Cosmic Frontier Experiment Status

Yann Guardincerri

April 6, 2015

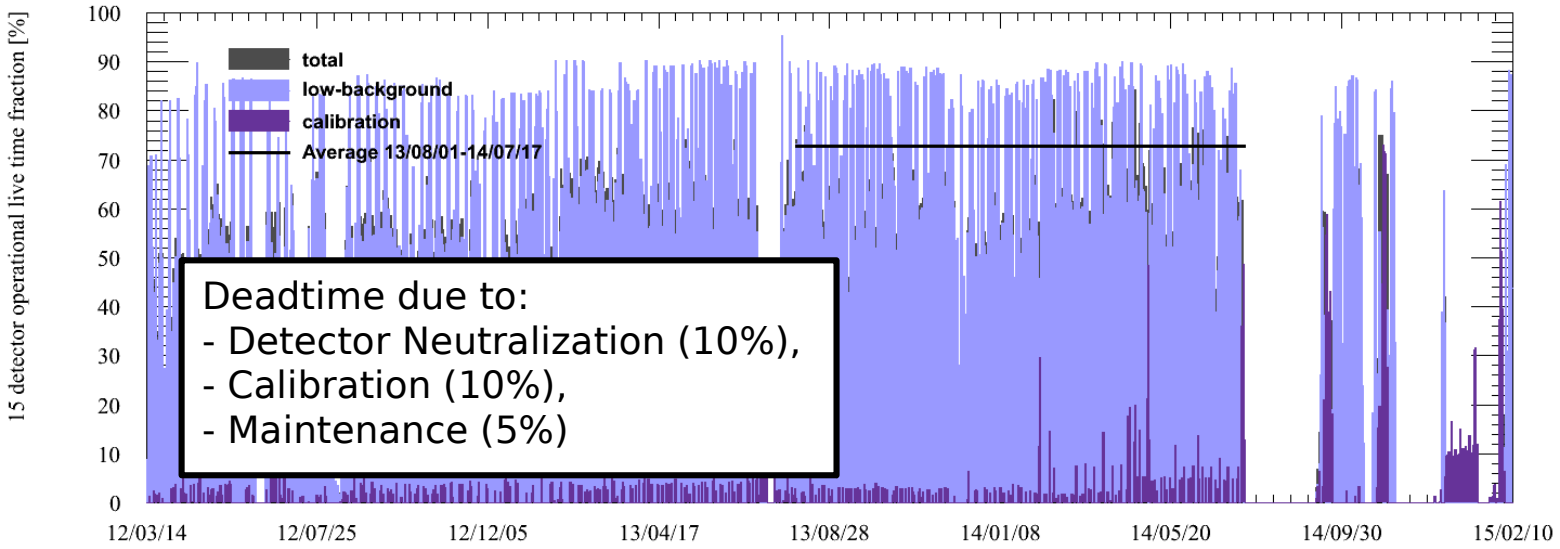
Fermilab Center for Particle Astrophysics

