# Acceptance Study for SciBooNE Charged-Current Coherent Pion Production Technical Note Rough Draft

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April 24, 2017

### Abstract

We showed that the SciBooNE guys tried to mess physics up by cutting out all of their CC-Coh Pion events from their data that was actually there! Duh. Do we need an abstract?

# 1 Introduction

The goal of this document is to provide a reference for the acceptance study performed for the SciBooNE charged current coherent pion  $(CC - Coh\pi^{+/-})$  re-analysis as well as provide documentation to the code used in this study (in the event anything needs to be revisited in the future).

The code currently lives in this github repository labeled SciBooNE-MC and the corresponding ROOT files used in the simulation can be downloaded from here (insert dropbox/Google Drive Link here)

The paper is structured such that Section 2 outlines Monte Carlo samples used in this study, Section 3 describes the SciBooNE detector as it was simulated in this study, Section 4 describes the various event samples that were used to both validate and generate the acceptance studies for the  $CC - Coh\pi^{+/-}$  sample. Section 5 gives a high level summary of the results including the event-reduction table as well as the CC-Coh- $\pi$  acceptance results.

Sections ?? - ?? provide supporting plots which are used to generate the acceptance tables found in Section ??.

The appendix is left to explain how the code is run and the details of the scripts within.

### 1.1 Goal

The goal of the reanalysis is to examine the acceptance modeling for the SciBooNE results in the presence of modern neutrino generators and updated models in order to understand why SciBooNE did not observe Charged-Current Coherent Pion Production at low neutrino energy. The purpose of this acceptance study is to blah blah blah... (coming back to this later...)

# 2 Samples

Five different samples were used in this study, three samples for  $\nu$ -mode and two samples in  $\bar{\nu}$ -mode.<sup>1</sup> Table 2 summarizes these samples. Details on these samples can be found in Appendix

		summary of Sa	mples
Mode	NEUT version	Pion-Model	Number of simulated events
$\overline{\nu}$	5.3.6	Rein-Sehgal	1,000,000
$\nu$	5.3.6	Berger-Sehgal	1,000,000
$\nu$	X.X.X	Rein-Sehgal	100,000
$\bar{ u}$	5.3.6	Rein-Sehgal	1,000,000
$\bar{\nu}$	5.3.6	Berger-Sehgal	1,000,000

Table 1: Summary of the samples used to build the acceptance model for this study.

# 3 Simulation

This section is intended to detail the nuances of this acceptance model, and to detail what assumptions are made in the acceptance modeling to result in accurate classifications of events as Charged-Current Coherent Pion Production.

### 3.1 The Detector

For the purposes of this acceptance study, the SciBooNE experiment is composed of two subdetectors. The first (and the more upstream) of the sub-detectors, is the Scintillator Bar Tracker (SciBar) which was originally conceived and constructed to function as the near detector for the K2K experiment [reference]. The second (and more downstream) of the sub-detectors, is the Muon Range Detector (MRD), which is the detector designed and constructed specifically for SciBooNE for measuring the momentum of muons produced from charged-current neutrino interactions up to 1.2~GeV/c by using the observed range of the trajectory of the muon. The coordinante system used throughout this study, and illustrated in Figure 3.1, puts the origin in the lower corner of the SciBar detector, has z along the beam direction, y opposite to gravity, and x to beam left.

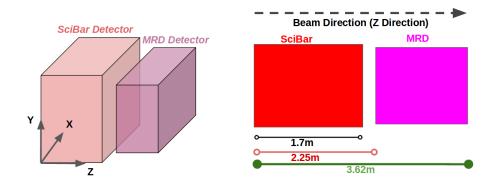


Figure 1: Representation of the SciBooNE detector and the coordinate frame we use in this study

<sup>&</sup>lt;sup>1</sup>All of these samples were generated by Callum Wilkinson (Thanks, Callum!)

### 3.1.1 The Scintillator Bar Tracker (SciBar)

The Scintillator Bar Tracker (SciBar) sub-detector is a scintillator detector which was used to identify neutrino interactions within SciBooNE. The dimensions of teh SciBar detector used in this simulation are 0 < x < 3.0 m, 0 < y < 3.0 m 0 < z < 1.7 m. This simulation models the scintillator materials as having a constant energy deposition per unit length (dE/dx) for both muons and pions of 2.04 MeV/cm based on previous SciBooNE analyses and mean values for typical particle momentum in the PDG.

### 3.1.2 The Muon Range Detector (MRD)

The Muon Range Detector (MRD), depicted in Figure 3.1.2 is located 0.55 m downstream of SciBar in the z-direction, and is a composition of two sets of thirteen alternating slabs of steel-scintillator layers, where the scintillator layers alternate between being horizontally oriented or vertically oriented, in the xy-plane. The steel layers have a z-direction thickness of 5.08 cm and the scintillator layers have a z-direction thickness of 0.6 cm. Combining all the layers of the different alternating materials results in 26 scintillator layers that "sandwich" twenty five steel layers inbetween and gives a total z-direction dimension of being 1.37m. The xy-plane is modeled as a square again (as was the case with SciBar, too) with dimensions in the x-direction and the y-direction of 2.6 m. The energy deposition per unit length (dE/dx) of a muon penetrating the scintillator layers is assumed to be a constant 2.04 MeV/cm while the energy deposition for the muon in the steel layers is assumed to be a greater value of 11.43 MeV/cm. Both these values are typical for muons at the energy range produced in SciBooNE and taken from the PDG

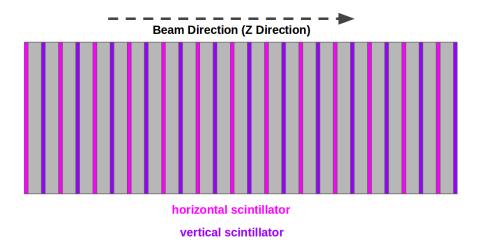


Figure 2: Depiction of the Muon Range Detector (MRB) which consists of alternating layers of horizontal scintillator (shown in pink) steel slabs (showin in grey) and vertical scintillator (shown in purple)

### 4 Event Selection

Two main samples are used in this study to generate an acceptance tables. The first is a charged current inclusive (CC-Inclusive) sample which requires a muon was created in the neutrino interaction and this muon intersects the MRD. This sample is described in Section 5.1.

The second sample is the charged current coherent pion  $CC - Coh\pi^{+/-}$  sample which requires a muon and charged pion are created in the neutrino interaction exclusively (e.g. no other final state particles in the event). This sample is described in Section 5.2.

Both of these samples are selected using NEUT MC-truth flags which ensure we are treating pure samples which are classified by the neutrino generator as belonging to the appropriate sample.

Whether or not the event identified by our selection makes it into the final sample used in the acceptance study depends on the behavior of the muon with respect to the MRD. A muon which enters the MRD from a neutrino interaction will either come to stop in the MRD, exit out the back of the MRD (assuming it's momentum is great enough), or exit out the side of the MRD. In the next sections we explain this classification further.

# 4.1 Muon Stops within the MRD ("Stopped")

The requirement to classify a neutrino interaction as a "stopped" event requires the muon from the interaction to have reached the MRD, penetrated at least three layers of steel (giving activity in three layers of scintillator), and to then deposit all of its remaining energy prior to reaching a boundary of the MRD. An illustration of a  $CC - Coh\pi^{+/-}$  event which would be classified as "stopped" is shown in Figure 4.1.

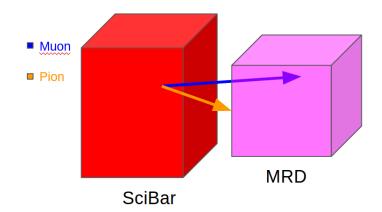


Figure 3: Depiction of an event that was classified as "Stopped."

These events allow for complete reconstruction of the muon's momentum based on the number of layers which the muon penetrated and the muons incident angle.

### 4.2 Muon exits out the back of the MRD ("Out-the-back")

The classification of a neutrino interaction as "out-the-back" requires that the muon from the interaction to have reached the MRD and to have had sufficient kinematics to have exited out the back face of the MRD without stopping. An illustration of such an event is given in Figure 4.2.

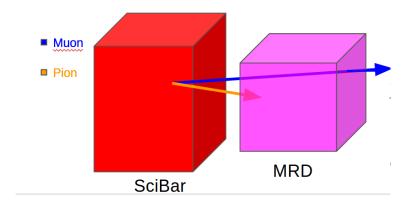


Figure 4: Depiction of an event that was classified as "out-the-back".

The exact momentum of muons which pass completely through the MRD could not be made in reconstruction, so these events were classified as having the minimum energy required to penetrate all the steel and scintillator layers of the MRD.

# 4.3 Muon exits out the side of the MRD ("Out-the-side")

The classification of a neutrino interaction as "out-the-side" requires that the muon from the interaction to have reached the MRD, penetrated at least three layers of steel, but to have then exited out the side of the active volume of the MRD (excluding the very back face). Events which are classified as "out-the-side" are excluded from this study because no accurate reconstruction of the muons momentum can be made when the muon exits out the side of the MRD. An illustration of such an excluded event which exits out the side of the MRD is given in Figure .

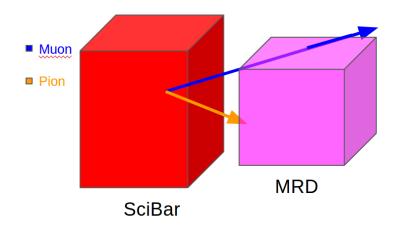


Figure 5: Depiction of an event that was classified as "Out-Side."

# 5 Results

The results of this acceptance study can be broken down into two different classification schemes of events. Those that met the conditions to qualify as a CC-Inclusive event, and those that met the

conditions of classification as Charged-Current Coherent Pion Production events. The plots in the two subsections below show our results.

### 5.1 Charged-Current Inclusive Events

Here we define the charged current inclusive sample (CC-Inclusive) which we use to validate our acceptance model against previous simulation studies which were done. Table 5.1 goes through the event selection criteria for selecting a sample of CC-Inclusive events from the neutrino mode ( $\nu$ -mode) Monte Carlo.

	$\nu$ -mode CC-Inclusive	Event Reduction	
Events Selection	NEUT v5.3.6 Rein-Sehgal	NEUT v5.3.6 Berger-Sehgal	NEUT vx.x.x Rein-Sehgal
Total Sample	1,000,000	1,000,000	100,000
CC-Inclusive Interaction	725,730	727,278	69,363
$(\mu + \text{n-other particles in SciBar})$			
Muon enters the MRD	263,698	262,608	24,250
Muon enters the MRD and	231,089	230,054	21,001
penetrates $\geq 3$ layers of steel			
"Stopped"-Events	177,406	175,799	16,062
"Out-the-back"-Events	15,389	15,952	1,421
"Out-the-side"-Events	38,294	38,303	3,518
Good CC-Inclusive Events	192,795	191,751	$17,\!483$

#### u-mode CC-Inclusive Event Reduction

Table 2: Event reduction table for a sample of  $\nu$ -mode CC-Inclusive evnets simulated in the Sci-BooNE geometry.

Figure 5.1 shows the momentum and angular distribution for the sample of  $\nu$ -mode CC-Inclusive events passing all our requirements for all three models considered in this study (NEUT v5.3.6 Rein-Sehgal, NEUT v5.3.6 Berger-Sehgal, NEUT vx.x.x Rein-Sehgal). The distributions have been normalized to the same area and show no strong differences between them.

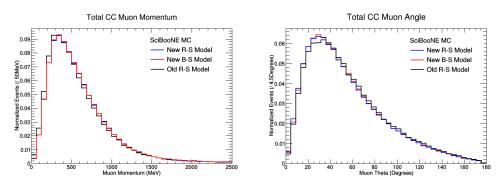


Figure 6: Muon Momentum (left) and Muon Angle (right) for  $\nu$ -mode CC-Inclusive interactions for all three models included in this study. These samples kinematics are, unsurprisingly, very similar for the sample of CC-Inclusive

Figure 5.1 represents the one-dimensional efficiency for selecting  $\nu$ -mode CC-Inclusive events for this study compared to results derived from Hirade's thesis (need proper reference) using the full SciBooNE Monte Carlo simulation. A few reference points are illustrated using dashed lines

to guide the readers eye. A few perecent difference is seen, but overall agreement between the two simulations hold.

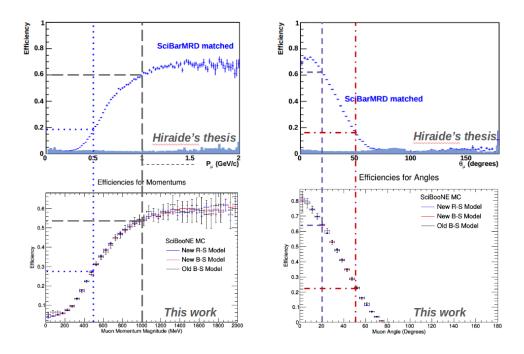


Figure 7: One-dimension efficiency plots for the  $\nu$ -mode CC-Inclusive sample.

Figure 5.1 shows the two-dimensional efficiency for selecting  $\nu$ -mode CC-Inclusive events for this study compared to results derived from Morgan's reference sample (need more words here about this...see email)

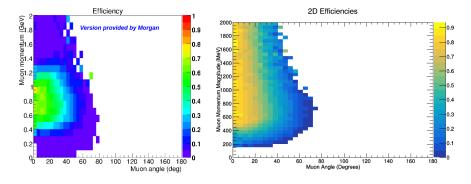


Figure 8: Two-dimensional efficiency plots for the  $\nu$ -mode Rein-Sehgal CC-Inclusive sample.

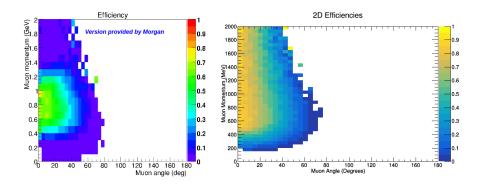


Figure 9: Two-dimensional efficiency plots for the  $\nu$ -mode Berger-Sehgal CC-Inclusive sample.

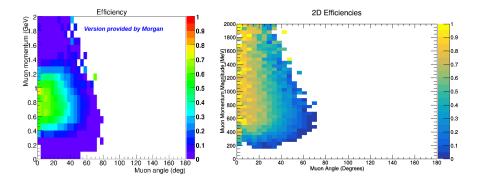


Figure 10: Two-dimensional efficiency plots for the  $\nu$ -mode Old Rein-Sehgal CC-Inclusive sample.

Similar to before, Table 5.1 goes through the event selection criteria for selecting a sample of CC-Inclusive events from the neutrino mode ( $\bar{\nu}$ -mode) Monte Carlo.

ū-mode	CC-In	clusive	Event	Reduction

Events Selection	NEUT v5.3.6 Rein-Sehgal	NEUT v5.3.6 Berger-Sehgal
Total Sample	1,000,000	1,000,000
CC-Inclusive Interaction	699,239	704,327
$\mu$ ( $\mu$ + n-other particles in SciBar)		
Muon enters the MRD	380,362	380,869
Muon enters the MRD and	336,373	337,979
penetrates $\geq 3$ layers of steel		
"Stopped"-Events	288,289	288,206
"Out-the-back"-Events	7,608	7,857
"Out-the-side"-Events	40,476	41,916
Good CC-Inclusive Events	295,897	296,063

Table 3: Event reduction table for a sample of  $\bar{\nu}$ -mode CC-Inclusive evnets simulated in the Sci-BooNE geometry.

Figure 5.1 shows the momentum and angular distribution for the sample of  $\bar{\nu}$ -mode CC-Inclusive events passing all our requirements for all three models considered in this study (NEUT v5.3.6

Rein-Sehgal, NEUT v5.3.6 Berger-Sehgal, NEUT vx.x.x Rein-Sehgal). The distributions have been normalized to the same area and show no strong differences between them.

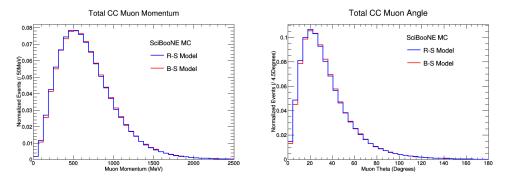


Figure 11: Muon Momentum (left) and Muon Angle (right) for  $\bar{\nu}$ -mode CC-Inclusive interactions for all three models included in this study. These samples kinematics are, unsurprisingly, very similar for the sample of CC-Inclusive

Figure 5.1 represents the one-dimensional efficiency for selecting  $\bar{\nu}$ -mode CC-Inclusive events for this study. No similar reference sample exists to be compared directly against, however we note that the shape and magnitude of the acceptance is nearly unchanged between  $\bar{\nu}$  and  $\nu$ -mode samples (as expected).

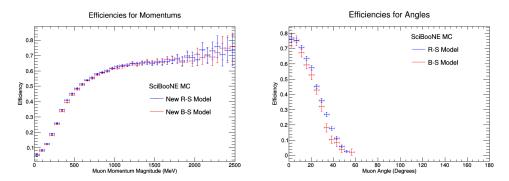


Figure 12: One-dimension efficiency plots for the  $\bar{\nu}$ -mode CC-Inclusive sample. Muon's Momentums is on the right and the Muon's Angles is on the left.

Figure 5.1 shows the two-dimensional efficiency for selecting  $\bar{\nu}$ -mode CC-Inclusive events for this study compared to results derived from Morgan's reference sample (need more words here about this...see email)

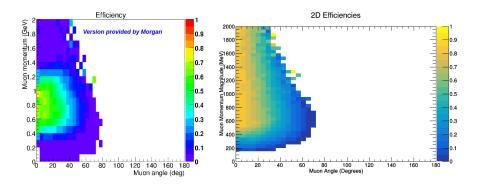


Figure 13: Two-dimensional efficiency plots for the  $\bar{\nu}$ -mode Rein-Sehgal CC-Inclusive sample.

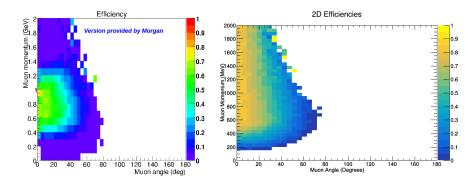


Figure 14: Two-dimensional efficiency plots for the  $\bar{\nu}$ -mode Berger-Sehgal CC-Inclusive sample.

Below are the tables that correspond to the five 2D Efficiency CC-Inclusive histograms that are above.

