

LABORATORY INFN CHNet

NAME OF THE INSTRUMENT

Scanner for *in-situ* digital radiography, developed by the CHNet laboratories.

GENERALDESCRIPTION:

The X-ray radiography, normally applied to paintings on canvas and wood, provides information on the state of conservation of the artwork and can reveal important details such as the presence of underlying paintings, *pentimenti* and/or restoration interventions carried out in the past. In addition, the use of digital detectors allows not only to obtain an immediate result, but also to maintain a wide range of gray levels and to make the stitching of the radiographic images via software.

The scanner for *in-situ* radiography was designed and built to meet the need not to move the works from the place where they are stored, while having no limits in the size of the works to be analyzed.

TECHNICAL DESCRIPTION:

The scanner for *in-situ* radiography consists of two independent aluminium units (each weighing less than 55 kg), one for handling the X-ray tube and the other for the digital detector. Typically, the two units are placed at 1 m from each other. The acquisition of the radiographies covers an area of 1 x 1 m², however the scanning of larger paintings is possible. The scan is adapted based on the size of the painting, and the images obtained are automatically stitched at the end of the measurement. For example, scanning an area of 1 x 1 m² requires 144 shots and about 3 hours.

The X-ray tube is a YXLON EVO 160D, maximum anode voltage 160 kV, maximum current 7 mA, air-cooled. The detector is a Teledyne DALSA RedEye200, consisting of a photodiode array with CMOS technology combined with a Gd₂O₂S scintillator screen. It is made up of 1024 x 1000 pixels of 96 µm per side and the digitization depth is 12 bits/pixel.

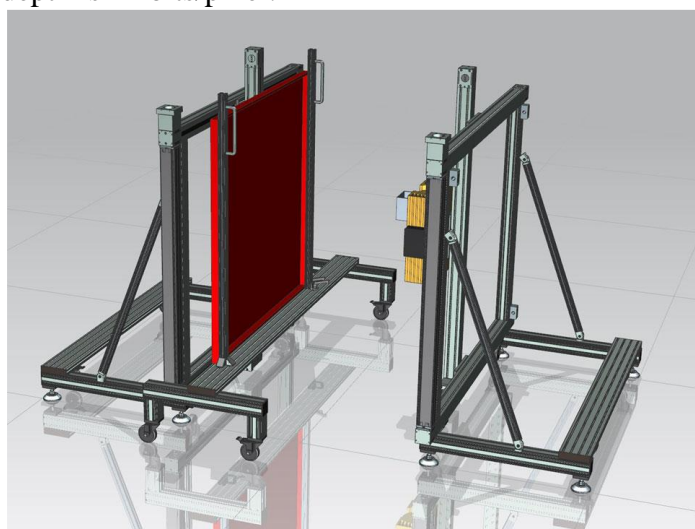


Figure 1: On the left, the unit for the detector handling; on the right the one for the X-ray tube.

FURTHER INFORMATION:

- A. Impallaria, F. Petrucci, S. Chiozzi, F. Evangelisti, S. Squerzanti, A scanner for in situ X-ray radiography of large paintings: the case of “Paolo and Francesca” by G. Previati, *Eur. Phys. J. Plus*, **2021**, *136*, 126
- M. Patti, R. Fontana, M. Raffaelli, G. Gollini, A. Impallaria, F. Petrucci, F. Tisato, Catalogo della mostra “Stati d'animo. Arte e psiche tra Previati e Boccioni”, Ferrara, **2018**, 182-187
- Impallaria, A.; Evangelisti, F.; Petrucci, F.; Tisato, F.; Castelli, L.; Taccetti, F. A new scanner for in situ digital radiography of paintings. *Appl. Phys.* **2016**, *122*, 1043

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