INVENTION DISCLOSURE FORM

Attorney-Client Privilege

The purpose of this form is to record and provide information for evaluating the patentability and commercial value of your invention. Public disclosure of your invention before filing a patent application will negatively impact upon the ability to protect it through patenting. **Disclosing your invention to a patent attorney with the invention disclosure before submitting your research result to a publishing organization is protected by attorney-client privilege.** Inventors are strongly encouraged to submit an Invention Disclosure for all inventions and discoveries that may solve a significant problem and/or have commercial value. Please try to complete as much of the form as possible.

---

1. KEY INVENTION INFORMATION

1.1. Invention title

Design of Hybrid AMI-OFDM using single full-spectrum LED

1.2. Invention contact

Provide details of the inventor who will be Innovation ANU's main contact for this invention disclosure.

Inventors name	1. Ones Sanjerico Sitanggang 2. Yeong Min Jang	**Phone number**	01066261806
		Email address	onessanjerico@gmail.com

2. INVENTION DESCRIPTION

In order to gain a patent, an invention must be (1) novel, i.e. must have at least one new feature that is not present (2) inventive, i.e. it must have at least one advanced feature which cannot be easily derived from a person skilled in the related art; and (3) useful, i.e. it must have an industrial application.

2.1. Circle the categories of your invention

The invention is **a method / a device / a process / a material / a design / an algorithm**

2.2. Provide a brief overview of your invention.

Provide a one paragraph overview of what your invention is by summarizing its structural, mechanical, procedural and technological highlights. Attach any related documents, such as papers, applications, flowcharts, drawings, diagrams, specifications, etc. ***In case of Software related invention flowchart must be included.***

This patent introduces a Hybrid AMI-OFDM (Alternate Mark Inversion - Orthogonal Frequency Division Multiplexing) signal design using a single full-spectrum LED in an Optical Camera Communication (OCC) system. In this system, AMI modulation and OFDM are combined to improve resistance to interference and data transmission efficiency. The OFDM signal is mapped to the LED intensity using the AMI approach, which provides advantages in terms of resistance to interference and distortion. This is superior to other modulation methods, such as OOK, because AMI alternates between positive and negative voltage transitions for bit 1, while bit 0 uses zero volts. In contrast, OOK relies on only two voltage levels, ON/OFF, which carries a risk of losing synchronization when many consecutive bit 0s occur. In addition, we have not found any publications regarding this type of modulation on the internet, making this patent a new contribution to the development of optical communication systems. Furthermore, we also introduce the system architecture diagram and the form of the output signal generated by this modulation, allowing other researchers to use this system as a reference for testing

or further development.

Figure 1 illustrates the architecture diagram of the Hybrid AMI-OFDM modulation in the OCC system, showing the steps from mapping the OFDM signal to the LED intensity using the AMI approach, through to the transmission of the signal via the optical medium. This diagram can serve as a reference for the implementation or development of similar systems. Figure 2 presents the simulation results from Diagram 1, displaying the output of the Hybrid AMI-OFDM in the OCC system.

