CLAIMS

1. An imaging system, comprising:

an objective lens; and

a line generation device, comprising:

a first light source to emit a first light beam at a first wavelength;

a second light source to emit a second light beam at a second wavelength; and

one or more line forming optics to shape a light beam emitted by the first light source into a line and a light beam emitted by the second light source into a line;

wherein the objective lens is to focus the first light beam and the second light beam at a focal point external to a sampling structure; and

wherein a line width of the first light beam is increased to lower overall power density of the first light beam on a surface of the sampling structure such that the power density of the first light beam on the surface of the sampling structure is below a photosaturation threshold of a first dye of a sample.

2. The imaging system of claim 1, wherein the sampling structure comprises a cover plate, a substrate, and a liquid passage between the cover plate and substrate, wherein the liquid passage comprises a top interior surface and a bottom interior surface, wherein the sample is located at the top interior surface or at the bottom interior surface of the liquid passage.

3. The imaging system of claim 2, further comprising: a time delay integration (TDI) sensor to detect fluorescence emissions from the sample, wherein the TDI sensor has a pixel size

between about 5 μm and about 15 μm, a sensor width between about 0.4 mm and about 0.8 mm, and a sensor length between about 16 mm and about 48 mm.

4. The imaging system of claim 3, further comprising: a z-stage for articulating the objective to adjust the line width of the first light beam and to adjust the line width of the second light beam.

5. The imaging system of claim 4, further comprising:

a processor; and

a non-transitory computer readable medium with computer executable instructions embedded thereon, the computer executable instructions configured to cause the imaging system to:

determine a quality of a signal from the TDI sensor; and

articulate the objective in the z-axis to adjust the focal point and optimize the quality of the signal from the TDI sensor.

6. The imaging system of claim 2, wherein the line width of the first light beam and the line width of the second light beam is between about 10 μm and about 30 μm.

7. The imaging system of claim 2, further comprising a one or more line widening optics to increase the line width of the first light beam and the line width of the second light beam.

8. The imaging system of claim 7, wherein the one or more line widening optics comprises defocus lens, a prism, or a diffuser.

9. The imaging system of claim 1, further comprising: at least one optical sensor, wherein the objective lens focuses a focal point for the at least one optical sensor within the sampling structure.

10. The imaging system of claim 1, wherein the imaging system is a DNA sequencing system, wherein the sampling structure is a flow cell.

11. The imaging system of claim 10, wherein the focal point is above a top interior surface of the flow cell or below a bottom interior surface of the flow cell.

12. The imaging system of claim 11, wherein the focal point is between about 50 µm and about 150 µm below the bottom interior surface of the flow cell or between about 50 µm and about 150 µm above the top interior surface of the flow cell.

13. An imaging system, comprising:

an objective lens; and

a line generation device, comprising:

a first light source to emit a first light beam at a first wavelength;

a second light source to emit a second light beam at a second wavelength; and

one or more line forming optics to shape a light beam emitted by the first light source into a line and a light beam emitted by the second light source into a line;

wherein the objective lens is to focus the first light beam and the second light beam at a focal point external to a sample of a sampling structure, the sampling structure comprising a cover plate, a substrate, and a liquid passage between the cover plate and substrate, wherein

the liquid passage comprises a top interior surface and a bottom interior surface, wherein the sample is located at the top interior surface or at the bottom interior surface of the liquid passage; and

wherein the focal point is below the bottom interior surface of the liquid passage to increase a line width of the first light beam and a line width of the second line beam at the top interior surface of the sampling structure.

14. The imaging system of claim 13, wherein the focal point is between about 50 µm and about 150 µm below the bottom interior surface of the sampling structure.

15. The imaging system of claim 14, wherein the line length of the first light beam and the line length of the second light is between about 1 mm and about 1.5 mm.

16. An imaging system, comprising:

an objective lens; and

a line generation device, comprising:

a first light source to emit a first light beam at a first wavelength;

a second light source to emit a second light beam at a second wavelength; and

one or more line forming optics to shape a light beam emitted by the first light source into a line and a light beam emitted by the second light source into a line;

wherein the objective lens is to focus the first light beam and the second light beam at a focal point external to a sample of a sampling structure, the sampling structure comprising a cover plate, a substrate, and a liquid passage between the cover plate and substrate, wherein the liquid passage comprises a top interior surface and a bottom interior surface, wherein the

sample is located at the top interior surface or at the bottom interior surface of the liquid passage; and

wherein the focal point is above the top interior surface of the liquid passage as to increase a line width of the first light beam and a line width of the second line beam at the top interior surface of the sampling structure.

17. The imaging system of claim 16, wherein the focal point is between about 50 μm and about 150 μm above the top interior surface of the sampling structure.

18. The imaging system of claim 17, wherein the line length of the first light beam and the line length of the second light is between about 1 mm and about 1.5 mm.

19. An imaging system, comprising:

an objective lens;

a line generation device, comprising:

a first light source to emit a first light beam at a first wavelength;

a second light source to emit a second light beam at a second wavelength; and

one or more line forming optics to shape a light beam emitted by the first light source into a line and a light beam emitted by the second light source into a line; and

one or more line widening optics to increase the line width of the first light beam and the line width of the second light beam, the one or more line widening optics comprising a Powell lens positioned after a defocus lens in an optical path from the first light source and second light source to the objective lens; and

wherein the objective lens is to focus the first light beam and the second light beam at a focal point external to a sample of a sampling structure.

20. An imaging system, comprising:

an objective lens; and

a line generation device, comprising:

a first light source to emit a first light beam at a first wavelength;

a second light source to emit a second light beam at a second wavelength; and

one or more line forming optics to shape a light beam emitted by the first light source into a line and a light beam emitted by the second light source into a line;

wherein the objective lens is to focus the first light beam and the second light beam at a focal point external to a sample of a sampling structure; and

wherein a line width of the first light beam is increased to lower overall power density of the first light beam on a surface of the sample such that the power density of the first light beam on the surface of the sample is below a photosaturation threshold of a first dye on the sample, and wherein a line width of the second light beam is increased to lower overall power density of the second light beam on a surface of the sample such that the power density of the second light beam on the surface of the sample is below a photosaturation threshold of a second dye on the sample.