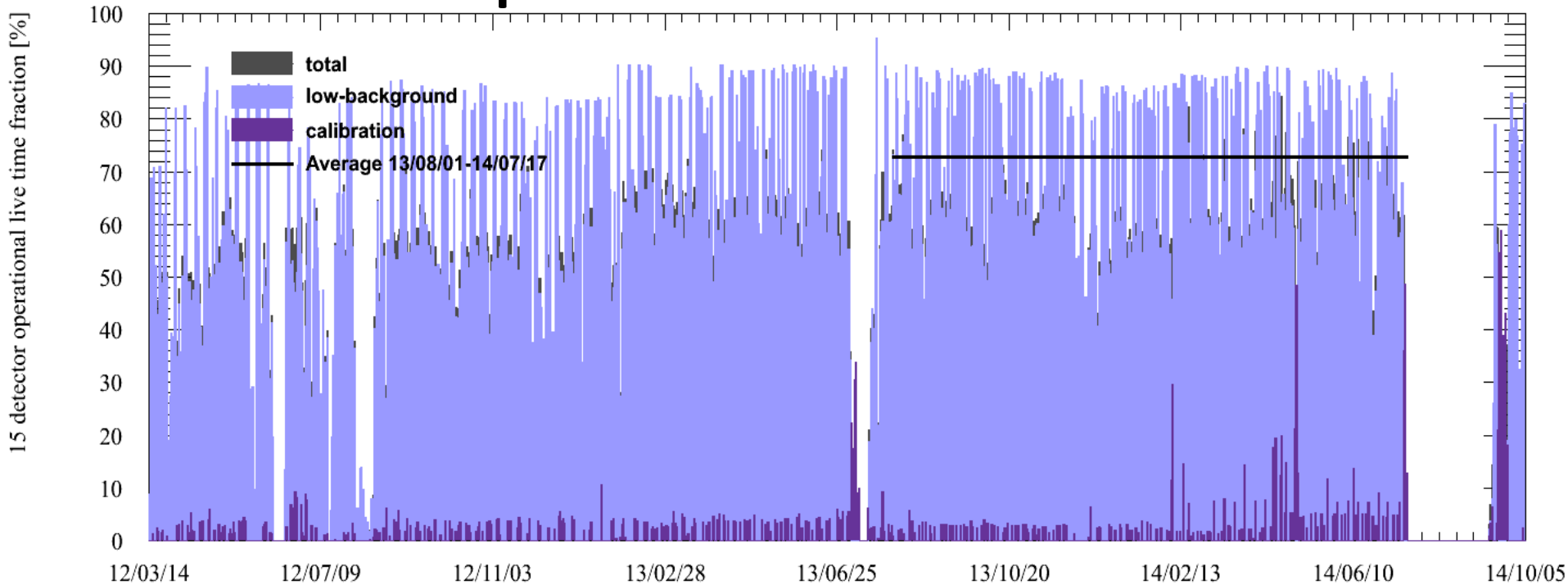
Cosmic Frontier Experiment Status

Oct 6, 2014

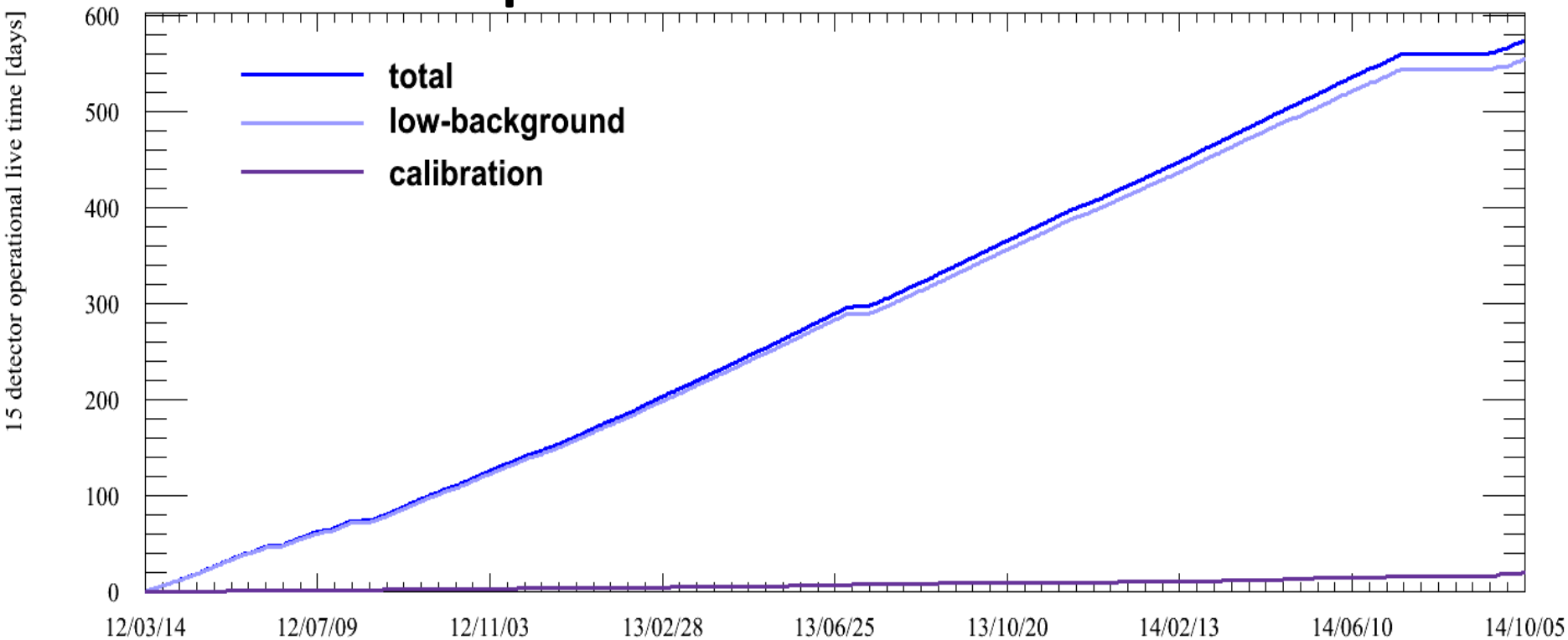
Experiment	Location	Status	Start of operations	Nominal end of operations	Physics
SuperCDMS	Soudan	Operating	Mar 2012	Mar 2015	Dark Matter
COUPP/PICO 2L	SNOLAB	Operating	Dec 2013	Dec 2014	Dark Matter
COUPP/PICO 60	SNOLAB	Operating	June 2013	Dec 2015	Dark Matter
Darkside 50	LNGS, Gran Sasso	Operating	Jan 2014	Dec 2016	Dark Matter
DAMIC	SNOLAB	Operating	Dec 2012	Dec 2014	Dark Matter
Dark Energy Survey	CTIO, Chile	Operating	Sep 2013	Feb 2018	Dark Energy
Pierre Auger	Argentina	Operating	2008	2015 (for FNAL)	High Energy Cosmic Rays
Holometer	Meson Lab	Operating	Sep 2014	2015	Spacetime

SuperCDMS Soudan



- Warmed up in late July for successful fridge maintenance
- Returned to 45 mK base temperature September 5
- Noise environment MUCH improved, mostly due to cryocooler repairs
- ~1.5 weeks of recomissioning detectors and retuning thresholds

SuperCDMS Soudan



- Now in “post physics” running: extended calibrations to study systematics
- Extended neutron calibration acquired Sept 16-22
- Since then acquiring background data to observe neutron activation lines for CDMSlite (HV) calibration
- Next week will begin extended high energy gamma calibrations

COUPP/PICO Operations Summary

- We continue to learn about particulates extracted from PICO-2L and COUPP60 earlier this year
  - Preliminary results from PNNL show mainly quartz and stainless steel corrosion
- Now working on spike tests in a small chamber of these contaminants to understand implications for bubble formation

COUPP/PICO Operations Summary

- Work ongoing on doing a clean re-fill of PICO-2L chamber
- Sampling apparatus built and operating at Fermilab to do sampling of new chamber before operation
- Plan is for an engineering run to test new cleaning procedures and filling with LAB scintillator as the buffer fluid (which may help with corrosion issues)
- On track for filling in the autumn

