

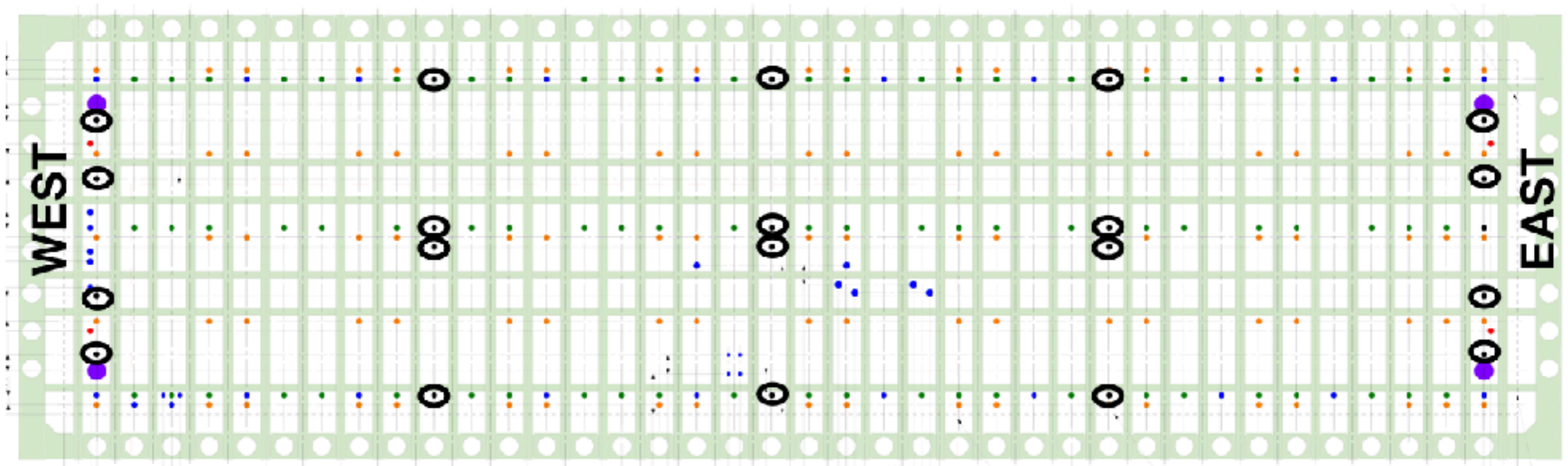
Laser System Installation and space needs

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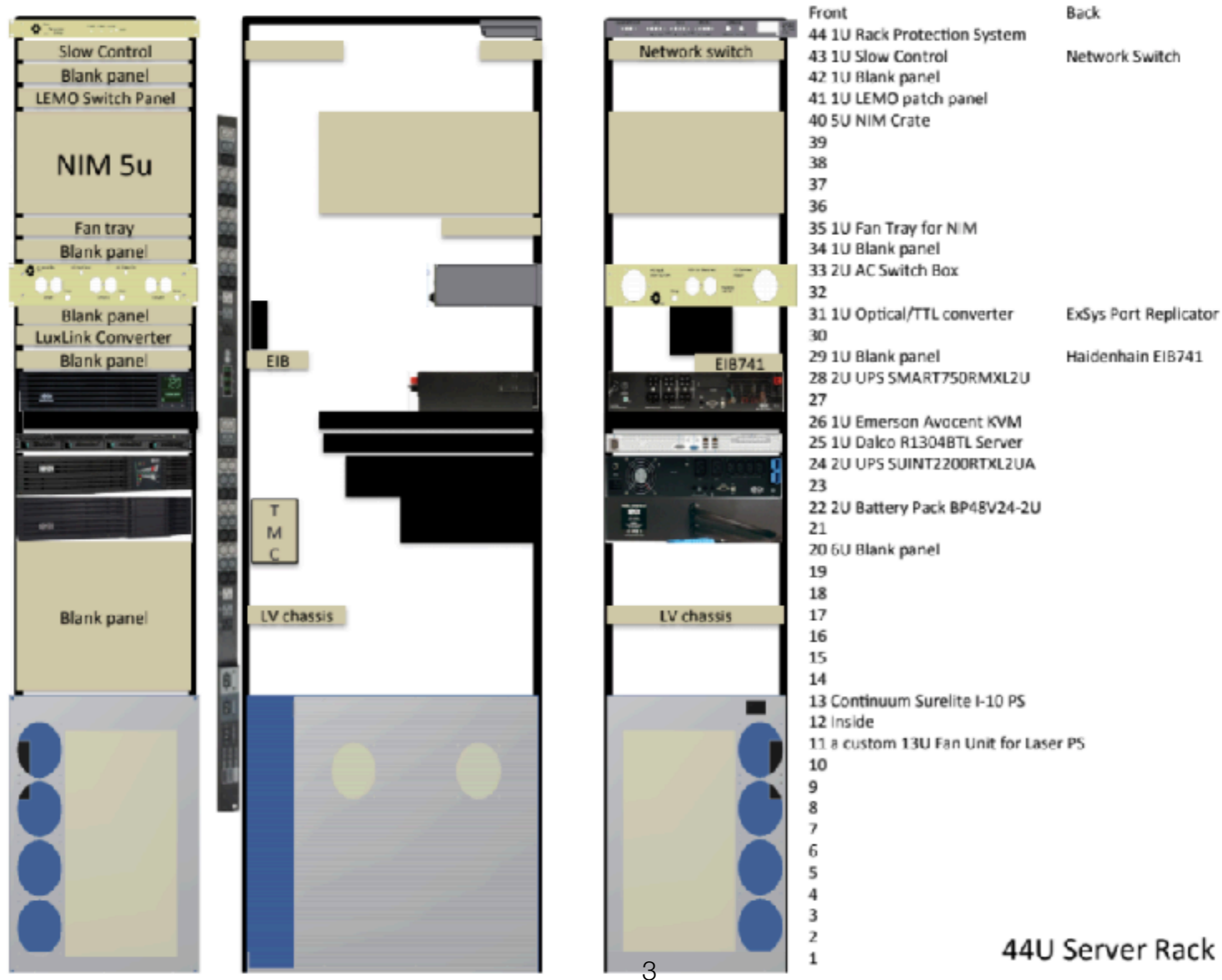
Laser Ionization System

