**The Particulate Nature of Subatomic Matter**

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**Summary**

This focuses on the particle side of the wave/particle duality, since Schrödinger has done a satisfactory job of covering the wave side. It treats the “fundamental” particles (leptons, photons, and quarks) as structures and examines their content: an immediate “upper” layer described as proto-matter, each bit of which is comprised of a lower layer described as infra-matter. It includes an explanation of color and charge as special instances of angular momentum at the infra-matter layer. It describes the differences among the flavors of quarks in terms of the orbital dynamics involved, with up and down quarks involving just s & p orbits of infra-matter, strange and charm adding d orbits, bottom (or beauty) adding f orbits, top (or truth) adding g orbits, and postulates higher states with additional orbits.

**Matter**

While much has been made of the wave nature of matter, the particulate nature is also important. Between them Planck and Einstein demonstrated the particulate nature of the photon. The particulate nature of atoms was never seriously questioned. The constituents of atoms also have particle properties: mass, velocity, momentum (both linear and angular), and a finite volume.

The simplest of the constituents of atoms are the electrons. These have rest mass of about. Their velocities vary from a tiny fraction of light to very near that of light, depending on local conditions. From Compton’s work, they have an effective radius of about 386 femtometers. Both the rest mass-energy and the effective radius have been measured to many significant figures. As the other constituents of the atom (the nuclei) are tiny, the electrons occupy what little space in the atom is occupied. In the case of a hydrogen atom, the diameter of which is about, the atom occupies a volume of . The electron only occupies.

**Proto-Matter**

The electron has 6 immediate constituents, each with particulate properties: a charged proto-lepton, 3 proto-photons, and 2 [gravitons](Article3-Gravity.htm). Each is moving briskly, with the proto-photons moving at the speed of light, the proto-lepton 12/13 of the speed of light, and the gravitons much faster than light. The proto-lepton has positive real rest mass, the proto-photons have essentially zero rest mass, and the gravitons (which are low-energy tachyons) have imaginary negative rest mass. The proto-matter each has a radius of not more than  (see gravitons paper above), while the radius of the graviton is small (circadiameter). From our perspective, only the proto-lepton is apparent, since its charge is the most noticeable property of the electron as a whole.

Similarly, the photon has 6 constituents: 4 proto-photons and 2 gravitons. Again, the proto-photons are moving at the speed of light and the gravitons faster. The photon occupies a volume whose circumference is equal to their graviton’s wavelengths. This implies a maximum intensity of light, since 2 photons of the same wavelength can’t occupy the same space. Each of the constituents has a diameter as above. Since energy varies directly as n, a form for finding the energy per equivalent piece was needed. This gives P\*, the energy equivalent piece count. For the electron and the photon, P\* is 12. EK/P\* gives the 1s kinetic energy of a piece (in this context, a bit of proto-matter). If only s orbits are involved, P\* is always an integer. See below for an analysis of P\* for non-s orbits.

It was possible to find the constituents of the photon and from there the other sub-atomic particles, by taking a force/energy balance on the constituents. For the photon, the proto-photons have essentially zero rest mass and the gravitons have imaginary rest mass, so all the effective mass is kinetic energy. A simple balance determined the gravitational attraction just balances the centripetal force outward for each proto-photon. In theory a photon-like structure can be built with any number of proto-photons, although only structures with 2 gravitons look viable. For constituents with a non-zero rest mass, a color or charge is necessary to bring a balance. Then the gravitational attraction is countered by the sum of the centripetal effect, a color on color repulsion, and a charge on charge repulsion. In most cases the repulsion is autologous: based on a single particle in orbit with charge or color effects pulling outwards against gravitational compression. In the case of charge, these effects are the result of the proto-photons. For color a similar proto-matter entity, the proto-pion, causes the pull outward. Note – this is a pull, by the proto-bosons, not a push.

