



UNIVERSITY OF
TORONTO

Multi-ring ν_e CC1 π^+ Selection Studies

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Multi-Ring ν_e CC1 π^+ Meeting
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Overview

- Changed $2\text{Re}\pi^0$ selection to a $1\text{Re}0$ selection
 - Much better performance than previous 0 selection
 - Results with different BDT training variables will be shown
 - All BDTs trained with $1e^\pm$ FSP as signal
- Some other things to discuss
 - Optical devices to TRIUMF
 - Travel plans
 - Compute Canada

pre-BDT Cuts and BDT Training Variables

pre-BDT cuts		
Cut	0 decay e	1 decay e
FCFV	Wall > 50 cm	
not 1Re	not 1Re-like (TN319, no FCFV requirement)	
0 decay e	1 sub-event	2 sub-events
E_{rec}^*	$E_{rec}^{CCQE} < 1.5 \text{ GeV}$	

BDT Training Variables

Trial 1	Trial 2	Trial 3	Trial 4
up to 3-ring $-\ln(L)$ ratios $m_{\pi 0}$	up to 4-ring $-\ln(L)$ ratios $m_{\pi 0}$	up to 3-ring $-\ln(L)$ ratios $m_{\pi 0}$ 1R+2R fit kinematics E_{rec} , towall e, towall π , p_{low}	up to 4-ring $-\ln(L)$ ratios $m_{\pi 0}$ 1R+2R fit kinematics E_{rec} , towall e, towall π , p_{low}

1Re0de Selection: Trial 1

visible FSP:	$1e1\pi^{+-}$	1e	1e other	$1\mu1\pi^{+-}$	1 μ	1 μ other	0l1 π^+	0l1 π^-	0l1 π^0	0lN π	0l other		1e $^{+-}$	other	FOM
FCFV	4.63	45.01	8.93	8.96	41.60	32.68	7.69	12.16	83.11	17.28	15.76		45.01	232.78	2.70
pre-BDT	2.45	6.92	3.88	3.22	25.21	7.20	7.07	11.41	75.78	10.43	13.91		6.92	160.56	0.53
post-BDT	0.21	4.15	0.15	0.02	0.07	0.05	0.07	0.09	2.46	0.18	0.19		4.15	3.50	1.50
NEUT mode:	ν_e CC1 π^+	ν_e CCQE	ν_e CCN π	ν_e CCDIS	ν_e CCother	$\bar{\nu}_e$ CC	ν_μ CC	NC					$\nu_e/\bar{\nu}_e$ CCQE	other	FOM
FCFV	9.04	39.19	2.29	1.12	4.10	2.82	83.28	135.95					40.68	237.13	2.44
pre-BDT	3.77	5.98	0.68	0.13	2.13	0.57	35.67	118.57					6.23	161.24	0.48
post-BDT	0.52	3.57	0.04	0.00	0.13	0.25	0.14	2.99					3.76	3.89	1.36
v type:	osc ν_e CC	int ν_e CC	ν_μ CC	NC									osc $\nu_e/\bar{\nu}_e$ CC	other	FOM
FCFV	38.06	20.50	83.28	135.95									38.06	239.76	2.28
pre-BDT	8.79	4.46	35.67	118.57									8.79	158.68	0.68
post-BDT	3.01	1.51	0.14	2.99									3.01	4.64	1.09

TN319 1-Ring Samples (10^{21} POT)				
Sample	osc ν_e CC	int ν_e CC	ν_μ CC	NC
ν_e CCQE	34.84	5.40	0.17	2.77
ν_e CC1 π^+	4.61	0.76	0.11	0.25

