Perception Testbed Fog Chamber Data Documentation
### November 1, 2021

Experiment Name: fog12
Start Time: 12-May-2021 13:01:09.953
Duration: 00:27:36.052
Target: USAF-1951
Target Distance: 17.6276 meters
Target Temperature: 60 C
Environment Notes: None.

File Information:
Visible Spectrum: 14941 Images
Longwave Infrared: 16561 Images
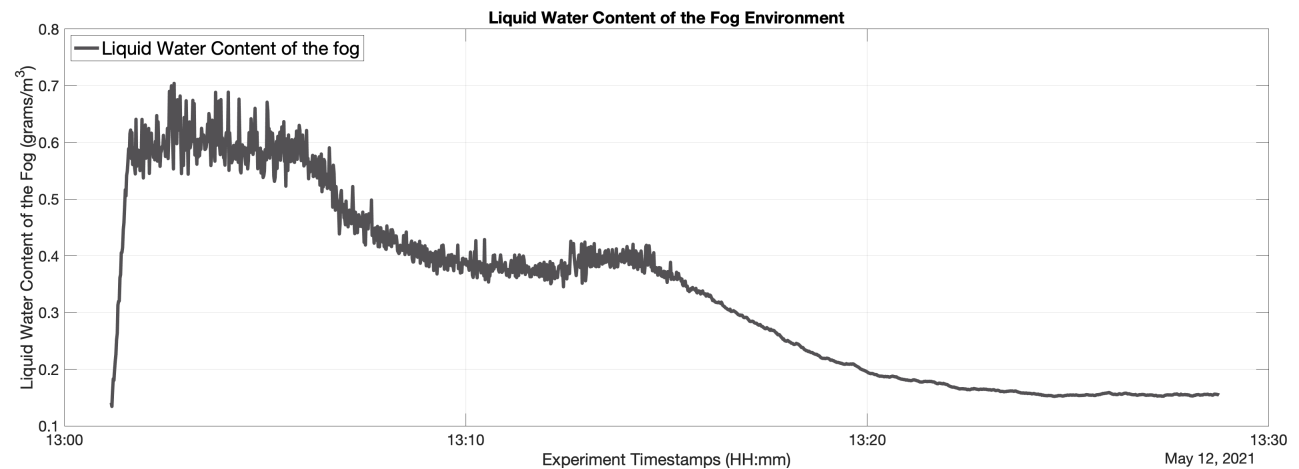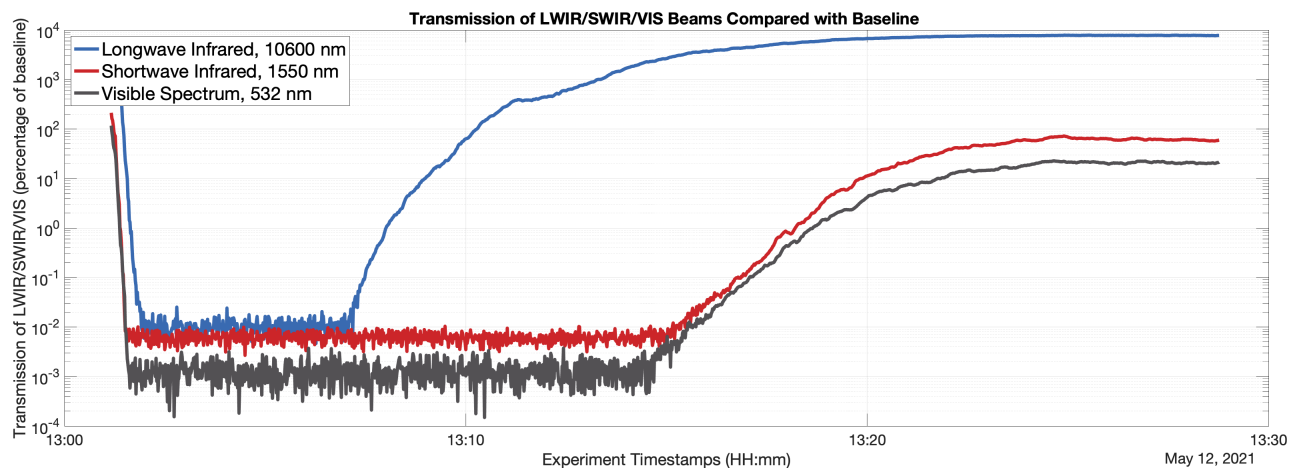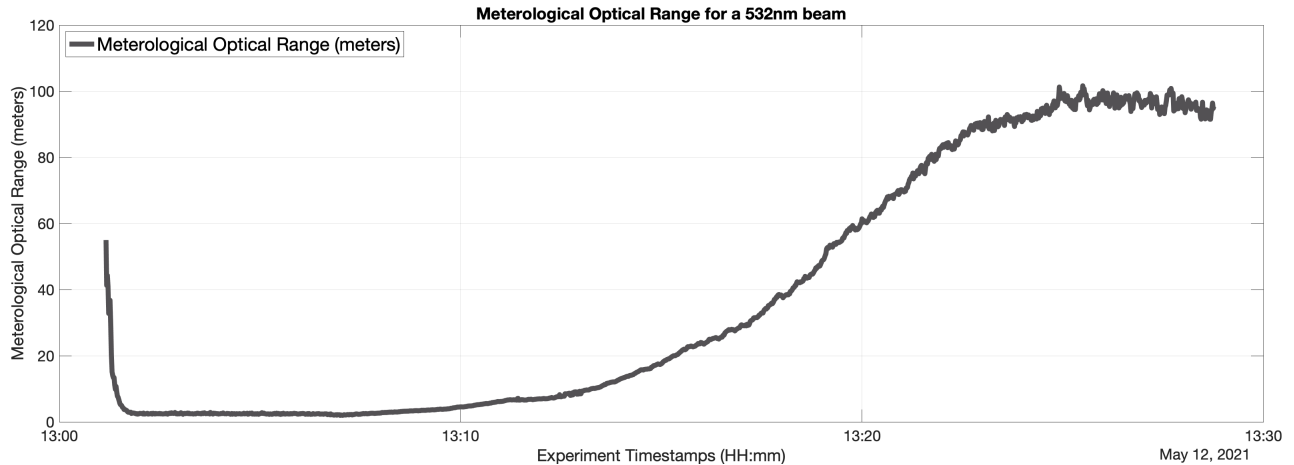**LIDAR:** 2172 Data & Images

