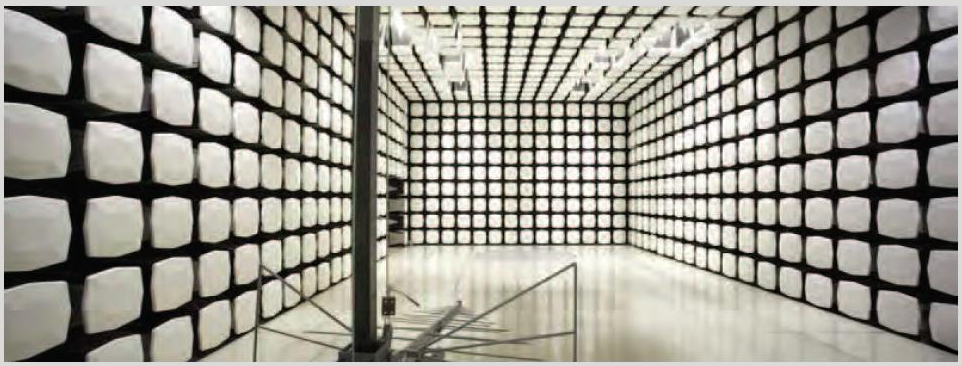
LightSpeed Aviation

Sierra

FCC 15.247:2022

Aviation Headset with Auxiliary Bluetooth Connection

Report: LISA0056 Rev. 1, Issue Date: May 4, 2022



CERT #3310.02

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CERTIFICATE OF TEST

Last Date of Test: March 9, 2022
LightSpeed Aviation
EUT: Sierra

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2022	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	
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	

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
01	Removed DCCF from the band edge measurements.	2022-05-04	20

ACCREDITATIONS AND AUTHORIZATIONS

element
2021.09.01

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 - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

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 – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

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.

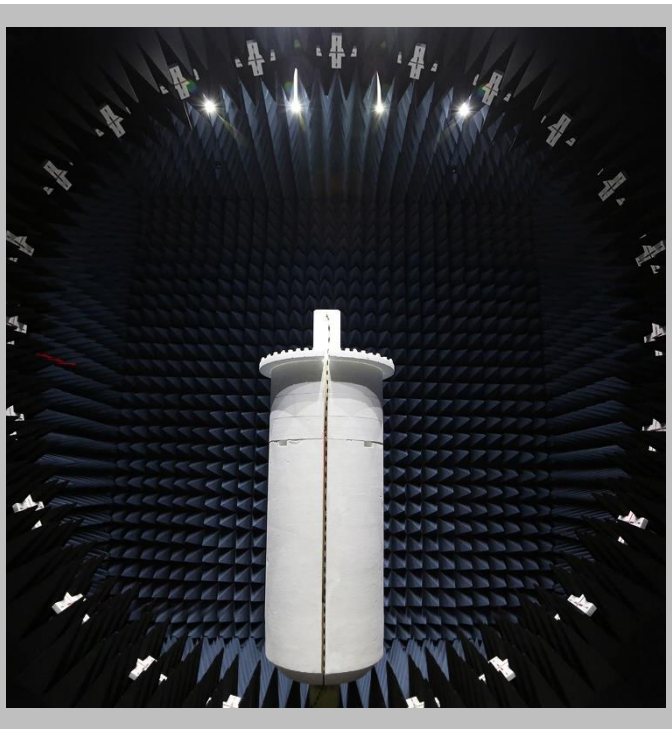
SCOPE

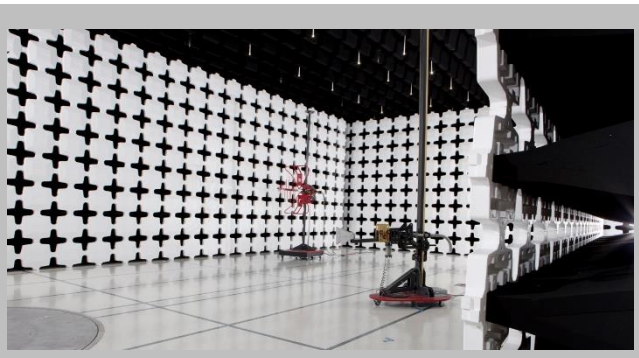
For details on the Scopes of our Accreditations, please visit:

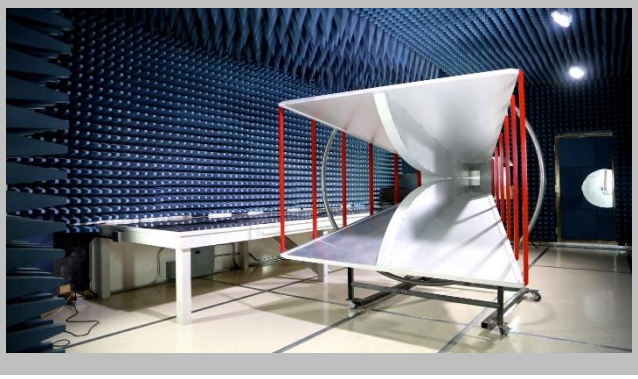
California Minnesota Oregon Texas Washington

FACILITIES

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-11 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
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
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 in the table below. A lab specific value may also be found in the applicable test description section. 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)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	3.2 dB	-3.2 dB

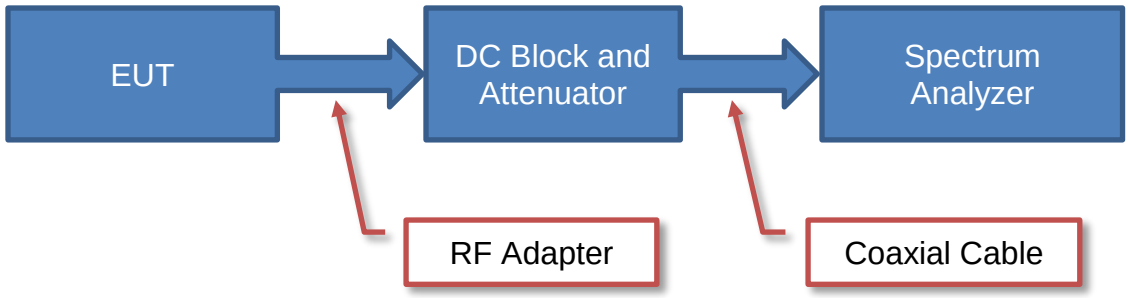
TEST SETUP BLOCK DIAGRAMS

Measurement Bandwidths

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Unless otherwise stated, measurements were made using the bandwidths and detectors specified. No video filter was used.

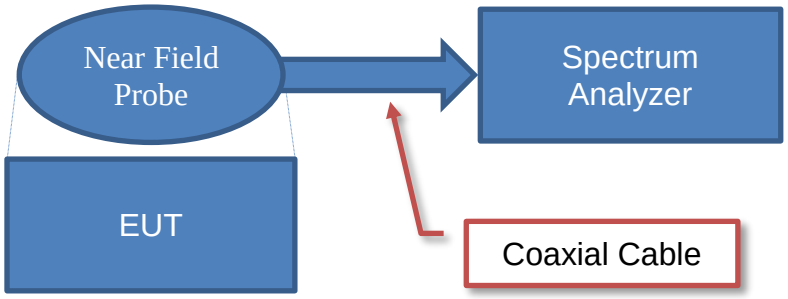
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

Near Field Test Fixture Measurements

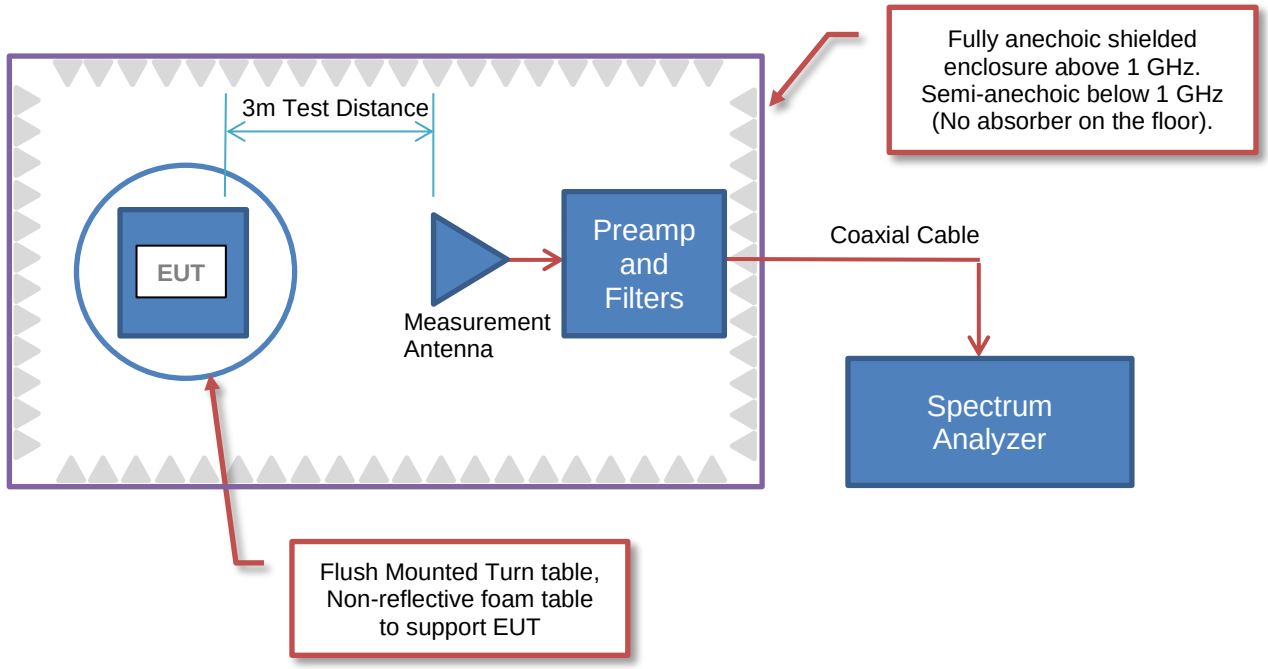


Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

Measured Level (Amplitude)		Factor: Antenna Factor		Factor: Cable Factor		Factor: Amplifier Gain		Distance Adjustment Factor		External Attenuation		Field Strength
42.6	+	28.6	+	3.1	-	40.8	+	0.0	+	0.0	=	**33.5**

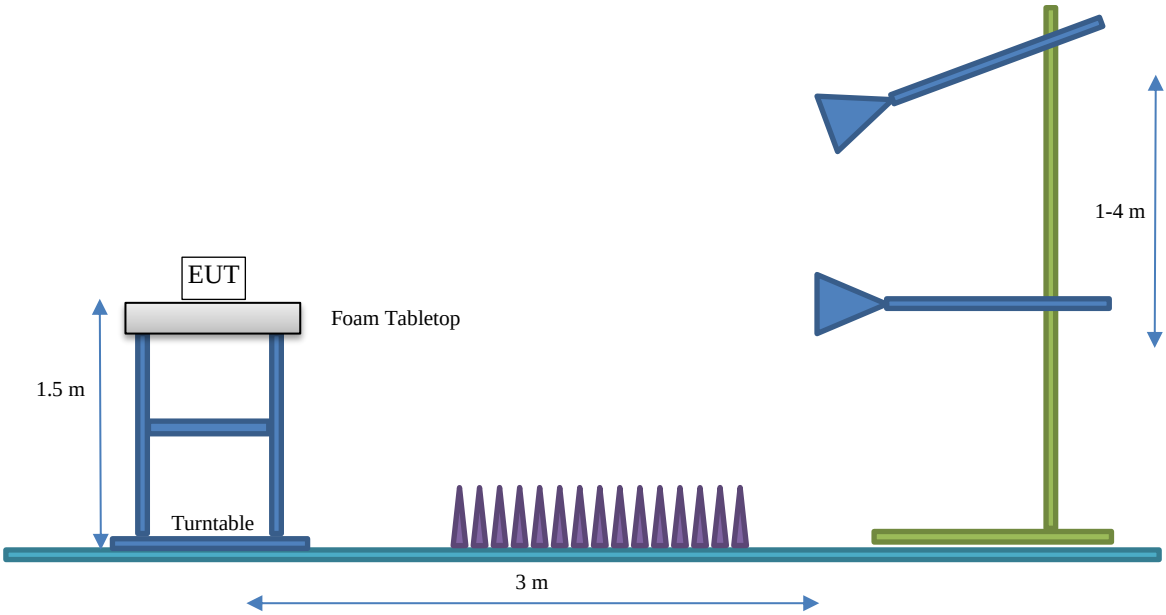
Conducted Emissions:

Measured Level (Amplitude)		Factor: Transducer Factor		Factor: Cable Factor		External Attenuation		Adjusted Level
26.7	+	0.3	+	0.1	+	20.0	=	**47.1**

TEST SETUP BLOCK DIAGRAMS

Bore Sighting (>1GHz)

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. Above 1 GHz, when required by the measurement standard, the antenna is pointed for both azimuth and elevation to maintain the receive antenna within the cone of radiation from the EUT. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	LightSpeed Aviation
Address:	6135 SW Jean Rd
City, State, Zip:	Lake Oswego, OR 97035
Test Requested By:	Ed Katz
EUT:	Sierra
First Date of Test:	March 8, 2022
Last Date of Test:	March 9, 2022
Receipt Date of Samples:	March 8, 2022
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Aviation Headset with Auxiliary Bluetooth Connection

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

POWER SETTINGS AND ANTENNAS

The power settings, antenna gain value(s) and cable loss (if applicable) used for the testing contained in this report were provided by the customer and will affect the validity of the results. Element assumes no responsibility for the accuracy of this information.

ANTENNA GAIN (dBi)

Type	Provided by:	Frequency Range (MHz)	Gain (dBi)
F-type	Manufacturer	2400-2500	4.0

The EUT was tested using the power settings provided by the manufacturer:

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types	Type	Channel	Position	Frequency (MHz)	Power Setting (dBm)
GFSK DH5	FHSS	0	Low Channel	2402	3
		39	Mid Channel	2441	
		78	High Channel	2480	
DQPSK 2DH5	FHSS	0	Low Channel	2402	
		39	Mid Channel	2441	
		78	High Channel	2480	
8DPSK 3DH5	FHSS	0	Low Channel	2402	
		39	Mid Channel	2441	
		78	High Channel	2480	

CONFIGURATIONS

Configuration LISA0056- 1

Software/Firmware Running During Test	
Description	**Version**
BlueTest 3	2.6.0.45

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Bluetooth Headphones	LightSpeed Aviation	Sierra	500042137

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Upper Cable	Yes	1.3 m	No	Bluetooth Headphones	Bluetooth Headphones
Lower Cable	Yes	0.5 m	No	Bluetooth Headphones	None

Configuration LISA0056- 2

Software/Firmware Running During Test	
Description	**Version**
BlueTest 3	2.6.0.45

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Bluetooth Headphones	LightSpeed Aviation	Sierra	500042135

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
SPI to Ethernet Adapter	CSR	M1616V2	None
USB-SPI Converter	CSR	DEV-SYS-1808-1A	268956
Laptop	Dell	Precision 3541	54FV3Z2

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Programming Cable	No	0.1 m	No	Bluetooth Headphones	SPI to Ethernet Adapter
Ethernet - Cat 5e	Yes	1.0 m	No	SPI to Ethernet Adapter	USB-SPI Converter
USB	Yes	1.8 m	No	USB-SPI Converter	Laptop

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2022-03-08	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	2022-03-09	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.
3	2022-03-09	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.
4	2022-03-09	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.
5	2022-03-09	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.
6	2022-03-09	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.
7	2022-03-09	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.
8	2022-03-09	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.
9	2022-03-09	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.
10	2022-03-09	Emissions Bandwidth (20 dB)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
11	2022-03-09	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 EMISSSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

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 10*log(DC), where DC is the worst-case dwell time of the radio while in a hopping mode in a 100 ms period.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	2021-12-09	2022-12-09
Antenna - Biconilog	EMCO	3142B	AXJ	2021-03-03	2023-03-03
Antenna - Double Ridge	EMCO	3115	AHC	2020-07-01	2022-07-01
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	NCR
Antenna - Standard Gain	ETS Lindgren	3160-08	AHV	NCR	NCR
Antenna - Standard Gain	ETS Lindgren	3160-09	AIV	NCR	NCR
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	2021-11-17	2022-11-17
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	2021-11-17	2022-11-17
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-08001200-30-10P	PAO	2021-11-17	2022-11-17
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	2021-11-17	2022-11-17
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	2021-07-16	2022-07-16
Cable	N/A	Bilog Cables	EVA	2021-11-17	2022-11-17
Cable	N/A	Double Ridge Horn Cables	EVB	2022-02-15	2023-02-15
Cable	None	Standard Gain Horn Cables	EVF	2021-11-17	2022-11-17
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	EVY	2021-07-16	2022-07-16
Attenuator	Coaxicom	3910-10	AWX	2022-02-10	2023-02-10
Filter - Low Pass	Micro-Tronics	LPM50004	LFD	2022-02-10	2023-02-10
Filter - High Pass	Micro-Tronics	HPM50111	HFO	2021-11-17	2022-11-17

SPURIOUS RADIATED EMISSSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	5.2 dB	-5.2 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 26500 MHz

POWER INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

LISA0056-1

MODES INVESTIGATED

Continuous Tx - Bluetooth, Low Channel = 2402 MHz, Mid Channel = 2441 MHz, High Channel = 2480 MHz

SPURIOUS RADIATED EMISSSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

EUT:	Sierra	Work Order:	LISA0056
Serial Number:	500042137	Date:	2022-03-08
Customer:	LightSpeed Aviation	Temperature:	19°C
Attendees:	Ed Katz	Relative Humidity:	39.4%
Customer Project:	None	Bar. Pressure (PMSL):	1031 mb
Tested By:	Jeff Alcoke	Job Site:	EV01
Power:	Battery	Configuration:	LISA0056-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	15	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

Test mode operates at 77.4% duty cycle, upward DCCF correction applied based on 10*log(1/Duty cycle) = 1.11 dB. When operating in FHSS mode, the worst-case transmission time over any 100 ms period is 2.91 ms. Downward DCCF correction applied based on 10*log(On Time/100 ms) = -15.36 dB Total correction applied = 1.11-15.36 = -14.2 dB.

