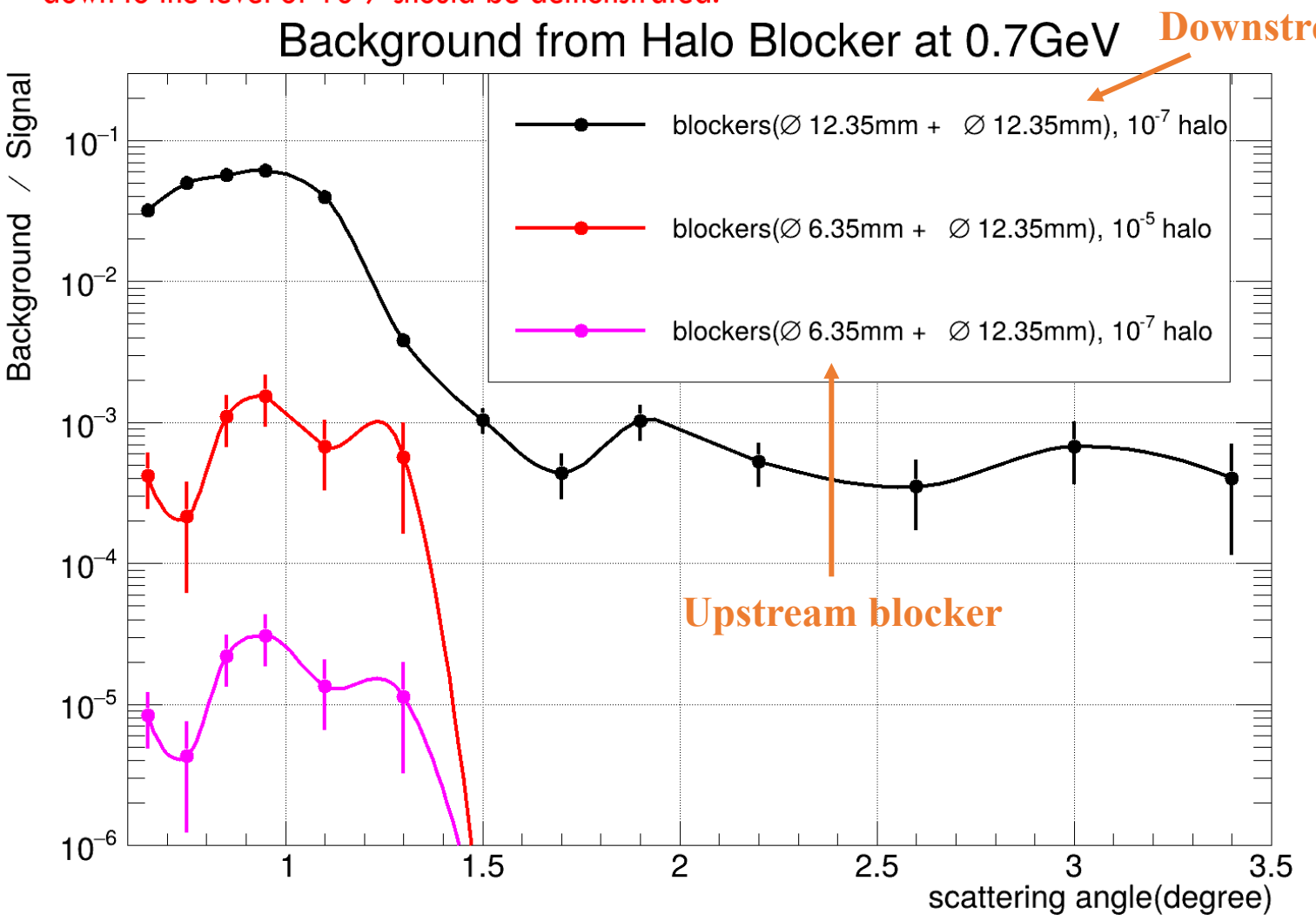
ERR Charge – PRad-II #4 Recommendation

The beam background contributions and associated uncertainties presented at the review were based on the beam halo level of 10-7, consistent with the original PAC proposal. On the other hand, the beam halo requirements were modified to 10-5 during the review. The beam background contributions and the corresponding uncertainties should be evaluated for beam halo levels of 10-5. Alternatively, the capability to measure the beam halo down to the level of 10-7 should be demonstrated.↵



Black curve:

- Bigger upstream tagger collimator
- 10^{-7} halo level,
- 4% background to signal ratio at low angles.

