

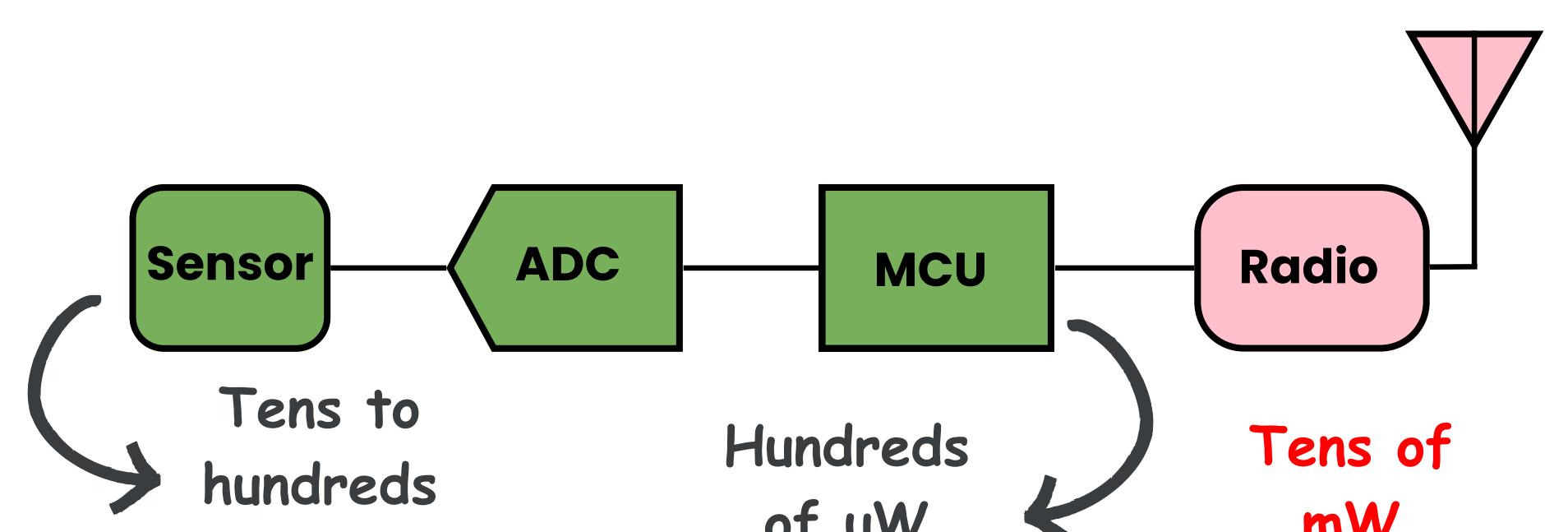
AudioCast: Enabling Ubiquitous Connectivity for Embedded Systems through Audio-Broadcasting Low-power Tags

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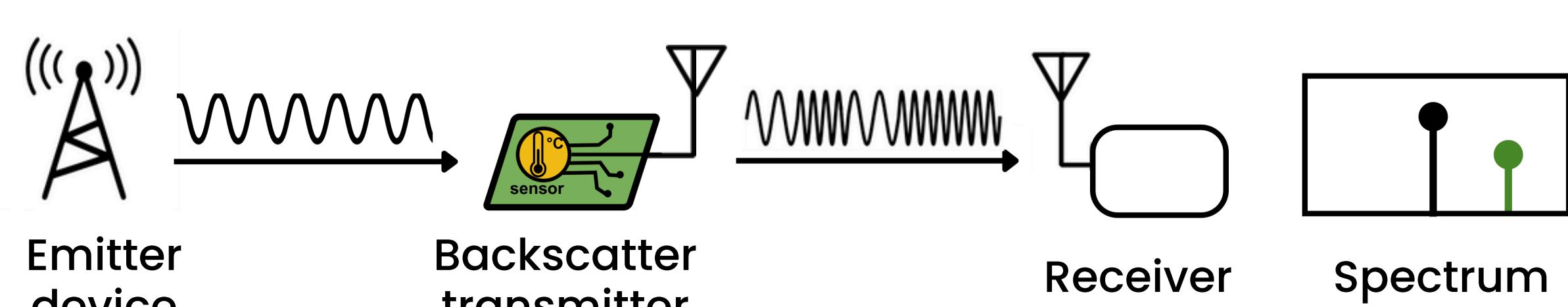
Energy Challenge

