

# CDMS Operations

- Model
- Status
- Schedule
- Budget



It's been a long winter, but CDMS commissioning is going well at Soudan. Now planning for extended operations.

# CDMS Operations

- We have 6 years of experience operating CDMS I at Stanford
  - Convenient site with easy access (important when developing CDMS)
  - Requires attention from at least 1 physicist on a daily basis
    - Cryogenic transfers (LN, LHe) and status check
    - Data Acquisition stop/start and check online diagnostics
      - Tells current condition of experimental apparatus
    - Check offline analysis status and diagnostic plots
      - Verify integrity of data taken during last 24 hours
      - Make sure data backed up to tape
  - Requires full-time technician
    - Maintain cryogenic system and keep supply of liquids, gases
    - Troubleshoot mechanical/electrical problems
  - Experimental site is also analysis center
    - Easier to answer questions about data conditions, anomalies
    - Promotes discussion between students, post-docs, senior physicists
    - Can readily fix problems with data processing

# CDMS Operations

- How does this model apply at Soudan?
  - Limited access to experiment
    - Remote control and monitoring vital
    - “off-hours” emergency access must be possible (cryogenics!)
    - Electronic logbook and documentation accessible from surface, home
    - Checklists to make sure things aren’t forgotten before leaving mine
    - Need high-speed network connection from mine to surface
  - Power problems
    - Summer lightning storms => power outages, transients
      - UPS backup vital for computers, electronics
      - Automatic recovery algorithms for cryogenic systems
  - Logistics
    - Complicated scheduling
      - Web-based rotations of experts, non-experts, technicians
    - Housing difficulties (expensive and scarce in summer)
      - CDMS is leasing two houses; 1 in Soudan, 1 in Ely
    - Difficult travel
      - Airline flights expensive from most CDMS institutions
      - Long drives from Minneapolis airport, Fermilab
      - Risk of accidents, especially in winter
        - » CDMS people already have had some close calls
      - Not much for people to do off-hours

# CDMS Operations

- Other problems at Soudan
  - We don't own the Soudan mine (Minnesota State Park- DNR)
    - No modifications to “historical” character of the State Park
    - Subject to their policies concerning access
  - We don't operate the Soudan mine (University of Minnesota)
    - Some difficulties in “culture”; initial frustration on both sides
    - Better communication, larger CDMS presence at Soudan has helped
  - We don't have sole occupancy (MINOS) of the Soudan mine
    - Constraints on CDMS space
    - Some initial distrust
    - Working together in the mine has improved this
  - We're not “locals”
    - Our California contingent really stands out in northern Minnesota :)
  - Working through these problems by communication

# CDMS Operations

- Operations
  - What's the right level of people stationed at Soudan?
    - At least 2 physicists, 1 technician (Jim Beaty)
  - Shifts at home institutions?
    - 1 person at each institution charged with monitoring experiment, data
  - How to respond to problems with experiment?
    - Expert “on-call” for phone communication or travel in emergencies
    - Reliable “emergency” access into mine as needed (experience => once/month at most)
- Analysis
  - Local operations center and data processing farm?
    - Surface Trailer now; hopefully surface building soon
  - What are the logistics of getting data/RQs out of Soudan
    - FEDEX for tapes, Internet for RQs; central repository at Fermilab
  - How should we coordinate analysis efforts?
    - Analysis phone conferences, workshops

# Cryogenics



Industrial control hardware (APACS) and software (Intellution)

