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SOLAR PLASMA AND NEUTRINO ASTRONOMY OF HIGH SPATIAL RESOLUTION

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1. Introduction

The analysis (by means of the method of multilevel dynamical contrasting (MMDC) developed and described by the author earlier [1a, 1b]) of images of the Sun in range of waves lengths of a soft x-ray has resulted in revealing of fractal skeletal structures (FSS) of the Sun [2]. The topology of these structures appeared identical to the same that was revealed and described earlier in a wide range of spatial scales, the phenomena and environments [1c]. MMDC analysis of images of solar spots (SS) in soft x-ray has shown they have three-dimensional structure of the same topology (see [2], Fig. 12). Hence from this in [2] the hypothesis has been put forward - *the Sun has internal FSS which can be by development of one of possible forms of filamentary matter (FM)* (for example, which was suggested by B.U.Rodionov [3]), *and SS are part of FSS of the Sun which have been squeezed out during its activity from within to its surface*. The revealed fragments of FSS of the Sun which have radius of rotation around of a star axis less radius of its disk on breadth of their locations (see [2], Fig. 13) can be good acknowledgement of this hypothesis. As soft x-ray cannot take out the image of "interior" of the Sun into a space the author considers the following general scheme of its formation: 1) neutrinos by passing through FSS of the Sun FM are coding and take out into space their image in their own flux; 2) this image transforms by any mechanism into an accompanying flux of x-ray quantums which develops on the screen of a telescope. For realization of such scheme it is necessary to describe the prospective nature and properties of FM of the Sun and to find mechanisms of formation and developing of its image in x-ray.

2. Parameters of modified model of filamentary matter

Suggested the FM model not up to the end still is developed and described, but it is suitable for primary estimations of basic parameters of such matter. Filaments of such FM are infinite chains of quarks in the Bose-condensate state (BCS) strung onto quantified a magnetic field flux which minimal value is $\Phi_0=\pi hc/e$, here, h - the Plank constant, c - velocity of light in vacuum, e - a charge of electron. Let's consider that all quarks are in BCS, they are relativistic and have identical energy ~ 5 MeV. Then the quark filament radius is defined by size of the de Broil wave ($r_q \sim 5\cdot10^{-13}$ cm), a magnetic field intensity inside of such filament is $H_q \sim 3\cdot10^{17}$ Gs and energy of quarks connection is ~ 5 GeV. According to the model, such the quark filament can be surrounded by an electron cloud in BCS. The minimal radius of such shell of relativistic electrons, which is covering a back magnetic flux (Φ_0) is $r_e \sim 3\cdot10^{-12}$ cm, and a field inside of this shell is $H_e \sim 7\cdot10^{15}$ Gs. The most important result of the analysis of revealed structures in the universe [1c] is its fractality. The above model of FM does not allow to build

structures of generations. Therefore the author modified it, assuming the FM was formed at very hot universe. The quark filaments of final length in those days could have a shell too of quarks. Internal cords and external shells of extended filaments of such matter can present consecutive chains of quarks in BCS with various combinations of charge composition. In particular, it can exist filaments which are consisting of identical sequence of the quarks which are in BCS (2×(-1/3)+2×(+2/3)+2×(-1/3)+· ·). The charge agreeing with unit of length of anyone filament is equal to zero. It is assumed the extended filaments of FM can be assembled of separate cylindrical blocks the length of which is connected with constant thin structure □=1/137. The blocks with electrons shells of the minimal length can be accepted as "electron linear atoms" (ELA) of such FM. From here for estimated calculations it is possible to believe, that quantity of nucleons in such ELA of FM $N_{Ne} \sim 6.5 \cdot 10^2$, length $l_a \sim 10^{-11}$ cm, linear density of nucleons in it $n_{Ne} \sim 6.5 \cdot 10^{13}$ cm^{-1}, its mass $m_{ae} \sim 1.3 \cdot 10^{-21}$ g, the relation of its length to diameter ~ 1.6. The density of substance of FM is $\sim 1.5 \cdot 10^{14}$ g/cm^3, i.e. as density of a nuclear matter. The LA of FM can build FSS, [1c], showing their universality. As average density of substance of the Sun is $\rho_C \sim 10$ g/cm^3 the volume fraction of FM inside a star should be small. The radius of ELA FM in 10^4 times is less than radius of hydrogen atom it is neutral and does not interact with usual atoms. Interaction of FM with usual nuclei must be extremely weak too. Such FM can exist neutral and inside the Sun as the temperature even of its most bowels is much lower than energy of connection even of electrons in external shell of its filaments inasmuch as energy of connection of electrons in such FM is ~ 5 МэВ.

3. Fractal skeletal structures of filamentary matter

Inasmuch as the topology of revealed FSS of the Sun was found identical to one which was before observable in the dust carbon deposits taken from chambers of plasma installations, the model of FSS construction of the FM of LA has been chosen similar to construction FSS of carbon nanotubes [1c]. The mass, number of electrons, length and diameter of tubes of generations with number n is in this case completely determined. Blocks of various generations of such FSS have scale factor K = 5. The full number of electrons in blocks of generation with number n is $N_{1e}^n \sim 3 \cdot 10^2 \cdot 2^{3(n-1)} \cdot 10^{n+1}$, and average electrons density in it is $n_{le}^n \sim 2^{4n+32}/5^{2n-38}$ cm^{-3}. The observable filaments of the Sun FM have diameter $\sim 3\ 10^9$ cm. According to this, we finds number of generation of blocks of this structure, n ~ 30, and then the average density of electrons in such filaments is $n_{le}^{30} \sim 2.5 \cdot 10^{30}$ cm^{-3}.

