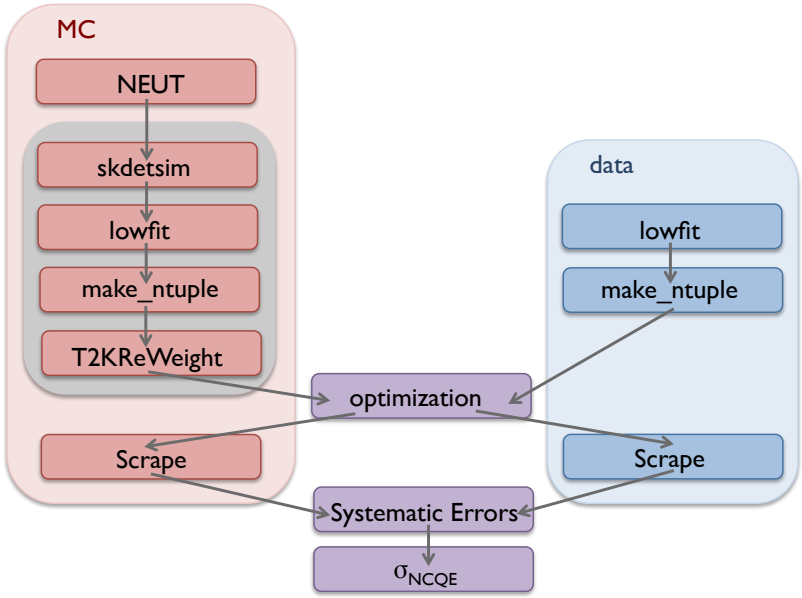
ncgamma analysis tools



Corina Nantais
Group meeting
18 May 2017

NEUT cards come from T2K MC

neut_num.card

neut_nue.card

neut_nmb.card

Put on svn from Huang-san's modified NEUT 5.1.4.2

Must move from svn to ncgamma/mc/neut/neut_5.3.2/src/t2kflux_zbs/

→ emailed Xiaoyue

Look like the cards used to generate T2K MC. Thinks Okumura-san used:

/disk01/sklb2/t2kmc/t2kmc_14c/t2k_neut_5.3.2_vectors/Cards/

e.g., neut_5.3.2_numu.card

standalone skdetsim for .dat generated by NEUT

- immediately after generated AND after neut_select to remove high energy events
- Fukuda-san told me to use his sample.card and test.csh
- test.csh just does ./skdetsim

- mv sample.card sample.card.bk
- SKCNTL-FILEFORMAT 0 → change to 1
  learned from SKLOWE school notes, to do with zbs and root,
  maybe why error that output.root is not a root file

- make
- ./test.csh
- took like 2h
- output.root not a ROOT file

```
~/ncgamma/mc/skdetsim/output@sukap001[349]_% root -l output.root
*** DISPLAY not set, setting it to 10.30.4.37:0.0
root [0]
Attaching file output.root as _file0...
Error in <TFile::Init>: output.root not a ROOT file
root [1]
```

