



MATERIAIS INTELIGENTES
PARA A RADIOCIÊNCIA

17^o

CONGRESSO DO COMITÉ
PORTUGUÊS DA URSI

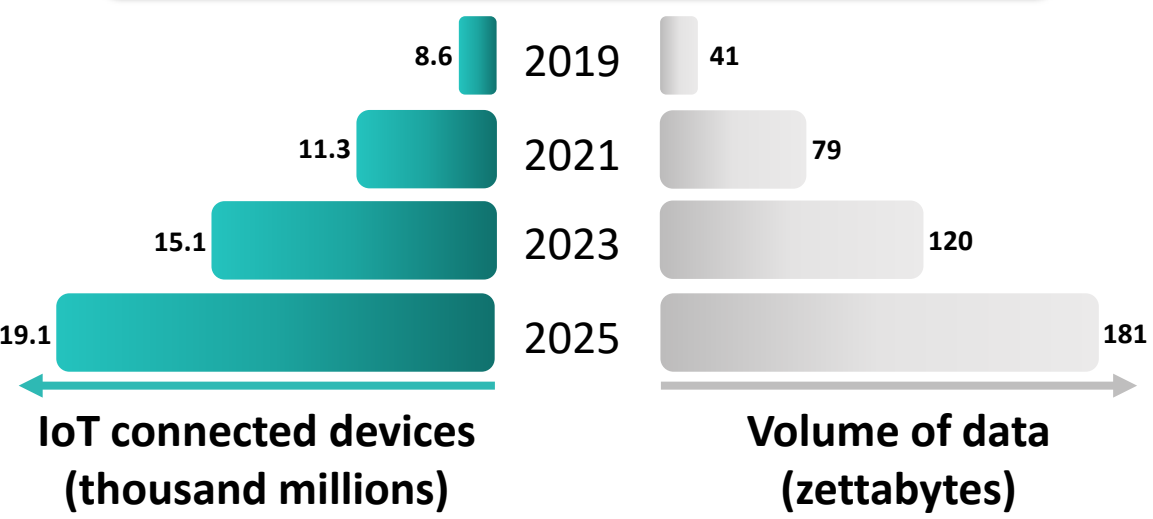
Photonic device based on a large-scale transparent luminescent solar concentrator for visible light communications for a sustainable Internet of Things

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Motivation

What are the implications of the rapid urbanization on IoT and Big Data?



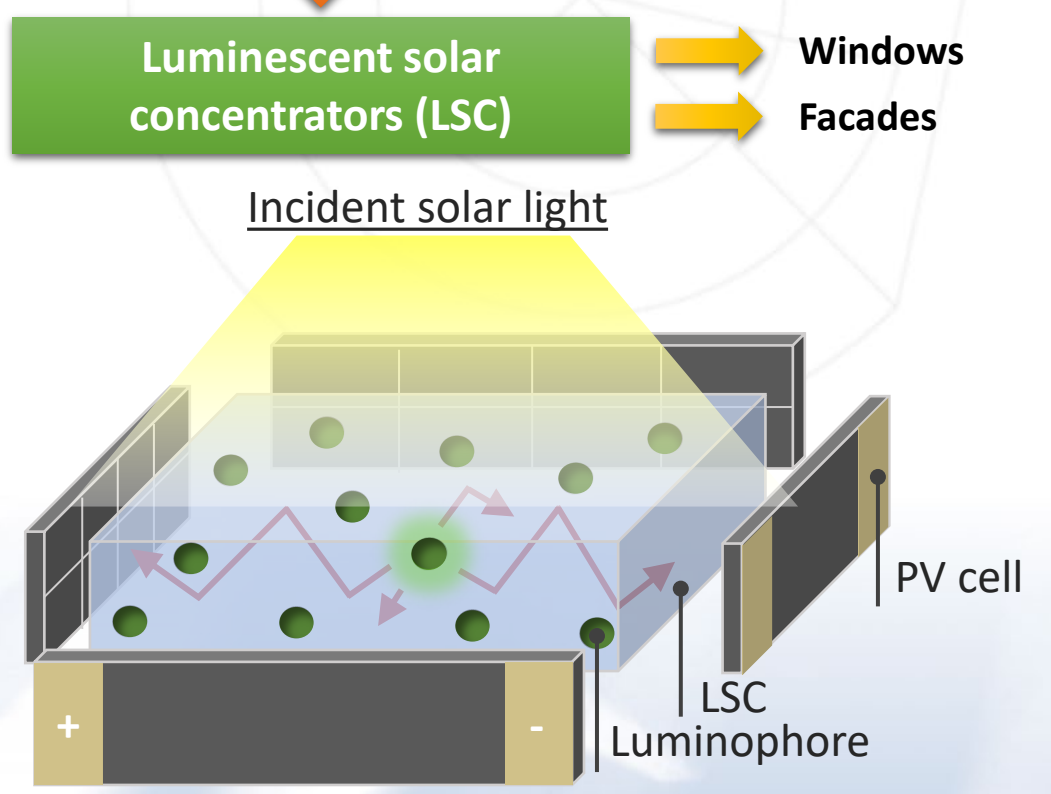
Wireless Communications



Zero Energy Buildings (ZEB)

Buildings that produces as much energy as it consumes over a certain period of time.

