166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983 rev2.1
Project Number:	11373

Code of Federal Regulations 47 Part 15 – Radio Frequency Devices

Subpart C – Intentional Radiators
Section 15.247
Operation within the bands 902 - 928 MHz,
2400 - 2483.5 MHz, 5725 - 5875 MHz,
and 24.0 - 24.25 GHz.

THE FOLLOWING **MEETS** THE ABOVE TEST SPECIFICATION

FCC ID: 2AZIU21-2374

Formal Name:	TILT
Kind of Equipment:	Bluetooth Low Energy (BLE V5.0) Angle Sensor: handheld, attachable, mountable
Frequency Range:	2402 – 2480 MHz
Test Configuration:	Table top, tested in three orthogonal positions
Model Number(s):	F-000410-01 Sensing Unit
Model(s) Tested:	F-000410-01 Sensing Unit
Serial Number(s):	P0200278
Date of Tests:	February 16th through March 4th, 2021
Test Conducted for:	Alcotek, Inc. 150 Hanley Ind. Ct. St. Louis, MO 63144, USA

NOTICE: The test report contains test data, equipment lists, photographs and/or other information regarding only the sample provided by the client for testing. This test report shall not be used to claim product approval or endorsement by any governmental, regulatory, or accrediting agency. Please see the "Description of Test Sample" page listed inside of this report.

166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983 rev2.1
Project Number:	11373

SIGNATURE PAGE

Report By:

Craig Brandt
Test Engineer

Reviewed By:

William Stumpf
OATS Manager

Approved By:

Brian Mattson
General Manager

166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983 rev2.1
Project Number: 11373

Table of Contents

i. Cover Page 1
ii. Signature Page 2
iii. Table of Contents 3
iv. ANAB Certificate of Accreditation 4
1.0 Summary of Test Report 5
2.0 Introduction 6
3.0 Test Facilities 6
4.0 Description of Test Sample 6
5.0 Test Equipment 8
6.0 Test Arrangements 10
7.0 Test Conditions 11
8.0 Modifications Made to EUT for Compliance 11
9.0 Additional Descriptions 11
10.0 FCC 15.31(e) Supply Voltage Requirement statement 12
11.0 FCC 15.203 Antenna Requirement statement 12
12.0 Results 13
13.0 Conclusion 13
Section A – Measurement Data 14
1.0 Duty Cycle of Test Unit 14
2.0 DTS Bandwidth (6 dB bandwidth) 17
3.0 Peak Output Power – Radiated 21
4.0 Peak Power Spectral Density 25
5.0 Emissions in Non-Restricted Frequency Bands – Radiated 27
5.1 Non-Restricted Band Emissions in the Vertical Polarization 28
5.1(a) 1 – 25 GHz: Low Channel – 2402 MHz 28
5.1(b) 1 – 25 GHz: Middle Channel – 2440 MHz 35
5.1(c) 1 – 25 GHz: High Channel – 2480 MHz 42
5.1(d) 30 – 1000 MHz: Low, Middle, & High Channels 48
5.2 Non-Restricted Band Emissions in the Horizontal Polarization 50
5.2(a) 1 – 25 GHz: Low Channel – 2402 MHz 50
5.2(b) 1 – 25 GHz: Middle Channel – 2440 MHz 57
5.2(c) 1 – 25 GHz: High Channel – 2480 MHz 64
5.2(d) 30 – 1000 MHz: Low, Middle, & High Channels 70
6.0 Emissions in Restricted Frequency Bands – Radiated 72
7.0 Authorized Band Edge – Radiated 81
8.0 Restricted Band Edge – Radiated 84
9.0 AC Line Conducted Emissions 93
Section B – Measurement Uncertainty 100

ANSI National Accreditation Board

CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

DLS Electronic Systems, Inc.
200 E. Marquardt Drive
Wheeling, IL 60090
(and satellite sites as shown on the scope)

Fulfills the requirements of

ISO/IEC 17025:2017

In the field of

TESTING

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

R. Douglas Leonard Jr., VP, PILR SBU
Expiry Date: 23 April 2022
Certificate Number: AT-1859

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

SATELLITE SITE

DLS Electronic Systems, Inc. (Oats site)
166 South Carter
Genoa City, Wisconsin 53128
www.dlsemc.com

1.0 Summary of Test Report

It was determined that the TILT, model F-000410-01 Sensing Unit, complies with the requirements of CFR 47 Part 15 Subpart C Section 15.247.

Subpart C Applicable Technical Requirements Tested:

Section	Description	Procedure	Note	Compliant?
15.31(e)	Supply Voltage Statement	N/A		Yes
15.203	Antenna Requirement Statement	N/A		Yes
Informative	Duty Cycle of Test Unit	ANSI C63.10-2013 Section 11.6(b)	1	Yes
15.247(a)(2)	DTS Bandwidth (6 dB Bandwidth)	ANSI C63.10-2013 Sections 6.9.2 & 11.8.2	1, 2	Yes
15.247(b)(3)	Peak Output Power	ANSI C63.10-2013 Sections 11.9.1.1 & G.5.3	1, 2	Yes
15.247(e)	Peak Power Spectral Density	ANSI C63.10-2013 Sections 11.10.2 & G.5.3	1, 2	Yes
15.247(d)	Emissions in Non-Restricted Frequency Bands	ANSI C63.10-2013 Sections 11.11.1(a), 11.11.2, & 11.11.3	1, 2	Yes
15.247(d) 15.205(b) 15.209(a)	Emissions in Restricted Frequency Bands	ANSI C63.10-2013 Section 11.12.1	1, 2	Yes
15.247(d)	Authorized Band Edge	ANSI C63.10-2013 Sections 6.10.4 & 11.11.1(a)	1, 2	Yes
15.247(d) 15.205(b) 15.209(a)	Restricted Band Edge	ANSI C63.10-2013 Section 6.10.5.2	1, 2	Yes
15.207	AC Line Conducted Emissions	ANSI C63.10-2013 & Section 6.2	3	Yes

Note 1: Radiated emission measurement.
Note 2: Tested in 3 orthogonal axes.
Note 3: AC Line Conducted measurement.

2.0 Introduction

During February 16th through March 4th, 2021 the TILT, model F-000410-01 Sensing Unit, as provided by Alcotek, Inc. was tested to the requirements of CFR 47 Part 15 Subpart C Section 15.247. To meet these requirements, the procedures contained within this report were performed by personnel of D.L.S. Electronic Systems, Inc.

3.0 Test Facilities

D.L.S. Electronic Systems, Inc. is a full-service EMC/Safety Testing Laboratory accredited to ISO 17025. ANAB Certificate and Scope can be viewed at http://www.dlsemc.com/certificate. Our facilities are registered with the FCC, ISED Canada, and VCCI.

Wisconsin Test Facility:
D.L.S. Electronic Systems, Inc.
166 S. Carter Street
Genoa City, Wisconsin 53128

Wheeling Test Facility:
D.L.S. Electronic Systems, Inc.
1250 Peterson Drive
Wheeling, IL 60090

FCC Registration #90531

4.0 Description of Test Sample

Description:

This unit contains a sensor that can measure and report angles in any direction from a reference point. This unit can be attached to another item and report position angles of that item from a reference point. Angles can be reported in real time or logged in memory for download at a later time. Real time data is transmitted via Bluetooth Low Energy (BLE) to the Operator Interface or to another BLE device. This unit has a limited operator interface via buttons and LEDs. This unit includes a USB port for internal battery charging and wired serial communication to PCs or other devices.

4.0 Description of Test Sample (continued)

Type of Equipment / Frequency Range:

DTS – Bluetooth Low Energy (BLE V5.0) / 2402 – 2480 MHz

Handheld, attachable, mountable

Physical Dimensions of Equipment Under Test:

Length: 9.0 mm x Width: 4.3 mm x Height: 1.7 mm

Power Source:

5 V DC Rechargeable Battery; Charging 5VDC

Internal Frequencies:

Switching Power Supply Frequency:

750 kHz

Clock, timing signal, & microprocessor operating frequencies:

BLE 2.4 GHz, 32 MHz, 32.768 kHz, 32 kHz

Transmit Frequencies Used For Test Purpose:

2402 MHz, 2440 MHz, 2480 MHz

Type of Modulation(s) / Antenna Type:

FSK, data rate 250 kbps – 1.37 Mbps, BLE V5.0 /

Chip, fixed Johanson 2450AT18D0100E (1.5 dBm Peak Gain)

5.0 Test Equipment

A list of the equipment used can be found in the table below. All primary equipment was calibrated against known reference standards with a verified traceable path to NIST.

D.L.S. Wisconsin – Radiated Emissions 30-1000 MHz – Site G1 – Test Equipment: (Pre-scan search: No Radiated Emissions detected from 30 to 1000 MHz)

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz-40 GHz	1-29-21	1-29-22
Antenna	EMCO	3104C	9701-4785	20 MHz-200 MHz	4-15-20	4-15-22
Antenna	Electro-Metrics	LPA-25	1205	200 MHz-1 GHz	4-15-20	4-15-22
Cable	Micro-Coax	UFB311A	CBL-100	30 MHz-18 GHz	5-5-20	5-5-21
Test Software	Rohde & Schwarz	ESK1	V1.7.1	N/A	N/A	N/A

D.L.S. Wisconsin – Radiated Emissions 1-18 GHz – Site G1 – Test Equipment:

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz-40 GHz	1-29-21	1-29-22
Horn Antenna	EMCO	3115	9903-5731	1 GHz-18 GHz	1-16-20	1-16-22
Cable	Micro-Coax	UFB311A	CBL-100	30 MHz-18 GHz	5-5-20	5-5-21
High Pass Filter	Q Microwave	100462	1	4.2 GHz-18 GHz	7-6-20	7-6-21
Preamplifier	Miteq	AMF-7D-01001800-22-10P	1777990	1 GHz-18 GHz	1-5-21	1-5-22
Test Software	Rohde & Schwarz	ESK1	V1.7.1	N/A	N/A	N/A

5.0 Test Equipment (continued)

D.L.S. Wisconsin – Radiated Emissions 18-25 GHz – Site G1 – Test Equipment:

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz-40 GHz	1-29-21	1-29-22
Horn Antenna	EMCO	3116	2549	18 GHz-40 GHz	1-28-21	1-28-23
Cable	Teledyne	096-0004-036	CBL-091	30 MHz-40 GHz	5-12-20	5-12-21
Cable	Micro-Coax	UFC142A	CBL-102	30 MHz-40 GHz	5-12-20	5-12-21
High Pass Filter	K & L	50140 11SH10-18000/T40000-K-K	8	18 GHz-40 GHz	5-5-20	5-5-21
Preamplifier	Miteq	AMF-8B-180265-40-10P-H/S	438727	18 GHz-26 GHz	5-5-20	5-5-21
Test Software	Rohde & Schwarz	ESK1	V1.7.1	N/A	N/A	N/A

D.L.S. Wisconsin – Radiated Fundamental – Site G1 – Test Equipment: (Substitution method)

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz-40 GHz	1-29-21	1-29-22
Horn Antenna	EMCO	3115	9903-5731	1 GHz-18 GHz	1-16-20	1-16-22
Cable	Micro-Coax	UFB311A	CBL-100	30 MHz-18 GHz	5-5-20	5-5-21
Signal Generator	Rohde & Schwarz	SMR40	100092	1 GHz-40 GHz	4-27-20	4-27-21
Horn Antenna	Com-Power	AH-118	071127	1 GHz-18 GHz	1-29-21	1-29-23
Cable	Mini-Circuits	APC-15FT-NMNM	0805A	30 MHz-18 GHz	6-1-20	6-1-21
Test Software	Rohde & Schwarz	ESK1	V1.7.1	N/A	N/A	N/A

5.0 Test Equipment (continued)

D.L.S. Wisconsin – AC Line Conducted (Screen Room)

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
Receiver	Narda PMM	9010F	020WW40102	10 Hz – 50 MHz	4-29-20	4-29-21
Cable	Beldin	9914	CBL-043	9 kHz – 30 MHz	3-17-20	3-17-21
Cable	Manhattan/CDT	RG-223/U	CBL-045	9 kHz – 30 MHz	3-17-20	3-17-21
LISN	ComPower	LI-220A	192036	9 kHz – 30 MHz	8-25-20	8-25-21
Filter- High-Pass	Solar Electronics	7930-120	090702	120 kHz – 30 MHz	10-13-20	10-13-21
Limiter	Electro-Metrics	EM-7600	705	9 kHz – 30 MHz	10-13-20	10-13-21
Test Software	Narda PMM	Emission Suite	V2.22	N/A	N/A	N/A

6.0 Test Arrangements

Emissions Measurement Arrangement:

All emission measurements were performed at D.L.S. Electronic Systems, Inc. and set up according to ANSI C63.10-2013, unless otherwise noted. Description of procedures and measurements can be found in Section A – Measurement Data. See separate exhibit for photos of the test set up. See Section B for measurement uncertainty.

Unless otherwise noted, the bandwidth of the measuring receiver / analyzer used during testing is shown below.

Frequency Range	Bandwidth (-6 dB)
10 to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz
Above 1 GHz	1 MHz

7.0 Test Conditions

Temperature and Humidity:

70 °F at 26% RH

Supply Voltage:

Tested while charging internal battery via USB port with USB power adapter

5.0 Volts DC from USB power adapter (Not provided with DUT):
Tech & Go! NeverBlock Wall Charger, Model 1310806TG,
SN: 2634103975

8.0 Modifications Made to EUT for Compliance

None noted at time of test.

9.0 Additional Descriptions

In following FCC Part 15 and ANSI C63.10 requirements, the EUT was programmed for continuous transmit, modulated, with the highest duty cycle achievable using the available programming test software (55.9% duty cycle). The EUT is portable and therefore was set up on a non-conductive table for testing purposes. It was programmed for continuous transmission on the lowest channel of operation (2402 MHz), on the middle channel of operation (2442 MHz), and the highest channel of operation (2480 MHz). The EUT is portable and therefore was rotated through 3 orthogonal axes to find worst-case. See Annex B for operation and setup specific to the FCC Rule part and ANSI C63.10 guidance.

10.0 FCC 15.31(e) Supply Voltage Requirement statement

FCC 15.31(e) - For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Compliance Statement: This device complies with the requirements of Part 15.31(e):

☒ This device is battery operated. All tests were performed using a new (or fully charged) battery.

☒ This device provides a constant regulated voltage to the RF circuitry regardless of supply voltage (see schematic diagrams).

☐ This device does not provide a constant regulated voltage to the RF circuitry regardless of supply voltage. Data has been supplied in this test report that supports compliance. Details:

11.0 FCC 15.203 Antenna Requirement statement

SECTION 15.203 ANTENNA REQUIREMENT

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device…. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221.

Statement: This wireless device (Intentional Radiator) meets the requirements of FCC Part 15.203:

☒ The antenna is permanently attached.

☐ The antenna has a unique coupling to the intentional radiator.
Description of coupling:

☐ This intentional radiator is professionally installed.

☐ This intentional radiator, in accordance with Section 15.31(d), must be measured at the installation site.

12.0 Results

Measurements were performed in accordance with ANSI C63.10-2013. Graphical and tabular data can be found in Section A at the end of this report.

13.0 Conclusion

The TILT, model F-000410-01 Sensing Unit, as provided by Alcotek, Inc., tested during February 16th through March 4th, 2021 **meets** the requirements of CFR 47 Part 15 Subpart C Section 15.247.

Section A – Measurement Data

1.0 Duty Cycle of Test Unit

Rule Part:

Informative.

Test Procedure:

ANSI C63.10-2013, Section 11.6(b)
Zero-span mode on a spectrum analyzer.

Limit:

Informative.

Results:

Duty Cycle Correction Factor = **5.1 dB**

Sample Equation(s):

One cycle = ON + OFF time = 0.204408818 ms
One ON time = 0.114228457 ms
Duty cycle x = (0.114228457 ms / 0.204408818 ms) = 0.55882 = 55.9%
Voltage Duty Cycle Correction Factor = 20 log (1/0.55882) = 5.1 dB

Notes:

Compliance with average limits is determined by adding the duty cycle correction factor of 5.1 dB to the linear average detector measurement and comparing the result to the average limit.

166 South Carter, Genoa City, WI 53128

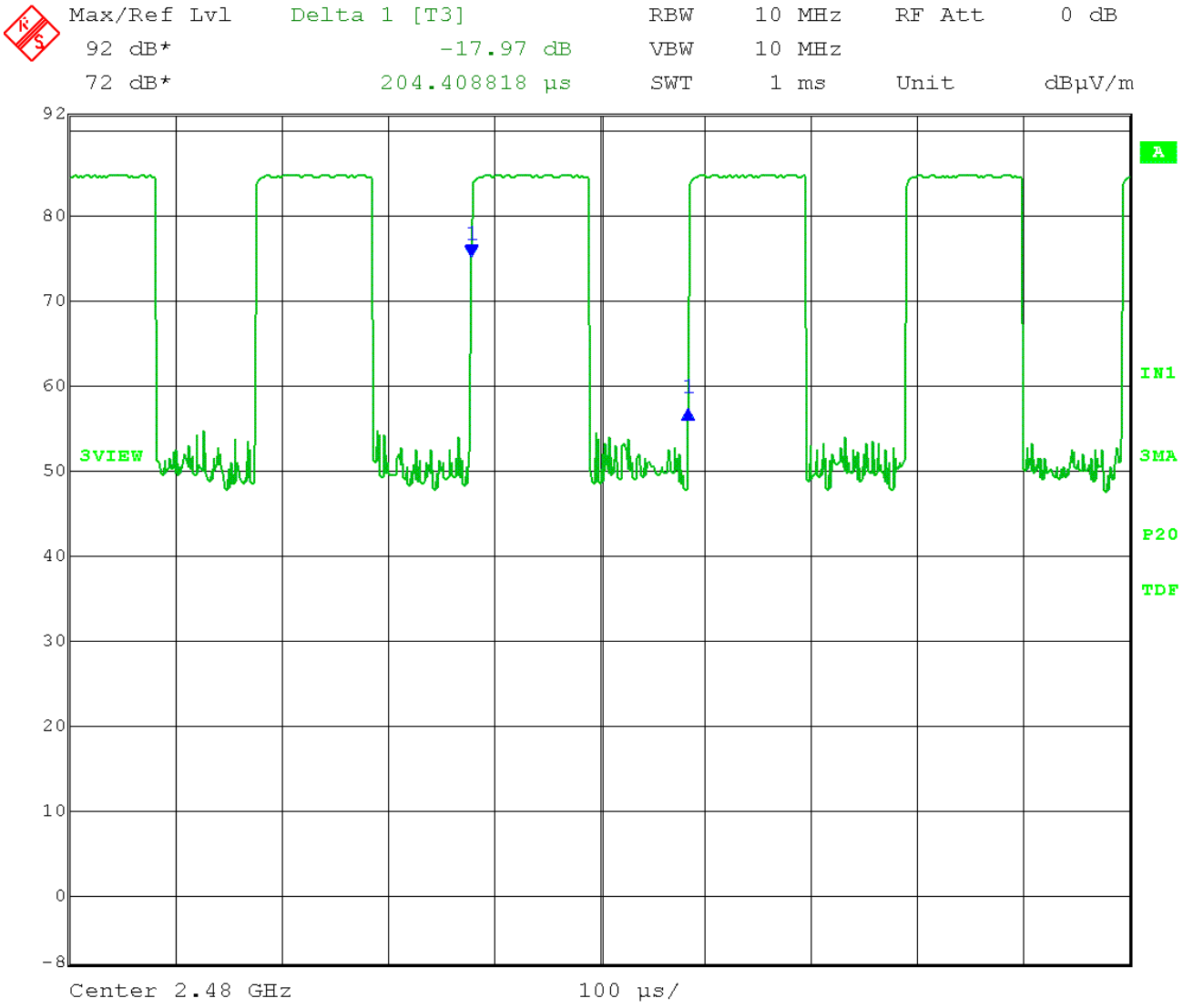
Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983 rev2.1
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Duty Cycle of Test Unit - Radiated
Operator:	cbrandt

Comment: High Channel: 2480 MHz

ON + OFF time = 0.204408818 ms
Duty cycle x = (0.114228457 ms / 0.204408818 ms) = 0.55882 = 55.9%
Voltage Duty Cycle Correction Factor = 20 log (1/0.55882) = **5.1 dB**

One cycle: 0.204408818 ms



166 South Carter, Genoa City, WI 53128

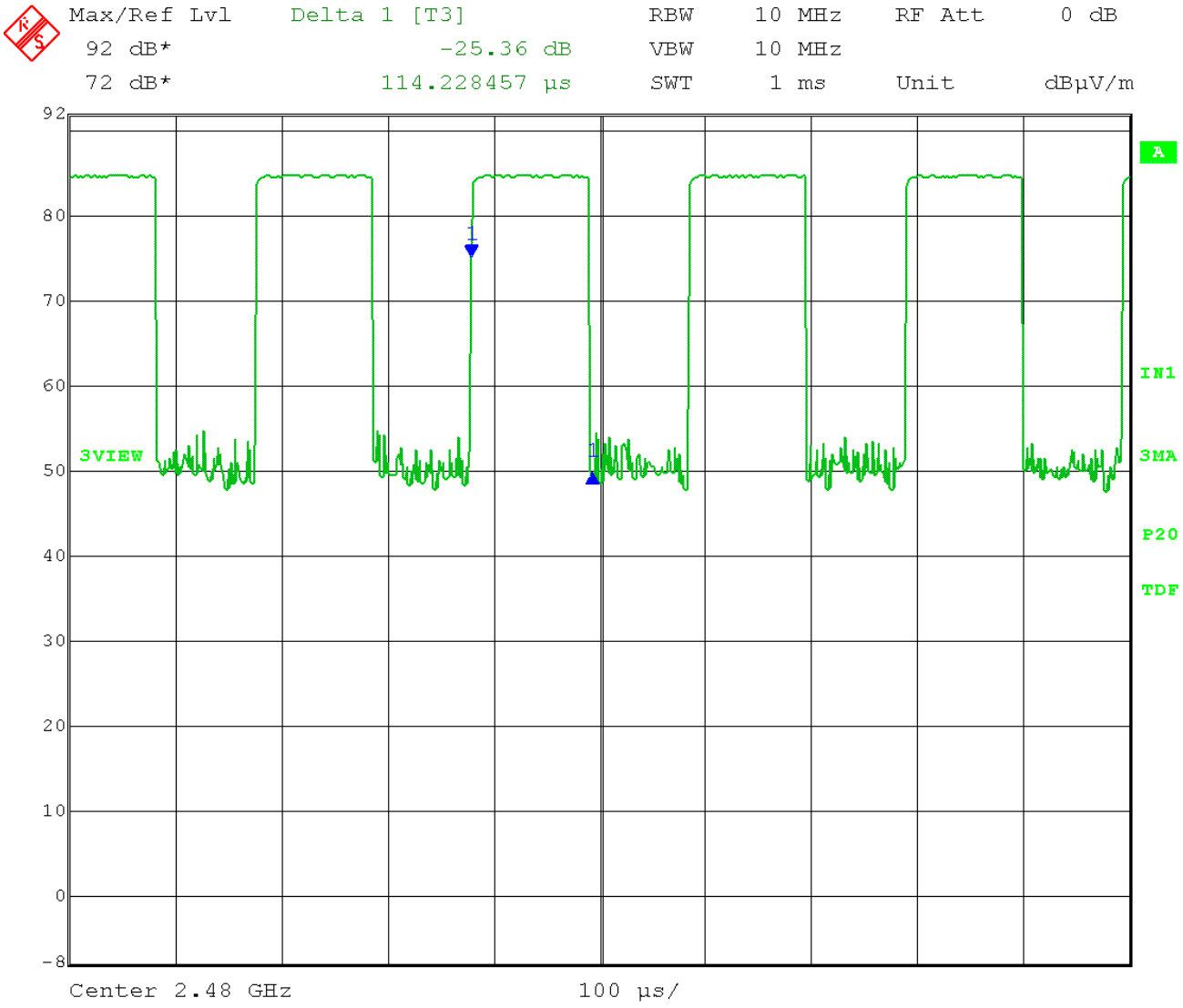
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983 rev2.1
Project Number: 11373

Test Date: 02-18-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Duty Cycle of Test Unit - Radiated
Operator: cbrandt

Comment: High Channel: 2480 MHz

ON + OFF time = 0.204408818 ms
Duty cycle x = (0.114228457 ms / 0.204408818 ms) = 0.55882 = 55.9%
Voltage Duty Cycle Correction Factor = 20 log (1/0.55882) = **5.1 dB**

ON time during one cycle = 0.114228457 ms



2.0 DTS Bandwidth (6 dB bandwidth)

Rule Part:

Section 15.247(a)(2)

Test Procedure:

ANSI C63.10-2013, Sections 6.9.2 and 11.8.2
Occupied bandwidth – relative measurement procedure.
Automatic bandwidth measurement function of spectrum analyzer.

Limit:

Minimum 6 dB bandwidth must be at least 500 kHz.

Results:

Compliant.
Minimum 6 dB bandwidth = 1.30 MHz

Sample Equation(s):

None

Notes:

Per ANSI C63.10 Section 5.11, the EUT was programmed for continuous transmit, modulated, with the highest duty cycle achievable using the available programming test software (55.9% duty cycle). The EUT is portable and therefore was set up on a non-conductive table for testing purposes. The EUT is portable and therefore was rotated through 3 orthogonal axes to find the strongest emission level. The EUT was tested at the low, middle, and high channels of operation in accordance with FCC 15.31(m).

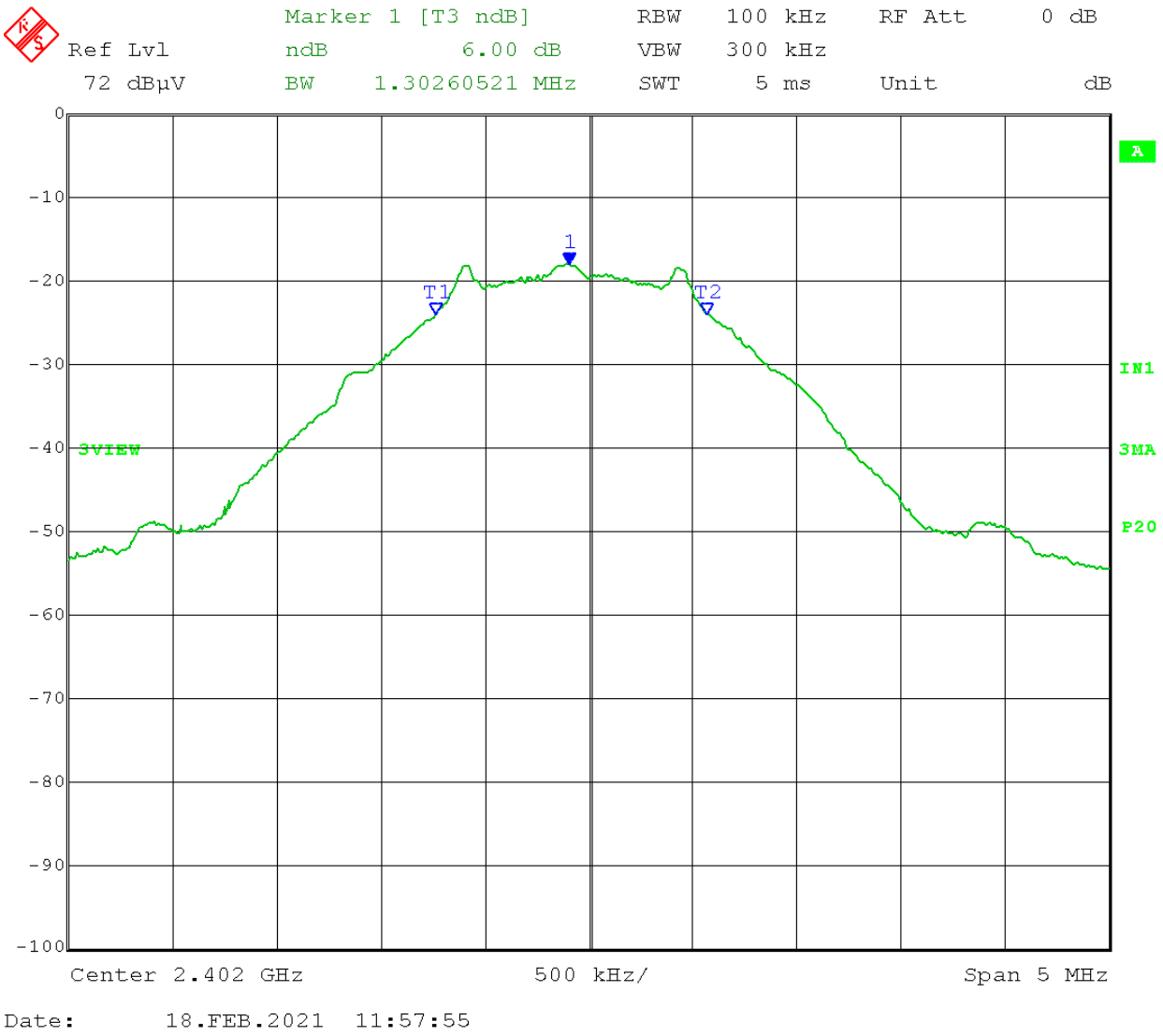
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983 rev2.1
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	DTS (6 dB) Bandwidth - Radiated
Operator:	Craig B

Comment: Power setting 20
Low Channel: 2402 MHz

6 dB Bandwidth = **1.30 MHz**



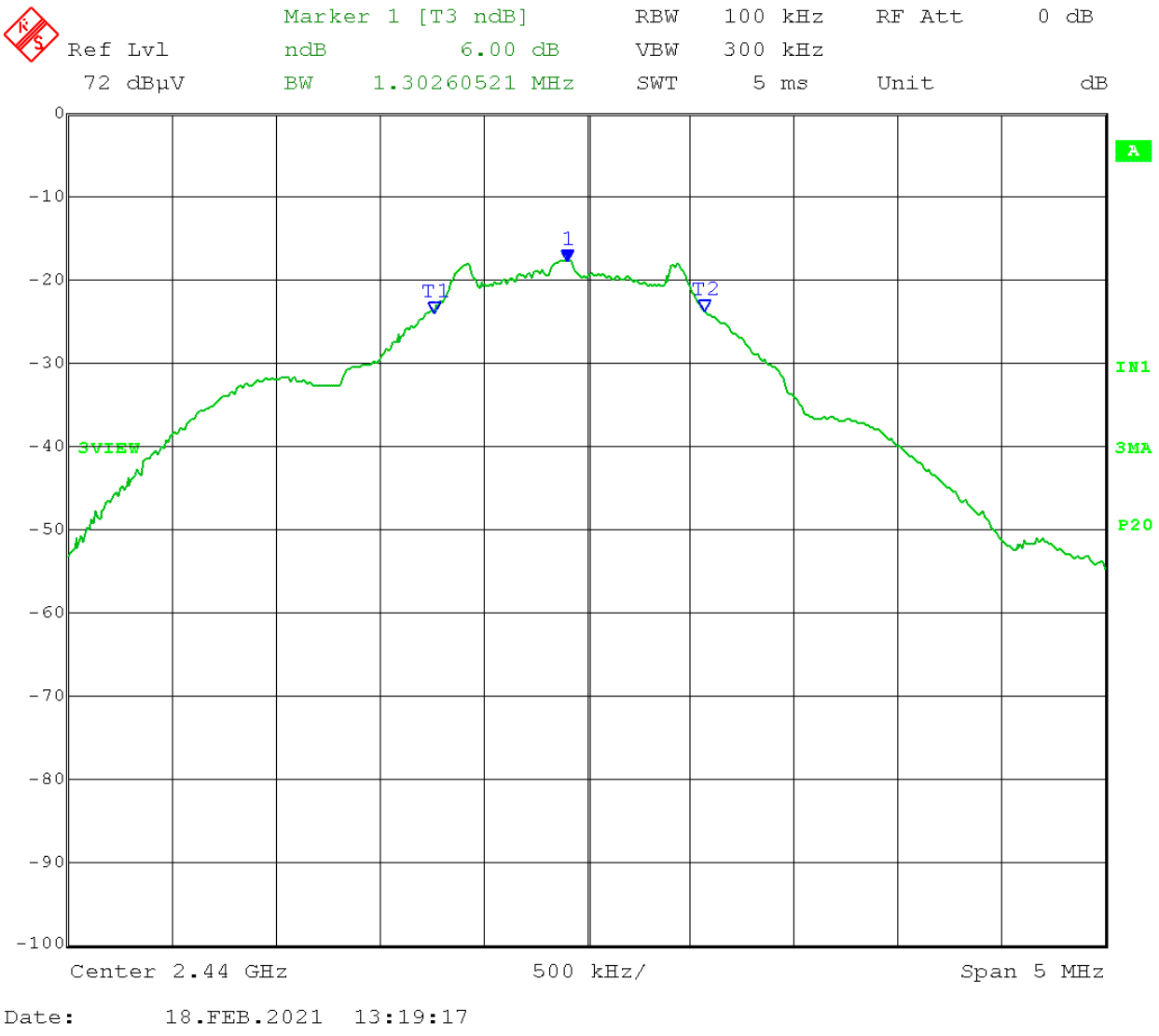
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983 rev2.1
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	DTS (6 dB) Bandwidth - Radiated
Operator:	cbrandt

Comment: Power setting 20
Mid Channel: 2440 MHz

6 dB Bandwidth = **1.30 MHz**



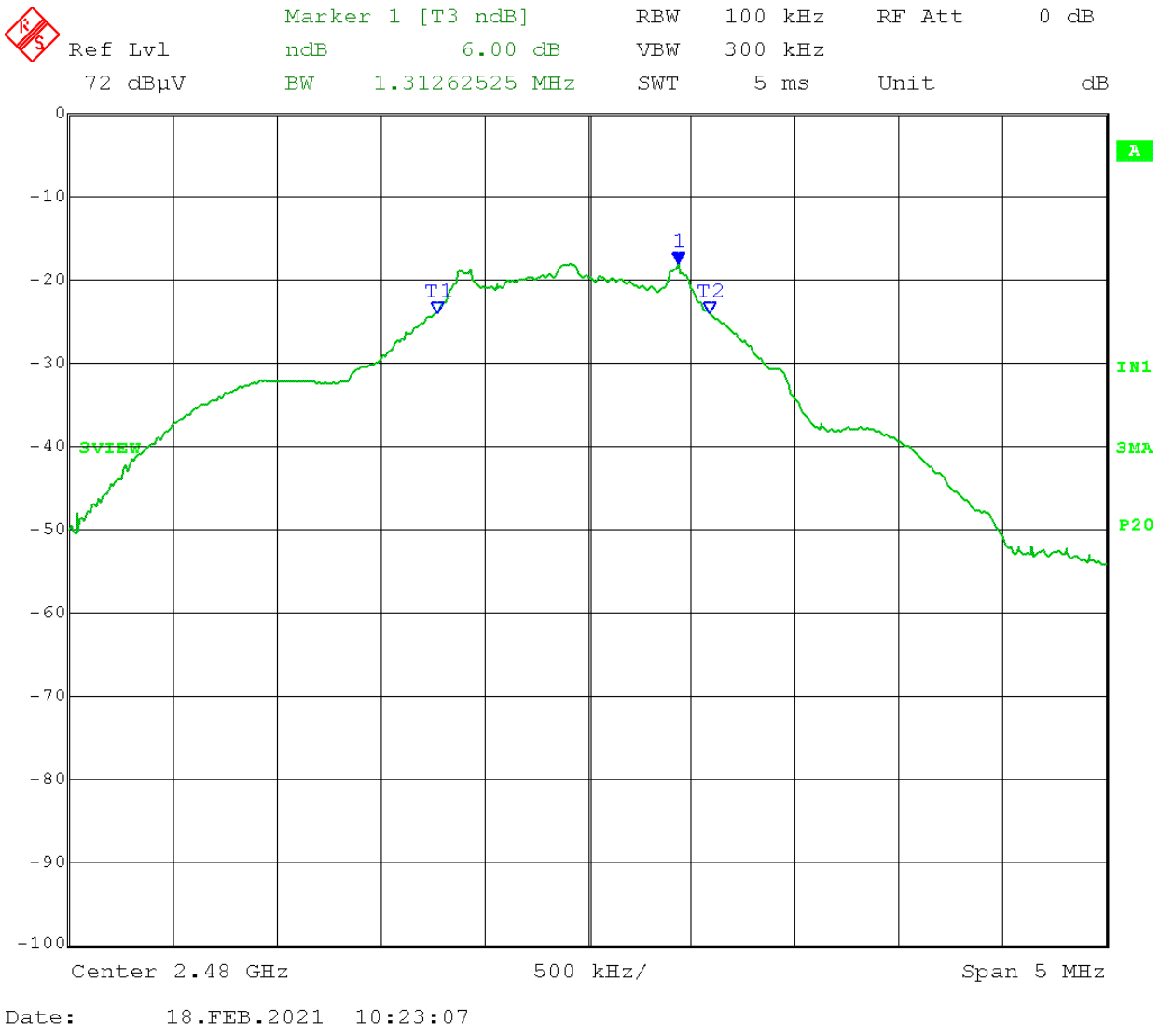
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983 rev2.1
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	DTS (6 dB) Bandwidth - Radiated
Operator:	cbrandt

Comment: Power setting 20
High Channel: 2480 MHz

6 dB Bandwidth = **1.31 MHz**



Section A

3.0 Peak Output Power – Radiated

Rule Part:

Section 15.247(b)(3)

Test Procedure:

ANSI C63.10-2013, Sections 11.9.1.1 and Annex G, Section 5.3
Maximum peak conducted output power.
RBW ≥ DTS bandwidth method.
Radiated configuration using Signal (antenna) substitution techniques.

Limit:

1 Watt (30 dBm) RF Conducted

Results:

Compliant
Maximum Peak Output Power measured -10.29 dBm EIRP.
(Less 1.5 dBi to account for EUT antenna gain = -11.79 dBm (**0.00007 Watts**) calculated RF conducted)

Sample Equation(s):

EIRP = Signal generator output - cable loss + antenna gain
EIRP (dBm) = -17.00 dBm – 2.96 dB + 9.67 dBi = -10.29 dBm

Per ANSI C63.10-2013, Section 11.3, the equivalent conducted output power is determined by subtracting the EUT transmit antenna gain from the EIRP.
Conducted Power (dBm) = EIRP (dBm) – antenna gain (dBi)
= -10.29 dBm – 1.5 dBi = -11.79 dBm
= 0.06622 mW = 0.00006622 W (rounded = **0.00007 Watts**)

Notes:

In following FCC Part 15 and ANSI C63.10 requirements, the EUT was programmed for continuous transmit, modulated, with the highest duty cycle achievable using the available programming test software (55.9% duty cycle). Power setting 20 was used per manufacturer's instruction. The EUT was rotated through 3 orthogonal axes to find the highest radiated field strength. The maximum field strength level was measured and, using ANSI C63.10 signal substitution techniques, converted into an Effective Isotropic Radiated Power Level (EIRP). The EIRP level was then mathematically converted to RF conducted output power by subtracting the antenna gain (1.5 dBi peak gain) from the EIRP level. The EUT was tested at the low, middle, and high channels of operation in accordance with FCC 15.31(m).

