GENTEX CORPORATION

Technical Report to the FCC and ISED Regarding Gentex Corporation

Model: eSight-01
FCC ID: NZLESIGHT01
ISED: 4112A-ESIGHT01

Emission Designator: 2M11L1D
9/11/2024

A report concerning approval for Gentex Corporation Homelink® model eSight-01
Please issue grant immediately upon review.

Measurements Made and Report Prepared by:

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Measurements Reviewed by:

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Brian Miller
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Gentex Corporation

Report Approved by:

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Jason Vargo
Laboratory Manager I
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Test Report Revision

REV Number	Date	Author	Description
1.0	6/19/2024	Patricia Szeszulski	Initial Release
2.0	8/15/2024	Patricia Szeszulski	Updated per reviewer comments
3.0	8/22/2024	Patricia Szeszulski	Updated table on page 45 updated RSS-247 to issue 3.

Results relate only to the items tested as received.

Compliance has been evaluated based on the Lab Manual section 7.6.2. The decision rule used regarding measurement uncertainty was to determine results solely on whether the measured values met the defined acceptance criteria without factoring in measurement uncertainty values.

1. General Information

1.1. Product Description

The product is a handheld wireless Bluetooth remote control operating in the 2402 to 2480 MHz band using an integral antenna. The remote is used to issue and receive commands and is powered via two AAA batteries.

The antenna system is an integral part of the unit. It cannot be altered nor replaced by the user.

1.2. Related Grants

This device will have functionality that is covered under 47 CFR 15 B. The device will have an FCC ID # of NZLESIGHT01 and an ISED ID # of 4112A-ESIGHT01 under both rule parts. Separate reports were submitted for functionality covered under 47 CFR 15 B requirements.

1.3. Test Methodology

Radiated Emissions testing was performed according to ANSI C63.10:2013. The power source for this product is two AAA batteries.

Conducted measurements were performed using the same power source.

Measurements were performed per FCC OET KDB 558074.

1.4. Test Facility

The 3-meter semi-anechoic chamber where these measurements were taken, is located on the grounds of Gentex Corporation's Corporate Labs, in the city of Zeeland, county of Ottawa, state of Michigan, United States of America.

For radiated measurements above 1 GHz, RF absorbing material is placed between the antenna and EUT in accordance with ANSI C63.4:2014 Section 5.5 and chamber manufacturer's instructions.

The 3m chamber has been added to our A2LA scope of accreditation on 05/20/2016 and includes accreditation to ANSI C63.4:2014 and ANSI C63.10:2013. The report filed with ISED, dated February 11, 2015, was accepted via a letter dated February 11, 2015. Our 3m chamber is registered with the ISED under Site# 4112A-2 and FCC under registration number 357351.

Corporate Mailing/Shipping Address	Site Address
Gentex Corporation	Gentex Corporation
600 N. Centennial Street	380 Riley Street
Zeeland, MI 49464	Zeeland, MI 49423

1.5. Accreditation

The Gentex Corporate EMC Lab is accredited to ISO/IEC 17025 by the American Association for Laboratory Accreditation (A2LA). Our laboratory scope and accreditation certificate #2529.01 are available from their web site www.a2la.org. Our scope of accreditation covers ANSI C63.4:2014, ANSI C63.10:2013, and Radiated Emissions at 3m, FCC 47 CFR Part 15, ISED RSS-210, and ISED RSS-247 Issue 3.

2. Product Labeling

2.1. Identifiers

The FCC Identifier assigned is FCC ID: NZLESIGHT01. The ISED certification number is 4112A-ESIGHT01. These identifiers will be labeled on the product housing.

The label will be placed within the battery compartment on the non-removable portion of the device.

Because of the small size of the device, the following statements will appear in the user's manual. Refer to attachment "Users Manual.pdf" for the entire text of the user's manual.

> "This device complies with FCC rules Part 15 and with ISED RSS-247 Issue 3. Operation is subject to the following two conditions:
> (1) This device may not cause harmful interference,
> (2) This device must accept any interference that may be received including interference that may cause undesired operation.
>
> WARNING: The transmitter has been tested and complies with FCC and ISED rules. Changes or modifications not expressly approved by the party responsible for the compliance could void the user's authority to operate the device."

The term "ISED:" before the certification/registration number only signifies that ISED technical specifications were met.

ISED: 4112A-ESIGHT01 FCC ID: NZLESIGHT01 MODEL: eSight-01

2.2. Label Drawing and Location on Product

The label drawing and location of the label on the assembly is included in the "Label Location.pdf" attachment.

3. Test Configuration

Radiated Emission measurements presented in the report were made in accordance with ANSI C63.10:2013. The EUT was placed on a 1 x 1.5m non-metallic table elevated 80cm above a conducting ground plane for measurements below 1GHz and elevated to 1.5m for measurements above 1GHz.

For radiated measurements above 1 GHz, RF absorbing material is placed between the antenna and EUT in accordance with ANSI C63.4:2014 Section 5.5 and chamber manufacturer's instructions.

For conducted measurements, a non-metallic table approximately 80cm x 90cm, 85cm above the floor was used.

4. Powerline Conducted Emissions Measurements

Powerline Conducted Measurements are not required for this product as the part is powered via two AAA batteries.

Emissions Data

4.1. Date(s) Tested: 8/12/2024-8/14/2024

4.2. Test Method Deviations: None

4.3. Temperature and Humidity conditions

	Measured Value	Unit
Temperature	22.1-23	ºC
Humidity	43.8-46.7	%R.H.

Measurement		Margin	Frequency	Mode
Worst Case Spurious Emission	50.08 dBuV/m	3.92 dB	4960 MHz	LE 2M
Maximum Peak Conducted Output Power	7.73 dBm	22.27dB	2440 MHz	LE 2M
Maximum 6dB Bandwidth	724 kHz	224 kHz	2402 MHz	LE 1M
Maximum 99% bandwidth	2.11 MHz	-	2440 MHz	LE 2M
Maximum Power Spectral Density	7.59 dBm	0.41 dB	2440 MHz	LE 1M

4.4. Summary of Results (Part 15.247)

- **DTS (6dB) Bandwidth:** Per FCC 15.247(a)(2) and RSS-247 paragraph 5.2 (a), the minimum 6dB bandwidth shall be at least 500kHz for all systems using digital modulation techniques.
- **Band Edge Measurement Requirement:** Per section 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

- **Measurement Uncertainty:** The standard uncertainty of measurement has been determined in accordance with the ISO Guide to the Expression of Uncertainty in Measurements. The estimation of measurement uncertainty reported is the expanded uncertainty for a coverage factor of k=2.26 and confidence interval of approximately 95%.

Expanded Uncertainty $U_{(k=2.26)}$ is as follows:

- Radiated Emissions – Bicon (30-250 MHz): 4.1 dB
- Radiated Emissions – LPA (250-1000 MHz): 5.0 dB
- Radiated Emissions – DRWG (26.5 GHz): 4.2 dB
- Conducted Emissions: 1.04 dB
- Frequency: 0.007 ppm

4.5. Test Equipment Setup and Procedure

4.5.1. Test Equipment

Equipment used			
ID / Serial #	**Manufacturer**	**Description**	**Cal / PM Due Date**
6595	Rohde and Schwarz	EMI Receiver	11/13/2024
CF GCL	Megaphase/Pasternack	3m Chamber Port and Cables	4/30/2025
8893	Com-Power	AH-118 Horn	4/22/2027
H6192	EMCO	3148 Log Periodic RX	5/13/2027
7257	ETS-Lindgren	Model 3116C 10-40GHx	5/10/2025
Tower 2	ETS-Lindgren	2171B Boresight Tower	VBU
PJ2246	ETS-Lindgren	Shielded Enclosure	9/30/2024
8292	Omega	iBTHX-W Virtual	10/2/2024
HL5 Transceiver-GCL	Gentex	Default Receiver	VBU
6539	Stanley	Tape Measure	6/19/2026
H4554	87V	Multimeter	1/11/2025
S/N:419726	AIM TTI	PL303-P	VBU
S/N:2053240	Miteq	AMF-4D-00501800-24-10P	12/31/2024
SW30	Gentex	3m Chamber Software	3/31/2025
SW48	Gentex	Gentex Emissions Measurement Software	3/31/2025
CBL146	Megaphase	EMC2-S1S1-72	10/31/2024
CBL 119	Megaphase	KB18-N1S1-36	4/30/2025
CBL 149	Megaphase	GC19-S1S1-72	10/31/2024
S/N:2053240	Miteq	AMF-4D-00501800-24-10P	10/21/2024
AT25	Pasternack	PE7004-3, 3dB fixed, DC - 18GHz, 2W	1/31/2025
AT30	Pasternack	PE7004-3, 3dB fixed, DC - 18GHz, 2W	1/31/2025
FLT009	Mini-Circuits	ZHFG-K4000+ High Pass Filter 4500 to 18000MHz	VBU

4.5.2. Test Equipment Setup and Procedure

EMI Receiver Settings Emissions:

Detector Function	: Peak
Resolution Bandwidth	:100kHz (below 1GHz)
	:1MHz (above 1GHz)
Video Bandwidth:	:300kHz (below 1GHz)
	:3MHz (above 1GHz)

EMI Receiver (in Spectrum Analyzer mode) Settings Occupied Bandwidth:

Detector	: Peak
Resolution Bandwidth	:1 MHz (to determine peak level)
	:10 kHz (to determine occupied bandwidth)
Video Bandwidth	:3 MHz (to determine peak level)
	:30 kHz (to determine occupied bandwidth)

Spectrum Analyzer Settings for Conducted measurements:

Detector Function	: Peak
Resolution Bandwidth	:120kHz (below 1GHz)
	:1MHz (above 1GHz)
Video Bandwidth:	:300kHZ (below 1GHz)
	:3MHz (above 1GHz)

For the testing, the EUT was placed at the center of a non-conducting table 80cm above the ground plane pursuant to ANSI C63.10:2013 for stand-alone equipment.

Equipment is placed in all three orthogonal orientations, End, Side, and Flat. These orientations are described below in Figure 6.2.3. See setup photos for further information.

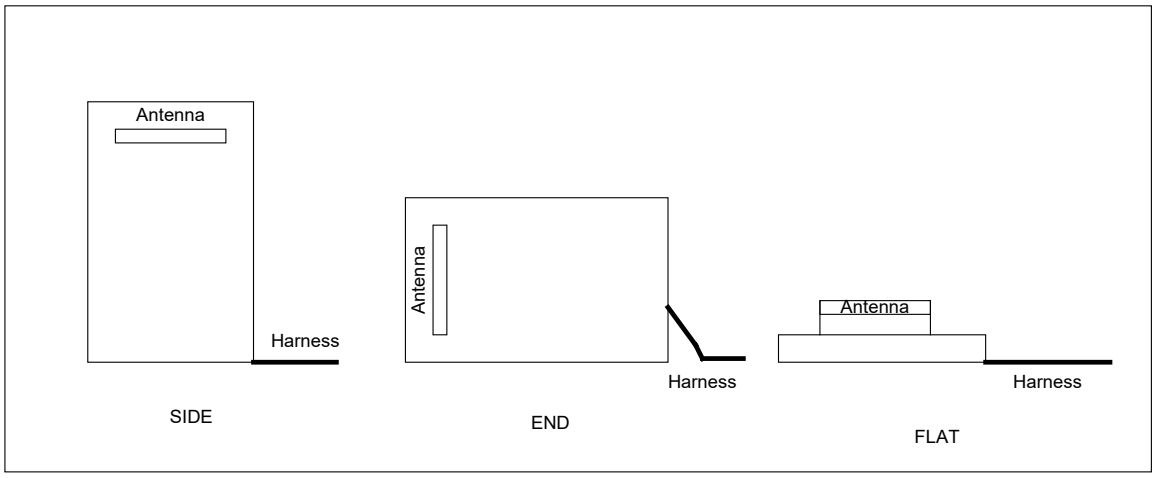


Figure 6.2.3 EUT Orthogonal Orientations

While in the prescribed orientation, the vertical antenna positioner sweeps in elevation from 1 to 4m in height until the operator finds the peak. The 3m turntable is then rotated through 360 degrees until a peak is found. The table is stopped at the peak location and the peak in elevation re-verified. Procedure is repeated for applicable

orientations/measurement antenna polarizations. Radiated testing was performed in all three orientations.

4.6. Measured Data – See Appendix A

5. Formulas and Sample Calculations

5.1. Calculation of ISED Limits from RSS-247 and 47 CFR Part 15.247

The Peak Tx Spurious Emissions limit for the fundamental is given by:
Limit dBuV/m= 1W ERP = 127.38 dBuV/m, which is the fundamental limit.

