CLAIMS

What is claimed is:

1. A real-world viewer comprising:

viewing optics positioned along a viewing optical axis for viewing a field of view of the real-world; and

an active display overlay unit optically coupled to the viewing optical axis of the viewing optics, for generating images and directing the images along the viewing optical axis of the viewing optics for simultaneous overlaid viewing of the images and the real-world scene as viewed in the field of view through the viewing optics, the active display overlay unit with power consumption at 200 mW capable of providing full-color luminance of at least 1200 fL (4111 candela/m^2) to the ocular of the host system with a luminance to power consumption fL:mW ratio of at least 6:1 (candela/m^2:mW ratio of at least 20:1) or greater, in which the active display overlay unit comprises:

an active transmissive display for generating the images along a display optical axis;

an LED backlight for illuminating the active transmissive display with LED illumination;

a lens arrangement for concentrating the LED illumination onto the active transmissive display; and

a beam combiner aligned with the active transmissive display along the display optical axis, and positioned along the viewing optical axis of the viewing optics for directing the images from the active transmissive display onto the viewing optical axis for combining with the field of view that is viewed by the viewing optics in an overlaid manner.

2. The viewer of Claim 1 in which the viewer is at least one of a weapon sight, an add-on accessory to a weapon sight, a rifle sight, an add-on accessory to a rifle sight, a surveillance system, an add-on accessory to a surveillance system, a fire-control system, an add-on accessory to a fire-control system, a laser target

locator and designator, an add-on accessory to a laser target locator and designator, a head or helmet mounted display, an add-on accessory to a head or helmet mounted display, a range finder or an add-on accessory to a range finder.

3. The viewer of Claim 1 in which the viewing optics are positioned along a longitudinal viewing optical axis.

4. The viewer of Claim 3 in which the display optical axis of the active display overlay unit is at an angle to the viewing optical axis of the viewing optics.

5. The viewer of Claim 1 in which the LED backlight is configured to provide a cone angle of illumination from the active transmissive display that substantially matches the viewing cone angle of the viewing optics.

6. The viewer of Claim 5 in which the LED backlight is configured to provide a cone angle of illumination of about +/- 10° or less from the active transmissive display.

7. The viewer of Claim 1 in which the lens arrangement comprises an integrated lens integrated in the LED backlight and a condenser lens positioned between the integrated lens and the active transmissive display.

8. A real-world viewer comprising:

viewing optics positioned along a viewing optical axis for viewing a field of view of the real-world; and

an active display overlay unit optically coupled to the viewing optical axis of the viewing optics, for generating images and directing the images along the viewing optical axis of the viewing optics for simultaneous overlaid viewing of the images and the real-world scene as viewed in the field of view through the viewing optics, the active display overlay unit with power consumption at 332 mW is capable of providing monochrome luminance of at least 5000 fL (17,130 candela/m^2) to the ocular of the host system with a luminance to power

consumption fL:mW ratio of at least 15:1 (candela/m^2:mW ratio of at least 51:1) or greater, in which the active display overlay unit comprises:

an active transmissive display for generating the images along a display optical axis;

an LED backlight for illuminating the active transmissive display with LED illumination;

a lens arrangement for concentrating the LED illumination onto the active transmissive display; and

a beam combiner aligned with the active transmissive display along the display optical axis, and positioned along the viewing optical axis of the viewing optics for directing the images from the active transmissive display onto the viewing optical axis for combining with the field of view that is viewed by the viewing optics in an overlaid manner.

9. The viewer of Claim 1 further comprising electronics for controlling the active display.

10. The viewer of Claim 9 in which the active display can provide images for at least one of active target reticle, range and wind information, GPS and compass information, target ID, and/or external sensor information.

11. The viewer of Claim 7 further comprising a housing for containing the viewing optics and the active display overlay unit.

12. The viewer of Claim 2 in which the field of view includes target or situational awareness elements therein.

13. The viewer of Claim 1 in which the active overlay display unit is configured to control brightness to allow for viewing under ambient conditions ranging from full sunlight to overcast starlight.