DarkSide-50 Status

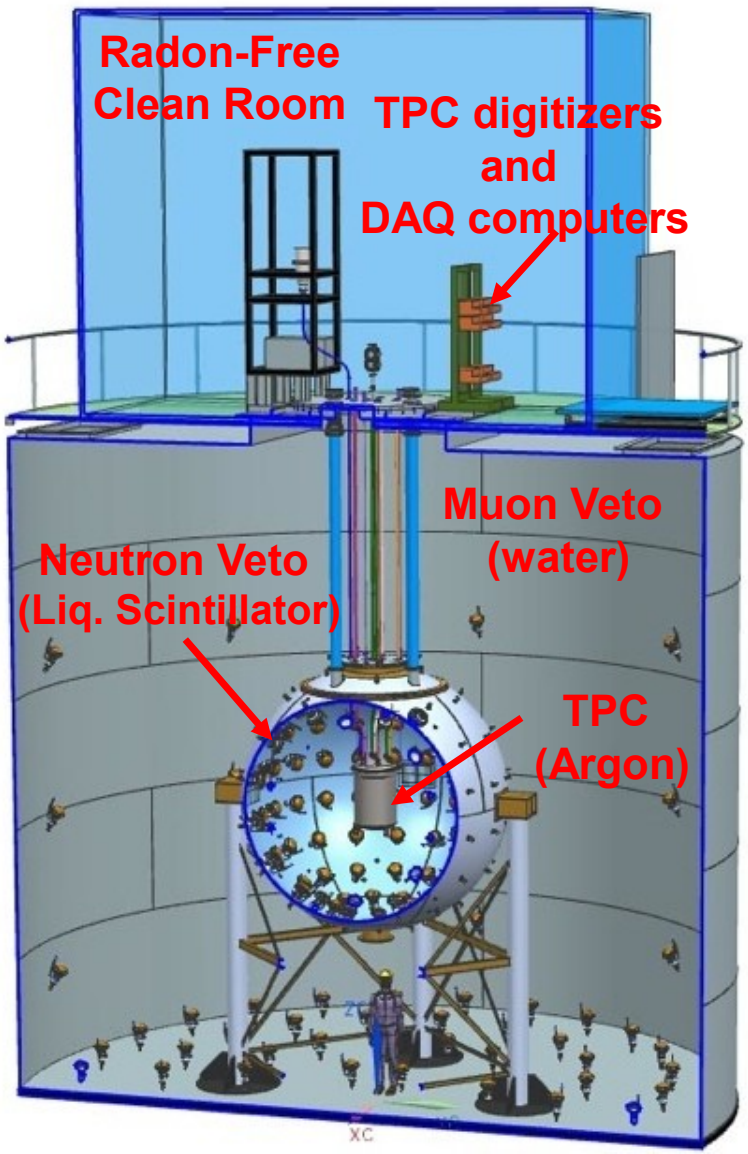
- **Neutron Veto** (PC only)

Readout

- Before (with TMB + PC mixture) neutron capture was driven by Boron with high cross section so 70 μs gates were sufficient
- Now (PC only): neutron captures in PC have τ=250μs so we modified veto readout system to accommodate longer capture times

Distillation

- One week reducing further the TMB (achieved 0.07%)
- One week of PC distillation to reduce impurities. This also reduced the PPO concentration but LY still high. Considering adding back the PPO in small steps.



