Work Summary
&
Thesis Project

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PUCP

Work Summary

- G4NUMI FLUX MAP WITH NA49 CUTS
- MUON MONITOR 4
  - Installation and Readout:
    - HV
    - Helium Gas supply
    - Signal Readout
      - Hardware
      - Software (ACNET and DATABASE STORAGE & Display)
  - Horn current scan coordination

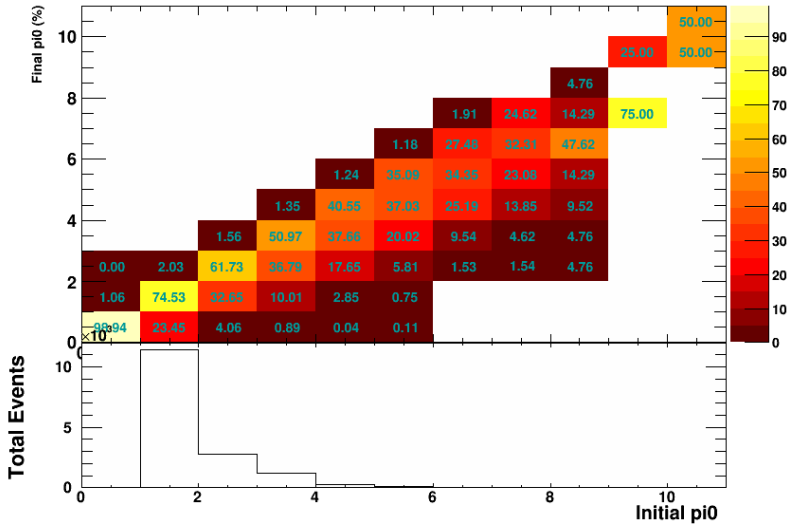
Thesis Project

- Probe the effects of varying intranuclear systematics on neutrino oscillation parameters of the PMNS matrix.
- For this I've used a fast MC developed for LBNE. Currently:
  - the results are for LAr, for the thesis they will be on Carbon, Lead and Iron.

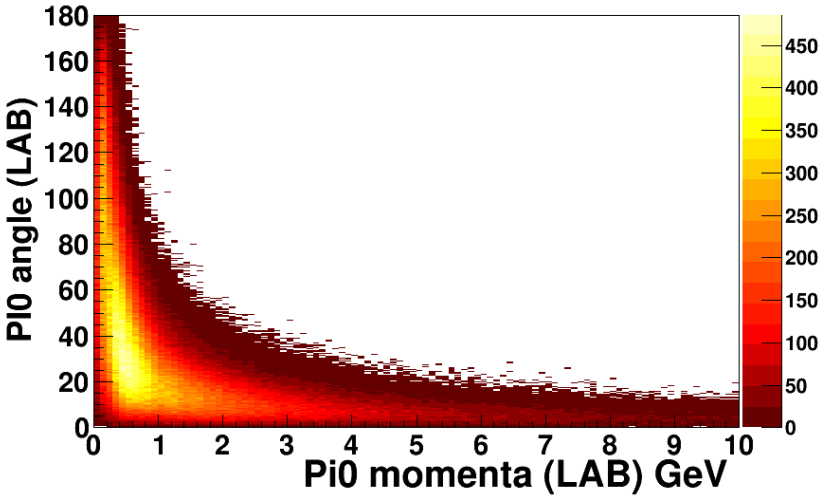
- The first systematic to study has been the MFP.
- NCπ^0 interaction can produce a signal similar to the ν_e CCQE signature and constitute a big background for ν_e appearance search.
- Therefore, study of what happens to π^0s after intranuclear rescatering is crucial to understand such variations in oscillation parameters when varying the MFP of pions.
- The events selected in this plots are reconstructed CCnue.

