



F2 Labs
16740 Peters Road
Middlefield, Ohio 44062
United States of America
www.f2labs.com

RADIATED SPURIOUS EMISSIONS

Manufacturer: **Babson Diagnostics, Inc.**
1205 Sheldon Cove, Suite 2-J
Austin, Texas 78753 USA

Applicant: **Same as Above**

Radio Module Model: **MuRata SP-KL1DX-V**

FCC ID: **2A83TWFASPD**

Testing Commenced: **2022-11-11**

Testing Ended: **2022-11-11**

Summary of Test Results: **In Compliance**

The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications and/or manufacturer's statement. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Wireless transmitter is pre-certified; testing was performed due to change in antenna.

Standards:

- **FCC Part 15 Subpart C, Section 15.247**
- **FCC Part 15.31(e)**
- **ANSI C63.10:2020**



Order Number: F2P28283E

Applicant: Babson Diagnostics, Inc.

FCC ID: 2A83TWFASPD

Evaluation Conducted by:

Julius Chiller, Senior Wireless Project Engineer

Report Reviewed by:

Ken Littell, Vice President of Operations

F2 Labs
26501 Ridge Road
Damascus, MD 20872
Ph 301.253.4500

F2 Labs
16740 Peters Road
Middlefield, OH 44062
Ph 440.632.5541

F2 Labs
8583 Zionsville Road
Indianapolis, IN 46268
Ph 317.610.0611

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1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

1.2 Measurement Procedure:

All measurements were performed according to ANSI C63.10 and recommended FCC procedure of measurement under Section 15.247 and in KDB558074. A list of the measurement equipment can be found in Section 5.

1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used, and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data and are expressed with a 95% confidence factor. Note: Only measurements listed below which relate to tests included in this Test Report are applicable to it.

Measurement Range	Expanded Uncertainty	Combined Uncertainty
Radiated Emissions <1 GHz @ 3m	$\pm 5.07\text{dB}$	± 2.54
Radiated Emissions <1 GHz @10m	$\pm 5.09\text{dB}$	± 2.55
Radiated Emissions 1 GHz to 2.7 GHz	$\pm 3.62\text{dB}$	± 1.81
Radiated Emissions 2.7 GHz to 18 GHz	$\pm 3.10\text{dB}$	± 1.55
AC Power Line Conducted Emissions, 150kHz to 30 MHz	$\pm 2.76\text{dB}$	± 1.38

This Uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

1.4 Document History

Document Number	Description	Issue Date	Approved By
F2P28283E-01E	First Issue	2023-01-19	K. Littell



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2 SUMMARY OF TEST RESULTS

Test Name	Standard(s)	Results
Radiated Spurious Emission	CFR 47 Part 15.247(d) / Part 15.209 / KDB558074	Complies

Modifications Made to the Equipment
None



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3 ENGINEERING STATEMENT

This report has been prepared on behalf of **Babson Diagnostics, Inc.**, to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15.247 of the FCC Rules using ANSI C63.10 and KDB558074 standards. The test results found in this test report relate only to the items tested.



4 EUT INFORMATION AND DATA

4.1 Equipment Under Test:

Radio Module Model: **SP-KL1DX-V**FCC ID: **VPPYLB1DX**

Serial No.: None Specified

4.2 Trade Name:

Bason Diagnostics

4.3 Power Supplies:

Battery – 12VDC

4.4 Applicable Rules:

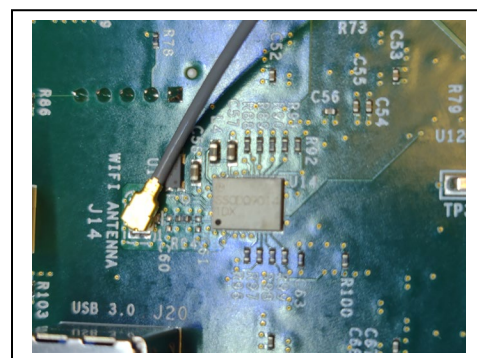
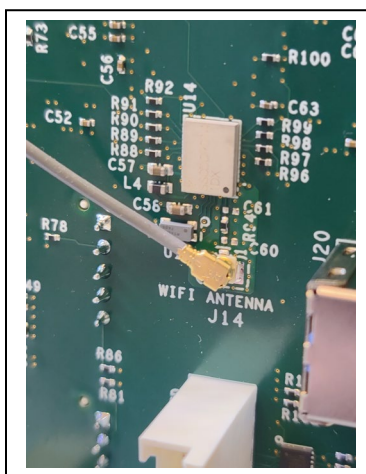
CFR 47, Part 15.247, subpart C

4.5 Antenna:

Monopole - Linx Technologies ANT-2.4-WRT-MON, 2.7dBi

4.6 Accessories:

Device	Manufacturer	Model Number	Serial Number
Antenna	Linx Technologies	ANT-2.4-WKT-MON	None Specified





4.7 Test Item Condition:

The equipment to be tested was received in good condition.

4.8 Testing Algorithm:

EUT was operated in continuous transmit mode on channels 1, 6, 11 of the 2.4 GHz Wi-Fi band. Scans and data for spurious emissions were made from 9kHz to 26 GHz.