- Renewable energy sources
- Energy-efficient technologies



<https://www.statista.com/statistics/871513/worldwide-data-created/>
<https://www.statista.com/statistics/1183457/iot-connected-devices-worldwide/>

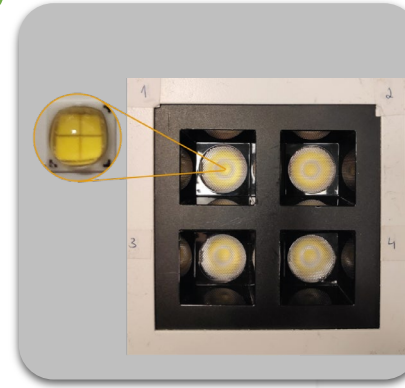
Integration of LSCs as receivers into VLC systems



Devices:

- ① Arduino Leonardo
- ② T-Cube LED Driver (Thorlabs)
- ③ Codex E-Lamp (Lightenjin) → Light Source
- ④ Large-scale prototype → VLC Receiver

③



Lifetime:
50 000 hours

Luminous efficacy:
80 lm/W

Luminous flux:
4000 lm

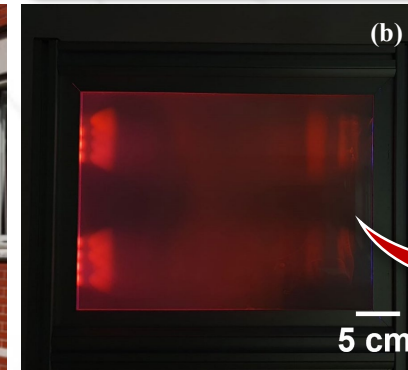
Future Work



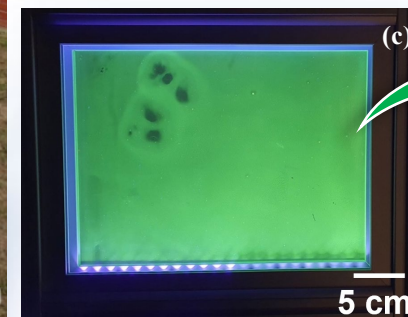
④

Outdoor
illumination

Integrated UV
irradiation



LSC based on
SEBS-Eu

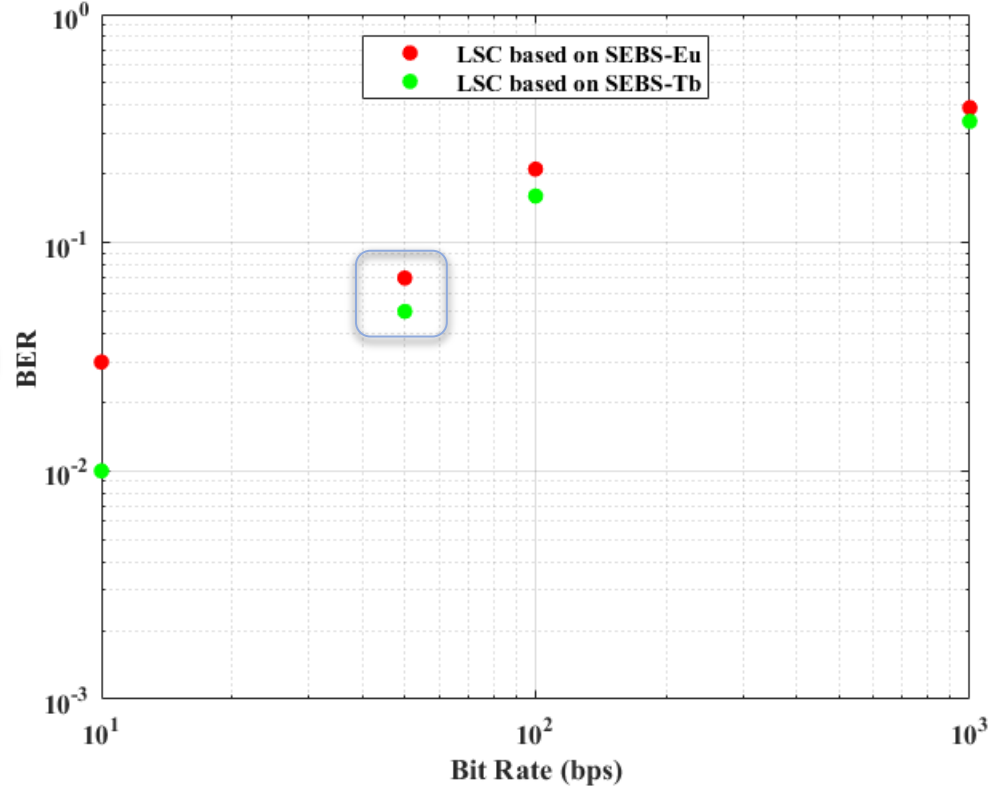


LSC based on
SEBS-Tb

Assessing Robustness of VLC System

Message: 100 bits

Wireless Link Distance: 1 m

