FOR THE SCOPE OF ACCREDITATION UNDER NVLAP LAB CODE 500051-0

TEST REPORT #010419

STANDARD: FCC PART 15

SUBPART C--INTENTIONAL RADIATORS

SECTION 15. 247 OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHZ, AND 5725-5850 MHZ

EQUIPMENT TESTED:

MX3 DIAGNOSTICS, INC.

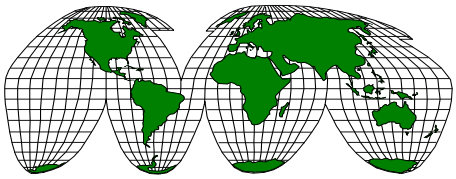
MODEL: HYD-PRO-18

FCC ID: 2ASD4-HYD-PRO-18

TEST DATE: 01 APRIL 2019

INTERNATIONAL

1100 Falcon Avenue
Glencoe, MN 55336



Tele: 320-864-4444
Fax: 320-864-6611

CERTIFICATION SERVICES, INC.

Prepared for:

MX3 Diagnostics, Inc.
2701 Stratford Drive
Austin, TX 78746

Test agent:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336
Tele: 320-864-4444
Fax: 320-864-6611

Test location:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336
Tele: 320-864-4444
Fax: 320-864-6611

Prepared by:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336

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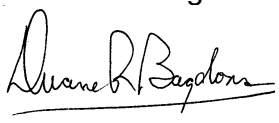
1.0 TEST SUMMARY

TEST REPORT: #010419	
COMPANY:	MX3 Diagnostics, Inc.
AGENT:	International Certification Services, Inc.
PHONE:	320-864-4444
TEST DATE:	01 April, 2019
EQUIPMENT UNDER TEST:	Hydration Measuring Instrument FCC ID: 2ASD4-HYD-PRO-18 Model: HYD-PRO-18
GENERAL TEST SUMMARY:	The testing was performed at International Certification Services, Inc. at 1100 Falcon Ave, Glencoe, MN 55336
VERIFICATION / CERTIFICATION STATUS:	The Hydration Measuring Instrument FCC ID: 2ASD4-HYD-PRO-18 Model: HYD-PRO-18 was found to be in compliance with the FCC Part 15 Subpart C, Section 15.247 requirements
MODIFICATIONS NECESSARY:	None

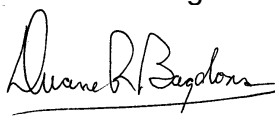
TESTED BY

Duane R. Bagdons



WRITTEN BY

Duane R. Bagdons



International Certification Services, Inc.

2.0 Applicable Standards

47 CFR Ch.1 (10-1-98 Edition)
FCC Part 15 Radio Frequency Devices
Subpart C Intentional Radiators
Section 15.247 Operation within the bands 902-928 Mhz, 2400-2483.5 Mhz and 5725-5850 Mhz.

3.0 Referenced Standards

ANSI C63.4-2014 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 Khz to 40 Ghz.
FCC DA- 00-705 Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
ANSI C63.4-2014 American National Standard for Methods of Measurement of Radio Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 Ghz
ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices, Section 11
FCC KDB 447498 D01 RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices.
FCC KDB 558074 D01 Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 of the FCC Rules V05R01
FCC KDB 447498 D01 General Exposure Guidance V06 Section 4.3.1

4.0 Equipment Units Tested

The equipment tested was a battery and AC powered 2400 to 2483.5 MHz transmitter. AC power comes from a plugin wall wart type USB charger. The product is typically used only with the internal battery power, but the battery can be charged from the AC public Mains during operation, so the unit was tested with AC power applied to it. The antenna is an integrated chip soldered onto the PC board. The Antenna is a Model: 2450AT42E010B surface mount, above metal, low profile mini chip antenna made by Johanson Technology. The gain of the antenna is specified at -2 peak dBi. This device uses a Nordic Semiconductor Model: nRF52832 for the Bluetooth Transceiver circuitry. The Hydration Measuring Instrument Model: Hyd-Pro-18 was configured as normal operation and was programmed to provide the special test sequences that were required to test to the FCC 15.247 requirements.

5.0 Equipment and Cable Configuration

See photo of the EUT test configuration setup in Attachment A

6.0 List of Test Equipment

Test Equipment	Model	S/N	Next Calibration Date
Spectrum Analyzer	Hewlett-Packard 8566B	2421A00458	12/01/19
Preamp	MiniCircuits ZKL-2R7	N/A	12/26/18
Preamp	Comlilnear Corporation CLC-102	22773	03/07/18
Preamp	Nextec NB00391	378	03/22/19
Loop Antenna	Electrometrics ALP-11 / EM-6870	286	06/01/18
Loop Antenna	EMCO 6512	8912-1074	06/01/18
Biconical Antenna	AH Systems Model SAS-200/540	328	04/17/18
Log Periodic Antenna (200-1000 MHz)	EMCO 3146	9111-3280	04/17/18
Horn Antenna (1-18 Ghz)	EMCO 3115	5697	08/17/18
Horn Antenna (3.95-5.85 Ghz)	Systron Donner DBK-520-15		05/26/18
Horn Antenna (5.4-8.2 Ghz)	Narda 642	207	05/26/18
Horn Antenna (8.2-12.4 Ghz)	Scientific Atlanta 8.2-12.4	1172	05/26/18
Horn Antenna (12.4-18 Ghz)	Alpha Industries 61932400	30	05/26/18
Horn Antenna (18-26 Ghz	Alpha Industries 61932500	55	05/26/18

All equipment is on a 2 year calibration cycle
Measurement cable losses, and antenna correction factors are included in the data sheets.

7.0 Units of Measurement.

Field strength measurements were recorded in dBm/m and dBuV/m with the antenna located at 3 meters distance from the EUT. Frequency measurements are recorded in Mhz

8.0 Location of Test Site

The open area test site (OATS) measurement facility used to collect the data was International Certification Services, Inc. at 1100 Falcon Ave in Glencoe, MN 55336. This site has been certified to be in spec of the normalized site attenuation per ANSI C63.4-2014**.**

9.0 Measurement Procedures

The antenna was placed at a distance of 3 meters from the EUT. The EUT was set on an insulating table in the OATS site and rotated through 360 degrees to determine the worst case EUT orientation. The antenna was then positioned vertical and horizontal to determine which antenna polarity orientation was worst case. Then certification data was recorded at all the transmitter frequencies from the fundamental to the 10th harmonic at an antenna height variation of from 1-4 meters.

