Таким образом, мы видим принципиальную возможность осуществления индуцированного распада изомерного состояния и использования запасенной в изомерных состояниях энергии.

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THE ORIGIN OF THE GENERALIZED MASS-ENERGY EQUATION $\Delta E = Ac^2\Delta M$ AND ITS APPLICATIONS IN GENERAL PHYSICS AND COSMOLOGY

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Einstein's (September 1905) derivation theorizes that when light energy (L) is emanated by a luminous body, its mass diminishes as $\Delta m = L/c^2$, and this equation is the speculative origin (without proof) of $\Delta E = c^2\Delta m$. The same derivation predicts that the mass of a luminous body inherently increases ($\Delta m = -0.034\ 90L/cv + L/c^2$) when it emits light energy; in some cases, the mass of the body also remains the same ($\Delta m = 0$). An alternative equation, $\Delta E = Ac^2\Delta M$, has been suggested, that implies that energy emitted on the annihilation of mass (or vice versa) can be equal to, less than, or more than that predicted by $\Delta E = c^2\Delta m$. The total kinetic energy of fission fragments of U^{235} or Pu^{239} is found experimentally to be 20 - 60 MeV less than the Q value predicted by Δmc^2, which can be explained with $\Delta E = Ac^2\Delta M$ with a value of A less than one. $\Delta E = c^2\Delta m$ has not yet been confirmed in chemical reactions. The energy emitted by gamma-ray bursts (the most energetic event after the big bang) of duration 0.1–100 s is 10^{45} J, which cannot be explained by $\Delta E = \Delta mc^2$, similarly to the case of quasars. This can be explained with a high value of A, i.e., 2.57×10^{18}. The mass of the particle Ds (2317) discovered at SLAC is lower than current estimates, which can be explained with a value of A more than one. $\Delta E = Ac^2\Delta M$ explains that the mass of the universe of 10^{55} kg was created from a dwindling amount of energy (10^{-444} J or less), where A is 2.568×10^{-471} J or less, that in the end may reduce to small energy. It explains the big bang, the annihilation of antimatter in the hadron epoch, black holes, dark matter, etc. For the origin of inherent gravitational energy it implies that it is another form of mass like other energies, hence gravitation and mass are inseparable.

LOW COUNTING EXPERIMENTS IN THE SOLOTVINA UNDERGROUND LABORATORY

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Experiments to search for ββ decay and to study of rare α and β decays were performed in the Solotvina Underground Laboratory (Transcarpathian region, Ukraine) with the help of low background crystal scintillators. One of the strongest restrictions on the Majorana neutrino mass $m_\nu \leq 1.7$ eV at 90% CL was obtained from the half-life limit ($T_{1/2} \geq 1.7 \times 10^{23}$ yr) on the 0νββ decay of ^{116}Cd. The half-life of ^{116}Cd relatively to the two neutrino mode was measured as $T_{1/2} = 2.9 \times 10^{19}$ yr. Double beta decay of ^{160}Gd was searched for with the help of Gd_2SiO_5(Ce) crystal. The half-life ($T_{1/2} = 7.7 \times 10^{15}$ yr) and spectrum shape were measured for the non-unique fourth-fold forbidden β decay of ^{113}Cd applying $CdWO_4$ scintillator. The α activity of natural tungsten (^{180}W, $T_{1/2} = 1.1 \times 10^{18}$ yr) has been observed for the first time by using the enriched $^{116}CdWO_4$ detectors. Application of $CaWO_4$, $ZnWO_4$, $CdWO_4$, GSO, YAG:Nd, $PbWO_4$, Molybddates crystal scintillators for high sensitive low counting experiments (ββ decay and dark matter search, study of rare β and α decay) is discussed.