

# DATA TRANSFER USING LIGHT – FIDELITY TECHNOLOGY

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# Introduction



- Light Fidelity (Li-Fi) refers to a bidirectional, high-speed and fully networked wireless communication technology similar to Wi-Fi.
- The term was coined by Harald Haas in Global Ted talks.
- It is a form of visible light communication and a subset of optical wireless communications (OWC) and could be a complement to RF communication (Wi-Fi or cellular networks), or even a replacement in contexts of data broadcasting

# Problem Statement



- Design and build a prototype which can transfer data using Li-Fi technology.

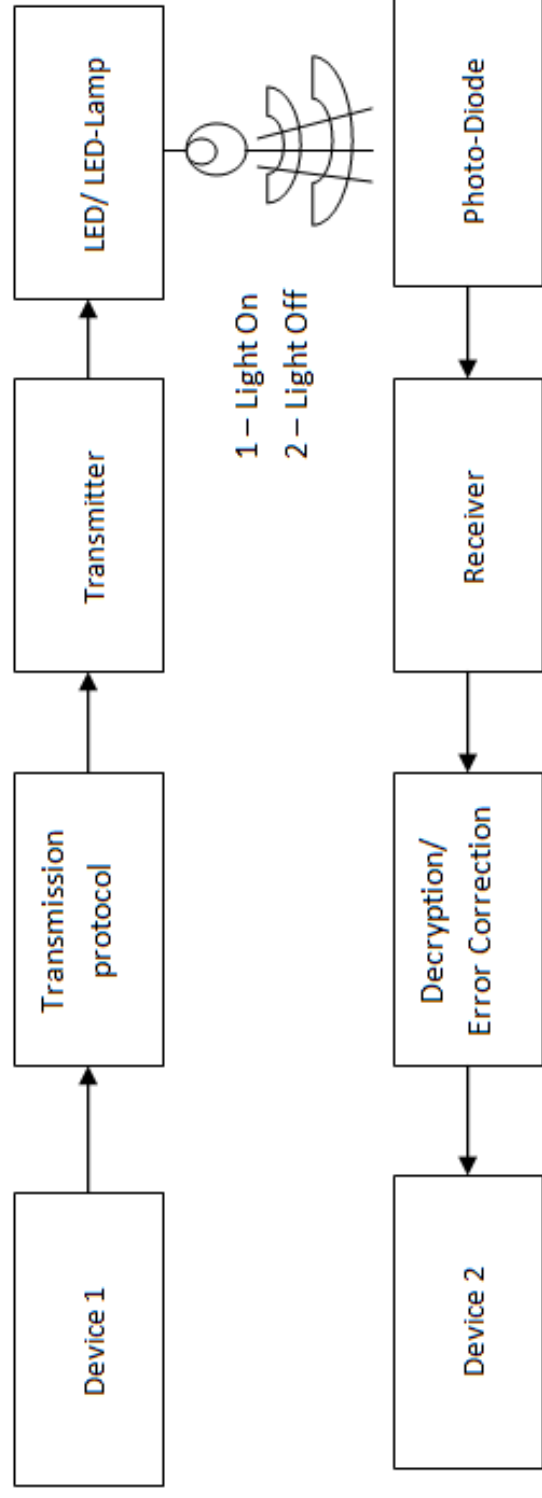
