EUROPEAN PLASMA RESEARCH ACCELERATOR WITH EXCELLENCE IN APPLICATIONS

Working Package Name

Name of speaker

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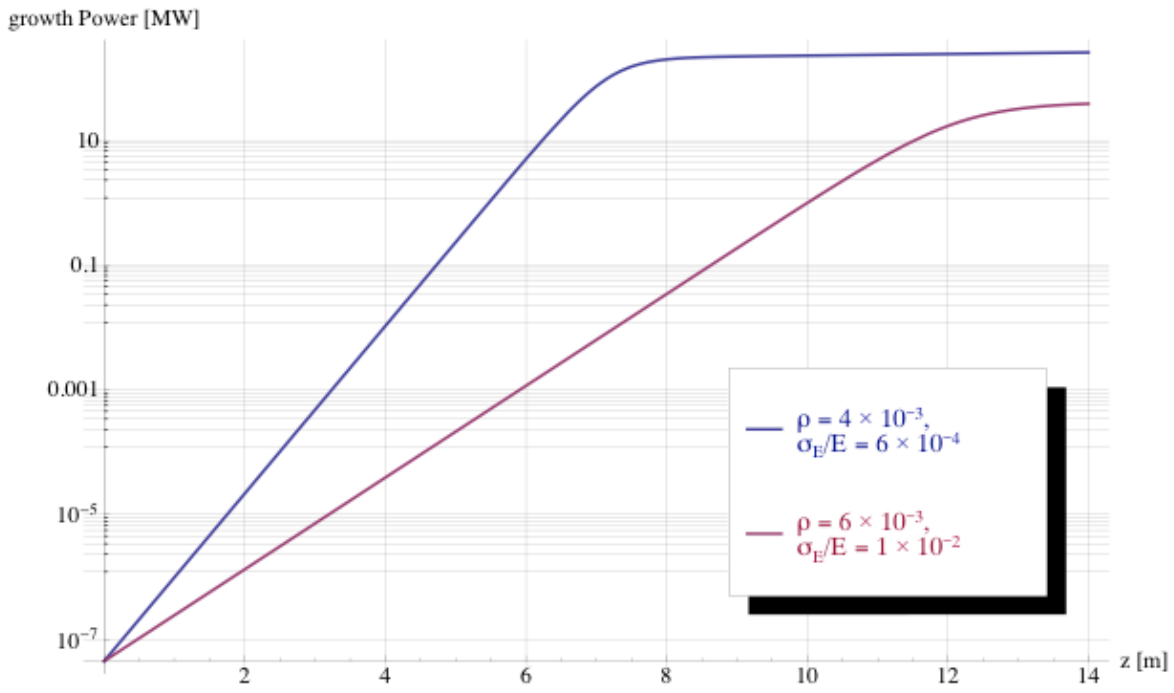
Review of scientific work

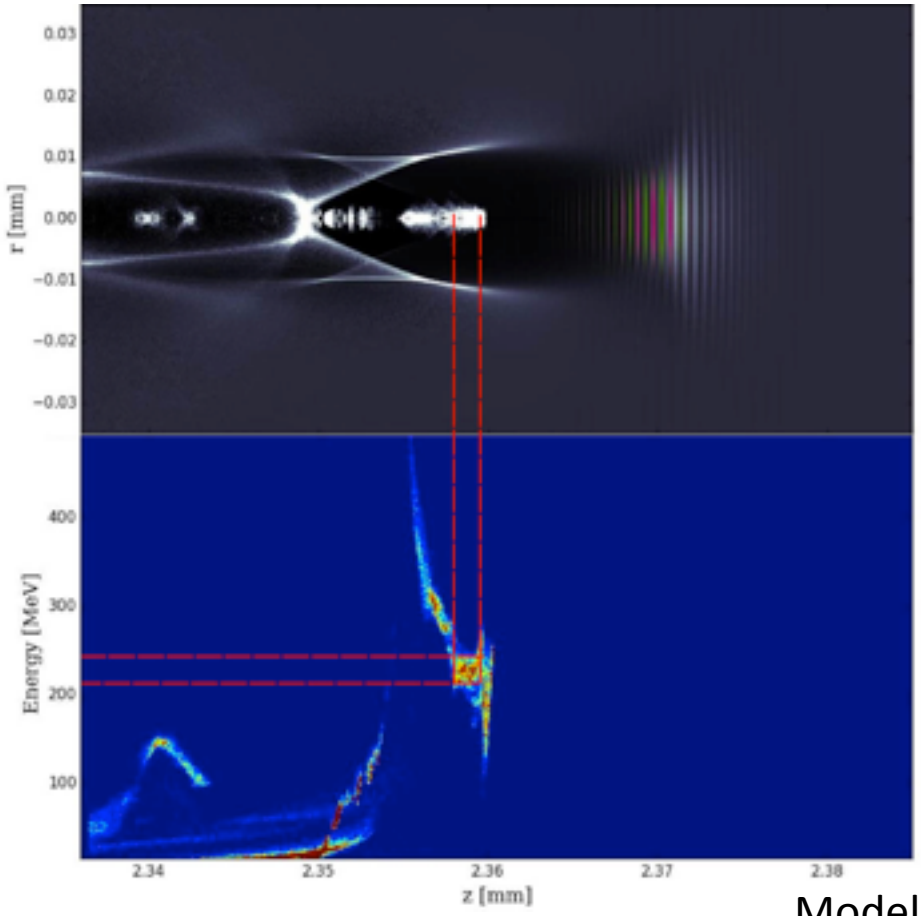
FEL modeling tools available (as presented in Pisa meeting) :

