42.65	74	-19.65	PASS	-19.65	54	-11.35	PASS	--	116	213

1-18GHz Vertical Data Table



1-18GHz Vertical Plot



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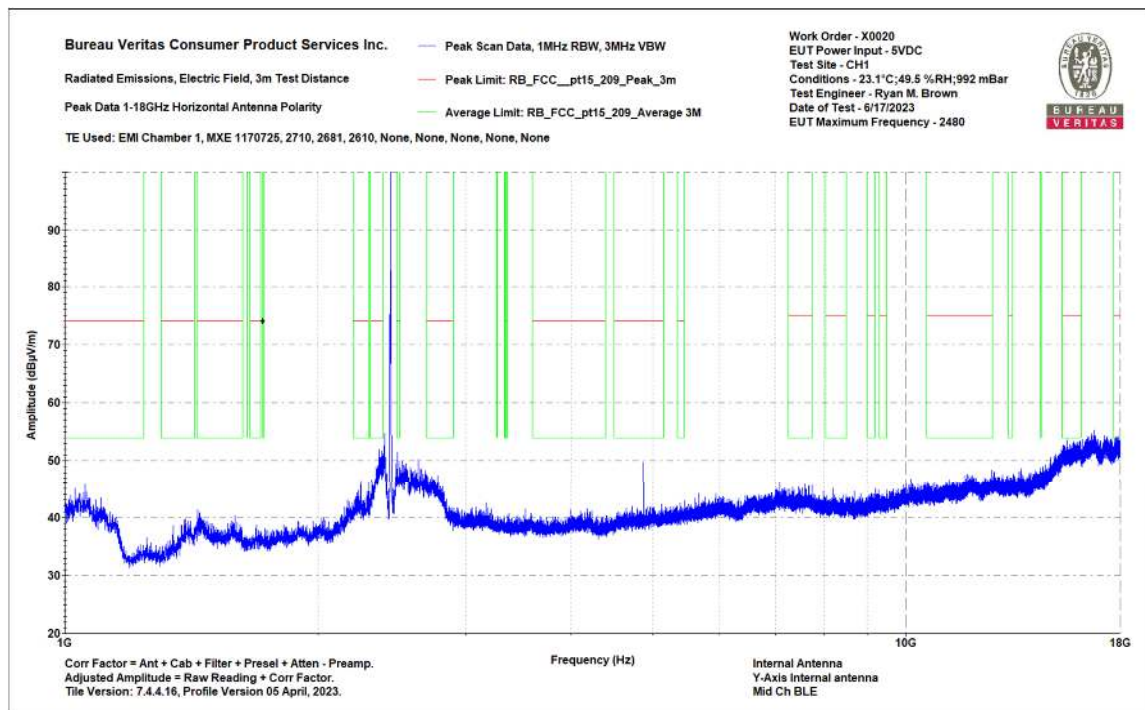


Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
1-18GHz Horizontal Data
Notes:
Internal Antenna
Y-Axis Internal antenna
Mid Ch BLE

Work Order - X0020
EUT Power Input - 5VDC
Test Site - CH1
Conditions - 23.1°C;49.5 %RH;992 mBar
Test Engineer - Ryan M. Brown
Date of Test - 6/17/2023

Frequency (MHz)	Raw Peak (dBμV)	Raw RMS Average (dBμV)	Correction Factor (dB/m)	Adjusted Peak (dBμV/m)	Adjusted RMS Average (dBμV/m)	Peak Limit FCC 15.209 (dBμV/m)	Peak Margin (dB)	Peak Result (Pass/Fail)	Peak Worst Margin (dB)	Average Limit FCC 15.209 (dBμV/m)	Average Margin (dB)	Average Result (Pass/Fail)	Average Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
2248	39.87	38.4	6.6	46.47	45	74	-27.53	PASS	—	54	-9	PASS	-9	150	164
4879.5	39.81	32.98	10	49.81	42.98	74	-24.19	PASS	—	54	-11.02	PASS	—	101	3
16197.9	29	20.44	21	50	41.44	74	-24	PASS	—	54	-12.56	PASS	—	200	148
17802.6	29.3	20.04	22.5	51.8	42.54	74	-22.2	PASS	—	54	-11.46	PASS	—	200	247
17850.3	29.07	20.31	22.5	51.57	42.81	74	-22.43	PASS	—	54	-11.19	PASS	—	111	0
17927.5	31.79	20.2	22.5	54.29	42.7	74	-19.71	PASS	-19.71	54	-11.3	PASS	—	107	303

1-18GHz Horizontal Data Table



1-18GHz Horizontal Plot

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Services Inc.

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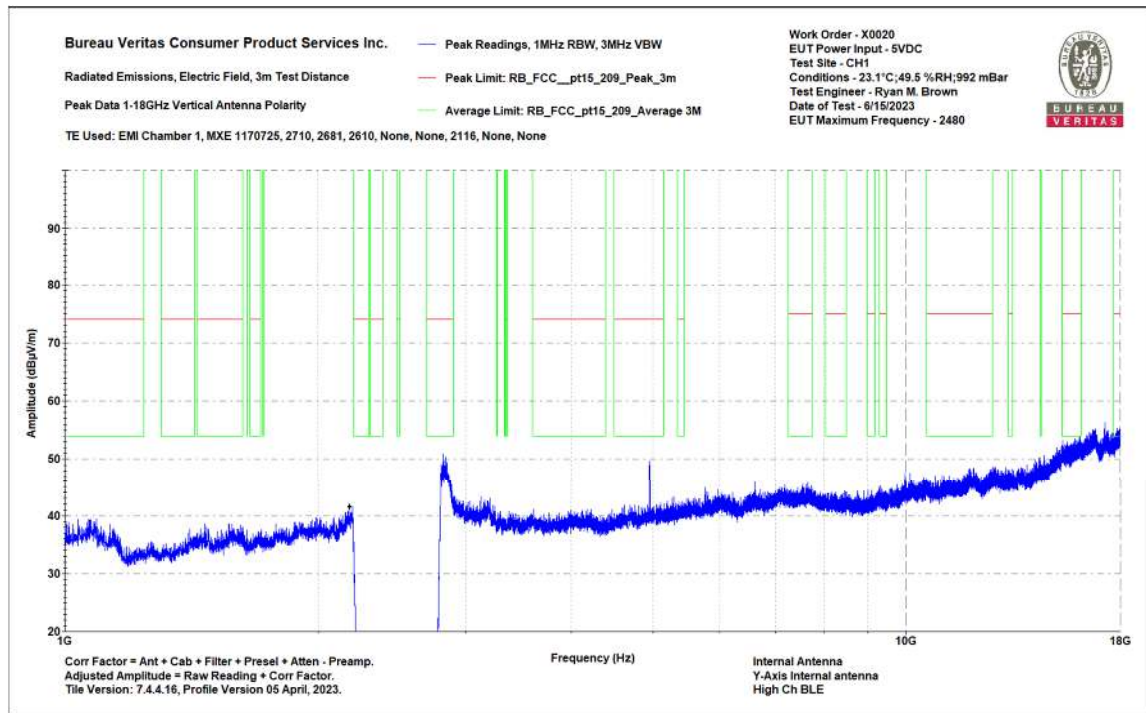
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Results for BLE 1Mbps GFSK Channel 39

Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 3m Distance 1-18GHz Vertical Data Notes: Internal Antenna Y-Axis Internal antenna High Ch BLE						Work Order - X0020 EUT Power Input - 5VDC Test Site - CH1 Conditions - 23.1°C;49.5 %RH;992 mBar Test Engineer - Ryan M. Brown Date of Test - 6/15/2023									
Frequency (MHz)	Raw Peak (dBµV)	Raw RMS Average (dBµV)	Correction Factor (dB/m)	Adjusted Peak (dBµV/m)	Adjusted RMS Average (dBµV/m)	Peak Limit FCC 15.209 (dBµV/m)	Peak Margin (dB)	Peak Result (Pass/Fail)	Peak Worst Margin (dB)	Average Limit FCC 15.209 (dBµV/m)	Average Margin (dB)	Average Result (Pass/Fail)	Average Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
2820.7	34.52	34.52	12.7	47.22	47.22	74	-26.78	PASS	--	54	-6.78	PASS	-6.78	101	95
4960.5	39.08	32.07	10.5	49.58	42.57	74	-24.42	PASS	--	54	-11.43	PASS	--	189	175
9108.8	28.45	28.45	13.6	42.05	42.05	74	-31.95	PASS	--	54	-11.95	PASS	--	118	70
17852.4	29.86	20.25	23.9	53.76	44.15	74	-20.24	PASS	--	54	-9.85	PASS	--	118	118
17950.8	29.62	19.78	23.9	53.52	43.68	74	-20.48	PASS	--	54	-10.32	PASS	--	115	192
17983.3	31.03	20.38	24	55.03	44.38	74	-18.97	PASS	-18.97	54	-9.62	PASS	--	139	347

1-18GHz Vertical Data Table



1-18GHz Vertical Plot



Test Report for Hayward Industries, Inc. Report No. EX0020-1 Issue 4

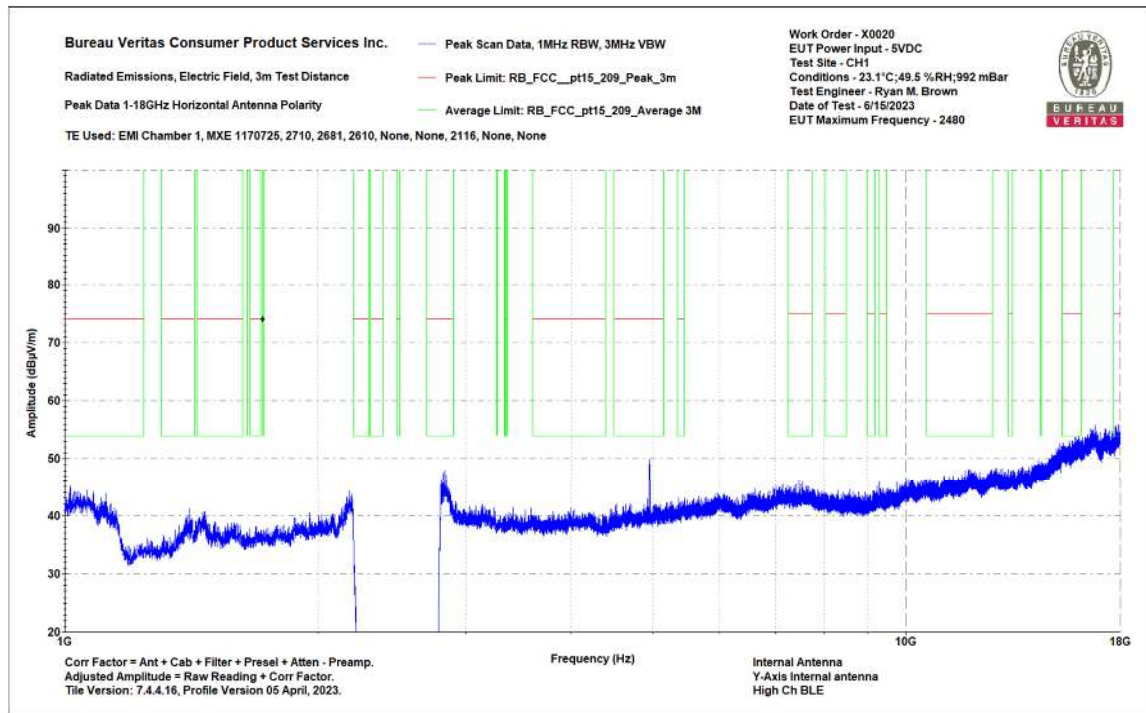


Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
1-18GHz Horizontal Data
Notes:
Internal Antenna
Y-Axis Internal antenna
High Ch BLE

Work Order - X0020
EUT Power Input - 5VDC
Test Site - CH1
Conditions - 23.1°C;49.5 %RH;992 mBar
Test Engineer - Ryan M. Brown
Date of Test - 6/15/2023
EUT Maximum Frequency - 2480

Frequency (MHz)	Raw Peak (dBµV)	Raw RMS Average (dBµV)	Correction Factor (dB/m)	Adjusted Peak (dBµV/m)	Adjusted RMS Average (dBµV/m)	Peak Limit FCC 15.209 (dBµV/m)	Peak Margin (dB)	Peak Result (Pass/Fail)	Peak Worst Margin (dB)	Average Limit FCC 15.209 (dBµV/m)	Average Margin (dB)	Average Result (Pass/Fail)	Average Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1012.6	44.52	44.52	-0.7	43.82	43.82	74	-30.18	PASS	-	54	-10.18	PASS	-	195	232
2831.2	34.3	34.3	12.3	46.6	46.6	74	-27.4	PASS	-	54	-7.4	PASS	-7.4	175	236
4959.6	39.33	35.55	10.5	49.83	46.05	74	-24.17	PASS	-	54	-7.95	PASS	-	133	196
16070.9	31.79	20.26	21.6	53.39	41.86	74	-20.61	PASS	-	54	-12.14	PASS	-	199	170
16199.2	30.35	20.52	21.5	51.85	42.02	74	-22.15	PASS	-	54	-11.98	PASS	-	125	150
17735.8	29.5	20.04	23.3	52.8	43.34	74	-21.2	PASS	-	54	-10.66	PASS	-	128	231
17773.5	30.26	19.46	23.7	53.96	43.16	74	-20.04	PASS	-	54	-10.84	PASS	-	150	68
17806.8	29.23	19.64	23.9	53.13	43.54	74	-20.87	PASS	-	54	-10.46	PASS	-	151	19
17934.3	28.3	20.17	23.9	52.2	44.07	74	-21.8	PASS	-	54	-9.93	PASS	-	198	157
17999	30.95	19.74	24.1	55.05	43.84	74	-18.95	PASS	-18.95	54	-10.16	PASS	-	100	91

1-18GHz Horizontal Data Table



1-18GHz Horizontal Plot

Bureau Veritas Consumer Product
Services Inc.

