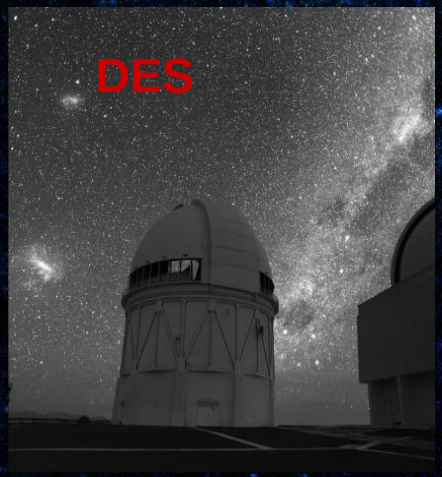
The HEP Experimental Astrophysics & Cosmology Program

Dark Matter,
Dark Energy and
Inflation Era Physics

Providing Enabling
Technology for
Future Experiments



Astrophysics & Cosmology Experimental Group

CMB (SPTPol)

J. Carlstrom (HEP) **

C. Chang (HEP) **

V. Novosad (MSD)

G. Wang (HEP)

V. Yefremenko (MSD)

Postdoc (HEP joint w/ Cosmic Theory group)

New Postdoc (HEP)

Dark Energy (DES)

J. Bernstein^(HEP/ALCD)

R. Biswas^(HEP)

E. Kovacs (HEP)

K. Kuehn^(HEP)

S. Kuhlmann (HEP)

H. Spinka (HEP)

R. Talaga (HEP)

Indirect Dark Matter (VERITAS)

K. Byrum (HEP)

G. Decerprit^(DESY)

R. Wagner (HEP)

B. Zitzer^(HEP)

** Joint w/ Univ. of Chicago

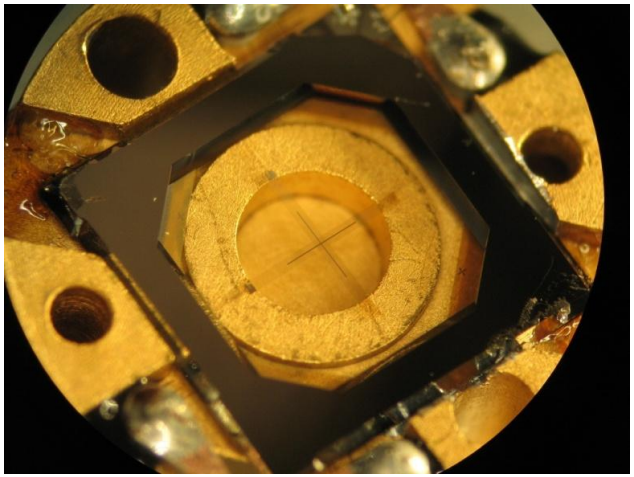
^ Postdoctoral Candidate

HEP – High Energy Physics Div.

MSD – Materials Science Div.

ALCD – Leadership Computing Div.

CMB (SPTPol)



CMB Program Funded !!! (as of Jul 2011 Fin Plan)

- John Carlstrom and Clarence Chang w/joint ANL-UC positions
- Vlad Yefremenko (MSD Eng), Val Novosad (MSD Physicist) & Gensheng Wang (HEP Physicist) leading the effort of fabrication of new ANL TES sensors
- New hires: Postdoc(s) (as recommended by non-accelerator review)

