

PMT Test Facility @ Boulby Underground Lab



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AIT / WATCHMAN Collaboration Meeting
2018 May 20th

The PMT ahWG (*ad hoc* Working Group) has tasked us with:

Primary goals:

- Construct PMT test facility at Boulby site
 - Steady state of ~140 PMTs expected per month
- Test 100 PMTs above and below ground by end of September

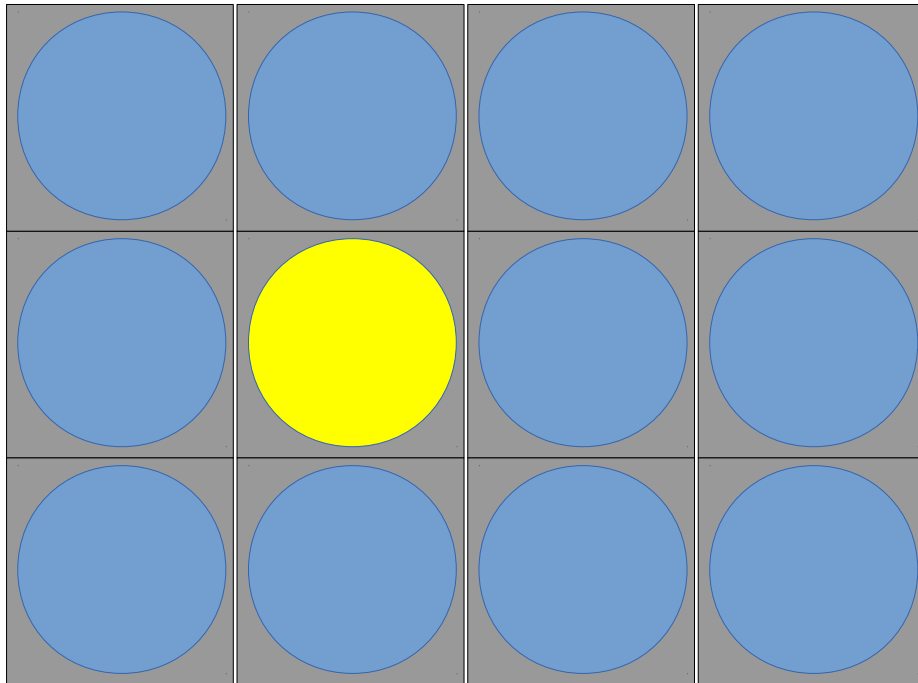
Secondary goals:

- Establish PMT storage facility on surface
 - Capacity for 2 months storage
- Establish PMT storage facility below ground
- Provide experience working underground



Planning for Tests

Will erect a “dark tent” at Boulby to test 11 PMTs per day (plus reference):



Default plan is to work underground 4 days / week (easier for Boulby staff)