One Distribution Center Circle, #1
Littleton, MA

Tel.: (978) 486-8880
Fax: (978) 486-8828



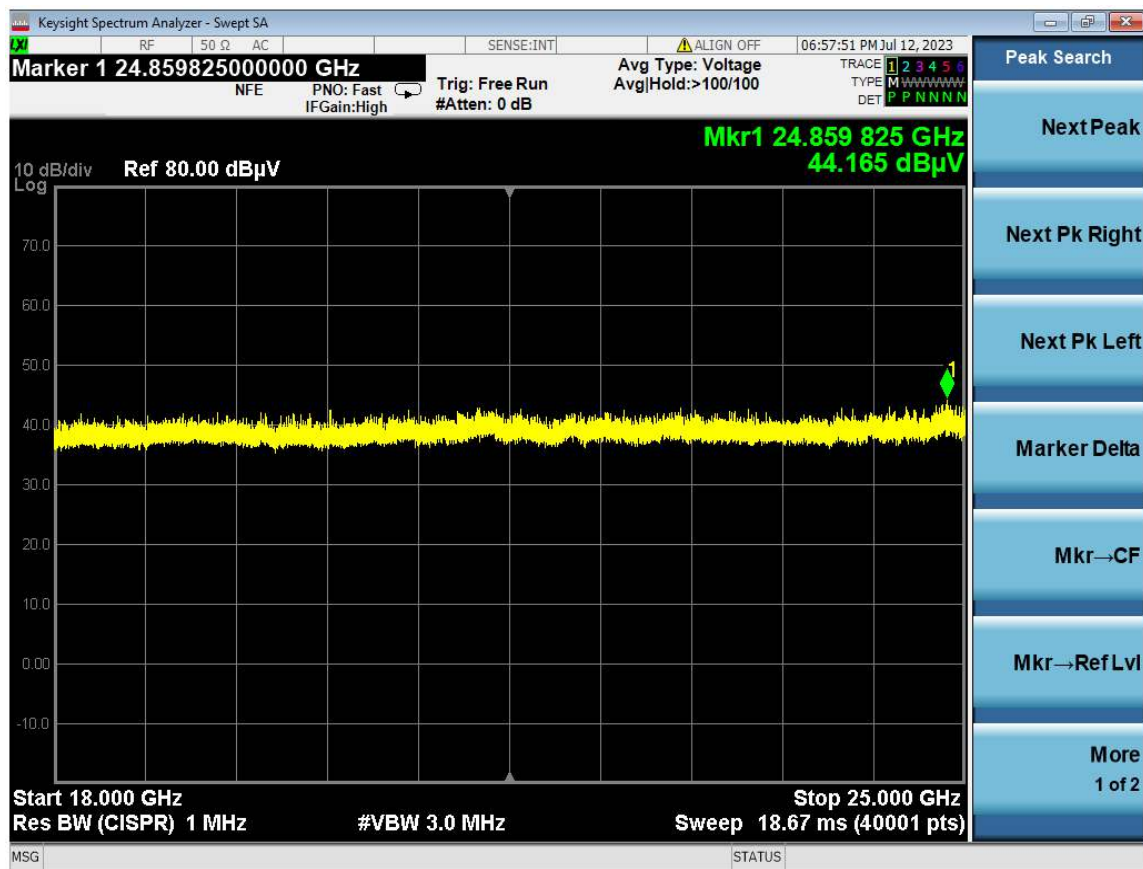
Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4



Radiated Emissions Table

Date: 12-Jul-23				Company: Hayward				Work Order: X0020					
Engineer: Yunus Fazloglu				EUT Desc: BT and 900 Wireless Module 2023				EUT Operating Voltage/Frequency: 3.3VDC					
Temp: 23.7C				Humidity: 55%				Pressure: 1003mbar					
Frequency Range: 18-25GHz								Measurement Distance: 1 m					
Notes: Internal antenna, 3 orthogonal planes of the module (X,Y,Z)								EUT Max Freq: 2480MHz					
No emissions detected. Peak measurement. Worst case noise floor recorded below.													
Measurement antenna HV polarity showed no significant difference in noise floor.													
Antenna Polarization (H/V)	Frequency (MHz)	Peak Reading (dBμV)	Average Reading (dBμV)	Antenna & Preamp Factor (dB)	Cable Factor (dB)	Adjusted Peak Reading (dBμV/m)	Adjusted Avg Reading (dBμV/m)	FCC 15.209 - Peak			FCC 15.209- Average		
								Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
Highest Noise Floor	24860.0	44.2	44.2	4.7	3.7	52.6	52.6	83.5	-30.9	Pass	63.5	-10.9	Pass
Table Result:				Pass by -10.9 dB				Worst Freq: 24860.0 MHz					
Test Site: EMI Chamber 1				Cable: Asset #2596									
Analyzer: 1274541				18-40GHz Horn with PreAmp: Asset #2709									
CSsoft Radiated Emissions Calculator v 1.017.225													
Adjusted Reading = Reading + Antenna & Preamp Factor + Cable Factor													
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18-25GHz Data Table



18-25GHz Plot



Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4



BLE 1Mbps GFSK Radiated Band-edge:

External Antenna

Radiated Emissions Table																			
Date: 15-Jun-23 Engineer: Ryan M. Brown Temp: 22.7C					Company: Hayward EUT Desc: BT923 Humidity: 51%					Work Order: X0020 EUT Operating Voltage/Frequency: 5VDC Pressure: 1001mbar									
Frequency Range: Band Edge										Measurement Distance: 3 m									
Notes: External Antenna										EUT Max Freq: 2480									
RMS Trace Averaging over 200 traces were used for all average measurements.																			
Antenna Polarization (H/V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dBm)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average							
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)					
Band Edge Low X-Axis External Antenna Vertical	V	2390.0	45.6	35.0	0.0	3.9	3.2	52.7	42.1	74.0	-21.3	Pass	54.0	-11.9	Pass				
	H	2390.0	45.2	35.3	0.0	3.9	3.2	52.3	42.4	74.0	-21.7	Pass	54.0	-11.6	Pass				
Band Edge Low X-Axis External Antenna Horizontal	V	2390.0	46.1	35.3	0.0	3.9	3.2	53.2	42.4	74.0	-20.8	Pass	54.0	-11.6	Pass				
	H	2390.0	45.7	35.6	0.0	3.9	3.2	52.8	42.7	74.0	-21.2	Pass	54.0	-11.3	Pass				
Band Edge High X-Axis External antenna Vertical	V	2483.5	47.0	35.6	0.0	3.9	3.0	53.9	42.5	74.0	-20.1	Pass	54.0	-11.5	Pass				
	H	2483.5	46.0	35.4	0.0	3.9	3.0	52.9	42.3	74.0	-21.1	Pass	54.0	-11.7	Pass				
Band Edge High X-Axis External antenna Horizontal	V	2483.5	46.2	36.3	0.0	3.9	3.0	53.1	43.2	74.0	-20.9	Pass	54.0	-10.8	Pass				
	H	2483.5	47.1	37.0	0.0	3.9	3.0	54.0	43.9	74.0	-20.0	Pass	54.0	-10.1	Pass				
Band Edge Low Y-Axis External Antenna Vertical	V	2390.0	45.9	35.1	0.0	3.9	3.2	53.0	42.2	74.0	-21.0	Pass	54.0	-11.8	Pass				
	H	2390.0	46.0	35.4	0.0	3.9	3.2	53.1	42.5	74.0	-20.9	Pass	54.0	-11.5	Pass				
Band Edge Low Y-Axis External Antenna Horizontal	V	2390.0	46.2	35.2	0.0	3.9	3.2	53.3	42.3	74.0	-20.7	Pass	54.0	-11.7	Pass				
	H	2390.0	45.6	35.0	0.0	3.9	3.2	52.7	42.1	74.0	-21.3	Pass	54.0	-11.9	Pass				
Band Edge High Y-Axis External Antenna Vertical	V	2483.5	47.3	35.4	0.0	3.9	3.0	54.2	42.3	74.0	-19.8	Pass	54.0	-11.7	Pass				
	H	2483.5	45.9	35.8	0.0	3.9	3.0	52.8	42.7	74.0	-21.2	Pass	54.0	-11.3	Pass				
Band Edge High Y-Axis External Antenna Horizontal	V	2483.5	46.8	35.6	0.0	3.9	3.0	53.7	42.5	74.0	-20.3	Pass	54.0	-11.5	Pass				
	H	2483.5	47.9	36.5	0.0	3.9	3.0	54.8	43.4	74.0	-19.2	Pass	54.0	-10.6	Pass				
Band Edge Low Z-Axis External Antenna Vertical	V	2390.0	46.9	35.0	0.0	3.9	3.2	54.0	42.1	74.0	-20.0	Pass	54.0	-11.9	Pass				
	H	2390.0	46.4	35.4	0.0	3.9	3.2	53.5	42.5	74.0	-20.5	Pass	54.0	-11.5	Pass				
Band Edge Low Z-Axis External Antenna Horizontal	V	2390.0	46.6	35.4	0.0	3.9	3.2	53.7	42.5	74.0	-20.3	Pass	54.0	-11.5	Pass				
	H	2390.0	46.5	35.1	0.0	3.9	3.2	53.6	42.2	74.0	-20.4	Pass	54.0	-11.8	Pass				
Band Edge High Z-Axis External antenna Vertical	V	2483.5	46.1	35.6	0.0	3.9	3.0	53.0	42.5	74.0	-21.0	Pass	54.0	-11.5	Pass				
	H	2483.5	45.8	35.2	0.0	3.9	3.0	52.7	42.1	74.0	-21.3	Pass	54.0	-11.9	Pass				
Band Edge High Z-Axis External Antenna Horizontal	V	2483.5	47.0	35.6	0.0	3.9	3.0	53.9	42.5	74.0	-20.1	Pass	54.0	-11.5	Pass				
	H	2483.5	44.9	36.5	0.0	3.9	3.0	51.8	43.4	74.0	-22.2	Pass	54.0	-10.6	Pass				
Table Result:					Pass by -10.1 dB					Worst Freq: 2483.5 MHz									
Test Site: EMI Chamber 1 Analyzer: 1170725					Cable 1: Asset #2681 Preamp: None					Cable 2: Asset #2610 Antenna: Asset #2710					Cable 3: --- Preselector: ---				
CSsoft Radiated Emissions Calculator v 1.017.225 Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor																			
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Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4



