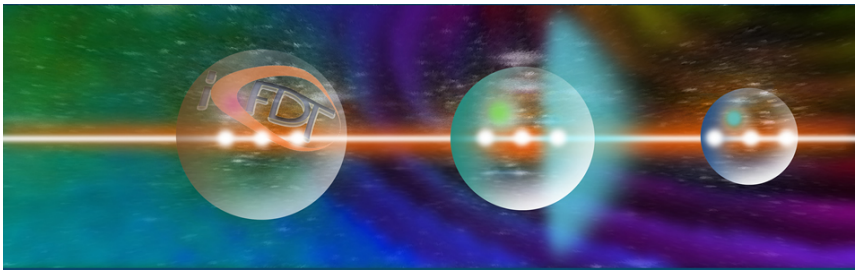

Contribution ID: **39** Type: **Talk**

THz metamaterials meet accelerators

Thursday, 4 October 2018 10:05 (20 minutes)

We propose to use building blocks of THz metamaterials and THz plasmonics for advanced accelerators. Metamaterial building blocks and plasmonic structures allow for a precise control of the electromagnetic near-field distribution in a volume that is defined by the geometry of the structure. THz radiation with wavelengths on the order of a hundred micron is well matched to the transverse and longitudinal size of typical electron bunches in advanced accelerators. Moreover, today's pulsed THz sources provide field strengths up to hundreds of MV/m and thus become competitive with standard microwave sources. And when combined with structures featuring high values of either electric or magnetic field enhancement, the maximum field strength can even be a hundred to a thousand times higher.
After a general discussion of the properties and possibilities offered by THz metamaterial and THz plasmonic structures we present two examples in more detail. A new concept and experimental results for an electron streaking detector with a femto- to sub-femtosecond resolution and a THz driven plasmon undulator. The ultrafast streaking device is based on a split ring resonator which is loaded by a single cycle THz pulse. The electron bunch passing through the resonator's gap experiences a transverse momentum transfer which sign and magnitude depend on the longitudinal bunch position. Thus, the longitudinal bunch density is mapped onto the transverse axis and can be easily measured with a spatially resolved electron detector. The THz driven undulator is composed of two graphene coated dielectric gratings separated by a vacuum gap. The plasmonic fields force the electron bunch on an oscillatory motion which in turn causes the bunch to radiate.

Primary author: Dr OLLMANN, Zoltan (University of Bern)

Co-authors: Mr ROHRBACH, David (University of Bern); Ms HAYATI, Mozhgan (University of Bern); Dr TARKESHIAN, Roxana (Universität Bern); Prof. FEURER, Thomas (University of Bern)

Presenter: Dr OLLMANN, Zoltan (University of Bern)

Session Classification: Satellite Meeting on Metameterials