# Objectives



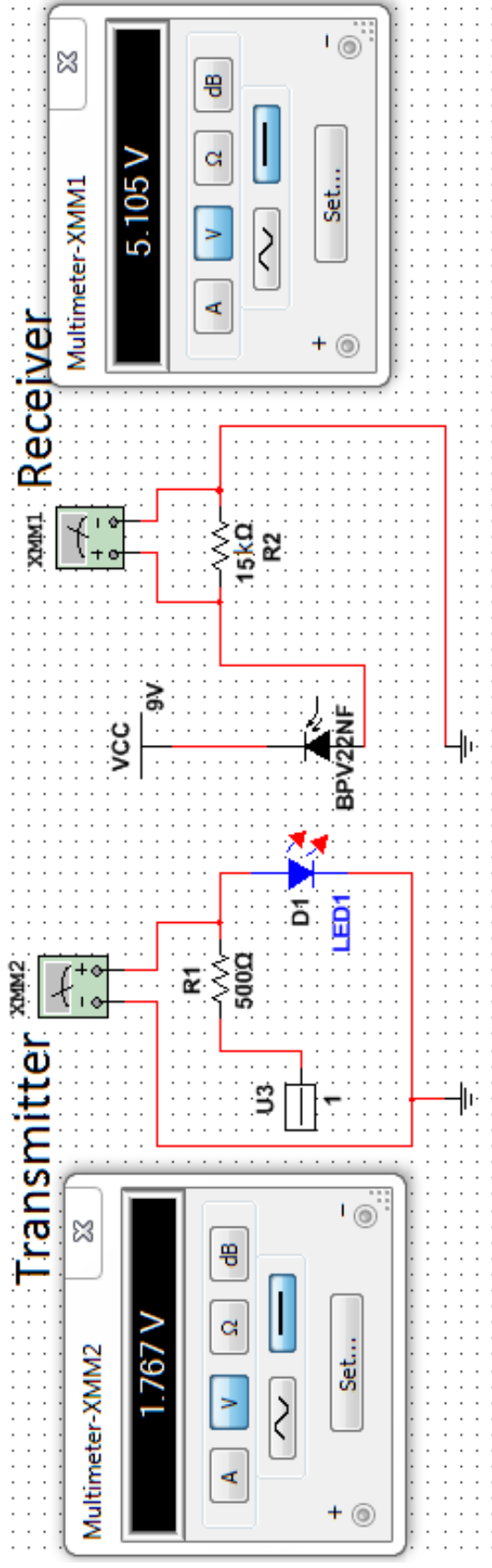
- Demonstrate that light can be used to transfer data using Li-fi technology.
- Create a prototype that transfers data using Li-fi technology.
- Create end to end application for data transmission and reception

# System Architecture

## Working principle

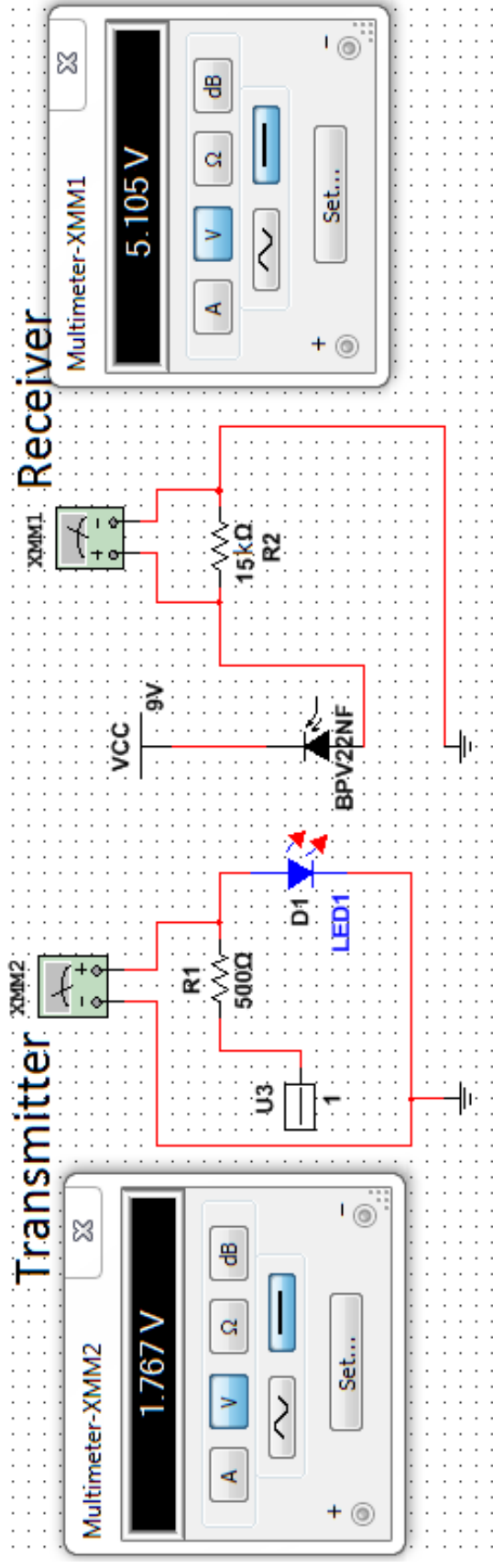


# Design – Circuit Diagram



# Design – Circuit Diagram

- The transmitter and receiver circuit diagram simulation is done by using MultiSIM. The results suggest that when data stream bit is '1' the voltage at receiver end is 5V which can be used by micro controller. When the data stream bit is '0', the receiving voltage will be 0V.