10.0 Reporting Measurement Data

See data sheets and plots in Attachment B.

11.0 Radiated Emissions Data

The frequency and amplitude of the tuned frequency of the EUT along with the frequencies and amplitudes of the harmonics up to the 10th harmonic are reported in the data sheets in Attachment B. This information is plotted against the limit of section 15.247 of FCC Part 15 subpart C. Both Horizontal and Vertical antenna polarities as well as antenna heights of 1 to 4 meters were observed but all maximum signal strengths occurred in the Horizontal antenna polarity and at 1.5 meter antenna height.

The Final Level, expressed in dBuV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBuV) and adding the antenna correction factor and cable loss factor (Factor dB) and subtracting the preamp gain. This result then has the FCC limit subtracted from it to provide the margin which gives the tabular data as shown in the data sheets in Attachment B.

Example:

Frequency	**Level**	+	**Factor**	=	**Corr Data**	-	**FCC Limit**	=	**Margin**
(MHz)	**(dBuV)**	+	**(dB)**	=	(dBuV/m)	-	**(dBuV/m)**	=	**(dB)**
100.0	20.6	+	11.0	=	31.6	-	43.5	=	-11.9

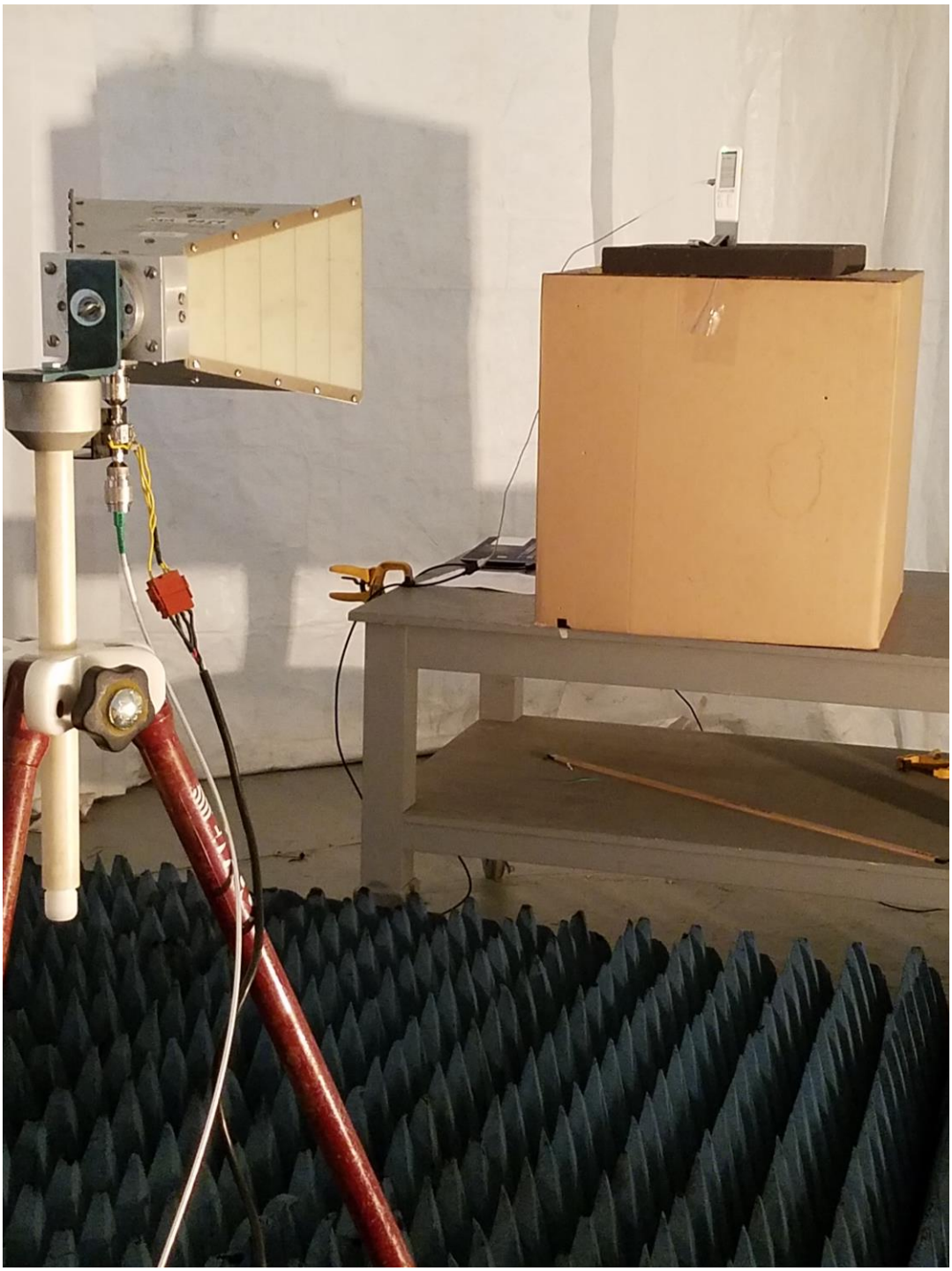
12.0 Summary of Results

The EUT passed the requirements of FCC Part 15 Subpart C, Section 15.247 as a DTS device. No modifications were necessary to accomplish this compliance.

