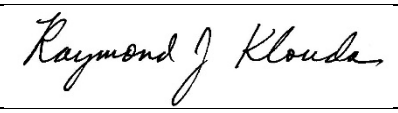
Engineering Test Report No. 2401893-02 Rev. B		
Report Date	February 19, 2025	
Manufacturer Name	Gentex Corporation	
Manufacturer Address	380 E. Riley Street Zeeland, MI 49464	
Model No.	Connected Smoke CO Nursery – PL1N	
Date Received	August 30, 2024	
Test Dates	September 3, 2024 – January 16, 2025	
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.249 Innovation, Science, and Economic Development Canada, RSS-210 Innovation, Science, and Economic Development Canada, RSS-GEN	
Test Facility	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515	FCC Reg. Number: 269750 IC Reg. Number: 2987A CAB Identifier: US0107
Signature		
Tested by	Nathaniel Bouchie	
Signature		
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	3675160	

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.249 and Innovation, Science, and Economic Development Canada, RSS-210 and RSS-Gen test specifications. The data presented in this test report pertains to the EUT on the test dates specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification. This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Table of Contents

1. Report Revision History

Revision	Date	Description
–	11 SEP 2024	Initial Release of Engineering Test Report No. 2401893-02
A	20 FEB 2025 By NDB	– Throughout the report: Updated report number to 2401893-02 Rev. A in the header. Changed Mode 1 from “Tx @ 5725.9MHz, Ch 111” to “Tx @ 5728.1MHz, Ch 112”. Changed Mode 3 from “Tx @ 5874.2MHz, Ch 352” to “Tx @ 5872.3MHz, Ch 342”. – Cover Page: Changed final date of testing to January 16, 2025. – Section 8: Changed Low transmit frequency from 5725.9MHz to 5728.1MHz. Changed High transmit frequency from 5874.2MHz to 5872.3MHz. – Section 20, Pages 13 - 14: Updated CE photographs to reflect new EUT cable routing. – Section 20, Pages 15 - 22: Updated CE measurements to reflect new EUT cable routing. – Section 21, Pages 24 - 29: Updated Duty Cycle plots for Low and High frequencies. Updated Duty Cycle calculations for Low and High frequencies. – Section 22, Pages 32 - 36: Updated RE photographs to reflect new EUT orientation. – Section 22, Pages 37 - 42: Updated RE measurements to reflect new EUT orientation. – Added Section 23.
B	4 MAR 2025 By NDB	– Throughout the report: Updated report number to 2401893-02 Rev. B in the header – Section 13: Added Band Edge row to summary table. – Section 23: Added Peak Band Edge measurements.

2. Introduction

2.1. Scope of Tests

This document presents the results of a series of RF emissions tests that were performed on the Gentex Corporation Connected Smoke CO Nursery (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was manufactured and submitted for testing by Gentex Corporation located in Zeeland, MI.

2.2. Purpose

The test series was performed to determine if the EUT meets the RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.249.

The test series was also performed to determine if the EUT meets the RF emission requirements of the Industry Canada Radio Standards Specification RSS-Gen and Industry Canada Radio Standards Specification RSS-210 for Transmitters.

Testing was performed in accordance with ANSI C63.10-2013.

2.3. Identification of the EUT

The EUT was identified as follows:

EUT Identification	
Product Description	Connected Smoke CO Nursery
Model/Part No.	PL1N
S/N	918-0023-002
Band of Operation	5725-5875 MHz
Modulation Type	CW
Software/Firmware Version	316-1133-040209
Rated Output Power	-4dBm
Antenna Type	Patch Antenna
Size of EUT	5.75 in x 5.75 in x 1.75 in
FCC ID Number	2AVK2-AT5815B

The EUT listed above was used throughout the test series.

3. Power Input

The EUT obtained 120VAC 60Hz power via a 3-wire unshielded power cord.

4. Grounding

The EUT was connected to ground through the third wire of its input power cord.

5. Support Equipment

The EUT was submitted for testing along with the following support equipment:

Description	Model #	S/N
Support Laptop	---	TR-13015

6. Interconnect Leads

The following interconnect cables were submitted with the EUT:

Item	Description
USB	Connects laptop to EUT

7. Modifications Made to the EUT

No modifications were made to the EUT during the testing.

8. Modes of Operation

Mode	Description
Tx @ 5728.1MHz, Ch 112	The EUT was configured to transmit on channel 112, which corresponded to 5728.1MHz.
Tx @ 5800.7MHz, Ch 233	The EUT was configured to transmit on channel 233, which corresponded to 5800.7MHz.
Tx @ 5872.3MHz, Ch 342	The EUT was configured to transmit on channel 342, which corresponded to 5872.3MHz.

9. Test Specifications

The tests were performed to selected portions of, and in accordance with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.249 and Innovation, Science, and Economic Development Canada, RSS-210 test specifications.

- Federal Communications Commission “Code of Federal Regulations”, Title 47, Part 15, Subpart C
- ANSI C63.4-2014, “American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz”
- ANSI C63.10-2013, “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”
- RSS-210 Issue 10, December 2019, “License-Exempt Radio Apparatus: Category I Equipment”
- RSS-Gen Issue 5, March 2019, Amendment 1, Innovation, Science, and Economic Development Canada, “Spectrum Management and Telecommunications, Radio Standards Specification, General Requirements for Compliance of Radio Apparatus”

10. Test Plan

No test plan was provided. Instructions were provided by personnel from Gentex Corporation and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.249, Innovation, Science, and Economic Development Canada, RSS-210, and ANSI C63.4-2014 specifications.

11. Deviation, Additions to, or Exclusions from Test Specifications

There were no deviations, additions to, or exclusions from the test specifications during this test series.

12. Laboratory Conditions

Ambient Parameters	Value
Temperature	23°C
Relative Humidity	42%
Atmospheric Pressure	1027mb

13. Summary

The following EMC tests were performed, and the results are shown below:

Test Description	Requirements	Test Methods	Results
Powerline Conducted Emissions Test (AC Mains)	FCC 15C RSS-GEN	ANSI C63.10: 2013	Conforms
Duty Cycle Factor Measurements	FCC 15C ISED RSS-210	ANSI C63.10: 2013	Conforms
Case Spurious Radiated Emissions	FCC 15C ISED RSS-210	ANSI C63.10: 2013	Conforms
Band-Edge Compliance	FCC 15C ISED RSS-210	ANSI C63.10: 2013	Conforms

14. Sample Calculations

For Powerline Conducted Emissions:

The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF).

Formula 1: VL (dBuV) = MTR (dBuV) + CF (dB).

For Radiated Emissions:

The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external preamplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

Formula 1: FS (dBuV/m) = MTR (dBuV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: FS (uV/m) = AntiLog [(FS (dBuV/m))/20]

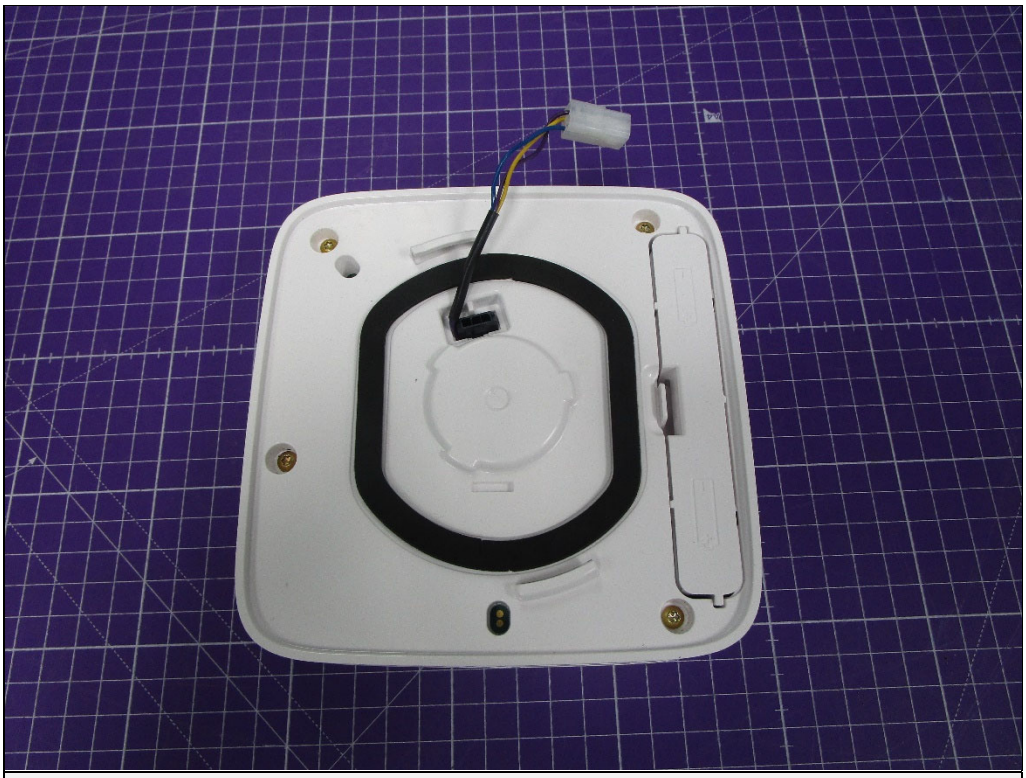
15. Statement of Conformity

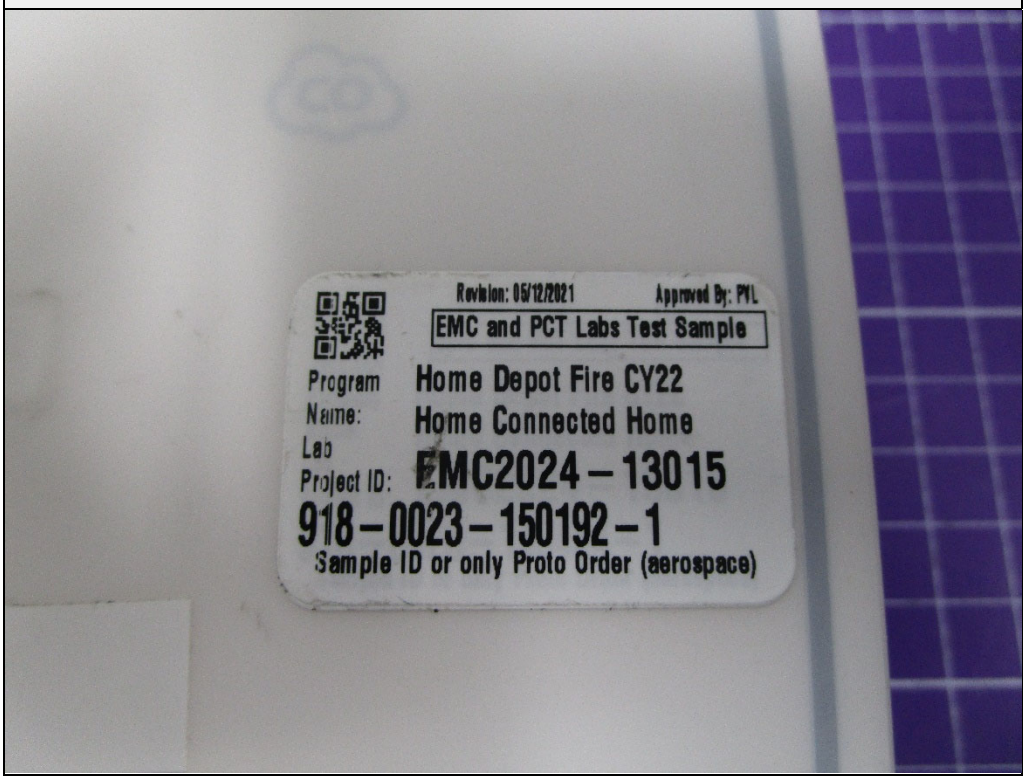
The Gentex Corporation Connected Smoke CO Nursery, Model No. PL1N, Serial No. 918-0023-002, did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.249 and Innovation, Science, and Economic Development Canada, RSS-210.

