



Dyno Equipment, Inc.

Trek

FCC 15.247:2018

Bluetooth Radio

Report # CLRI0002.1



NVLAP[®]
TESTING

NVLAP LAB CODE: 200676-0



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CERTIFICATE OF TEST



Last Date of Test: April 16, 2018
Dyno Equipment, Inc.
Model: Trek

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2018	ANSI C63.10:2013, KDB 558074

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
11.6	Duty Cycle	Yes	Pass	
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.1.1	Output Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Victor Ratinoff, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY



Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS



United States

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

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

SCOPE

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

<http://portlandcustomer.element.com/ts/scope/scope.htm>

<http://gsi.nist.gov/global/docs/cabs/designations.html>

MEASUREMENT UNCERTAINTY



Measurement Uncertainty

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

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

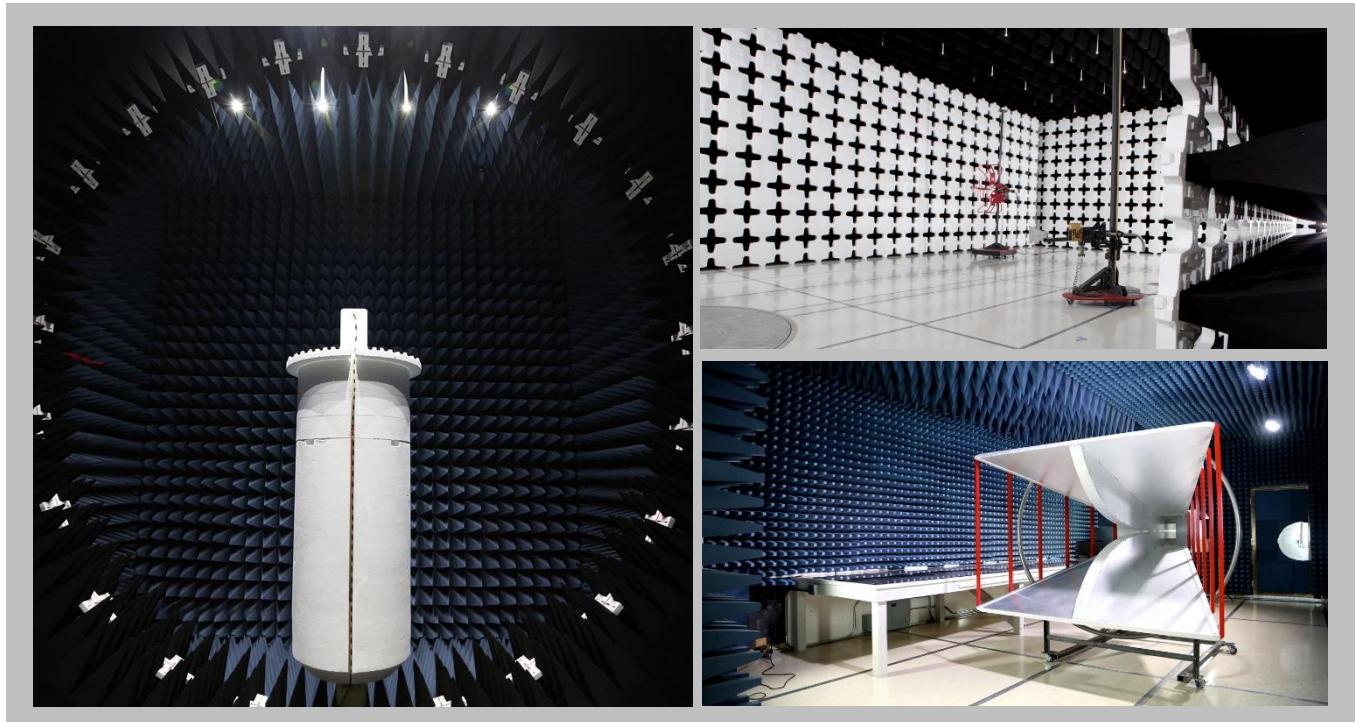
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

<u>Test</u>	<u>+ MU</u>	<u>- MU</u>
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

FACILITIES

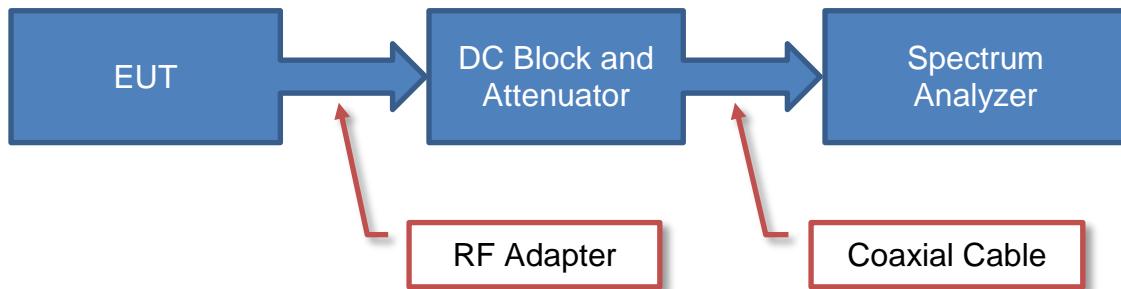


California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011 (425) 984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code: 201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157

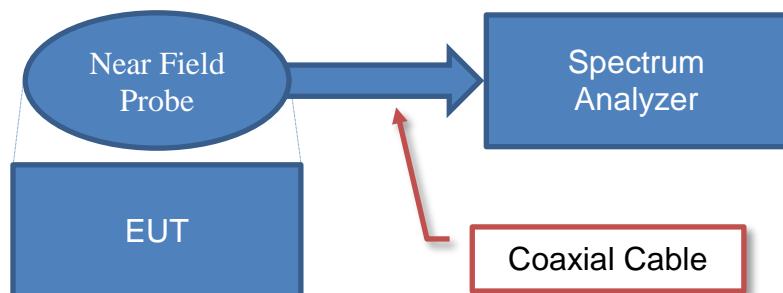


Test Setup Block Diagrams

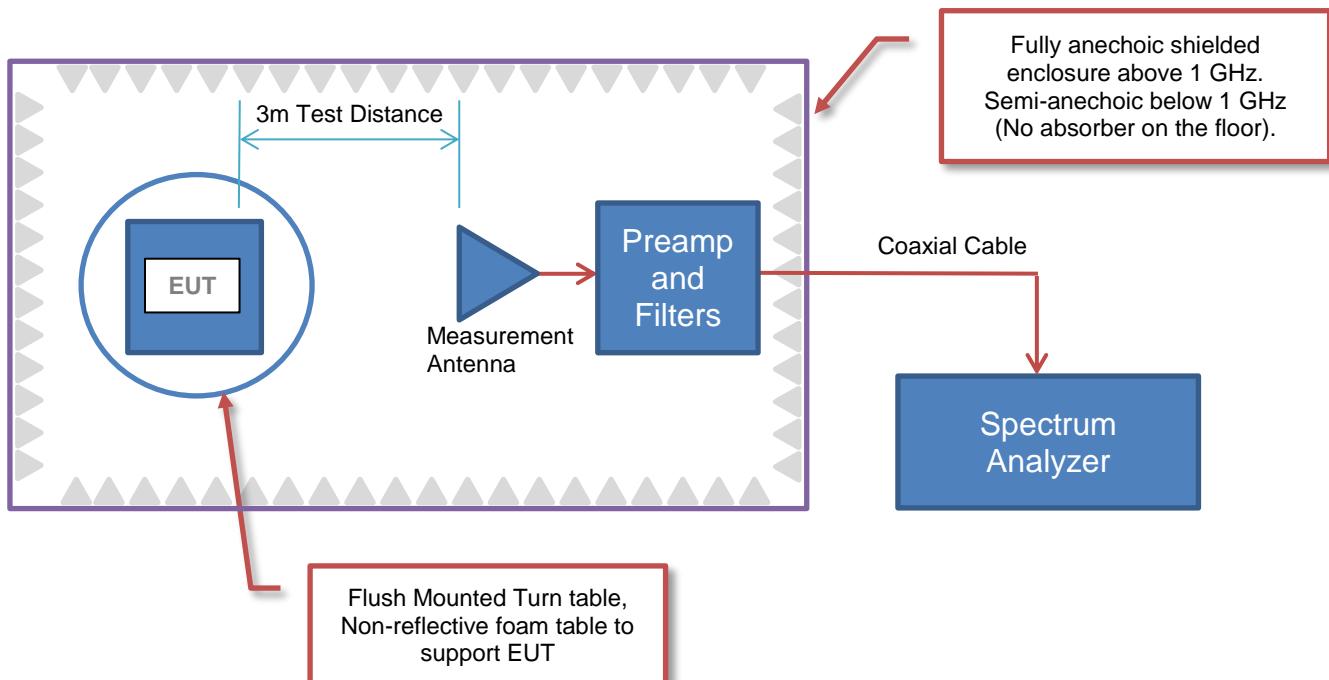
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION



Client and Equipment Under Test (EUT) Information

Company Name:	Dyno Equipment, Inc.
Address:	19 Honors Dr.
City, State, Zip:	Newport Beach, CA 92660
Test Requested By:	Chris Brown of Clarity Design, Inc.
Model:	Trek
First Date of Test:	April 16, 2018
Last Date of Test:	April 16, 2018
Receipt Date of Samples:	April 16, 2018
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

Modular Camera Slider System for Smartphones and Small Cameras. This device is a camera accessory used for taking moving videos/ time lapses. A movement profile is configured on the app and sent via BLE to the Trek device. This device then drives along a preconfigured track communicating progress via BLE to the phone.

Testing Objective:

To demonstrate compliance of the Bluetooth radio to FCC 15.247 requirements.

CONFIGURATIONS



Configuration CLRI0002- 1

EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
Trek	Dyno Equipment, Inc.	Trek	544-X3-0006	

Configuration CLRI0002- 2

EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
Trek	Dyno Equipment, Inc.	Trek	544-X3-0026	

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	4/16/2018	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	4/16/2018	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	4/16/2018	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	4/16/2018	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	4/16/2018	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	4/16/2018	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	4/16/2018	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

DUTY CYCLE



XMIT 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5181A	TGZ	24-Aug-15	24-Aug-18
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	28-Dec-17	28-Dec-18
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum.

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

If the transmit duty cycle < 98 percent, burst gating may have been used during some of the other tests in this report to only take the measurement during the burst duration.

DUTY CYCLE



TbTx 2017.12.14

XMi 2017.12.13

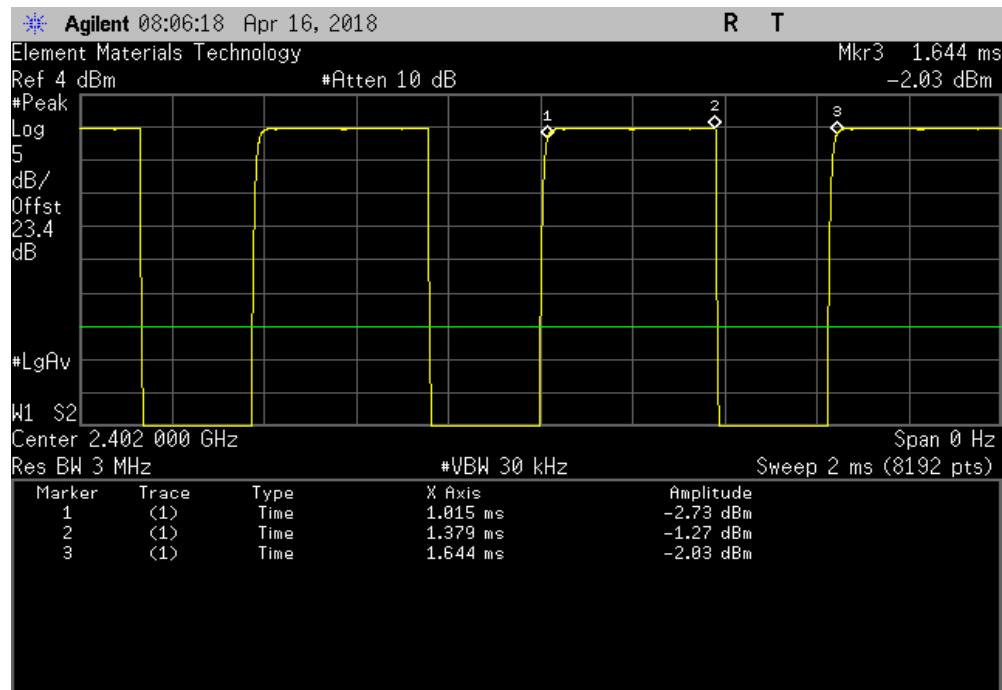
EUT:	Trek		Work Order:	CLRI0002	
Serial Number:	544-X3-0006		Date:	16-Apr-18	
Customer:	Dyno Equipment, Inc.		Temperature:	20.5 °C	
Attendees:	Dave West, Chris Brown		Humidity:	39.2% RH	
Project:	None		Barometric Pres.:	1019 mbar	
Tested by:	Salvador Solorzano	Power:	Battery	Job Site:	OC13
TEST SPECIFICATIONS		Test Method			
FCC 15.247:2018		ANSI C63.10:2013			
COMMENTS					
DC block+20dB attenuator+coax cable+client provided patch cable=23.4dB offset					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration #	1	Signature			
			Pulse Width	Period	Number of Pulses
BLE/GFSK Low Channel, 2402 MHz			363.846 us	628.452 us	1
BLE/GFSK Low Channel, 2402 MHz			N/A	N/A	5
BLE/GFSK Mid Channel, 2440 MHz			362.337 us	625.61 us	1
BLE/GFSK Mid Channel, 2440 MHz			N/A	N/A	5
BLE/GFSK High Channel, 2480 MHz			364.002 us	627.974 us	1
BLE/GFSK High Channel, 2480 MHz			N/A	N/A	5
					Value (%)
					Limit (%)
					Results