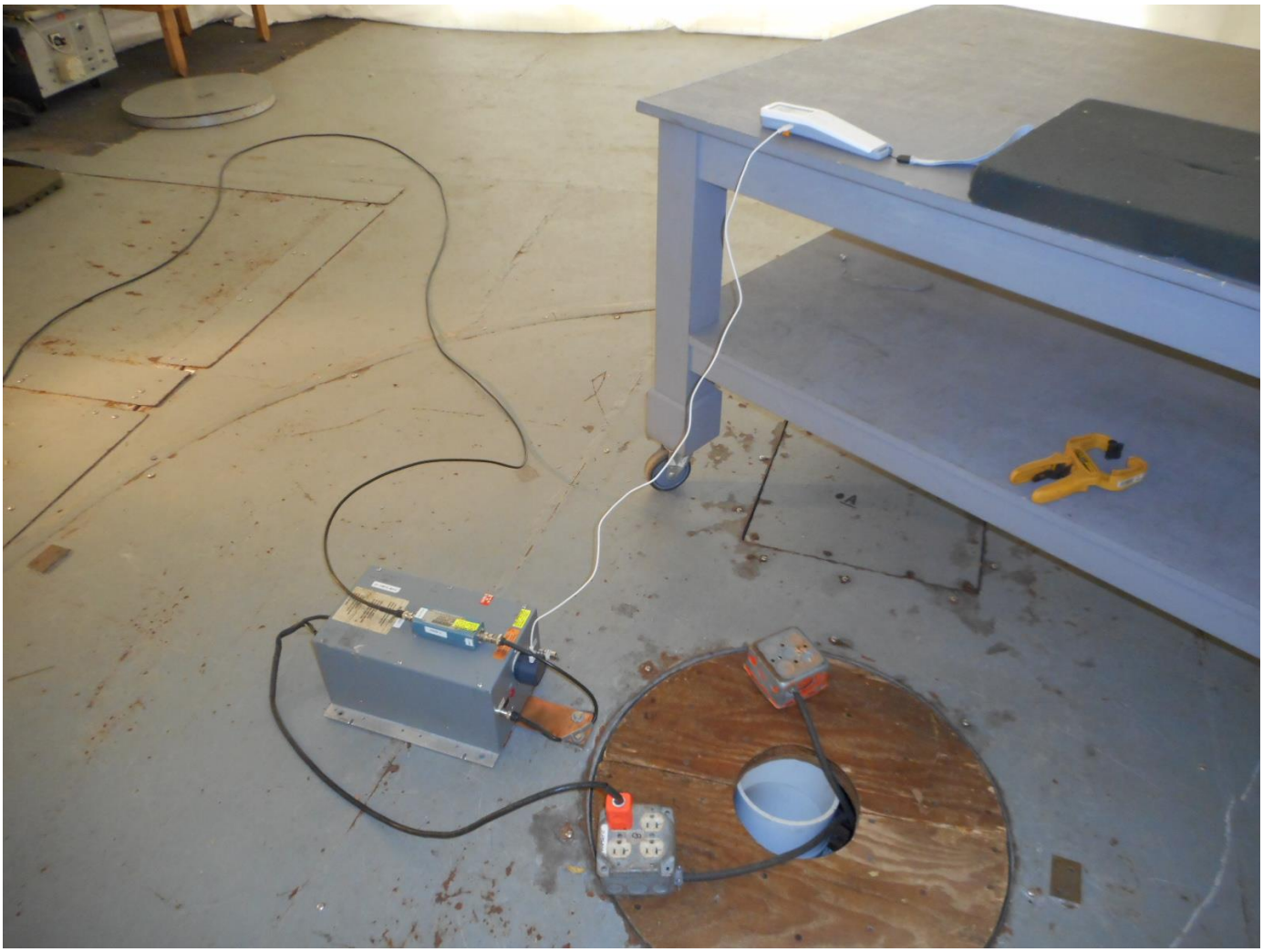
13.0 Attachment A Test Set Up

RADIATED AND CONDUCTED MEASUREMENT TEST SET UP

MX3 Diagnostics, Inc.
Model: Hyd-Pro-18
FCC ID: 2ASD4-HYD-PRO-18
Radiated Emissions Test Configuration



MX3 Diagnostics, Inc.
Model: Hyd-Pro-18
FCC ID: 2ASD4-HYD-PRO-18
Conducted Emissions Test Configuration



14.0 Attachment B Test Data

MX3 Diagnostics, Inc.
Model: HYD-PRO-18
FCC ID: 2ASD4-HYD-PRO-18
Temperature: 10.5 Deg C.
Humidity: 68 % R.H.

Test Technician: Duane R. Bagdons

Center Frequency: 2402.159 Mhz (low channel)
2440.11 Mhz (mid channel)
2480.105 Mhz (high channel)

Preliminary testing was done to determine what antenna polarity and antenna height generated the highest signal levels. Tests were performed at this test configuration and then each frequency was maximized to 0-360 degrees orientation and antenna height of 1-4 meters.

