GENTEX CORPORATION

Technical Report to the FCC and ISED Regarding Gentex Corporation - Homelink© VI

Model: UAHL6A
FCC ID: NZLUAHL6A
ISED: 4112A-UAHL6A

Emission Designator: 1M04L1D
3/19/2025

A report concerning approval for Gentex Corporation Homelink® model UAHL6A
Please issue grant immediately upon review.

Measurements Made by:

Bolay Pacheco Digitally signed by Bolay Pacheco Date: 2025.03.27 09:35:24 -04'00'

Bolay Pacheco
Laboratory Validation Engineer III
Gentex Corporation

Report Prepared

Patricia Szeszulski Digitally signed by Patricia Szeszulski Date: 2025.03.27 09:39:40 -04'00'

Patricia Szeszulski
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Report Reviewed by:

Michael Foster Digitally signed by Michael Foster Date: 2025.03.27 16:32:37 -04'00'

Michael Foster
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Report Submitted by:

Brian Miller Digitally signed by Brian Miller Date: 2025.03.27 16:14:39 -04'00'

Brian Miller
Laboratory Group Leader – Regulatory II
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Report Approved by:

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Jason Vargo
Laboratory Manager I
Gentex Corporation

Test Report Revision

REV Number	Date	Author	Description
1.0	3/19/2025	Patricia Szeszulski	Initial Release

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 Gentex Corporation HomeLink® HLVI Universal Garage Door Opener is a low-power transceiver OEM device that is installed into the automotive rearview mirror. The installation is provided by trained technicians during the course of the manufacture of the automobile. It is powered by the 12 Volt system of the automobile.

This Universal Garage Door Opener has the capability to

1. Learn the frequency and bit code format of the user's existing garage door remote control devices
2. Transmit and receive frequency hopping spread spectrum in the 902 to 928 MHz band using an internal antenna as per Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15.247
3. Transmit and receive frequency digital transmission system in the 2402 to 2480MHz band using an internal antenna as per Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15.247.

The unit is designed for the periodic operation of a control signal, which typically activates a garage door opener receiver.

The unit is supplied to the automobile manufacturer without harness. For testing purposes, a typical assembly and 2-conductor cable harness were used to power to the unit.

The three-button HomeLink® unit replaces up to three hand-held transmitters. In addition to the typical operation of the garage door, the unit will learn the radio frequency codes of other transmitter types to activate entry door locks, estate gates, security systems, and home or office lighting.

The antenna system is an integral part of the unit. It cannot be altered nor replaced by the user. The service of this system is only available from the Automobile Manufacturer's Dealerships and Gentex Corporation.

1.2. Related Grants

This device will have functionality that is covered under 47 CFR 15.247, 15.231, and 15B and ISED Canada RSS-210 and RSS-247. The device will have a FCC ID # of NZLUAHL6A and an ISED ID # of 4112A-UAHL6A under both rule parts. Separate reports were submitted for functionality covered under other rule parts.

1.3. Test Methodology

Radiated Emissions testing was performed according to ANSI C63.10:2013. The power source for this product is a 12V automotive vehicle battery.

Conducted measurements were performed using a power supply.

Measurements were performed per FCC OET KDB 558074.

The unit is supplied to the automobile manufacturer without harness. For testing purposes, a 2-conductor cable harness was used to interface to the unit. The unit ground is provided through the negative terminal of the harness.

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.

2. Product Labeling

2.1. Identifiers

The FCC Identifier assigned is FCC ID: NZLUAHL6A. The ISED certification number is 4112A-UAHL6A. These identifiers will be labeled on the product housing.

The label will be placed on the exterior of the HL housing using laser etching that will permanently affix the label.

Because of the small size of the device and because the installation is inside a portion of the automobile, 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. 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.

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. The harness was run down the edge of the test table to a power supply beneath the turntable

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 12V battery.

5. Emissions Data

5.1. Date(s) Tested: 3/10/2025-3/17/2025

5.2. Test Method Deviations: None

5.3. Temperature and Humidity conditions

	Measured Value	Unit
Temperature	19.6-20.6	ºC
Humidity	39.9-42.3	%R.H.

5.4. Summary of Results (Part 15.247)

Measurement		Margin (dB)	Frequency (MHz)
Worst Case Spurious Emission	53.45 dBuV/m	0.55	17360 MHz
Maximum Peak Conducted Output Power	6.61 dBm	23.39	-
Minimum 6dB Bandwidth	680 kHz	180 kHz	-
Maximum 99% bandwidth	1042.5 kHz	-	-
Maximum Power Spectral Density	3.57 dBm	4.43	-

- **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

5.5. Test Equipment Setup and Procedure

5.5.1. Sample(s) Used for Measurements

Sample ID(s):	905-7067-154280-1, 905-7067-154281-1

5.5.2. Test Equipment

Equipment used			
ID / Serial #	**Manufacturer**	**Description**	**Cal / PM Due Date**
6595	Rohde and Schwarz	EMI Receiver (Firmware Version: 3.66 SP1)	11/19/2025
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	6/30/2025
7187	Omega	iBTHX-W Virtual	9/24/2025
HL5 Transceiver-GCL	Gentex	Default Receiver	VBU
6539	Stanley	Tape Measure	6/19/2026
2039	87V	Multimeter	6/27/2025
S/N:419726	AIM TTI	PL303-P	VBU
S/N:2053240	Miteq	AMF-4D-00501800-24-10P	12/31/2025
SW30	Gentex	3m Chamber Software	3/31/2025
SW48	Gentex	Gentex Emissions Measurement Software	3/31/2025
CBL146	Megaphase	Cable	10/31/2025
CBL 149	Megaphase	cable	10/31/2025
2069595	Miteq	Amplifier	10/31/2025
FLT009	Mini-Circuits	ZHFG-K4000+, 4500 MHz High Pass Filter, DC - 18GHz	11/1/2025
CBL 119	Megaphase	KB18-N1S1-36	4/30/2025
AT55	Pasternack	7094-10	1/31/2026

5.5.3. 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. The 2-

conductor harness was routed down the edge of the test table to a power supply beneath the turntable.

Equipment is placed in one of the three orthogonal orientations, End, side, and flat. These orientations are described below in figure 6.2.3.

