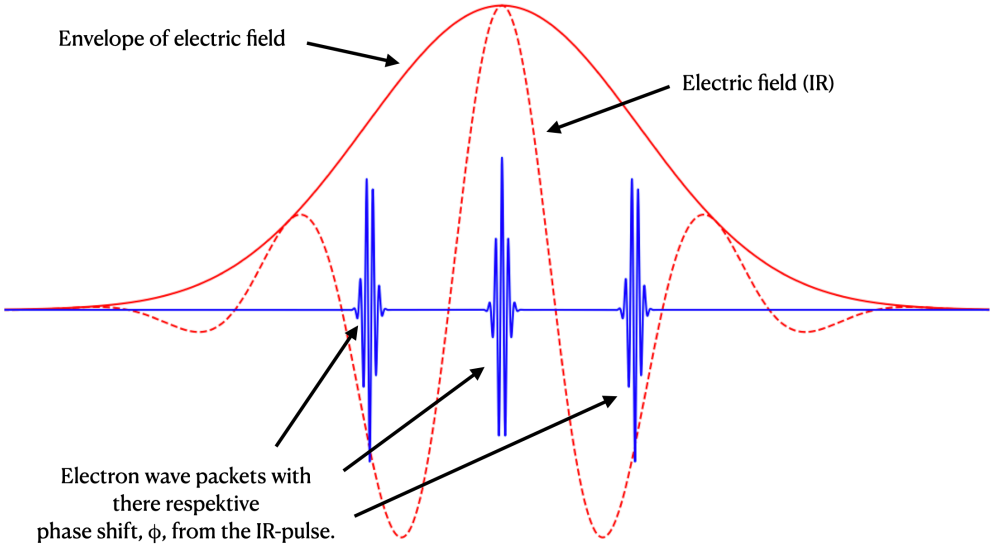
Looking at photoionization with electron wave-packet interferes

In this project the goal is to find a photoelectron distribution over frequencies for different vector potentials. Two XUV (extreme ultraviolet) photon attosecond pulses photoionize an atom and the vector potential gives a phase shift for the photoelectron. This will be done with a code taking in the vector potential and giving out the phase shifts, which will later be put into the XUV attosecond pulses. The figure below shows three photoelectrons that have gotten there phase shift from the red infrared electric field.



Here is a plot showing an electric field of photons (infrared field) that gives a phase shift to three photoelectrons that are created by XUV photon attosecond pulses that photoionize an atom.

When an atom has an electron that gets extra energy from a pulse of photons this electron can be kicked away from the atom and thus a photoelectron is created. This photoelectron can also be described as a pulse in the electric field, which can be seen as the blue pulses in the figure above. This photoelectron can then be affected by an infrared field that gives the phase shift that is especially visible for the photoelectrons that are first and last in the figure.

In the long run this research might help controlling the photoionization of different materials. It might be important if one could find a way to use this process in order to probe smaller materials. It could be a possible outcome since the pulses can be highly controllable. For example the number of photoelectrons sent out from the atom, the amplitude of them and all the tools in the set up can be controlled.

Why would this be important in the long run? Since we already have components in our phones and computers that have details on the nano level (10^(-9) m), it is logical that the future of technology lies in the nano scales since we are sort of already there. In the future we might need to use less of the seldom occurring metals in our Earth. Through designing parts of our technology in the nano scale we can help using less of those treasured metals. Also in the future we will probably see smaller computational components and bigger and more flexible screens. Good probing could be an important part in order to find good materials and create well designed components for these tools. Thus, this project has an important role in the chain of this process.

by Andreas Stokkeland