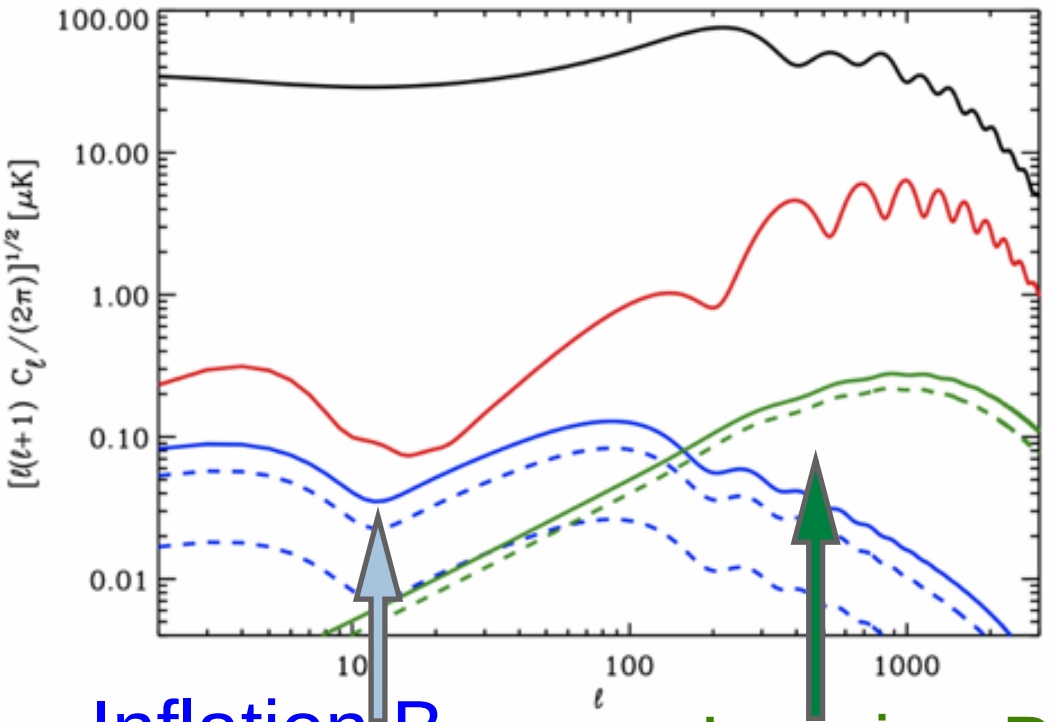
Goals for next year(s):

- Establish CMB Science Program at ANL
  - w/ strong ties to Cosmic Theory group (New joint CMB/Cosmic Theory PD)
- Installation, commissioning and performance of new ANL-TES camera

Future Goals

- DOE leadership within CMB program
- Provide the Enabling Technologies (Sensors and MKIDs)

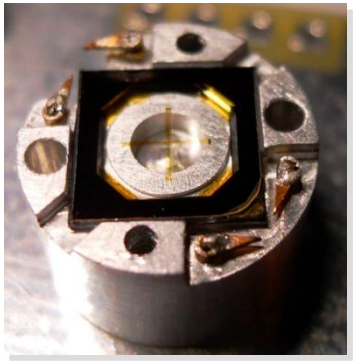
CMB: Goal & method



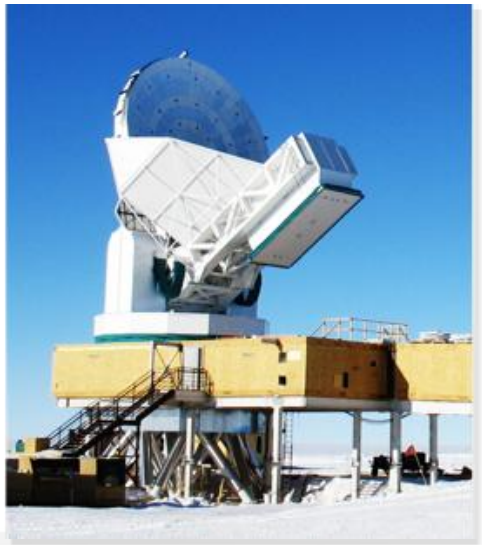
Inflation B-modes (probes physics at 10^{16} GeV)

Lensing B-modes (constrains neutrino mass $\sum m_\nu = 1.5$ eV)

Clarence Cheng

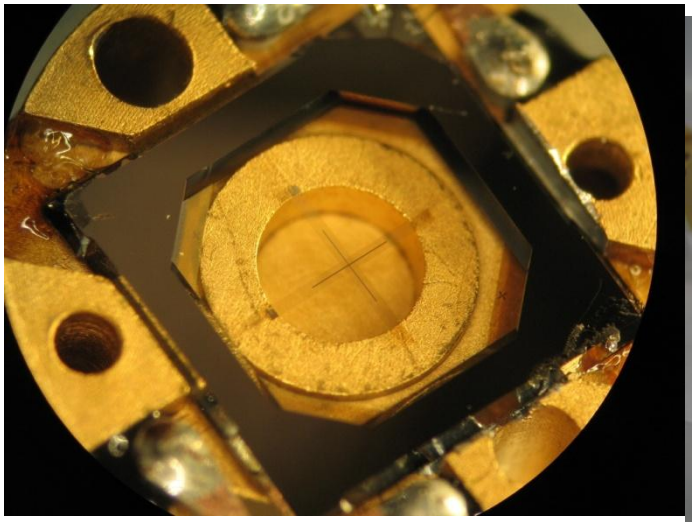


Put lots of ANL detectors onto SPT



Production in process

- Fabricate detectors
- Distribute for screening
- Machine mounts
- Gold plate & Wiring for mounts
- Pixel assembly