- Over the past decade, sensors and processors have significantly become energy efficient, but radio communication has not

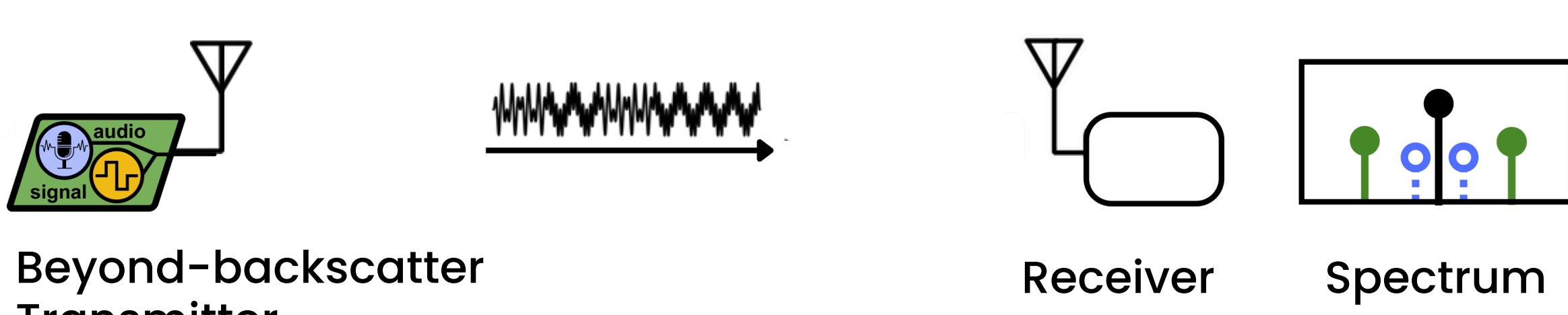


Typical architecture of embedded systems

- Backscatter mechanism enables transmission at tens of μ W's of power consumption



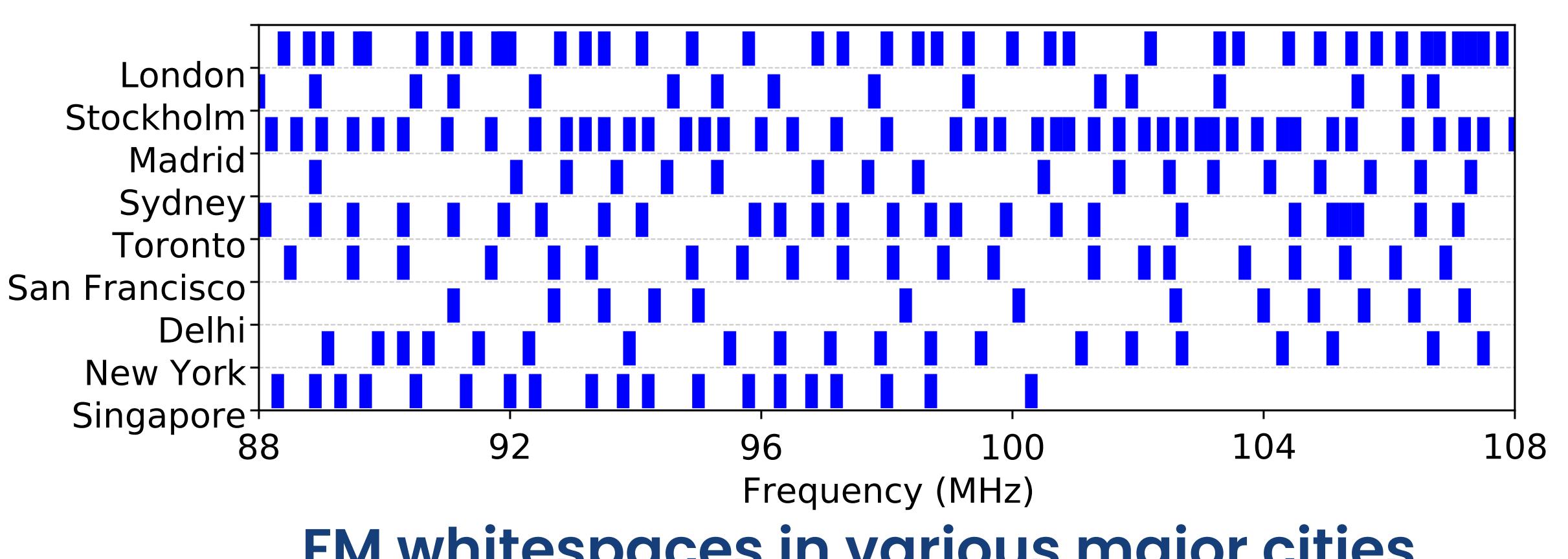
- Conventional backscatter systems require a **dedicated** carrier emitter device
- Emitter and tag need to be in **close proximity** for longer communication range



