

Abstract Submitted  
for the APR21 Meeting of  
The American Physical Society

**Development of Cosmic Ray Detector, Circuit Systems, and Timestamp Collection Using FPGA** JOSEPH HUANG, ALEXANDER LEE, JACQUELINE NGUYEN, Evergreen Valley College, AYDAN PIRANI, Evergreen Valley High School, CINDY TRAN, Andrew P. Hill High School, SEWAN FAN<sup>1</sup>, Evergreen Valley College — A team of undergraduate students from Evergreen Valley College will present the progress of assembling an improved version of a cosmic ray detector (based on guidelines prescribed by the LBL Cosmic Ray Project). Fiber optic cables are embedded in precisely cut grooves of a plastic scintillator sheet and attached to a photomultiplier tube for subsequent tests. To process the analog data from the scintillator, an Analog Devices ADCMP562 Comparator Evaluation Board is tested with an HP Pulse Generator to determine the output waveforms of the circuit board. To record high-accuracy timestamps of cosmic ray events, our team used Verilog, a hardware description language (HDL) for digital logic, to design a 32-bit digital counter with triggered pulse. The designs were simulated using ModelSim, an HDL simulation environment, for analysis and debugging. The Verilog designs are to be loaded onto Intel's field-programmable gate array (FPGA) chip, which would output timestamps accurate to one-hundred millionth of a second. The FPGA would receive high-accuracy time data from a GPS device, and an Arduino Mega would record timestamps from the FPGA output.

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Date submitted: 11 Jan 2021

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