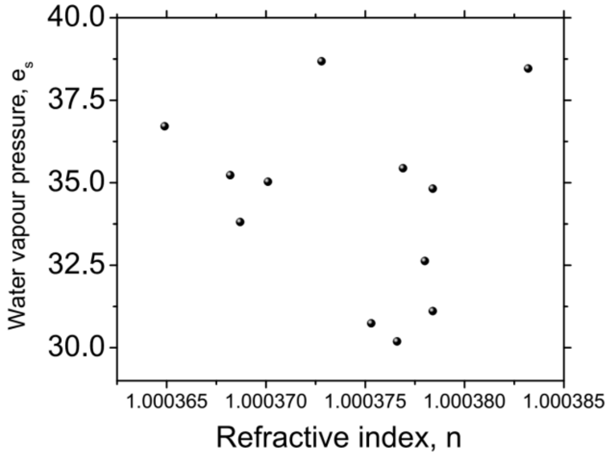

Figure 5: Change of water vapour with refractive index.

4.2 k-factor

Fig. 6. show the change of k-factor with surface refractivity. According to Freeman [17], to determine the k-factor, one need to know the relationship between the radius of curvature of the ray, ρ, and the change of refractivity, N, with height, h, if v is the velocity of wave propagation. The k-factor was determined using the relation discussed in the literature [18-19] hence:

$$k = \frac{1}{1 - a/\rho} \quad (6)$$

Where a is the earth radius given as 6375 km and ρ is further related to the surface refractivity as;

$$\rho = \left(\frac{a}{1 - 0.04665\, e^{0.005577 N_S}} \right) \quad (7)$$

where a and Ns retains their usual meanings.

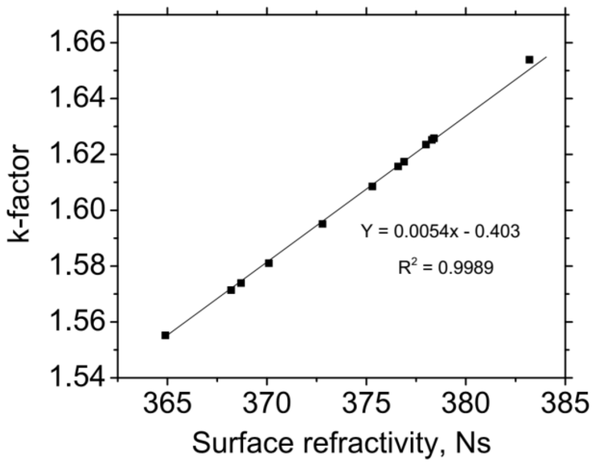

Figure 6: Change of k-factor with surface refractivity

The effective earth radius (k-factor) was observed to show a linear fit with surface refractivity. The values of the k-factor were above the global standard value of 1.333. This is an indication that signal distortion could be observed in the study area.

5. Conclusion

In this study, the In-Situ measurement of temperature, pressure and relative humidity (primary radiocilmatic data) was carried out at Nsukka, Nigeria between August 2013 to July 2014. The data from these station was employed to determine the refractivity (N), refractive index (n) and k-factor. The k-factor determined from the measurement were used to evaluate the propagation conditions over Nsukka and its implication on microwave communication. The result of the k-factor show a monthly variation from 1.555- 1.653, indicating that signal distortion is possibel in the study area since the k-factor value is > 1.333.

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Author Profile

Engr (Dr.) **Pius Ezeali Okpani** obtained First Class Honours B.Sc degree in Electrical and Electronic Engineering from Obafemi Awolowo University, Ile-Ife in August, 1985, M.Sc Degree in Physics (Solar Energy) from Usmanu Danfodiyo University, Sokoto in December, 2000 and Ph.D in Physics (Solar Energy) from Ebonyi State University, Abakaliki in February, 2009. He is a member of a number of professional bodies such as Solar Energy Society of Nigeria (May, 1988), The Nigerian Society Of Engineers (November, 1994), Nigerian Institute Of Physics (August, 2005). He also a registered Electrical Engineer with COREN (August , 2002).

Patrick Akata Nwofe, Ph.D (Northumbria, UK), received the B.Sc (Hons), Upper Division in Physics and Astronomy from the University of Nigeria, Nigeria, in 2001. He was awarded a tuition-free scholarship for a masters degree programme (September 2003-September 2004) by Northumbria University, United Kingdom and a maintenance allowance scholarship by Ebonyi State Oversea Scholarship (HIPACT), Nigeria in 2003. He received the M.Sc with Commendation in Optoelectronics and Communications System from the University of Northumbria at Newcastle, United Kingdom in 2004. He joined the Department of Industrial Physics, Ebonyi State University, Nigeria as a lecturer in 2006. In 2010, he was awarded a Ph.D. research studentship by Northumbria University, United Kingdom and by Education Trust Fund, Nigeria. He finished his Ph.D. in exactly three years (November 2010 - November 2013), with many publications in high impact factor journals, research presentations in many reputable international conferences, and international awards. He joined back in Ebonyi State University in 2014. He is a member of the European Energy Centre, and the European Centre for Research Training and Development.

Nathaniel Obiekwe Chukwu, received the HND (Hons) upper division in the Area of Physics/Electronics from the Nigerian Institute of Science Laboratory Technology in conjunction with University of Nigeria Nsukka, in 2006. His is currently undergoing a post graduate programme for the award of post graduate Diploma in the Department of Industrial Physics, Ebonyi State University under the supervision of Engr (Dr) Pius Ezeali Okpani.