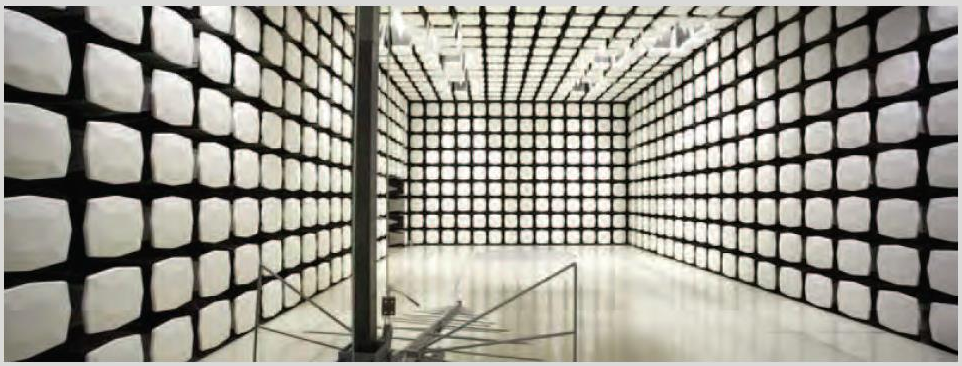
Pehratek Products

Remote Control for XM-5000 RF
FCC 15.231:2022
Low Power Radio

Report: PEHR0004.6, Issue Date: June 20, 2022



CERT #3310.05

CERTIFICATE OF TEST

Last Date of Test: June 6, 2022
Pehratek Products
EUT: Remote Control for XM-5000 RF

Radio Equipment Testing

Standards

Specification	Method
FCC 15.231:2022	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions (Transmitter)	No	N/A	Not required for a battery powered EUT.
6.5, 6.6	Field Strength of Fundamental	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.9.2	Emissions Bandwidth	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Eric Brandon, Department Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

European Union

European Commission – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIT / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

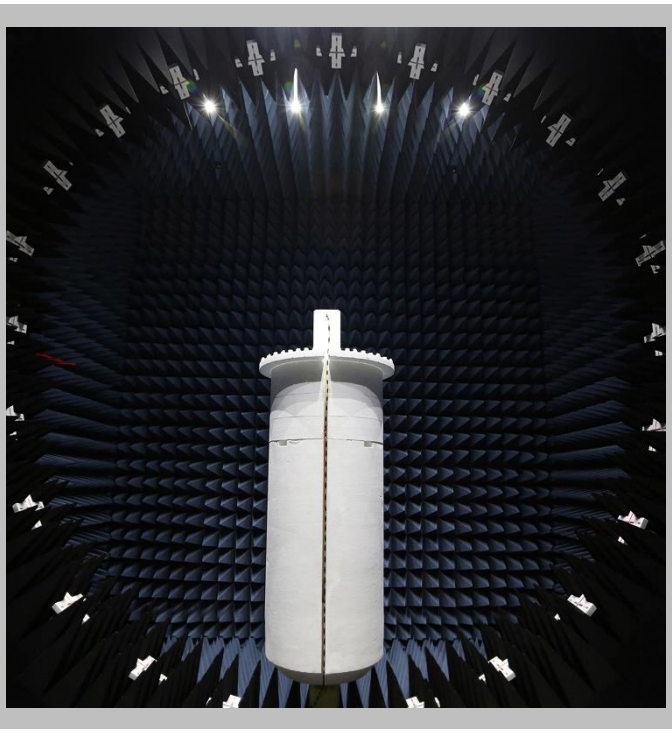
For details on the Scopes of our Accreditations, please visit:

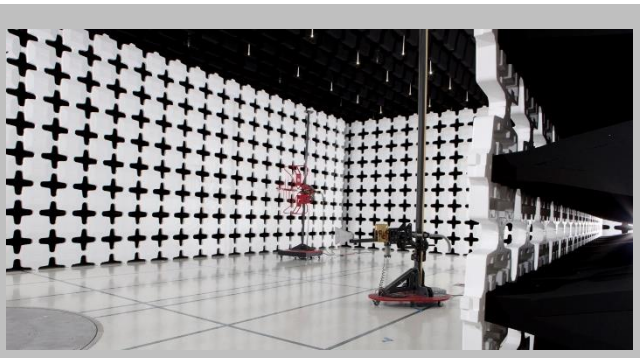
California Minnesota Oregon Texas Washington

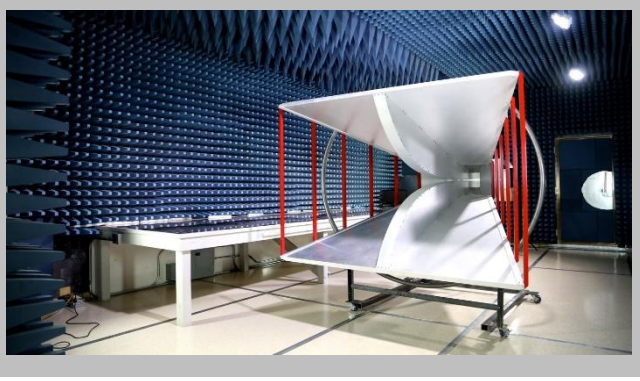
FACILITIES

element
2020.12.15

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found in the table below. A lab specific value may also be found in the applicable test description section. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	3.2 dB	-3.2 dB

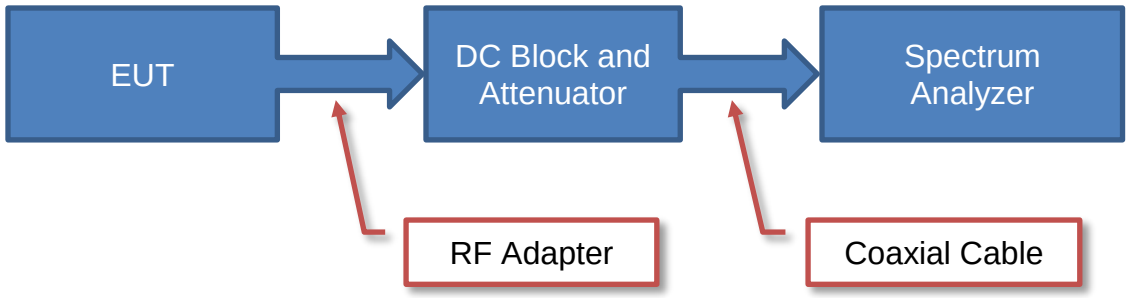
TEST SETUP BLOCK DIAGRAMS

Measurement Bandwidths

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Unless otherwise stated, measurements were made using the bandwidths and detectors specified. No video filter was used.

