RF Exposure Evaluation declaration

Product Name : AIS Class B Transponder

Model No. : CAMINO-108, CAMINO-108W

FCC ID : WZ7AIS-B108, WZ7AIS-W

Applicant : Alltek Marine Electronics Corp.

Address : 7F, No.605, Ruei Guang Rd., Neihu, Taipei, Taiwan, 114 R.O.C.

Date of Receipt : May 06, 2013

Date of Declaration : Dec. 23, 2013

Report No. : 135096R-SAUSP01V00

Report Version : V1.0

Testing Laboratory

0914

RF Exposure Evaluation declaration

Date of Declaration : Dec. 23, 2013
Report No.: 135096R-SAUSP01V00

Product Name	AIS Class B Transponder
Applicant	Alltek Marine Electronics Corp.
Address	7F, No.605, Ruei Guang Rd., Neihu, Taipei, Taiwan, 114 R.O.C.
Manufacturer	Alltek Marine Electronics Corp.
Model No.	CAMINO-108, CAMINO-108W
Trade Name	AMEC
Test Result	Complied

Documented By : April Chen

(Adm. Specialist / April Chen)

Technical Acceptance By : Paddy Chen

(Engineer / Paddy Chen)

Approved By :

(Director / Vincent Lin)

Revision History

Rev.	Issue Date	Revisions	Effect page
V1.0	December 23, 2013	Initial Issue	All

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	AIS Class B Transponder
Trade Name	AMEC
Model No.	CAMINO-108, CAMINO-108W
FCC ID.	WZ7AIS-B108, WZ7AIS-W
Frequency Range	WLAN: 2412-2462MHz for 802.11b/g/n-20BW VHF : 156.025MHz~162.025MHz
Number of Channels	802.11b/g/n-20MHz: 11
Data Speed	WLAN: 802.11b: 1-11Mbps, 802.11g: 6-54Mbps, 802.11n: up to 72.2Mbps VHF : 9600bps/per channel
Type of Modulation	WLAN: 802.11b:DSSS, DBPSK, DQPSK, CCK 802.11g/n:OFDM, BPSK, QPSK, 16QAM, 64QAM VHF : GMSK/FM
Channel Separation	WLAN: 802.11b/g/n: 5 MHz VHF : 25KHz
Antenna Type	Dipole
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto
USB Cable	Shielded, 1.8m
NMEA2000 Cable	Shielded, 3m
VHF Cable	Shielded, 10m
GPS Cable	Shielded, 10m
Hardware	M-PCB-B108MBV1
Software	V1.2.6

Antenna List

No.	Manufacturer	Model No.	Antenna Type	Peak Gain
1	Alltek Marine Electronics Corp.	M-ANT-SAA04-05005G-01	Dipole	2 dBi for 2.4 GHz

2. RF Exposure Evaluation

2.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	30
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: $Pd = (Pout*G)/(4*Pi*R^2)$

Where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, 1 mW/cm^2. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 23℃ and 58％ RH.

2.3. Test Result of RF Exposure Evaluation

Product : AIS Class B Transponder
Test Item : RF Exposure Evaluation
Test Site : N/A

FOR WLAN

802.11b-Peak Gain: 2.0dBi

Frequency (MHz)	Conducted Power (dBm)	Duty Cycle	Output Power to Antenna (mW)	Power Density at R = 60 cm (mW/cm^2)	Limit (mW/ cm^2)	Pass/Fail
2412	15.85	1	38.5	0.0013	1	Pass
2437	15.21	1	33.2	0.0012	1	Pass
2462	14.11	1	25.8	0.0009	1	Pass

802.11g-Peak Gain: 2.0dBi

Frequency (MHz)	Conducted Power (dBm)	Duty Cycle	Output Power to Antenna (mW)	Power Density at R = 60 cm (mW/cm^2)	Limit (mW/ cm^2)	Pass/Fail
2412	22.71	1	186.6	0.0065	1	Pass
2437	22.44	1	175.4	0.0061	1	Pass
2462	21.18	1	131.2	0.0046	1	Pass

802.11n (20M)-Peak Gain: 2.0dBi

Frequency (MHz)	Conducted Power (dBm)	Duty Cycle	Output Power to Antenna (mW)	Power Density at R = 60 cm (mW/cm^2)	Limit (mW/ cm^2)	Pass/Fail
2412	20.89	1	122.7	0.0043	1	Pass
2437	20.64	1	115.9	0.0041	1	Pass
2462	19.48	1	88.7	0.0031	1	Pass

Note: The conducted output power is refer to report No.: 135096R-RFUSP42V01 from the QuieTek.

FOR VHF

Peak Gain: 2.86dBi

Frequency (MHz)	Conducted Power (dBm)	Duty Cycle	Output Power to Antenna (mW)	Power Density at R = 60 cm (mW/cm^2)	Limit (mW/ cm^2)	Pass/Fail
156.025	33.70	1	2344.2	0.1001	0.104	Pass
162.025	33.80	1	2398.8	0.1024	0.108	Pass

Note: The conducted output power is refer to report No.: F130840E1 from the PHOENIX.

EXPOSURE FROM SOURCES WITH MULTIPLE FREQUENCES

$$\sum_{i>1\ MHz}^{300\ GHz} \frac{S_i}{S_L} \leq 1$$

S_i is the power density at frequency i;

S_L is the power density reference level from Table .

Both of the WLAN and VHF can transmit simultaneously, the formula of calculated the MPE is :

0.0065/1 + 0.1001/0.104 = 0.969

Therefore, the conclusion data is less than “1”, so compliance with the MPE limit.