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	1620-170	1,547820 1,728657 1,747423	0.554007	-	0.323233	-	0.0788235		_	_	-	-				=			_	_	-	= 0		_	_	_	-				
	1600-1630	0.728648 0.728648	0.538378	0.535354	0.3622-45	<u> </u>	_	2 -	_	_	-					=			_	_				_	_	_					
	1556160	176742 174734 1717333	0.587.00	112	0.416667	0.18m47	0.0525316	033333								-						= 0									
	1200-1220	1,872016 1,793631 1,793249	1000000	0.484043	0.433735	0.232148	17.3	0.0714286			_									_						_					
	1.550 1500	750037 750035 75003	2 19 19 19 19 19 19 19 19 19 19 19 19 19	22322	3,403,45	_	325	19																							
al	1400-1450 1	0.75.906		Ť	18120	_	_	0.136364		_	_	-			-	_	-		_	_	-			_	_	_	-		-	0.0	
hga	1350-1400 14	385734 0. 728296 0.		_	35764 0.5	_	_	0.166667	0.0		_	-	0.0			=	0.0			-	-	= 0				-	0.0			0 0	
Š	6		-	-	0 0			0.00		-	-	-	= =	-	_	=				_	-	= 0			-	_			0	0 0	
I-Berger-Sek	Н	000		-	-	_	÷		-	-	-	-				=			_	_	-			_	-	_	-				
3erį	븬		0.579366		0.426456	-	Ť	31 0.0388235	_	_	_	-	= =			=			_	_	-			_	_	_					
T-F	1200-1250	0.54204 0.754204 0.731077	0,000	0.535057	0.474736	0.30065	_	0.0359231	-	_	_	-	= =			=			-	_	-			_	_	_					
_		0.820268 0.814236 0.717208	1023074	0.528678	0.444332	0.296117	11214286	0.138879	_	_	-					=			_	_				_	_	_			0		
Vew	1100-1130	0.813725 0.804494 0.723725	0.640326	0222220	0.475631	0.325411	0.272981	0.180723	0.0344828							=						= 0									
$\vdash$	1020-1100	1.8 1.82-40-45 1.77/2/86	0.633392	0570750	0.490654	0357923	0.26-Q16	0.213839	0.0851054		0.160567									_						_					
[Or	0201 000	7788.45 80.42.05 750738	653155	571275	515256	342320	29.294	132184	_		0.0714286																				
Ш	H	.814815 .72267 .720384	634515	822005	518553	368859	313023	151292	÷		0.046667				-				_	_				_	_	_			-		
Histogram	H	000	165554 0.1	o'	1517520 0.3	_	_	0.219613 0.0	Ť	_	0.0227273 0.0					2			_	_				_	_	_	-		0		
tog	H	773406 0.77	_	-	47864 0.0	-	_	1707244 011	-		22	8		-		=	0 0		-		-			-	-		-				
Η̈́	90	000	5 6	_	0 0	_	_		Ť			0.03125		-		=			0	-	-	= 0		_	_	-			0		
$\Box$	H	000	47 0.651855	-	7 0.548275	_	÷	53 023507	_		136 0.0162162		70			=	0 0		-		-			-	-	-	-				
r 2	15	000	0.661647	0.622306	0.55257	0.352764	0.331052	0.255-223		_	0.0-26135	_	0.012345/			=					-						-				
oj (	002-002	0.843373	0.689404	0.637363	0.551801	0.403834	0.330302	0.358368	0.125182	0.006002	0.0363535	0.0120482				=			_	_	-			_	_	_					
ble	002-029	0.801402	0.677215	0.615445	0.054788	0.425045	0.345987	0.369272	0.135503	0.0009991	0.039056	0.0166667	0.00280899			-															
Tak	029 000	1880435 1805305 1801724	1687027	1620688	1564264	0.419254	13-22670	1261486	1120520	0.0780856	0.0367232	0.0195072			_	_			_	_				_	_	_			_		
5.	009 025	817002 817109 708354	(02351	700700	254316	_	319185	187.04	8318117			0.011.213			_					Ī				Ī		_					
ble	H	.811448 0.73689 0.	0 0	578365 0.	.406522 0.	_	_	0.24064 0.	Ť	_	-	0.00-20357	0.0			-	0 0		_	_		= 0	0.0	_		_			0	0 0	
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Ε.	102 103	1,728.7,1 1,725.7,1 1,711.245	0.58254	-	0.405.40	0.327-0.6	÷	0.148536	÷	_	_	0.000740456				=				_	-					_			0		
	02:00	0.615385 0.581731 0.5725	0.51703	0.447548	0.355351	0.275212	0.22483	0.181.67	0.0810965	0.045/2005	0.00745573					=				_						_					
	330-400	0.478261	0,415013	0.381265	0.312166	0233583	0.192308	0.141328	0.0552683	5232100	_									_						_					
	300-320	#2222 #6604 #2963	318452	125122	25328	170164		1031873	0.0199523	282-1200																					
	300	000			0.0	-	_		_	0.0	_	-		-		=	0 0			-	-	= 0		_		-	-				
	220.31	0,235.849 0,235.29		÷	0.172859		_	77 00302038	0.000-555304		-	-				=			-	_	-	= 0		-		_	-				
	200-220	115781 1178711 1178711	0.0973451	_	0.085743		0.0139147	0.00231467	_			-				=				_	-	= 0		_		_	-				
	156-200	0.0025	0.030604	0.0354035	0.00486618	-			-	-0									-					-	-0				0		
	100.150			-		_	-		_	-		-			_				_	_	-	-		_	-	_			_		
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	a/Aayy op o															-															
	WWW.B.S.	0-45 Deg 450 Deg 9-135 Deg	8.22.5 Day	225-27 Dag 0	27.31.5 Day	36-40.5 Deg	40.5-45 Deg 0	45 40 5 Day	4 28.5 Day	585.63 Dag 0	63-67-5 Dag 0	70 72 Day	70 (0.0 Unit	81-85.5 Day	822-90 Deg 0	Mester of the control of	945.99 Day	108 Dev	108-112.5 Day	12.5-117 Day	17-121.5 Dag 0	St. o. Etc. Day	30,5 135 Dev	35 130,5 Day	(20.5-144 Dag 0	44.148.5 Day	148.5.153 Day	157.5 162 Dev	00.5 Day	166.5 LT Day	180 Day 1
	New.	0.45 Dog 4.50 Dog 9.135 Deg	18.2	225.2	27.8	36.40	40.5-4	9 5	54.58	585.6	63.67	2029	100	81.85	85.5.9	16.00	945.5	116.5	108-11	112.5	Ž.	2 2	10.00	135-12	130.5	144.1	9	1070	162.1	9 5	12

	1950 2010	1.05 0.785 0.725 0.725 0.725	23333	12.					 									
	990-1920	0.53333 0.7773 0.77		0.066067														
	858-1900 1	882253 84215 171 170													-			
	1820 18	0.85748 0.095833 0.0625 0.04789 0.0			- 0			000	 00				-	-				0.0
	30-1800 18		0.647059 0.6						 00		0.0			0.0				0.0
	B-1758 17	20 171256 171256 18247.0 168		571439				000	 00				0.0	0.0				0.0
	GT 17H 17	1 0 82523 0 63829 0 63825 0 423077						000			0.0		0.0					0.0
	1630 163	1.0000000 1.000000000000000000000000000		0.552940 0.4					 00					0.0				
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	50 1450 1300	833333 7 0.73556 0.7766 0.77853							 									
[ga]	1400.14	1 1875 7 1860377 1 168 4 1825			833333				 									
Sek				0.238095	0.25				 									
in-	13tB-1358			0.54667	8.25				 									
Æ	1239-13EE			38837	0.25	0.23333			 									
NM-Rein-Sehgal	1200-1230	17859 17859 17864 17868 15871	0.633465	0.436364	0.357148				 									
q p	1150-1200	0.75 0.883544 0.888679 0.855203	0.291298	0.376812	0.208333													
Old	1108-1158	0.815789 0.775316 0.715357 0.815357	0.503817 0.521m8	3,7857	0.307002	14287												
for	1928-1198	0.777778 0.807092 0.851064 0.68889 0.64176	1594837	0.465909	0.318182	200			 									
Щ	999 1620		531034		14051	0.0714285												
gra	920-1000	810811 67887 67887 67808 61656	0.654054 (	79997		0.139032			 									
2D Histogram for	900-920	1 0.792453 0.746988 0.726115 0.651961	0.614213						 									
Η	850.900	0.72369 0.72369 0.72363 0.72363	0.593458	394537	0.28777	0.122807												
	800-830	0.509091 0.65 0.74681 0.71656	1592637	0.493878		0.17671		HHIT	 									
for	20.800	0875 087750 077907 0719178 0695187	0.659574	0.462838	031672	0.15942 0.13233 0.0754217	0.0689655											
Table 6: Table for	789-758	0.74559 0.74559 0.742538 0.74229	0.532939	0.456311	0.256534	0.286992												
Tak	350-700	0.7 0.73 0.73 0.73 0.73 0.73 0.73 0.73 0	544061	45454	34557	0.2358	0.0869365	1022222	 									
6:	30.630	857.43 85 85 813 87 82 82 83 83 83 83 83 83 83 83 83 83 83 83 83		0540881		0.102991 0.102991			 									
$_{\rm le}$	530 600	1 0.721519 0.773109 0.656442																
Tal		1 506667 1 765937 1 682692 1 647482	53142	1000	24231	170588 107595	0125323											
	500			1- 0			_	M33898										0.0
			629	79	7187	3314	7	22										
	420	2 ja 2 ja	18797 0.455969 11863 0.466981	34230 0.35440 32600 0.35630	56228 0.271875 53462 0.159325	320513 0.133144 320513 0.107463 07754 0.057555	_											
	4m 4m 50 4	0.46667 0.46667 0.25 0.51622 0.57427	762826	0.38 42.00	0.256228	0.160819	0.0056338		 									
	350 4m	0.8 0.87148 0.47058 0.46667 0.451613 0.825 0.50091 0.821622 0.50155 0.47427	0.346154 0.518797 0	0.29577 0.38429 0.	0.461017 0.256228 0	0.0816327 0.160819 0.0238095 0.0320513 0.0120032 0.0802564	0.0056338	0.00	 									0 0
	310 350 350 400	05 08 087148 0.857148 0.450677 0.855714 0.451633 0.855714 0.451633 0.8557 0.85687 0.856874 0.516155 0.474277	9 0289488 0.346154 0.518797 0	0.24444 0.29503 0.38429 0. 0.15372 0.23577 0.38269 0.	0.15122 0.161017 0.256228 0 0.0843882 0.14176 0.163462 0	0.053554 0.081637 0.160819 0.023622 0.023805 0.0320513 0.0120029 0.0320513	0.0056338											0 0
	230 300 300 350 350 400	0.5 0.5 0.8774 0.87188 0.86774 0.87188 0.86667 0.8878 0.86774 0.451013 0.825 0	0.24759 0.289488 0.345154 0.518797 0 0.1375 0.16 0.296296 0.390863 0	0.47 0.24444 0.29503 0.38429 0.043333 0.15372 0.23577 0.38269 0.04333	0.15122 0.161017 0.256228 0	0.0816327 0.160819 0.0238095 0.0320513 0.0120032 0.0802564	0.0056338											0 0 0
	200-250 230-300 300-350 350-400	1033333 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	0.04 0.24769 0.280488 0.345154 0.518797 0 0.061585 0.1375 0.16 0.266296 0.390863 0	0.097501 0.07 0.24444 0.290503 0.38429 0.	0.15122 0.161017 0.256228 0 0.0843882 0.14176 0.163462 0	0.053554 0.081637 0.160819 0.023622 0.023805 0.0320513 0.0120029 0.0320513	0.0056338	88.0										
	150.2EE 200.250 220.300 300.350 350.4EE	1033333 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	0.04 0.24769 0.280488 0.345154 0.518797 0 0.061585 0.1375 0.16 0.266296 0.390863 0	0.47 0.24444 0.29503 0.38429 0.043333 0.15372 0.23577 0.38269 0.04333	0.15122 0.161017 0.256228 0 0.0843882 0.14176 0.163462 0	0.053554 0.081637 0.160819 0.023622 0.023805 0.0320513 0.0120029 0.0320513	0.0056338	0 0 0 0										
	100-150 150-200 200-250 220-300 300-350 350-400	1033333 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	0.04 0.24769 0.280488 0.345154 0.518797 0 0.061585 0.1375 0.16 0.266296 0.390863 0	0.097501 0.07 0.24444 0.290503 0.38429 0.	0.15122 0.161017 0.256228 0 0.0843882 0.14176 0.163462 0	0.053554 0.081637 0.160819 0.023622 0.023805 0.0320513 0.0120029 0.0320513	0.0056338	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0										
	MeV/c 31 100 100 150 150 200 200 550 250 300 310 350 350 400	1033333 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	0.04 0.24769 0.280488 0.345154 0.518797 0 0.061585 0.1375 0.16 0.266296 0.390863 0	0.097501 0.07 0.24444 0.290503 0.38429 0.	0.15122 0.161017 0.256228 0 0.0843882 0.14176 0.163462 0	0.053554 0.081637 0.160819 0.023622 0.023805 0.0320513 0.0120029 0.0320513	0.0056338	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0										
	30-100 100-150 150-20 200-250 250-300 300-350 350-400	1033333 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	0 0 0.0446667 0.04 0.24789 0.280488 0.345154 0.518797 0	0 0 0.088.657 0.087.61 0.07 0.244444 0.246503 0.38423 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	0 0.05528 0.05	0.053554 0.081637 0.160819 0.023622 0.023805 0.0320513 0.0120029 0.0320513	0 0 0 0 0 0 0 0	675-27bg		105-18 Day	125.117.50 <sub>0g</sub> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	17-225-105, 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	28.5.15.28 Dog 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	185-1895 Deg 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	44.445.185.00 <sub>1</sub> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	23.42.50 pg   1   1   1   1   1   1   1   1   1	102-106-5 Drg	72-1755 Dag 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

33-310	715882	12.89	17.00	321-129	1/2																										
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н		_	-	_	_	_									= 1	= 0												==			
1800-183	0.534983	0.711409	0.56000	0.49(8)(9	0307692	91								= 1	= 1	= 0				_	= :				_						
1730-1890	0.285356	0.718579	1246734	0.472222	822										= :													==			
30-1750	20,638	19110	81818	94882	358974	19																			_						
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1359.1					_	_						-		-	= 1	= 0					-				_		-	= =			
1500-15	25150	0.71379	193744			0.28205	0.142857	20000						-	= 1	= 0					-				_			==			
1430-1300	0.820896	0.712513	0.531818	0.488-62	0.464286	0.290323	7 .				В				-	= 0									В						
400-1-50	23331	531919	2001094	30109	405405	2002	192318	31			_		_						_	_				_	_	_	_		_		_
-	85124	2988	2,692			12827	63625	77			_	_	_							_					_	_					
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30 1258-0		-	= 0		8 0.64	1 0.3983		= =																				= =		= =	
1206-12	8.0				_	=	0296512	0.23520	22					= 1	= 1	= 0					-				_						
1130-120	0.821212	0.736423	0.6363N	0.557719	0.487885	0.374753	0.33748	0.30550		В					= :					В				В				==			
100-1150	820728	.759636	28934	254074	45382	393846	315942	211338	(B3333		_		_						_	_					_	_	_		_		_
58-1160	535	128131	2000	100	10292	120057	22833	9000	_	_										_					_						
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H			-	_	_	_		-	-			0.12		-	= 1	= 0	0 0				-									= =	
F	-	-	= 0	0		_	-	= =	-					-	= 1	= 0					-							= =		= =	
800.83	_				-	_	-	= =	-	0.1210	20162	0.125			= 1	= 0															
730.800		_	_	-	_	_	-	= =		0.1365	0.8772	0.425		-	= 1	= 0					-				_						
788-758	1.846154	0.780004	0.72938	0.616002	0.538364	0.49538	0.40234	0.383774	0.185291	0.133106					-													==			
59-70	2698	77094	ON THE	631832	530737	490008	731897	255594	191678	1390-6	0850662	0.482759	8																		
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5EB 65		_		_	_	_	_		_	_	<u> </u>	_	0.0051	-	= 1	= 0					-				_		-	==		= =	
450-300	0.74132	81089.0	0.04299	0.51183	0.45537	0.39462	0.333169	0.25831	0.14963	_	_	=			= 1	= 0									_			==		= =	
400-450	0583034	0.562628	0223918	0.46546	0.383340	0.342622	0.29-631	0.175444	0.127891	1258800	0.0406544	0.00-447928			= -																
0-400	510204	10	1,20	38182	318072	292653	22230	13113	103003	637772	020202	7918HH																			
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238.38	0.0		= 0	-					9 9114	0.0003				-	= 1	= 0											-	==			
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# 5.2 Charged-Current Coherent Pion Production Events

Here we define the Charged-Current Coherent Pion Production sample (CC-Coh  $\pi^{+/-}$ ) which we use to validate our acceptance model against previous simulation studies which were done. Table 5.2 goes through the event selection criteria for selecting a sample of CC-Coh  $\pi^{+/-}$  events from the neutrino mode ( $\nu$ -mode) Monte Carlo.

	$\nu$ -mode CC-Coherent P	ion Event Reduction	
Events Selection	NEUT v5.3.6 Rein-Sehgal	NEUT v5.3.6 Berger-Sehgal	NEUT vx.x.x Rein-Sehgal
Total Sample	1,000,000	1,000,000	100,000
CC-Coherent Pion Interaction	12,186	2,576	1,320
$(\mu + \pi + \varnothing \text{ in SciBar})$			
Both muon and pion are	8,535	1,845	884
forward going			
Muon enters the MRD and	7,407	1,592	767
penetrates $\geq 3$ layers of steel			
"Stopped"-Events	6,448	1,350	669
"Out-the-back"-Events	530	150	56
"Out-the-side"-Events	429	92	42
Good Coherent Pion Events	6.978	1 500	725

u-mode CC-Coherent Pion Event Reduction

Table 9: Event reduction table for a sample of  $\nu$ -mode Charged Current Coherent Pion events simulated in the SciBooNE geometry.

Here will be the plots for CC-Coh Pion with the total momentum efficiencies and the angle efficiencies!

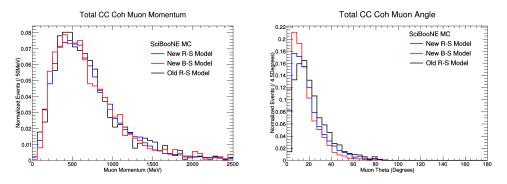
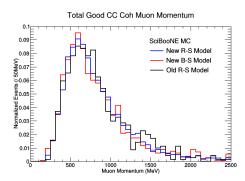


Figure 15: "Total" Muon Momentum (left) and "Total" Muon Angle (right) for  $\nu$ -mode CC-Coh  $\pi^{+/-}$  interactions for all three models included in this study. The "Total" classification means that all CC-Coh  $\pi^{+/-}$  events are included in these histograms.

Here will be the plots for CC-Coh Pion with the good momentum efficiencies and the angle efficiencies!



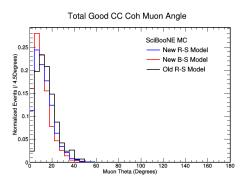


Figure 16: "Good" Muon Momentum (left) and "Good" Muon Angle (right) for  $\nu$ -mode CC-Coh  $\pi^{+/-}$  interactions for all three models included in this study. The "Good" classification means that only the stopped and not-stopped CC-Coh  $\pi^{+/-}$  events are included for these histograms.

Now from here on will be the rest of the results for CC-Coh Events (so this will be the |t| and  $Q^2$  plots with the explanations for what they are!!). You might also want to make a figure that depicts what the  $\theta_{particle}$ 's are... think about it.

The NewANMBergerSehgal.C macro also calculates many different quantities for the generated simulation of the events and saves the information in histograms that are later called upon through the plotting macros (which are after all of the analysis macros). The first quantity that is calculated for the different vertexes is the momentum of both the muon and the pion, which are both calculated using the equations:

$$|\vec{p}_{\mu}| = \sqrt{P_{\mu_x}^2 + P_{\mu_y}^2 + P_{\mu_z}^2} \tag{1}$$

$$|\vec{p}_{\pi}| = \sqrt{P_{\pi_x}^2 + P_{\pi_y}^2 + P_{\pi_z}^2} \tag{2}$$

The momentum is reported in units of MeV/c.

The next quantity that is calculated in the macro is the angle from the beam-direction for both the muon and the pion, which are labeled as either  $\theta_{\mu}$ , or  $\theta_{\pi}$ , respectively. The angle from the beam-direction is the same as the angle from the z-direction, and this angle is known as the azimuthal angle. The calculation of the azimuthal angle is slightly more involved than the simple calculation used for finding the magnitude of the momentum of the two particles, and is calculated using the equations:

$$\theta_{\mu} = tan^{-1}(\sqrt{P_{\mu_x}^2 + P_{\mu_y}^2}/P_{\mu_z}) \tag{3}$$

$$\theta_{\pi} = tan^{-1}(\sqrt{P_{\pi_x}^2 + P_{\pi_y}^2}/P_{\pi_z}) \tag{4}$$

The angles are reported in units of °, and should run from 0° to 180°. In the case of Charged-Current Coherent Pion Production, the angle should never be larger than 90°.

The last two quantities that this analysis macro calculates are the two different types of four-momentum transfers specific to this interaction, which are  $Q^2$  and |t|. The  $Q^2$  corresponds to the four-momentum transfer from the neutrino and muon to the nucleus and pion, and is calculated using the equation:

$$Q^2 = |(P_{\nu_{\mu}} - P_{\mu})^2| \tag{5}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute  $Q^2$ :

$$Q^{2} = |(P_{\nu_{\mu,x}} - P_{\mu_{x}})^{2} + (P_{\nu_{\mu,y}} - P_{\mu_{y}})^{2} + (P_{\nu_{\mu,z}} - P_{\mu_{z}})^{2} + (P_{\nu_{\mu,E}} - P_{\mu_{E}})^{2}|$$

$$(6)$$

 $Q^2$  is reported in units of  $(MeV/c)^2$ .

The |t| corresponds to the four-momentum transfer from the neutrino, muon, and pion to the nucleus, and is calculated using the equation:

$$|t| = |(Q - P_{\pi})^{2}| = |(P_{\nu_{\mu}} - P_{\mu} - P_{\pi})^{2}| \tag{7}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute |t|:

$$|t| = |(P_{\nu_{\mu,x}} - P_{\mu_x} - P_{\pi_x})^2 + (P_{\nu_{\mu,y}} - P_{\mu_y} - P_{\pi_y})^2 + (P_{\nu_{\mu,z}} - P_{\mu_z} - P_{\pi_z})^2 + (P_{\nu_{\mu,E}} - P_{\mu_E} - P_{\pi_E})^2|$$
(8)

|t| is reported in units of  $(MeV/c)^2$ .

 $\nu$ -Mode |t| and  $Q^2$  plots are below:

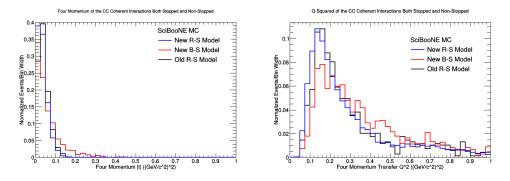


Figure 17: The |t| Good Momentum Transfer (left) and  $Q^2$  Good Momentum Transfer (right) for  $\nu$ -mode CC-Coh  $\pi^{+/-}$  interactions for the three models included in this study. The Good classification means that this includes both the stopped and the not-stopped classifications of the CC-Coh  $\pi^{+/-}$  events only.

Similar to before, Table 5.2 goes through the event selection criteria for selecting a sample of CC-Coh  $\pi^{+/-}$  events from the neutrino mode ( $\bar{\nu}$ -mode) Monte Carlo.

Here will go the plots for CC-Coh Events for ANM both the momentums and the angles for total events.

# $\bar{\nu}$ -mode CC-Coherent Pion Event Reduction

Events Selection	NEUT v5.3.6 Rein-Sehgal	NEUT v5.3.6 Berger-Sehgal
Total Sample	1,000,000	1,000,000
CC-Coherent Pion Interaction	36,669	7,790
$(\mu + \pi + \varnothing \text{ in SciBar})$		
Both muon and pion are	24,675	5,477
forward going		
Muon enters the MRD and	20,445	4,517
penetrates $\geq 3$ layers of steel		
"Stopped"-Events	18,935	4,203
"Out-the-back"-Events	372	82
"Out-the-side"-Events	1,138	232
Good Coherent Pion Events	19,307	4,285

Table 10: Event reduction table for a sample of  $\bar{\nu}$ -mode Charged Current Coherent Pion events simulated in the SciBooNE geometry.

