observation (3.7km line-of-sight with GPS) using a Yagi array antenna coupled through a 50-ohm feeder to the UNAOHM model EP742A field strength meter.

The partial pressure of water e was determined from the equation as follow:

$$e = e_s H \qquad (2)$$

where H is the relative humidity, and e_s is the saturation vapour pressure determined by Clausius-Clapeyron equation given as:

$$e_s = 6.11 \exp\left[\frac{17.26(T - 273.16)}{T - 35.87}\right] \qquad (3)$$

In relation with the measured meteorological parameters such as the temperature, pressure and
relative humidity radio refractivity was calculated using;

$$N = 77.6\frac{P}{T} + 3.37 \times \frac{10^5 e}{T^2} \qquad (4)$$

where
P = atmospheric pressure (hPa)
e = water vapour pressure (hPa)
t = absolute temperature (K)

Equation (4) may be employed for the propagation of radio frequencies up to 100GHz as presented by Willoughby, et al, 2002 [7]. The error associated with the application of the above formula is less than 0.5% (ITU-R, 2003).

3. Results and Discussion

Figures: 1 and 2 show the variations in the profile of radio refractivity in the day and night respectively for the month of March 2013—this implies that the refractivity is higher in the nights compared to the days because of the high humidity and low temperature at nights. Figures: 3 and 4 shows the signal strength measured during the day and night respectively—this shows the effect of different degrees of refractivity on the broadcast signal strength measured. Generally, radio refractivity and broadcast signal strength are inversely related with negative correlation coefficient which implies inverse relationship.

