

# Dark Matter Identification: Connecting Theory and Signature Space



**Monday 1 April 2019 - Friday 12 April 2019**

**Mainz Institute for Theoretical Physics, Johannes Gutenberg University**

## Scientific Programme

The nature of Dark Matter (DM) is a truly fundamental problem of particle physics and cosmology, which requires physics Beyond the Standard Model (BSM). The existence of DM, contributing 80% of the matter in the Universe, has been established beyond any reasonable doubt thus providing undeniable experimental confirmation of BSM physics.

The complementarity of collider and non-collider DM searches led to a substantial number of recent studies and the upcoming upgrade of direct detection (DD), indirect detection (ID), cosmological, and collider experiments create a real possibility for the DM problem to be elucidated in the next few years.

During the 2 weeks of this Program, we expect leading scientists and active young researchers to make progress in developing the following objectives:

discuss and work on the classification and building of sets of Minimal Consistent DM (MCDM) models for a consistent characterisation of DM searches

start the implementation of missing models into DM tools such as micrOMEGAs and/or MadDM

adapt and improve the tools designed for comprehensive scans of parameter space to MCDM

assess the potential of all collider signatures, including the less explored signatures from mono-Z,W,H production, vector-boson fusion with missing transverse momentum, soft-lepton, displaced vertices and disappearing tracks, the latter also characterise non-WIMP scenarios

develop strategies for comparing/mapping the multidimensional MCDM parameter space for collider and DD/ID searches

as a result of the discussions and development above – develop mapping between models (theory space) and various DM signals at collider and non-collider experiments (signature space); this development would be a great step towards decoding the nature of DM in case some signals are observed.

We will organise working groups on specific topics defined together with the participants. In addition to the talks planned by the organisation committee, each working group will be responsible for organising 30 minutes presentations. There will be a maximum of 4 talks per day, in order to leave time for discussion sessions and collaborative work.