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## The search for C-noninvariant decay $\pi^0 \rightarrow 3\gamma$ and the rare decay $\pi^0 \rightarrow 4\gamma$ in NA62 (CERN) experiment

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The aim of the poster is to demonstrate status of the work in estimation of NA62 [1] experiment sensitivity towards the search for forbidden decay  $\pi^0 \rightarrow 3\gamma$  and rare decay  $\pi^0 \rightarrow 4\gamma$ . Current branching-ratio upper limit is  $3.1 \times 10^{-8}$  (90% C.L.) for the  $\pi^0 \rightarrow 3\gamma$  decay and  $2 \times 10^{-8}$  (90% C.L.) for  $\pi^0 \rightarrow 4\gamma$  decay established in Los Alamos National Laboratory [2].

$K^+ \rightarrow \pi^+\pi^0$  decays were used as a source of  $\pi^0$ . Selection criteria for events with 3 or 4 products after  $\pi^0$  decay in NA62 detector were developed. NA62 detector and all physical processes were modelled with Monte Carlo method using Geant4. Estimation of experiment sensitivity without background events consideration is 1 order better, than current upper limit for  $\pi^0 \rightarrow 3\gamma$  and  $\pi^0 \rightarrow 4\gamma$  decays. Background processes for both decays were studied. Main contribution in background events is  $K^+ \rightarrow \pi^+\pi^0$ ,  $\pi^0 \rightarrow 2\gamma$  decay, when photon interacts with detector, and  $e^+e^-$  pair is created. Comparison of Monte Carlo simulation and experimental data was done. The estimation of number of background events inside signal region was obtained.

Literature:

1. Cortina Gil E., et al. The Beam and detector of the NA62 experiment at CERN // JINST 2017. V. 12. P05025
2. McDonough J., et al. New searches for the C-noninvariant decay  $\pi^0 \rightarrow 3\gamma$  and the rare decay  $\pi^0 \rightarrow 4\gamma$  // Phys. Rev. D 38(1988), 2121

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