Internal Antenna

Radiated Emissions Table															
Date: 17-Jun-23				Company: Hayward				Work Order: X0020							
Engineer: Ryan M. Brown				EUT Desc: BT923				EUT Operating Voltage/Frequency: 5VDC							
Temp: 22.7C				Humidity: 51%				Pressure: 1001mbar							
Frequency Range: Band Edge								Measurement Distance: 3 m							
Notes: Internal Antenna								EUT Max Freq: 2480							
RMS Trace Averaging over 200 traces were used for "Band Edge High Y-Axis - Horizontal" only. For other positions RMS average was not necessary since their Adjusted Peak were below the average limits.															
Antenna Polarization (H/V)	Frequency (MHz)	Peak Reading (dBμV)	Average Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBμV/m)	Adjusted Avg Reading (dBμV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average			
									Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)	
Band Edge Low X-Axis															
V	2390.0	34.9	34.9	0.0	3.9	3.2	42.0	42.0	74.0	-32.0	Pass	54.0	-12.0	Pass	
H	2390.0	33.7	33.7	0.0	3.9	3.2	40.8	40.8	74.0	-33.2	Pass	54.0	-13.2	Pass	
Band Edge High X-Axis															
V	2483.5	40.5	40.5	0.0	3.9	3.0	47.4	47.4	74.0	-26.6	Pass	54.0	-6.6	Pass	
H	2483.5	33.7	33.7	0.0	3.9	3.0	40.6	40.6	74.0	-33.4	Pass	54.0	-13.4	Pass	
Band Edge Low Y-Axis															
V	2390.0	34.9	34.9	0.0	3.9	3.2	42.0	42.0	74.0	-32.0	Pass	54.0	-12.0	Pass	
H	2390.0	37.2	37.2	0.0	3.9	3.2	44.3	44.3	74.0	-29.7	Pass	54.0	-9.7	Pass	
Band Edge High Y-Axis															
V	2483.5	37.0	37.0	0.0	3.9	3.0	43.9	43.9	74.0	-30.1	Pass	54.0	-10.1	Pass	
H	2483.5	43.9	33.9	0.0	3.9	3.0	50.8	40.8	74.0	-23.2	Pass	54.0	-13.2	Pass	
Band Edge Low Z-Axis															
V	2390.0	33.5	33.5	0.0	3.9	3.2	40.6	40.6	74.0	-33.4	Pass	54.0	-13.4	Pass	
H	2390.0	37.7	37.7	0.0	3.9	3.2	44.8	44.8	74.0	-29.2	Pass	54.0	-9.2	Pass	
Band Edge High Z-Axis															
V	2483.5	34.4	34.4	0.0	3.9	3.0	41.3	41.3	74.0	-32.7	Pass	54.0	-12.7	Pass	
H	2483.5	39.2	39.2	0.0	3.9	3.0	46.1	46.1	74.0	-27.9	Pass	54.0	-7.9	Pass	
Table Result:				Pass by -6.6 dB				Worst Freq: 2483.5 MHz							
Test Site: EMI Chamber 1				Cable 1: Asset #2681				Cable 2: Asset #2610				Cable 3: ---			
Analyzer: 1170725				Preamp:				Antenna: Asset #2710				Preselector: ---			
CSsoft Radiated Emissions Calculator v 1.017.225															
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor															
Copyright Curtis-Straus LLC 2000															

Notch filter range (used for internal antenna high channel): 2.2GHz to 2.8GHz notch filter range was checked for emissions and no emissions were found. No differences observed between horizontal or vertical antenna polarizations.

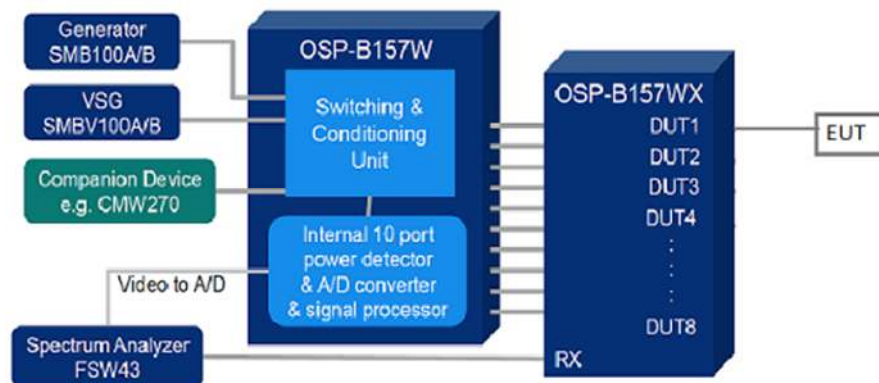
4.3 6dB CHANNEL BANDWIDTH & 99% OBW

4.3.1 LIMITS

The minimum 6 dB bandwidth shall be 500 kHz.

4.3.2 TEST SETUP

SCHEMATIC RF-CABLING



4.3.3 TEST EQUIPMENT USED

Equipment	Manufacturer	Asset No.	Model No.	Serial No.	Last Cal.	Next Cal.
Cable	Carlisle	2595	UTIFLEX	N/A	1/17/2023	1/17/2024
Signal Analyzer	Rohde-Schwarz	2200	FSV 40	101551	10/09/2023	10/09/2024
OSP-B157W8	Rohde-Schwarz	2558	OSP_B157W8	100955	8/26/2021	2/26/2024
10dB Attenuator	Min Circuits	10dB-01-Brown	N/A	N/A	2/13/23	2/13/24
30dB 20W Atten	Weinschel Associates	2121	89-30-11	703	2/13/23	2/13/24

4.3.4 TEST PROCEDURES

6dB CHANNEL BANDWIDTH

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) ≥ 3 RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.



- g. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

99% OBW

- a. The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- b. The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
- c. Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than $[10 \log (OBW/RBW)]$ below the reference level. Specific guidance is given in 4.1.5.2.
- d. Step a) through step c) might require iteration to adjust within the specified range.
- e. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- f. Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

4.3.5 DEVIATIONS

No deviations from the standard.

4.3.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer's specifications.

4.3.7 TEST RESULTS

BLE (GFSK) 1Mbps

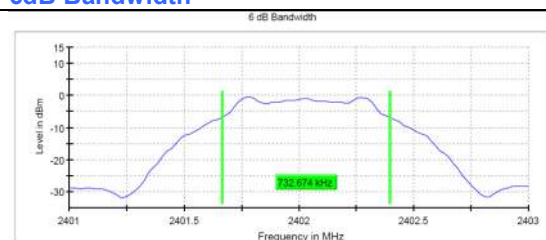
External Antenna

Test date: 12/7/2023

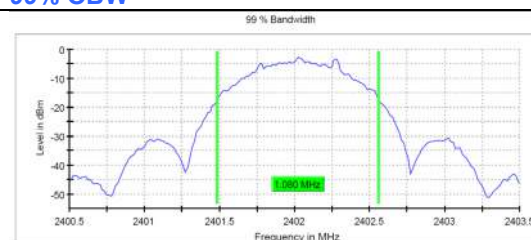
CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	99% OBW (MHz)	PASS / FAIL
0	2402	0.732674	1.080000	Pass
19	2440	0.732674	1.080000	Pass
39	2480	0.712872	1.080000	Pass

CH0

6dB Bandwidth



99% OBW



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40300 GHz	2.40300 GHz
Span	2.000 MHz	2.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	101	~ 40
Swepttime	18.938 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	10 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.27 dB	0.50 dB

Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40050 GHz	2.40050 GHz
Stop Frequency	2.40350 GHz	2.40350 GHz
Span	3.000 MHz	3.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 100.000 kHz
SweepPoints	200	~ 200
Swepttime	63.151 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	25 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.14 dB	0.30 dB

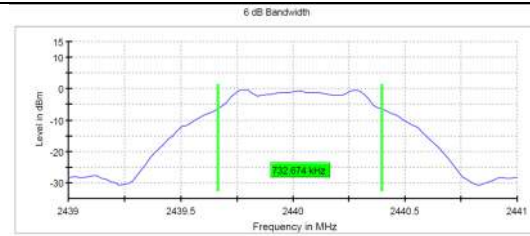


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CH19

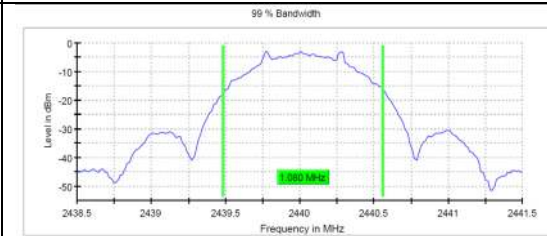
6dB Bandwidth



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.43900 GHz	2.43900 GHz
Stop Frequency	2.44100 GHz	2.44100 GHz
Span	2.000 MHz	2.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	101	~ 40
SweepTime	18.938 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	13 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.11 dB	0.50 dB

99% OBW

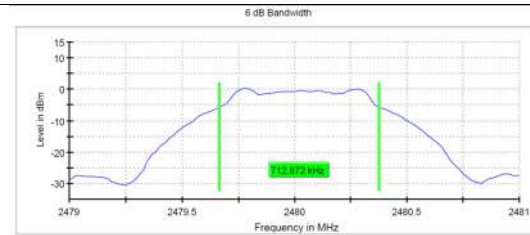


Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.43850 GHz	2.43850 GHz
Stop Frequency	2.44150 GHz	2.44150 GHz
Span	3.000 MHz	3.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 100.000 kHz
SweepPoints	200	~ 200
SweepTime	63.151 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	26 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.19 dB	0.30 dB

CH39

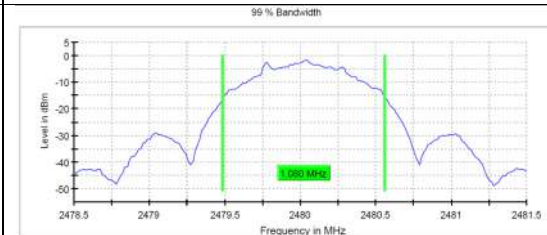
6dB Bandwidth



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47900 GHz	2.47900 GHz
Stop Frequency	2.48100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	101	~ 40
SweepTime	18.938 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	10 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.40 dB	0.50 dB

99% OBW



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47850 GHz	2.47850 GHz
Stop Frequency	2.48150 GHz	2.48150 GHz
Span	3.000 MHz	3.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 100.000 kHz
SweepPoints	200	~ 200
SweepTime	63.151 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	25 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.29 dB	0.30 dB



Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4



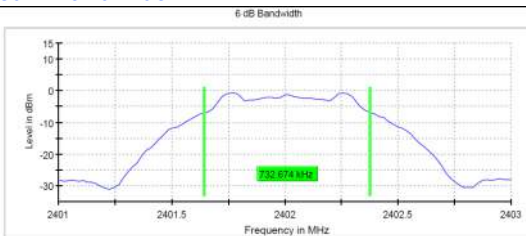
Internal Antenna

Test date: 12/4/2023

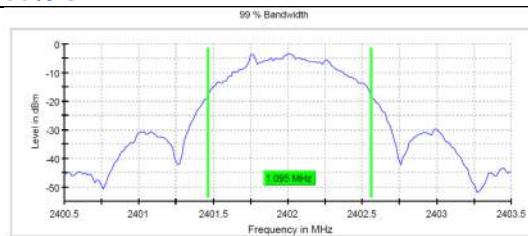
CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	99% OBW (MHz)	PASS / FAIL
0	2402	0.732674	1.095000	Pass
19	2440	0.752476	1.080000	Pass
39	2480	0.712872	1.095000	Pass

CH0

6dB Bandwidth



99% OBW



Measurement

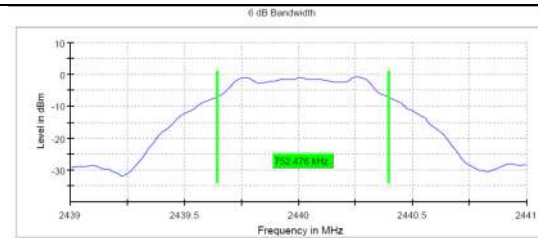
Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40300 GHz	2.40300 GHz
Span	2.000 MHz	2.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	101	~ 40
Sweptime	18.938 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	15 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.10 dB	0.50 dB

Measurement

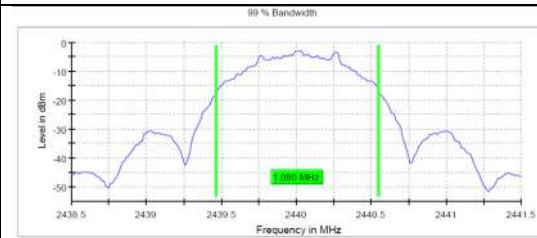
Setting	Instrument Value	Target Value
Start Frequency	2.40050 GHz	2.40050 GHz
Stop Frequency	2.40350 GHz	2.40350 GHz
Span	3.000 MHz	3.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 100.000 kHz
SweepPoints	200	~ 200
Sweptime	63.151 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	20 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.06 dB	0.30 dB

