

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Comparison between different femtosecond lasers used in LASIK surgery

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History

- In optics, an **ultrashort pulse** of light is an electromagnetic pulse whose time duration is of the order of a femtosecond (10^{-15} second).
- Such pulses have a broadband optical spectrum, and can be created by mode-locked oscillators. They are commonly referred to as ultrafast events.
- The 1999 Nobel Prize in Chemistry was awarded to Ahmed H. Zewail for using ultrashort pulses to observe chemical reactions on the timescales they occur on, opening up the field of femtochemistry



Commercially available femtosecond lasers for refractive surgery.

Medscape



AMO
iFS laser®



Technolas perfect vision
FEMTEC®



Ziemer
Femto LDV®



Zeiss Meditec
VisuMax®



Wavelight
UltraFlap®

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AMO refractive suite Ics Intralase and Visx S4 IR



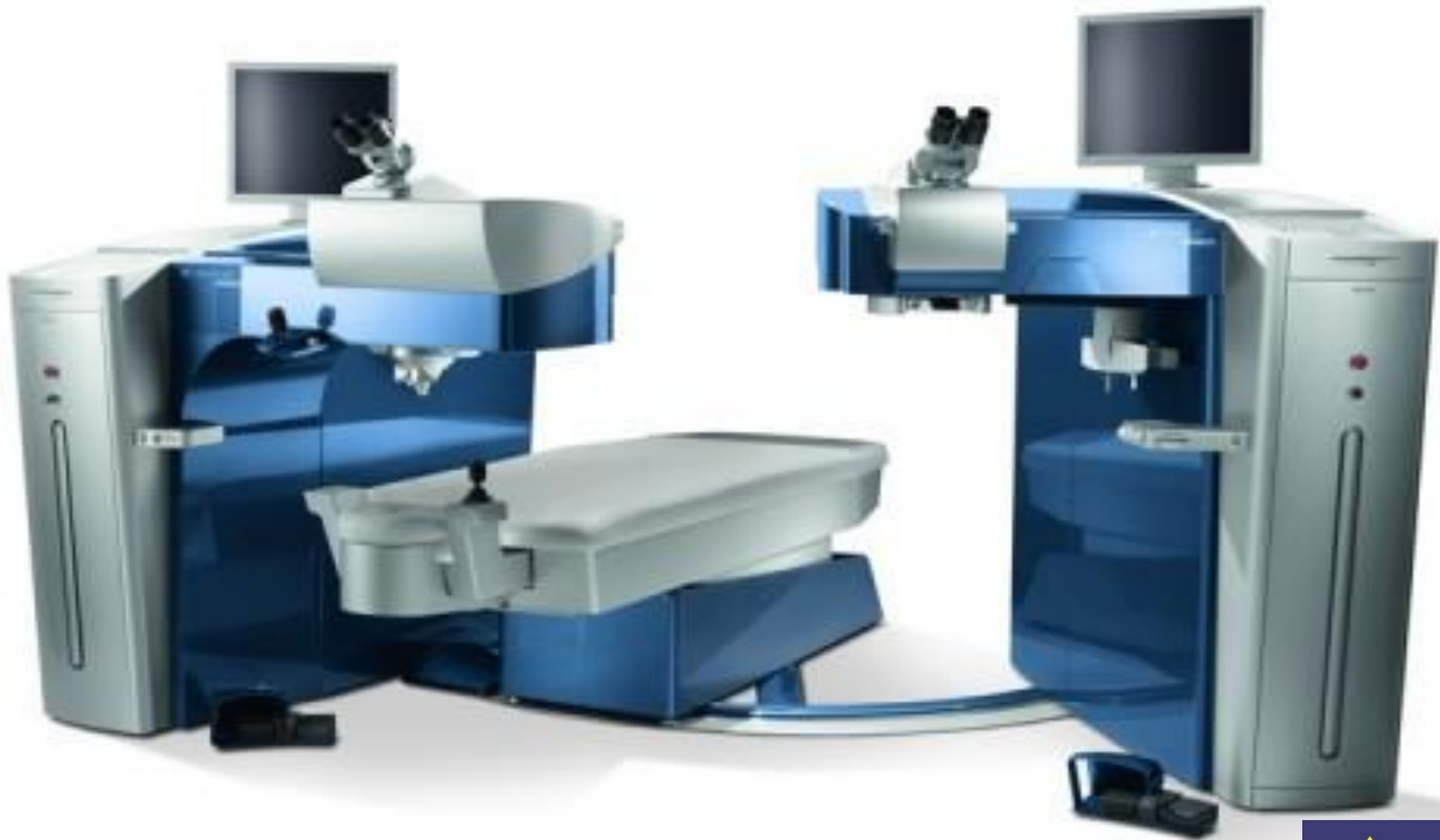
Technolas PV suite



Visumax Femto and Mel 80



Alcon Wavelight Suite



The Ziemer LDV Crystalline femto

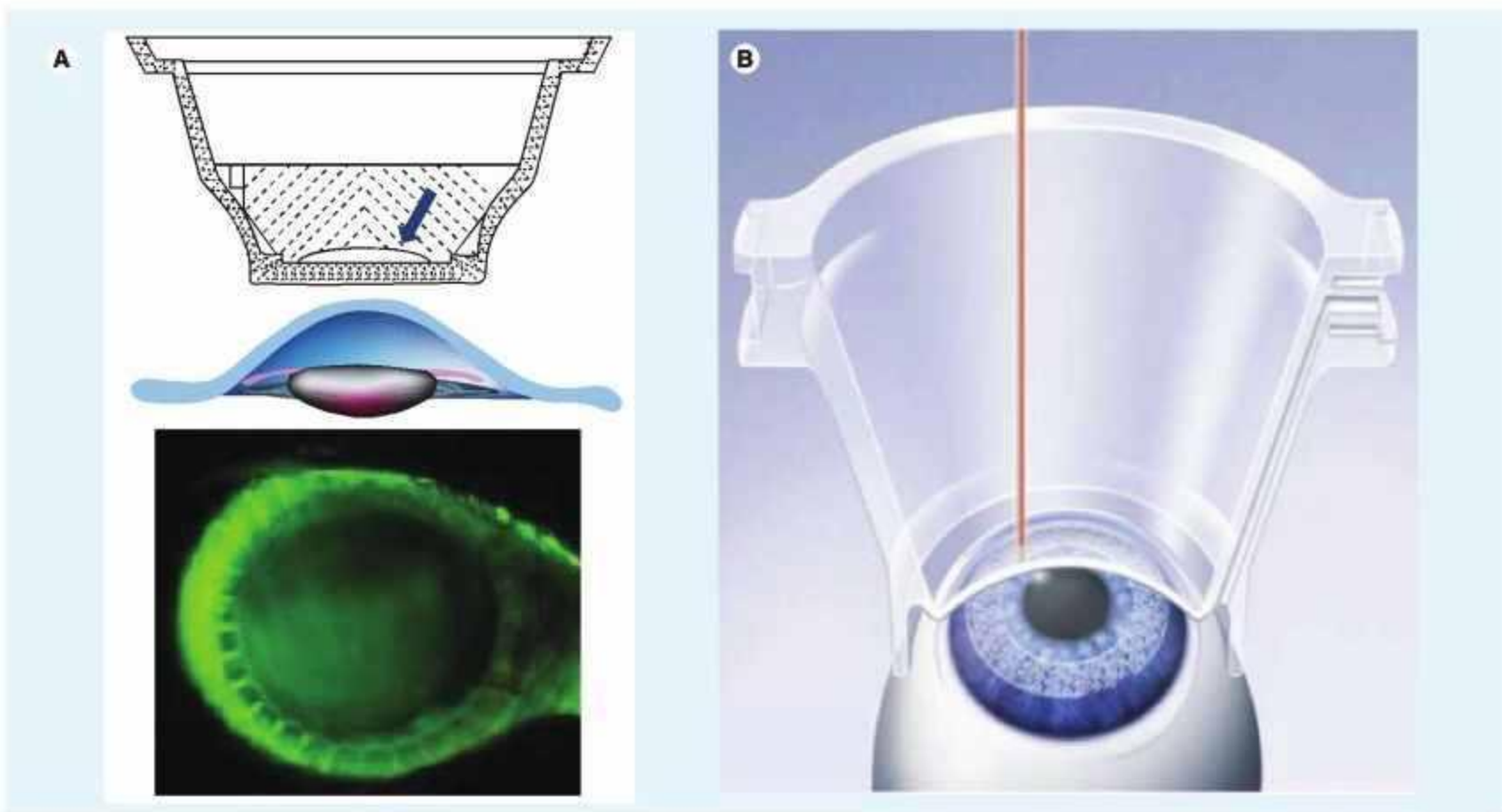


Table 1. Technical features of femtosecond lasers

Feature	Intralase IFS	Carl Zeiss Visumax	Technolas	Alcon wavelight	Ziemer LDV