**5 LIST OF MEASUREMENT INSTRUMENTATION**

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber	CL166-E	Albatross Projects	B83117-DF435-T261	US140023	2023-08-22
Receiver	CL151	Rohde & Schwarz	ESU40	100319	2023-03-31
Low Loss Cable Set	--	Pasternack	PE3C0666-252 / PE3C066-50CM	None Spec.	2023-10-12
Horn Antenna 18-26.5 GHz	CL114	A.H. Systems, Inc.	SAS-572	237	2023-07-30
Pre-Amplifier	CL250	Com-Power	PAM-118A	18040011	2023-04-01
Pre-Amplifier	CL285	Com-Power	PAM-0207	322	2023-03-30
Antenna, JB3 Combination	CL175	Sunol Sciences	JB3	A030315	2023-09-22
Horn Antenna	CL098	Emco	3115	9809-5580	2023-01-26
Amplifier w/Monopole & 18" Loop	CL163-Loop	A.H. Systems, Inc.	EHA-52B	100	2023-10-20
Pre-Amplifier	CL189	Com-Power	PAM-840A	461303	2023-03-30
Software:	Tile Version 3.4.B.3		Software Verified: 2022-11-11		
Software:	EMC 32, Version 8.53.0		Software Verified: 2022-11-11		
Temp/Hum. Recorder	CL294	Thermpro	TP50	2	2023-04-15



6 RADIATED SPURIOUS EMISSIONS

Radiated emissions were measured in a Semi-Anechoic Chamber. All emissions generated that fall in the restricted bands per FCC Part 15.205 were examined.

6.1 Requirements:

All emissions that fall in the restricted bands defined in FCC Part 15.205 shall not exceed the maximum field strength listed in FCC Part 15.209(a).



6.2 Radiated Spurious Emission Test Data

Test Date(s):	2022-11-11	Test Engineer:	J. Chiller
Standard(s):	CFR 47 Part 15.247(d); Part 15.209 / KDB558074	Air Temperature:	22.1°C
		Relative Humidity:	46%

Notes: Plots are peak, max hold prescan data included only to determine what frequencies to investigate and measure. The EUT was initially placed in a semi-anechoic chamber and rotated in all three orthogonal positions to maximize the emissions. Characterization measurements were then performed to determine at which frequencies significant emissions occurred. These graphs are shown below.

The equipment was fully exercised with all cabling attached to the EUT and was positioned for maximum emissions. While the equipment was energized, the receiving antenna was scanned from 1.0 meter to 4.0 meters in both vertical and horizontal polarities while the turntable was adjusted 360 degrees to determine the maximum field strength. The tables of measured results can be found below.

In the following plots, the black line indicates ambient noise, and the red line indicates the measurement with the EUT on. Emissions to be found by the EUT were measured and listed in tables. The plots are for reference only and the limit lines are not actual limit lines but merely a guide.

