

Update on Simulations of PC plates Attenuation

L. Heilbronn, D. Powers, Y. Kamyshkov / UT

MC statistics

Number of PC	Initial n's
0	1.E+08
12	1.E+09
16	1.E+09
18	1.E+09
19	1.E+09
20	1.E+09
21	1.E+09
22	1.E+09
24	1.E+09

Passed to detector without any interactions

# PC	counts	error	fit [†]
0 [*]	1.8755E+08	43307	1.19E+08
12	325873	570.853	304682.3
12	325934	570.906	304682.3
16	42663	206.55	41635.29
18	15358	123.927	15391.07
19	9354	96.7161	9357.769
20	5721	75.6373	5689.524
21	3488	59.0593	3459.23
22	2105	45.8803	2103.212
24	744	27.2764	777.4818

* scaled up $\times 10$

† fit for last 6 points 18-24 PC

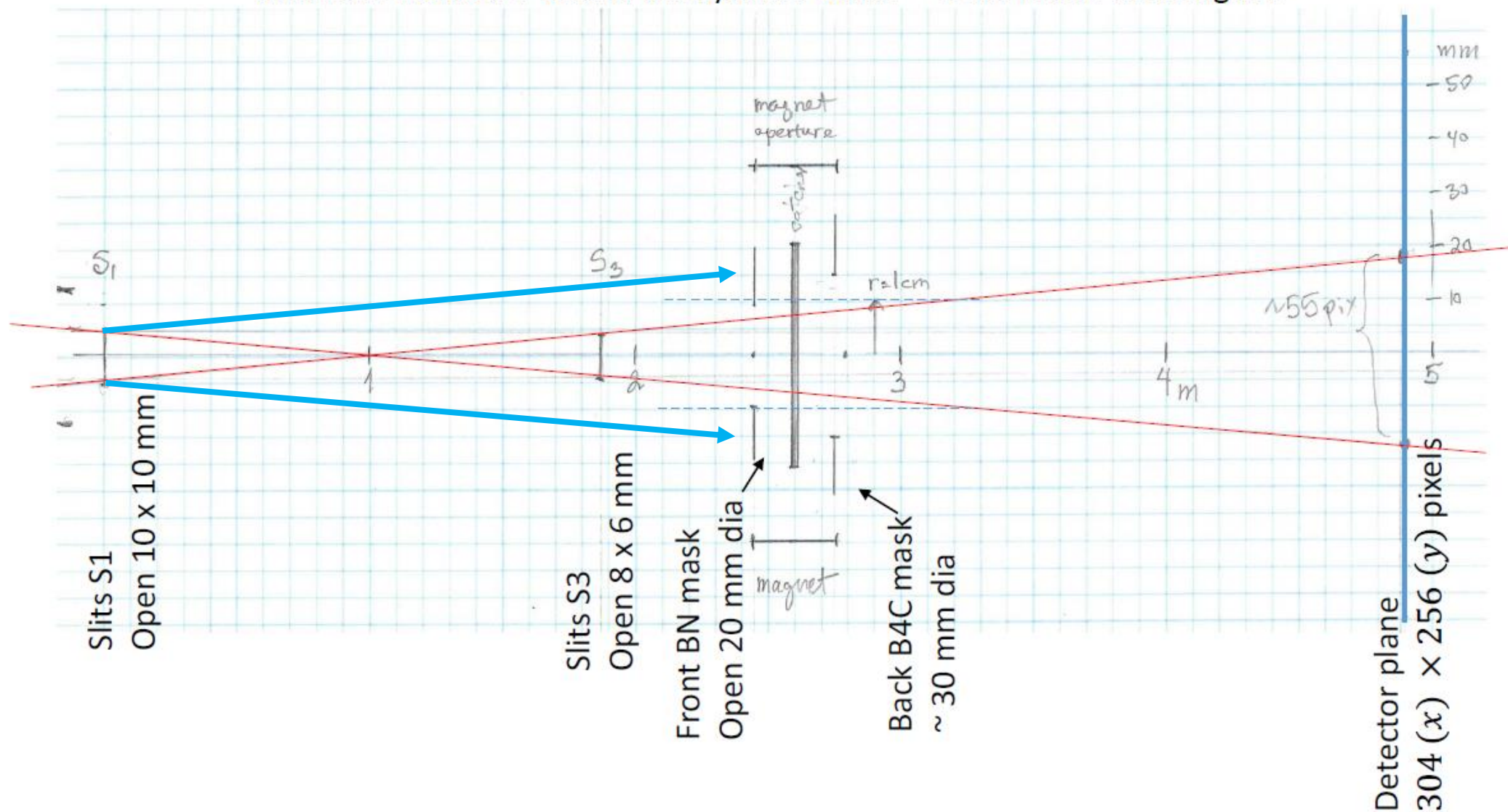
Question about F_0

file "SNS_downstream_pinneuts_noPC_dmp.out"				
number of events		number 9	number 10	number 11
in file	no inter	scattered in S3	scattered in PC	all scattered mainly air
18848491	18754717	4	6 ?	93774
Only 19% survive?		If neutrons hit S_3 and not show in the detector they are not recorded in the output file		includes in S3, PC, air, BN mask, B4C mask