Since the energy and force equations are continuous, we need to look to the angular momentum to find a quantization. It was possible to generalize a formula to calculate the velocity needed to produce m units of extra angular momentum for a proto-lepton (or other proto-matter with rest energy) in a ns orbit where , and , of . This often has as rationals, rather than integers. The photon has zero angular momentum (with 2 wavicles each in the 1s, 2s, and 3s sub-shells), but the neutrino does have angular momentum. Assuming the simplest case, the Electron-Neutrino has 4 wavicles: 2 gravitons in the 1s orbitals and a proto-photon in a 2s & a 3s orbital. From the Planck equations, with a 6 piece photon, as above, the 1s pieces have 1/12th the energy each. This gives an angular momentum of 1 unit of This angular momentum is only the structural portion, the proto-lepton has angular momentum as well (from its constituent’s orbits), but it is a constant for all the negatively charged leptons. The sum of the two is typically given as 6 small units, so the proto-lepton contributes either 5 (if its angular momentum adds to the structural amount), or 7 if they are aligned oppositely (which seems likelier – and will be used hereafter for calculations).   
  
A solution assuming the muon differs from the electron solely by the orbits the proto-matter occupies implies a half-life typical of strong interactions:. The actual half-life () indicates a weak decay mode, involving changes in the proto-matter itself. While a proto-lepton is present in each, they are not the same thing.

It is possible to calculate various balance points, where the proto-lepton has m extra units of angular momentum. The obvious balance point for the muon has the proto-lepton in a 3s orbit moving 24/25c (so 9.36 MeV “rest” energy, giving a fourth unit of angular momentum). Alternately and more likely, the muon could have its 3s proto-lepton travelling 15/17c (with 18 MeV “rest” energy), giving 2 extra units of angular momentum paired to a 4s proto-photon (making -6 units total for the muon). This likelier solution is used in calculations below, although both were examined. Similarly the tauon could have its proto-lepton in a 4s orbit moving 40/41c (hence 132.17 MeV “rest” energy) for a fifth unit of angular momentum , but the solution that best fits the reported value has a 5s proto-tauon moving 45/53 c (404.5 MeV) with 4 extra units of angular momentum balanced to a 8s proto-photon. Overall, only wavicles where the forces balance and angular momentum is conserved and quantized would be observed.

In order to generate the required angular momentum, the charged proto-lepton in the electron would have a rest energy of 48.207445 KeV (in a 2s orbit balanced by a proto-photon), which is 5/53 the total energy of the electron. This can be balanced by an electron-neutrino with a 2s proto-photon partly offsetting the angular momentum of a 3s proto-photon (plus, as always, a pair of 1s gravitons). There are many possible neutrino states that could match the Muon and Tauon. See also the [Neutrino](Neutrino.htm) for an analysis of the possible states that wavicle can enter.

In all 3 cases of charged leptons, besides the proto-photon paired to the proto-lepton, there are also a pair of proto-photons in the other available s orbital which have 0 net angular momentum. Additional charged leptons are possible, some with 3 or more units of structural angular momentum.

**Mezzo-Matter and Infra-Matter**

As the proto-lepton has “rest” energy, it follows that it is a structure comprised of moving pieces. These pieces will be called mezzo-matter, if they have additional structure, or Infra-matter if they are final. Some of the mezzo-matter pieces contribute to the charge of a proto-matter structure, while others contribute to the “color” in the nuclear sense. Additional pieces may have energy other than the quantizations derived for charge and color. The infra-matter adds the trivial amount present in the proto-photons, proto-pion, and the 2 kinds of mezzo-matter.

2 obvious solutions for distributing the energy of the proto-matter between the charge portions and non-charge portions of were examined: there can be color (or chroma) bits and/or there may be bits that add neither charge nor color. Starting from the simpler assumption, the color or chroma bits may either cause net color or add to white. Since 6 states have been identified with the colors, the easiest mapping treats the chroma bits as occupying p orbitals in quarks. The charge bits may also occupy p orbitals (where the vectors cancel to 0), or they can be in s orbitals with their angular momentum perpendicular to whatever angular momentum comes from the color. If when a p orbital is occupied, there are always 3 tachyons among the 6 orbits, 2 stable solutions can be produced: their angular momentum can be distributed 60 degrees apart or 120 degrees apart. Cases where the 3 are clumped produce reinforcement, where the outer pair adds to a vector that complements the vector of angular momentum of the central vector – hitting a combined maximum where the central vector is minimal and a minimum where the central vector is maximum, which produces a constant angular momentum. Cases where they are 120 degrees apart have the angular momentum add to zero, or white. Higher *l* orbits are also possible, giving rise to strangeness, charm, etc. Since these don’t have reinforcement (which is peculiar to the p and similar orbits), cases with net amounts appear unlikely. Similarly, the chroma or color bits can be in s orbits, as long as the angular momentum cancels out.