- h2root output.hbk
- h1.Print()
- 3000 events, as expected

- compare branches
  from NEUT 5.3.2 (recently generated)
  to NEUT 5.1.4.2 (17 Jan 2016)

```
root [2] h1.Print()
******************************************************************************
*Tree    :h1        : dst                                                    *
*Entries :     3000 : Total =          605963 bytes  File  Size =     170058 *
*        :          : Tree compression factor =   3.50                       *
******************************************************************************
*Br    0 :year      : year/I                                                 *
*Entries :     3000 : Total  Size=      12539 bytes  File Size  =        154 *
*Baskets :        1 : Basket Size=      64000 bytes  Compression=  78.37     *
*.............................................................................*
*Br    1 :nev       : nev/I                                                  *
*Entries :     3000 : Total  Size=      12534 bytes  File Size  =       4296 *
*Baskets :        1 : Basket Size=      64000 bytes  Compression=   2.81     *
*.............................................................................*
*Br    2 :numnu     : numnu/I                                                *
*Entries :     3000 : Total  Size=      12544 bytes  File Size  =       1737 *
*Baskets :        1 : Basket Size=      64000 bytes  Compression=   6.95     *
*.............................................................................*
*Br    3 :mode      : mode/I                                                 *
*Entries :     3000 : Total  Size=      12539 bytes  File Size  =       2899 *
*Baskets :        1 : Basket Size=      64000 bytes  Compression=   4.16     *
*.............................................................................*
*Br    4 :ipnu      : ipnu[numnu]/I                                          *
*Entries :     3000 : Total  Size=      70740 bytes  File Size  =      15761 *
*Baskets :        2 : Basket Size=      64000 bytes  Compression=   4.45     *
*.............................................................................*
*Br    5 :pnu       : pnu[numnu]/F                                           *
*Entries :     3000 : Total  Size=      70741 bytes  File Size  =      58208 *
*Baskets :        2 : Basket Size=      64000 bytes  Compression=   1.21     *
*.............................................................................*
*Br    6 :ncap      : ncap/I                                                 *
*Entries :     3000 : Total  Size=      12539 bytes  File Size  =        154 *
*Baskets :        1 : Basket Size=      64000 bytes  Compression=  78.37     *
*.............................................................................*
*Br    7 :nchtot    : nchtot/I                                               *
*Entries :     3000 : Total  Size=      12549 bytes  File Size  =       8994 *
*Baskets :        1 : Basket Size=      64000 bytes  Compression=   1.34     *
*.............................................................................*
*Br    8 :nprmg     : nprmg/I                                                *
*Entries :     3000 : Total  Size=      12544 bytes  File Size  =       4320 *
*Baskets :        1 : Basket Size=      64000 bytes  Compression=   2.79     *
*.............................................................................*
*Br    9 :nprmpi    : nprmpi/I                                               *
*Entries :     3000 : Total  Size=      12549 bytes  File Size  =       3273 *
*Baskets :        1 : Basket Size=      64000 bytes  Compression=   3.69     *
*.............................................................................*
*Br   10 :npidr     : npidr/I                                                *
*Entries :     3000 : Total  Size=      12544 bytes  File Size  =       3116 *
*Baskets :        1 : Basket Size=      64000 bytes  Compression=   3.87     *
*.............................................................................*
*Br   11 :npidc     : npidc/I                                                *
*Entries :     3000 : Total  Size=      12544 bytes  File Size  =       1150 *
*Baskets :        1 : Basket Size=      64000 bytes  Compression=  10.50     *
*.............................................................................*
```

neut_select

- was having trouble, I think because of changes from DISK to LOCAL
- in the end, compared to Fukuda-san's
  1) ran Fukuda-san's modified copy of Huang-san's (messy)
  2) ran a cleaned up version of Fukuda-san's
  3) modified my copy to be like Fukuda-san's
- actually, I had made all of the correct changes
  - maybe a problem with naming, from 514 (NEUT 5.1.4.2) to 532 (NEUT 5.3.2)
  - maybe a problem with formatting, specifically line continuation "&" in Fortran

```
c*** open output zbs file for selected events
ccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
C      call set_rflist(luno, fname_out,'DISK',' ','RPL',' ',' ',
      call set_rflist(luno, fname_out,'LOCAL',' ','RPL',' ',' ',
     &     'recl=5670 status=unknown',' ','0644')
      call skopenf(luno,0,'z',ierr)

c*** main loop
      do i = 4, narg

c*** get input file name
         call getarg(i, fname_in)

c*** open input rfm file
         if (fname_in(1:5) .eq. '/disk') then
            call set_rflist(10,fname_in,'DISK',' ','RED',' ',' ',
     &           'recl=5670 status=old',' ',' ')
            print *, 'open as DISK: ', fname_in(1:lenchr(fname_in))
         else
            call set_rflist(10,fname_in,'LOCAL',' ','RED',' ',' ',
     &           'recl=5670 status=old',' ',' ')
            print *, 'open as LOCAL: ', fname_in(1:lenchr(fname_in))
         endif
```

skcount_num.F (nue, nmb)

standalone skdetsim for .dat by neut_select/

NEUT 5.3.2 (recently generated)

