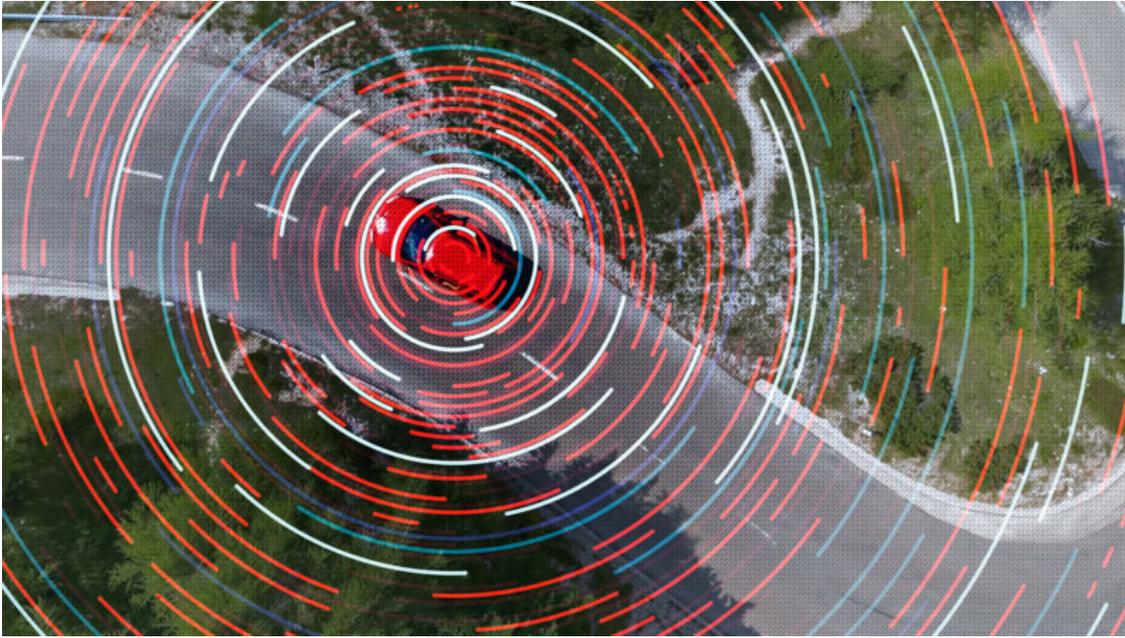


As Appeared in Automotive Digest, May 2019



How New LIDAR Sensors Lets Autonomous Vehicles See More and Drive More Safely

By Greg Smolka, Insight LIDAR
gsmolka@insightlidar.com

Making “Sense” of How Sensors Make Autonomous Vehicle Safe

Getting an autonomous vehicle (AV) from place to place is easy. Getting there safely is the real challenge. Just as a human driver must be aware of his or her surroundings, an autonomous vehicle (AV) must be aware of the obstacles in its path and the safety hazards it will encounter along the way. To detect these obstacles and hazards, manufacturers equip AVs with a variety of sensors.

What & How Laser Imaging Detection & Ranging (LIDAR) Sees & Senses:

Just as sight is the most important sense for a human driver, Laser Imaging Detection and Ranging (LiDAR) sensors are the most important sensors for an autonomous vehicle. They allow autonomous vehicles to see the world around them in three dimensions, and the better an AV “sees,” the safer it will be. That’s the reason companies are working on a new generation of LIDAR sensors. These new sensors will not only help AVs see better, but also be less expensive to manufacture and use.

Limitations of Conventional LIDAR Sensors:

Conventional LIDAR sensors emit short pulses of laser light and measure the time it takes for the pulses to reach an object and bounce back to the detector. While this sounds good in theory, these sensors have a limited range, limited resolution, and update slowly. They're also expensive to manufacture and to design into a vehicle.

Why a New FMCW sensor (Frequency Modulated Continuous Wave):

To address these issues, several companies, including Insight LIDAR, have been working on a new type of LIDAR sensor. These new sensors, known to technology developers as FMCW sensors (Frequency Modulated Continuous Wave), allow AVs to see objects up to 200 m away or more and with up to 40 times the resolution than the current generation of LIDAR sensors. They also allow the AV to measure the velocity at which an object is moving and are less susceptible to interference from sunlight and other nearby LIDAR signals. The result is that the AV can respond more quickly and appropriately to obstacles and hazards, and in the end, operate more safely.

Instead of emitting laser pulses, the new breed of FMCW LIDAR sensors emit a continuous wave of light and measure not only the time it takes for the light to be reflected back to the sensor, but also the frequency shift of the returned signal.

The Solution: Use of Photonic Integrated Circuits (PICs) brings Lower Cost, Smaller, Reliable Sensors:

Several companies, including Insight LiDAR, are developing FMCW technology, but they still face challenges of miniaturization and low cost required by the automotive industry. Yet, by designing these sensors into semiconductor-scale optical chips known as Photonic Integrated Circuits (PICs), the path to an automotive grade solution becomes more clear. Because PICs can be manufactured economically using standard semiconductor processes, production costs for a PIC-based FMCW LIDAR sensor are substantially lower than the costs for conventional sensors. A single PIC provides all the laser transmission, control and detection functions, which makes the LIDAR sensor smaller and more reliable, too.

Why Insight LIDAR Sensors:

Insight LiDAR, one of the industry's leading FMCW technology providers, has more than a decade of experience with this technology, adapting it from its medical imaging background. Its Digital Coherent LiDAR sensors combine the advantages of FMCW detection with ultra-high-resolution and direct Doppler velocity measurement, enabling AVs to identify and classify objects up to 5x faster than other techniques.

Further, Insight LiDAR's ability to design all the core components onto PICs enables low cost, scalable, and most importantly, safe LIDAR systems— critical requirements for any automotive component to become truly viable.

Making Safety Foremost in AV Design:

Passenger and pedestrian safety is paramount in any AV design. Digital Coherent LiDAR sensors improve AV safety by delivering the long-range, high-resolution, 3D “vision” that designers have been searching for.

So What About Insight LiDAR:

Insight LiDAR, launched in 2016, licensed key technologies of Insight Photonic Solutions, based in Boulder, CO and expanded and adapted these to autonomous vehicle LiDAR. Insight Photonic Solutions is an award winning, global leader in photonic-chip based fast-scan, swept wavelength laser technology. Insight's products are used in applications ranging from biomedical imaging to semiconductor manufacturing to material processing to environmental sensing.

Connecting with the Insight LIDAR Team:

Website: <https://insightlidar.com/>

Insight LIDAR Headquarters:
2650 Crescent Drive, Suite 201, Lafayette,,CO, 80026
contact@insightlidar.com