



**Technical Report to the FCC
Gentex Corporation**

**Model: UAHLCD
FCC ID: NZLUAHLCD
ISED: 4112A-UAHLCD**

3/2/21

A report concerning approval for Gentex Corporation model UAHLCD
Please issue grant immediately upon review.

Measurements Made by:

Measurements Reviewed by:

Bolay Pannell
Senior EMC Test Engineer
Gentex Corporation

Dan Brasier
Corporate Labs Development Engineer
Gentex Corporation

Report Prepared, Approved, and Submitted by:

Brian Miller
Corporate Labs Group Leader – Wireless Regulatory
Gentex Corporation

Test Report Revision

REV Number	Date	Author	Description
1.0	2/22/21	Brian Miller	Initial Release.
2.0	3/2/21	Brian Miller	This is an amendment to the FCC Report Form for Part 15 Intermodulation Spurious Emissions.pdf report for EMC2020-06997 dated 2/22/21. Alterations were made on 3/2/21 to include limit lines on the sweep graphs.

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 Bluetooth and HomeLink OEM device that is installed into the automobile 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.

The unit is designed for the periodic operation as a toll module.

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 unit is only operational when interrogated by a reader operating in the same protocol.

The antenna system is an integral part of the unit. It cannot be altered nor replaced by the user. 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 Part 15 and ISED Canada RSS-RSS-210 and RSS-247. The device will have FCC ID # of NZLUAHLCD and ISED ID # of 4112A-UAHLCD.

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, thus conducted emissions measurements are not required.

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.

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.

Tabletop testing was conducted on a 3m turntable described in the site recertification report. The 3m chamber has been added to our A2LA scope of accreditation on 4/18/2019 and includes accreditation to ANSI C63.4:2014, ANSI C63.10:2013, and C63.26:2015. Our 3m chamber is registered with the ISED under Site# 4112A-2 and FCC under registration number 357351.

Corporate Mailing/Shipping Address

Gentex Corporation
600 N. Centennial Street
Zeeland, MI 49464

Site Address

Gentex Corporation
380 Riley Street
Zeeland, MI 49464

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, ANSI C63.26:2015 and Radiated Emissions at 3m, FCC 47 CFR Part 90, ISSED RSS-137.

2. Product Labeling

2.1. Identifiers

The FCC Identifier assigned is FCC ID: NZLUAHLCD. The ISSED certification number is 4112A-UAHLCD. These identifiers will be labeled on the product housing.

The label will be printed on a label, which will be placed on the exterior of the housing and permanently affixed.

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.

"The receiver portion of the device complies with FCC rule Part 15. 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 ISSED rules. Changes or modifications not expressly approved by the party responsible for the compliance could void the user's authority to operate the device."

This equipment complies with FCC and ISSED radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must be at least 20cm from the user and must not be co-located or operating in conjunction with any other antenna or transmitter.

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

ISSED: 4112A-UAHLCD FCC ID: NZLUAHLCD

2.2. Label Drawing and Location on Product

The label drawing is included in the "Label.pdf" attachment.

A diagram showing the 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 C63.10-2014. 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 straight down from the center of the turntable to a power supply connection sitting at the base of the table. The power supply is located beneath the floor of the chamber.

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.

4. Test Procedures

Requirements

Per FCC KDB 996369 section VII and footnote 9, a transmitter module capable of transmitting simultaneously with another transmitter must be tested by following the simultaneous test procedures described in 15.31(k).

15.31(k) states that composite systems (i.e. systems which incorporate difference devices contained in a single enclosure) shall be measured for compliance with the technical standards in accordance with procedures in 2.947(f).

Preliminary radiated measurements were performed to determine the frequencies where the significant emissions might be found. The DUT at one set position and the measuring antenna at a set height without maximizing. The measurements were measured using peak detector and plotted via test software. The measuring antenna positioned at a 3-meter distance from the DUT. The measurements were taken in the frequency range of 30MHz to 18GHz. All preliminary measurements were performed with the DUT operating on the center channel of the HomeLink high band and Bluetooth low energy bands, 915MHz and 2440MHz respectively.

All significant emissions found in the preliminary sweeps were then measured using a peak detector at a distance of 3 meters. The measurements were made with a bicon over the range of 30-300Mhz and with a log periodic over the range of 300-1000MHz. A double ridged waveguide antenna was utilized over the frequency range of 1GHz to 18GHz. The DUT was rotated so all sides were exposed to the receiving antenna and measurements were performed with both horizontal and vertical polarizations on the receiving antenna. The measuring antenna was raised and lowered from 1-4 meters for each antenna polarization to find the maximum reading.

5. Conducted Emissions Measurements

Conducted Measurements are not required for this product.

