WHAT IS CLAIMED IS:

1. A light detection and ranging (lidar) system for a vehicle comprising:

a transceiver;

a first device including a laser source configured to generate a beam, and one or more optical components;

a second device including one or more analog-to-digital converters (ADCs); and

a processor configured to alternately (1) operate the first device to generate, based on the beam, an optical signal associated with a local oscillator (LO) signal, and (2) operate the transceiver to transmit the optical signal to an environment, wherein

in response to transmitting the optical signal, the transceiver is configured to receive a returned optical signal that is reflected from an object in the environment, and pair the returned optical signal with the LO signal to generate an electrical signal, and

the second device is configured to generate, based on the electrical signal, a digital signal.

2. The lidar system of claim 1, wherein the processor is configured to periodically turn on the first device with a first duty cycle and turn on the transceiver with a second duty cycle.

3. The lidar system of claim 1, wherein the transceiver includes at least one of silicon photonics circuitry, photonic lightwave circuit (PLC), or III-V semiconductor circuitry.

4. The lidar system of claim 1, wherein the first device includes at least one of silicon photonics circuitry, PLC, or III-V semiconductor circuitry.

5. The lidar system of claim 1, wherein the second device includes at least one of silicon photonics circuitry, PLC, or III-V semiconductor circuitry.

6. The lidar system of claim 1, wherein the transceiver has a first group of N transmit (TX) channels, a second group of N TX channels, and 2N receive (RX) channels, wherein N is an integer, and the second device has 2N channels.

7. The lidar system of claim 6, wherein N is in the range from 8 to 16.

8. The lidar system of claim 6, wherein

the first device is configured to generate a first optical signal associated with a first LO signal,

in response to the first device generating the first optical signal, the transceiver is configured to transmit the first optical signal to the environment through the first group of N TX channels,

in response to the transceiver transmitting the first optical signal, the first device is configured to generate a second optical signal associated with a second LO signal, and

in response to the first device generating the second optical signal, the transceiver is configured to transmit the second optical signal to the environment through the second group of N TX channels.

9. The lidar system of claim 6, wherein

in response to turning on the first device, the first device is configured to selectively provide the optical signal to one of the first group of N TX channels or the second group of N TX channels,

in response to turning on the transceiver, the transceiver is configured to transmit the optical signal to the environment through the one of the first group of N TX channels or the second group of N TX channels, receive, through the 2N RX channels, the returned optical signal, and pair the returned optical signal with the LO signal to generate the electrical signal, and

the second device is configured to generate, based on the electrical signal through the 2N channels of the second device, the digital signal.

10. The lidar system of claim 6, further comprising:

a plurality of optical amplifiers configured to provide amplified optical signals to the first group of N TX channels,

wherein the number of the plurality of optical amplifiers is less than N.

11. The lidar system of claim 10, wherein the plurality of optical amplifiers include one or more tapered optical amplifiers (TPAs), wherein the one or more TPAs contain a tapered section in which a cross-section area of an amplified beam is gradually increased.

12. The lidar system of claim 11, wherein the one or more TPAs are one or more tapered semiconductor optical amplifiers (SOAs).

13. The lidar system of claim 10, wherein the first device is configured to provide, based on the beam, a seed optical signal to the plurality of optical amplifiers.

14. The lidar system of claim 13, further comprising a splitter,

wherein the first device is configured to provide the seed optical signal to the plurality of optical amplifiers through the splitter.

15. The lidar system of claim 14, wherein the splitter is coupled to an input side of an optical amplifier using one of butt coupling or lens coupling.

16. The lidar system of claim 1, wherein the transceiver is an integrated circuit including at least one of silicon photonics circuitry, PLC, or III-V semiconductor circuitry.

17. The lidar system of claim 1, wherein the transceiver includes a transmitter device; and a receiver device.

18. The lidar system of claim 17, wherein one of the transmitter device or the receiver device is an integrated circuit including at least one of silicon photonics circuitry, PLC, or III-V semiconductor circuitry.

19. An autonomous vehicle control system comprising:

one or more processors; and one or more computer-readable storage mediums storing instructions which, when executed by the one or more processors, cause the one or more processors to:

alternately (1) operate a first device including a laser source to generate, based on a beam generated from the laser source, an optical signal associated with a local oscillator (LO) signal, and (2) operate a transceiver to transmit the optical signal to an environment, wherein the first device includes one or more optical components,

in response to transmitting the optical signal, cause the transceiver to receive a returned optical signal that is reflected from an object in the environment, and pair the returned optical signal with the LO signal to generate an electrical signal,

cause a second device to generate, based on the electrical signal, a digital signal wherein the second device includes one or more analog-to-digital converters (ADCs), and

control operation of a vehicle using the digital signal.

20. An autonomous vehicle comprising:

at least one of a steering system or a braking system; and

a vehicle controller comprising one or more processors configured to:

alternately (1) operate a first device including a laser source to generate, based on a beam generated from the laser source, an optical signal associated with a local oscillator (LO) signal, and (2) operate a transceiver to transmit the optical signal to an environment, wherein the first device includes one or more optical components,

in response to transmitting the optical signal, cause a transceiver to receive a returned optical signal that is reflected from an object in the environment, pair the returned optical signal with the LO signal to generate an electrical signal,

cause a second device to generate, based on the electrical signal, a digital signal, wherein the second device includes one or more analog-to-digital converters (ADCs), and

control the at least one of the steering system or the braking system using the digital signal.