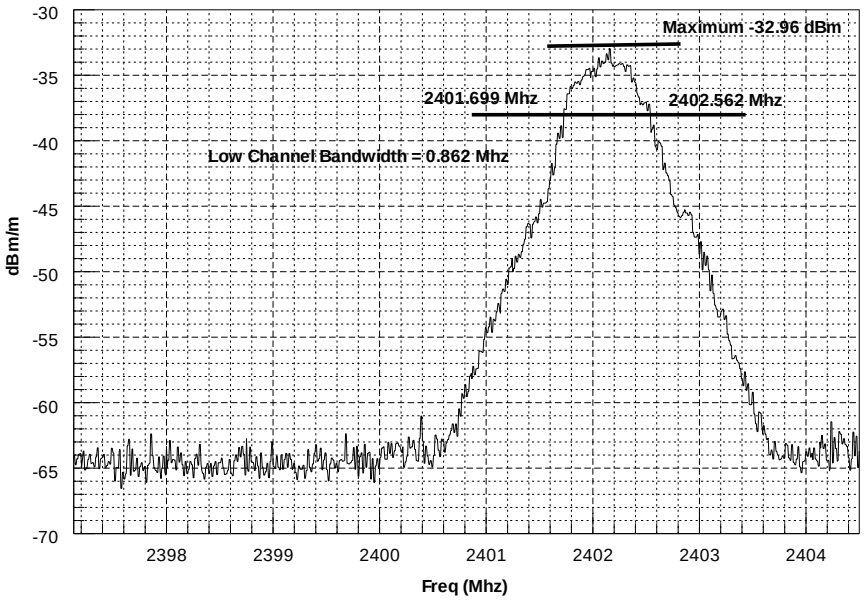
15.0 15.247 (a) (1) Not Applicable

16.0 15.247 (a) (2) DTS Bandwidth PASS

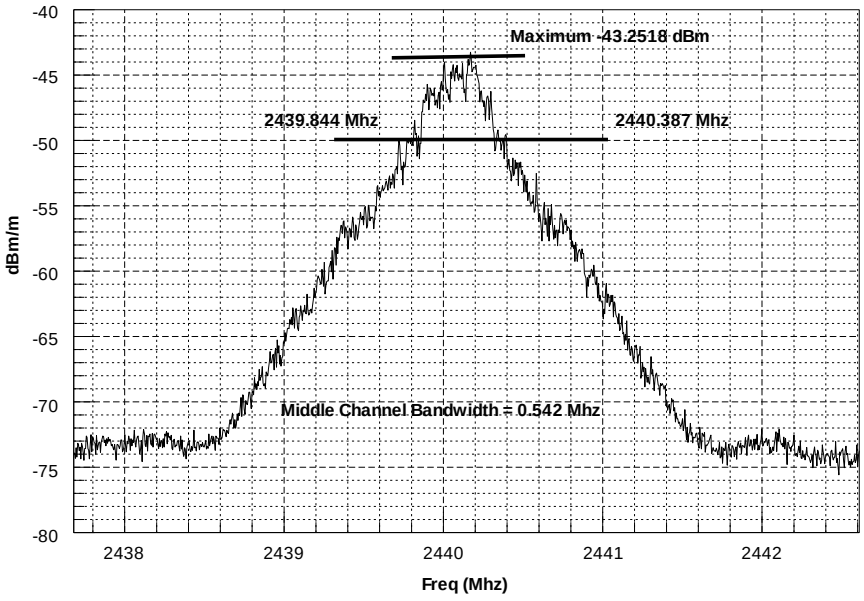
Systems using digital modulation techniques may operate in the 902-928 Mhz, 2400-2483.5 Mhz and 5725-5850 Mhz bands. The minimum 6 dB bandwidth shall be at least 500 Khz.

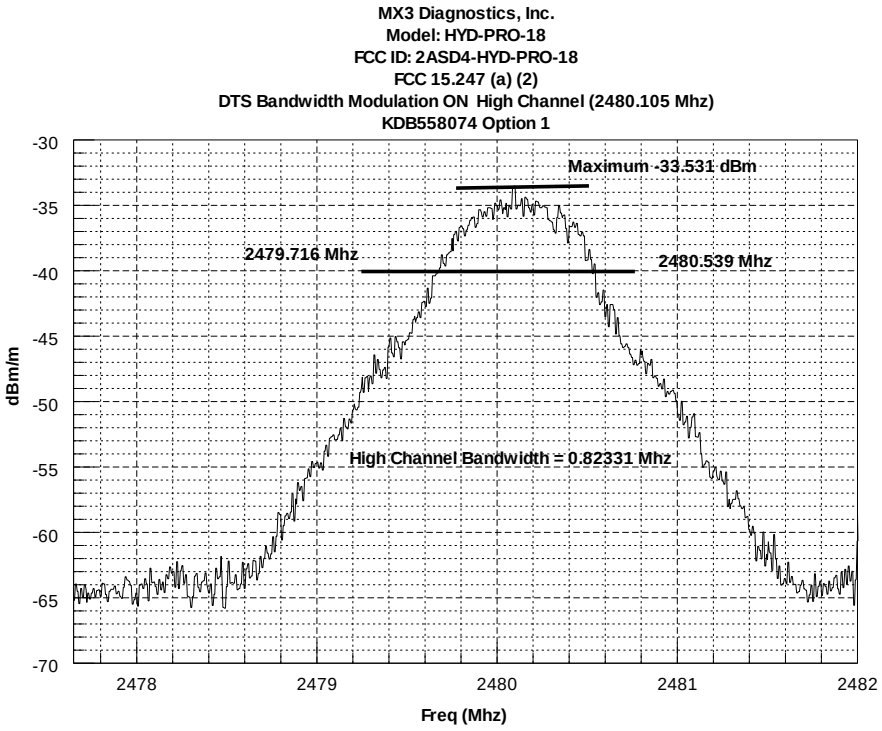
Channel (Frequency)	DTS Bandwidth (Mhz)
Low: 2402.159 Mhz	0.862
Middle: 2440.11 Mhz	0.542
High: 2480.105	0.823

MX3 Diagnostics, Inc.
Model: HYD-PRO-18
FCC ID: 2ASD4-HYD-PRO-18
FCC 15.247 (a) (2)
DTS Bandwidth Modulation ON Low Channel (2402.159 Mhz
KDB558074 Option 1



MX3 Diagnostics, Inc.
Model: HYD-PRO-18
FCC ID: 2ASD4-HYD-PRO-18
FCC 15.247 (a) (2)
DTS Bandwidth Modulation ON Mid Channel (2440.11 Mhz)
KDB558074 Option 1





17.0 15.247 (b) (1) Not Applicable

18.0 15.247 (b) (2) Not Applicable

19.0 15.247 (b) (3) Output Power PASS

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

This data was measured in units of dBm/m. Equations from ANSI C63-10: 2013 Section G5.2 were used to convert from dBm to watts

(31) EIRP = P + L

PSD = Measured Power Spectral Density (including all correction factors) (dBm/m)
L = Free Space Propagation Loss (dB)

mW = 10 LOG dBm
W = mW / 1000
L = 20 LOG (F) + 20 LOG (d) - 27.5 (32)

$EIRP = PSD_{measured} + L$

$EIRP_{(W)} = 10^{(PSD_{dBm} / 10)} / 1000 = 10^{((PSD_{dBm} - 30) / 10)}$

Freq (Mhz)	$PSD_{Measured}$ (dBm/m)	L (dB)	EIRP (dBm/m)	EIRP (mW)	EIRP (W)
2402.159	-52.71	49.65	-3.06	0.494	0.000494
2440.11	-54	49.79	-4.21	0.379	0.000379
2480.105	-53.68	49.93	-4.05	0.393	0.000393

See graphs in previous section

20.0 15.247 (b) (4) Antenna PASS

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The antenna used is a mini chip antenna made by Johanson Technology Model: 2450AT42E010B with a gain of -2.0 dBi.

21.0 15.247 (c) Antenna Gain Not Applicable

Operation with directional antenna gains greater than 6 dBi.