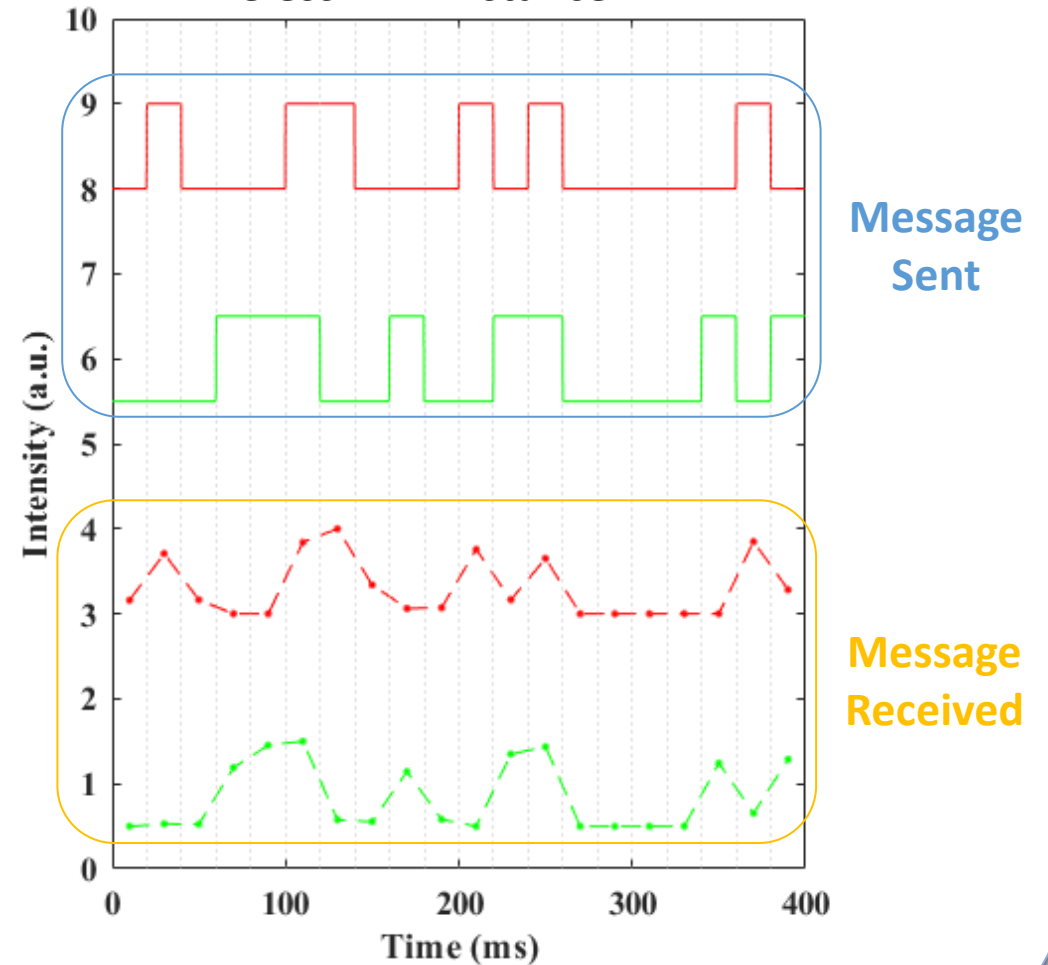


$$\text{Bit Error Rate (BER)} = \frac{\text{Bit Errors}}{\text{Total Bits}}$$



Bit rate: 50 bps

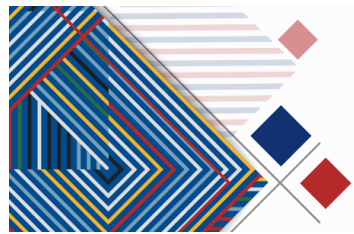
Message: 100 bits

Wireless Link Distance: 1 m



Conclusion and Future Work

- **Luminescent solar concentrators (LSCs)** integrated into **visible light communication (VLC)** systems can increase data transmission efficiency while **harvesting energy**.
 Sustainable solution for the rising demand of IoT devices.
- The low transmission rates considered simulate VLC systems for key distribution or systems that require low data transmission.
- The exploitation of transmitters from mobile flash LEDs appears to be a promising approach.
 More compact and practical alternative to commercial luminaires for the progress of VLC technology.



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