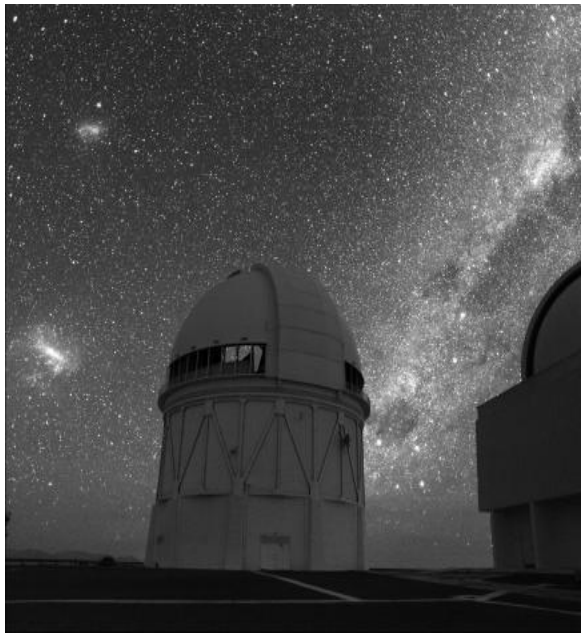


Summary

Clarence Cheng

- Aim to detect CMB B-modes for inflation and neutrino mass by putting lots of ANL detector on SPT (SPTpol)
- Prototyping complete with demonstrated excellent performance. Design finalized.
- Production is underway:
  - Fabrication at ANL-MSD/CNM
  - Detectors distributed between ANL, UChicago, CWRU, and UCB for screening.
  - Mounts machined at UMich. Delivered to UChicago for wiring and pixel assembly.
- On track for delivery of first set of ANL detectors for observation in 2012.

Dark Energy (DES)



Present:

- PreCam Success!!
- DES commissioning continues; first light spring next year.
- Stronger ties to Cosmic Theory Group w/proposal for 4 members of this group to join DES.

Future:

- Continued strengthening of the DE program.
  - DE and Cosmic Theory groups will propose to join LSST
  - Strengthen connections to CMB DE program

DES Group Update (Since May)

Steve Kuhlmann

- Photometric calibration progress (PreCam)
  - Comparing to sparse set of standard stars
  - Stars mag 15-16, widths 4% -> 2%
  - Stars mag 16-18, widths 8% -> 4%

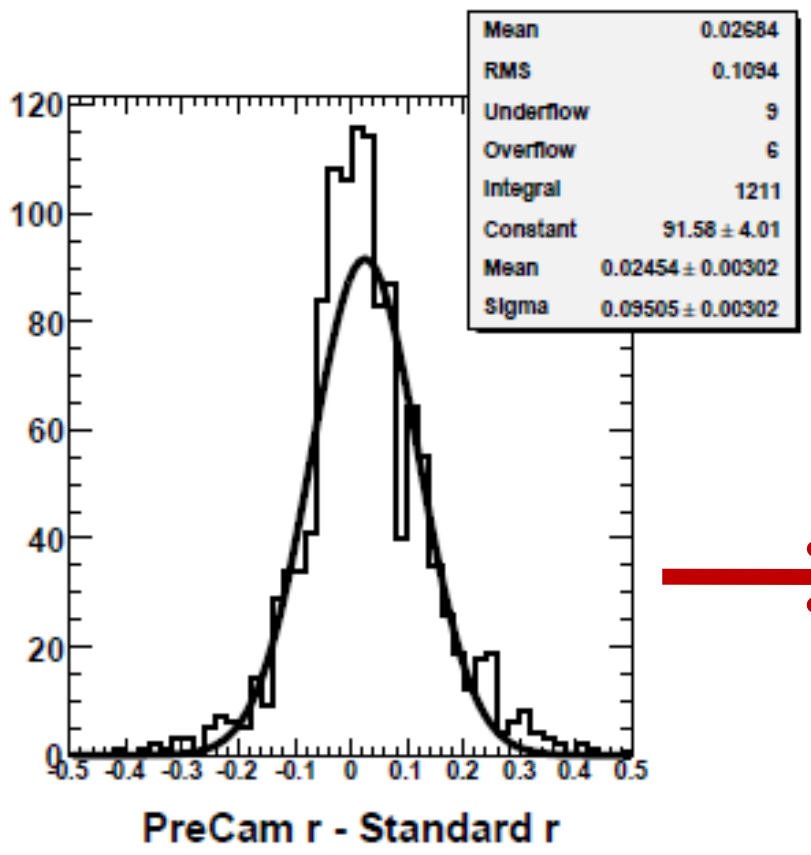
- Supernova strategy paper nearing submission
  - Collaboration-wide 1-week review after next week's DES collaboration meeting discussions