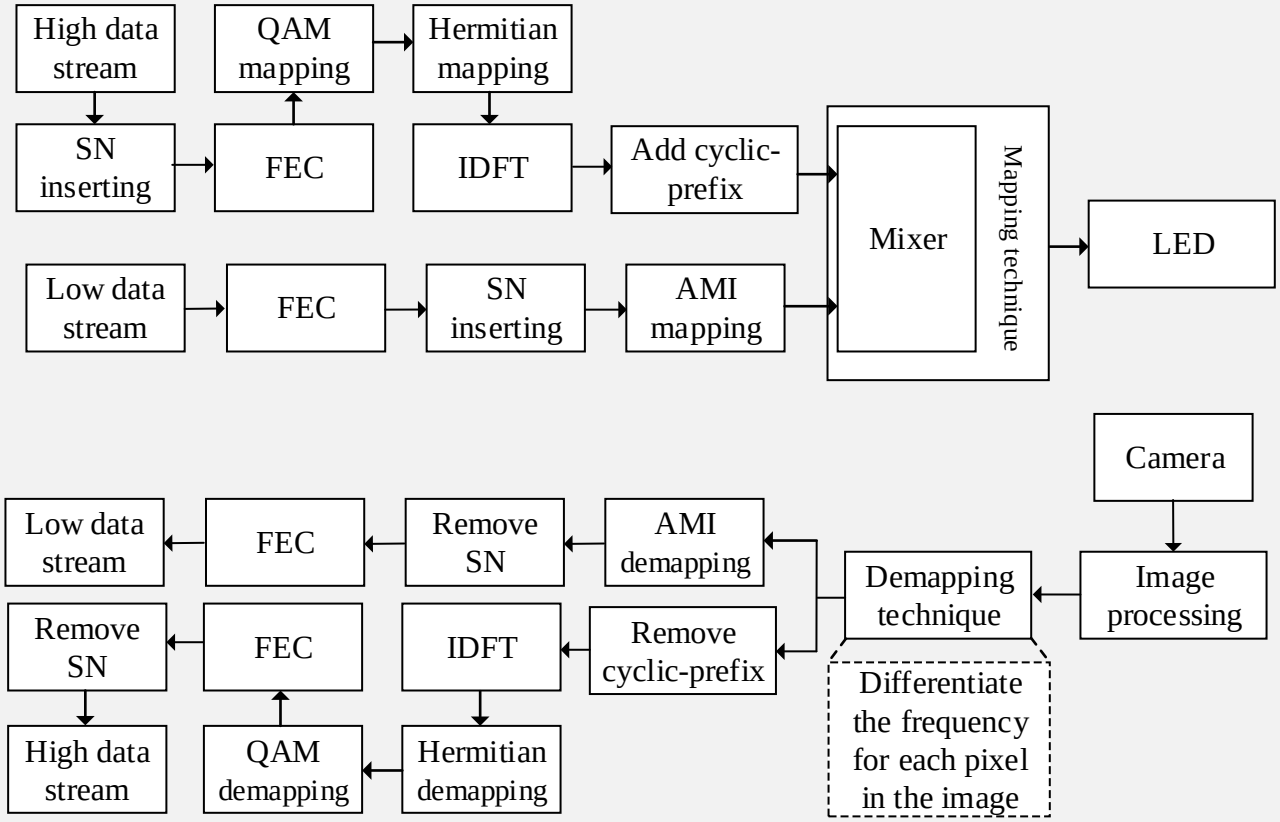

Figure 1. HAMI-OFDM Architecture in OCC system

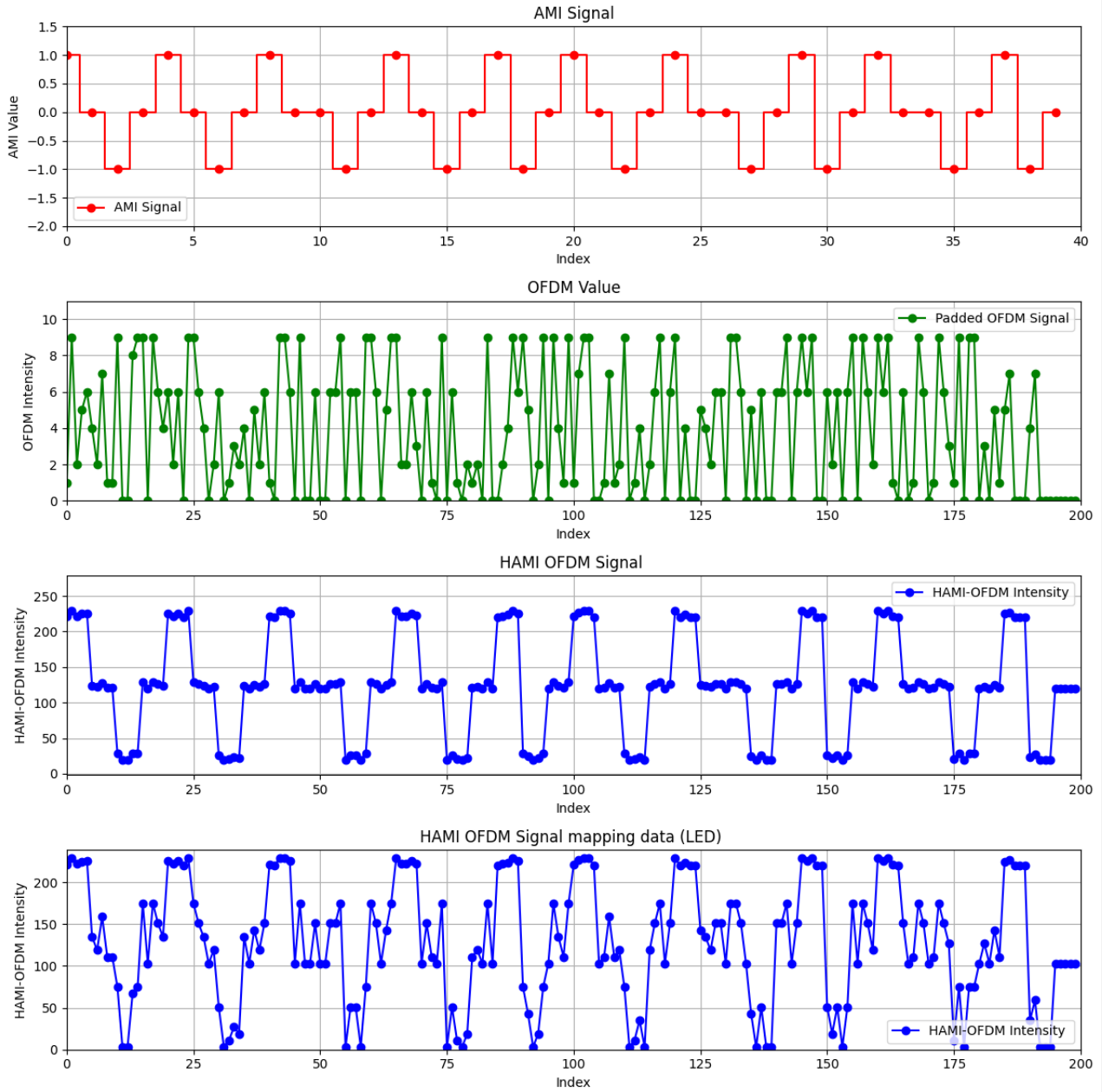

Figure 2. HAMI-OFDM signal based on OCC system

2.3. What are new features of your invention compared to existing technology?

1. We introduce a new hybrid modulation, namely HAMI-OFDM.
2. We introduce a modulation system based on OCC and explain how to perform data mapping and demapping in the OCC system using a single light, based on the proposed architecture.
3. We provide an overview of the signal intensity levels to be transmitted using a single LED.

2.4. What problem does your invention solve (that is not solved by existing technology)?

This invention addresses issues related to resistance against interference and distortion in optical communication systems that have not been fully resolved by existing technologies. Optical communication systems using OOK-OFDM often experience synchronization loss when many consecutive bit 0s occur, which leads to reduced transmission efficiency and quality. Additionally, this modulation supports the full spectrum, allowing data transmission with a wider bandwidth and higher stability. By utilizing various light wavelengths, the system can reduce interference during data transmission.

2.5. **What solutions currently exist to address or attempt to address this problem? What are the deficiencies of the known solutions?**

1. Current optical communication systems use OOK-OFDM and QAM to increase data capacity. However, OOK-OFDM often experiences synchronization loss when many consecutive bit 0s occur, while QAM is susceptible to distortion and interference.
2. Additionally, the existing solutions are still not sufficiently resistant to interference and distortion, and they have limitations in maintaining synchronization during continuous data transmission.
3. Hybrid AMI-OFDM (HAMI-OFDM) addresses these issues by using AMI modulation, which enhances resistance to interference, prevents synchronization loss, and supports the full spectrum to reduce interference and improve transmission stability.

