

## **QCC Quarknet Center 2020-2021 Annual Report**

The focus of the summer 2021 Quarknet workshop was to learn how to program an Arduino Mega microcontroller board. A Quarknet Program teacher from Cardozo High School wired an Arduino Mega to an Adafruit GPS receiver/antenna system, wrote the code, and completed three tasks:

- a) The Arduino function "TimerOne()" was used to generate a square pulse with 1 second period and 100 msec width; the Arduino was programmed to read the pulse; the Serial Monitor data was collected and analyzed. An error analysis was performed. The shape of the signal was observed on an oscilloscope.
- b) The GPS NMEA data was collected and recorded.
- c) Measured the timing errors on the GPS PPS signal period and width; serial monitor data for consecutive PPS pulses were recorded and plotted. Excel was used to calculate the time difference between each pair of consecutive PPS pulses.

The goal of the project is to use the Arduino with a data acquisition front end circuit (DAQ) we are designing for a cosmic ray particle astrophysics detector. The project involves programming an Arduino Mega microcontroller board to receive and process digital and analog data from a DAQ front end circuit board, a GPS receiver, and atmospheric sensors. The project also involves programming a Raspberry Pi single board computer to automatically upload the cosmic ray data to the cloud on a daily basis.