

DUNE Collaboration Meeting

Fermilab, May 2017

NSI Working Group Status

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NSI Group tasks (writing)

- 1) produce and keep updated a literature database with all “relevant” NSI work related to long baseline neutrino experiments, particularly DUNE;
 - (a) Have regular discussions in this group about what we are learning from the literature.
- 2) write a tex document with sections about the specific contribution from each NSI subgroup; to be implemented later in official documents;

Improving session 4. Neutrino Mixing, Mass Hierarchy, and CP Violation – Search for Nonstandard Interactions

- Current “old” official document
 - [LBNE Science Book](#)
- Future DUNE document. Online for editing session 4
 - [Using overleaf with git...](#)

NSI Group tasks (computing)

- 1) integrate existing/known NSI/non-unitarity models in GLoBES and/or gain expertise in installing and running already existing tools in the DUNE nodes;
- 2) learn how to produce more realistic simulated DUNE NSI energy spectra by interfacing with the GLoBES simulation of the DUNE ND and FD;
- 3) produce realistic sensitivities using the whole framework built by doing items 1 and 2.

Improving the current limits and studying new cases

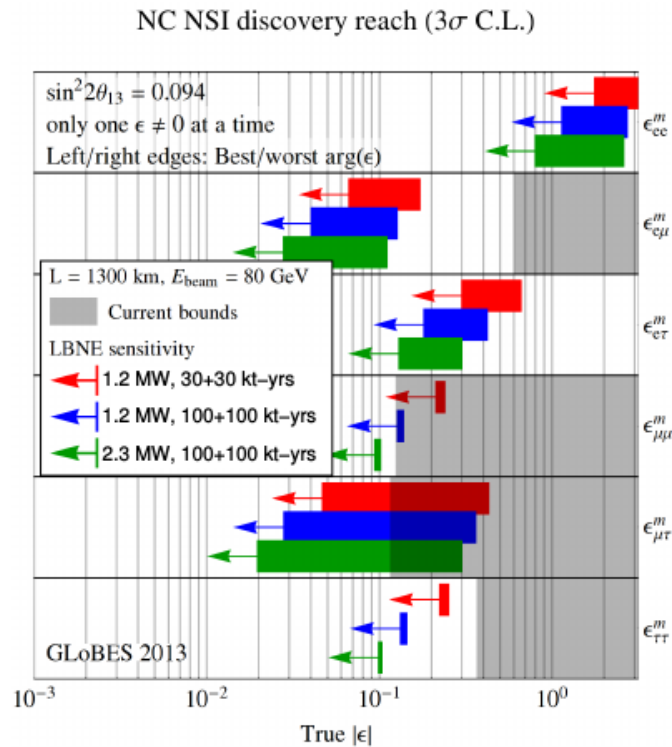
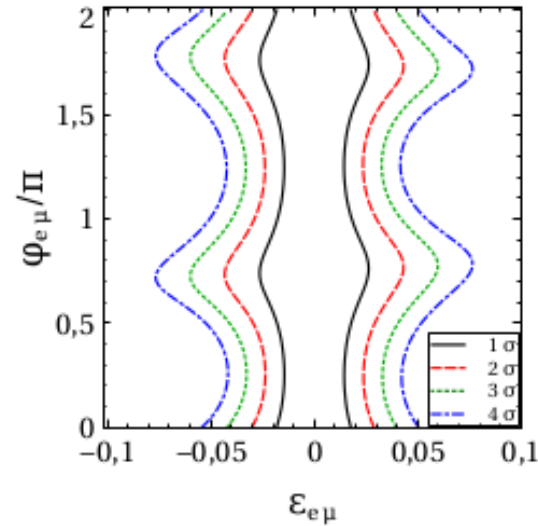


