



Optimized Nanoresonator Design Signals Breakthroughs in Spectrometry and Device Efficiency

[View U.S. Patent No. 10,107,940 in PDF format.](#)

WARF: P160052US01

Inventors: Zongfu Yu, Ming Zhou

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a new structure and method that greatly increase the absorption cross section of small electromagnetic resonators.

Overview

An optical resonator is an arrangement of optical components that allows a beam of light to circulate in a closed path. Nanoresonators are a type of optical resonator that can effectively concentrate light into subwavelength dimensions, which is important for applications that require strong light-matter interactions, such as ultrafast photodetectors, single molecule fluorescence imaging and Raman spectroscopy.

Light concentration is key to how well the resonator works and can be evaluated by the ratio between the optical cross section and the geometrical size of a nanoresonator. There are two approaches to improving the concentration ratio: reduce the size of the resonator or increase the optical cross section. However, the first approach is constrained by the minimum size of a useful resonator, and progress using the second approach has been slow because the maximum optical cross section is limited by the resonant wavelength.

The Invention

UW-Madison researchers have developed a new method and structure for increasing the cross section of nanoresonators, thereby improving the concentration ratio of light (or other electromagnetic radiation) and device performance. The key to their approach is that the nanoresonator is surrounded by a material that provides increased light concentration.

Applications

- Imaging sensors and photodetectors in cameras and security devices
- Multispectral cameras
- Systems for using nanoresonators as taggants for medical conditions
- Could enable new technologies in light sensing and solar energy conversion

Key Benefits

- Increases the absorption cross section of resonators without the drawbacks of conventional lens systems
- Increases efficiency of photodetectors
- Improves imaging and photographic quality in settings with weak light
- Enables strong light-matter interactions necessary in photonic research

We use cookies on this site to enhance your experience and improve our marketing efforts. By continuing to browse without changing your browser settings to block or delete cookies, you agree to the storing of cookies and related technologies on your device. [See our privacy policy.](#)

Can work in conjunction with other technologies to improve device efficiency

OK



WARF
Wisconsin Alumni Research Foundation

| info@warf.org | 608.960.9850

- Can be manufactured at microscopic scales using integrated circuit techniques
- Broadly applicable to cavity-type resonators as well as other devices that provide energy resonance

Stage of Development

The researchers' approach achieves more than $1,000\sigma$ for a single subwavelength nanoresonator.

Additional Information

For More Information About the Inventors

- [Zongfu Yu](#)

Related Technologies

- [WARF reference number P140145US01 describes a compact and easily manufactured optical spectrometer.](#)

Publications

- Zhou M., Shi L., Zi J. and Yu Z. 2015. Extraordinarily Large Optical Cross Section for Localized Single Nanoresonator. Phys. Rev. Lett. 115, 023903.

Tech Fields

- [Analytical Instrumentation, Methods & Materials : Optics](#)
- [Information Technology : Hardware](#)

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867

We use cookies on this site to enhance your experience and improve our marketing efforts. By continuing to browse without changing your browser settings to block or delete cookies, you agree to the storing of cookies and related technologies on your device. [See our privacy policy.](#)

OK



WARF
Wisconsin Alumni Research Foundation

| info@warf.org | 608.960.9850