# Resources



- Hardware
  - MSP430g2553 micro controller launch pad
  - LED
  - Photo-Diode
  - Device
  - Batteries
  - Resistors
  - Devices
  - Computer
  - Mobile
- Software

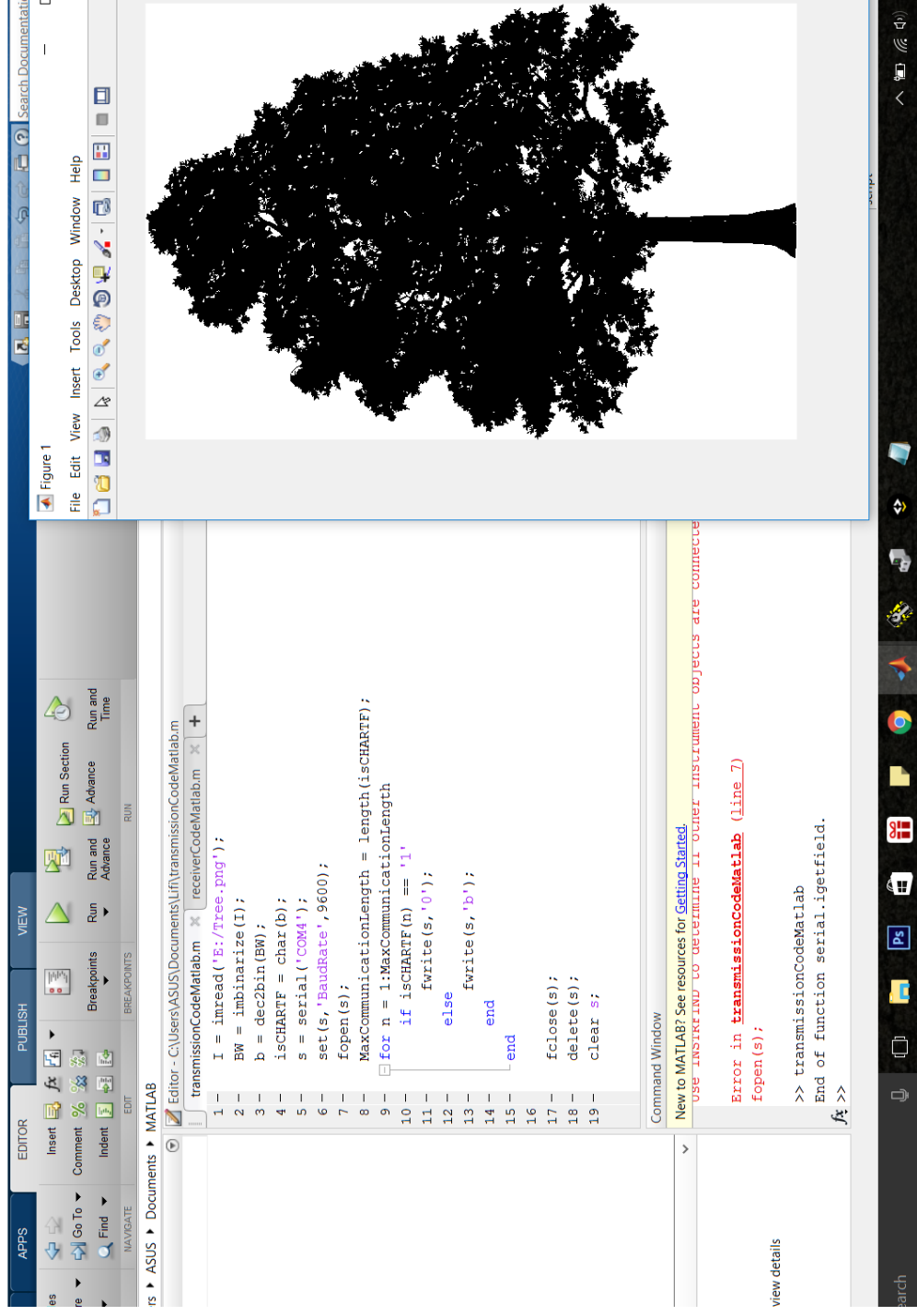


# Results & Conclusion



- Photo Diode and LED have been interfaced with MSP430 and results were analysed.
- The main focus of mid-sem was on designing and simulation of circuits for transmitting and receiving data (stream of '1' and '0').
- NI Multisim was used for simulation of circuit designed for transmitting & receiving data.