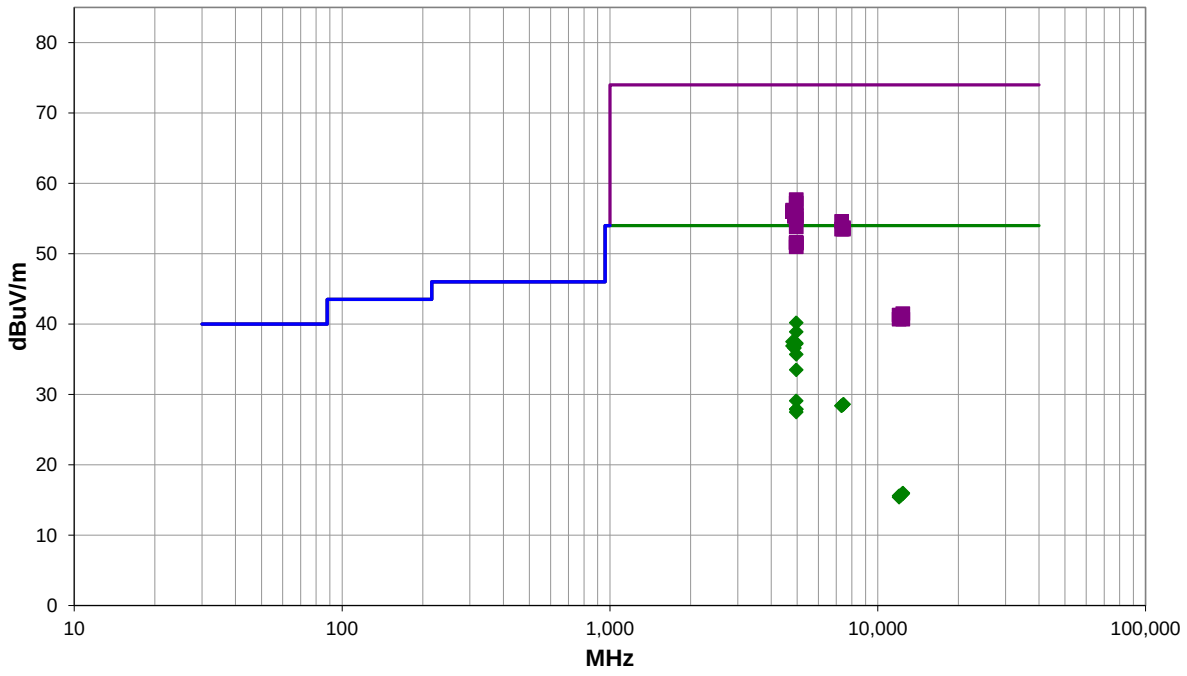
Please reference data comments below for Channel, Data Rate, and EUT orientation.

EUT OPERATING MODES

Continuous Tx - Bluetooth, Low Channel = 2402 MHz, Mid Channel = 2441 MHz, High Channel = 2480 MHz

DEVIATIONS FROM TEST STANDARD

None



Run #: 15 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

RESULTS - Run #15

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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
4960.017	46.0	8.4	1.0	189.0	-14.2	0.0	Vert	AV	0.0	40.2	54.0	-13.8	High Ch, DH5, EUT Vert
4959.950	44.7	8.4	1.4	88.0	-14.2	0.0	Horz	AV	0.0	38.9	54.0	-15.1	High Ch, DH5, EUT Vert
4959.808	49.3	8.4	1.0	189.0	0.0	0.0	Vert	PK	0.0	57.7	74.0	-16.3	High Ch, DH5, EUT Vert
4803.940	43.5	8.2	2.1	65.0	-14.2	0.0	Horz	AV	0.0	37.5	54.0	-16.5	Low Ch, DH5, EUT Vert
4959.975	43.1	8.4	2.7	219.0	-14.2	0.0	Horz	AV	0.0	37.3	54.0	-16.7	High Ch, DH5, EUT on Side
4882.017	43.3	8.2	1.5	163.0	-14.2	0.0	Vert	AV	0.0	37.3	54.0	-16.7	Mid Ch, DH5, EUT Vert
4960.283	48.8	8.4	1.4	88.0	0.0	0.0	Horz	PK	0.0	57.2	74.0	-16.8	High Ch, DH5, EUT Vert
4959.975	43.0	8.4	1.2	176.0	-14.2	0.0	Vert	AV	0.0	37.2	54.0	-16.8	High Ch, DH5, EUT on Side
4803.953	42.9	8.2	1.6	163.0	-14.2	0.0	Vert	AV	0.0	36.9	54.0	-17.1	Low Ch, DH5, EUT Vert
4881.975	42.6	8.2	1.3	74.0	-14.2	0.0	Horz	AV	0.0	36.6	54.0	-17.4	Mid Ch, DH5, EUT Vert
4804.317	48.0	8.2	2.1	65.0	0.0	0.0	Horz	PK	0.0	56.2	74.0	-17.8	Low Ch, DH5, EUT Vert
4804.067	47.8	8.2	1.6	163.0	0.0	0.0	Vert	PK	0.0	56.0	74.0	-18.0	Low Ch, DH5, EUT Vert
4882.417	47.7	8.2	1.5	163.0	0.0	0.0	Vert	PK	0.0	55.9	74.0	-18.1	Mid Ch, DH5, EUT Vert
4960.033	41.5	8.4	1.0	349.0	-14.2	0.0	Horz	AV	0.0	35.7	54.0	-18.3	High Ch, DH5, EUT Horz
4960.275	47.2	8.4	2.7	219.0	0.0	0.0	Horz	PK	0.0	55.6	74.0	-18.4	High Ch, DH5, EUT on Side
4960.342	47.0	8.4	1.2	176.0	0.0	0.0	Vert	PK	0.0	55.4	74.0	-18.6	High Ch, DH5, EUT on Side
4882.175	47.1	8.2	1.3	74.0	0.0	0.0	Horz	PK	0.0	55.3	74.0	-18.7	Mid Ch, DH5, EUT Vert
4959.950	46.6	8.4	1.0	349.0	0.0	0.0	Horz	PK	0.0	55.0	74.0	-19.0	High Ch, DH5, EUT Horz
7325.042	40.0	14.6	1.5	5.0	0.0	0.0	Horz	PK	0.0	54.6	74.0	-19.4	Mid Ch, DH5, EUT Vert
4959.442	45.4	8.4	1.5	176.0	0.0	0.0	Vert	PK	0.0	53.8	74.0	-20.2	High Ch, DH5, EUT Horz
7439.958	38.6	15.1	1.5	51.0	0.0	0.0	Horz	PK	0.0	53.7	74.0	-20.3	High Ch, DH5, EUT Vert
4959.950	39.3	8.4	1.5	176.0	-14.2	0.0	Vert	AV	0.0	33.5	54.0	-20.5	High Ch, DH5, EUT Horz
7441.525	38.4	15.1	1.5	277.0	0.0	0.0	Vert	PK	0.0	53.5	74.0	-20.5	High Ch, DH5, EUT Vert
7323.917	39.0	14.5	1.5	322.0	0.0	0.0	Vert	PK	0.0	53.5	74.0	-20.5	Mid Ch, DH5, EUT Vert
4959.925	43.2	8.4	1.5	168.0	0.0	0.0	Vert	PK	0.0	51.6	74.0	-22.4	High Ch, 3DH5, EUT Vert
4960.008	43.1	8.4	1.5	157.0	0.0	0.0	Vert	PK	0.0	51.5	74.0	-22.5	High Ch, 2DH5, EUT Vert
4960.208	43.1	8.4	1.4	67.0	0.0	0.0	Horz	PK	0.0	51.5	74.0	-22.5	High Ch, 3DH5, EUT Vert
4959.558	42.6	8.4	1.3	70.0	0.0	0.0	Horz	PK	0.0	51.0	74.0	-23.0	High Ch, 2DH5, EUT Vert
4960.092	34.9	8.4	1.5	168.0	-14.2	0.0	Vert	AV	0.0	29.1	54.0	-24.9	High Ch, 3DH5, EUT Vert
7441.858	27.7	15.1	1.5	51.0	-14.2	0.0	Horz	AV	0.0	28.6	54.0	-25.4	High Ch, DH5, EUT Vert
7440.742	27.7	15.1	1.5	277.0	-14.2	0.0	Vert	AV	0.0	28.6	54.0	-25.4	High Ch, DH5, EUT Vert
7322.850	28.1	14.5	1.5	5.0	-14.2	0.0	Horz	AV	0.0	28.4	54.0	-25.6	Mid Ch, DH5, EUT Vert
7323.217	28.1	14.5	1.5	322.0	-14.2	0.0	Vert	AV	0.0	28.4	54.0	-25.6	Mid Ch, DH5, EUT Vert
4959.875	33.7	8.4	1.5	157.0	-14.2	0.0	Vert	AV	0.0	27.9	54.0	-26.1	High Ch, 2DH5, EUT Vert
4960.133	33.7	8.4	1.4	67.0	-14.2	0.0	Horz	AV	0.0	27.9	54.0	-26.1	High Ch, 3DH5, EUT Vert
4960.158	33.3	8.4	1.3	70.0	-14.2	0.0	Horz	AV	0.0	27.5	54.0	-26.5	High Ch, 2DH5, EUT Vert
12397.760	41.0	0.5	1.9	306.0	0.0	0.0	Horz	PK	0.0	41.5	74.0	-32.5	High Ch, DH5, EUT Vert
12008.600	41.5	-0.2	1.5	111.0	0.0	0.0	Vert	PK	0.0	41.3	74.0	-32.7	Low Ch, DH5, EUT Vert
12206.890	41.1	0.1	1.5	240.0	0.0	0.0	Horz	PK	0.0	41.2	74.0	-32.8	Mid Ch, DH5, EUT Vert
12206.280	41.1	0.1	3.2	65.0	0.0	0.0	Vert	PK	0.0	41.2	74.0	-32.8	Mid Ch, DH5, EUT Vert

SPURIOUS RADIATED EMISSSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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
12399.220	40.2	0.5	1.5	346.0	0.0	0.0	Vert	PK	0.0	40.7	74.0	-33.3	High Ch, DH5, EUT Vert
12011.110	40.9	-0.2	3.6	354.0	0.0	0.0	Horz	PK	0.0	40.7	74.0	-33.3	Low Ch, DH5, EUT Vert
12399.880	29.7	0.5	1.9	306.0	-14.2	0.0	Horz	AV	0.0	16.0	54.0	-38.0	High Ch, DH5, EUT Vert
12399.480	29.6	0.5	1.5	346.0	-14.2	0.0	Vert	AV	0.0	15.9	54.0	-38.1	High Ch, DH5, EUT Vert
12205.450	29.8	0.1	1.5	240.0	-14.2	0.0	Horz	AV	0.0	15.7	54.0	-38.3	Mid Ch, DH5, EUT Vert
12207.430	29.8	0.1	3.2	65.0	-14.2	0.0	Vert	AV	0.0	15.7	54.0	-38.3	Mid Ch, DH5, EUT Vert
12009.050	30.0	-0.2	1.5	111.0	-14.2	0.0	Vert	AV	0.0	15.6	54.0	-38.4	Low Ch, DH5, EUT Vert
12008.230	29.8	-0.2	3.6	354.0	-14.2	0.0	Horz	AV	0.0	15.4	54.0	-38.6	Low Ch, DH5, EUT Vert

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

EUT:	Sierra	Work Order:	LISA0056
Serial Number:	500042137	Date:	2022-03-08
Customer:	LightSpeed Aviation	Temperature:	19°C
Attendees:	Ed Katz	Relative Humidity:	39.4%
Customer Project:	None	Bar. Pressure (PMSL):	1031 mb
Tested By:	Jeff Alcoke	Job Site:	EV01
Power:	Battery	Configuration:	LISA0056-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	19	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

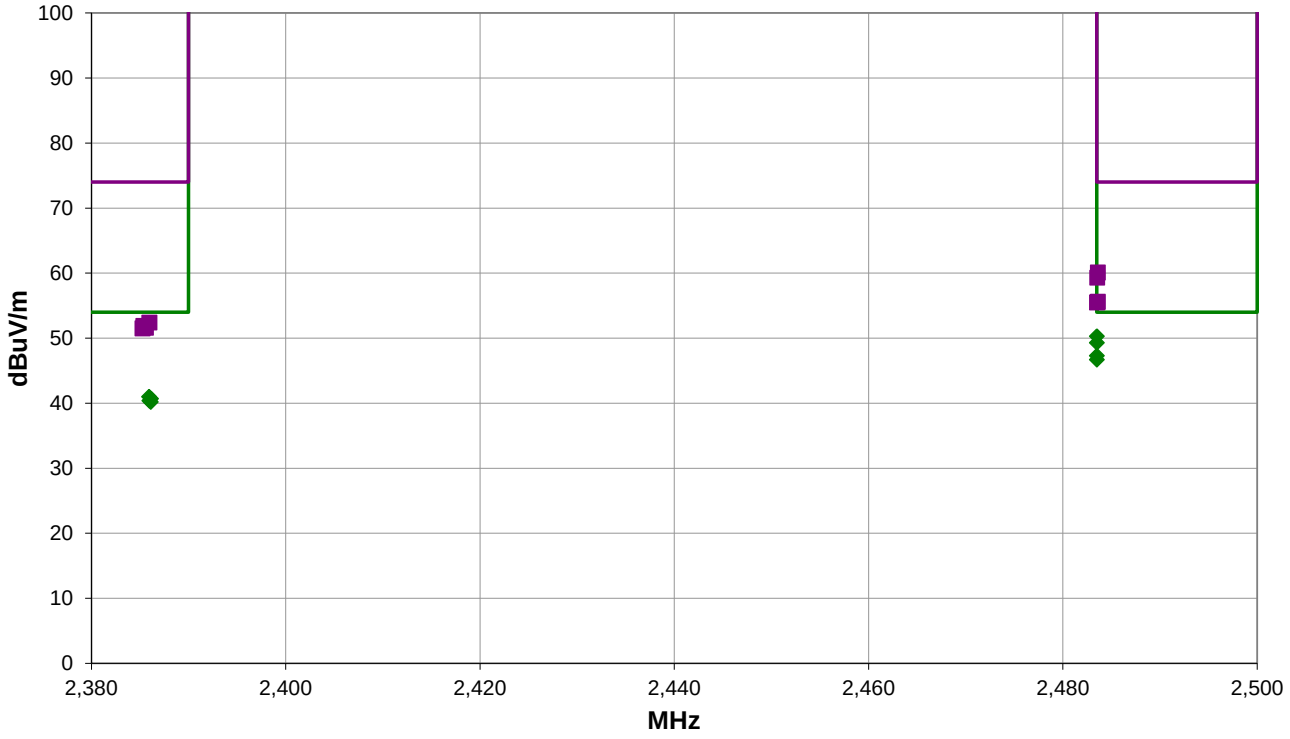
Please reference data comments below for Channel, Data Rate, and EUT orientation.

EUT OPERATING MODES

Continuous Tx - Bluetooth, Low Channel = 2402 MHz, Mid Channel = 2441 MHz, High Channel = 2480 MHz

DEVIATIONS FROM TEST STANDARD

None



Run #: 19 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

RESULTS - Run #19

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.500	41.9	-1.6	1.0	144.0	3.0	10.0	Vert	AV	0.0	50.3	54.0	-3.7	High Ch, 2DH5, EUT Horz
2483.500	40.9	-1.6	1.0	142.0	3.0	10.0	Vert	AV	0.0	49.3	54.0	-4.7	High Ch, 3DH5, EUT Horz
2483.500	38.9	-1.6	1.0	154.0	3.0	10.0	Vert	AV	0.0	47.3	54.0	-6.7	High Ch, DH5, EUT Horz
2483.500	38.3	-1.6	1.0	335.0	3.0	10.0	Horz	AV	0.0	46.7	54.0	-7.3	High Ch, DH5, EUT on Side
2385.930	32.6	-1.6	1.0	145.0	3.0	10.0	Vert	AV	0.0	41.0	54.0	-13.0	Low Ch, DH5, EUT Horz
2386.130	32.3	-1.6	1.0	137.0	3.0	10.0	Horz	AV	0.0	40.7	54.0	-13.3	Low Ch, DH5, EUT on Side
2385.963	32.0	-1.6	1.0	145.0	3.0	10.0	Vert	AV	0.0	40.4	54.0	-13.6	Low Ch, 2DH5, EUT Horz
2386.107	31.8	-1.6	1.0	145.0	3.0	10.0	Vert	AV	0.0	40.2	54.0	-13.8	Low Ch, 3DH5, EUT Horz
2483.607	51.7	-1.6	1.0	144.0	3.0	10.0	Vert	PK	0.0	60.1	74.0	-13.9	High Ch, 2DH5, EUT Horz
2483.533	50.9	-1.6	1.0	142.0	3.0	10.0	Vert	PK	0.0	59.3	74.0	-14.7	High Ch, 3DH5, EUT Horz
2483.600	47.2	-1.6	1.0	335.0	3.0	10.0	Horz	PK	0.0	55.6	74.0	-18.4	High Ch, DH5, EUT on Side
2483.517	47.1	-1.6	1.0	154.0	3.0	10.0	Vert	PK	0.0	55.5	74.0	-18.5	High Ch, DH5, EUT Horz
2385.960	44.0	-1.6	1.0	145.0	3.0	10.0	Vert	PK	0.0	52.4	74.0	-21.6	Low Ch, DH5, EUT Horz
2385.357	43.5	-1.6	1.0	137.0	3.0	10.0	Horz	PK	0.0	51.9	74.0	-22.1	Low Ch, DH5, EUT on Side
2385.603	43.2	-1.6	1.0	145.0	3.0	10.0	Vert	PK	0.0	51.6	74.0	-22.4	Low Ch, 2DH5, EUT Horz
2385.260	43.1	-1.6	1.0	145.0	3.0	10.0	Vert	PK	0.0	51.5	74.0	-22.5	Low Ch, 3DH5, EUT Horz

CONCLUSION

Pass

Tested By

DUTY CYCLE

XMit 2022.02.07.0

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	N5182B	TFU	2020-11-20	2022-11-20
Cable	Micro-Coax	UFD150A-1-0720-200200	EVK	2021-03-14	2022-03-14
Attenuator	S.M. Electronics	SA26B-20	AUY	2021-03-14	2022-03-14
Block - DC	Fairview Microwave	SD3379	AMW	2021-03-14	2022-03-14
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	2021-07-06	2022-07-06

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

TbtTx 2021.12.14.1 XMit 2022.02.07.0

EUT:	Sierra	Work Order:	LISA0056
Serial Number:	500042135	Date:	9-Mar-22
Customer:	LightSpeed Aviation	Temperature:	20.7 °C
Attendees:	Ed Katz	Humidity:	37.7% RH
Project:	None	Barometric Pres.:	1025 mbar
Tested by:	Jeff Alcoke	Job Site:	EV06
Power:	Battery		

TEST SPECIFICATIONS	Test Method
FCC 15.247:2022	ANSI C63.10:2013

COMMENTS

Reference level offset includes: DC Block, 20 dB attenuator, measurement cable, and manufacturers SMA patch cable.

