



BeamXpert  
**DESIGNER**

make light matter

## Simulation Software

Real-time Simulation of Laser Radiation  
in Optical Systems

# Make light matter

**BeamXpertDESIGNER** offers real-time simulation of propagation of laser radiation through optical systems. The software provides intuitive CAD-like interaction with optical elements in a 3D graphic and speaks the language of laser technology.

Easy learnability and pronounced interactivity make it possible to achieve speedy precise results.

## Outcome:

**Increased added value through significantly accelerated workflow!**

A white circle with a thin border containing the text "3h" in white.

The testers\* saved 3 hours of working time/month with BeamXpertDESIGNER on average.

**12 % of the testers\* even confirmed a monthly time saving of more than 10 h.**

A white circle with a thin border containing the text "PLUS" in white.

Furthermore: The testers\* liked the **simple operation** and the **short familiarization (82 % each)**, the **laser standard-compliant results (50 %)** and the availability of the **component database (47 %)**.

A white circle with a thin border containing the text "100%" in white.

**100 % of all beta testers would recommend BeamXpertDESIGNER to their peers in the laser market.**

54 % of them would even recommend the beta version of BeamXpertDESIGNER without any restrictions!

*\* Online survey with 40 beta testers from the laser market.  
26 % of the testers used BeamXpertDESIGNER several times a week and  
54 % of them several times a month to solve their problems.*



## Lean and fast – focused on essential features



### **Rapid to learn, easy to use**

After just 1 hour of training,  
the first reliable results  
are obtained



### **Intuitive operating with Drag & Drop**

Direct clicking, moving  
and rotating of  
optical components



### **CAD-like 3D representation**

Instructive visual work  
with 3D objects



### **Real-time simulation**

Very fast basic algorithm  
enables  
3D real-time simulation



### **Component database**

Direct integration of standard  
optical components from  
common manufacturers



### **Results conforming to laser standards**

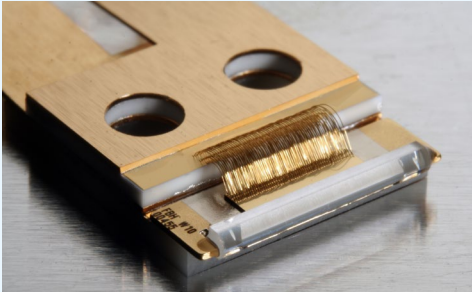
Output of laser beam  
parameters according to  
ISO 11145 and ISO 11146

## Try BeamXpertDESIGNER

You want to check how BeamXpertDESIGNER can speed up your workflow?  
We will be happy to provide you with a demo version. Simply register under:

[www.beamxpert.com/demoverision](http://www.beamxpert.com/demoverision)

### Collimation of Diode Laser Radiation

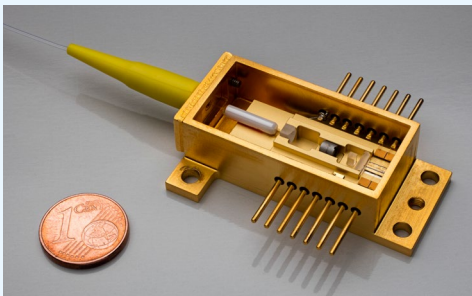


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In order to apply the very good beam quality of diode lasers the highly divergent radiation has to be formed first to a parallel laser beam. This collimation is typically done by one or more microlenses. Using improper lenses can deteriorate the beam quality supplied by the laser diode significantly.

With the help of BeamXpertDESIGNER, it can be decided which available lenses are best suited. In addition, the effect of possible lens misalignments on the beam quality can be quantitatively determined.

### Fiber Coupling



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The ability to couple laser radiation into fibers allows the separation of the laser beam generation location from the beam application location. This is a great advantage in practice. For coupling of the laser radiation into the fiber, the laser radiation has to be transformed to a spot with a precisely specified size and has to hit the fibre core as precisely as possible. The size of the spot and the degradation of the beam quality caused by the aberration of the fiber optic coupler depend on the lenses used.

Both can be calculated with BeamXpertDESIGNER. In addition, it is possible to quantitatively estimate the losses during coupling due to misalignment of the lenses.

