14. Fusion of two neutrons to deuterium

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In our construction of the world, of how the universe developed and is still changing today, we also assume more differentiated model concepts for atoms than the standard model of particle physics does. In it, the objects, electrons, protons and neutrons are neither small spheres nor quasi point-like objects, as required by quantum mechanics. They are not extremely tiny strings, which are only mathematically captured in complex equations and which are only be understood by a few experts. Shape or size does not seem to play a special role in quantum mechanics. Also how one should imagine the masses and charges or the mass and charge distribution has no primary meaning. In the meantime, such questions are considered rather pragmatically and physicists speak only of probabilities to find a particle with its impulse at a certain place. Particles are described by their physical properties such as color charge, gluons and quarks. This is consistent with mathematics, but not with anything concretely imaginable. For example, particle or better a particle as state function does not itself say anything, but whose square can describe the probability of location or impulse.

Particle physics now knows a large number of particles, some of which are extremely short-lived, all of which have been investigated in particle accelerators. There is a coherent theory that is difficult to attack, with whose help can be used to make very accurate predictions. But we always have it to do with protons, electrons or lighter atomic nuclei, which are vastly inflated with energy and then be brought head-on to a collision. The energy value of the protons was increased by orders of magnitude; the Proton mass was many times larger, so it consisted of many mass building blocks, before it met another mass object that was much too large. Two artificially generated mass collections that collide. Thereby were the mass collections again into individual objects with the most diverse masses and characteristics fragmented. It is no wonder that so many foreign particles arise? We create high-energy electromagnetic fields with huge coils, concentrated on a few protons. We create artificial masses for a short time, which stick so long at the proton, as they move almost at the speed of light, i.e. they are than cut off from the environment. Then everything collapses and we see very briefly these created masses, before they become what they are made of again - energy.

What all the exotic particles that have been created have in common is that they are not stable. Only the electrons are really stable, the protons, neutrons in atomic nuclei and the atomic nuclei of the periodic table. All the neutral atoms of the periodic table of elements and some of their isotopes are fortunately permanently stable. In the suns, no neutron atoms are forged, that would never have made a colorful world possible, and not even atoms that contain more neutrons than protons, leaving not enough electrons for a complex atomic shell. Neutral atoms, and in particular the higher neutral atoms, have a very complex shell, which makes many chemical and biological properties of the atoms possible.

In our approach the protons and the electrons, the only two really elementary particles of this world, exist as two planes of the area size R_e^2, which are opposite each other in the distance R_e and d_p. The basic sizes of the space are thus determined by R_e, d_p and the thickness of the plane δ. The universe has to make do with this and only with it. If it wants to create something interesting, then a very sophisticated complex network must be created in the background, in which these two very simple building blocks create complicated, diverse atoms with the most varied properties.

We just want to show that the simplest fusion to deuterium can be different than previously assumed. Our plane model approach of the particles plays a decisive role here. The particles do not have to be tunneling and also a strong nuclear power is not needed.

Until now, it was assumed that deuterium on the Sun is formed by the fusion of two protons. The model is based on the theory that there is a strong interaction force that acts in the near range of 1.4 fm, attracting particles first and then again repulsing them the closer they get to each other. Two protons then require at least 250 keV to get, against the electrical repulsion, to a distance of about 3 fm. Then they would have crossed the potential wall and would fall deeply into the energetic potential pot, in which they are stuck from now on. The new force is mediated by the quantum chromodynamics of gluons flying back and forth between the three quarks (up and down quarks). The color charges always change in such a way that a total of white is generated (color charge zero). The residual charge now explains the attraction to other particles, when they are in the vicinity of about 2.5 fm. The strong interaction opens up the new world of quarks, which will then form the basis for the standard model of particles. According to the quark model, there is a sophisticated substructure within protons and neutrons. When two protons fuse, a positron and a neutrino are emitted, and we get a deuterium atom.

The temperature in the sun in the central region is about 15 Millions Kelvin. Since the electrons are not degenerated at this temperature, we can assume the kinetic energy of the plasma gas with about 2 keV by means of the Boltsmann distribution. The protons, as well as the electrons have this kinetic energy. This means that the electrons have to move much faster because of the lower mass. If we also assume that the gas is normally distributed, there are also particle energies up to 15 keV. Since the distribution, however, decreases exponentially, particle energies up to 250 keV would be completely unrealistic.