The Rx Spurious Emissions limit for the fundamental is given by:
Limit dBuV/m= 20*Log(200uV/m) =46.0dBuV/m

The Rx Spurious Emissions limit for the harmonics is given by**:**
Limit dBuV/m= 20*Log(500uV/m) =54.0dBuV/m

Appendix A

1. Radiated (Tx) Measurements

1. DUT Transmitting at 2402MHz (Fundamental)

Peak/Average Measurement - 2402MHz Mode LE 1M

Frequency (MHz)	Orientation (Flat/End/Side)	Measurement Polarization (H/V)	Peak Measurement (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Average Measurement (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)
2402	Flat	H	106.79	127.3	20.51	104.78	-	-
4804	Side	V	56.1	74.0	17.90	48.08	54.0	5.92
7206	Flat	H	53.9	74.0	20.10	41.22	54.0	12.78
9608	Flat	74	55.9	74.0	18.10	42.5	54.0	11.50
12010	End	H	59.91	74.0	14.09	47.42	54.0	6.58
14412	End	V	62.1	74.0	11.90	49.31	54.0	**4.69**
16814	Flat	V	55.27	74.0	18.73	42.32	54.0	11.68
19216	End	V	52.24	74.0	21.76	39.65	54.0	14.35
21618	Flat	H	50.81	74.0	23.19	39.24	54.0	14.76
24020	Flat	V	53.4	74.0	20.60	40.44	54.0	13.56

Peak/Average Measurement - 2402MHz Mode LE 2M

Frequency (MHz)	Orientation (Flat/End/Side)	Measurement Polarization (H/V)	Peak Measurement (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Average Measurement (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)
2402	Flat	H	107.11	127.3	20.19	101.09	-	-
4804	Flat	H	55.8	74.0	18.20	45.96	54.0	8.04
7206	Flat	V	53.14	74.0	20.86	40.77	54.0	13.23
9608	Flat	H	55.05	74.0	18.95	42.53	54.0	11.47
12010	Flat	V	59.97	74.0	14.03	47.32	54.0	6.68
14412	Flat	V	61.83	74.0	12.17	49.36	54.0	**4.64**
16814	End	V	55.04	74.0	18.96	42.32	54.0	11.68
19216	Side	H	51.94	74.0	22.06	39.66	54.0	14.34
21618	End	V	50.68	74.0	23.32	39.29	54.0	14.71
24020	End	V	52.34	74.0	21.66	41.23	54.0	12.77

DUT Transmitting at 2440MHz (Fundamental)

Peak/Average Measurement - 2440MHz Mode LE 1M

Frequency (MHz)	Orientation (Flat/End/Side)	Measurement Polarization (H/V)	Peak Measurement (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Average Measurement (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)
2440	Flat	H	106.67	127.3	20.63	104.4	-	-
4880	Flat	H	58.07	74.0	15.93	49.8	54.0	**4.20**
7320	Side	H	53.14	74.0	20.86	40.97	54.0	13.03
9760	End	V	55.18	74.0	18.82	42.9	54.0	11.10
12200	Flat	H	60.11	74.0	13.89	47.68	54.0	6.32
14640	Flat	H	61.69	74.0	12.31	49.17	54.0	4.83
17080	Flat	V	55.41	74.0	18.59	42.84	54.0	11.16
19520	Side	H	52.16	74.0	21.84	39.58	54.0	14.42
21960	Side	H	51.37	74.0	22.63	38.73	54.0	15.27
24400	Side	V	54.14	74.0	19.86	42.87	54.0	11.13

Peak/Average Measurement - 2440MHz Mode LE 2M

Frequency (MHz)	Orientation (Flat/End/Side)	Measurement Polarization (H/V)	Peak Measurement (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Average Measurement (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)
2440	Flat	H	107.06	127.3	20.24	102.01	-	-
4880	Side	V	57.63	74.0	16.37	48.64	54.0	5.36
7320	Flat	V	53.49	74.0	20.51	41.1	54.0	12.90
9760	Side	V	55.16	74.0	18.84	43.05	54.0	10.95
12200	Flat	V	61.14	74.0	12.86	47.49	54.0	6.51
14640	Flat	H	62.09	74.0	11.91	49.81	54.0	**4.19**
17080	End	V	56.97	74.0	17.03	42.83	54.0	11.17
19520	End	H	51.72	74.0	22.28	39.65	54.0	14.35
21960	End	H	51.43	74.0	22.57	38.8	54.0	15.20
24400	End	V	52.38	74.0	21.62	40.6	54.0	13.40

DUT Transmitting at 2480MHz (Fundamental)

Peak/Average Measurement - 2480MHz Mode LE 1M

Frequency (MHz)	Orientation (Flat/End/Side)	Measurement Polarization (H/V)	Peak Measurement (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Average Measurement (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)
2480	Side	H	106.41	127.3	20.89	104.12	-	-
4960	Flat	H	57.03	74.0	16.97	49.62	54.0	**4.38**
7440	End	V	54.01	74.0	19.99	41.38	54.0	12.62
9920	Flat	V	55.7	74.0	18.30	43.21	54.0	10.79
12400	Side	V	60.22	74.0	13.78	47.69	54.0	6.31
14880	Side	V	62.09	74.0	11.91	49.57	54.0	4.43
17360	Flat	H	55.64	74.0	18.36	42.8	54.0	11.20
19840	Flat	V	52.22	74.0	21.78	40.59	54.0	13.41
22320	Side	V	51.84	74.0	22.16	39.89	54.0	14.11
24800	End	H	53.24	74.0	20.76	40.85	54.0	13.15

Peak/Average Measurement - 2480MHz Mode LE 2M

Frequency (MHz)	Orientation (Flat/End/Side)	Measurement Polarization (H/V)	Peak Measurement (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Average Measurement (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)
2480	Flat	H	105.53	127.3	21.77	103.41	-	-
4960	Side	H	58.32	74.0	15.68	50.08	54.0	**3.92**
7440	Flat	V	53.79	74.0	20.21	41.52	54.0	12.48
9920	Flat	V	56.43	74.0	17.57	42.99	54.0	11.01
12400	End	H	61.19	74.0	12.81	49.58	54.0	4.42
14880	Flat	V	62.05	74.0	11.95	49.6	54.0	4.40
17360	Flat	H	55.31	74.0	18.69	42.84	54.0	11.16
19840	Side	V	52.33	74.0	21.67	41.36	54.0	12.64
22320	End	V	52.35	74.0	21.65	38.92	54.0	15.08
24800	Flat	V	52.65	74.0	21.35	40.8	54.0	13.20

2. Conducted Emissions

1. 99% Bandwidth

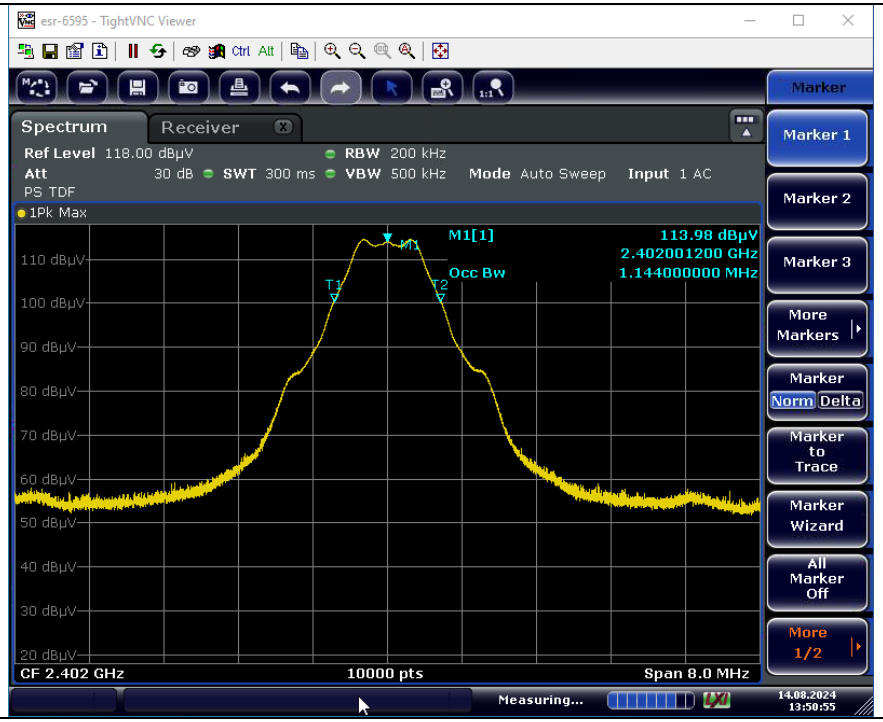
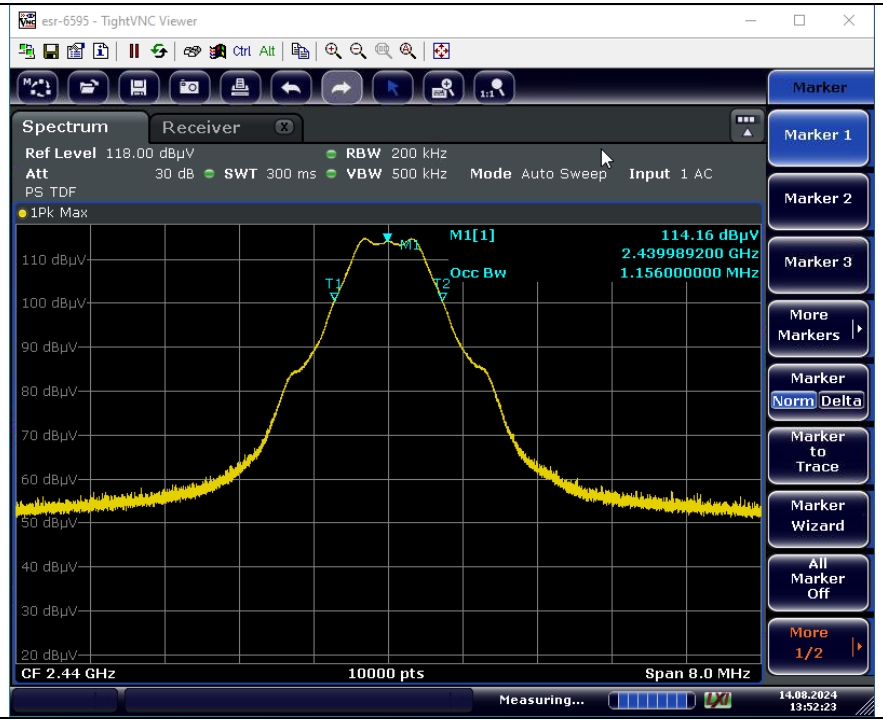
Measurement Settings:
Frequency Span: 2-5 times the OBW
RBW: 1 to 5% of the OBW
VBW: 3 times the RBW
Detector: Peak
Trace Max Hold

This Measurements is a conducted measurement. Prior to the measurement the EUT is placed into a continuous transmit mode via an HCI cable attached to the EUT.

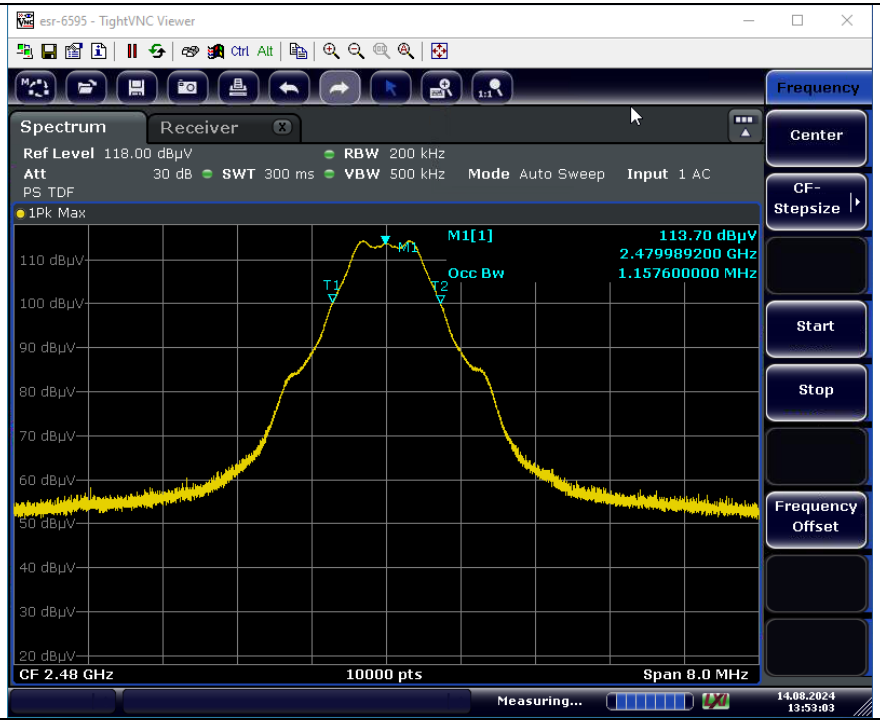
In the measurement of the 99% bandwidth, the transmit frequency was set to the low, middle, and high channels and modes LE 1M and LE 2M.

