

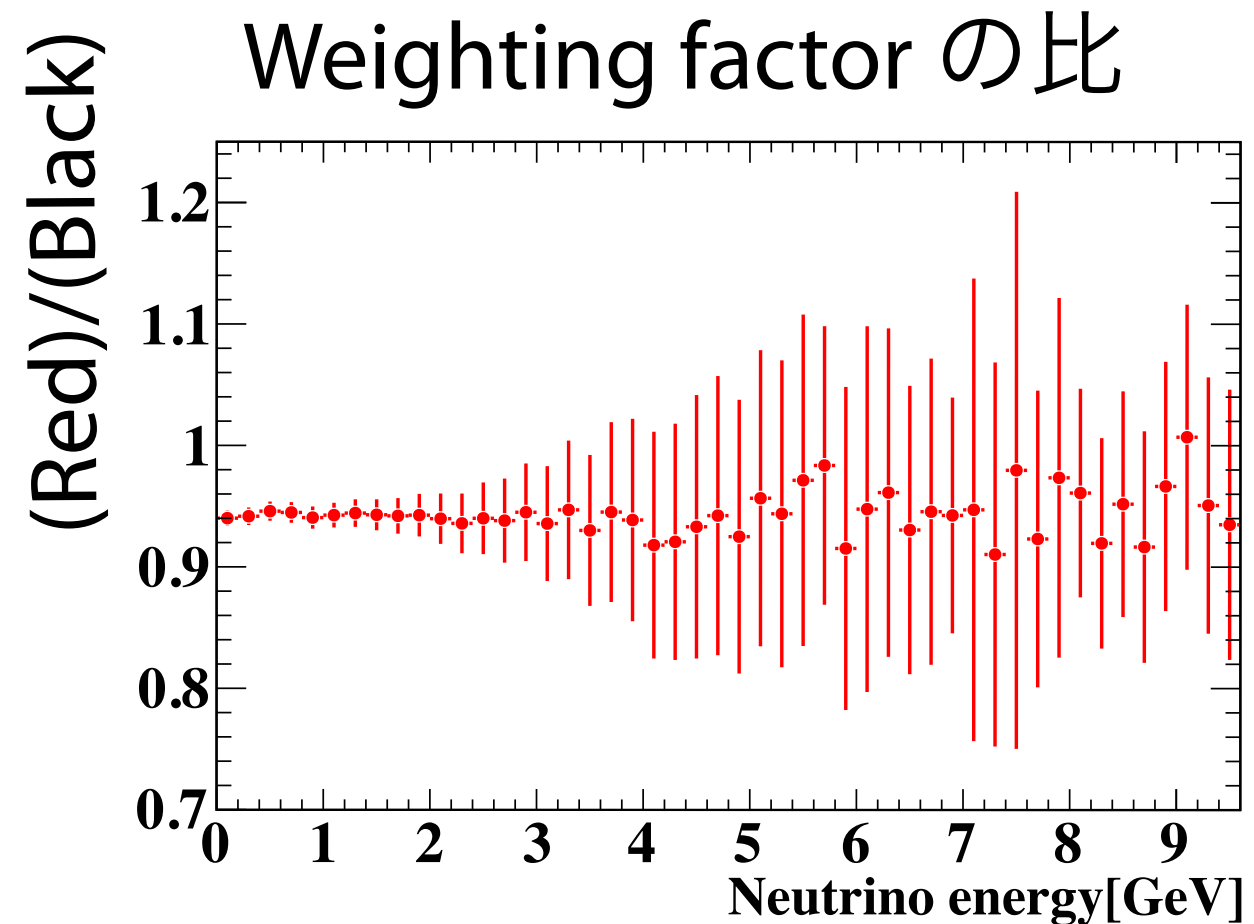
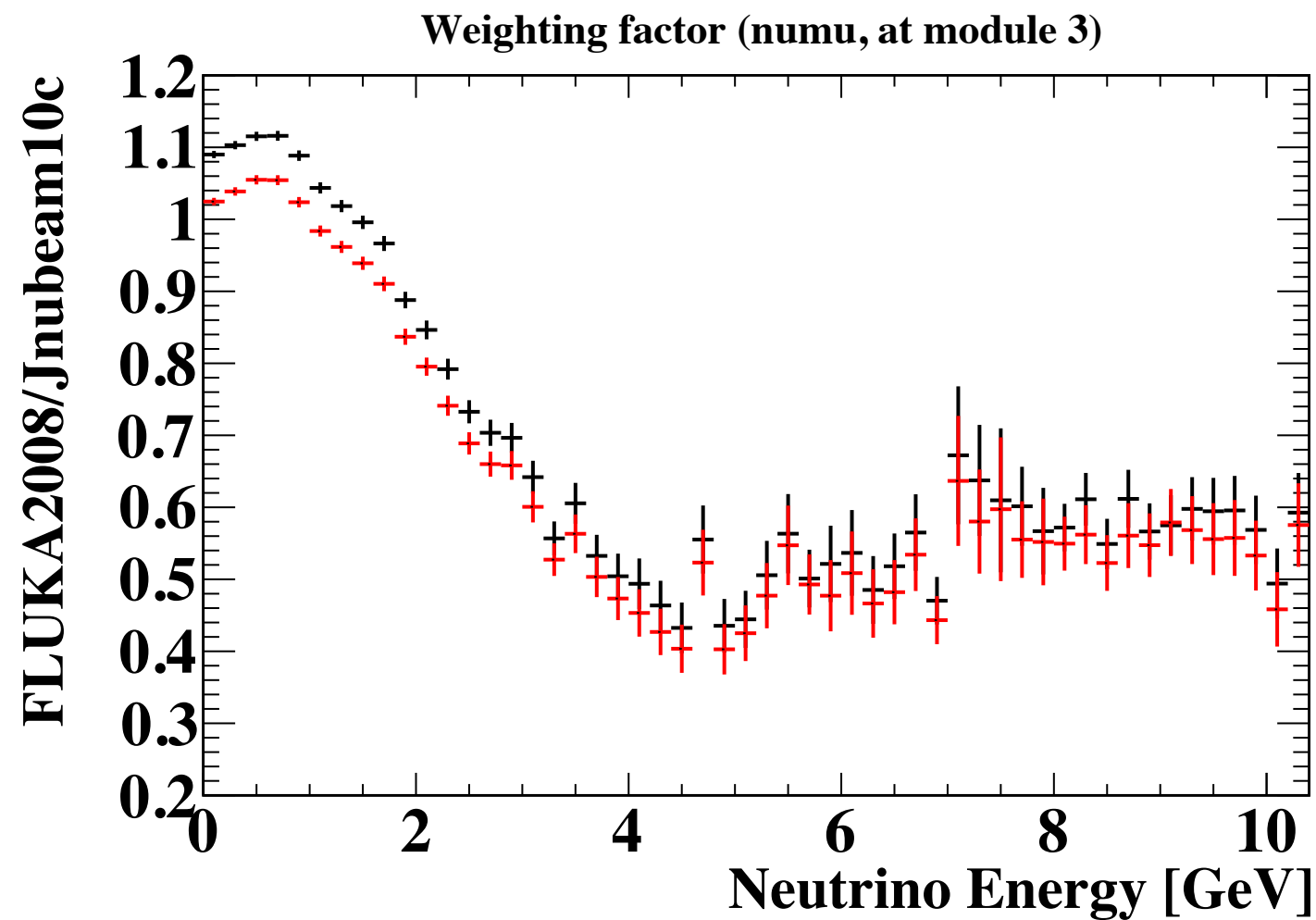
INGRID MC