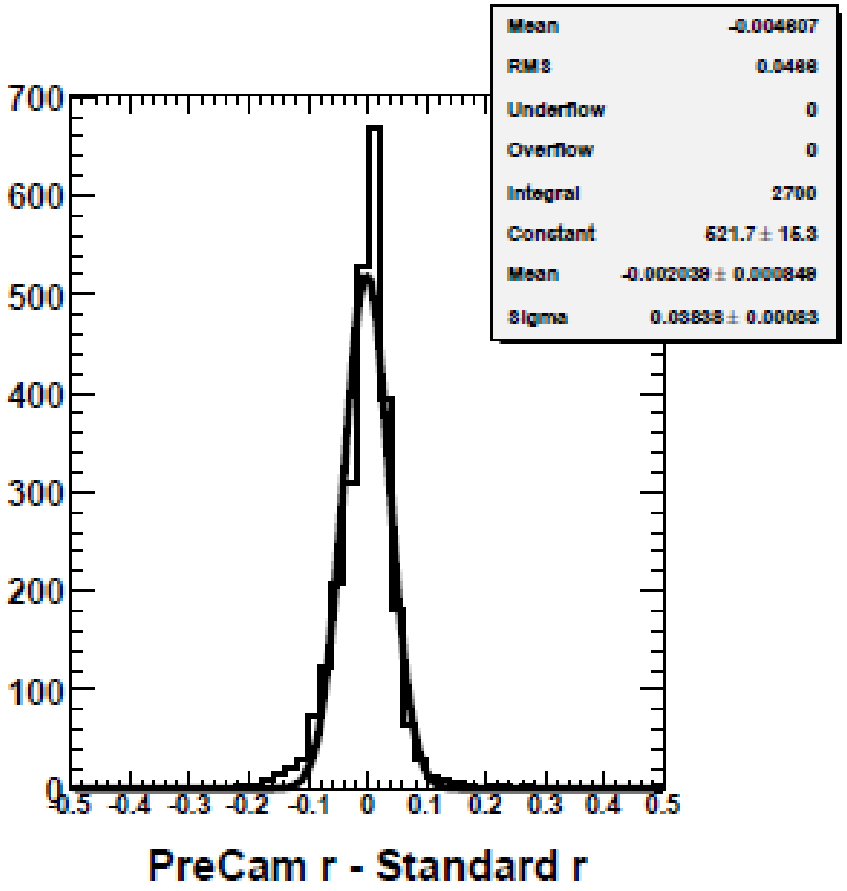
- Continued DECam commissioning: mechanical engineering
  - f/8 platform, Instrument Controls/Alarms

- Working with Habib/Heitmann on DES and LSST membership proposals (see next talk).

DES Group Update (Since May)

Steve Kuhlmann





For stars dimmer than mag 16, PreCam measurement versus SDSS.
On left is result from May, on right is current result.
Improvements include aperture and width tuning, galaxy removal.

Indirect Dark Matter (VERITAS)

Present

- Complete L2 trigger upgrade for VERITAS: Installation & Commissioning Continues
- Science – Continued Data analysis focusing on DM, LIV and fundamental physics

Future Goals

- Establish ties with Cosmic Theory in DM Simulations for Indirect detection
- Provide enabling technology for next generation
  - Large Area Photodetectors for camera
  - Wireless readout
- Utilize unique lab resources
  - New economical & automated mechanical telescope designs

