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Search for EC/EC-capture of ^{58}Ni on excited states of ^{58}Fe.

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Double electron-capture (EC/EC) of ^{58}Ni on excited states of ^{58}Fe is investigated at Baksan neutrino observatory INR RAS in DULB-4900 laboratory (4900 m w. e.) using the ultralow-background HPGe detector with a sensitive volume of 200 cm^3 ($\sim$ 1 kg mass) and a natural nickel sample of $\sim$ 68% ^{58}Ni with a mass of $\sim$ 6 kg. The detector is surrounded by low-background shield consist of 180 mm oxygen-free copper, 150 mm lead, 1 mm cadmium and 80 mm polyethylene. After preliminarily analysis of the experimental data accumulated over 3200 hours, the experimental limits are obtained for the 2νEC/EC decay of ^{58}Ni to the 2^+_1, 811 keV and 2^+_2, 1675 keV excited states of ^{58}Fe. The limits are $T_{1/2}$ (EC/EC, $0 \rightarrow 2^+_1$) > $4{\cdot}10^{21}$ yr, and $T_{1/2}$ (EC/EC, $0 \rightarrow 2^+_2$) > $7{\cdot}10^{21}$ yr. At the same time, the sensitivity of the experimental setup for one year of measurements to the processes mentioned above is: S (EC/EC, $0 \rightarrow 2^+_1$) = $2{\cdot}10^{22}$ yr, and S (EC/EC, $0 \rightarrow 2^+_2$) = $1.3{\cdot}10^{22}$ yr. All limits are at 90% CL.

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