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RF Exposure Evaluation Report

APPLICANT	KELVIN HUGHES LIMITED
	VOLTAGE, MOLLISON AVENUE ENFIELD EN3 7XQ UNITED KINGDOM
FCC ID	CICDTX-A3-FDLR
MODEL NUMBER	DTX-A3-AFFB
PRODUCT DESCRIPTION	X BAND MARINE RADAR
STANDARD APPLIED	CFR 47 Part 2.1091
PREPARED BY	Mario de Aranzeta

We, TIMCO ENGINEERING, INC. declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and meets the requirements.

The attached report shall not be reproduced except in full without the written approval of TIMCO ENGINEERING, INC.

GENERAL REMARKS

Attestations

This equipment has been evaluated in accordance with the standards identified in this report. To the best of my knowledge and belief, these evaluations were performed using the procedures described in this report.

I attest that the necessary evaluations were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, Fl 32669

Authorized Signatory Name:

Mario de Aranzeta
Engineering Project Manager

Date: June 30, 2014

GENERAL INFORMATION

EUT Description	X BAND MARINE RADAR
FCC ID	CICDTX-A3-FDLR
Model Number	DTX-A3-AFFB
Frequency Range	9220 TO 9480 MHz
Type of Emission	48M2P0N
Modulation	Pulsed
EUT Power Source	☒ 110–120Vac/50– 60Hz ☐ DC Power 12V ☐ Battery Operated Exclusively
Test Item	☐ Prototype ☐ Pre-Production ☒ Production
Type of Equipment	☒ Fixed ☐ Mobile ☐ Portable
Test Conditions	The temperature was 26°C relative humidity of 54%.
Revision History to the EUT	None
Test Facility	Timco Engineering Inc. 849 NW State Road 45 Newberry, FL 32669 USA.

RF Exposure Requirements

General information

Device type: Part 80 and 90 radar assembly designed ffor X band use.

Devices that operate under Part 90 of this chapter are subject to RF exposure evaluation prior to equipment authorization or use.

Antenna

The manufacturer does specify the antennas and the gains run from 28 to 39 dB in gain.

Configuration	Antenna	Type	Gain
Fixed mounted	Slot arrays	Horizontal	28 to 39 dB

Operating configuration and exposure conditions:

The conducted output power is 200 Watts Peak/ 27 Watts average. This value is based on a 50 µs pulse length and a 2500 Hz pulse repetition rate.

MPE Calculation:

The minimum separation distance is calculated as follows:

$$E(V/m) = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power density: } P_d(mW/cm^2) = \frac{E^2}{3770}$$

The limit for general uncontrolled exposure environment is shown in FCC rule Part 1 section 1310Table 1.

Case 1: lowest gain antenna

Inputs:
Frequency: 9400 MHz
Antenna gain 28 dBi
Antenna diameter: 3.7 m
Mean power (average): 27 Watts

Results: The distance required for compliance is less than the diameter of the antenna and therefore the user will always be at a distance greater than required for compliance.

$P := 27000$ mean power in mW $f := 9400$ MHz   Frequency

$Gi := 28$ Gain in dBi $\lambda := \left(\dfrac{29892}{f} \right)$

$Gn := 10^{\left(\frac{Gi}{10} \right)}$ $\lambda = 3.18$ centimeters

$Gn = 630.957$ Gain numeric

$D := 370$ cm   antenna diameter

$R := \dfrac{\left(0.6 \cdot D^2\right)}{\lambda}$

$R = 2.583 \times 10^4$ Distance to center of radiation

$Slimit := \dfrac{(P \cdot Gn)}{\left(4 \cdot \pi \cdot R^2\right)}$ FCC and IC limit

controlled exposure limit

$Slimit = 2.032 \times 10^{-3}$ $\dfrac{mW}{cm^2}$ 5 $\dfrac{mW}{cm^2}$

$\Sigma Sexp^*(texp) = Slimit^*(tave)$ uncontrolled exposure limit

$\Sigma := Slimit \cdot 6$ 1 $\dfrac{mW}{cm^2}$

$\Sigma = 0.012$ $\dfrac{mW}{cm^2}$

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FCC ID: CICDTX-A3-FDLR
Report: K\KELVIN_CIC\1055AUT14\1055AUT14TestReport.docx

Case 2: highest gain antenna

Inputs:
Frequency: 9400 MHz
Antenna gain 39 dBi
Antenna diameter: 5.5 m
Mean power (average): 27 Watts

Results: The distance required for compliance is less than the diameter of the antenna and therefore the user will always be at a distance greater than required for compliance.

$P := 27000$ mean power in mW $f := 9400$ MHz   Frequency

$Gi := 39$ Gain in dBi $\lambda := \left(\dfrac{29892}{f}\right)$

$Gn := 10^{\left(\frac{Gi}{10}\right)}$

$\lambda = 3.18$ centimeters

$Gn = 7.943 \times 10^3$ Gain numeric

$D := 550$ cm   antenna diameter

$R := \dfrac{\left(0.6 \cdot D^2\right)}{\lambda}$

$R = 5.708 \times 10^4$ Distance to center of radiation

$Slimit := \dfrac{(P \cdot Gn)}{\left(4 \cdot \pi \cdot R^2\right)}$ FCC and IC limit

controlled exposure limit

$Slimit = 5.239 \times 10^{-3}$ $\dfrac{mW}{cm^2}$ 5 $\dfrac{mW}{cm^2}$

$\Sigma Sexp^*(texp) = Slimit^*(tave)$ uncontrolled exposure limit

$\Sigma := Slimit \cdot 6$ 1 $\dfrac{mW}{cm^2}$

$\Sigma = 0.031$ $\dfrac{mW}{cm^2}$

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