# Commissioning

Bruce Baller

# Outline

- Project closeout – ORCs
- Management overview
- Commissioning Review
- Summary

| Document | Authors | Docdb | Date |
|---|---|---|---|
| ORC Documents for Muon Counter System | Linda F. Bagby et al. | 4342-v1 | 2-Jun-15 |
| Final ORC | Linda F. Bagby | 3965-v1 | 10-Dec-14 |
| MicroBooNE Group 3 pORC @ LArTF | Linda F. Bagby et al. | 3964-v1 | 10-Dec-14 |
| LArTF entry system test | Michael Sarychev | 3961-v1 | 10-Dec-14 |
| TPC-R0 Test Stand pORC | Linda F. Bagby et al. | 3932-v1 | 25-Nov-14 |
| Group 2 pORC @ LArTF Documents | Linda F. Bagby et al. | 3890-v2 | 24-Nov-14 |
| ORC request UV laser Rack R2 at LArTF | Thomas Strauss | 3885-v2 | 11-Nov-14 |
| ORC request UV laser Rack R1 at LArTF | Thomas Strauss | 3884-v2 | 11-Nov-14 |
| Group 1 pORC Documents | Linda F. Bagby | 3818-v1 | 21-Oct-14 |
| ORC@LArTF | Linda F. Bagby | 3757-v1 | 26-Sep-14 |
| MicroBoone LArTF DAQ-R2, R3, R4 Rack ORC | Linda F. Bagby et al. | 2847-v2 | 25-Sep-14 |
| Microboone LArTF TPC-R2 Rack ORC-Computer Room | Linda F. Bagby et al. | 3286-v3 | 17-Jul-14 |
| Inline purity monitor rack ORC | Ben Carls | 2744-v13 | 9-Mar-14 |
| ORC Phase 1 Cryogenic System Test Run | Robert Sanders | 3080-v1 | 15-Dec-13 |
| MicroBoone Drift High Voltage Rack ORC | Linda F. Bagby et al. | 3065-v2 | 9-Dec-13 |
| PMT Test Stand at PAB ORC Authorization | Linda F. Bagby et al. | 2779-v1 | 29-Oct-13 |
| Task Force 6: Operational Readiness Clearance | Linda F. Bagby | 2886-v1 | 2-Oct-13 |
| Microboone LArTF Network Rack ORC | Linda F. Bagby et al. | 2716-v1 | 22-Sep-13 |
| New Mexico Cosmic Ray Detector Operational | Alistair McLean et al. | 2790-v2 | 19-Aug-13 |
| | | | |
| Cosmic Paddle Assembly ORC Documentation | Linda F. Bagby et al. | 2780-v1 | 13-Aug-13 |
| Microboone TPC-R2 Rack pORC@DAB | Linda F. Bagby et al. | 3203-v2 | 11-Aug-13 |
| D0 Annex DAQ Rack Test Stand ORC | Linda F. Bagby | 2258-v1 | 1-Nov-12 |
| Simple Rack Protection System | Jamieson Olsen | 1863-v1 | 24-Jan-12 |
| Electrical Safety ORC Review Guidelines | Steve Chappa | 1808-v1 | 16-Dec-11 |
| HV Leakage Test of RG180 and RG316 | Walter F Jaskierny | 1806-v1 | 16-Dec-11 |
| 182 – 1.3.4.1.3. A Fully Loaded MicroBooNE Vessel | | | |
| Response to a 0.1g Seismic Event | J Sondericker | 1068-v1 | 26-May-11 |
| Seismic Loads at Fermilab | R Schmitt | 499-v1 | 25-May-11 |
| Microboone foam and coating flammability test results | Hans Jostlein | 820-v1 | 15-Feb-10 |
| Electrical Installation Guidelines | Other Other | 802-v1 | 31-Jan-10 |

