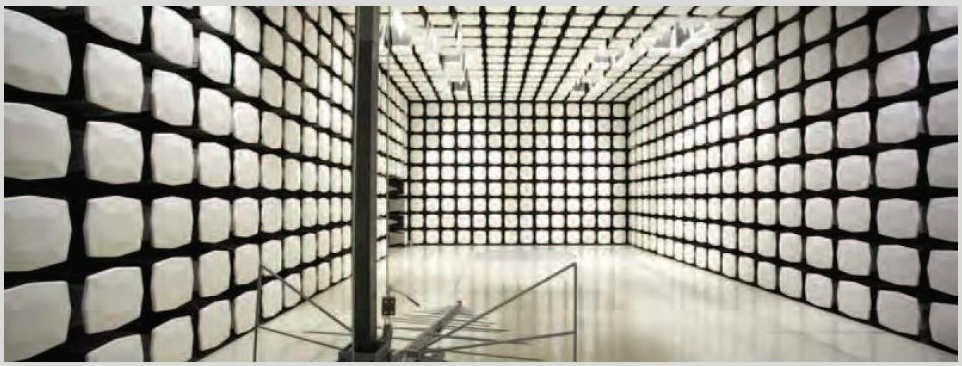
Boston Scientific Neuromodulation

Blink-32 IPG

FCC 15.247:2019

Bluetooth Low Energy (DTS) Radio

Report # BOSN0134



NVLAP LAB CODE: 200676-0

CERTIFICATE OF TEST

Last Date of Test: October 21, 2019
Boston Scientific Neuromodulation
EUT: Blink-32 IPG

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2019	ANSI C63.10:2013, KDB 558074

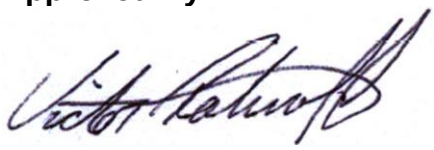
Results

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

Deviations From Test Standards

None

Approved By:



Victor Ratinoff, Operations Manager

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

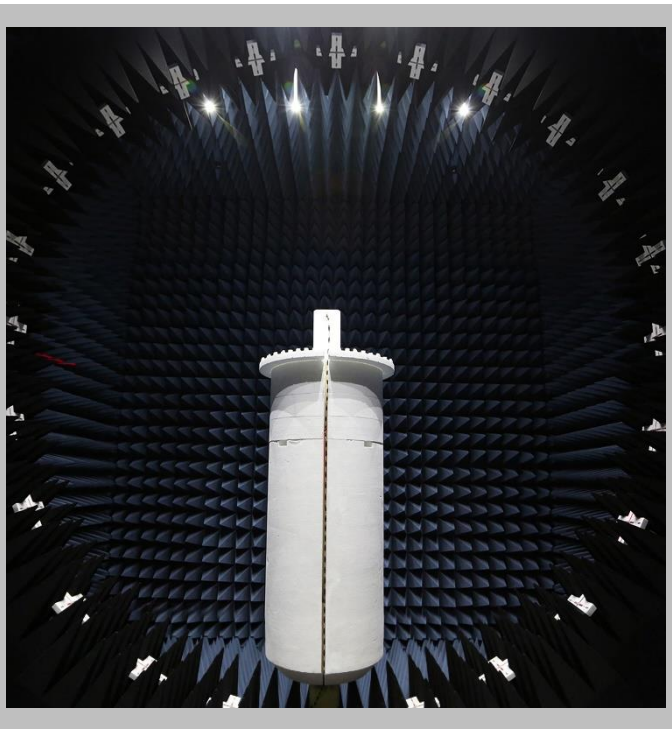
MIC – Recognized by MIC as a CAB for the acceptance of test data.

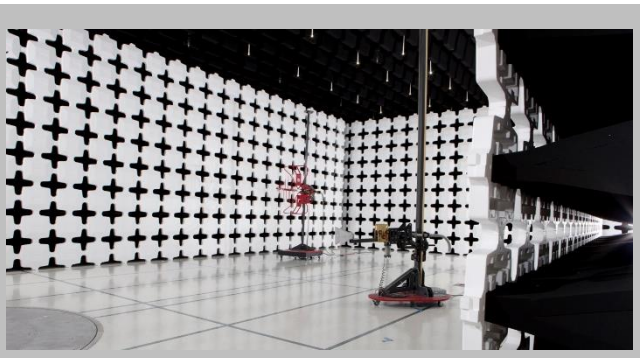
SCOPE

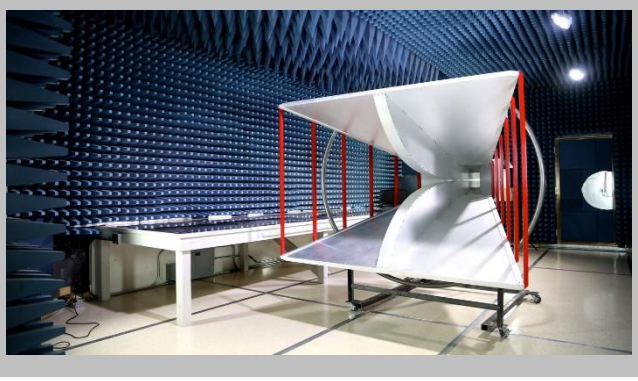
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

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.

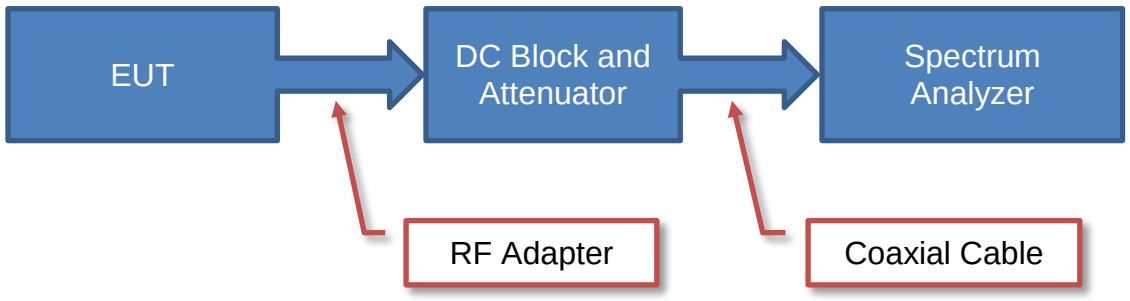
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

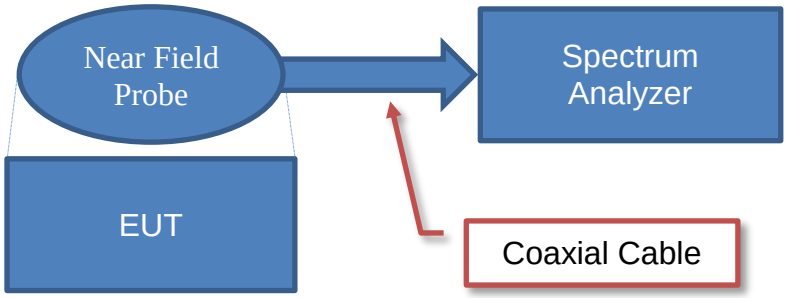
Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

Test Setup Block Diagrams

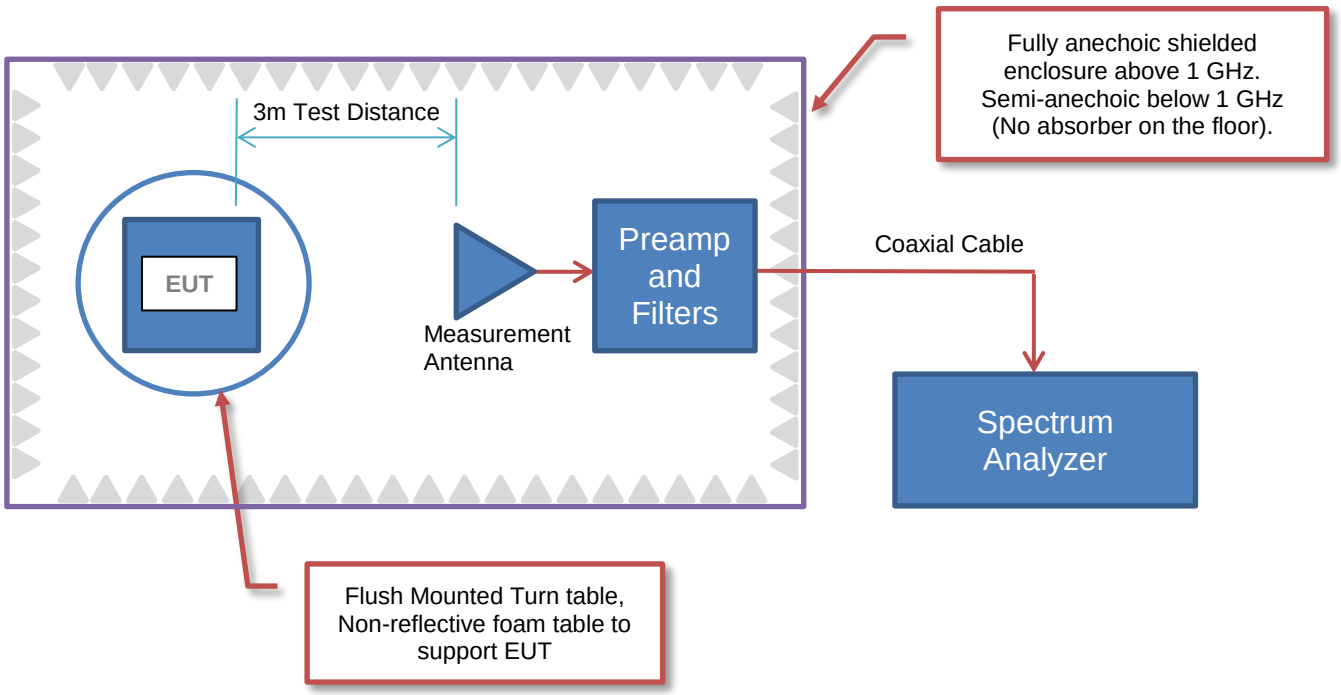
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Boston Scientific Neuromodulation
Address:	25155 Rye Canyon Loop
City, State, Zip:	Santa Clarita, CA 91355
Test Requested By:	Habet Ter-Petrosyan
EUT:	Blink IPG
First Date of Test:	October 14, 2019
Last Date of Test:	October 21, 2019
Receipt Date of Samples:	October 14, 2019
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Generates electrical pulses used to stimulate different nerve fibers depending upon the application, e.g., mitigation of chronic pain.