- AudioCast:** our **beyond-backscatter** transmitter does not require an external carrier emitter and draws just under **200 μ W** power

Revisiting the FM Broadcast Spectrum

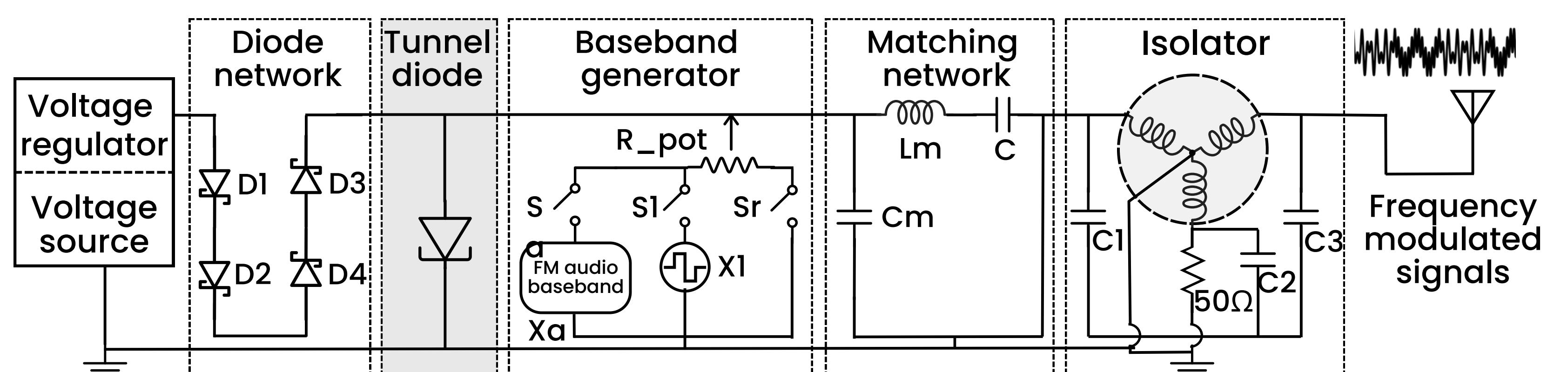
- FM radio listenership has declined over the past decade, with many stations shutting down globally resulting in **whitespaces**