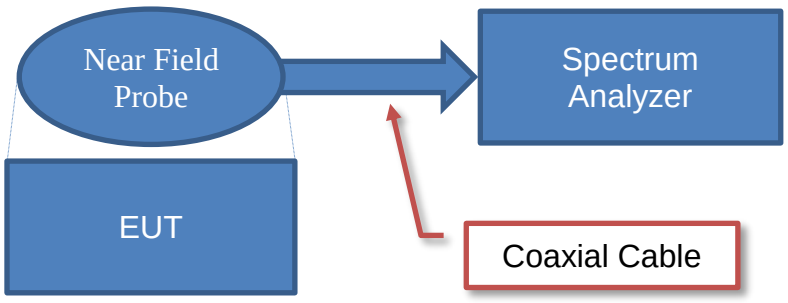
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

Near Field Test Fixture Measurements

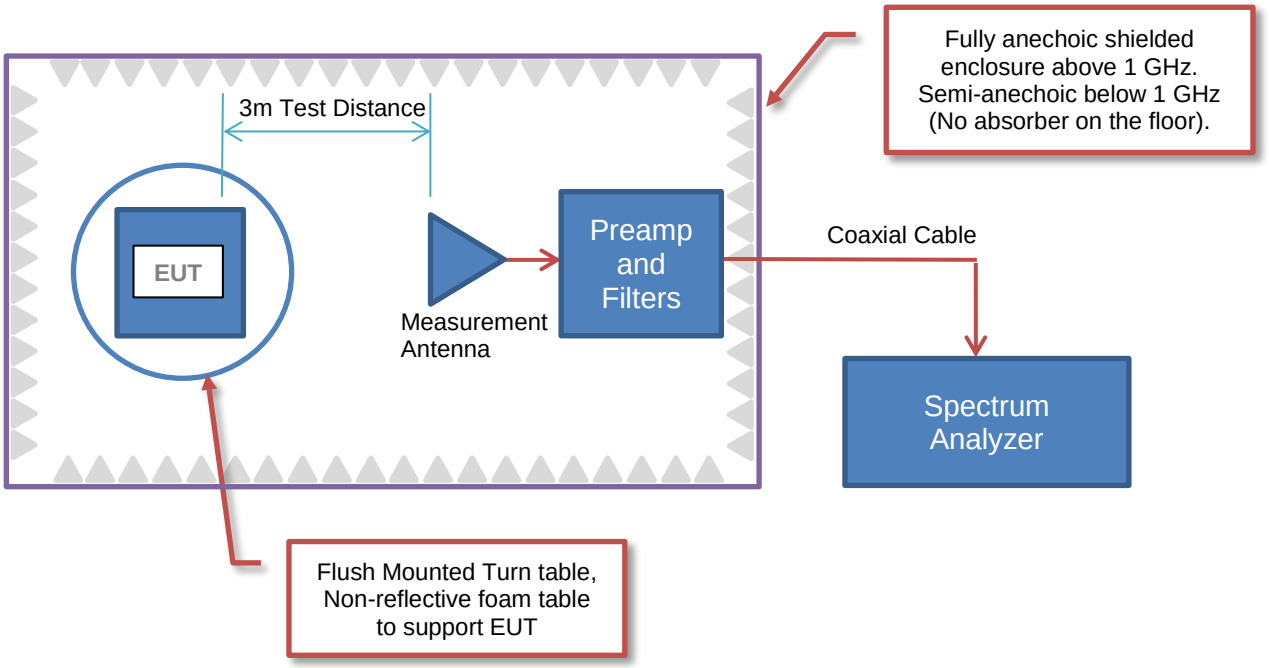


Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

Measured Level (Amplitude)		Factor: Antenna Factor		Factor: Cable Factor		Factor: Amplifier Gain		Distance Adjustment Factor		External Attenuation		Field Strength
42.6	+	28.6	+	3.1	-	40.8	+	0.0	+	0.0	=	**33.5**

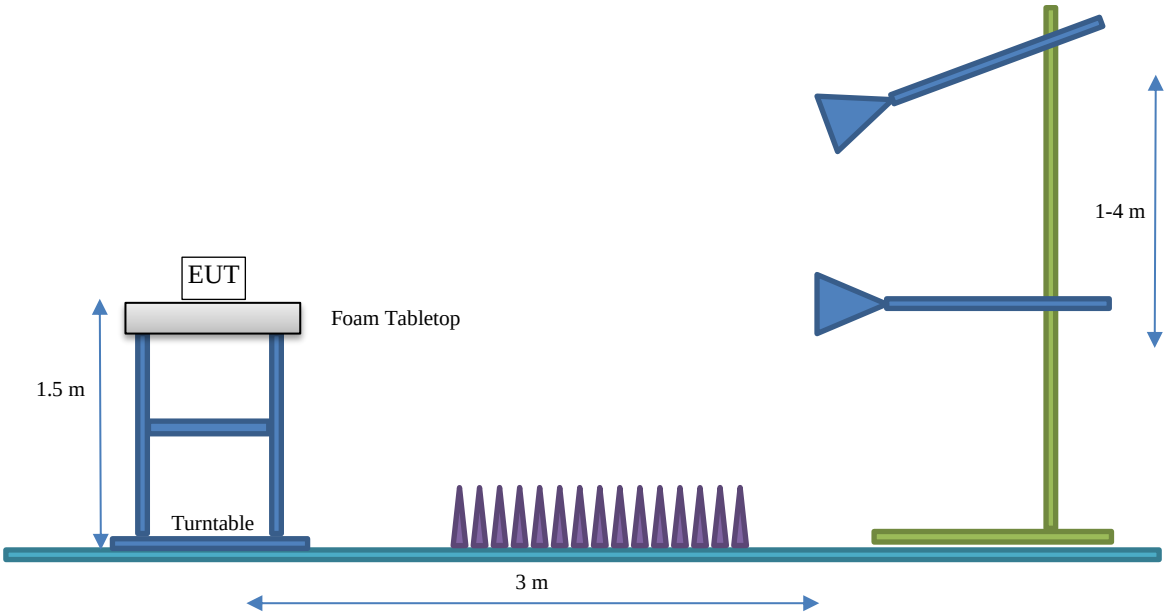
Conducted Emissions:

Measured Level (Amplitude)		Factor: Transducer Factor		Factor: Cable Factor		External Attenuation		Adjusted Level
26.7	+	0.3	+	0.1	+	20.0	=	**47.1**

TEST SETUP BLOCK DIAGRAMS

Bore Sighting (>1GHz)

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. Above 1 GHz, when required by the measurement standard, the antenna is pointed for both azimuth and elevation to maintain the receive antenna within the cone of radiation from the EUT. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Pehratek Products
Address:	9285 Pierson Lake Road
City, State, Zip:	Chaska, MN 55318
Test Requested By:	Jim Pehringer
EUT:	Remote Control for XM-5000 RF
First Date of Test:	March 2, 2022
Last Date of Test:	June 6, 2022
Receipt Date of Samples:	March 2, 2022
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Visual Reinforcement Apparatus (VRA/COR). Utilizes a periodic radio to send short bursts of data which triggers a nearby visual reinforcement audiometer, typically for distraction purposes.

Testing Objective:
To demonstrate compliance to FCC 15.231 specifications.

CONFIGURATIONS

Configuration PEHR0004- 4

Software/Firmware Running During Test	
Description	**Version**
Continuous Test Firmware	1.0

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
XM-5000 RF Remote	Pehratek Products	None	Sample 1

Configuration PEHR0004- 7

Software/Firmware Running During Test	
Description	**Version**
Timing Test Firmware	1.1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
XM-5000 RF Remote	Pehratek Products	None	Sample 2

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2022-03-02	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2022-03-02	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2022-03-03	Emissions Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2022-06-06	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWER SETTINGS AND ANTENNAS

The power settings, antenna gain value(s) and cable loss (if applicable) used for the testing contained in this report were provided by the customer and will affect the validity of the results. Element assumes no responsibility for the accuracy of this information. The power settings below reflect the maximum power that the EUT is allowed to transmit at during normal operation.

