The Sensitivity of air Cherenkov telescopes for anisotropies in the γ-ray background

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- Motivation
- Discription of ToyMC
- Effect of abilities on power spectrum measurement
- Comparison with experiments

Motivation

- Diffuse γ-ray background
  may contain fraction from DM annihilation
- Origin may have imprint in anisotropy power spectrum
  - Emissivity of DM annihilation $\sim\rho^2$
  - Emissivity of conventional sourced $\sim\rho$

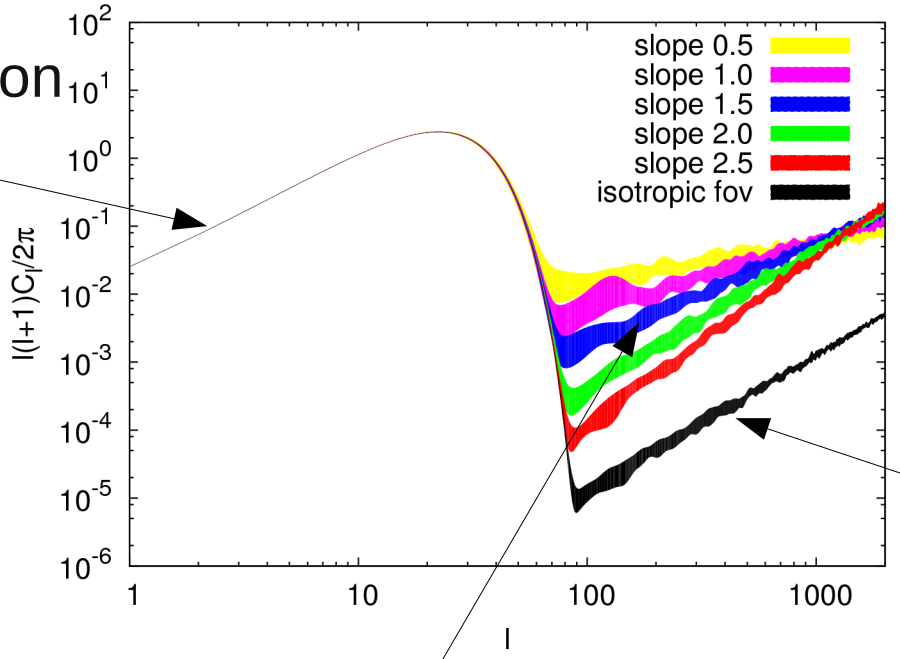
- How well can the anisotropy power spectrum be measured?
- What are the key abilities?

ToyMC

- Create skymap with given anisotropy power spectrum power law: $l(l+1)\,C_l \sim l^{\Gamma}$
- Create eventlist of experiment
  - Field of view (fov)
  - Point spread function (psf)
  - Signal to (isotropic) noise (s/n ratio)
- Multipol analysis of eventlist → et voilà ...

What do we see?