Testing Objective:
To demonstrate compliance of the Bluetooth Low Energy (DTS) radio to FCC 15.247 requirements.

CONFIGURATIONS

Configuration BOSN0134- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Implantable Pulse Generator (IPG)	Boston Scientific Neuromodulation	Vercise Blink-32 (DB-1432)	101041
Lead 1	Boston Scientific Neuromodulation	ARG Lead	3219342
Lead 2	Boston Scientific Neuromodulation	ARG Lead	3219340
Lead Extension 1	Boston Scientific Neuromodulation	ARG Ext	3219381
Lead Extension 2	Boston Scientific Neuromodulation	ARG Ext	3219465

Configuration BOSN0134- 6

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Implantable Pulse Generator (IPG)	Boston Scientific Neuromodulation	Vercise Blink-32 (DB-1432)	76749292

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2019-10-14	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	2019-10-21	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2019-10-21	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2019-10-21	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.
5	2019-10-21	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2019-10-21	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.
7	2019-10-21	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 2019.05.10

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

Transmitting on Low Ch 37 - 2402 MHz & High Ch 39 - 2480 MHz
Transmitting on Low Ch 37 - 2402 MHz, Mid Ch 18 - 2442 MHz, & High Ch 39 - 2480 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

BOSN0134 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26500 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
Cable	Northwest EMC	8-18GHz RE Cables	OCO	10-Jan-2019	12 mo
Cable	Northwest EMC	18-26GHz RE Cables	OCK	19-Dec-2018	12 mo
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	10-Jan-2019	12 mo
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	9-Sep-2019	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	HHX	2-Jul-2019	12 mo
Antenna - Biconilog	Teseq	CBL 6141A	AYE	7-Nov-2017	24 mo
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2-Jul-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	10-Jan-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOI	19-Dec-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOF	10-Jan-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOE	10-Jan-2019	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AHT	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHR	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AHN	NCR	0 mo
Antenna - Double Ridge	EMCO	3115	AHB	28-Mar-2018	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	18-Dec-2018	12 mo
Saline tank	N/A	N/A	ZZZ	NCR	N/A

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

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

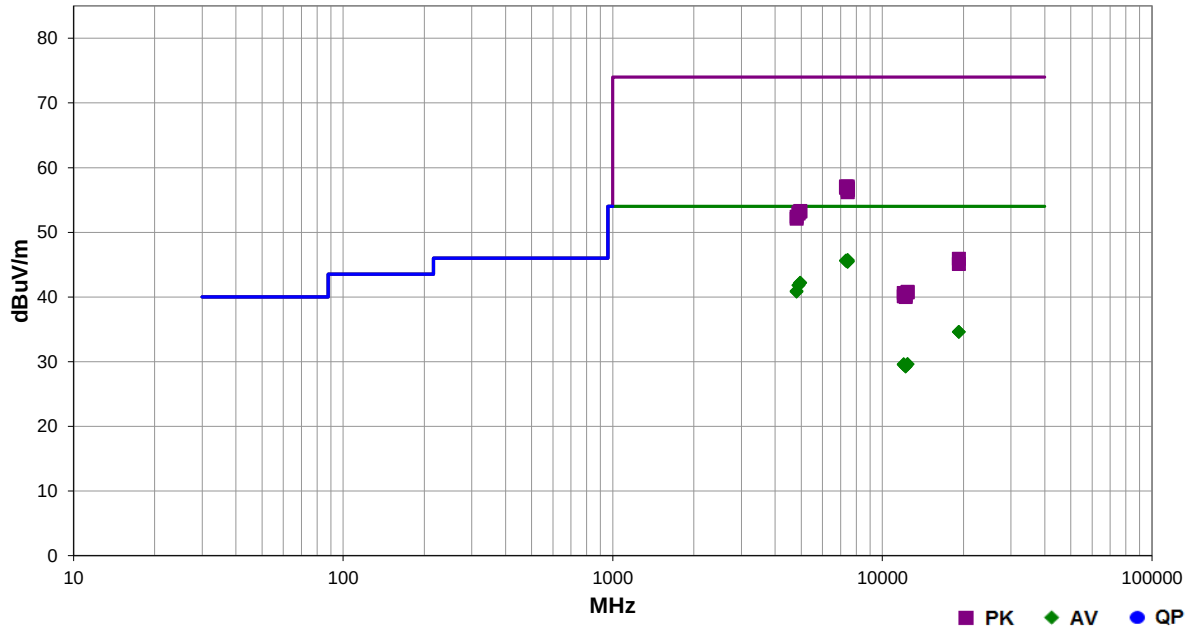
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.08.15.1 PSA-ESCI 2019.05.10

Work Order:	BOSN0134	**Date:**	14-Oct-2019		
Project:	None	**Temperature:**	20.2 °C		
Job Site:	OC10	**Humidity:**	49.4% RH		
Serial Number:	101041	**Barometric Pres.:**	1016 mbar	**Tested by:**	Johnny Candelas
EUT:	Blink IPG				
Configuration:	2				
Customer:	Boston Scientific Neuromodulation				
Attendees:	Habet Ter-Petrosyan				
EUT Power:	Battery				
Operating Mode:	Transmitting on Low Ch 37 - 2402 MHz, Mid Ch 18 - 2442 MHz, & High Ch 39 - 2480 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

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



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
7439.243	27.2	18.5	3.7	188.0	3.0	0.0	Horz	AV	0.0	45.7	54.0	-8.3	EUT Vert, High Ch
7440.037	27.2	18.5	1.5	0.0	3.0	0.0	Vert	AV	0.0	45.7	54.0	-8.3	EUT Vert, High Ch
7325.220	27.2	18.4	1.5	324.0	3.0	0.0	Horz	AV	0.0	45.6	54.0	-8.4	EUT Vert, Mid Ch
7325.580	27.2	18.4	1.5	190.0	3.0	0.0	Vert	AV	0.0	45.6	54.0	-8.4	EUT Vert, Mid Ch
7440.857	27.0	18.5	1.4	68.0	3.0	0.0	Horz	AV	0.0	45.5	54.0	-8.5	EUT on Side, High Ch
7439.567	27.0	18.5	2.0	60.0	3.0	0.0	Vert	AV	0.0	45.5	54.0	-8.5	EUT on Side, High Ch
7440.360	27.0	18.5	1.9	26.0	3.0	0.0	Horz	AV	0.0	45.5	54.0	-8.5	EUT Horiz, High Ch
7439.403	26.9	18.5	1.5	360.0	3.0	0.0	Vert	AV	0.0	45.4	54.0	-8.6	EUT Horiz, High Ch
4959.083	28.7	13.5	1.5	189.0	3.0	0.0	Horz	AV	0.0	42.2	54.0	-11.8	EUT Vert, High Ch
4959.497	28.7	13.5	1.5	2.0	3.0	0.0	Vert	AV	0.0	42.2	54.0	-11.8	EUT Vert, High Ch
4884.743	28.5	13.3	1.5	237.0	3.0	0.0	Horz	AV	0.0	41.8	54.0	-12.2	EUT Vert, Mid Ch
4884.530	28.5	13.3	1.5	189.0	3.0	0.0	Vert	AV	0.0	41.8	54.0	-12.2	EUT Vert, Mid Ch
4804.633	28.2	12.7	3.5	83.0	3.0	0.0	Horz	AV	0.0	40.9	54.0	-13.1	EUT Vert, Low Ch
4804.323	28.1	12.7	1.8	260.0	3.0	0.0	Vert	AV	0.0	40.8	54.0	-13.2	EUT Vert, Low Ch
7440.060	38.6	18.5	3.7	188.0	3.0	0.0	Horz	PK	0.0	57.1	74.0	-16.9	EUT Vert, High Ch
7325.400	38.7	18.4	1.5	190.0	3.0	0.0	Vert	PK	0.0	57.1	74.0	-16.9	EUT Vert, Mid Ch
7326.230	38.5	18.4	1.5	324.0	3.0	0.0	Horz	PK	0.0	56.9	74.0	-17.1	EUT Vert, Mid Ch
7440.753	38.3	18.5	2.0	60.0	3.0	0.0	Vert	PK	0.0	56.8	74.0	-17.2	EUT on Side, High Ch

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
7439.523	38.3	18.5	1.5	360.0	3.0	0.0	Vert	PK	0.0	56.8	74.0	-17.2	EUT Horiz, High Ch
7440.577	38.1	18.5	1.5	0.0	3.0	0.0	Vert	PK	0.0	56.6	74.0	-17.4	EUT Vert, High Ch

