# Indirect dark matter searches with gamma-ray observatories

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## Introduction

It is generally accepted nowadays that the matter density of the Universe mainly consists of an unknown component, called Dark Matter (DM). It is also believed that DM is formed of a new neutral, stable and non-baryonic elementary particle. In high density environments of the Universe DM may self-annihilate and produce a strong gamma-ray signal. Among all possible targets, dwarf galaxies of the Local Group are among the most promising for discoveries due to their large DM content. Though no dark matter signal has ever been detected and the data has been used to shrink the allowed parameter space for dark matter particles. This project aims at using the predicted increase of the number of known dwarf galaxies and estimate the improvement in the detection sensitivity to a dark matter signal that will be achieved by the future gamma-ray observatories.

## Objectives

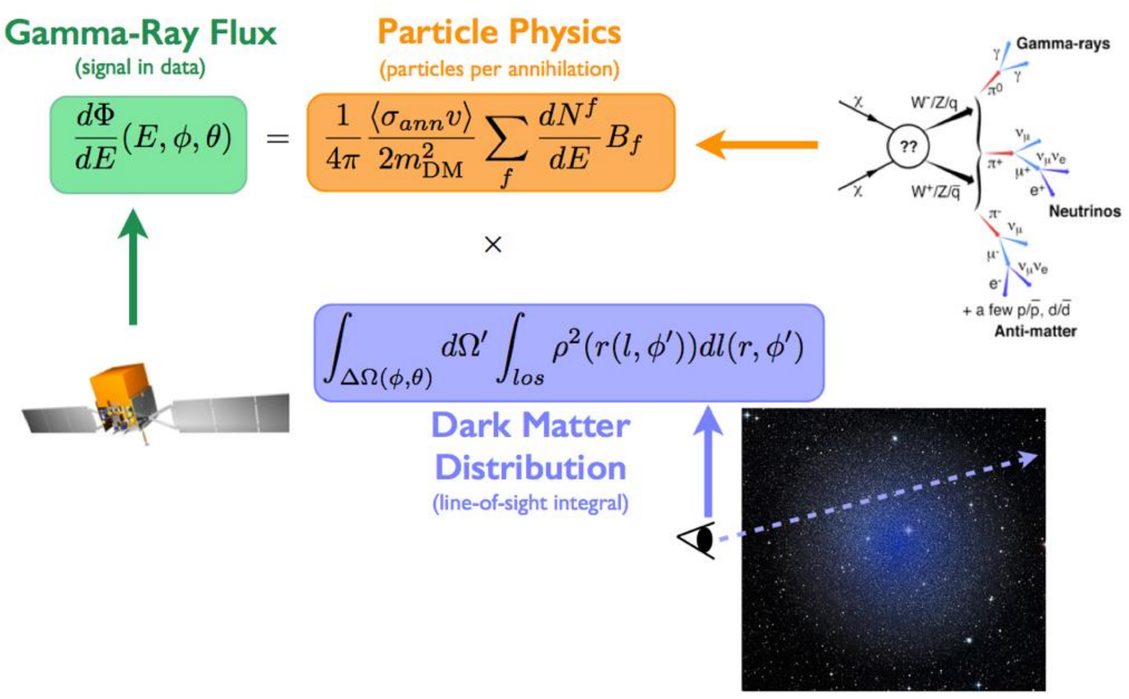
- Study new models of dark matter annihilation
- Calculate the gamma ray flux
- Estimate the sensitivity of CTA and other future gamma-ray experiments
- Implement analysis techniques to optimize the sensitivity to a Dark Matter signal.

