INGRID
of expectation with 11b tuned-v3 at 200kA horn current

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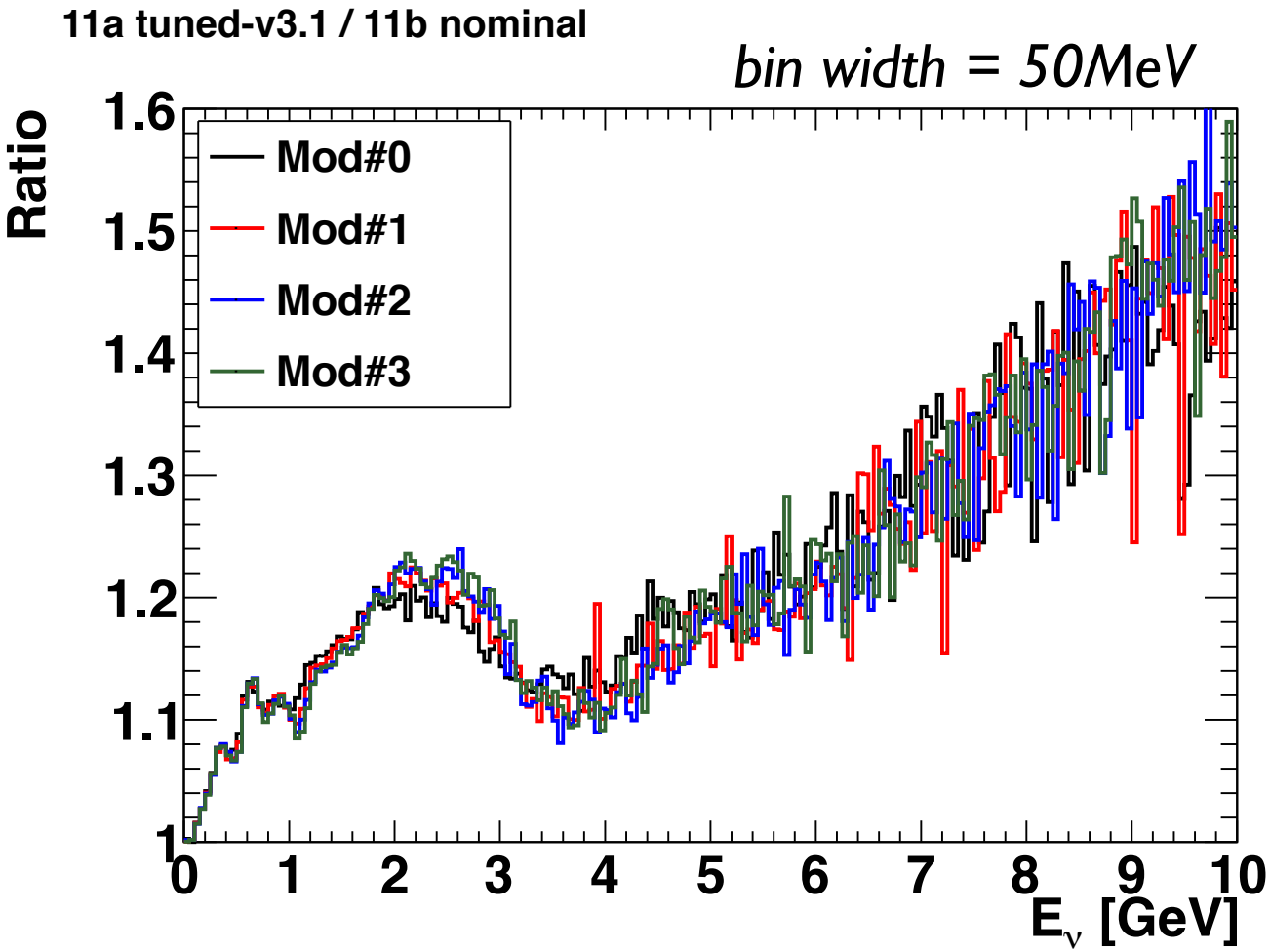
Overview