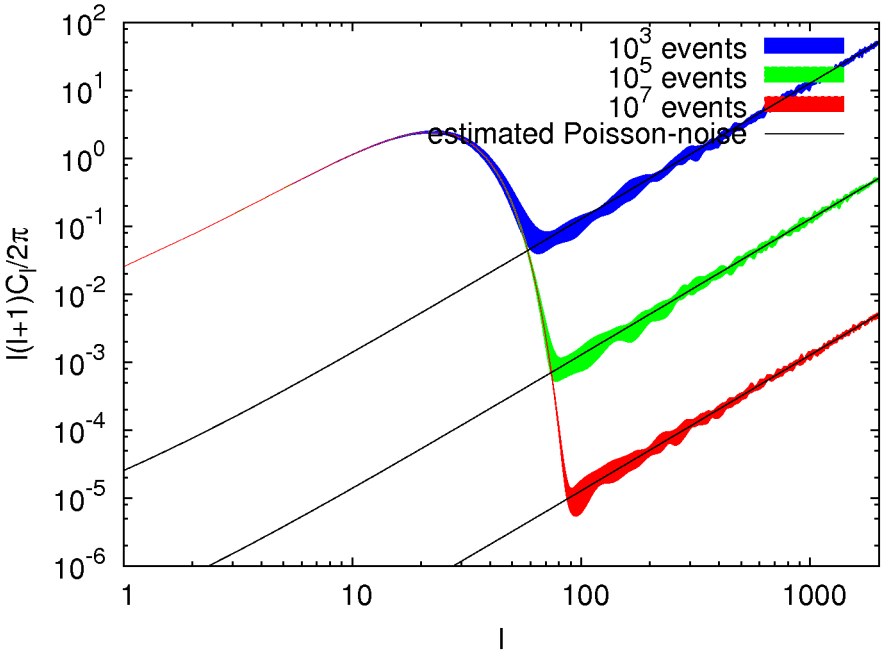
Windowing function



Poisson noise

Interesting part

Influence of event number

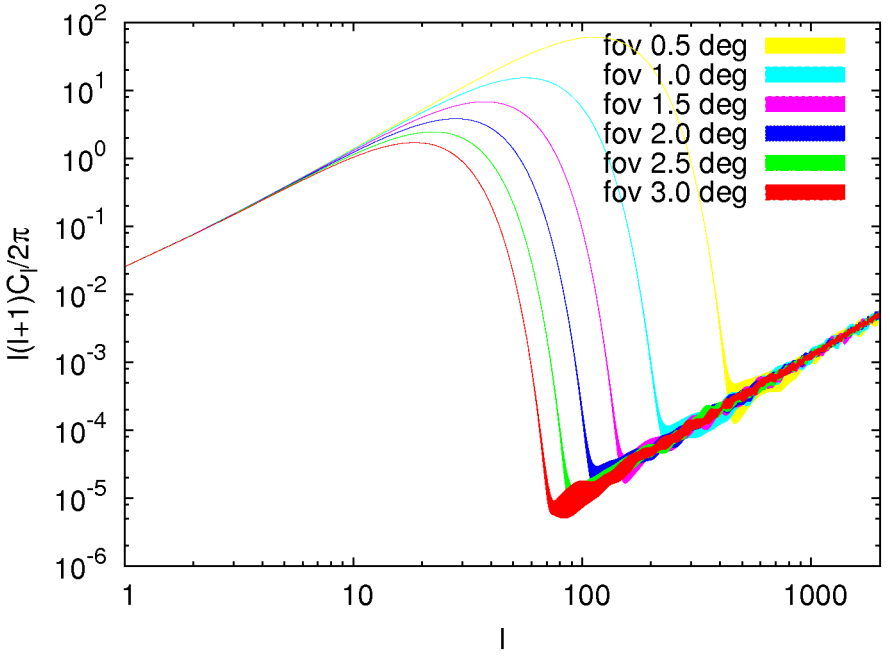


Poisson Noise: $C_l = 1/4\pi N$