DUTY CYCLE

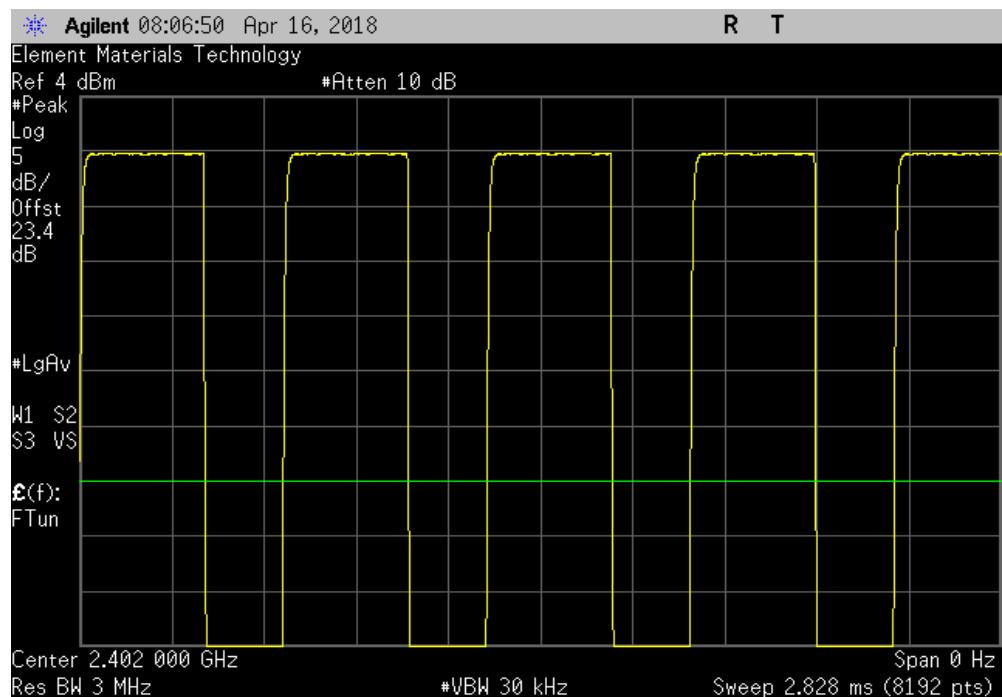


TbTx 2017.12.14 XMII 2017.12.13

BLE/GFSK Low Channel, 2402 MHz					
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
363.846 us	628.452 us	1	57.9	N/A	N/A



BLE/GFSK Low Channel, 2402 MHz					
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
N/A	N/A	5	N/A	N/A	N/A

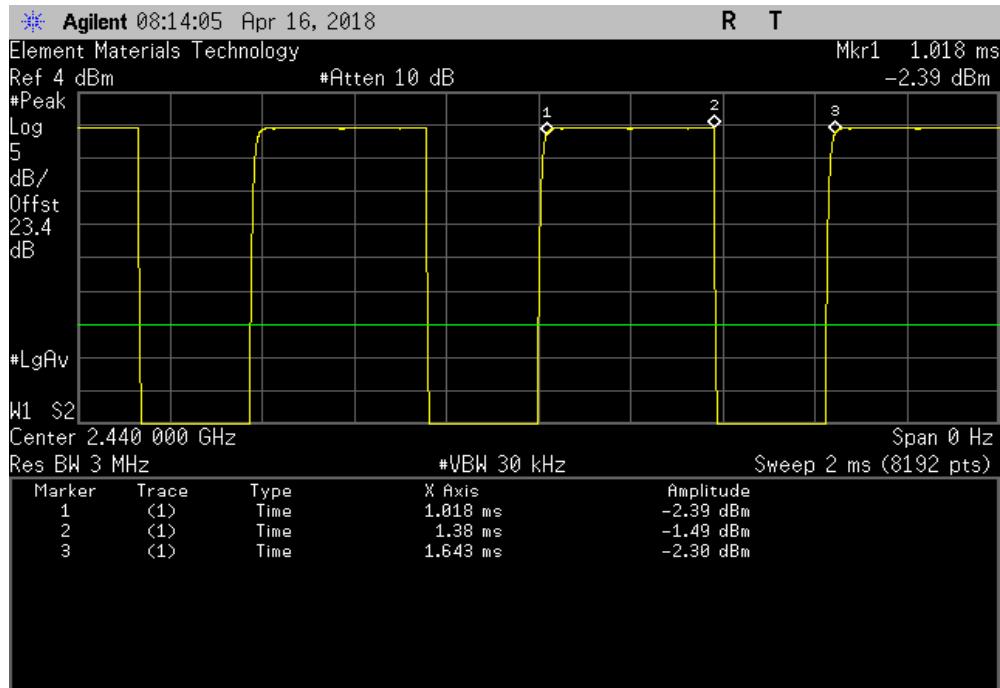


DUTY CYCLE

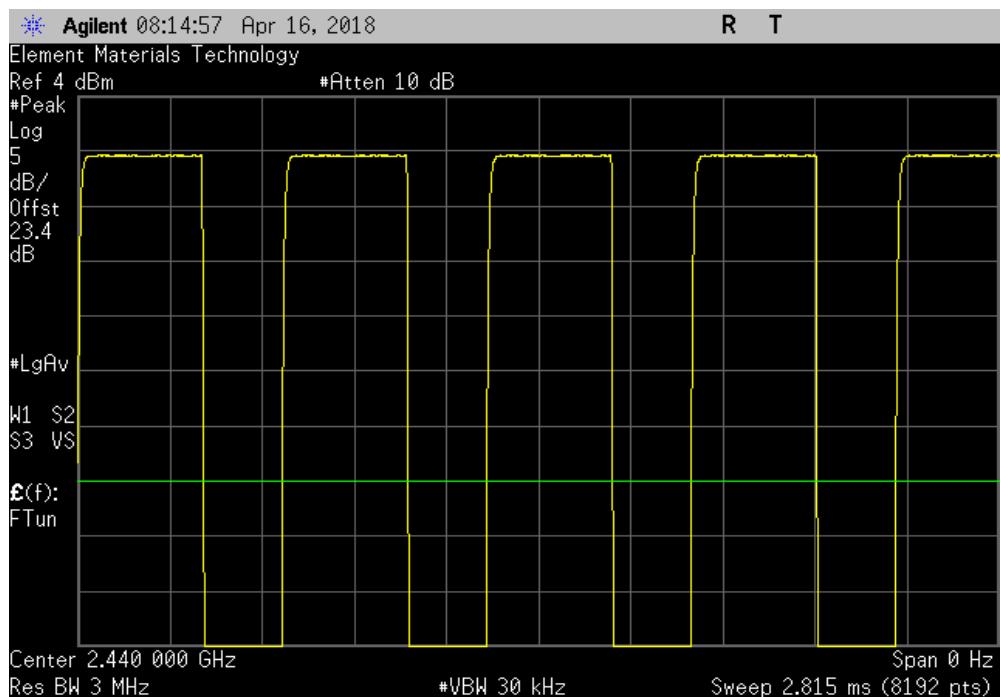


TbTx 2017.12.14 XMII 2017.12.13

BLE/GFSK Mid Channel, 2440 MHz					
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
362.337 us	625.61 us	1	57.9	N/A	N/A



BLE/GFSK Mid Channel, 2440 MHz					
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
N/A	N/A	5	N/A	N/A	N/A

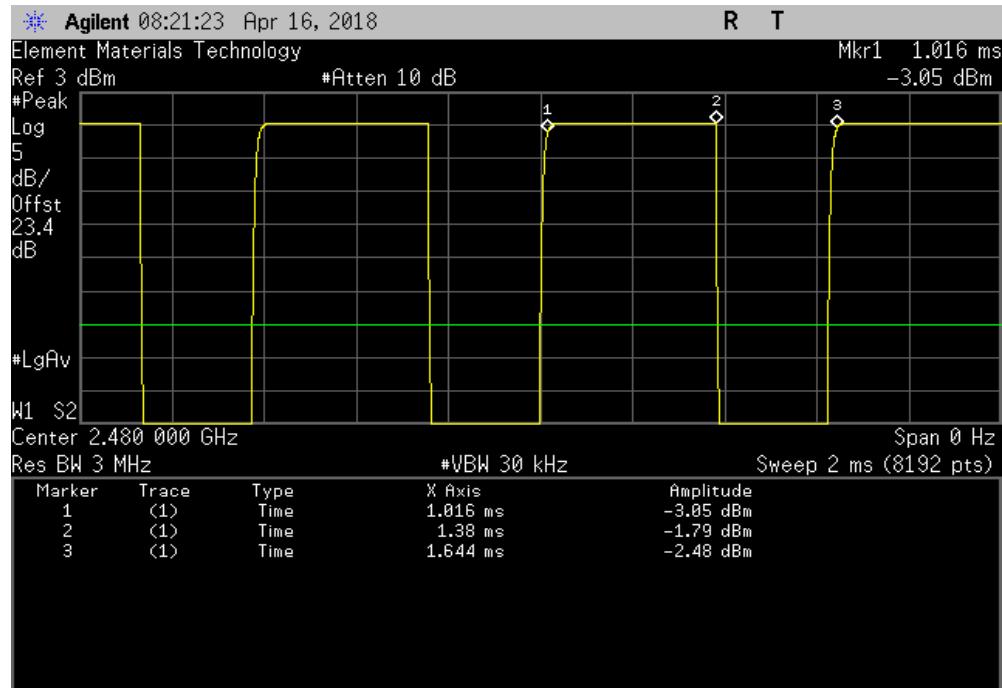


DUTY CYCLE

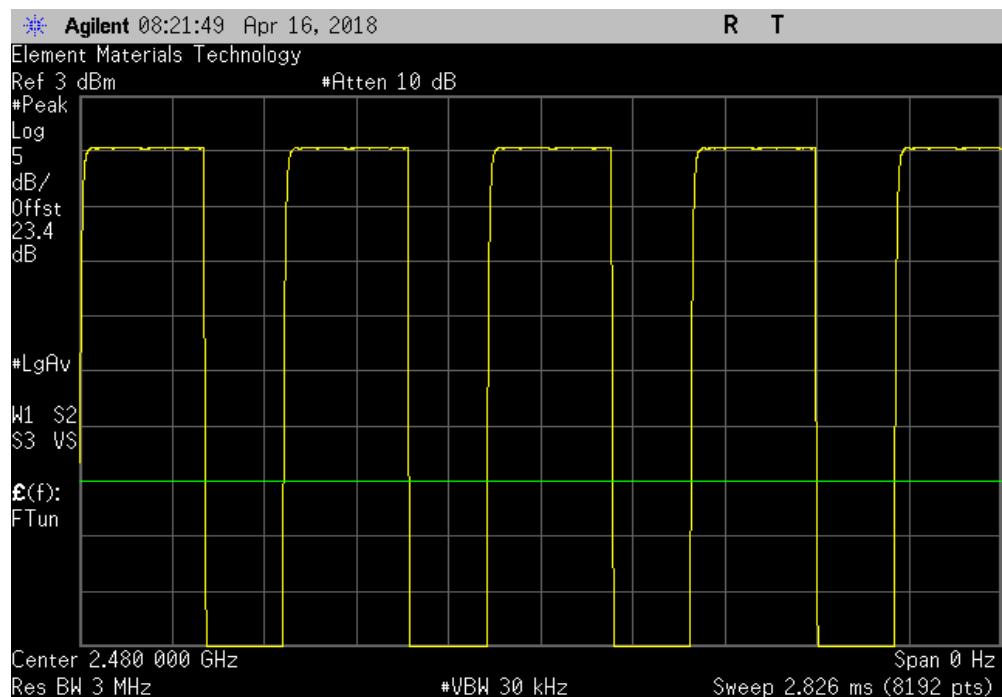


TbTx 2017.12.14 XMII 2017.12.13

BLE/GFSK High Channel, 2480 MHz					
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
364.002 us	627.974 us	1	58	N/A	N/A



BLE/GFSK High Channel, 2480 MHz					
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
N/A	N/A	5	N/A	N/A	N/A



OCCUPIED BANDWIDTH



XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5181A	TGZ	24-Aug-15	24-Aug-18
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	28-Dec-17	28-Dec-18
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The EUT was set to the channels and modes listed in the datasheet.

