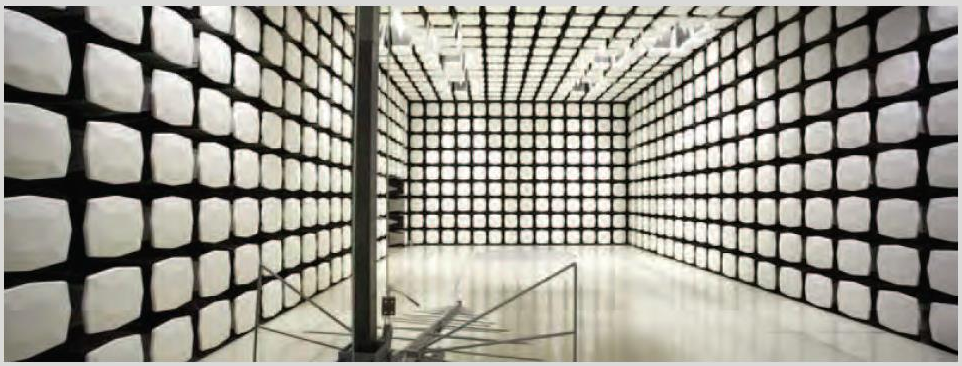
WatchGuard Video

MIC-WRL-TRN-420

FCC 15.247:2020

902 - 928 MHz FHSS Transceiver

Report: WTVD0035.1, Issue Date: June 1, 2020



NVLAP LAB CODE: 201049-0

CERTIFICATE OF TEST

Last Date of Test: May 22, 2020
WatchGuard Video
EUT: MIC-WRL-TRN-420

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2020	ANSI C63.10:2013, KDB 558074

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions (Transmitter)	No	N/A	Not required for a battery powered EUT.
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
7.5	Duty Cycle	Yes	N/A	Characterization of radio operation.
7.8.2	Carrier Frequency Separation	Yes	Pass	
7.8.3	Number of Hopping Frequencies	Yes	Pass	
7.8.4	Dwell Time	Yes	Pass	
7.8.5	Output Power	Yes	Pass	
7.8.5	Equivalent Isotropic Radiated Power	Yes	Pass	
7.8.6	Band Edge Compliance	Yes	Pass	
7.8.6	Band Edge Compliance - Hopping Mode	Yes	Pass	
7.8.7	Occupied Bandwidth	Yes	Pass	
7.8.8	Spurious Conducted Emissions	Yes	Pass	
11.10.2	Power Spectral Density	No	N/A	Not required for FHSS devices.

Deviations From Test Standards

None

Approved By:

Kyle Holgate, 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. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

REVISION HISTORY

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

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

A2LA - 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) and as a CAB for the acceptance of test data.

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

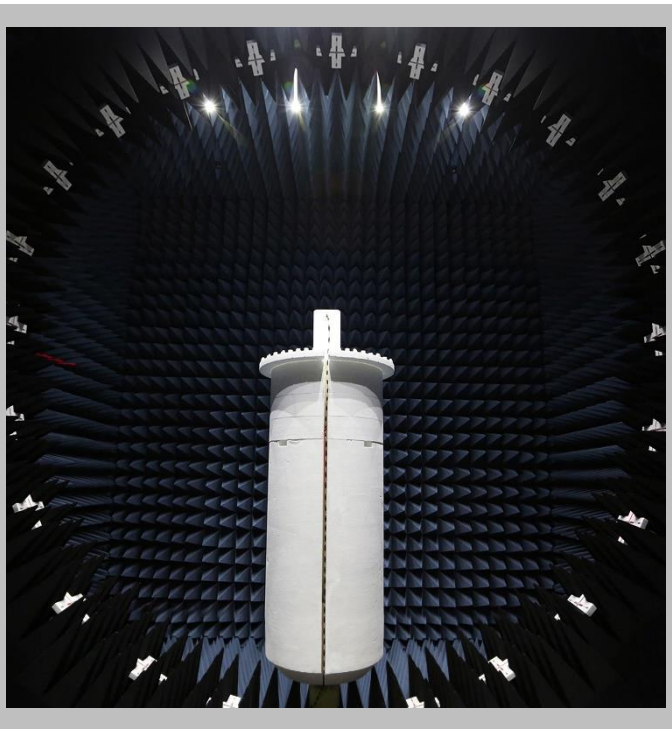
MIC – Recognized by MIC as a CAB for the acceptance of test data.

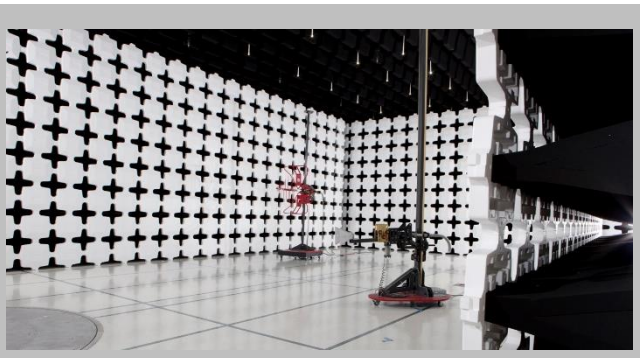
SCOPE

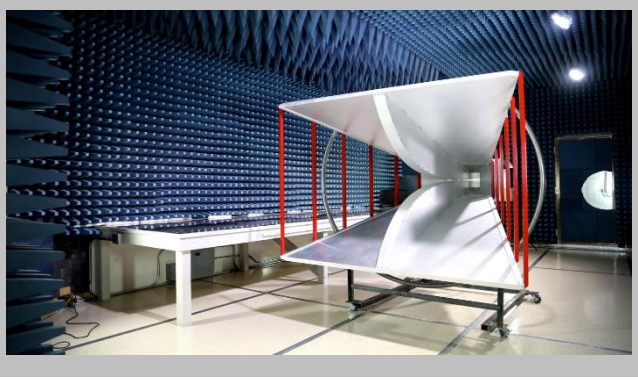
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

California	Minnesota	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 EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP				
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	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	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

Measurement Uncertainty

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

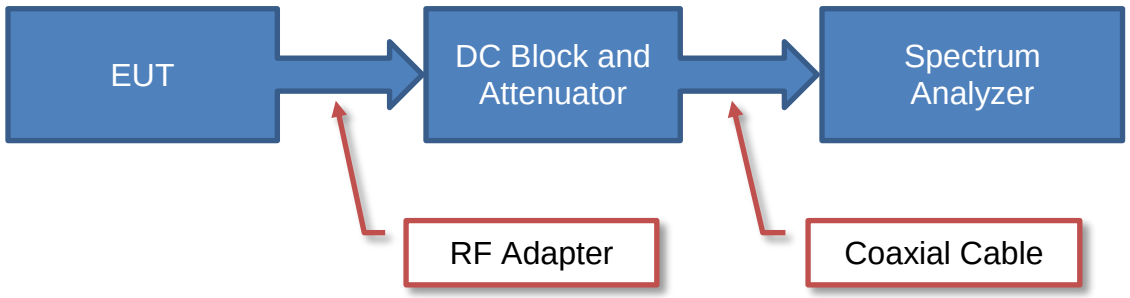
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable 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.

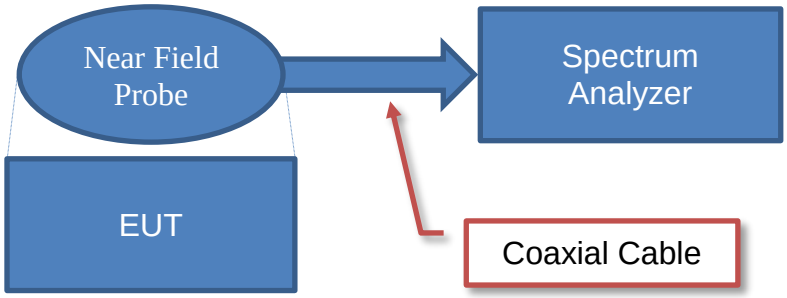
Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	2.6 dB	-2.6 dB

Test Setup Block Diagrams

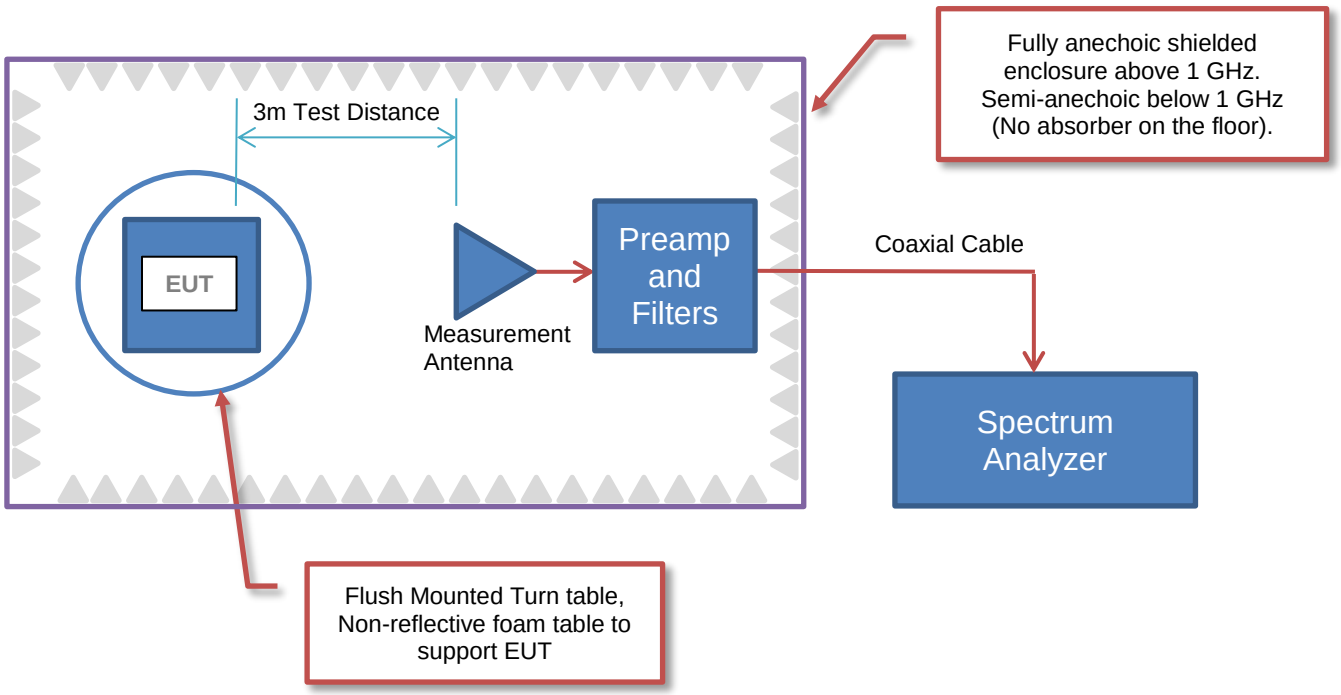
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	WatchGuard Video
Address:	415 East Exchange Pkwy
City, State, Zip:	Allen, TX 75002
Test Requested By:	Navaid Karimi
EUT:	MIC-WRL-TRN-420
First Date of Test:	May 21, 2020
Last Date of Test:	May 22, 2020
Receipt Date of Samples:	May 21, 2020
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
The EUT is the MIC-WRL-TRN-420 "Transmitter" component. It communicates with the MIC-WRL-CHG-410 "Base" component. These two components operate as a pair and comprise the operational wireless microphone system.

Testing Objective:
Seeking to demonstrate compliance under FCC 15.247:2020 for operation in the 902 - 928 MHz Band.

CONFIGURATIONS

Configuration WTVD0035- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wireless Microphone Transceiver	WatchGuard Video	MIC-WRL-TRN-420	7C
Internal Antenna	Fractus	FR05-S1-R-0-105	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Microphone	WatchGuard Video	None	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Microphone Cable	Unknown	1.5m	No	Microphone	Microphone transmitter

Configuration WTVD0035- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wireless Microphone Transceiver	WatchGuard Video	MIC-WRL-TRN-420	8C

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Debug Box	WatchGuard Video	WGA00407	None
Wireless Base	WatchGuard Video	MIC-WRL-CHG410	LRTB-049047
Laptop	Dell	Lattitude E5570	3VX20G2
(Laptop) Power Supply	Dell	LA65NM130	CN-0G4X7T
(Debug Box) Power Supply	Fekko	M120100A001	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Debug Box Power Cable	Unknown	1.0m	No	Debug Box	Power Supply
USB Cable	Yes	0.2m	No	Laptop	Debug Box
RJ-45 Cable	No	1.0m	No	Wireless Base	Debug Box
Laptop Power Supply DC	No	1.0m	No	Power supply	Laptop
Laptop Power Supply AC	No	1.0m	No	C Mains	Power Supply

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2020-05-21	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2020-05-22	Carrier Frequency Separation	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	2020-05-22	Number of Hopping Frequencies	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	2020-05-22	Dwell Time	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	2020-05-22	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.
6	2020-05-22	Equivalent Isotropic Radiated 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.
7	2020-05-22	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.
8	2020-05-22	Band Edge Compliance - Hopping Mode	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
9	2020-05-22	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.
10	2020-05-22	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2020.04.03.0

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

MODES OF OPERATION

Continuously Tx Low Channel 902.25 MHz Full Power
Continuously Tx Mid Channel 914.75 MHz Full Power
Continuously Tx High Channel 927.75 MHz Full Power

POWER SETTINGS INVESTIGATED

Battery 3.7 VDC

CONFIGURATIONS INVESTIGATED

WTVD0035 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12400 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Filter - High Pass	Micro-Tronics	HPM50108	HGD	2019-09-18	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AJF	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	PAK	2019-09-18	12 mo
Cable	Northwest EMC	8-18GHz	TXD	2020-05-14	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAJ	2020-03-11	12 mo
Cable	Northwest EMC	1-8.2 GHz	TXC	2020-03-11	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJL	2018-10-11	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	2020-05-07	12 mo
Amplifier - Pre-Amplifier	Fairview Microwave	FMAM63001	PAS	2020-01-27	12 mo
Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	2019-08-01	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	2020-02-05	24 mo
Filter - Band Reject	Wainwright Instruments	WTRCTV5-750-1000-20-70-60EEK	CUL	2020-02-16	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 (in no-hop, single channel mode) 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 within 2 MHz of the allowable band may have been taken using the integration method from ANSI C63.10 clause 11.13.3. This procedure uses the channel power feature of the spectrum analyzer to integrate the power of the emission within a 1 MHz bandwidth.

