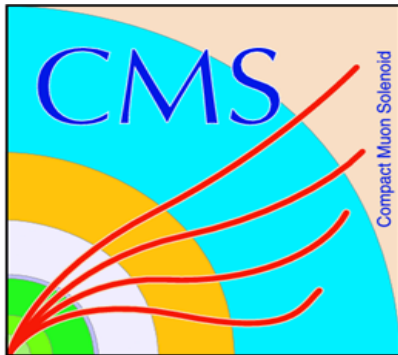


PIRE Activities and Plans for the Coming Year



Jose Lazo-Flores
Valeria Radicci
(and Federico)



UIC



KU



The PIRE Group



- NSF's Partnership for International Research and Education (PIRE) program
- List of represented institutions
 - Paul Scherrer Institut (PSI), Institut für Teilchenphysik (ETH-Zürich), University of Nebraska at Lincoln (UNL), Kansas University (KU), Kansas State University (KS), University of Illinois at Chicago (UIC), University of Puerto Rico at Mayagüez (UPRM)
- Professors involved in the program
 - A. Dominguez (UNL), Ken Bloom (UNL), A. Bean (KU), T. Bolton (KS), I. Chakaberia (KS), C. Gerber (UIC), A. Lopez (UPRM)
- Post-docs
 - Valeria Radicci (KU) and Jose Lazo-Flores (UNL)
- List of graduate students
 - T. Kelly (UNL), J. Acosta (UPRM), S. Khalatian (UIC), S. Oliveros (UPRM), J. Sibille (KU), S. Shrestha (KS)
- List of undergraduate students
 - D. Olseson (UNL), C. Martin (KU), A. McVea (KU), N. Krzyzanowski (UIC), Eric Stachura (UIC), L. Rivera (UPRM), A. Al-Rawi (KS)



Summer '09 Program



- Series of lessons to
 - Give students an overview of experimental physics
 - Present the summer projects at PSI
 - Match their interest with projects
- Lesson plan
 - General talk on Particle physics by Alice Bean
 - Particle detection techniques by Tony Kelly
 - Covered charged particle, photons and neutrons
 - High Energy Physics detectors by Alice Bean
 - How to design a physics experiment with focus on CMS
 - Semiconductor detectors by Valeria Radicci
 - Particle detection and the application of silicon for CMOS electronics
 - Silicon detectors by Jenifer Sibille
 - Performance and operational characteristics, radiation damage, annealing ...



Summer '09 Program



- Lesson Plan (continue)
 - CMOS electronics by Shruti Shrestha
 - MOSFET characteristics, analog and digital MOS model, examples of CMOS digital circuits implemented in the pixel ROCs
 - How to setup a cold box by Tony Kelly
 - The Bpix Read Out Chip (ROC) Design by Me
 - Pixel Barrel Module by Samvel Khalatian
 - Calibration, testing and irradiation effect on the read out electronic
- Additional lessons
 - ROOT lessons by Tony Kelly
 - Accelerator physics by Roland Horisberger
- Projects list
 - Current ROC calibration (Wolfram Erdmann and me)
 - 1) Measurements of irradiated ROCs by Samvel and Eric (UIC)
 - 2) Module trimming at low threshold by Luis (UPRM) and Ali (KU)



Summer '09 Program



- Projects list (continue)
 - New digital read out architecture (Valeria, Beat, and Wolfram)
 - 3) Chip design by Shruti (K-State) and Dane (UNL)
 - ADC and PLL simulation and test
 - New ROC simulation
 - 4) Micro-twisted pair cables tests (Angel Lopez)
 - Tested different lengths of cable by Sandra (UPRM)
 - » Work done at UPRM
 - 5) Module test with X-Ray box (Alice and me)
 - Experimental setup by Ali (KU)
 - Pixel sensor design and performances (Tilman)
 - 6) Inter-pixel capacitance measurements (Jennifer and Tilman)
 - Fanout board for the inter-pixel capacitance
 - 7) Irradiated sensor efficiency measurements (Jennifer and Tilman)
 - Measurements and analysis by Jennifer (KU) and Natalie (UIC)
 - 8) Study the Cal inject charge vs temperature
 - Tony's Masters thesis



