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Modeling of lasers with the computer program: LASCAD

The computer program LASCAD provides a unique combination of simulation tools to optimize LASer Cavity Analysis and Design. Especially the following tools are available:

- Thermal and Structural Finite Element Analysis of thermal effects in laser crystals
- ABCD Gaussian Beam Propagation Code taking into account thermal lensing, gain guiding, etc.
- Dynamic Analysis of Multimode and Q-switched operation analyzing the dynamic 3D behaviour of laser beams
- 3D Physical Optics Beam Propagation Code including diffraction, gain dynamics, etc.

An easy to use graphical users interface allows the combined use of these complex engineering tools. In this way, LASCAD helps the laser engineer to overcome the many interacting technical and physical problems he is confronted with when he develops a laser. Especially thermal lensing is of growing importance, due to the tendency to miniaturize laser systems, while simultaneously increasing power output. The effect strongly depends on system characteristics, such as material parameters, resonator geometry, pump beam distribution and cooling layout. It interferes with gain dynamics, mode competition, Q-switching and other effects, which control beam quality and laser efficiency in a complicated manner. Based on a numerical simulation of these effects, LASCAD™ provides the laser engineer with a quantitative understanding of the characteristics of a resonator design. The GUI of LASCAD, as shown in the figure, can be used as an optical workbench on the PC, allowing the intuitive design of laser resonators. In this way LASCAD™ helps users to process experimental results without wasting valuable time studying complicated manuals:

- Optical elements, such as mirrors, lenses or crystals can be added, combined, adjusted or removed by mouse clicks
- Astigmatism in the resonator and crystal is automatically taken into account
- The program menu makes available thermal finite element analysis, Gaussian ABCD matrix code, physical optics code, analysis of the Q-switched operation, computation of laser stability and power output.

Biography

Ivan Bozovic received his PhD in Solid State Physics from Belgrade University, Yugoslavia, where he was later elected a professor and the Physics Department Konrad Altmann has completed his PhD in Physics from the Ludwig-Maximilian University of Munich, Germany, at 1975. The issue of his thesis was the quantum mechanical description of molecular spectra. For this work, he obtained the marking "with excellence". From 1976 to 1991 he was with the industrial company Messerschmitt-Bolkow-Blohm and developed a computer program for the description of a gas dynamic CO₂ laser. From 1991 to 1993 he was with the German Aerospace and developed computer programs and published papers concerning laser beam propagation in the atmosphere. In 1993 he founded the company LAS-CAD GmbH with the purpose to integrate different simulation tools, necessary for the analysis of the multi-physics interaction in solid-state lasers, into the commercial program LASCAD. This program provides the laser engineer with the ability of a quantitative understanding of the complicated effects in laser systems. He has over 25 years of progressively responsible experience in computational physics especially in the field of optics. He wrote more than 40 scientific publications in molecular physics, propagation engineering and laser technology and applied for 38 patents, of which 15 have been granted. He also wrote programs for the simulation of laser beam propagation in the atmosphere. In 2014 he was becoming Adjunct Professor of the National Engineering Center for DPSSL of the Chinese Academy of Science.

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