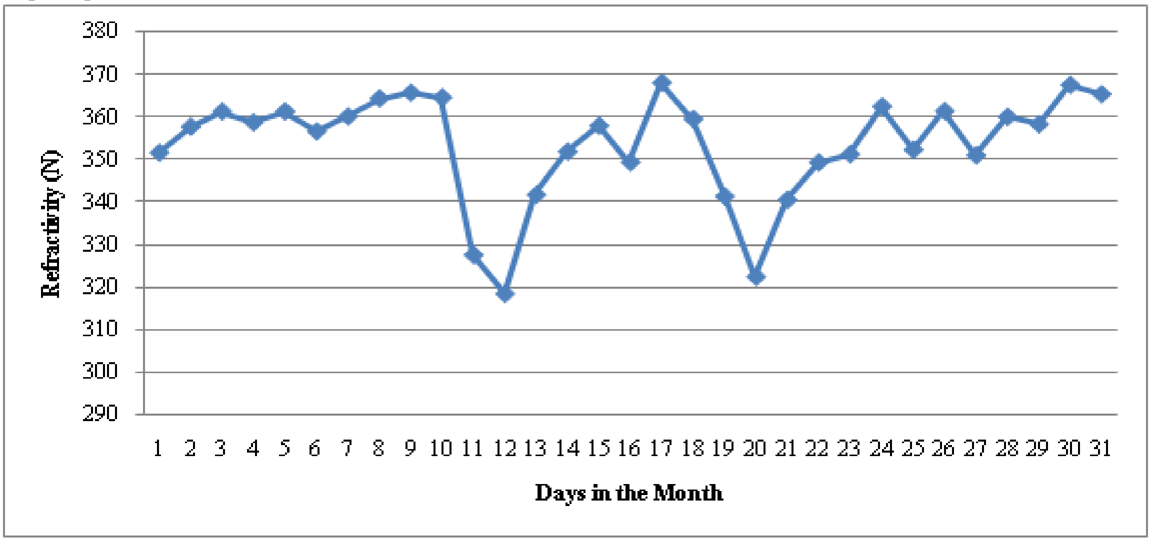

Figure 1: Variation of Radio Refractivity for days in the Month

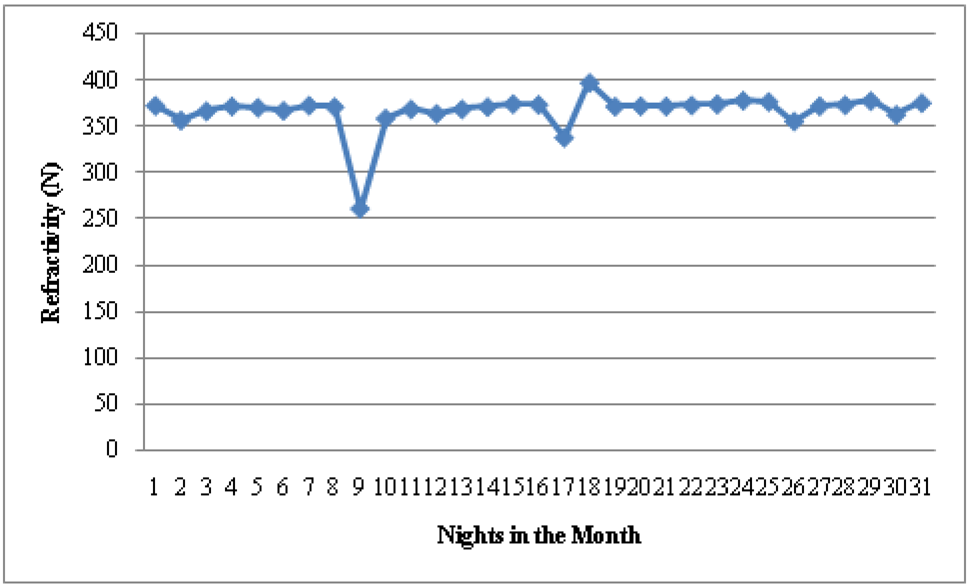

Figure 2: Variation of Radio Refractivity for Nights in the Month

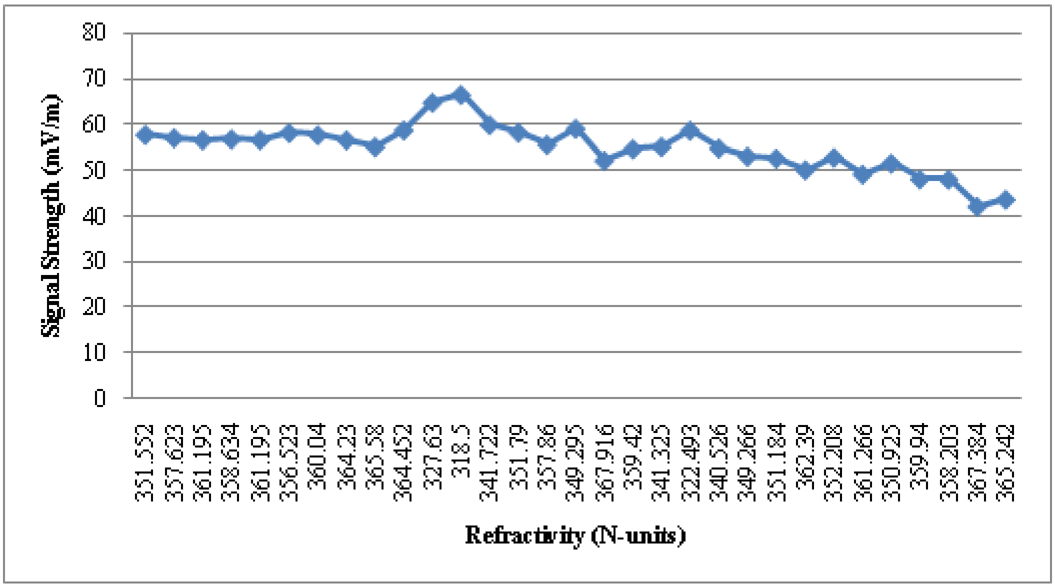

Figure 3: Plot of Signal Strength against Refractivity during the Day

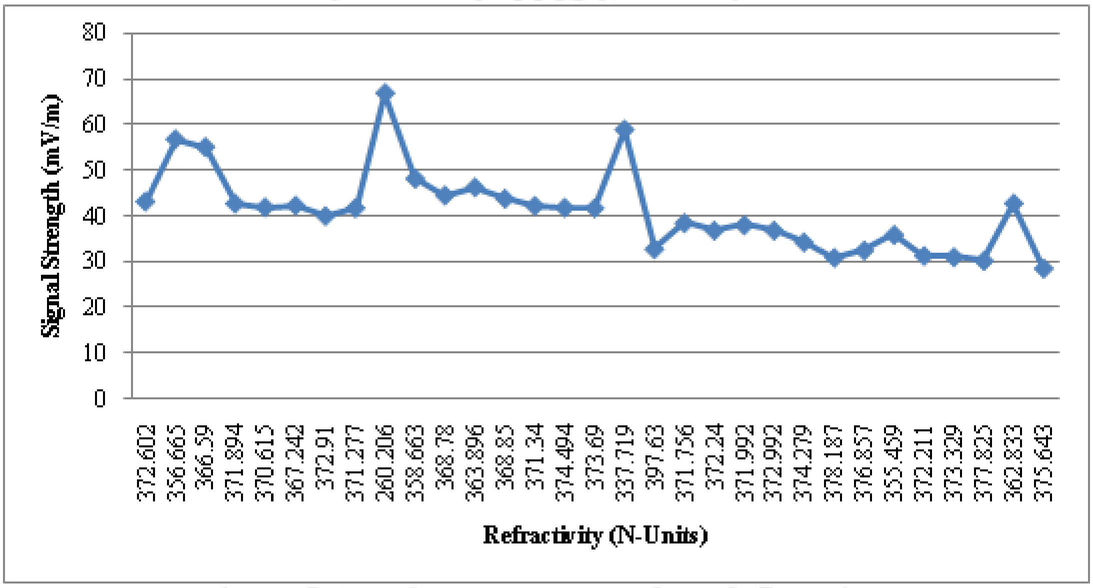

Figure 4: Plot of Signal Strength against Refractivity at Night

4. Conclusion

This paper investigated the effect of vertical variation of radio refractivity in the troposphere on broadcast signal strength. Refractivity is an important factor in predicting the performance of radio link in an environment where it's to be deplored. The change in atmospheric condition leads to radio wave propagation. The diurnal variations are influenced by three atmospheric parameters; water vapor has the greatest effect on refractivity variations followed by temperature. The effect of refractivity should be compensated for when designing wireless communication links in an environment.

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