

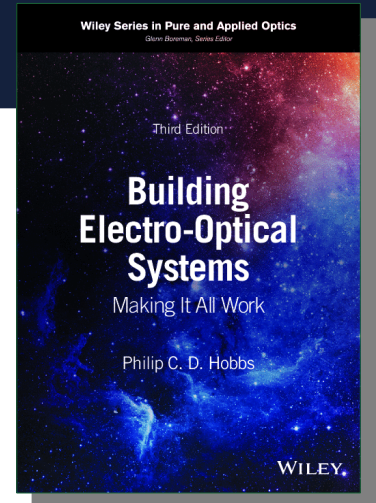
# ElectroOptical Innovations

Enabling Ultrasensitive Measurements

electrooptical.net

**Higher performance, lower risk, lower cost.**

We bring a unique breadth of experience to designing ultrasensitive measurement systems. We work closely with your team, bringing optical and electronics expertise to make measurements work. Partnering with us has got our customers better instruments at lower risk, usually with significant cost savings in engineering and bill of materials.



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January 26<sup>th</sup>, 2022

## Where We've Worked

- > BioOptics
- > Semiconductor Equipment
- > Noninvasive Medical Instruments
- > Industrial Measurements
- > Particle Detection
- > Geophysical Measurements
- > Consumer Electronics
- > Process Control

## Things We've Done

- > Fast Microplate Readers
- > Flow Cytometry Modules
- > Laser Drivers
- > PMT, APD, SiPM/MPPC Modules
- > Coherent Lidar
- > TOF Lidar
- > Optical Microscopy

- Special-purpose coherent lidar designs, from hypersonic particles to vehicles to honeybees
- The Laser Noise Canceller, a simple circuit that allows shot noise limited measurements in unattended systems, with lasers up to 70 dB noisier than that
- *In Situ* Coherent Lidar (ISICL) systems for particle mapping inside plasma etch chambers, detecting particles with 50 photons despite a background  $10^8$  times brighter
- Radar fuel gauge: 100 ps-class TDR & sampler, BOM < \$2.
- Surface voltage scanner for sub-monolayer organic contamination.
- Low cost MPPC-based cathodoluminescence system for use inside SEM chambers
- Complete proof of concept prototype for the first commercial atomic- and magnetic-force microscope
- NA6 Microscope: Amplitude & phase with 6x resolution.
- *R-T* Laser Locking: downhole cavity-locked laser with Allan variance <  $10^{-10}$  @ 10,000 s
- Biochip Front End: shot noise limited at 2 nA in a 100-MHz bandwidth (8 electrons noise per measurement)
- Proof of concept prototype for noninvasive blood glucose and alcohol measurement
- Multispectral sensors for agriculture and fire detection
- Ultrasensitive front ends for photodiodes, APDs, and SiPM/MPPCs with wide bandwidth at very low noise

Call us to discuss your instrument

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# ElectroOptical Innovations

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Here are some of our designs that are available for semi-custom or off-the-shelf solutions. Using modules helps with faster time to market and reduces overall cost.

**Laser Noise Canceller** Two beam autobalancing photoreceiver allowing shot noise limited measurements in unattended systems, with lasers up to 70 dB noisier than that. Nanoamps to miliamps, DC-100MHz.

**Ultraquiet Laser Driver** > 20 dB below shot noise up to 250 mA. Suitable for flow cytometry, microplate readers, and other CW low noise applications.

**Coherent Lidar** Shot-noise-limited detection and tracking of particles, vehicles, and honeybees.

**SiPM PMT Replacement** High reliability, low cost SiPM module suitable for PMT replacement in lidar, flow cytometry, microplate and other applications. DC-6MHz or DC-100MHz.

**Photodiode Modules** Shot Noise Limited from < 25 nW to microwatts. Suitable for low light precision measurements & dose limited applications *e.g.* laser microscopy.

**High Speed APD Module** DC-450MHz low noise linear modules for a range of APDs. Super low noise wideband TIA: 350 pV/ $\sqrt{\text{Hz}}$ . Good for fast, low noise systems, *e.g.* airborne lidar.

**High Speed SiPM Module** High speed linear SiPM/MPPC modules that can go from photon counting to linear measurements with the twist of a dial. Low cost and highly reliable.

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