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.0% occupied bandwidth was also measured at the same time which can be needed during Output Power depending on the applicable method.

OCCUPIED BANDWIDTH



TbTx 2017.12.14

XMI 2017.12.13

EUT:	Trek	Work Order:	CLRI0002
Serial Number:	544-X3-0006	Date:	16-Apr-18
Customer:	Dyno Equipment, Inc.	Temperature:	20.5 °C
Attendees:	Dave West, Chris Brown	Humidity:	39.2% RH
Project:	None	Barometric Pres.:	1019 mbar
Tested by:	Salvador Solorzano	Power:	Battery
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2018		ANSI C63.10:2013	
COMMENTS			
DC block+20dB attenuator+coax cable+client provided patch cable=23.4dB offset			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature	
		Value	Limit (±)
		713.666 kHz	500 kHz
		711.451 kHz	500 kHz
		714.206 kHz	500 kHz

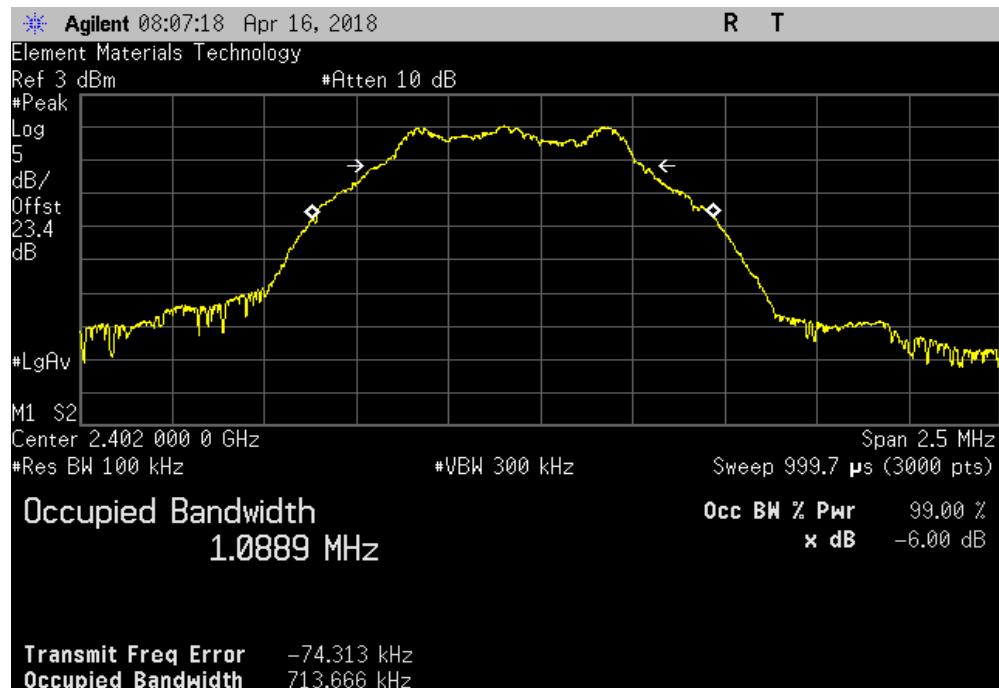
BLE/GFSK Low Channel, 2402 MHz
 BLE/GFSK Mid Channel, 2440 MHz
 BLE/GFSK High Channel, 2480 MHz

OCCUPIED BANDWIDTH

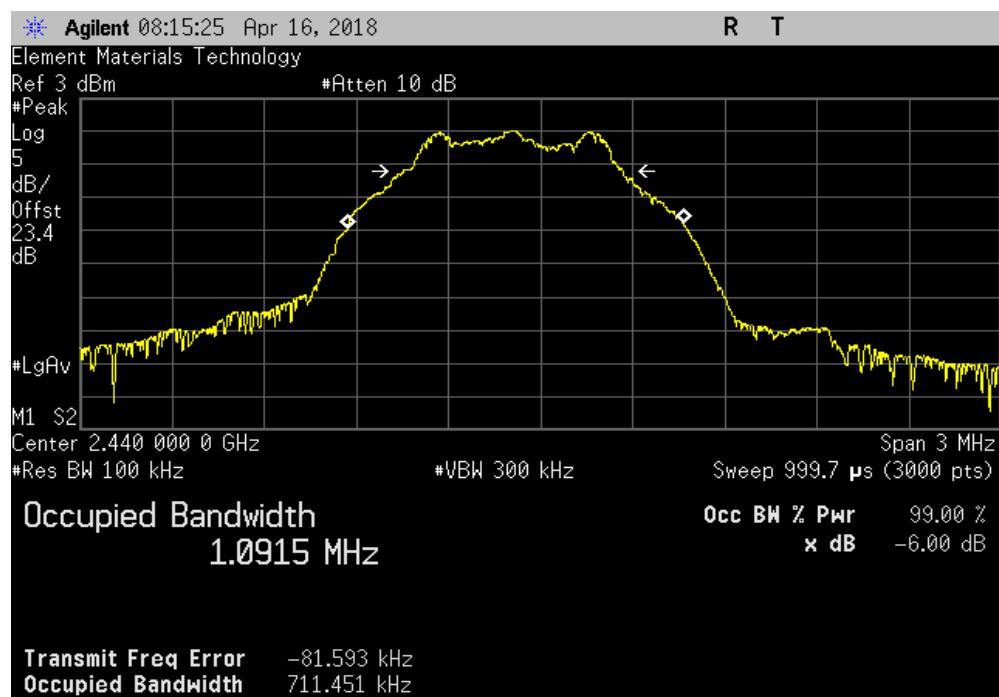


TbTx 2017.12.14 XMI 2017.12.13

BLE/GFSK Low Channel, 2402 MHz			Value	Limit (≥)	Result
			713.666 kHz	500 kHz	Pass



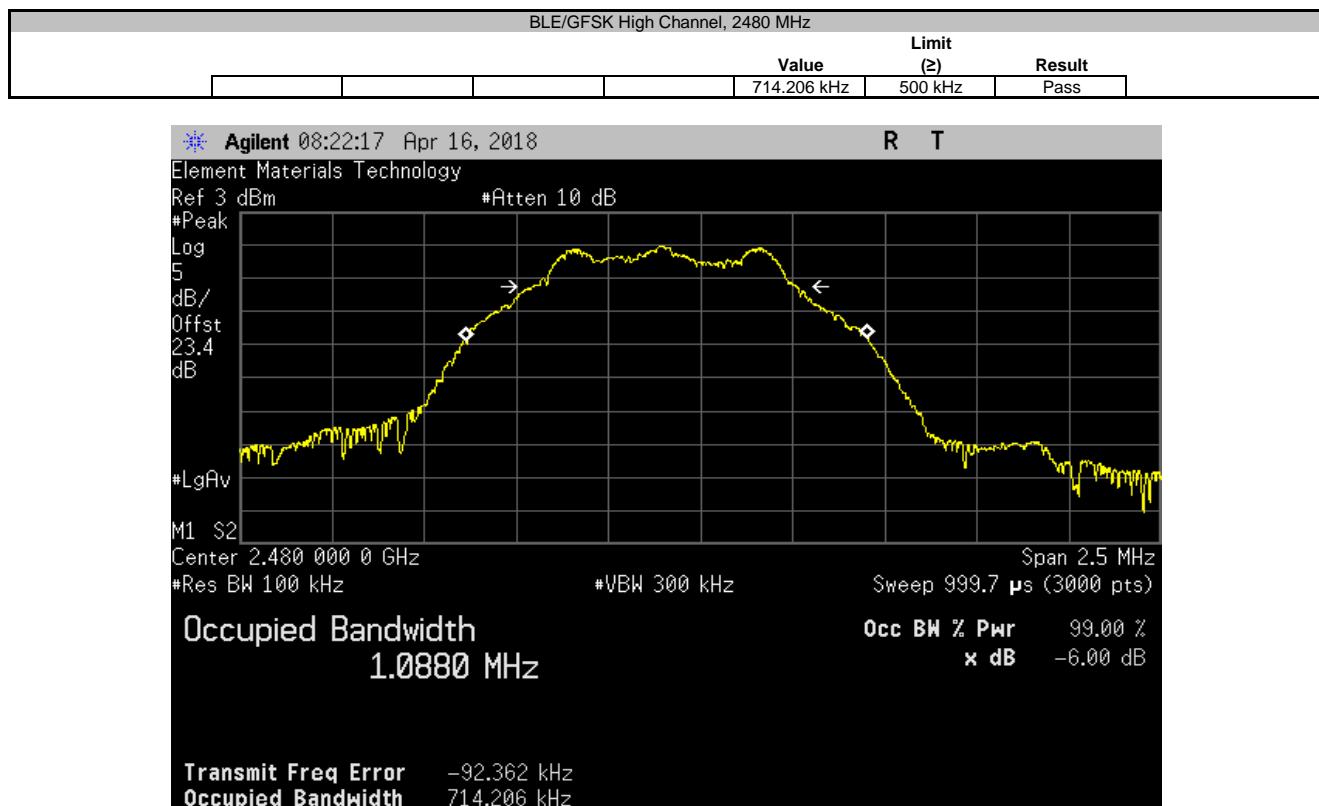
BLE/GFSK Mid Channel, 2440 MHz			Value	Limit (≥)	Result
			711.451 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH



TbTx 2017.12.14 XMII 2017.12.13



OUTPUT POWER



XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5181A	TGZ	24-Aug-15	24-Aug-18
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	28-Dec-17	28-Dec-18
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

Prior to measuring peak transmit power the DTS bandwidth (B) was measured.

