INGRID MC

Expected observed events (numu)

Target : Fe, horn 270kA

module	0	1	2	3	4	5	6
# of observations [/10^21pot]	757438	1042948	1241523	1308124	1241656	1041447	756305

→ horizontal sum = 7.39×10^6 / 10^21pot

module	7	8	9	10	11	12	13
# of observations [/10^21pot]	812938	1083748	1274812	1340887	1290506	1081501	826819

→ vertical sum = 7.71×10^6 / 10^21pot

Total : 1.51 × 10^7 / 10^21pot

Expected observed events (numubar)

Target : Fe, horn 270kA

module	0	1	2	3	4	5	6
# of observations [/10^21pot]	31111	39991	50231	53626	47857	39950	32264

→ horizontal sum = 2.95×10^5 / 10^21pot

module	7	8	9	10	11	12	13
# of observations [/10^21pot]	35584	42501	51301	56144	50985	43785	35934

→ vertical sum = 3.16×10^5 / 10^21pot

Total : 6.11 × 10^5 / 10^21pot

Expected observed events (nue)

Target : Fe, horn 270kA

module	0	1	2	3	4	5	6
# of observations [/10^21pot]	7119	8436	8989	10042	9297	8342	6965

→ horizontal sum = 5.19×10^4 / 10^21pot

module	7	8	9	10	11	12	13
# of observations [/10^21pot]	7587	8762	9814	10170	10128	8776	7459

→ vertical sum = 6.27×10^6 / 10^21pot

Total : 1.22 × 10^5 / 10^21pot

Expected observed events (nuebar)

Target : Fe, horn 270kA

module	0	1	2	3	4	5	6
# of observations [/10^21pot]	724	785	841	869	797	801	693

→ horizontal sum = 5.51×10^3 / 10^21pot

module	7	8	9	10	11	12	13
# of observations [/10^21pot]	7587	8762	9814	10170	10128	8776	7459

→ vertical sum = 5.85×10^3 / 10^21pot

Total : 1.13 × 10^4 / 10^21pot

Compare of # of observations Data vs MC (horn 270kA)

- Beam data : all physic run data
- MC data : Jnubeam Flux10b × Cross-section(NEUT) × INGRID neutrino efficiency
  - Sum # of numu, numubar, nue, nuebar event
  - Consider the scintillator mass (scale up × 1.038)
- Normalized by POT

	Data	MC
# of observations / 10^14 pot	1.52	1.64

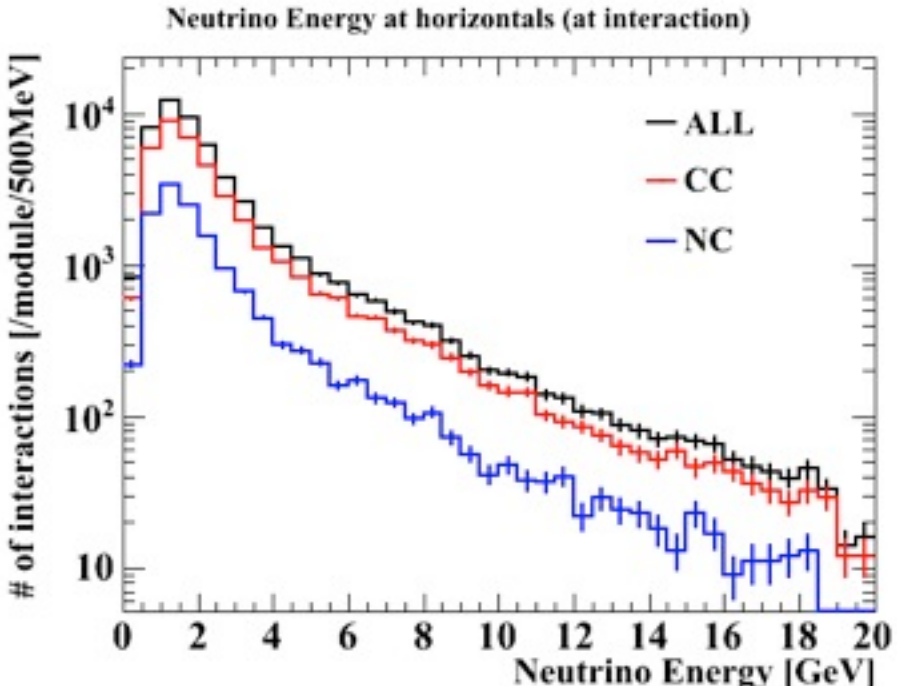
- This result is very preliminary, without error.

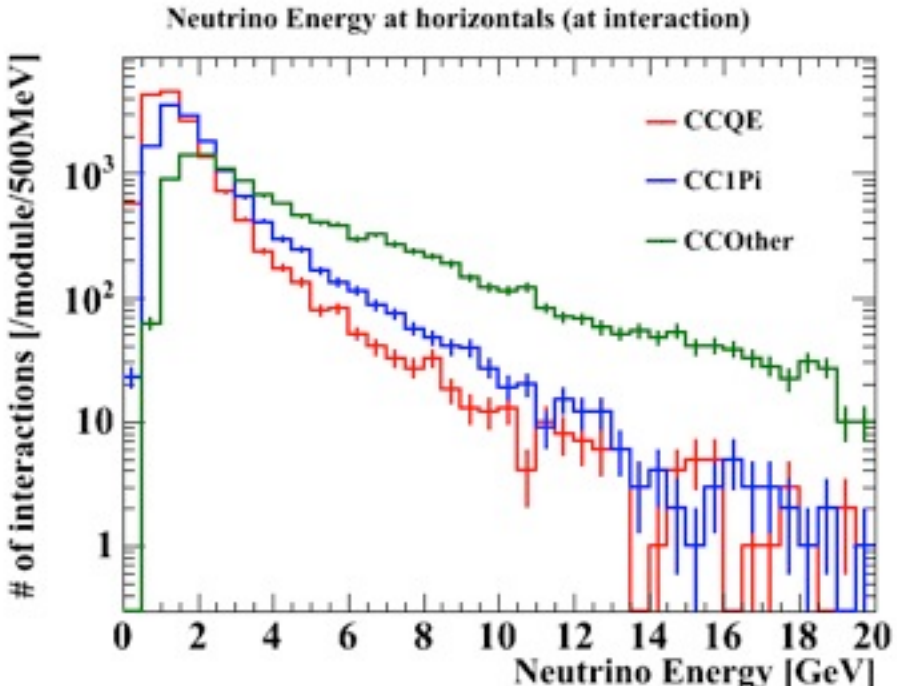
Neutrino energy spectrum

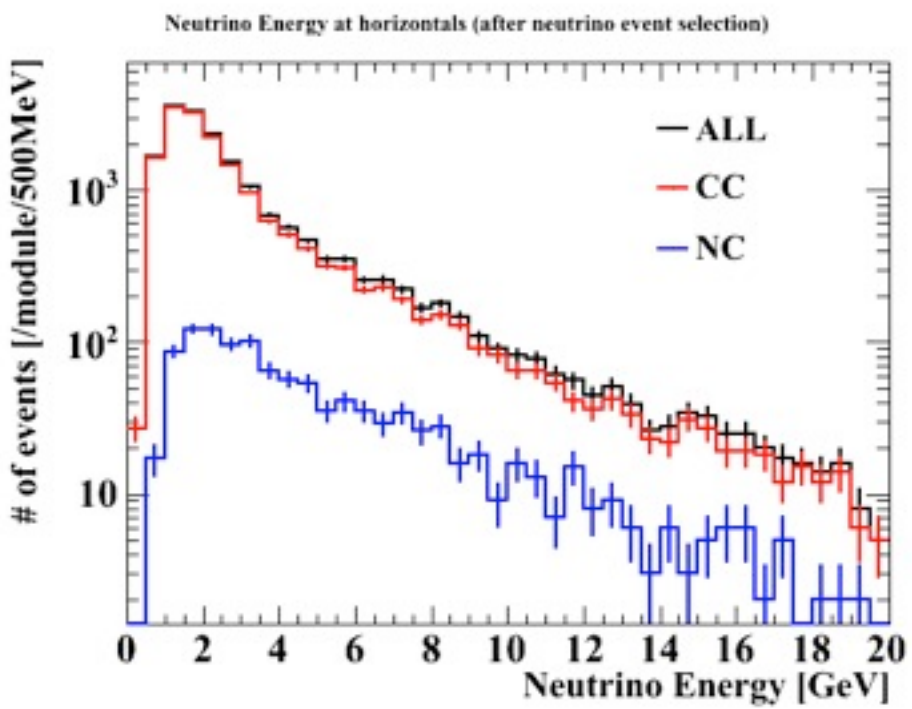
- Draw energy spectrum at each module at each step
  - Neutrino interaction within modules
  - Observation by INGRID with neutrino event selection
- Only numu interaction
- Interaction → observation の順番

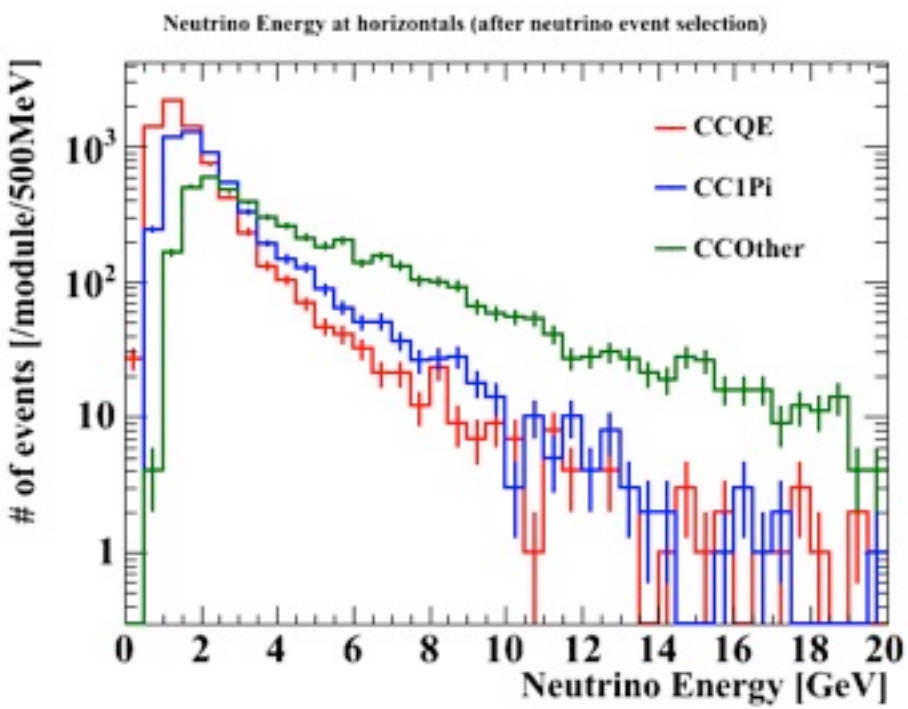
Horizontal modules

All horizontal modules

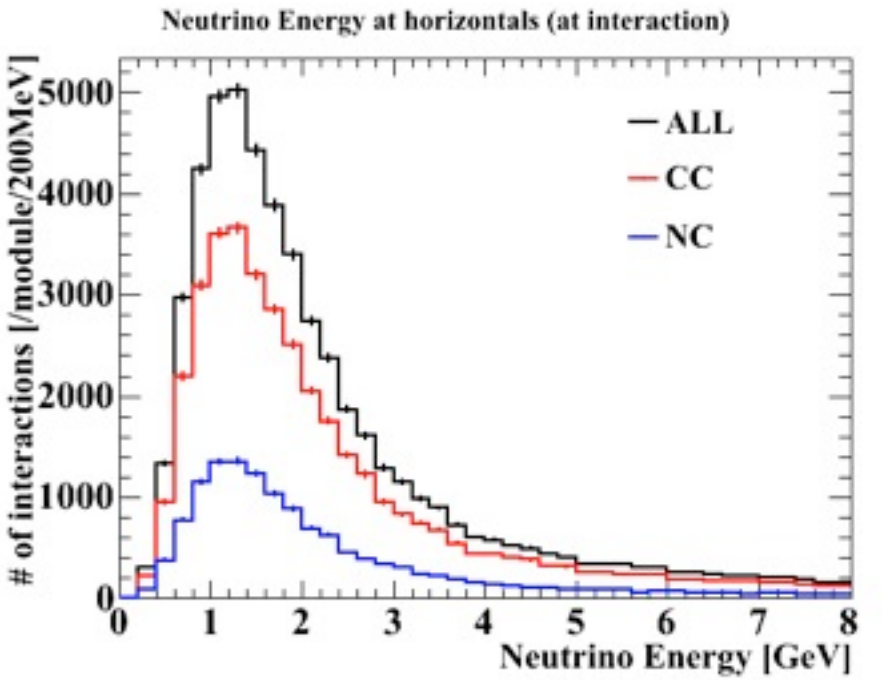


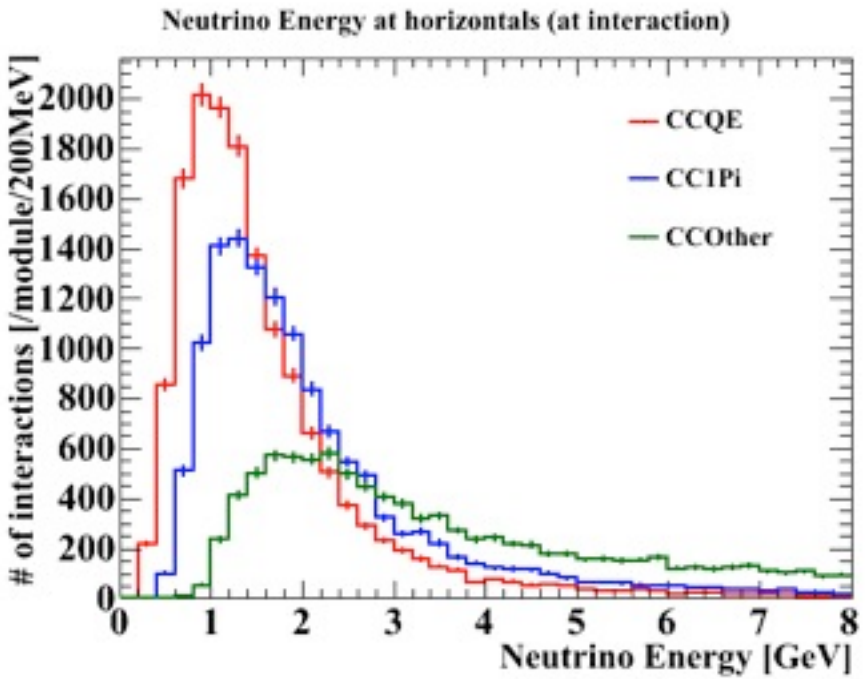


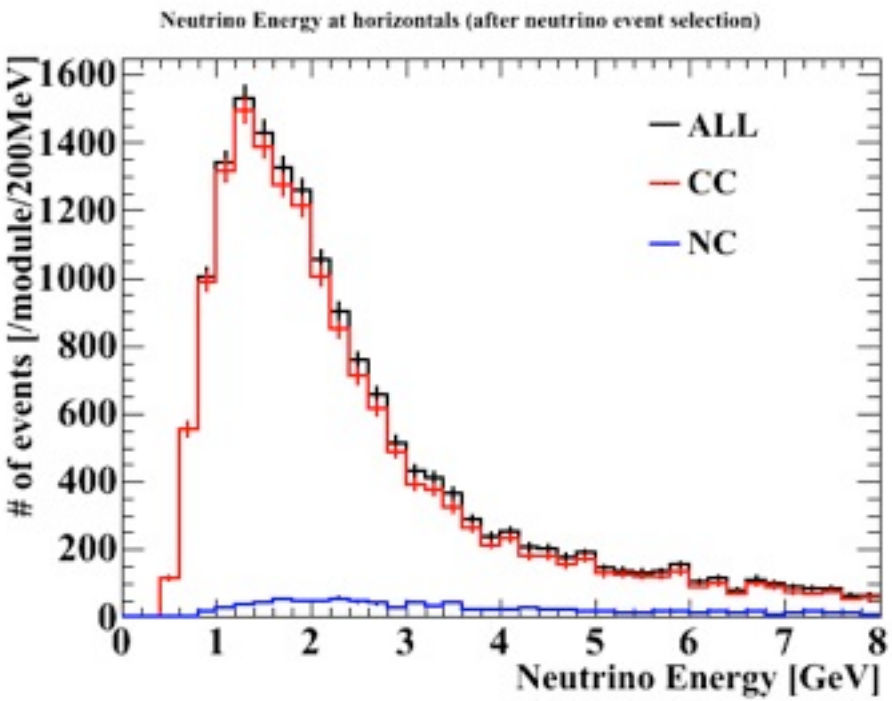


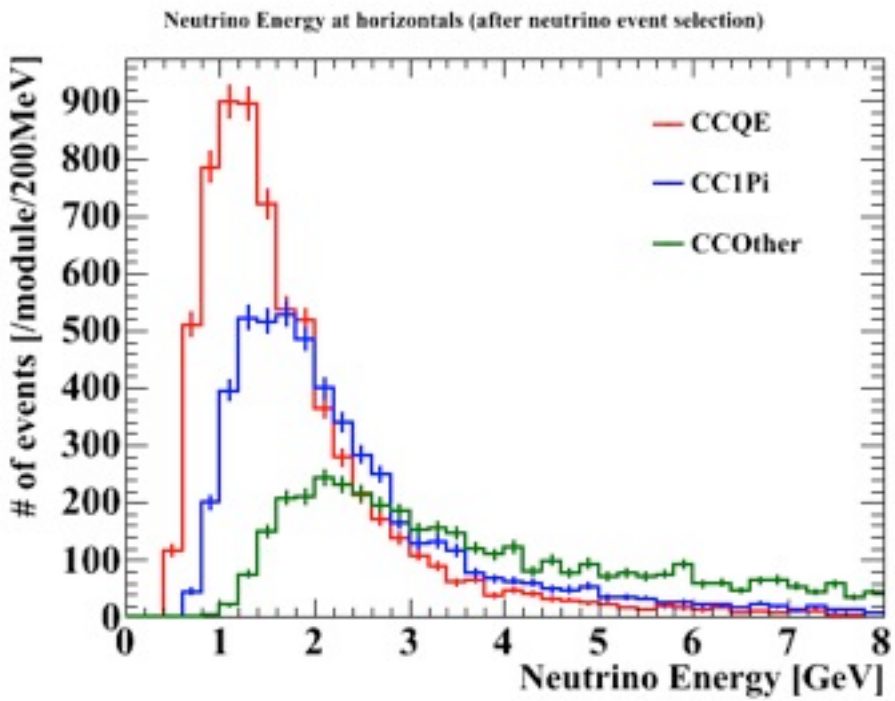


All horizontal modules (low energy)