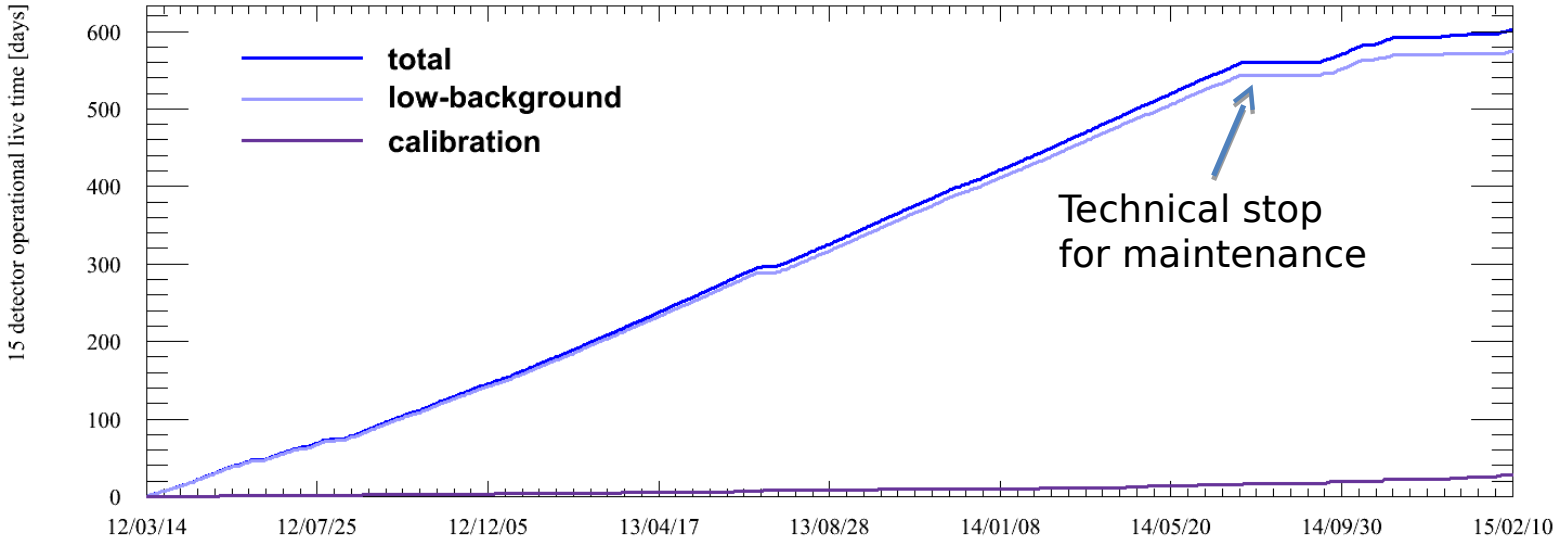
Cosmic Frontier Experiment Status

April 6,2015

Experiment	Location	Status	Start of operations	Nominal end of operations	Physics
SuperCDMS	Soudan	Operating	Mar 2012	Sep 2015	Dark Matter
COUPP/PICO 2L	SNOLAB	Operating	Dec 2013	Sep 2017	Dark Matter
COUPP/PICO 60	SNOLAB	Operating	June 2013	Sep 2017	Dark Matter
Darkside 50	LNGS (Gran Sasso)	Operating/Calibrating	Jan 2014	Sep 2017	Dark Matter
DAMIC	SNOLAB	Operating	Dec 2012	Sep 2016	Dark Matter
Dark Energy Survey	CTIO, Chile	Operating	Sep 2013	Feb 2018	Dark Energy
Pierre Auger	Argentina	Operating	2008	Sep 2015 (for FNAL)	High Energy Cosmic Rays
Holometer	Meson Lab	Operating	Sep 2014	Sep 2016	Spacetime