11 PMTs / day * 4 days / week

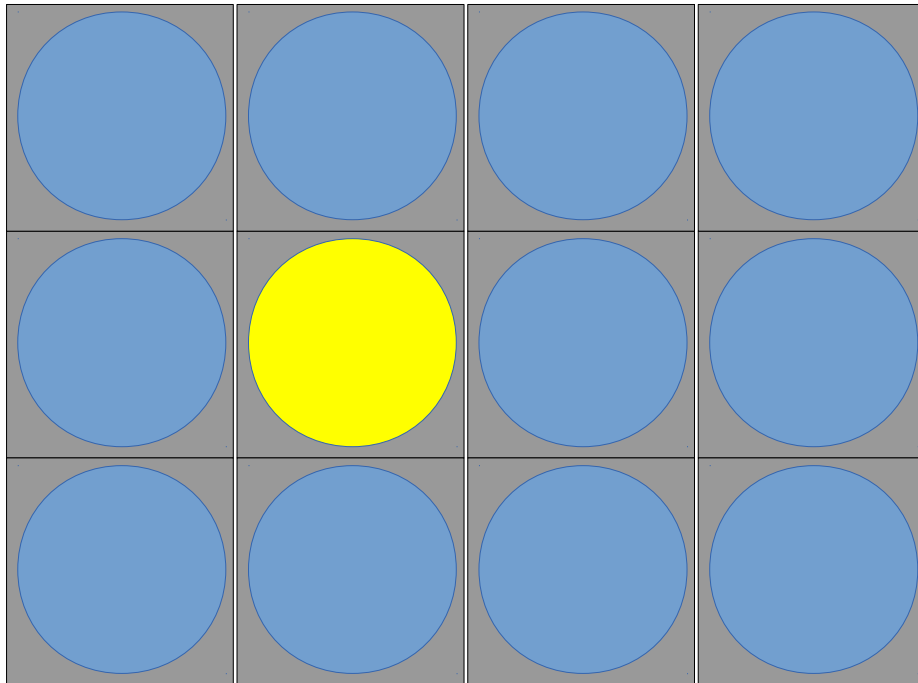
= 44 PMTs / week

= ~175 PMTs / month

(25% above Hamamatsu delivery rate)

Planning for Tests

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11 PMTs / day * 4 days / week

= 44 PMTs / week

= ~175 PMTs / month

(25% above Hamamatsu delivery rate)

Can go to 7 days per week if needed!

PMT Storage



Underground storage
in new lab

→ see Sean's talk

Surface storage for
~300 PMTs in old
workshop once
machines are moved
(~2 month capacity)

Double doors for easy access from car park on delivery

PMT Storage



Underground storage
in new lab



Double doors for easy access from car park on delivery

Surface Test Facility

Use of **B**oulby **I**nternational **S**ubsurface **A**strobiology **L**ab space



Temporary use for
surface test period

Central area (shown)
will be fitted with dark
tent (5' x 5') and
electronics rack

Also use blackout
curtains to ensure light
tightness

Working with Matt Needham at University of Edinburgh

Kit currently available:

- LED driver boxes (1 or 2 channel).
- NIM electronics --> in particular ortec 416a gate and delay modules
- small NIM bins
- 2 ORTEC 456 HV power supplies (giving 4 channels) up to 2500 V but not current monitoring
- CAEN N470 4 channel HV supply, goes up to a few kV (with current monitoring)
- 3 CAEN DT4571N power supplies that work via USB
- TTi QL355TP LV supplies
- 2 CAEN VME V792 QDC modules (32 channels each).[*]
- CAEN waveform digitizer 16 channel DT5742
- Oscilloscope
- Pulse generator

Still needed:

- Dark tent
- PMT mounting structures (x12)
- Geomagnetic strategy (coils? orient w/ field?)
- Sample tube to test the test setup

First Step: Construct surface test facility by mid-July

- Will be done with UK-only effort (Sheffield + Edinburgh)
- Ready by time PMTs scheduled to arrive
- Also start of UK summer holidays (~6 weeks, esp. Aug)

Three options for how to proceed:

Option 1:

- Test all 100 PMTs above and below ground
- Complete testing by end of September
- Needs 3 people throughout August & September
 - UK can supply 1 (supervisor), US supply 2 people

First Step: Construct surface test facility by mid-July

Three options for how to proceed:

Option 2:

- Test all 100 PMTs above and below ground
- Complete testing by end of October (1 month delay)
- Needs 3 people throughout September & October
 - US participation reduced
 - Will not meet goal of “underground experience”

First Step: Construct surface test facility by mid-July

Three options for how to proceed:

Option 3:

- Reduce level of testing from 100 above and below
- Complete testing by end of September
- Needs fewer people throughout August & September
 - US participation reduced
 - Will not meet goal of “underground experience”

- The PMT ahWG has set primary & secondary goals
- Boulby is able to accommodate storage and testing
 - Can be done at both surface & underground facilities
- PMT test facility to be constructed by mid-July

- Collaboration needs to decide how to proceed w/ testing
 - Is US participation an option? (can be students)
 - Is full testing above and below ground necessary?

- **Note:** Renting accomm. will be necessary during test period
 - 3 bedroom flat in Whitby for 2 – 3 months