99% Bandwidth Mode LE 1M

Channel #	Frequency (MHz)	99% Bandwidth (MHz)
0	2402	1.144
19	2440	1.156
39	2480	1.157

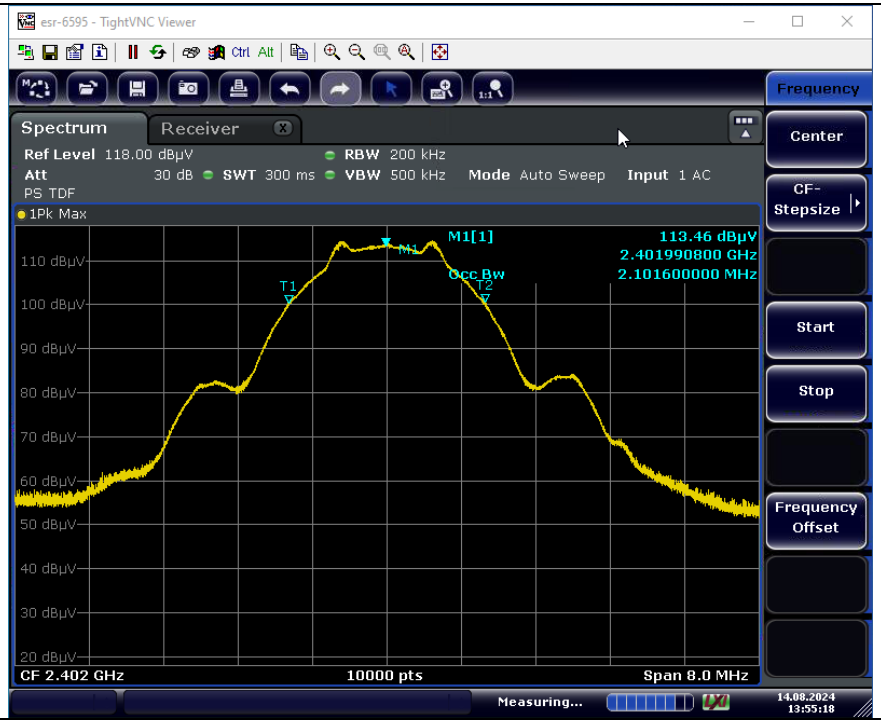
2402 MHz Mode LE 1M	2440 MHz Mode LE 1M
	

2480 MHz Mode LE 1M

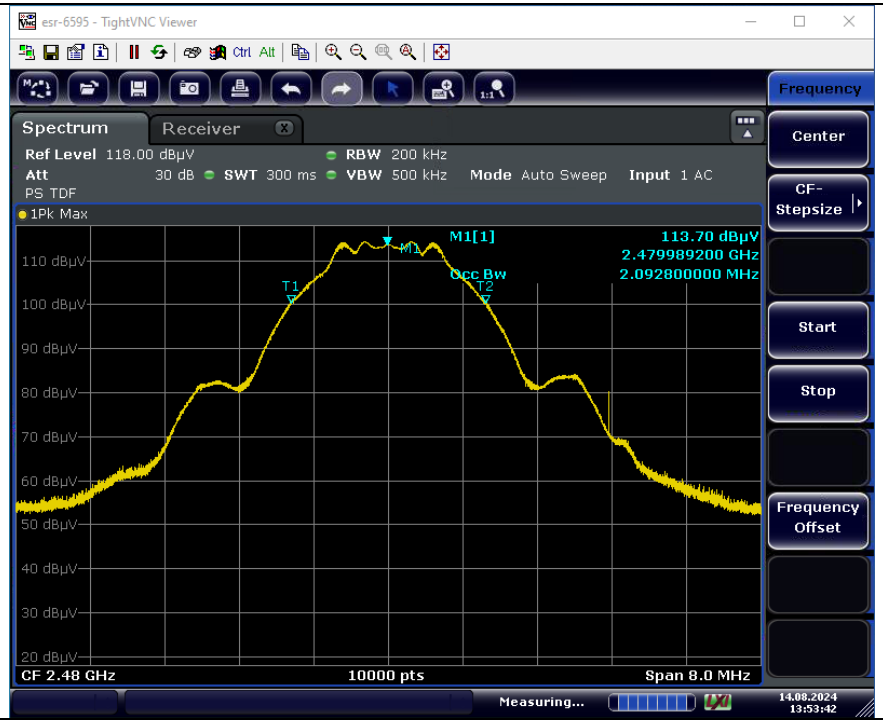


99% Bandwidth Mode LE 2M

Channel #	Frequency (MHz)	99% Bandwidth (MHz)
0	2402	2.101
19	2440	2.11
39	2480	2.092

2402 MHz Mode LE 2M	2440 MHz Mode LE 2M
	

2480 MHz Mode LE 2M



2. 6dB Bandwidth

Measurement Settings:
RBW: in the range of 1 to 5% of the OBW but not less than 100kHz
VBW: Equal to or greater than 3 times the RBW
Span: Greater than the DTS bandwidth
Sweep time: No faster than the coupled (auto) time
Detector: Peak
Trace mode: Max Hold

6dB Bandwidth Requirement: Per 15.247(a)(2), systems using digital modulation may operate in the 2400-2483.5 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz

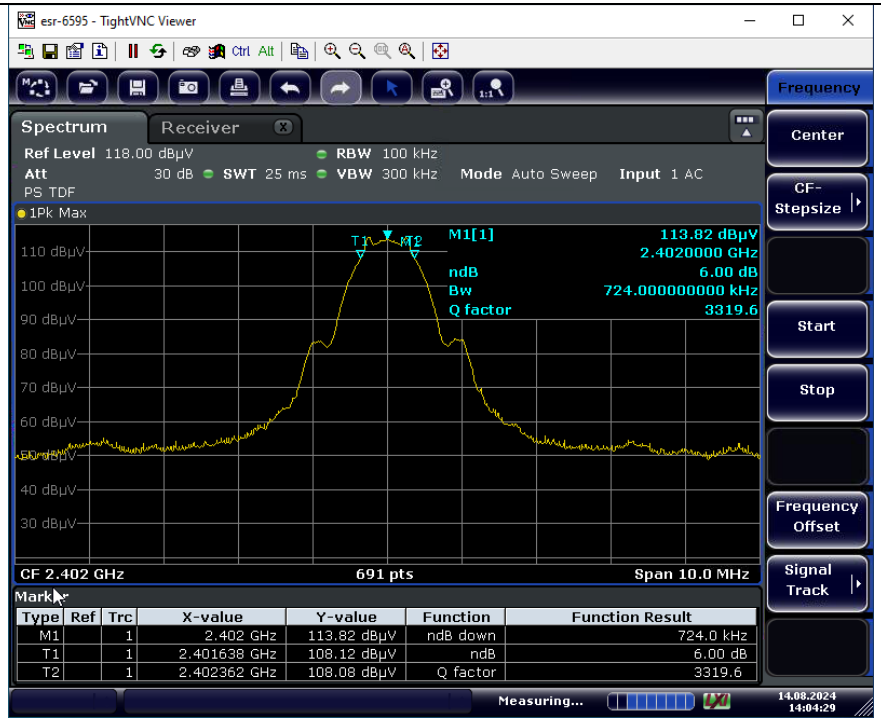
This measurement is a conducted measurement performed with the receiver per test method ANSI C63.10 section 11.8. Prior to measurement the EUT is placed into a continuous transmit mode via an HCI cable attached to the EUT.

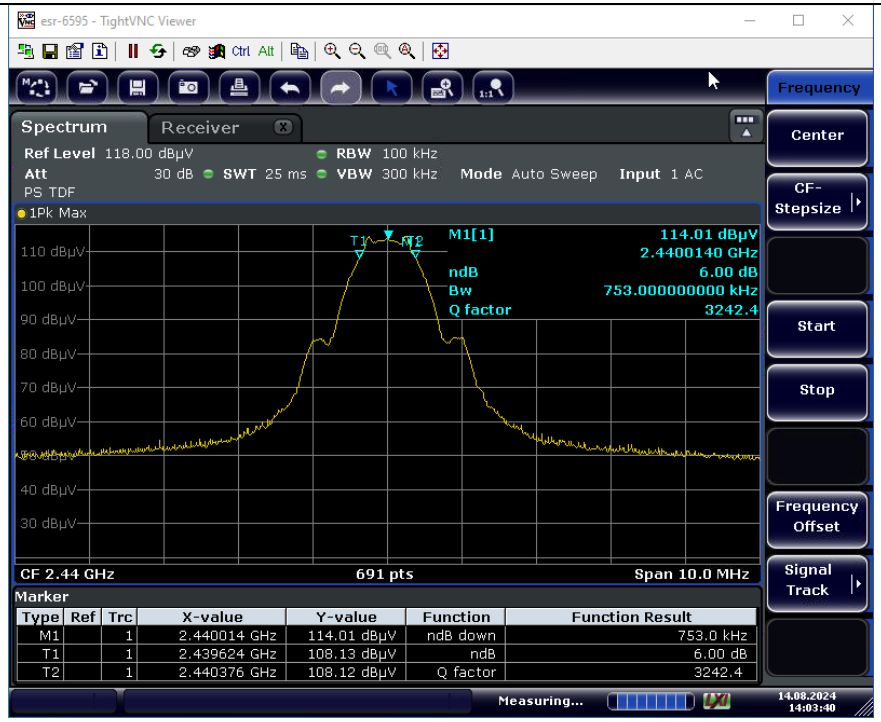
In the measurement of the 6dB bandwidth, the transmit frequency was set to low, middle, and high channels and modes LE 1M and LE 2M.

6dB Bandwidth Mode LE 1M

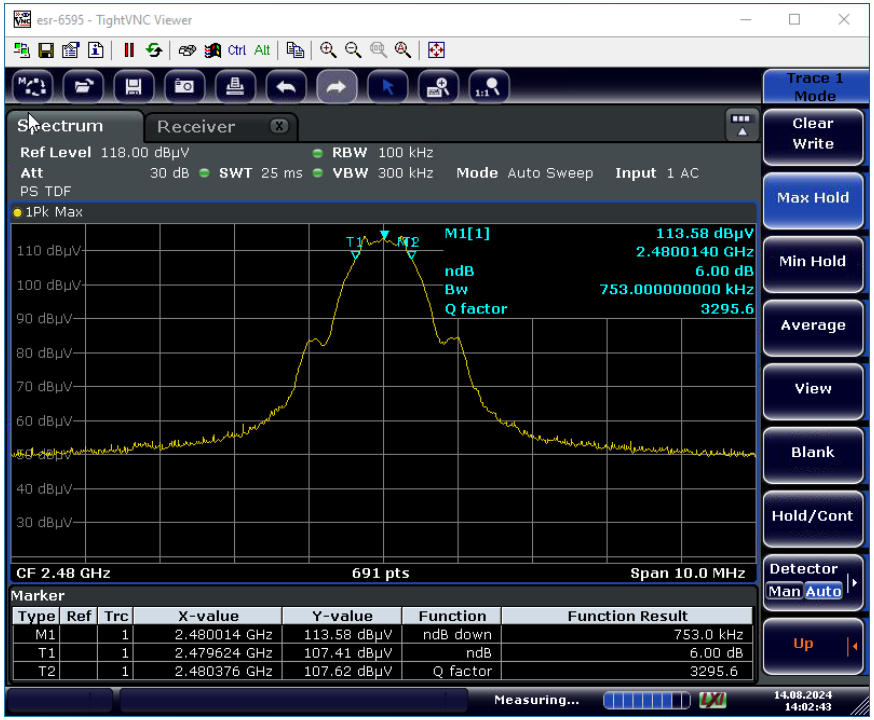
Channel #	Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Margin
0	2402	724	>500	224
19	2440	753	>500	253
39	2480	753	>500	253

2402 MHz Mode LE 1M	2440 MHz Mode LE 1M



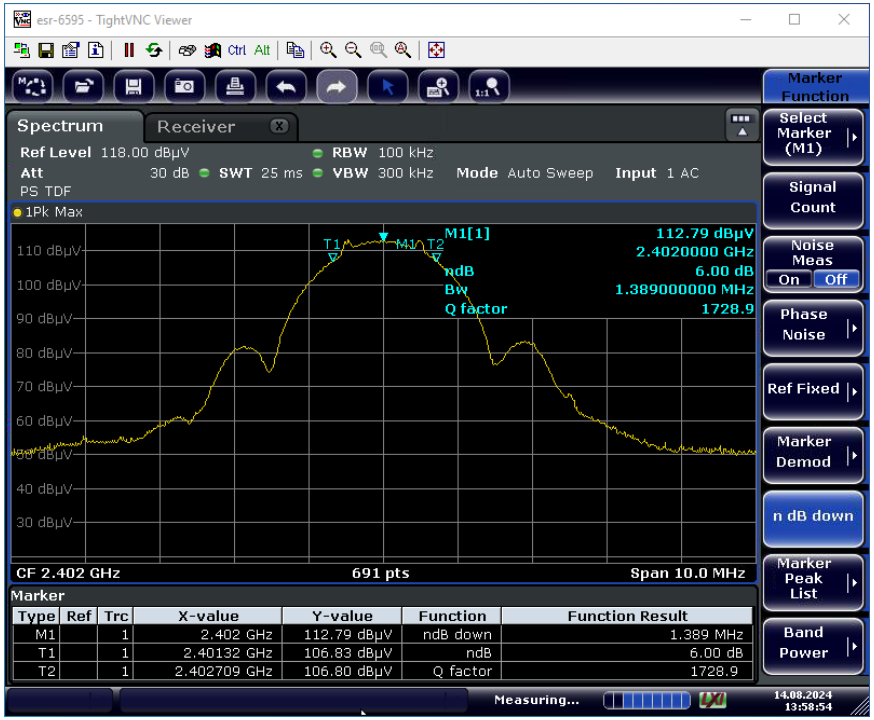
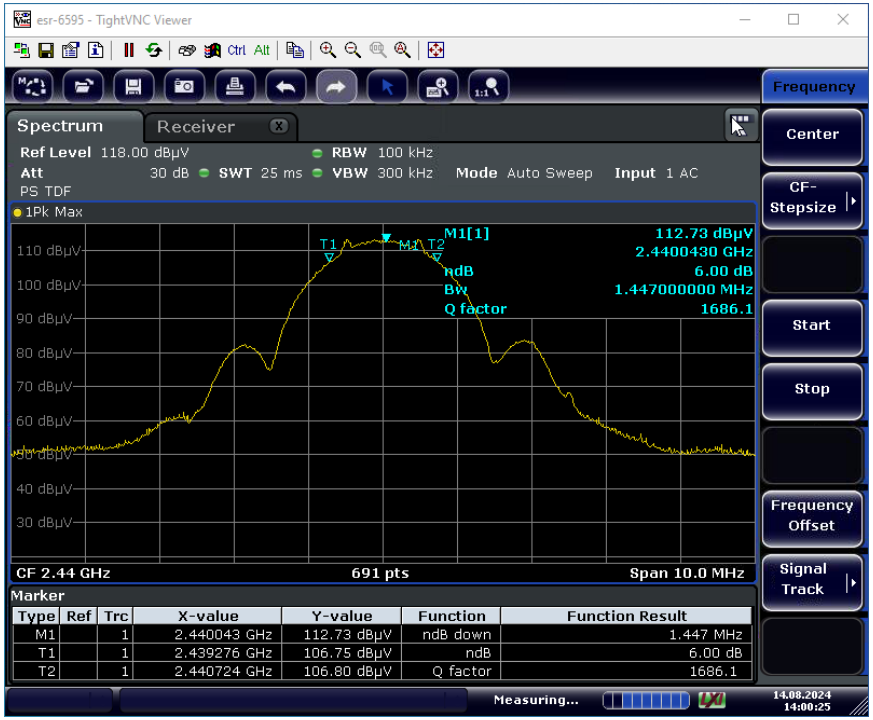