## Methods

**New models of dark matter annihilation**

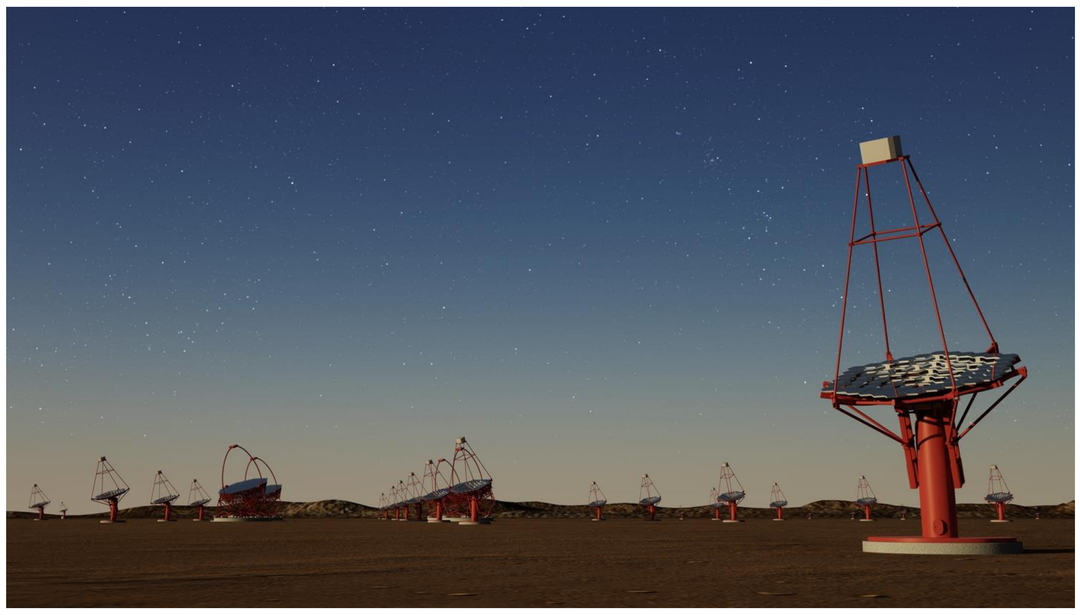
This project start with a overview of dark matter annihilation process including secluded and scalar doublets. The idea is to have a list of potential model candidates to be tested by CTA.

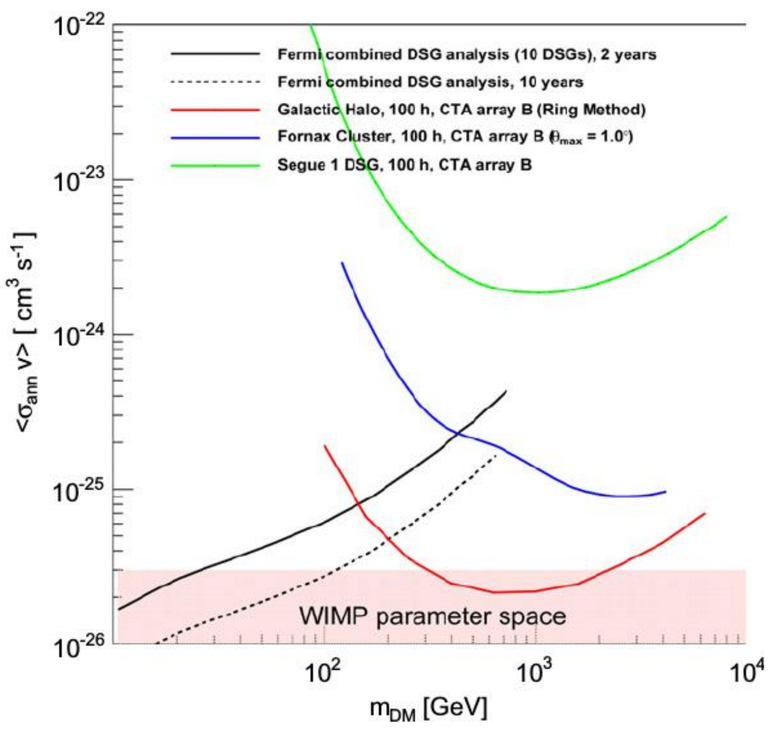
**Calculate the gamma ray flux**




## Methods

**Estimate the sensitivity of CTA and other future gamma-ray experiments**






**Implement analysis techniques to optimize the sensitivity to a Dark Matter signal.**

This is the challenging part of the project for which there is no recipe. The possibility to detect a Dark Matter signal depends on the measurement strategy and on the analysis techniques. Current experiments have developed strategies and techniques optimized for their telescope and array configurations. Such an optimization still has to be done for CTA and this project intends to contribute with these efforts.

The basic procedure consists in comparing the signal in different parts of the sky, subtracting the diffuse emission to keep on the Dark Matter signal. The analysis procedure used by the H.E.S.S. experiment, is going to be the starting point for the development of such optimization.

## Contact Info

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