- 1214 events

NEUT 5.1.4.2 (17 Jan 2016)

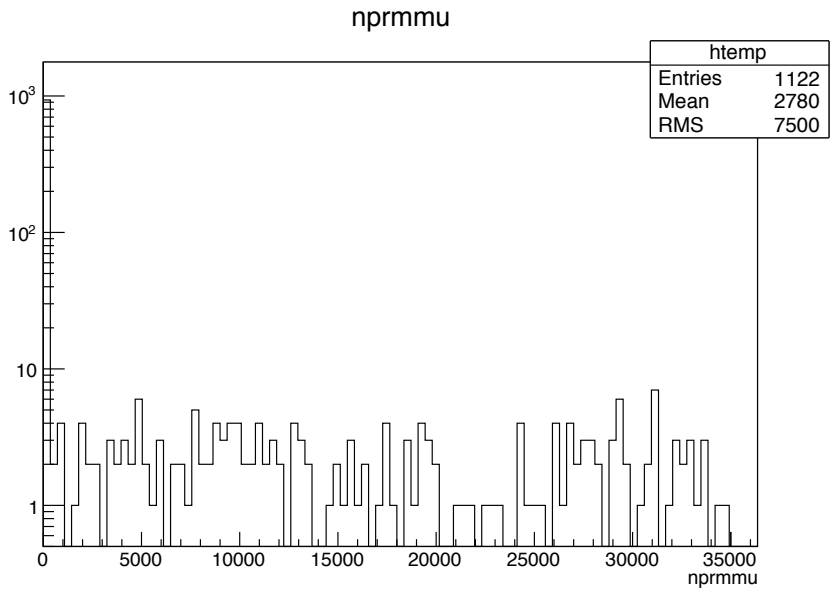
- 1122 events

Most of the plots of the 39 branches looks the same,
except for the following 3 branches:

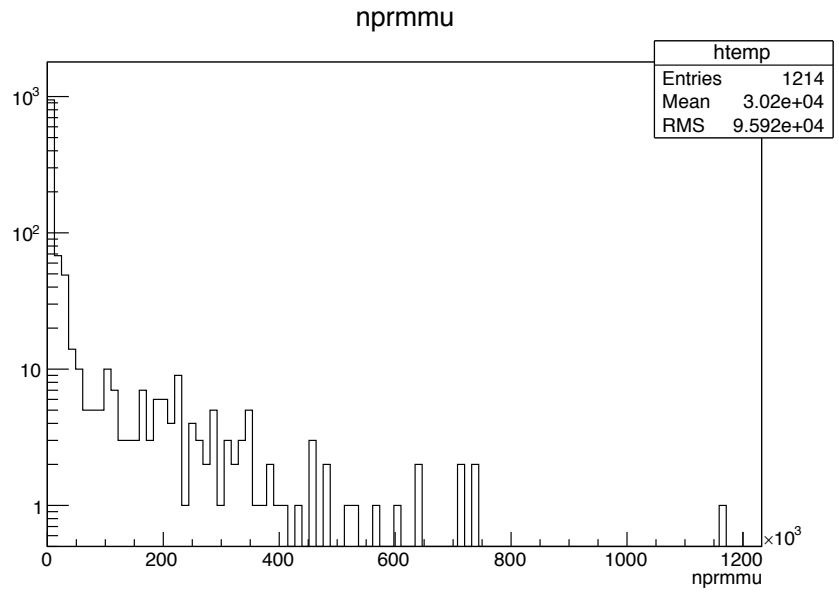
nprmmu

- 514 select looks different than 532 select,
  and different than 514 and 532 (before neut_select/)

