

M&O — Change Management

Technical Change Control and Procedures

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NSF Mid-Term Review
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Deliverables

Provide stable and well-understood hardware, software, and detector configurations via:

- Effective change control, testing, and release procedures
- Well-defined operations procedures providing oversight and ensuring data quality
- Detector configuration change review and management plan that balances the needs of science working groups and operations team

Testing Resources



SPTS test setup - computers, “string” of DOM mainboards

South Pole Test System (SPTS)

- scaled-down replica of ICL hardware and software
- small number of real DOMs, full string of DOM mainboards
- ability to “replay” hitspool data through entire system

Northern Test System (NTS) - Upgrade

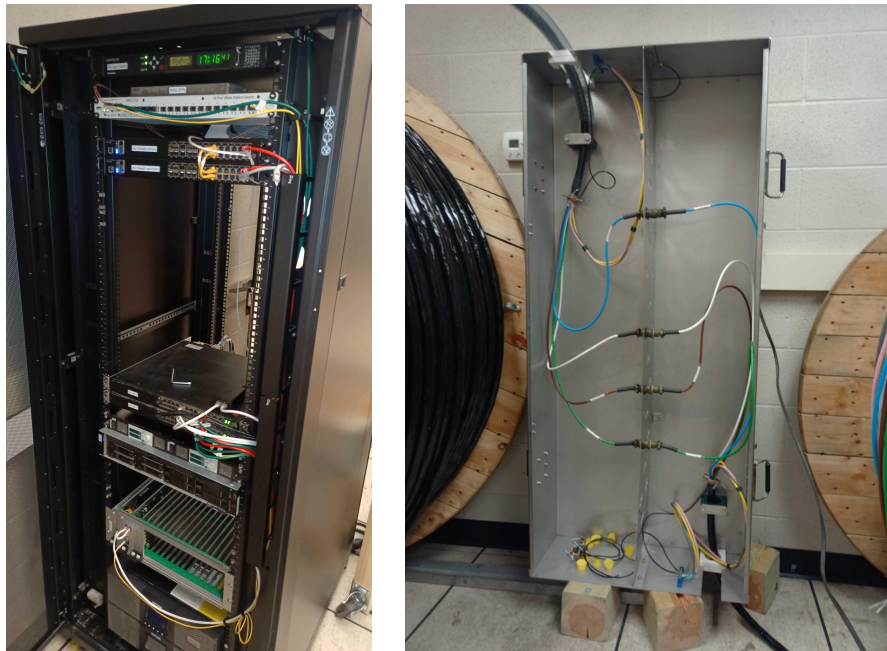
- Upgrade-specific test site for hardware/software validation
- Will host all types of Upgrade hardware modules deployed
- Seamlessly integrated into SPTS - Gen1+Upgrade integration testing

PSL Cable Test System (PCTS)

- Full-length Gen1 cable for communications testing

PSL Modular Dark Freezer Labs (mDFLs)