16. Certification

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.249 and Innovation, Science, and Economic Development Canada, RSS-210 test specifications. The data presented in this test report pertains to the EUT as received by the customer on the test date specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

17. Photographs of EUT

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Approved By: PVL
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Home Connected Home
Lab Project ID:
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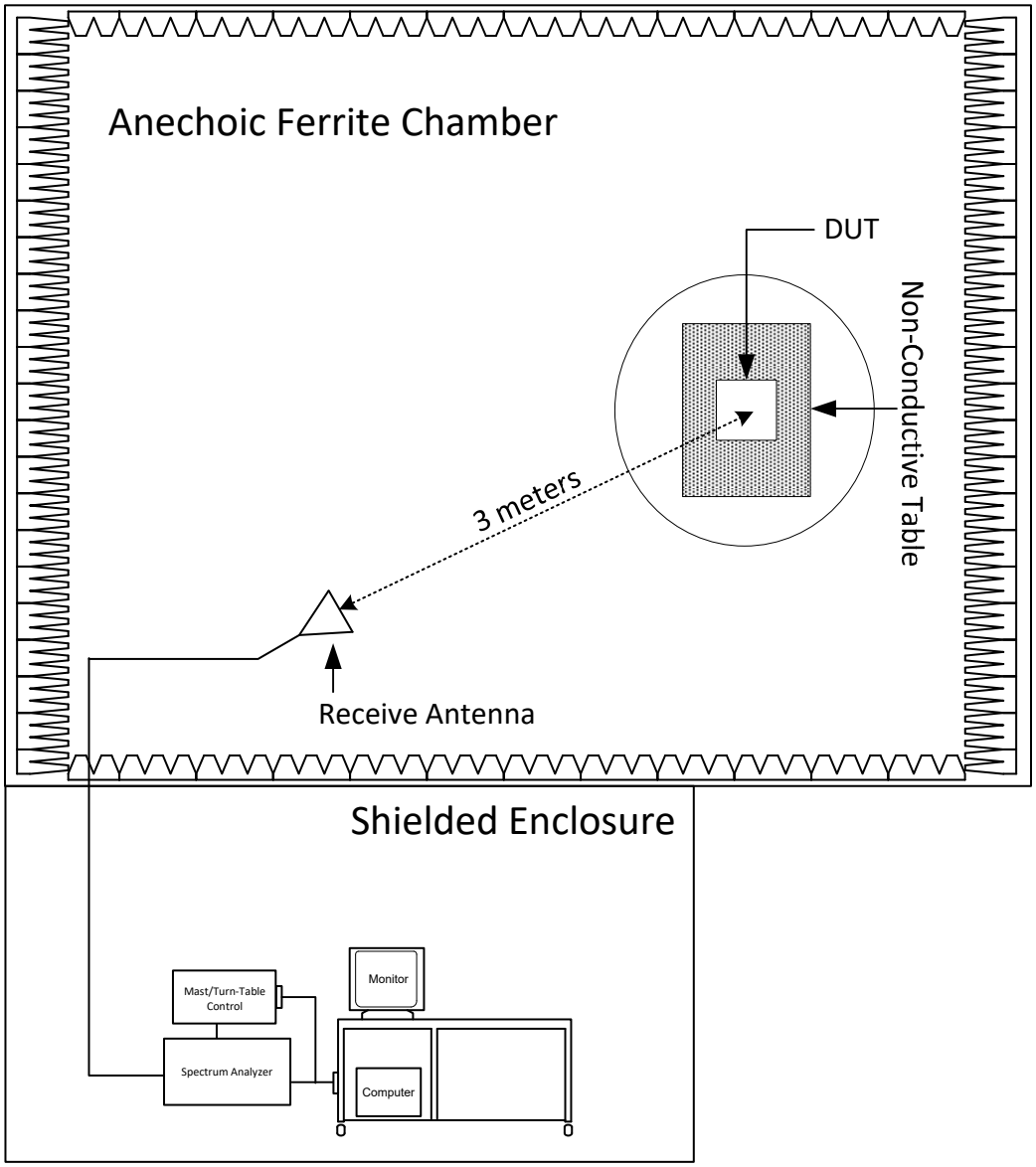
918-0023-150192-1
Sample ID or only Proto Order (aerospace)

18. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW18	PREAMPLIFER	PLANAR ELECTRONICS	PE2-30-20G20R6G-3R0-10-12-SFF	PL34312/2148	18-26.5GHZ	2/23/2024	2/23/2025
APW3	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-35-120-5R0-10-12	PL2924	1GHZ-20GHZ	3/20/2024	3/20/2025
APW17	PREAMPLIFIER (26.5-40GHZ)	PLANAR ELECTRONICS	PE2-36-26D540G-5R0-10-12-292FF	PL30297/2039	26.5-40GHz	06/11/2024	06/11/2025
CDZ4	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
GRB0	1MHZ, LISN SIGNAL CHECKER	ELITE	LISNCHKR1M	1	1MHZ	02/11/2025	02/11/2027
MEA9	MICRO-OHM METER	KEITHLEY	580	---	10UOHM-200KOHM	11/30/2024	11/30/2025
NHG1	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NHH1	STANDARD GAIN HORN ANTENNA	NARDA	V637	---	26.5-40GHZ	NOTE 1	
NSDS1	UNIVERSAL SPHERICAL DIPOLE SOURCE	AET	USDS-H	AET-1116		NOTE 1	
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-2000MHz	10/03/2024	10/03/2026
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	4/26/2024	4/26/2026
PLF2	CISPR16 50UH LISN	ELITE	CISPR16/70A	002	150kHz-30MHz	3/26/2024	3/26/2025
PLF4	CISPR16 50UH LISN	ELITE	CISPR16/70A	003	150kHz-30MHz	3/26/2024	3/26/2025
R21F	3M ANECHOIC CHAMBER NSA	EMC TEST SYSTEMS	3M ANECHOIC		30MHZ-18GHZ	3/1/2024	3/1/2025
R23P	ROOM 23			001	---	CNR	
RBG3	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101592	2HZ-44GHZ	3/7/2024	3/7/2025
SHC2	Power Supplies	HENGFU	HF60W-SL-24	A11372702	24V	NOTE 1	
T1EF	10DB 25W ATTENUATOR	WEINSCHEL	46-10-34	CD3550	DC-18GHZ	1/3/2024	1/3/2026
VBR8	COMMERCIAL CONDUCTED EMISSIONS.EXE	ELITE				N/A	
VBV2	COMMERCIAL RADIATED EMISSIONS.EXE	ELITE		---	---	N/A	
XLT18	5W, 50Ω TERMINATION	JFW INDUSTRIES	50T-199 N M	---	DC-18 GHZ	12/20/2023	12/20/2025
XPQ5	FILTER	K&L MICROWAVE	11SH10-9000/U2000-O/O	1	5000-5800 MHZ	9/14/2023	9/14/2025

N/A: Not Applicable I/O: Initial Only CNR: Calibration Not Required
NOTE 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

19. Block Diagram of Test Setup



Radiated Measurements Test Setup

20. Powerline Conducted Emissions Test (AC Mains)

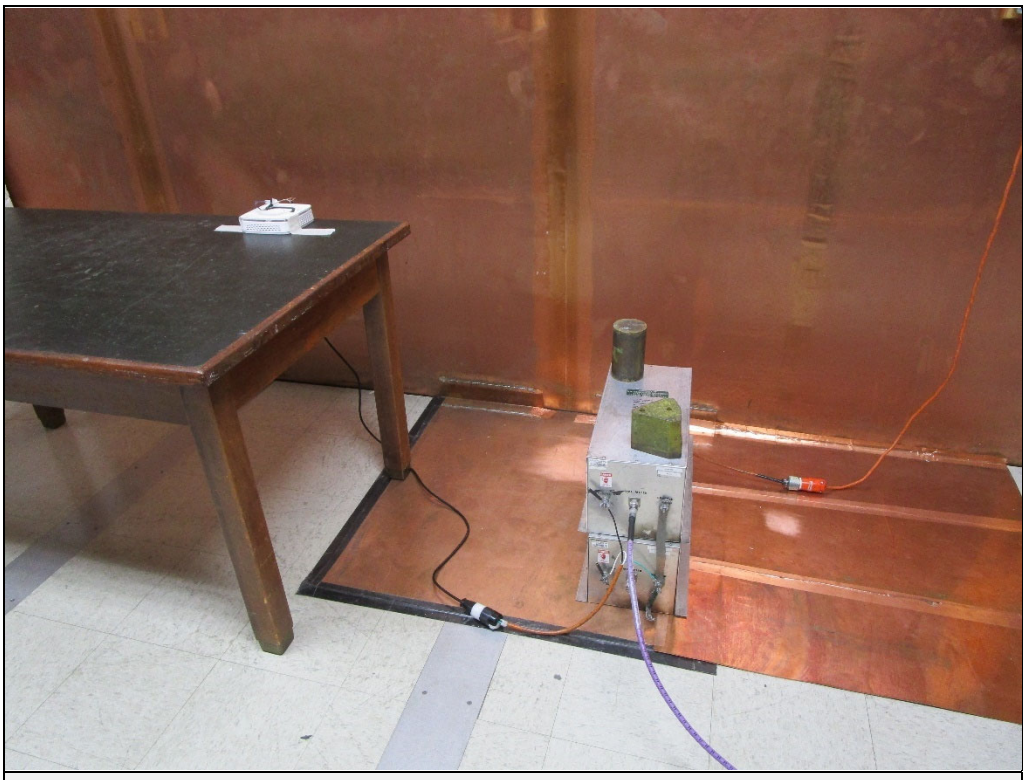
Test Information	
Manufacturer	Gentex Corporation
Product	Connected Smoke CO Nursery
Model	PL1N
Serial No	918-0023-002
Mode	Tx @ 5728.1MHz, Ch 112 Tx OFF

Test Setup Details	
Setup Format	Tabletop
Type of Test Site	Semi-Anechoic
Test site used	R23P
Note	None

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Conducted disturbance (mains port) (150 kHz – 30 MHz)	2.7

Requirements		
All radio frequency voltages on the power lines for any frequency or frequencies of an intentional radiator shall not exceed the limits in the following table:		
Frequency of Emission (MHz)	Conducted Limits (dBµV)	
	Quasi-peak	Average
0.15-05 0.5-5 5-30	66 to 56* 56 60	56-46* 46 50

Procedures
The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms. 1) The EUT was operated in the Tx @ 5728.1MHz, Ch 112 mode. 2) Measurements were first made on the Voltage high line. 3) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands. 4) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector. 5) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.) 6) Steps (4) and (5) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits. 7) Steps (3) through (6) were repeated on the Voltage return line. 8) Steps (2) through (7) were repeated with the EUT operated in the Tx OFF mode.



