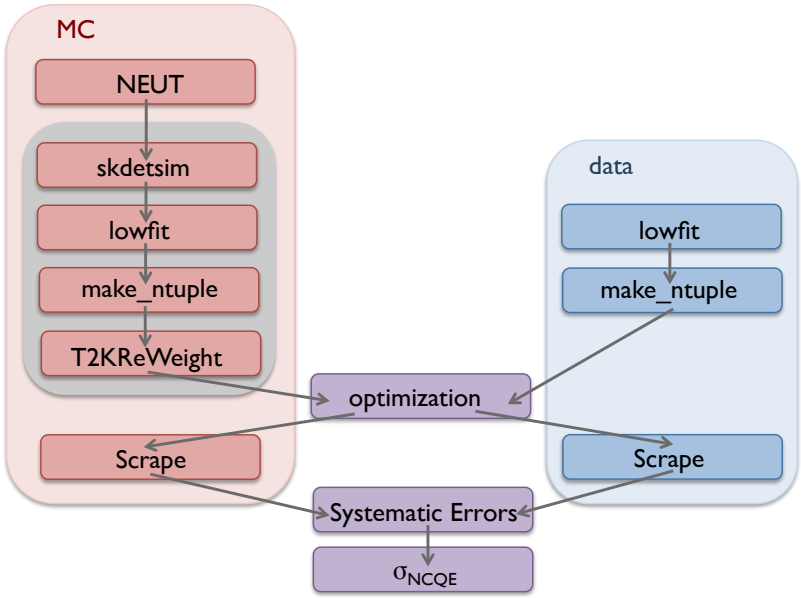
Corina Nantais
group meeting
09 November 2017



SelectionFigures

- compared to TN-244, current work seems to have **more cc** and **less nc other**

Possible explanations

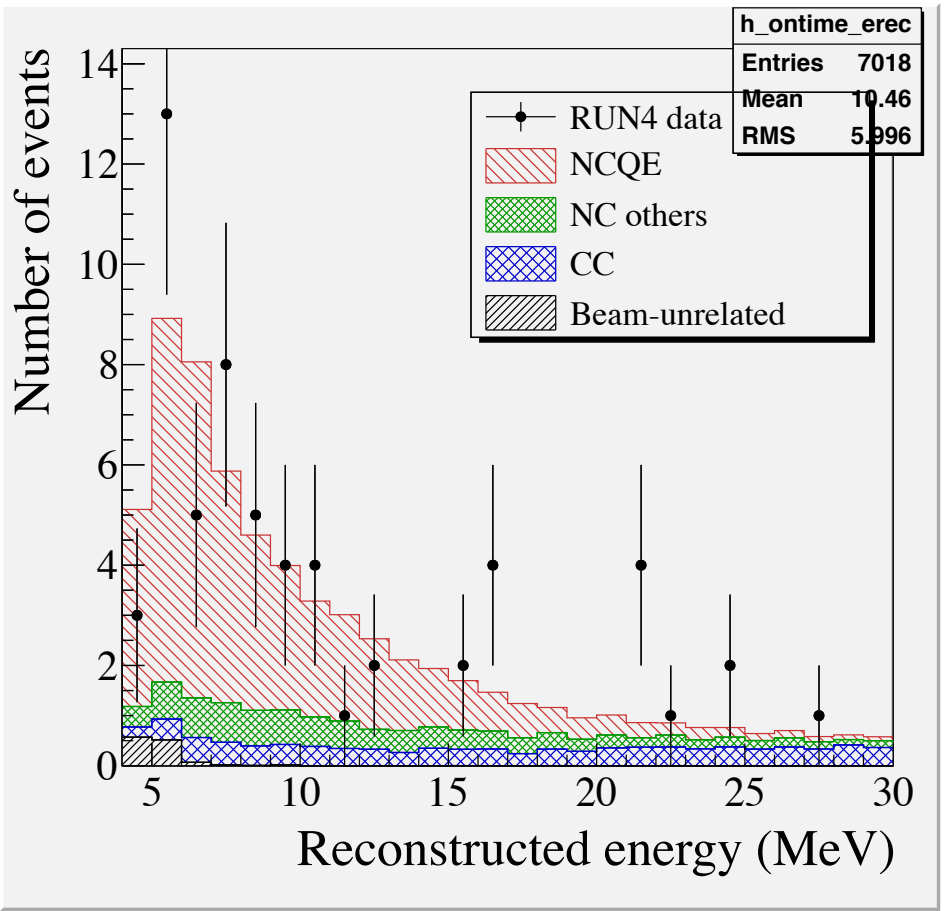
- NEUT 5.3.3 instead of 5.3.2
- Prob3++ instead of SterileAna
- T2KReWeight updated

