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ABOUT RESTRICTIONS ON VOLUME OF THE INFORMATION IN THE UNIVERSE

Abstract

Information is an integral part of Universe. Information is indissolubly connected with a matter (energy). Information in Universe is formed at the phase transitions, inflationary, and usual expansions either. The information carriers are heterogeneities of matter (energy). The degree of heterogeneity is measured by Shannon's information entropy. In the report restrictions on volume of the information in the Universe are resulted. From the informational point of view four types of mass (energy) are available: ·The mass of the black hole, containing heterogeneities (information) in the volume proportional to a square of mass. ·The mass of the usual substance, containing heterogeneities (information) in the volume proportional to mass. ·The mass of the dark matter, containing heterogeneities (information) in the volume essentially smaller then the usual substance (researches are under way now) contains. ·The dark energy that contains no heterogeneities (information). It is known (J.Bekenstein-1972, S.Hawking-1975, R.Penrose-1989) that Universe contains the greatest possible volume of the information, if it is the only one black hole. The maximum volume of the information in our Universe is 10**120 bits (10 in a degree 120). The report shows, that Universe by the mass of M, which consists of optimum black holes everyone by mass of Mopt=(h*c**3)/(4*pi*G*k*T*ln2) kg, contains the minimally possible volume of the information that equals Iun min=(M*c**2)/(2*k*T*ln2) bits. Designation: h – reduced Planck constant, c – speed of light, G – gravitational constant, k – Boltzmann constant, T - temperature of the Universe. Mass of the optimum black hole, which minimal volume of information in Universe is reached, approximately one fortieth of Earth's mass. The minimal volume of the information in our Universe is 10**91 bits. Minimal possible volume of information in Universe, which filled with optimum black holes only, as twice as less than volume information in Universe, filled with only ordinary substance. The range of information volumes in Universe by the mass of M from below and from above is (M*c**2)/(2*k*T*ln2); ((M**2)2*pi*G)/(h*c) bits, the range in our Universe is 10**91; 10**120 bits. The known volume estimations of information in our Universe, without taking into account the information in black holes, conjecture size 10**90 (I.Gurevich-1989-10**90, R.Penrose-1989-10**88, S.Lloyd-2001-10**90). It is less, than minimal possible volume of information in Universe. Hence, black holes should be necessarily in our Universe. Being assumed, that in each galaxy there is a black hole mass about millions Sun's mass the volume information in Universe, both in usual substance and in black holes, is approximately equal to 10**100 bits.