Test Setup for Powerline Conducted Emissions Test

Test Setup for Powerline Conducted Emissions Test

Test Setup for Powerline Conducted Emissions Test

Test Setup for Powerline Conducted Emissions Test

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Significant Emissions Data

VBR8 12/06/2024

Manufacturer	:	Gentex
Model	:	PL1N
DUT Revision	:	
Serial Number	:	918-0023-002
DUT Mode	:	Tx OFF
Line Tested	:	High, PLF4
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Jan 15, 2025 04:07:16 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

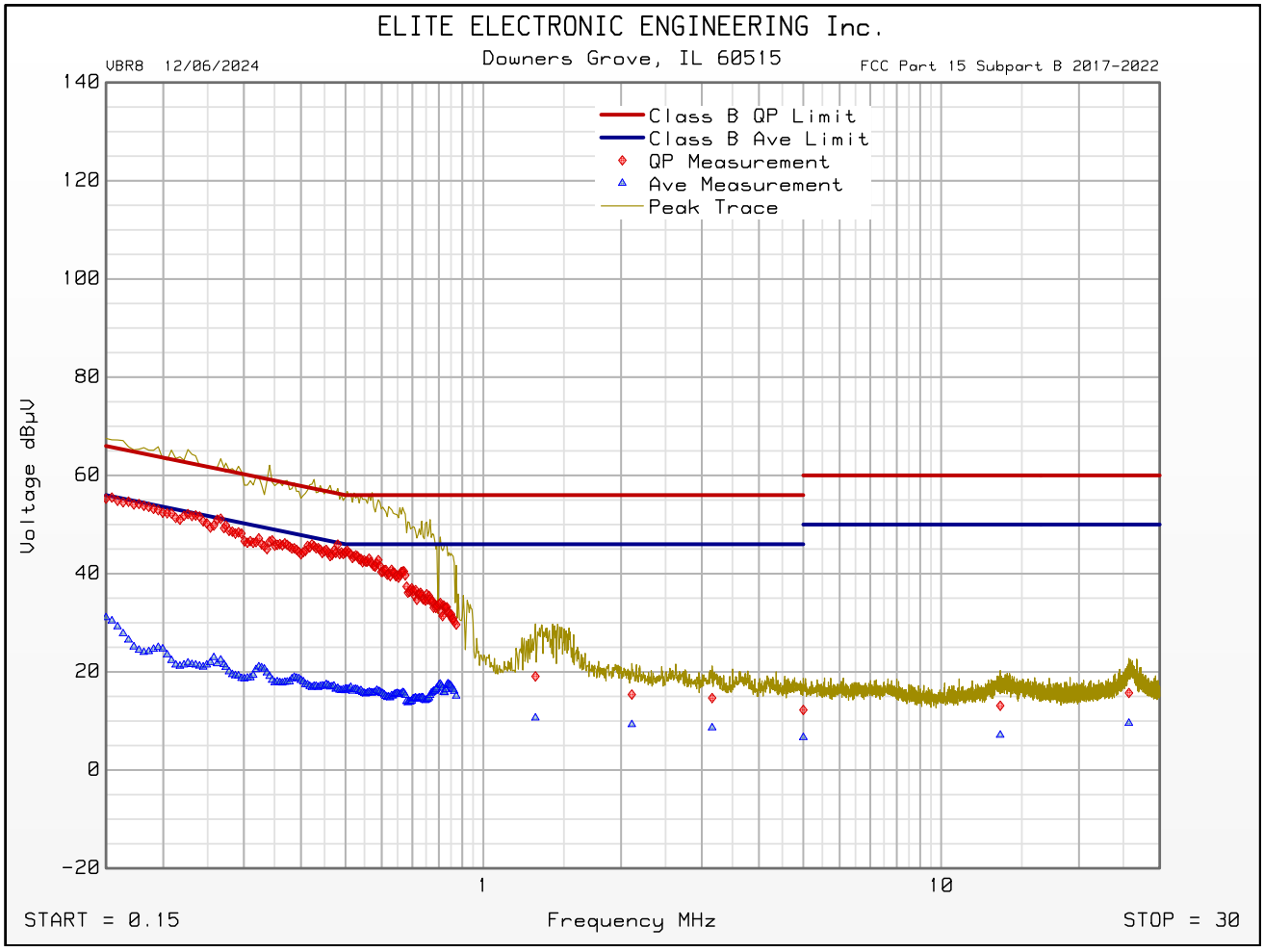
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.267	51.2	61.2		22.4	51.2	
0.481	45.9	56.3		16.7	46.3	
0.505	44.7	56.0		16.5	46.0	
0.806	34.0	56.0		17.5	46.0	
1.300	19.1	56.0		10.6	46.0	
2.111	15.4	56.0		9.3	46.0	
3.161	14.7	56.0		8.6	46.0	
5.000	12.2	56.0		6.6	46.0	
13.456	13.1	60.0		7.1	50.0	
25.704	15.7	60.0		9.6	50.0	

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Cumulative Data

VBR8 12/06/2024

Manufacturer	:	Gentex
Model	:	PL1N
DUT Revision	:	
Serial Number	:	918-0023-002
DUT Mode	:	Tx OFF
Line Tested	:	High, PLF4
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Jan 15, 2025 04:07:16 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Significant Emissions Data

VBR8 12/06/2024

Manufacturer	:	Gentex
Model	:	PL1N
DUT Revision	:	
Serial Number	:	918-0023-002
DUT Mode	:	Tx OFF
Line Tested	:	Neutral, PLF2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Jan 16, 2025 06:51:58 AM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

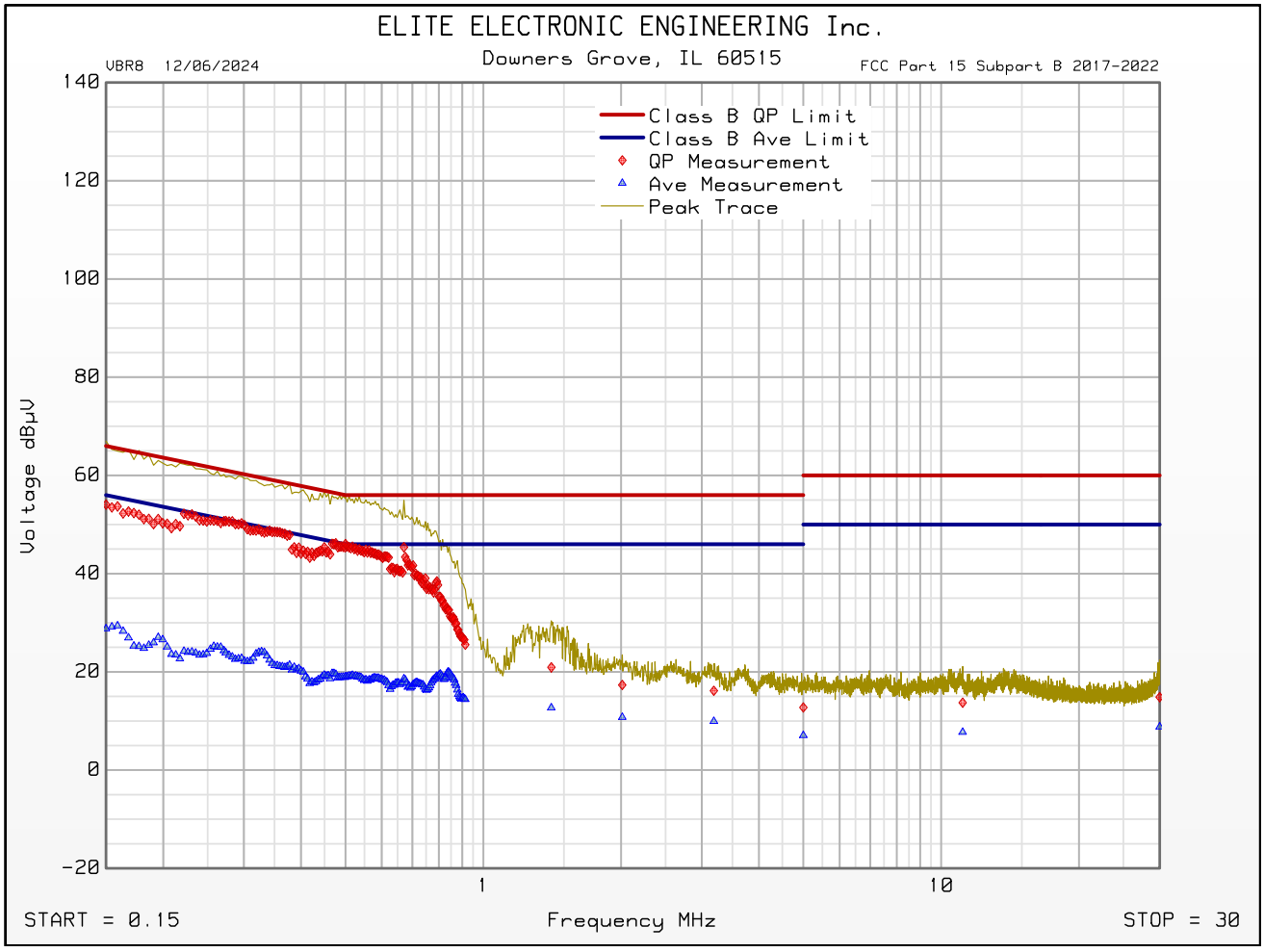
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.274	50.7	61.0		23.9	51.0	
0.500	46.0	56.0		19.1	46.0	
0.792	38.4	56.0		19.1	46.0	
1.408	20.9	56.0		12.7	46.0	
2.012	17.3	56.0		10.8	46.0	
3.188	16.2	56.0		9.9	46.0	
5.000	12.8	56.0		7.1	46.0	
11.138	13.7	60.0		7.7	50.0	
29.997	14.9	60.0		8.8	50.0	

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Cumulative Data

VBR8 12/06/2024

Manufacturer	:	Gentex
Model	:	PL1N
DUT Revision	:	
Serial Number	:	918-0023-002
DUT Mode	:	Tx OFF
Line Tested	:	Neutral, PLF2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Jan 16, 2025 06:51:58 AM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Significant Emissions Data

VBR8 12/06/2024

Manufacturer	:	Gentex
Model	:	PL1N
DUT Revision	:	
Serial Number	:	918-0023-002
DUT Mode	:	Tx ON
Line Tested	:	High, PLF4
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Jan 15, 2025 03:54:30 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