Additionally, the infra-matter must have some energy to be bound together to form proto-matter. That means that neither the proto-photons nor the photons themselves are luxons: they have rest energy, making them tardyons. They are very quick moving tardyons, but still travel somewhat less than the speed of light. Measuring the speed of extremely low energy photons would give a ceiling on the rest energy of the proto-photon. Alternately, measuring the exact moment a glitch occurs in the rhythm of Pulsars in widely different frequencies could be used. From the existing data on photons, the rest energy should be less than 10-20 eV. This could be a luxon/tachyon pair in the 1s orbits where the tachyon has a tiny bit of energy at the infra-matter radius, producing a bit of net angular momentum. Like the proto-pion, the proto-photon has trivial angular momentum in the direction of the relevant vector (here along the z axis), causing it to weakly cling.

The angular momentum of a tachyon is large compared to the angular momentum of a luxon in a similar orbit. Based on the energy and velocity of each, the angular momentum of the luxon is trivial. This trivial amount does account for the stickiness of the proto-photon to the charged structures and the stickiness of the proto-pion to colored structures. That is, it causes the electro-magnetic and the strong force.

It should be noted that in addition to the standard orbits a 0s case is possible, where a small structure is embedded at the center of a large structure – such as a stationary electron containing a nucleus. These are at best transitory, since any contact with the larger structure from outside is likely to disturb it. In this case s may not be the right name, since the s orbits come in pairs, and this is a solitary situation.

As charge on the electron is 3 times that on a down quark, so a solution with the proto-lepton having 3 tachyon constituents, adding to -7 small units of angular momentum is plausible. As the amount of angular momentum for an ns infra-matter tachyon is independent of n, this can be accomplished by addition or subtraction. The easiest addition has a 1s pair, a 2s pair, and a 3s pair each comprised of a tachyon and a luxon. This gives an average 1s energy equivalent for the charge bit of 4.0172871(4) KeV. Some of this can be rest energy within the tardyon charge bit; the rest is divided up evenly between the kinetic energy of the 2 types of bits. From the reported angular momentum, an exact velocity can also be calculated: with , L=7\* ħ/36c, and trivial rest energy the velocity is for 1s. Velocity is proportionately slower for the higher orbits (). This gives a minimum diameter of  for the charge luxon bits of Inframatter, and a rest energy of  for the charge tachyon bits. A more complex analysis is possible treating the non-tachyonic charge bits as [structures](ChargeBit-Structure.docx).

As the Muon has so much more energy than an electron, a structure with 6 chroma bits in the 2p orbits makes sense: with 3 being tachyons and 3 luxons, where the color adds to white (Pcolor\*~14.5). That leaves the charge bits as 1s, 2s, and 3s orbits, or a Pcharge\* of 23. Using these P\*s as exact, gives an E/Pcolor\* of 1.2340506 MeV for a 1s orbit equivalent. A more refined analysis showed a best fit if the rest energy of the tardyon was about .203 Mev, with the other 2.131 Mev evenly split between the Kinetic energy of the 2 types. Without an exact angular momentum, the velocity, minimum diameter, and rest energy can’t be calculated. A rough estimate gives a velocity about 30 times that of the charge bit.

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| The eccentricity of the various orbits was earlier calculated for electrons, but applies here also: |  |
| For the Tauon, additional orbits are needed. If the mean radius of the p orbits is equal to the radius of the 1s orbit (as the 2s, 3s, etc. are assumed to be), the typical energy per bit for the luxons, where velocity is constant (given the above formula for eccentricity), gave:  Here the average energy is the mean of the minimum energy and the maximum energy or f(1/r). |  |
| For the tachyons, where velocity varies directly with radius, the overall function came to f(1/r2), or:  In most cases there are equal numbers of luxons and tachyons, but where they differ the correct formula is needed for each. For example, in our model of the proto-pion there are charge bits in 5 of the 2p orbits and a color luxon in the 6th. |  |

A third form was derived for the tardyon (such as p electrons) where v is indirectly related to 1/r, since E=f(1/r2), but only for specific cases as there is significant non-zero rest energy for both the nucleus and the electron, and the kinetic energy available to the electron varies as the fraction of the total energy the nucleus represents.

