https://www.youtube.com/watch?v=znbfrubQ2F8&t=1822s

How Small Is It - 05 - The Higgs Boson (4K)

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(01)- [Music] hello and welcome to our segment on the higgs boson i remember back in high school a long time ago when we were learning about magnetism i was particularly impressed by what could be going on at a point here far from the actual magnet that could move an object like an iron filing i think it was my curiosity back then that led me to the math institute at oxford where i studied the mathematical foundations for quantum field theory which is the theory of what's going on in this so-called empty space* ("boiling" vacuum) if we can get a deeper understanding of the nature of force in space distant from a particle we'll have what we need to know in order to get an understanding of the higgs boson [Music] we saw in our first segment. The particles with electric charge create an electromagnetic field * and the field is always a certain state of curvatures of space-time dimensions curvatures that decrease in the field from the "source" around themselves that stretches out in all directions this field is attached to the particle * O.K. as if the particle were the "center of the local field .. O.K. as if the particle were the "crooked center of the local field" - the curvature of the local space-time it will go where the particle goes in quantum field theory fields like these are quantized that is they contain tiny massless energy-less * The field is a curved, perhaps even twisted 3 + 3D space-time, which necessarily "in the surface" appears as grainy and therefore as "quantized", ie as "condensed" and "dilute", as points and gaps, as "nothing" and "Something" like ones alternating with zeros… simply a grainy surface bits of the field we have seen that the photon is a certain type of disturbance an excitation or vibration in the electromagnetic field we'll call these a localized vibrating ripple * (waves of what? of course, the dimensions of space-time) it moves with a life of its own it is not attached to the particle that created and sustains the field the photon has no mass no charge a spin of one making it a boson and travels at the speed of light in a vacuum in our segment on the atom we saw that energy was quantized and equal to planck's constant times the photon's frequency [Music] now we take a little leap if a photon is actually a localized vibrating ripple in the quantized electromagnetic field why not consider the electron to be a localized vibrating ripple in a quantized matter field a field that permeates all the space in the universe * I see that progressive physicists are increasingly thinking that matter-elements are "a kind of wave of something," so physicists are getting closer to my HDV vision that matter particles are a "ball of coiled dimensions" of "**Length and Time**." Simply a "field" a certain state of curvature of 3 + 3 dimensions, in which "grains" "balls", ie balls of the same packed dimensions 3 + 3 of that space-time, float. Simply, more and more states of differently curved states of fields float in space-time and in them "grains" = balls of packed dimensions (photons in a "quantized electromagnetic **field**, or electrons in another **field** as - as the author writes here: *"why not*

