CLAIMS

1. An ophthalmic lens for an eye, the ophthalmic lens comprising a front surface, a back surface, an optical centre, and an optical zone about the optical centre, wherein:

the optical zone comprises a base prescription for the eye, and at least one region with a plurality of low transmission non-refractive features, providing a total light transmittance;

the base prescription comprises a spherical correction, an astigmatic correction, or a spherical and an astigmatic correction;

the plurality of low transmission non-refractive features each absorb at least 80% of light incident on the low transmission non-refractive features; and

the total light transmittance through the optical zone is between 85 percent and 99 percent of the total light transmittance through the optical zone of a similar single vision lens with the base prescription and devoid of the plurality of low transmission non-refractive features.

2. The lens of claim 1, wherein the plurality of low transmission non-refractive features comprise of a plurality of borders forming a plurality of apertures; and wherein the plurality of apertures include at least 3 apertures; and wherein each aperture circumscribes a substantially transparent region comprising the base prescription for the eye; and wherein a shape of each aperture is at least one of the following: circular, elliptical, oval, triangular, rectangular, square, pentagonal, or hexagonal, or octagonal, or any other regular polygon, or an irregular polygon, or a random shape; and wherein a surface area of the circumscribed transparent region of at least one of the plurality of apertures is between 0.25 sq mm and 7.5 sq mm; and wherein the plurality of apertures are configured in a circular, hexagonal, radial, spiral, regular, irregular, or random arrangement; and wherein a width of the border of any of the plurality of apertures is between 5 μm to 250 μm such that the border remains substantially non-diffractive.

3. The lens of claim 1, wherein each of the low transmission non-refractive feature has a width between 5 μm to 250 μm, is substantially non-diffractive, and is configured to be at least one of the following: dot-like, arc-like, or a straight line, a zig-zag line, a curvilinear line, or a striae; and wherein the plurality of the low transmission non-refractive features are arranged in at least one pattern; wherein the at least one pattern includes at least: a moiré pattern, a curvilinear pattern, a spoke wheel pattern, a dot-like pattern, a Memphis pattern, a rectangular grid pattern, a regular pattern, an irregular pattern, a hexagonal pattern, a spiral pattern, a swirl pattern, a radial pattern, an array of lines, a zig-zag, an interference pattern, a random pattern with dots, a random pattern with straight lines, a random pattern with non-circular dots, a random pattern with curvilinear lines, a random pattern with arcs, a random pattern with zig-zag lines or a random pattern.

4. The lens of claim 1, wherein a total surface area of the plurality of low transmission non-refractive features occupies between 2.5 percent and 15 percent of a total surface area of the optical zone; and the plurality of low transmission non-refractive features are configured to be within a central 5 mm of the optical zone; and a region outside a central 6 mm of the optical zone is substantially devoid of the non-refractive features.

5. The lens of claim 1, wherein the plurality of low transmission non-refractive features are applied at least in one of the locations: on the front surface, on the back surface, or within a material of the lens; and wherein the plurality of low transmission non-refractive features are configured to be at least one of the following: opaque, translucent, reflective, spectrally sensitive, polarisation sensitive, or absorbent.

6. The lens of claim 5, wherein the low transmission non-refractive features are configured such that the material characteristics are spectrally sensitive to certain visible wavelengths between 420 to 760 nm, inclusive; and wherein the plurality of low transmission non-refractive features are at least in part electronically tuneable, and are activated at least in part, when incident light on the lens is linearly, or circularly, or elliptically polarised.

7. The lens of claim 6, wherein the lens is configured to provide, when tested on a schematic, bench-top, or a physical, model eye configured with a distance refractive error substantially matching the base prescription, an on-axis, or an off-axis wide-field, optical performance, for at least one pupil between 3 mm and 6 mm inclusive, and at least one wavelength 420 nm to 760 nm inclusive, which is within 5% variation of that obtained with a single vison lens that is devoid of the low transmission non-refractive features; wherein the optical performance is gauged as modulation transfer function as a function of spatial frequencies; and wherein the off-axis wide-field includes at least 5 degrees of a visual field of the model eye.