DEVIATIONS FROM TEST STANDARD

None

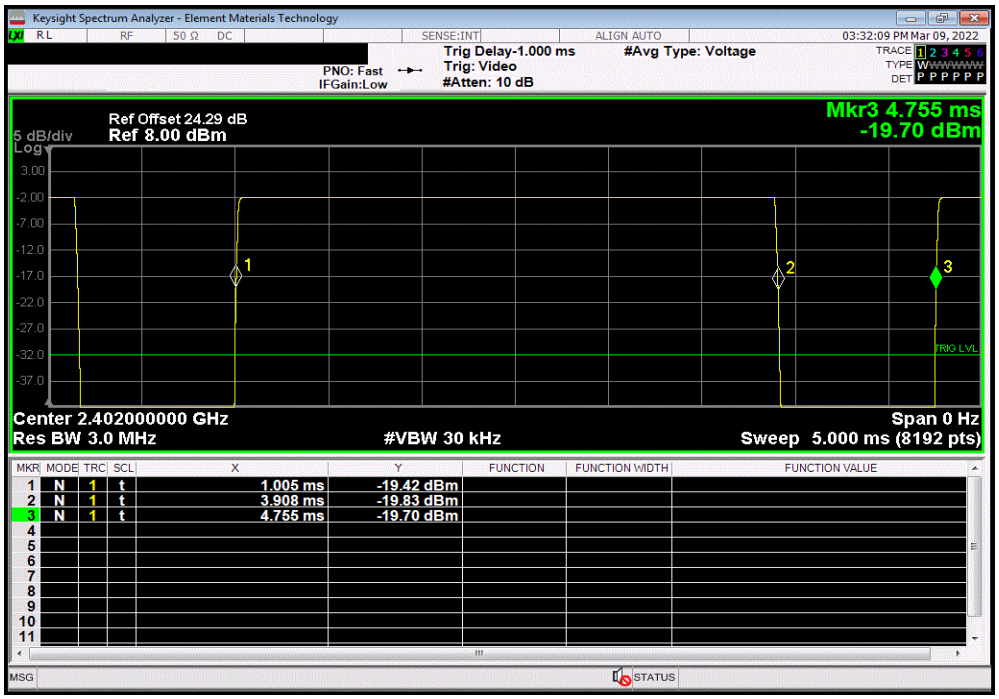
Configuration #	2	Signature

		Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
DH5, GFSK							
	Low Channel, 2402 MHz	2.903 ms	3.75 ms	1	77.4	N/A	N/A
	Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
	Mid Channel, 2441 MHz	2.917 ms	3.75 ms	1	77.8	N/A	N/A
	Mid Channel, 2441 MHz	N/A	N/A	5	N/A	N/A	N/A
	High Channel, 2480 MHz	2.912 ms	3.75 ms	1	77.7	N/A	N/A
	High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A
2DH5, pi/4-DQPSK							
	Low Channel, 2402 MHz	2.915 ms	3.75 ms	1	77.7	N/A	N/A
	Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
	Mid Channel, 2441 MHz	2.928 ms	3.751 ms	1	78.1	N/A	N/A
	Mid Channel, 2441 MHz	N/A	N/A	5	N/A	N/A	N/A
	High Channel, 2480 MHz	2.927 ms	3.75 ms	1	78.1	N/A	N/A
	High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A
3DH5, 8-DPSK							
	Low Channel, 2402 MHz	2.928 ms	3.751 ms	1	78.1	N/A	N/A
	Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
	Mid Channel, 2441 MHz	2.928 ms	3.75 ms	1	78.1	N/A	N/A
	Mid Channel, 2441 MHz	N/A	N/A	5	N/A	N/A	N/A
	High Channel, 2480 MHz	2.928 ms	3.75 ms	1	78.1	N/A	N/A
	High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

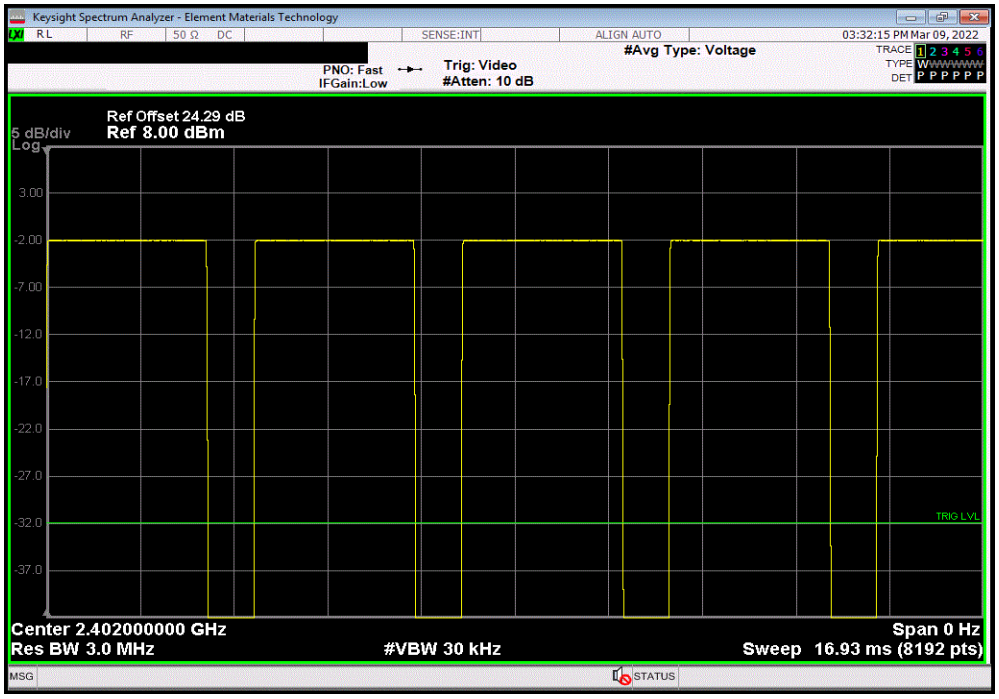
DUTY CYCLE

TbtTx 2021.12.14.1 XMit 2022.02.07.0

DH5, GFSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.903 ms	3.75 ms	1	77.4	N/A	N/A



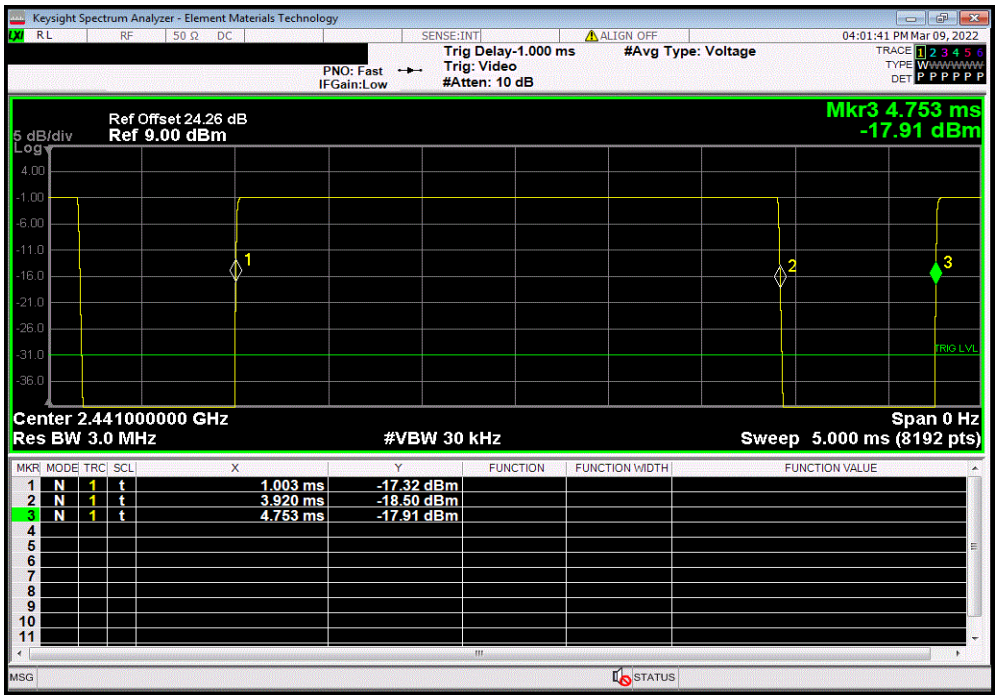
DH5, GFSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



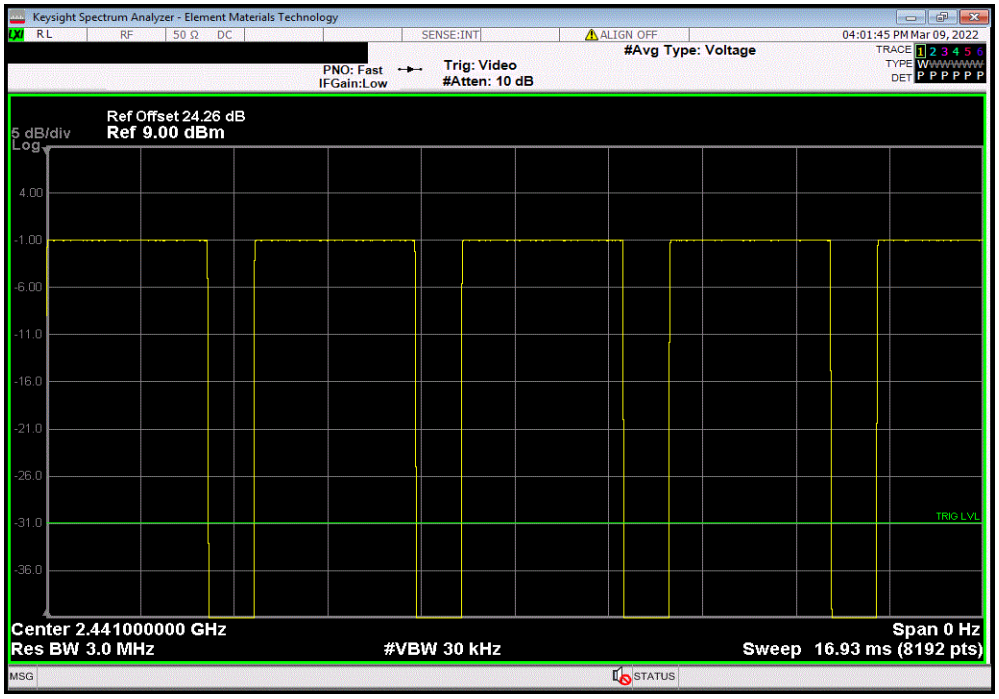
DUTY CYCLE

TbtTx 2021.12.14.1 XMit 2022.02.07.0

DH5, GFSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.917 ms	3.75 ms	1	77.8	N/A	N/A



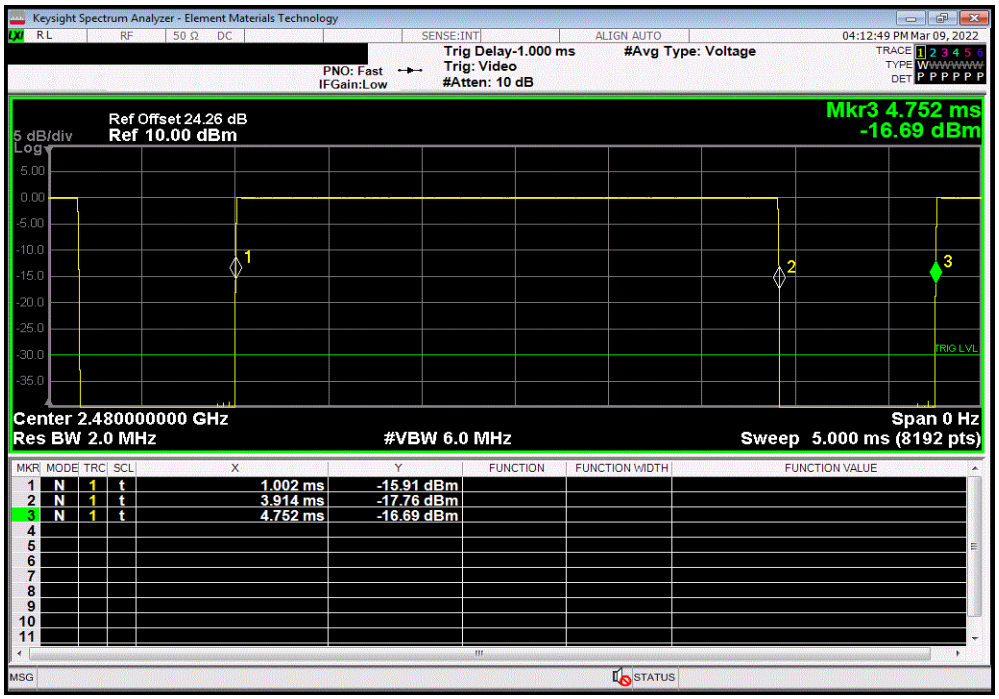
DH5, GFSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



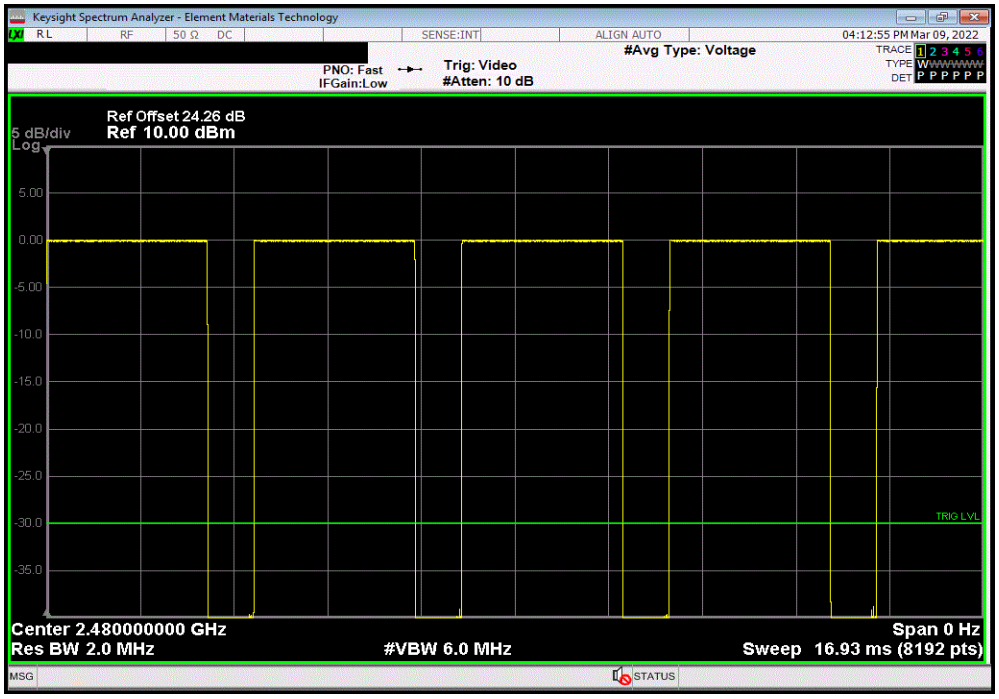
DUTY CYCLE

TbtTx 2021.12.14.1 XMit 2022.02.07.0

DH5, GFSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.912 ms	3.75 ms	1	77.7	N/A	N/A



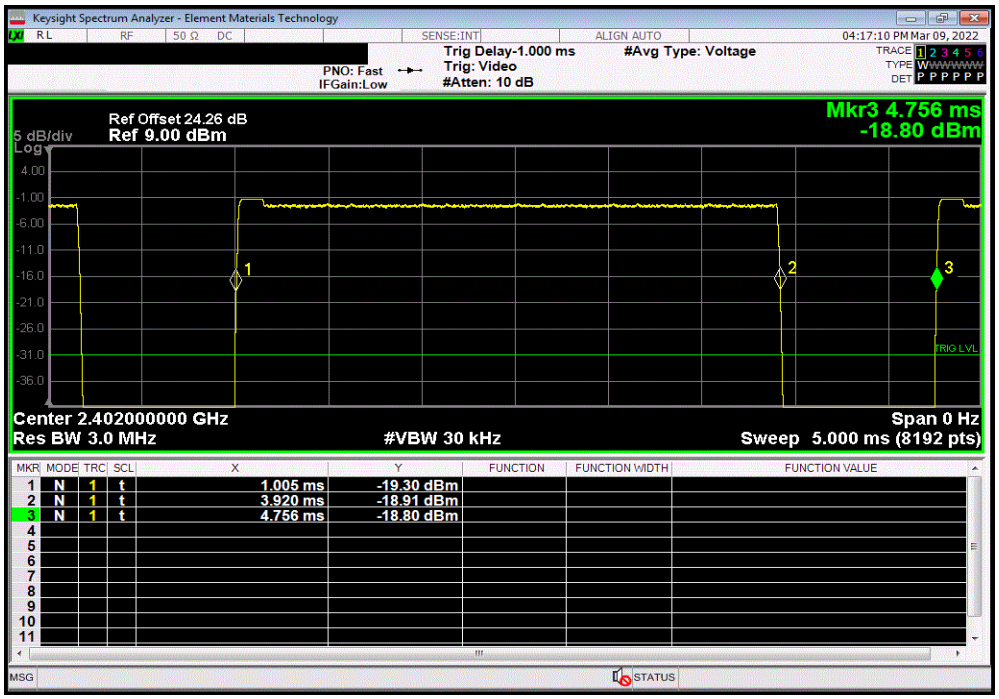
DH5, GFSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



