EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

XMit 2022.12.28.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	S.M. Electronics	SA26B-20	RFW	2023-02-07	2024-02-07
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2022-04-25	2023-04-25
Generator - Signal	Keysight	N5171B (EXG)	TEY	2023-01-23	2026-01-23

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) = Max Measured Power + Antenna gain (dBi)

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

element

TbtTx 2022.06.03.0 XMit 2022.12.28.0

EUT:	TSI OmniTrak Module PM (7591-01)			**Work Order:**	TSIN0196
Serial Number:	LCOPC_061			**Date:**	02/22/2023
Customer:	TSI, Incorporated			**Temperature:**	22.8°C
Attendees:	Andrew Bentley			**Humidity:**	18.4%
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Christopher Heintzelman	**Power:**	5VDC Battery	**Job Site:**	MN11

TEST SPECIFICATIONS	Test Method
FCC 15.247:2023	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, DC block, and attenuator.

DEVIATIONS FROM TEST STANDARD

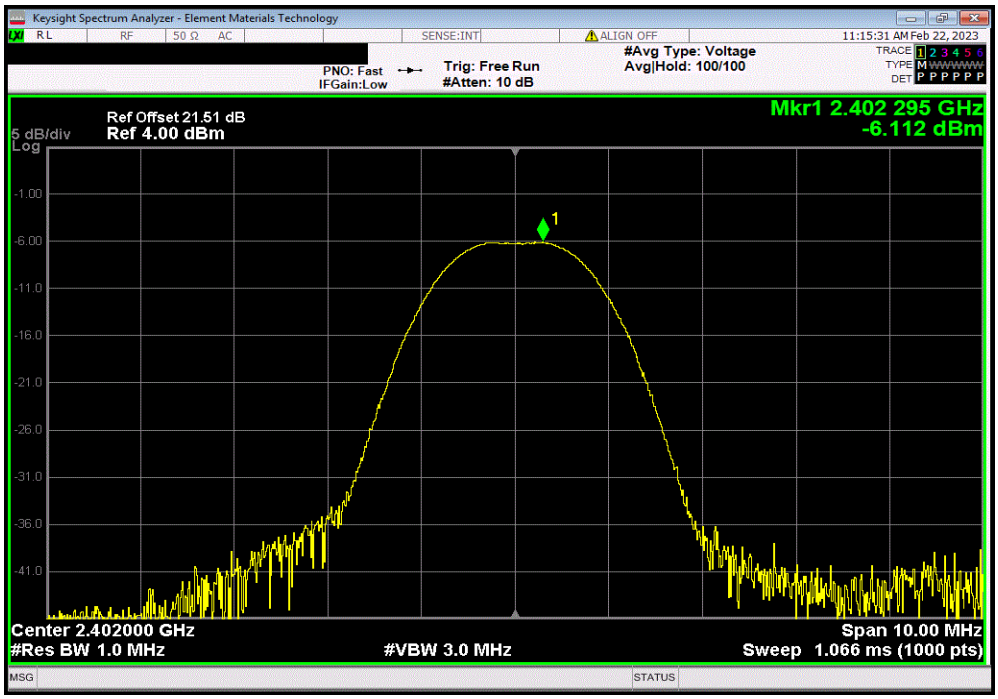
None

Configuration #	TSIN0196-2	Signature

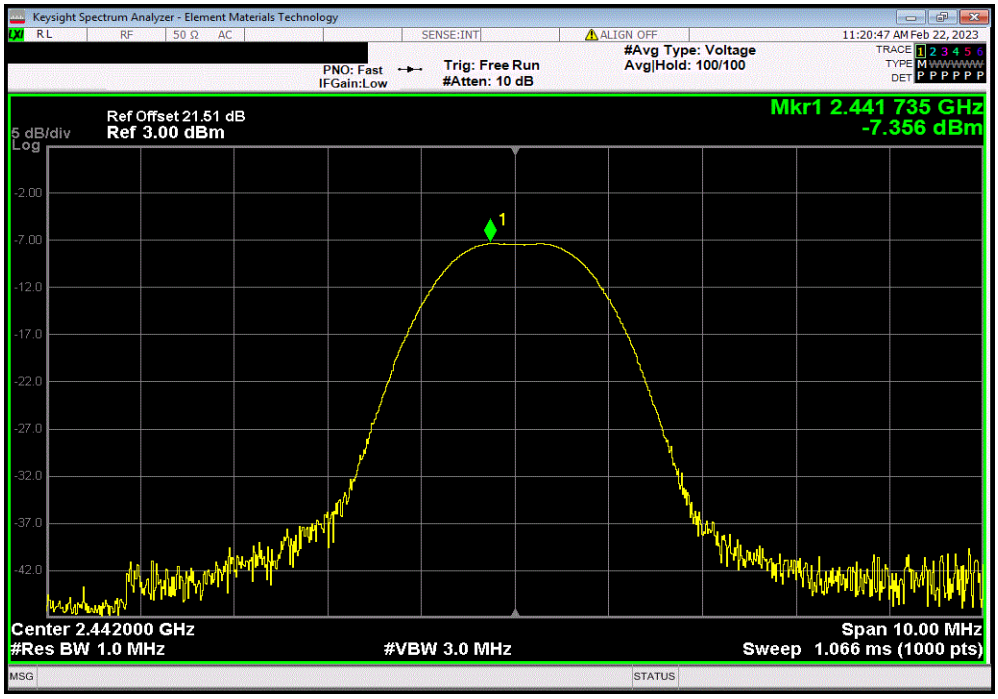
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
BLE/GFSK 125 kbps					
Low Channel, 2402 MHz	-6.112	2	-4.112	36	Pass
Mid Channel, 2442 MHz	-7.356	2	-5.356	36	Pass
High Channel, 2480 MHz	-8.113	2	-6.113	36	Pass
BLE/GFSK 500 kbps					
Low Channel, 2402 MHz	-6.063	2	-4.063	36	Pass
Mid Channel, 2442 MHz	-7.291	2	-5.291	36	Pass
High Channel, 2480 MHz	-8.12	2	-6.12	36	Pass
BLE/GFSK 1 Mbps					
Low Channel, 2402 MHz	-6.006	2	-4.006	36	Pass
Mid Channel, 2442 MHz	-7.011	2	-5.011	36	Pass
High Channel, 2480 MHz	-7.941	2	-5.941	36	Pass
BLE/GFSK 2 Mbps					
Low Channel, 2402 MHz	-5.959	2	-3.959	36	Pass
Mid Channel, 2442 MHz	-7.181	2	-5.181	36	Pass
High Channel, 2480 MHz	-8.062	2	-6.062	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

BLE/GFSK 125 kbps, Low Channel, 2402 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-6.112	2	-4.112	36	Pass

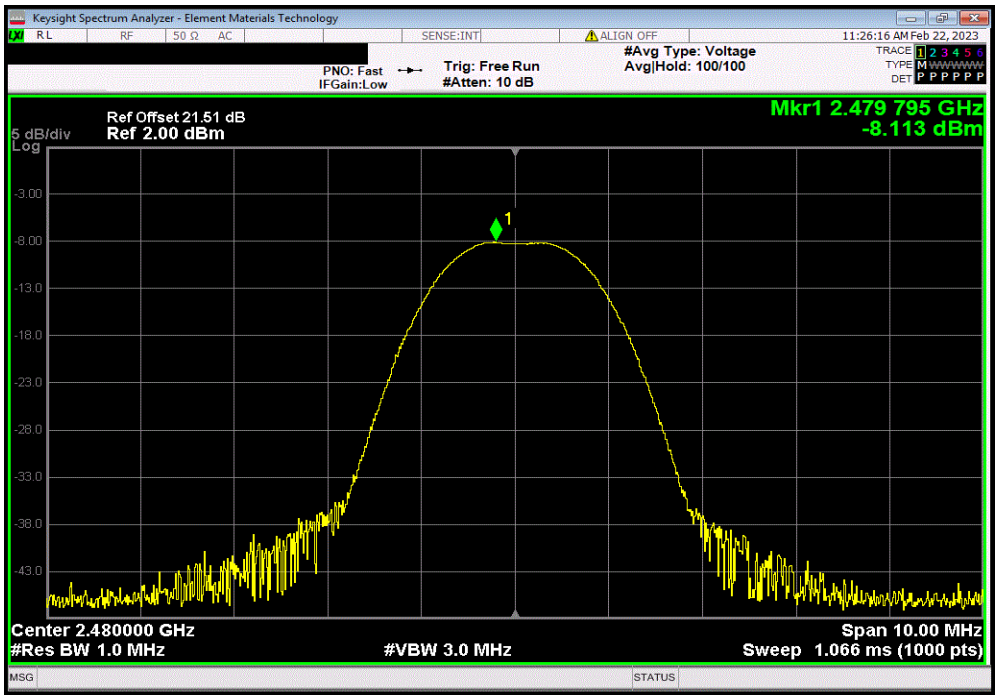


BLE/GFSK 125 kbps, Mid Channel, 2442 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-7.356	2	-5.356	36	Pass

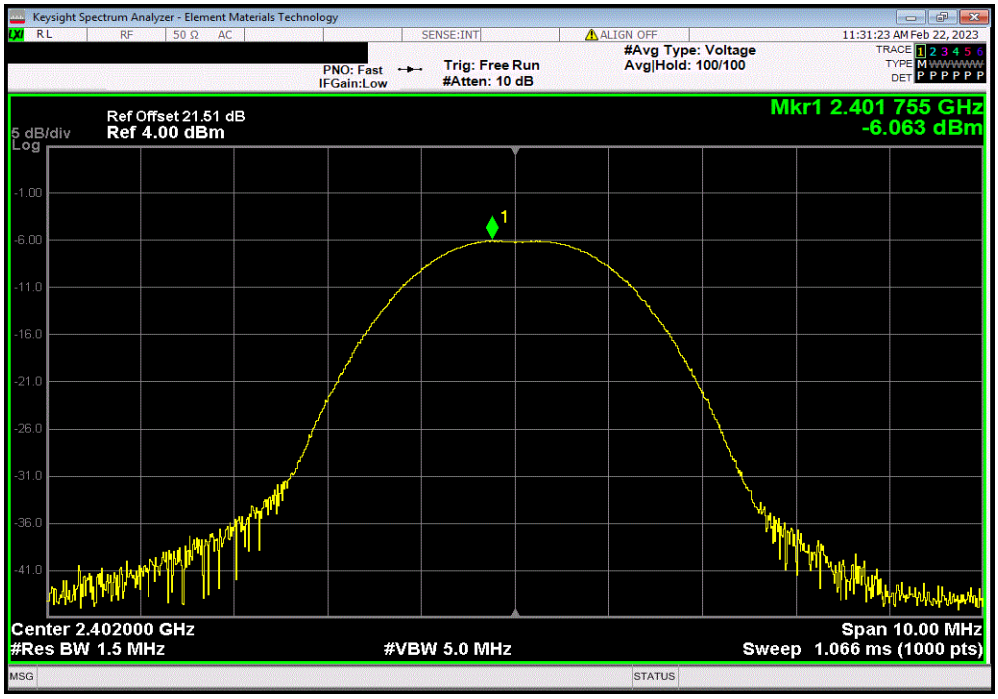


EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

BLE/GFSK 125 kbps, High Channel, 2480 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-8.113	2	-6.113	36	Pass

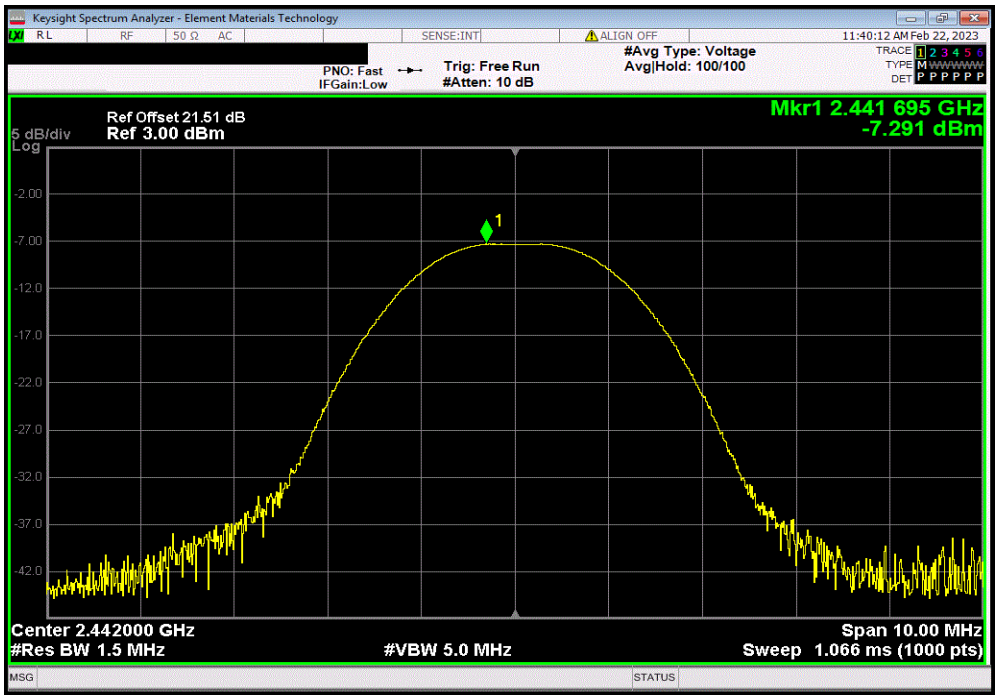


BLE/GFSK 500 kbps, Low Channel, 2402 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-6.063	2	-4.063	36	Pass

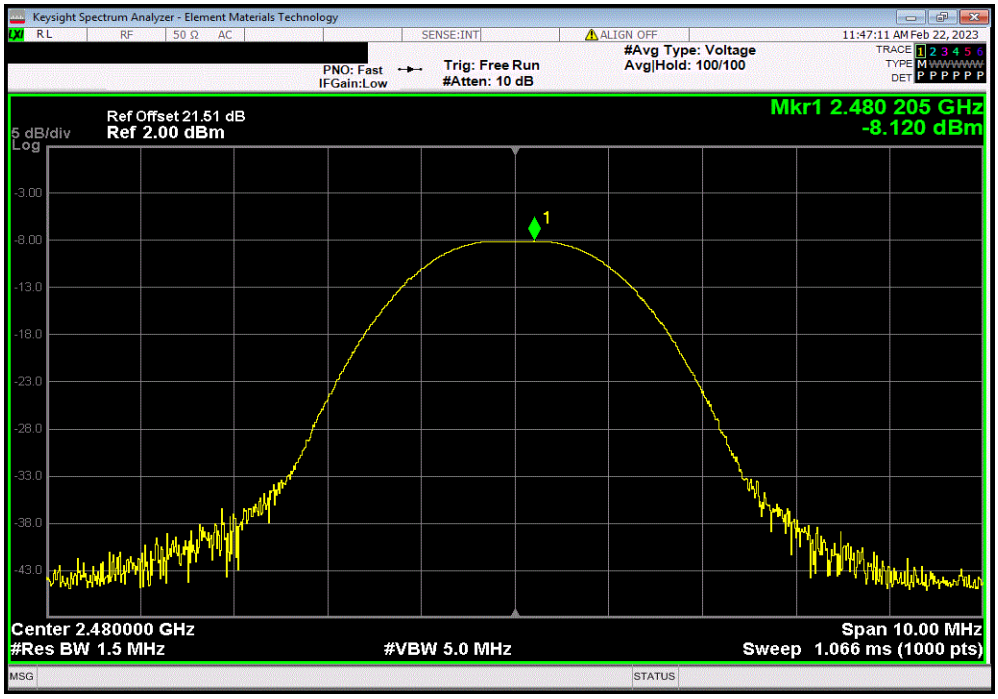


EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

BLE/GFSK 500 kbps, Mid Channel, 2442 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-7.291	2	-5.291	36	Pass

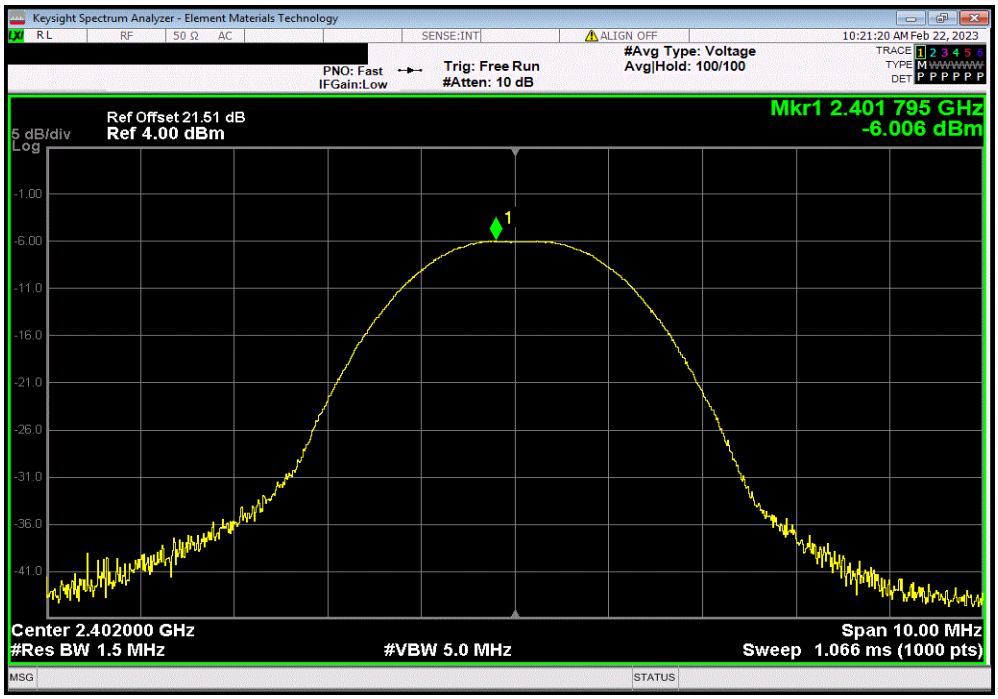


BLE/GFSK 500 kbps, High Channel, 2480 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-8.12	2	-6.12	36	Pass

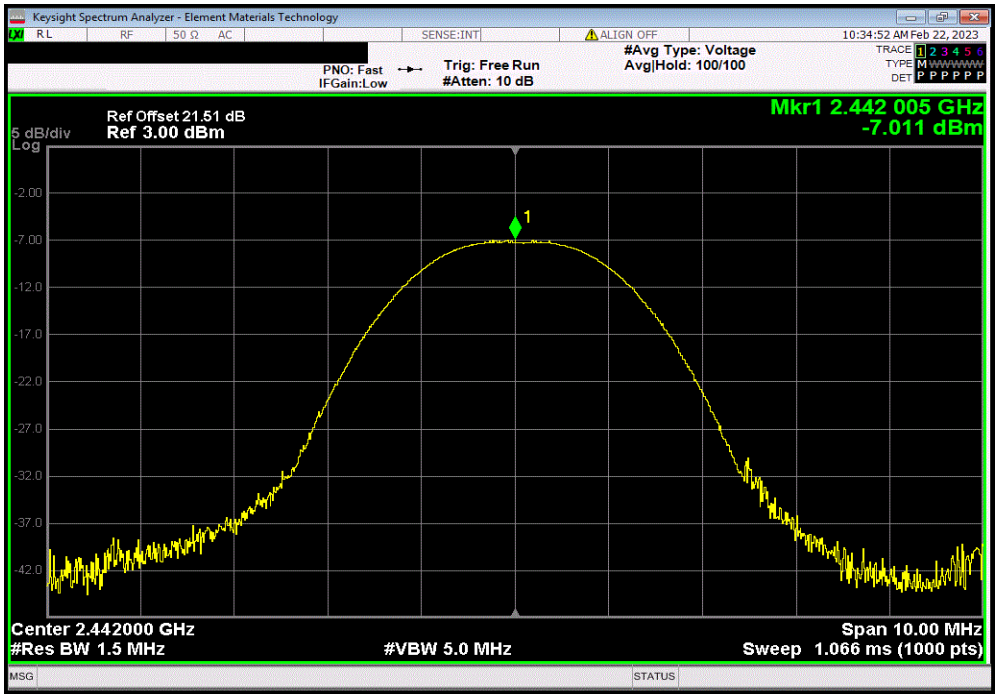


EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

BLE/GFSK 1 Mbps, Low Channel, 2402 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-6.006	2	-4.006	36	Pass

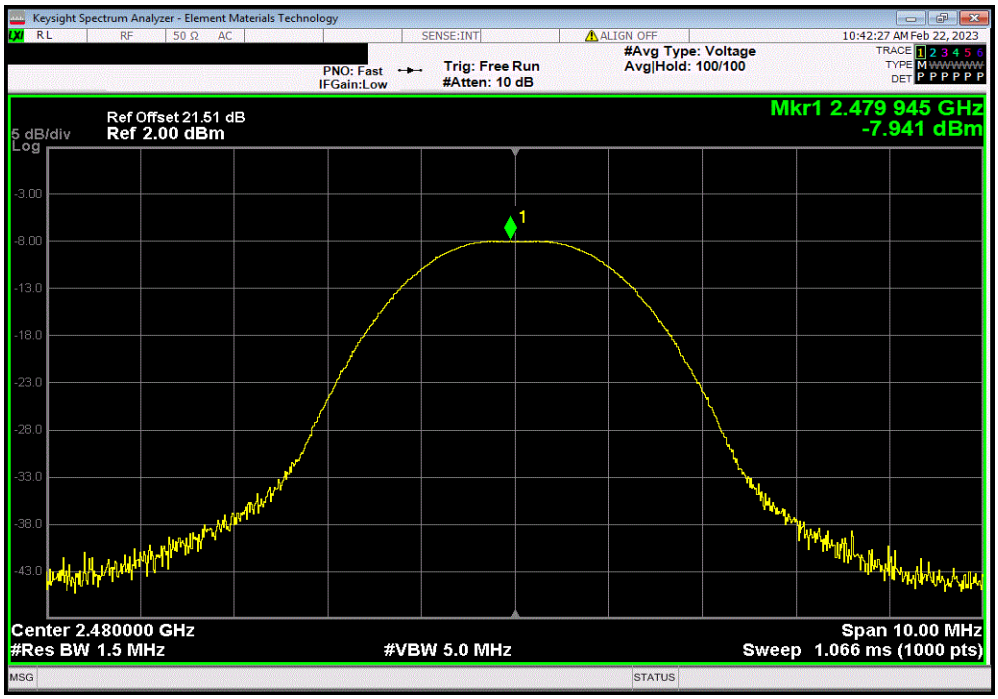


BLE/GFSK 1 Mbps, Mid Channel, 2442 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-7.011	2	-5.011	36	Pass

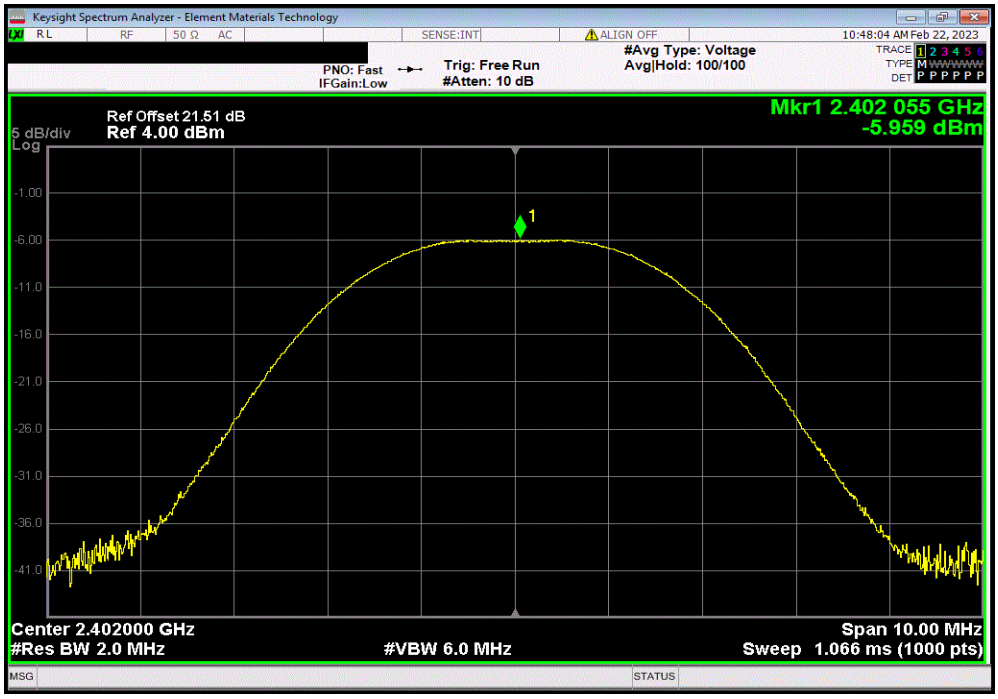


EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

BLE/GFSK 1 Mbps, High Channel, 2480 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-7.941	2	-5.941	36	Pass



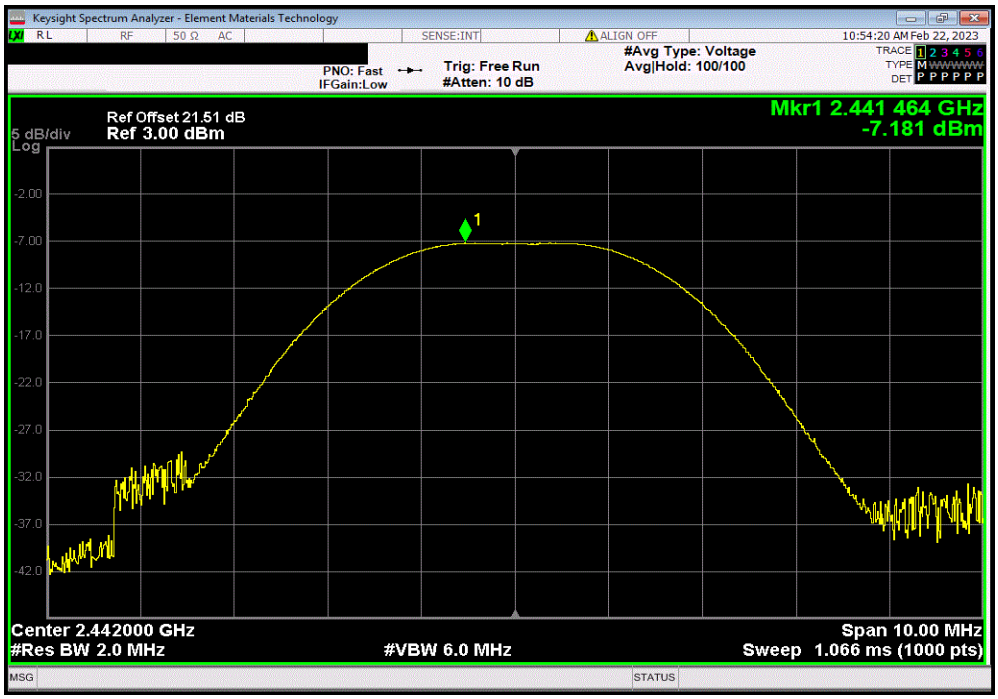
BLE/GFSK 2 Mbps, Low Channel, 2402 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-5.959	2	-3.959	36	Pass



