

## Minutes of Feb 4 2021 ProtoDUNE-ND Electronics Integration Meeting

- Attendee: Linda, Trevor, Howard, Geoff, MinJeong, Steve, Zelimire, Sasha, Anne, Karen, Matt and Ting
- News and latest action tasks
  - Still waiting from division office on restarting MINOS decommissioning. Decision expected today or tomorrow.
  - ArgonCube2x2 cryostat is coming to Fermilab earlier, sometime in May. Plan is being adjusted for that.
  - Sasha has been uploading design files to DUNE docDB and getting ready to start SEDR -- big thanks to Sasha and DUBNA group.
  - Sasha mentioned the size of equipment planned on the rack at cryostat access platform is likely in size of VME crate. He will need rack space for two crates there.
  - We will start to look a small half rack with depth like 24" at Fermilab or do a new purchase.
  - MinJeong reported the LAr filter tank needs to be within 4m of the main cryostat. The limits is due to use of vacuum jacked pipe. We will talk to Gary for a final location of the tank in MINOS hall
  - On DC required for ADC board, Sasha reported that +5V with 5A is needed for the current board. He expected 24W for all ADC boards.
  - Linda reported that Tyler of PPD EE department is getting the DAB load test-stand restarted (for another experiment). Ting will explore possibility to get the teststand under to neutrino division ownership and let our techs to take charge of its operation. For now we shall be able to use it to test Wiener power supply. Joe Harris is learning the operation.
- SEDR and ORC reviews
  - Linda gave a nice presentation on safety engineering design review (SEDR) and operation readiness clearance (ORC) focusing on documentation need.
  - There are links in her slides for Fermilab guidelines and practice one needs to follow in order to operate custom designed equipment on-site at Fermilab.
  - Many of the electronics in ArgonCube will fall into the category of "custom electrical equipment" that is equipment not commercially available
  - During the design and safety review, there is a checklist of hazards we need to consider - -- see list on page 7 of the presentation slide.
  - SEDR is the process Linda put together to help subsystem for the review. Linda put together a list of design documentations we need to start the SEDR process which lead the ORC approval
  - In order to help subsystem in the process, we like to get involved earlier and review the documentations during the "pro-production" stage.
  - In addition to the schematics, Gerber file and BOM, we also need the artwork where we use to pinpoint issues with component layout and safety protection etc.
  - The light readout electronics is the first system of 2x2 we will perform SEDR and ORC. Sasha is doing excellent works to collect design documentations.
  - Linda and Matt are going through the documentations Sasha posted in DUNE docDB. We will determine a timeline for the review.
  - Linda will also follow up today's talk with an example of reviewed electronics system and go over it in our next meeting
- 2x2 networking and computing
  - Geoff gave a great introduction for us to start a plan for networking and computing for 2x2 test in MINOS hall.
  - He summarized the general practice of DAQ server (linux) and networking specification and procurement for a Fermilab experiment

- Linux server procurement usually goes to KOI company and networking plan needs first discussion with Fermilab networking group for procurement and support.
  - We will need to define the data rate, down-time acceptance level, storage requirement etc. to put together a plan.
  - For argonCube2x2, light readout is expected to dominate the data rate. Sasha will give a report on the data rate estimate in one of the meetings
  - We expect to have computer servers electrically isolated from TPC readout and a network switch on building ground
  - We also expect to have another set of network switches on detector ground to connect front-end electronics needing network access
  - All networks shall have fiber up-links
  - Depending on the data rate, we will decide the capability of switch link rate: 1Gb, 10Gb, 40Gb or 100Gb.
  - We need a computing rack not a relay rack to host the DAQ server and networking switches
  - We discussed the possibility to re-use the computing rack at upstream end of MINOS hall.
  - Steve is to look the possibility to move the MINOS computing rack downstream. It will replace one of the relay racks we reserved for 2x2.
  - On DAQ computing servers, we need to involve artDAQ group.
  - We need core serves of gateway, file and database in addition to DAQ servers.
  - For light and charge readout systems, we will need to define the "board reader" hardware and function under artDAQ framework.
  - VEM controller is the "board reader" for MINERvA DAQ.
  - Geoff also showed design examples of ICARUS networking and computing. We will start collect info for our design.
  - In addition to the DAQ part of the computing and networking, we will need to get input from Trevor on cryogenic control PLCs.
  - Detector slow control is something we will have to start to assign people to work on.
  - Howard discussed works at Lab-F for MINERvA DAQ. He plan to keep the lab F, not moving things underground.
  - We will need to have a dedicated discussion on how we re-install and recommission MINERvA DAQ in MINOS hall. It is needed for module checkout this summer.
  - Geoff's talk is a great start, and we will follow this up with more detailed discussion in the future.
- Summary of action tasks:
    - Ting will explore the possibility for neutrino division to take ownership of DAB load-tester
    - Sasha to collect artwork of light readout boards for SEDR review
    - Linda to find a SEDR example and we will go over it at our next meeting
    - Steve to look into moving the MINOS computing rack to downstream end
    - Sasha to estimate data rate from light readout system
    - Ting and Howard to arrange discussion of MINERvA rack re-installation at MINOS hall
    - Ting to explore communication channels to artDAQ group
- We will meet again in two weeks, Feb 18. Tentative agenda includes PLC work at BERN and SEDR example.