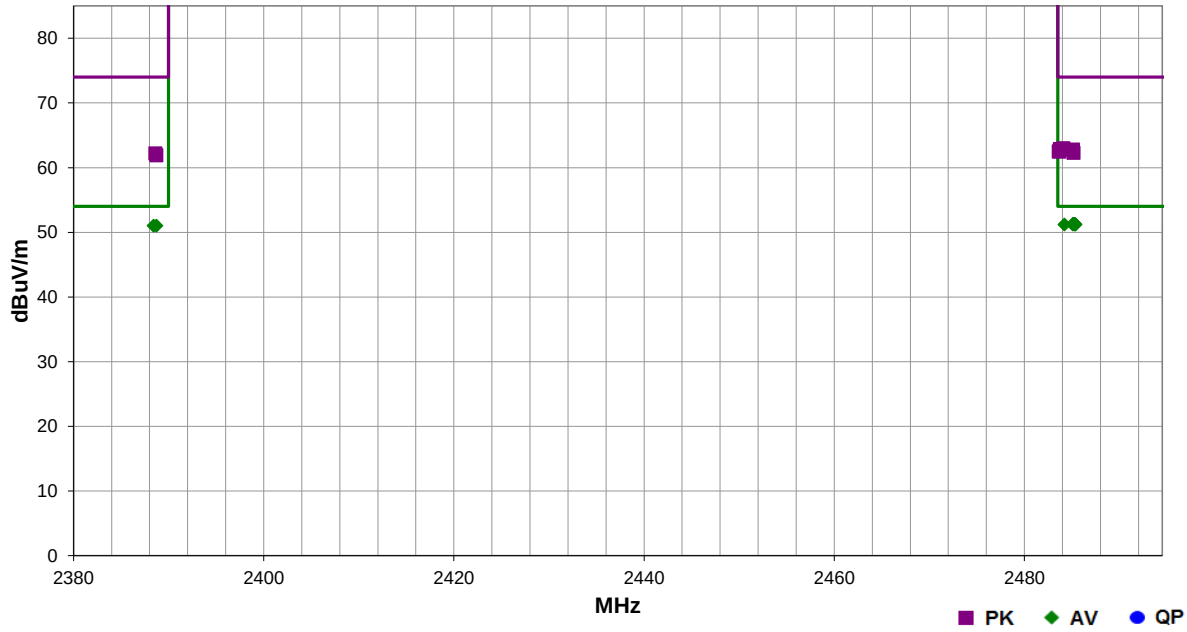
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.08.15.1 PSA-ESCI 2019.05.10

Work Order:	BOSN0134	**Date:**	14-Oct-2019		
Project:	None	**Temperature:**	20.2 °C		
Job Site:	OC10	**Humidity:**	49.4% RH		
Serial Number:	101041	**Barometric Pres.:**	1016 mbar	**Tested by:**	Johnny Candelas
EUT:	Blink-32 IPG				
Configuration:	2				
Customer:	Boston Scientific Neuromodulation				
Attendees:	Habet Ter-Petrosyan				
EUT Power:	Battery				
Operating Mode:	Transmitting on Low Ch 37 - 2402 MHz & High Ch 39 - 2480 MHz				
Deviations:	None				
Comments:	Band Edge				

Test Specifications	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

Run #	45	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
2485.117	27.9	3.4	1.5	18.0	3.0	20.0	Horz	AV	0.0	51.3	54.0	-2.7	EUT Vert, High Ch
2485.327	27.9	3.4	1.5	286.0	3.0	20.0	Vert	AV	0.0	51.3	54.0	-2.7	EUT Vert, High Ch
2484.210	27.8	3.4	1.5	197.0	3.0	20.0	Horz	AV	0.0	51.2	54.0	-2.8	EUT on Side, High Ch
2485.383	27.8	3.4	3.08	24.0	3.0	20.0	Vert	AV	0.0	51.2	54.0	-2.8	EUT on Side, High Ch
2485.287	27.8	3.4	1.5	125.0	3.0	20.0	Horz	AV	0.0	51.2	54.0	-2.8	EUT Horiz, High Ch
2485.100	27.8	3.4	1.5	279.0	3.0	20.0	Vert	AV	0.0	51.2	54.0	-2.8	EUT Horiz, High Ch
2388.727	27.8	3.2	1.5	215.0	3.0	20.0	Horz	AV	0.0	51.0	54.0	-3.0	EUT Vert, Low Ch
2388.420	27.8	3.2	1.5	103.0	3.0	20.0	Vert	AV	0.0	51.0	54.0	-3.0	EUT Vert, Low Ch
2484.103	39.6	3.4	1.5	125.0	3.0	20.0	Horz	PK	0.0	63.0	74.0	-11.0	EUT Horiz, High Ch
2483.730	39.5	3.4	3.08	24.0	3.0	20.0	Vert	PK	0.0	62.9	74.0	-11.1	EUT on Side, High Ch
2485.113	39.4	3.4	1.5	286.0	3.0	20.0	Vert	PK	0.0	62.8	74.0	-11.2	EUT Vert, High Ch
2483.663	39.1	3.4	1.5	18.0	3.0	20.0	Horz	PK	0.0	62.5	74.0	-11.5	EUT Vert, High Ch
2483.603	39.1	3.4	1.5	279.0	3.0	20.0	Vert	PK	0.0	62.5	74.0	-11.5	EUT Horiz, High Ch
2485.163	38.9	3.4	1.5	197.0	3.0	20.0	Horz	PK	0.0	62.3	74.0	-11.7	EUT on Side, High Ch
2388.613	39.0	3.2	1.5	103.0	3.0	20.0	Vert	PK	0.0	62.2	74.0	-11.8	EUT Vert, Low Ch
2388.707	38.7	3.2	1.5	215.0	3.0	20.0	Horz	PK	0.0	61.9	74.0	-12.1	EUT Vert, Low Ch

DUTY CYCLE

XMit 2019.06.11

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.

OCCUPIED BANDWIDTH

XMit 2019.09.05

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	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Generator - Signal	Agilent	E8257D	OCZ	NCR	NCR
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20

TEST DESCRIPTION

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

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

OCCUPIED BANDWIDTH

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	**Blink-32 IPG**			**Work Order:**	**BOSN0134**
Serial Number:	**76749292**			**Date:**	**21-Oct-19**
Customer:	**Boston Scientific Neuromodulation**			**Temperature:**	**20 °C**
Attendees:	**Habet Ter-Petrosyan**			**Humidity:**	**49.7% RH**
Project:	**None**			**Barometric Pres.:**	**1018 mbar**
Tested by:	**Salvador Solorzano**	**Power:**	**Battery**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

DC Block + 20 dB Attenuator + Cable + customers patch cable = 23.51 dB Offset

DEVIATIONS FROM TEST STANDARD

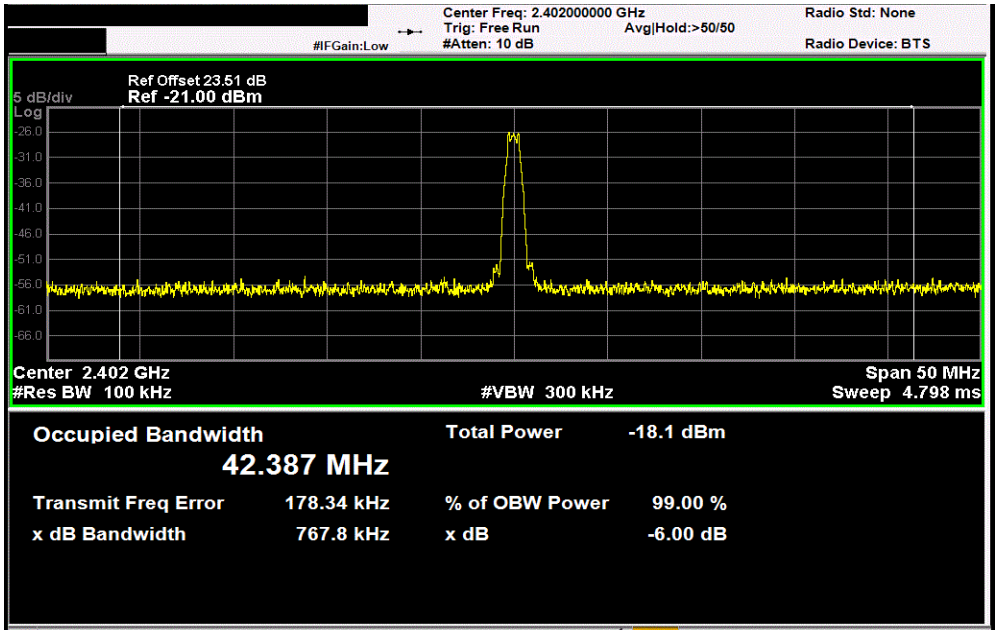
None

Configuration #	**6**	*Signature*

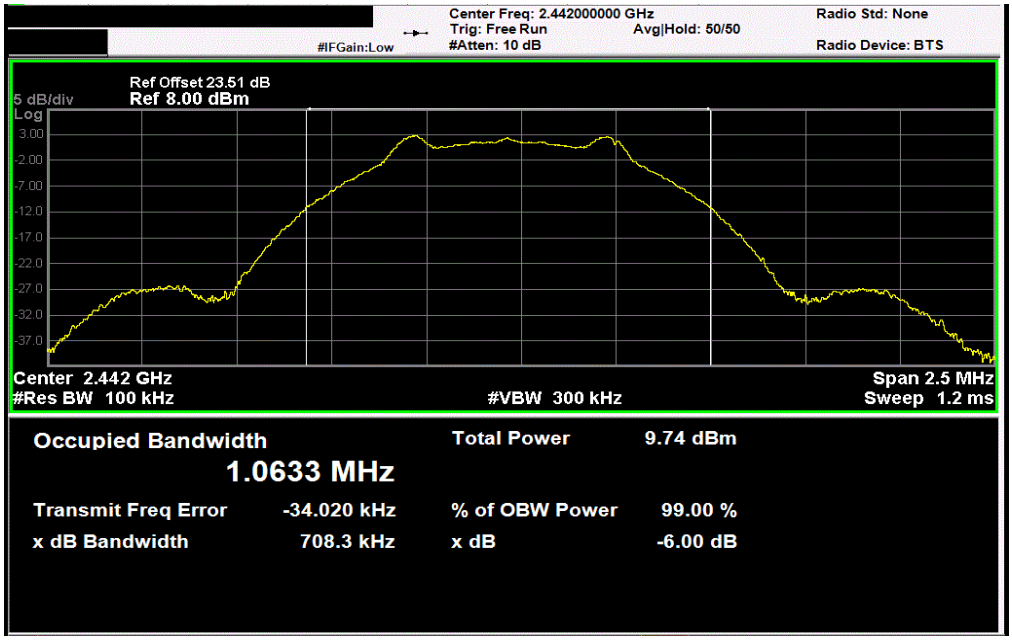
	Value	**Limit (≥)**	**Result**
BLE/GFSK Low Channel, 2402 MHz	767.77 kHz	500 kHz	Pass
BLE/GFSK Mid Channel, 2442 MHz	708.325 kHz	500 kHz	Pass
BLE/GFSK High Channel, 2480 MHz	718.778 kHz	500 kHz	Pass

