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INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS

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(SUMMARIES)

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International Atomic Energy Agency

and

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NEUTRINO REST MASS FROM COSMOLOGY

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If the temperature of the early hot universe exceeded the value 1.8×10^{10} K, electron neutrinos were created in a number comparable to the number of the photons of the relict background radiation. If the temperature exceeded the value 12×10^{10} K, muon neutrinos were created in the same number. If the neutrinos have a tiny, but non-vanishing, rest mass, their gravity can influence the cosmological history of our universe. From a computer simulation of the expansion of the universe we have arrived at the following conclusion. At the present time, when the temperature is $T = 2.7$ K and the Hubble constant is about (50 ± 5) Km sec^{-1} Mpc^{-1}, the rest mass of any of the neutrinos cannot be larger than 40 eV, if the deceleration parameter of the galaxies is $q_0 < 1.34$. The rest mass of any of the neutrinos cannot be larger than 36 eV if the universe is older than 10^{10} years. These are smaller than the laboratory mass limits. In the sea of a non-relativistic neutrino gas an astronomical body will produce a mass concentration. One may try to explain the "missing mass puzzle" of the clusters of galaxies on this way. For example, the neutrino gas concentration round the Coma cluster may explain its stability. The diameter of the Coma cluster can be reproduced by assuming a neutrino rest mass ~ 1 eV. If the missing mass is not a neutrino concentration, one can see 1 eV as upper limit.