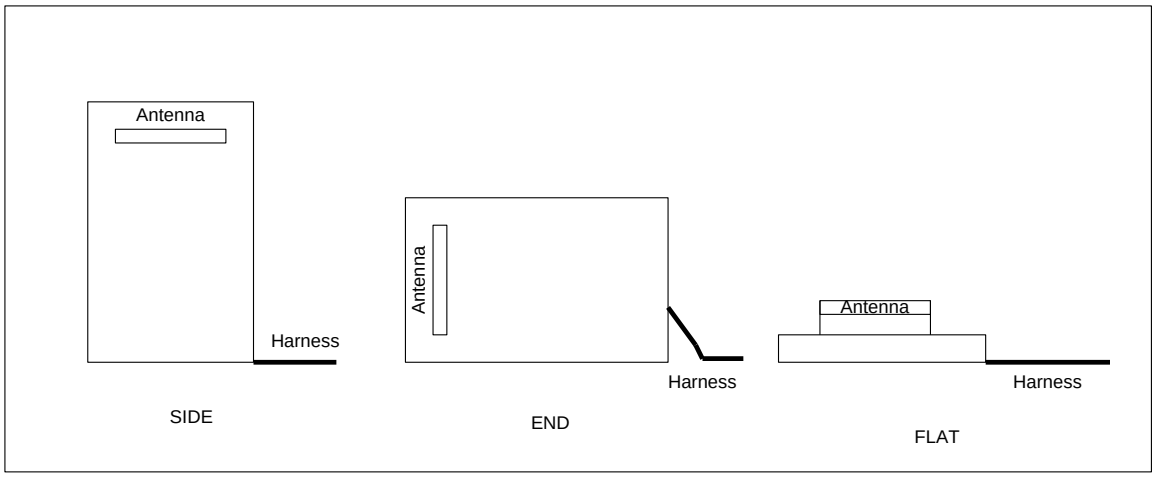


Figure 6.2.3 EUT Orthogonal Orientations

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 the in-vehicle position only.

5.6. Measured Data – See Appendix A

6. Formulas and Sample Calculations

6.1. Calculation of ISED Limits from RSS-247and 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

7. Antenna Gain

Antenna gain was calculated by taking the maximum EIRP and subtracting the peak conducted output power in dBm at a given frequency. EIRP was calculated from the max filed strength values at 3m using equation 1 below. Max field strength values in dBuV/m were taken from the fundamental emission measurements in section A.1 and conducted Output power values in dBm were taken from section B.3. Measurement settings can also be referenced in those sections.

1. EIRP(dBm) = Power Received (dBuV/m) +20*Log(d in meters) – 104.77

Frequency (MHz)	Max Field Strength at 3m (dBuV)	Max Field Strength Converted to EIRP (dBm)	Conducted Output Power (dBm)	Antenna Gain (dBi)
2402	97.29	2.062425094	5.82	-3.757574906
2440	96.65	1.422425094	6.27	-4.847574906
2480	97.57	2.342425094	6.61	-4.267574906

*Cable corrections were taken into account using the measurement receiver.

8. Power Targets

Frequency (MHz)	Memory Map Value (decimal)
2402-2480	80

Appendix A

A. Radiated Measurements

1. TX Measurements

Measurement Settings:
Measurement Frequency: Below 1GHz
Span: 500kHz or greater
RBW: 100/120kHz
VBW: 300kHz or 3 x RBW
Sweep Time: 25ms
Attenuation: Auto
Measurement Frequency: Above 1GHz
Span: 500kHz or greater
RBW: 1MHz
VBW: 3MHz or 3 x RBW
Sweep Time: 25ms
Attenuation: Auto

This measurement is a radiated measurement performed with a receiver. Prior to measurement the EUT is placed into a continuous transmit mode with 100% duty cycle via a communications board attached to the EUT.

i. DUT Transmitting at 2402MHz (Fundamental)

Peak/Average Measurement - 2402MHz

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	Side	H	97.29	127.3	30.01	95.06	-	-
4804	Side	H	50.94	74.0	23.06	40.12	54.0	13.88
7206	Side	V	56.72	74.0	17.28	45.43	54.0	8.57
9608	Side	H	56.29	74.0	17.71	44.12	54.0	9.88
12010	Side	V	60.46	74.0	13.54	48.56	54.0	5.44
14412	Side	V	61.51	74.0	12.49	49.62	54.0	4.38
16814	Side	V	64.28	74.0	**9.72**	52.36	54.0	**1.64**
19216	Side	V	45.32	74.0	28.68	33.54	54.0	20.46
21618	Side	V	41.57	74.0	32.43	32.14	54.0	21.86
24020	Side	H	44.21	74.0	29.79	33.44	54.0	20.56

ii. DUT Transmitting at 2440MHz (Fundamental)

Peak/Average Measurement - 2440MHz

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	Side	H	96.65	127.3	30.65	95.8	-	-
4880	Side	H	50.6	74.0	23.40	40.16	54.0	13.84
7320	Side	H	54.19	74.0	19.81	41.97	54.0	12.03
9760	Side	H	57.43	74.0	16.57	44.13	54.0	9.87
12200	Side	V	61.08	74.0	12.92	48.37	54.0	5.63
14640	Side	V	63.97	74.0	10.03	51.61	54.0	2.39
17080	Side	H	65.19	74.0	**8.81**	52.13	54.0	**1.87**
19520	Side	H	45.12	74.0	28.88	32.54	54.0	21.46
21960	Side	H	41.02	74.0	32.98	31.47	54.0	22.53
24400	Side	V	43.22	74.0	30.78	32.14	54.0	21.86

iii. DUT Transmitting at 2480MHz (Fundamental)

Peak/Average Measurement - 2480MHz

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	97.57	127.3	29.73	95.18	-	-
4960	Side	H	50.14	74.0	23.86	39.7	54.0	14.30
7440	Side	V	56.05	74.0	17.95	44.33	54.0	9.67
9920	Side	V	57.22	74.0	16.78	44.7	54.0	9.30
12400	Side	H	61.66	74.0	12.34	49.39	54.0	4.61
14880	Side	V	65.42	74.0	8.58	53.18	54.0	0.82
17360	Side	V	66.78	74.0	**7.22**	53.45	54.0	**0.55**
19840	Side	H	44.23	74.0	29.77	30.487	54.0	23.51
22320	Side	V	42.56	74.0	31.44	31.78	54.0	22.22
24800	Side	V	45.07	74.0	28.93	33.07	54.0	20.93