consider "- local vibrating waves for packed packages, it is simply a package of coiled dimensions of the 3 + 3 space-time continuum, which is here in the form of the smallest curvatures such as "mesh, raster, web". …, The 3 + 3D state vibrates as an electromagnetic field**,** sometimes a gravitational field, sometimes a weak field, sometimes as a quark field, then a higgs-field, and these are still states with different curvatures of dimensions that float "in themselves". I do not understand that physicists do not deal with this, nor do they read (even intentionally do not read) that "fields" can be various curved states of "THE SAME" space-time and which "particles" (photons, electrons, muons, neutrinos, etc.) "float". etc. as "packages" of coiled dimensions of the same space-time.). Is the HDV so terribly big "gigantic phantasmagoria" as they curse me and very disgustingly humiliate my opponents ???? - - Of course, there are no reasons, let alone evidence [Music] this is not as odd as it might look in our first segment on the microscopic we saw the wave properties of the electron * I do not know why it is not possible to observe in real nature even "balls of coiled dimensions" ???, only to "observe" how they "sway in the waves" .. because "dimensions" cannot be observed with anything ... only "crooked dimensions" just like, ie in a state of matter or field and in the second segment on the atom we saw that its behavior is described by the schrodinger wave equation *The "successor of Schroeders" has not yet been found to write a "package" equation. I have already indicated these visions at http://www.hypothesis-of-universe.com/index.php?nav=e , if I were a mathematician for a long time there would be a new theory and in our third segment on elementary particles we saw how electrons and positrons can be materialized at any point in space * it's not a "point" it's a "ball" of coiled dimensions! ! ! what's happening is that the photon has disturbed the electron field to the point that it generates the kinds of waves that constitute electron particles * you say: "photon disturbed the field" that by "disturbing it", this "disturbed" field generates electrons - but you are not blind, deaf and stupid, that's exactly it: a photon as a ball of packed dimensions when it "hits" the field (curved dimensions) electron, changes the curvature of the field dimensions and generates another packet, otherwise packed packet, ie electron.
http://www.hypothesis-of-universe.com/docs/eh/eh_076.pdf ; http://www.hypothesis-of-universe.com/docs/eg/eg_045.pdf ; http://www.hypothesis-of-universe.com/docs/eh/eh_048.pdf ; http://www.hypothesis-of-universe.com/docs/eh/eh_069.pdf ; These were all my attempts to find and search for "packages" of coiled dimensions for bosons (it certainly sounds like speculation, but intuition is needed for the search) a convenient way to illustrate elementary particle interactions is to use feynman diagrams invented by richard feynman in 1948 straight lines are for fermions squiggly lines are for forced particles bosons and the back arrow on a fermion indicates an antiparticle. This is what quantum field theory is all about these fields generate particles * The homogeneous Euclidean flat field is a bare raster of space-time. If space-time 3 + 3D were quantized, it means that the flatness and homogeneity change to the "ripple" of the dimensions or to the variability of the curvatures of the dimensions… and in the Planck size scale it must be the "foam" of the dimensions in which the quantum "floats" = clusters = packages and… and… and what ?, but packed dimensions into balls. This is the basic idea of the construction of elementary particles. (an idea for which I am frequented by a giant with gigantic phantasmagoria) (if it was phantasmagoria, why don't they give strong counter-arguments?) you can't have a particle without a field and every field will have its particle elementary bosons force particles require force fields elementary fermions matter particles require matter fields in modern physics there is no such thing as empty space fields pervade space they are a condition or property of space you can't have space without fields * And again and again to the point of frostbite: if 3 + 3D space-time is non-curved, it is Euclidean flat, it shows no fields. The field is then a certain curvature of the "selected" dimensions from x, y, z, t1, t2, t3. For each field there are different curved dimensions and with different curvature; bosons then

"packs" for these fields, thus "as vibrant mini-sites" of this field [Music] here's a couple of examples of how this electromagnetic force works when two electrons approach each other their charge generates a disturbance in the electromagnetic field this disturbance pushes them apart * into each other, ie into a package with higher curvature of dimensions, they are elementary packages with a certain "coiling" of dimensions, and somehow these coiling cannot be "fitted" ((I'm not a mathematician, but smart people can imagine that))); electron with a positron, on the other hand, annihilate because their curvatures "cancel each other out", ie straighten up and "leave a flat cp" after them, or they do not cancel out and, conversely, generate two other opposite packets with different curvature packing and their paths are bent outward the same is true if an electron and a positron pass near each other the disturbance in this case is similar in type but different in its details with the result that the oppositely charged electron and positron are attracted to each other their paths are bent inward * excellent, the dimensions are bent-curved inwards, the orbits along which they approach each other, but "bent" = the dimensions "inside" the electron and the positron are packed in the opposite way here's the feynman diagram for an electron electron interaction with a photon field mediates the force that changes the momentum of the two electrons one says they exchange virtual photons but this is just jargon the diagram is used for convenience a virtual particle is not really a particle at all a particle is a nice regular ripple * a particle is a "precisely tailored packed pack" of curved dimensions that "floats" around it, which is a less crooked state of less curved dimensions - the field. Certainly once I mathematical expressions of those curvatures for each elementary particle I for each field. How simple Sherlock Holmes in a field one that can travel smoothly and effortlessly through space this virtual particle is a disturbance in the field that will never be found on its own it doesn't have the energy to become a well-formed ripple moving through space this kind of disturbance will decay or break apart once its cause is gone [Music] this kind of interaction between the electromagnetic field and the electron field is important because the force that the two charged particles exert on each other is generated by this interaction this force is one of the four fundamental forces in nature * even forces are de facto "state and manifestation of curvature" of spatiotemporal dimensions (3 + 3) they are characterized by a coupling constant the coupling constant for the electromagnetic force is 1 over 137 we will use the electromagnetic force as a model for the strong and weak nuclear forces the complete picture of what is going on with electromagnetism is still an area of active research called quantum electrodynamics

