WiDAQ: An Inexpensive, Scalable Slow-Control System Using Do-It-Yourself Electronics and Wireless Data CICI HANNA, HENRY HUNT, Enrico Fermi Institute, University of Chicago, EVAN ANGELICO, Stanford University, SERGEI NAGAITSEV, Fermi National Accelerator Laboratory — Slow-control systems for experiments in particle and accelerator physics often require 10s to 100s of channels for monitoring and controlling instruments such as thermocouples, pressure gauges, heaters, instrument relays, and interlocks over long periods of time. Especially for large distributed systems, many-channel control systems present integration challenges, including cable management and modular flexibility. This system – a custom slow-control system that features wireless data transfer, modular architecture, low cost per module, live web monitoring, and long-term data storage – was designed to address those issues. The prototype "WiDAQ" system controls and monitors two 500W heaters with thermocouple feedback using Raspberry Pi Zero and TeensyDuino as front-end controllers with Bluetooth, Wifi, MQTT, Node-RED, MongoDB, and GraphQL as data transfer and storage mechanisms. The wireless data transfer, as well as the Internet-of-Things architecture of the front-end and web-application user interface, enables this system to scale to 100s of controllers distributed over 100s of meters, and is easily modified to incorporate other types of instruments for different slow-control systems.

Cici Hanna
Enrico Fermi Institute, University of Chicago