Hiro suggestions

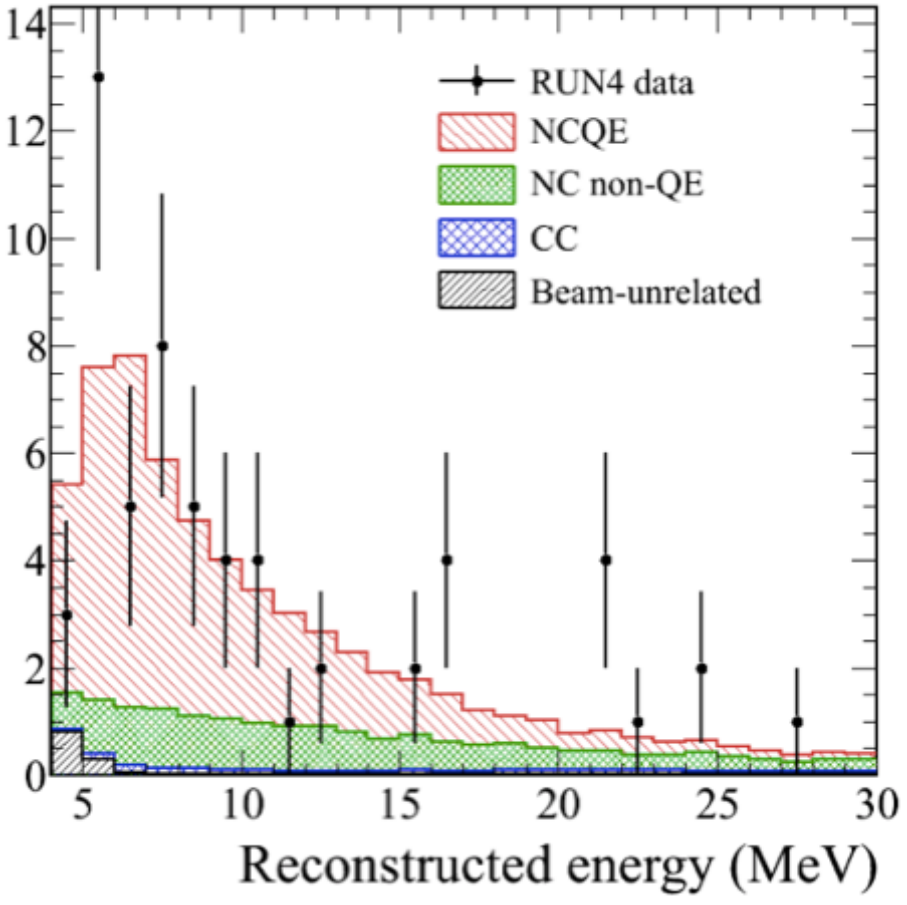
- number of events
- neut mode

erec

26 October 2017



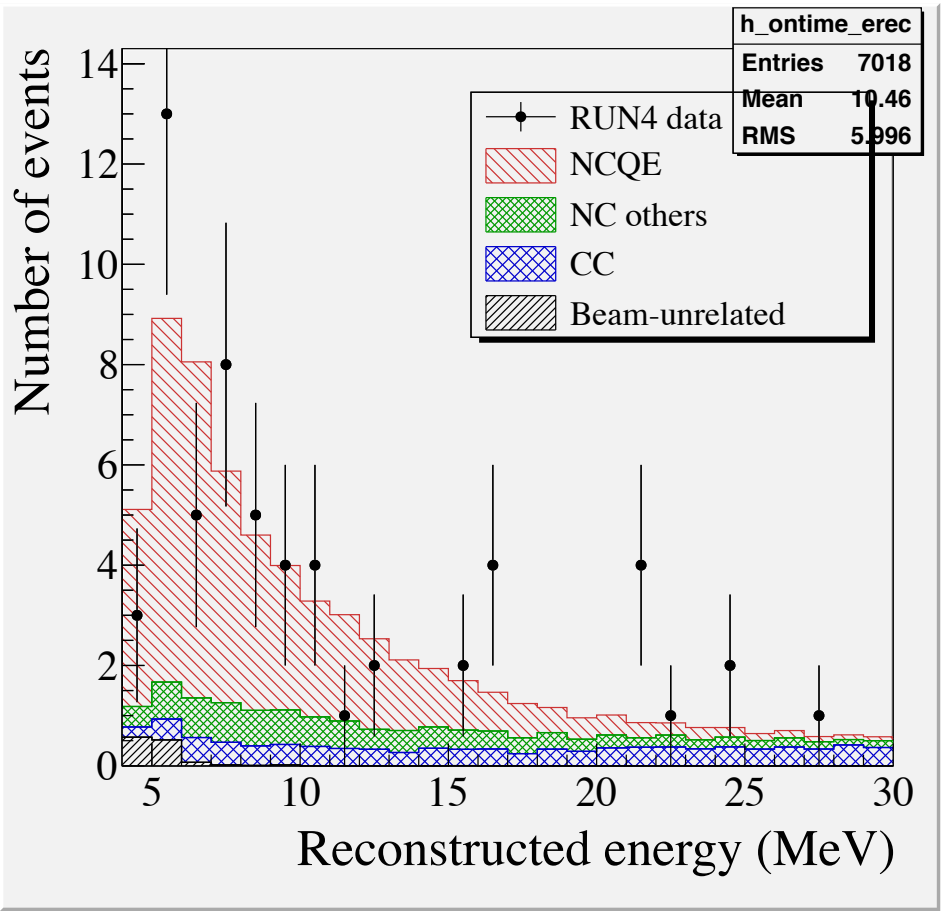
