

Not so long ago, the value of the branching ratio of a neutral pion decay to an electron-positron pair ($\pi^0 \rightarrow e^-e^+$) has been updated and became more accurate thanks to the fact, that new measurements were performed at KTeV experiment at Fermilab. In this context it has been showed, that the Standard Model theoretical prediction is not precise enough. The resulting discrepancy was not explained yet. In presented work, there are summarized preceding results, already computed correction were taken into account and newly the Bremsstrahlung contribution was thoroughly calculated. Besides, the contribution of π -loop corrections in terms of double-logarithms is estimated. In the end, because of the persisting disagreement of the accepted theory with the experiment, an additional contribution is suggested from beyond the Standard Model on the basis of models describing the dark matter. The latter mentioned is a hot candidate to explain many phenomena, for example the mysterious source of a great amount of γ -rays coming from the center of our galaxy and having the origin in the annihilation of electron-positron pairs.