At present for solar pumping basically the solid-state active mediums are used, due to its high efficiency of transformation. One of the main lacks of solid-state active mediums is thermal lensing effect which leads to the laser beam expansion and as consequence to reduction of density of output power.

For indemnification of lens effect, maintenance as much as possible the homogeneous or symmetric pumping concerning an axis is required.

In this connection it was considered the thermal lensing effect in Nd:YAG laser rods at pump by the concentrated solar flux of Big Solar Concentrator (BSC) SPA "Physics-Sun" (Tashkent) with the total power of a solar flux up to 1 MW on a focal plane with a diameter ~ 40 cm.:

For the solution of a problem the computer model of considered process is developed and numerical experiments were carried out. The new multi-element pumping scheme (fig. 1.) is offered. Calculations of parameters of solar laser system have been carried out in three stages: calculation of distribution of the absorbed power in an active element (the Monte Carlo method was used); calculation of distribution of temperature in a laser rod for the given absorbed power (the numerical method for solution of the equation of heat conductivity with an internal source of heat was used); calculation of a focal length (the three-dimensional ray tracing method was used);

![Fig. 1. The multi-element pumping scheme (system of secondary concentrators with active elements).](image1)

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**Innovative Aspects and Main Advantages**

The new and effective multi-element scheme providing symmetric enough pumping which allows to compensate the thermal lens effect in conditions BSC with power up to 1 MW better than existing schemes is offered. Use of the offered scheme and application of new ceramic active elements in the length comparable to the sizes of focal spot of BSC can allow to increase the maximal power of solar pumped lasers, achieved in the world at least in ten times.

![Fig. 2. Focal length as function of the absorbed power. B-for homogeneous distribution of the absorbed power, C-for the scheme presented in fig. 1.](image2)

**Areas of application**

These results are used in design development of the solar laser on the basis of BSC which we are carrying out within the framework of the STCU project #Uz-121. Results of calculations also can be used for an estimation of the maximal output power which can be achieved and optical correction for indemnification of lens effect in high power solar pumped lasers. Application of solar pumped lasers underlies many modern scientific and technical projects: transportation of energy in space, from space to the ground; sounding of an atmosphere, ocean and the ground from space, detection, illumination and tracking mobile objects, communication in open space; reception of fuel materials, photosynthesis and a number of other ground applications.

**Stage of development**

The experimental Stand for carrying out of researches on transformation of energy of the concentrated solar flux of BSC to laser radiation is developed and created. Now tests of separate units of the Stand are carrying out.

**Contact details**

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