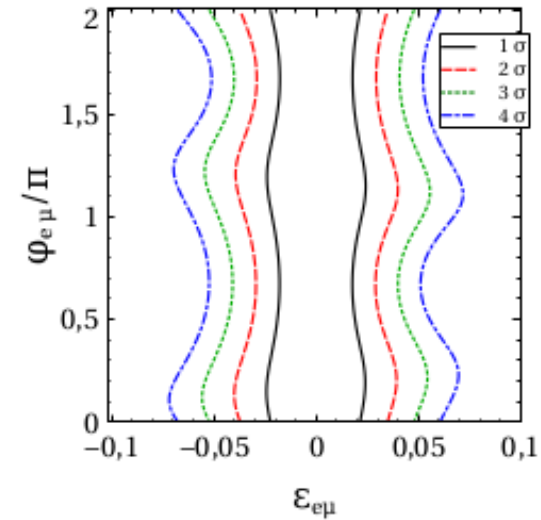
Figure 4.31: Nonstandard interaction discovery reach in LBNE with increasing exposure: 1.2 MW, 60 kt-years (red) + 1.2 MW, 200 kt · year (blue) + 2.3 MW, 200 kt · year (green). The left and right edges of the error bars correspond to the most favorable and the most unfavorable values for the complex phase of the respective NSI parameters. The gray shaded regions indicate the current model-independent limits on the different parameters at 3σ [172,173]. For this study the value of $\sin^2 2\theta_{13}$ was assumed to be 0.09. Figure courtesy of Joachim Kopp.

- New limits from others...
- Considering matter density variations
- Include new models from the literature as Non-Unitarity