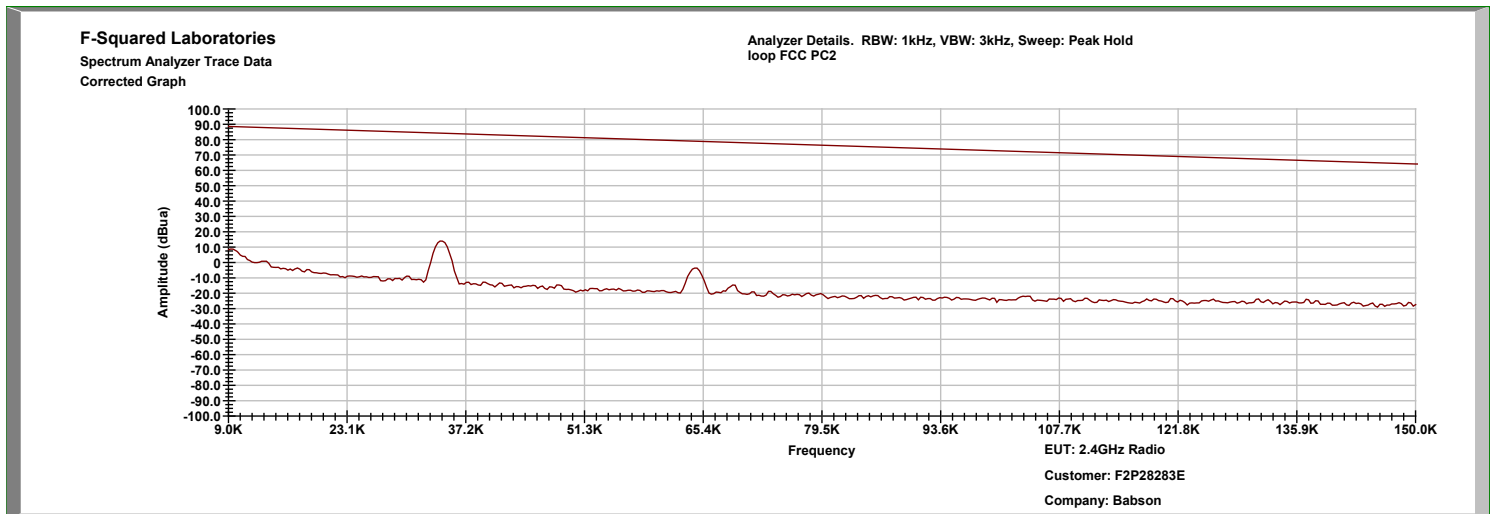


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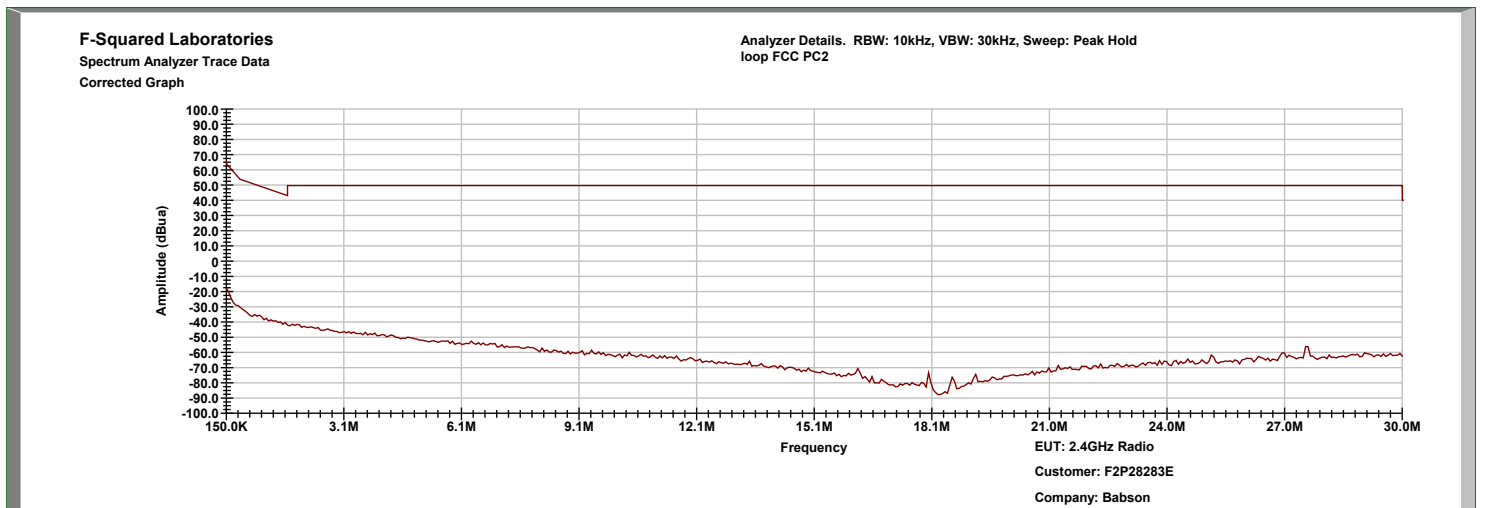
Applicant: Babson Diagnostics, Inc.

FCC ID: 2A83TWFASPD

Characterization Scan, 0.009 MHz to 0.15 MHz



Characterization Scan, 0.15 MHz to 30 MHz



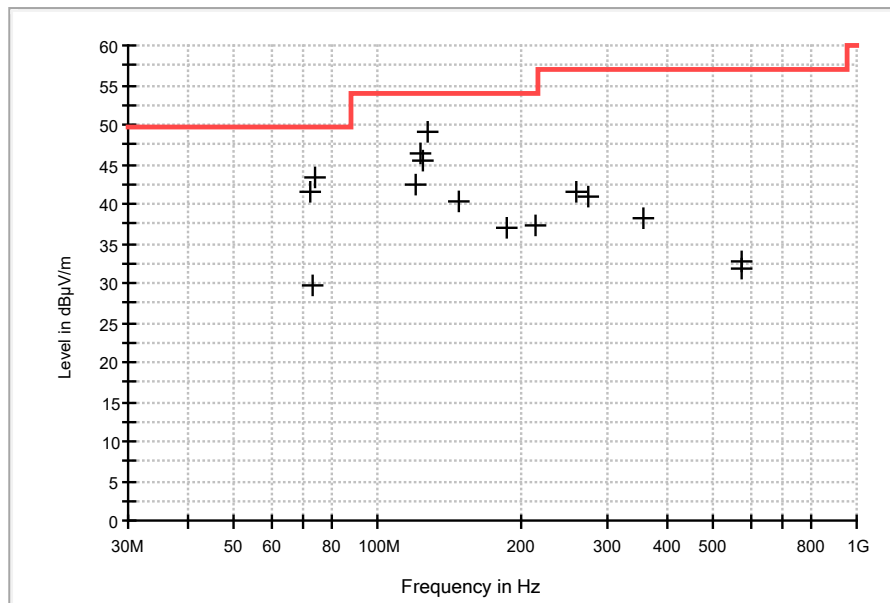


Measurements

Note: Measurements include data from all channels.

