

## Development of precision timing silicon detectors for future high energy collider experiments

This research program, which is submitted to the US-Japan Cooperation Program in HEP, aims to advance the development of silicon detectors, focusing on the technology that achieves O(10) picoseconds time resolution for minimum ionizing particles (MIP) together with a spatial resolution of the order of O(10) microns. It includes as a goal the implementation of a versatile testing system for prototype characterization and design of readout electronics that can match the sensor layout and performance. In this research program we will develop a prototype of a highly granular silicon precision timing detector, i.e. a 4D detector, for future colliders, using Capacitor-Coupled Low gain Avalanche Diode (AC-LGAD) technology. The radiation tolerance of such detectors will be investigated and techniques to improve radiation-hardness will be studied. KEK, University of Tsukuba with Hamamatsu Photonics K.K. (HPK) and BNL are developing novel designs of AC-LGAD sensors and a versatile benchmarking system will be developed and implemented at the Fermilab Test Beam Facility that will be used for precise characterization of sensors developed in this program together with colleagues at UCSC and LBNL. Dedicated readout electronics will be studied and prototyped, building upon existing fast-time ASIC designs. The project includes the ambitious scope opportunity to develop a monolithic LGAD for low-mass detector applications, if funds allow.

### Type of presentation (in-person/online)

in-person presentation

### Type of presentation (scientific results or project proposal)

project proposal for future work

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