14. The viewer of Claim 1 in which the active overlay display unit is capable of outputting a specific wavelength of imagery and dimming for viewing the real

world and active overlay display unit images using an image intensifier night vision device or thermal imaging device.

15. The viewer of Claim 1 in which the active overlay display unit provides at least one of a monochrome, multi-color and/or full color overlaid image.

16. The viewer of Claim 1 in which the active overlay display unit provides at least one of a bi-level and/or full gray scale overlay image.

17. The viewer of Claim 2 further comprising mechanical and electrical boresight capabilities to the real world viewing optical axis.

18. The viewer of Claim 1 further comprising means to package the active display overlay unit as an integral part of the real-world viewer.

19. The viewer of Claim 1 in which the active display overlay unit is an accessory add-on device to the real-world viewer.

20. The viewer of Claim 1 in which the viewer is a weapons sight and the viewing optics are:

direct viewing optics positioned along a longitudinal viewing optical axis, the active display overlay unit having the active transmissive display for generating the images along a display optical axis, the LED backlight for illuminating the active transmissive display with LED illumination and configured to provide a cone angle of about +/- 10° or less from the active transmissive display.

21. A method of viewing with a real-world viewer comprising:

viewing a field of view of the real-world with viewing optics positioned along a viewing optical axis; and

simultaneously viewing images generated by an active display overlay unit optically coupled to the viewing optical axis of the viewing optics, the images being directed along the viewing optical axis of the viewing optics for simultaneous overlaid viewing of the images and the real-world scene as viewed

in the field of view through the viewing optics, the active display overlay unit with power consumption at 200 mW capable of providing full-color luminance of at least 1200 fL (4111 candela/m^2) to the ocular of the host system with a luminance to power consumption fL:mW ratio of at least 6:1 (candela/m^2:mW ratio of at least 20:1) or greater, in which the active display overlay unit comprises:

an active transmissive display for generating the images along a display optical axis;

an LED backlight for illuminating the active transmissive display with LED illumination;

a lens arrangement for concentrating the LED illumination onto the active transmissive display; and

a beam combiner aligned with the active transmissive display along the display optical axis, and positioned along the viewing optical axis of the viewing optics for directing the images from the active transmissive display onto the viewing optical axis for combining with the field of view that is viewed by the viewing optics in an overlaid manner.

22. The method of Claim 21 further comprising employing the viewer as at least one of a weapon sight, an add-on accessory to a weapon sight, a rifle sight, an add-on accessory to a rifle sight, a surveillance system, an add-on accessory to a surveillance system, a fire-control system, an add-on accessory to a fire control system, a laser target locator and designator, an add-on accessory to a laser target locator and designator, a head or helmet mounted display, an add-on accessory to a head or helmet mounted display, a range finder, or an add-on accessory to a range finder.

23. The method of Claim 21 further comprising positioning the viewing optics along a longitudinal viewing optical axis.

24. The method of Claim 23 further comprising positioning the display optical axis of the active display overlay unit at an angle to the viewing optical axis of the viewing optics.

25. The method of Claim 21 further comprising configuring the LED backlight to provide a cone angle of illumination from the active transmissive display that substantially matches the viewing cone angle of the viewing optics.

26. The method of Claim 25 further comprising providing a cone angle of illumination of about +/- 10° or less from the active transmissive display.

27. The method of Claim 21 further comprising providing the lens arrangement with an integrated lens integrated in the LED backlight and a condenser lens positioned between the integrated lens and the active transmissive display.

28. A method of viewing with a real-world viewer comprising:

viewing a field of view of the real-world with viewing optics positioned along a viewing optical axis;

simultaneously viewing images generated by an active display overlay unit optically coupled to the viewing optical axis of the viewing optics, the images being directed along the viewing optical axis of the viewing optics for simultaneous overlaid viewing of the images and the real-world scene as viewed in the field of view through the viewing optics; and

providing monochrome luminance from the active display overlay unit with power consumption at 332 mW of at least 5000 fL (17,130 candela/m^2) to the ocular of the host system with a luminance to power consumption fL:mW ratio of at least 15:1 (candela/m^2:mw ratio of at least 51:1) or greater, in which the active display overlay unit comprises:

an active transmissive display for generating the images along a display optical axis;

an LED backlight for illuminating the active transmissive display with LED illumination;

a lens arrangement for concentrating the LED illumination onto the active transmissive display; and

a beam combiner aligned with the active transmissive display along the display optical axis, and positioned along the viewing optical axis of the viewing optics for directing the images from the active transmissive display onto the viewing optical axis for combining with the field of view that is viewed by the viewing optics in an overlaid manner.

