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Smart*Light: a Tunable Inverse Compton Scattering (ICS) X-Ray Source for Imaging and Analysis

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A tunable, tabletop, Inverse Compton Scattering (ICS) hard X-ray source is being designed and built at Eindhoven University of Technology as part of a European Interreg program between The Netherlands and Belgium. This compact X-ray source will bridge the gap between conventional lab sources and synchrotrons: The X-ray photon energy will be generated between 1 and 100 keV with a brilliance typically a few orders of magnitude above the best available lab sources. *SmartLight will find applications in material science, cultural heritage and medical imaging.*

In the ICS process photons from a laser pulse bounce off a relativistic electron bunch, turning them into X-ray photons through the relativistic Doppler effect. In the first phase SmartLight will use a 100 kV DC photogun as electron source and compact X-band linear accelerator technology developed by the CLIC program from CERN to accelerate the electrons further to an energy of 30 MeV. A 12 mJ, 800 nm, 100 fs laser pulse will be focused to a 5 spot and interact with the electron pulse that will be also focused to a spot of about 5 m resulting in an X-ray photon flux of 105 photons per pulse at 1 kHz rep rate, in 1% bandwidth, with an energy up to 40 keV.

The setup is currently under construction. First light is expected in 2022.

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Yes

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