



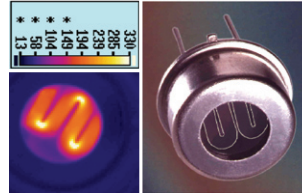
Ion Optics

Ion Optics designs and manufactures wavelength-tuned silicon chips that emit infrared (IR) radiation very efficiently, in very narrow frequency bands. We can thus supply IR emission “where you want it,” while blocking emission “where you don’t.”

Military customers currently use our chips for friend-or-foe identification at a distance. Security personnel equipped with a specialized thermal camera can see markers that incorporate our technology, while the markers remain invisible to conventional night vision systems. More broadly, we manufacture a new class of electrically-pulsed, high-intensity, high-efficiency, low-thermal-mass infrared radiators suitable for gas analysis, spectroscopy and calibration.

Our core technology consists of micrometer-scale features machined into surfaces and crystals. These micro-machined structures modify the reflection and absorption characteristics of the surface. The IR band that the chip emits or absorbs is determined by the precise geometry of the structures on the chip. Each batch of chips can thus be configured during production to emit a lot of power in a narrow, precisely-defined band.

These emissions can be detected by sensors matched to those specific bands, but remain invisible to many IR detectors that aren’t. The emissions are likewise invisible to “night vision” image intensifiers and to the naked eye. The technology can thus serve as an extremely compact, efficient engine for wavelength-specific IR emitters and detectors.



Applications include friend-or-foe markers for personnel, equipment, landing strips and armored vehicle illuminator arrays.

We are currently incorporating our IR emitting chips in a family of extremely compact, accurate and inexpensive gas sensors that combine our emitters with detectors and associated filters on a single chip. Carbon dioxide, methane and many other gases have unique infrared signatures in the mid-wave infrared bands. The more finely tuned the incoming beam, the more accurate the response. A very finely tuned emitter thus substitutes for a great deal of hardware in the optical system and dramatically reduces power consumption in the detector.

Integrated chip-based sensors offer many unique advantages. Low-power consumption is very important in security and military applications and in any portable gas detector or industrial safety system because devices can then be operated at low voltages that eliminate the risks of electrical sparks. The chips can be hermetically sealed and are thus not susceptible to poisoning by the gases they monitor. They are very compact, highly reliable and can be manufactured in large quantities at low cost. They will be suitable for monitoring industrial processes, indoor air quality and respiration and automotive systems. Different sensors will be tuned to detect carbon dioxide, carbon monoxide, sulfur dioxide, nitrogen oxides, ammonia and other gases.

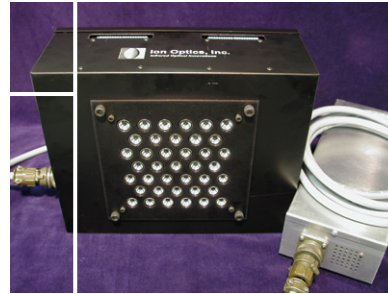
PRODUCTS

Our SensorChip is a micro-electro-mechanical system (MEMS) photonic crystal that emits and absorbs extremely efficiently in a narrow IR waveband. The chip can be engineered to operate at virtually any narrowly-specified wavelength across the range of IR bands. We set the target infrared wavelength during chip production, using standard, stable semiconductor manufacturing techniques. We manufacture very compact SensorChips at comparatively low cost, using industry-leading, automated wafer-level packaging in our manufacturing process.

Our markIR family of narrow-band emitters and arrays of emitters incorporate our SensorChip to provide high power for longer-range markers and beacons for military and para-military identification and signaling. The markers run on about one-tenth the electric power of existing conventional IR emitters. They can be packaged in arrays for even higher power or mixed to allow rapid field switching between two or more wavelengths. We currently manufacture markIR devices in 3-5 micron and 8-12 micron wavelengths. We believe ours is the only 8-12 micron product in this arena.

Our first-generation pulsIR family of sources provides efficient pulsed broadband IR light for spectroscopy, gas sensing and military and defense applications. These highly-integrated sources dramatically reduce system costs by reducing component count and maximizing IR light efficiency. The reflectIR products add reflectors to forward project the light.

Our tunIR products use the same SensorChip IR light engine for spectroscopy and gas sensing.



CUSTOMERS & PARTNERS

We originally developed our core technology for military and space applications. Our products are operating on satellites currently in Earth orbit and have been mounted on spacecraft that have traveled to Mars.

We are developing products in collaboration with Wilcox Industries (next-generation military identification), Respiroics (disposable CO2 sensor for medical applications), Siemens (air quality monitoring in buildings) and Mine Safety Appliances (industrial gas sensing). Other product development partners include RAE Systems, Andros, Vulcain, Baxter Healthcare and Draeger. Our R&D partners have included the U.S. Department of Energy, National Institutes of Health, National Aeronautics and Space Administration (NASA), Defense Advanced Research Projects Agency (DARPA), U.S. Department of Transportation, National Institute of Science (NIST) and Technology and the National Science Foundation (NSF).

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