6. Radiated Emissions Data

6.1. Date(s) Tested: 2/22/21

6.2. Test Method Deviations: None.

6.3. Temperature and Humidity conditions

	Measured Value	Unit
Temperature	23	°C
Humidity	41.8	%R.H.

6.4. Summary of Results

The plots of the peak preliminary spurious radiated emissions are presented below in section 7. As displayed in the sweep plots, the intermodulation product of simultaneous transmissions from the DUT did not generate any additional spurious radiated emissions, which exceeded the limits.

- **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): 4.5 dB
- Radiated Emissions – LPA (250-1000 MHz): 4.2 dB
- Radiated Emissions – DRWG (1-18 GHz): 5.0 dB
- Frequency: 0.15ppm

6.5. Test Equipment Setup and Procedure

6.5.1. Test Equipment Used

Description	Model #	ID Number	Cal Due
EMCO Biconical Antenna [30-250 MHz]	3110B	H6189	7/16/21
EMCO LPA Antenna [250-1000MHz]	3148	H6192	7/16/21
Com-Power Double Ridged Waveguide [1-18GHz]	AH-118	7182	12/4/21
Rohde & Schwarz EMI Receiver	ESR26	6595	10/12/21
Cables, attenuator and port feed through	various	CF GCL	4/30/21

Com-Power Double Ridged Waveguide	AHA-118	8893	11/25/22
3m Chamber SW	N/A	SW30	3/31/21
Miteq Preamplifier	AM-1300	1429993	12/31/21
Gentex Emissions Software	N/A	SW48	3/31/21

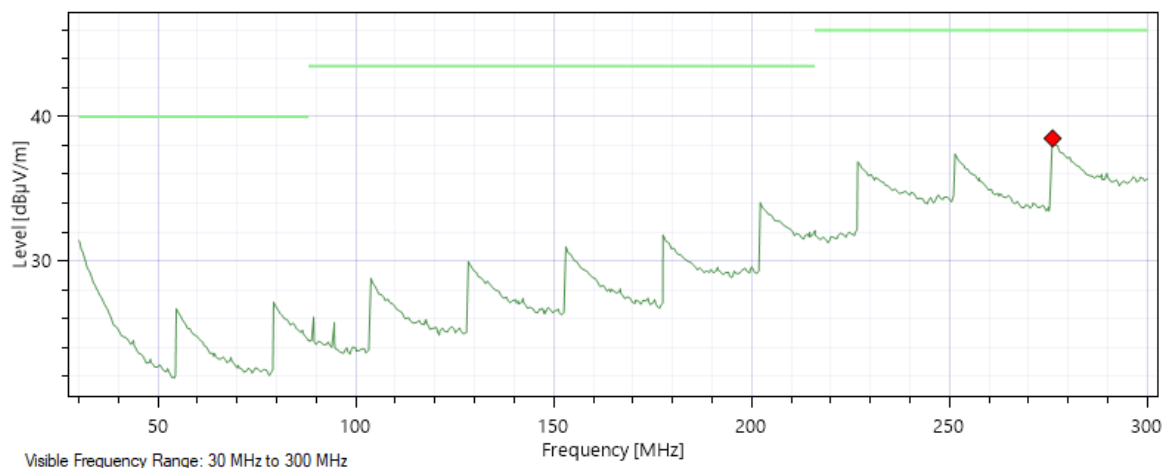
EMI Receiver Settings Emissions:

Detector Function: Quasi-Peak
Resolution Bandwidth: 120 kHz (below 1GHz)
1MHz (above 1GHz)

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

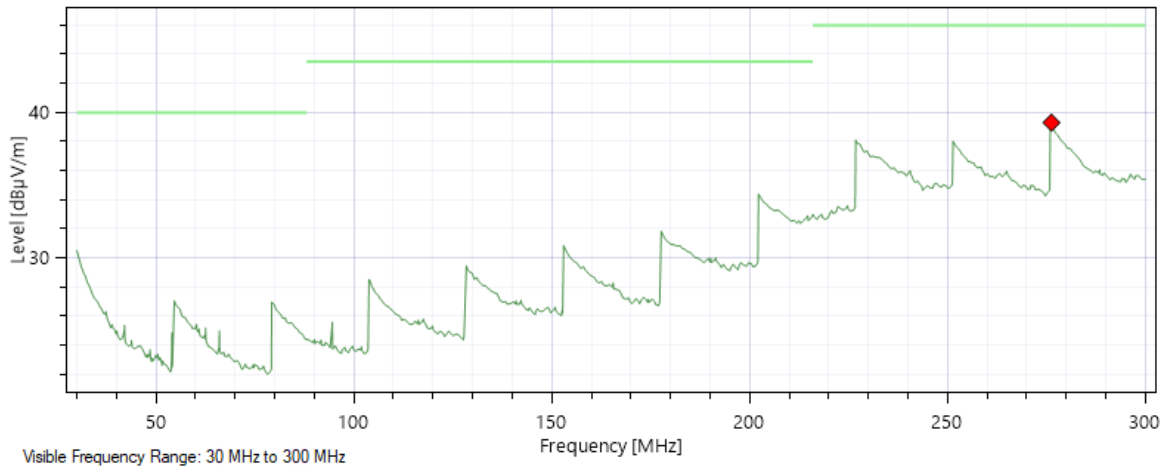
Detector: Quasi-Peak
Resolution Bandwidth: 1 MHz (to determine peak level)
10 kHz (to determine occupied bandwidth)
Video Bandwidth: 3 MHz (to determine peak level)
30 kHz (to determine occupied bandwidth)

