Brief update on LBL baseline model work

S. Dolan, R. Gran, J. Kim, L. Munteanu, B. Radics

YORK UNIVERSITÉ UNIVERSITY

Baseline model validations

- See Laura M's talk on 29.08.2022: baseline model validation tasks
  - Dials for each interaction modes, defining validation plots, look at variables, etc.

    - Very fruitful discussions at the DUNE LBL workshop
    - We now have a preliminary plan for the organisation of DIRT2 work for OA analyses
    - Started a T2K-inspired spreadsheet
      - Contains dials for each interaction mode + action items, priorities and people responsible for different tasks

DUNE ND TDR Dials

File Edit View Insert Format Data Tools Extensions Help Last edit was 1 hour ago

Share

	Name	Name (Engine)	Type	Central Value	Prior Uncertain	Notes	Status	Priority	Responsible
2	Rvn1p		GENIE RW			Change xsec of transition region		2	Rik+Anne
3	AGKY		GENIE RW			Multiplicity dials		2	Anne+Rik
4	BY parameters		GENIE RW					2	Rik+Anne
5	non RES background							2	Richie
6	Revisiting the W cut off					Investigative work		4	Rik
7	Multiplicty madness							2	Stephen + Laura
8	Q2 tweaks ad hoc beyond BY							3	Rik
9	Energy fraction to neutrons							1	Stephen + Laura
10	AMU					Alt model RW		3	Rik

Example for SIS/DIS dials

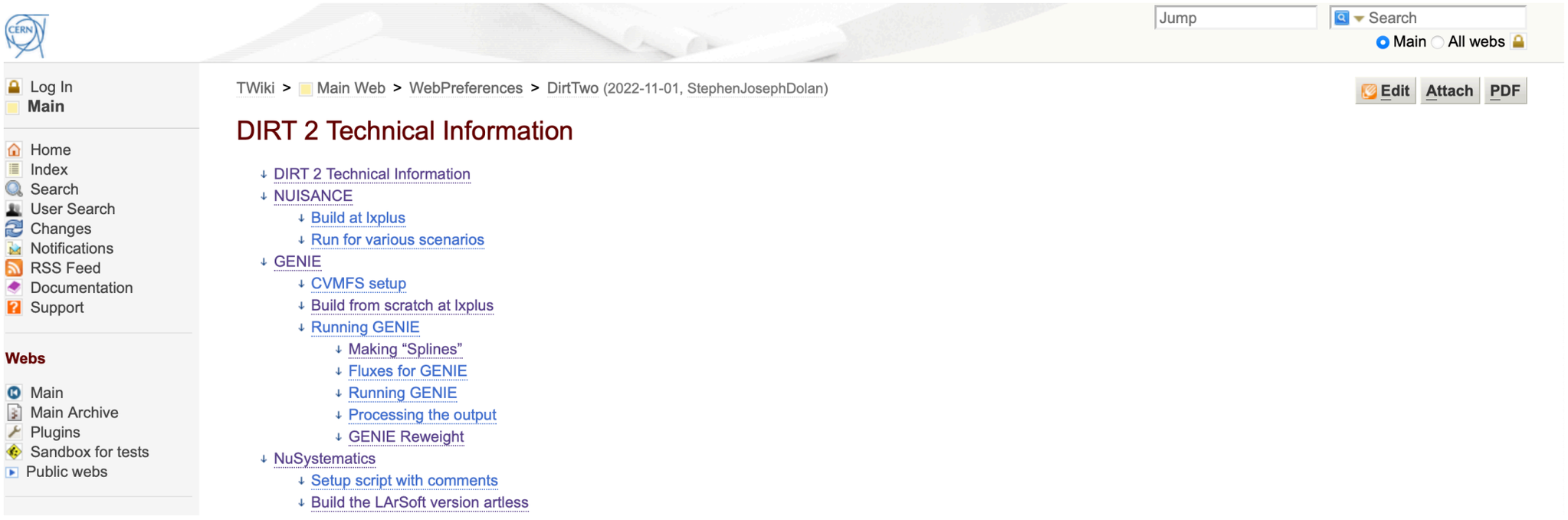
CCQE | 2p2h | Res | SIS/DIS | "Nightmares" | FSI | Misc | Fake data studies | Validatio | Explore

Baseline model validations software

- Genie version: **v3.02.00**, Genie Reweight: **v1.02.00**
- Update: Nusystematics works with Genie v3 + Genie Reweight
- Validation scheme:
  - Genie -> ModelVar -> Nuisance
  - Genie -> Nusystematics reweight -> Nuisance
- Technical steps:
  - Nusystematics out of LArSoft is compatible with Genie v3 but needs art-system to build
  - We wanted to have an ‘artless’ Nusystematics to work with Genie v3 to run cross-section model reweights independently .
  - Used Luke P’s Nusystematics CMakeLists.txt to build the LArSoft version ‘artless’.
  - Updates to Genie and Genie Reweight library name changes to link against.
  - A few interface changes in the Nusystematics code when calling Genie functions.