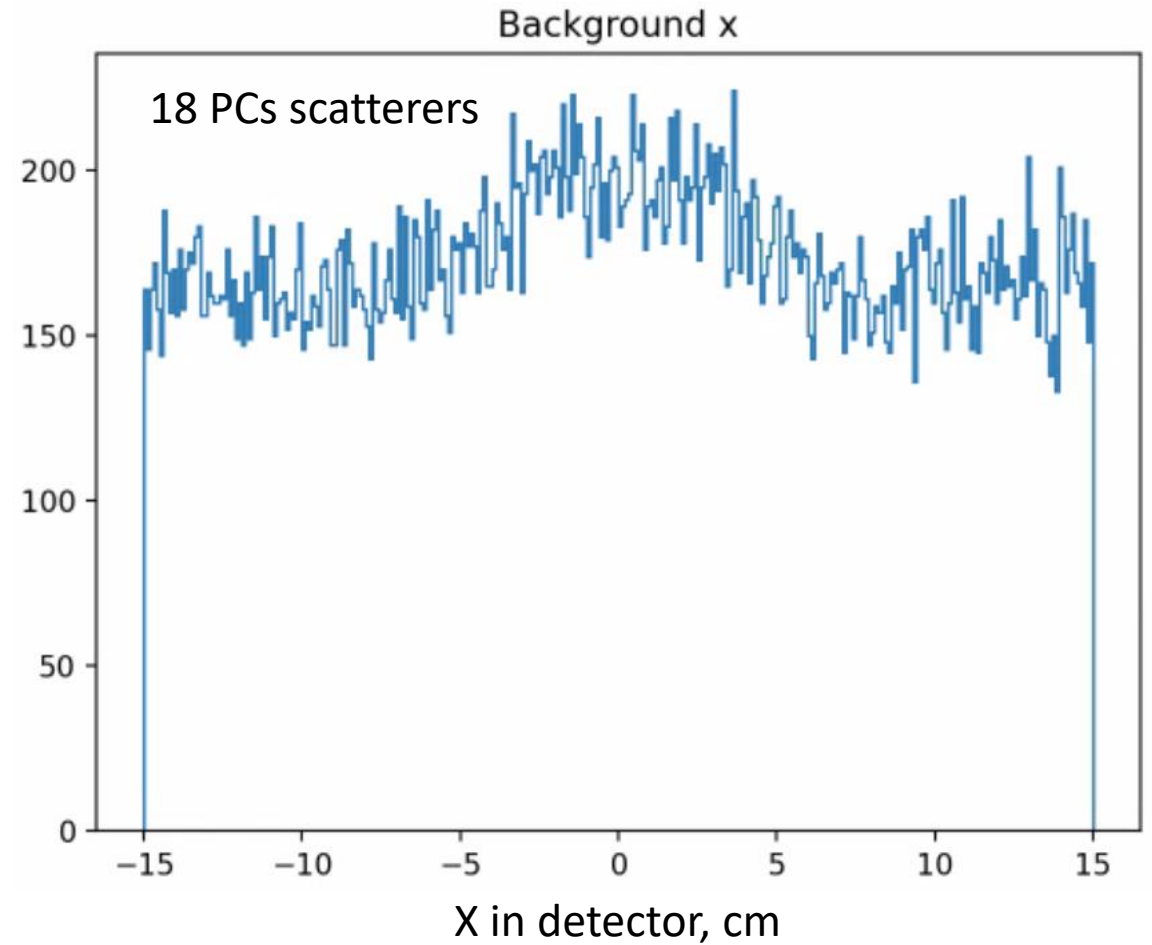
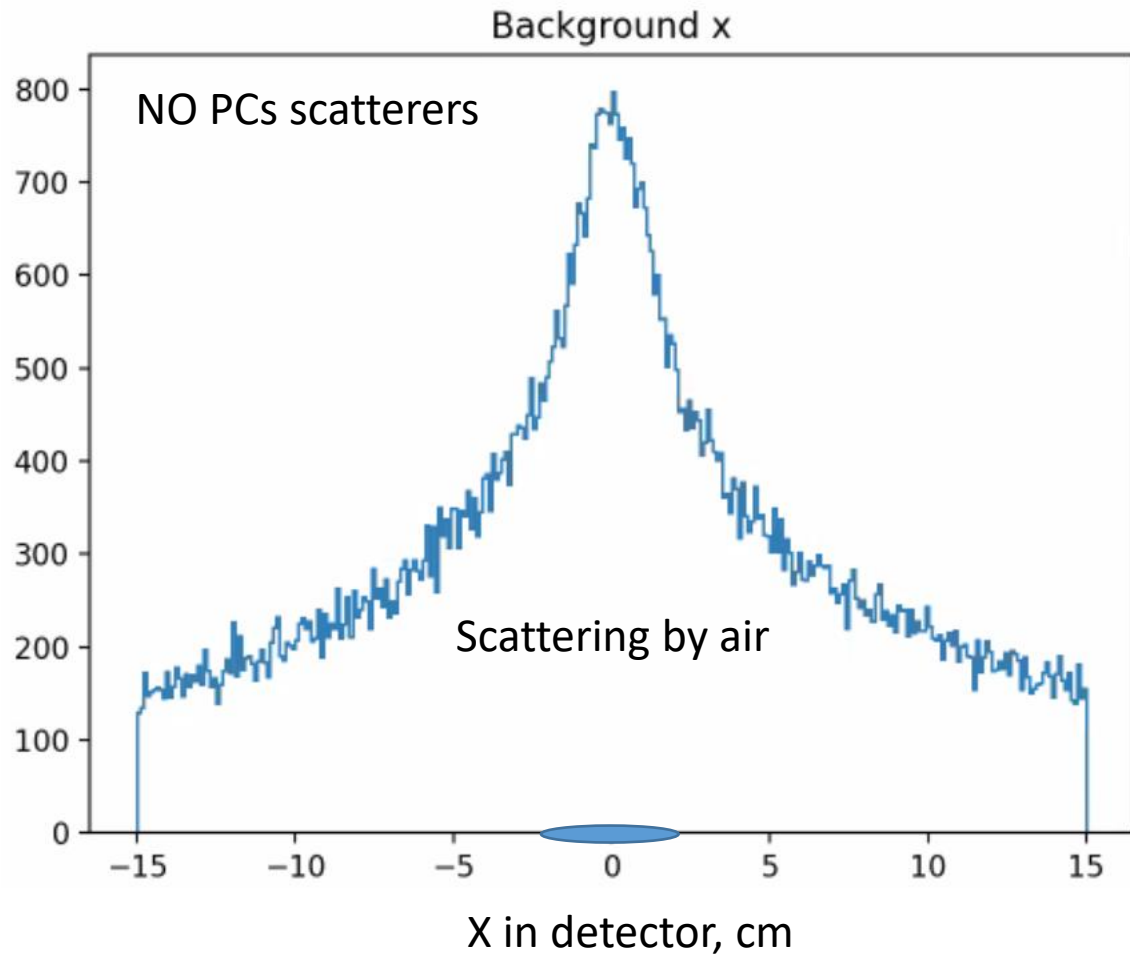
Starting with 1×10^8 at S_1 simulation without PC gives 1.88×10^7 in the detector
 Air losses in 5 m between S_1 and the detector should be $\sim 5\% \times 5 < 25\%$. It is 81% in simulation.