- Just update # of expectation of INGRID MC by using latest tuned flux at 200kA horn current.
- Current # of expectation by using the following MC :
  - Flux : 10d nominal (horn current = 250kA, RunI proton beam conf.)
  - NEUT : 5.0.6 → will be update by using latest NEUT
  - Detector MC (w/o noise MC) → will be update by using ND280software
- Generate new tuned flux : 11b v3
  - Jnubeam code updated 11a → 11b
  - Hadron tuning is same as 11a v3 (latest released version)
  - Proton beam is nominal, not real parameter (but few % effect at maximum)

Calculation of INGRID Nexp

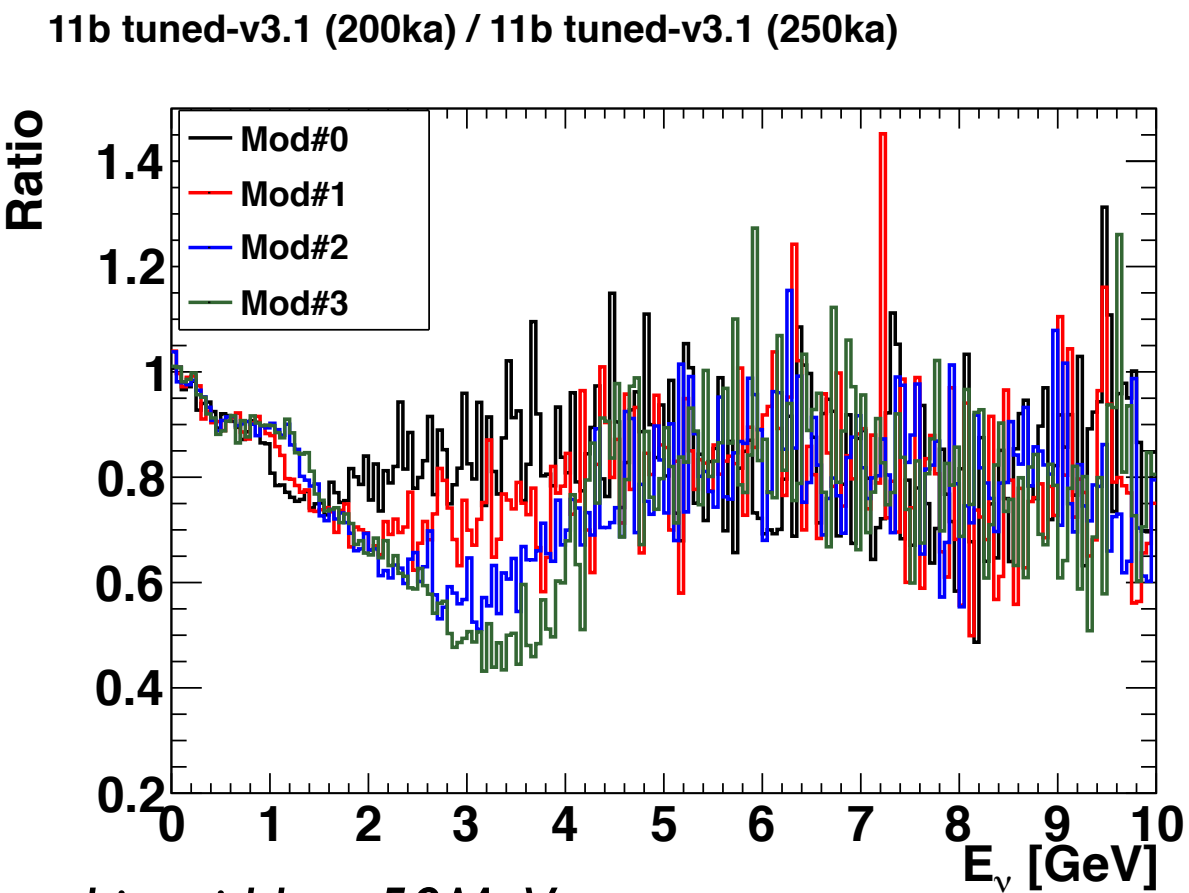
- Calculate two # of expectation of INGRID
  - # of expectation at horn current 250kA
    - Update from previous Nexp by using the flux ratio : (11b v3 at 250kA horn) / (10d nominal at 250kA)
  - # of expectation at horn current 200kA
    - Calculate by using the flux ratio : (11b v3 at 250kA horn) / (10d nominal at 250kA)
- And then, estimate the Nexp ratio (200kA/250kA).