8. The lens of claim 7, wherein the lens is configured to provide, when tested on the schematic, bench-top, or physical, model eye, a substantial correction of the distance refractive error of the model eye and an increase in spike trains depicting retinal ganglion cell activity; wherein the retina of the model eye is configured to capture images of a visual scene projected through the model eye corrected with the lens and wherein the captured images serve as an input stream for a virtual retinal simulator comprising at least one of the image processing : (a) spatiotemporal filtering of the input stream of images resulting in a band-pass current, (b) an instantaneous non-linear contrast gain control using variable feedback gate shunt conductance, and (c) a discrete set of noisy integrate-and-fire cell models, resulting in spike trains depicting retinal ganglion cell activity; wherein the lens provides the increase in spike trains depicting the retinal ganglion cell activity compared to that obtained with a single vison lens that is devoid of the low transmission non-refractive features.

9. The lens of claim 8, wherein the captured images of the visual scene result in artificial edges, or spatial luminous contrast profiles, spread across a wide-field of a retina of the model eye.

10. The lens of claim 9, wherein the captured images of the visual scene comprise captured images at various decentration positions to emulate one of the following: on-eye movement of the lens; eye movements of the wearer, or combination thereof, provides a temporal variation of the said artificial edges, or spatial luminous contrast profiles, spread across the wide-field of the retina of the model eye.

11. The lens of claim 10, wherein the retinal ganglion cell activity, gauged as mean retinal spike rate, or a non-stationarity in neural response, is observed in at least one of on-centre / off-surround retinal field and on-surround / off-centre retinal field.

12. The lens of claim 11, wherein the retinal ganglion cell activity, or the non-stationarity in neural response, gauged as mean retinal spike rate integrated over a certain time frame, is at least 1.5 times of the retinal ganglion cell activity of a single vison lens that is devoid of the low transmission non-refractive features; and wherein the certain time frame over which the mean retinal spike rate is integrated over is at least 1 second.

13. The lens of claim 12, wherein the retinal ganglion cell activity, or the non-stationarity in neural response, gauged in terms of mean retinal spike rate as a function of time, follows one of the following: a non-linear, an aperiodic, a sinusoidal, a quasi-sinusoidal, a rectangular-wave, a quasi-rectangular-wave, a square-wave, a quasi-square-wave, or a non-monotonic, pattern depicting a temporal variation in the overall retinal ganglion cell activity.

14. The lens of claim 13, wherein the lens provides visual performance that is substantially similar to that obtained with a single vision lens devoid of the low transmission non-refractive features.

15. The lens of claim 14, wherein the lens provides at least one of slowing, retarding, or preventing myopia progression, measured by change in axial length or distance refractive error of the eye over time; wherein the measurement of change over time is considered after at least 6, 12, or 24 months of lens wear.

16. The lens of claim 15, wherein the non-refractive features were applied using pad-printing, laser etching, photo-etching, or laser printing.

17. The lens of claim 16, wherein the plurality of non-refractive features are activated and turn opaque, at least in part, when the incident light is coming from a LCD or a LED or an OLED monitor screen, TV screen, tablet screen, or mobile screen or a screen of similar electronic devices.

18. The lens of claim 17, wherein the off-axis wide-field includes at least 15 degrees of a visual field of the model eye.

19. The lens of claim 10, wherein the on-eye movement is within 1 mm of a well-centred on-eye lens position and in one of the following directions: horizontal, oblique, vertical or combinations thereof.

20. An ophthalmic lens for an eye, the ophthalmic lens comprising a front surface, a back surface, an optical centre, and an optical zone about the optical centre, wherein:

the optical zone comprises a base prescription for the eye, and at least one region with a plurality of low transmission non-refractive features, providing a total light transmittance;

the base prescription comprises a spherical correction for myopia, with or without an astigmatic correction; and

the total light transmittance through the optical zone is at least 85 percent of the total light transmittance through a like optical zone of a single vision lens with the base prescription and devoid of the plurality of low transmission non-refractive features.