

Beaming power photovoltaic laser power converters for power-by-light

Photovoltaic laser power converters (PVLPCs) are the core element of power-by-light (PBL) systems, which are basically made up of a power laser, an optical fiber, and a PVLPC. PBL allows the safe transfer of power in situations where the direct use of electrical energy to power electronic equipment is either not possible or not recommendable.

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Optical Power Beaming is the process by where you convert electricity into laser light, send it some distance away and then turn it back into usable electricity. The beam is shaped and conditioned to be optimized for power, distance and efficiency and the entire system is packaged and controlled to be safe.

Laser Power Converters (LPC) specially designed for the efficient converting monochromatic light energy are commonly utilized to receive laser power. ... Although bandgap-matched GaInP can be obtained by epitaxial growth and obtained a 40% PCE at 532 nm laser light ... Beaming power: Photovoltaic laser power converters for power-by-light. Joule ...

For the multijunction PV cells (MJPV), including multijunction solar cells (MJSCs) [1,2] for converting the sunlight and multijunction laser power converters (MJLPCs) [3][4] [5] [6][7][8][9][10] ...

The experiment results are shown in Fig. 7, which gives the I-V characteristics for GaAs PV converters coupled to the 808 nm laser beam at 0.5 W/cm², 3 W/cm², 5 W/cm², and plots the short-circuit current, open-circuit voltage, and maximum power output of the GaAs PV converter as a function of the input power.

Optical power transmission (also called power-by-light) is an elegant solution to power wireless sensor nodes. At the sensor, optical power in form of monochromatic laser light is converted to electricity by photovoltaic laser power converters. These photovoltaic cells are optimized for the monochromatic wavelength of the light - opposed to solar cells, where the cell is optimized for ...

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High-efficiency multijunction laser power converters are demonstrated for low temperature applications with an optical input at 808 nm. The photovoltaic power converting III-V semiconductor devices are designed ...

Laser power converters for power-by-light and optical-wireless have been discussed in the literature, 1,2 and

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this paper addresses the aspects of (1) directed laser beams enabling electric-power generation at remote locations and (2) cases in which a very-high-power aimed beam travels through the ambient atmosphere to reach a targeted optical-to-electric (OE) ...

The organic laser power converters exhibit a 36.2% efficiency at a 660 nm laser with a photon flux of 9.5 mW cm⁻² and achieve wireless micro power transfer with an output of 0.5 W on a 2 meter ...

Recently, a PVLPC has demonstrated the highest efficiency for any photovoltaic converter, i.e. 68.9% at a laser illumination of 858 nm. This review begins with a brief overview ...

DOI: 10.1016/J.FRARED.2015.03.010 Corpus ID: 119578803; Design and optimization of GaAs photovoltaic converter for laser power beaming @article{Shan2015DesignAO, title={Design and optimization of GaAs photovoltaic converter for laser power beaming}, author={Tiqiang Shan and Xinglin Qi}, journal={Infrared Physics & Technology}, year={2015}, volume={71}, pages={144 ...

Most photovoltaic (pv) cells are designed and developed for the conversion of the broad spectrum of solar energy into electrical power; however, it is well known that a pv cell demonstrates the maximum optical to electrical conversion efficiency when illuminated by monochromatic light at a wavelength that closely corresponds to the band-gap energy of the ...

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PhotoVoltaic Laser Power Converters (PVLPCs) currently exhibit the highest photovoltaic efficiency, i.e. 68.9% at a laser illumination of 858 nm. They are the core element of Power-byLight (PBL) systems which basically made up of a power laser, an optical fibre and a PVLPC. PBL allowsthe safe transfer of power in situations where the direct use of electrical ...

Experiment results under 808 nm laser power beaming show that high optical-to-electrical conversion efficiency of 53.23% at 5 W/cm² is achieved using the optimized GaAs PV laser converter. Finally, accurate extraction of the key parameters, viz. the ideality factor, reverse saturation current, series resistance and shunt resistance is introduced.

The core of a PBL system is the photovoltaic laser power converter (PVLPC) which transforms the laser light delivered through an optical fibre into electricity. Recently, a PVLPC has ...

The high-efficiency capabilities of multijunction laser power converters are demonstrated for high-power applications with an optical input of around 1470 nm. The InP-based photovoltaic power converting III-V semiconductor devices are designed here, with 10 lattice-matched subcells (PT10-InGaAs/InP), using thin InGaAs absorbing layers connected by ...

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Power-by-light systems allow the power transmission using light instead of electricity. Photovoltaic laser power converters are the key elements of power-by-light systems. Photovoltaic laser power converters exhibit the highest photovoltaic efficiency. Photovoltaic laser power converters target an operation close to the radiative limit.

Power-by-light systems allow the power transmission using light instead of electricity. Photovoltaic laser power converters are the key elements of power-by-light systems. Photovoltaic laser ...

Recent developments in long wavelength and cryogenic laser power converters have unlocked record performances in both areas. Here, devices for an optical input at ~1470 nm are studied for cryogenic applications, combining these cryogenic and long-wavelength attributes. Multijunction laser power converters are demonstrated to have a high-efficiency operation at ...

Although the examples and components discussed here will involve laser power beaming, the general arguments also apply to microwave power beaming. The two main technologies for power beaming use either microwave/millimeter-wave frequencies or near-infrared lasers. Figure 1 shows a schematic representation of a laser power-beaming system.

Semiconductor laser and power converter for optical wireless power transmission ... R. Peña, C. Vázquez, M. Hinojosa, and I. Rey-Stolle, "Beaming power: Photovoltaic laser power converters for power-by-light," *Joule* (2021). [2]K. Jin and W. Zhou, "Wireless Laser Power Transmission: A Review of Recent Progress," *IEEE Transactions on Power ...*

Recently, a PVLPC has demonstrated the highest efficiency for any photovoltaic converter, i.e., 68.9% at a laser illumination of 858 nm. This review begins with a brief overview of the ...

Photovoltaic multijunction power-converting III-V semiconductor devices generate electrical power from the optical energy of laser beams. They exhibit conversion efficiencies reaching values greater than 60% and 50% for the GaAs and the InP material systems, respectively. The applications of optical wireless power transmission and power-over-fiber ...

According to Jaffe, power beaming could also make possible the transmission of power from solar-energy-collecting satellites in space to the ground, wherever it's needed--whether that's a forward operating base, a developing country, or a refugee camp. (The power for the demonstration that day was coming from an electrical outlet in the building.)

Photovoltaic power converters can be used to generate electricity directly from laser light. In this paper we report the development of GaAs PV power converters with improved conversion efficiency at high power densities.



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The conversion of monochromatic light into electrical power by photovoltaic power converters (PPCs) has attracted increasing attention 1,2,3,4,5,6,7,8,9,10,11,12.This light energy conversion ...

Singlet fission photovoltaic cells as dual-wavelength laser power converters compatible with highly efficient solar cells. I applied photovoltaic cells equipped with singlet ...

Stable and reliable optical power converting devices are obtained using vertical multi-junction laser power converters. They are based on the GaAs and the InP material systems and are used for power-over-fiber or power-beaming applications. This study demonstrates that, in addition to providing the overall best conversion efficiencies with output voltages ideal for ...

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