1 Data Snapshot: fog12

The following images describe the variation in data during the experiment.
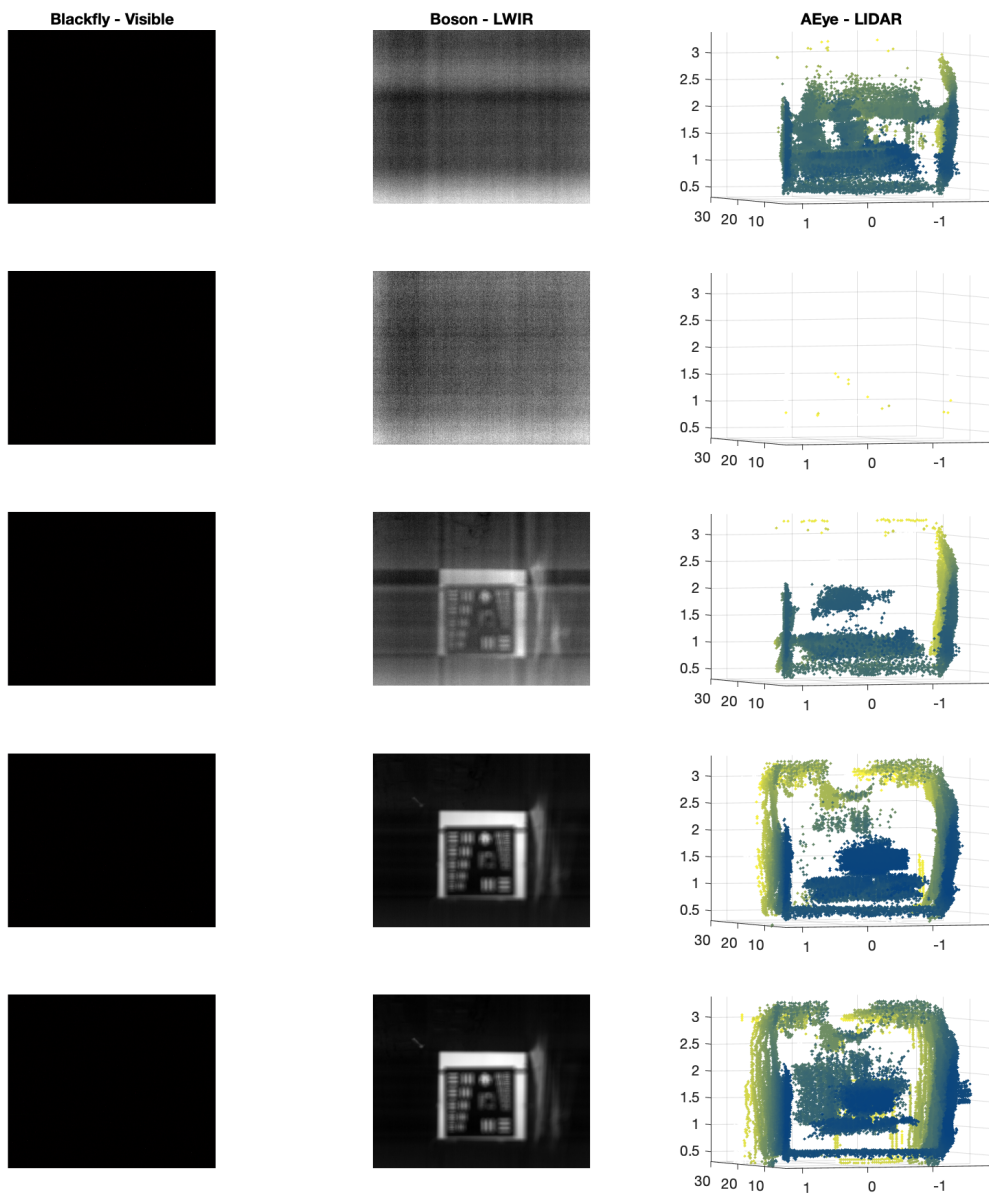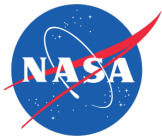
2 Experiment Environment: fog12

The following graphs show the variation in the environment during the experiment.

3 Experiment Setup and Equipment Specifications

3.1 Perception Testbed Hardware

A novel testbed, featuring a visible spectrum camera, a longwave infrared camera, and a lidar was built and transported to the Fog Chamber at Sandia National Laboratories for fog chamber testing. The perception testbed features the following equipment:

- FLIR BlackFly - Visible Range Camera

- FLIR Boson – Long wave infrared thermal camera

- AEye Intelligent LIDAR

3.2 Environment Montioring Equipment

During fog experiments, the following equipment was used for characterization of the fog and light scattering resulting from the fog:

- Malvern Spraytec instrument with inhalation cell accessory - produces a measurement of fog particle sizes, this information is useful in understanding light scattering.

- Transmissometer – used in measuring the Meterological Optical Range (MOR) a light emitting diode and camera are used under a static distance to measure the optical effects of the fog.

4 Useful References

The following documents may be useful in understanding the scope and context of the experiments.

Shish, Kimberlee H., et al. "Survey of Capabilities and Gaps in External Perception Sensors for Autonomous Urban Air Mobility Applications." AIAA Scitech 2021 Forum. 2021.

Redman, Brian J., et al. "Measuring resolution degradation of long-wavelength infrared imagery in fog." Optical Engineering 58.5 (2019): 051806.

Wright, Jeremy B., et al. "Optical characterization of the Sandia fog facility." Degraded Environments: Sensing, Processing, and Display 2017. Vol. 10197. International Society for Optics and Photonics, 2017.