CONFOCAL FIBER-OPTIC LASER METHOD FOR INTRAOCULAR LENS POWER MEASUREMENT

Technology Summary

Available for licensing and commercial development is a novel apertureless fiber-optic laser confocal design. Intraocular lens (IOL) dioptic power is a fundamental parameter where precise measurement is critical in characterizing and in evaluating the effectiveness and safety of IOL's. The present invention is a simple, accurate, objective, quick and relatively inexpensive method for IOL power measurement.

The invention incorporates an apertureless fiber-optic laser confocal design. A key feature of the design is a single-mode optical fiber coupler that simultaneously performs several essential functions. First, it provides effective launching and delivery of the input laser emission. Second, the fiber tip serves as a point light source used for formation of a collimated Gaussian laser beam profile for IOL testing. Third, the tip serves as a highly sensitive point receiver of the back reflectance laser emission. Fourth, the fiber coupler provides delivery of the spatially separated back reflected laser emission to a detector system. The combination of these unique features provides high accuracy (exceeding 1 μm) in spatially locating the IOL focal point and measuring the IOL power. This invention is also unique in that it allows for measurement of a wide range of both positive and negative powers including high-magnification IOL's with power greater than ±20 diopters. The simple and highly sensitive IOL power testing method provides the CDRH/FDA and the scientific community with an independent source of measurement data and information for evaluating the effectiveness and safety of novel IOL products.

Potential Commercial Applications

- Applicable to any optical element or system, such as contact lenses, eyeglasses, high power negative and positive power mirrors, among others.
- Can be used with monofocal, multifocal, and future IOL designs because of its adaptable confocal microscopy principles.

Competitive Advantages

- Highly accurate, precise, reproducible and objective quantitative evaluation of critical optical properties unique to toric IOLs, such as spherical equivalent and cylinder dioptric powers (below 0.08 D), which significantly exceeds the ISO tolerance.
- Precise assessment of other IOL key properties such as anterior cylinder axis, optical plane orthogonality and IOL markings used for IOL positioning in the eye during cataract surgery.

Publications:

"Confocal laser method for quantitative evaluation of critical optical properties of toric intraocular lenses." *J. Cataract Refract. Surg.* 2016 Mar;42(3): 455-61 PMID: 27063527

Inventors:

Ilko Ilev

Intellectual Property:

United States patent: US 7,719,668 B2, issued 05.18.2010

Licensing Contact:

Whitney Hastings, M.S., Ph.D.
FDA Technology Transfer Program
Email: FDAInventionlicensing@fda.hhs.gov
Phone: 240-402-2232

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Licensing Contact:
Whitney Hastings, M.S., Ph.D.
FDA Technology Transfer Program
Email: FDAInventionlicensing@fda.hhs.gov
Phone: 240-402-2232