

Modulator

Demodulator

### 1. Motivation

- The radio spectrum is both scarce and expensive
- Visible Light Communication (VLC) presents itself as a viable alternative
- Applications of VLC are already present in modern technologies such as Vehicle-to-Everything (V2X) Communication
- Minimizing the amount of resources necessary for developing such schemes means more teams will be able to advance the field of VLC.

### 3. Methodology

- The first step was developing a smartphone application for demodulating the LED screen
- Every LED on the screen was modulated at a frequency of  $\nu = 500Hz$
- We chose a resolution of 1920 x 1080 pixels, a framerate of 30fps, ISO of 100 and exposure time of  $\frac{1}{5000} s$

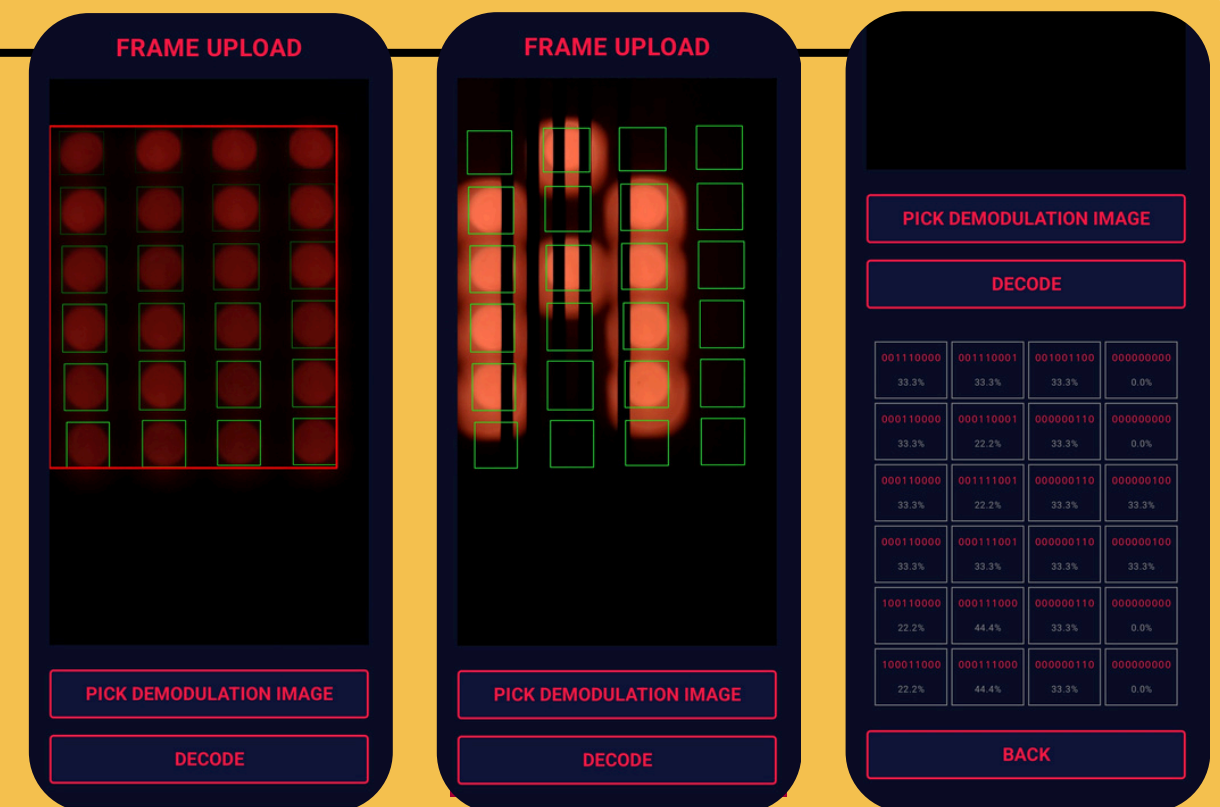


Figure 1: Frame demodulation flow

### 2. Research Question

What is a feasible method to implement a communication scheme for a custom LED-screen platform, focusing on the red-to-red optical link, while using the On-Off Keying with Manchester Encoding modulation technique?

### 4. Results

- We obtained an average BER of less than  $10^{-1}$  for all three demodulation protocols
- We obtained an average Data Transfer Rate (DTR) of  $144 \frac{bits}{frame}$  if all LEDs are in use

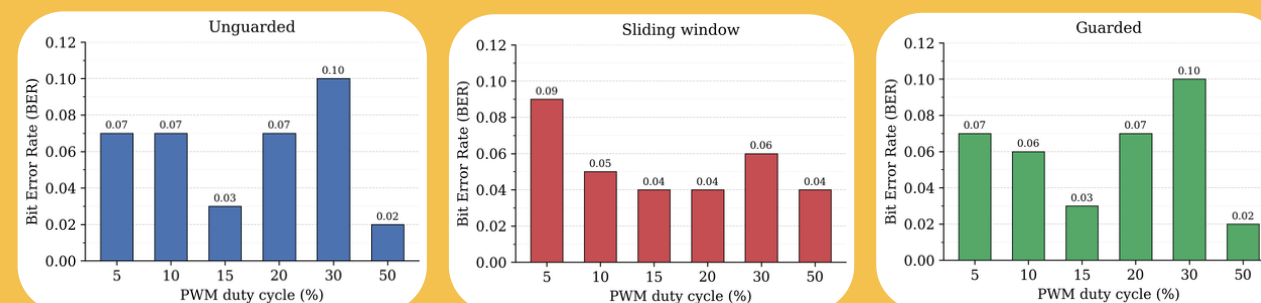


Figure 2: BER plotted against the LED screen PWM for the three demodulation techniques

### 5. Conclusions

- Our methods provide a reliable method for MIMO communication systems
- However, the limited resolution doesn't allow for the presence of important headers in the data frame, making our techniques unfeasible for real-world MIMO systems