Red curve:

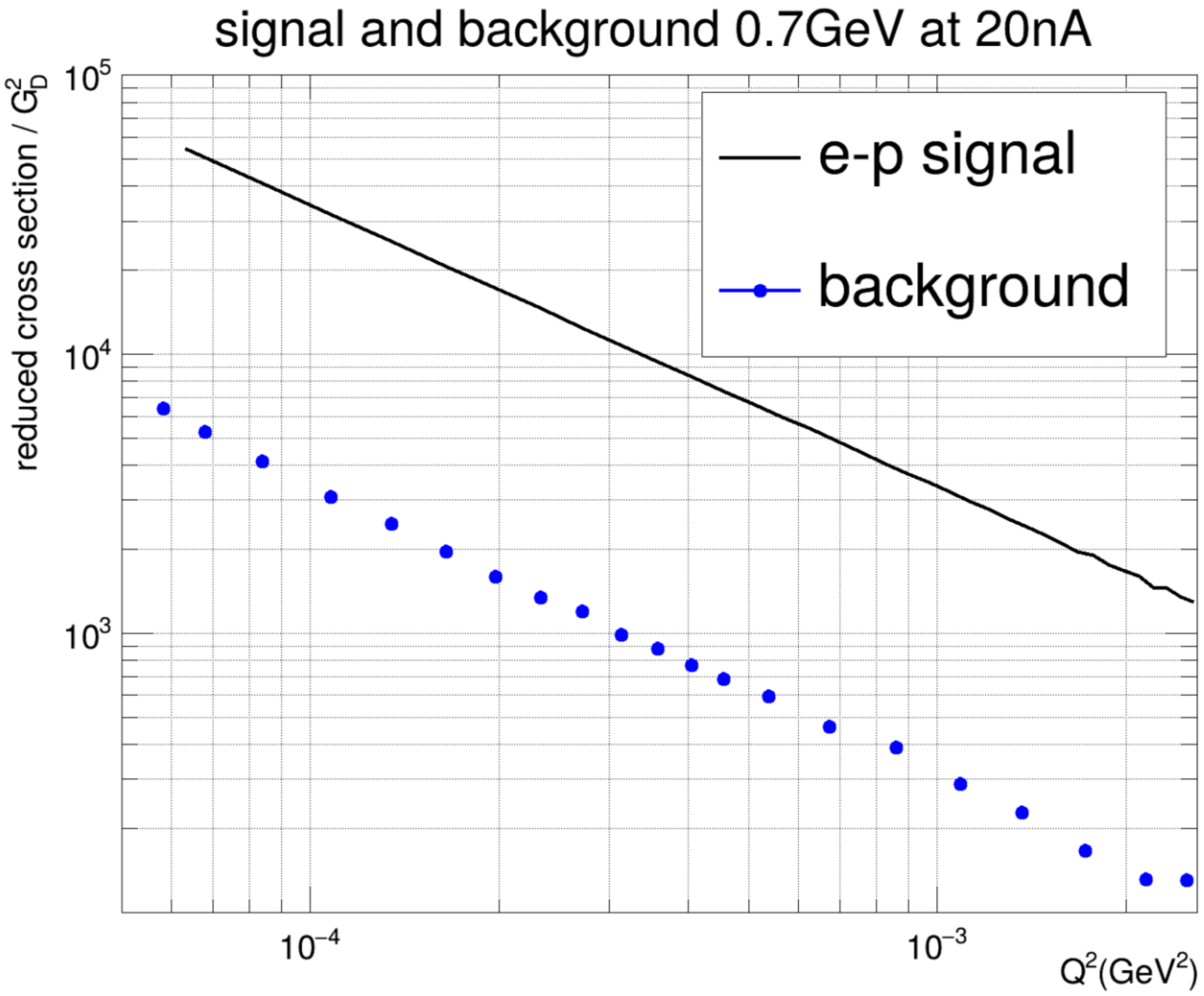
- Smaller upstream tagger collimator
- 10^{-5} halo level.
- Background ratio reduced to 0.1% level at low angles.