Re-calc # of expected events

A.Murakami

Weighting factor (GCALOR → FLUKA2008)

Weighting factor (Neutrino energy) =
Flux ratio : (FLUKA2008)/(Jnubeam10c(GCALOR))



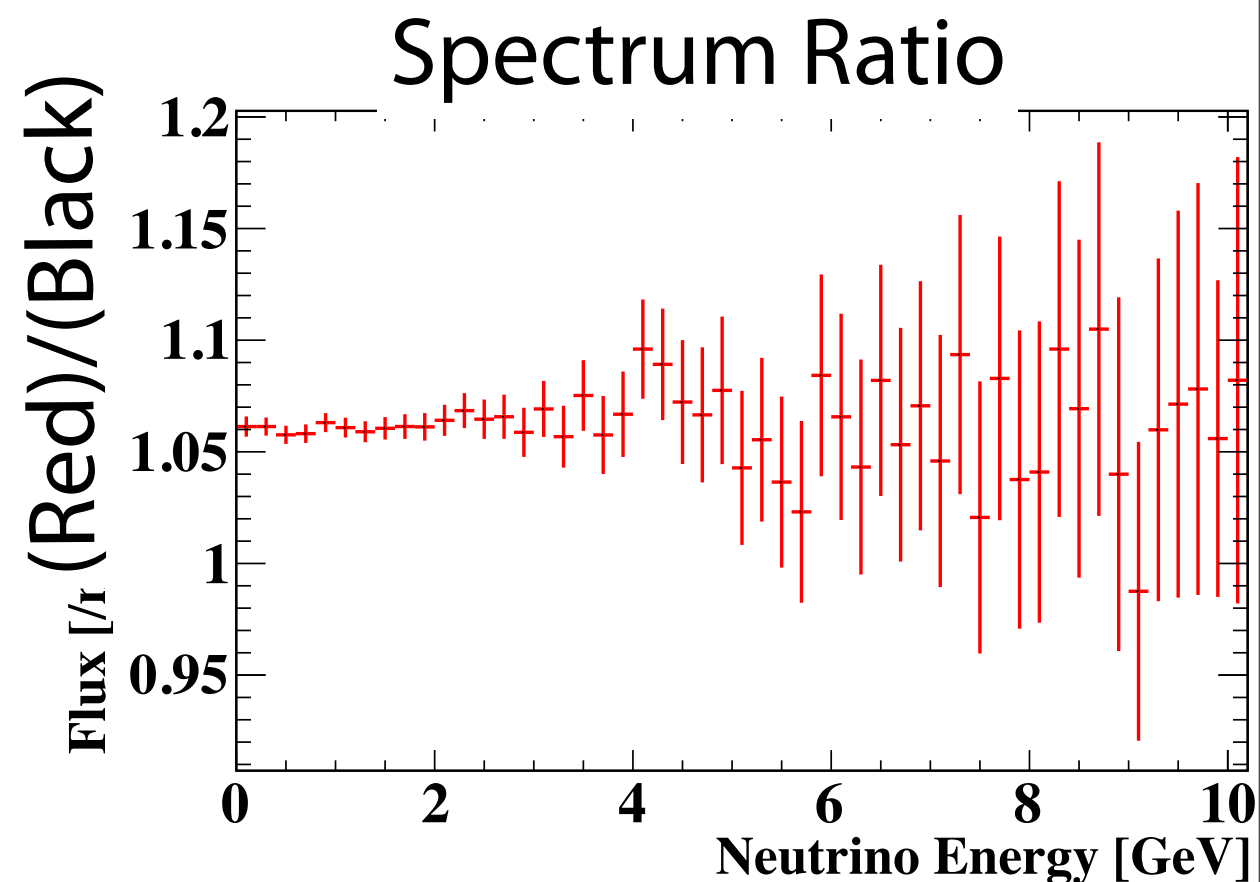
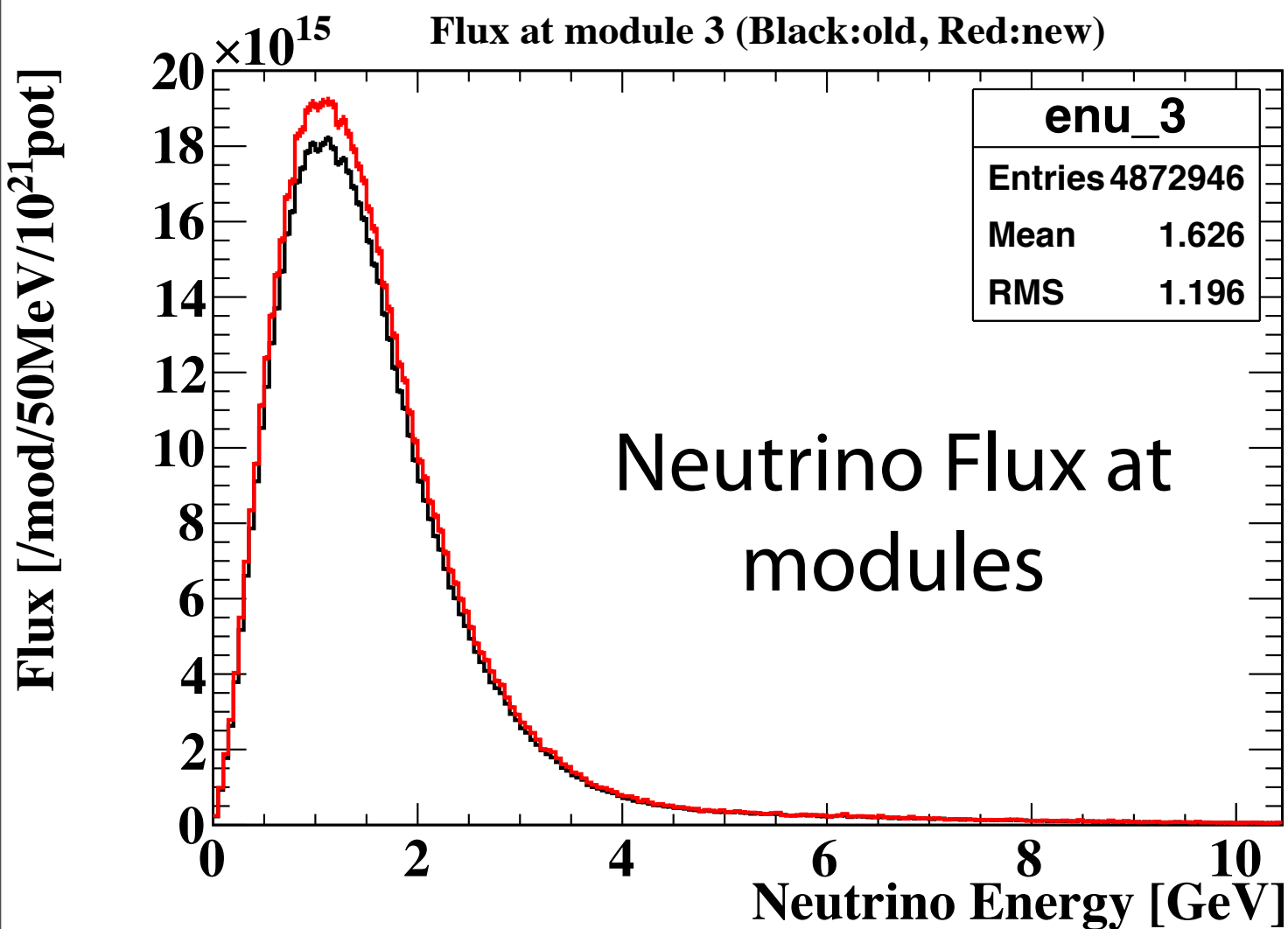
Black : using for calc # of observations with
FLUKA2008.