ANTENNA GAIN (dBi)

Type	Provided by:	Frequency Range (MHz)	Gain (dBi)
Monopole	Manufacturer	433 MHz	1.9 dBi

The EUT was tested using the power settings provided by the manufacturer which were based upon:

☐ Test software settings
☒ Rated power settings

SETTINGS FOR ALL TESTS IN THIS REPORT

XM-5000 and remote control	Power Setting
Periodic	-5 dBm

FIELD STRENGTH OF FUNDAMENTAL

PSA-ESCI 2022.1.12.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

RF remote transmitting at 434 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

PEHR0004 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	1000 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Amplifier - Pre-Amplifier	Miteq	AM-1064-9079 and SA18E-10	AOO	2022-01-24	2023-01-24
Cable	Element	Biconilog Cable	MNX	2022-01-24	2023-01-24
Antenna - Biconilog	Ametek	CBL 6141B	AYS	2021-03-09	2023-03-09

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was configured for continuous un-modulated CW operation at its single transmit frequency. The field strength of the transmit frequency was maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT in 3 orthogonal planes (per ANSI C63.10:2013).

Peak measurements were made with a resolution bandwidth of 100 kHz and a video bandwidth of 300 kHz for measurements at or below 1 GHz. A duty cycle correction factor was added to the peak readings to mathematically derive the average levels. The supporting screen captures and duty cycle calculation is contained in the “Duty Cycle” module in this report.

FIELD STRENGTH OF FUNDAMENTAL

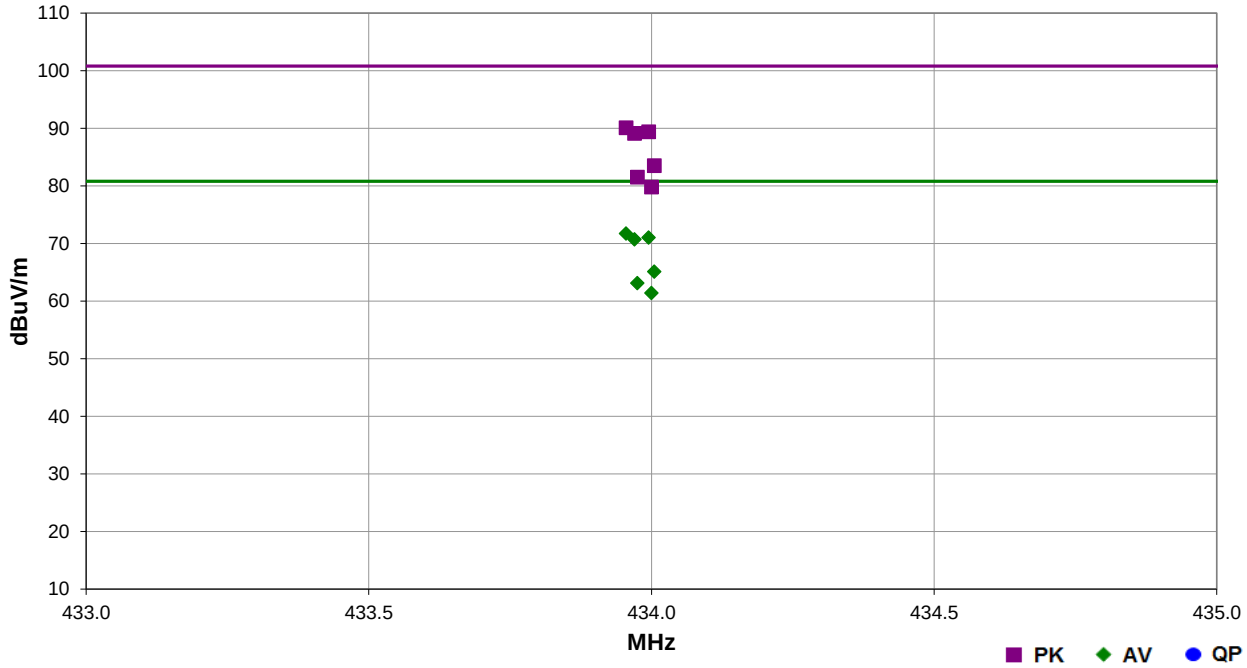
element

EmiR5 2021.12.28.2 PSA-ESCI 2022.1.12.0

Work Order:	PEHR0004	**Date:**	2022-03-02		
Project:	None	**Temperature:**	23.7 °C		
Job Site:	MN09	**Humidity:**	25% RH		
Serial Number:	1	**Barometric Pres.:**	1023 mbar	**Tested by:**	Chris Patterson
EUT:	Remote Control for XM-5000 RF				
Configuration:	4				
Customer:	Pehratek Products				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	RF remote transmitting at 434 MHz				
Deviations:	None				
Comments:	Duty Cycle Correction Factor = 20 log [((1)(12.01))/100] = -18.4 dB				

Test Specifications	**Test Method**
FCC 15.231(b):2022	ANSI C63.10:2013

Run #	19	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
433.955	89.0	1.1	1.2	144.0	-18.4	0.0	Vert	AV	0.0	71.7	80.8	-9.1	EUT Vert
433.995	88.3	1.1	2.0	232.0	-18.4	0.0	Horz	AV	0.0	71.0	80.8	-9.8	EUT Horz
433.970	88.0	1.1	2.3	240.0	-18.4	0.0	Horz	AV	0.0	70.7	80.8	-10.1	EUT On Side
433.955	89.0	1.1	1.2	144.0		0.0	Vert	PK	0.0	90.1	100.8	-10.7	EUT Vert
433.995	88.3	1.1	2.0	232.0		0.0	Horz	PK	0.0	89.4	100.8	-11.4	EUT Horz
433.970	88.0	1.1	2.3	240.0		0.0	Horz	PK	0.0	89.1	100.8	-11.7	EUT On Side
434.005	82.4	1.1	1.1	143.0	-18.4	0.0	Vert	AV	0.0	65.1	80.8	-15.7	EUT On Side
434.005	82.4	1.1	1.1	143.0		0.0	Vert	PK	0.0	83.5	100.8	-17.3	EUT On Side
433.975	80.4	1.1	2.1	148.0	-18.4	0.0	Vert	AV	0.0	63.1	80.8	-17.7	EUT Horz
433.975	80.4	1.1	2.1	148.0		0.0	Vert	PK	0.0	81.5	100.8	-19.3	EUT Horz
434.000	78.7	1.1	3.2	232.0	-18.4	0.0	Horz	AV	0.0	61.4	80.8	-19.4	EUT Vert
434.000	78.7	1.1	3.2	232.0		0.0	Horz	PK	0.0	79.8	100.8	-21.0	EUT Vert

SPURIOUS RADIATED EMISSIONS

element

PSA-ESCI 2022.1.12.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

RF remote transmitting at 434 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

PEHR0004 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	8200 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	2022-01-24	2023-01-24
Cable	Element	Double Ridge Guide Horn Cables	MNV	2022-01-24	2023-01-24
Antenna - Double Ridge	ETS Lindgren	3115	AIB	2020-09-03	2022-09-03
Amplifier - Pre-Amplifier	Miteq	AM-1064-9079 and SA18E-10	AOO	2022-01-24	2023-01-24
Cable	Element	Biconilog Cable	MNX	2022-01-24	2023-01-24
Antenna - Biconilog	Ametek	CBL 6141B	AYS	2021-03-09	2023-03-09

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequency in each operational band and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = Calculated Average based on Peak and Duty Cycle Correction Factor

Peak measurements were made with a resolution bandwidth of 100 kHz and a video bandwidth of 300 kHz for measurements at or below 1 GHz. Above 1 GHz, a resolution bandwidth of 1 MHz and a video bandwidth of 3 MHz was used.