OCCUPIED BANDWIDTH

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



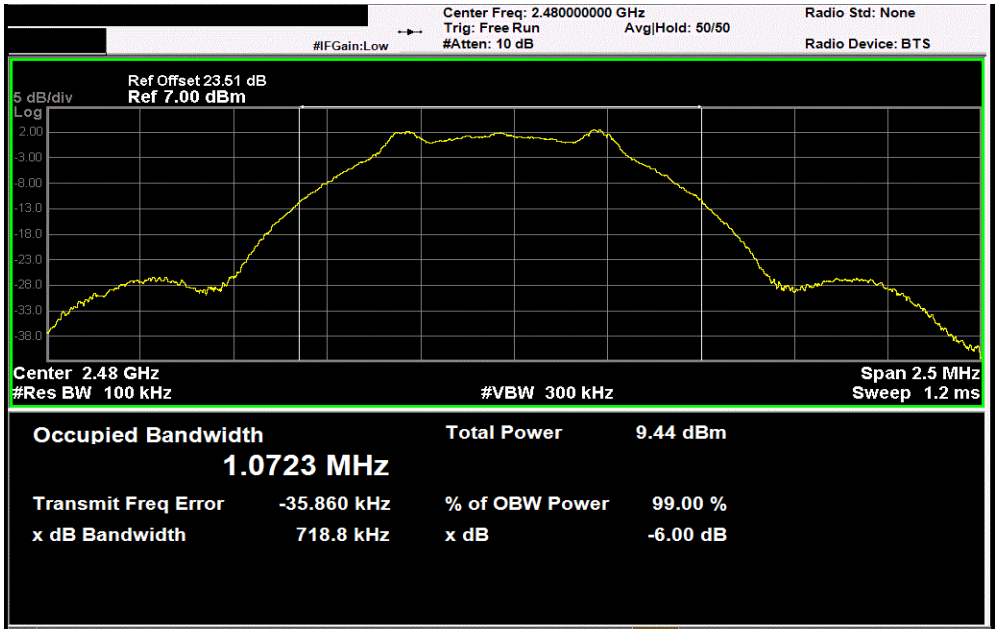
BLE/GFSK Mid Channel, 2442 MHz						
				Value	Limit (≥)	Result
				708.325 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

TbtTx 2019.08.30.0 XMit 2019.09.05

BLE/GFSK High Channel, 2480 MHz						
				Value	Limit (≥)	Result
				718.778 kHz	500 kHz	Pass



OUTPUT POWER

XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR

TEST DESCRIPTION

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

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

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

OUTPUT POWER

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	Blink-32 IPG			**Work Order:**	BOSN0134
Serial Number:	76749292			**Date:**	21-Oct-19
Customer:	Boston Scientific Neuromodulation			**Temperature:**	20.1 °C
Attendees:	Habet Ter-Petrosyan			**Humidity:**	49.5% RH
Project:	None			**Barometric Pres.:**	1018 mbar
Tested by:	Salvador Solorzano	**Power:**	Battery	**Job Site:**	OC13

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

DC Block + 20 dB Attenuator + Cable + customers patch cable = 23.51 dB Offset

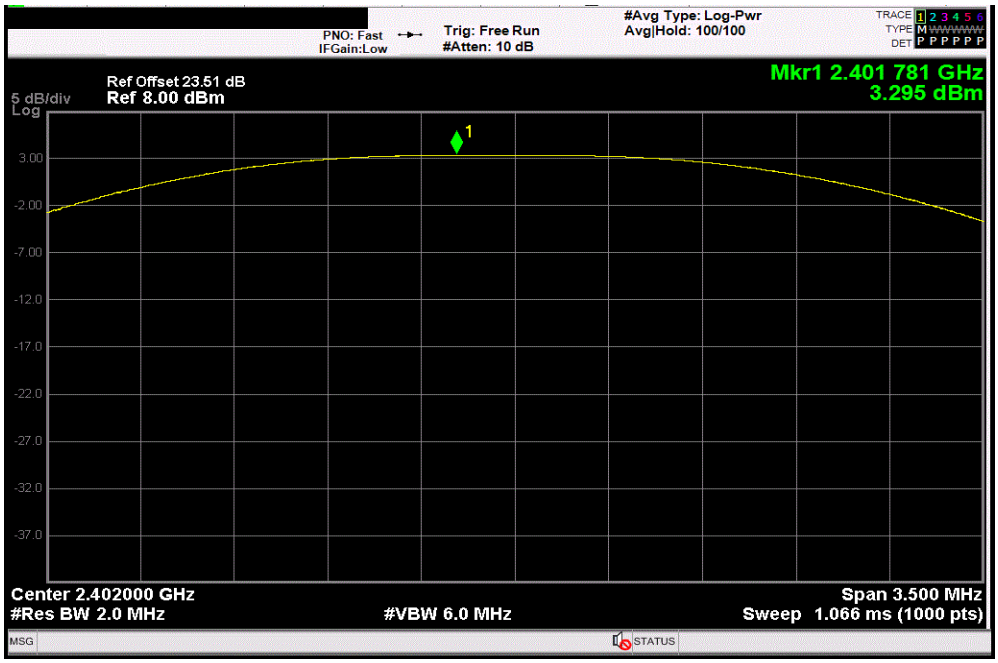
DEVIATIONS FROM TEST STANDARD

None

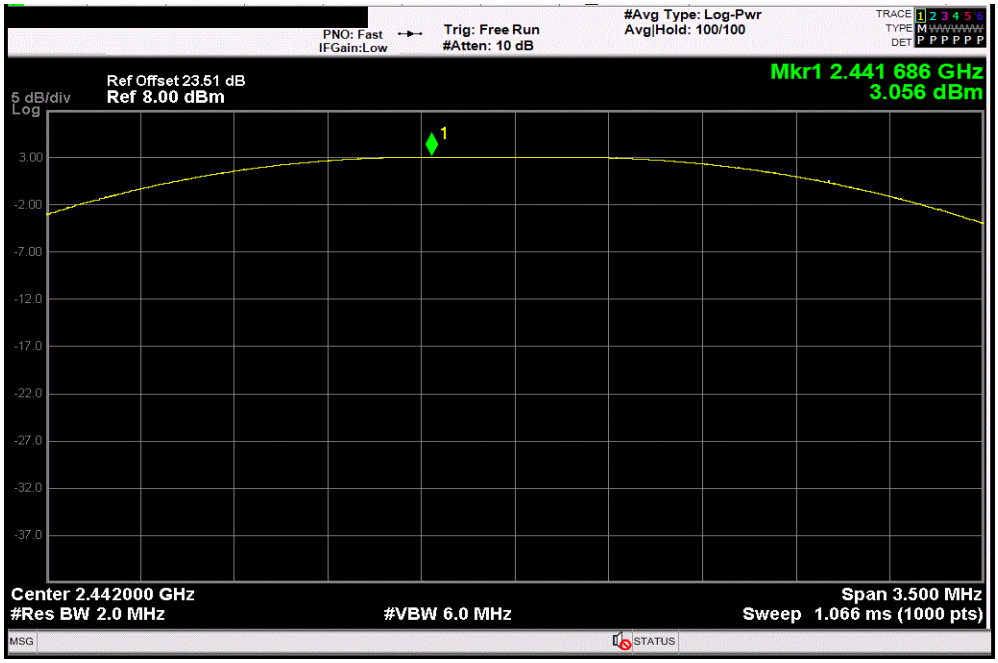
Configuration #	6	Signature

	Out Pwr (dBm)	Limit (dBm)	Result
BLE/GFSK Low Channel, 2402 MHz	3.295	30	Pass
BLE/GFSK Mid Channel, 2442 MHz	3.056	30	Pass
BLE/GFSK High Channel, 2480 MHz	2.649	30	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				3.295	30	Pass



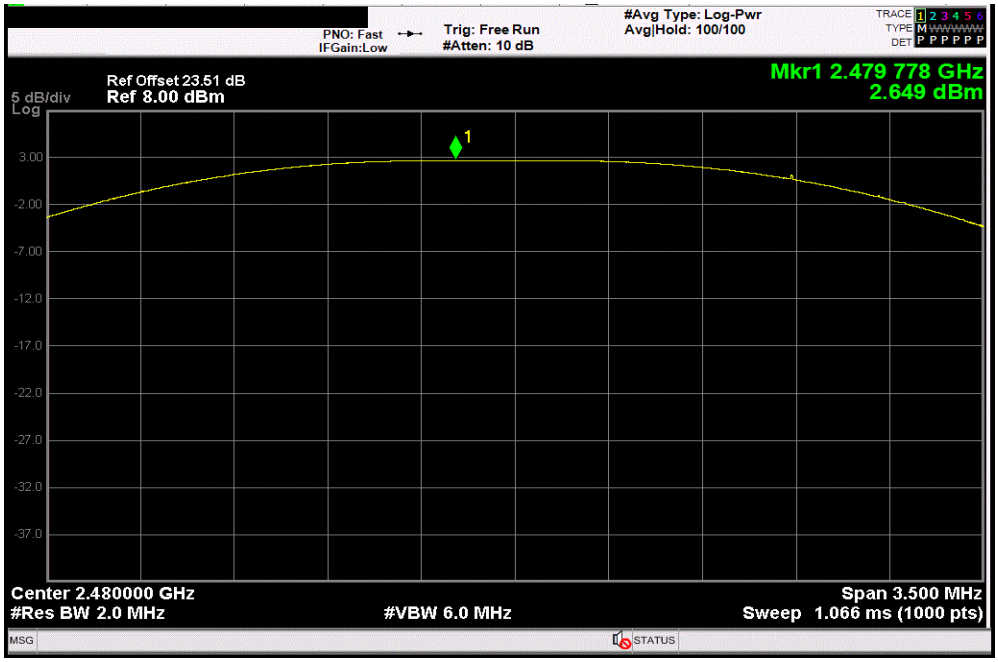
BLE/GFSK Mid Channel, 2442 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				3.056	30	Pass



