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Search for sub-GeV dark sector mediator particle in NA64 at SPS

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NA64 experiment at CERN SPS is designed for direct and missing energy search for dark sector particle decays in sub-GeV range. Assuming an existence of new effective force between dark sector and ordinary matter, transmitted by a new massive gauge boson, one can perform a search for such a particle in an active beam dump experiment like NA64. Dark sector particles may be produced in high-energy electron recoil processes, via coupling of mediator particle to electrons, followed by subsequent decay of the mediator in visible/invisible modes. The case of scalar mediator particle is studied, we calculate mediator production cross section using exact tree-level method and compare the results with previous calculations via Weizsacker-Williams method, resulting in modification of NA64 Monte-Carlo simulation package. Simulation results are cross checked with vector mediator particle case.

Primary author(s) : SHCHUKIN, Dmitry (P.N. Lebedev Physical Institute); NA64 COLLABORATION

Presenter(s) : SHCHUKIN, Dmitry (P.N. Lebedev Physical Institute)

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