COSMIC RAY ORIGIN AND FUTURE TRAVELS WITH VELOSITIES OF CR PROTONS OF DIFFERENT ENERGIES

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THE MATTER OF PROBLEM, 1

Usually, when are talking on the origin of Cosmic Rays (or Astroparticles), have in view protons, nucleus of different Z, electrons, gamma-quants, and neutrino of high and very high energy generated in our Galaxy and in different astrophysical objects in the Universe, outside the Galaxy. Moreover, during many years energetic particles generated on the Sun were called as Solar Cosmic Rays (SCR), but now increased the tendency to rename this phenomenon as Solar Energetic Particles (SEP) event. We will show that SEP, energetic particles generated in magnetospheres of the Earth, Jupiter, Saturn and other planets, in interplanetary space, and in atmospheres of stars have the same nature as Galactic and Intergalactic CR: they are all runaway particles from the Maxwell-Boltzmann distribution of background plasma where they were generated.

THE MATTER OF PROBLEM, 2

Energy of these run-away particles is much higher than average energy of background thermal particles. We will show in our report that the energy of all these run-away particles have the same general nature: it is always transfer energy from the Macro-objects and Macro-processes directly to charged particles, to Micro-objects. This transfer energy is formatted in dynamic plasma with frozen in magnetic fields: really magnetic fields ’glues’ thermal background particles in Macro-objects and Macro-processes involved billions thermal particles. Through magnetic fields runaway particles can interact not only with thermal background particles (and loose energy), but also directly with Macro-objects and Macro-processes with very high macro-energy (many order higher than energy of run-away particles with energy increasing.

THE MATTER OF PROBLEM, 3

We come to conclusion that the main cause of origin of all types of Cosmic Rays in any objects and processes in the Universe is the transform energy from Macro-world directly to Micro-world through frozen in magnetic fields in plasmas. Let us outline that without frozen in magnetic fields run-away particles cannot interact with whole macro objects or macro-processes, but only with objects of Micro-world (ions, electrons, atoms, molecules, and so on, and mostly with loosing energy). At the stage when in early Universe were formatted exited small density plasmas objects with frozen in magnetic fields, where formatted also Cosmic Rays of different types. We consider also the problem of formatting energy spectrum of different types of CR.

TRAVEL WITH THE SPEED OF CR PROTONS OF VARIOUS ENERGIES IN THE UNIVERSE

1. Necessary conditions

Let us hope that our Civilization managed to avoid self-destruction due to possible thermonuclear wars. In this case, a solution to the problem of controlled thermo-nuclear fusion and the creation of powerful ion engines for spacecraft with relativistic velocities comparable to those observed in CR protons can be expected in a few hundred years. Then what we see now as mental travel can become real.

2. Examples of protons with different energies

- We consider different energies of protons, but the case of the highest energies is especially impressive: a proton with an energy of 10^19 eV. In this case, it will cross our Galaxy (about one hundred thousand light years in size) in just 5 minutes of its life. At the same time, astronaut will see a fantastic picture: stars and planets will fly towards at a speed close to the speed of light, strongly compressed in the direction of motion (by a factor of 10^10) and unchanged in transverse directions (for example, for the Sun 10 cm and about a million km; for the Earth, respectively 1 mm and 17 thousand km).

3. Proton with an energy of 10^19 eV in the Galaxy and in the Universe

- A proton with an energy of 10^19 eV will cross our Galaxy about 10^5 light years in size in just 5 minutes of its life (T = 10^(-10) x 10^5 light years = 10^(-5) years = 300 s = 5 m). In one year of its life, corresponding astronavt will cover the path of 10 billion light years: this means that in several years of its life it can approach the border of the Universe and study the situation in the early Universe shortly after Big Bang.

4. Can thought flights become real?

I do not think that the described variant with a proton of 10^19 eV can be realized even in the next millions of years (the problem of radiation hazard of background matter), but variants with spaceships that correspond to the velocities of CR protons with energies of 2, 10 and 100 billion eV (compression in the direction of motion 2, 10 and 100 times) are quite real in the next millennium. In this case, it will be necessary to solve very difficult problems of acceleration and weakening of the radiation hazard for relativistic spacecraft with velocities corresponding to different energies of CR protons.