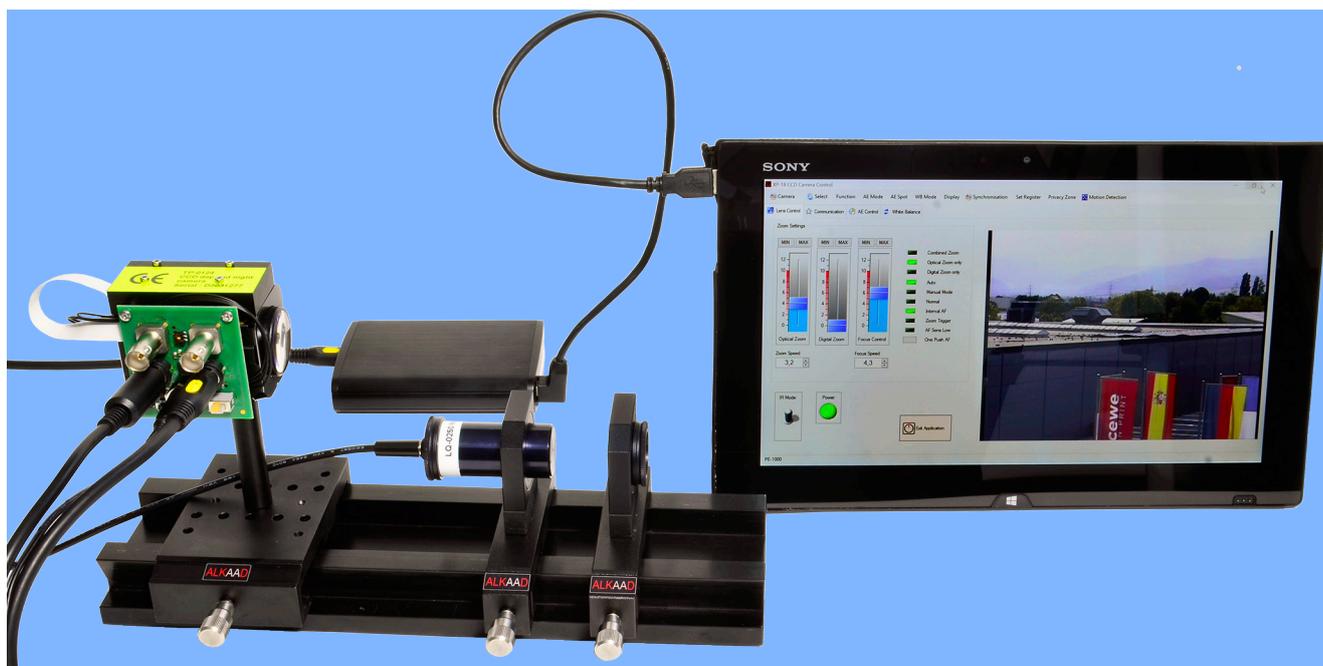


PE-1000 Camera and Imaging



Pinhole Camera
CCD Sensor
Spectral Sensitivity of CCD Chip

Camera Obscura
Magnification
Active Night Vision

Objective
Iris and Depth of Field



The principle of creating an image through projection on a surface is known since ancient times. Aristotle observed images of the sun through holes generated by the leaves of a tree, while Arab scientists used this principle in astronomy to observe the solar eclipses. The most clear and detailed description is made by Leonardo da Vinci in his work "Codice Atlantico" where for the first time, the structure of the human eye is commented as a "camera obscura". But most of our respect should be paid to

Giovanni Antonio Canaletto. As a painter he used the principle of the camera obscura in a very practical and commercial application. Although he did not take photographs as one understands it today, he imaged scenes and objects on canvas through a narrow hole in a curtain and painted them. With the help of this technique he was able to produce more than 900 paintings during his period. Later Giovanni Battista Della Porta suggested for the first time that a lens may be applied to the hole. This was the initial step for the invention of the portable "camera obscura" as a working tool for

outlining at that time.

In the frame of this experiment a high performance industrial CCD zoom camera with USB computer connection is applied. Parameters like diaphragm size, position and the influence of lenses on the brightness, sharpness and dimensions of the image are investigated. The variable diaphragm demonstrates the effect of depth of field. Furthermore a LED emitting invisible radiation to the human eye is provided to study the exciting technology of active night vision.



A. Full illumination



B. Without illumination



C. NIR LED illumination

The series of pictures taken with the CCD camera shows an example (A) at full illumination and (B) in the darkened room. Due to high sensitivity of the camera a dimly shape of the object can be seen. In that moment, when the NIR LED is switched on and the camera switched into the NIR mode, a bright black and white image of the object appears. The

leaves of the plant appear in white colour, indicating the reflection of the NIR radiation. To document the recorded images the frame grabber and the note pad is used. For each measurement with different parameters like the iris diameter, focusing, exposition time and so on a file for the students report is created.

PE-1000 CCD Camera & Night Vision consisting of:

Item	Code	Qty.	Description	Details page
1	CA-0110	1	CCD day & night camera block module	128 (14)
2	CA-0120	1	Tablet PC Windows	128 (15)
3	CA-0150	1	USB Video frame grabber	128 (18)
4	ES-1000	1	Camera control software	
5	LQ-0250	1	NIR LED in \varnothing 25 housing	120 (13)
6	MM-0020	2	Mounting plate C25 on carrier MG20	93 (1)
7	MP-0130	1	Optical Bench MG-65, 300 mm	93 (7)
8	OC-0060	1	Biconvex lens $f=60$ mm in C25 mount	99 (5)
9	UM-PE10	1	Manual Camera & Night Vision	
Option (order separately)				
10	CA-0100	1	Flat panel TV	128 (13)

Highlights

Basic experiment

★★★ Night vision

Intended institutions and users:

- Physics Laboratory
- Engineering department
- Electronic department
- Biophotonics department
- Physics education in Medicine
- Security forces