187 events > bin 1



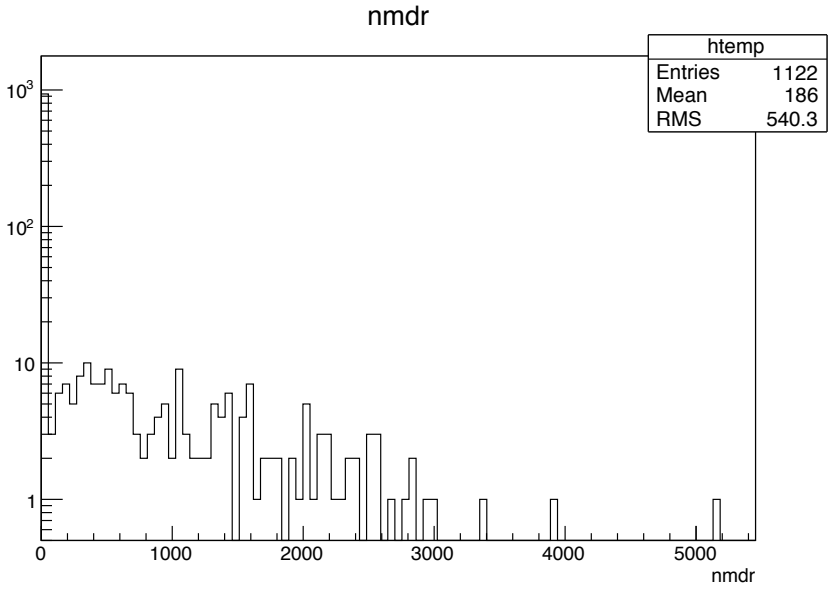
269 events > bin 1



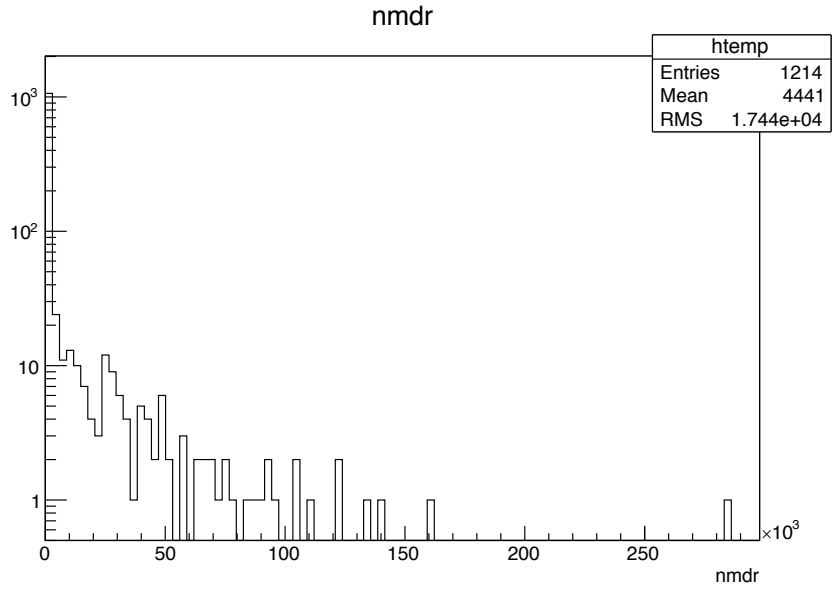
nmdr

- 514 select looks different than 532 select (and 514 and 532)

