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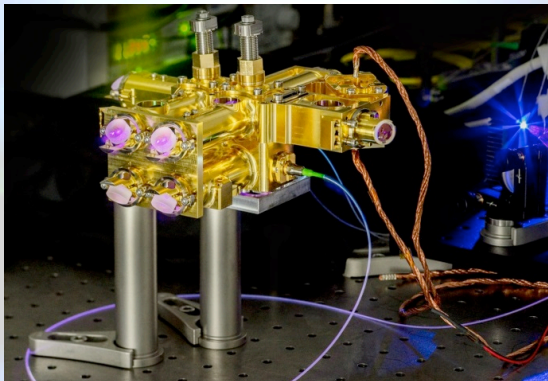
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Packaging of Optical Systems for Harsh Environments in Automotive, Aviation and Space

Abstract

Optical systems, such as laser ignition spark plugs, laser sensing systems or advanced imaging systems, often have to be prepared to work in extremely demanding environmental conditions. These conditions might be composed of mechanical shock and vibrations, high or low temperature or steep temperature gradients, high humidity, high radiation load or even a multitude of such conditions that arise from applications in automotive, aviation, aerospace, medical equipment and science instrumentation. The scientist or engineer that developed a laboratory breadboard for a proof-of-principle of the design idea then faces the demand to transfer this design into something ruggedized that will survive the harsh environmental conditions in the final application. In particular challenging is to achieve stability and alignment tolerances that can be in the micron or arcsec range.

The talk will give a comprehensive overview of optical systems packaging technology, and will focus on joining and bonding, as it is the final and crucial process step to secure and maintain accuracy and stability of the packaged optical system. Some application examples will be given for the described technologies, such as a laser spark plug for laser ignition, a miniaturized source for laser-breakdown raman spectroscopy, a photon source for quantum communication, and mounted lenses for large aperture imaging systems.



Entangled photon source for satellite based quantum communication (left), GRISM assembly for satellite based imaging spectrometers (right) - examples for space-suitable optical systems.