OUTPUT POWER

TbtTx 2019.08.30.0 XMit 2019.09.05

BLE/GFSK High Channel, 2480 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				2.649	30	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR

TEST DESCRIPTION

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

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

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

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

element

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	**Blink-32 IPG**			**Work Order:**	**BOSN0134**
Serial Number:	**76749292**			**Date:**	**21-Oct-19**
Customer:	**Boston Scientific Neuromodulation**			**Temperature:**	**20 °C**
Attendees:	**Habet Ter-Petrosyan**			**Humidity:**	**49.5% RH**
Project:	**None**			**Barometric Pres.:**	**1018 mbar**
Tested by:	**Salvador Solorzano**	**Power:**	**Battery**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

DC Block + 20 dB Attenuator + Cable + customers patch cable = 23.51 dB Offset

DEVIATIONS FROM TEST STANDARD

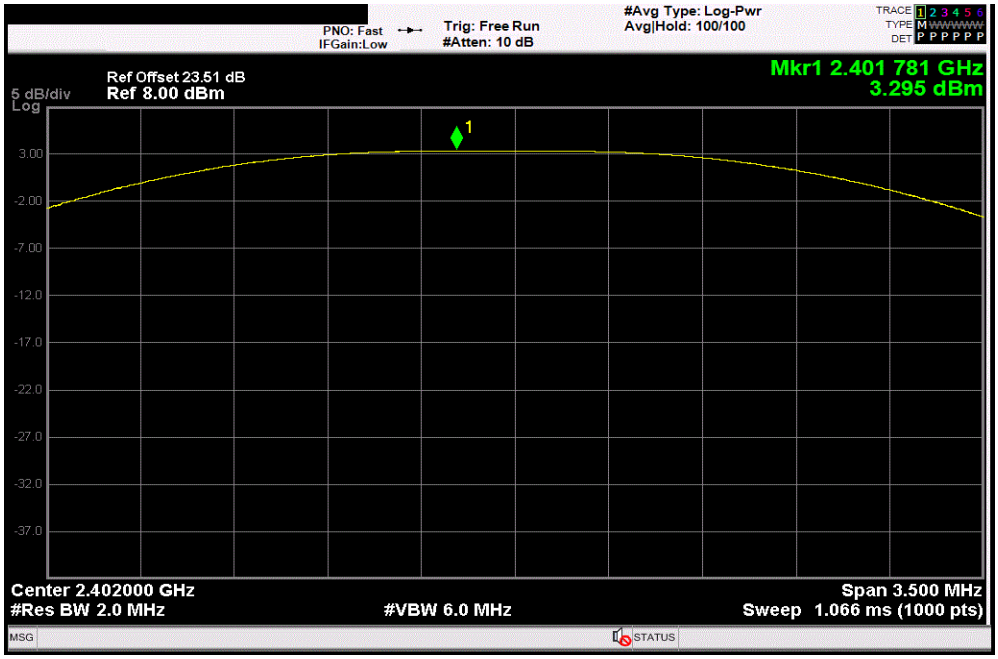
None

Configuration #	**6**	*Signature*

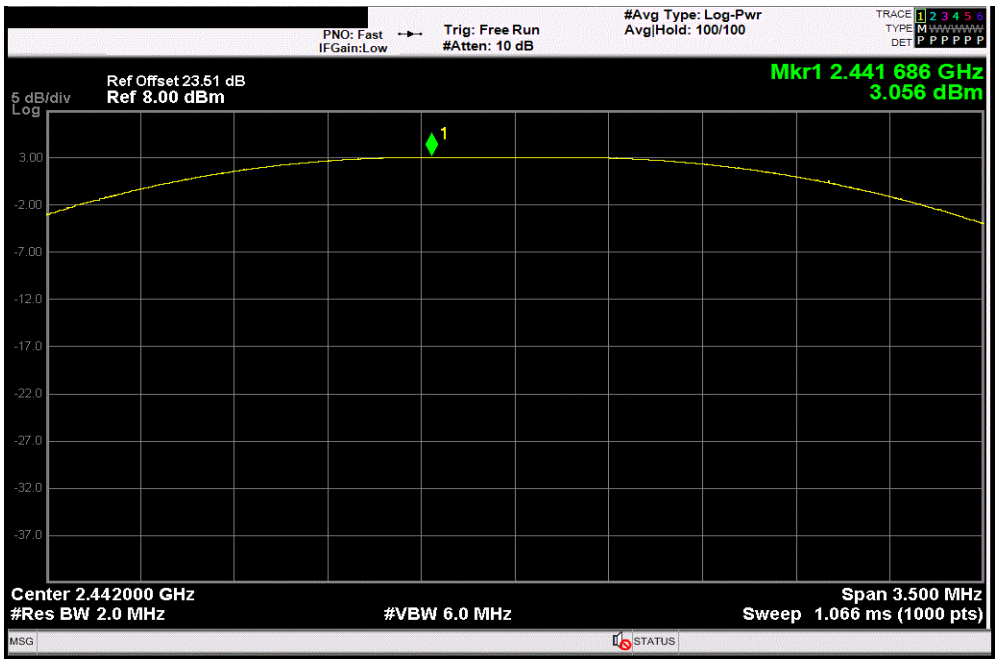
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
BLE/GFSK Low Channel, 2402 MHz	3.295	0.17	3.465	36	Pass
BLE/GFSK Mid Channel, 2442 MHz	3.056	0.17	3.226	36	Pass
BLE/GFSK High Channel, 2480 MHz	2.649	0.17	2.939	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

BLE/GFSK Low Channel, 2402 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		3.295	0.17	3.465	36	Pass

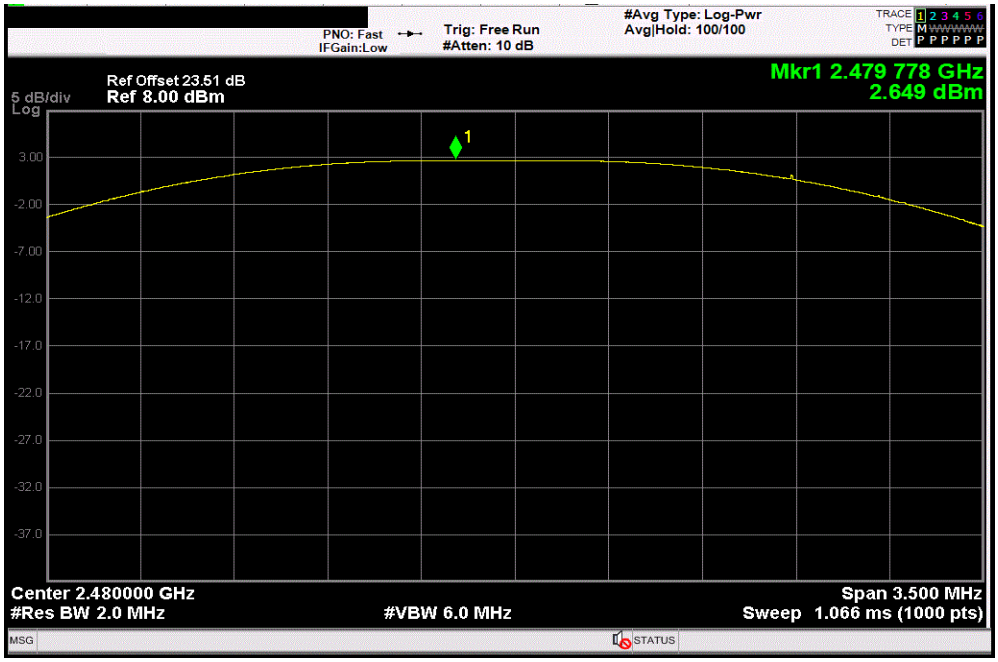


BLE/GFSK Mid Channel, 2442 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		3.056	0.17	3.226	36	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

BLE/GFSK High Channel, 2480 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		2.649	0.17	2.939	36	Pass



POWER SPECTRAL DENSITY

XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	Tgu	15-Feb-18	15-Feb-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR

TEST DESCRIPTION

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

Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.

POWER SPECTRAL DENSITY

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	**Blink-32 IPG**			**Work Order:**	**BOSN0134**
Serial Number:	**76749292**			**Date:**	**21-Oct-19**
Customer:	**Boston Scientific Neuromodulation**			**Temperature:**	**20.1 °C**
Attendees:	**Habet Ter-Petrosyan**			**Humidity:**	**49.7% RH**
Project:	**None**			**Barometric Pres.:**	**1018 mbar**
Tested by:	**Salvador Solorzano**	**Power:**	**Battery**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

