THE NEW SYSTEM FOR FORENSIC DOCUMENT EXAMINATION

ForensicXP-4010 D

ForensicXP–4010 D 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 automatic examination of the objectively measurable optical parameters, is aimed for forensic document experts involved with questioned document inspection.

Key features:

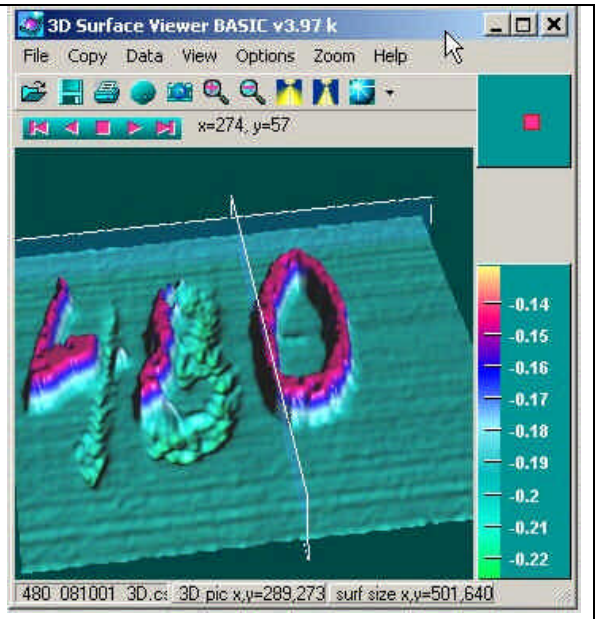
- **Nondestructive analysis of questioned document in presence of seemingly equal but physically different features in 400-1000 nm region**
- **High-resolution color and infrared digital imaging**
- **Spectral imaging of absorption, reflectance, transmittance and fluorescence of questioned document using powerful hyperspectrum technique**
- **Advanced automatic scanning: collection of images, one for each wavelength band, or collection of spectra, one for each image pixel**
- **Analysis of spectrums from every 15 x 15 μm^2 of questioned document area**
- **Powerful x10 Zoom optics suitable for high-resolution investigation of document field ranging from 15x20 mm to 150x200 mm in direct "Optical Zoom" mode or unlimited magnification in "Digital" 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, equipped with up-to-date PC with 20" LCD monitor**

Software modules

Spectrum processor

During 2 years of R&D, original color processor software was developed, based on Spectral Imaging processing. The exceptional sensitivity and broad spectral range permits to detect very small differences in similar inks. Original algorithm is applied for drawing sequence of lines determination.

- 16-bits per color channel processing
- Imager calibration
- Flexible spectral range selection
- Original color enhancement algorithm
- Split screen for simultaneous ink analysis from 2 separate documents
- Markers for reference and questioned ink comparison
- Area of interest zoom
- Processed image reporting
- Saving document and processing options (job save)

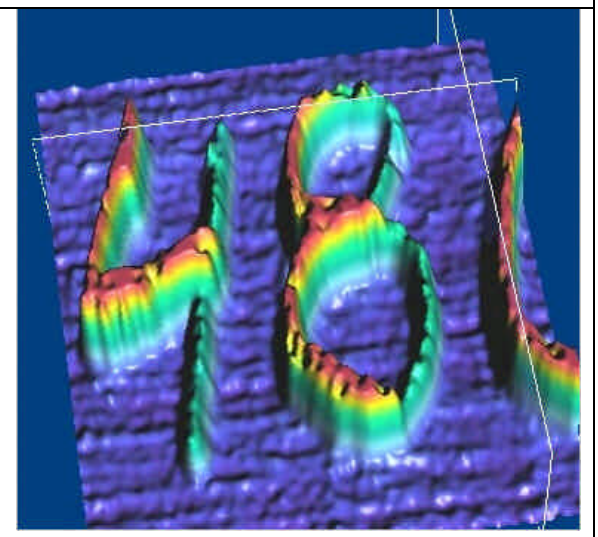


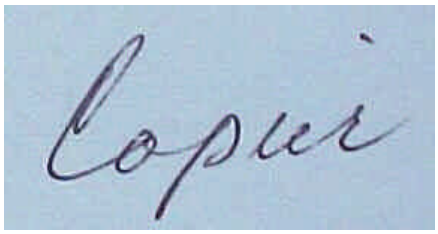
3D Forensic View

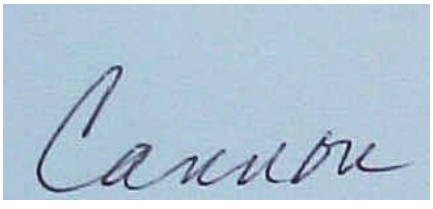
3D Forensic View is advanced software tool for examination of ink difference, pen pressure, as well as for detection of drawing sequence of the lines.

