

Weather Variation and its Effect on Transmission of Communication Signal

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Abstract: This paper x-rayed the nature of weather variation and its effect on transmission of communication signal from the data collected from the transmitting station of Nigerian Television Authority, Abakaliki, Ebonyi State Nigeria. From the data collected in the two prominent seasons in Nigeria, it was observed in fig 1 and fig 2 from the data gotten in the month of June and July which is the peak of rainy season that bad signals are most frequently noticed than that of fig 3 and fig 4 which is the data gotten from November and December which is the peak of dry seasons. The bad signals affects the transmission and these results to break in transmission, mismatch and fading of images, scattering and absorption and sometimes the station may go off air. Moreover, weather variations affect the signals by reducing the strength before it reaches the receiving end.

Keyword: Weather, Transmission, Communication, Signal, Television, Rain attenuation and Radio wave.

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Introduction

Weather variation occurs because of differences in temperature which causes density changes in the air and water, and the resulting pressure gradients which stimulates the movement of those fluids [1]. At the lower part of the atmosphere, weather parameters affects radio signal transmission at frequencies above 30MHz [2,3,4,5]. The refraction that occurs in the lower atmosphere significantly influences the performance of the wireless communication system and is because of spatial distribution of refractive index in the atmosphere. Refractivity variation is responsible for various phenomena in the wave propagation such as range and elevation error in radar acquisition, refraction and fading of electromagnetic waves, ducting and scintillation [6,7,].

Satellite communication in ku-band often suffers from rain attenuation causing link outage. This issue is critical around the equatorial region where tropical weather conditions are characterized by common convective rain event and extremely high rainfall rate [8].

Rain attenuation on transmission of signal

Rain along the transmission path is the major weather effect on satellite communication at frequencies above 10GHz. Rain attenuation is the weakening of the satellite signals as it passes through rain drops. Rain drops absorbs and scatter radio wave energy which degrades the reliability and performance of communication link. Rain effects are dependent on frequency, rain rate, drop size distribution and drop shape, which are determined by the type of rain [9].

The most common causes of rain attenuations are scattering and absorption. Scattering is the process by which signals interact with transmission in a way that causes the signal to travel in direction different from the original direction. The interaction between the RF energy and particles causes scattering [10].

Scattering also occurs when signal travelling in the atmosphere encounters rain droplet and are scattered in different directions [11]. The scattering effects are mostly noticed in TV set as interference. Sometimes the received signal on the TV disappears and after sometimes the qualities of the pictures and the audio will be badly affected. Moreover, scattering can occur inform of refraction and diffraction. This affects

the signals by reducing the strength before it reaches the receiving end [7].

Rain attenuation due to absorption occurs when radio wave travelling in the atmosphere strikes a rain droplet, part or all the energy of the signal is converted to heat and is absorbed by it. Absorption by molecular resonance in the atmosphere is a major factor affecting radio propagation [12].

Collection of data

Data were gotten from the transmitting station in Nigerian Television Authority, NTA, Abakaliki, Ebonyi State for two prominent seasons in Nigeria.

Result and discussion

Figure 1 and 2 showed the nature of transmitted signals in the month June and July which is the peak of rainy season while figure 3 and 4 showed the nature of transmitted signals in the month of November and December which is the peak of dry seasons in Nigeria.

From the graph plotted from the data collected, it was observed that better signals were transmitted in dry seasons than rainy seasons. The bad signals results to signal breaking, mismatch and fading of signals and these are most often noticed in the raining seasons. Sometimes the results of bad signals in rainy seasons may cause the station to go off air which was noticed often in the month of July in the graph. These result to stopping of important messages and news that are being broadcasted. Moreover, lightning and thunder strike are most often noticed in the raining season which damages the transmitter and causes the station to go off air for several days or months before repair. Also during heavy rain fall, public power supply which supplies power to the station went off and the station have to wait for the restoration of power and these affects the transmission.

Conclusion

The analysis of the result obtained from the graph plotted showed that bad signals are

mostly noticed in the raining seasons than the dry seasons during radio and television transmission.

