

## Decoding the Nature of Dark Matter in collider and non-collider searches

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Determination of the nature of Dark Matter (DM) is one of the most fundamental problems of particle physics and cosmology. If DM is light enough and interacts with Standard Model particles directly or via some mediators with a strength beyond the gravitational one, it can be directly produced at the Large Hadron Collider or future particle accelerators. The typical signature from DM produced in particles collisions is missing transverse energy, MET, due to the fact that they escape undetected from the experimental apparatus. We have found that different energy dependence of the cross-sections is connected to a different distributions of the invariant mass of the DM pair, and consequently to different MET distributions such that certain DM operators can be distinguished from each other and, through this, it is possible to characterise the spin of DM in some cases. On the other hand DM searches in non-collider experiments – DM direct and indirect detection ones provide independent complimentary potential to probe the nature of DM and DM theory space.

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