MAGREF SNS Beam Line 4A Configuration

All beam tracks are within the cylinder with $r = 1$ cm inside the magnet



Devyn also looked at the beam scattering in simulations



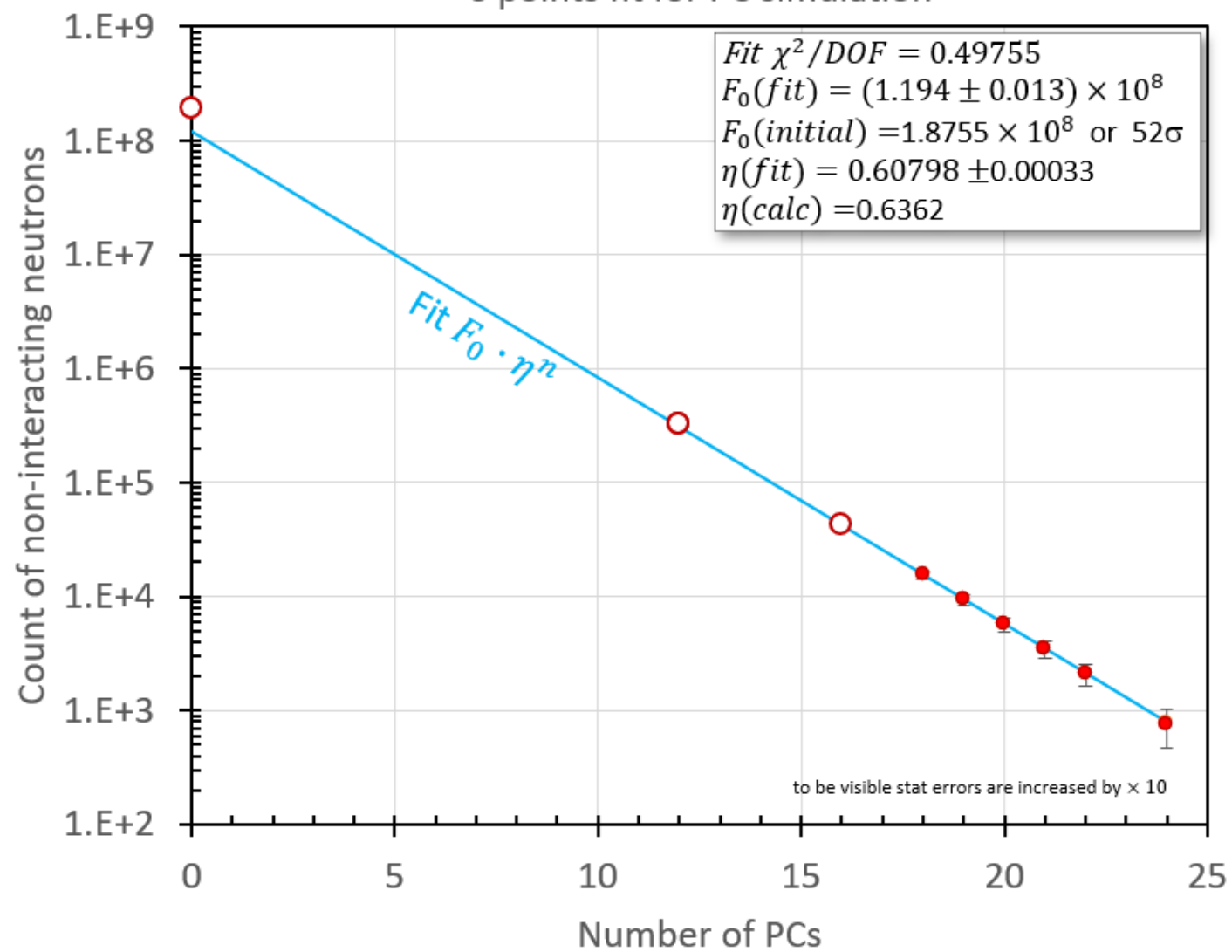
Plots made by Devyn Powers

Fit with exponential function $F_n = F_0 \cdot \eta^n$,
 where F_n - simulated beam intensity with
 n – number of attenuating PC plates,
 η – attenuation factor per plate,
 F_0 - intensity on the detector without PC