Robust, unattended operation

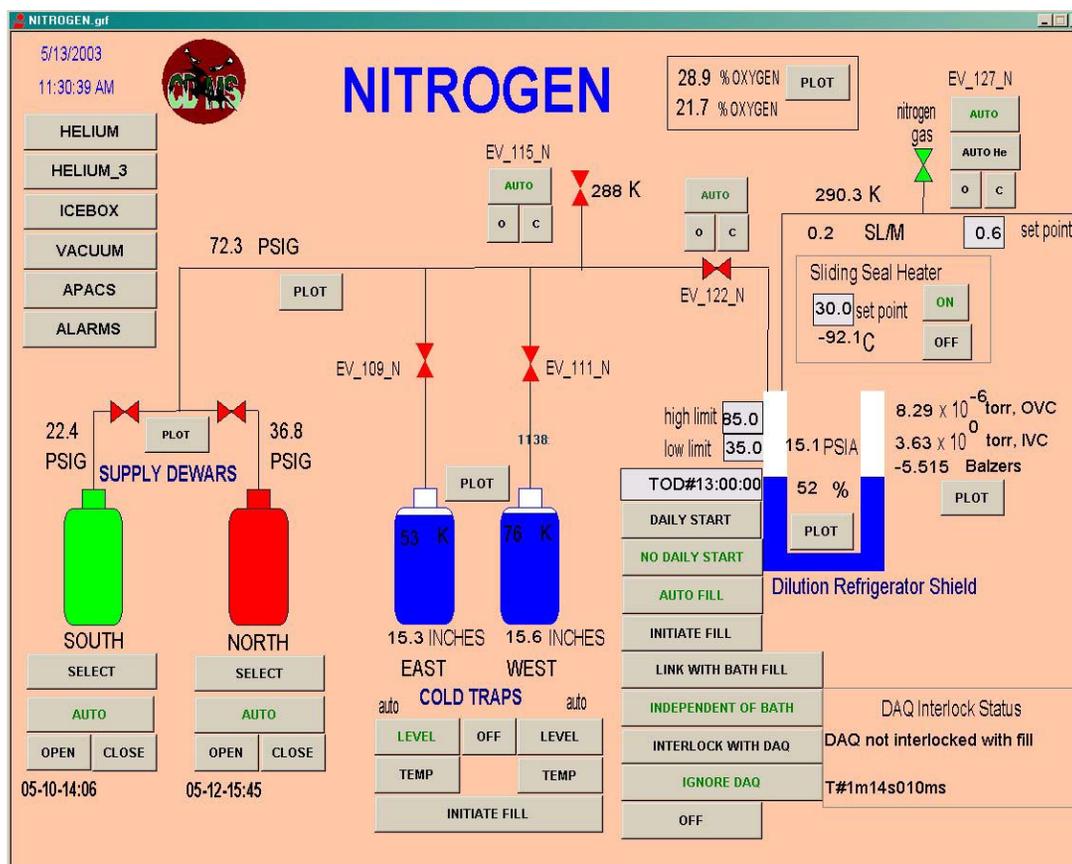
Remote control and monitoring

Still working the glitches out of the system

Recovery algorithms need tailoring

UPS failures

# Cryogenics Monitoring



# RF-shielded, Class-10000 clean, experimental rooms



Cleanliness vital for CDMS (ambient radioactivity from dust, Rn is huge background)  
RF-shielding protects sensitive detector front-end amplifiers from electrical noise

Confined spaces make work difficult; lots of time spent gowning  
Pump and fan noise wears on people, makes communication harder  
Still have 60 Hz + harmonics electrical noise

# Web Camera Monitoring

Safari File Edit View History Bookmarks Window Help (Plugged In) Wed 08:05:57 AM

WJ-NT104 MAIN PAGE(CAMERA CONTROL/PULL TYPE)

http://131.212.67.74/ Google

Soudan Lab WebTools Radiation S...annual 1997 Apple Amazon eBay Yahoo! News

## WJ-NT104 Camera View

MULTI INPUT SELECTION MODE

INPUT SELECT	
1	<input type="button" value=""/>
2	<input type="button" value=""/>
3	<input type="button" value=""/>
4	<input type="button" value=""/>

PRESET SELECT	
1	<input type="button" value=""/>
2	<input type="button" value=""/>
3	<input type="button" value=""/>
4	<input type="button" value=""/>
5	<input type="button" value=""/>
6	<input type="button" value=""/>
7	<input type="button" value=""/>
8	<input type="button" value=""/>

QUAD SCREEN MODE

ALARM LIST



ZOOM		FOCUS			IRIS		AUTOPAN		PRESET	
WIDE	TELE	FAR	NEAR	AUTO	CLOSE	OPEN	RESET	ON	OFF	1
<input type="button" value=""/>										

