Progress Update

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Energy Resolution: Method 1



double	Ee =	: sqr	t(me	*me +	pe*	'pe);	
double	Ері	= sq	rt(m	pi*mp	i +	ppi*p	opi);
Enu = E	Ee +	Epi	+ 140	9.;			

Energy Resolution: Method 2 (fixed)

four-momentum!

$$E_{\nu} = \frac{m_{\mu}^2 + m_{\pi^+}^2 - 2m_N(E_{\mu} + E_{\pi^+}) + 2p_{\mu} \cdot p_{\pi^+}}{2(E_{\mu} + E_{\pi^+} - |p_{\mu}| \cos \theta_{\nu\mu} - |p_{\pi^+}| \cos \theta_{\nu\pi^+} - m_N)}$$



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UofT Neutrino/DM Meeting

Comparison to v_{μ} CC1 π (Sophie)



Method 1 vs. Method 2



$\nu_{_{\!\!\!\!\mu}}\,NC0\pi$ background in 2Re π sample



Note that this is 0π above Cherenkov threshold

$\nu_{_{\mu}}$ NC0 π NEUT modes

numu NC0pi neut modes: 2Repi



- Seems to primarily be low-energy ν_{μ} NC $1\pi^{_0/+/-}$ and NC elastic events
- Not sure why these are being reconstructed as 2-ring events

$2Re\pi vs 1R\mu$ Likelihood Ratio



Likelihood Ratio vs. E_{rec}



Likelihood Ratio vs. $m_{e\pi}$



Cutflow Test

2Repi	2Repi1de
FCFV	FCFV
2 rings	2 rings
eπ-like	eπ-like
0 decay e	1 decay e
p _e -p _π < 800 MeV	$ p_{e}-p_{\pi} < 800 \text{ MeV}$
cos(θ)<0.7 cos(θ)>0.9	cos(θ)<0.7 cos(θ)>0.9
E _{rec} < 1.5 GeV	E _{rec} < 1.5 GeV
m _{eπ} > 240MeV	d2se < 200cm
$nll_{2Re\pi}$ - $nll_{1R\mu}$ < -700	

FCFV: evclass==1 && evis>30. && nhitac<16 && fqwall_2r>100.

 $|p_{e}-p_{\pi}| < 800 MeV$



$cos(\theta)$



 $E_{rec} < 1.5 \text{ GeV}$

Erec: 2Repi



$m_{_{e\pi}} > 240 MeV \parallel n \parallel_{_{2Re\pi}} - n \parallel_{_{1R\mu}} < -700$



Cutflow

Sample	cut	numu/nu mub CC	intrinsic nue/nue b CC	osc nue/nue b CC	numu/nu mub NC	intrinsic nue/nue b NC	Signal	Bkgd	Purity	FOM
2Repi	FCFV	414.82	27.42	42.45	168.32	4.77	42.45	615.33	0.06	1.655
	2 rings	66.04	5.10	4.99	83.02	2.11	4.99	156.26	0.03	0.393
	epi-like	6.74	2.28	2.34	5.19	0.19	2.34	14.40	0.14	0.572
	0 decay e	1.48	1.00	0.88	3.17	0.11	0.88	5.76	0.13	0.342
	p_e-p_pi < 800MeV	0.75	0.56	0.82	2.64	0.09	0.82	4.03	0.17	0.372
	cos(theta)<0.7>0.9	0.51	0.50	0.75	1.93	0.07	0.75	3.01	0.20	0.389
	Erec < 1.5 GeV	0.23	0.38	0.73	1.76	0.06	0.73	2.43	0.23	0.409
	m_epi nll_2Repi- nll_1Rmu	0.20	0.37	0.68	1.36	0.04	0.68	1.98	0.25	0.415
2Repi1de	FCFV	414.82	27.42	42.45	168.32	4.77	42.45	615.33	0.06	1.655
	2 rings	66.04	5.10	4.99	83.02	2.11	4.99	156.26	0.03	0.393
	epi-like	6.74	2.28	2.34	5.19	0.19	2.34	14.40	0.14	0.572
	1 decay e	3.35	1.14	1.43	1.63	0.06	1.43	6.18	0.19	0.517
	p_e-p_pi < 800MeV	1.95	0.70	1.37	1.32	0.05	1.37	4.02	0.25	0.592
	cos(theta)<0.7>0.9	1.53	0.63	1.28	1.04	0.04	1.28	3.25	0.28	0.600
	Erec < 1.5 GeV	0.83	0.51	1.26	0.92	0.04	1.26	2.30	0.35	0.666
	d2se < 200cm	0.70	0.50	1.24	0.87	0.04	1.24	2.11	0.37	0.679