29. The method of Claim 21 further comprising controlling the active display with electronics.

30. The method of Claim 29 further comprising providing images for at least one of active target reticle, range and wind information, GPS and compass information, target ID, and/or external sensor information, with the active display.

31. The method of Claim 27 further comprising containing the viewing optics and the active display overlay unit within a housing.

32. The method of Claim 22 further comprising viewing target or situational awareness elements in the field of view.

33. The method of Claim 21 further comprising controlling the active display brightness to allow for viewing under ambient conditions ranging from full sunlight to overcast starlight.

34. The method of Claim 21 further comprising outputting a specific wavelength of imagery and dimming of the active overlay display unit for viewing the real-world and active overlay display unit images using an image intensifier night vision device or thermal imaging device.

35. The method of Claim 21 further comprising providing at least one of a monochrome, multi-color and/or full color overlaid image.

36. The method of Claim 21 further comprising providing a bi-level and/or full gray scale overlay image.

37. The method of Claim 22 further comprising providing mechanical and electrical boresight capabilities to the real-world viewing optical axis.

38. The method of Claim 21 further comprising providing a means to package the active display overlay unit as an integral part of the real-world viewer.

39. The method of Claim 21 further comprising providing the active display overlay unit as an accessory add-on device to the real-world viewer.

40. The method of Claim 21 in which the viewer is a weapons sight, the method further comprising:

viewing the field of the real-world with direct viewing optics positioned along a longitudinal viewing optical axis, the active display overlay unit having the active transmissive display generating the images along a display optical axis, the LED backlight illuminating the active transmissive display with LED illumination and configured to provide a cone angle of about +/- 10° or less from the active transmissive display.

CLAIMS

What is claimed is:

1. A real-world viewer comprising:

viewing optics positioned along a viewing optical axis for viewing a field of view of the real-world; and

an active display overlay unit optically coupled to the viewing optical axis of the viewing optics, for generating images and directing the images along the viewing optical axis of the viewing optics for simultaneous overlaid viewing of the images and the real-world scene as viewed in the field of view through the viewing optics, the active display overlay unit with power consumption at 200 mW capable of providing full-color luminance of at least 1200 fL (4111 candela/m^2) to an ocular lens assembly of a host system with a luminance to power consumption fL:mW ratio of at least 6:1 (candela/m^2:mW ratio of at least 20:1) or greater, in which the active display overlay unit comprises:

an active transmissive display for generating the images along a display optical axis;

an LED backlight for illuminating the active transmissive display with LED illumination;

a lens arrangement for concentrating the LED illumination onto the active transmissive display; and

a beam combiner aligned with the active transmissive display along the display optical axis, and positioned along the viewing optical axis of the viewing optics for directing the images from the active transmissive display onto the viewing optical axis for combining with the field of view that is viewed by the viewing optics in an overlaid manner.

2. The viewer of Claim 1 in which the viewer is at least one of a weapon sight, an add-on accessory to a weapon sight, a rifle sight, an add-on accessory to a rifle sight, a surveillance system, an add-on accessory to a surveillance system, a fire-control system, an add-on accessory to a fire-control system, a laser target

locator and designator, an add-on accessory to a laser target locator and designator, a head or helmet mounted display, an add-on accessory to a head or helmet mounted display, a range finder or an add-on accessory to a range finder.

3. The viewer of Claim 1 in which the viewing optics are positioned along a longitudinal viewing optical axis.

4. The viewer of Claim 4 in which the display optical axis of the active display overlay unit is at an angle to the viewing optical axis of the viewing optics.

5. The viewer of Claim 1 in which the LED backlight is configured to provide a cone angle of illumination from the active transmissive display that substantially matches the viewing cone angle of the viewing optics.

