

Can we use crystal/nano structures to modulate a relativistic electron beam?

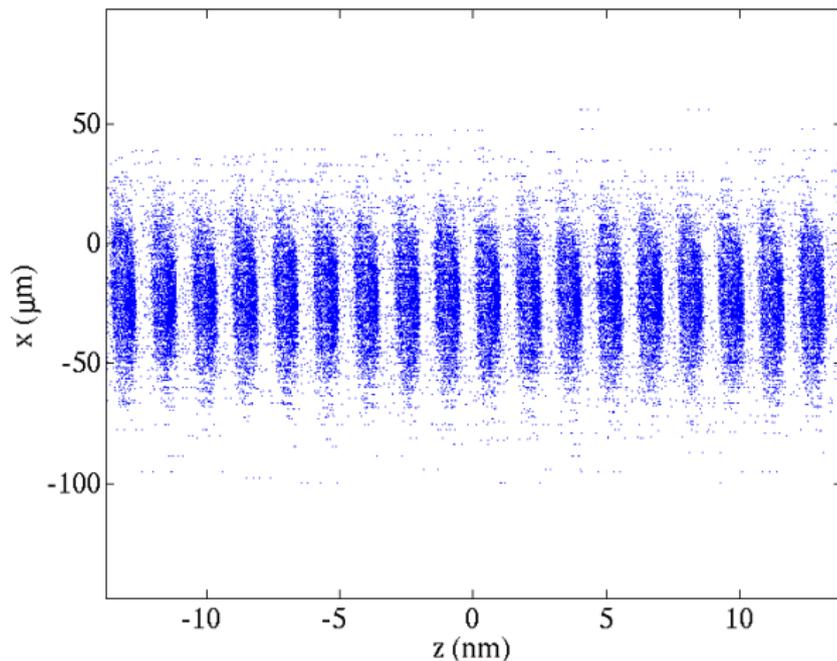
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Workshop on Beam Acceleration in Crystals and Nanostructures,  
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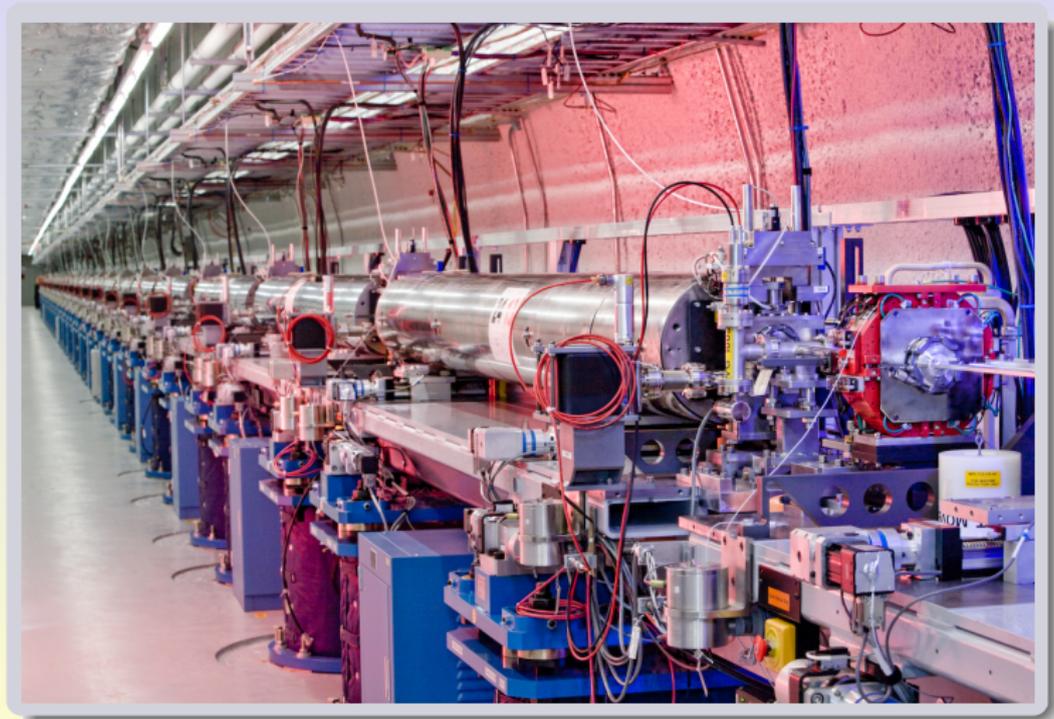
# Microbunched electron beam

FEL radiation is produced by an electron beam that is microbunched with the period  $\lambda_r$ .



# LCLS undulator at SLAC

This is achieved in a  $\sim 100$  m long magnetic undulator through the mechanism of an FEL instability.



# The Challenge

How to modulate an electron beam on the scale  $\lesssim$  nanometer using crystals/nanostructures, and avoid  $\sim 100$  m undulators? External modulation of e-beams for FELs is called *seeding*, it can be done with laser beams and a frequency multiplication (limited by a factor of  $\lesssim 100$ ).

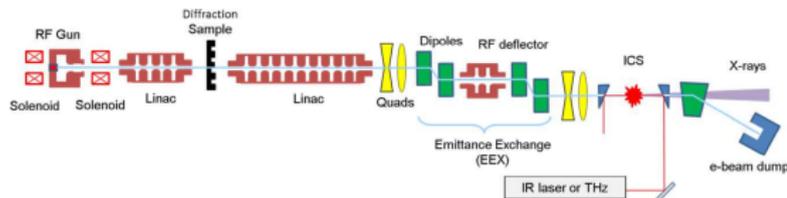
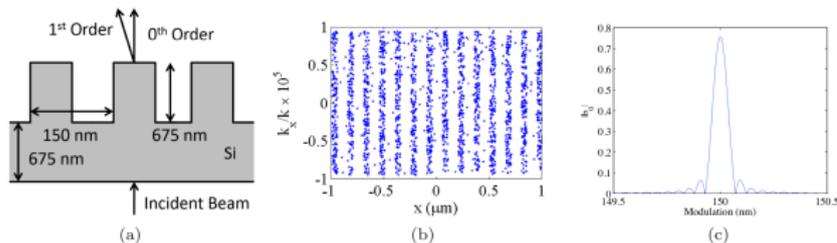
There are some ideas how to use crystals:

Nano-modulated electron beams via electron diffraction and emittance exchange for coherent x-ray generation

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# From Vladimir's talk

Maybe we need something like this?

