140 GHz & 28 GHz mmWave Measurements for Integrated Sensing and Communications (ISAC)

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NOKIA BELL LABS

COSMOS

NSF

Motivations

- Employing frequencies likely to be used in next generation (5G, 6G) network technology to understand how the signal propagates in a variety of environments

- Outdoor:
  - Smart city applications, self driving cars, proximity sensors
- Indoor:
  - Workplace safety (i.e. warehouses, construction areas)

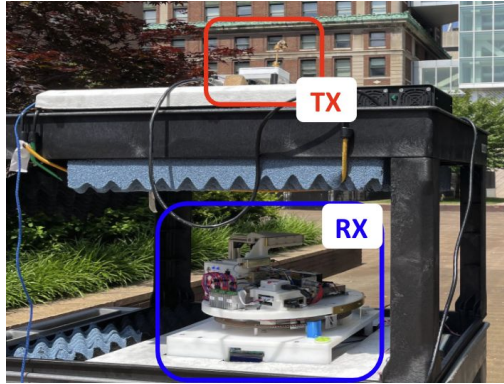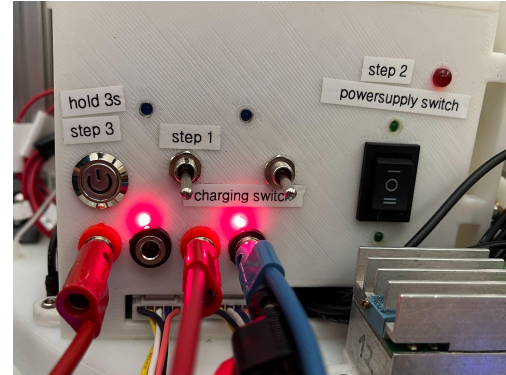# 28 GHz Measurement Platform
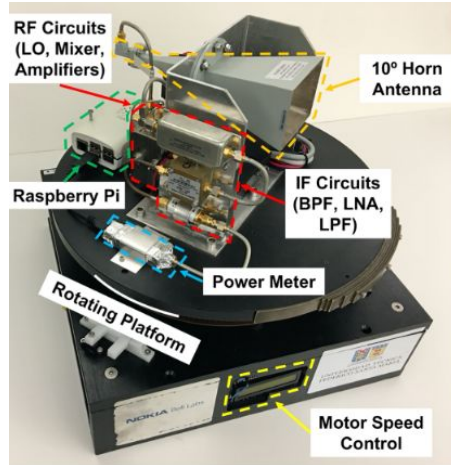
28 GHz RX
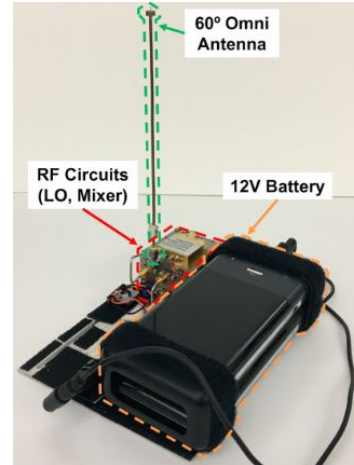
28 GHz omnidirectional TX

Key:
RX: Receiver, TX: Transmitter, IF circuit: Intermediate Frequency, BPF: Berkeley Packet
Filter, LNA: Low-Noise Amplifier, LPF: Low Pass Filter

140 GHz Measurement Platform

140 GHz TX/RX

Battery Hub

How We Conduct Experiments

There are different procedures for room scans with the 28GHz and 140GHz TX/RX respectively:

1. 28 GHz
   a. Allow the RX to spin for 60 seconds in one place after running the experiment command from the terminal/command prompt
   b. Move it roughly 1 meter in a straight line up and down the room in different "lanes" until every position in the room has had a collect initiated from it.
   c. Due to the repetitive nature of this method, it takes 50-60 collects to cover most rooms.

2. 140 GHz (with lidar)
   a. Run experiment through command prompt and allow the routine to collect data for 15 minutes. A total room scan takes 3 or 4 fifteen minute collects.
   b. The data collected is condensed into .pcap files where it can be analyzed with a specialized tool.