7. Intermodulation Spurious Emissions



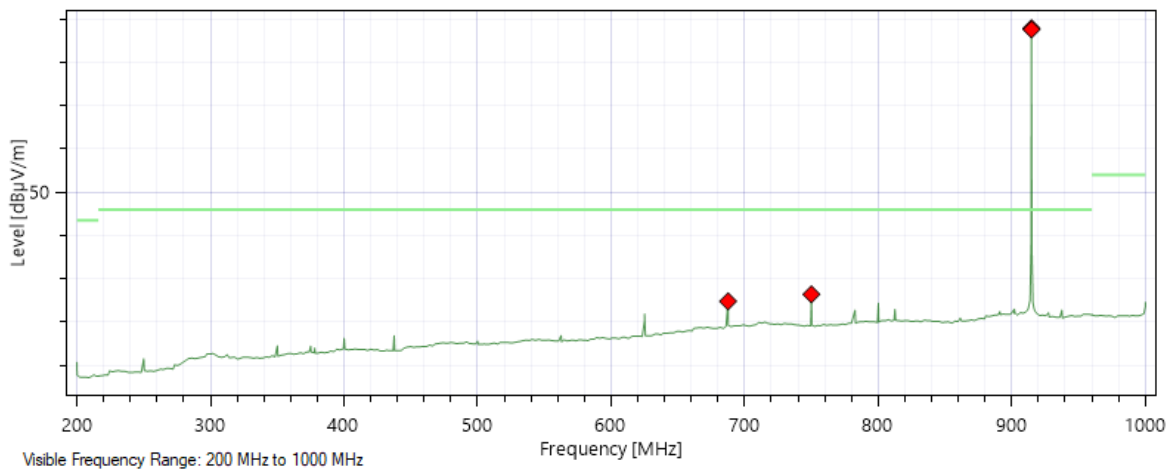
30 - 300MHz – Horizontal Polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)
276.060000	38.497	46	-7.503



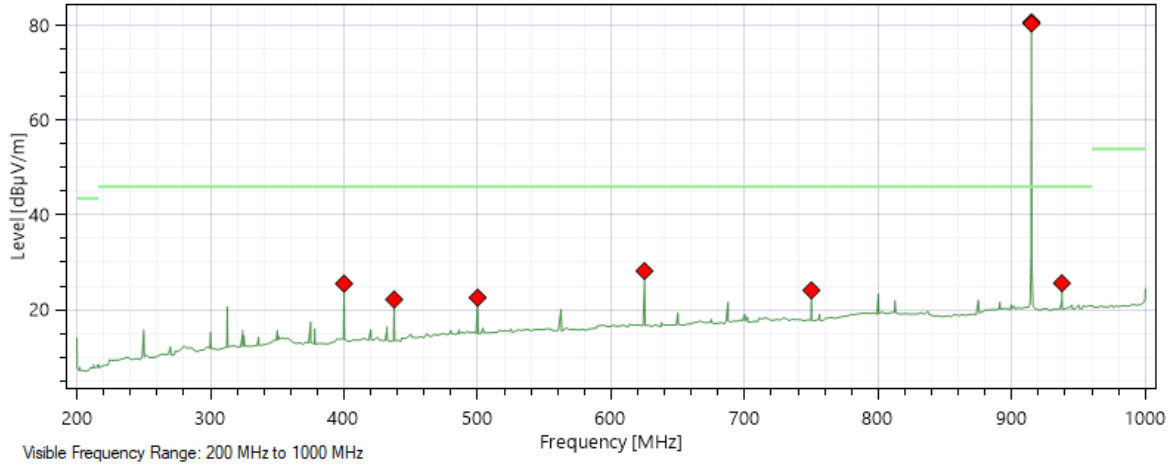
30 - 300MHz – Vertical Polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)
276.270000	39.309	46	-6.691