Red : re-make weighting factor with same
Flux files as Black one.

→ Not consistent !

The Reason

The normalization of energy spectrum with Jnubeam10c (GCALOR) flux file was not correct.



→ ~ 5% difference

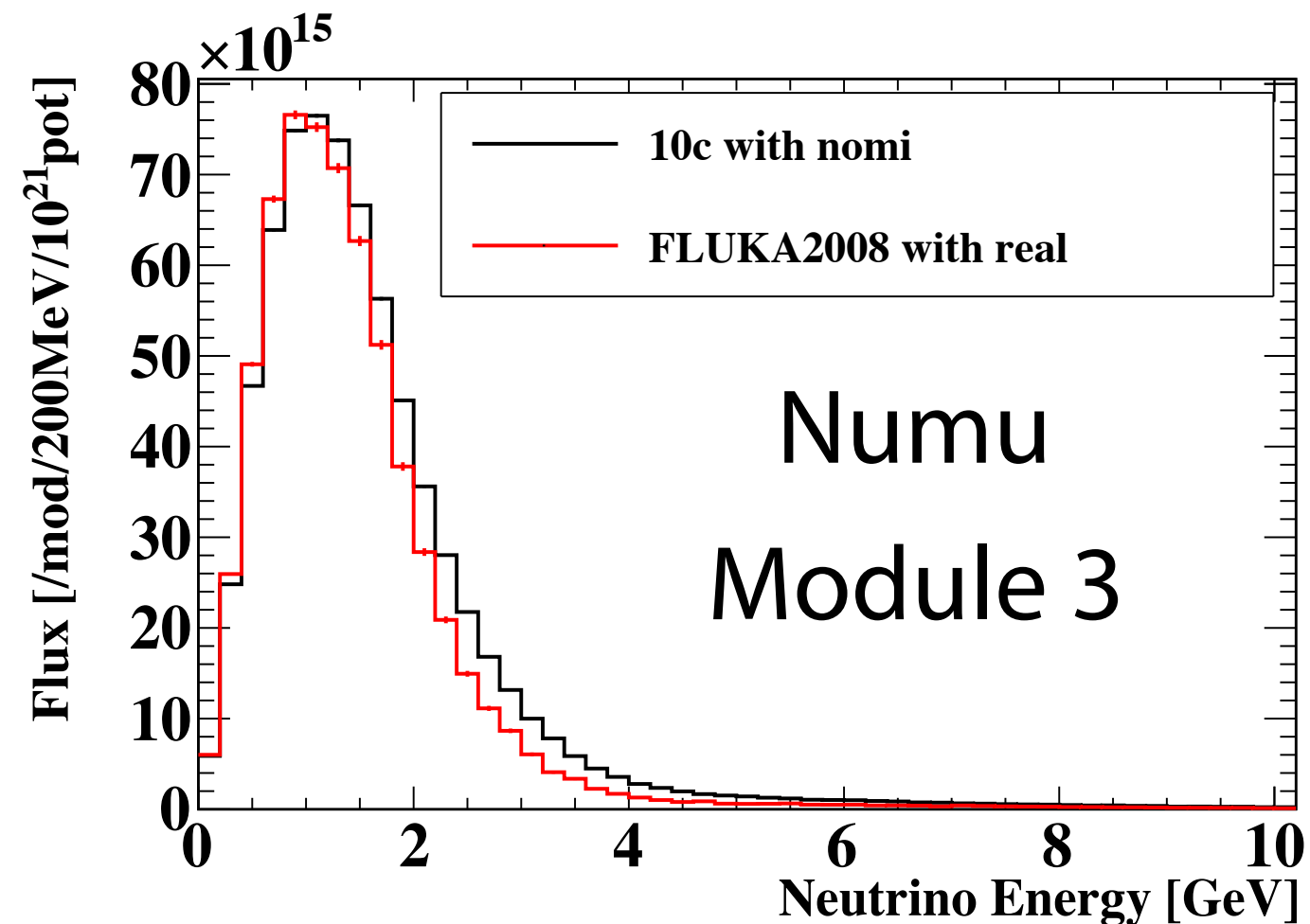
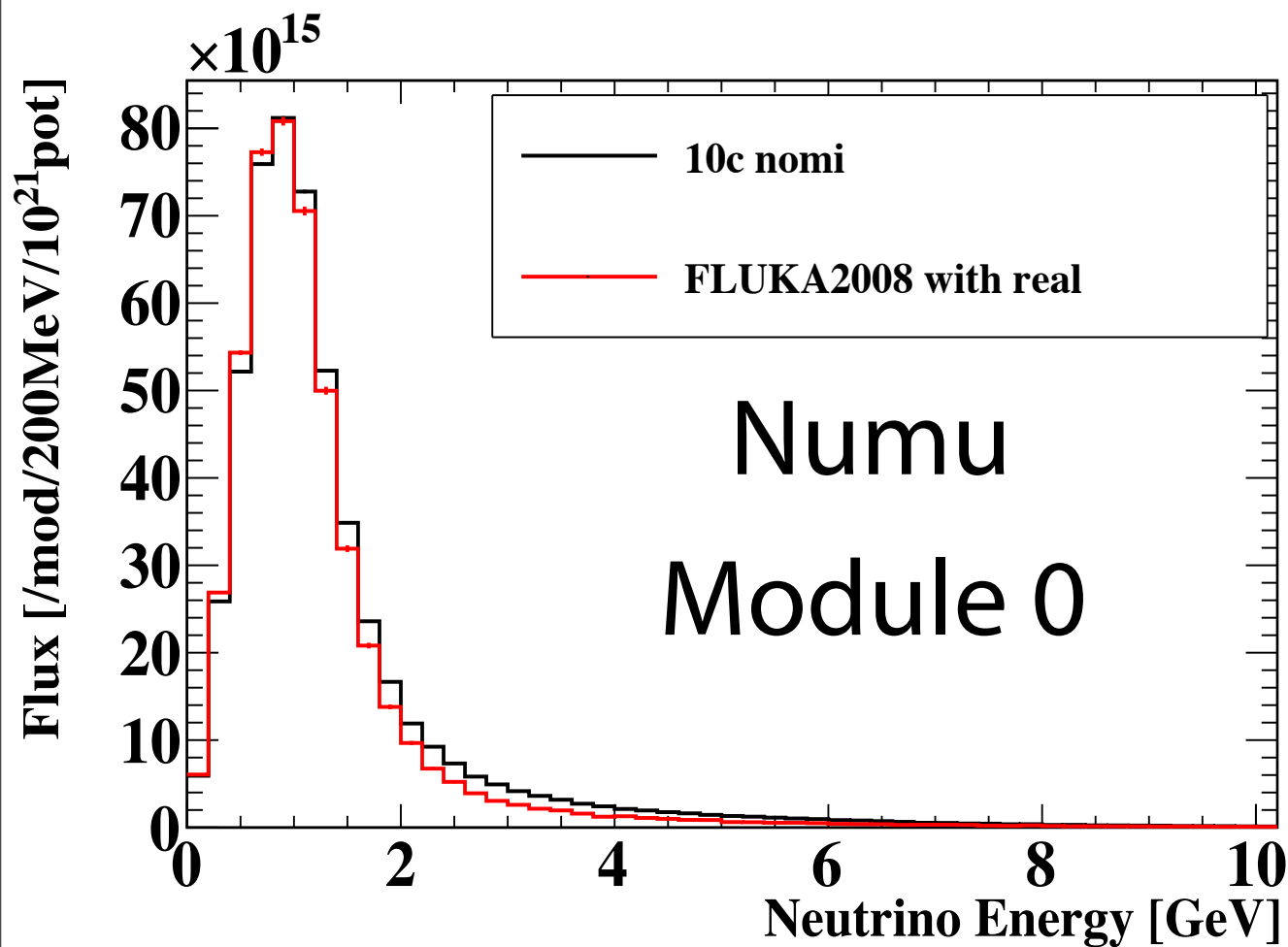
Black : not correct spectrum

Red : re-make one correctly

Energy spectrum (Flux to each module)

