



RESEARCH PROJECT
“Solar Pumped Laser”

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Solar Pumped Radiation Balanced Lasing

Mohammad Sahil has studied in the Elite Graduate Program “Advanced Optical Technologies” at the University of Erlangen-Nürnberg. There and at the Max Planck Institute of the Science of Light, the scientist worked with force sensors based solar pumped radiation balanced Lasing as his master’s thesis.

Introduction

All life on Earth is fundamentally sustained by the Sun, which provides essential for the survival of ecosystems and human civilisation. Many ancient civilisations and modern religions have revered the Sun as a divine entity.

Beyond its spiritual significance, the Sun is a powerhouse of energy. The amount of solar energy that reaches the Earth in just one hour is sufficient to meet the global energy demands of humanity for an entire year. This immense potential makes solar energy a promising solution to the worldwide energy crisis. However, the key challenge lies in capturing and utilising this energy sustainably and efficiently.

Match made in lab (Heaven for Scientists)

Lasers have revolutionised the world, impacting fields from medical science to military technology, and from academia to industry. Solar pumped lasers were developed soon after the invention of Lasers. These are fundamentally same solid-state lasers pumped using sun light. However, they suffer from low efficiency and poor heat management leading to not so favourable option.

For rescue comes another kind of laser, known as radiation balanced laser. These laser use light in the form of anti-stokes fluorescence for heat management. Basically, they don’t require active heat management.

Best of two worlds

Combining these two lasers will give us the best of the two worlds. Only catch, is it even possible to combine them? The master thesis was based on finding that out.

On one hand Radiation balanced laser requires certain power and wavelength conditions to work and on the other hand solar pumping require high power pumping and heat management. Solar pumping requires efficient collection of solar light and Radiation balanced laser requires high level of pumping power.

Outlook

During the master thesis many simulations were done to find the sweet spot where radiation balanced lasing could work with solar light pumping. Theoretically it is possible to make such radiation balanced laser which can be pumped using solar light.

This opens possibilities in the field of sustainable laser, which can contribute to fulfil our current energy needs. These lasers do not require energy from PowerGrid for functioning and can function on their own in remote places and provide a suitable and sustainable laser.



A sunny day inside the Max Planck Institute

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