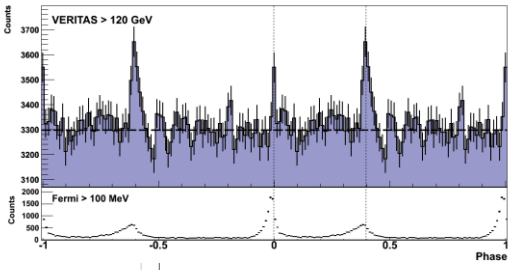
VERITAS

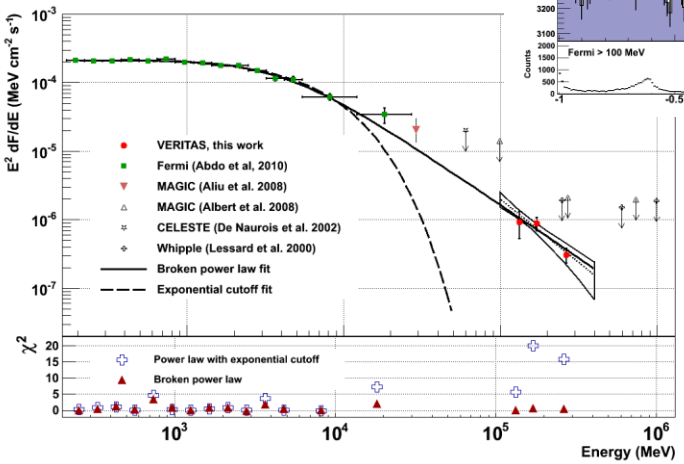
US invented this field (with DOE & NSF support)

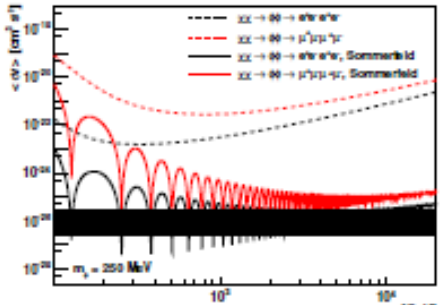
KB

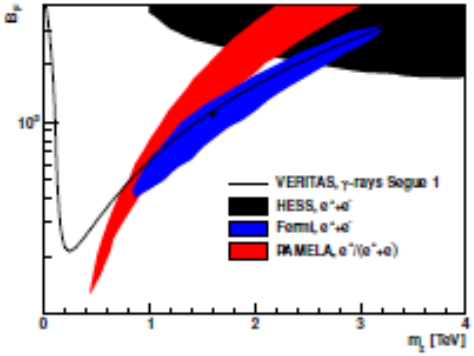
Currently the most sensitive TeV Observatory in the world.

Press Release Next Week: First Detection of Crab Pulsar above 100 Gev in Science (Note this result is embargoed until next thurs)









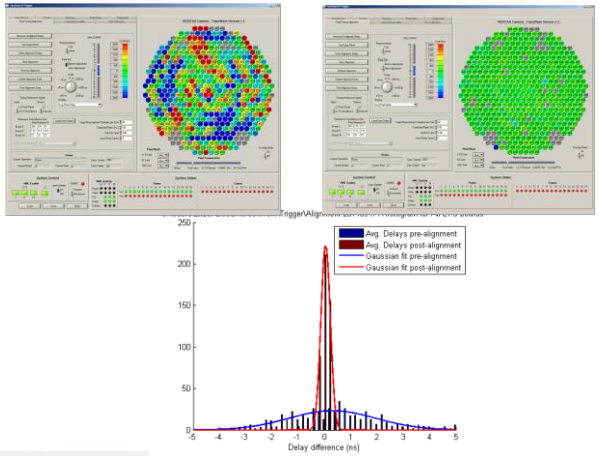
VERITAS Deep Observations of Segue 1 (paper now being internally review)

- Excludes some DM models
- Complementary to other measurements

New 400MHz FPGA Level 2 Trigger for VERITAS

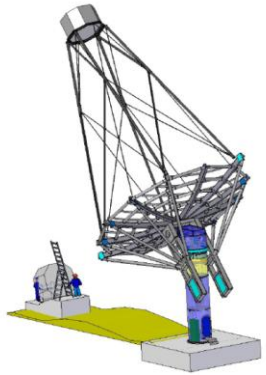
- 4 L2 trigger crates now being tested on Telescope 3
- Trigger alignment has been performed on all 4 crates (Pixel to pixel alignment better than 500psec)
- New trigger coincidence parameters being studied

PLAN to install at new moon: Oct or Nov.



ANL lead Mechanical Telescope designs for CTA

KB



Quarter dish for DC telescope. All components built in Chicago based US industry (with special capabilities – rolled beams)

Quarter dish in Berlin with mirrors installed and mirror controls for alignment. This has been a big success for finalizing telescope design.