(02)- or qed for short in quantum electrodynamics electrons are the central packets of packed dimensions matter particle for the electromagnetic force using this as a model * so I can be right that they are "packs of packed rolled dimensions" and data from thousands of high energy scattering and collision experiments over the last 25 years we have come to understand that quarks are the central particle matter * http://www.hypothesis-of-universe.com/index.php?nav=ea for the strong nuclear force we have seen that an electron is a vibrating ripple * but no one has yet explored that an electron can be like a package of coiled dimensions in that 3 + 3 dimensional field with a certain curvature for elm. field in the electron matter field [Music] similarly a quark is a vibrating ripple in the cork matter * vibrating waves - you say, but experimentally it was not measured and proven…, it can easily be the package I have rolled up, why not ???? field electrons carry the electric charge * charge is a "property" according to the type of coil to some particular coil configuration that generates an electromagnetic force field quarks also carry electric charge * http://www.hypothesis-of-universe.com/docs/ea/ea_003.pdf ; http://www.hypothesis-of-universe.com/docs/ea/ea_030.pdf and other schemes in my designs http://www.hypothesis-of-universe.com/docs/ea/ea_026.jpg here perhaps gluons (?) so they too generate an electromagnetic force field although with only one-third to two-thirds of a charge their

electromagnetic force field is weaker than the electrons but it turns out they also carry a different kind of charge we call color charge this charge generates a gluon force field this is a significant difference and we'll cover it in more detail shortly we have seen that an accelerating electron creates a vibrating ripple in its electromagnetic field called a photon similarly an accelerating quark creates a vibrating ripple in its gluon field called a gluon and like photons gluons are massless spin-one particles making them bosons and where photons can accelerate electrons gluons can accelerate quarks and where an energetic photon can create an electron anti-electron or positron pair an energetic gluon can create a cork anti-cork pair and where interacting electrons disturb the electric field in a way that creates virtual photons that exert the force of the electromagnetic field the em force interacting quarks disturb the gluon field in a way that creates virtual gluons that exert the force of the gluon field the strong nuclear force note that the em force can be attractive or repulsive depending on the charge but the strong force is always attractive so we can now add the gluon to our standard model of particle physics one of the key differences between the em force and the strong force is that the em force involves an electromagnetic force field whereas the strong force involves a gluon force field you'll recall from our previous chapter on elementary particles the quark theory predicted the existence of the omega particle which was eventually discovered one of the particle configurations turned out to have three strange quarks *http://www.hypothesis-of-universe.com/docs/ea/ea_006.pdf [Music] like two electrons in the ground state orbital for atoms this presented a problem these are fermions and follow the pauli exclusion principle so an extra property was needed to explain the combinations for electrons it was spin with two values up or down for quarks it was color charge with three values red blue or green the fact that no charge has ever been seen in the mesons and hadrons made from quarks indicates that the three charge colors neutralize each other in these configurations this led to the idea to use red green and blue because they neutralize each other when combined our rule for allowing quark combinations was that they had to add up to a whole unit of electric charge we can now add the rule that they have to add up to no color charge at all another even more dramatic difference is that gluons carry color charge as well as quarks where quarks carry a red green or blue charge gluons carry two charges one is a color and the other is an anti-color here's an example of how this works we have two quarks one with a green charge and another with a blue charge when the green quark disturbs the gluon field it creates a gluon this gluon carries away a green charge and an anti-blue charge this turns the green quark blue when the gluon encounters a blue cork it is absorbed and the gluons anti-blue and green charge turns the blue cork green the actual functioning of the cork gluon relationship follows the mathematical model called SU-3 the math was invented in the late 1800s and was the foundation for today's abstract algebra a hundred years later it turned out to be very useful for particle physics but using color is quite helpful in fact the study of quarks gluons and their color charges is called quantum chromodynamics or QCD * ← I do not comment on this interpretation of the whole paragraph, because I have it kept separately as an elem structure. particles from space-time dimensions - see HDV http://www.hypothesis-of-universe.com/docs/ea/ea_006.pdf for short it is a very active area of research and changes in our understanding are expected as we learn more our very idea of what a proton looks like has now shifted from a point particle to a three-part particle ? shouldn't it be the expression that the shape contains three dimensions? to a whirlwind of elementary particle activity in fact it is very difficult to distinguish between the disturbances that represent virtual particles and disturbances that represent actual particles in a plasma like this but for our purposes we can view a proton as a cloud of gluons holding three quarks together and again the vision of physicists does not deviate significantly from HDV - on the contrary, the "cloud" will certainly be a "ball of packed dimensions" of 3 + 3 spatio-temporal quantities.