22.0 15.247 (d) Out of Band Spurious Emissions PASS

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is 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. If the transmitter complies with the conducted power limits based on the use of RMS

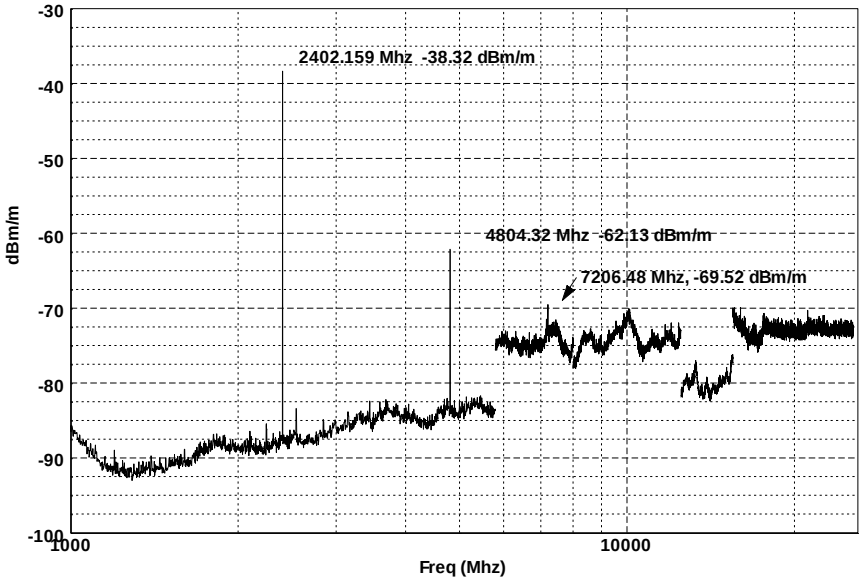
averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

No signals from the Intentional Radiator were observed in the frequency spectrum of 30-1000 Mhz

Above 1000 Mhz the following signals were detected coming from the Intentional Radiator:

Channel Frequency (Mhz)	Maximum Fundamental Power Output (dBm/m)	Harmonic (dBm/m)	Power Difference (dBm)
2402.159	-38.32		
4804.32		-62.13	23.81
7206.48		-69.52	31.20
2440.11	-43.25		
4880.22		-63.88	20.63
7320.33		-69.07	25.82
2480.105	-33.53		
4960.21		-65.37	31.84
7440.32		-65.8	32.27

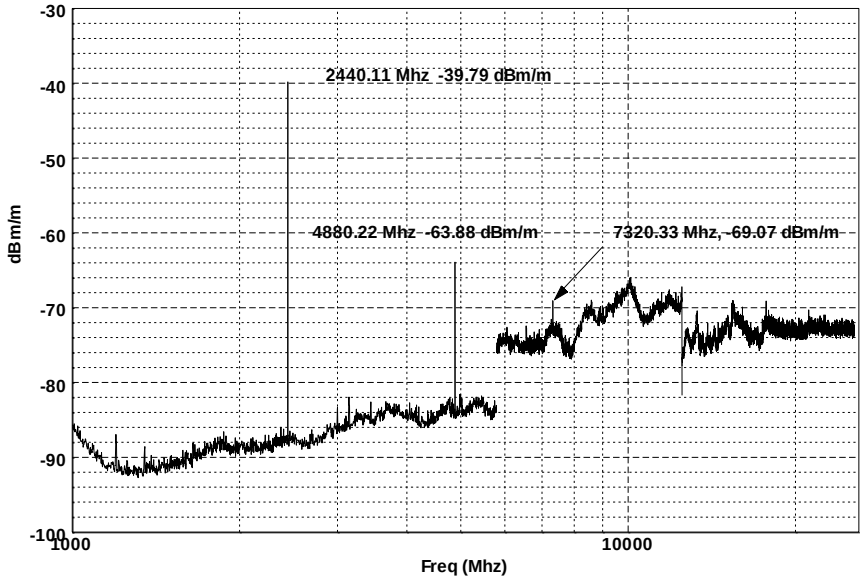
MX3 Diagnostics, Inc.
Model: HYD-PRO-18
FCC ID: 2ASD4-HYD-PRO-18
FCC 15.247 (d)
Spurious Harmonics Low Channel 2402.159 Mhz



International Certification Services, Inc.

June 27, 2019

MX3 Diagnostics, Inc.
Model: HYD-PRO-18
FCC ID: 2ASD4-HYD-PRO-18
FCC 15.247 (d)
Spurious Harmonics Middle Channel 2440.11 Mhz

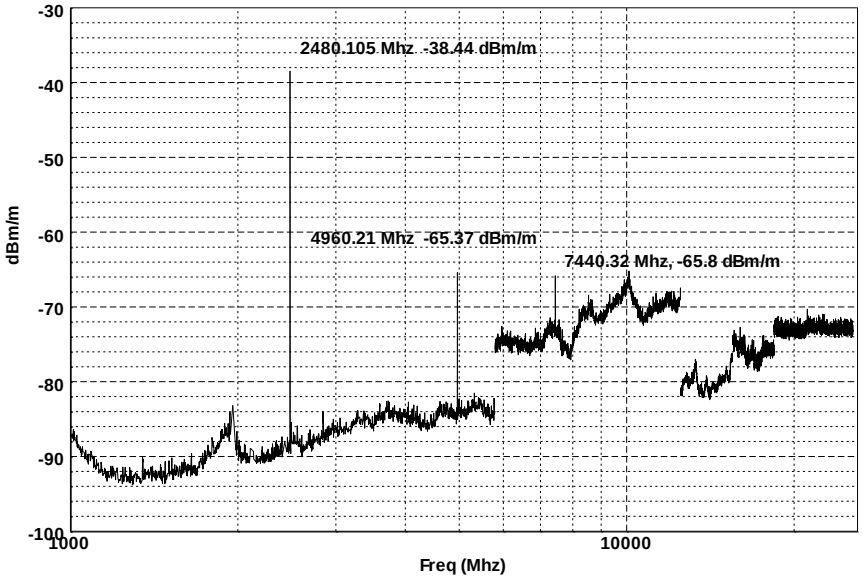


International Certification Services, Inc.

June 27, 2019

International Certification Services, Inc.

MX3 Diagnostics, Inc.
Model: HYD-PRO-18
FCC ID: 2ASD4-HYD-PRO-18
FCC 15.247 (d)
Spurious Harmonics High Channel 2480.105 Mhz



International Certification Services, Inc.