Some recent results



NH

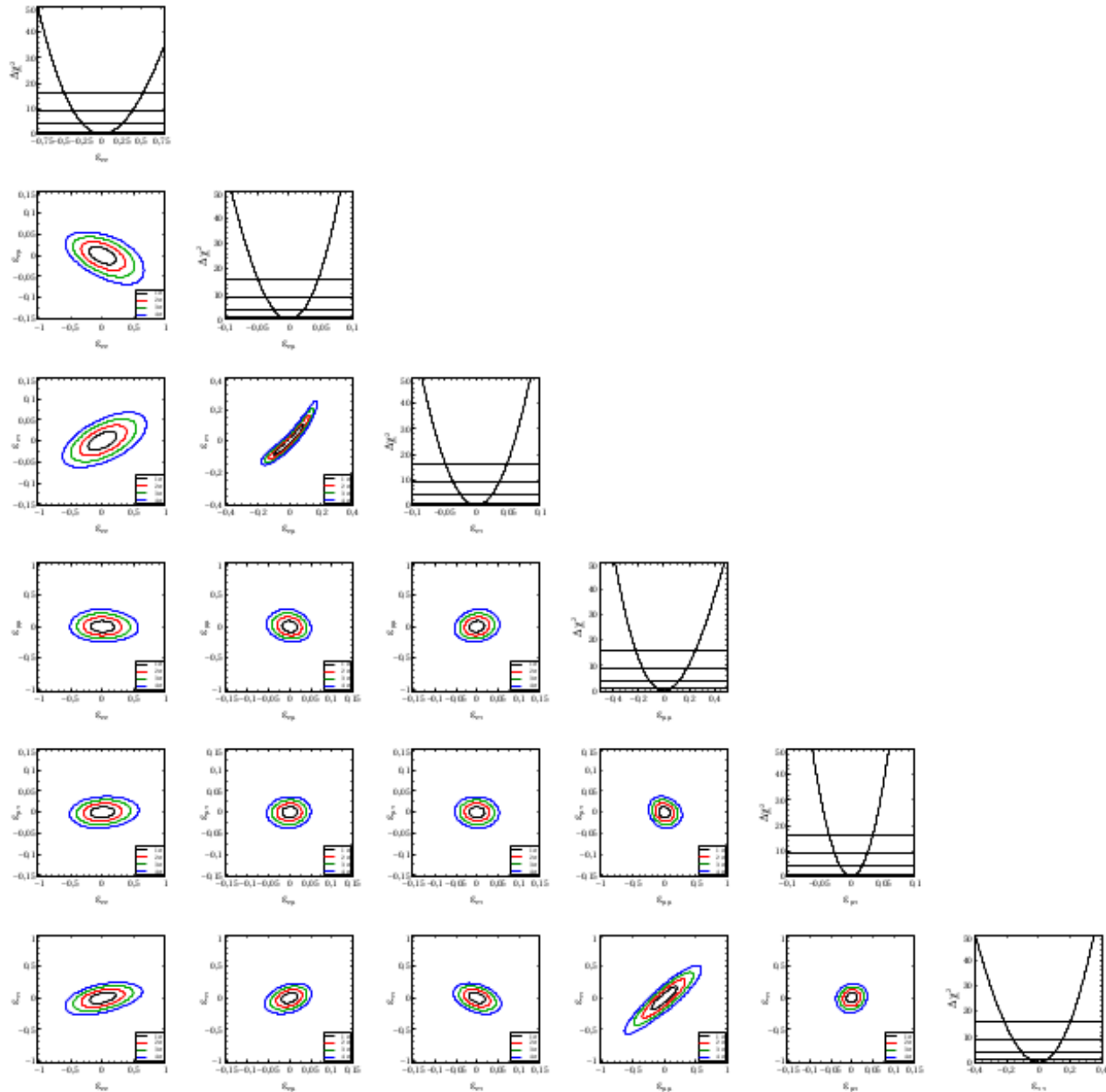


IH

Parâmetro	1 σ	2 σ	3 σ	4 σ
ϵ_{ee}	$[-0.22 \rightarrow 0.23]$	$[-0.36 \rightarrow 0.38]$	$[-0.495 \rightarrow 0.535]$	$[-0.63 \rightarrow 0.695]$
$\epsilon_{e\mu}$	$[-0.095 \rightarrow 0.09]$	$[-0.13 \rightarrow 0.12]$	$[-0.155 \rightarrow 0.15]$	$[-0.18 \rightarrow 0.17]$
$\epsilon_{e\tau}$	$[-0.015 \rightarrow 0.015]$	$[-0.025 \rightarrow 0.025]$	$[-0.04 \rightarrow 0.04]$	$[-0.05 \rightarrow 0.05]$
$\epsilon_{\mu\mu}$	$[-0.21 \rightarrow 0.205]$	$[-0.35 \rightarrow 0.33]$	$[-0.49 \rightarrow 0.455]$	$[-0.63 \rightarrow 0.58]$
$\epsilon_{\mu\tau}$	$[-0.085 \rightarrow 0.085]$	$[-0.135 \rightarrow 0.135]$	$[-0.185 \rightarrow 0.185]$	$[-0.23 \rightarrow 0.23]$
$\epsilon_{\tau\tau}$	$[-0.19 \rightarrow 0.18]$	$[-0.315 \rightarrow 0.295]$	$[-0.44 \rightarrow 0.4]$	$[-0.57 \rightarrow 0.51]$
$\phi_{e\mu}$	$[0 \rightarrow 2\pi]$	$[0 \rightarrow 2\pi]$	$[0 \rightarrow 2\pi]$	$[0 \rightarrow 2\pi]$
$\phi_{e\tau}$	$[0 \rightarrow 2\pi]$	$[0 \rightarrow 2\pi]$	$[0 \rightarrow 2\pi]$	$[0 \rightarrow 2\pi]$
$\phi_{\mu\tau}$	$[0 \rightarrow 2\pi]$	$[0 \rightarrow 2\pi]$	$[0 \rightarrow 2\pi]$	$[0 \rightarrow 2\pi]$

40+40kt in 3.5yr, NH

All sensitivities - preliminary




People currently involved

- Felipe Kamiya (my master's student), Gefan-Campinas (Marcelo Guzzo, Orlando Peres, David Vanegas and possibly others), Omar Miranda, Valencia (Mariam Tortola, Gabriela Berenboim) and maybe others
- If you would like to get involved, please, contact Jae, Alex, or Celio