2. Restricted Band-Edge Measurement

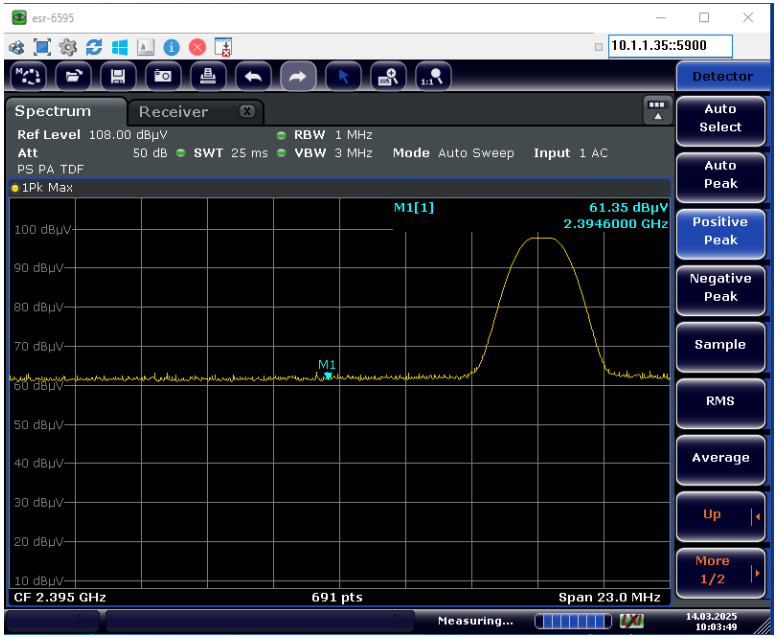
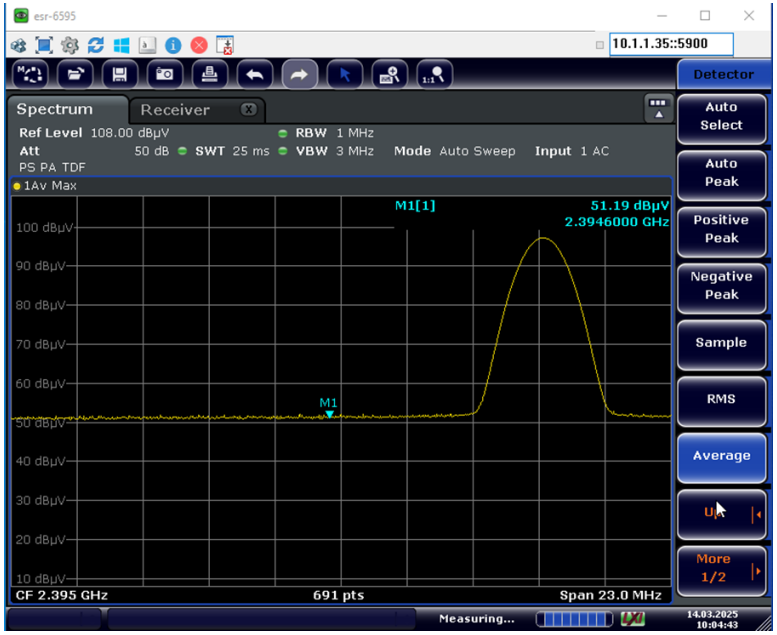
Measurement Settings:
RBW:1MHz
VBW: 3x RBW
Sweep time: No faster than Coupled (auto) time
Detector: Peak and Average
Trace: Max Hold

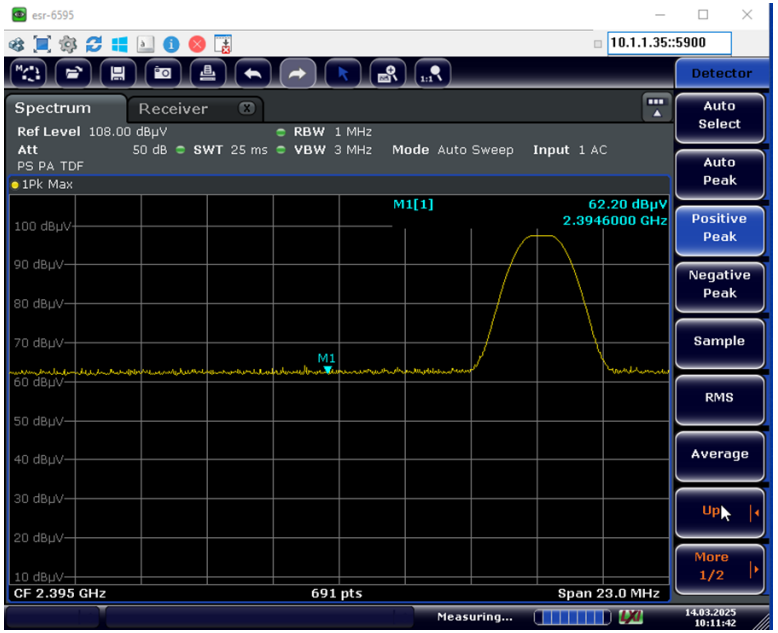
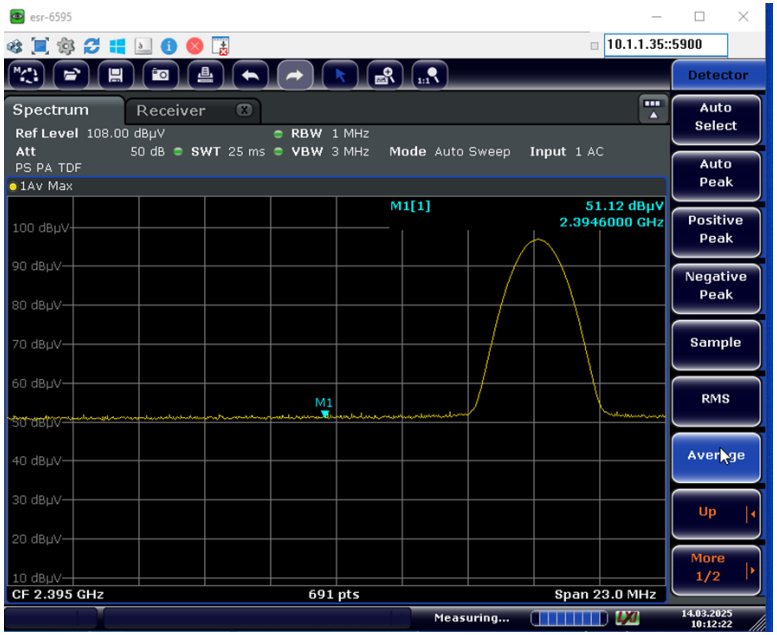
Per section 15.205 only spurious emissions are permitted in the frequency bands 2310-2390MHz and 2483.5-2500MHz and shall not exceed the limits shown in 15.209.