- Walk-in freezers for hardware cold-testing



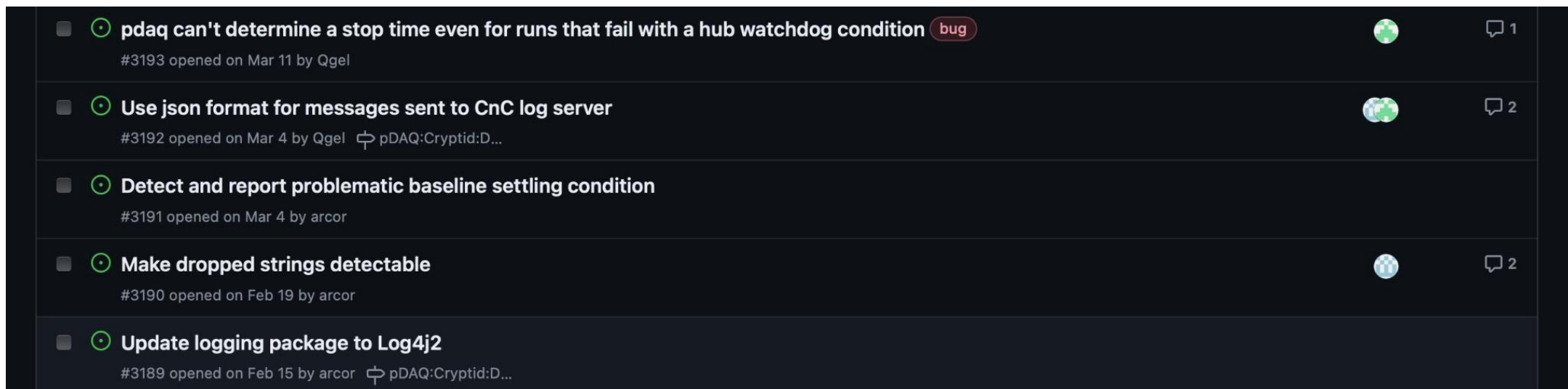
NTS - Upgrade cabling systems

Hardware Procedures

- Candidate hardware always installed first at SPTS/NTS
 - Full system testing using replay data
 - Validation and documentation of upgrade procedures
- Testing coordinated via operations group
 - Important/impactful upgrades presented at collaboration-wide teleconferences
- Hardware upgrades at pole typically staged
 - e.g. 50% server upgrade in 1st year, 50% next year
 - Old hardware typically remains at pole over winter
- All hardware changes recorded to logbook (logbook@icecube.wisc.edu)

Online Software Development

- All source code under revision control (**GitHub** has replaced Subversion)
 - Includes: DAQ, SNDAQ, Experiment Control, Online Filtering System, Data Handling system...
- Bugs / feature development tracked in issue tracking system (GitHub Issues)
 - Track: severity, impact, owner, detailed description, etc.
 - Issue numbers referenced in code check-ins and release notes
- Changes discussed on weekly development teleconferences



A screenshot of a GitHub Issues list on a dark theme. The list contains five issues, each with a green circle icon, a title, a description, and a comment count. The first issue is marked as a 'bug'.

Issue ID	Title	Description	Comment Count
#3193	pdaq can't determine a stop time even for runs that fail with a hub watchdog condition	opened on Mar 11 by Qgel	1
#3192	Use json format for messages sent to CnC log server	opened on Mar 4 by Qgel, linked to pDAQ:Cryptid:D...	2
#3191	Detect and report problematic baseline settling condition	opened on Mar 4 by arcor	0
#3190	Make dropped strings detectable	opened on Feb 19 by arcor	2
#3189	Update logging package to Log4j2	opened on Feb 15 by arcor, linked to pDAQ:Cryptid:D...	0

Software Testing + Release

- Testing emphasized in development
 - Unit tests for individual components / functionality
 - Integration and system testing at SPTS
- Releases named, numbered, and tagged in version control system
- All major changes (DAQ, DOM mainboard software, Filtering) reviewed at collaboration-wide teleconference before deployment
- 8- to 24-hour test runs of release candidates at pole
 - Return to previous version until vetted
 - Data quality vetted by operations group

Operations: Day-to-Day

- Non-standard procedures (including software releases) require a **Non-Standard Operations Request** form
 - reviewed / approved by the Run Coordinator (W. Thompson)
- All changes to the detector / online systems recorded in the logbook (logbook@icecube.wisc.edu)
- Changes affecting data-taking also recorded in IceCube Live with associated run number

IceCube Non-Standard Operation Request

The purpose of this questionnaire is to collect summary information about requests for special runs (such as flasher runs, debugging and commissioning runs, etc..) in a uniform way. It can also serve as a check list to ensure all aspects of the special run mode are clarified.