(03)- [Music] another significant difference between the em force and the strong force is that the coupling constant for the strong force is 137 times stronger * I once researched this (1983-4) I did not find a reason… but I was "close". and most importantly where the elm force decreases with distance the strong force increases with distance as the distance between quarks grows to the diameter of a proton * the deep essence of this phenomenon will again be in the "curvature", in the way of curving dimensions, ie what is the "geometric curve" that presents the "force" the strength of the force approaches 18 tons imagine 18 tons focused on such a tiny spot this makes it virtually impossible to separate quarks in fact with a force that strong the energy it takes to separate two quarks in * čili prakticky nelze změnit křivost dimenzí lokality ve které se nachází ty dva kvarky a hadron is greater than the energy it takes to create two new quarks * or practically cannot change the cursions of the locality dimension in which there are two quarks so before we reach separation energies new quarks are created instead these new quarks immediately combine to create new hadrons one last item on the strong force answers the question i raised at the end of our segment on the atom what holds the protons together in the nucleus in 1934 the japanese physicist haraki yakawa made the earliest attempt to explain the nature of the nuclear force according to his theory a particle was being shared between nucleons like molecules share electrons between atoms to bind them together he even calculated the mass of this particle we now know as a pion the shared particle is attached to both protons the situation is similar to two people pulling on a ball each person exerts a force on the ball and the effect is as if each exerted a force on the other here's a two proton example of how we think it works first in one of the protons an energetic gluon spontaneously creates a down quark anti-down quark pair next the pion drifts into the other proton and the anti-down quark annihilates a down quark leaving the other down quark to take its place the diameter of a proton is 1.662 femtometers at a separation of less than a half a centimeter the nuclear force is repulsive this prevents nucleon collapse it then becomes attractive over a short range peaking at 1.3 femtometers with a force much stronger than the electromagnetic repulsion and it becomes negligible by around three femtometers where the electromagnetic repulsion takes over the proton is key to helping us understand the origin of mass the only stable elementary particles in the proton with mass are the two up quarks and one down quark their tiny masses constitute only one percent of the mass of the proton 99 comes from the energy of the fields and motion of the moving parts following the famous E equals m c^2 so it is quite accurate to say that confined energy is the origin of mass we'll bring this point home when we get to the higgs boson the weak nuclear force or weak interaction is responsible for radioactivity for example beta radiation ejecting electrons and neutrinos it's the force that turns a neutron into a proton unlike quantum electrodynamics in quantum chromodynamics there is no separate matter field that creates a particle with a weak force charge sometimes called weak isospin or weak hypercharge instead all fermions already have this charge including electrons quarks and neutrinos like accelerating electrons and quarks create vibrating ripples in their respective force fields called photons and gluons accelerating electrons quarks and neutrinos can create vibrating ripples in the weak hypercharge field called z particles [Music] and where photons can accelerate electrons [Music] and gluons can accelerate quarks z particles can accelerate neutrinos and electrons and quarks because they all carry the weak charge but for the weak hypercharge there are two additional particles called w minus and w plus like the gluon carries color charge W minus carries a negative electric charge equal to the charge of an electron and w plus carries a positive electric charge equal to the charge of a positron the Z particle has no charge at all they are all spin 1 particles making them bosons * Spin again is a certain embodiment of curvature of dimensions in the package they are the force particles for the weak interaction just like the photons and gluons can create matter antimatter particle pairs the w and z bosons can create matter and antimatter particle pairs and like interacting electrons and quarks disturb their respective force fields

creating virtual photons and gluons that exerts the force of their fields interacting particles carrying the weak hypercharge disturb the weak hypercharge field creating virtual w and z bosons that exert the force of the field the force can be attractive or repulsive depending on a variety of circumstances we call it the weak force because its coupling constant is 3.3 million times smaller than the strong force coupling constant and unlike massless photons and gluons these particles are massive around 50 times more massive than an up quark and 160 000 times more massive than an electron this makes the range of the weak force around 1 tenth of one percent of the diameter of a proton all the force particles actually exert a force on their respective matter particles but the weak force