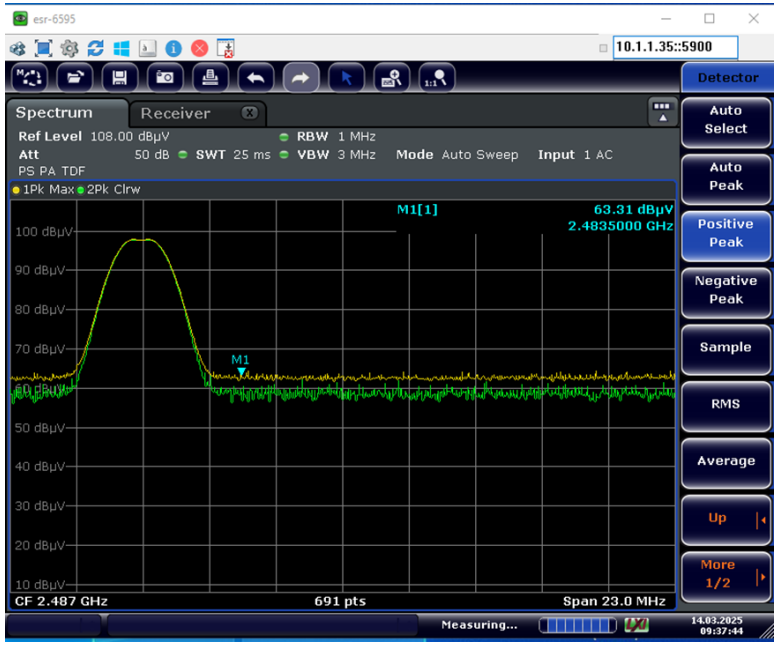
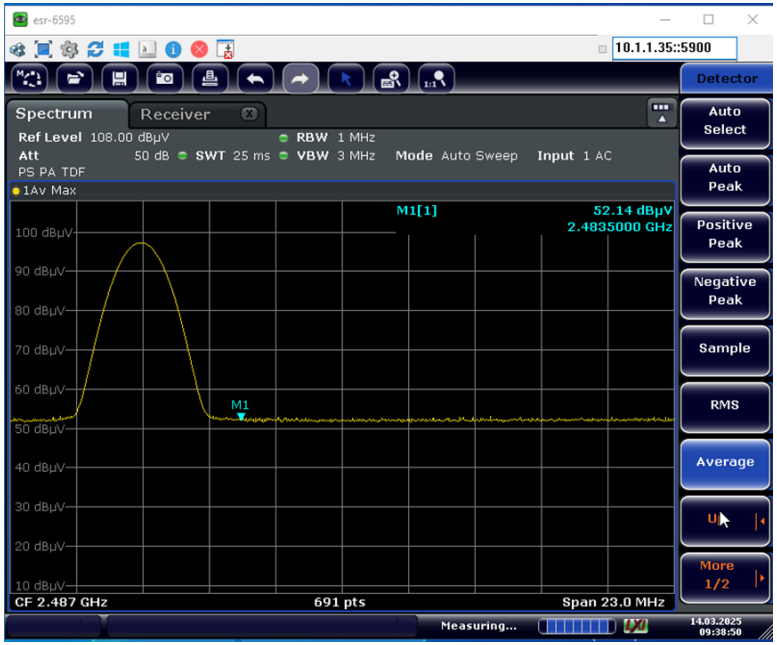
This measurement is a conducted measurement performed with a receiver. Prior to measurement the EUT is placed into a continuous transmit mode via a communications board attached to the EUT.

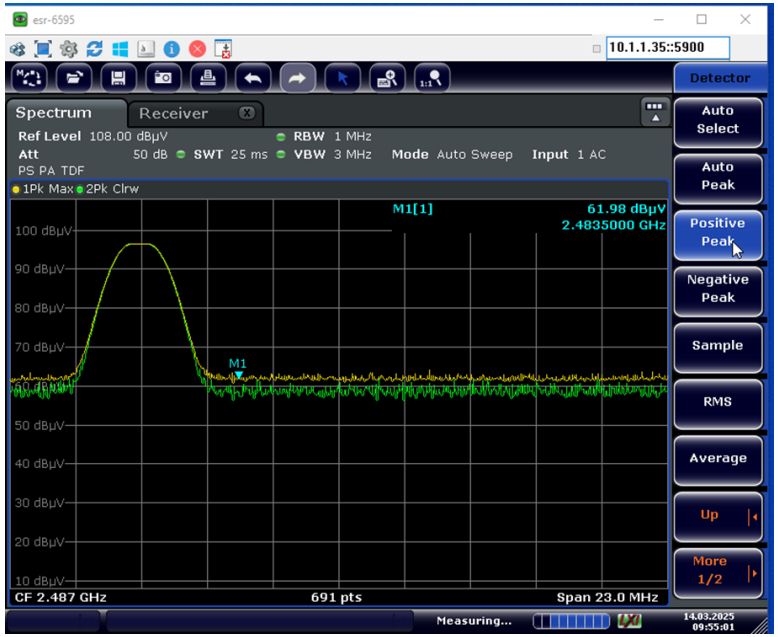
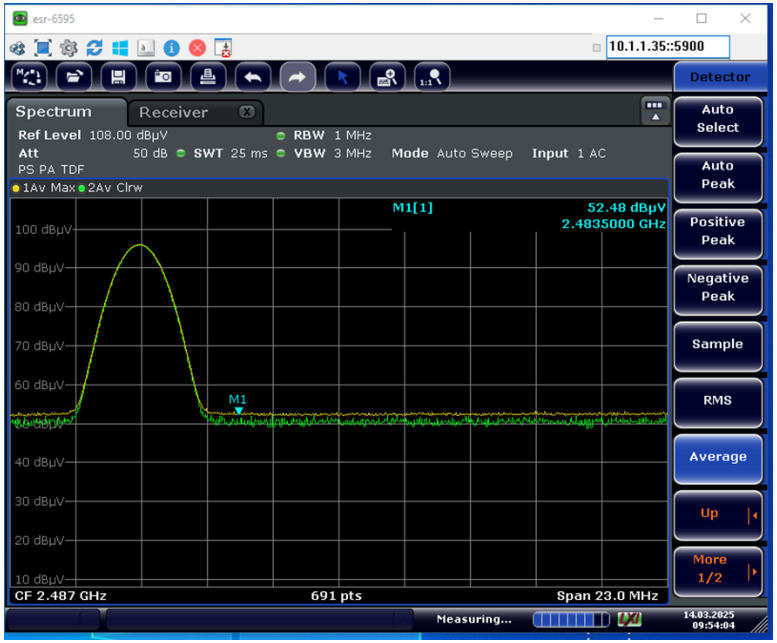
The restricted band edge measurement was performed with the transmitter set separately at 2402MHz and 2480MHz. For each of the measurements the emissions were below the limit

Measurement Frequency	Antenna Polarization	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
2394.6	Horizontal	61.35	74	12.65	Peak
2394.6	Horizontal	51.19	54	2.81	Average
2394.6	Vertical	62.2	74	11.8	Peak
2394.6	Vertical	51.12	54	2.88	Average
2483.5	Horizontal	63.31	74	10.69	Peak
2483.5	Horizontal	52.14	54	1.86	Average
2483.5	Vertical	61.98	74	12.02	Peak
2483.5	Vertical	52.48	54	1.52	Average

