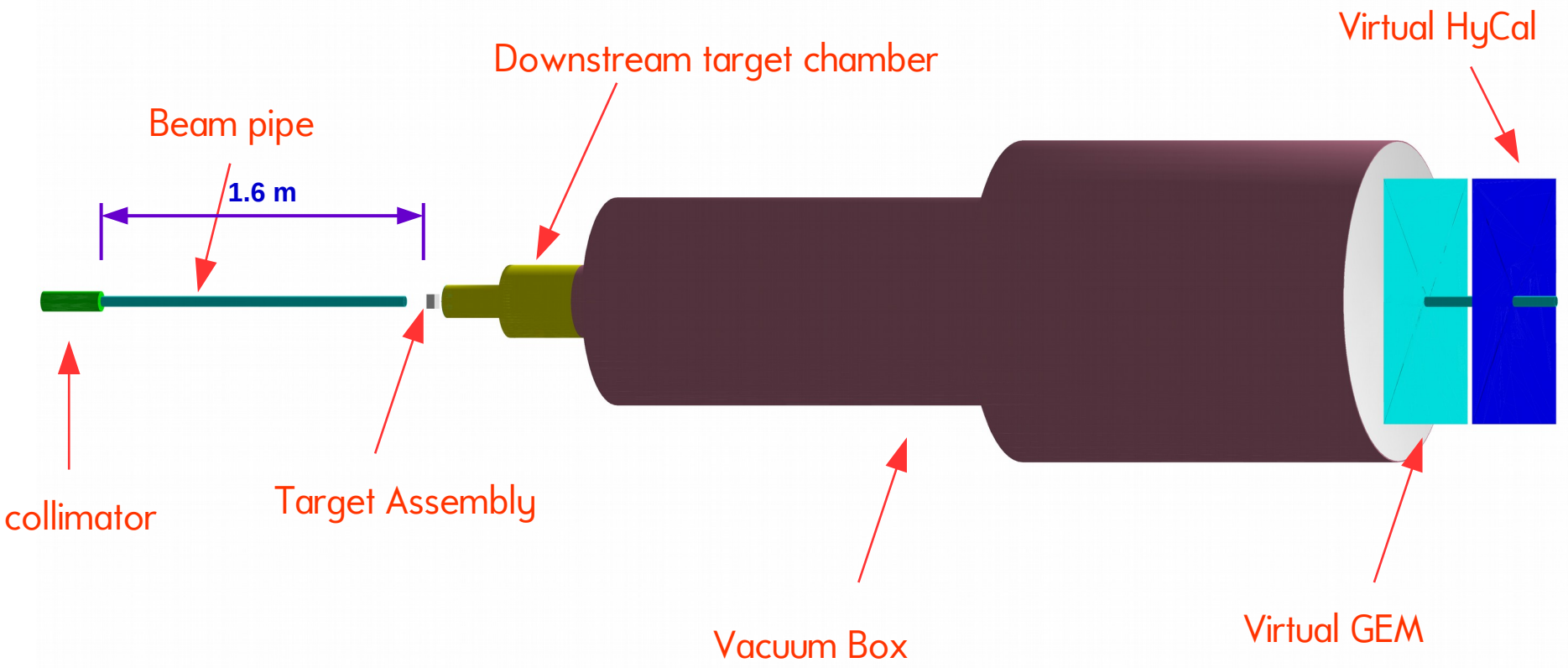
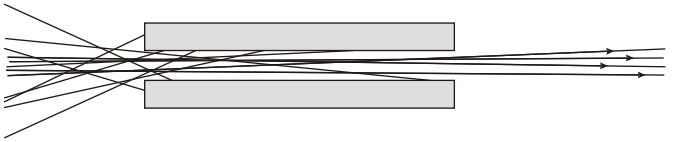
Short summary to small angle background simulation