TN-244



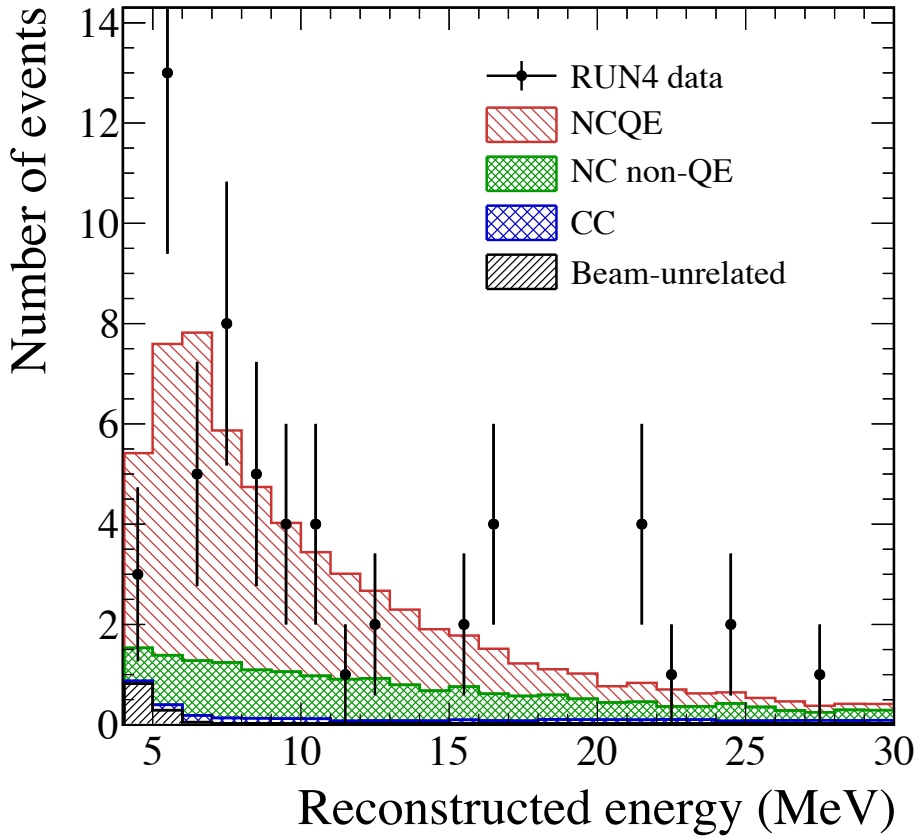
erec

July 2015 is the same as TN-244
(Huang-san looking over my shoulder, and providing some files)