Where the radio test software does not provide for a duty cycle at continuous transmit conditions (> 98%) and the RMS (power average) measurements were made across the on and off times of the EUT transmissions, a duty cycle correction is added to the measurements using the formula of 10*log(1/dc).

RMS measurements taken for a FHSS radio also may have a duty cycle correction subtracted using the formula 20*log(dc), based on the requirements for pulsed operation from ANSI C63.10 section 7.5.

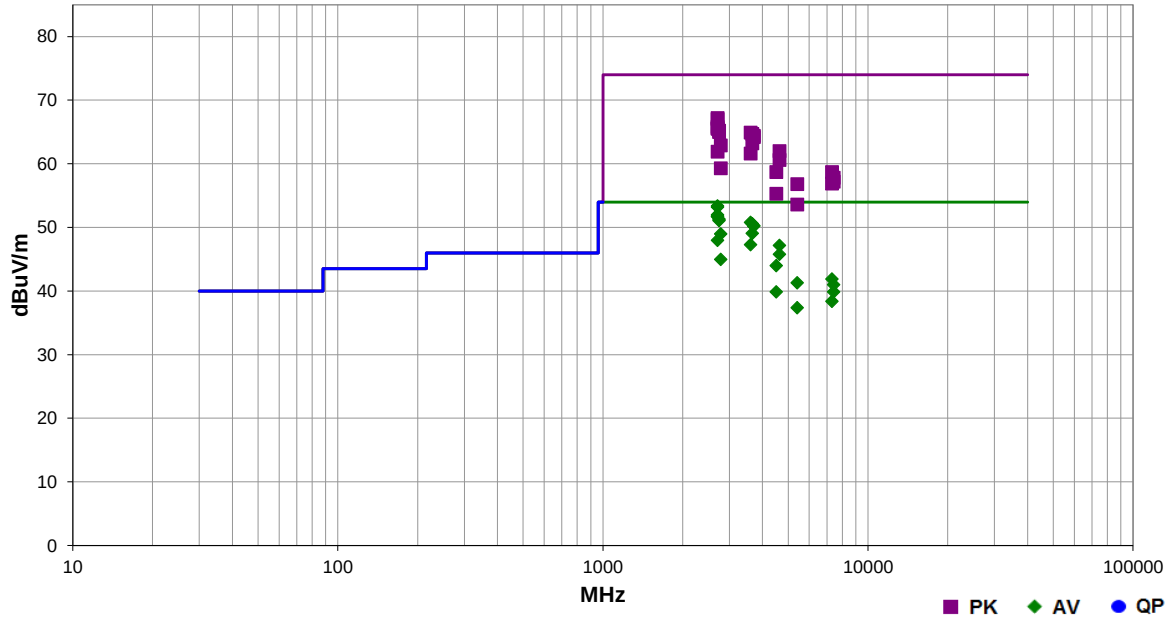
SPURIOUS RADIATED EMISSIONS

EmiR5 2020.04.20.0 PSA-ESCI 2020.04.03.0

Work Order:	WTVD0035	**Date:**	2020-05-21		
Project:	None	**Temperature:**	21.9 °C		
Job Site:	TX02	**Humidity:**	55.9% RH		
Serial Number:	7C	**Barometric Pres.:**	1013 mbar	**Tested by:**	Brandon Hobbs
EUT:	MIC-WRL-TRN-420				
Configuration:	1				
Customer:	WatchGuard Video				
Attendees:	Navaid Karimi				
EUT Power:	Battery 3.7 VDC				
Operating Mode:	Continuously Transmitting at Low Channel 902.25 MHz, Mid Channel 914.75 MHz and High Channel 927.75 MHz Full Power Reference Data Comments for EUT Orientation and Channel Frequency				
Deviations:	None				
Comments:	PN: MIC-WRL-TRN-420. When operating in normal FHSS mode, the worst-case transmission time over any 100 ms period is 21.58 ms. Downward DCCF correction applied based on 20*log(On Time(21.58 ms)/100 ms) = -13.3 dB. Total correction applied = -13.3 dB.				

Test Specifications	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

Run #	20	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



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
2706.767	72.1	-5.3	2.9	346.9	-13.3	0.0	Horz	AV	0.0	53.4	54.0	-0.5	EUT On Side, Low Channel
2706.758	71.9	-5.3	3.6	9.0	-13.3	0.0	Horz	AV	0.0	53.2	54.0	-0.7	EUT Horizontal, Low Channel
2706.775	70.7	-5.3	3.1	127.0	-13.3	0.0	Vert	AV	0.0	52.0	54.0	-1.9	EUT On Side, Low Channel
2706.783	70.5	-5.3	3.7	235.0	-13.3	0.0	Vert	AV	0.0	51.8	54.0	-2.1	EUT Vertical, Low Channel
2706.767	70.4	-5.3	2.9	168.0	-13.3	0.0	Horz	AV	0.0	51.7	54.0	-2.2	EUT Vertical, Low Channel
2744.275	69.8	-5.1	2.8	158.0	-13.3	0.0	Horz	AV	0.0	51.3	54.0	-2.6	EUT On Side, Mid Channel
2744.308	69.6	-5.1	3.7	121.0	-13.3	0.0	Vert	AV	0.0	51.1	54.0	-2.8	EUT On Side, Mid Channel
3608.892	64.1	0.1	2.9	212.0	-13.3	0.0	Vert	AV	0.0	50.8	54.0	-3.1	EUT On Side, Low Channel
3659.100	63.9	0.1	3.8	218.0	-13.3	0.0	Vert	AV	0.0	50.6	54.0	-3.3	EUT On Side, Mid Channel
3711.083	63.4	0.3	2.4	226.9	-13.3	0.0	Vert	AV	0.0	50.3	54.0	-3.6	EUT On Side, High Channel
3711.050	63.3	0.3	2.3	193.0	-13.3	0.0	Horz	AV	0.0	50.2	54.0	-3.7	EUT On Side, High Channel
3659.042	62.4	0.1	2.0	208.9	-13.3	0.0	Horz	AV	0.0	49.1	54.0	-4.8	EUT On Side, Mid Channel
2783.267	67.5	-5.1	3.6	118.9	-13.3	0.0	Vert	AV	0.0	49.0	54.0	-4.9	EUT On Side, High Channel
2706.767	66.7	-5.3	3.5	33.0	-13.3	0.0	Vert	AV	0.0	48.0	54.0	-5.9	EUT Horizontal, Low Channel
3609.050	60.6	0.1	2.5	205.0	-13.3	0.0	Horz	AV	0.0	47.3	54.0	-6.6	EUT On Side, Low Channel
2706.908	72.5	-5.3	2.9	346.9	0.0	0.0	Horz	PK	0.0	67.2	74.0	-6.7	EUT On Side, Low Channel
4638.625	57.4	3.2	3.2	201.0	-13.3	0.0	Vert	AV	0.0	47.2	54.0	-6.7	EUT On Side, High Channel
2706.867	72.3	-5.3	3.6	9.0	0.0	0.0	Horz	PK	0.0	67.0	74.0	-6.9	EUT Horizontal, Low Channel
2706.883	71.1	-5.3	3.1	127.0	0.0	0.0	Vert	PK	0.0	65.8	74.0	-8.1	EUT On Side, Low Channel
4638.608	56.0	3.2	3.7	153.9	-13.3	0.0	Horz	AV	0.0	45.8	54.0	-8.1	EUT On Side, High Channel

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
2706.867	70.9	-5.3	3.7	235.0	0.0	0.0	Vert	PK	0.0	65.6	74.0	-8.3	EUT Vertical, Low Channel
2706.625	70.8	-5.3	2.9	168.0	0.0	0.0	Horz	PK	0.0	65.5	74.0	-8.4	EUT Vertical, Low Channel
2744.383	70.3	-5.1	2.8	158.0	0.0	0.0	Horz	PK	0.0	65.2	74.0	-8.7	EUT On Side, Mid Channel
2744.333	70.1	-5.1	3.7	121.0	0.0	0.0	Vert	PK	0.0	65.0	74.0	-8.9	EUT On Side, Mid Channel
2783.283	63.5	-5.1	3.6	63.9	-13.3	0.0	Horz	AV	0.0	45.0	54.0	-8.9	EUT On Side, High Channel
3609.200	64.8	0.1	2.9	212.0	0.0	0.0	Vert	PK	0.0	64.9	74.0	-9.0	EUT On Side, Low Channel
3659.142	64.6	0.1	3.8	218.0	0.0	0.0	Vert	PK	0.0	64.7	74.0	-9.2	EUT On Side, Mid Channel
3711.275	64.1	0.3	2.4	226.9	0.0	0.0	Vert	PK	0.0	64.4	74.0	-9.5	EUT On Side, High Channel
3711.217	63.9	0.3	2.3	193.0	0.0	0.0	Horz	PK	0.0	64.2	74.0	-9.7	EUT On Side, High Channel
4511.142	54.8	2.6	2.4	207.0	-13.3	0.0	Vert	AV	0.0	44.0	54.0	-9.9	EUT On Side, Low Channel
3659.133	63.1	0.1	2.0	208.9	0.0	0.0	Horz	PK	0.0	63.2	74.0	-10.7	EUT On Side, Mid Channel
2783.383	68.0	-5.1	3.6	118.9	0.0	0.0	Vert	PK	0.0	62.9	74.0	-11.0	EUT On Side, High Channel
4639.017	58.8	3.2	3.2	201.0	0.0	0.0	Vert	PK	0.0	62.0	74.0	-11.9	EUT On Side, High Channel
2706.858	67.2	-5.3	3.5	33.0	0.0	0.0	Vert	PK	0.0	61.9	74.0	-12.0	EUT Horizontal, Low Channel
7318.250	45.1	10.2	2.4	184.9	-13.3	0.0	Vert	AV	0.0	41.9	54.0	-12.0	EUT On Side, Mid Channel
3608.842	61.5	0.1	2.5	205.0	0.0	0.0	Horz	PK	0.0	61.6	74.0	-12.3	EUT On Side, Low Channel
5413.350	49.8	4.9	1.9	135.9	-13.3	0.0	Horz	AV	0.0	41.3	54.0	-12.6	EUT On Side, Low Channel
7422.133	44.3	10.1	1.5	157.0	-13.3	0.0	Vert	AV	0.0	41.0	54.0	-12.9	EUT On Side, High Channel
4638.917	57.4	3.2	3.7	153.9	0.0	0.0	Horz	PK	0.0	60.6	74.0	-13.3	EUT On Side, High Channel
4511.292	50.7	2.6	1.7	171.9	-13.3	0.0	Horz	AV	0.0	39.9	54.0	-14.0	EUT On Side, Low Channel
7422.217	43.2	10.1	1.5	154.9	-13.3	0.0	Horz	AV	0.0	39.9	54.0	-14.0	EUT On Side, High Channel
2783.417	64.4	-5.1	3.6	63.9	0.0	0.0	Horz	PK	0.0	59.3	74.0	-14.6	EUT On Side, High Channel
4511.017	56.1	2.6	2.4	207.0	0.0	0.0	Vert	PK	0.0	58.7	74.0	-15.2	EUT On Side, Low Channel
7317.742	48.5	10.2	2.4	184.9	0.0	0.0	Vert	PK	0.0	58.7	74.0	-15.2	EUT On Side, Mid Channel
7318.192	41.6	10.2	1.5	153.0	-13.3	0.0	Horz	AV	0.0	38.4	54.0	-15.5	EUT On Side, Mid Channel
7422.458	47.7	10.1	1.5	157.0	0.0	0.0	Vert	PK	0.0	57.8	74.0	-16.1	EUT On Side, High Channel
5413.333	45.9	4.9	3.2	142.9	-13.3	0.0	Vert	AV	0.0	37.4	54.0	-16.5	EUT On Side, Low Channel
7421.525	47.1	10.1	1.5	154.9	0.0	0.0	Horz	PK	0.0	57.2	74.0	-16.7	EUT On Side, High Channel
7318.250	46.7	10.2	1.5	153.0	0.0	0.0	Horz	PK	0.0	56.9	74.0	-17.0	EUT On Side, Mid Channel
5413.233	51.9	4.9	1.9	135.9	0.0	0.0	Horz	PK	0.0	56.8	74.0	-17.1	EUT On Side, Low Channel
4511.350	52.7	2.6	1.7	171.9	0.0	0.0	Horz	PK	0.0	55.3	74.0	-18.6	EUT On Side, Low Channel
5413.292	48.7	4.9	3.2	142.9	0.0	0.0	Vert	PK	0.0	53.6	74.0	-20.3	EUT On Side, Low Channel

DUTY CYCLE

XMit 2020.03.25.0

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

TEST DESCRIPTION

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 test software provided for operation in a fixed, single channel mode allows the EUT to operate continuously at 100% Duty Cycle.