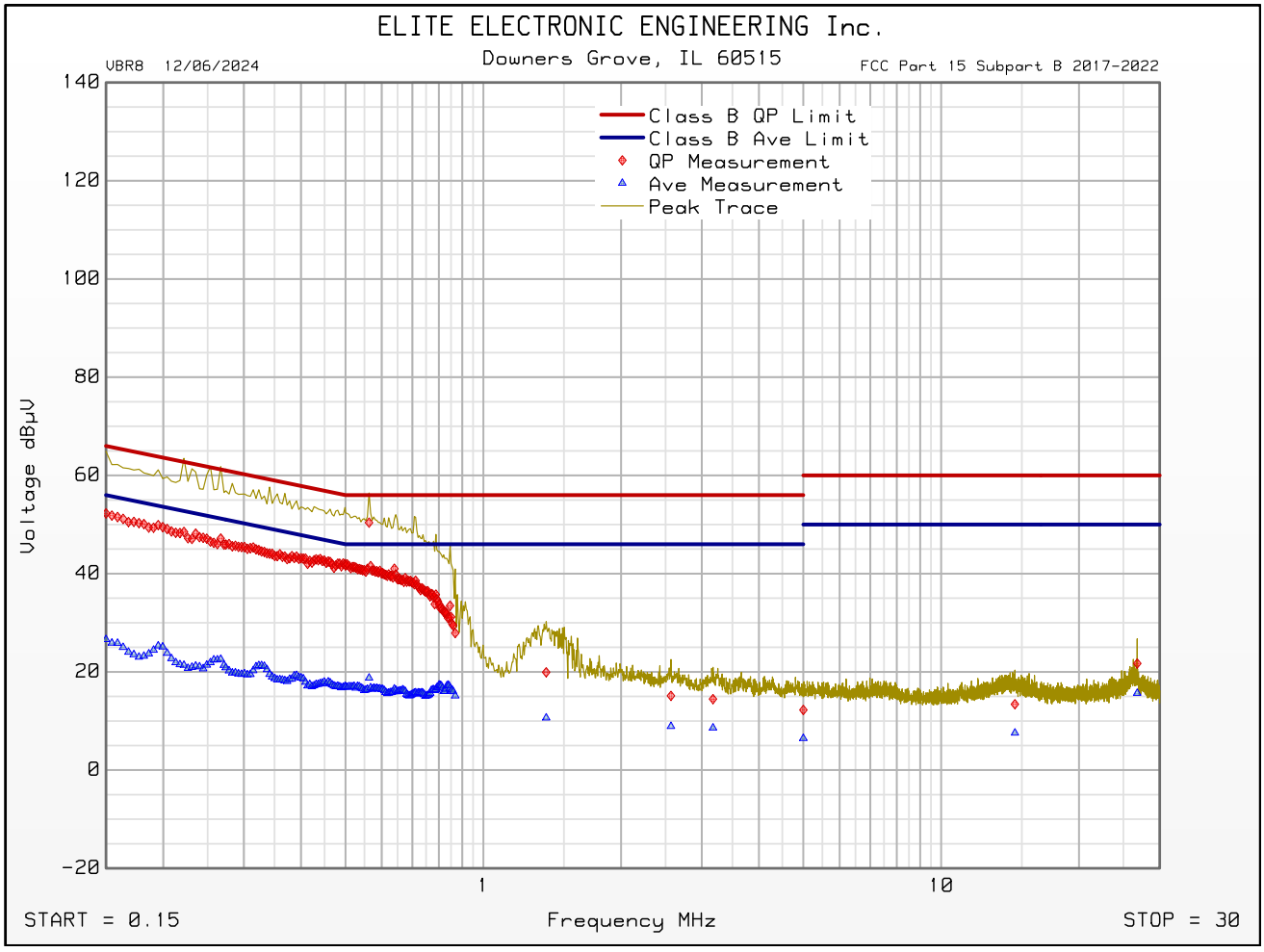
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.150	52.3	66.0		26.6	56.0	
0.495	42.1	56.1		16.9	46.1	
0.563	50.4	56.0		18.8	46.0	
0.792	34.8	56.0		16.8	46.0	
1.372	19.9	56.0		10.6	46.0	
2.570	15.1	56.0		8.9	46.0	
3.175	14.5	56.0		8.6	46.0	
5.000	12.2	56.0		6.5	46.0	
14.486	13.4	60.0		7.6	50.0	
26.802	21.7	60.0		15.7	50.0	

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Cumulative Data

VBR8 12/06/2024

Manufacturer	:	Gentex
Model	:	PL1N
DUT Revision	:	
Serial Number	:	918-0023-002
DUT Mode	:	Tx ON
Line Tested	:	High, PLF4
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Jan 15, 2025 03:54:30 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Significant Emissions Data

VBR8 12/06/2024

Manufacturer	:	Gentex
Model	:	PL1N
DUT Revision	:	
Serial Number	:	918-0023-002
DUT Mode	:	Tx ON
Line Tested	:	Neutral, PLF2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Jan 15, 2025 03:43:07 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

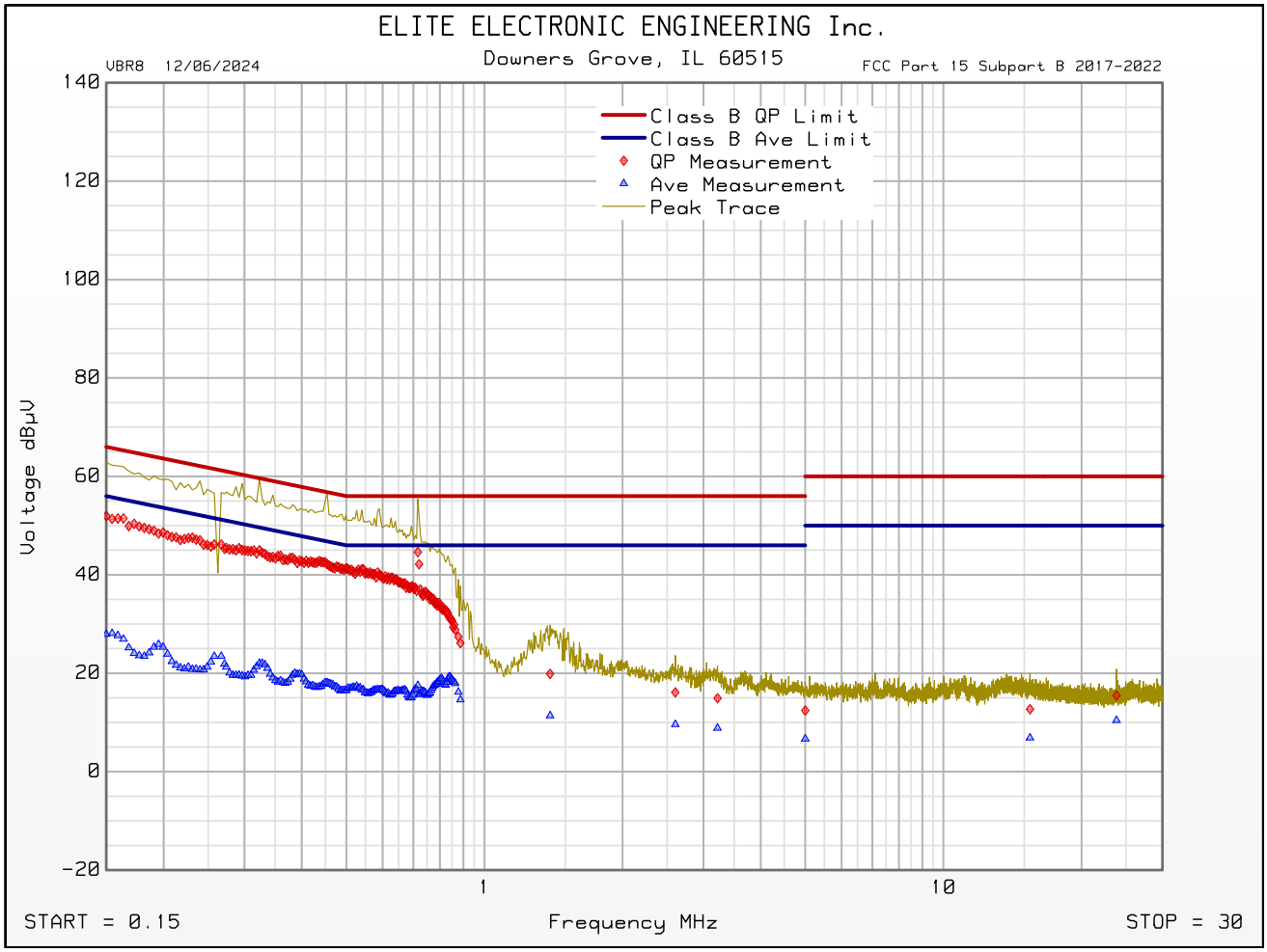
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.164	51.5	65.3		26.9	55.3	
0.450	42.6	56.9		18.1	46.9	
0.716	44.6	56.0		17.5	46.0	
0.797	34.3	56.0		18.4	46.0	
1.390	19.9	56.0		11.4	46.0	
2.606	16.1	56.0		9.6	46.0	
3.220	14.9	56.0		8.9	46.0	
5.000	12.4	56.0		6.6	46.0	
15.440	12.7	60.0		6.9	50.0	
23.827	15.5	60.0		10.4	50.0	

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Cumulative Data

VBR8 12/06/2024

Manufacturer	:	Gentex
Model	:	PL1N
DUT Revision	:	
Serial Number	:	918-0023-002
DUT Mode	:	Tx ON
Line Tested	:	Neutral, PLF2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Jan 15, 2025 03:43:07 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

21. Duty Cycle Factor Measurements

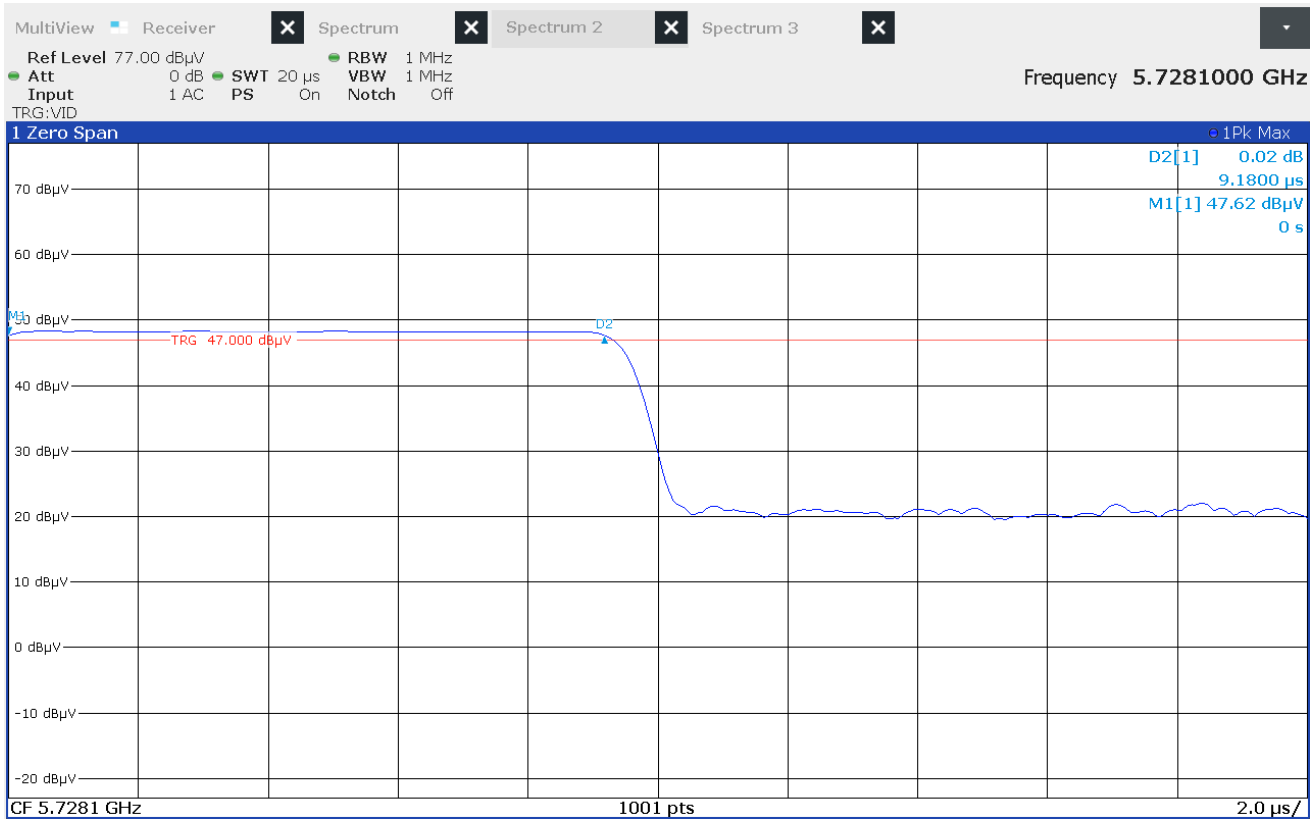
Test Information	
Manufacturer	Gentex Corporation
Product	Connected Smoke CO Nursery
Model	PL1N
Serial No	918-0023-002
Mode	Tx @ 5728.1MHz, Ch 112 Tx @ 5800.7MHz, Ch 233 Tx @ 5872.3MHz, Ch 342

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test site used	Room 21
Notes	None