Energy spectrum of Flux to each module

Jnubeam10c(GCALOR) Flux is made correctly



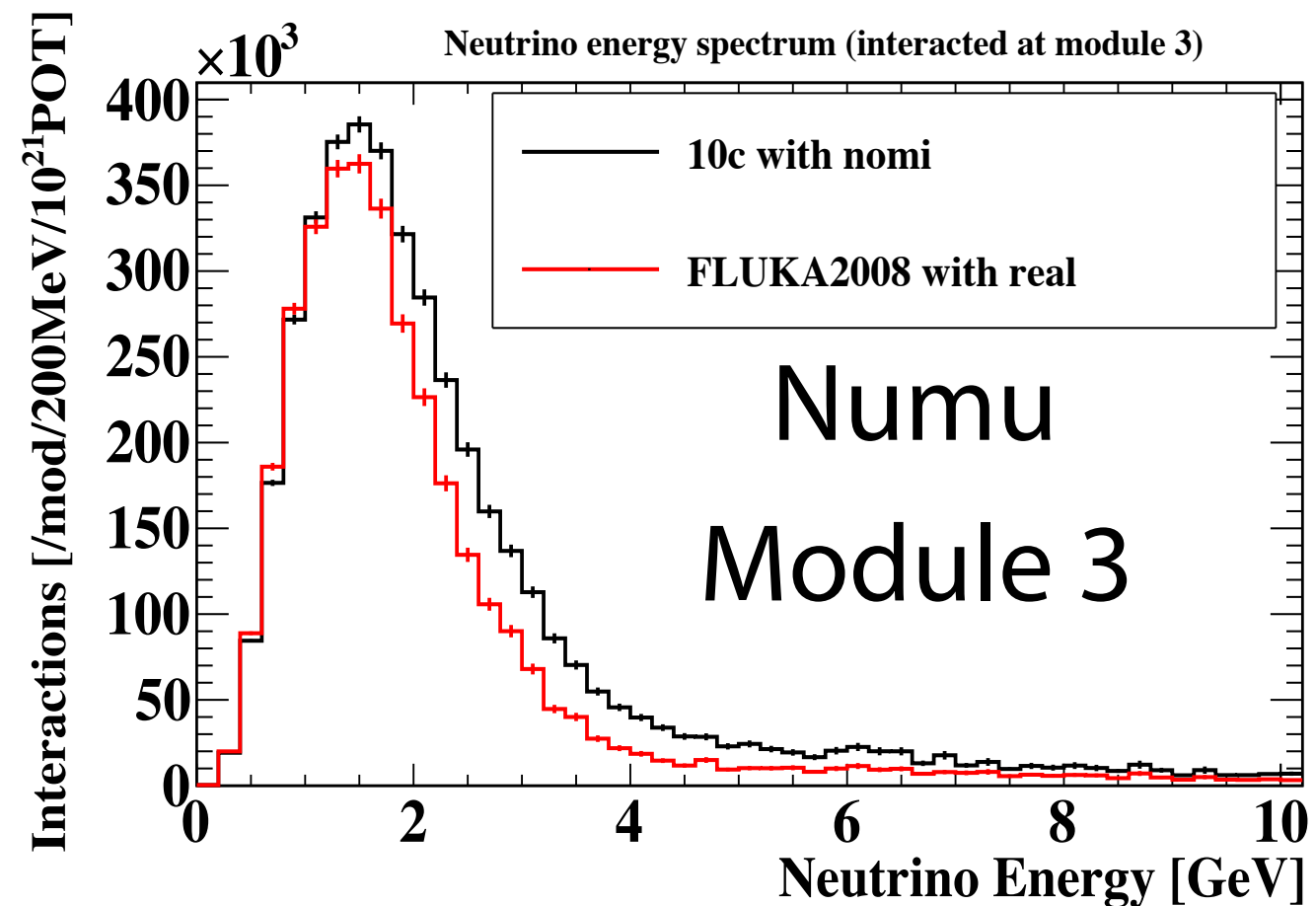
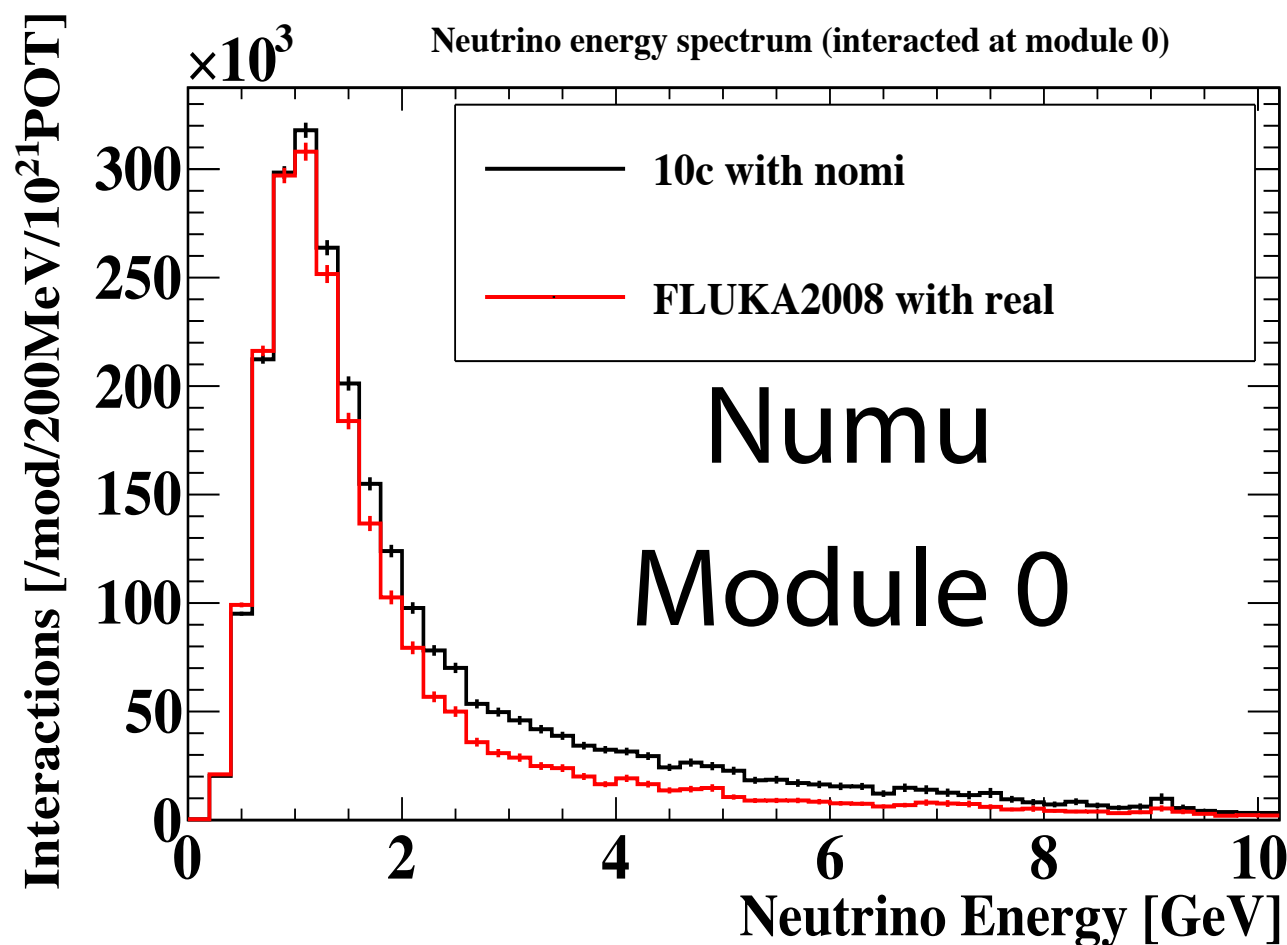
Integrated Flux at all modules (MC)