setup

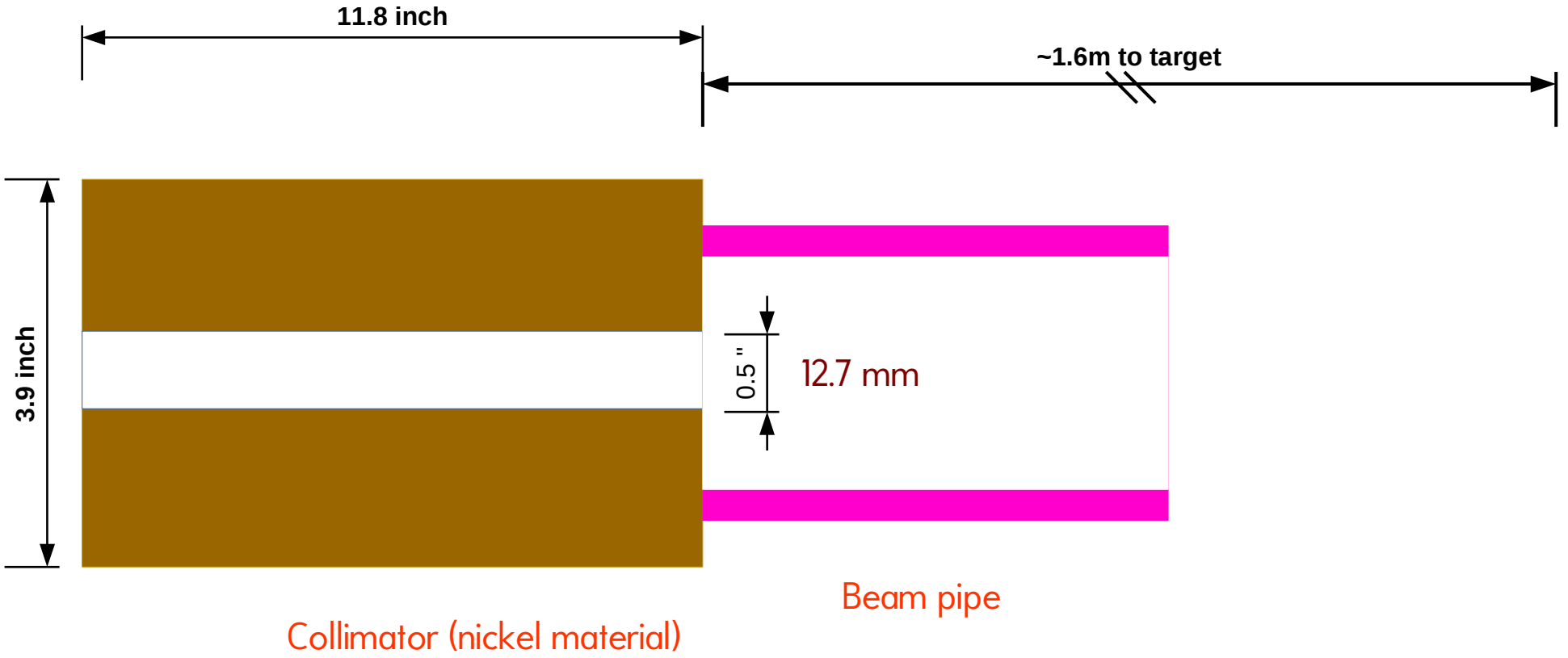
All dimension follow real setup



Collimator in experiment



Collimator

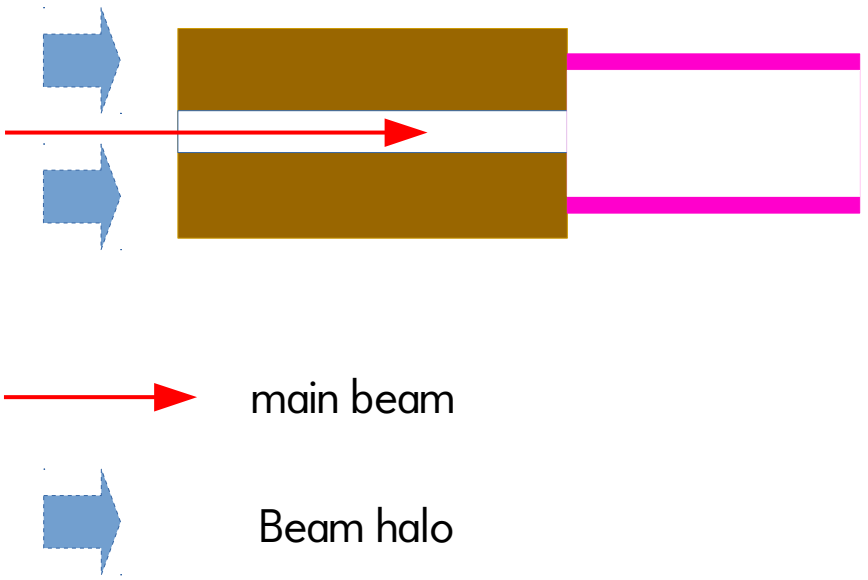


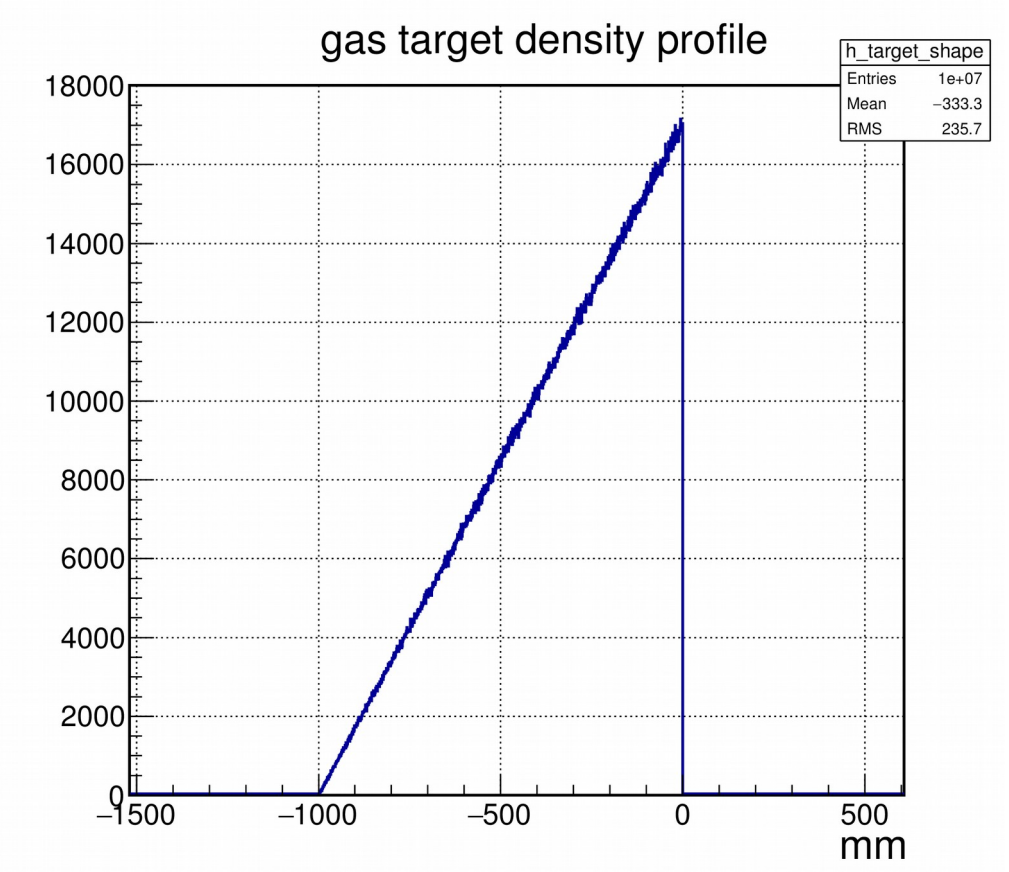
Beam pipe

Collimator (nickel material)