26 October 2017



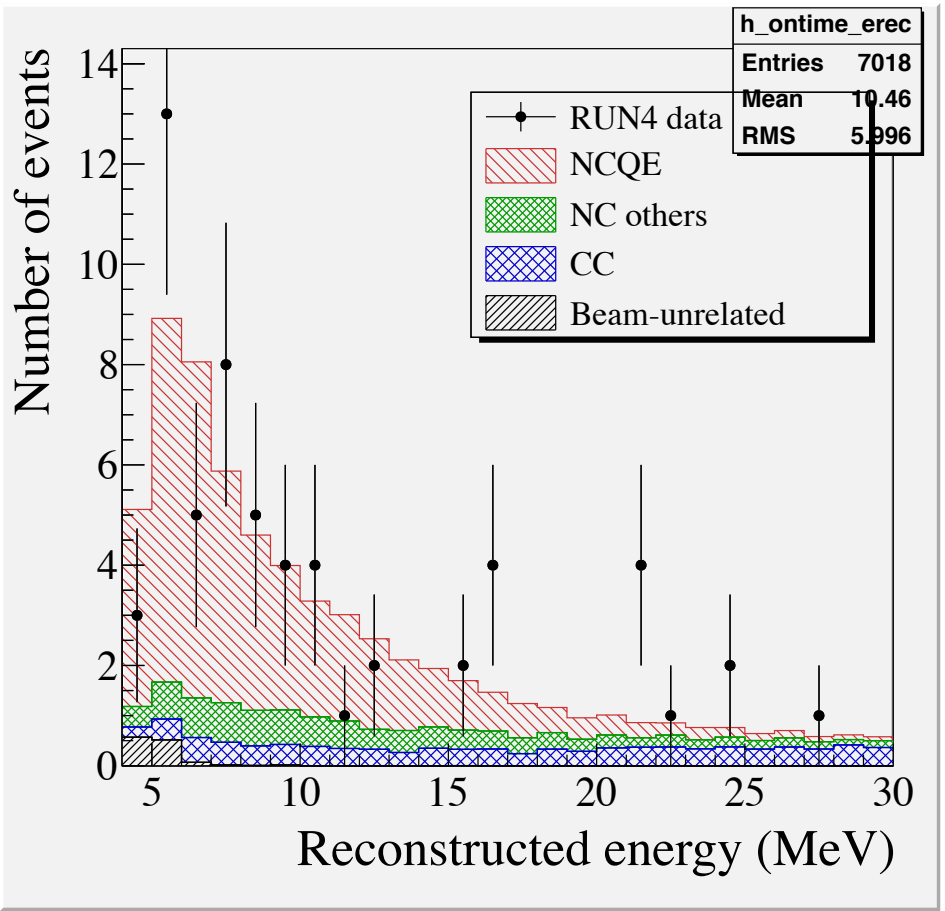
July 2015



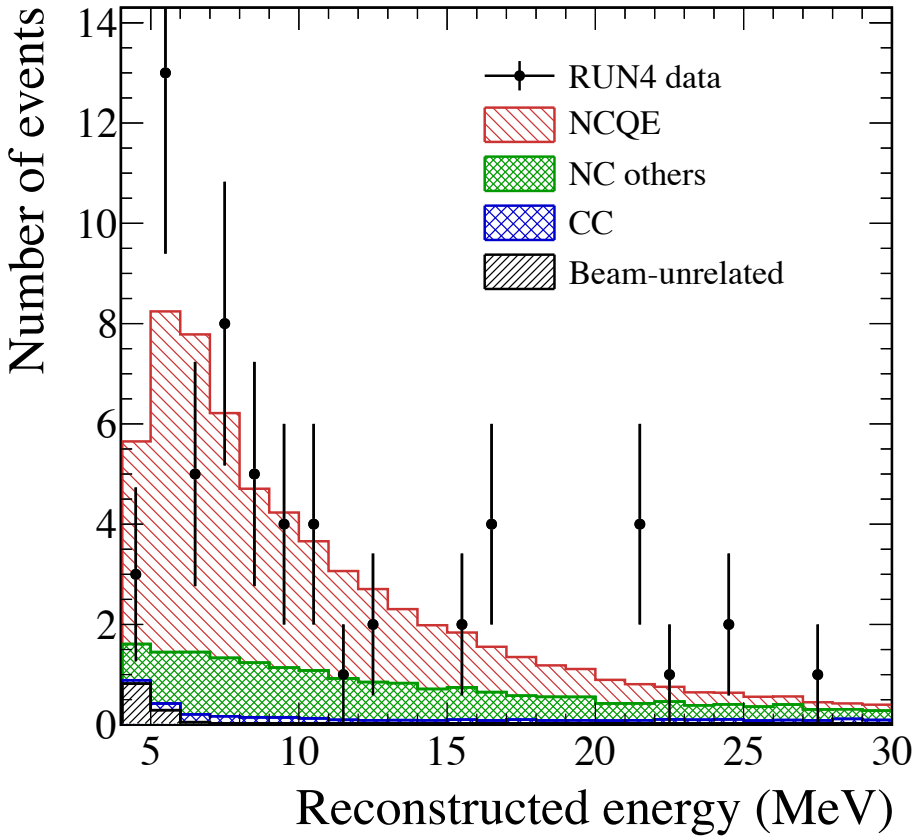
erec

17Jan2016 is pretty much the same as TN-244
(I did it myself, but Huang-san helped to confirm that everything was fine)