The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

De Facto EIRP Limit: The EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER



TbTx 2017.12.14

XMI 2017.12.13

EUT:	Trek	Work Order:	CLRI0002
Serial Number:	544-X3-0006	Date:	16-Apr-18
Customer:	Dyno Equipment, Inc.	Temperature:	20.5 °C
Attendees:	Dave West, Chris Brown	Humidity:	39.2% RH
Project:	None	Barometric Pres.:	1019 mbar
Tested by:	Salvador Solorzano	Power:	Battery
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2018		ANSI C63.10:2013	
COMMENTS			
DC block+20dB attenuator+coax cable+client provided patch cable=23.4dB offset			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature	
		Value	Limit (-)
		770.726 uW	1 W
		744.218 uW	1 W
		694.384 uW	1 W

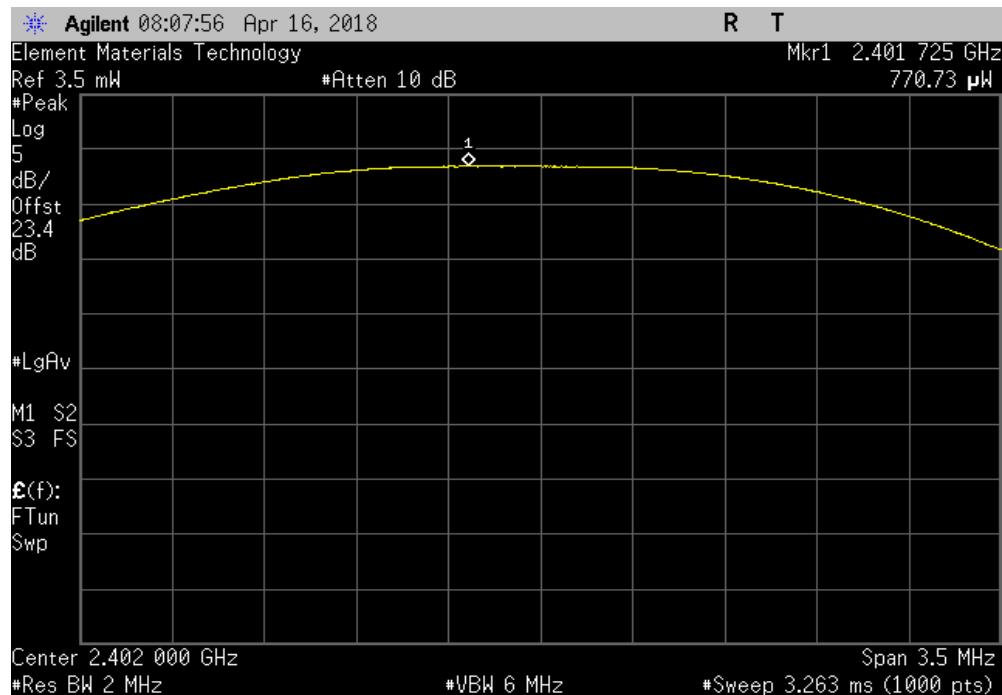
BLE/GFSK Low Channel, 2402 MHz
BLE/GFSK Mid Channel, 2440 MHz
BLE/GFSK High Channel, 2480 MHz

OUTPUT POWER

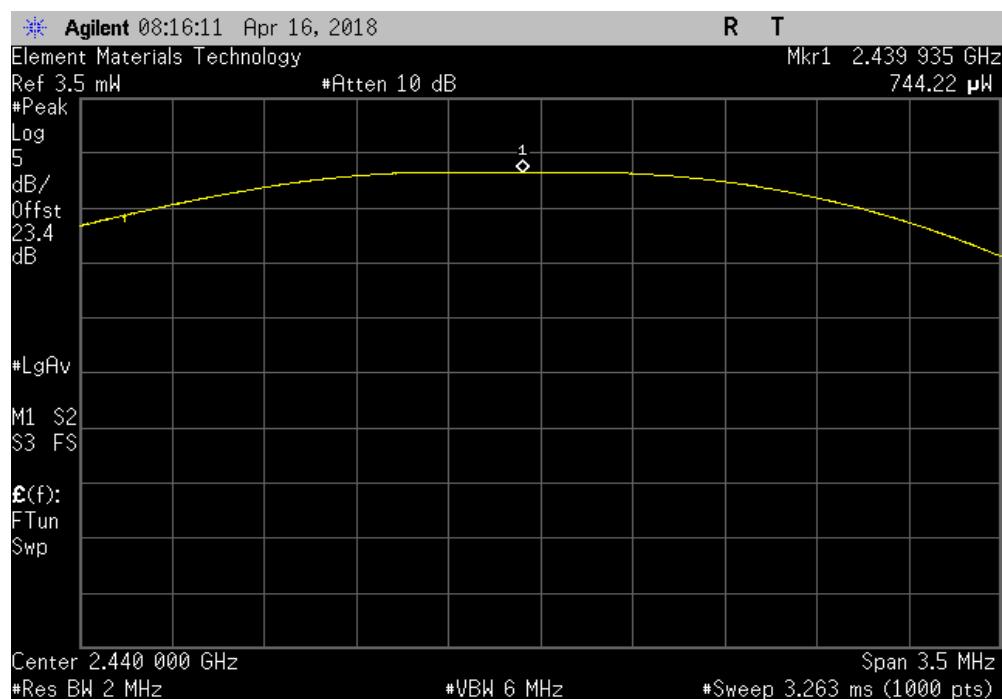


TbTx 2017.12.14 XMII 2017.12.13

BLE/GFSK Low Channel, 2402 MHz			Value	Limit (≤)	Result
			770.726 uW	1 W	Pass



BLE/GFSK Mid Channel, 2440 MHz			Value	Limit (≤)	Result
			744.218 uW	1 W	Pass

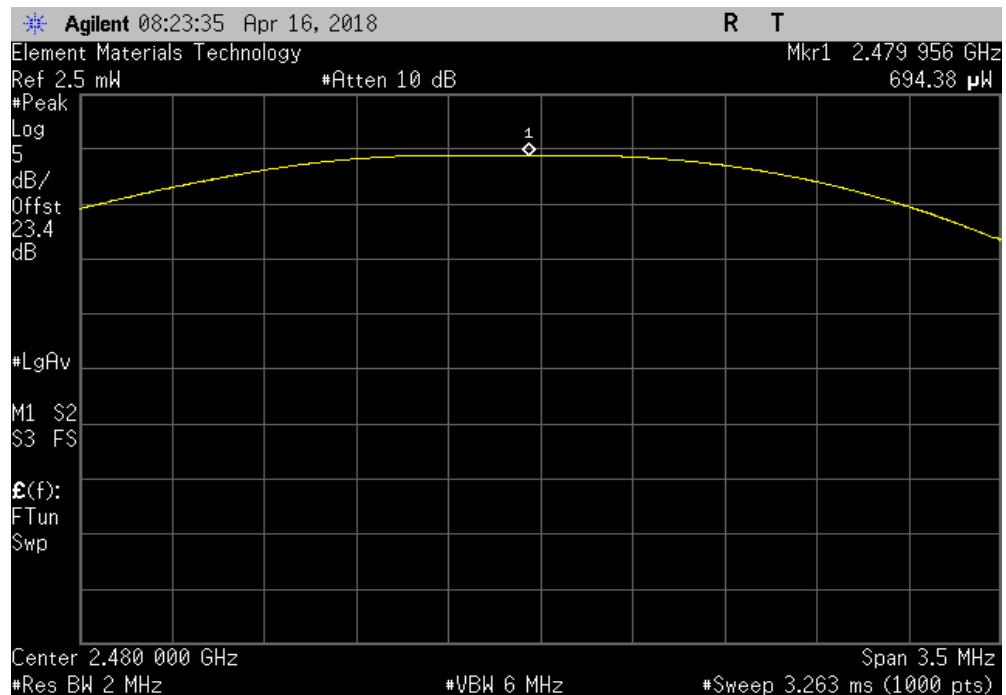


OUTPUT POWER



TbTx 2017.12.14 XMII 2017.12.13

BLE/GFSK High Channel, 2480 MHz			Value	Limit (<)	Result
			694.384 uW	1 W	Pass



POWER SPECTRAL DENSITY



XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5181A	TGZ	24-Aug-15	24-Aug-18
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	28-Dec-17	28-Dec-18
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The power spectral density was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method AVGPSD-1 in section 11.10.3 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging and RMS detection across the full power of the burst. This method is allowed as the same method has been used to determine the conducted output power.

POWER SPECTRAL DENSITY



TbTx 2017.12.14

XMI 2017.12.13

EUT:	Trek	Work Order:	CLRI0002	
Serial Number:	544-X3-0006	Date:	16-Apr-18	
Customer:	Dyno Equipment, Inc.	Temperature:	20.5 °C	
Attendees:	Dave West, Chris Brown	Humidity:	39.2% RH	
Project:	None	Barometric Pres.:	1019 mbar	
Tested by:	Salvador Solorzano	Power:	Battery	
TEST SPECIFICATIONS		Test Method		
FCC 15.247:2018		ANSI C63.10:2013		
COMMENTS				
DC block+20dB attenuator+coax cable+client provided patch cable=23.4dB offset				
DEVIATIONS FROM TEST STANDARD				
None				
Configuration #	1	Signature		
		Value dBm/3kHz	Limit < dBm/3kHz	Results
		-15.544	8	Pass
		-15.975	8	Pass
		-16.196	8	Pass

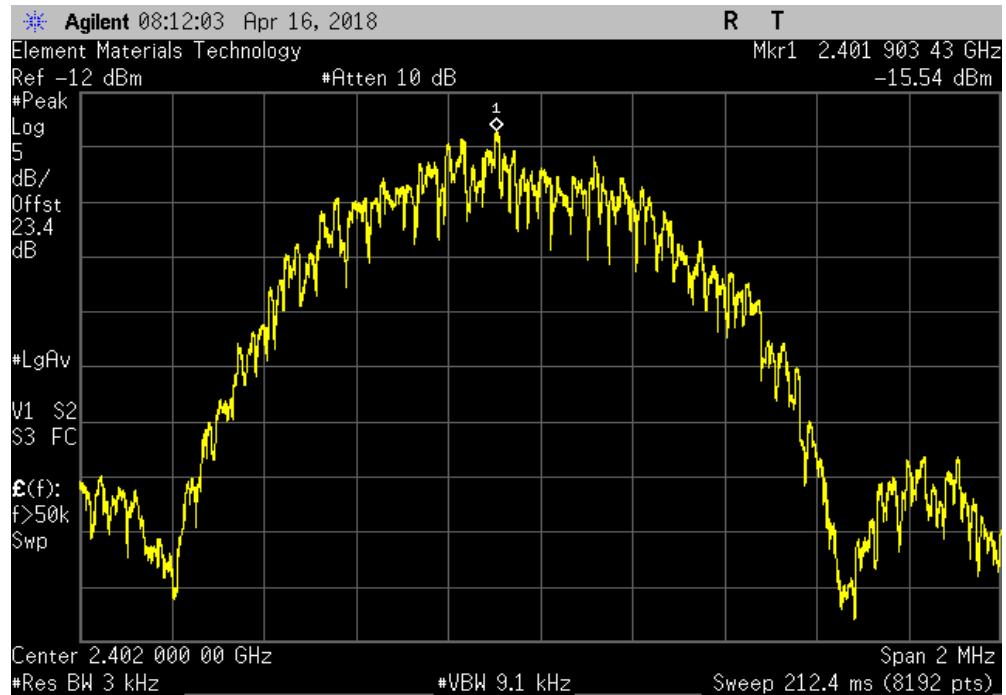
BLE/GFSK Low Channel, 2402 MHz
BLE/GFSK Mid Channel, 2440 MHz
BLE/GFSK High Channel, 2480 MHz

POWER SPECTRAL DENSITY

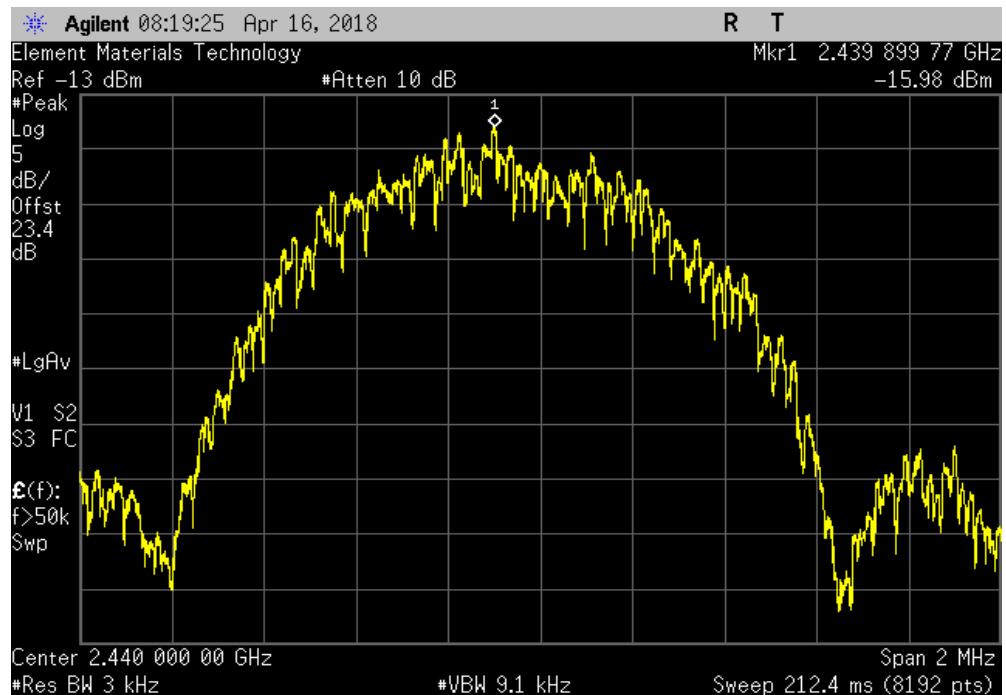


TbTx 2017.12.14 XMII 2017.12.13

BLE/GFSK Low Channel, 2402 MHz		
Value	Limit	Results
dBm/3kHz	< dBm/3kHz	
-15.544	8	Pass