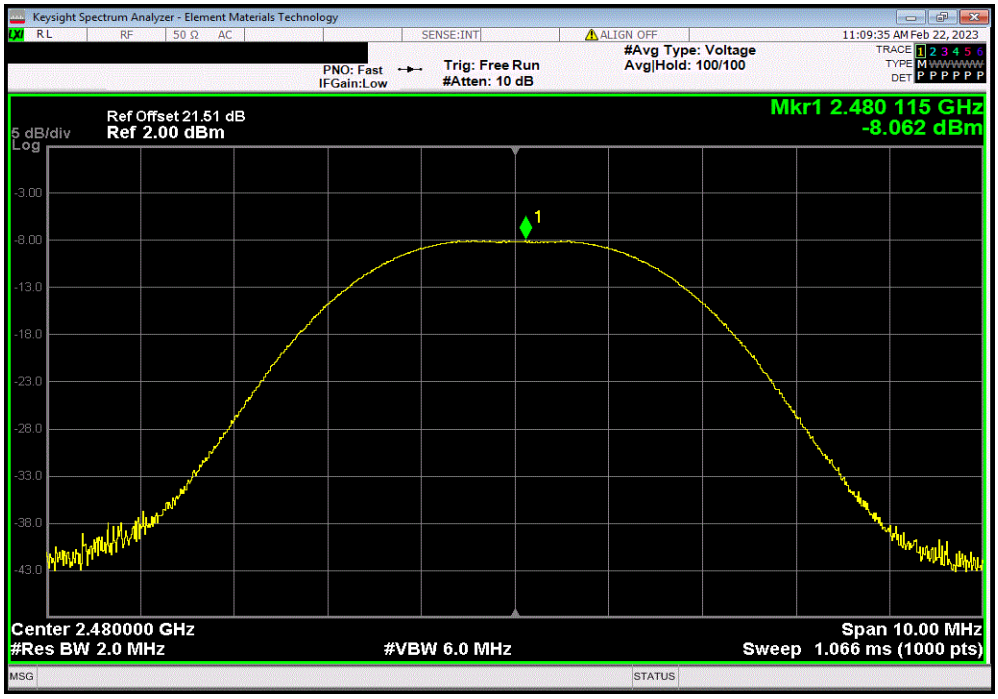
EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

TbtTx 2022.06.03.0 XMit 2022.12.28.0

BLE/GFSK 2 Mbps, Mid Channel, 2442 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-7.181	2	-5.181	36	Pass



BLE/GFSK 2 Mbps, High Channel, 2480 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		-8.062	2	-6.062	36	Pass



POWER SPECTRAL DENSITY

XMit 2022.12.28.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	S.M. Electronics	SA26B-20	RFW	2023-02-07	2024-02-07
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Generator - Signal	Keysight	N5171B (EXG)	TEY	2023-01-23	2026-01-23
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2022-04-25	2023-04-25

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

element

TbtTx 2022.06.03.0 XMit 2022.12.28.0

EUT:	TSI OmniTrak Module PM (7591-01)			**Work Order:**	TSIN0196
Serial Number:	LCOPC_061			**Date:**	02/22/2023
Customer:	TSI, Incorporated			**Temperature:**	22.8°C
Attendees:	Andrew Bentley			**Humidity:**	18.4%
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Christopher Heintzelman	**Power:**	5VDC Battery	**Job Site:**	MN11

TEST SPECIFICATIONS	Test Method
FCC 15.247:2023	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, DC block, and attenuator.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	TSIN0196-2	Signature

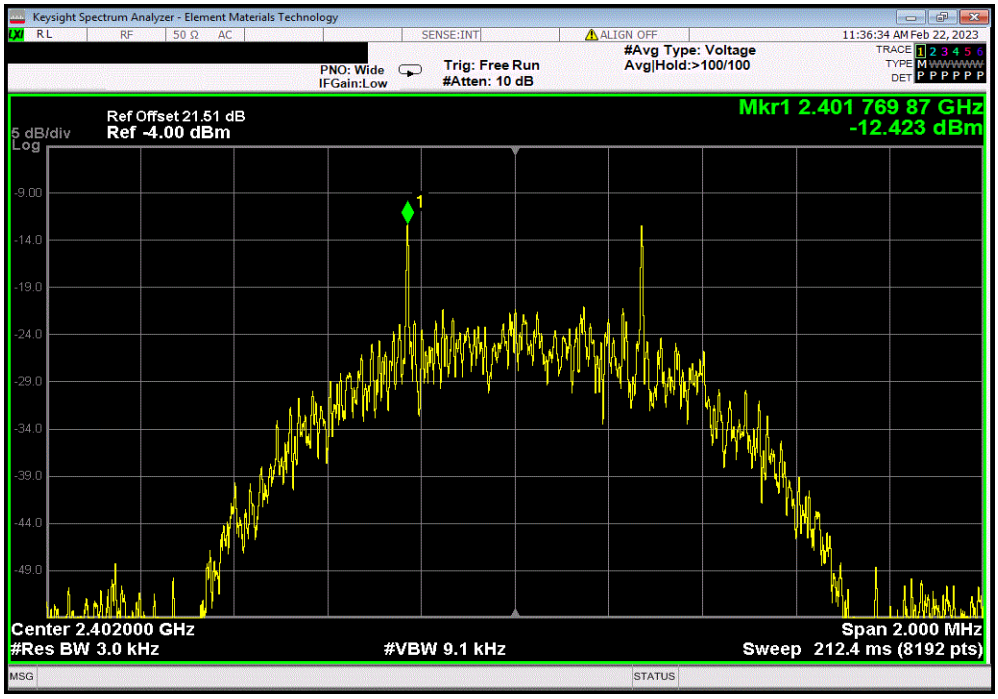
		Value dBm/3kHz	Limit < dBm/3kHz	Results
BLE/GFSK 125 kbps				
	Low Channel, 2402 MHz	-12.353	8	Pass
	Mid Channel, 2442 MHz	-13.461	8	Pass
	High Channel, 2480 MHz	-14.267	8	Pass
BLE/GFSK 500 kbps				
	Low Channel, 2402 MHz	-12.423	8	Pass
	Mid Channel, 2442 MHz	-13.519	8	Pass
	High Channel, 2480 MHz	-14.382	8	Pass
BLE/GFSK 1 Mbps				
	Low Channel, 2402 MHz	-21.261	8	Pass
	Mid Channel, 2442 MHz	-22.36	8	Pass
	High Channel, 2480 MHz	-23.19	8	Pass
BLE/GFSK 2 Mbps				
	Low Channel, 2402 MHz	-23.725	8	Pass
	Mid Channel, 2442 MHz	-24.798	8	Pass
	High Channel, 2480 MHz	-25.831	8	Pass

BLE/GFSK 125 kbps, Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-12.353	8	Pass

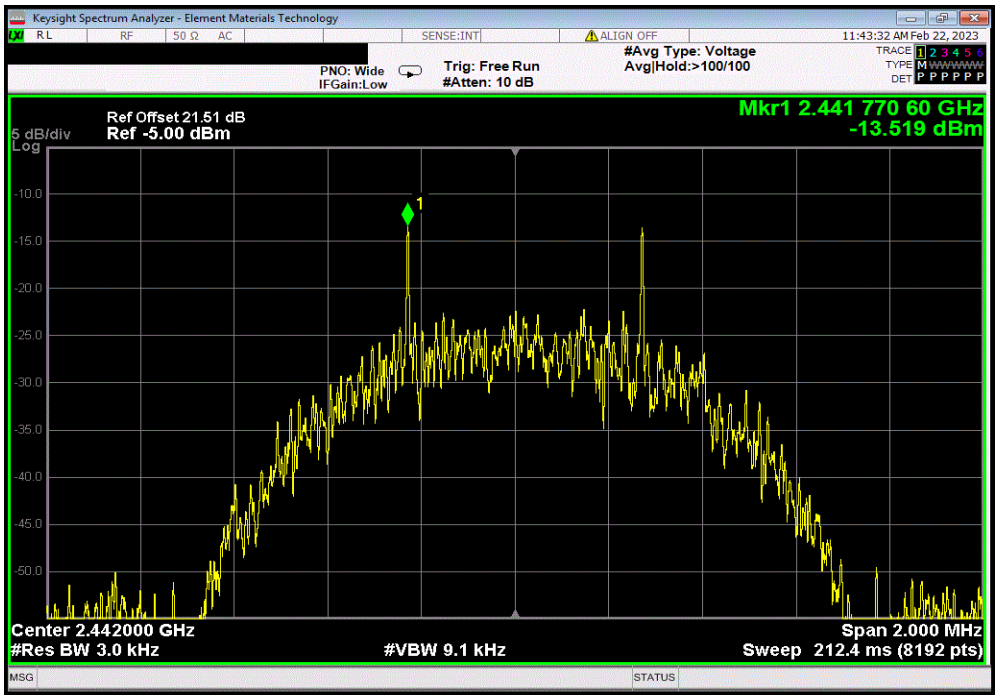
BLE/GFSK 125 kbps, Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-13.461	8	Pass

BLE/GFSK 125 kbps, High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-14.267	8	Pass

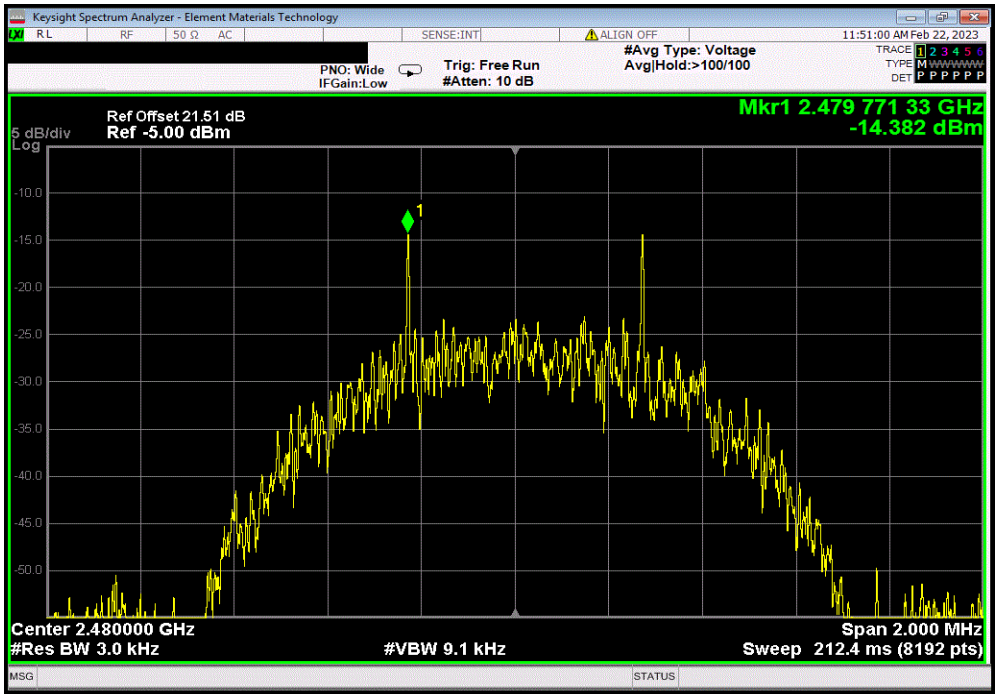
BLE/GFSK 500 kbps, Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-12.423	8	Pass



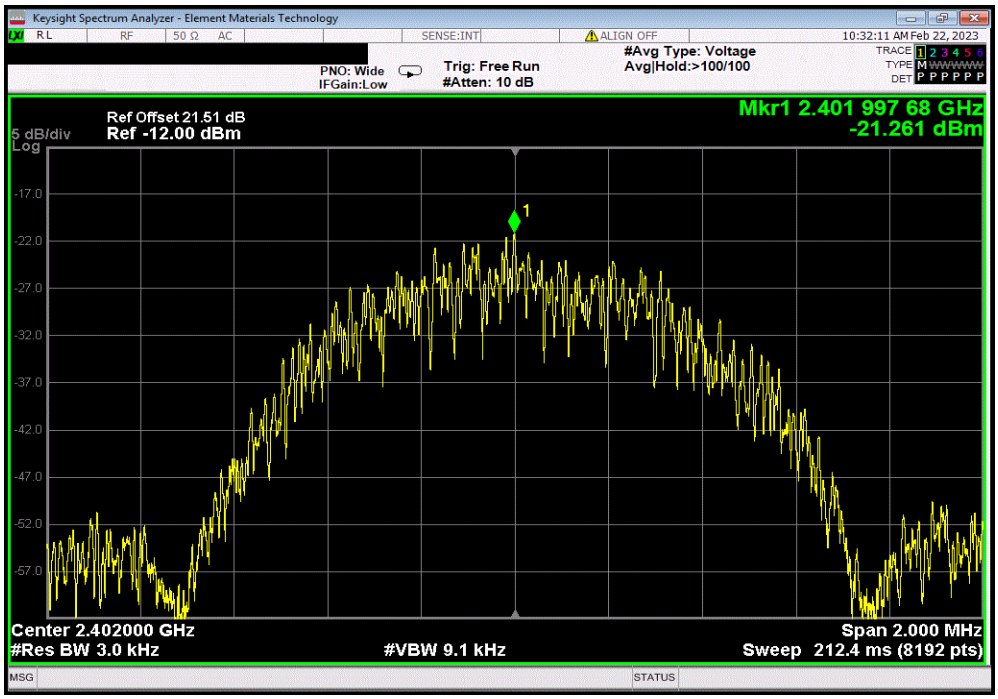
BLE/GFSK 500 kbps, Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-13.519	8	Pass



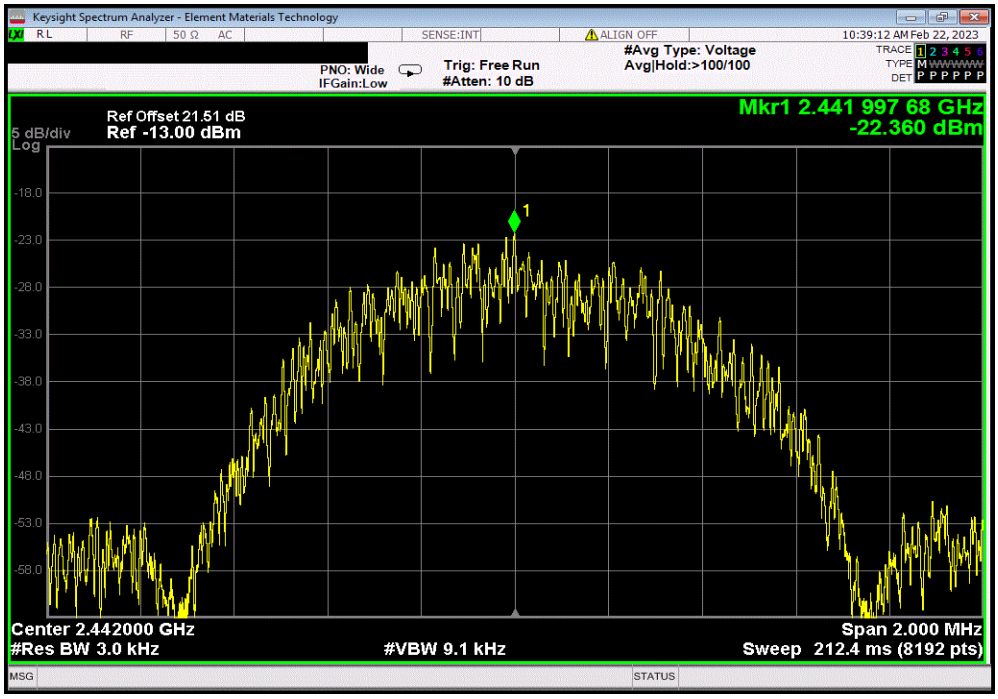
BLE/GFSK 500 kbps, High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-14.382	8	Pass



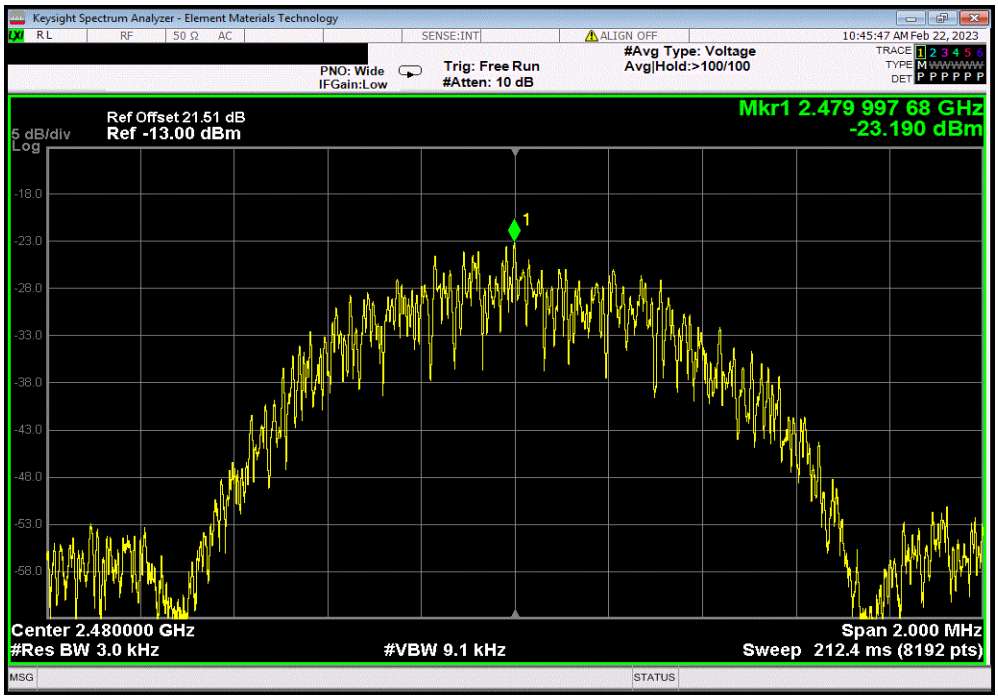
BLE/GFSK 1 Mbps, Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-21.261	8	Pass



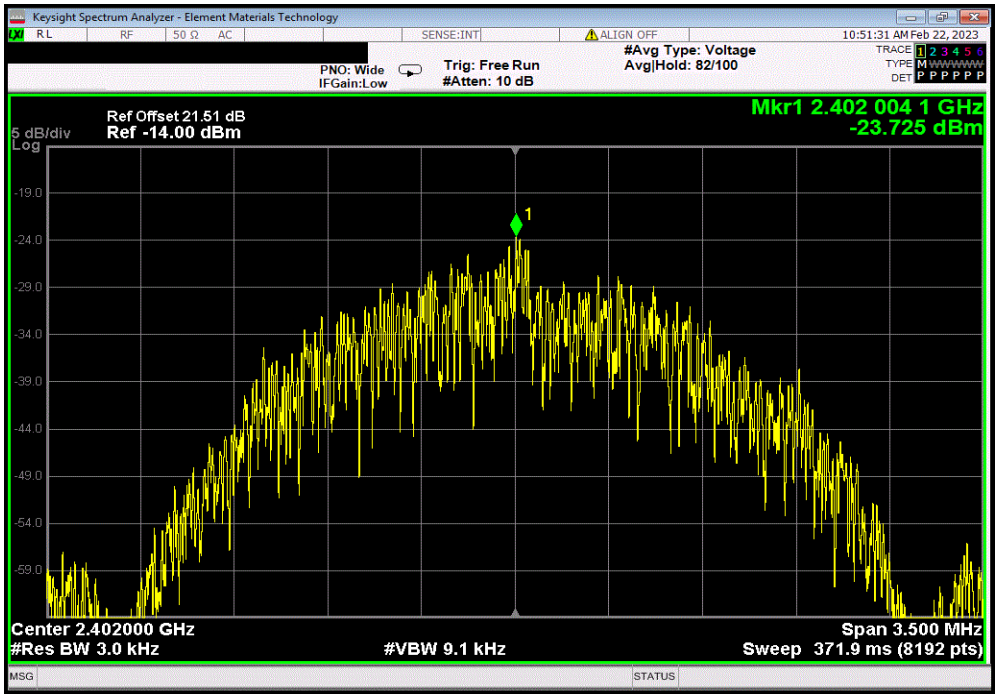
BLE/GFSK 1 Mbps, Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-22.36	8	Pass



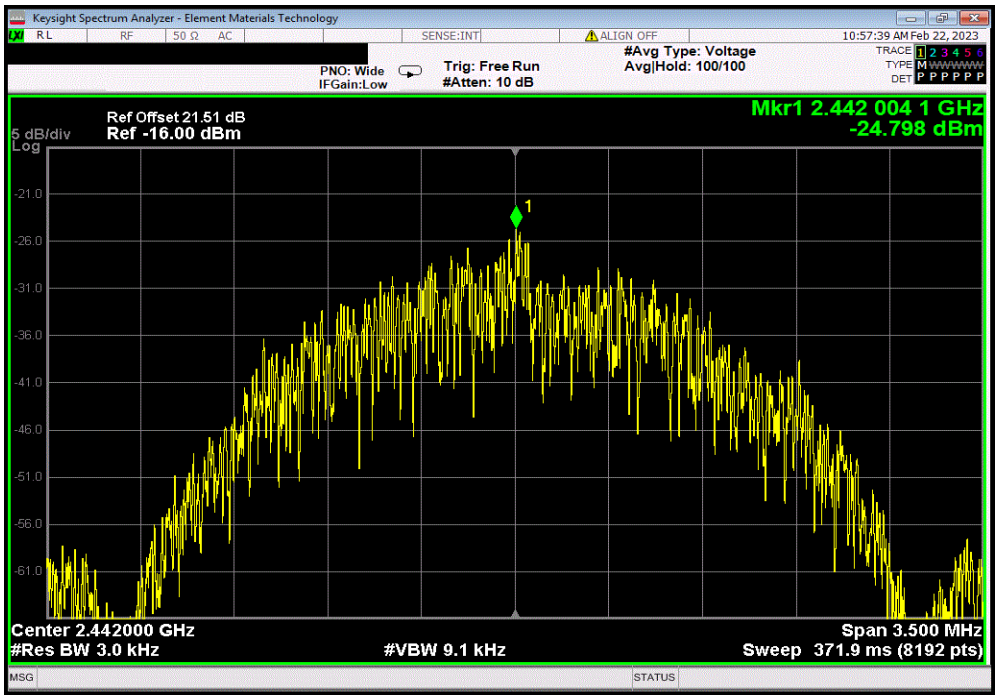
BLE/GFSK 1 Mbps, High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-23.19	8	Pass



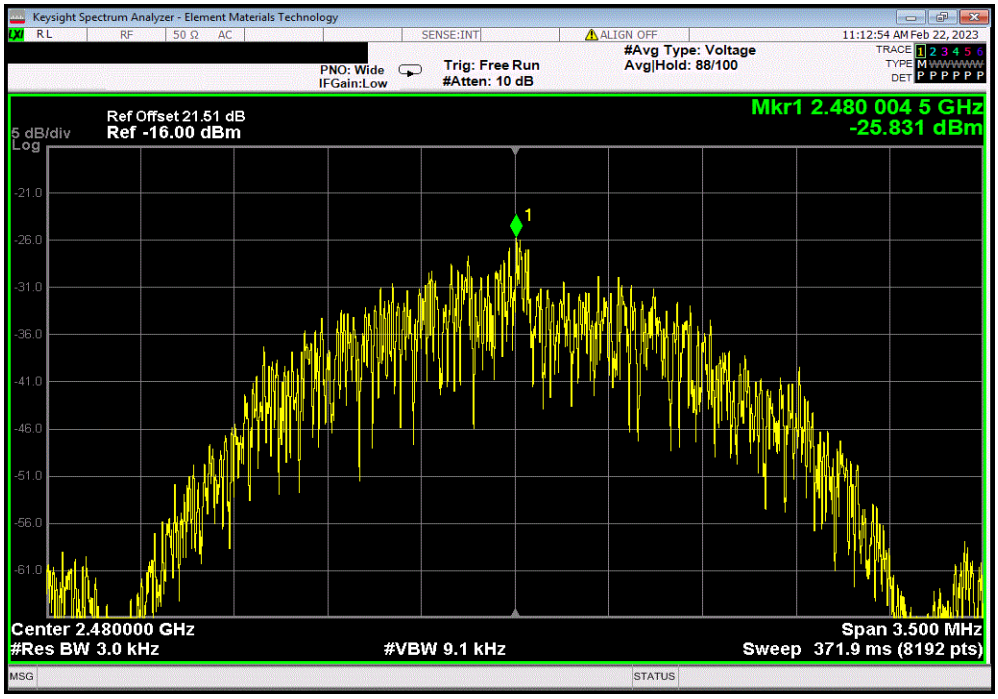
BLE/GFSK 2 Mbps, Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-23.725	8	Pass



BLE/GFSK 2 Mbps, Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-24.798	8	Pass



BLE/GFSK 2 Mbps, High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-25.831	8	Pass



BAND EDGE COMPLIANCE

XMit 2022.12.28.0

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TEST EQUIPMENT

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Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Generator - Signal	Keysight	N5171B (EXG)	TEY	2023-01-23	2026-01-23
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2022-04-25	2023-04-25

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 2022.06.03.0 XMit 2022.12.28.0

EUT:	TSI OmniTrak Module PM (7591-01)			**Work Order:**	TSIN0196
Serial Number:	LCOPC_061			**Date:**	02/22/2023
Customer:	TSI, Incorporated			**Temperature:**	22.8°C
Attendees:	Andrew Bentley			**Humidity:**	18.4%
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Christopher Heintzelman	**Power:**	5VDC Battery	**Job Site:**	MN11

TEST SPECIFICATIONS	Test Method
FCC 15.247:2023	ANSI C63.10:12013
RSS-247 Issue 2:2017	ANSI C63.10:12013

COMMENTS

Reference level offset includes measurement cable, DC block, and attenuator.