2402 MHz Peak Horizontal	2402 MHz Average Horizontal
	

2402 MHz Peak Vertical	2402 MHz Average Vertical
	

2480 MHz Peak Horizontal	2480 MHz Average Horizontal
	

2480 MHz Peak Vertical	2480 MHz Average Vertical
	

B. Conducted Emissions

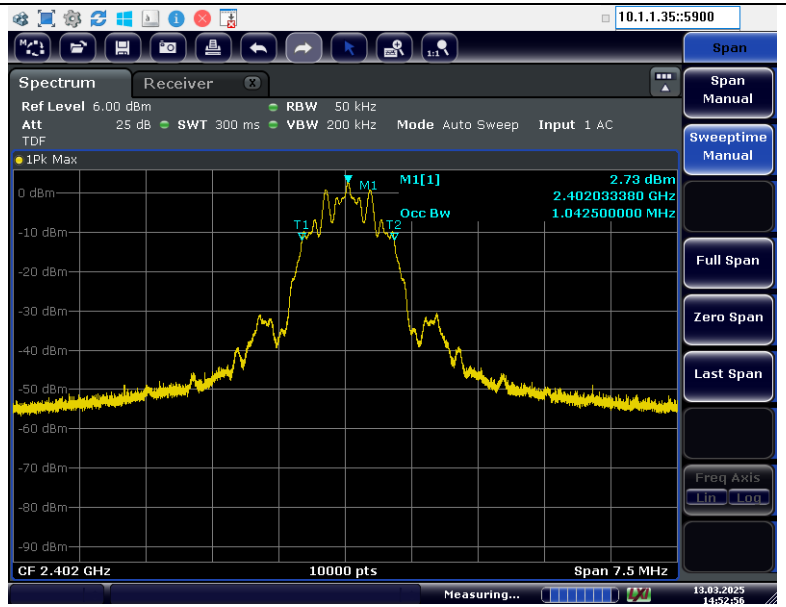
1. 99% Bandwidth

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 a communications board attached to the EUT.

In the measurement of the 99% bandwidth, the transmit frequency was set to the low, middle, and high channels of operation.

Channel	99% BW (kHz)
Low	1042.5
Mid	1039.5
High	1040

2402 MHz	2440 MHz
	

2480 MHz

10.1.1.35::5900
Frequency
Spectrum
Receiver
Ref Level 6.00 dBm
RBW 50 kHz
Att 25 dB
SWT 300 ms
VBW 200 kHz
Mode Auto Sweep
Input 1 AC
TDF
1Pk Max
M1
M1[1]
3.53 dBm
2.480022880 GHz
1.040250000 MHz
Occ Bw
T1
T2
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.48 GHz
10000 pts
Span 7.5 MHz
Center
CF-Stepsize
Start
Stop
Frequency Offset
Measuring...
13.03.2025
14:54:52

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 a communication board attached to the EUT.

In the measurement of the 6dB bandwidth, the transmit frequency was set to low, middle, and high channels of operation.

Channel #	Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)
0	2402	680	>500
19	2440	680	>500
39	2480	680	>500

2402 MHz	2440 MHz

2480 MHz

10.1.1.35::5900
Marker Function
Spectrum
Receiver
Ref Level 8.00 dBm
RBW 100 kHz
Att 25 dB
SWT 18.9 µs
VBW 300 kHz
Mode Auto FFT
Input 1 AC
TDF
1Pk Max
T1
M1
T2
M1[1]
3.63 dBm
2.48002250 GHz
ndB 6.00 dB
Bw 680.000000000 kHz
Q factor 3647.1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
1000 pts
Span 5.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.4800225 GHz 3.63 dBm ndB down 680.0 kHz
T1 1 2.4796825 GHz -2.49 dBm ndB 6.00 dB
T2 1 2.4803625 GHz -2.44 dBm Q factor 3647.1
Select Marker (M1)
Signal Count
Noise Meas
On Off
Phase Noise
Ref Fixed
Marker Demod
n dB down
Marker Peak List
Band Power
Measuring...
13.03.2025
14:57:46

3. Peak Output Power

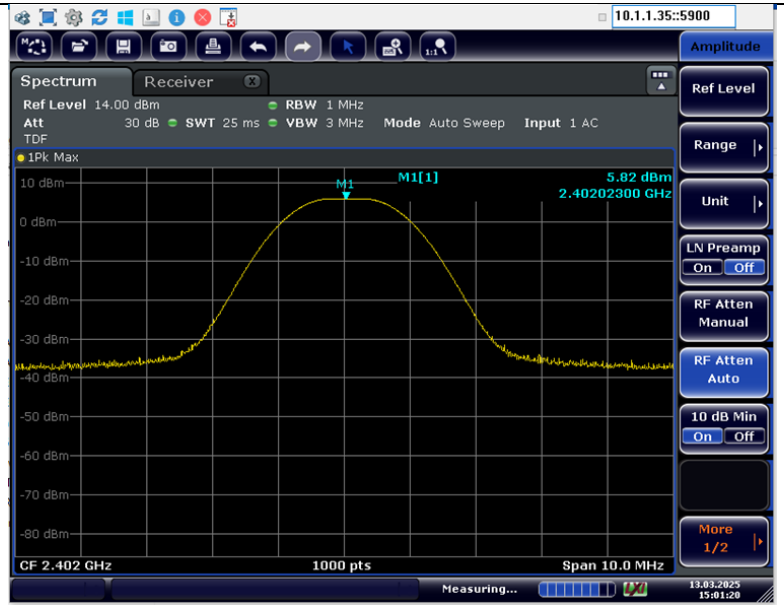
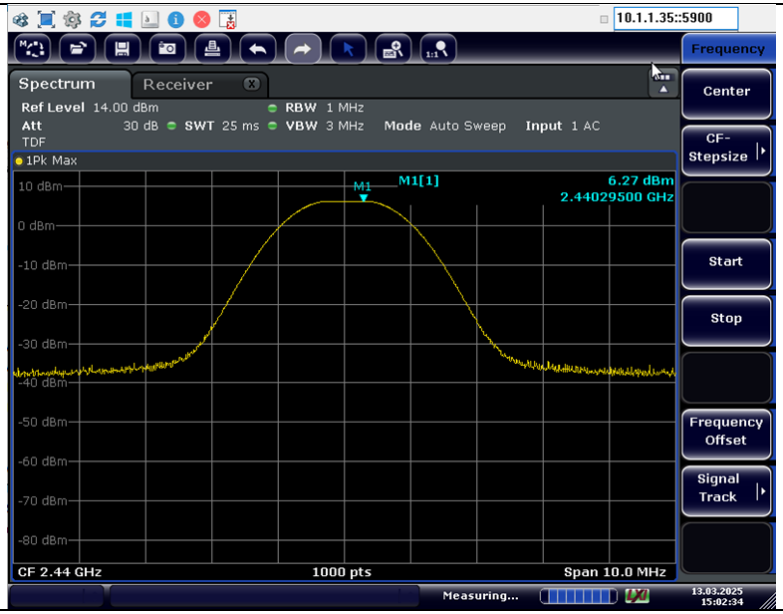
Measurement Settings:
RBW: Greater than the worst case DTS occupied bandwidth
VBW: Equal to or greater than 3 times the RBW
Span: Equal to or greater than 3 times the RBW
Sweep time no faster than coupled (auto) time
Detector: Peak

