

# PHENIX FRONT-END ELECTRONICS – OVERVIEW

*PHENIX Collaboration*

*(For a complete list of authors, see article “PHENIX Experiment at RHIC.”)*

ORNL has responsibility for several aspects of the front-end electronics being designed and constructed for the PHENIX detector. PHENIX has eleven different detector subsystems, all of which share a common logical front-end architecture in order to achieve uniformity of timing, trigger, and control distribution, as well as of data readout into the data collection system. However, the specifics of the front-end electronics vary considerably among subsystems, reflecting the very different raw signal amplitudes, electrode characteristics, and noise requirements of the many subsystems. ORNL is involved in supplying at least part of the front-end electronics for seven of the eleven PHENIX subsystems.

The ORNL Instrumentation and Control Division supplies the great bulk of the personnel working on the electronics. All the engineers and technicians are based there. Personnel range from full-time Ph.D.-level electronics engineers to undergraduate and masters' students working with the group for a semester or more. Several theses have already been completed on various parts of the overall electronics effort.

All members of the High-Energy Reactions Group in the Physics Division have an involvement in preparing these electronics. Responsibilities range from overall management and general setting of specifications and requirements to detailed testing and software preparation. Physics and I&C Divisions are jointly responsible for testing of prototype and final production electronics when connected to the PHENIX subsystems. An overview of specific ORNL responsibilities is as follows.

## Multiplicity-Vertex Detector (ORNL, LANL):

design, fabrication and testing of both ASICs; design, prototype fabrication, and testing of all Interface Modules; schematics for the Multi-Chip Module used to attach the ASICs to the silicon detectors; design and testing of all control logic

## Pad Chamber (ORNL, Lund University, Vanderbilt, Weizmann Institute, BNL, Stony Brook):

design, fabrication, and automated testing of preamp/discriminator ASIC; design, fabrication, and prototype testing of all Front-End Modules and all control logic

## EMCalorimeter (ORNL, BNL, University of Münster, Kurchatov Institute):

design, fabrication, and testing of all aspects, including two ASICs, all seven types of boards, and all control logic, for both the PbSc and the PbGl calorimeters

## Ring-Imaging Cerenkov Counter (ORNL, University of Tokyo, Waseda University, Hiroshima, Nagasaki):

design, fabrication, and prototype testing of the integrator/discriminator and trigger ASIC; system design; testing stations

## Muon Tracker (ORNL, LANL):

system design; design, fabrication, and testing of the two ASICs used, including the MuTR-specific preamplifier/shaper ASIC matched to the cathode-strip chambers

Muon Identifier (ORNL):

all aspects, including in-panel preamplifiers, both types of boards, and all control logic, cabling plant, and support infrastructure