



Fermi

The Gamma-ray Large Area Space Telescope

Highlights from the Fermi Summer School 2011

Liz Hays and Jamie Holder

<http://fermi.gsfc.nasa.gov>



Two weeks of science and analysis in Lewes



Fermi Summer School 2011 - Lewes, Delaware

People and Activities

- **10 days**
- **25 students** (grad students and post-docs from 20 US and non-US institutions)
- **5 core instructors**
 - **Chuck Dermer** (fundamentals of HE astro), **Benoit Lott** (AGN, LAT analysis), **Eric Charles** (LAT Instrument), **Gernot Maier** (TeV - Imaging Cherenkov), **John Pretz** (TeV - Water Cherenkov)
- **11 supplemental instructors and lecturers**
 - **FSSC tutorials, GeV/TeV astrophysics** (pulsars, GRBs, SNR/PWN, binaries, dark matter)
- **Afternoons devoted to tutorials and hands-on analysis projects** (e.g. AGN detection and lightcurves (3C454.3 and many others), V407Cyg Nova spectrum, extent of M31, GRB 080916C, W49B, spectrum of LS I +61 303, pulsar subtraction and phase-resolved analysis, recreating response for LAT, TeV telescopes)
 - **New P6 V11 response functions and accompanying updates to Science Tools (v9r23p1)**
 - **Specialty simulation sets for LAT, air shower generated cherenkov light and particles on the ground**

Program - I

Tuesday

- * Fermi Mission Overview - Julie McEnery
- * Fermi-LAT Sources - Elizabeth Ferrara
- * High Energy Astronomy Overview - Chuck Dermer
- * Exploring LAT Data - Elizabeth Ferrara

Wednesday

- * AGN in the LAT - Benoit Lott
- * AGN Physics in the Age of Fermi - Chuck Dermer
- * Detectors I: Fermi-LAT Overview - Eric Charles
- * Introduction to Likelihood Analysis - Benoit Lott

Thursday

- * Gamma Rays from SNR and PWN - Pat Slane
- * Cosmic Rays and Supernova Remnants with Fermi - Chuck Dermer
- * Detectors II: Imaging Atmospheric Cherenkov Telescopes: An Introduction into Ground-based Gamma-ray Astronomy - Gernot Maier
- * Python Analysis - Jeremy Perkins

Friday

- * LAT Observations of Gamma-ray Bursts - Julie McEnery
- * GRBs with the Fermi LAT and GBM - Chuck Dermer
- * Detectors III: The Fermi Gamma-ray Burst Monitor - Valerie Connaughton

Saturday

- * LAT Instrument Response Functions - Eric Charles
- * GeV/TeV Connections - Jeremy Perkins
- * EBL/IGMF - Chuck Dermer

Program - II

Monday

- * Fermi Large Area Telescope Observations of (Rotation-Powered) Pulsars - Paul Ray
- * Detectors IV: TeV Astrophysics with Water Cherenkov Ground Arrays - Part 1: Scientific Motivation - John Pretz
- * Using Tempo 2 with LAT Data - Paul Ray

Tuesday

- * Gamma-ray Binaries - Jamie Holder
- * Massive Binaries - Stan Owocki
- * TeV Astrophysics with Water Cherenkov Ground Arrays - Part 2: Details and Sensitivity - John Pretz
- * Likelihood 2 - Benoit Lott

Wednesday

- * LAT Event Reconstruction - Eric Charles
- * Why Search for Dark Matter with Fermi? - Savvas Koushiappas
- * Gamma-ray Pulsars - Theory and Modeling - Alice Harding

Thursday

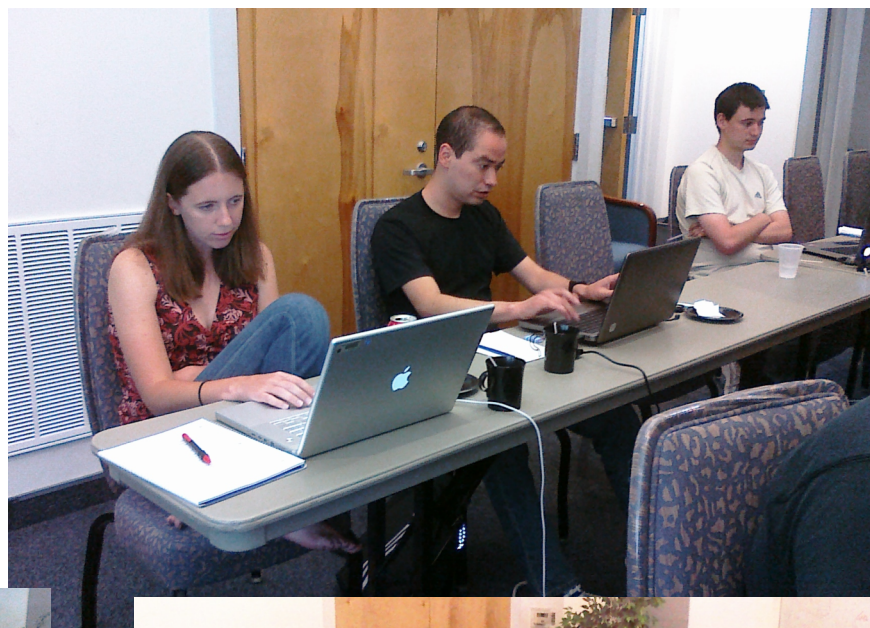
- * GeV Flares and Particle Acceleration in the Galaxy - Liz Hays
- * A Little History, but ... in Astronomy it's Resolution, Resolution, Resolution - Bill Atwood