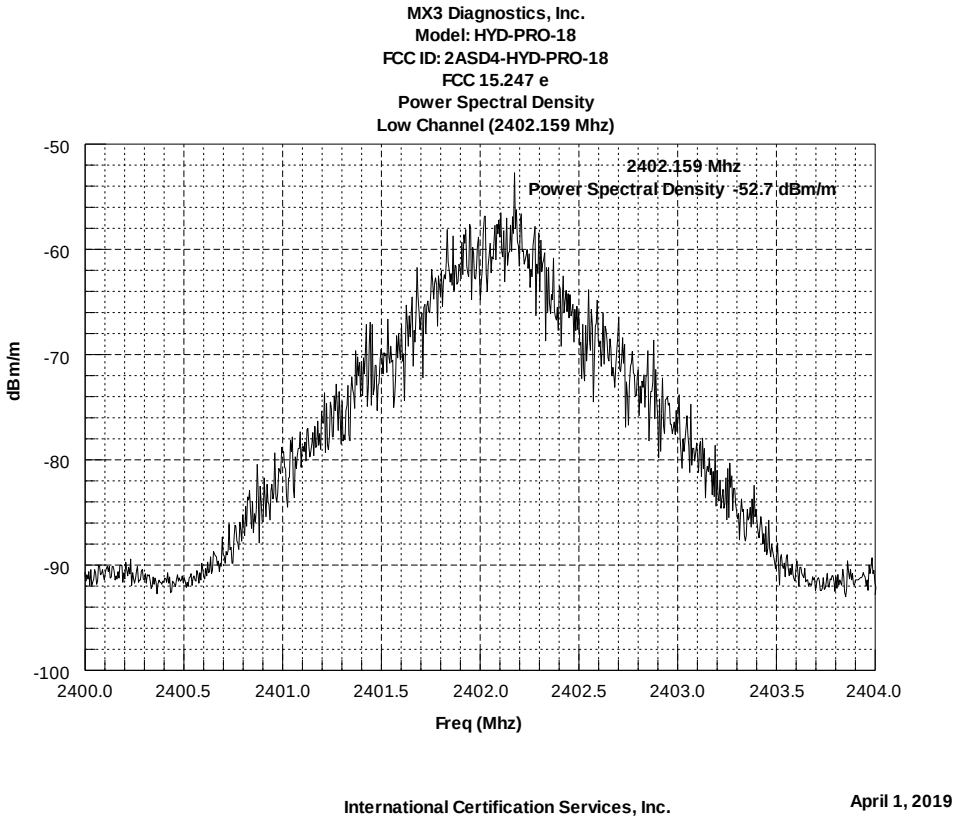
June 28, 2019

International Certification Services, Inc.

23.0 15.247 (e) Power Spectral Density PASS

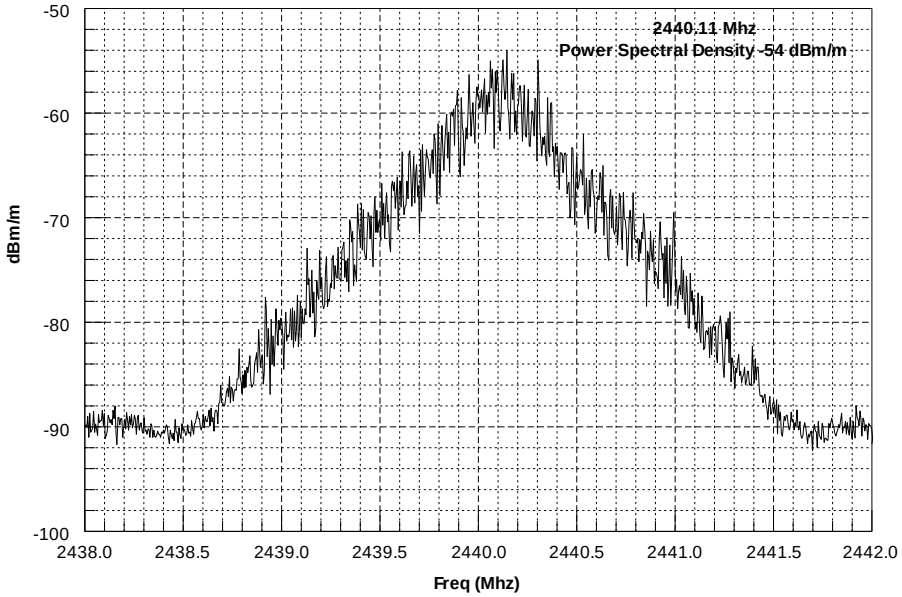
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Channel Frequency (Mhz)	Power Spectral Density (dBm)	FCC 15.247 (e) (dBm)
2402.159	-52.71	8
2440.11	-54	8
2480.105	-53.68	8



International Certification Services, Inc.

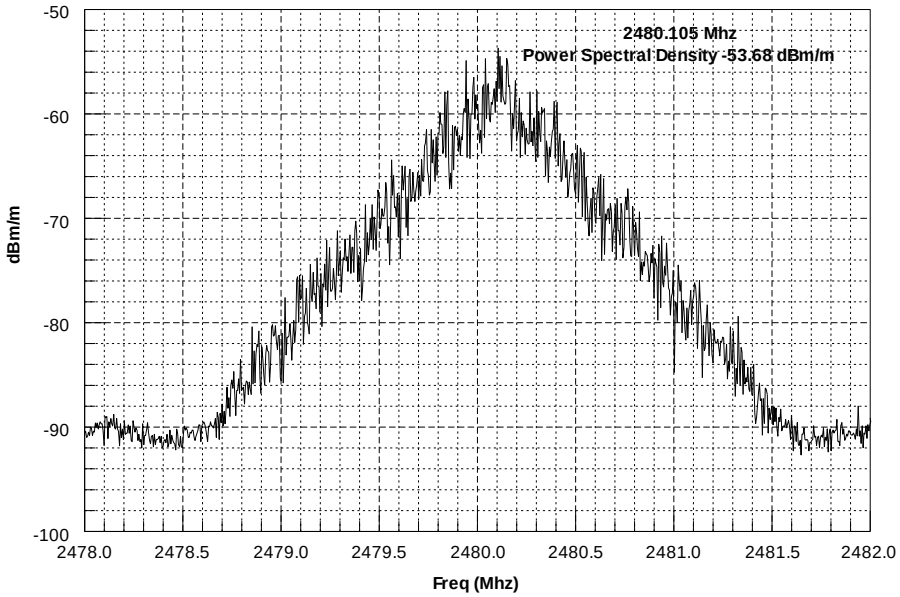
MX3 Diagnostics, Inc.
Model: HYD-PRO-18
FCC ID: 2ASD4-HYD-PRO-18
FCC 15.247 e
Power Spectral Density
Middle Channel (2440.11 Mhz)



International Certification Services, Inc.