Measurement Campaigns

Indoor:

CEPSR 4th floor lounge

CEPSR 8th floor lab

CEPSR 8th floor office
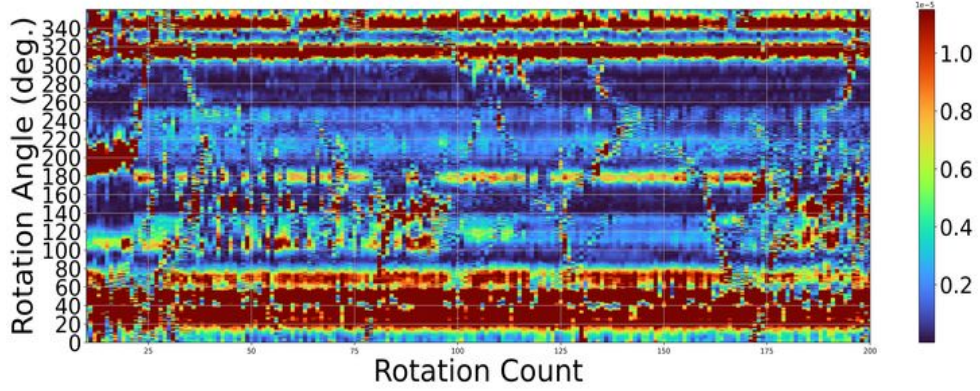
MUDD 1st floor lounge
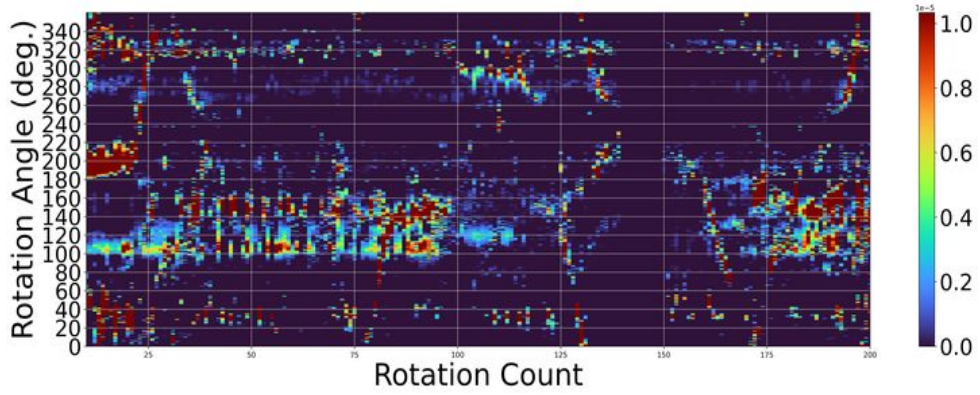
PUPIN room 426 (classroom)

Outdoor:
Corner of 120th & Amsterdam
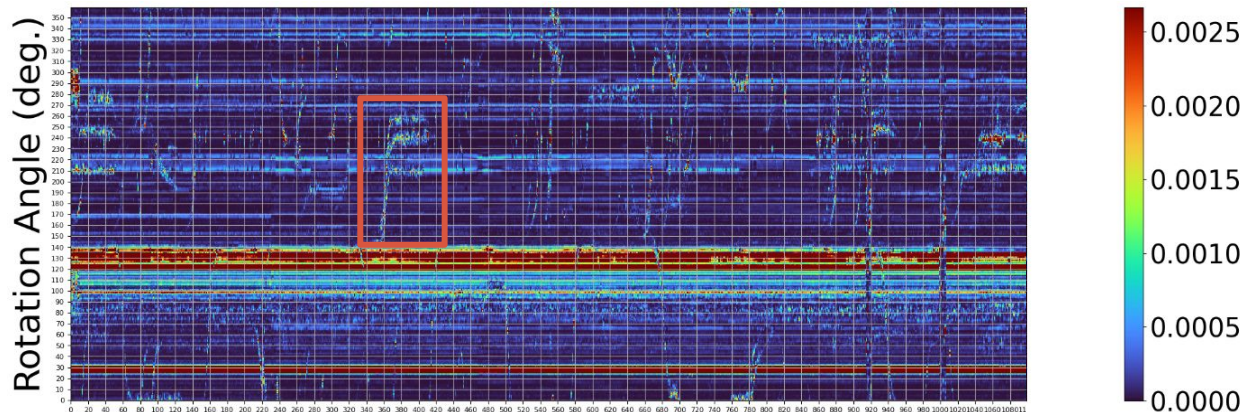
28 GHz Outputs