Section A

DLS Electronic Systems, Inc.

Company: Alcokec, Inc.
Operator: Craig B
Date of test: 02-16-2021
Temperature: 68 deg. F
Humidity: 26% R.H.
Detector: Max Peak; RBW: 3 MHz; VBW: 10 MHz
Limit: 30 dBm

Power setting 20 (maximum)

EIRP - Substitution Method

Model: **Sensing Unit**						
Channel: **Low - 2402 MHz**						
Frequency and Polarization (MHz)	Max. Field Strength of EUT @ 3 meters (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)
2402 vertical	84.64	-17.90	2.92	9.72	**-11.10**	30.00
2402 horizontal	84.66	-18.10	2.92	9.72	-11.30	30.00

EIRP = Signal generator output - cable loss + antenna gain

Section A

DLS Electronic Systems, Inc.

Company: Alcokec, Inc.
Operator: Craig B
Date of test: 02-16-2021
Temperature: 68 deg. F
Humidity: 26% R.H.
Detector: Max Peak; RBW: 3 MHz; VBW: 10 MHz
Limit: 30 dBm

Power setting 20 (maximum)

EIRP - Substitution Method

Model: **Sensing Unit**						
Channel: **Mid - 2440 MHz**						
Frequency and Polarization (MHz)	Max. Field Strength of EUT @ 3 meters (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)
2440 vertical	85.55	-17.05	2.96	9.67	-10.34	30.00
2440 horizontal	85.55	-17.00	2.96	9.67	**-10.29**	30.00

EIRP = Signal generator output - cable loss + antenna gain

Section A

DLS Electronic Systems, Inc.

Company: Alcokec, Inc.
Operator: Craig B
Date of test: 02-16-2021
Temperature: 68 deg. F
Humidity: 26% R.H.
Detector: Max Peak; RBW: 3 MHz; VBW: 10 MHz
Limit: 30 dBm

Power setting 20 (maximum)

EIRP - Substitution Method

Model: **Sensing Unit**						
Channel: **High - 2480 MHz**						
Frequency and Polarization (MHz)	Max. Field Strength of EUT @ 3 meters (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)
2480 vertical	84.92	-17.42	2.99	9.58	-10.83	30.00
2480 horizontal	84.92	-17.40	2.99	9.58	**-10.81**	30.00

EIRP = Signal generator output - cable loss + antenna gain

4.0 Peak Power Spectral Density

Rule Part: Section 15.247(e)

Test Procedure: ANSI C63.10-2013, Sections 11.10.2 and Annex G, Section 5.3
Maximum Peak Power Spectral Density
Method PKPSD (peak PSD)
Radiated configuration using Signal (antenna) substitution techniques.

Limit: +8 dBm in any 3 kHz band during continuous transmission

Results: Compliant
Peak Power Spectral Density measured -26.64 dBm/3kHz EIRP.
(Less 1.5 dBi to account for EUT antenna gain = **-28.14 dBm/3kHz** RF conducted)

Sample Equation(s): Maximum Field Strength level at 3 meters = 69.09 dBµV/m in 3 kHz bandwidth.
Using the relationship between field strength and EIRP as determined in the Output Power measurement for the High channel, 84.92 dBµV/m at 3 meters - (-10.81) dBm EIRP = 95.73 dB.
Peak PSD = 69.09 dBµV/m at 3 meters - 95.73 = EIRP of -26.64 dBm in 3 kHz bandwidth.
Per ANSI C63.10-2013, Section 11.3, the equivalent conducted power spectral density is determined by subtracting the EUT transmit antenna gain from the EIRP.
Conducted Peak Power Spectral Density (dBm/3 kHz) = EIRP (dBm/3 kHz) - antenna gain (dBi)
= -26.64 dBm/3kHz - 1.5 dBi = -28.14 dBm/3kHz

Notes: In following FCC Part 15 and ANSI C63.10 requirements, the EUT was programmed for continuous transmit, modulated, with the highest duty cycle achievable using the available programming test software (55.9% duty cycle). Power setting 20 was used per manufacturer's instruction. The EUT was rotated through 3 orthogonal axes to find the highest radiated field strength. The maximum field strength level was measured and, using relationship between field strength and EIRP as determined in the Output Power measurement, converted into an Effective Isotropic Radiated Power Level (EIRP). The EIRP level was then mathematically converted to RF conducted power spectral density by subtracting the antenna gain (1.5 dBi peak gain) from the EIRP level.

It was decided that, since the Output Power measured in a 3 MHz bandwidth was less than -10 dBm, it would not be possible for the power in a 3 kHz bandwidth to exceed the limit of +8 dBm. Therefore, Peak Power Spectral Density measurements were not taken on the other two (low and middle) channels.

166 South Carter, Genoa City, WI 53128

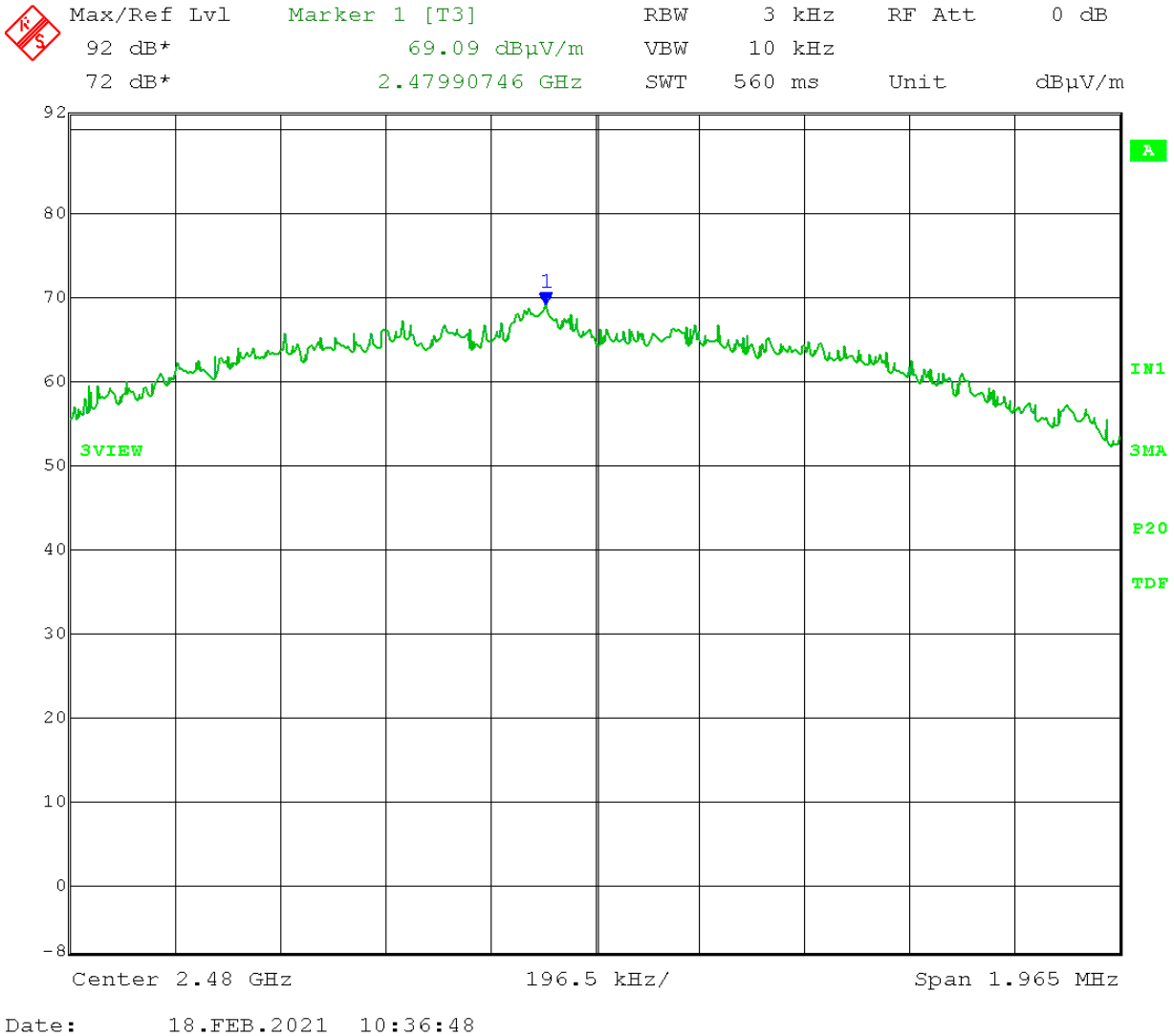
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983 rev2.1
Project Number: 11373

Test Date: 02-18-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Power Spectral Density – Radiated at 3 meters
Operator: Craig B
Detector: Peak; max-hold

Comment: Power setting: 20
High Channel: 2480 MHz
Limit: +8 dBm

Maximum Field Strength level at 3 meters = 69.09 dBµV/m in 3 kHz bandwidth
Using correction factor obtained from Substitution Method for Fundamental Output Power:

69.09 dBµV/m at 3 meters = EIRP of -26.64 dBm in 3 kHz bandwidth
(Less 1.5 dBi to account for EUT antenna gain = **-28.14 dBm/3kHz** RF conducted)



Section A

5.0 Emissions in Non-Restricted Frequency Bands – Radiated

Rule Part:

Section 15.247(d)

Test Procedure:

ANSI C63.10-2013, Sections 11.11.1(a), 11.11.2, and 11.11.3
Maximum PEAK conducted power procedure.
Reference level measurement.
Emission level measurement.

Limit:

20 dB down from the highest emission level within the authorized band as measured with a 100 kHz resolution bandwidth (RBW).

Results:

Compliant

Sample Equation(s):

None

Notes:

In following FCC Part 15 and ANSI C63.10 requirements, the EUT was programmed for continuous transmit, modulated, with the highest duty cycle achievable using the available programming test software (55.9% duty cycle). Power setting 20 was used per manufacturer's instruction. The EUT was rotated through 3 orthogonal axes to find the highest radiated field strength at each frequency of interest. The maximum field strength level of the fundamental emission was measured and recorded. The field strength of all emissions found outside of the restricted frequency bands of FCC 15.205 were then measured and verified to be greater than 20 dB below the level of the fundamental emission. The EUT was tested at the low, middle, and high channels of operation in accordance with FCC 15.31(m).

5.1 Non-Restricted Band Emissions in the Vertical Polarization

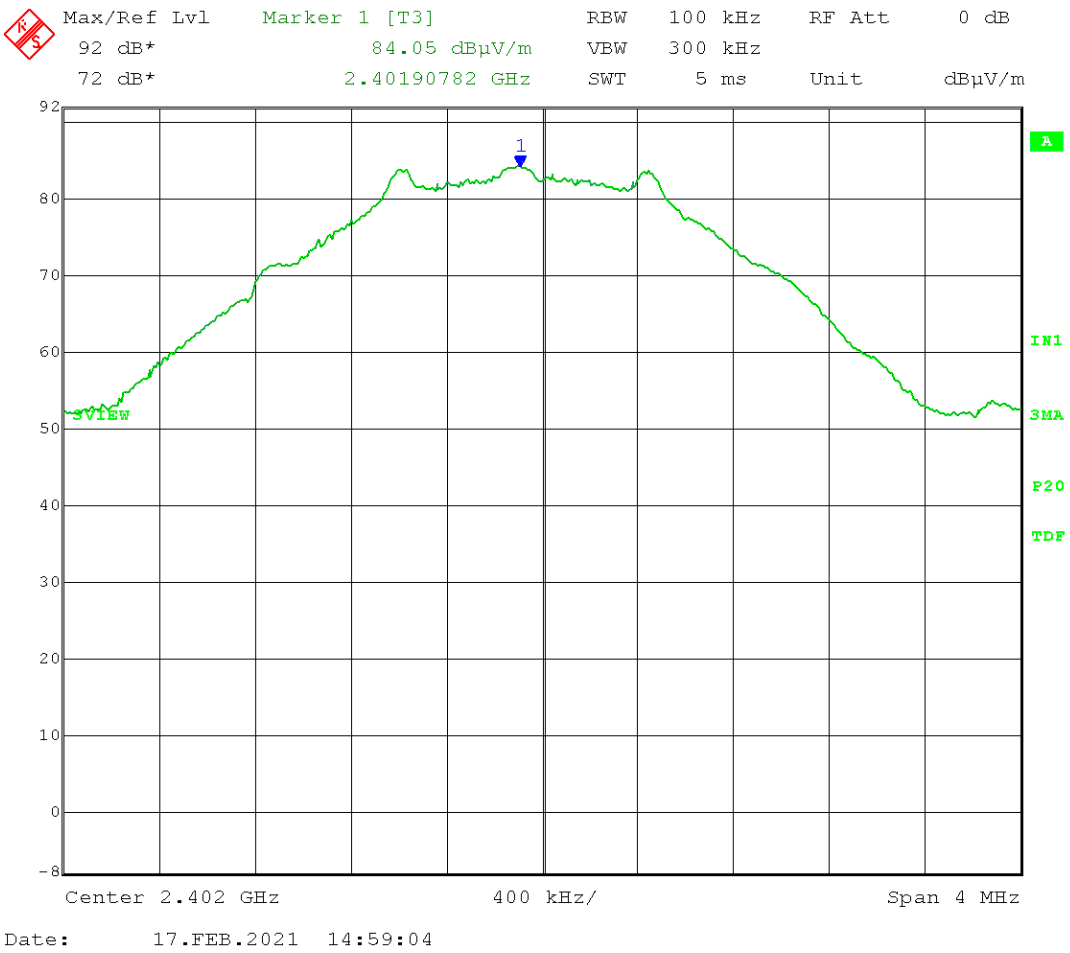
5.1(a) 1 – 25 GHz: Low Channel – 2402 MHz

Test Date: 02-17-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak detector; max-hold
Field strength level of fundamental emission maximized

Comment: Power setting 20
Low Channel: 2402 MHz
Reference Level measurement

Reference Level = 84.05 dBµV/m at 3 meters (radiated emission level maximized)
Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters

VERTICAL:



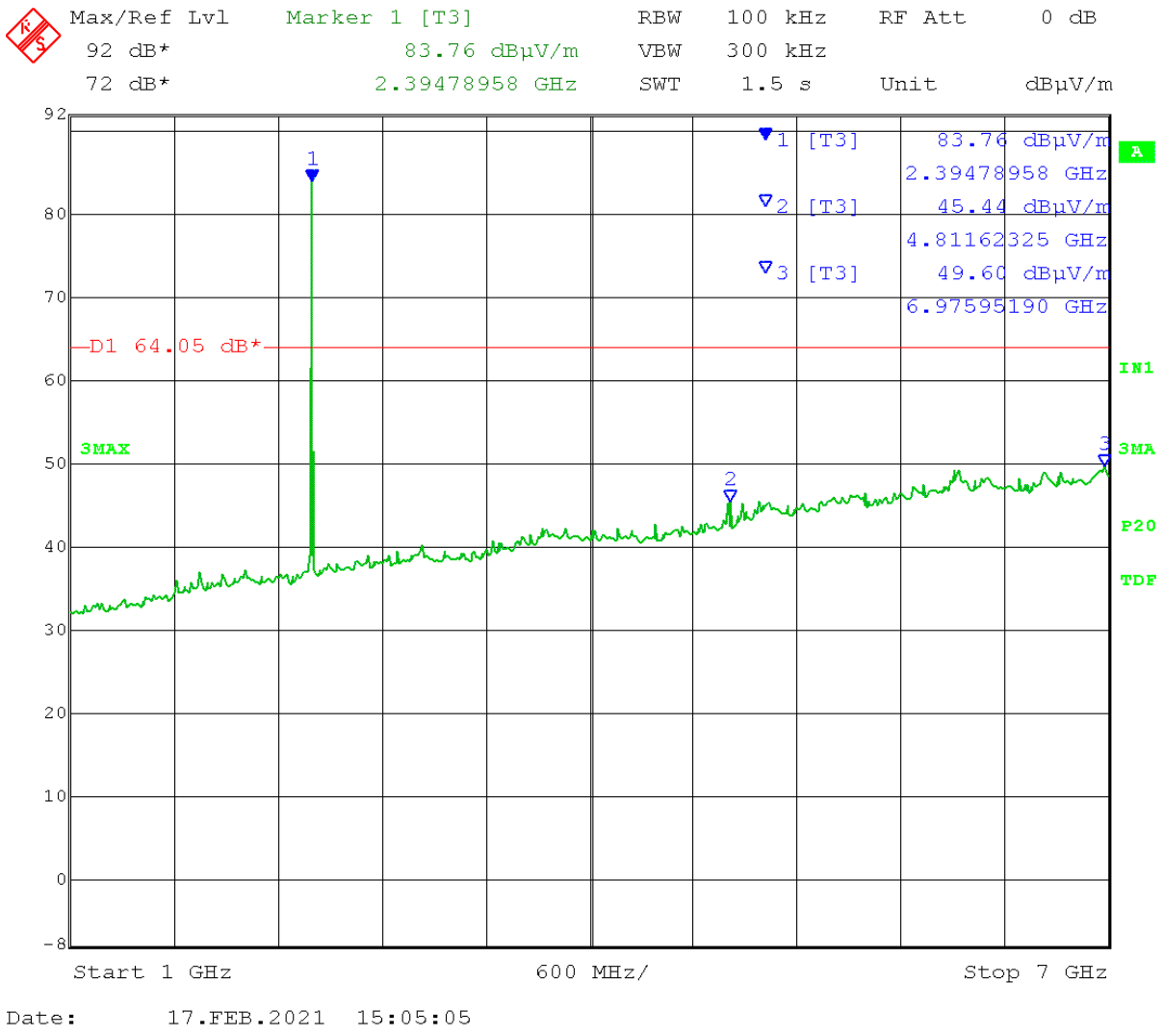
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983 rev2.1
Project Number:	11373

Test Date:	02-17-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak detector; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 Low Channel: 2402 MHz Emission Level measurement

Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters

VERTICAL: Frequency Range: 1 – 7 GHz



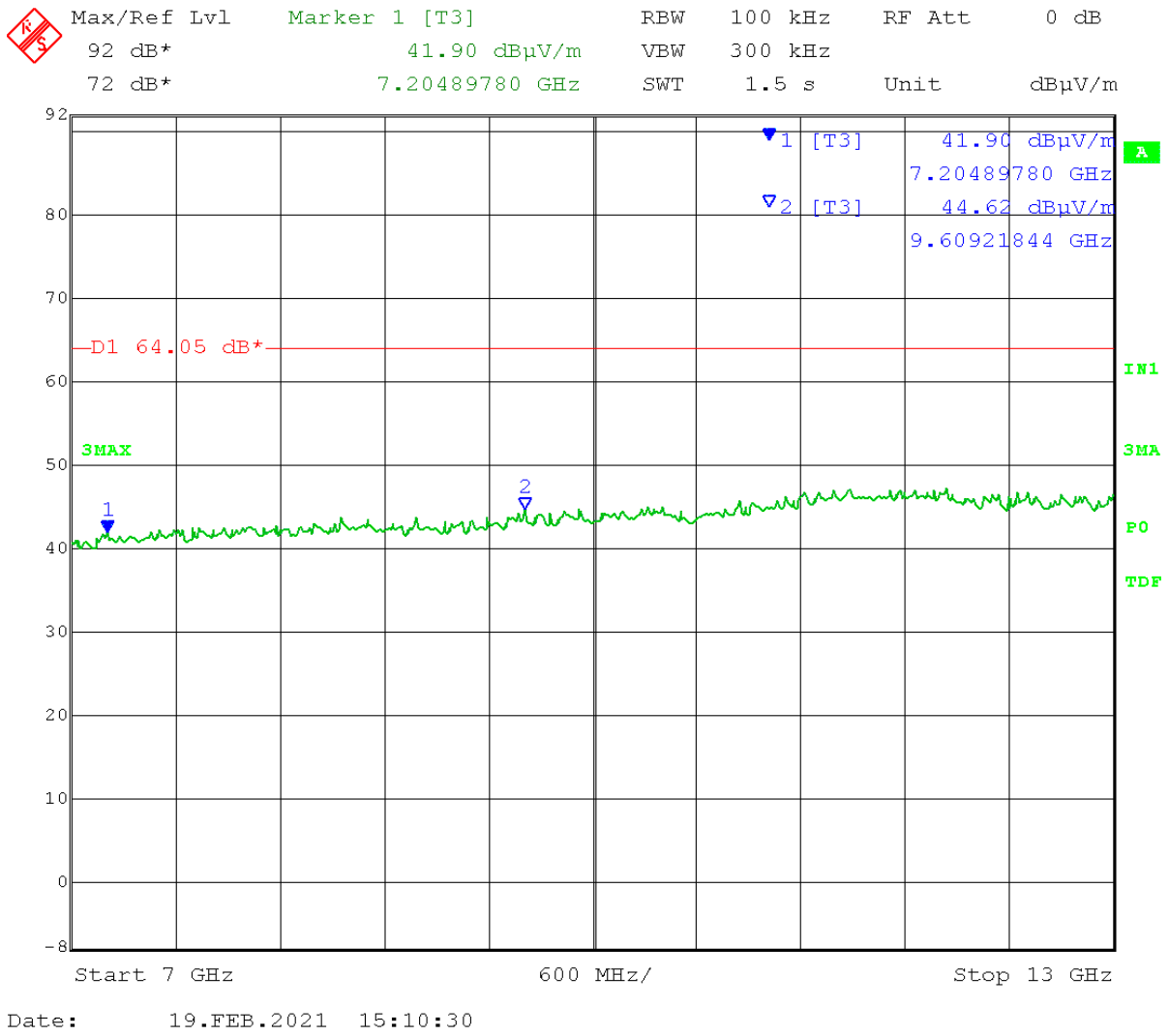
166 South Carter, Genoa City, WI 53128

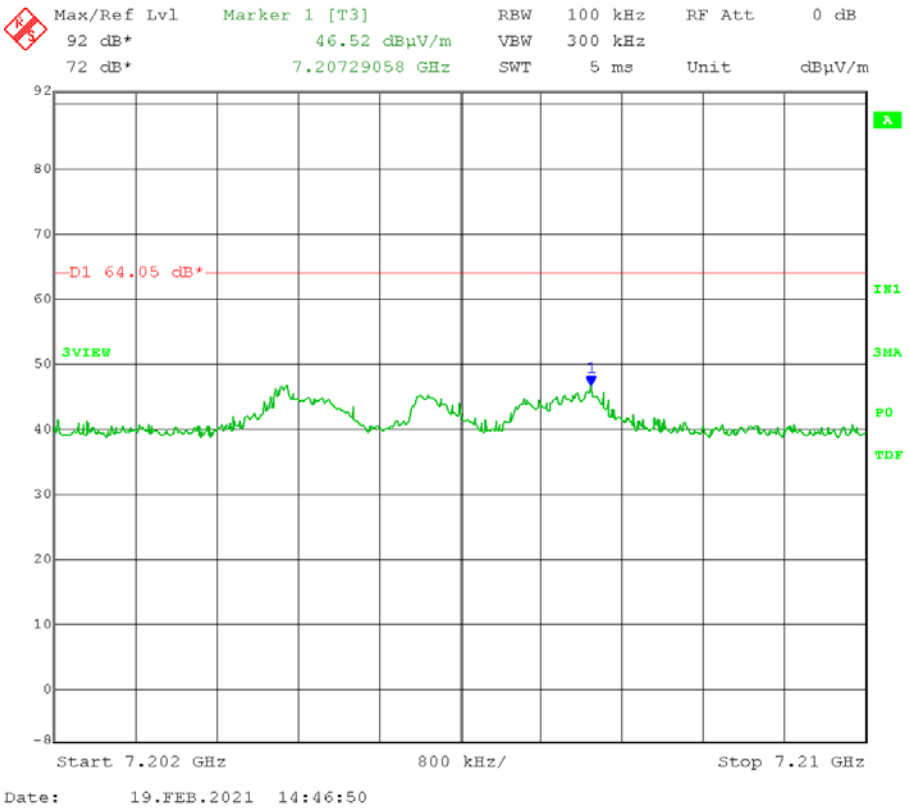
Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983 rev2.1
Project Number:	11373

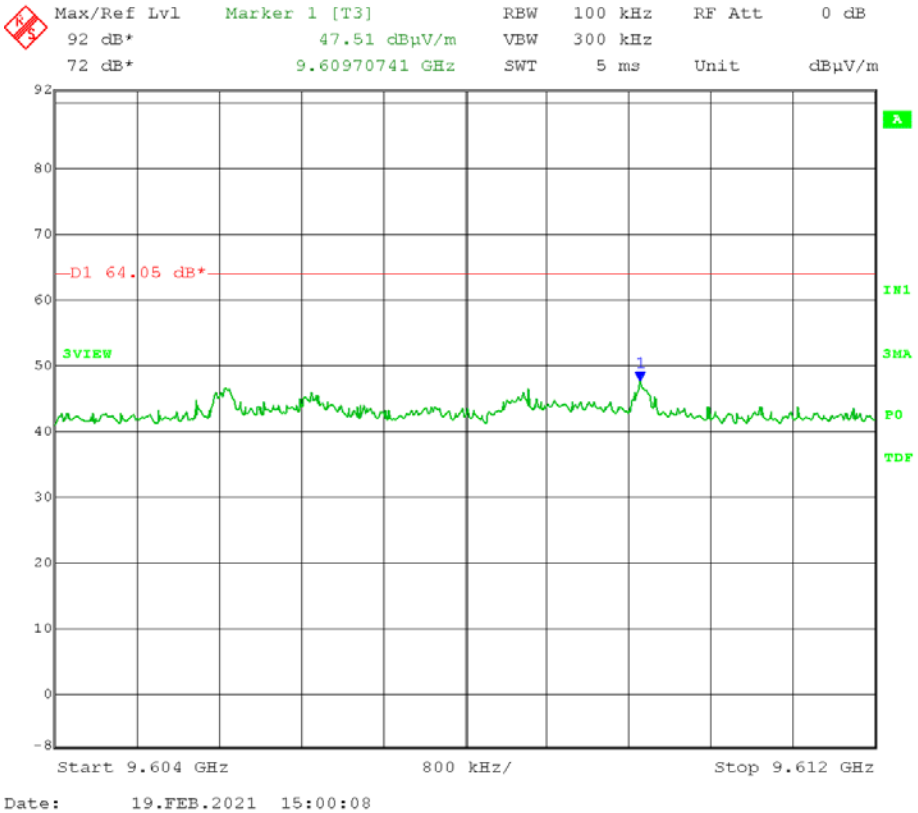
Test Date:	02-19-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak detector; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 Low Channel: 2402 MHz Emission Level measurement

Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters

VERTICAL: Frequency Range: 7 – 13 GHz




Max/Ref Lvl
92 dB*
72 dB*
Marker 1 [T3]
46.52 dBµV/m
7.20729058 GHz
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 0 dB
Unit dBµV/m
D1 64.05 dB*
3VIEW
IN1
3MA
PO
TDF
Start 7.202 GHz
800 kHz/
Stop 7.21 GHz
Date: 19.FEB.2021 14:46:50


Max/Ref Lvl
92 dB*
72 dB*
Marker 1 [T3]
47.51 dBµV/m
9.60970741 GHz
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 0 dB
Unit dBµV/m
D1 64.05 dB*
3VIEW
IN1
3MA
PO
TDF
Start 9.604 GHz
800 kHz/
Stop 9.612 GHz
Date: 19.FEB.2021 15:00:08

166 South Carter, Genoa City, WI 53128

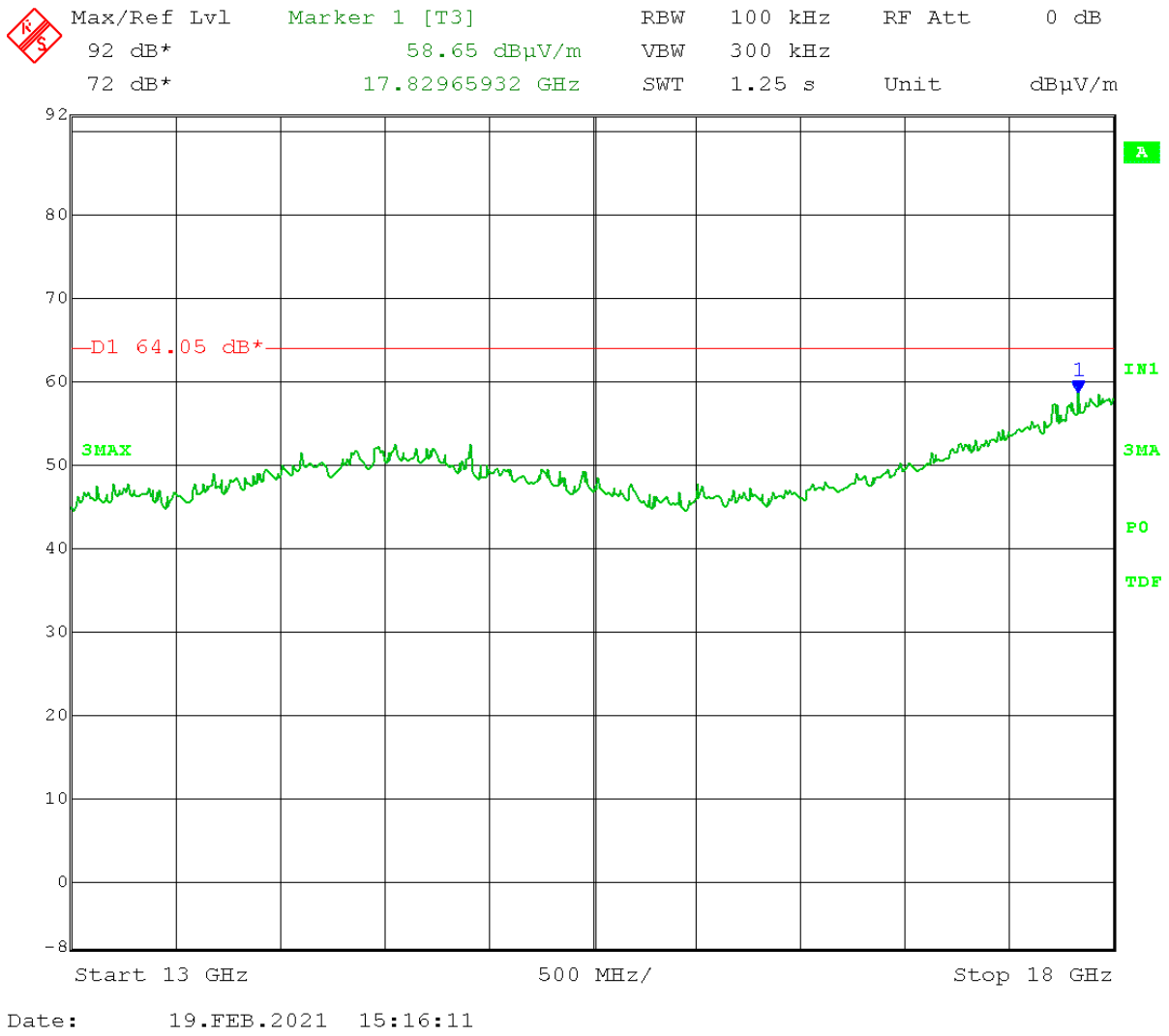
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-19-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak detector; max-hold
DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized)
(Special attention paid to harmonics of fundamental frequency)

Comment: Power setting 20
Low Channel: 2402 MHz
Emission Level measurement

Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters

VERTICAL: Frequency Range: 13 – 18 GHz



166 South Carter, Genoa City, WI 53128

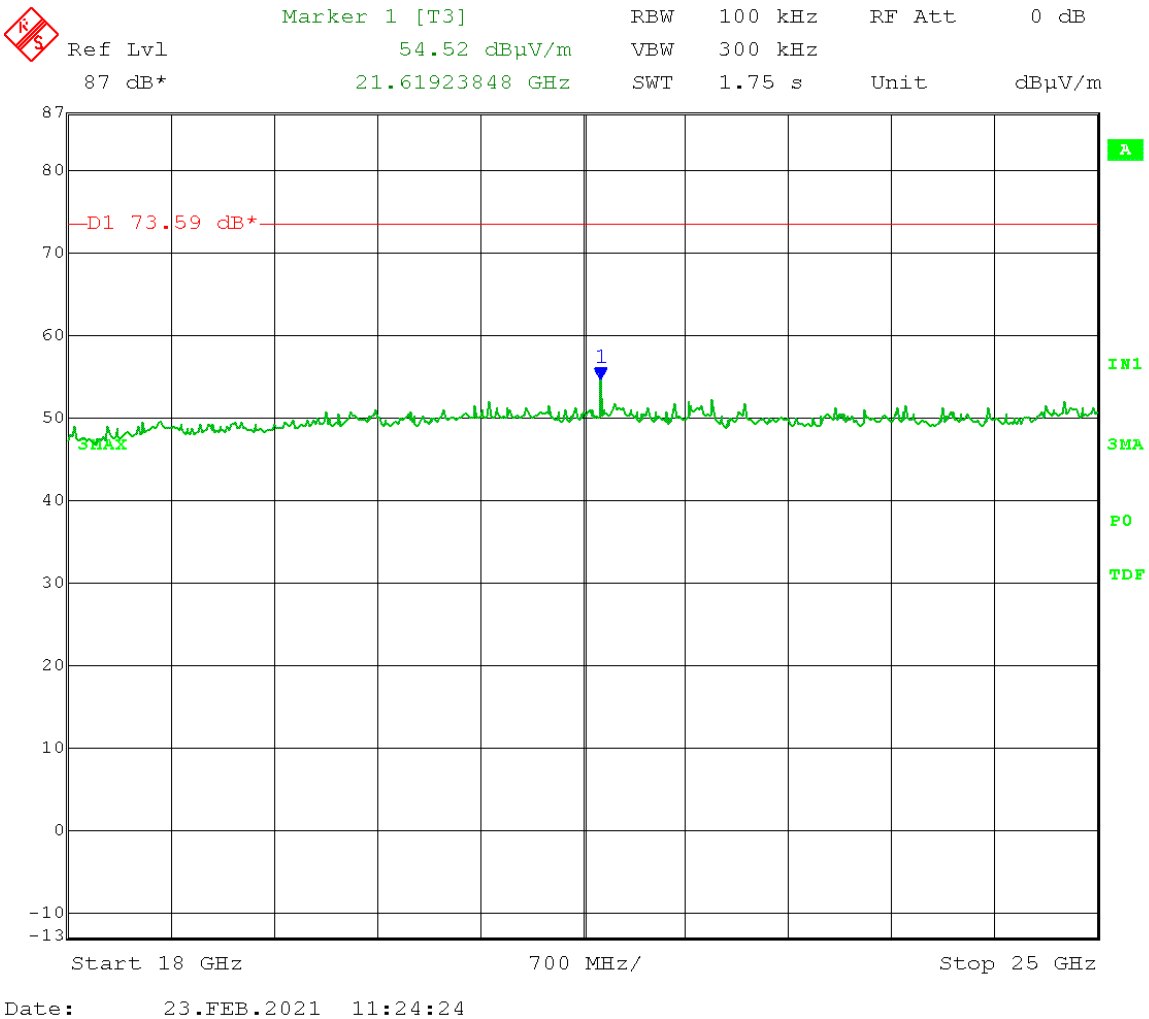
Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-23-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak; max-hold Receive antenna moved near and around every surface of DUT to search for emissions. All recorded levels taken at a 1-meter test distance. (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 Low Channel: 2402 MHz Emission Level measurement

Limit corrected for 1 meter test distance by adding 9.54 dB, [20 log (1m/3m)]

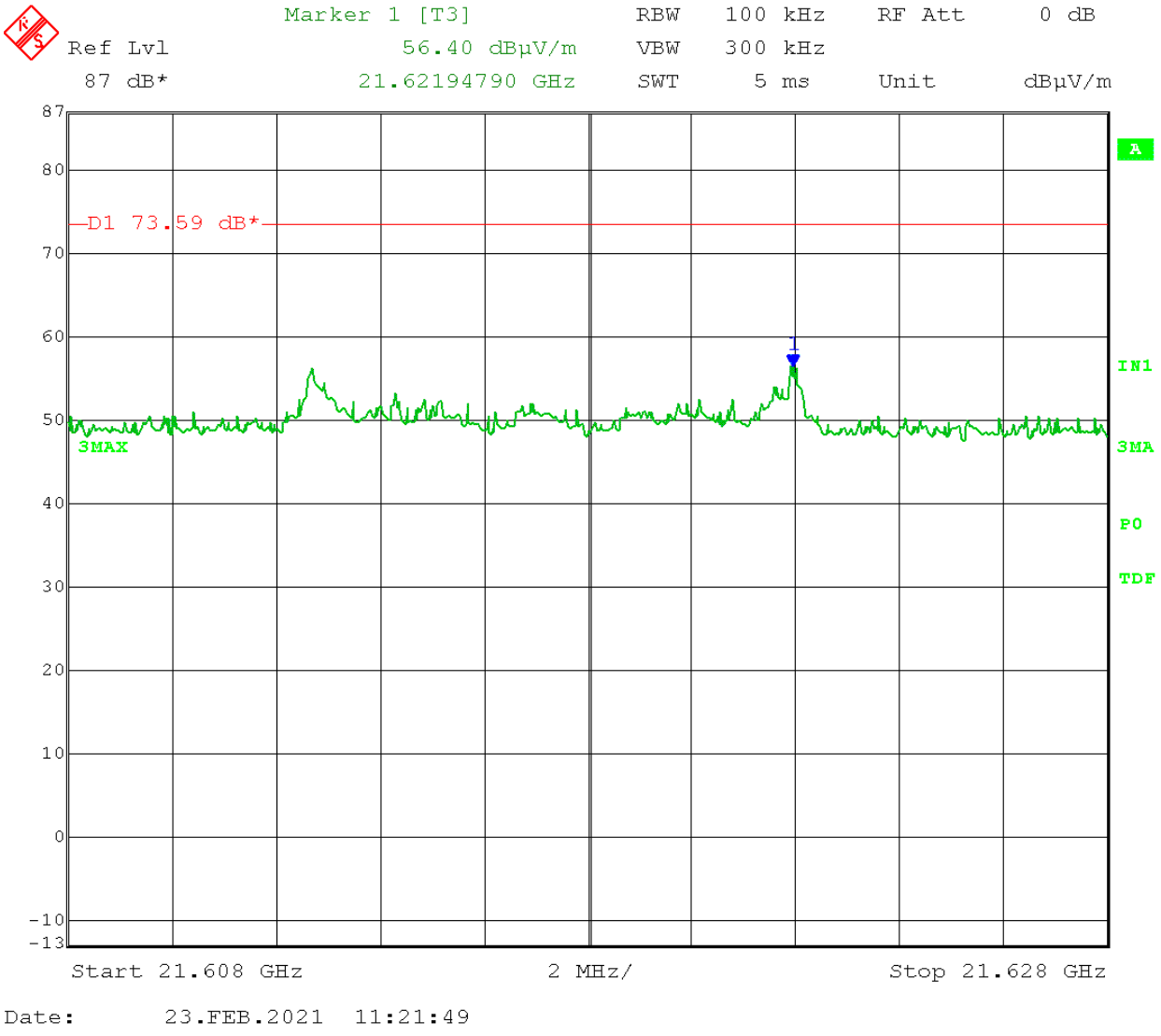
Limit = 84.05 dBµV/m – 20 dB = 64.05 dBµV/m at 3 meters, + 9.54 dB = **73.59 dBµV/m** at 1 meter