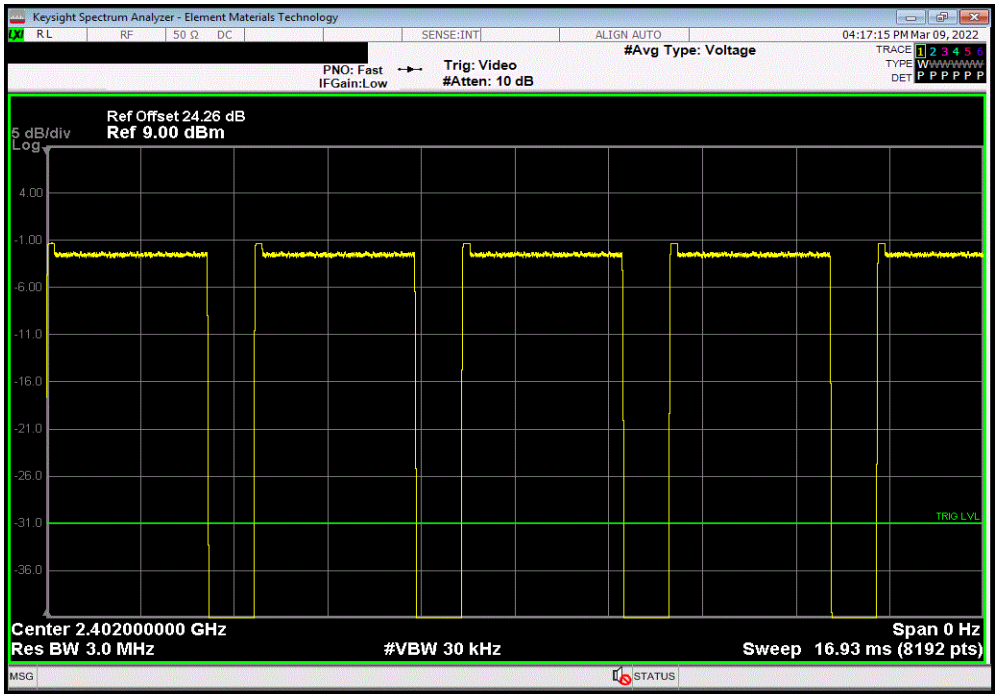
DUTY CYCLE

TbtTx 2021.12.14.1 XMit 2022.02.07.0

2DH5, pi/4-DQPSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.915 ms	3.75 ms	1	77.7	N/A	N/A



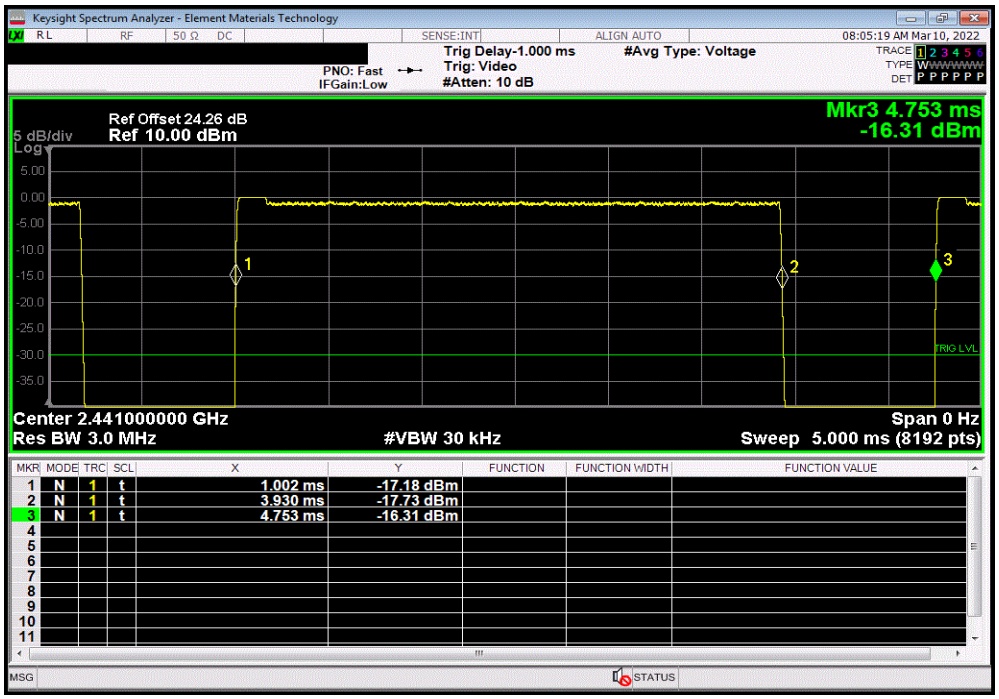
2DH5, pi/4-DQPSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



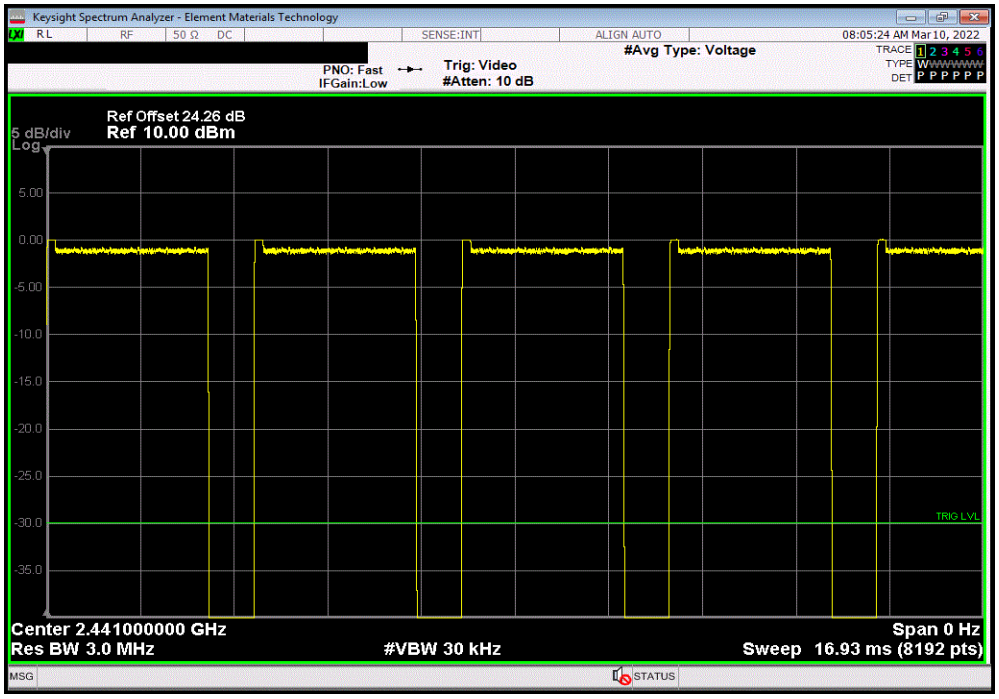
DUTY CYCLE

TbtTx 2021.12.14.1 XMit 2022.02.07.0

2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.928 ms	3.751 ms	1	78.1	N/A	N/A



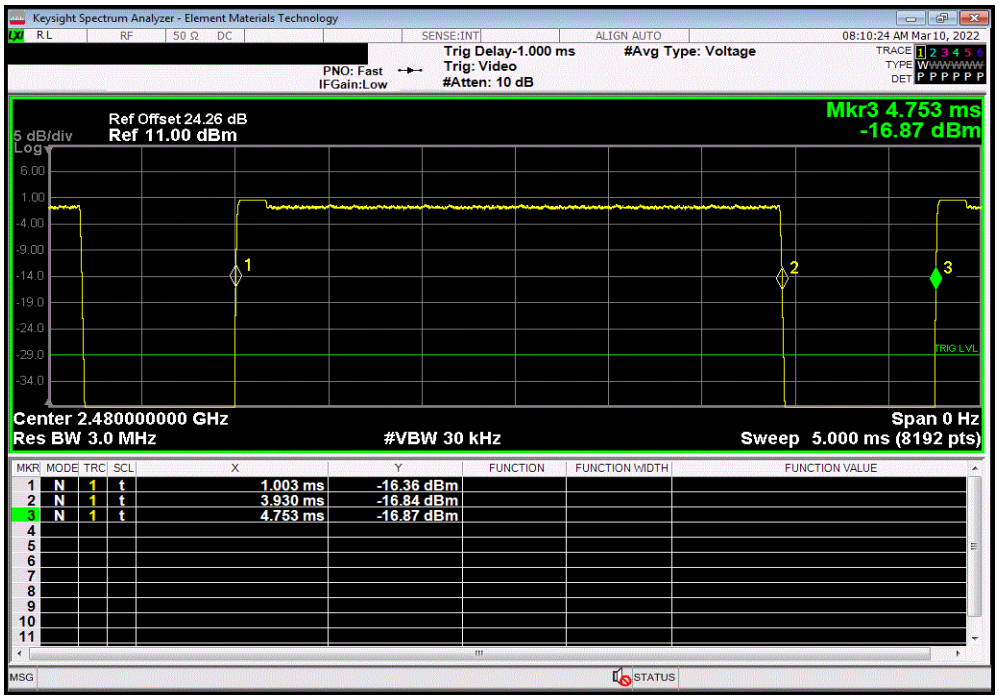
2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



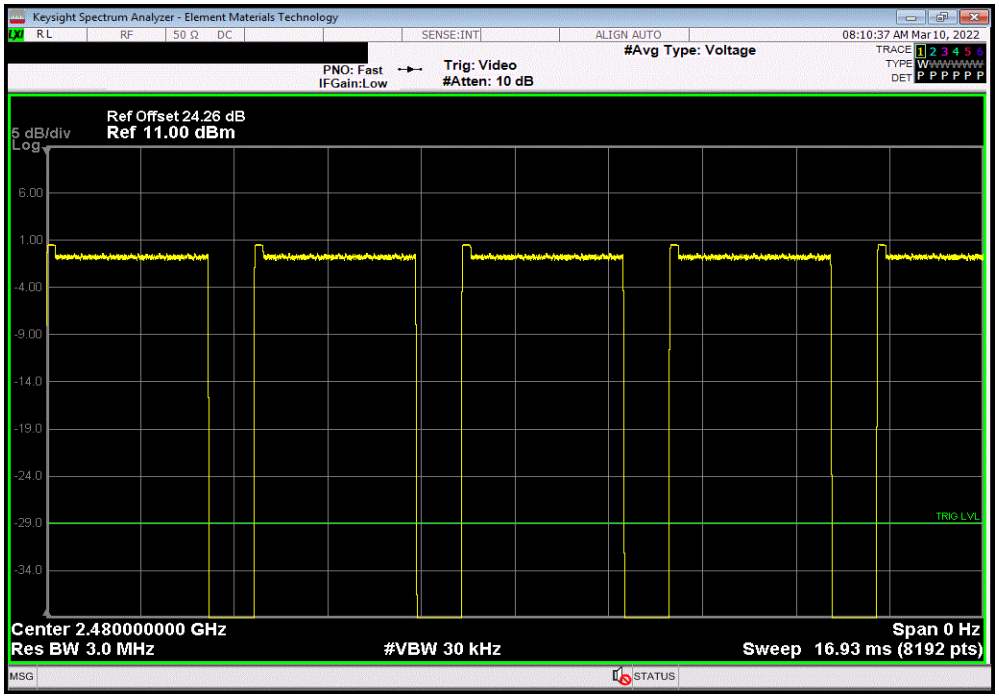
DUTY CYCLE

TbtTx 2021.12.14.1 XMit 2022.02.07.0

2DH5, pi/4-DQPSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.927 ms	3.75 ms	1	78.1	N/A	N/A



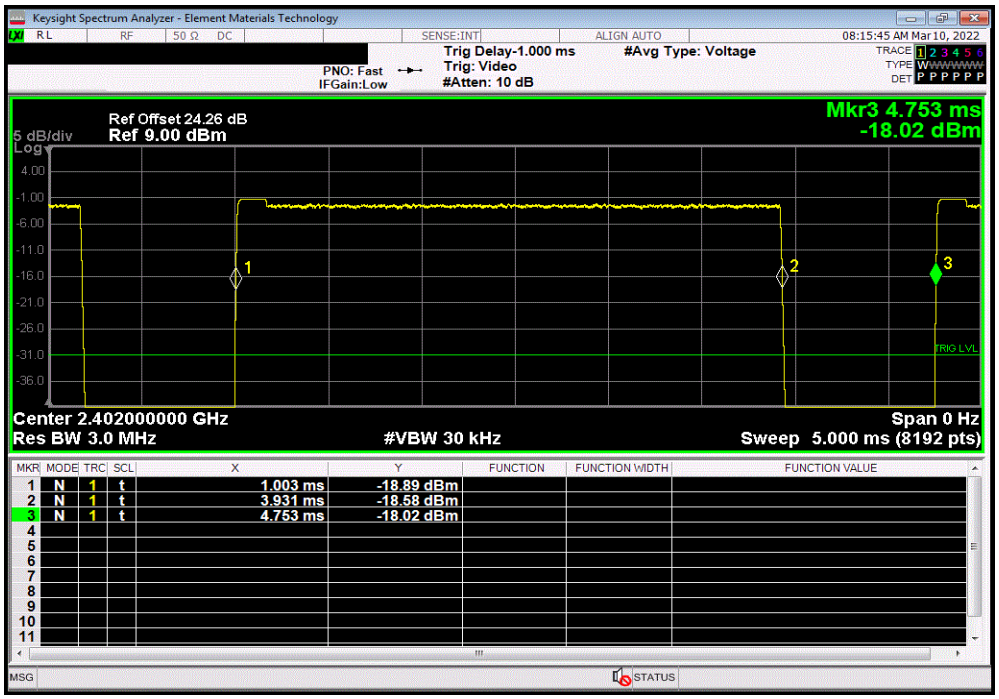
2DH5, pi/4-DQPSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



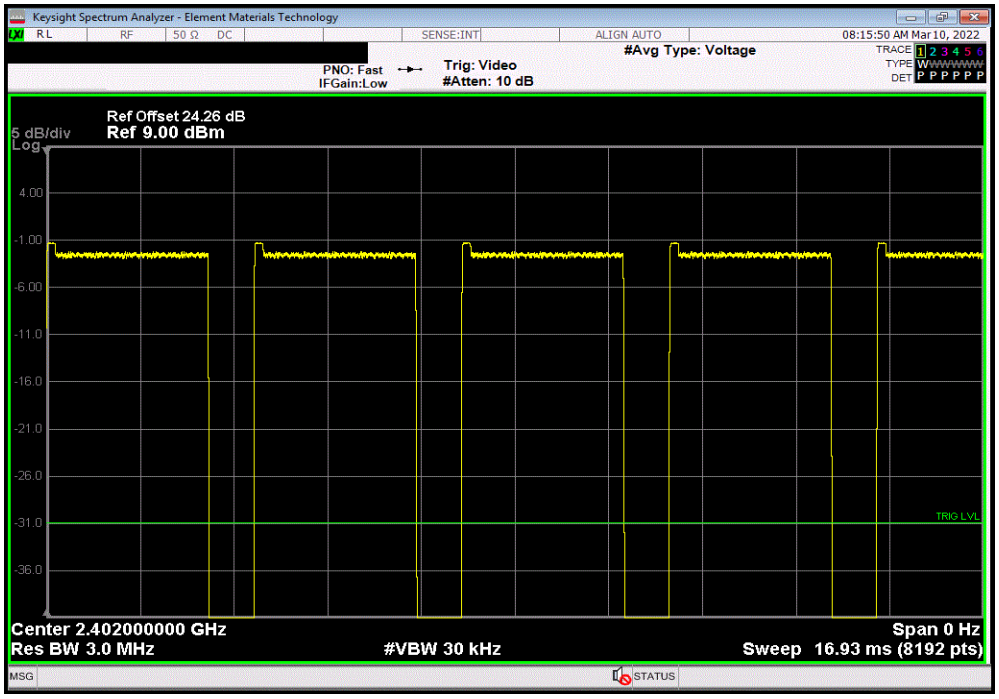
DUTY CYCLE

TbtTx 2021.12.14.1 XMit 2022.02.07.0

3DH5, 8-DPSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.928 ms	3.751 ms	1	78.1	N/A	N/A



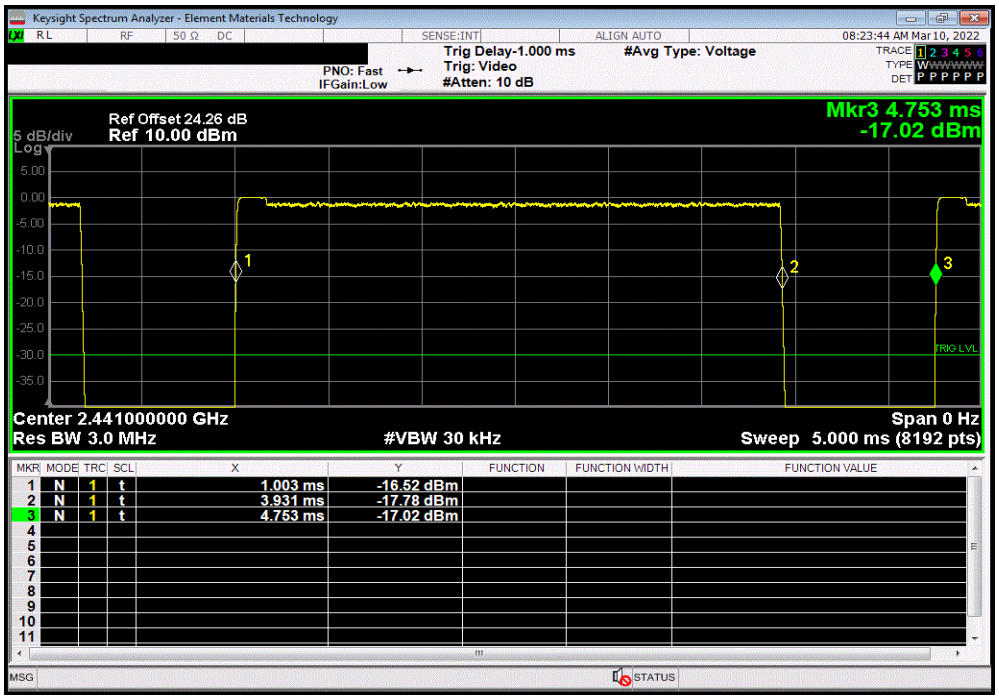
3DH5, 8-DPSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



