

How can solar cells be made from optical antennas?

Regarding the experimental realization of such solar cells built from optical antennas (e.g., InP), several fabrication techniques, such as solvothermal process, (32) metal-assisted etching, (33) metal-organic vapor phase epitaxy (MOVPE), (34) and molecular beam epitaxy (MBE) (35) techniques, can be employed to fabricate InP optical antennas.

Are solar rectennas a viable alternative to conventional photovoltaics?

Mupparapu, R. and Cunha, J. and Jacassi, A. and Tantussi, F. and Proietti Zaccaria, R. and Summerer, L. Solar rectennas offer an alternative to conventional photovoltaics for harnessing power from solar irradiance. This project investigates solar rectennas for visible light frequencies.

Are resonant optical antennas a viable alternative route for solar cells?

Herein, we propose an alternative route by using resonant optical antennas. The diameter of the resonant antenna controls the absorption peak and the average visible transparency of the solar cells.

How does a thermal spectral converter work in a low-bandgap solar cell?

For the low-bandgap cell ($E_g = 0.55$ eV), the heat generated in the cell during the solar PV process is due to thermalization (down to E_g) of nearly the entire solar spectrum. The presence of a thermal spectral converter reduces the normalized heat generation in the cell by a factor of ~ 3 .

How do solar cells work in space?

Current space missions mostly rely on semiconductor solar cells which perform energy conversion of electromagnetic radiation into electricity by means of the photovoltaic effect.

How to optimize optical antenna performance?

A detailed optimization process is conducted to maximize the performance of optical antennas by varying their geometric dimensions for VTSCs. At the same time, the widely used classical DB theory was used to estimate electrical characteristic parameters of solar cells.

We present a systematic study of tunable, plasmon extinction characteristics of arrays of nanoscale antennas that have potential use as sensors, energy-harvesting devices, catalytic converters, in near-field optical microscopy, and in surface-enhanced spectroscopy. Each device is composed of a palladium triangular-prism antenna and a flat counterelectrode. ...

A rectenna, or rectifying antenna (Fig. 1), is a device for the conversion of electromagnetic energy propagating through space to direct current in a circuit. It has one or more elements, each consisting of an antenna, filter circuits and a rectifying diode or bridge rectifier either for each antenna element or for the power from several elements combined.

These antennas were also used as a basis to predict the geometry and materials of solar antenna construction. Subsequently, Farber (1988) worked on the antenna based energy conversion concept at the University of Florida's Solar Energy and Energy Conversion Laboratory. As a part of his work, he transmitted microwave radiation in the 0.2-3 ...

A rectenna (rectifying antenna) is a special type of receiving antenna that is used for converting electromagnetic energy into direct current (DC) electricity. They are used in wireless power transmission systems that transmit power by radio waves. A simple rectenna element consists of a dipole antenna with a diode connected across the dipole elements. The diode rectifies the AC ...

The reproducibility of nanometric scale antennas. Ideally, these antennas should be insensitive to polarization as well as the angle of incidence of the incoming radiation, and allow absorption in the [400; 1300 nm] range where most of the solar spectrum energy is to be found. o The development of a rectifier working in the THz range. The ...

A combination between the solar energy and RF energy harvesting is discussed in Jaffe J. Energy conversion and transmission modules for space solar power. ... Geyi W. Optimal design of an antenna array for energy harvesting. IEEE Antennas and Wireless Propagation Letters. 2013; 12:155-158; 38. Monti G, Tarricone L, Spartano M. X-band ...

The idea of using the basic science underlying photosynthesis in the design of solar fuels has been discussed for over 100 years ago by an Italian scientist, Giacomo Ciamician [15], in a famous lecture entitled "The photochemistry of the future", when he stated: "Photochemistry will artificially put solar energy to practical uses. To do this, it would be sufficient to be able to ...

There is a growing interest in recent years on developing solar cells and increasing their conversion efficiency. This interest was motivated by the demand on producing clean and inexpensive energy, where the current solar cell technology failed to fulfill the market demand due to its low efficiency obtained. Thus, an efficient alternative is highly required to overcome the ...

In this paper, we try to find the best solution for our energy harvesting application by designing an efficient optical antenna which receives the solar radiation and converts it from AC to DC by integrating a rectifier. This work consists of designing a Vivaldi optical antenna with a maximum electric field captured in its gap.

The theoretical maxima of solar energy conversion efficiencies and productivities in oxygenic photosynthesis are evaluated. These are contrasted with actual measurements in a variety of photosynthetic organisms, including green microalgae, cyanobacteria, C4 and C3 plants. Minimizing, or truncating, the chlorophyll antenna size of the photosystems can improve ...

Wambold, Raymond A. ; Chen, James M. ; Cutler, Paul H. et al. / Tunable optical extinction of nano-antennas

for solar energy conversion from near-infrared to visible. Plasmonics: Metallic Nanostructures and Their Optical Properties XIII. editor / Din Ping Tsai ; Allan D. Boardman. SPIE, 2015. (Proceedings of SPIE - The International Society for ...

Author(s): Melis, Anastasios | Abstract: The theoretical maxima of solar energy conversion efficiencies and productivities in oxygenic photosynthesis are evaluated. These are contrasted with actual measurements in a variety of photosynthetic organisms, including green microalgae, cyanobacteria, C4 and C3 plants. Minimizing, or truncating, the chlorophyll antenna size of the ...

Also Read: 5 Methods of Solar Energy Harvesting. What is RF Energy Harvesting Circuit Design? An antenna, an energy conversion module, a matching network, and a load are the parts that make up a typical RF-EH circuit. The rectenna system was made up of a rectifier, an RF input filter, an antenna, and an impedance-matching network.

Received 6 July 2022, accepted 17 August 2022, date of publication 23 August 2022, date of current version 29 August 2022. Digital Object Identifier 10.1109/ACCESS.2022.3201127 Integrated Solar Mesh Dipole Antenna Based Energy Harvesting System MORSY AHMED MORSY AND KHALID SALEH Department of Electrical Engineering, College of Engineering, ...

A Truncated Light-harvesting chlorophyll Antenna size (TLA), in all classes of photosynthetic organisms, would help to alleviate excess absorption of sunlight and the ensuing wasteful non-photochemical dissipation of excitation energy. Thus, solar-to-biomass energy conversion efficiency and photosynthetic productivity in high-density cultures ...

This study aims to determine the maximum possible energy conversion efficiency of visibly transparent solar cells using the detailed balance limit (also known as the Shockley-Queisser limit) and compare it to the efficiency of traditional ...

Photosynthesis combines solar energy capture and conversion to power oxygenic water splitting and carbon fixation. Integral to its ... antenna complexes funnel excitation en- ... use solar energy to power the transformation of abundant chemicals such as water and CO

The proposed mechanisms for the conversion of solar energy to electricity include those exploiting the particle nature of light in conventional photovoltaic cells, where absorbed photons generate electron-hole pairs, and those using the collective electromagnetic nature of the light, where sunlight is captured by antennas and rectified.

Solar energy converts sunlight into electricity via photovoltaic cells, making it a sustainable option for outdoor applications. ... achieving circular polarization for enhanced energy conversion [49,50]. Monopole antennas, often used in mobile communications and RFID systems, are adaptable for circular polarization [51,52].



Antenna solar energy conversion

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