DC Block + 20 dB Attenuator + Cable + customers patch cable = 23.51 dB Offset

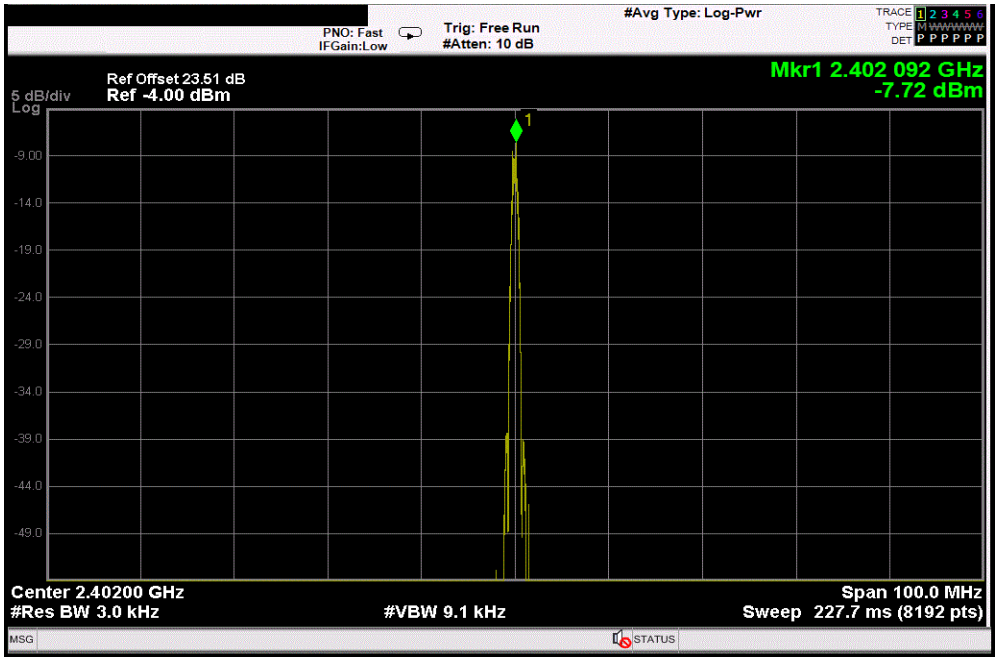
DEVIATIONS FROM TEST STANDARD

None

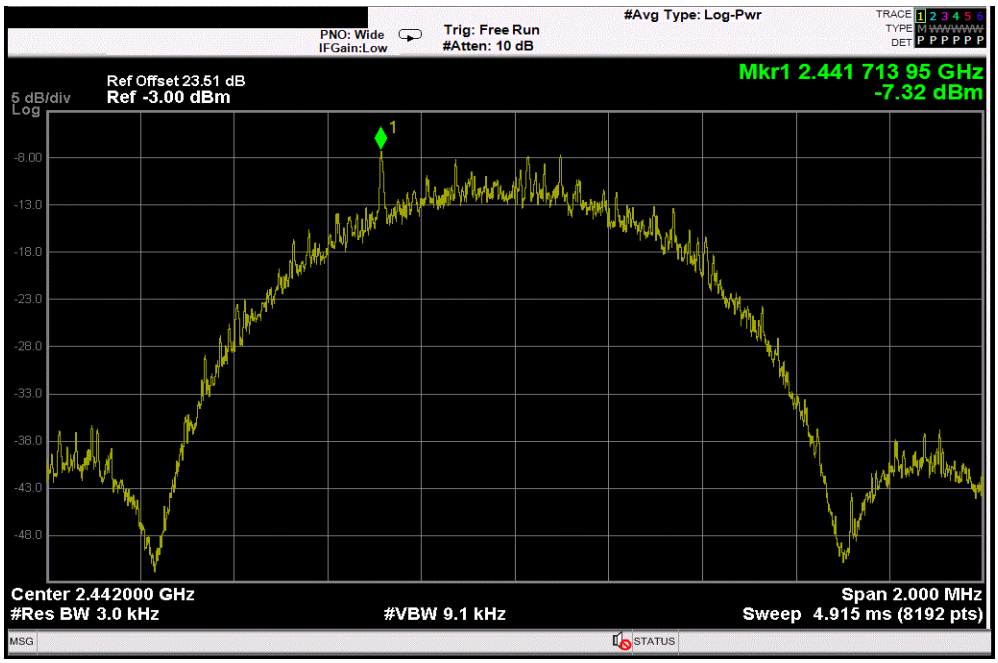
Configuration #	**6**	*Signature*

	Value dBm/3kHz	**Limit < dBm/3kHz**	**Results**
BLE/GFSK Low Channel, 2402 MHz	-7.717	8	Pass
BLE/GFSK Mid Channel, 2442 MHz	-7.324	8	Pass
BLE/GFSK High Channel, 2480 MHz	-6.761	8	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-7.717	8	Pass



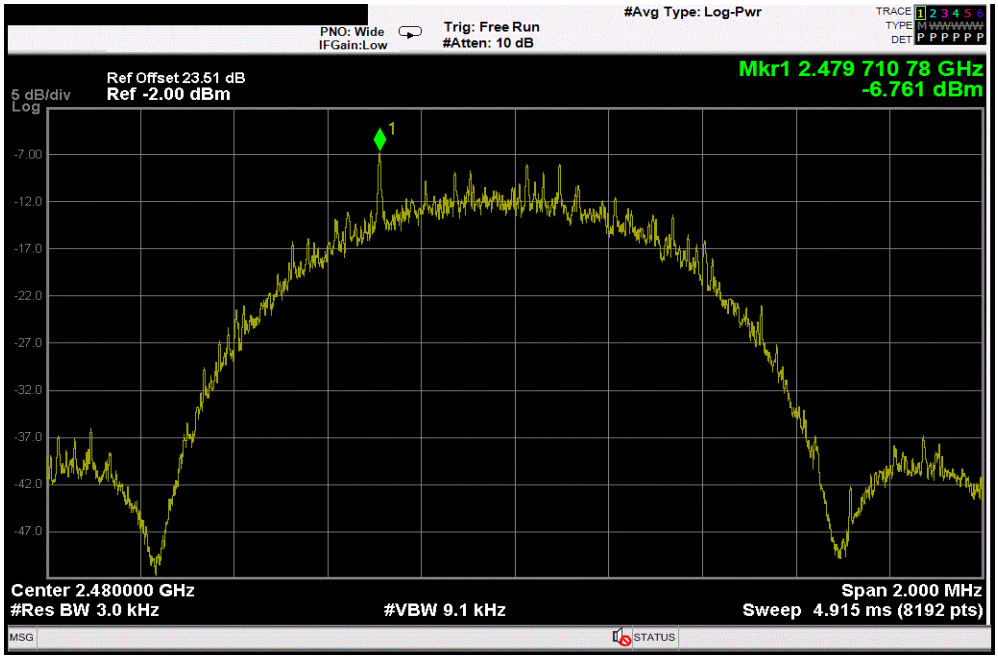
BLE/GFSK Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-7.324	8	Pass



POWER SPECTRAL DENSITY

TbtTx 2019.08.30.0 XMit 2019.09.05

BLE/GFSK High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-6.761	8	Pass



BAND EDGE COMPLIANCE

XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR

TEST DESCRIPTION

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

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

BAND EDGE COMPLIANCE

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	**Blink-32 IPG**			**Work Order:**	**BOSN0134**
Serial Number:	**76749292**			**Date:**	**21-Oct-19**
Customer:	**Boston Scientific Neuromodulation**			**Temperature:**	**20 °C**
Attendees:	**Habet Ter-Petrosyan**			**Humidity:**	**49.6% RH**
Project:	**None**			**Barometric Pres.:**	**1018 mbar**
Tested by:	**Salvador Solorzano**	**Power:**	**Battery**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

DC Block + 20 dB Attenuator + Cable + customers patch cable = 23.51 dB Offset

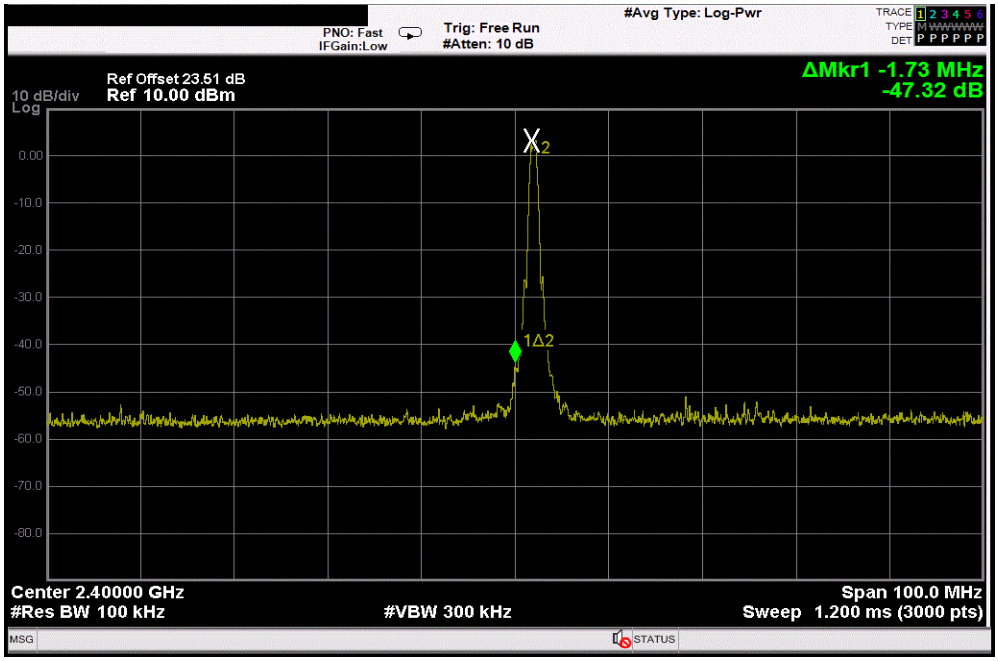
DEVIATIONS FROM TEST STANDARD

None

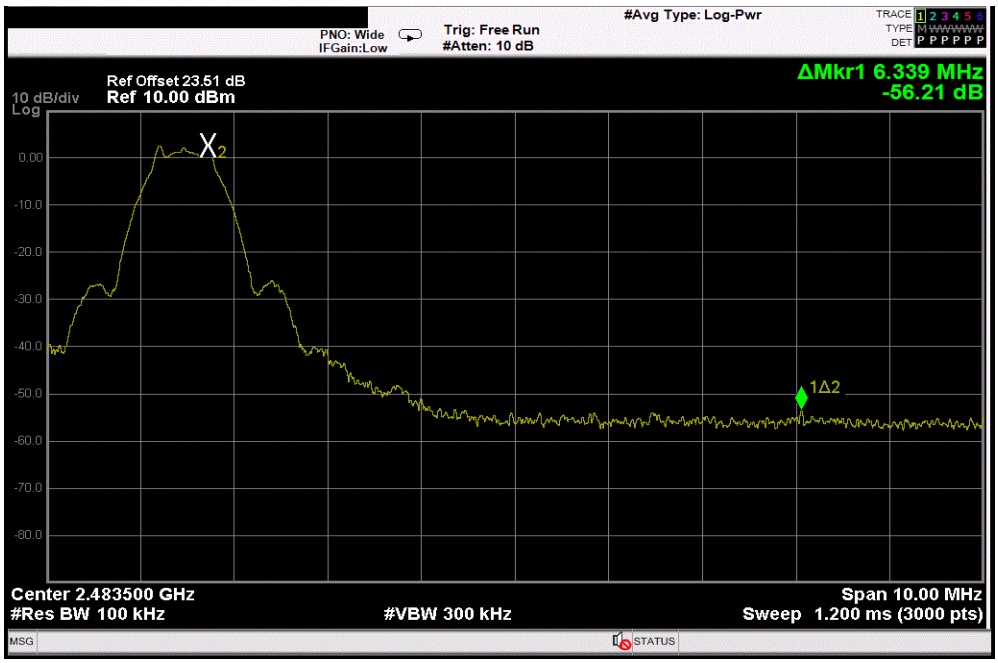
Configuration #	**6**	*Signature*

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
BLE/GFSK Low Channel, 2402 MHz	-47.32	-20	Pass
BLE/GFSK High Channel, 2480 MHz	-56.21	-20	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-47.32	-20	Pass



