TSS-4100

Exhibit K - Radiation Exposure Information

Exhibit K - Radiation Exposure Information

This section affirms compliance with respect to controlled and uncontrolled exposure limits for Maximum Permissible Exposure (MPE).

Requirements:

The rules concerning RF radiation exposure are contained in part 47 CFR 1.1310, 2.1091 and 2.1093.

FCC Section 1.1310 Table 1 defines the MPE power density limits for 1090MHz under the frequency range from 300 to 1500MHz as follows:

(A) Controlled Exposures	3.63mW/cm^2
(B) Uncontrolled Exposure	727uW/cm^2

The TSS-4100 Transponder/TCAS-II system antennas are mounted along the fuselage of air transport aircraft. These locations are accessible to airport maintenance personnel only and are in general not accessible to the general population. In addition, airline maintenance and ramp operating procedures do not allow the system to utilize any of the bottom mounted radiating antennas when in the airport gate area where maintenance personnel have access to the aircraft. These limited access restrictions placed upon the TSS-4100 falls under the definition of section (A) Controlled Exposures which requires a MPE power density limit of no more than 3.63mW/cm^2 averaged over a 6 minute period.

Section 2.1091(b) defines a “mobile device” as “a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitters radiating structures and the body of the user(s) or nearby persons.”

Since the TSS-4100 antenna mounting locations, along the top and bottom of the fuselage of air transport aircraft, are inaccessible in normal usage to any personnel and are located greater than 20 centimeters from any personnel, it falls under the definition mobile device in Section 2.1091(b).

The TSS-4100 does not fall into any of the categories described in Section 2.1091(c) that are subject to routine environmental evaluation for RF exposure.

As such, the TSS-4100 is “… categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use”.

Radiation Hazard Assessment:

The TSS-4100 transmitter output is very low power. Under maximum operating conditions, the average power output of the Transponder/TCAS-II is in the order of 5.5 watt, roughly equivalent to a night light.

Calculations Supporting Findings are based on the following:

Peak Power……..438W
Worst Case Duty Cycle…….0.044 or 4.4% for 200 mSec/Sec
Limited Case Duty Cycle…….0.022 or 2.2% for 800 mSec/Sec
Distance in meters…….. 0.20m
Frequency (MHz)…….1030 and 1090 are the frequencies that are used in a Transponder/TCAS II system. For purposes of these calculations 1030 was used. Both frequencies produce the same results for P_d although 1030 produces a slightly higher power level P, Effective Radiated Power.

Calculations:

The Composite Duty Cycle (%) = Worst Case * T/1 Sec + Limited Case * T/1 Sec

The Composite Duty Cycle of the Transmitter is, therefore

(0.044 * 0.2) + (0.022 * 0.8) = 0.026 or 2.6%

Average Power (W) = Peak Power W * Duty Cycle

The Average Power is therefore

= 438*0.026 = 1`1.4 W or 11,400 mW

The power density S (mW/cm^2) at a distance d (cm) from an isotropic source radiating a power of P (mW) can be calculated using:

$S = P / (4 \pi d^2)$

The power density 20cm from the antenna is, therefore

$S = 11,400 / (4 \pi 20^2) = 11,400 / 5026.5 =$ **$2.266\ mW/cm^2$**

Compliance Statement:

The TSS-4100 does not exceed the MPE limits of 3.63 mW/cm^2 average power in a 6 minute period at a distance of 20cm, in fact it produces less than a two thirds of that power density: a calculated 2.266mW/cm^2. In operation, this antenna is on the exterior of an aircraft fuselage, and passengers inside are shielded from even this radiation by the aircraft's grounding skin. When on the ground the only emitting antennas are located along the top of the fuselage of an aircraft.