CH19

6dB Bandwidth



99% OBW



Measurement

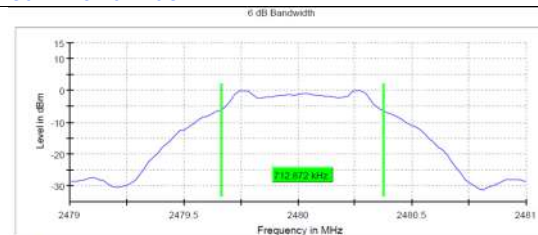
Setting	Instrument Value	Target Value
Start Frequency	2.43900 GHz	2.43900 GHz
Stop Frequency	2.44100 GHz	2.44100 GHz
Span	2.000 MHz	2.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	101	~ 40
SweepTime	18.938 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.19 dB	0.50 dB

Measurement

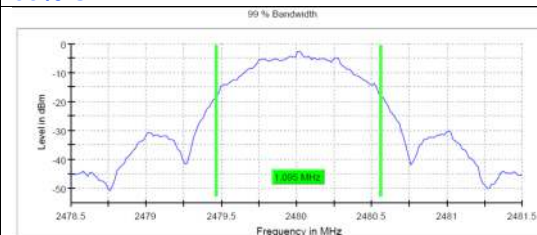
Setting	Instrument Value	Target Value
Start Frequency	2.43850 GHz	2.43850 GHz
Stop Frequency	2.44150 GHz	2.44150 GHz
Span	3.000 MHz	3.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 100.000 kHz
SweepPoints	200	~ 200
SweepTime	63.151 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	27 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.30 dB

CH39

6dB Bandwidth



99% OBW



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47900 GHz	2.47900 GHz
Stop Frequency	2.48100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	101	~ 40
SweepTime	18.938 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	13 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.25 dB	0.50 dB

Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47850 GHz	2.47850 GHz
Stop Frequency	2.48150 GHz	2.48150 GHz
Span	3.000 MHz	3.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 100.000 kHz
SweepPoints	200	~ 200
SweepTime	63.151 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	15 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.30 dB



4.4 CONDUCTED OUTPUT POWER

4.4.1 LIMITS

For systems using digital modulation in the 2400–2483.5 MHz band: 1 Watt (30dBm)

4.4.2 TEST SETUP

Refer to section 4.3.2.

4.4.3 TEST EQUIPMENT USED

Refer to section 4.3.3.

4.4.4 TEST PROCEDURES

Average conducted output power was measured in accordance with ANSI C63.10 - 2013 Section 11.9.2.3.2 (Method AVGPM-G).

4.4.5 DEVIATIONS

No deviations from the standard.

4.4.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer's specifications



Test Report for Hayward Industries, Inc.
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4.4.7 TEST RESULTS

BLE (GFSK) 1Mbps:

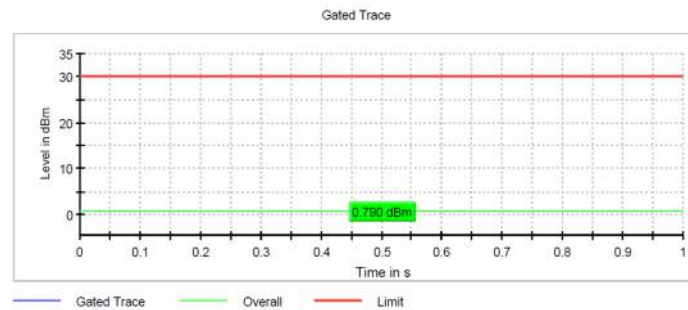
External Antenna

Test date: 12/7/2023

CHANNEL	CHANNEL FREQUENCY (MHz)	AVG POWER (dBm)	AVG POWER (mW)	AVG POWER LIMIT (W)	PASS/FAIL
0	2402	0.790	1.20	1	PASS
19	2440	1.164	1.31	1	PASS
39	2480	1.706	1.48	1	PASS

Note: Power measurements are final and compensated for all the path losses (attenuator and cable losses) within the measurement setup.

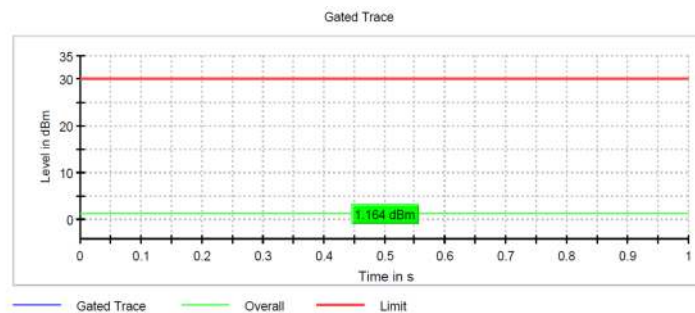
CH0



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 μ s	1.000 μ s

CH19



OSP PowerMeter settings

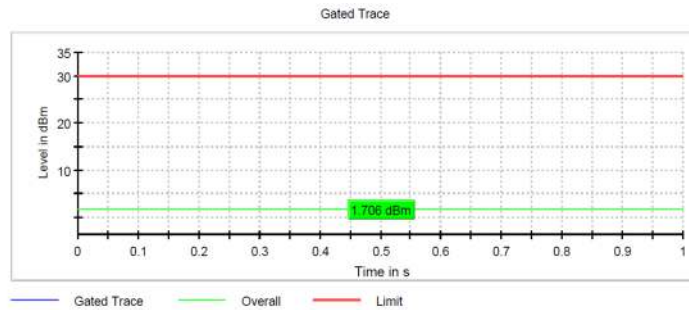
Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 μ s	1.000 μ s



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CH39



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 μ s	1.000 μ s

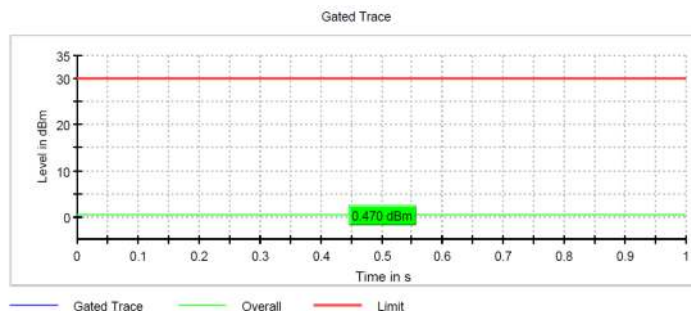
Internal Antenna

Test date: 12/4/2023

CHANNEL	CHANNEL FREQUENCY (MHz)	AVG POWER (dBm)	AVG POWER (mW)	AVG POWER LIMIT (W)	PASS/FAIL
0	2402	0.470	1.11	1	PASS
19	2440	0.898	1.23	1	PASS
39	2480	1.124	1.30	1	PASS

Note: Power measurements are final and compensated for all the path losses (attenuator and cable losses) within the measurement setup.

CH0



OSP PowerMeter settings

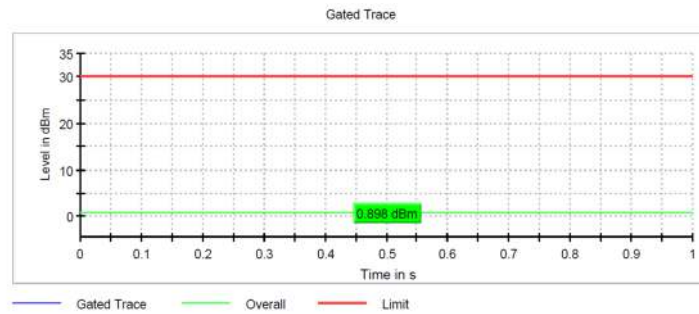
Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 μ s	1.000 μ s



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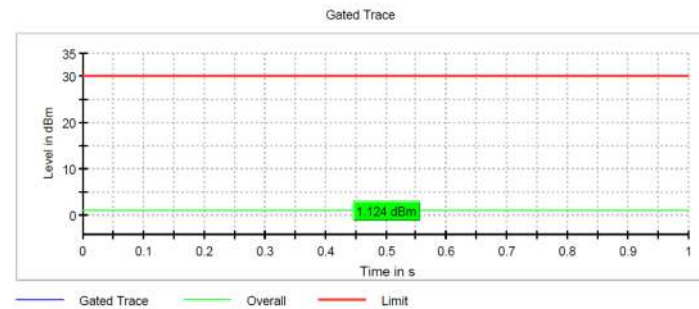
CH19



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 μ s	1.000 μ s

CH39



OSP PowerMeter settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 μ s	1.000 μ s



4.5 POWER SPECTRAL DENSITY

4.5.1 LIMITS

The limit for Power Spectral Density is 8dBm/3KHz.

4.5.2 TEST SETUP

Refer to section 4.3.2.

4.5.3 TEST EQUIPMENT USED

Refer to section 4.3.3.

4.5.4 TEST PROCEDURES

Power Spectral Density was measured in accordance with ANSI C63.10 - 2013 Section 11.10.2 (Method PKPSD (Peak PSD)).

1. Set the span to 1.5 times the DTS bandwidth
2. Set the RBW = 10 kHz, VBW $\geq 3 \times$ RBW, Detector = peak.
3. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

4.5.5 DEVIATIONS

No deviations from the standard.

4.5.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer's specifications.

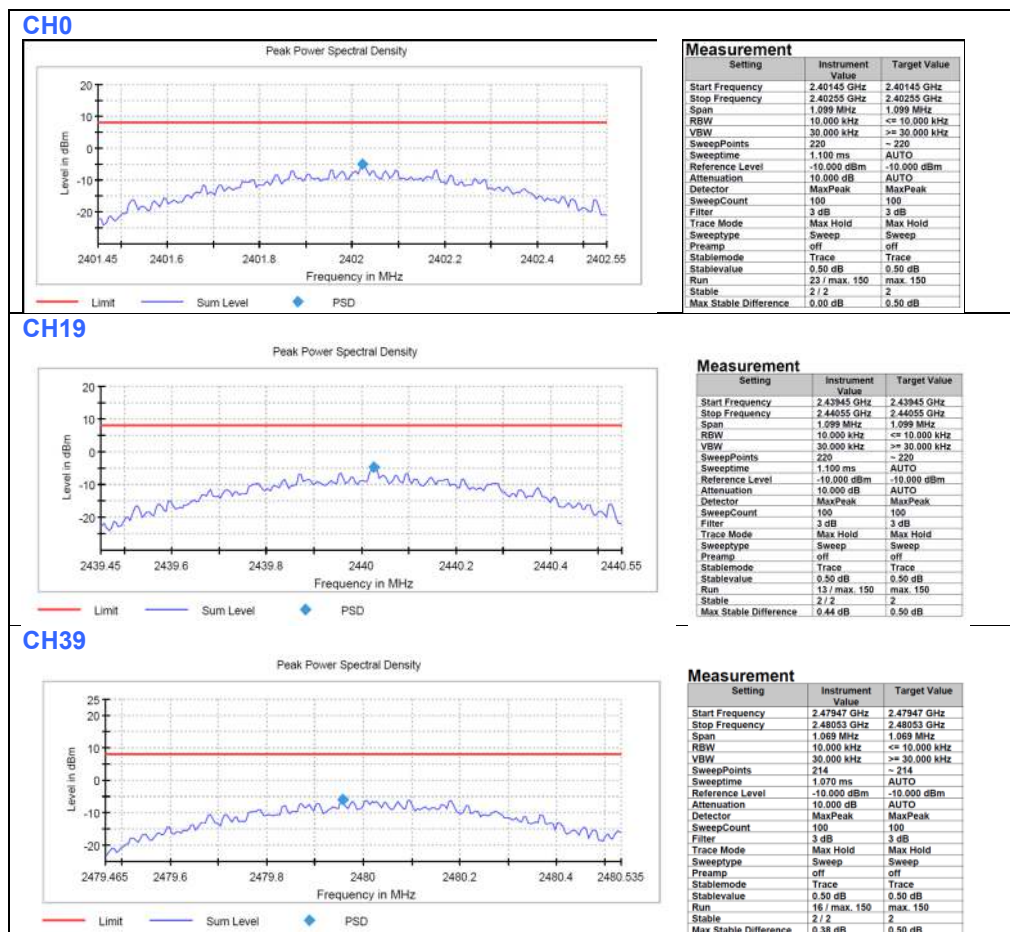
4.5.7 TEST RESULTS

BLE (GFSK) 1Mbps:

