EUROPEAN NETWORK FOR NOVEL ACCELERATORS
EuroNNAc4
NPACT supported by EU via I-FAST

Contribution ID: **123** Type: **Poster (student)**

A semi-analytical method to calculate wakefield from electron beams passing through dielectric-coated circular waveguides

Tuesday, 20 September 2022 19:20 (1 hour)

The dielectric accelerator is one of the most advanced accelerator concept, in which the ultra high accelerating field can be excited by either optical to infrared laser or ultrashort relativistic electron bunches. The beam driven dielectric wakefield accelerators (DWFA) make use of the electromagnetic Cherenkov radiation (wakefield) from the electron bunches that pass through the dielectric-lined waveguides. These high gradient fields may create strong instabilities on the beam itself causing issues in plasma acceleration experiments (PWFA), plasma lensing experiments and in recent beam diagnostic applications. We propose a semi-analytical method to calculate these high gradient fields without resorting to time consuming simulations. Ultra-relativistic bunches traveling in these dielectric capillaries can interact only with TM0n modes that travel at the speed of light. Any perturbation can be written as sum of potentially excitable harmonics, with amplitudes dictated by the shape of the power spectrum of the beam. By executing 2D simulations on a generic section of the structure it is possible to calculate the dispersion diagram of the modes and estimate the frequencies at which these modes can be excited. Finally, with these frequencies it is possible to calculate the coefficients with which to multiply the amplitudes of the corresponding harmonics

Primary author: Mr FRANCESCONE, Daniele (Istituto Nazionale di Fisica Nucleare)

Co-authors: BOSCO, Fabio (Istituto Nazionale di Fisica Nucleare); CARILLO, Martina (Istituto Nazionale di Fisica Nucleare); FICCADENTI, Luca (Istituto Nazionale di Fisica Nucleare); GIULIANO, Lucia (Istituto Nazionale di Fisica Nucleare); MOSTACCI, Andrea (Istituto Nazionale di Fisica Nucleare); MIGLIORATI, Mauro (Istituto Nazionale di Fisica Nucleare); PALUMBO, LUIGI (UNIVERSITA' LA SAPIENZA ROMA); SILVI, Gilles Jacopo (Istituto Nazionale di Fisica Nucleare)

Presenter: Mr FRANCESCONE, Daniele (Istituto Nazionale di Fisica Nucleare)

Session Classification: Poster Session