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Brilliance increase of Thomson scattered x-rays by modulating the undulator laser pulse

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At the ATLAS facility electron beams with energy of more than 100 MeV can be generated by laser wakefield acceleration (LWFA). These beams can be used to produce highly brilliant and extremely short x-ray pulses by Thomson scattering of the counter propagating laser pulse, but previous experiments produced an insufficient number of photons for applications.

Mathematically can be shown that, with appropriate stretching and chirping of the undulator laser pulse and a corresponding adaption of the laser parameter to the varying wavelength, a reduction of the bandwidth as well as an increase of the peak intensity, hence an improvement of the brilliance can be achieved.

The scheduled experiments will be performed with higher laser energy, are based on the results of these calculations and should further enhance the brilliance of the generated x-ray beams.
In comparison to other groups (e.g. Debus et al. 2010, Ghebregziabher et at. 2013) in our case there is not only an enlargement of the interaction region or a reduction of the bandwidth but both of it.

I would like to present the simulation results of the improvement of Thomson scattered x-rays produced by LWFA electrons.

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