187 events > bin 1



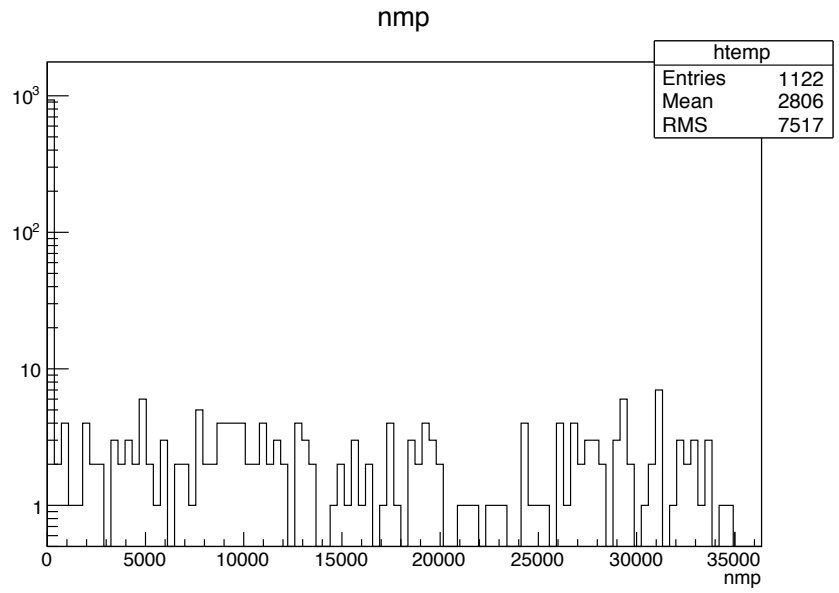
151 events > bin 1



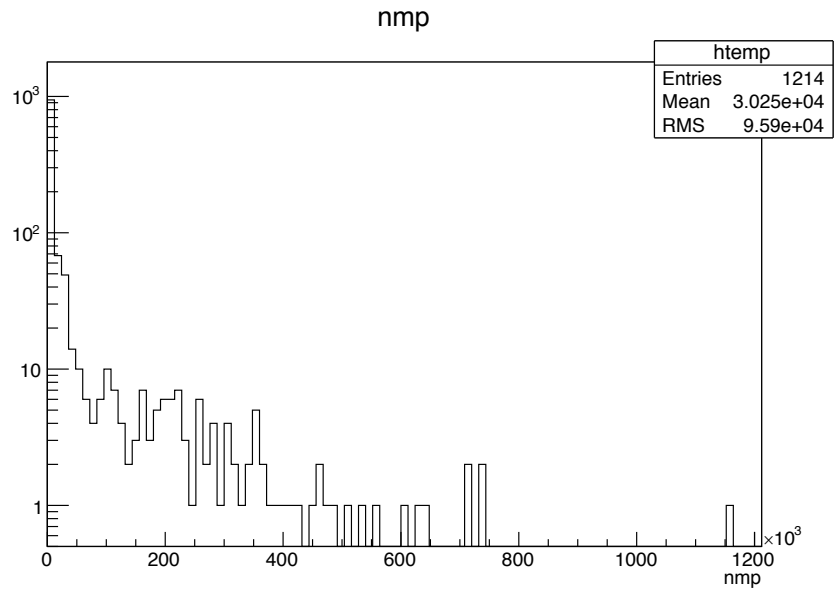
nmp

- 514 select looks different than 532 select, and 514 and 532

190 events > bin 1



271 events > bin 1



T2KReWeight v1r27p2

Compare Alex v1r15p1 to v1r27p2

- ncgamma/T2KReWeight/

```
[~/ncgamma/T2KReWeight@sukap001[332]_% ls
BANFF.sh          NIWG.sh              genWeightsNC_NIWG.cxx
BANFF_PREFIT.sh   PrepareBanffNQS.py   genWeights_2012a.cxx
FLUX_PREFIT.sh    XSEC_PREFIT.sh       genWeights_ncgamma.cxx
MAQE.sh           env.csh
Makefile          env.sh
```

genWeightsNC_NIWG.cxx, genWeights_2012a.cxx, genWeights_ncgamma.cxx
are all in T2KReWeight/TestVer/app/

genWeightsNC_NIWG.cxx and genWeights_ncgamma.cxx
are modified by Alex, I think

Kendall Skype

Short term:

1) T2KReWeight v1r27p2 on OA sample
   minituples hosted somewhere, get weights, ttree them, compare
   → search t2k.org

2) T2KReWeight v1r27p2 without modifications on ncgamma
   next, with ncgamma Processing scripts

3) T2KReWeight v1r27p2 modified by mirroring Alex's genWeights_ncgamma.cxx
   confirm that he actually turns off NCQE reweighting

4) T2KReWeight v1r27p2 without reweighting on OA sample

Kendall Skype

Long term:

- read TN-263 on XSEC best practices
- read Stephan Dolan's slides from XSEC workshop
- read Callum's talk on 1 bin measurements to be in XSEC premeeting (also in CC0pi+2p2h notes)
- problems with efficiency
  - can't turn 1 event into a distribution
  - phase space, maybe invesitgate with Gibuu
- read Dan Ruterbories P0D NCQE thesis
  - compare to his (old) T2KReWeight systematics
  - can look at shape uncertainties (?) e.g., CC background, but maybe not because only 4% of ncgamma events
  - use MAQE for NC as a stand in?
- read work by Pierre Lasorak from January CM or NIWG meetings
  - pion spectrum uncertainties, W shape error (?)