(04)- has a unique additional capability it can change one flavor of quark into another or one type of lepton into another the idea that a force field particle can cause a matter field particle to decay ie transform into another particle was a new one we'll use beta decay from our radium to polonium *, http://www.hypothesis-of-universe.com/index.php?nav=ef energy experiment to help illustrate how this works the process consists of two phases the first phase is similar to the way an electron emits a photon when it drops to a lower energy state in an atom here a down quark drops to the lower energy up quark and emits a w boson that carries away the energy and a full unit of electric charge the remaining quark's charge then goes from minus one-third to positive two-thirds making it an up cork however the mass of the weak field quantum is so large that there is not enough energy in a down quark quantum leap to an up quark to create a fully independent w boson instead what is created is a virtual w boson however in the second phase because there is enough energy in the virtual boson to create an electron and a neutrino it decays into these particles this is possible because both the electron and the neutrino carry the weak hypercharge this is how our radium turned into polonium in our segment on the atom [Music] because of the significant amount of energy needed to produce these massive z and w weak force bosons it wasn't until 1972 that the first evidence for enrico fermi's weak interaction theory was found this event shows a neutrino electron interaction that would require a z boson it was recorded by the gargamel bubble chamber at cern final proof came for z and w bosons when the proton anti-proton collider was built at cern in 1983 here's the standard model with all the stable fermions if we add the excited state versions of these fermions we get the full view all of space is filled with matter fields they can spawn fermion particles as waves this includes all the leptons and the quarks these particles carry one or more charges color charge electromagnetic charge and weak hypercharge particles with a charge fill the space around them with a force field that can spawn force particles when excited by particles that carry their charge these are the bosons the bosons are the force carriers or mediators of all fermion particle interactions this model has had great success in explaining observed natural behavior at the quantum level but there was one serious problem that had to do with the mass of the particles one way to look at it is that it didn't explain how elementary particles acquire mass * Weight is the "property" of each elementary particle and it does not get the fact that someone (HIGGS-BOSON) gives it to all particles, but it follows from a certain "" prescribed "" topologically uniform configuration of "package" for all particles or given that we know that confined energy generates mass * ?? What does the author mean: He generates mass or weight ??? Energy cannot generate "mass" is the state of mass another way to look at the problem is that the standard model did not explain how photons no matter how much energy they have confined do not have mass

http://www.hypothesis-of-universe.com/docs/f/f_008.pdf →
Pythagorova věta o energii $E^2 = p^2 .c^2 + m_0^2 . c^4 . \Delta t^2 / t^2$
$m . v . x_c = m_0 . c^2 . t_c . t_c / t_v$

http://www.hypothesis-of-universe.com/docs/f/f_010.pdf ; http://www.hypothesis-of-universe.com/docs/f/f_039.pdf in classical physics mass is a measure of the inertia * ??? This is not a satisfied perfect truthful explanation, it is just speculation, of a body the mass of an object causes it to resist a change in its speed or direction the greater the mass the greater the resistance this * and the resistance lays the resistance.?? This is not a satisfied perfect truthful explanation is codified as force equals mass times acceleration in quantum field theory on the other hand the energy of a quantum is represented by oscillations in its field since both mass and energy are associated with oscillations in the particle field * Small resumes: Energy quantums oscillate in the particle field. Why do not say that "particle field" is a mousse dimension of timescorial which "oscillation" and this manifestation of foaming is called oscillation "quantity of energy", which is just the variability of the crook dimensions of the foam dimension we can simply combine Einstein's equation for mass energy and Planck's equation for wave energy to calculate the mass * Wave is there what? Apparently the oscillation? And oscillation is apparently "shake foam dimension of space-time", which is a "dense transformation" of the curse of the environment, the field. Who put the field in motion? A field that vibrates-oscillates, only this has a "quantity, such as energy. But before starting the vibration field, the field is standing ?? and is not quantized ?? a wave the faster a particle is oscillating the harder it is to change its direction or speed so this corresponds to our normal **weight** understanding * This understanding of the weight (energy), such an understanding of the weight ", does not correspond to the exact formulations of explanation - understanding weight by" higgs-mechanism ". Both explanations are very different. And different are the explanation and understanding of the weight of HDV. This is simple, It fits into small sentences: weight is the property of matter. More complicated to explanation with HDV is an explanation of mass (perception of energy) and ploli. The principle of material (fields) is "the dimension of 3 + 3 space-time. Each diameter curves of 3 + 3 D space-time is "in itself" of the material (elements) or fields. The universe after a large bang does not begin with an imprisoned state in Big-RIP, but it begins with singularity, respectively the space-time area of very-viemi-very crooked dimensions, the site "swimming" in the infinite Euclidovsky flat space room - the new universe launches the existence of bodies Huge twisting dimensions into the "foam", the foaming continues on the pledge scales into the "strain foam", whirling vacuum ", respectively to quark-gluon plasma. Genesis of changes in conditions, thus the changes in the dimensions leads to the start of the flow-flow of time and the start of expanding space-time- better call the space-time unpacking and to start "packaging dimensions" in the foam to accurate packages-kokones-geons that will have properties and behavior of matter. Thus, the curvature of the dimensions changes, either bailed into elemental particles (or atoms, molecules, compounds, etc. Chemistry, biology to DNA) or are unpacked into macro directs, ie. Into intergalactic time-space together with physical fields. Properties such as weight, spin, charge, parity, etc. They are only "frozen" states of certain obstructed bogus dimensions 3 + 3d space-time, which is no longer changed.