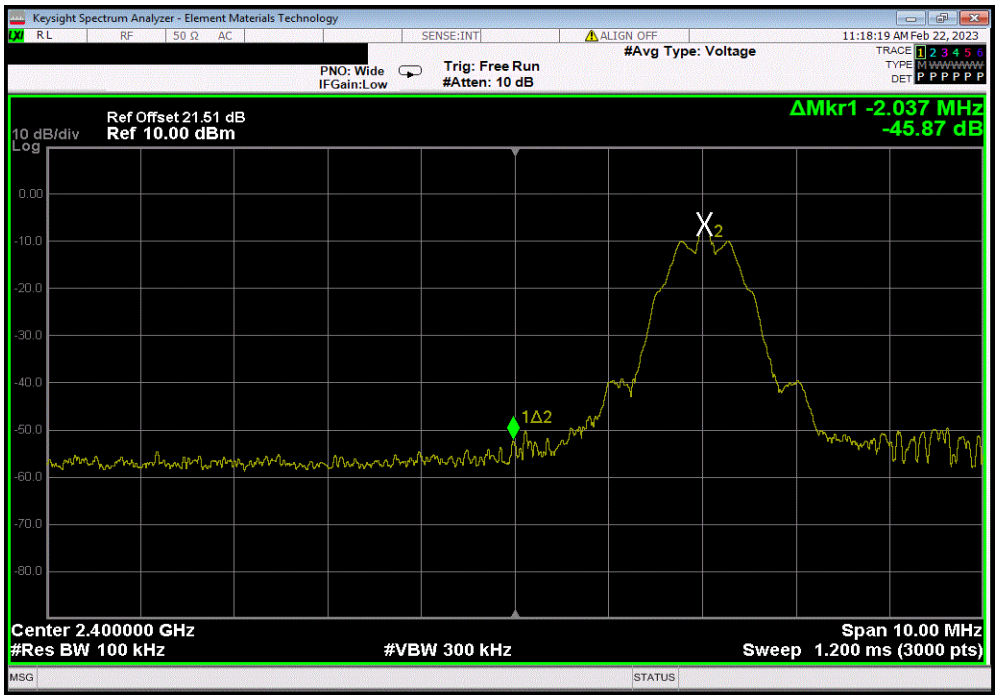
DEVIATIONS FROM TEST STANDARD

None

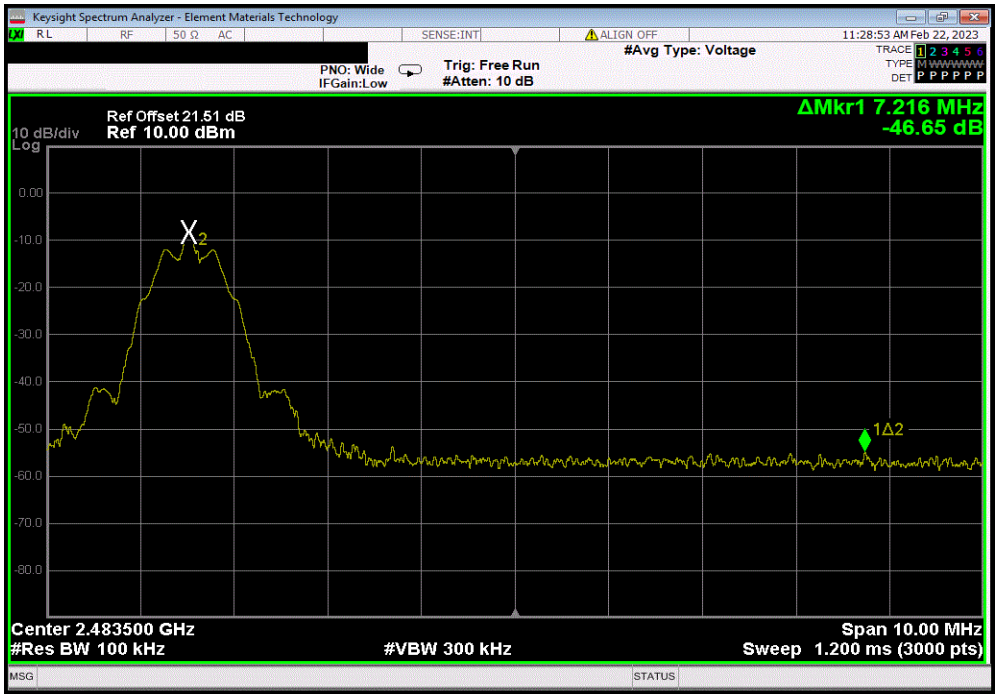
Configuration #	TSIN0196-2	Signature

		Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK 125 kbps				
	Low Channel, 2402 MHz	-45.87	-20	Pass
	High Channel, 2480 MHz	-46.65	-20	Pass
BLE/GFSK 500 kbps				
	Low Channel, 2402 MHz	-46.74	-20	Pass
	High Channel, 2480 MHz	-46.53	-20	Pass
BLE/GFSK 1 Mbps				
	Low Channel, 2402 MHz	-45.37	-20	Pass
	High Channel, 2480 MHz	-46.92	-20	Pass
BLE/GFSK 2 Mbps				
	Low Channel, 2402 MHz	-33.19	-20	Pass
	High Channel, 2480 MHz	-46.41	-20	Pass

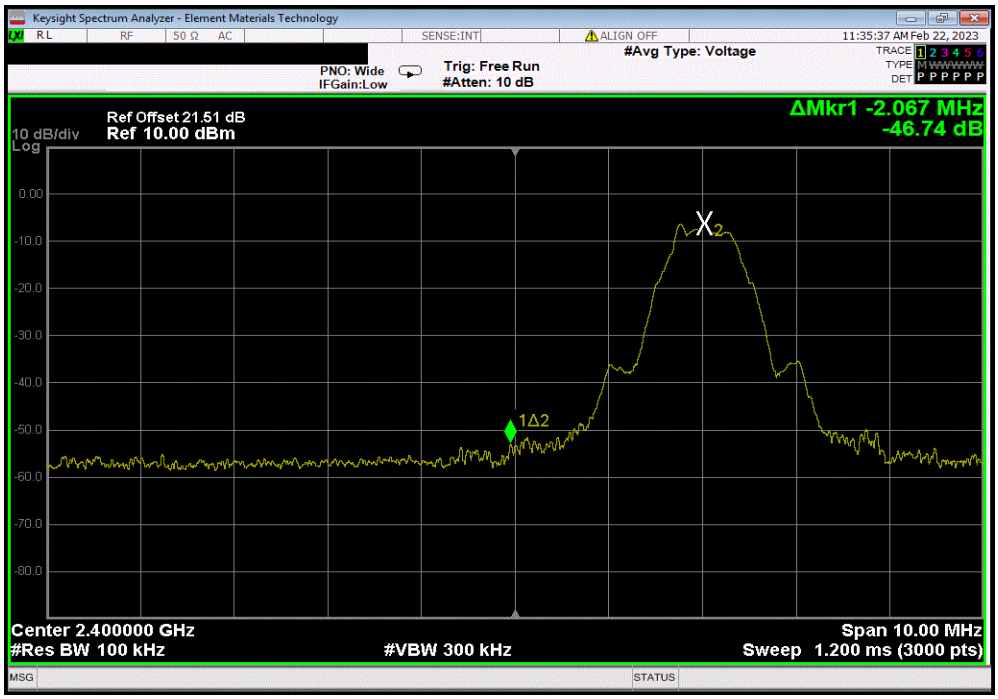
BLE/GFSK 125 kbps, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-45.87	-20	Pass



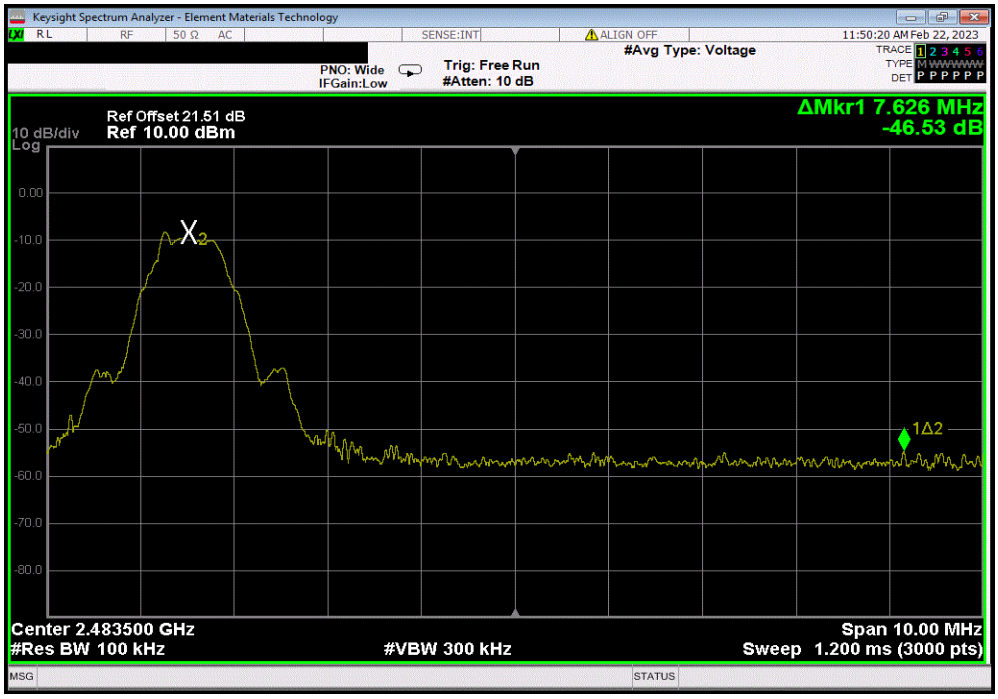
BLE/GFSK 125 kbps, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-46.65	-20	Pass



BLE/GFSK 500 kbps, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-46.74	-20	Pass

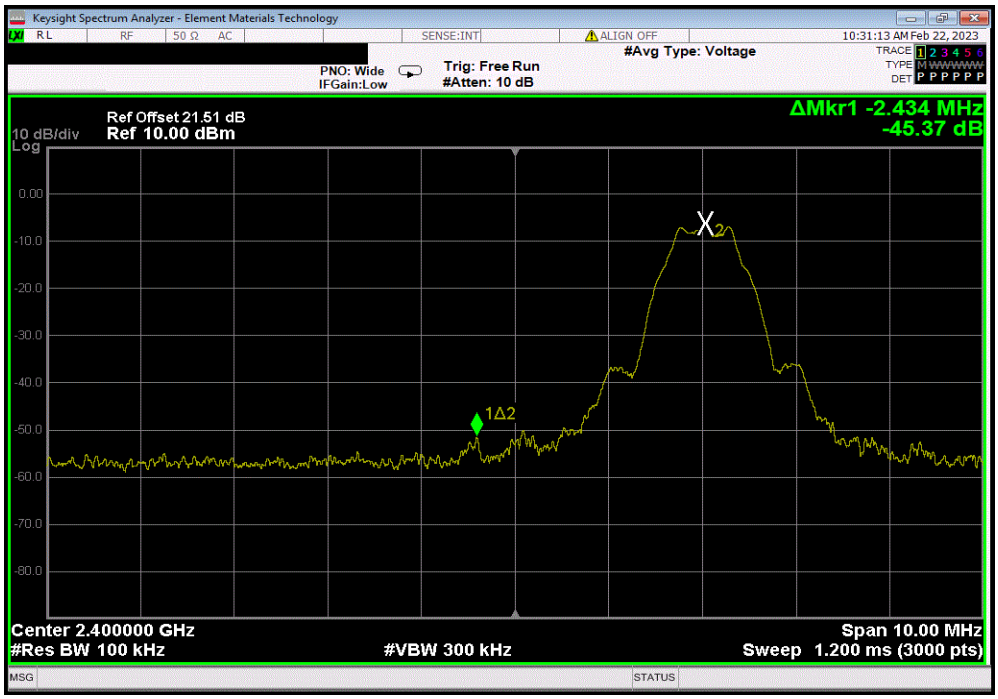


BLE/GFSK 500 kbps, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-46.53	-20	Pass

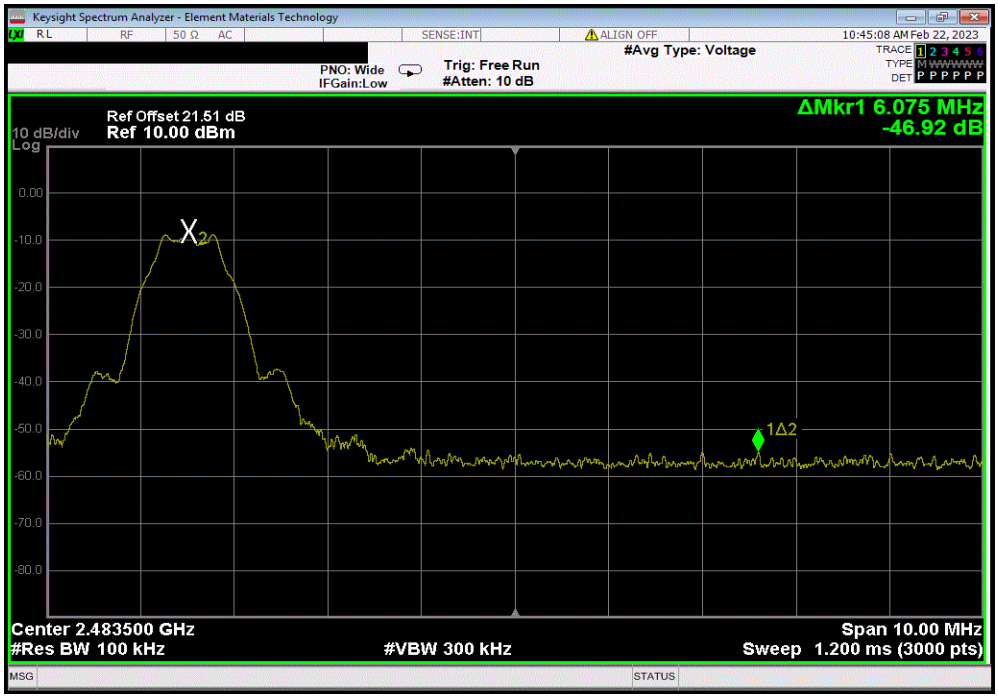


BAND EDGE COMPLIANCE

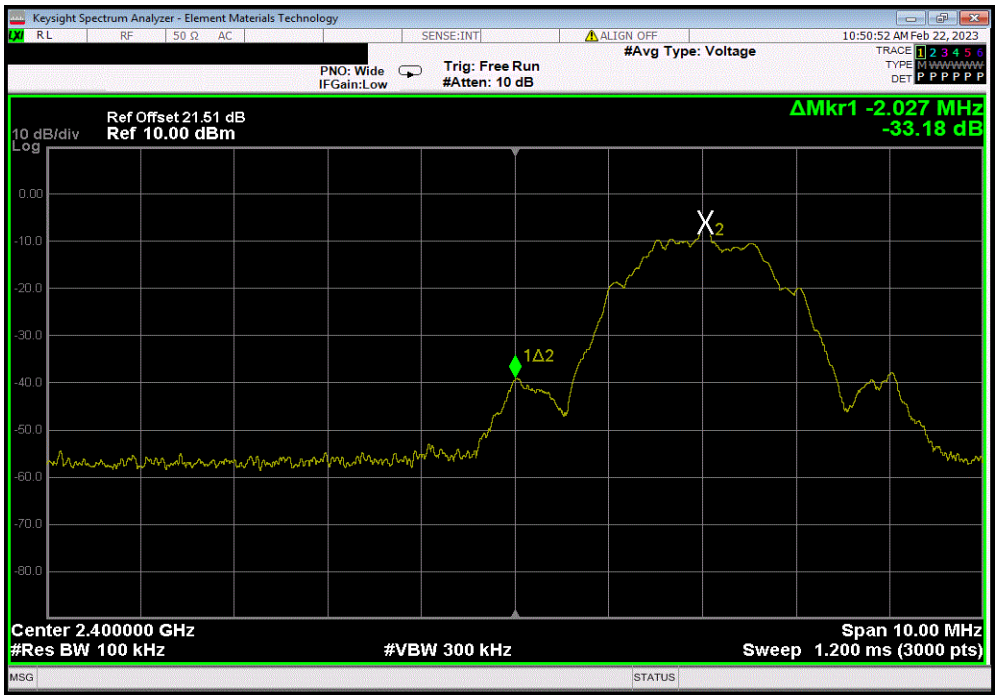
BLE/GFSK 1 Mbps, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-45.37	-20	Pass



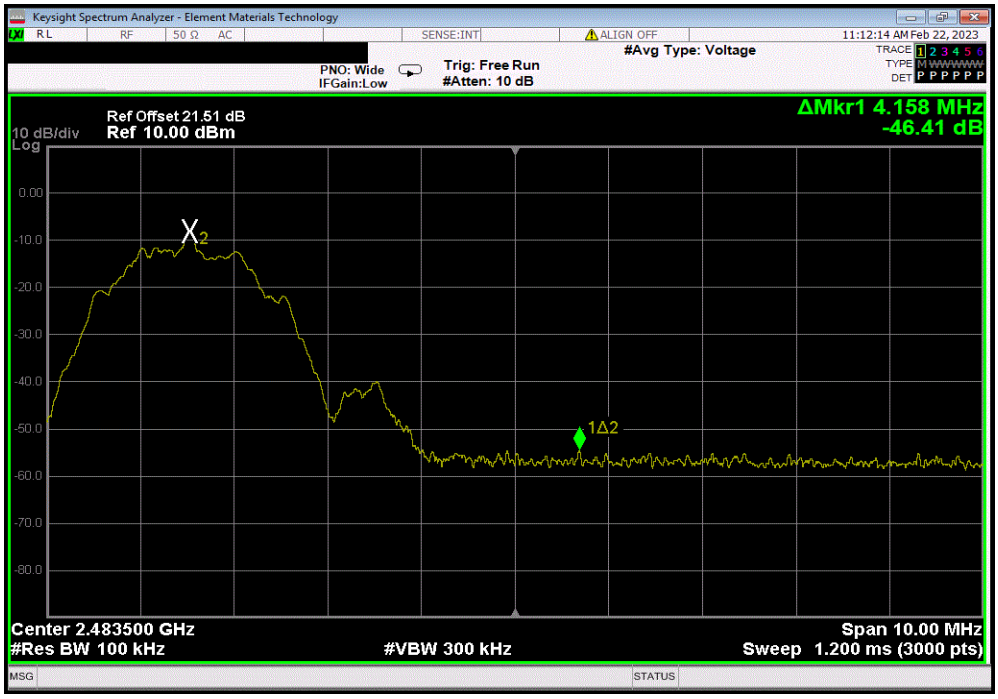
BLE/GFSK 1 Mbps, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-46.92	-20	Pass



BLE/GFSK 2 Mbps, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-33.19	-20	Pass



BLE/GFSK 2 Mbps, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-46.41	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2022.12.28.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2023-01-23	2026-01-23
Attenuator	S.M. Electronics	SA26B-20	RFW	2023-02-07	2024-02-07
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2022-04-25	2023-04-25

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 fundamental was measured with a 100 kHz resolution bandwidth and the highest value was recorded. The rest of the spectrum was then measured with a 100 kHz resolution bandwidth and the highest value was found. The difference between the value found on the fundamental and the rest of the spectrum was compared against the limit to determine compliance.

The reference level offset for the fundamental screen capture was based on a measured value of the loss between the spectrum analyzer and the EUT which was verified at the time of test. The remaining screen capture(s) use an internal transducer factor on the analyzer to correct the displayed trace based on the cable loss over frequency. The reference level offset for the additional screen capture(s) is then based on the expected attenuator value and any other losses.

Fundamental Offset = Ref Lvl Offset showing measured composite factor of all losses

Remaining Screen capture(s) Offset = “Internal” cable loss factor not shown on screen capture + Ref Lvl Offset showing expected attenuator value and any other losses

SPURIOUS CONDUCTED EMISSIONS

element

TbtTx 2022.06.03.0 XMit 2022.12.28.0

EUT:	TSI OmniTrak Module PM (7591-01)			**Work Order:**	TSIN0196
Serial Number:	LCOPC_061			**Date:**	02/22/2023
Customer:	TSI, Incorporated			**Temperature:**	22.8°C
Attendees:	Andrew Bentley			**Humidity:**	18.4%
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Christopher Heintzelman	**Power:**	5VDC Battery	**Job Site:**	MN11

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2023	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, DC block, and attenuator.

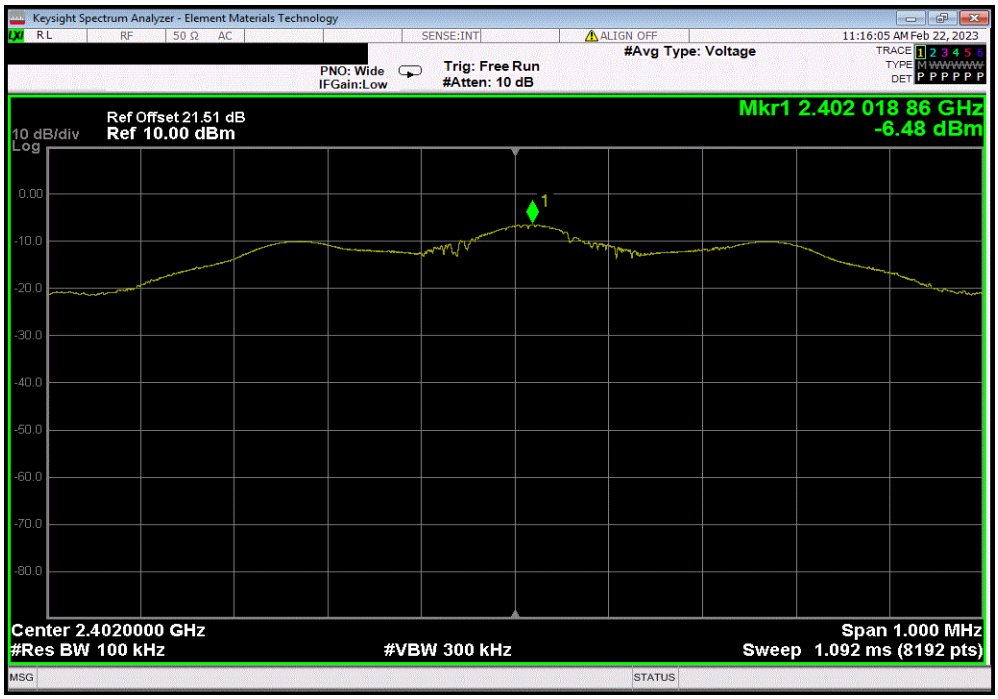
DEVIATIONS FROM TEST STANDARD

None

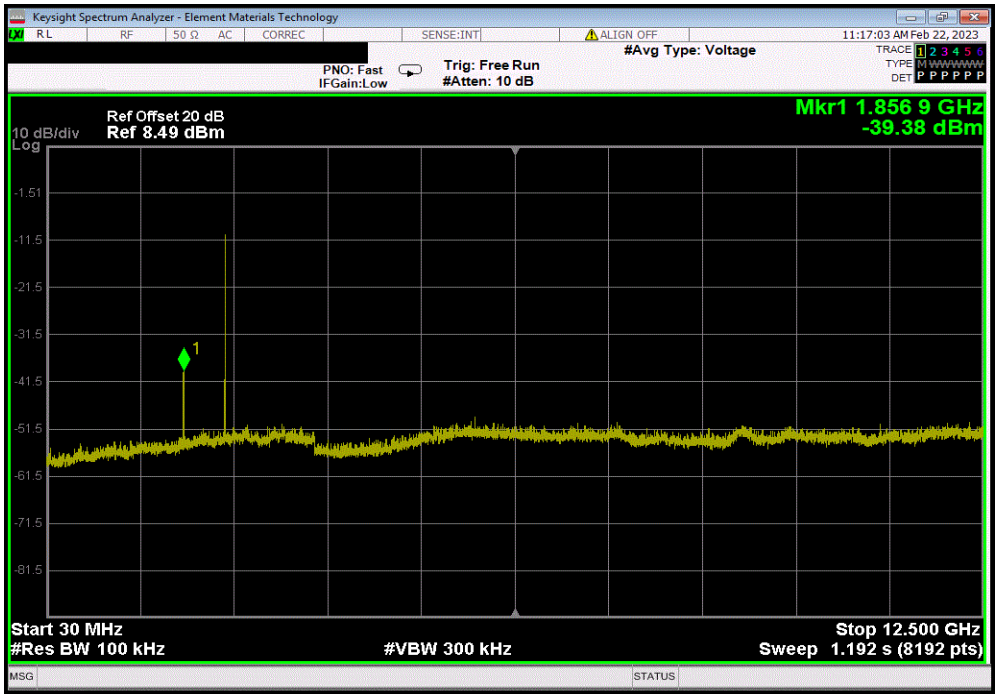
Configuration #	**TSIN0196-2**	*Signature*

		Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK 125 kbps						
	Low Channel, 2402 MHz	Fundamental	2402.02	N/A	N/A	N/A
	Low Channel, 2402 MHz	30 MHz - 12.5 GHz	1856.88	-32.9	-20	Pass
	Low Channel, 2402 MHz	12.5 GHz - 25 GHz	24896.23	-31.1	-20	Pass
	Mid Channel, 2442 MHz	Fundamental	2442.01	N/A	N/A	N/A
	Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	5525.87	-42.05	-20	Pass
	Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	24945.06	-29.39	-20	Pass
	High Channel, 2480 MHz	Fundamental	2480.01	N/A	N/A	N/A
	High Channel, 2480 MHz	30 MHz - 12.5 GHz	1850.79	-27.32	-20	Pass
	High Channel, 2480 MHz	12.5 GHz - 25 GHz	24893.18	-28.99	-20	Pass
BLE/GFSK 500 kbps						
	Low Channel, 2402 MHz	Fundamental	2401.76	N/A	N/A	N/A
	Low Channel, 2402 MHz	30 MHz - 12.5 GHz	12166.59	-43.06	-20	Pass
	Low Channel, 2402 MHz	12.5 GHz - 25 GHz	24888.6	-30.69	-20	Pass
	Mid Channel, 2442 MHz	Fundamental	2441.76	N/A	N/A	N/A
	Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	1850.79	-31.65	-20	Pass
	Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	24839.76	-29.73	-20	Pass
	High Channel, 2480 MHz	Fundamental	2479.76	N/A	N/A	N/A
	High Channel, 2480 MHz	30 MHz - 12.5 GHz	5652.23	-41	-20	Pass
	High Channel, 2480 MHz	12.5 GHz - 25 GHz	24795.51	-29.34	-20	Pass
BLE/GFSK 1 Mbps						
	Low Channel, 2402 MHz	Fundamental	2402.02	N/A	N/A	N/A
	Low Channel, 2402 MHz	30 MHz - 12.5 GHz	12120.92	-43.45	-20	Pass
	Low Channel, 2402 MHz	12.5 GHz - 25 GHz	24819.92	-30.56	-20	Pass
	Mid Channel, 2442 MHz	Fundamental	2442.02	N/A	N/A	N/A
	Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	1858.41	-28.31	-20	Pass
	Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	24987.79	-29.75	-20	Pass
	High Channel, 2480 MHz	Fundamental	2480.02	N/A	N/A	N/A
	High Channel, 2480 MHz	30 MHz - 12.5 GHz	5206.17	-39.82	-20	Pass
	High Channel, 2480 MHz	12.5 GHz - 25 GHz	24986.27	-29.51	-20	Pass
BLE/GFSK 2 Mbps						
	Low Channel, 2402 MHz	Fundamental	2402.02	N/A	N/A	N/A
	Low Channel, 2402 MHz	30 MHz - 12.5 GHz	1850.79	-29.93	-20	Pass
	Low Channel, 2402 MHz	12.5 GHz - 25 GHz	24975.58	-30.88	-20	Pass
	Mid Channel, 2442 MHz	Fundamental	2442.02	N/A	N/A	N/A
	Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	1850.79	-27.04	-20	Pass
	Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	24993.9	-29.81	-20	Pass
	High Channel, 2480 MHz	Fundamental	2480.02	N/A	N/A	N/A
	High Channel, 2480 MHz	30 MHz - 12.5 GHz	7205.08	-40.76	-20	Pass
	High Channel, 2480 MHz	12.5 GHz - 25 GHz	24995.42	-28.29	-20	Pass

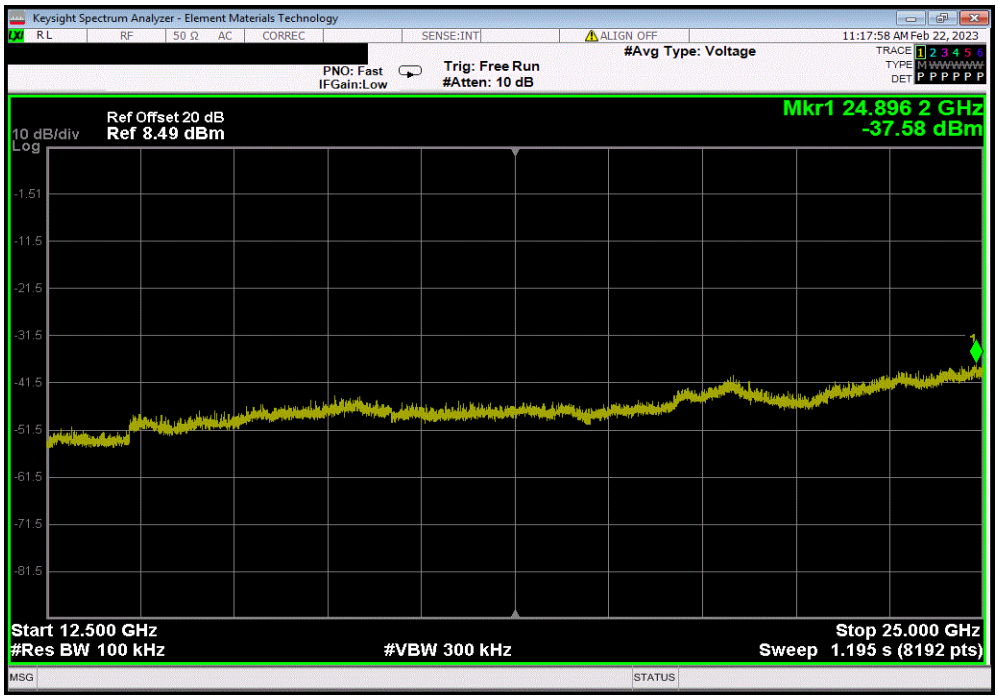
BLE/GFSK 125 kbps, Low Channel, 2402 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2402.02	N/A	N/A	N/A