A duty cycle correction factor was added to the peak readings to mathematically derive the average levels. The supporting screen captures and duty cycle calculation is contained in the “Duty Cycle” module in this report.

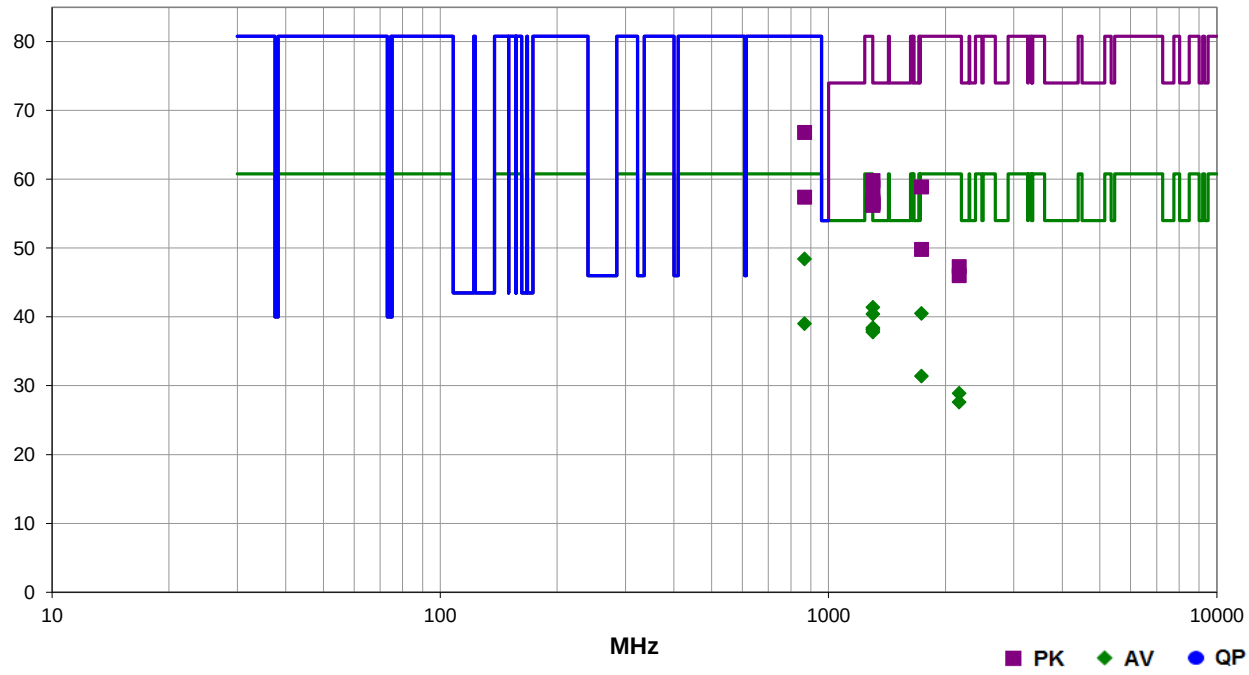
SPURIOUS RADIATED EMISSIONS

EmiR5 2021.12.28.2 PSA-ESCI 2022.1.12.0

Work Order:	PEHR0004	**Date:**	2022-03-02		
Project:	None	**Temperature:**	22.7 °C		
Job Site:	MN09	**Humidity:**	25.7% RH		
Serial Number:	1	**Barometric Pres.:**	1021 mbar	**Tested by:**	Chris Patterson
EUT:	Remote Control for XM-5000 RF				
Configuration:	4				
Customer:	Pehratek Products				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	RF remote transmitting at 434 MHz				
Deviations:	None				
Comments:	Duty Cycle Correction Factor = 20 log [((1)(12.01))/100] = -18.4 dB				

Test Specifications	**Test Method**
FCC 15.231(b):2022	ANSI C63.10:2013

Run #	13	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
867.970	56.5	10.3	2.1	249.0	-18.4	0.0	Horz	AV	0.0	48.4	60.8	-12.4	EUT Horz
1302.040	65.5	-5.7	3.6	310.0	-18.4	0.0	Vert	AV	0.0	41.4	54.0	-12.6	EUT On Side
1301.880	64.5	-5.7	1.7	27.0	-18.4	0.0	Horz	AV	0.0	40.4	54.0	-13.6	EUT Horz
867.970	56.5	10.3	2.1	249.0		0.0	Horz	PK	0.0	66.8	80.8	-14.0	EUT Horz
1302.040	65.5	-5.7	3.6	310.0		0.0	Vert	PK	0.0	59.8	74.0	-14.2	EUT On Side
1301.880	64.5	-5.7	1.7	27.0		0.0	Horz	PK	0.0	58.8	74.0	-15.2	EUT Horz
1301.830	62.5	-5.7	1.3	117.0	-18.4	0.0	Horz	AV	0.0	38.4	54.0	-15.6	EUT On Side
1301.960	62.3	-5.7	1.5	46.0	-18.4	0.0	Vert	AV	0.0	38.2	54.0	-15.8	EUT Vert
1301.790	62.2	-5.7	3.7	249.0	-18.4	0.0	Horz	AV	0.0	38.1	54.0	-15.9	EUT Vert
1302.080	61.9	-5.7	4.0	312.0	-18.4	0.0	Vert	AV	0.0	37.8	54.0	-16.2	EUT Horz
1301.830	62.5	-5.7	1.3	117.0		0.0	Horz	PK	0.0	56.8	74.0	-17.2	EUT On Side
1301.960	62.3	-5.7	1.5	46.0		0.0	Vert	PK	0.0	56.6	74.0	-17.4	EUT Vert
1301.790	62.2	-5.7	3.7	249.0		0.0	Horz	PK	0.0	56.5	74.0	-17.5	EUT Vert

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
1302.080	61.9	-5.7	4.0	312.0		0.0	Vert	PK	0.0	56.2	74.0	-17.8	EUT Horz
1735.920	63.3	-4.4	3.7	72.0	-18.4	0.0	Horz	AV	0.0	40.5	60.8	-20.3	EUT Horz
867.915	47.1	10.3	2.3	149.0	-18.4	0.0	Vert	AV	0.0	39.0	60.8	-21.8	EUT On Side
1735.920	63.3	-4.4	3.7	72.0		0.0	Horz	PK	0.0	58.9	80.8	-21.9	EUT Horz
867.915	47.1	10.3	2.3	149.0		0.0	Vert	PK	0.0	57.4	80.8	-23.4	EUT On Side
1735.750	54.2	-4.4	1.5	149.0	-18.4	0.0	Vert	AV	0.0	31.4	60.8	-29.4	EUT On Side
1735.750	54.2	-4.4	1.5	149.0		0.0	Vert	PK	0.0	49.8	80.8	-31.0	EUT On Side
2170.250	48.7	-1.4	3.0	76.0	-18.4	0.0	Horz	AV	0.0	28.9	60.8	-31.9	EUT Horz
2170.040	47.4	-1.4	1.1	239.0	-18.4	0.0	Vert	AV	0.0	27.6	60.8	-33.2	EUT On Side
2170.250	48.7	-1.4	3.0	76.0		0.0	Horz	PK	0.0	47.3	80.8	-33.5	EUT Horz
2170.040	47.4	-1.4	1.1	239.0		0.0	Vert	PK	0.0	46.0	80.8	-34.8	EUT On Side

