1.1 Preface

Optical wireless communications (OWC) has been identified as a promising candidate to complement conventional RF communication ,especially for indoor short and medium range data transmission .OWC leverage optical spectrum, which includes infrared (IR) and visible light, to wirelessly transmit information. OWC has many advantages including low-cost front-ends, energy-efficient transmission, huge (THz) bandwidth, no electromagnetic interference, etc [1].

Visible light communication (VLC) is a category of OWC, which uses visible light between 375 nm and 780 nm. VLC relies on white LEDs which already provide illumination and are quickly becoming the dominant lighting source to transmit data. VLC modulate white LEDs at high rates in a way that is imperceptible to humans. Therefore, VLC can enable the dual functionality of illumination and communication simultaneously. Visible light is safe for human and has no eye safety constraints like infrared. VLC has potential applications in a number of areas. These include smart lighting, indoor localization, vehicles and transportation, underwater communication, etc. Recently, VLC is drawing intense attention from standardization groups. The VLC consortium (VLCC) was founded in 2003 in Japan which contributes to research, development, and standardization of VLC. The VLCC has added a visible light physical layer to the existing IrDA infra-red standard. In 2010, the task group IEEE 802.15.7 published the P802.15.7 draft standard [2].

In VLC, Simple two-level on-off keying (OOK) and pulse position modulation (PPM) are supported in IEEE standard due to their compatibility with existing constant current LED drivers, but their low spectral efficiency have limited the achievable data rates of VLC. OFDM has been considered for VLC thanks to its ability to boost the achievable data rates. OFDM can combat inter-symbol-interference (ISI) efficiently with simple single-tap equalizers in the frequency domain. OFDM supports adaptive bit and energy loading of different subcarriers according to the channel quality. OFDM can also avoid low-frequency noises caused by ambient light and the DC wander effect in electrical circuits.

1.2 Problem Statement

Clipping the negative values of the output signal in OFDM-VLC system is a straightforward and basic approach. It can efficiently reduce PAPR, improve SNR by compensating the transmit power, and prevent the necessity of estimating the bias value added at the transmitter to keep the signal real-positive. Clipping techniques reduce large signals only or hard-clip large signal peaks. This cause distortion noise in the transmitted signal that cannot be removed which affect on the performance degradation of communication as well as illumination. This noise is commonly referred to as clipping noise

1.3 Objectives

The objective of this thesis is to;

- Study the performance of the OFDM-VLC system.
- Study the effect of clipping noise in ACO-OFDM system.

1.4 Methodology

To provide an in-depth analysis of the effect of clipping noise in ACO-OFDM in visible light communication systems. Matlab software will be used to simulate the performance of the BER of the ACO-OFDM system in the presence of double-sided signal clipping and AWGN.

1.5 Thesis Outlines

The dissertation is organized as, in chapter two the visible light communication will be introduced ,chapter three will explains in details ACO-OFDM for Visible light communications, chapter four shows the simulation and Results, and chapter five will Provides the Conclusions and Recommendations.