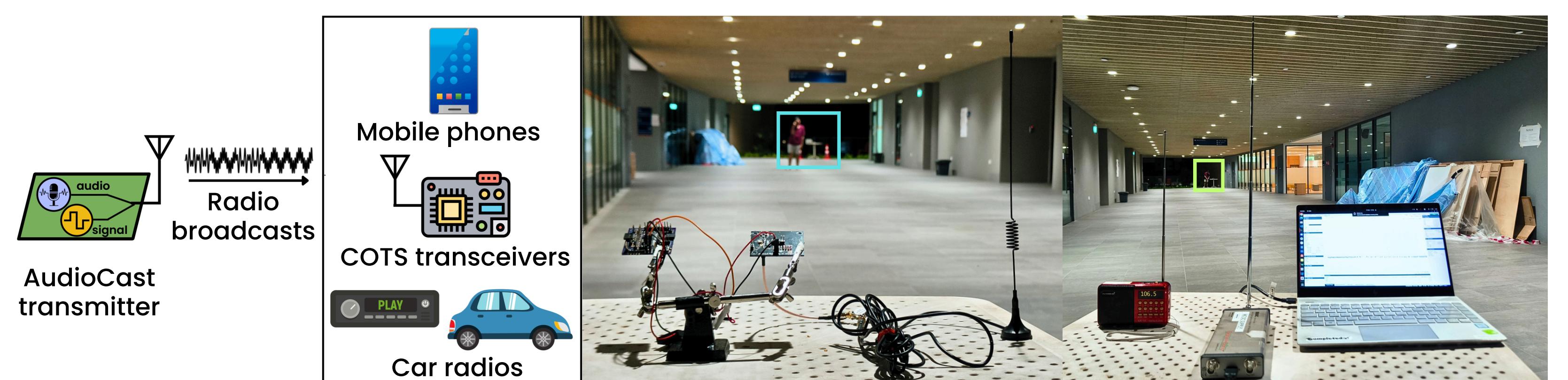
FM whitespaces in various major cities

AudioCast Design

- We instantiate a beyond-backscatter transmitter in the FM radio broadcast band which supports long-range transmission