EMISSIONS BANDWIDTH

XMit 2022.02.07.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Amplifier - Pre-Amplifier	Miteq	AM-1064-9079 and SA18E-10	AOO	2022-01-24	2023-01-24
Cable	Element	Biconilog Cable	MNX	2022-01-24	2023-01-24
Antenna - Biconilog	Ametek	CBL 6141B	AYS	2021-03-09	2023-03-09
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18

TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power.

The 20 dB occupied bandwidth is required to be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.

EMISSIONS BANDWIDTH

XMit 2022.02.07.0

EUT:	**Remote Control for XM-5000 RF**			**Work Order:**	**PEHR0004**
Serial Number:	**1**			**Date:**	**3-Mar-22**
Customer:	**Pehratek Products**			**Temperature:**	**22.2 °C**
Attendees:	**None**			**Humidity:**	**21.4% RH**
Project:	**None**			**Barometric Pres.:**	**1035 mbar**
Tested by:	**Chris Patterson**	**Power:**	**Battery**	**Job Site:**	**MN09**

TEST SPECIFICATIONS	**Test Method**
FCC 15.231:2022	ANSI C63.10:2013

COMMENTS

RF remote transmitting at 434 MHz. Limit = 434 MHz (0.0025) = 1.085 MHz. Modulation type FSK.

DEVIATIONS FROM TEST STANDARD

None

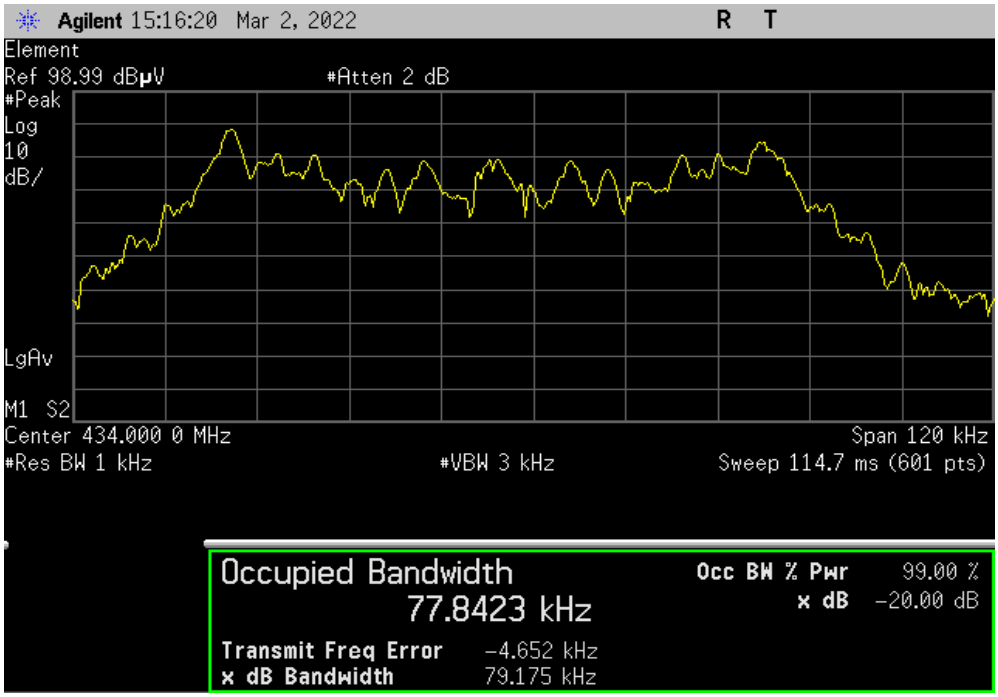
Configuration #	**4**	*Signature*

	Measured OBW (kHz)	**OBW Limit (MHz)**	**Result**
Occupied Bandwidth	79.175	≤ 1.085	Pass

EMISSIONS BANDWIDTH

XMit 2022.02.07.0

Occupied Bandwidth						
					OBW	
				Measured OBW (kHz)	Limit (MHz)	Result
				79.175	≤ 1.085	Pass



DUTY CYCLE

XMit 2022.02.07.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	Element	Biconilog Cable	MNX	2022-01-24	2023-01-24
Amplifier - Pre-Amplifier	Miteq	AM-1064-9079 and SA18E-10	AOO	2022-01-24	2023-01-24
Antenna - Biconilog	Ametek	CBL 6141B	AYS	2021-03-09	2023-03-09
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Block - DC	Fairview Microwave	SD3379	AMI	2021-08-13	2022-08-13
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18

TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power.

For software controlled or pre-programmed devices, the manufacturer shall declare the duty cycle class or classes for the equipment under test. For manually operated or event dependant devices, with or without software controlled functions, the manufacturer shall declare whether the device once triggered, follows a pre-programmed cycle, or whether the transmission is constant until the trigger is released or manually reset. The manufacturer shall also give a description of the application for the device and include a typical usage pattern. The typical usage pattern as declared by the manufacturer shall be used to determine the duty cycle and hence the duty class.

Where an acknowledgement is required, the additional transmitter on-time shall be included and declared by the manufacturer.

To derive average emission measurements, a duty cycle correction factor was utilized:

Duty Cycle = On time/100 milliseconds (or the period, whichever is less)

Where “On time” = N1L1 +N2L2 +….

Where N1 is the number of type 1 pulses, L1 is length of type 1 pulses, N2 is the number of type 2 pulses, L2 is the length of type 2 pulses, etc.

Therefore, Duty Cycle = (N1L1 +N2L2 +…)/100mS or T, whichever is less. (Where T is the period of the pulse train.)

The measured values for the EUT’s pulse train are as follows:

Period = 100 mSec
Pulsewidth of Type 1 Pulse = 12.01 mSec
Number of Type 1 Pulses = 1

Duty Cycle Correction Factor = 20 log [((1)(12.01))/100] = -18.4 dB

The duty cycle correction factor of -18.4 dB was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100kHz and a video bandwidth of 300kHz.

DUTY CYCLE

element

XMit 2022.02.07.0

EUT:	**Remote Control for XM-5000 RF**			**Work Order:**	**PEHR0004**
Serial Number:	**1**			**Date:**	**3-Mar-22**
Customer:	**Pehratek Products**			**Temperature:**	**22.3 °C**
Attendees:	**None**			**Humidity:**	**20.9% RH**
Project:	**None**			**Barometric Pres.:**	**1036 mbar**
Tested by:	**Chris Patterson**	**Power:**	**Battery**	**Job Site:**	**MN09**

TEST SPECIFICATIONS	**Test Method**
FCC 15.231:2022	ANSI C63.10:2013

COMMENTS

RF remote transmitting at 434 MHz. Modulation type FSK.

