



Infrared Imaging and Laser Sensing

www.attolloengineering.com

Michael MacDougal, Ph.D.
President

Tony Vengel
Vice-President of Business Development

Starting a company – our path

- Gov't funding is a pathway to getting funding without dilution of equity
 - Offered through DOE, NSF, DoD, NOAA, etc.
 - Small Business Innovative Research (SBIR)
 - Phase I - ~\$150K for 6-9 months => fast sprint to show feasibility
 - Phase II - ~ \$1M for 2 years => more methodical, develop product
 - Phase III - > \$3M
 - Much harder to obtain these, but you get the same rights as earlier SBIRs
 - Allow you to bring a product through manufacturing
 - Straight government programs
 - Higher dollars, but very strict on deliverables
 - Compete against large companies, must have an inside track

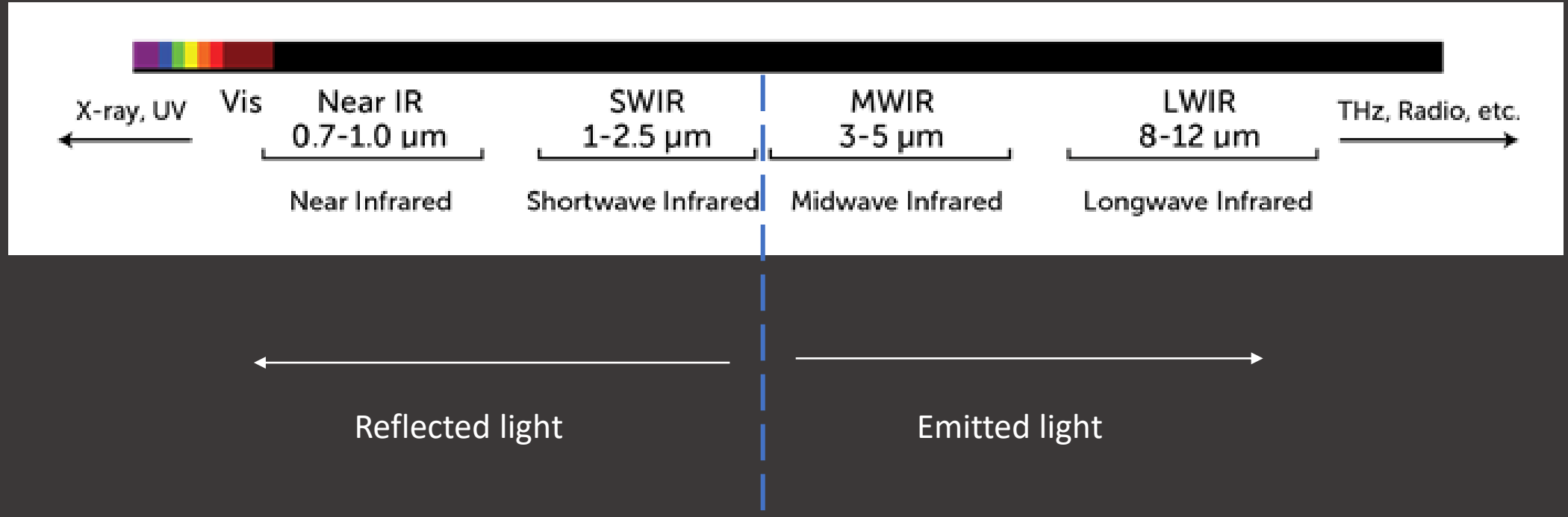


Company Details and Heritage

- Attollo was founded in 2012 in Camarillo with the purpose of developing IR technologies and sensors primarily for emitting and imaging
- Principals previously founded and led Aerius Photonics in Ventura (sold to FLIR in 2011), where they built the company into a leading supplier of several IR technologies
- Company growth – located in the infrared corridor
 - 21,000 square foot facility
 - 2500 square feet of clean room
 - 28 employees – expected to hire an additional 5 in the next year
- AS9100 Certified Manufacturer – March 2019



