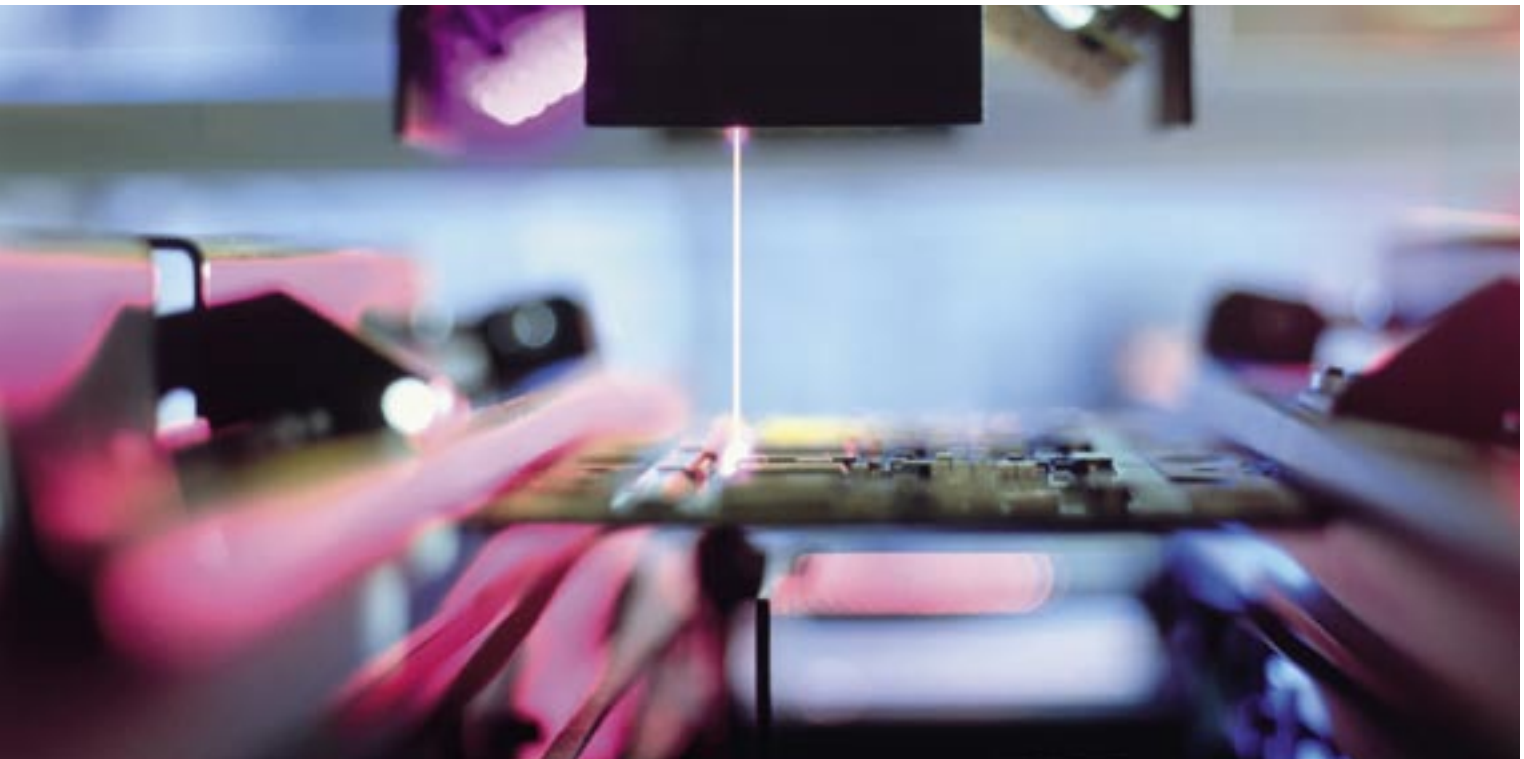


Ultrashort pulses, micromachining, process monitoring, multi-kilowatt fundamental-mode laser beams, disk or fiber lasers – when talk turns to the future of the laser, these are just a few of the topics that come up. So what does the future hold? What stays, what goes? What surprises await us?

In the following, we'll be discussing these issues with Prof. Dr. Thomas Graf, director of the Institute for Beam Tools (IFSW) in Stuttgart, Prof. Dr. Helmut Hügel, founder and former director of IFSW, Prof. Dr. Andreas Tünnermann, head of the Institute of Applied Physics (IAP) at Friedrich Schiller University,

Jena, and Prof. Dr. Reinhart Poprawe M. A., director of the Fraunhofer Institute for Laser Technology (ILT), Aachen. The users are represented by Dipl.-Ing. Frank Löschmann and Dipl.-Ing. Klaus Löffler of Volkswagen AG and Dr. Klaus-Dieter Debschütz and Dr. Wolfgang Becker of DaimlerChrysler AG. Rounding off the discussion group are Dr. Mathias Kammüller, Dipl.-Ing. (FH) Paul Seiler, and Dipl.-Ing. Peter Leibinger of TRUMPF GmbH + Co. KG, representing the laser and machine manufacturers. Discussion moderators are Gabriela Buchfink, Dr. Klaus Parey, and Frank Neidhart.



What innovations are research laboratories currently working on?

Graf: There's still plenty of work to do on all fronts. Increasingly better laser devices are creating ever more fascinating application possibilities. At IFSW (Institute for Beam Tools), we've been able to make some important contributions, with advances in the area of CO₂ lasers, the invention of the disk laser, and fundamental research into laser-based manufacturing methods. Even so, our experience has shown: it's a long road from an idea for a laser to an industrially viable device and its successful implementation.

Tünnermann: That matches my experience with the fiber laser. It takes about 12 to 15 years to develop a new type of laser before it's ready for the market.

Often, other innovations determine when an idea can be realized. Disk lasers and fiber lasers are pumped using diode lasers. It wasn't until such diode lasers had become available that it was possible to implement the concept.

What priorities do manufacturers set in the development of new products?

Leibinger: As a laser manufacturer, our goal is to be the first to make cutting-edge technology available for wide application in industrial production facilities. In concrete terms, that means we convert the latest research findings into industrially viable products. In doing so, we want to supply our customers with fully developed devices, not make their production facility a testing ground.

Kammüller: Lasers are universal tools. They can be utilized for an extremely diverse range of processes and tasks. And new applications are constantly emerging. For each application, the laser requires a matching machine. That's why we develop laser machining systems, based on the platform concept:

the standard machine is equipped with standardized interfaces. The machine can be expanded to include additional modules, allowing it to be tailored for a particular process or special application.

What trends do you see as researchers?

Tünnermann: Our institute sees a trend toward miniaturization of the technical components. An optical systems technology will develop, analogous to microelectronics. Use of methods from semiconductor technology will make it possible to integrate all components of the laser device automatically in one system (chip).

Poprawe: In the processes that we are working on, "micro" is also where we are headed. Here, ablation and structuring should be mentioned. Beyond that, we aim to make advances in surface treatment methods such as polishing and cleaning.

Do manufacturers and institutes really provide you with the solutions that you, as users, need?

Debschütz: Well, yes and no. We use the products the manufacturers offer us, but adapt them to our own needs. There are no off-the-rack solutions for us. Before a process can move on to serial production, our research and development departments must do their work. They investigate the application possibilities, develop systems that are perfectly tailored to our production lines, and fine-tune the machining process in test runs. Only after the process is running reliably and the quality is right do we use it in serial production.

Which processes are used in serial production?

And which ones will follow in the years to come?

Becker: At DaimlerChrysler AG, we have been using lasers for cutting for many years. The same is true for laser welding,