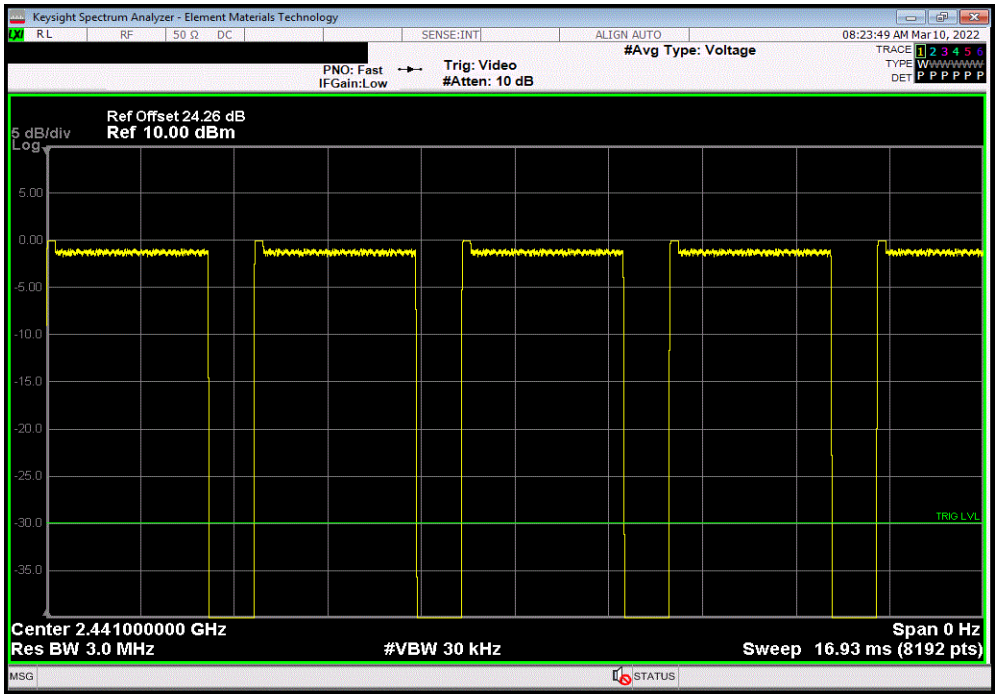
DUTY CYCLE

TbtTx 2021.12.14.1 XMit 2022.02.07.0

3DH5, 8-DPSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.928 ms	3.75 ms	1	78.1	N/A	N/A



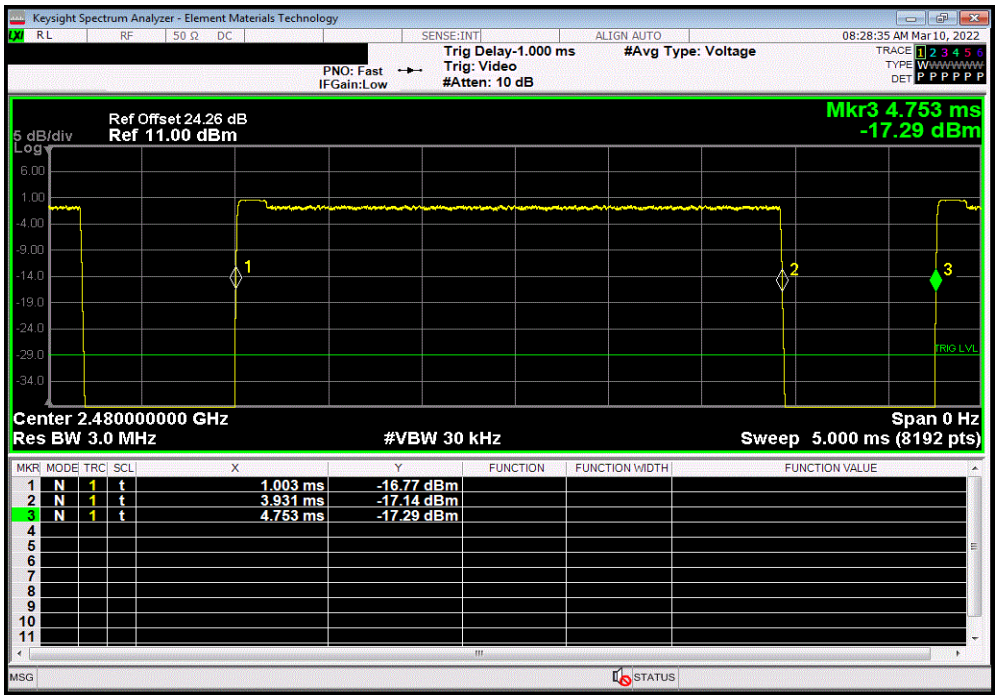
3DH5, 8-DPSK, Mid Channel, 2441 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



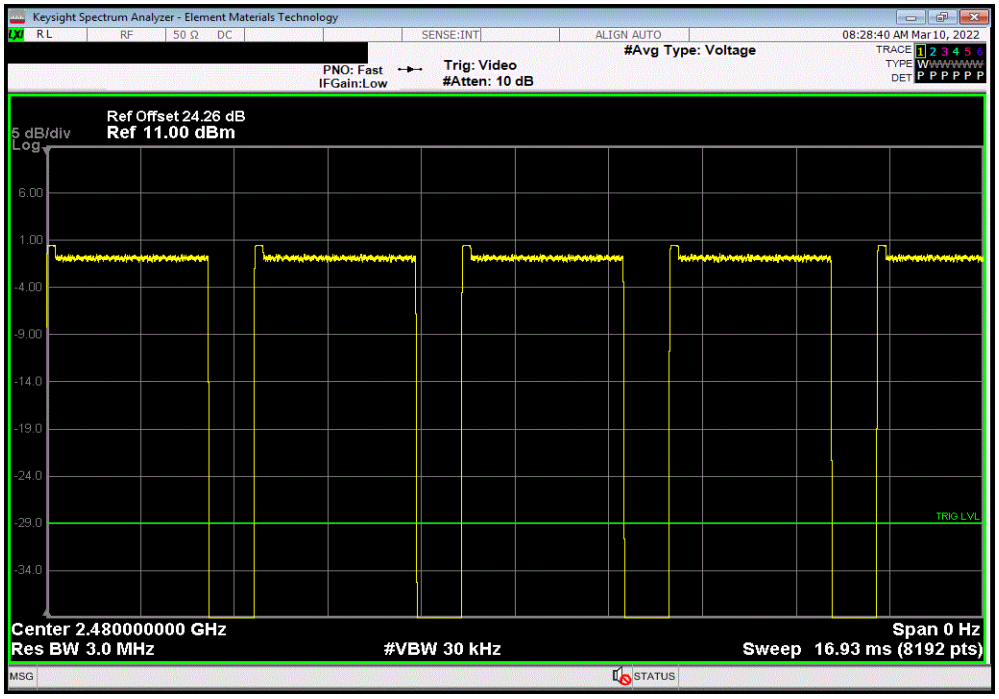
DUTY CYCLE

TbtTx 2021.12.14.1 XMit 2022.02.07.0

3DH5, 8-DPSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.928 ms	3.75 ms	1	78.1	N/A	N/A



3DH5, 8-DPSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



CARRIER FREQUENCY SEPARATION

XMit 2022.02.07.0

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	N5182B	TFU	2020-11-20	2022-11-20
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	2021-03-14	2022-03-14
Attenuator	S.M. Electronics	SA26B-20	AUY	2021-03-14	2022-03-14
Block - DC	Fairview Microwave	SD3379	AMW	2021-03-14	2022-03-14
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	2021-07-06	2022-07-06

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The channel carrier frequencies in the 2400-2483.5MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Or, if the output power is less than 125 mW, the channel separation can be 25 kHz or 2/3 of the 20dB bandwidth. 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

TbtTx 2021.12.14.1 XMit 2022.02.07.0

EUT:	Sierra			Work Order:	LISA0056
Serial Number:	500042135			Date:	9-Mar-22
Customer:	LightSpeed Aviation			Temperature:	20.7 °C
Attendees:	Ed Katz			Humidity:	37.4% RH
Project:	None			Barometric Pres.:	1025 mbar
Tested by:	Jeff Alcoke	Power:	Battery	Job Site:	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2022	ANSI C63.10:2013

COMMENTS

Reference level offset includes: DC Block, 20 dB attenuator, measurement cable, and manufacturers SMA patch cable. Largest measured 20 dB emission bandwidth = 1.338 MHz. 1.338 MHz * 2/3 = 0.892 MHz

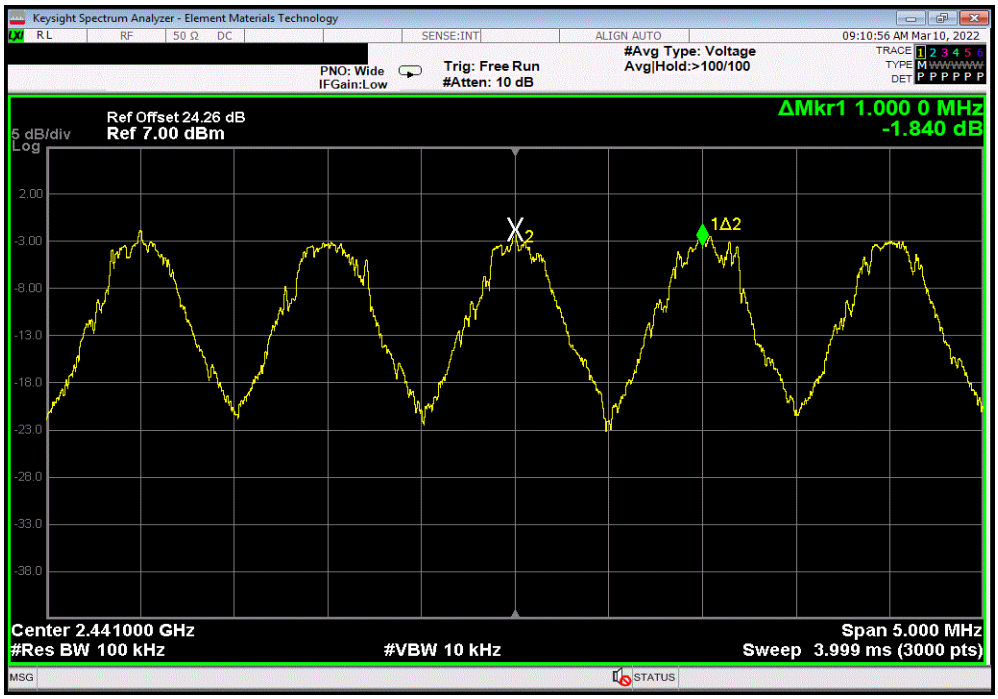
DEVIATIONS FROM TEST STANDARD

None

Configuration #	2	Signature

	Value	Limit (≥)	Results
Hopping Mode (All Channels)			
DH5, GFSK			
Mid Channel, 2441 MHz	1.0 MHz	0.892 MHz	Pass

Hopping Mode (All Channels), DH5, GFSK, Mid Channel, 2441 MHz						
				Value	Limit (≥)	Results
				1.0 MHz	0.892 MHz	Pass



NUMBER OF HOPPING FREQUENCIES

XMit 2022.02.07.0

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	N5182B	TFU	2020-11-20	2022-11-20
Cable	Micro-Coax	UFD150A-1-0720-200200	EVK	2021-03-14	2022-03-14
Attenuator	S.M. Electronics	SA26B-20	AUY	2021-03-14	2022-03-14
Block - DC	Fairview Microwave	SD3379	AMW	2021-03-14	2022-03-14
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	2021-07-06	2022-07-06

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

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

NUMBER OF HOPPING FREQUENCIES

TbtTx 2021.12.14.1 XMit 2022.02.07.0

EUT:	**Sierra**	**Work Order:**	**LISA0056**
Serial Number:	**500042135**	**Date:**	**9-Mar-22**
Customer:	**LightSpeed Aviation**	**Temperature:**	**20.7 °C**
Attendees:	**Ed Katz**	**Humidity:**	**37.4% RH**
Project:	**None**	**Barometric Pres.:**	**1025 mbar**
Tested by:	**Jeff Alcoke**	**Job Site:**	**EV06**
Power:	**Battery**		

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2022	ANSI C63.10:2013

COMMENTS

Reference level offset includes: DC Block, 20 dB attenuator, measurement cable, and manufacturers SMA patch cable.

DEVIATIONS FROM TEST STANDARD

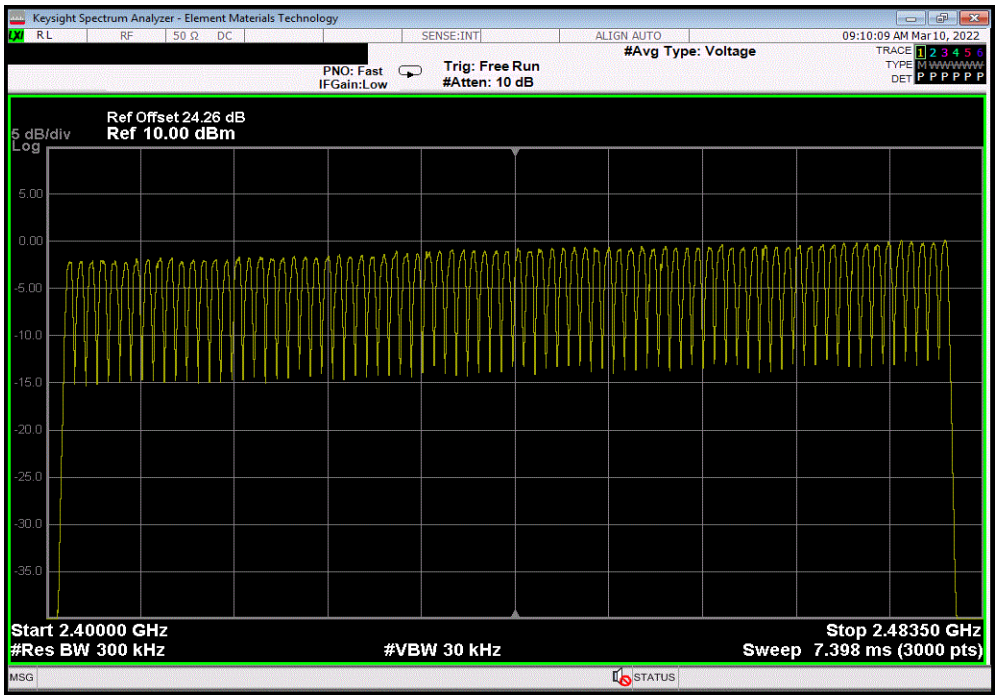
None

Configuration #	**2**	*Signature*

	Number of Channels	**Limit (≥)**	**Results**
Hopping Mode (All Channels)			
DH5, GFSK			
Mid Channel, 2441 MHz	79	15	Pass

NUMBER OF HOPPING FREQUENCIES

Hopping Mode (All Channels), DH5, GFSK, Mid Channel, 2441 MHz						
				Number of Channels	Limit (≥)	Results
				79	15	Pass



DWELL TIME

XMit 2022.02.07.0

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	N5182B	TFU	2020-11-20	2022-11-20
Cable	Micro-Coax	UFD150A-1-0720-200200	EVK	2021-03-14	2022-03-14
Attenuator	S.M. Electronics	SA26B-20	AUY	2021-03-14	2022-03-14
Block - DC	Fairview Microwave	SD3379	AMW	2021-03-14	2022-03-14
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	2021-07-06	2022-07-06

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

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 Bluetooth this would be 79 Channels * 400mS = 31.6 Sec.

- On Time During 31.6 Sec = Pulse Width * Average Number of Pulses * Scale Factor
- Average Number of Pulses is based on 4 samples.
- Scale Factor = 31.6 Sec / Screen Capture Sweep Time = 31.6 Sec / 6.32 Sec = 5

DWELL TIME

element

TbtTx 2021.12.14.1 XMit 2022.02.07.0

EUT:	Sierra	Work Order:	LISA0056
Serial Number:	500042135	Date:	9-Mar-22
Customer:	LightSpeed Aviation	Temperature:	20.7 °C
Attendees:	Ed Katz	Humidity:	37.5% RH
Project:	None	Barometric Pres.:	1025 mbar
Tested by:	Jeff Alcoke	Power: Battery	Job Site: EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2022	ANSI C63.10:2013

COMMENTS

Reference level offset includes: DC Block, 20 dB attenuator, measurement cable, and manufacturers SMA patch cable.

DEVIATIONS FROM TEST STANDARD

None

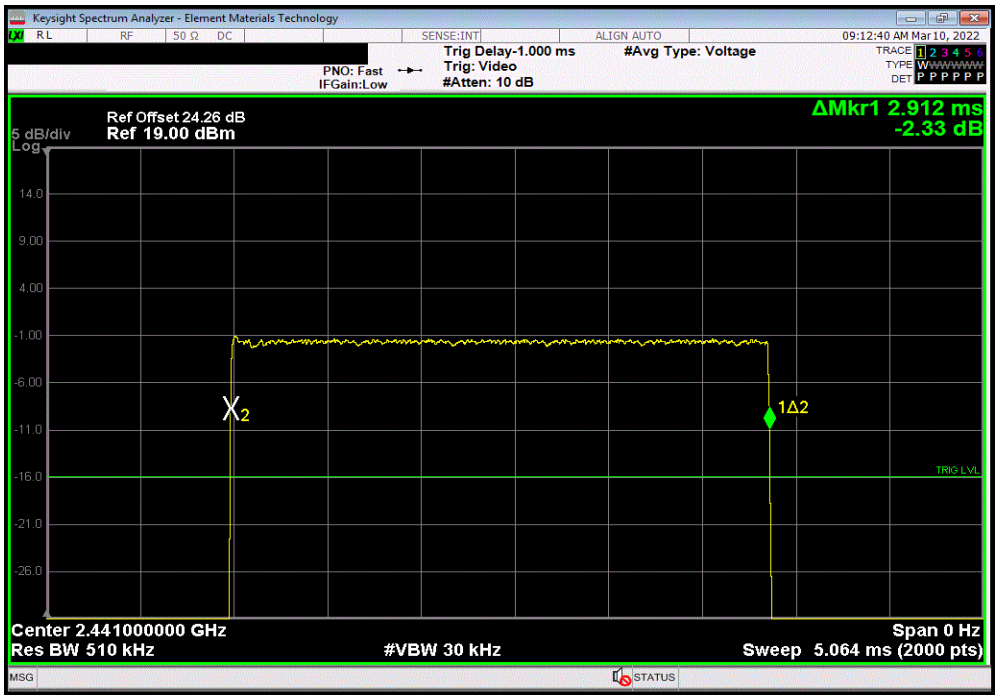
Configuration #	2	Signature

	Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
Hopping Mode (All Channels)							
DH5, GFSK							
Mid Channel, 2441 MHz	2.912	N/A	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	22	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	22	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	22	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	22	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	2.912	N/A	22	5	320.32	400	Pass
2DH5, pi/4-DQPSK							
Mid Channel, 2441 MHz	2.923	N/A	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	22	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	22	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	22	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	21	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	2.923	N/A	22	5	321.53	400	Pass
3DH5, 8-DPSK							
Mid Channel, 2441 MHz	2.925	N/A	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	22	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	21	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	22	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	N/A	21	N/A	N/A	N/A	N/A	N/A
Mid Channel, 2441 MHz	2.925	N/A	22	5	321.75	400	Pass