SuperCDMS Soudan – 3 years of data taking





March 2012

Feb 2015

SuperCDMS Soudan 2015 Operations Plan

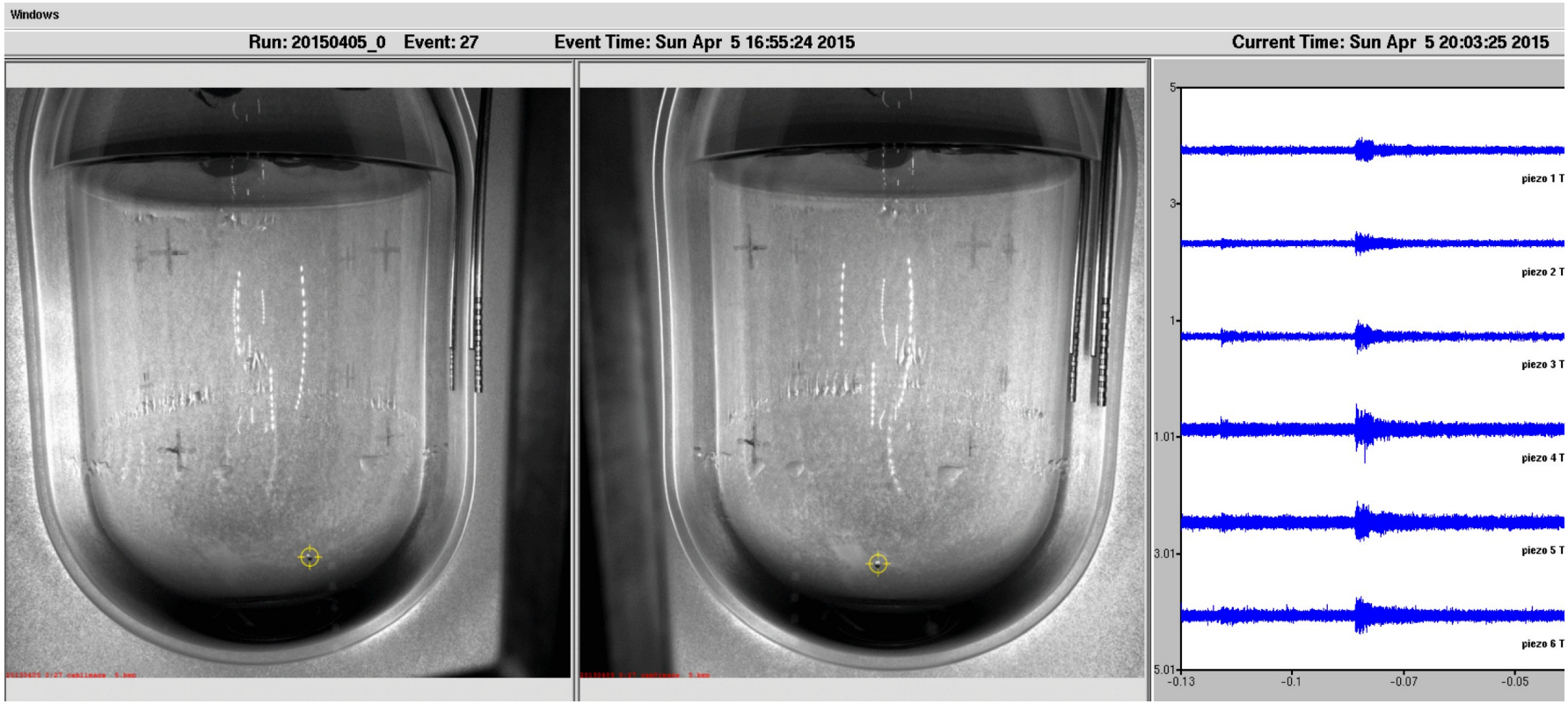
- CDMSlite Run 3 (Feb-May, 2015)
  - 3 month run underway with lower energy thresholds
  - Substantial improvement expected in sensitivity to very low mass WIMPs
- Photo-Neutron Calibration data (June-August, 2015)
  - Mono-energetic neutrons for nuclear recoil E scale
- Systematic studies (September – December, 2015)
  - Study electrical and vibrational noise sources
  - Determine reasons for failures of detector channels
  - Measure dilution refrigerator performance
- Decommission in 2016

COUPP/PICO Operations Summary

- We continue to learn about particulates extracted from PICO-2L and COUPP/PICO60 last year
- Ongoing testing of particulate sources of events in small test chambers at Northwestern and Queens
- Goal remains to eliminate all sources of background
  - Prevent them from getting in (new run of PICO-2L)
  - Remove them in situ