Copyright © 1998-1999

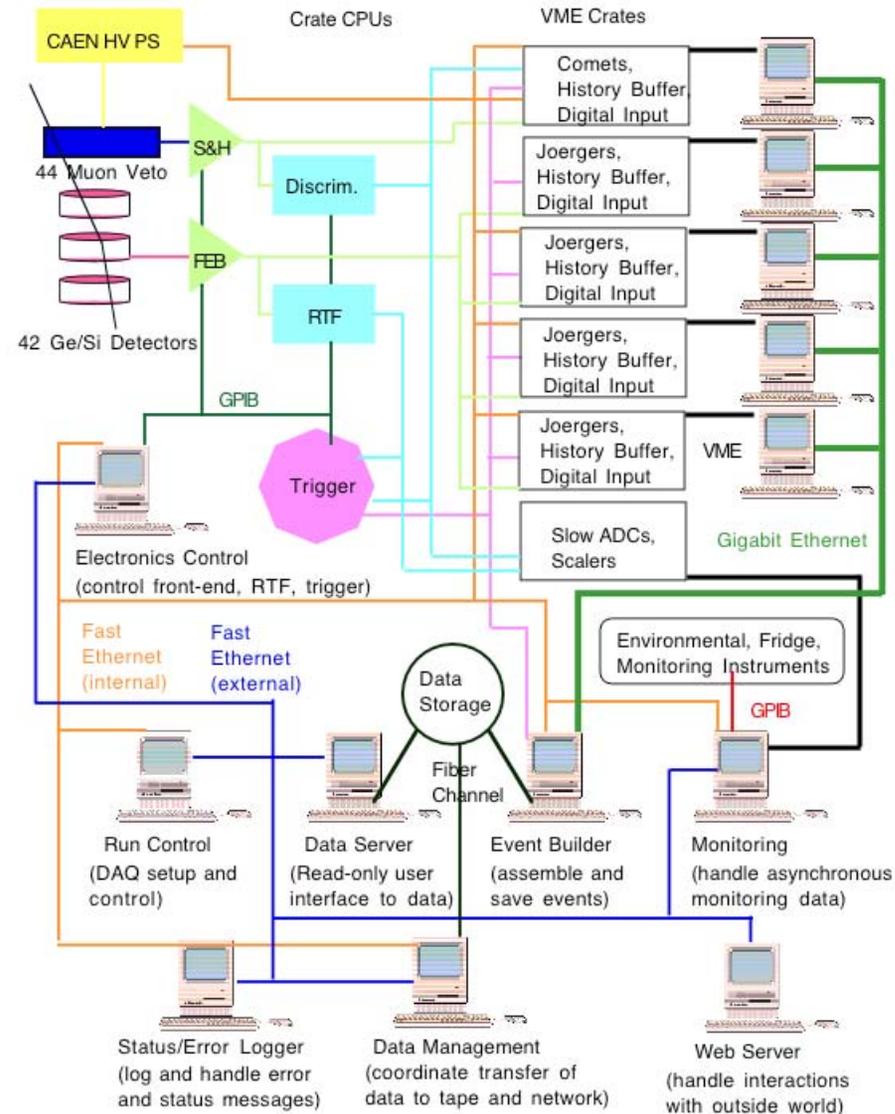
Open "http://131.212.67.74/cgi-bin/camctr/PCH=1&VIEW.x=320&VIEW.y=240&BASE.x=640&BASE.y=480" in a new window behind the current window

# Electronics and DAQ



Room for electronics, data acquisition adjacent to experimental area  
Suitable for diagnostic work, too noisy for control room

# Data Acquisition



# Data Acquisition

The screenshot shows a Safari browser window displaying the CDMS DAQII Home Page. The browser's address bar shows the URL <http://cdms.physics.ucsb.edu/daqii/>. The main content area features a window titled "CDMS Run Control GUI. Welcome rubak using Linux".

The GUI window has a menu bar with "File", "Tools", "Monitoring", "Experiment Mode", and "Help". Below the menu bar, there are several fields for monitoring the system:

File Name	314_1522_F0002	Experiment Mode	Random Triggers
Run State	stop	Total Time	52.50 mins
Time Passed	0.22 mins	Event Number	0 Events
Trigger Rate	0.00 Hz	Live Time	0.00 %

Below these fields are control buttons: "Config", "Run", "Pause", "Resume", "Stop", and "Abort". A mouse cursor is hovering over the "Pause" button.