### Frequency Conversion



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In certain wavelength ranges, laser radiation cannot be generated directly or only with great technical difficulties. Instead, laser radiation is generated in an easily accessible wavelength range and converted into the desired wavelength range using nonlinear crystals. In order to achieve optimum conversion efficiencies, the laser radiation must be focused into the crystal while closely defined parameters (focus diameter and position, Rayleigh length, etc.) are maintained.

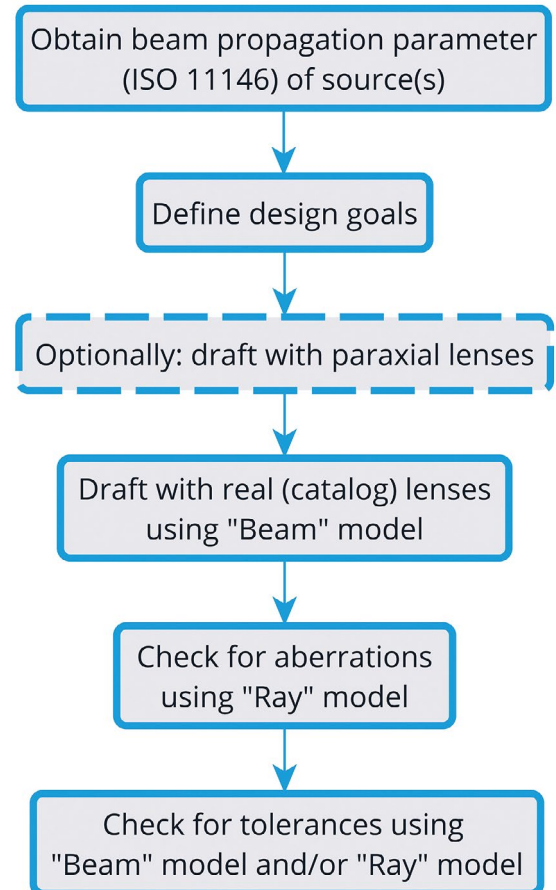
With BeamXpertDESIGNER it is possible to determine the necessary lens combinations quickly and reliably.

## Theoretical Foundation

BeamXpertDESIGNER uses two different modeling approaches. The first model uses the propagation of the first and second order moments of the intensity distributions for simulation. A proprietary approach allows a less restrictive application of the paraxial approximation. Since the calculation is very fast, the simulation can be carried out in real time.

In the second model, the laser radiation is represented by a bundle of geometrical-optical beams propagated through the system by classical raytracing. These bundles are designed in such a way that they correspond to the so-called Gauss-Schell model. From the bundle, the beam propagation parameters, including the particularly important beam quality factor  $M^2$ , can be derived at any location in the optical system. The change of the beam quality factor of the beam as it passes through the optical system allows to determine the amount of the occurring aberrations (e.g. by inappropriate lens selection or arrangement).

Therefore, a typical workflow consists of the interactive design of the optical system using the propagation of the intensity moments with subsequent control for aberrations with the help of the Gauss-Schell ray bundles as schematically illustrated.



## System Requirements

- Operating system: Windows 7, 8 and 10 (32 bit and 64 bit) Home and Professional editions are supported.
- Free USB port for the copy protection dongle
- The software uses the OpenGL support of graphics processing units. The use of a dedicated graphics card is generally not necessary.
- For a perfect 3D CAD experience, UHD monitors are also supported (under suitable hardware).
- For the first installation it is recommended to use a CD/DVD drive that is able to read Mini CDs.

# The BeamXpert GmbH in Berlin

BeamXpert GmbH was founded as a spin-off of the Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (FBH) in Berlin.

The BeamXpert team consists of the physicists Dr. Bernd Eppich and Dr. Guido Mann, who together have more than 50 years of experience in theoretical and practical laser physics.

The continuous further development of BeamXpertDESIGNER is guaranteed by the regular feedback of users in the national and international network of the founders in research and education as well as in industry.

Demo version, information, videos, online manual, FAQ and order at:  
**[www.beamxpert.com](http://www.beamxpert.com)**



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