signal = oscillated nue/nueb CC

Previous FOM Bests 2Repi: 0.40 2Repi1de: 0.66

$2Re\pi$ breakdown

cut	nue NC 1pi+	nue NC 1pi-	nue NC 1pi0	nue NC Npi	nue NC 0pi	numu NC 1pi+	numu NC 1pi-	numu NC 1pi0	numu NC Npi	num NC 0	ı pi
FCFV	0.61	0.49	1.34	0.83	1.51	18.96	14.91	50.38	26.4	7	57.60
2 rings	0.17	0.14	0.83	0.15	0.81	5.02	3.79	34.72	4.2	5	35.23
epi-like	0.04	0.03	0.03	0.03	0.05	0.96	0.74	1.22	1.04	4	1.23
0 decay e	0.02	0.02	0.03	0.01	0.03	0.37	0.48	1.08	0.44	4	0.80
p_e-p_pi < 800MeV	0.01	0.02	0.03	0.01	0.03	0.28	0.39	0.97	0.24	4	0.74
cos(theta)<0.7>0.9	0.01	0.01	0.02	0.01	0.02	0.23	0.33	0.61	0.1	6	0.61
Erec < 1.5 GeV	0.01	0.01	0.01	0.00	0.02	0.22	0.30	0.52	0.12	2	0.60
m_epi nll_2Repi- nll_1Rmu	0.00	0.01	0.01	0.00	0.01	0.15	0.22	0.50	0.1	1	0.39
cut	nue CC1pi	nue CCQE	nue CCother	numu CC1pi	numu CCQE	numu CCother	Signal	Backg	round F	Purity	
cut FCFV	nue CC1pi 19.07	nue CCQE 32.69	nue CCother 18.11	numu CC1pi 93.86	numu CCQE 126.25	numu CCother 194.71	Signal	.07 Backg	round F 638.71	Purity 0.01	3
cut FCFV 2 rings	nue CC1pi 19.07 5.03	nue CCQE 32.69 2.19	nue CCother 18.11 2.88	numu 93.86 29.36	numu CCQE 126.25 10.50	numu CCother 194.71 26.18	Signal 19 5	.07 Backg .03 C	round F 638.71 156.23	Purity 0.03	3
cut FCFV 2 rings epi-like	nue 19.07 5.03 3.33	nue 32.69 2.19 0.56	nue CCother 18.11 2.88 0.74	numu 93.86 29.36 0.94	numu 126.25 10.50 0.14	numu 194.71 26.18 5.66	Signal 19 5 3	.07 Backg .03 .33	round F 638.71 156.23 13.41	Purity 0.03 0.03 0.24	3 3 0
cutFCFV2 ringsepi-like0 decay e	nue 19.07 5.03 3.33 1.09	nue 32.69 2.19 0.56 0.49	nue 18.11 2.88 0.74 0.30	numu 93.86 29.36 0.94 0.11	numu 126.25 10.50 0.14 0.07	numu 194.71 26.18 5.66 1.29	Signal 19 5 3 1	Backg .07 .03 .33 .09	round F 638.71 156.23 13.41 5.55	Purity 0.03 0.04 0.24 0.14	3 3 0 5
cutFCFV2 ringsepi-like0 decay e p_e-p_pi <	nue 19.07 5.03 3.33 1.09 0.82	nue 32.69 2.19 0.56 0.49 0.37	nue 18.11 2.88 0.74 0.30 0.19	numu 93.86 29.36 0.94 0.11 0.10	numu 126.25 10.50 0.14 0.07 0.07	numu 194.71 26.18 5.66 1.29 0.57	Signal 19 5 3 1 0	Backg .07 .03 .03 .04 .09 .05 .82 .05	round F 638.71 156.23 13.41 5.55 4.04	Purity 0.03 0.04 0.24 0.14 0.14	3 3 0 5
cut FCFV 2 rings epi-like 0 decay e [p_e-p_pi] < 800MeV	nue 19.07 5.03 3.33 1.09 0.82 0.73	nue 32.69 2.19 0.56 0.49 0.37 0.36	nue 18.11 2.88 0.74 0.30 0.19 0.16	numu 93.86 29.36 0.94 0.11 0.10	numu 126.25 10.50 0.14 0.07 0.07 0.05	numu 194.71 26.18 5.66 1.29 0.57 0.37	Signal 19 5 3 1 0 0	Backg .07 .03 .03 .04 .09 .05 .82 .05	round F 638.71 (156.23) 13.41 (15.55) 4.04 (156.23) 3.03 (156.23)	Purity 0.03 0.24 0.14 0.14 0.24	3 3 5 7
cut FCFV 2 rings epi-like 0 decay e [p_e-p_pi] <	nue 19.07 5.03 3.33 1.09 0.82 0.73 0.65	nue 32.69 2.19 0.56 0.49 0.37 0.36 0.33	nue 18.11 2.88 0.74 0.30 0.19 0.16 0.13	numu 93.86 29.36 0.94 0.11 0.10 0.09	numu 126.25 10.50 0.14 0.07 0.07 0.05 0.05 0.04	numu 194.71 26.18 5.66 1.29 0.57 0.37 0.11	Signal 19 5 3 1 1 0 0 0 0 0 0	Backg .07 .03 .03 .04 .09 .05 .65 .05	round F 638.71 (156.23) 13.41 (16) 5.55 (16) 4.04 (16) 3.03 (16) 2.50 (16)	Purity 0.03 0.24 0.14 0.14 0.24 0.24	3 3 5 7 0