Flux ratio (νμ) : 11bv3.1 (200kA) / 11a nom (200kA)



This ratio includes only hadron prod. tuning effect

Flux ratio (νμ) : 11bv3.1 (200kA) / 11bv3.1 (250kA)

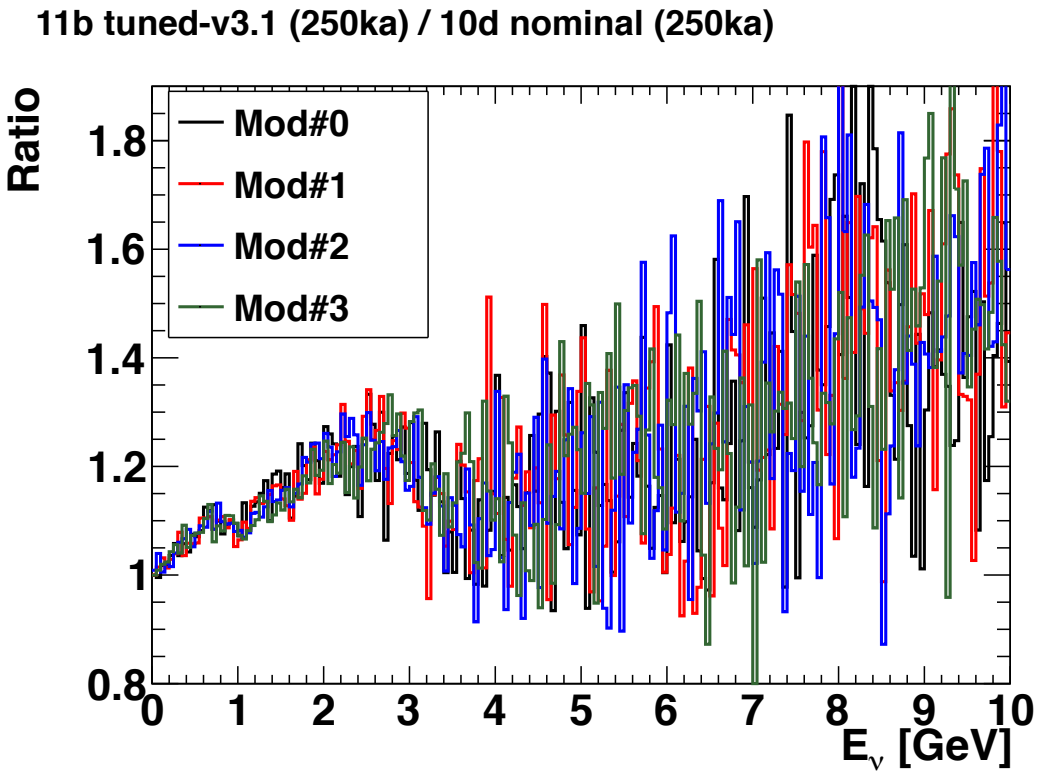


bin width = 50MeV

This ratio includes only horn focusing

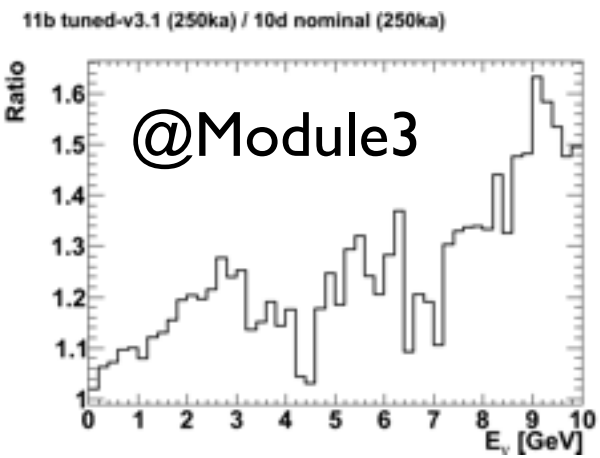
The dip depth around 3GeV (K contribution is dominant) of each modules is different.
→Is is possible to constrain K/π ratio by using the difference of # of events at each module ?