DEVIATIONS FROM TEST STANDARD

None

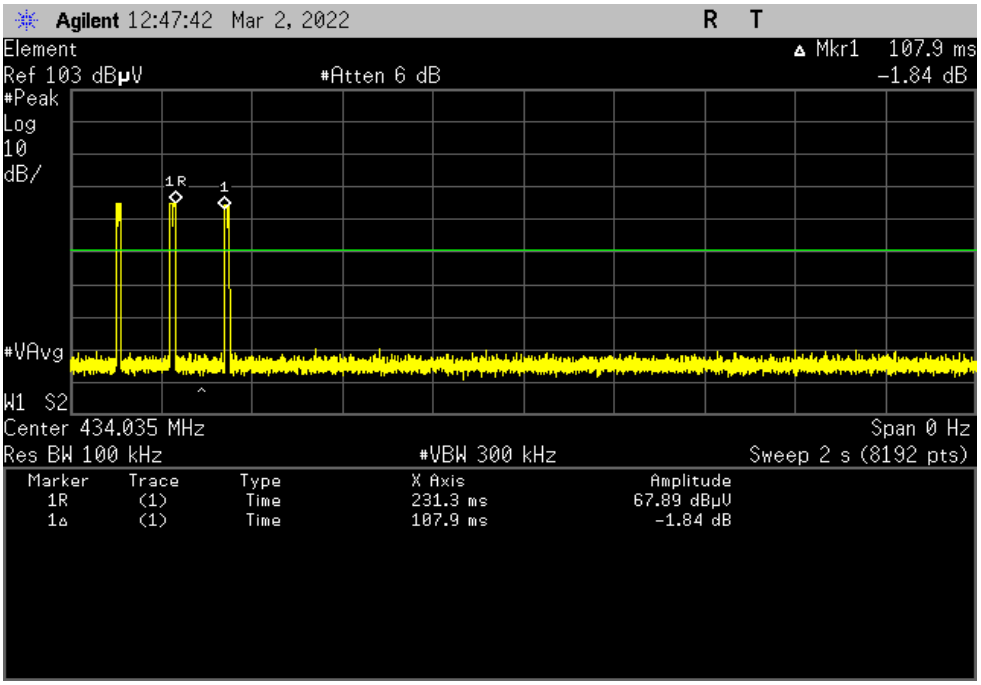
Configuration #	**4**	*Signature*

	Type 1 Pulse Width (ms)	**Type 1 Pulse Count**	**On Time in 100 ms**
2 s	N/A	N/A	N/A
100 ms	N/A	N/A	N/A
20 ms	12.01	1	12.01

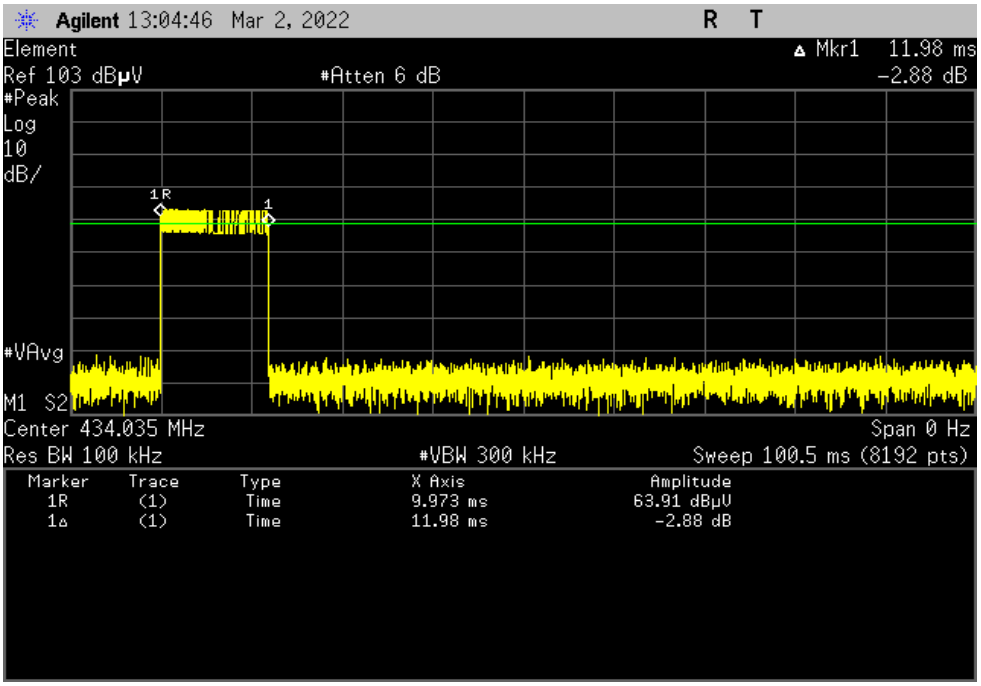
DUTY CYCLE

element
XMit 2022.02.07.0

2 s							
					Type 1 Pulse Width (ms)	Type 1 Pulse Count	On Time in 100 ms
					N/A	N/A	N/A



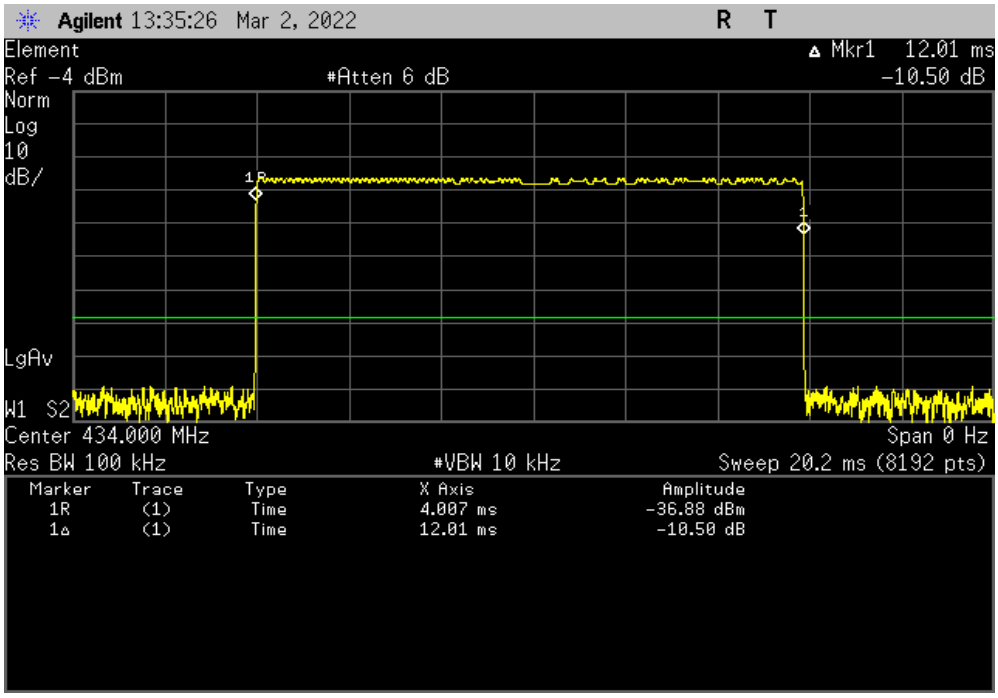
100 ms							
					Type 1 Pulse Width (ms)	Type 1 Pulse Count	On Time in 100 ms
					N/A	N/A	N/A



DUTY CYCLE

XMit 2022.02.07.0

20 ms						
				Type 1 Pulse Width (ms)	Type 1 Pulse Count	On Time in 100 ms
				12.01	1	12.01



DUTY CYCLE

XMit 2022.02.07.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12
Block - DC	Fairview Microwave	SD3379	AMI	2021-08-13	2022-08-13
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2022-04-25	2023-04-25

TEST DESCRIPTION

A near-field probe was placed near the transmitter. A low-loss coaxial cable was used to connect the near-field probe to the spectrum analyzer.