$2Re\pi 1de breakdown$

cut	nue NC 1pi+	nue NC 1pi-	nue NC 1pi0	nue NC Npi	nue NC 0pi	numu NC 1pi+	numu NC 1pi-	numu NC 1pi0	numu NC Npi	numu NC 0pi
FCFV	0.61	0.49	1.34	0.83	1.51	18.96	14.91	50.38	26.47	57.60
2 rings	0.17	0.14	0.83	0.15	0.81	5.02	3.79	34.72	4.25	35.23
epi-like	0.04	0.03	0.03	0.03	0.05	0.96	0.74	1.22	1.04	1.23
1 decay e	0.02	0.01	0.00	0.02	0.02	0.50	0.19	0.13	0.44	0.37
p_e-p_pi < 800MeV	0.02	0.01	0.00	0.01	0.02	0.44	0.14	0.09	0.32	0.35
cos(theta)<0.7>0.9	0.01	0.01	0.00	0.01	0.01	0.36	0.11	0.07	0.22	0.28
Erec < 1.5 GeV	0.01	0.01	0.00	0.01	0.01	0.35	0.09	0.04	0.16	0.28
d2se < 200cm	0.01	0.00	0.00	0.01	0.01	0.33	0.09	0.04	0.15	0.26
cut	nue CC1pi	nue CCQE	nue CCother	numu CC1pi	numu CCQE	numu CCother	Signal	Backg	round F	urity
cut FCFV	nue CC1pi 19.07	nue CCQE 32.69	nue CCother 18.11	numu CC1pi 93.86	numu CCQE 126.25	numu CCother 194.71	Signal	.07 Backg	round F 638.71	urity 0.03
cut FCFV 2 rings	nue CC1pi 19.07 5.03	nue CCQE 32.69 2.19	nue CCother 18.11 2.88	numu CC1pi 93.86 29.36	numu CCQE 126.25 10.50	numu CCother 194.71 26.18	Signal 19 5	.07 [.03]	round P 638.71 156.23	urity 0.03 0.03
cut FCFV 2 rings epi-like	nue 19.07 5.03 3.33	nue 32.69 2.19 0.56	nue 18.11 2.88 0.74	numu 93.86 29.36 0.94	numu 126.25 10.50 0.14	numu CCother 194.71 26.18 5.66	Signal 19 5 3	.07 Backg .03 .33	round P 638.71 156.23 13.41	urity 0.03 0.03 0.20
cut FCFV 2 rings epi-like 1 decay e	nue 19.07 5.03 3.33 2.19	nue 32.69 2.19 0.56	nue 18.11 2.88 0.74 0.31	numu 93.86 29.36 0.94	numu 126.25 10.50 0.14 0.05	numu 194.71 26.18 5.66 2.81	Signal 19 5 3 2	Backg .07 2.03 .33 2.19	round P 638.71 (156.23 (13.41 (5.42 (urity 0.03 0.03 0.20 0.29
cut FCFV 2 rings epi-like 1 decay e [p_e-p_pi] < 800MeV	nue 19.07 5.03 3.33 2.19 1.85	nue 32.69 2.19 0.56 0.06 0.04	nue 18.11 2.88 0.74 0.31 0.19	numu 93.86 29.36 0.94 0.49	numu 126.25 10.50 0.14 0.05	numu 194.71 26.18 5.66 2.81 1.46	Signal 19 5 3 2 1	Backg .07 2.03 .33 2.00 .19 2.00 .85 2.00	round P 638.71 (156.23 (13.41 (5.42 (3.55 (urity 0.03 0.03 0.20 0.29 0.34
cut FCFV 2 rings epi-like 1 decay e [p_e-p_pi] < 800Me∨	nue 19.07 5.03 3.33 2.19 1.85 1.71	nue 32.69 2.19 0.56 0.004 0.04 0.04	nue 18.11 2.88 0.74 0.31 0.19 0.17	numu 93.86 29.36 0.94 0.49 0.44	numu 126.25 10.50 0.14 0.05 0.05 0.05	numu 194.71 26.18 5.66 2.81 1.46 1.11	Signal 19 5 3 2 1 1	Backg .07 .03 .03 .03 .19 .04 .85 .05	round P 638.71 (156.23 (13.41 (5.42 (3.55 (2.82 (urity 0.03 0.03 0.20 0.29 0.34 0.38
cut FCFV 2 rings epi-like 1 decay e [p_e-p_pi] <	nue 19.07 5.03 3.33 2.19 1.85 1.71 1.62	nue 32.69 2.19 0.56 0.004 0.04 0.04 0.03	nue 18.11 2.88 0.74 0.31 0.19 0.17 0.12	numu 93.86 29.36 0.94 0.49 0.44 0.38	numu 126.25 10.50 0.14 0.05 0.05 0.04 0.054	numu 194.71 26.18 5.66 2.81 1.46 1.41 0.49	Signal 19 5 3 2 1 1 1 1	Backg .07 .03 .03 .03 .33 .03 .19 .04 .85 .05 .71 .05	round R 638.71 (156.23 (13.41 (5.42 (3.55 (2.82 (1.94 (urity 0.03 0.03 0.20 0.29 0.34 0.38 0.45