BLE/GFSK Mid Channel, 2440 MHz		
Value	Limit	Results
dBm/3kHz	< dBm/3kHz	
-15.975	8	Pass

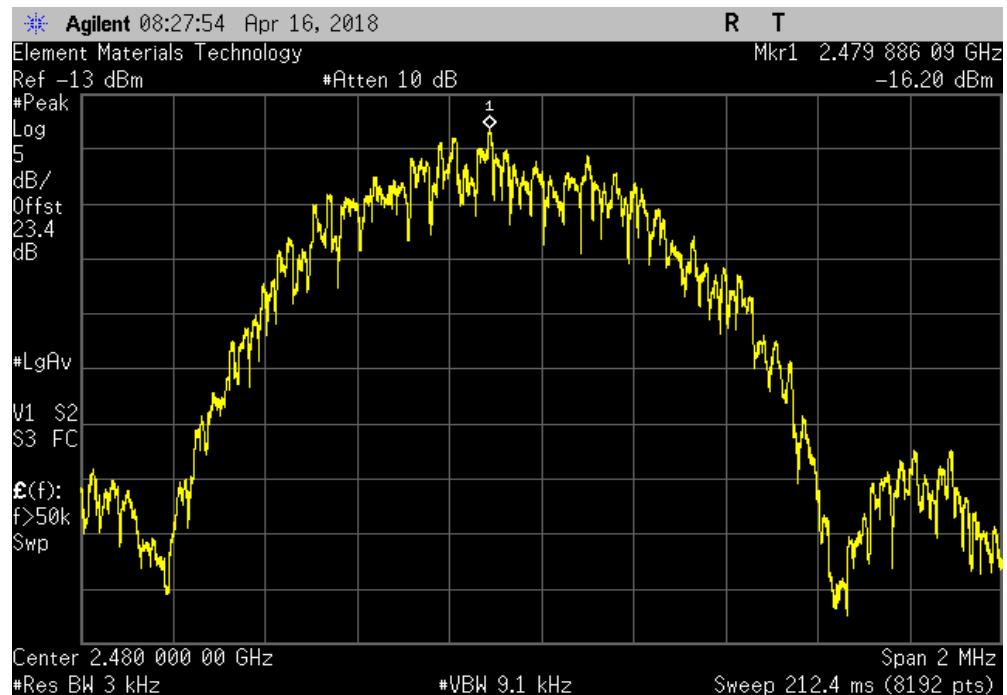


POWER SPECTRAL DENSITY



TbTx 2017.12.14 XMII 2017.12.13

BLE/GFSK High Channel, 2480 MHz			
	Value dBm/3kHz	Limit < dBm/3kHz	Results
	-16.196	8	Pass



BAND EDGE COMPLIANCE



XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5181A	TGZ	24-Aug-15	24-Aug-18
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	28-Dec-17	28-Dec-18
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE



TbTx 2017.12.14

XMi 2017.12.13

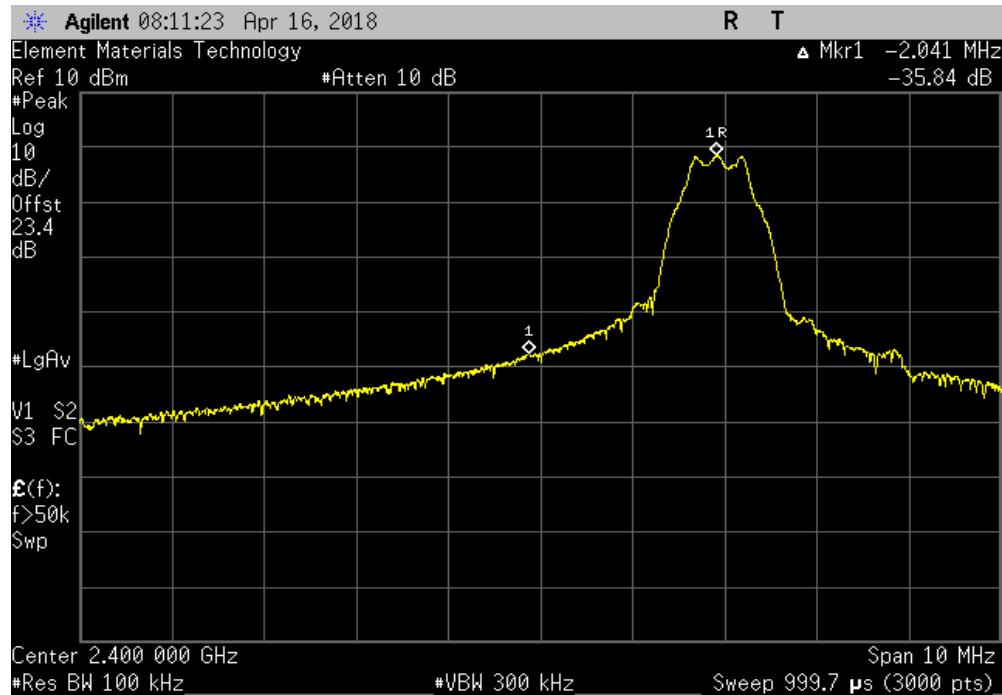
EUT:	Trek		Work Order:	CLRI0002	
Serial Number:	544-X3-0006		Date:	16-Apr-18	
Customer:	Dyno Equipment, Inc.		Temperature:	20.3 °C	
Attendees:	Dave West, Chris Brown		Humidity:	39.2% RH	
Project:	None		Barometric Pres.:	1019 mbar	
Tested by:	Salvador Solorzano	Power:	Battery	Job Site:	OC13
TEST SPECIFICATIONS		Test Method			
FCC 15.247:2018		ANSI C63.10:2013			
COMMENTS					
DC block+20dB attenuator+coax cable+client provided patch cable=23.4dB offset					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration #	1	Signature			
			Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz			-35.84	-20	Pass
BLE/GFSK High Channel, 2480 MHz			-42.51	-20	Pass

BAND EDGE COMPLIANCE

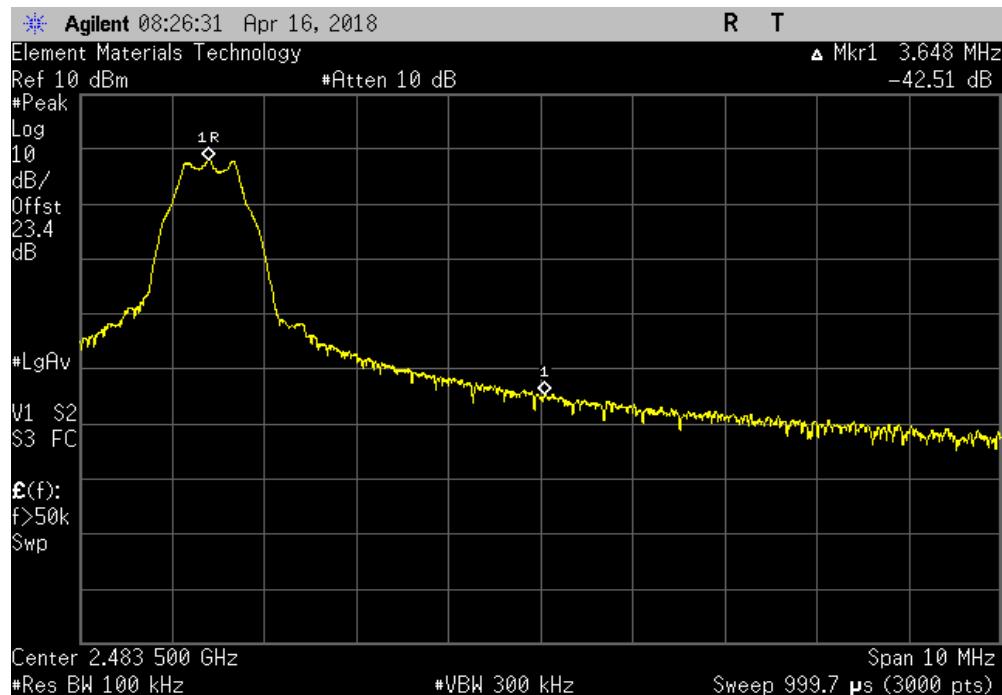


TbTx 2017.12.14 XMII 2017.12.13

BLE/GFSK Low Channel, 2402 MHz			
	Value (dBc)	Limit ≤ (dBc)	Result
	-35.84	-20	Pass



BLE/GFSK High Channel, 2480 MHz			
	Value (dBc)	Limit ≤ (dBc)	Result
	-42.51	-20	Pass



SPURIOUS CONDUCTED EMISSIONS



XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5181A	TGZ	24-Aug-15	24-Aug-18
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	28-Dec-17	28-Dec-18
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

SPURIOUS CONDUCTED EMISSIONS



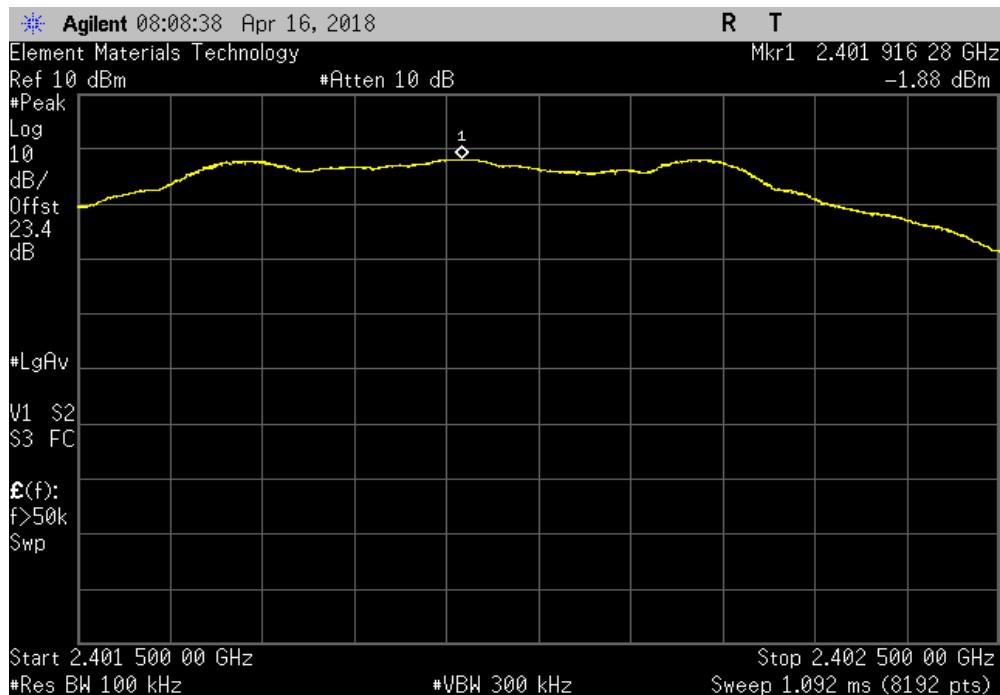
EUT: Trek		Work Order: CLRI0002		
Serial Number: 544-X3-0006		Date: 16-Apr-18		
Customer: Dyno Equipment, Inc.		Temperature: 20.5 °C		
Attendees: Dave West, Chris Brown		Humidity: 39.2% RH		
Project: None		Barometric Pres.: 1019 mbar		
Tested by: Salvador Solorzano	Power: Battery	Job Site: OC13		
TEST SPECIFICATIONS		Test Method		
FCC 15.247:2018		ANSI C63.10:2013		
COMMENTS				
DC block+20dB attenuator+coax cable+client provided patch cable=23.4dB offset				
DEVIATIONS FROM TEST STANDARD				
None				
Configuration #	1	Signature		
		Frequency Range	Max Value (dBc)	
		Limit ≤ (dBc)	Result	
BLE/GFSK Low Channel, 2402 MHz		N/A	N/A	
BLE/GFSK Low Channel, 2402 MHz		-38.62	-20	Pass
BLE/GFSK Low Channel, 2402 MHz		-49.78	-20	Pass
BLE/GFSK Mid Channel, 2440 MHz		N/A	N/A	N/A
BLE/GFSK Mid Channel, 2440 MHz		-39.53	-20	Pass
BLE/GFSK Mid Channel, 2440 MHz		-49.1	-20	Pass
BLE/GFSK High Channel, 2480 MHz		N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz		-39.71	-20	Pass
BLE/GFSK High Channel, 2480 MHz		-49.41	-20	Pass