* Required

General information

Title *

Short working title of the request

Your answer

Point of contact *

Provide the email address of the person to contact regarding feedback

Your answer

Description *

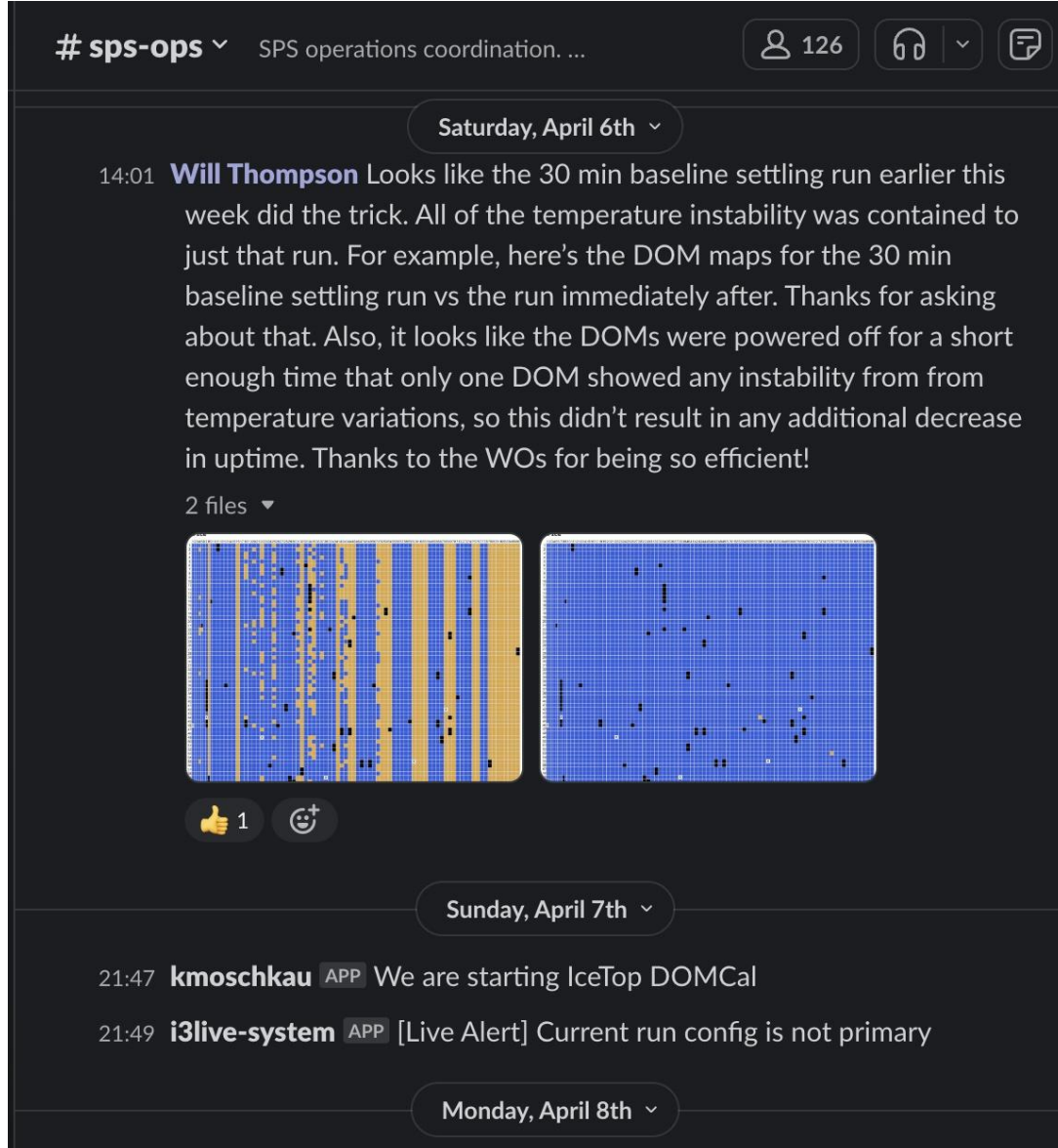
Give a description of your request, including the purpose or goal.

