ÖAW — AUSTRIAN ACADEMY OF SCIENCES

MODULAR SETUP OF SLR LASER AND DETECTION PACKAGES

Nadine M. Trummer[1], Michael A. Steindorfer[1], Franz Koidl[1], Peiyuan Wang[1], Georg Kirchner[1], Andre Kloth[2], Jost Munder[2], Jens Steinborn[2], Tim Flohrer[3], Andrea di Mira[3], Clemens Heese[3]

[1]IWF/ÖAW, Austria; [2]Digos Potsdam GmbH, Germany; [3]European Space Agency, Germany

An increasing number of facilities capable of doing satellite laser ranging, space debris laser ranging or optical communication pushes the demand to create accurate, cost-efficient, reliable and yet simple components to be integrated. In the framework of the development and upgrade of the new Izaña-1 SLR station located on Tenerife in Spain, IWF Graz created new concepts for modular piggyback laser and detection packages. Optical components are selected based on commercial off the shelf (COTS) products and simulated with raytracing software.

DETECTION PACKAGE

- Detection packages (img 1) mounted on Nasmyth focus
- Adjustable field of view iris followed by a collimation to ≈ 1 cm.
- Wavelength separation of incoming light through dichroic mirrors
- Distribution to sensor modules (optical guidance cameras, adjustment cameras, single photon avalanche detectors (SPAD))
- Package operates temperature control and necessary interfaces

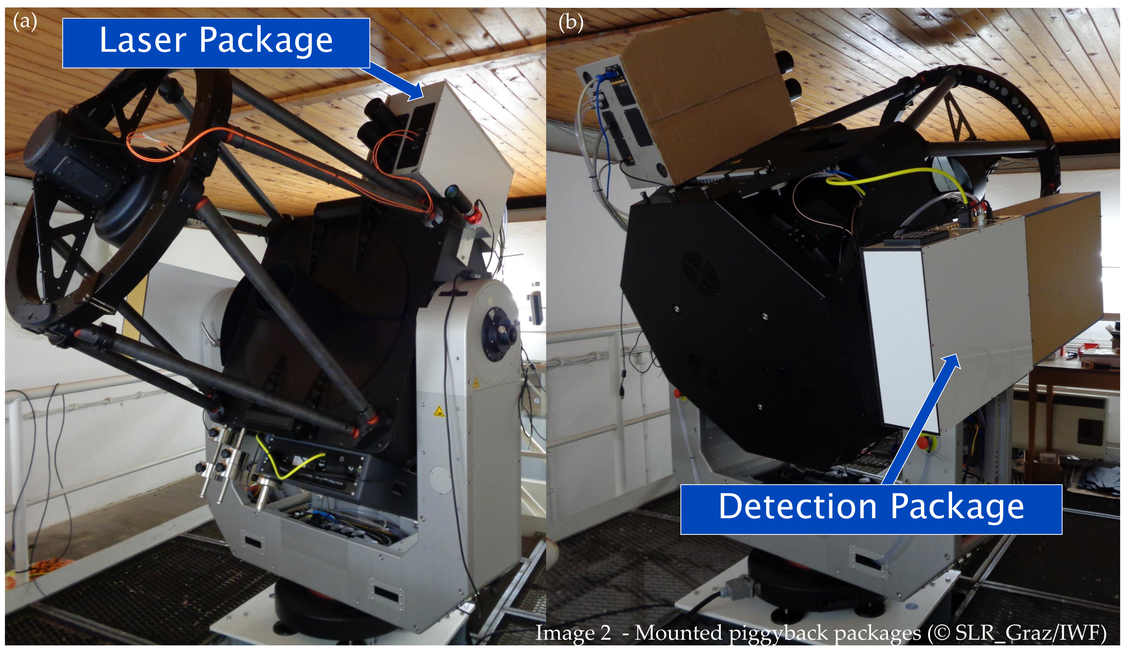

Image 2 - Mounted piggyback packages (© SLR_Graz/IWF)

LASER PACKAGE

- Pulsed laser source at wavelengths 532 nm / 1064 nm
- Laser with two separate beam expansion telescopes, collimated part in between
- Power adjustment and measurement via a combination of wave plates and polarizing beam splitters
- Flexible beam divergence variation via motorized lens holder
- Direction control through a motorized tip-tilt mirror

A MODULAR DESIGN APPROACH

- Documentation of the design process using 3D-CAD-Software (Autodesk Inventor)
- Identifying and standardizing reoccurring subunits
- Utilizing a Cage-rod-system, allowing for future additions and upgrades
- Optimization of mechanical design, allowing the use of identical subunits on both 532 nm and 1064 nm beam paths