COUPP/PICO Operations Summary

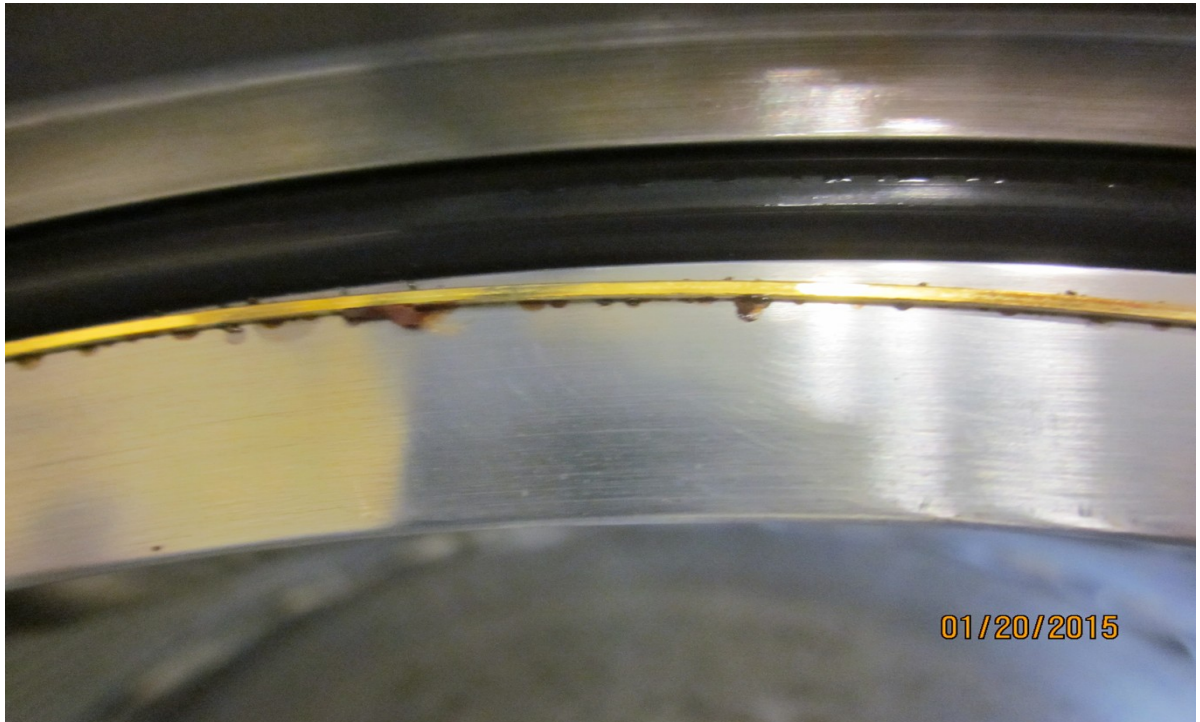
- PICO-2L with new jar flange, cleaning process and QA now operational for 1 month



Engineering run to test whether particulates come in from the fill or are produced in situ

