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FEbeam: A Comprehensive Field Emission Data Processing for Field Emission and Breakdown Analysis in RF Environment

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As the ubiquity of field emission sources becomes more prevalent in that a variety of cathode materials and geometries are being tested or used, an easy-to-use data processing pipeline FEbeam was developed, and it is a part of the FEmaster platform [1-3]. This algorithm processes and converts raw data to the standard format enabling further physics interpretation: combining 17 different subroutines, it processes the raw waveforms obtained from the bidirectional coupler and Faraday cup into the final field emission parameter space, Fowler-Nordheim and Millikan coordinates. FEbeam's modular design also allows for direct interfacing with FEpic, an image processing software to determine the number of emitters from images that can be obtained in situ at AWA's ACT facility, while providing postprocessing analysis options and can be completely automated when paired with FEBreak. FEbeam was originally designed for ACT but can be extended for using in any RF system with ease. This algorithm also uses a knee point selection to search if cathode emission behavior diverge from Fowler-Nordheim law. Thus, FEbeam is a useful tool enhancing the ease of development for the next generation of field emission injectors.

References:

- [1] E. Jevarjian, M. Schneider, and S. V. Baryshev, arXiv:2009.13046
- [2] T. Y. Posos, O. Chubenko, and S. V. Baryshev, arXiv:2012.03578
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Primary authors: SCHNEIDER, Mitchell (Los Alamos National Laboratory); Ms JEVARJJAN, Emily (Michigan State University); Dr SHAO, Jiahang (Argonne National Laboratory); BARYSHEV, Sergey

Presenter: SCHNEIDER, Mitchell (Los Alamos National Laboratory)

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