

CLAIMS

WHAT IS CLAIMED IS:

1. A monolithic fiber-lens array, the array comprising:
a plurality of optical fibers integrated into a fiber block; and
a plurality of lens elements integrated into a lens block,
wherein:
the fiber block is coupled to the lens block via a transparent adhesive layer, and
tips of the plurality of optical fibers are aligned with respective focal points of the plurality lens elements.
2. The array of claim 1, wherein the fiber block comprises a first substrate having a first surface configured to include the tips of the plurality of optical fibers in a first position configuration.
3. The array of claim 2, wherein the lens block comprises a second substrate having a first surface configured to include focal points of the plurality of lens elements in a second position configuration.
4. The array of claim 3, wherein a thickness of the second substrate is equal to a focal length of the plurality of lens elements.
5. The array of claim 3, wherein the first position configuration is identical to the second position configuration, and wherein coupling the fiber block to the lens block comprises adhering the first surface of the first substrate to the first surface of the second substrate while matching the first position configuration to the second position configuration.
6. The array of claim 3, wherein the second substrate comprises a wedged substrate that is configured to reduce backscattered light returning into the plurality of optical fibers.

7. The array of claim 6, wherein focal lengths of the plurality of lens elements varies with a respective position on the wedged substrate.
8. The array of claim 7, wherein a focal length of each of the plurality of lens elements is equal to a thickness of the second substrate at the respective position on the wedged substrate.
9. The array of claim 7, wherein the plurality of lens elements comprises a plurality of thin-film lenses, and wherein a size of a lens element of the plurality of lens elements is adjusted to optimize the array for atmospheric optical communication.
10. An off-axis, fiber-array collimator, the collimator comprising:
a monolithic fiber block including a plurality of optical fibers; and
a reflector optically coupled to the monolithic fiber block,
wherein:
the reflector is coupled to the monolithic fiber block via a transparent adhesive layer,
and
a reflector axis of the reflector is at an angle with respect to a beam axis of a beam of the plurality of optical fibers.
11. The collimator of claim 10, wherein the reflector comprises an off-axis parabolic reflector, and wherein the angle comprises 45 degrees.
12. The collimator of claim 10, wherein the monolithic fiber block comprises a substrate having a first surface configured to include tips of the plurality of optical fibers in a first position configuration.
13. The collimator of claim 12, wherein the reflector comprises a monolithic reflector block including a plurality of thin-film parabolic reflectors.

14. The collimator of claim 13, wherein positions of centers of the plurality of parabolic thin-film reflectors match the first position configuration.
15. The collimator of claim 14, wherein an axis of each parabolic thin-film reflectors is at the angle with respect to a beam axis of a respective beam of the plurality of optical fibers, and wherein the angle comprises 45 degrees.
16. The collimator of claim 14, wherein the monolithic reflector block is coupled to the monolithic fiber block using a transparent adhesive.
17. A method comprising:
fabricating a fiber block including a plurality of optical fibers;
fabricating a lens block including a plurality of thin-film lenses;
coupling the fiber block to the lens block by using a transparent adhesive layer; and
aligning tips of the plurality of optical fibers with respective focal points of the plurality of thin-film lenses.
18. The method of claim 17, wherein fabricating the fiber block comprises embedding the plurality of optical fibers in a first substrate and positioning tips of the plurality of optical fibers in a first position configuration on a first surface of the first substrate.
19. The method of claim 18, wherein fabricating the lens block comprises realizing the plurality of thin-film lenses on a first surface of a second substrate so that respective focal points of the plurality of thin-film lenses form a second position configuration on a second surface of the second substrate, wherein the second position configuration matches the first position configuration.
20. The method of claim 19, wherein coupling the fiber block to the lens block comprises joining the first surface of the first substrate to the second surface of the second substrate so

that the tips of the plurality of optical fibers are aligned with the respective focal points of the plurality of thin-film lenses, and wherein the second substrate comprises a wedged substrate.