# Transmitter



# Transmitter & Debugging

workspace:transmitter - IAR Embedded Workbench IDE - MSP430 7.102

File Edit View Project Emulator Tools Window Help

workspace

Debug

Files

- Transmitter - Debug
  - main.c
  - Output

```
#include <msp430.h>

void TXUART(char *pData);

int main(void)
{
    WDTCTL = WDTPW + WDTHOLD;
    if (CALCCL_1MHZ == 0x00FF)
    {
        while(1);
    }

    DCOCTL = 0;
    BCSCTL1 = CALBC1_1MHZ;
    DCOCTL = CALDCO_1MHZ;
    PSEL2 = BIT1 + BIT2;
    PSEL2 = BIT1 + BIT2;
    UCA0CTL1 |= UCSSEL_2;
    UCA0BR0 = 0x65;
    UCA0BR1 = 0;
    UCA0CTL1 = UCSSEL_2 + UCSW0;
    IE2 |= UCA0RXIE;
    PDIR = 0x40;
    POUT = 0x40;
    while(1)
    {
        int chr = -1;
        if (IFG2UCA0RXIFG) {
            chr = UCA0RXBUF;
        }
        if (chr == 'b') {
            POUT = 0x40;
        }
        for(int i=0; i<1000; i++);
    }
    return 0;
}
```

Transmitter

debug Log

Log

- Thu May 25, 2017 01:13:53: Download complete.
- Thu May 25, 2017 01:13:53: Loaded debuggee: C:\Users\ASUS\Documents\IAR\Debug\Exe\Transmitter.d43
- Thu May 25, 2017 01:13:53: Target reset
- Thu May 25, 2017 01:13:53: Invalid parameter(s): (SetNewEEMBreakpointin), pwBpHandle=0, lAddrVal=0xc00c, bpMode=0x1, status=0xffff
- Thu May 25, 2017 01:13:53: Failed to set hardware breakpoint
- Thu May 25, 2017 01:13:53: No state storage buffer implemented on connected device (EnableEnergyTrace)
- Thu May 25, 2017 01:14:01: IAR Embedded Workbench 7.10.2 (C:\Program Files (x86)\IAR Systems\Embedded Workbench 7.10.2\bin\430proc.d