To the emergence of matter, fields and their genesis changes in sequence, even the second sequence, ie genesis of laws, rules, symmetry, principles that do not increase the singularity of BIG-BANG, but also born in the flow of time and curve dimensions. [Music] dirac identified the oscillation of a particle between his right-handed incarnations and its left-handed incarnations as a mechanism for fermion mass the faster the oscillations the more energetic the particle the more massive it is it might seem strange a particle changing its spin on the fly but if you recall that particles travel as waves and spin can be viewed as a phase shift in the wave it's not too hard to visualize we'll use electrons as an example a left-handed spinning electron has a spin one-half and carries a weak hypercharge a right-handed spinning electron

has a spin of minus one-half and carries no weak hypercharge * How did they find out? *so for an electron to switch from left to right it must emit a quantum of weak charge and lose a full unit of spin and for it to switch back it must absorb a quantum of weak charge and gain a full unit of spin* now * What is the "quantum" of charge? What is the charge made of? how do we quantify it? Here we had a very large problem for particle physics it was understood that a derivative of the z boson was a candidate for the electron spin and charge transition but there was no standard model mechanism for ejecting and absorbing weak hypercharge out of the blue where did it come from and where did the charge go in 1964

(05)- n order to resolve this problem Francois Englert Robert brought Peter Higgs and others proposed a new field that permeated all of space now called the higgs field they proposed that this field contained a condensate **of weak charge a condensate** * that is, they did not search the universe with scientific instruments for factual observational, they proposed on paper an idea (Hell with devils), that is, it is common speculation. I also designed HDV here; ad2) what is it ?? "Condensate" charge is what ??? Charge is a property of matter, ie particles, ie the state of a certain curvature of "selected" dimensions but has the property that adding to it or subtracting from it leaves it the same a particle carrying weak charge could use a weak charged virtual Z boson to move the charge to this condensate without noticeably changing the field and it could which field should not change? before the "higgs field design" or the "higgs field"? That is, human speculation, ideas, not finding reality use the same Z boson mechanism to absorb a weak charge from the condensate without noticeably changing the field this was called the higgs mechanism * this is a very incomprehensible interpretation with the higgs mechanism an elementary particle that carries a weak hypercharge **can oscillate and therefore has mass** * interesting, by oscillating the element this "gains" mass? and from where ? from what ? and how? and with what? is oscillation a "magic" for mass formation? electrons neutrinos and quarks all carry this charge **and interact with the higgs field so they can oscillate and therefore they have mass** * So: electrons, neutrinos, quarks are flying everywhere, and suddenly a Higgs field comes from somewhere and a mutual interaction begins? or vice versa? : first the higg-field spreads and electrons, neutrinos and quarks rush into it from somewhere to "catch, gain" mass in the field? photons don't carry weak hypercharge and therefore they cannot interact with the higgs field and therefore they cannot oscillate and therefore no matter how much energy they may have they have no mass the process is a little different from particle to particle and physicists use subtler concepts of durality gauge symmetry and symmetry breaking but **this is the basic idea** you'll note that. The particles that interact with the higgs field are not slowed down the higgs field is not like molasses if the higgs field slowed particles down in any way objects in motion would no longer remain in motion this is not what we see in the real **world here's one more important idea about mass** * Therefore, the idea of changing, change the idea, and HDV can also be designed. the reason the masses are different for different particles is that the coupling strength of the interaction with the higgs field is stronger for some particles than others increasing the coupling strength is like increasing the stiffness of the spring in a harmonic oscillator it has the effect of increasing the oscillator's frequency and we have already determined that if we increase a particle's oscillation frequency we increase its mass * and the frequency will increase the power supply we did not have before increasing frequency and stolen to increase weight with that fraction? Or frequency increases herself apart? now we can ask what is a higgs boson we have learned that under the right circumstances excited fields * What does the "excited field" look like? And who excites him? and what? generate particles this also applies to the higgs field if ?!? it exists it has an associated particle that particle is called the higgs boson so working in reverse if !?! we can find the higgs boson we'll have strong evidence that the higgs field exists and the higgs mechanism is real and the