DarkSide-50 Status

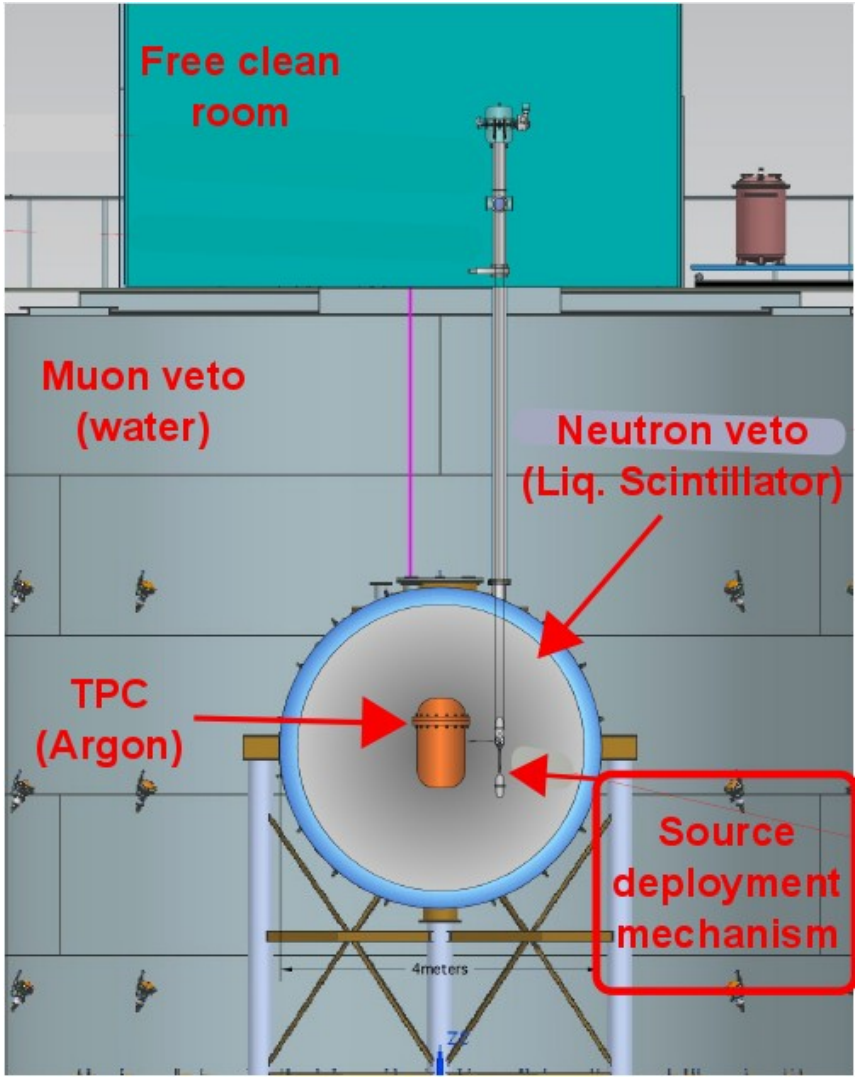
[1]● **Calibration**

Assembly

• The equipment has been shipped to LNGS and assembled. Currently being tested

DAQ

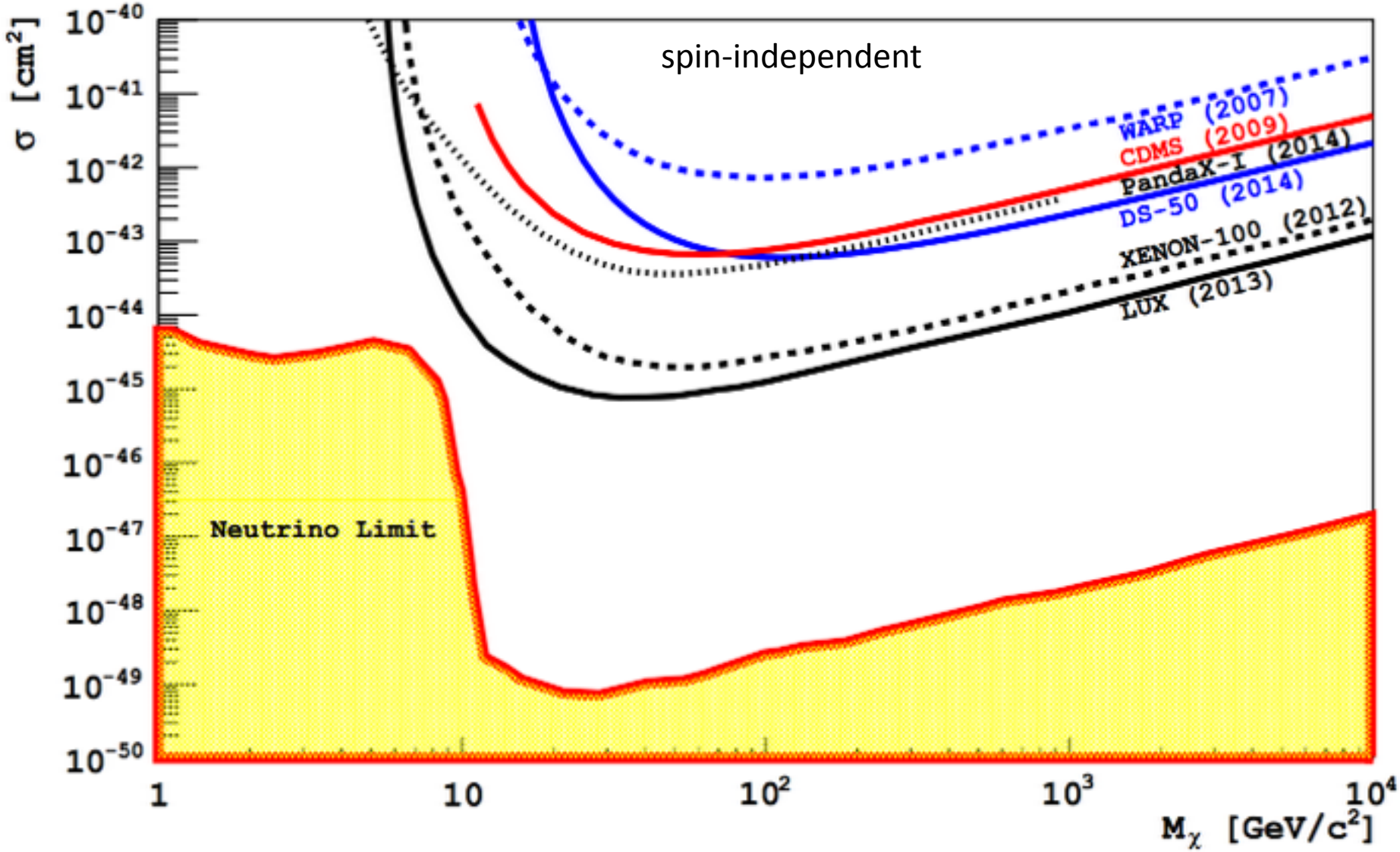
• Performing tests to accommodate higher rate and large acquisition gates



● **New physics campaign started two weeks ago.**

● **New publication: arXiv:1410.0653**

Dark Side 50 result (arXiv:1410.0653)

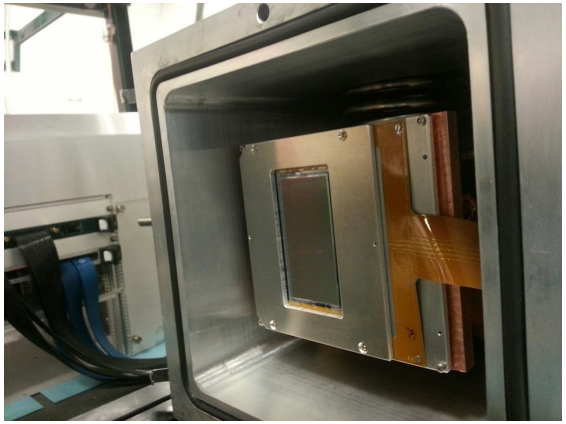


DAMIC – Dark Matter In CCDs

FNAL, UChicago, UMich, Mexico, Argentina, Paraguay, Zurich

August - September 2014

- DAMIC-100 detectors packaging
  - Completed packaging of two detectors.
  - Packaging a third one in reduced mass experimental package.
  - Testing the packaged detectors at Fermilab.



- DAMIC@Snolab: Next Upgrade
  - Waiting for machined copper pieces from vendors.
  - Began fabrication of nitrogen purge bag to reduce Radon background.
  - Planed for early December 2014 or January 2015.

Status: taking data with prototype detectors. Uptime >95%. High quality data.