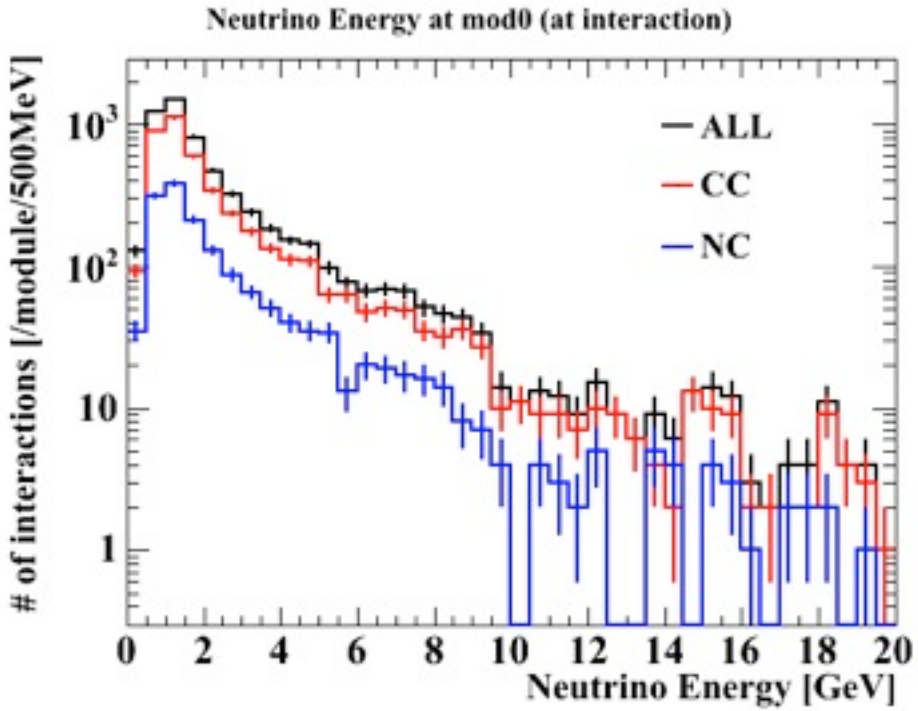


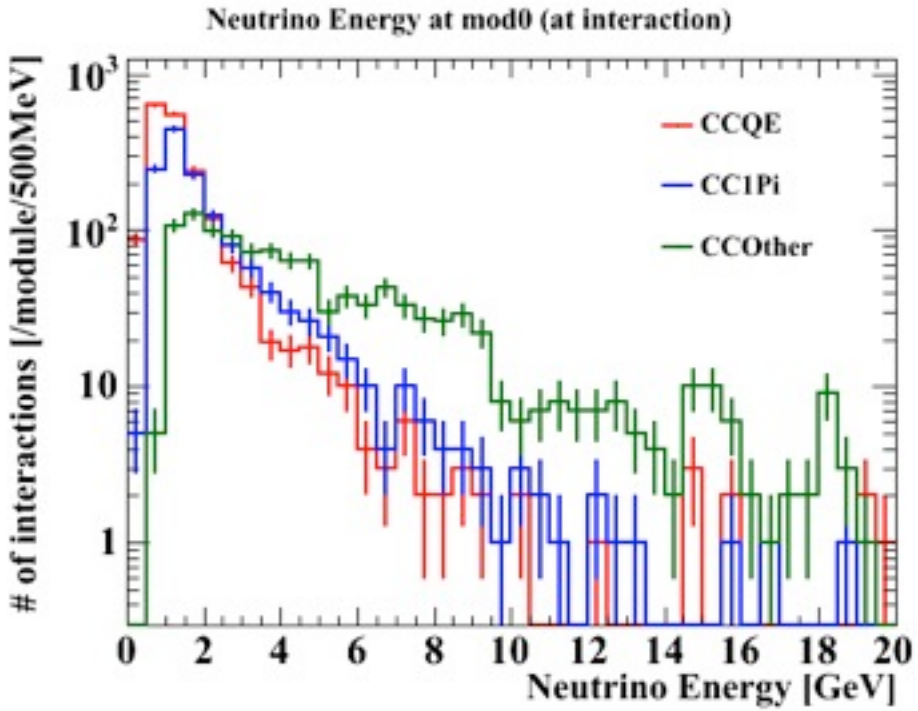


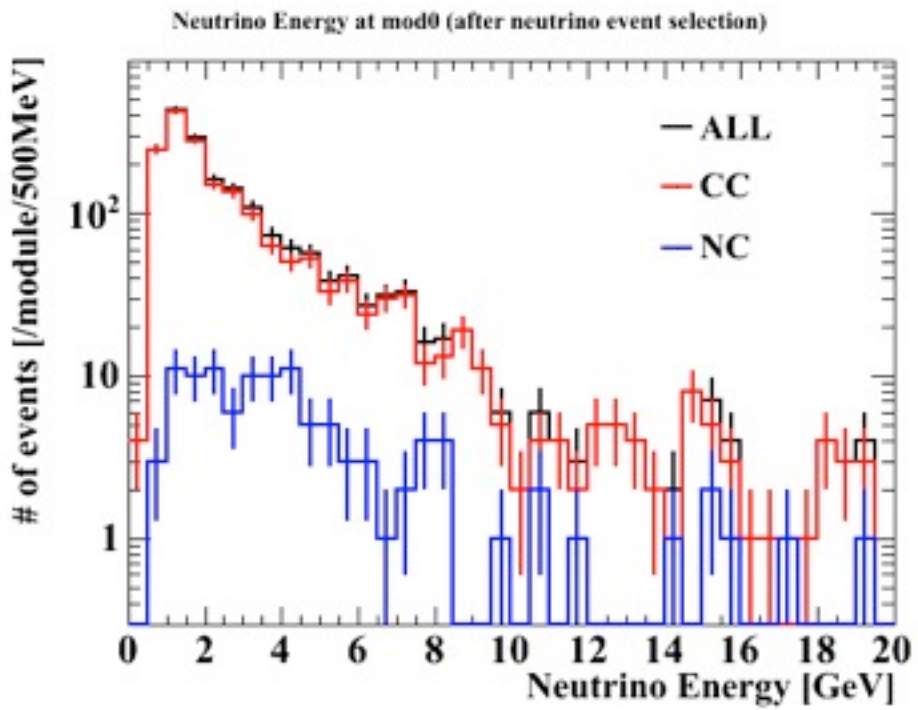


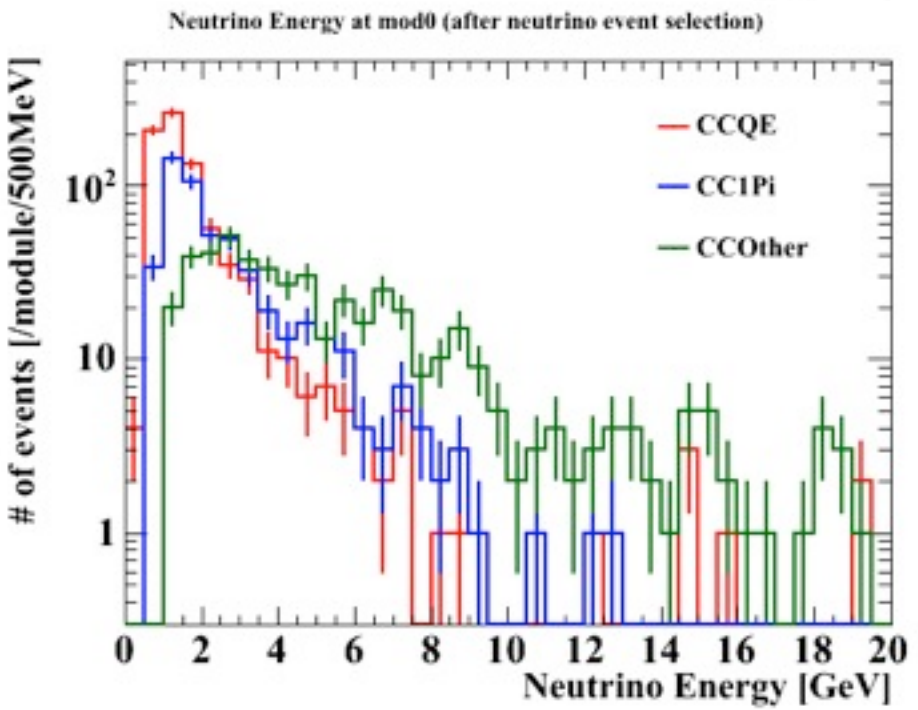


module 0

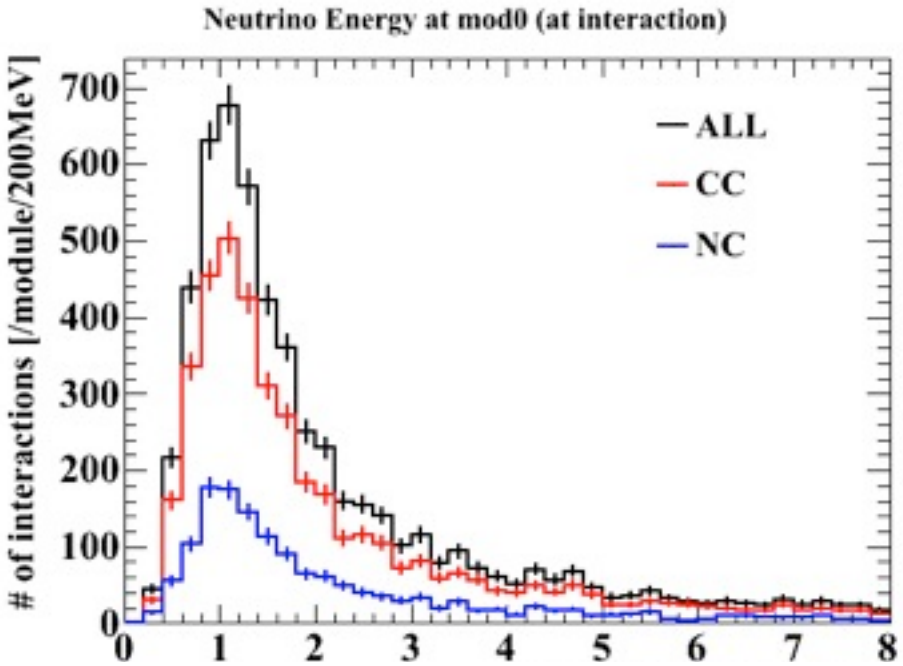

Neutrino Energy at mod0 (at interaction)
# of interactions [/module/500MeV]
Neutrino Energy [GeV]
ALL
CC
NC

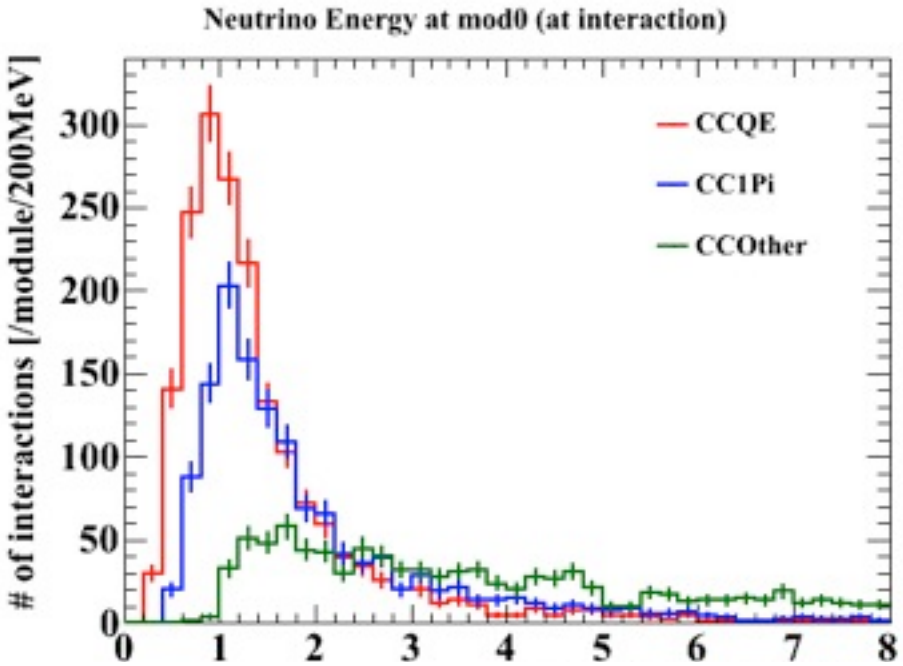

Neutrino Energy at mod0 (at interaction)
# of interactions [/module/500MeV]
Neutrino Energy [GeV]
CCQE
CC1Pi
CCOther

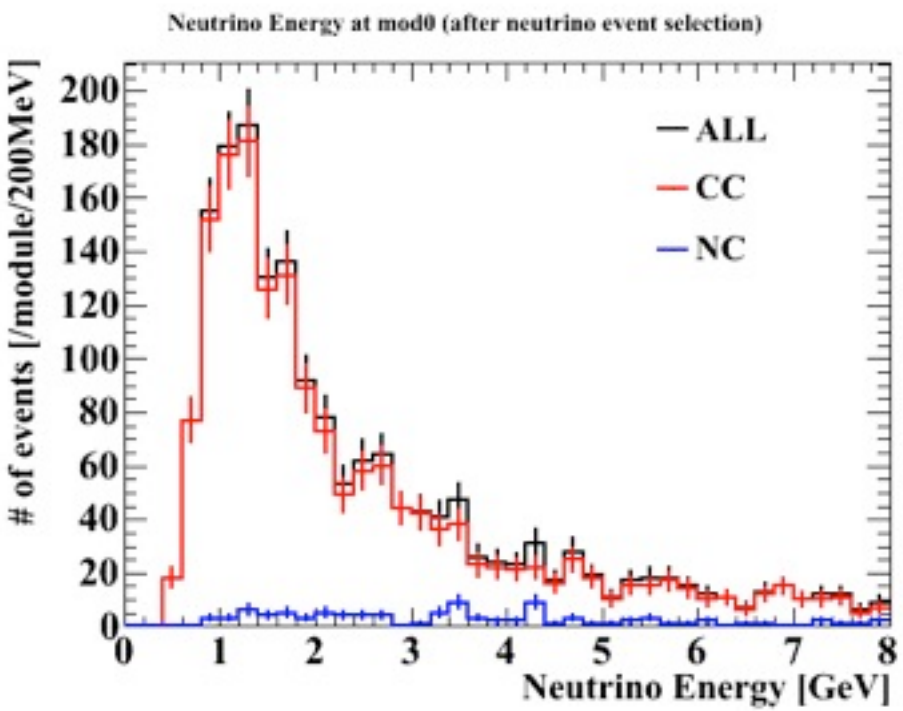

Neutrino Energy at mod0 (after neutrino event selection)
# of events [/module/500MeV]
Neutrino Energy [GeV]
ALL
CC
NC

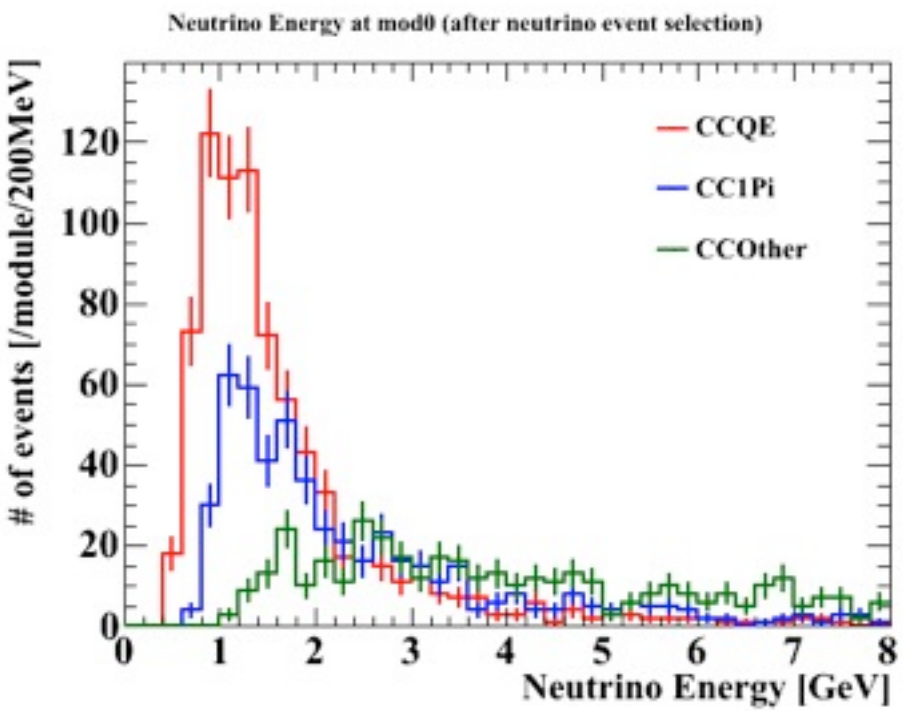

Neutrino Energy at mod0 (after neutrino event selection)
# of events [/module/500MeV]
Neutrino Energy [GeV]
CCQE
CC1Pi
CCOther

modules 0 (low energy)