This is where the quantum mechanical tunnel effect comes into play. If one regards the position and the energy value of a particle statistically as only its residence probability, then also a larger potential, from a certain thickness to a certain statistical probability, can be skipped or penetrated. Matching to the repulsive potential, there is a possibility for energy-rich protons, at the corresponding distance to get to the necessary proximity of 3 fm. The tunnel effect gives us a factor of about 14 and the Gaussian distribution of 8, which then creates both together a worldly condition to overcome the necessary 500 keV (or 250 keV for each proton). What remains unanswered, however, is the question of where the much energy of the deuterium atom comes from. On the one hand, we need the large amount of energy to create an electron when converting from neutron to proton and the kinetic energy that the electron, neutrino and deuterium bring together. The total is an enormous 1.1 MeV per nucleon. We put about 30 keV of kinetic energy into the fusion and 2.2 MeV are converted. The deuterium atom has a smaller mass than the two protons. Thus, mass seems to have been converted into energy during this process - but how? The protons tunnel through each other with far too little energy and then trigger a process that draws enormous energies from the mass of the particles and releases them. Two stable protons find a new common stability, without there being any reason why the process is exactly so, with exactly these energies. Where does this new stability come from and why then does an electron become superfluous? What is a neutrino, what does it mean? How can a neutron arise from a proton and why do exactly these energy values become free during beta decay?

According to our ideas, two positively charged protons can only form a compound, if at all, under exotic conditions. Also a proton cannot have an electron if it did not have it. This does not mean that under special circumstances Beta Plus decay cannot occur. Furthermore, we do not believe that a completely new elemental force has to be introduced separately. If an electron and a proton come so close to each other that there is only a R_e distance between the planes, then we are no longer dealing with a spherically symmetric field, but with two capacitor plates facing each other rather than anything else. Then different laws do apply here. No electric field penetrates anymore and we have a new stability, which results from the basic conditions of space and not from the detour of a new force effect.

In the range of 2.8 fm electron and proton behave differently than in a larger distance. The electrical world for these two particles to each other is only one-dimensional, because then the spatial structure in our universe has no more freedom. The states for the R_e-distance (2.8 fm) are all used up, the freedom lies only in the d_p-distance of the planes or the spatial structure, which is determined by the particles.

From the electrons we know that there is a lowest energy level. We know this because an electron in an atom, in its lowest state, moves at speed of 2.2 10^6 m/s on a trajectory a_0. That is 1/137 th of the speed of light. a_0 and v_0 also correspond to the uncertainty relation.

With a free electron it would not be clear how large the blur is. In theory, a free electron can be anywhere in space with a certain probability. Only in the bound state do we learn something about its lowest energy level and thus about the most realistically probable location and impulse range.

According to our ideas, it will also have this uncertainty as a free particle if it drifts unbound through space. The blur is an expression for the many unpredictable connections to other particles, but we know nothing about it with a free particle. Also with the proton we cannot find out so easily how large its blur is in the movement and in the place. Here, the lowest energy state does not play a special role, even for the atom. That's why we do not learn anything about it in the atom. We must therefore make indirect considerations.

As we have already shown, the uncertainty of the electron in the atom is a_0. This includes a certain impulse blur. If we assume that the mass remains approximately unchanged, then we can transfer the impulse blur to a velocity blur. We also assume that the average velocity is derived from the electrical attraction and inertia. It turns out that with increasing mass, the average speed does not change, i.e. the proton has the same average speed, but should also have a similar speed blur. Apparently, for example, the lowest energy level is not only synonymous with the uncertainty in the location, but it is also in equilibrium with centrifugal force due to inertia and electrical attraction. Only now the angular momentum still plays a role, which can change only quantized.

Behind this is again the blurring of all things. It turns out that the orbital velocity for electrons at the lowest level is a_0. The orbit radius is mass dependent, the orbit velocity not. So a heavier electron would have a smaller orbit, at the same speed. A proton would have a similar speed blur as an electron, i.e. an impulse 1836 times larger or a radius $a_0/1836$ times smaller than that of the electron. This would give us a clue as to how large the blur of the proton might be in general. This would then be in the range of 27 fm and would thus be about 20 times greater than the distance of the strong nuclear force. Therefore we only need about 1/20 of the energy, namely 25 keV, in order to lie with the electron in the uncertainty range of the proton.

Similar to the hull, there is for the electron a stable lowest shell in the proton's region of residence, which has a fixed energy value. At 25 keV the electron's range of residence is 27 fm. Proton and Electrons could then remain together without radiation. If the electrons have more energy, they would have to release it, as with the shell. If, on the other hand, too little energy is available, then they stay free. They then do not come so close to the proton for so long that the levels only see each other. Here is a difference to normal conception about charges. Charges attract each other spherically, but in the area of the uncertainty relation the jumps of the electron are too big for a fixed relation between them. Only at 25 keV the electron has the right uncertainty for the proton. Then the velocity of the electrons is about 0.3 c and with this velocity the two forms a quasi-neutron state. The new formed neutron first gains some energy.

A kinetic energy of 25 keV instead of 2 keV has after Boltzmann a probability of only 10^{-11}. Each 100 a billionth particle would be big enough. It is a small value, but not unrealistic, especially if the density inside the star is quite large as a hundred times that of lead. If both particles are in the blur of the other, they are stuck. And this applies not only to the electron, but also to the proton in the same way. Proton and electron both consist of two planes of the area size R_e^2 but have a different plane distance. This means that even with a blur of the proton of 27 fm still leaves enough space for the electron to move within this volume. If the electron is within the fuzziness of the proton, they form together only a "quasi" neutron. At the correspondingly high temperatures in the sun, it would be hit by a random but rare impact with more than 25 keV. If they are not knocked out and the two charges come close at random to 2.8 fm, they form a real neutron. Therefore planes must not only come close enough, but also face each other exactly.