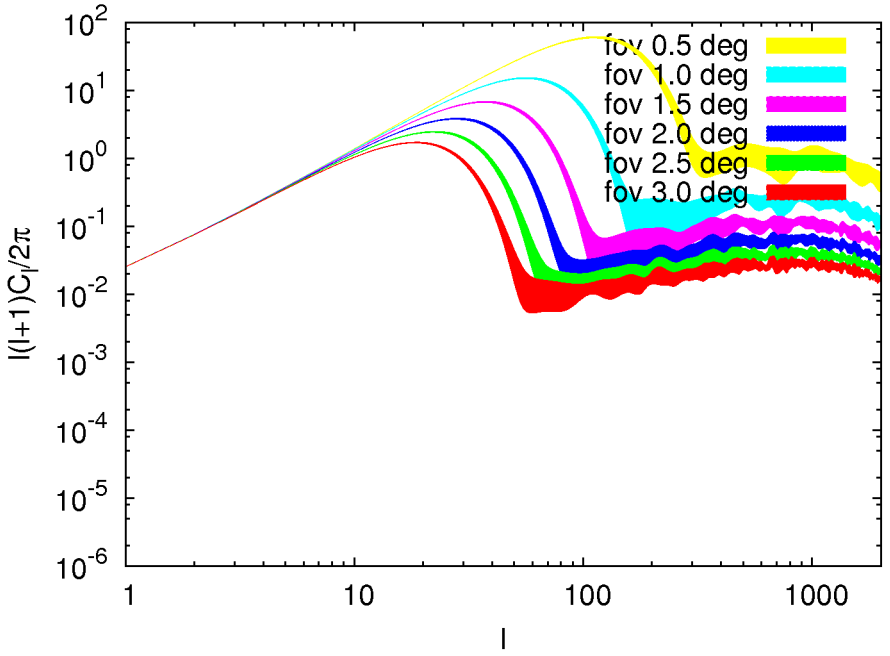
→ signal must be larger to be detectable

Influence of fov

Isotropic fov:



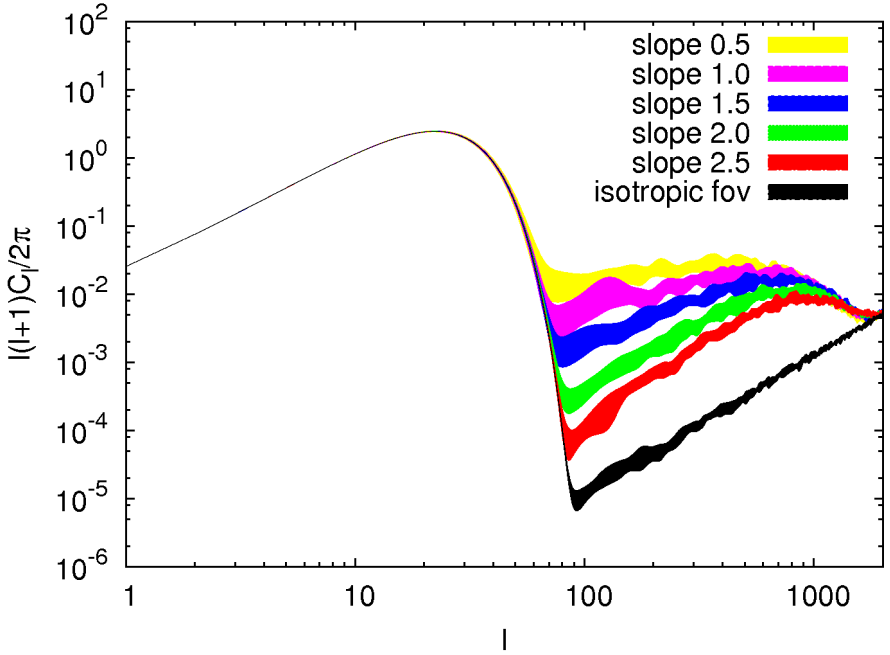
Anistotropies with slope 0.5:



