

Phenomenology of Dark Matter Indirect Detection **(Master 2 internship + possible PhD thesis project)**

About 85% of the matter in the Universe is in the form of an unknown substance dubbed **Dark Matter (DM)**. While some of its general properties are known, its actual nature is still undetermined. The most popular hypothesis is that it consists of a new, **yet-to-be-discovered elementary particle**. One of the possible strategies to investigate it is via the so-called **Indirect Detection (ID)**: studying the possible excesses in **cosmic rays** that could be produced by the annihilations (or decays) of DM particles in the galactic halo, and comparing them with the theoretical predictions from particle physics models.

Within this broad context, the proposed Master 2 internship (and the possible ensuing PhD project) will proceed in different directions: X-rays, velocity-dependent annihilations, primordial black holes constraints, synchrotron bounds, purely gravitational effects... (to be decided according to the interest and the opportunity).

Following the typical course, after the Master 2 internship lasting a few months during Spring 2024 and subject to mutual agreement, the student can then apply for a PhD fellowship (from EDPIF or from other sources) and, if successful, start the PhD in Fall 2024, for a duration of 3 years.

Application procedure: Candidates should send by email to marco.cirelli@gmail.com:

- i. their CV,
- ii. a transcript of their academic records,
- iii. a short description of their interests (optional, and in any case no longer than 1 page).
- iv. They should also arrange for 1 or 2 short letters of recommendation to be sent to the same address, by scientists familiar with their studies and academic record.

Applications are preferred **within December 31st, 2023**, but will be considered afterwards if the position is not filled. Short-listed candidates will be invited for a meeting, either in person or remotely.