

INSIDE THE TECHNOLOGY

IntraLase® FS Laser

Unlocking the Molecular World

- The scientific breakthrough that made it possible for scientists to visualize molecules in motion is now advancing the science of the LASIK procedure.
- The IntraLase FS femtosecond (fem⁻¹⁵-second) laser is the fourth generation of a breakthrough in the field of ultra-fast laser science. Generating light pulses as short as one-quadrillionth of a second, femtosecond laser technology has opened new fields of scientific study and provided the basis of femtochemistry research that won the 1999 Nobel Prize in Chemistry.
- Femtosecond lasers are capable of localizing energy down to the smallest dimensions – in the nano- and micro-scales – with light pulses so short that they can capture images of atoms in motion, providing a never-before-seen view of molecular reactions.
- A team of University of Michigan physicists, biomedical engineers and ophthalmologists were first to employ the femtosecond laser in the field of ophthalmology at the Center for Ultrafast Optical Sciences and the Kellogg Eye Center, with early research funding from the National Science Foundation.
 - The University of Michigan (U of M) research revealed the suitability of femtosecond lasers in delicate corneal surgery, and led to a patent application from the U of M, and the founding of IntraLase Corp.
- IntraLase Corp.'s use of the femtosecond laser in refractive surgery was recognized internationally in 2002, winning the prestigious Innovationspreis Award from the Berthold Leibinger Stiftung, a German non-profit foundation that supports the advancement of science and research.
- Today, femtosecond lasers are being used in a variety of applications in the fields of science (photophysics and photochemistry), medicine (nanosurgery and photodisruption) and industry (micromachining).

IntraLase System Components

IntraLase FS Laser: This ultra-fast femtosecond laser produces a stream of high-repetition, short-duration light pulses with an optical beam. It generates 60,000 pulses per second (60 kHz), with a pulse duration of approximately 600 femtoseconds, the equivalent of less than a billionth of a second.

IntraLase IntraLASIK® Software: Proprietary software allows for physician-programmed laser specifications based on each patient's individual parameters, including flap diameter and thickness, location and width of the hinge, and edge angle, all of which are input into the program prior to initiating the first step.

IntraLase Patient Interface™: The sterile disposable device is required for each eye treated and serves as the interface between the laser and the patient's eye, providing the depth reference plane for the beam of laser light.

How the 4th Generation IntraLase FS Laser Works

The IntraLase FS laser uses an infrared beam of light to precisely separate tissue through a process called photodisruption, wherein highly focused laser pulses divide tissue at the molecular level.

- Pulsing at a rate of 60,000 pulses per second, the IntraLase laser prepares the intracorneal bed and creates the flap from below the surface of the cornea, using an “inside-out” process.
- The beam of laser light is precisely focused to a point within the stroma (central layer of the cornea) where each pulse of the laser emits a tiny approximately 2- to 3-micron spot of energy, creating a microscopic bubble (cavitation bubble) of carbon dioxide and water vapor.
- Thousands of these tiny bubbles then define the architecture of the intracorneal surface, as well as the distinct beveled edge of the resulting flap.
- Bubbles are then stacked along the edge up to the corneal surface to complete the first step of the LASIK procedure.
- The IntraLase Method from start to finish typically takes 15 - 30 seconds.
- The physician then lifts the flap to expose the prepared corneal bed for treatment by the excimer laser (the second step of the LASIK procedure).
- The LASIK procedure is completed when the flap is repositioned over the treated bed. The flap is held in position by the beveled side walls of the flap.

The IntraLase Method: A Patient's Perspective

Before the IntraLase Method: After applying numbing drops to ensure the patient's comfort a clear plastic ring, which keeps the eye open and stabilizes the cornea with mild suction, is engaged by the surgeon with a syringe-locking thumb activator.

During: The surgeon lowers the laser and centers a video display of a two-millimeter circle onto an image of the patient's eye to ensure centration. Once centered, laser software identifies flap diameter, depth, hinge location and width, and side-cut architecture – factors which can be tailor-made based on the patient's needs. The surgeon then initiates the procedure by engaging the laser. In approximately 15 - 30 seconds, the laser flap is complete and the process is repeated on the other eye.

After: After step one, the surgeon either positions the patient's bed under the excimer laser, which sits next to the IntraLase laser, or has the patient move to a separate excimer laser bed. The surgeon then lifts the corneal flap and proceeds with step two, the excimer laser treatment.

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