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Charge of the Installation & Integration Working Group

The Installation & Integration working group (WG) will develop a detailed plan for the installation of the DUNE Far Detector (FD) as well as for the installation of protoDUNE. The plan will have strong connections with all the other FD WGs. This WG will provide the required equipment & tools and labor for the Installation tasks.

The charge of this WG will be to cover the development and planning for an offsite integration facility, installation of the TPC mechanical support system, installation of the FD components (APA, CPA, field cage, ground plane) in the cryostat, installation and integration of the supporting systems (electronics, electronics feedthroughs, warm and cold cabling, HV feedthrough, DAQ). The same tasks will apply to protoDUNE. An important task for this WG will be to develop a robust Quality Assurance (QA) plan to ensure the integrity of the components at all steps.

WP 1: Preparation of Far site Integration Facility
Development of the Far site Integration Facility (IF) (including underground and on surface at SURF and a potential off-site facility). These should allow storage, inspection, testing, packaging of all components received at the Far Site. Detailed coordination plan between the different sites will be developed.

WP 1': Preparation of CERN site Facility for protoDUNE
Similarly, the reception, storage, inspection, test and pre-assembly of the different detector components will be coordinated at the CERN facility. A detailed plan for the site will be developed.

WP 2: Assembly of the FD components
Assembly, installation and integration of the detector components (Field Cage, APAs, CPAs, ground plane, Light Collection System, HV feedtrough). Pre-assembly will happen on surface. Detector sections will be transported underground for their installation underground. After inspection and testing, the cryostat will be closed. At the integration facility (IF) parts will be prepared and staged for the underground installation. Due to delivery and schedule issues, the current plan is to install the cold electronics and the photon detection system in the APAs at the IF.

WP 2': Assembly of the protoDUNE components
Development of the plan for detector component assembly. This WP also includes potential pre-assembly details. Inspection and final testing will be performed before the assembly package is signed-off.

WP 3: Interface Agreement and Integration with the cryogenics for FD
Develop a detailed agreement with Cryogenics WG

WP 3': Interface Agreement and Integration with the cryogenics for protoDUNE
Develop a detailed agreement with Cryogenics WG

WP 4: Interface and integration with Electronics for FD
Detailed interface agreement between Electronics WG and Installation WG. Our scope here is to install the CE on the APAs, install the feedthroughs and install the cold and warm cables. The actual testing and test equipment is part of the other WBS elements. Cabling from the front-end electronics to the feedtroughs. Installation of the readout racks. Cabling from the feedtroughs to the racks and from the racks to the counting room.

WP 4': Interface and integration with Electronics for protoDUNE
Similar to WP4.

WP5: Interface and integration of DAQ for FD
Detailed interface agreement between DAQ WG and Installation WG. Installation of the DAQ racks. Cabling of the DAQ components.

WP5': Interface and integration of DAQ for protoDUNE
Similar to WP5.

WP 6: Development of the tooling required for installation.
Identify the tools that will be required for installation and integration of the different components, such as support rails, scaffolding, temporary floors, temporary ventilation/lighting.

WP 7: Material handling
Identify specialized access equipment, environmental control equipment for installation area if needed.

WP 8: Transport and Storage
Specialized shipping containers/ storage racks for components both for surface transport and getting underground. This will be developed strongly with Dual-Phase WG, who will need to perform this work too.

WP9: Tests and Mockups
Identify the different Mockups or tests that will have to be done along the way. Provide a detailed plan of the steps for each, provide de facility and equipment required.

WP 10: QA plan for FD
Each of the above WPs will require very detailed QA plans to ensure the integrity of the FD at all steps. The plan should include tests to be performed during the installation that will indicate the state of the different detector components. Each step of the integration between the different systems will also be included in the plan.

WP 10': QA plan for protoDUNE
Similar to WP10.

WP 11: Commissioning of FD
Develop a commissioning plan for all components of the FD.

WP 11': Commissioning of protoDUNE
Develop a commissioning plan for all components of the protoDUNE.