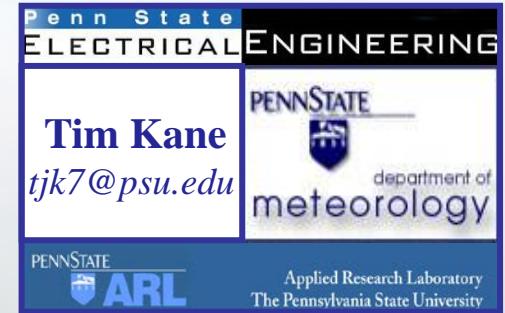




# Integrated FSO & Sensor System Networks

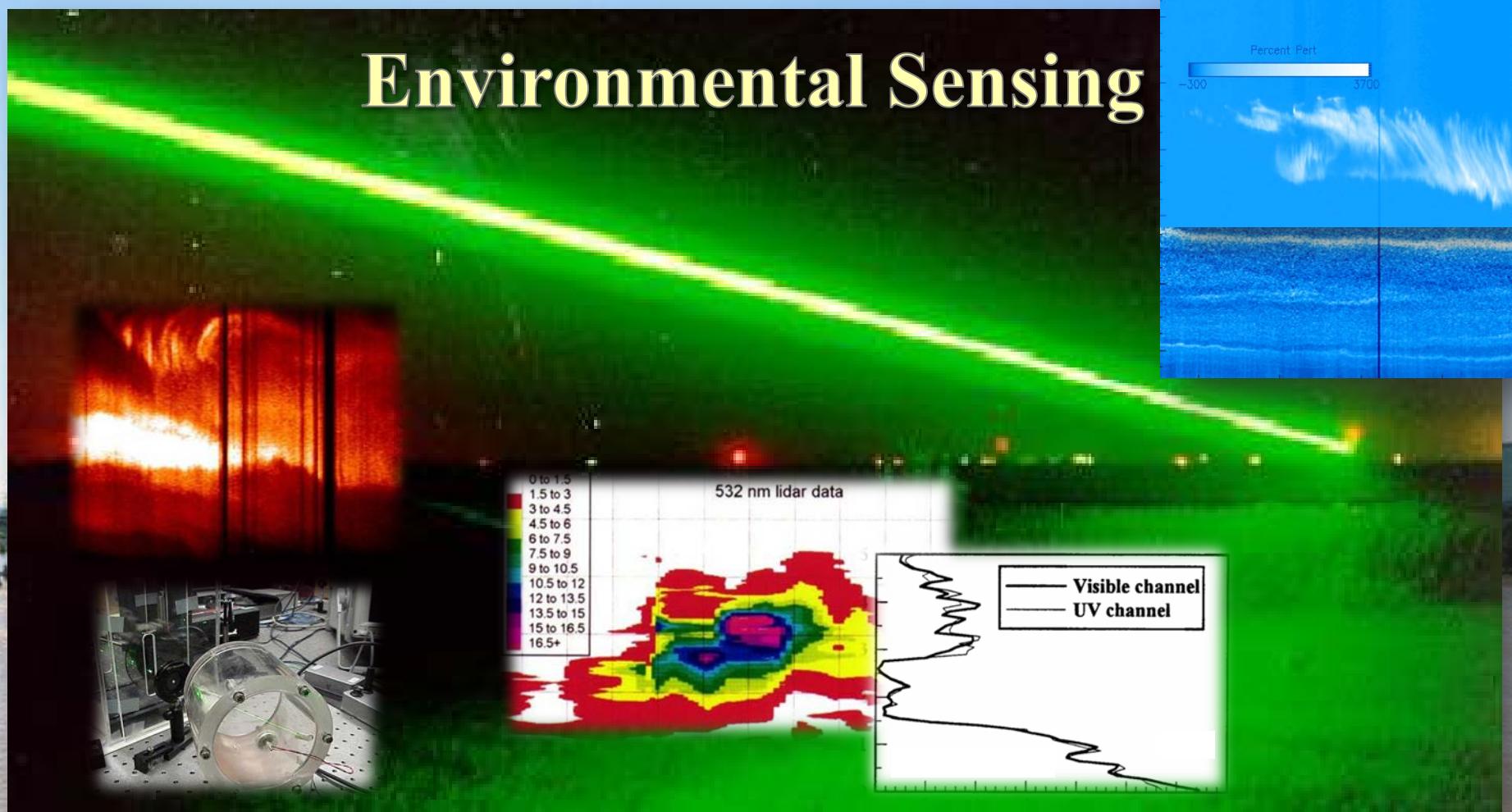


*14 July 2017  
Arlington*

<http://photonics.psu.edu/>

NSF NeTS Workshop 2017

# Environmental Sensing



- Lidar
- Imagers
- Spectrometers
- *In situ*

etc.