6. The viewer of Claim 5 in which the LED backlight is configured to provide a cone angle of illumination of about +/- 10° or less from the active transmissive display.

7. The viewer of Claim 1 in which the lens arrangement comprises an integrated lens integrated in the LED backlight and a condenser lens positioned between the integrated lens and the active transmissive display.

8. A real-world viewer comprising:

viewing optics positioned along a viewing optical axis for viewing a field of view of the real-world; and

an active display overlay unit optically coupled to the viewing optical axis of the viewing optics, for generating images and directing the images along the viewing optical axis of the viewing optics for simultaneous overlaid viewing of the images and the real-world scene as viewed in the field of view through the viewing optics, the active display overlay unit with power consumption at 332 mW is capable of providing monochrome luminance of at least 5000 fL (17,130 candela/m^2) to an ocular lens assembly of a host system with a luminance to

power consumption fL:mW ratio of at least 15:1 (candela/m^2:mW ratio of at least 51:1) or greater, in which the active display overlay unit comprises:

an active transmissive display for generating the images along a display optical axis;

an LED backlight for illuminating the active transmissive display with LED illumination;

a lens arrangement for concentrating the LED illumination onto the active transmissive display; and

a beam combiner aligned with the active transmissive display along the display optical axis, and positioned along the viewing optical axis of the viewing optics for directing the images from the active transmissive display onto the viewing optical axis for combining with the field of view that is viewed by the viewing optics in an overlaid manner.

9. The viewer of Claim 1 further comprising electronics for controlling the active transmissive display.

10. The viewer of Claim 9 in which the active transmissive display can provide images for at least one of active target reticle, range and wind information, GPS and compass information, target ID, and/or external sensor information.

11. The viewer of Claim 7 further comprising a housing for containing the viewing optics and the active display overlay unit.

12. The viewer of Claim 2 in which the field of view includes target or situational awareness elements therein.

13. The viewer of Claim 1 in which the active overlay display unit is configured to control brightness to allow for viewing under ambient conditions ranging from full sunlight to overcast starlight.

14. The viewer of Claim 1 in which the active overlay display unit is capable of outputting a specific wavelength of imagery and dimming for viewing the real

world and active overlay display unit images using an image intensifier night vision device or thermal imaging device.

15. The viewer of Claim 1 in which the active overlay display unit provides at least one of a monochrome, multi-color and/or full color overlaid image.

16. The viewer of Claim 1 in which the active overlay display unit provides at least one of a bi-level and/or full gray scale overlay image.

17. The viewer of Claim 2 further comprising mechanical and electrical boresight capabilities to the real world viewing optical axis.

18. The viewer of Claim 1 further comprising means to package the active display overlay unit as an integral part of the real-world viewer.

19. The viewer of Claim 1 in which the active display overlay unit is an accessory add-on device to the real-world viewer.

20. The viewer of Claim 1 in which the viewer is a weapons sight and the viewing optics are:

direct viewing optics positioned along a longitudinal viewing optical axis having the active transmissive display for generating the images along a display optical axis, the LED backlight for illuminating the active transmissive display with LED illumination and configured to provide a cone angle of about +/- 10° or less from the active transmissive display.

21. A method of viewing with a real-world viewer comprising:

viewing a field of view of the real-world with viewing optics positioned along a viewing optical axis; and

simultaneously viewing images generated by an active display overlay unit optically coupled to the viewing optical axis of the viewing optics, the images being directed along the viewing optical axis of the viewing optics for simultaneous overlaid viewing of the images and the real-world scene as viewed in the field of view through the viewing optics, the active display overlay unit

with power consumption at 200 mW capable of providing full-color luminance of at least 1200 fL (4111 candela/m^2) to an ocular lens assembly of a host system with a luminance to power consumption fL:mW ratio of at least 6:1 (candela/m^2:mW ratio of at least 20:1) or greater, in which the active display overlay unit comprises:

an active transmissive display for generating the images along a display optical axis;

an LED backlight for illuminating the active transmissive display with LED illumination;

a lens arrangement for concentrating the LED illumination onto the active transmissive display; and

a beam combiner aligned with the active transmissive display along the display optical axis, and positioned along the viewing optical axis of the viewing optics for directing the images from the active transmissive display onto the viewing optical axis for combining with the field of view that is viewed by the viewing optics in an overlaid manner.