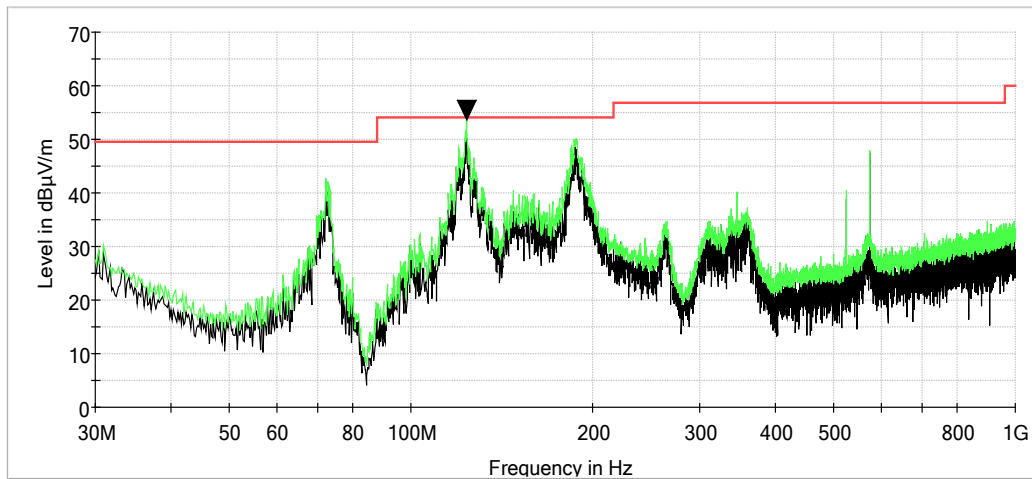
QuasiPeak

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (deg)	Reading (dBμV)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
72.290000	V	100.00	8.00	55.7	-14.2	41.50	49.6	-8.1
72.870000	H	100.00	174.00	43.9	-14.2	29.70	49.6	-19.9
73.460000	V	100.00	0.00	57.5	-14.2	43.30	49.6	-6.3
120.020000	H	100.00	176.00	51.0	-8.4	42.60	54.0	-11.4
123.120000	V	100.00	195.00	54.5	-8.1	46.40	54.0	-7.6
123.700000	H	100.00	120.00	53.5	-8.1	45.40	54.0	-8.6
127.000000	V	100.00	207.00	57.2	-8.1	49.10	54.0	-4.9
147.370000	V	100.00	66.00	49.5	-9.2	40.30	54.0	-13.7
186.170000	H	100.00	264.00	47.1	-10.1	37.00	54.0	-17.0
212.550000	V	100.00	81.00	48.0	-10.6	37.40	54.0	-16.6
259.890000	H	100.00	134.00	50.3	-8.7	41.60	56.9	-15.3
275.020000	V	100.00	0.00	48.7	-7.7	41.00	56.9	-15.9
359.020000	H	100.00	256.00	43.6	-5.5	38.10	56.9	-18.8
575.140000	H	100.00	5.00	33.1	-0.4	32.70	56.9	-24.2
575.140000	V	100.00	352.00	32.1	-0.4	31.70	56.9	-25.2