BLE/GFSK High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-56.21	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2019.06.11

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20

TEST DESCRIPTION

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

SPURIOUS CONDUCTED EMISSIONS

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	**Blink-32 IPG**			**Work Order:**	**BOSN0134**
Serial Number:	**76749292**			**Date:**	**21-Oct-19**
Customer:	**Boston Scientific Neuromodulation**			**Temperature:**	**20.1 °C**
Attendees:	**Habet Ter-Petrosyan**			**Humidity:**	**49.6% RH**
Project:	**None**			**Barometric Pres.:**	**1018 mbar**
Tested by:	**Salvador Solorzano**	**Power:**	**Battery**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

DC Block + 20 dB Attenuator + Cable + customers patch cable = 23.51 dB Offset

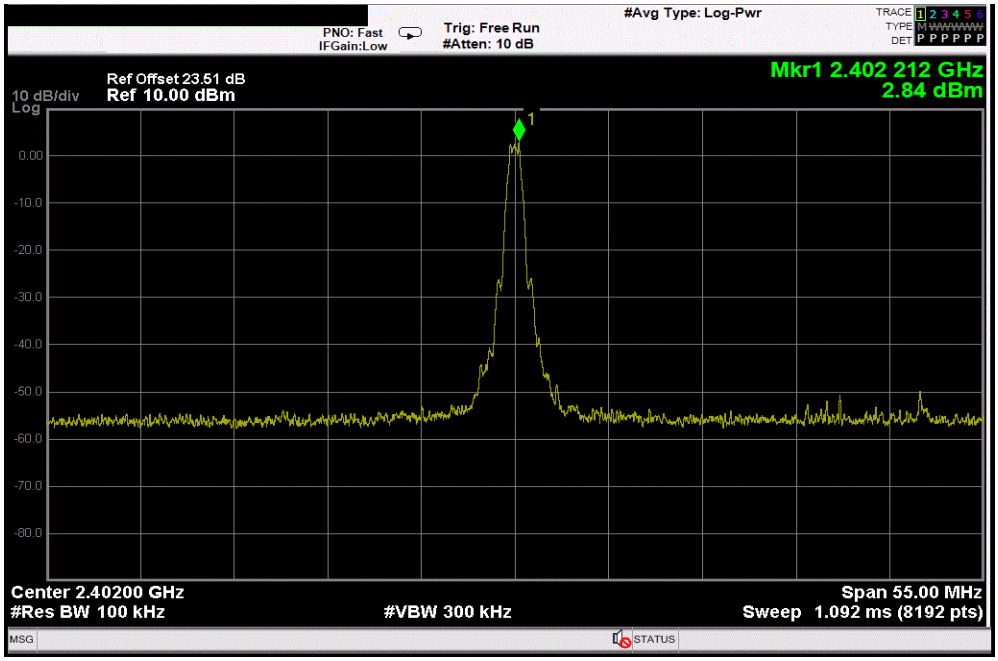
DEVIATIONS FROM TEST STANDARD

None

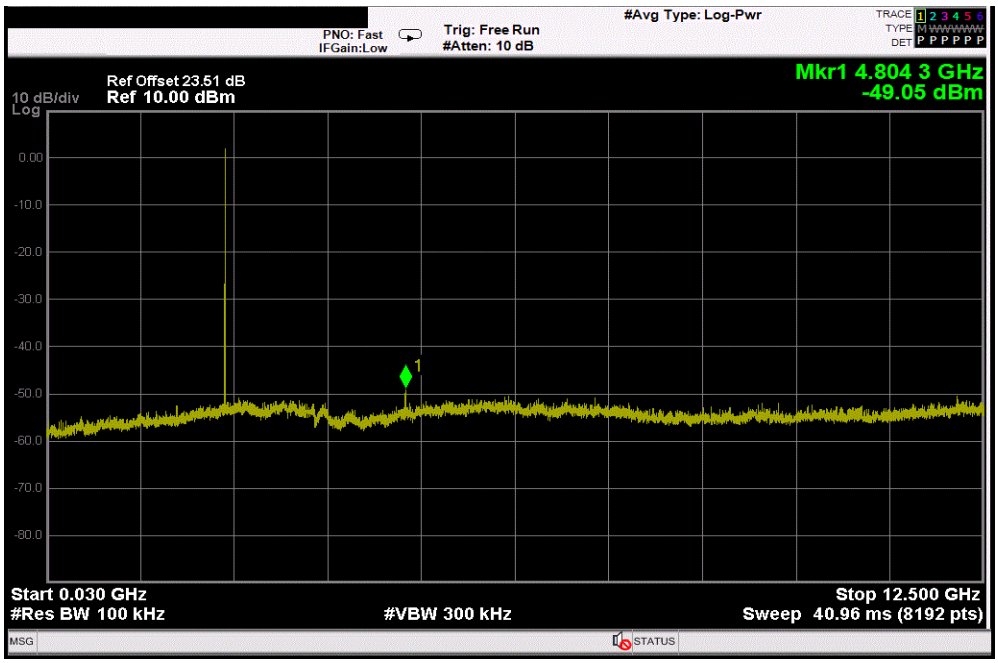
Configuration #	**6**	*Signature*

	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	Fundamental	2402.21	N/A	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	30 MHz - 12.5 GHz	4804.25	-51.89	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	12.5 GHz - 25 GHz	24928.27	-37.99	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	Fundamental	2441.72	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	4883.42	-51.78	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	24984.74	-38.78	-20	Pass
BLE/GFSK High Channel, 2480 MHz	Fundamental	2480.22	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	30 MHz - 12.5 GHz	4961.06	-52.46	-20	Pass
BLE/GFSK High Channel, 2480 MHz	12.5 GHz - 25 GHz	24949.64	-38.1	-20	Pass

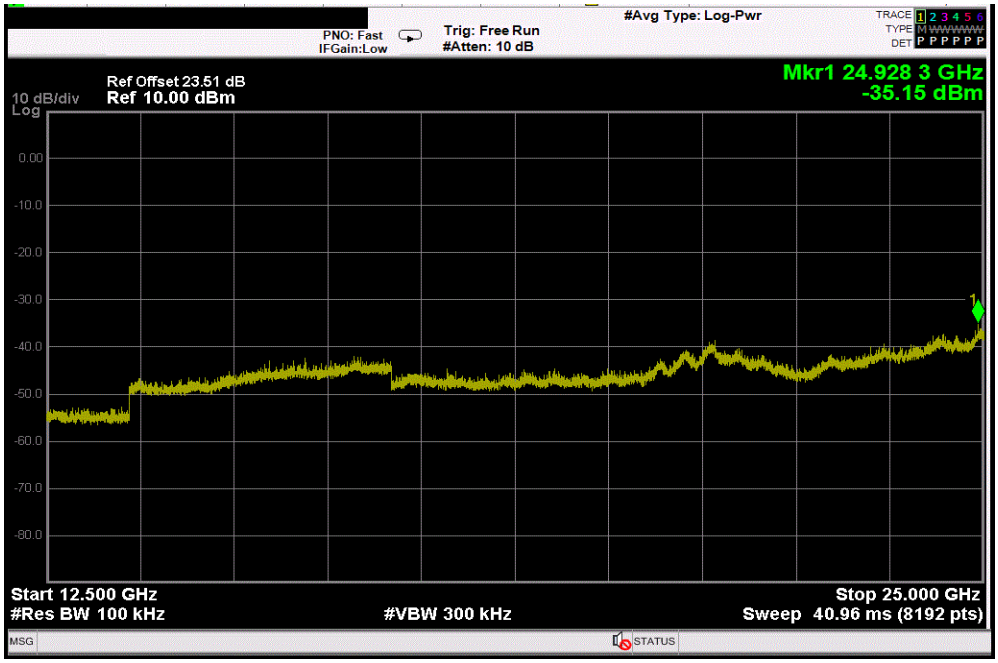
BLE/GFSK Low Channel, 2402 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		2402.21	N/A	N/A	N/A



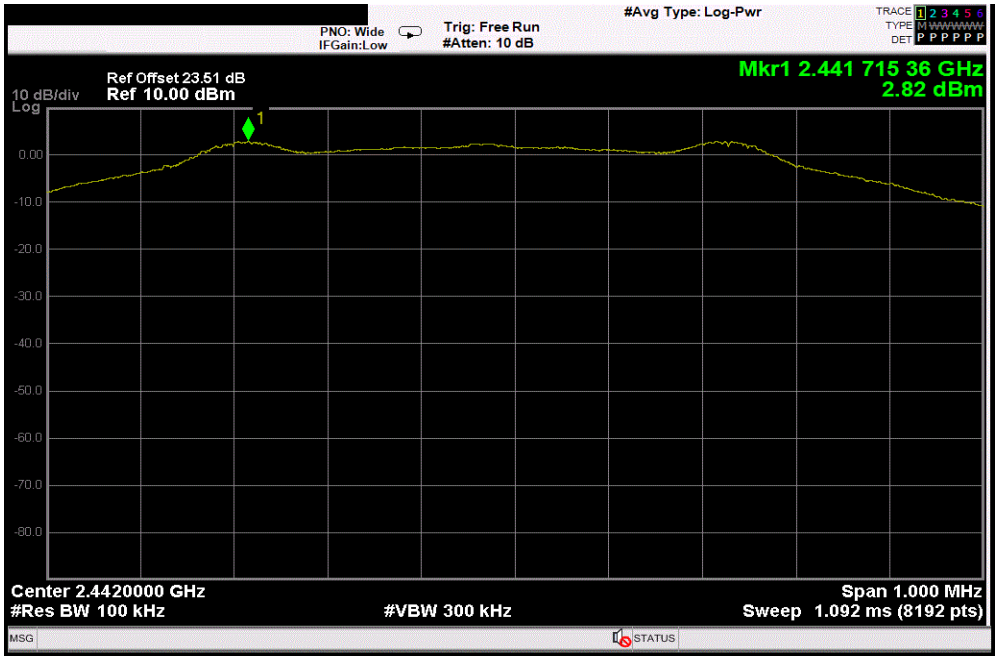
BLE/GFSK Low Channel, 2402 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	4804.25	-51.89	-20	Pass