A quick look at RHC cutflow

Sample	cut	numu/nu mub CC	intrinsic nue/nue b CC	osc nue/nue b CC	numu/nu mub NC	intrinsic nue/nue b NC	Signal	Bkgd	Purity	FOM
2Repi	FCFV	179.41	13.16	11.63	71.45	2.44	11.63	266.46	0.04	0.697
	2 rings	28.83	2.38	1.26	36.50	1.08	1.26	68.79	0.02	0.150
	epi-like	2.57	0.99	0.53	2.21	0.09	0.53	5.86	0.08	0.210
	0 decay e	0.51	0.55	0.37	1.35	0.05	0.37	2.46	0.13	0.219
	p_e-p_pi < 800MeV	0.28	0.26	0.34	1.16	0.05	0.34	1.74	0.16	0.233
	cos(theta)<0.7>0.9	0.20	0.22	0.29	0.87	0.03	0.29	1.33	0.18	0.228
	Erec < 1.5 GeV	0.06	0.12	0.24	0.62	0.02	0.24	0.82	0.23	0.234
	m_epi nll_2Repi- nll_1Rmu	0.05	0.12	0.23	0.45	0.02	0.23	0.64	0.27	0.249
2Repi1de	FCFV	179.41	13.16	11.63	71.45	2.44	11.63	266.46	0.04	0.697
	2 rings	28.83	2.38	1.26	36.50	1.08	1.26	68.79	0.02	0.150
	epi-like	2.57	0.99	0.53	2.21	0.09	0.53	5.86	0.08	0.210
	1 decay e	1.41	0.38	0.15	0.69	0.03	0.15	2.51	0.06	0.093
	p_e-p_pi < 800MeV	0.91	0.20	0.13	0.56	0.03	0.13	1.69	0.07	0.099
	cos(theta)<0.7>0.9	0.73	0.18	0.12	0.44	0.02	0.12	1.37	0.08	0.100
	Erec < 1.5 GeV	0.26	0.10	0.10	0.34	0.01	0.10	0.70	0.12	0.108
	d2se < 200cm	0.21	0.09	0.09	0.32	0.01	0.09	0.63	0.13	0.111

2Reπ breakdown (RHC)

cut	nue NC 1pi+	nue NC 1pi-	nue NC 1pi0	nue NC Npi	nue NC 0pi	numu NC 1pi+	numu NC 1pi-	numu NC 1pi0	numu NC Npi	num NC (u)pi
FCFV	0.30	0.25	0.67	0.44	0.78	7.51	5.96	22.27	10.9	7	24.74
2 rings	0.08	0.07	0.43	0.08	0.42	2.09	1.63	15.45	1.8	3	15.50
epi-like	0.02	0.01	0.02	0.02	0.02	0.39	0.31	0.55	0.4	3	0.53
0 decay e	0.01	0.01	0.02	0.01	0.01	0.15	0.20	0.50	0.1	8	0.33
p_e-p_pi < 800MeV	0.00	0.01	0.02	0.00	0.01	0.11	0.16	0.46	0.1	1	0.31
cos(theta)<0.7>0.9	0.00	0.01	0.01	0.00	0.01	0.10	0.14	0.29	0.0	8	0.27
Erec < 1.5 GeV	0.00	0.00	0.00	0.00	0.01	0.07	0.10	0.18	0.0	4	0.22
m_epi nll_2Repi- nll_1Rmu	0.00	0.00	0.00	0.00	0.00	0.04	0.06	0.18	0.0	4	0.14
cut	nue CC1pi	nue CCQE	nue CCother	numu CC1pi	numu CCQE	numu CCother	Signal	Backg	round	Purity	
cut FCFV	nue CC1pi 5.99	nue CCQE 11.33	nue CCother 7.47	numu CC1pi 41.43	numu CCQE 60.03	numu CCother 77.95	Signal	.99	272.09	Purity 0.0)2