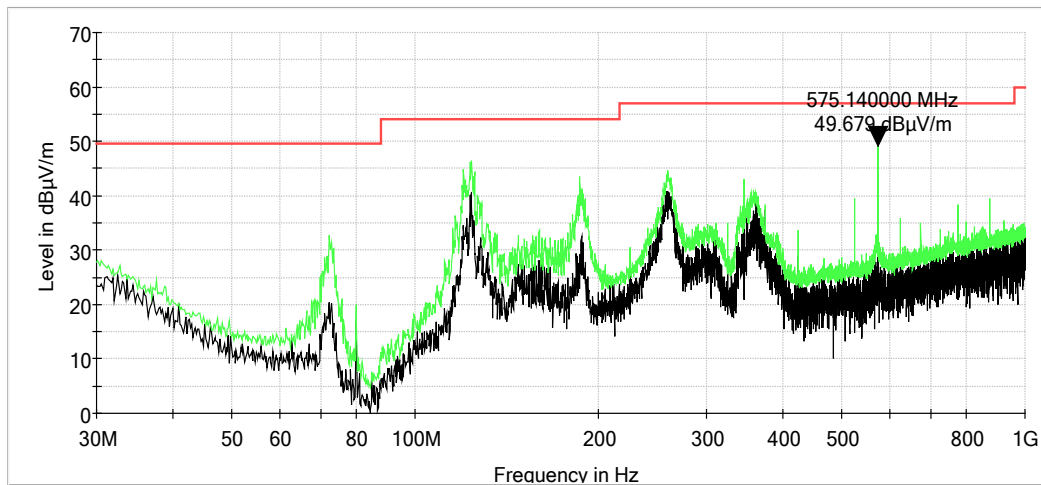




Characterization Scan, 30 MHz to 1000 MHz, Vertical

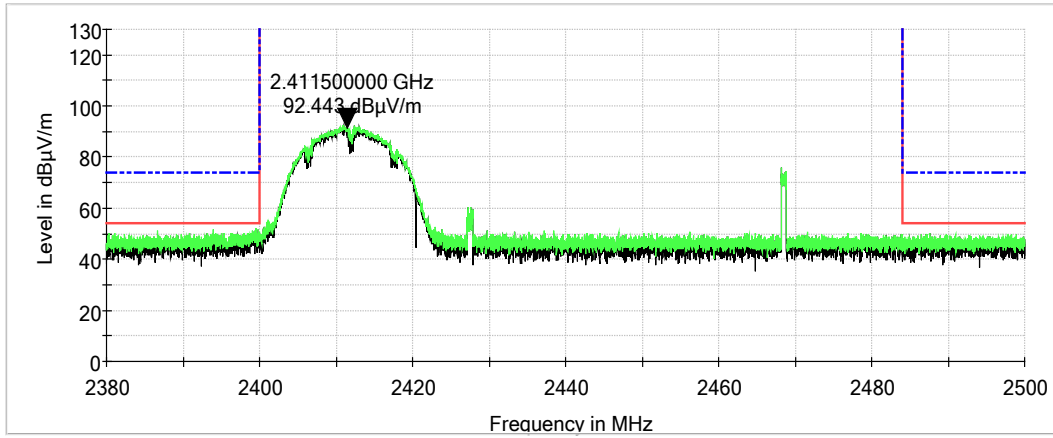


Characterization Scan, 30 MHz to 1000 MHz, Horizontal

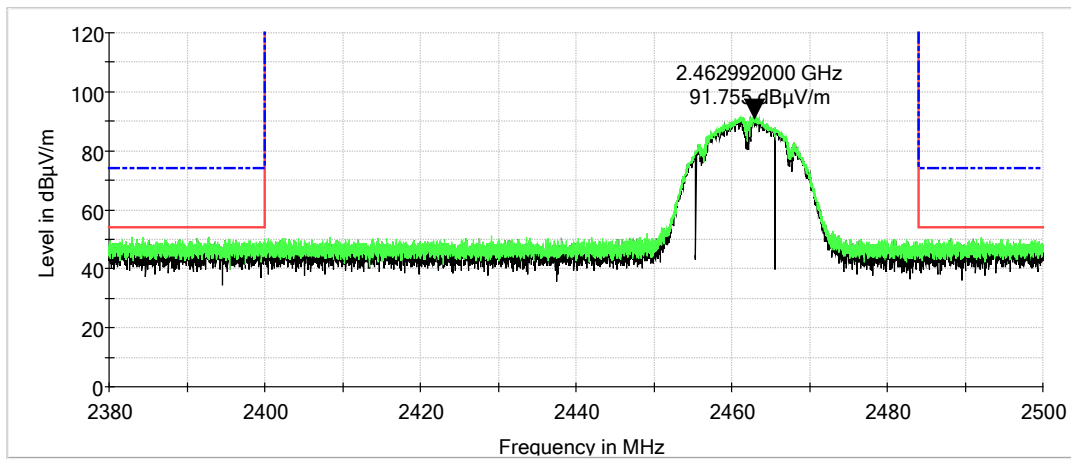




Lower Band Edge, Vertical



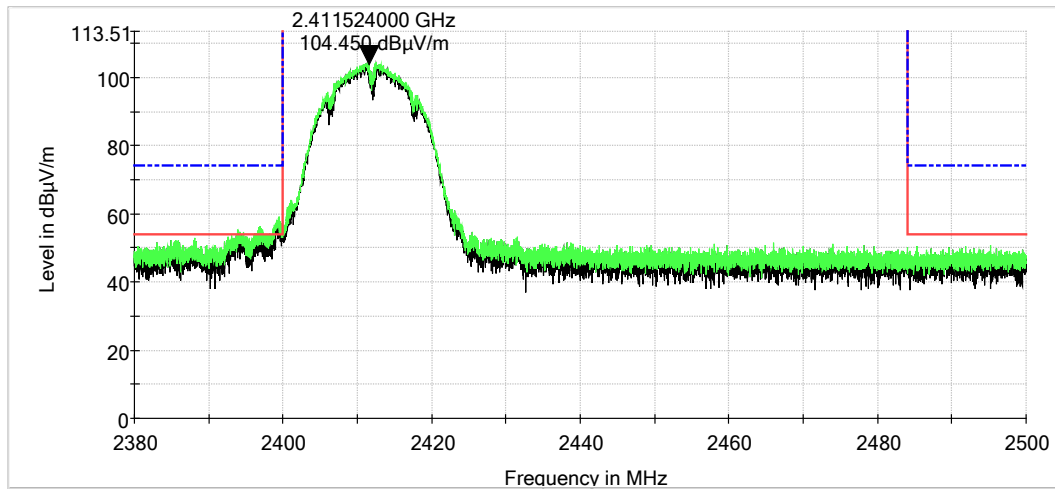
Upper Band Edge, Vertical



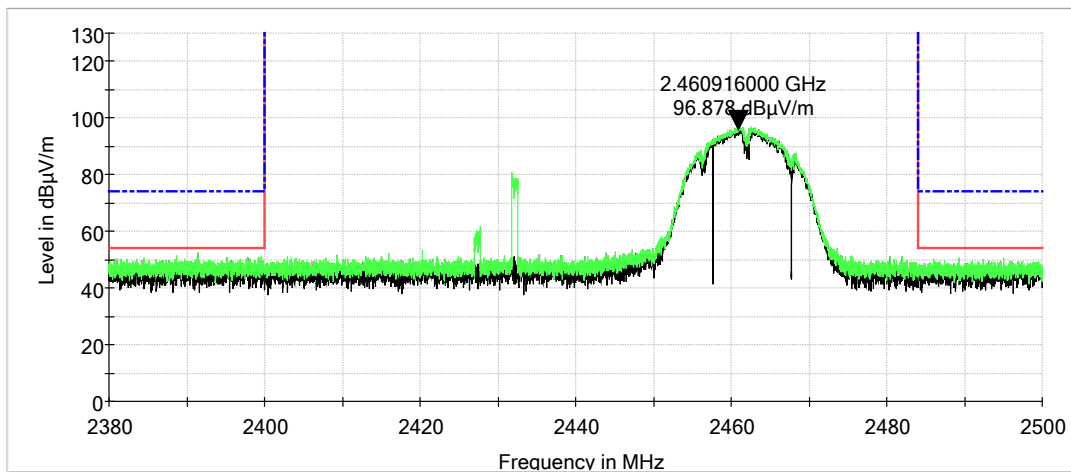


Note: The red limit line is the Average limit and the scan data in green and black are Peak Emissions. The Peak scan is touching the Average limit line and may appear to be non-compliant, but it is indeed compliant when measured with the respective detectors as indicated in the data results table.

Lower Band Edge, Horizontal



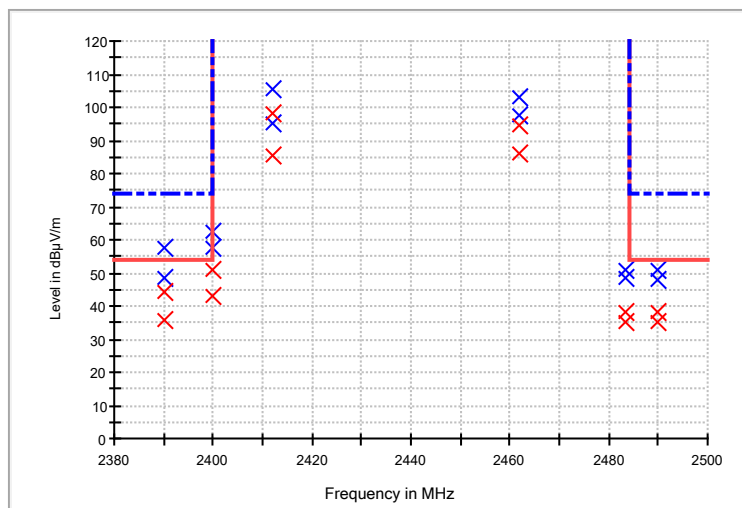
Upper Band Edge, Horizontal





Band Edge Measurements

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
2390.000000	57.6	44.2	1000.000	100.0	H	255.0	10.6	9.8	54.0
2390.000000	48.4	35.6	1000.000	100.0	V	222.0	10.6	18.4	54.0
2400.000000	57.7	43.0	1000.000	100.0	V	222.0	10.5	11.0	54.0
2400.000000	62.1	51.2	1000.000	100.0	H	255.0	10.5	2.8	54.0
2483.500000	51.2	38.4	1000.000	100.0	H	245.0	10.5	15.6	54.0
2483.500000	48.4	35.3	1000.000	100.0	V	131.0	10.5	18.7	54.0
2490.000000	50.7	38.0	1000.000	100.0	H	245.0	10.6	16.0	54.0
2490.000000	48.1	35.3	1000.000	100.0	V	131.0	10.6	18.7	54.0



