

u-Channel: Aerogel Correction Cont'd

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May 14, 2026

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KaonLT Experiment, Jefferson Lab Hall C



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E_B	p_{SHMS}	n_{AGC}
KaonLT Heep Coin		
10.6	4.84	1.011
8.2	4.67	1.011
6.2	3.49	1.011
4.9	2.58	1.030
3.8	2.58	1.030
PionLT Heep Coin		
9.2	5.02	1.011
7.9	5.51	1.011
9.2	6.27	1.011
KaonLT Physics		
10.6/6.2	3.48	1.015
10.6/6.2	4.97	1.015
10.6/8.2	5.38	1.011
10.6/8.2	6.04	1.011

- Add low Q^2 Heep Coin from KaonLT
- Add high p_{SHMS} Heep Coin from PionLT

→ Momentum range now brackets physics data

- Different aerogel trays
- Assume interaction probability $1 - \epsilon$ scales linearly with density $\rho \propto n - 1$

$$\frac{1 - \epsilon_1}{n_1 - 1} = \frac{1 - \epsilon_2}{n_2 - 1}$$



- My initial script (numbers shown last week) had counting errors for uncorrelated variables

$$\Delta\epsilon = \epsilon \sqrt{\frac{1}{N_{did}} + \frac{1}{N_{should}}}$$

- Binomial errors, Ali's thesis: for $\epsilon = N_{did}/N_{should}$,

$$\Delta\epsilon = \sqrt{\frac{N_{did}N_{should} - N_{did}^2}{N_{should}^3}} = \epsilon \sqrt{\frac{1}{N_{did}} - \frac{1}{N_{should}}}$$

- This assumes total number of trials known precisely
- Taking $\delta N_{should} = \sqrt{N_{should}}$ and binomial errors on N_{did} gives

$$\Delta\epsilon = \epsilon \sqrt{\frac{2}{N_{did}} - \frac{1}{N_{should}}}$$

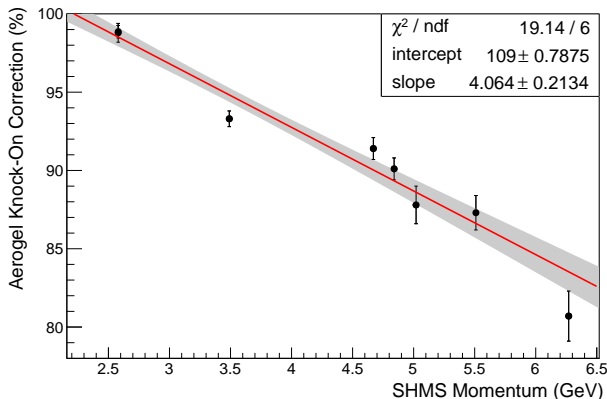
- Finally, an ad-hoc correction can be added to force a $\chi^2/\text{NDF} \sim 1$

Linear Fit: Uncorrelated Errors



$$\Delta\epsilon = \epsilon \sqrt{\frac{1}{N_{did}} + \frac{1}{N_{should}}}$$

<i>PSHMS</i>	ϵ_{AGC}
2.58	$98.8 \pm 0.6 \%$
2.58	$98.9 \pm 0.4 \%$
3.49	$93.3 \pm 0.5 \%$
4.67	$91.4 \pm 0.7 \%$
4.84	$90.1 \pm 0.7 \%$
5.02	$87.8 \pm 1.2 \%$
5.51	$87.3 \pm 1.1 \%$
6.27	$80.7 \pm 1.6 \%$