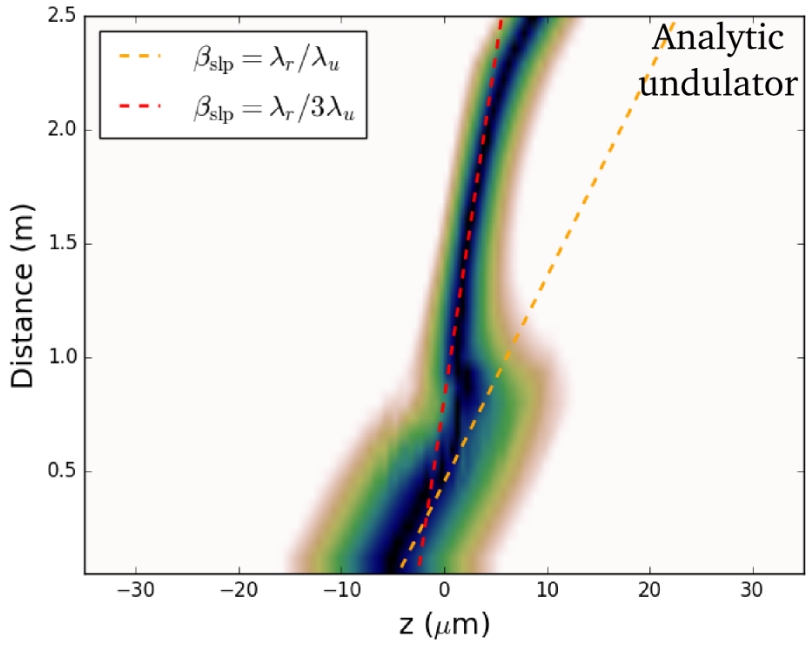
- Virtual Laboratory and Computor Aided Design for Free Electron Lasers outline and simulations (G. Dattoli, F. Nguyen et al.), Then, simulations in different cases : PROMETEO, GENESIS, CHIMERA (I. Andriyash), PUFFIN ...



Review of scientific work

FEL modeling tools under development (I. Andriyash, SOLEIL) : CHIMERA code including LPA and FEL





Modelling : I. Andriyash

Review of scientific work

FEL Modeling :

• Start with some existing parameter set (WP11)
evaluate the differences between a parameter set and a distribution

• Test with reference parameters of EuPRAXIA at 1 GeV

• REQUEST TO WP2-3 :get a set of relaible scaling LPA parameters for FEL optimisation? => guide for parameter range