Magenta curve:

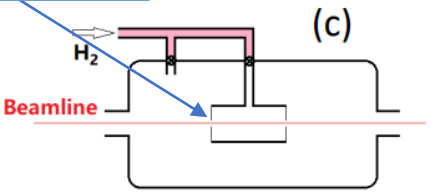
- Smaller upstream tagger collimator
- 10^{-7} halo level
- background ratio 0.002%.

ERR Charge – PRad-II #2 Recommendation

Recommendation:↵
A plot of reduced cross section vs Q^2 showing signal events and expected background events would help everyone see the potential for the background correction to introduce systematic errors into the radius determination. ↵

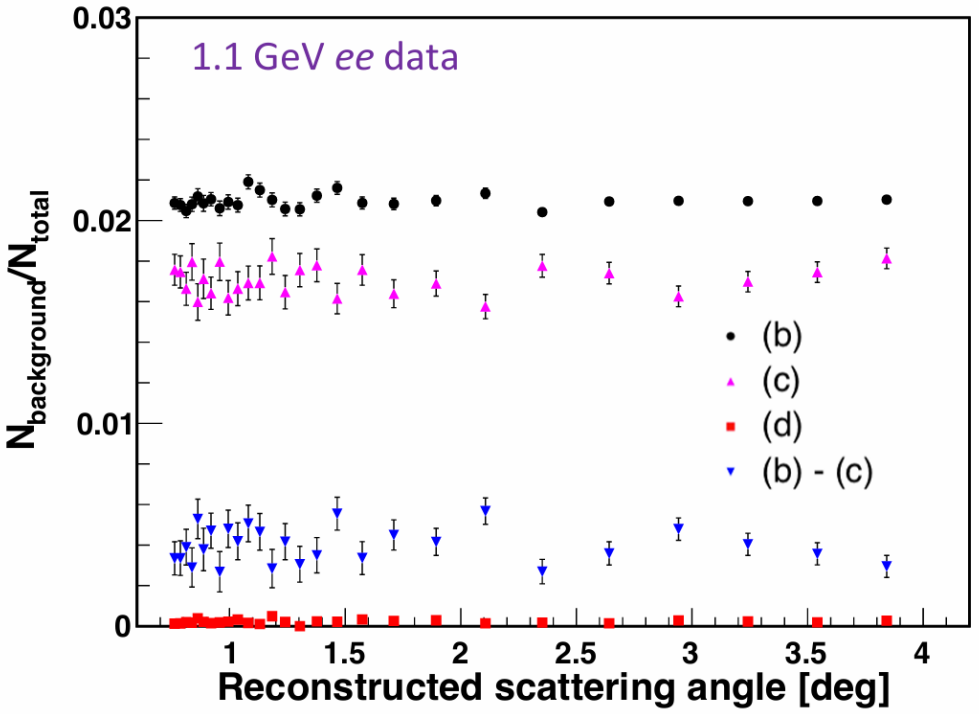


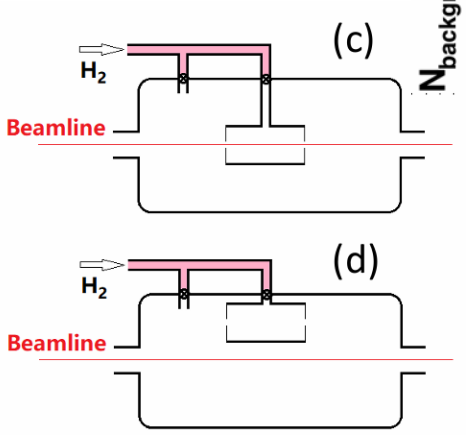
- Result based on beam halo level of 10^{-5}, dominated by target cell window