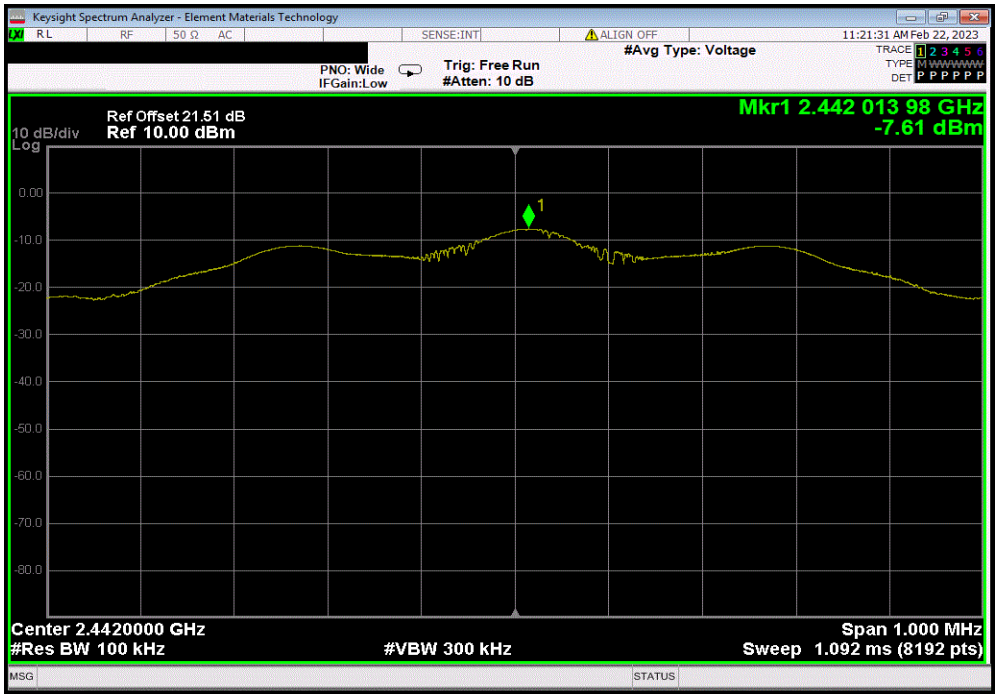
BLE/GFSK 125 kbps, Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	1856.88	-32.9	-20	Pass



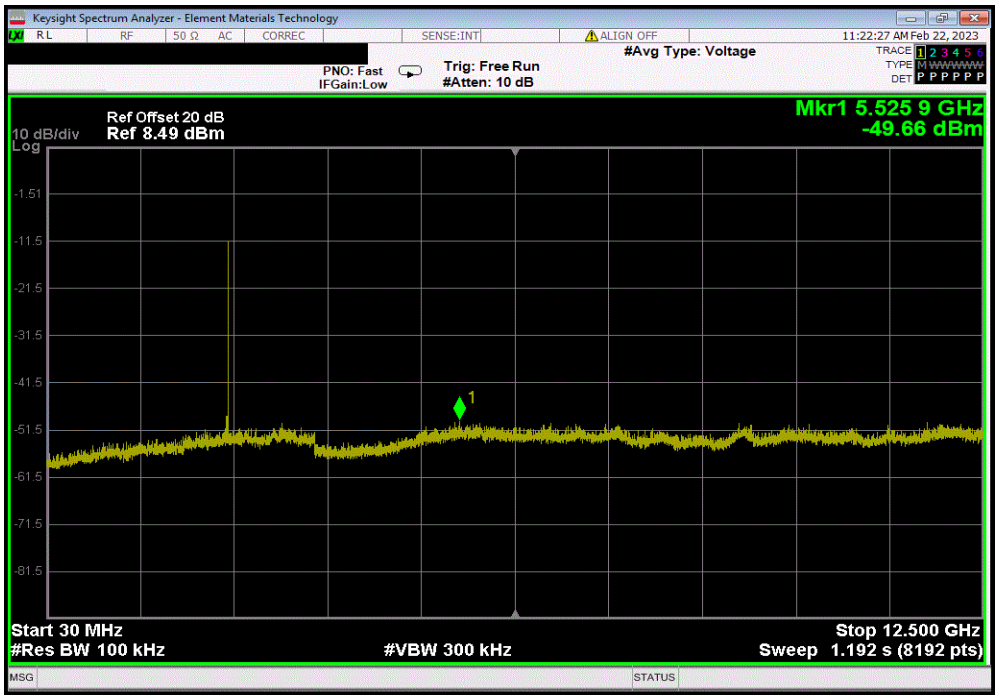
BLE/GFSK 125 kbps, Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24896.23	-31.1	-20	Pass



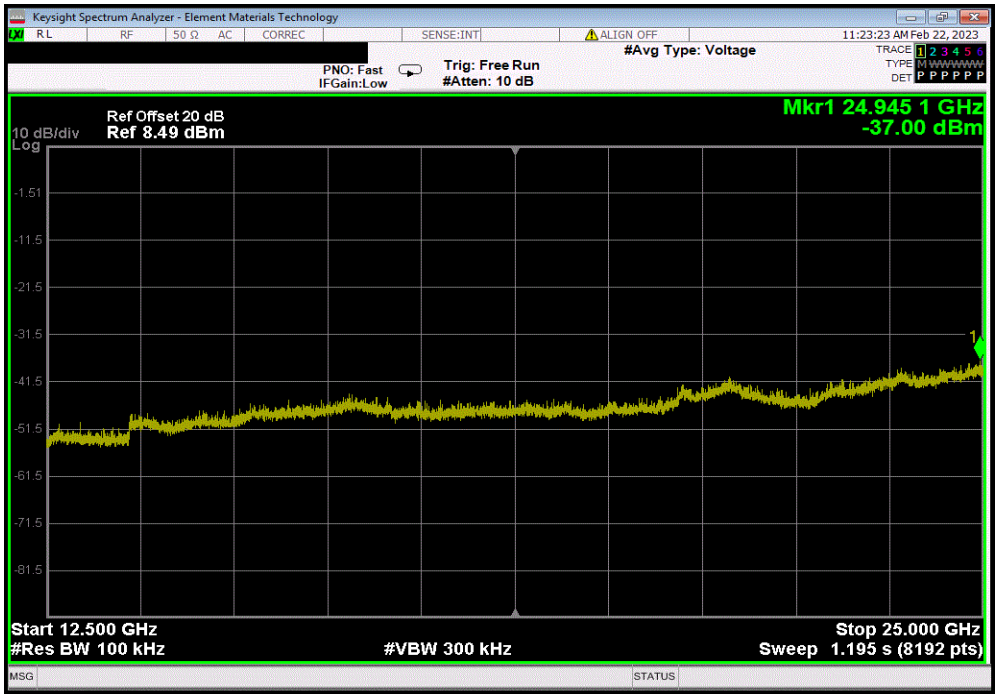
BLE/GFSK 125 kbps, Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental	2442.01	N/A	N/A	N/A



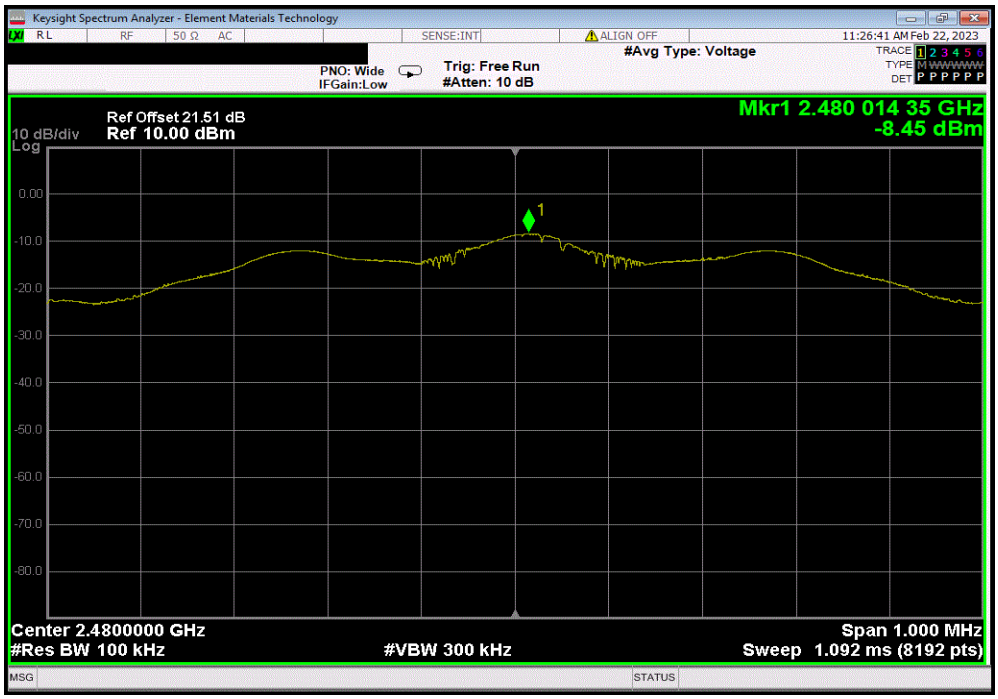
BLE/GFSK 125 kbps, Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	5525.87	-42.05	-20	Pass



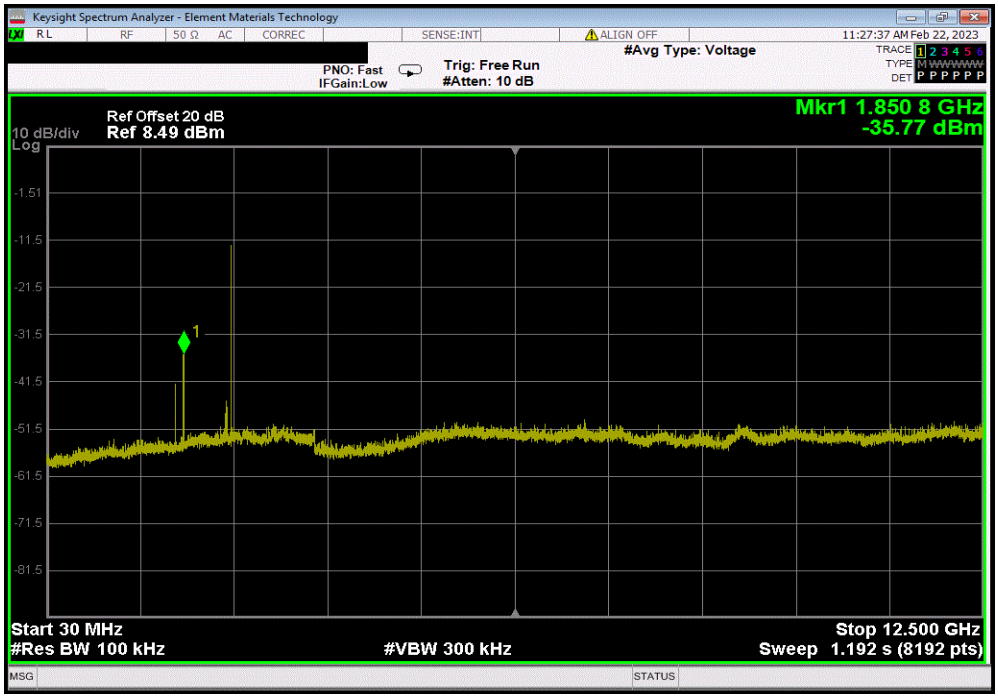
BLE/GFSK 125 kbps, Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24945.06	-29.39	-20	Pass



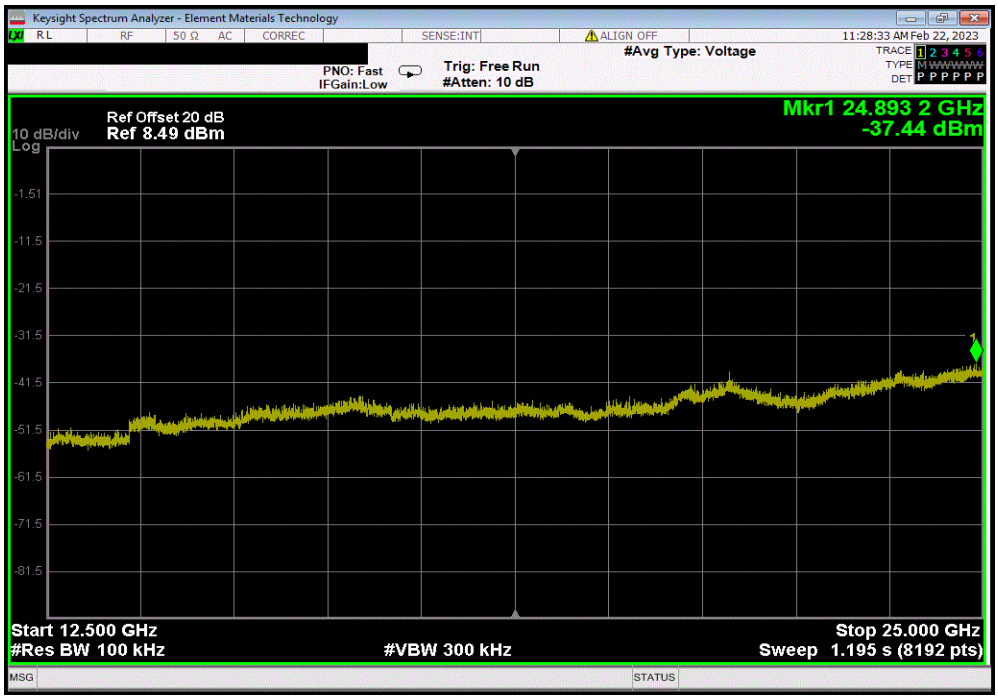
BLE/GFSK 125 kbps, High Channel, 2480 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2480.01	N/A	N/A	N/A



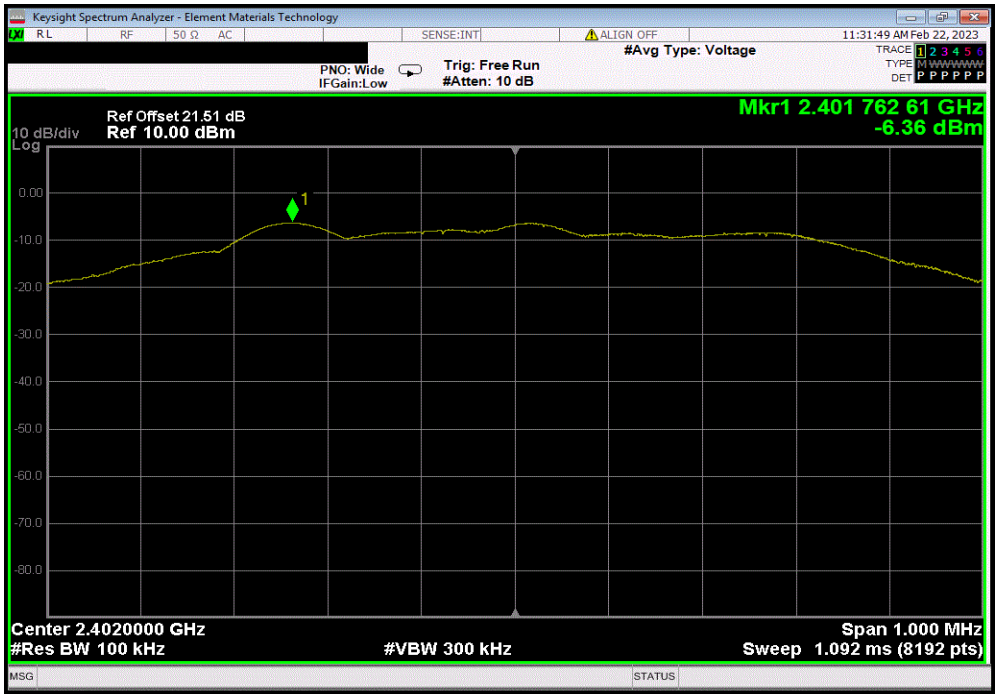
BLE/GFSK 125 kbps, High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	1850.79	-27.32	-20	Pass



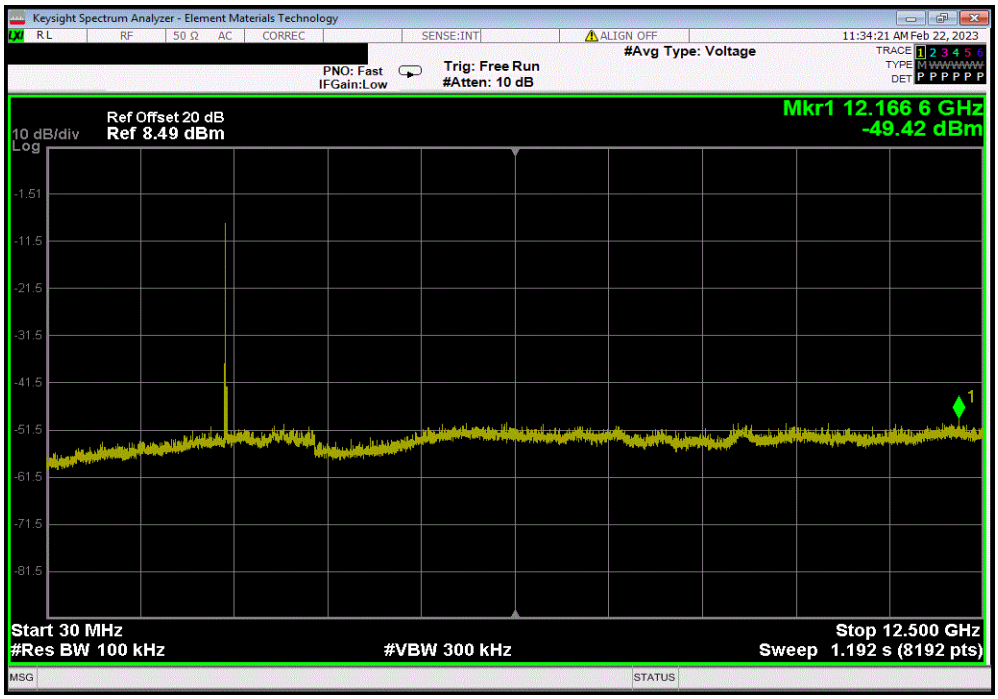
BLE/GFSK 125 kbps, High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24893.18	-28.99	-20	Pass



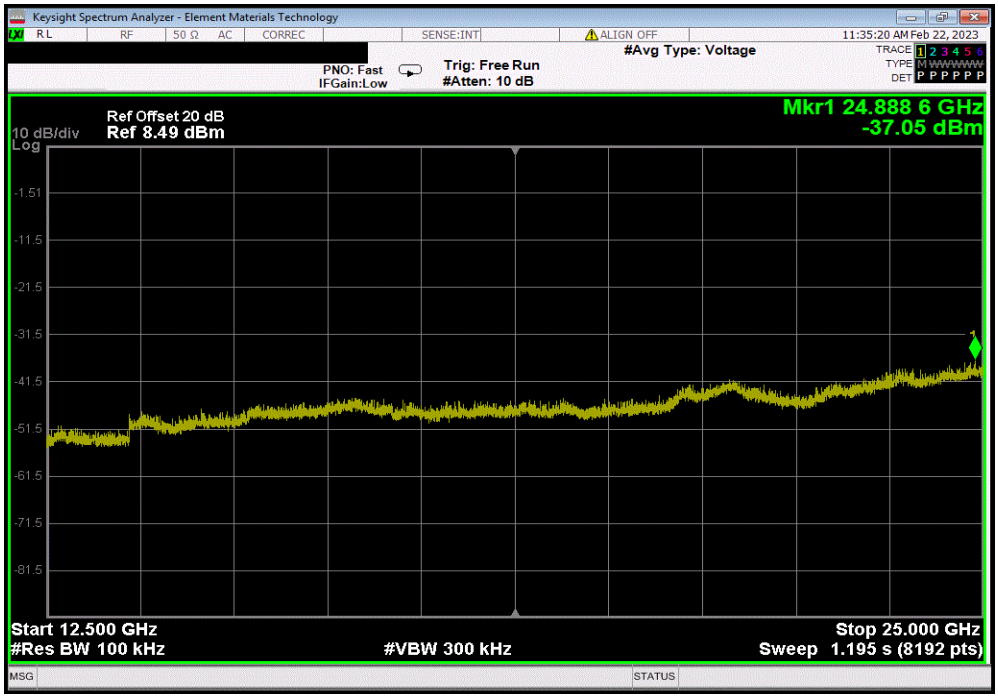
BLE/GFSK 500 kbps, Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental	2401.76	N/A	N/A	N/A



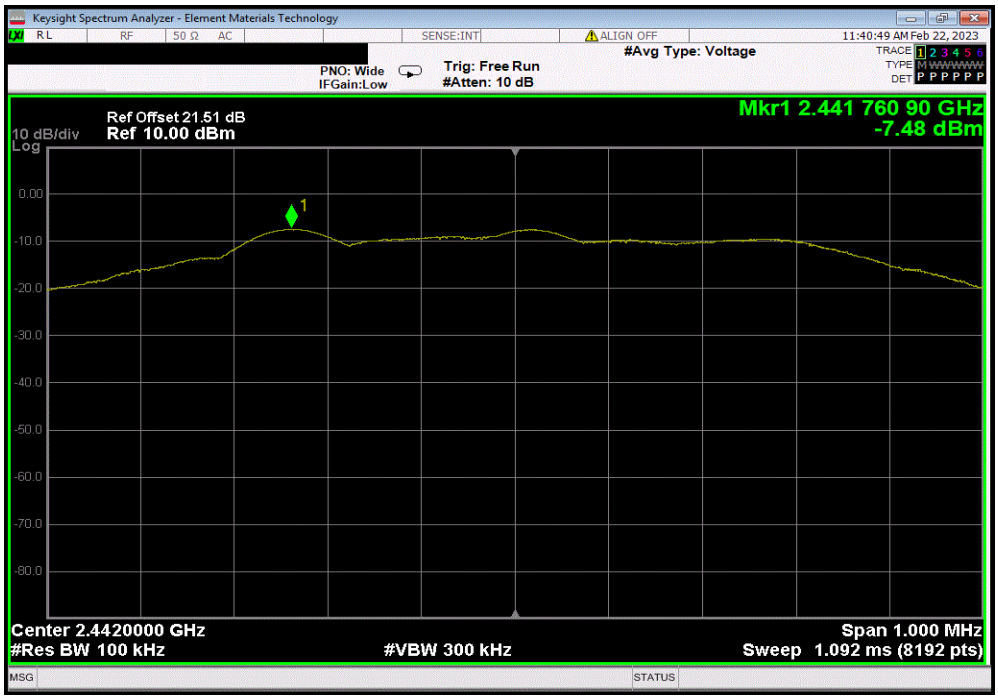
BLE/GFSK 500 kbps, Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	12166.59	-43.06	-20	Pass



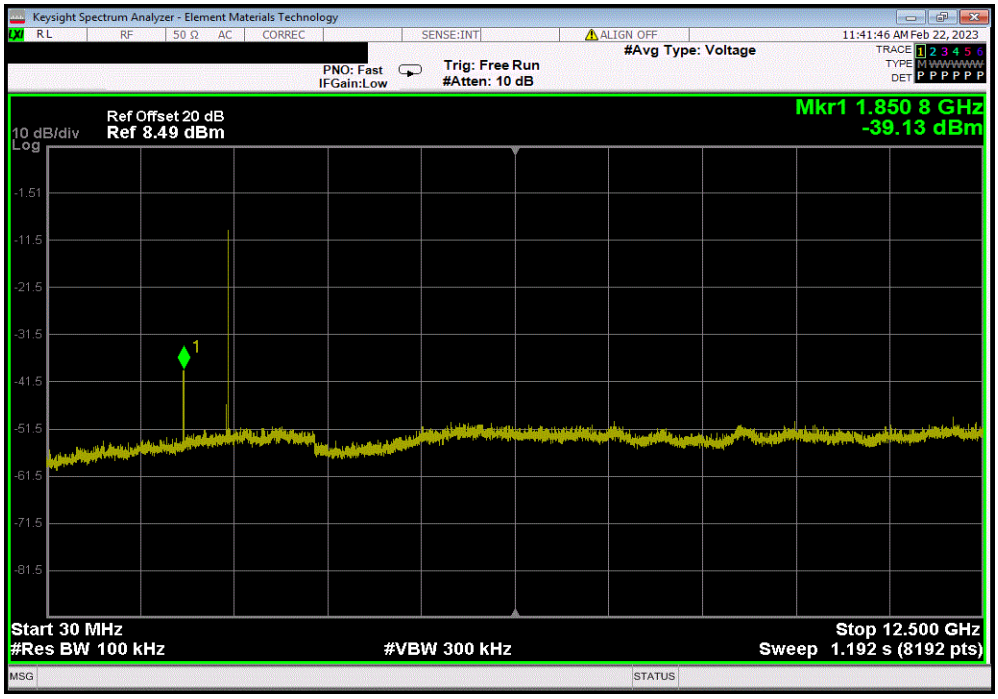
BLE/GFSK 500 kbps, Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24888.6	-30.69	-20	Pass



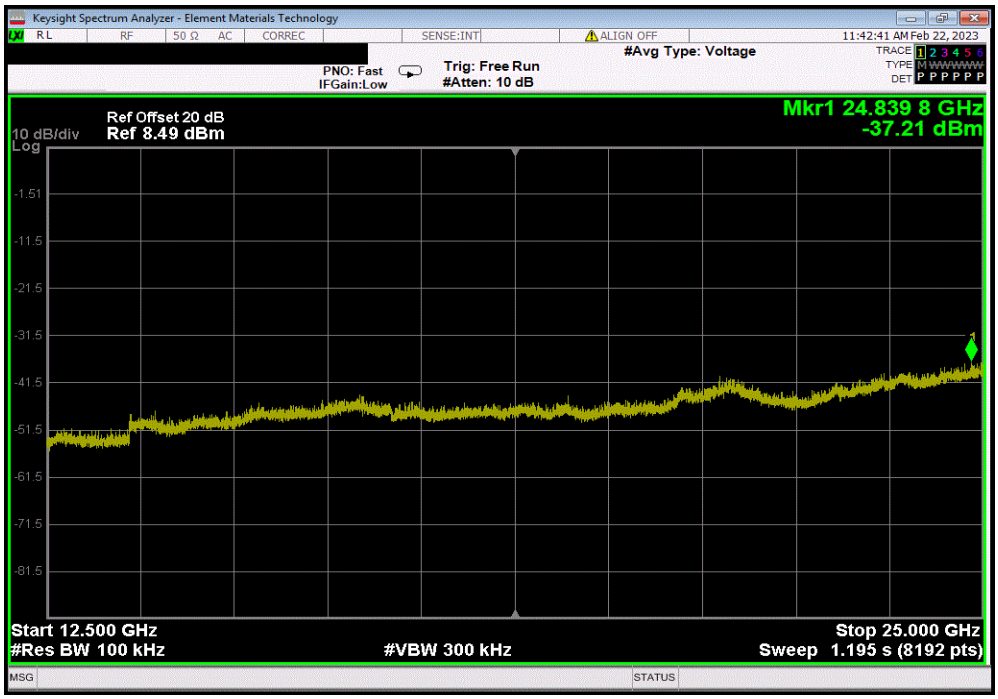
BLE/GFSK 500 kbps, Mid Channel, 2442 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2441.76	N/A	N/A	N/A



