

Newport Motion with a Renewed Focus on Automated Optical Fiber Alignment Systems

Fiber optic sensors constitute the core of telecommunication markets as well as being important part of automotive and industrial applications. With the recent renewed growth and technology advances in fiber optics, there is an increasing need for automating photonics alignment. Recent and related application notes have shown that Newport can provide various integrated solutions for alignment and metrology of optical fibers and fiber optic components such as waveguides, fiber collimators and other devices.

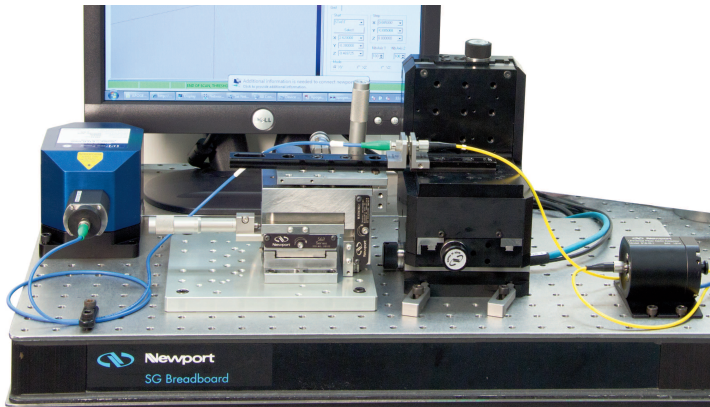


Figure 1: VP25XL-XYZR single-mode fiber alignment setup

Shown in Figure 1 is a basic fiber alignment system using a [VP-25XL-XYZR](#), an [ULTRAalign 561](#) assembly, an [XPS-C4 universal motion controller](#), a [2936-C power meter](#), a [918D detector](#) and the Apogee software from GBCS, a third party supplier. The system demonstrates the alignment of single-mode fibers with a 9µm standard core diameter. Measured transmitted optical power through the fiber devices is relayed from the detector/meter as analog signals to the XPS. The Apogee software then initiates, through the XPS, the corresponding position corrections of the VP stages to further optimize the power.

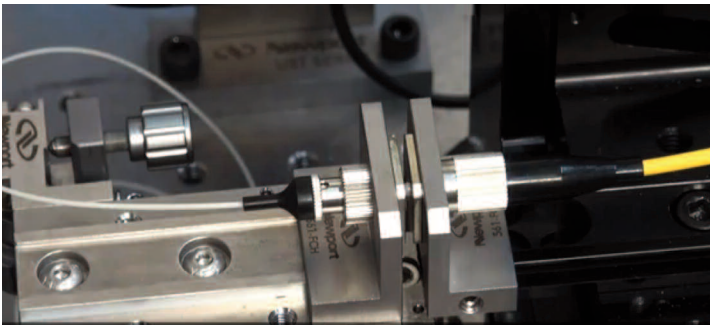


Figure 2: Single-mode fiber to fiber alignment

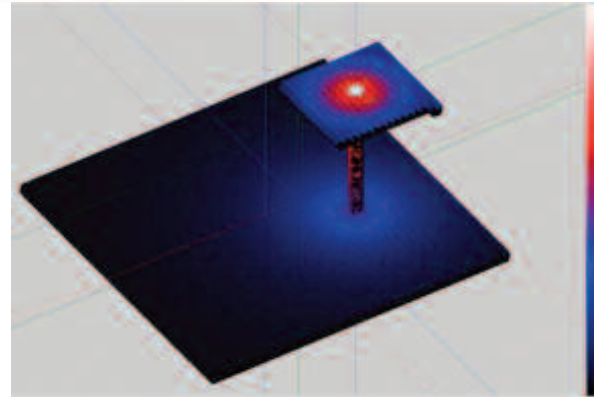


Figure 3: 3D representation of optical throughput versus time

The alignment process is accomplished initially with coarse positioning and then fine adjustment. A raster scan or other scanning techniques is performed with the VP-25XL-XYZ to find a position with a minimum threshold of transmitted light into the device. Once this position is determined, an optimization routine, or a combination of user-selectable optimization routines, is started to maximize the amount of transmitted light. A graphical representation of the optimization result is shown in Fig 3.

The motion assembly and Apogee are configurable, allowing easy conversions to align more complicated devices like a WDM multiplexer with one or more fibers on both ends. To get a better view of the alignment process, a bridge can be supplied for mounting cameras to monitor the relative positions of the fibers in both the vertical and horizontal planes as shown in Fig 4.