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

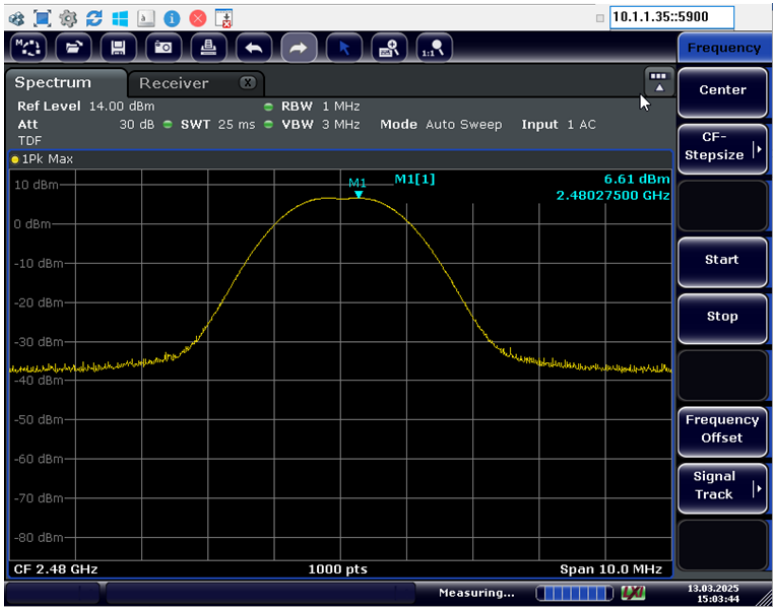
This measurement is a conducted measurement performed with the receiver per test method ANSI C63.10 section 11.9. Prior to measurement the EUT is placed into a continuous transmit mode via a communications board attached to the EUT.

In the measurement of the Peak Output Power, the transmit frequency was set to low, middle, and high channels of operation.

Channel #	Frequency (MHz)	Power Output (dBm)	Limit (dBm)	Result
0	2402	5.82	30	24.18
19	2440	6.27	30	23.73
39	2480	6.61	30	23.39

2402 MHz	2440 MHz
	

2480 MHz


10.1.1.35::5900
Frequency
Spectrum
Receiver
Ref Level 14.00 dBm
RBW 1 MHz
Att 30 dB
SWT 25 ms
VBW 3 MHz
Mode Auto Sweep
Input 1 AC
TDF
1Pk Max
M1
M1[1]
6.61 dBm
2.48027500 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
1000 pts
Span 10.0 MHz
Center
CF-Stepsize
Start
Stop
Frequency Offset
Signal Track
Measuring...
13.03.2025
15:03:44

4. Power Spectral Density

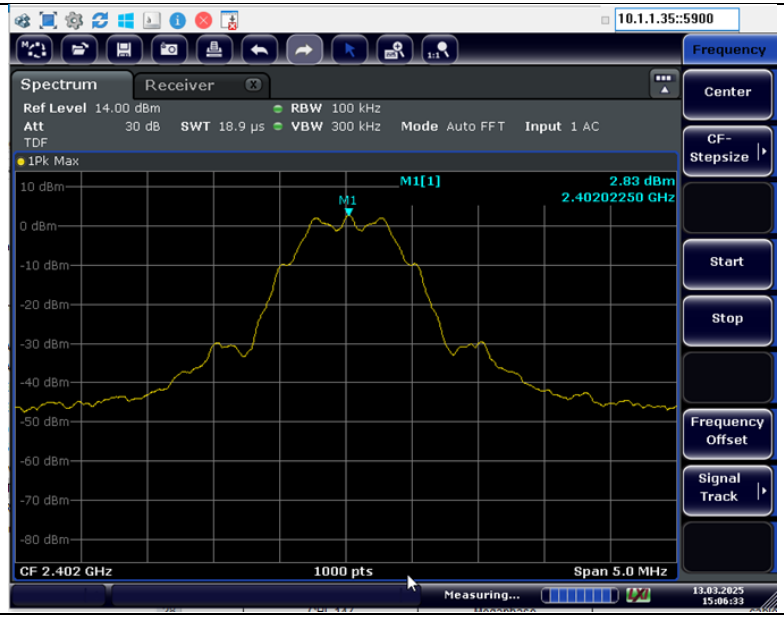
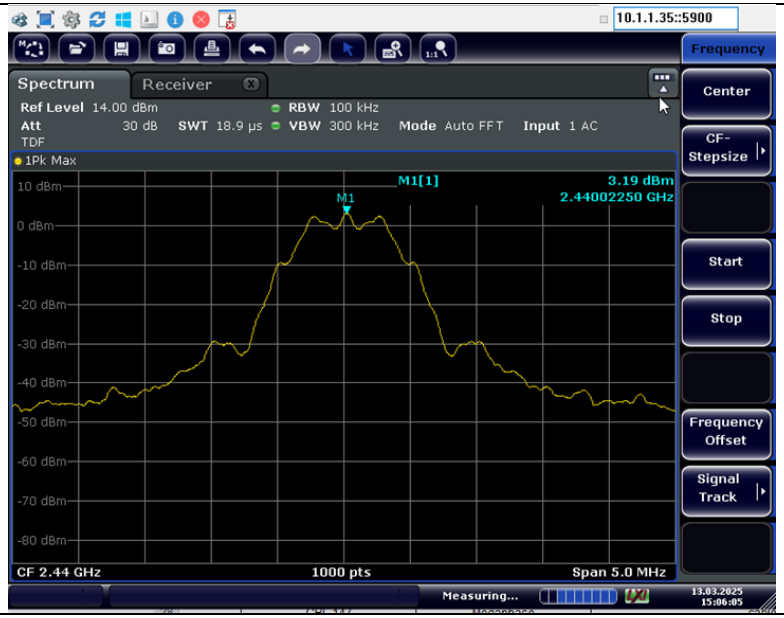
Measurement Settings:
Span: Greater than 1.5 times the DTS bandwidth
RBW: set to between 3kHz and 100kHz
VBW: Equal to or greater than 3 times the RBW
Sweep time: No faster than the coupled (auto) time
Detector: Peak
Trace mode: Max hold

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.

