Claims

1. A system comprising: a beam steering assembly configured to adjust an incident beam to form a corrected beam; a beam monitoring assembly optically coupled to the beam steering assembly, the beam monitoring assembly configured to generate monitoring data for the corrected beam, wherein the monitoring data includes one or more offset parameters of the corrected beam, wherein the beam monitoring assembly comprises: a leak mirror configured to: receive the corrected beam from the beam steering assembly; reflect a first portion of the corrected beam; and transmit a second portion of the corrected beam; and a beam splitter configured to: receive the second portion of the corrected beam transmitted by the leak mirror; transmit a third portion of the corrected beam through at least a first optical element to a first imaging device; and reflect a fourth portion of the corrected beam through at least a second optical element to a second imaging device, wherein the third portion of the corrected beam and the fourth portion of the corrected beam are formed from the second portion of the corrected beam; and a controller communicatively coupled to the beam monitoring assembly and the beam steering assembly, wherein the controller includes one or more processors configured to execute a set of program instructions stored in memory, wherein the program instructions are configured to cause the one or more processors to: store one or more zero parameters of the corrected beam; calculate at least one difference between the one or more zero parameters and the one or more offset parameters of the corrected beam; determine one or more beam position adjustments of the incident beam based on the at least one difference between the one or more zero parameters and the one or more offset parameters of the corrected beam; and direct the beam steering assembly, via one or more motor drivers, to actuate one or more motors to adjust the incident beam to form the corrected beam.

2. The system in claim 1, wherein the one or more offset parameters of the corrected beam includes at least one of: an offset pointing component of an offset position of the corrected beam, an offset translation component of the offset position of the corrected beam, an offset beam size, or offset beam breathing data.

3. The system in claim 2, wherein at least one of the offset pointing component of the offset position of the corrected beam, the offset translation component of the offset position of the corrected beam, the offset beam size, or the offset beam breathing data includes at least one of an x-direction component or a y-direction component.

4. The system in claim 1, wherein the one or more zero parameters of the corrected beam includes at least one of: a zero pointing component of a zero position of the corrected beam, a zero translation component of the zero position of the corrected beam, a zero beam size, or zero beam breathing data.

5. The system in claim 4, wherein at least one of the zero pointing component of the zero position of the corrected beam, the zero translation component of the zero position of the corrected beam, the zero beam size, or the zero beam breathing data includes at least one of an x-direction component or a y-direction component.

6. The system in claim 1, wherein calculating the difference between the one or more zero parameters and the one or more offset parameters of the corrected beam includes calculating a pointing difference between a zero pointing component of a zero position of the corrected beam and an offset pointing component of an offset position of the corrected beam.

7. The system in claim 1, wherein calculating the difference between the one or more zero parameters and the one or more offset parameters of the corrected beam includes calculating a translation difference between a zero translation component of a zero position of the corrected beam and an offset translation component of an offset position of the corrected beam.

8. The system in claim 1, wherein calculating the difference between the one or more zero parameters and the one or more offset parameters of the corrected beam includes calculating a beam size difference between a zero beam size and an offset beam size.

9. The system in claim 1, wherein calculating the difference between the one or more zero parameters and the one or more offset parameters of the corrected beam includes calculating a beam breathing data difference between zero beam breathing data and offset beam breathing data.

10. The system in claim 1, wherein the beam steering assembly is further configured to: generate encoder data for the one or more motors following actuation of the one or more motors.

11. The system in claim 10, wherein the program instructions are further configured to: verify the actuation of the one or more motors in response to the one or more beam position adjustments via the encoder data.

12. The system in claim 1, wherein the beam steering assembly comprises: at least two prisms coupled to the one or more motors, wherein actuating the one or more motors to alter a distance between the two prisms via the one or more motors adjusts a translation component of a position of the incident beam to form the corrected beam, wherein actuating the one or more motors to tilt at least one of the two prisms via the one or more motors adjusts a pointing component of the position of the incident beam to form the corrected beam, wherein actuating the one or more motors to simultaneously alter the distance between the two prisms and tilt at least one of the two prisms via the one or more motors adjusts a beam size of the incident beam to form the corrected beam.