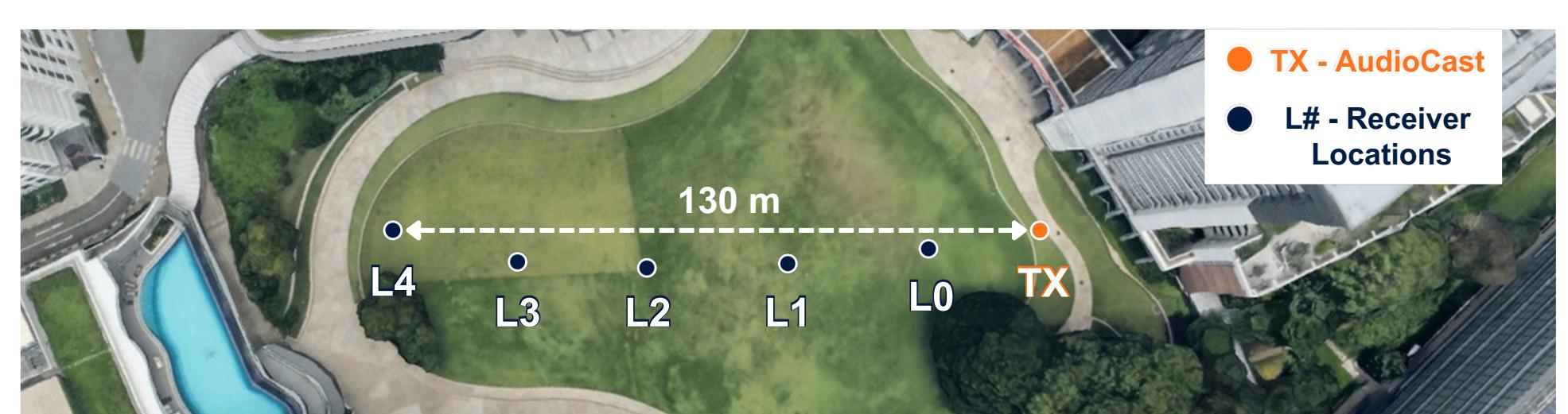
AudioCast transmitter design schematic



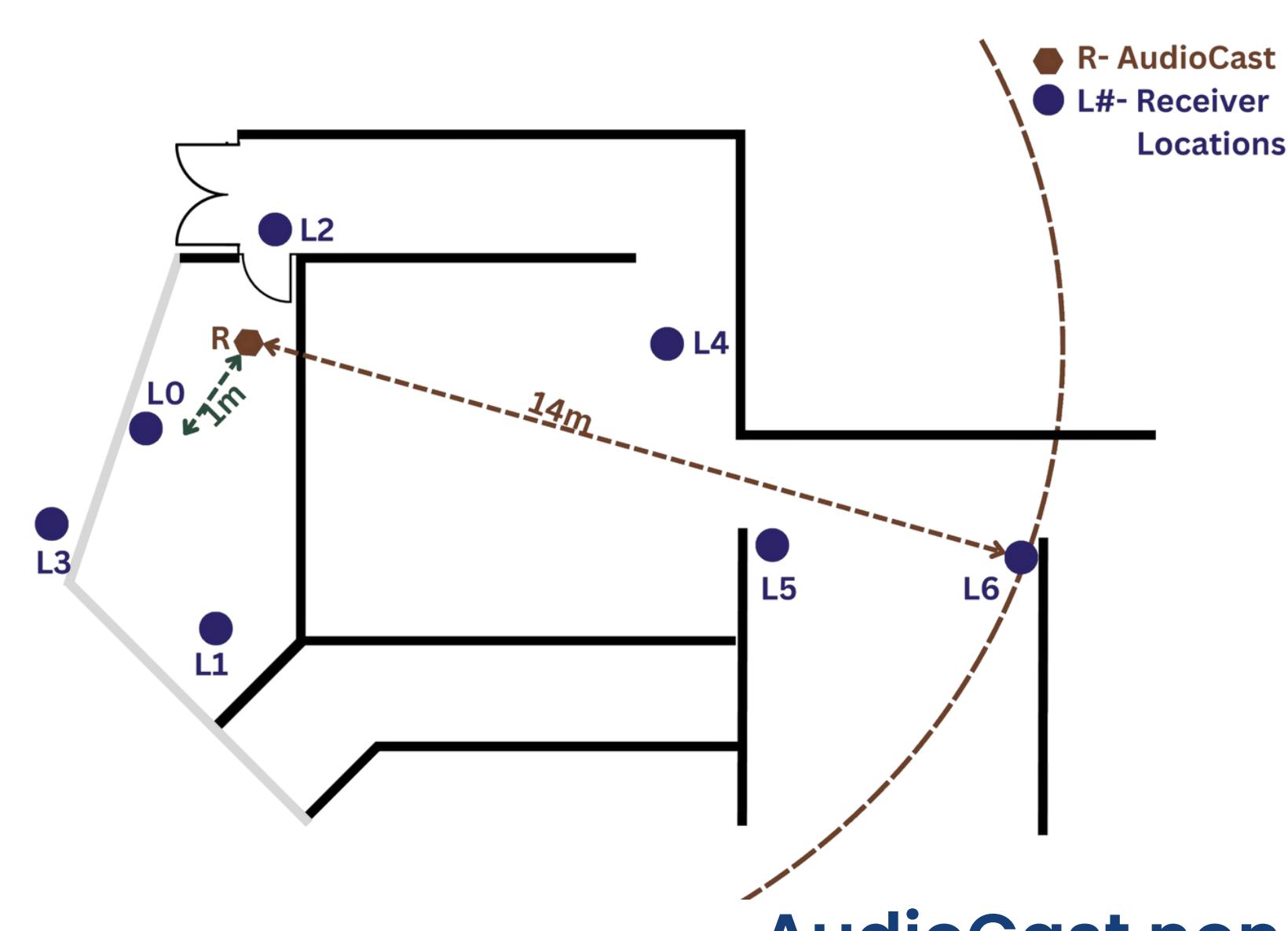
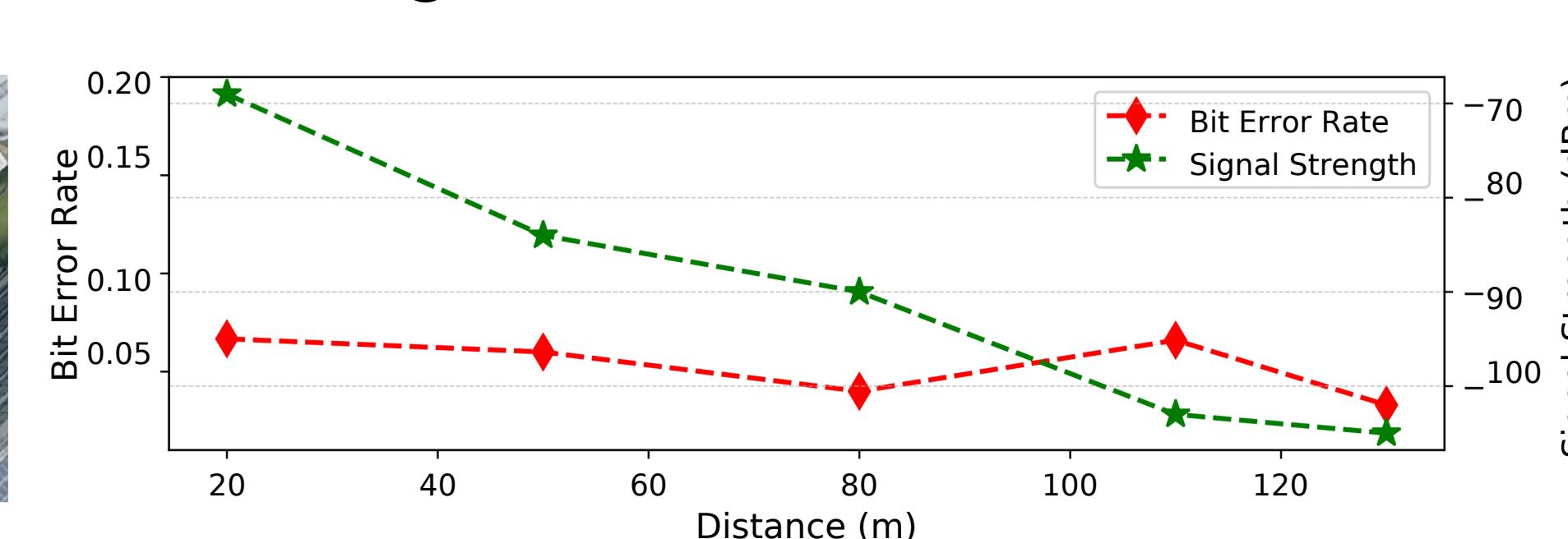
AudioCast operates in the FM-broadcast spectrum and transmits data as audio broadcasts that are compatible with commodity FM receivers