COUPP/PICO Operations Summary

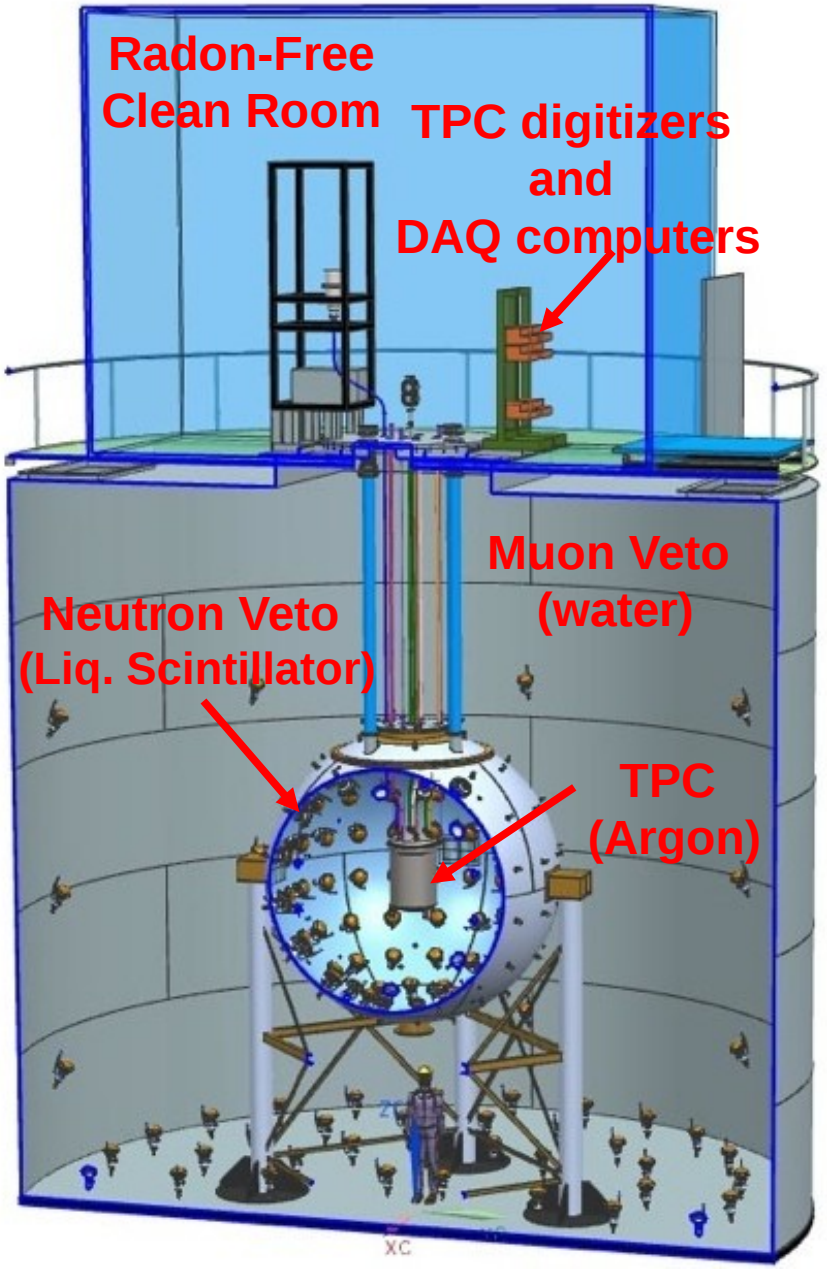
- PICO60 vessel to be removed and inspected this month
- Particular interest in flange seal
  - Damage to quartz flange a possible source of radioactivity
  - Galvanic rust (observed in prototype, see image) possible source of particulates



Replacement seal design (PTFE gasket) in place to be tested in parallel on prototype vessel

DarkSide-50 Status

- **TPC: MILESTONE**
  - **Incident**
    - March 2nd : Power failure → Burst disk ruptured → Lost ~8kg of Atm Ar
    - Incident was solved and actions taken to prevent future similar problems
  - **Data Taking**
    - After refilling data taken to establish status of the detector: everything OK
  - **Underground Ar**
    - Several tasks to establish a secure system to deploy UAr
    - Filling UAr **COMPLETED**: from March 25th to April 1st.
    - Data taking with UAr: running since April 1st to establish Ar39 reduction factor

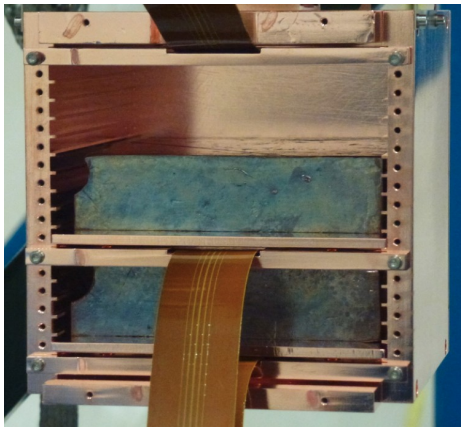


DAMIC – Dark Matter In CCDs

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

March 2015 – April 2015

- DAMIC@Snolab: March upgrade
  - One new detector installed.
  - New inner ancient lead shield installed to produce a super-shielded CCD to test the
  - limits of the current package design.



