Newsletter 2

HORIZON-CL4-2023-TWIN-TRANSITION-01-02.

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FLASH

Flexible Laser-Based Manufacturing

Preparation of three laser beam coupling module

The FLASH system makes use of three different laser sources: a 1080 nm continuous wave (CW) infrared source, a 515 nm “short” pulse (1-10 ns) source, and a 527 nm “long” pulse (300 ns) source.

This permits multi-wavelength emission simultaneously with a broad range of pulse lengths. These three laser sources, combined with three beam delivery heads provide a great degree of machining flexibility. This includes welding, cutting, drilling, texturing, micro-machining, macro-polishing, all to different levels of precision or efficiency for the desired application and material. Additionally, using multiple beams at the same time allows the advanced processing to take place, for example, one source can provide the bulk of material removal, while a second source cleans the surface, resulting in a fast, low roughness process.

To use the lasers in the different processing heads the first step is to overlap them spatially. To do so, the three laser sources will be integrated using a laser beam coupling module, which is already a standard product at Synova for two laser sources and is currently adapted to introduce a third laser beam. The optical diagram of the laser beam coupling module has been conceptualised (Figure 1) and consists of off-the-shelf optical components that have been adapted to meet the FLASH specifications.

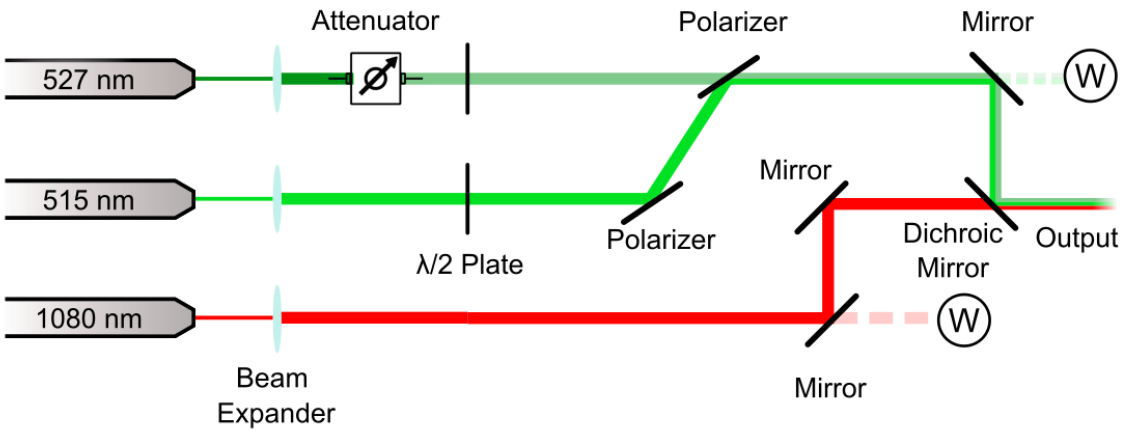

Figure 1 - Optical drawing of three laser beam coupling module.

First, each laser beam will pass through a beam expander, allowing the adjustment of the three laser beams to the same size for further efficient coupling within the fibre. The long pulse laser beam additionally passes through an attenuator to control independently, power and pulse duration, which is needed for water jet guided laser technology. The laser beams pass through half-wave plates to control polarisation orientation. The green lasers are combined with polarisation. The continuous wave infrared laser beam is directed by mirrors and is ultimately combined with the remaining lasers via dichroic mirror.