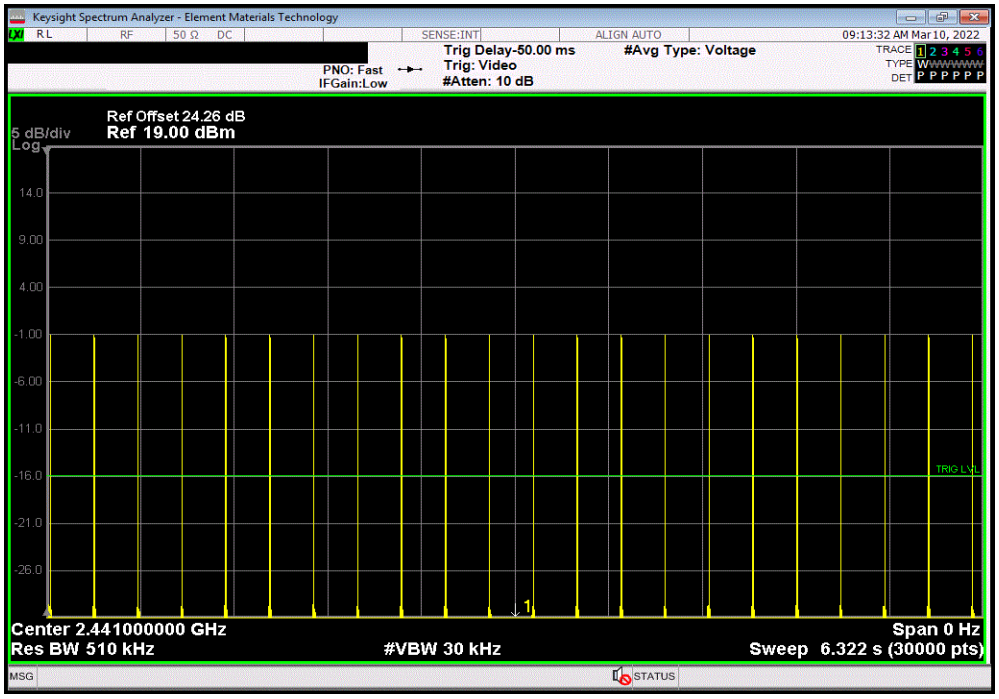
DWELL TIME

TbtTx 2021.12.14.1 XMit 2022.02.07.0

Hopping Mode (All Channels), DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
2.912	N/A	N/A	N/A	N/A	N/A	N/A



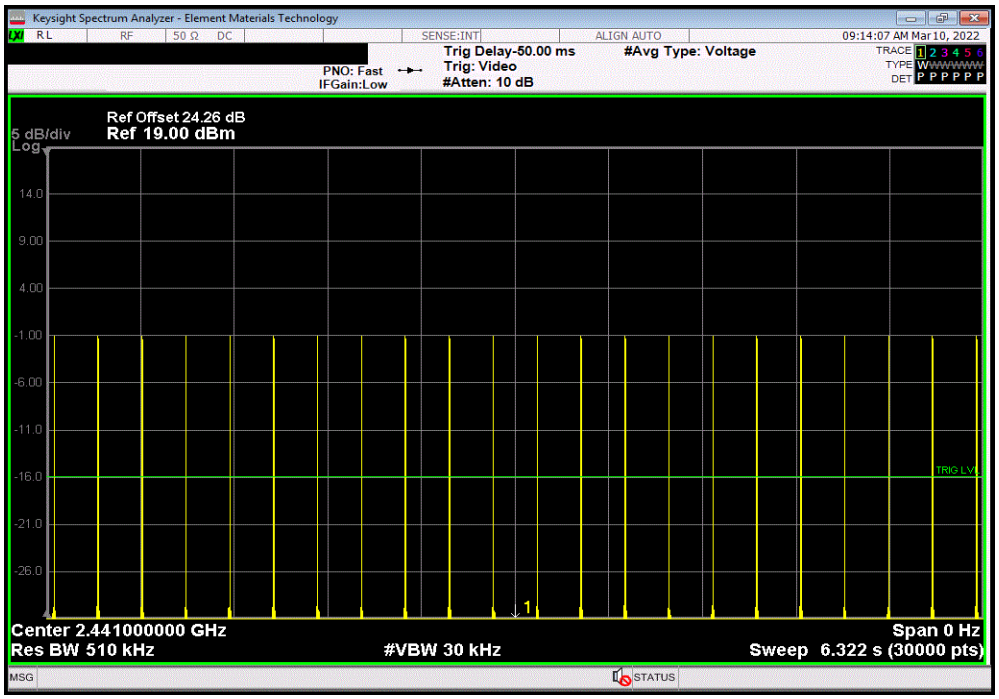
Hopping Mode (All Channels), DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	22	N/A	N/A	N/A	N/A	N/A



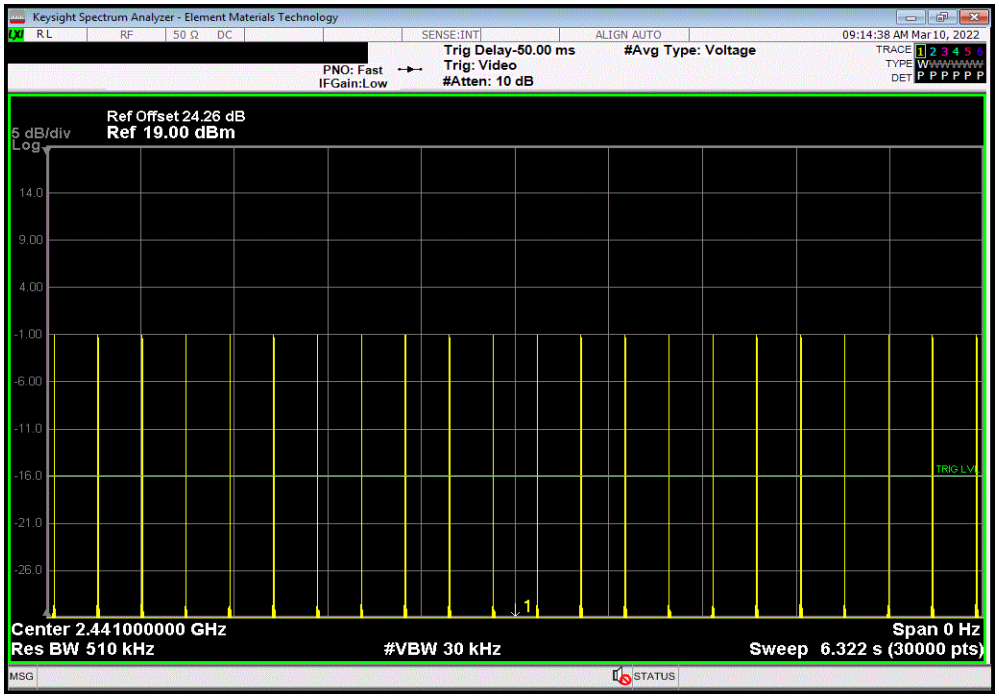
DWELL TIME

TbtTx 2021.12.14.1 XMit 2022.02.07.0

Hopping Mode (All Channels), DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	22	N/A	N/A	N/A	N/A	N/A



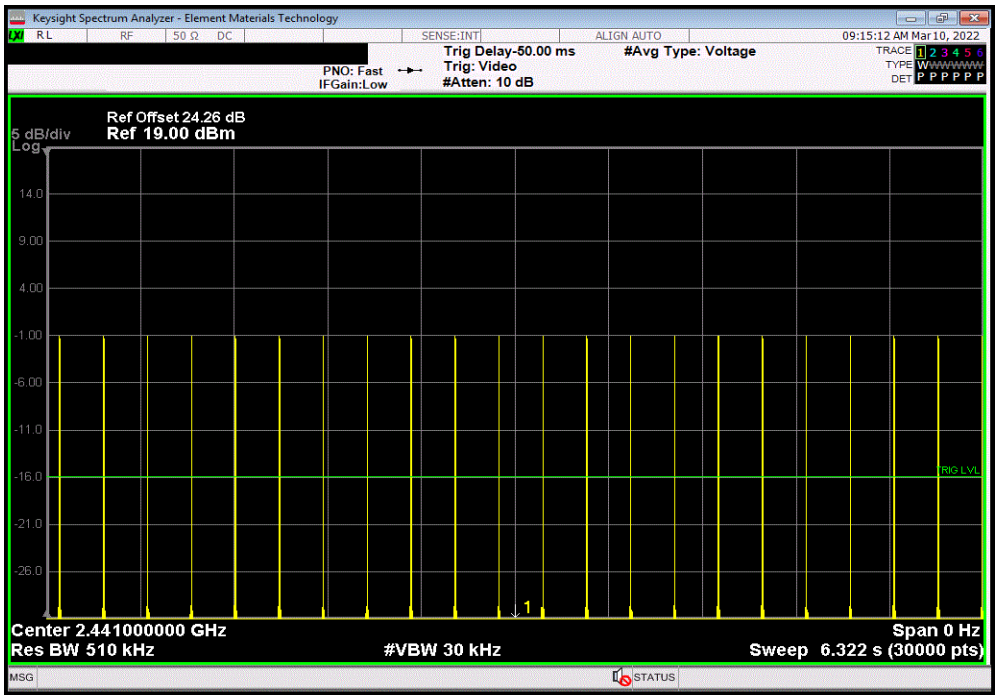
Hopping Mode (All Channels), DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	22	N/A	N/A	N/A	N/A	N/A



DWELL TIME

TbtTx 2021.12.14.1 XMit 2022.02.07.0

Hopping Mode (All Channels), DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	22	N/A	N/A	N/A	N/A	N/A



Hopping Mode (All Channels), DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
2.912	N/A	22	5	320.32	400	Pass

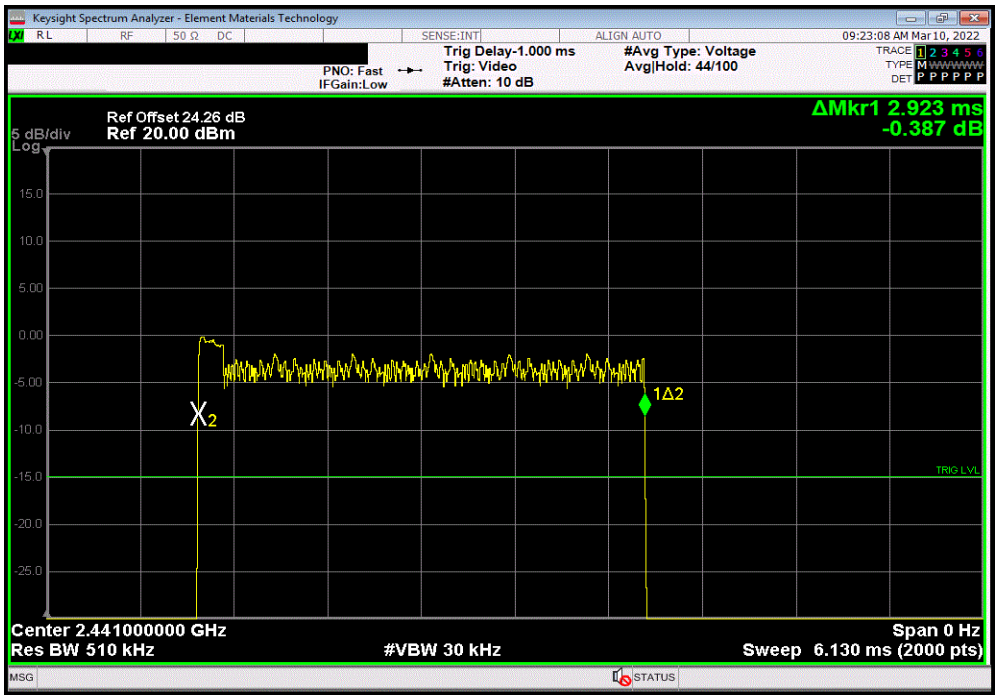
Calculation Only

No Screen Capture Required

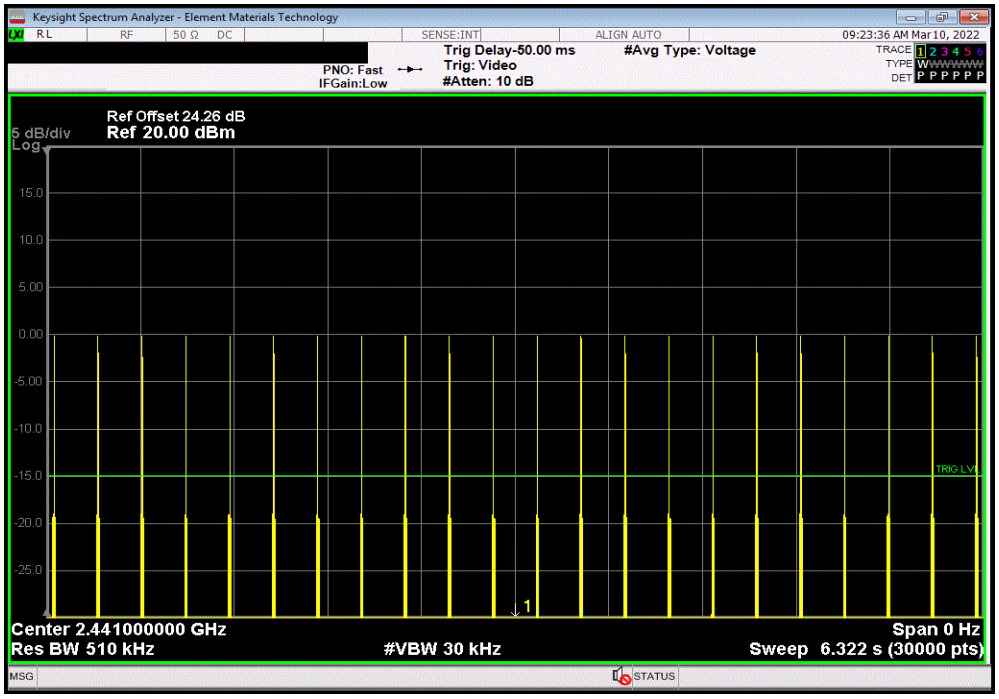
DWELL TIME

TbtTx 2021.12.14.1 XMit 2022.02.07.0

Hopping Mode (All Channels), 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
2.923	N/A	N/A	N/A	N/A	N/A	N/A



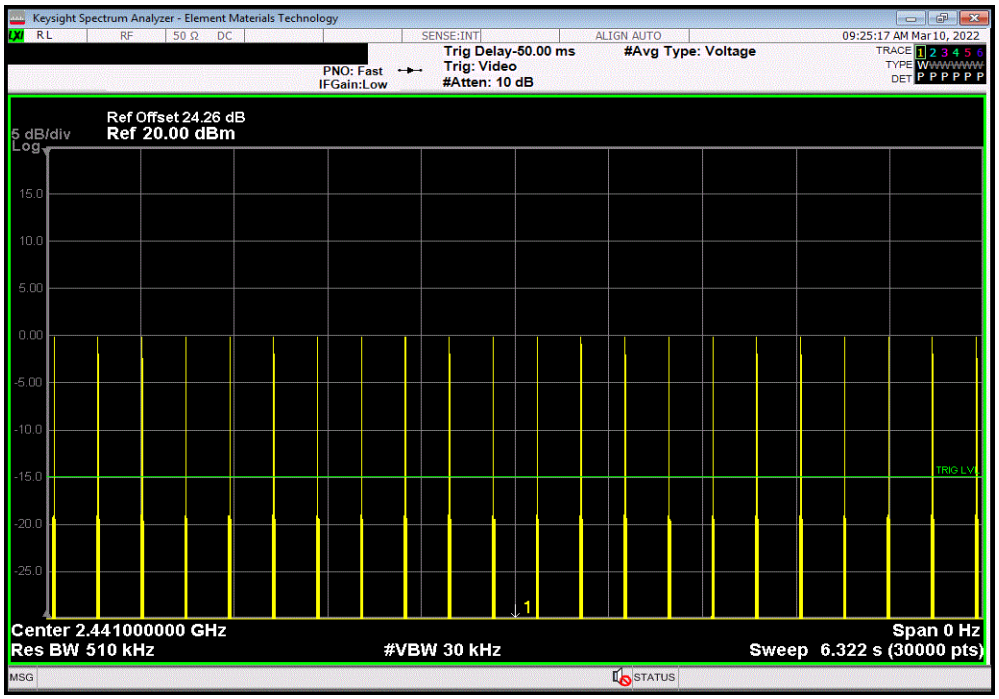
Hopping Mode (All Channels), 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	22	N/A	N/A	N/A	N/A	N/A



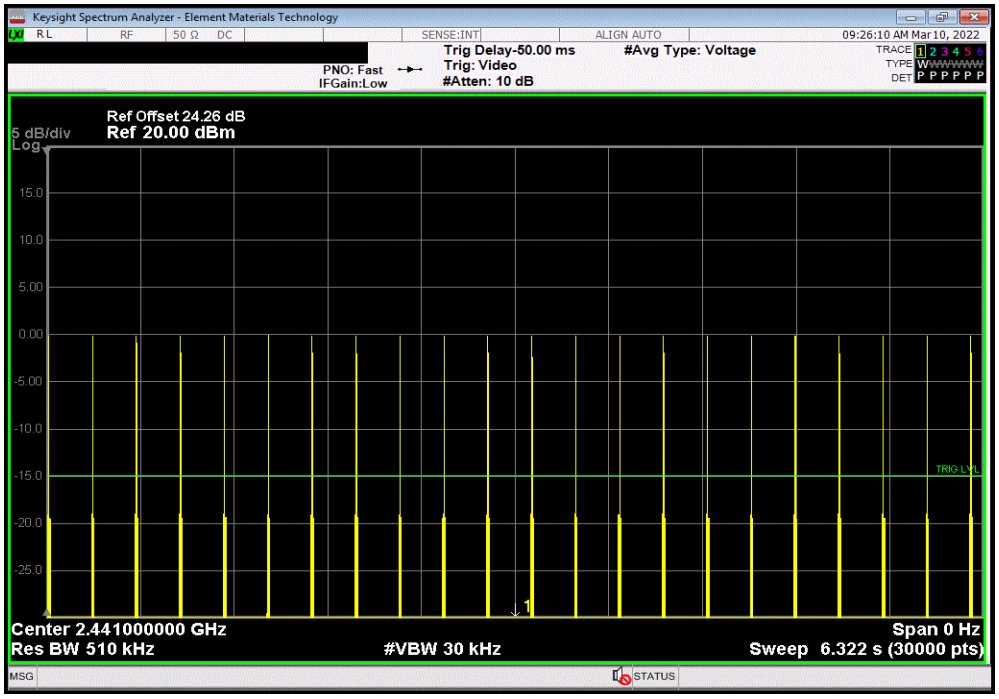
DWELL TIME

TbtTx 2021.12.14.1 XMit 2022.02.07.0

Hopping Mode (All Channels), 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	22	N/A	N/A	N/A	N/A	N/A