VERTICAL Frequency Range: 18 – 25 GHz



166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373



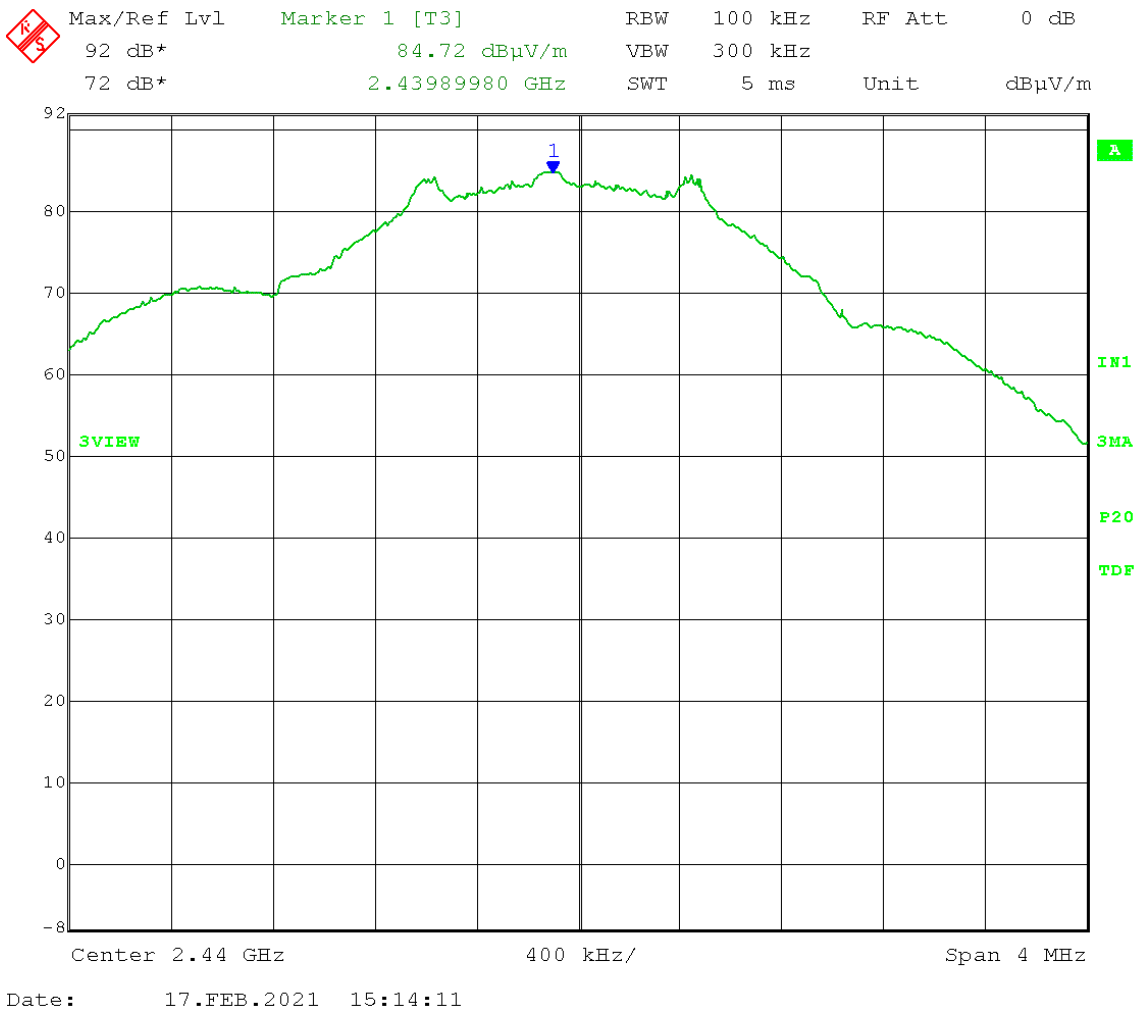
5.1(b) 1 – 25 GHz: Middle Channel – 2440 MHz

Test Date: 02-17-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak detector; max-hold
Field strength level of fundamental emission maximized

Comment: Power setting 20
Mid Channel: 2440 MHz
Reference Level measurement

Reference Level = 84.72 dBµV/m at 3 meters (radiated emission level maximized)
Limit = 84.72 dBµV/m – 20 dB = **64.72 dBµV/m** at 3 meters

VERTICAL:



166 South Carter, Genoa City, WI 53128

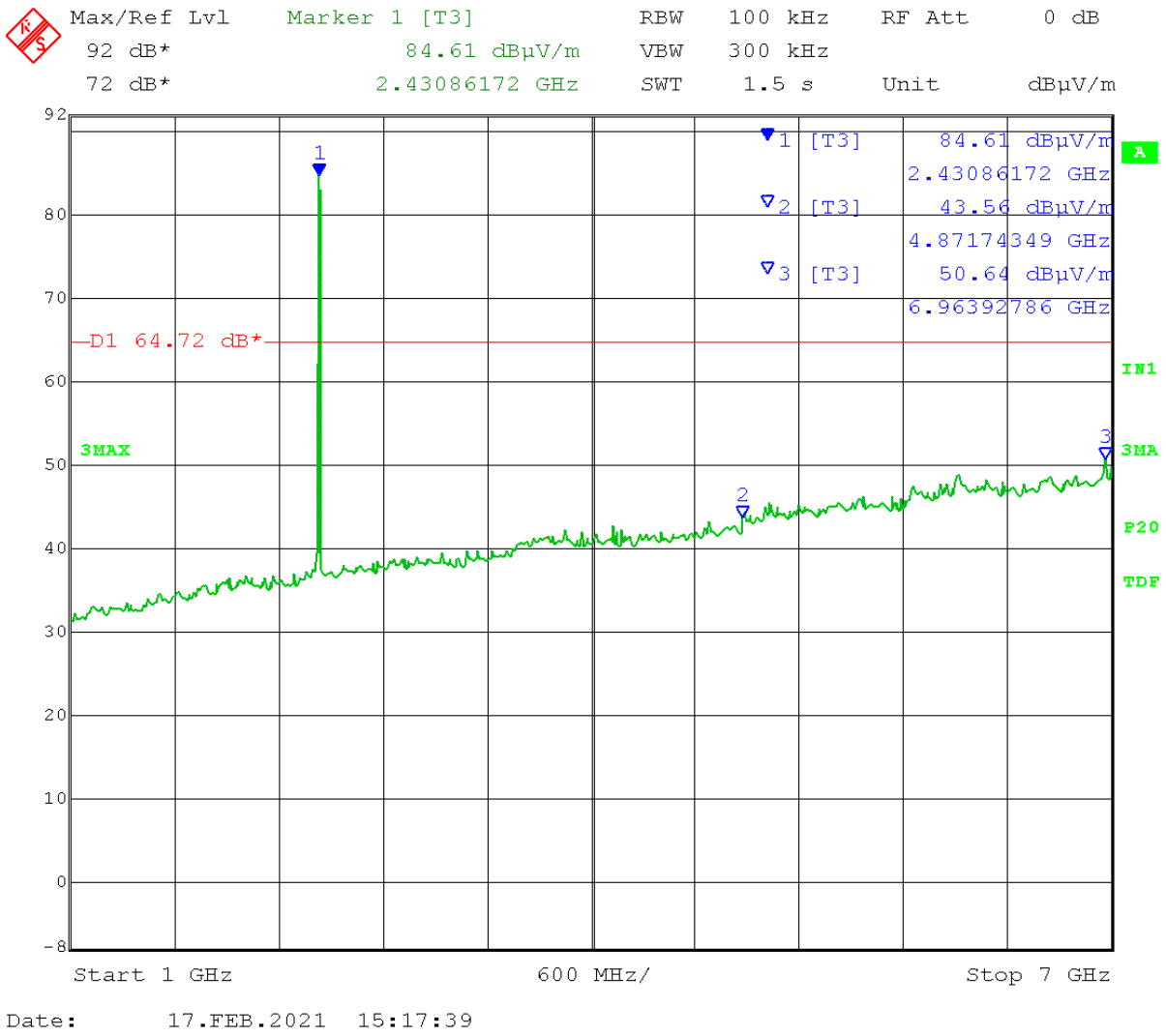
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-17-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak detector; max-hold
DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized)
(Special attention paid to harmonics of fundamental frequency)

Comment: Power setting 20
Mid Channel: 2440 MHz
Emission Level measurement

Limit = 84.72 dBµV/m – 20 dB = **64.72 dBµV/m** at 3 meters

VERTICAL: Frequency Range: 1 – 7 GHz



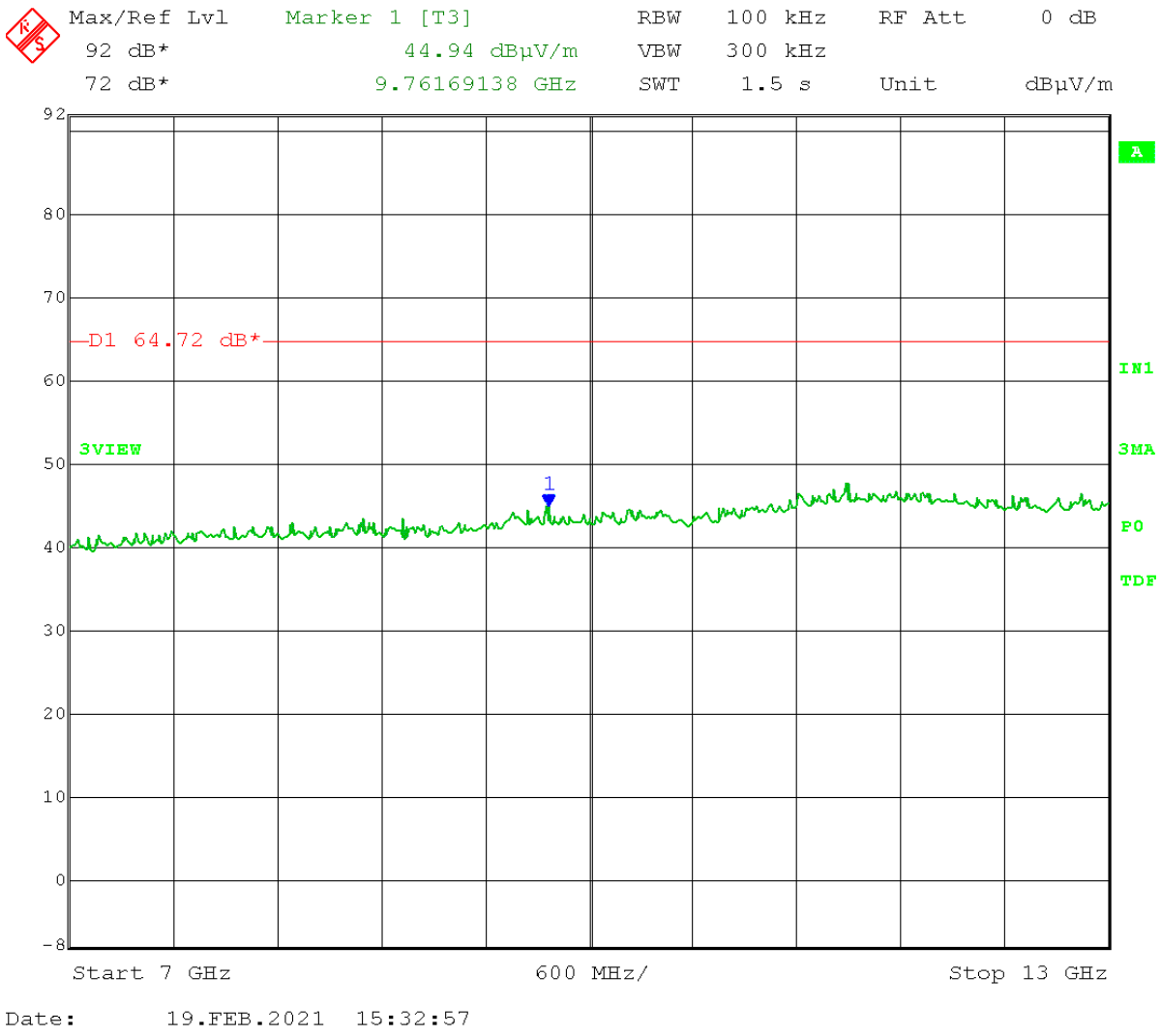
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-19-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak detector; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 Mid Channel: 2440 MHz Emission Level measurement

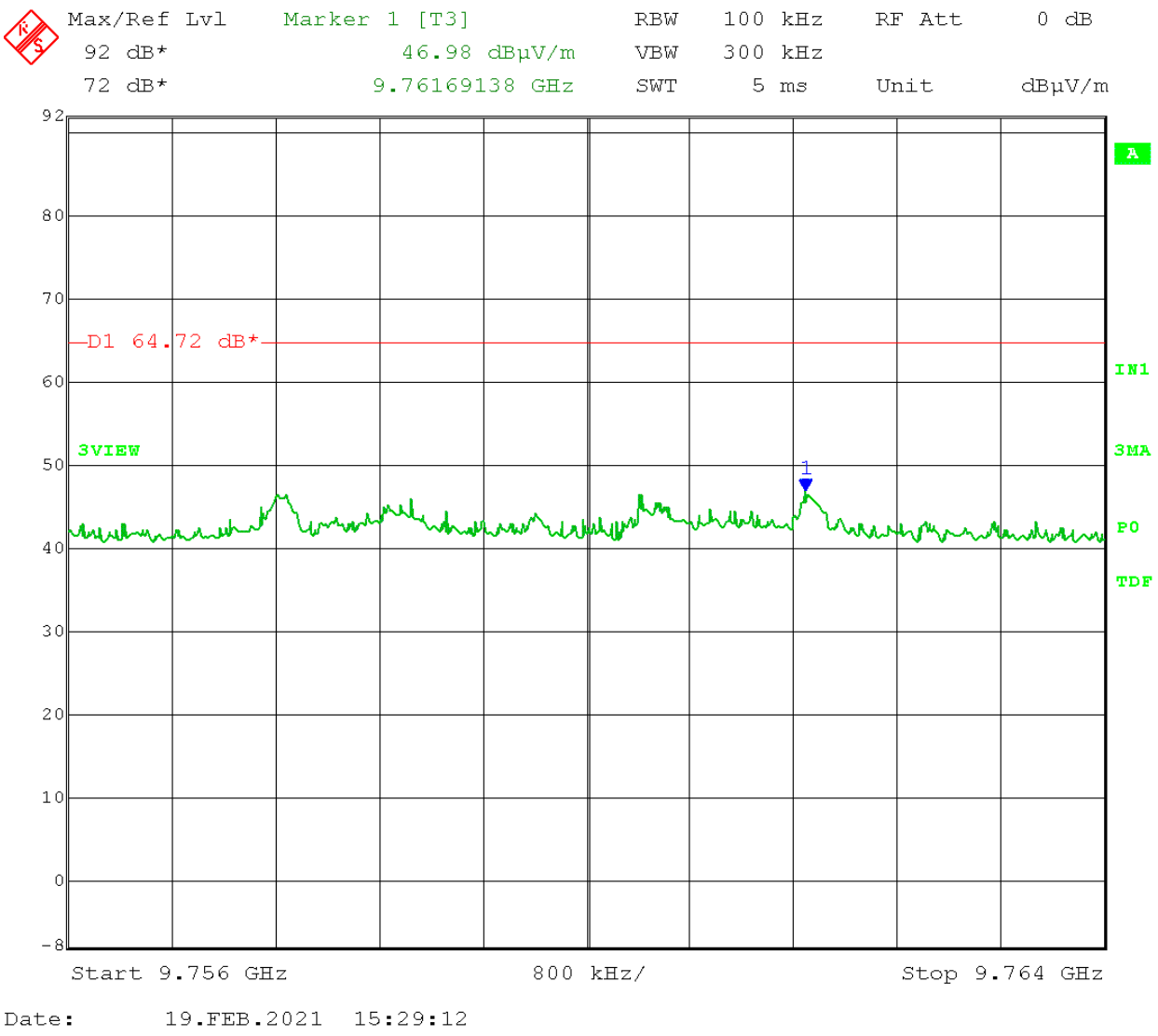
Limit = 84.72 dBµV/m – 20 dB = **64.72 dBµV/m** at 3 meters

VERTICAL: Frequency Range: 7 – 13 GHz



166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373



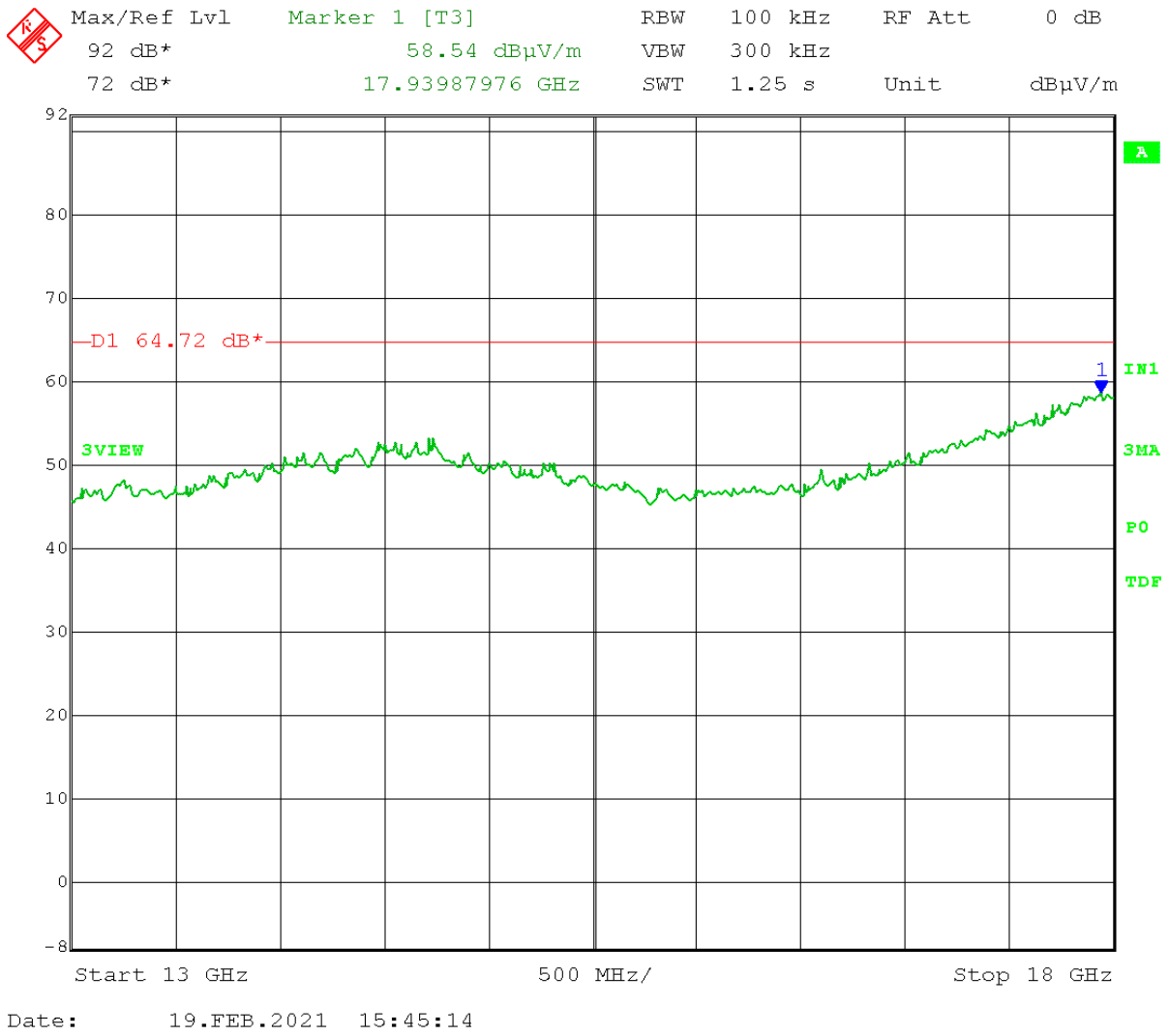
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-19-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak detector; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 Mid Channel: 2440 MHz Emission Level measurement

Limit = 84.72 dBµV/m – 20 dB = **64.72 dBµV/m** at 3 meters

VERTICAL: Frequency Range: 13 – 18 GHz



166 South Carter, Genoa City, WI 53128

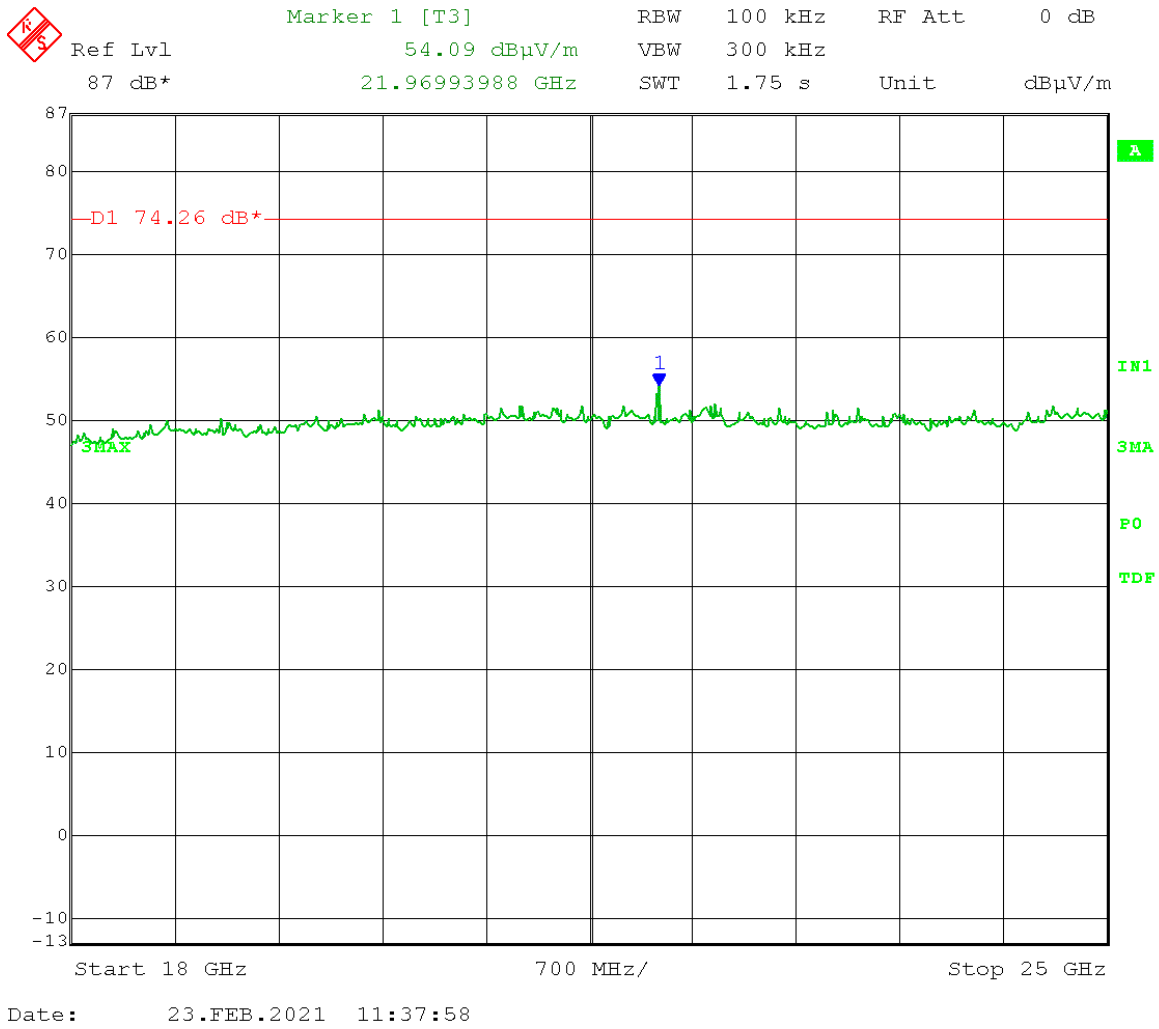
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-23-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak; max-hold
Receive antenna moved near and around every surface of DUT to search for emissions.
All recorded levels taken at a 1-meter test distance.
(Special attention paid to harmonics of fundamental frequency)

Comment: Power setting 20
Mid Channel: 2440 MHz
Emission Level measurement
Limit corrected for 1 meter test distance by adding 9.54 dB, [20 log (1m/3m)]

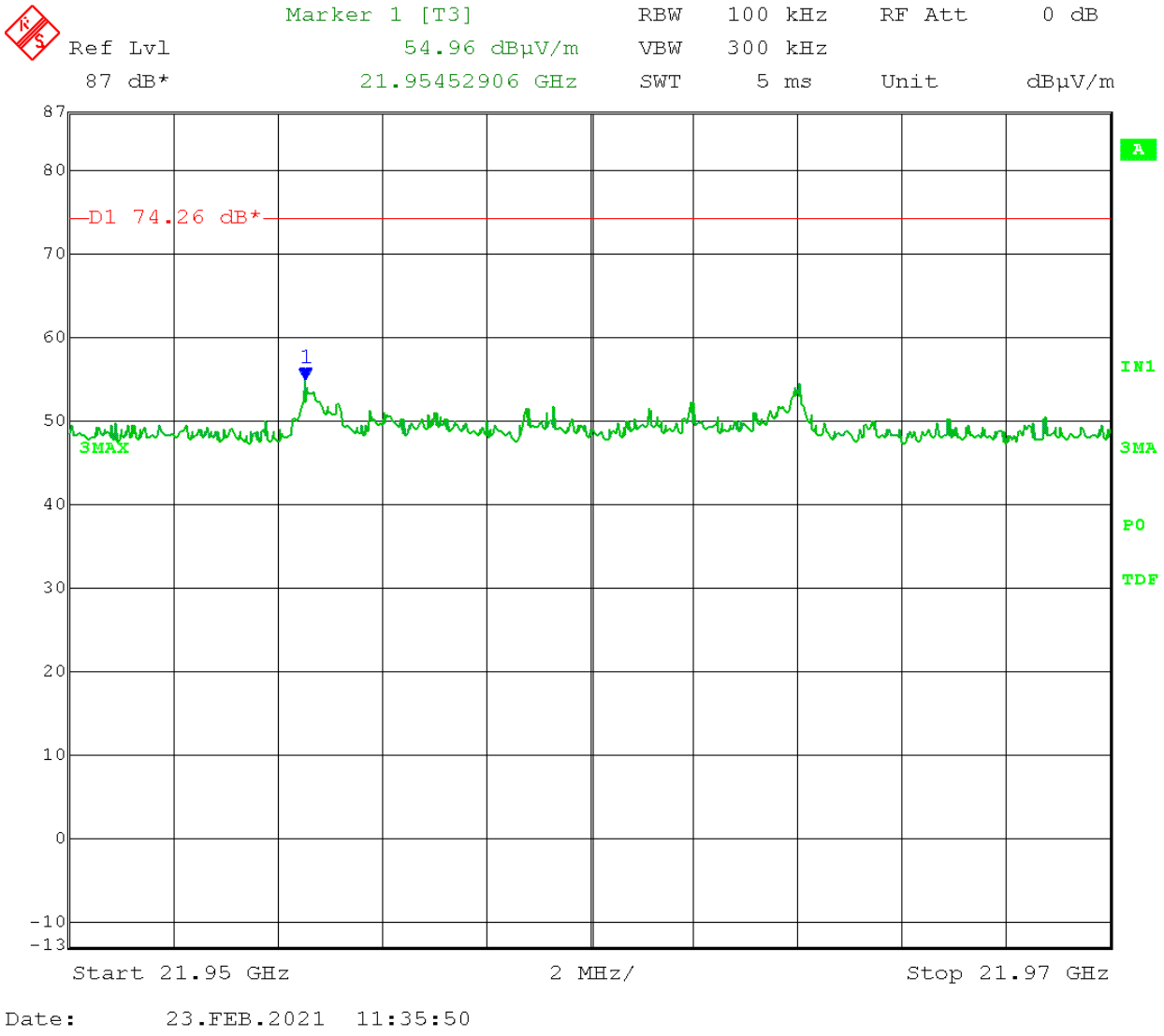
Limit = 84.72 dBµV/m – 20 dB = 64.72 dBµV/m at 3 meters, + 9.54 dB = **74.26 dBµV/m** at 1 meter

VERTICAL Frequency Range: 18 – 25 GHz



166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373



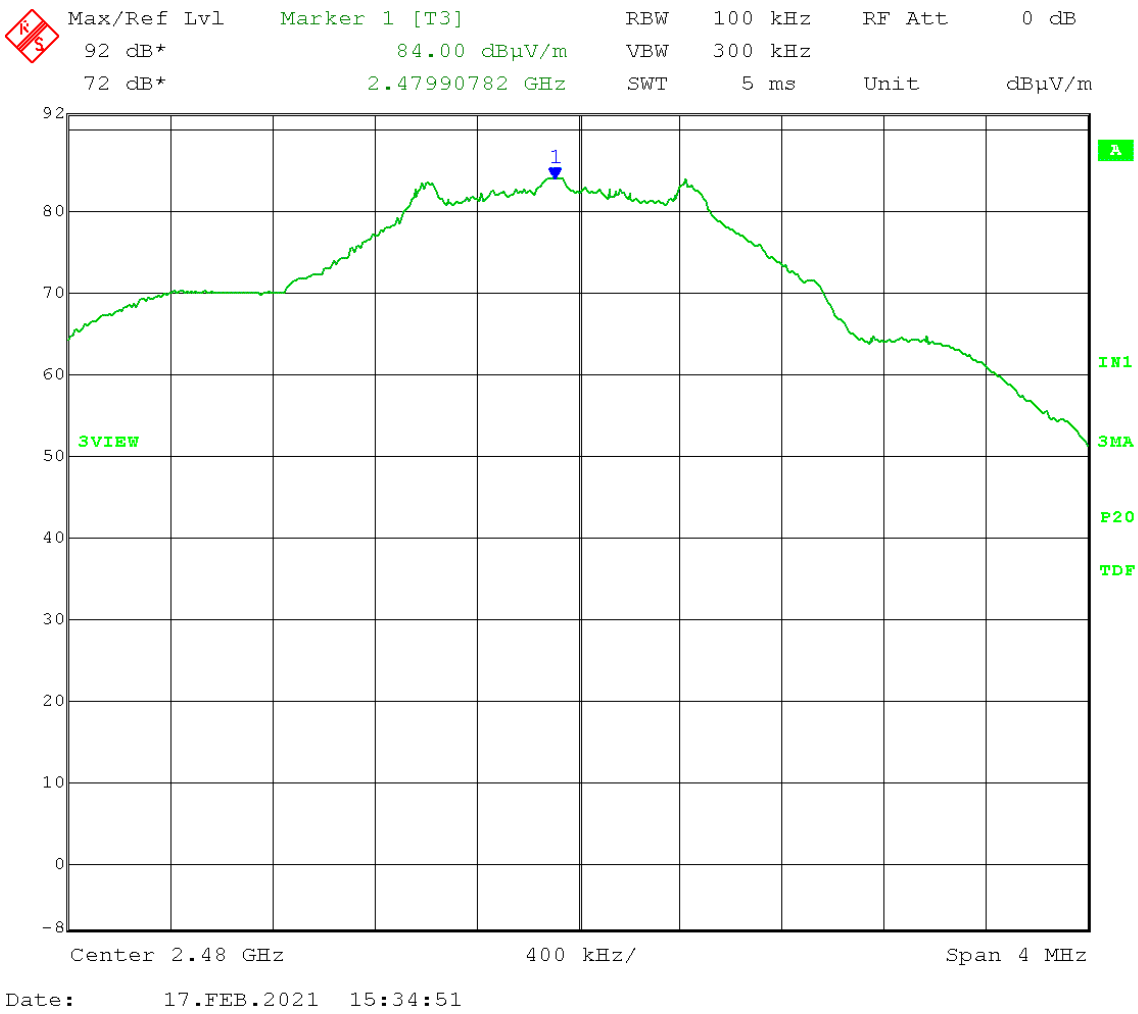
5.1(c) 1 – 25 GHz: High Channel – 2480 MHz

Test Date: 02-17-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak detector; max-hold
Field strength level of fundamental emission maximized

Comment: Power setting 20
High Channel: 2480 MHz
Reference Level measurement

Reference Level = 84.00 dBµV/m at 3 meters (radiated emission level maximized)
Limit = 84.00 dBµV/m – 20 dB = **64.00 dBµV/m** at 3 meters

VERTICAL:



166 South Carter, Genoa City, WI 53128

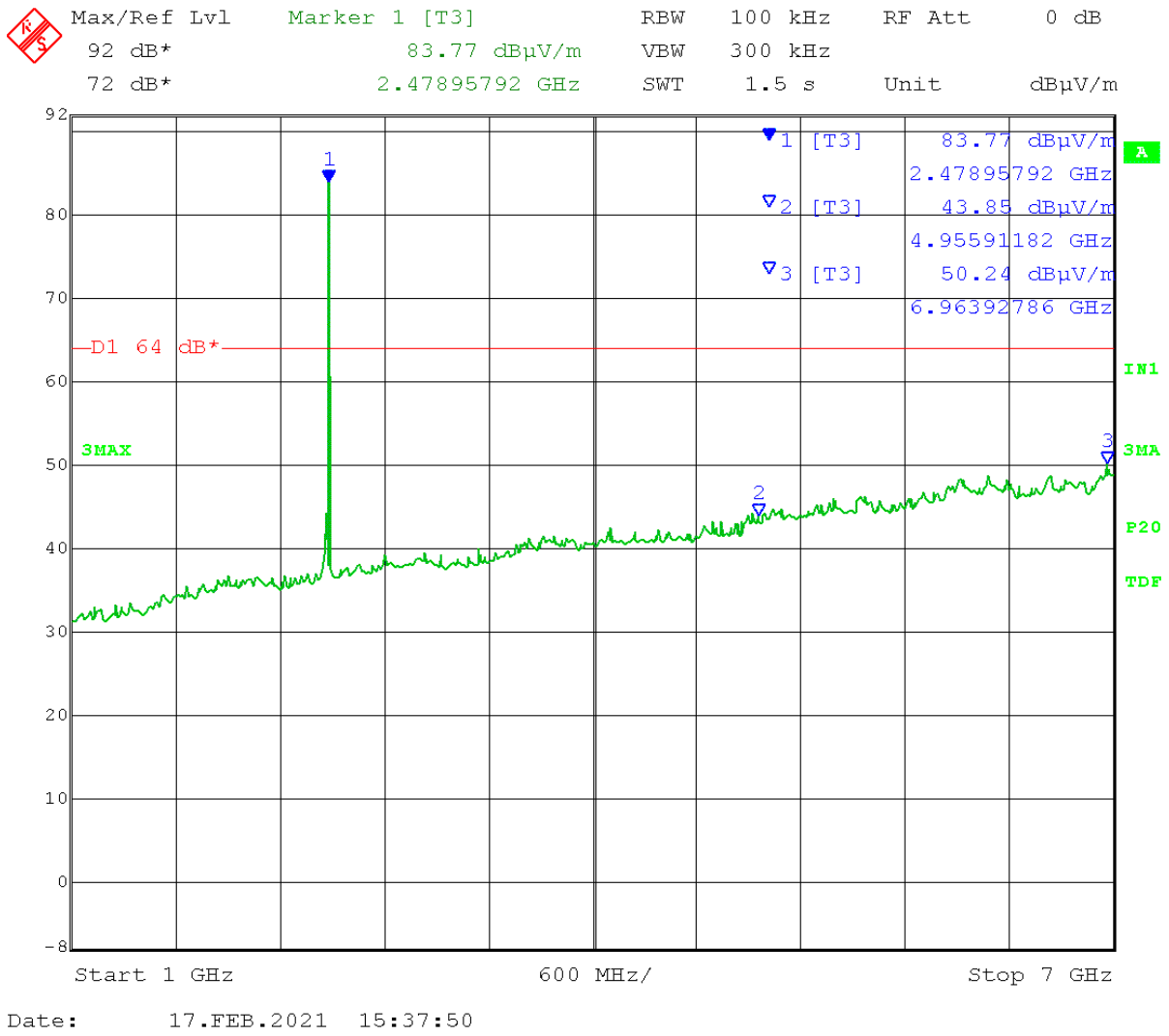
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-17-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak detector; max-hold
DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized)
(Special attention paid to harmonics of fundamental frequency)