External Antenna

Test date: 12/7/2023

Channel	FREQ. (MHz)	Peak PSD (dBm)	Limit (dBm)	PASS /FAIL
0	2402	-4.885	8	PASS
19	2440	-4.736	8	PASS
39	2480	-6.072	8	PASS





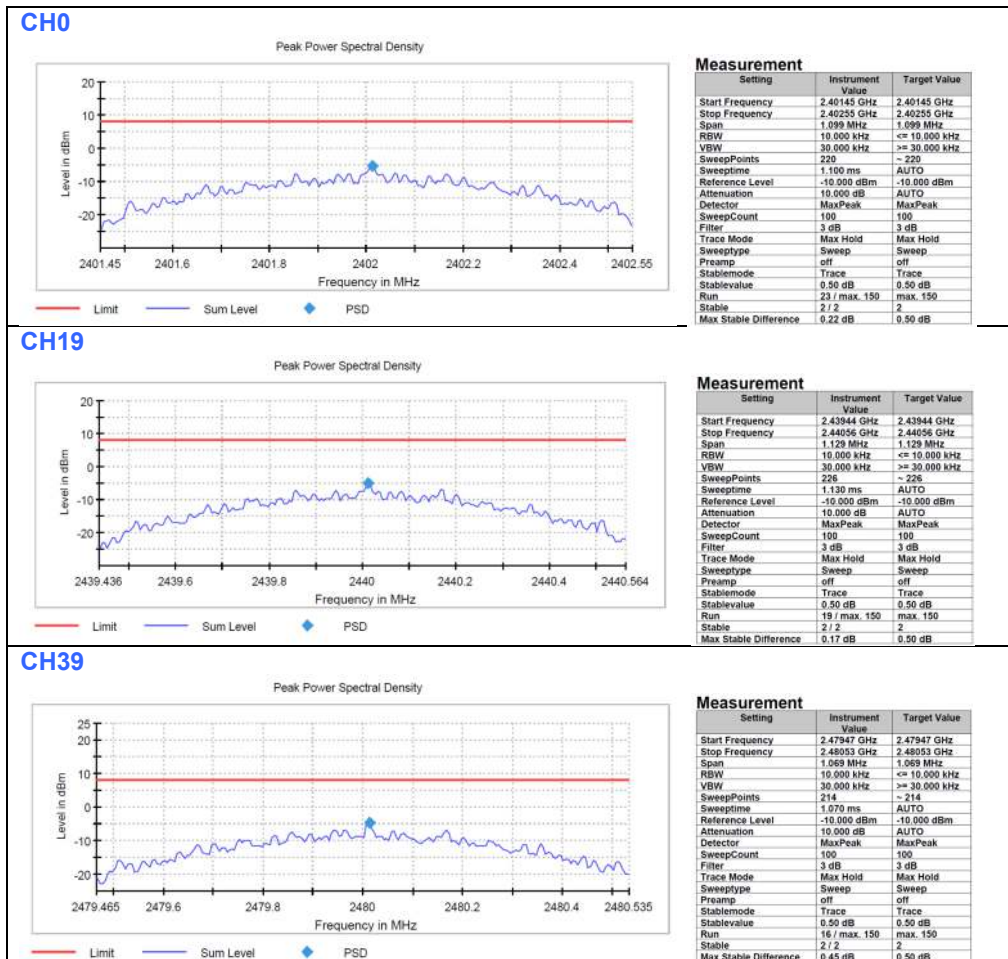
Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4



Internal Antenna

Test date: 12/4/2023

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-5.415	8	PASS
19	2440	-4.900	8	PASS
39	2480	-4.806	8	PASS





4.6 CONDUCTED SPURIOUS EMISSIONS AND BAND-EDGES

4.6.1 LIMITS

30dB below the highest emission level in the operating band (in 100kHz RBW).

4.6.2 TEST SETUP

Refer to section 4.3.2.

4.6.3 TEST EQUIPMENT USED

Refer to section 4.3.3.

4.6.4 TEST PROCEDURES

Conducted spurious emissions were measured in accordance with ANSI C63.10 - 2013 section 11.11.

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Set span to encompass the spectrum to be examined
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

4.6.5 DEVIATIONS

No deviations from the standard.

4.6.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer's specifications.



Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4



4.6.7 TEST RESULTS

BLE (GFSK) 1Mbps Conducted Spurious Emissions:

External Antenna

Test date: 12/7/2023

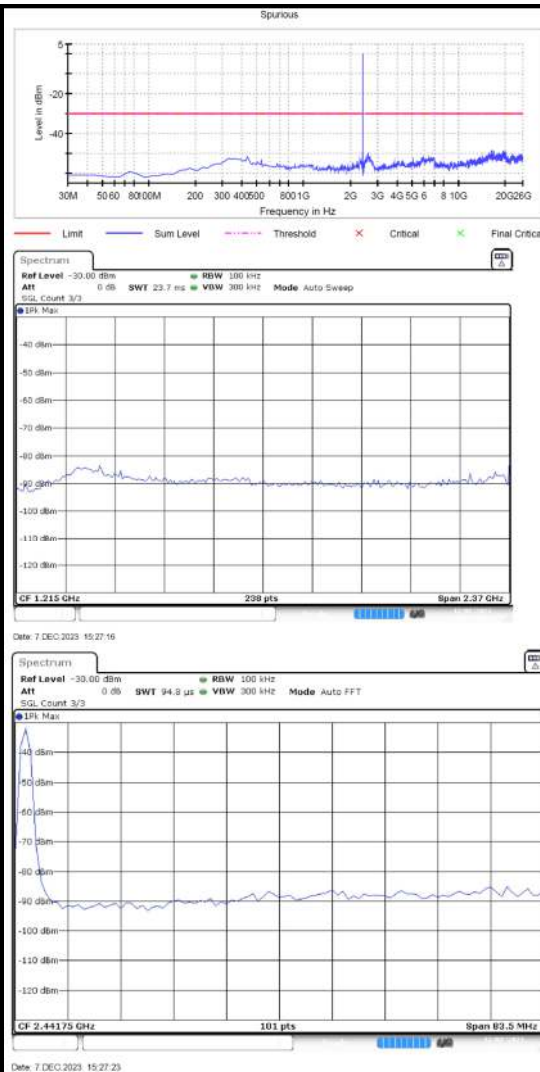
CH 0

Inband Peak

Frequency (MHz)	Level (dBm)
2402.066832	0.0

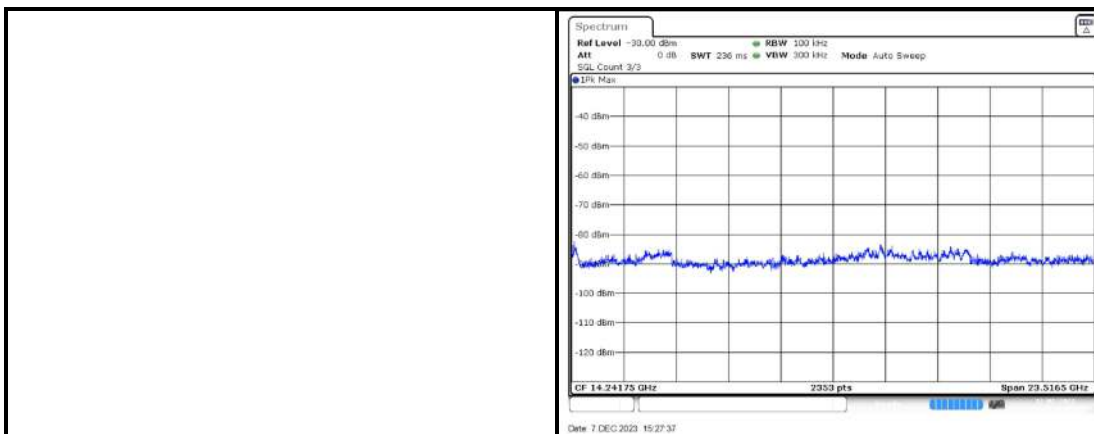
Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2395.021008	-47.6	17.6	-30.0
16390.516468	-48.6	18.6	-30.0
16340.545155	-48.9	18.9	-30.0
16900.223863	-49.0	19.0	-30.0
19498.732150	-49.0	19.0	-30.0
16350.539418	-49.2	19.2	-30.0
19548.703464	-49.2	19.2	-30.0
19838.537080	-49.4	19.4	-30.0
16400.510731	-49.4	19.4	-30.0
19858.525606	-49.5	19.5	-30.0
19198.904271	-49.6	19.6	-30.0
16370.527943	-49.6	19.6	-30.0
2598.434020	-49.7	19.7	-30.0
18119.523906	-49.7	19.7	-30.0
15850.826286	-49.7	19.7	-30.0





Test Report for Hayward Industries, Inc.
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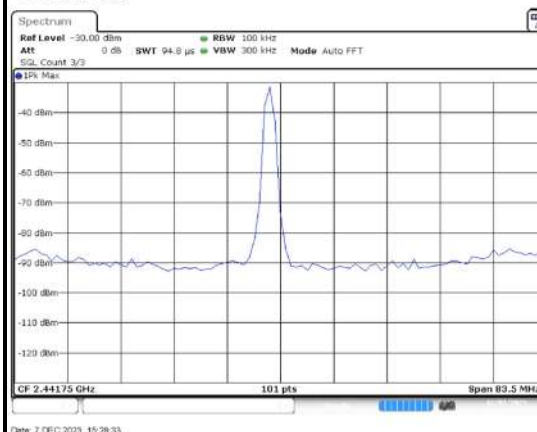
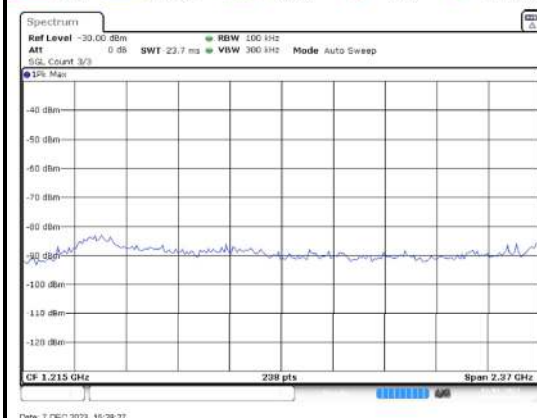
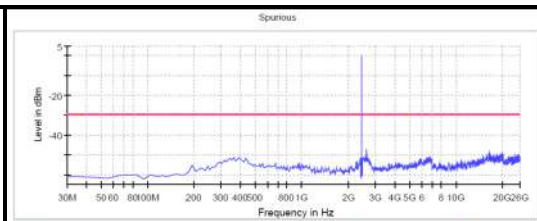
CH 19

Inband Peak

Frequency (MHz)	Level (dBm)
2440.096535	0.3

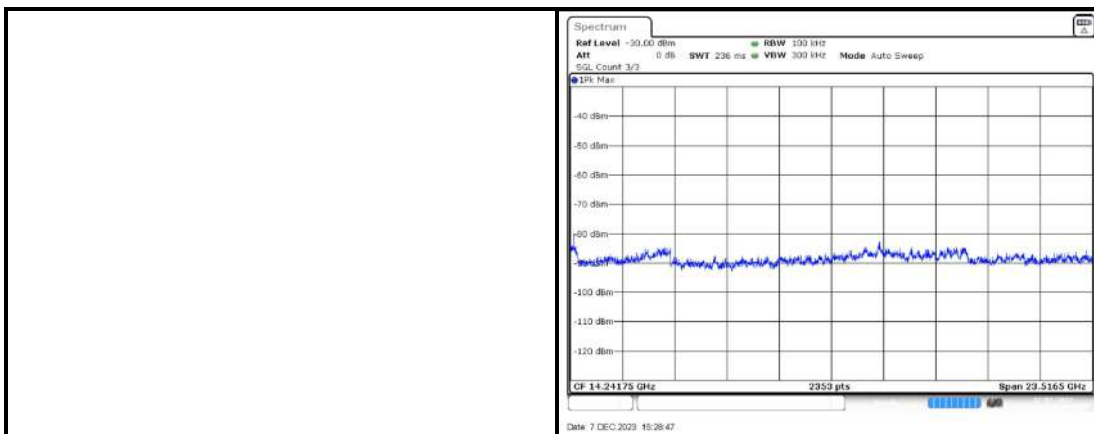
Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2628.416808	-47.2	17.5	-29.7
16410.504994	-48.0	18.3	-29.7
16390.516468	-48.2	18.5	-29.7
16370.527943	-49.1	19.4	-29.7
19858.525606	-49.2	19.5	-29.7
16340.545155	-49.3	19.6	-29.7
19468.749363	-49.4	19.7	-29.7
16360.533680	-49.4	19.7	-29.7
16430.493519	-49.5	19.8	-29.7
25735.152040	-49.5	19.8	-29.7
17829.690289	-49.6	19.9	-29.7
16400.510731	-49.7	19.9	-29.7
19738.594454	-49.7	20.0	-29.7
20088.393646	-49.7	20.0	-29.7
16330.550892	-49.7	20.0	-29.7