Results

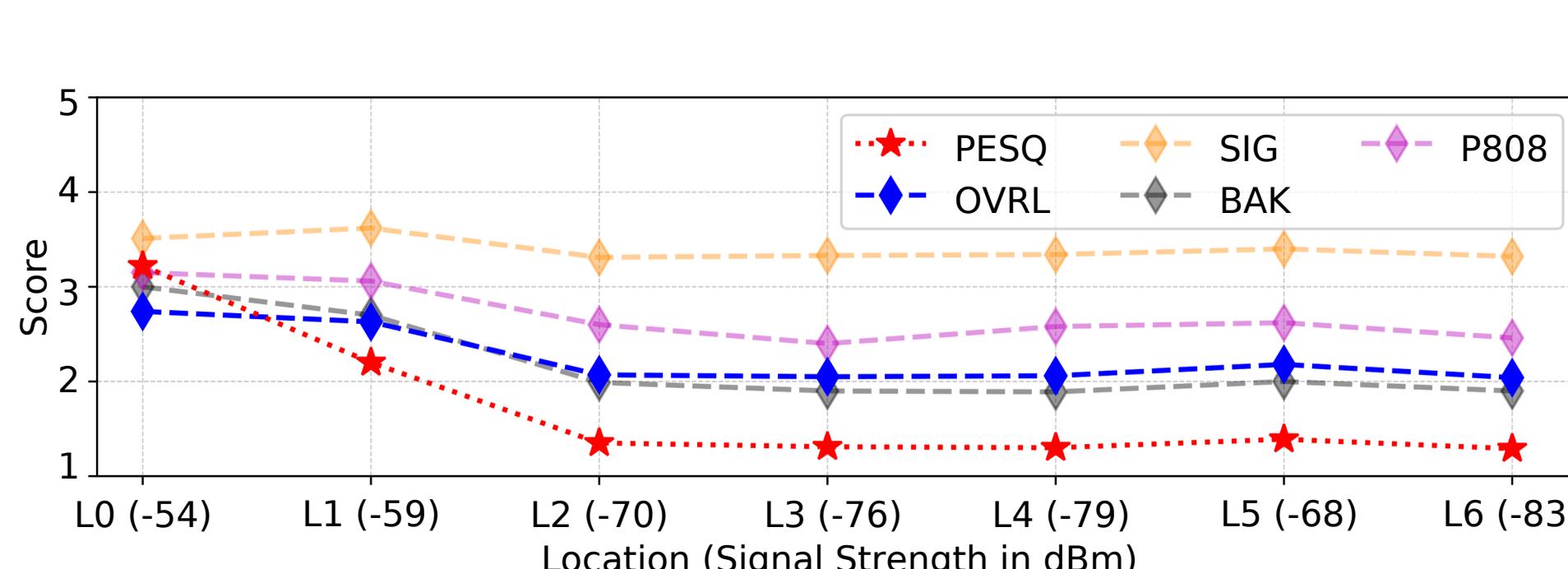
- AudioCast offers a line-of-sight outdoor range of **130 m** with a bit error rate of **0.033** and non-line-of-sight indoor range of 14 m with **PESQ > 1.3**