Nominal primary pi0

Production & Disappearance

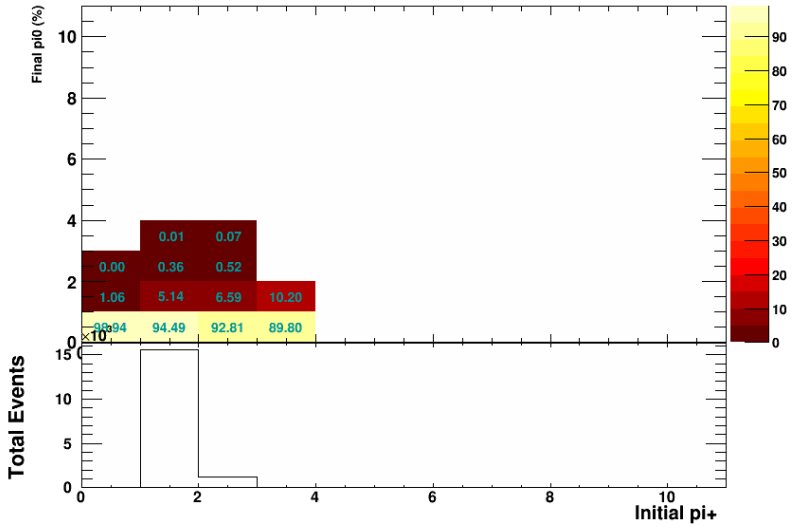


Phase space

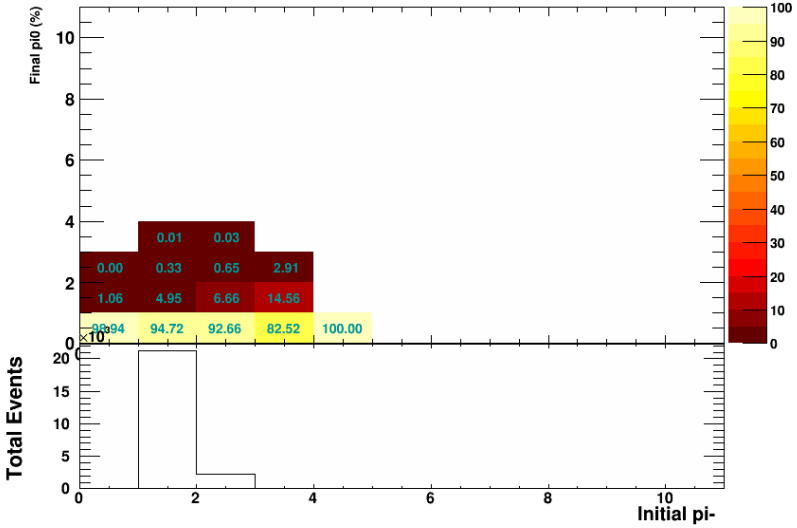


Nominal Pion Migrations

pi+-> pi0

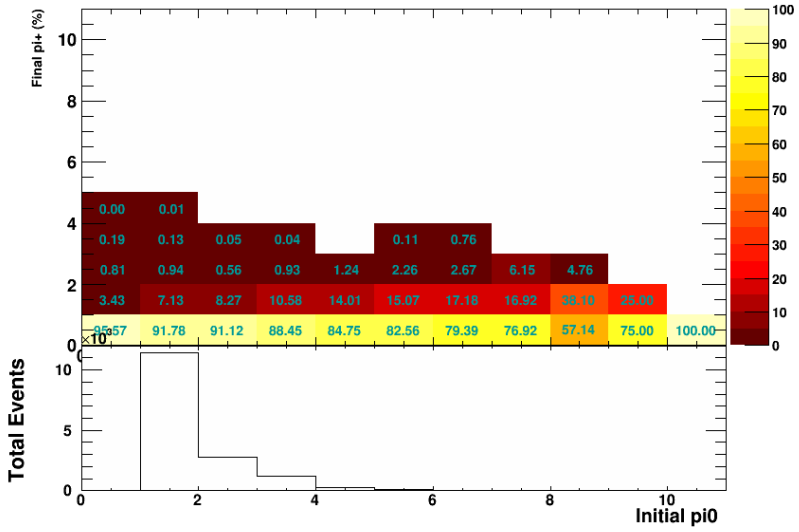


pi--> pi0

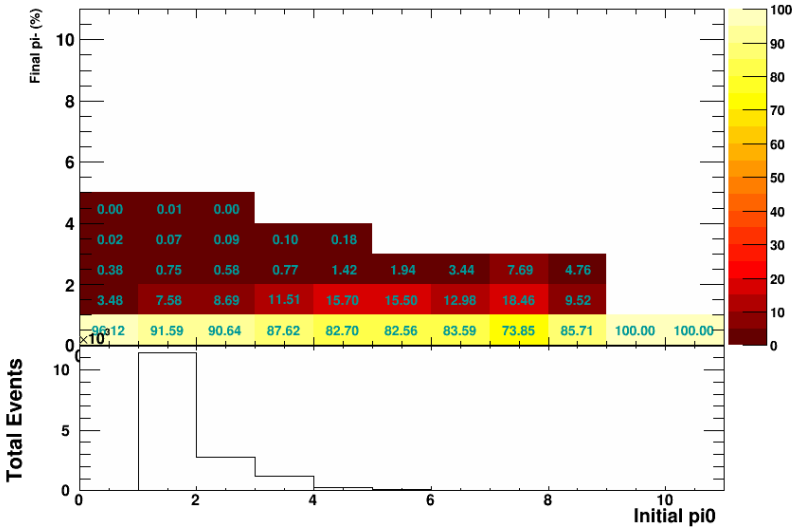