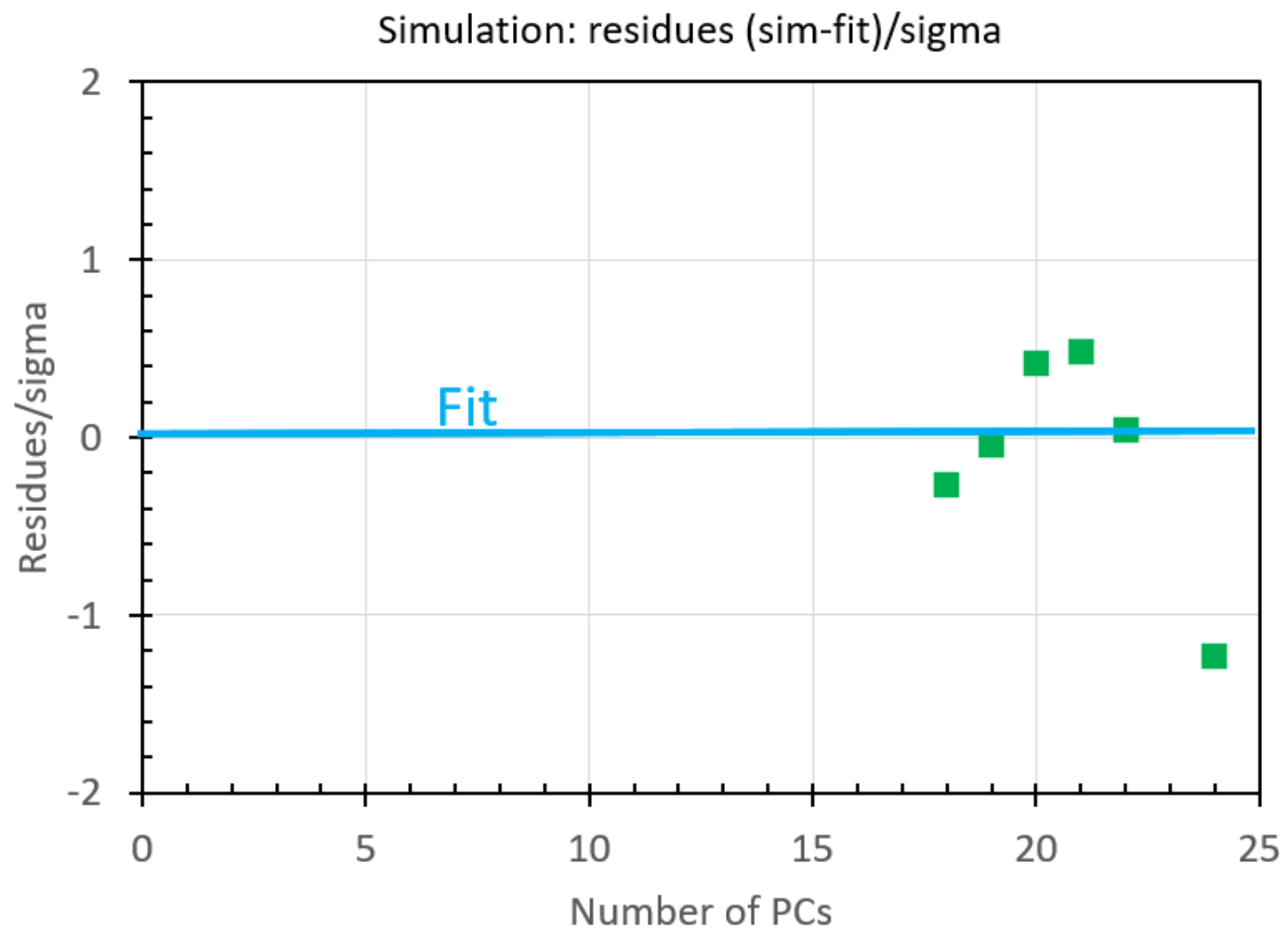
Calculation of η attenuation per PC plate from x-sections (October 2021 after remeasuring PCs)

density	1.195	g/cm3	thick	1.27	mm	1 u	1.66E-27	kg	lambda ave	3.216Å
				u/mol	x-sec, b	abs, b	abs_x	# at/cm2	nΣi	
C	16	12.0107	u	192.1712	5.551	0.0035	0.0062598	5.75E+21	0.0319591	
O	3	15.999	u	47.997	4.232	0.00019	0.0003398	1.08E+21	0.00456368	
H	14	1.00784	u	14.10976	82.02	0.3326	0.5948551	5.03E+21	0.41571912	
				254.278	g/mol	6.02E+23	#/mol	tot nΣ	0.4522419	
				0.151765	g/cm2	3.59E+20	#	exp(-nΣ)	0.63620025	