Collimator in PRad

Target Setup





Residue gas density distribution

Beam halo profile

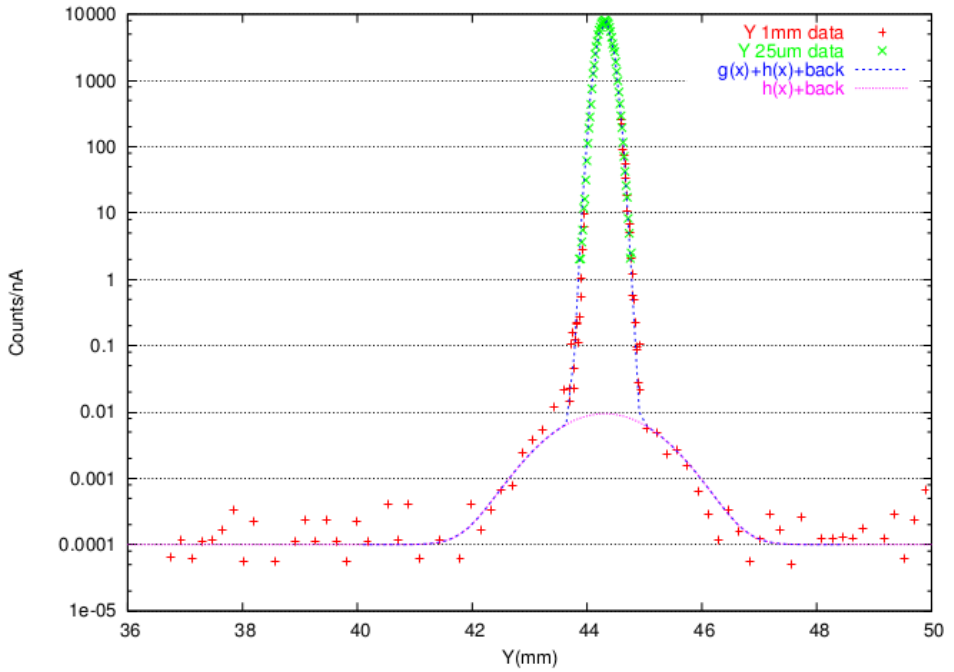
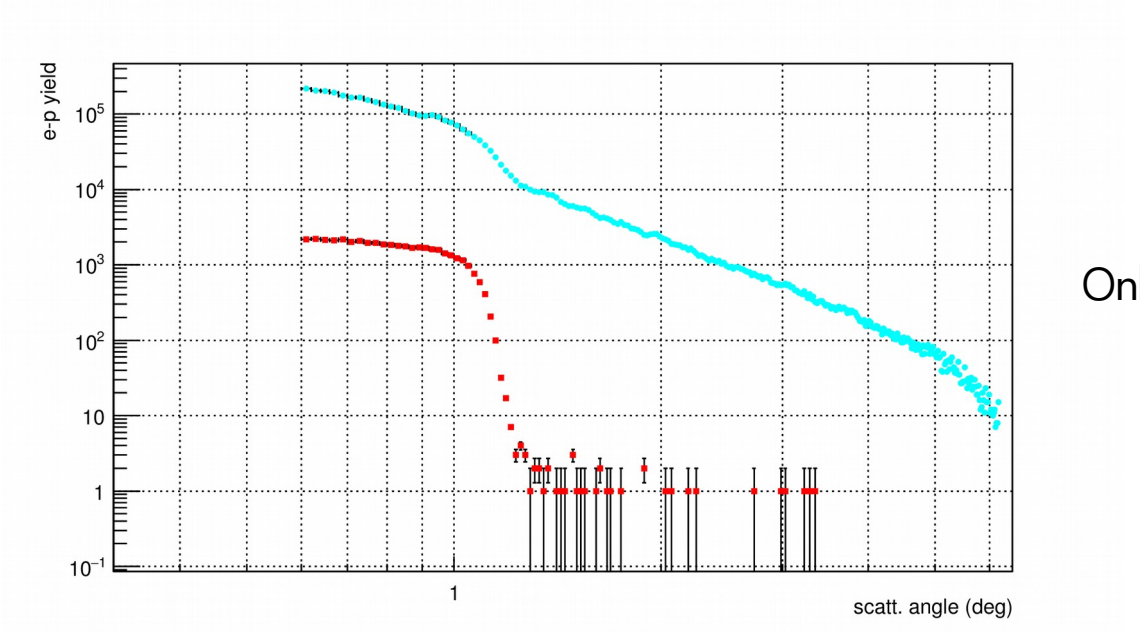


Table 1: Profile parameters obtained by fitting the data to the sum of two Gaussian functions with a common mean for all the scans.