2480 MHz Mode LE 1M

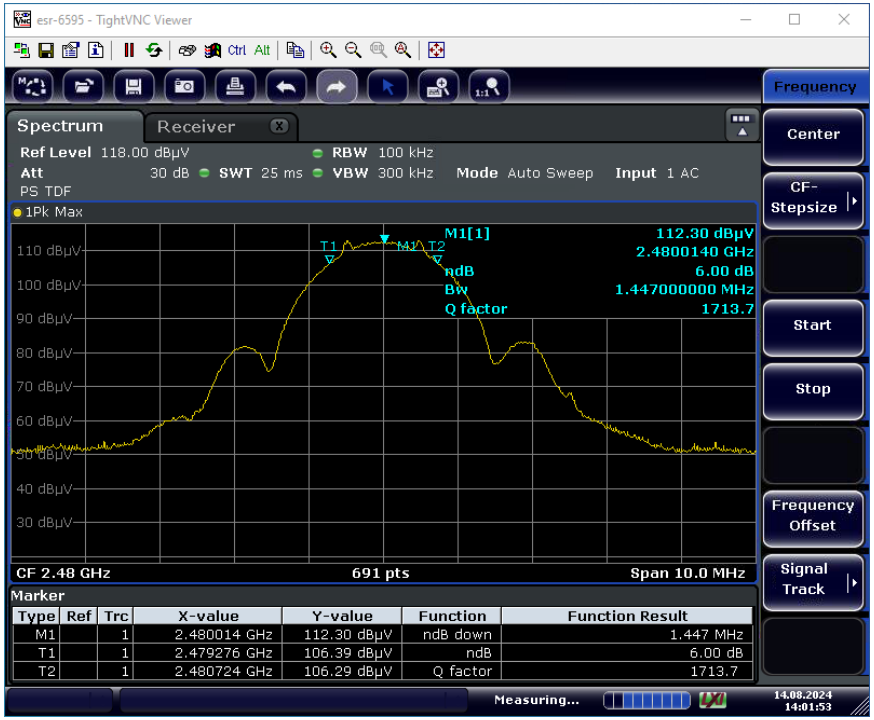


6dB Bandwidth Mode LE 2M

Channel #	Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Margin
0	2402	1389	>500	889
19	2440	1447	>500	947
39	2480	1447	>500	947

2402 MHz Mode LE 2M	2440 MHz Mode LE 2M
	

2480 MHZ Mode LE 2M



3. Peak Output Power

Measurement Settings:
RBW: Greater than the worst case DTS occupied bandwidth
VBW: Equal to or greater than 3 times the RBW
Span: Equal to or greater than 3 times the RBW
Sweep time no faster than coupled (auto) time
Detector: Peak

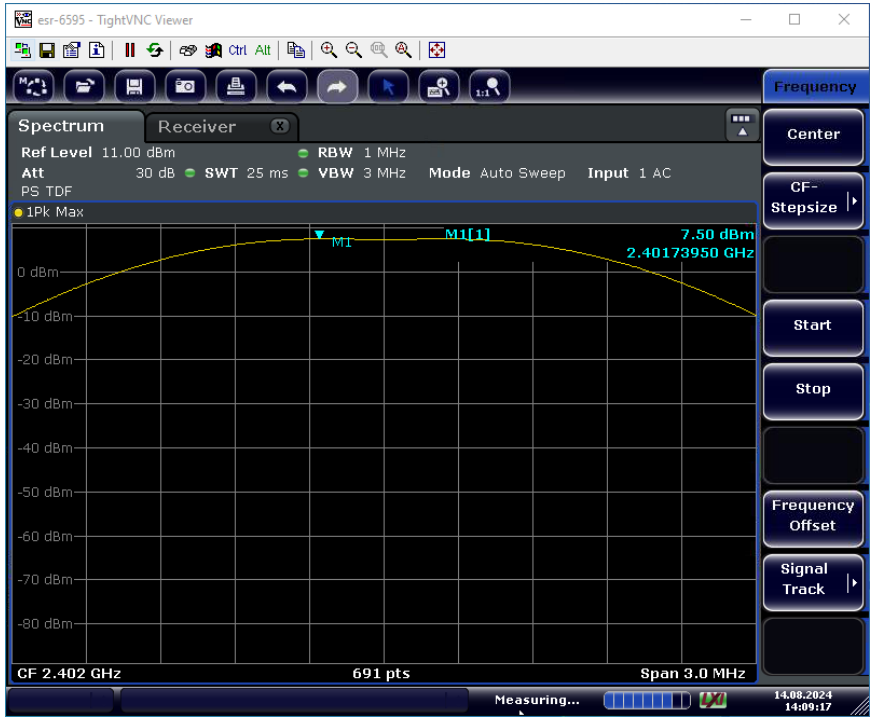
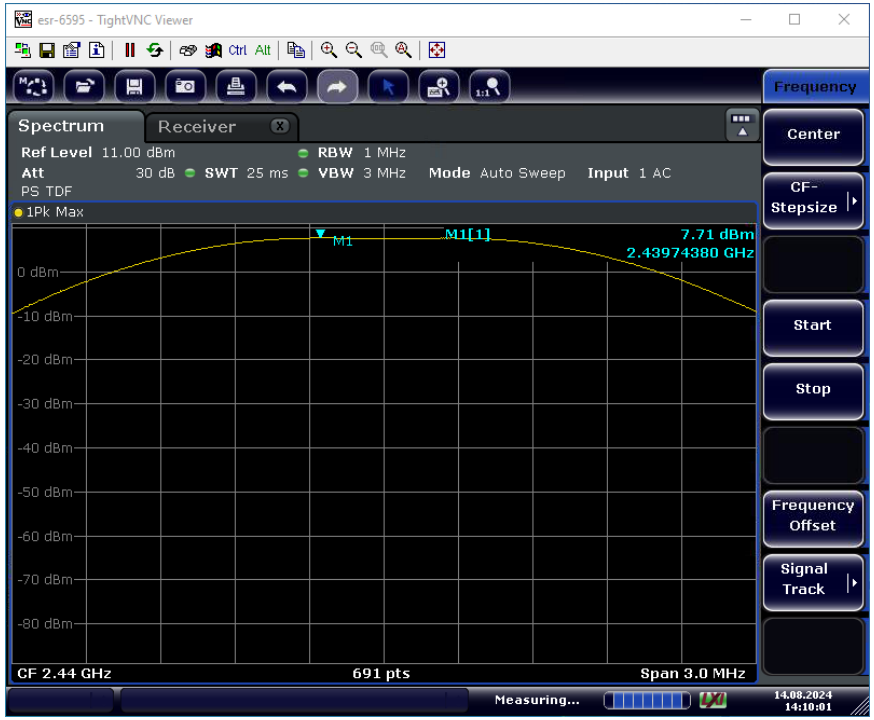
Peak Output Power Requirement: Per 15.247(b)(3) The maximum Peak Conducted Output Power of the intentional radiator shall not exceed the 1W (30dBm) for systems using digital modulation in the 2400-2483.5MHz

This measurement is a conducted measurement performed with the receiver per test method ANSI C63.10 section 11.9. Prior to measurement the EUT is placed into a continuous transmit mode via a HCI cable attached to the EUT.

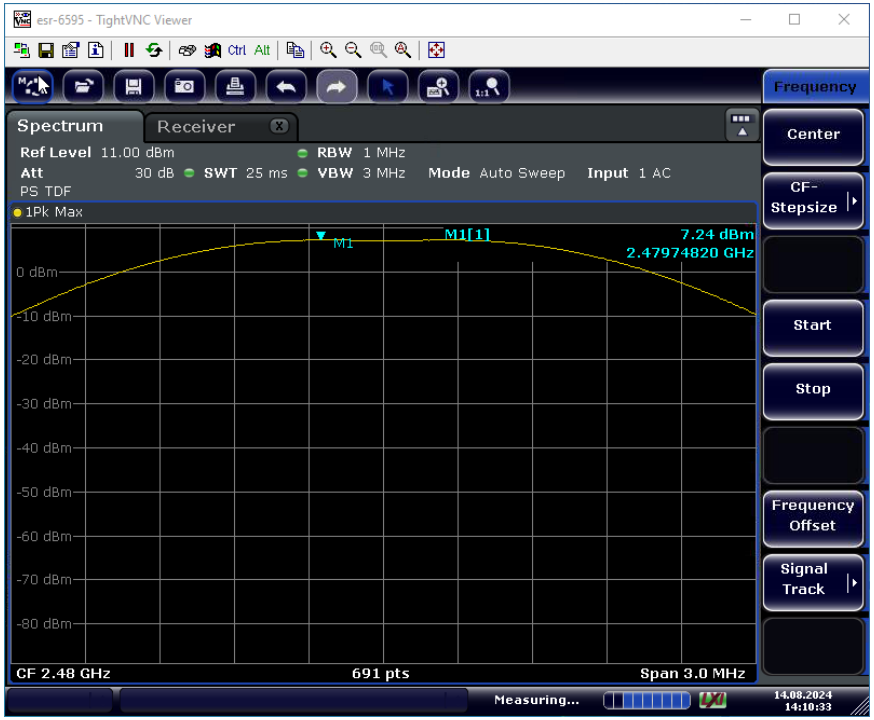
In the measurement of the Peak Output Power, the transmit frequency was set to low, middle, and high channels and modes LE 1M and LE 2M.

Peak Output Power Mode LE 1M

Channel #	Frequency (MHz)	Power Output (dBm)	Limit (dBm)	Margin
0	2402	7.5	30	-22.5
19	2440	7.71	30	-22.29
39	2480	7.24	30	-22.76

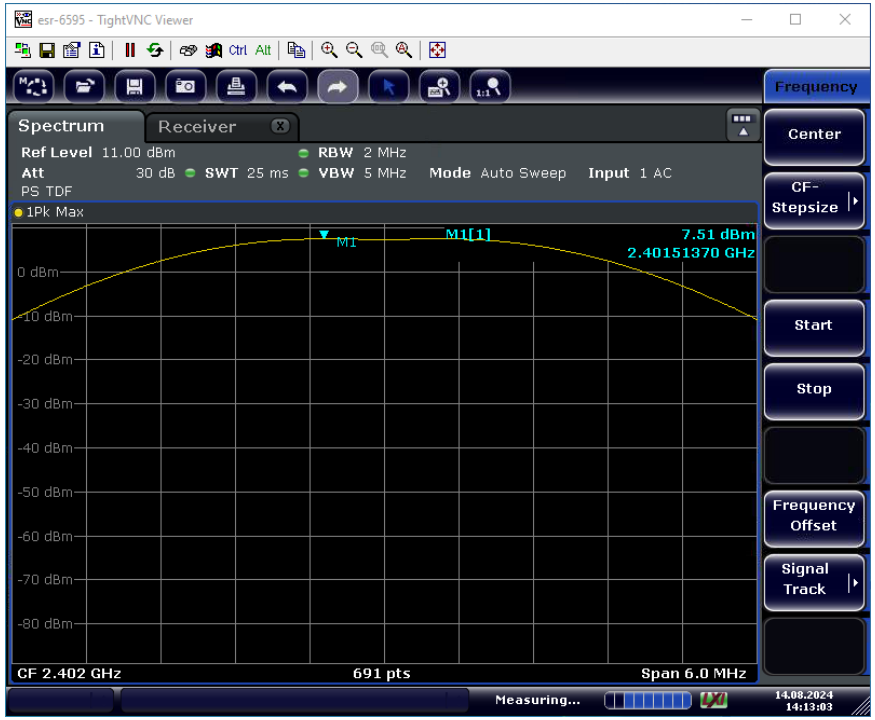
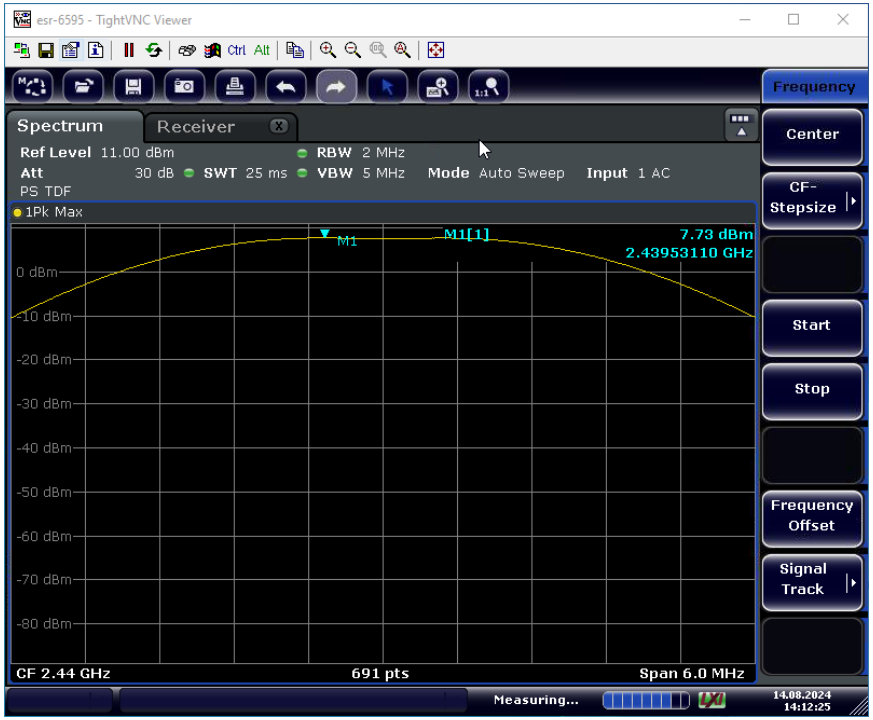
2402 MHz Mode LE 1M	2440 MHz Mode LE 1M
	

