Smart*Light – An Inverse Compton Source for Cultural Heritage

M. Alfeld, H.L. Castricum, P.H.A. Mutsaers[1], J. Dik, K. Janssens[2], O.J. Luiten[1]

Delft University of Technology, 3mE – MSE, Delft, the Netherlands, [1]Eindhoven University of Technology, Applied Physics, Coherence and Quantum Technology, Eindhoven, the Netherlands. [2]University of Antwerp, Department of Chemistry, AXES research group, Antwerp, Belgium **m.alfeld@tudelft.nl**

X-ray techniques are very well suited for the investigation of cultural heritage objects, as they allow to look below the surface of an objects and identify chemical species without causing visible alteration in it.

Many techniques, such as X-ray radiography, XRF and XRD are available on site, making use of X-ray tubes. However, more powerful techniques, such as phase contrast imaging, K-edge imaging and fast scanning XRD imaging are in practice limited to Synchrotron Radiation (SR) sources. Consequently, they are only available for short beam times and require sampling or the transport of an object over vast distances.

The Smart*Light project aims to bridge the gap between X-ray tubes and Synchrotron sources by using the inverse Compton effect: photons in the IR range, scattered back by a electron beam gain energy and can be enhanced to the X-ray level.

Inverse Compton Sources are compact and can be installed on site, e.g. in a shielded cellar of a museum and thus allow for the application of advanced X-ray techniques near the common storage place of an object.

This contribution will summarize the design and expected performance of Smart*Light at the first experiment (expected Fall 2020) and in later upgrades as well as possible applications on cultural heritage objects.

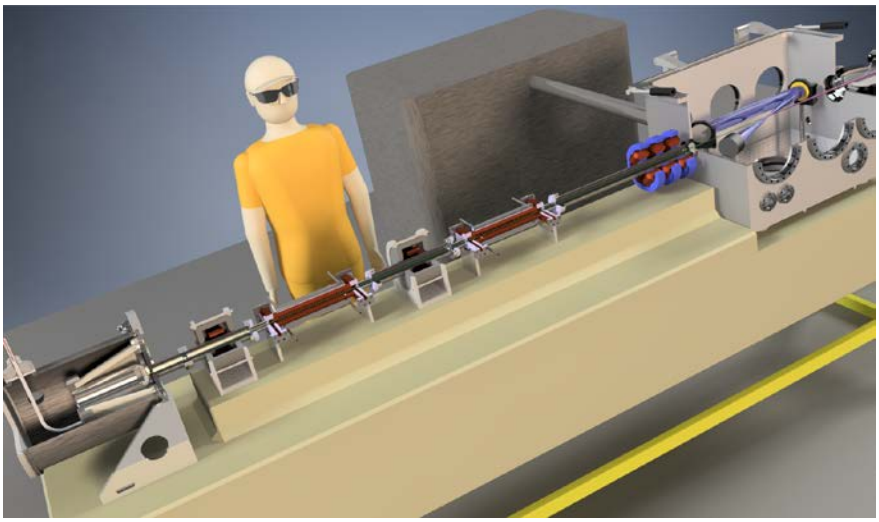

Figure 1: Artistic impression of Smart*Light.