



Two-dimensional laser beam combining

## Technology Summary

A new laser-beam-combining system is disclosed based on an advanced time-division-multiplexing technique comprising a 1D or 2D array of pulsed lasers, a beam deflector, and a power supply and controller connected to the beam deflector. The system is configured such that the beam deflector receives each laser pulse from the array of pulsed lasers, and by controlling the timing of the laser pulses and the deflection properties of the beam deflector, the laser pulses can be combined to form a laser beam. Therefore, the combined beam will have the same quality (i.e., spatial profile and spectral bandwidth) as the quality of the individual lasers, yet the average power of the combined beam can be much higher than the average power of the individual lasers as it can have a much higher repetition rate.

## Application & Market Utility

By combining 1000 pulsed laser beams (10 kHz repetition rate; 0.6 kW average power) using this system, the resultant beam will have a 10 MHz repetition rate with a 1000-fold increase in average power (600 kW, approaching the individual pulsed lasers' peak power), making it suitable for laser directed energy weapons and large-area, high-speed laser manufacturing. This system is robust, can be designed to have a small footprint, and can deliver an overall optical energy efficiency of more than 99%.

## Next Steps

Proof of concept has been established. Seeking partner for continued development and/or licensing.

TECHNOLOGY READINESS LEVEL

1-3

### Seeking

Investment | Licensing | Research

### Keywords

- laser beam combining
- time division multiplexing
- KTN beam deflector
- directed energy weapon
- laser manufacturing

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