CARRIER FREQUENCY SEPARATION

XMit 2020.03.25.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Block - DC	Fairview Microwave	SD3379	AMM	13-Mar-20	13-Mar-21
Attenuator	Fairview Microwave	SA4018-20	TYW	13-Mar-20	13-Mar-21

TEST DESCRIPTION

The channel carrier frequencies in the 902-928 MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. The EUT was operated in pseudorandom hopping mode. The spectrum was scanned across two adjacent peaks. The separation between the peaks of these channels was measured.

CARRIER FREQUENCY SEPARATION

element

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**MIC-WRL-TRN-420**			**Work Order:**	**WTVD0035**
Serial Number:	**8C**			**Date:**	**22-May-20**
Customer:	**WatchGuard Video**			**Temperature:**	**22.7 °C**
Attendees:	**Navaid Karimi**			**Humidity:**	**53.3% RH**
Project:	**None**			**Barometric Pres.:**	**1015 mbar**
Tested by:	**Brandon Hobbs**	**Power:**	**Battery 3.7 VDC**	**Job Site:**	**TX03**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

PN: MIC-WRL-TRN-420. All measurement path losses were accounted for and represented in the analyzer reference level offset: Cable, DC block and inline attenuator.

DEVIATIONS FROM TEST STANDARD

None

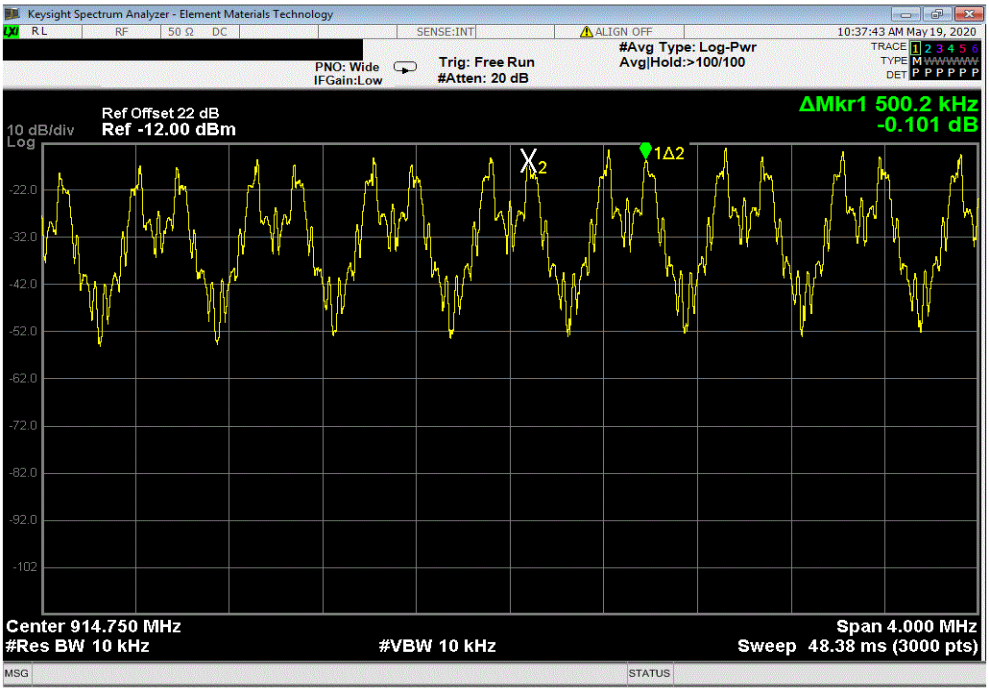
Configuration #	**2**	*Signature*

		Value	**Limit (≥)**	**Results**
902 MHz - 928 MHz Band				
	Hopping Mode			
	Mid Channel 914.75 MHz	0.5 MHz	163.641 kHz	Pass

CARRIER FREQUENCY SEPARATION

TbtTx 2019.08.30.0 XMit 2020.03.25.0

902 MHz - 928 MHz Band, Hopping Mode, Mid Channel 914.75 MHz						
				Value	Limit (≥)	Results
				0.5 MHz	163.641 kHz	Pass



NUMBER OF HOPPING FREQUENCIES

XMit 2020.03.25.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21
Block - DC	Fairview Microwave	SD3379	AMM	13-Mar-20	13-Mar-21
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Attenuator	Fairview Microwave	SA4018-20	TYW	13-Mar-20	13-Mar-21

TEST DESCRIPTION

The number of hopping frequencies was measured across the authorized band. The hopping function of the EUT was enabled.

NUMBER OF HOPPING FREQUENCIES

element

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**MIC-WRL-TRN-420**			**Work Order:**	**WTVD0035**
Serial Number:	**8C**			**Date:**	**22-May-20**
Customer:	**WatchGuard Video**			**Temperature:**	**22.3 °C**
Attendees:	**Navaid Karimi**			**Humidity:**	**51.6% RH**
Project:	**None**			**Barometric Pres.:**	**1015 mbar**
Tested by:	**Brandon Hobbs**	**Power:**	**Battery 3.7 VDC**	**Job Site:**	**TX03**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

PN: MIC-WRL-TRN-420. All measurement path losses were accounted for and represented in the analyzer reference level offset: Cable, DC block and inline attenuator.

DEVIATIONS FROM TEST STANDARD

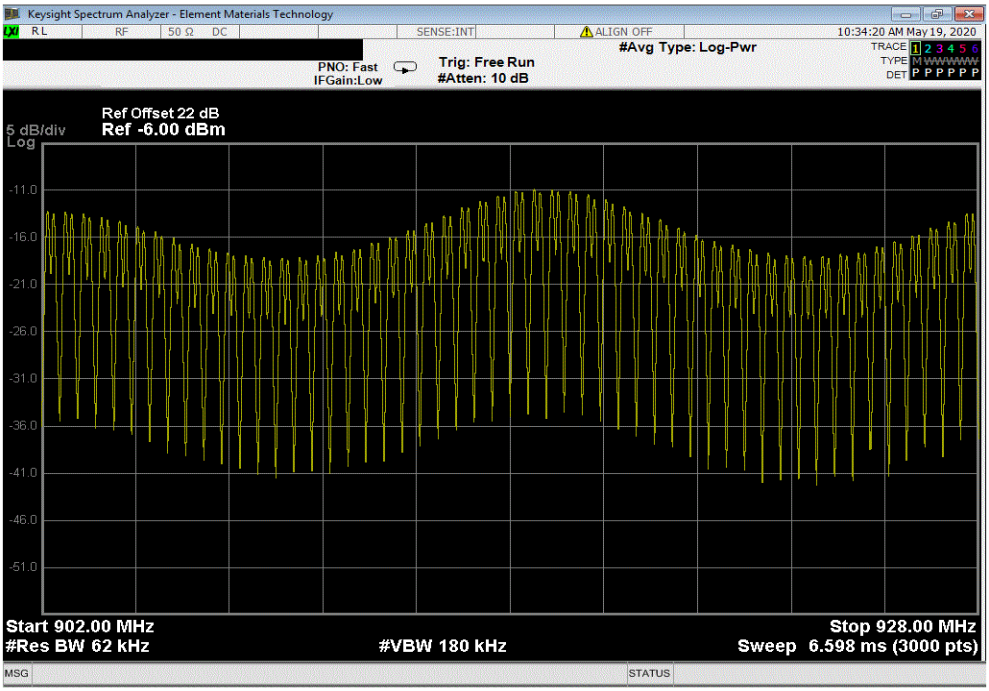
None

Configuration #	**2**	*Signature*

		Number of Channels	**Limit (≥)**	**Results**
902 MHz - 928 MHz Band				
	Hopping Mode			
	Mid Channel 914.75 MHz	52	50	Pass

NUMBER OF HOPPING FREQUENCIES

902 MHz - 928 MHz Band, Hopping Mode, Mid Channel 914.75 MHz						
				Number of Channels	Limit (≥)	Results
				52	50	Pass



DWELL TIME

XMit 2020.03.25.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Block - DC	Fairview Microwave	SD3379	AMM	13-Mar-20	13-Mar-21
Attenuator	Fairview Microwave	SA4018-20	TYW	13-Mar-20	13-Mar-21

TEST DESCRIPTION

The average dwell time per hopping channel was measured at one hopping channel in the middle of the authorized band.
The hopping function of the EUT was enabled.

The dwell time limit is based on the Number of Hopping Channels * 400 mS. For [900 MHz radio] this would be [52] Channels * 400mS = [20.8 seconds].

On Time During [20.8] Sec = Pulse Width * Average Number of Pulses * Scale Factor

- Average Number of Pulses is based on 4 samples.
- Scale Factor = [20.8] Sec / Screen Capture Sweep Time = [20.8] Sec / [4.16] Sec = [5]

DWELL TIME

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	MIC-WRL-TRN-420			**Work Order:**	WTVD0035
Serial Number:	8C			**Date:**	22-May-20
Customer:	WatchGuard Video			**Temperature:**	22.7 °C
Attendees:	Navaid Karimi			**Humidity:**	51.5% RH
Project:	None			**Barometric Pres.:**	1015 mbar
Tested by:	Brandon Hobbs	**Power:**	Battery 3.7 VDC	**Job Site:**	TX03

TEST SPECIFICATIONS	Test Method
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

PN: MIC-WRL-TRN-420. All measurement path losses were accounted for and represented in the analyzer reference level offset: Cable, DC block and inline attenuator.

DEVIATIONS FROM TEST STANDARD

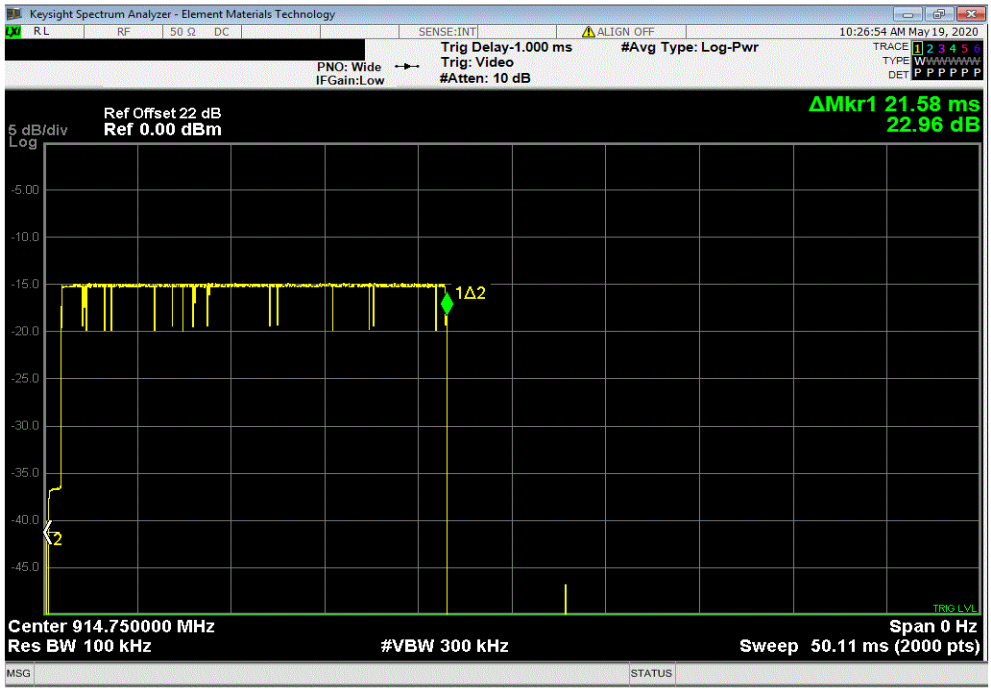
None

Configuration #	2	Signature

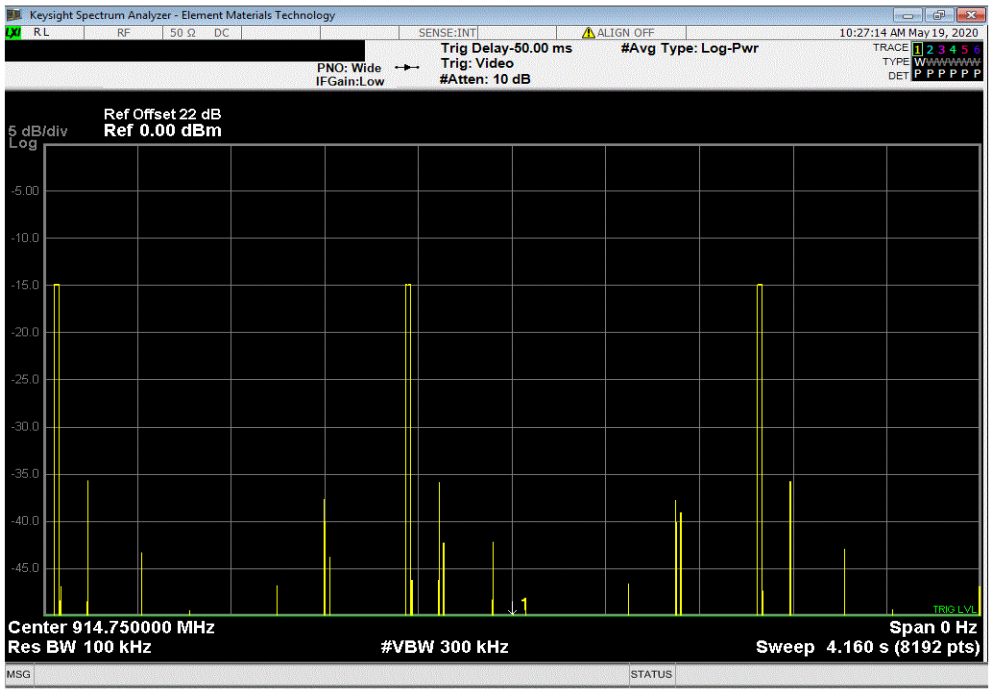
	Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 20.8 s	Limit (ms)	Results
902 MHz - 928 MHz Band							
Hopping Mode							
Mid Channel 914.75 MHz	21.582	N/A	N/A	N/A	N/A	N/A	N/A
Mid Channel 914.75 MHz	N/A	3	N/A	N/A	N/A	N/A	N/A
Mid Channel 914.75 MHz	N/A	3	N/A	N/A	N/A	N/A	N/A
Mid Channel 914.75 MHz	N/A	3	N/A	N/A	N/A	N/A	N/A
Mid Channel 914.75 MHz	N/A	3	N/A	N/A	N/A	N/A	N/A
Mid Channel 914.75 MHz	21.582	N/A	3	5	323.73	400	Pass

