Special techniques of photography applied to watermarks search

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Art photography Digitalization Cultural landscape

Index

1. Introduction. Importance of the photography in the documentation of the watermarks and of the paper in general.

- **The development of digital technology** makes that now and day can considerer a photography like first order resource in paper documentation because it achieve a double function:
    1. Record of the work.
    2. Using specific techniques allow its analysis and study.

- **The purpose of this communication** is to present the professional photographic point of view the issue as watermarks and paper in general in that the photographic technique is used widely and are not always adequately. It is intended for studious and experts in documentation, as well as people who develop fieldwork.

- **Current technology can provide a level of information** about the piece like never before. It is therefore necessary to keep abreast of these developments and open to, even if it means a change in how often you work. The ultimate purpose -at least mine- is to provide all possible information that can be produced by these techniques and higher quality, to respond to applications requiring multiple projects, from research to dissemination in all written and digital.

2. Methodology and guidelines for actuation.

2.1. Field photography and studio photography (photography work/ professional photography)

- Although not all studio photography is made by professionals and they can only carry out their work in a laboratory or studio, I have proposed this title for differentiate **the work aimed at achieving images**, better or worse, the watermarks or other documents to verify its existence and proceed thus, staffing and study and those pursuing a **faithful record and of confirmed quality.**

- The purpose of these lectures is provide knowledge that make these two fields getting closer.

2.2. Image features. Essentials elements for recording watermarks. Purpose of the images.

- Before start any work of photographic documentation we have to value all fundamental aspects that must have a image to be visible. In my view there are several essential characteristics that must know of an image:
    - Size and resolution. Pixels, cm, ppi.
    - File format. Tiff or JPEG among others.
    - Color profile.
    - ISO (sensor sensibility)
    - Focusing. (focused or blurred image)
    - Density.Sub/overexposure. Histogram.
    - Framing.
    - Color difference.

- That depend on the destination of the images resolution and file format required (72 ppi/jpeg mail, 300 ppi/TIF for offset printing, 150 ppi/jpeg for tablet files, 400 ppi for injek printing...)

2.3. Means and tools.

- **Camera**. Obviously the requirements for either field (photography work or professional photography) are different. We can differentiate:
    - Field photography:
        - *Compact camera*
        - *Reflex camera*
    - Studio photography*:
        - D*igital camera*
        - *Digital back*

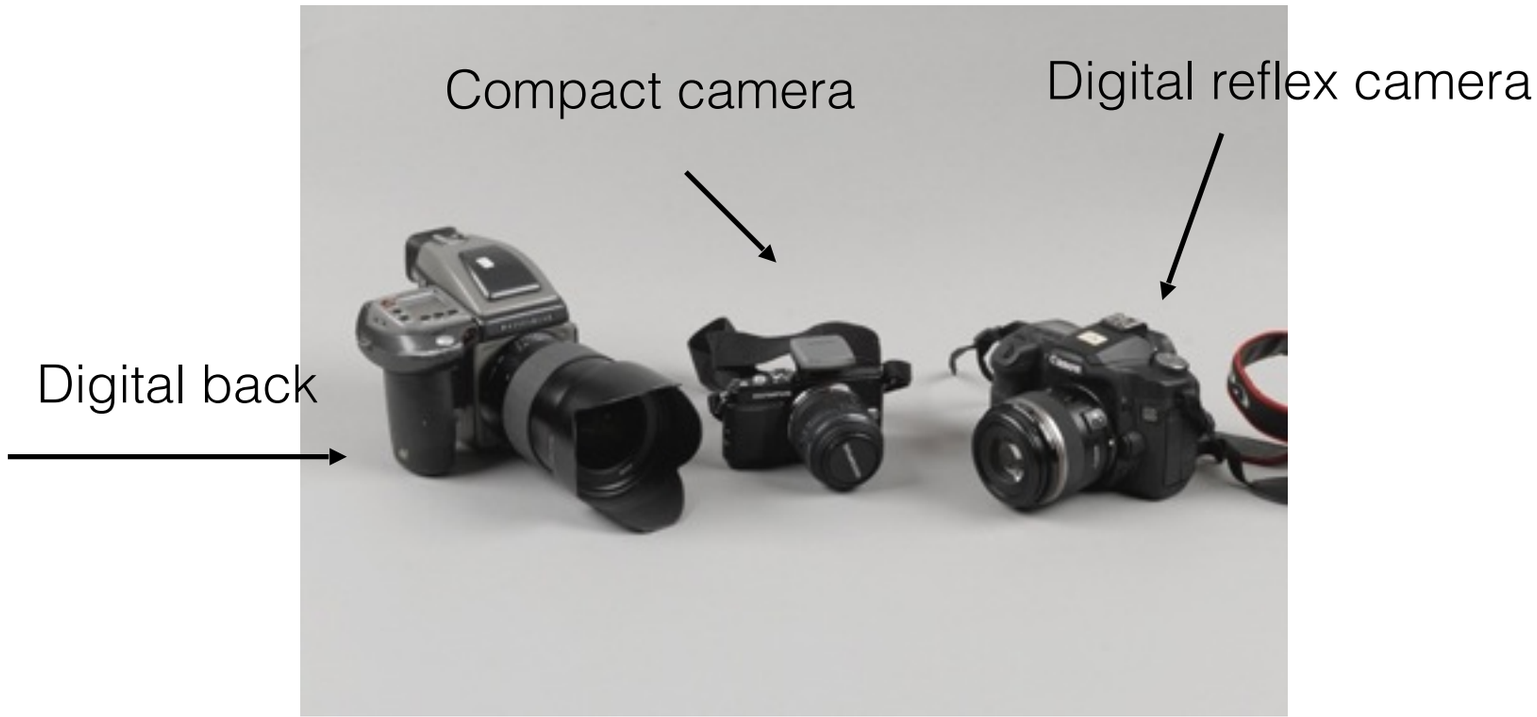
*Differences mainly affect color depth and size of the sensor

The basic properties that a camera must have for reproduction paper documents and mainly watermarks are, in my opinion the following:

- *Possibility of eliminating the integrated camera flash*
- *Accessory for tripod*
- *Manual function*
- *Compensation of exposition*
- *White balance*
- *Manual Iso*

2.3. Means and tools.

- **Tripod**. Made of aluminum or alloy. No plastic. 1.20 cm unfolded.
- **Crystal/ anti-glare methacrylate**. So useful for flatten documents. I employ it for both reflected and transmitted light. Never for UV photography and infrared. It should always be “extramegaclean” and removes resolution image. Also produces a high color deviation.



- *I will talk about camera for professional use when dealing with special techniques of photography.

2.4. The light and space of work.

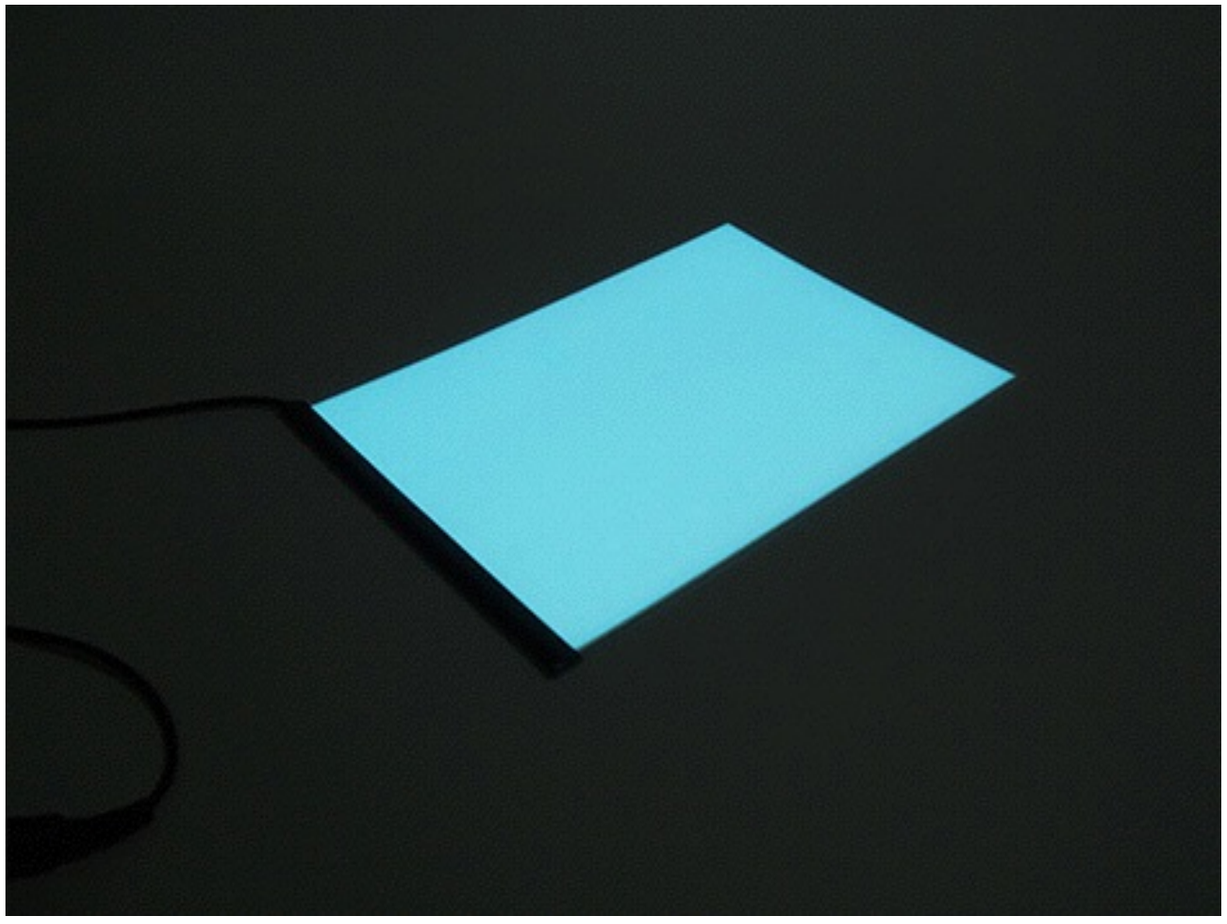
- **Sources of light.** Their use depends on several factors, among which are type of illumination, the budget and expertise of photographer.
    - For **shots of transmitted light** may use a "**sheet of light" or a light box also**. Both incorpore lamps or tubes of cool light. It is appropriate for human eye but presents problems for photographic uses because this type of illumination do not reproduce properly tonal range. Other difficulty resides in its light low power that makes necessary the use of long times of exposition and diaphragms too opened. Workspaces when operating with this light should stay dark.
- **Reflected light shots** allowed the use of more varied sources. Namely:
    - Tungsten/halogen. After proper filtering good color reproduction. Problems: it emits heat and IR radiation.
    - Cool light. Unsuitable for the reproduction of color. Severe problems for reproduce gold and other metals. High index of UV radiation.
    - Studio flash with screens. Is the better light. The closest to the sun. Correct reproduction of colors. Short time of exposition. Without UV radiation. It does not need to work in the dark.