NSI Group Tools

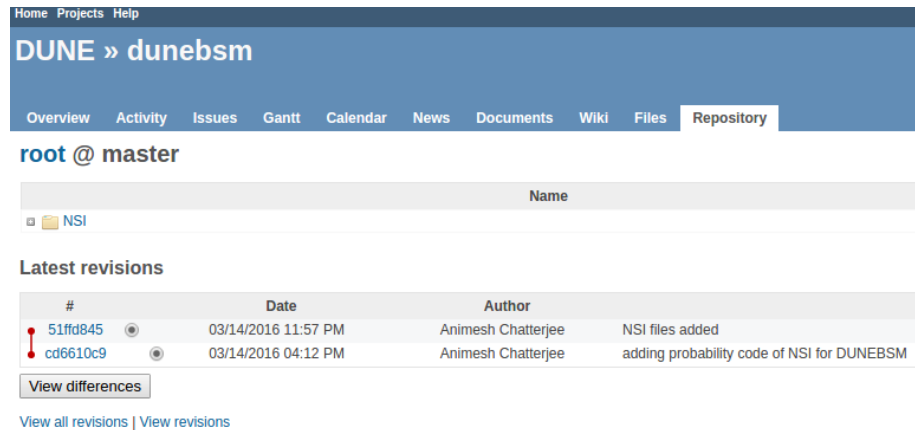
BSM Wiki



The screenshot shows the top portion of a web browser displaying the DUNE BSM Wiki. At the top, there is a navigation bar with links for 'Home', 'Projects', and 'Help'. Below this, a blue header bar contains the text 'DUNE » dunebsm'. Underneath the header is a secondary navigation menu with links for 'Overview', 'Activity', 'Issues', 'Gantt', 'Calendar', 'News', 'Documents', 'Wiki' (which is highlighted), 'Files', and 'Repository'. The main content area below the navigation menu starts with the heading 'DUNE BSM Wiki'. Underneath this heading, there is a link for 'New-User Documentation: Getting Started'. Further down, there are three lines of text providing links to BSM Indico meetings: 'BSM Indico meetings: <https://indico.fnal.gov/categoryDisplay.py?categId=501>', '(UTA2016 collaboration meeting <https://indico.fnal.gov/conferenceOtherViews.py?view=standard&confId=10276>)', and '(FNAL2015 collaboration meeting <https://indico.fnal.gov/conferenceOtherViews.py?view=standard&confId=10100>)'. At the bottom of the screenshot, there is a note: 'All documents should be stored in DUNE docdb: <http://docs.dunescience.org:8080/cgi-bin/DocumentDatabase>. Please, don't forget to add "BSM" among your keywords and topics when uploading docs.'

- <https://cdcv.s.fnal.gov/redmine/projects/dunebsm/wiki>
- Page concentrating all the BSM group information
- Easy access to the repository

BSM Repository



The screenshot shows the web interface of the DUNE » dunebsm repository. At the top, there are navigation links: Home, Projects, and Help. Below that, the breadcrumb path is DUNE » dunebsm. A secondary navigation bar includes Overview, Activity, Issues, Gantt, Calendar, News, Documents, Wiki, Files, and Repository (which is highlighted). The user is logged in as root @ master. A tree view shows a folder named NSI. Below this, the 'Latest revisions' section contains a table with the following data:

#	Date	Author	
51ffd845	03/14/2016 11:57 PM	Animesh Chatterjee	NSI files added
cd6610c9	03/14/2016 04:12 PM	Animesh Chatterjee	adding probability code of NSI for DUNEBSM

Below the table, there is a 'View differences' button and two links: 'View all revisions' and 'View revisions'.

- <https://cdcvns.fnal.gov/redmine/projects/dunebsm/repository>
- Page where to find the NSI code for GloBES
- Alternatively:
 - Enrique Fernandez-Martinez (UAM) et al.
 - <http://www.theophys.kth.se/~mbl/montecubes/>

Previous meetings

- NSI subgroup meetings (to help people getting started)
 - <https://drive.google.com/drive/>
- BSM Physics meetings and documents (many concerning NSI)
 - <https://indico.fnal.gov/>
 - <http://docs.dunescience.org>