If this is the case, the electron and the proton fall from R_e to the d_p distance. Closer than to the d_p distance of the two planes of electron and proton we cannot come, there is no room for that. We gain 0.78 MeV of kinetic energy. The planes must therefore slowdown 0.78 MeV of kinetic energy again and this does not happen via the kinetic energy of the neutron as a new whole, but via a shift in the proton planes that are slightly compressed. This means that the mass of the proton or neutron as a whole increases. The neutron is in an excited state. If the electron hits the proton frontally at 2.8 fm, it gains energy of 0.34 MeV. But this is not an energy that has to be applied from the outside.

From the point of view of a neutron, this quasi-state remains unusually stable for a long time. In our time world, it lasts an average of 15 minutes before the two particles separate again. These 15 minutes are mainly due to the "Qasi Neutron State". After an average of 15 minutes or 10^{20} connections, the two particles seem to collide randomly frontally at distance R_e. Then the two move accelerated towards each other, are slowed down and thereby heavier for a short time, before they separate again in the opposite direction. The electron is thrown out again at 1.1 MeV. This process takes about 1 minute. The smallest change in speed for electrons is 1.7 10^{-12} m/s, the electron hits at d_p at almost the speed of light onto the proton, so it takes 10^{20} steps before it is decelerated to zero. At 10^{18} Connections between proton and electron per second this takes 30 s or one minute back and forth. The energy balance would then be balanced. As much energy is released as was put into it. According to this approach, there should be more neutrons than expected according to the solar model. The number of short-lived neutrons would be much higher.

If two neutrons, both in the "real" neutron state, meet in this one minute, only one of the two electrons is released, but the rest remains stable. For two neutrons or a neutron and a proton there should be much be easier to get close to each other, since both particles are of similar spatial blur. Neutrons have no charge to the outside; the blur is only dependent on mass and velocity, because the neutron is in the right state. Because the neutron is charge-free in the correct state, it can come unusually close to the proton or another neutron before the two react with each other. Probably they will only react when they are in the range of 2.8 fm. Then again there is a one-dimensional connection. The electron of the neutron sees the proton again like a capacitor and both particles attract each other. In this process, 0.78 MeV of energy must be processed. Probably the energy is stored for a short time in a compression of the planes, thus also in a mass increase. If the energy is released again, the light electron can leave the bond well on the outside, the two heavy protons on both side of the second electron, not. The resulting deuterium atom can therefore only convert its energy into kinetic energy. For the remaining three particles, energy of 2.2 MeV would have to be applied in order to separate them from each other again. By this amount they are also correspondingly lighter than protons and electrons individually.

A neutron produced under normal conditions decays after about 15 minutes. The electron is mainly at a distance of 27 fm before it is swallowed and then released again with great kinetic energy. The chance of hitting a second neutron is almost excluded. In the central area of the sun this already looks different. Here the density is very high. Neutrons are produced permanently and the chance that a neutron with a swallowed electron is accidentally hit by another neutron or a proton with the correct position (plane frontal) is much higher. Free neutrons are not stable, they become heavier than protons and electrons individually and there is a possibility to separate again. So they decay. For two bound neutrons it is possible to give off only one electron. Then for the particles are much more difficult to separate from each other. The particle mass decreases, the planes relax and the whole deuterium atom gains kinetic energy. Thus it has a very high kinetic energy, but is now stable in its inner structure.

With the fusion to the deuterium atom, we do not have a process in which energy is absorbed for a short time and then released again, but this complicated connection transforms inner energy into outer kinetic energy. The excited state of the particles in the deuterium can get rid of its energy by radiation, kinetic energy and also by a neutrino for maintaining the lepton number. This, in turn, leads to the conclusion that the deuterium is permanently stable.

What is it about neutrino?

Quantum mechanics tells us that every beta decay produces a neutrino. In beta plus decay a neutrino and in beta minus decay an antineutrino. Measurements of the solar neutrinos have now clearly detected neutrinos that refer to proton decay and the associated neutrinos, i.e. no antineutrinos that are released during neutron formation. However, it is very conspicuous, that only about 50% of the solar neutrinos are received. At least half of the predicted neutrinos are missing.

We now assume the following. Whenever the space is folded from three dimensions to one dimension it is registered by the network. A chargeless impulse is created which may be associated with a lepton charge and which may have a positive or negative angular momentum. This pulse is what we can measure and is called neutrino or antineutrino. So if the electron and the proton form a neutron for a short time, then a positive pulse is emitted, that is the neutrino measured on Earth. If the electron then jumps out of the connection again, we have a negative pulse, the antineutrino. Neutrino and antineutrino cancel each other out. But on Earth we only measure the neutrinos, because for the antineutrinos from the Sun, the other half of the events, the devices are not constructed.