2.4. The light and space of work.

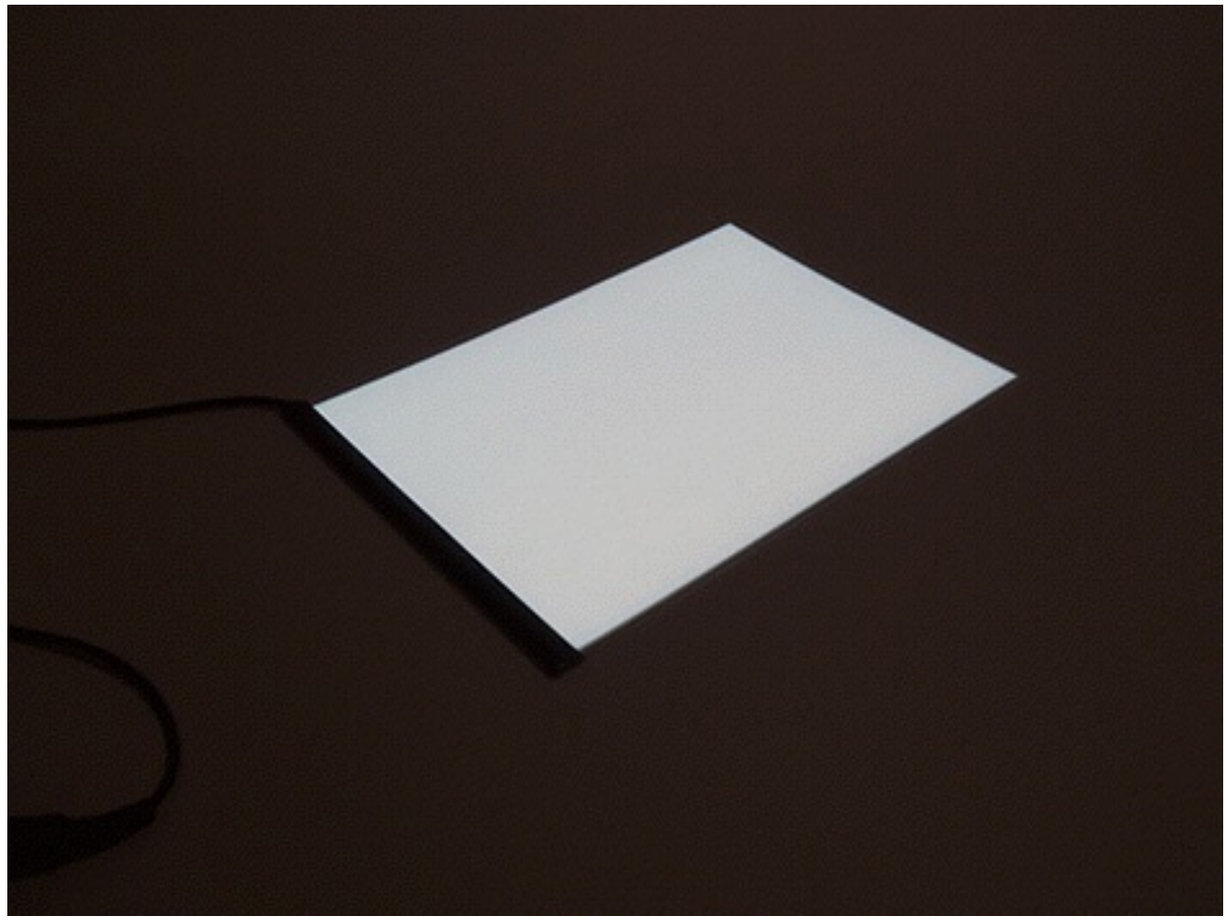
Light sources and its use in photography

TYPE OF ILLUMINATION	COLOR TEMPERATURE	APPLICATION	EXPOSITION/ DIAPHRAGM	COLOR DEVIATION
Solar	5000/ 5500º K	Inadvisable	—--	—--
Solar indoor	4000/ 5000º K	Visualisation Not photography	—--	—--
Tungsten/ Halogen	3200º/ 3500º K	Suitable display for photography	Long expositions Opened diaphragms	Yellow (Y)
Cool light	Variable	Inadvisable display for photography	Long expositions Opened diaphragms	Green (G)
Studio flash with screens	5500º K	Optimal for photography It is not possible to display	Closed diaphragms Short expositions	Colored adjusted

2.4. The light and space of work.

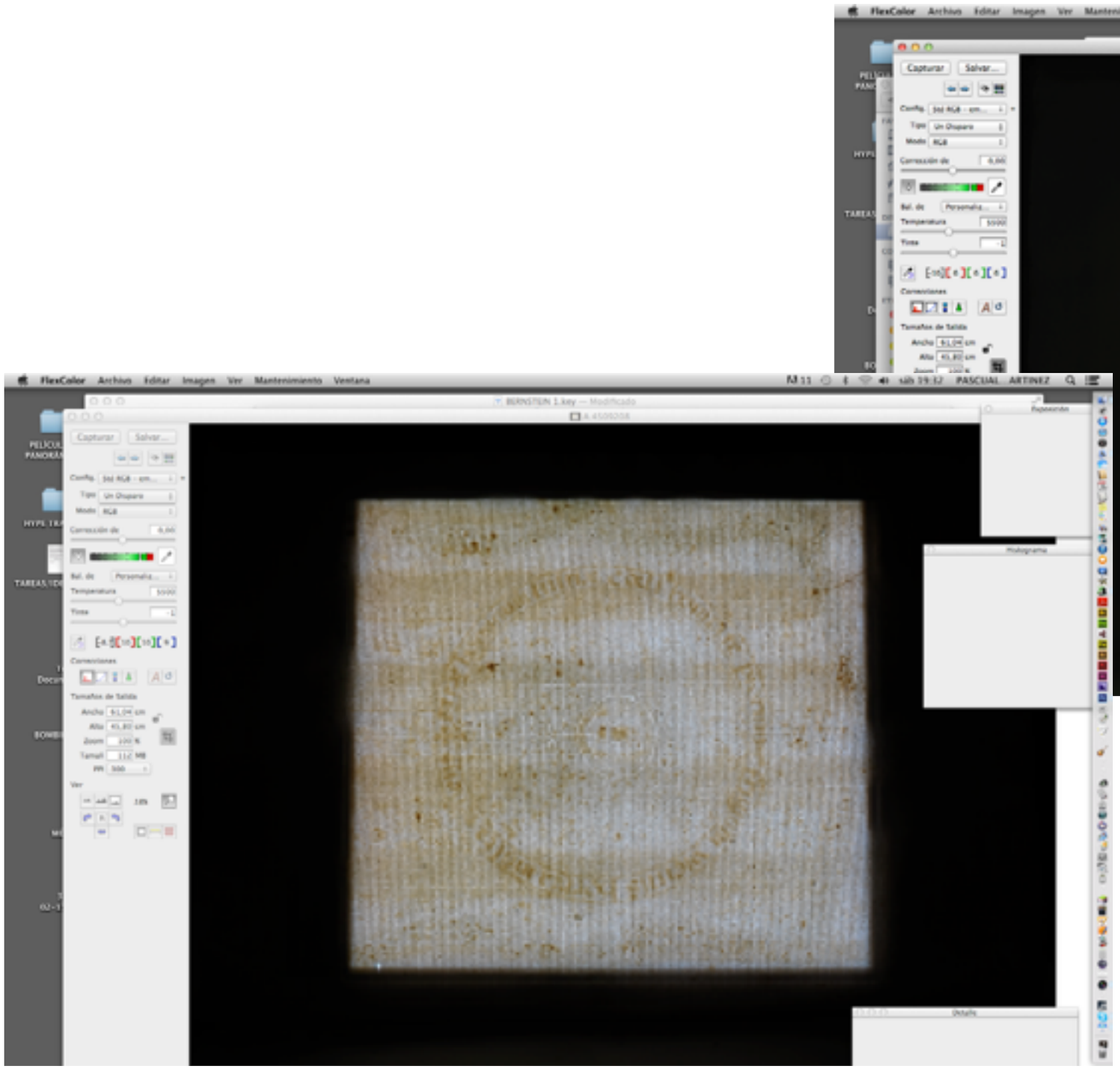


Light sheet without color correction.