Comment: Power setting 20
High Channel: 2480 MHz
Emission Level measurement

Limit = 84.00 dBµV/m – 20 dB = **64.00 dBµV/m** at 3 meters

VERTICAL: Frequency Range: 1 – 7 GHz



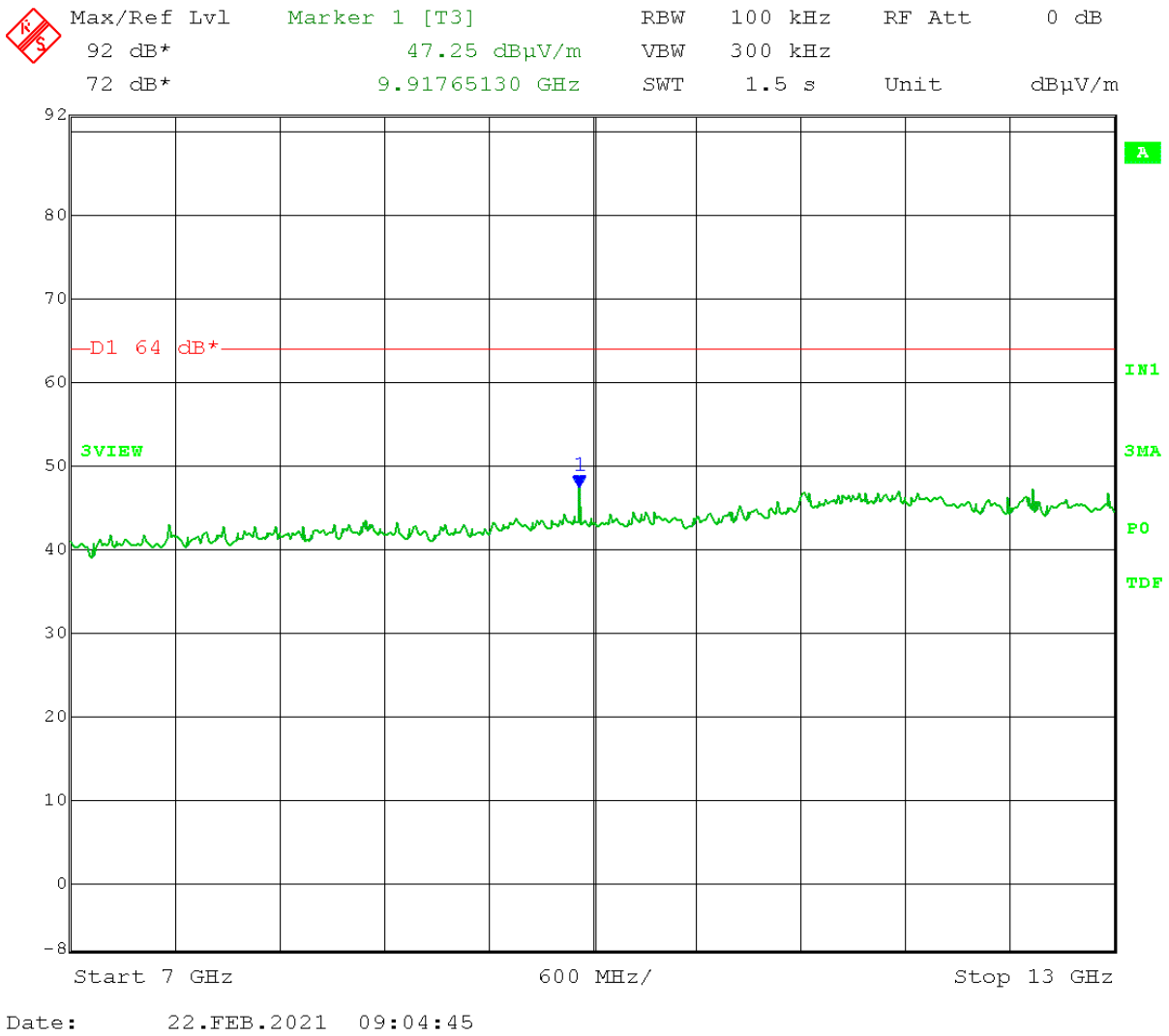
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-22-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak detector; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 High Channel: 2480 MHz Emission Level measurement

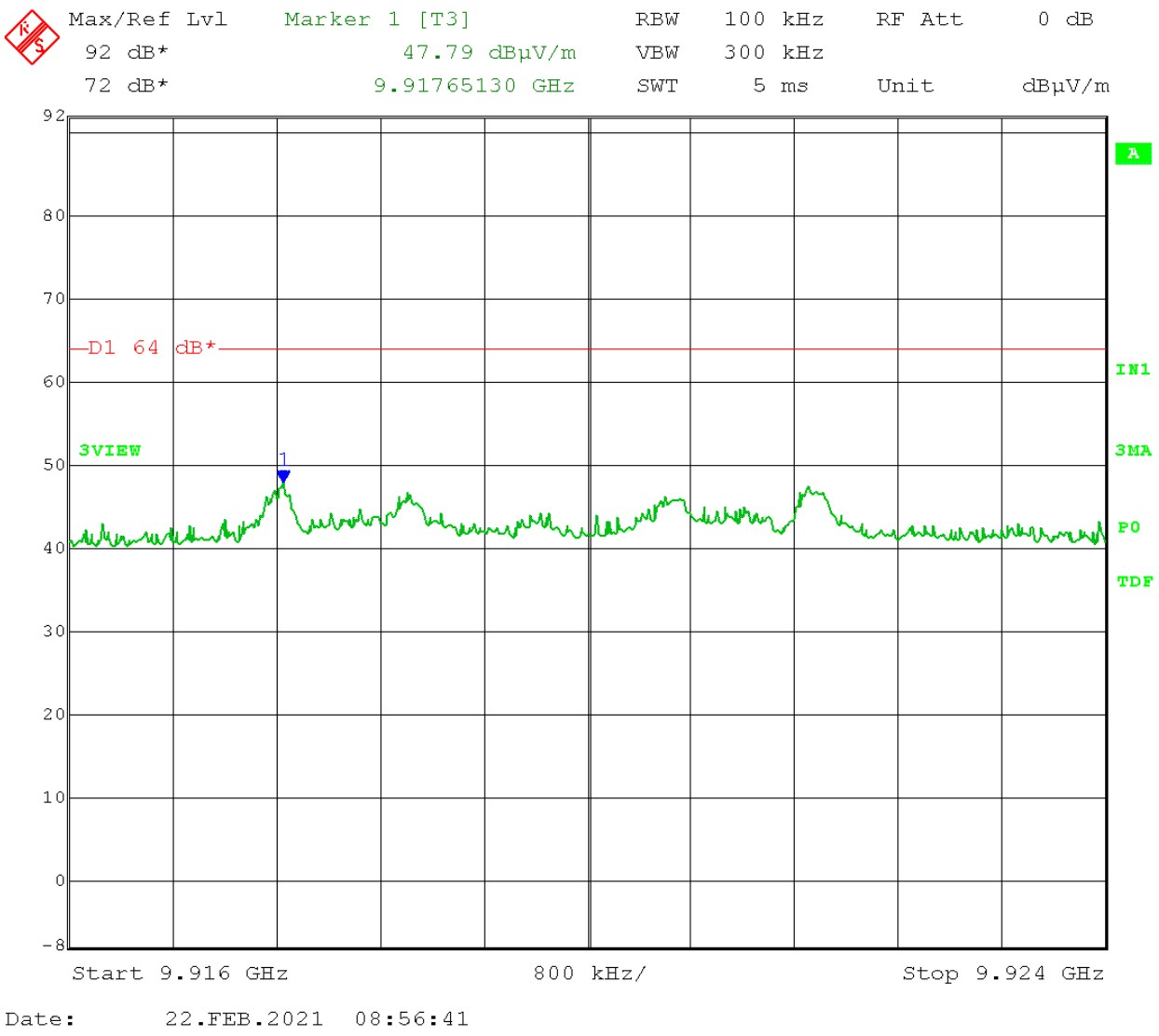
Limit = 84.00 dBµV/m – 20 dB = **64.00 dBµV/m** at 3 meters

VERTICAL: Frequency Range: 7 – 13 GHz



166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373



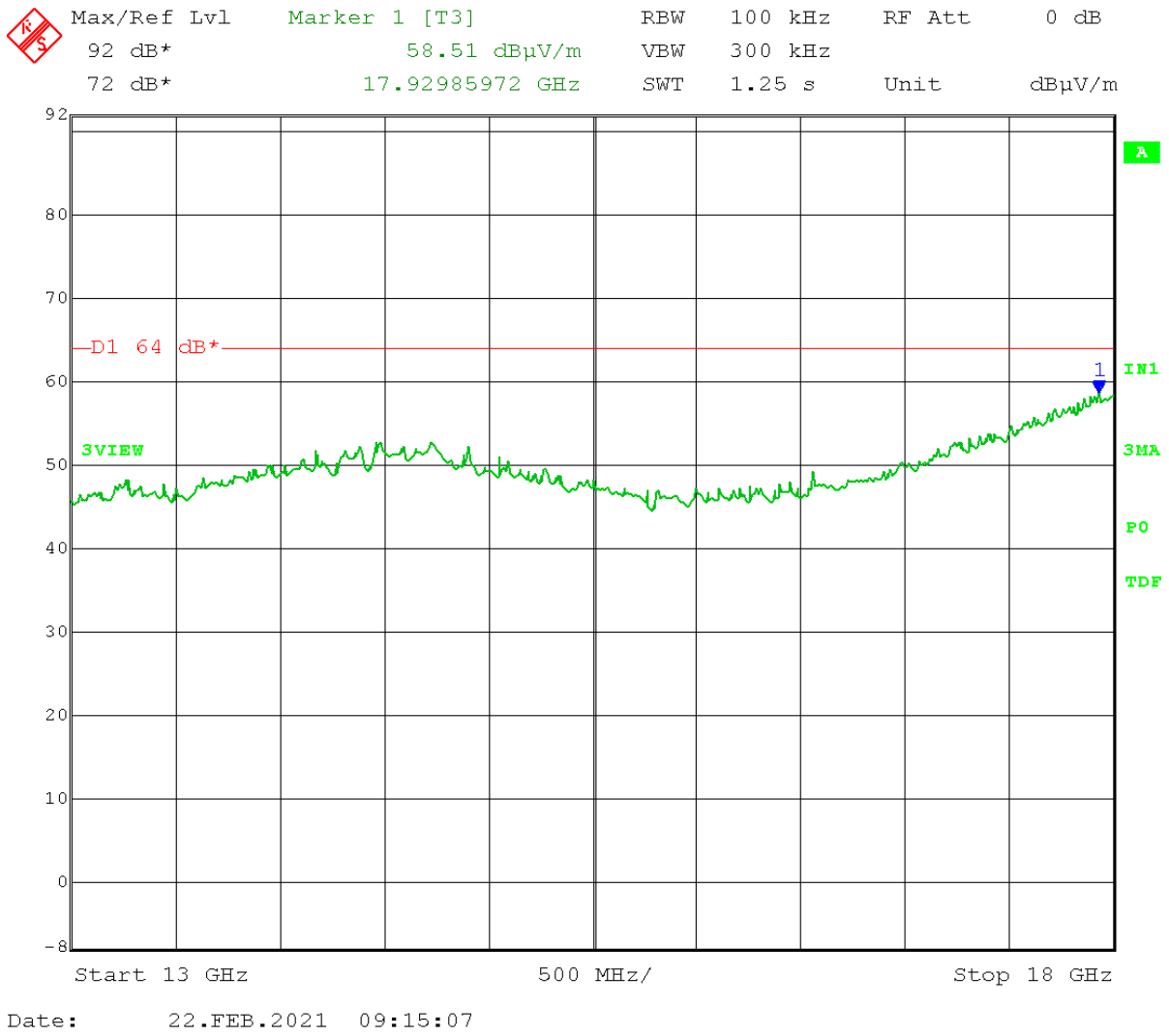
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-22-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak detector; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 High Channel: 2480 MHz Emission Level measurement

Limit = 84.00 dBµV/m – 20 dB = **64.00 dBµV/m** at 3 meters

VERTICAL: Frequency Range: 13 – 18 GHz



166 South Carter, Genoa City, WI 53128

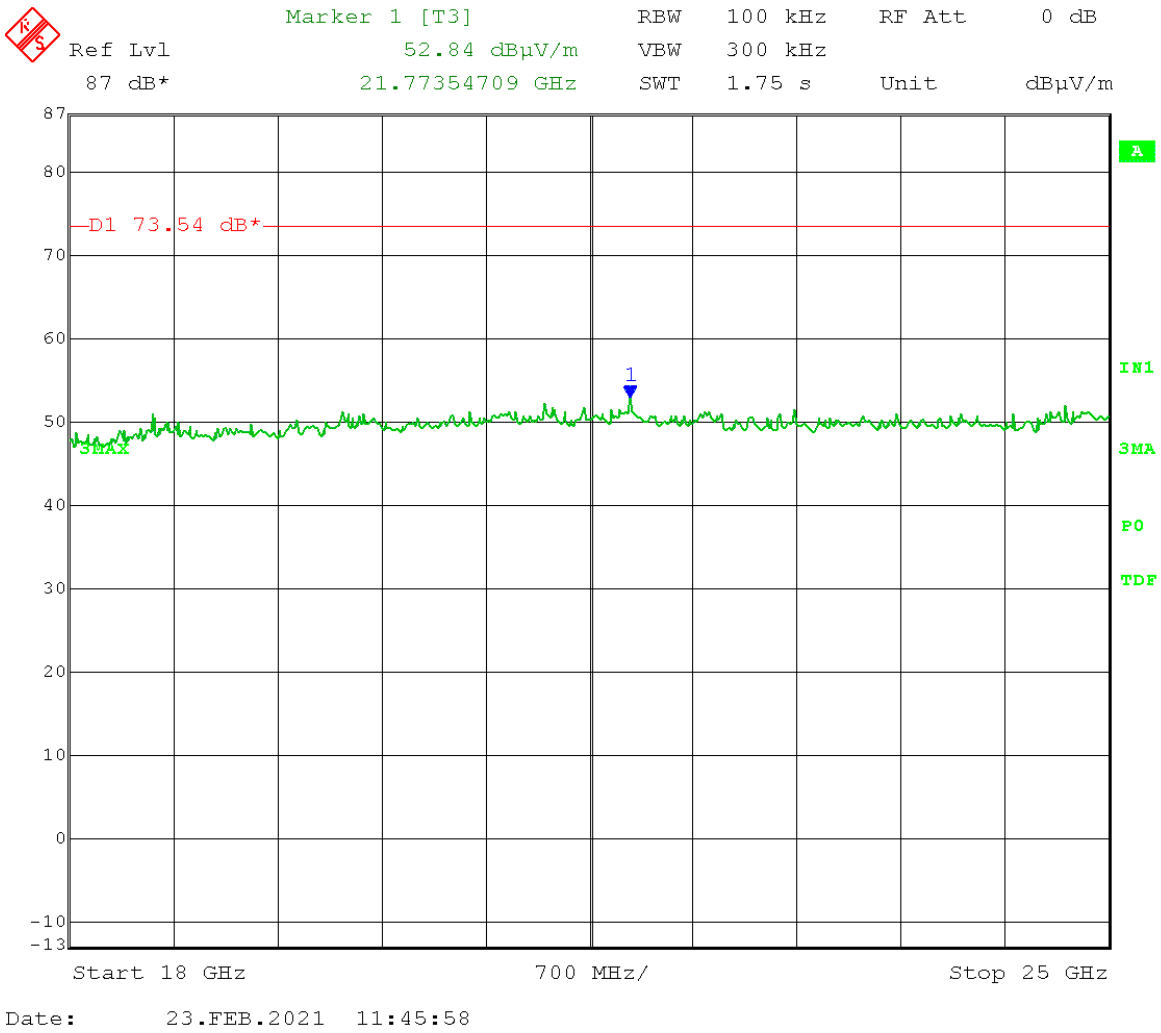
Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-23-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak; max-hold Receive antenna moved near and around every surface of DUT to search for emissions. All recorded levels taken at a 1-meter test distance. (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 High Channel: 2480 MHz Emission Level measurement

Limit corrected for 1 meter test distance by adding 9.54 dB, [20 log (1m/3m)]

Limit = 84.00 dBµV/m – 20 dB = 64.00 dBµV/m at 3 meters, + 9.54 dB = **73.54 dBµV/m** at 1 meter

VERTICAL Frequency Range: 18 – 25 GHz



166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

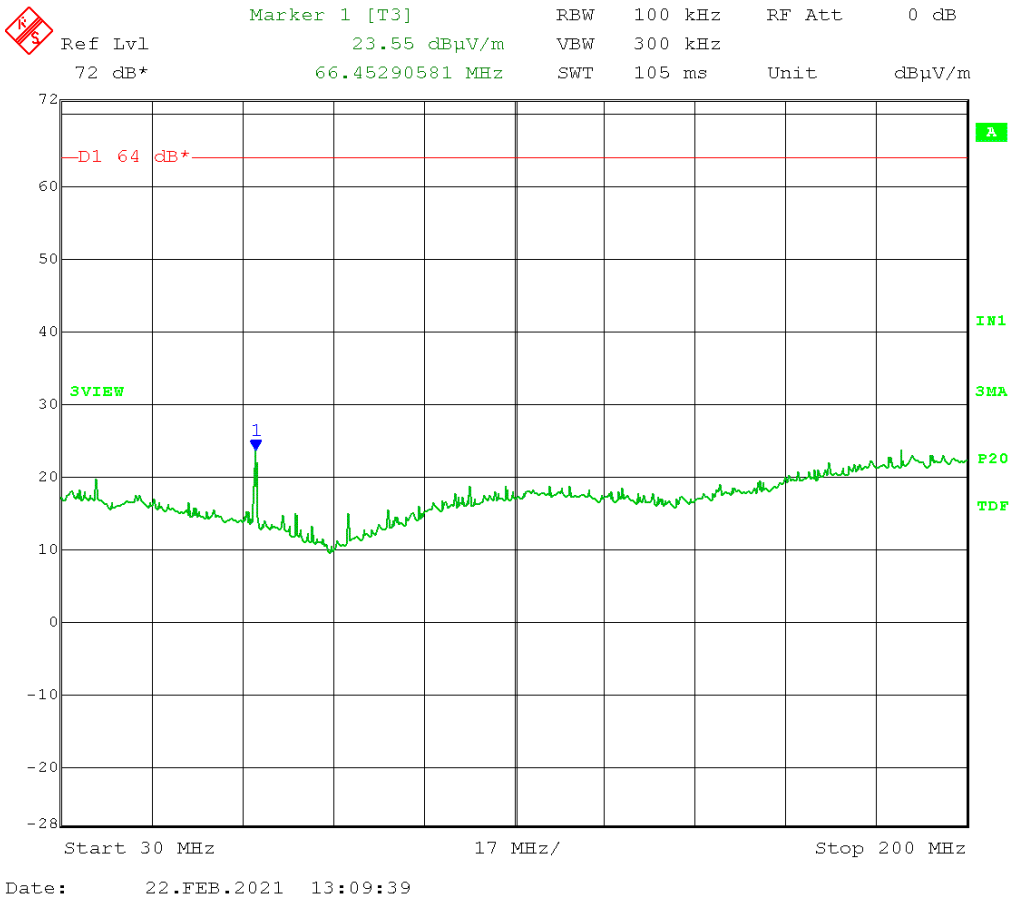
5.1(d) 30 – 1000 MHz: Low, Middle, & High Channels

Test Date: 02-22-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak; max-hold
DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized)
(Special attention paid to harmonics of fundamental frequency)

Comment: Power setting 20
Low Channel: 2402 MHz; Mid Channel: 2440 MHz; High Channel: 2480 MHz
Emission Level measurement

Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters
Limit = 84.72 dBµV/m – 20 dB = **64.72 dBµV/m** at 3 meters
Limit = 84.00 dBµV/m – 20 dB = **64.00 dBµV/m** at 3 meters

VERTICAL Frequency Range: 30 – 200 MHz



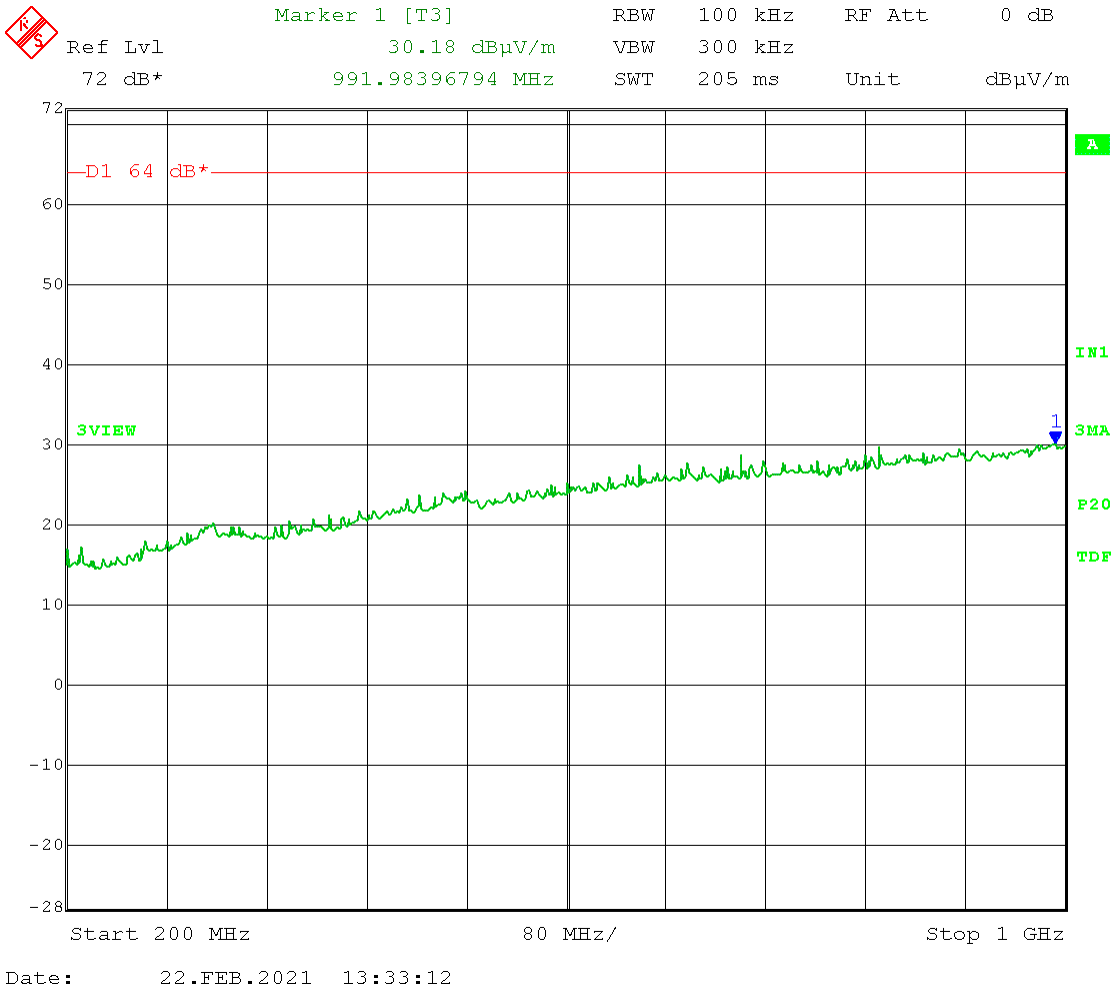
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-22-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 Low Channel: 2402 MHz; Mid Channel: 2440 MHz; High Channel: 2480 MHz Emission Level measurement

Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters
Limit = 84.72 dBµV/m – 20 dB = **64.72 dBµV/m** at 3 meters
Limit = 84.00 dBµV/m – 20 dB = **64.00 dBµV/m** at 3 meters

VERTICAL Frequency Range: 200 – 1000 MHz



5.2 Non-Restricted Band Emissions in the Horizontal Polarization

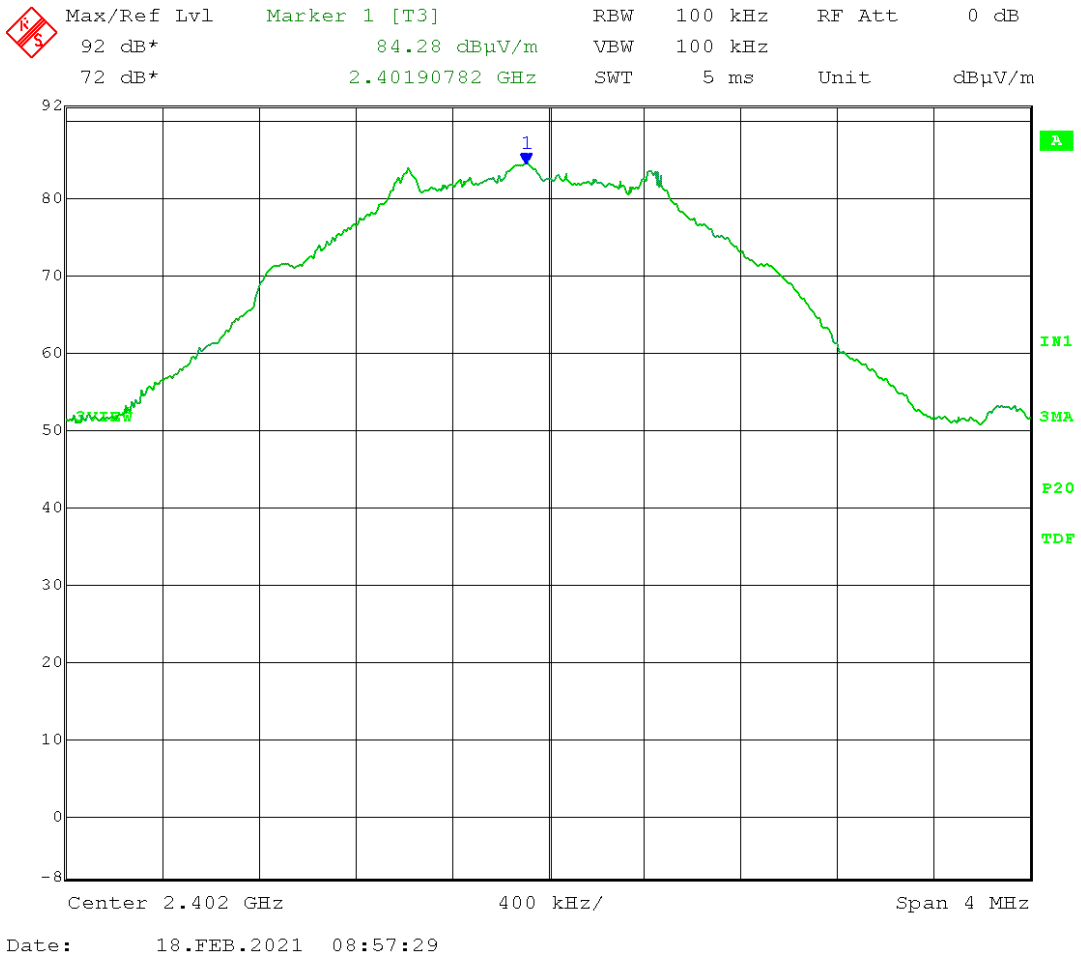
5.2(a) 1 – 25 GHz: Low Channel – 2402 MHz

Test Date: 02-18-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak detector; max-hold
Field strength level of fundamental emission maximized

Comment: Power setting 20
Low Channel: 2402 MHz
Reference Level measurement

Reference Level = 84.28 dBµV/m at 3 meters (radiated emission level maximized)
Limit = 84.28 dBµV/m – 20 dB = **64.28 dBµV/m** at 3 meters

HORIZONTAL:



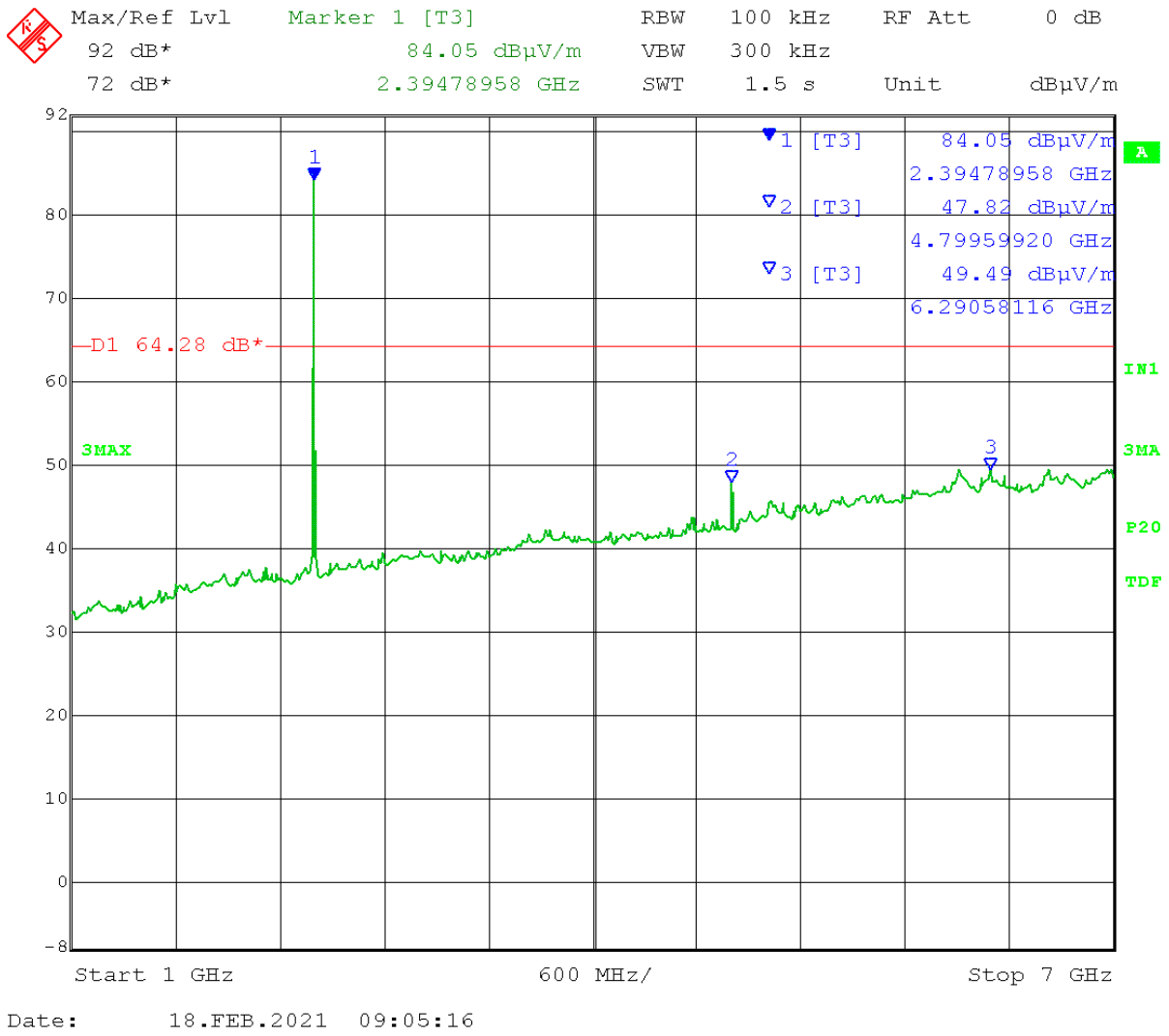
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 Low Channel: 2402 MHz Emission Level measurement

Limit = 84.28 dBµV/m – 20 dB = **64.28 dBµV/m** at 3 meters

HORIZONTAL Frequency Range: 1 – 7 GHz



166 South Carter, Genoa City, WI 53128

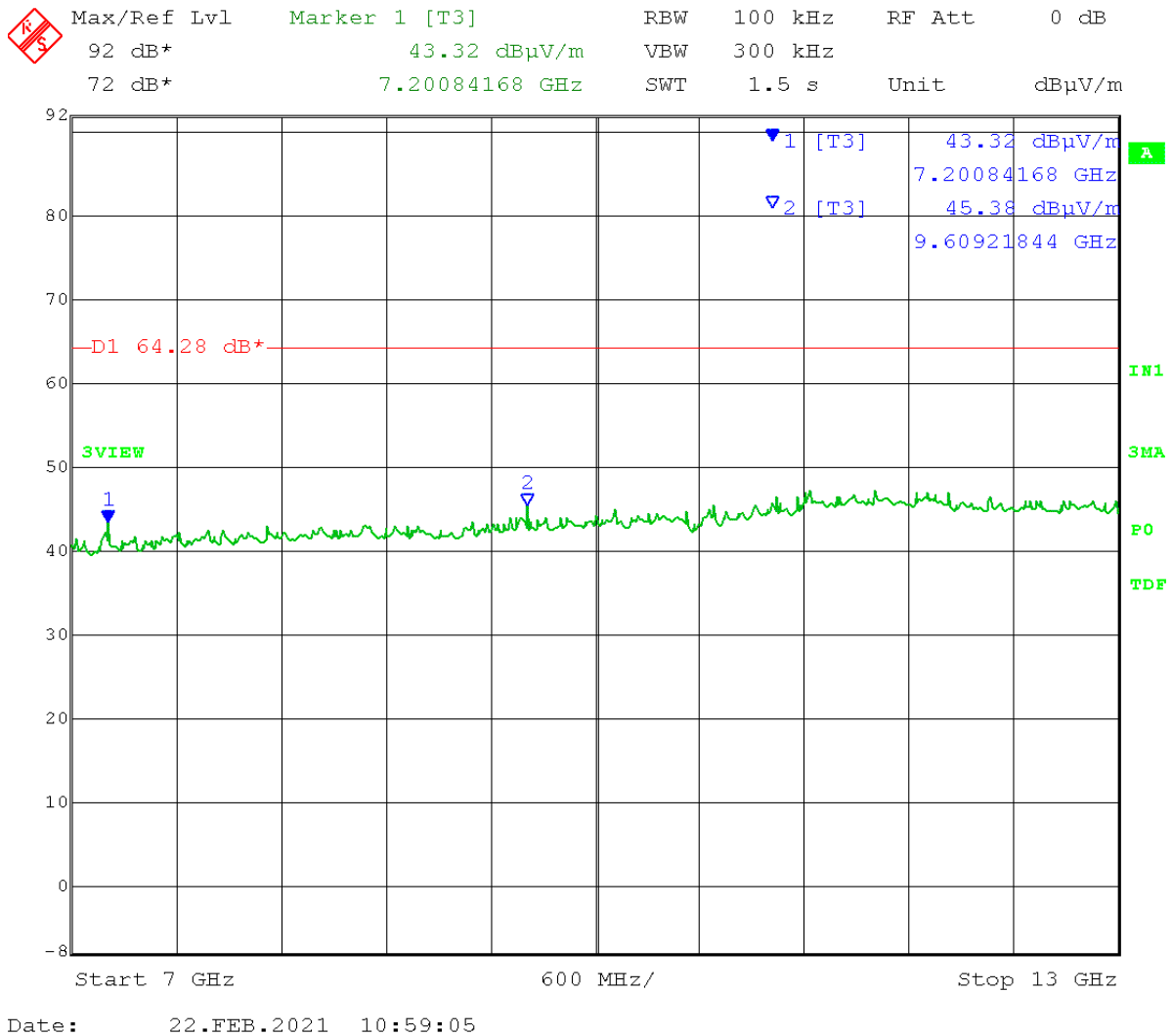
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

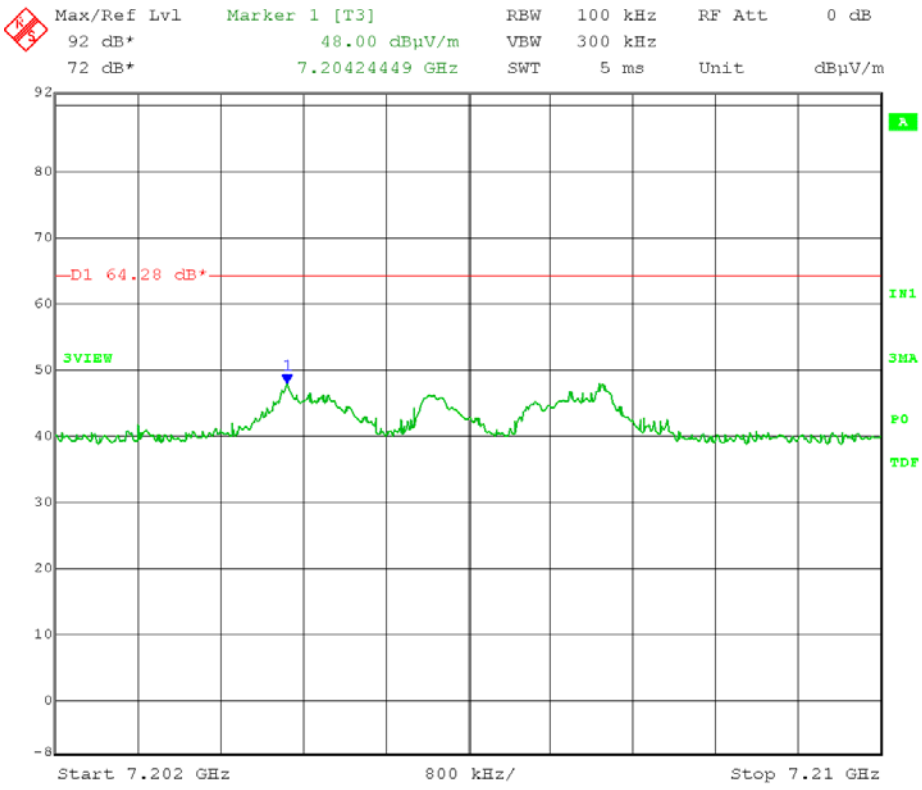
Test Date: 02-22-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak; max-hold
DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized)
(Special attention paid to harmonics of fundamental frequency)

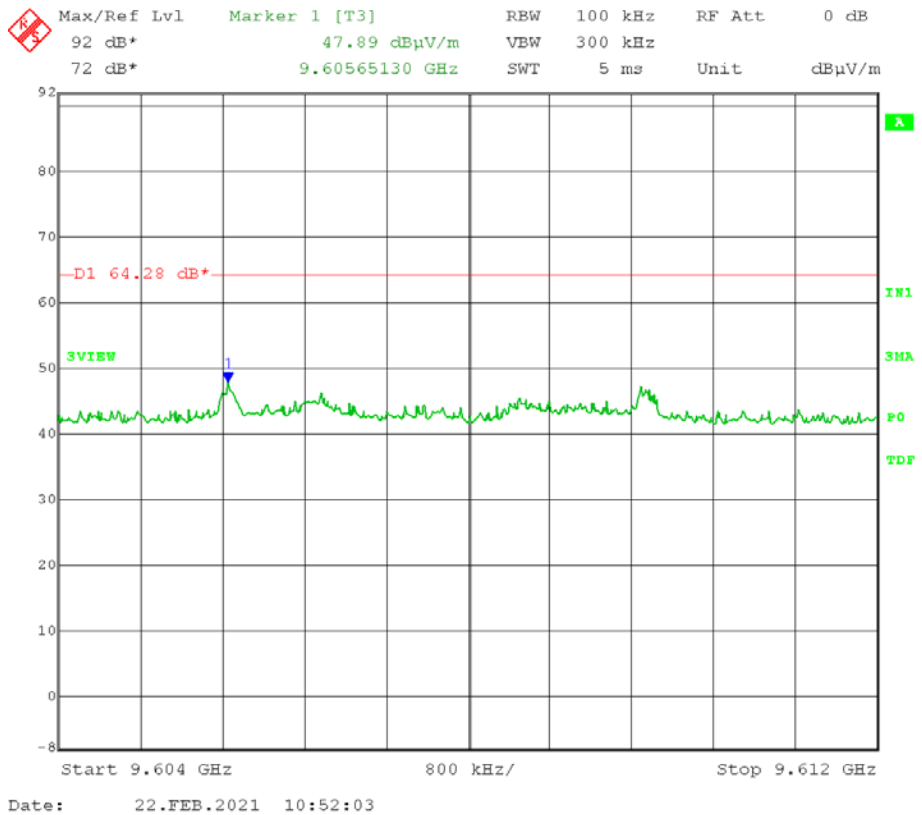
Comment: Power setting 20
Low Channel: 2402 MHz
Emission Level measurement

