

TV-Microscope with Coaxial UV-Lasercoupling

Gräfelfing, 18.01.2008. The “London Centre for Nanotechnology” (LCN), a division of University College London recently approached Opto Sonderbedarf GmbH to build a TV-Microscope with integrated, coaxial UV-Laser coupling. The goal of the system was to display a laser spot diameter of precisely $3.5\mu\text{m}$ in the object field, whilst simultaneously projecting the laser spot onto a CCD. A key element of the design was the utilisation of non dispersing optics and materials so that both laser beam and image rays remained completely intact and co-located.

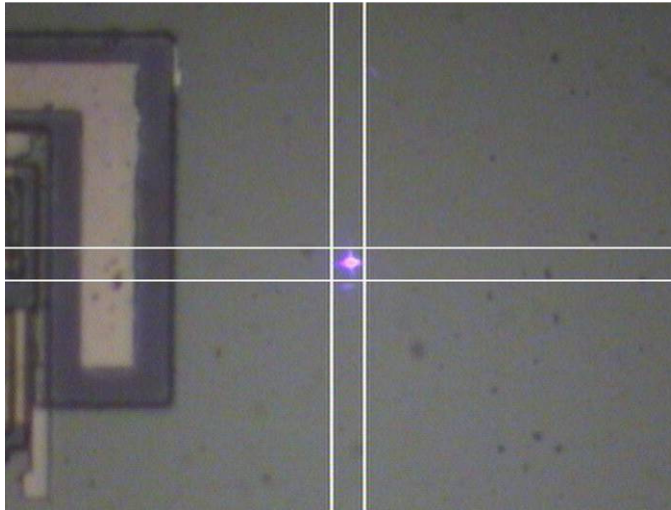


Figure 1: The distance between the parallel lines of the double lined reticle displayed is $10\mu\text{m}$.

The projected laser-spot was required to be clearly and accurately displayed on to the CCD-camera, so that its position on the substrate was exactly as imaged on the CCD.

To display the laser-spot accurately, Opto designed a fully adjustable, custom light microscope complete with visible illumination. Opto worked closely with LCN to integrate their laser source to the new design via an armoured fibre cable and a collimation and interface module designed exclusively by Opto for this application.

Opto already had experience in coaxially connecting lasers to similar visible spectrum TV-microscope systems, but with different specifications and lesser technical requirements. The development of the LCN system required Opto to resource its previous laser experience and combine it with its 25 years of knowledge and expertise in manufacturing customised optomechanical solutions.

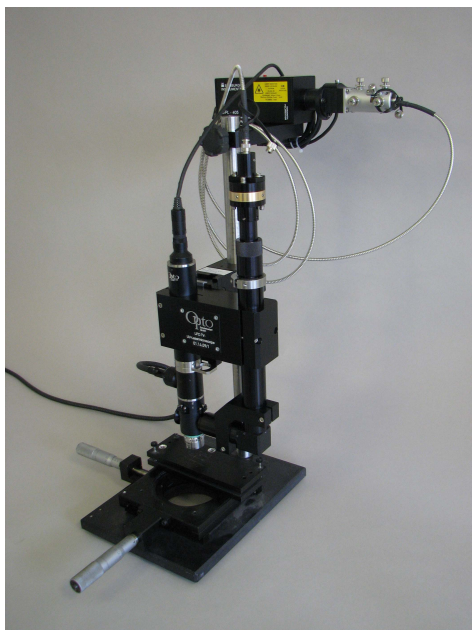


Figure 2: TV Microscope with coaxial UV-Lasercoupling.

Commenting on the development, lead engineer Dr. Holger Perthen commented: “Our biggest challenge was accurately achieving the required diameter of the laser-spot, and to co-locate the spot on the substrate and CCD simultaneously. This required us to apply two of our core strengths – combining high end optics with precision mechanics to create a perfectly balanced system designed exactly to purpose.”

After working with LCN with a series of prototypes and test imagery, the final configuration comprised Opto’s custom TV-microscope with an optimised 20x planar objective, 1x TV tube, achieving an object field of $220 \times 165 \mu\text{m}^2$ displayed on a 1/2” camera chip. The laser beam was introduced to the optical microscope by a coaxial collimation module

designed to specification by Opto. With help of a series of beam-formatting-optics, the laser beam profile was formatted in such a way, that the 20x objective could clearly image the laser beam with the required size of less than 4µm even after the infinite connection into the TV-microscope.

Opto's goal, in conjunction with its suppliers, clients and end users is to provide customer oriented inspection solutions, designed perfectly to application, balancing advanced optics and complex mechanics in perfect harmony.

Opto is a manufacturer of innovative optical systems and components which enable the visualisation of microscopic and macroscopic structures with the highest quality.

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