Collecting software build/run steps: Nuisance, Nusys, Genie+RW

- To facilitate the base model validation tasks



https://twiki.cern.ch/twiki/bin/view/Main/DirtTwo

Validation example: MaCCQE

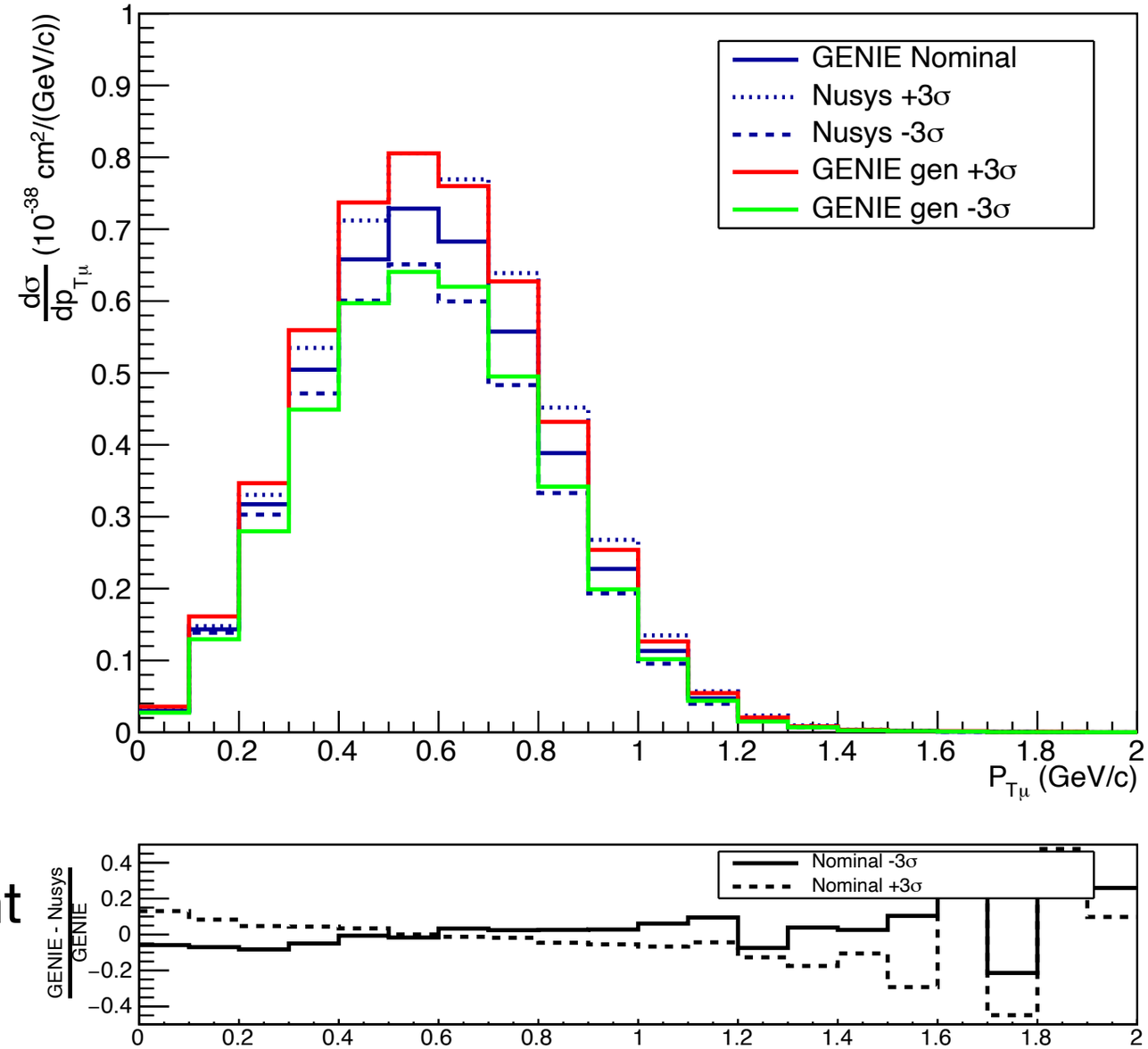
- ν_μ-Ar CCQE events generated by GENIE 3.02.00, G18_10a (Default Genie, LFG, FSI hA2018)
- DUNE ν_μ flux
- QEL-Ma parameter in G18_10a config/GSystUncertaintyTable.xml and CommonParam.xml
  - Nominal value: 0.990
  - +/- 1sigma: 0.03