- Plan for DUNE Single-Phase: Assume 20 lasers nominal
 - This will require significant rack space and space on top of the cryostat



Rack space

- Based on uB experience, one rack per laser minimum is needed



Rack space

- This is a big ask! — 20 racks just for ionization laser
 - Terri tells me that in the 80 rack budget they have, they reserved roughly 1/3 (i.e., about 26 racks) to CISC and Calibration together. But, CISC needs are not that big so it can be delegated to Calibration.
 - CISC will finalize their rack needs in the coming weeks and will keep calibration leadership informed.
 - We also need to understand PNS, RSDS and other rack space requirements. [Do we have some rough estimates here?](#)

Laser power requirements

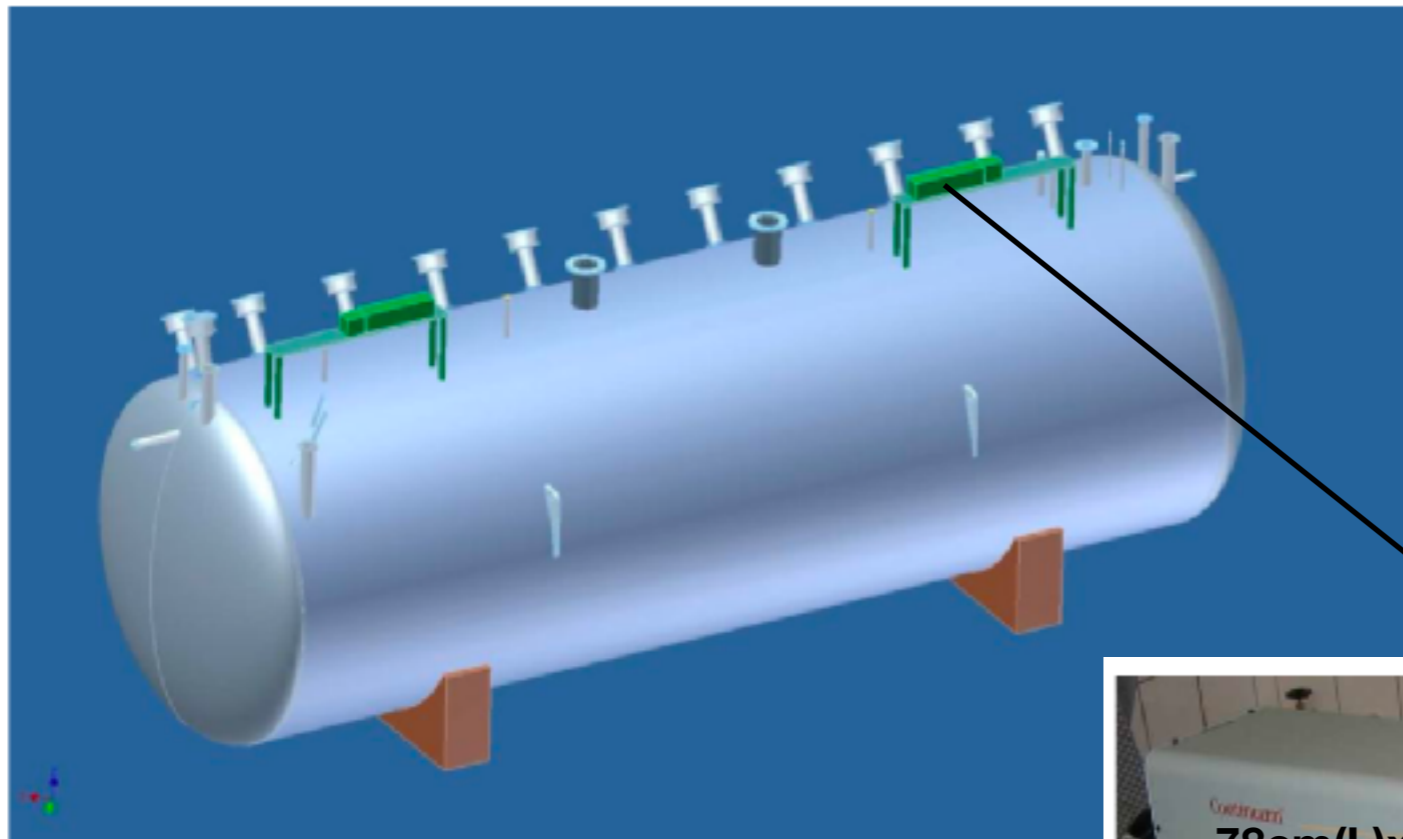
- Per uB, laser power requirements are
 - 208-240 VAC, single phase, 10 A.
 - The total heat dissipation from the power unit is about 2 kW.
 - uB also used a custom-built UPS system for safety; cooling and custom-built fans in the rack
 - Linda Bagby notes that laser rack packaging in uB took a lot of effort by Thomas Strauss (Bern Postdoc at the time) and included a lot of custom-built items — so it would be good to rethink this for DUNE and reduce the number of custom-built items and explore commercially available systems. This will make everyones life easy!
 - Sowjanya has full list of rack items from uB — we need to understand why there was a need for custom-built items.