SPURIOUS CONDUCTED EMISSIONS

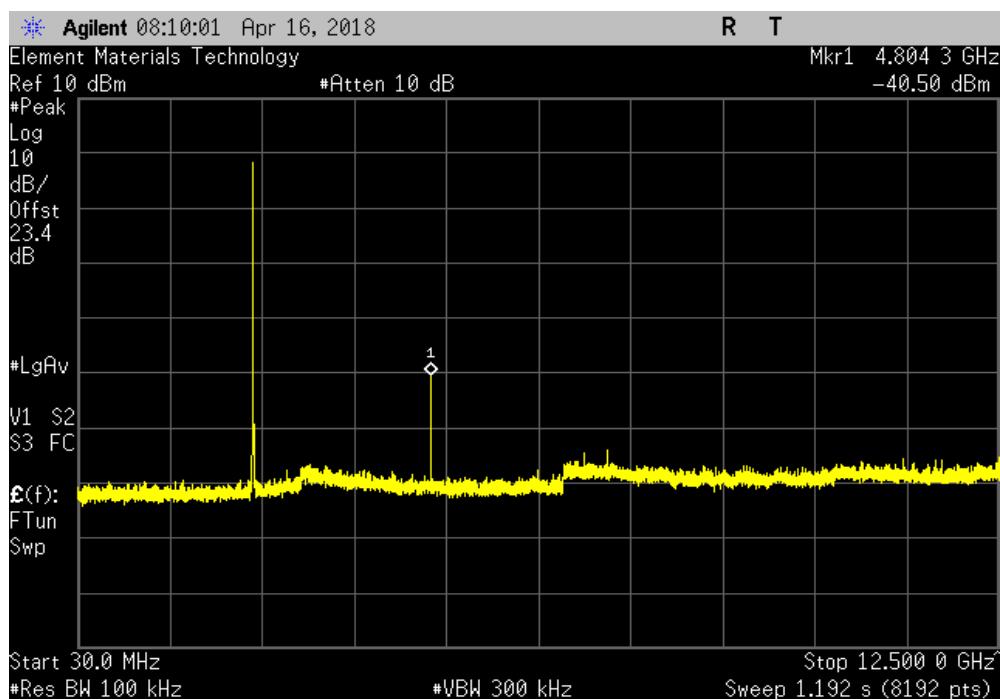


TbTx 2017.12.14 XMII 2017.12.13

Frequency Range		Max Value (dBc)	Limit \leq (dBc)	Result
Fundamental		N/A	N/A	N/A



Frequency Range		Max Value (dBc)	Limit \leq (dBc)	Result
30 MHz - 12.5 GHz		-38.62	-20	Pass

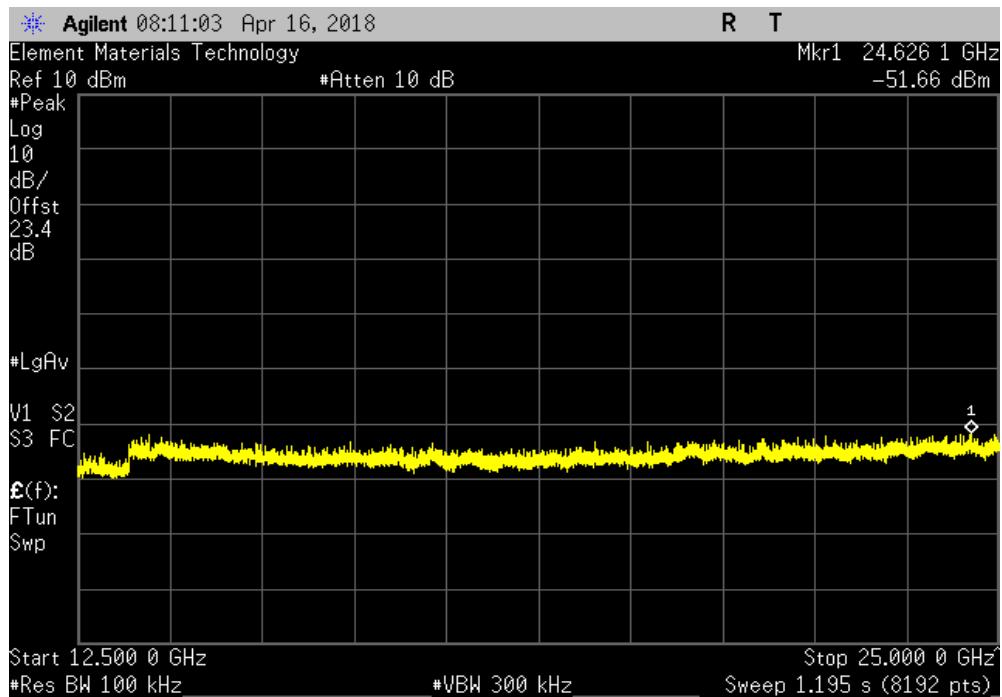


SPURIOUS CONDUCTED EMISSIONS

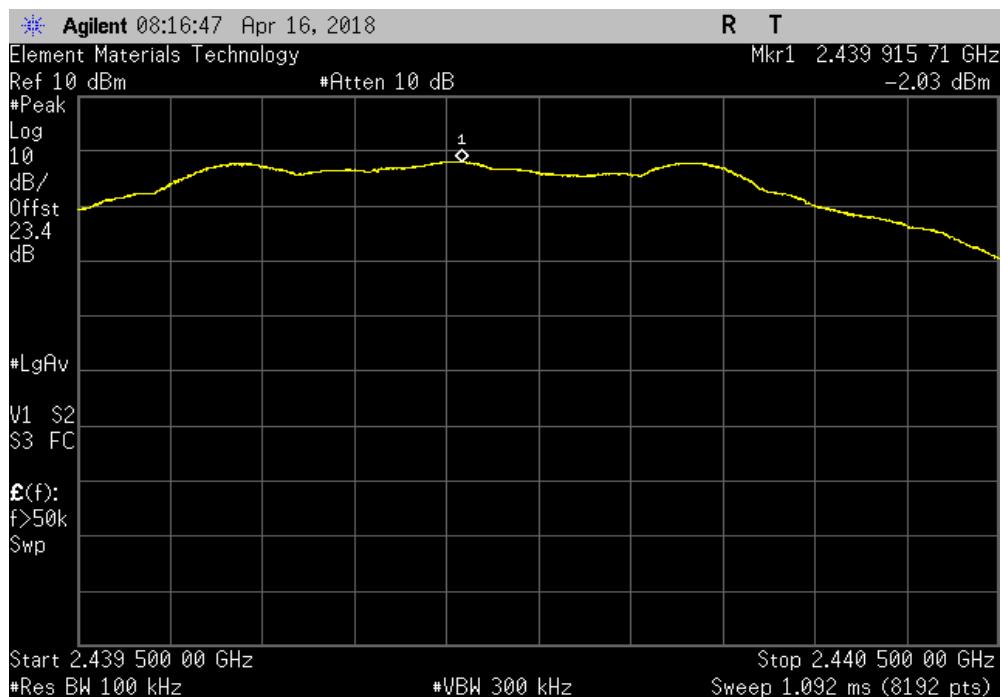


TbTx 2017.12.14 XMII 2017.12.13

Frequency Range		Max Value (dBc)	Limit \leq (dBc)	Result
12.5 GHz - 25 GHz		-49.78	-20	Pass



Frequency Range		Max Value (dBc)	Limit \leq (dBc)	Result
Fundamental		N/A	N/A	N/A

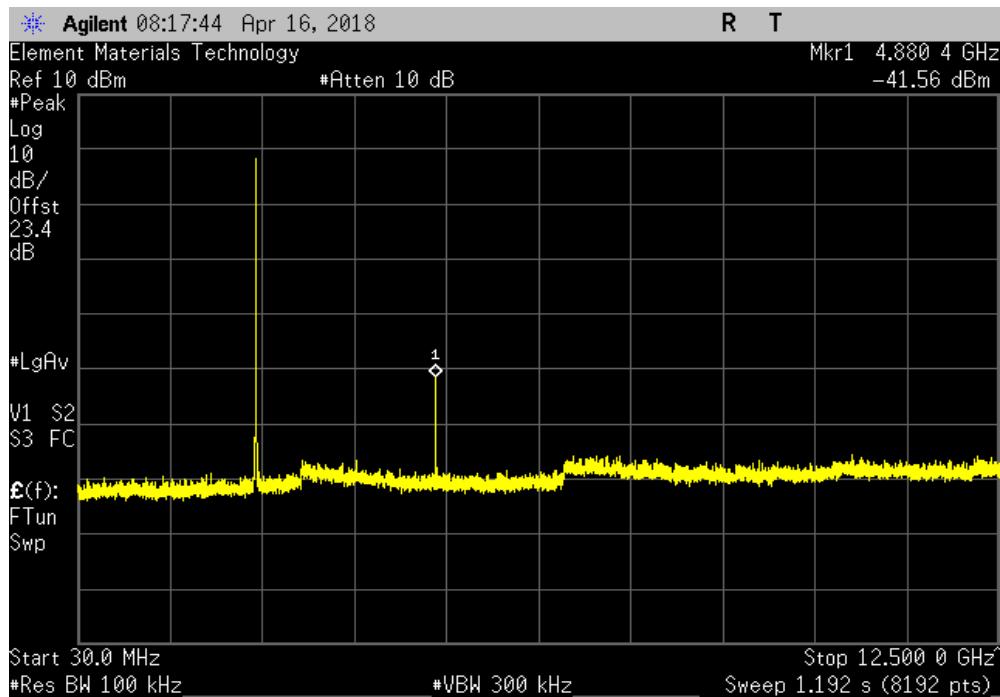


SPURIOUS CONDUCTED EMISSIONS

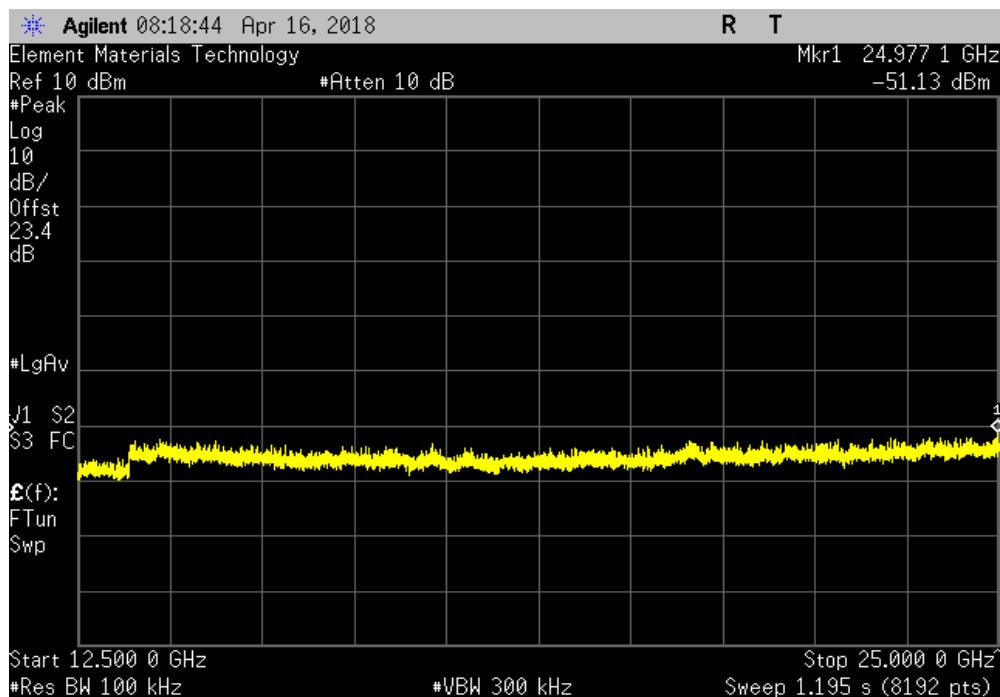


TbTx 2017.12.14 XMII 2017.12.13

BLE/GFSK Mid Channel, 2440 MHz			
Frequency Range	Max Value (dBc)	Limit \leq (dBc)	Result
30 MHz - 12.5 GHz	-39.53	-20	Pass