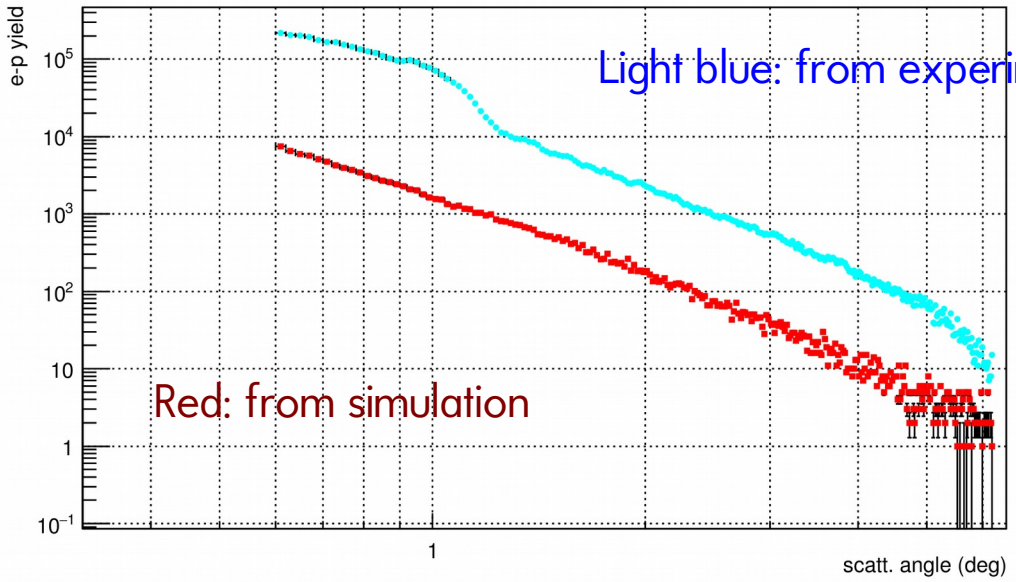
	scan1	scan2 (Fig. 6)	scan3 (Fig 4)	scan3-X plate (Fig 5)	scan4
Date	Dec. 5 17:09	Dec. 9 14:45	Dec. 9 14:51	Dec. 9 14:51	Dec. 10 18:22
$\sigma_{core}[\mathrm{X}](mm)$	0.045	0.053	0.052	0.052	0.106
$\sigma_{halo}[\mathrm{X}](mm)$	0.380	0.470	0.494	0.476	0.656
$\sigma_{core}[\mathrm{Y}](mm)$	0.104	0.111	0.110		0.085
$\sigma_{halo}[\mathrm{Y}](mm)$	0.949	0.855	0.771		0.617
$\frac{A_{halo}}{A_{core}}[\mathrm{X}]$	$4.2 * 10^{-5}$	$1.1 * 10^{-5}$	$8.0 * 10^{-6}$	$7.3 * 10^{-6}$	$3 * 10^{-4}$
$\frac{A_{halo}}{A_{core}}[\mathrm{Y}]$	$1.3 * 10^{-5}$	$4.8 * 10^{-6}$	$5.8 * 10^{-6}$		$< 7 * 10^{-5}$
Motor Speed	0.250mm/sec	0.250mm/sec	0.125mm/sec	0.125mm/sec	1.5mm/sec
Wires	25μm/1mm	25μm/1mm	25μm/1mm	25μm/1x10mm^{2}plate	50μm

[Ref: A. P. Freyberger, *large dynamic range beam profile measurements*]