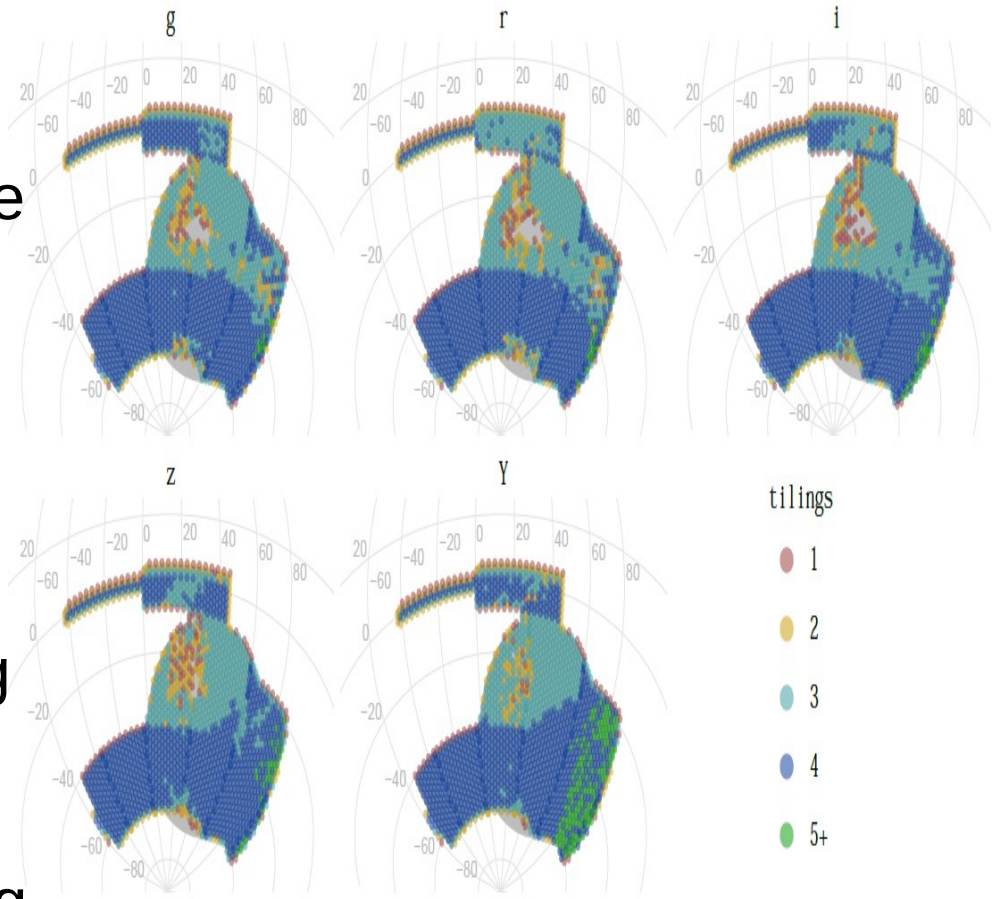
- Next Upgrade: April 6
  - Will replace inner lead shield with copper to measure background difference and evaluate a possible surface contamination on the ancient lead.

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

DES Summary

DARK ENERGY SURVEY

- Status: DES finished observing season 2 (out of 5+) in mid-February. We are 10% behind our originally-planned observations.
- Current DES activities: Preparing a Y3 request to NOAO, writing and submitting papers, planning the work trip for late-July to replace LN2 pump and 2 LN2 line segments. Working on primary mirror support algorithm.