DWELL TIME

902 MHz - 928 MHz Band, Hopping Mode, Mid Channel 914.75 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 20.8 s	Limit (ms)	Results
21.582	N/A	N/A	N/A	N/A	N/A	N/A

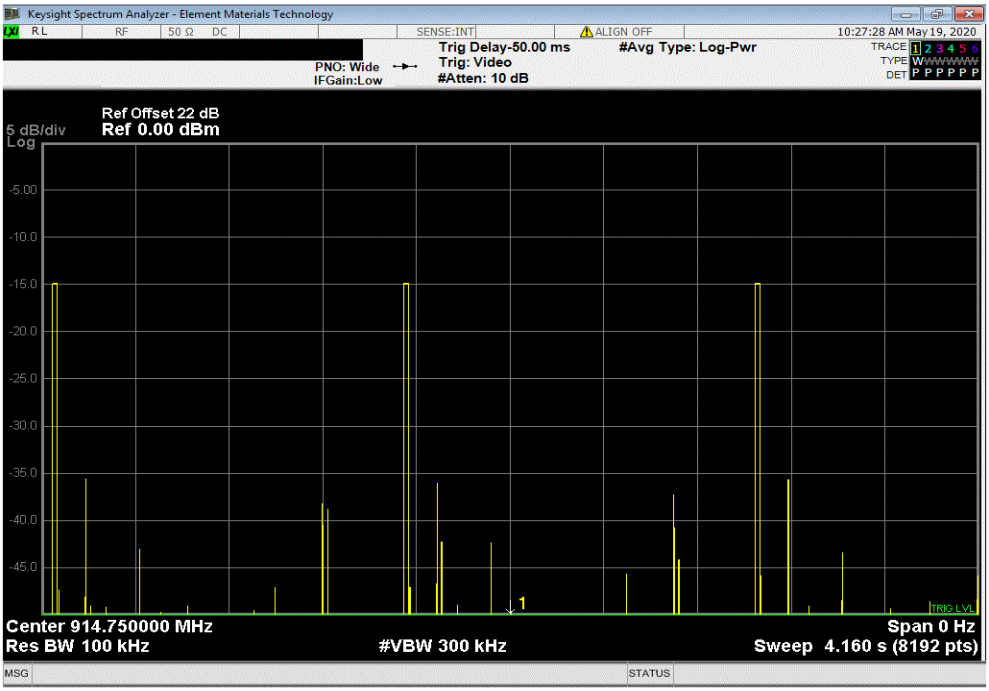


902 MHz - 928 MHz Band, Hopping Mode, Mid Channel 914.75 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 20.8 s	Limit (ms)	Results
N/A	3	N/A	N/A	N/A	N/A	N/A

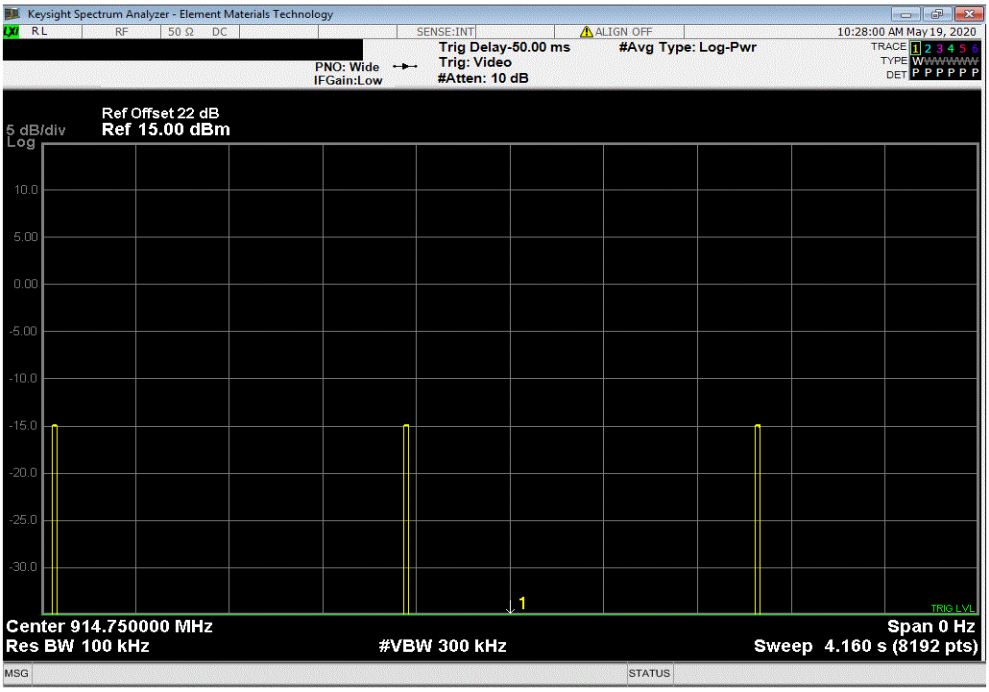


DWELL TIME

902 MHz - 928 MHz Band, Hopping Mode, Mid Channel 914.75 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 20.8 s	Limit (ms)	Results
N/A	3	N/A	N/A	N/A	N/A	N/A

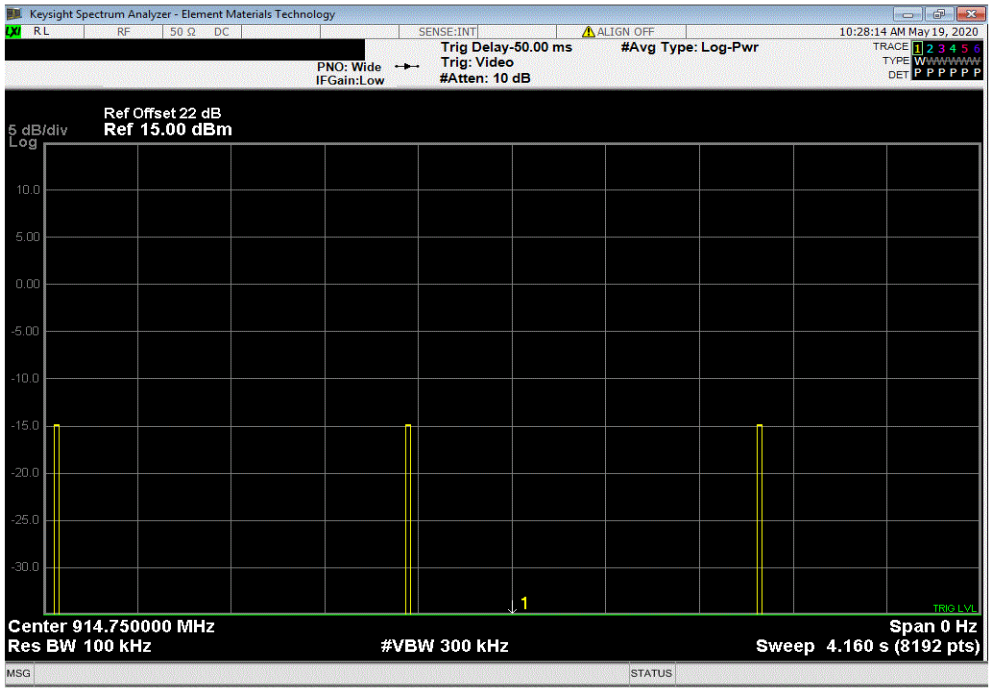


902 MHz - 928 MHz Band, Hopping Mode, Mid Channel 914.75 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 20.8 s	Limit (ms)	Results
N/A	3	N/A	N/A	N/A	N/A	N/A



DWELL TIME

902 MHz - 928 MHz Band, Hopping Mode, Mid Channel 914.75 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 20.8 s	Limit (ms)	Results
N/A	3	N/A	N/A	N/A	N/A	N/A



902 MHz - 928 MHz Band, Hopping Mode, Mid Channel 914.75 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 20.8 s	Limit (ms)	Results
21.582	N/A	3	5	323.73	400	Pass

Calculation Only

No Screen Capture Required

OUTPUT POWER

XMit 2020.03.25.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	Fairview Microwave	SA4018-20	TYW	13-Mar-20	13-Mar-21
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Block - DC	Fairview Microwave	SD3379	AMM	13-Mar-20	13-Mar-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21

TEST DESCRIPTION

The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

OUTPUT POWER

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**MIC-WRL-TRN-420**			**Work Order:**	**WTVD0035**
Serial Number:	**8C**			**Date:**	**22-May-20**
Customer:	**WatchGuard Video**			**Temperature:**	**22.4 °C**
Attendees:	**Navaid Karimi**			**Humidity:**	**55.6% RH**
Project:	**None**			**Barometric Pres.:**	**1013 mbar**
Tested by:	**Brandon Hobbs**	**Power:**	**Battery 3.7 VDC**	**Job Site:**	**TX03**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

PN: MIC-WRL-TRN-420. All measurement path losses were accounted for and represented in the analyzer reference level offset: Cable, DC block and inline attenuator.

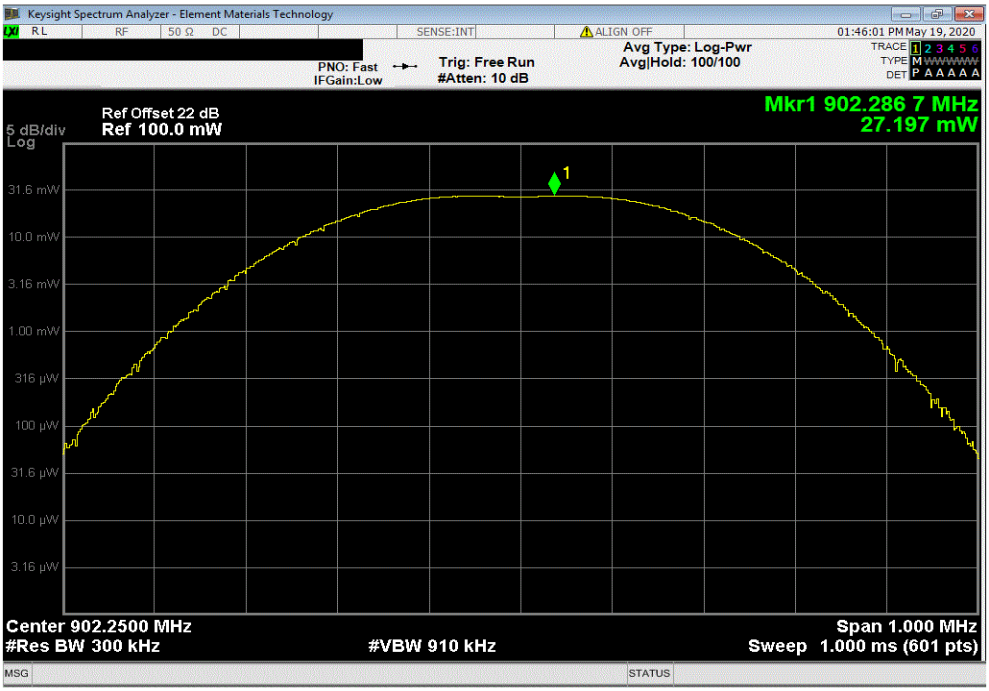
DEVIATIONS FROM TEST STANDARD

None

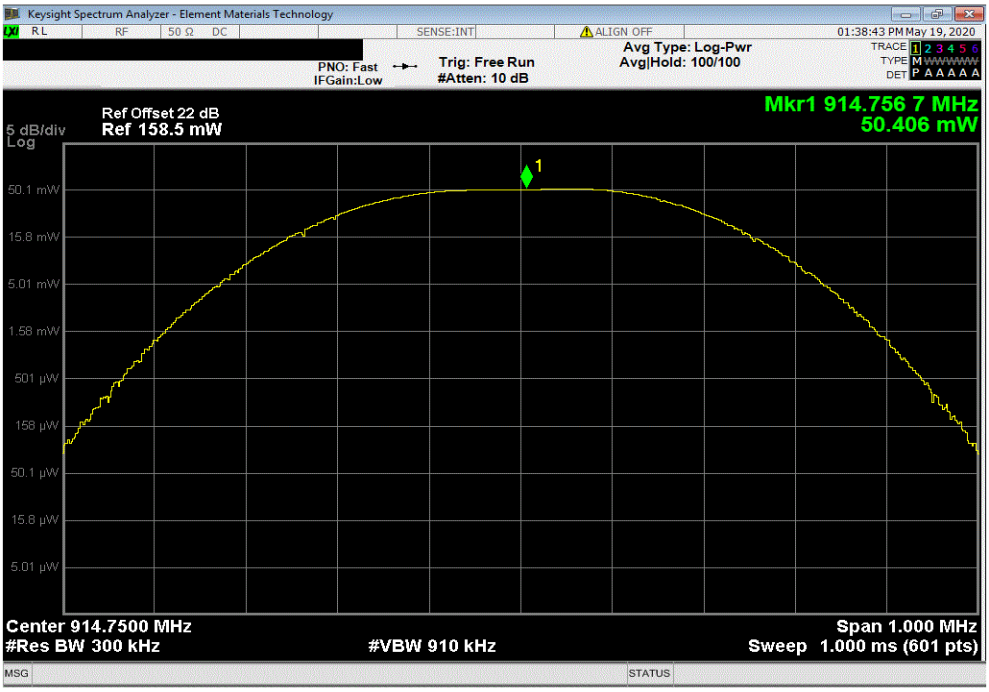
Configuration #	**2**	*Signature*

	Value	**Limit (<)**	**Result**
902 MHz - 928 MHz Band			
Non Hopping Mode			
Low Channel 902.25 MHz	27.197 mW	1 W	Pass
Mid Channel 914.75 MHz	50.406 mW	1 W	Pass
High Channel 927.75 MHz	25.927 mW	1 W	Pass

