



Contribution ID: 15

Type: talk

First experimental evidence for self-modulation of an electron bunch in a plasma

Tuesday, September 26, 2017 11:00 AM (30 minutes)

The self-modulation instability is fundamental for the plasma wakefield acceleration experiment of the AWAKE collaboration at CERN where this effect is used to generate proton bunches short enough for producing high acceleration fields. Utilizing the availability of flexible electron beam shaping together with excellent diagnostics including an RF deflector, a supporting experiment was set up at the electron accelerator PITZ (Photo Injector Test facility at DESY, Zeuthen site). This gives valuable results since the underlying physics is the same for electron and proton beams. The goals are to demonstrate and investigate in detail the self-modulation of long electron beams.

In 2016 experiments were conducted with an improved setup compared to the preceding year. An upgraded plasma cell with improved layout was used together with an ArF excimer laser for plasma generation. Here we present first measurements showing clear evidence of self-modulation: the longitudinal profile of the self-modulated electron bunch was measured with an RF deflector. Additionally the longitudinal phase space was measured showing characteristic energy modulations.

Primary author: Dr GROSS, Matthias (DESY)

Co-authors: Dr MARTINEZ DE LA OSSA, Alberto (DESY); Dr SCHROEDER, Carl (Lawrence Berkeley National Laboratory); Dr RICHTER, Dieter (HZB); Dr MALYUTIN, Dmitrii (HZB); Prof. GRUENER, Florian (CFEL / Universitaet Hamburg); Dr STEPHAN, Frank (DESY, Zeuthen site); Mr KOSS, Gerald (DESY); LOISCH, Gregor (DESY Zeuthen); Dr HUCK, Holger (DESY); Mr ISAEV, Igor (DESY); Mr GOOD, James (DESY); Dr OSTERHOFF, Jens (Deutsches Elektronen-Synchrotron DESY); Mr ENGEL, Johannes (DESY); KHOJOYAN, Martin (SOLEIL synchrotron); Dr KRASILNIKOV, Mikhail (DESY); Mr LISHILIN, Osip (DESY); Dr BRINKMANN, Reinhard (DESY); Mr PHILIPP, Sebastian (DESY); Dr MEHRLING, Timon (DESY); Dr RUBLACK, Tino (DESY); Dr RENIER, Yves (DESY)

Presenter: Dr GROSS, Matthias (DESY)

Session Classification: Plenary 4

Track Classification: Invited Plenary Talk