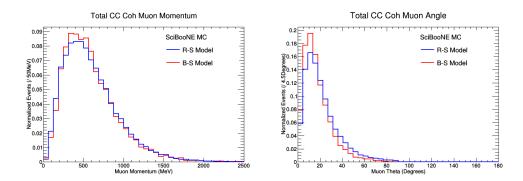


Figure 18: "Total" Muon Momentum (left) and "Total" Muon Angle (right) for  $\nu$ -mode CC-Coh  $\pi^{+/-}$  interactions for all three models included in this study. The "Total" classification means that all CC-Coh  $\pi^{+/-}$  events are included in these histograms.

Here will go the plots for CC-Coh Events for ANM both the momentums and the angles for good events.

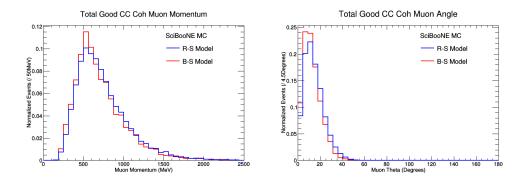


Figure 19: "Good" Muon Momentum (left) and "Good" Muon Angle (right) for  $\bar{\nu}$ -mode CC-Coh  $\pi^{+/-}$  interactions for both of the models included in this study. The "Good" classification means that only the stopped and not-stopped CC-Coh  $\pi^{+/-}$  events are included in these histograms.

Here should be a description of the different t and q plots!  $\bar{\nu}$ -Mode |t| and  $Q^2$  plots are below:

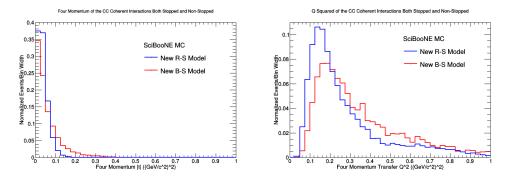


Figure 20: The |t| Good Momentum Transfer (left) and  $Q^2$  Good Momentum Transfer (right) for  $\bar{\nu}$ -mode CC-Coh  $\pi^{+/-}$  interactions for both of the models included in this study. The Good classification means that this includes both the stopped and the not-stopped classifications of the CC-Coh  $\pi^{+/-}$  events only.

# A Appendix: Sample Details

Appendix on samples

### A.1 $\nu$ -Mode Rein-Sehgal NEUTv5.3.6

A sample of 1,000,000  $\nu$  interactions were simulated using the NEUT generator (v5.3.6) and the Rein-Sehgal model for coherent pion production. This sample correspond to the file labeled

SciBooNE\_numu\_coh\_RooTrack.root

found at the following link (put link to sample here).

### A.2 $\nu$ -Mode Berger-Sehgal NEUTv5.3.6

A sample of 1,000,000  $\nu$  interactions were simulated using the NEUT generator (v5.3.6) and the Berger-Sehgal model for coherent pion production. This sample correspond to the file labeled

SciBooNE\_numu\_coh\_RooTrack\_NEW.root

found at the following link (put link to sample here).

### A.3 $\nu$ -Mode Rein-Sehgal NEUTvx.x.x

A sample of  $100,000 \nu$  interactions were simulated using the NEUT generator (vx.x.x, believed to be the version used by the SciBooNE collaboration in the original publication) and the corresponding older Rein-Sehgal model for coherent pion production. This sample correspond to the file labeled

SciBooNE\_numu\_coh\_OLDNEUT\_RooTrack.root

found at the following link (put link to sample here).

### A.4 barv-Mode Rein-Sehgal NEUTv5.3.6

A sample of 1,000,000  $\bar{\nu}$  interactions were simulated using the NEUT generator (v5.3.6) and the Rein-Sehgal model for coherent pion production. This sample correspond to the file labeled

SciBooNE\_numubar\_coh\_RooTrack.root

found at the following link (put link to sample here).

# A.5 $\bar{\nu}$ -Mode Berger-Sehgal NEUTv5.3.6

A sample of 1,000,000  $\bar{\nu}$  interactions were simulated using the NEUT generator (v5.3.6) and the Berger-Sehgal model for coherent pion production. This sample correspond to the file labeled

SciBooNE\_numubar\_coh\_RooTrack\_NEW.root

found at the following link (put link to sample here).

### A.6 Vertex Distributions

The events were all given a random initial point that was generated with the goal that the vertex distributions of this simulation would closely match the vertex distributions that Hiraide (need to put a reference) showed in his thesis. This was done by... etc.

Put in the code for how we made the vertex distributions of the interactions.

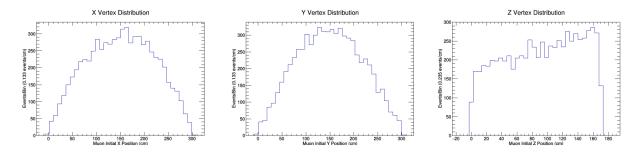


Figure 21: Vertex distributions of the events in the new Rein-Sehgal sample.

### A.7 NewNMReinSehgal.C

This file is the macro that corresponds to the "NewNMReinSehgal.h" file, which connects with this file: "SciBooNE\_numu\_coh\_RooTrack.root". This file performs the main analysis for this generated sample, and then organizes the information into many different histograms. The histograms are then written to a file titled "totalmuoninfoRS.root" inside the "ROOTFILES" directory. The "ROOTFILES" directory is included in the SciBooNE-MC repository (it is absolutely pertinent that this directory be located where the macro files are located due to how the calls of the combined data macros reference the now saved histograms). When this macro is run (which can take a while), it also plots a few different histograms. The histograms that are plotted are the ones shown in the figures below with descriptions included with the corresponding figures. The order that the histograms appear in this paper is the same order they will be shown when this macro is run in root.

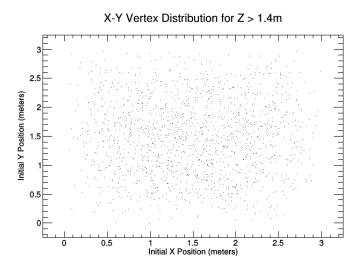


Figure 22: New  $\nu$ -Mode Rein-Sehgal X-Y vertex distributions for muons that made it to the MRD and penetrated at least to the third layer of steel.

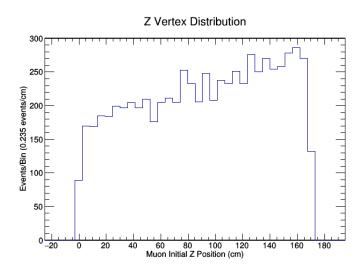


Figure 23: New  $\nu$ -Mode Rein-Sehgal Z vertex distributions for the interactions.

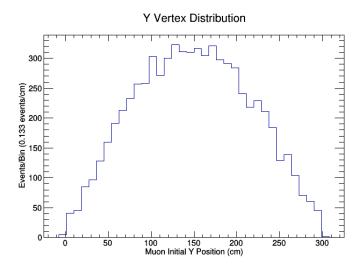


Figure 24: New  $\nu$ -Mode Rein-Sehgal Y vertex distributions for the interactions.

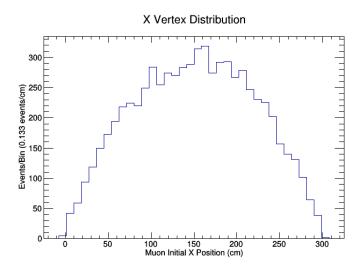


Figure 25: New  $\nu$ -Mode Rein-Sehgal X vertex distributions for the interactions.

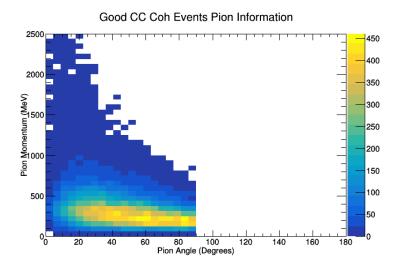


Figure 26: This is a 2D histogram for the momentum and angle of the pion in the CC Coh Pion events that met the qualification of being "good".

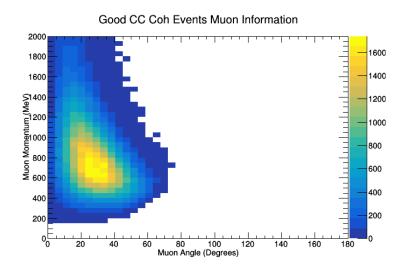


Figure 27: This is a 2D histogram for the momentum and angle of the muon in the CC Coh Pion events that met the qualification of being "good".

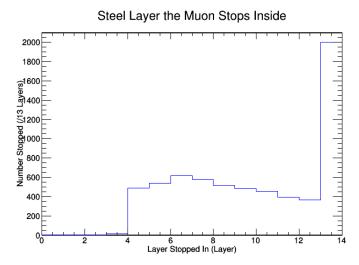


Figure 28: This histogram shows the amount of muons that embedded (or "Stopped") in a corresponding layer of steel in our simulation.

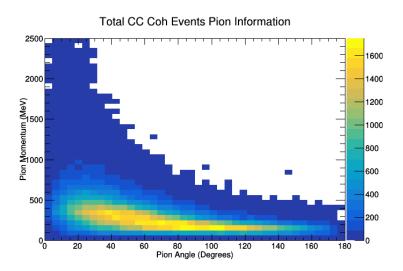


Figure 29: This is a 2D histogram for the momentum and angle of the pion in the total CC Coh Pion events.

### Total CC Coh Events Muon Information Muon Momentum (MeV) Muon Angle (Degrees)

Figure 30: This is a 2D histogram for the momentum and angle of the muon in the total CC Coh Pion events.

The NewNMReinSehgal.C macro also calculates many different quantities for the generated simulation of the events and saves the information in histograms that are later called upon through the plotting macros (which are after all of the analysis macros). The first quantity that is calculated for the different vertexes is the momentum of both the muon and the pion, which are both calculated using the equations:

$$|\vec{p}_{\mu}| = \sqrt{P_{\mu_x}^2 + P_{\mu_y}^2 + P_{\mu_z}^2} \tag{9}$$

$$|\vec{p}_{\pi}| = \sqrt{P_{\pi_x}^2 + P_{\pi_y}^2 + P_{\pi_z}^2} \tag{10}$$

The momentum is reported in units of MeV/c.

The next quantity that is calculated in the macro is the angle from the beam-direction for both the muon and the pion, which are labeled as either  $\theta_{\mu}$ , or  $\theta_{\pi}$ , respectively. The angle from the beam-direction is the same as the angle from the z-direction, and this angle is known as the azimuthal angle. The calculation of the azimuthal angle is slightly more involved than the simple calculation used for finding the magnitude of the momentum of the two particles, and is calculated using the equations:

$$\theta_{\mu} = tan^{-1}(\sqrt{P_{\mu_x}^2 + P_{\mu_y}^2}/P_{\mu_z}) \tag{11}$$

$$\theta_{\pi} = tan^{-1}(\sqrt{P_{\pi_x}^2 + P_{\pi_y}^2}/P_{\pi_z}) \tag{12}$$

The angles are reported in units of °, and should run from 0° to 180°. In the case of Charged-Current Coherent Pion Production, the angle should never be larger than 90°.

The last two quantities that this analysis macro calculates are the two different types of four-momentum transfers specific to this interaction, which are  $Q^2$  and |t|. The  $Q^2$  corresponds to the four-momentum transfer from the neutrino and muon to the nucleus and pion, and is calculated using the equation:

$$Q^2 = |(P_{\nu_{\mu}} - P_{\mu})^2| \tag{13}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute  $Q^2$ :

$$Q^{2} = |(P_{\nu_{\mu,x}} - P_{\mu_{x}})^{2} + (P_{\nu_{\mu,y}} - P_{\mu_{y}})^{2} + (P_{\nu_{\mu,z}} - P_{\mu_{z}})^{2} + (P_{\nu_{\mu,E}} - P_{\mu_{E}})^{2}|$$
(14)

 $Q^2$  is reported in units of  $(MeV/c)^2$ .

The |t| corresponds to the four-momentum transfer from the neutrino, muon, and pion to the nucleus, and is calculated using the equation:

$$|t| = |(Q - P_{\pi})^{2}| = |(P_{\nu_{\mu}} - P_{\mu} - P_{\pi})^{2}| \tag{15}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute |t|:

$$|t| = |(P_{\nu_{\mu,x}} - P_{\mu_x} - P_{\pi_x})^2 + (P_{\nu_{\mu,y}} - P_{\mu_y} - P_{\pi_y})^2 + (P_{\nu_{\mu,z}} - P_{\mu_z} - P_{\pi_z})^2 + (P_{\nu_{\mu,E}} - P_{\mu_E} - P_{\pi_E})^2|$$
 (16)

|t| is reported in units of  $(MeV/c)^2$ .

# A.8 NewNMBergerSehgal.C

This file is the macro that corresponds to the "NewNMBergerSehgal.h" file, which connects with this file: "SciBooNE\_numu\_coh\_RooTrack\_NEW.root". This file performs the main analysis for this generated sample, and then organizes the information into many different histograms. The histograms are then written to a file titled "totalmuoninfoBS.root" inside the "ROOTFILES" directory. The "ROOTFILES" directory is included in the SciBooNE-MC repository (it is absolutely pertinent that this directory be located where the macro files are located due to how the calls of the combined data macros reference the now saved histograms).

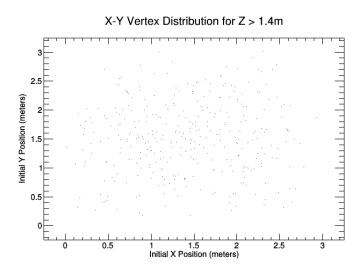


Figure 31: New  $\nu$ -Mode Berger-Sehgal X-Y vertex distributions for muons that made it to the MRD and penetrated at least to the third layer of steel.

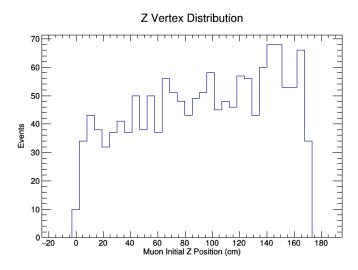


Figure 32: New  $\nu$ -Mode Berger-Sehgal Z vertex distributions for the interactions.

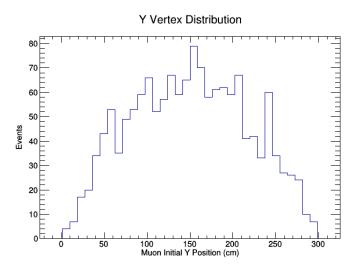


Figure 33: New  $\nu$ -Mode Berger-Sehgal Y vertex distributions for the interactions.

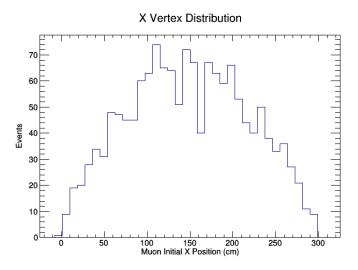


Figure 34: New  $\nu$ -Mode Berger-Sehgal X vertex distributions for the interactions.

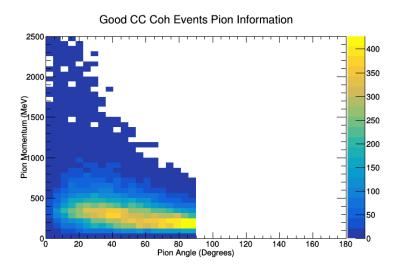


Figure 35: This is a 2D histogram for the momentum and angle of the pion in the CC Coh Pion events that met the qualification of being "good".

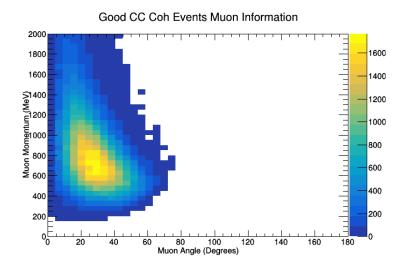


Figure 36: This is a 2D histogram for the momentum and angle of the muon in the CC Coh Pion events that met the qualification of being "good".!

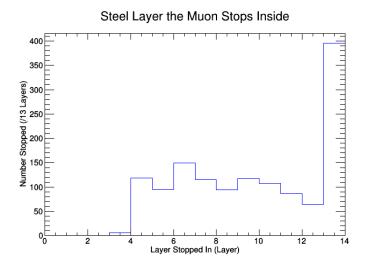


Figure 37: This histogram shows the amount of muons that embedded (or "Stopped") in a corresponding layer of steel in our simulation.

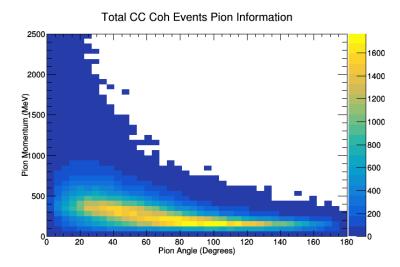


Figure 38: This is a 2D histogram for the momentum and angle of the pion in the total CC Coh Pion events.

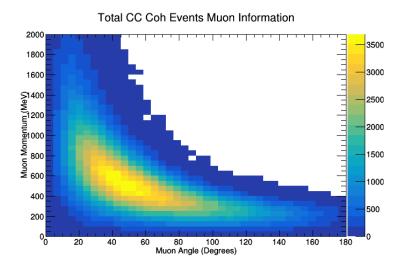


Figure 39: This is a 2D histogram for the momentum and angle of the muon in the total CC Coh Pion events.

The NewNMBergerSehgal.C macro also calculates many different quantities for the generated simulation of the events and saves the information in histograms that are later called upon through the plotting macros (which are after all of the analysis macros). The first quantity that is calculated for the different vertexes is the momentum of both the muon and the pion, which are both calculated using the equations:

$$|\vec{p}_{\mu}| = \sqrt{P_{\mu_x}^2 + P_{\mu_y}^2 + P_{\mu_z}^2} \tag{17}$$

$$|\vec{p}_{\pi}| = \sqrt{P_{\pi_x}^2 + P_{\pi_y}^2 + P_{\pi_z}^2} \tag{18}$$

The momentum is reported in units of MeV/c.

The next quantity that is calculated in the macro is the angle from the beam-direction for both the muon and the pion, which are labeled as either  $\theta_{\mu}$ , or  $\theta_{\pi}$ , respectively. The angle from the beam-direction is the same as the angle from the z-direction, and this angle is known as the azimuthal angle. The calculation of the azimuthal angle is slightly more involved than the simple calculation used for finding the magnitude of the momentum of the two particles, and is calculated using the equations:

$$\theta_{\mu} = tan^{-1}(\sqrt{P_{\mu_x}^2 + P_{\mu_y}^2}/P_{\mu_z}) \tag{19}$$

$$\theta_{\pi} = tan^{-1} \left( \sqrt{P_{\pi_x}^2 + P_{\pi_y}^2} / P_{\pi_z} \right) \tag{20}$$

The angles are reported in units of °, and should run from 0° to 180°. In the case of Charged-Current Coherent Pion Production, the angle should never be larger than 90°.

The last two quantities that this analysis macro calculates are the two different types of four-momentum transfers specific to this interaction, which are  $Q^2$  and |t|. The  $Q^2$  corresponds to the four-momentum transfer from the neutrino and muon to the nucleus and pion, and is calculated using the equation:

$$Q^2 = |(P_{\nu_{\mu}} - P_{\mu})^2| \tag{21}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute  $Q^2$ :

$$Q^{2} = |(P_{\nu_{\mu,x}} - P_{\mu_{x}})^{2} + (P_{\nu_{\mu,y}} - P_{\mu_{y}})^{2} + (P_{\nu_{\mu,z}} - P_{\mu_{z}})^{2} + (P_{\nu_{\mu,E}} - P_{\mu_{E}})^{2}|$$
(22)

 $Q^2$  is reported in units of  $(MeV/c)^2$ .

The |t| corresponds to the four-momentum transfer from the neutrino, muon, and pion to the nucleus, and is calculated using the equation:

$$|t| = |(Q - P_{\pi})^{2}| = |(P_{\nu_{\mu}} - P_{\mu} - P_{\pi})^{2}| \tag{23}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute |t|:

$$|t| = |(P_{\nu_{\mu,x}} - P_{\mu_x} - P_{\pi_x})^2 + (P_{\nu_{\mu,y}} - P_{\mu_y} - P_{\pi_y})^2 + (P_{\nu_{\mu,z}} - P_{\mu_z} - P_{\pi_z})^2 + (P_{\nu_{\mu,E}} - P_{\mu_E} - P_{\pi_E})^2|$$
(24)

|t| is reported in units of  $(MeV/c)^2$ .

### A.9 OldNMReinSehgal.C

This file is the macro that corresponds to the "OldNMReinSehgal.h" file, which connects with this file: "SciBooNE\_numu\_coh\_OLDNEUT\_RooTrack.root". This file performs the main analysis for this generated sample, and then organizes the information into many different histograms. The histograms are then written to a file titled "totalmuoninfoOBS.root" inside the "ROOTFILES" directory. The "ROOTFILES" directory is included in the SciBooNE-MC repository (it is absolutely pertinent that this directory be located where the macro files are located due to how the calls of the combined data macros reference the now saved histograms).