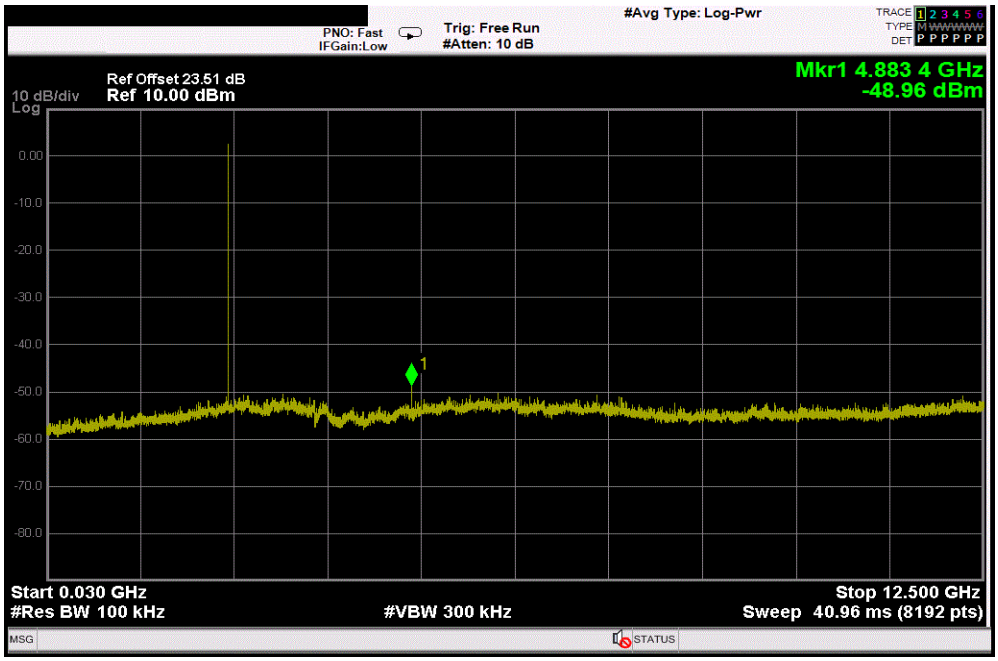
BLE/GFSK Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24928.27	-37.99	-20	Pass



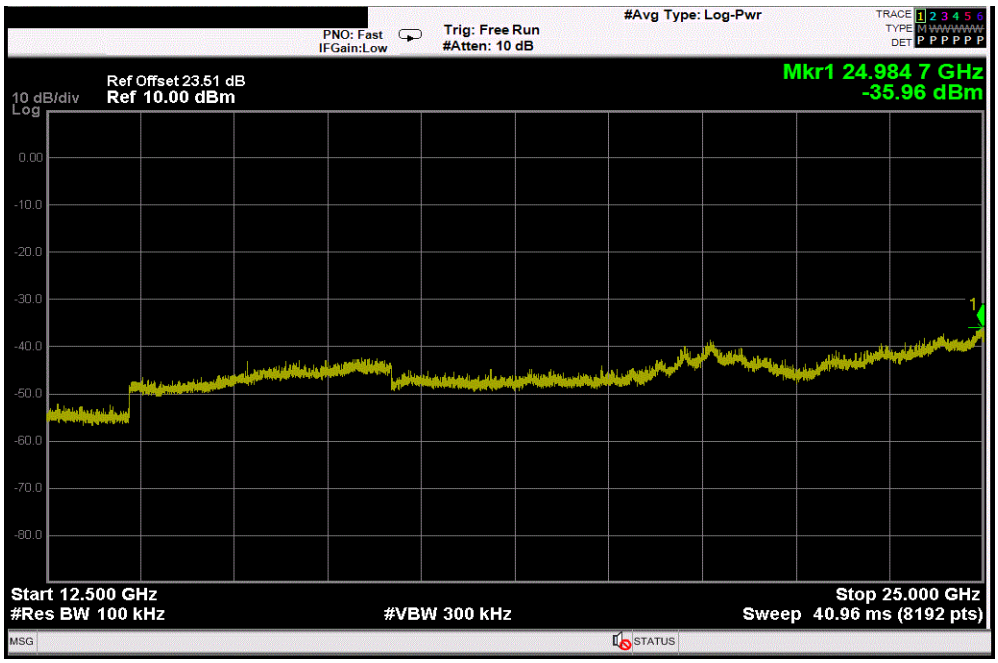
BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental	2441.72	N/A	N/A	N/A



BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	4883.42	-51.78	-20	Pass



BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24984.74	-38.78	-20	Pass

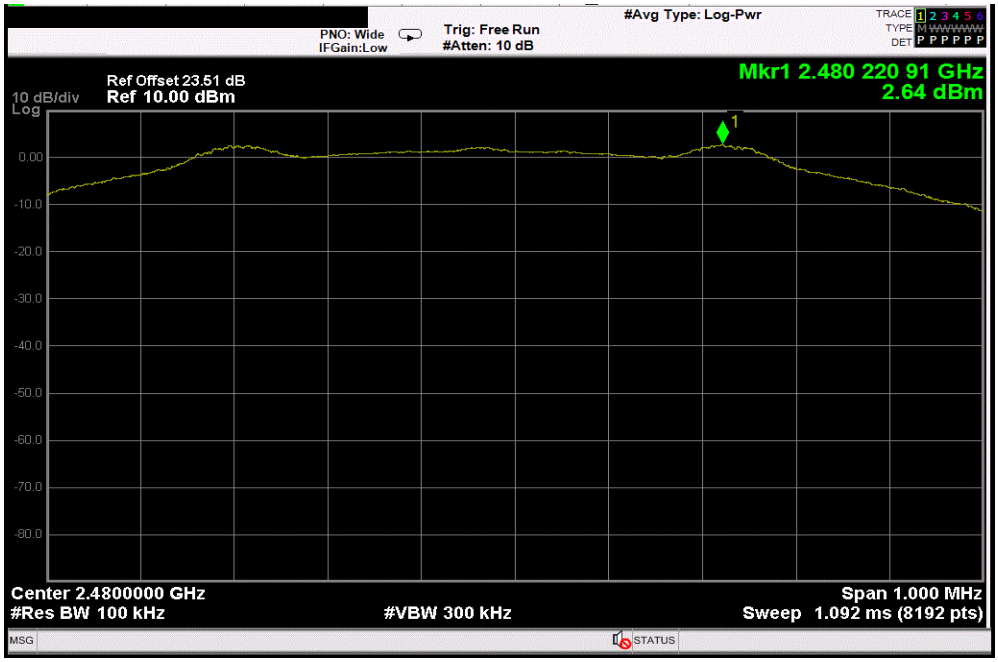


SPURIOUS CONDUCTED EMISSIONS

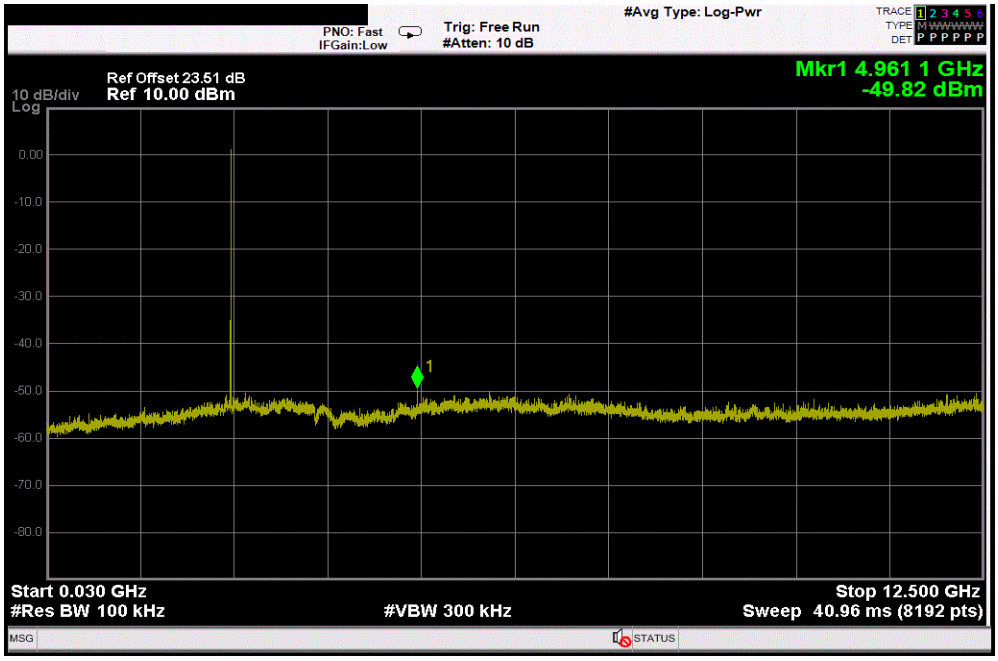
element

TbtTx 2019.08.30.0 XMit 2019.09.05

BLE/GFSK High Channel, 2480 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		2480.22	N/A	N/A	N/A



BLE/GFSK High Channel, 2480 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	4961.06	-52.46	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

TbtTx 2019.08.30.0 XMit 2019.09.05

BLE/GFSK High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24949.64	-38.1	-20	Pass