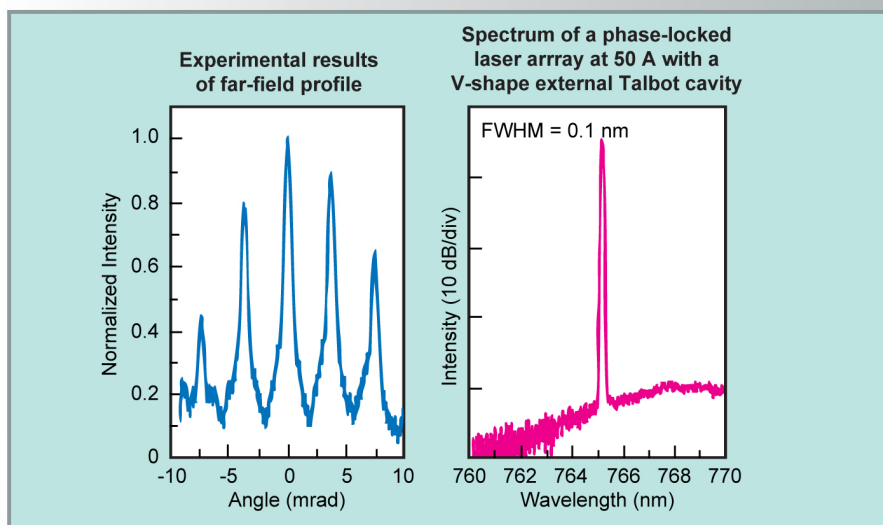


# Resonator for Coherent Addition of Semiconductor Laser Arrays and Applications for a Solar Pumped Laser Array

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## Technology Summary

ORNL inventors designed a scalable V-shaped resonator for coherent addition of semiconductor laser arrays. A V-shaped external Talbot cavity offers a solution for the broad-area laser-diode-array coherent-beam combination. In this design, narrow line width and high output power from the laser array have been achieved without using the spatial filter. This technology is scalable to broad-area laser-diode stacked arrays.

With extremely high electrical-to-optical conversion efficiency and low cost, broad-area laser diode arrays are considered very promising lightweight high power sources. However, each broad-area laser diode in an array is a multimode laser. The broad spectrum and poor beam quality of an entire array are drawbacks to their application and only allow their use as pumping sources of solid-state or fiber lasers.

Currently, the coherent beam combination is the most promising technology to achieve both narrow line-width and improved beam quality. ORNL's invention further improves this combination, making it scalable and efficient. The innovative ORNL approach to reaching high power densities is based on using many low-power lasers. Each laser in the array outputs only a few watts and could be pumped by solar energy. Using such low power lasers will significantly relax the design requirements for the solar pumping setup.

## Advantages

- Scalable to broad-area laser diode stacked array
- No spatial filter
- Improved spectral line width and beam quality
- Use of solar energy as a pumping source
- Use of solar energy for laser beam energy transport

## Potential Applications

- For directed energy laser communication in space and underwater, detection and sensing applications, hydrogen production, and clean fuel production (e.g., ethanol and methanol)

## Patent

Application in preparation

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