

DUNE
Atmospheric Neutrinos
and Nucleon Decay
WG Meeting

2015/10/26
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Nucleon Decay WG web page

Michel and I are working to come up to speed quickly; please help us to identify areas where work has already been done, or is in progress.

We have started by posting some information on the WG web page here:

<https://web.fnal.gov/collaboration/DUNE/SitePages/Nucleon%20Decay%20Working%20Group.aspx>

Fermilab

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[DUNE at Work](#) [DUNEscience.org](#) [LBNF](#) [LBNF at Work](#)

Nucleon Decay Working Group

Purpose:
Evaluate and demonstrate the experimental sensitivity of DUNE to various nucleon decay modes and other baryon number non-conserving processes.

Coordinator/Manager/Convenor:	Jen Raaf, Michel Sorel
Deputies:	
Email list:	dune-physics-pdk@fnal.gov (archives)

Associated working groups:

- Atmospheric Neutrinos Physics WG
- Cosmics/Cosmogenics Physics WG
- Far Detector Performance WG
- Far Detector Simulation and Reconstruction WG
- Far Detector Optimization Task Force

Tasks:

Name	Area of work or associated working group	Tasks
		Review comprehensive list of nucleon decay modes
		Survey of nucleon decay and n-nbar oscillation generators
		Sensitivities for key nucleon decay channels
	Atmospheric Neutrinos WG Cosmics/Cosmogenics WG	Study background rates and rejection capabilities
	Far Detector Simulation & Reco WG	Evaluate reconstruction capabilities
		Detection efficiency studies

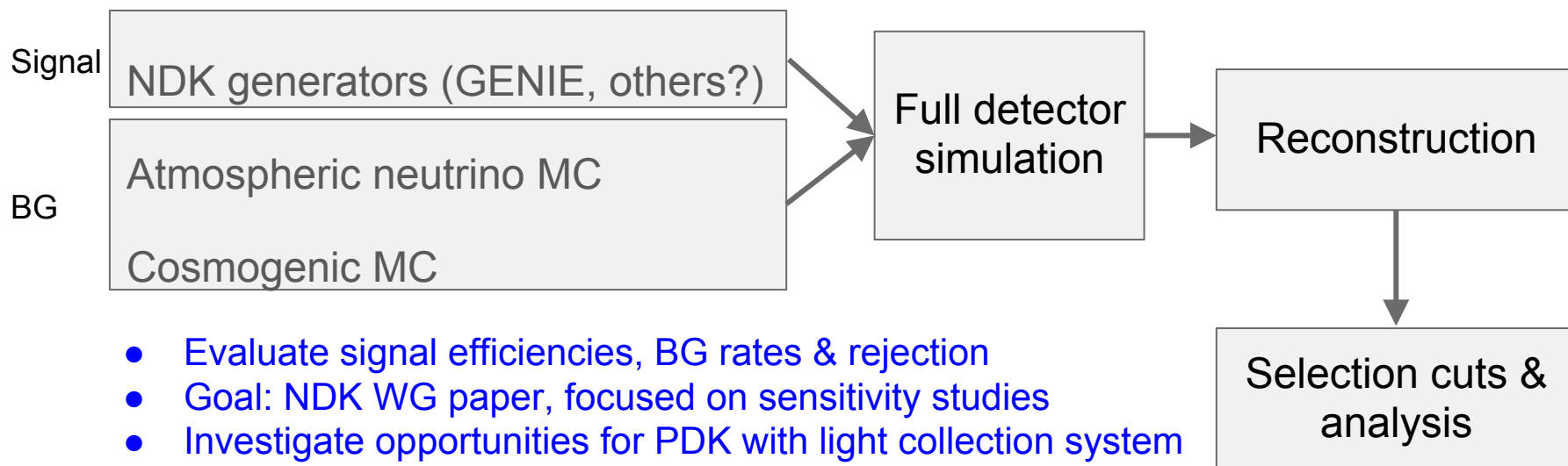
Short/Medium/Longer-term Tasks

1) Develop comprehensive list of nucleon decay modes (short-term)

- Identify promising modes for which we should do full simulations

2) Collect/unify useful documentation (short-term)

3) Evaluate tools for every link in the analysis chain (medium-term)



- Evaluate signal efficiencies, BG rates & rejection
- Goal: NDK WG paper, focused on sensitivity studies
- Investigate opportunities for PDK with light collection system
 - Triggering; Offline selection of PDK events

4) Cross-check sensitivities with real data (longer-term)

- How can real data be used in the short-term to feed into cross-checking simulations?
 - Test beam data: LArIAT/protoDUNE/WA105
 - Neutrino data: MicroBooNE/SBND
- What can we learn from these data that will be useful to NDK WG?

Tasks: a bit more detail

- **Detection efficiency studies**

Acceptance studies (vertex position, orientation, energy dependence)

Topology studies: kaon-decay kink recognition

Momentum resolution

Event reconstruction studies: decay vertex, mass, co-linearity, etc.

Impact of nuclear effects

- **Background rejection/evaluation studies**

Particle ID: p/K/pi/mu separation

Rejection of accompanying particles in atmospheric neutrino BG events?

De-excitation gamma studies

And of course, we will continue coordination with the atmospheric neutrino and cosmogenics WG efforts.

Call for contributors

Please let us know to which tasks you plan to contribute, or other tasks that we haven't explicitly listed here.

We look forward to productive and fruitful collaboration in the coming months!