13. The system in claim 1, wherein the beam steering assembly comprises: a reflecting mirror coupled to the one or more motors, wherein displacing the reflecting mirror via the one or more motors adjusts a pointing component of a position of the incident beam to form the corrected beam.

14. The system in claim 1, wherein the beam steering assembly comprises: at least one prism coupled to the one or more motors, wherein rotating the prism via the one or more motors adjusts a translation component of a position of the incident beam to form the corrected beam.

15. The system in claim 1, wherein the first optical element is a telescope beam expander, wherein the second optical element is a focusing lens.

16. The system in claim 15, wherein the first imaging device and the second imaging device is a camera, wherein each camera is capable of measuring the corrected beam in at least one of an x-direction or a y-direction.

17. The system in claim 16, wherein the camera of the first imaging device measures at least a translation component of a position of the corrected beam and a pointing component of the position of the corrected beam, wherein the camera of the second imaging device measures the pointing component of the position of the corrected beam.

18. The system in claim 15, wherein at least one of the first imaging device and the second imaging device is a bi-cell detector, wherein each bi-cell detector is capable of measuring the corrected beam in either an x-direction or a y-direction.

19. The system in claim 18, wherein the bi-cell detector of the first imaging device measures at least a translation component of a position of the corrected beam and a pointing component of the position of the corrected beam, wherein the bi-cell detector of the second imaging device measures the pointing component of the position of the corrected beam.

20. The system in claim 15, further comprising: a beam modulator, wherein the beam modulator receives the first portion of the corrected beam reflected by the leak mirror.

21. The system in claim 1, wherein the one or more motors includes at least one of: a direct drive motor, a stepper motor, a brushless motor, a piezoelectric motor, or a servo motor.

22. The system in claim 1, further comprising: at least one illumination source configured to generate the incident beam.

23. A method, comprising: receiving an incident beam; adjusting the incident beam to form a corrected beam via a beam steering assembly; generating monitoring data for the corrected beam via a beam monitoring assembly optically coupled to the beam steering assembly, wherein the monitoring data includes one or more offset parameters of the corrected beam, wherein the beam monitoring assembly comprises: a leak mirror configured to: receive the corrected beam from the beam steering assembly; reflect a first portion of the corrected beam; and transmit a second portion of the corrected beam; and a beam splitter configured to: receive the second portion of the corrected beam transmitted by the leak mirror; transmit a third portion of the corrected beam through at least a first optical element to a first imaging device; and reflect a fourth portion of the corrected beam through at least a second optical element to a second imaging device, wherein the third portion of the corrected beam and the

fourth portion of the corrected beam are formed from the second portion of the corrected beam; storing one or more zero parameters of the corrected beam; calculating at least one difference between the one or more zero parameters and the one or more offset parameters of the corrected beam; determining one or more beam position adjustments of the incident beam based on the at least one difference between the one or more zero parameters and the one or more offset parameters of the corrected beam; and directing the beam steering assembly, via one or more motor drivers, to actuate one or more motors based on the one or more beam position adjustments to adjust the incident beam to form the corrected beam.

24. The method of claim 23, wherein the one or more offset parameters of the corrected beam includes at least one of: an offset pointing component of an offset position of the corrected beam, an offset translation component of the offset position of the corrected beam, an offset beam size, or offset beam breathing data.

25. The method of claim 24, wherein at least one of the offset pointing component of the offset position of the corrected beam, the offset translation component of the offset position of the corrected beam, the offset beam size, or the offset beam breathing data includes at least one of an x-direction component or a y-direction component.

