

## Graduation Design Project Proposal Form

### Project # C17

<b>Project Title:</b> Chaotic Physical-Layer Encryption for Optical OFDM-Based VLC systems
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<b>Number of Students:</b> Two to three
<b>Students Qualifications</b>
<b>Statement of Problem</b> The secure communication is achieved through employing encryption protocol at higher layers such as media access control (MAC) layer, which encrypts the data frames but leaves the control frames and headers without protection. Hence it is a risky practice to build security on top of an insecure foundation. It is desirable to ensure a secure physical layer against threats in the optical OFDM system. The physical layer can be thought as a transparent pipe for data communication and inherently augment the security procedures at the higher layers, which will lead to an overall more secure system.
<b>Brief Description of the Project</b> The technology of visible light communication (VLC) is regarded as an appealing technique for upcoming wireless indoor multimedia communications. Considering the broadcast aspect of visible light propagation, the visible light interface is exposed and approachable to both licensed and unlicensed parties settled within the illuminated region. This project designs a chaotic physical-layer encryption method for orthogonal frequency division multiplexing (OFDM)-based VLC schemes to enhance the confidentiality at the physical layer. A logistic map is utilized for the chaos mapping. The method uses a multiple-fold encryption operation which implements chaotic scrambling of the subcarrier allocation in time and frequency domains. The method is expected to support high security at physical layer for optical OFDM systems.
<b>Objectives</b> Enhancing the confidentiality of VLC networks by suggesting a chaotic physical-layer encryption method for OFDM-based optical systems in an indoor environment. The method is expected to have the following properties: (1) High security at the physical layer, and (2) Low complexity.  Chaotic method can provide high data privacy and security due to its high initial condition sensitivity. Therefore, high security at the physical layer can be supported. Also, the chaotic method will not bring any redundancy for signal bandwidth and is feasible to realize data encryption without changing any optical module or electrical circuit due to the excellent digital processing of OFDM signal. Therefore, a low complexity design can be realized.

## **Technical Approach and Expected Deliverables**

In this project, numerical computation software such as Matlab is utilized to design and analyze the physical layer encryption method.