Pulse rate	150 KHz	500 KHz	80 KHz	200 KHz	>1 MHz
Pulse duration (fs)	>500	400	>500	350	200–300
Spot size (µm)	1–5	1	>1	5	<2
Pulse energy (nJ)	500–1300	<300	>500	300–1500	<100
Concept	Amplified	Amplified	Amplified	Amplified	Oscillator
Additional feature	Greatest number of treated eyes	Flex Smile	IntraCor	Low OBL formation	Portable, low energy
Suction	Manual	Computer-controlled low pressure	Manual	Manual	Computer-controlled within hand piece
Laser–cornea coupling	Flat	Curved	Curved	Flat	Flat

Patient interface (Docking)

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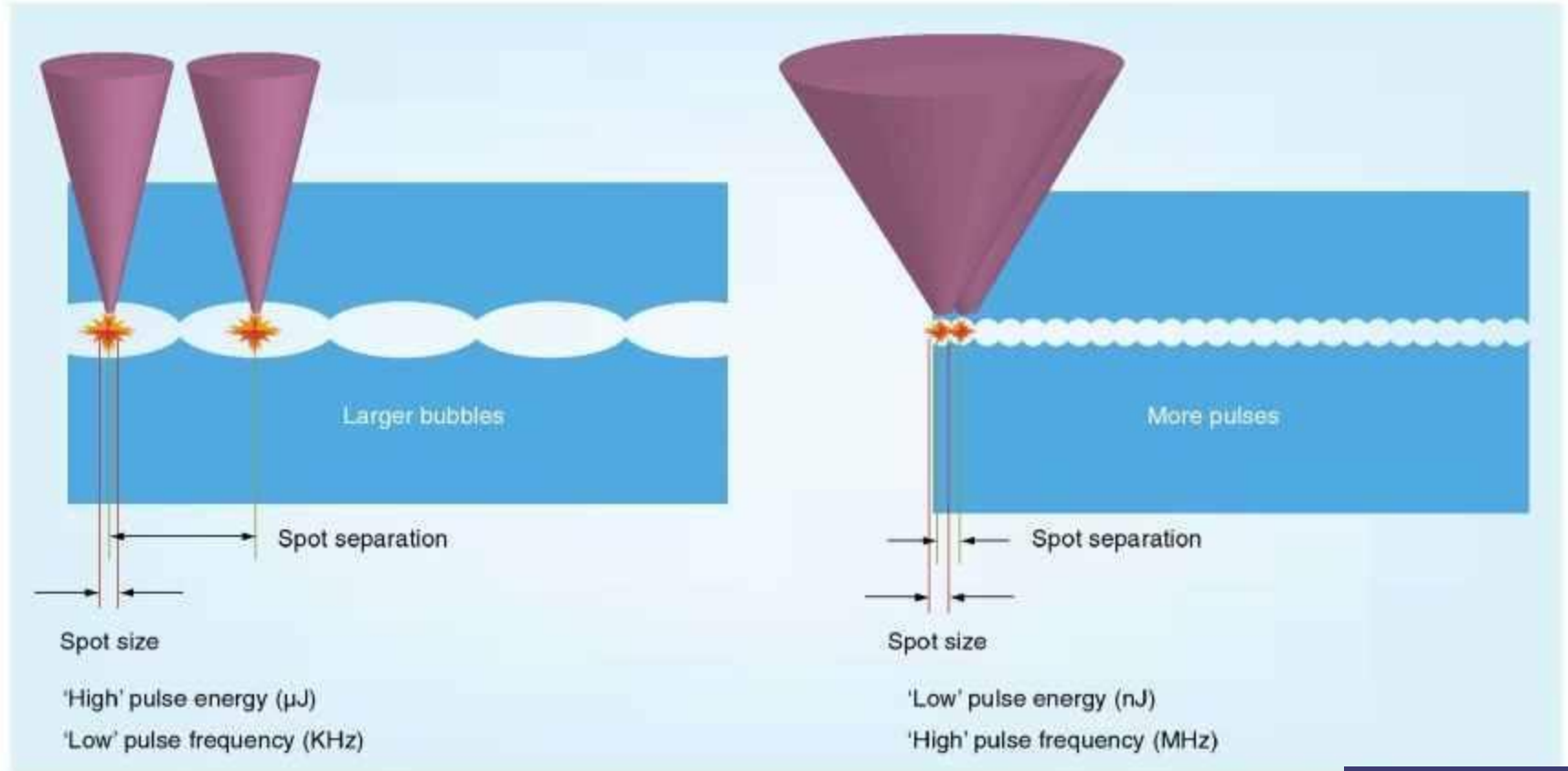


