

Abstract 4 – Paper ID: 079**Solid-State Optical Beam Scanner for LiDAR Application**

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Abstract

We demonstrate a silica arrayed waveguide grating (AWG) based on optical phased array (OPA) solid-state beam scanner with a low total insertion loss of 4.04 dB. The 64-channel AWG OPA, combined with a digital MEMS device, achieves two-dimensional (2D) optical beam steering via wavelength tuning from 1535 nm to 1565 nm, providing a field-of-view (FOV) of $15.8^\circ(\text{H}) \times 12^\circ(\text{V})$. Furthermore, the FOV is efficiently expanded to $76.58^\circ \times 48^\circ$ using a compact lens relay system without deteriorating the beam profile. A metalens with a hyperbolic cylindrical phase gradient reshapes the elliptical output beam into a circular profile, yielding a full-angle divergence of $0.125^\circ(\text{H}) \times 0.095^\circ(\text{V})$. In addition, we propose and experimentally demonstrate a synchronous transceiving FMCW ranging scheme using a single silica AWG OPA chip, functioning as both transmitter (Tx) and receiver (Rx), offering a promising approach with a negligible errors and highlighting its potential for future solid-state FMCW LiDAR sensors.

Keywords: Optical phased array, arrayed waveguide grating, 2D beam steering