WAVTRACE

**ANALYSIS RECORD**

| |
|---|
| **Test/Analysis Report:** 7220-0012-00 **Rev:** A<br>**Product:** Hub and Remote TRAs |
| **Configuration:** See Table 1 |
| |
| |
| **Specification:** IEEE C95.1-1991 |
| |
| **Test / Analysis Date**: Sept 8, 1999 |
| **Engineer**: Jay McCandless |
| **Cognizant Engineer:** Tom Mehrkens |
| **Pass / Fail**: PASS |
| **Notice of other test findings:** |

## 1.0 Introduction

### 1.1 Scope:

This report describes the analysis used and the results to determine conformance or non-conformance with IEEE C95.1-1991 (IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields 3 kHz to 300 GHz, which states that the maximum safe power density applied to the human body from 15 to 300 GHz is 10 mW / cm squared averaged over 6 minutes at 15 GHz and 1.8 minutes at 40.

### 1.2 Purpose:

As long as Wavtrace can show that the worse case maximum power density possible to apply to the body is less than 10mW/cm than no further action is required.

## 2.0 Analysis:

### 2.1 Background

Our worst case power density applied to the human body analysis has the following assumptions:

- A human eye is applied to the radiating aperture, either the center of the horn for the hub TRA, or the center of the dish for the remote TRA.

- The power density is constant over long periods of time >1.8 minutes. However, since we are transmitting only half the time the power density is ½ the transmitted power.
- The transmitted power is reduced by 0.5 dB due to losses in the waveguide bend and radiating aperture.
- In most cases the aperture has a power taper across it, so the peak power is greater than the average power by 2 dB ($10\log\pi/2$) for each plane that has a taper.
- With the above caveats, the power density is calculated by dividing the radiated power by the area of the radiating aperture.

## 2.2 Analysis Chart (Table 1)

| TRA Configuration / Assembly # | Antenna / Assembly # | Radiating Aperture Size (cm squared) | Transmit Power for: 4 QAM 16 QAM 64 QAM (dBm) | E plane taper gain (dB) | H plane taper gain (dB) | Time averaging + Insertion loss (3.5 dB) | Peak Radiated Power (mW) | Worst Case Power Density (mW/cm squared) | Verdict |
|---|---|---|---|---|---|---|---|---|---|
| ASSY, HUB TRA, 30 DEG VPOL, HG, 38 GHz / #2000-0106-01 | 2000-0004-04 | 12.19 | 13 | 0 | 2 | -3.5 | 14.13 | 1.16 | SAFE |
| | | | 10 | | | | 7.079458 | 0.58 | SAFE |
| | | | 7 | | | | 3.548134 | 0.29 | SAFE |
| ASSY, HUB TRA, 30 DEG HPOL, HG, 38 GHz / #2000-0104-01 | 2000-0017-02 | 12.19 | 13 | 2 | 2 | -3.5 | 22.39 | 1.84 | SAFE |
| | | | 10 | | | | 11.22018 | 0.92 | SAFE |
| | | | 7 | | | | 5.623413 | 0.46 | SAFE |
| ASSY, HUB TRA, 30 DEG VPOL, HG, 31 GHz / #2000-0174-00 | 2000-0014-00 | 20.080605 | 13 | 0 | 2 | -3.5 | 14.13 | 0.70 | SAFE |
| | | | 10 | | | | 7.079458 | 0.35 | SAFE |
| | | | 7 | | | | 3.548134 | 0.18 | SAFE |
| ASSY, HUB TRA, 30 DEG HPOL, HG, 31 GHz / #2000-0172-00 | 2000-0122-00 | 20.080605 | 13 | 2 | 2 | -3.5 | 22.39 | 1.11 | SAFE |
| | | | 10 | | | | 11.22018 | 0.56 | SAFE |
| | | | 7 | | | | 5.623413 | 0.28 | SAFE |
| ASSY, HUB TRA, 30 DEG VPOL, HG, 28 GHz / #2000-0110-01 | 2000-0014-00 | 20.080605 | 13 | 0 | 2 | -3.5 | 14.13 | 0.70 | SAFE |
| | | | 10 | | | | 7.079458 | 0.35 | SAFE |
| | | | 7 | | | | 3.548134 | 0.18 | SAFE |
| ASSY, HUB TRA, 30 DEG HPOL, HG, 28 GHz / #2000-0108-01 | 2000-0122-00 | 20.080605 | 13 | 2 | 2 | -3.5 | 22.39 | 1.11 | SAFE |
| | | | 10 | | | | 11.22018 | 0.56 | SAFE |
| | | | 7 | | | | 5.623413 | 0.28 | SAFE |
| ASSY, REMOTE TRA, VPOL & HPOL, 38 GHz / #2000-0046-00 & #2000-0047-00 | 6585-0004-00 | 558.65 | 13 | 2 | 2 | -3.5 | 22.39 | 0.04 | SAFE |
| | | | 10 | | | | 11.22018 | 0.02 | SAFE |
| | | | 7 | | | | 5.623413 | 0.01 | SAFE |
| ASSY, REMOTE TRA, VPOL & HPOL, 31 GHz / #2000-0118-00 & #2000-0119-00 | 6585-0003-00 | 558.65 | 13 | 2 | 2 | -3.5 | 22.39 | 0.04 | SAFE |
| | | | 10 | | | | 11.22018 | 0.02 | SAFE |
| | | | 7 | | | | 5.623413 | 0.01 | SAFE |
| ASSY, REMOTE TRA, VPOL & HPOL, 28 GHz / #2000-0048-00 & #2000-0049-00 | 6585-0003-00 | 558.65 | 13 | 2 | 2 | -3.5 | 22.39 | 0.04 | SAFE |
| | | | 10 | | | | 11.22018 | 0.02 | SAFE |
| | | | 7 | | | | 5.623413 | 0.01 | SAFE |

## 3.0 Results/Recommendations

The results show that all present TRA configurations are safe.