Infrared Spectrum



- MWIR and LWIR are considered thermal bands

Attollo Vision

Focus on technologies at the intersection of IR imaging and lasers

Product Emphasis

- IR Imagers

SWIR



MWIR IDCA



CoreCam



IR Imagery



- Laser Sensing

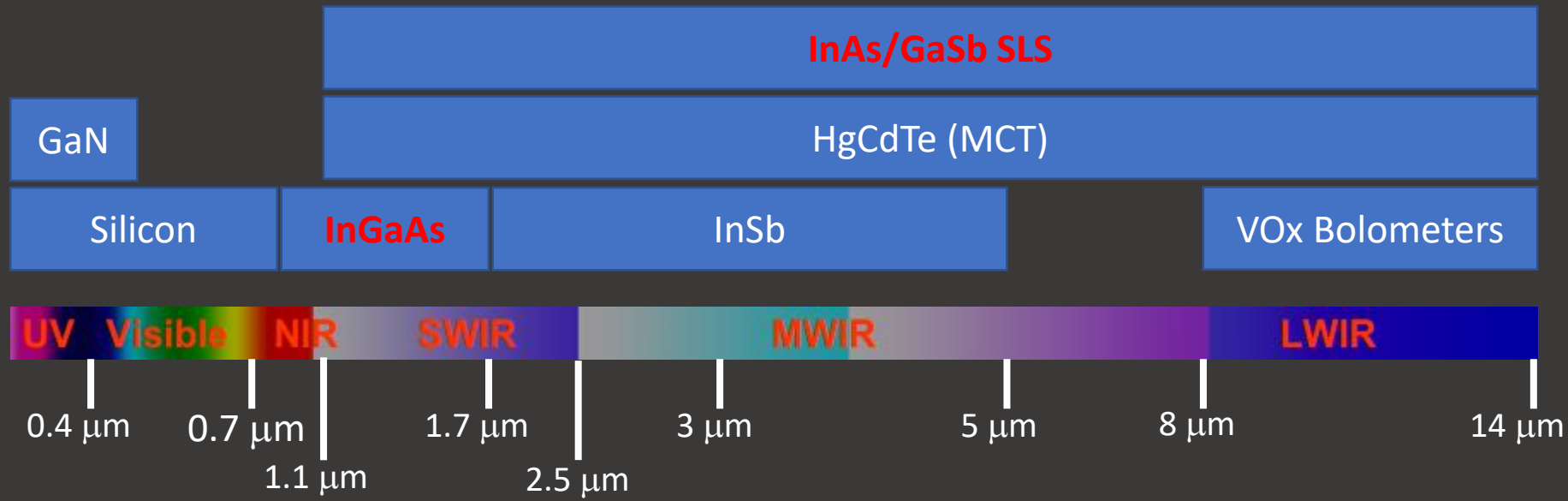
WASP LRF