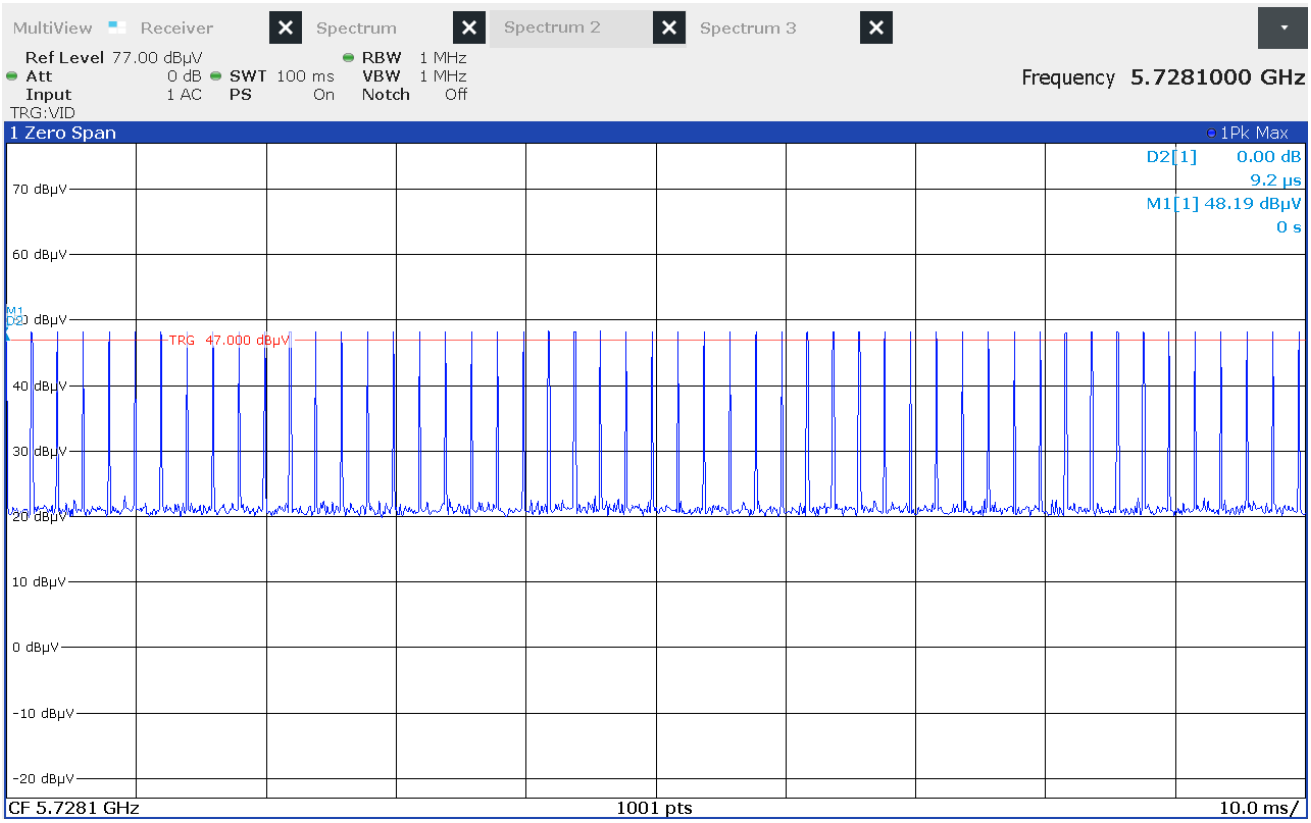
Procedures
The duty cycle factor is used to convert peak detected readings to average readings when pulsed modulation is employed. This factor is computed from the time domain trace of the pulse modulation signal. With the transmitter set up to transmit for maximum pulse density, the time domain trace is displayed on the spectrum analyzer. This trace is obtained by tuning center frequency to the transmitter frequency and then setting a zero span width with 10msec/div. The amplitude settings are adjusted so that the on/off transitions clear the 4th division from the bottom of the display. The markers are set at the beginning and end of the “on-time”. The trace is recorded. Next the spectrum analyzer center frequency is set to the transmitter frequency with a zero span width and 10msec/div. This shows if the word is longer than 100msec or shorter than 100msec. If the word period is less than 100msec, the display is set to show at least one word. The on-time and off-time are then measured. The on-time is total time signal level exceeds the 4th division. Off-time is time under for the word period. The duty cycle is then computed as the (On-time/ word period) where the word period = (On-time + Off-time).

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5728.1MHz, Ch 112
Carrier Frequency	5728.1MHz
Parameters	On time = 0.00918ms
Notes	None

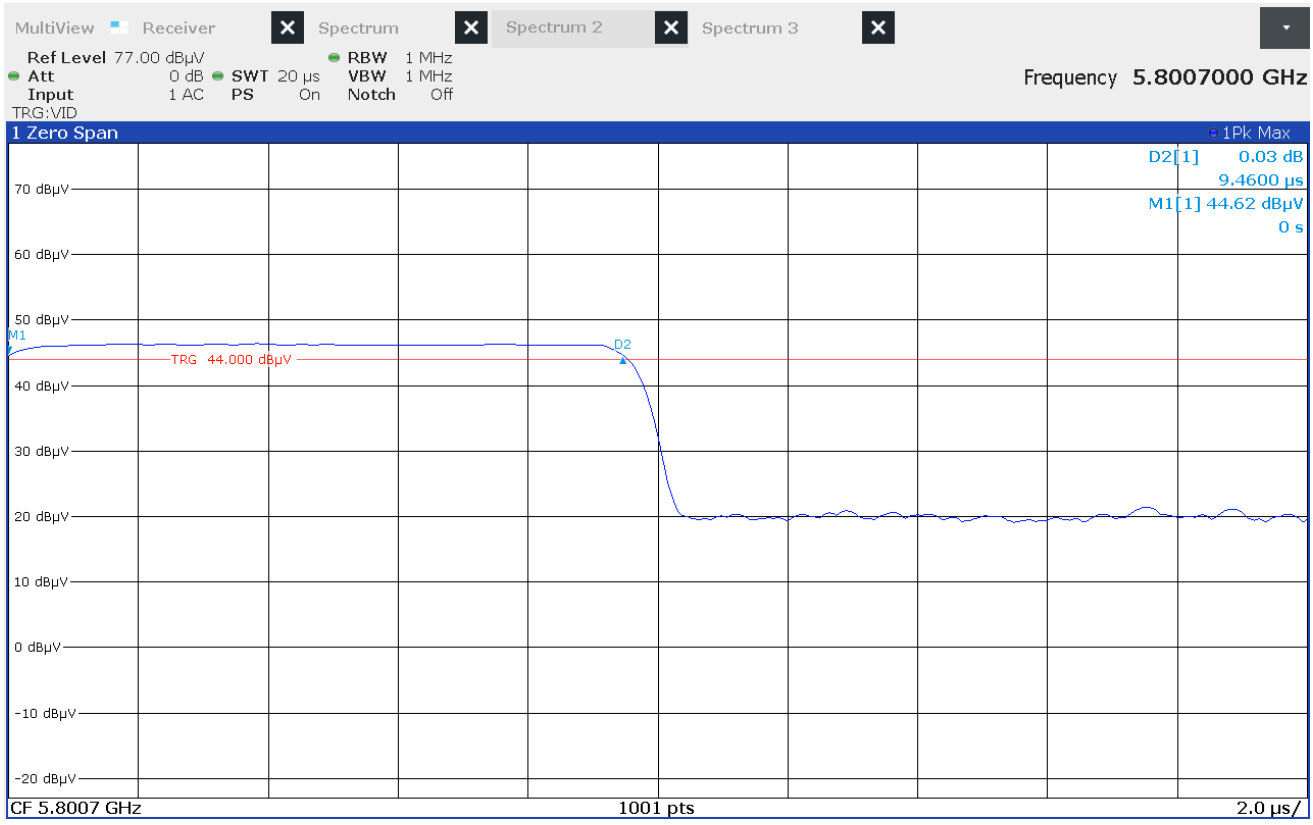


Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5728.1MHz, Ch 112
Carrier Frequency	5728.1MHz
Parameters	Number of Pulses = 51
Notes	None

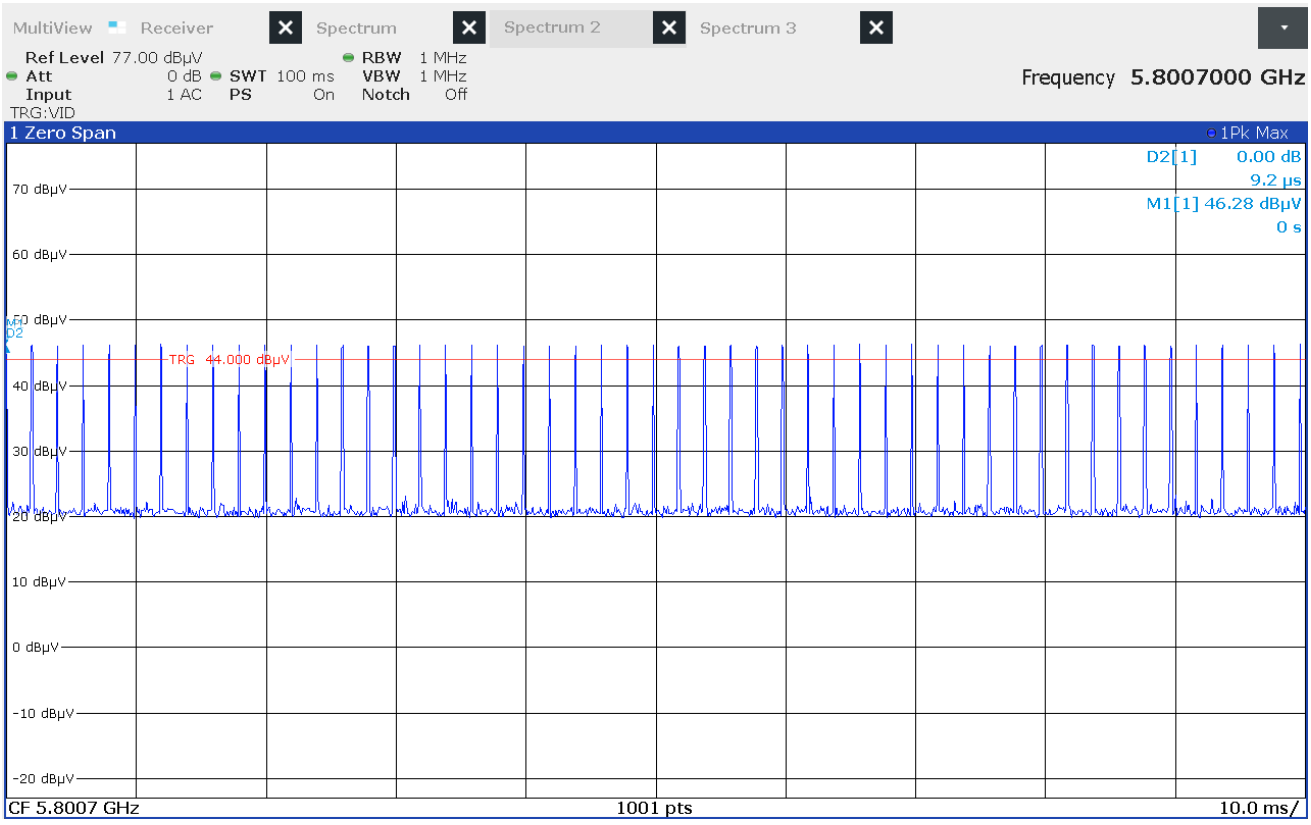


$$\text{Duty Cycle Factor} = 20\log\left(\frac{On-Time}{100\text{msec}}\right) = 20\log\left(\frac{0.00918 * 51}{100}\right) = \mathbf{-46.59}$$

Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5800.7MHz, Ch 233
Carrier Frequency	5800.7MHz
Parameters	On time = 0.00946ms
Notes	None

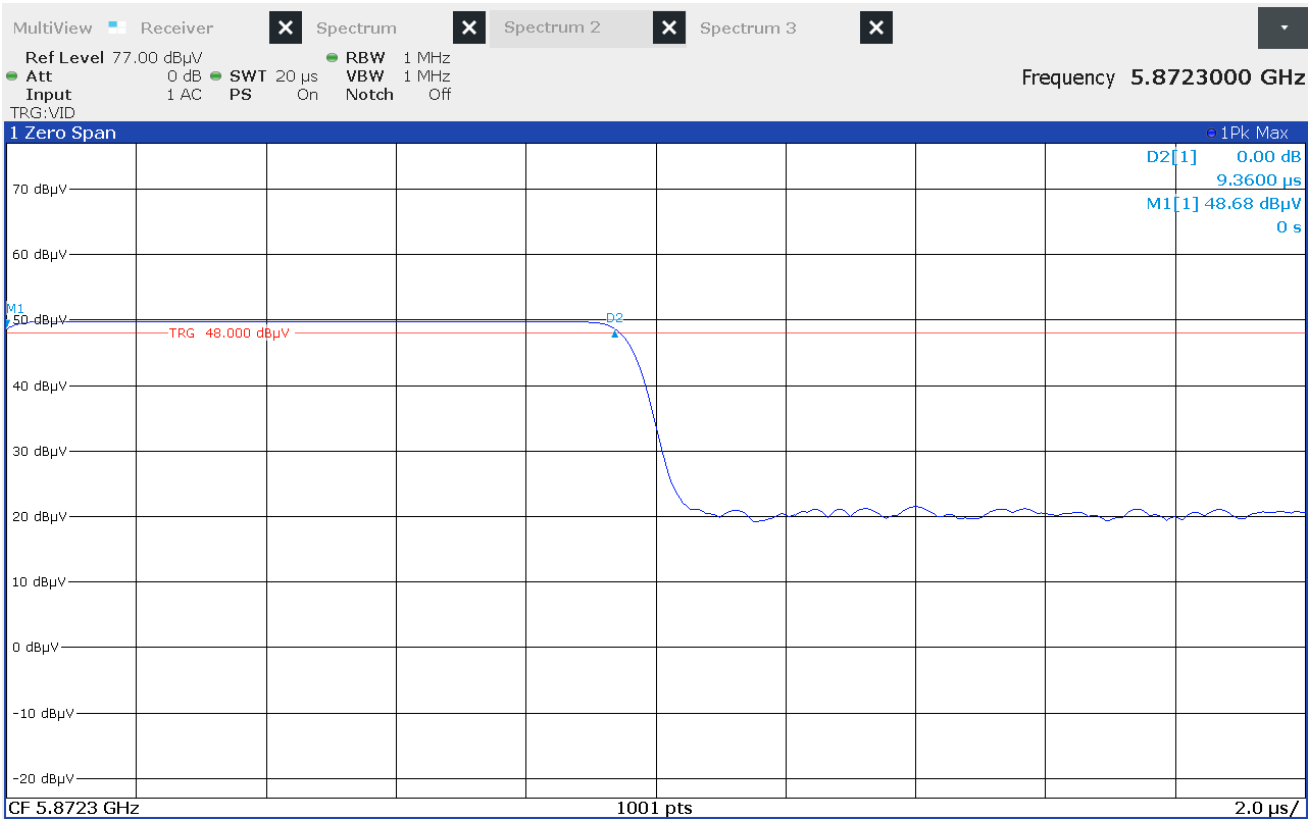


Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5800.7MHz, Ch 233
Carrier Frequency	5800.7MHz
Parameters	Number of Pulses = 51
Notes	None

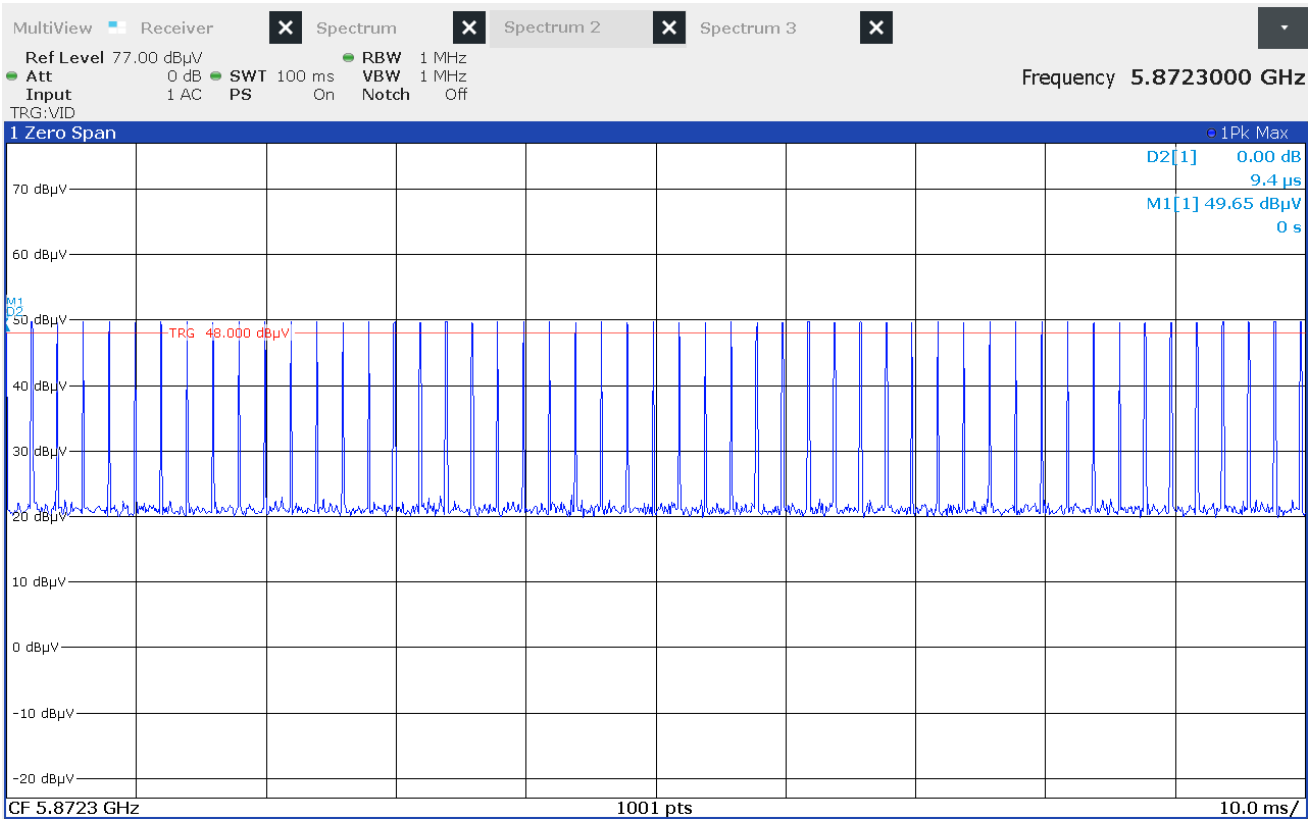


$$\text{Duty Cycle Factor} = 20\log\left(\frac{On-Time}{100\text{msec}}\right) = 20\log\left(\frac{0.00946*51}{100}\right) = \mathbf{-46.33}$$

Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5872.3MHz, Ch 342
Carrier Frequency	5872.3MHz
Parameters	On time = 0.00936ms
Notes	None



Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5872.3MHz, Ch 342
Carrier Frequency	5872.3MHz
Parameters	Number of Pulses = 51
Notes	None



$$\text{Duty Cycle Factor} = 20\log\left(\frac{On-Time}{100\text{msec}}\right) = 20\log\left(\frac{0.00936 * 51}{100}\right) = \mathbf{-46.42}$$

22. Case Spurious Radiated Emissions

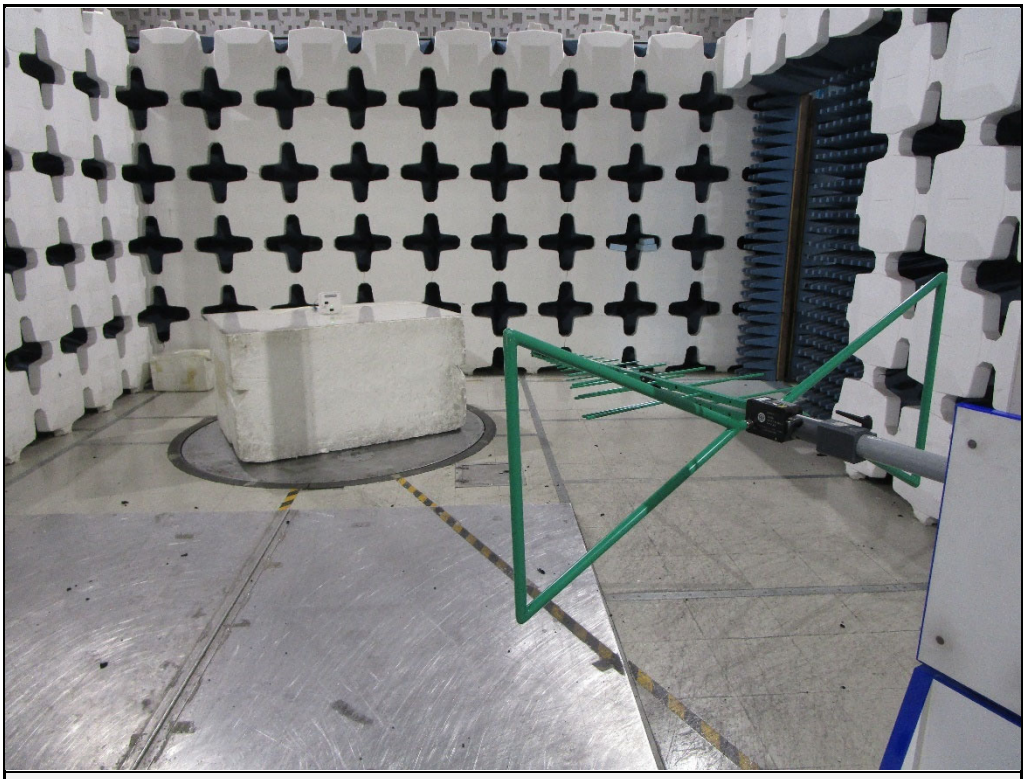
Test Information	
Manufacturer	Gentex Corporation
Product	Connected Smoke CO Nursery
Model	PL1N
Serial No	918-0023-002
Mode	Tx @ 5728.1MHz, Ch 112 Tx @ 5800.7MHz, Ch 233 Tx @ 5872.3MHz, Ch 342

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test site used	Room 21
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Notes	None

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Requirements		
The field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:		
Fundamental Frequency	Field Strength of Fundamental (mV/m)	Field Strength (mV/m)
902-928 MHz 2400-2483.5 MHz 5725-5875 MHz 24.0-24.25 MHz	50 50 50 250	500 500 500 2500