Limit = 84.28 dBµV/m – 20 dB = **64.28 dBµV/m** at 3 meters

HORIZONTAL Frequency Range: 7 – 13 GHz




Max/Ref Lvl
92 dB*
72 dB*
Marker 1 [T3]
48.00 dBµV/m
7.20424449 GHz
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 0 dB
Unit dBµV/m
D1 64.28 dB*
3VIEW
IN1
3MA
PO
TDF
Start 7.202 GHz
800 kHz/
Stop 7.21 GHz
Date: 22.FEB.2021 11:07:26


Max/Ref Lvl
92 dB*
72 dB*
Marker 1 [T3]
47.89 dBµV/m
9.60565130 GHz
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 0 dB
Unit dBµV/m
D1 64.28 dB*
3VIEW
IN1
3MA
PO
TDF
Start 9.604 GHz
800 kHz/
Stop 9.612 GHz
Date: 22.FEB.2021 10:52:03

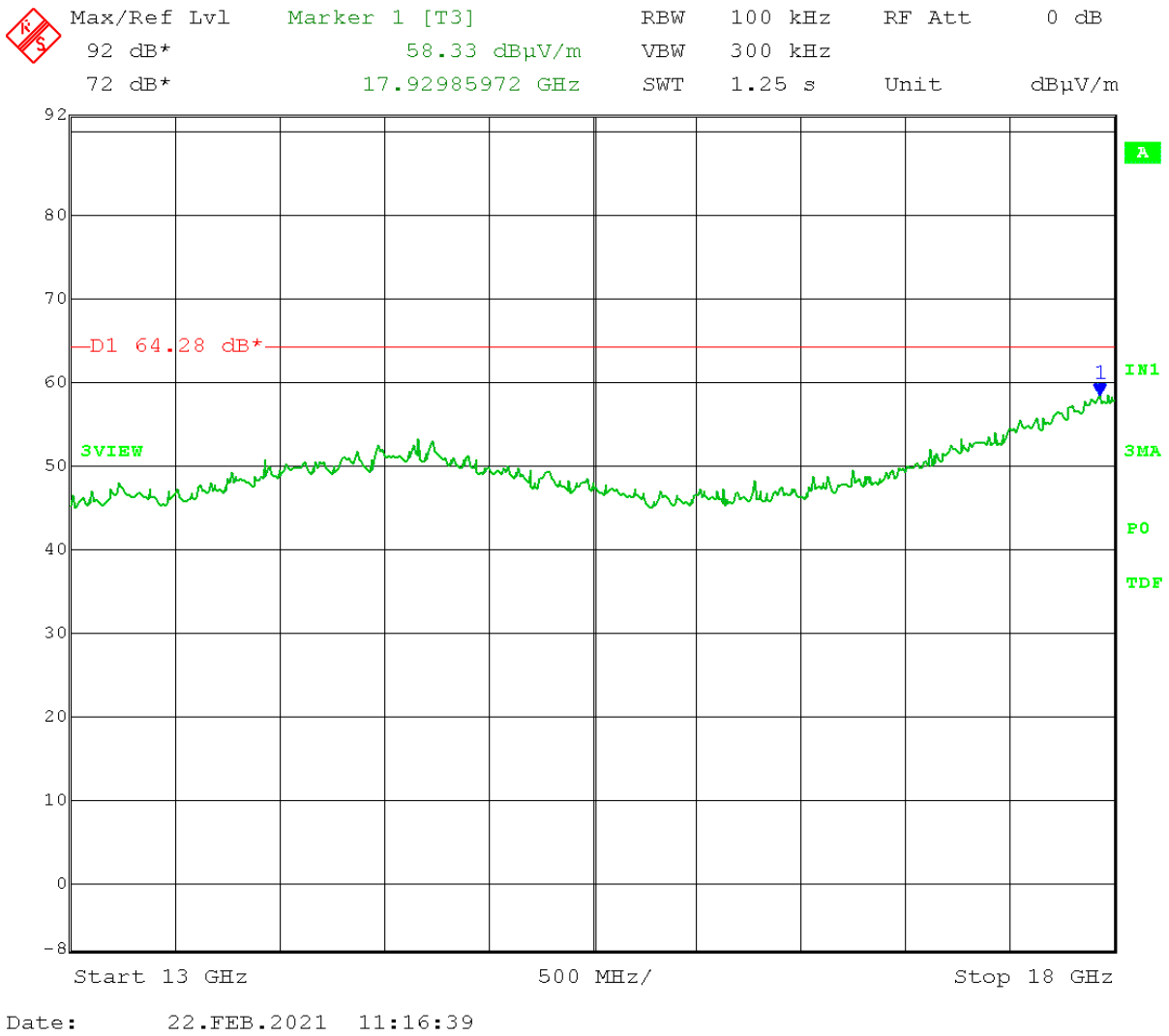
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-22-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 Low Channel: 2402 MHz Emission Level measurement

Limit = 84.28 dBµV/m – 20 dB = **64.28 dBµV/m** at 3 meters

HORIZONTAL Frequency Range: 13 – 18 GHz



166 South Carter, Genoa City, WI 53128

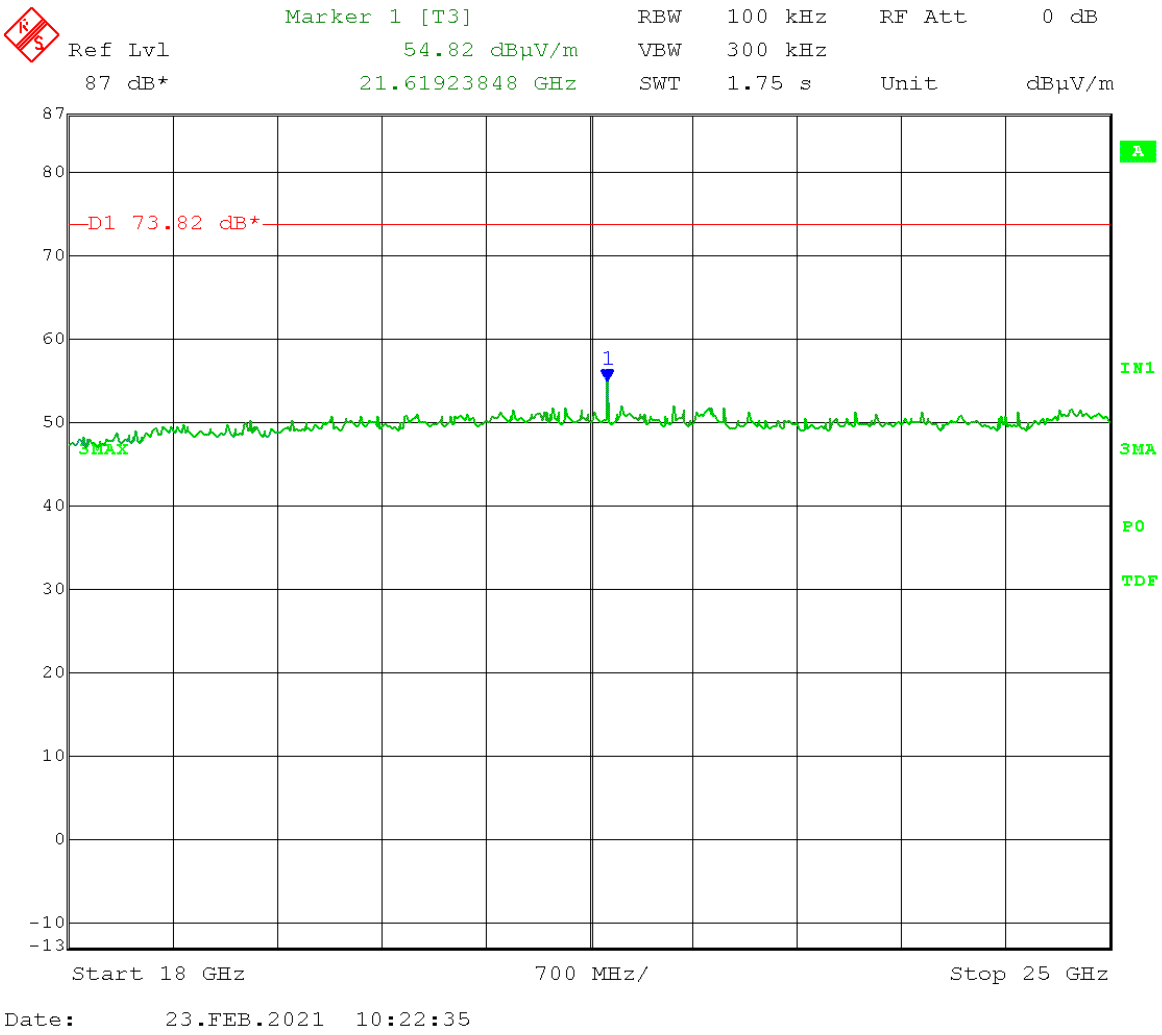
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-23-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak; max-hold
Receive antenna moved near and around every surface of DUT to search for emissions.
All recorded levels taken at a 1-meter test distance.
(Special attention paid to harmonics of fundamental frequency)

Comment: Power setting 20
Low Channel: 2402 MHz
Emission Level measurement
Limit corrected for 1 meter test distance by adding 9.54 dB, [20 log (1m/3m)]

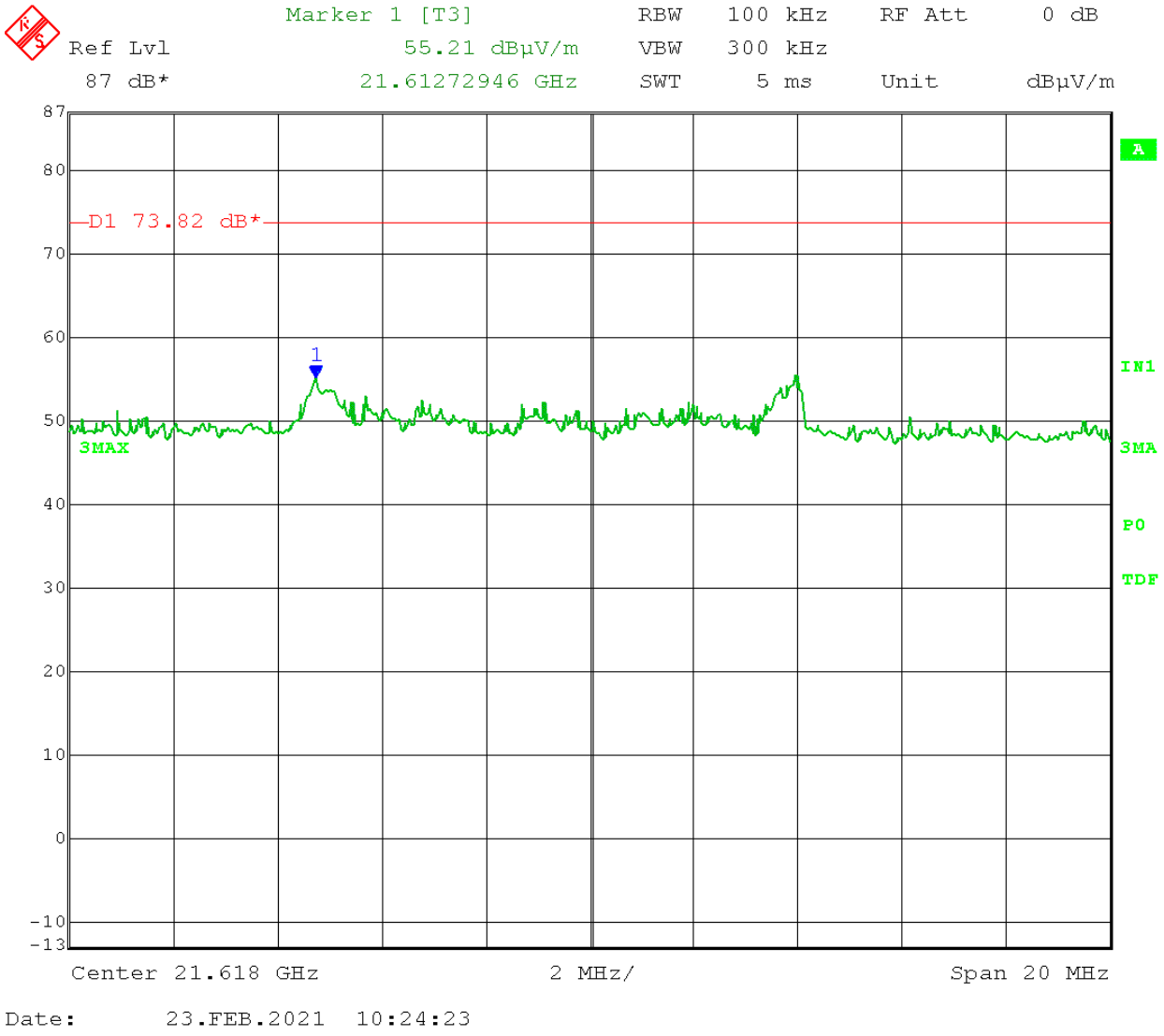
Limit = 84.28 dBµV/m – 20 dB = 64.28 dBµV/m at 3 meters, + 9.54 dB = **73.82 dBµV/m** at 1 meter

HORIZONTAL Frequency Range: 18 – 25 GHz



166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373



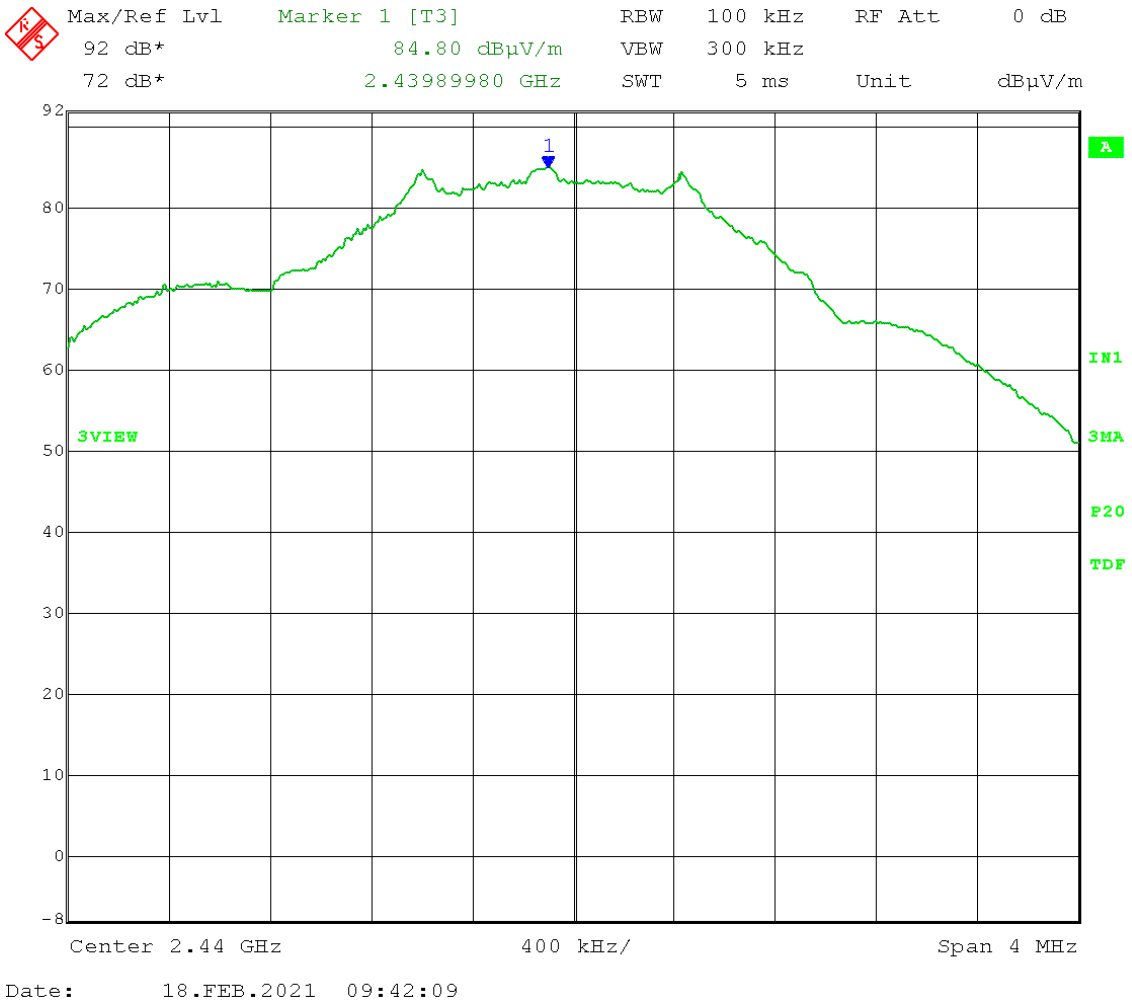
5.2(b) 1 – 25 GHz: Middle Channel – 2440 MHz

Test Date: 02-18-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak detector; max-hold
Field strength level of fundamental emission maximized

Comment: Power setting 20
Mid Channel: 2440 MHz
Reference Level measurement

Reference Level = 84.80 dBµV/m at 3 meters (radiated emission level maximized)
Limit = 84.80 dBµV/m – 20 dB = **64.80 dBµV/m** at 3 meters

HORIZONTAL:



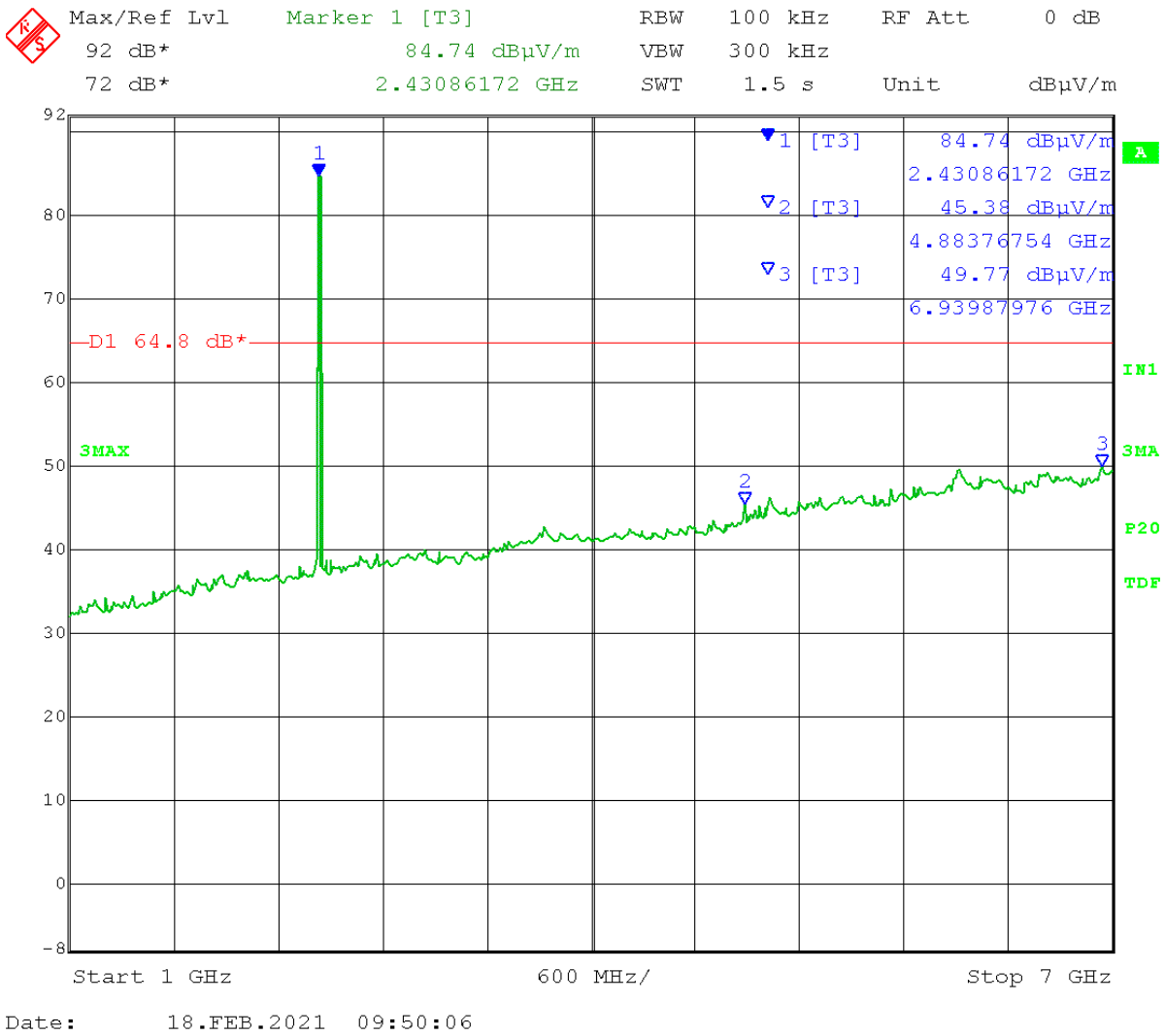
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak detector; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 Mid Channel: 2440 MHz Emission Level measurement

Limit = 84.80 dBµV/m – 20 dB = **64.80 dBµV/m** at 3 meters

HORIZONTAL Frequency Range: 1 – 7 GHz



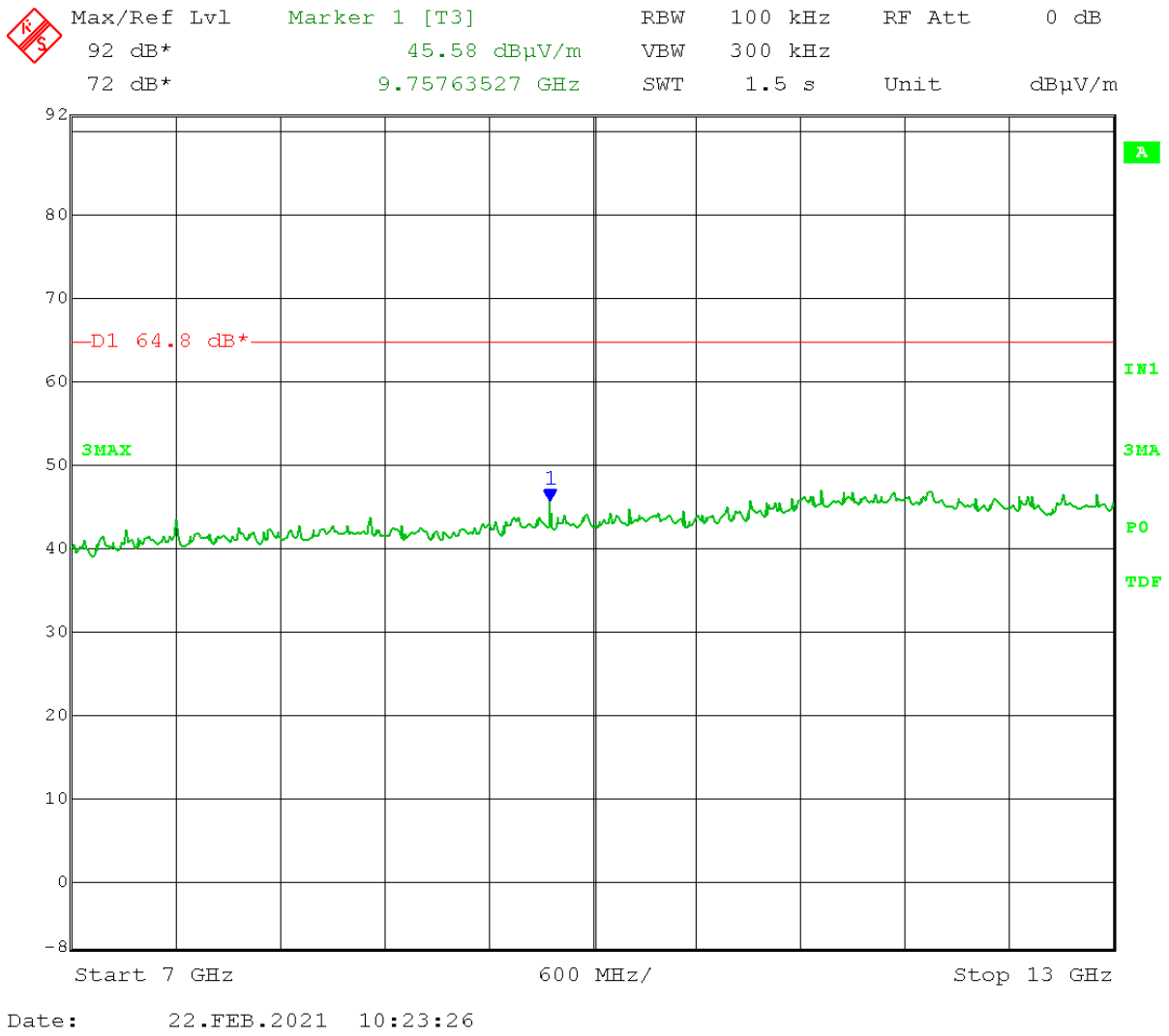
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-22-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak detector; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 Mid Channel: 2440 MHz Emission Level measurement

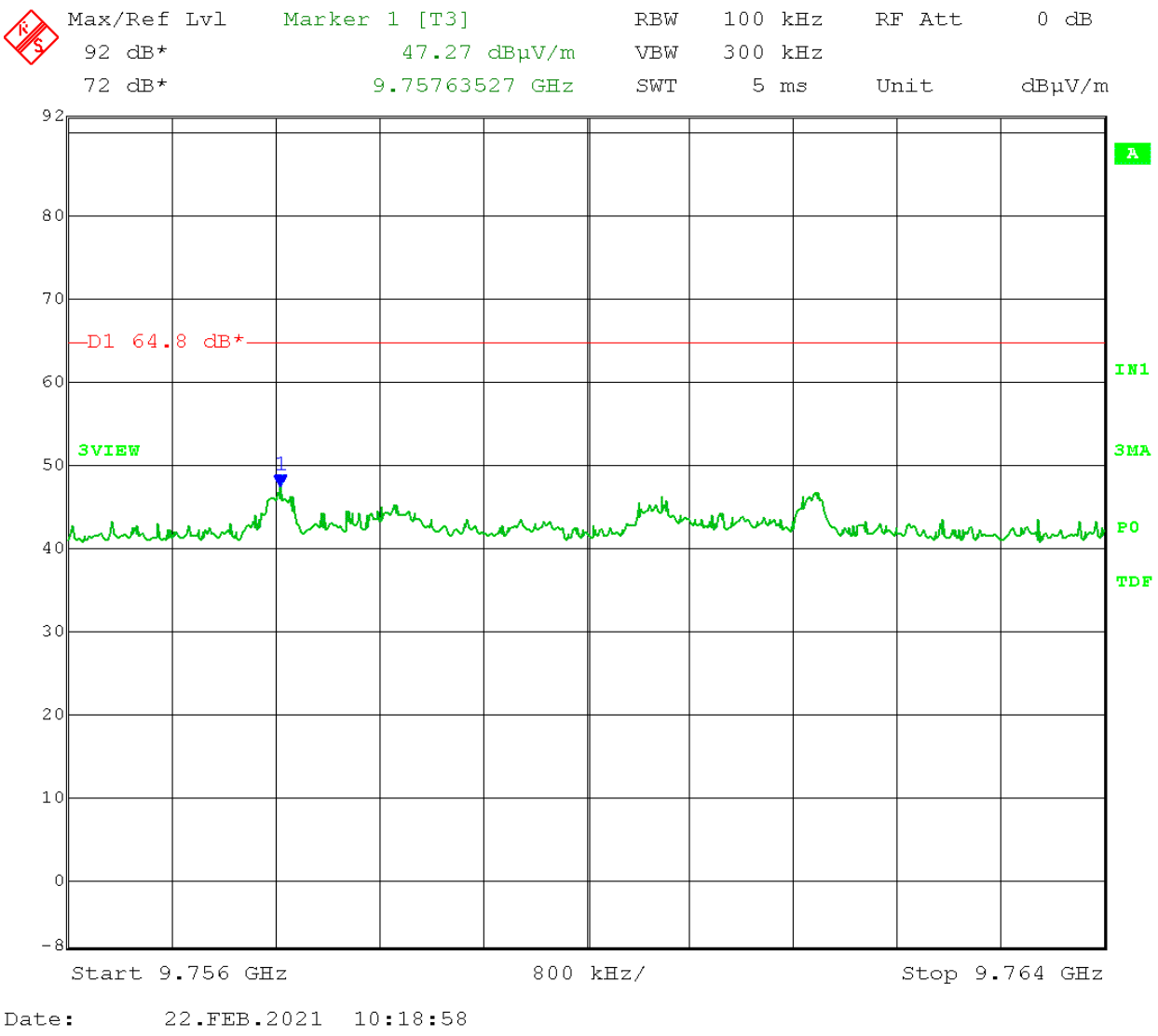
Limit = 84.80 dBµV/m – 20 dB = **64.80 dBµV/m** at 3 meters

HORIZONTAL Frequency Range: 7 – 13 GHz



166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373



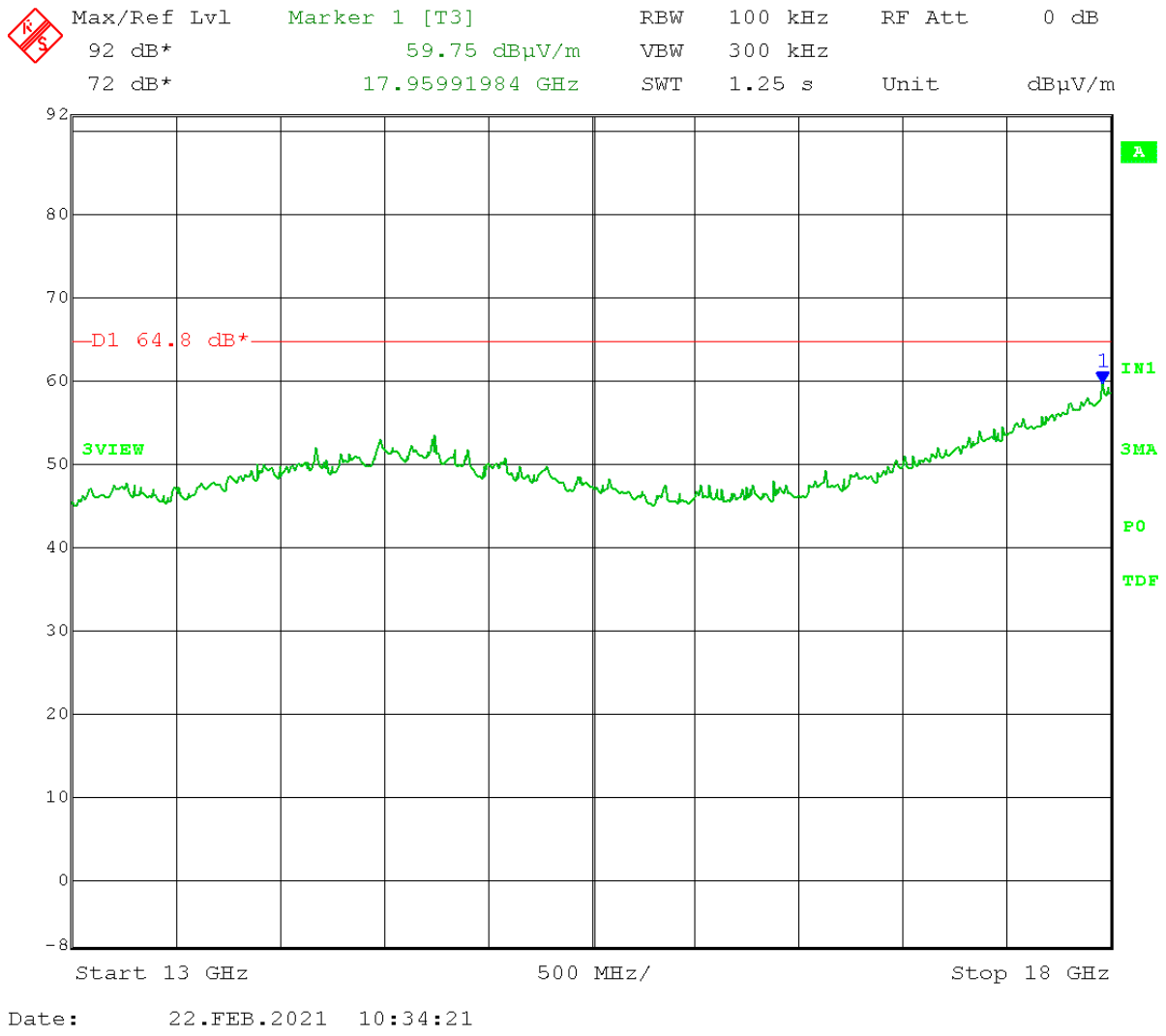
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-22-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak detector; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 Mid Channel: 2440 MHz Emission Level measurement

Limit = 84.80 dBµV/m – 20 dB = **64.80 dBµV/m** at 3 meters

HORIZONTAL Frequency Range: 13– 18 GHz



166 South Carter, Genoa City, WI 53128

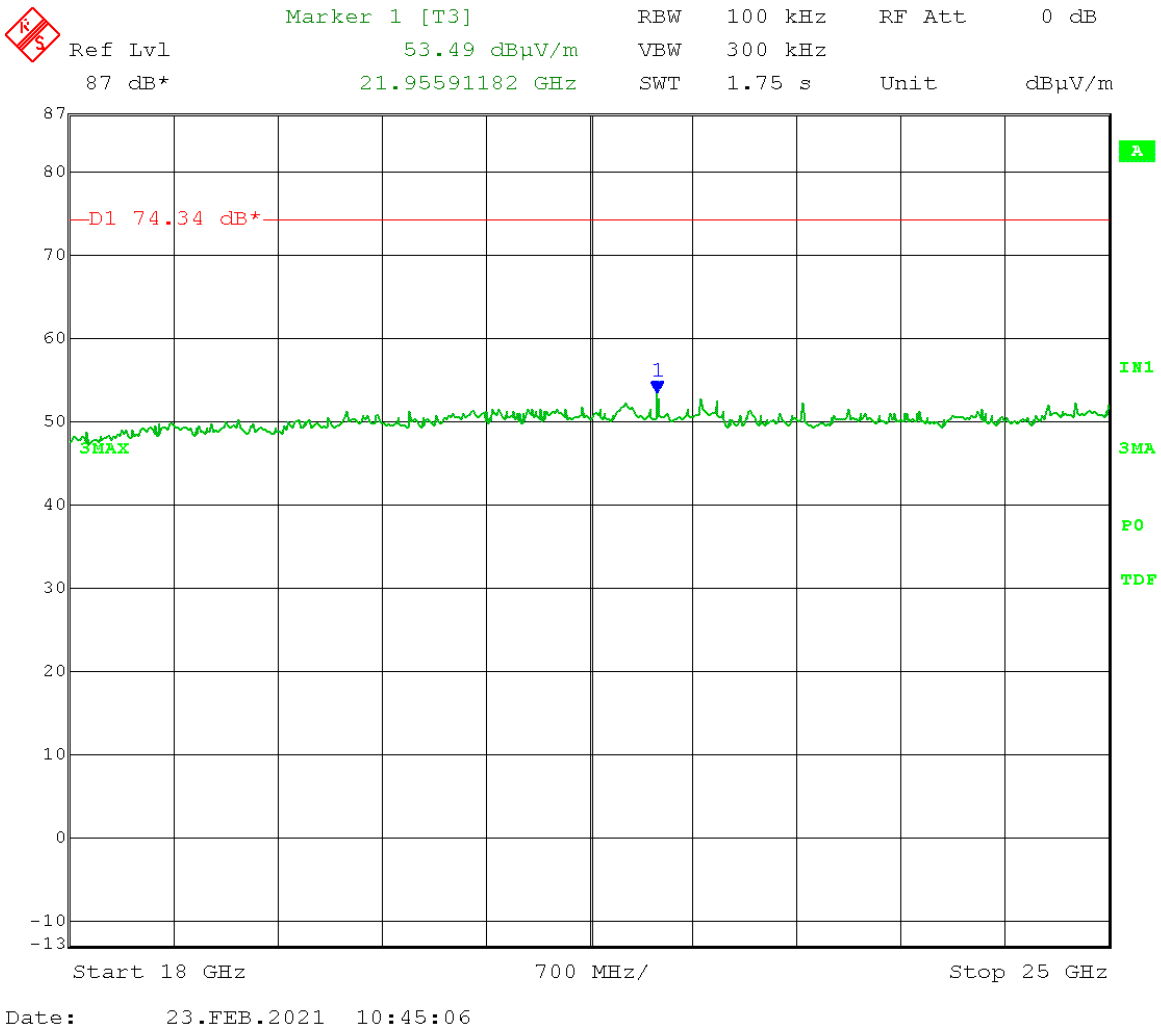
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-23-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak; max-hold
Receive antenna moved near and around every surface of DUT to search for emissions.
All recorded levels taken at a 1-meter test distance.
(Special attention paid to harmonics of fundamental frequency)

Comment: Power setting 20
Mid Channel: 2440 MHz
Emission Level measurement
Limit corrected for 1 meter test distance by adding 9.54 dB, [20 log (1m/3m)]

