



TÜBİTAK UEKAE
NATIONAL RESEARCH INSTITUTE OF ELECTRONICS

ForensicXP-4010

FORENSIC DOCUMENT EXAMINATION SYSTEM



ForensicXP-4010 is the only commercially available forensic digital imaging spectrograph for large-scale document examination. The instrument together with original 2D/3D processing software represents a new generation of nondestructive tools for authenticity determination of different types of documents and handwritings. The system, based on examination of the objectively measurable physical parameters, is aimed for forensic document experts involved with questioned document inspection.

Key features:

- Nondestructive analysis of questioned document in presence of seemingly equal but physically different features
- High-resolution color and infrared digital imaging
- Spectral imaging of absorption, reflectance, transmittance and fluorescence of questioned document using hyper spectrum technique
- Powerful x20 Zoom optics suitable for high-resolution investigation of document field ranging from 10x7,5 mm to 200x150mm in direct view mode or unlimited size document in "Auto Stitch" mode of operation
- Advanced on-line digital signal and image processing for direct analysis of documents for their originality and writing line sequence indications
- 3D visualization software for advanced analysis of measured features in questioned document. A valuable tool designed for pen pressure analysis and line sequence determination.
- Full automated, PC controlled operation.
- Single-box integrated device (535x510 mm bench space) equipped with up to date PC.

TÜBİTAK UEKAE
NATIONAL RESEARCH INSTITUTE OF ELECTRONICS

P.K. 74
41470 Gebze/Kocaeli
TURKEY

Tel : +90 (262) 648 1540
Fax : +90 (262) 648 1547
e-mail : orl@uekae.tubitak.gov.tr
www.uekae.tubitak.gov.tr



Technical Specifications

CCD color camera	1164x838 pixels RGB output
Spectral response	400 to 1000 nm
Optics	X20 Zoom Lens with motorized zooming, focusing and auto-iris
Field of view (Optical magnification)	From 10x7,5 mm to 200x150 mm
Iris range	F 1.2 - 1000
Imaging filter	Linear variable interference filter
Passband FWHM	25-45 nm at 500 nm 35-50 nm at 700 nm 40-65 nm at 900 nm
Minimal spectral examination area	13x13 μm^2

Illumination:

Long-wave ultraviolet, incident / transmitted	365 nm
Short-wave ultraviolet, incident	256 nm
Visible/infrared, incident spot	Adjustable
Visible/infrared, transmitted	Behind diffusing window
Visible/infrared, coaxial	Fiber optic illumination adapter
Visible/infrared, oblique	Angle and position adjustable fiber optic adapter
Bench space requirement	535x510 mm

Spectral Enhancement of Questioned Features in Imaging Spectroscopy

Basics of operation:

The most important tool of a document examiner is his or her vision, but obtaining vivid images of minute or obliterated objects with the naked eye is not always an easy task. Specially designed lenses, modern optoelectronics and digital technologies can, in many cases, help solve the questions in documents under inspection. **ForensicXP-4010** represents a new generation of instruments developed for the document examination, based on precise spectral measurement of the micro-specimens. Each specimen is individually measured to form an image that is visualized using advanced dedicated original algorithm that enhances spectral features of the specimens. The patent pending method, newly developed in our Institute, that can be classified as Spectrally Enhanced Imaging Spectroscopy (SEIS), has proved to be especially useful for different ink detection and sequence of the lines determination.

Using modern spectral imaging technology and advanced processing, it is possible to detect very small differences between inks and papers, as well as to reveal obliterated materials. Most of the traditional methods of forensic analysis rely on "eye-balling" of an image/specimen visualized at 256 levels of grayscale. An examiner eye is capable of distinguishing, on the average, about 20-30 individual grayscale levels. The actual number depends upon individual eye sensitivity as well as the physical condition of observation, such as angle of view, object shape, size and boundaries. **ForensicXP-4010** is designed to enhance your analysis work by assisting substantial increase of the eye capability. The instrument precisely captures optical visible and near-infrared spectrum of each image point, records resulting hyper spectrum and, sequentially processes the spectrum by special algorithm to enhance questioned features. Finally, the result is painted in an easy-to-see form on a PC screen. Compared to a grayscale operation, the human eye and brain are capable of distinguishing at least several tens of thousands of different individual colors, with corresponding increase of the dynamic range of the observer perception. Another important consideration is that the examiner in most of the cases is concerned with color difference rather than with color itself. In general, when objects are viewed adjacent to each other they appear to be more different than when viewed in isolation. In such relative and comparative observations the human vision is acting in such a way as to enhance our ability to detect color differences. In this respect **ForensicXP-4010** follows the natural human way of document analysis, based on color difference associated with physically different origin of the examined features.

◆ Due to continuing product improvements, these specifications are subject to change without notice.