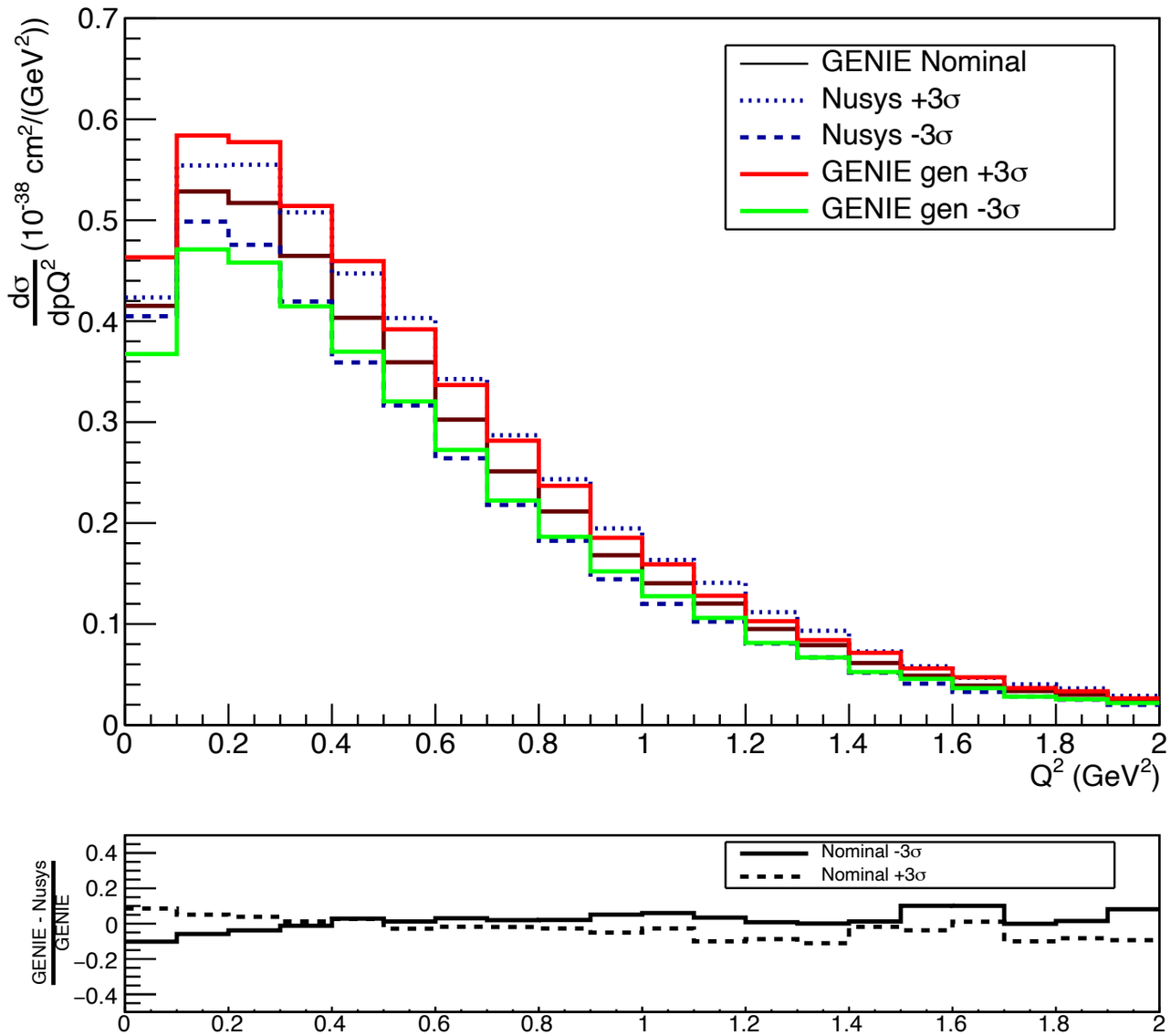
GENIE

```
<param_set name="QuasiElastic">
  <!--
      ~~~
```

Validation example: MaCCQE

- ν_μ-Ar CCQE events generated by GENIE 3.02.00, G18_10a (Default Genie, LFG, FSI hA2018)
- DUNE ν_μ flux
- QEL-Ma parameter
  - Nominal value: 0.99
  - +/- 1sigma: 0.03
- Qualitative agreement between Nusystematics reweights and GENIE regenerated +/- 3sigma
- [Difference probably due to Nusystematics dialing slightly different parameter value/sigma/knot(?)]



Validation example: MaCCQE

- ν_μ-Ar CCQE events generated by GENIE 3.02.00, G18_10a (Default Genie, LFG, FSI hA2018)
- DUNE ν_μ flux
- QEL-Ma parameter
  - Nominal value: 0.99
  - +/- 1sigma: 0.03
- Qualitative agreement between Nusystematics reweights and GENIE regenerated +/- 3sigma
- [Difference probably due to Nusystematics dialing slightly different parameter value/sigma/knot(?)]