



Istituto Nazionale di Fisica Nucleare  
SEZIONE DI NAPOLI



UNIVERSITÀ DEGLI STUDI DI NAPOLI  
FEDERICO II

# A New Computational Approach to Gamma-Ray Flux Modeling for WIMP Annihilation Detection

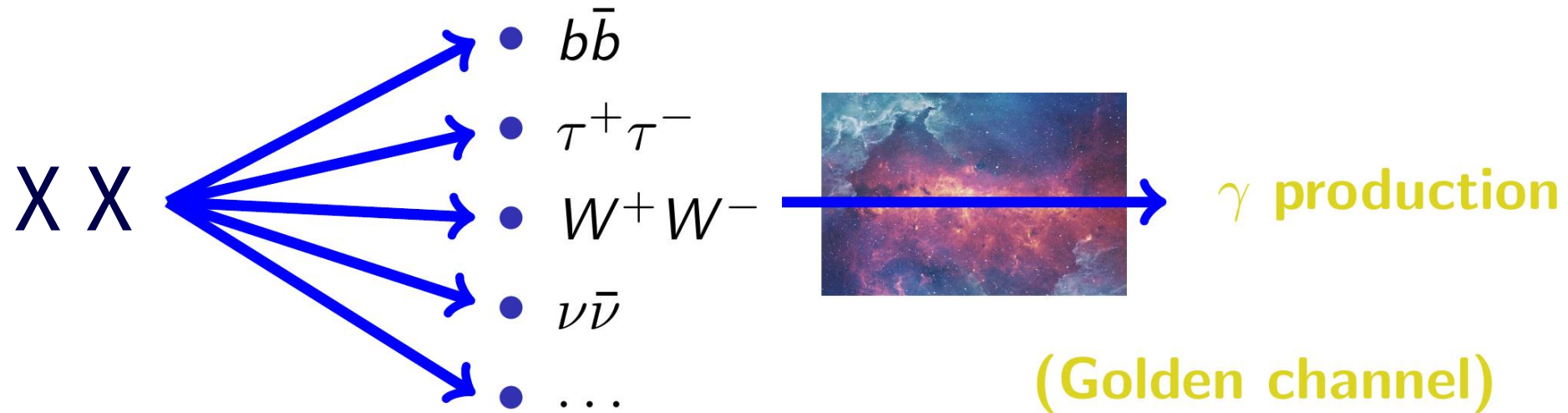
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# WIMP Indirect Detection



Expected gamma-ray flux on Earth:

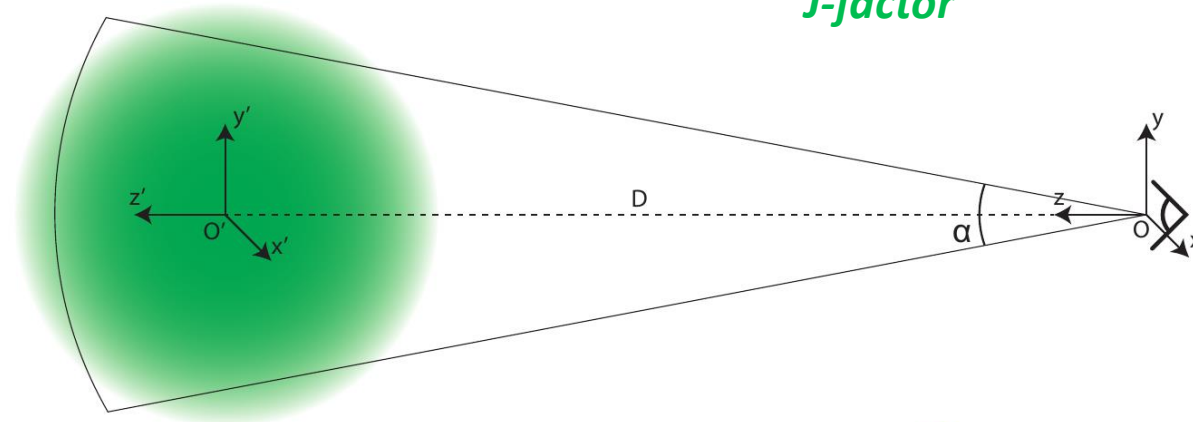
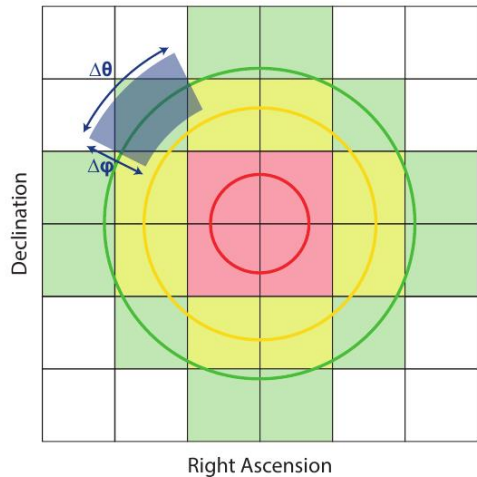
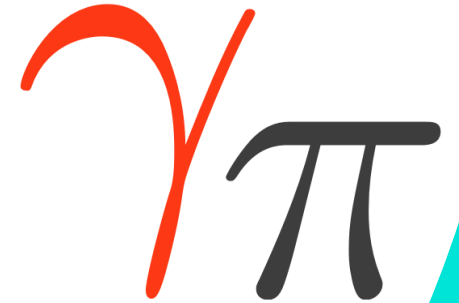
$$\frac{d\Phi_\gamma}{dE} = \int_V \frac{\Phi}{dE dV} dV = \frac{1}{8\pi} \frac{\langle \sigma v \rangle}{m_\chi^2} \frac{dN_\gamma}{dE} \int_{\Delta\Omega} d\Omega \int_{l.o.s.} dl \rho_\chi^2$$

# Spatial Model Computation

$$\frac{d\Phi_\gamma}{dE} = \int_V \frac{\Phi}{dEdV} dV = \frac{1}{8\pi} \frac{\langle \sigma v \rangle}{m_\chi^2} \frac{dN_\gamma}{dE} \int_{\Delta\Omega} d\Omega \int_{l.o.s.} dl \rho_\chi^2$$

Method developed and implemented in:

*J-factor*



$$dl = dr, \quad \Delta\theta = 2\pi/n_{pix}, \quad \Delta\phi = \frac{\Omega}{\Delta\theta \sin \phi}$$

# Sanity Checks

To test the validity of my method, I reproduced J-factor values computed by M. R. Buckley et al. (2015) for the DM halo in the Large Magellanic Cloud, also computing sensitivity curves for the detection with the Cherenkov Telescope Array Observatory.