2.6. **What advantages does your invention have over existing technologies?**

- By introducing HAMI-OFDM modulation, this system can enhance resistance to interference and distortion in optical communication.
- By utilizing the full spectrum and AMI modulation, we can reduce interference and improve data transmission stability.
- By addressing the synchronization issues present in OOK-OFDM, this system ensures higher data transmission efficiency.
- By utilizing a single full-spectrum LED, this system offers a simpler and more cost-effective optical communication solution.

2.7. **How does your invention achieve these advantages? (New Features in Structure, Information Processing Technique, Types of Information Used, Processing Order, etc.)**

- HAMI-OFDM modulation combines AMI and OFDM to enhance resistance to interference and distortion, while also addressing synchronization issues in OOK-OFDM.
- The use of Full Spectrum and AMI modulation reduces interference and improves data transmission stability by utilizing more stable light intensity.
- Solving Synchronization Issues through AMI modulation ensures more stable transitions between bit 1 and 0, improving transmission efficiency.
- The use of a Single Full-Spectrum LED simplifies the system design, reduces costs, and enhances transmission efficiency without requiring many additional components.

2.8. **Are there any limitations to your invention? (Technical or Economical)**

To implement the rolling shutter OFDM, we need to use a camera that supports rolling shutter mode, but there are no specific requirements for the type of LED used (as any LED can be utilized in this process).

3. PUBLIC DISCLOSURE

3.1. **Has a description of the invention been disclosed, in whole or in part? If so, provide details below.**

Type of disclosure and aspect of invention disclosed	Date of disclosure	Supporting Documents attached

		☐
		☐
		☐
		☐

3.2. **Do you intend to publically disclose your invention in the next 6-12 months? If so, provide details below.**

Type of disclosure and aspect of invention disclosed	Anticipated date of disclosure	Supporting Documents attached
		☐
		☐