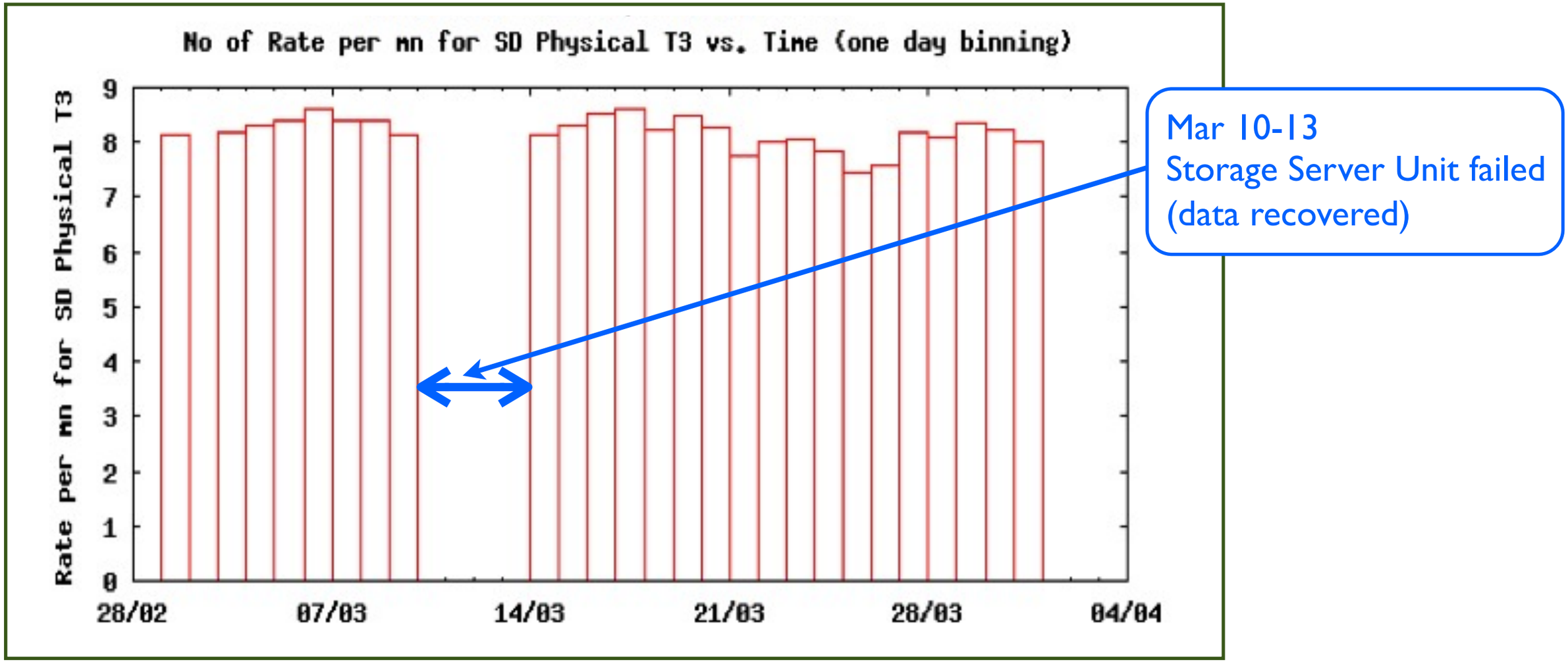
Completion Map after Y2
Goal after 5 seasons is 10 tilings each field

Pierre Auger Observatory

Activities between Mar 1 - Mar 31

- SD efficiency: 97.32% efficiency in the past two weeks, on-going maintenance, upgrade
  R&D activity (involves SD) continuing in the field.
- Recent FD observation period: Mar 13 - 29; very smooth, rain on Mar 24, 27
  - remote shift operational
- Radio array (AERA) - **deployment completed** (153 stations, 17 km^2)
  - stable & continuous data taking

