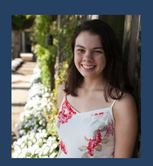
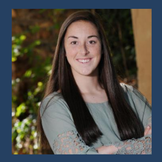
Laser Propagation Through a Turbulent Atmosphere

MIDN 4/C Ashley Sweet, MIDN 4/C Gwendelyn Pattison
Professor Svetlana Avramov-Zamurovic, Weapons and Systems Department
Associate Professor Cody Brownell, Mechanical Engineering Department

Background

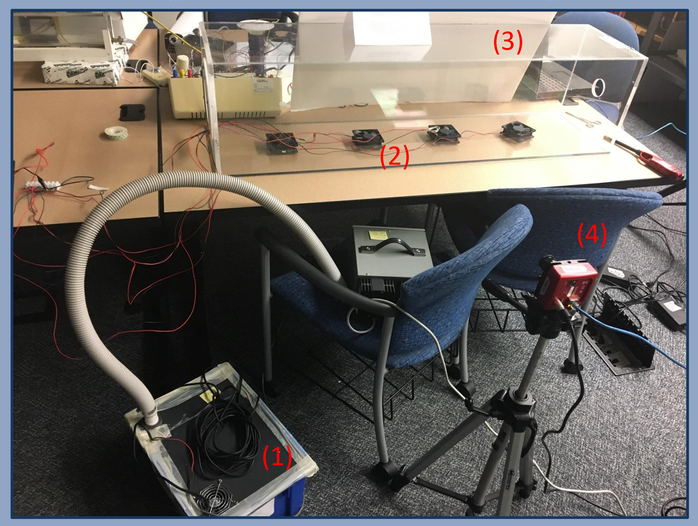
The USS Ponce is the first ship in the U.S. Navy to implement a laser weapon system (LaWS).

Maritime conditions commonly have fog and water particles in the air that have varying indices of refraction and movement of water particles through winds.

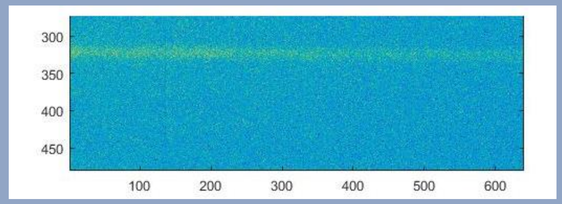
Materials

Fog machine (1), 12V computer fans (2), 1cm thick Glass tank: 122cmx30.5cmx30.53m(3), Thor 340M-GE camera (4), 633nm 2.0MW laser (5)

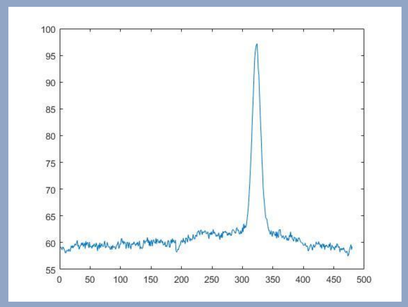
Experiment Setup



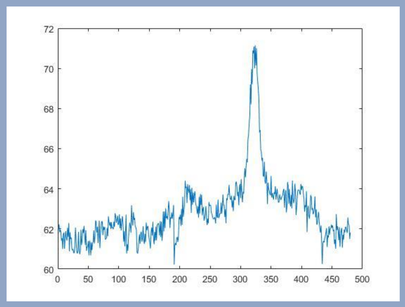
Results



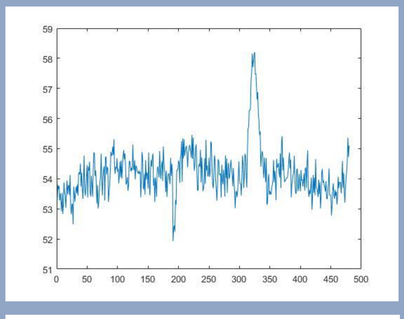
The beam decreases in intensity with increasing propagation distance



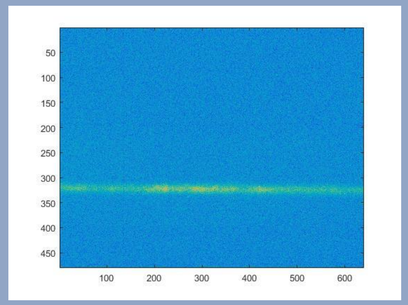
Fog with no wind

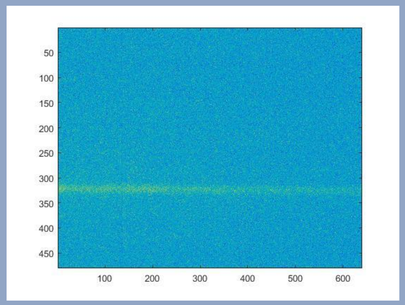


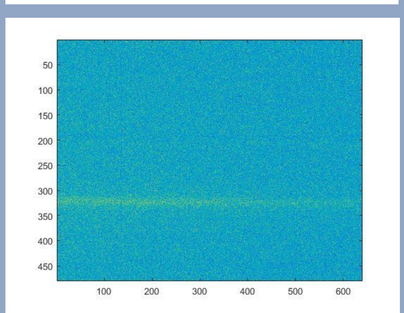
Fog with 2 seconds of wind



Fog with 8 seconds of wind







Conclusion

As a beam propagates through fog, the beam slightly scatters and as a result the beam lessens in intensity. As the beam passes through increasing wind flow in the same foggy conditions, scattering increases and the beam intensity decreases. The more wind, the more scattering.

References

Bruce, Robert. "The US Navy'S Electric Weaponry". *Small Arms Defense Journal*, 2016

"Propagation Through Atmospheric Turbulence". *Numerical Simulation Of Optical Wave Propagation With Examples In MATLAB*, pp. 149-184. *SPIE*

Acknowledgements

MSC Graphics Center
Professor Svetlana Avramov-Zamurovic, Weapons and Systems Department