



## **TECHNOLOGY AVAILABLE FOR LICENSING**

### **Photonic Crystal Devices using Negative Refraction**

Non-Provisional Patent Application #11/920,613

Inventors: Srinivas Sridhar, Patanjali Parimi, Plarenta Vodo, Wentao Lu, Yongjian Huang

#### **Invention Details:**

The technology is a lens that is able to focus far-off objects due to its plano-concave shape. The lens is fabricated from a photonic crystal (PhC) having a negative refractive index and left-handed electromagnetic properties. Using this lens, it is possible to produce a real image of a far field radiation.

#### **Benefits of the Invention:**

##### Advantages

- Sharper image
- Enhanced resolution
- Reduced aberration in image formed
- Lightweight
- Increased focal length control
- Reduced optical system length
- Larger bandwidth
- Better able to focus a pulse or broadband radiation

##### Applications

- Far field imaging
- Solid state filters, antennas
- Optics
- Radar
- Astronomical telescopes
- High-power laser beams
- Enhanced sensing, imaging
- Commercial and defense microwave communications

#### **The Bottom Line:**

Left-handed metamaterials can be used to build smaller, lighter-weight, more flexible, and less expensive lenses, sensors, and antenna systems than what is already currently available. This invention addresses the limitation of far field imaging with flat lenses. Using this technology, it is possible to produce a real image of a far field radiation using a left-handed plano-concave lens.

#### **For More Information:**

Please contact:

**Anthony N. Pirri, Ph.D.**  
Division of Technology Transfer  
Northeastern University  
360 Huntington Ave, 960 RP  
Boston, MA 02115-5000  
**Phone:** 617-373-8810  
**Fax:** 617-373-8866  
**Email:** a.pirri@neu.edu

or

**Srinivas Sridhar, Ph.D.**  
Department of Physics  
Northeastern University  
360 Huntington Avenue, 111 DA  
Boston, MA 02115-5000  
**Phone:** 617-373-2930  
**Fax:** 617-373-2823  
**Email:** s.sridhar@neu.edu