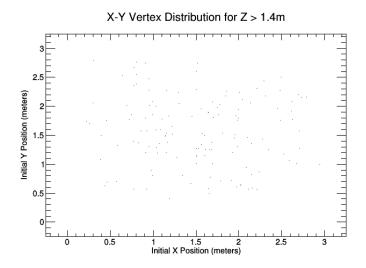


Figure 40: Old  $\nu$ -Mode Rein-Sehgal X-Y vertex distributions for muons that made it to the MRD and penetrated at least to the third layer of steel.

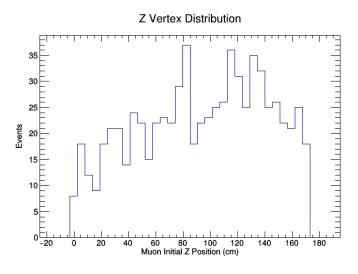


Figure 41: Old  $\nu$ -Mode Rein-Sehgal Z vertex distributions for the interactions.

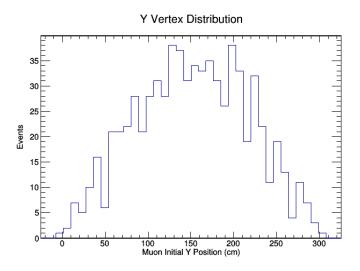


Figure 42: Old  $\nu$ -Mode Rein-Sehgal Y vertex distributions for the interactions.

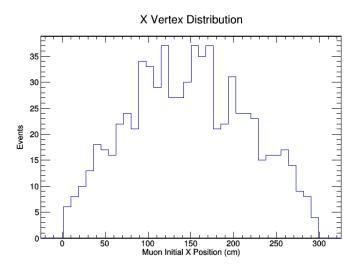


Figure 43: Old  $\nu$ -Mode Rein-Sehgal X vertex distributions for the interactions.

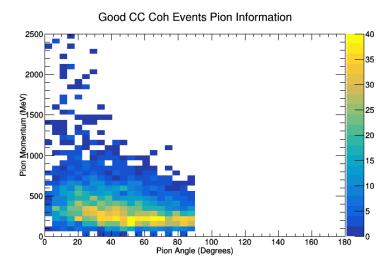


Figure 44: This is a 2D histogram for the momentum and angle of the pion in the CC Coh Pion events that met the qualification of being "good".

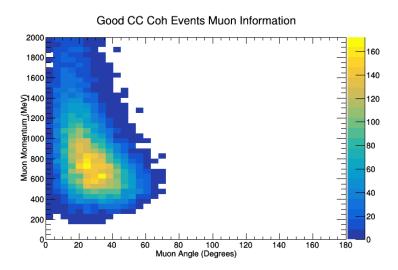


Figure 45: This is a 2D histogram for the momentum and angle of the muon in the CC Coh Pion events that met the qualification of being "good".

# Steel Layer the Muon Stops Inside

Figure 46: This histogram shows the amount of muons that embedded (or "Stopped") in a corresponding layer of steel in our simulation.

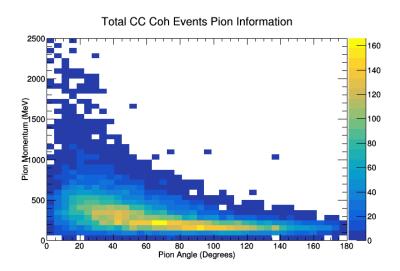


Figure 47: This is a 2D histogram for the momentum and angle of the pion in the total CC Coh Pion events.

### Total CC Coh Events Muon Information Muon Momentum (MeV) 1200 800 800 800 Muon Angle (Degrees)

Figure 48: This is a 2D histogram for the momentum and angle of the muon in the total CC Coh Pion events.

The OldNMReinSehgal.C macro also calculates many different quantities for the generated simulation of the events and saves the information in histograms that are later called upon through the plotting macros (which are after all of the analysis macros). The first quantity that is calculated for the different vertexes is the momentum of both the muon and the pion, which are both calculated using the equations:

$$|\vec{p}_{\mu}| = \sqrt{P_{\mu_x}^2 + P_{\mu_y}^2 + P_{\mu_z}^2} \tag{25}$$

$$|\vec{p}_{\pi}| = \sqrt{P_{\pi_x}^2 + P_{\pi_y}^2 + P_{\pi_z}^2} \tag{26}$$

The momentum is reported in units of MeV/c.

The next quantity that is calculated in the macro is the angle from the beam-direction for both the muon and the pion, which are labeled as either  $\theta_{\mu}$ , or  $\theta_{\pi}$ , respectively. The angle from the beam-direction is the same as the angle from the z-direction, and this angle is known as the azimuthal angle. The calculation of the azimuthal angle is slightly more involved than the simple calculation used for finding the magnitude of the momentum of the two particles, and is calculated using the equations:

$$\theta_{\mu} = tan^{-1}(\sqrt{P_{\mu_x}^2 + P_{\mu_y}^2}/P_{\mu_z}) \tag{27}$$

$$\theta_{\pi} = tan^{-1}(\sqrt{P_{\pi_x}^2 + P_{\pi_y}^2}/P_{\pi_z}) \tag{28}$$

The angles are reported in units of °, and should run from 0° to 180°. In the case of Charged-Current Coherent Pion Production, the angle should never be larger than 90°.

The last two quantities that this analysis macro calculates are the two different types of four-momentum transfers specific to this interaction, which are  $Q^2$  and |t|. The  $Q^2$  corresponds to the four-momentum transfer from the neutrino and muon to the nucleus and pion, and is calculated using the equation:

$$Q^2 = |(P_{\nu_{\mu}} - P_{\mu})^2| \tag{29}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute  $Q^2$ :

$$Q^{2} = |(P_{\nu_{\mu,x}} - P_{\mu_{x}})^{2} + (P_{\nu_{\mu,y}} - P_{\mu_{y}})^{2} + (P_{\nu_{\mu,z}} - P_{\mu_{z}})^{2} + (P_{\nu_{\mu,E}} - P_{\mu_{E}})^{2}|$$
(30)

 $Q^2$  is reported in units of  $(MeV/c)^2$ .

The |t| corresponds to the four-momentum transfer from the neutrino, muon, and pion to the nucleus, and is calculated using the equation:

$$|t| = |(Q - P_{\pi})^{2}| = |(P_{\nu_{\mu}} - P_{\mu} - P_{\pi})^{2}| \tag{31}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute |t|:

$$|t| = |(P_{\nu_{\mu,x}} - P_{\mu_x} - P_{\pi_x})^2 + (P_{\nu_{\mu,y}} - P_{\mu_y} - P_{\pi_y})^2 + (P_{\nu_{\mu,z}} - P_{\mu_z} - P_{\pi_z})^2 + (P_{\nu_{\mu,E}} - P_{\mu_E} - P_{\pi_E})^2|$$
(32)

|t| is reported in units of  $(MeV/c)^2$ .

## A.10 NewANMReinSehgal.C

This file is the macro that corresponds to the "NewANMReinSehgal.h" file, which connects with this file: "SciBooNE\_numubar\_coh\_RooTrack.root". This file performs the main analysis for this generated sample, and then organizes the information into many different histograms. The histograms are then written to a file titled "totalmuoninfoRSBar.root" inside the "ROOTFILES" directory. The "ROOTFILES" directory is included in the SciBooNE-MC repository (it is absolutely pertinent that this directory be located where the macro files are located due to how the calls of the combined data macros reference the now saved histograms).

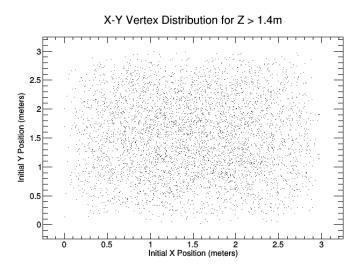


Figure 49: New  $\bar{\nu}$ -Mode Rein-Sehgal X-Y vertex distributions for muons that made it to the MRD and penetrated at least to the third layer of steel.

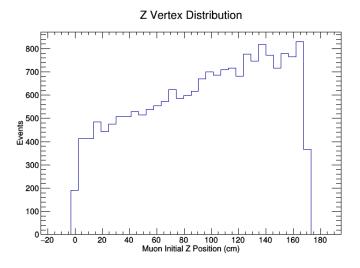


Figure 50: New  $\bar{\nu}$ -Mode Rein-Sehgal Z vertex distributions for the interactions.

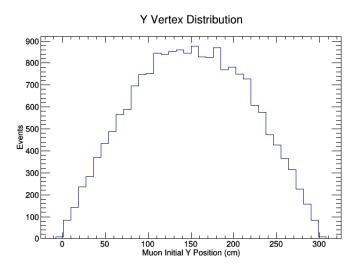


Figure 51: New  $\bar{\nu}$ -Mode Rein-Sehgal Y vertex distributions for the interactions.

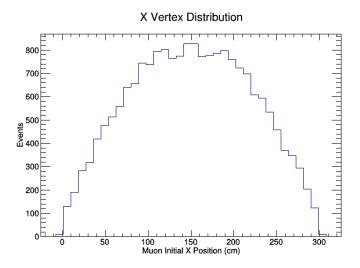


Figure 52: New  $\bar{\nu}$ -Mode Rein-Sehgal X vertex distributions for the interactions.

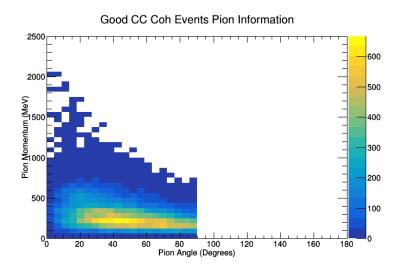


Figure 53: This is a 2D histogram for the momentum and angle of the pion in the CC Coh Pion events that met the qualification of being "good".

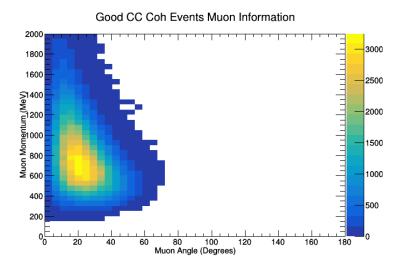


Figure 54: This is a 2D histogram for the momentum and angle of the muon in the CC Coh Pion events that met the qualification of being "good".

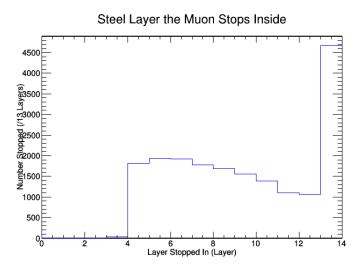


Figure 55: This histogram shows the amount of muons that embedded (or "Stopped") in a corresponding layer of steel in our simulation.

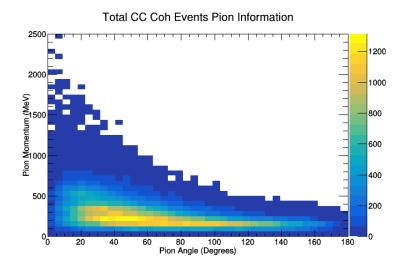


Figure 56: This is a 2D histogram for the momentum and angle of the pion in the total CC Coh Pion events.

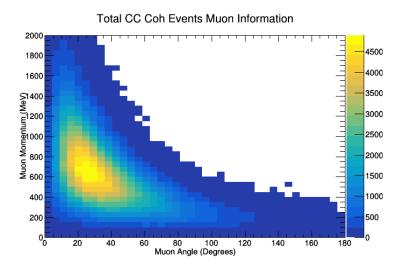


Figure 57: This is a 2D histogram for the momentum and angle of the muon in the total CC Coh Pion events.

The NewANMReinSehgal.C macro also calculates many different quantities for the generated simulation of the events and saves the information in histograms that are later called upon through the plotting macros (which are after all of the analysis macros). The first quantity that is calculated for the different vertexes is the momentum of both the muon and the pion, which are both calculated using the equations:

$$|\vec{p}_{\mu}| = \sqrt{P_{\mu_x}^2 + P_{\mu_y}^2 + P_{\mu_z}^2} \tag{33}$$

$$|\vec{p}_{\pi}| = \sqrt{P_{\pi_x}^2 + P_{\pi_y}^2 + P_{\pi_z}^2} \tag{34}$$

The momentum is reported in units of MeV/c.

The next quantity that is calculated in the macro is the angle from the beam-direction for both the muon and the pion, which are labeled as either  $\theta_{\mu}$ , or  $\theta_{\pi}$ , respectively. The angle from the beam-direction is the same as the angle from the z-direction, and this angle is known as the azimuthal angle. The calculation of the azimuthal angle is slightly more involved than the simple calculation used for finding the magnitude of the momentum of the two particles, and is calculated using the equations:

$$\theta_{\mu} = tan^{-1}(\sqrt{P_{\mu_x}^2 + P_{\mu_y}^2}/P_{\mu_z}) \tag{35}$$

$$\theta_{\pi} = tan^{-1}(\sqrt{P_{\pi_x}^2 + P_{\pi_y}^2}/P_{\pi_z}) \tag{36}$$

The angles are reported in units of °, and should run from 0° to 180°. In the case of Charged-Current Coherent Pion Production, the angle should never be larger than 90°.

The last two quantities that this analysis macro calculates are the two different types of four-momentum transfers specific to this interaction, which are  $Q^2$  and |t|. The  $Q^2$  corresponds to the four-momentum transfer from the neutrino and muon to the nucleus and pion, and is calculated using the equation:

$$Q^2 = |(P_{\nu_{\mu}} - P_{\mu})^2| \tag{37}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute  $Q^2$ :

$$Q^{2} = |(P_{\nu_{\mu,x}} - P_{\mu_{x}})^{2} + (P_{\nu_{\mu,y}} - P_{\mu_{y}})^{2} + (P_{\nu_{\mu,z}} - P_{\mu_{z}})^{2} + (P_{\nu_{\mu,E}} - P_{\mu_{E}})^{2}|$$
(38)

 $Q^2$  is reported in units of  $(MeV/c)^2$ .

The |t| corresponds to the four-momentum transfer from the neutrino, muon, and pion to the nucleus, and is calculated using the equation:

$$|t| = |(Q - P_{\pi})^{2}| = |(P_{\nu_{\mu}} - P_{\mu} - P_{\pi})^{2}| \tag{39}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute |t|:

$$|t| = |(P_{\nu_{\mu,x}} - P_{\mu_x} - P_{\pi_x})^2 + (P_{\nu_{\mu,y}} - P_{\mu_y} - P_{\pi_y})^2 + (P_{\nu_{\mu,z}} - P_{\mu_z} - P_{\pi_z})^2 + (P_{\nu_{\mu,E}} - P_{\mu_E} - P_{\pi_E})^2|$$
(40)

|t| is reported in units of  $(MeV/c)^2$ .

### A.11 NewANMBergerSehgal.C

This file is the macro that corresponds to the "NewANMBergerSehgal.h" file, which connects with this file: "SciBooNE\_numubar\_coh\_RooTrack\_NEW.root". This file performs the main analysis for this generated sample, and then organizes the information into many different histograms. The histograms are then written to a file titled "totalmuoninfoBSBar.root" inside the "ROOTFILES" directory. The "ROOTFILES" directory is included in the SciBooNE-MC repository (it is absolutely pertinent that this directory be located where the macro files are located due to how the calls of the combined data macros reference the now saved histograms).

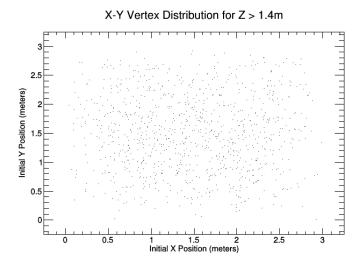


Figure 58: New  $\bar{\nu}$ -Mode Berger-Sehgal X-Y vertex distributions for muons that made it to the MRD and penetrated at least to the third layer of steel.

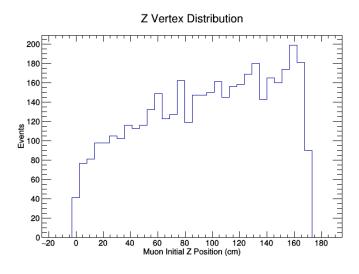


Figure 59: New  $\bar{\nu}$ -Mode Berger-Sehgal Z vertex distributions for the interactions.

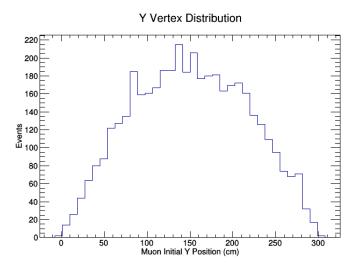


Figure 60: New  $\bar{\nu}$ -Mode Berger-Sehgal Y vertex distributions for the interactions.

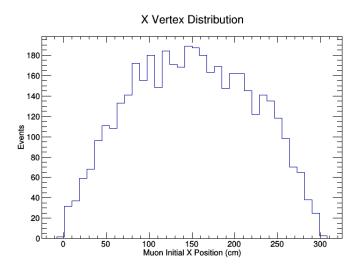


Figure 61: New  $\bar{\nu}$ -Mode Berger-Sehgal X vertex distributions for the interactions.

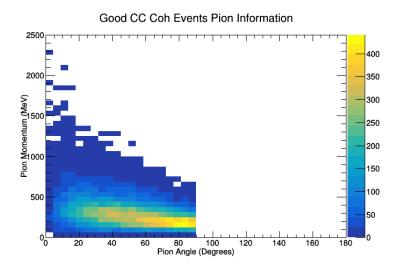


Figure 62: This is a 2D histogram for the momentum and angle of the pion in the CC Coh Pion events that met the qualification of being "good".

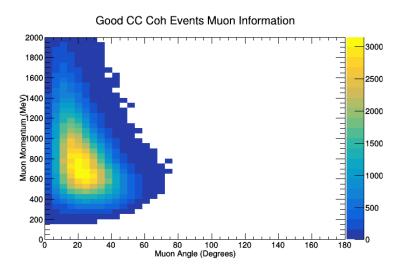


Figure 63: This is a 2D histogram for the momentum and angle of the muon in the CC Coh Pion events that met the qualification of being "good".

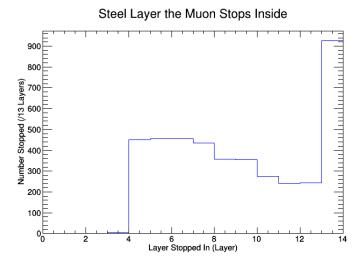


Figure 64: This histogram shows the amount of muons that embedded (or "Stopped") in a corresponding layer of steel in our simulation.

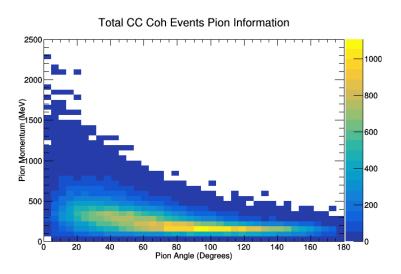


Figure 65: This is a 2D histogram for the momentum and angle of the pion in the total CC Coh Pion events.

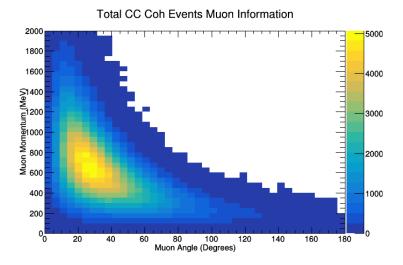


Figure 66: This is a 2D histogram for the momentum and angle of the muon in the total CC Coh Pion events.

The NewANMBergerSehgal.C macro also calculates many different quantities for the generated simulation of the events and saves the information in histograms that are later called upon through the plotting macros (which are after all of the analysis macros). The first quantity that is calculated for the different vertexes is the momentum of both the muon and the pion, which are both calculated using the equations:

$$|\vec{p}_{\mu}| = \sqrt{P_{\mu_x}^2 + P_{\mu_y}^2 + P_{\mu_z}^2} \tag{41}$$

$$|\vec{p}_{\pi}| = \sqrt{P_{\pi_x}^2 + P_{\pi_y}^2 + P_{\pi_z}^2} \tag{42}$$

The momentum is reported in units of MeV/c.

The next quantity that is calculated in the macro is the angle from the beam-direction for both the muon and the pion, which are labeled as either  $\theta_{\mu}$ , or  $\theta_{\pi}$ , respectively. The angle from the beam-direction is the same as the angle from the z-direction, and this angle is known as the azimuthal angle. The calculation of the azimuthal angle is slightly more involved than the simple calculation used for finding the magnitude of the momentum of the two particles, and is calculated using the equations:

$$\theta_{\mu} = tan^{-1}(\sqrt{P_{\mu_x}^2 + P_{\mu_y}^2}/P_{\mu_z}) \tag{43}$$

$$\theta_{\pi} = tan^{-1}(\sqrt{P_{\pi_x}^2 + P_{\pi_y}^2}/P_{\pi_z}) \tag{44}$$

The angles are reported in units of °, and should run from 0° to 180°. In the case of Charged-Current Coherent Pion Production, the angle should never be larger than 90°.