MC	numu [/10 ¹⁴ POT]	numubar [/10 ¹⁴ POT]	(numu+numubar) [/10 ¹⁴ POT]
10c nomi	8.90E+11	5.76E+10	9.48E+11
FLUKA2008 real New	8.10E+11	3.71E+10	8.47E+11
Ratio (FLUKA/10c)	0.910	0.644	0.89

Energy spectrum (after interacted at module)

The energy spectrum of neutrino interacted in each module.

Using correct weighting factor (GCALOR $\rightarrow$ FLUKA2008)



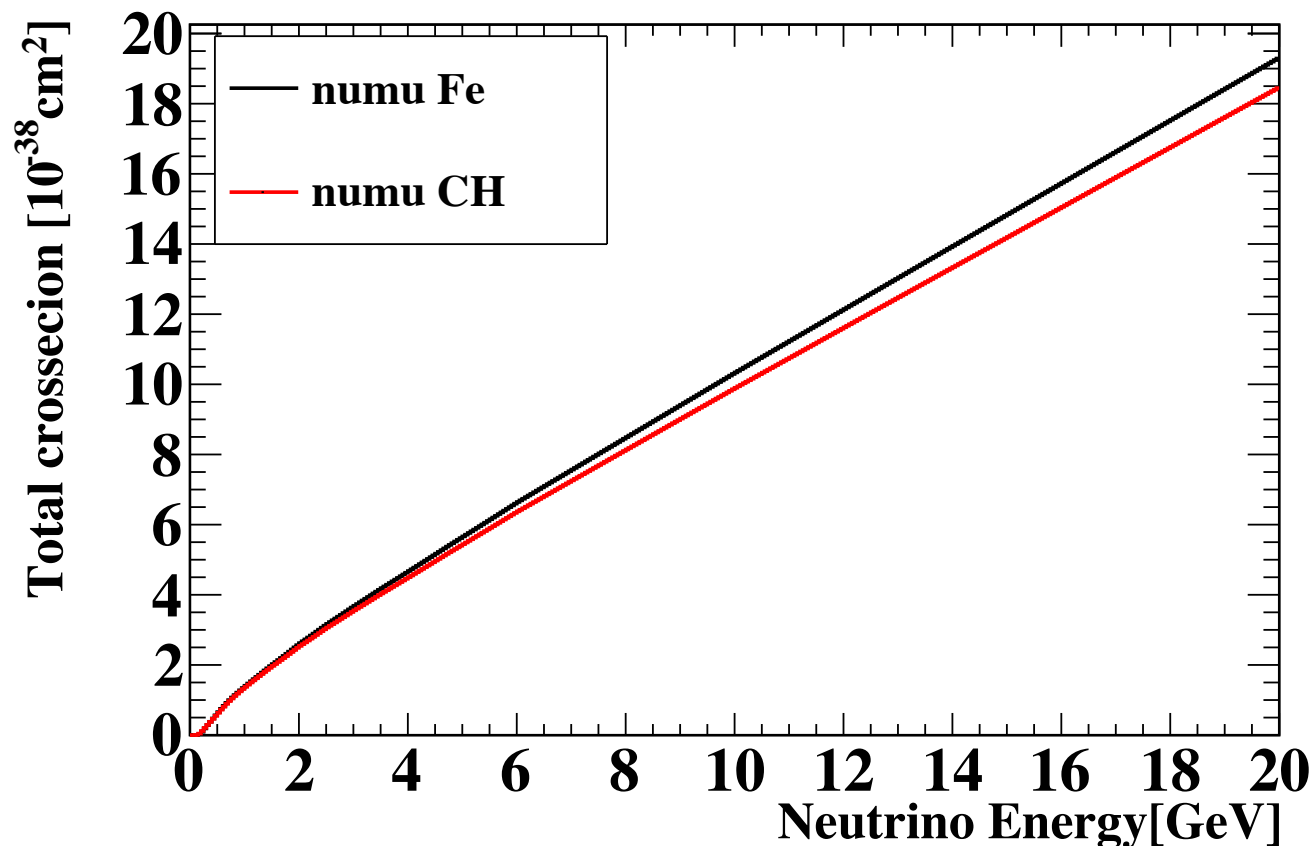
Black : with Jnubeam 10c flux file

Red : the result of Jnubeam10c $\times$ weighting factor

of interaction at all modules (MC)

MC	numu [/10 ¹⁴ POT]	numubar [/10 ¹⁴ POT]	(numu+numubar) [/10 ¹⁴ POT]
10c nomi	5.16	0.162	5.32
FLUKA2008 real New	4.15	0.069	4.22
Ratio (FLUKA/10c)	0.804	0.426	0.79