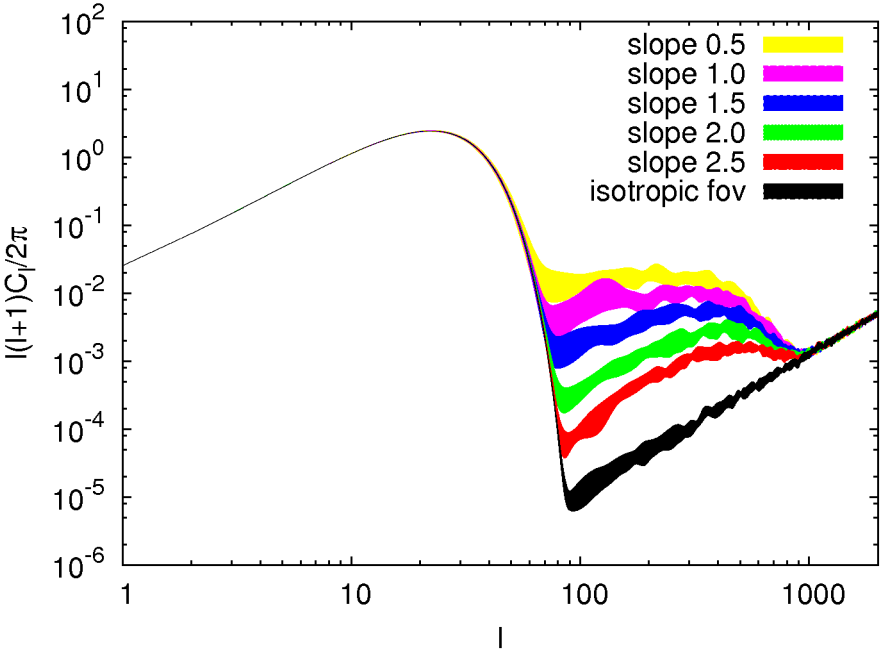
fov affects windowing function
→ smaller fov, larger minimal usefull l-value