26 October 2017



17Jan2016 mod (22 Jan)



numbers of events
selections.root
erec

- h_ontime_erec->Integral() = 59
- h_ncqe_erec->Integral() = 43.0
- h_ncoth_erec->Integral() = 10.0
- h_cc_erec->Integral() = 9.2
- h_offtime_erec->Integral() = 1.2

17Jan2016mod
59
44.3
15.6
2.7
1.2

15.6 + 2.7 = 18.3 for background

10.0 + 9.2 + 1.2 = 20.4 for background

compared to TN-244, current work seems to have **more cc** and **less nc other**

TN-244

Table 22: Summaries of NCQE cross-section of T2K RUN1-3 and T2K RUN1-4.

T2K RUN	N^{obs}	N^{exp}_{sig}	N^{exp}_{bg}	$< \sigma^{obs}_{\nu,NCQE} >$	Stat. error	Sys. error
1-3	43	34.8	16.2	1.55×10^{-38}cm^2	±25.48%	$^{+41.93\%}_{-21.29\%}$
1-4	102	77.6	34.6	1.75×10^{-38}cm^2	±15.42%	$^{+40.0\%}_{-17.63\%}$

Run 4 only
102 - 43 = 59 data
77.6 - 34.8 = 42.8 signal
34.6 - 16.2 = 18.4 background

GetSize() = N
GetBinContent(0)
GetBinContent(N-1)

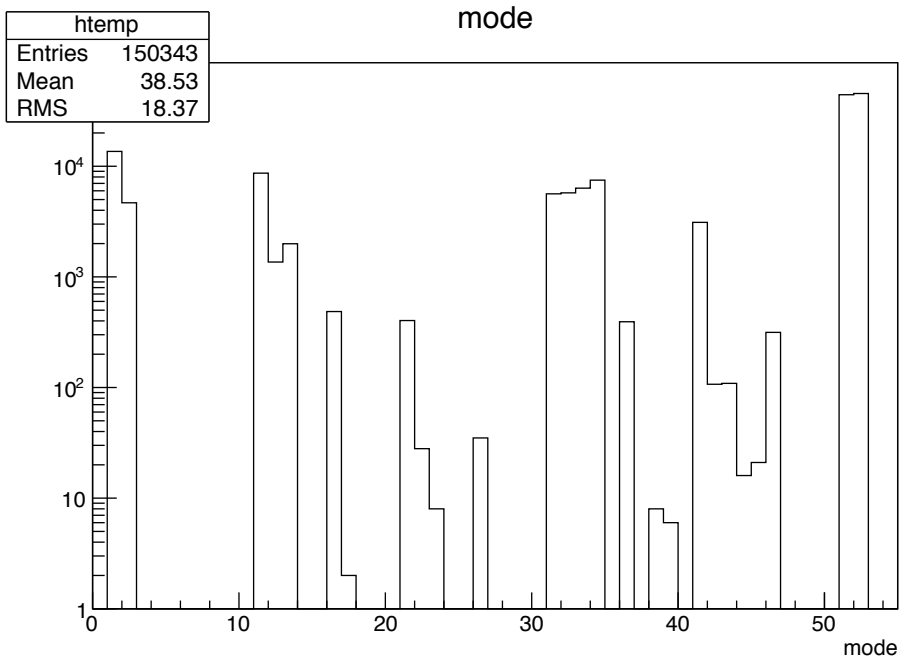
checked that nothing in overflow and underflow