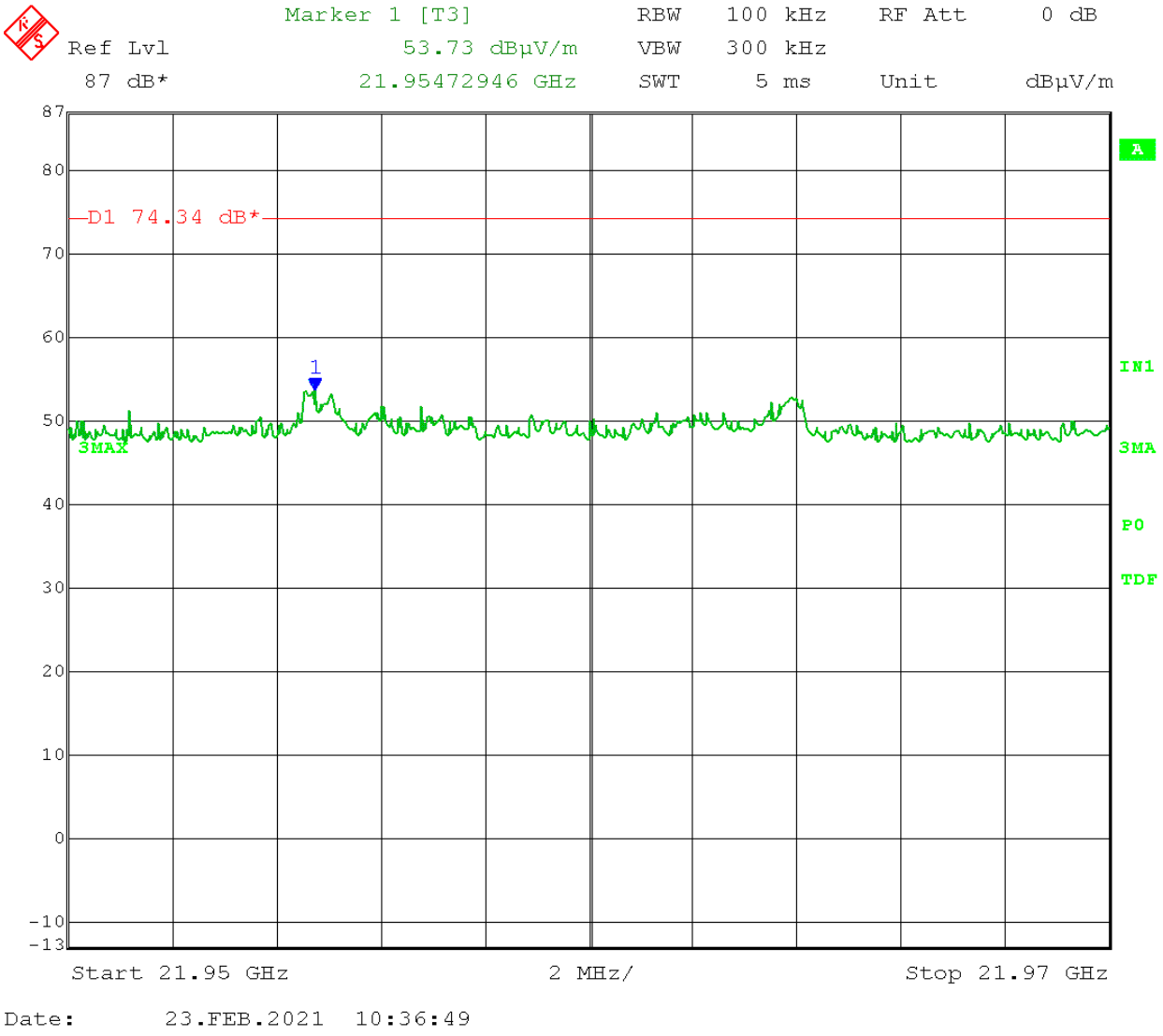
Limit = 84.80 dBµV/m – 20 dB = 64.80 dBµV/m at 3 meters, + 9.54 dB = **74.34 dBµV/m** at 1 meter

HORIZONTAL Frequency Range: 18 – 25 GHz



166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373



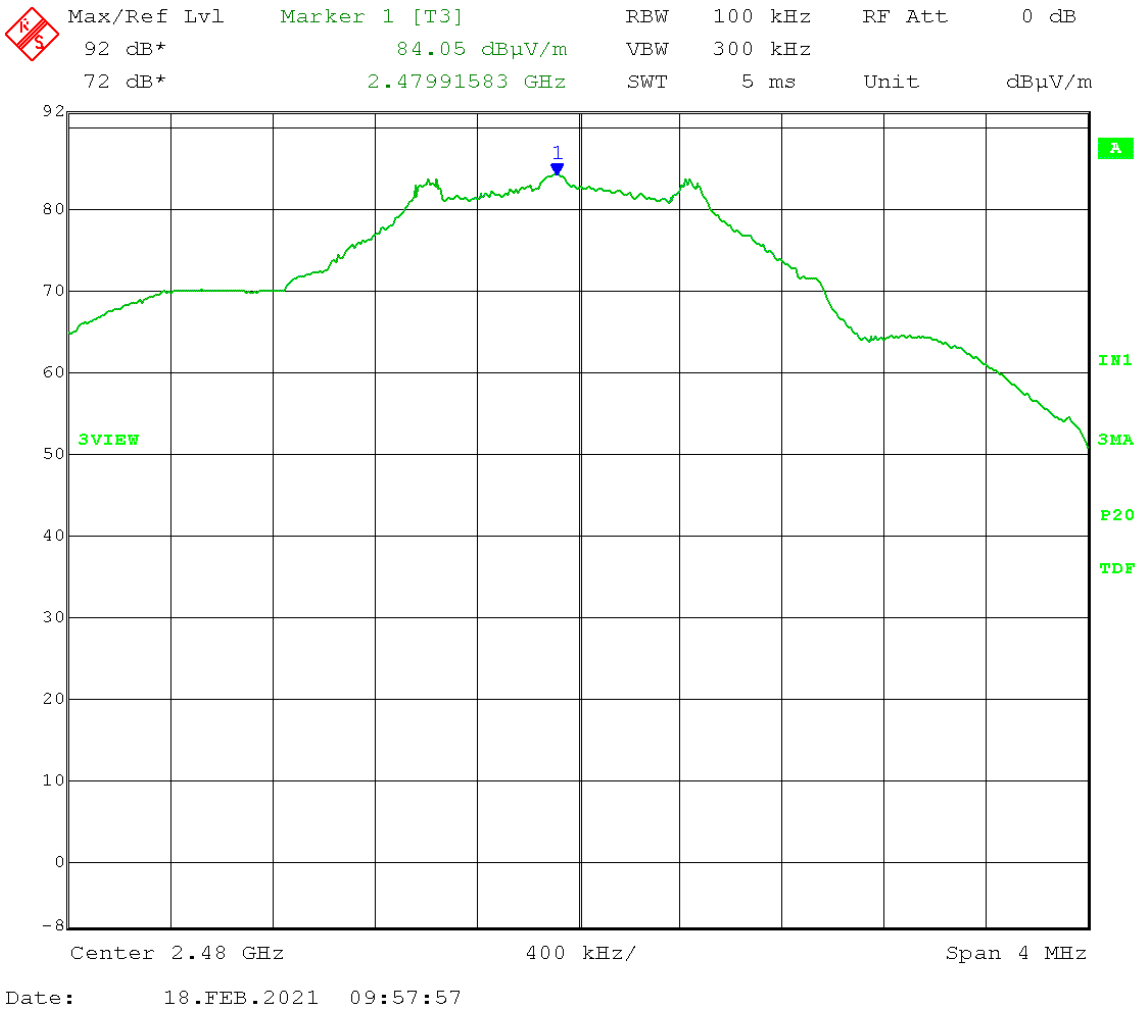
5.2(c) 1 – 25 GHz: High Channel – 2480 MHz

Test Date: 02-18-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak detector; max-hold
Field strength level of fundamental emission maximized

Comment: Power setting 20
High Channel: 2480 MHz
Reference Level measurement

Reference Level = 84.05 dBµV/m at 3 meters (radiated emission level maximized)
Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters

HORIZONTAL:



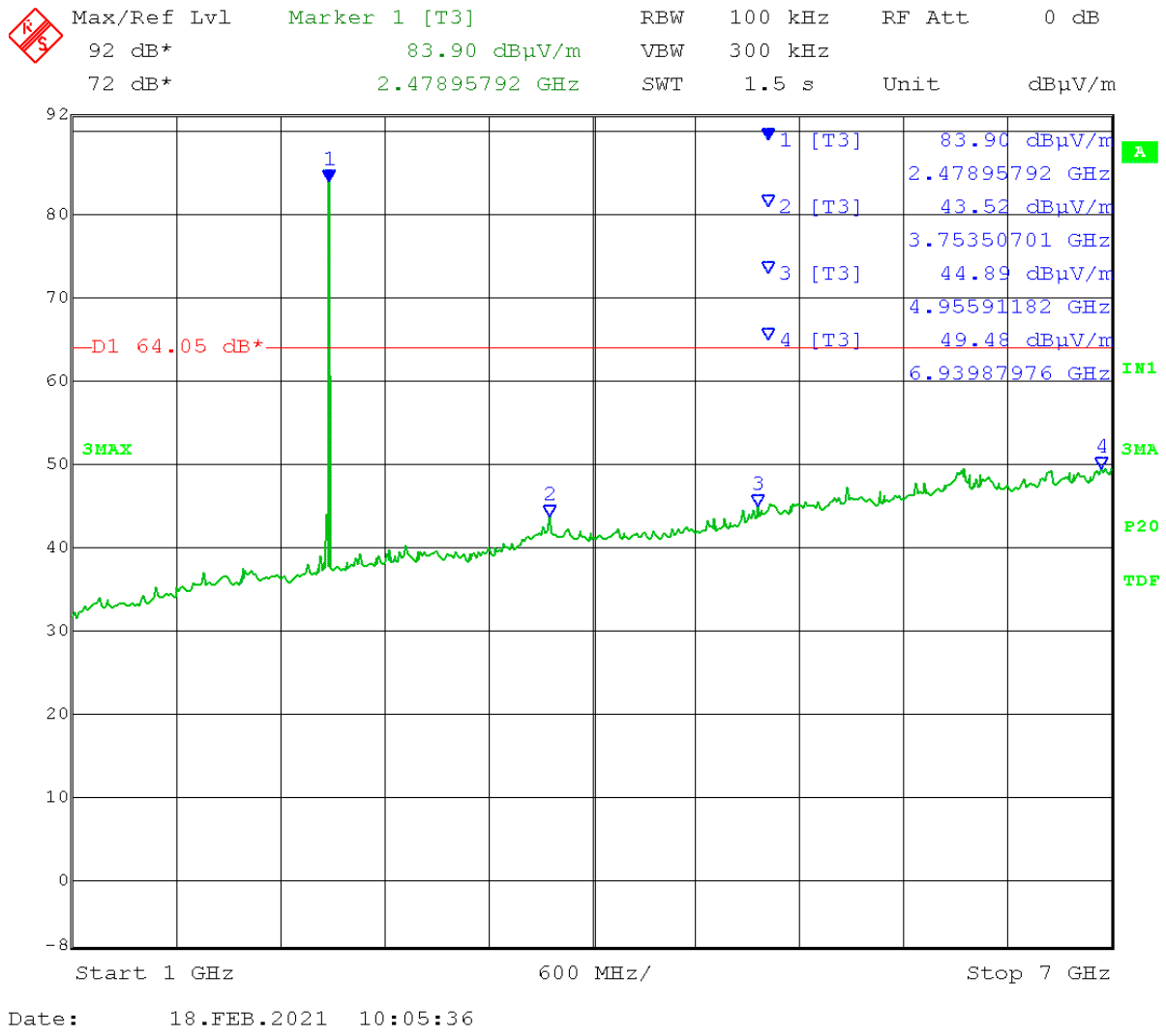
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak detector; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 High Channel: 2480 MHz Emission Level measurement

Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters

HORIZONTAL Frequency Range: 1 – 7 GHz



166 South Carter, Genoa City, WI 53128

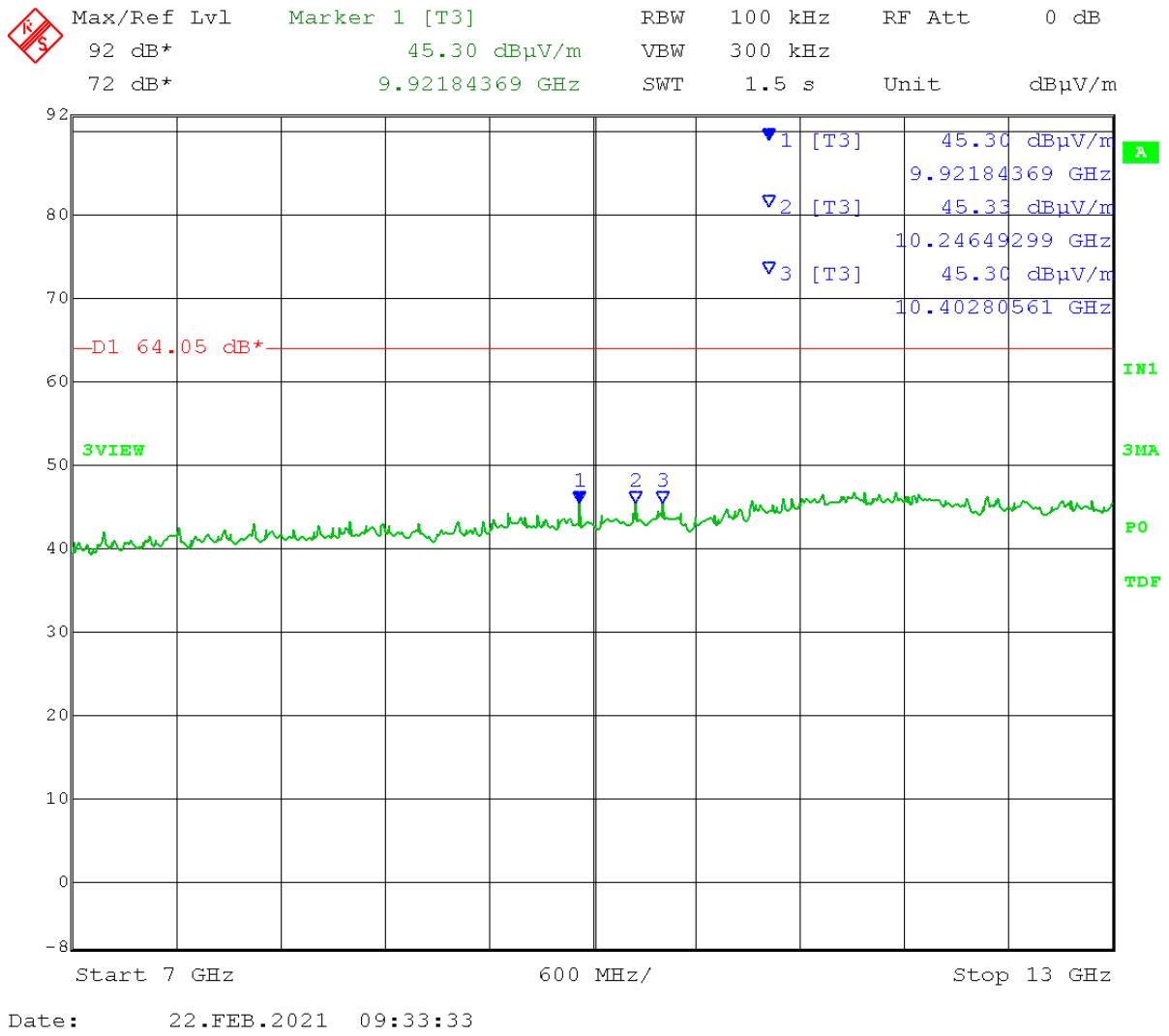
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-22-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak detector; max-hold
DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized)
(Special attention paid to harmonics of fundamental frequency)

Comment: Power setting 20
High Channel: 2480 MHz
Emission Level measurement

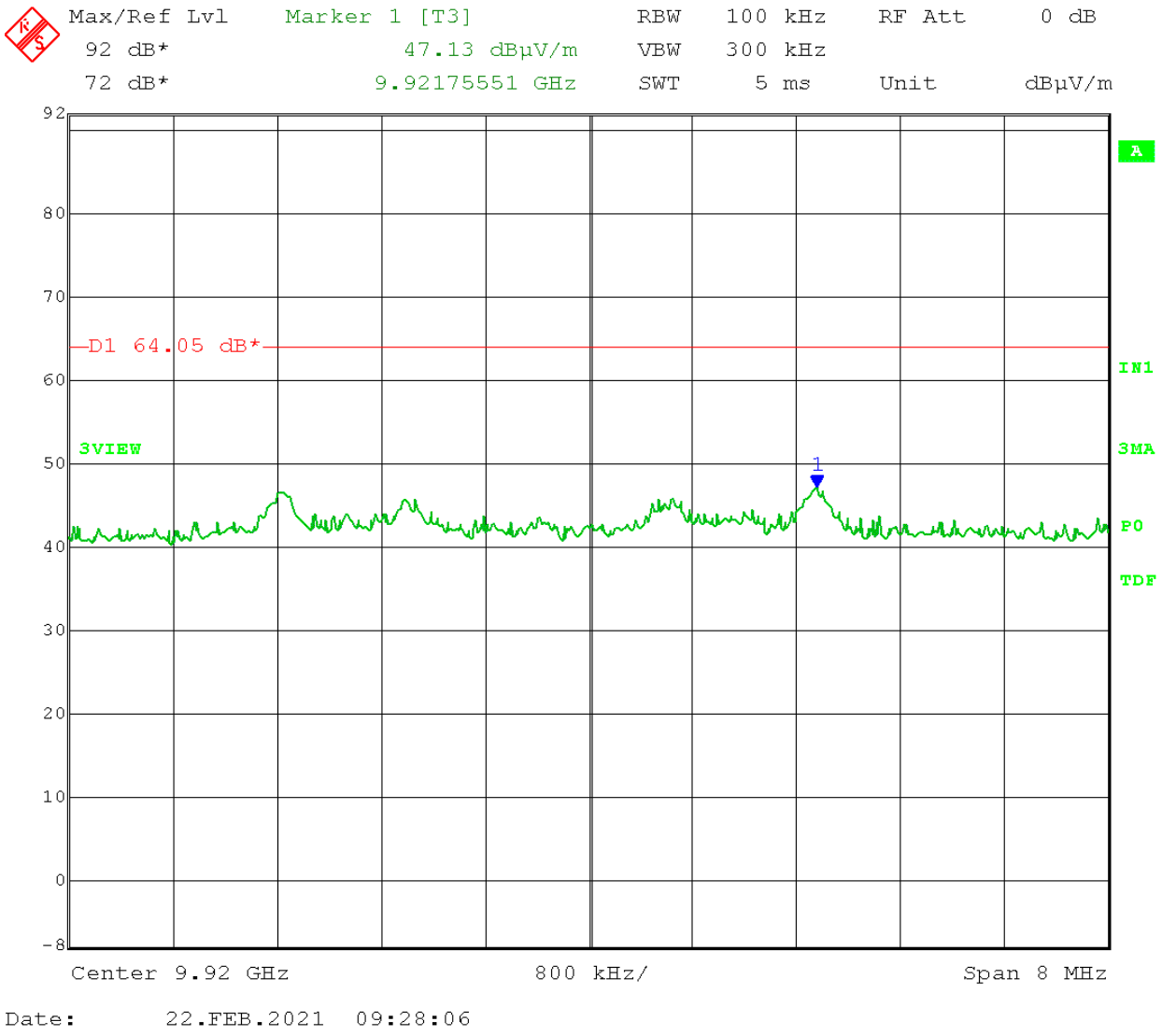
Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters

HORIZONTAL Frequency Range: 7 – 13 GHz



166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373



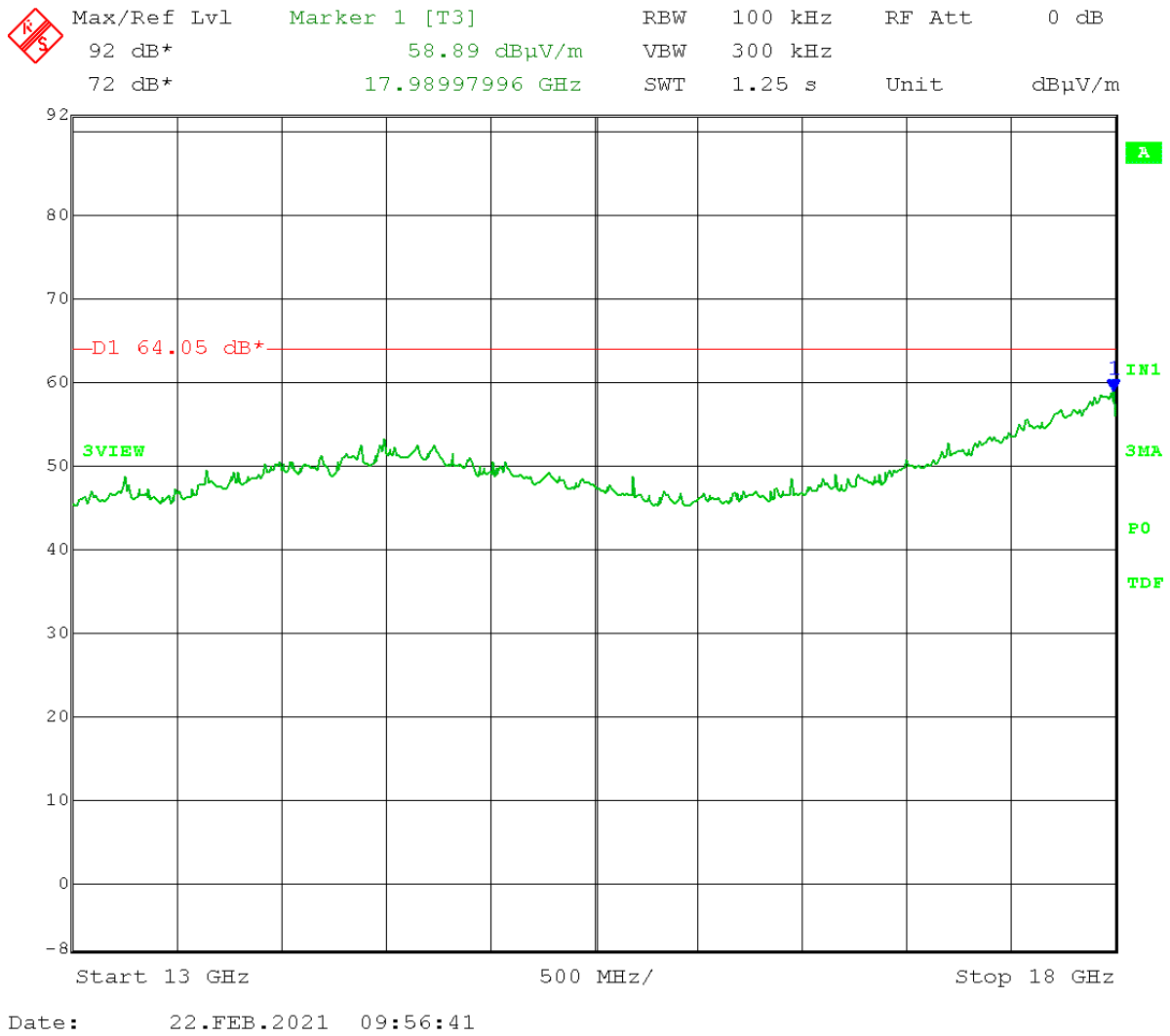
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-22-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator:	cbrandt
Note:	Peak detector; max-hold DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized) (Special attention paid to harmonics of fundamental frequency)
Comment:	Power setting 20 High Channel: 2480 MHz Emission Level measurement

Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters

HORIZONTAL Frequency Range: 13 – 18 GHz



166 South Carter, Genoa City, WI 53128

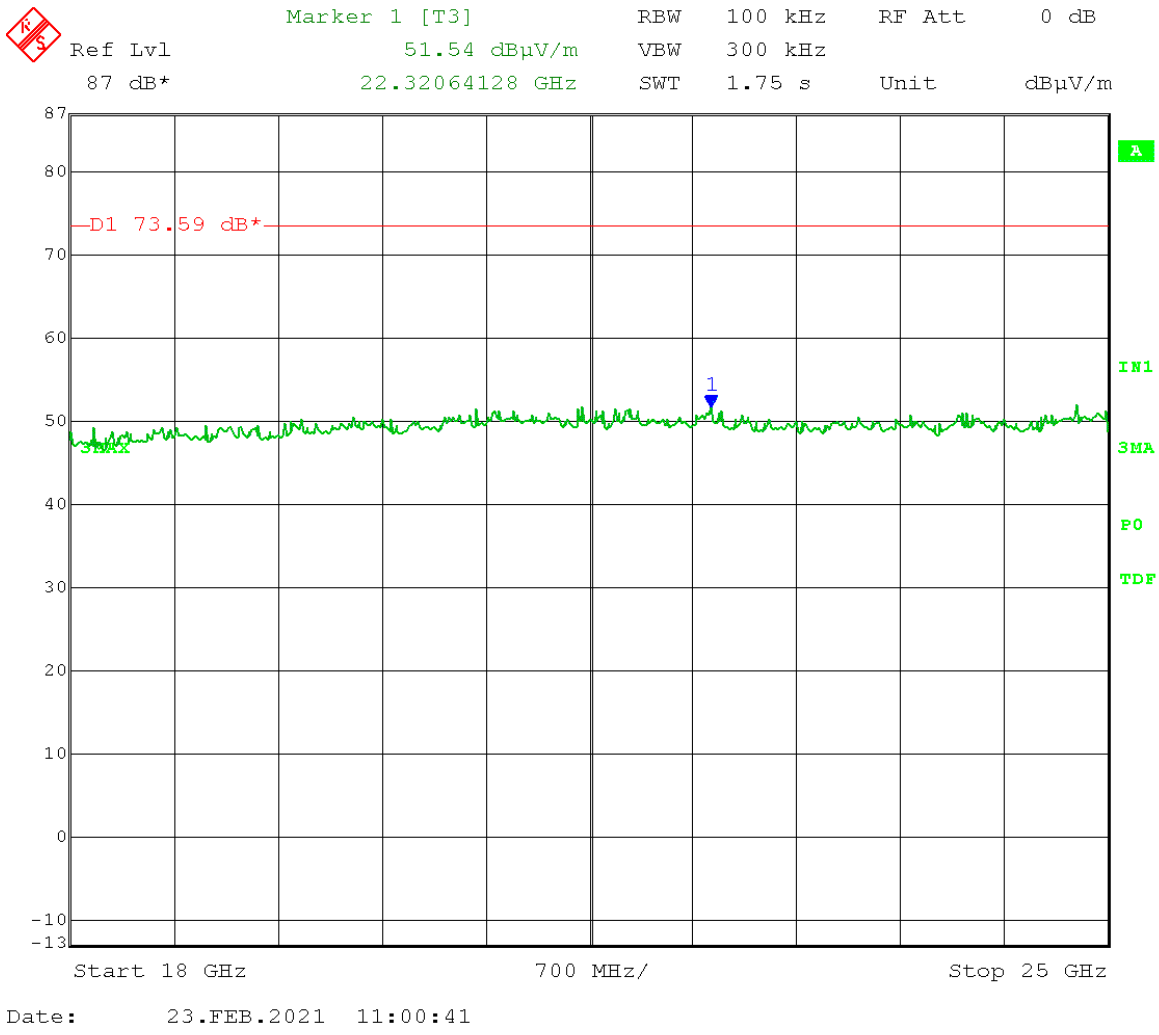
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-23-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak; max-hold
Receive antenna moved near and around every surface of DUT to search for emissions.
All recorded levels taken at a 1-meter test distance.
(Special attention paid to harmonics of fundamental frequency)

Comment: Power setting 20
High Channel: 2480 MHz
Emission Level measurement
Limit corrected for 1 meter test distance by adding 9.54 dB, [20 log (1m/3m)]

Limit = 84.05 dBµV/m – 20 dB = 64.05 dBµV/m at 3 meters, + 9.54 dB = **73.59 dBµV/m** at 1 meter

HORIZONTAL Frequency Range: 18 – 25 GHz



166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

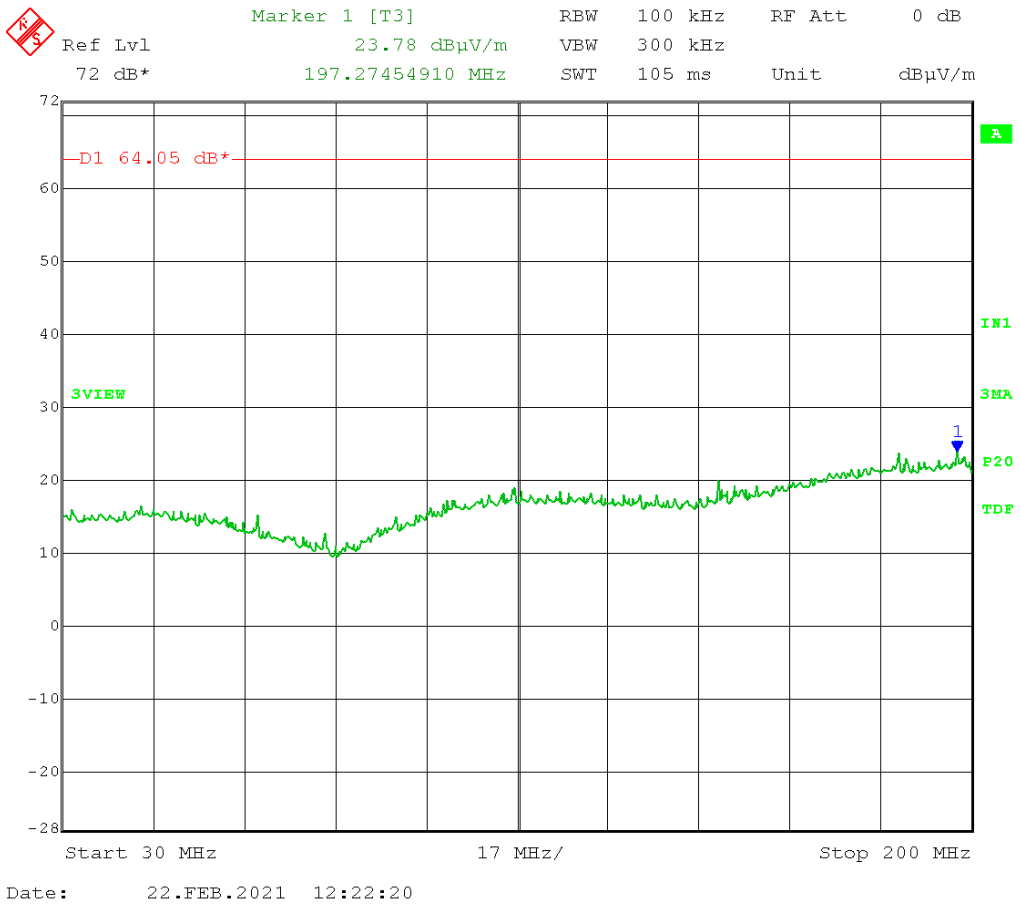
5.2(d) 30 – 1000 MHz: Low, Middle, & High Channels

Test Date: 02-22-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak; max-hold
DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized)
(Special attention paid to harmonics of fundamental frequencies)

Comment: Power setting 20
Low Channel: 2402 MHz; Mid Channel: 2440 MHz; High Channel: 2480 MHz
Emission Level measurement

Limit = 84.28 dBµV/m – 20 dB = **64.28 dBµV/m** at 3 meters
Limit = 84.80 dBµV/m – 20 dB = **64.80 dBµV/m** at 3 meters
Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters

HORIZONTAL Frequency Range: 30 – 200 MHz



166 South Carter, Genoa City, WI 53128

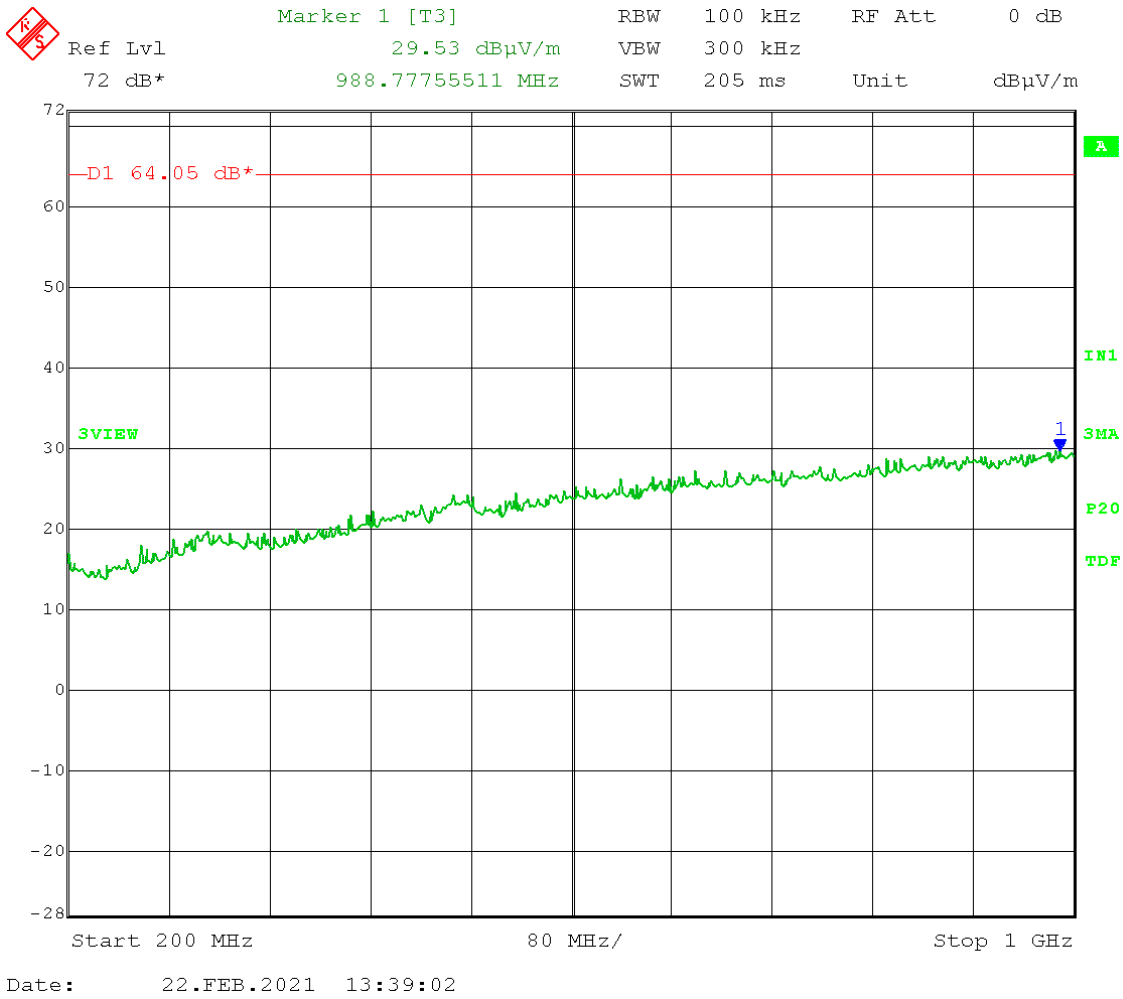
Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-22-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Emissions in Non-Restricted frequency bands – Radiated at 3 meters
Operator: cbrandt
Note: Peak; max-hold
DUT orientation and receive antenna height moved through entire range of positioning while scanning in max-hold mode. (All emission results maximized)
(Special attention paid to harmonics of fundamental frequencies)

Comment: Power setting 20
Low Channel: 2402 MHz; Mid Channel: 2440 MHz; High Channel: 2480 MHz
Emission Level measurement

Limit = 84.28 dBµV/m – 20 dB = **64.28 dBµV/m** at 3 meters
Limit = 84.80 dBµV/m – 20 dB = **64.80 dBµV/m** at 3 meters
Limit = 84.05 dBµV/m – 20 dB = **64.05 dBµV/m** at 3 meters

HORIZONTAL Frequency Range: 200 – 1000 MHz



Section A

6.0 Emissions in Restricted Frequency Bands – Radiated

Rule Part:

Sections 15.247(d), 15.205(b), and 15.209(a)

Test Procedure:

ANSI C63.10-2013, Section 11.12.1
Radiated emission measurements.

Limit:

Table in FCC 15.209

NOTE: The limit for Average emissions was lowered from 54 dBµV/m to 48.9 dBµV/m to account for the 55.9 duty cycle of the DUT.

Results:

Compliant

Sample Equation(s):

None

Notes:

In following FCC Part 15 and ANSI C63.10 requirements, the EUT was programmed for continuous transmit, modulated, with the highest duty cycle achievable using the available programming test software (55.9% duty cycle). Power setting 20 was used per manufacturer's instruction. The EUT was rotated through 3 orthogonal axes to find the highest radiated field strength at each frequency of interest. The maximum field strength level of all emissions found inside of the restricted frequency bands of FCC 15.205 were measured and recorded. The EUT was tested at the low, middle, and high channels of operation in accordance with FCC 15.31(m).

166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Radiated Emissions

Alcotek, Inc.
Project: TILT, model F-000410-01 Sensing Unit

No Radiated Emissions were found from the TILT, model F-000410-01 Sensing Unit

from 30 to 1000 MHz

with the device in modulated continuous transmit mode, (55.9% duty cycle). Power setting 20.