26. The method of claim 23, wherein the one or more zero parameters of the corrected beam includes at least one of: a zero pointing component of a zero position of the corrected beam, a zero translation component of the zero position of the corrected beam, a zero beam size, or zero beam breathing data.

27. The method of claim 26, wherein at least one of the zero pointing component of the zero position of the corrected beam, the zero translation component of the zero position of the corrected beam, the zero beam size, or the zero beam breathing data includes at least one of an x-direction component or a y-direction component.

28. The method of claim 23, wherein calculating the difference between the one or more zero parameters and the one or more offset parameters of the corrected beam includes calculating a pointing difference between a zero pointing component of a zero position of the corrected beam and an offset pointing component of an offset position of the corrected beam.

29. The method of claim 23, wherein calculating the difference between the one or more zero parameters and the one or more offset parameters of the corrected beam includes calculating a translation difference between a zero translation component of a zero position of the corrected beam and an offset translation component of an offset position of the corrected beam.

30. The method of claim 23, wherein calculating the difference between the one or more zero parameters and the one or more offset parameters of the corrected beam includes calculating a beam size difference between a zero beam size and an offset beam size.

31. The method of claim 23, wherein calculating the difference between the one or more zero parameters and the one or more offset parameters of the corrected beam includes calculating a beam breathing data difference between zero beam breathing data and offset beam breathing data.

32. The method of claim 23, further comprising: generating encoder data for the one or more motors following actuation of the one or more motors.

33. The method of claim 32, further comprising: verifying the actuation of the one or more motors based on the encoder data.

34. The method of claim 23, wherein the beam steering assembly comprises: at least two prisms coupled to the one or more motors, wherein actuating the one or more motors to alter a distance between the two prisms via the one or more motors adjusts a translation component of a position of the incident beam to form the corrected beam, wherein actuating the one or more motors to tilt at least one of the two prisms via the one or more motors adjusts a pointing component of the position of the incident beam to form the corrected beam, wherein actuating the one or more motors to simultaneously alter the distance between the two prisms and tilt at least one of the two prisms via the one or more motors adjusts a beam size of the incident beam to form the corrected beam.

35. The method of claim 23, wherein the beam steering assembly comprises: a reflecting mirror coupled to the one or more motors, wherein displacing the reflecting mirror via the one or more motors adjusts a pointing component of a position of the incident beam to form the corrected beam.

36. The method of claim 23, wherein the beam steering assembly comprises: at least one prism coupled to the one or more motors, wherein rotating the prism via the one or more motors adjusts a translation component of a position of the incident beam to form the corrected beam.

37. The method of claim 23, wherein the first optical element is a telescope beam expander, wherein the second optical element is a focusing lens.

38. The method of claim 37, wherein the first imaging device and the second imaging device is a camera, wherein each camera is capable of measuring the corrected beam in at least one of an x-direction or a y-direction.

39. The method of claim 38, wherein the camera of the first imaging device measures at least a translation component of a position of the corrected beam and a pointing component of the position of the corrected beam, wherein the camera of the second imaging device measures the pointing component of the position of the corrected beam.

40. The method of claim 37, wherein at least one of the first imaging device and the second imaging device is a bi-cell detector, wherein each bi-cell detector is capable of measuring the corrected beam in either an x-direction or a y-direction.

41. The method of claim 40, wherein the bi-cell detector of the first imaging device measures at least a translation component of a position of the corrected beam and a pointing component of the position of the corrected beam, wherein the bi-cell detector of the second imaging device measures the pointing component of the position of the corrected beam.

42. The method of claim 37, wherein the beam monitoring assembly further comprises: a beam modulator, where the beam modulator is configured to receive the first portion of the corrected beam reflected by the leak mirror.

43. The method of claim 23, wherein the one or more motors includes at least one of: a direct drive motor, a stepper motor, a brushless motor, a piezoelectric motor, or a servo motor.

44. The method of claim 23, wherein the incident beam is received from an illumination source configured to generate the incident beam.