902 MHz - 928 MHz Band, Non Hopping Mode , Low Channel 902.25 MHz						
				Value	Limit (<)	Result
				27.197 mW	1 W	Pass

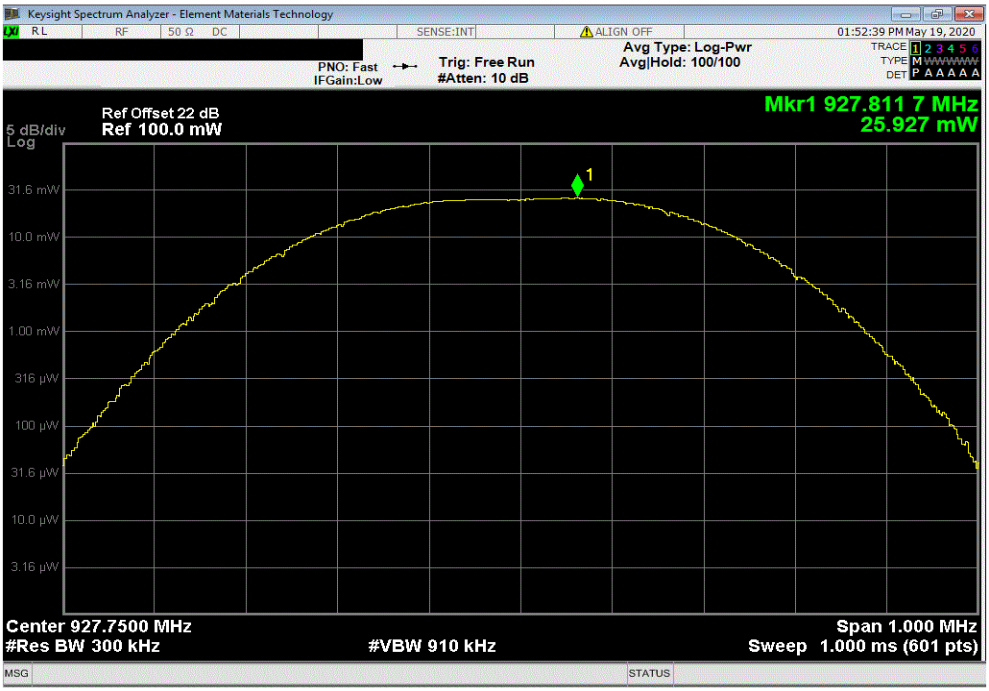


902 MHz - 928 MHz Band, Non Hopping Mode , Mid Channel 914.75 MHz						
				Value	Limit (<)	Result
				50.406 mW	1 W	Pass



OUTPUT POWER

902 MHz - 928 MHz Band, Non Hopping Mode , High Channel 927.75 MHz						
				Value	Limit (<)	Result
				25.927 mW	1 W	Pass



EQUIVALENT ISOTROPIC RADIATED POWER

XMit 2020.03.25.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Block - DC	Fairview Microwave	SD3379	AMM	13-Mar-20	13-Mar-21
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21
Attenuator	Fairview Microwave	SA4018-20	TYW	13-Mar-20	13-Mar-21

TEST DESCRIPTION

The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

Equivalent Isotropic Radiated Power (EIRP) = Max Measured Power + Antenna gain (dBi)

EQUIVALENT ISOTROPIC RADIATED POWER

element

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**MIC-WRL-TRN-420**			**Work Order:**	**WTVD0035**
Serial Number:	**8C**			**Date:**	**22-May-20**
Customer:	**WatchGuard Video**			**Temperature:**	**22.7 °C**
Attendees:	**Navaid Karimi**			**Humidity:**	**51.6% RH**
Project:	**None**			**Barometric Pres.:**	**1015 mbar**
Tested by:	**Brandon Hobbs**	**Power:**	**Battery 3.7 VDC**	**Job Site:**	**TX03**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

PN: MIC-WRL-TRN-420. All measurement path losses were accounted for and represented in the analyzer reference level offset: Cable, DC block and inline attenuator.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	**2**	*Signature*

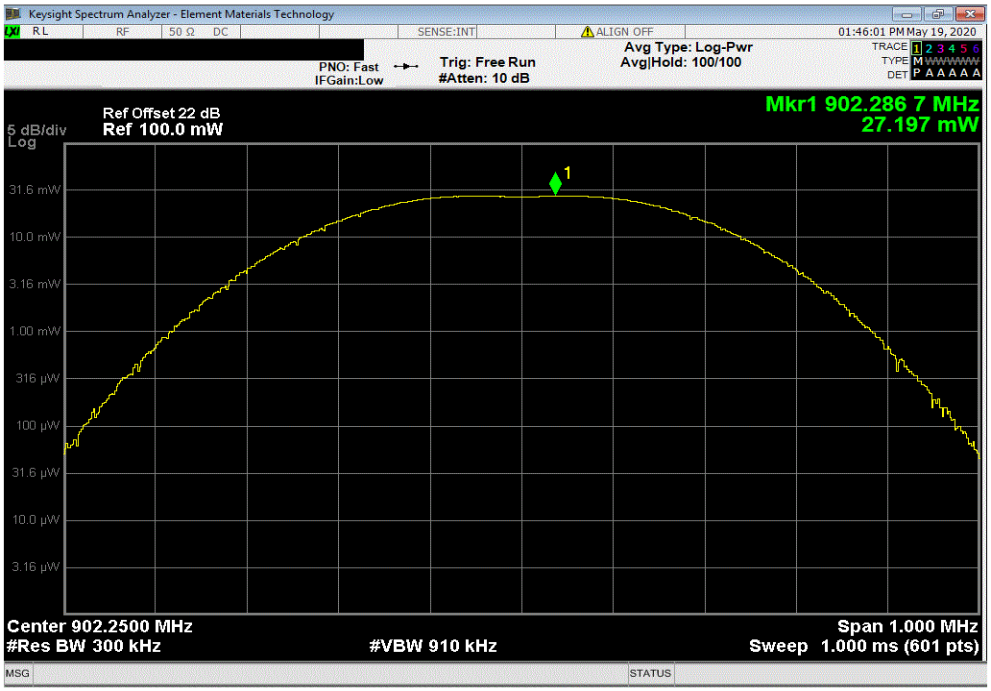
	Initial Value	Antenna Gain (dBi)	Duty Cycle Correction (dB)	Final Value	Limit (<)	Result
902 MHz - 928 MHz Band						
Non Hopping Mode						
Low Channel 902.25 MHz	27.197 mW	1.7	0	40.2 mW	4 W	Pass
Mid Channel 914.75 MHz	50.406 mW	1.7	0	74.6 mW	4 W	Pass
High Channel 927.75 MHz	25.927 mW	1.7	0	38.3 mW	4 W	Pass

EQUIVALENT ISOTROPIC RADIATED POWER

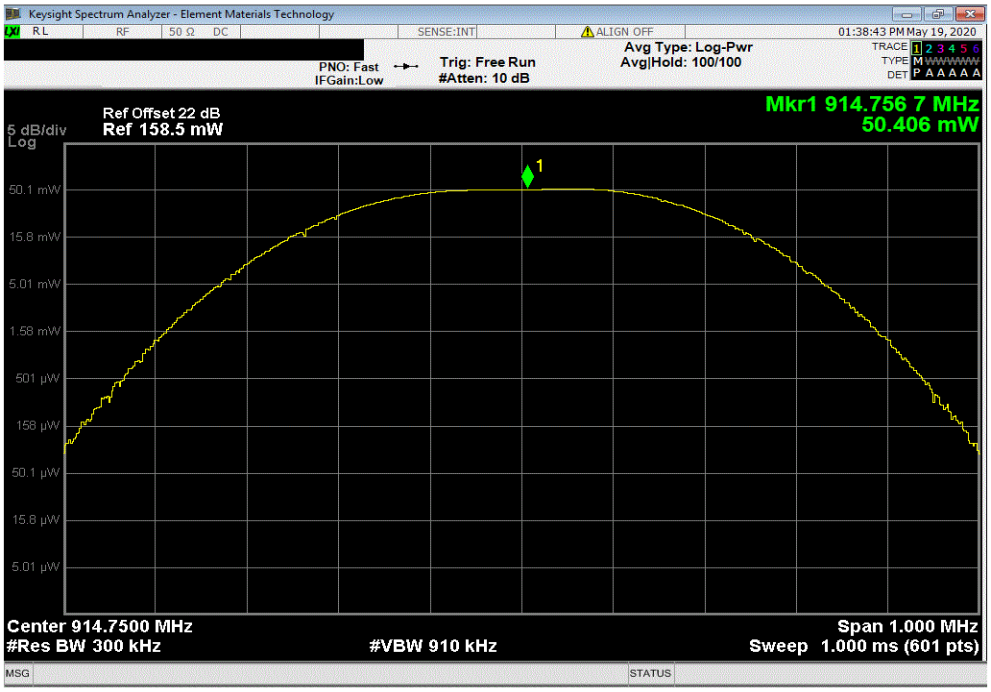
element

TbtTx 2019.08.30.0 XMit 2020.03.25.0

902 MHz - 928 MHz Band, Non Hopping Mode , Low Channel 902.25 MHz						
	Initial Value	Antenna Gain (dBi)	Duty Cycle Correction (dB)	Final Value	Limit (<)	Result
	27.197 mW	1.7	0	40.2 mW	4 W	Pass

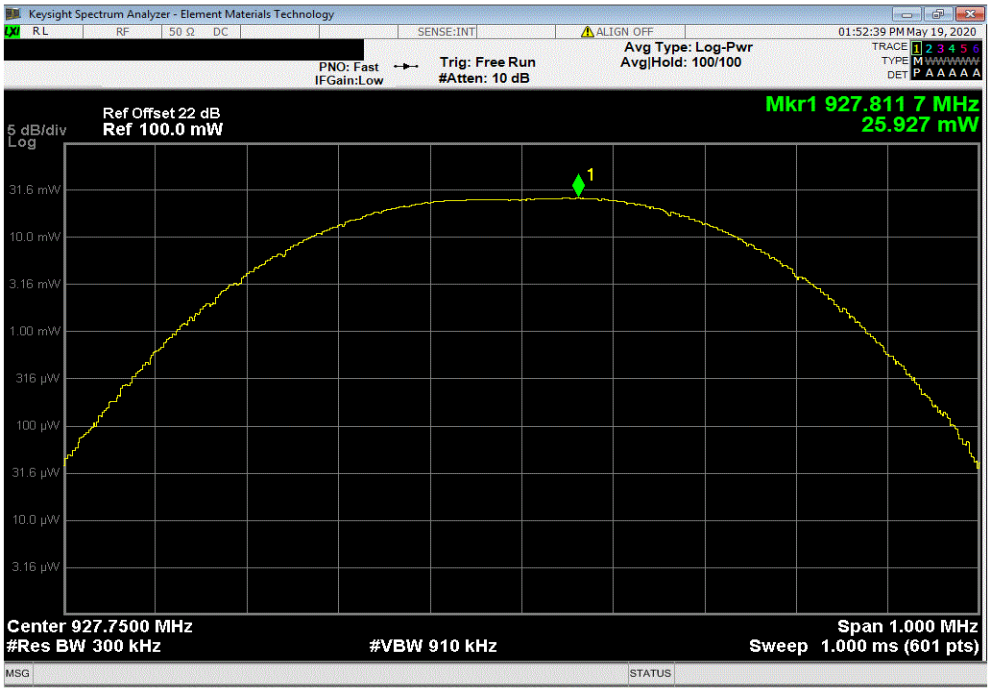


902 MHz - 928 MHz Band, Non Hopping Mode , Mid Channel 914.75 MHz						
	Initial Value	Antenna Gain (dBi)	Duty Cycle Correction (dB)	Final Value	Limit (<)	Result
	50.406 mW	1.7	0	74.6 mW	4 W	Pass



EQUIVALENT ISOTROPIC RADIATED POWER

902 MHz - 928 MHz Band, Non Hopping Mode , High Channel 927.75 MHz						
	Initial Value	Antenna Gain (dBi)	Duty Cycle Correction (dB)	Final Value	Limit (<)	Result
	25.927 mW	1.7	0	38.3 mW	4 W	Pass



BAND EDGE COMPLIANCE

XMit 2020.03.25.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Block - DC	Fairview Microwave	SD3379	AMM	13-Mar-20	13-Mar-21
Attenuator	Fairview Microwave	SA4018-20	TYW	13-Mar-20	13-Mar-21

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

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

BAND EDGE COMPLIANCE

element

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**MIC-WRL-TRN-420**			**Work Order:**	**WTVD0035**
Serial Number:	**8C**			**Date:**	**22-May-20**
Customer:	**WatchGuard Video**			**Temperature:**	**22.4 °C**
Attendees:	**Navaid Karimi**			**Humidity:**	**52% RH**
Project:	**None**			**Barometric Pres.:**	**1015 mbar**
Tested by:	**Brandon Hobbs**	**Power:**	**Battery 3.7 VDC**	**Job Site:**	**TX03**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

PN: MIC-WRL-TRN-420. All measurement path losses were accounted for and represented in the analyzer reference level offset: Cable, DC block and inline attenuator.