Nominal Pion Migrations

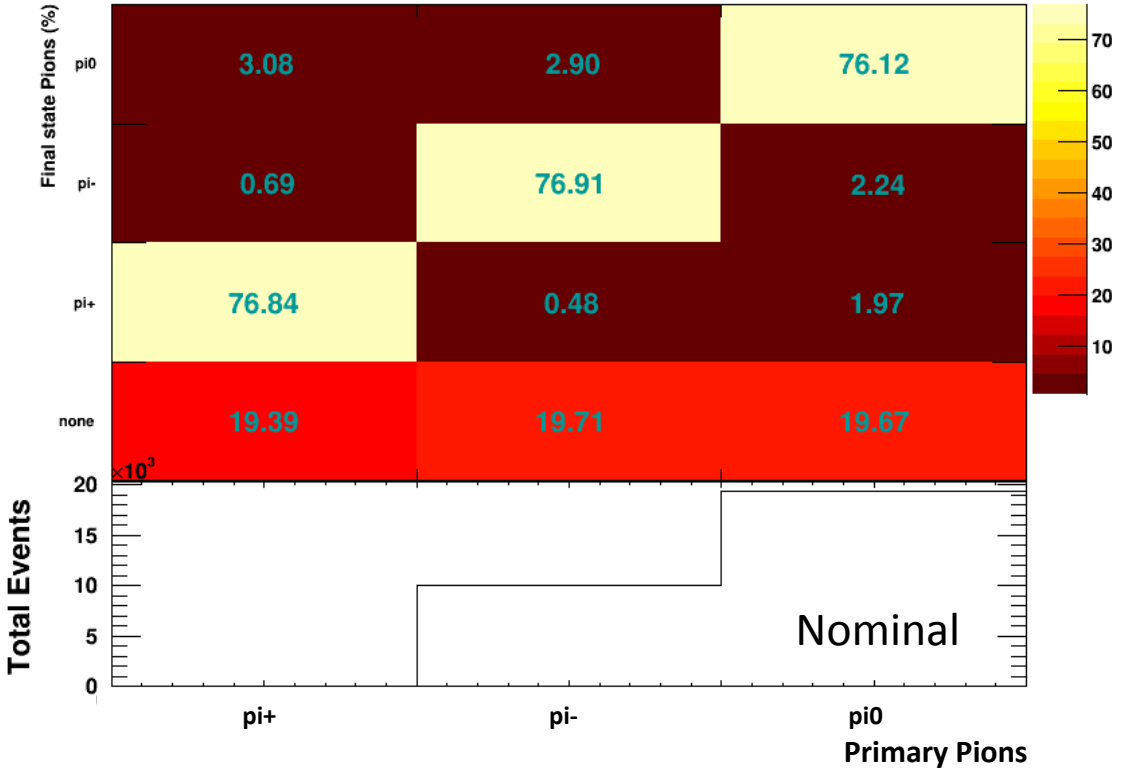
pi0->pi+

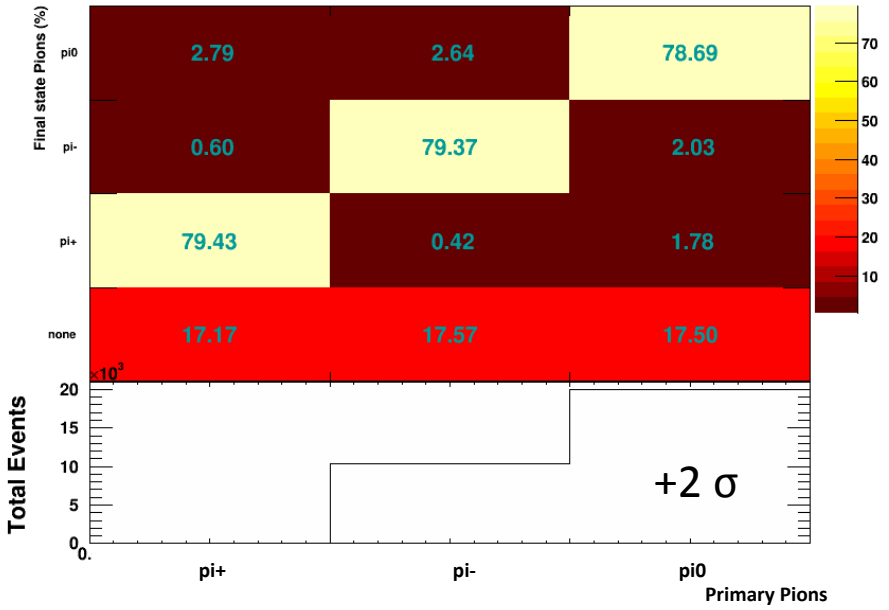


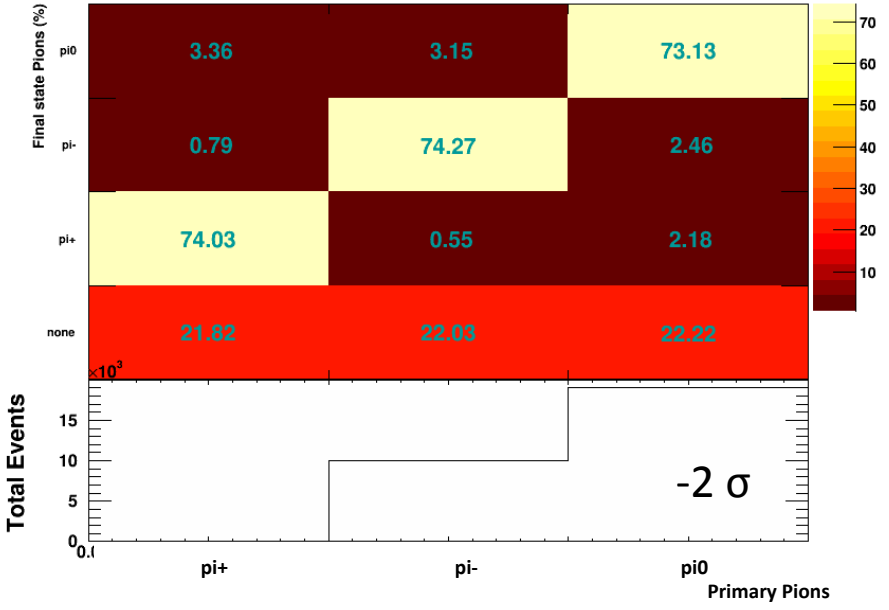
pi0-> pi-



Pion migrations

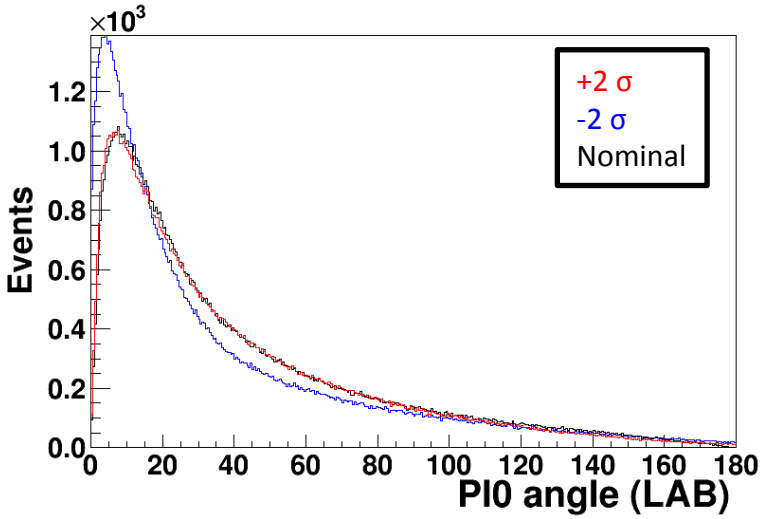




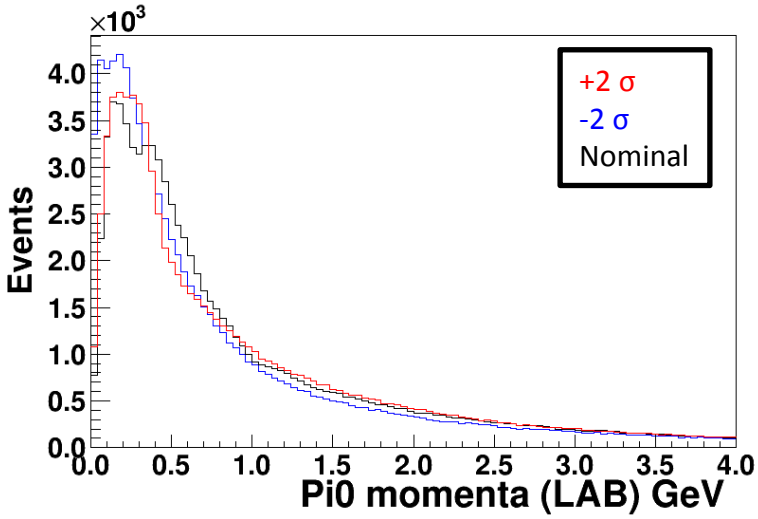


Nominal fsi pi0 Events

