Prague, Czech Republic June 21-25, 2021

Contribution ID: **236** Type: **Oral presentation**

#11-236 Large area scanning of painted arts with photon counting detectors

Thursday, June 24, 2021 9:40 AM (20 minutes)

The restoration and preservation processes of the old painted arts are often combined with more or less extensive inspection of work. Any manipulation with the investigated object needs to be non-invasive and non-destructive as the historical price of the artefacts can be incalculable. Information about the sample surface can be obtained by visual methods varying from digital photography to advanced methods like infrared reflectography or ultraviolet fluorescence. Nevertheless, visual techniques are unable to provide information about the internal structure of the investigated sample. Such information can be obtained only by transmission methods utilizing more penetrating radiation such as X-ray radiography or various adapted techniques of computed tomography (limited-angle tomography, laminography or tomosynthesis).

Radiography systems used in this work are equipped with the large area detector based on Timepix photon counting technology. Such detectors are operated in a dark-current-free data collection mode with energy-resolving capabilities. Besides conventional X-ray radiography or CT, these detectors are, therefore, convenient for advanced approaches like energy-sensitive radiography or X-ray fluorescence imaging.

The historical painted arts are typically flat and vary in dimensions from several decimetres to square metres. This range is significantly larger than the standard size of any available imaging detector. This arises a need for advanced scanning devices and techniques allowing imaging of objects significantly larger than the detector field of view. The Institute of Experimental and Applied Physics, Czech Technical University in Prague in cooperation with ALMA laboratory of the Academy of Fine Arts designed and constructed a device dedicated for radiographic inspection of large-area painted artwork. The device allows automatic scanning of paintings in step-and-shoot manner in which the sample is acquired in a set of partially overlapping tiles. The tiles are then co-registered and merged into a final radiographic image.

The obtained radiographies typically consist of hundreds of megapixels and bring very detailed information about the condition of the inspected artwork that can be used for evaluation of any structural damage, later restoration interventions or even complete overpainting of the whole artwork. We would like to summarize the recent results in this field achieved at the Institute of Experimental and Applied Physics in close collaboration with our partners. High-resolution X-ray images of historical paintings of different scales are shown. Different scanning strategies are discussed. Potential upgrades of the mentioned set-up to further exploit its functionality like topographic mapping of elemental composition using X-ray fluorescence are mentioned.

Primary author: ZEMLICKA, Jan (IEAP CTU in Prague)

Co-authors: DUDAK, Jan (Institute of Experimental and Applied Physics, Czech Technical University in Prague); VAVŘÍK, Daniel (Institute of Theoretical and Applied Mechanics, Czech Academy of Sciences); KUMPOVÁ, Ivana (Institute of Theoretical and Applied Mechanics, Czech Academy of Sciences); PECH, Michal (Academy of Fine Arts in Prague, ALMA Laboratory,); HRADILOVÁ, Janka (Academy of Fine Arts in Prague, ALMA Laboratory,)

Presenter: ZEMLICKA, Jan (IEAP CTU in Prague)

Session Classification: 11 Current Trends in Development of Radiation Detectors

Track Classification: 11 Current Trends in Development of Radiation Detectors