Laser power requirements

- Terri would like to know what is the load of the power unit in the rack
 - We don't have a measurement from uB since the lasers were kept on building ground as opposed to detector ground since lasers are expected to be noisy (although no issues in uB) — this is more of a preventive measure. Terri wants to keep them on detector ground in DUNE
 - Linda suggests looking into newer lasers that are not noisy; also suggests measuring this in uB.
 - Since they were on building ground, uB essentially didn't care about the loads. The Power Distribution Units (PDUs) in the rack were also not networked so no measurement from that on actual power loads.
- Terri thinks the load is around 5 kW (heard from somebody?)
- Terri says that 5 kW is the upper limit so in principle it may not be an issue but if uB can measure it, that would be great — Sowjanya/Linda has a plan on how to measure this but this is low priority for now;

Cryostat Space requirements

- Lasers are placed on an aluminum optical bench on top of the cryostat
- The benches are fixed with four poles each (made of thin wall stainless steel tubes) that are inserted in support tubes, welded to the top of the cryostat. Tubes are filled with insulating foam via top openings to enhance insulation. Electrical insulation was guaranteed by spacers.
- About 2m (L) x 0.5 m (H) x 0.5 m (W) will be needed on top of the cryostat per laser box



Optical bench is
193 cm (L) x 50 cm (H) x 50 cm (W)

20 cm (L)x18 cm (H) x 17 cm (W)

Laser box
(sits on the optical bench)



Other Constraints

- Main constraint: the power supply feeding the laser head needs to be within 5 m of laser
 - Terri thinks this is a tight requirement and can be an issue
 - Michele says that one has some flexibility by ordering the connection to a defined length but it can't be more than several feet since not just HV, cooling and flash signal timing goes through it — Terri would like us to investigate this
- Terri thinks it is possible to try to keep the laser racks closer to their FT location as the laser FT pattern matches the rack pattern currently planned
 - Terri will send a proposed rack placement map and Sowjanya will investigate and propose desired racks for laser to minimize the distance b/n the laser rack and the FT
 - At the scope review workshop, Sowjanya and Terri to get together to understand with cryostat engineers about space on top of the cryostat for laser benches like in uB

Other Constraints

- Need a clear sight of path from the box to the laser feedthrough and clearance at the top of the feedthrough (about 1.5 to 2 m) to insert the laser system
- Clearance is also needed around the laser box/bench enough for a person to move around the table and align the laser system carefully

Needs for PE laser and LPS system

(from Jelena)

- Assume no dedicated laser is needed for the PE system — so needs there
- Together for both systems, rack space of 1 to 2 NIM bins (+ standard rack infrastructure) is needed
 - What about other rack elements (rack fans, power supplies etc.)?
- It seems like assigning one rack for both PE and LPS system should be more than sufficient?