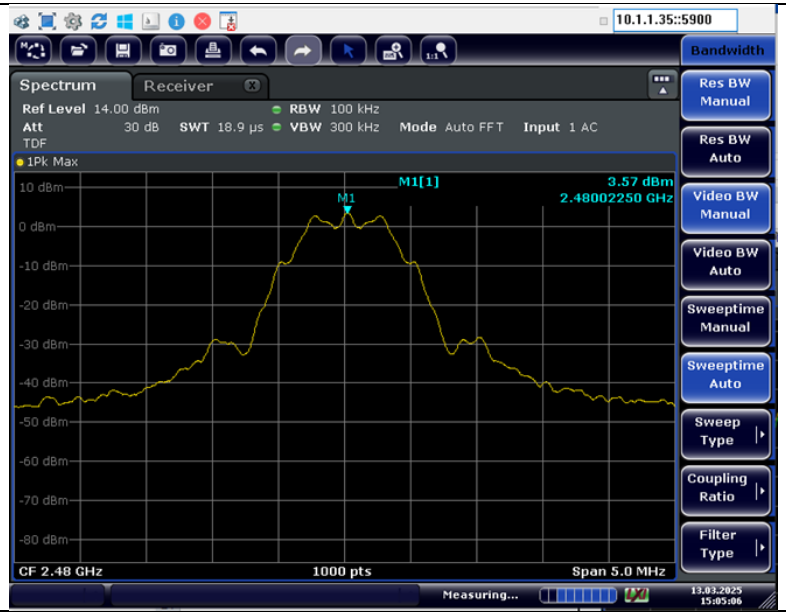
This measurement is a conducted measurement performed with the receiver per test method ANSI C63.10 section 11.10. Prior to measurement the EUT is placed into a continuous transmit mode via communications board attached to the EUT.

In the measurement of the power spectral density, the transmit frequency was set to low, middle, and high channels of operation.

Channel #	Frequency (MHz)	Measurement PPSD (dBm)	Limit (dBm)	Result
0	2402	2.83	8	5.17
19	2440	3.19	8	4.81
39	2480	3.57	8	4.43

2402 MHz	2440MHz
	

2480 MHz


10.1.1.35::5900
Bandwidth
Spectrum
Receiver
Ref Level 14.00 dBm
RBW 100 kHz
Att 30 dB
SWT 18.9 µs
VBW 300 kHz
Mode Auto FFT
Input 1 AC
TDF
1Pk Max
M1[1]
3.57 dBm
2.48002250 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
1000 pts
Span 5.0 MHz
Res BW Manual
Res BW Auto
Video BW Manual
Video BW Auto
Sweeptime Manual
Sweeptime Auto
Sweep Type
Coupling Ratio
Filter Type
Measuring...
13.03.2025
15:05:06

5. Conducted Emissions Sweep – 30MHz to 25GHz

Sweep 1: Peak - 100 kHz
Segment: 1
Start Frequency: 30 MHz
End Frequency: 1000 MHz
Band: Band 1
Detector: Peak
Sweep Mode: FFT
Attenuator: 5 dB
Pre-Amp: On
Max Hold Trace Mode: Off
Bandwidth Filter: EMI (6dB)
RBW: 100 kHz
Step Size: AUTO (25 kHz)
Dwell Time: 10ms
Notch Filter (2.4 - 2.5 GHz): Disabled
Notch Filter (5.725 - 5.875 GHz): Disabled

Sweep 1: Peak - 100 kHz
Segment: 2
Start Frequency: 1000 MHz
End Frequency: 4000 MHz
Band: Band 2
Detector: Peak
Sweep Mode: FFT
Attenuator: 10 dB
Pre-Amp: On
Max Hold Trace Mode: Off
Bandwidth Filter: EMI (6dB)
RBW: 100 kHz
Step Size: AUTO (25 kHz)
Dwell Time: 10ms
Notch Filter (2.4 - 2.5 GHz): Disabled
Notch Filter (5.725 - 5.875 GHz): Disabled

Sweep 1: Peak - 100 kHz
Segment: 3
Start Frequency: 4000 MHz
End Frequency: 18000 MHz
Band: Band 3
Detector: Peak
Sweep Mode: FFT
Attenuator: 5 dB
Pre-Amp: On
Max Hold Trace Mode: Off
Bandwidth Filter: EMI (6dB)
RBW: 100 kHz
Step Size: AUTO (25 kHz)
Dwell Time: 10ms
Notch Filter (2.4 - 2.5 GHz): Disabled
Notch Filter (5.725 - 5.875 GHz): Disabled

Sweep 1: Peak - 100 kHz
Segment: 4
Start Frequency: 18000 MHz
End Frequency: 26000 MHz
Band: Band 4
Detector: Peak
Sweep Mode: FFT
Attenuator: 5 dB
Pre-Amp: On
Max Hold Trace Mode: Off
Bandwidth Filter: EMI (6dB)
RBW: 100 kHz
Step Size: AUTO (25 kHz)
Dwell Time: 10ms
Notch Filter (2.4 - 2.5 GHz): Disabled
Notch Filter (5.725 - 5.875 GHz): Disabled

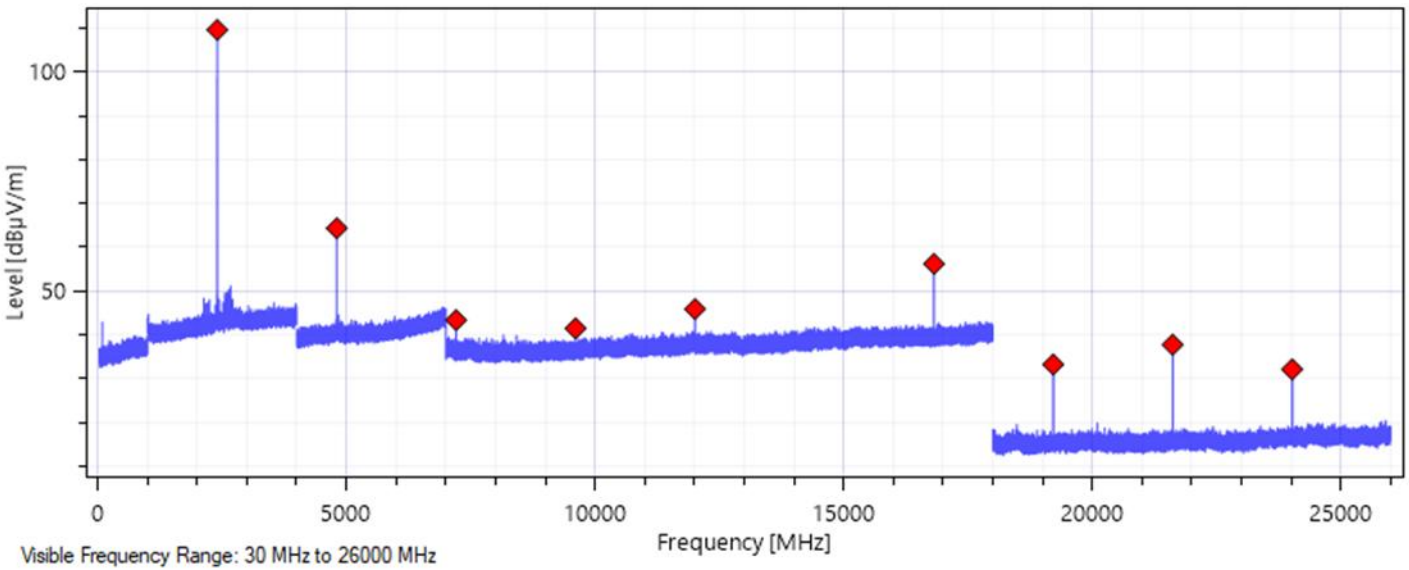
Per section 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the 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 communications board attached to the EUT.