neutcore/nemodsel.F

```
  ***** CHARGED CURRENT *****

     -- ELASTIC --
 1 : NEU,N --> LEPTON-,P
 2 : NEU,N+X --> LEPTON-,P+X  (X=(N or P))

     -- SINGLE PI FROM DELTA RESONANCE --
11 : NEU,P --> LEPTON-,P,PI+
12 : NEU,N --> LEPTON-,P,PI0
13 : NEU,N --> LEPTON-,N,PI+

16 : NEU,O(16) --> LEPTON-,O(16),PI+

     -- SINGLE GAMMA FROM DELTA RESONANCE --
17 : NEU,N --> LEPTON-,P,GAMMA

     -- MULTI PI (1.3 < W < 2.0 GeV) --
21 : NEU,(N OR P) --> LEPTON-,(N OR P),MULTI PI

     -- SINGLE ETA FROM DELTA RESONANCE --
                        (added 97/12/01 J.Kameda)
22 : NEU,N --> LEPTON-,P,ETA0

     -- SINGLE K FROM DELTA RESONANCE --
                        (added 98/02/25 J.Kameda)
23 : NEU,N --> LEPTON-,LAMBDA,K+

     -- DEEP INELASTIC (2.0 GeV < W , JET set) --
26 : NEU,(N OR P) --> LEPTON-,(N OR P),MESONS

  ***** NEUTAL CURRENT *****

     -- SINGLE PI FROM DELTA RESONANCE --
31 : NEU,N --> NEU,N,PI0
32 : NEU,P --> NEU,P,PI0
33 : NEU,N --> NEU,P,PI-
34 : NEU,P --> NEU,N,PI+

36 : NEU,O(16) --> NEU,O(16),PI0

     -- SINGLE GAMMA FROM DELTA RESONANCE --
38 : NEU,N --> NEU,N,GAMMA
39 : NEU,P --> NEU,P,GAMMA

     -- MULTI PI (1.3 GeV < W < 2.0 GeV) --
41 : NEU,(N OR P) --> NEU,(N OR P),MULTI PI

     -- SINGLE ETA FROM DELTA RESONANCE --
                        (added 97/12/01 J.Kameda)
42 : NEU,N --> NEU,N,ETA0
43 : NEU,P --> NEU,P,ETA0

     -- SINGLE  K  FROM DELTA RESONANCE --
                        (added 98/02/20 J.Kameda)
44 : NEU,N --> NEU,LAMBDA,K0
45 : NEU,P --> NEU,LAMBDA,K+

     -- DEEP INELASTIC (2.0 GeV < W , JET set) --
46 : NEU,(N OR P) --> NEU,(N OR P),MESONS

     -- ELASTIC --
51 : NEU,P --> NEU,P
52 : NEU,N --> NEU,N
```

Mode

- all MC comes from ncgamma.xsec_prefit.ankowski.nosel.root
- this is made by runscrape.csh
- takes in lemc/weights_postfit_banff_xsec/ and lemc/lentuple
- mode branch (no weights)



SelectionPlots.py

- look at mode, after applying weights

```
if tree.isCC:
    hmode_cc.Fill(mode, Weight([weights, pot, p_energy, p_wall, p_ewall, p_ovaq, p_prea, p_angle] ) )

elif tree.isQE:
    hmode_ncqe.Fill(mode, Weight([weights, pot, p_energy, p_wall, p_ewall, p_ovaq, p_prea, p_angle] ) )

else:
    hmode_ncoth.Fill(mode, Weight([weights, pot, p_energy, p_wall, p_ewall, p_ovaq, p_prea, p_angle] ) )
```

Make the same plots for 17Jan2016

use Jan2017 ncgamma.xsec_prefit.ankowski.nosel.root
with my version of SelectionPlots.py

changed scrapedir

```
#scrapedir = os.path.expandvars("/home/cnantais/ncgamma/Processing/")

#testing with 17Jan2016 files
scrapedir = os.path.expandvars("/disk01/usr4/cnantais/Attempts/17jan2016/ncgamma_mod/Processing")

files = { "ontime"   : join(scrapedir,"ncgamma.data.ontiming.nosel.root"),
          "offtime"  : join(scrapedir,"ncgamma.data.offtiming.nosel.root"),
          "widetime": join(scrapedir,"ncgamma.data.widetiming.nosel.root"),
          "mc"       : join(scrapedir,"ncgamma.xsec_prefit.ankowski.nosel.root")
}
```