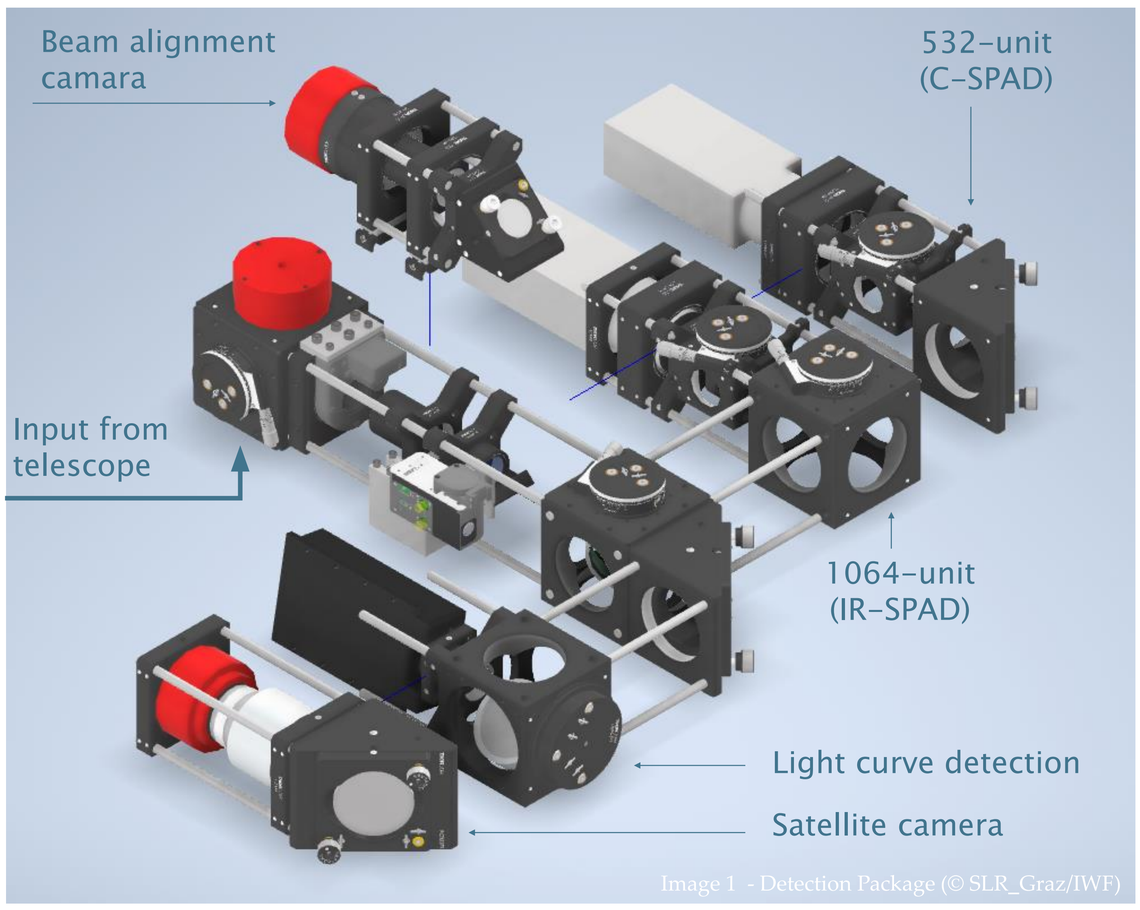

Image 1 - Detection Package (© SLR_Graz/IWF)

TESTING, ALIGNMENT, MAINTENANCE

- Dedicated tool allows quick insertion and removal of an alignment camera at pre-defined positions (e.g. in front of SPADs)
- Modular piggyback system allows easy access for maintenance and upgrades
- 3D-CAD software enables the testing of new sub-unit configurations even after shipping

SUMMARY

Piggyback type laser and detection packages strive to provide a compact, modular design for SLR-applications, utilizing modern 3D-CAD-software to model and document the process.

A cage-rod-system provides the framework for the packages, which allows a flexible, modular design approach. Reoccurring subunits are identified and, if applicable, standardized. The reliance on motorized linear and rotary units allows flexible and immediate divergence variation, FOV control, direction control and power measurements.

Alignment tools based on COTS components allow a seamless integration of the testing device into the beam path at predefined positions.

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IWF — INSTITUT FÜR WELTRAUMFORSCHUNG, WWW.OEAW.AC.AT/IWF, NADINEMARIA.TRUMMER@OEAW.AC.AT