



## ACTIVE SOLDERING PROCESS FOR RETARDATION PLATES

### Task

Soldering processes are already being used today to mount optical components, especially in space applications, such as in the MERLIN project. In this context, active soldering is developing into a technology that can ensure a resilient connection of special optical components, such as retardation plates. Fraunhofer ILT has established methods in the field of packaging with which adjustable, highly stable holders for retardation plates can be produced.

### Method

The active soldering process is used here to fix  $\lambda/2$  or  $\lambda/4$  retardation plates directly to a metallic counterpart. The soldering process does not require any complex pretreatment of the optical substrates, such as the application of adhesion-promoting coatings. Process steps such as applying flux or creating an evacuated environment to increase wetting of the joining partners with solder are also eliminated. In addition, processing can be carried out quickly without the aid of complex soldering systems. Optimized mechanical interfaces

ultimately lead to a single component that can be integrated into an existing laser system. If necessary, such a component can be adjusted or even replaced.

### Results

The active soldering process was used in combination with optimized mechanical interfaces to assemble retardation plates. Fraunhofer ILT checked the quality of the assembled phase plates using thermal and mechanical alternating loads. The observed stress states in the optical substrate remained within the acceptance range. No damage or misalignment of the retardation plates was observed.

### Applications

The assembly of optical components is often limited by their mechanical properties or special geometry. The process developed at Fraunhofer ILT makes it possible to mount particularly thin substrates with direction-dependent, thermal expansion coefficients. By eliminating expensive pretreatment processes of the optical substrates in this assembly technology, the institute is helping to develop economical industrial applications that require individual and robust components stable for the long-term and over a large temperature range.

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1 Retardation plate in holder.