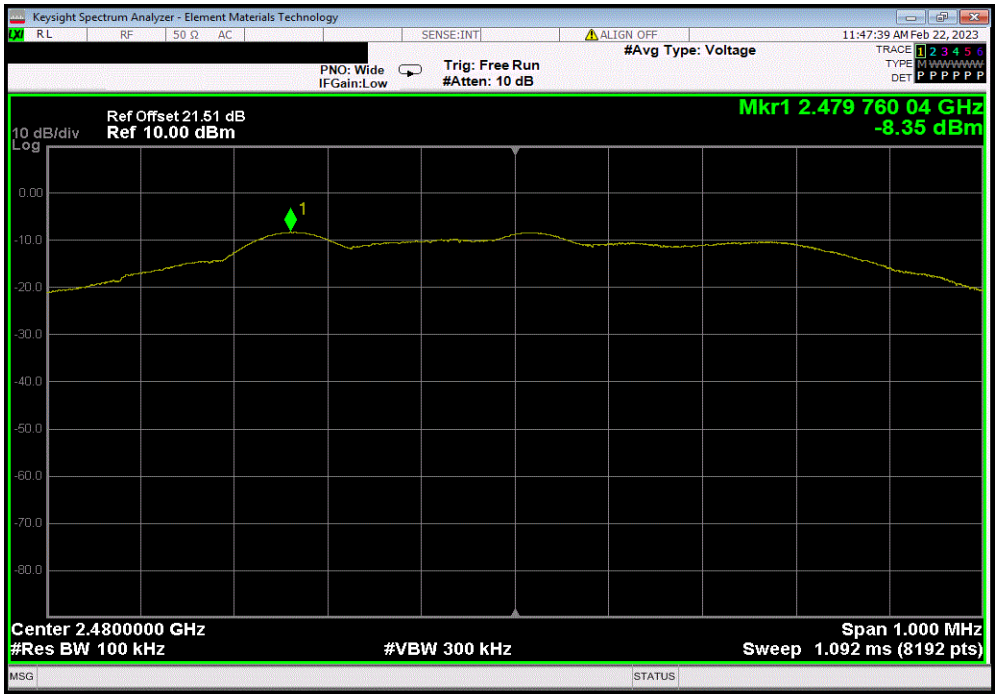
BLE/GFSK 500 kbps, Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	1850.79	-31.65	-20	Pass



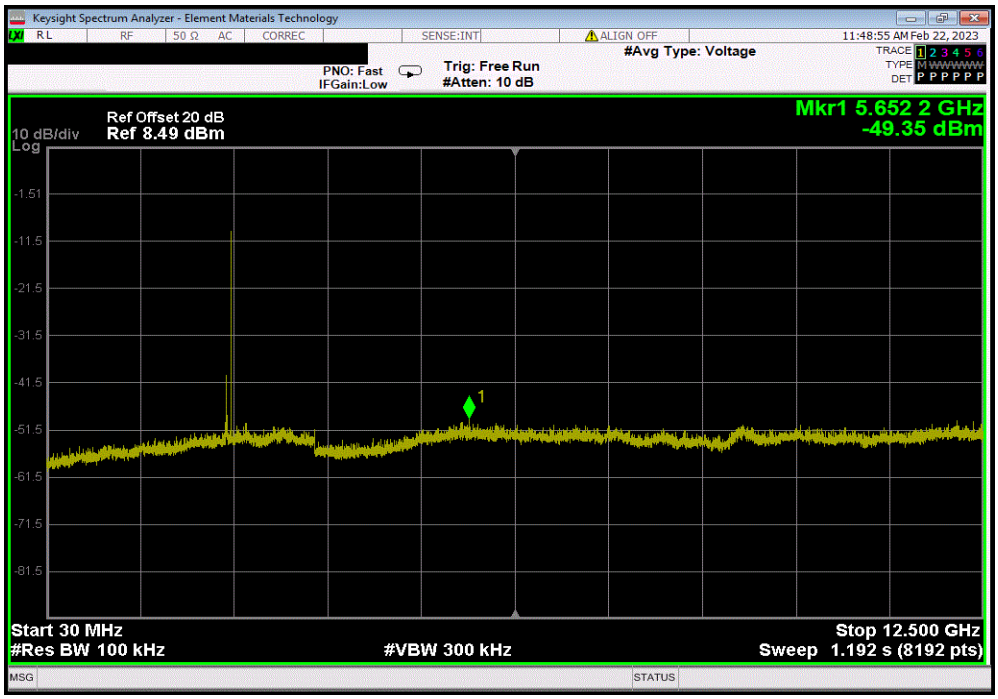
BLE/GFSK 500 kbps, Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24839.76	-29.73	-20	Pass



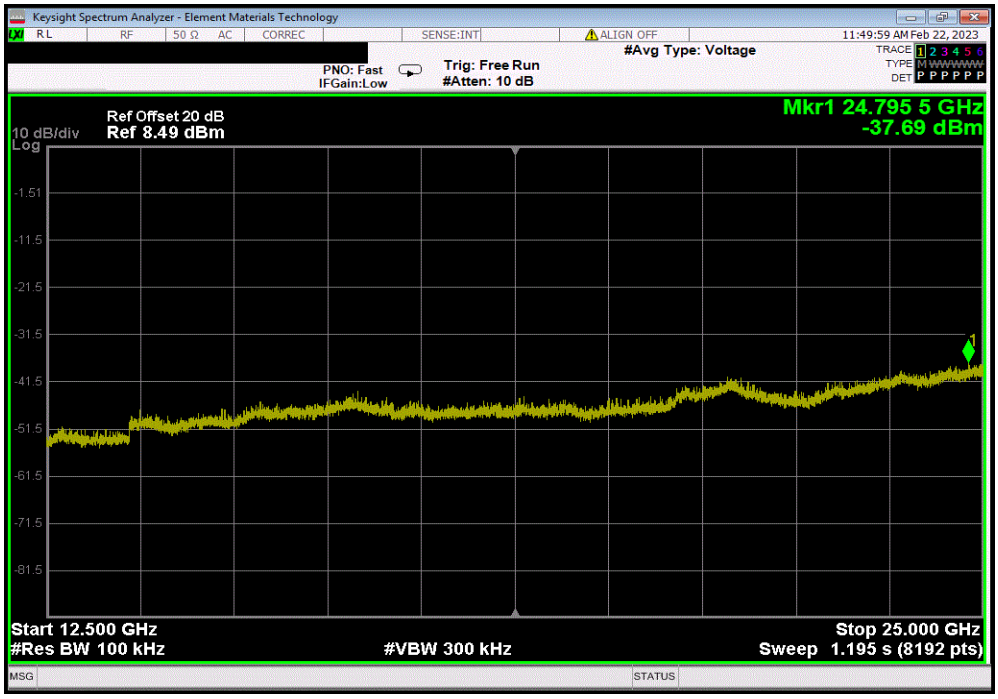
BLE/GFSK 500 kbps, High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental	2479.76	N/A	N/A	N/A



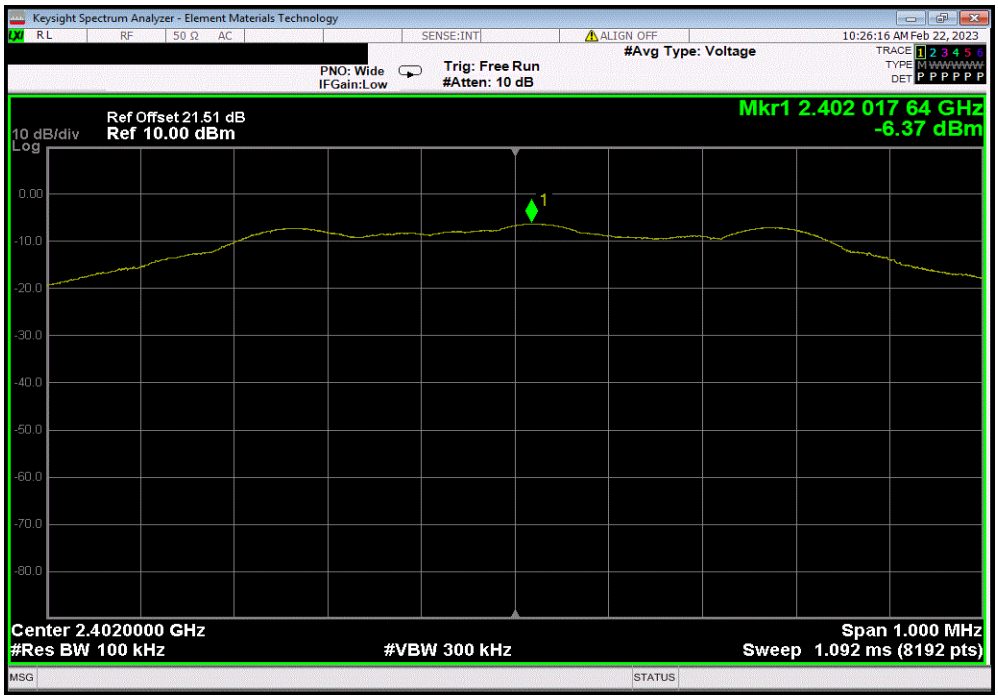
BLE/GFSK 500 kbps, High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	5652.23	-41	-20	Pass



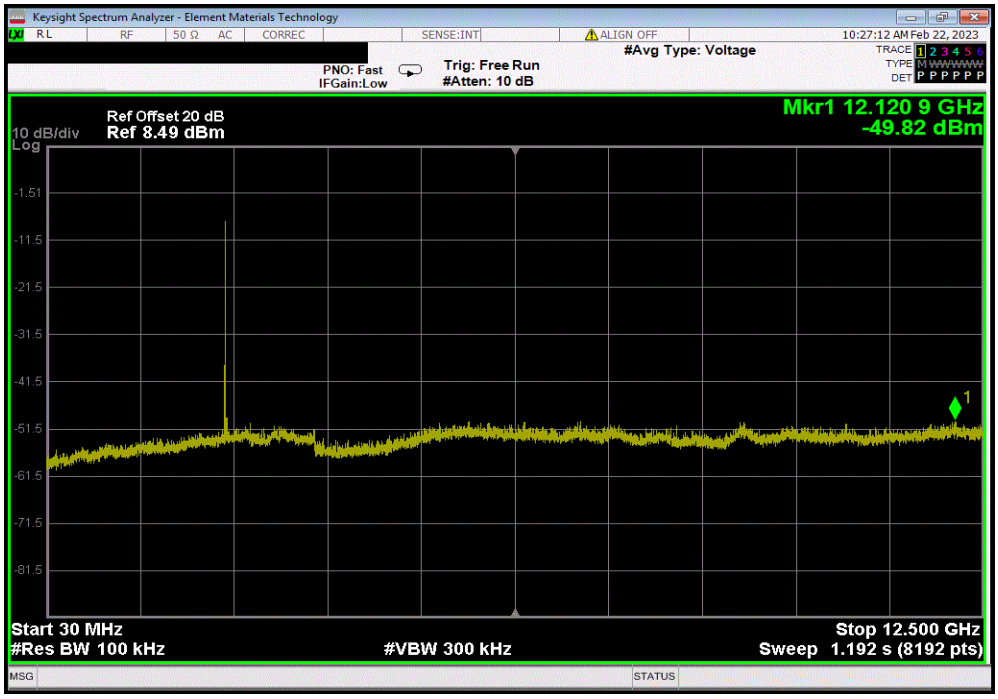
BLE/GFSK 500 kbps, High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24795.51	-29.34	-20	Pass



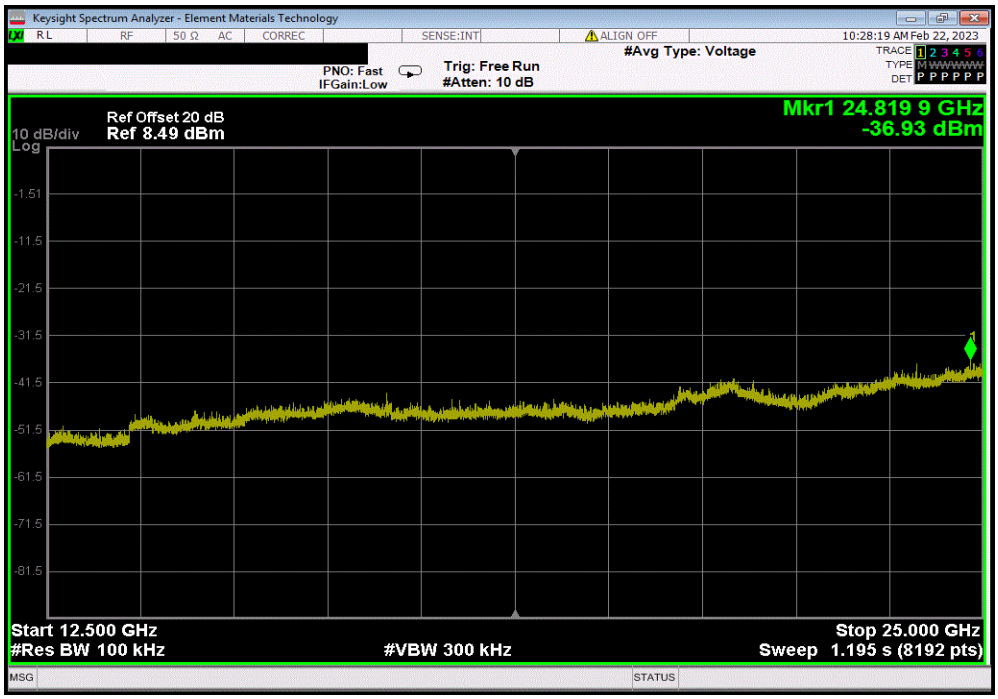
BLE/GFSK 1 Mbps, Low Channel, 2402 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2402.02	N/A	N/A	N/A



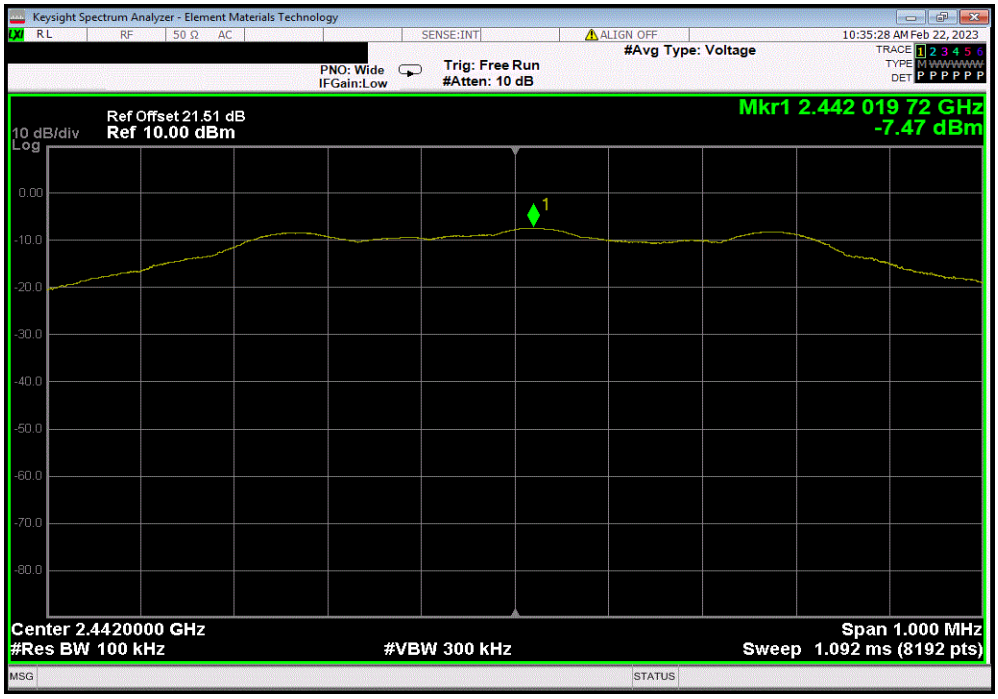
BLE/GFSK 1 Mbps, Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	12120.92	-43.45	-20	Pass



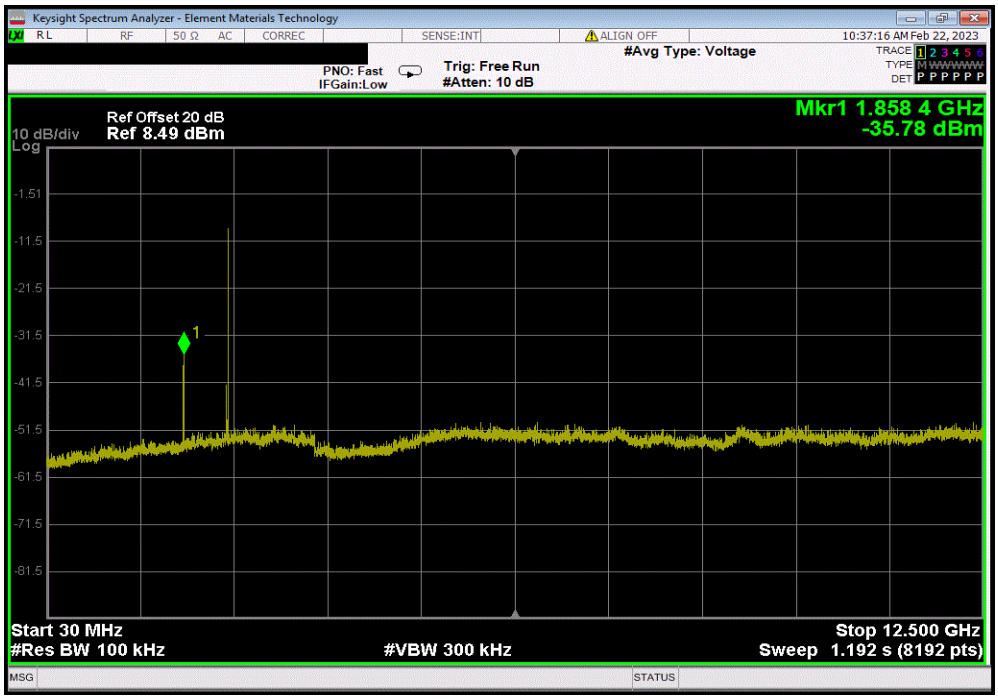
BLE/GFSK 1 Mbps, Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24819.92	-30.56	-20	Pass



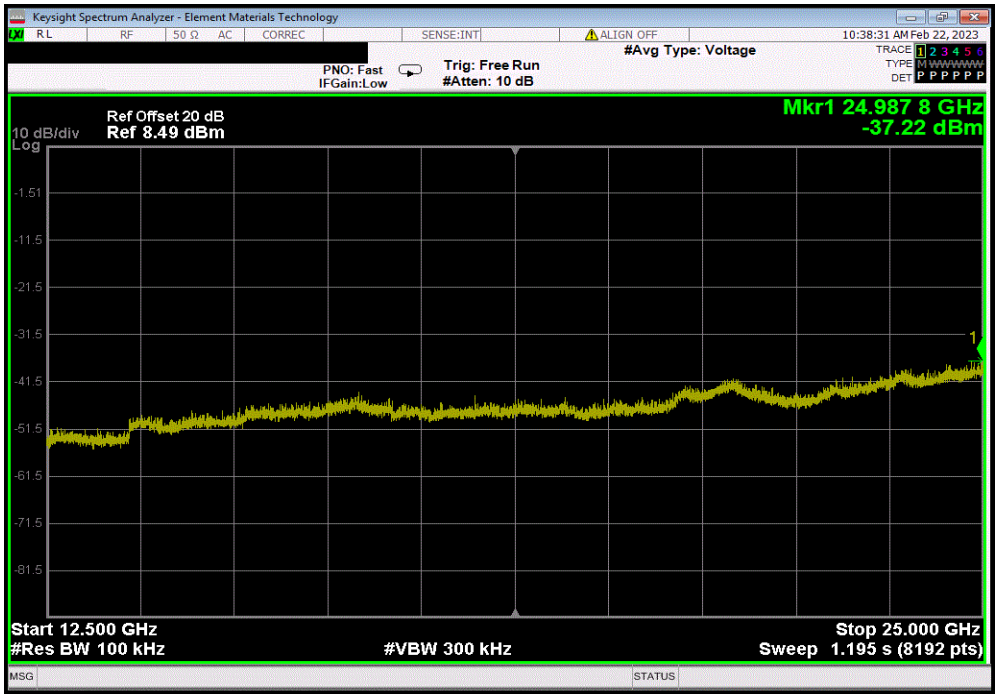
BLE/GFSK 1 Mbps, Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental	2442.02	N/A	N/A	N/A



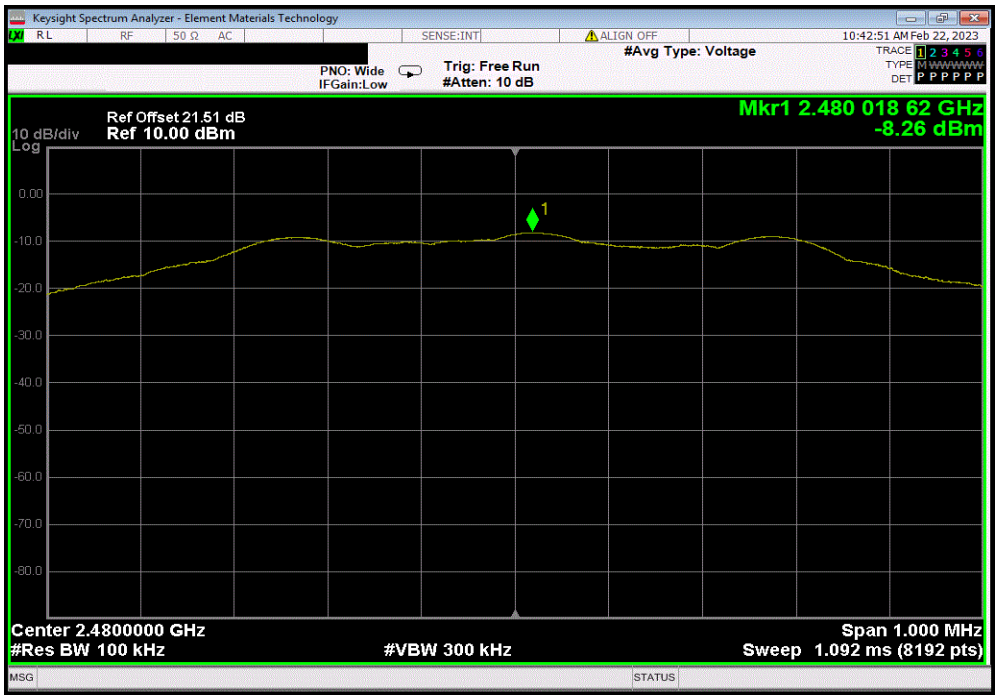
BLE/GFSK 1 Mbps, Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	1858.41	-28.31	-20	Pass



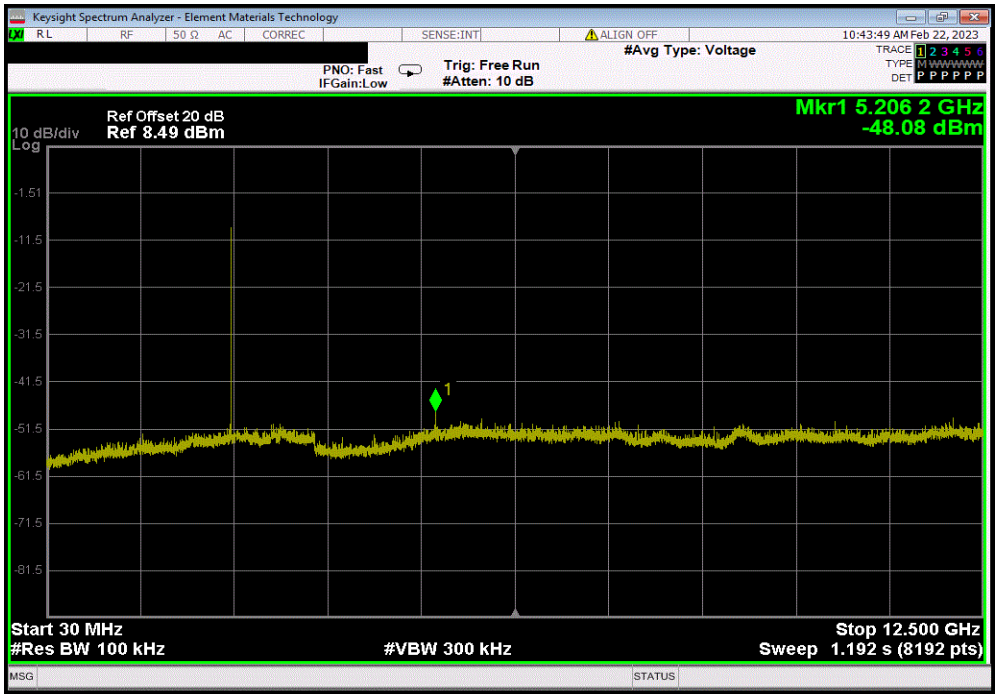
BLE/GFSK 1 Mbps, Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24987.79	-29.75	-20	Pass



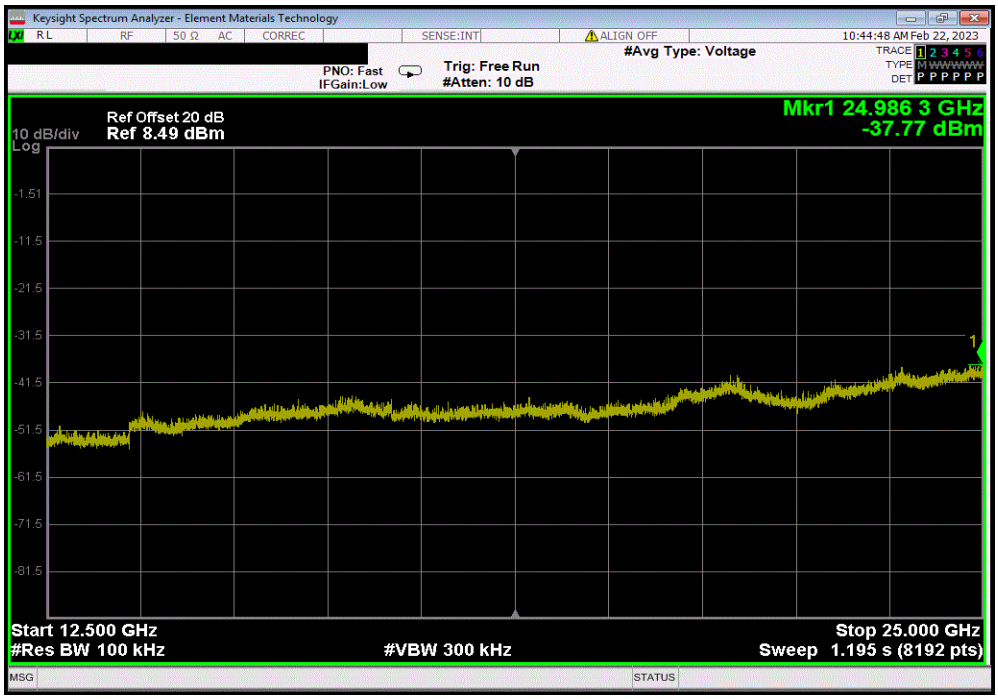
BLE/GFSK 1 Mbps, High Channel, 2480 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2480.02	N/A	N/A	N/A



