Use Cases for Light Communications

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LC Use Cases

- Vehicle to Vehicle Communications
- Manufacturing and Harsh Environments
- Power Plants
- Nuclear Facilities
- LC for Secure Offices
- Some Calculation for the Security Risks of LC

Weaknesses of RF Networks

1. Vulnerable to a variety of cyber attacks such as man-in-the-middle attack (MITM), packet spoofing, packet injection, sniffing, unauthorized tapping and transfer

2. Electromagnetic interference (EMI) in the instrumentation and control system (I&C System) to perform safety function

3. Not reliable in a noisy environment

LC for V2V and V2X Communications

- V2V and V2X include inter and intra vehicle networks
- LC can help to reduce the interference between these networks

LC Application in Manufacturing and Harsh Environments

- Wi-Fi cause interference on RF devices in these environments
- Large number of users and robots need to be connected to network
- Even wired networks are not completely practical due to the moving robots or arms

LC for Power Plants

- The electro magnetic radiance from power generators, voltage converters and transmission lines cause interference on RF systems in power plants
- LC can provide a safe and reliable wireless communication technique, specially in emergency

LC for Nuclear Facilities

- There are three major issues
  - Electromagnetic compatibility (EMC) or interference (EMI) issues
  - Cyber security
  - Installation issues due to the type of the building structure
- In nuclear power plant control rooms, radio devices have been banned because of concerns about interference to the instrumentation and control equipment.
- NO Wi-Fi or Bluetooth is permitted.
- Wired network is costly and bulky
- A mesh network using of LED lights can reduce the pain

LC-based Wireless Sensor Networks in Nuclear Facilities

- In 2009, the Nuclear Regulatory Commission (NRC) issued a cyber security rule requiring licensees to provide high assurance that critical systems and networks are adequately protected from cyber attacks [10 CFR 73.54].

- Although great effort has been spent to improve cyber security of RF wireless network technology such as Wi-Fi can still not be implemented everywhere in NPP.

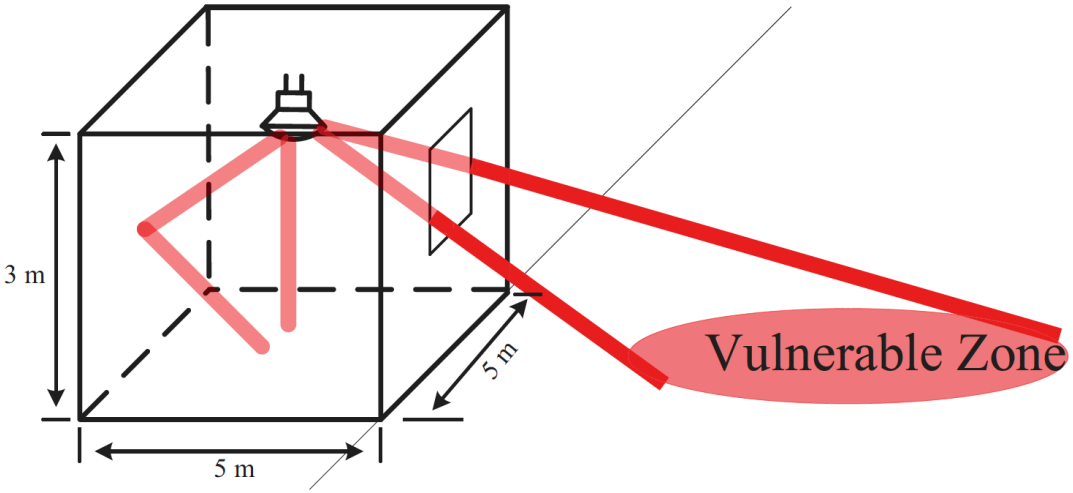
LC-based Wireless Sensor Networks in Nuclear Facilities

- Measurement and control, condition monitoring, predictive maintenance, and management of operational transients and accidents