LIDAR Transmitter

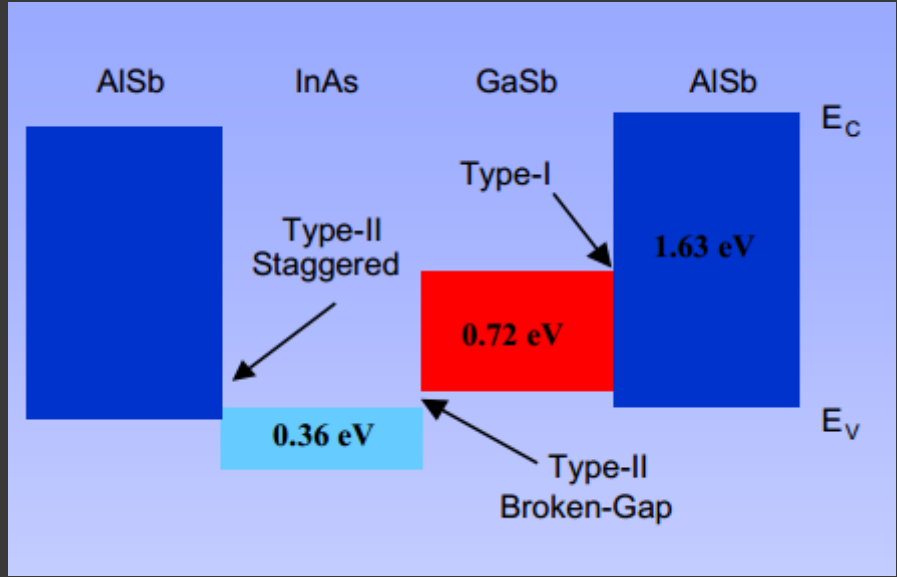
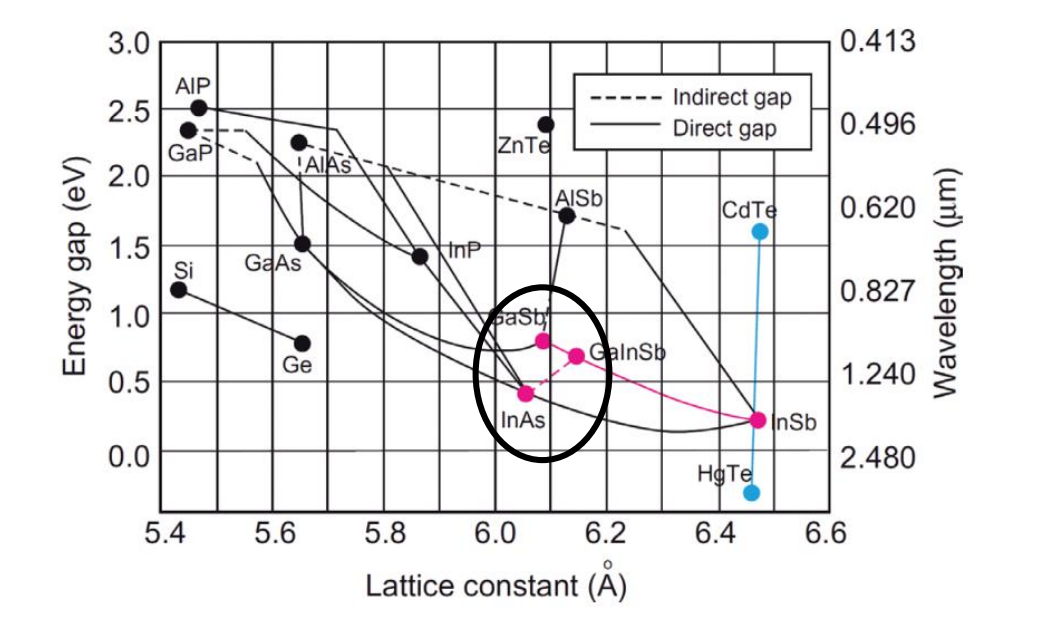


Material Systems for Detectors



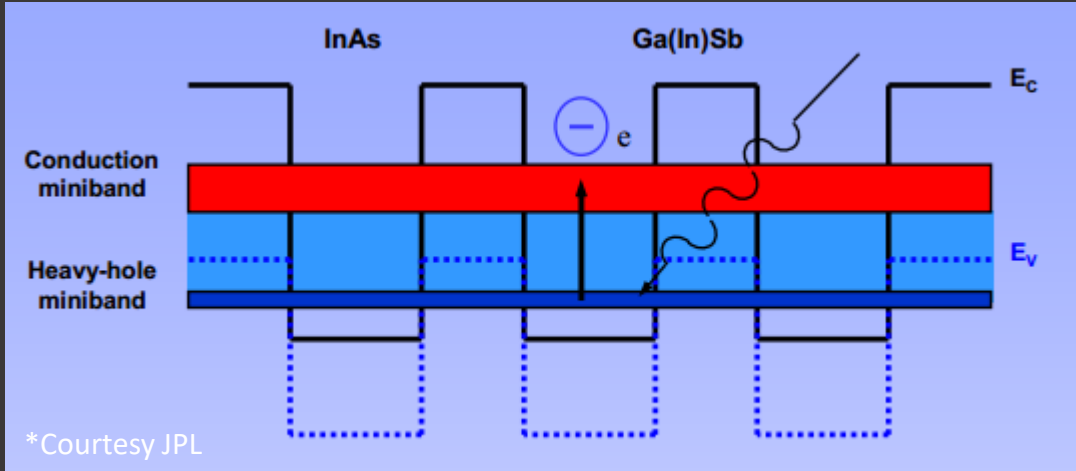
- Optical band and substrates determine the desired material
- We focus on III-V epitaxially-grown materials