Test Report for Hayward Industries, Inc.
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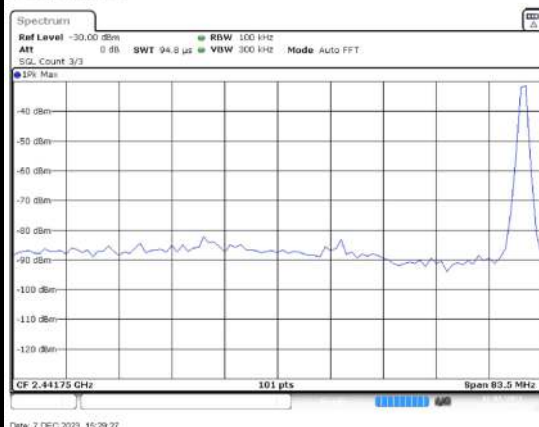
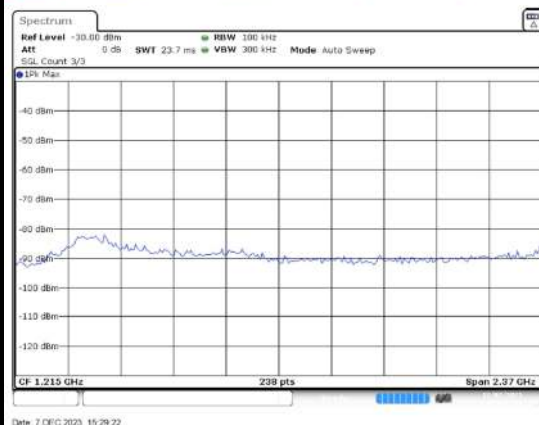
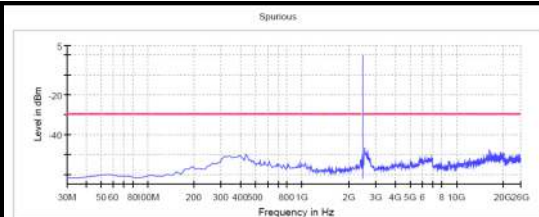
CH 39

Inband Peak

Frequency (MHz)	Level (dBm)
2480.606436	0.3

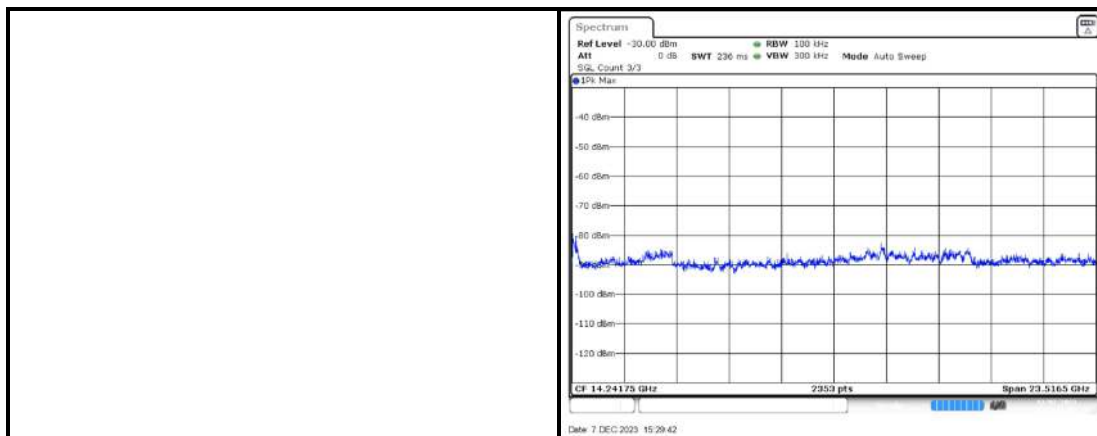
Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2528.474182	-46.7	17.0	-29.7
2668.393859	-47.8	18.1	-29.7
16350.539418	-47.9	18.2	-29.7
2558.456970	-48.5	18.8	-29.7
16360.533680	-48.6	18.9	-29.7
19248.875584	-49.0	19.3	-29.7
16420.499256	-49.1	19.4	-29.7
17879.661602	-49.1	19.4	-29.7
20238.307586	-49.2	19.5	-29.7
20258.296111	-49.3	19.5	-29.7
16380.522206	-49.3	19.5	-29.7
16460.476307	-49.4	19.7	-29.7
19428.772312	-49.4	19.7	-29.7
2548.462707	-49.4	19.7	-29.7
16440.487782	-49.5	19.8	-29.7



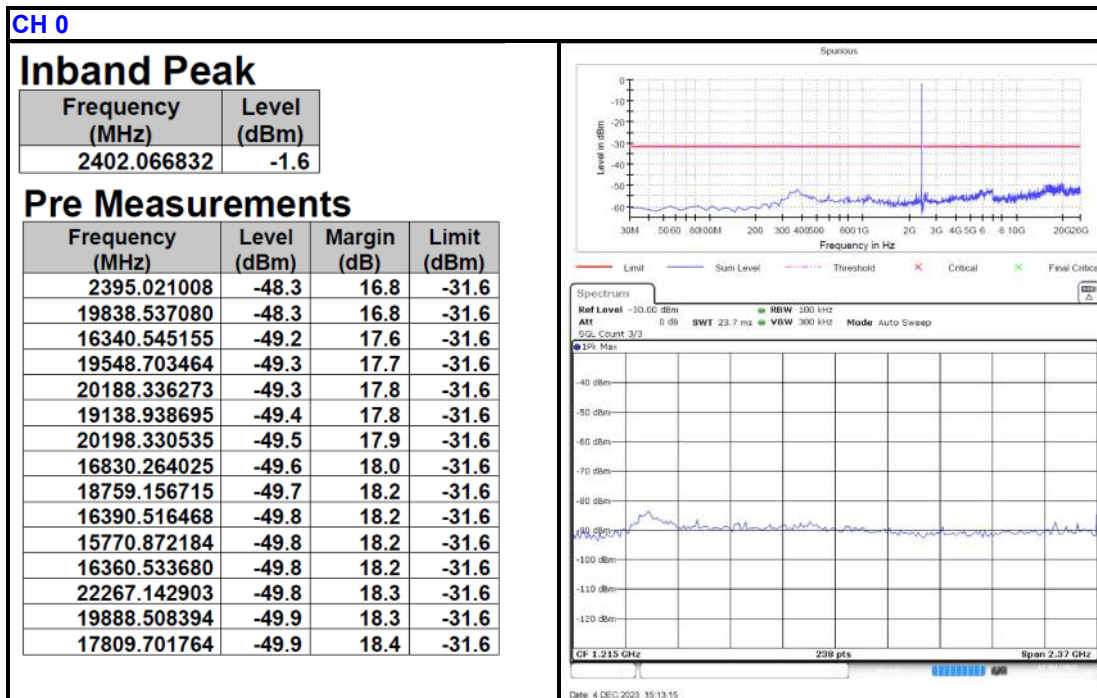


Test Report for Hayward Industries, Inc.
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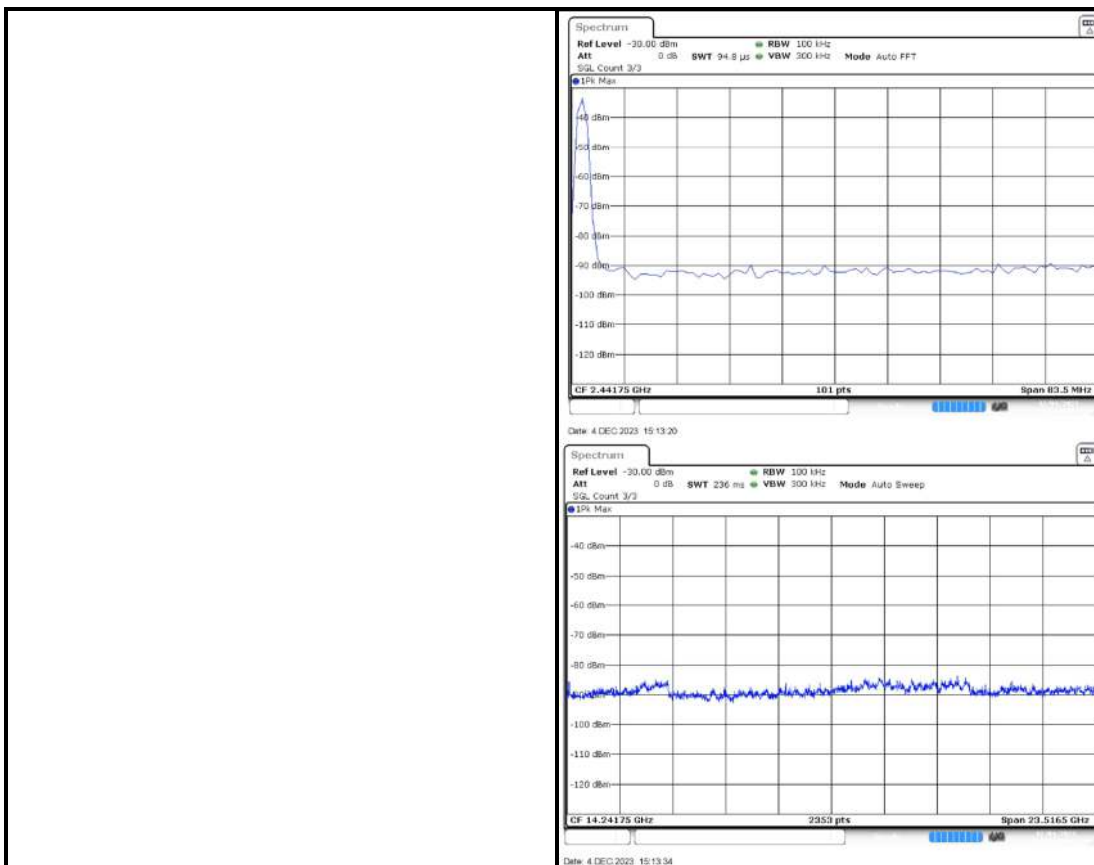
Internal Antenna