Your answer

138618	2023-11-29 13:03:48	8:00:05	2835.36	-	sps-IC86-2023-slc-triggers-V314	Cyclops1+trig-instr	dark	SR	PP	★★★★★	munland	GOOD	GOOD	+
138617	2023-11-29 05:03:39	8:00:09	2831.90	-	sps-IC86-2023-slc-triggers-V314	Cyclops1+trig-instr	dark	SR	PP	★★★★★	jvara	GOOD	GOOD	+
138616	2023-11-28 21:03:40	7:59:59	2827.39	-	sps-IC86-2023-slc-triggers-V314	Cyclops1+trig-instr	dark	FS	PP	★★★★★	jvara	GOOD	GOOD	1 unfiltered event +
138615	2023-11-28 20:52:12	0:10:42	2828.96	-	sps-IC86-2023-slc-triggers-V314	Cyclops1+trig-instr	dark	FS	PP	★★★★★	wthompson	GOOD	GOOD	baseline settling run IC86-2023 run start new baselines: baselin... new spe corrections: h... new domcals: domcal-20... new noise rates: rates... new i3live: v4.7.2 (Hy... new PnF: V23-11-00 new PnF toolset: pnf-p... +
138614	2023-11-28 14:53:44	5:56:12	2804.20	-	sps-IC86-2022-DM...310-supersaver-2	Cyclops1+trig-instr	dark	FS	PP	★★★★★	munland	GOOD	GOOD	+
138613	2023-11-28 06:52:50	8:00:09	2802.13	-	sps-IC86-2022-DM...310-supersaver-2	Cyclops1+trig-instr	dark	SR	PP	★★★★★	munland	GOOD	GOOD	manually set events an... +
138612	2023-11-27 22:52:40	8:00:10	2802.48	-	sps-IC86-2022-DM...310-supersaver-2	Cyclops1+trig-instr	dark	SR	PP	★★★★★	munland	GOOD	GOOD	+



Operational Communications

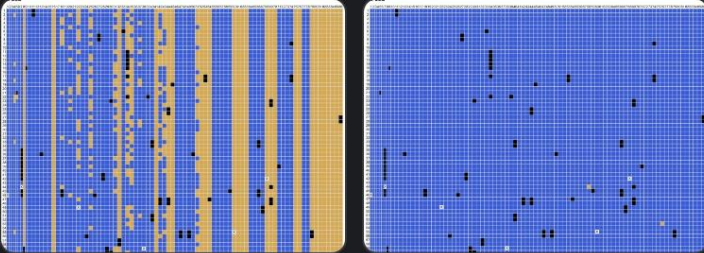


#sps-ops SPS operations coordination. ... 126

Saturday, April 6th

14:01 **Will Thompson** Looks like the 30 min baseline settling run earlier this week did the trick. All of the temperature instability was contained to just that run. For example, here's the DOM maps for the 30 min baseline settling run vs the run immediately after. Thanks for asking about that. Also, it looks like the DOMs were powered off for a short enough time that only one DOM showed any instability from from temperature variations, so this didn't result in any additional decrease in uptime. Thanks to the WOs for being so efficient!

2 files



Sunday, April 7th

21:47 **kmoschkau** APP We are starting IceTop DOMCal

21:49 **i3live-system** APP [Live Alert] Current run config is not primary

Monday, April 8th

- Real-time communications with pole is mission-critical
 - facilitated by Iridium satellite link
 - winterovers can send/receive e-mail 24/7
 - IceCube Live / Slack chat integration for real-time messaging
- Emergency contact list provides mobile phone numbers for subject-matter experts for onsite Winterovers

Run Metadata

- Detector **G**eometry, **C**alibration, and **D**etector status metadata stored in GCD database
 - Mirrored from pole to northern data center
- Calibration results vetted on operations calls before insertion into database
 - Monthly cadence for IceTop calibrations
- Metadata tagged with validity dates
- These data used online and offline for data calibration and reconstruction in data processing, as well as a basis for simulating detector data.