Project CD-4

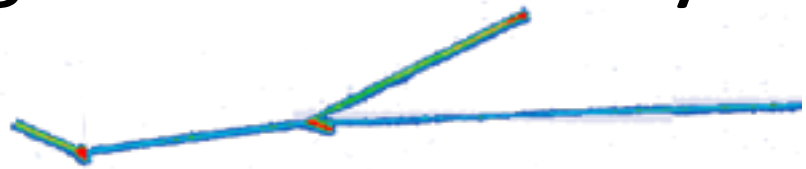
ORCs for groups of racks

# Commissioning overview

- Launched at January 2014 collaboration mtg

- Scope
  - Transition from a construction project to an operating experiment
  - Ensure that
    - Technical systems operate and are optimal
    - Monitoring systems are in place
    - Equipment & personnel protection systems are in place
      - Engineered and administrative controls
    - Experiment operating structure is functional
    - Interfaces with the laboratory are well defined
    - Communication mechanisms are functional
  - This scope is the responsibility of each commissioning team
    - With lots of help…

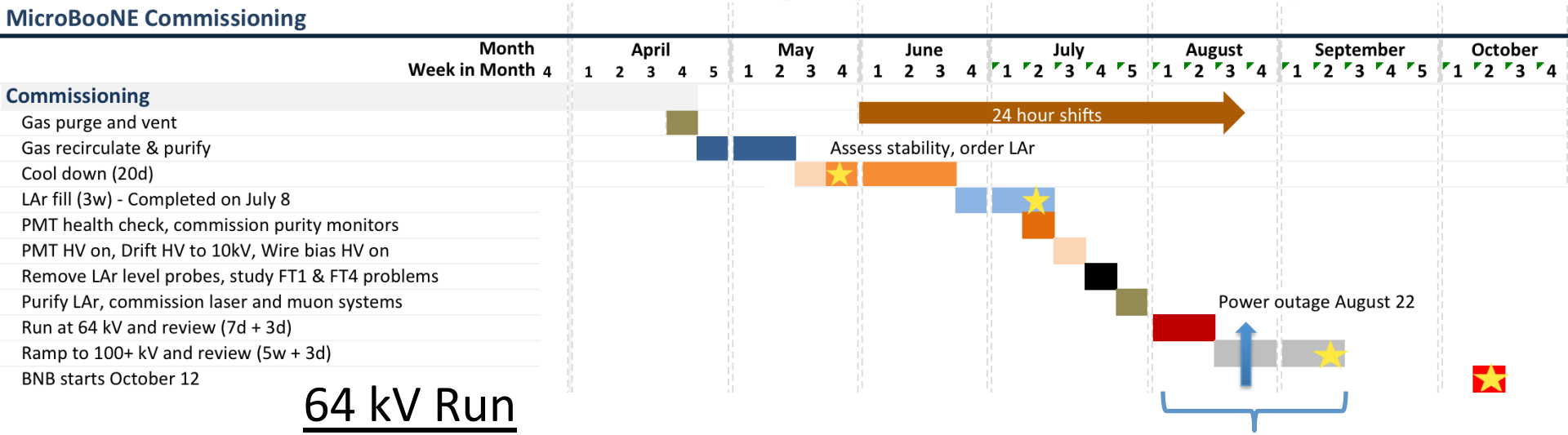
# Organization in July



- 14 commissioning teams
  - 13 lead by post-docs
- The PMT trigger task force is charged with developing and executing a plan for measuring the efficiency of the PMT trigger that will be used to inform the setting of the PMT trigger thresholds for first beam data-taking.