Test date: 12/4/2023





Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4



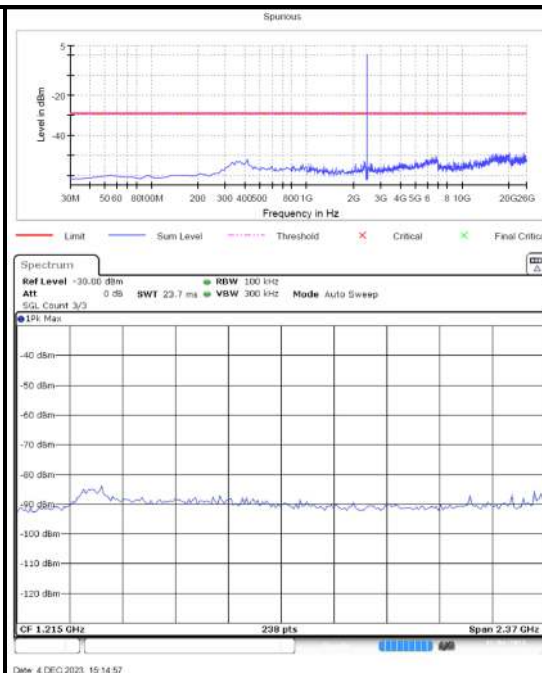
CH 19

Inband Peak

Frequency (MHz)	Level (dBm)
2440.096535	0.8

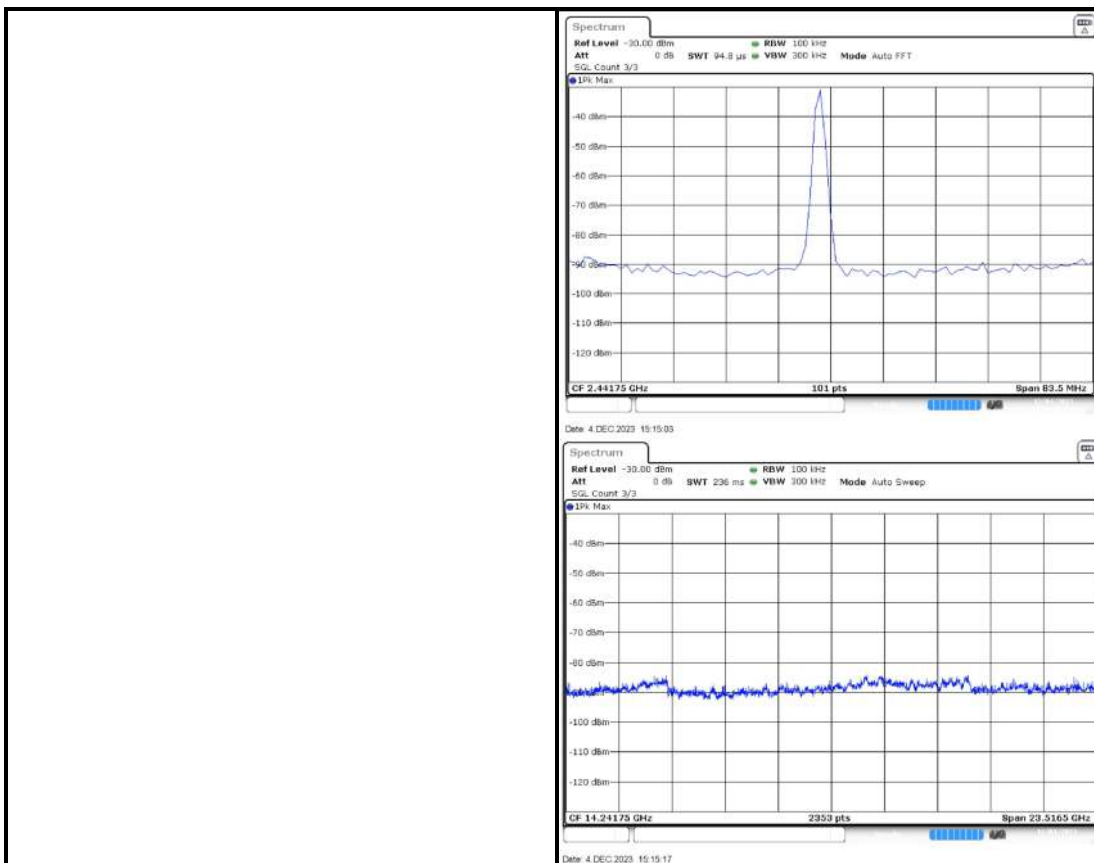
Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
24975.588079	-48.8	19.6	-29.2
20288.278899	-49.0	19.8	-29.2
20278.284637	-49.2	19.9	-29.2
16370.527943	-49.3	20.1	-29.2
15810.849235	-49.3	20.1	-29.2
20098.387909	-49.5	20.2	-29.2
19798.560030	-49.6	20.3	-29.2
20198.330535	-49.6	20.3	-29.2
19158.927221	-49.6	20.4	-29.2
22297.125691	-49.7	20.5	-29.2
15770.872184	-49.8	20.5	-29.2
19468.749363	-49.8	20.6	-29.2
19568.691989	-49.9	20.6	-29.2
19768.577242	-49.9	20.6	-29.2
16460.476307	-49.9	20.7	-29.2





Test Report for Hayward Industries, Inc.
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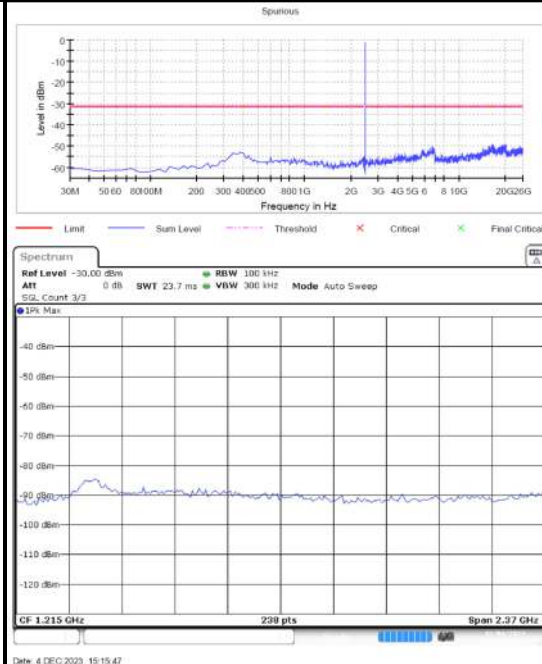
CH 39

Inband Peak

Frequency (MHz)	Level (dBm)
2479.779703	-1.3

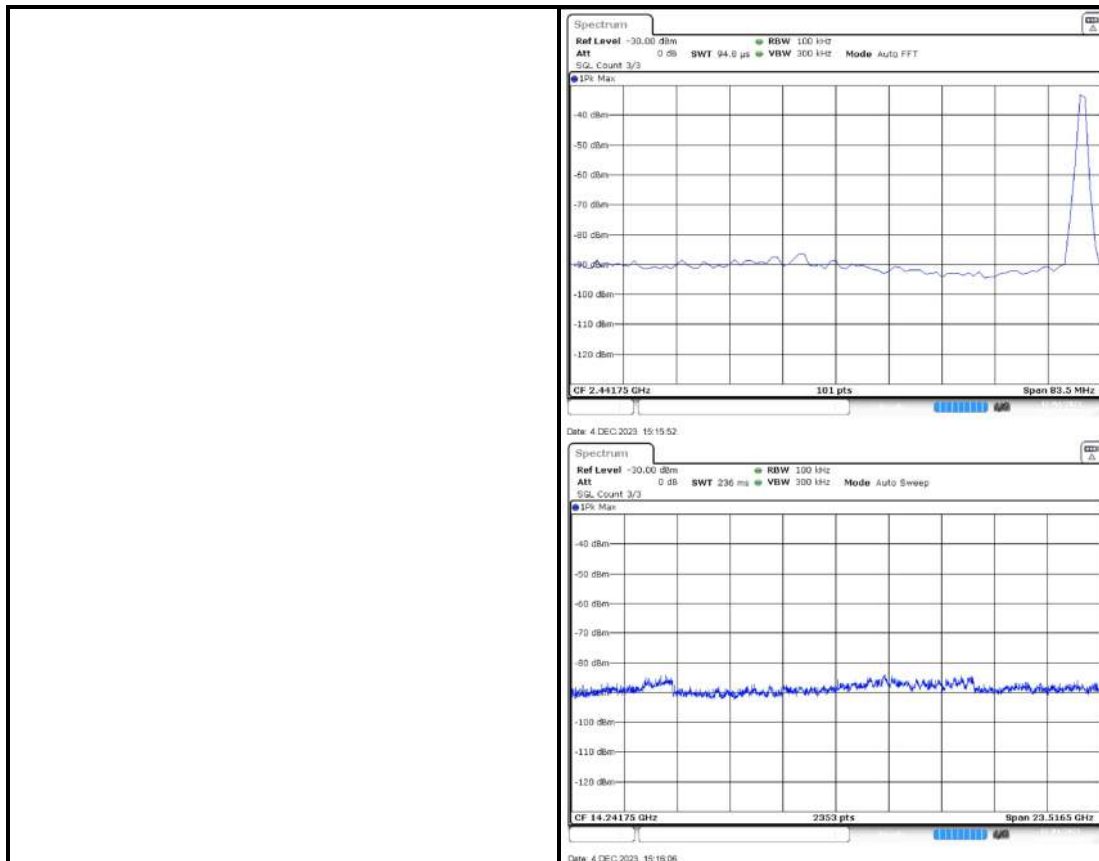
Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
19798.560030	-49.0	17.7	-31.3
16380.522206	-49.1	17.7	-31.3
16730.321398	-49.3	17.9	-31.3
16440.487782	-49.3	18.0	-31.3
20278.284637	-49.3	18.0	-31.3
20098.387909	-49.4	18.1	-31.3
20328.255950	-49.5	18.1	-31.3
16750.309924	-49.5	18.2	-31.3
19808.554292	-49.5	18.2	-31.3
19148.932958	-49.7	18.3	-31.3
20348.244475	-49.7	18.4	-31.3
19528.714938	-49.7	18.4	-31.3
19818.548555	-49.7	18.4	-31.3
16370.527943	-49.8	18.4	-31.3
20268.290374	-49.8	18.4	-31.3





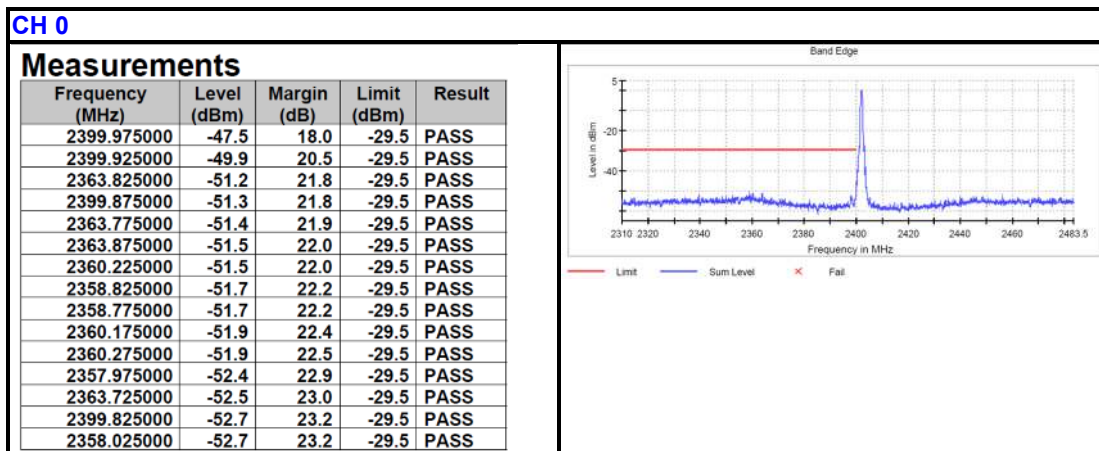
Test Report for Hayward Industries, Inc.
Report No. EX0020-1 Issue 4



BLE (GFSK) 1Mbps Conducted Bandedges:

