MEDICAL OPPORTUNITIES UTILIZING:

SIDE ILLUMINATED FIBER OPTICS (SIFO)

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Keywords: **Optical fiber, Side Illuminated Fiber Optics (SIFO), distributed sensing, high spatial resolution, multiple sensing points, optical fiber sensors, medical sensing and imaging**

Background & Technology: Side Illuminated Fiber Optics (SIFO) is an innovative patented technique for sensing light signals from multiple points and directions along optical fibers. Whereas current optical fibers are illuminated via fiber end-faces (axial illumination), SIFO utilizes the lateral cylindrical surface of fiber for light and signal collection. These signals then propagate toward the fiber end-faces where they can be assessed to determine different parameters of wavelength, intensity and timing.

SIFO Advantages (vs. Axial Illumination):

1. SIFO collects light along a specified length and up to a 360^{o} circumference of fiber. Thus, SIFO can detect parameters and "see" objects in all directions (regions hidden from the tip of an axially illuminated fiber).
2. Because light can be collected along the fiber length, it is often unnecessary to move the fiber to collect signals at disparate locations.
3. SIFO can be combined with axial Illumination.
4. SIFO can be adjusted to produce a device with customized spatial resolutions.
5. Multiple sources can be placed along the fiber length to produce a device with a very high density of sensing points. It is possible to produce 1,000 sensing points for every centimeter of fiber length, or 2,500 sensing points for every inch of SIFO fiber.
6. Multiple sources simultaneously activated along SIFO's fiber length increases its signal and sensitivity by n-fold whereas, in axial illumination, only one light source per fiber is typically used.
7. Experimental data indicates that SIFO has the potential to achieve nanometric resolutions in distributed sensing, whereas axial illumination achieves resolutions in the centimeter range.

Commercial Applications: The diagnostic imaging market is projected to reach $35B by 2026. Verivas Solutions holds a preferred position in the vascular and urologic fields of use for imaging and sensing applications of SIFO through its relationship with Bio-Investigations Ltd.

Lateral and circumferential imaging and sensing of structures for assessing, monitoring, treatment, positioning and deployment of devices are all potential applications of SIFO. These applications are likely to be particularly advantageous in the cardiovascular and urologic fields of medicine where detailed "real time" assessments of structures are required for endovascular and endo-urologic treatments and device deployment. SIFO provides the technology to significantly upgrade the capability of physicians to both assess and treat patients more precisely and with greater facility than can be done with the limitations of axial fiber optic devices. SIFO has the potential to be transformational in the medical sensing and imaging fields.

Stage of Development: Ongoing development, application and testing of prototypes

Intellectual Property Information: The SIFO technology proprietary fence currently includes 64 issued patents in 36 countries (India is currently pending). The most comprehensive patent is also the most current-issued one, US 10,876,960 carrying an issue date of December 29, 2020. An additional patent is pending in 71 countries.

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