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Interplay between collider and dark matter searches in composite Higgs models

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Many composite Higgs models predict the existence of vector-like quarks with masses outside the reach of the LHC, e.g. mQ > 2 TeV, in particular if these models contain a dark matter candidate. In such models the mass of the new resonances is bounded from above to satisfy the constraint from the observed relic density. We therefore develop new strategies to search for vector-like quarks at a future 100 TeV collider and evaluate what masses and interactions can be probed. We find that masses as large as ~6.4 (~9) TeV can be tested if the fermionic resonances decay into Standard Model (dark matter) particles. We also discuss the complementarity of dark matter searches, showing that most of the parameter space can be closed. On balance, this study motivates further the consideration of a higher-energy hadron collider for a next generation of facilities

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