Friday

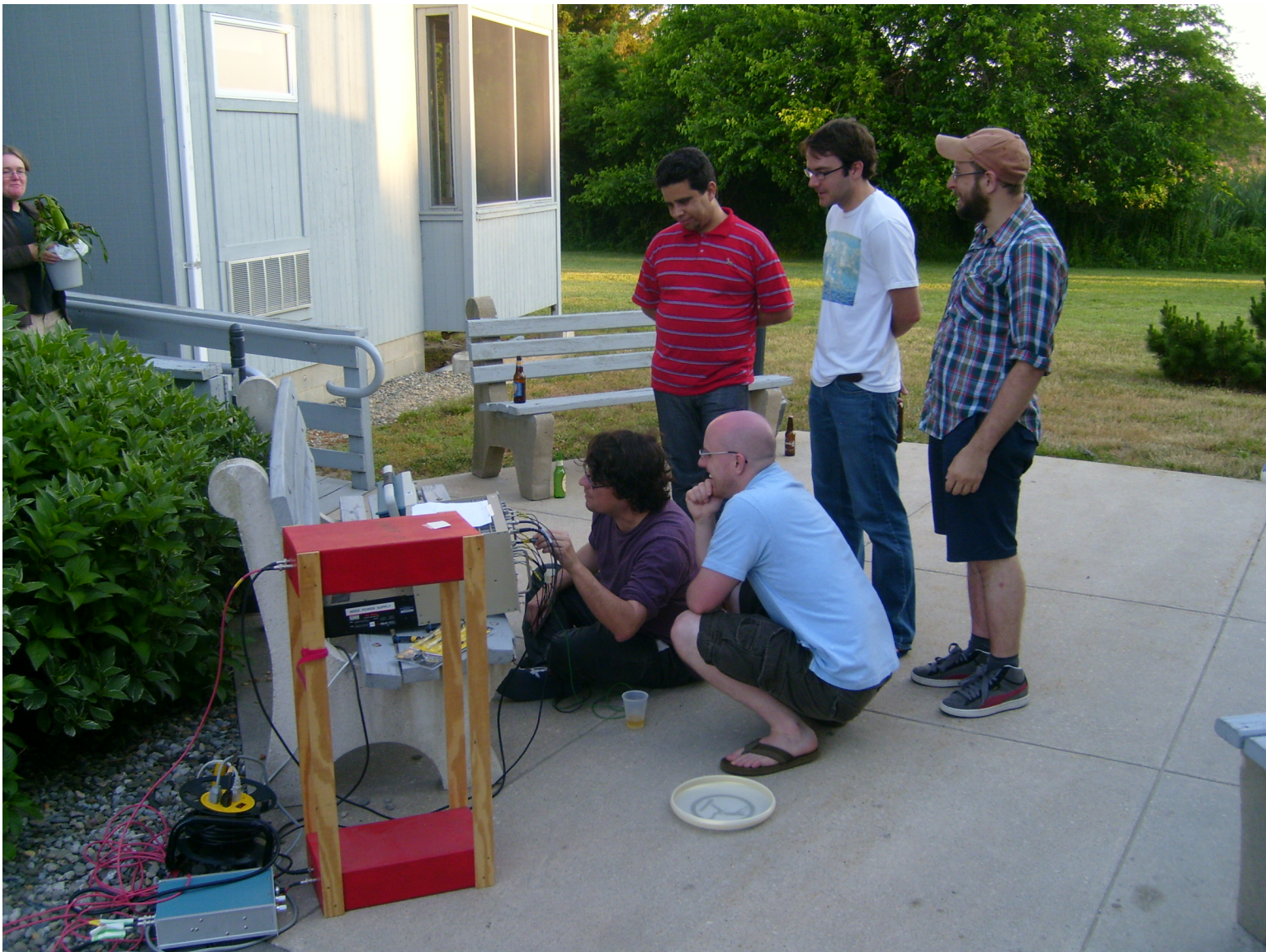
- * Workshop Reports
- * Student Feedback