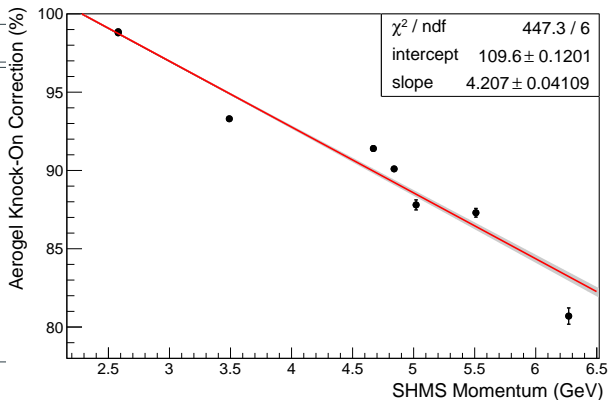


Linear Fit: Binomial Errors



$$\Delta\epsilon = \epsilon \sqrt{\frac{1}{N_{did}} - \frac{1}{N_{should}}}$$

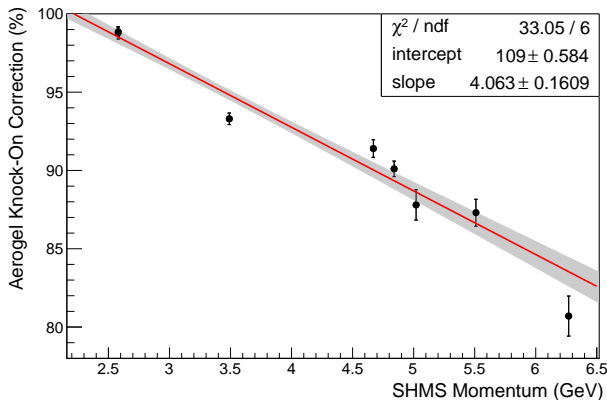
<i>PSHMS</i>	ϵ_{AGC}
2.58	$98.8 \pm 0.04 \%$
2.58	$98.9 \pm 0.03 \%$
3.49	$93.3 \pm 0.09 \%$
4.67	$91.4 \pm 0.2 \%$
4.84	$90.1 \pm 0.2 \%$
5.02	$87.8 \pm 0.3 \%$
5.51	$87.3 \pm 0.3 \%$
6.27	$80.7 \pm 0.5 \%$





$$\Delta\epsilon = \epsilon \sqrt{\frac{2}{N_{did}} - \frac{1}{N_{should}}}$$

<i>PSHMS</i>	ϵ_{AGC}
2.58	$98.8 \pm 0.3 \%$
2.58	$98.9 \pm 0.3 \%$
3.49	$93.3 \pm 0.4 \%$
4.67	$91.4 \pm 0.6 \%$
4.84	$90.1 \pm 0.6 \%$
5.02	$87.8 \pm 0.9 \%$
5.51	$87.3 \pm 0.8 \%$
6.27	$80.7 \pm 1.1 \%$

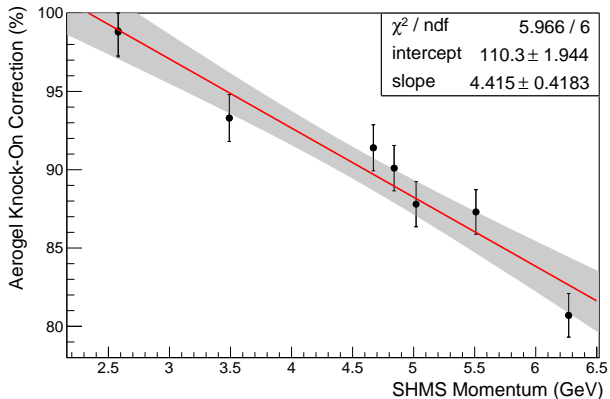


Linear Fit: Ad-Hoc Uncertainty



$$\Delta\epsilon = \sqrt{\Delta\epsilon_{BINOMIAL}^2 + (A\epsilon)^2}$$

<i>PSHMS</i>	ϵ_{AGC}
2.58	$98.8 \pm 1.6 \%$
2.58	$98.9 \pm 1.6 \%$
3.49	$93.3 \pm 1.5 \%$
4.67	$91.4 \pm 1.5 \%$
4.84	$90.1 \pm 1.4 \%$
5.02	$87.8 \pm 1.4 \%$
5.51	$87.3 \pm 1.4 \%$
6.27	$80.7 \pm 1.4 \%$





- Calculated from the linear fit to the Heep Coin results
- Uncertainties from the confidence interval
- Values change depending on which method is used to calculate $\Delta\epsilon$
- Expect slight modifications if offsets change
- *Still need to rescale for density - all values at $n=1.011$*

(Q^2, W)	p_{SHMS}	n_{AGC}	ϵ_{AGC} (%)			
			UNCORR	BINOM	MISC	ADHOC
(3.0, 3.14)	6.04	1.011	84.4±1.1	84.1±0.3	84.4±0.9	83.6±1.6
(3.0, 2.32)	3.48	1.015	94.8±0.5	94.9±0.1	94.8±0.3	94.9±1.3
(2.1, 2.95)	4.97	1.015	88.8±0.8	88.6±0.2	88.8±0.6	88.3±1.1
(4.4, 2.74)	5.38	1.011	87.1±0.9	86.9±0.2	87.1±0.7	86.5±1.3