



RF Radiation Exposure Compliance statement

For Alcatel 7390 31GHz Cross-Pol TS Transceiver

This equipment ---- Alcatel 7390 31GHz Cross-Pol TS (Terminal Station) Transceiver---- has been tested and calculated in accordance with the requirements of **FCC 1.1307(b) and FCC 1.1310**.

With 35dBi antenna, which is the maximum gain of the antenna supplied with 7390 system cross-pol version, this equipment complies with the FCC RF Radiation Exposure requirement of $5\text{mW}/\text{cm}^2$ (**Occupational / Controlled Exposure**) and $1\text{mW}/\text{cm}^2$ (**General Population/Uncontrolled Exposure**) at distance of 1meter.

Warning statement are provided in the installation Manual, and will be attached on the label of antenna.

(For detailed calculation and analysis, please refer to the Appendix).

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Appendix

**Analysis of complying with
FCC 1.1307(b) ‘Actions that may have a significant environmental effects, for which
Environmental Assessments (EAs) must be prepared’
&
FCC 1.1310 ‘Radio Frequency Radiation Exposure Limits’
For Alcatel 7390 LMDS 31GHz TS**

1. Introduction

As per FCC1.1307 (b) table-1, LMDS subscriber transceiver ---- in this case it is Alcatel 7390 LMDS 31GHz TS transceiver ---- shall have a warning label stating minimum safety distance to comply with the RF Radiation Exposure Limit, which is specified in FCC1.1310.

In FCC 1.1310, the RF Radiation Exposure Limits of 31GHz are:

- a). 5mW/cm² (Occupational / Controlled Exposure)
- b). 1 mW/cm² (General Population/Uncontrolled Exposure)

And the evaluating method is given in FCC OST/OET Bulletin Number 65----
‘Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields’

2. Calculation & Analysis

2.1 Near Field (Fresnel Regional)

$$R_{nf} = D^2 / 4 \lambda$$
$$= 0.3 \times 0.3 / 4 \times 0.01 = 2.25 \text{ m}$$

Where R_{nf} = extend of near field,
 D = Maximum dimension of Antenna, 0.3 m (page 22 of Terminal Station user manual)
 λ = Wavelength, 0.01 m @ 31GHz

Within Near Field region, the maximum power density is:

$$S_{nf} = 16\eta P / \pi D^2$$



$$\begin{aligned} &= 16 \times 0.75 \times 0.05 / 3.14 \times 0.3 \times 0.3 \\ &= 2.12 \text{ W / m}^2 \\ &= \mathbf{0.212 \text{ mW/ cm}^2} \end{aligned}$$

Where S_{nf} = Maximum near field power density
 η = Aperture efficiency, typically 0.5 ~ 0.75, 0.75 is the worst case.
 P = power fed to the antenna. In this case, typical output power of Alcatel 7390 31GHz TS is 17dBm = 0.05 W

2.2 Transition Region

$$\begin{aligned} R_{ff} &= 0.6 D^2 / \lambda \\ &= 0.6 \times 0.3 \times 0.3 / 0.01 \\ &= 5.4 \text{ m} \end{aligned}$$

Where R_{ff} = distance to beginning of far field
 D = antenna diameter, 0.3 m
 λ = Wavelength, 0.01 m

Within transition region, the power density is:

$$S_t = S_{nf} \times R_{nf} / R$$

Where S_t = power density in the transition region
 S_{nf} = maximum power density in near field, which is 0.212 mW/ cm².
 R_{nf} = extent of near field, which is 2.25 m
 R = distance to point of interest

So, the point of interest with maximum power density in transition region will be just at the border of these two regions, where $R = R_{nf}$

Then maximum $S_t = S_{nf} = \mathbf{0.212 \text{ mW/ cm}^2}$

2.3 Far Field Region (Fraunhofer Region)

$$S_{ff} = PG / 4 \pi D^2$$

Where S_{ff} = power density in far field region (on axis)
 P = Power fed to the antenna, which is 0.05 W



G = power gain of the antenna in the direction of interest relative to an isotropic radiator, which is 35 dBi = 3162.68 (page 18 of Terminal Station user Manual)
D = distance to the point of interest

So, in this case, the point of interest with maximum power density in far field region will be at the point where far field region begins ($R_{ff} = 5.4\text{m}$)

$$\begin{aligned}\text{Then maximum } S_{ff} &= 0.05 \times 3162.68 / 4 \times 3.14 \times 5.4 \times 5.4 \\ &= 0.43 \text{ W / m}^2 \\ &= \mathbf{0.043 \text{ mW/cm}^2}\end{aligned}$$

3. Analysis

The above calculation was taken for on axis power density. And because of the highly directional nature of aperture antennas, the likelihood of significant human exposure to RF radiation is considerably reduced. The power densities existing at locations where people may be typically exposed are substantially less than on-axis power density. (Page 26 ~ 27 of Bulletin 65).

So, the above-calculated data represents the maximum power density that will be produced by transceiver.

4. Conclusion:

Base on the above calculation and analysis, Alcatel 7390 LMDS 31GHz TS complies with the FCC 1.1307(b) and FCC 1.1310.

The maximum power density across far field, transition field, near field is 0.212 mW/cm^2 , which is less the Radiofrequency Radiation Exposure Limit of 1 mW / cm^2 and 5 mW / cm^2 .

For the safety side, we claim “never pass closer then 1m (3 ft) in front of an operating X-Pol RT’ (page 9 of Terminal Station User Manual).

A following warning statement will be included in the label attached to transceiver antenna.



Warning - When it is in opration, never touch the antenna, do not stand in front of it, and never pass closer than 1 m (3 ft) in front of it.