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Sid Sanders
TIMCO Engineering

April 16, 2004

Reference - FCC Correspondence Numbers: 11671 and 10349
731 Confirmation Number: TC787589
FCC ID: K6630053X30

Subject: FCC Equipment Authorization System

The following addresses the points made in Stan Lyles e-mail of 3/26/2004. Please pass the information back to him by your channels. Before the due date.

Point 1.

The responses to FCC correspondence 10349 are as follows;

1) Calibration certificate for NARDA Probe 8761D is attached.
2) Grant refers to a 0db antenna. The intent was that it referred to a 0dBi antenna. Using OET65 (97/01) page 19 equation. 3 for R=50cm, P=12500mW and Gain=1

Equations for Predicting RF Fields

Calculations can be made to predict RF field strength and power density levels around typical RF sources. For example, in the case of a single radiating antenna, a prediction for power density in the far-field of the antenna can be made by use of the general Equations (3) or (4) below [for conversion to electric or magnetic field strength see Equation (1) in Section 1]. These equations are generally accurate in the far-field of an antenna but will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction.

$$S = \frac{PG}{4\pi R^2} \qquad (3)$$

where: S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

A value for S of 0.397mw/cm^2 is obtained.

Conversely a distance of 70.6cm is required for a predicted 0.200mw/cm^2

The frequency of 156.800MHz has a free space wave-length of 1.912m and therefore the measurement distance is in the near-field and according to OET 65 the formula will over predict power density.

The MPE results are considered consistent with these calculations given the uncertainties inherent in the method due to the near field effect and the worst-case bias of the predictions.

User manual page 7 refers to a 6**dBi** (3.85dBd) antenna. Using the same prediction method for a 6dBi antenna yields a 0.200mw/cm^2 field strength with an R value of 141cm

P = 25W x 50% = 12500mW
G = nominally 6dBi = Numeric Gain of 3.98 (Not 6dbd)

3) The impact on the RF exposure safety distance and manual changes are covered in the responses to points 5 & 6 to FCC Correspondence 11671.

Point 2.

The MPE report page 5 defines the probe as being a NARDA 8761D this should have also been checked off on page 7. Amended pages 5 & 7 are attached.

Point 3.

M. Flom Associates Inc. has been carrying out evaluations of alternative probes to replace the NARDA units currently used. The photograph was of an AR probe being evaluated at the time. The measurement results in the MPE report were those taken with the NARDA 8761D and the correct photograph has been added to the report. Amended page 6 attached.

Point 4.

The issues raised are all agreed and the applicant has updated the User Manual to emphasis the RF Safety issues raised by different gain antennas. These changes are on pages 4 and 7 of the Manual.

Changes of text for page 4

This radio is restricted to occupational use, work related operations only where the radio operator must have the knowledge to control the exposure conditions of its passengers and bystanders by maintaining the minimum separation distance.

The safety distance is determined by the antenna gain. With a 0dBi gain whip antenna the safety distance 0.6 meters (2 feet); with a 3 foot 3dBi gain whip the safety distance is 1.0 meter (3.25 feet) and with an 8 foot 6dBi fiberglass whip the safety distance is 1.2 meters (4 feet).

When passengers or bystanders are closer to the antenna than the limits stated the operator must either cease transmitting or restrict operation to low power. Failure to observe these restrictions will result in exceeding the FCC RF exposure limits.

Antenna Installation:

The antenna must be located at least 0.6 m (2 feet) away from passengers in order to comply with the FCC RF exposure requirements. The distance given is for a zero gain whip antenna. Use of higher gain antennas will increase this safety distance as discussed above.

For roof top installation, the antenna must be placed in the center of the roof.

Changes of text for page 7

SELECTING AN ANTENNA

Marine antennas are made to radiate signals equally in all horizontal directions, but not straight up. The objective of a marine antenna is to enhance the signal toward the horizon. The degree to which this is accomplished is called the antenna's gain. It is measured in decibels (dBi) and is one of the major factors in choosing an antenna. In terms of effective radiated power (ERP), antennas are rated on the basis of how much gain they have over a theoretical antenna with zero gain. A 3 foot, 3dBi gain antenna represents twice as much gain over the imaginary antenna. The length of the antenna you choose, however, must also be related to the size of your boat as FCC RF exposure distances are increased with higher gain.

