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RF Exposure Evaluation Report

Client:	**Gentex Corporation**
Address:	**380 Riley Street** **Zeeland, MI 49464**
EUT:	**EG-01-AC-00**
Test Report No.:	**RFE20220506-20-M1G**
Approved By:	 **Fox Lane,** **EMC Test Engineer**
Date:	**June 27, 2024**
Total Pages:	**8**

Revision Page

Rev. No.	Date	Description
0	18 December 2023	Issued by FLane Prepared by FLane
A	18 March 2024	Model number, FCC ID and IC ID were updated-KV
B	25 April 2024	IC ID has been updated-KV
C	15 May 2024	Corrected Calculation for <50mm testing Updated distance to 3cm/30mm – FL
D	4 June 2024	Updated Units and round up values – FL
E	12 June 2024	Added SAR estimate calculation – FL
F	27 June 2024	Updated ISED SAR estimate to Conducted Power + tune up tolerance – FL
G	27 June 2024	Set SAR calculation back to EIRP – FL

1 Regulatory Requirements:

FCC Part 1.1310, 2.1091, 2.1093
KDB 447498 D01
RSS-102, Issue 5

Summary:
The purpose of this report is to reevaluate the EUT's transmitter at a different distance than reported in the original grant. This is for exemption from routine SAR testing.

EUT:

Model:	**EG-01-AC-00**
FCC ID:	**NZLEG-01-AC-00**
IC:	**4112A-EG01AC00**
MPE Lab	Nebraska Center for Excellence in Electronics
MPE Labs FCC Cab Designation:	US1060
MPE Labs ISED Cab Designation:	US0177

2 FCC Limits, Part 1.1310

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	$*900/f^2$	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	$*180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

Occupational/Controlled	☐
General Population/uncontrolled	☒

FCC Power Density Calculations

Mod. (802.11x / Data rate	Frequency	Conducted Output Power	Peak Power EIRP +10% for Tolerance (P_{10})	SAR Exemption Calc (SAC)	Sar Exemption Limit (SAL)	% of limit	Result
	GHz	mW	mW			%	
B 1	2.4120	20	22	1.1	3.0	38.0	PASS
B 1	2.4370	20	22	1.1	3.0	37.9	PASS
B 1	2.4620	20	22	1.1	3.0	37.6	PASS
B 11	2.4120	20	22	1.1	3.0	38.3	PASS
B 11	2.4370	20	21	1.1	3.0	37.3	PASS
B 11	2.4620	20	22	1.1	3.0	37.6	PASS
G 6	2.4120	20	22	1.2	3.0	38.7	PASS
G 6	**2.4370**	**20**	23	1.2	**3.0**	39.1	PASS
G 6	2.4620	19	21	1.1	3.0	37.4	PASS
G 54	2.4120	20	22	1.2	3.0	38.5	PASS
G 54	2.4370	19	21	1.1	3.0	36.7	PASS
G 54	2.4620	20	22	1.1	3.0	37.9	PASS
N 0	2.4120	20	22	1.1	3.0	37.6	PASS
N 0	2.4370	20	22	1.1	3.0	37.6	PASS
N 0	2.4620	19	21	1.1	3.0	37.0	PASS
N 7	2.4120	20	22	1.1	3.0	37.8	PASS
N 7	2.4370	20	21	1.1	3.0	37.2	PASS
N 7	2.4620	19	21	1.1	3.0	36.7	PASS

Distance (d)	30	mm

SAC = (P_{10} / d)*sqrt(f) – used to calculate exposure at "d"(mm) per KDB447498 Sec. 4.3.1(a)

EIRP = Cond. Power * Gain, measured as field strength

f = Frequency (GHz)

S = power density (mW/cm^2)

P_{10} = transmitter conducted power (in mW)

G = antenna numeric gain (Numerical)

d = distance to radiation center (mm)

Result:
Complies
Note:
The user's manual will stipulate that a 3cm/30mm distance from the user is to be maintained. EIRP values in mW were multiplied by 1.1 to account for a 10% tolerance. Worst case transmitter/modulation margin was bolded.

