

## Services offered

FORINST uses its own equipment and with which it currently offers an additional technical service: the analysis of disputed texts, especially superimposed strokes within them, whether homogeneous (strokes of the same type) or heterogeneous (strokes of different types), e.g. handwriting mixed with typewritten text).

It uses essentially five techniques:

The first technique (**Laser profilometry**) is based on the “**interferential method**” and allows the user to observe (and measure with a micrometric precision of one thousandth of a millimeter) the distance between the removal of the pen, the shape, width and depth of the grooves, and other characteristics of the questioned writing thanks to the extremely high definition of the three-dimensional scans obtainable with this innovative instrument.

From the study of these measurements it is possible to objectively determine the time sequence with which the crossing strokes were written.

The second technique (**Reverse Engineering**) consists of the **physical reconstruction** (on a plastic material) of a particularly significant point of the document subjected to a three-dimensional scan obtained by examination of the laser profilometry. The technique starts with a scanned area of a few square millimeters, which is normally magnified by approximately 10-15 times on Cartesian planes X and Y and about 200 times on the third axis (Z) making it possible to obtain a small plastic model representing the superimposition of two strokes, an area in which there are certain pen pauses etc. This feature makes it possible for anyone, even nonexperts of metrology (e.g. a judge) to literally “touch” the fine points of these crossovers in the tiniest detail.

The third technique (**Video comparison**) uses a **multi-spectral illumination system**. The device was designed specifically to digitally view the anomalies created by fraudulent tampering with documents. The instrument makes it possible to conduct the following analyses: in the ultraviolet range (using a UV LED source of light), in the visible range (using an RGB LED source of light) and in the near infrared (using an IR LED source of light)

The fourth technique (**Spectrophotometry**) uses the **spectrophotometer** (by reflectance) dedicated to the **chromatic characterization of the ink**. For example it can be used to ascertain whether the same writing instrument was used to add text or make corrections, etc. (and consequently the same ink) as that used for writing the main text.

Operative procedures: comparison of the spectral responses between two inks (e.g. a suspicious addition of text to a will) or ascertaining whether the added text, corrections, etc. were made during one sitting or at different times.

Assumption: if both writings were written simultaneously (and with the same pen) they are subject to the same environmental conditions and dry in the same way. As a result their spectral responses must produce a similar result. The instrument operates on a field having a diameter of approximately 600 µm in a spectral range of 360 -1000 nm with a resolution of 2 nm. The results of the measurements are saved in the form of histograms with the relative spectral responses of the inks being examined. Moreover, for each portion of examined graphisms, an image is saved in order to be able to repeat the measurement at the same point in cases of objections, additional examinations, etc.

The fifth technique (**Image Processing**) refers to the **two-dimensional morphology** of the writing and involves observing the shape and width of the grooves, measuring the distance between the pen pauses, etc.).

The recording procedure involves using a digital camera combined with an optic high-resolution microscope; subsequently the digitalized images are processed with a special software application and used to make the required two-dimensional measurements.

**Note:** it is important to note that all the techniques described above are based on **noncontact** optoelectronic solutions “for the purpose of conserving the integrity of the document” and are absolutely noninvasive, nondestructive and therefore can be repeated infinitely.

Another subject is **the chemical analysis of the inks**, which is a destructive method involving the removal of small portions of the graphisms from the document being examined. This method allows you to date the document only if the exhibit is not too old.