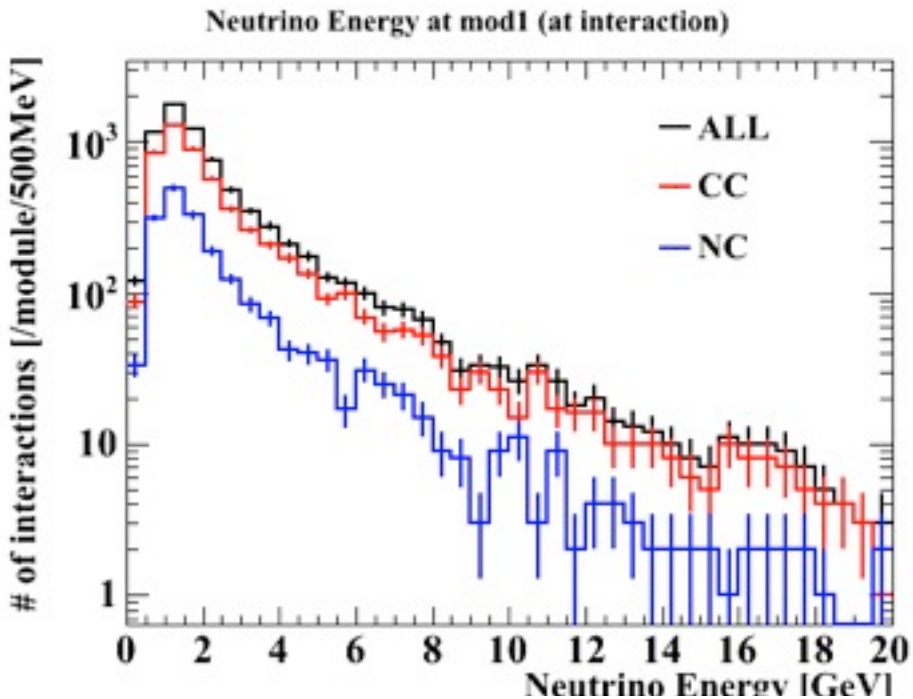


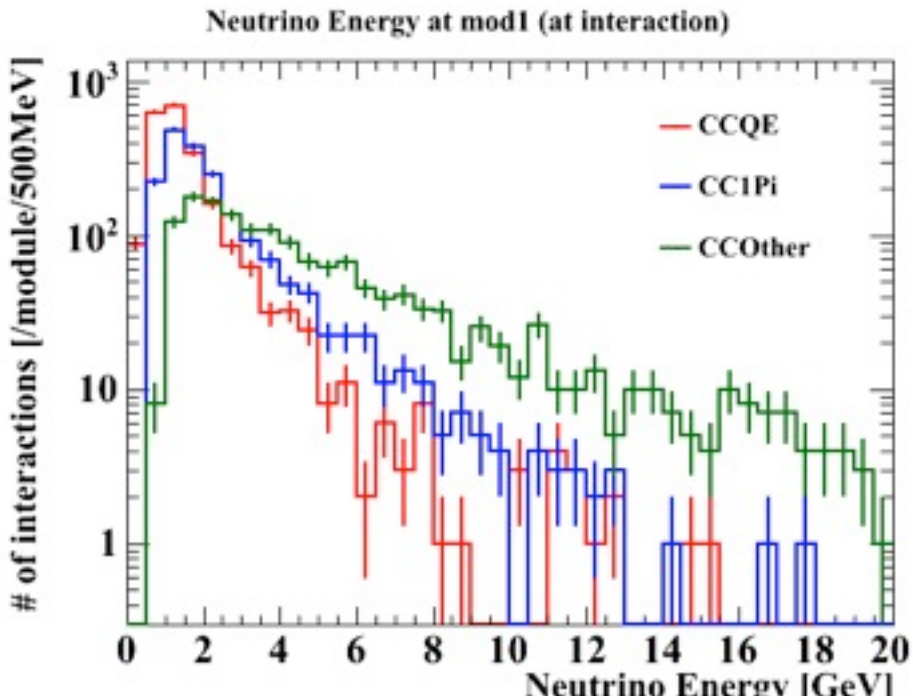


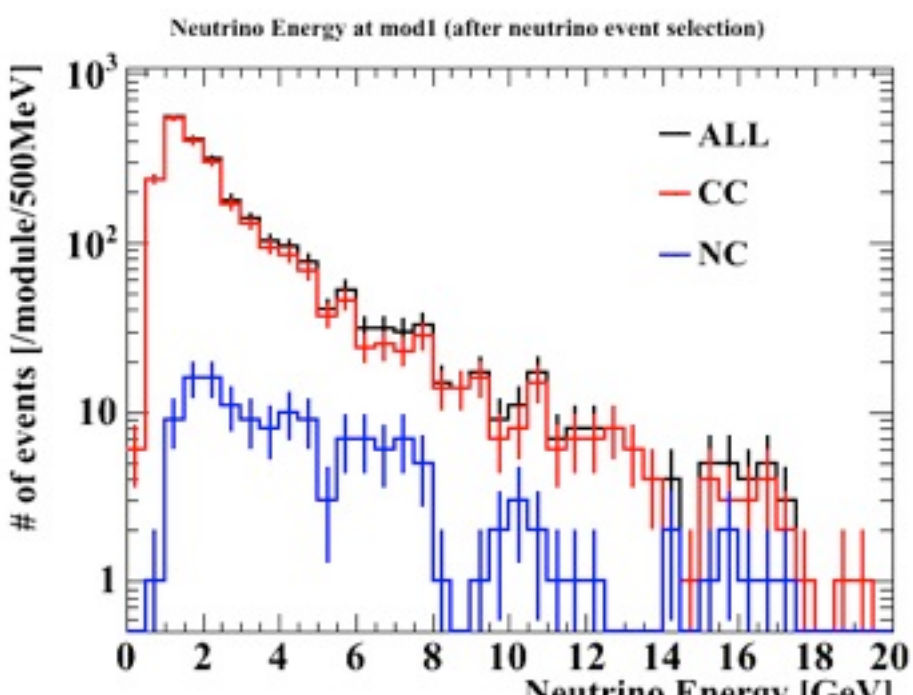


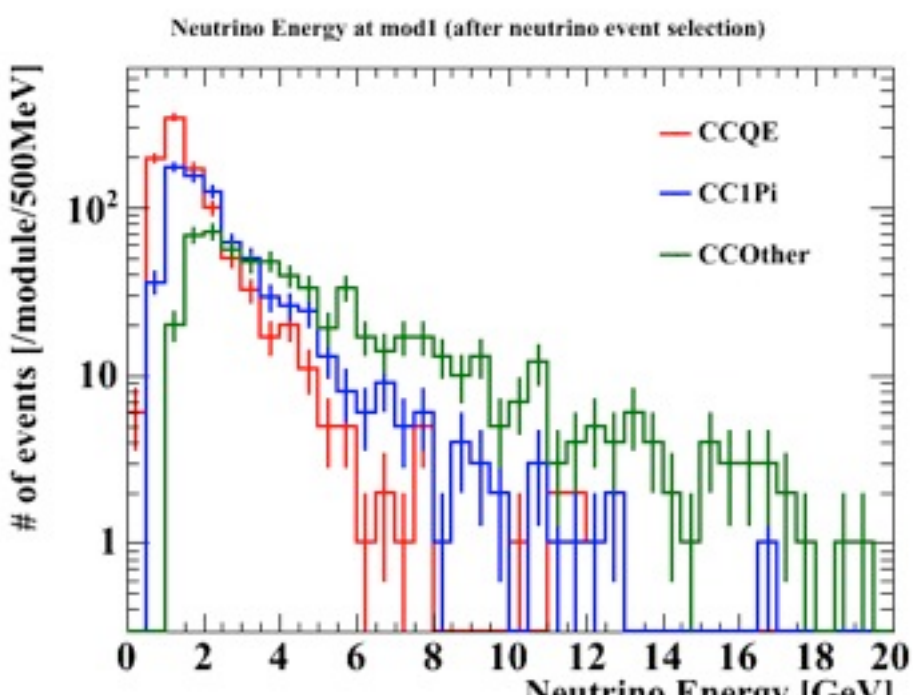


module 1

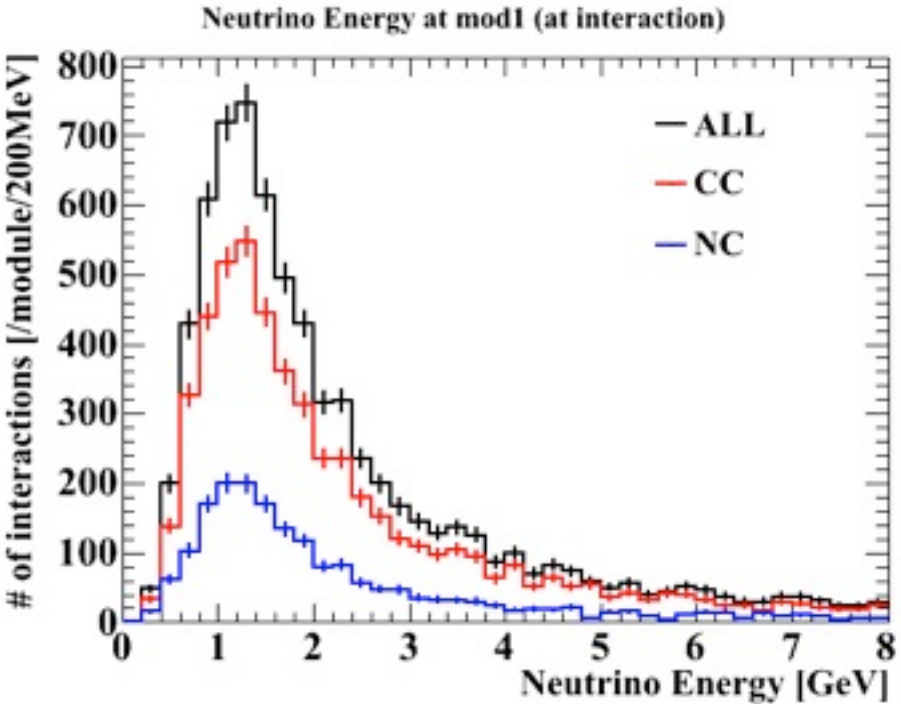

Neutrino Energy at mod1 (at interaction)
# of interactions [/module/500MeV]
Neutrino Energy [GeV]
ALL
CC
NC

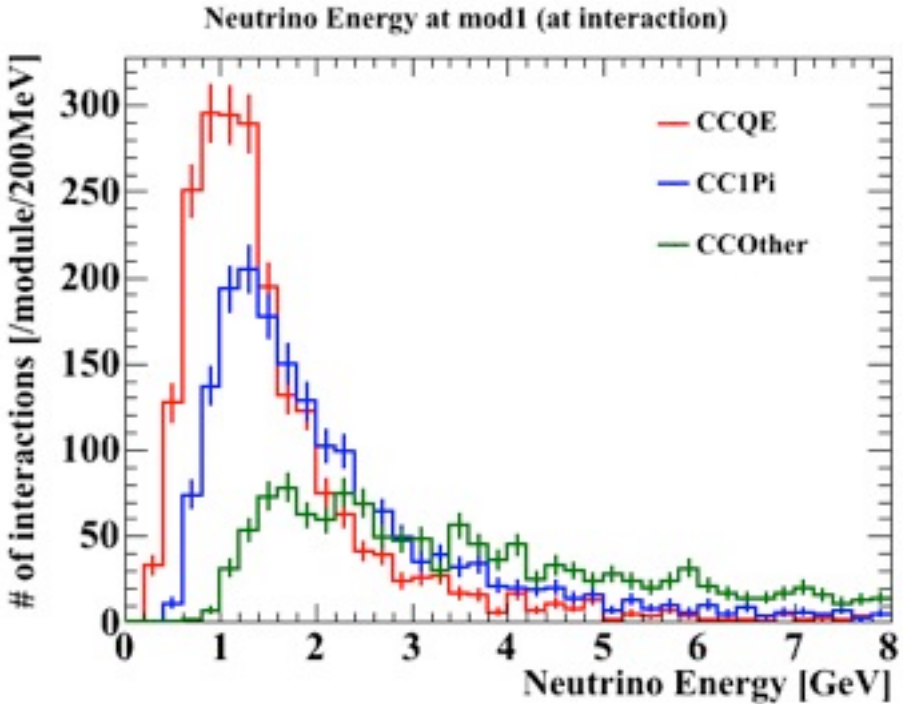

Neutrino Energy at mod1 (at interaction)
# of interactions [/module/500MeV]
Neutrino Energy [GeV]
CCQE
CC1Pi
CCOther

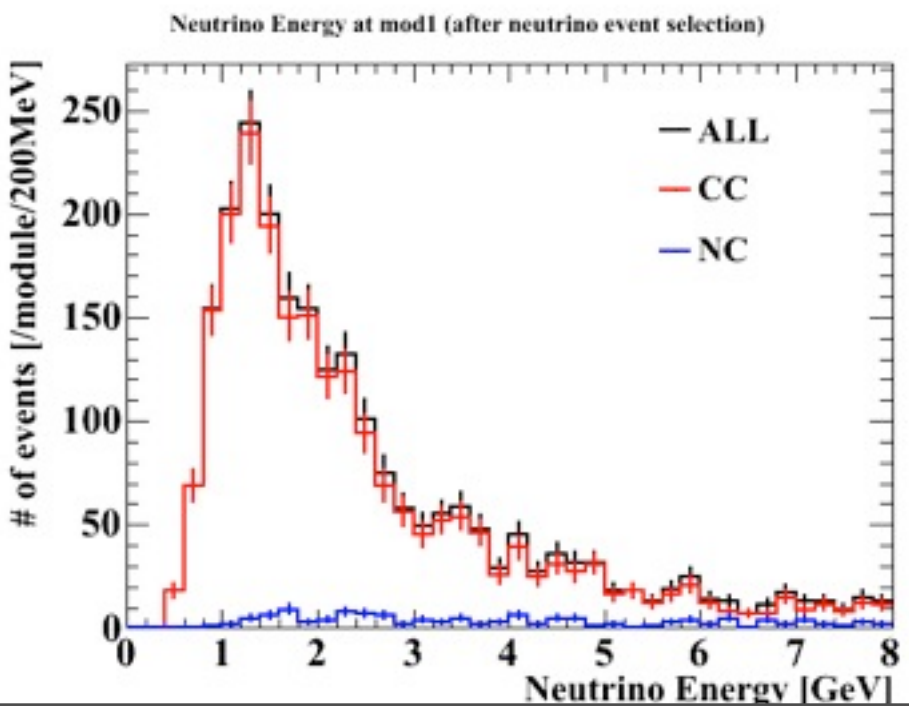

Neutrino Energy at mod1 (after neutrino event selection)
# of events [/module/500MeV]
Neutrino Energy [GeV]
ALL
CC
NC

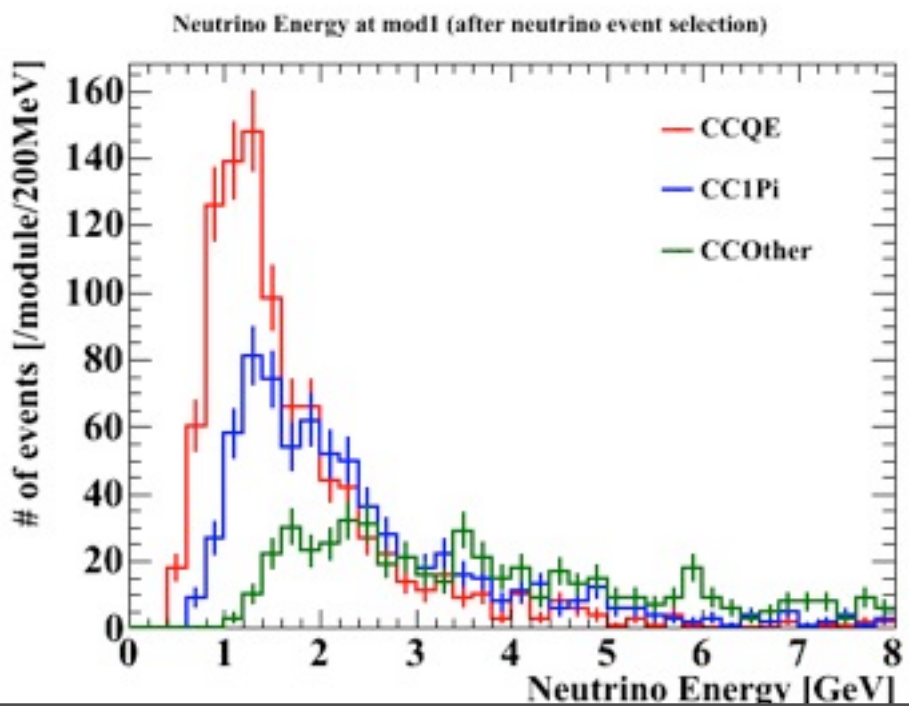

Neutrino Energy at mod1 (after neutrino event selection)
# of events [/module/500MeV]
Neutrino Energy [GeV]
CCQE
CC1Pi
CCOther

module 1 (low energy)