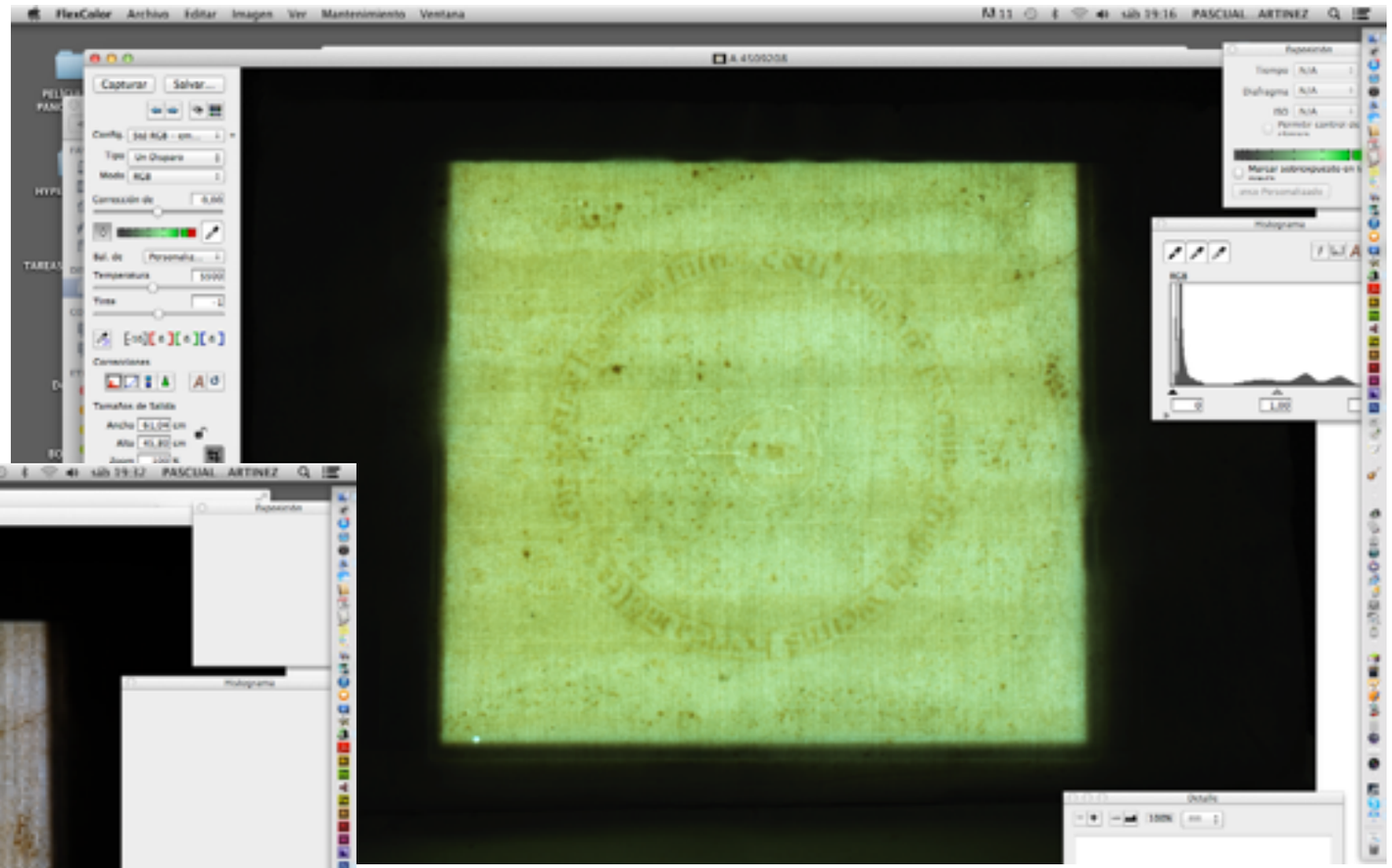


Light sheet corrected

2.4. The light and space of work.



Light sheet corrected



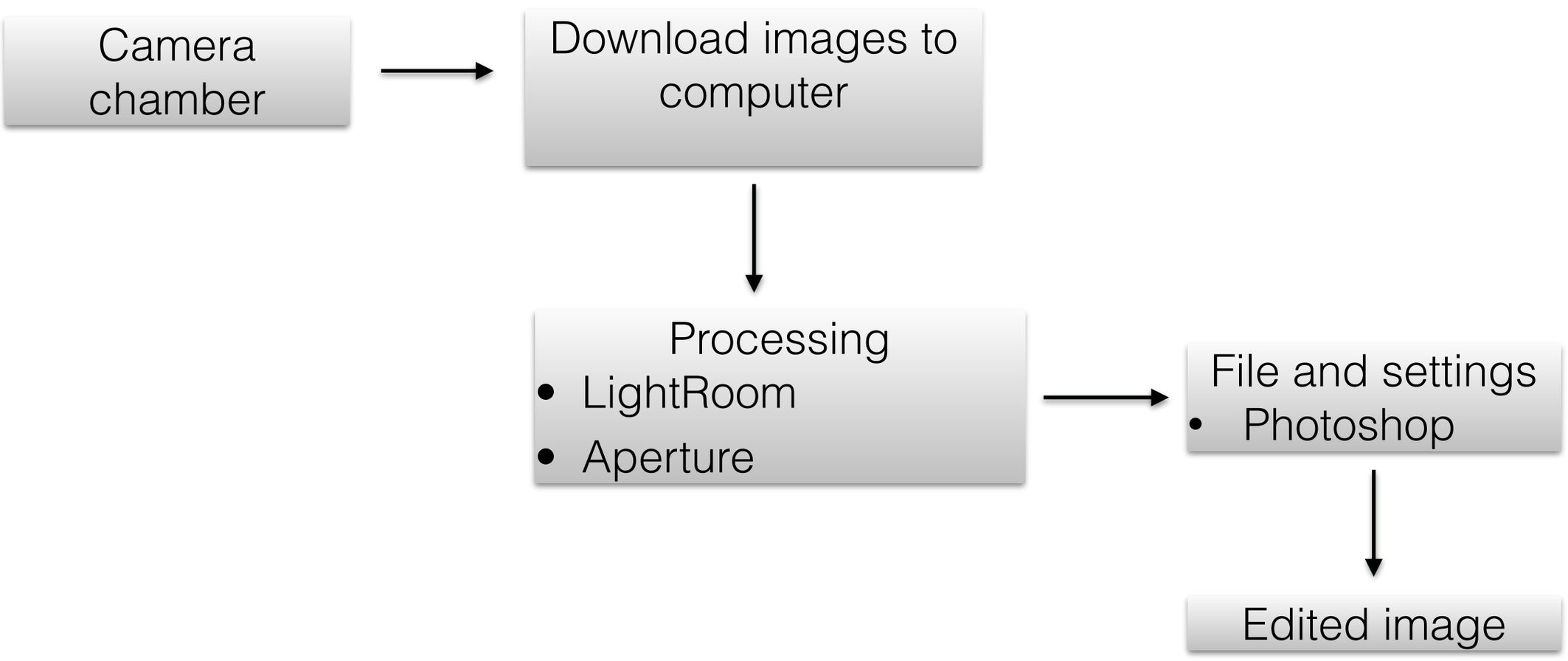
Light sheet without color correction.

2.4. The light and space of work.

Document. Visible light and color chart.

2.5. Image processing.

- As we have seen in previous examples graphics, It is better that the images are downloaded and edited in a program to use (Aperture, LightRoom), then being adjusted in Photoshop. Dismissal from there copy the image intended every purpose, as expressed by the proposed scheme:

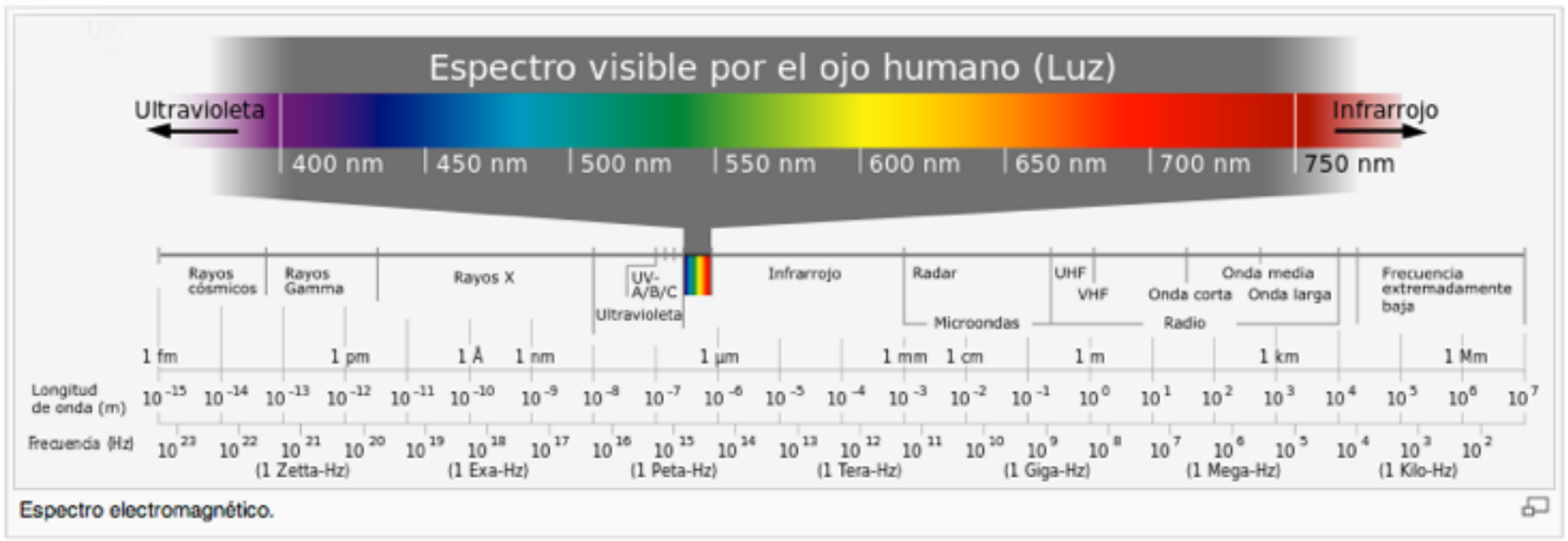


2.6. Shot realization. Establishment of criteria

- For start a piece of work or a project we must establish **criteria for their execution**. We should valore different factors, like **features of document** (book sewing or cut-sheet) size, state of conservation etc. It is therefore necessary a **visual examination** of the work. From the data obtained from this study, we developed the **method of photographic work**. We will decide which kind of illumination, if we have to use crystal or not, worthwhile if details or whole page or if you have to use special techniques. For me this is very important and it supposes a teamwork between different technicians involved in the project. To perform it is necessary that all parts work properly aware of the other.

3. Analysis of photographic techniques.

3.1. Electromagnetic spectrum



Espectro electromagnético.

- Human eye is sensible to electromagnetic radiation with wavelengths comprised between 400 and 780 nm* approximately, interval spectrum called **visible light.** The shortest wavelengths of visible spectrum correspond to violet light and the longest to red light, and between these two extremes we found all colors of rainbow. Electromagnetic waves with wavelengths slightly lower than the visible light are called **ultraviolet rays** and with slightly higher wavelengths are known as i**nfrared waves**. (Tippler/ Mosca: Physics for science and technologies).

*We will discuss this item in the visible photography section.

3.1. Electromagnetic spectrum

- Digital camera is capable of recording the wavelengths close to both sides of visible spectrum, are known near infrared and near ultraviolet.

Visible light

Infrared

Ultraviolet

3.1. Visible photography

- As we have seen in the previous point, photography that we called **“visible”** records wavelengths comprised between 400 and 780 nm. Historically it has always been considered that visible light ends at 700 nm, but now a day we know that can afford 780 nm in certain light intensities and **this is crucial** for photography as we shall see.

- Before proceeding, I want to make a parenthesis for remember that the **human vision is not the same as the camera**. Photographers know the way our brain gets used to see like the camera. In general therms the camera is much more limited that human eye, but precisely in this area that we are interested in the camera has a higher capacity, certainly caused by lighting techniques.

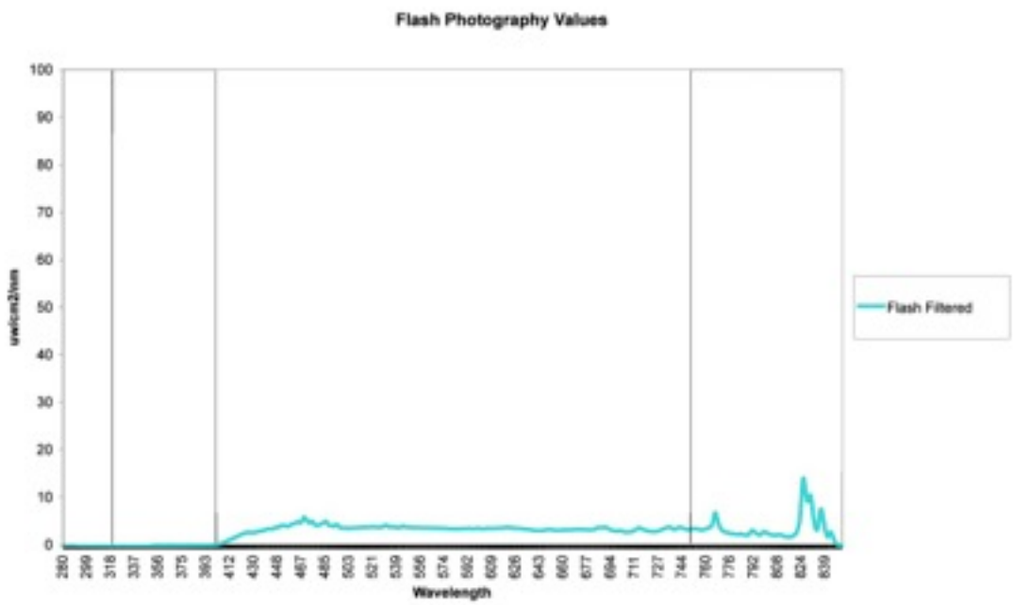
- Is usually not considered visible light like a special technique or scientific but although the means are more or less conventional, they are adapted to speciality, so that the obtained information can go beyond mere documentation of the piece photographed.

3.1. Visible photography

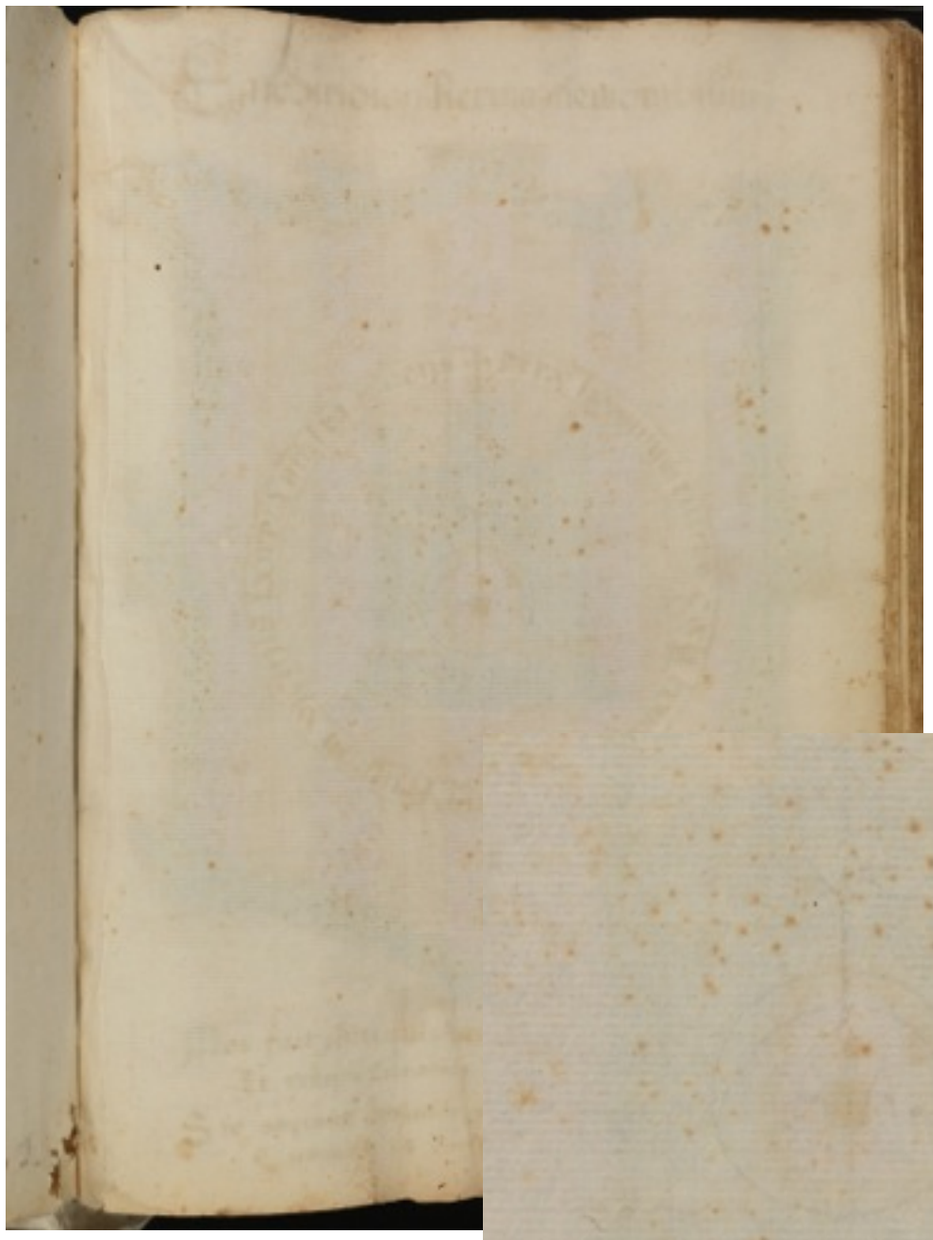
- The **usual professional lighting technique** applied to works of art, and in them the books and paper documents are included, is to expose the work to exceptional lighting conditions producing an optimal reflection of materials color, likely reaching 780 nm and is faithfully recorded by the digital camera (or rather digital back). Is what we came to call lighting sphere. The light source used is studio flash properly filtered. UV radiation emitted is null. For that reason we say that camera see, in this case, more than human eye because these certain conditions are only produced in the moment of the flash. This technique is valid for the illuminated by reflexion.