The last two quantities that this analysis macro calculates are the two different types of four-momentum transfers specific to this interaction, which are  $Q^2$  and |t|. The  $Q^2$  corresponds to the four-momentum transfer from the neutrino and muon to the nucleus and pion, and is calculated using the equation:

$$Q^2 = |(P_{\nu_{\mu}} - P_{\mu})^2| \tag{45}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute  $Q^2$ :

$$Q^{2} = |(P_{\nu_{\mu,x}} - P_{\mu_{x}})^{2} + (P_{\nu_{\mu,y}} - P_{\mu_{y}})^{2} + (P_{\nu_{\mu,z}} - P_{\mu_{z}})^{2} + (P_{\nu_{\mu,E}} - P_{\mu_{E}})^{2}|$$

$$(46)$$

 $Q^2$  is reported in units of  $(MeV/c)^2$ .

The |t| corresponds to the four-momentum transfer from the neutrino, muon, and pion to the nucleus, and is calculated using the equation:

$$|t| = |(Q - P_{\pi})^{2}| = |(P_{\nu_{\mu}} - P_{\mu} - P_{\pi})^{2}| \tag{47}$$

This equation is the four-momentum notational form. The code follows the equation below in order to compute |t|:

$$|t| = |(P_{\nu_{\mu,x}} - P_{\mu_x} - P_{\pi_x})^2 + (P_{\nu_{\mu,y}} - P_{\mu_y} - P_{\pi_y})^2 + (P_{\nu_{\mu,z}} - P_{\mu_z} - P_{\pi_z})^2 + (P_{\nu_{\mu,E}} - P_{\mu_E} - P_{\pi_E})^2|$$
(48)

|t| is reported in units of  $(MeV/c)^2$ .

### A.12 NMCombinedPlots.C

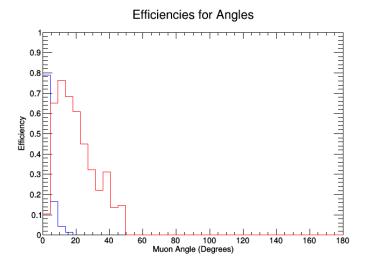


Figure 67:

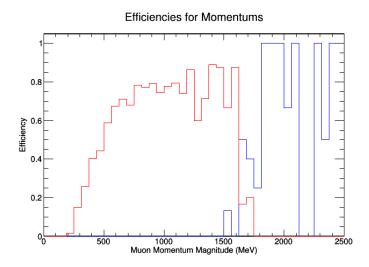


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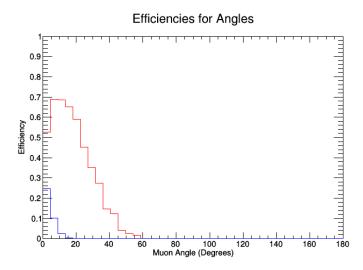


Figure 69:

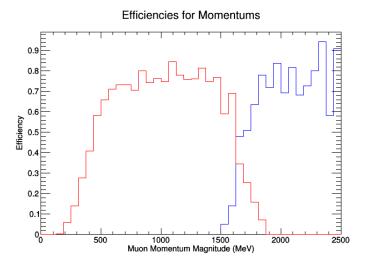


Figure 70:

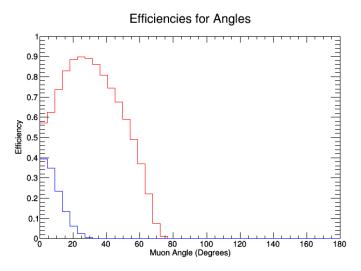


Figure 71:

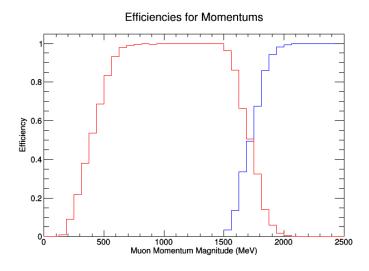


Figure 72:

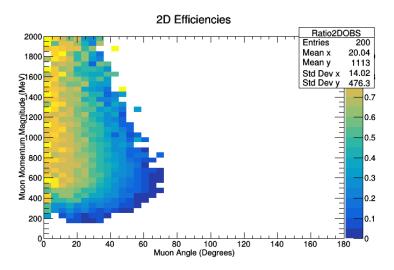


Figure 73:

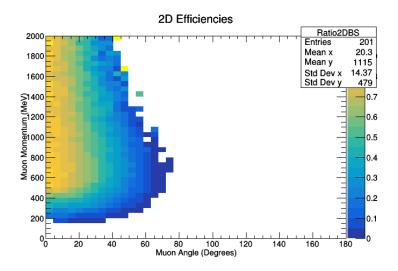


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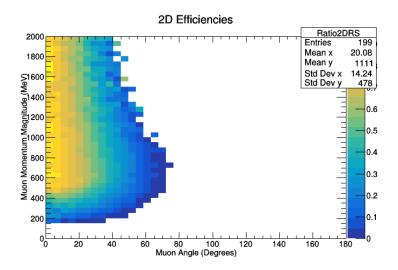


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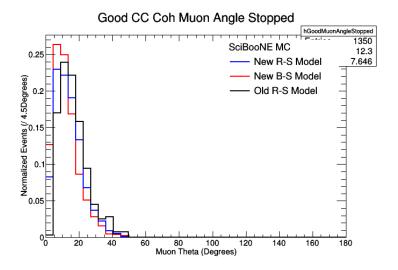


Figure 76:

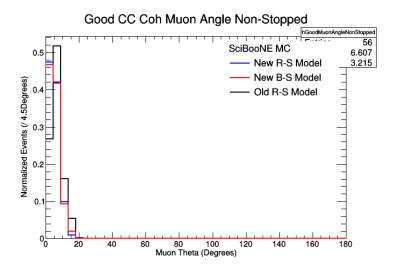


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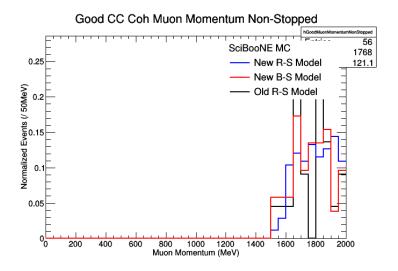


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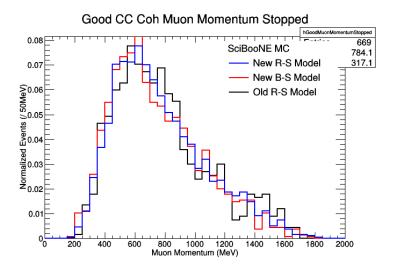


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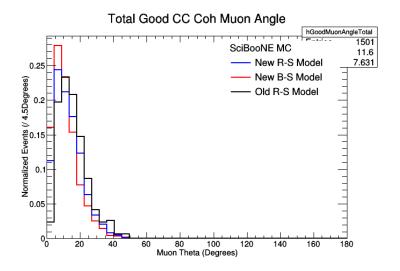


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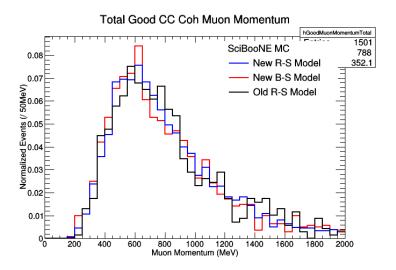


Figure 81:

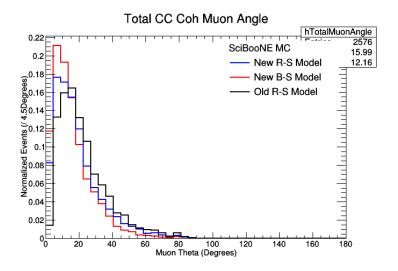


Figure 82:

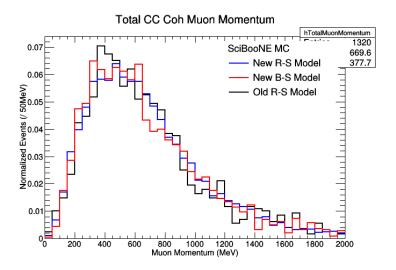


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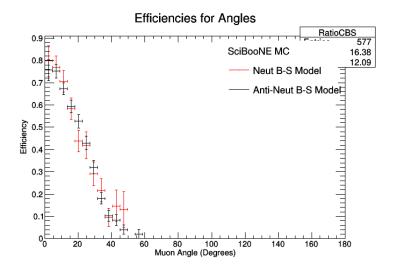


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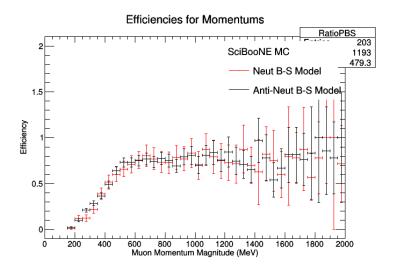


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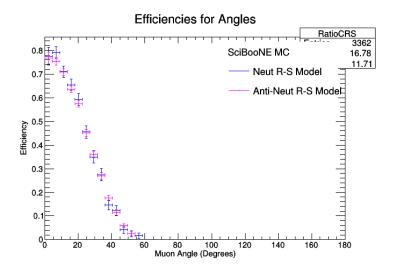


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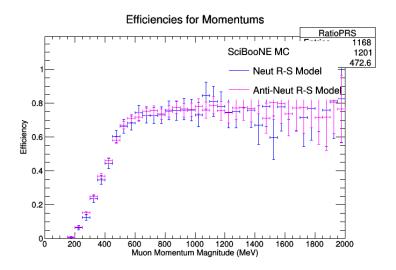


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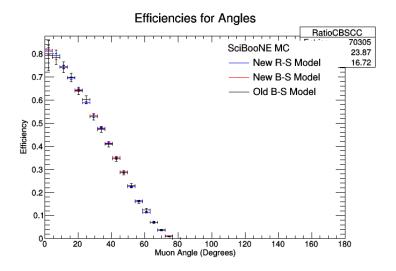


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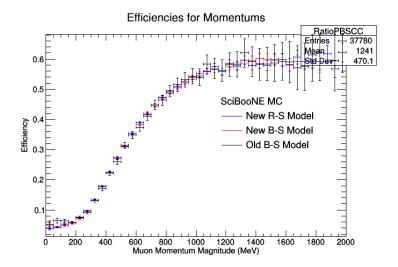


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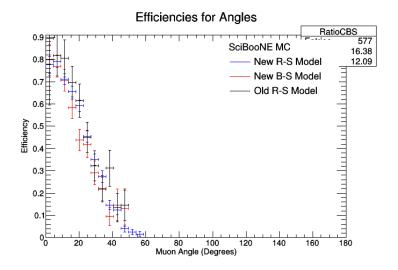


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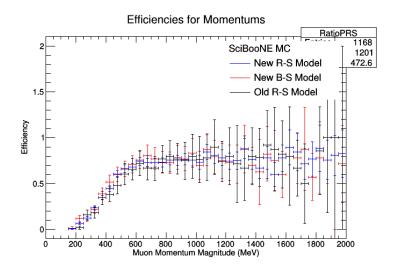


Figure 91:

# A.13 NMPionPlotting.C

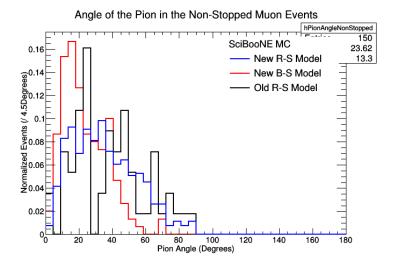


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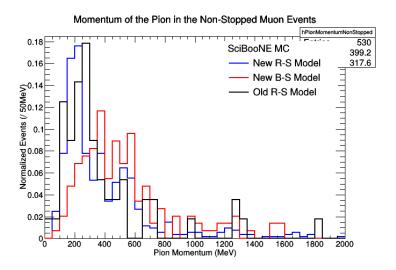


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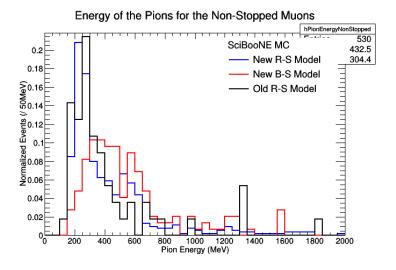


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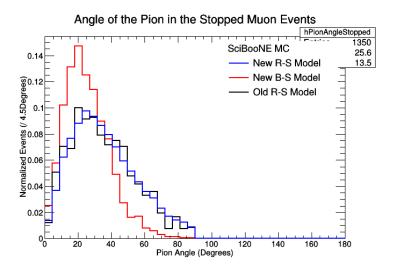


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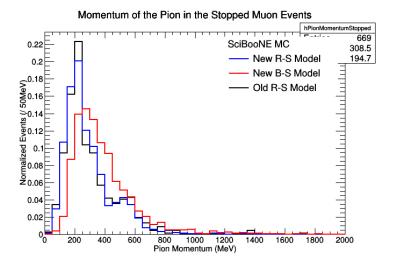


Figure 96:

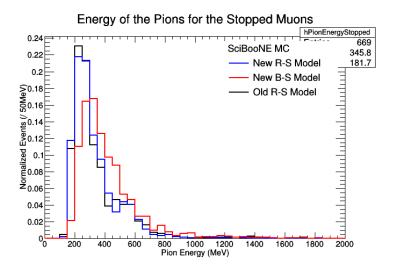


Figure 97:

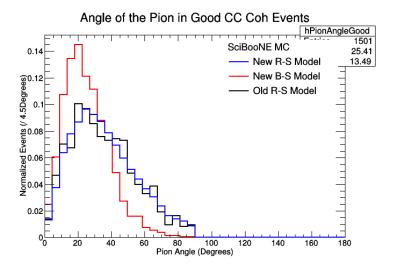


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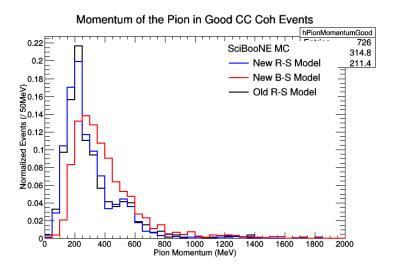


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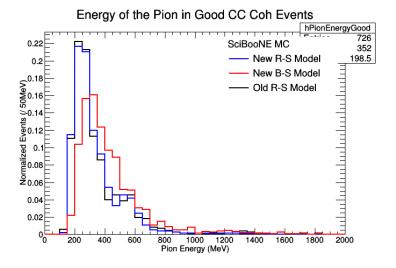


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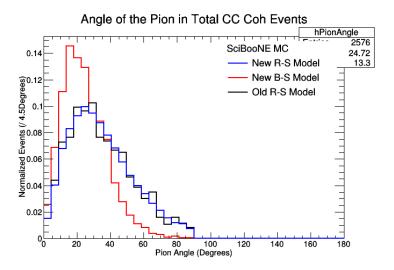


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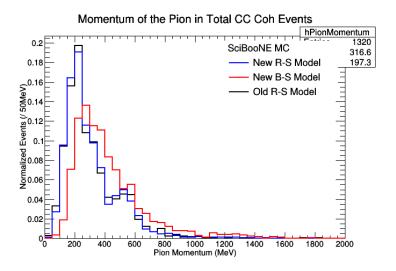


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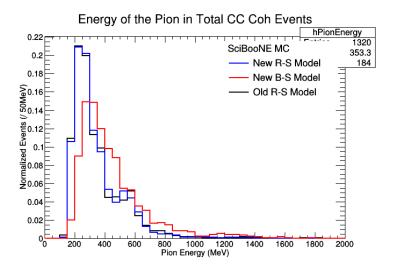


Figure 103:

# A.14 NMFourSquaredPlotting.C

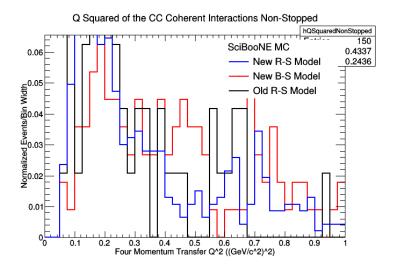


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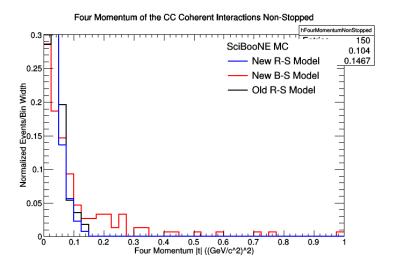


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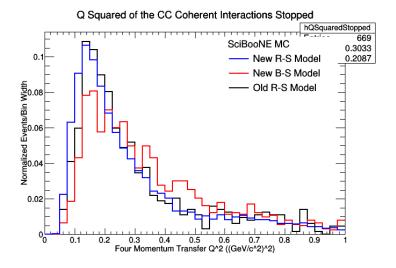


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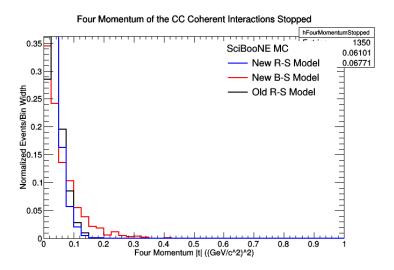


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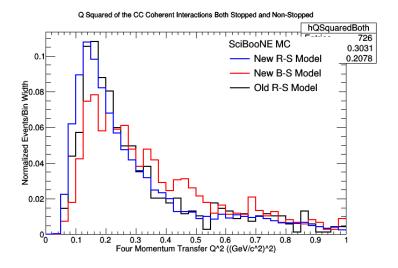


Figure 108:

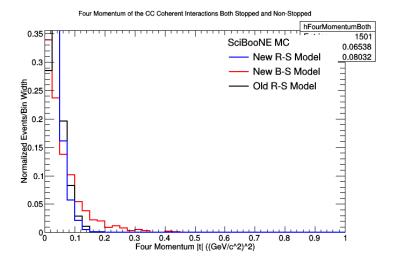


Figure 109:

# A.15 ANMCombinedPlots.C

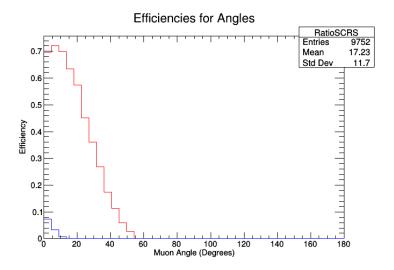


Figure 110:

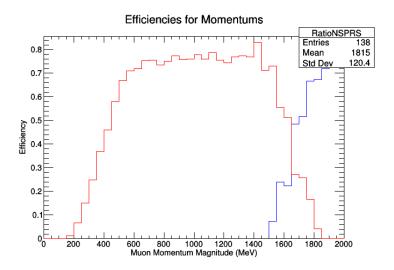


Figure 111:

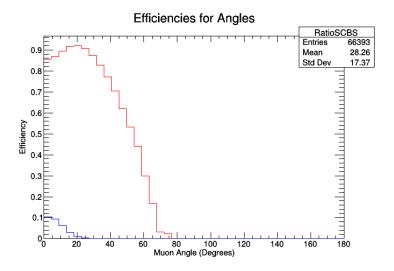


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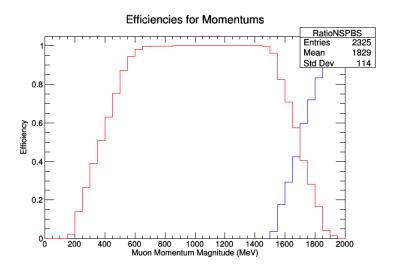


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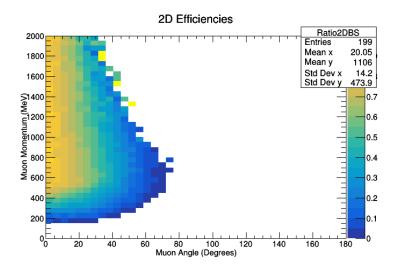


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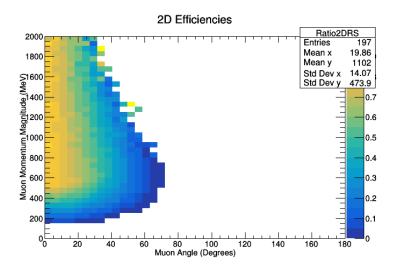


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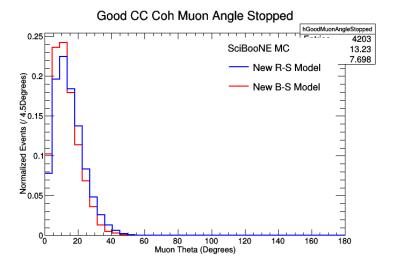


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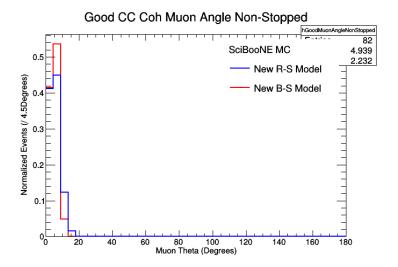


Figure 117:

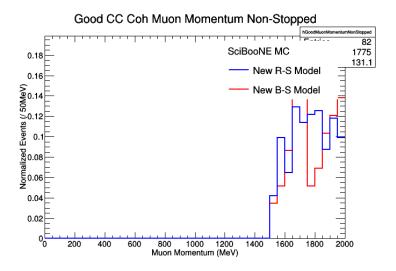


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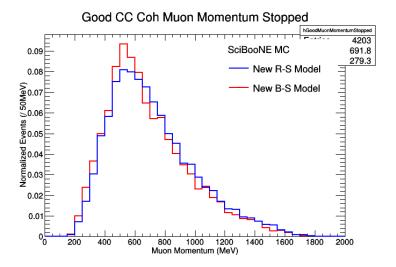