Operations: Week-to-Week

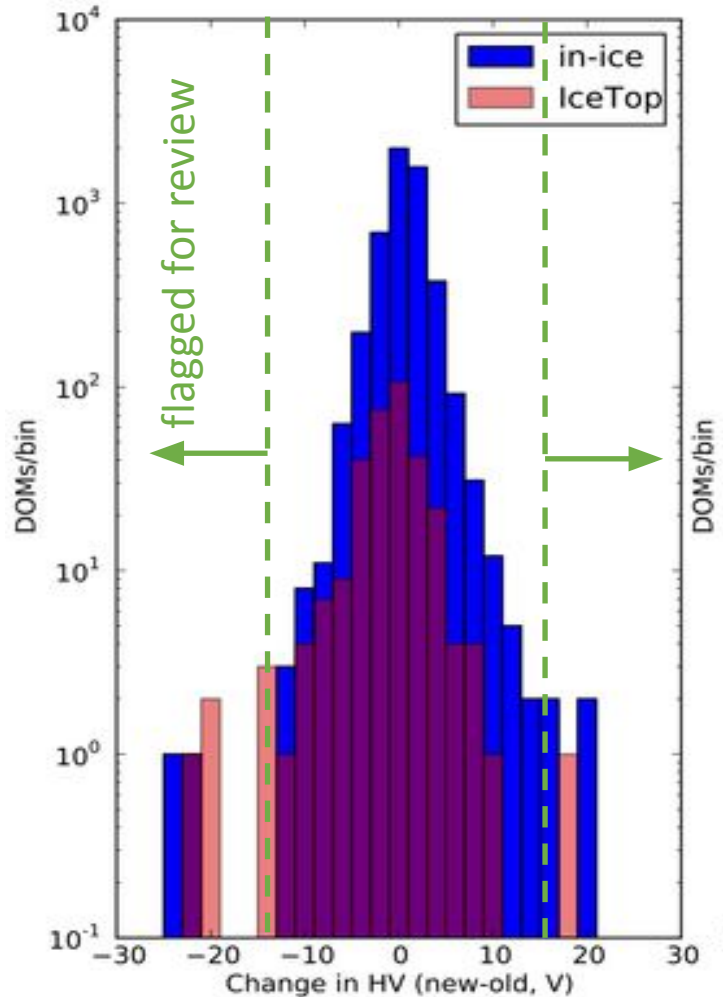
- Weekly operations teleconference
 - Report by rotating monitoring shifter (typically grad student) on data quality
 - Discussion of pending non-standard operations or operational issues
 - Minutes / action items recorded
- Review of weekly data quality triggers “Good Run List snapshot”
 - Run coordinator makes final decision on run goodness
 - Recorded in IceCube Live database
 - snapshot triggers further offline data processing
 - Generally, data ready for working group use 1.5–2 weeks after data-taking

Good Run List

131910	GOOD	+
131909	GOOD	baseline settling run +
131908	GOOD	blessed ARA pulsing on 01 and 22 partial I3 +
131907	GOOD	stopped for ARA pulser... new PnF:
131906	GOOD	stopped to update PnF +
131905	GOOD	+
131904	GOOD	+
131903	GOOD	+
131902	GOOD	+
131901	GOOD	+
131900	GOOD	baseline settling run full detector so
131899	BAD	down +
131898	GOOD	DOMCal IT +
131897	GOOD	DOMCal IT +
131896	GOOD	stopped for DOMCal IT +
131895	GOOD	+