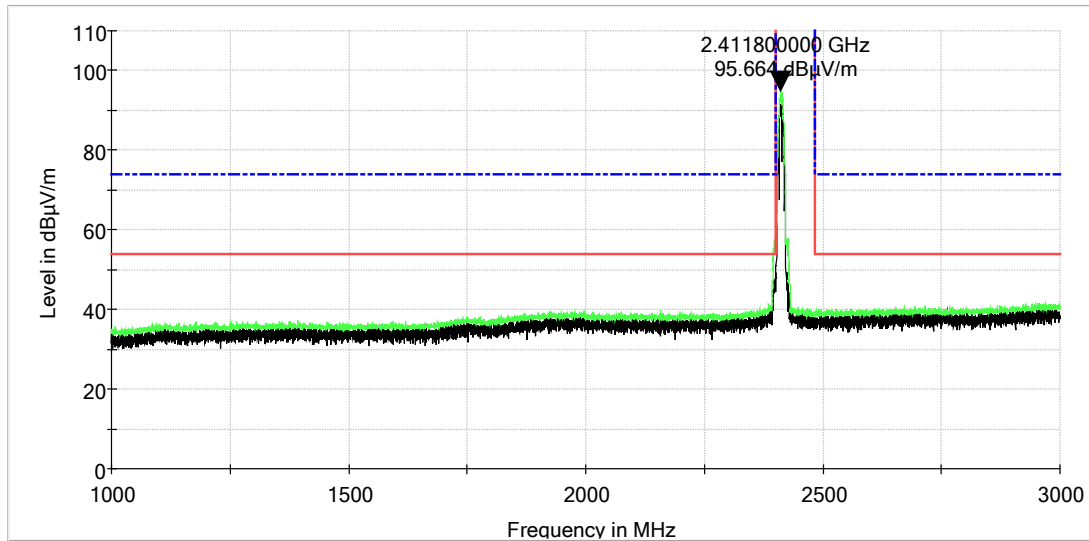


Order Number: F2P28283E

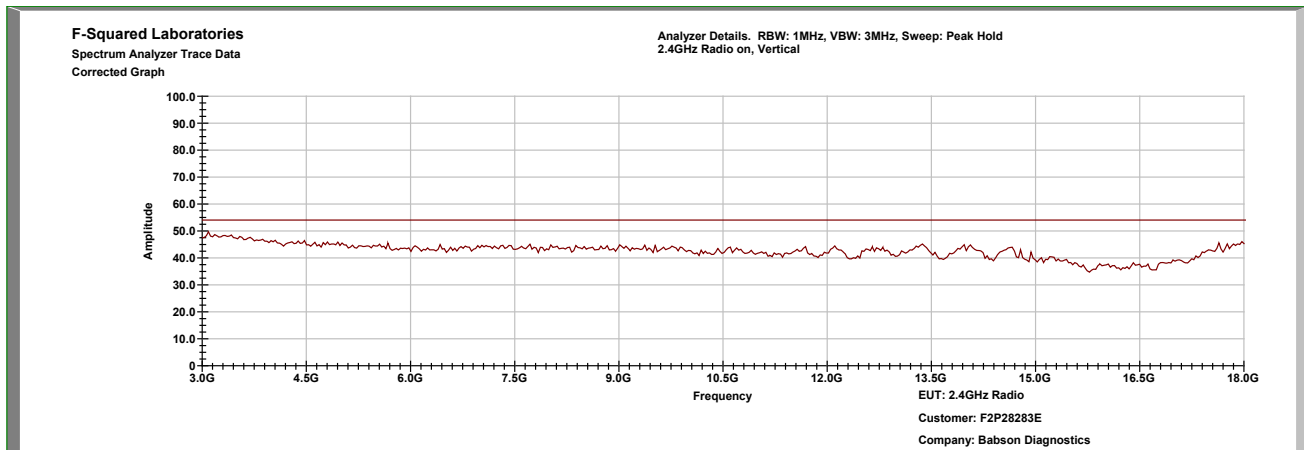
Applicant: Babson Diagnostics, Inc.