Y2 Observing Summary through 10/3

- DES started "Year 2" night of August 15, 2014

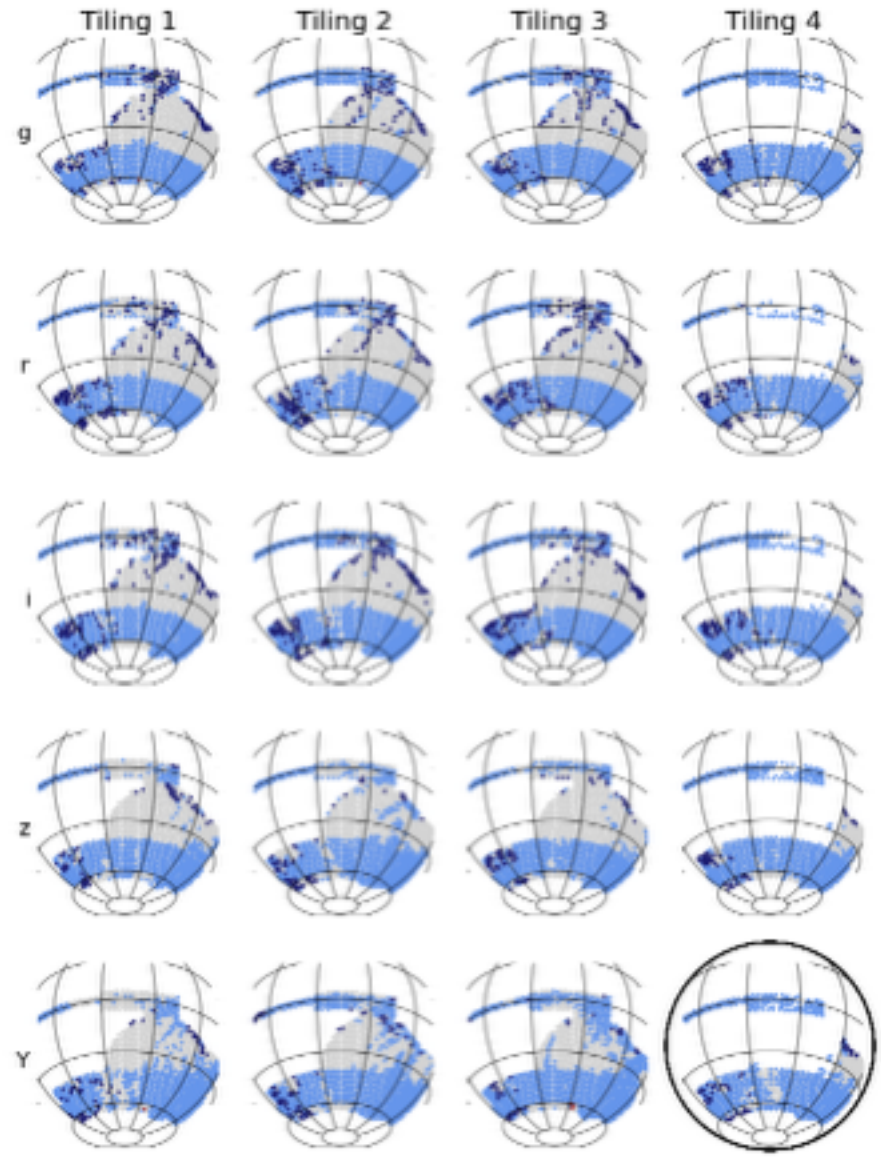
	# Nights	Total Hours	Hours Observing	Lost Camera or Telescope	Lost Obs. Error	Lost Weather
Aug.	***8 ½***	***87 ¾***	***53 ¾***	***0***	***0***	***34***
Sept.	***18***	***181 ¼***	***122 ¼***	***0.75***	***0***	***58 ¼***
Oct.	***3***	***30.5***	***23.5***	***0***	***0***	***7***
Total	***26 ½***	***299.5***	***199 ½***	***0.75***	***0***	***99 ¼***
		100%	***67%***	***0.3%***	***0%***	***32.7%***

- The first 7 half-nights were great and included seeing records in all DES filters
- Y2 has been among the cloudiest Aug. to Sept's in the past 31 years.