The band edge measurement was performed with the transmitter set separately at the low, mid, and high channel of operation. For each of the measurements the emissions were at 20dB below the peak of the signal.

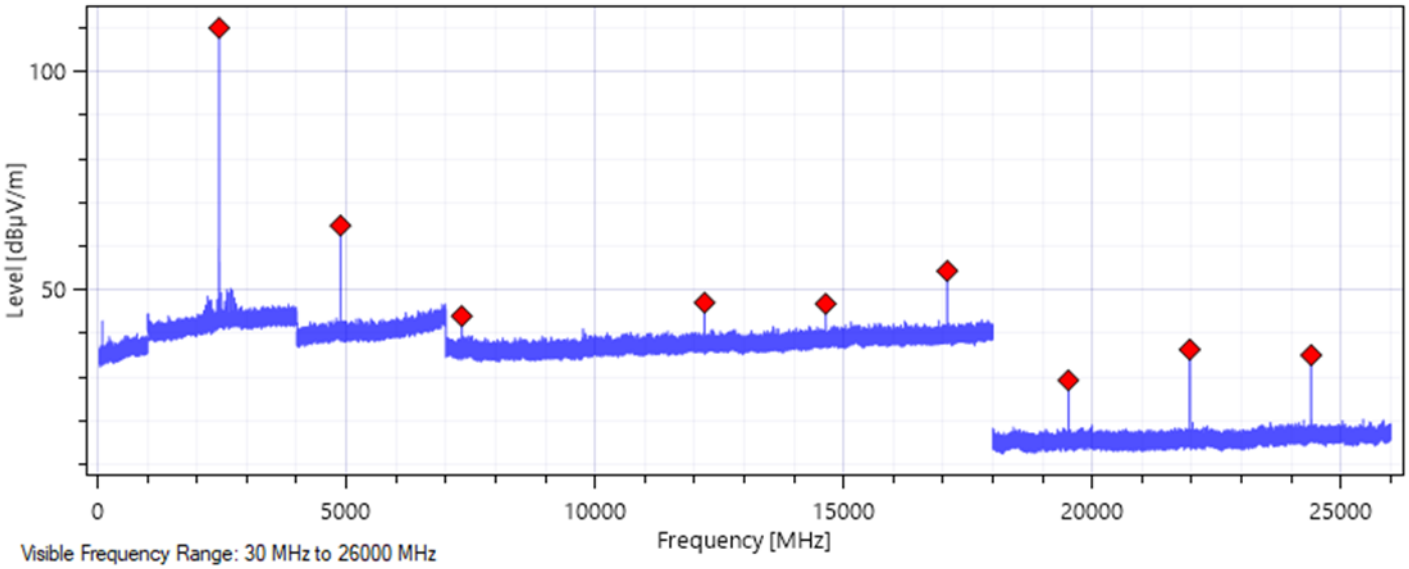
Channel	Worse-Case Delta - (dB)	Limit (dB)
Low	45.274	20
Mid	45.335	
High	45.125	

2402 MHz



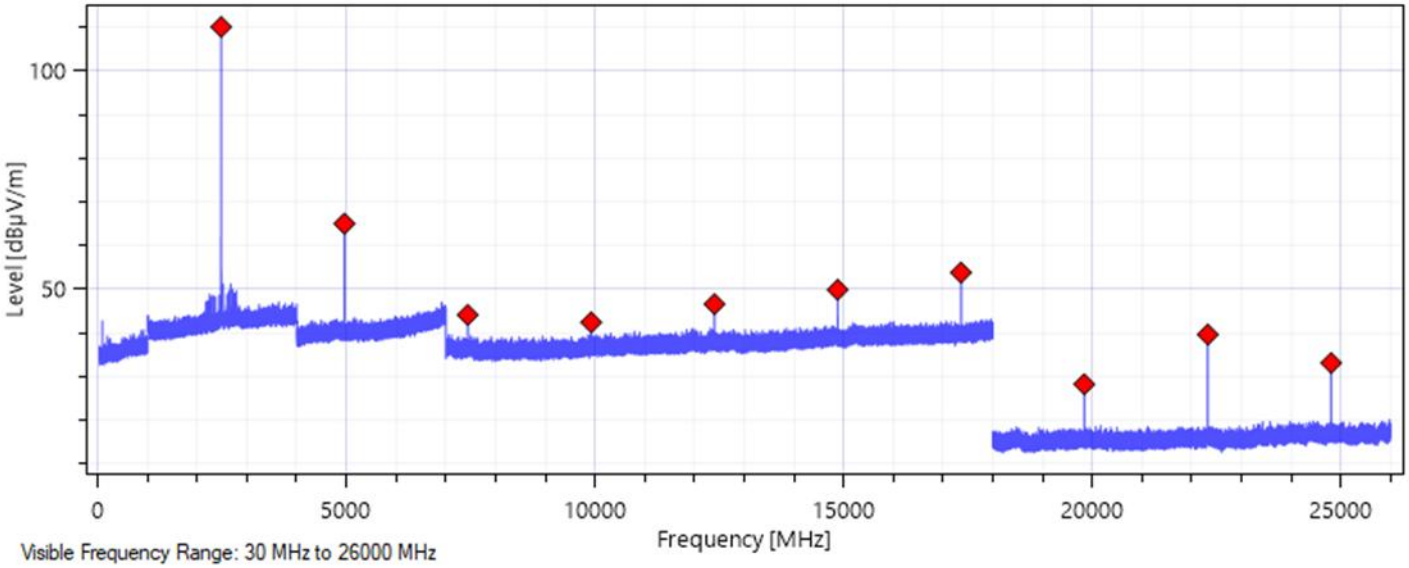
Frequency (MHz)	Level (dBµV/m)
2,402.025000	109.636
4,804.550000	64.362
7,205.325000	43.378
9,607.100000	41.478
12,011.375000	45.893
16,815.925000	56.206
19,214.200000	33.241
21,615.975000	37.761
24,017.750000	32.13

2440 MHz



Frequency (MHz)	Level (dBµV/m)
2,440.025000	110.112
4,880.550000	64.777
7,319.300000	44.005
12,201.375000	47.102
14,638.650000	46.826
17,081.925000	54.372
19,518.200000	29.286
21,957.975000	36.331
24,402.750000	35.06

2480 MHz



Frequency (MHz)	Level (dBµV/m)
2,480.025000	110.178
4,959.550000	65.053
7,439.325000	44.142
9,921.100000	42.46
12,401.375000	46.61
14,878.650000	49.921
17,358.425000	53.862
19,838.200000	28.276
22,322.475000	39.651
24,802.750000	33.129