Typically a 3 foot 3dBi stainless steel whip is used on a sailboat mast

The longer 8 foot 6dBi fiberglass whip primarily used on larger power boats, that require the additional gain.

An amended Manual is uploaded with this response.

<u>Point 5.</u>

The antenna is 6dBi and the appropriate safety distances based on the MPE tests have been included in the Manual update. The 6dBi antenna is usually only used on large power boats where it is mounted on the radar bar or on the bridge wing.

<u>Point 6.</u>

The requirements for the operator to have sight of the RF Safety label have been added to the Manual for both methods of console mounting (pages 11 & 14).

Changes of text for page 11

4.1 LOCATION

The radio can be mounted at any angle. Choose a mounting location that:

- is far enough from any compass to avoid any deviation in compass reading due to the speaker magnet
- provides accessibility to the front panel controls
- allows connection to a power source and an antenna
- has nearby space for installation of a microphone hanger
- the antenna must be mounted at least 3 feet from radio

The FCC RF exposure label should be visible to the operator in the installed position. If not then a self adhesive panel label can be obtained from your Standard Horizon Dealer, by calling (800) 767-2450, or by e-mailing marinetech@vxstdusa.com

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Changes of text for page 15

4.7 OPTIONAL MMB-84 FLUSH MOUNT INSTALLATION

1. Make a rectangular template for the flush mount measuring 2" H x 5-5/16" W.

2. Use the template to mark the location where the rectangular hole is to be cut. Confirm the space behind the dash or panel is deep enough to accommodate the transceiver (at least 6 inches deep). There should be at least 1/2 inch between the transceiver's heat sink and any wiring, cables or structures.

3. Cut out the rectangular hole and insert the transceiver.

4. Fasten the brackets to the sides of the transceiver with the lock washer nut combination, so that the mounting screw base faces the mounting surface (see Figure 2).

5. Turn the adjusting screw to adjust the tension so that the transceiver is tight against the mounting surface.

6. Fix self-adhesive FCC Exposure Label supplied with MMB-84 kit on the panel next to the transceiver where it can clearly seen by the operator.

Point 7.

The change of Equipment Code is agreed. As the applicant's agent we request that TIMCO make the change on the Grant. An updated form 731 will be uploaded.

I hope that with these points answered that the Grant will be confirmed.

Yours sincerely,

David E. Lee
Laboratory Manager
M. Flom Associates, Inc.

Attachments

L3 communications
Narda Microwave-East

Certificate of Calibration

L-3 Communications, Narda Microwave-East, hereby certifies that the referenced instrument has been calibrated by qualified personnel to Narda's approved test procedures.

Furthermore, the instrument meets, or exceeds, all published specifications and the calibration has been performed with test instrumentation that, where applicable, is traceable to the National Institute of Standards and Technology.

Narda's calibration measurements are traceable to the National Institute of Standards and Technology to the extent allowed by the bureau's calibration facilities.

Customer: M. FLOM ASSOC
CHANDLER, AZ 85225

Certificate #: 33515 1

Model #: 8761D
Description: PROBE
Date Calibrated: 02/20/2003

Serial #: 01016
PO #: 308210
R.O. #: 33515

Vince Donovan
Manager of Instruments Assembly and Test

John C. Stine
Director of Quality Assurance

Name of Test: Environmental Assessment

Specification: FCC: 47 CFR 1.1310

Measurement Guide: ANSI/IEEE C95.1 1992

Test Equipment: Maximum Permissible Exposure (MPE) measurement system, consisting of:
Narda 8717-1174R, Radiation meter
Narda 8761D, E-field probe (300 kHz – 3 GHz)
(Calibrated Feb-2003)

Measurement Procedure:

1. The following measurements were performed with a Narda probe using ANSI/IEEE C95.1 as a guide.

2. Prior to making any measurements, the measurements system was calibrated in accordance with the manufacturer's procedures.

3. The EUT's radiating element (antenna) was placed on a 1 m tall table for ease of testing. For equipment normally operated on a metal surface, a ground plane was used.

4. The remaining equipment necessary to operate the EUT was maintained at a distance from the measurement arrangement suitable to minimize interference with the measurements.

5. The minimum safe distance was calculated from the formula Power Density = EIRP / $4\pi R^2$ (Peak Watts/m^2). The calculation is shown with the measurement data.