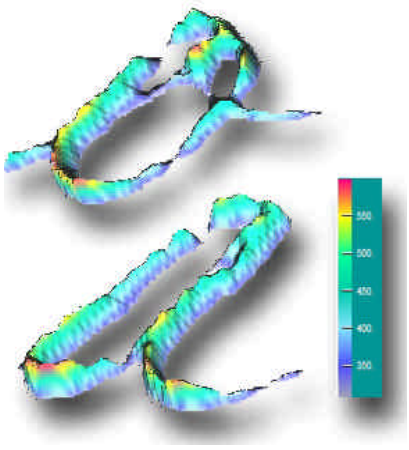
Aimed for document experts and handwriting examiners

- User friendly interface
- Fast real time rendering (rotation in all angles in space to optimize observation)
- Flexible zoom in all directions
- Color palettes
- Light adjustment
- Web friendly output images
- Measurement of features
- Profiling of 3D features
- 2 separate documents processing







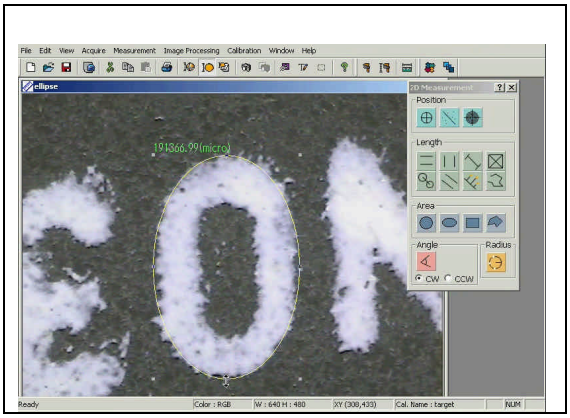


ScienceGL Inc 3D Forensic visualization tools

Image analysis and on-screen measurements

2D image basic measuring software tools allow quantitative data for comparisons of handwriting and typewriting

- Feature position coordinates
- Distances
- Angles
- Areas
- Diameters and Radii
- Unlimited stitch of images, captured from neighboring areas of a document
- On-screen Rulers, Grids and examiner notes
- Calibration procedure allows absolute measuring values
- Measuring statistics



ForensicXP-4010 D Main Specifications

CCD color camera	1392x1024 pixels digital output
Spectral response	350 to 1100 nm
Quantum efficiency (max.)	65 %
Integration time	1 msec. to 65 sec.
Parfocal Lens with motorized zoom, focus and iris	
Optical Zoom	x 10
Digital Zoom	unlimited
Field of view (Optical magnification)	From 15x20 mm to 150x200 mm
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	15 x 15 μm^2
Illumination:	
Long-wave ultraviolet, incident and transmitted	365 nm
Middle-wave ultraviolet, incident	313 nm
Short-wave ultraviolet, incident	256 nm
Luminescence excitation	455, 470, 505, 530, 590, 615, 630 nm
Anti-Stokes excitation	850 or 980 nm
Visible/infrared, incident spot	Adjustable
Visible/infrared, transmitted	Behind diffusing window
Visible/infrared, coaxial	Illumination adapter
Visible/infrared, oblique	Position adjustable moveable adapter
Computer	Up-to-date PC and 20" LCD monitor

Spectral Enhancement of Questioned Features in Imaging Spectroscopy

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 to solve the questions in documents under inspection. **ForensicXP-4010 D** 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 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 D** is designed to enhance your analysis work by assisting substantial increase of the eye capability. The instrument precisely captures 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 D** follows the natural human way of document analysis, based on color difference associated with physically different origin of the examined features.

Thanks to the dedicated digital hyper spectrum measurement, optimized processing and true color visualization the **ForensicXP-4010 D** can reveal some hidden features of the questioned document that are invisible by other contemporary instruments. Among other important features of **ForensicXP-4010 D** one should note the non-destructive principles of examination, decision making based on objectively measured optical parameters of the document. With this new tool, the examiner is gaining unprecedented sensitivity, as well as the accuracy and validity of decision. Once you see its benefits you cannot do without it!