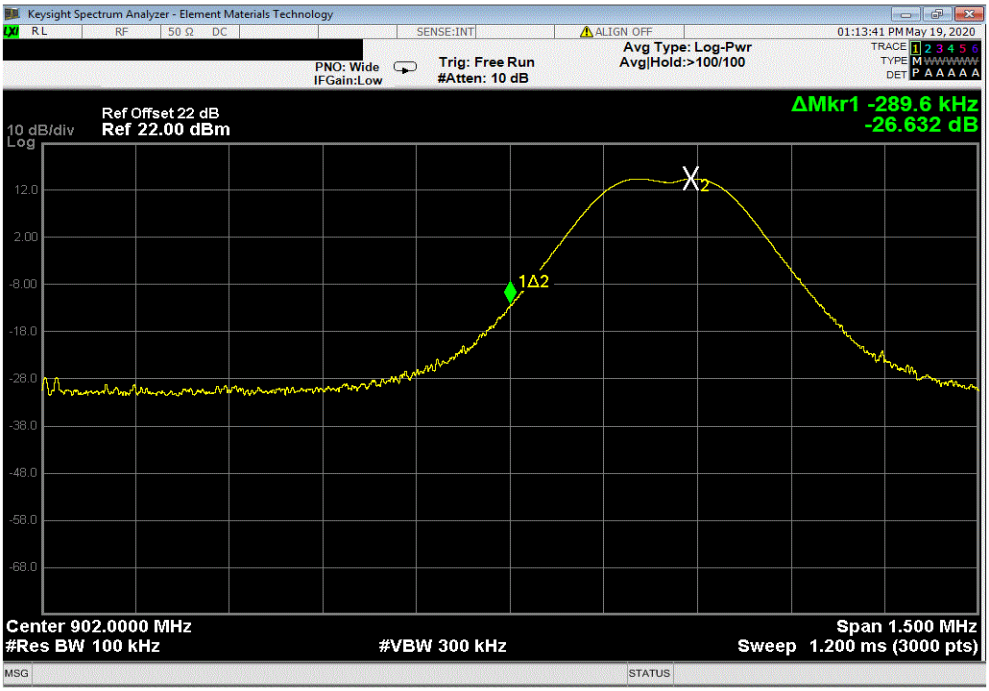
DEVIATIONS FROM TEST STANDARD

None

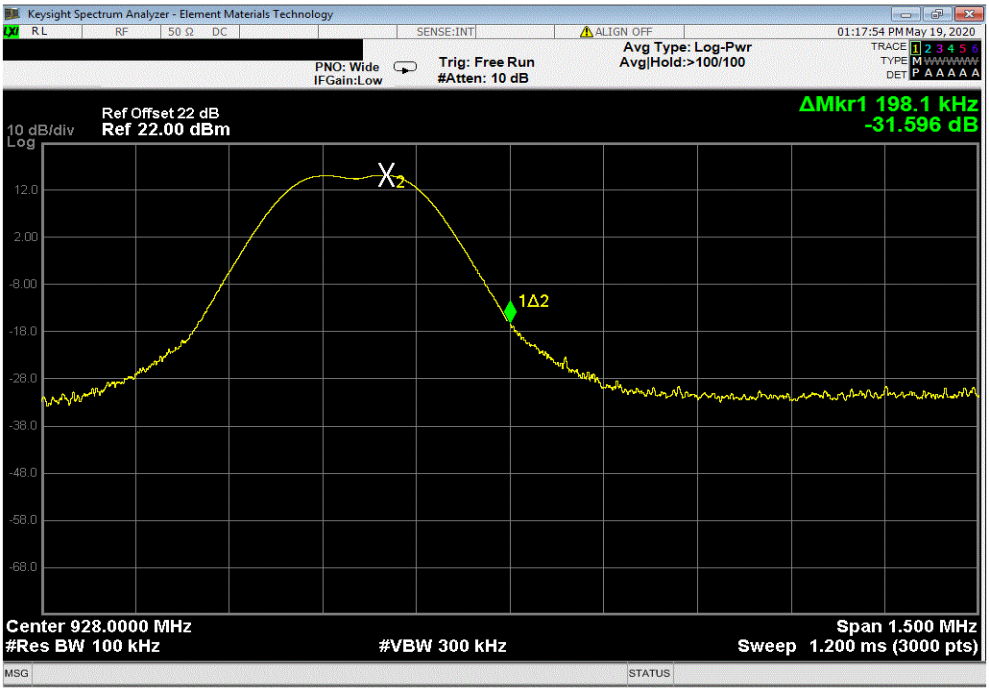
Configuration #	**2**	*Signature*

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
902 MHz - 928 MHz Band			
Non Hopping Mode			
Low Channel 902.25 MHz	-26.63	-20	Pass
High Channel 927.75 MHz	-31.6	-20	Pass

902 MHz - 928 MHz Band, Non Hopping Mode , Low Channel 902.25 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-26.63	-20	Pass



902 MHz - 928 MHz Band, Non Hopping Mode , High Channel 927.75 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-31.6	-20	Pass



BAND EDGE COMPLIANCE -HOPPING MODE

XMit 2020.03.25.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21
Block - DC	Fairview Microwave	SD3379	AMM	13-Mar-20	13-Mar-21
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Attenuator	Fairview Microwave	SA4018-20	TYW	13-Mar-20	13-Mar-21

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to its normal pseudo-random hopping sequence. 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 -HOPPING MODE

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**MIC-WRL-TRN-420**			**Work Order:**	**WTVD0035**
Serial Number:	**8C**			**Date:**	**22-May-20**
Customer:	**WatchGuard Video**			**Temperature:**	**22.6 °C**
Attendees:	**Navaid Karimi**			**Humidity:**	**53.4% RH**
Project:	**None**			**Barometric Pres.:**	**1013 mbar**
Tested by:	**Brandon Hobbs**	**Power:**	**Battery 3.7 VDC**	**Job Site:**	**TX03**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

PN: MIC-WRL-TRN-420. All measurement path losses were accounted for and represented in the analyzer reference level offset: Cable, DC block and inline attenuator.

DEVIATIONS FROM TEST STANDARD

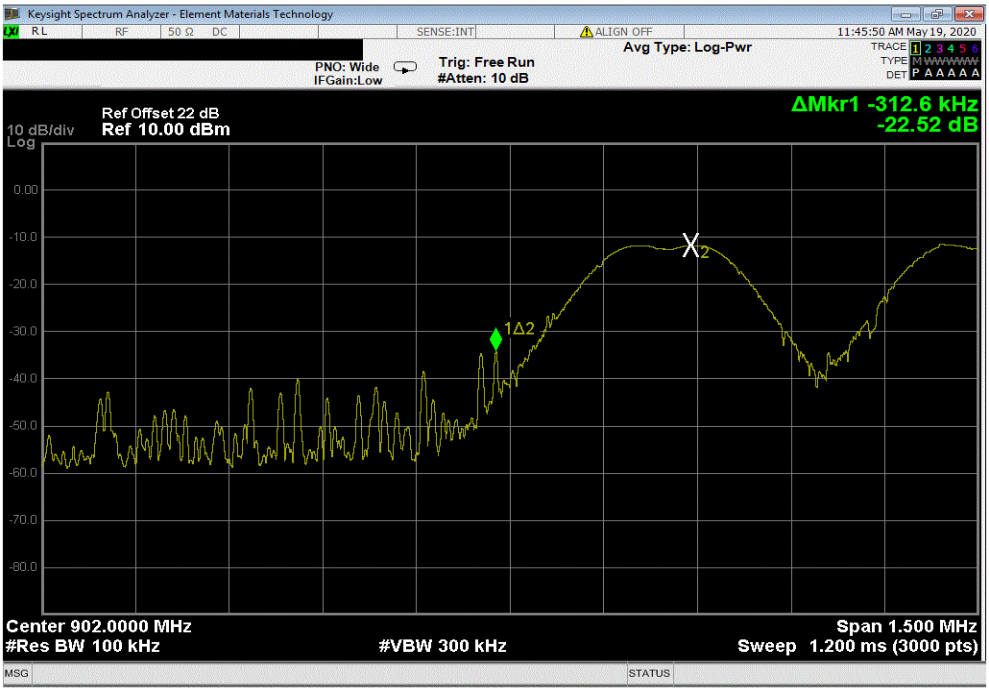
None

Configuration #	**2**	*Signature*

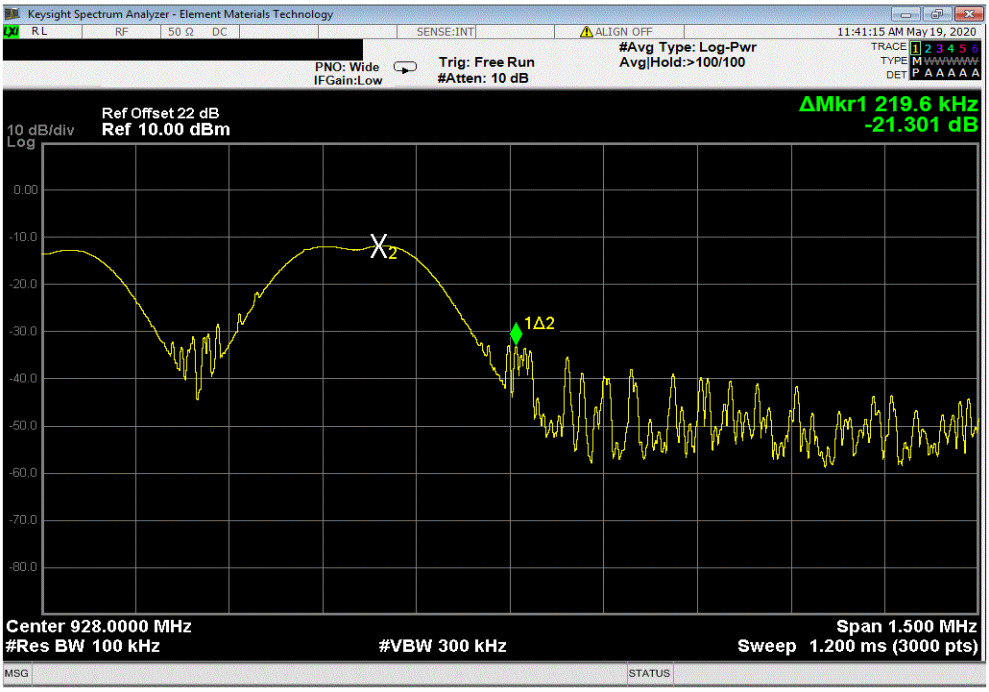
	Value (dBc)	**Limit ≤ (dBc)**	**Result**
902 MHz - 928 MHz Band			
Hopping Mode			
Low Channel 902.25 MHz	-22.52	-20	Pass
High Channel 927.75 MHz	-21.3	-20	Pass

BAND EDGE COMPLIANCE -HOPPING MODE

902 MHz - 928 MHz Band, Hopping Mode, Low Channel 902.25 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-22.52	-20	Pass



902 MHz - 928 MHz Band, Hopping Mode, High Channel 927.75 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-21.3	-20	Pass



OCCUPIED BANDWIDTH

XMit 2020.03.25.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3379	AMM	13-Mar-20	13-Mar-21
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21
Attenuator	Fairview Microwave	SA4018-20	TYW	13-Mar-20	13-Mar-21

TEST DESCRIPTION

The 20 dB and the 99% occupied bandwidth was measured with the EUT set to low, medium and high transmit frequencies in the band. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode.

OCCUPIED BANDWIDTH

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**MIC-WRL-TRN-420**			**Work Order:**	**WTVD0035**
Serial Number:	**8C**			**Date:**	**22-May-20**
Customer:	**WatchGuard Video**			**Temperature:**	**22.3 °C**
Attendees:	**Navaid Karimi**			**Humidity:**	**52.6% RH**
Project:	**None**			**Barometric Pres.:**	**1015 mbar**
Tested by:	**Brandon Hobbs**	**Power:**	**Battery 3.7 VDC**	**Job Site:**	**TX03**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

PN: MIC-WRL-TRN-420. All measurement path losses were accounted for and represented in the analyzer reference level offset: Cable, DC block and inline attenuator.