Neutrino cross-section

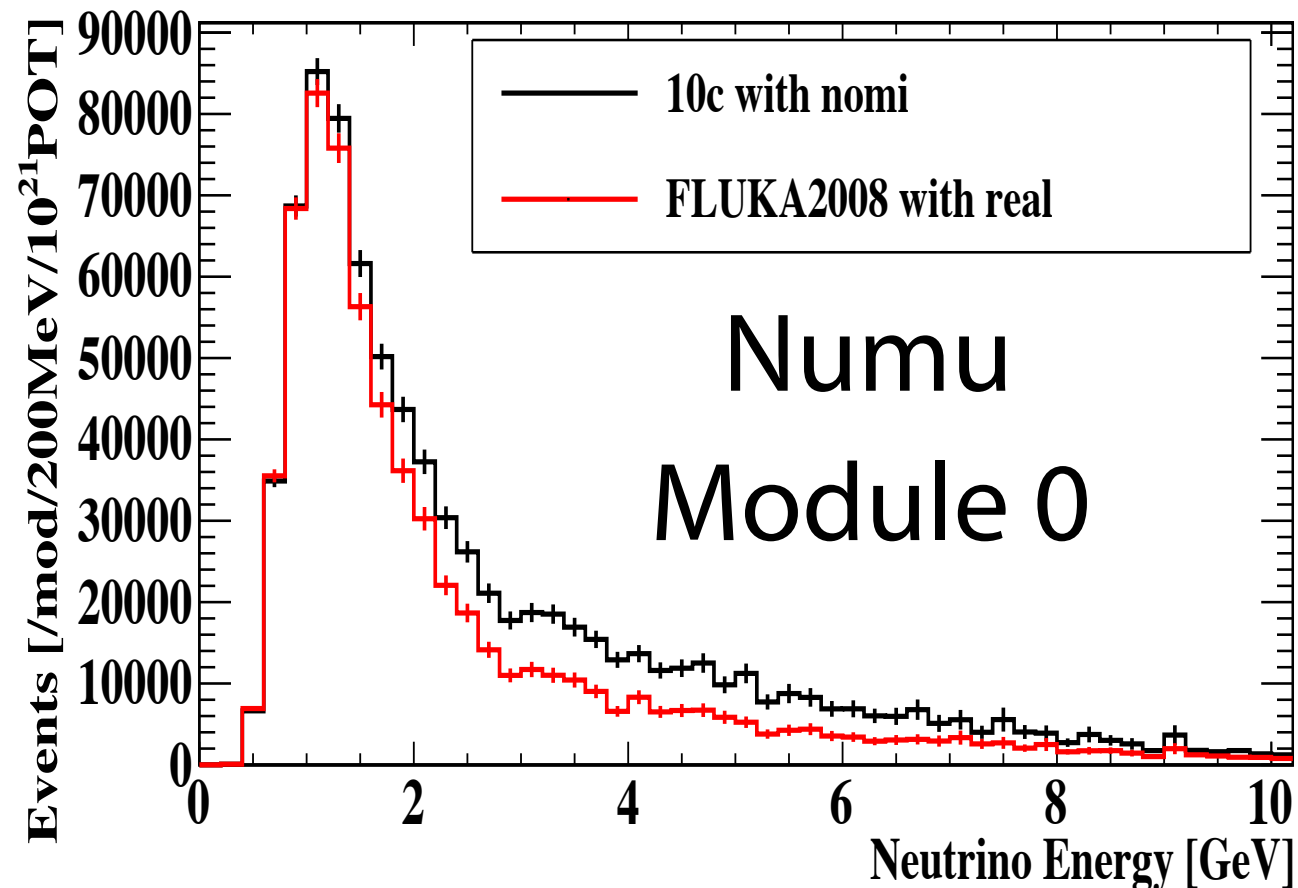


Neutrino interaction model : Fe target
INGRID Mass : Total Fe + Total Scintillator

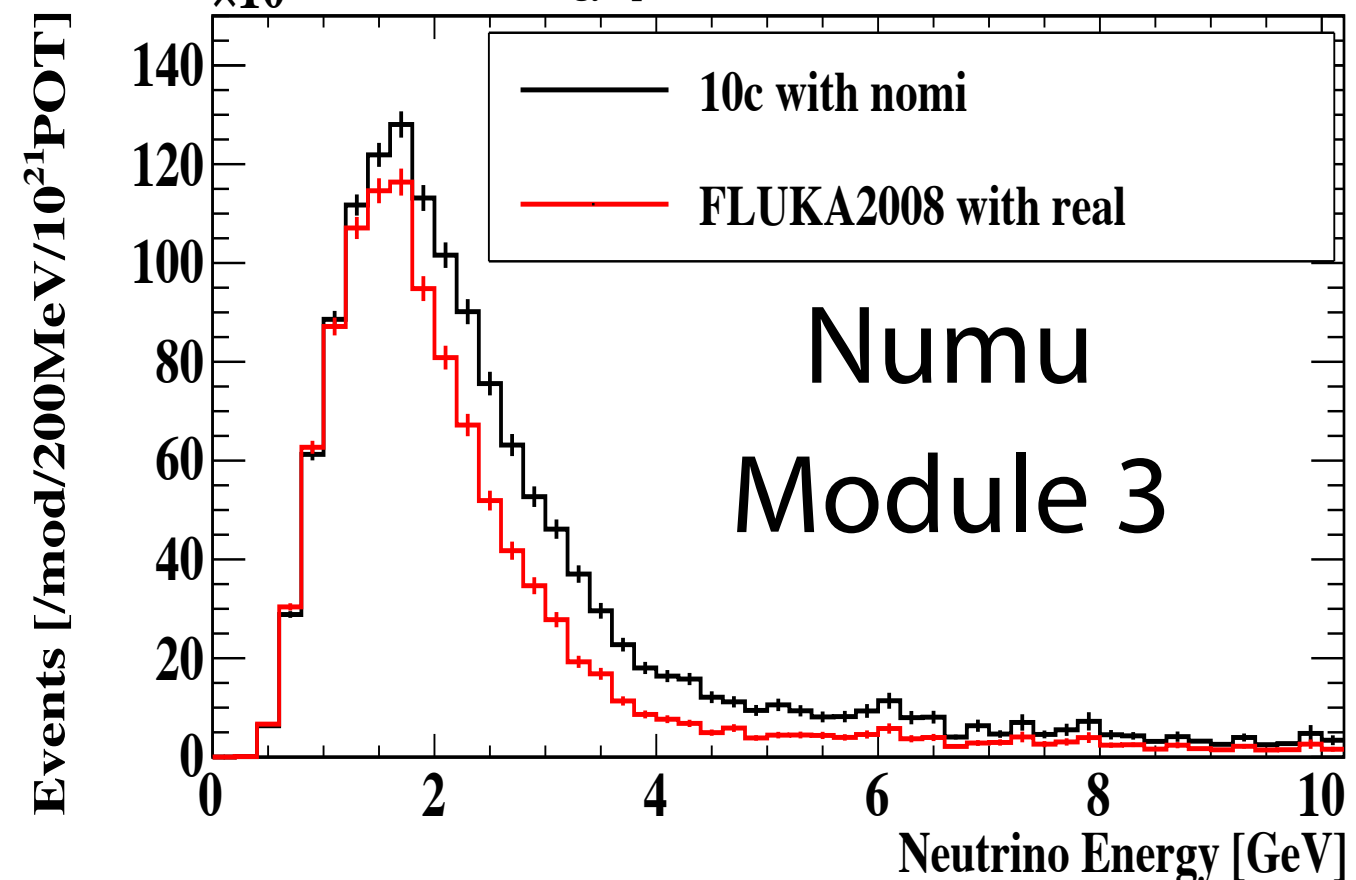
Energy spectrum (after neutrino selection)

