CFEL SCIENCE

SEMINAR

11th June 2014 - 2:00 p.m.

CFEL-bldg. 99, seminar room IV

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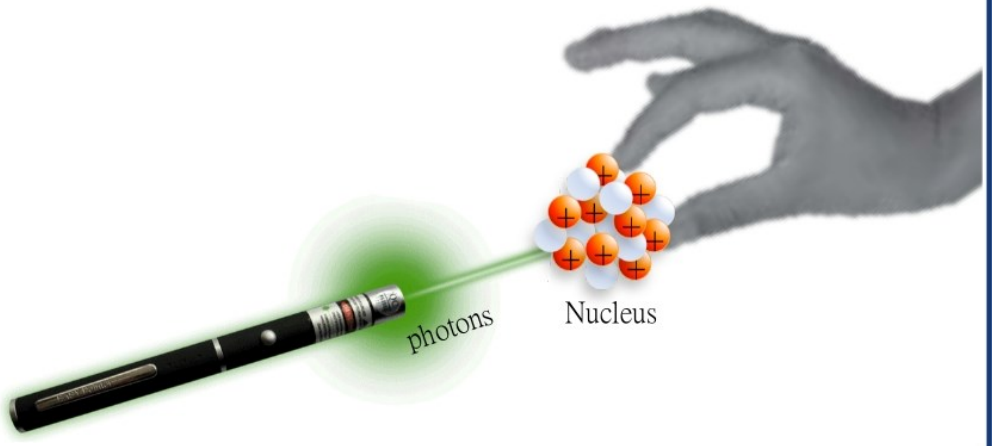
Coherent control of X-ray photons and nuclei

The extension of quantum optics towards x-ray and nuclei is motivated by modern X-ray Free Electron Lasers (XFEL) which open the possibility to coherently control nuclear states. As a first application I will discuss the coherent population transfer between nuclear states in a three-level system driven by XFEL pulses. Such a level scheme is relevant for the triggering of isomers and might play a role for future energy storage solutions. On the other hand, x-ray can be focused on spots essentially smaller than a single atom and used in future photonic circuits. Therefore finding ways to control a single x-ray photon become important.

The second part of this talk puts forward a nuclear forward scattering setup that allows coherent control and producing entanglement of a single x-ray photon using ^{57}Fe nuclei. Finally, I will present that quantum optics provides a significant improvement for detection in nuclear physics. The low-lying isomeric transition of ^{229}Th can be addressed by VUV lasers and provides a potential next generation frequency standard. A main impediment is the large uncertainty of the nuclear transition frequency. Using an electromagnetically modified nuclear forward scattering setup, coherence effects may reduce this uncertainty down to an unprecedented level.



Host: Nina Rohringer- MPIPKS