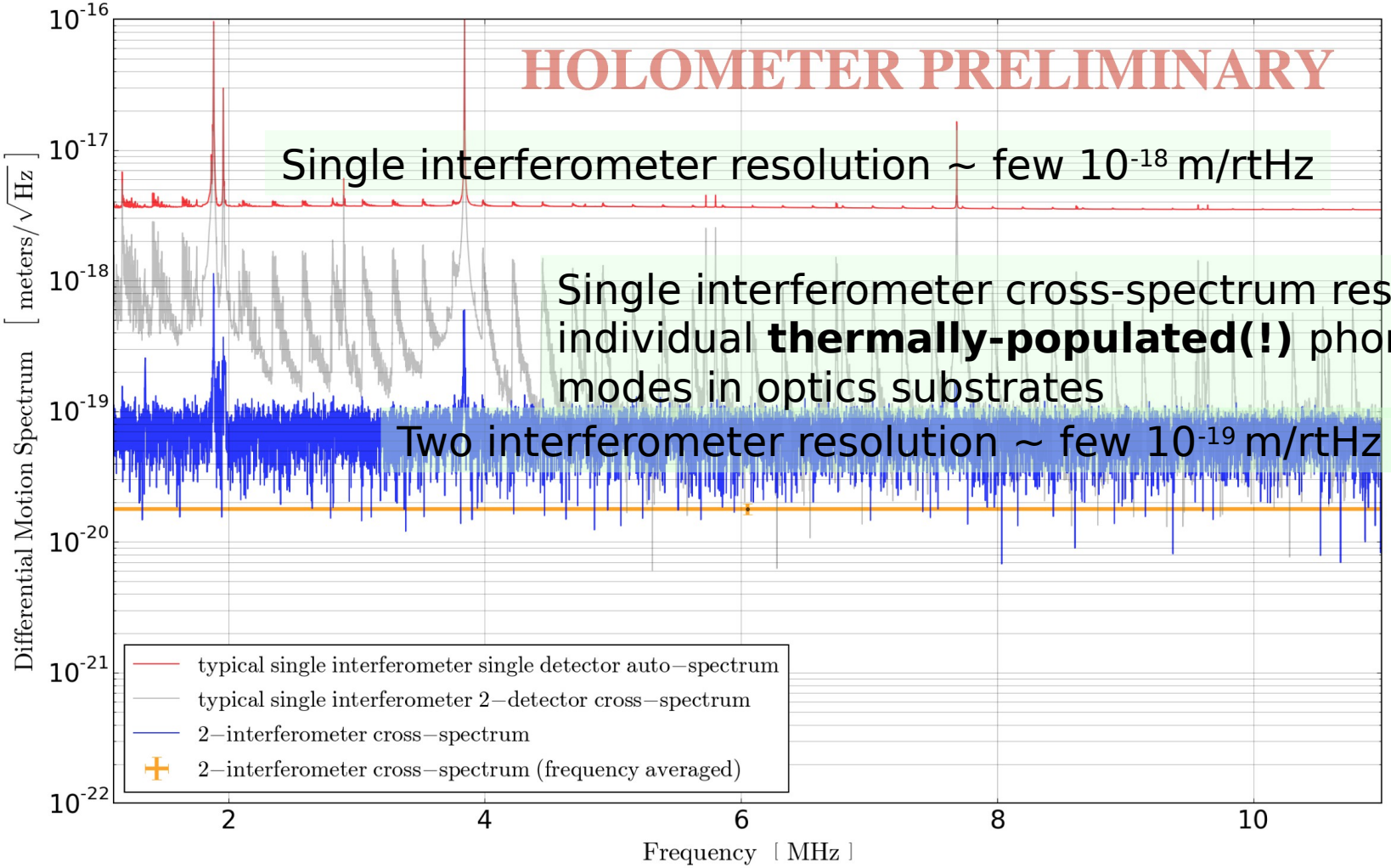
✤ Mar 1 - 31: Number of triggers from cosmic rays (E > 10^{18} eV) per minute ~ 12000 / day



Holometer Operations Status

4/6/2015

- Initial science results with **unprecendented** high frequency position sensitivity presented at March 27 Wine & Cheese



Rapidly approaching holographic noise sensitivity at 10^{-20} m/rtHz. Systematics studies underway.