e-p yield from collimator and residue gas



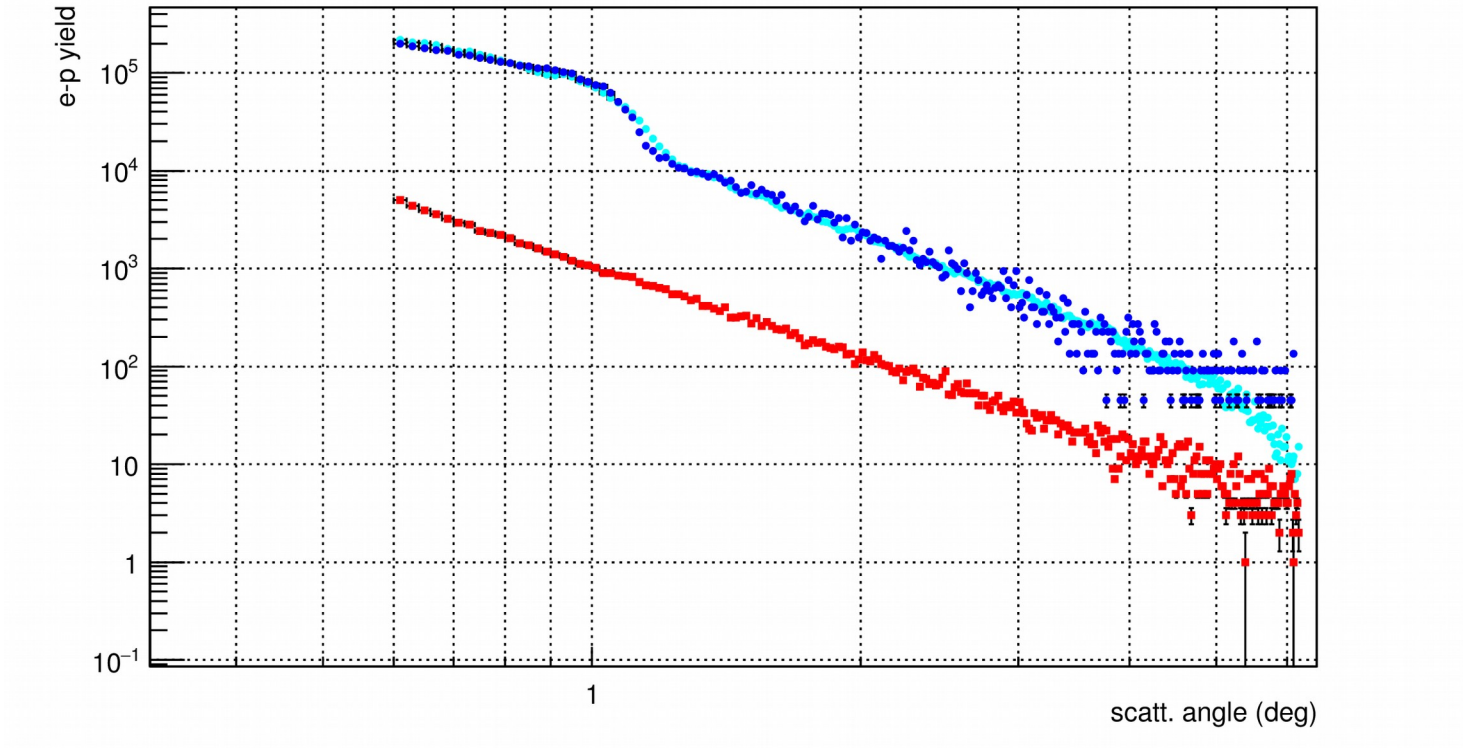
Only collimator, no residue gas



Only residue gas, no collimator

Collimator in experiment

- Red: from simulation, target at 0, for compare
- Light blue: from experimental data, empty target run
- Blue: from simulation, with collimator, residue gas

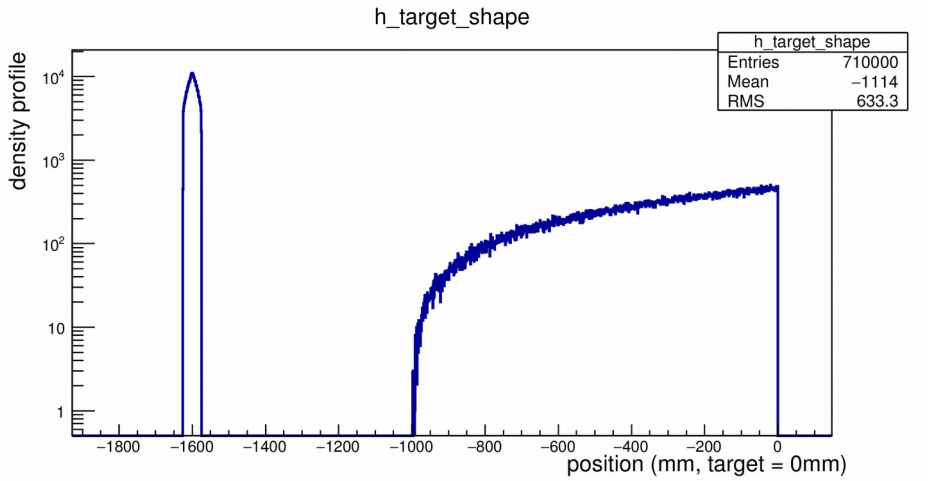


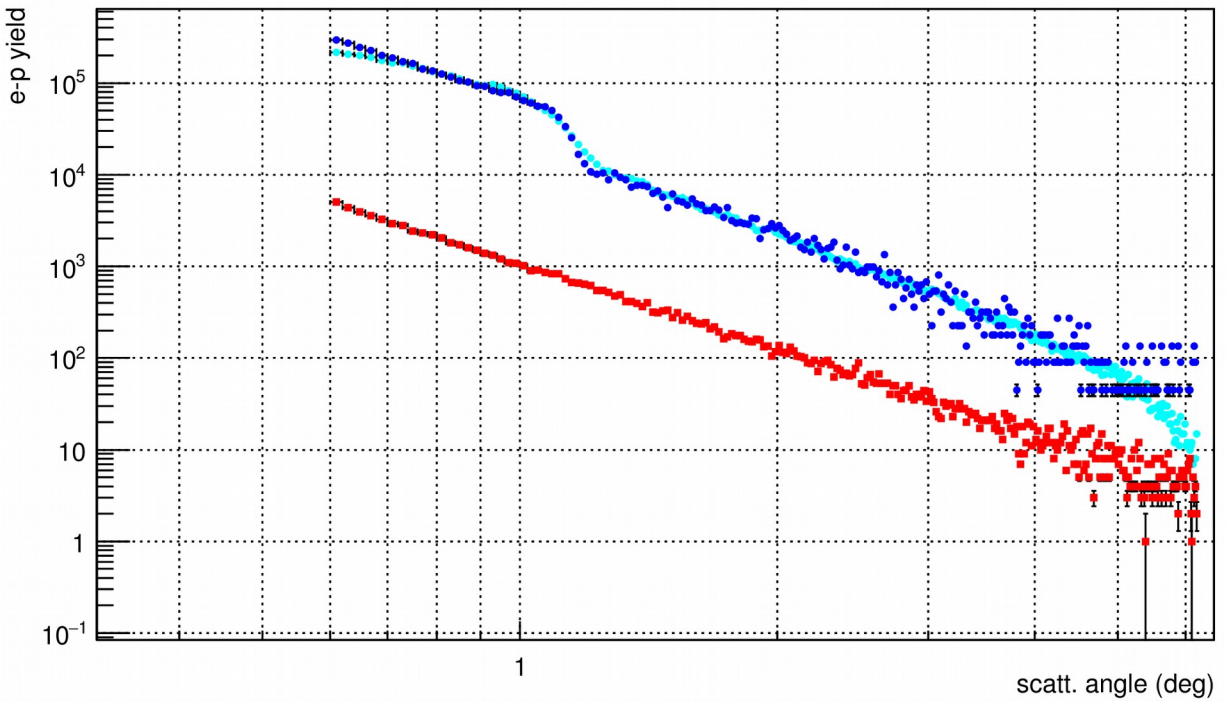
e-p yield with collimator and residue gas