For software controlled or pre-programmed devices, the manufacturer shall declare the duty cycle class or classes for the equipment under test. For manually operated or event dependant devices, with or without software controlled functions, the manufacturer shall declare whether the device once triggered, follows a pre-programmed cycle, or whether the transmission is constant until the trigger is released or manually reset. The manufacturer shall also give a description of the application for the device and include a typical usage pattern. The typical usage pattern as declared by the manufacturer shall be used to determine the duty cycle and hence the duty class.

It was verified that the transmitter stopped transmitting within 5 seconds of the button being released. This was checked for when the button was held for longer than 5 seconds and for when the button was pressed for a short period of time. The time between button release and the end of transmission was measured and compared against the limit to determine compliance.

DUTY CYCLE

XMit 2022.02.07.0

EUT:	Remote Control for XM-5000 RF			Work Order:	PEHR0004
Serial Number:	2			Date:	6-Jun-22
Customer:	Pehratek Products			Temperature:	20.6 °C
Attendees:	None			Humidity:	49.5% RH
Project:	None			Barometric Pres.:	1010 mbar
Tested by:	Christopher Heintzelman	Power:	Battery	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.231:2022	ANSI C63.10:2013

COMMENTS

The value indicates how many seconds the last transmission occurred after the release of the button. RF remote transmitting at 434 MHz. Modulation type FSK.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	7	Signature

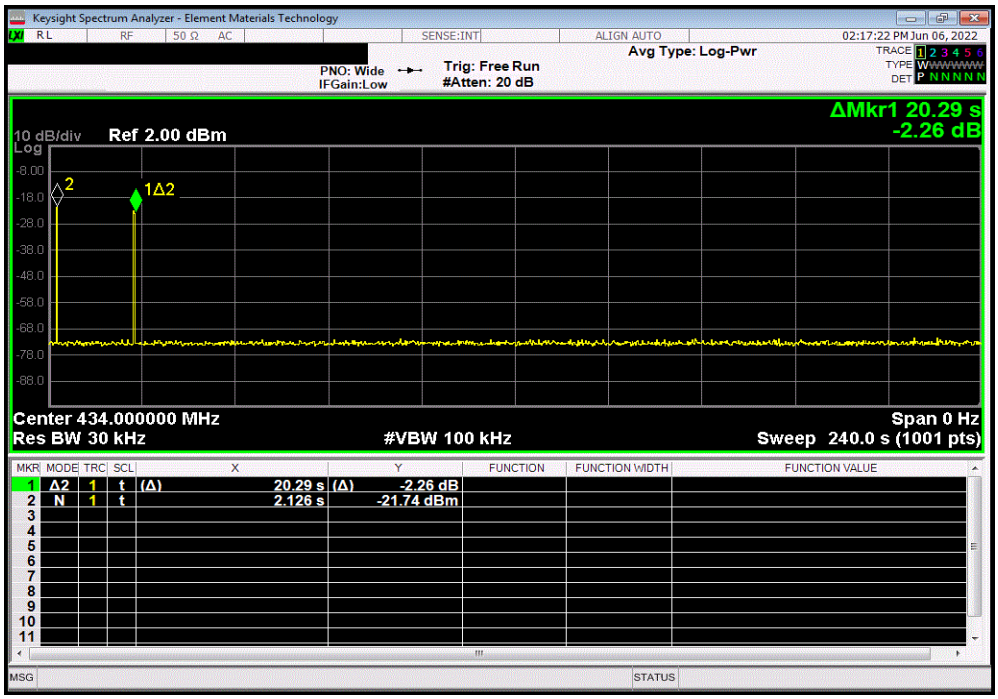
	Value (s)	Limit (s)	Result
Button held 20 seconds, 240 second span	0.3	5.0	Pass
Button held 20 seconds, 60 second span	-0.1	5.0	Pass
Button single press 240 second span	4.0	5.0	Pass
Button single press 60 second span	4.0	5.0	Pass
Button single press 5 second span	4.1	5.0	Pass

DUTY CYCLE

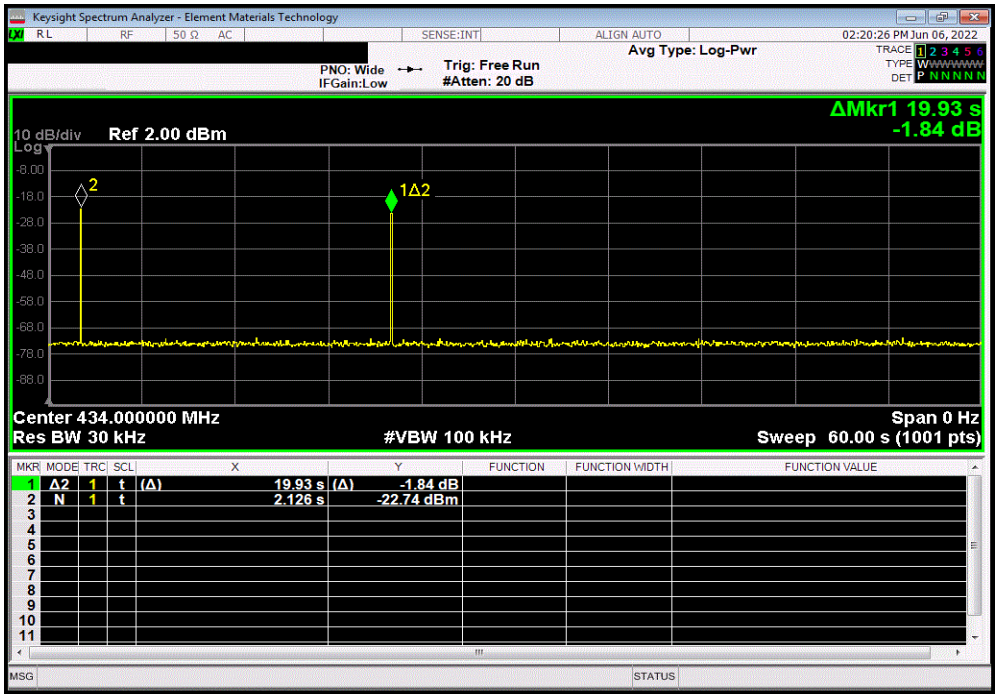
element

XMit 2022.02.07.0

Button held 20 seconds, 240 second span						
				Value (s)	Limit (s)	Result
				0.29	5.0	Pass



