

Timeline, Production, and Quality Control

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Outline

- Timeline
 - ProtoDUNE Run 2
 - Needs for test stands during construction, and later for detector integration and installation
- Production
- Quality Control Plans

Very short term (i)

- In the very short term the most urgent areas of work are
 - WIB firmware
 - Need to have new firmware for system tests of FEMBs with COLDATA or CRYO
 - Two prototype boards in hand (at BNL and at Penn)
 - Need to make quick progress toward having a minimal system that supports standalone noise measurements (at least)
 - Initial version of firmware requirements document presented yesterday
 - Working on identifying lead engineer, organizing work
 - May require additional boards / test stands for firmware development

Very short term (ii)

- In the very short term the most urgent areas of work are
 - Fully define PTC / interface to DDSS
 - Realized in February that we need a redesign of the PTC to properly establish interface between TPC Electronics and DDSS
 - For the moment we just have some ideas on how the components at the interface between TPC electronics and DDSS would be designed
 - We need technology choices / design for the DDSS to make sure that we can properly design our interfaces
 - Interface with Slow Controls
 - Need to understand how fans and heaters supplies are going to be controlled / powered (custom cards / supplies or via the slow controls ? Communication with DDSS?)
 - Further value engineering on power supplies ?

The path to ProtoDUNE Run 2

- Components for the 2nd run of ProtoDUNE-SP need to arrive at CERN in the Summer of 2021
 - Schedule will be driven by availability and testing of ASICs and FEMBs
 - All other detector components must be installed and ready for data taking by the time the FEMBs arrive at CERN
- Goal should be (for all components) to have new design and build / test prototypes prior to March 2021, in such a way that a final design review can be made in the Spring before producing the components for the 2nd run of ProtoDUNE-SP

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 - Despite the fact that the PTC is going to be a new design, the features being added are small on the scale of the WIB
 - The WIB is the biggest ticket item

WIB for ProtoDUNE Run 2

- Which WIB are we going to use for the 2nd run of ProtoDUNE ?
- Intermediate WIB (presented by Jack yesterday) or prototype of DUNE WIB (hardware/firmware requirements presented by Volodya and Josh) ?
- As long as we do not have changes on the backplane and on the connectors between the WIB and the cold cables, we can change the WIBs during a run (i.e. start with intermediate WIB and migrate to prototype of DUNE WIB later)
- This relaxes the schedule for the WIB (but not if we insist on having all production readiness reviews completed prior to 2nd run of ProtoDUNE)
- Also, we will change the connectors between the WIB and the cold cables at a certain point

Production (i)

- We need the components on top of the cryostat to be delivered at SURF toward the end of 2025 for installation during 2026
 - Components for 2nd detector need to be delivered at SURF one year later
- Number of components (1 detector), need to consider spares and components for test stands / cold boxes
 - 150 WIECs
 - 150 PTCs
 - 750 WIBs
- Procurement of parts will start in 2nd half of 2022 and continue for 2-3 years, testing will start when parts are delivered, will continue until installation

Production (ii)

- WIBs will play an important role also in testing of ASICs and FEMBs (will be used for data taking)
 - May have to fabricate more parts during pre-production run and use those for the test stands
- Not expecting any particular issue with fabrication / assembly of components
 - Will just require time, given the number of components to be fabricated

Quality Control

- Plan is to test all the detector components prior to their shipment to SURF
- Power supplies and bias voltage supplies
 - Need burn-in stations
- Cables and optical fibers
 - Need test stations
- WIEC, WIBs and PTC
 - Need test stands where all the functionality of these parts is tested for a few days (remember 150 full crates per detector)
- All test results to be stored in database
 - Reminder: components on top of the cryostat can be accessed, repaired, or replaced, unlike the components inside the cryostat

Conclusions

- Do not expect any major issues with being ready for 2nd run of ProtoDUNE-SP, production, or quality control
- In the short term the big issue is making fast progress on
 - WIB firmware
 - Understanding of DDSS design (and as a consequence design of PTC)
 - Understanding the design of Slow Control