3 ISED Limits, RSS 102

RSS 102, Issue 6, Section 6.3

6.3 SAR exemption limits

Devices operating at or below the applicable output power levels (adjusted for tune-up tolerance) specified in table 11, based on the separation distance, are exempt from SAR evaluation. The separation distance, defined as the distance between the user and/or bystander and the antenna and/or radiating element of the device or the outer surface of the device, shall be less than or equal to 20 cm for these exemption limits to apply.

Table 11: Power limits for exemption from routine SAR evaluation based on the separation distance

Frequency (MHz)	≤ 5 mm(mW)	10 mm (mW)	15 mm(mW)	20 mm(mW)	25 mm(mW)	30 mm(mW)	35 mm(mW)	40 mm(mW)	45 mm(mW)	> 50 mm(mW)
≤ 300	45	116	139	163	189	216	246	280	319	362
450	32	71	87	104	124	147	175	208	248	296
835	21	32	41	54	72	96	129	172	228	298
1900	6	10	18	33	57	92	138	194	257	323
2450	3	7	16	32	56	89	128	170	209	245
3500	2	6	15	29	50	72	94	114	134	158
5800	1	5	13	23	32	41	54	74	102	128

The exemption limits in table 11 Table 11 are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 50 mm from a flat phantom, which provides a SAR value of approximately 0.4 W/kg for 1 g of tissue.

For limb-worn devices where the 10 gram of tissue applies, the exemption limits for routine evaluation in table 11 are multiplied by a factor of 2.5.

For controlled-use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in table 11 Table 11 are multiplied by a factor of 5.

ISED Power Density Exemption Calculations							
Mod. (802.11x / Data rate	Freq.	Conducted Power	Cond. Power +10% Tolerance	Antenna Gain	EIRP +10% Tolerance (P_{Max})	Exemption Limit ($P_{Max-Exem}$)	Result
	MHz	mW	mW	Num.	mW	mW	
B 1	2412.000	20.000	22.00	2.43	53.51	89.21	PASS
B 1	2437.000	19.860	21.85	2.43	53.13	89.07	PASS
B 1	2462.000	19.630	21.59	2.43	52.52	88.93	PASS
B 11	2412.000	20.180	22.20	2.43	53.99	89.21	PASS
B 11	2437.000	19.540	21.49	2.43	52.28	89.07	PASS
B 11	2462.000	19.590	21.55	2.43	52.41	88.93	PASS
G 6	2412.000	20.400	22.44	2.43	54.58	89.21	PASS
G 6	2437.000	20.490	22.54	2.43	54.82	89.07	PASS
G 6	2462.000	19.480	21.43	2.43	52.12	88.93	PASS
G 54	2412.000	20.300	22.33	2.43	54.31	89.21	PASS
G 54	2437.000	19.210	21.13	2.43	51.39	89.07	PASS
G 54	2462.000	19.750	21.73	2.43	52.84	88.93	PASS

N 0	2412.000	19.830	21.81	2.43	53.05	89.21	PASS
N 0	2437.000	19.700	21.67	2.43	52.71	89.07	PASS
N 0	2462.000	19.290	21.22	2.43	51.61	88.93	PASS
N 7	2412.000	19.930	21.92	2.43	53.32	89.21	PASS
N 7	2437.000	19.520	21.47	2.43	52.22	89.07	PASS
N 7	2462.000	19.160	21.08	2.43	51.26	88.93	PASS

SAR Estimate calculation per RSS102 Issue 6 Sec 7.1.8

$SAR_{Estimated}$(W/kg) = (P_{Max}/$P_{Max\text{-}Exemption}$)*0.25*SAR_{Limit}(W/kg)
0.246W/kg = (54.82/89.07)*0.25*1.6

P_{Max} = The maximum EIRP level including tune-up tolerance for the exempted transmitter
$P_{Max\text{-}Exem}$ = The maximum power level of exemption at the same frequency and distance for the exempted transmitter
SAR_{Limit} = The applicable SAR limit (e.g. 1.6W/kg for 1g or 4W/kg for 10g)

Note:
The user's manual will stipulate that a 3cm/30mm distance from the user is to be maintained. EIRP values in mW were multiplied by 1.1 to account for a 10% tolerance.

Result:
The EUT was found to be exempt from routine SAR testing and **COMPLIANT** with FCC and ISED RF exposure requirements.

REPORT END