standard model of particle physics is correct quantum field theory predicts that this particle's mass should be around 125 giga electron volts with zero spin called a scalar boson „H“ note that all the other force particle bosons the photons gluons W and Z bosons at a spin of one and are called vector bosons this large mass around 133 times more massive * mass or weight than a proton * Why are you creating him? Why don't you catch it easily in real-universe, we don't change, we don't change? makes it difficult to form one it takes a great deal of energy at the time the higgs boson was proposed no existing accelerator could do the job this is why the large hydron collider at cern was built this large hadron collider or lhc for short is the world's largest and most powerful particle accelerator here's how it works using hydrogen with the electrons removed proton packs containing billions of protons are accelerated down a linear accelerator like we saw at slack the first booster accelerates the protons to 91.6 percent of the speed of light the protons are then flung into the proton synchrotron they circle here for 1.2 seconds reaching 99.9 percent of the speed of light the protons are then channeled into the super proton synchrotron here they are accelerated to the point where they can enter the large hadron collider here there are two pipes that carry the proton beams in opposite directions each beam is accelerated to 7 tera electron volts that's 7 trillion electron volts and because they are traveling at each other the total energy of a collision is 14 trillion electron volts this ought to be enough to kick the higgs field into producing a higgs boson *why do you want Higgs-boson when you just need a higgs-field to meet him electrons, neutrin and quarks what do they want to "buy weight"? as the protons approach each other they are traveling at 99.999999 of the speed of light the actual collision creates hundreds of particles – jet´s that scatter out in all directions detecting and measuring the trajectories momentum and energy of each of these particles is the next big step [Music] for cross-checking purposes CERN uses two main detectors one of them is the compact muon

(06)- solenoid or cms for short it was designed to search for the higgs boson and dark matter the second detector is called atlas it uses different technical solutions and a different magnet system it is seven stories high we'll take a closer look at this one the detecting components in atlas are each designed to detect different kinds of particles pixel detector and semiconductor tracker contain layers of silicon charged particles passing through the silicon release electrons that flow to millions of microscopic metallic spheres under the silicon layer these are all electronically connected to the computer that keeps track of their path the transition radiation tracker can distinguish between different types of charged particles it contains a large number of tubes filled with gas passing charged particles produce electrons that flow down a wire in each tube different particles produce different currents a strong magnetic field is created around these inner trackers the generated curves and particle paths enable us to calculate the particle's momentum like we did at slack [Music] atlas has two calorimeters like the calorimeter we used in the beta decay experiment they are used to measure the energy of the transiting particles but these two don't use heating water that would take forever the electromagnetic calorimeter measures the energy of photons and leptons like electrons and positrons it contains many layers of lead and stainless steel that absorb the particles between the layers is liquid argon at minus 180 degrees centigrade immersed in the liquid argon is a copper grid passing particles drive electrons to the copper and measuring the number gives us the energy of the particle [Music] the hydronic calorimeter measures the same for hadrons like protons neutrons and mesons [Music] it is a large array of steel and scintillator sheets that create photons when struck by charged particles light fibers carry the light to intensity measuring devices the light intensity gives us a measure of the energy of the hadrons entering the calorimeter at the outer layer is a muon spectrometer with a surface area the size of several football fields in the attached chambers there are tubes also filled with gas [Music] the electrons that are generated by the passing muon drift to the center this enables the system to