Summer Program Report



- Irradiated ROCs (Eric and Samvel)
 - Pulse shape analysis package written
 - Re-analyzed existing data
 - Tested additional ROCs
 - Results will be written in a CMS Internal note
- Cal inject studies
 - Experimental setup completed
 - Now taking cosmic and source data
- TBM Problem
 - Only existing TBM board burned
 - Used for testing single chips
 - Solution was to implement the TBM in test the boards FPGA
 - Implementation done by Chris (KU)
- New chip components testing (Dane and Shruti)
 - Dane completed the test board for the 4 and 8 bit ADC
 - Now testing the chips
 - Shruti completed the test board for the PLLs (Phase Lock Loop)
 - Now testing and taking measurements



Summer Program Report



- Charge collection efficiency measurements (Natalie & Jennifer)
 - Now finished with the testing of the samples irradiated at highest fluence (5×10^{15} neq/cm²)
 - Analyzed the data they have
 - Will be written as part of Jennifer's thesis
- Trimming exercise (Luis and Ali)
 - Checked trim bits differences after trimming at different Vcal values
 - Studied Vcal S-Curves for different VthrComp values
 - Results will be written in a CMS Internal note
- Module test in X-ray box (Ali)
 - Ali finished setting things up
 - Ran out of time
- Inter-pixel capacitance measurements (Asma)
 - Tilman and Silvan prepared the chips for these measurements
 - Asma did some testing



Summer Program Summery



	May	June	July	August	
Samvel (UIC)	←————→			8	
Alice	12	————→		31	
Eric (UIC)	16	————→		31	
Natalie (UIC)	16	————→		31	
Tony (UNL)	18	————→			?
Dane (UNL)	18	————→		15	
Chris (KU)	21	————→		31	
Ali (KU)	21	————→		31	
Luis (UPRM)	26	————→		31	

**Friday (7/31) was the last day
at work for most students
Dane stays until August 15th**

Tony is still with us...

- Summer was very productive
- Results were produced in all projects
 - Studies will continue
 - Some will now be picked up by group members
- Analysis software has been updated and documented
 - psi46expert, takeData are working in SL5 environment
 - Still sorting out bugs in upgrades
 - FPGA TBM bugs are also being sorted out



Future Plans and Projects



- Internal cross-talk measurements of current ROC
 - Lessons learned to be used in ROC upgrade
- New ROC design starts this fall
 - Design should be submitted by May
 - Should have prototypes by mid summer
- New ROCs need to be tested
 - Adapter boards need to be designed
 - Mounting boards need to be designed
- Test board firmware will need to be updated to readout new ROCs
 - This is a big project but can be broken into smaller closed projects for students



Future Plans and Projects



- Micro twisted pair cables
 - Test the bundle of 7 package
 - Test with digital signals
 - Cross-talk measurements
 - Testing setup needs to be design
- Pixel capacitances **
 - Second run
 - More statistics
 - Bias voltage dependencies tests
 - Test capacitances on Fpix sample
 - If we can acquire one
 - Simulations
 - To measure different parameters
- Efficiencies measurements with scintillators
 - Requires working trigger setup

** Possible projects



Future Plans and Projects



- 3D detectors **
 - Simulations
 - Testing
- Test beams **
 - Irradiation of several 100s sensors at the Swiss Light Source (SLS)
 - From the RD50 collaboration
 - 4 weeks of beam time
 - Would use a few students
- Continue with current unfinished studies
 - Charge Collection Efficiencies, Trimming, ROC irradiation performance, X-ray box, etc

** Possible projects



Future Plans and Projects



- Are our students limited to CMS related projects?
- Projects from the Swiss Light Source (SLS) group
 - Working with X-Rays from SLS
 - They use silicon Pixel detectors
 - Their readout chip is based on early ROC technology
 - They work closely with the PSI pixel group
- List of possible projects
 - ROC testing
 - Data analysis
 - Readout hardware and firmware
- SLS beam time
 - Experimental setup



Summery



- Productive summer
 - The group learn a lot about the ROC performance from the results of student projects
- Plenty of projects for the next year
 - Continue to test the current ROC
 - Testing and development of next iteration of ROC
 - Enough projects to keep ~10, or more, students busy
- Work they do is proving to be vital to the group
- We do exchange information with the installed detector
 - Will have unforeseen projects as the detector is commissioned

"We are at the very beginning of time for the human race. It is not unreasonable that we grapple with problems. But there are tens of thousands of years in the future. Our responsibility is to do what we can, learn what we can, improve the solutions, and pass them on." R. Feynman