Profile Likelihood with the Alpha Factor

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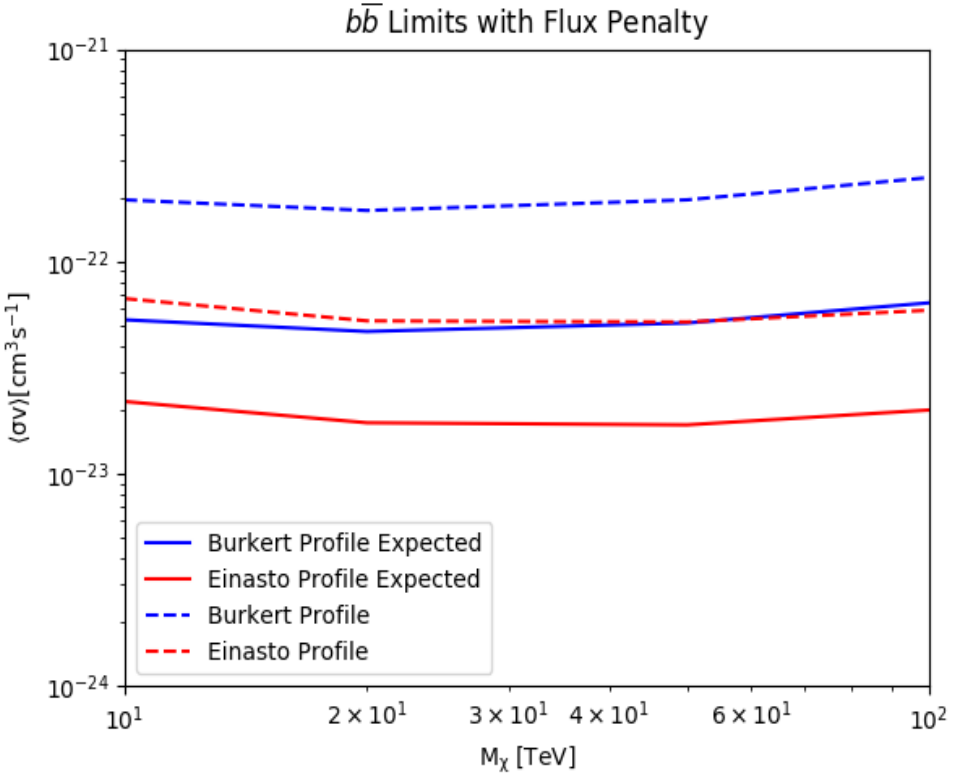
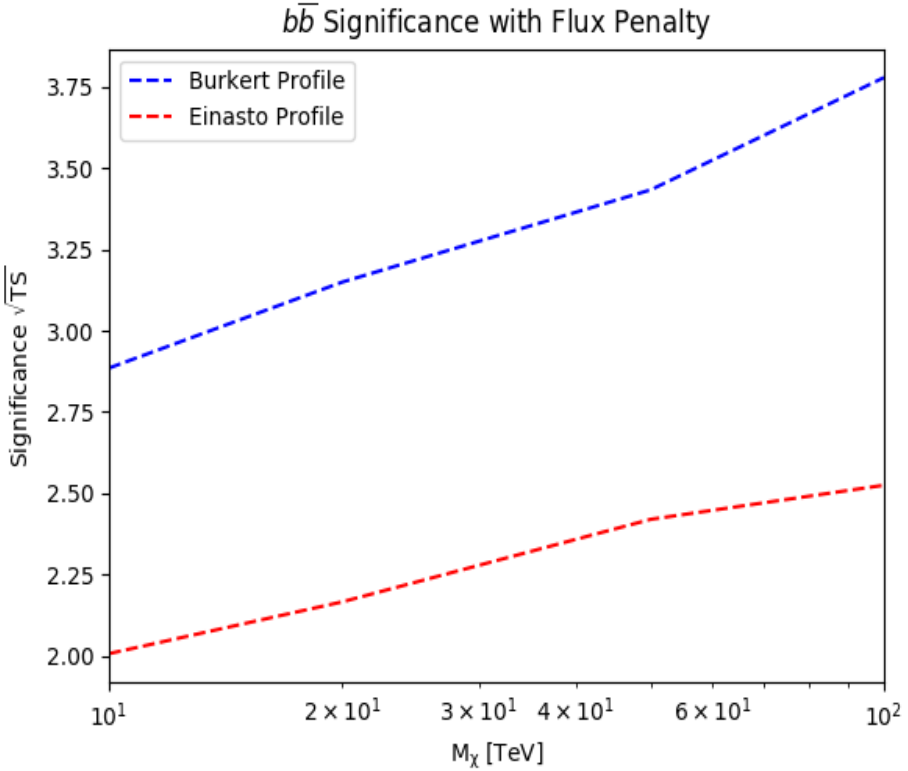
Profile Likelihood

- Treat alpha background as estimate of true-background
  - Let true background be a Poisson-distributed variable in each fhit and spatial bin
- Treat true background as nuisance parameter
  - Find true background in each bin such that likelihood is maximized for a given signal hypothesis
  - Formula is analytic in single-bin case
- Sum this profile likelihood together in each bin while fitting signal
- See: https://docs.gammapy.org/0.6/stats/fit_statistics.html#wstat

Limits with Profile Approach





Discussion

- Still an overall excess even with profile likelihood background
- Consistent with Pooja's results
  - For a very large (>5 degree) source hypothesis, significance distribution has very wide tails
  - Leads to overall excess on sky
- Histogram of significance in each ROI for DM fit is also consistent with this
- Alpha maps may not work for sources this large
- Where to go from here?