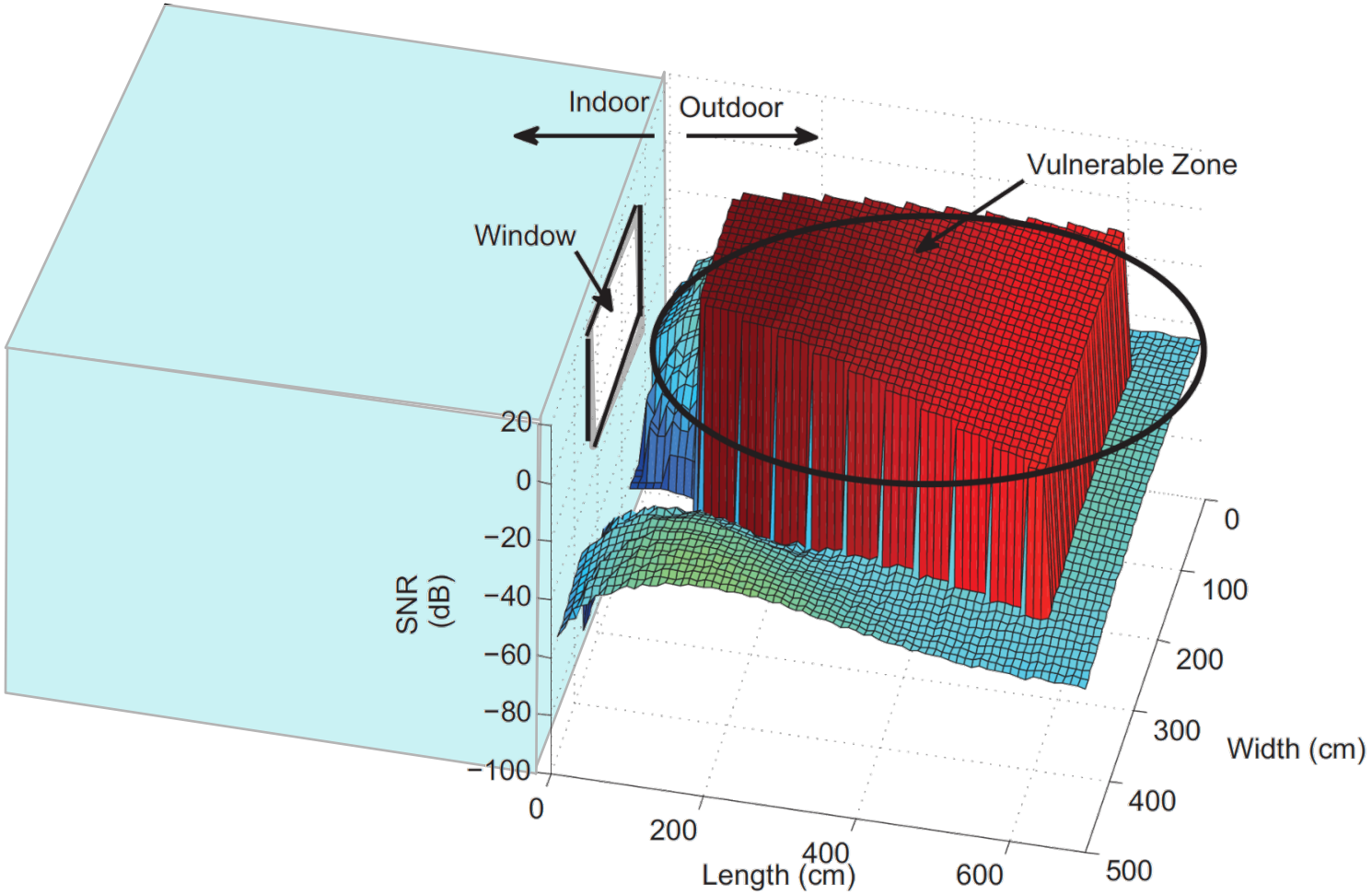
- Integrated networks of wireless sensors that can be used to measure parameters in order to improve process safety and efficiency, increase output, and optimize maintenance activities

LC for Secure Offices

- LC is a reliable candidate for wireless connectivity in secure buildings
- The light leaked through windows and doors is can impose a security risk