2480 MHz Mode LE 1M

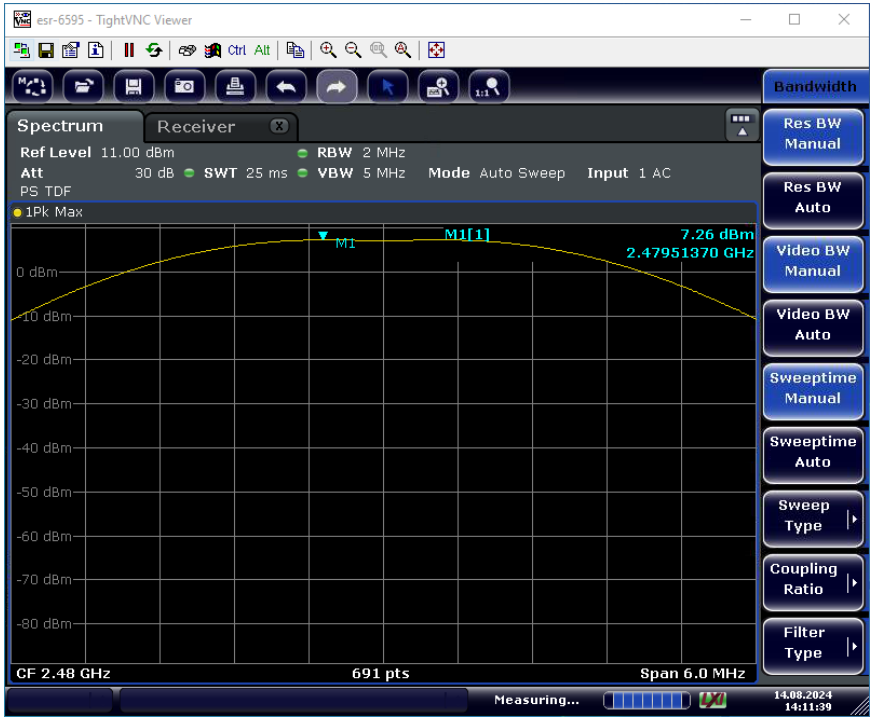


Peak Output Power Mode LE 2M

Channel #	Frequency (MHz)	Power Output (dBm)	Limit (dBm)	Margin
0	2402	7.51	30	-22.49
19	2440	7.73	30	-22.27
39	2480	7.26	30	-22.74

2402 MHz Mode LE 2M	2440 MHz Mode LE 2M
	

2480 MHz Mode LE 2M



4. Power Spectral Density

Measurement Settings:
Span: Greater than 1.5 times the DTS bandwidth
RBW: set to between 3kHz and 100kHz
VBW: Equal to or greater than 3 times the RBW
Sweep time: No faster than the coupled (auto) time
Detector: Peak
Trace mode: Max hold

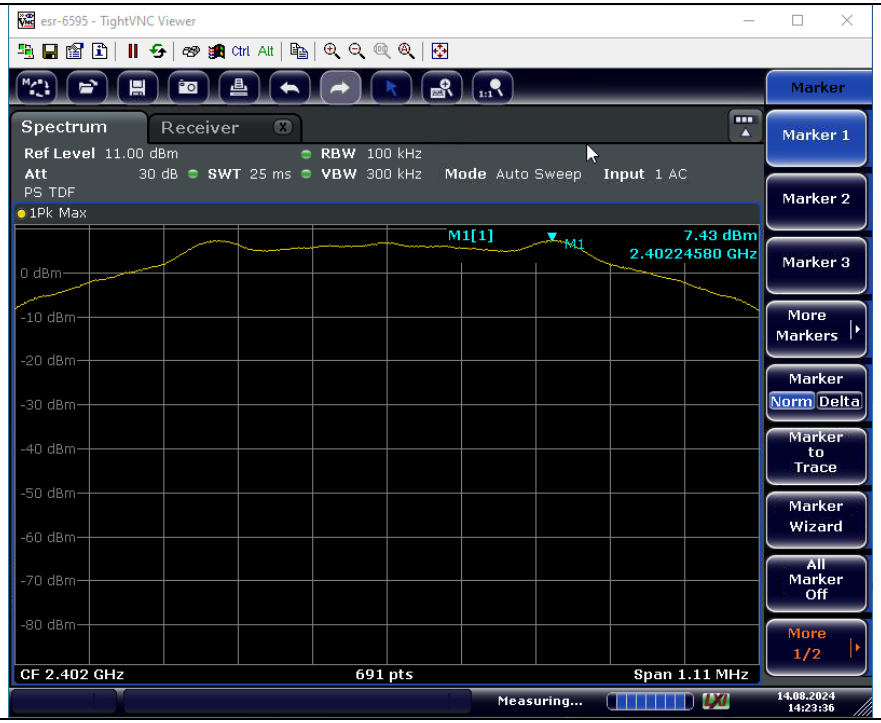
Power Spectral Density requirement: Per 15.247(e) for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission. The same method of determining the conducted output power shall be used to determine the power spectral density.

This measurement is a conducted measurement performed with the receiver per test method ANSI C63.10 section 11.10. Prior to measurement the EUT is placed into a continuous transmit mode via a HCI cable attached to the EUT.

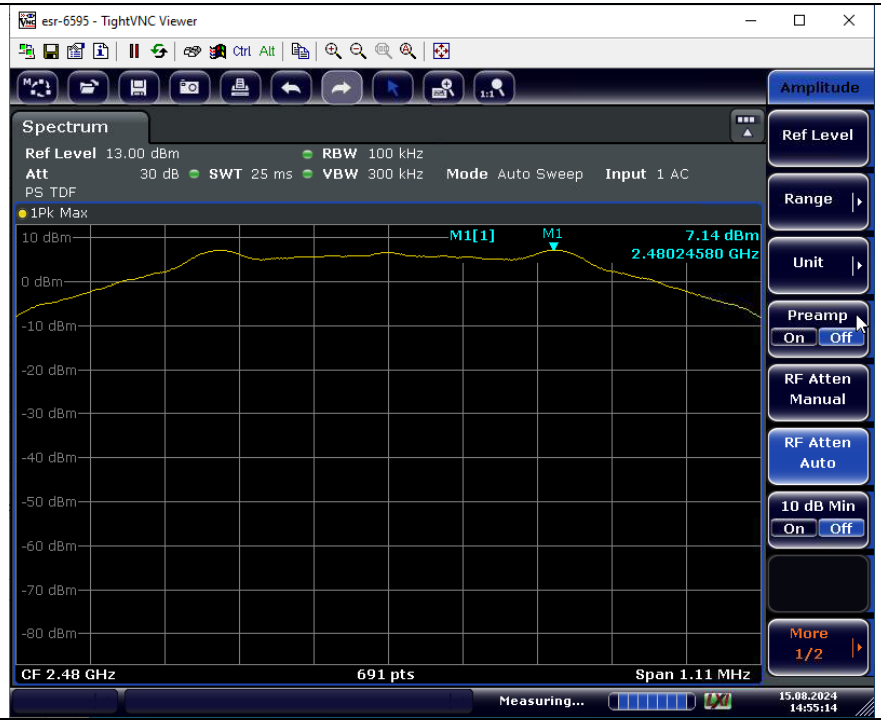
In the measurement of the power spectral density, the transmit frequency was set to low, middle, and high channels and modes LE 1M and LE 2M

Power Spectral Density Mode LE 1M

Channel #	Frequency (MHz)	Measurement PPSD (dBm)	Limit (dBm)	Result
0	2402	7.43	8	-0.57
19	2440	7.59	8	-0.41
39	2480	7.08	8	-0.92

2402 MHz Mode LE 1M	2440 MHz Mode LE 1M
	

2480 MHz Mode LE 1M

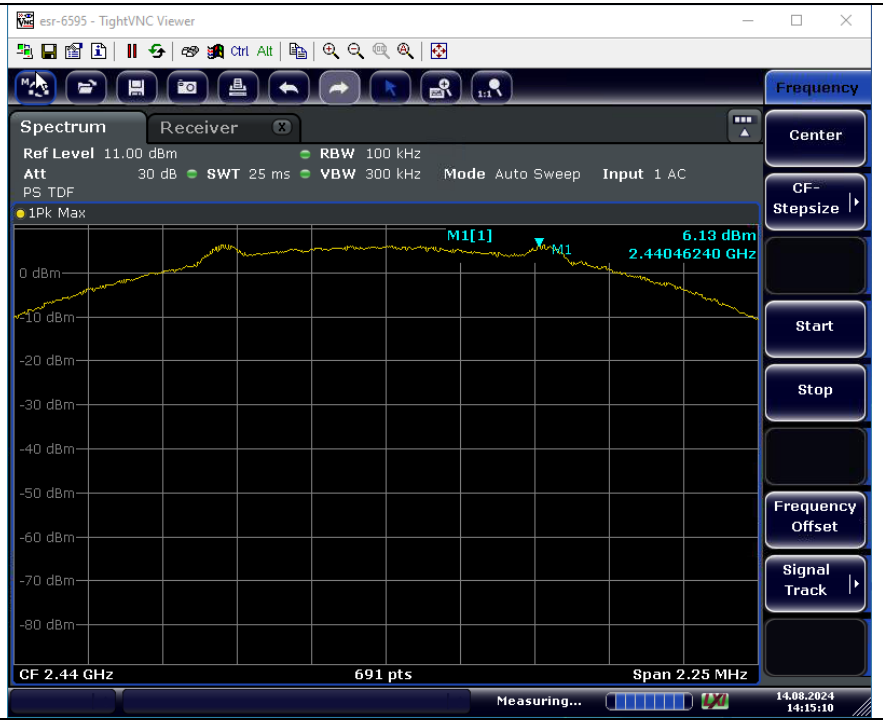


Power Spectral Density Mode LE 2M

Channel #	Frequency (MHz)	Measurement PPSD (dBm)	Limit (dBm)	Result
0	2402	6.12	8	-1.88
19	2440	6.13	8	-1.87
39	2480	5.87	8	-2.13

2402 MHz Mode LE 2M

2440 MHz Mode LE 2M



2480 MHz Mode LE 2M


5. Conducted Emissions Sweep – 30MHz to 25GHz

Measurement Settings:
Sweep 1: Peak - 100 kHz
- Start Frequency: 30MHz
- End Frequency: 1000MHz
- Detector: Peak
- Sweep Mode: FFT
- Attenuator: 5dB
- Pre-Amp: On
- Max Hold Trace Mode: Off
- Bandwidth Filter: EMI (6dB)
- RBW: 100kHz
- Step Size: Auto (25kHz)
- Dwell Time: 10ms

Measurement Settings:
Sweep 2: Peak – 1000kHz
- Start Frequency: 1000MHz
- End Frequency: 18000MHz
- Detector: Peak
- Sweep Mode: FFT
- Attenuator: 5dB
- Pre-Amp: On
- Max Hold Trace Mode: Off
- Bandwidth Filter: EMI (6dB)
- RBW: 1000kHz
- Step Size: Auto (250kHz)
- Dwell Time: 10ms

Measurement Settings:
Sweep 2: Peak – 1000kHz
- Start Frequency: 18000MHz
- End Frequency: 26000MHz
- Detector: Peak
- Sweep Mode: FFT
- Attenuator: 5dB
- Pre-Amp: On
- Max Hold Trace Mode: Off
- Bandwidth Filter: EMI (6dB)
- RBW: 1000kHz
- Step Size: Auto (250kHz)
- Dwell Time: 10ms

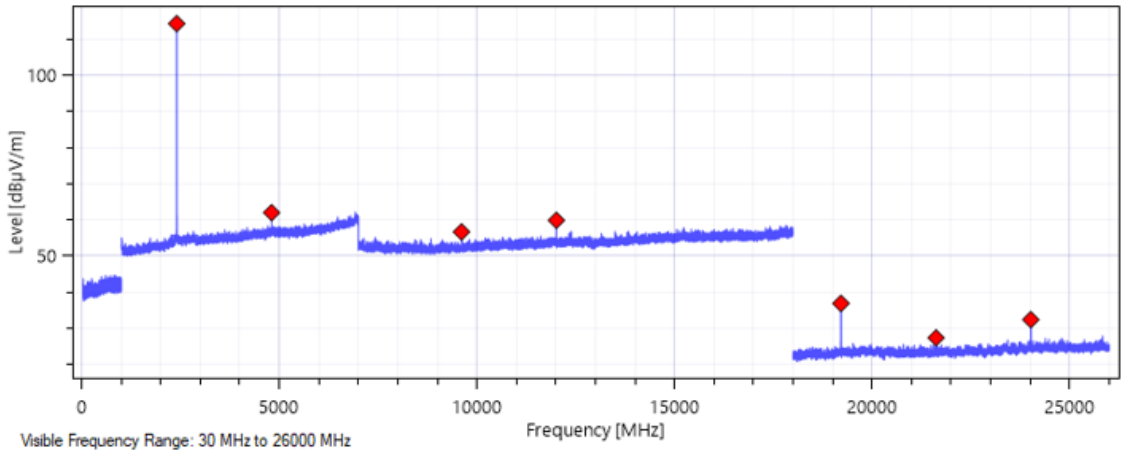
Per section 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

This measurement is a conducted measurement performed with a receiver per test method ANSI C63.10 section 11.10. Prior to measurement the EUT is placed into a continuous transmit mode via a HCI cable attached to the EUT.