On the left side of the GUI, there is a tree view showing the system hierarchy:

- CDMS
  - Configuration Manager
    - Detectors
      - Detector 1
      - Detector 3
      - Detector 5
    - GPiB Devices
    - VME Devices
    - High Voltage
    - Process Manager
    - VME Server

At the bottom of the GUI, there is a log table with the following columns: "Time", "Originator", and "Error Message".

Time	Originator	Error Message
03-14 3:18:03PM	RUNCONTROL	Experiment successfully stopped
03-14 3:18:03PM	RUNCONTROL	GPiB server not started yet!
03-14 3:18:03PM	RUNCONTROL	VME server not started yet!
03-14 3:18:03PM	RUNCONTROL	Connection failure to InterLockManag...
03-14 3:17:58PM	CAEN	CAEN Not Ramped
03-14 3:17:58PM	CAEN	CAEN Not Ramped
03-14 3:17:58PM	CAEN	CAEN Not Ramped
03-14 3:17:58PM	CAEN	CAEN Not Ramped
03-14 3:17:58PM	CAEN	CAEN Not Ramped
03-14 3:17:58PM	CAEN	CAEN Not Ramped
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03-14 3:17:58PM	CAEN	CAEN Not Ramped
03-14 3:17:58PM	CAEN	CAEN Not Ramped
03-14 3:17:58PM	CAEN	CAEN Not Ramped

At the bottom of the browser window, there is a status bar that says "Go to 'http://cdms.physics.ucsb.edu/daqii/download/gui.jar'"

# CDMS Data Flow

- Raw data rates up to 20 MB/s (calibration)
  - Use of Gigabit Ethernet, Fibre-channel SCSI disks, superDLT tape (160 GB) to handle local flow
- Offline reduction must keep up with DAQ
  - First pass in local analysis farm
  - Raw data tapes, RQs (reduced quantities) shipped to Fermilab for storage, reprocessing
- Distribution of RQs to collaborating institutions via Internet

# Working Underground



Control and monitoring area on mezzanine level near electronics room  
Open, relatively-quiet space suitable for operating the experiment

# CDMS Personnel Scheduling

Opera File Edit View Navigation Bookmarks Window Help (Plugged In) Tue 15:34:13 PM

CDMS Soudan Schedule

Back Forward Reload Home Hotlist Print New

Opera OperaMail eBay Amazon Amazon.com Ebay.com Find in page

http://titus.stanford.edu/cdms\_restricted/Soudan/schedule.html Google search 50%

last updated 10/7/2003 16:00 C - Capcosm U - Undergrove S - Shiflet T - Travel Black - No access Green - Holiday

Cage rail work continues. Very limited access to operations area for change (7 JD, 13 JD, 17 JD)

April 2003 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Cryogenics Cool down for camera 1, 2. Improve automatic operation and monitoring.

Facility

Shield/Veto Funds veto installation and Commissioning. Final source calibration. Install pellet monitoring.

Electronics Commissioning

Data Acquisition Commissioning

Detectors Commissioning of Tower 1 at Soudan. Complete fabrication for Tower 2.

Engineers/Technicians

Rick Schaefer

Bruce Lundberg

Rodney Chisaz

Bryan Johnson

James Williams

Das Orr

Das Hahn

Das Chalkias

Lou Kulis

Desera Seitz

Jim Beary

Physicists

Vuk Mandic

Clarence Chang

Geoffrey Wang

Shantia Kanab

Walter Ogilvie

Rupak Halapathra

Joel Sander

Ron Fenn

Chris Savage

Henry Veloso

Loeg D'Amico

Margita Feuerster

Bernard Sadoulet

Rick Glazek

John Paul

Theresa Pope

Mike Amella

Mike Crider

Eric Rosenberg

Dou Holmgren

Nader

Murabotfah

Mi Lu

Ray Bunker

Blas Cabrera

Das Bauer

Das Mikrakis

Paul Brink

April 2003 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Go to "http://cdms.physics.ucsb.edu/daq/ToDoList.html"

ing environment  
very thin client  
nt and monitoring  
pendence. No

# Electronic Notebook

**CDMS SOUDAN STATUS PAGE** ( Mine Phone: 218-753-6611 Fax: 218-753-6905 )

This page brings together a number of tasks under one status page. Details and History are found in the links.  
 This page will be updated every Wednesday.  
 To force direct link access before starting, Click [tools](#) and login, then go **BACK** to this page with browser.

