Generation of short hard X-ray pulses of tailored duration using a Mössbauer source

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In this talk, we will talk about how to generate short X-ray pulses of tailored duration and to perform time-resolved nuclear scattering. If time is allowed, we will also mention our preliminary results of another project about X-ray tapered waveguide. In the main part, we theoretically investigate a scheme for flexible generations of single hard X-ray pulses of duration in the range of 1 ns - 100 ns from a radioactive Mössbauer source [1]. The scheme uses a magnetically perturbed 57FeBO3 crystal illuminated with recoilless 14.4 keV photons from a radioisotope 57Co nuclide. Such compact X-ray source is useful for the extension of quantum optics to 10 keV energy scale which has been spotlighted in recent years. So far, experimental achievements are mostly performed in synchrotron radiation facilities. However, tabletop and portable hard X-ray sources are still limited for time-resolved measurements and for implementing coherent controls over nuclear quantum optics systems. The availability of compact hard X-ray sources may become the engine to apply schemes of quantum information down to the subatomic scale.

[1] G.-Y Wang and W.-T. Liao, Phys. Rev. Applied 10, 014003 (2018).