Tunable III-V Material: SLS Strained Layer Superlattice



- InAs limited to band edge at 3.5 μm
- Superlattice is a repeating crystalline superstructure used to create new band effects (i.e. like QWs)
- Generally grown using MBE

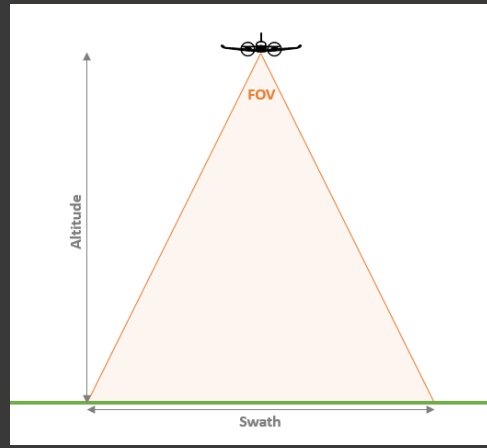
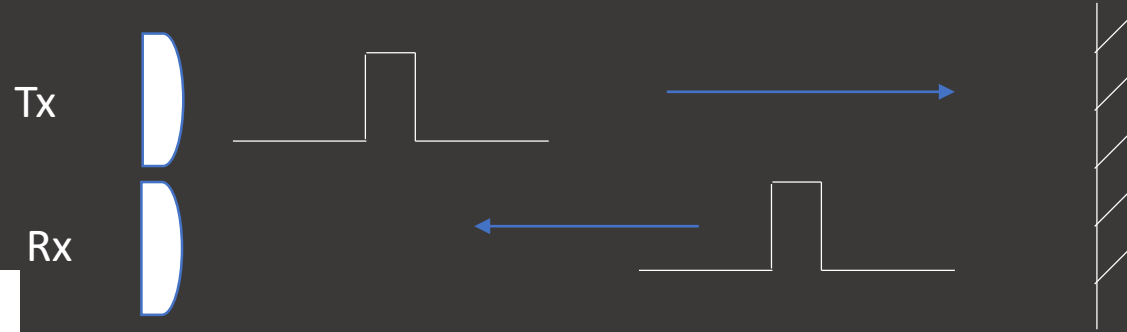
Tunable band structure



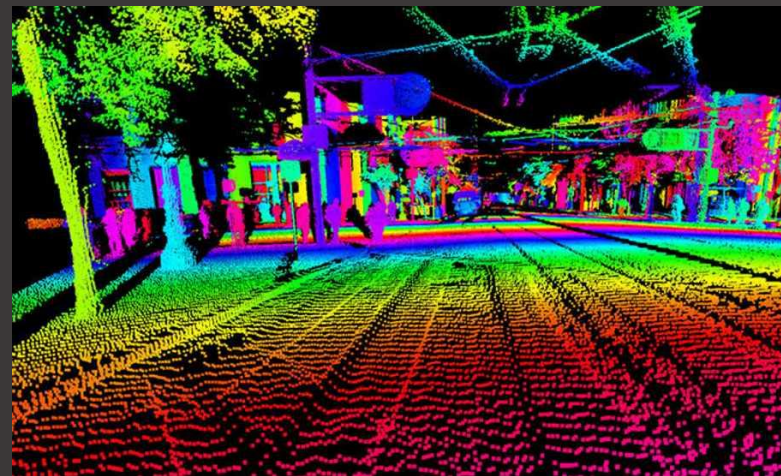
- Just like QWs, we can adjust the wavelength by changing the thickness of the constituent layers
- Staggered band give us more flexibility