Flux ratio (νμ) : 11bv3.1 (250kA) / 10d nom (250kA)



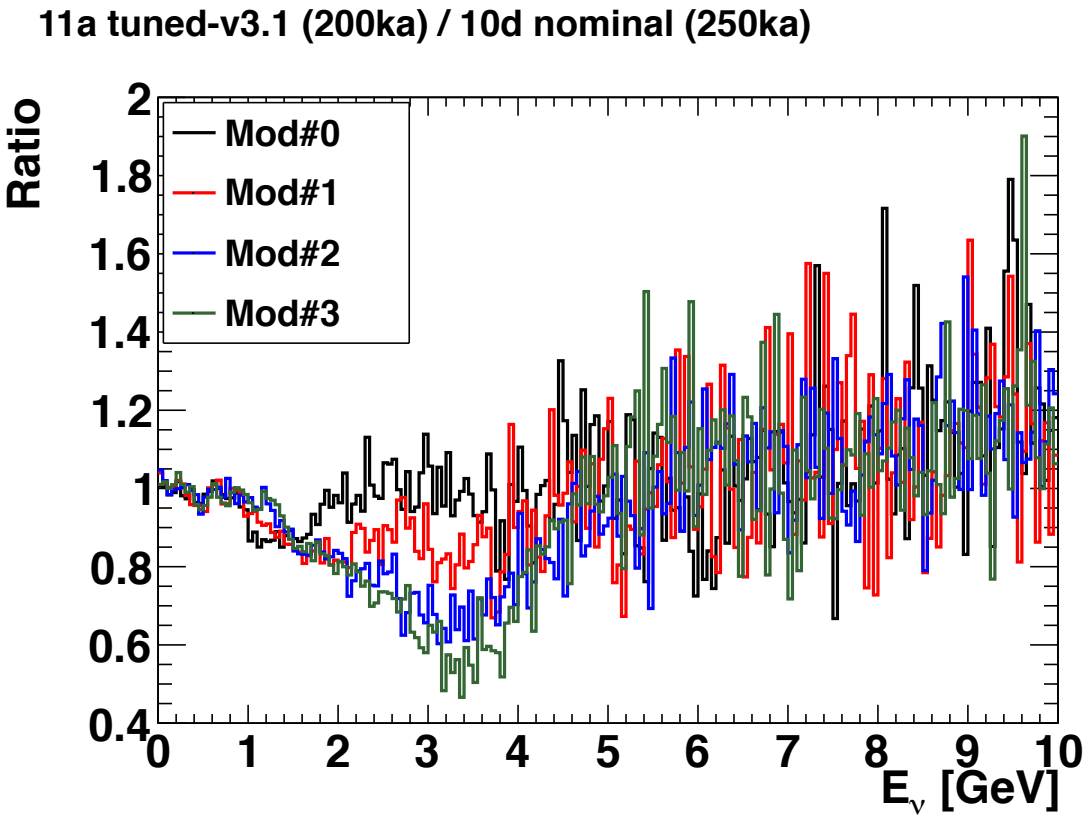
bin width = 50MeV

This ratio include horn current difference and hadron prod. tuning.



