likelihood of non-uniform illumination. Another common problem during imaging (irrespective of imaging mode) is image non-uniformity. For example, when identical samples are placed at different locations of an imaging surface or a field of view, the corresponding image appears to be non-uniform based on the location, even though the identical samples emits identical signal. There is a need in the art to address image non-uniformity.

SUMMARY

[0005] According to a first aspect of the present disclosure, there is provided an illumination system, including: an imaging surface configured to have an imaging target placed thereon; a light source configured to emit a beam of light; a beam splitter configured to split the beam of light from the light source into a first beam and a second beam; a first mirror configured to reflect the first beam to provide a reflected first beam that illuminates the imaging surface; and a second mirror configured to reflect the second beam to provide a reflected second beam that illuminates the imaging surface, wherein the reflected first beam and the reflected second beam provide off-axis illumination of the imaging surface; and wherein the reflected first beam and the reflected second beam provide substantially symmetrical illumination of the imaging surface, wherein the first beam, the second beam, the first reflected beam, and the second reflected beam, are positioned on a same side as the imaging surface with respect to a virtual line connecting the first mirror and the second mirror.

[0006] Disclosed herein is an illumination system that includes a surface, a light source, a beam splitter, and a first mirror. The surface is configured to have an imaging target placed thereon. The light source is configured to emit a beam of light. The beam splitter is configured to split the beam of light from the light source into a first beam and a second beam. The second beam illuminates the surface. The first mirror is configured to reflect the first beam from the beam splitter to provide a reflected first beam that illuminates the surface.

[0007] According to a second aspect of the present disclosure, there is provided an illumination method, including: providing an imaging surface with an imaging target placed thereon; providing a beam of light with a light source; splitting the beam of light from the light source into a first beam and a second beam; and illuminating the imaging surface, wherein illuminating comprises: (i) using a first mirror to reflect the first beam to produce a reflected first beam that illuminates the imaging surface, and (ii) using a second mirror to reflect the second beam to produce a reflected second beam that illuminates the imaging surface, wherein the reflected first

beam and the reflected second beam provide off-axis illumination of the imaging surface; and wherein the reflected first beam and the reflected second beam provide substantially symmetrical illumination of the imaging surface, wherein the first beam, the second beam, the first reflected beam, and the second reflected beam, are positioned on a same side as the imaging surface with respect to a virtual line connecting the first mirror and the second mirror.

[0008] Disclosed herein is an illumination method that includes providing a beam of light with a light source. The method also includes splitting the beam of light into a first beam and a second beam. The method further includes illuminating a surface with an imaging target placed thereon. Illuminating includes using a first mirror to reflect the first beam to produce a reflected first beam that illuminates the surface. The second beam is split from the beam of light such that it illuminates the surface.

[0009] An imaging system is also disclosed. The imaging system includes an imaging surface, a mirror, and a capturing device. The imaging surface is configured to have an imaging target placed thereon. The capturing device is configured to capture an image of the imaging target through a path of emitted light that extends from the imaging target, reflects off of the mirror, and to the capturing device. The mirror, the capturing device, or both are configured to move in a diagonal direction with respect to the imaging surface to reduce a length of the path of emitted light.

[0010] Disclosed herein is an imaging system that includes an imaging surface, a mirror, a mirror shaft, a capturing device, a capturing device shaft, and a transmission block. The imaging surface is configured to have an imaging target placed thereon. The mirror is configured to move in a first diagonal direction along the mirror shaft. The capturing device is configured to capture an image of the imaging target through a path of emitted light that extends from the imaging target, reflects off of the mirror, and to the capturing device. The capturing device is configured to move in a second diagonal direction along the capturing device shaft. The transmission block transmits movement between the mirror and the capturing device, thereby causing the mirror and the capturing device to move simultaneously.

[0011] An imaging method is also disclosed. The method includes placing an imaging target on an imaging surface. The method also includes causing a capturing device, a mirror, or both to move in a diagonal direction with respect to the imaging surface. The method further includes capturing an image of the imaging target, using the capturing device, through a path of emitted light that extends from the imaging target, reflects off of the mirror, and to the capturing device.

CLAIMS

1. An illumination system, comprising:

an imaging surface configured to have an imaging target placed thereon;

a light source configured to emit a beam of light;

a beam splitter configured to split the beam of light from the light source into a first beam and a second beam;

a first mirror configured to reflect the first beam to provide a reflected first beam that illuminates the imaging surface; and

a second mirror configured to reflect the second beam to provide a reflected second beam that illuminates the imaging surface,

wherein the reflected first beam and the reflected second beam provide off-axis illumination of the imaging surface; and

wherein the reflected first beam and the reflected second beam provide substantially symmetrical illumination of the imaging surface,

wherein the first beam, the second beam, the first reflected beam, and the second reflected beam, are positioned on a same side as the imaging surface with respect to a virtual line connecting the first mirror and the second mirror.

2. The illumination system of claim 1, wherein the beam of light has a beam of light optical power, the first beam has a first beam optical power and the second beam has a second beam optical power, and wherein the first beam optical power and the second beam optical power are each at least 40% of the beam of the light optical power.

3. The illumination system of claim 2, wherein the first beam optical power and the second beam optical power are each at least 45% of the beam of the light optical power.

4. The illumination system of claim 3, wherein the first beam optical power and the second beam optical power are substantially equal.

5. The illumination system of claim 1, further comprising a third mirror, wherein the reflected first beam or the reflected second beam is configured to reflect off of the third mirror prior to illuminating the imaging surface.

6. The illumination system of claim 1, wherein the beam splitter comprises a prism, a plate, a dielectric mirror, a metal coated mirror, a beam splitter cube, a fiber optic beam splitter, or optical fibers configured to collimate light into a bundle before producing two or more output beams.

7. The illumination system of claim 1, wherein the first beam reflects off of the beam splitter, and wherein the second beam passes through the beam splitter.

8. The illumination system of claim 1, further comprising a second beam splitter configured to split the reflected first beam into two reflected beams that provide different degrees of off-axis illumination of the imaging surface.

9. The illumination system of claim 8, further comprising a third beam splitter configured to split the reflected second beam into two reflected beams that provide different degrees of off-axis illumination of the imaging surface.

10. The illumination system of claim 1, wherein an angle between a center of the first beam and a center of the second beam is from 62° to 68°.

11. The illumination system of claim 1, wherein an angle between a center of the reflected first beam and a center of the reflected second beam is from 106° to 114°.

12. The illumination system of claim 1, wherein a first distance from the beam splitter to the first mirror to the imaging surface is substantially equal to a second distance from the beam splitter to the second mirror to the surface.

13. An illumination method, comprising:

providing an imaging surface with an imaging target placed thereon;

providing a beam of light with a light source;

splitting the beam of light from the light source into a first beam and a second beam; and

illuminating the imaging surface, wherein illuminating comprises: (i) using a first mirror to reflect the first beam to produce a reflected first beam that illuminates the surface,

and (ii) using a second mirror to reflect the second beam to produce a reflected second beam that illuminates the imaging surface,

wherein the reflected first beam and the reflected second beam provide off-axis illumination of the imaging surface; and

wherein the reflected first beam and the reflected second beam provide substantially symmetrical illumination of the imaging surface,

wherein the first beam, the second beam, the first reflected beam, and the second reflected beam, are positioned on a same side as the imaging surface with respect to a virtual line connecting the first mirror and the second mirror.

14. The method of claim 13, wherein the beam of light has a beam of light optical power, the first beam has a first beam optical power and the second beam has a second beam optical power, and wherein the first beam optical power and the second beam optical power are each at least 40% of the beam of the light optical power.