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DESIGN AND ANALYSIS OF SOLAR POWERED LASER SYSTEM FOR POWER GENERATION IN SATELLITES

Abstract

For successful performance of the spacecraft, it should be provided with sufficient power till the end-of-life (EOL).Solar energy has been the major source of energy since the advent of satellites. Sunlight consists of a wide range of electromagnetic waves but not all of this range is converted into usable electric power. Numerous technologies have been developed to generate power with higher efficiencies and to reduce the satellite power sizing. One such advancement is the usage of laser light as the main power source which is being converted from sunlight. This paper deals with the concept of amplification of power generated by application of lasers. Some crystals have the potential to convert sunlight which is poly chromatic and non-coherent into highly energetic monochromatic and coherent electromagnetic waves. The proposed system is the use of Fresnel lenses to concentrate the sunlight on the active medium of crystalline ceramic ND-YAG (neodymium doped yttrium aluminium garnet) laser, resulting in optical pumping, which increases the stimulated emission and generate laser light. This light would then be fed onto a solar panel to generate higher power enabling the conversion of greater fraction of solar energy into electrical energy which can be used by different subsystems, providing a considerable increase in the maximum power produced by current-day solar panels. The mechanism's design will be discussed along with its analysis as compared to traditional solar panel based power generation systems. This will conclusively give a system that can reach the power requirements at extremities with optimal sizing in the satellite.