cut FCFV 2 rings	nue 5.99 1.59	nue 11.33 0.78	nue CCother 7.47 1.27	numu CC1pi 41.43 12.79	numu 60.03 5.11	numu CCother 77.95 10.92	Signal 5	.99 .59	round 272.09 68.46	Purity 0.0 0.0)2)2
cut FCFV 2 rings epi-like	nue 5.99 1.59 1.02	nue 11.33 0.78 0.17	nue 7.47 1.27 0.33	numu 41.43 12.79 0.35	numu 60.03 5.11 0.06	numu 77.95 10.92 2.15	Signal 5 1 1	.99 Backg .59 .02	round 272.09 68.46 5.37	Purity 0.0 0.0 0.1	02 02 .6
cut FCFV 2 rings epi-like 0 decay e	nue 5.99 1.59 1.02	nue 11.33 0.78 0.17 0.15	nue 7.47 1.27 0.33	numu 41.43 12.79 0.35 0.04	numu 60.03 5.11 0.06 0.03	numu 77.95 10.92 2.15 0.43	Signal 5 1 1 0	Backg .99 . .59 . .02 . .63 .	round 272.09 68.46 5.37 2.20	Purity 0.0 0.0 0.1 0.2	02 02 .6
cutFCFV2 ringsepi-like0 decay e p_e-p_pi <	nue 5.99 1.59 1.02 0.63 0.43	nue 11.33 0.78 0.17 0.15 0.10	nue 7.47 1.27 0.33 0.14 0.07	numu 41.43 12.79 0.35 0.04	numu 60.03 5.11 0.06 0.03 0.03	numu 77.95 10.92 2.15 0.43 0.21	Signal 5 1 1 0 0 0	Backg .99 . .59 . .02 . .63 . .43 .	round 272.09 68.46 5.37 2.20 1.64	Purity 0.0 0.1 0.2 0.2	02 02 .6 22 21
cut FCFV 2 rings epi-like 0 decay e [p_e-p_pi] < 800MeV	nue 5.99 1.59 1.02 0.63 0.43	nue 11.33 0.78 0.17 0.15 0.10 0.10	nue 7.47 1.27 0.33 0.14 0.07 0.06	numu 41.43 12.79 0.35 0.04 0.04	numu 60.03 5.11 0.06 0.03 0.03 0.03 0.03 0.03	numu 77.95 10.92 2.15 0.43 0.21 0.15	Signal 5 1 1 0 0 0 0	Backg .99 .59 .02 .63 .43 .37	round 272.09 272.09 68.46 5.37 2.20 1.64 1.26	Purity 0.0 0.1 0.2 0.2 0.2	02 02 .6 22 21
cut FCFV 2 rings epi-like 0 decay e [p_e-p_pi] <	nue 5.99 1.59 1.02 0.63 0.43 0.37 0.29	nue 11.33 0.78 0.77 0.17 0.15 0.10 0.10 0.009 0.04	nue 7.47 1.27 0.33 0.14 0.07 0.06 0.036	numu 41.43 12.79 0.35 0.04 0.04 0.03	numu 60.03 5.11 0.06 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03	numu 77.95 10.92 2.15 0.43 0.21 0.15 0.03	Signal 5 5 1 1 0 0 0 0 0 0 0 0 0 0 0	Backg .99	round 272.09 2 68.46 2 5.37 2.20 1 1.64 2 1.26 0.78 2	Purity 0.0 0.1 0.2 0.2 0.2 0.2	22 22 21 23 27