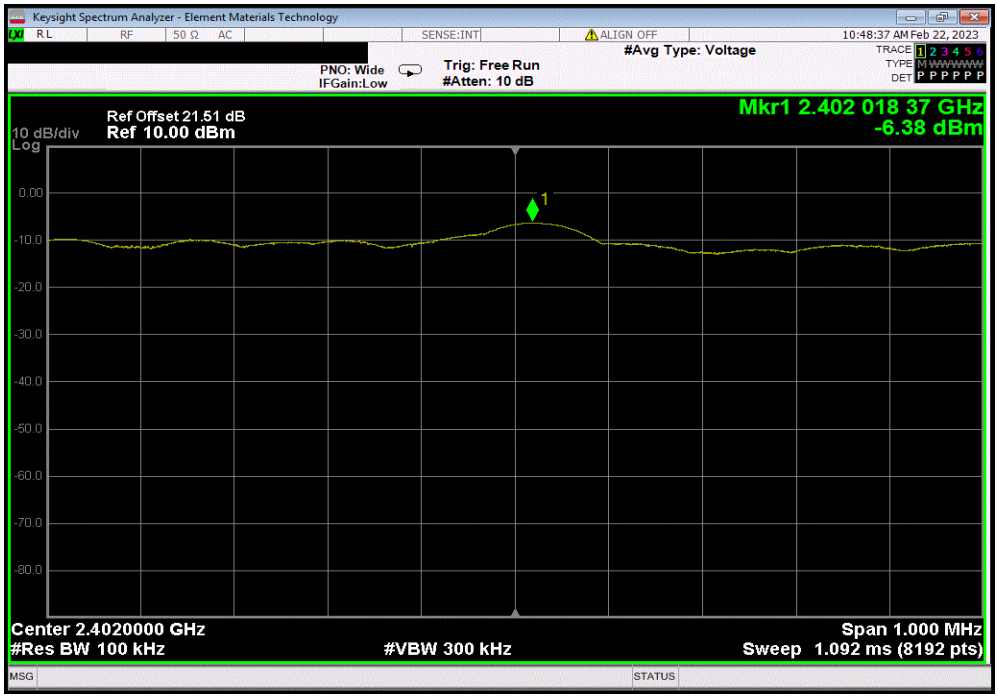
BLE/GFSK 1 Mbps, High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	5206.17	-39.82	-20	Pass



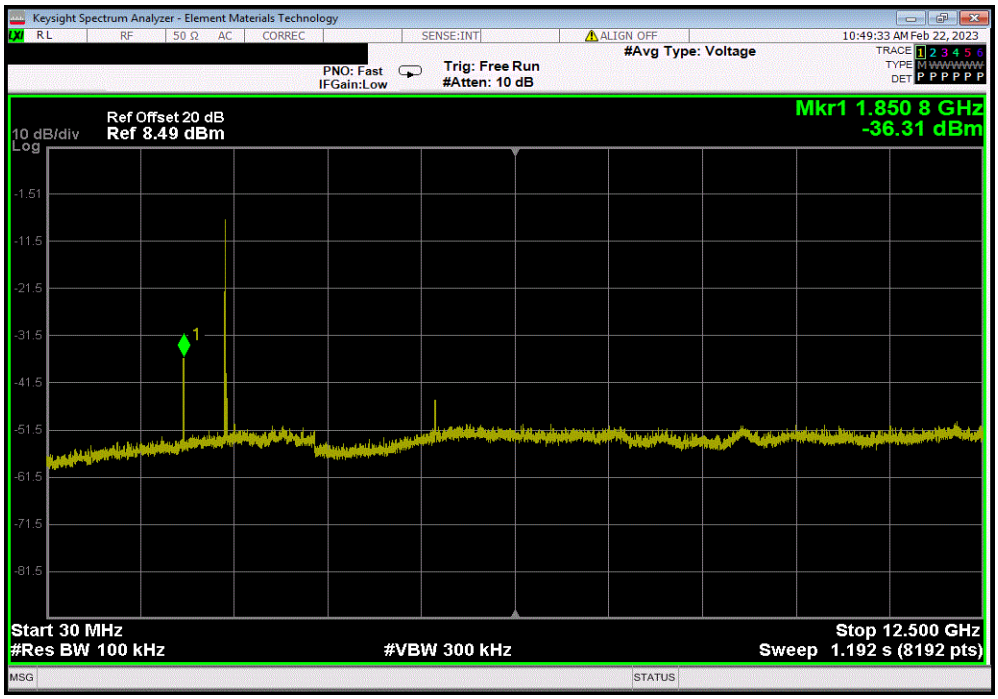
BLE/GFSK 1 Mbps, High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24986.27	-29.51	-20	Pass



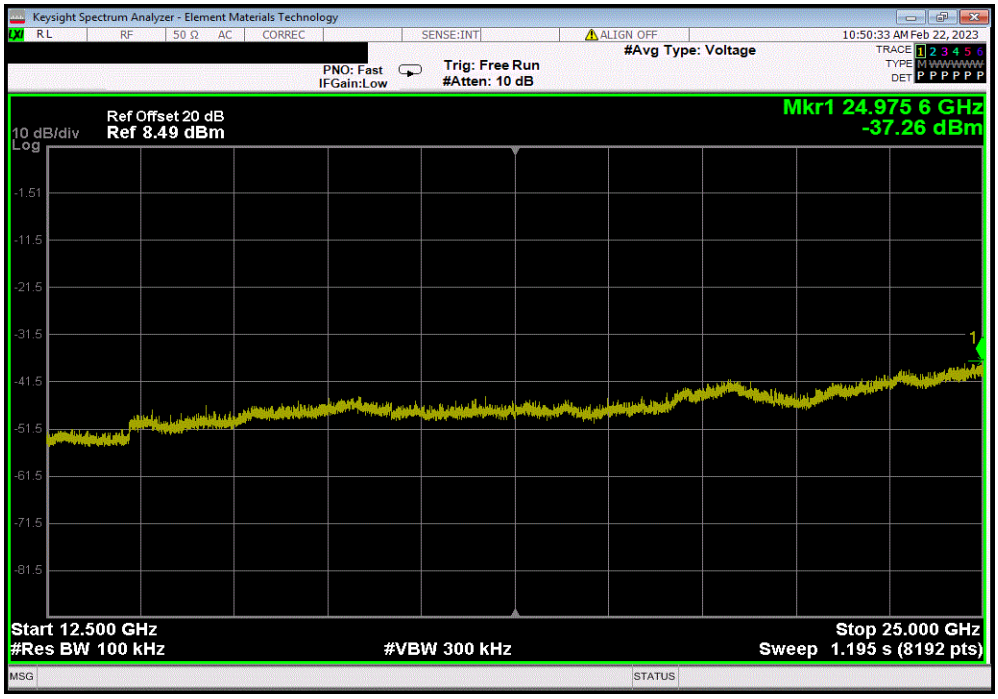
BLE/GFSK 2 Mbps, Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental	2402.02	N/A	N/A	N/A



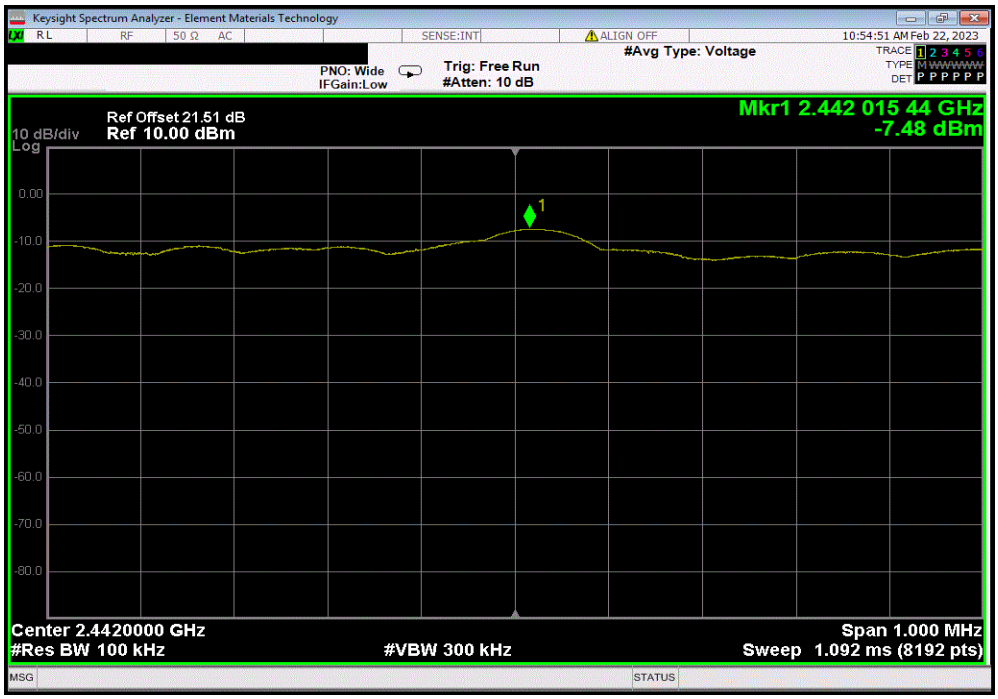
BLE/GFSK 2 Mbps, Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	1850.79	-29.93	-20	Pass



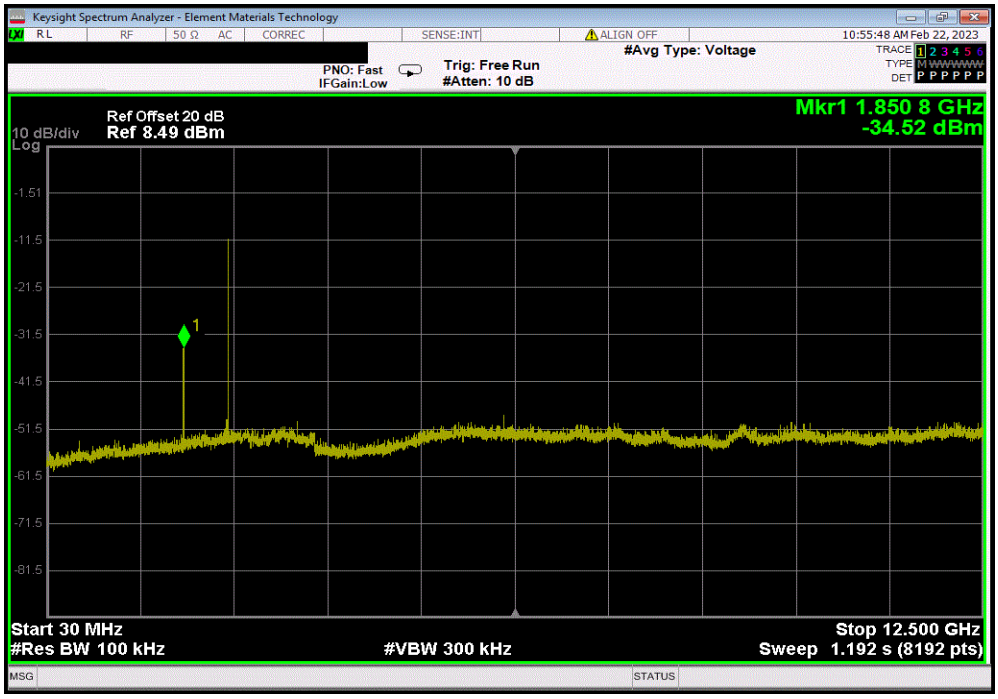
BLE/GFSK 2 Mbps, Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24975.58	-30.88	-20	Pass



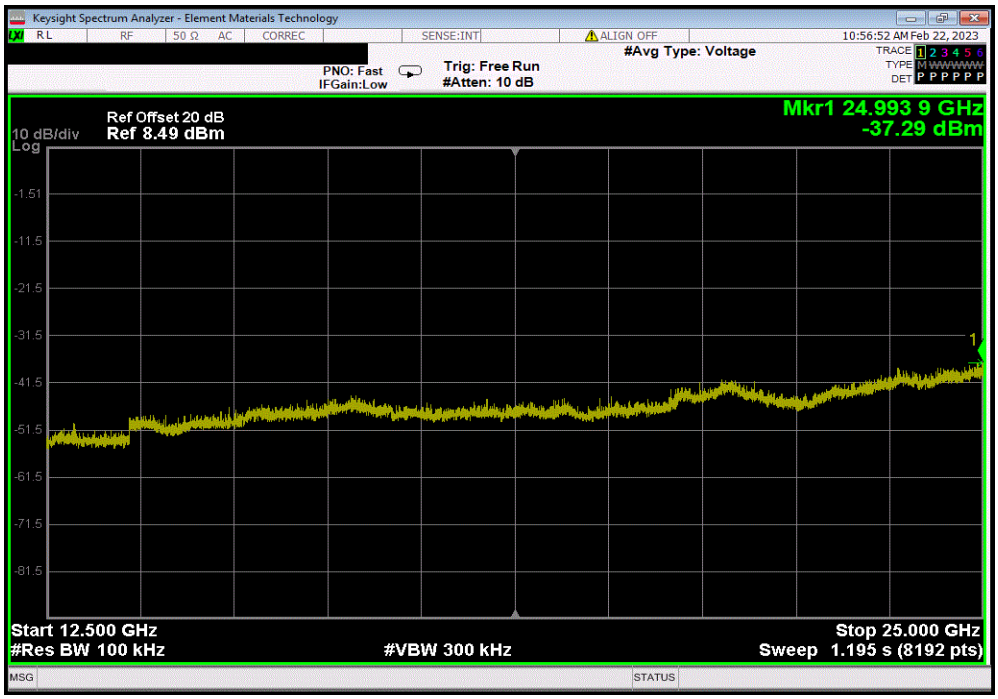
BLE/GFSK 2 Mbps, Mid Channel, 2442 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2442.02	N/A	N/A	N/A



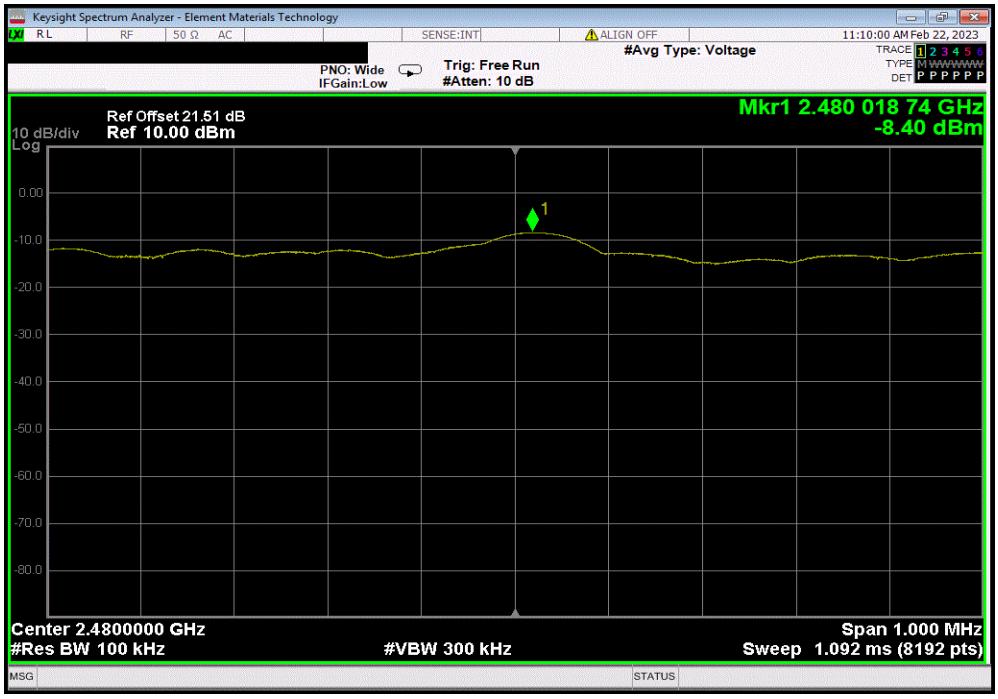
BLE/GFSK 2 Mbps, Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	1850.79	-27.04	-20	Pass



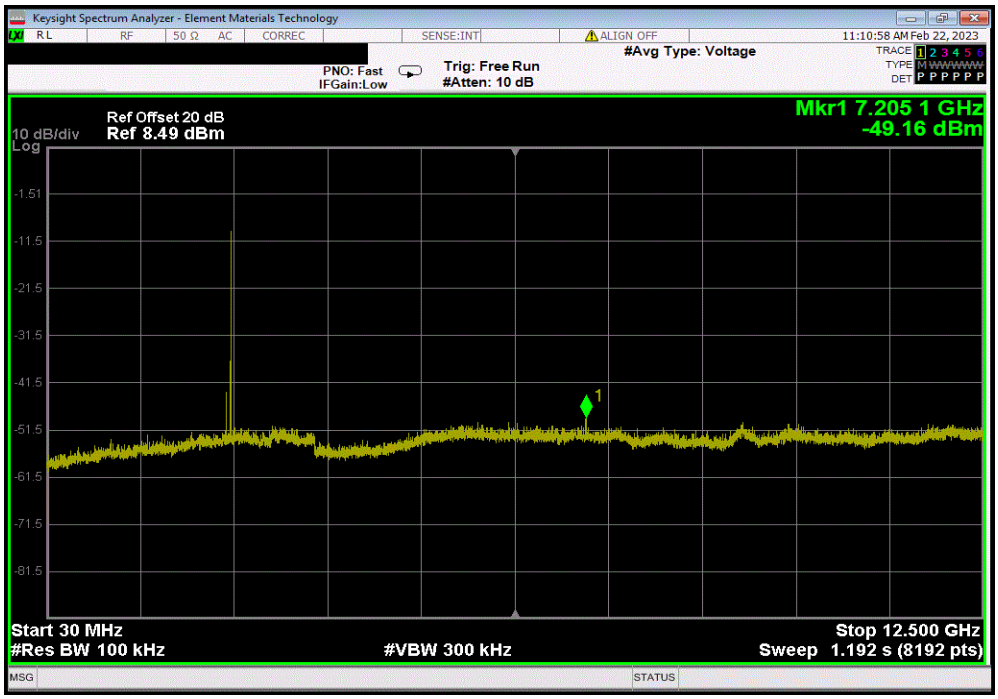
BLE/GFSK 2 Mbps, Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24993.9	-29.81	-20	Pass



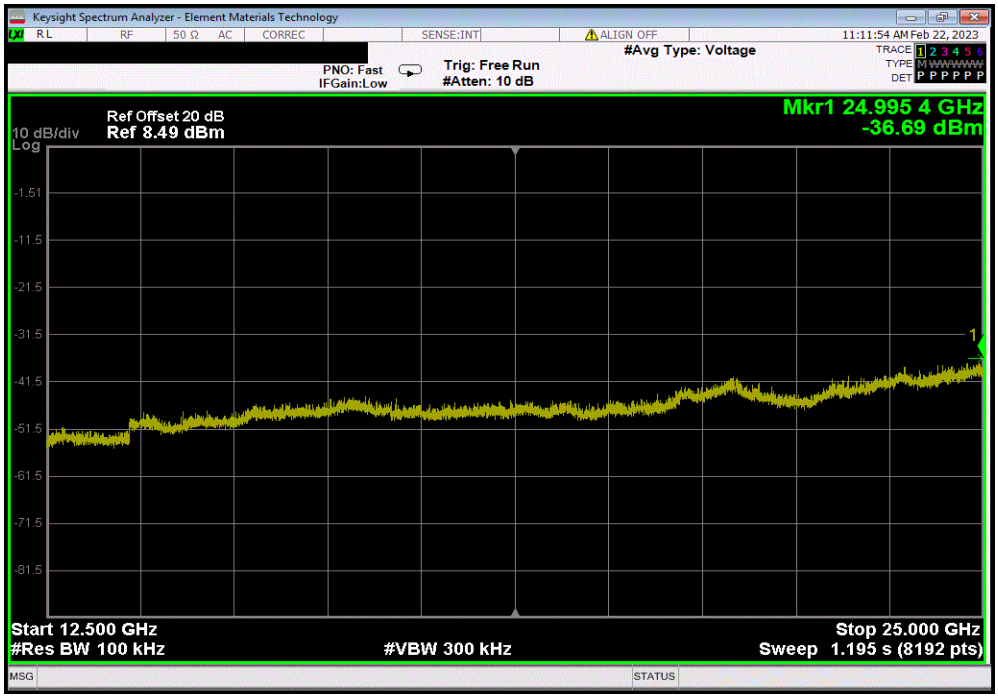
BLE/GFSK 2 Mbps, High Channel, 2480 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2480.02	N/A	N/A	N/A



BLE/GFSK 2 Mbps, High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	7205.08	-40.76	-20	Pass



BLE/GFSK 2 Mbps, High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24995.42	-28.29	-20	Pass



SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

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 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).

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Double Ridge	ETS Lindgren	3115	AIB	2022-09-01	2024-09-01
Cable	Element	Double Ridge Guide Horn Cables	MNV	2023-01-31	2024-01-31
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	2023-01-31	2024-01-31
Filter - High Pass	Micro-Tronics	HPM50108	HFW	2022-09-10	2023-09-10
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2022-05-18	2023-05-18
Antenna - Biconilog	Ametek	CBL 6141B	AYS	2021-03-09	2023-03-09
Cable	Element	Biconilog Cable	MNX	2023-01-31	2024-01-31
Amplifier - Pre-Amplifier	Miteq	AM-1064-9079 and SA18E-10	AOO	2023-01-31	2024-01-31
Filter - Low Pass	Micro-Tronics	LPM50004	HGG	2022-09-10	2023-09-10
Attenuator	Coaxicom	3910-20	AXY	2022-09-10	2023-09-10
Filter - High Pass	Micro-Tronics	HPM50111	HFM	2022-09-10	2023-09-10
Antenna - Standard Gain	ETS-Lindgren	3160-07	AJJ	NCR	NCR
Cable	Element	Standard Gain Cable	MNW	2023-01-31	2024-01-31
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	2023-01-31	2024-01-31
Antenna - Standard Gain	ETS-Lindgren	3160-08	AJP	NCR	NCR
Amplifier - Pre-Amplifier	L-3 Narda-Miteq	AMF-6F-12001800-30-10P	PAP	2023-01-31	2024-01-31
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	NCR
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNP	2022-09-10	2023-09-10
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	2022-09-10	2023-09-10

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	5.2 dB	-5.2 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 26500 MHz

POWER INVESTIGATED

5VDC Battery

CONFIGURATIONS INVESTIGATED

TSIN0196-4
TSIN0196-5
TSIN0196-6

MODES INVESTIGATED

Transmitting BLE Low and High Channels (2402 and 2480 MHz) 1 Mbps, 2 Mbps, 500 kbps, 125 kbps Modulated. PRBS9
Transmitting BLE Low, Mid and High Channels (2402, 2442, 2480 MHz) 1 Mbps, 2 Mbps, 500 kbps, 125 kbps Modulated. PRBS9

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

EUT:	TSI OmniTrak Module tVOC (7591-02)	Work Order:	TSIN0196
Serial Number:	LCOPC_055	Date:	2023-03-09
Customer:	TSI, Incorporated	Temperature:	22.8°C
Attendees:	Andrew Bentley	Relative Humidity:	25.3%
Customer Project:	None	Bar. Pressure (PMSL):	1030 mb
Tested By:	Marcelo Aguayo	Job Site:	MN09
Power:	5VDC Battery	Configuration:	TSIN0196-6

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	
RSS-247 Issue 2:2017	

TEST PARAMETERS

Run #:	116	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

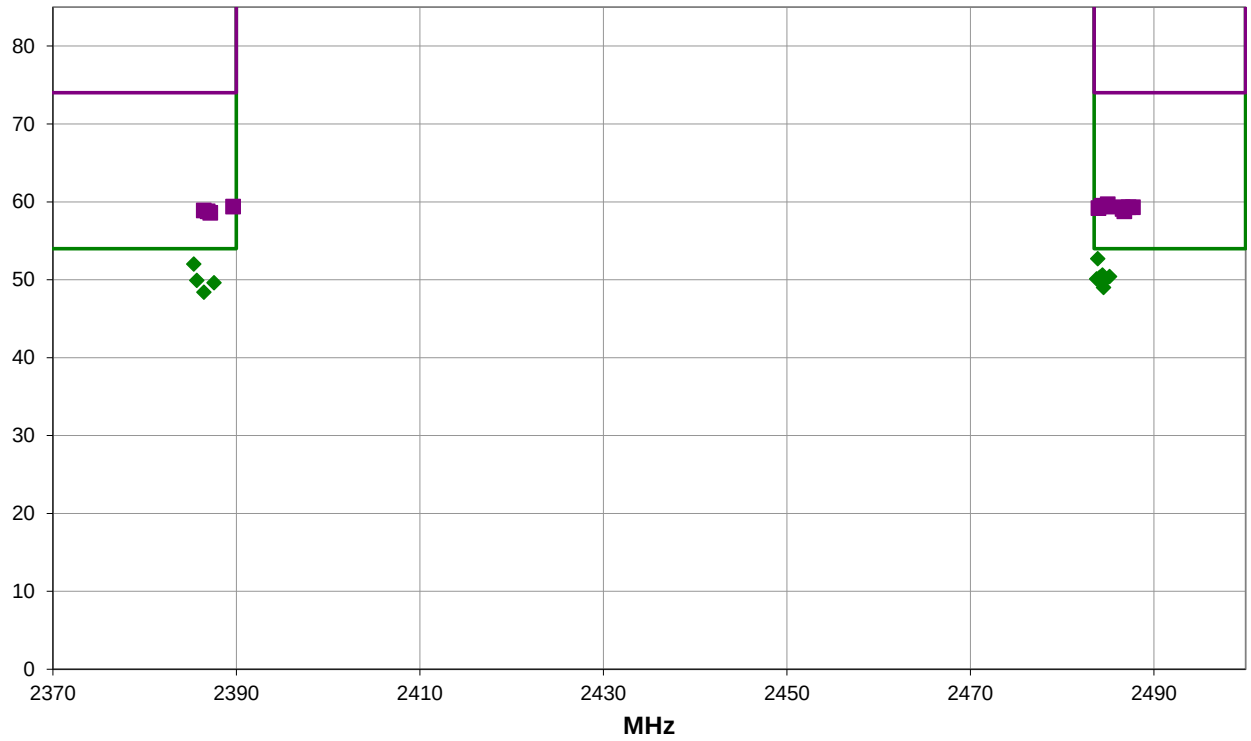
Data Rate (bps)	Duty Cycle (%)	DCCF (dB)		Data Rate (bps)	Duty Cycle (%)	DCCF (dB)
125k	83.1	0.8		500k	58	2.4
1M	65.8	1.8		2M	36.1	4.4