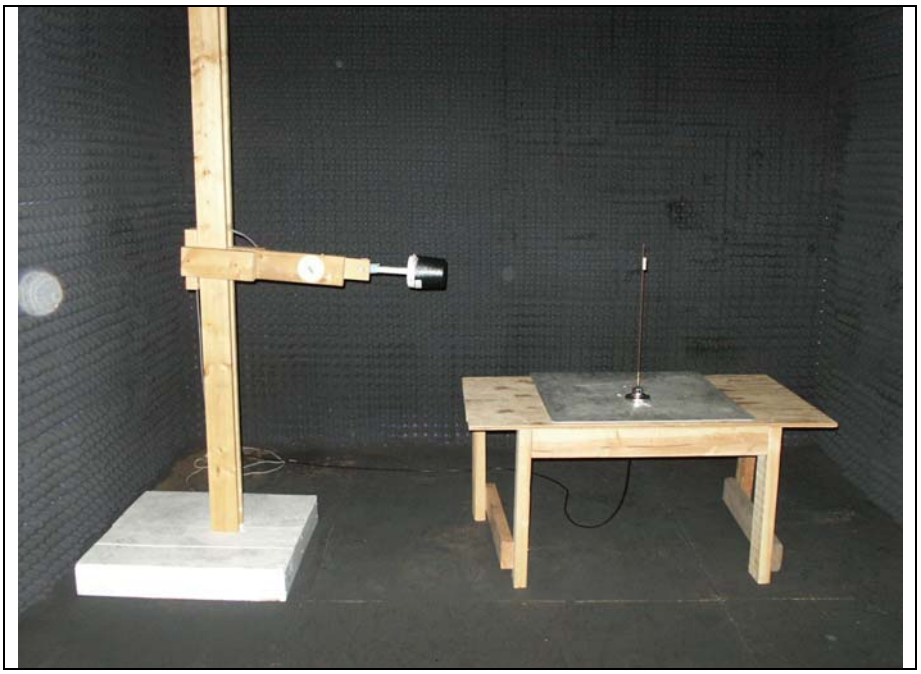
6. With the EUT operating at maximum power, a search was initiated for worst case emissions with the probe raised and lowered over a range of 0.2 to 2 meters in height and over a horizontal plane of 0^o to 360^o.

7. Average values were calculated for the whole body (0.2-2.0m), lower body (0.2-0.8m) and upper body (1.0-2.0m).

Results: Attached.

Test Setup: Maximum Permissible Exposure (MPE)

State:



Name of Test: R.F. Radiation Exposure

FCC Rules: 1.1307, 1.1310, 1.1311, 2.1091
Description, EUT: See page 2 of Test Report

Test Frequencies, MHz = 156.800
Power, Conducted, W = 25
Antenna Model = ¼ Wave Whip
Antenna Gain = 0 dBi
Power + Ant. Gain = 12.5 (50% duty cycle)
Limit: Uncontrolled Exposure = 0.200 mW/cm^2

Limits: Uncontrolled Exposure	0.3-1.234 MHz:	Limit [mW/cm^2] = 100
47 CFR 1.1310	1.34-30 MHz:	Limit [mW/cm^2] = ($180/f^2$)
Table 1, (B)	30-300 MHz:	Limit [mW/cm^2] = 0.2
	300-1500 MHz	Limit [mW/cm^2] = f/1500
	1500-100,000 MHz:	Limit [mW/cm^2] = 1.0

Instruments
X Narda 8717-1174R, Radiation Meter
Narda 8760B, E-field probe (300 kHz – 1 GHz)
X Narda 8761D, E-field probe (300 kHz – 3 GHz)

Results at tested distances

Probe Height, m	**Power Density, mW/cm^2** Freq. 156.8 MHz Distance 50 cm
2.0	0.0267
1.8	0.0463
1.6	0.0874
1.4	0.1427
1.2	0.1996
1.0	0.1826
0.8	0.1014
0.6	0.1605
0.4	0.1389
0.2	0.1155

Power Density Calculations: The measured power density readings were summed and the results divided by the number of readings to calculate the average.

	156.800 MHz
Whole body average (0.2 - 0.8 m, mW/cm^2) =	0.120
Lower body average (0.2 - 0.8 m, mW/cm^2) =	0.129
Upper body average (1.0 - 2.0 m, mW/cm^2) =	0.114

Performed by: David Lee