Human Exposure to Electromagnetic Fields

This document demonstrates that the Ocean Signal ATB1 class B AIS transponder is in compliance with US requirements for protection of the general public (uncontrolled) from exposure to electromagnetic fields.

In the US regulation 47CFR chapter 2.1091 requires Radiofrequency radiation exposure evaluation to the limits in 47 CFR chapter 1.1310[1] which specifies that in the bands

30 – 300MHz the exposure limit is 0.2mW/cm^2;

and in the band

1,500 – 100,000MHz the exposure limit is 1mW/cm^2

AIS transmissions

From Test Report 75936859-04[2] the measured conducted RF power at 162.025MHz is stated as 37.96dBM (6252mW).

The AIS maximum transmission rate is 12 x 26.6mS/min

Duty Cycle = 0.3192/60=0.0053

Maximum Antenna Gain = 9dBi (7.9)

$\therefore$Average radiated power = 263mW

Distance at which the power density meets the 0.2mW/cm^2 limit is given by:

$$r = \sqrt{(263/(4 \times \pi \times 0.2))}$$

r = 10.2 cms (=4 inches)

According to the procedure in KDB447498 (v05r02) section 4.3, SAR testing is excluded if the following criteria is met.

$$(P/d)^* \sqrt{f} \leq 3.0 \text{ for 1-g SAR}$$

Where

P is the time averaged maximum conducted power in mW

d minimum separation distance in mm

f is the frequency in GHz

Power and distance are rounded values.

For d = 50mm, f = 162MHz and P = 6252mW

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[1] 1.1310 Radiofrequency radiation exposure limits

[2] Test by TÜV SÜD Product Service.

(263/50) * √0.162 = 0.4

Which is much less the value of 3 specified for exemption to 1-g SAR evaluation.

Wi-Fi transmissions

For the Wi-fi module the radiated output of the module is given in report RXA1503-0042MPE01.

Band	Maximum Tune-up Procedure (dBm)	Antenna Gain (dBi)
802.11b	23	2
802.11g	23	2
802.11n (20M)	23	2

Solving for S, the power density at 20cm is

Band	Test Result (mW/cm^2)	Limit Value (mW/cm^2)
802.11b	0.06	1
802.11g	0.06	1
802.11n (20M)	0.06	1

Therefore, the ATB1 with the maximum external antenna gain meets the requirements for exposure to radiated electromagnetic fields at a worst case distance of 20 cm from the transmitting antenna at both frequencies.

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9th July 2019