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Measurements of Slice Energy Spread at Low-energy Photoinjectors

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The slice energy spread of the electron beam is one of the key parameters for high performance of linac-driven free electron lasers (FELs). The simulated uncorrelated energy spread in modern XFEL photoinjectors with beam energies of many tens of MeV is on the order of a few keV or even less. Thus, accurate measurement of the slice energy spread is not trivial. Two recent studies on high energy (>100 MeV) photoinjectors at SwissFEL and European XFEL have reported much higher slice energy spread than expected at their XFEL working points (200 –250 pC). A new method for measuring slice energy spread at a lower beam energy (~20 MeV) is proposed and demonstrated at the Photo Injector Test facility at DESY Zeuthen (PITZ). The contribution will summarize previous results obtained on high energy injectors and then review the details of the technique used at PITZ as well as the experimental results for 250 pC, which are considerably lower than the results measured at high energy injectors.

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Primary authors: KRASILNIKOV, Mikhail (Deutsches Elektronen-Synchrotron DESY at Zeuthen); QIAN, Houjun (Deutsches Elektronen-Synchrotron DESY at Zeuthen)

Co-authors: LUEANGARAMWONG, Anusorn (Deutsches Elektronen-Synchrotron DESY at Zeuthen); LI, Xiangkun (Deutsches Elektronen-Synchrotron DESY at Zeuthen); LISHILIN, Osip (Deutsches Elektronen-Synchrotron DESY at Zeuthen); AFTAB, Namra (Deutsches Elektronen-Synchrotron DESY at Zeuthen); BOONPORN-PRASERT, Prach (Deutsches Elektronen-Synchrotron DESY at Zeuthen); GEORGIEV, Georgi (Deutsches Elektronen-Synchrotron DESY at Zeuthen); GOOD, James (Deutsches Elektronen-Synchrotron DESY at Zeuthen); GROSS, Matthias (Deutsches Elektronen-Synchrotron DESY at Zeuthen); KOSCHITZKI, Christian (Deutsches Elektronen-Synchrotron DESY at Zeuthen); NIEMCZYK, Raffael (Deutsches Elektronen-Synchrotron DESY at Zeuthen); OPPELT, Anne (Deutsches Elektronen-Synchrotron DESY at Zeuthen); STEPHAN, Frank (Deutsches Elektronen-Synchrotron DESY at Zeuthen); VASHCHENKO, Grygorii (Deutsches Elektronen-Synchrotron DESY at Zeuthen); WEILBACH, Tobias (Deutsches Elektronen-Synchrotron DESY at Zeuthen); ABOULBANINE, Zakaria (Deutsches Elektronen-Synchrotron DESY at Zeuthen); ADHIKARI, Gowri (Deutsches Elektronen-Synchrotron DESY at Zeuthen); SHU, Guan (Institute of High Energy Physics (IHEP) Chinese Academy of Sciences)

Presenter: KRASILNIKOV, Mikhail (Deutsches Elektronen-Synchrotron DESY at Zeuthen)

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