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Search for muon catalyzed d^3He fusion.

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The measurement of cross-section for the nuclear fusion reaction $d +^3 He \rightarrow ^4He + p$ at ultra-low energies is of interest in pure and applied physics. This fusion process is involved in the primordial nucleo-synthesis of the light elements in the early Universe. This reaction is a mirror reaction of the $d + t \rightarrow ^4He + n$ fusion process and can be considered as a perspective source of thermonuclear energy.
We present a detailed study of the search for muon catalyzed d^3He-fusion, which was performed using the MuSun experimental setup. Based on the collected statistics , an upper limit for the rate λ_f of muon catalyzed d^3He fusion was set in this experiment performed with the $D_2 +^3 He(5\%)$ gas mixture at $31K$ temperature with the gas density $\phi = 6.2\%$ of the LHD $\lambda_f \leq 6.3 \cdot 10^4 s^{-1}$ at 90% $C.L.$

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