BLE/GFSK Mid Channel, 2440 MHz			
Frequency Range	Max Value (dBc)	Limit \leq (dBc)	Result
12.5 GHz - 25 GHz	-49.1	-20	Pass

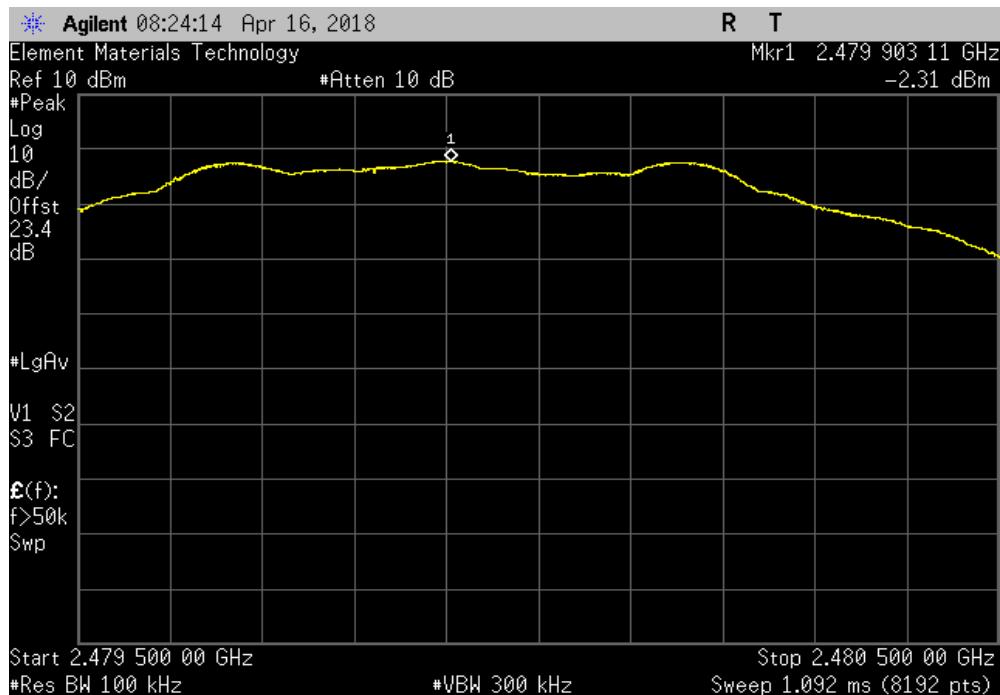


SPURIOUS CONDUCTED EMISSIONS

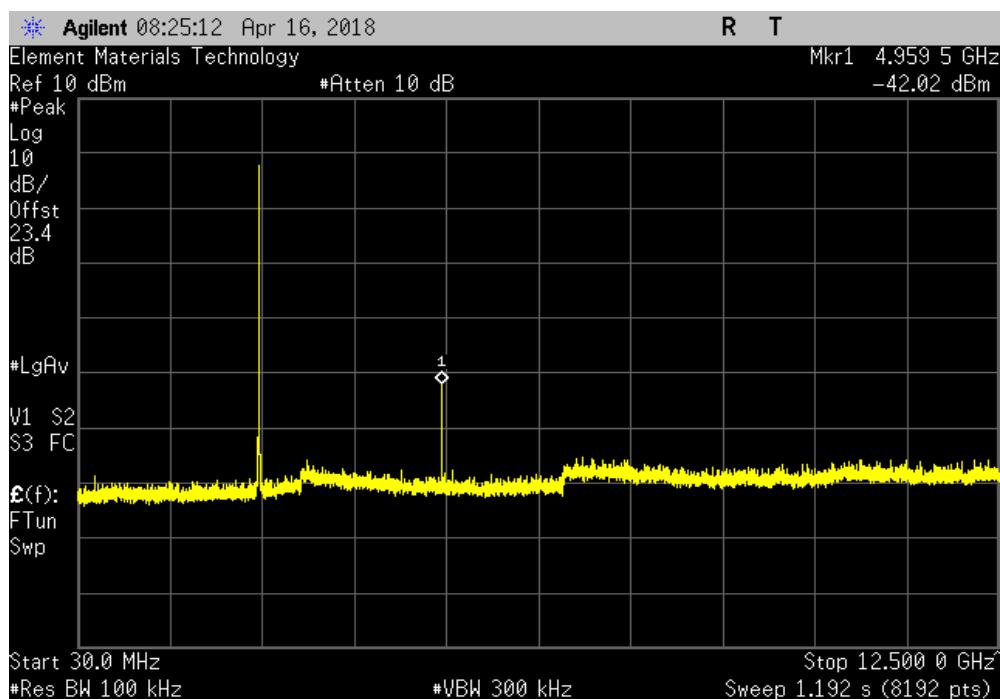


TbTx 2017.12.14 XMII 2017.12.13

Frequency Range		Max Value (dBc)	Limit \leq (dBc)	Result
Fundamental		N/A	N/A	N/A



Frequency Range		Max Value (dBc)	Limit \leq (dBc)	Result
30 MHz - 12.5 GHz		-39.71	-20	Pass

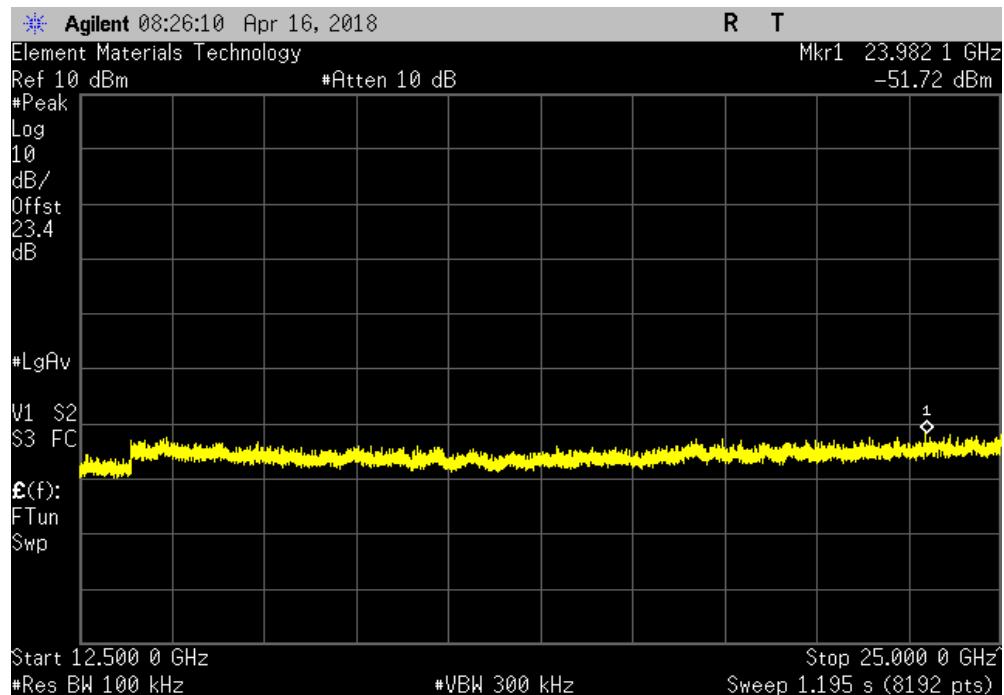


SPURIOUS CONDUCTED EMISSIONS



TbTx 2017.12.14 XMII 2017.12.13

BLE/GFSK High Channel, 2480 MHz			
Frequency Range	Max Value (dBc)	Limit \leq (dBc)	Result
12.5 GHz - 25 GHz	-49.41	-20	Pass



SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2017.12.19

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

MODES OF OPERATION

Low Ch. 2402 MHz, Mid Ch. 2440 MHz, High Ch. 2480 MHz

Low Ch. 2402 MHz & High Ch. 2480 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

CLRI0002 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26000 MHz
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SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Attenuator	Fairview Microwave	SA18H-20	TKQ	NCR	0 mo
Cable	Northwest EMC	8-18GHz RE Cables	OCO	1-Aug-2017	12 mo
Cable	Northwest EMC	18-26GHz RE Cables	OCK	27-Dec-2017	12 mo
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	13-Jul-2017	12 mo
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	1-Aug-2017	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	HHX	1-Aug-2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141A	AYE	7-Nov-2017	24 mo
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	1-Aug-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	13-Jul-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOI	27-Dec-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOF	1-Aug-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOE	1-Aug-2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AHT	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHR	NCR	0 mo
Antenna - Double Ridge	ETS Lindgren	3117	AHQ	28-Sep-2017	24 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AHN	NCR	0 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	21-Nov-2017	12 mo

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

SPURIOUS RADIATED EMISSIONS

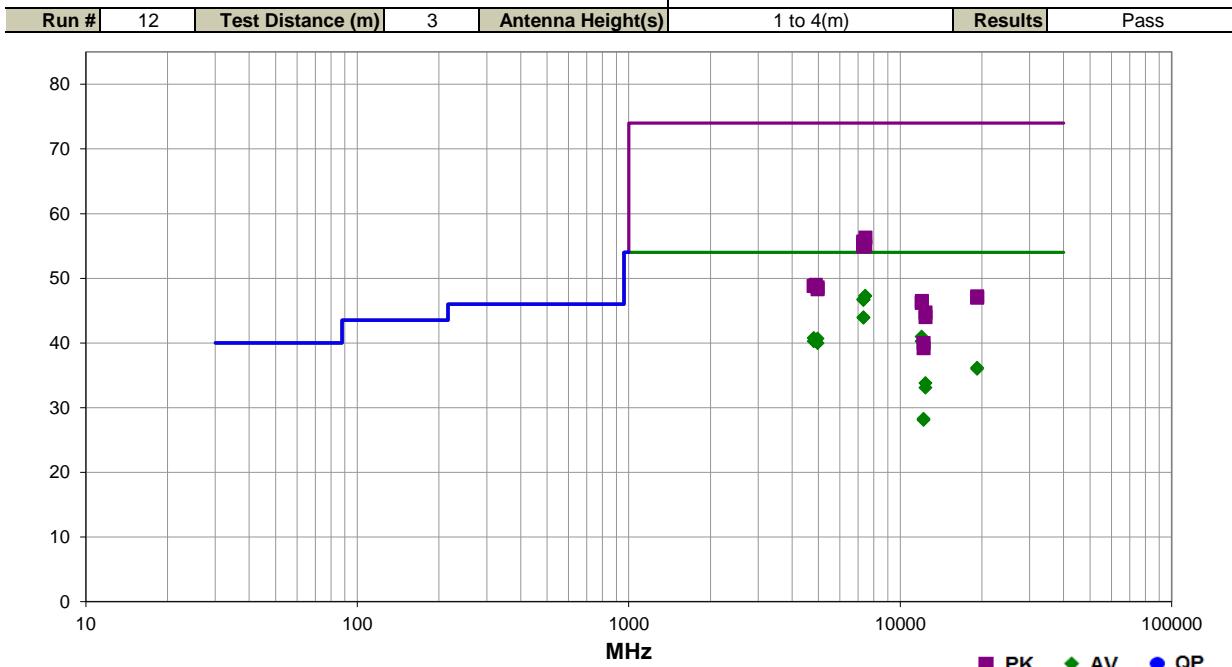


EmiR5 2018.02.06

PSA-ESCI 2017.12.19

Work Order:	CLRI0002	Date:	16-Apr-2018	
Project:	None	Temperature:	21.3 °C	
Job Site:	OC10	Humidity:	40% RH	
Serial Number:	544-X3-0026	Barometric Pres.:	1020 mbar	Tested by: Salvador Solorzano
EUT:	Trek			
Configuration:	2			
Customer:	Dyno Equipment, Inc.			
Attendees:	Dave West, Chris Brown			
EUT Power:	Battery			
Operating Mode:	Low Ch. 2402 MHz, Mid Ch. 2440 MHz, High Ch. 2480 MHz			
Deviations:	None			
Comments:	Using Duty Cycle Correction Factor 2.37dB 10*log (1/duty cycle during testing)			

