Skysong Innovations
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Case ID:M22-144P
Published: 11/3/2022

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Novel 2D Scalable High Power Optical Phased Array Architecture with Beam Steering

Background

Optical communication provides the fastest way of data transmission. The beam width of optical signals can be very narrow compared to radio frequency (RF) or millimeter-wave signals, which provides increased capacity for sensing and imaging. Optical phased array systems have been developed recently as an alternative to microwave phased systems. These systems have high power transmission capabilities but may need several laser sources to manage the power handling capability of optical waveguides and prevent undesired non-linear effects. Additionally, the significant power loss due to phase shifters in optical systems is undesirable for high-power applications.

Invention Description

Researchers at Arizona State University have developed a novel scalable two-dimensional (2D) optical phased array system that can transmit high power signals without limitations on the power handling capabilities of the optical waveguides. This system prevents the effects of phase shifter loss in the transmitted power by using multiple laser sources working coherently for higher power signal generation. This system also significantly reduces the complexity of the electronic control of the phase shifters.

The novel architecture of this system uses integrated nano-scale lasers coupled together through 2D optical coupling networks, which also serve as the phase shifters of the proposed phased array system. Each pixel includes a local laser source or an array of nano-scale lasers and antennae. The effect of the loss of the optical phase-shifters on the transmit power is effectively eliminated with this architecture by utilizing the phase shifters as the coupling elements between the sources.

Potential Applications

- Light Detection and Ranging (LiDAR) products
- Free space optical transmitters and imagers

Benefits & Advantages

- Scalable in the 2D direction (transmitted power can scale with size of array)
- Eliminates phase shifter induced power loss
- Improves efficiency and transmitted power
- Improves phase noise of transmitted signal due to coupling between sources
- Simplifies phase control scheme and interconnection of architecture
- Less required electronic DC power for control circuitry of individual pixels,

rows and columns

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