1Re0de Selection: Trial 2

visible FSP:	1e1 π^{+-}	1e	1e other	1 μ 1 π^{+-}	1 μ	1 μ other	0l1 π^+	0l1 π^-	0l1 π^0	0lN π	0l other		1e $^{+-}$	other	FOM
FCFV	4.63	45.01	8.93	8.96	41.60	32.68	7.69	12.16	83.11	17.28	15.76		45.01	232.78	2.70
pre-BDT	2.45	6.92	3.88	3.22	25.21	7.20	7.07	11.41	75.78	10.43	13.91		6.92	160.56	0.53
post-BDT	0.29	4.76	0.21	0.03	0.15	0.07	0.11	0.15	3.56	0.20	0.29		4.76	5.05	1.52
NEUT mode:	ν_e CC1 π^+	ν_e CCQE	ν_e CCN π	ν_e CCDIS	ν_e CCother	$\bar{\nu}_e$ CC	ν_μ CC	NC					$\nu_e/\bar{\nu}_e$ CCQE	other	FOM
FCFV	9.04	39.19	2.29	1.12	4.10	2.82	83.28	135.95					40.68	237.13	2.44
pre-BDT	3.77	5.98	0.68	0.13	2.13	0.57	35.67	118.57					6.23	161.24	0.48
post-BDT	0.66	4.10	0.05	0.01	0.16	0.28	0.25	4.31					4.31	5.50	1.38
v type:	osc ν_e CC	int ν_e CC	ν_μ CC	NC									osc $\nu_e/\bar{\nu}_e$ CC	other	FOM
FCFV	38.06	20.50	83.28	135.95									38.06	239.76	2.28
pre-BDT	8.79	4.46	35.67	118.57									8.79	158.68	0.68
post-BDT	3.54	1.72	0.25	4.31									3.54	6.27	1.13

TN319 1-Ring Samples (10^{21} POT)				
Sample	osc ν_e CC	int ν_e CC	ν_μ CC	NC
ν_e CCQE	34.84	5.40	0.17	2.77
ν_e CC1 π^+	4.61	0.76	0.11	0.25

1Re0de Selection: Trial 3

visible FSP:	1e1 π^{\pm}	1e	1e other	1 μ 1 π^{\pm}	1 μ	1 μ other	0l1 π^+	0l1 π^-	0l1 π^0	0lN π	0l other		1e $^{\pm}$	other	FOM
FCFV	4.63	45.01	8.93	8.96	41.60	32.68	7.69	12.16	83.11	17.28	15.76		45.01	232.78	2.70
pre-BDT	2.45	6.92	3.88	3.22	25.21	7.20	7.07	11.41	75.78	10.43	13.91		6.92	160.56	0.53
post-BDT	0.21	4.66	0.18	0.02	0.04	0.04	0.04	0.09	2.29	0.08	0.16		4.66	3.14	1.67
NEUT mode:	ν_e CC1 π^+	ν_e CCQE	ν_e CCN π	ν_e CCDIS	ν_e CCother	$\bar{\nu}_e$ CC	ν_μ CC	NC					$\nu_e/\bar{\nu}_e$ CCQE	other	FOM
FCFV	9.04	39.19	2.29	1.12	4.10	2.82	83.28	135.95					40.68	237.13	2.44
pre-BDT	3.77	5.98	0.68	0.13	2.13	0.57	35.67	118.57					6.23	161.24	0.48
post-BDT	0.58	4.01	0.04	0.01	0.15	0.26	0.10	2.66					4.21	3.59	1.51
v type:	osc ν_e CC	int ν_e CC	ν_μ CC	NC									osc $\nu_e/\bar{\nu}_e$ CC	other	FOM
FCFV	38.06	20.50	83.28	135.95									38.06	239.76	2.28
pre-BDT	8.79	4.46	35.67	118.57									8.79	158.68	0.68
post-BDT	3.43	1.62	0.10	2.66									3.43	4.37	1.23

TN319 1-Ring Samples (10^{21} POT)				
Sample	osc ν_e CC	int ν_e CC	ν_μ CC	NC
ν_e CCQE	34.84	5.40	0.17	2.77
ν_e CC1 π^+	4.61	0.76	0.11	0.25

