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Sommario/riassunto	This thesis describes in detail the search for new phenomena in mono-jet final states with the ATLAS experiment at the LHC. The final state is considered the golden channel in the searches for large extra dimensions (LED) but also allows access to a very rich SUSY-related phenomenology pertaining to the production of weakly interacting massive particles (WIMPS), SUSY Dark Matter candidates, GMSB SUSY models with very light gravitino masses, as well as stop an sbottom pair production in compressed scenarios (with nearly degenerated squarks and the lightest neutralino), and also invisible Higgs searches, among others. Here, a number of these scenarios are explored. The measurements presented yield new powerful constraints on the existence of extra spatial dimensions, the pair production of WIMPs, and also provide the best limit to date on the gravitino mass. .