Influence of psf

psf: 0.1 deg



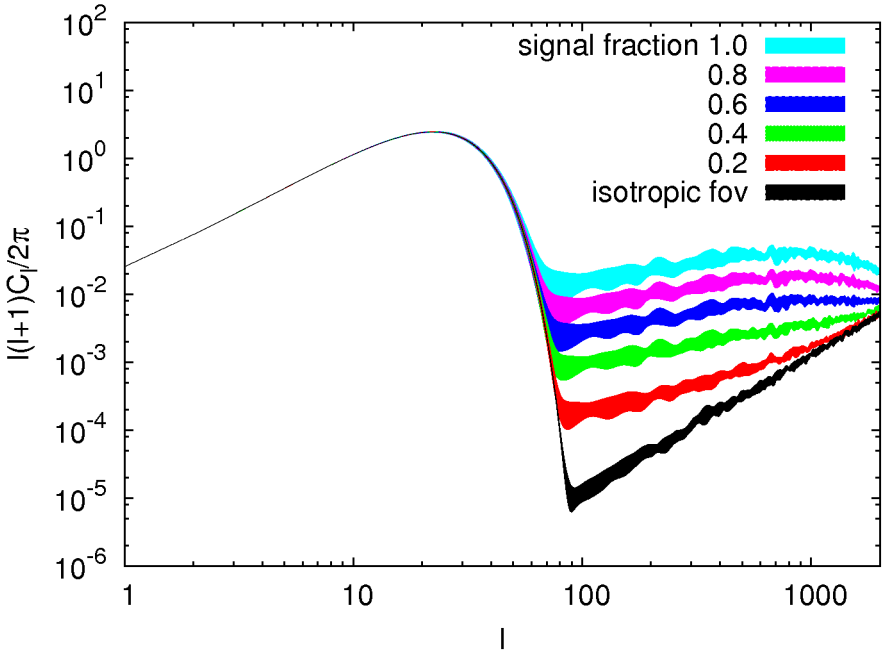
psf: 0.2 deg



psf smears out anisotropies

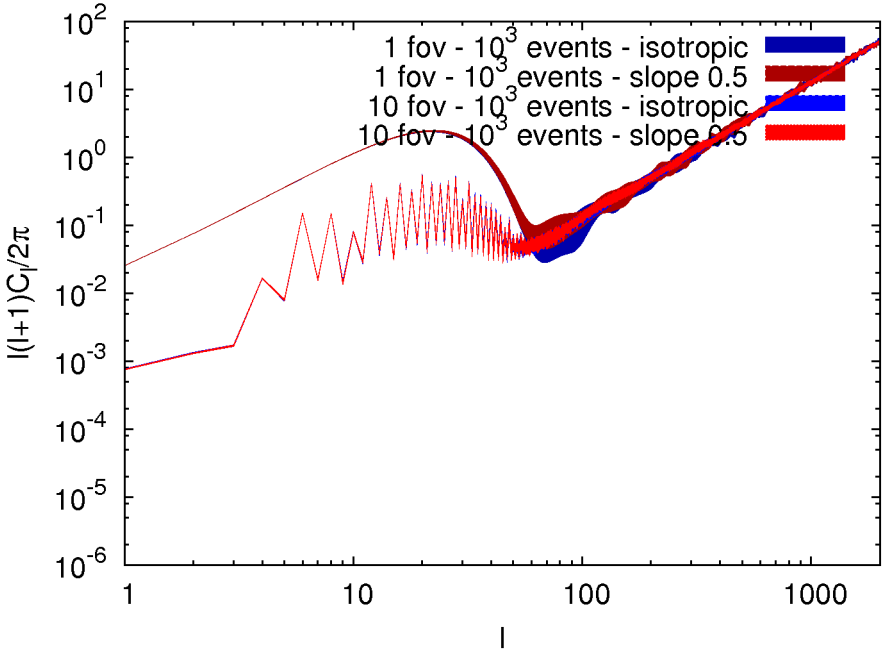
→ larger psf lovers l-value of unification with poisson noise