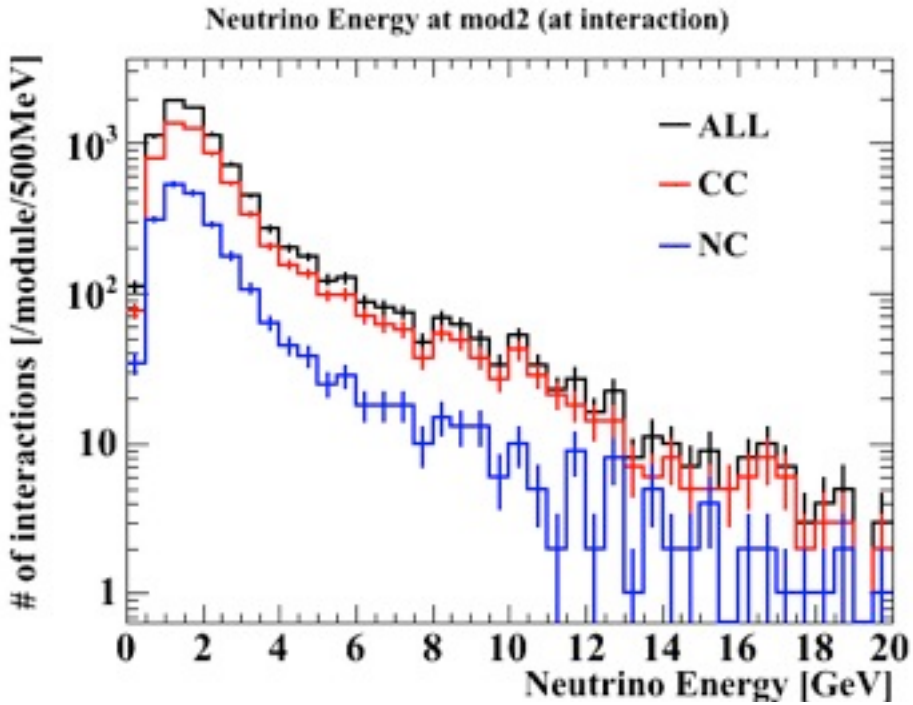


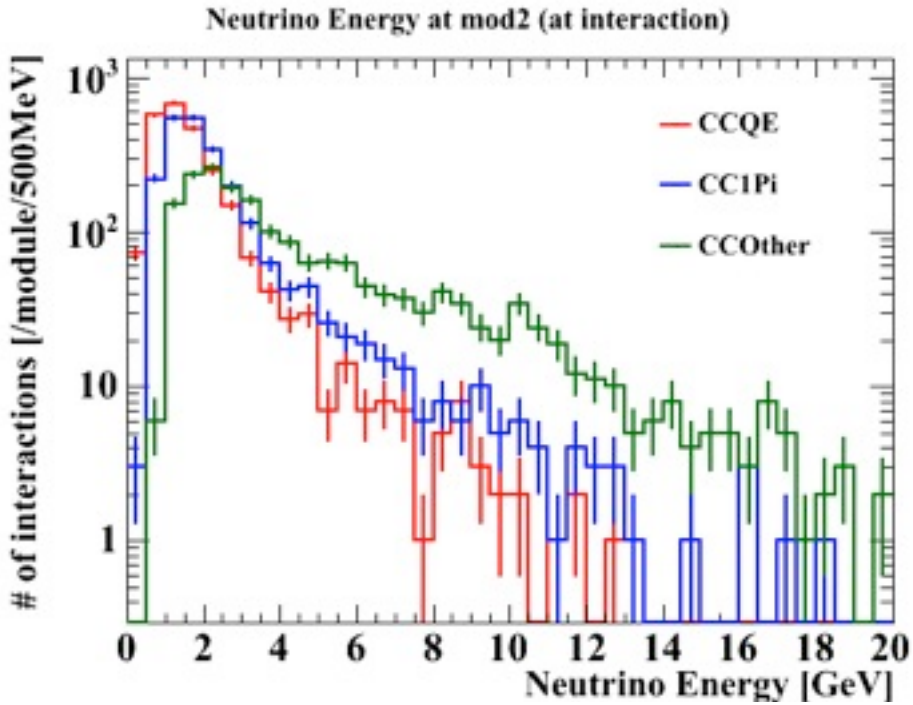


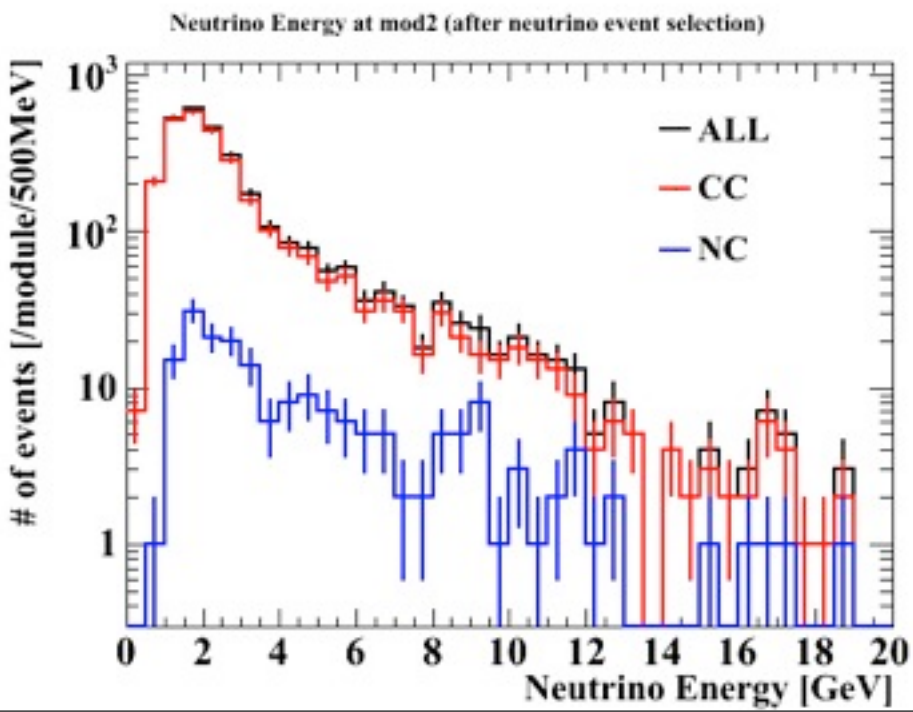


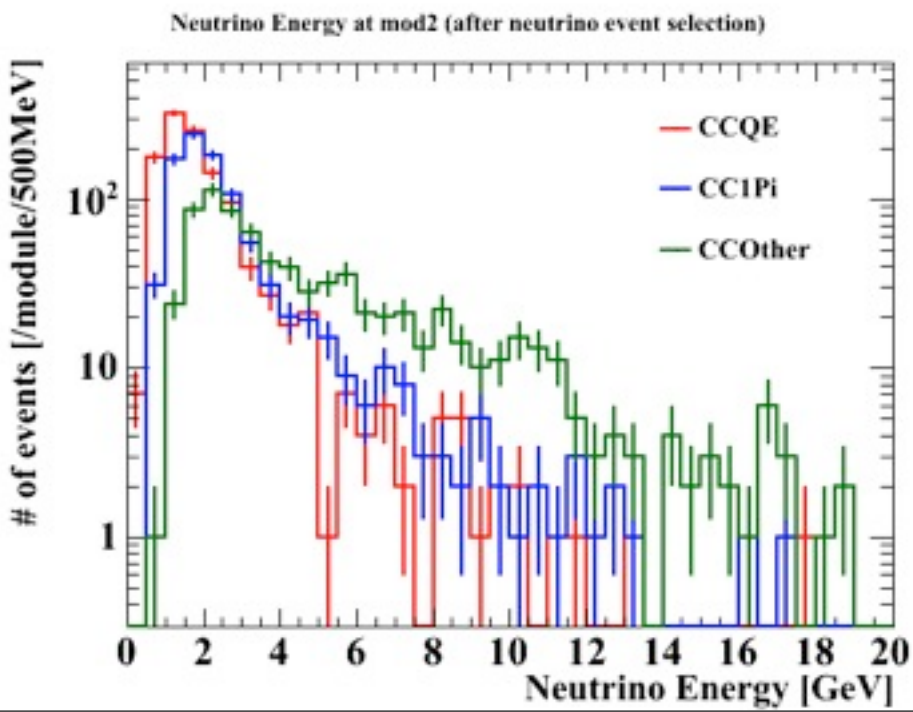


module 2

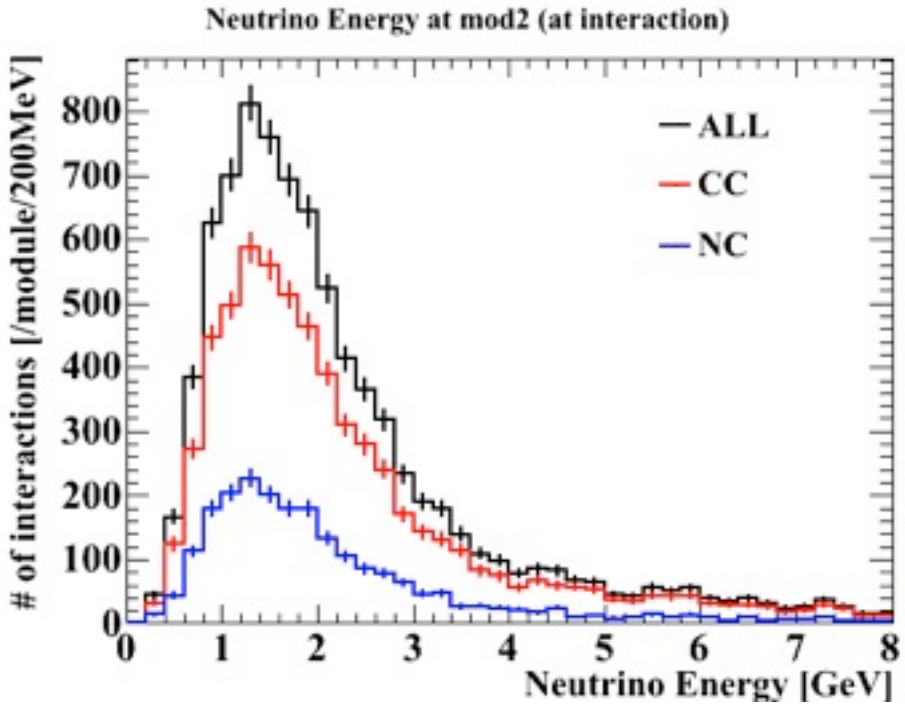

Neutrino Energy at mod2 (at interaction)
# of interactions [/module/500MeV]
Neutrino Energy [GeV]
ALL
CC
NC

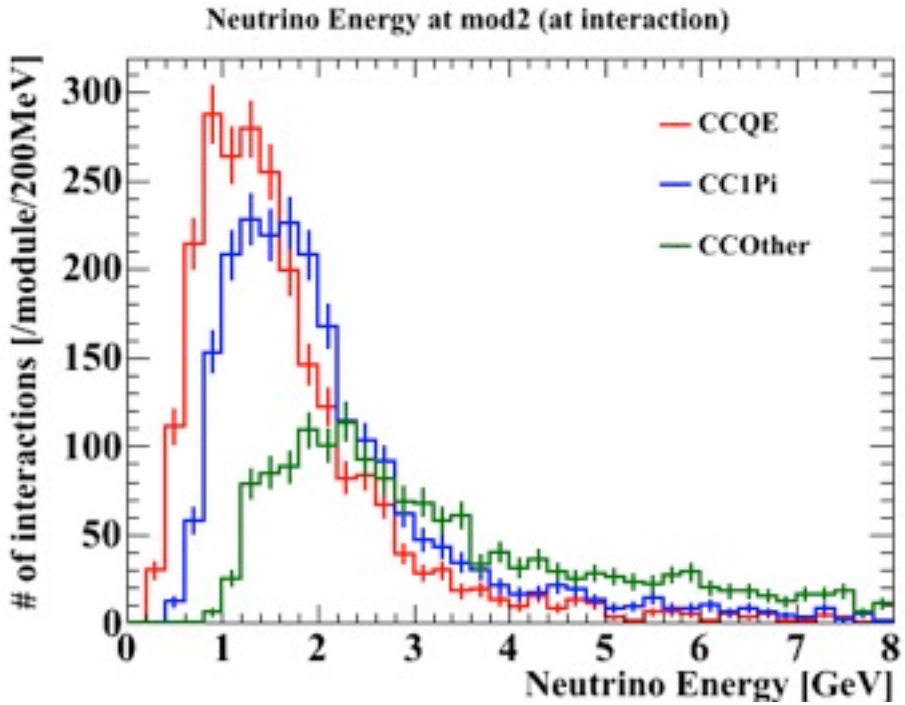

Neutrino Energy at mod2 (at interaction)
# of interactions [/module/500MeV]
Neutrino Energy [GeV]
CCQE
CC1Pi
CCOther

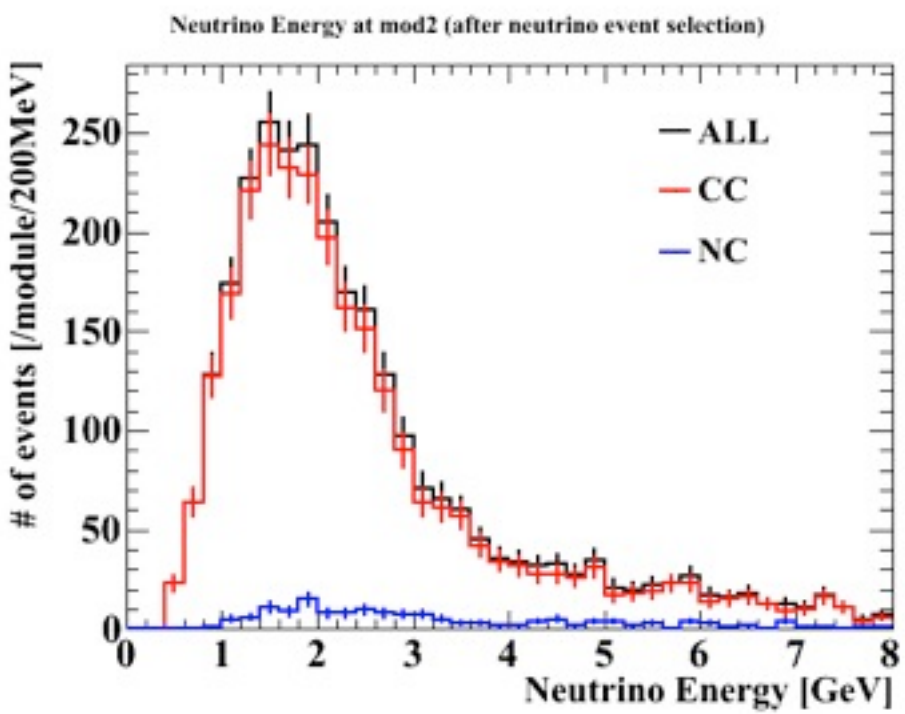

Neutrino Energy at mod2 (after neutrino event selection)
# of events [/module/500MeV]
Neutrino Energy [GeV]
ALL
CC
NC

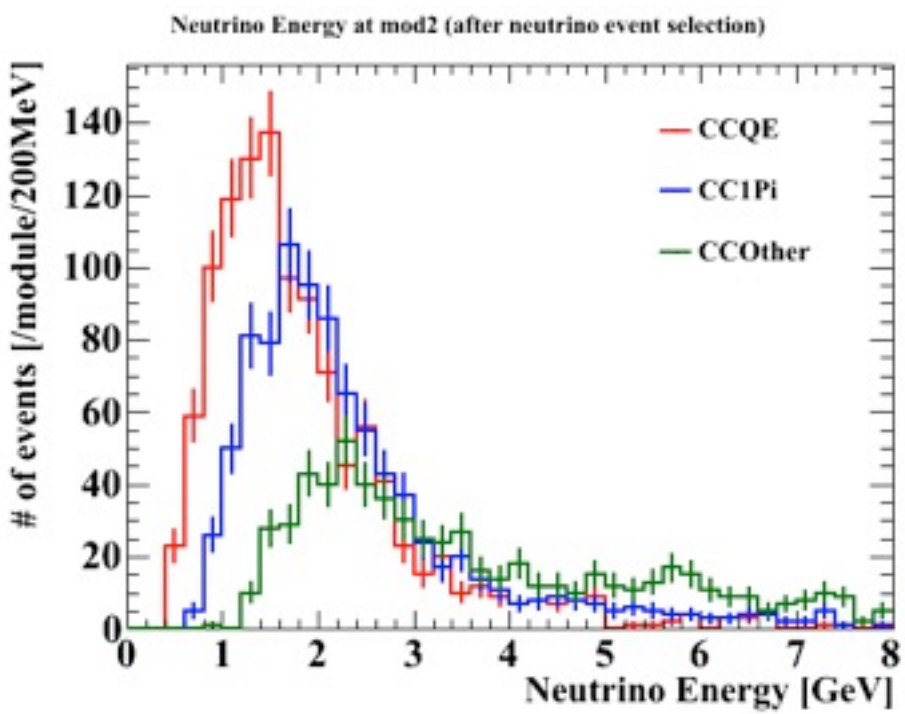

Neutrino Energy at mod2 (after neutrino event selection)
# of events [/module/500MeV]
Neutrino Energy [GeV]
CCQE
CC1Pi
CCOther

module 2 (low energy)