(pre-scan search for emissions in 3-meter chamber, Site G1)

02-22-2021

FCC Part 15.205/15.209

Radiated Emissions in Restricted Frequency Bands

EUT: Sensing Unit
Manufacturer: Alcotek, Inc.
Operating Condition: 70 deg F; 26% R.H.
Test Site: DLS O.F. G1
Operator: cbrandt #11373
Test Specification: Transmit with 55.9% duty cycle (Lowered Average Limit line by 5.1 dB to compensate for this)
Comment: 120 V 60 Hz; Low, Mid, and High channels
Date: 03-03-2021

TEXT: "Vert 3 meters"

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with VERTICAL Antenna Polarization

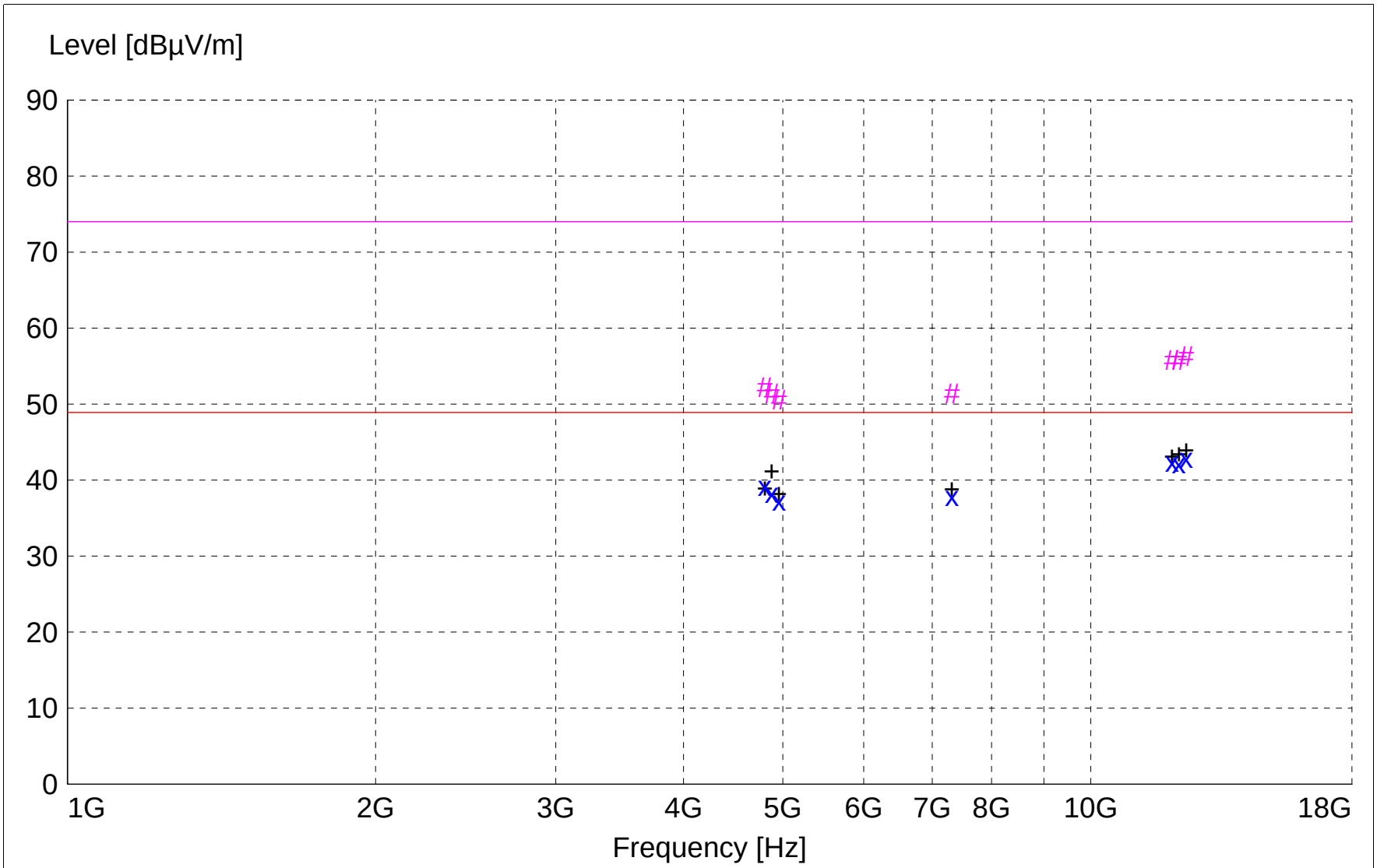
Sample Equations:

Total Level(dBµV/m)	= Level(dBµV)	+ System Loss(dB)	+ Antenna Factor(dBµV/m)	
24.6	= 35.51	+ (-22.1)	+ 11.20	

Margin(dB)	= Limit(dBµV/m)	- Total Level(dBµV/m)
15.4	= 40	- 24.6

Graph Markers:

+	Frequency marker (Level of marker not related to final level)
|	Final maximized level using Quasi-Peak detector
X	Final maximized level using Average dector
#	Final maximized level using Peak detector
-	Background Scan Peak Detector (Optional)
-	Background Scan Average Detector (Optional)



x x xMES A373a_sv_Average
#MES A373a_sv_Peak
+ + +MES A373a_sv_Peak_List
——— LIM FCC 15.209 3m AVG c 3m AVG Limit corrected for duty cycle
——— LIM FCC 15.209 3m pk 3m Peak Limit

MEASUREMENT RESULT: "A373a_sv_Final"

3/3/2021 2:25PM

Frequency	Level	Antenna Factor	System Loss	Total Level	Limit	Margin	Height Ant.	EuT Angle	Final Detector	Comment
MHz	dBµV	dBµV/m	dB	dBµV/m	dBµV/m	dB	m	deg		
12397.220000	51.80	38.91	-47.8	42.9	48.9	6.0	1.14	218	AVERAGE	High ch
12007.350000	49.92	39.81	-47.4	42.4	48.9	6.5	1.33	120	AVERAGE	Low ch
12197.460000	50.72	39.18	-47.7	42.2	48.9	6.7	1.20	219	AVERAGE	Mid ch
4802.870000	59.68	32.97	-53.4	39.2	48.9	9.7	1.92	21	AVERAGE	Low ch
4878.870000	58.19	33.18	-53.1	38.3	48.9	10.6	1.80	27	AVERAGE	Mid ch
7318.390000	51.75	36.37	-50.2	37.9	48.9	11.0	2.39	141	AVERAGE	Mid ch
4958.850000	56.51	33.22	-52.4	37.3	48.9	11.6	1.77	33	AVERAGE	High ch
12397.220000	65.22	38.91	-47.8	56.4	74.0	17.6	1.14	218	MAX PEAK	High ch
12197.460000	64.31	39.18	-47.7	55.8	74.0	18.2	1.20	219	MAX PEAK	Mid ch
12007.350000	63.36	39.81	-47.4	55.8	74.0	18.2	1.33	120	MAX PEAK	Low ch
4802.870000	72.69	32.97	-53.4	52.2	74.0	21.8	1.92	21	MAX PEAK	Low ch
4878.870000	71.39	33.18	-53.1	51.5	74.0	22.5	1.80	27	MAX PEAK	Mid ch
7318.390000	65.22	36.37	-50.2	51.4	74.0	22.6	2.39	141	MAX PEAK	Mid ch
4958.850000	69.75	33.22	-52.4	50.6	74.0	23.4	1.77	33	MAX PEAK	High ch

FCC Part 15.205/15.209

Radiated Emissions in Restricted Frequency Bands

EUT: Sensing Unit
Manufacturer: Alcotek, Inc.
Operating Condition: 70 deg F; 26% R.H.
Test Site: DLS O.F. G1
Operator: cbrandt #11373
Test Specification: Transmit with 55.9% duty cycle (Lowered Average Limit line by 5.1 dB to compensate for this)
Comment: 120 V 60 Hz; Low, Mid, and High channels
Date: 03-03-2021

TEXT: "Horz 3 meters"

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with HORIZONTAL Antenna Polarization

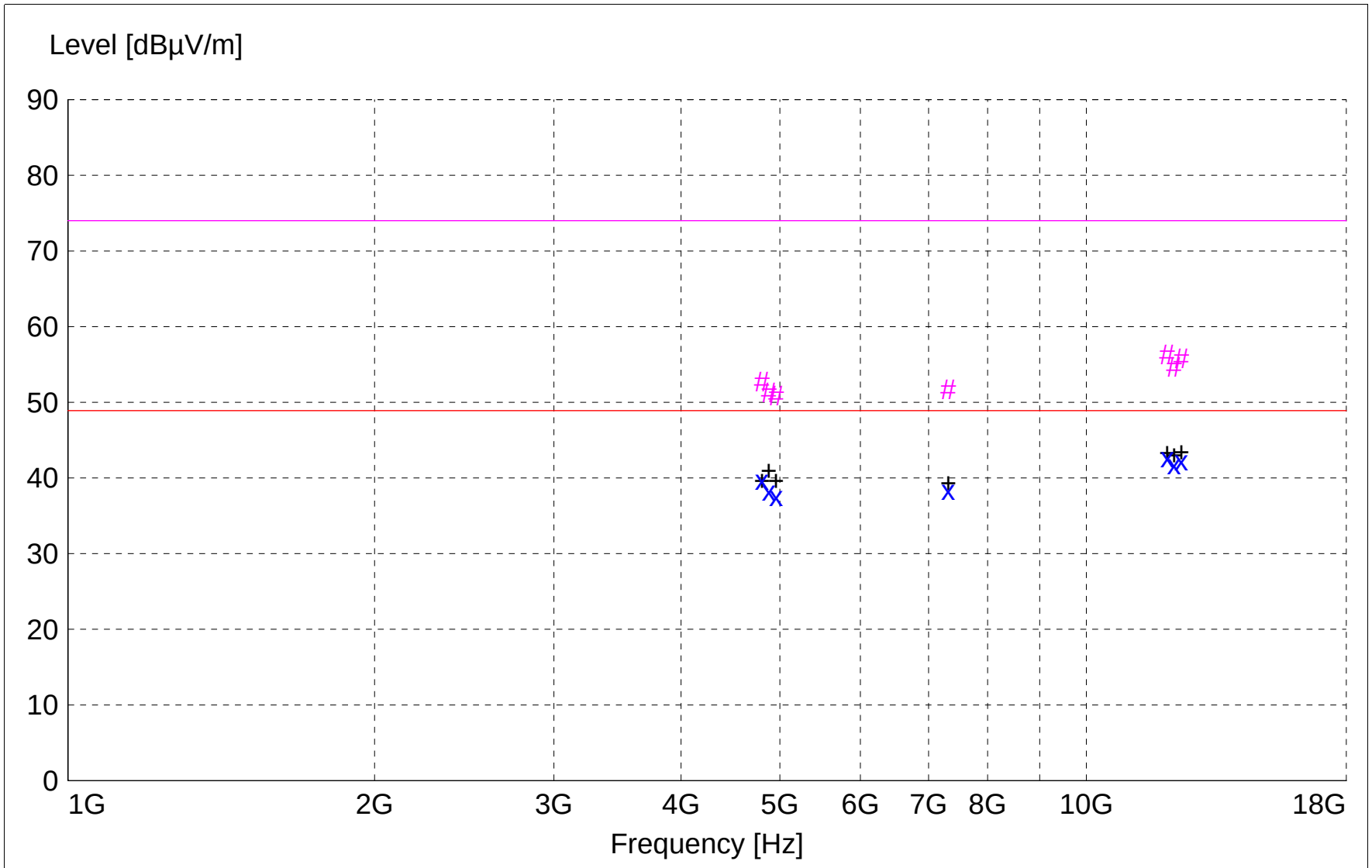
Sample Equations:

Total Level(dBµV/m)	= Level(dBµV)	+ System Loss(dB)	+ Antenna Factor(dBµV/m)	
24.6	= 35.51	+ (-22.1)	+ 11.20	

Margin(dB)	= Limit(dBµV/m)	- Total Level(dBµV/m)
15.4	= 40	- 24.6

Graph Markers:

+	Frequency marker (Level of marker not related to final level)
|	Final maximized level using Quasi-Peak detector
X	Final maximized level using Average dector
#	Final maximized level using Peak detector
-	Background Scan Peak Detector (Optional)
-	Background Scan Average Detector (Optional)



x x xMES A373a_sh_Average
#MES A373a_sh_Peak
+ + +MES A373a_sh_Peak_List
——— LIM FCC 15.209 3m AVG c 3m AVG Limit corrected for duty cycle
——— LIM FCC 15.209 3m pk 3m Peak Limit

MEASUREMENT RESULT: "A373a_sh_Final"

3/3/2021 12:08PM

Frequency	Level	Antenna Factor	System Loss	Total Level	Limit	Margin	Height Ant.	EuT Angle	Final Detector	Comment
MHz	dBµV	dBµV/m	dB	dBµV/m	dBµV/m	dB	m	deg		
12007.270000	50.28	39.81	-47.4	42.7	48.9	6.2	1.21	224	AVERAGE	Low ch
12397.150000	51.17	38.91	-47.8	42.3	48.9	6.6	1.28	222	AVERAGE	High ch
12197.220000	50.21	39.18	-47.7	41.7	48.9	7.2	1.86	207	AVERAGE	Mid ch
4802.850000	60.21	32.97	-53.4	39.8	48.9	9.1	1.79	135	AVERAGE	Low ch
7318.520000	52.29	36.37	-50.2	38.4	48.9	10.5	1.52	327	AVERAGE	Mid ch
4878.880000	58.25	33.18	-53.1	38.3	48.9	10.6	1.84	137	AVERAGE	Mid ch
4958.890000	56.79	33.22	-52.4	37.6	48.9	11.3	1.73	138	AVERAGE	High ch
12007.270000	63.90	39.81	-47.4	56.3	74.0	17.7	1.21	224	MAX PEAK	Low ch
12397.150000	64.70	38.91	-47.8	55.8	74.0	18.2	1.28	222	MAX PEAK	High ch
12197.220000	63.22	39.18	-47.7	54.7	74.0	19.3	1.86	207	MAX PEAK	Mid ch
4802.850000	73.19	32.97	-53.4	52.7	74.0	21.3	1.79	135	MAX PEAK	Low ch
7318.520000	65.58	36.37	-50.2	51.7	74.0	22.3	1.52	327	MAX PEAK	Mid ch
4878.880000	71.25	33.18	-53.1	51.3	74.0	22.7	1.84	137	MAX PEAK	Mid ch
4958.890000	70.10	33.22	-52.4	50.9	74.0	23.1	1.73	138	MAX PEAK	High ch

166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Radiated Emissions

Alcotek, Inc.
Project: TILT, model F-000410-01 Sensing Unit

No Radiated Emissions were found from the TILT, model F-000410-01 Sensing Unit

from 18 to 25 GHz

with the device in modulated continuous transmit mode, (55.9% duty cycle). Power setting 20.

(At a 1-meter test distance)

02-23-2021

Section A

7.0 Authorized Band Edge – Radiated

Rule Part:

Section 15.247(d)

Test Procedure:

ANSI C63.10-2013, Sections 6.10.4 and 11.11.1(a)
Authorized-band band-edge measurements (relative method).
Maximum PEAK conducted power procedure.

Limit:

20 dB down from the highest emission level within the authorized band as measured with a 100 kHz resolution bandwidth (RBW).

Results:

Compliant

Sample Equation(s):

None

Notes:

In following FCC Part 15 and ANSI C63.10 requirements, the EUT was programmed for continuous transmit, modulated, with the highest duty cycle achievable using the available programming test software (55.9% duty cycle). Power setting 20 was used per manufacturer's instruction. The EUT was rotated through 3 orthogonal axes to find the highest radiated field strength at each frequency of interest. The maximum field strength level of the fundamental emission was measured with a span wide enough to capture the peak level of the emission as well as any modulation products that fell outside of the operating band. The marker-delta function of the spectrum analyzer was used to show that the level at the band-edge (including all modulation product outside of the authorized band) are greater than 20 dB below the peak level of the fundamental emission. The EUT was tested at the low and high channels of operation.

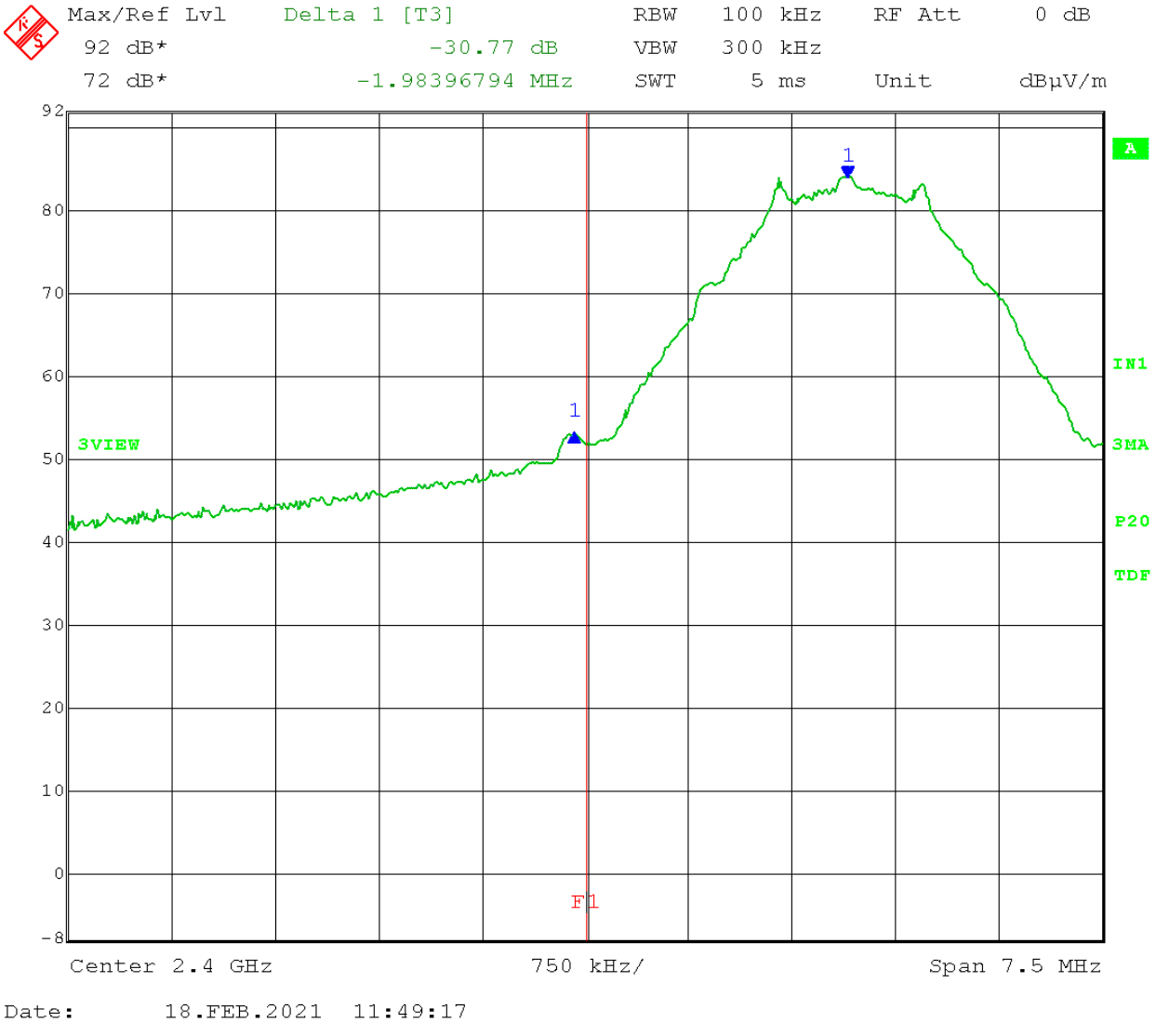
166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-18-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Lower Band Edge Compliance – Radiated (3-meter vertical)
Operator: cbrandt
Detector: Peak; max-hold

Comment: Power setting: 20
Low Channel: 2402 MHz

Band-Edge Frequency = 2.4 GHz
Limit at Band-Edge > 20 dB Below Peak In-Band Emission
Emission at Band-Edge is **30.77** dB below the Peak in-band emission.

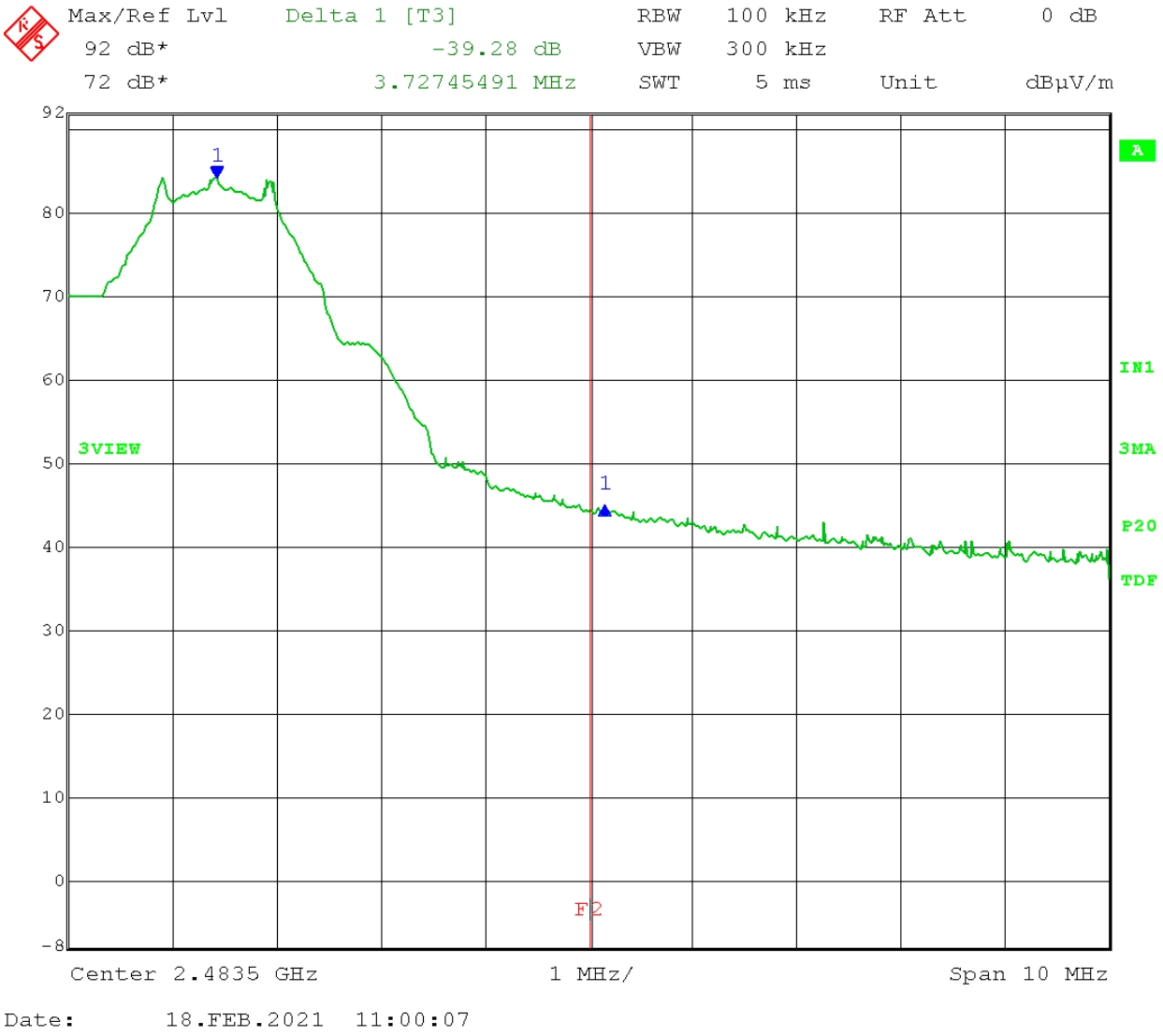


166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-18-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Upper Band Edge Compliance – Radiated (3-meter horizontal)
Operator: cbrandt
Detector: Peak; max-hold
Comment: Power setting: 20
High Channel: 2480 MHz

Band-Edge Frequency = 2.4835 GHz
Limit at Band-Edge > 20 dB Below Peak In-Band Emission
Emission at Band-Edge is **39.28** dB below the Peak in-band emission.



Section A

8.0 Restricted Band Edge – Radiated

Rule Part:

Sections 15.247(d), 15.205(b), and 15.209(a)

Test Procedure:

ANSI C63.10-2013, Section 6.10.5.2
Restricted-band band-edge measurements.

Limit:

Table in FCC 15.209

Results:

Compliant

Sample Equation(s):

None

Notes:

In following FCC Part 15 and ANSI C63.10 requirements, the EUT was programmed for continuous transmit, modulated, with the highest duty cycle achievable using the available programming test software (55.9% duty cycle). Power setting 20 was used per manufacturer's instruction. The EUT was rotated through 3 orthogonal axes to find the highest radiated field strength at each frequency of interest. The maximum field strength level at the band-edge (including all modulation product outside of the authorized band) was measured and recorded. The EUT was tested at the low and high channels of operation.

The measured values of Average emissions were adjusted by adding 5.1 dB to correct for the 55.9% duty cycle of the DUT.

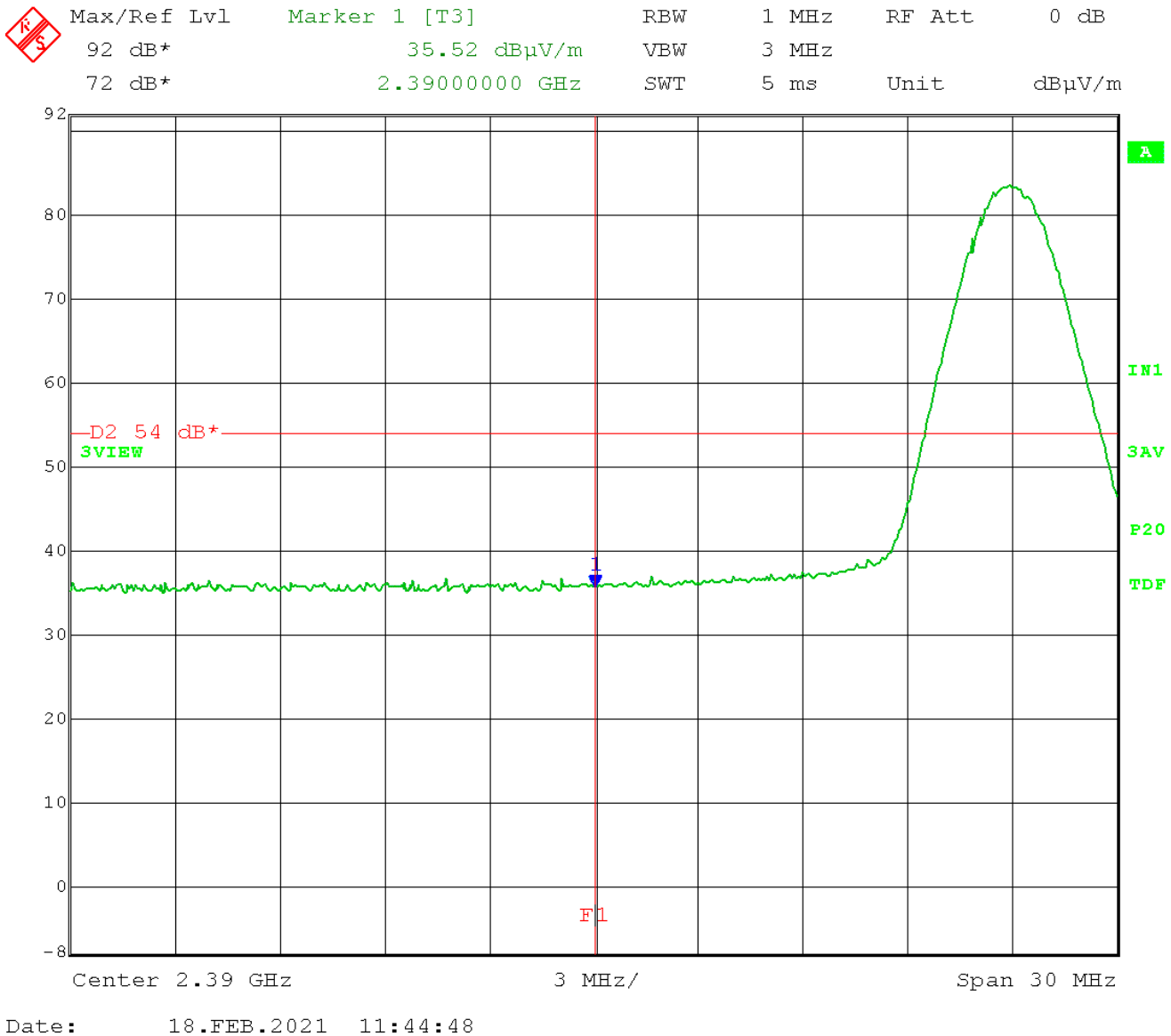
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Lower Restricted Band-Edge - Radiated
Operator:	cbrandt
Comment:	Low Channel: 2402 MHz
	Lower Restricted Band-Edge frequency: 2.390 GHz
	Duty cycle correction factor 5.1 dB (duty cycle is less than 98%)
Detector:	Linear Average with max-hold

Average level at restricted band edge: 35.52 dBµV/m + 5.1 dB (duty cycle) = **40.62** dBµV/m

VERTICAL:
AVERAGE: Limit: 54 dBµV/m at 3meters



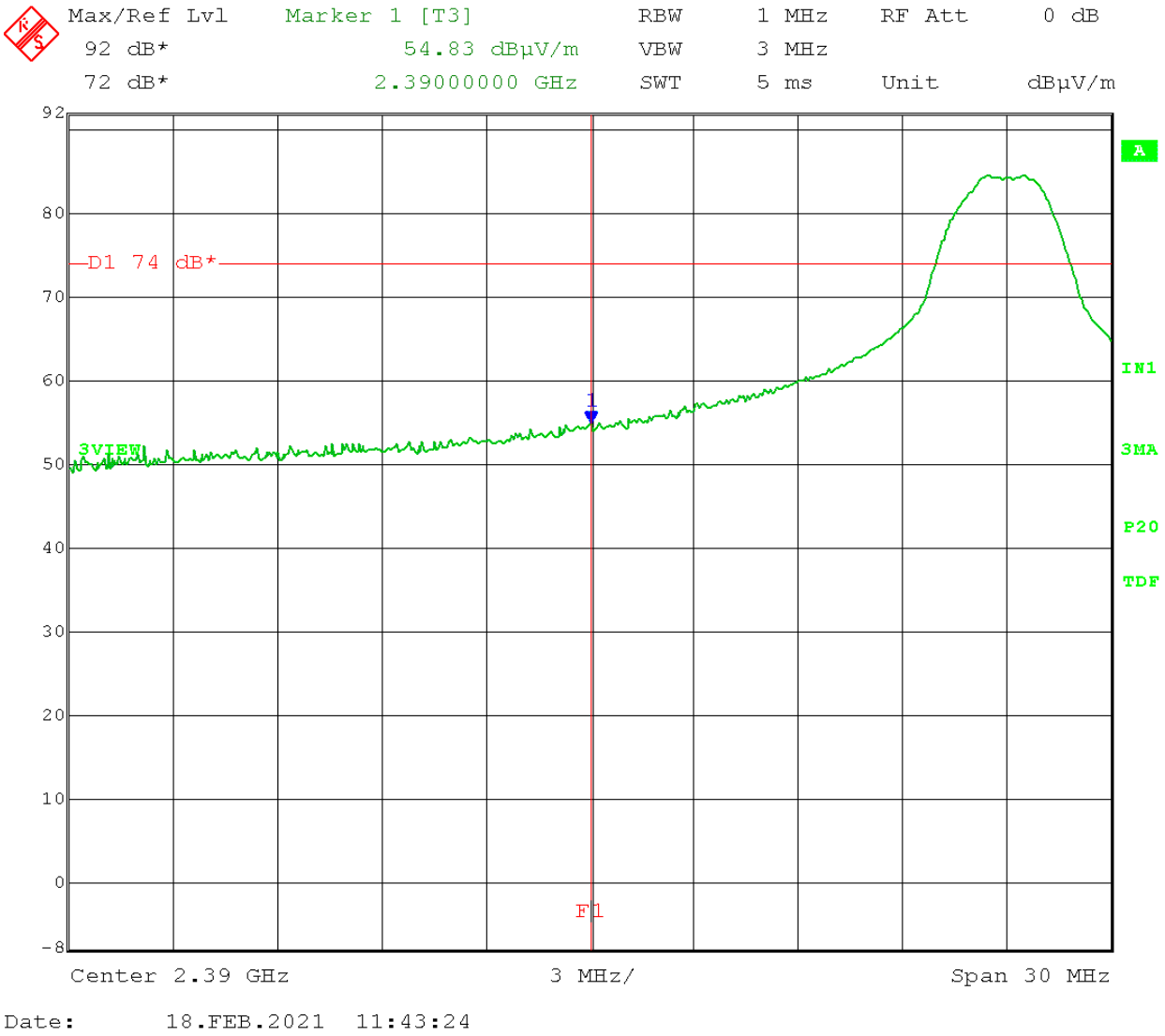
166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

Test Date: 02-18-2021
Company: Alcotek, Inc.
EUT: Sensing Unit
Test: Lower Restricted Band-Edge - Radiated
Operator: cbrandt
Comment: Low Channel: 2402 MHz
Lower Restricted Band-Edge frequency: 2.390 GHz
Detector: Peak with max-hold

Peak level at restricted band edge: **54.83** dBµV/m

VERTICAL:
PEAK: Limit: 74 dBµV/m at 3meters



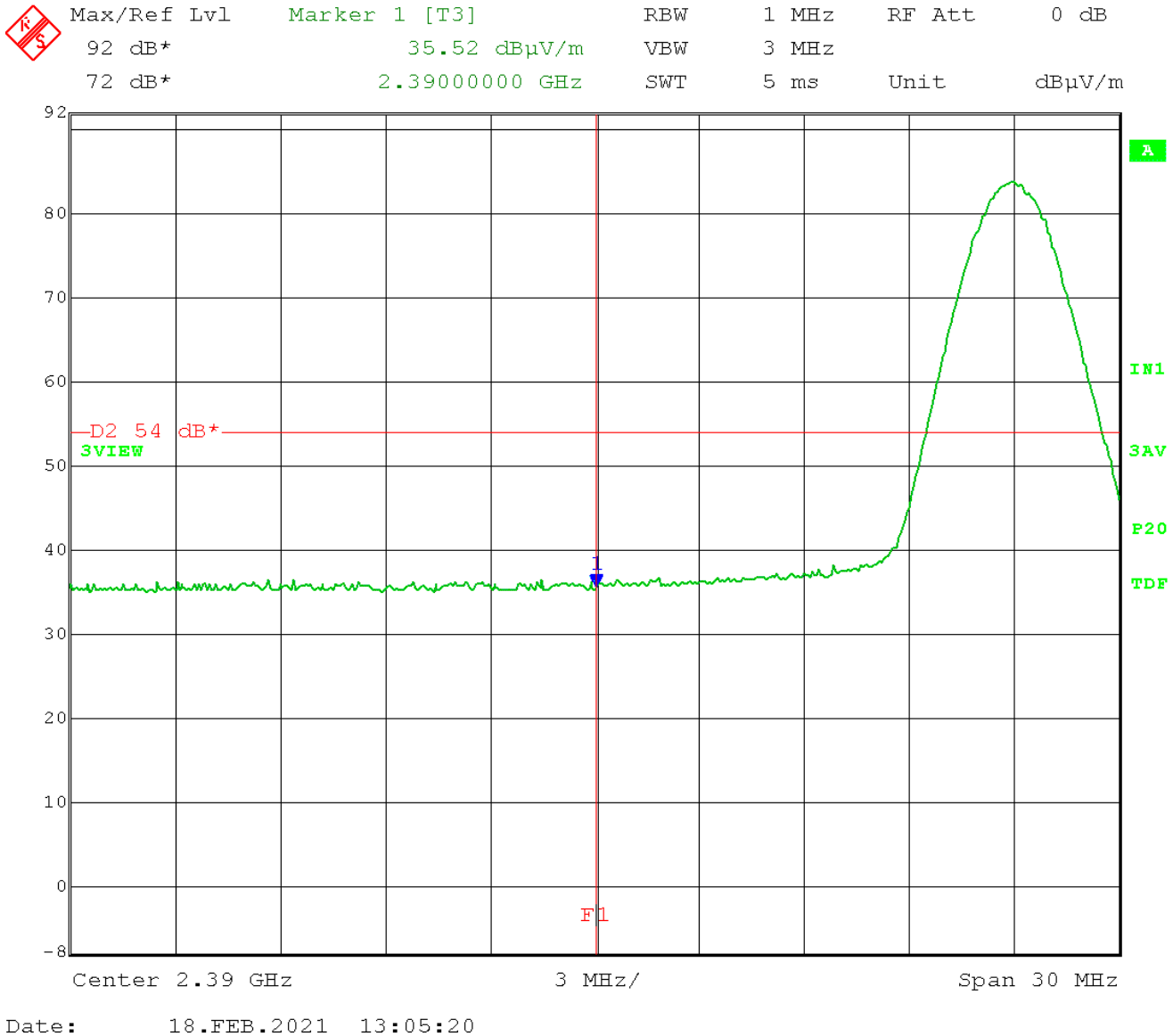
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Lower Restricted Band-Edge - Radiated
Operator:	cbrandt
Comment:	Low Channel: 2402 MHz
	Lower Restricted Band-Edge frequency: 2.390 GHz
	Duty cycle correction factor 5.1 dB (duty cycle is less than 98%)
Detector:	Linear Average with max-hold

Average level at restricted band edge: 35.52 dBµV/m + 5.1 dB (duty cycle) = **40.62** dBµV/m

HORIZONTAL:
AVERAGE: Limit: 54 dBµV/m at 3meters



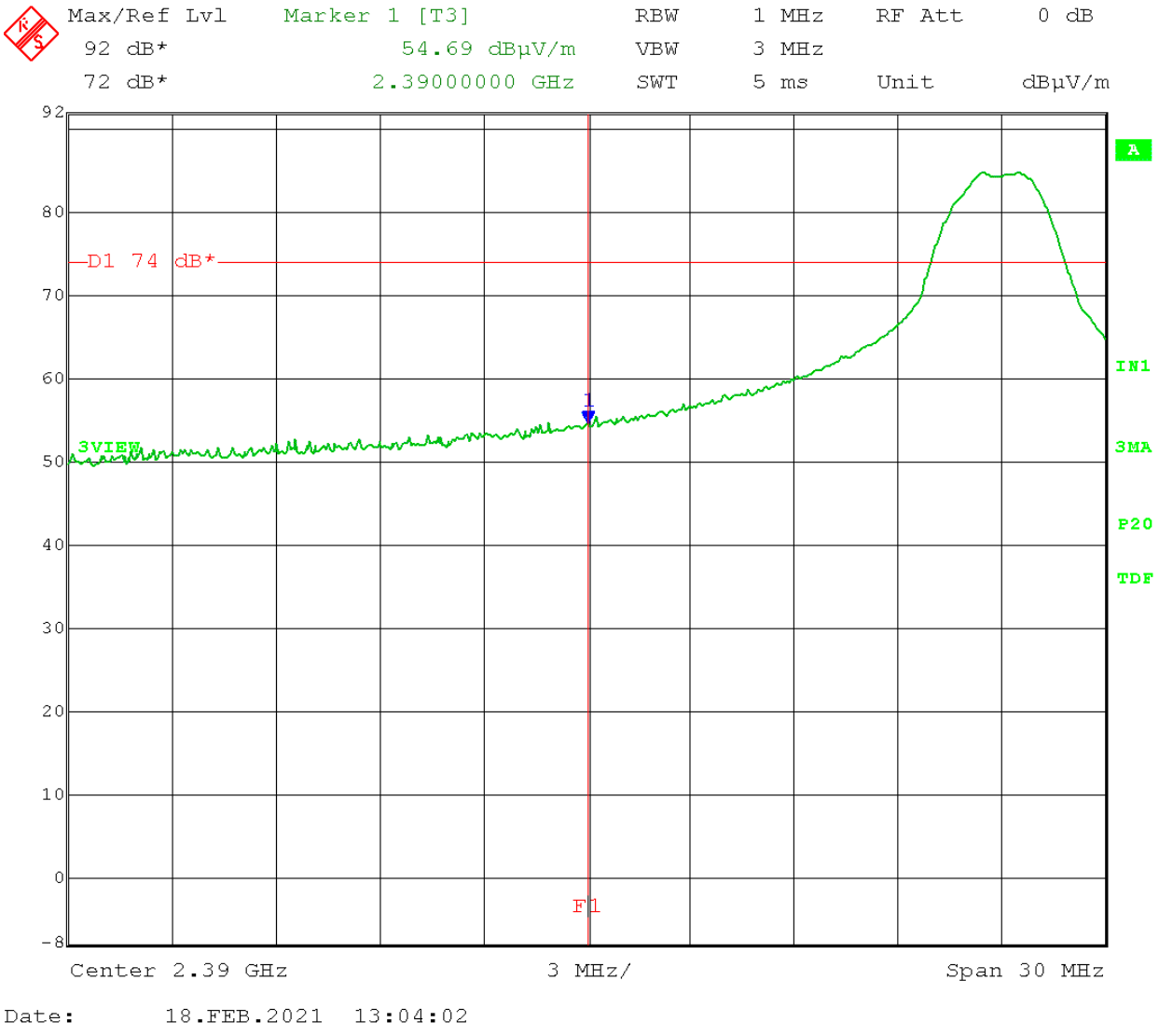
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Lower Restricted Band-Edge - Radiated
Operator:	cbrandt
Comment:	Low Channel: 2402 MHz
	Lower Restricted Band-Edge frequency: 2.390 GHz
Detector:	Peak with max-hold