- Wind
- Aerosols
- Turbulence
- Surfaces & Interfaces

# Integrated Sensors and FSO

- The *complete* optical channel impacts FSO system design and operation!
- Integrated Sensing
- Adaptive Operation (i.e., variable rates, etc.)
- *Ad hoc* networks

- Photonics
  - ❖ Mid-IR (Quantum cascade, 4  $\mu\text{m}$ ?)
  - ❖ MEMS
  - ❖ etc.
- Integrate PEOPLE!

# Example: Autonomous Swarms

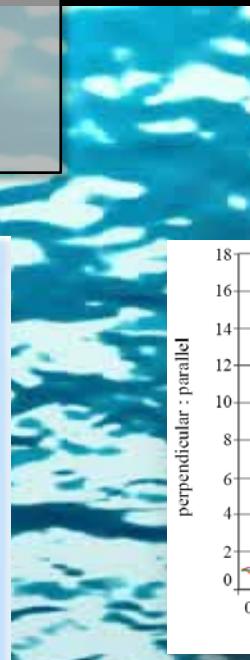
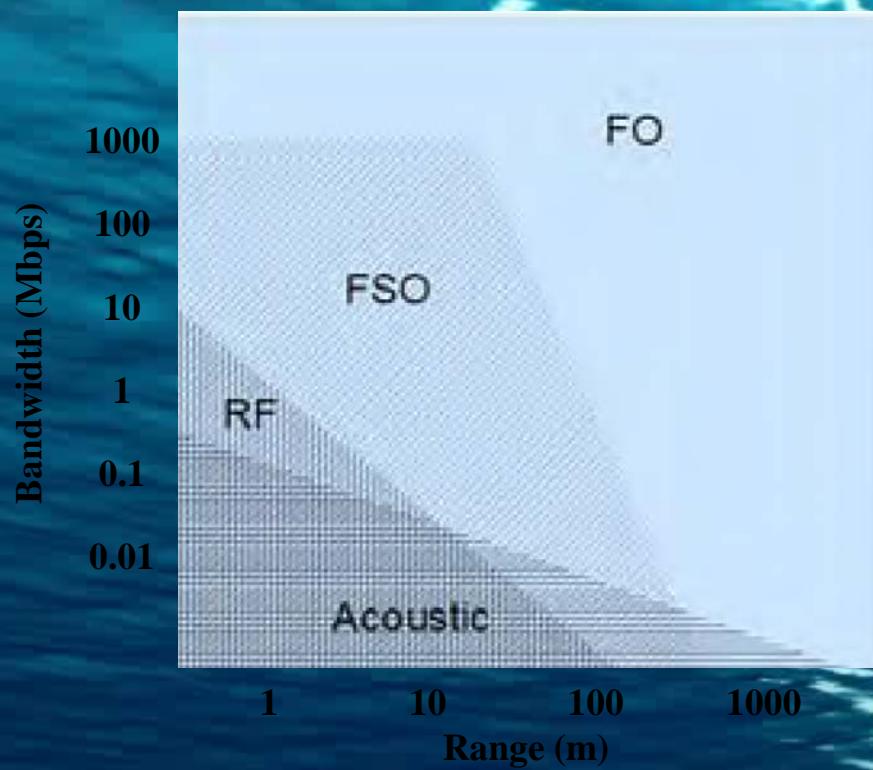
The image is a composite of three parts. On the left, a dark gray box contains a bulleted list of technologies: RF, V2V, I2V, and Integrate remote data and models. To the right of this list is a 3D simulation environment showing a cluttered urban landscape with buildings and trees. Several green and pink wireframe boxes represent autonomous agents or sensors moving through the space. A small inset in the top right corner of the simulation shows a close-up of one of these agents. At the bottom left, there is a photograph of a black rectangular optical sensor unit. It has a yellow lens on the front left, several blue and black connectors on the front right, and a circular port on the side. The background of the entire image is a blurred version of the 3D simulation scene.

- RF
  - ❖ Cluttered Environ
  - ❖ Space Weather
- V2V
- I2V
- Integrate remote data and models

- ATP
  - ❖ Positioning
  - ❖ Imaging
  - ❖ Timing
- Not restricted to 1.55  $\mu\text{m}$
- Ground Floor!

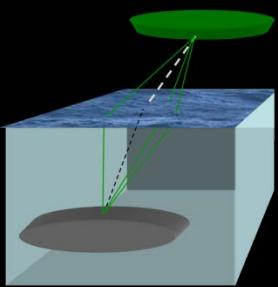
# Example: uFSO

- Burst Comm
- Hybrid Approach
- Need better Radiative Transfer Modeling →



- Bubbles
- Hydrosols
- Internal Waves
- Surface Dyn. & Comp. →

# Example: Interfaces & Unique FSO Scenarios



- Monitoring
- 2-D Turbulence
- Aero-Optics and AO

- Unfriendly RF environs.
- Industry
- DoD
- etc.

