Twitter Thread by NotTheMacAnon

NotTheMacAnon
@NotTheMacAnon1

Localized Surface Plasmon Resonance - an overview | ScienceDirect Topics

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In some cases, almost 100% of the light energy can be converted to the second harmonic frequency. These cases typically involve intense pulsed laser beams passing through large crystals, and careful alignment to obtain phase matching.

In other cases, like second-harmonic imaging microscopy, only a tiny fraction of the light energy is converted to the second harmonic—but this light can nevertheless be detected with the help of optical filters.

Generating the second harmonic, often called frequency doubling, is also a process in radio communication; it was developed early in the 20th century, and has been used with frequencies in the megahertz range. It is a special case of frequency multiplication.

An electron (purple) is being pushed side-to-side by a sinusoidally-oscillating force, i.e. the light's electric field. But because the electron is in an anharmonic potential energy environment (black curve), the electron motion is not sinusoidal.

The three arrows show the Fourier series of the motion: The blue arrow corresponds to ordinary (linear) susceptibility, the green arrow corresponds to second-harmonic generation, and the red arrow corresponds to optical rectification.

Electro-optic rectification (EOR), also referred to as optical rectification, is a non-linear optical process that consists of the generation of a quasi-DC polarization in a non-linear medium at the passage of an intense optical beam.

For typical intensities, optical rectification is a second-order phenomenon[1] which is based on the inverse process of the electro-optic effect.

It was reported for the first time in 1962,[2] when radiation from a ruby laser was transmitted through potassium dihydrogen phosphate (KDP) and potassium dideuterium phosphate (KDdP) crystals.

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The term "electro-optic" is often erroneously used as a synonym for "optoelectronic".

Opto-electronics (or optronics) is the study and application of electronic devices and systems that source, detect and control light, usually considered a sub-field of photonics.

In this context, light often includes invisible forms of radiation such as gamma rays, X-rays, ultraviolet and infrared, in addition to visible light.

Optoelectronic devices

are electrical-to-optical

or optical-to-electrical transducers,

or instruments that use such devices in their operation.

Optoelectronics is based on the quantum mechanical effects of light on electronic materials, especially semiconductors, sometimes in the presence of electric fields.

•Photoelectric or photovoltaic effect, used in:
■photodiodes (including solar cells)
■phototransistors
■photomultipliers
■optoisolators
■integrated optical circuit (IOC) elements
•Photoconductivity, used in:
■photoresistors
■photoconductive camera tubes

■charge-coupled imaging devices
•Stimulated emission, used in:
■injection laser diodes
■quantum cascade lasers
•Lossev effect, or radiative recombination, used in:
■light-emitting diodes or LED
■OLEDs
•Photoemissivity, used in
■photoemissive camera tube

Important applications of optoelectronics include:
•Optocoupler
•Optical fiber communications

An opto-isolator (also called an optocoupler, photocoupler, or optical isolator) is an electronic component that transfers electrical signals between two isolated circuits by using light.

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An opto-isolator contains a source (emitter) of light, almost always a near infrared light-emitting diode (LED), that converts electrical input signal into light, a closed optical channel (also called dielectrical channel),

and a photosensor, which detects incoming light and either generates electric energy directly, or modulates electric current flowing from an external power supply.

The sensor can be a photoresistor, a photodiode, a phototransistor, a silicon-controlled rectifier (SCR) or a triac. Since LEDs can sense light in addition to emitting it, construction of symmetrical, bidirectional opto-isolators is possible.

An optocoupled solid-state relay contains a photodiode opto-isolator which drives a power switch, usually a complementary pair of MOSFETs.

A slotted optical switch contains a source of light and a sensor, but its optical channel is open, allowing modulation of light by external objects obstructing the path of light or reflecting light into the sensor.

Electronic equipment and signal and power transmission lines can be subjected to voltage surges induced by lightning, electrostatic discharge, radio frequency transmissions,

switching pulses (spikes) and perturbations in power supply.

Transformers and opto-isolators are the only two classes of electronic devices that offer reinforced protection — they protect both the equipment and the human user operating this equipment.

They contain a single physical isolation barrier, but provide protection equivalent to double isolation.