Hands-On Sessions



Hardware: Muons



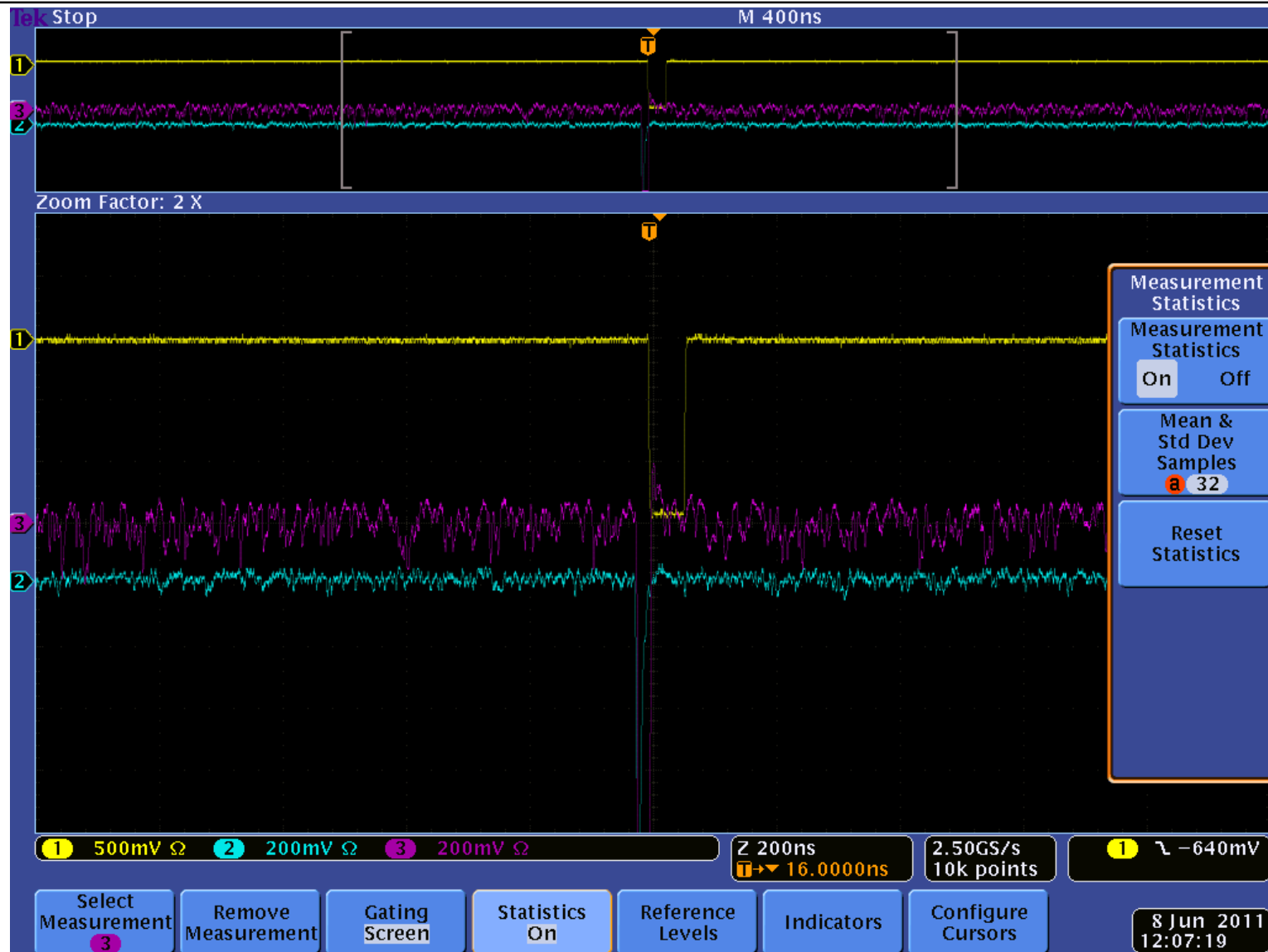
Hardware: Optical & Cherenkov



Hardware: Cherenkov



Rediscovery of Cherenkov Events



Rediscovery of Cherenkov Events



Extracurriculars



Extracurriculars



Conclusions

- **Student feedback very positive**
 - Content received well overall although students from wide range of backgrounds. Instrument oriented folks particularly happy to set ample coverage of experiments and detection techniques.
 - Venue worked well although transportation required cars and planning (and there were those pesky mosquitos...)
 - Tricky to have hands-on sessions structured enough while keeping them open-ended enough (varied from student to student)
 - Make more tutorial materials available ahead of time
 - Great suggestions for future! deeper likelihood coverage: model comparison, issues with backgrounds, specialty cases like faint or extended sources; modeling component for reduced data
- **Pencilled in again for next year (May 29th – June 8th)**
- **Total cost was <40K (plus travel and evening meals).**
 - **Suggestions for external funding support?**

The End