22. The method of Claim 21 further comprising employing the viewer as at least one of a weapon sight, an add-on accessory to a weapon sight, a rifle sight, an add-on accessory to a rifle sight, a surveillance system, an add-on accessory to a surveillance system, a fire-control system, an add-on accessory to a fire control system, a laser target locator and designator, an add-on accessory to a laser target locator and designator, a head or helmet mounted display, an add-on accessory to a head or helmet mounted display, a range finder, or an add-on accessory to a range finder.

23. The method of Claim 21 further comprising positioning the viewing optics along a longitudinal viewing optical axis.

24. The method of Claim 23 further comprising positioning the display optical axis of the active display overlay unit at an angle to the viewing optical axis of the viewing optics.

25. The method of Claim 21 further comprising configuring the LED backlight to provide a cone angle of illumination from the active transmissive display that substantially matches the viewing cone angle of the viewing optics.

26. The method of Claim 30 further comprising providing a cone angle of illumination of about +/- 10° or less from the active transmissive display.

27. The method of Claim 21 further comprising providing the lens arrangement with an integrated lens integrated in the LED backlight and a condenser lens positioned between the integrated lens and the active transmissive display.

28. A method of viewing with a real-world viewer comprising:

viewing a field of view of the real-world with viewing optics positioned along a viewing optical axis;

simultaneously viewing images generated by an active display overlay unit optically coupled to the viewing optical axis of the viewing optics, the images being directed along the viewing optical axis of the viewing optics for simultaneous overlaid viewing of the images and the real-world scene as viewed in the field of view through the viewing optics; and

providing monochrome luminance from the active display overlay unit with power consumption at 332 mW of at least 5000 fL (17,130 candela/m^2) to an ocular lens assembly of a host system with a luminance to power consumption fL:mW ratio of at least 15:1 or greater, in which the active display overlay unit comprises:

an active transmissive display for generating the images along a display optical axis;

an LED backlight for illuminating the active transmissive display with LED illumination;

a lens arrangement for concentrating the LED illumination onto the active transmissive display; and

a beam combiner aligned with the active transmissive display along the display optical axis, and positioned along the viewing optical axis of the viewing

optics for directing the images from the active transmissive display onto the viewing optical axis for combining with the field of view that is viewed by the viewing optics in an overlaid manner.

29. The method of Claim 21 further comprising controlling the active transmissive display with electronics.

30. The method of Claim 29 further comprising providing images for at least one of active target reticle, range and wind information, GPS and compass information, target ID, and/or external sensor information, with the active display.

31. The method of Claim 27 further comprising containing the viewing optics and the active display overlay unit within a housing.

32. The method of Claim 22 further comprising viewing target or situational awareness elements in the field of view.

33. The method of Claim 21 further comprising controlling the active transmissive display brightness to allow for viewing under ambient conditions ranging from full sunlight to overcast starlight.

34. The method of Claim 21 further comprising outputting a specific wavelength of imagery and dimming of the active overlay display unit for viewing the real-world and active overlay display unit images using an image intensifier night vision device or thermal imaging device.

35. The method of Claim 21 further comprising providing at least one of a monochrome, multi-color and/or full color overlaid image.

36. The method of Claim 21 further comprising providing a bi-level and/or full gray scale overlay image.

37. The method of Claim 22 further comprising providing mechanical and electrical boresight capabilities to the real-world viewing optical axis.

38. The method of Claim 21 further comprising providing a means to package the active display overlay unit as an integral part of the real-world viewer.

39. The method of Claim 21 further comprising providing the active display overlay unit as an accessory add-on device to the real-world viewer.

40. The method of Claim 24 in which the viewer is a weapons sight, the method further comprising:

viewing the field of the real-world with direct viewing optics positioned along a longitudinal viewing optical axis, the active display overlay unit having the active transmissive display generating the images along a display optical axis, the LED backlight illuminating the active transmissive display with LED illumination and configured to provide a cone angle of about +/- 10° or less from the active transmissive display.