FCC ID: 2A83TWFASPD

Characterization Scan, 1 GHz to 3 GHz, Vertical



Characterization Scan, 3 GHz to 18 GHz, Vertical



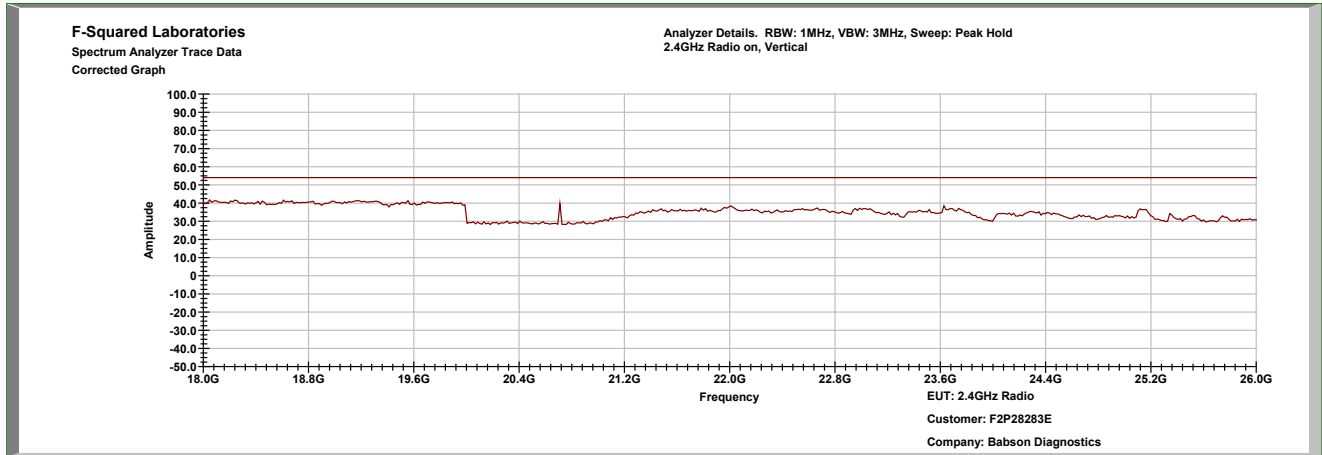


Order Number: F2P28283E

Applicant: Babson Diagnostics, Inc.

FCC ID: 2A83TWFASPD

Characterization Scan, 18 GHz to 26 GHz, Vertical



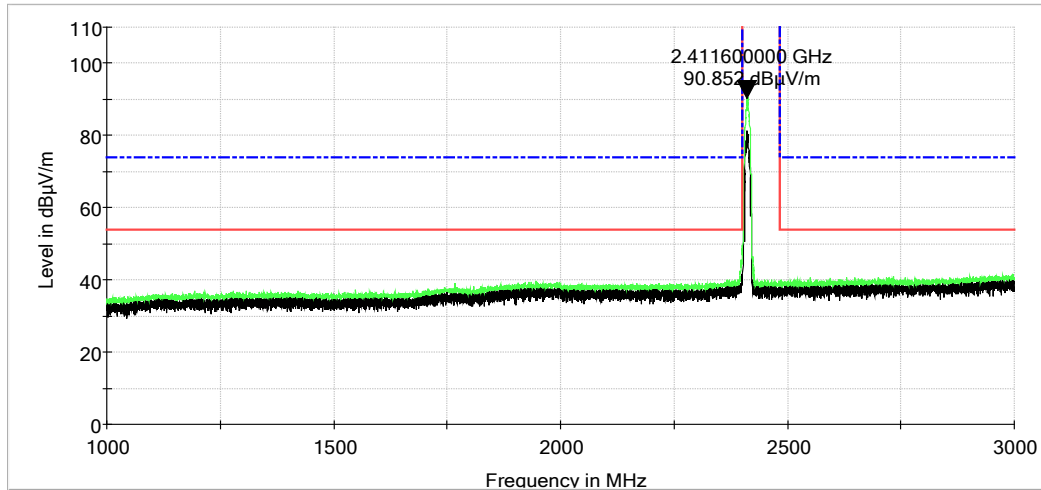


Order Number: F2P28283E

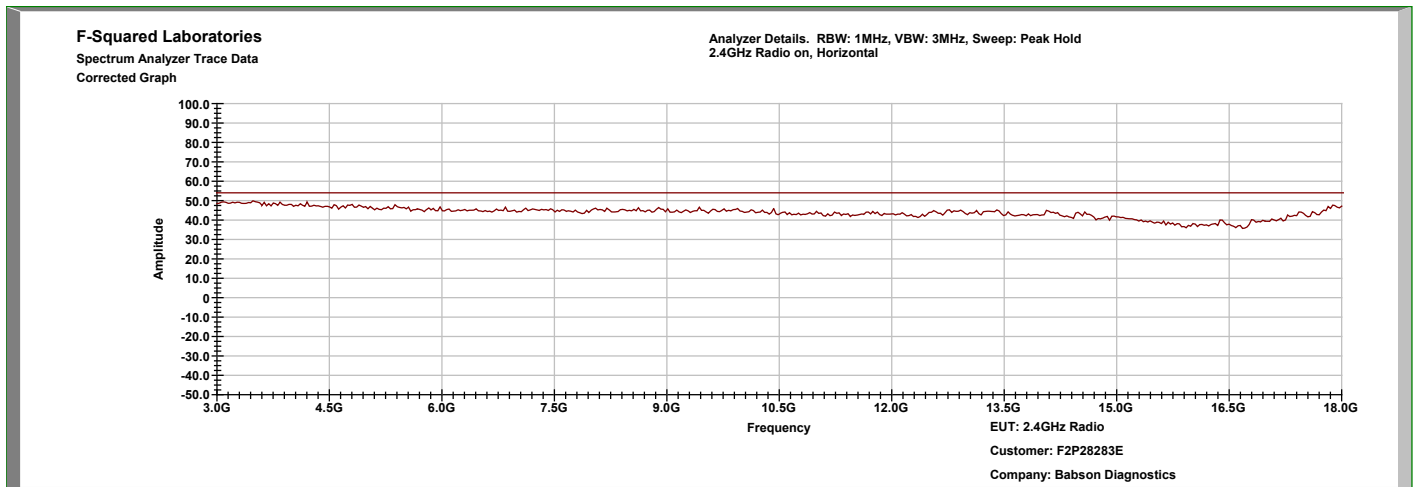
Applicant: Babson Diagnostics, Inc.