April 1, 2019

MX3 Diagnostics, Inc.
Model: HYD-PRO-18
FCC ID: 2ASD4-HYD-PRO-18
FCC 15.247 e
Power Spectral Density
High Channel (2480.105 Mhz)



International Certification Services, Inc.

April 1, 2019

15.247 (f) Hybrid Systems Not Applicable

For the purposes of this section, hybrid systems are those that employ a combination of both frequency hopping and digital modulation techniques. The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned-off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4. The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

24.0 15.247 (g) FHSS systems Not Applicable

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

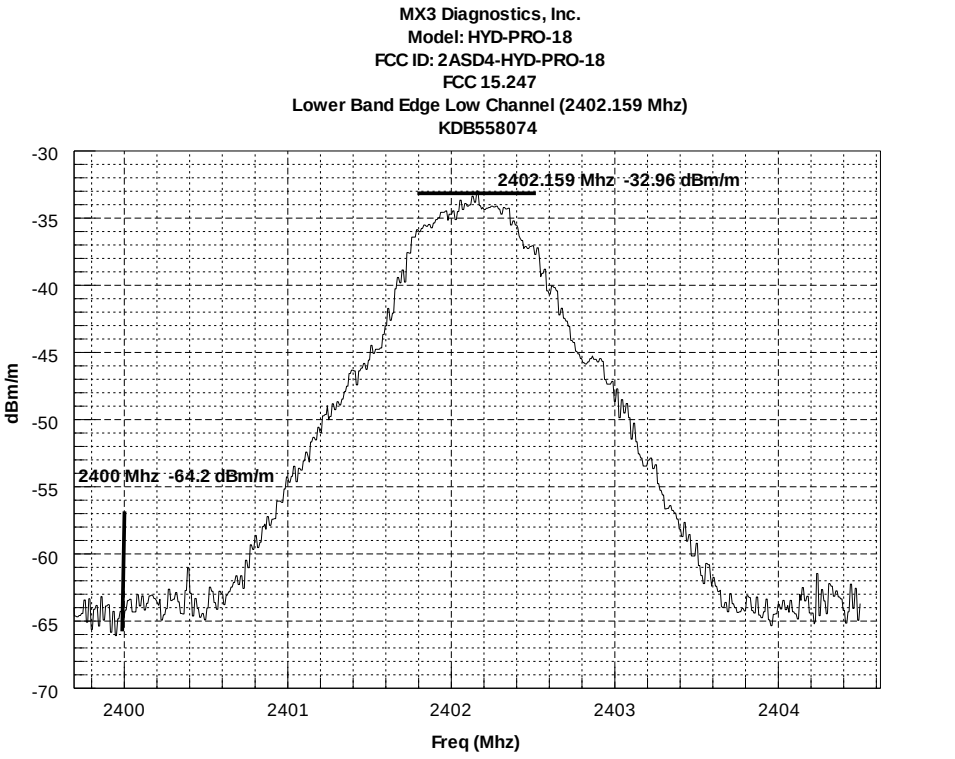
25.0 15.247 (h) FHSS Systems Not Applicable

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

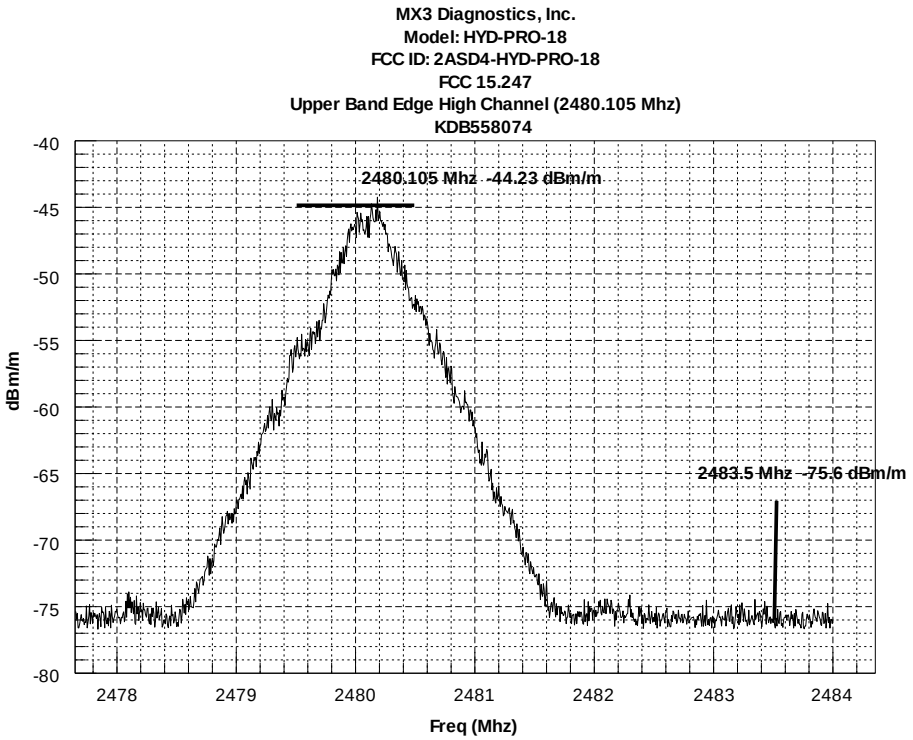
26.0 15.247 (i) PASS

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. *See* §1.1307(b)(1) of this chapter.