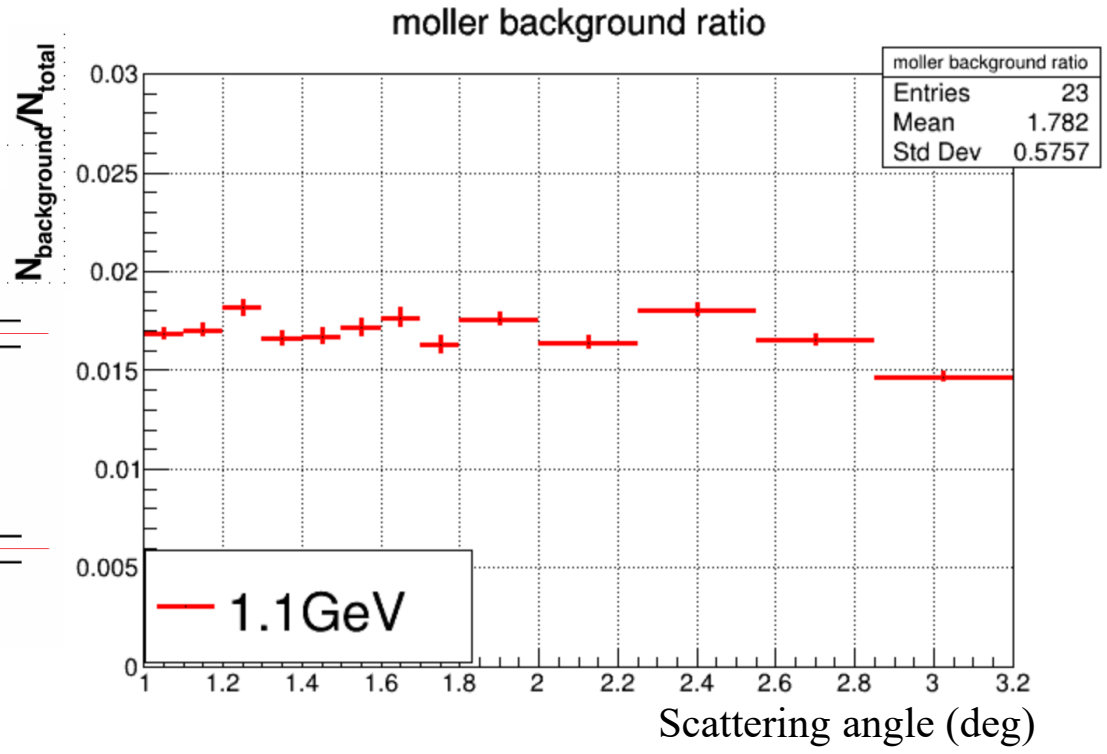


- ~9% total background to signal ratio at 0.7GeV, no obvious angle dependence.

- In PRad data, moller background ratio is ~1.7% (c – d, coming from halo hit on target cell win.)
- Simulation based on halo level of 10^{-5}, moller background ratio is also around 1.7%, same with PRad data
- As the simulation match the PRad data very well, could think PRad had a halo level of 10^{-5}