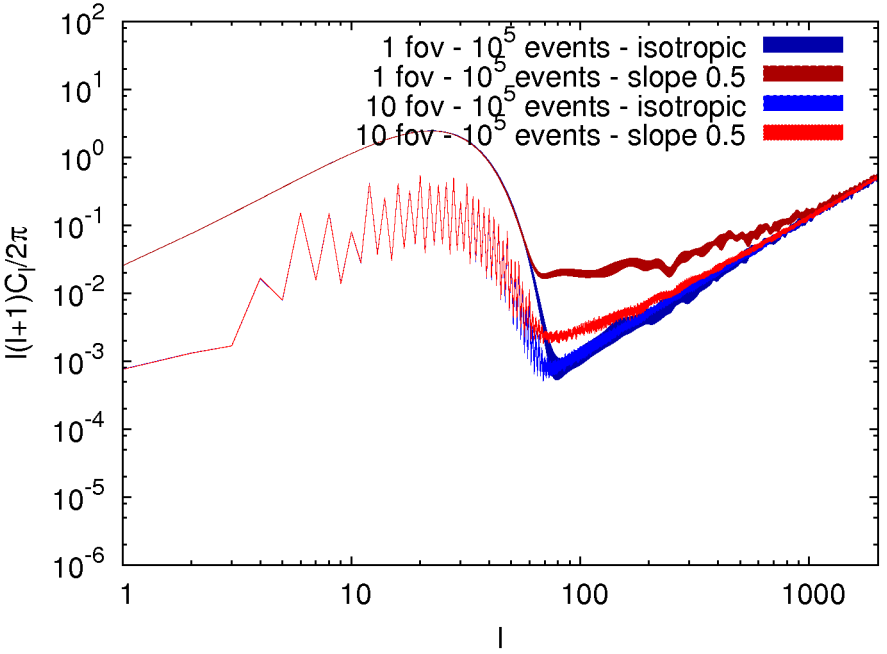
Influence of s/n

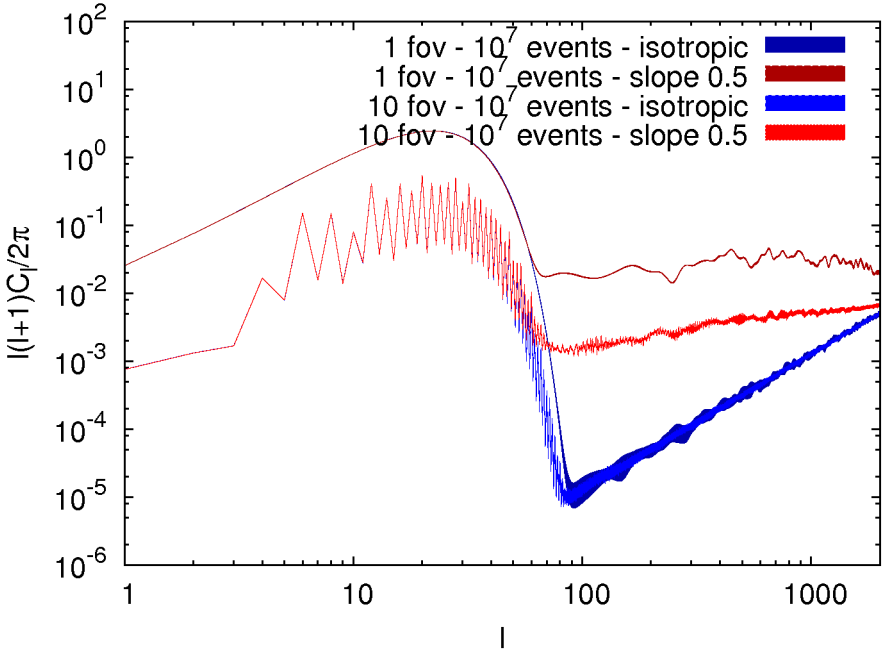


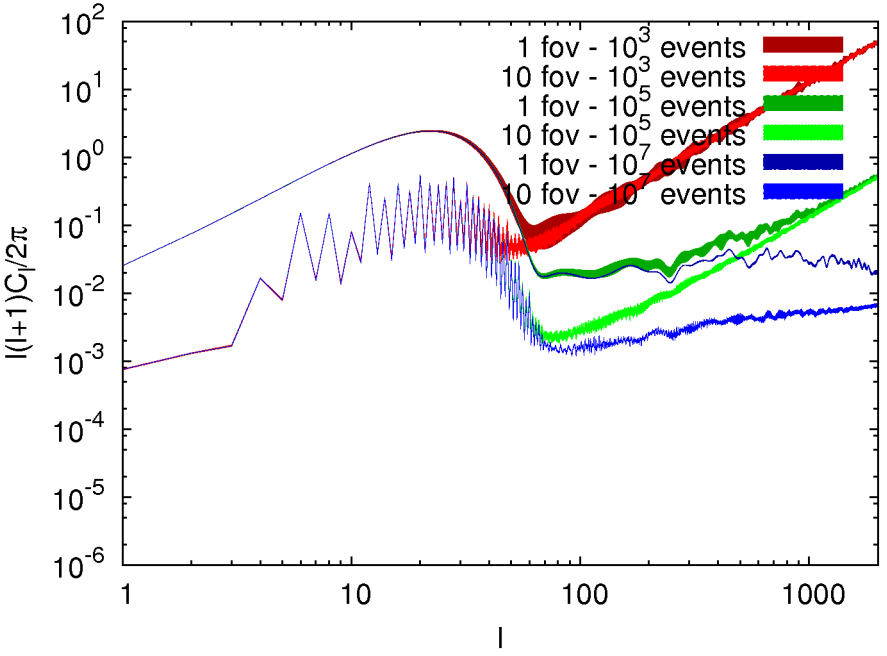
s/n (due to gamma hadron separation and isotropic component) decrease signal strength and can affect interesting region

Influence of observation strategy









Comparison with experiments

	Current experiments (H.E.S.S.)	Future experiments (CTA)
fov	2.5 deg	larger
psf	0.1 deg	~ 0.03 deg (energy dependent)
Number of γ-like events per hour	~5000	larger (x10)

Summary

- ToyMC for anisotropy studies with small fov instruments
- fov and psf truncate useful l-region to measure spectrum
- s/n seems to be most important ability
- More sensitive for long observation on one fov