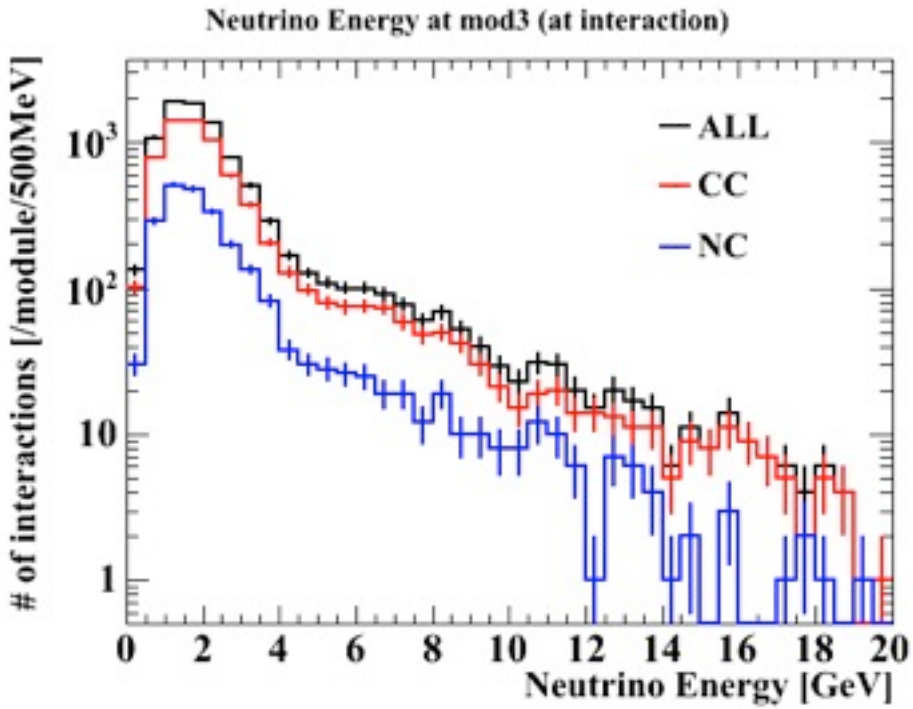


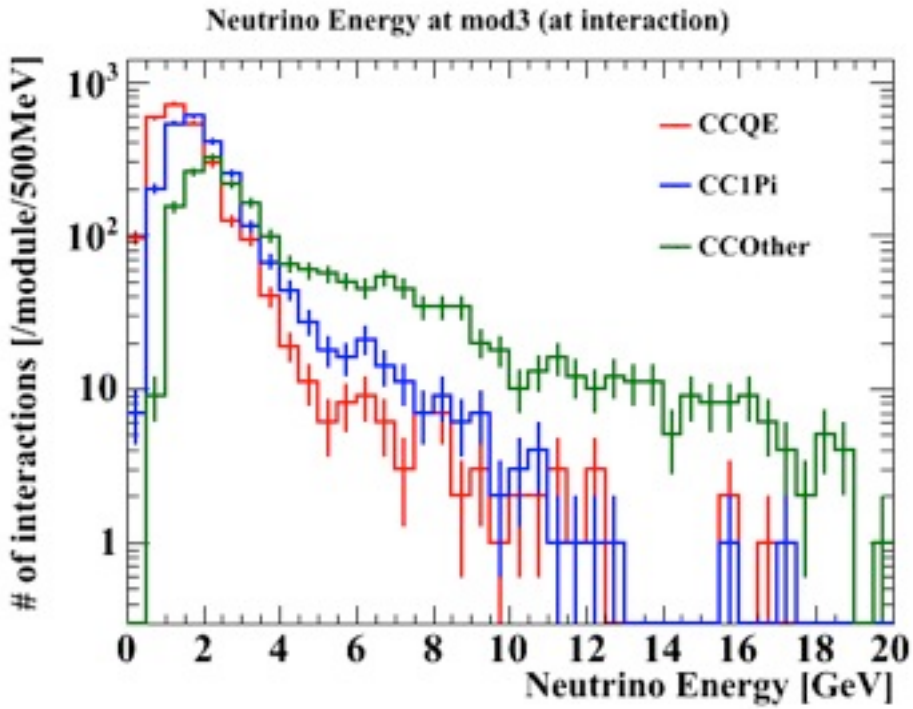


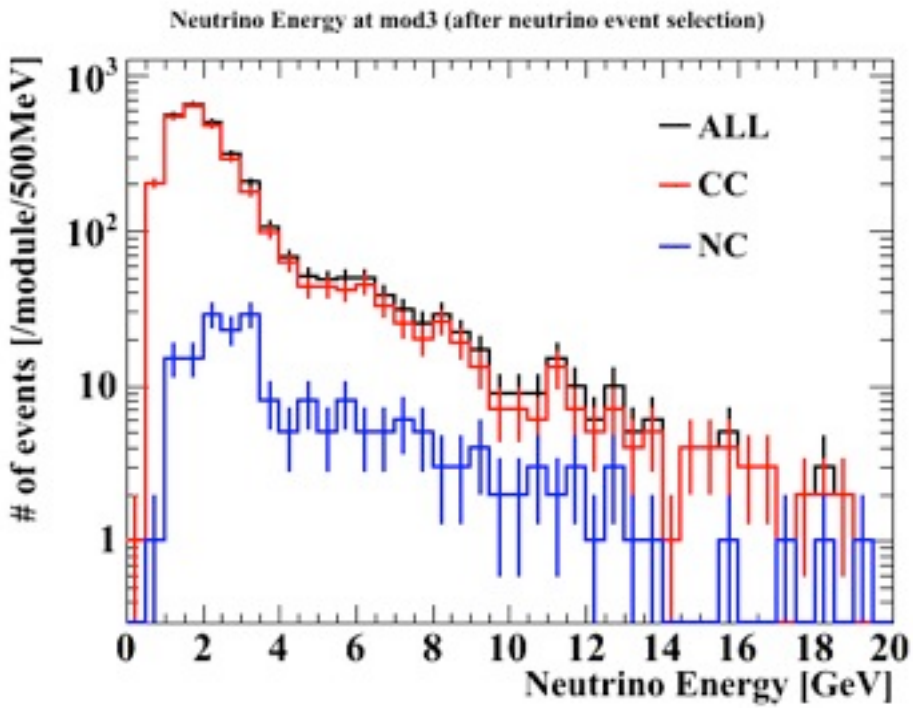


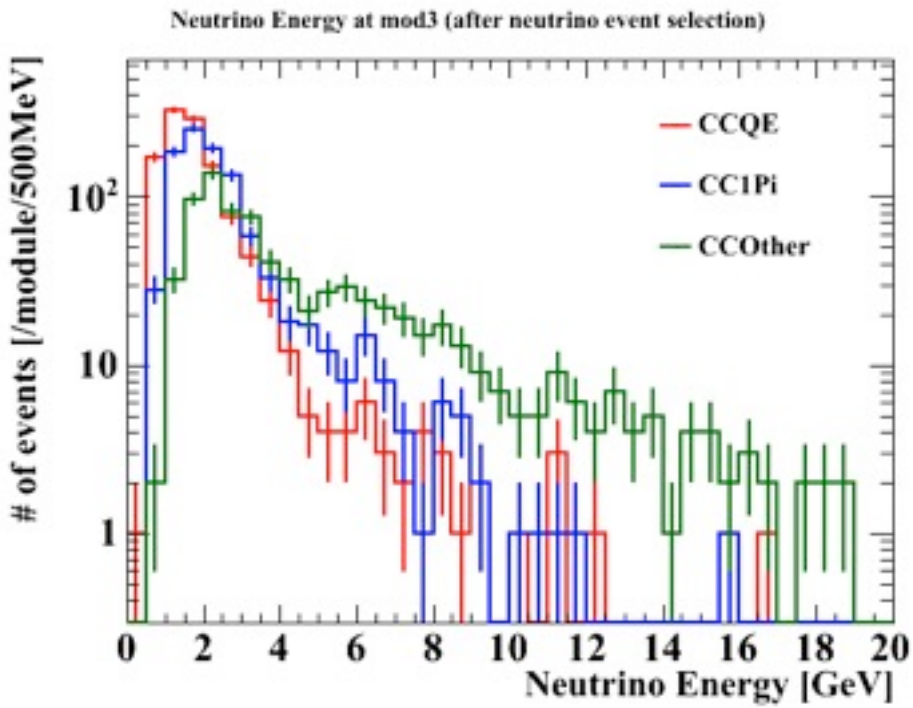


module 3

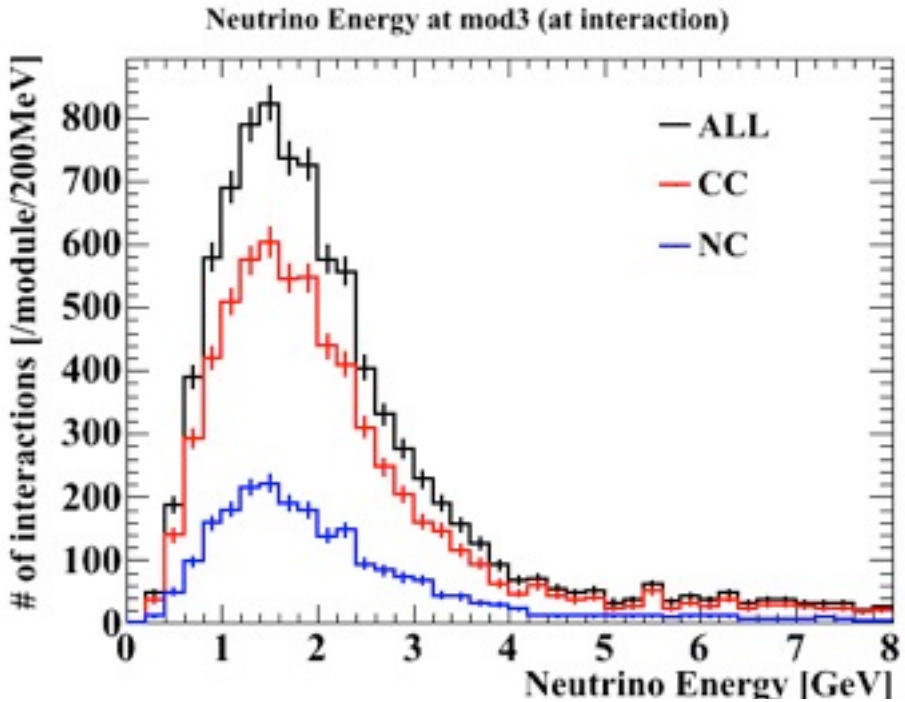

Neutrino Energy at mod3 (at interaction)
ALL
CC
NC
# of interactions [/module/500MeV]
Neutrino Energy [GeV]

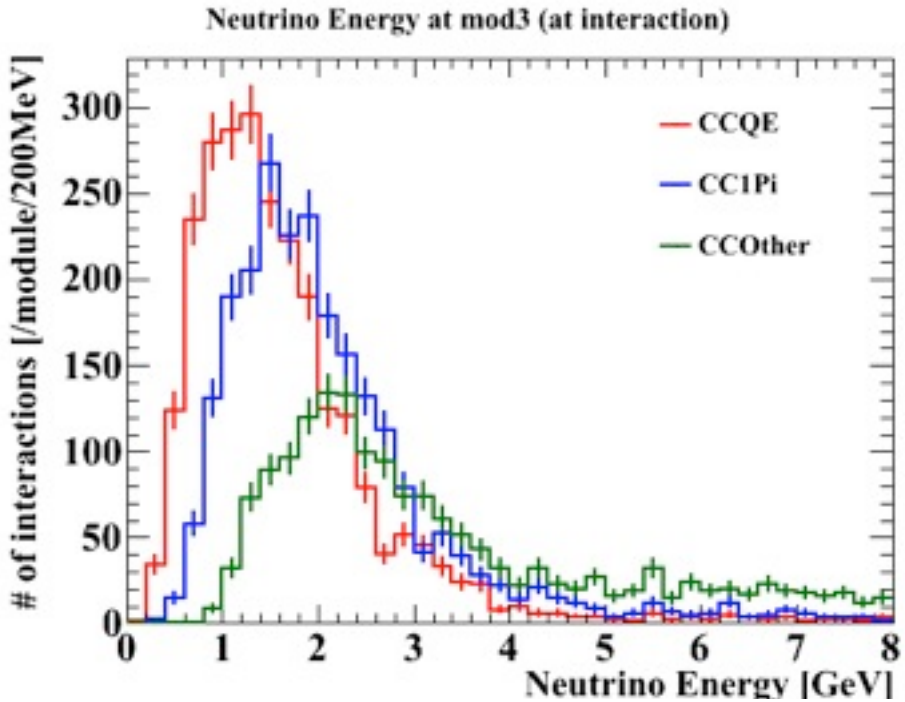

Neutrino Energy at mod3 (at interaction)
CCQE
CC1Pi
CCOther
# of interactions [/module/500MeV]
Neutrino Energy [GeV]

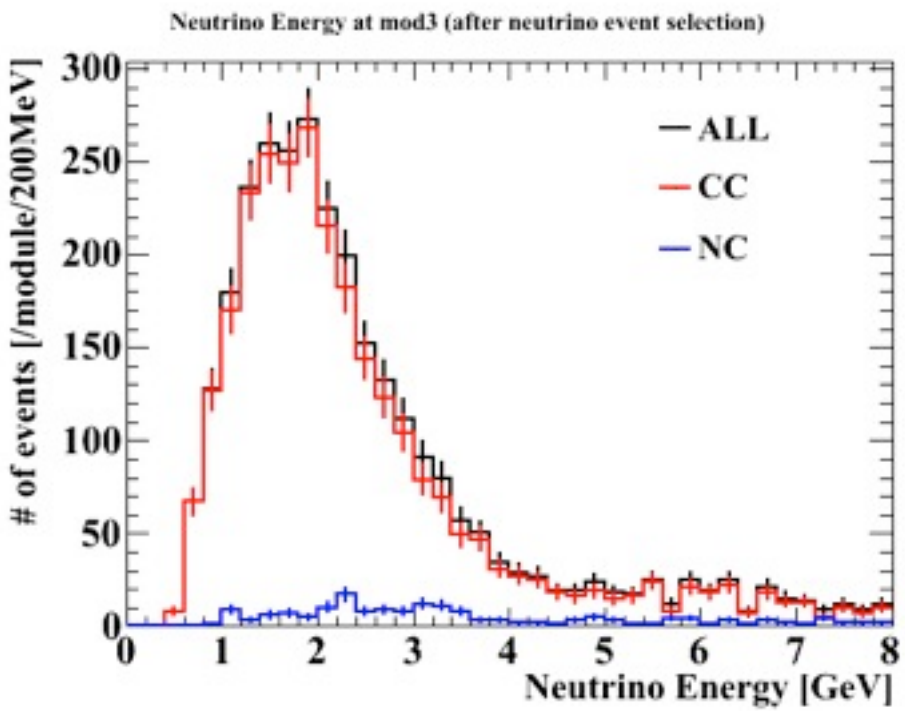

Neutrino Energy at mod3 (after neutrino event selection)
ALL
CC
NC
# of events [/module/500MeV]
Neutrino Energy [GeV]

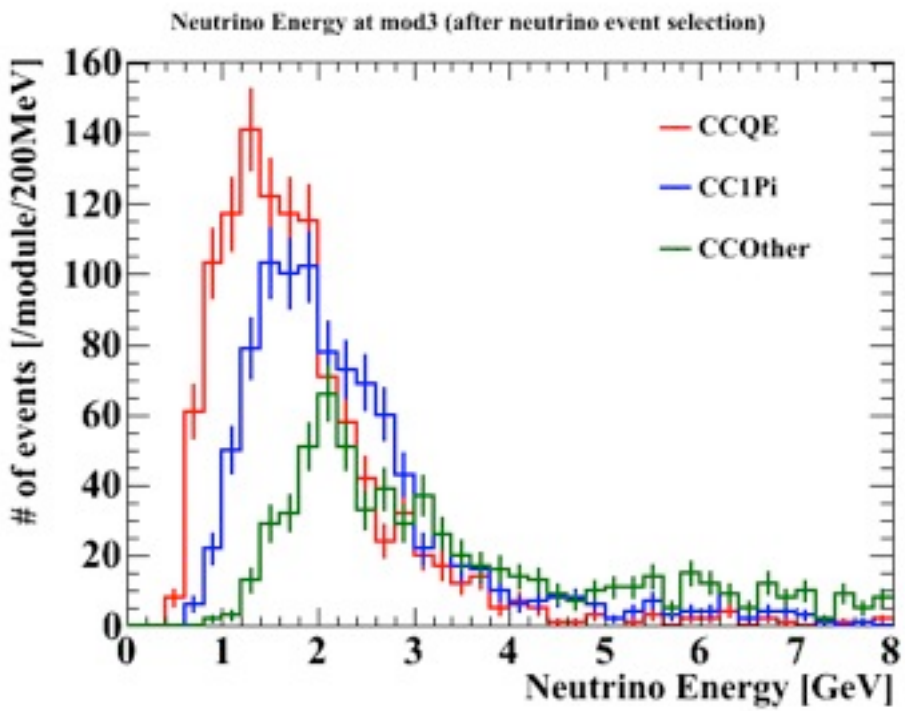

Neutrino Energy at mod3 (after neutrino event selection)
CCQE
CC1Pi
CCOther
# of events [/module/500MeV]
Neutrino Energy [GeV]

module 3 (low energy)