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Visumax and Femtec curved docking systems. **(A)** Visumax and **(B)** Femtec curved docking systems. Note the limbal suction in the Visumax device

Different cutting profiles between high-energy and lower energy devices

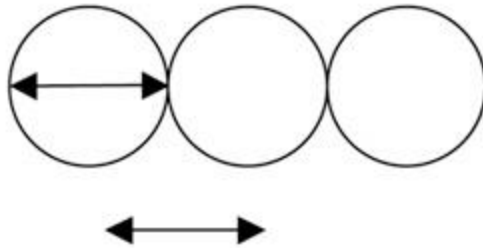
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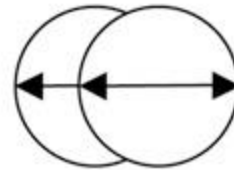
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Overlap of laser pulses

Distance between the center of 2 pulses equals the diameter of focus: No overlap

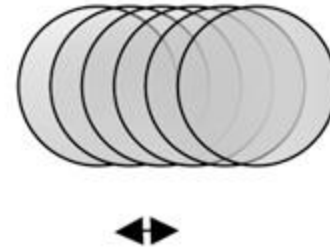


Distance between the center of 2 pulses equals half the diameter of focus: 50% overlap



Distance between the center of 2 pulses = diameter of focus/n
Overlap = $(n - 1/n)\%$

Example: $n = 5$; 80% overlap



Reference: Je´roˆme C. Vryghem, MD, Thibaut Devogelaere, MD, FEBO, Pavel Stodulka, MD, PhD. J CATARACT REFRACT SURG - VOL 36, MARCH 2010

Special features

- Visumax: SMILE and FLEX
- No use of Excimer
- Technolas: Intra Cor
- Combined Corneal and lens surgery

Introducing more than one technology

Example from Japan



Shinagawa LASIK Center in Tokyo, JAPAN

We have performed approx. **952,392 LASIK cases** since being established in 2004.



Awards: High volume Center



*“Ziemer Award for the highest number of refractive treatments worldwide”
(2009 through 2010)*



“SCHWIND AMARIS Award for the highest treatment volume worldwide in 2010”



*“Top IntraLASE Volume Customer”
(2005 through 2008)*



*“For the highest treatment volume worldwide on the ALLEGRETTO Wave EYE-Q laser system”
(2006 through 2008)*



Laser Systems at Shinagawa LASIK Center

Femtosecond Lasers

FEMTO LDV™ &
Crystal Line™
(Ziemer, Switzerland)



16 Units

IntraLase FS60™ &
iFS (AMO, USA)



19 Units

Refractive Suite (Alcon, US)



1 Unit

Excimer Lasers

AMARIS
(SCHWIND, Germany)



