present disclosure thus provides an imaging system for imaging an object within an extended depth-of-field (EDOF) at an imaging wavelength λ and with an average modulation transfer function (MTF), comprising:

an optical system having an optical axis and consisting of a single lens element and an aperture stop arranged objectwise of the single lens element, the optical system having an amount of spherical aberration SA such that $0.2\lambda \leqq SA \leqq 5\lambda$ when forming an image of the object, the single lens element being made of a glass or plastic material that generates an amount of axial chromatic aberration that increases the EDOF up to 20% while decreasing the average MTF of the optical system by no more than 25%, relative to the optical system having no chromatic aberration, the aperture stop being located at an axial position that substantially minimizes comatic aberration; and

an image sensor arranged to receive the raw image and form therefrom a digitized electronic raw image.

[0006A] The present disclosure similarly provides a method of forming an image of an object over an extended depth of field (EDOF) at an imaging wavelength λ, comprising:

forming a raw image of an object with an optical system consisting of a single lens element and an aperture stop arranged objectwise of the single lens element, the optical system having an amount of spherical aberration SA such that $0.2\lambda \leqq SA \leqq 5\lambda$;

wherein the single lens element is made of a glass or plastic material, and the glass material being selected to generate an amount of chromatic aberration that increases the EDOF by no more than 20% while decreasing the average MTF by no more than 25%, relative to the optical system having no chromatic aberration, the aperture stop being located at an axial position that substantially minimizes comatic aberration; and

using an image sensor, electronically capturing the raw image to form a digitized raw image.

[0006B] Thus it can be that the

applying the enhanced MTF to the digitized raw image to obtain the contrast-enhanced image.

13. The method of claim 12, including:

measuring a distance between the object and the optical system; and

forming the enhanced MTF by applying a two-dimensional linear digital filter to the raw MTF according to the measured distance.

14. The method of claim 13, including measuring the raw MTF at different distances that overlap the depth of field DOF by using a slanted edge with uniform incoherent backlighting.

15. The method of claim 11, wherein the raw image has an associated raw MTF, and further comprising:

forming an enhanced MTF from the raw MTF by multiplying the raw MTF by a gain function, wherein the enhanced MTF is substantially constant as a function of focus position; and

applying the enhanced MTF to the digitized raw image to obtain the contrast-enhanced image of the object.

16. The method of claim 9, including providing at least one diffraction feature on one or more surfaces of the single lens element so as to reduce chromatic aberration.

17. The method of claim 9, including providing at least one aspheric surface to the single lens element.

18. The method of claim 9, further comprising: capturing N raw images of the object; and averaging the N raw images to form a reduced-noise raw image.

~~18~~19. The system of claim 1, wherein the aperture stop is located relative to the single lens element at or near a zero-coma position.

~~19~~20. The method of claim 9, wherein the aperture stop is located relative to the single lens element at or near a zero-coma position.