Hercules SETUP utility by HW-group.com

UDP Setup Serial TCP Client TCP Server UDP Test Mode About

Received/Sent data

Serial Name COM4 Baud 9600 Data size 8 Parity none Handshake OFF Mode Free

Open

HWg FW update

Modem lines CD RI DSR CTS DTR RTS

Send

HEX Send

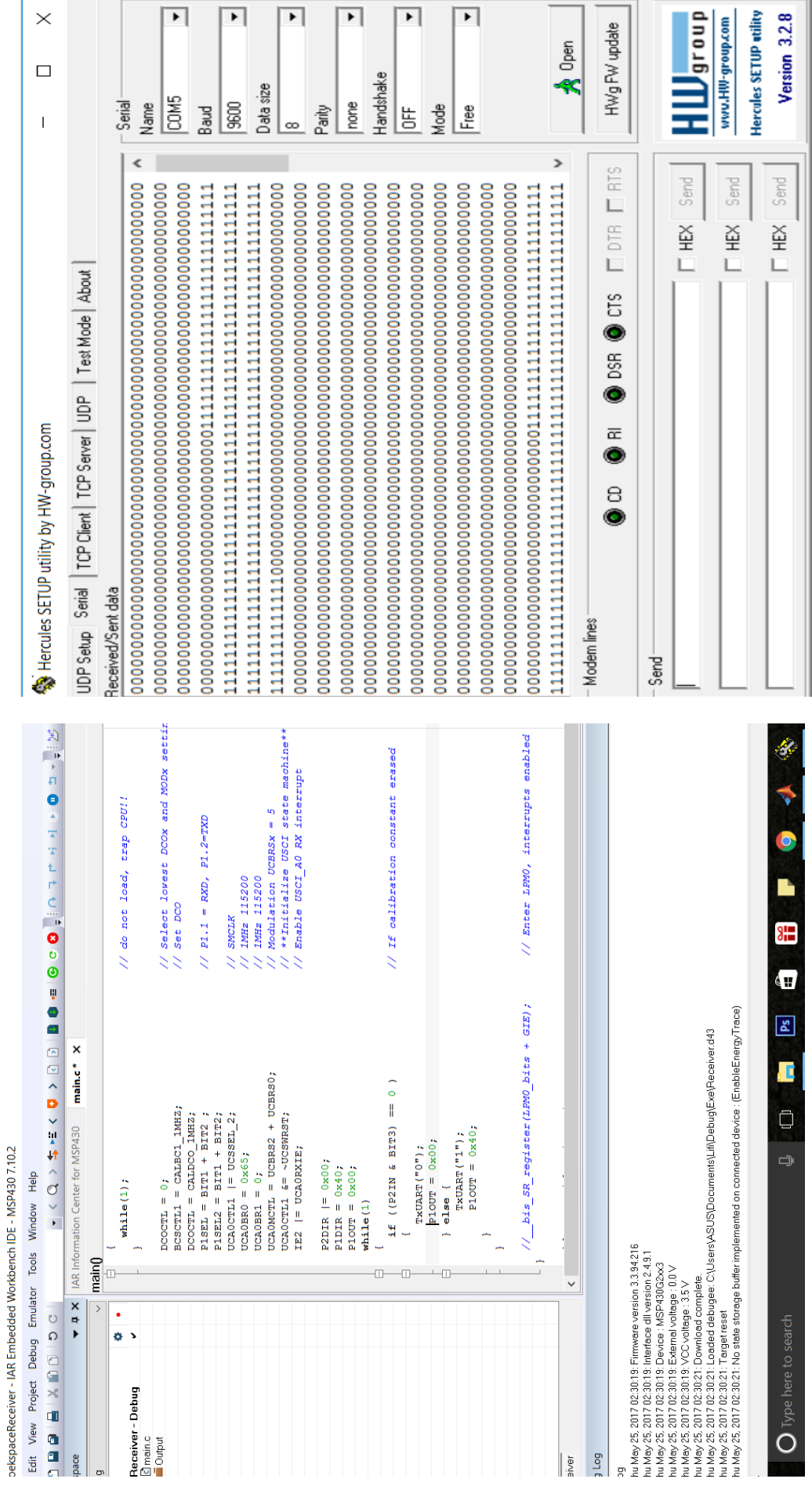
HEX Send

HEX Send

Serial port COM3 opened  
Serial port COM3 closed  
Serial port COM3 opening error  
Serial port COM3 opening error  
Serial port COM3 opened  
Serial port COM3 closed  
Serial port COM3 opening error  
Serial port COM4 opening error  
Serial port COM4 opening error  
Serial port COM4 opening error  
Serial port COM4 opening error  
Serial port COM4 opening error  
Serial port COM4 opening error  
Serial port COM4 opening error  
Serial port COM4 opened  
Serial port COM4 closed

HWgroup  
www.HW-group.com  
Hercules SETUP utility  
Version 3.2.8

# Receiver & Debugging



# Problem faced



- During receiving data, the reception data stream does not match with stream that was transmitted, but it showed a pattern.
- The sensitivity of receiver should be increased and this can be done using feedback op-amp at receiver.
- The internal frequency should be same at transmitting and receiving end.

# Future Scope/Work



- Create application for transmission of data.

# References

- Harald Haas, Liang Yin, Yunlu Wang, and Cheng Chen. What is liFi? Journal of Lightwave Technology, 34(10):1533 - 1544, 2015.
- S. Hossain, S. Islam, and Z. Abadin. Methodology to Achieve Enhanced Data Transmission Rate using LiFi in VLC Technology. International Journal of Engineering Research, 2014.
- Chris Nagy. Embedded Systems Design Using the TI MSP430 Series. Embedded Technology Series, Newnes, USA, 2003.
- S Chatterjee, S. Agarwal, and A. Nath. Scope and Challenges in Light Fidelity (LiFi) Technology in

Thank you