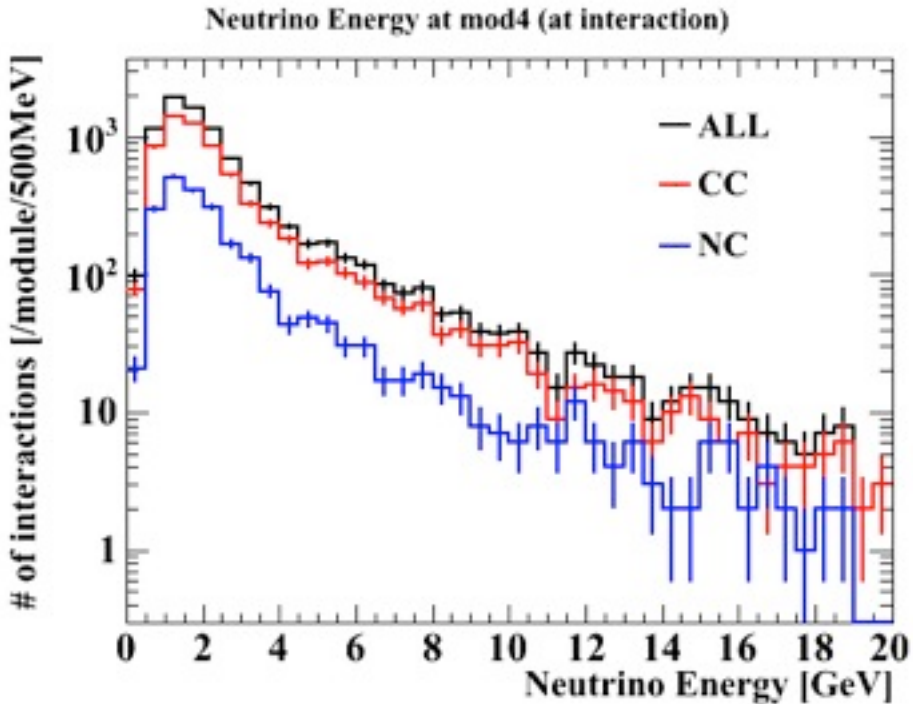


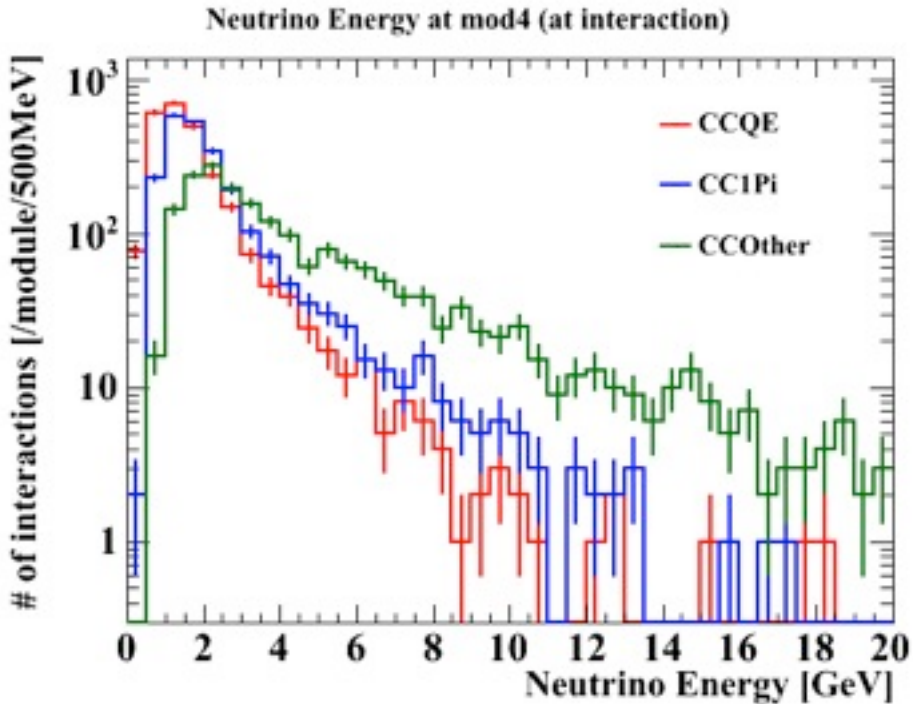


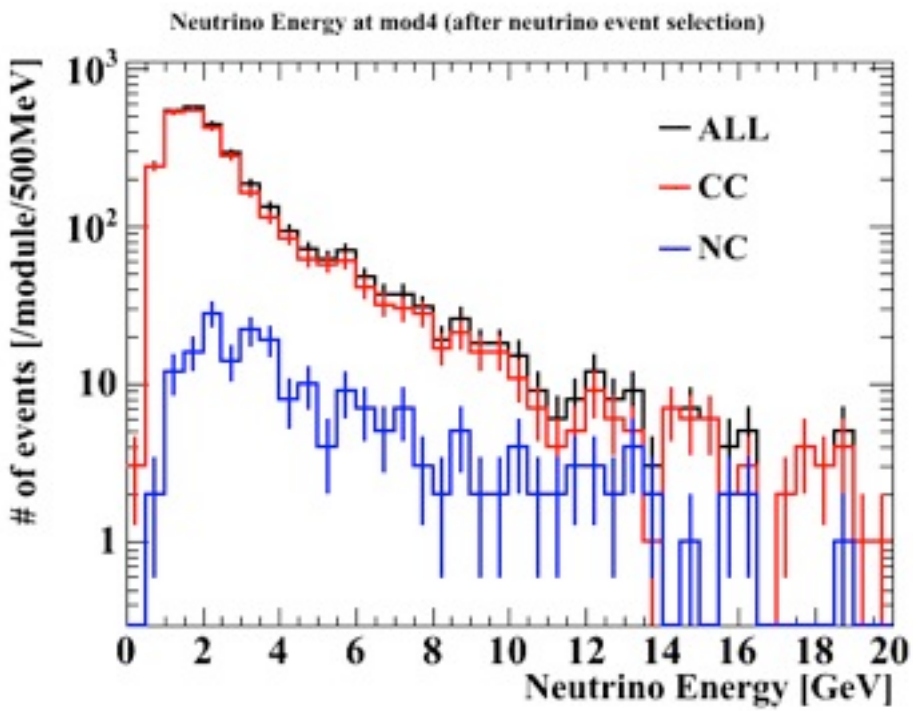


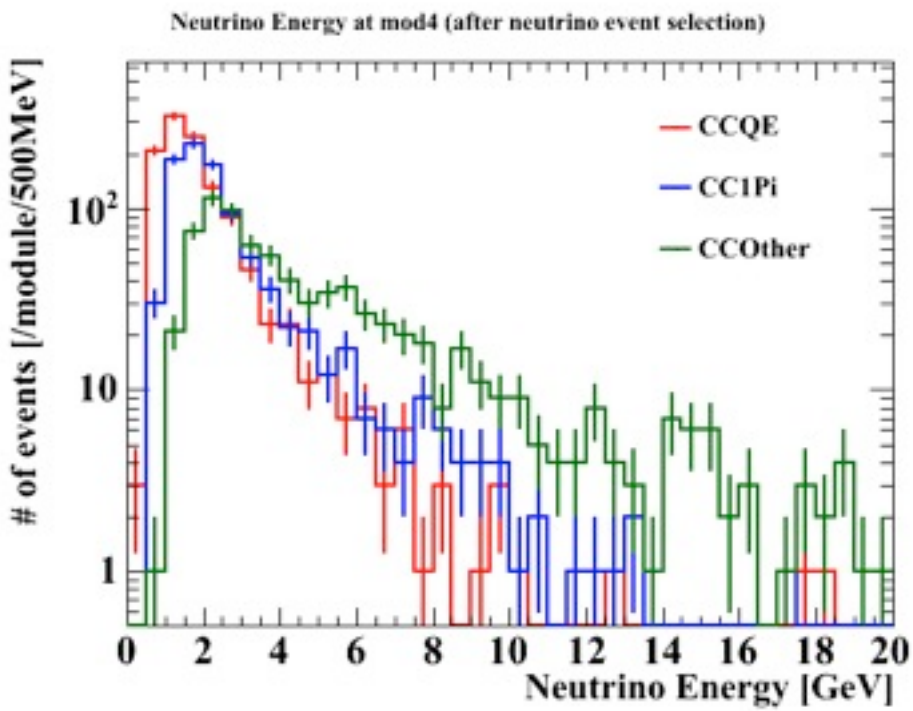


module 4

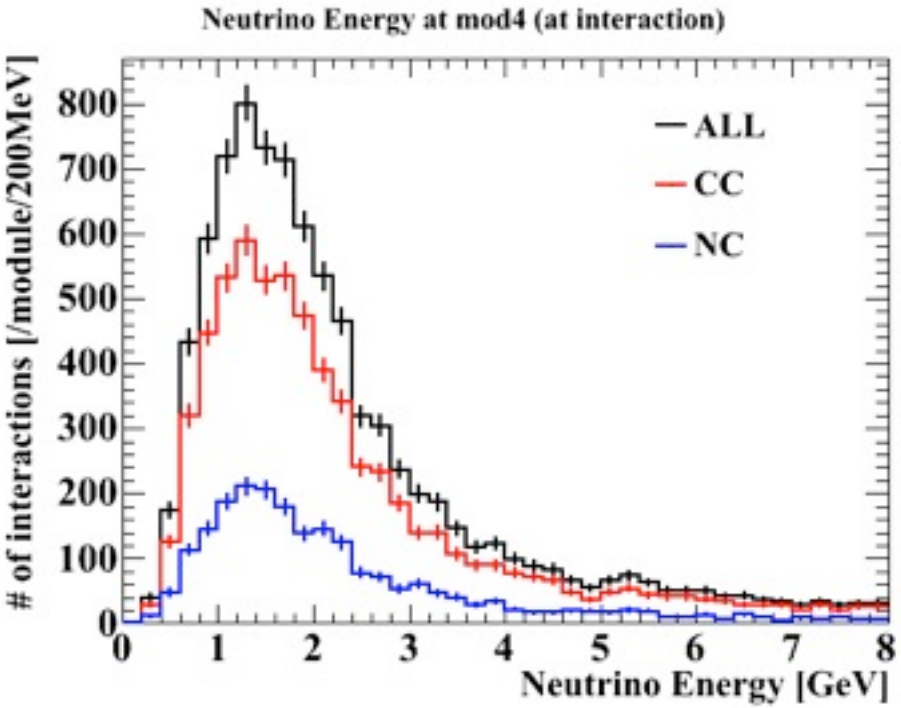

Neutrino Energy at mod4 (at interaction)
# of interactions [/module/500MeV]
Neutrino Energy [GeV]
ALL
CC
NC

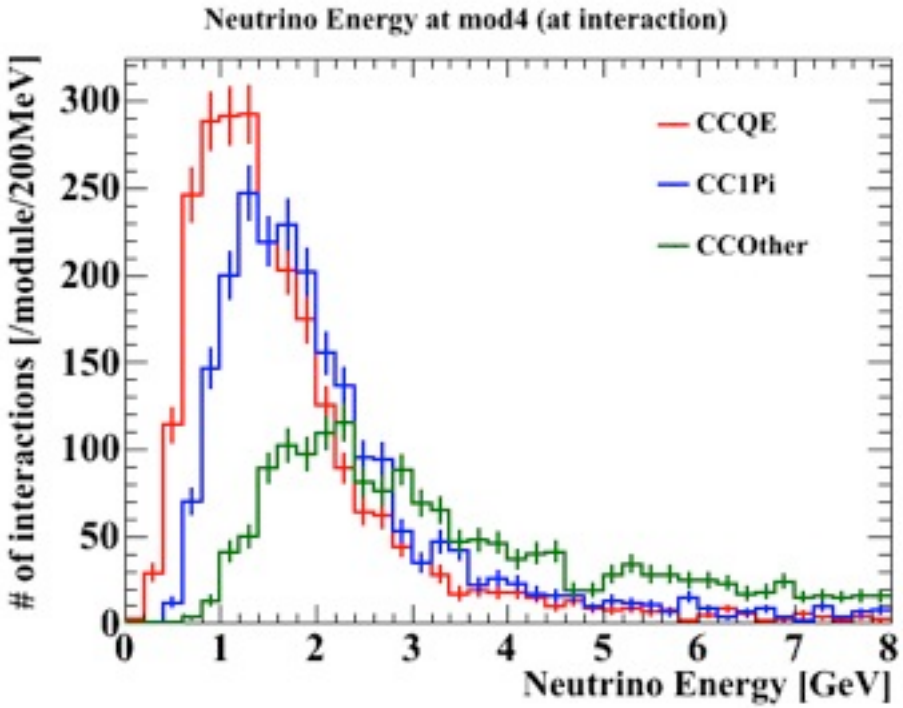

Neutrino Energy at mod4 (at interaction)
# of interactions [/module/500MeV]
Neutrino Energy [GeV]
CCQE
CC1Pi
CCOther

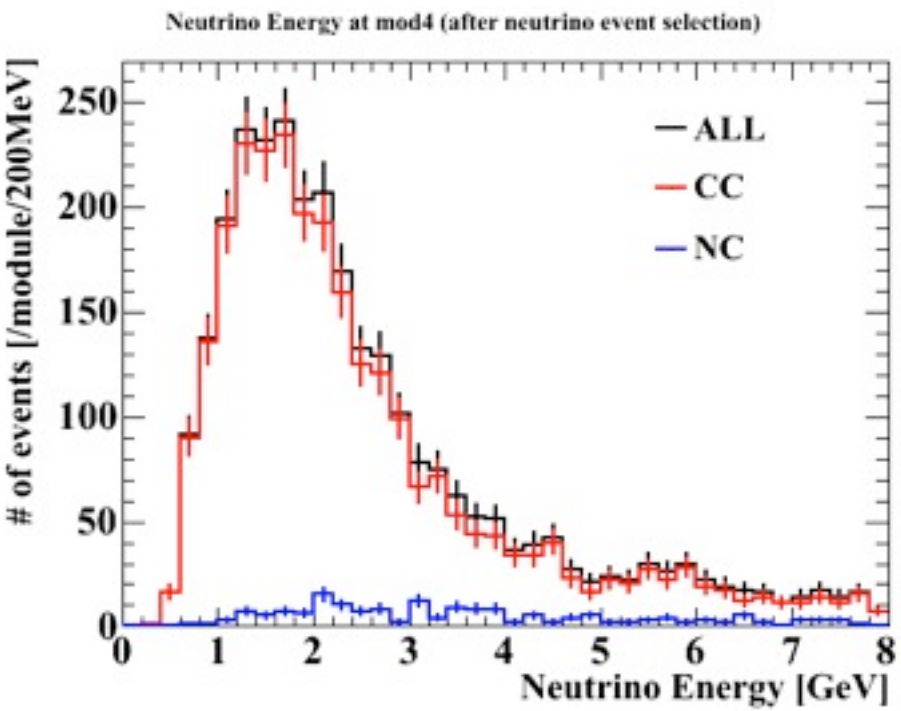

Neutrino Energy at mod4 (after neutrino event selection)
# of events [/module/500MeV]
Neutrino Energy [GeV]
ALL
CC
NC

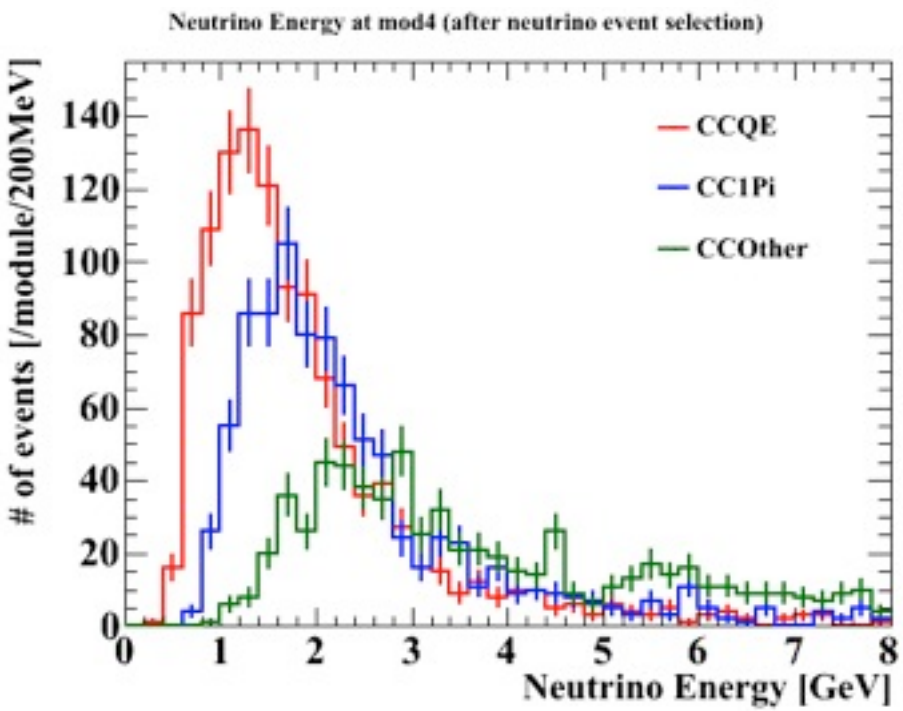

Neutrino Energy at mod4 (after neutrino event selection)
# of events [/module/500MeV]
Neutrino Energy [GeV]
CCQE
CC1Pi
CCOther

module 4 (low energy)