1Re0de Selection: Trial 4

visible FSP:	1e1 π^{\pm}	1e	1e other	1 μ 1 π^{\pm}	1 μ	1 μ other	0l1 π^+	0l1 π^-	0l1 π^0	0lN π	0l other		1e $^{\pm}$	other	FOM
FCFV	4.63	45.01	8.93	8.96	41.60	32.68	7.69	12.16	83.11	17.28	15.76		45.01	232.78	2.70
pre-BDT	2.45	6.92	3.88	3.22	25.21	7.20	7.07	11.41	75.78	10.43	13.91		6.92	160.56	0.53
post-BDT	0.27	5.12	0.23	0.02	0.06	0.07	0.07	0.12	3.10	0.17	0.25		5.12	4.35	1.66
NEUT mode:	ν_e CC1 π^+	ν_e CCQE	ν_e CCN π	ν_e CCDIS	ν_e CCother	$\bar{\nu}_e$ CC	ν_μ CC	NC					$\nu_e/\bar{\nu}_e$ CCQE	other	FOM
FCFV	9.04	39.19	2.29	1.12	4.10	2.82	83.28	135.95					40.68	237.13	2.44
pre-BDT	3.77	5.98	0.68	0.13	2.13	0.57	35.67	118.57					6.23	161.24	0.48
post-BDT	0.68	4.42	0.05	0.01	0.18	0.29	0.15	3.71					4.63	4.84	1.50
v type:	osc ν_e CC	int ν_e CC	ν_μ CC	NC									osc $\nu_e/\bar{\nu}_e$ CC	other	FOM
FCFV	38.06	20.50	83.28	135.95									38.06	239.76	2.28
pre-BDT	8.79	4.46	35.67	118.57									8.79	158.68	0.68
post-BDT	3.82	1.80	0.15	3.71									3.82	5.65	1.24

TN319 1-Ring Samples (10^{21} POT)				
Sample	osc ν_e CC	int ν_e CC	ν_μ CC	NC
ν_e CCQE	34.84	5.40	0.17	2.77
ν_e CC1 π^+	4.61	0.76	0.11	0.25

1Re0de: Trial Comparison

		Trial 1	Trial 2	Trial 3	Trial 4
Final State Particles	1e ^{+/-}	4.15	4.76	4.66	5.12
	other	3.50	5.05	3.14	4.35
	FOM	1.50	1.52	1.67	1.66
NEUT Mode	$\nu_e \bar{\nu}_e$ CCQE	3.76	4.31	4.21	4.63
	other	3.89	5.50	3.59	4.84
	FOM	1.36	1.38	1.51	1.50
Neutrino Type	osc $\nu_e \bar{\nu}_e$ CC	3.01	3.54	3.43	3.82
	other	4.64	6.27	4.37	5.65
	FOM	1.09	1.13	1.23	1.24

BDT Training Variables

Trial 1	Trial 2	Trial 3	Trial 4
up to 3-ring -ln(L) ratios $m_{\pi 0}$	up to 4-ring -ln(L) ratios $m_{\pi 0}$	up to 3-ring -ln(L) ratios $m_{\pi 0}$ 1R+2R fit kinematics E_{rec} , towall e, towall π , p_{low}	up to 4-ring -ln(L) ratios $m_{\pi 0}$ 1R+2R fit kinematics E_{rec} , towall e, towall π , p_{low}

Variable Importance

From Trial 4 Training

- Likelihood ratios of interest:
 - $nll6 := nll1rmu - nll2rpie$
 - $nll1 := nll1re - nll1rmu$
 - $nll7 := nll1rmu - nll2ree$
 - $nll4 := nll1re - nll2ree$
 - $nll5 := nll1rmu - nll2repi$
 - $nll10 := nll2rpie - nll2ree$
 - $nll3 := nll1re - nll2rpie$
 - $nll9 := nll2repi - nll2ree$
 - $nll2 := nll1re - nll2repi$
 - $nll8 := nll2repi - nll2rpie$
 - $nll17 := nll2rpie - nll3repi$
- Curiously, ToWall of the e and π from the 2Re π -like fit are the highest ranked
 - Should be including ToWall of the e from the 1Re fit instead, and perhaps ToWall of both e's from the 2Ree fit?
- Momenta of e's from the 2Ree fit are also ranked quite highly
- p_{low} ranked highly as well – perhaps 2Ree related instead of 2Re π related

