Outlook and plans

• The plan is to complete the feasibility studies by end of March (foreseen meeting in person at CERN).
  ➡ If the results are successful we will start preparing a proposal right after to be ready by Summer/Autumn 2024.

• There are two fundamental aspects to be evaluated by then. If needed to give priority to long lived particles with the heavy neutral leptons as benchmark scenario:

  1. Address the background level from:
     • *Cosmics*: this study can be carried out using existing ProtoDUNE data
     • *Potential signal-like events from the target or the surrounded ones* (We focus on the T2 target as starting point)
       • We agreed on identifying golden channels and disentangle the background sources for each of them (i.e. lepton-pion channels)
       • Provide a table in the next two weeks (Josu)
     • Other sources to be evaluated (relevant for scattering signatures)

  2. Trigger

• In parallel to these activities the exploration of new interesting phenomenological scenarios will be ongoing.
Feasibility studies

1. Background level

i. Complete simulation of the target (related questions or issues common with beam people, view of what is available and ready next meeting or next to next (Justo and Laura).

   • Evaluate the activity from the main target arriving to the detector:
     • Estimate the number of muons as a cross-check of the simulations (we will look at existing ProtoDUNE data)
     • Summarise existing ProtoDUNE numbers (Laura, Animesh, Justo and Albert)
     • Retrieve existing ProtoDUNE data. Ideally understand if (Albert will discuss with Filippo and Leigh, Alex will work on that):
       • Data with CRTs synchronise with the SPS spill? Available data files shared with Animesh
       • Data collected with random trigger?
       • If is not possible to estimate it from existing data, it is possible to measure in the coming protoDUNEs data taking campaigns.
     • Evaluate the number of expected neutrinos, other sources as high energy neutrons,…

II. Background from atmospherics (Animesh)

III. Background from cosmics relevant to scattering to be evaluated with existing ProtoDUNE data (to be discussed Leigh)

   • Main results regarding backgrounds summarised here: https://arxiv.org/pdf/2211.01166.pdf and a technical note (Animesh will report today)

2. Define from the golden channels the expected topology of the events and evaluate the reconstruction efficiency and detector effects for those particular channels. Geometry from NP02 and NP04 to be defined as close as possible

   Team: Animesh, Albert, Alex, Justo, Laura and PhD. Input from Salva, Josu, Filippo and Francesco’s
Trigger

- Define trigger primitives based on directionality (input from Salva and Josu about the interesting topologies)
- Evaluate the trigger activity
- As a second step trigger, ideas to use the trigger form the light can be studied
- Test and validation in 50 l and probably cold box
  - First results need to be ready by March

Team: Animesh, Alex, student from IFIC (to be confirmed), a student from CERN, input from Francesco, Giovanna
Outlook and plans

• Overall organisation carried out by Animesh and Laura.

• The responsible persons to coordinate each activity are:
  - Phenomenology studies: Pilar and Jacobo
  - Feasibility studies: Justo and Laura
  - Trigger developments: Animesh

• We will meet all regularly in a monthly-basis.