Superlattice Characteristic	Advantage	Tangible Benefit to FPAs
Band structure engineering	Suppress Auger related dark current	Higher operating temperature
Large electron effective mass	Smaller leakage currents	Higher detectivity
Interband transitions	Normal incidence absorption	High quantum efficiency (fast arrays)
Adjustable bandgap	Tunable cutoff from 3 to 20 μ m	Multicolor capability
III-V semiconductor based	Highly uniform	Cheap, robust, uniform

Laser Sensing and LIDAR



Time of flight sensing
1 ft = 1 ns

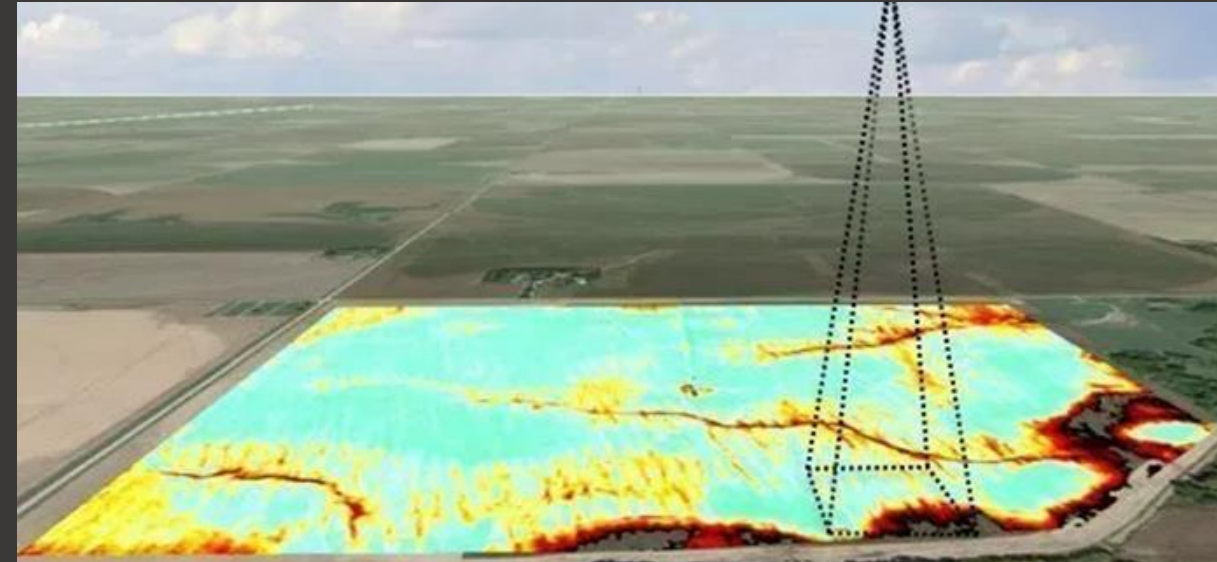
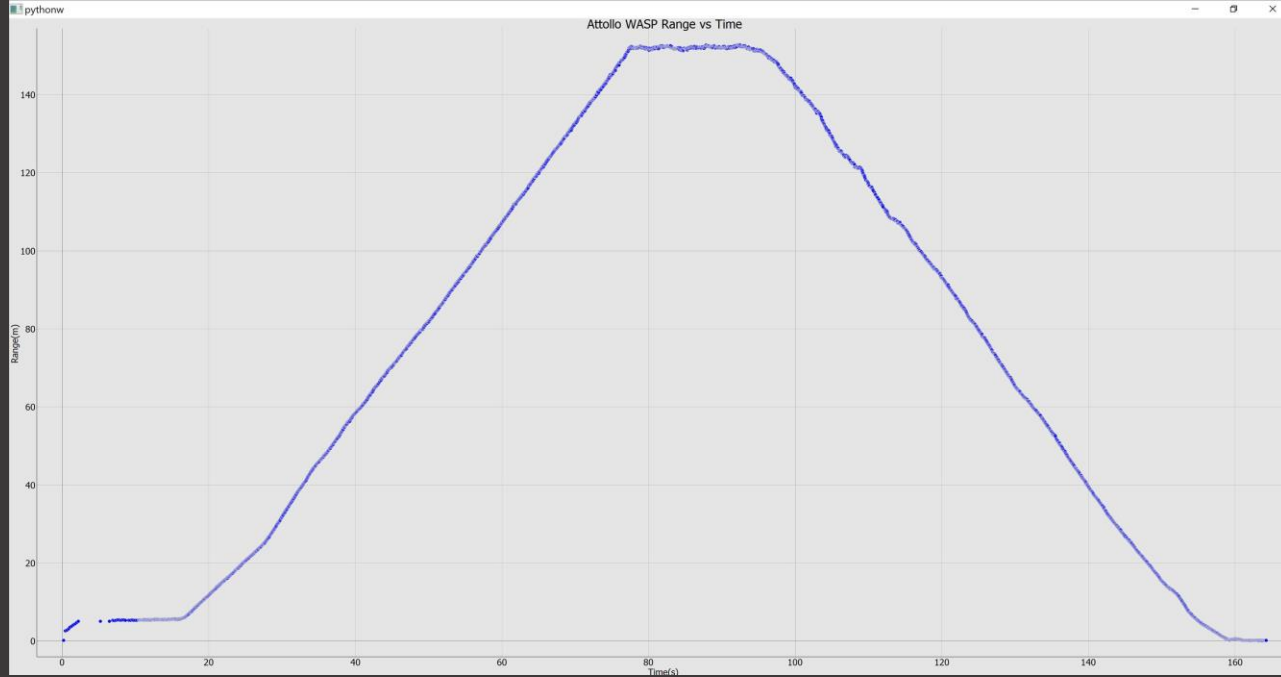