Rank	Variable	Variable Importance
1	towall_pi	3.470e-02
2	towall_e	3.447e-02
3	m_pi0	3.070e-02
4	p_low	2.827e-02
5	e_rec_ccqe	2.739e-02
6	pe2_2ree	2.703e-02
7	pe_2rpie	2.679e-02
8	pe1_2ree	2.571e-02
9	pe_1re	2.505e-02
10	pe_2repi	2.486e-02
11	nll6	2.438e-02
12	pmu_1rmu	2.405e-02
13	nll1	2.344e-02
14	nll7	2.335e-02
15	ppi_2rpie	2.307e-02
16	nll4	2.284e-02
17	nll5	2.225e-02
18	nll10	2.082e-02
19	nll3	2.024e-02
20	nll9	2.015e-02
21	nll2	2.005e-02
22	nll8	1.949e-02
23	nll17	1.911e-02
24	ppi_2repi	1.555e-02
25	nll18	1.536e-02
26	nll15	1.475e-02
27	nll16	1.441e-02
28	nll19	1.417e-02
29	nll14	1.399e-02
30	nll13	1.391e-02
31	nll11	1.385e-02
32	nll20	1.369e-02
33	nll21	1.358e-02
34	nll22	1.334e-02
35	nll12	1.312e-02
36	nll23	7.945e-03
37	nll30	7.736e-03
38	nll29	7.616e-03
39	nll31	7.584e-03
40	nll42	7.524e-03
41	nll38	7.466e-03
42	nll43	7.318e-03
43	nll24	7.201e-03
44	nll32	7.177e-03
45	nll55	7.162e-03
46	nll59	7.136e-03
47	nll33	7.136e-03
48	nll39	7.119e-03
49	nll47	7.106e-03
50	nll37	7.081e-03

Optical Devices

- Still haven't been able to send the optical devices out to TRIUMF
- No word back yet regarding NSERC account
 - Asked Crystal yesterday
 - Will try e-mailing John again
- Possible to use TRIUMF account instead?

Travel Plans

- Would like to attend upcoming SK and T2K collaboration meetings
 - SK: May 23 – 25
 - T2K: July 23 – 27 (Paris)
- Haven't booked flights/hotels yet
 - I have registered for the T2K meeting and have been given affordable accommodations on Ecole Polytechnique campus
 - 360 EUR total for registration + accommodations
 - Not yet paid
- Awaiting reimbursement for previous T2K meeting and Hyper-K ML workshop
 - Pending NSERC account availability
 - Won't be able to pay for flights/accommodations until at least one of these is reimbursed

Compute Canada

- Can I renew my existing role, or do I have to change sponsors?

Compute Canada Role Identifier (CCRI): yst-723-01

Doctoral Student, Physics, Un. of Toronto, activated

last renewed on 2018-04-20 14:16

Sponsored by

sab-064-01 , hirohisa tanaka: Faculty, Physics and Astronomy, Un. of BC

Resource Allocation Projects

RAPI	Group Name	Status	Title	Allocations	Member?	Manager?	Owner?
sab-064-ah	rpp-tanaka-ab	Active	Research Portal and Platform for T2K computing	8 allocations - RPP 2017	✓	✗	✗
sab-064-af	rpp-tanaka	Inactive	Research Portal and Platform for the T2K neutrino oscillation experiment.	6 allocations - Research Platforms and Portal call 2015.	✓	✗	✗
sab-064-ae	rrg-tanaka-ac	Inactive	Computing for the T2K Neutrino Oscillation Experiment	4 allocations - NRAC 2014	✓	✗	✗
sab-064-ad	rrg-tanaka-ab	Inactive	Analysis for the T2K Neutrino Oscillation Experiment	3 allocations - NRAC 2013	✓	✗	✗
sab-064-ac	rrg-tanaka	Inactive	The Tokai-to-Kamioka Experiment	3 allocations - NRAC Call 2011	✓	✗	✗
sab-064-ab	def-tanaka-ab	Inactive	Tokai-to-Kamioka (T2K) Neutrino Oscillation Experiment	2 allocations - NRAC Call 2011 3 allocations - Second NRAC Round	✓	✗	✗
sab-064-aa	def-tanaka	Active	Default Resource Allocation Project	1 allocation - WestGrid LRAC Call 2009 3 allocations - No RAC	✓	✗	✗