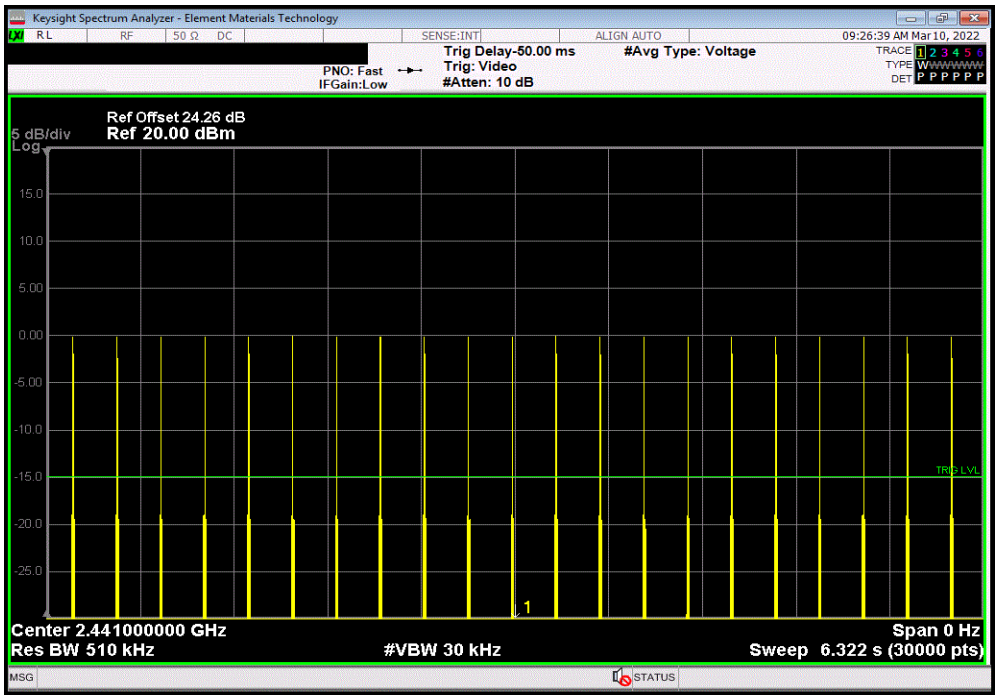
Hopping Mode (All Channels), 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	22	N/A	N/A	N/A	N/A	N/A



DWELL TIME

TbtTx 2021.12.14.1 XMit 2022.02.07.0

Hopping Mode (All Channels), 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	21	N/A	N/A	N/A	N/A	N/A



Hopping Mode (All Channels), 2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
2.923	N/A	22	5	321.53	400	Pass

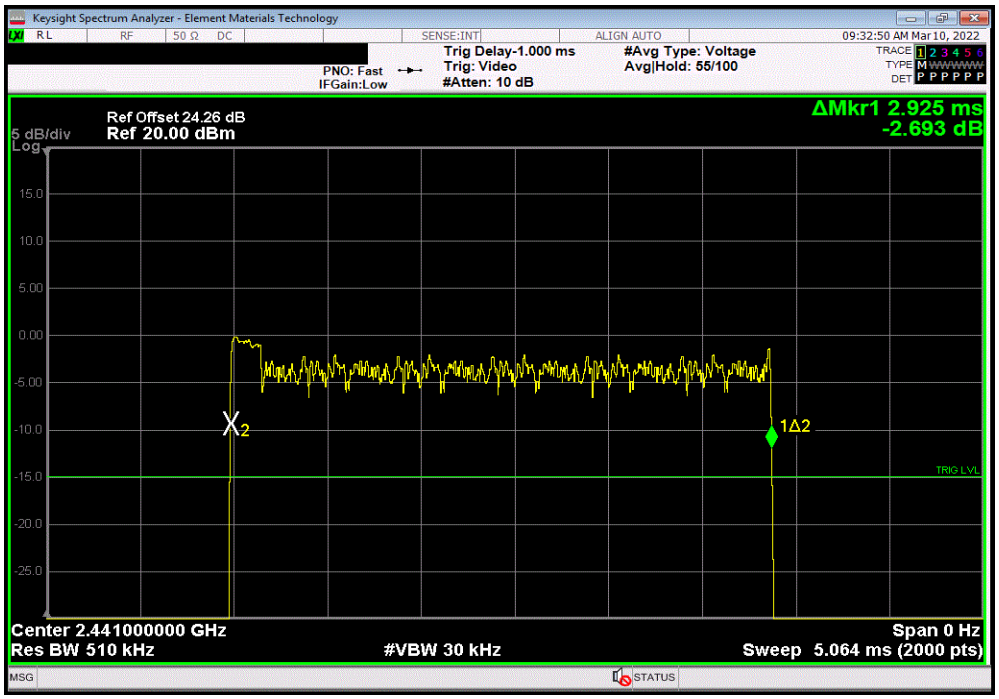
Calculation Only

No Screen Capture Required

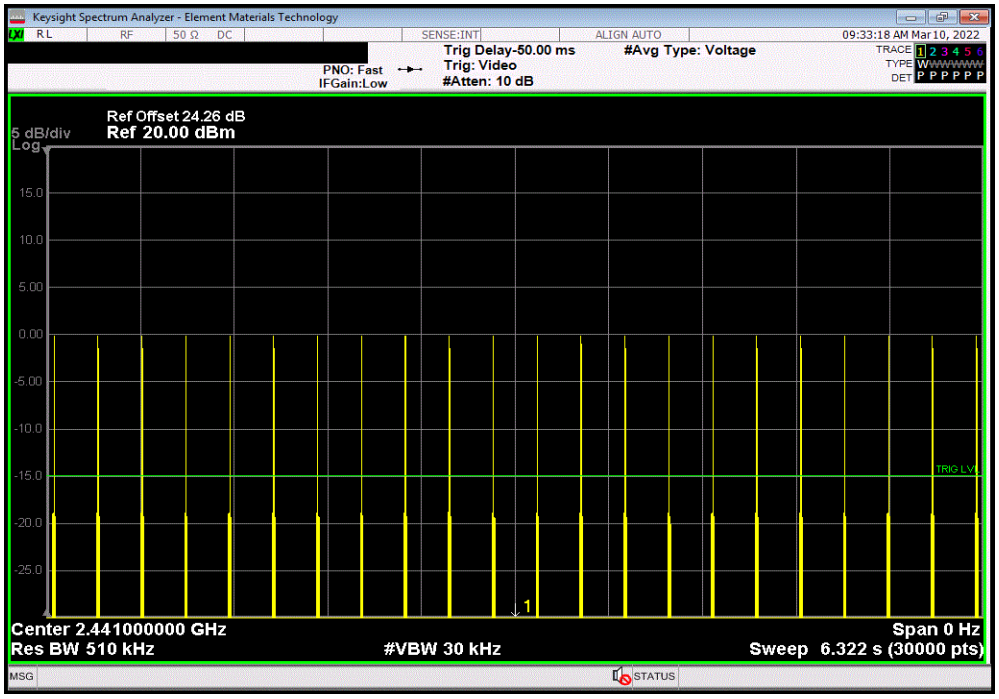
DWELL TIME

TbtTx 2021.12.14.1 XMit 2022.02.07.0

Hopping Mode (All Channels), 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
2.925	N/A	N/A	N/A	N/A	N/A	N/A

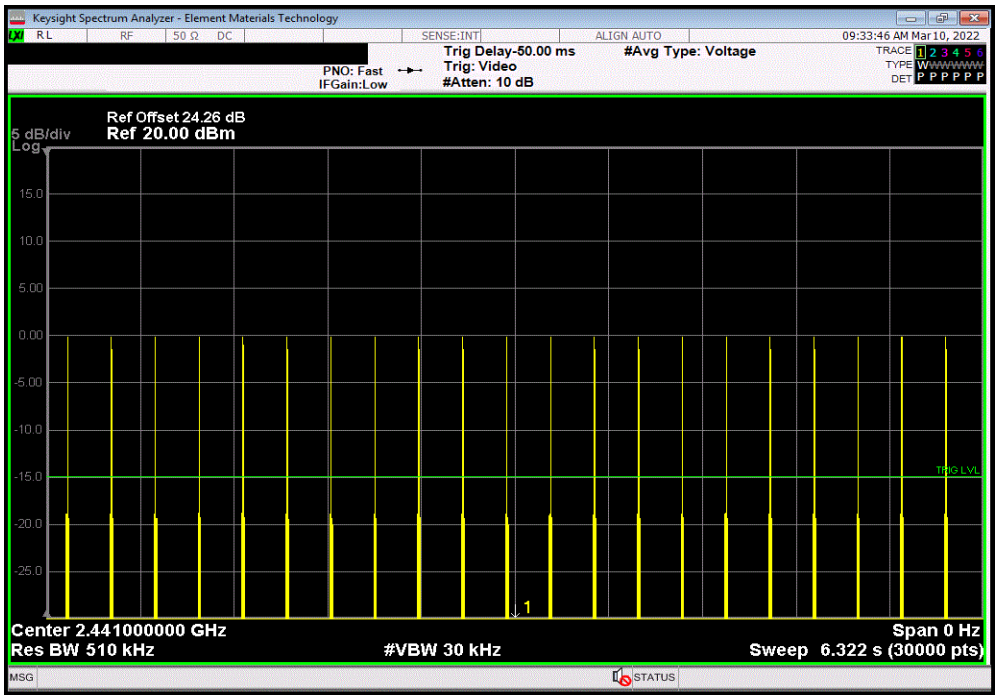


Hopping Mode (All Channels), 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	22	N/A	N/A	N/A	N/A	N/A

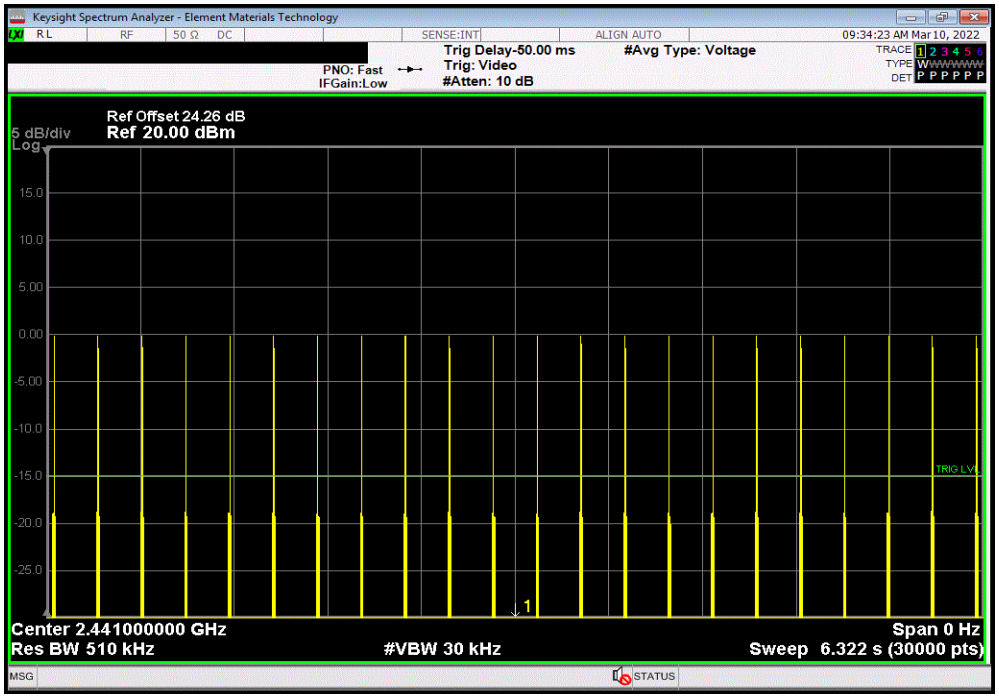


DWELL TIME

Hopping Mode (All Channels), 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	21	N/A	N/A	N/A	N/A	N/A

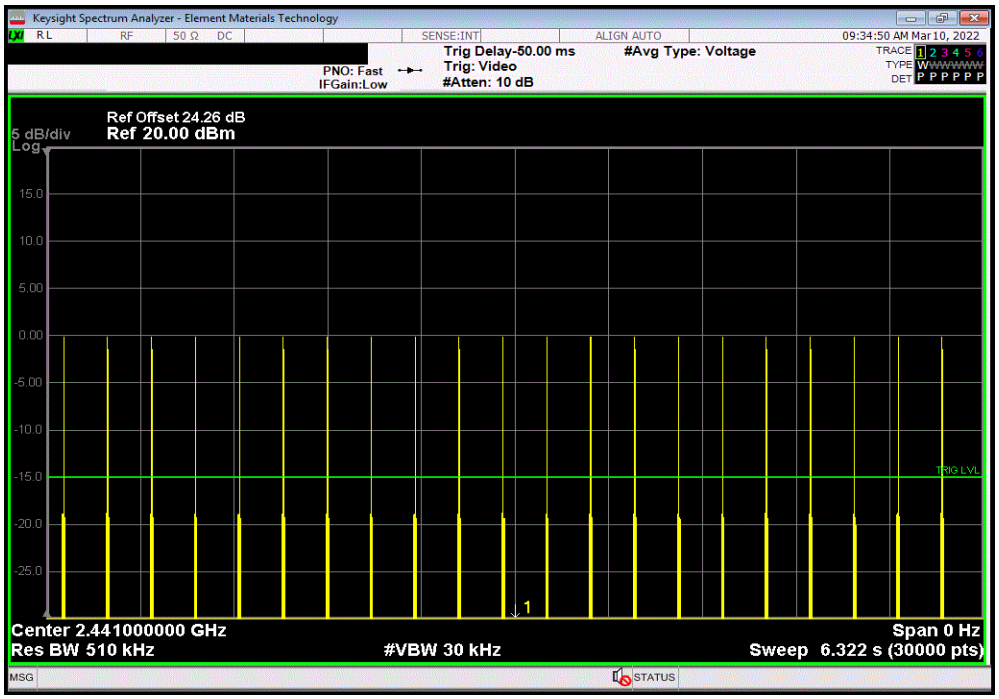


Hopping Mode (All Channels), 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	22	N/A	N/A	N/A	N/A	N/A



DWELL TIME

Hopping Mode (All Channels), 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
N/A	21	N/A	N/A	N/A	N/A	N/A



Hopping Mode (All Channels), 3DH5, 8-DPSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 31.6 s	Limit (ms)	Results
2.925	N/A	22	5	321.75	400	Pass

Calculation Only

No Screen Capture Required

OUTPUT POWER

XMit 2022.02.07.0

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	N5182B	TFU	2020-11-20	2022-11-20
Cable	Micro-Coax	UFD150A-1-0720-200200	EVK	2021-03-14	2022-03-14
Attenuator	S.M. Electronics	SA26B-20	AUY	2021-03-14	2022-03-14
Block - DC	Fairview Microwave	SD3379	AMW	2021-03-14	2022-03-14
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	2021-07-06	2022-07-06

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

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 2021.10.29.2 XMit 2022.02.07.0

EUT:	Sierra	Work Order:	LISA0056
Serial Number:	500042135	Date:	9-Mar-22
Customer:	LightSpeed Aviation	Temperature:	20.7 °C
Attendees:	Ed Katz	Humidity:	37.6% RH
Project:	None	Barometric Pres.:	1025 mbar
Tested by:	Jeff Alcoke	Job Site:	EV06
Power:	Battery		

TEST SPECIFICATIONS	Test Method
FCC 15.247:2022	ANSI C63.10:2013

COMMENTS

Reference level offset includes: DC Block, 20 dB attenuator, measurement cable, and manufacturers SMA patch cable.

DEVIATIONS FROM TEST STANDARD

None

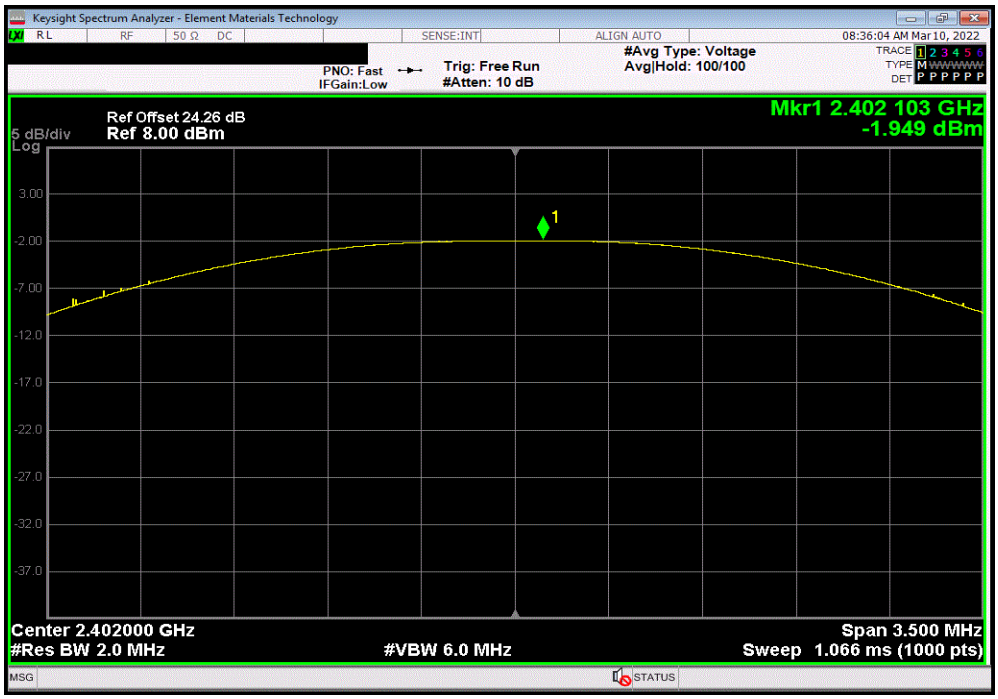
Configuration #	2	Signature

		Out Pwr (dBm)	Limit (dBm)	Result
DH5, GFSK				
	Low Channel, 2402 MHz	-1.949	21	Pass
	Mid Channel, 2441 MHz	-0.9	21	Pass
	High Channel, 2480 MHz	0.028	21	Pass
2DH5, pi/4-DQPSK				
	Low Channel, 2402 MHz	-0.505	21	Pass
	Mid Channel, 2441 MHz	0.808	21	Pass
	High Channel, 2480 MHz	1.306	21	Pass
3DH5, 8-DPSK				
	Low Channel, 2402 MHz	-0.263	21	Pass
	Mid Channel, 2441 MHz	0.969	21	Pass
	High Channel, 2480 MHz	1.44	21	Pass