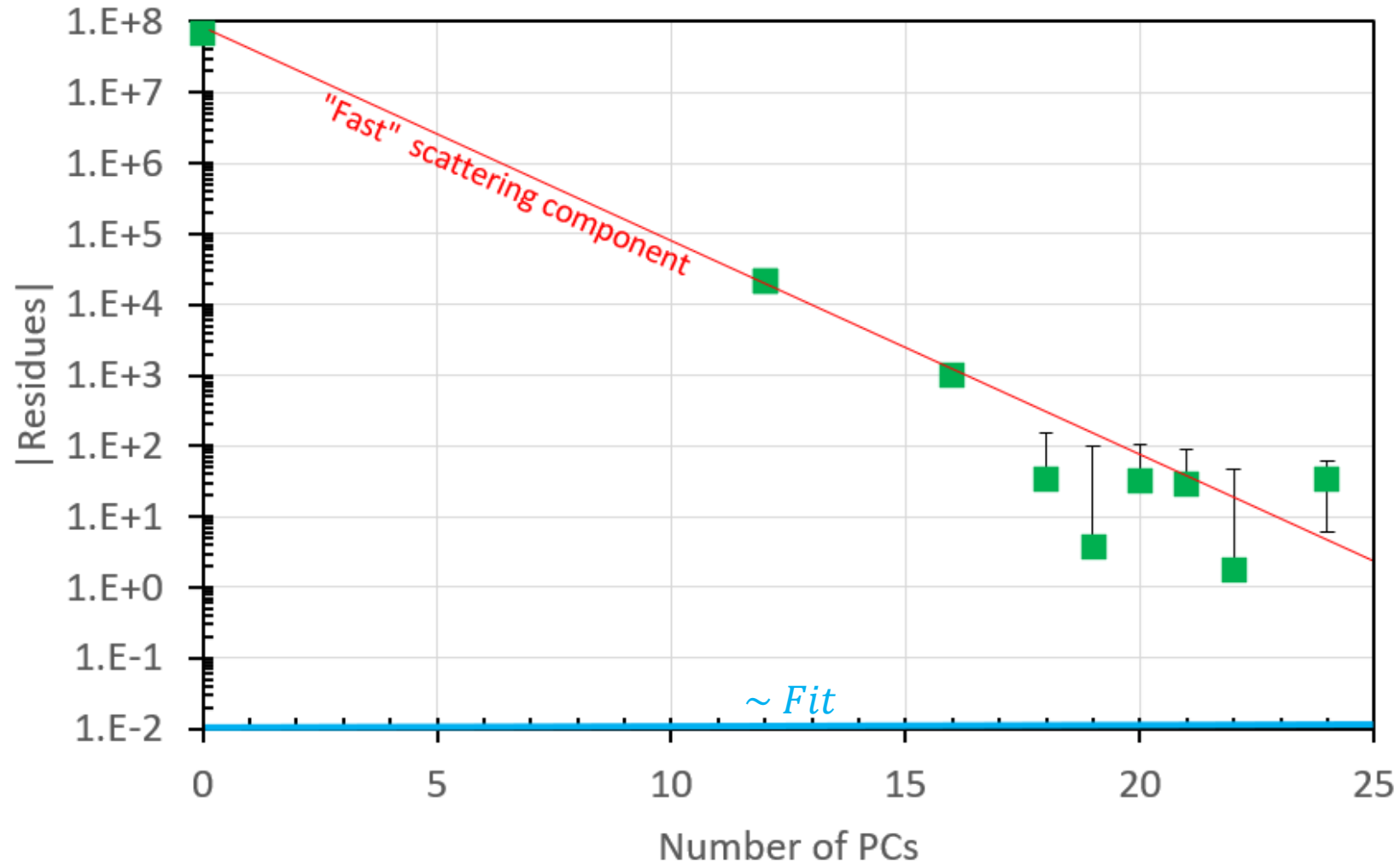
6 points fit for PC simulation



Nice $\chi^2 = 0.5/DoF$ in the fit

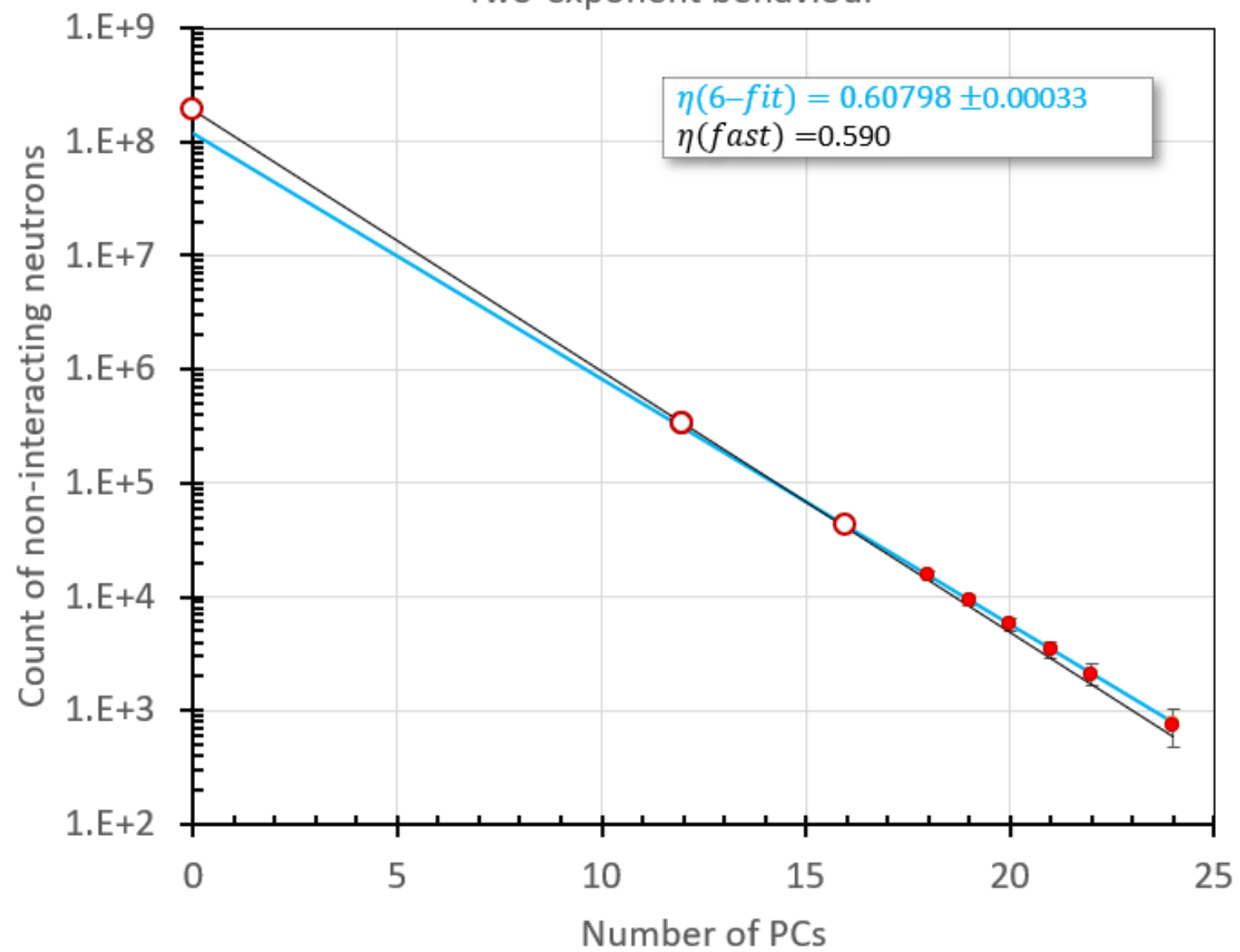


Simulation: ABS residues (sim-fit)



Three negatives
are turned to
positives here

Two-exponent behaviour



- Need to understand two-components effect in simulation before applying two-exponent fit to data