DEVIATIONS FROM TEST STANDARD

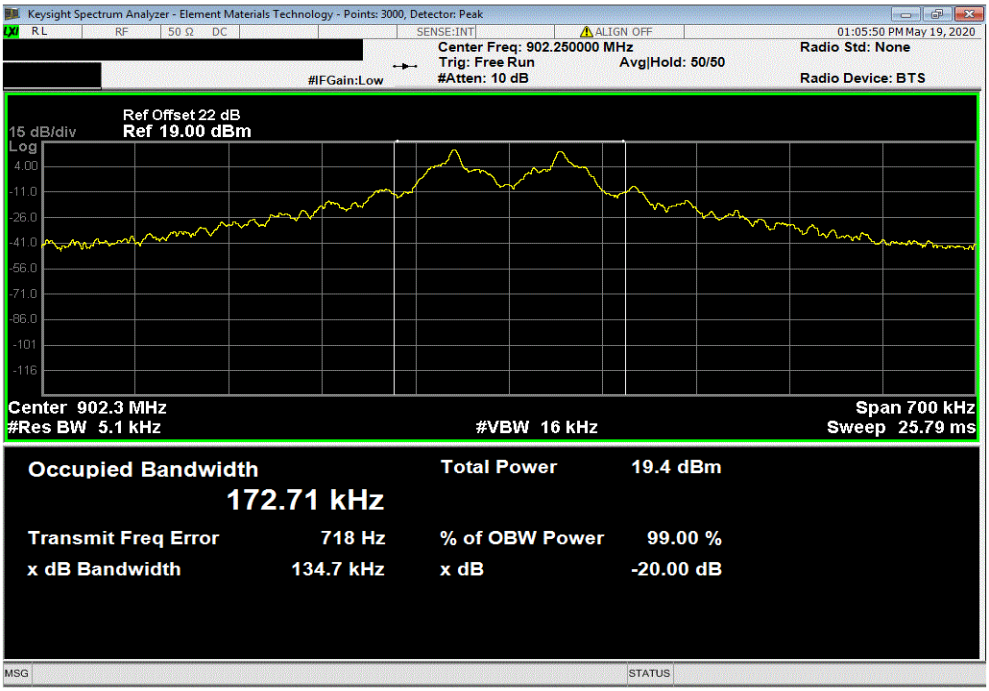
None

Configuration #	**2**	*Signature*

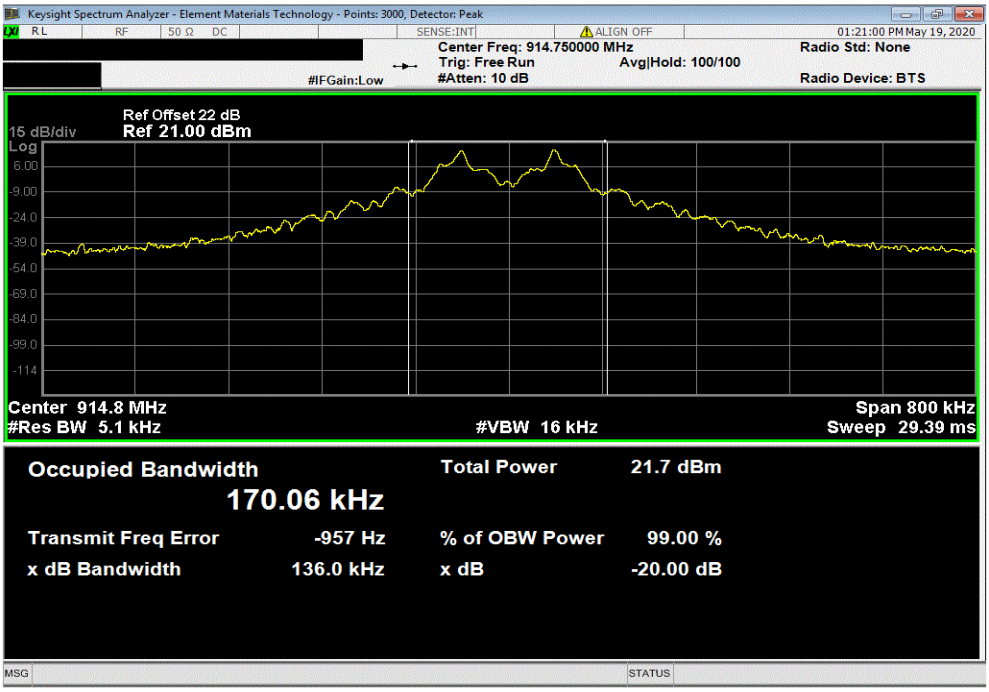
	99% Value	**-20dB Value**	**Limit (≤)**	**Result**
902 MHz - 928 MHz Band				
Non Hopping Mode				
Low Channel 902.25 MHz	172.71 kHz	134.652 kHz	250 kHz	Pass
Mid Channel 914.75 MHz	170.06 kHz	136.009 kHz	250 kHz	Pass
High Channel 927.75 MHz	167.47 kHz	135.831 kHz	250 kHz	Pass

OCCUPIED BANDWIDTH

902 MHz - 928 MHz Band, Non Hopping Mode , Low Channel 902.25 MHz						
			99% Value	-20dB Value	Limit (≤)	Result
			172.71 kHz	134.652 kHz	250 kHz	Pass

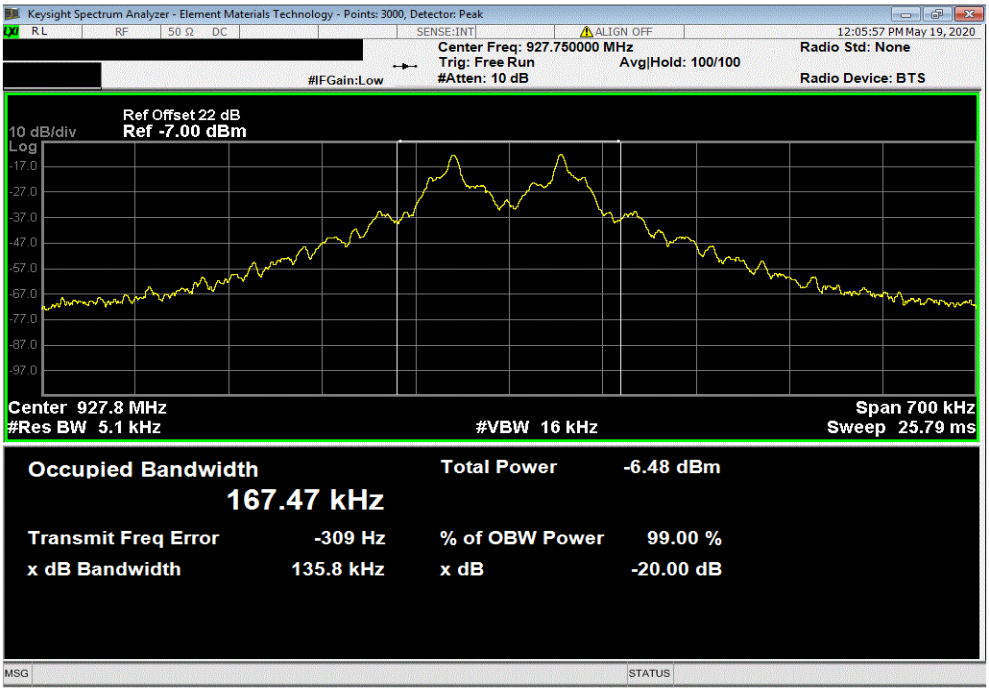


902 MHz - 928 MHz Band, Non Hopping Mode , Mid Channel 914.75 MHz						
			99% Value	-20dB Value	Limit (≤)	Result
			170.06 kHz	136.009 kHz	250 kHz	Pass



OCCUPIED BANDWIDTH

902 MHz - 928 MHz Band, Non Hopping Mode , High Channel 927.75 MHz						
			99% Value	-20dB Value	Limit (≤)	Result
			167.47 kHz	135.831 kHz	250 kHz	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2020.03.25.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	Fairview Microwave	SA4018-20	TYW	13-Mar-20	13-Mar-21
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Block - DC	Fairview Microwave	SD3379	AMM	13-Mar-20	13-Mar-21

TEST DESCRIPTION

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 in a no-hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

SPURIOUS CONDUCTED EMISSIONS

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**MIC-WRL-TRN-420**			**Work Order:**	**WTVD0035**
Serial Number:	**8C**			**Date:**	**22-May-20**
Customer:	**WatchGuard Video**			**Temperature:**	**22.8 °C**
Attendees:	**Navaid Karimi**			**Humidity:**	**53.1% RH**
Project:	**None**			**Barometric Pres.:**	**1013 mbar**
Tested by:	**Brandon Hobbs**	**Power:**	**Battery 3.7 VDC**	**Job Site:**	**TX03**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

PN: MIC-WRL-TRN-420. All measurement path losses were accounted for and represented in the analyzer reference level offset: Cable, DC block and inline attenuator.

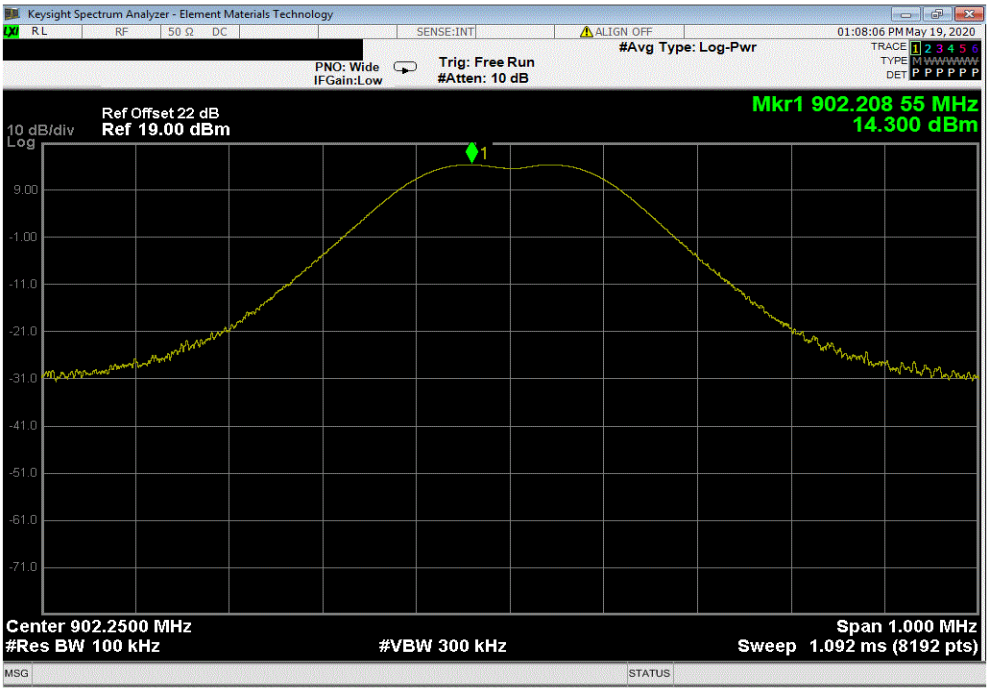
DEVIATIONS FROM TEST STANDARD

None

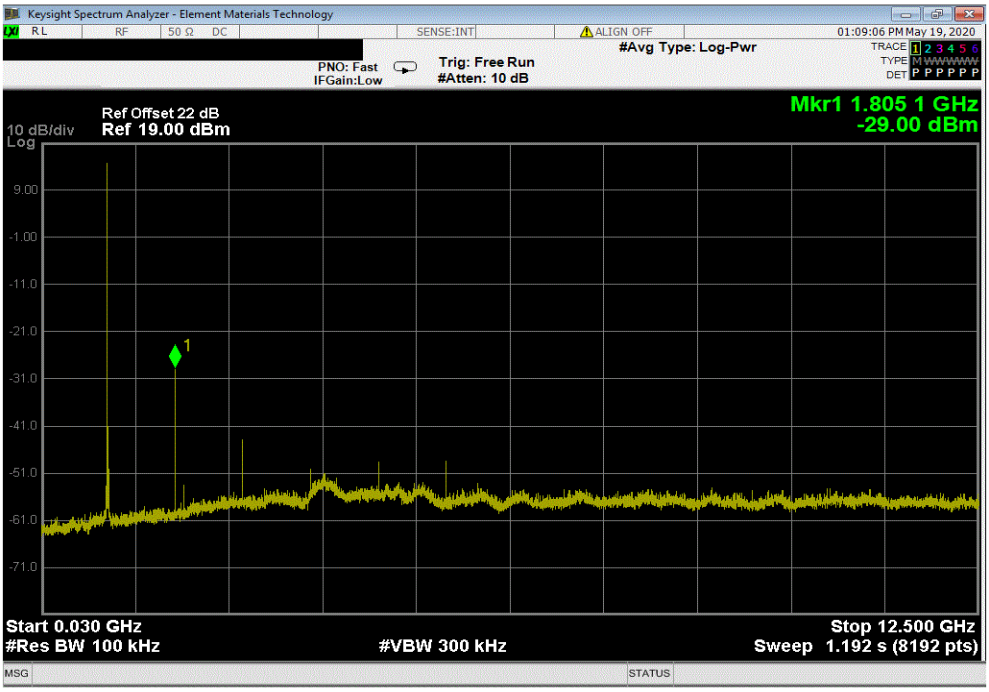
Configuration #	**2**	*Signature*

		Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
902 MHz - 928 MHz Band						
	Non Hopping Mode					
	Low Channel 902.25 MHz	Fundamental	902.21	N/A	N/A	N/A
	Low Channel 902.25 MHz	30 MHz - 12.5 GHz	1805.12	-43.3	-20	Pass
	Low Channel 902.25 MHz	12.5 GHz - 25 GHz	24056.89	-64.32	-20	Pass
	Mid Channel 914.75 MHz	Fundamental	914.79	N/A	N/A	N/A
	Mid Channel 914.75 MHz	30 MHz - 12.5 GHz	1829.48	-42.5	-20	Pass
	Mid Channel 914.75 MHz	12.5 GHz - 25 GHz	22341.59	-67.33	-20	Pass
	High Channel 927.75 MHz	Fundamental	927.8	N/A	N/A	N/A
	High Channel 927.75 MHz	30 MHz - 12.5 GHz	1855.36	-45.65	-20	Pass
	High Channel 927.75 MHz	12.5 GHz - 25 GHz	21049.02	-65.77	-20	Pass