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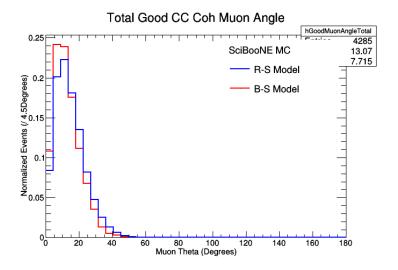


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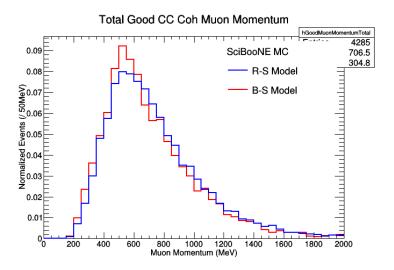


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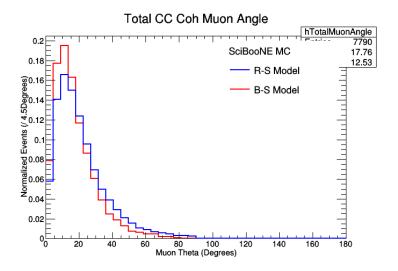


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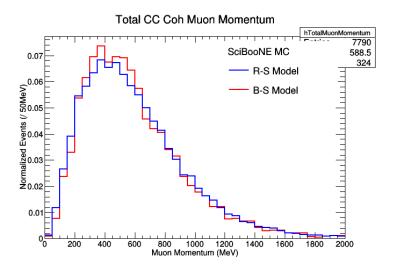


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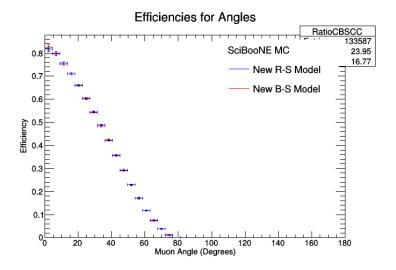


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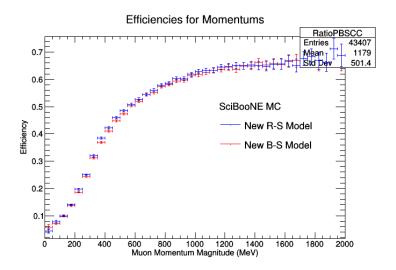


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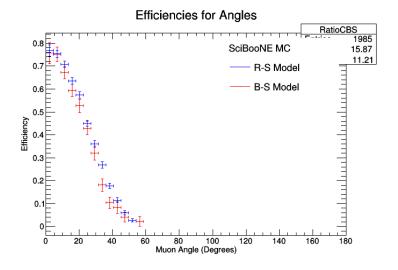


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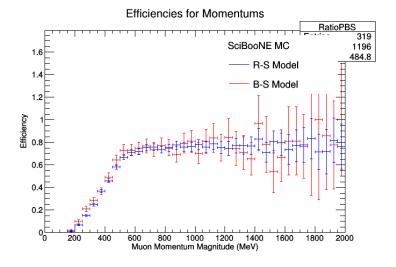


Figure 127:

# A.16 ANMPionPlotting.C

I need to come back and insert all of my images here.

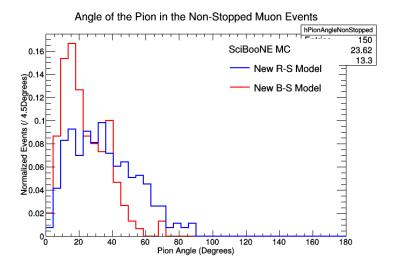


Figure 128:

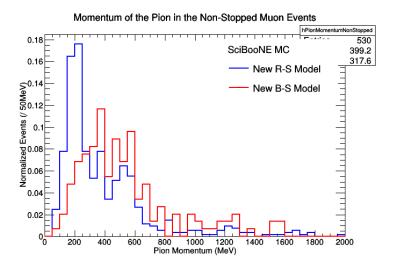


Figure 129:

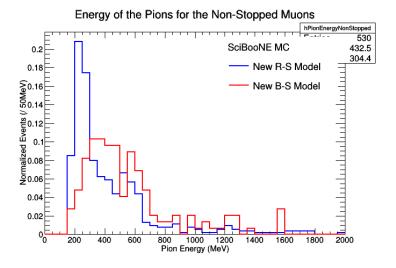


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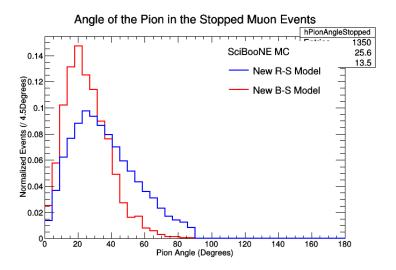


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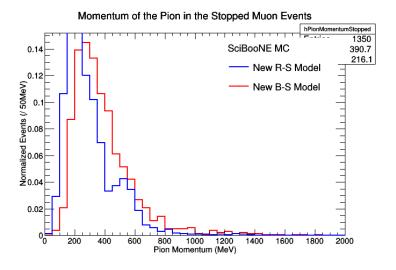


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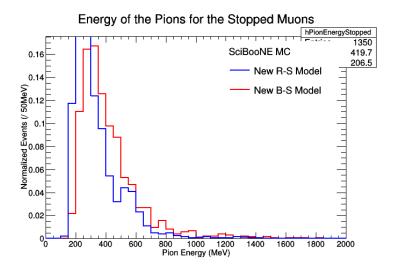


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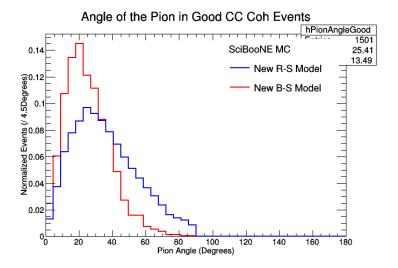


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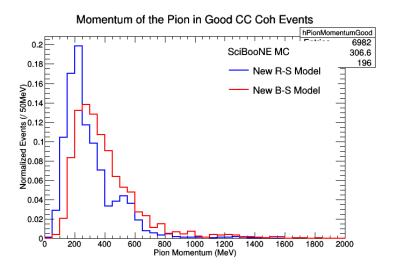


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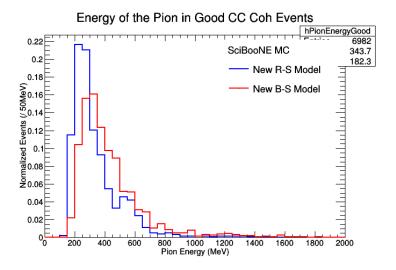


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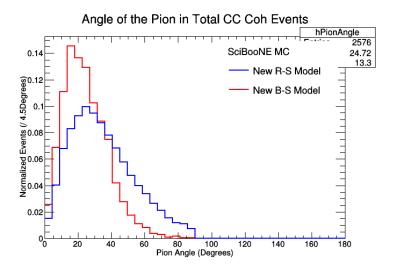


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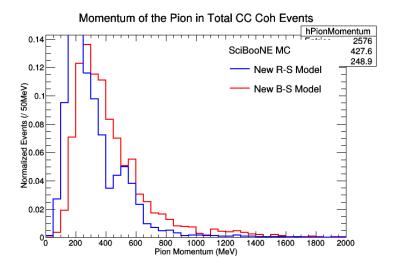


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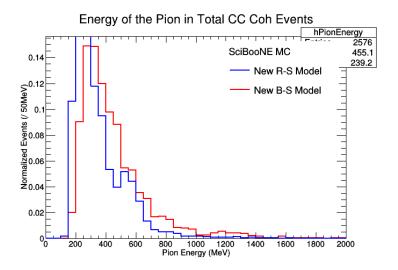


Figure 139:

### A.17 ANMFourSquaredPlotting.C

I need to come back and insert all of my images here.

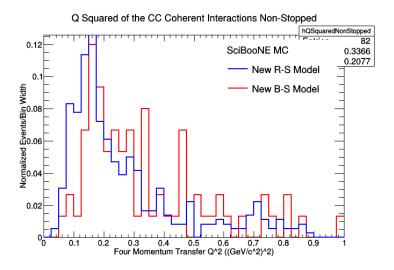


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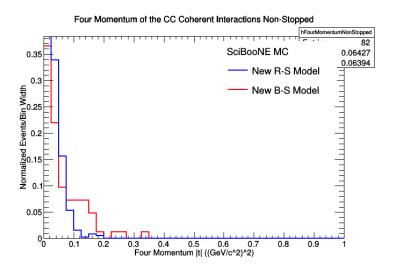


Figure 141:

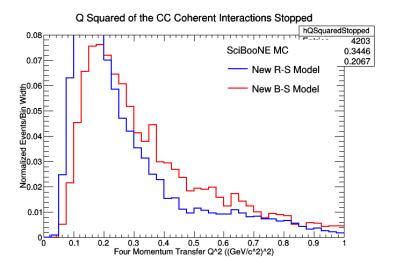


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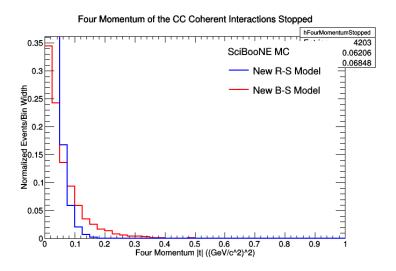


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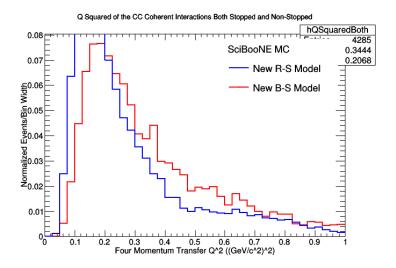


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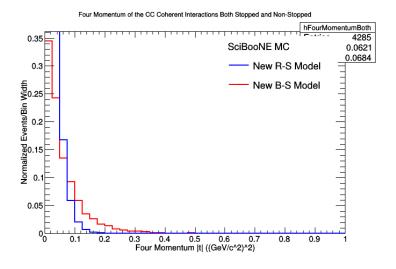


Figure 145:

## B Steps for Running the Code

The instructions on how to run the code and the order the files need to run in so that there are no resulting error messages, or other issues while running the code, are detailed in this section.

- Step 1: This is the first step. (Run the NewNM macros and the NewANM macros and the OldNM macro.)
- Step 2: This is the second step. (Run the combined plotting macros.)
- Step 3: This is the third step. (Run the Pion Plotting macros.)
- Step 4: Etc. (Run the FourSquaredMomentum macros.)

### C Closing Remarks and Cautions

These are just a few cautionary suggestions for potential issues that might be encountered while trying to use this code. This will also be where and further closing remarks can be made.

### D Acknowledgements

Thank everyone who helped, and thank everyone who gave their inputs into your acceptance study. YOU NEED TO GIVE A HUGE AND SPECIAL THANKS TO DR. ASAADI RIGHT HERE! (He has been suuuuuuuper patient...)

#### E Figures and Tables

#### E.1 List of Figures

There will eventually be a huge list of figures here.

#### E.2 List of Tables

There will eventually be the event reduction tables and 2D histogram tables here.

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	739-1809 180	7793 0.8 77494 0.7	_	-		0.416667 0.4			1						0								= 0	-						= 1	= 0	-		
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	1600-1650	-	0.704835	-	-			0.1272									0						= 0							= 1	= 0			
	1539-1600	0.0	52552	0 0		=		0.191489									0			0	_		= 0							= :	= 0			
	1300 1350	1	0.727468	3664	9911120	_	_	0.486556															= 0							= 1	= 0			
	1450-1500	215622.0	0.7169-46	0.585284	0.497836	0.384615	0.335191	8.25	0.0350	10						П		В			_		= 0					В		= 1	= 0			
gal	1400-1-50	98620	0.72093	92820	0.500901	0.488953		0.261194	1 1 3 47					В		В							= 0			В					= 0			
éhi	1330-14III	82248	721683	1961190	1566828	389868	307116	1182432			_	_	_	_	_	_	_	_	_	_	_	_			_	_	_	_	_				_	_
l-Kem-Sehga	1310 1350	811321	735724	20d138	589935	785387	371868	283609	1012101	7						_					_						_							_
Æ	230-1300 1	80128	_	_	168274	_	0 Stut.	33333		0.1-2837											_		= 0		-	_	_	_		-	= 0			-
_	E	39.774 0.7		0 0	50962 07	0.463785 0.4			23027	-	95	0	0		0		0	0	0	0	_		= 0							= 1	= 0	0.0		
New NM		8302712 0.8 830275 0.7	-	_	_	_	36111 0.3	316279 0.293333	534	0.07070	0.1	0	0		0								= 0	-						= 1	= 0	-		
ew	Е	8875 0.76 80875 0.82		_	_	1481938 0.44						0	0				0			0	_	-	= =	-						= 1	= 0			
Z	ㄸ	-	_	-	_	Ť	9	18 0.52837	100	92	1970												= 0	-	-					= 1	= 0		-	
tor	1030-1100	12 0.852174 12 0.828974	-	0.0			_	1 0336748			129 83												= 0						-	= 1	= 0		-	
am	10001	0.803922	-	-		Ť	Ť	-	0.14523	=	15 0.4571429	_	0.13636		0		0						= 0							= 1	= 0			
<u>2</u>	920-1000	0.29823	_	0.656648	-	_	_	0362308	-	_	0.0814815	1 0.0465465										-	= 0							-	= 0			
Histogram	000 930	0.809981	0.763083	0.6236	_	_	0.439182	0.3775Ki	-			0.08-0.121	0.02-8902	_							_		= 0							= :	= 0		. =	
Ξ	850-900	0.83884	0.7840.08	2812490	0.58894	0.532462	0.455387	0.378892		017740				58.0							_		= 0							-	= 0		. =	_
7	800-850	9/2962'0	7067.0	0.661-496	0.601285	0.542536	0.465472	0.404237	0.252880	0.207	0.12807	0.074184	0.0347222	0.0131579	В						_		= 0				_			= 1	= 0		. =	
tor :	220-830	280	0.757746	0.6764	0.617109	0.5-6332	0.486242	0.416728	28370	0.153930	0.133188	0.0654045	0.046586	0.0121212		В										В					= 0			
ble 1	310-730	773438 828302	277896	67315	61255	1537204	21223	AZIBIB	2755	188606	133764	88-5225	0724638	0.0234114	00546541																			
Lac	02.0	846455	786013	20109	628604	535199		410602	_	_	12822	083686	0.44898 0	0.020135 0	_			_	_	_	_					_	_	_						
	39 029 001	84186 0.		681216	923967	57336	E 12	4 B	0 0	1812	-	_		0173-0	0		0	0	0	0	_		= 0				-			= 1	= 0			-
	9	8 0 219682*0		9 =			_			_	=	_	_	0.0121873 0.0			0				_		= 0	-			_			= 1	= 0	0.0		
able	320 320	816092 0.8 824047 0.7	787	200	931 0.6	629	263	27 83	1634 0 2	2696	9863 0.1	4586 0.0	EG06081 0.0				0			0	_		= 0		-					= 1	= 0			
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	400-450	0553846	-	0.49825	0.44342	038159	0.32288	027265	017770	0.12370	0.0810889	2 0.0418139	0.00645756								_		= 0							= 1	= 0			
	350-400	16296170	0.479167	0.4604152	0.356223	0.328982	0.260465	0.228974	010000		0.045331	0.0165922		В		В	В	В		В	_	-	= 0			В				-	= 0			
	310.350	202120	0.334426	0.330233	0.284783	0.240517	0.215553	0.167825	9819800	0.0355327	0.0248-49-4						В	В			_		= 0				_			= :	= 0		. =	
	250.310	0.248182	131	0.230374	0.20088	0.1-6399	0.138368	0.1043-0	0.0451908	0.0115123				В		В							= 0			В					= 0			
	200.230	125923	150948	13-613	1120614	0.0852575	0.047748	0037579	100241035		_	_	_	_	_	_	_	_	_	_	_	_				_	_	_						_
	150 200	123457	1289374 0269374	189682	_		7581900				_	_	_		_			_	_	_	_				_		_	_						_
	108-130 13	70	20	32	2	2	2				0	0	0				0	0	0	0		-	-	-						= 1	= 0	0.0		
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	a/Natv (E-0																																	
	New NM R.S. B.	0 Sag	Dog	Down or other transfer or othe	Dog B	1 Dog 1	1 Dog 1	Dog D	Down or other transfer or othe	(Day	Dog 0	Dog 0	Dog 0	B Zhor :	Dog B	B Zuci	Dog B	1 Deg B	Dog B	1 Deg 1	99-103.5 Day 0	103 5 108 Deg 0	19 5 117 Day 0	17.121.5 Dev	121 5 125 Day 0	126-1305 Day 0	To Deg.	95 Deg B	3514 Deg 0	Maries Deg	1000	127 5 4 67 Day 0	R2 1665 Dev II	185547 Deg 8
	NewN	0.45 Deg 45 9 Deg	9-135 Day	18.22.5 Do	225.27	27-31 5 Day	315.31	36-40 5 Dry	200.5	495.54	25,53	585-65	63.67.5	675.72	23.83	765.81	81.855	855.91	98.94	945.99 Deg	99-103	1855	119 21	117.12	121 5-1	126-13	1315.1	135-13	75 E	1	7	2 2	162.16	166.5.1

	550-300	7,54521	0.083030	CE200	0.555	0.20625	0.181818									_	_	_						_	_	_						
	1900-1950	201008	745763	-	_	1,285714	_	_																	Ī	_						
	0061028	734872 0.78105 0.	0.0338	-	Ť	929	299	_	_		= 0								_	_	0 0				_	_			0 0		0 0	
	1800-1850 185	0 0	201807	-	-	.402-439 0.3	-	Ť	-	-				-		-			-	-	-			-	_	_	-	- 1			-	0.0
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	0081-02/1 02/		0.6867	-	-			700001.0 71	-	-	= 0													-	_	_	-	= :				
	1700.1	0 0	0.70381		0.436081	_	0.28574		_							_			_	_				_	_	_		= :				
	1620-1730	1,720657	0.74740	11564017	0.4475	0.33333	0.214286	0.0388235	_	-															_	_	-					
	1600-163	0.77560	0.664251	0.538375	0.535354	0.3622-55	0.181818	_	2	-														_	_	_	-					
	1550,1600	1275742 171174	0.77.78.33	0.587135	6.5	0.416567	118@4F	0.0526316	0,333333																							
	1500-1530	0.793631	1708240	1590654	14840.8	1433735	0.2321-69	173	0.0714286					_	_	_	_	_	_	_			_	_	_	_		_		_		
	1-50-1500	-	6892		÷	3121	_	325	0.25								_	_	_	_					_	_						
gal	1 021100	-	25835	_	-	-	348624 0.	_	0.136364 0.	-	= 0								_	_	0 0	-			_	_			0 0		0 0	
ehg	1350 1400 140	0.0	0.728296	-	-	453169 0.4			0.166667 0.1	-	0.0				-	-	-	-	-	-	0.0			-	-	_	-				0 0	
Š	н	0 0		-	-	-		_	0.16	-						-				-	0 0			-	_	_	-				0 0	
g.	30 130 130	0.0	10.718861		Ť	26 0.431408	-	Ť	-	- E	= =		-		-	-			-	_		-	-	-	_	_	-	= :				
New NM-Berger-Sehgal	50 1230 1300	0 0	0.730,759		-	0.425456		÷	_	0.0909091															_	_		= :				
M-1	1200-1250	0.75427.0	7,000,00	0,615.16	0.535057	0.474730	130054	0.233918	0.1620114	0.0759231						-			-	-				_	_	_	-	-				
$\Xi$	1130-1300	11820268	0.717308	162074	0.528678	0.444332	0.296117	0.214286	_	_	0.000000													_	_	_	-					
eW	1050 1100 1100 1130	0.813725 0.804494	0.7878	0.6-0.326	022223	0.475631	1325411	0.272981	0.180723	0.0869265	0.0344828																					
Ž	1020-1100	182-49-45	90770	0.633392	05717780	0.490654	032232	0.26-576	0212820	0.133838	tingating	-	James 1												_	_						
for 1	0201 9000	228-081	2000	653155	571275	2012	345320	29.294	236700			CONTRACTOR														_						
Ш	0.0192	-	70384	134515	822005	218223	368859	313023 0	202332	151202		100000				_	_	_	_	_				_	-	-						
12: Table for 2D Histogram	26 026 00	0 0	70008 0.	0	57BS0 0.3	0 1	13620-12	_	_	- 1	00,000	-			-	-	_	_	_	_				_	_	_	-					
sto	F	822223 725448 U.S.	20 900	_	2	521099 0.5	-	Ť	÷	120744 0.1	-	_			-	-			-	-	0 0		-	-	-	-	-				0 0	
Hi	820.900	0 0	0 0		0	-	0 0	0	=						-	0			_	_			-	_	_	_	-	= 1				
$\Omega$	0.8008	22	87 0,75235 07 0,71027	-	÷	_	64 139652	÷	-	58 0.161453				- 0	-						-						-	-			-	
i,	220 800	0 0	0.78087	6 6	<u>-</u>	0.55257		=	<u>-</u>	0.197558	5 0	i c	ic	23820 0 03											_	_	-	- 1				
e fc	700.730	0.814286	0.782736	0.089404	0.637363	0.551891	0.403834	0.330302	0.358858	0.204505	0.120182	0.00000	0.000000	-										_	_	_	-	- 1				
gpl	002-029	0.801402	0.794269	0.677215	0.615.445	0.054788	0.425045	782545.0	0.359272	0.19-403	0.130363	0.000000	0.005000	DIRECTED IN					_	_												
Ë	000-000	1880435	1801724	1687027	1620688	1564264	1419254	13-22-23	1261486	12020	20210	none/on	0.0195672	- Constant		_	_	_	_	_			_	_	_	_				_		
12:	009 025	-	78254	02331	÷	25-4516	-	÷	÷	18724	_						_	_	_	_					_	_						
ble	020 030	-	78689	0 2020	0,58865	.06522	366159	_	_	-	U.Habasa	0 0	1.						_	_	0.0				_	_	-				0 0	
Lab	Ė	-		-	-			~	_		_	_	-	-		-							-	-	_	_	-	-			-	
Г	100	1,728.77	0,500.00	0.582547	0.521715	0.405.40	0.327-0	0.222-053	0.21234	0.1-18533	_	-													_	_	-					
	400-50	0.615385	0.5725	0.517113	0.45548	0.355361	0.275212	0.22483	0.181.67	0.135334	0.081000	0.000000	0.007000												_	_						
	330-400	0.45264	0.462343	0.415013	0.381265	0212166	023358	8022610	0.141328	0.0978814	0.00000000	one man													_	_		_				
	300-350	20222	202263	318462	221873	29	170164	129627	0.40285	0.0531873	- 5															_						
	300	0 0	0 0			-	5 6	-	Ť		= 0								_	_	0.0		-		-	_	-	= 1			0 0	
	250-310	-	0.22322	_	_		0.081796	_	_	0.011.021						-	-		-	-	0 0			-	_	_	-	-			0 0	
	300.250	0.157895 0.176471	013676	0.0973451	0.0930736	0.0857143		0.0139147	0.00251467		= 0													_	_	_		- 1				
	150.300	0.0625	50007	0.020004	0.0354035	0.00485618	1000000	_	_							_	_	_	_	_				_	_	_				_		
	021-001				_			_	_							_	_	_	_	_				_	_	_						
	00700							_	-																_	_		-				
	OLEO Mery is																															
	S-RIVINA	No.	9-135 Deg	8 22.5 Day	225-27 Dag	7-31.5 Day	10-30 Day	40.5-45 Dag	15-40-5 Dag	192 54 Day	04-08-0 LPg	None of the last	120 C 120 Day		765.81 Day	81-85.5 Day	825.00 Day	98-94.5 Day	945.09 Deg	99-103.5 Deg	103 5 108 Day	MZ Day	17.121.5 Day	-126 Day	126-130.5 Day	135 Day	20 0 Deg	Mary Part Control	100 Day	123 157.5 Day	162 Day	Tag Day
	New.	0.45 Day 4.59 Day	9-13	18 22	22.5	27.3	36.40	40.5	45.4	49.0	1000	- Constant	0.00	100	100	81.85	80.00	98.98	945	99.11	18.	119.5	171	121.5	135.1	130.2	9	7	1 1	100	197	100.5