Each of the components in this assembly were chosen for various reasons. The VP-25XL is ideal for fiber alignment due to its 10nm MIM, low profile and high reliability. It is modular, enabling the assembly of compact XYZ stacks. With a direct read encoder, the VP-25XL will stay in position over long periods while the devices are processed. Complementing the VP-25XL is the 561 ULTRAalign steel stage assembly, designed specifically for manual fiber alignment. The 561 is very stable and is easily upgradeable for automation. The XPS motion controller does not only have a high-performance servo system, but also comes with plenty of I/O's and other features necessary in alignment applications.

A video of this fiber alignment system is available at:

http://youtu.be/gyc_WJ-vCXk

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Figures 4, 5, 6 and 7 illustrate other versions of Newport alignment systems that span across levels of performance required by various customers. In turn, the level of performance dictates the budget. Figures 4 and 5 are high performance systems utilizing XMS stages, while Figures 6 and 7 utilize manual stages upgraded with motorized actuators for simpler, cost effective solutions. Newport and its software partner, now have the capability to supply automated fiber alignment solutions. Based on the specific application requirements, one can pick from a number of motion configurations that will meet the needed alignment resolution, stability, reliability, throughput and budget.

For any questions about Newport motion solutions for fiber alignment, please contact our application engineers at tech@newport.com.

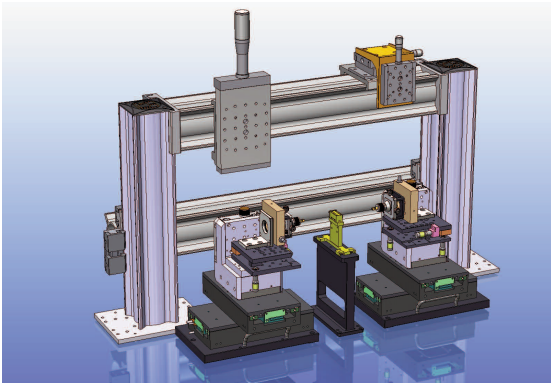


Figure 4: 2 x 6-axis with XMS160 with error mapping for XY, VP25-XL for Z, SR50CC and 37 for tip-tilt-rotation with an X95 bridge

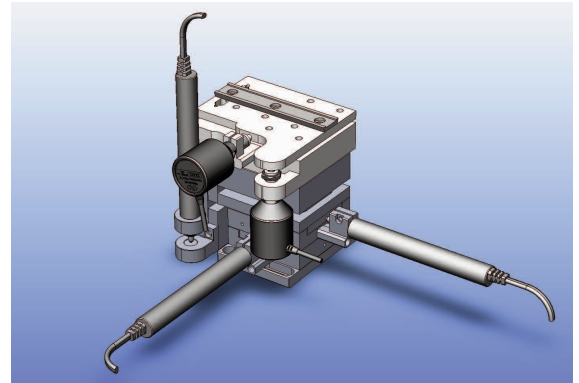


Figure 6: Low cost 5-axis with 562F-XYZ fiber alignment stages, 562-TILT platform, 3 x TRA12 and 2 x NSA12 actuators

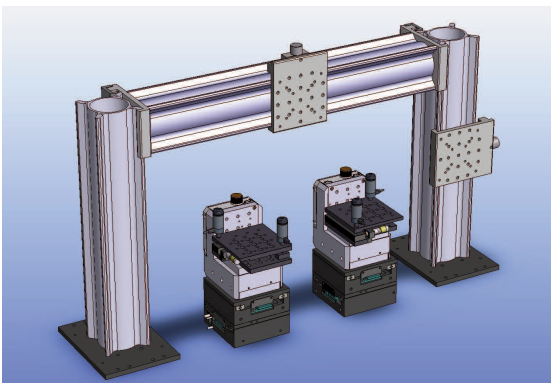


Figure 5: 2 x 6-axis with XMS50 for XY, VP25-XL for Z, 37 for tilt-rotation

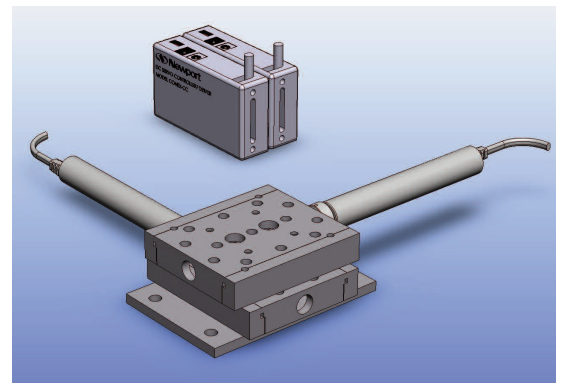


Figure 7: Simple 2-axis with 2 x UMR8.25 and CONEX-TRA25CC