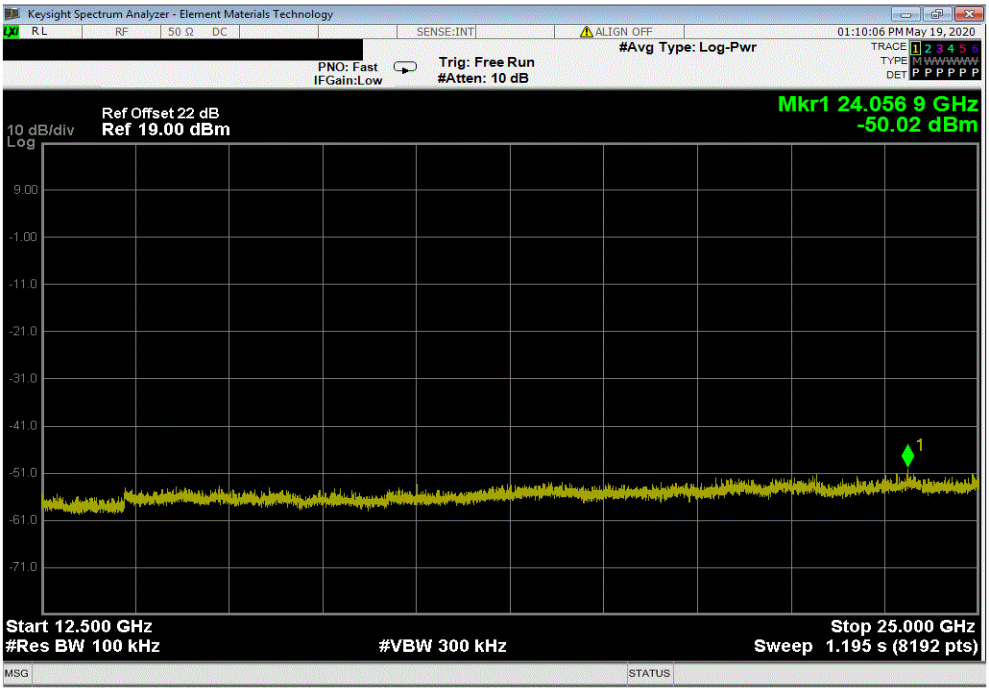
902 MHz - 928 MHz Band, Non Hopping Mode , Low Channel 902.25 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	902.21	N/A	N/A	N/A



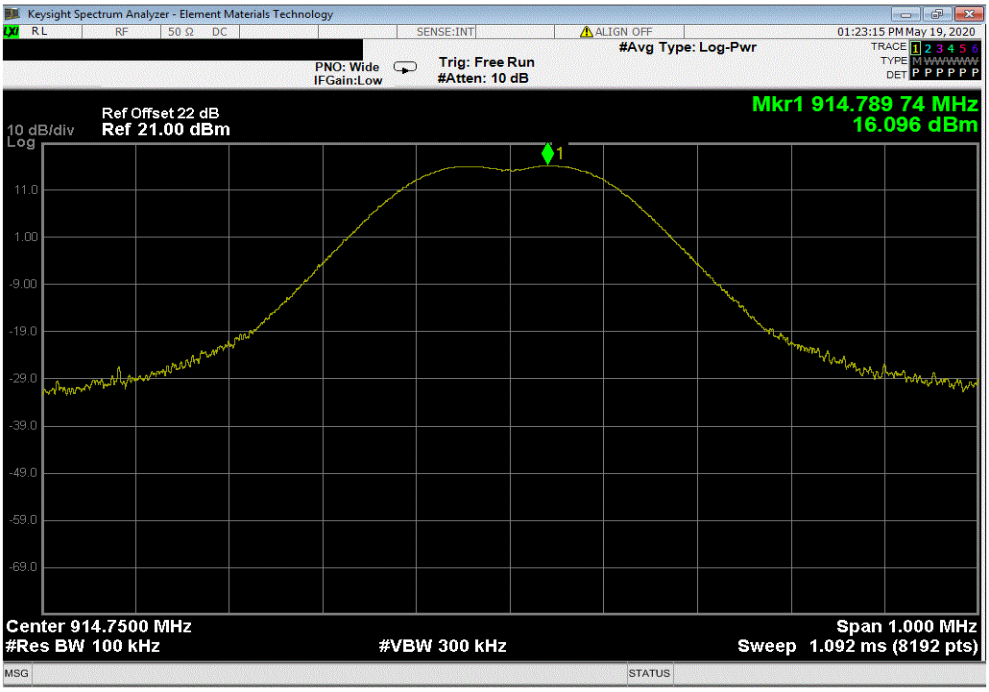
902 MHz - 928 MHz Band, Non Hopping Mode , Low Channel 902.25 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	1805.12	-43.3	-20	Pass



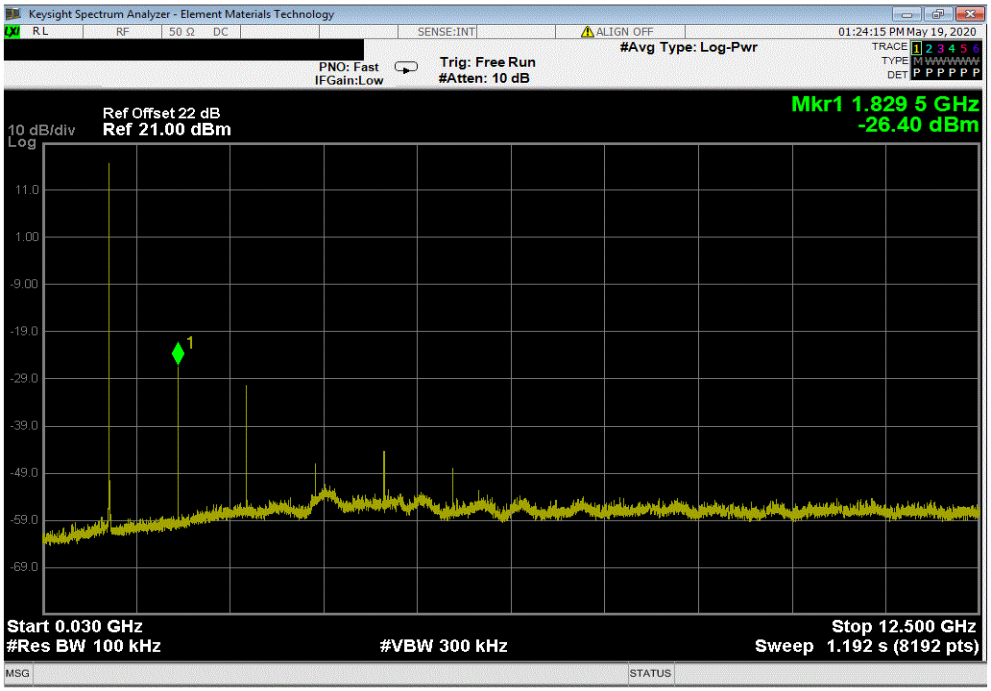
902 MHz - 928 MHz Band, Non Hopping Mode , Low Channel 902.25 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24056.89	-64.32	-20	Pass



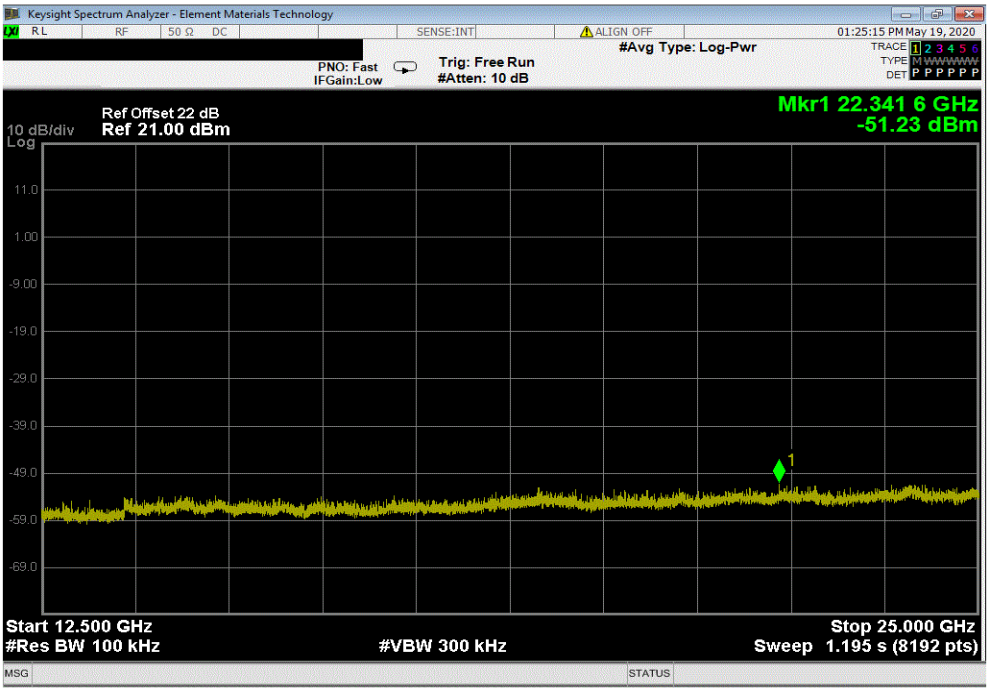
902 MHz - 928 MHz Band, Non Hopping Mode , Mid Channel 914.75 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental	914.79	N/A	N/A	N/A



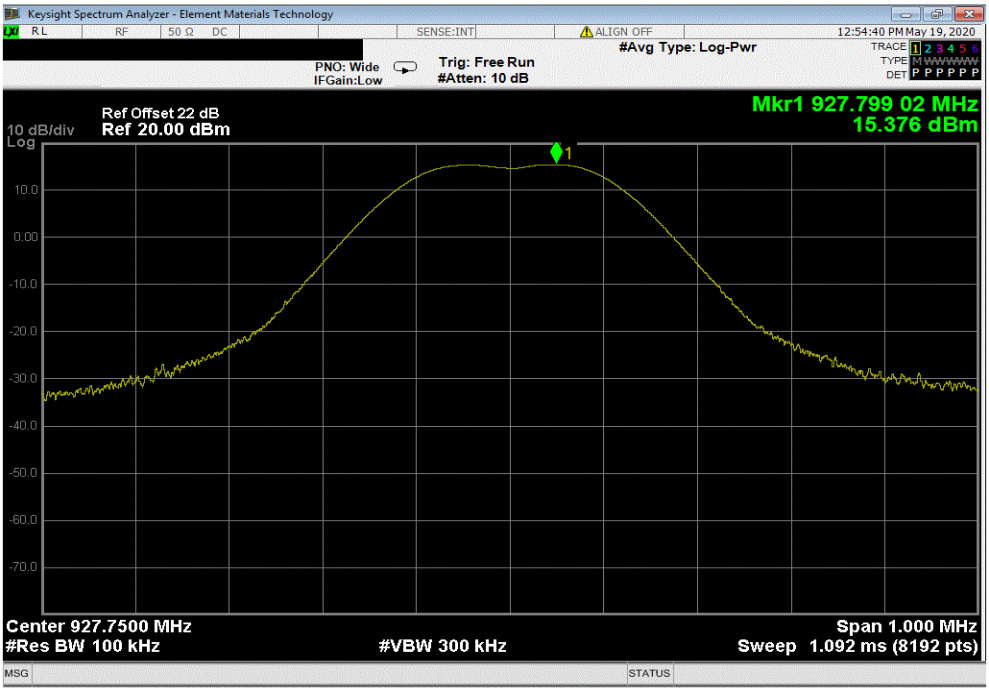
902 MHz - 928 MHz Band, Non Hopping Mode , Mid Channel 914.75 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz	1829.48	-42.5	-20	Pass



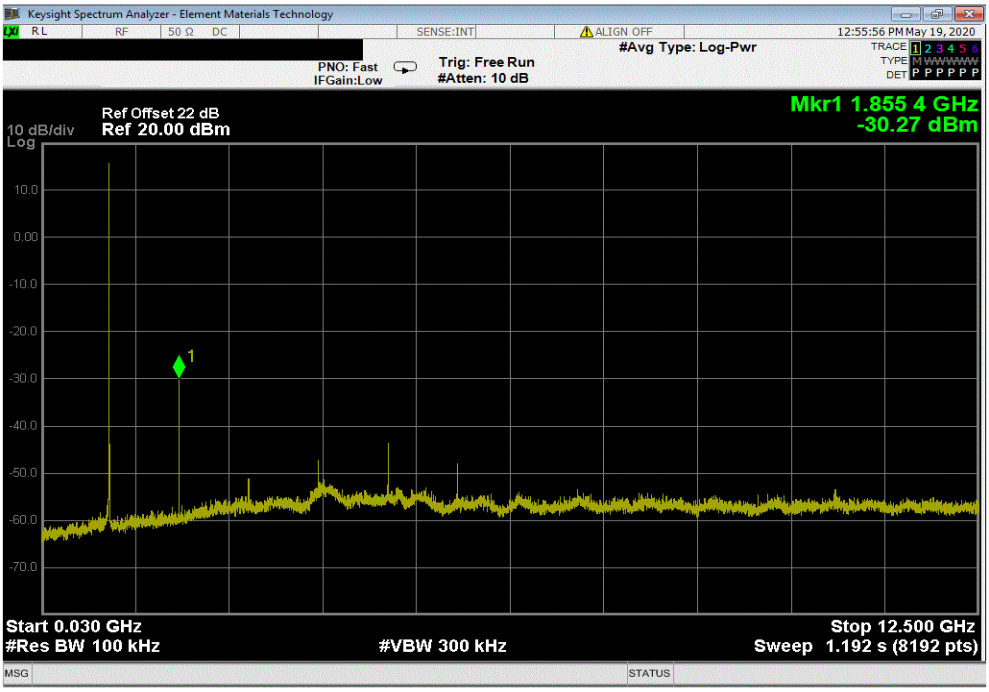
902 MHz - 928 MHz Band, Non Hopping Mode , Mid Channel 914.75 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz	22341.59	-67.33	-20	Pass



902 MHz - 928 MHz Band, Non Hopping Mode , High Channel 927.75 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	927.8	N/A	N/A	N/A



902 MHz - 928 MHz Band, Non Hopping Mode , High Channel 927.75 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	1855.36	-45.65	-20	Pass



902 MHz - 928 MHz Band, Non Hopping Mode , High Channel 927.75 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz	21049.02	-65.77	-20	Pass