- Time of flight sensing – to understand distance precisely in real time
 - Drones as an altimeter or to map to 1 cm resolution or <10cm accuracy
 - Collision avoidance on airborne or land vehicles



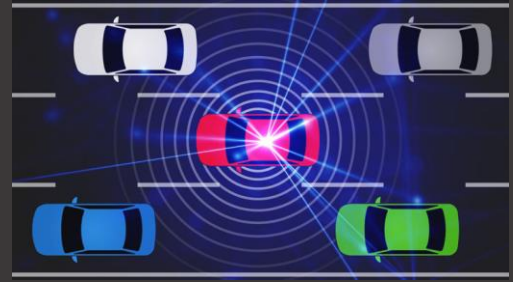
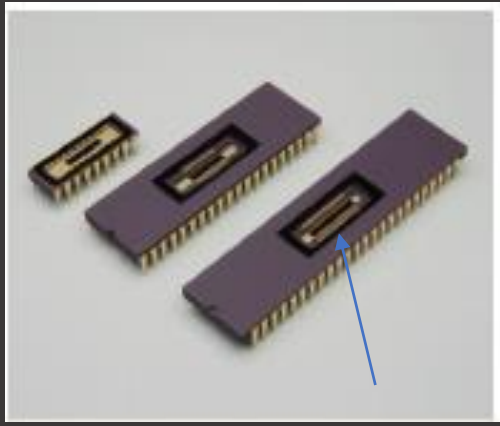
Laser Rangefinders

- Applications include:
 - Drone/UAV height sensing
 - Precise mapping and treatment at the plant level

