

### Fall 2011 State of the ID Lab

October, 2011





### **ASICs at the Discovery Frontier**



### **New/Immediate Projects**



## Much, much going on...

- Hopeless to cover everything
- Just a brief overview of the most active projects
- For further detailed information, 2 websites:



# ANITA3





### **Physics Goals**

- Discovery experiment for "BZ" neutrinos, created by the so-called GZK process
- Uses the entire Antarctic continent as a detector!
- Best near-term chance to observe neutrinos from earliest universe
- 3<sup>rd</sup> (final) flight in December 2013



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# ANITA3 – ID Lab



## Askaryan Radio Array (ARA)



# ARA – ID Lab

### IRS, IRS2, IRS3 ASIC



### **Our Developments**

- ANITA trigger/digitizer electronics  $\rightarrow$  to ARA
- "array crossing" waveform sampler (IRS)
- Built "testbed" almost 4 years ago....
- Finally deployed in January, taking data
- First "station" January 2012











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### Title: Time-Encoded Differential Absorption Org/PI: University of Hawaii / John Madey



#### **Technical Merit**

- Real time detection and imaging of concealed SNMs through use of GHz avalanche PD arrays and multi Gigabit xfer links
- Based on differential absorption using a novel, rapidly tunable, high duty cycle, intense monochromatic gamma ray source

#### **Technical Approach**

- Exploit existing facilities and capabilities at UH for development and testing of source, detector and DAQ technologies
- Investigate source stability; quantum efficiency and time resolution of detectors; and operation of DAQ routing chips
- gamma ray wavelengths by increasing the e-beam energy

#### Broader Impact

- Focus on systems development and testing provides students with critical insights into the issues for detection of SNMs
  - Project funds support 2 grad students and one student continuing as a postdoc in the second year
  - Our laboratory has served as the centerpiece of numerous tours by visiting local high school students and teachers
- Required technologies are common to HEP and x-ray crystallography, establishing broad support for future development
- Integration of these advanced technologies will feed back into these communities in support of research and manufacturing

<u>S</u>	•FY09: \$398K	•FY12: \$399K
	•FY10: \$392K	•FY13: \$379K
	•FY11: \$388K	•Total: \$1,956K

#### Major Milestones / Accomplishments

- FY09: basic testbed design, installation, integration and test
- FY10: detector v.2 eval; test ebeam and optics stabilization
- FY11: detector v.3 eval; ebeam and optics subsystems ass'y
  - FY12: detector v.4 eval, ebeam and optics integration
  - FY13: detector v.5 evaluation; tests of integrated system

#### <u>Team</u>

 co-PIs: Assoc. Prof. Gary Varner Assoc. Prof. Eric Szarmes

#### Last updated on: 04/13/2011

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### Bremsstrahlung x-rays: UH FEL

### First x-rays: September 2010

50MeV max. (40MeV typ.)



### **TEDA – ID Lab**

cPCI crate (control room)



Master module

# Large Area Photodetector



### **Project goals**

- Photomultipliers still built on vacuum tube technology
- CRT  $\rightarrow$  flat panel screen transition
- Integrated readout electronics
- Necessary for next generation (large) detectors





**CHAMP** 



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# Belle II – ID Lab



## Got fiber?





## Our activities KLM – ID Lab



# SuperKEKB – ID Lab

### **STURM2 ASIC Our Developments** x-ray monitoring • High speed sampler, compact RF amplifiers • Test at the ATF2 facility Survived shaking IDL フラナガン GSV STURM2 Belle ØVarner ATF2 CHIP State of the Instrumentation Dev. Lab -- October 2011 17

# Personnel changes...

- Since this summer
  - Left for industry: Xi Zhao
  - Off to graduate school: Louis Ridley
  - Returned to Chicago: Daniel Booth
  - Fall arrivals:
    - Prof. Roberto Mussa (INFN Torino)
    - Zhe Cao (USTC postdoc)
    - Joachim Cohen (Paris)
    - Dmitri Liventsev (ITEP/KEK)
  - Next Finnish (Savonia) visitors (from January)
    - Lauri Virta, Janne Himanen, Ari Parviainen, Lauri Karpinnen
    - Jussi Kangaskoski



# Manpower needed...

- 1. Endcap KLM 150 channel system (full quadrant test of muon system) →
- iTOP beam test --> boards and board test plan
   [512 channel system = 4x 128ch]
- 3. ATF2 (Fermionics-based) DAQ [128 channels]
- 4. xFEL Fermionics readout [128 channels]
- 5. mini-Time Cube [12x 64-channel tube readout minimum?]
- 6. fDIRC2 readout [14x 64-channel tubes]





120 X-Stri

1855

3255

## Announcements



## **Milestones and Opportunities**

- Belle II iTOP/KLM by 2014, pixel upgrade thereafter
- Disruptive technology: LAPPD (Detector dev center ANL)
- ANITA 3<sup>rd</sup> Flight approved  $\rightarrow$  active R&D (ASICs, trigger...)
- New initiatives: ARA Test bed installed, year 2 & 3
- Great opportunities life cycle of a university
  - Jr./Sr. research projects (EE 399/499, PHYS 499)
  - Directed study/NASA Space Grant/REU/PUF (Japan/Antarctica/Paris)
  - Publications (NIM/IEEE/JINST ...)
  - Board/firmware/chip design (PHYS476)
  - Many designs in queue; BLAB3B, STURM3, GRAPH...
    - Design, layout, simulation and test opportunities