T2KReWeight r27 on ncgamma

my_setup.csh

setenv T2KREWEIGHT /home/cnantais/ncgamma/T2KReWeight_v1r27p2

setenv NEUT_ROOT /usr/local/sklib_gcc4.8.5/neut_5.3.3_Eb_patch
is that ok?

source my_setup.csh

Alex wrote scripts for T2KReWeight

(from t2k.org instructions)

T2KReWeight

The executable requires a number of command line options. The easier way is to use the shell scripts:

XSEC_PREFIT.sh

FLUX_PREFIT.sh

NIWG.sh

BANFF.sh

BANFF_PREFIT.sh

MAQE.sh

BANFF.sh, BANFF_PREFIT.sh, FLUX_PREFIT.sh, XSEC_PREFIT.sh

```
#!/bin/sh
source ~ahimmel/skenv.sh
source /home/cnantais/ncgamma/T2KReWeight/env.sh
cd /home/cnantais/ncgamma/T2KReWeight
infile=$1
outfile=banff/banff.`basename $infile`
log=logs/${outfile/root/log}
echo "$infile -> $outfile"
/home/cnantais/ncgamma/T2KReWeight/genWeights_ncgamma.exe -i $infile -o $outfile -t 500 -p ~ahimmel/ana/T2K/banff/postfit/postfit_banff_v7_osc_marg.root  >& $log
```

#source ~ahimmel/skenv.sh
source /home/cnantais/ncgamma/skenv_py.csh
(all scripts)

#source /home/cnantais/ncgamma/T2KReWeight/env.sh
source /home/cnantais/ncgamma/T2KReWeight_v1r27p2/my_setup.csh
(all scripts, except NIWG.sh)

cd /home/cnantais/ncgamma/T2KReWeight
(all scripts)
is this ok? keep scripts in here, but don't use executables from here

BANFF.sh, BANFF_PREFIT.sh, FLUX_PREFIT.sh, XSEC_PREFIT.sh

```
#!/bin/sh
source ~ahimmel/skenv.sh
source /home/cnantais/ncgamma/T2KReWeight/env.sh
cd /home/cnantais/ncgamma/T2KReWeight
infile=$1
outfile=banff/banff.`basename $infile`
log=logs/${outfile/root/log}
echo "$infile -> $outfile"
/home/cnantais/ncgamma/T2KReWeight/genWeights_ncgamma.exe -i $infile -o $outfile -t 500 -p ~ahimmel/an
```

```
~/ncgamma/T2KReWeight_v1r27p2/app@sukap001[371]_% ls
CVS
Makefile
genWeightsFromGHEPTree.cxx
genWeightsFromGRooTracker_FluxTuningexample.cxx
genWeightsFromNRooTracker_BANFF_2015.cxx
genWeightsFromNRooTracker_BANFF_2016.cxx
genWeightsFromNRooTracker_BANFFv2_2013.cxx
genWeightsFromNRooTracker_BANFFv2_2014.cxx
genWeightsFromNRooTracker_BANFFv3_2014.cxx
genWeightsFromNRooTracker_ND280_NIWG_Validation.cxx
genWeightsFromNRooTracker_NEUTexample.cxx
genWeightsFromNRooTracker_TrkrNuMu.cxx
genWeightsFromNeutroot_example.cxx
genWeightsFromSK_FSIandSI.cxx
genWeightsFromSK_NIWG2015.cxx
genWeightsFromSK_NIWGexample.cxx
genWeightsSKsplines_NIWG.cxx
genWeightsSKsplines_NIWG.exe
genWeightsSKsplines_NIWG.o
genWeightsSKsplines_NIWG2015.cxx
genWeightsSKsplines_NIWG2015.exe
genWeightsSKsplines_NIWG2015.o
genWeightsSKsplines_NIWG_BeRPA.cxx
genWeightsSKsplines_NIWG_BeRPA.exe
genWeightsSKsplines_NIWG_BeRPA.o
genWeights_2012a.cxx
genWeights_2013a.cxx
genWeights_2015.cxx
genWeights_2015.exe
genWeights_2015.o
genWeights_SK_2016.cxx
genWeights_SK_2016.exe
genWeights_SK_2016.o
genWeights_SK_SFRFG_RPA.cxx
genWeights_SK_SFRFG_RPA.exe
genWeights_SK_SFRFG_RPA.o
generate_ND280_Systematics_Covariance_2015.cxx
martini_nieves_ratio.root
throwParmsFromJnuBeam.cxx
```