Television and radio stations in Nigeria should be digitalized and measures taken to eliminate the problems noticed as a result of bad signal experienced in the raining seasons.

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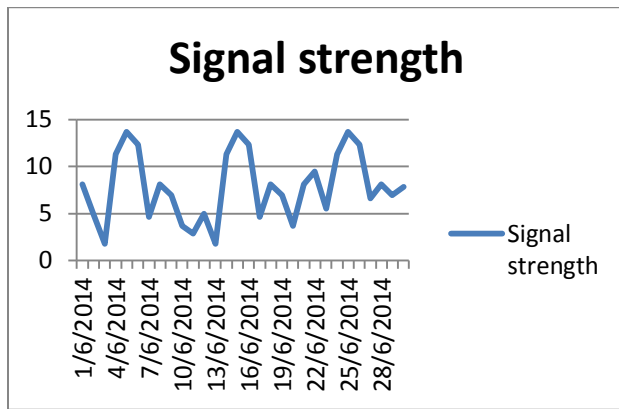


Fig 1: The nature of signal strength for the month of June, 2014

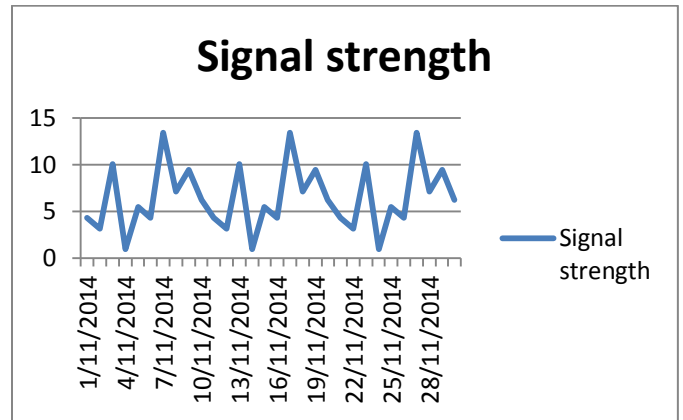


Fig 3: The nature of signal strength in the month of November

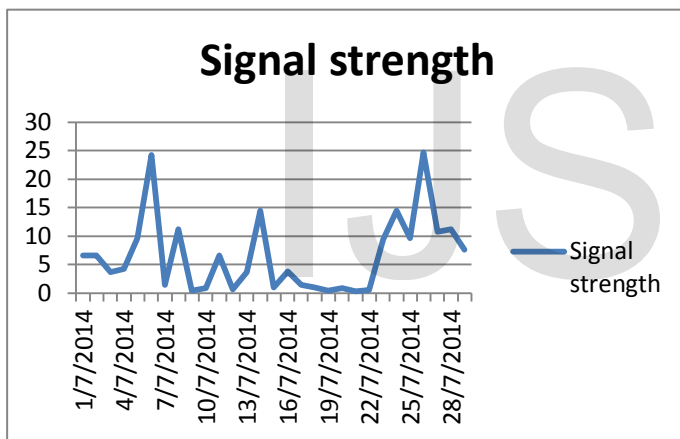


Fig 2: The nature of signal strength in the month of July, 2014

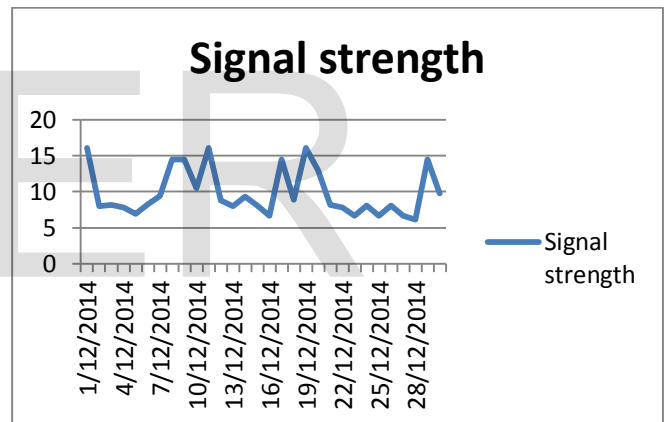


Fig 4: The nature of signal strength in the month of December, 2014