| **Commissioning**<br>*B. Baller, M. Toups* | | |
|---|---|---|
| **Beam**<br>*T. Miceli* | **Cryogenics Liaison**<br>*B. Carls* | **Control Room**<br>*A. Schukraft*<br>*J. Zennamo* |
| **DAQ**<br>*W. Ketchum*<br>*Y.T. Tsai* | **Drift HV**<br>*S. Lockwitz* | ***Electrical Integration***<br>*L. Bagby* |
| **Laser**<br>*M. Luethi*<br>*S. Tuflani* | **Mini Muon Tagger**<br>*M. Bass*<br>*L. Kalousis* | **Offline**<br>*B. Baller* |
| **Online**<br>*N. Tagg* | **PMTs**<br>*T. Wongjirad* | **PMT Trigger ε Task Force**<br>*B. Eberly*<br>*T. Wongjirad* |
| **Readout**<br>*G. Karagiorgi*<br>*K. Terao* | **Slow Controls**<br>*S. Gollapinni* | **TPC**<br>*J. Asaadi* |

# Schedule & Plans in July




## 64 kV Run

"Full" dress rehearsal for physics data taking

Stable DAQ running ~continuously (Huffman compression?)

PMT readout size (100 - 1500?)

Full event processing – PUBS, swizzling, tape storage, reconstruction

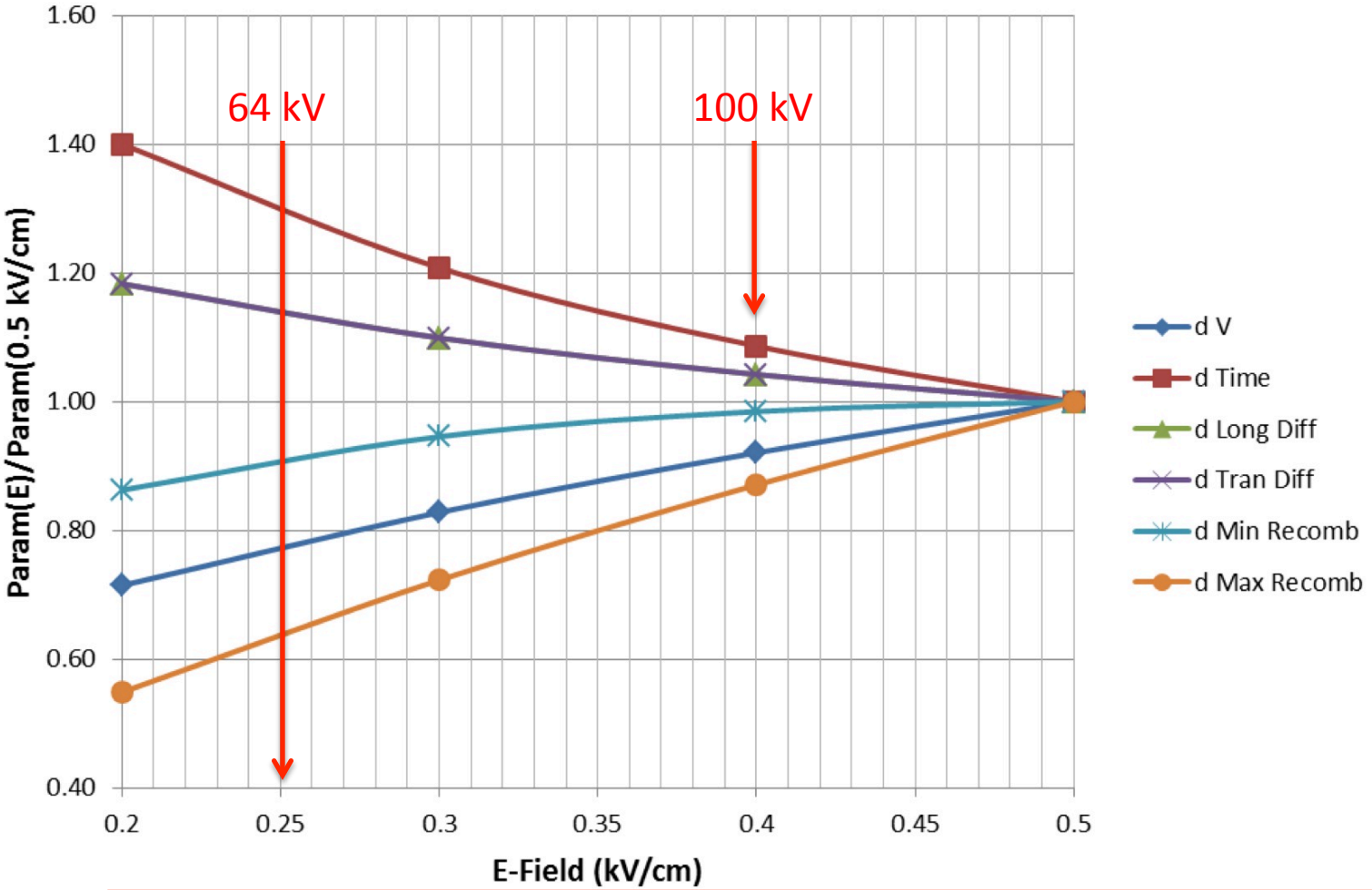
Laser commissioning & data taking

Muon tagger(?)

Run plan discussion tomorrow

Ref Task Force 3 *"Physics Capability at ½ drift field"* docs 2808, 2733

# TPC operations with drift HV = 64 kV




Summary for E = 0.25 kV/cm relative to 0.5 kV/cm

30% longer drift time → DAQ readout, cosmic rays

15% increase in diffusion broadening of hits at maximum drift

10% reduction in collected charge due to increased recombination (MIPs)

35% reduction in collected charge due to increased recombination (protons) PID?

# Significant events that affect operations

- Investigate and mitigate noise – Jonathan
- Drift high voltage trip, instabilities – Matt
  - Operating at 70 kV
- High singles rate in PMTs (radon?) - Taritree

# Collaboration review of running at 70 kV

## Expectations & Risks

- A third ramp above 70 kV is likely to give the same results as the last two since as far as we understand the relevant experimental conditions, they are the same
- Additional HV power supply trips have serious risks associated with them (e.g. mini-Captain experience)

Matt Toups presentation to collaboration at Sep 4 Status meeting

Collaboration consensus to operate at 70 kV for the initial physics run

