Reg. No: 2015/18/M/ST2/00518; Principal Investigator: prof. dr hab. Maria Teresa Krawczyk

Project has a character of singlets within supersymmetry or not. Precise theoretical description of the processes with the Higgs boson at the LHC is necessary for performing dedicated searches of additional particles that appear in such models. Those particles in general weakly interact with W and Z bosons and therefore precise caclulations for their production processes are needed. It implies the necessity of including loop corrections which, due to their complicated and very involved structure, require the development of numerical codes. Models that will be in the focus of the current proposal possess particles that can serve as good candidates for dark matter. Combining the current LHC data with the measurements of dark matter relic density and from dedicated astrophysics experiments allows even now exclude some of the proposed theoretical scenarios. With new expected data from LHC run 2 we may expect a real breakthrough in disentangling some of controversies coming from direct dark matter measurements. Properties of the Higgs particle are very sensitive to the dark matter sector, especially in the "Higgs portal" models, where only Higgs particle interacts with dark matter particles and the searches at the LHC for new particles and measurements of their properties might indispensable for building a theory of fundamental interactions at very high energies. We will investigate the stability of various models, which is a necessary condition for a consistent description of processes at high energies, possibly up the he Planck scale where they will meet with gravity.

As a result of the project we aim at building theoretical description of the newest LHC data as well as astrophysical observations in models with extended Higgs sector which will allow to make projections for future experiments and accelerators, such as linear e+e- collider.