The energy spectrum of neutrino left after neutrino selection.
Using correct weighting factor

Neutrino energy spectrum (after neutrino selection) at module 0



Neutrino energy spectrum (after neutrino selection) at module 3



of events after event selection at all modules (MC)

MC	numu [/10 ¹⁴ POT]	numubar [/10 ¹⁴ POT]	(numu+numubar) [/10 ¹⁴ POT]	Ratio to 10c nomi
10c nomi	1.72	0.0599	1.78	1.00
FLUKA2008 real Old	1.38	0.0263	1.41	0.79
FLUKA2008 real New	1.32	0.0246	1.34	0.76

Data(Run29~34) = 1.52 / 10¹⁴POT

	Ratio to Data
10c nomi	1.17
FLUKA2008 old	0.93
FLUKA2008 new	0.88

Back up

of interactions at each modules (MC, numu)

1	# of interactions of 10c(nomi) [/10 ²¹ POT]
2	# of interactions of FLUKA2008(real) [/10 ²¹ POT]
ratio(%)	2 / 1

MC	mod0	1	2	3	4	5	6
1	2.73E+06	3.55E+06	4.13E+06	4.33E+06	4.19E+06	3.58E+06	2.71E+06
2	2.25E+06	2.86E+06	3.29E+06	3.46E+06	3.31E+06	2.84E+06	2.23E+06
ratio	82.3	80.4	79.6	79.8	79.0	79.3	82.3

MC	mod7	8	9	10	11	12	13
1	2.89E+06	3.73E+06	4.29E+06	4.48E+06	4.32E+06	3.76E+06	2.93E+06
2	2.40E+06	3.01E+06	3.45E+06	3.62E+06	3.43E+06	2.97E+06	2.37E+06
ratio	83.0	80.7	80.5	80.9	79.5	79.1	80.6

of interactions at each modules (MC ,numubar)

1	# of interactions of 10c(nomi) [/10 ²¹ POT]
2	# of interactions of FLUKA2008(real) [/10 ²¹ POT]
ratio(%)	2 / 1

MC	mod0	1	2	3	4	5	6
1	8.36E+04	1.09E+05	1.30E+05	1.42E+05	1.31E+05	1.04E+05	7.95E+04
2	3.89E+04	4.55E+04	5.44E+04	5.92E+04	5.42E+04	4.55E+04	3.79E+04
ratio	46.5	41.7	41.9	41.6	41.2	43.7	47.7

MC	mod7	8	9	10	11	12	13
1	9.58E+04	1.11E+05	1.41E+05	1.47E+05	1.33E+05	1.17E+05	9.34E+04
2	4.37E+04	4.91E+04	5.61E+04	5.58E+04	5.40E+04	5.19E+04	4.47E+04
ratio	45.6	44.1	39.7	37.9	40.5	44.5	47.8

of events after event selection at each modules (MC, numu)

1	# of interactions of 10c(nomi) [/10 ²¹ POT]
2	# of interactions of FLUKA2008(real) [/10 ²¹ POT]
ratio(%)	2 / 1

MC	mod0	1	2	3	4	5	6
1	8.63E+05	1.19E+06	1.43E+06	1.48E+06	1.45E+06	1.21E+06	8.70E+05
2	6.65E+05	9.01E+05	1.08E+06	1.12E+06	1.08E+06	8.98E+05	6.71E+05
ratio	77.1	75.5	75.2	75.6	74.6	73.9	77.1

MC	mod7	8	9	10	11	12	13
1	9.36E+05	1.27E+06	1.48E+06	1.54E+06	1.48E+06	1.27E+06	9.51E+05
2	7.29E+05	9.61E+05	1.13E+06	1.19E+06	1.11E+06	9.45E+05	7.16E+05
ratio	77.9	75.9	76.1	76.9	75.3	74.1	75.3

of events after event selection at each modules (MC, numubar)

1	# of interactions of 10c(nomi) [/10 ²¹ POT]
2	# of interactions of FLUKA2008(real) [/10 ²¹ POT]
ratio(%)	2 / 1

Nobs	mod0	1	2	3	4	5	6
1	3.09E+04	4.09E+04	4.93E+04	5.23E+04	4.91E+04	3.88E+04	2.87E+04
2	1.38E+04	1.63E+04	1.99E+04	2.11E+04	1.96E+04	1.61E+04	1.35E+04
ratio	44.7	39.9	40.4	40.4	39.8	41.5	46.9

Nobs	mod7	8	9	10	11	12	13
1	3.54E+04	4.11E+04	5.22E+04	5.77E+04	4.78E+04	4.49E+04	3.46E+04
2	1.48E+04	1.81E+04	1.99E+04	2.03E+04	1.89E+04	1.99E+04	1.62E+04
ratio	41.7	44.1	38.1	35.1	39.6	44.3	46.8