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	1959 2000	18	.78333	1,000	0.33333	19	17	_		_	_		_		_				_	_	_				_	_	_			_		
	1990-1990		_	_		_	_	-		_	_	_	_	_					_	_	_	= 0			_	_					-	-
	Н						9.69			-		=	=	=	-	-	=		-	_		= 0				_		-		-	= =	
	1859 1999				14					-		=	=	=			-			_		= 0				_						
	1800-1850	0.857143	0.958333	0.625	0.615385	0373	7999810						_				. =					= 0										
	1750-1800	923077	820087	- Carrier	0.647059	333333	22222																									
	1708-1758 17		_				_				В	_		_	0.0	0.0	0 00					= 0	0.0				ш с	0.0		B 1	2 0	0.00
	н											=		=	_							= 0							-		= =	
	16301700											=		=								= 0										
	1638-1658	999999	0.563333	0.612245	144444	0.384615	0.35294	2	·? =											В	В	= 0			В	В						
	1550-1600	15 18	1914651	923846	97.0	7	23333	233333																								
	1588-1558 1		0.68889																_	_		= 0				_				-	= 0	
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ga	1400-1450	1872	78199°0	890	0568966	0.44444	77	1134	0.23.23.33			_		_						_	В	= 0				_						
Old NM-Rein-Sehgal	1358-1468	0.77.778 1 0.55 0.75 1 0.6 0.83333 0.80.700 0.815789 0.8 0.74559 0.861111 0.923077 0.825	78897	694444	413793	FLT81-1	1238195	7	27 27 28 29 20 20 20 20 20 20 20 20 20 20 20 20 20	_	_	_	_	_					_	_	_				_	_						
ų.	B-1358	72028	65059	70588	78947	99200	4994	144	12.5		_									_						_						
žei.	1300 13	11	292	288	2 2	857 0.4	837 18.5	925			_	=	_	=	_	_	_	_				= 0	0.0					0.0	-	0	= =	
I-I	Si 1230-	0.861	989	9.76	925	8517	1.348	1 38	3 0.25		0.333				-							= 0									00	
$\leq$	1398-12	1783	0.73104	0.7053	963346	0.40659	0.43636	0.2857	0.357148				=									= 0										
р	1158-1200	F 8	0.683544	62988970	88193	9.465116	0.376812	72227	0.28833																							
$\overline{0}$	00-1150	915789	25336	75557	33817	221008	84545	2878	0.207802	142857										_						_						
for (	1188 11	- <u></u>	1884	9889	1837		6069	98-2											-	_		= 0				_		-	-		= 0	
Table 13: Table for 2D Histogram fo	50 1050	0.77.778 77 0.80.7002	13 853	3890	200	14 1977			12121	18		=		=	-		-					= 0									= =	
raı	1000-1	9980	0.7472	0.706	1 05258	0531034	=		0.14651	2 0.0714285	E E											= 0				_						
8	950 100	0.70923	0.78087	0.75509	0.65405	0.49359		0.360825	0.257376	0.12903	0.35714	172		=								= 0										
list	900-920	1.792453	0.746988	0.78115	0.614213	0.513228	42	0.407407	0.29661	0.23636	В			_					В	В	В	= 0			В	В						
Ξ (	98.98	28.8809	863979	75365	593458	524887	474654	394237	259259	122807	6251511	0416667																				
$2\Gamma$	8.20 83	16861	14681	11656	1941	592437 0	<u> </u>		227423		0.176471.0			1111		0 0				_		= 0	0 0			_		0 0			= =	
ŌĽ	80 80	1877	200	212	3574 0.6	1861	ė	œ i			0.13253 0.1	2417	9992	3		0.0				_		= 0	0 0			_		0 0			= =	
e f	922	87 087	89	68	9 9 9	181	_	_		80	92 0.13	NS 007	988	=	-		-					= 0									= =	
gp	700-75	17/20	0.7325	9.95	0.6329	0.550781	_	-	0.256534				=	=	-							= 0										
Ë	659.70	1- sp	0.73477	0.7878	0.668224	0.544061	710191-0	0.424749	0.340557	0.220588	0.138728	0.03240	956900	0.02222						_		= 0				_						
33	00.630	557.43	813053		658291	522727	1540881	41195	1291545	212996	0.102991	0942408	75	910989																		
e 1	9 009	- 80	91213	5982	31818	1926	=	_	231003	18261	102011	378592	380922	9521					_	_				-	_	_	-					
abl	530	0.904782 0.9	22.0 250	200	20	192 0.35	227 174	25		970	100 95	1638	3523	20	_		=					= 0					-		-		= =	
Ë	500-3	999	0.765	200	0.60	0.530	0.455	837	2 2 2	0.170				=								= 0										
	58 588	0.608696	0.642857	0.630952	0.455969	0.466981	0.354407	0.296296	0.271875	0.133144	0.107463	0.0555556	0.0241379	0.003389KB								= 0										
	400-450	257148 A56667	625	22162	318797	390863	384230	282619	256228	618091	(620513	1897554	(H26338																			
	358 4m 4	470588	Ť	200031	-	296296	_		0.161077	0.0816327 0	_	0129032		_	0 0	0 0						= 0	0 0					0 0			0.0	
	H	-				_	-			-	_	2		=	0 0							= 0					-				= =	
	310.35	0.28571	-	0363854	-	910	_	_	5 0.15122	6 0.0636364	0.023622	=	=	=	-	= =	-					= 0	= =					= =	-			
	230 300	2 19	0.181818	0.290323		0.1375	20.0	0.133333	0.0869565	0.0108596		=		=								= 0										
	200-250	200	10769231	0.15	0.04	0.0615385	1957561	70.		_	_	_	_	_					_	_	_				_	_						
	158.20			8071788	29991500	0.0217391					Ī									_						_						
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	HAMRS	45 Deg	43.5 Deg	2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	22.5.27 Day	315 Day	S. B. Dag	405 Day	48.56 Lbg	5-54 Deg	54585 Dyg	No Section	201 S79-	2 72 Ling	40.00	855 Per	Sel De	945 Dec	5.90 Day	110 5 Drg	IR 5-108 Deg	118-112-5 Deg	117-121 5 Dev	121 5 126 Drg	9-130.5 Dt	130 5-135 Deg	135-139 5 Deg	141 148 5 Dev	3.5.453 De	133-157.5 Day	75 lb2 D.	166 5-171 Day
	6	14	3.	27.5	2 2	12.71	31	36	7 4	8	70	00	ŝ	29	P. I	9.5	06	8	94	99	18	11 2	1 2	12	123	22	21.5	1 1	: 1	2	2 2	e e

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	Н	.53891 .08852		1322523			0.0	0 0		В.	= 0		0 00			= 0				= 0		0 00	_	0 1	= 0	0 0		_		0.00	
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	H	0.78523	-	_		_	_				= 0					= 0				= 0				= 1	= 0						
	ш	2000 E	0.681818	-	125874	_					= 0					= 0				= 0				-	= 0						
	1650-1700	5334	0.628592	0.509091	134837	053333	2.				= 0			В		= 0				= 0				-	= 0						
	1600 1650	0.792-0-4	18/2/91	0.533875	0.346154	0.333333																									
	ΞĪ	38036	380237	157.581	1,41,2162	292593	299991		_	_				_	_			_	_				_	_				_			
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S-u	a	7836	-	_	467192 B45	_	29582 026			-	= 0	-				= 0	-			= 0	-		-	-	= 0	0 0	-	-	-		
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Ź	B 1200 E	0.79636	-	7682190	0.00000	_	_	0.233294	2		= 0				0	= 0			0	= 0	-		0	-	= 0			0			
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14: Table for 2D Histogram for New ANM-Rein-Sehgal		9346		0.62265	0.00382		0.315942	-	0.083333		= 0					= 0				= 0			_	-	= 0			_			
or ]	1000 1050 1050 1100	0.780172	0.69735	0.649693	15030	0.420697	0.358079	0234048	0.181818		= 0					= 0			_	= 0			_		= 0			_			
n f	100 103	0.808855		0.6463-6	0.48878	0.425238	0.34746	0.2519TB	0.125	0.157895	= 0					= 0				= 0					= 0						
ran	920 1000	0.79961	0.7051.78	0.656827	051303	0.439291	0.3661.36	021810	_	0.114286	= 0			В		= 0				= 0					= 0						
tog	026 006	0.816404	0.699029	0.649262	0509034	0.428421	037/224	0214834			1433333B	2				= 0				= 0					= 0						
His	850 900	0.802672	0.723165	0.652591	0.525933	0.463828	0.40734	0.246708	0.136364	0.105263				В		= 0			В	= 0					= 0						
D	E8 E8	883654	1627	1161/9	283536	76737	98889	233294	0.173556	0.121076	0.195	7							_				_					_			
r 2	П	8314	736591	578973	50H67	72237	3,403238	252766	138963	13664	A-62//80	7		_					_			_	_	_				_			
of (	$\rightarrow$	207477 207477	2938	675302	238364	9238	1923	280552	182301			2286820							_												
pld	H	81736	29162	685785	200000	46000	753897	2333	2960	1380-6		982-1200							_				_					_			
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4		1800012 1800012 178460		-	566528 05	=	6 6	25/11/2 11/2	_	0 1	1081/281	_	_			= 0				= 0	-			-	= 0	0 0					
ble 1	H		_	0 1	5 0	_	= 0	-	_	-	_	M515464 0.01	_			= 0	-			= 0	-		-	= 1	= 0	0 0		-		-	
ab	H	1 0.822749	-	_		-	_	-	÷	-	= 0	0 0				= 0	-			= 0	-			= 1	= 0						
Г	E E	0.722011	0.642998	0.578125	0.00183	0.394628	0.333169	0.202046	Ť	-	0.0526316					= 0				= 0					= 0						
	400-420	0.511915	0529018	0.500719	0.28534	13-42622	0294831	0.17744	0.127891	0.08K3-221	1449944					= 0			_	= 0			_	-				_			
	330-400	52264	1.627	8002	318672	1292653	22232	13113	0.103003	16537772	1820202	To the latest of		_	_				_				_					_			
	300-350	201406	372408	32415	237522	21821	768667	JR9-64		8170428	SIM MISS								_				_								
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	New ANATES	45.9 Dy	135.48 Deg	18-22.5 Deg	27.31.5 Dec	315.36 Deg	36-40.5 Deg	6-46 Dec	195.54 Deg	14.38.5 Deg	CO CLU DEL	775 72 Dec	2 7 5 Deg	765-81 Deg	31-Ki 5 Deg	San He con	945.49 Dec	99-103 5 Day	103 5 108 Deg	10 5 117 Day	17 1215 Dev	21.5 126 Day	126-1305 Day	20 2 12 Day	135-1395 DPg	44 1 49 E Day	45-130 Di	153-1575 Dag	157.5-162 Day	165 5 17 Day	17 175 Deg 175 1월 Deg
	لك					Ť	_	_	Ť		Ť	Ī					Ť		Ť	_		Ť	Ť	_	_	_		Ť	_	_	