- have to make genWeights_ncgamma_cn, by comparing to Alex's code
- which genWeights to start with in T2KReWeight_v1r27p2/app/?
- not TN-263, look at other T2KReWeight tech notes

- where to find postfit_banff_v7_osc_marg.root, or its equivalent?
- use ahimmel for now?

MAQE.sh

- needs genWeightsNC_MAQE.exe from TestVer/app/

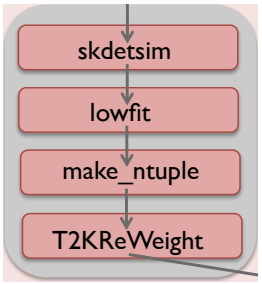
```
#!/bin/sh
source ~ahimmel/skenv.sh
source /home/cnantais/ncgamma/T2KReWeight/env.sh
cd /home/cnantais/ncgamma/T2KReWeight
infile=$1
outfile=maqe.`basename $infile`
log=logs/${outfile/root/log}
echo "$infile -> $outfile"
genWeightsNC_MAQE.exe -i $infile -o $outfile  >& $log
```

why is genWeightsNC_MAQE.exe in TestVer/app/, but not cnantais/ncgamma/T2KReWeight/?

NIWG.sh

needs genWeightsNC_NIWG.exe in cnantais/ncgamma/T2KReWeight/

ProcessNCEL_mc.sh



For processing the MC, Alex wrote an automated tool
ncgamma/Processing/ProcessNCEL_mc.sh

This script does simulation, reconstruction, ntuples, and reweighting.
Produces the output root ntuples.

#export odir=/disk/usr4/$USER/lemc
export odir=/disk01/usr4/$USER/lemc

#export vecdir=/disk/usr4/cnantais/neutfile/select/
export vecdir=/disk01/usr4/cnantais/neutfile/select/

source $HOME/ncgamma/T2KReWeight/env.sh
source $HOME/ncgamma/T2KReWeight_v1r27p2/my_setup.csh
is that ok?

source ~ahimmel/skenv.sh | tee -a $log
source $HOME/ncgamma/T2KReWeight_v1r27p2/my_setup.csh | tee -a $log
is this ok? I don't know what "| tee –a &log" means?

ncgamma/Processing/PrepareNQS.py

#batchdir = "/disk/usr4/cnantais/batchlogs"

batchdir = "/disk01/usr4/cnantais/batchlogs”

Are nqs/ and nqs_list_allmc created by PrepareNQS.py?

Test with 1 file first

./ProcessNCEL_mc.sh 001 numu
(before python PrepareNQS.py and ./nqs_list_allmc)

Using scripts with r27

- maybe cp all scripts from T2KReWeight/ to T2KReWeight_v1r27p2

Japan trip

T2K-SK premeeting

5-10 min update on ncgamma analysis tools, specifically improvements to MC

T2K-exotics

short update on incorporating BdNMC

21 May – 28 May: Minouchi

28 May – 05 June: SK dorm (3rd shift)

- drive by myself on Sunday
- park car at Sophie's hotel, Manten, on Monday and then bus back to Kamioka
- rides to SK CM from others in dorm
  (Gianmaria, Kasia, Piotr, Chris Walter, Kate, Ed Kearns,
  plus Japanese names I need to google translate)