- The **techniques used** in the photographic documentation of books and documents are three:

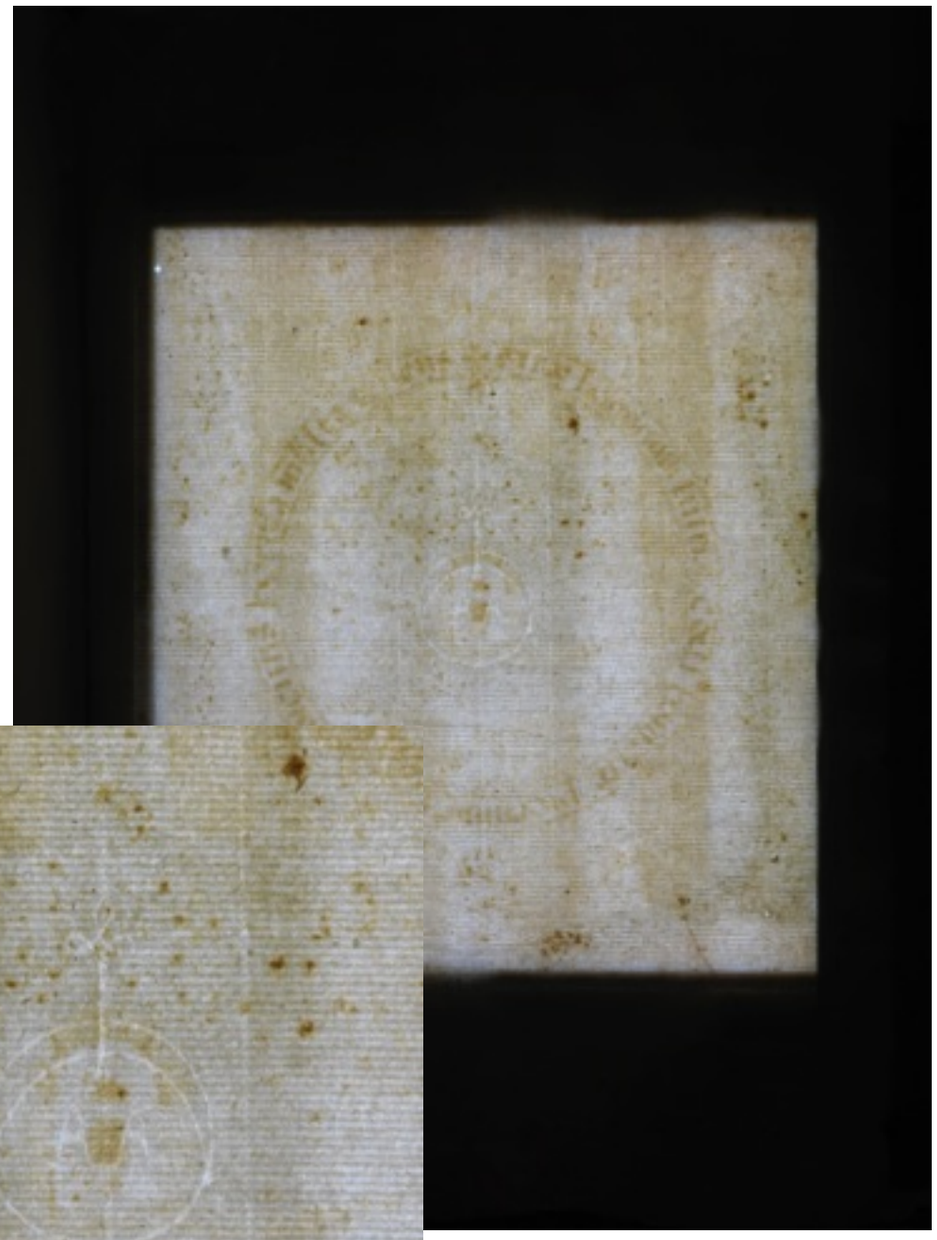
  - Reflected light
  - Transmitted light(Backlight)
  - Raking light.



3.1. Visible photography



Visible light reflected



Visible light transmitted

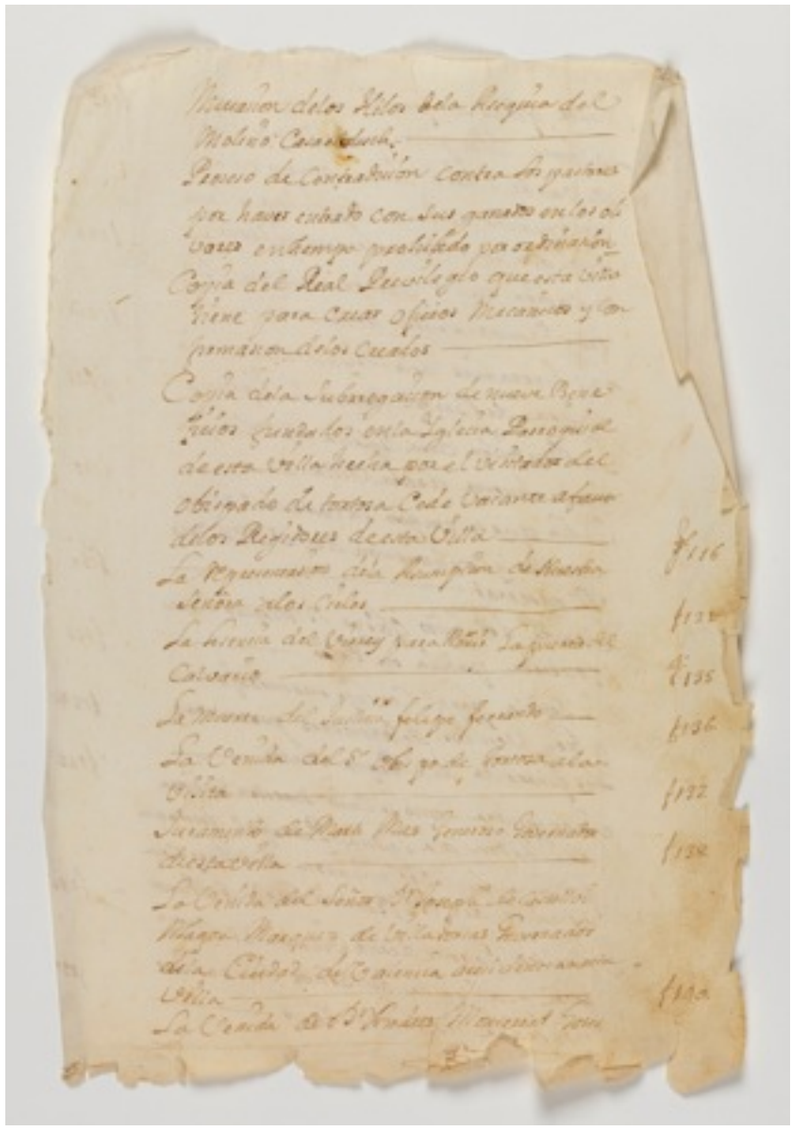
3.1. Visible photography

- In the register of watermarks the technique most frequently used is **transmitted light**. Although flash equipment can be used, the tool most frequently used is the “light sheet” or similar devices. It is very useful because it provides uniform light. Most of times are composed of cool light. At a photographic level presents series of issues:

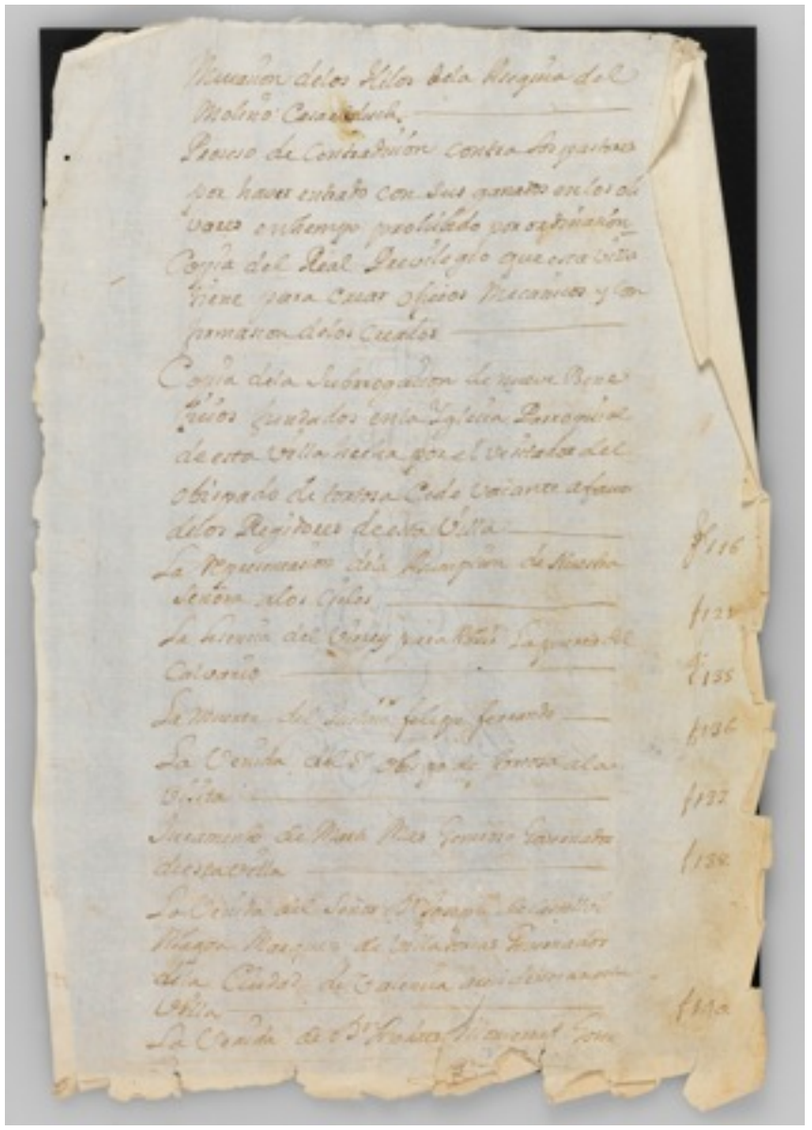
  - The light source is not photographic and although the reproduction of colors is not the main theme of transmitted light, is not correct.
  - Emits perceptible dominant of color.
  - To be of very low intensity it needs long time of exposition that can affect the definition of image and opened diaphragms, in this case affects the depth of field.
  - Needs dark to shoot.

