What is claimed is:

[Claim 1] A system for safely providing retinal phototherapy, comprising:

means for generating an interferometric signal or pattern comprising a near infrared light beam for application to a retina of an eye;

a photodetector for detecting the interferometric signal or pattern reflected from the retina and determining if a level or concentration of melanin within the retinal pigment epithelium of the retina of the eye is elevated compared to a normal level or concentration using the detected interferometric signal or pattern; and

means for adjusting one or more treatment parameters of the retinal phototherapy if the level or concentration of melanin in the retinal pigment epithelium of the eye exceeds the normal level or concentration by a predetermined amount.

[Claim 2] The system of claim 1, wherein the light beam has a wavelength between 600nm and 1000nm and a depth resolution of the order of 3 to 10 microns.

[Claim 3] The system of claim 1, wherein the light beam is split into a reference beam and a sample beam applied to the retina.

[Claim 4] The system of any of claims 1-3, including an optical coherence tomography device which applies the light beam to the retina and detects the interferometric signal or pattern.

[Claim 5] The system of any of claims 1-4, wherein the one or more treatment parameters are adjusted when the change in interferometric signal or pattern is ten percent or greater.

[Claim 6] The system of any of claims 1-5, wherein the one or more treatment parameters are adjusted when the level or concentration of melanin in the retinal pigment epithelium is at least three times greater than the normal level or concentration.

[Claim 7] The system of claim 4, wherein the optical coherence tomography device calculates a ratio of abnormal retinal pigment epithelium melanin and normal retinal pigment epithelium melanin densities according to the calculation of:

$[\{N\sigma_s + \mu_{backscat}\}_{RPE} / \{2N(\sigma_s + \sigma_a) + 2\mu_{backscat}\}_{RPE}]$ times $[1 - \exp[-2w\{N(\sigma_s + \sigma_a) + \mu_{backscat}\}_{RPE}]]$, wherein

N is the number density of the melanin aggregates that absorb and scatter the light beam;

σ_s denotes a cross section of a melanin aggregate for backwards scattering;

σ_a denotes a cross section of a melanin aggregate for absorption; and

$\mu_{back\ scat}$ is a coefficient for backscattering from a structural matrix of the retina.

[Claim 8] The system of any of claims 1-7, wherein the adjusting means adjusts at least one of a retinal spot size of a treatment light beam, a pulse train duration of the treatment light beam, a duty cycle of the treatment light beam, or a power of the treatment light beam.

[Claim 9] The system of claim 8, wherein the adjusting means increases a retinal spot size of a treatment light beam, lowers a pulse train duration of a treatment light beam, lowers a duty cycle of a treatment light beam, or lowers a power of a treatment light beam.

[Claim 10] The system of any of claims 1-9, including means for automatically adjusting one or more treatment parameters of a retina therapy system when the concentration of melanin in the retinal pigment epithelium of the eye exceeds the predetermined amount.