CLAIMS

~~What is claimed is:~~

1. A system comprising:

a vehicle;

a light source coupled to the vehicle, wherein the light source is configured to emit at least one light pulse toward an environment of the vehicle; and

a controller operable to:

determine an emission vector of the at least one light pulse;

determine an elevation angle component of the emission vector; ~~and~~

dynamically determine a ground-skimming beam elevation angle based on a predetermined height above a roadway at a predetermined distance away from the vehicle;

compare the elevation angle component to the ground-skimming beam elevation angle; and

dynamically adjust a per pulse energy of ~~of~~ at least one subsequent light pulse based on the comparison~~determined elevation angle component~~.

2. The system of claim 1, wherein the light source is configured to emit light in a scanning pattern.

3. The system of claim 2, wherein the controller is further operable to adjust the emission vector of the at least one subsequent light pulse according to the scanning pattern.

4. The system of claim 1, wherein the controller is operable to dynamically adjust the per pulse energy of the at least one subsequent light pulse further based on at least one of: point cloud data, map data, image data, object data, retroreflector location data, time of day, ambient light condition, sun position, a pose of the vehicle, a heading of the vehicle, or an operating condition of the vehicle.

5. The system of claim 1, further comprising a light detection and ranging (LIDAR) system, wherein the light source is an element of the LIDAR system.

6. The system of claim 1, wherein the at least one subsequent light pulse comprises a plurality of light pulses.

~~7. The system of claim 6, wherein a pulse length of at least one light pulse of the plurality of light pulses is between 10 picoseconds to 10 nanoseconds.~~

~~8.~~7.The system of claim 6, wherein the controller is operable to dynamically adjust a per pulse energy of at least one light pulse of the plurality of light pulses, wherein the pulse energy of at least one light pulse is between 10 nanojoules and 10 microjoules.

~~9.~~8.The system of claim 6, wherein a pulse repetition rate of at least a portion of the plurality of light pulses is between 50 kilohertz and 1 megahertz.

~~10.~~9. The system of claim 1, wherein the light source comprises a fiber laser operable to emit light pulses having a wavelength of 905 nanometers or 1550 nanometers.

~~11.~~10. The system of claim 1~~0~~,9 wherein the controller is operable to dynamically adjust the per pulse energy of the at least one subsequent light pulse by adjusting at least one of a seed laser parameter or a pump laser parameter.

~~12.~~11. A method comprising:

determining an emission vector of a light pulse emitted by a light source of a light detection and ranging (LIDAR) system;

determining an elevation angle component of the emission vector; ~~and~~

dynamically determining a ground-skimming beam elevation angle based on a predetermined height above a roadway at a predetermined distance away from the vehicle;

comparing the elevation angle component to the ground-skimming beam elevation angle; and

dynamically adjusting a per pulse energy of at least one subsequent light pulse emitted by the light source based on the comparison~~determined elevation angle component~~.

~~13.~~12. The method of claim ~~12~~11, wherein the LIDAR system is coupled to a vehicle, wherein dynamically adjusting the per pulse energy of the at least one subsequent light pulse is further based on at least one of: point cloud data, map data, image data, object data, retroreflector location data, time of day, ambient light condition, sun position, a pose of the vehicle, a heading of the vehicle, or an operating condition of the vehicle.

~~14.~~13. The method of claim ~~12~~11, further comprises causing the light source to emit a plurality of light pulses.

~~15. The method of claim 14, wherein a pulse length of at least one light pulse of the plurality of light pulses is between 10 picoseconds to 10 nanoseconds.~~

~~16.~~14. The method of claim ~~14~~13, wherein dynamically adjusting a per pulse energy of the at least one subsequent light pulse comprises adjusting a pulse energy of at least one light pulse of the plurality of light pulses, wherein the pulse energy of at least one light pulse is between 10 nanojoules and 10 microjoules.

~~17.~~15. The method of claim ~~14~~13, wherein a pulse repetition rate of at least a portion of the plurality of light pulses is between 50 kilohertz and 1 megahertz.

~~18.~~16. The method of claim ~~12~~11, wherein the light source comprises a fiber laser operable to emit light having a wavelength of 905 nanometers or 1550 nanometers.

~~19.~~17. The method of claim ~~18~~16, wherein dynamically adjusting the per pulse energy of the at least subsequent one light pulse comprises adjusting at least one of a seed laser operating parameter or a pump laser operating parameter.

~~20.~~18. The method of claim 1~~2~~,11 wherein dynamically adjusting the per pulse energy of the at least one subsequent light pulse is further based on a laser safety standard.

19. The system of claim 1, wherein the predetermined distance is between 60 and 200 meters away from the vehicle, and wherein the predetermined height is between 0 and 4 meters above the roadway.

20. The method of claim 11, wherein the predetermined distance is between 60 and 200 meters away from the vehicle, and wherein the predetermined height is between 0 and 4 meters above the roadway.