Make the same plots for 17Jan2016

recall, updated POT

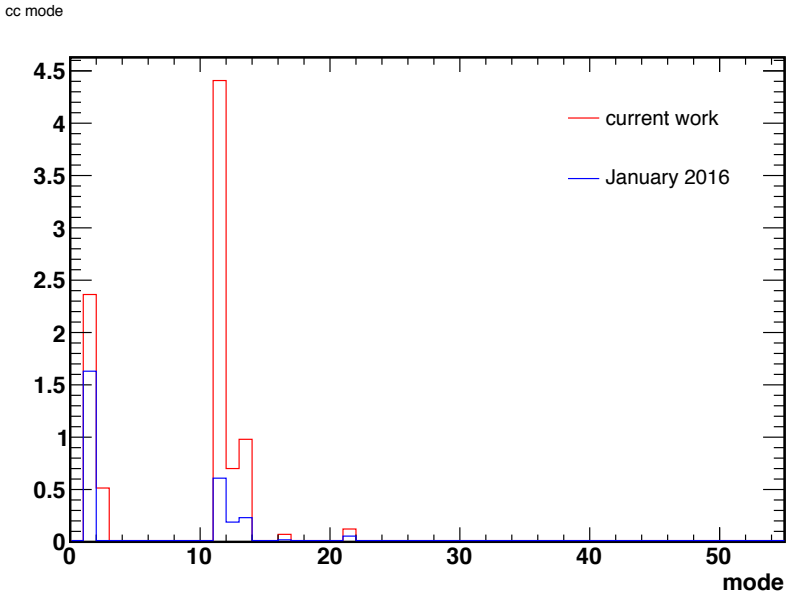
```
otscale = 1
for fc, fn in files.items():
    f = TFile(fn)
    tree = f.Get("ncgamma")

    if fc == "ontime" or fc == "widetime":
        pot = [1.]*4
    elif fc == "offtime":
        pot = [6*0.2/495.*otscale] + [8*0.2/495.*otscale]*3
    else:
        #pot = [ 0.323e20/1.e21, 1.108e20/1.e21, 1.580e20/1.e21, 3.560e20/1.e21 ]
        pot = [ 0.32875e20/1.e21, 1.13406e20/1.e21, (0.21777e20+1.39028e20)/1.e21, 3.63628e20/1.e21 ]
```

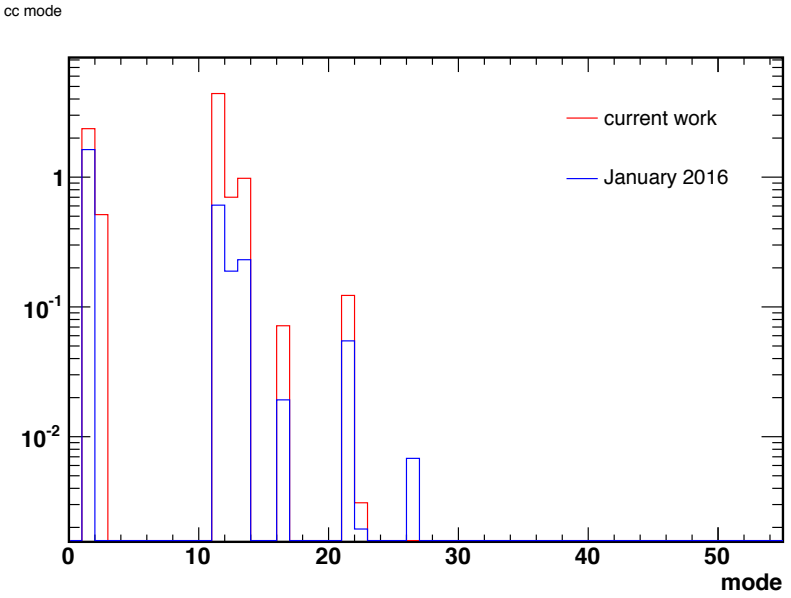
had to change branches back to run 3, instead of 3b and 3c

```
Traceback (most recent call last):
  File "SelectionPlots.py", line 293, in <module>
    p_wall  = [ tree.wallpass1, tree.wallpass2, tree.wallpass3b, tree.wallpass3c, tree.wallpass4 ]
AttributeError: 'TTree' object has no attribute 'wallpass3b'
```

3 instances

change back afterwards!





current work (9.2) > January 2016 (2.7)

biggest difference

11 : NEU,P --> LEPTON-,P,PI+

January 2016 doesn't have mode=2

2 : NEU,N+X --> LEPTON-,P+X (X=(N or P))