The emissions sweep was performed with the transmitter set separately at 2402MHz, 2440MHz, and 2480MHz in modes LE 1M and LE 2M. For each of the sweeps, the emissions were below the limit.

Channel #	Mode	Frequency (MHz)	Worst Case Delta (dB)	Limit (dBm)	Margin
0	LE 1M	2402	52.373	20	32.373
0	LE 2M	2402	52.647	20	32.647
19	LE 1M	2440	53.067	20	33.067
19	LE 2M	2440	53.038	20	33.038
39	LE 1M	2480	52.836	20	32.836
39	LE 2M	2480	52.452	20	32.452

Peak Measurement - 2402MHz LE 1M



Test Profile: BLE Emissions Sweep for ANSI C63.10

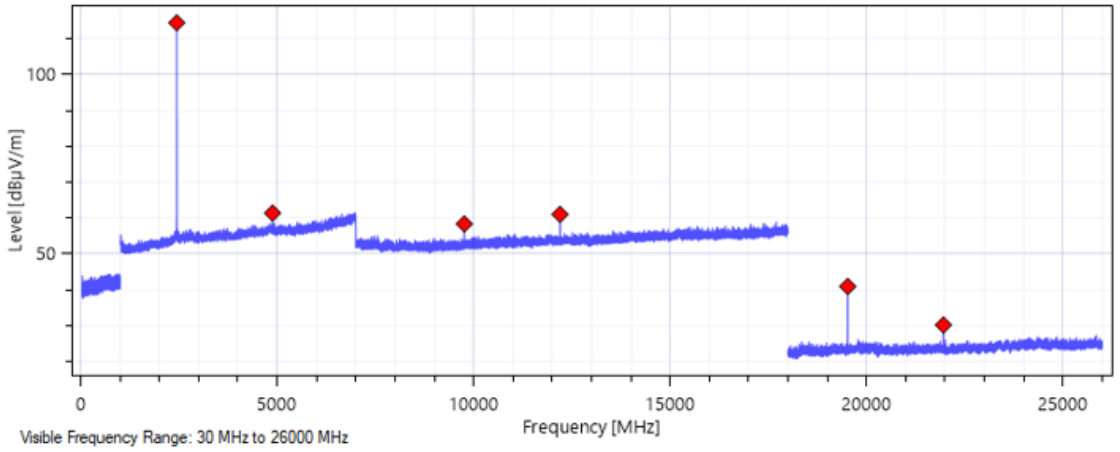
Trace: 2402 1M, Band: Band 2 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
2,401.750000	114.429	No Limit at Frequency	No Limit at Frequency
4,803.500000	62.056	No Limit at Frequency	No Limit at Frequency
9,609.000000	56.719	No Limit at Frequency	No Limit at Frequency
12,011.250000	59.938	No Limit at Frequency	No Limit at Frequency

Trace: 2402 1M 18, Band: Band 3 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
19,214.000000	36.903	No Limit at Frequency	No Limit at Frequency
21,620.250000	27.397	No Limit at Frequency	No Limit at Frequency
24,017.500000	32.419	No Limit at Frequency	No Limit at Frequency

Peak Measurement - 2440MHz LE 1M



Test Profile: BLE Emissions Sweep for ANSI C63.10

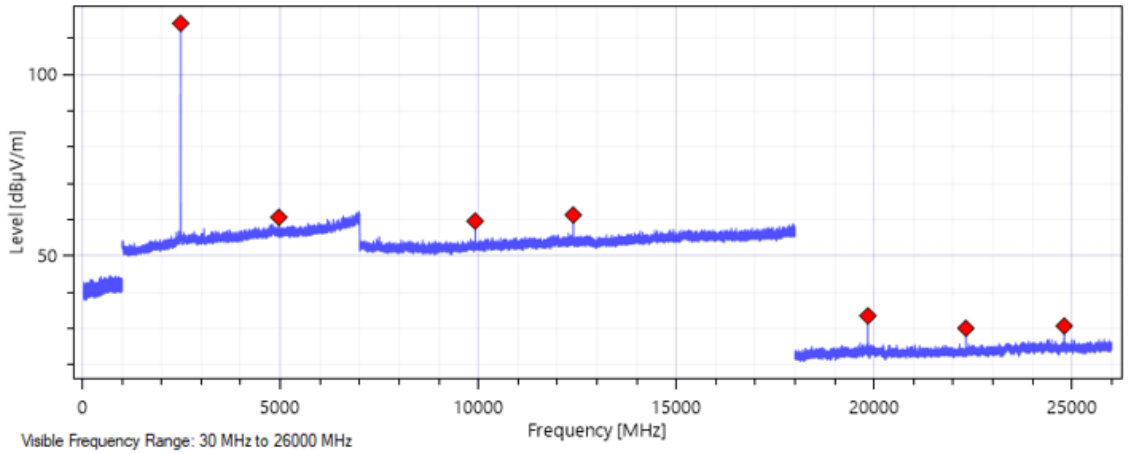
Trace: 2440 1M, Band: Band 2 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
2,439.750000	114.49	No Limit at Frequency	No Limit at Frequency
4,879.750000	61.423	No Limit at Frequency	No Limit at Frequency
9,761.000000	58.399	No Limit at Frequency	No Limit at Frequency
12,198.750000	61.048	No Limit at Frequency	No Limit at Frequency

Trace: 2440 1M 18, Band: Band 3 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
19,522.000000	40.941	No Limit at Frequency	No Limit at Frequency
21,957.500000	30.188	No Limit at Frequency	No Limit at Frequency

Peak Measurement - 2480MHz LE 1M



Test Profile: BLE Emissions Sweep for ANSI C63.10

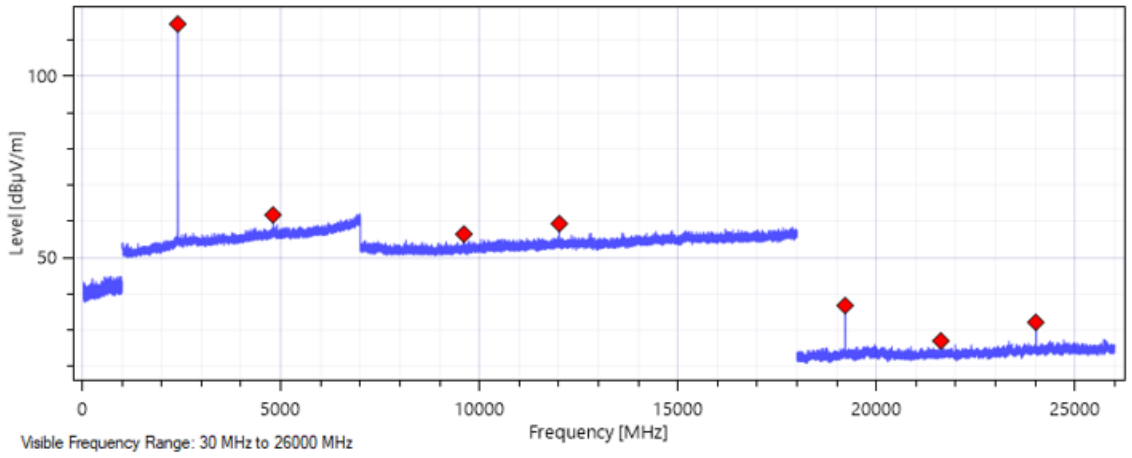
Trace: 2480 1M, Band: Band 2 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
2,479.750000	114.13	No Limit at Frequency	No Limit at Frequency
4,959.500000	60.648	No Limit at Frequency	No Limit at Frequency
9,919.000000	59.604	No Limit at Frequency	No Limit at Frequency
12,398.750000	61.294	No Limit at Frequency	No Limit at Frequency

Trace: 2480 1M 18, Band: Band 3 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
19,842.000000	33.473	No Limit at Frequency	No Limit at Frequency
22,317.750000	30.042	No Limit at Frequency	No Limit at Frequency
24,802.500000	30.677	No Limit at Frequency	No Limit at Frequency

Peak Measurement - 2402MHz LE 2M



Test Profile: BLE Emissions Sweep for ANSI C63.10

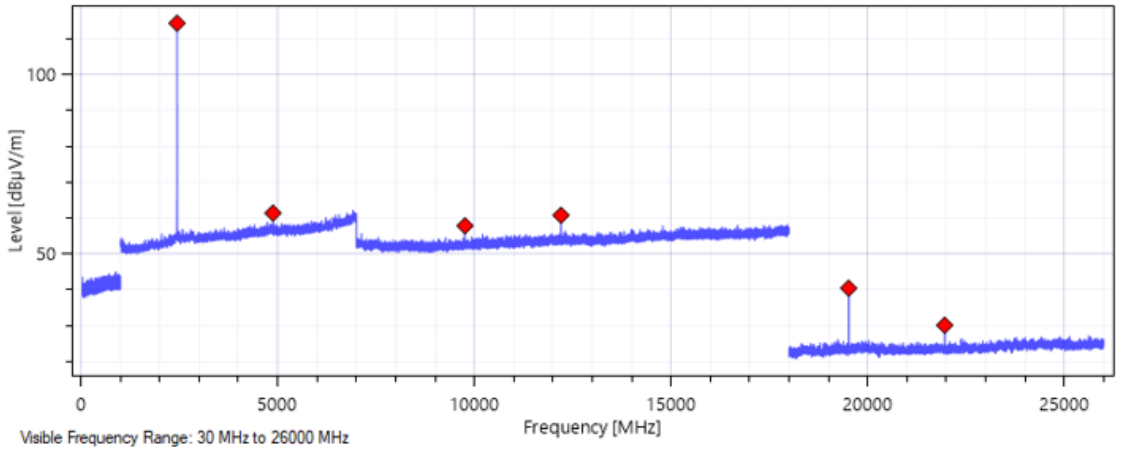
Trace: 2402 2M, Band: Band 2 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
2,401.500000	114.427	No Limit at Frequency	No Limit at Frequency
4,803.000000	61.78	No Limit at Frequency	No Limit at Frequency
9,610.000000	56.507	No Limit at Frequency	No Limit at Frequency
12,012.500000	59.368	No Limit at Frequency	No Limit at Frequency

Trace: 2402 2M 18, Band: Band 3 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
19,212.000000	36.809	No Limit at Frequency	No Limit at Frequency
21,622.500000	27.057	No Limit at Frequency	No Limit at Frequency
24,015.250000	32.18	No Limit at Frequency	No Limit at Frequency

Peak Measurement - 2440MHz LE 2M



Test Profile: BLE Emissions Sweep for ANSI C63.10

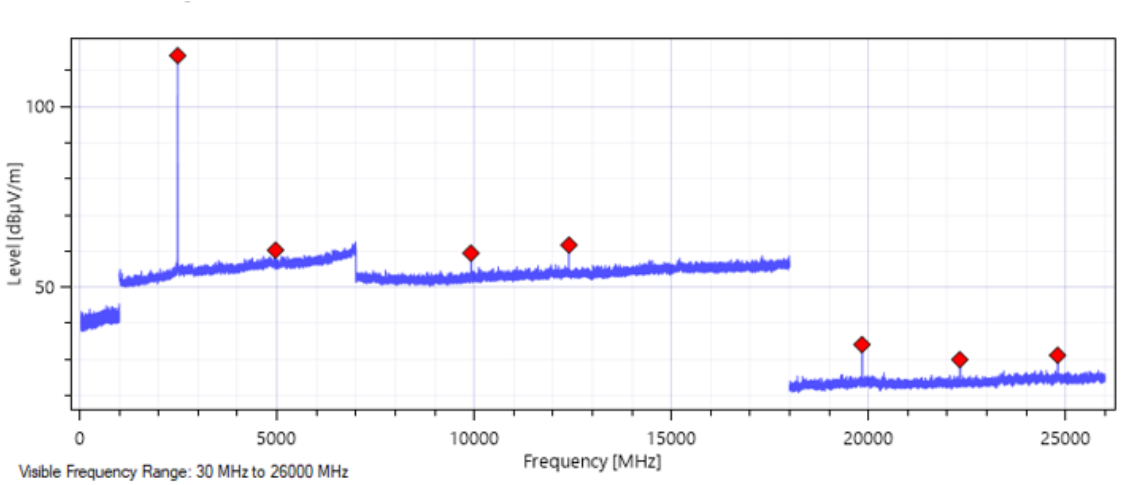
Trace: 2440 2M, Band: Band 2 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
2,440.500000	114.472	No Limit at Frequency	No Limit at Frequency
4,881.000000	61.434	No Limit at Frequency	No Limit at Frequency
9,762.000000	57.886	No Limit at Frequency	No Limit at Frequency
12,202.500000	60.82	No Limit at Frequency	No Limit at Frequency

