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Xsuite: a flexible python toolkit for beam dynamics

Wednesday, 22 May 2024 16:00 (2 hours)

Xsuite is a modular simulation package bringing to a single flexible and modern framework capabilities of different tools developed at CERN in the past decades notably MAD-X Sixtrack Sixtracklib COMBI and Py-HEADTAIL. The suite consists of a set of Python modules (Xobjects, Xpart, Xtrack, Xcoll, Xfields, Xdeps) that can be flexibly combined together and with other accelerator-specific and general-purpose python tools to study complex simulation scenarios. Different computing platforms are supported including conventional CPUs as well as GPUs from different vendors. The code allows for symplectic modeling of the particle dynamics combined with the effect of synchrotron radiation impedances feedbacks space charge electron cloud beam-beam beamstrahlung and electron lenses. For collimation studies beam-matter interaction is simulated using the K2 scattering model or interfacing Xsuite with the BDSIM/Geant4 library and with the FLUKA code. Methods are made available to compute and optimize the accelerator lattice functions, chromatic properties and equilibrium beam sizes. By now the tool has reached a mature stage of development and is used for simulations studies by a large and diverse user community.

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Primary author: IADAROLA, Giovanni (European Organization for Nuclear Research)

Co-authors: LATINA, Andrea (European Organization for Nuclear Research); ABRAMOV, Andrey (European Organization for Nuclear Research); LINDSTROM, Bjorn (European Organization for Nuclear Research); MONTANARI, Carlo Emilio (Bologna University); DROIN, Colas (European Organization for Nuclear Research); DI CROCE, Davide (Ecole Polytechnique Fédérale de Lausanne); DEMETRIADOU, Despina (European Organization for Nuclear Research); ASVESTA, Foteini (European Organization for Nuclear Research); VAN DER VEKEN, Frederik (European Organization for Nuclear Research); STERBINI, Guido (European Organization for Nuclear Research); DILLY, Joschua (European Organization for Nuclear Research); PARASCHOU, Konstantinos (European

Organization for Nuclear Research); DENIAU, Laurent (European Organization for Nuclear Research); METHER, Lotta (European Organization for Nuclear Research); VAN RIESEN-HAUPT, Léon (Ecole Polytechnique Fédérale de Lausanne); HOFER, Michael (European Organization for Nuclear Research); HERMES, Pascal (European Organization for Nuclear Research); KICSINY, Peter (European Organization for Nuclear Research); NIEDERMAYER, Philipp (GSI Helmholtzzentrum für Schwerionenforschung GmbH); BELANGER, Philippe (University of British Columbia & TRIUMF); DE MARIA, Riccardo (European Organization for Nuclear Research); LOPACIUK, Szymon (European Organization for Nuclear Research); PIELONI, Tatiana (Ecole Polytechnique Fédérale de Lausanne); PREBIBAJ, Tirsi (European Organization for Nuclear Research); BUFFAT, Xavier (European Organization for Nuclear Research)

Presenter: PARASCHOU, Konstantinos (European Organization for Nuclear Research)

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