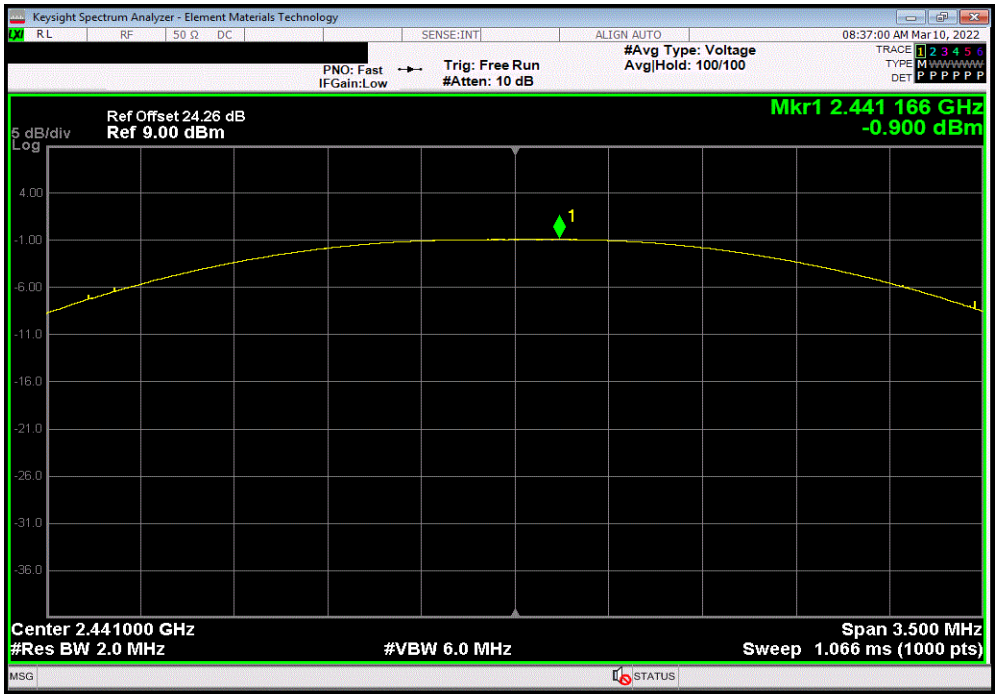
OUTPUT POWER

TbtTx 2021.10.29.2 XMit 2022.02.07.0

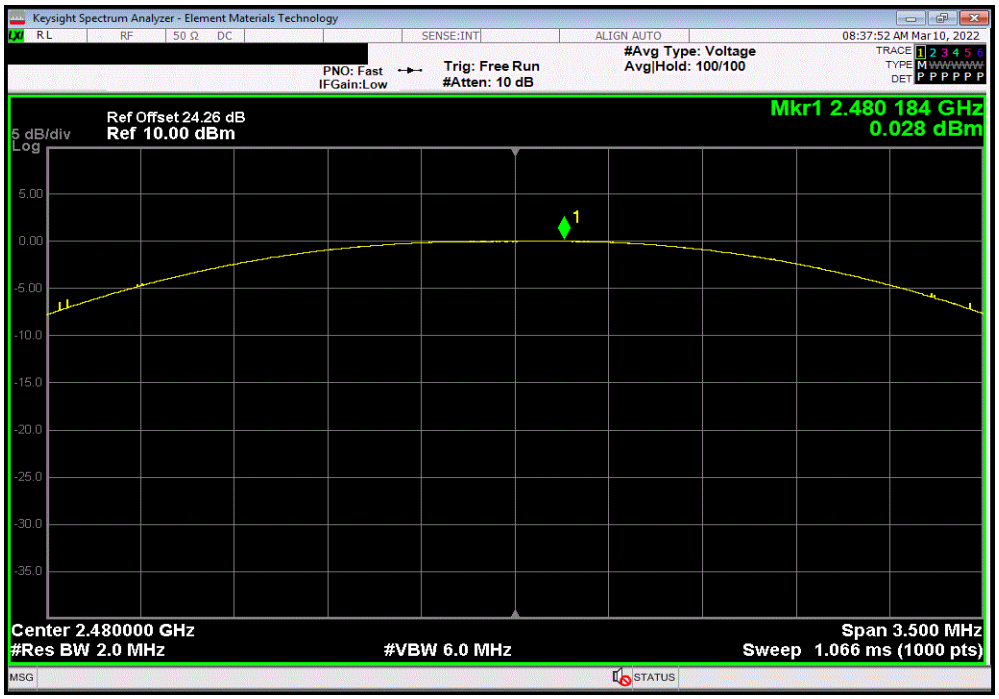
DH5, GFSK, Low Channel, 2402 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				-1.949	21	Pass



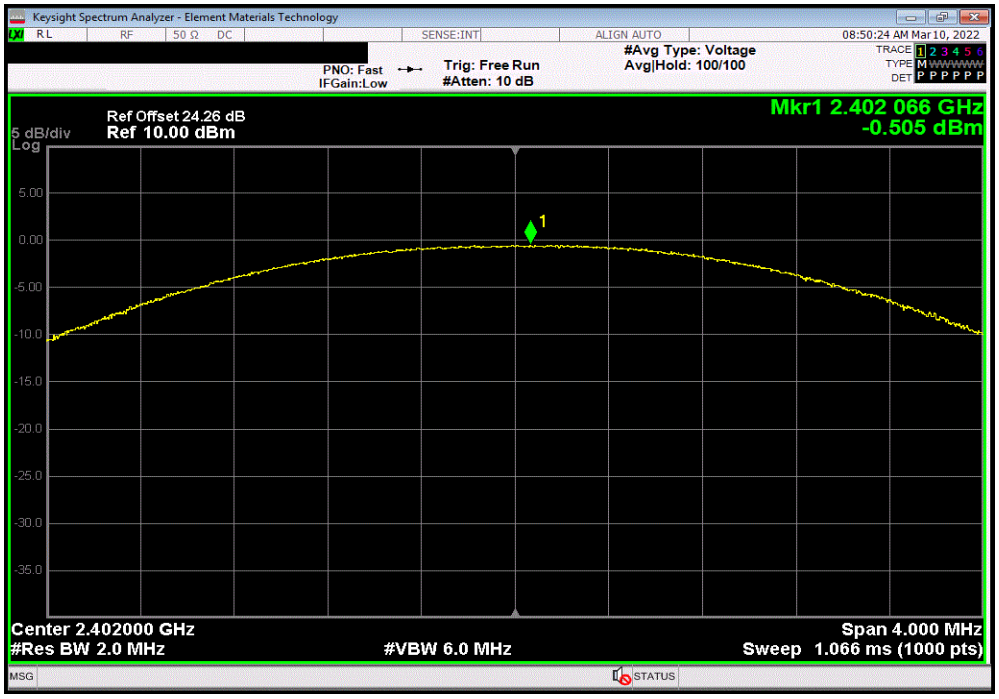
DH5, GFSK, Mid Channel, 2441 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				-0.9	21	Pass



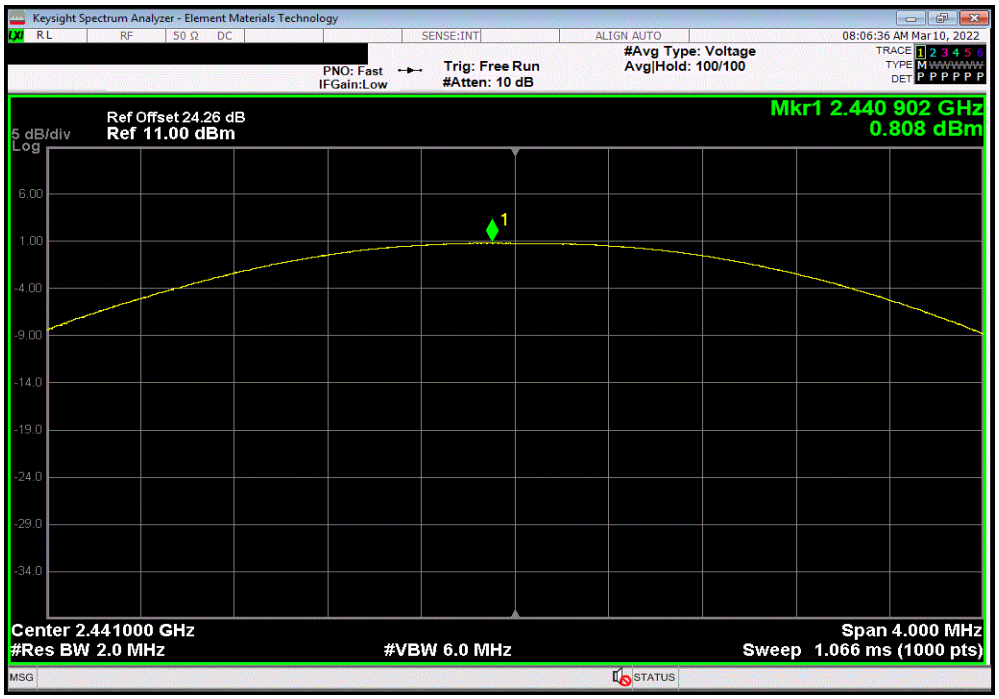
DH5, GFSK, High Channel, 2480 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				0.028	21	Pass



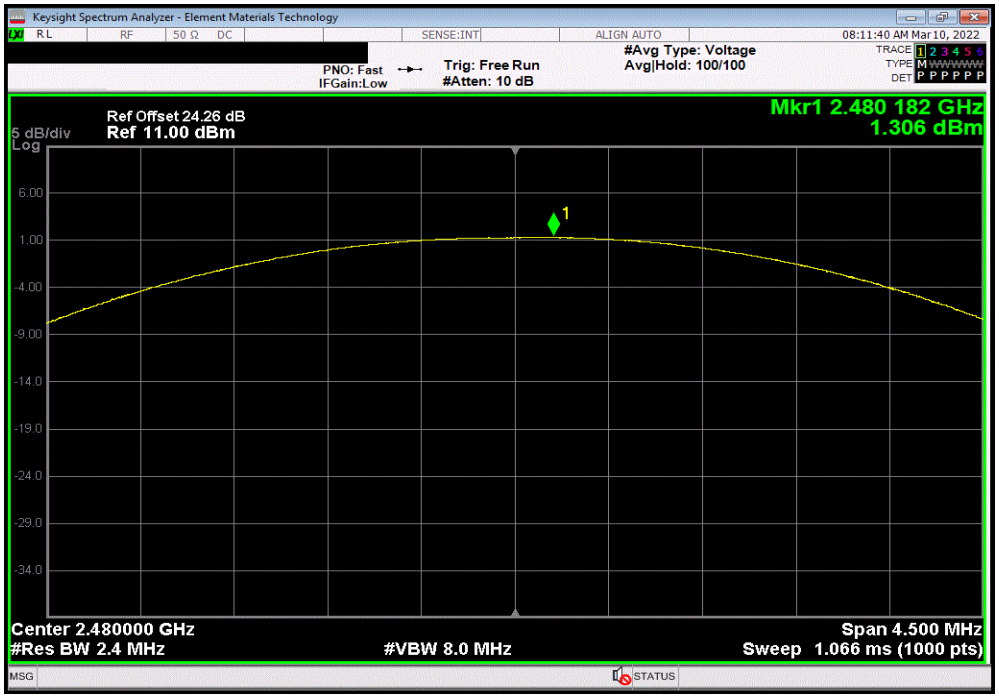
2DH5, pi/4-DQPSK, Low Channel, 2402 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				-0.505	21	Pass



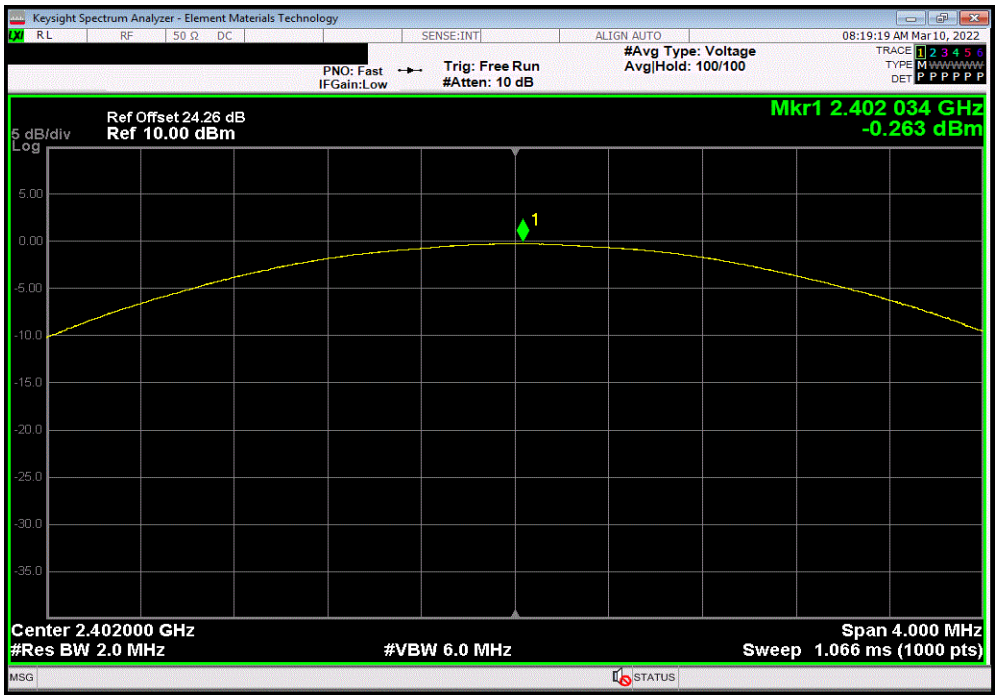
2DH5, pi/4-DQPSK, Mid Channel, 2441 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				0.808	21	Pass



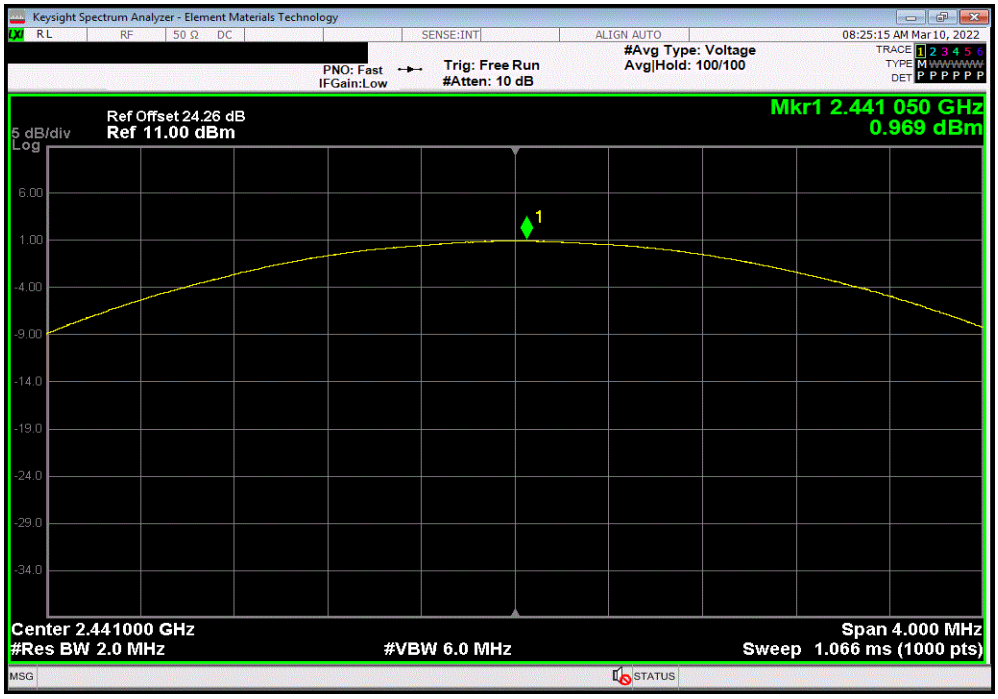
2DH5, pi/4-DQPSK, High Channel, 2480 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				1.306	21	Pass



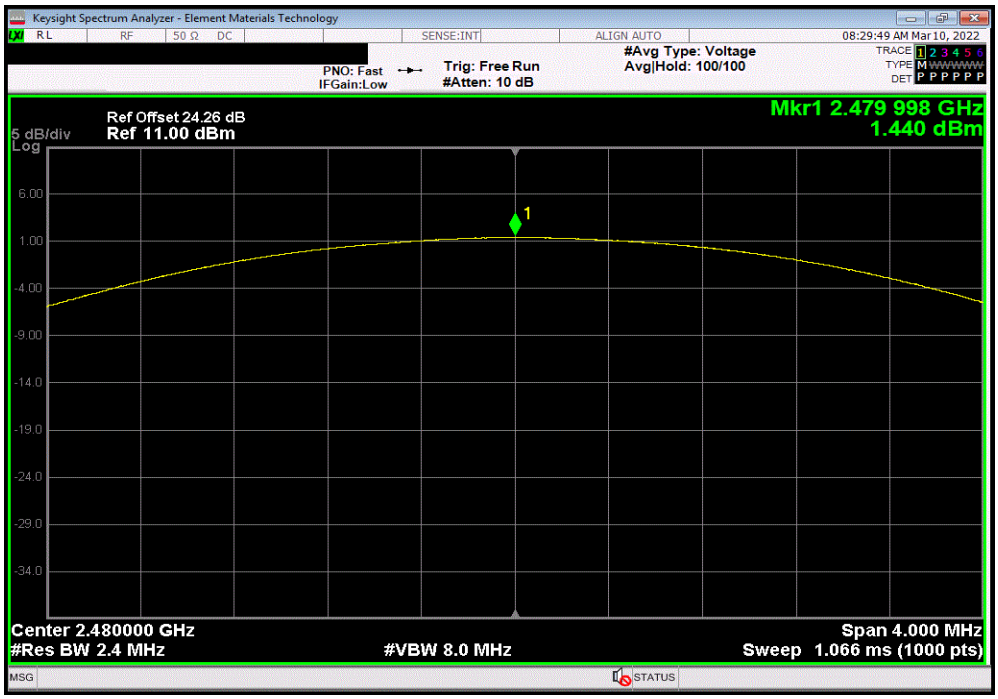
3DH5, 8-DPSK, Low Channel, 2402 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				-0.263	21	Pass



3DH5, 8-DPSK, Mid Channel, 2441 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				0.969	21	Pass



OUTPUT POWER

TbtTx 2021.10.29.2 XMit 2022.02.07.0

3DH5, 8-DPSK, High Channel, 2480 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				1.44	21	Pass