17-11-23

2Reπ1de breakdown (RHC)

cut	nue NC 1pi+	nue NC 1pi-	nue NC 1pi0	nue NC Npi	nue NC 0pi	numu NC 1pi+	numu NC 1pi-	numu NC 1pi0	numu NC Npi	numu NC 0pi
FCFV	0.30	0.25	0.67	0.44	0.78	7.51	5.96	22.27	10.97	24.74
2 rings	0.08	0.07	0.43	0.08	0.42	2.09	1.63	15.45	1.83	15.50
epi-like	0.02	0.01	0.02	0.02	0.02	0.39	0.31	0.55	0.43	0.53
1 decay e	0.01	0.00	0.00	0.01	0.01	0.20	0.09	0.04	0.20	0.16
p_e-p_pi < 800MeV	0.01	0.00	0.00	0.01	0.01	0.17	0.07	0.03	0.13	0.15
cos(theta)<0.7>0.9	0.01	0.00	0.00	0.00	0.00	0.14	0.06	0.03	0.09	0.12
Erec < 1.5 GeV	0.01	0.00	0.00	0.00	0.00	0.11	0.04	0.01	0.06	0.11
d2se < 200cm	0.01	0.00	0.00	0.00	0.00	0.11	0.04	0.01	0.05	0.10
cut	nue CC1pi	nue CCQE	nue CCother	numu CC1pi	numu CCQE	numu CCother	Signal	Backg	round P	urity
cut FCFV	nue CC1pi 5.99	nue CCQE 11.33	nue CCother 7.47	numu CC1pi 41.43	numu CCQE 60.03	numu CCother 77.95	Signal	.99	272.09	urity 0.02
cut FCFV 2 rings	nue CC1pi 5.99 1.59	nue CCQE 11.33 0.78	nue CCother 7.47 1.27	numu CC1pi 41.43 12.79	numu 60.03 5.11	numu CCother 77.95 10.92	Signal 5	.99 Backg .59 -	round P 272.09 68.46	0.02 0.02
cut FCFV 2 rings epi-like	nue 5.99 1.59 1.02	nue 11.33 0.78 0.17	nue 7.47 1.27 0.33	numu 41.43 12.79 0.35	numu 60.03 5.11 0.06	numu CCother 77.95 10.92 2.15	Signal 5	.99 Backg .59 .02	round P 272.09 68.46 5.37	0.02 0.02 0.16
cut FCFV 2 rings epi-like 1 decay e	nue 5.99 1.59 1.02 0.38	nue 11.33 0.78 0.17 0.02	nue 7.47 1.27 0.33 0.14	numu 41.43 12.79 0.35 0.21	numu 60.03 5.11 0.06 0.03	numu 77.95 10.92 2.15 1.17	Signal 5 1 1 0	Backg .99	round P 272.09 68.46 5.37 2.29	0.02 0.02 0.16 0.14
