In this paper, the probability of occurrence of a fade depth and the outage probability of microwave signals is estimated based on the effect of the tropical geoclimatic factors derived from atmospheric refractivity gradient. The data cover a period of 3 years (2011 -2013) measured at the lowest 100 m above the ground for terrestrial LOS link design application in a tropical location, Akure, Nigeria.

Results are presented based on the dependence of monthly, annual averages value and seasonal value of the radio refractivity, $N$, point refractivity gradient and the geo-climatic factor, $K$. The outage probability of fade depth exceeded at a given time over a single frequency is therefore estimated at a given path length. In addition, the parameter, needed for clear air propagation and interference, expressed as the percentage of the time with the refractivity gradient below $-100 \text{ km}^{-1}$, are also presented.

The overall result shows that the geoclimatic factor which caters for geographical and climatic conditions in multipath fading distribution varies with the month, season and year. Finally, based on the link geometrical parameters used, the fade depth exceeded for 0.01% of time can be estimated by logarithmic fits with very high coefficient of determination

**Key words:** Outage probabilities, Fade depth, microwave signals, LOS, tropical location