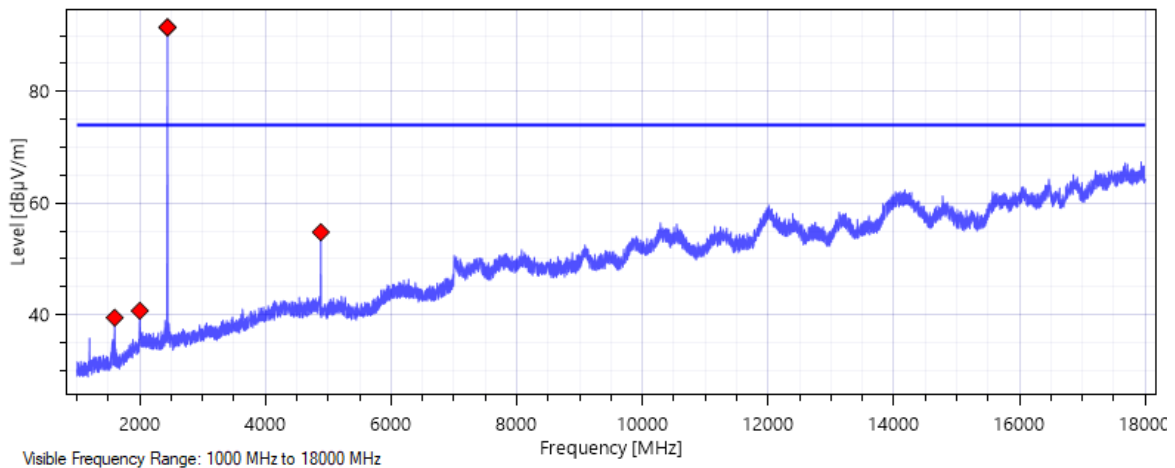
200 - 1000MHz – Horizontal Polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)
687.500000	24.787	46	-21.213
749.990000	26.405	46	-19.595
914.690000 (HomeLink Fundamental)	87.919	46	41.919



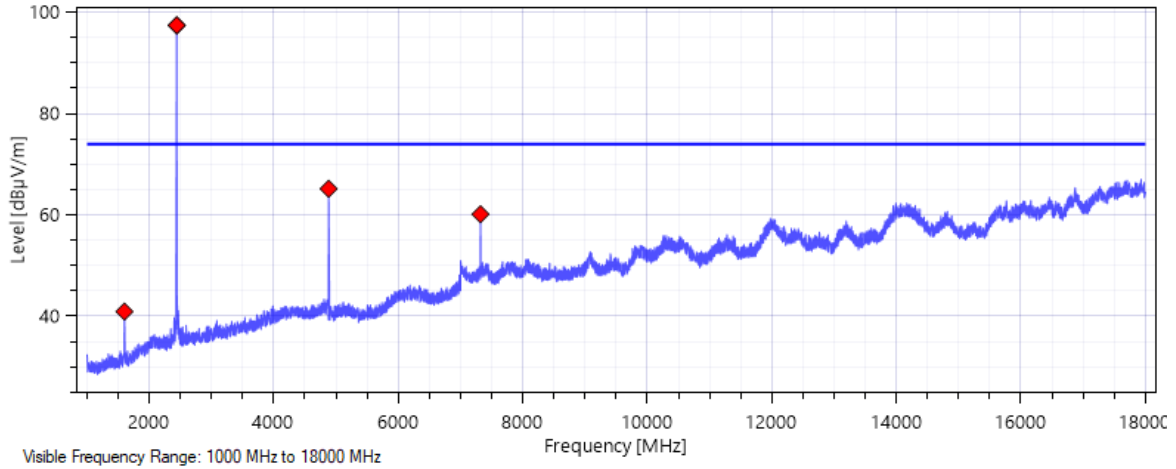
300 - 1000MHz – Vertical Polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)
400.010000	25.521	46	-20.479
437.510000	22.185	46	-23.815
500.000000	22.572	46	-23.428
625.010000	28.194	46	-17.806
749.990000	24.116	46	-21.884
914.690000 (HomeLink Fundamental)	80.742	46	34.742
937.490000	25.616	46	-20.384



1GHz – 18GHz - Horizontal Polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)
1,600.000000	39.52	74	-34.48
2,000.000000	40.761	74	-33.239
2,440.250000 (BLE Fundamental)	91.518	74	17.518
4,879.500000 (BLE 2 nd Harmonic)	54.824	74	-19.176



1GHz – 18GHz - Vertical Polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)
1,600.250000	40.921	74	-33.079
2,440.250000 (BLE Fundamental)	97.458	74	23.458
4,880.500000 (BLE 2 nd Harmonic)	65.162	74	-8.838
7,319.250000 (HomeLink 8 th Harmonic)	60.142	74	-13.858