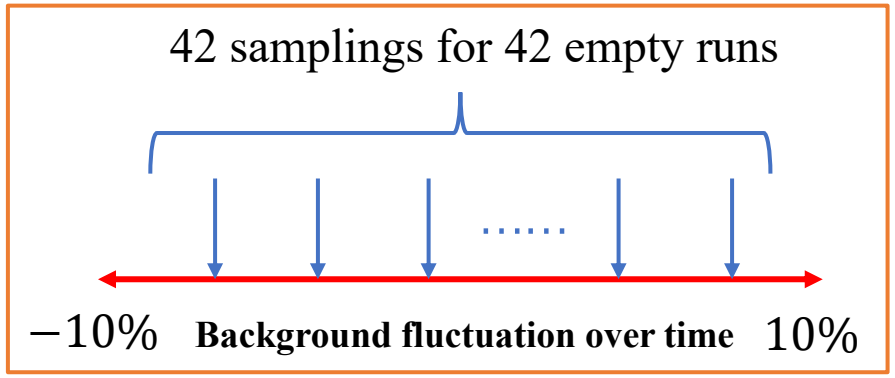


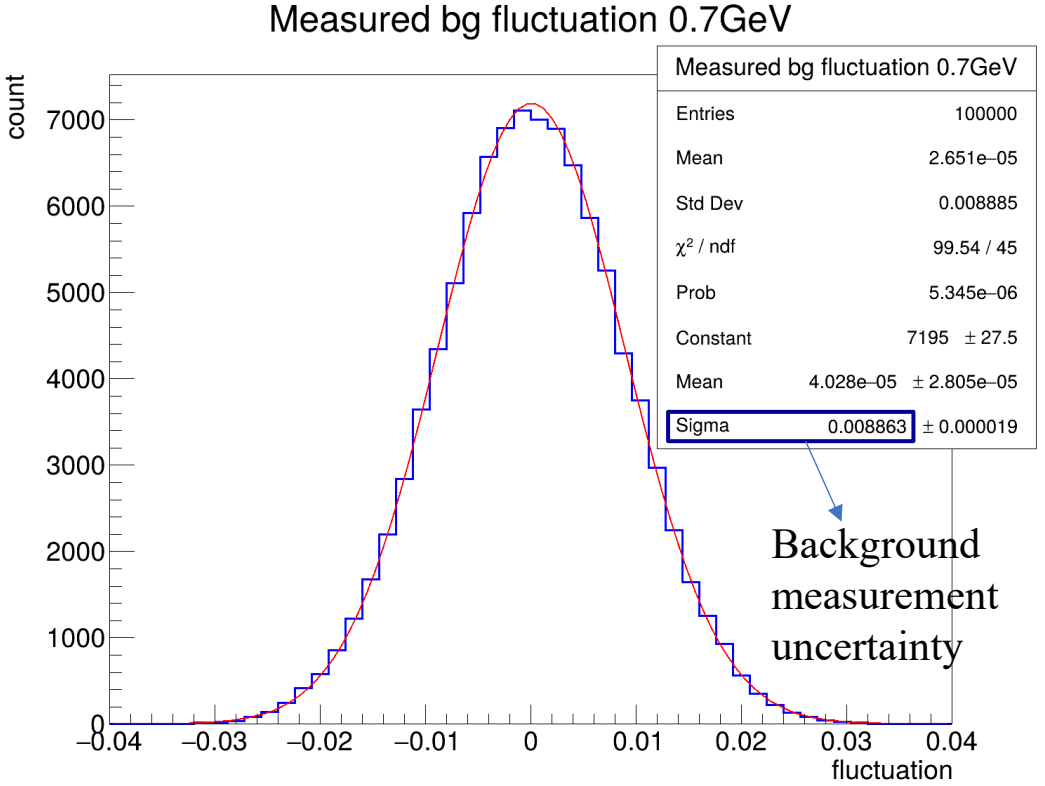




Halo Background Subtraction Uncertainty

- **Assume 1 empty target run after every 3 production runs(similar with PRad)**
- 7 PAC days for 0.7GeV, in total 126 production runs and 42 empty target runs.
- Assume halo ±10% fluctuation over time (number from PRad data), carry out 42 samplings through out the total period to get the average syst. uncertainty from time variation.
- The uncertainty of background measurement due to background fluctuation is 0.89%. For ~10% backgroud ratio, capable to keep 0.1% systematic uncertainty of background subtraction.





Halo Background Subtraction Uncertainty

- **1 empty target run after every 3 production runs**
- 10% background ratio in each bin
- The projected syst. uncertainty of subtraction due to background statistics