



Successful with Excimer Laser Solutions

An interview with Richard Waldemann, General Manager and Vice President,
Excimer Laser Business Unit, Coherent in Goettingen / Germany

Special Issue



Richard Waldermann, General Manager and Vice President, Excimer Laser Business Unit, Coherent in Goettingen / Germany:
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New Coherent Factory for Assembly and Test of LineBeam Systems in Goettingen



Successful with Excimer Laser Solutions

The Coherent Excimer Business Unit, which began as Lambda Physik, has a 40 year history in producing excimer lasers for industrial and scientific applications. Here we interview company General Manager Richard Waldermann on the current state of excimer lasers and their future prospects.

Keywords: Excimer Laser, ELA – Excimer Laser Annealing, LLO – Laser Lift-Off, LASIK

LASER: What is the Coherent Excimer Business Unit?

Waldermann: Located in Goettingen, this group develops, manufactures and markets excimer lasers. We also provide applications development support and after sales service from this location. While I imagine that most readers are aware that Coherent at its Goettingen site – formally operating under the name of Lambda Physik – has long been a leader in excimer laser technology, many people may not realize that, over the years, our expertise has expanded to include beam delivery systems. In fact, the vast majority of our equipment sales

are now for complete laser systems which include sophisticated beam delivery optics.

The Excimer Business Unit has enjoyed tremendous success, particularly over the past ten years. We have increased our floor space over that time by a factor of five to approximately 20,000 m². And, that expansion has also included equipment and infrastructure for automated testing and quality control that have dramatically improved the reliability of our products to meet highest industry standards. One important aspect of this has been the installation of 5,000 m² of cleanroom space in our production environment. We now perform all product assembly under cleanroom conditions including all testing and laser tube production.

LASER: What markets and applications do you currently serve?

Waldermann: Our excimer products support a very diverse range of applications. In terms of sales volume, the single biggest is Excimer Laser Annealing (ELA) for the flat panel display market. ELA is the standard production process in the fabrication of AMLCD and AMOLED displays used on

Title

virtually all advanced smartphones. The products we supply for ELA are our VYPER excimer lasers and line beam optics, comprising LineBeam Systems which deliver the high energy pulses in a long line beam that performs silicon annealing at market-enabling throughput rates. However, this has been a “moving target” because display manufacturers keep increasing the size of their panels as well as the pixel density of their displays. These changes pose increased optical challenges for us, but we have managed to increase both the productivity and the quality of the line beam. Around 10 years ago, a production ELA system required a 370 mm line beam combined with our 300W UV laser; today, it is 1,600 mm driven by 3.6 kW UV power.

LASER: There are other solutions of Excimer Lasers ...

Waldermann: An important develop-

ing application for us is Laser Lift-Off (LLO), which is utilized in the fabrication of flexible displays, such as are already being employed in certain smartphones. Here, again, the excimer output is formed into the shape of a long, thin line beam, which we call “UV blade.” The finished panel is scanned underneath the line beam in order to ablate an ultra-thin layer of material holding it to the rigid glass substrate on which it was produced. The result is a finished, functional display which is as flexible as a piece of paper. With ELA and LLO, the excimer laser advances display production to a bright and flexible future.

In terms of unit volume, our single biggest application is LASIK (Laser-Assisted in Situ Keratomileusis), a surgical procedure that enables more than a million people per year to reach their perfect vision. We’ve serviced the LASIK market for more

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Assembly of Line Beam Optical Components at Coherent in Goettingen



“Excimer lasers offer a unique combination of deep ultraviolet (UV) output, together with high pulse energy, which can’t be equaled by any other type of laser or light source. The short excimer wavelengths enable the production of very small features at extremely high precision because optical resolution scales directly with wavelength, due to diffraction. Also, UV light doesn’t penetrate very far into most materials, which limits the laser affected area.”

than 20 years, but here, too, the lasers have steadily improved in terms of their performance, reliability and ease of use. Currently, our main focus for LASIK products is to deliver new control concepts and an advanced modularity which will simplify their operation.

We also support numerous other industrial and research applications, including Fiber Bragg Grating (FBG) writing and Pulsed Laser Deposition (PLD). The latter is a unique method for producing high quality thin films, which eliminates thermal effects at the substrate. There are many exciting potential application areas for this.

LASER: What do you see as your key advantages over your competition in these areas?

Waldermann: A major factor in our success against other excimer laser producers has been the ability to deliver a total system, including both laser and beam delivery optics, which I mentioned at the outset. There are often many different ways in which our customers could potentially perform their particular process, including laser and also non-laser based solutions. Therefore, we have to present a highly optimized solution, in terms of both its performance and total cost of ownership, in order to be successful. We’ve found that it is necessary to design the laser and beam delivery

system together in close cooperation to achieve this high level of system optimization.

LASER: What is the outlook for excimer lasers?

Waldermann: Excimer lasers offer a unique combination of deep ultraviolet (UV) output, together with high pulse energy, which can’t be equaled by any other type of laser or light source. The short excimer wavelengths enable the production of very small features at extremely high precision because optical resolution scales directly with wavelength, due to diffraction. Also, UV light doesn’t penetrate very far into most materials, which limits the laser affected area. Additionally, high pulse energy, combined with rapid repetition rate, enables high process throughput using excimer lasers. No other laser technology can provide UV light at wavelengths like 308 nm, 248 nm, 193 nm or 157 nm with the kind of output power that an excimer produces.

These characteristics are important because in nearly every field we support – including microelectronics, displays, new energy, mobility, biotechnology and even basic research – there are two overarching trends: The first is the need to produce smaller, higher precision features and thinner films, and the second is to accomplish these processes at higher speed and lower cost. The output characteristics of excimer lasers make them inherently better at satisfying the first of these requirements, while our ongoing improvements in their performance, reliability and cost-of-ownership keep them competitive in the latter. All this makes the future of excimer lasers look exceptionally bright.

Our special thanks go to Richard Waldermann, Rainer Paetzel and Petra Wallenta for making this happen !

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Final Assembly and Test of LineBeam 1300 Optical System with VYPER Excimer laser

All Pictures: Coherent