Y2 WF Survey Status

DARK ENERGY SURVEY

	# WF Images	# WF Good	# WF "Bad"
Aug.	***1382***	***955 (69%)***	***427***
Sept.	***3023***	***2056 (68%)***	***967***
Oct.	***449***	***329 (73%)****	***120****
Total	***4854***	***3340 (69%)***	***1514***

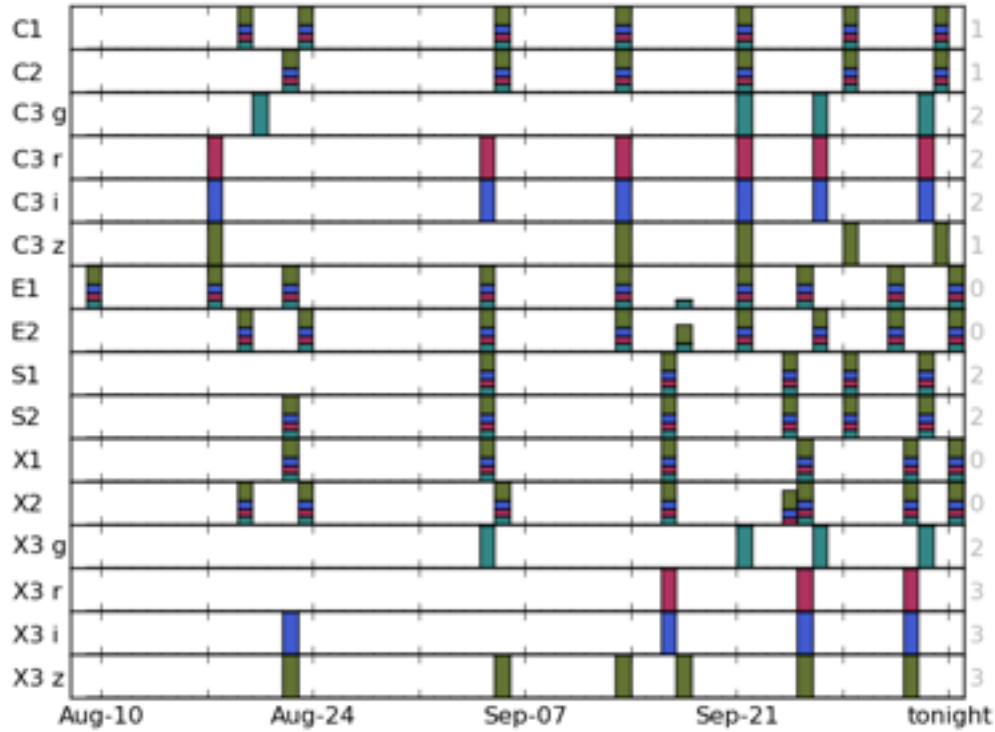


- Individual WF exposures are graded "Good" or "Bad" as part of the DESDM "First Cut" output. This informs what exposures need to be redone.
- Right: WF tilings after night of Oct. 3
- Way ahead of Y1 pace in r,i,z

* DQ through Oct. 2

Y2 SN Survey Status

- In Y1 the SN fields had a median # days between revisits of about 6.5 days. The maximums gaps were 11 to 16 nights.
- In Y2, we've had combinations of a gappy schedule and bad weather.
- Worst gaps so far in Y2 are 12 to 21+ nights (see right).
- Gaps Improving in last 2 weeks
- More spectroscopically confirmed Type Ia's already than last year?



	# SN Images	# SN Good	# SN "Bad"
Aug.	***228***	***116 (51%)***	***112***
Sept.	***469***	***413 (83%)***	***56***
Oct.	***78***	***78****	***0****
Total	***775***	***607 (78%)***	***168***