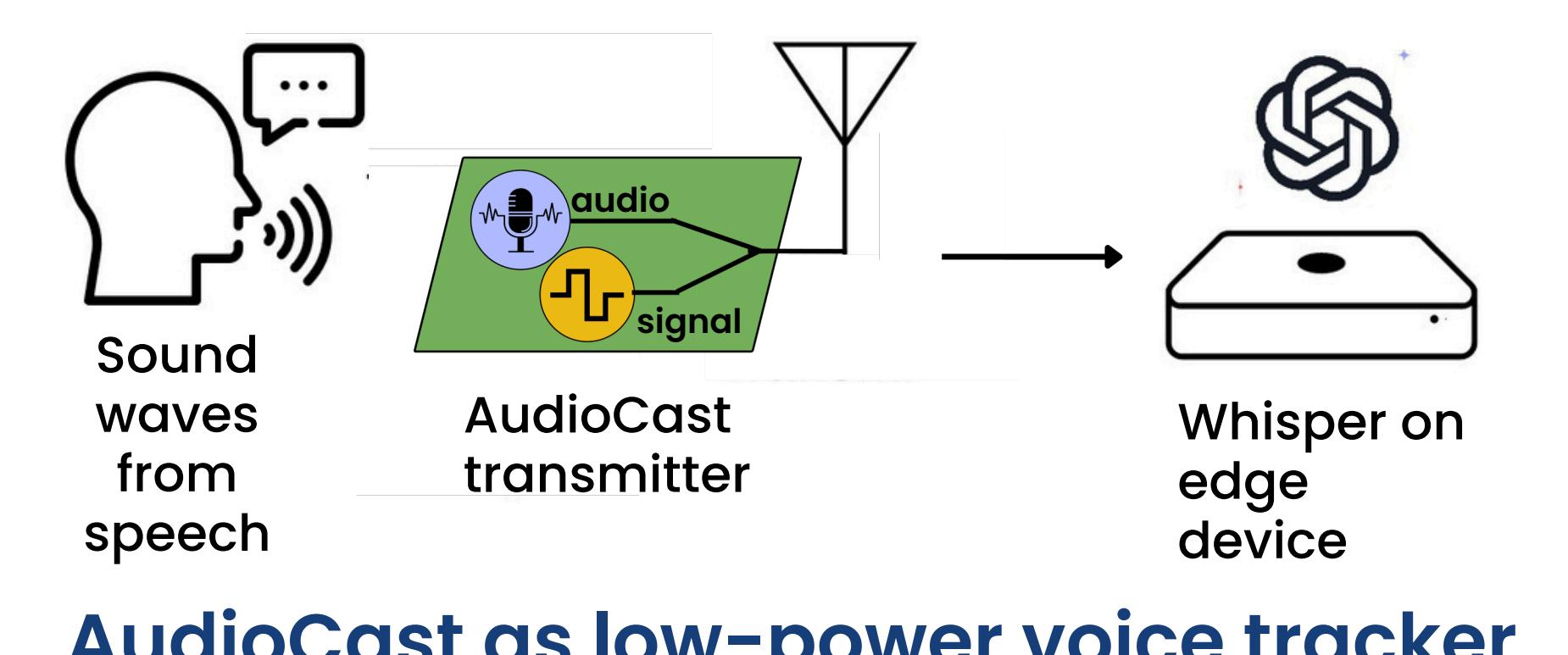
AudioCast line-of-sight evaluation



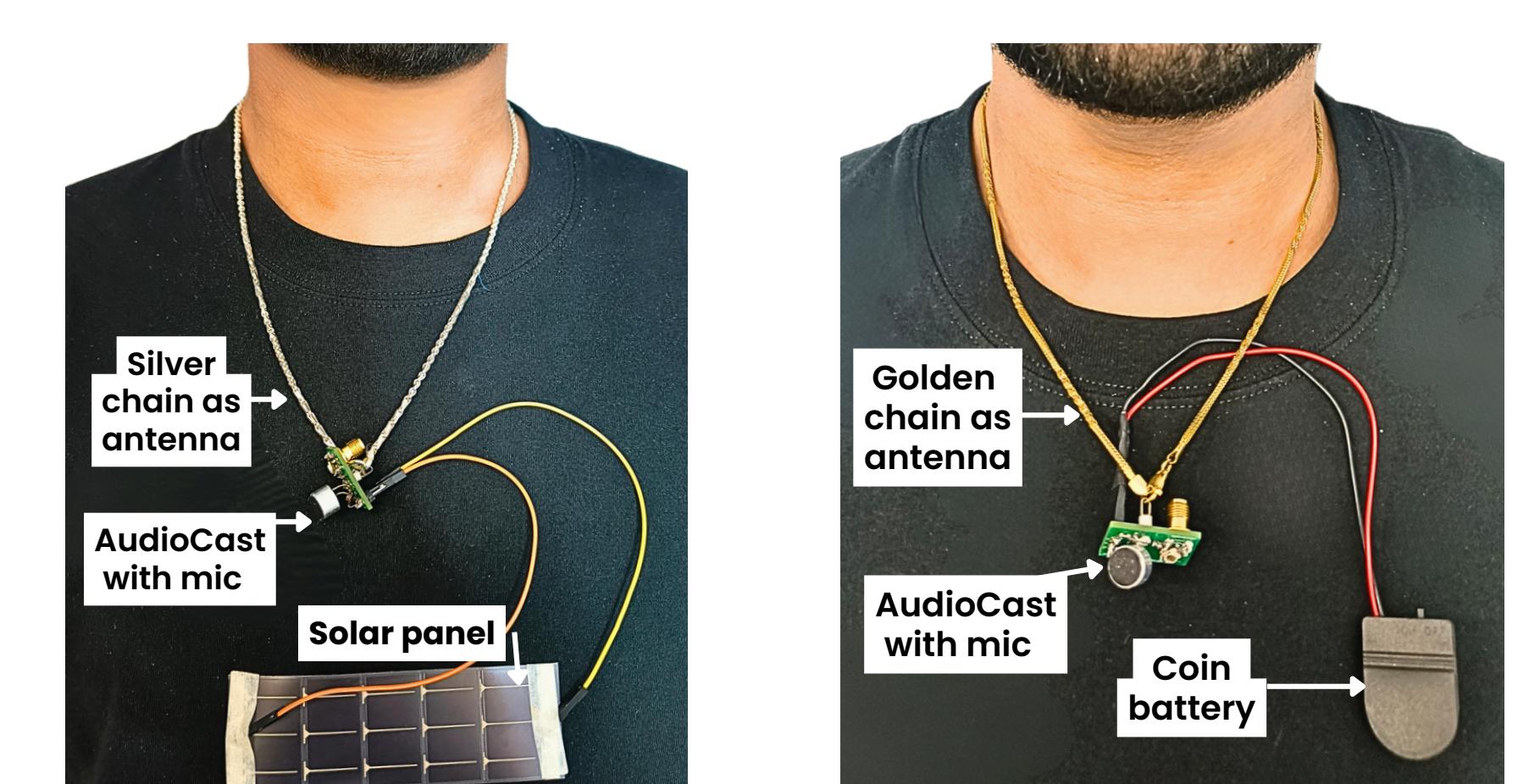
AudioCast non-line-of-sight evaluation



Use cases



AudioCast as low-power voice tracker



AudioCast as a smart pendant

Full Paper

GitHub



IMWUT 2025

