H.B. Compliance Solutions

RF Exposure MPE Report

For the

Inergy Systems

SEMS

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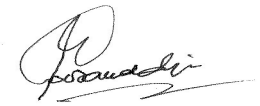

Hoosamuddin Bandukwala

Cert # ATL-0062-E

1. Equipment Overview

Product Name:	SEMS
Model(s) Tested:	IH40
FCC ID:	2A93L-SEMS
Supply Voltage Input:	Primary Power: +5VDC
Frequency Range:	**WiFi** 802.11b/g/n20: 2412MHz - 2462MHz 802.11n40: 2422MHz – 2452MHz **Z-Wave** 908.4-920MHz
No. of Channels:	**WiFi** - 802.11b/g/n20: 11, 802.11n40: 7 **Zwave** - 5
Type(s) of Modulation:	**WiFi** 802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n (HT20/HT40): OFDM (64QAM, 16QAM, QPSK, BPSK) **Zwave** 908.4/916MHz: FSK/GFSK, 912/920MHz: DSSS OQPSK
Range of Operation Power:	Wifi- 0.184W (Conducted) Zwave- 19.7mW (Radiated)
Emission Designator:	N/A
Channel Spacing(s)	None
Test Item:	Pre-Production
Type of Equipment:	Fixed
Antenna Requirement (§15.203) :	Type of Antenna: Internal PCB Patch (Wifi) / External Whip Dipole (Z-wave) Gain of Antenna: 2.8dBi (Wifi) 2.7dBi (Z-wave)
Environmental Test Conditions:	Temperature: 15-35°C Humidity: 30-60% Barometric Pressure: 860-1060 mbar
Modification to the EUT:	None

2. Applicable Standard

According to §1.1307 the criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter. Test Limits

Evaluated against exposure limits: General Use _X_ or Controlled Use ___

Maximum Permissible Exposure (MPE)

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

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

RF exposure compliance will need to be determined with respect to 1.1307(c) and (d) of the FCC rules. The emissions should be within the limits at 300kHz in the above table. (Use 300kHz limits for 150kHz)

3. Test Results

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG/4\pi R^2$

Where,

S = power density (mW/cm2)
P = output power at the antenna terminal (mW)
G = gain of transmit antenna (numeric)
R = distance from transmitting antenna (cm)

For Z-Wave Transmitter

Maximum peak output power at antenna input terminal = 12.94 (dBm)
Maximum peak output power at antenna input terminal = 19.7 (mW)
Antenna gain (typical) = 2.7 (dBi)
Maximum antenna gain = 1.860 (numeric)
Prediction distance = 20 (cm)
Prediction frequency = 920 (MHz)
MPE limit for uncontrolled exposure at prediction frequency = 0.613 (mW/cm^2)
Power density at prediction frequency = 0.00728 (mW/cm^2)

To solve for the minimum mounting distance required;

$R = \sqrt{(PG/4\pi S)}$

$R = \sqrt{(19.7 \times 1.86 / 4\pi \times 0.00728)}$ = 20 cm (Based on continuous transmission)

For Wifi Transmitter

Maximum peak output power at antenna input terminal = 22.65 (dBm)
Maximum peak output power at antenna input terminal = 184 (mW)
Antenna gain (typical) = 2.8 (dBi)
Maximum antenna gain = 1.9 (numeric)
Prediction distance = 20 (cm)
Prediction frequency = 2462 (MHz)
MPE limit for uncontrolled exposure at prediction frequency = 1 (mW/cm^2)
Power density at prediction frequency = 0.06955 (mW/cm^2)

To solve for the minimum mounting distance required;

R = √ (PG/4πS)

R = √ (184 x 1.9 / 4π x 0.06955) = 20 cm (Based on continuous transmission)

Simultaneous Transmission Evaluation

Limit

The sum of the ratios of the peak or spatially averaged results to the applicable frequency dependent MPE limits must be <1 at all locations where users and bystanders can by exposed.

Calculation

Mode	Cellular Modem Power Density/Limit	Zigbee Power Density/Limit	WiFi Power Density/Limit	Z-Wave	∑(Power Density/Limit) of Cellular+Zigbee+WiFi+Zwave
Cellular Modem	0.094				
Zigbee		0.019			
WiFi			0.069		
Z-Wave				0.007	0.189

The Cellular, Zigbee, WiFi and Z-Wave transmitter, the aggregated (power density/limit) is smaller than 1, and the MPE of 4 collocated transmitters is compliant.

Note: FCC ID for the pre-certified Cellular Modem N7NHL7648 and for Zigbee XFFZ357PA20

END OF TEST REPORT