Watermarks. Transmitted light

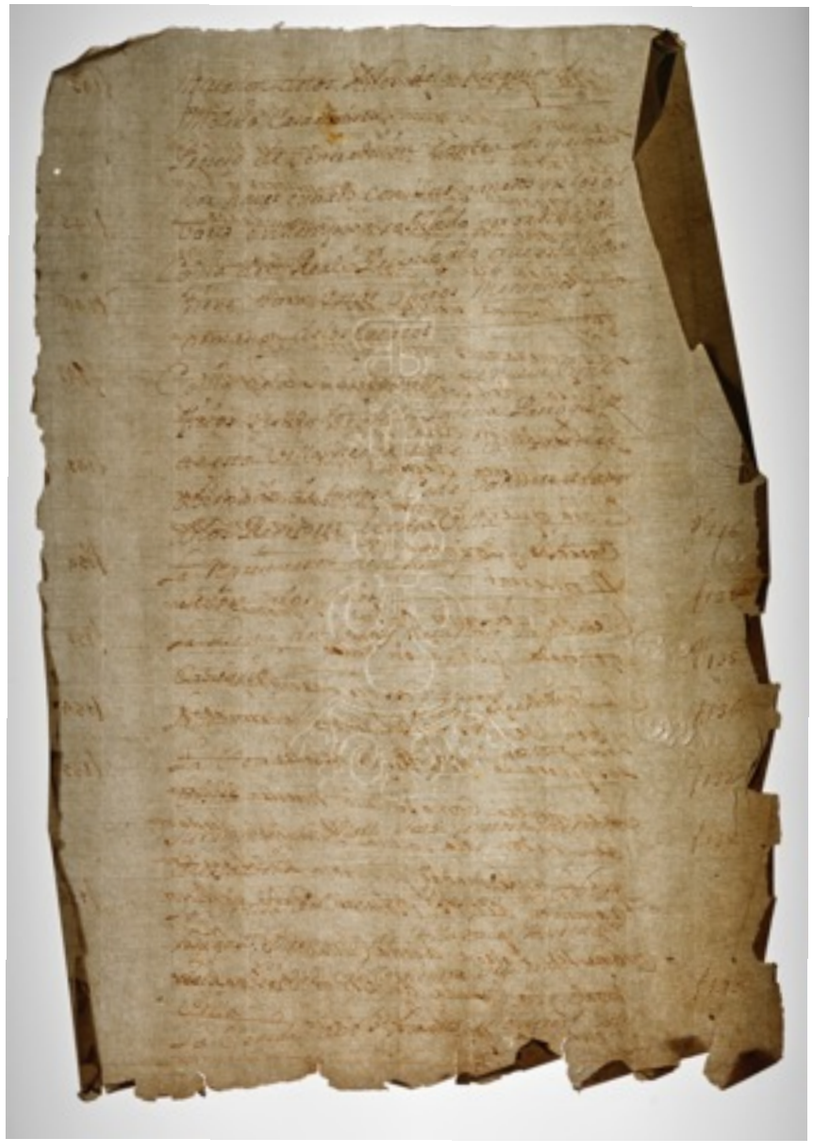
3.1. Visible photography



Visible light reflected on white background.



Visible light reflected on black background.



Visible light transmitted

3.1. Visible photography

- **Reflected light.** Both the previous display as at the time of shot, the placement of a cardboard black behind leaf served properly to look and photography.

- **Crystal.** If the piece is rugged or difficult to maintain rigid we use an anti-glare crystal. If not, better not use it. To my understanding, sometimes abuse this technique because the photographic process is not known sufficient. In in a document that has ridges or other uniformity problems lighting can be placed so that the rays fall parallel on the same. So no shadows will occur. Many inclination or flatness problems are eliminated by using closed diaphragms.

- **Technical data.**
    - **Camera sensor** size 7.216 x 5.412 pxl
    - **Lighting equipment.** Studio Flash

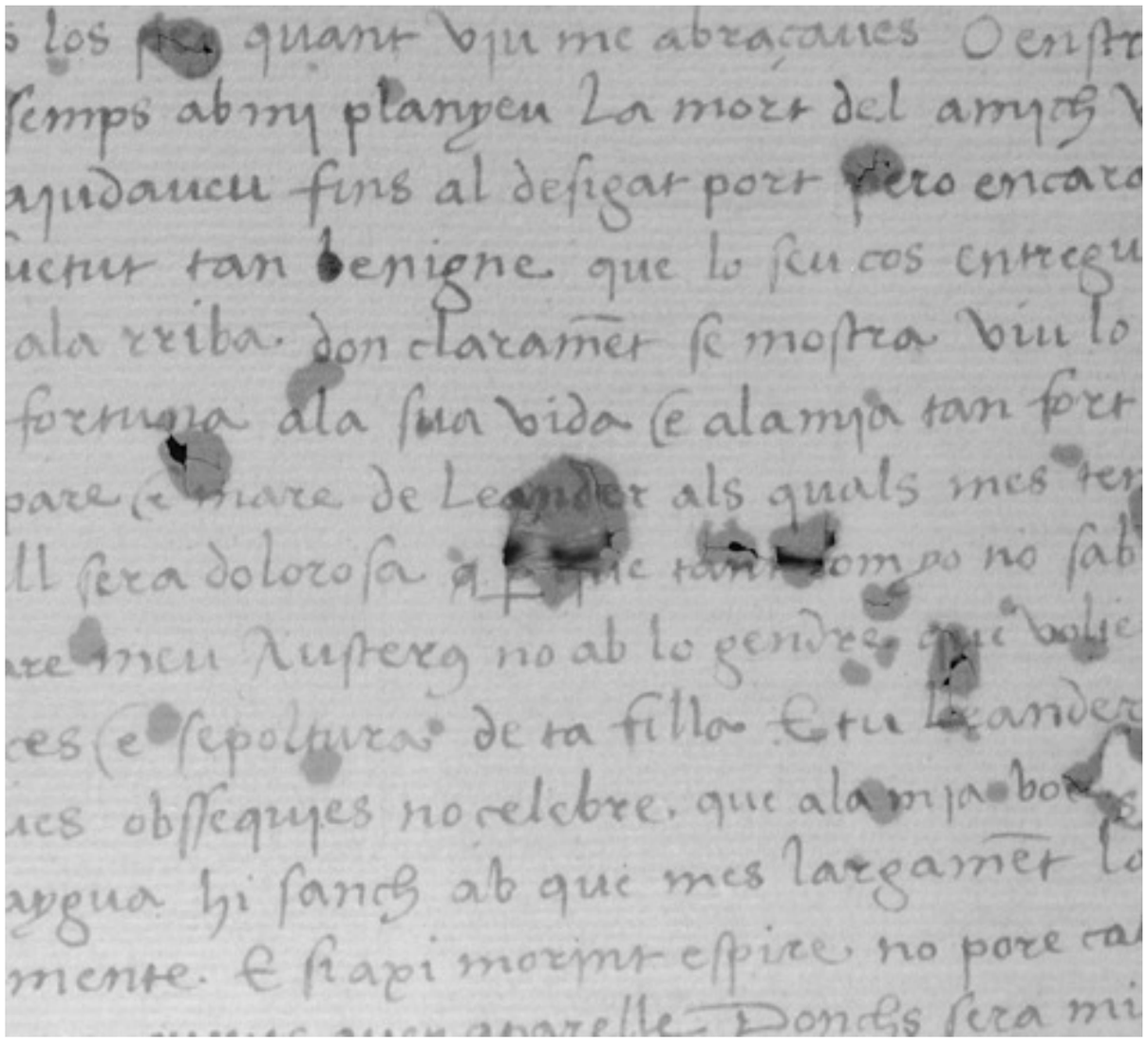
3.1. Infrared photography

- **Digital sensor** is capable of recording wavelengths that make up the visible spectrum and the near infrared part to approximately 950 nm. We can remove part or all of the visible radiation by placing a red filter with different densities.

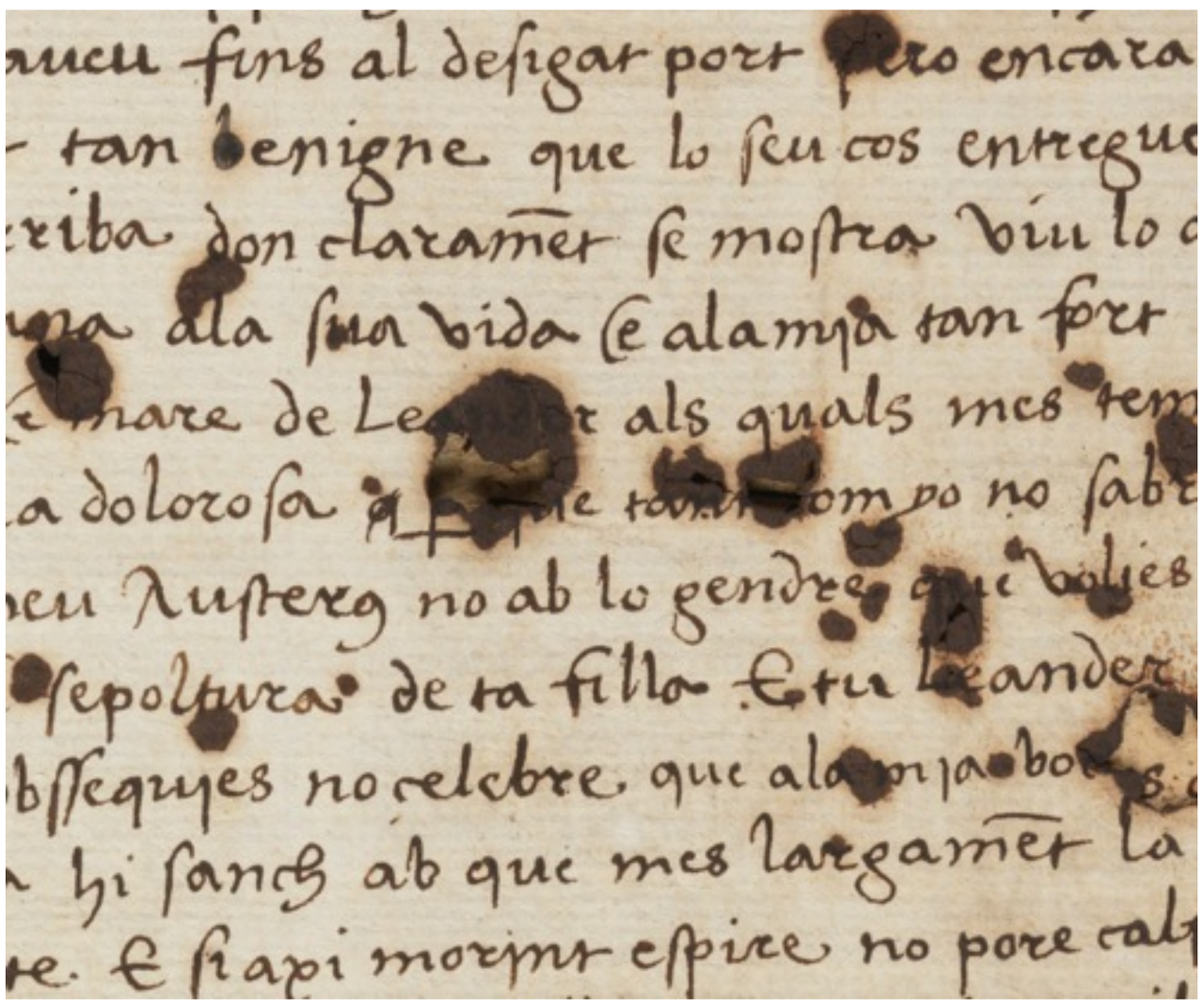
- It has been **used in restoration**, for a long time, with analogue camera for their capacity of penetration in paint layer. Technological development has made today have a much higher quality images with a much greater power of information, may reach this area of the spectrum.

- This technology is also applicable to **books and documents in paper or parchment.** Its main applications we highlight the legibility of handwriting affected by scratches or stains. Also provide very useful information on the composition and paper-making.

