

LIGHT SENSOR (MIR-VIS) - HIGHLY SENSITIVE AT ROOM TEMPERATURE

Reference No. 67342

CHALLENGE

Light sensors are used in a wide variety of commercial and scientific applications. When it comes to counting single photons CCD-sensors are not sensitive enough, so photomultipliers consisting of several amplifier stages are generally used. In the IR-range, the actual CCD-technology can only provide a resolution of a few hundred pixels per dimension, whereas sensors for the visible light have a resolution which is one order of magnitude higher. Additionally, IR-sensors need to be cooled to reach their best resolution. This increases the production and maintenance costs of IR-sensors significantly. Furthermore, the frame rate of infrared cameras is typically only in the range of a few Hertz, i.e. lower than what can be achieved with detectors operating in the visible light.

INNOVATION

The invented detector consists of a semiconductor hetero-structure of a resonance tunneling diode (RTD):

- 400 nm – 4 μm
- Very high sensitivity: 30 000 W/A
- Prototype works at room temperature
- Sensitive enough to detect single photons with a count rate of a few hundred MHz
- Linear detection in respect to the incident light.

Expanding the detection range to lower wavelengths, e.g. in the soft x-ray range, should also be possible. The active area has a diameter of only 100 nm to a few μm . Including the electrical connections the sensor has a size of 1 μm^2 - 10 μm^2 .

COMMERCIAL OPPORTUNITIES

- Sensor
- Nightvision
- Spectroscopy

DEVELOPMENT STATUS

Prototype running

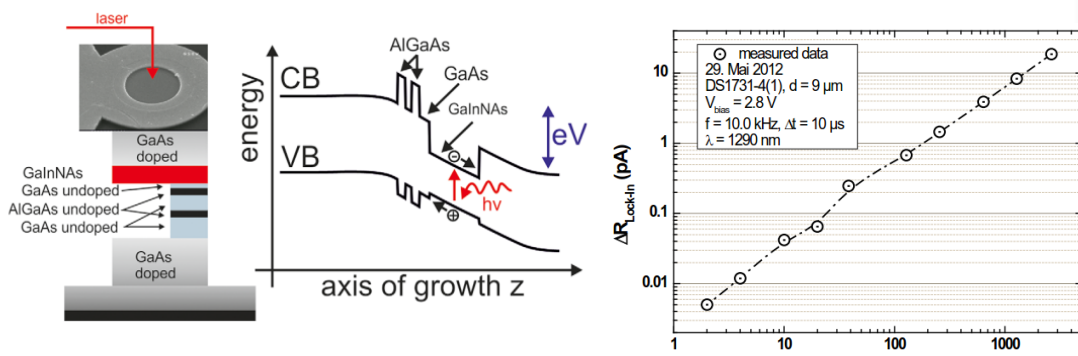
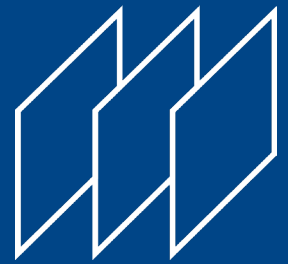


Figure: Example of sensor structure with band structure (left). Linearity of sensor in respect to irradiation (right).

REFERENCES:

(1) HARTMANN ET AL., APPL. PHYS. LETT. 100, 172113 (2012)



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