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Search for heavy sterile neutrino from Ds decay

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Standard Model of high energy physics is very successful, but neutrino sector is not completely accommodated into it (e.g. neutrino oscillations). One of the possible solution is introduction of heavy sterile neutrino, which does not have any flavour and interacts with only flavour SM neutrinos via oscillations.

In this talk we present the preparatory studies dedicated to the future search heavy sterile neutrino N in CMS Experiment, where N is originating from $Ds^+ \rightarrow \mu^+ N \rightarrow \mu^+ \mu^+ \pi^-$ decay, and Ds^+ are coming from semi-leptonic decays $Bs^0 \rightarrow Ds^+ \mu^- \mu_{\nu}$. These studies are original and were conducted for the first time within the CMS Experiment.

The talk is divided into the two parts. For the first one we study the reference and normalisation channels $Ds^+ \rightarrow \pi^+ \pi^+ \rightarrow K^+ K^- \pi^+$ and $Ds^+ \rightarrow \pi^+ \pi^- \pi^+$ (where Ds^+ is coming from both prompt and semi-leptonic Bs^0), using CMS data (2018 $\sqrt{s} = 13$ TeV pp-collisions) with the dedicated BParking dataset (which contains a detached muon with large p_T – semi-leptonic signature). For the second one we provide the detailed studies of signal $Ds^+ \rightarrow \mu^+ N$ decay using Monte-Carlo simulation samples with CMS detector 2018 conditions. Several points on $(m_N, V_{N\mu})$ plane are generated for the sterile neutrino properties, where m_N and $V_{N\mu}$ are the expected mass of N and coupling parameter with mass. We study kinematic and topological variables of the involved particles, generator and reconstruction efficiencies in dependence of N properties.

The obtained results will be used for the future search for this decay and heavy sterile neutrino, using real CMS Experiment data.

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