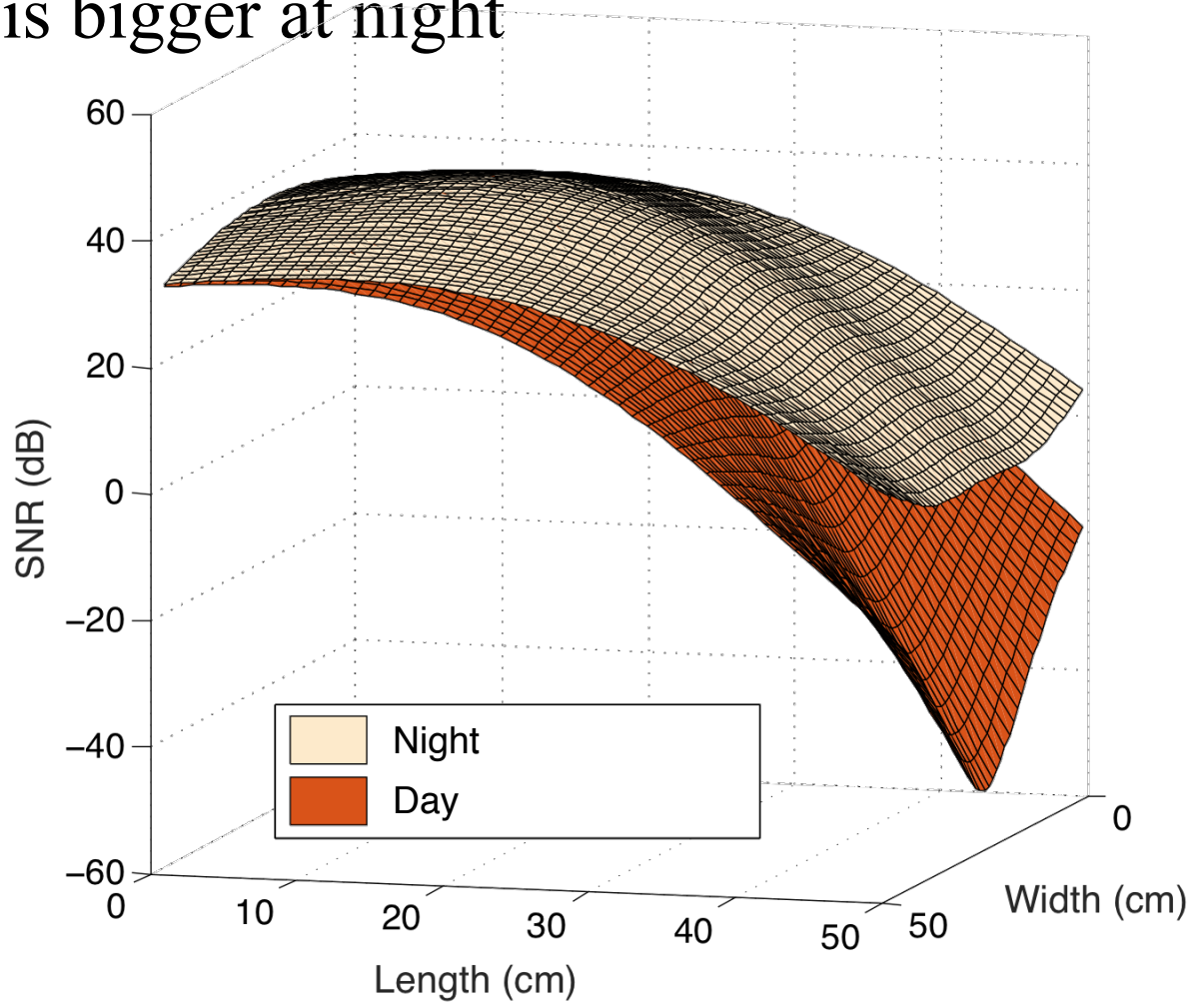


SNR for Leaked Signals Through a Window



SNR for Leaked Signals Through a Window

- The risk is bigger at night



SNR for Leaked Signals Through a Window

- Eavesdropper would need a huge lens to be able to get information from signals