# Commissioning review Sept 24 -25

- Included commissioning activities, shift taking and data management
- Review elements
  - Deliverables – What commissioning teams will have in place for the first physics run
    - Not necessarily what was in the original scope, e.g. supernova data stream
  - Tech note – System overview and results from completed commissioning activities
  - Review presentations
- Reviewers were collaboration members + 1 external
- Classification of recommendations by reviewers
  - Commissioning = To be completed before first beam
  - Operations = To be completed at a later date (aka upgrade)
    - Example: Recommendation requires significant beam down-time to address
  - Some re-classification done in consultation with Bonnie and Sam
    - Example: Recommendation to provide features that were not in the original commissioning scope

## Review

- Agenda
- Charge

# Commissioning review web site

The 14 systems that will be reviewed and the system leads (points of contact) are listed below:

## Documentation

- Deliverables: *define what each system can deliver by the start of our initial physics run*
- Technote: *documents the status of the deliverables and demonstrates the readiness of the system prior to the review*

1. **Beam (T. Miceli)**: Deliverables, Technote
2. **DAQ (W. Ketchum, Y-T, Tsai)**: Deliverables and Technote
3. **Databases (J. St. John, A. Szelc)**: Deliverables, Technote
4. **Data Management (M. Kirby, K. Terao)**: Deliverables, Technote
5. **Drift HV (S. Lockwitz)**: Deliverables, Technote
6. **Muon Tagger (M. Bass, L. Kalousis)**: Deliverables, Technote
7. **Online (Nathaniel Tagg)**: Deliverables, Technote
8. **Laser (M. Luethi, S. Tufanli)**: Deliverables, Technote, Background Info
9. **PMTs (T. Wongjirad)**: Deliverables, Technote
10. **Purity Monitoring (B. Carls)**: Deliverables, Technote, Background Info
11. **Readout (G. Karagiorgi, K. Terao)**: Deliverables, Technote
12. **Shift-Taking (M. Mooney)**: Deliverables, Technote
13. **Slow Controls (S. Gollapinni)**: Deliverables, Technote
14. **TPC (J. Asaadi)**: Deliverables, Technote, Expert Documentation