Test Specifications	Test Method
FCC 15.247:2018	ANSI C63.10:2013



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7440.775	28.2	16.7	1.0	301.0	2.4	0.0	Horz	AV	0.0	47.3	54.0	-6.7	EUT Vert, High Ch
7439.083	28.2	16.7	1.0	350.0	2.4	0.0	Vert	AV	0.0	47.3	54.0	-6.7	EUT Vert, High Ch
7319.817	27.8	16.6	3.3	196.0	2.4	0.0	Horz	AV	0.0	46.8	54.0	-7.2	EUT Vert, Mid Ch
7322.275	27.7	16.6	1.0	50.0	2.4	0.0	Vert	AV	0.0	46.7	54.0	-7.3	EUT Vert, Mid Ch
7321.067	27.7	16.6	2.2	152.0	2.4	0.0	Horz	AV	0.0	46.7	54.0	-7.3	EUT on Side, Mid Ch
7321.158	27.7	16.6	1.0	222.0	2.4	0.0	Vert	AV	0.0	46.7	54.0	-7.3	EUT on Side, Mid Ch
7320.083	25.0	16.6	1.0	353.0	2.4	0.0	Horz	AV	0.0	44.0	54.0	-10.0	EUT Horz, Mid Ch
7320.242	24.9	16.6	3.4	155.0	2.4	0.0	Vert	AV	0.0	43.9	54.0	-10.1	EUT Horz, Mid Ch
12008.530	42.9	-4.3	1.9	183.0	2.4	0.0	Horz	AV	0.0	41.0	54.0	-13.0	EUT Vert, Low Ch
4803.975	27.1	11.3	1.0	160.0	2.4	0.0	Vert	AV	0.0	40.8	54.0	-13.2	EUT Vert, Low Ch
4959.733	26.6	11.7	1.0	305.0	2.4	0.0	Horz	AV	0.0	40.7	54.0	-13.3	EUT Vert, High Ch
4877.725	26.4	11.6	1.0	238.0	2.4	0.0	Horz	AV	0.0	40.4	54.0	-13.6	EUT Vert, Mid Ch
4879.492	26.4	11.6	2.7	358.0	2.4	0.0	Vert	AV	0.0	40.4	54.0	-13.6	EUT Vert, Mid Ch
4803.917	26.6	11.3	1.0	32.0	2.4	0.0	Horz	AV	0.0	40.3	54.0	-13.7	EUT Vert, Low Ch
12008.420	42.2	-4.3	1.0	300.0	2.4	0.0	Vert	AV	0.0	40.3	54.0	-13.7	EUT Vert, Low Ch
4962.358	25.9	11.7	1.0	48.0	2.4	0.0	Vert	AV	0.0	40.0	54.0	-14.0	EUT Vert, High Ch
7441.217	39.6	16.7	1.0	301.0	0.0	0.0	Horz	PK	0.0	56.3	74.0	-17.7	EUT Vert, High Ch
19215.120	37.7	-3.9	0.2	175.0	2.4	0.0	Horz	AV	0.0	36.2	54.0	-17.8	EUT Vert, Low Ch

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
19216.210	37.5	-3.9	1.5	189.0	2.4	0.0	Vert	AV	0.0	36.0	54.0	-18.0	EUT Vert, Low Ch
7319.117	39.1	16.6	2.2	152.0	0.0	0.0	Horz	PK	0.0	55.7	74.0	-18.3	EUT on Side, Mid Ch
7319.933	39.0	16.6	1.0	353.0	0.0	0.0	Horz	PK	0.0	55.6	74.0	-18.4	EUT Horz, Mid CH
7321.975	38.8	16.6	1.0	50.0	0.0	0.0	Vert	PK	0.0	55.4	74.0	-18.6	EUT Vert, Mid Ch
7318.817	38.7	16.6	3.4	155.0	0.0	0.0	Vert	PK	0.0	55.3	74.0	-18.7	EUT Horz, Mid Ch
7318.267	38.5	16.6	1.0	222.0	0.0	0.0	Vert	PK	0.0	55.1	74.0	-18.9	EUT on Side, Mid Ch
7439.192	38.3	16.7	1.0	350.0	0.0	0.0	Vert	PK	0.0	55.0	74.0	-19.0	EUT Vert, High Ch
7319.375	38.3	16.6	3.3	196.0	0.0	0.0	Horz	PK	0.0	54.9	74.0	-19.1	EUT Vert, Mid Ch
12398.360	34.8	-3.4	1.0	236.0	2.4	0.0	Vert	AV	0.0	33.8	54.0	-20.2	EUT Vert, High Ch
12398.380	34.1	-3.4	2.0	346.0	2.4	0.0	Horz	AV	0.0	33.1	54.0	-20.9	EUT Vert, High Ch
4880.225	37.4	11.6	2.7	358.0	0.0	0.0	Vert	PK	0.0	49.0	74.0	-25.0	EUT Vert, Mid Ch
4879.167	37.2	11.6	1.0	238.0	0.0	0.0	Horz	PK	0.0	48.8	74.0	-25.2	EUT Vert, Mid Ch
4804.633	37.5	11.3	1.0	32.0	0.0	0.0	Horz	PK	0.0	48.8	74.0	-25.2	EUT Vert, Low Ch
4803.617	37.5	11.3	1.0	160.0	0.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	EUT Vert, Low Ch
4960.175	36.9	11.7	1.0	305.0	0.0	0.0	Horz	PK	0.0	48.6	74.0	-25.4	EUT Vert, High Ch
4961.283	36.6	11.7	1.0	48.0	0.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	EUT Vert, High Ch
12198.400	29.0	-3.1	1.0	209.0	2.4	0.0	Horz	AV	0.0	28.3	54.0	-25.7	EUT Vert, Mid Ch
12197.960	28.8	-3.1	1.0	247.0	2.4	0.0	Vert	AV	0.0	28.1	54.0	-25.9	EUT Vert, Mid Ch
19217.110	51.1	-3.9	0.2	175.0	0.0	0.0	Horz	PK	0.0	47.2	74.0	-26.8	EUT Vert, Low Ch
19218.290	50.9	-3.9	1.5	189.0	0.0	0.0	Vert	PK	0.0	47.0	74.0	-27.0	EUT Vert, Low Ch
12010.620	50.9	-4.4	1.9	183.0	0.0	0.0	Horz	PK	0.0	46.5	74.0	-27.5	EUT Vert, Low Ch
12008.120	50.5	-4.3	1.0	300.0	0.0	0.0	Vert	PK	0.0	46.2	74.0	-27.8	EUT Vert, Low Ch
12398.160	48.1	-3.4	1.0	236.0	0.0	0.0	Vert	PK	0.0	44.7	74.0	-29.3	EUT Vert, High Ch
12398.190	47.4	-3.4	2.0	346.0	0.0	0.0	Horz	PK	0.0	44.0	74.0	-30.0	EUT Vert, High Ch
12201.730	43.1	-3.1	1.0	209.0	0.0	0.0	Horz	PK	0.0	40.0	74.0	-34.0	EUT Vert, Mid Ch
12198.590	42.3	-3.1	1.0	247.0	0.0	0.0	Vert	PK	0.0	39.2	74.0	-34.8	EUT Vert, Mid Ch

SPURIOUS RADIATED EMISSIONS



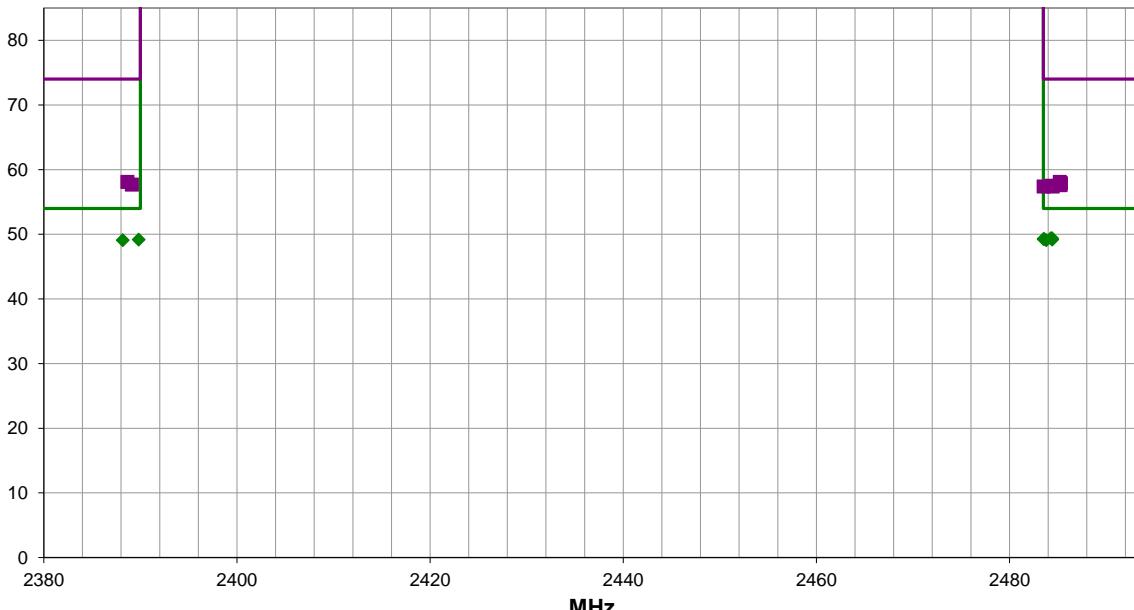
EmiR5 2018.03.06.1

PSA-ESCI 2017.12.19

Work Order:	CLRI0002	Date:	16-Apr-2018	
Project:	None	Temperature:	21.3 °C	
Job Site:	OC10	Humidity:	45.9% RH	
Serial Number:	544-X3-0026	Barometric Pres.:	1020 mbar	Tested by: Salvador Solorzano
EUT:	Trek			
Configuration:	2			
Customer:	Dyno Equipment, Inc.			
Attendees:	Dave West, Chris Brown			
EUT Power:	Battery			
Operating Mode:	Low Ch. 2402 MHz & High Ch. 2480 MHz			
Deviations:	None			
Comments:	Using Duty Cycle Correction Factor 2.37dB 10*log (1/duty cycle during testing) Band Edge			

Test Specifications		Test Method
FCC 15.247:2018		ANSI C63.10:2013

Run #	25	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass



Freq (MHz)	Calculated Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2484.290	27.9	3.1	3.3	156.0	2.4	16.0	Horz	AV	0.0	49.4	54.0	-4.6	EUT Horiz, High Ch
2484.407	27.9	3.1	1.5	91.0	2.4	16.0	Vert	AV	0.0	49.4	54.0	-4.6	EUT Horiz, High Ch
2483.593	27.8	3.1	3.0	347.0	2.4	16.0	Horz	AV	0.0	49.3	54.0	-4.7	EUT Vert, High Ch
2483.527	27.8	3.1	1.1	229.0	2.4	16.0	Vert	AV	0.0	49.3	54.0	-4.7	EUT Vert, High Ch
2389.823	27.9	2.9	1.3	254.0	2.4	16.0	Horz	AV	0.0	49.2	54.0	-4.8	EUT Horiz, Low Ch
2484.427	27.7	3.1	1.5	241.0	2.4	16.0	Vert	AV	0.0	49.2	54.0	-4.8	EUT on Side, High Ch
2388.177	27.8	2.9	1.5	100.0	2.4	16.0	Vert	AV	0.0	49.1	54.0	-4.9	EUT Horiz, Low Ch
2483.803	27.6	3.1	1.5	262.0	2.4	16.0	Horz	AV	0.0	49.1	54.0	-4.9	EUT on Side, High Ch
2388.663	39.2	2.9	1.3	254.0	0.0	16.0	Horz	PK	0.0	58.1	74.0	-15.9	EUT Horiz, Low Ch
2485.210	39.0	3.1	1.5	91.0	0.0	16.0	Vert	PK	0.0	58.1	74.0	-15.9	EUT Horiz, High Ch
2485.333	38.8	3.1	1.5	241.0	0.0	16.0	Vert	PK	0.0	57.9	74.0	-16.1	EUT on Side, High Ch
2389.113	38.8	2.9	1.5	100.0	0.0	16.0	Vert	PK	0.0	57.7	74.0	-16.3	EUT Horiz, Low Ch
2485.280	38.5	3.1	3.0	347.0	0.0	16.0	Horz	PK	0.0	57.6	74.0	-16.4	EUT Vert, High Ch
2484.340	38.4	3.1	3.3	156.0	0.0	16.0	Horz	PK	0.0	57.5	74.0	-16.5	EUT Horiz, High Ch
2483.543	38.3	3.1	1.1	229.0	0.0	16.0	Vert	PK	0.0	57.4	74.0	-16.6	EUT Vert, High Ch
2484.477	38.3	3.1	1.5	262.0	0.0	16.0	Horz	PK	0.0	57.4	74.0	-16.6	EUT on Side, High Ch