Trace: 2440 2M 18, Band: Band 3 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
19,516.250000	40.453	No Limit at Frequency	No Limit at Frequency
21,955.500000	30.113	No Limit at Frequency	No Limit at Frequency

Peak Measurement - 2480MHz LE 2M



Test Profile: BLE Emissions Sweep for ANSI C63.10

Trace: 2480 2M, Band: Band 2 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
2,479.500000	114.152	No Limit at Frequency	No Limit at Frequency
4,961.000000	60.27	No Limit at Frequency	No Limit at Frequency
9,918.250000	59.453	No Limit at Frequency	No Limit at Frequency
12,402.500000	61.7	No Limit at Frequency	No Limit at Frequency

Trace: 2480 2M 18, Band: Band 3 (Peak Detector)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
19,836.000000	34.139	No Limit at Frequency	No Limit at Frequency
22,315.500000	29.982	No Limit at Frequency	No Limit at Frequency
24,795.000000	31.172	No Limit at Frequency	No Limit at Frequency

6. Band Edge Measurement

Measurement Settings:
RBW:100kHz
VBW: 3x RBW
Sweep time: No faster than Coupled (auto) time
Detector: Peak
Trace: Max Hold

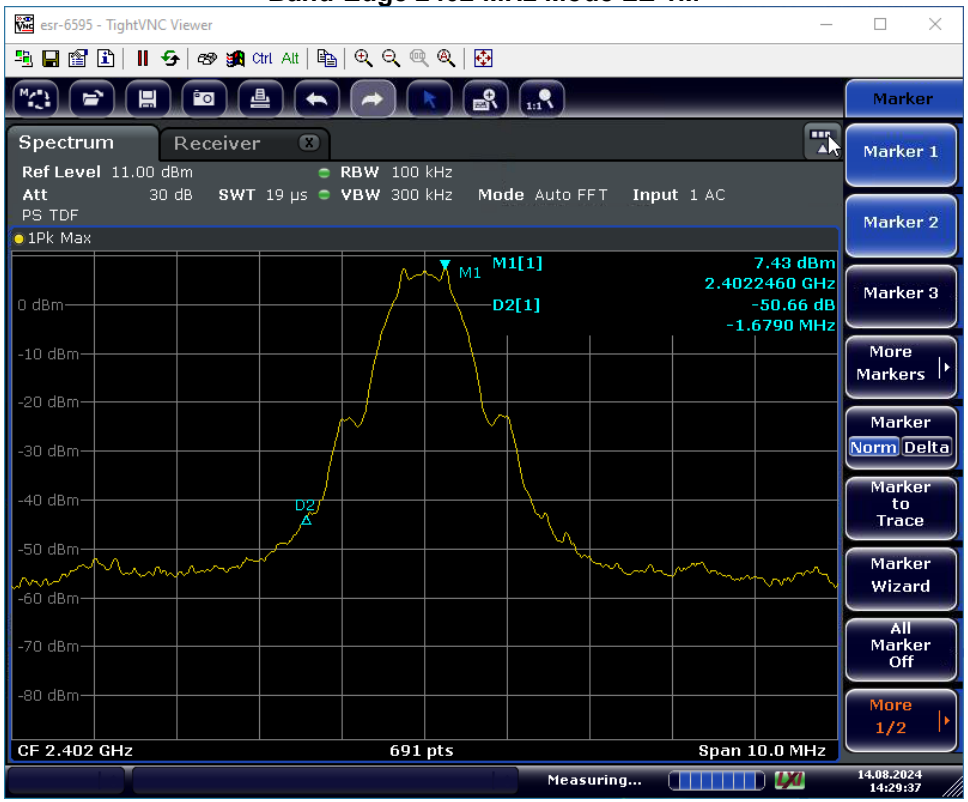
Per section 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

This measurement is a conducted measurement performed with a receiver. Prior to measurement the EUT is placed into a continuous transmit mode via a HCI cable attached to the EUT.

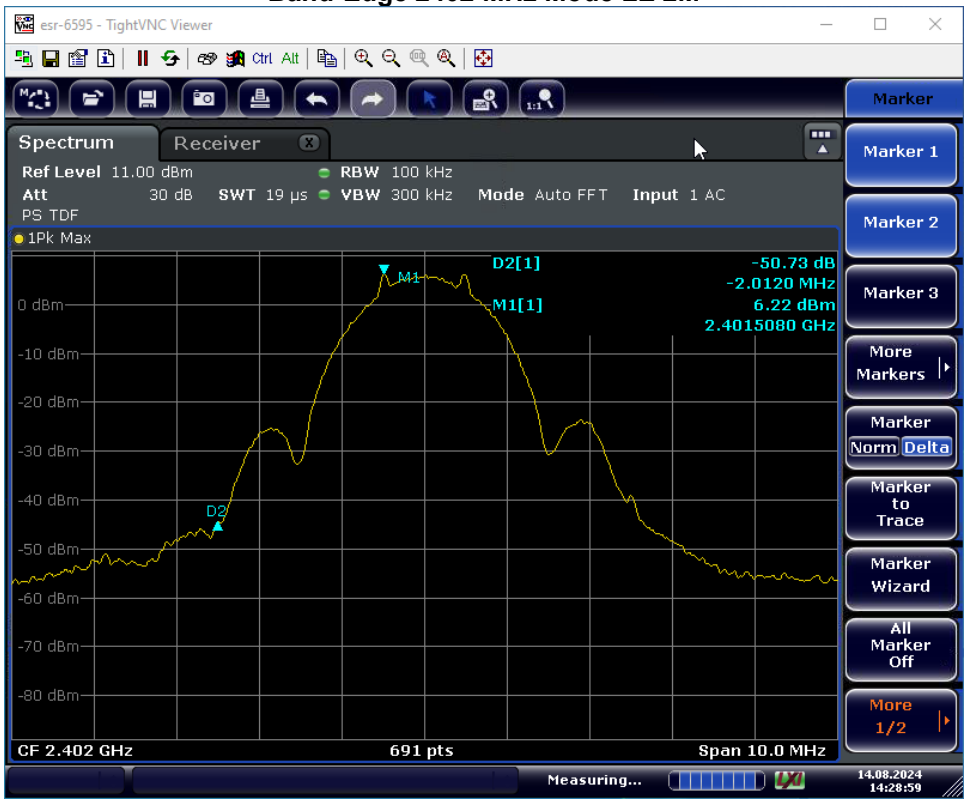
The band edge measurement was performed with the transmitter set separately at 2402MHz and 2480MHz in modes LE 1M and LE 2M. For each of the measurements the emissions were greater than 40dB below the peak of the signal.

Channel #	Center Frequency	Mode	Worst Case OOB Delta from Peak Fundamental (dBc)	Minimum Requirement (dB)	Margin (dB)
0	2402	LE 1M	-50.66	20	30.66
0	2402	LE 2M	-50.73	20	30.73
39	2480	LE 1M	-53.67	20	33.67
39	2480	LE 2M	-44.58	20	24.58

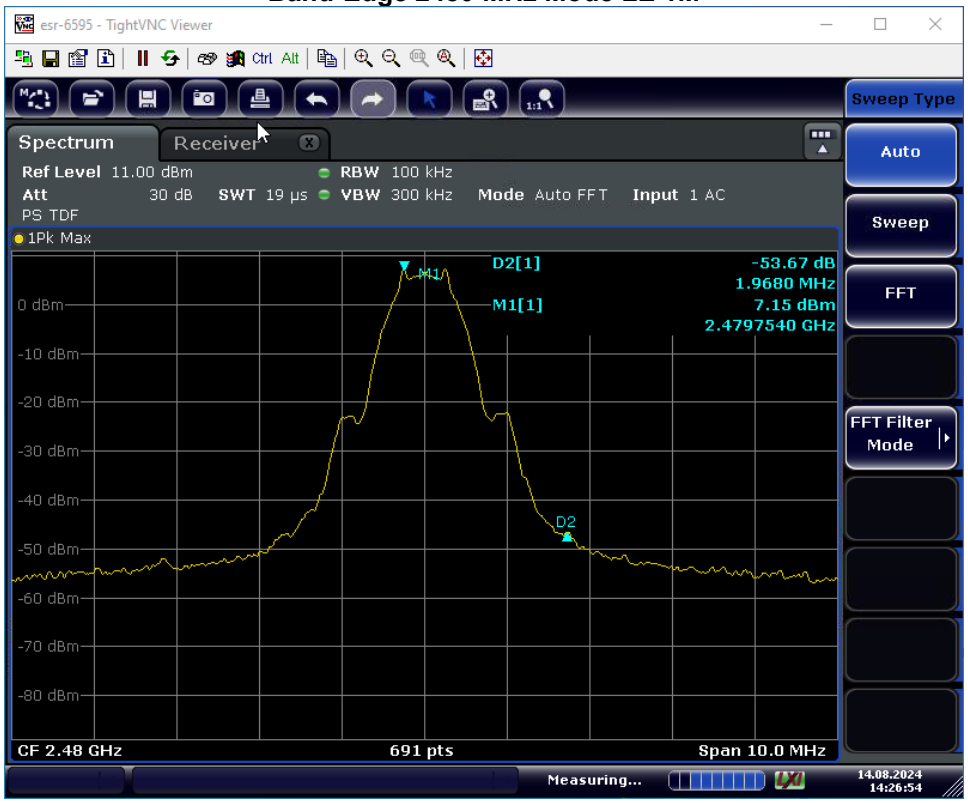
Band-Edge 2402 MHz Mode LE 1M



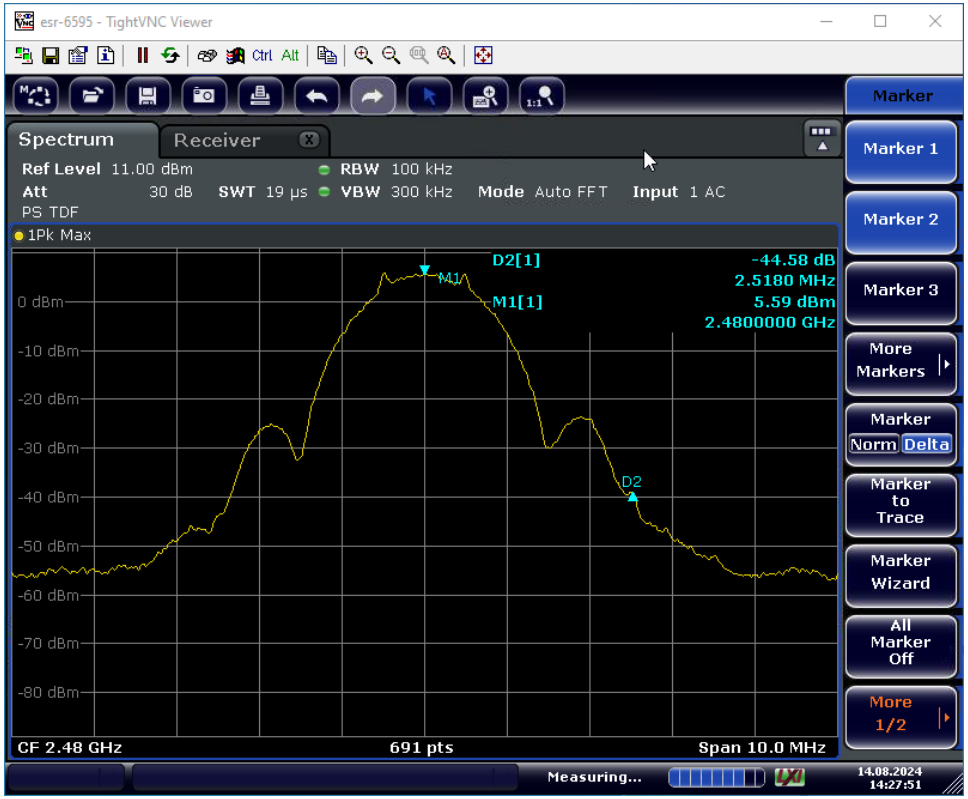
Band-Edge 2402 MHz Mode LE 2M



Band-Edge 2480 MHz Mode LE 1M



Band-Edge 2480 MHz Mode LE 2M



7. Restricted Band-Edge Measurement

Measurement Settings:
RBW:1MHz
VBW: 3x RBW
Sweep time: No faster than Coupled (auto) time
Detector: Peak and Average
Trace: Max Hold