Roughly scaled by beam flux according to beam halo profile

Previous simulation results

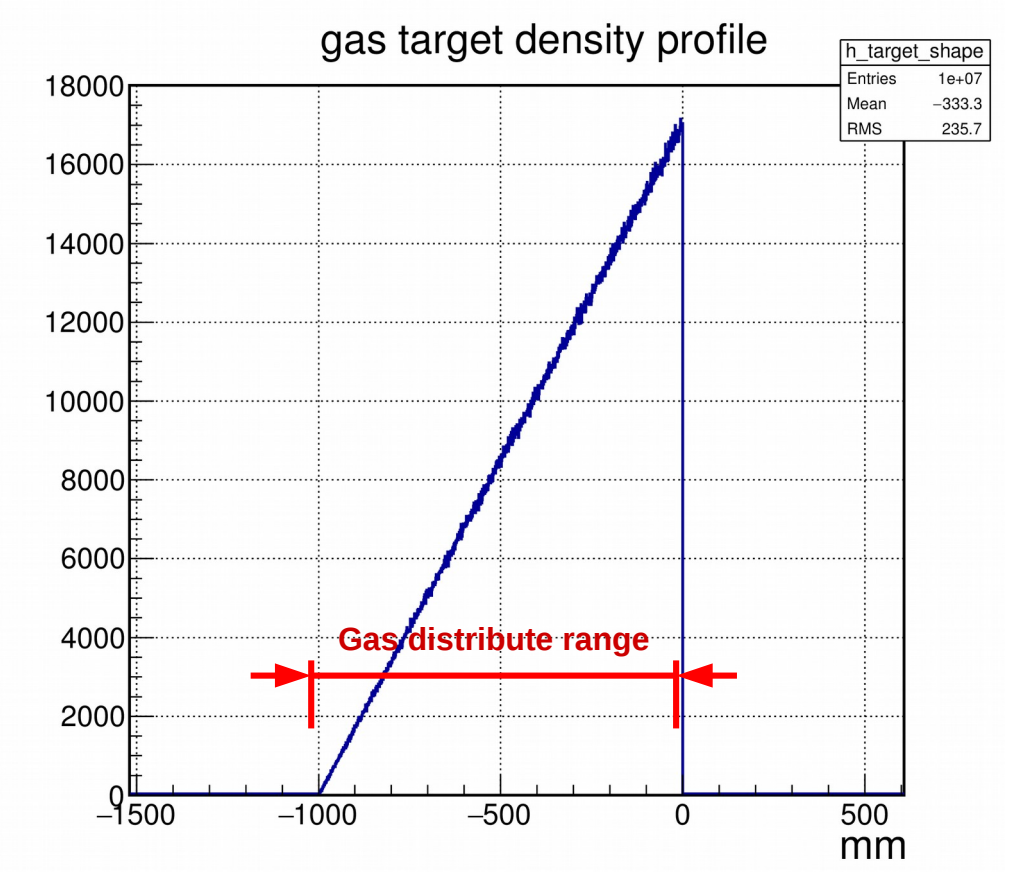
- Residue gas in combination with beam pipe will only have effect on the slope of the background yield line, no bump
- Bump due to a sharp peak at around 1.6m upstream, which is the same location where collimator ends.