Original heatmap →

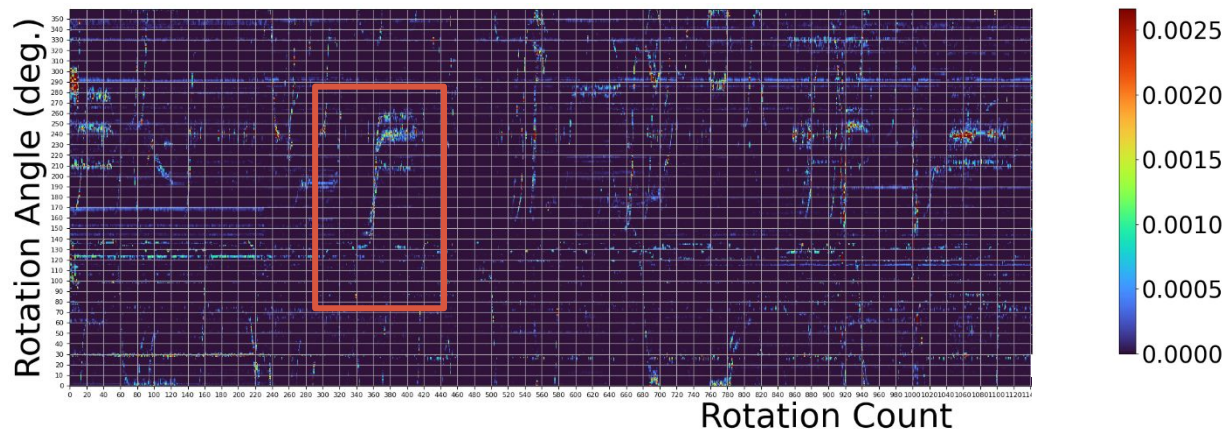(With Background
Subtraction) →

140 GHz Outputs
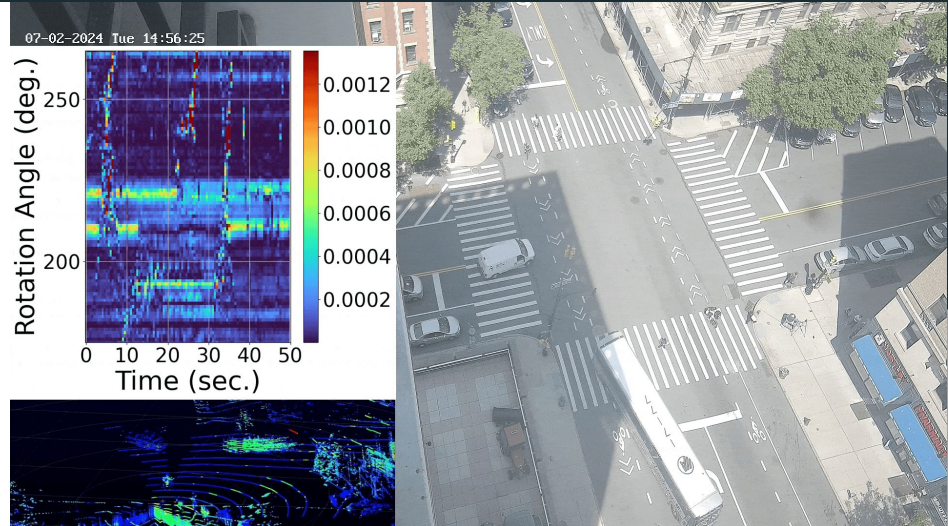
Original heatmap →
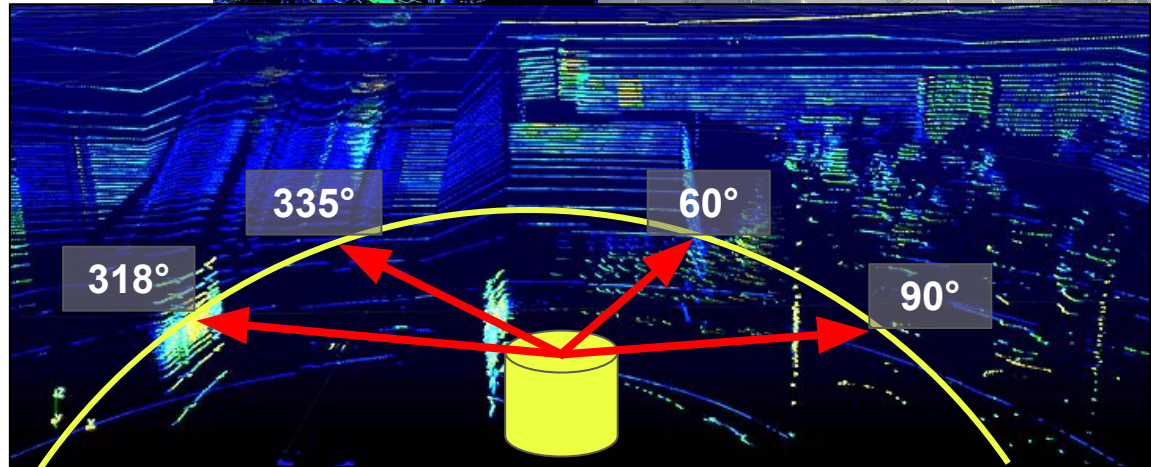

(With Background Subtraction) →

LiDAR Outputs

To the right are the aforementioned .pcap files showing a visualization of the data collected by the 140 GHz TX/RX and lidar.

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Thank you!