MPE Calculation

Product:	Element 7 HV, Element 9 HV, Element 12 HV
Model no.:	E70532, E70534, E70536
Evaluation Model:	E70534
FCC ID:	PJ5-ELEMDISP
Rating:	DC 12V, 3A Max
RF Transmission Frequency:	2412MHz-2462MHz
No. of Operated Channel:	11
Modulation:	DSSS, OFDM
Antenna Type:	Internal Antenna
Antenna Gain:	2dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Raymarine multifunction display which support Wi-Fi function operated at 2.4GHz- Add a new alternative GPS receiver and 12-inch LCD display, no any effect about RF transmitting, other part remains the same include main board and RF module. - Appearance was changed (Add a new model Element 12HV) -Three models difference information as below:

Object / part No.	Type / model	Display size	GPS model
Element 9HV	E70534	9-inch	WGR7640-0-17WLNSP QUALCOMM
Element 7HV	E70532	7-inch	WGR7640-0-17WLNSP QUALCOMM
Element 12HV	E70536	12-inch	UBX-M8030-KT uBlox

According to subpart 15.247(i)and subpart §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm2)	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	30
30–300	27.5	0.073	0.2	30
300–1,500	/	/	f/1500	30
1,500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:
Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm2);

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P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

Maximum peak output power at antenna input terminal (dBm):	**14.2**
Maximum peak output power at antenna input terminal (mW):	**26.30268**
Prediction distance (cm):	**20**
Antenna Gain, typical (dBi):	**2.0**
Maximum Antenna Gain (numeric):	**2.0**
The worst case is power density at predication frequency at 20 cm (mW/cm2):	**0.00829**
MPE limit for general population exposure at prediction frequency (mW/cm2):	1.0

0.00829 (mW/cm^2) < 1 (mW/cm^2)

Result: Compliant

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Date: 2019-03-11

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Date: 2019-03-11

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