**Reflection of the laser radiation during laser welding**

Due to the known advantages of laser welding such as its high flexibility, its strong local heat input and a big process velocity, a substantial increase in the use of this production process in the industrial application occurred. However, during a welding process not the total energy of the laser radiation gets absorbed by the material, there is also a reflection. These reflections could cause damages to the system components and lead to power loss. Furthermore are these reflections a threat of the operator. Especially before the keyhole is formed, the intensity of the reflected light is strong. Therefore, the focus is on the transient behavior of the reflection of the laser radiation during the formation of the keyhole.

For theoretical investigations a numerical simulation model was build with the commercial code COMSOL Multiphysics. The model takes into account the three phases of the metal: solid, liquid and vapor. With the knowledge of the phase interface between the liquid and vapor phase the propagation of the light is calculated with the help of a raytracer.

For an experimental evaluation of the model the intensity of the reflected light was obtained by the help of a modular assembled radiation analyzer. With this measuring system the reflected light is time and place resolved, detected on the whole hemisphere around the process.