# Commissioning review web site

## Reviewers

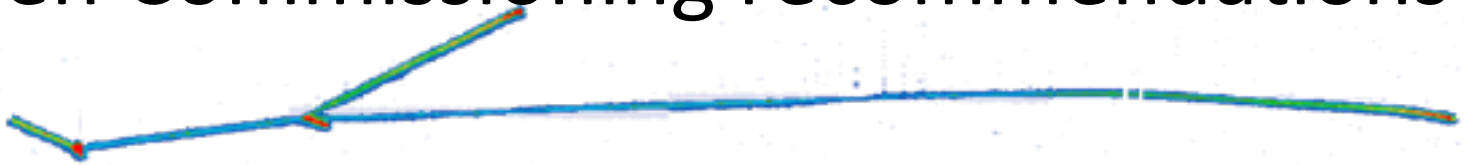
*Reviewer reports are due by COB on Monday September 28, 2015 and should be emailed to Bruce Baller, Matt Toups, Bonnie Fleming, and Sam Zeller*

- Beam reviewers: M. Bishai, A. Marchionni
- DAQ reviewers: G. Horton-Smith, A. Norman, R. VandeWater
- Readout reviewers: G. Horton-Smith, A. Norman, R. Vandewater
- Database reviewers: L. Rochester, P. Spentzouris, S. Wolbers
- Data Management reviewers: L. Rochester, P. Spentzouris, S. Wolbers
- Drift HV reviewers: I. Kreslo, B. Lundberg, X. Qian
- TPC reviewers: I. Kreslo, B. Lundberg, X. Qian
- UV Laser reviewers: T. Bolton, C. James
- Muon Tagger reviewers: T. Bolton, C. James
- PMTs reviewers: T. Bolton, F. Cavanna
- Purity Monitors reviewers: B. Rebel, J. Spitz
- Online reviewers: D. Naples, S. Pate
- Slow Controls reviewers: D. Naples, S. Pate
- Shift-Taking reviewers: D. Naples, S. Pate

# Recommendations status

| Area | Total | Commissioning Open | Commissioning Closed | Operations Open | Operations Closed |
|---|---|---|---|---|---|
| Beam | 25 | 0 | 9 | 6 | 10 |
| DAQ | 7 | 0 | 3 | 0 | 4 |
| DataBase | 7 | 1 | 1 | 3 | 2 |
| DataManage | 12 | 1 | 3 | 3 | 5 |
| HV | 4 | 0 | 1 | 0 | 3 |
| Interface | 3 | 1 | 1 | 0 | 1 |
| Laser | 1 | 0 | 1 | 0 | 0 |
| OM | 2 | 1 | 0 | 1 | 0 |
| PMT | 3 | 0 | 0 | 2 | 1 |
| PurityMonitor | 14 | 0 | 9 | 3 | 2 |
| Readout | 8 | 2 | 4 | 2 | 0 |
| Shift | 11 | 1 | 1 | 2 | 7 |
| SloMon | 7 | 0 | 6 | 0 | 1 |
| TPC | 1 | 0 | 1 | 0 | 0 |
| Total | 105 | 7 | 40 | 22 | 36 |

# Open Commissioning recommendations



- Documentation improvements
  - Detailed BNB timing and distribution ~90% complete
  - Online monitoring – minor corrections
  - Offline data management – needs work
- External matching of BNB and detector data
  - Done during swizzling (binary → ROOT format) using GPS time stamps - verification…
- Test database replication, backups, hot swapping, caching proxy DB
  - All tests done except for hot swapping – needs beam downtime
- Verify that BNB triggers are not vetoed by external triggers
  - Done at the sub-% level. Completion date Nov 30

# Summary

- The detector is commissioned