First experiment towards „Steady State Micro Bunching“ successfully performed at the Metrology Light Source

Jörg Feikes
HZB, Berlin

In cooperation with the Helmholtz-Center, Berlin, and the Tsinghua University, Beijing, a proof of principle experiment towards Steady State Micro Bunching (SSMB) was successfully performed at the Metrology Light Source (MLS), the electron storage ring of PTB in Berlin-Adlershof. It could be proven that 1 µm long structures created within a stored electron bunch of a few mm length by the interaction of a co-propagating pulsed laser in the undulator section of the MLS, can radiate coherently in the same undulator one revolution later. Coherent radiation is a very promising type of synchrotron radiation as the intensity increases with the square of the number of the radiating electrons, thus amplifying the intensity by many orders of magnitude in comparison to the usual incoherent undulator radiation which increases linearly with the number of radiators. This was the first time worldwide that the conservation of micro structures in electron bunches over a complete revolution in a storage ring could be confirmed and is a first important step towards a new type of very intense synchrotron light source based on the „Steady State Micro Bunching“ scheme.