GUARDIAN™

Short-range digital LiDAR sensor

THE FUTURE. TODAY.

LiDAR is paving the way to greater automation in an array of applications. Used in conjunction with other sensing technologies—cameras, radar—LiDAR will be essential to better perception and, ultimately, better security.

LiDAR still suffers from a number of misconceptions, but experts all agree on one thing: LiDAR needs to offer good performance at an affordable price tag. Using our digital processing expertise resulted in our first digital LiDAR—Guardian. Designed with ruggedness, reliability, and adaptability in mind, Guardian is a short-range, COTS digital LiDAR sensor and development platform for custom integration.
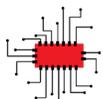
DIGITAL LiDAR

Detecting incoming photons is the first step in LiDAR. Making sense of detections and positively identifying obstacles, estimating their size and speed come after. The notion that a LiDAR sensor must provide a 1 mm (0.04 in) or 0.1° resolution is still very strong in some industries, namely automotive. However, in many applications (even automotive), this type of resolution amounts to trying to see a pebble on pavement 100 m (328 ft) away. We can probably agree that's not usually useful.

Regardless of resolution, many LiDAR sensors currently on the market use a conventional, analog thresholding method to detect light echoes and estimate the distance of obstacles from the photodetector outputs. This has several shortcomings. Set the threshold too low and background noise triggers false positives. Set the threshold too high and some obstacles go undetected.

To resolve this problem, Phantom Intelligence replaces the analog logic of sensors with a completely digital analysis of the photodetector outputs. Digitizing back scattered photons and applying smart digital processing enables detecting objects much closer to the noise floor. This supplies a much-needed improvement to detection, reducing the number of false positives and extending the sensor's effective range—demonstrating that digital processing is a much smarter way to do LiDAR

BENEFITS & FEATURES

- Digital & solid state
- Small & light
- Vibration resistant
- Better detection capabilities
- 40 m (131 ft) range
- ±3 cm (1.2 in) accuracy

DOING LiDAR BETTER

Solid state

Digital enables solid-state sensors for smaller, more rugged devices

Better detection

Digital increases the ability to discriminate between hard to detect objects

More range

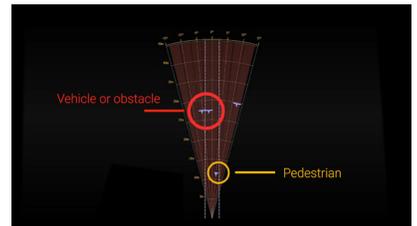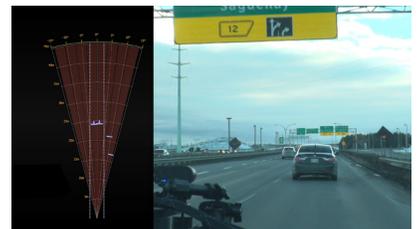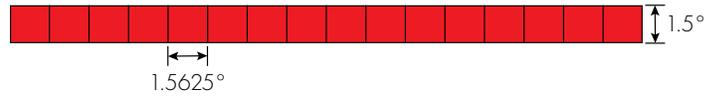Digital filters unwanted noise, which enables seeing further

Edge processing

Digital substantially reduces the bandwidth to the onboard computer for smaller cables

SPECIFICATIONS

Dimensions (W×D×H)		78×37×48 mm (3.07×1.46×1.89 in)
Mass	Aluminum casing	180 g (6.4 oz)
	Plastic casing	80 g (2.8 oz)
Input / Output		USB Type-C™ port
Power supply		5 V from USB Type-C port
Power consumption		≤2.5 W
Laser	Output power	70 W
	Wavelength	905 nm
	Pulse length	24 ns

Field of view (H×V)	25×1.5° [1]
Data refresh rate	Up to 50 Hz
Range	40 m (131 ft)
Accuracy	±3 cm (1.18 in)
Distance precision	<10 cm (3.94 in)
Distance resolution	1 mm (0.04 in)
Operating temperature range	−40–85 °C (−40–185 °F)

[1] Contact Phantom Intelligence for other optics options.