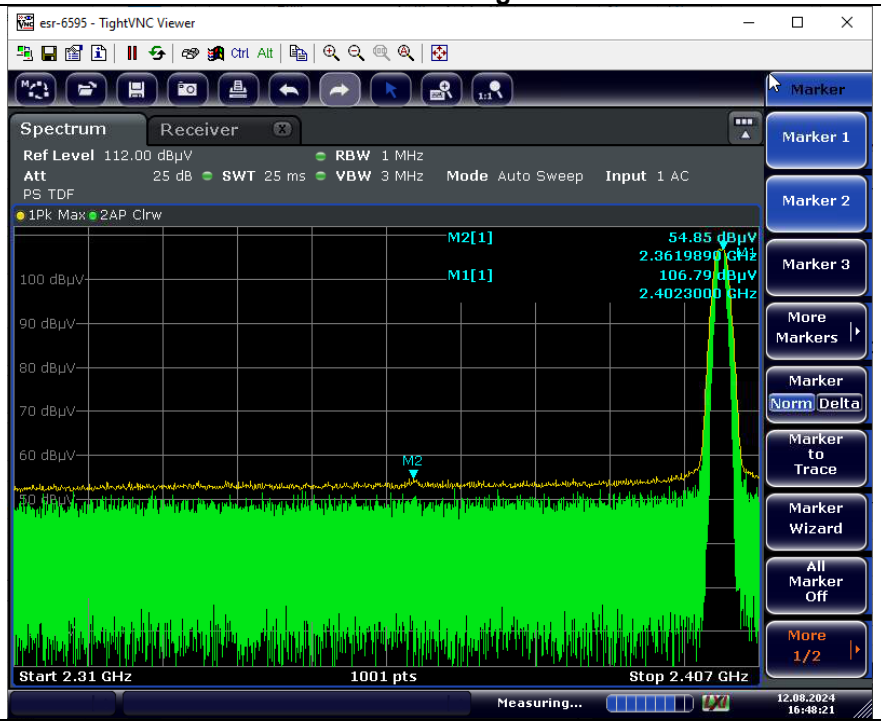
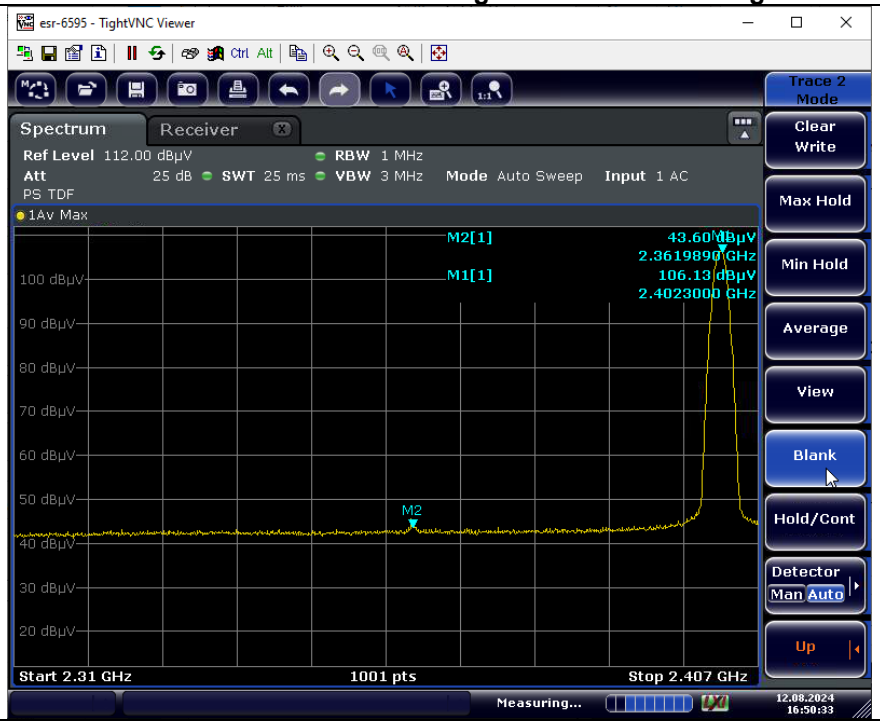
Per section 15.205 only spurious emissions are permitted in the frequency bands 2310-2390MHz and 2483.5-2500MHz and shall not exceed the limits shown in 15.209.

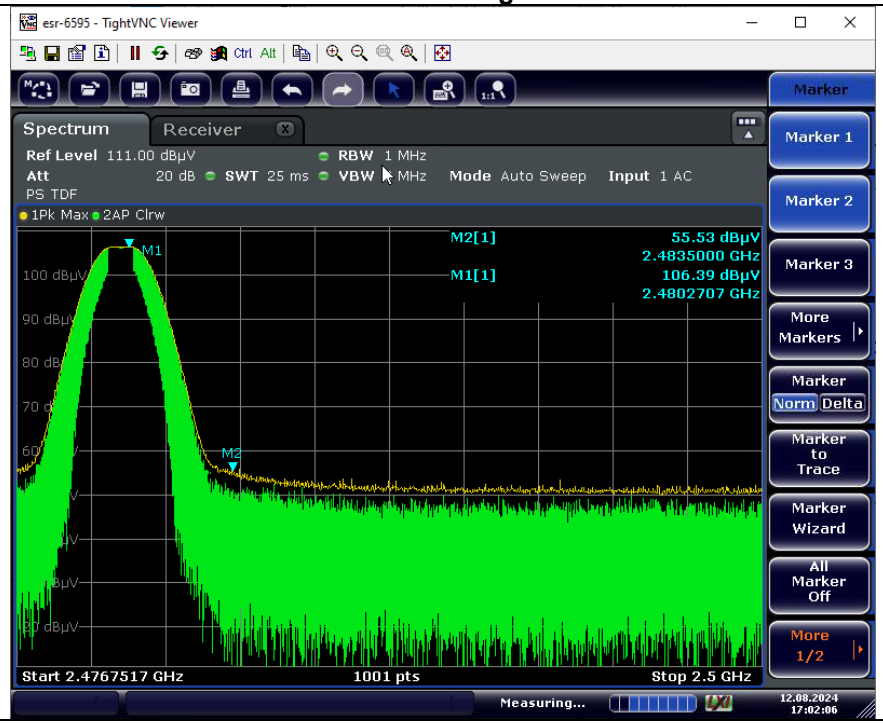
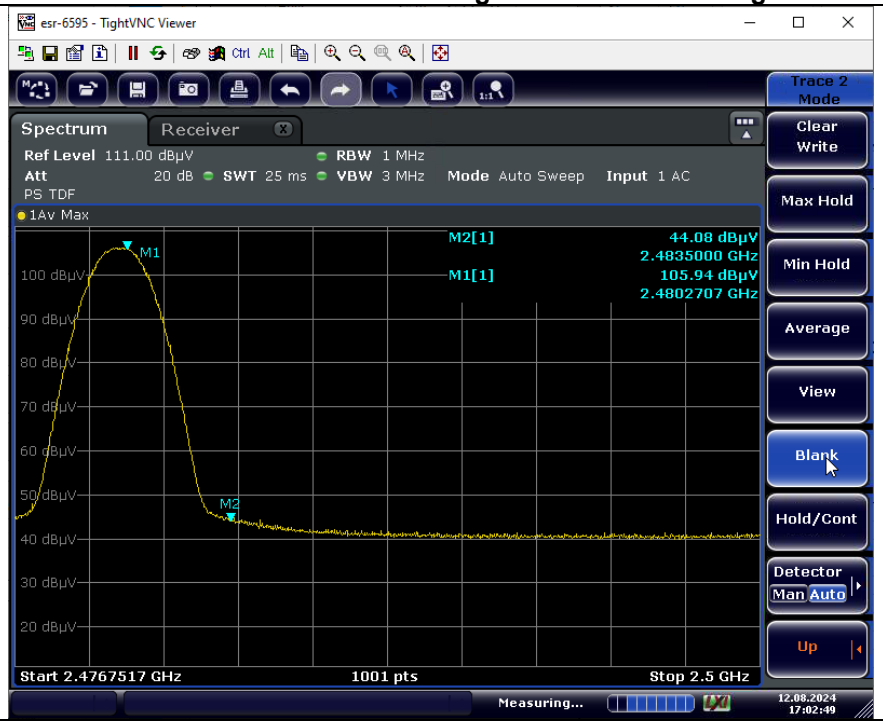
This measurement is a conducted measurement performed with a receiver. Prior to measurement the EUT is placed into a continuous transmit mode via a HCI cable attached to the EUT.

The restricted band edge measurement was performed with the transmitter set separately at 2402MHz and 2480MHz in modes LE 1M and LE 2M. For each of the measurements the emissions were below the limit.

Restricted Band-Edge Mode LE 1M

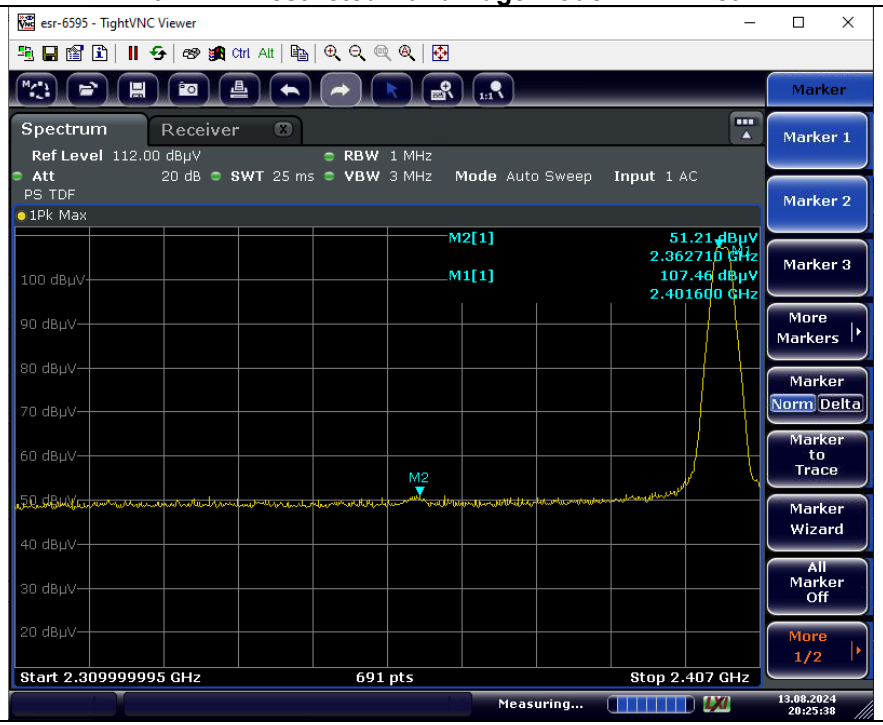
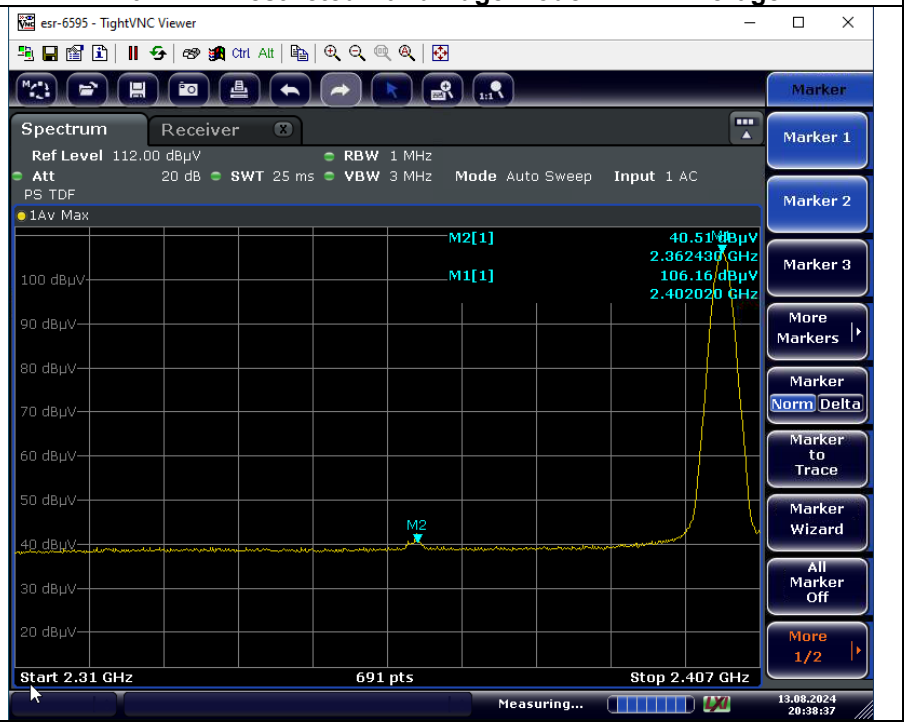
Measurement Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
2361.9	54.85	74	19.15	Peak
2361.9	43.6	54	10.4	Average
2483.5	55.53	74	18.47	Peak
2483.5	44.08	54	9.92	Average

2402 MHz Restricted Band Edge Mode LE 1M Peak	2402 MHz Restricted Band Edge Mode LE 1M Average
	

2480 MHz Restricted Band Edge Mode LE 1M Peak	2480 MHz Restricted Band Edge Mode LE 1M Average
	

Restricted Band Edge Measurement Mode LE 2M

Measurement Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
2362	51.21	74	22.79	Peak
2362	40.51	54	13.49	Average
2483.5	60.22	74	13.78	Peak
2483.5	45.36	54	8.64	Average

2402 MHz Restricted Band Edge Mode LE 2M Peak	2402 MHz Restricted Band Edge Mode LE 2M Average
	

2480 MHz Restricted Band Edge Mode LE 2M Peak	2480 MHz Restricted Band Edge Mode LE 2M Average