Final State pi0 angle



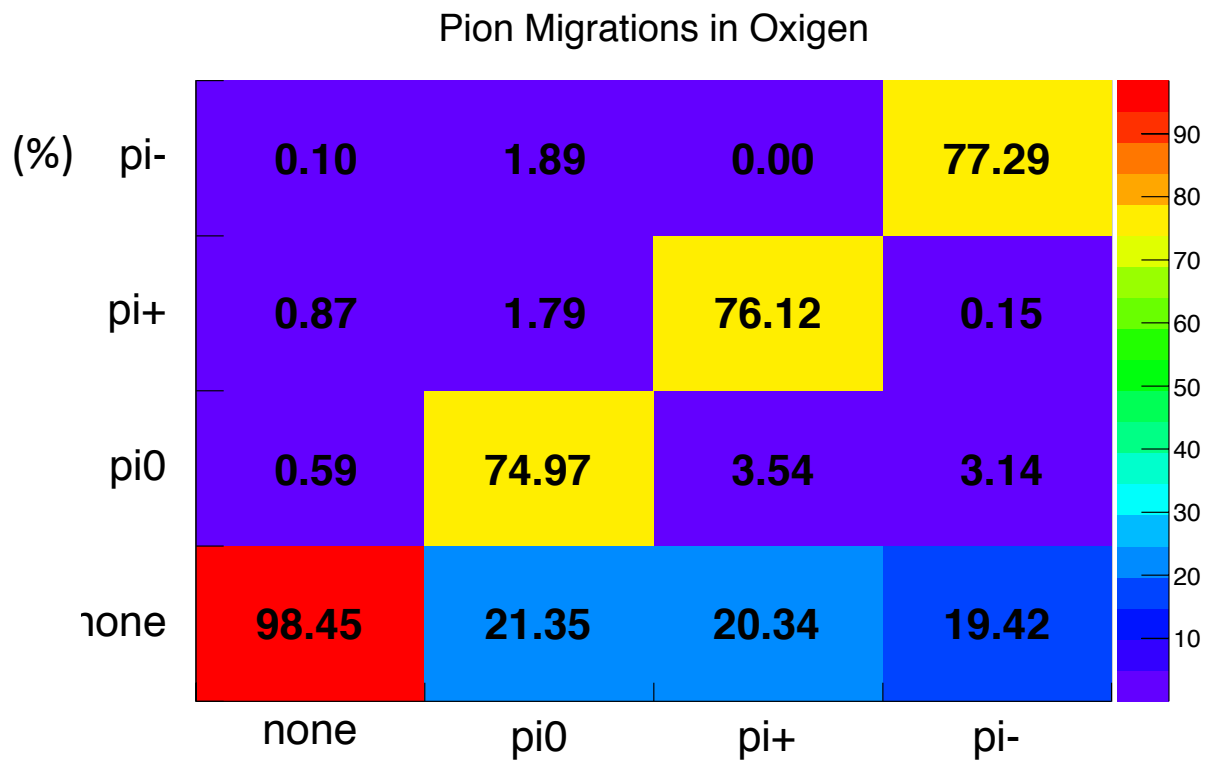
Final State pi0 momentum



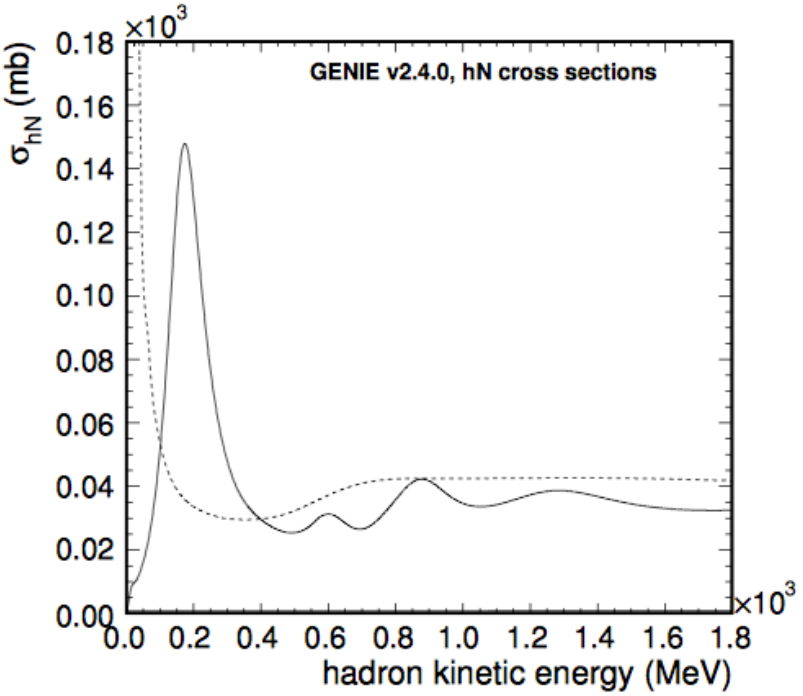
Occupancy of primary and final state hadronic systems (Oxigen)

Final-	Primary Hadronic System									
State	$0\pi X$	$1\pi^0 X$	$1\pi^+ X$	$1\pi^- X$	$2\pi^0 X$	$2\pi^+ X$	$2\pi^- X$	$\pi^0\pi^+ X$	$\pi^0\pi^- X$	$\pi^+\pi^- X$
$0\pi X$	**293446**	12710	22033	3038	113	51	5	350	57	193
$1\pi^0 X$	1744	**44643**	3836	491	1002	25	1	1622	307	59
$1\pi^+ X$	2590	1065	**82459**	23	14	660	0	1746	5	997
$1\pi^- X$	298	1127	1	**12090**	16	0	46	34	318	1001
$2\pi^0 X$	0	0	0	0	**2761**	2	0	260	40	7
$2\pi^+ X$	57	5	411	0	1	**1999**	0	136	0	12
$2\pi^- X$	0	0	0	1	0	0	**134**	0	31	0
$\pi^0\pi^+ X$	412	869	1128	232	109	106	0	**9837**	15	183
$\pi^0\pi^- X$	0	0	1	0	73	0	8	5	**1808**	154
$\pi^+\pi^- X$	799	7	10	65	0	0	0	139	20	**5643**