FCC ID: 2A83TWFASPD

Characterization Scan, 1 GHz to 3 GHz, Horizontal



Characterization Scan, 3 GHz to 18 GHz, Horizontal



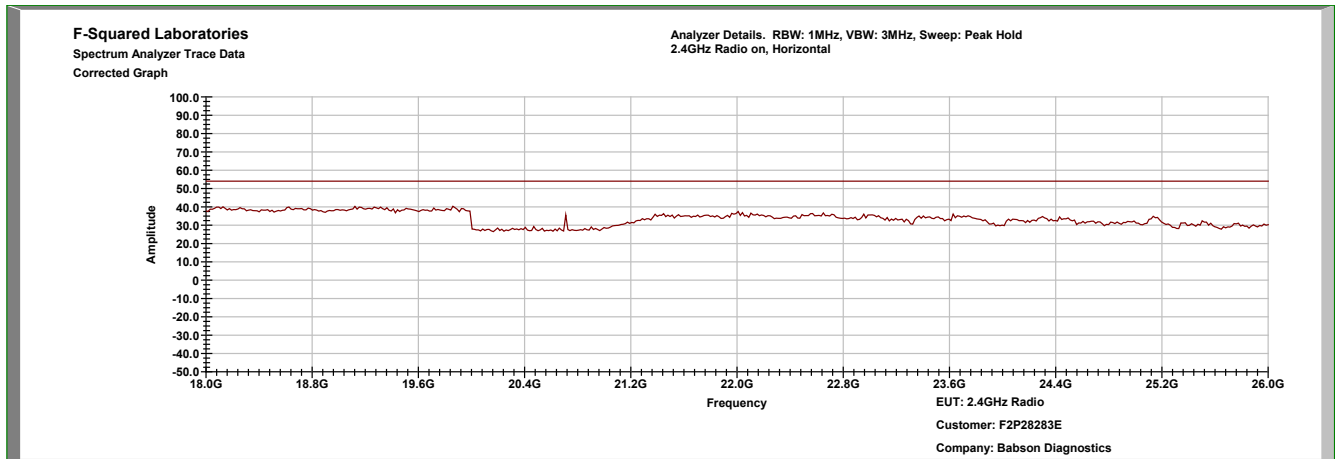


Order Number: F2P28283E

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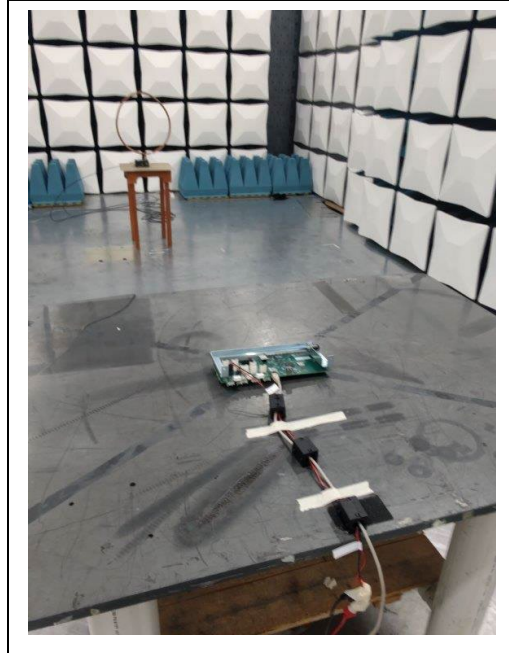
OFDM: Characterization Scan, 18 GHz to 26 GHz, Horizontal



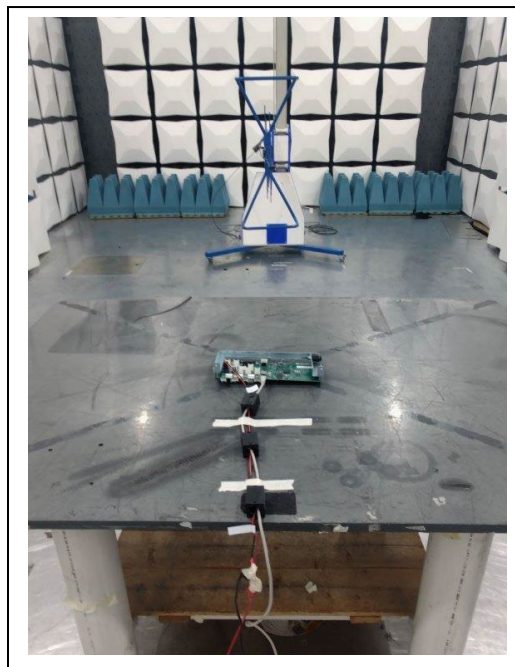


7 TEST SETUP PHOTOGRAPHS

Radiated Spurious Emissions: 0.009 MHz to 30 MHz

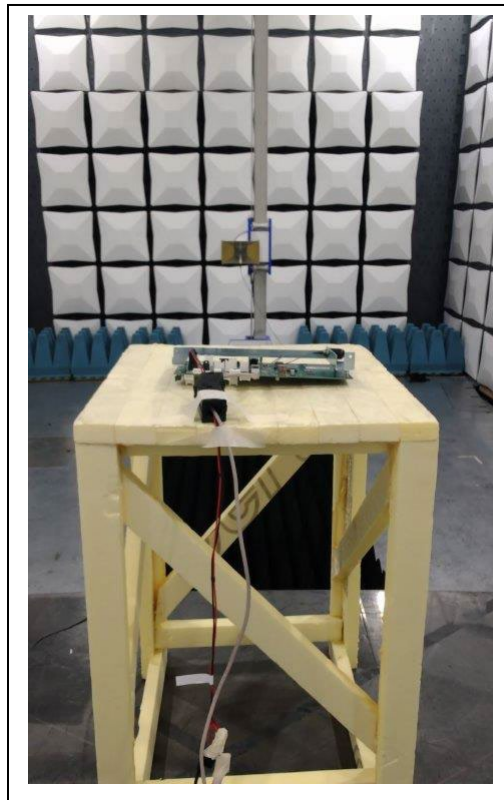


Radiated Spurious Emissions: 30 MHz to 1000 MHz





Radiated Spurious Emissions: 1 GHz to 18 GHz



Radiated Spurious Emissions: 18 GHz to 26 GHz