cut FCFV 2 rings epi-like 1 decay e [p_e-p_pi] < 800MeV	nue 5.99 1.59 1.02 0.38 0.25	nue 11.33 0.78 0.17 0.02 0.01	nue 7.47 1.27 0.33 0.14 0.07	numu 41.43 12.79 0.35 0.21 0.19	numu 60.03 5.11 0.06 0.03 0.03	numu 77.95 10.92 2.15 1.17 0.69	Signal 5 1 1 0 0 0	Backg .99	round P 272.09 / 68.46 / 5.37 / 2.29 / 1.58 /	urity 0.02 0.02 0.16 0.14 0.14
cut FCFV 2 rings epi-like 1 decay e [p_e-p_pi] < 800MeV	nue 5.99 1.59 1.02 0.38 0.25	nue 11.33 0.78 0.17 0.02 0.01 0.01 0.01	nue 7.47 1.27 0.33 0.14 0.07 0.06	numu 41.43 12.79 0.35 0.21 0.19	numu 60.03 5.11 0.06 0.03 0.03 0.02	numucest 77.95 10.92 2.15 1.17 0.69 0.55	Signal 5 1 1 0 0 0 0	Backg .99 .59 .02 .38 .25 .23 .23	round P 272.09 1 68.46 1 5.37 1 2.29 1 1.58 1	urity 0.02 0.02 0.16 0.14 0.14 0.15
cut FCFV 2 rings epi-like 1 decay e [p_e-p_pi] <	nue 5.99 1.59 1.59 0.38 0.25 0.23 0.24 0.16	nue 11.33 0.78 0.71 0.01 0.01 0.01 0.01 0.01 0.01 0.01	nue 7.47 1.27 0.33 0.14 0.07 0.06 0.06 0.033	numu 41.43 12.79 0.35 0.21 0.19 0.16	numu 60.03 5.11 0.06 0.03 0.03 0.02 0.02 0.01	numuce 77.95 10.92 2.15 1.17 0.69 0.55 0.155	Signal 5 5 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0	Backg .99 .59 .02 .38 .23 .16	round P 272.09 1 68.46 1 5.37 1 2.29 1 1.58 1 0.64 1	urity 0.02 0.02 0.16 0.14 0.14 0.15 0.19

Thoughts

- Moving Erec cut from 2 GeV to 1.5 GeV seemed to be beneficial for both samples
 - targeting v_{μ} CCDIS background
- $m_{e\pi}$ vs $nll_{2Re\pi}$ -nll_{1Rµ} cut effective at reducing v_{μ} NC0 π backgrounds in 2Re π sample
- Have yet to identify promising cut for ν_{μ} NC1 $\pi^{_0}$ background in 2Re π sample
 - $m_{e\pi}$ vs $nll_{2Re\pi}$ - nll_{2Ree} cut improved purity, but not FOM
 - v_{μ} NC1 π^{0} remains as largest background in 2Re π sample
- Start preparing code for grid search