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Er mørk materie en partikkel, og hva er dens egenskaper? Avhandlingen ser på flere modeller som beskriver mørk materie som en ny fundamental partikkel, og analyserer hvordan disse kan hjelpe oss med å forklare en rekke diskrepanser mellom astrofysiske observasjoner og den kosmologiske standardmodellen.

Today there is an insurmountable evidence that there is much more invisible matter in the universe than the visible kind that makes up the galaxies, stars and planets. This invisible matter, known as Dark matter (DM) in the literature, accounts for 85% of the total matter in the universe. The present day precise cosmological experiments demand an equally accurate model prediction of the amount of DM in the universe. In this dissertation, we have developed an efficient method to estimate radiative strong-force corrections to the DM abundance.

Astrophysical observations on scales larger than the galactic scales can be described very well by what is known as the cosmological *concordance* model. In the concordance model, DM is assumed to only interact gravitationally. Though successful on large scales the model has difficulties in explaining some of the observations on scales smaller than sub-galactic scales. A DM model allowing for interactions much stronger than the weak gravitational interaction can lift some of the discrepancies between model predictions and small-scale observations. This work performs a systematic scrutinization of model frameworks that can alleviate the discrepancies.

Lastly, we also constrain scenarios where the amount of dark matter can decrease with time, for example, due to decay etc. We find that such classes of models have the potential to alleviate discrepancies between some late and early time cosmological observations.