3.1. Infrared photography

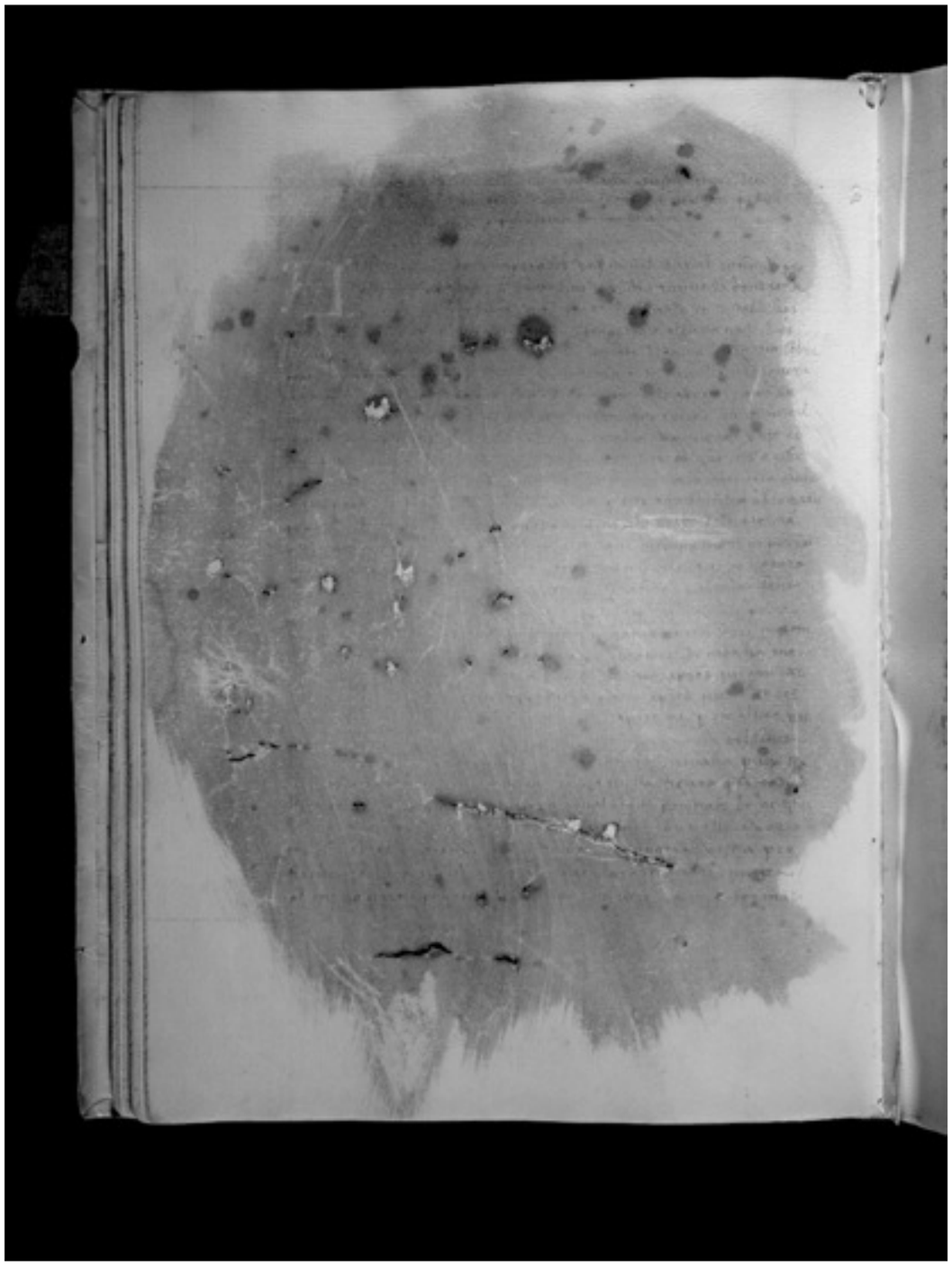


Infrared photograph 950 nm



Visible light reflected

3.1. Infrared photography



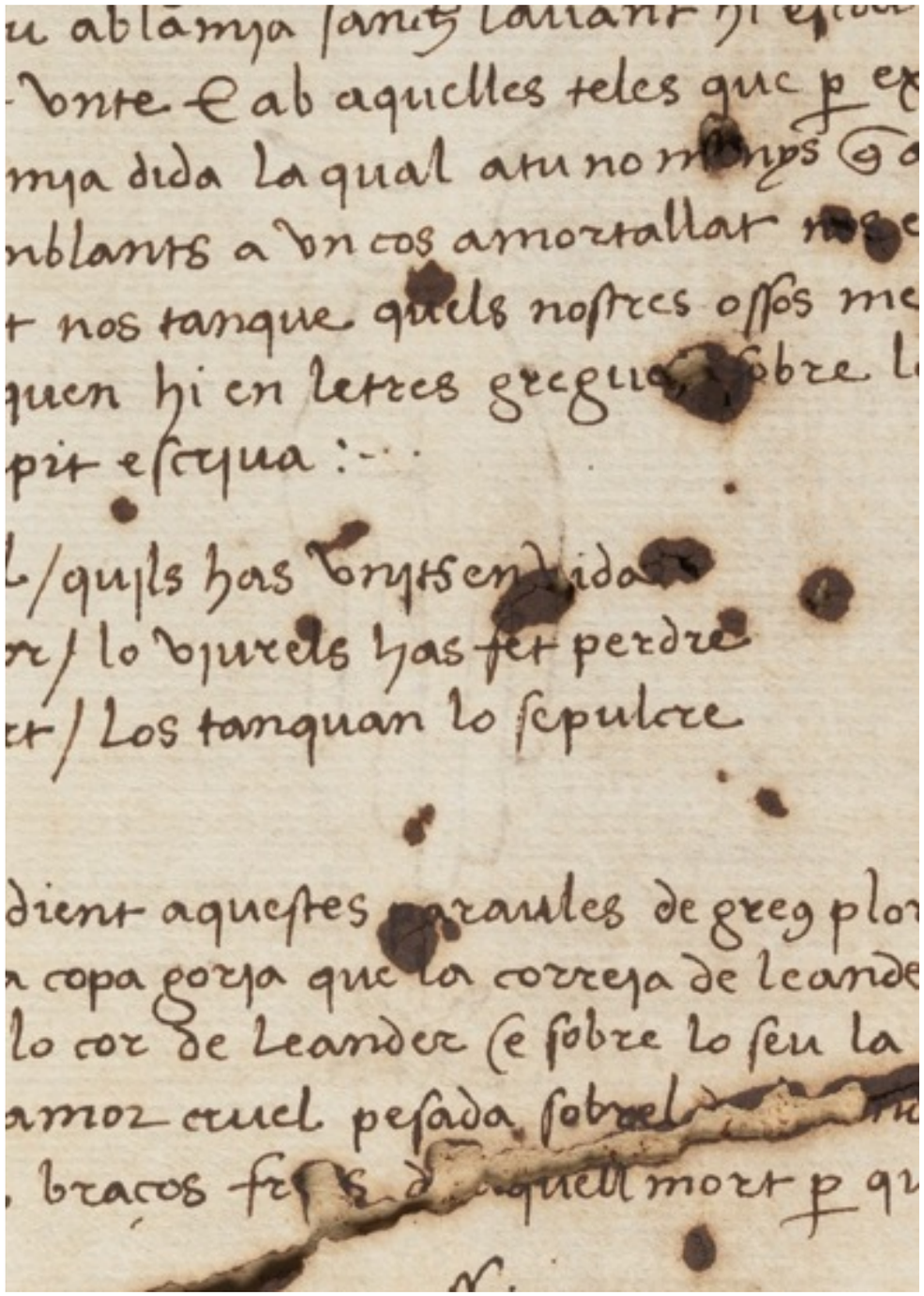
Infrared photograph 950 nm

Photograph visible light reflected

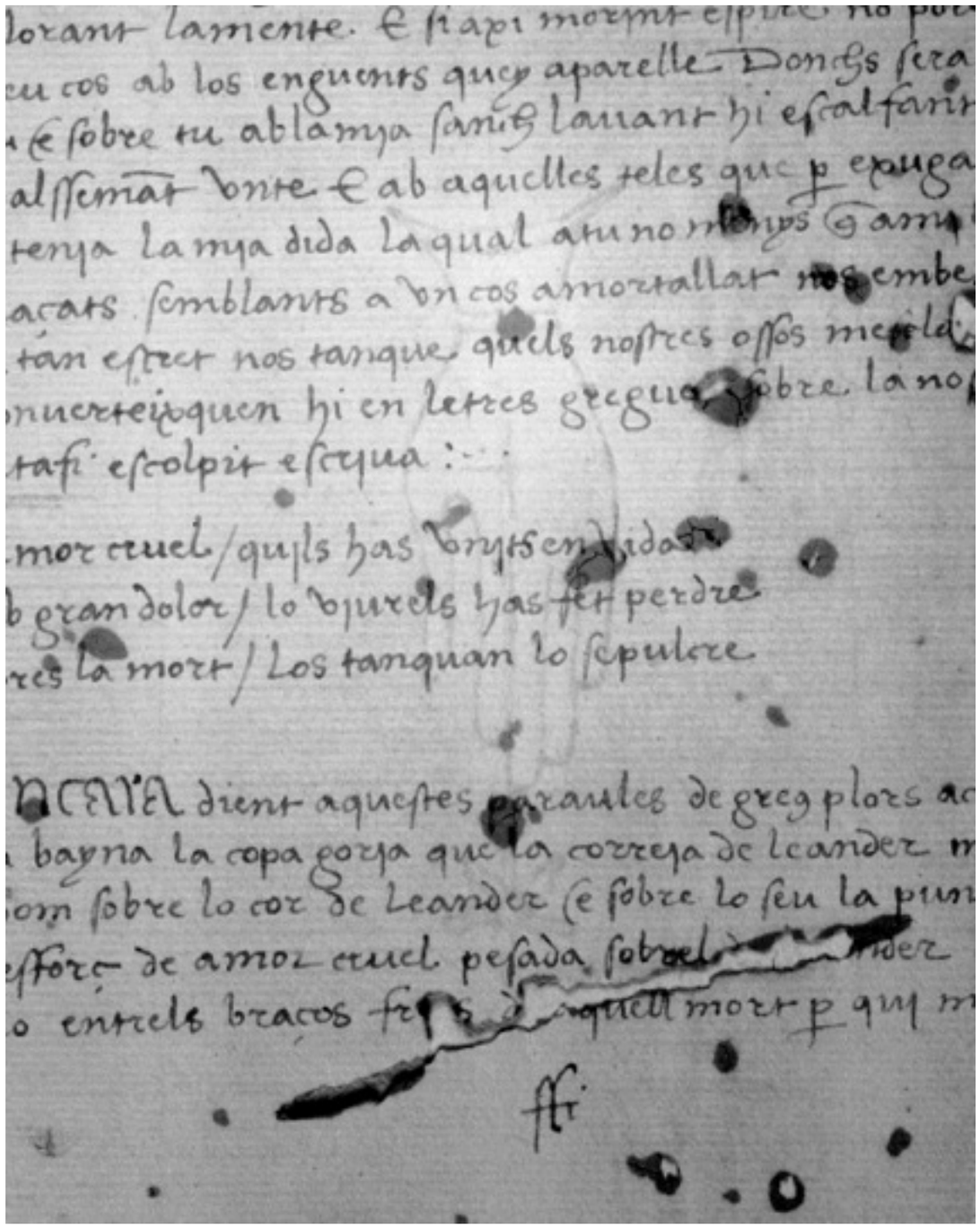
3.1. Infrared photography

- For use in documenting the watermarks provides the following information:
    - Provides an overview of the stroke and different register to that provided by visible light transmitted.
    - Removes stains caused by oxidation, fungi, etc.
    - You can eliminate writing which gives a clean paper aspect, thus highlighting the watermark and greatly facilitating their identification and study through the rubbings.
    - It can make the watermark visible in the case of match drawings. Makes them look more precisely the role as irregularities eagles, wrinkles, etc.