4. Formation and development of images of the FSS of FM of the Sun

The average density of the Sun matter is $\sim 10 \cdot g \cdot cm^{-3}$, the average electrons density of its plasmas is $n_e^S \sim 5 \cdot 10^{24}$ cm^{-3} $\sim 5 \cdot 10^5 \cdot n_{le}^{30}$ cm^{-3}. On sharp gradients of electron density, occurs amplified oscillations of electronic neutrinos and turning of their some part into muonic ones [4], it is especial if a condition of a resonance for this process is satisfied. Thus, the image of FSS of the Sun FM can form in a neutrino flux, which is coming through a body of the Sun in a direction of the observer, inasmuch in areas with rather homogeneous electron density neutrino do not cooperate almost with substance. For those regions for which the condition of the resonant oscillations is satisfied the image contrast in the neutri-

nos flow can make up value almost 100 %. Neutrino dispersion on filaments of FM, due to a high tension of a magnetic field in them, can promote also for formation of FSS image. Thus, the neutrino flow is able to forming and freely to carry over the image of internal structure of the star from within into outside. Further there is a problem connected with development of such image. Inasmuch as in the nature there is no of such screen which would be able to develop such image it is necessary to try to find such mechanism of generation (by neutrino flux) of accompanying quantums which fly in direction, of propagation of the same neutrino flux. Most probably it is possible for Dirac neutrino for which the magnetic moment within the framework of Standard model is distinct from a zero. According to the theory [5] at movement in a homogeneous magnetic field only those neutrino the spin of which is directed against of magnetic field are able to radiate quantums and frequency of photons of this spinal radiation is defined by coup of the neutrino spin. The probability of such process is very small even for fields ~ 10^{17} Gs. In the paper [5] the probability expression of radiation of light quantums at neutrino movement in a homogeneous magnetic field is resulted. On the basis of the expression obtained in this paper, it is possible to show, that the full probability of radiation of quantums at neutrino movement across a homogeneous magnetic field is proportional $\sim H^8$, i.e., quickly grows with increase of the magnetic field value. However and in this case the probability of obtaining of an accompanying flux of quantum is small for obtaining the real image in real time. If neutrinos move in very of strong variable magnetic field they are able also to radiate quantums. Inasmuch as LA of FM inside itself carry direct and back quantified magnetic fluxes, the neutrino movement across of FM with oriented blocks actually means their movement in strongly variable magnetic field which frequency of change is determined by average of linear density of LA of FM along a trajectory. The layer of such oriented LA of FM can be organized of free not included in rotating FSS of the Sun which form original halo on the distance determined by equality of a gravitation and centrifugal force acting on them. The estimation gives such halo will be on distance ~ 10^8 km from a star. As length of wave in which have been obtained images of the Sun (which were discussed here) is ~ 10^{-6} cm, then the average linear density of LA of FM in halo should be ~ 10^6 cm^{-1}. As the possible mechanism of development of the latent image in the neutrino flux, it would be possible to consider also their interaction with probable halo from particles of "a dark matter» (DM), but for this purpose it is necessary to know, first of all, its physical nature which remains a riddle for us in present time, and its interaction with FSS of FM and neutrino. Here it is necessary to note onto that fact, the LA of FM may be considered also as the DM particles. If the conclusion of the author about observation by him of FSS of FM appears precisely confirmed then we know the answer of a problem about the mechanism of conversion of the image of interiors of the Sun coded in a neutrino flux, and then it will be necessary to find this mechanism only. At the given moment the estimations, obtained from the analysis of a database of images of the Sun shows that at the taking into account of the model of construction of FSS of FM described above and gathering of quantums during several tens of minutes by the area of an entrance lens of a telescope by square ~ 10^4 cm^2, the obtained flux of accompanying x-ray quantums (generated for

the account not for a while yet of the unknown mechanism) is found by sufficient for development of the image of insides of the Sun.

5. Neutrino astronomy of the high spatial resolution

If solar neutrinos are Dirac-neutrinos then they possess by not the zero magnetic moment and at interaction with a magnetic field they are able to radiate quantums of light. Inasmuch as value of magnetic moment of the neutrino is very small, in order the probability of such process was not zero, very big intensity of a magnetic field is necessary. It can take place only inside filaments of the matter which was been considered above. If suggested FM is a reality then there can be and a neutrino astronomy of the high spatial resolution. The fact is that the image of "insides" of the star is coded in a neutrino flux given birth inside of the same star. Further, this flux carry out image to outside and (by means of interaction with FSS of FM of the Sun and halo of oriented, free LA or DM particles) translates this image into coded (but already in a flux of quantums) the image, decoding of which occurs on the screen of a telescope. Construction of images in an optical or x-ray range has very high spatial resolution. Therefore the described above neutrino astronomy can take place only under condition of existence of FM, similar which has been described in item 2. The examples presented in paper shows that the hypotheses suggested by the author can have a reality and are the facts of development of FSS of FM inside the Sun and its nearest space environment.

6. Conclusion

The fact of observation of the images displaying internal structure of the star, can solve many problems connected to neutrino physics: a) to prove existence of neutrino oscillations, i.e., that solar neutrinos are Dirac-neutrinos; b) to study of FSS of FM and their dynamics inside stars/galaxies through the analysis of their images in various ranges of lengths of waves; c) to study dynamic character of the moment and neutrino mass and their interactions with LA of FM or DM particles. Thus, already now we have a neutrino astronomy which allows us to look into bowels of stars and galaxies, to observe their internal structure and to study processes taking place inside them, to reveal FSS of FM and to study their properties, as inside stars, as in their environment. All this can give a new push into researching of space objects, understanding of processes of their formation, and searching a new energy sources taking place in the universe.

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