	30.2000	821231	1663507	0.487179	0.482730	9833																							
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	н	0.815789	_	0.325641	_	0.136364	. =					= 1	- 0								= 0								
	1730-1800	762767.0	0.727488	0.573034	0.445783	0.380932	. =				= 1	= 1					= 1				= 0			==					_
	1708-1750	0.824074	0.698795	231915	0.443299	0.4						= :																	
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Ę		799588.0	0.714434	0.570148	0.493639	0.407609	1157895		В			= :									= 0								
gų	330 1400 1400 1450	1992	6902.0	0.403365	0.518738	0.401487	1.242424	0.285714				-									= 0								
$\tilde{\mathbf{v}}$	330-1400	813084	711163	624873	594687	30003	410236		1.7																				
ger	1338	200003	720774	286433	548585	7447	-	-	_	_					_														_
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	1030-1100	0.840432	0.73664	2501590	0.583187	0.5	13564	0.283262	0.195632	0.130435	0.0769231	= :									= 0			==					
tor	000-1050	818653	718873	1989	569439	301982 485068	20084	257162	229299	145455																			
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☱	ΙĖΙ	50 F	円	5 19	59	17 9	-	F	222	148	20																		
grar	0.950 930	32208 0.80 304378 0.23	73200 0.7E	34716 0.55		0 0		_	_	<u> </u>	140254 0.285714	9	0 0			0					= 0			= =		-	 0	- 0	-
stograr	900-920	0.83208	0.732009	0.700111	0.578702 0	0.508479	0.372638	0.3159.08	0.213368 0	8-60Er0	0.149254	0.77				0													
Histogram	859 900 909 950	802280 22080	0.782567 0.732009	0.686 0.4010	0.578702		0.372638	0.3159.08	0.213368 0	0.20252 0.1309-6 (	0.15044 0.1-0254		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				0	- 0		0							0		0 0
<u> </u>	800 850 850 900 900 950	802280 220280 82080	0.7686 0.782567 0.752009	0.700111	0.578702 0	0.508479	0.372638	0.3159.08	0.213368 0	0.18807 0.20252 0.1309-6	0.1-0.667 0.1150-44 0.1-0.254	1 11333/14	1002000	0 0 0		0 0 0										00	0 0		0 0
<u> </u>	750 800 800 850 850 900 900 950	0.85629.4 0.845438 0.855072 0.83208 0.812541 0.702568 0.781474 0.804378	0.78147 0.7686 0.78367 0.73200	0.537 0.53488 0.73645 0.700111	0.609545 0.603815 0.602548 0.578702 0	0.545725 0.588095 0.525974 0.58473 0.47021 0.440747 0.45739 0.446730	0.36731 0.398878 0.392036 0.372638	0.20774 0.311813 0.255835 0.315938	0.259352 0.254042 0.228395 0.213368 0	0.210306 0.188017 0.20252 0.130948 0	0.149296 0.14667 0.115044 0.149254	U.0854064 U.0555/14 U	0.0000000000000000000000000000000000000	0 0 0															
<u> </u>	720-800 800-850 850-900 900-950	802280 220280 82080	0.78147 0.7686 0.78367 0.73200	0.686 0.4010	0.609545 0.603815 0.602548 0.578702 0	0.508479	0.36731 0.398878 0.392036 0.372638	0.20774 0.311813 0.255835 0.315938	0.259352 0.254042 0.228395 0.213368 0	0.210306 0.188017 0.20252 0.130948 0	0.12426 0.149296 0.144667 0.115044 0.142254	U.M.46372 U.MSJUBA U.USSS714 U	1002000	-															
<u> </u>	70.750 720.800 800.850 850.900 900.950	0.85629.4 0.845438 0.855072 0.83208 0.812541 0.702568 0.781474 0.804378	0.77378 0.781473 0.76586 0.78267 0.752008	0.537 0.53488 0.73645 0.700111	0.609545 0.603815 0.602548 0.578702 0	0.545725 0.588095 0.525974 0.58473 0.47021 0.440747 0.45739 0.446730	0.40723 0.4673 0.4683 0.4683 0.4283	0.27721 0.20774 0.311813 0.25835 0.315938	0.267346 0.259352 0.254042 0.228395 0.213368 0	0.176355 0.200306 0.188017 0.202572 0.130948 0	0.12426 0.149296 0.144667 0.115044 0.142254	0.2646372 0.2854064 0.055574 0	0.0000000000000000000000000000000000000																
Table for 2D	650.700   710.750   750.800   800.850   850.900   900.950	0.82707 0.86524 0.8458 0.85572 0.859.8 0.8361 0.8254 0.7258 0.743 0.8933	0.77378 0.781475 0.7686 0.762567 0.722000	0.555-55 0.537 0.534-58 0.5355 0.500.0 0.85669 0.573-64 0.5356 0.586 0.586	0.404(35 0.409545 0.6(3815 0.6(2548 0.5787)2 0	0.539545 0.545725 0.58805 0.525974 0.568473	0.40723 0.4673 0.4683 0.4683 0.4283	0.27721 0.20774 0.311813 0.25835 0.315938	0.367346 0.25932 0.254042 0.228395 0.213368 0	0.20367 0.17635 0.20306 0.188017 0.202572 0.130948 0	0.146563 0.12426 0.146296 0.14667 0.115044 0.146254	0.080987 0.0846872 0.0854084 0.0855744 0	0.0050.004 0.0057.0047 0.0050.005 0.0055.004	0 2399300															
Table for 2D	600.650   650.700   710.750   750.810   800.850   850.900   900.950	808388   124962   125088   125089   125088   126	0.774114 0.78382 0.77378 0.781475 0.7586 0.792507 0.722008	0.58371 0.5858 0.5568 0.537 0.5368 0.5810 0.58171 0.58572 0.85689 0.57384 0.5556 0.586	0.62878 0.62953 0.80405 0.809545 0.603815 0.602548 0.578712 0	0.500.07 0.500.20 0.509.55 0.557.55 0.500.05 0.539.74 0.500.43 0.500.00 0.400.87 0.400.01 0.400.70 0.400.70 0.400.70	0.418747 0.422946 0.407023 0.306731 0.30887 0.302036 0.325638	0.35745 0.34608 0.37521 0.30774 0.31813 0.25835 0.315938	0.23265 0.27491 0.267346 0.259352 0.254042 0.228395 0.213368 0	0.189664 0.202367 0.176355 0.200306 0.188017 0.202572 0.130948 0	0.14569 0.14558 0.12428 0.146296 0.14667 0.15044 0.146254	0.008.65 0.008.0357 0.004.057.0 0.005.044 0.00557.44 0	DESCRIPTION DESCRI	0 239900															
15: Table for 2D	350-010   600-650   650-710   710-750   720-810   800-850   850-910   900-950	0.79576 0.89484 0.84907 0.82797 0.86524 0.86488 0.85502 0.82808	0.78837 0.774114 0.78382 0.77578 0.78147 0.7686 0.72567 0.72608	0.7096 0.7455 0.74656 0.75046 0.757 0.75448 0.75045 0.700111	0.6-6331 0.6-27-8 0.6-25-35 0.40-65 0.4055 0.60-68-15 0.50-78 0.5-27-12 0	0.5788 0.5087 0.5828 0.3956 0.5675 0.5806 0.5597 0.50043	0.4005 0.4057 0.42545 0.40723 0.3671 0.3687 0.3203 0.3263	031695 037045 03408 037021 030774 0311813 025958 031593	0.2363 0.2355 0.2749 0.35746 0.2932 0.25404 0.2835 0.21338 0	0.194822 0.189684 0.203367 0.175355 0.210306 0.188017 0.202572 0.130948 0	0.128324 0.14609 0.14563 0.12428 0.149286 0.14667 0.115044 0.140254	1986-512 1798-55 1798-55 1798-572 1798-1164 1798-574 1	0.004 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0 239300															
ble 15: Table for 2D	350-010   600-650   650-710   710-750   720-810   800-850   850-910   900-950	808388   124982   124983   124883   124	0.7817.4 0.78587 0.7240.4 0.78382 0.773778 0.781475 0.78586 0.78567 0.78200	0.72538 0.71795 0.74535 0.74886 0.537 0.537 0.5348 0.72813 0.55519 0.70815 0.508171 0.508573 0.28609 0.57344 0.5556 0.508 0.54715	0.600038 0.6-633 0.62878 0.628536 0.60055 0.609545 0.603815 0.62854 0.57872 0	0.51213.4 0.57881 0.50187 0.58283 0.58935 0.56725 0.58095 0.55974 0.504.73 0.48174 0.48174 0.48174 0.48174	0.353491 0.40037 0.418747 0.422945 0.401723 0.366731 0.36874 0.322638 0.322638	0.20015 0.20595 0.37745 0.34608 0.37721 0.2074 0.211813 0.20835 0.215938	0.229012 0.23659 0.23565 0.27490 0.357846 0.25952 0.254042 0.228355 0.213368 0	0.169149 0.194822 0.189664 0.20357 0.176355 0.210306 0.188017 0.202572 0.139948 0	0.126419 0.125324 0.146019 0.146358 0.12425 0.146266 0.14667 0.115044 0.146254 0.146254	12/19954 12/29	0.05.5090	0 2393000															
15: Table for 2D	300.530   350.600   600.650   650.700   700.750   720.800   800.850   850.900   900.650	0.79576 0.89484 0.84907 0.82797 0.86524 0.86488 0.85502 0.82808	0.7817.4 0.78587 0.7240.4 0.785362 0.773578 0.781475 0.78586 0.78567 0.782008	0.7096 0.7455 0.74656 0.75046 0.757 0.75448 0.75045 0.700111	0.000038 0.0-0331 0.0-278 0.0-253 0.00-035 0.009545 0.00835 0.0-0558 0.57870 0	0.5788 0.5087 0.5828 0.3956 0.5675 0.5806 0.5597 0.50043	0.555401 0.400137 0.48547 0.425945 0.40783 0.396731 0.59673 0.32698 0.32658	0.20015 0.20595 0.37745 0.34608 0.37721 0.2074 0.211813 0.20835 0.215938	0.229012 0.23659 0.23565 0.27490 0.357846 0.25952 0.254042 0.228355 0.213368 0	0.169149 0.194822 0.189664 0.203367 0.176355 0.20386 0.188017 0.202572 0.139948 0	0.129419 0.125324 0.146019 0.14635 0.12455 0.146256 0.14657 0.115044 0.146254	12/19954 12/29	0.004 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0 2393000															
ble 15: Table for 2D	450.500   500.550   550.000   600.650   650.700   700.750   720.800   800.850   850.000   900.650	208380 103830 103838 10	0.88138 0.781754 0.76837 0.778114 0.783302 0.778378 0.781475 0.78367 0.78367 0.782008	0.72538 0.71795 0.74535 0.74886 0.537 0.537 0.5348 0.72813 0.55519 0.70815 0.508171 0.508573 0.28609 0.57344 0.5556 0.508 0.54715	0.516755 0.500138 0.6453H 0.62678 0.62653K 0.4065 0.40954K 0.500815 0.60254K 0.528712 0	1 0512134 057386 056187 058288 058955 056725 058065 055974 058043 058130	0.35250 0.35340 0.40017 0.418347 0.42246 0.40723 0.9671 0.36870 0.30036 0.3268	127247 130815 13499 135745 13488 135721 135183 12588 13598	0.21244 0.229012 0.22659 0.22265 0.27449 0.25756 0.25952 0.254042 0.225355 0.213388 0	0.448848 0.169149 0.194822 0.18964 0.203367 0.20355 0.20306 0.188017 0.20252 0.13948 0	0.114256 0.124419 0.135324 0.14509 0.14555 0.12435 0.14256 0.14567 0.14554 0.145254	1509-2662 117-159-31 1138-3372 1138-3372 1138-3164 1138-374 11	0.05.5090	0 2393000															
ble 15: Table for 2D	400-50   420-500   300-530   550-500   600-550   650-700   700-750   750-800   800-850   850-900   900-950	80380 67302 88500 15380 16380 68560 68560 68560 68560 68560 686000	0.5885 0.7815 0.7815 0.7815 0.7825 0.	0.58284 0.85834 0.72886 0.77835 0.74835 0.74888 0.73846 0.7377 0.58669 0.6737 0.5656 0.566 0.56716	0.54675 0.60038 0.64539 0.62878 0.62538 0.4055 0.409545 0.60815 0.60548 0.52872 0	0.4554 051234 05788 05687 05828 05858 05858 05852 05862 05897 05843 05843	0.35250 0.35340 0.40017 0.418347 0.42246 0.40723 0.9671 0.36870 0.30036 0.3268	127247 130815 13499 135745 13488 135721 135183 12588 13598	0.17693 0.21244 0.229012 0.23659 0.232955 0.27490 0.367346 0.559552 0.2540-20 0.228355 0.213388 0	0.118950 0.148848 0.169149 0.19482 0.18964 0.216367 0.176555 0.210306 0.18807 0.150946 0.18957	0.080655 0.004556 0.024419 0.035334 0.04509 0.04558 0.045286 0.046657 0.05044 0.04554	LANGERT LANGERS LAYERS LANGES LANGERS LANGERS LANGES LANGE	DESCRIPTOR DESCRIPTION OF THE PROPERTY DESCRIPTION DESCRIPTION OF THE PROPERTY	0 2393000															
ble 15: Table for 2D	331-40   400-60   420-50   300-53   550-80   600-60   650-70   700-750   720-80   800-850   850-90   900-650	4 0.40488 0.505161 0.70579 0.80561 0.70578 0.834484 0.84607 0.82631 0.8363 0.8360 0.83	0.48322 0.5835 0.88139 0.78154 0.78837 0.77414 0.78382 0.77557 0.78145 0.7886 0.7856 0.72507 0.72809		7 0.385731 0.44787 0.34675 0.546038 0.546331 0.54878 0.543535 0.540354 0.540354 0.540354 0.540354 0.540354 0.540354	1 0.52278 0.55777 0.4559.4 0.5123.4 0.5128.8 0.5958.7 0.588.8 0.589.5 0.56723 0.589.9 0.589.7 0.588.7 0.518.7	1.24525 128885 122524 1253801 1.4837 1.48294 1.48295 128621 128621 128621 128622 128687 128621 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 128622 128687 12862	1.17-48 1.2326 1.27747 1.301615 1.314995 1.37745 1.346188 1.37721 1.311813 1.23688 1.33598	0.12777 0.1763 0.21244 0.229012 0.23659 0.22555 0.27491 0.357346 0.59352 0.254042 0.23355 0.21358 0	0.100349 0.118930 0.148848 0.169140 0.194822 0.18064 0.203367 0.17535 0.20316 0.18007 0.20257 0.13040 0	0.02236 0.08065 0.10426 0.126119 0.125324 0.14636 0.14626 0.14626 0.14625	1509-2562 117-159-31 117-25-3 117-25-3 117-25-3 117-3-3 117-3-3 117-3-	DESCRIPTOR DESCRIPTION OF THE PROPERTY DESCRIPTION DESCRIPTION OF THE PROPERTY	0 2393000															
ble 15: Table for 2D	300.350   330.400   400.450   430.500   300.530   550.000   500.650   550.700   700.750   750.800   800.850   850.000   900.650	0.8218.0 1.05.00 0.50.00 0.05.	0.5530.2 0.48032.2 0.50355 0.83139 0.78154 0.75837 0.774114 0.78352 0.73378 0.78145 0.7586 0.7269 0.72500	13,000   14,000   14,000   17,000   16,000   17,000   1	0.312G7   0.385731   0.445737   0.51675   0.500138   0.046333   0.68353   0.68353   0.04635   0.04635   0.68353	CARGON   CANDER STATES   CANDER CANDER CANDER CANDER   CANDER C	1.00   1.00	0.3728 0.2326 0.2326 0.77147 0.90615 0.35714 0.34088 0.37721 0.30774 0.31813 0.25588	0.0025481 0.12777 0.17693 0.21244 0.229012 0.22663 0.22955 0.27449 0.267346 0.55952 0.254040 0.228355 0.213388 0	0.510817 0.10349 0.118939 0.148848 0.169149 0.194822 0.18964 0.20367 0.176355 0.20316 0.18017 0.1267 0.13940 0.	0.080655 0.004556 0.024419 0.035334 0.04509 0.04558 0.045286 0.046657 0.05044 0.04554	LANGERT LANGERS LAYERS LANGES LANGERS LANGERS LANGES LANGE	DESCRIPTOR DESCRIPTION OF THE PROPERTY DESCRIPTION DESCRIPTION OF THE PROPERTY	0 2393000															
ble 15: Table for 2D	229.300   300.350   321.400   400.400   420.500   420.500   500.530   550.000   500.650   550.700   770.750   770.300   800.850   850.900   900.850	2008   12   12   12   12   12   12   12   1	0.77107 0.35302 0.48322 0.5852 0.8853 0.75174 0.75857 0.774114 0.75322 0.77577 0.77415 0.75857 0.77509	- 1958-1 0 19925 0 1957 1 1955 0 1955 0 1955 0 1955 0 1958 1 1958 0 1958	0.4426 0.31267 0.35731 0.4487 0.3675 0.3675 0.50038 0.54331 0.5428 0.5258 0.00403 0.00403 0.50038 0.5258 0.5770	185109 0.45534 0.55208 0.55777 0.45534 0.551314 0.55288 0.566387 0.55288 0.55384 0.55387 0.55387 0.55397 0.55397 0.45539 0.55387 0.45539 0.55387 0.553	0.05557 0.05676 0.254225 0.25558 0.257559 0.540010 0.400020 0.40000 0.	48.88.2 1.37.28 1.72.48 1.22.20 1.27.947 1.33.89.5 1.37.14 1.33.77.1 1.23.77.1 1.33.77	0.12777 0.1763 0.21244 0.229012 0.23659 0.22555 0.27491 0.357346 0.59352 0.254042 0.23355 0.21358 0	0.510817 0.10349 0.118939 0.148848 0.169149 0.194822 0.18964 0.20367 0.176355 0.20316 0.18017 0.1267 0.13940 0.	0.02236 0.08065 0.10426 0.126119 0.125324 0.14636 0.14626 0.14626 0.14625	LANGERT LANGERS LAYERS LANGES LANGERS LANGERS LANGES LANGE	DESCRIPTOR DESCRIPTION OF THE PROPERTY DESCRIPTION DESCRIPTION OF THE PROPERTY	0 2393000															
ble 15: Table for 2D	300.350   330.400   400.450   430.500   300.530   550.000   500.650   550.700   700.750   750.800   800.850   850.000   900.650	0.4277   0.23126   0.42124   0.45126   0.45126   0.45127   0.45126   0.45127   0.451	0.23(0) 0.27(0) 0.23(0) 0.23(0) 0.23(0) 0.20(0)	1-478-4   1-47	0.10.03.34   0.20.426   0.20.467   0.385731   0.44787   0.34675   0.50.038   0.54533   0.54537   0.65838   0.63858   0.60858   0.60858   0.568888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.568	D.114-66   D.1551-69   D.155	0.05557 0.05676 0.254225 0.25558 0.257559 0.540010 0.400020 0.40000 0.	48.88.2 1.37.28 1.72.48 1.22.20 1.27.947 1.33.89.5 1.37.14 1.33.77.1 1.23.77.1 1.33.77	0.0025481 0.12777 0.17693 0.21244 0.229012 0.22663 0.22955 0.27449 0.267346 0.55952 0.254040 0.228355 0.213388 0	0.510817 0.10349 0.118939 0.148848 0.169149 0.194822 0.18964 0.20367 0.176355 0.20316 0.18017 0.1267 0.13940 0.	0.02236 0.08065 0.10426 0.126119 0.125324 0.14636 0.14626 0.14626 0.14625	LANGERT LANGERS LAYERS LANGES LANGERS LANGERS LANGES LANGE	DESCRIPTOR DESCRIPTION OF THE PROPERTY DESCRIPTION DESCRIPTION OF THE PROPERTY	0 2393000															
ble 15: Table for 2D	150-200   250-250   250-300   350-350   350-300   440-50   450-500   350-50   550-50	2008   12   12   12   12   12   12   12   1	0.23(0) 0.27(0) 0.23(0) 0.23(0) 0.23(0) 0.20(0)	- 1958-1 0 19925 0 1957 1 1955 0 1955 0 1955 0 1955 0 1958 1 1958 0 1958	0.10.03.34   0.20.426   0.20.467   0.385731   0.44787   0.34675   0.50.038   0.54533   0.54537   0.65838   0.63858   0.60858   0.60858   0.568888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.568	185109 0.45534 0.55208 0.55777 0.45534 0.551314 0.55288 0.566387 0.55288 0.55384 0.55387 0.55387 0.55397 0.55397 0.45397 0.55387 0.45397 0.55387 0.553	0.05557 0.05676 0.254225 0.25558 0.257559 0.540010 0.400020 0.40000 0.	48.88.2 1.37.28 1.72.48 1.22.20 1.27.947 1.33.89.5 1.37.14 1.33.77.1 1.23.77.1 1.33.77	0.0025481 0.12777 0.17693 0.21244 0.229012 0.22663 0.22955 0.27449 0.267346 0.55952 0.254040 0.228355 0.213388 0	0.510817 0.10349 0.118939 0.148848 0.169149 0.194822 0.18964 0.20367 0.176355 0.20316 0.18017 0.1267 0.13940 0.	0.02236 0.08065 0.10426 0.126119 0.125324 0.14636 0.14626 0.14626 0.14625	LANGERT LANGERS LAYERS LANGES LANGERS LANGERS LANGES LANGE	DESCRIPTOR DESCRIPTION OF THE PROPERTY DESCRIPTION DESCRIPTION OF THE PROPERTY	0 2393000															
ble 15: Table for 2D	1.00-150   130-200   2.00-230   2.50-300   3.00-350   3.00-300   4.00-50   4.50-500   3.00-330   5.00-300   5.00-350   6.00-350   6.00-350   7.00-350   7.00-350   8.00-850   8.00-850   9.00-850	0.4277   0.23126   0.42124   0.45126   0.45126   0.45127   0.45126   0.45127   0.451	0.23(0) 0.27(0) 0.23(0) 0.23(0) 0.23(0) 0.20(0)	1-478-4   1-47	0.10.03.34   0.20.426   0.20.467   0.385731   0.44787   0.34675   0.50.038   0.54533   0.54537   0.65838   0.63858   0.60858   0.60858   0.568888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.568	D.114-66   D.1551-69   D.155	0.05557 0.05676 0.254225 0.25558 0.257559 0.540010 0.400020 0.40000 0.	48.88.2 1.37.28 1.72.48 1.22.20 1.27.947 1.33.89.5 1.37.14 1.33.77.1 1.23.77.1 1.33.77	0.0025481 0.12777 0.17693 0.21244 0.229012 0.22663 0.22955 0.27449 0.267346 0.55952 0.254040 0.228355 0.213388 0	0.510817 0.10349 0.118939 0.148848 0.169149 0.194822 0.18964 0.20367 0.176355 0.20316 0.18017 0.1267 0.13940 0.	0.02236 0.08065 0.10426 0.126119 0.125324 0.14636 0.14626 0.14626 0.14625	LANGERT LANGERS LAYERS LANGES LANGERS LANGERS LANGES LANGE	DESCRIPTOR DESCRIPTION OF THE PROPERTY DESCRIPTION DESCRIPTION OF THE PROPERTY	0 2393000															
ble 15: Table for 2D	50-10   100-150   130-200   200-250   230-300   300-350   330-300   400-50   430-500   500-300   500-500   600-550   650-700   700-750   730-800   800-850   850-900   900-550	0.4277   0.23126   0.42124   0.45126   0.45126   0.45127   0.45126   0.45127   0.451	0.23(0) 0.27(0) 0.23(0) 0.23(0) 0.23(0) 0.20(0)	1-478-4   1-47	0.10.03.34   0.20.426   0.20.467   0.385731   0.44787   0.34675   0.50.038   0.54533   0.54537   0.65838   0.63858   0.60858   0.60858   0.568888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.568	D.114-66   D.1551-69   D.155	0.05557 0.05676 0.254225 0.25558 0.257559 0.540010 0.400020 0.40000 0.	48.88.2 1.37.28 1.72.48 1.22.20 1.27.947 1.33.89.5 1.37.14 1.33.77.1 1.23.77.1 1.33.77	0.0025481 0.12777 0.17693 0.21244 0.229012 0.22663 0.22955 0.27449 0.267346 0.55952 0.254040 0.228355 0.213388 0	0.510817 0.10349 0.118939 0.148848 0.169149 0.194822 0.18964 0.20367 0.176355 0.20316 0.18017 0.1267 0.13940 0.	0.02236 0.08065 0.10426 0.126119 0.125324 0.14636 0.14626 0.14626 0.14625	LANGERT LANGERS LAYERS LANGES LANGERS LANGERS LANGES LANGE	DESCRIPTOR DESCRIPTION OF THE PROPERTY DESCRIPTION DESCRIPTION OF THE PROPERTY	0 2393000															
ble 15: Table for 2D	0-50 AMY; C   51-10   101-150   150-200   201-20   201-20   301-350   330-400   401-60   430-500   300-530   50-500   401-60   50-500   50-500   701-750   730-800   801-850   850-900   901-60	0.4277   0.23126   0.42124   0.45126   0.45126   0.45127   0.45126   0.45127   0.451	0.23(0) 0.27(0) 0.23(0) 0.23(0) 0.23(0) 0.20(0)	1-478-4   1-47	0.10.03.34   0.20.426   0.20.467   0.385731   0.44787   0.34675   0.50.038   0.54533   0.54537   0.65838   0.63858   0.60858   0.60858   0.568888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.56888   0.568	D.114-66   D.1551-69   D.155	0.05557 0.05676 0.254225 0.25558 0.257559 0.540010 0.400020 0.40000 0.	48.88.2 1.37.28 1.72.48 1.22.20 1.27.947 1.33.89.5 1.37.14 1.33.77.1 1.23.77.1 1.33.77	0.0025481 0.12777 0.17693 0.21244 0.229012 0.22663 0.22955 0.27449 0.267346 0.55952 0.254040 0.228355 0.213388 0	0.510817 0.10349 0.118939 0.148848 0.169149 0.194822 0.18964 0.20367 0.176355 0.20316 0.18017 0.1267 0.13940 0.	0.02236 0.08065 0.10426 0.126119 0.125324 0.14636 0.14626 0.14626 0.14625	LANGERT LANGERS LAYERS LANGES LANGERS LANGERS LANGES LANGE	DESCRIPTOR DESCRIPTION OF THE PROPERTY DESCRIPTION DESCRIPTION OF THE PROPERTY	0 2393000															
ble 15: Table for 2D	TES   0.50 ANY/C   50.40   100.450   120.400   200.420   200.420   300.850   300.850   300.400.60   400.60   400.60   300.850   500.00   500.600   500.00   700.750   730.800   800.850   850.900   900.600	0.4277   0.23126   0.42124   0.45126   0.45126   0.45127   0.45126   0.45127   0.451	0 0 0 0.700033 0.130039 0.271067 0.55302 0.50052 0.50052 0.50052 0.75105 0.751054 0.75057 0.77114 0.75302 0.771578 0.751450 0.77050 0.770507 0.77000	1-478-4   1-47	0 0 0 0 0 0.09664 0.09428 0.09428 0.00428 0.00428 0.04287 0.0457 0.0507 0.0507 0.0507 0.0507 0.0507 0.0507 0.0042 0.0042 0.00954 0.00954 0.00954 0.000	D.114-66   D.1551-69   D.155	1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0.08593 0.085481 0.17777 0.1783 0.2244 0.25912 0.2565 0.2565 0.2574 0.2558 0.2593 0.2585 0.2598 0	2 0 0 0 0 0 0 0 0 0.013608 0.4510817 0.10349 0.18939 0.148848 0.15949 0.15922 0.158064 0.150367 0.17035 0.210306 0.18037 0.2033 0.15037 0.15037 0.15039 0	124524 014526 01524 014526 0154524 014500 014650 01	12/2/2/2 12/2/2 1	DESCRIPTOR DESCRIPTION OF THE PROPERTY DESCRIPTION DESCRIPTION OF THE PROPERTY	123333		8-85 50 50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	26 of 100 cm		20 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	20g 31g 20g 20g 20g 20g 20g 20g 20g 20g 20g 20		1000	250202020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	200 A 1970 DOI:	1.83:1382.Deg 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Management of the control of the con	133:475 por	250 291 291 291 291 291 291 291 291 291 291	100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0