3.1. Infrared photography

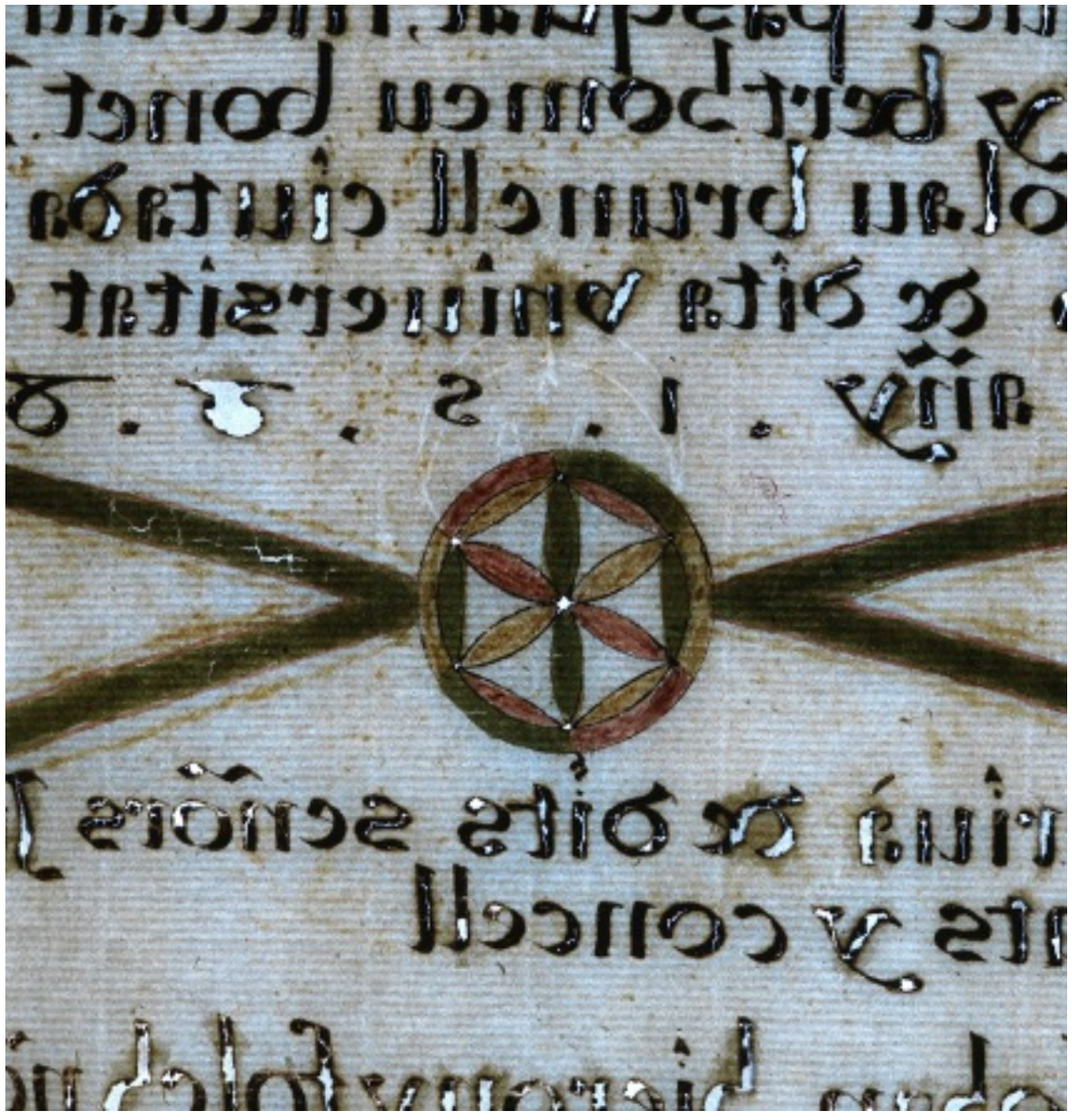


Photograph visible light reflected

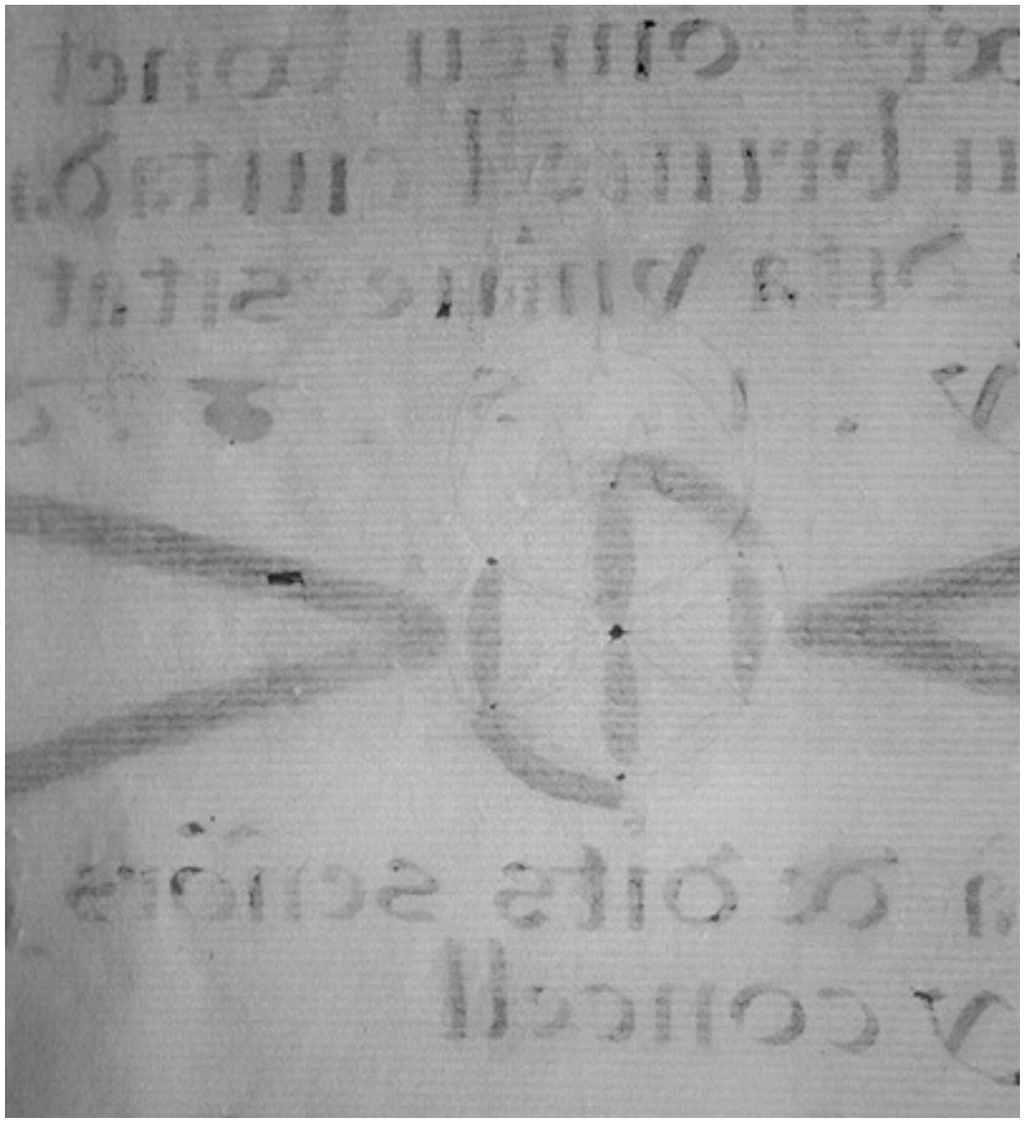


Infrared photograph 950 nm

3.1. Infrared photography



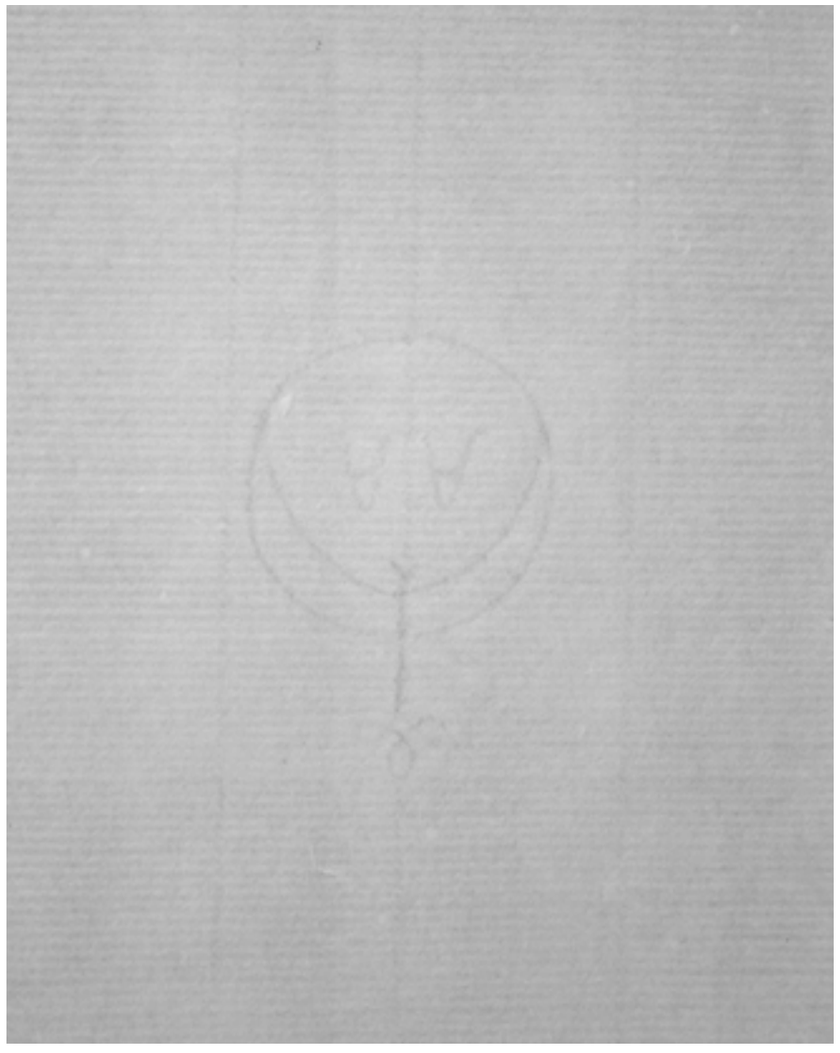
Photograph visible light transmitted



Infrared photograph 950 nm

3.1. Infrared photography

Photograph visible light transmitted



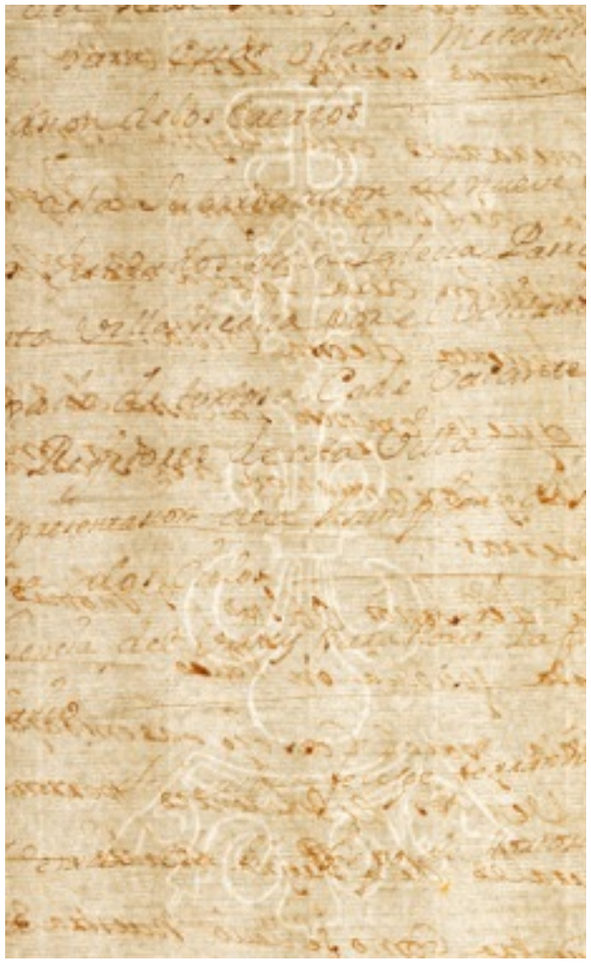
Infrared photograph 950 nm

Photograph visible light reflected

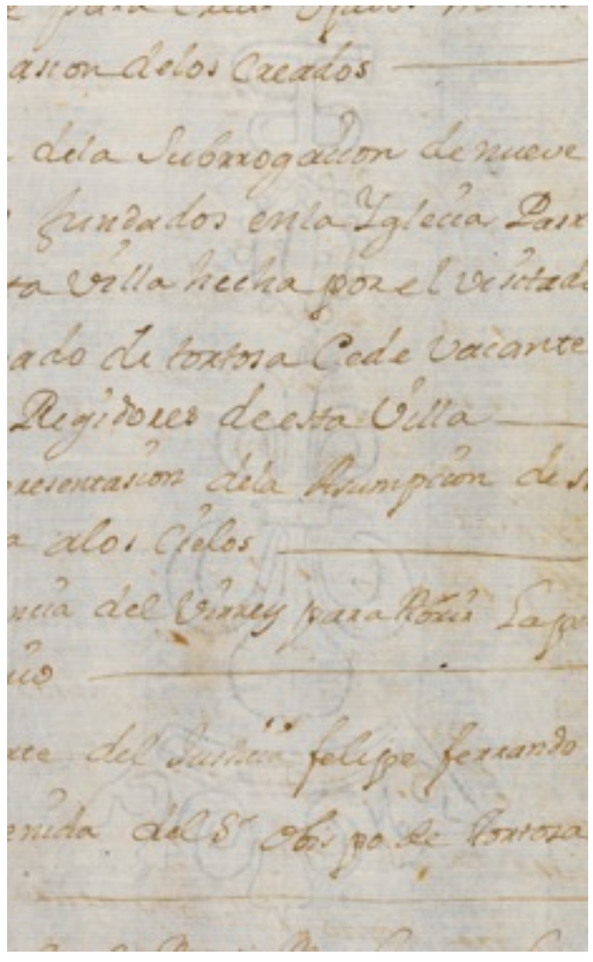
3.1. Infrared photography

- Datasheet.
    - Camera sensor size 6.496 x 4.872 pxl.
    - Lighting. Reflected light. Flash de estudio with diffuser screens or halogen 300 W symmetrically arranged at 45º and 1.5 m of the object. Gives better results with direct diffused light.
    - Filtering. Glass filters mounted camera lens. Densities 780 nm, 850 nm. and 950 nm.
    - Focus. Very complex. Variable Deviation from visible focus. Need tests for each shot.
    - Diaphragm combination/ Speed/ ISO : f11/ 1/125 / ISO 100.
    - Image: Monochrome. Tiff / 300ppi / 55x41cm.
    - Features photo taking. You need to shoot with different filtering provided to obtain accurate information as there is always a greater ability to penetrate better.
    - Image processing: Photoshop. Levels and low contrast. No focus masks exaggerated or treatments.
- Conclusions. For us, the application of infrared photography in the study of the watermarks is interesting and provides valuable data. You must always compare it with images of reflected visible and especially with transmitted light sockets.

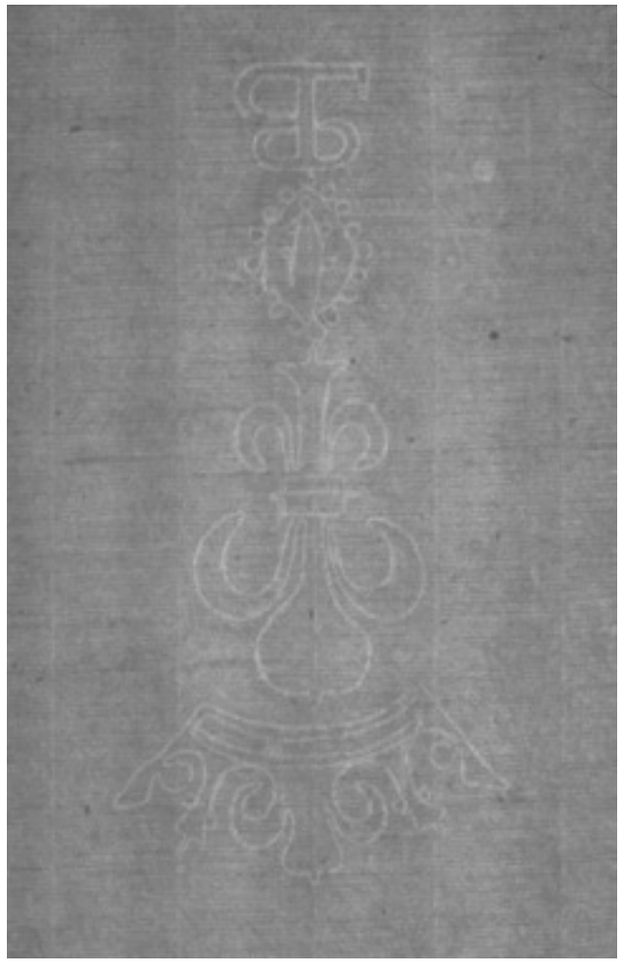
3.1. Infrared photography



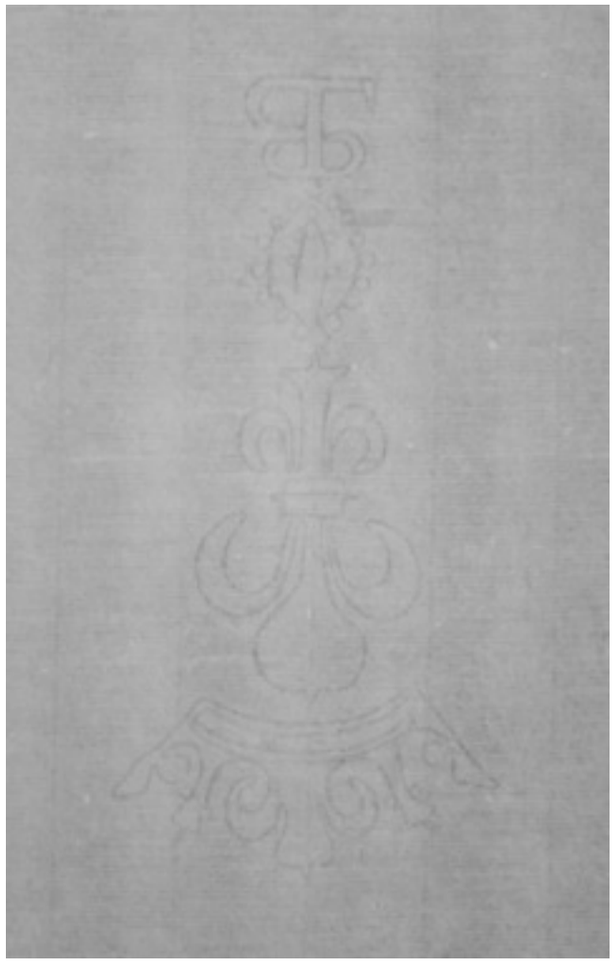
Visible light photography. Observation and tracing are hampered by straight writing and verse.



Photograph visible light reflected with black cardboard sheet below. Lighting 45º. Straight writing difficult observation.