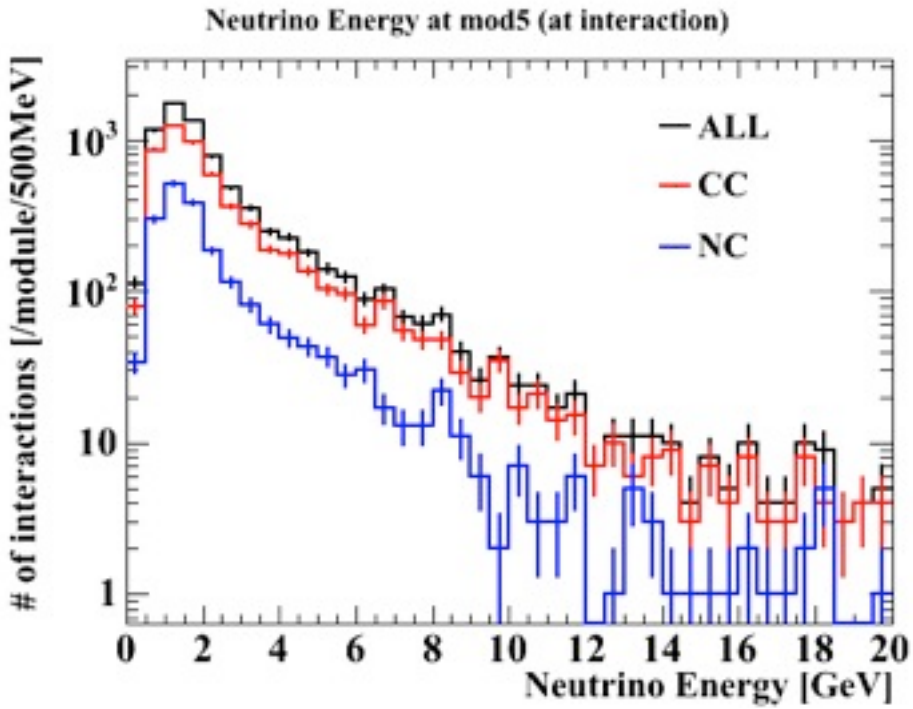


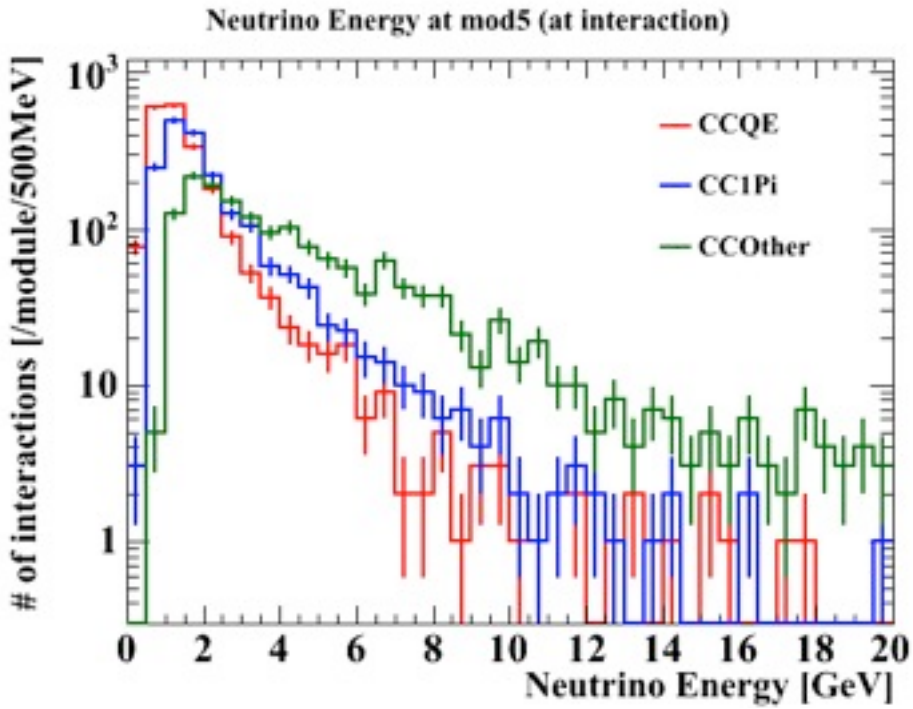


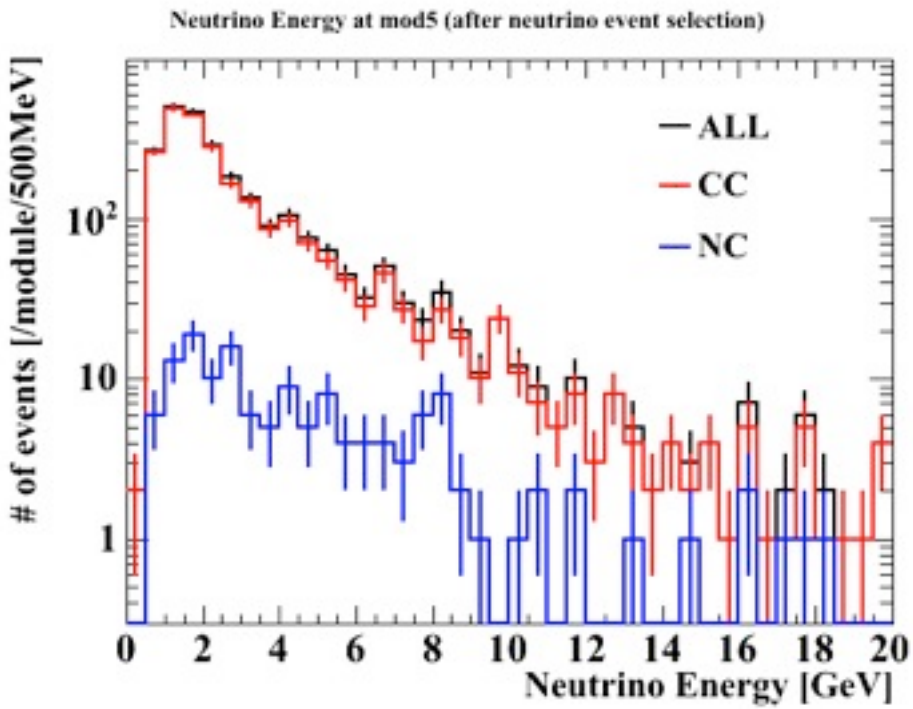


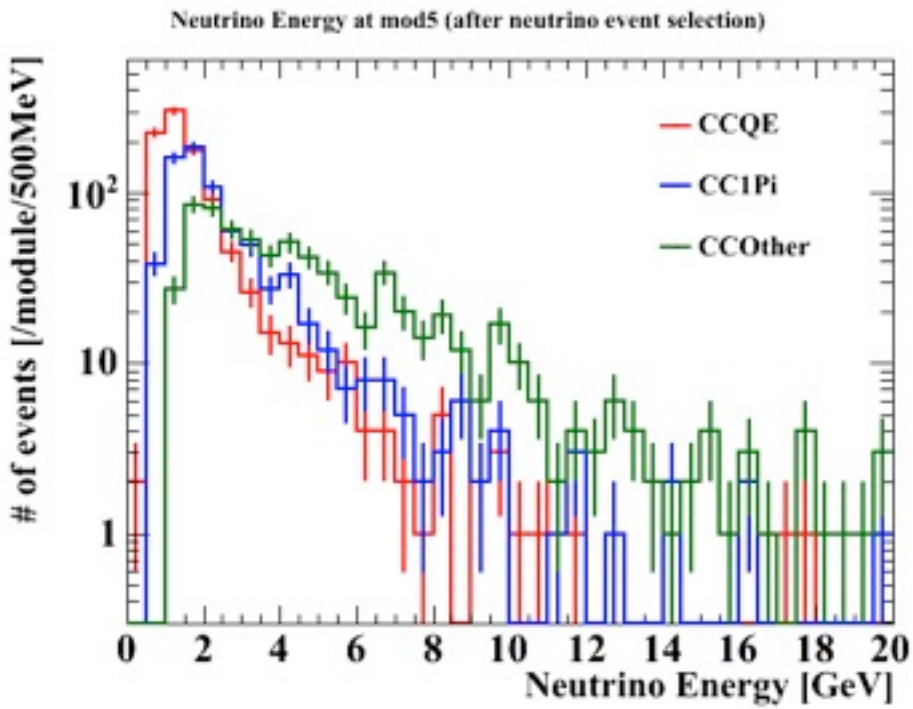


module 5

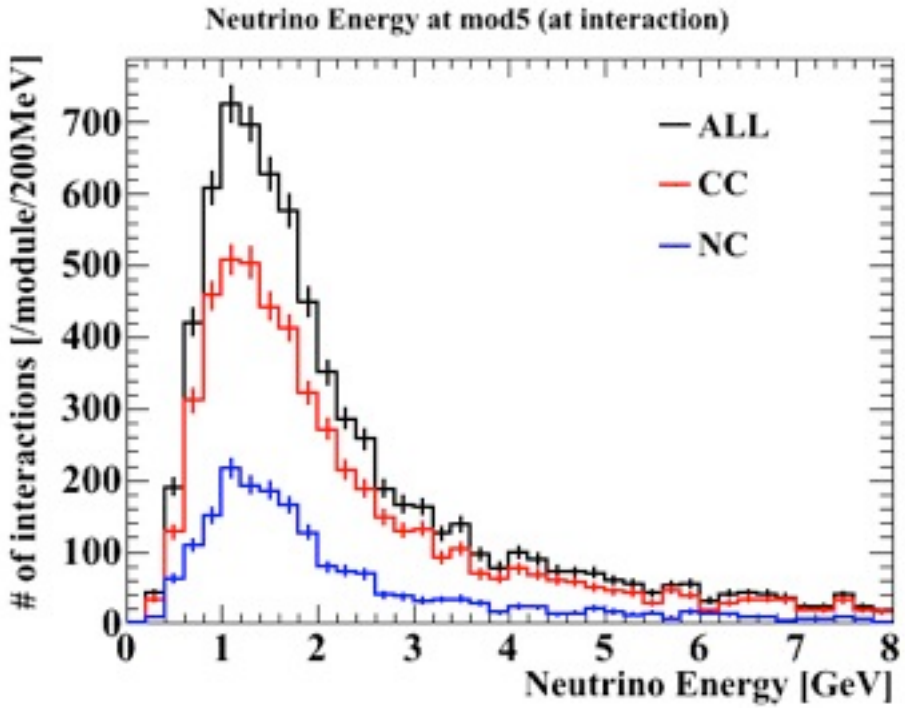

Neutrino Energy at mod5 (at interaction)
ALL
CC
NC
# of interactions [/module/500MeV]
Neutrino Energy [GeV]

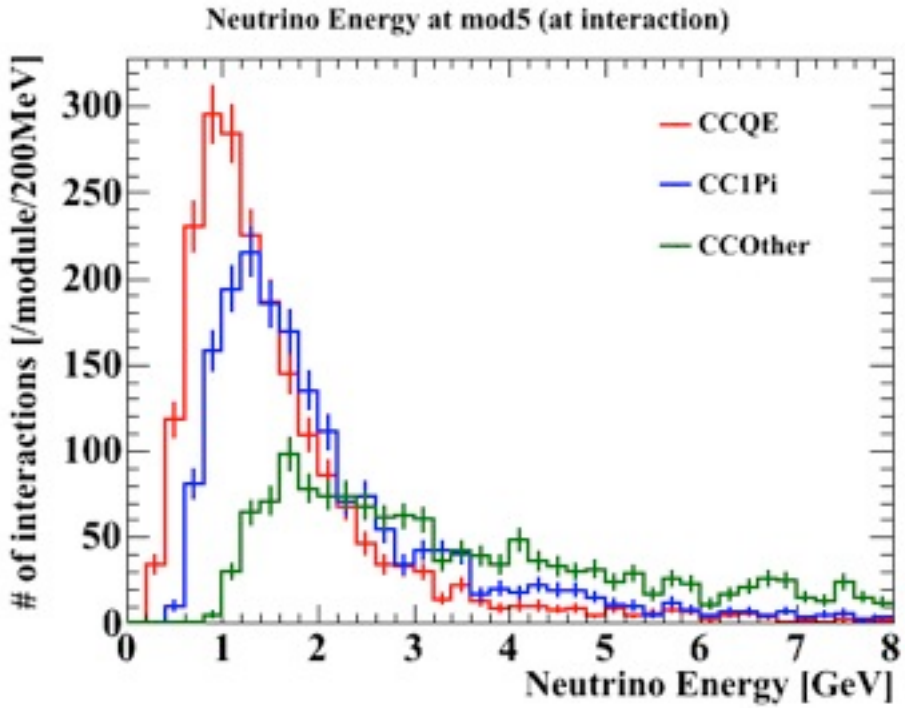

Neutrino Energy at mod5 (at interaction)
CCQE
CC1Pi
CCOther
# of interactions [/module/500MeV]
Neutrino Energy [GeV]

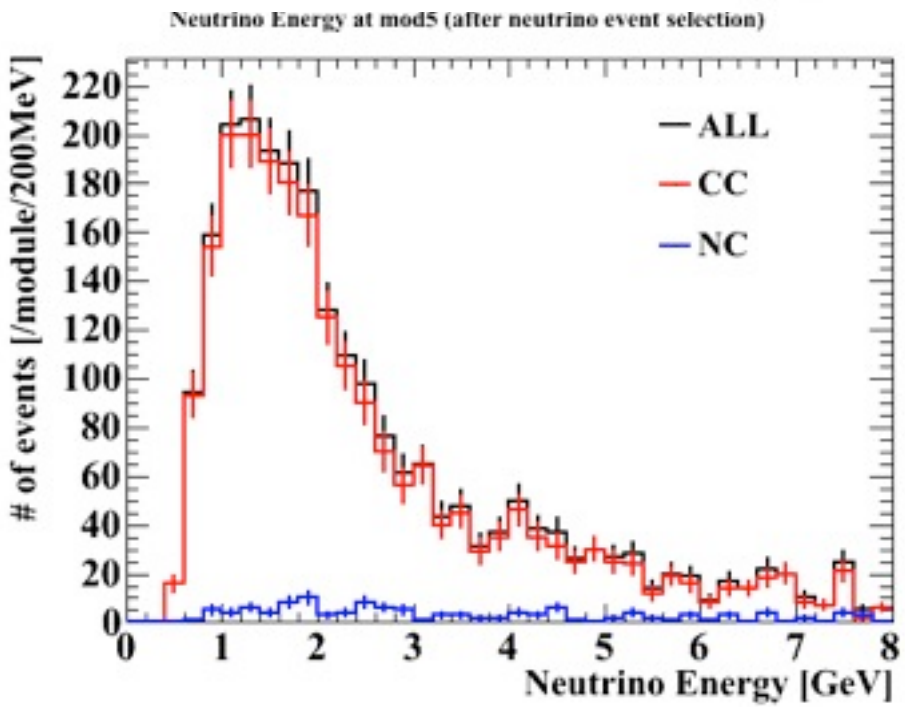

Neutrino Energy at mod5 (after neutrino event selection)
ALL
CC
NC
# of events [/module/500MeV]
Neutrino Energy [GeV]

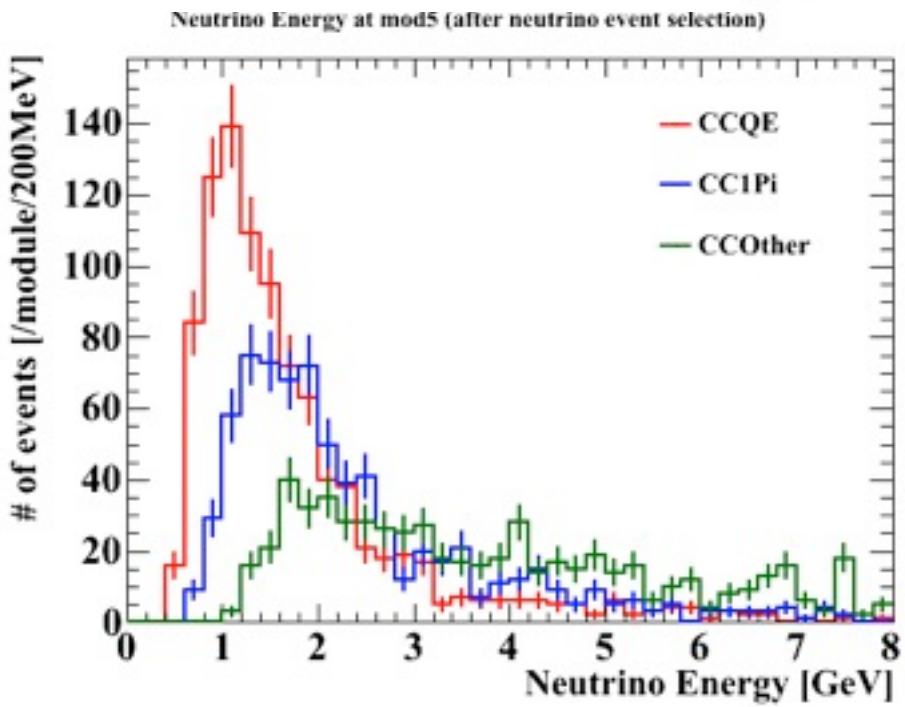

Neutrino Energy at mod5 (after neutrino event selection)
CCQE
CC1Pi
CCOther
# of events [/module/500MeV]
Neutrino Energy [GeV]

module 5 (low energy)