27.0 Lower Band Edge: PASS



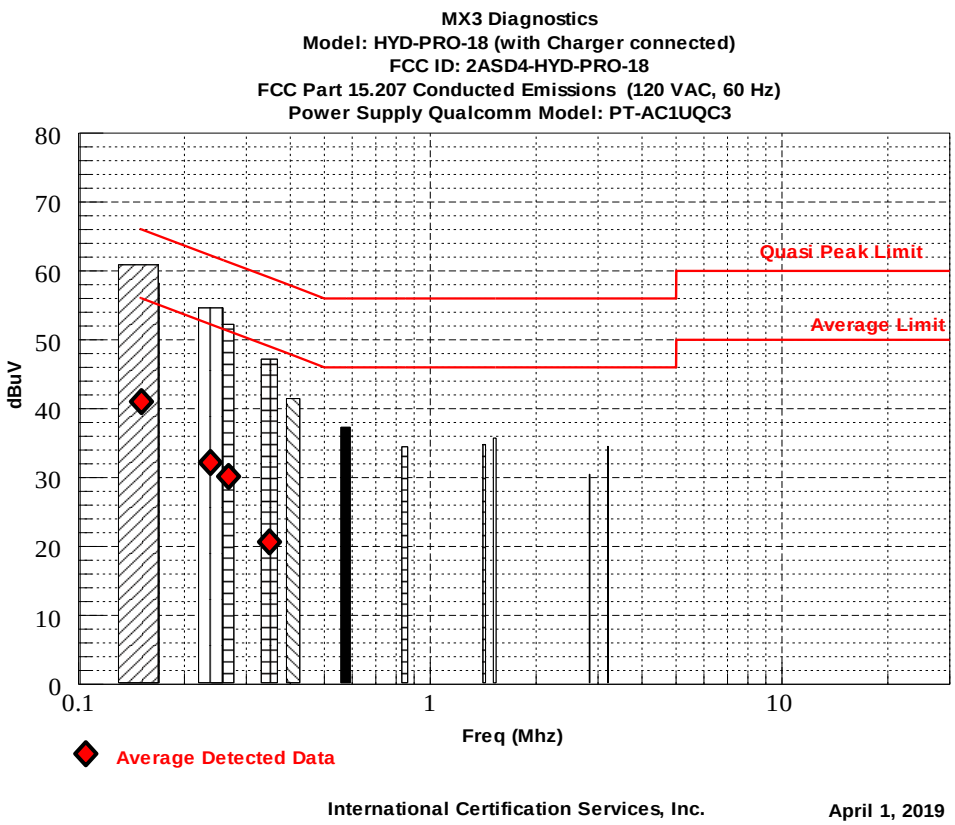
28.0 Upper Band Edge: PASS



International Certification Services, Inc. April 1, 2019

International Certification Services, Inc.

29.0 Power Line Conducted Emissions: PASS



30.0 SAR Requirements: PASS

Using the equation from FCC KDB 447498 D01 General Exposure Guidance V06 Section 4.3.1

4.3.1 Standalone SAR test exclusion considerations

a) For 100 Mhz to 6 Ghz and test separation distances <= 50 mm

$$\frac{\text{(max power of channel, including tune-up tolerance, mw)}}{\text{(min test separation distance, mm)}} \quad X \quad \sqrt{f_{Ghz}}$$

Low Frequency Channel: 2402.159

$$SAR = \frac{0.494}{25.4} \quad X \quad \sqrt{2.402159}$$

$$SAR = 0.03$$

International Certification Services, Inc.

Middle Frequency Channel: 2440.11

$$SAR = \frac{0.379}{25.4} \times \sqrt{2.44011}$$

SAR = 0.023

High Frequency Channel: 2480.105

$$SAR = \frac{0.393}{25.4} \times \sqrt{2.480105}$$

SAR = 0.024

Channel (Frequency)	Maximum Power Spectral Density (mW)	SAR	SAR Limit
Low: 2402.159 Mhz	0.494	0.03	<=3
Middle: 2440.11 Mhz	0.379	0.023	<=3
High: 2480.105	0.393	0.024	<=3

31.0 ATTACHMENT C Product Information

Product Information Sheet as supplied by the Customer

COMPANY NAME: MX3 Diagnostics, Inc.

CUSTOMER REPRESENTATIVE: International Certification Services, Inc.

EQUIPMENT DESCRIPTION: Hydration Analyzer

MODEL NUMBER: HYD-PRO-18
FCC ID: 2ASD4-HYD-PRO-18

SERIAL NUMBER: N/A

TYPE OF TEST:
_____Development
_____Initial Design Verification
_____Design Change (Please describe exact changes below)
__X__Production Sample (Audit Test)

OSCILLATOR FREQUENCIES:
Bluetooth Radio: 2.4 to .48 Ghz
Crystals: 32 Mhz, 32.768 Khz

POWER INTERFACE:
Frequency: 50/60 Hz
Voltage: 100-240 VAC

POWER SUPPLY:
Type: Switching
Manufacturer: Qualcomm
Model: PT-AC1UQC3

POWER CABLE:

☐ Hardwired ☒ Flexible

☐ Shielded ☒ Unshielded

☐ Current ☒ Removable

POWER LINE FILTER: None

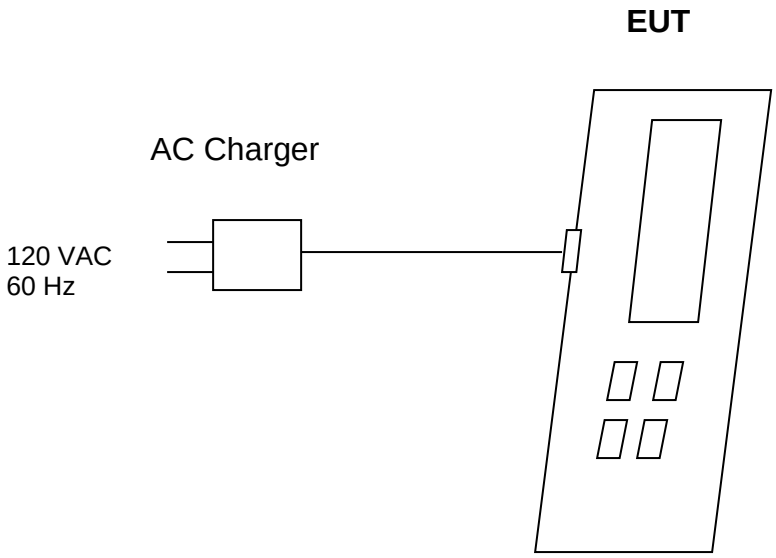
CABINET SHIELDING PROVISION:
Plastic enclosure

SOFTWARE AND / OR OPERATING MODES:
I-v2.0.1 (Rev 2) .

INTERFACING EQUIPMENT OR SIMULATORS: None

I/O CABLES: None

MX3 Diagnostics, Inc.
Model: HYD-PRO-18
FCC ID: 2ASD4-HYD-PRO-18
Power Supply: Qualcomm Model: PT-AC1UQC3
Test Configuration



International Certification Services, Inc.