Infrared photography 950 nm. Transmitted light. The watermark appears without the writing. Same document images



Infrared photography 950 nm. Reflected light. The watermark appears without the writing. Same document images

3.2. Ultraviolet photography (Ultraviolet fluorescence)

Ultraviolet photograph

Photograph visible light reflected

3.2. Ultraviolet photography (Ultraviolet fluorescence)

- Although not particularly applicable to photography watermarks, I thought briefly about this technique because of its high importance in the documentation of books and documents on paper and parchment.

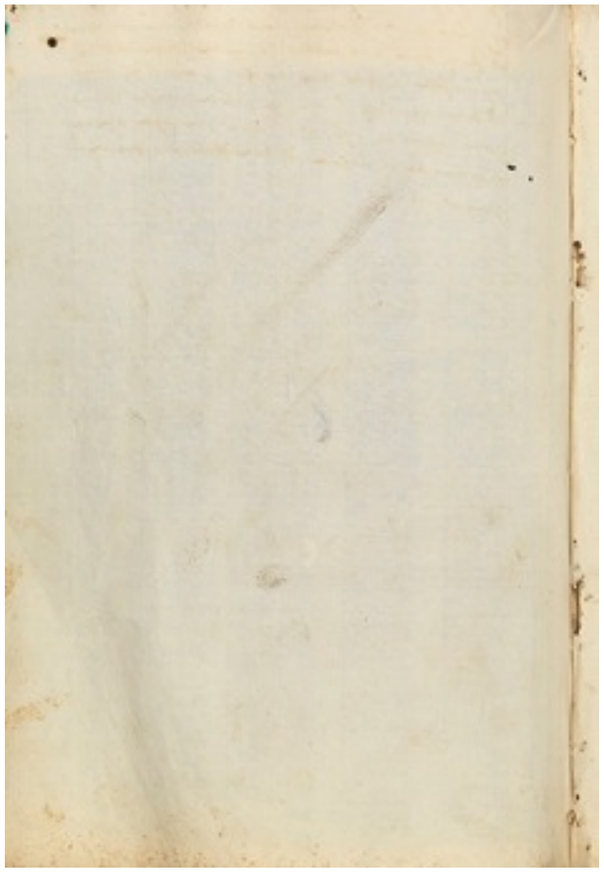
- In this case the wavelength is on the other side to that occupied by the infrared spectrum. It is part of the **near ultraviolet**. The camera sensor, properly filtered, can record the fluorescence reflecting materials when exposed to UV light from the wood lamps or black light tubes.

- It is used much in restoration and conservation of documents because it allows the readability of the lost writings of wear or aging. Its impact is superficial so it does not encourage information to register of watermarks, although that could be interesting for further study of the work.

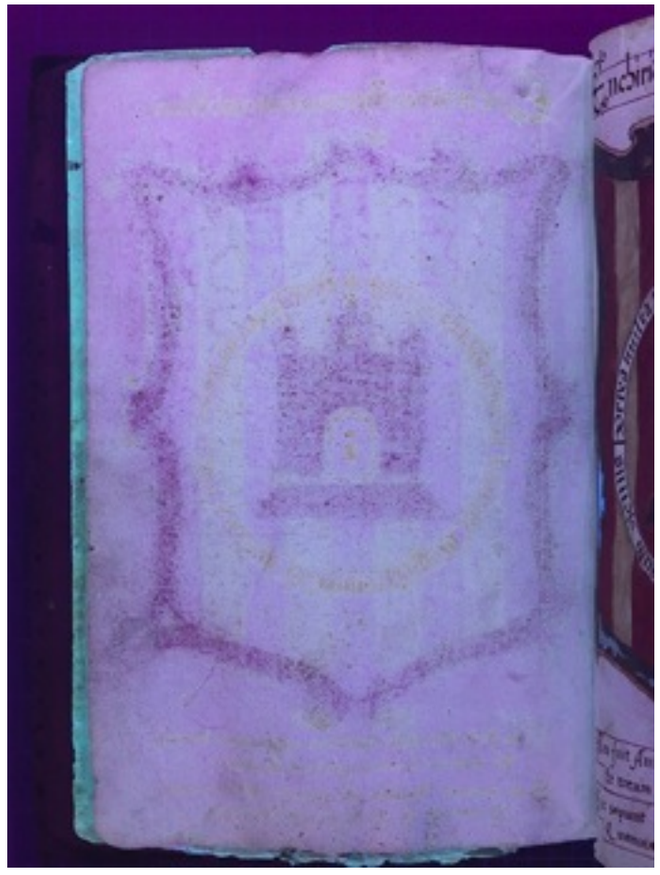
- Datasheet:
    - Camera. The same used in visible.
    - Lighting. Black light tubes or wood lamps. Warming filter.
    - Exposition / ISO. ISO 400 / Very long exposition, between 8 y 16 “/ diaphragms f 8.
    - Conventional processing image although it is necessary unsharp mask.
    - Surrounding conditions. Total darkness and UV protection glasses. Toxic.

3.2. Ultraviolet photography (Ultraviolet fluorescence)

Ultraviolet photograph
doc. A



Photograph visible light
reflected
doc. A



Ultraviolet photograph
doc. B

Photograph visible light
reflected
doc. B

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