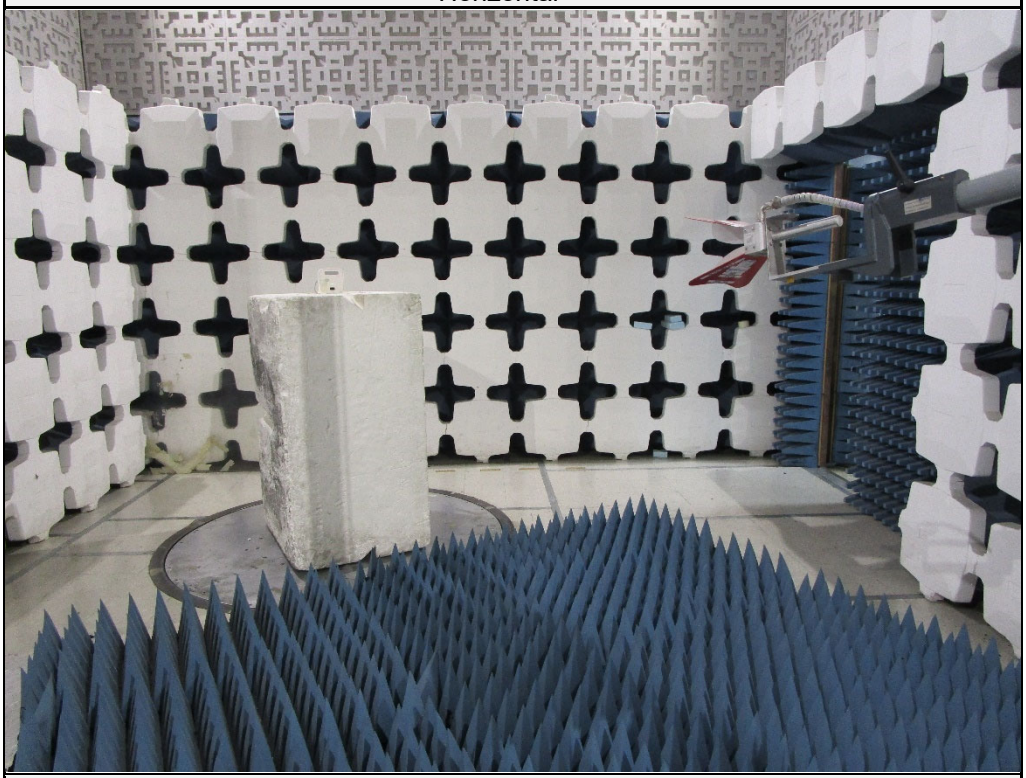
Procedures
Radiated measurements were performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads. Preliminary radiated emissions tests were performed to determine the emission characteristics of the EUT. For the preliminary test, a broadband measuring antenna was positioned at a 3 meter distance from the EUT. The entire frequency range from 30MHz to 40GHz was investigated using a peak detector function. The final open field emission tests were then manually performed over the frequency range of 30MHz to 40GHz. a) The field strength of the fundamental was measured using a double ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on a 1.5 meter high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer. b) The field strengths of all of the harmonics were then measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on a 1.5 meter high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer. c) To ensure that maximum or worst case emission levels at the fundamental and harmonics were measured, the following steps were taken when measuring the fundamental emissions and the spurious emissions: i) The EUT was rotated so that all of its sides were exposed to the receiving antenna. ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured. iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings. iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.



Test Setup for Spurious Radiated Emissions, 30-1000MHz – Antenna Polarization Horizontal

Test Setup for Spurious Radiated Emissions, 30-1000MHz – Antenna Polarization Vertical

Test Setup for Spurious Radiated Emissions, 1GHz-18HGz – Antenna Polarization Horizontal



Test Setup for Spurious Radiated Emissions, 1GHz-18HGz – Antenna Polarization Vertical

Test Setup for Spurious Radiated Emissions, 18GHz-26GHz – Antenna Polarization Horizontal

Test Setup for Spurious Radiated Emissions, 18GHz-26GHz – Antenna Polarization Vertical

Test Setup for Spurious Radiated Emissions, 26GHz-40GHz – Antenna Polarization Horizontal

Test Setup for Spurious Radiated Emissions, 26GHz-40GHz – Antenna Polarization Vertical

Test Setup for Spurious Radiated Emissions

Test Setup for Spurious Radiated Emissions

Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5728.1MHz, Ch 112
Carrier Frequency	5728.1MHz
Parameters	Peak Measurements
Notes	None

Frequency (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total (dBµV/m) at 3m	Peak Total (µV/m) at 3 m	Peak Limit (µV/m) at 3 m	Margin (dB)
5728.100	H	50.9		5.3	35.3	0.0	91.5	37785.7	500000.0	-22.4
5728.100	V	51.4		5.3	35.3	0.0	92.0	39840.8	500000.0	-22.0
11456.200	H	49.1	*	7.7	38.6	-38.6	56.9	696.8	5000.0	-17.1
11456.200	V	49.2	*	7.7	38.6	-38.6	56.9	702.4	5000.0	-17.0
17184.300	H	49.2	*	9.6	42.5	-37.4	63.9	1559.3	5000.0	-10.1
17184.300	V	49.9	*	9.6	42.5	-37.4	64.5	1680.4	5000.0	-9.5
22912.400	H	37.8	*	1.5	40.6	-26.3	53.6	479.2	5000.0	-20.4
22912.400	V	37.7	*	1.5	40.6	-26.3	53.5	473.8	5000.0	-20.5
28640.500	H	42.0	*	1.6	43.8	-34.4	53.0	444.9	5000.0	-21.0
28640.500	V	43.0	*	1.6	43.8	-34.4	53.9	497.4	5000.0	-20.0
34368.600	H	42.5	*	1.5	44.0	-34.1	54.0	499.3	5000.0	-20.0
34368.600	V	42.2	*	1.5	44.0	-34.1	53.7	482.9	5000.0	-20.3

Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5728.1MHz, Ch 112
Carrier Frequency	5728.1MHz
Parameters	Quasi-Peak/Average Measurements
Notes	None

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total (dBuV/m) at 3m	Average Total (uV/m) at 3 m	Average Limit (uV/m) at 3 m	Margin (dB)
5728.10	H	50.92		5.3	35.3	0.0	-46.6	45.0	176.9	50000.0	-49.0
5728.10	V	51.38		5.3	35.3	0.0	-46.6	45.4	186.6	50000.0	-48.6
11456.20	H	49.12	*	7.7	38.6	-38.6	-46.6	10.3	3.3	500.0	-43.7
11456.20	V	49.19	*	7.7	38.6	-38.6	-46.6	10.3	3.3	500.0	-43.6
17184.30	H	49.21	*	9.6	42.5	-37.4	-46.6	17.3	7.3	500.0	-36.7
17184.30	V	49.86	*	9.6	42.5	-37.4	-46.6	17.9	7.9	500.0	-36.1
22912.40	H	37.79	*	1.5	40.6	-26.3	-46.6	7.0	2.2	500.0	-47.0
22912.40	V	37.69	*	1.5	40.6	-26.3	-46.6	6.9	2.2	500.0	-47.1
28640.50	H	41.99	*	1.6	43.8	-34.4	-46.6	6.4	2.1	500.0	-47.6
28640.50	V	42.96	*	1.6	43.8	-34.4	-46.6	7.3	2.3	500.0	-46.6
34368.60	H	42.45	*	1.5	44.0	-34.1	-46.6	7.4	2.3	500.0	-46.6
34368.60	V	42.16	*	1.5	44.0	-34.1	-46.6	7.1	2.3	500.0	-46.9

Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5800.7MHz, Ch 233
Carrier Frequency	5800.7MHz
Parameters	Peak Measurements
Notes	None

Frequency (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total (dBµV/m) at 3m	Peak Total (µV/m) at 3 m	Peak Limit (µV/m) at 3 m	Margin (dB)
5800.700	H	53.3		5.3	35.6	0.0	94.2	51333.3	500000.0	-19.8
5800.700	V	53.8		5.3	35.6	0.0	94.8	54688.9	500000.0	-19.2
11601.400	H	49.1	*	7.8	38.7	-38.6	57.0	709.5	5000.0	-17.0
11601.400	V	49.2	*	7.8	38.7	-38.6	57.1	715.3	5000.0	-16.9
17402.100	H	49.2	*	9.7	42.5	-37.5	63.9	1561.1	5000.0	-10.1
17402.100	V	49.5	*	9.7	42.5	-37.5	64.1	1612.2	5000.0	-9.8
23202.800	H	38.5	*	1.5	40.6	-26.3	54.3	518.6	5000.0	-19.7
23202.800	V	38.4	*	1.5	40.6	-26.3	54.2	512.7	5000.0	-19.8
29003.500	H	41.9	*	1.4	43.8	-35.3	51.8	390.8	5000.0	-22.1
29003.500	V	42.0	*	1.4	43.8	-35.3	51.9	395.3	5000.0	-22.0
34804.200	H	42.8	*	1.6	44.1	-34.2	54.3	521.4	5000.0	-19.6
34804.200	V	41.8	*	1.6	44.1	-34.2	53.3	463.6	5000.0	-20.7

Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5800.7MHz, Ch 233
Carrier Frequency	5800.7MHz
Parameters	Quasi-Peak/Average Measurements
Notes	None

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total (dBuV/m) at 3m	Average Total (uV/m) at 3 m	Average Limit (uV/m) at 3 m	Margin (dB)
5800.70	H	53.27		5.3	35.6	0.0	-46.3	47.9	247.7	50000.0	-46.1
5800.70	V	53.82		5.3	35.6	0.0	-46.3	48.4	263.9	50000.0	-45.6
11601.40	H	49.08	*	7.8	38.7	-38.6	-46.3	10.7	3.4	500.0	-43.3
11601.40	V	49.15	*	7.8	38.7	-38.6	-46.3	10.8	3.5	500.0	-43.2
17402.10	H	49.22	*	9.7	42.5	-37.5	-46.3	17.5	7.5	500.0	-36.4
17402.10	V	49.5	*	9.7	42.5	-37.5	-46.3	17.8	7.8	500.0	-36.2
23202.80	H	38.48	*	1.5	40.6	-26.3	-46.3	8.0	2.5	500.0	-46.0
23202.80	V	38.38	*	1.5	40.6	-26.3	-46.3	7.9	2.5	500.0	-46.1
29003.50	H	41.89	*	1.4	43.8	-35.3	-46.3	5.5	1.9	500.0	-48.5
29003.50	V	41.99	*	1.4	43.8	-35.3	-46.3	5.6	1.9	500.0	-48.4
34804.20	H	42.82	*	1.6	44.1	-34.2	-46.3	8.0	2.5	500.0	-46.0
34804.20	V	41.8	*	1.6	44.1	-34.2	-46.3	7.0	2.2	500.0	-47.0

Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5872.3MHz, Ch 342
Carrier Frequency	5872.3MHz
Parameters	Peak Measurements
Notes	None

Frequency (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total (dBµV/m) at 3m	Peak Total (µV/m) at 3 m	Peak Limit (µV/m) at 3 m	Margin (dB)
5872.300	H	49.7		5.4	35.9	0.0	91.1	35737.3	500000.0	-22.9
5872.300	V	53.5		5.4	35.9	0.0	94.8	54843.0	500000.0	-19.2
11744.600	H	48.9	*	7.9	38.8	-38.6	57.0	704.8	5000.0	-17.0
11744.600	V	49.8	*	7.9	38.8	-38.6	57.9	780.9	5000.0	-16.1
17616.900	H	50.2	*	9.8	42.2	-37.7	64.5	1687.2	5000.0	-9.4
17616.900	V	50.4	*	9.8	42.2	-37.7	64.7	1726.5	5000.0	-9.2
23489.200	H	37.9	*	1.7	40.6	-26.3	53.9	494.6	5000.0	-20.1
23489.200	V	37.3	*	1.7	40.6	-26.3	53.3	461.6	5000.0	-20.7
29361.500	H	42.6	*	1.1	43.8	-35.4	52.1	402.5	5000.0	-21.9
29361.500	V	42.7	*	1.1	43.8	-35.4	52.2	407.6	5000.0	-21.8
35233.800	H	42.1	*	1.7	44.1	-34.4	53.5	472.9	5000.0	-20.5
35233.800	V	41.6	*	1.7	44.1	-34.4	53.0	445.9	5000.0	-21.0

