

Claims

1. A system for performing retinal phototherapy or photostimulation, comprising

a plurality of laser consoles (42), each laser console generating at least one treatment beam (52) having a predetermined wavelength between 750nm and 1300nm, a power or intensity between 100 watts and 590 watts per square centimeter, and a duty cycle of 10% or less and a total exposure duration of 500 milliseconds or less such that the retinal tissue experiences phototherapy or photostimulation without being damaged, wherein the treatment beams have different wavelengths;

at least one optical lens or mask (44) for each of the treatment beams (52) configured to optically shape each of the treatment beams (52) into a plurality of radiant beams (58) to produce a geometric pattern of simultaneously produced multiple laser spots or other geometric objects;

a coaxial wide-field non-contact digital optical viewing camera (46), wherein the coaxial wide-field non-contact digital optical viewing camera (46) is configured to protect the radiant beams (58) to at least a portion of the retina (18); and a scanning mechanism (64) for controllably moving the radiant treatment beams (58) over a treatment area of the retina.

2. The system of claim 1, wherein the beams (58) are combined into a single output beam (52).

3. The system of claim 2, wherein the single output beam (52) projected from the coaxial wide-field non-contact digital optical viewing camera (46) is steered according to an offset pattern so as to achieve complete, incomplete or overlapping coverage of the retina (18).

4. The system of claim 1, wherein the radiant beams (58) are simultaneously projected from the coaxial wide-field non-contact digital optical viewing camera (46) and steered according to the offset pattern configured to achieve complete, incomplete or overlapping coverage of the retina (18).

5. The system of claim 1, wherein each of the radiant beams (58) is sequentially projected from the coaxial wide-field non-contact digital optical viewing camera (46) and steered according to the offset pattern so as to result in identical coverage of the retina (18) for each wavelength and exclude simultaneous treatment of the retina by multiple radiant beams.

6. The system of any of claims 1-5, including a diaphragm adjusted on an iris aperture (82) so as to block a portion of the radiant

beams (58) from an outer perimeter portion of the retina, wherein the radiant beams are transmitted to an inner central portion of the retina.

7. The system of any of claims 1–5, including a liquid crystal display array (86) configured on a grid aperture so as to block a portion of the one or more radiant beams from one or more selective grid portions of the retina and transmit the radiant beams to any unblocked portions of the retina.

8. The system of any of claims 1–5, wherein a portion of the one or more radiant beams (58) selectively blocked so as to attenuate areas of peak power or to prevent treatment of scar tissue on the retina.

9. The system of any of claims 1–5, 7, 8, wherein a fundus image of the retina is displayed parallel to or superimposed over a result image from a retinal diagnostic modality.

10. The system of claim 9, further comprising a fundus image of the retina (18) archived before, during and/or after the radiant beams are projected from the coaxial wide-field non-contact digital optical viewing camera (46), and treatment parameters thereof recorded, including graphically noting areas of treatment application or treatment exclusion.

11. The system of any of claims 1–10, wherein the optical lens or mask (44) includes diffractive optics to generate a plurality of laser beam spots from the one or more radiant beams and wherein the laser beams are projected from the coaxial wide-field non-contact digital optical viewing camera (46).

12. The system of claim 11, wherein the plurality of laser beams is projected from the coaxial wide-field non-contact digital optical viewing camera (46) to at least a portion of the retina (18), including the fovea (22).

13. The system of claim 11, wherein the plurality of laser beams projected from the coaxial wide-field non-contact digital optical viewing camera (46) is comprised of at least one hundred laser beams.

14. The system of claim 13, wherein the plurality of laser beams projected from the coaxial wide-field non-contact digital optical viewing camera (46) has a single predetermined pattern.

15. The system of claim 12, wherein the plurality of laser beams projected from the coaxial wide-field non-contact digital optical viewing camera (46) is applied to substantially the entire retina (18).

16. The system of claim 12, wherein the plurality of laser beams projected from the coaxial wide-field non-contact digital optical viewing camera (46) is applied to substantially the entire retina (18) at the same time.

17. The system of any of claims 1-16, wherein the one or more radiant beams projected from the coaxial wide-field non-contact digital optical viewing camera (46) is comprised of a plurality of simultaneously applied radiant beams.