EUT OPERATING MODES

Transmitting BLE High Ch 02480 MHz, 1 Mbps Mod, PRBS9

DEVIATIONS FROM TEST STANDARD

None



Run #: 116 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

RESULTS - Run #116

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity/ Transducer	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.883	31.5	-3.2	1.5	283.0	4.4	20.0	Horz	AV	0.0	52.7	54.0	-1.3	EUT Horz, High Ch 39 2Mbps
2385.375	31.1	-3.5	1.5	283	4.4	20	Horz	AV	0.0	52	54	-2	EUT Horz, Low Ch 0 2Mbps
2484.408	31.5	-3.2	2.4	146.0	2.4	20.0	Horz	AV	0.0	50.7	54.0	-3.4	EUT Horz, High Ch 39 500kbps
2485.183	31.8	-3.2	1.5	359.0	1.8	20.0	Horz	AV	0.0	50.4	54.0	-3.6	EUT Horz, High Ch 39 1Mbps
2484.092	31.7	-3.2	1.5	187.0	1.8	20.0	Vert	AV	0.0	50.3	54.0	-3.7	EUT Horz, High Ch 39 1Mbps
2484.158	31.6	-3.2	2.7	117.0	1.8	20.0	Horz	AV	0.0	50.2	54.0	-3.8	EUT On Side, High Ch 39 1Mbps
2483.775	31.5	-3.2	2.4	251.0	1.8	20.0	Vert	AV	0.0	50.1	54.0	-3.9	EUT Vert, High Ch 39 1Mbps
2484.425	31.5	-3.2	1.5	305.0	1.8	20.0	Vert	AV	0.0	50.1	54.0	-3.9	EUT Vert, High Ch 39 1Mbps
2484.717	31.4	-3.2	1.5	40.0	1.8	20.0	Vert	AV	0.0	50.0	54.0	-4.0	EUT On Side, High Ch 39 1Mbps
2385.700	31.1	-3.5	1.5	200.0	2.4	20.0	Horz	AV	0.0	50.0	54.0	-4.0	EUT Horz, Low Ch 500kbps
2387.575	31.2	-3.4	2.5	221.0	1.8	20.0	Horz	AV	0.0	49.6	54.0	-4.4	EUT Horz, Low Ch 0 1Mbps
2484.533	31.4	-3.2	1.5	3.0	0.8	20.0	Horz	AV	0.0	49.0	54.0	-5.0	EUT Horz, High Ch 39 125kbps
2386.467	31.1	-3.5	1.5	132.0	0.8	20.0	Horz	AV	0.0	48.4	54.0	-5.6	EUT Horz, Low Ch 125kbps
2484.975	42.9	-3.2	1.5	283.0	0.0	20.0	Horz	PK	0.0	59.7	74.0	-14.3	EUT Horz, High Ch 39 2Mbps
2484.283	42.7	-3.2	1.5	187.0	0.0	20.0	Vert	PK	0.0	59.5	74.0	-14.5	EUT Horz, High Ch 39 1Mbps
2484.908	42.6	-3.2	2.4	251.0	0.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	EUT Vert, High Ch 39 1Mbps
2389.625	42.8	-3.4	1.5	348.0	0.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	EUT Horz, Low Ch 0 2Mbps
2486.592	42.5	-3.2	1.5	305.0	0.0	20.0	Vert	PK	0.0	59.3	74.0	-14.7	EUT Vert, High Ch 39 1Mbps
2487.725	42.5	-3.2	2.4	146.0	0.0	20.0	Horz	PK	0.0	59.3	74.0	-14.7	EUT Horz, High Ch 39 500kbps
2487.250	42.5	-3.2	1.5	3.0	0.0	20.0	Horz	PK	0.0	59.3	74.0	-14.7	EUT Horz, High Ch 39 125kbps
2483.950	42.4	-3.2	1.5	359.0	0.0	20.0	Horz	PK	0.0	59.2	74.0	-14.8	EUT Horz, High Ch 39 1Mbps
2486.583	42.3	-3.2	1.5	40.0	0.0	20.0	Vert	PK	0.0	59.1	74.0	-14.9	EUT On Side, High Ch 39 1Mbps
2386.433	42.4	-3.5	2.5	221.0	0.0	20.0	Horz	PK	0.0	58.9	74.0	-15.1	EUT Horz, Low Ch 0 1Mbps
2486.783	42.0	-3.2	1.5	239.0	0.0	20.0	Horz	PK	0.0	58.8	74.0	-15.2	EUT On Side, High Ch 39 1Mbps
2386.875	42.3	-3.5	1.5	132.0	0.0	20.0	Horz	PK	0.0	58.8	74.0	-15.2	EUT Horz, Low Ch 125kbps
2387.158	42.1	-3.5	1.5	200.0	0.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	EUT Horz, Low Ch 500kbps

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

EUT:	TSI OmniTrak Module tVOC (7591-02)	Work Order:	TSIN0196
Serial Number:	LCOPC_055	Date:	2023-03-08
Customer:	TSI, Incorporated	Temperature:	22.8°C
Attendees:	Andrew Bentley	Relative Humidity:	25.3%
Customer Project:	None	Bar. Pressure (PMSL):	1030 mb
Tested By:	Marcelo Aguayo	Job Site:	MN09
Power:	5VDC Battery	Configuration:	TSIN0196-6

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	
RSS-247 Issue 2:2017	

TEST PARAMETERS

Run #:	109	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

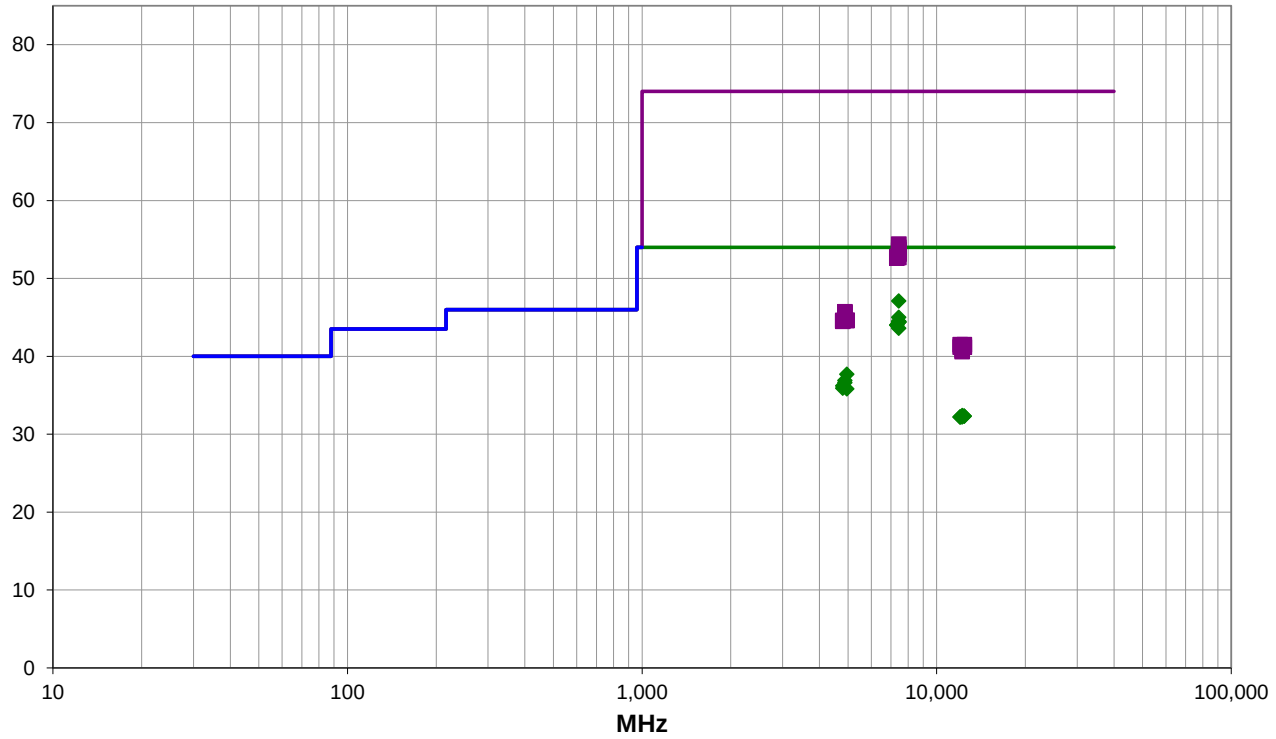
Data Rate (bps)	Duty Cycle (%)	DCCF (dB)		Data Rate (bps)	Duty Cycle (%)	DCCF (dB)
125k	83.1	0.8		500k	58	2.4
1M	65.8	1.8		2M	36.1	4.4

EUT OPERATING MODES

Transmitting BLE High Ch 39 2480 MHz, 1 Mbps Mod, PRBS9

DEVIATIONS FROM TEST STANDARD

None



Run #: 109

PK AV QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

RESULTS - Run #109

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity/ Transducer	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7439.608	28.9	13.8	2.3	317.0	4.4	0.0	Vert	AV	0.0	47.1	54.0	-6.9	EUT Horz, High Ch 39 2Mbps
7440.100	28.9	13.8	2.6	249.0	2.4	0.0	Vert	AV	0.0	45.1	54.0	-8.9	EUT Horz, High Ch 39 500kbps
7437.733	28.9	13.8	1.5	48.0	1.8	0.0	Vert	AV	0.0	44.5	54.0	-9.5	EUT Horz, High Ch 39 1Mbps
7440.433	28.8	13.8	1.5	99.0	1.8	0.0	Horz	AV	0.0	44.4	54.0	-9.6	EUT Horz, High Ch 39 1Mbps
7441.900	28.8	13.8	1.5	109.0	1.8	0.0	Horz	AV	0.0	44.4	54.0	-9.6	EUT Vert, High Ch 39 1Mbps
7439.292	28.8	13.8	1.5	128.0	1.8	0.0	Vert	AV	0.0	44.4	54.0	-9.6	EUT Vert, High Ch 39 1Mbps
7438.908	28.8	13.8	1.5	44.0	1.8	0.0	Horz	AV	0.0	44.4	54.0	-9.6	EUT On side, High Ch 39 1Mbps
7437.883	28.8	13.8	1.3	84.0	1.8	0.0	Vert	AV	0.0	44.4	54.0	-9.6	EUT On side, High Ch 39 1Mbps
7323.617	29.1	13.1	1.5	116.0	1.8	0.0	Horz	AV	0.0	44.0	54.0	-10.0	EUT Horz, Mid Ch 20 1Mbps
7327.667	29.1	13.1	1.9	73.0	1.8	0.0	Vert	AV	0.0	44.0	54.0	-10.0	EUT Horz, Mid Ch 20 1Mbps
7439.750	29.0	13.8	1.5	130.0	0.8	0.0	Vert	AV	0.0	43.6	54.0	-10.4	EUT Horz, High Ch 39 125kbps
4957.500	30.9	5.0	2.7	341.0	1.8	0.0	Horz	AV	0.0	37.7	54.0	-16.3	EUT Horz, High Ch 39 1Mbps
4883.550	30.1	5.0	1.5	287.0	1.8	0.0	Horz	AV	0.0	36.9	54.0	-17.1	EUT Horz, Mid Ch 20 1Mbps
4884.650	29.8	5.0	4.0	156.0	1.8	0.0	Vert	AV	0.0	36.6	54.0	-17.4	EUT Horz, Mid Ch 20 1Mbps
4802.517	29.3	5.1	1.5	332.0	1.8	0.0	Horz	AV	0.0	36.2	54.0	-17.8	EUT Horz, Low Ch 0 1Mbps
4803.008	29.0	5.1	1.0	354.0	1.8	0.0	Vert	AV	0.0	35.9	54.0	-18.1	EUT Horz, Low Ch 0 1Mbps
4957.958	29.0	5.0	1.5	155.0	1.8	0.0	Vert	AV	0.0	35.8	54.0	-18.2	EUT Horz, High Ch 39 1Mbps
7440.250	40.6	13.8	2.6	249.0	0.0	0.0	Vert	PK	0.0	54.4	74.0	-19.6	EUT Horz, High Ch 39 500kbps
7441.517	40.2	13.8	2.3	317.0	0.0	0.0	Vert	PK	0.0	54.0	74.0	-20.0	EUT Horz, High Ch 39 2Mbps
7438.883	39.9	13.8	1.3	84.0	0.0	0.0	Vert	PK	0.0	53.7	74.0	-20.3	EUT On side, High Ch 39 1Mbps
7442.258	39.8	13.8	1.5	48.0	0.0	0.0	Vert	PK	0.0	53.6	74.0	-20.4	EUT Horz, High Ch 39 1Mbps
7439.617	39.6	13.8	1.5	128.0	0.0	0.0	Vert	PK	0.0	53.4	74.0	-20.6	EUT Vert, High Ch 39 1Mbps
7438.808	39.4	13.8	1.5	109.0	0.0	0.0	Horz	PK	0.0	53.2	74.0	-20.8	EUT Vert, High Ch 39 1Mbps
7439.125	39.4	13.8	1.5	44.0	0.0	0.0	Horz	PK	0.0	53.2	74.0	-20.8	EUT On side, High Ch 39 1Mbps
7437.592	39.3	13.8	1.5	294.0	0.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	EUT Horz, High Ch 39 1Mbps
7323.692	39.7	13.1	1.5	116.0	0.0	0.0	Horz	PK	0.0	52.8	74.0	-21.2	EUT Horz, Mid Ch 20 1Mbps
7440.217	38.9	13.8	1.5	130.0	0.0	0.0	Vert	PK	0.0	52.7	74.0	-21.3	EUT Horz, High Ch 39 125kbps
7323.875	39.5	13.1	1.9	73.0	0.0	0.0	Vert	PK	0.0	52.6	74.0	-21.4	EUT Horz, Mid Ch 20 1Mbps
12211.630	30.1	0.5	1.5	155.0	1.8	0.0	Vert	AV	0.0	32.4	54.0	-21.6	EUT Horz, Mid Ch 20 1Mbps
12397.730	29.7	0.8	1.5	136.0	1.8	0.0	Horz	AV	0.0	32.3	54.0	-21.7	EUT Horz, High Ch 39 1Mbps
12397.560	29.7	0.8	1.5	35.0	1.8	0.0	Vert	AV	0.0	32.3	54.0	-21.7	EUT Horz, High Ch 39 1Mbps
12208.730	29.9	0.5	1.4	170.0	1.8	0.0	Horz	AV	0.0	32.2	54.0	-21.8	EUT Horz, Mid Ch 20 1Mbps
12009.850	31.1	-0.7	1.5	116.0	1.8	0.0	Horz	AV	0.0	32.2	54.0	-21.8	EUT Horz, Low Ch 0 1Mbps
12009.530	31.1	-0.7	1.5	318.0	1.8	0.0	Vert	AV	0.0	32.2	54.0	-21.8	EUT Horz, Low Ch 0 1Mbps
4883.883	40.7	5.0	4.0	156.0	0.0	0.0	Vert	PK	0.0	45.7	74.0	-28.3	EUT Horz, Mid Ch 20 1Mbps
4882.850	40.6	5.0	1.5	287.0	0.0	0.0	Horz	PK	0.0	45.6	74.0	-28.4	EUT Horz, Mid Ch 20 1Mbps
4961.408	39.6	5.0	2.7	341.0	0.0	0.0	Horz	PK	0.0	44.6	74.0	-29.4	EUT Horz, High Ch 39 1Mbps
4959.942	39.6	5.0	1.5	155.0	0.0	0.0	Vert	PK	0.0	44.6	74.0	-29.4	EUT Horz, High Ch 39 1Mbps
4802.667	39.5	5.1	1.5	332.0	0.0	0.0	Horz	PK	0.0	44.6	74.0	-29.4	EUT Horz, Low Ch 0 1Mbps
4802.017	39.4	5.1	1.0	354.0	0.0	0.0	Vert	PK	0.0	44.5	74.0	-29.5	EUT Horz, Low Ch 0 1Mbps

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity/ Transducer	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
12398.490	40.7	0.8	1.5	136.0	0.0	0.0	Horz	PK	0.0	41.5	74.0	-32.5	EUT Horz, High Ch 39 1Mbps
12011.420	42.1	-0.6	1.5	318.0	0.0	0.0	Vert	PK	0.0	41.5	74.0	-32.5	EUT Horz, Low Ch 0 1Mbps
12399.750	40.4	0.8	1.5	35.0	0.0	0.0	Vert	PK	0.0	41.2	74.0	-32.8	EUT Horz, High Ch 39 1Mbps
12009.300	41.9	-0.7	1.5	116.0	0.0	0.0	Horz	PK	0.0	41.2	74.0	-32.8	EUT Horz, Low Ch 0 1Mbps
12210.420	40.3	0.5	1.4	170.0	0.0	0.0	Horz	PK	0.0	40.8	74.0	-33.2	EUT Horz, Mid Ch 20 1Mbps
12208.130	40.1	0.5	1.5	155.0	0.0	0.0	Vert	PK	0.0	40.6	74.0	-33.4	EUT Horz, Mid Ch 20 1Mbps

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

EUT:	TSI OmniTrak Module PM/tVOC (7591-04)	Work Order:	TSIN0196
Serial Number:	LCOPC_056	Date:	2023-03-09
Customer:	TSI, Incorporated	Temperature:	22.8°C
Attendees:	Andrew Bentley	Relative Humidity:	25.6%
Customer Project:	None	Bar. Pressure (PMSL):	1027 mb
Tested By:	Marcelo Aguayo	Job Site:	MN09
Power:	5VDC Battery	Configuration:	TSIN0196-5

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	
RSS-247 Issue 2:2017	

TEST PARAMETERS

Run #:	135	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

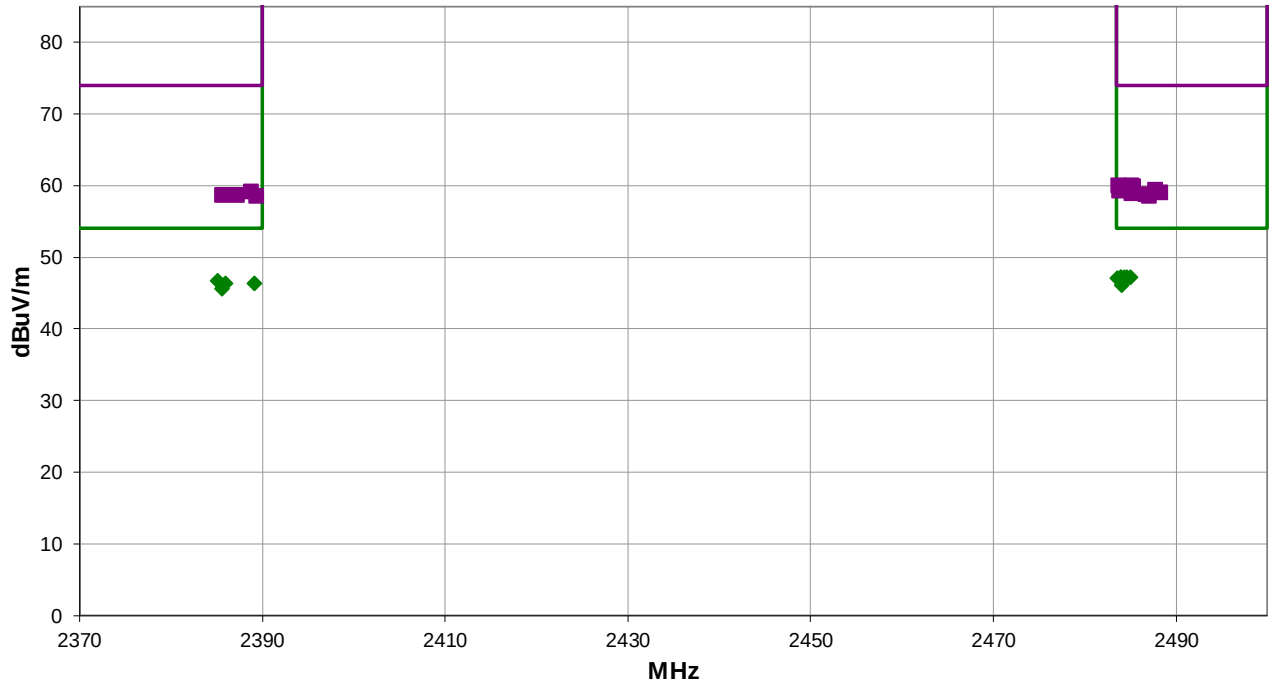
Data Rate (bps)	Duty Cycle (%)	DCCF (dB)		Data Rate (bps)	Duty Cycle (%)	DCCF (dB)
125k	83.1	0.8		500k	58	2.4
1M	65.8	1.8		2M	36.1	4.4

EUT OPERATING MODES

Transmitting BLE Low and High Channels (2402 and 2480 MHz) 1 Mbps, 2 Mbps, 500 kbps, 125 kbps Modulated. PRBS9

DEVIATIONS FROM TEST STANDARD

None



Run #: 135 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

RESULTS - Run #135

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
2484.675	31.5	-3.2	1.5	175.0	1.8	20.0	Horz	AV	0.0	50.1	54.0	-3.9	EUT Horz, High Ch, 1Mbps
2484.025	31.5	-3.2	1.5	188.0	1.8	20.0	Horz	AV	0.0	50.1	54.0	-3.9	EUT Vert, High Ch, 1Mbps
2483.950	31.4	-3.2	1.5	18.0	1.8	20.0	Vert	AV	0.0	50.0	54.0	-4.0	EUT Horz, High Ch, 1Mbps
2485.025	31.4	-3.2	1.5	116.0	1.8	20.0	Vert	AV	0.0	50.0	54.0	-4.0	EUT Vert, High Ch, 1Mbps
2484.342	31.4	-3.2	1.5	253.0	1.8	20.0	Horz	AV	0.0	50.0	54.0	-4.0	EUT On Side, High Ch, 1Mbps
2483.608	31.3	-3.2	1.5	116.0	1.8	20.0	Vert	AV	0.0	49.9	54.0	-4.1	EUT On Side, High Ch, 1Mbps
2484.042	31.3	-3.2	1.5	111.0	4.4	20.0	Horz	AV	0.0	52.5	54.0	-1.5	EUT Horz, High Ch, 2Mbps
2483.983	31.3	-3.2	1.5	38.0	2.4	20.0	Horz	AV	0.0	50.5	54.0	-3.5	EUT Horz, High Ch, 500kbps
2484.058	31.3	-3.2	1.5	22.0	0.8	20.0	Horz	AV	0.0	48.9	54.0	-5.1	EUT Horz, High Ch, 125kbps
2385.100	31.3	-3.5	3.5	84.0	1.8	20.0	Horz	AV	0.0	49.6	54.0	-4.4	EUT Horz, Low Ch, 1Mbps
2389.167	31.1	-3.4	1.5	286.0	2.4	20.0	Horz	AV	0.0	50.1	54.0	-3.9	EUT Horz, Low Ch, 500kbps
2386.000	31.1	-3.5	1.5	105.0	4.4	20.0	Horz	AV	0.0	52.0	54.0	-2.0	EUT Horz, Low Ch, 2Mbps
2385.642	31.1	-3.5	3.2	341.0	0.8	20.0	Horz	AV	0.0	45.6	54.0	-8.4	EUT Horz, Low Ch, 125kbps
2483.667	43.2	-3.2	1.5	175.0	0.0	20.0	Horz	PK	0.0	60.0	74.0	-14.0	EUT Horz, High Ch, 1Mbps
2485.158	43.2	-3.2	1.5	116.0	0.0	20.0	Vert	PK	0.0	60.0	74.0	-14.0	EUT Vert, High Ch, 1Mbps
2485.342	43.1	-3.2	1.5	188.0	0.0	20.0	Horz	PK	0.0	59.9	74.0	-14.1	EUT Vert, High Ch, 1Mbps
2487.767	42.6	-3.2	1.5	253.0	0.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	EUT On Side, High Ch, 1Mbps
2483.833	42.4	-3.2	1.5	116.0	0.0	20.0	Vert	PK	0.0	59.2	74.0	-14.8	EUT On Side, High Ch, 1Mbps
2388.808	42.5	-3.4	3.5	84.0	0.0	20.0	Horz	PK	0.0	59.1	74.0	-14.9	EUT Horz, Low Ch, 1Mbps
2488.292	42.3	-3.3	1.5	18.0	0.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	EUT Horz, High Ch, 1Mbps
2485.183	42.1	-3.2	1.5	38.0	0.0	20.0	Horz	PK	0.0	58.9	74.0	-15.1	EUT Horz, High Ch, 500kbps
2486.683	42.0	-3.2	1.5	22.0	0.0	20.0	Horz	PK	0.0	58.8	74.0	-15.2	EUT Horz, High Ch, 125kbps
2387.267	42.2	-3.5	1.5	286.0	0.0	20.0	Horz	PK	0.0	58.7	74.0	-15.3	EUT Horz, Low Ch, 500kbps
2385.608	42.1	-3.5	1.5	105.0	0.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	EUT Horz, Low Ch, 2Mbps
2487.108	41.7	-3.2	1.5	111.0	0.0	20.0	Horz	PK	0.0	58.5	74.0	-15.5	EUT Horz, High Ch, 2Mbps
2389.350	41.9	-3.4	3.2	341.0	0.0	20.0	Horz	PK	0.0	58.5	74.0	-15.5	EUT Horz, Low Ch, 125kbps

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

EUT:	TSI OmniTrak Module PM/tVOC (7591-04)	Work Order:	TSIN0196
Serial Number:	LCOPC_056	Date:	2023-03-09
Customer:	TSI, Incorporated	Temperature:	22.8°C
Attendees:	Andrew Bentley	Relative Humidity:	25.6%
Customer Project:	None	Bar. Pressure (PMSL):	1027 mb
Tested By:	Marcelo Aguayo	Job Site:	MN09
Power:	5VDC Battery	Configuration:	TSIN0196-5

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	
RSS-247 Issue 2:2017	

TEST PARAMETERS

Run #:	131	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

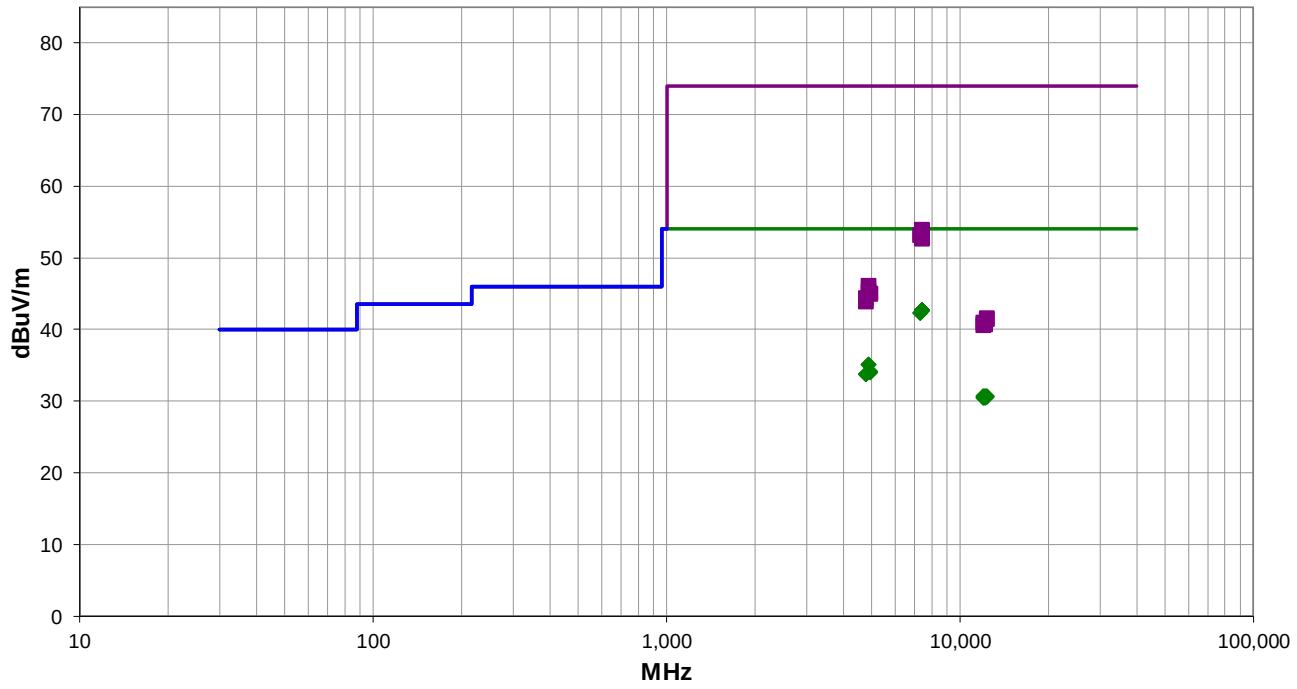
Data Rate (bps)	Duty Cycle (%)	DCCF (dB)		Data Rate (bps)	Duty Cycle (%)	DCCF (dB)
125k	83.1	0.8		500k	58	2.4
1M	65.8	1.8		2M	36.1	4.4

EUT OPERATING MODES

Transmitting BLE Low, Mid and High Channels (2402, 2442, 2480 MHz) 1 Mbps, 2 Mbps, 500 kbps, 125 kbps Modulated. PRBS9

