

CLAIMS

1. An optical component comprising:
a substrate;
an opaque layer on a first side of the substrate, the opaque layer defining an aperture to transmit light over a field of view of at least 120°; and
a meta-surface, on a second side of the substrate opposite the first side, to focus the light transmitted by the aperture through the substrate.
2. The optical component of claim 1, wherein the substrate is planar.
3. The optical component of claim 1, wherein the substrate is curved.
4. The optical component of claim 1, wherein the substrate has a thickness t_{sub} and a refractive index at a wavelength of the light of n_{sub} , the aperture has a diameter of D_{in} , and the meta-surface has a diameter $D_{meta} = D_{in} + t_{sub} \tan[\sin^{-1}(1/n_{sub})]$.
5. The optical component of claim 1, wherein the meta-surface is configured to focus the light incident over all of the field of view to a focal plane parallel to the second side of the substrate.
6. The optical component of claim 5, further comprising:
a detector array, in the focal plane, to detect the light focused by the meta-surface.
7. The optical component of claim 5, further comprising:
a light source array in the focal plane, and
wherein the meta-surface is configured to collimate a beam emitted by the light source array and the aperture is configured to emit the beam.
8. The optical component of claim 7, wherein the meta-surface and/or the aperture are further configured to modulate the beam emitted by the light source array.
9. The optical component of claim 1, wherein the meta-surface is configured to focus the light incident over all of the field of view with a Strehl ratio of at least 80%.

10. The optical component of claim 1, wherein the meta-surface comprises an array of at least 1000×1000 meta-atoms.
11. The optical component of claim 1, wherein the meta-surface has different yet continuous portions configured to capture input beams at different angles of incidence.
12. The optical component of claim 1, wherein the meta-surface is configured to correct at least one third-order Seidel aberration.
13. The optical component of claim 1, wherein the meta-surface is a first meta-surface, and further comprising:
 - a second meta-surface, disposed in at least a portion of the aperture, to modulate and/or filter the light transmitted by the aperture.
14. The optical component of claim 13, wherein the second meta-surface is configured to modulate the light transmitted by the aperture with a spatial modulation pattern that depends on an angle of incidence of the light transmitted by the aperture.
15. A method comprising:
 - transmit light over a field of view of at least 120° through an aperture formed on a first side of a substrate; and
 - focusing the light with a meta-surface on a second side of the substrate opposite the first side.
16. The method of claim 15, wherein focusing the light comprises focus the light incident over all of the field of view to a focal plane parallel to the second side of the substrate.
17. The method of claim 16, further comprising:
 - detecting the light focused by the meta-surface with a detector array in the focal plane.
18. The method of claim 16, further comprising:
 - collimating a beam emitted by the light source array in the focal plane with the meta-surface; and
 - emitting the beam through the aperture.

19. The method of claim 15, wherein focusing the light comprises focusing the light incident over all of the field of view with a Strehl ratio of at least 80%.
20. The method of claim 15, wherein focusing the light comprises correcting at least one third-order Seidel aberration.
21. The method of claim 15, further comprising:
modulating at least of a phase, an amplitude, a polarization, or a wavelength of the light transmitted by the aperture with another meta-surface disposed in at least a portion of the aperture based on an angle of incidence of the light transmitted by the aperture.
22. The method of claim 15, further comprising:
filtering the light transmitted by the aperture with another meta-surface disposed in at least a portion of the aperture.
23. A sensor comprising:
a substrate;
a light source array, supported by a first portion of the substrate, to emit light;
a first meta-lens, in optical communication with the light source array, to project the light emitted by the light source array toward an object over a field of view of at least about 120°, the first meta-lens comprising a first planar substrate having a first meta-surface on a first side facing the light source array and a first aperture on a second side;
a second meta-lens, in optical communication with the object, to collect the light scattered and/or reflected by the object over a field of view of at least about 120°, the second meta-lens comprising a second planar substrate having a second aperture on a first side facing the object and a second meta-surface on a second side; and
a detector array, supported by a second portion of the substrate and in optical communication with the second meta-lens, to detect the light collected by the second meta-lens.