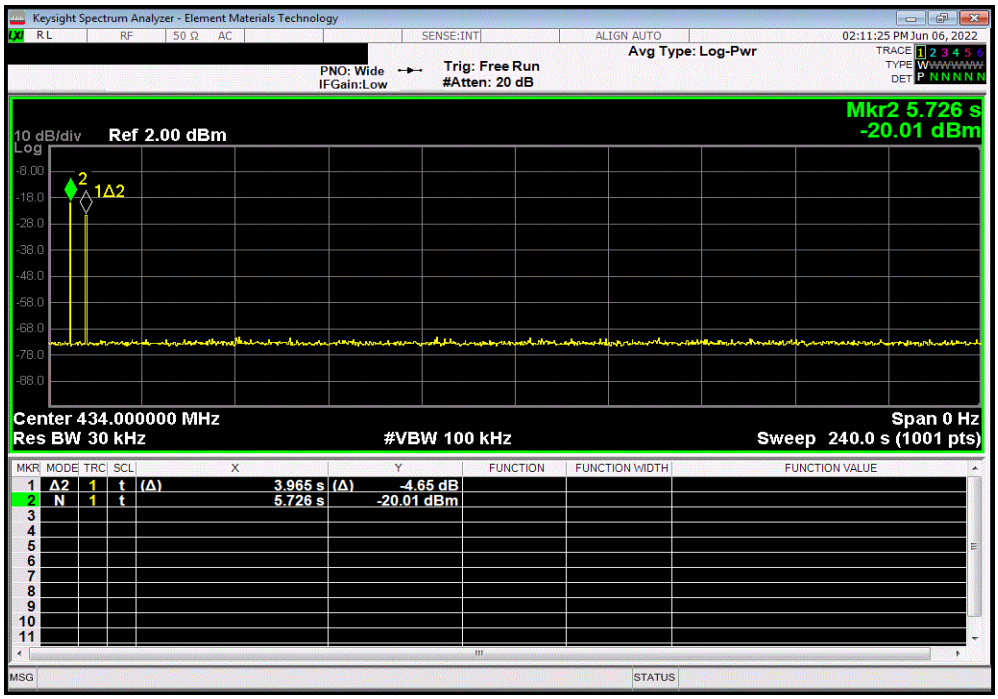
Button held 20 seconds, 60 second span						
				Value (s)	Limit (s)	Result
				-0.1	5.0	Pass



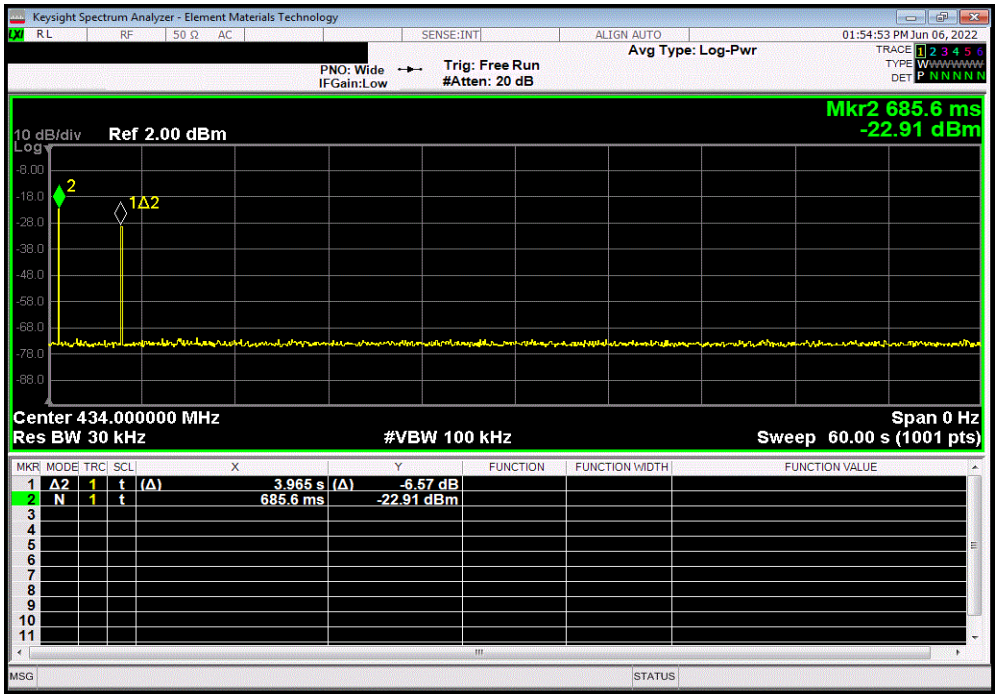
DUTY CYCLE

XMit 2022.02.07.0

Button single press 240 second span						
				Value (s)	Limit (s)	Result
				4.0	5.0	Pass



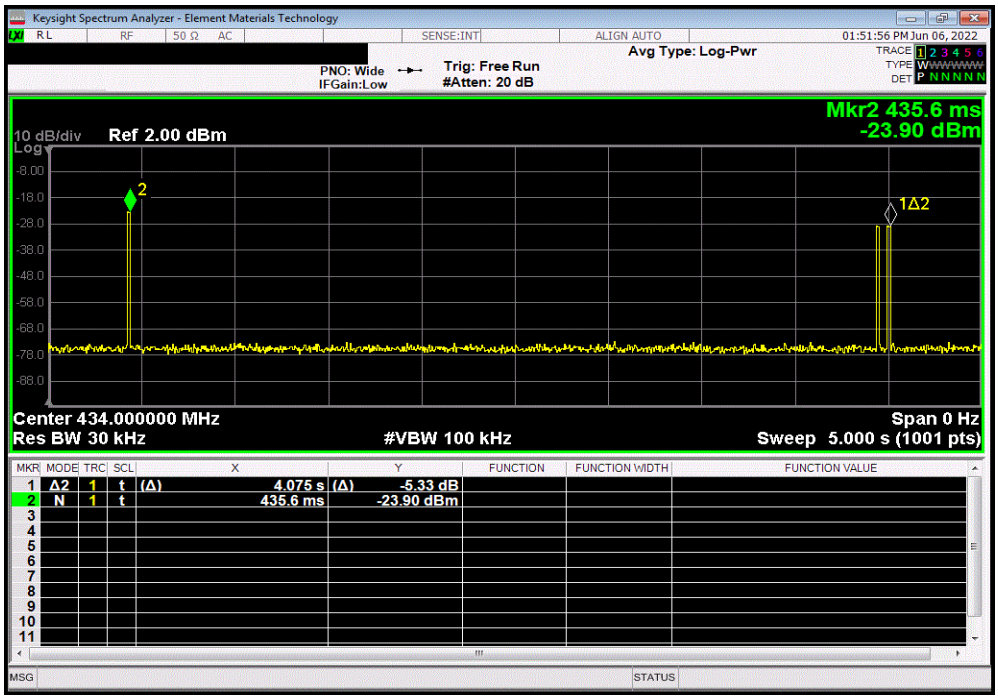
Button single press 60 second span						
				Value (s)	Limit (s)	Result
				4.0	5.0	Pass



DUTY CYCLE

XMit 2022.02.07.0

Button single press 5 second span						
				Value (s)	Limit (s)	Result
				4.1	5.0	Pass



End of Test Report