

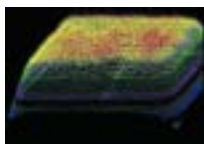
Excimer Laser Technology for High Precision

Background

In 1993 ATL Lasertechnik recognized that expanding the range of applications for coherent UV radiation in science, medicine and industry required a new generation of excimer lasers to fill the technology gap between large, conventional UV laser sources such as excimer lasers (moderate rep rates, hundreds of millijoules) and rfi-excited UV sources (high rep rates, micro-joules). This technology gap is particularly apparent in applications requiring deep UV laser radiation (248nm, 193nm and 157nm) beyond the current range of diode-pumped solid-state sources.

This gap has now been filled by ATL Lasertechnik with a new range of powerful air cooled excimer lasers* based upon metal-ceramic technology.

* US & EU Patents



ATLEX 300i, 248nm beam profile, far field

ATLEX Concept

The ATLEX series of short pulse excimer lasers employs state of the art metal-ceramic technology and creates powerful new concepts in equipment and design of the discharge process. The technique of intensified ultra-fast preionization OPEC (patented) provides highly efficient laser performance with pulse duration of a few nanoseconds and enhanced reliability of all high voltage components. The main features of ATLEX laser design are:

- **OPEC: ultra-fast preionization technique**
- **Laser head volume <3l**
- **Total-Metal-Ceramic Tube**
- **Air-cooled up to 500Hz**
- **RS-485 interface for system integration**
- **Energy stabilization mode**
- **Handheld controller**
- **Meets European CE Standard**

The unique ATLEX laser design results in a rectangular-shaped beam of unsurpassed homogeneity (see profile), unlike competing small lasers with more Gaussian profile, often also described as excellent but far less useful for materials processing including medical applications.



Metal Ceramic Tube

The ATLEX metal-ceramic laser tube is entirely manufactured of halogen and UV-resistant aluminium alloy and ceramics. A considerable lower rate of gas contamination,

long static gas lifetime and improved electrical reliability are guaranteed by the use of ceramic insulated high voltage feed-throughs of both peaking capacitors and main electrodes. Additionally, an internal electrostatic dust purifier - depressing window contamination - is provided as a standard.

The ATLEX vessel geometry provides symmetrical cooling resulting in an excellent beam quality and beam pointing stability.



ProMaster turnkey workstation

OPEC - Preionization

Optimized Preionization Electric Circuit:

- **Excellent beam homogeneity**
- **Low beam divergence**
- **Reduced high voltage**
- **Improved gas purity and gas life time**
- **Long windows cleaning and chamber service intervals**



25 micron hole in Polyamide

Optics Holder

For cleaning purposes the gimbal mounted optics can be easily removed and reinstalled. The mechanically stable construction of the resonator holder ensures that resonator optics alignment will be maintained during optics removal or replacement.

Laser Controller

The ATLEX laser incorporates a newly designed micro-processor-based control unit providing the user with numerous useful functions and options. All the functions of the laser including stabilization of the energy / output power, trigger rate, HV adjustment and auto-gas refilling can be controlled both from the hand-held remote control unit RCU) and from the optional IBM compatible PC.

Applications

ATLEX lasers are designed for numerous applications in medicine (eye surgery), micro-electronic industry and science where a very high precision processing and high reliability of laser technology are required.

• Micromachining

Very short excimer laser pulses of 10-20mJ with equivalent Megawatt peak power are used in rapid prototyping, micro-machining systems for processing micro-electronic and bio-medical components in materials like polymers, in organics (glass), thin metals, plastics and ceramics.



MicroMaster system (based on ATLEX) sets a new standard in micromachining (Courtesy of OPTEC S.A)



Precise holes drilled in wall of fine Nylon tube (Courtesy of Irepa Laser)

• Refractive Surgery

The randomized flying spot method combined with a fractal projection technique sets a new standard in wavefront-assisted refractive surgery for a wide range of myopia, hyperopia and astigmatism as well as corneal irregularity corrections.

This unique method requires a special customized raw beam profile, a small uniform spot size (<1mm) and repetition rates of a few hundred Hz at 193nm.



Refractive surgery with IsoBeam system (Courtesy of Kera Technology)

• Spectroscopy

Short pulses of about 3-5ns provides researchers a new powerful UV tool for photo-ionisation processes and high resolution TOF spectroscopy.



TOF-set-up for clusters detection based on ATLEX SP 193nm and 248nm (Courtesy of Humboldt University, Berlin)

Technical Data

Gas Medium		F2	ArF	KrF	XeCl	XeF
Wavelength	nm	157	193	248	308	351
Max. Pulse Energy ¹	mJ	1	13	20	10	7
Max. Average Power	ATLEX-300-SI ATLEX-500-SI	W W	0.2 0.5	4.0 6.0	6.0 10.0	3.0 5.0
Max. Rep Rate	ATLEX-300-SI ATLEX-500-SI	Hz Hz		300 500		
Pulse Duration ²				4 - 6		
Beam Dimensions ²	mm			4 x 6		
Beam Divergence ²	mrad			2 x 1		
Energy Stability ³ (stand. Dev.)	%			3		
Dimensions (LxWxH)	mm			540 x 470 x 370		
Weight	kg			55		
Cooling				Air		
Power Requirements				230 VAC / 6, 3 A / 50-60 Hz / 1 phase		

All specifications are typical data and subject to change without notice due to product improvements

¹ measured at low rep. rates: allow 10% reduction of output energy and power for laser equipped with stabilisation mode

² FWHM ³ measured at max. high voltage