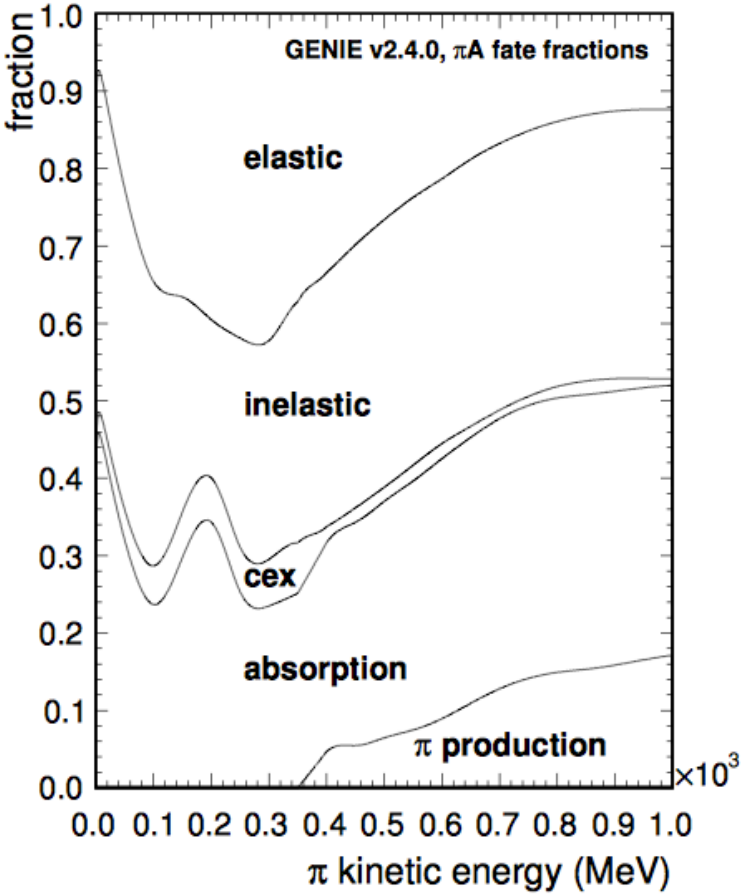
Occupancy of primary and final state hadronic systems (Oxigen)



GENIE MFP input

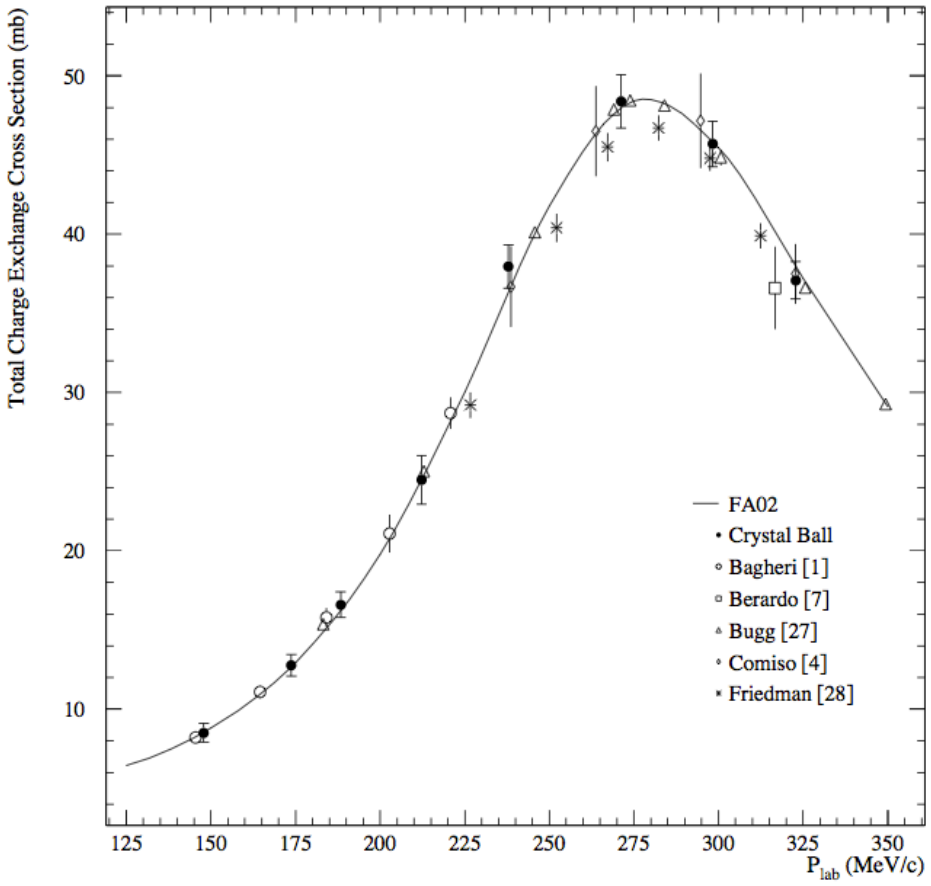


Pion nucleon cross-section used for determining pion mean free path.



Default fate fractions for rescattered pions.

Differential cross section of the charge-exchange reaction



pi- -> pi0 particularly high
(expected from genie around 7mb)