Tektronix 3014B [Remote Scope](#) Spy-fridge: [Soudan WEBCAM](#) Check the [WeatherCam](#) on the surface

TASK	Status & Recent Work	Next Milestone	Notebooks & Links
<i>Fridge &amp; Icebox</i>	Installed dielectric breaks on all cryo lines going through the RF wall. Fixed large leaks from the Ebox. Insulated the electronics feedthrough panel for APCs/thermometry lines from the RF wall.	Cool down to base.  See sidebar to the right for full Co60 thermometer instructions and tables.	<a href="#">Cryo Notebook</a>  <a href="#">Soudan tech Work Plan</a> <a href="#">Icebox Mating Procedure</a>  <a href="#">Co60 Therm Instructions</a> <a href="#">Icebox Co60 Table</a> <a href="#">Co60pix1</a> <a href="#">Co60pix2</a>
<i>Shield</i>	Completed in parallel with Run 16.		<a href="#">Shield Notebook</a>
<i>Veto</i>	Muon cosmic setup is now being read out by the CDMS DAQ in control room.	Fix broken light pulser circuit at Santa Barbara, returns with Ray	<a href="#">Veto Notebook</a>
<i>DAQ</i>	Substantial work completed on upgrading the user interfaces, i.e. FEB/RTF/runcontrol guis. Integrated new Struck digitizers into the daq system. All the Stuck digitizers were tested for functionality and readback of known input square pulse.	Establish data throughput from datasrv in the mine to the analysis cluster on the surface. Write out all auxiliary files needed for darkPipe analysis. Establish the data monitoring chains.	<a href="#">DAQ Notebook</a>  <a href="#">DAQ Daily logs</a>
<i>Soudan Computers</i>	Channel 2 of Webfridge Cam (link above) views the electronics room.  <b>DAQ COMPUTERS</b> <b>control:</b> private and FNL LANs <b>monitor:</b> private LAN <b>tower1:</b> private and gigabit LANs <b>vetocrate:</b> private and gigabit LANs <b>builder:</b> private and gigabit LANs <b>datasrv:</b> private and FNL LANs	Purchase replacement power supplies and disk drives. Install ready-to-go images of OS and daq software on replacement drives.	<a href="#">Network Notebooks</a>  <a href="#">Computer Diagram</a>

# Working at the Surface



CDMS currently has analysis farm in this old surface trailer

Limited space for expansion (currently 6, dual-processor, Linux machines)

Not “user-friendly” (no nearby food, water, toilet)

Temperature regulation is not very good

# Working at the Surface



- Developing plan (together with MINOS) for operations center in Soudan surface building
- Facilities already exist (kitchen, restrooms, heating/AC, space for computers,...)
- MINOS already paying lease on building for next 4 years
- Need fiber optic network connection (~\$15K) from mine
- May need to enclose more working space on mezzanine

# CDMS Schedule

- May-June
  - Finish commissioning, calibration
  - Setup surface operations facility
- July-May 2004
  - First long data run
- June 2004 - August 2004
  - Install more detectors
- September 2004 - December 2005
  - Second long data run
- January 2005 - March 2005
  - Install final set of detectors (subject to additional funding)
- April 2005 - ??
  - Run until we find WIMPS (or the money runs out)!

# CDMS Budget

- Funding from Fermilab, NSF, DOE University
  - Fermilab equipment funding ends in FY2003
  - Fermilab operations funding needed: ~ \$350K/year for next two years
    - CDMS-specific
      - Cryogenics ~\$160K
      - Technician \$ 80K
      - Travel \$ 30K
      - Supplies \$ 25K
      - 
      - \$295K
    - Facility
      - Hoist, electrical, ... \$35K More like \$50-60K this year
      - Lease \$20K
      - 
      - \$55K

Financial model should supply facility funding for both CDMS and MINOS directly from Fermilab to Soudan