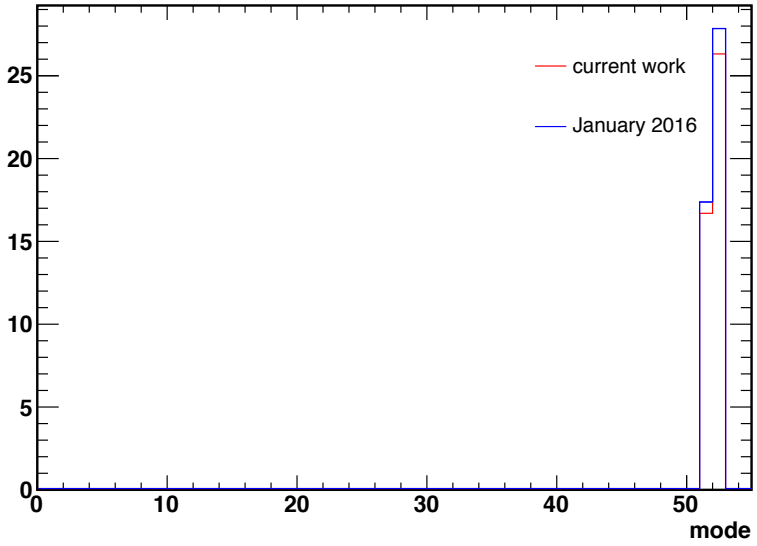
current work doesn't have mode = 26

26 : NEU,(N OR P) --> LEPTON-,(N OR P),MESONS

fractions of an event

cc mode

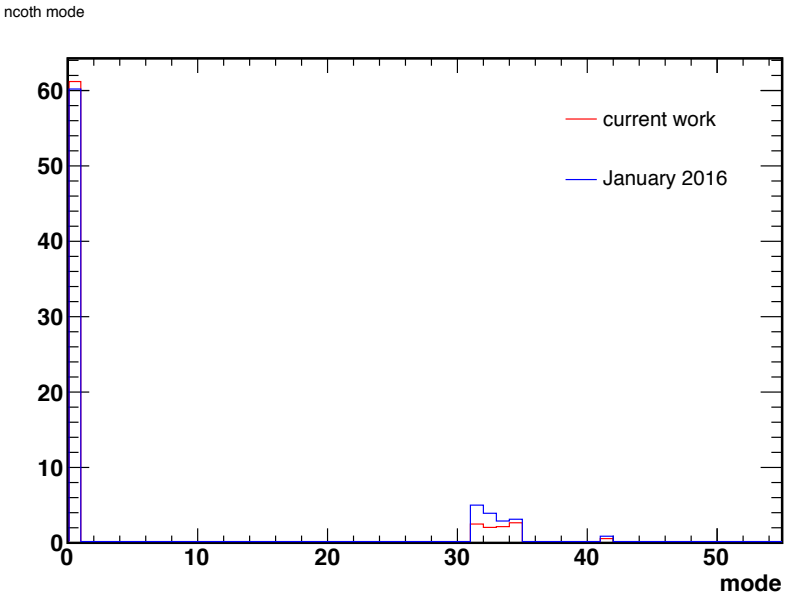
ncqe mode

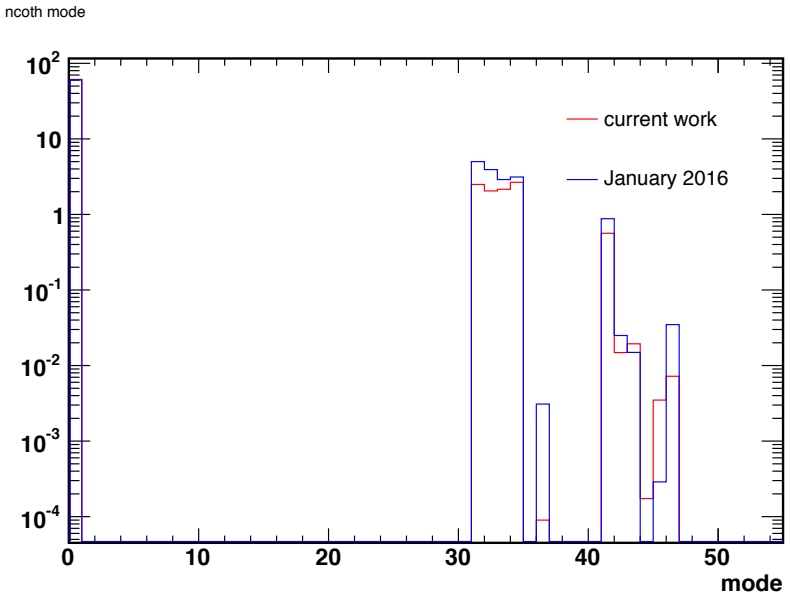


January 2016 (45.2) > current work (43.0)
but not by much

expecting 44.3
→ maybe because POT changed?

ncqe mode





January 2016 (15.9) > current work (10.0)

31 : NEU,N --> NEU,N,PI0
32 : NEU,P --> NEU,P,PI0
33 : NEU,N --> NEU,P,PI-
34 : NEU,P --> NEU,N,PI+

expecting 15.6
→ maybe because POT changed

3 bins where current work > January 2016

- mode = 43
  43 : NEU,P --> NEU,P,ETA0
- mode = 44 (none for January 2016)
  44 : NEU,N --> NEU,LAMBDA,K0
- mode = 45
  45 : NEU,P --> NEU,LAMBDA,K+

fractions of an event

ncoth mode

ignore mode = 0

Conclusion

	17Jan2017	current work
cc	2.7	9.2
ncqe	44.3	43.0
ncoth	15.6	10.0

What to do?