DEVIATIONS FROM TEST STANDARD

None



Run #: 131 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

RESULTS - Run #131

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7441.958	28.8	13.8	1.5	300.0	1.8	0.0	Horz	AV	0.0	44.4	54.0	-9.6	EUT Horz, High Ch, 1Mbps
7439.717	28.8	13.8	1.5	349.0	1.8	0.0	Vert	AV	0.0	44.4	54.0	-9.6	EUT Horz, High Ch, 1Mbps
7439.000	28.8	13.8	1.5	2.0	1.8	0.0	Horz	AV	0.0	44.4	54.0	-9.6	EUT Vert, High Ch, 1Mbps
7440.500	28.8	13.8	1.1	273.0	1.8	0.0	Vert	AV	0.0	44.4	54.0	-9.6	EUT Vert, High Ch, 1Mbps
7437.833	28.8	13.8	1.9	359.0	1.8	0.0	Horz	AV	0.0	44.4	54.0	-9.6	EUT On Side, High Ch, 1Mbps
7440.308	28.8	13.8	1.5	319.0	1.8	0.0	Vert	AV	0.0	44.4	54.0	-9.6	EUT On Side, High Ch, 1Mbps
7438.308	28.8	13.8	1.5	354.0	4.4	0.0	Horz	AV	0.0	44.4	54.0	-9.6	EUT Horz, High Ch, 2Mbps
7438.217	28.8	13.8	1.5	334.0	2.4	0.0	Horz	AV	0.0	44.4	54.0	-9.6	EUT Horz, High Ch, 500kbps
7326.617	29.2	13.1	1.4	0.0	1.8	0.0	Horz	AV	0.0	44.1	54.0	-9.9	EUT Horz, Mid Ch, 1Mbps
7328.158	29.2	13.1	2.5	149.0	1.8	0.0	Vert	AV	0.0	44.1	54.0	-9.9	EUT Horz, Mid Ch, 1Mbps
7437.950	28.8	13.8	1.5	56.0	0.8	0.0	Horz	AV	0.0	43.4	54.0	-10.6	EUT Horz, High Ch, 125kbps
4886.000	30.1	5.0	1.5	180.0	1.8	0.0	Horz	AV	0.0	36.9	54.0	-17.1	EUT Horz, Mid Ch, 1Mbps
4884.842	30.0	5.0	1.5	318.0	1.8	0.0	Vert	AV	0.0	36.8	54.0	-17.2	EUT Horz, Mid Ch, 1Mbps
4959.742	29.1	5.0	1.5	157.0	1.8	0.0	Vert	AV	0.0	35.9	54.0	-18.1	EUT Horz, High Ch, 1Mbps
4958.250	29.0	5.0	1.5	211.0	1.8	0.0	Horz	AV	0.0	35.8	54.0	-18.2	EUT Horz, High Ch, 1Mbps
4802.383	28.6	5.1	1.5	354.0	1.8	0.0	Horz	AV	0.0	35.5	54.0	-18.5	EUT Horz, Low Ch, 1Mbps
4801.883	28.6	5.1	1.5	71.0	1.8	0.0	Vert	AV	0.0	35.5	54.0	-18.5	EUT Horz, Low Ch, 1Mbps
7437.833	40.1	13.8	1.5	2.0	0.0	0.0	Horz	PK	0.0	53.9	74.0	-20.1	EUT Vert, High Ch, 1Mbps
7442.367	39.9	13.8	1.5	56.0	0.0	0.0	Horz	PK	0.0	53.7	74.0	-20.3	EUT Horz, High Ch, 125kbps
7437.733	39.8	13.8	1.5	300.0	0.0	0.0	Horz	PK	0.0	53.6	74.0	-20.4	EUT Horz, High Ch, 1Mbps
7438.183	39.7	13.8	1.5	349.0	0.0	0.0	Vert	PK	0.0	53.5	74.0	-20.5	EUT Horz, High Ch, 1Mbps
7441.825	39.6	13.8	1.5	319.0	0.0	0.0	Vert	PK	0.0	53.4	74.0	-20.6	EUT On Side, High Ch, 1Mbps
7437.558	39.5	13.8	1.5	354.0	0.0	0.0	Horz	PK	0.0	53.3	74.0	-20.7	EUT Horz, High Ch, 2Mbps
7325.592	40.0	13.1	1.4	0.0	0.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	EUT Horz, Mid Ch, 1Mbps
7326.650	40.0	13.1	2.5	149.0	0.0	0.0	Vert	PK	0.0	53.1	74.0	-20.9	EUT Horz, Mid Ch, 1Mbps
7442.000	39.2	13.8	1.1	273.0	0.0	0.0	Vert	PK	0.0	53.0	74.0	-21.0	EUT Vert, High Ch, 1Mbps
7439.150	38.9	13.8	1.9	359.0	0.0	0.0	Horz	PK	0.0	52.7	74.0	-21.3	EUT On Side, High Ch, 1Mbps
7441.842	38.8	13.8	1.5	334.0	0.0	0.0	Horz	PK	0.0	52.6	74.0	-21.4	EUT Horz, High Ch, 500kbps
12010.180	31.3	-0.6	1.5	99.0	-1.1	0.0	Vert	AV	0.0	30.7	54.0	-23.3	EUT Horz, Low Ch, 1Mbps
12397.970	29.8	0.8	1.5	41.0	-1.1	0.0	Horz	AV	0.0	30.6	54.0	-23.4	EUT Horz, High Ch, 1Mbps
12208.290	30.1	0.5	1.5	24.0	-1.1	0.0	Horz	AV	0.0	30.6	54.0	-23.4	EUT Horz, Mid Ch, 1Mbps
12397.710	29.7	0.8	1.6	4.0	-1.1	0.0	Vert	AV	0.0	30.5	54.0	-23.5	EUT Horz, High Ch, 1Mbps
12208.130	29.9	0.5	1.3	261.0	-1.1	0.0	Vert	AV	0.0	30.4	54.0	-23.6	EUT Horz, Mid Ch, 1Mbps
12011.850	31.0	-0.6	3.8	269.0	-1.1	0.0	Horz	AV	0.0	30.4	54.0	-23.6	EUT Horz, Low Ch, 1Mbps
4884.225	41.0	5.0	1.5	180.0	0.0	0.0	Horz	PK	0.0	46.0	74.0	-28.0	EUT Horz, Mid Ch, 1Mbps
4884.983	40.3	5.0	1.5	318.0	0.0	0.0	Vert	PK	0.0	45.3	74.0	-28.7	EUT Horz, Mid Ch, 1Mbps
4962.233	40.0	5.0	1.5	211.0	0.0	0.0	Horz	PK	0.0	45.0	74.0	-29.0	EUT Horz, High Ch, 1Mbps
4958.325	40.0	5.0	1.5	157.0	0.0	0.0	Vert	PK	0.0	45.0	74.0	-29.0	EUT Horz, High Ch, 1Mbps

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4804.442	39.2	5.1	1.5	71.0	0.0	0.0	Vert	PK	0.0	44.3	74.0	-29.7	EUT Horz, Low Ch, 1Mbps
4802.225	38.7	5.1	1.5	354.0	0.0	0.0	Horz	PK	0.0	43.8	74.0	-30.2	EUT Horz, Low Ch, 1Mbps
12398.930	40.7	0.8	1.5	41.0	0.0	0.0	Horz	PK	0.0	41.5	74.0	-32.5	EUT Horz, High Ch, 1Mbps
12399.650	40.6	0.8	1.6	4.0	0.0	0.0	Vert	PK	0.0	41.4	74.0	-32.6	EUT Horz, High Ch, 1Mbps
12010.570	41.5	-0.6	1.5	99.0	0.0	0.0	Vert	PK	0.0	40.9	74.0	-33.1	EUT Horz, Low Ch, 1Mbps
12210.080	40.3	0.5	1.3	261.0	0.0	0.0	Vert	PK	0.0	40.8	74.0	-33.2	EUT Horz, Mid Ch, 1Mbps
12208.410	40.2	0.5	1.5	24.0	0.0	0.0	Horz	PK	0.0	40.7	74.0	-33.3	EUT Horz, Mid Ch, 1Mbps
12007.590	41.2	-0.7	3.8	269.0	0.0	0.0	Horz	PK	0.0	40.5	74.0	-33.5	EUT Horz, Low Ch, 1Mbps

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

EUT:	TSI OmniTrak Module PM (7591-01)	Work Order:	TSIN0196
Serial Number:	LCOPC_060	Date:	2023-03-08
Customer:	TSI, Incorporated	Temperature:	22.6°C
Attendees:	Andrew Bentley	Relative Humidity:	24.2%
Customer Project:	None	Bar. Pressure (PMSL):	1030 mb
Tested By:	Marcelo Aguayo	Job Site:	MN09
Power:	5VDC Battery	Configuration:	TSIN0196-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	
RSS-247 Issue 2:2017	

TEST PARAMETERS

Run #:	90	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

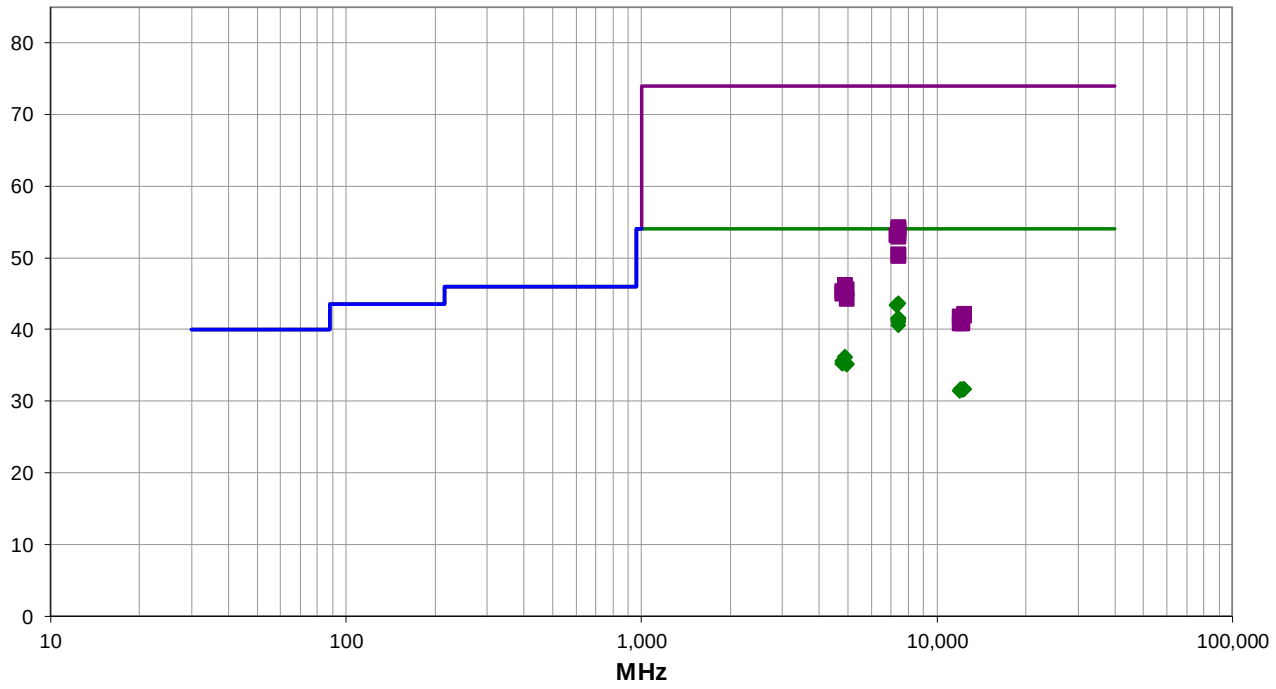
Data Rate (bps)	Duty Cycle (%)	DCCF (dB)		Data Rate (bps)	Duty Cycle (%)	DCCF (dB)
125k	83.1	0.8		500k	58	2.4
1M	65.8	1.8		2M	36.1	4.4

EUT OPERATING MODES

Transmitting BLE Low, Mid and High Channels (2402, 2442, 2480 MHz) 1 Mbps, 2 Mbps, 500 kbps, 125 kbps Modulated. PRBS9

DEVIATIONS FROM TEST STANDARD

None



Run #: 90 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

RESULTS - Run #90

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
7438.425	28.9	13.8	1.5	75.0	4.4	0.0	Horz	AV	0.0	47.1	54.0	-6.9	EUT Vert, Ch 39 2Mbps
7439.233	28.9	13.8	1.5	259.0	2.4	0.0	Horz	AV	0.0	45.1	54.0	-8.9	EUT Vert, Ch 39 500kbps
7440.067	28.8	13.8	1.5	215.0	1.8	0.0	Horz	AV	0.0	44.4	54.0	-9.6	EUT Vert, Ch 39 1Mbps
7439.650	28.8	13.8	1.5	349.0	1.8	0.0	Vert	AV	0.0	44.4	54.0	-9.6	EUT Vert, Ch 39 1Mbps
7438.017	28.8	13.8	1.5	106.0	1.8	0.0	Vert	AV	0.0	44.4	54.0	-9.6	EUT On Side, Ch 39 1Mbps
7440.200	28.8	13.8	3.6	102.0	0.8	0.0	Horz	AV	0.0	43.4	54.0	-10.6	EUT Vert, Ch 39 125kbps
7438.358	28.7	13.8	1.1	258.0	1.8	0.0	Horz	AV	0.0	44.3	54.0	-9.7	EUT On Side, Ch 39 1Mbps
7327.467	29.1	13.1	1.5	254.0	1.8	0.0	Horz	AV	0.0	44.0	54.0	-10.0	EUT Vert, Ch 20 1Mbps
7328.133	29.1	13.1	1.4	84.0	1.8	0.0	Vert	AV	0.0	44.0	54.0	-10.0	EUT Vert, Ch 20 1Mbps
7437.542	26.1	13.8	1.5	220.0	1.8	0.0	Horz	AV	0.0	41.7	54.0	-12.3	EUT Horz, Ch 39 1Mbps
7440.317	26.1	13.8	1.5	16.0	1.8	0.0	Vert	AV	0.0	41.7	54.0	-12.3	EUT Horz, Ch 39 1Mbps
4883.717	30.1	5.0	1.5	45.0	1.8	0.0	Horz	AV	0.0	36.9	54.0	-17.1	EUT Vert, Ch 20 1Mbps
4884.708	29.9	5.0	3.6	356.0	1.8	0.0	Vert	AV	0.0	36.7	54.0	-17.3	EUT Vert, Ch 20 1Mbps
4804.992	29.3	5.1	1.5	6.0	1.8	0.0	Horz	AV	0.0	36.2	54.0	-17.8	EUT Vert, Ch 0 1Mbps
4961.950	29.1	5.0	1.5	323.0	1.8	0.0	Horz	AV	0.0	35.9	54.0	-18.1	EUT Vert, Ch 39 1Mbps
4804.258	29.0	5.1	1.5	26.0	1.8	0.0	Vert	AV	0.0	35.9	54.0	-18.1	EUT Vert, Ch 0 1Mbps
4961.933	29.0	5.0	2.6	228.0	1.8	0.0	Vert	AV	0.0	35.8	54.0	-18.2	EUT Vert, Ch 39 1Mbps
7438.025	40.4	13.8	1.5	215.0	0.0	0.0	Horz	PK	0.0	54.2	74.0	-19.8	EUT Vert, Ch 39 1Mbps
7442.008	40.2	13.8	1.1	258.0	0.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	EUT On Side, Ch 39 1Mbps
7442.150	40.2	13.8	1.5	259.0	0.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	EUT Vert, Ch 39 500kbps
7440.083	39.9	13.8	3.6	102.0	0.0	0.0	Horz	PK	0.0	53.7	74.0	-20.3	EUT Vert, Ch 39 125kbps
7440.892	39.6	13.8	1.5	75.0	0.0	0.0	Horz	PK	0.0	53.4	74.0	-20.6	EUT Vert, Ch 39 2Mbps
7439.100	39.5	13.8	1.5	106.0	0.0	0.0	Vert	PK	0.0	53.3	74.0	-20.7	EUT On Side, Ch 39 1Mbps
7324.892	40.0	13.1	1.5	254.0	0.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	EUT Vert, Ch 20 1Mbps
7325.967	40.0	13.1	1.4	84.0	0.0	0.0	Vert	PK	0.0	53.1	74.0	-20.9	EUT Vert, Ch 20 1Mbps
7438.342	39.1	13.8	1.5	349.0	0.0	0.0	Vert	PK	0.0	52.9	74.0	-21.1	EUT Vert, Ch 39 1Mbps
12398.140	29.7	0.8	1.5	248.0	-1.1	0.0	Horz	AV	0.0	31.6	54.0	-22.4	EUT Vert, Ch 39 1Mbps
12397.710	29.7	0.8	1.5	71.0	-1.1	0.0	Vert	AV	0.0	31.6	54.0	-22.4	EUT Vert, Ch 39 1Mbps
12010.580	31.1	-0.6	1.2	115.0	-1.1	0.0	Horz	AV	0.0	31.6	54.0	-22.4	EUT Vert, Ch 0 1Mbps
12209.570	30.0	0.5	1.5	277.0	-1.1	0.0	Horz	AV	0.0	31.6	54.0	-22.4	EUT Vert, Ch 20 1Mbps
12212.270	29.9	0.5	2.1	291.0	-1.1	0.0	Vert	AV	0.0	31.5	54.0	-22.5	EUT Vert, Ch 20 1Mbps
12008.240	31.0	-0.7	1.5	254.0	-1.1	0.0	Vert	AV	0.0	31.4	54.0	-22.6	EUT Vert, Ch 0 1Mbps
7437.767	36.6	13.8	1.5	220.0	0.0	0.0	Horz	PK	0.0	50.4	74.0	-23.6	EUT Horz, Ch 39 1Mbps
7441.633	36.4	13.8	1.5	16.0	0.0	0.0	Vert	PK	0.0	50.2	74.0	-23.8	EUT Horz, Ch 39 1Mbps
4885.242	41.2	5.0	3.6	356.0	0.0	0.0	Vert	PK	0.0	46.2	74.0	-27.8	EUT Vert, Ch 20 1Mbps
4882.575	41.0	5.0	1.5	45.0	0.0	0.0	Horz	PK	0.0	46.0	74.0	-28.0	EUT Vert, Ch 20 1Mbps
4961.183	40.5	5.0	2.6	228.0	0.0	0.0	Vert	PK	0.0	45.5	74.0	-28.5	EUT Vert, Ch 39 1Mbps
4805.558	40.2	5.1	1.5	26.0	0.0	0.0	Vert	PK	0.0	45.3	74.0	-28.7	EUT Vert, Ch 0 1Mbps

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

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
4803.967	39.9	5.1	1.5	6.0	0.0	0.0	Horz	PK	0.0	45.0	74.0	-29.0	EUT Vert, Ch 0 1Mbps
4957.775	39.2	5.0	1.5	323.0	0.0	0.0	Horz	PK	0.0	44.2	74.0	-29.8	EUT Vert, Ch 39 1Mbps
12399.270	41.3	0.8	1.5	71.0	0.0	0.0	Vert	PK	0.0	42.1	74.0	-31.9	EUT Vert, Ch 39 1Mbps
12398.000	41.1	0.8	1.5	248.0	0.0	0.0	Horz	PK	0.0	41.9	74.0	-32.1	EUT Vert, Ch 39 1Mbps
12008.660	42.5	-0.7	1.2	115.0	0.0	0.0	Horz	PK	0.0	41.8	74.0	-32.2	EUT Vert, Ch 0 1Mbps
12208.970	40.5	0.5	2.1	291.0	0.0	0.0	Vert	PK	0.0	41.0	74.0	-33.0	EUT Vert, Ch 20 1Mbps
12008.180	41.5	-0.7	1.5	254.0	0.0	0.0	Vert	PK	0.0	40.8	74.0	-33.2	EUT Vert, Ch 0 1Mbps
12211.830	40.3	0.5	1.5	277.0	0.0	0.0	Horz	PK	0.0	40.8	74.0	-33.2	EUT Vert, Ch 20 1Mbps

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

EUT:	TSI OmniTrak Module PM (7591-01)	Work Order:	TSIN0196
Serial Number:	LCOPC_060	Date:	2023-03-08
Customer:	TSI, Incorporated	Temperature:	22.6°C
Attendees:	Andrew Bentley	Relative Humidity:	24.2%
Customer Project:	None	Bar. Pressure (PMSL):	1030 mb
Tested By:	Marcelo Aguayo	Job Site:	MN09
Power:	5VDC Battery	Configuration:	TSIN0196-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	
RSS-247 Issue 2:2017	

TEST PARAMETERS

Run #:	96	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

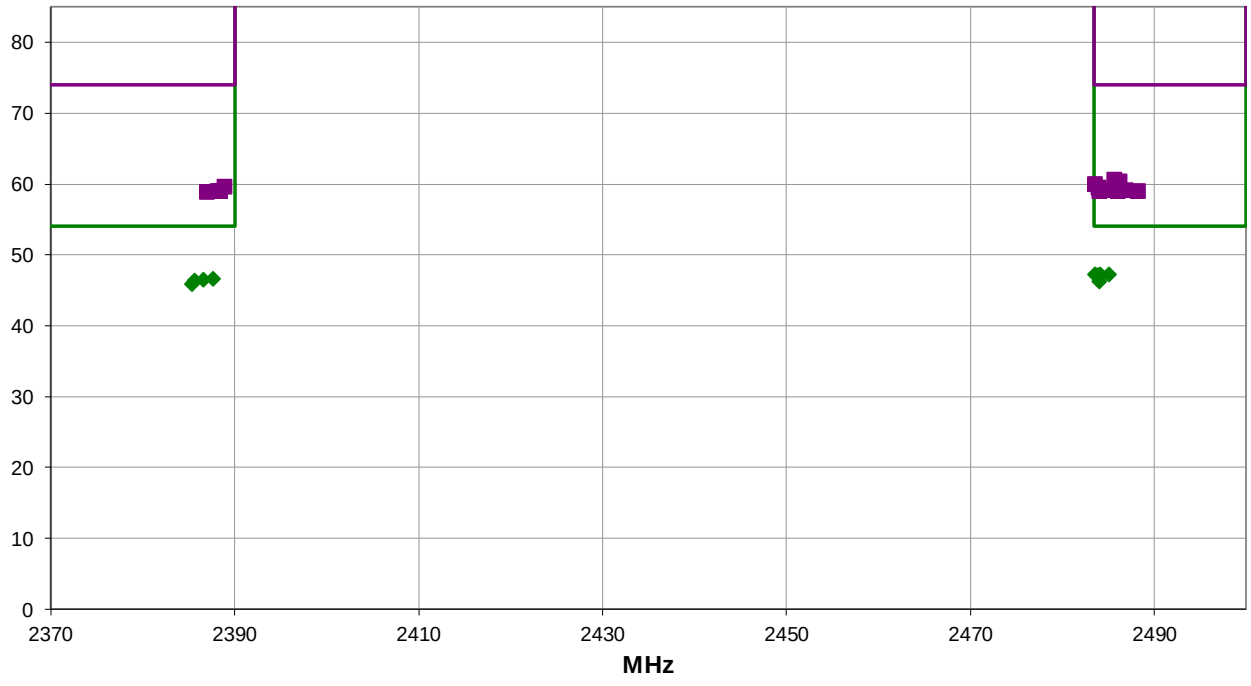
Data Rate (bps)	Duty Cycle (%)	DCCF (dB)		Data Rate (bps)	Duty Cycle (%)	DCCF (dB)
125k	83.1	0.8		500k	58	2.4
1M	65.8	1.8		2M	36.1	4.4

EUT OPERATING MODES

Transmitting BLE Low and High Channels (2402 and 2480 MHz) 1 Mbps, 2 Mbps, 500 kbps, 125 kbps Modulated. PRBS9

DEVIATIONS FROM TEST STANDARD

None



Run #: 96 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

RESULTS - Run #96

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
2485.167	31.5	-3.2	1.5	163.0	1.8	20.0	Horz	AV	0.0	50.1	54.0	-3.9	EUT Horz, Ch 39 1 Mbps
2484.183	31.5	-3.2	1.5	70.0	1.8	20.0	Horz	AV	0.0	50.1	54.0	-3.9	EUT Vert, Ch 39 1 Mbps
2483.642	31.5	-3.2	1.5	38.0	1.8	20.0	Horz	AV	0.0	50.1	54.0	-3.9	EUT On Side, Ch 39 1 Mbps
2483.900	31.5	-3.2	1.5	265.0	2.4	20.0	Horz	AV	0.0	50.7	54.0	-3.3	EUT Horz, Ch 39 500 kbps
2483.775	31.4	-3.2	1.5	306.0	1.8	20.0	Vert	AV	0.0	50.0	54.0	-4.0	EUT Horz, Ch 39 1 Mbps
2483.967	31.4	-3.2	1.5	63.0	1.8	20.0	Vert	AV	0.0	50.0	54.0	-4.0	EUT On Side, Ch 39 1 Mbps
2484.033	31.4	-3.2	1.5	29.0	0.8	20.0	Horz	AV	0.0	49.0	54.0	-5.0	EUT Horz, Ch 39 125 kbps
2483.967	31.3	-3.2	1.8	116.0	1.8	20.0	Vert	AV	0.0	49.9	54.0	-4.1	EUT Vert, Ch 39 1 Mbps
2484.150	31.3	-3.2	2.4	6.0	1.8	20.0	Horz	AV	0.0	49.9	54.0	-4.1	EUT Horz, Ch 39 2 Mbps
2386.633	31.3	-3.5	1.2	115.0	2.4	20.0	Horz	AV	0.0	50.2	54.0	-3.8	EUT Horz, Ch 0 500 kbps
2385.383	31.3	-3.5	1.5	103.0	0.8	20.0	Horz	AV	0.0	48.6	54.0	-5.4	EUT Horz, Ch 0 125 kbps
2387.642	31.1	-3.4	1.5	55.0	1.8	20.0	Horz	AV	0.0	49.5	54.0	-4.5	EUT Horz, Ch 0 1 Mbps
2385.692	31.1	-3.5	1.5	233.0	4.4	20.0	Horz	AV	0.0	52.0	54.0	-2.0	EUT Horz, Ch 0 2 Mbps
2485.708	43.8	-3.2	1.5	163.0	0.0	20.0	Horz	PK	0.0	60.6	74.0	-13.4	EUT Horz, Ch 39 1 Mbps
2486.317	43.5	-3.2	1.5	265.0	0.0	20.0	Horz	PK	0.0	60.3	74.0	-13.7	EUT Horz, Ch 39 500 kbps
2483.600	43.1	-3.2	1.5	70.0	0.0	20.0	Horz	PK	0.0	59.9	74.0	-14.1	EUT Vert, Ch 39 1 Mbps
2388.933	43.0	-3.4	1.5	103.0	0.0	20.0	Horz	PK	0.0	59.6	74.0	-14.4	EUT Horz, Ch 0 125 kbps
2484.008	42.6	-3.2	1.5	29.0	0.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	EUT Horz, Ch 39 125 kbps
2485.508	42.3	-3.2	1.8	116.0	0.0	20.0	Vert	PK	0.0	59.1	74.0	-14.9	EUT Vert, Ch 39 1 Mbps
2486.925	42.3	-3.2	1.5	38.0	0.0	20.0	Horz	PK	0.0	59.1	74.0	-14.9	EUT On Side, Ch 39 1 Mbps
2484.083	42.2	-3.2	1.5	306.0	0.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	EUT Horz, Ch 39 1 Mbps
2486.075	42.2	-3.2	1.5	63.0	0.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	EUT On Side, Ch 39 1 Mbps
2488.242	42.3	-3.3	2.4	6.0	0.0	20.0	Horz	PK	0.0	59.0	74.0	-15.0	EUT Horz, Ch 39 2 Mbps
2388.133	42.4	-3.4	1.5	55.0	0.0	20.0	Horz	PK	0.0	59.0	74.0	-15.0	EUT Horz, Ch 0 1 Mbps
2388.442	42.3	-3.4	1.5	233.0	0.0	20.0	Horz	PK	0.0	58.9	74.0	-15.1	EUT Horz, Ch 0 2 Mbps
2387.033	42.3	-3.5	1.2	115.0	0.0	20.0	Horz	PK	0.0	58.8	74.0	-15.2	EUT Horz, Ch 0 500 kbps

CONCLUSION

Pass

Tested By

End of Test Report