13 Units

Visx star S4 IR
(AMO, USA)



3 Units

ALLEGRETTO
wave Eye-Q (Alcon,
USA)



13 Units

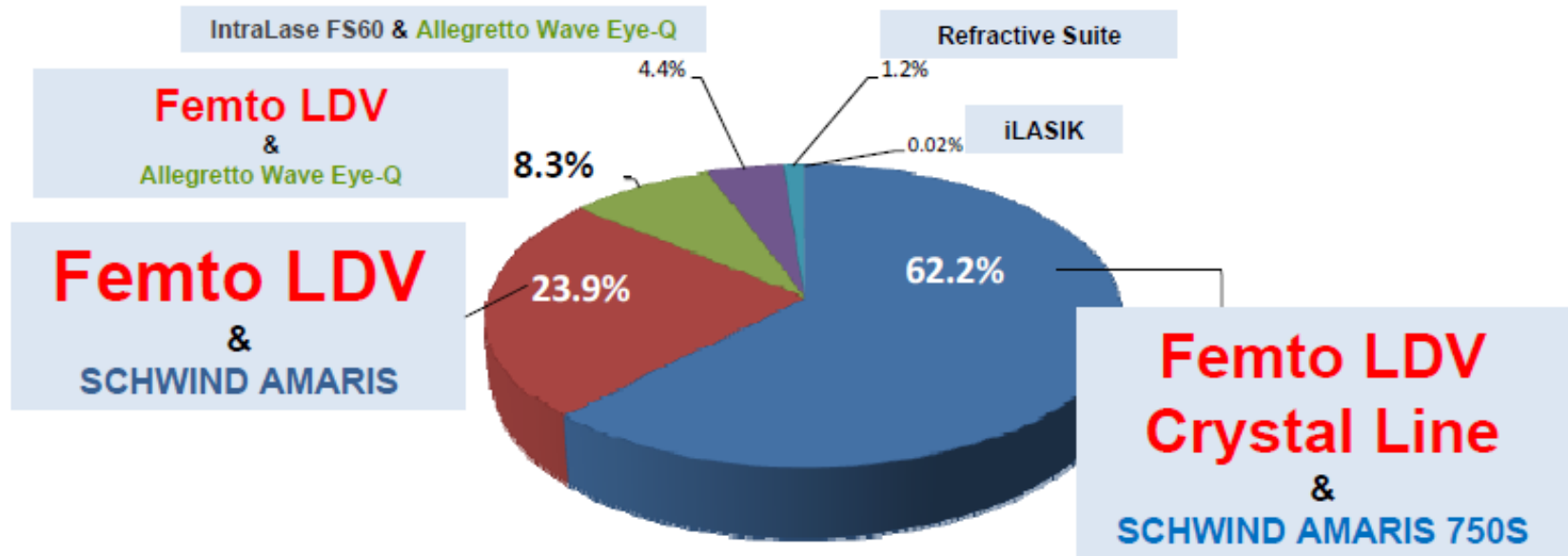
Other procedures also available:

- Surface ablation (PRK, LASEK, EpiLASIK)
- Intracorneal Ring Segment
- Phaikic IOL
- Multi-focal IOL
- CK (Conductive keratoplasty)
- KAMRA® Intracorneal Inlay



Shinagawa

Patients choose LASIK using Crystal Line or FEMTO LDV Option



- LASIK using either Crystal Line or Femto LDV is the choice for **94.4%** of our patients!! Among them, **62.2 %** of patients chose Crystal Line!!
- Although the price is higher, patients are choosing the benefits of the **Crystal Line technology**.

Data obtained : August 2011



- - Machines he has in the center (Shinagawa Centers)
 - 16 crystal line LDV femto
 - 19 intralase FS60
 - 13 amaris
 - 13 eye-Q
 - 3 visx
 - 1 Alcon refractive suite



- charge per patient for femto-lasik
LDV crystal line+ Amaris 750HZ 4100\$
LDv+ amaris 500 3300\$
Alcon refractive suite 3100\$
LDV + eyeQ 400 2800\$
Intralase+ visx 2000\$

Thank you for your attention

