Claims:

What is claimed is:

1. A light detection and ranging (LIDAR) system comprising:

a seed laser configured to output a beam;

a modular modulator configured to receive the beam output from the seed laser and modulate the beam to create a modulated beam;

a modular amplifier configured to receive the modulated beam from the modular modulator and generate an amplified beam, wherein the modular amplifier comprises a particular semiconductor optical amplifier having multiple apertures; and

a modular transceiver chip coupled to the modular modulator and the modular amplifier, the modular transceiver chip configured to emit the beam perpendicularly from a first surface of the modular transceiver chip through an optical window and receive a reflected beam from a target through the optical window.

2. The LIDAR system of claim 1, wherein the seed laser comprises a laser having a grating structure that provides optical feedback to output the beam.

3. The LIDAR system of claim 2, wherein the seed laser comprises a lens coupling the beam to the modular modulator, the lens having a pitch in a range of 450 to 550 micrometers.

4. The LIDAR system of claim 1, wherein the modular modulator performs in-phase and quadrature modulation to generate the modulated beam.

5. The LIDAR system of claim 1, wherein the modular modulator performs frequency modulation to generate the modulated beam.

6. The LIDAR system of claim 1, wherein the modular modulator and the seed laser are integrated into a single chip.

7. The LIDAR system of claim 6, wherein the seed laser is mounted on a first submount and the modular transceiver chip coupled to the modular modulator is mounted on a second submount for aligning a height of the seed laser and a height of the modular transceiver chip for optical coupling.

8. The LIDAR system of claim 1, wherein the modular amplifier comprises a semiconductor optical amplifier.

9. The LIDAR system of claim 1, wherein the modular amplifier comprises a tapered semiconductor optical amplifier that is configured to receive the modulated beam from the modular modulator and generate the amplified beam through stimulated emission.

10. The LIDAR system of claim 1, wherein the modular amplifier includes one of indium phosphide (InP), gallium arsenide (GaAs), indium monoarsenide (InAs), gallium and nitride (GaN), indium antimonide (InSb), or rare-earth doped material.

11. The LIDAR system of claim 1, wherein the particular semiconductor optical amplifier has additional material on its sides for bow management.

12. The LIDAR system of claim 1, wherein the modular amplifier comprises a first bar mounted on a first portion of the modular amplifier and a second bar mounted on a second portion of the modular amplifier, the second bar having a coefficient of thermal expansion matching that of the first bar, the first bar and the second bar configured to lower a junction temperature of the modular amplifier.

13. The LIDAR system of claim 1, wherein the modular modulator is optically coupled to the modular amplifier by a lens array.

14. The LIDAR system of claim 13, wherein the lens array compensates for a height difference in a first height of a submount of the modular modulator and a second height of a submount of the modular amplifier.

15. The LIDAR system of claim 1, further comprising a splitter that couples the modular modulator to the modular amplifier, wherein the splitter includes a 1-to-16 splitter with a pitch in a range of 450 to 550 micrometers.

16. The LIDAR system of claim 1, further comprising a lens array that couples the modular modulator to the modular amplifier, and a splitter that includes a plurality of 1-to-4

splitter chips with a pitch in a range of 450 to 550 micrometers, and wherein the lens array includes four lenses and have a pitch in a range of 450 to 550 micrometers.

17. The LIDAR system of claim 1, wherein the modular modulator, the modular amplifier and the modular transceiver chip are horizontally integrated.

18. The LIDAR system of claim 1, wherein the modular modulator, the modular amplifier and the modular transceiver chip are vertically integrated.

19. The LIDAR system of claim 1, wherein the modular modulator, the modular amplifier and the modular transceiver chip are part of an autonomous vehicle.

20. The LIDAR system of claim 1, wherein the modular modulator, the modular amplifier and the modular transceiver chip are part of an autonomous vehicle control system.