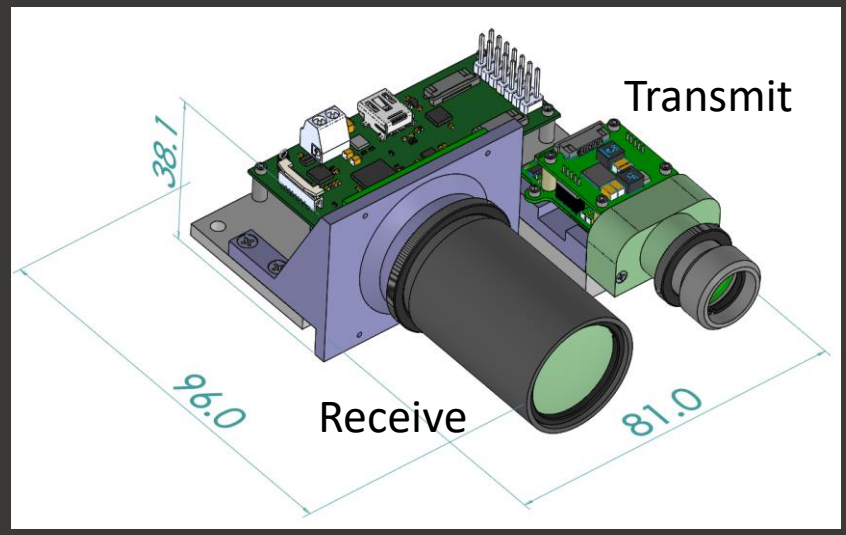


LIDAR Systems

- Automotive – driverless car or driver assist with three dimensional awareness using LIDAR – our Attollo designed and manufactured InGaAs detectors
- Currently working as a tier two provider of components
- High signal to noise detectors

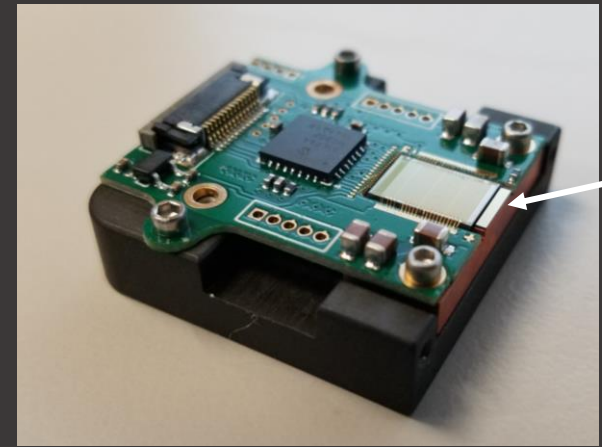


Laser Arrays for LIDAR

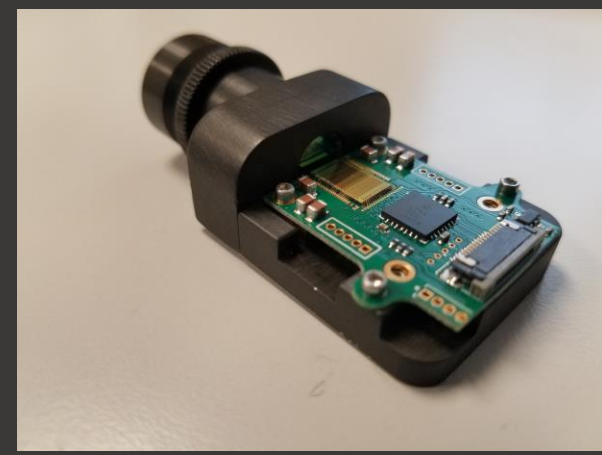


LIDAR System

- 64 beams to get wide swath
- Can rotate or dither beams to view other axis



64 channel laser bar



Transmitter

Product Offerings

- IR Imagers
 - SWIR, MWIR, and LWIR sensors
 - Packaged sensors
 - IR Cameras
- Laser Sensing
 - Laser rangefinder (Wasp 200)
 - Laser warning system
 - LADAR receivers (High SNR detectors)
- Integrated
 - Laser triggered, SWIR Imagers



The Team Responsible for this





For more information please contact us at:

Attollo Engineering LLC

Attention: Tony Vengel

160 Camino Ruiz

Camarillo CA 93012

Email: tony.Vengel@attolloengineering.com

Website: <http://www.attolloengineering.com/>

Office: (805) 384-8046

Mobile: (805) 245-9979