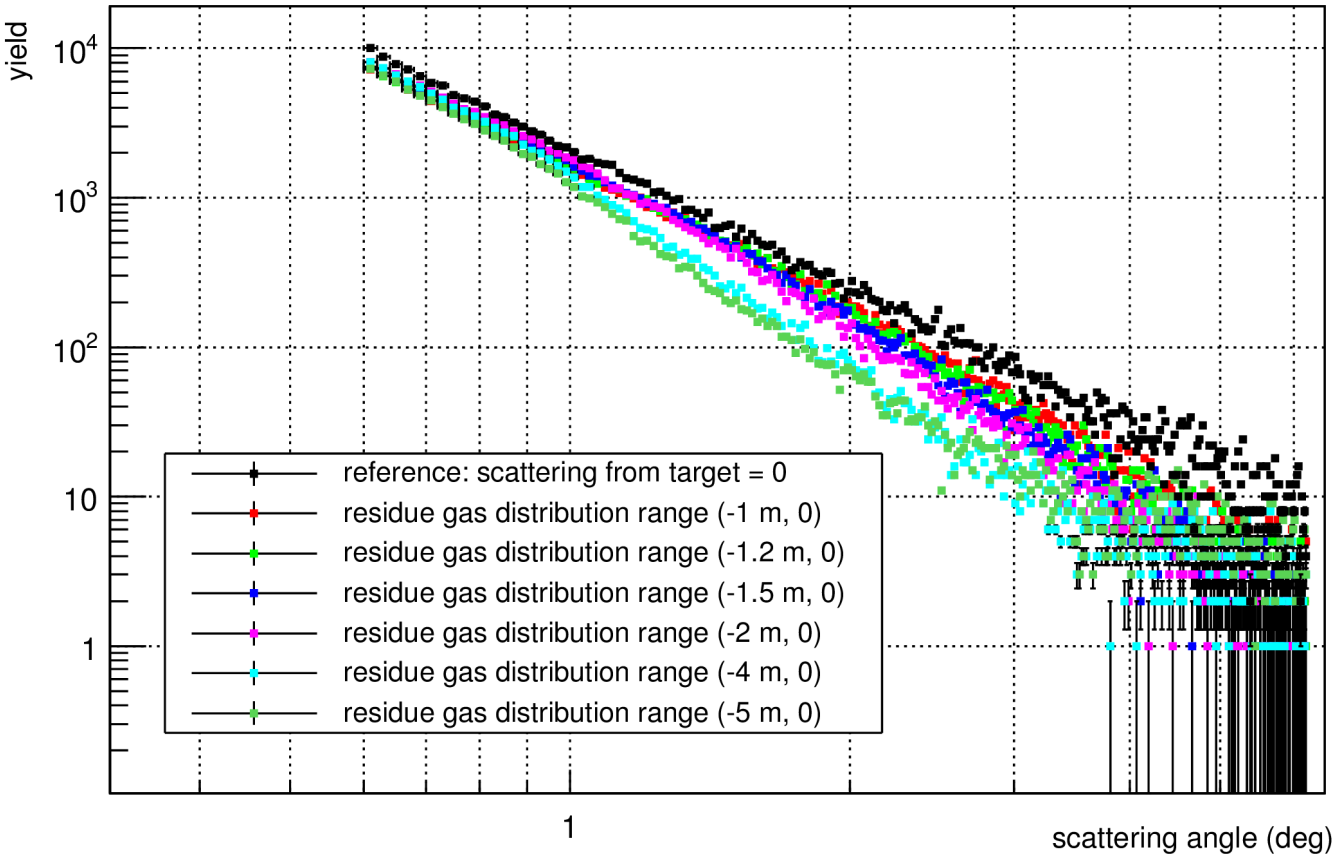
Target Setup

- Different residue gas distribution will lead to different ep yield line (shape change).
- Against residue gas distribution range