Oct 3

Perspective

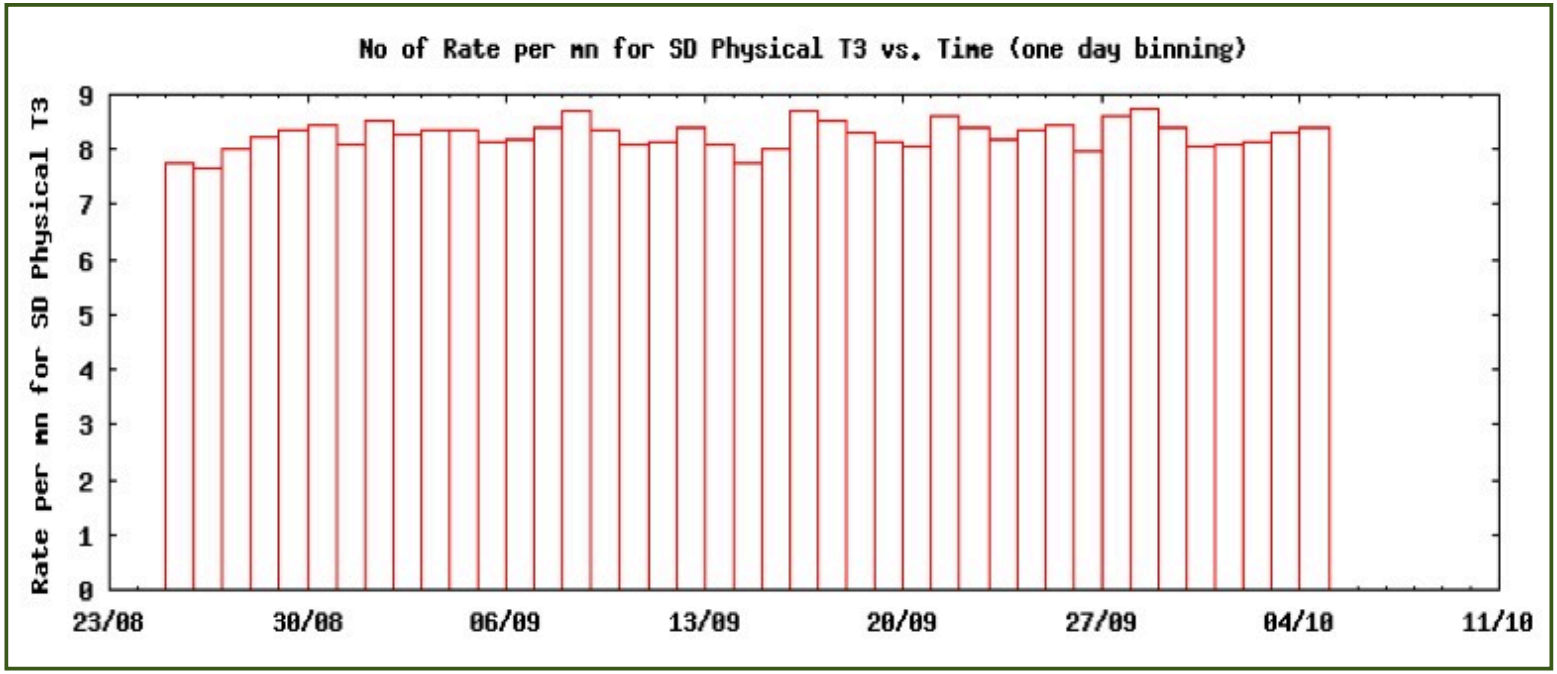
- At the end of September in Y1 we had 2886 Good WF images, 40% in r,i,z-bands
- In Y2 at the end of September (fewer nights up to this point than Y1) we have 3011 Good WF images, 74% in r,i,z-bands, even though we've already been clouded out more than total of Y1
- Seeing is better in Y2 (thanks CTIO)
- DECam is working well
- We are encouraged that during observing in Y2 the shutter has been open ~69% of the time. We averaged 63% during Y1 and our monthly best in Y1 was 66%.

Pierre Auger Observatory

Activities between Aug 25 - Oct 4

- SD efficiency: 98.1% efficiency in the past two weeks, on-going maintenance, upgrade R&D activity (involves SD) continuing in the field, very stable.
  - number of black tanks ≤ 15 on any given day (since Aug 25)
- Recent FD observation period: -Aug 15 - Sept 3; smooth, rain on Aug 23, 24, high wind Aug 25
  - Sept 13 - Oct 2; smooth, high wind Sept 25, 28
- Radio array (AERA) - stable & continuous data taking

✤ Aug 25 - Oct 5: Number of triggers from cosmic rays (E > 10^{18} eV) per minute ~ 12000 / day



Holometer (E-990) Operations Status:

- Recovering from vacuum leak last week.
- Vacuum system reached a few mTorr before the leak was fixed.
- Cause is suspected to be repeated inadvertent bumping of vacuum valve knob installed in a high traffic location, causing the valve to become slightly open.
- Knobs now wrapped in bubble wrap to avoid avoid future accidents.

- Auto-locking control system now installed on both interferometers.
- Currently tuning second interferometer in preparation for a long data run over next weekend.
- Evenings and weekends are the best time for running, due to less human activity near the holometer lab.
    - Lawn mowers and construction equipment create large seismic instabilities.