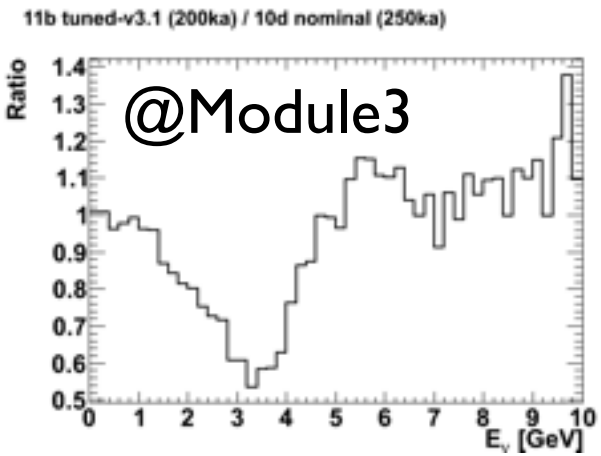
→ Do weighting INGRID MC energy spectrum by using flux ratio w/ coarse binning (width=200MeV, the bottom figure)

Flux ratio (νμ) : 11b-v3 (200kA) / 10d nom (250kA)



bin width = 50MeV

This ratio include horn current difference and hadron prod. tuning.



→ Do weighting INGRID MC energy spectrum by using flux ratio w/ coarse binning (width=200MeV, the bottom figure)

Expected # of events

Expected # of events at 14 standard modules

unit:[/10^{14}POT]	numu	numuber	total	Ratio to 250kA
11av2 (250kA, *w/ Noise MC*)	1.504	0.027	1.531	
11bv3 (250kA, *w/ Noise MC*)	1.502	0.027	1.529	1.000
11bv3 (200kA, *w/ Noise MC*)	1.150	0.028	1.178	0.770
11av2 (250kA, *w/o Noise MC*)	1.543	0.028	1.571	
11bv3 (250kA, *w/o Noise MC*)	1.541	0.028	**1.569**	1.000
11bv3 (200kA, *w/o Noise MC*)	1.183	0.021	**1.204**	**0.768**

- ** Efficiency for **numuber** w/o Noise MC is assumued by one for numu w/o Noise MC → will estimate for numuber.*
- *Need proton beam tuning for these flux*

back up

Tuning files

- Flux ratio root files are put at the followings
  - scbn00:/export/scraid1/data/beamMC//tune/11bv3.1/nd34

11bv3 (w/ Noise MC, at 200kA)

module	numu	numub	numu+numub
0	6.172E+05	1.607E+04	6.332E+05
1	7.881E+05	1.789E+04	8.060E+05
2	9.210E+05	2.121E+04	9.422E+05
3	9.504E+05	2.256E+04	9.730E+05
4	9.156E+05	2.149E+04	9.371E+05
5	7.909E+05	2.004E+04	8.110E+05
6	6.244E+05	1.691E+04	6.413E+05
7	6.737E+05	1.679E+04	6.905E+05
8	8.299E+05	1.966E+04	8.496E+05
9	9.512E+05	2.290E+04	9.741E+05
10	9.868E+05	2.422E+04	1.011E+06
11	9.470E+05	2.176E+04	9.688E+05
12	8.419E+05	1.955E+04	8.614E+05
13	6.936E+05	1.799E+04	7.115E+05
sum	1.153E+07	2.790E+05	1.181E+07

[/10^21 pot]

11bv3 (w/o Noise MC,250kA)

[/10^21 pot]

module	numu	numub	numu+numub
0	6.172E+05	1.607E+04	6.332E+05
1	7.881E+05	1.789E+04	8.060E+05
2	9.210E+05	2.121E+04	9.422E+05
3	9.504E+05	2.256E+04	9.730E+05
4	9.156E+05	2.149E+04	9.371E+05
5	7.909E+05	2.004E+04	8.110E+05
6	6.244E+05	1.691E+04	6.413E+05
7	6.737E+05	1.679E+04	6.905E+05
8	8.299E+05	1.966E+04	8.496E+05
9	9.512E+05	2.290E+04	9.741E+05
10	9.868E+05	2.422E+04	1.011E+06
11	9.470E+05	2.176E+04	9.688E+05
12	8.419E+05	1.955E+04	8.614E+05
13	6.936E+05	1.799E+04	7.115E+05
sum	1.153E+07	2.790E+05	1.181E+07