Residue gas density distribution

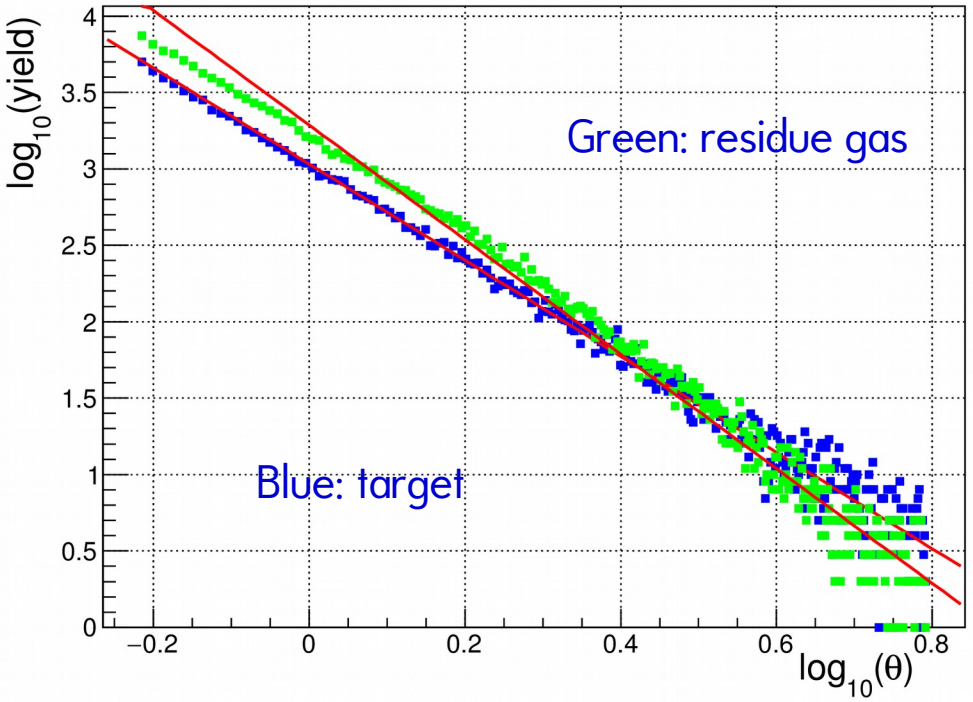
Shape compare for residue gas



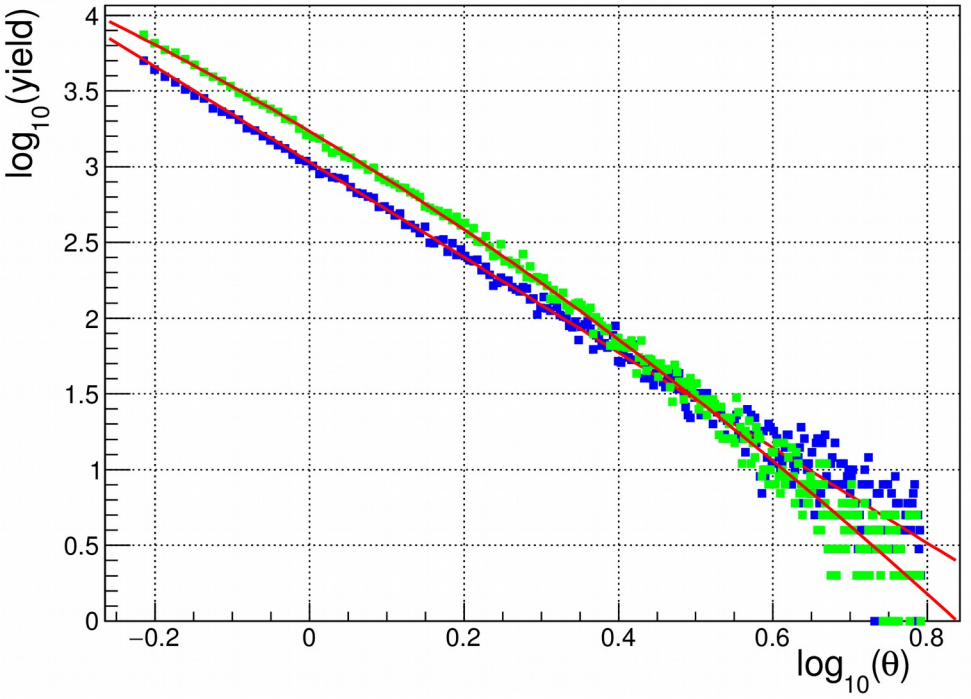
- The longer residue gas distribution, the more change in ep yield shape
- In simulation, (-1.2 m, 0 m) residue gas distribution agrees most with experimental data

Collimator in experiment

pol1 fitting for residue gas



pol2 fitting for residue gas

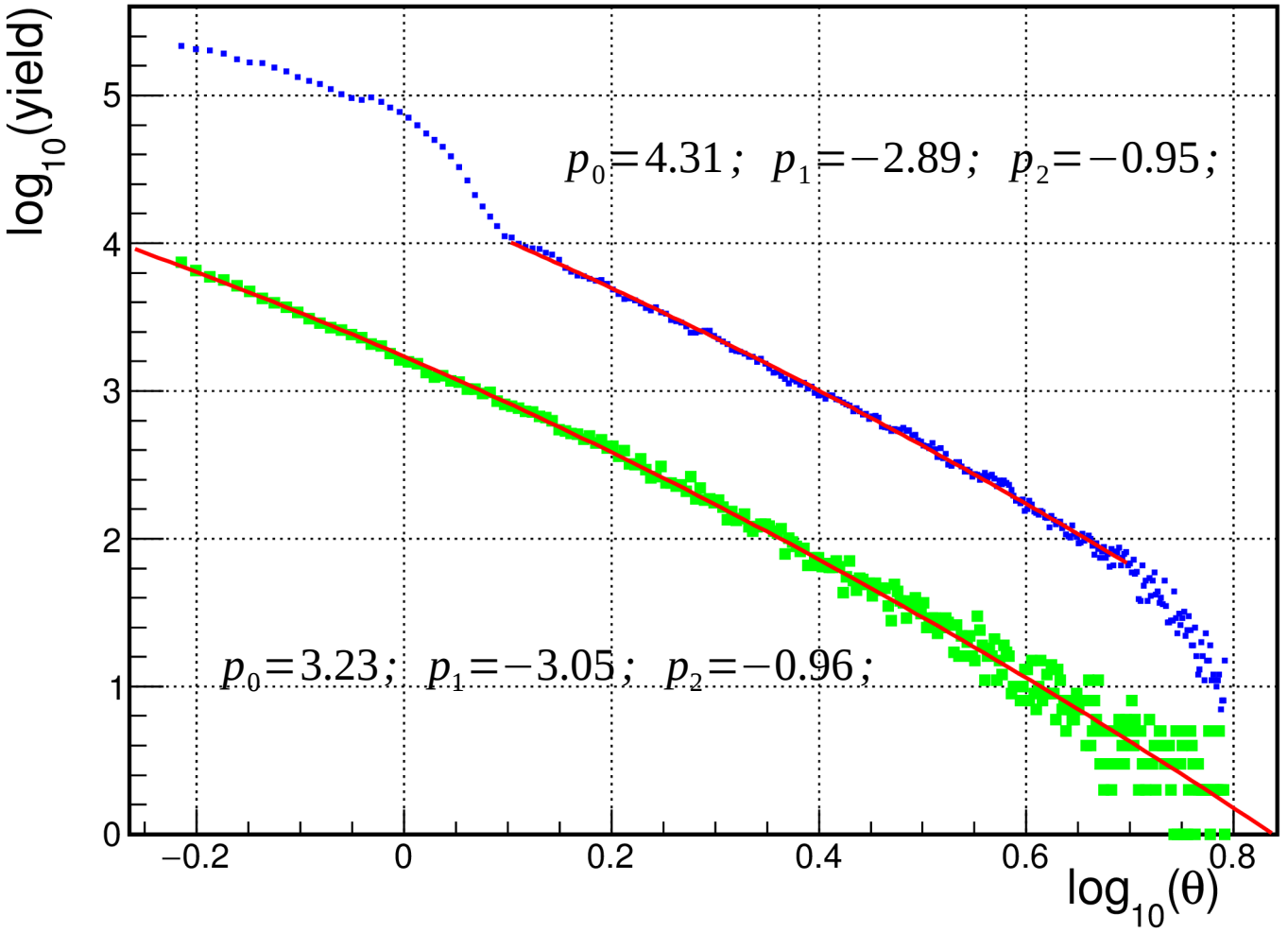


k1 = -3.144

k2 = -3.746

Slope relative change: 19%

Compare between experimental data and simulation



pol2 fitting for both