Test Details	
Manufacturer	Gentex Corporation
Model	PL1N
S/N	918-0023-002
Mode	Tx @ 5872.3MHz, Ch 342
Carrier Frequency	5872.3MHz
Parameters	Quasi-Peak/Average Measurements
Notes	None

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total (dBuV/m) at 3m	Average Total (uV/m) at 3 m	Average Limit (uV/m) at 3 m	Margin (dB)
5872.30	H	49.74		5.4	35.9	0.0	-46.4	44.6	170.7	50000.0	-49.3
5872.30	V	53.46		5.4	35.9	0.0	-46.4	48.4	261.9	50000.0	-45.6
11744.60	H	48.86	*	7.9	38.8	-38.6	-46.4	10.5	3.4	500.0	-43.4
11744.60	V	49.75	*	7.9	38.8	-38.6	-46.4	11.4	3.7	500.0	-42.5
17616.90	H	50.16	*	9.8	42.2	-37.7	-46.4	18.1	8.1	500.0	-35.9
17616.90	V	50.36	*	9.8	42.2	-37.7	-46.4	18.3	8.2	500.0	-35.7
23489.20	H	37.86	*	1.7	40.6	-26.3	-46.4	7.5	2.4	500.0	-46.5
23489.20	V	37.26	*	1.7	40.6	-26.3	-46.4	6.9	2.2	500.0	-47.1
29361.50	H	42.59	*	1.1	43.8	-35.4	-46.4	5.7	1.9	500.0	-48.3
29361.50	V	42.7	*	1.1	43.8	-35.4	-46.4	5.8	1.9	500.0	-48.2
35233.80	H	42.08	*	1.7	44.1	-34.4	-46.4	7.1	2.3	500.0	-46.9
35233.80	V	41.57	*	1.7	44.1	-34.4	-46.4	6.6	2.1	500.0	-47.4

23. Band-Edge Compliance

Test Information	
Manufacturer	Gentex Corporation
Product	Connected Smoke CO Nursery
Model	PL1N
Serial No	918-0023-002
Mode	Tx @ 5728.1MHz, Ch 112 Tx @ 5872.3MHz, Ch 342

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test site used	Room 21
Notes	The general radiated emission limits in 15.209 were used to determine compliance.

Requirements
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209 and RSS-GEN, whichever is the lesser attenuation.

Procedures
Band Edge 1) The EUT was setup inside the test chamber on a non-conductive stand. 2) A broadband measuring antenna was placed at a test distance of 3 meters from the EUT. 3) The EUT was set to transmit continuously at the channel closest to the low band-edge. 4) The EUT was maximized for worst case emissions at the measuring antenna. The maximum meter reading was recorded. 5) To determine the band edge compliance, the following spectrum analyzer settings were used: a. Center frequency = band-edge frequency. b. Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation. c. Resolution bandwidth (RBW) ≥ 1% of the span. d. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. e. The marker was set on the highest point outside the frequency band. The peak outside the frequency band was collected and compared to the generic limit of the FCC 15.209 standard.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Test Details	
Manufacturer	Gentex Corporation
EUT	Connected Smoke CO Nursery
Model No.	PL1N
Serial No.	918-0023-002
Mode	Tx @ 5728.1MHz, Ch 112
Frequency Tested	5728.1MHz
Notes	Low Band Edge – Peak Measurements

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
5725.00	H	29.38		5.3	35.3	0.0	70.0	3160.5	5000.0	-4.0
	V	26.82		5.3	35.3	0.0	67.4	2353.7	5000.0	-6.5

Test Details	
Manufacturer	Gentex Corporation
EUT	Connected Smoke CO Nursery
Model No.	PL1N
Serial No.	918-0023-002
Mode	Tx @ 5728.1MHz, Ch 112
Frequency Tested	5728.1MHz
Notes	Low Band Edge – Average Measurements

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
5725.00	H	11.63		5.3	35.3	0.0	0.0	52.2	409.5	500.0	-1.7
	V	11.57		5.3	35.3	0.0	0.0	52.2	406.7	500.0	-1.8

Test Details	
Manufacturer	Gentex Corporation
EUT	Connected Smoke CO Nursery
Model No.	PL1N
Serial No.	918-0023-002
Mode	Tx @ 5872.3MHz, Ch 342
Frequency Tested	5872MHz
Notes	High Band Edge – Peak Measurements

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
5875.000	H	30.66		5.4	36.0	0.0	72.0	3979.2	5000.0	-2.0
	V	32.05		5.4	36.0	0.0	73.4	4669.8	5000.0	-0.6

Test Details	
Manufacturer	Gentex Corporation
EUT	Connected Smoke CO Nursery
Model No.	PL1N
Serial No.	918-0023-002
Mode	Tx @ 5872.3MHz, Ch 342
Frequency Tested	5872MHz
Notes	High Band Edge – Average Measurements

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
5875.00	H	11.81		5.4	36.0	0.0	0.0	53.1	454.2	500.0	-0.8
	V	11.9		5.4	36.0	0.0	0.0	53.2	456.9	500.0	-0.8

24. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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ELECTRICAL

Valid To: June 30, 2025 Certificate Number: 1786.01

In recognition of the successful completion of the A2LA Accreditation Program evaluation process, accreditation is granted to this laboratory to perform the following automotive electromagnetic compatibility and other electrical tests:

Test Technology:	Test Method(s)[1]:
Transient Immunity *(Max Voltage 60V/Max current 100A)*	ISO 7637-2 (including emissions); ISO 7637-3; ISO 16750-2:2012, Sections 4.6.3 and 4.6.4; CS-11979, Section 6.4; CS.00054, Section 5.9; EMC-CS-2009.1 (CI220); FMC1278 (CI220, CI221, CI222); GMW 3097, Section 3.5; SAE J1113-11; SAE J1113-12; ECE Regulation 10.06 Annex 10
Electrostatic Discharge (ESD) *(Up to +/-25kV)*	ISO 10605 (2001, 2008); CS-11979 Section 7.0; CS.00054, Section 5.10; EMC-CS-2009.1 (CI 280); FMC1278 (CI280); SAE J1113-13; GMW 3097 Section 3.6
Conducted Emissions	CISPR 25 (2002, 2008), Sections 6.2 and 6.3; CISPR 25 (2016), Sections 6.3 and 6.4; CS-11979, Section 5.1; CS.00054, Sections 5.6.1 and 5.6.2; GMW 3097, Section 3.3.2; EMC-CS-2009.1 (CE 420); FMC1278 (CE420, CE421, CE 430, CE440)

Test Technology:	Test Method(s)[1]:
Radiated Emissions Anechoic *(Up to 6GHz)*	CISPR 25 (2002, 2008), Section 6.4; CISPR 25 (2016), Section 6.5; CS-11979, Section 5.3; CS.00054, Section 5.6.3; GMW 3097, Section 3.3.1; EMC-CS-2009.1 (RE 310); FMC1278 (RE310, RE320);
Vehicle Radiated Emissions	CISPR 12; CISPR 36; ICES-002; ECE Regulation 10.06 Annex 5
Bulk Current Injection (BCI) *(1 to 400MHz 500mA)*	ISO 11452-4; CS-11979, Section 6.1; CS.00054, Section 5.8.1; GMW 3097, Section 3.4.1; SAE J1113-4; EMC-CS-2009.1 (RI112); FMC1278 (RI112); ECE Regulation 10.06 Annex 9
Radiated Immunity Anechoic *(Up to 6GHz and 200V/m)* *(Including Radar Pulse 600V/m)*	ISO 11452-2; CS-11979, Section 6.2; CS.00054, Section 5.8.2; GMW 3097, Section 3.4.2; EMC-CS-2009.1 (RI114); FMC1278 (RI114); SAE J1113-21; ECE Regulation 10.06 Annex 9
Radiated Immunity Magnetic Field	ISO 11452-8; FMC 1278 (RI140)
Radiated Immunity Reverb *(360MHz to 6GHz and 100V/m)*	ISO/IEC 61000-4-21; GMW 3097, Section 3.4.3; EMC-CS-2009.1 (RI114); FMC1278 (RI114); ISO 11452-11
Radiated Immunity *(Portable Transmitters)* *(Up to 6GHz and 20W)*	ISO 11452-9; EMC-CS-2009.1 (RI115); FMC1278 (RI115); GMW 3097, Sec 3.4.4
Vehicle Radiated Immunity (ALSE)	ISO 11451-2; ECE Regulation 10.06 Annex 6
Vehicle Product Specific EMC Standards	EN 14982; EN ISO 13309; ISO 13766; EN 50498; EC Regulation No. 2015/208; EN 55012
Electrical Loads	ISO 16750-2
Stripline	ISO 11452-5
Transverse Electromagnetic (TEM) Cell	ISO 11452-3

Test Technology:	Test Method(s)[1]:
Emissions	
Radiated and Conducted (3m Semi-anechoic chamber, up to 40 GHz)	47 CFR, FCC Part 15 B (using ANSI C63.4:2014); 47 CFR, FCC Part 18 (using FCC MP-5:1986); ICES-001; ICES-003; ICES-005; IEC/CISPR 11, Ed. 4.1 (2004-06); AS/NZS CISPR 11 (2004); IEC/CISPR 11 Ed 5 (2009-05) + A1 (2010); KN 11 (2008-5) with RRL Notice No. 2008-3 (May 20, 2008); CISPR 11; EN 55011; KS C 9811; CNS 13803 (1997, 2003); CISPR 14-1; EN 55014-1; AS/NZS CISPR 14.1; CISPR 16-2-1 (2008); CISPR 16-2-1; KS C 9814-1; KN 14-1; IEC/CISPR 22 (1997); EN 55022 (1998) + A1(2000); EN 55022 (1998) + A1(2000) + A2(2003); EN 55022 (2006); IEC/CISPR 22 (2008-09); AS/NZS CISPR 22 (2004); AS/NZS CISPR 22, 3rd Edition (2006); KN 22 (up to 6 GHz); CNS 13438 (up to 6 GHz); VCCI V-3 (up to 6 GHz); CISPR 32; EN 55032; KS C 9832; KN 32; ECE Regulation 10.06 Annex 7 (Broadband); ECE Regulation 10.06 Annex 8 (Narrowband); ECE Regulation 10.06 Annex 14 (Conducted)
Cellular Radiated Spurious Emissions	ETSI TS 151 010-1 GSM; 3GPP TS 51.010-1, Sec 12; ETSI TS 134 124 UMTS; 3GPP TS 34.124; ETSI TS 136 124 LTE; E-UTRA; 3GPP TS 36.124
Current Harmonics	IEC 61000-3-2; IEC 61000-3-12; EN 61000-3-2; KN 61000-3-2; KS C 9610-3-2; ECE Regulation 10.06 Annex 11
Flicker and Fluctuations	IEC 61000-3-3; IEC 61000-3-11; EN 61000-3-3; KN 61000-3-3; KS C 9610-3-3; ECE Regulation 10.06 Annex 12
Immunity	
Electrostatic Discharge	IEC 61000-4-2, Ed. 1.2 (2001); IEC 61000-4-2 (1995) + A1(1998) + A2(2000); EN 61000-4-2 (1995); EN 61000-4-2 (2009-05); KN 61000-4-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-2; EN 61000-4-2; KN 61000-4-2; KS C 9610-4-2; IEEE C37.90.3 2001
Radiated Immunity	IEC 61000-4-3 (1995) + A1(1998) + A2(2000); IEC 61000-4-3, Ed. 3.0 (2006-02); IEC 61000-4-3, Ed. 3.2 (2010); KN 61000-4-3 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-3; EN 61000-4-3; KN 61000-4-3; KS C 9610-4-3; IEEE C37.90.2 2004