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TWAC : EIC Pathfinder Open European project on Novel dielectric acceleration

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Particle accelerators are devices of primary importance in a large range of applications such as fundamental particle physics, nuclear physics, light sources, imaging, neutron sources, and transmutation of nuclear waste. They are also used every day for cargo inspection, medical diagnostics, and radiotherapy worldwide. Electron is the easiest particle to produce and manipulate, resulting in unequaled energy over cost ratio.

However, there is an urgent and growing need to reduce the footprint of accelerators in order to lower their cost and environmental impact, from the future high-energy colliders to the portable relativistic electron source for industrial and societal applications. The radical new vision we propose will revolutionize the use of accelerators in terms of footprint, beam time delivery, and electron beam properties (stability, reproducibility, monochromaticity, femtosecond-scale bunch duration), which is today only a dream for a wide range of users. We propose developing a new structure sustaining the accelerating wave pushing up the particle energy, which will enable democratizing the access to femtosecond-scale electron bunch for ultrafast phenomena studies.

This light and compact accelerator, for which we propose breaking through the current technological barriers, will open the way toward compact accelerators with an energy gain gradient of more than 100 MeV/m and enlarge time access in the medical environment (preclinical and clinical phase studies).

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Footnotes

<https://twac.ijclab.in2p3.fr/en/twac/>
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Primary author: BRUNI, Christelle (Université Paris-Saclay, CNRS/IN2P3, IJCLab)

Co-authors: GONNIN, Alexandre (Université Paris-Saclay, CNRS/IN2P3, IJCLab); LAMURE, Anne-Laure (RadiaBeam); SZWAJ, Christophe (Laboratoire de Physique des Lasers, Atomes et Molécules); EVAIN, Clement (Laboratoire de Physique des Lasers, Atomes et Molécules); ROUSSEL, Eléonore (Laboratoire de Physique des Lasers, Atomes et Molécules); ALMASI, Gabor (University of Pecs); KRIZSAN, Gergo (University of Pecs); MARTINET, Guillaume (Université Paris-Saclay, CNRS/IN2P3, IJCLab); TÓTH, György (MTA-PTE High-Field Terahertz Research Group); GULER, Hayg (Université Paris-Saclay, CNRS/IN2P3, IJCLab); CAYLA, Jean-Noël (Université Paris-Saclay, CNRS/IN2P3, IJCLab)

Paris-Saclay, CNRS/IN2P3, IJCLab); HEBLING, János (University of Pecs); CASSOU, Kevin (Université Paris-Saclay, CNRS/IN2P3, IJCLab); PALFALVI, Laszlo (University of Pecs); OMEICH, Maher (Université Paris-Saclay, CNRS/IN2P3, IJCLab); LE PARQUIER, Marc (Université des Sciences et Technologies de Lille); AMIENS, Marie (Laboratoire de Physique des 2 Infinis Irène Joliot-Curie); KELLERMEIER, Max Joseph (Deutsches Elektronen-Synchrotron); PITTMAN, Moana (Centre Laser de l'Univ. Paris-Sud); PUZO, Patrick (Université Paris-Saclay, CNRS/IN2P3, IJCLab); GAURON, Philippe (Université Paris-Saclay, CNRS/IN2P3, IJCLab); BIELAWSKI, Serge (Laboratoire de Physique des Lasers, Atomes et Molécules); BEN ABDILLAH, Sidi Mohammed (Université Paris-Saclay, CNRS/IN2P3, IJCLab); TURNÁR, Szabolcs (University of Pecs); OKSENHENDLER, Thomas (iteox); VINATIER, Thomas (Deutsches Elektronen-Synchrotron); SOSKOV, V. (Université Paris-Saclay, CNRS/IN2P3, IJCLab); CHAUMAT, Vincent (Université Paris-Saclay, CNRS/IN2P3, IJCLab); TIBAI, Zoltan (University of Pecs)

Presenters: BRUNI, Christelle (Université Paris-Saclay, CNRS/IN2P3, IJCLab); PUZO, Patrick (Université Paris-Saclay, CNRS/IN2P3, IJCLab)

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