Peak level at restricted band edge: **54.69** dBµV/m

HORIZONTAL:
PEAK: Limit: 74 dBµV/m at 3meters



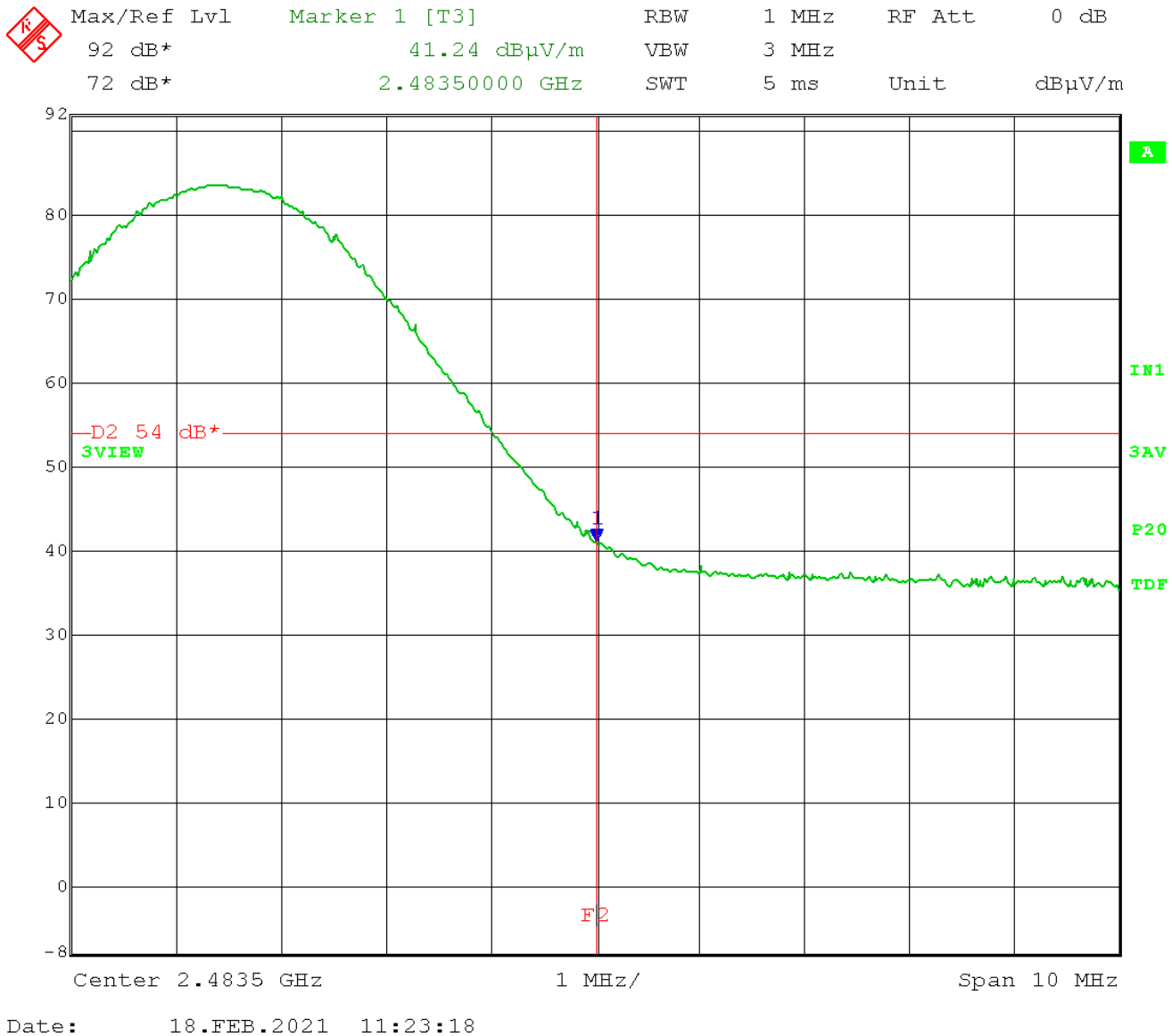
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Upper Restricted Band-Edge - Radiated
Operator:	cbrandt
Comment:	High Channel: 2480 MHz
	Upper Restricted Band-Edge frequency: 2.4835 GHz
	Duty cycle correction factor 5.1 dB (duty cycle is less than 98%)
Detector:	Linear Average with max-hold

Average level at restricted band edge: 41.24 dBµV/m + 5.1 dB (duty cycle) = **46.34** dBµV/m

VERTICAL:
AVERAGE: Limit: 54 dBµV/m at 3meters



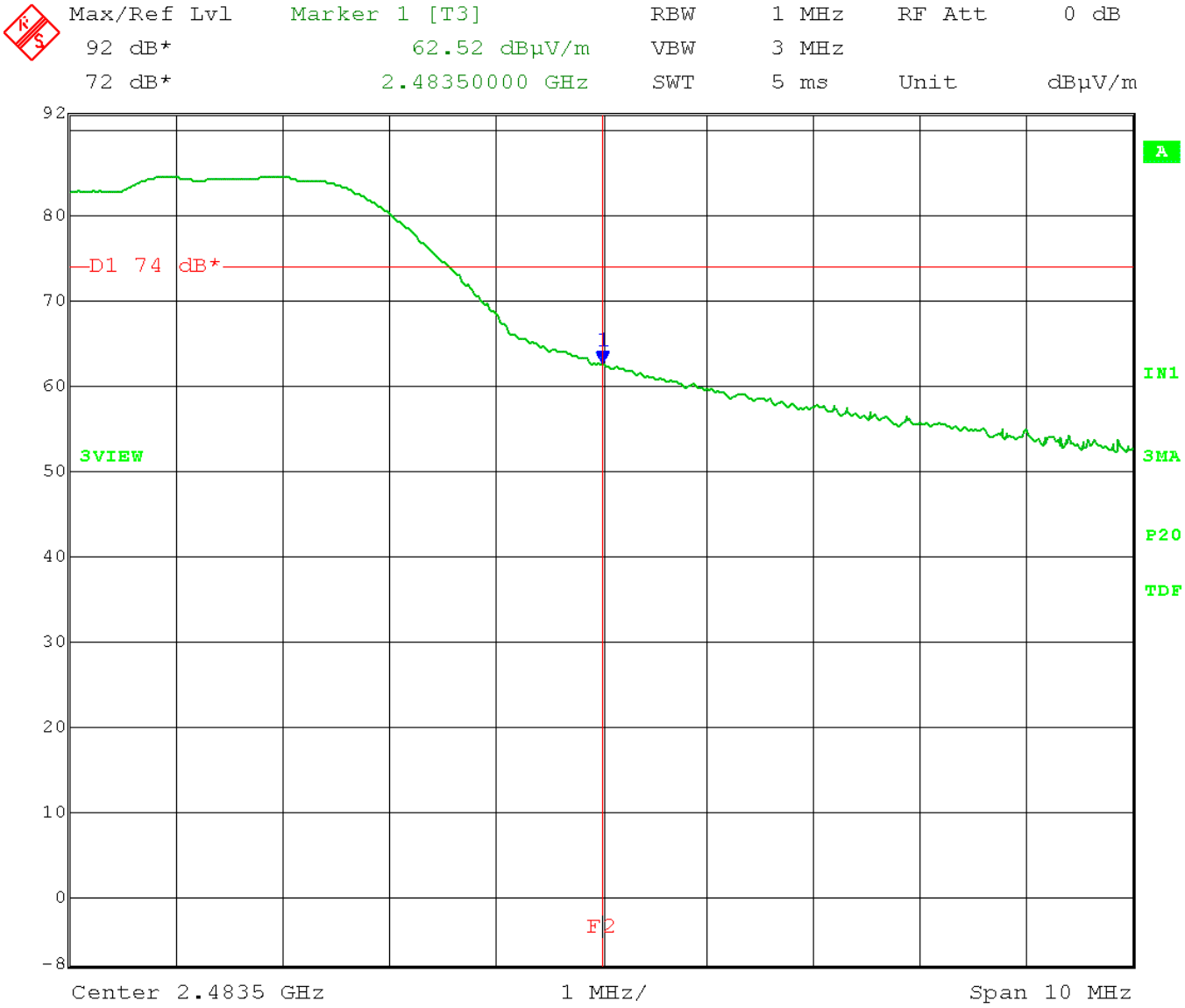
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Upper Restricted Band-Edge - Radiated
Operator:	cbrandt
Comment:	High Channel: 2480 MHz
	Upper Restricted Band-Edge frequency: 2.4835 GHz
Detector:	Peak with max-hold

Peak level at restricted band edge: **62.52** dBµV/m

VERTICAL:
PEAK: Limit: 74 dBµV/m at 3meters



Date: 18.FEB.2021 11:24:36

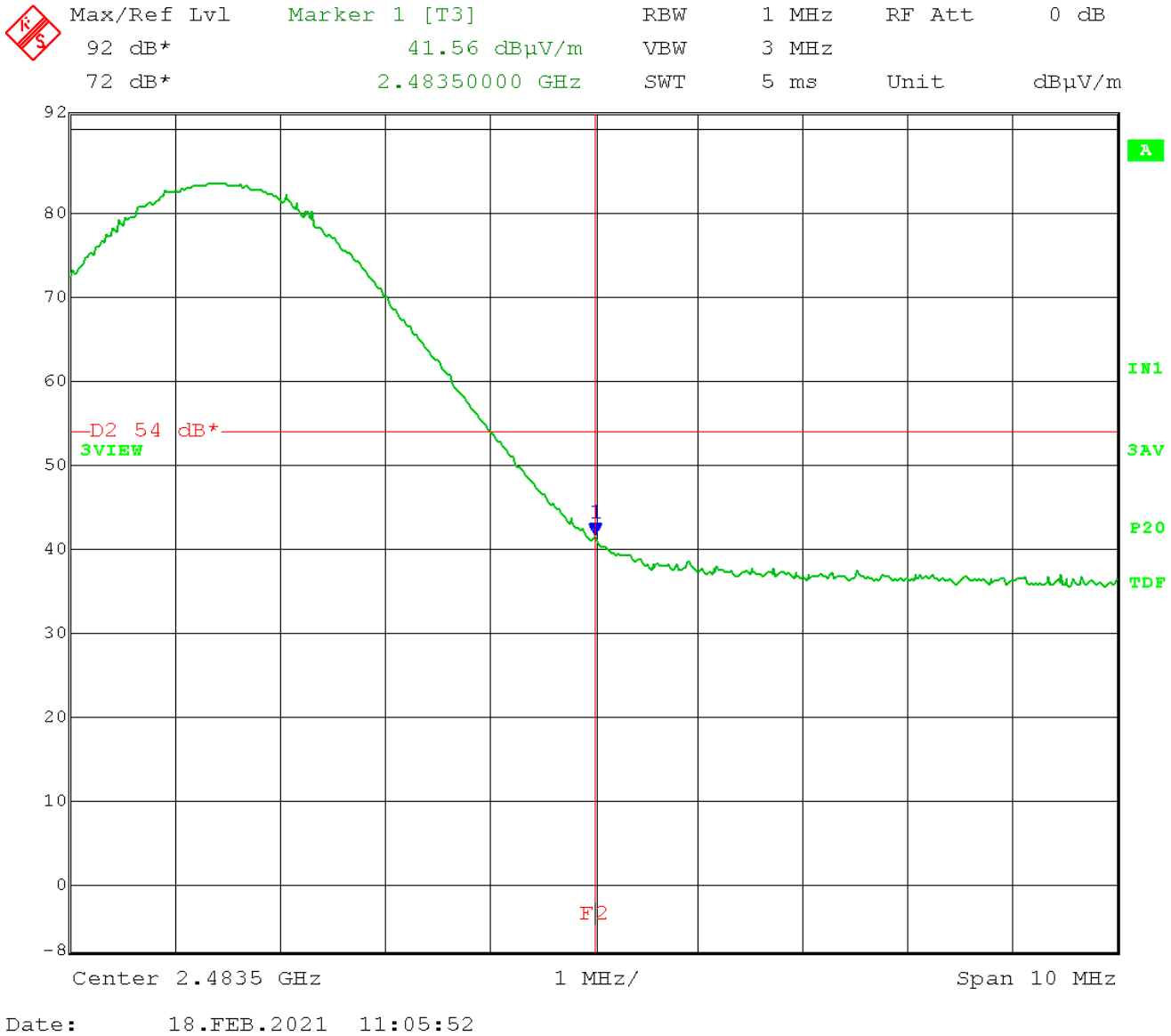
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Upper Restricted Band-Edge - Radiated
Operator:	cbrandt
Comment:	High Channel: 2480 MHz
	Upper Restricted Band-Edge frequency: 2.4835 GHz
	Duty cycle correction factor 5.1 dB (duty cycle is less than 98%)
Detector:	Linear Average with max-hold

Average level at restricted band edge: 41.56 dBµV/m + 5.1 dB (duty cycle) = **46.66** dBµV/m

HORIZONTAL:
AVERAGE: Limit: 54 dBµV/m at 3meters



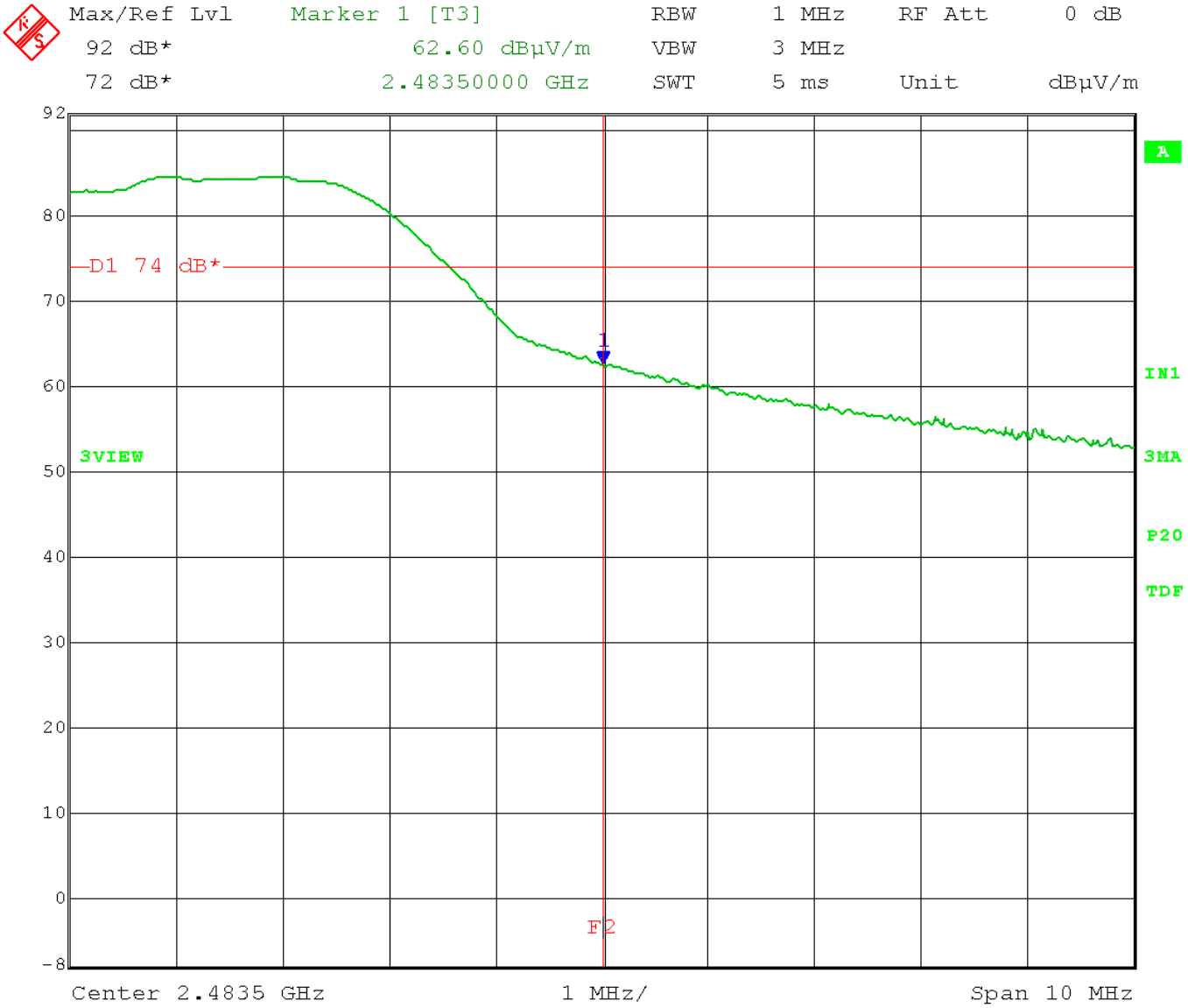
166 South Carter, Genoa City, WI 53128

Company:	Alcotek, Inc.
Model Tested:	F-000410-01 Sensing Unit
Report Number:	25983
Project Number:	11373

Test Date:	02-18-2021
Company:	Alcotek, Inc.
EUT:	Sensing Unit
Test:	Upper Restricted Band-Edge - Radiated
Operator:	cbrandt
Comment:	High Channel: 2480 MHz
	Upper Restricted Band-Edge frequency: 2.4835 GHz
Detector:	Peak with max-hold

Peak level at restricted band edge: **62.60** dBµV/m

HORIZONTAL:
PEAK: Limit: 74 dBµV/m at 3meters



Date: 18.FEB.2021 11:04:51

Section A

9.0 AC Line Conducted Emissions

Rule Part:

Sections 15.207

Test Procedure:

ANSI C63.10-2013, Section 6.2
Standard test method for ac powerline conducted emissions from unlicensed wireless devices.

Limit:

Table in FCC 15.207

Results:

Compliant

Sample Equation(s):

None

Notes:

In following FCC Part 15 and ANSI C63.10 requirements, the EUT was programmed for continuous transmit, modulated, with the highest duty cycle achievable using the available programming test software (55.9% duty cycle). Power setting 20 was used per manufacturer's instruction.

This was an AC Conducted emissions measurement.
The EUT was powered with 5.0 Volts DC from a Tech & Go! NeverBlock USB power adapter (Model 1310806TG, SN: 2634103975) (Not provided with DUT). The power adapter was connected to a Line Impedance Stabilization Network using a 1-meter non-shielded power cord.

PMM NARDA REPORT: 11373 Alcotek Sensing Unit Line 1_001

Report issuing date : 03-04-2021

Standard : FCC Part 15.207
Test Type : Voltage Mains Test
Test Site : DLS Genoa Screen Room
Temperature : 71 °F
Humidity : 22 %
Test Specs : Line 1
Operator : cbrandt
DLS Project # : 11373
Result : Pass

EUT

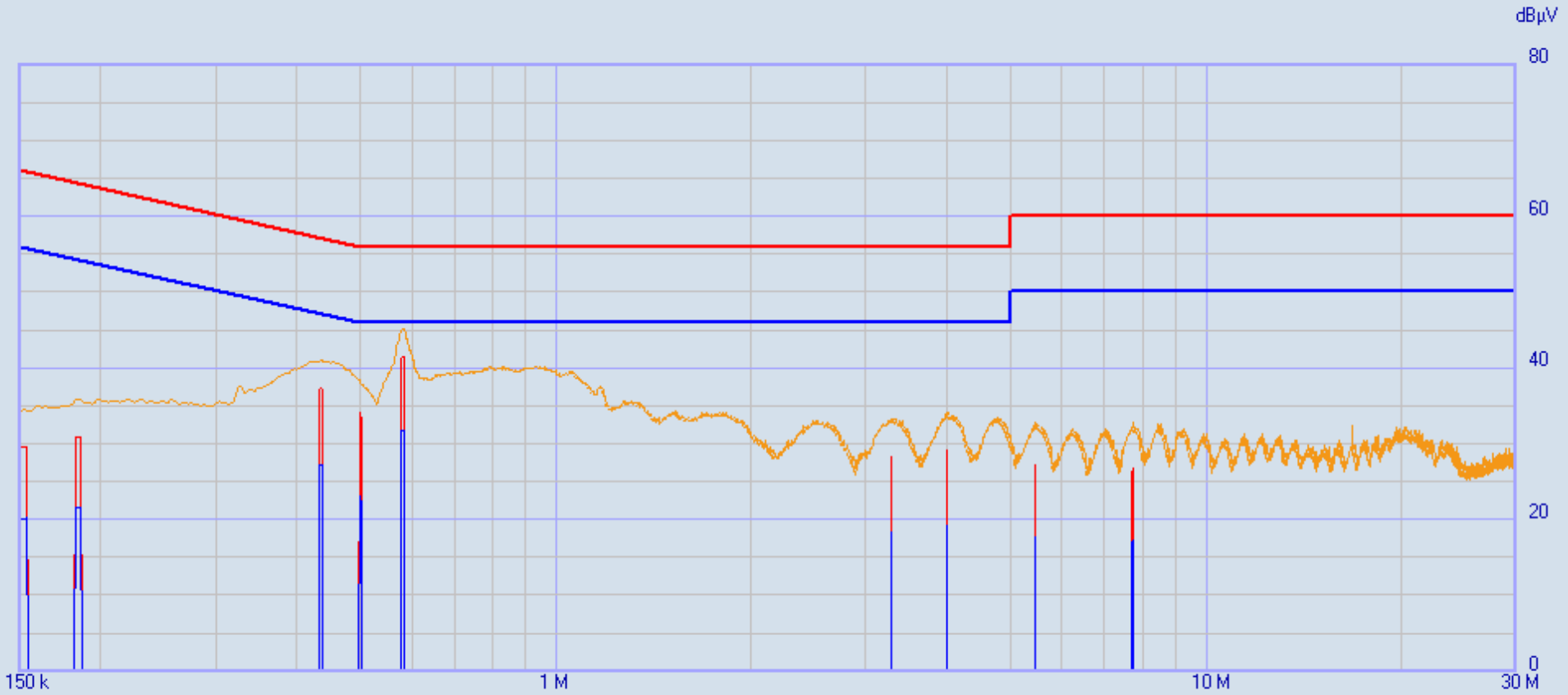
Manufacturer : Alcotek, Inc.
Model : Sensing Unit
Product : Part of Q201102-100 sensor system
Notes : 3 V DC; tested with off-the-shelf 120 V 60 Hz USB adapter
: Adapter: Roku model W15-007N1A; SN: none
Comments : Continuous Transmit with 55.9% duty cycle

Testing Company : DLS Electronic Systems
Tel./Fax : 262-279-0210
Web site : http://www.dlsemc.com

Receiver Details

Model : PMM 9010F
Brand : Narda
S/N : 020WW40102
Last Calibration : 04/29/2020

NOTE: The column in the table that is labeled "delta" shows the margin in dB with respect to the limit. A negative number indicates the level of the emission is under the limit by the given value, while a positive number indicates the emission level is above the limit by the given value.



11373 Alcotek Sensing Unit Line 1_001

	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (2.045 kHz)	P Q C	1500 ms	9 kHz	10	OFF	ON	...	...

Ancillary = General
Nr. of Worst = Infinite (12)

Limits:
FCC 15_207 QP
FCC 15_207 AV

Factors:
LISN DLS#665
LIM #507 w CBL-035
HPF #592
Cables 43 & 45

Peak
QPeak
C-Avg

11373 Alcotek Sensing Unit Line 1_001 04/03/2021 13:47:31
Rel. SW 2.22 (August 2015)
Rel. FW 1.93 01/10/19
Margin: 100 dB

	Frequency [MHz]	QPeak [dBµV]	Limit FCC 15_20.. [dBµV]	Delta [dB]	C-Avg [dBµV]	Limit FCC 15_20.. [dBµV]	Delta [dB]	Factor LISN DLS#.. [dB]	Factor LIM #507 .. [dB]	Factor HPF #592 [dB]	Factor Cables 43.. [dB]
1	0.15	29.45	66.00	-36.55	19.96	56.00	-36.04	0.10	9.68	2.16	0.09
2	0.152045	29.54	65.89	-36.35	20.05	55.89	-35.84	0.09	9.68	2.13	0.09
3	0.15409	29.64	65.78	-36.14	20.16	55.78	-35.62	0.09	9.68	2.10	0.10
4	0.18272	30.75	64.36	-33.61	21.45	54.36	-32.91	0.07	9.68	1.81	0.09
5	0.184765	30.83	64.27	-33.44	21.53	54.27	-32.74	0.07	9.68	1.80	0.08
6	0.18681	30.88	64.18	-33.30	21.53	54.18	-32.65	0.07	9.68	1.78	0.08
7	0.43221	37.22	57.21	-19.99	27.17	47.21	-20.04	0.04	9.78	0.97	0.14
8	0.434255	37.23	57.17	-19.94	27.18	47.17	-19.99	0.04	9.78	0.96	0.14
9	0.4363	37.22	57.13	-19.91	27.19	47.13	-19.94	0.04	9.78	0.95	0.14
10	0.499695	34.09	56.01	-21.92	23.06	46.01	-22.95	0.04	9.77	0.88	0.15
11	0.50174	33.77	56.00	-22.23	22.69	46.00	-23.31	0.04	9.77	0.88	0.15
12	0.503785	33.47	56.00	-22.53	22.32	46.00	-23.68	0.04	9.77	0.88	0.15
13	0.57945	41.32	56.00	-14.68	31.66	46.00	-14.34	0.03	9.76	0.77	0.16
14	0.581495	41.50	56.00	-14.50	31.76	46.00	-14.24	0.03	9.75	0.76	0.17
15	0.58354	41.45	56.00	-14.55	31.65	46.00	-14.35	0.03	9.75	0.76	0.17
16	3.27885	28.26	56.00	-27.74	18.31	46.00	-27.69	0.04	9.76	0.15	0.45
17	3.280895	28.27	56.00	-27.73	18.31	46.00	-27.69	0.04	9.76	0.15	0.45
18	3.28294	28.27	56.00	-27.73	18.32	46.00	-27.68	0.04	9.76	0.15	0.45
19	3.99051	29.08	56.00	-26.92	19.19	46.00	-26.81	0.04	9.81	0.22	0.46
20	3.992555	29.08	56.00	-26.92	19.20	46.00	-26.80	0.04	9.81	0.22	0.46
21	3.9946	29.11	56.00	-26.89	19.22	46.00	-26.78	0.04	9.81	0.22	0.46
22	5.44655	27.19	60.00	-32.81	17.67	50.00	-32.33	0.04	9.81	0.14	0.51
23	5.448595	27.18	60.00	-32.82	17.66	50.00	-32.34	0.04	9.81	0.14	0.51
24	5.45064	27.21	60.00	-32.79	17.64	50.00	-32.36	0.04	9.81	0.14	0.51
25	7.669465	26.63	60.00	-33.37	17.13	50.00	-32.87	0.03	9.81	0.17	0.59
26	7.67151	26.63	60.00	-33.37	17.13	50.00	-32.87	0.03	9.81	0.17	0.59
27	7.673555	26.67	60.00	-33.33	17.08	50.00	-32.92	0.03	9.81	0.17	0.59

PMM NARDA REPORT: 11373 Alcotek Sensing Unit Line 2_001

Report issuing date : 03-04-2021

Standard : FCC Part 15.207
Test Type : Voltage Mains Test
Test Site : DLS Genoa Screen Room
Temperature : 71 °F
Humidity : 22 %
Test Specs : Line 2
Operator : cbrandt
DLS Project # : 11373
Result : Pass

EUT

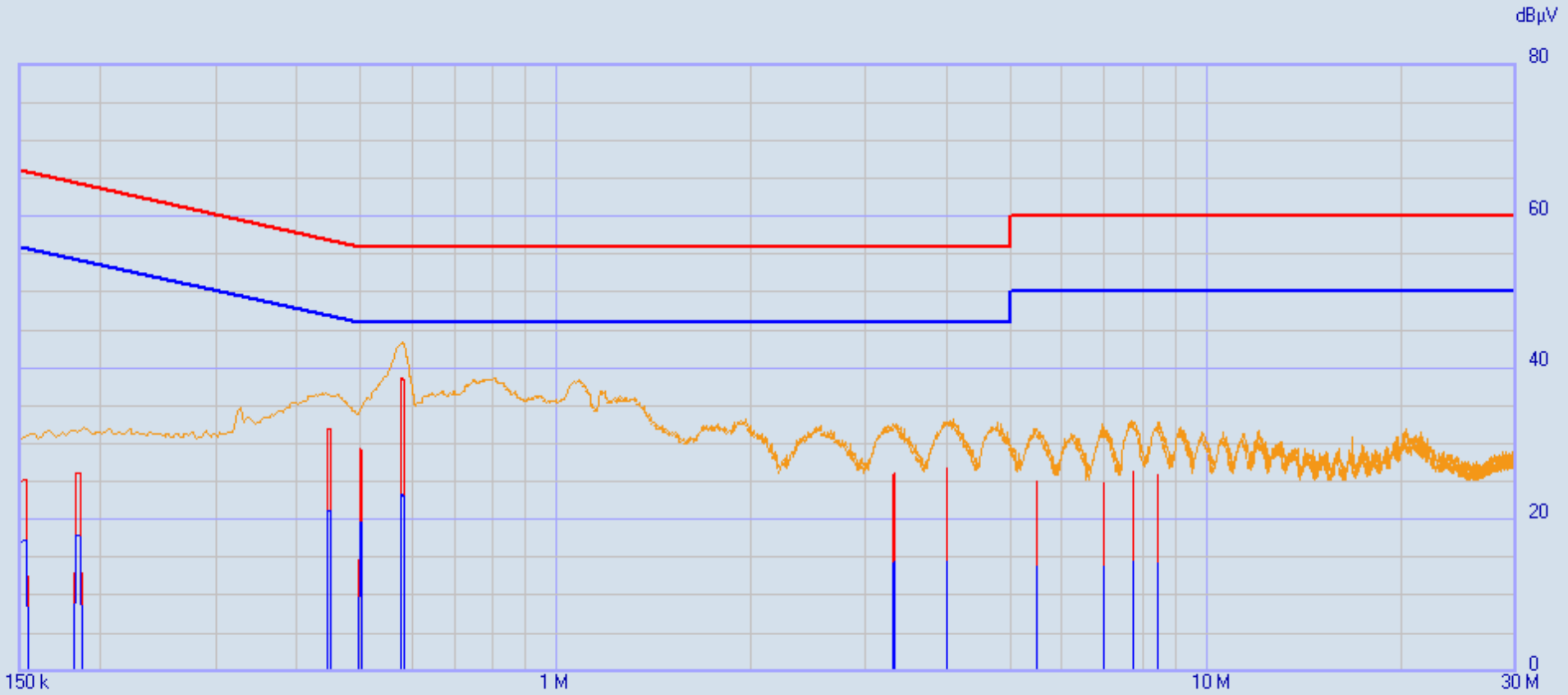
Manufacturer : Alcotek, Inc.
Model : Sensing Unit
Product : Part of Q201102-100 sensor system
Notes : 3 V DC; tested with off-the-shelf 120 V 60 Hz USB adapter
: Adapter: Roku model W15-007N1A; SN: none
Comments : Continuous Transmit with 55.9% duty cycle

Testing Company : DLS Electronic Systems
Tel./Fax : 262-279-0210
Web site : http://www.dlsemc.com

Receiver Details

Model : PMM 9010F
Brand : Narda
S/N : 020WW40102
Last Calibration : 04/29/2020

NOTE: The column in the table that is labeled "delta" shows the margin in dB with respect to the limit. A negative number indicates the level of the emission is under the limit by the given value, while a positive number indicates the emission level is above the limit by the given value.



11373 Alcotek Sensing Unit Line 2_001

	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (2.045 kHz)	P Q C	1500 ms	9 kHz	10	OFF	ON	...	...

Ancillary = General
Nr. of Worst = Infinite (7)

Limits:
FCC 15_207 QP
FCC 15_207 AV

Factors:
LISN DLS#665
LIM #507 w CBL-035
HPF #592
Cables 43 & 45

Peak
QPeak
C-Avg

11373 Alcotek Sensing Unit Line 2_001 04/03/2021 14:00:34
Rel. SW 2.22 (August 2015)
Rel. FW 1.93 01/10/19
Margin: 100 dB

	Frequency [MHz]	QPeak [dBµV]	Limit FCC 15_20.. [dBµV]	Delta [dB]	C-Avg [dBµV]	Limit FCC 15_20.. [dBµV]	Delta [dB]	Factor LISN DLS#.. [dB]	Factor LIM #507 .. [dB]	Factor HPF #592 [dB]	Factor Cables 43.. [dB]
1	0.15	25.06	66.00	-40.94	17.12	56.00	-38.88	0.10	9.68	2.16	0.09
2	0.152045	25.12	65.89	-40.77	17.14	55.89	-38.75	0.09	9.68	2.13	0.09
3	0.15409	25.23	65.78	-40.55	17.18	55.78	-38.60	0.09	9.68	2.10	0.10
4	0.18272	26.06	64.36	-38.30	17.88	54.36	-36.48	0.07	9.68	1.81	0.09
5	0.184765	26.14	64.27	-38.13	17.86	54.27	-36.41	0.07	9.68	1.80	0.08
6	0.18681	26.04	64.18	-38.14	17.71	54.18	-36.47	0.07	9.68	1.78	0.08
7	0.446525	31.91	56.94	-25.03	21.09	46.94	-25.85	0.04	9.78	0.94	0.14
8	0.44857	31.91	56.90	-24.99	21.08	46.90	-25.82	0.04	9.78	0.93	0.14
9	0.450615	31.86	56.86	-25.00	21.05	46.86	-25.81	0.04	9.78	0.93	0.14
10	0.499695	29.37	56.01	-26.64	19.65	46.01	-26.36	0.04	9.77	0.88	0.15
11	0.50174	29.27	56.00	-26.73	19.60	46.00	-26.40	0.04	9.77	0.88	0.15
12	0.503785	29.16	56.00	-26.84	19.52	46.00	-26.48	0.04	9.77	0.88	0.15
13	0.57945	38.55	56.00	-17.45	23.23	46.00	-22.77	0.03	9.76	0.77	0.16
14	0.581495	38.56	56.00	-17.44	23.21	46.00	-22.79	0.03	9.75	0.76	0.17
15	0.58354	38.36	56.00	-17.64	23.02	46.00	-22.98	0.03	9.75	0.76	0.17
16	3.30339	26.12	56.00	-29.88	14.41	46.00	-31.59	0.04	9.76	0.15	0.45
17	3.305435	26.13	56.00	-29.87	14.42	46.00	-31.58	0.04	9.76	0.15	0.45
18	3.30748	26.11	56.00	-29.89	14.41	46.00	-31.59	0.04	9.76	0.15	0.45
19	3.980285	26.65	56.00	-29.35	14.41	46.00	-31.59	0.04	9.81	0.22	0.46
20	3.98233	26.68	56.00	-29.32	14.46	46.00	-31.54	0.04	9.81	0.22	0.46
21	3.984375	26.67	56.00	-29.33	14.49	46.00	-31.51	0.04	9.81	0.22	0.46
22	5.47109	24.80	60.00	-35.20	13.59	50.00	-36.41	0.04	9.81	0.15	0.52
23	5.473135	24.91	60.00	-35.09	13.65	50.00	-36.35	0.04	9.81	0.15	0.52
24	5.47518	24.90	60.00	-35.10	13.70	50.00	-36.30	0.04	9.81	0.15	0.52
25	6.957805	24.82	60.00	-35.18	13.69	50.00	-36.31	0.03	9.80	0.15	0.57
26	6.95985	24.84	60.00	-35.16	13.69	50.00	-36.31	0.03	9.80	0.15	0.57
27	6.961895	24.81	60.00	-35.19	13.71	50.00	-36.29	0.03	9.80	0.15	0.57
28	7.69605	26.29	60.00	-33.71	14.32	50.00	-35.68	0.03	9.81	0.17	0.59
29	7.698095	26.31	60.00	-33.69	14.30	50.00	-35.70	0.03	9.81	0.17	0.59
30	7.70014	26.24	60.00	-33.76	14.20	50.00	-35.80	0.03	9.81	0.17	0.59
31	8.4118	25.93	60.00	-34.07	14.11	50.00	-35.89	0.03	9.80	0.13	0.60
32	8.413845	25.95	60.00	-34.05	14.07	50.00	-35.93	0.03	9.80	0.13	0.60
33	8.41589	25.92	60.00	-34.08	14.07	50.00	-35.93	0.03	9.80	0.13	0.60

Section B – Measurement Uncertainty

Compliance with the limits in this standard are based on the results of the compliance measurement. Our calculated measurement uncertainty including the measurement instrumentation, associated connections between the various instruments in the measurement chain, and other contributions, are provided in this section of the test report.

Radiated Emission 30 MHz to 25 GHz Uncertainty

Parameter		Expanded Uncertainty (K=2)
Occupied Channel Bandwidth		+/-1.14%
RF Output Power, Conducted		+/-0.89dB
Unwanted Emissions, Conducted		+/-2.62dB
All Emissions, Radiated		+/-4.95dB
DC and Low Frequency Voltages		+/-2.42%
Time		+/-0.01%
Duty Cycle		+/-0.05%

AC Line Conducted Emissions 150 kHz to 30 MHz Uncertainty

AC Line Conducted		Uncertainty (+/- dB)
Contribution	Probability Distribution	
		150 kHz - 30 MHz
Combined Standard Uncertainty	Normal	1.05
Expanded Uncertainty	**Normal (k=2)**	**2.10**

166 South Carter, Genoa City, WI 53128

Company: Alcotek, Inc.
Model Tested: F-000410-01 Sensing Unit
Report Number: 25983
Project Number: 11373

END OF REPORT

Revision #	Date	Comments	By
1.0	04-12-2021	Initial Release	CB
2.0	04-19-2021	Moved setup photos to a separate exhibit.	CB
2.1	06-25-2021	Corrected Output Power calculation on page 21. Original had a typo of -10.92 dBm instead of the correct value of -10.29 dBm. This changed the calculated Peak Output Power result.	CB