determine its track here are a few examples electrons plow through the inner detector leaving a trail before stopping in the electromagnetic calorimeter photons will act the same way in the calorimeter but they do not leave any track through the inner detector since they have no charge protons leave a track but will most likely pass through the electromagnetic calorimeter into the hydronic calorimeter neutrons behave in a similar way but leave no track through the inner detector muons pass all the way through atlas leaving tracks behind in every layer and as was the case with beta radiation neutrinos pass all the way through atlas without being detected at all the lhc produces a billion collisions per second that gives the particles produced by any one collision less than a billionth of a second to clear the tunnel and pass into the detectors but with particles traveling near the speed of light and the radius of the tube being just over three centimeters they are all clear in 10 to the minus 10 seconds [Music] out of hundreds of billions of particles created by a few seconds worth of collisions only a few are massive enough to be interesting but massive particles like the higgs boson itself will decay into lighter particles so rapidly that they never reach the detectors we cannot see them directly but we can detect the lighter particles created by their decay we can then deduce the originating particles by their decay signatures *((Even the devil in hell we can't we see directly, but we know that there are because of the hole with line smoke and sulfur) just like we did in the cloud chambers on mountaintops on july 4th 2012 45 years after peter higgs proposed its existence cern announced that one of these interesting particles created in a 2011 collision turned out to fit the decay signature or the higgs boson here's a higgs boson decay into two photons event recorded by atlas in 2016 that illustrates the decay mode for higgs found in the 2011 event orange lines show the trajectories of charged particles as they passed through the inner tracking systems the green and blue cones show jets of particles produced in the collision [Music] the green boxes show the energy deposits in the electromagnetic calorimeter the yellow boxes show the energy deposits in the hydronic calorimeter the longer the box the greater the energy deposited the extremely long

(07)- green boxes out of the bottom represent the energy deposited by the two photons created by the higgs boson ?? decay according to the standard model of particle physics there are several ways for a higgs particle to form and to decay through W+- Z and quark particles here is a two photon one it's rare but easily identified* when it happens as two colliding protons approach each other they overlap then two highly energetic gluons collide creating a virtual top quark and anti-top cork pair this is called gluon gluon fusion these unstable quarks quickly decay into a higgs boson the higgs boson in turn decays into (again *crumbles*) ("Does it fall apart? or converted "? For example, neutron "transforms" to proton, electron and anitineutrino and water is "fallen" to hydrogen and oxygen) a virtual top quark and anti-top quark they quickly decay into two high-energy photons it is the photons that were detected by atlas [Music] in our search to find out what is actually happening at that point in empty space outside the magnet we have learned a lot we have discovered that **empty space is a complex entity** *Because time-space on Planckovských scales is wavy, rather foamy, or a very distorted dimension .., therefore, is a "strain vacuum" wearing "dark energy". it can be stretched as seen in the expanding universe it can be bent as understood by general relativity it's filled with various types of matter fields force fields and the higgs field according to the standard model the elements of these fields are quantized massless and almost energy-less and we know that empty space offers resistance to change in these fields for example permittivity and permeability we know that with enough energy the elements of a field can bunch up into localized particles with properties like mass spin and various types of charges that spew out their own field elements into the empty space around them but as much as we've discovered it feels like we're still just scratching the surface the order in the standard model like the order in the periodic table of the elements lends itself to the theory that there is an underlying structure

yet to be discovered * HDV - The basic structure for the standard model will (until the physicists understands) 3 + 3 dimensional space-time, which is beautifully modeled in its own dimension curve and "fields" and "all elementary particles" style packaging-wrapping dimensions into a ball - for particles And in the wavy surfaces for fields that "swim" as "prescribed" curses, one in the other, float in each other = wear. this along with the mysteries of dark matter and dark energy plus the fundamental incompatibilities with general relativity also speak to a deeper reality loop quantum gravity string theory and supersymmetry are just a few of the candidate theories currently being explored * HDV is still examined to this day in that vein as we approach the end of our how small is it video book we'll take a look at the smallest that small can get in quantum mechanics there is a minimum length * (Length = widespread = line) called the planck length it is over 62 trillion times smaller than a neutrino * From this perspective Question: When you-physically quantized gravity, "what" you actually quantity? and "What"? what for" ? our smallest elementary particle this planck length is as many times smaller than this dot as this dot is smaller than the visible universe theoretically it is impossible to determine the difference between two locations less than one plank length apart this idea takes us back to our first segment on the microscopic where we saw how light diffraction created the same problem for optical microscopes as we pointed out at the start of our story you can't probe a grain of sand with your finger how are we going to find out what's happening at this plank level the level where the quantized field elements operate this is just one of the many challenges for physicists of tomorrow it should be interesting please take a look at the credit segment it will point to other resources for additional research thank you for watching [Music]
44:38
you
**********.

I will still add a summary view to this topic later
JN, 29.11.2021

Development of my opinions on Higgse since 2004 →

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Wikipedia : Empty place in our mosaice is Higgs Boson, which needs a standard model of a unifying description of electromagnetic and weak interaction. This particle should help explain the formation of particle weight and reason, for example, the particles of electromagnetic interaction photon zero serene weight and particle of weak interaction Z and W Bosons of peace weight so huge

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