Operations: Year-to-Year

yearly high voltage change



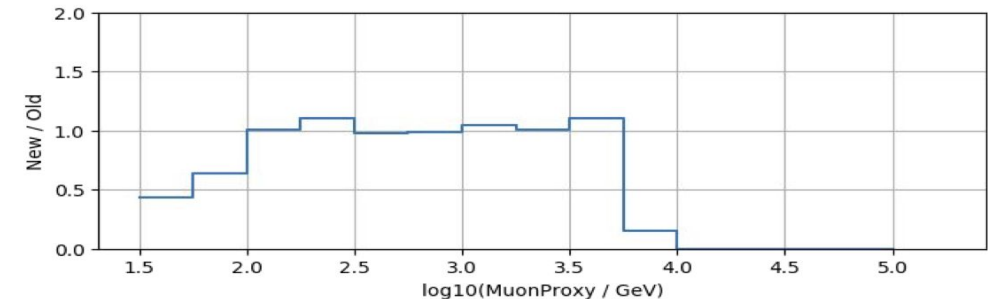
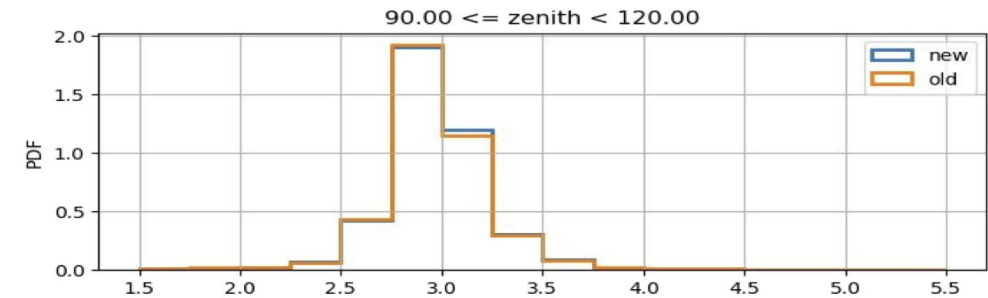
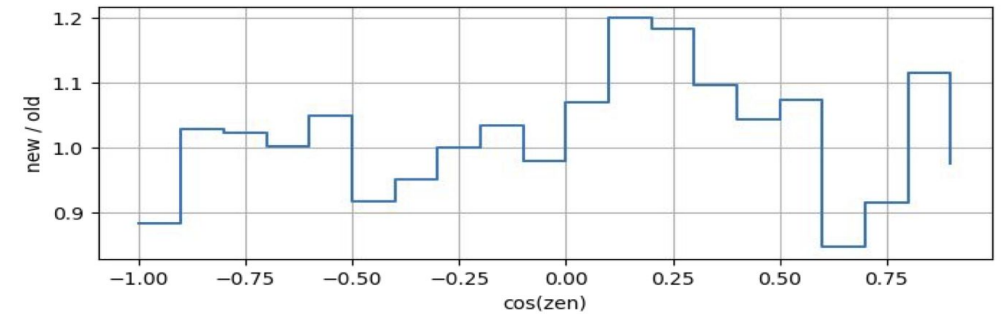
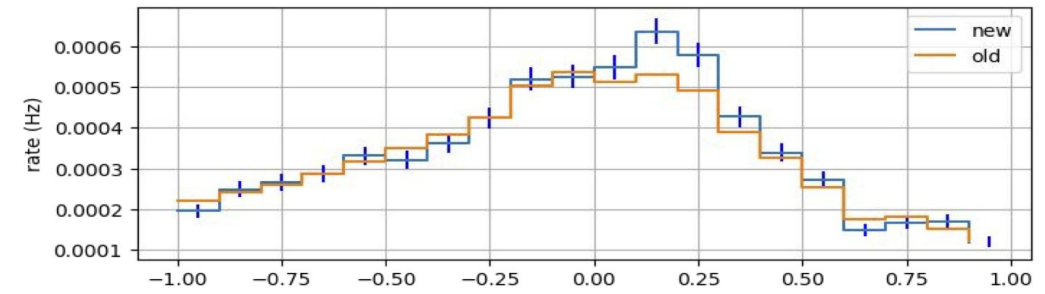
- Major detector configuration is constant for an entire year (physics run)
 - DOM settings (high voltage, threshold, etc.)
 - DAQ triggers
 - PnF filters
- Configuration changes validated with automated tests and review by calibration group
- Configuration XML files are named, numbered, and version-controlled in repository
 - never changed after use in data-taking
 - run configuration information tracked in IceCube Live

TFT Board

- Trigger and filter change requests managed by the Trigger Filter Transmission Board
 - balance competing needs for CPU and satellite bandwidth
- Proposals for trigger / filter changes submitted to TFT for yearly review
 - Science case justification
 - Resource requirements
- TFT presents physics run season plan to collaboration
 - Implemented by operations group
- Move to Pass3 processing online driven by this board
 - Updated Online Filtering proposed, test run taken and vetted, run started Nov. 2023
 - Updates to Offline Filtering in support of Pass3 in progress

Physics Run Start

- Calibration runs performed, vetted, and used to tune configuration
- SPTS used to validate trigger and filter changes
- 24-hour test run data reviewed and approved by working groups
 - Reviewed regardless of major changes to filter selections



Summary

- Testing procedures and validation on test systems contribute to high uptime
- Traceable, reproducible data flow in online software and detector configuration
- Operations procedures balance stability with year-to-year flexibility in physics runs
 - Critical for support of continued science expansion

Thank you!



M. Wolf / NSF