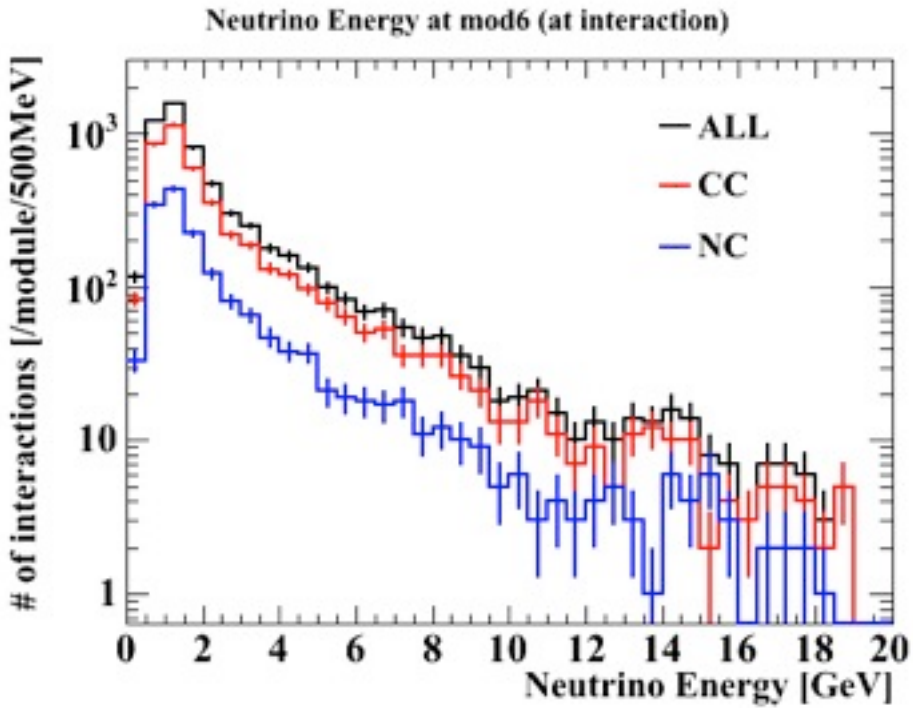


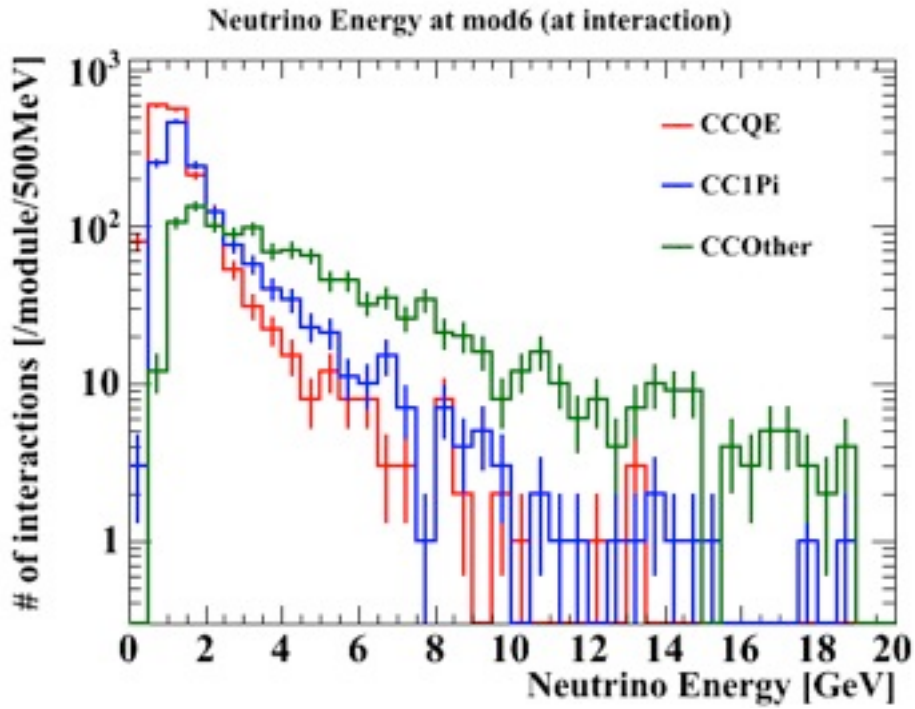


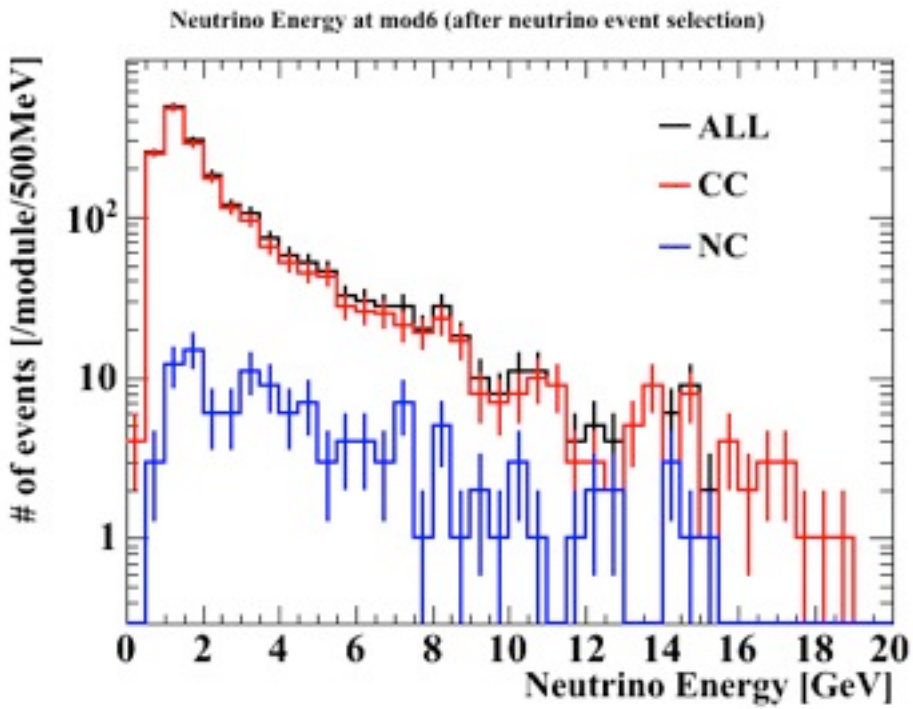


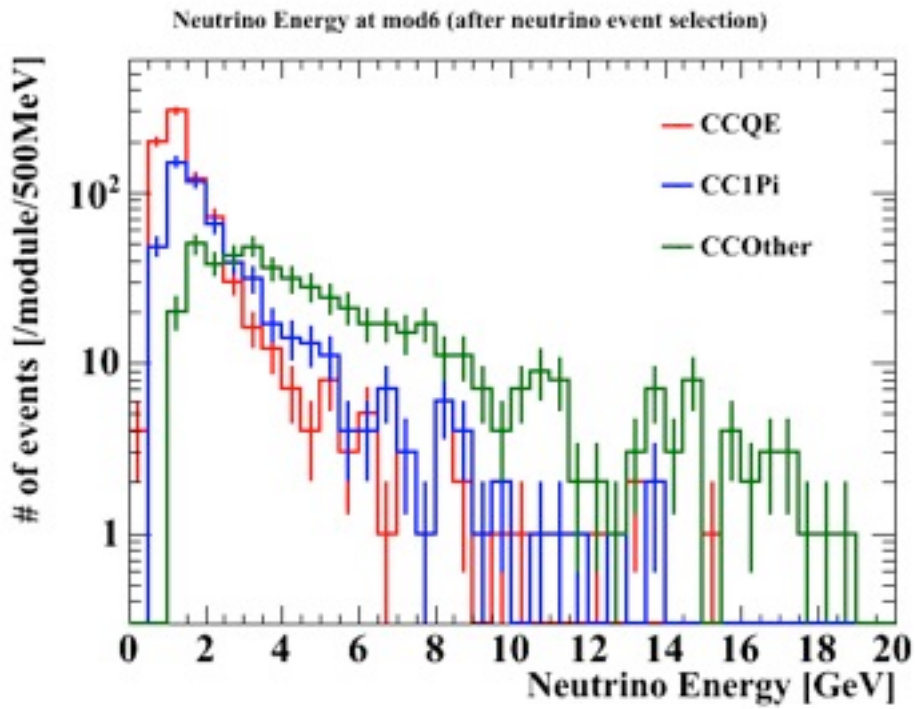


module 6

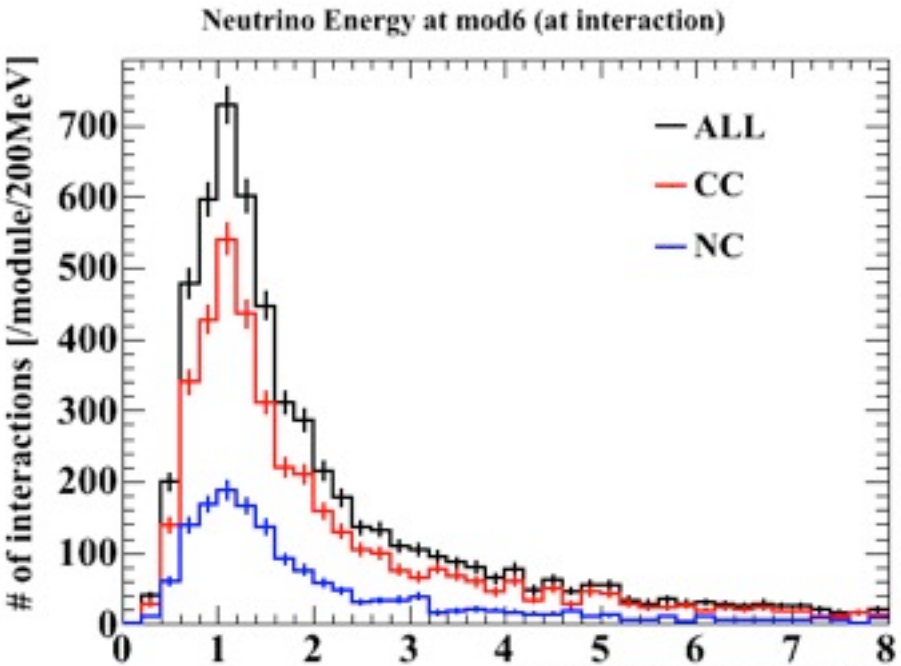

Neutrino Energy at mod6 (at interaction)
ALL
CC
NC
# of interactions [/module/500MeV]
Neutrino Energy [GeV]

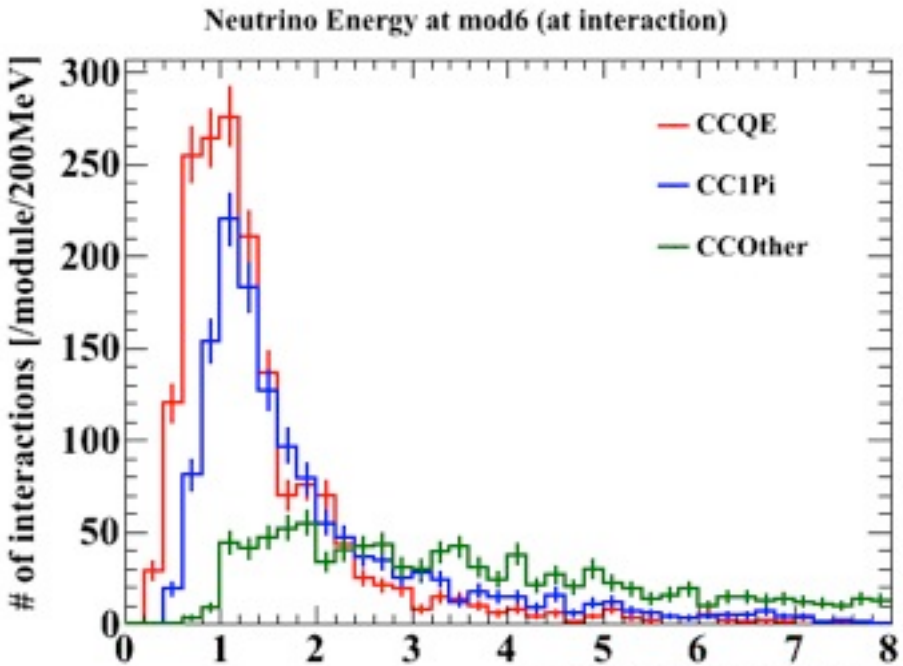

Neutrino Energy at mod6 (at interaction)
CCQE
CC1Pi
CCOther
# of interactions [/module/500MeV]
Neutrino Energy [GeV]

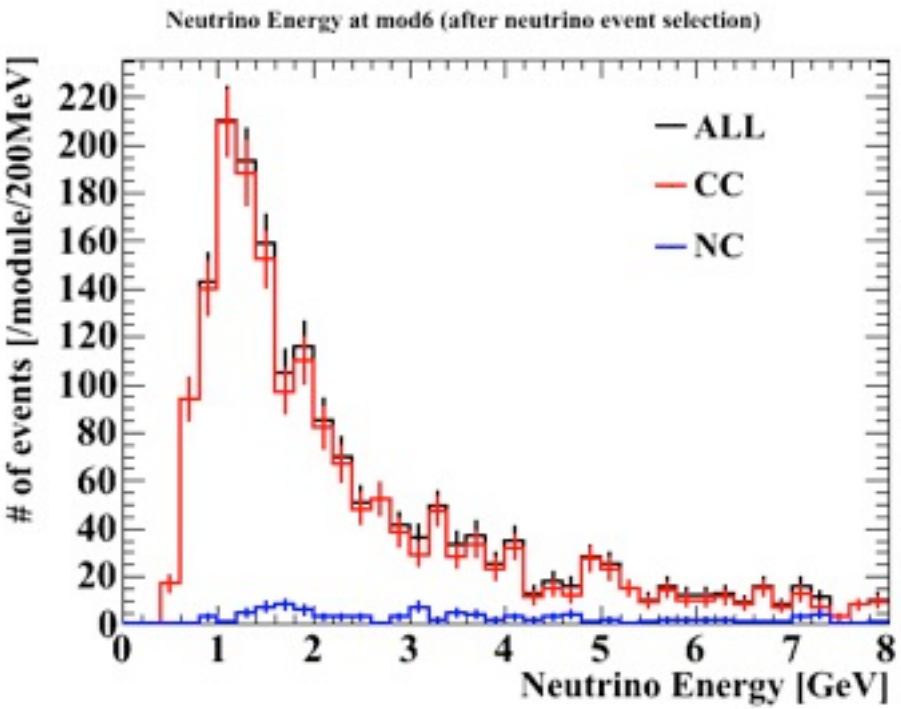

Neutrino Energy at mod6 (after neutrino event selection)
ALL
CC
NC
# of events [/module/500MeV]
Neutrino Energy [GeV]

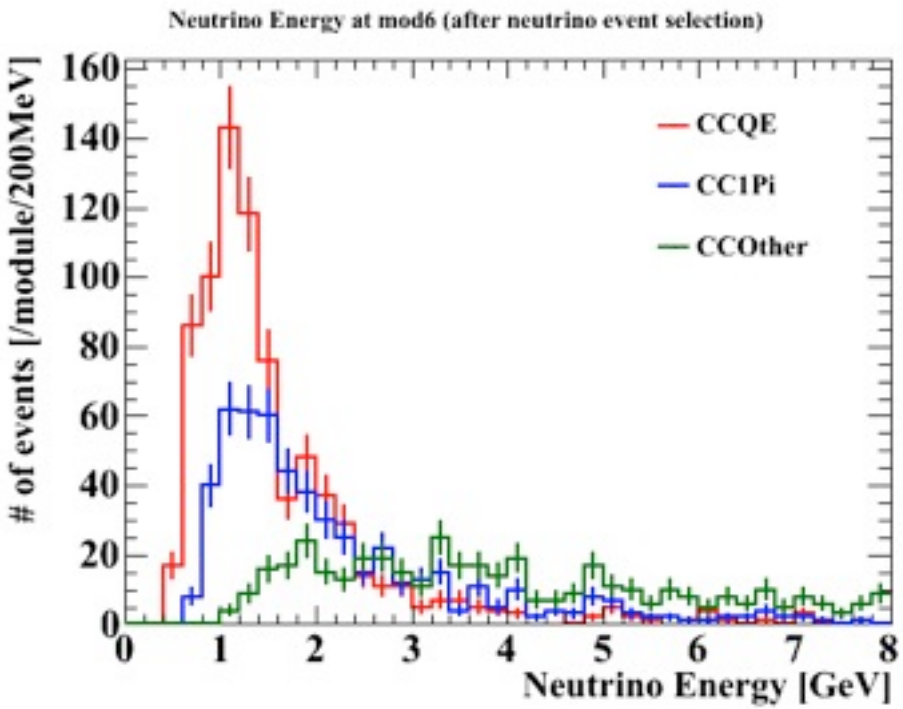

Neutrino Energy at mod6 (after neutrino event selection)
CCQE
CC1Pi
CCOther
# of events [/module/500MeV]
Neutrino Energy [GeV]

module 6 (low energy)









Vertical modules