BEAM SEGMENTATION

1.5°

1.5625°

REFLECTANCE VS. DISTANCE

3M 0.05×0.10 m 94 % reflectance tape
40.0 m

Pedestrian 12 % reflectance
16.0 m

0.5×0.5 m Permaflect 18 %
Lambertian reflectance target
6500 lx
13.8 m

0.5×0.5 m Permaflect 10 %
Lambertian reflectance target
6500 lx
13.2 m

0.5×0.5 m Permaflect 50 %
Lambertian reflectance target
6500 lx
15.8 m

0.5×0.5 m Permaflect 94 %
Lambertian reflectance target
6500 lx
17.0 m

Distance (m) / Reflectance (%)
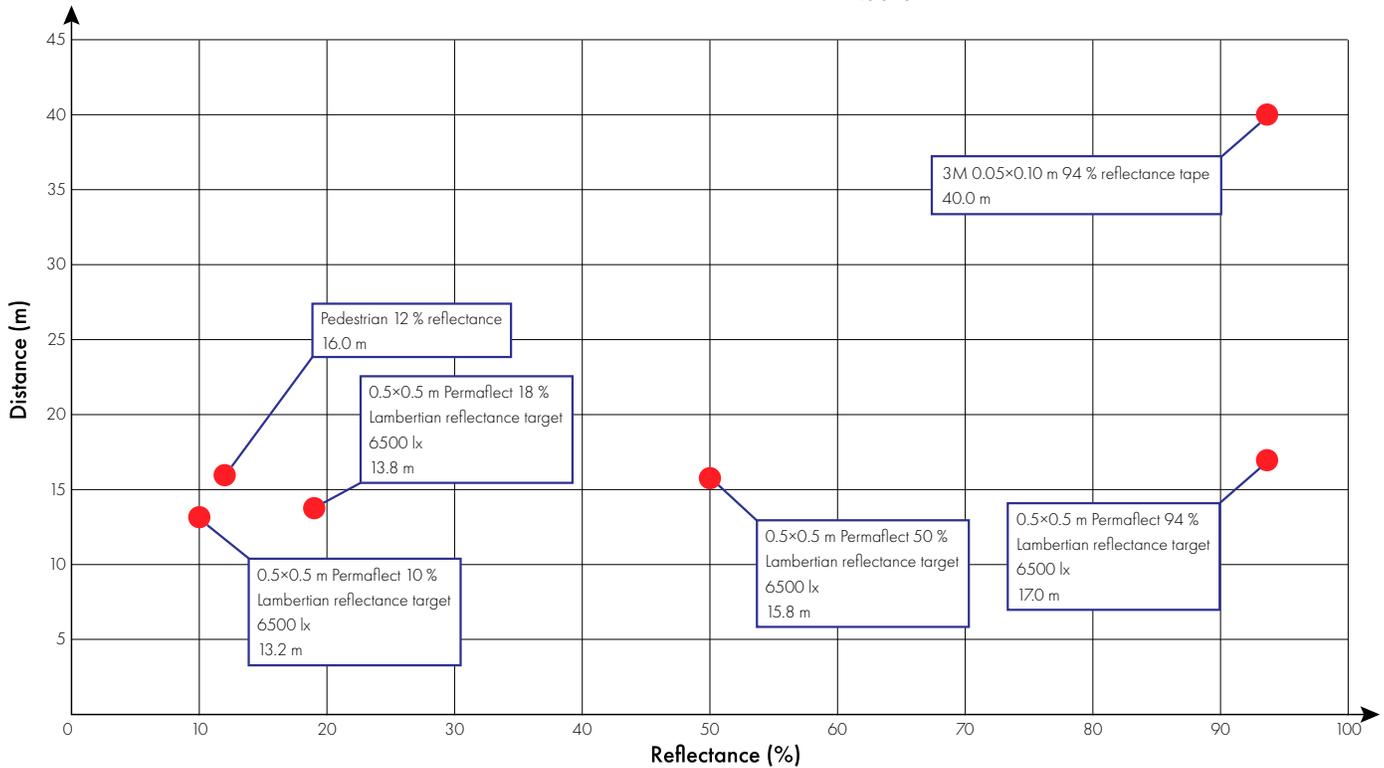
Lambertian reflectance defines an ideal diffusely reflecting surface. The apparent brightness of a Lambertian surface is the same regardless of the observer's angle of view, making it a more objective method of measuring a LiDAR sensor's range performance.

Visit Labsphere for more about Permaflect® targets.