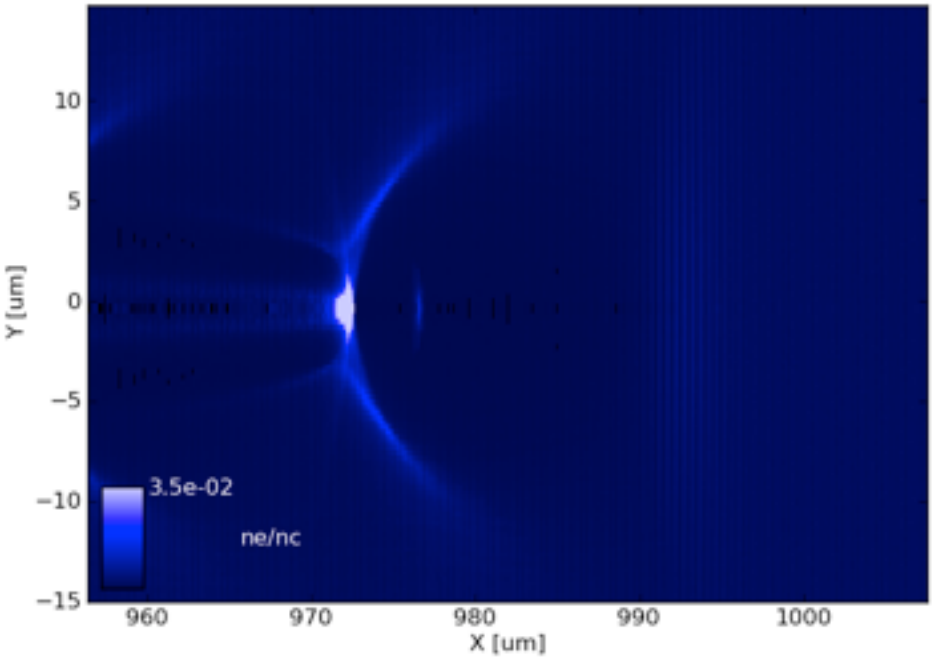
• REQUEST TO WP2-3 :set of 6D-distribution for our baseline cases (even if deviations, at least in Energy) : : started for the moment with one calculation by F. Massimo (WP6)

• REQUEST TO WP2-3 :compare in a detailed report the codes used or to be used with the experimental data obtained for experimental set of data to evaluate the degree of confidence in the electron beam, including the phase space portraits
look for existing measured data in one single experiment : what can we reach now for an FEL on paper ?
a first step by F. Massimo

Review of scientific work

Modeling by F. Massimo (**work in progress**) :

x_average	=	7598.203270 um
sigma_x	=	7.003502 um
sigma_y	=	21.724261 um
sigma_z	=	3.240566 um
Bunch length (FWHM)=	55.015637 fs	
Q	=	1838.720197 pC
gamma_average	=	1072.431326
Energy	=	548.012408 MeV
Relative energy spread =	0.213861	
sigma_divergence	=	0.030319 rad
emittance_y =	766.836783 mm-mrad	
emittance_z =	16.788390 mm-mrad	



Analysis by G. Dattoli et al. :
the beam, as it is, cannot be exploited for a FEL.
=> specific transport system required

For FEL aplication, it would be easier to define our desired parameters at the end of the transport line.

Hiring and personnel

- SOLEIL : I. Andriyash : development of the CHIMERA code, part time then E. Roussel (from Mid-April 2017) (modeling)
- LOA : F. Massimo for 2 years (2016-2017) : CALDER -PIC simulations (1 GeV case) and FEL
- UHH : post-doc found, starting early 2017 (FEL simulations, cryo undulator) for 2 years
- ENEA : FEL simulations

Events and publications

- Participation to the PISA meeting : discussion on the required parameters
- Participation of some members to the Workshop Daresbury : Designing Future X-ray FELs, Daresbury, 31/08- 02/09/ 2016 (G. Dattoli, A. Maier, M. E. Couprie, I. Andriyash)

Outlook & AOB

- Next to be done :

- MS5 : State-of-the-art of short period undulator (SOLEIL) M7, Activity report, preparation for D6.1 : Report on state-of-the-art of short period undulators, Report, Public, M12

  1. Review of undulator technologies.
  2. Developments and state-of-the art of cryogenics undulators (SOLEIL and University of Hamburg).
  3. Progress of superconducting undulators (STFC).
  4. Advanced and novel undulators, such as bi-harmonic undulators, RF undulators, micro-machined undulators and plasma undulators (all).
  5. Transverse gradient undulators, which are considered to be a possible solution for handling the large energy spread provided by laser plasma accelerators different participants in WP6.

  => one presently operational set of undulator parameters, and two sets of optimistic parameter set, or define a parameter range.

- FEL calculations

  Use the different tools for the existing LPA experiments for benchmarking then move to the 1 GeV case without/with beam manipulation