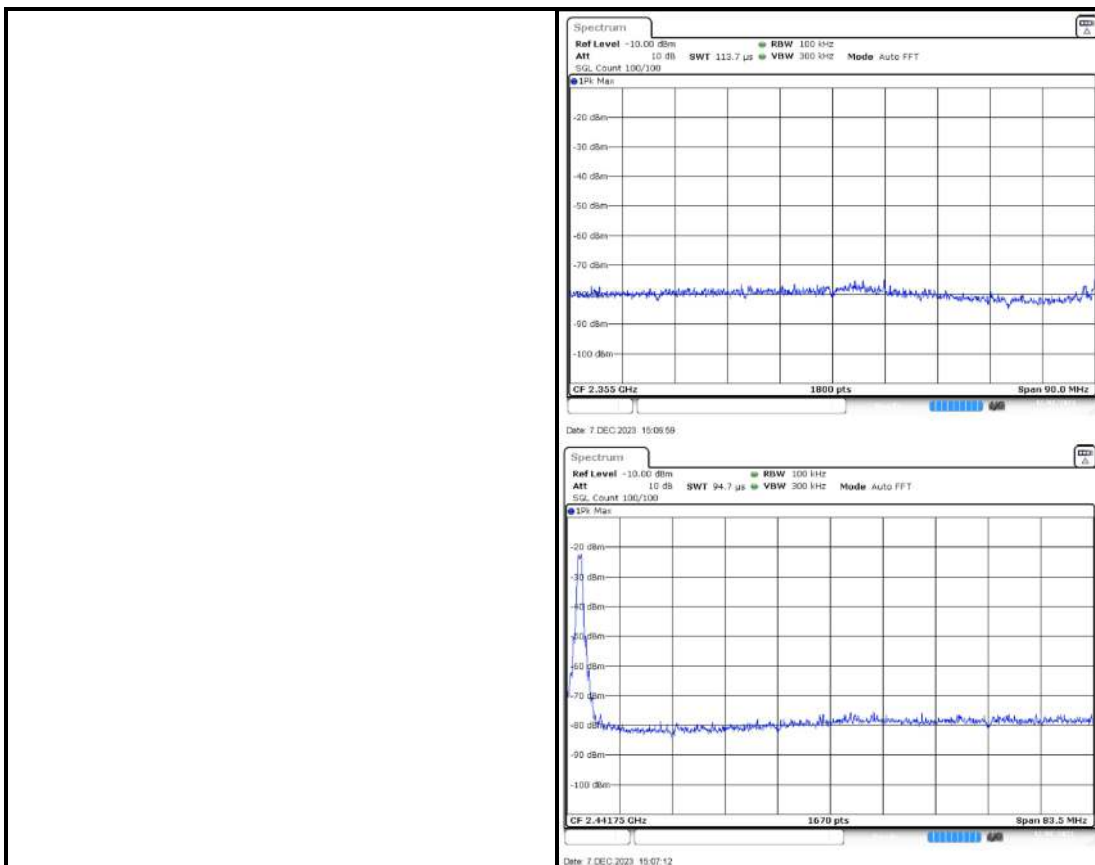
External Antenna

Test date: 12/7/2023





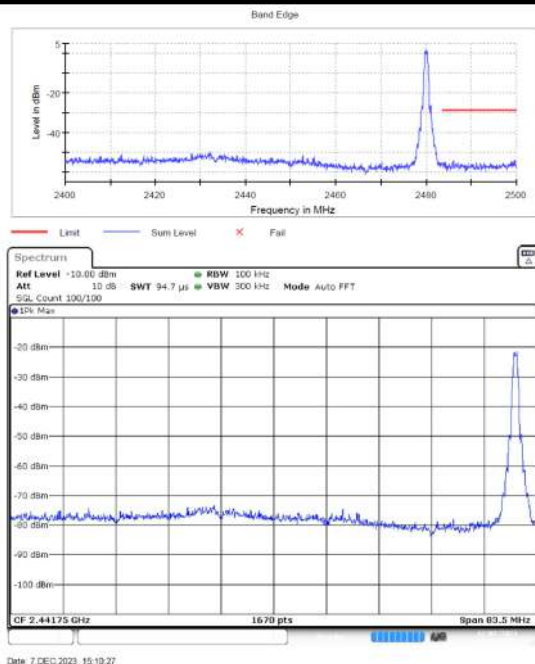
Test Report for Hayward Industries, Inc.
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CH 39

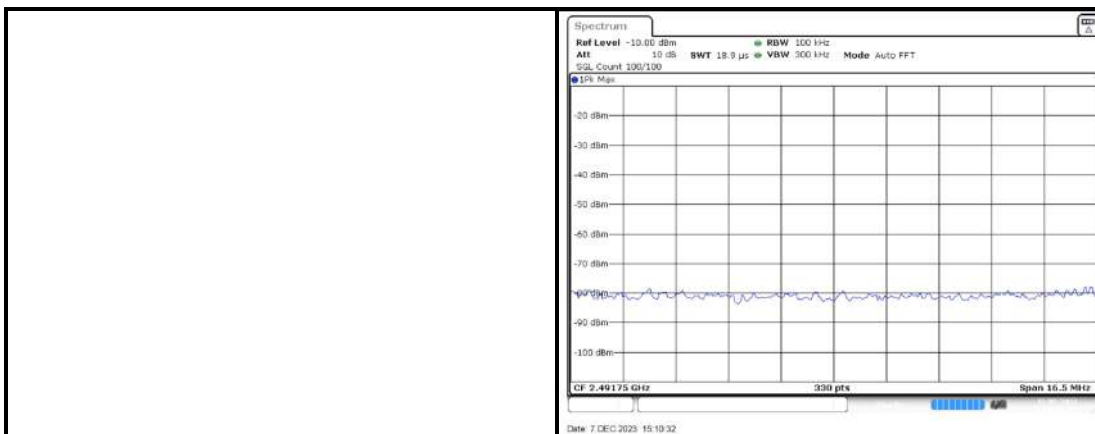
Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2499.825000	-54.1	25.3	-28.7	PASS
2499.625000	-54.1	25.4	-28.7	PASS
2499.775000	-54.1	25.4	-28.7	PASS
2499.575000	-54.4	25.7	-28.7	PASS
2485.975000	-54.6	25.9	-28.7	PASS
2499.275000	-54.9	26.2	-28.7	PASS
2486.025000	-55.0	26.3	-28.7	PASS
2498.725000	-55.2	26.5	-28.7	PASS
2499.025000	-55.2	26.5	-28.7	PASS
2484.075000	-55.2	26.5	-28.7	PASS
2484.125000	-55.3	26.5	-28.7	PASS
2499.325000	-55.3	26.5	-28.7	PASS
2498.675000	-55.3	26.6	-28.7	PASS
2499.725000	-55.3	26.6	-28.7	PASS
2487.025000	-55.4	26.6	-28.7	PASS



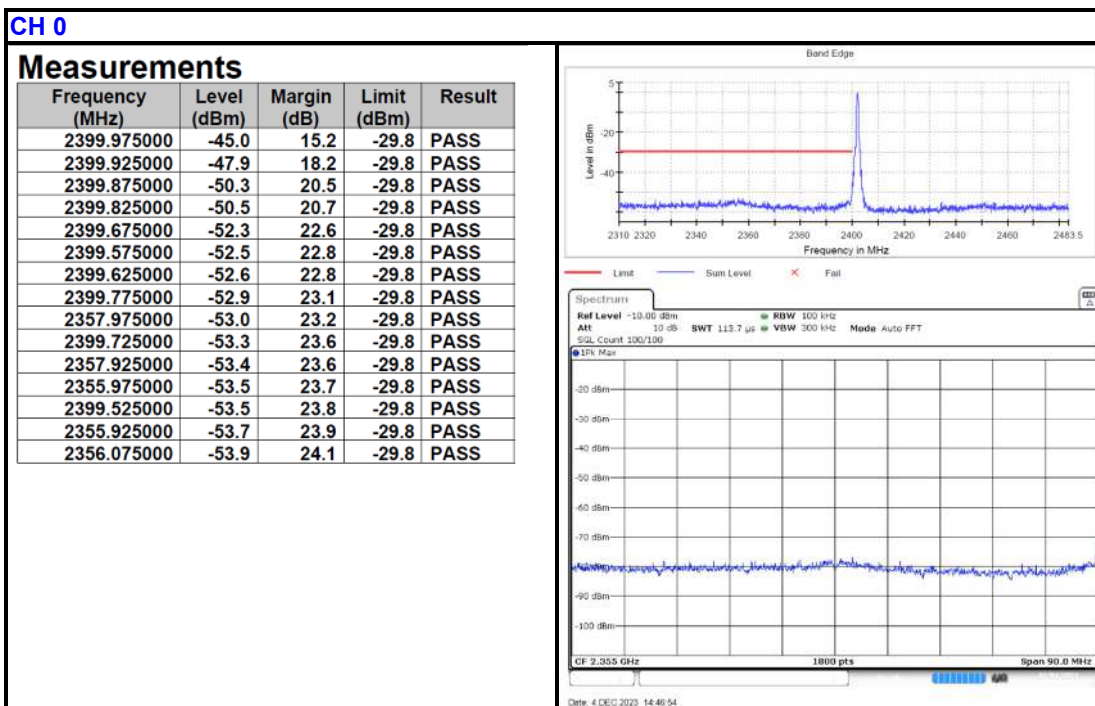


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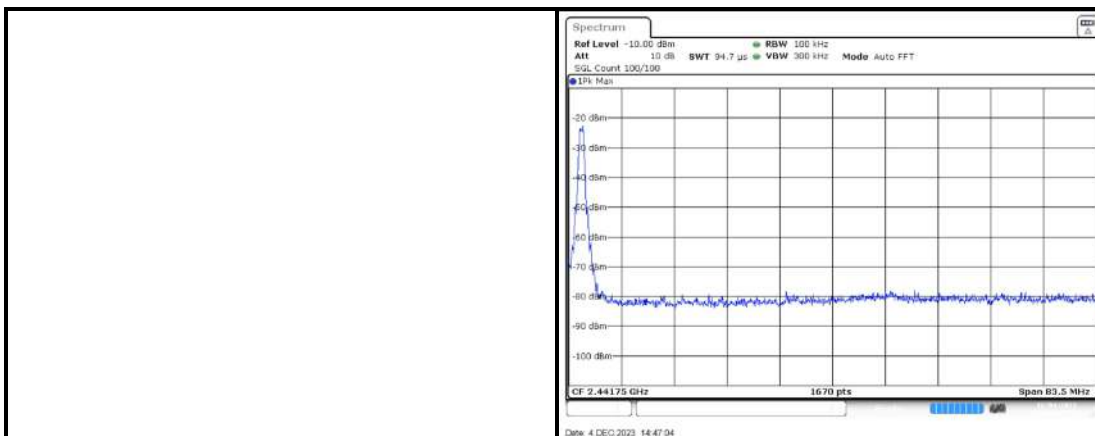
Internal Antenna

Test date: 12/4/2023





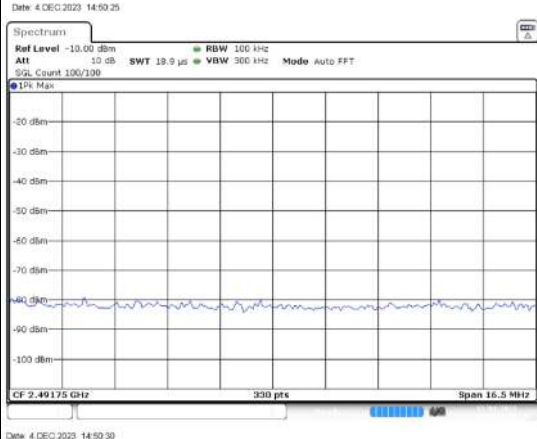
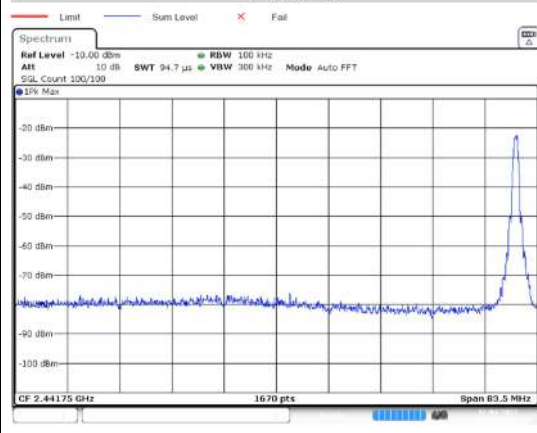
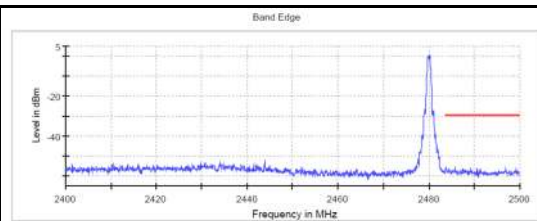
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Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2485.875000	-55.6	26.1	-29.4	PASS
2485.825000	-55.7	26.3	-29.4	PASS
2483.575000	-56.0	26.6	-29.4	PASS
2487.475000	-56.2	26.7	-29.4	PASS
2483.775000	-56.2	26.8	-29.4	PASS
2487.525000	-56.3	26.8	-29.4	PASS
2483.625000	-56.3	26.9	-29.4	PASS
2483.875000	-56.4	26.9	-29.4	PASS
2484.425000	-56.4	26.9	-29.4	PASS
2484.375000	-56.4	27.0	-29.4	PASS
2491.375000	-56.5	27.0	-29.4	PASS
2483.725000	-56.5	27.0	-29.4	PASS
2496.925000	-56.5	27.1	-29.4	PASS
2490.625000	-56.5	27.1	-29.4	PASS
2496.975000	-56.6	27.1	-29.4	PASS





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5 PHOTOGRAPHS OF THE TEST CONFIGURATIONS

Please refer to the Test Setup Photos exhibit.



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6 MODIFICATIONS TO THE EUT DURING TESTING

None.

---END OF REPORT---