While the Muon has a Pcolor\* 14.534, the Tauon has a Pcolor\* of 324.53 (with kmn=4), possibly as 2p, 3p, 3d, 4p, 4d, 4f, 5p, and 5d chroma bits (with all the 1s, 2s, 3s, and 4s orbitals filled with charge bits). That gives a Pcharge\* of 20.

At this point a review of the possible geometries is required. With single sphere solutions, all the proto-matter is in s orbits around a common center. For neutral structures, solutions are also possible with 2 or more spheres touching. These can be a quark and an anti-quark, a diquark and a quark, or a pair of diquarks. Single sphere structures are smaller than multiple-sphere for a given energy. No single sphere solutions were examined for the proton (as they would be < 1.5 fm in diameter), but both single sphere and multiple sphere solutions were examined for the mesons. For charged structures, the charge related proto-photons orbit the clump of spheres, forming a photon-like shell. This has the absolute value of 3z proto-photons for a structure with charge of z. If structures with net color larger than a single sphere were to form, there would be a pion-like structure with multiple proto-pions orbiting (proportionate to the net color present). As is, the proto-pion orbits at the surface of the individual spheres with net color (either a quark or a diquark). As with neutral structures, charged structures can be comprised of 1, 3, 4, or more total spheres (but not 2). Starting with the 5 sphere structure, it is necessary to examine the arrangement of the spheres in 3 dimensions (with a tetrahedron of the 4 inner spheres possible). Charged structures with mixed charge types can also have proto-photons at the surface of individual spheres, besides the overall photon-like shell. A deuteron, for instance, with a z=1 has 3 proto-photons orbiting the 4 sphere clump, but 2 of the individual spheres also have a proto-photon circling in their basic structure (1 of the diquarks and the down quark). In this context proto-photon count appears to be conserved, with the total number of proto-photons present in a structure equal to the count if the structure were broken into constituent quarks. In the deuteron case, each diquark would have 1 when independent as would the down quark, while the up quark would have 2. Then there are 5 proto-photons total when taken separately; and 5 when combined.

Like the proto-photon, the proto-pion has only trivial rest energy (about 10.267 times as much as the proto-photon), and trivial angular momentum. While the proto-photon has angular momentum in the z direction (that is aligned to charge), the proto-pion has its angular momentum in the xy plain in one of the 6 color directions. To achieve this, the proto-pion has infra-photons in 1s, 2s, and 2p orbits, with 5 tachyons and 5 luxons. The 3 tachyons in the p orbits have their angular momentum distributed 60 degrees apart, so they have net in the central direction of a constant (though small) amount.

The quarks can have their angular momentum aligned or opposite. In the case of the diquark, the 2 proto-quarks are normally both in 2s orbits, with their structural angular momentum opposite, but in some cases both have angular momentum in the same direction, with 1 in the 2s orbit and the other in the 3s. The charge related angular momentum remains aligned based on charge. For proto-quarks this is L=-7/3 for the down, strange, and beauty (or bottom), and +14/3 for the up, charm, and top (or truth). Where a quark is matched to its corresponding anti-quark, the charge related angular momentum always cancels out, but the structure related need not. If the quark is bound to an anti-quark of another type, it is often difficult to locate the matching solution with L=0 (although so far not impossible). It often required assuming at least 1 quark contained its proto-quark in a higher-energy orbit: 3s or above.

For simplicity it was assumed the structures with the least absolute angular momentum were best. This usually means high rest-energy proto-matter in low s orbits, except the gravitons have to be 1s – since they are tachyons and have huge angular momentum even there.

Baryons have 3 plausible structures under this theory: a trio of monoquarks, a monoquark plus a diquark, and a single tri-quark. Multiple attempts were made to try to force various baryons into the 3 monoquark model, and none fit (not even the delta). Some less well studied baryons may eventually be found to match this case. The negrons (or dark matter particles) look like good matches to the single sphere with 3 proto-quark case. This leaves the diquark (a sphere with 2 proto-quarks sharing a common center) plus a monoquark as the most likely case for the baryons.

The content of the nucleus (described in detail [elsewhere](Article2-Structure.htm)) includes monoquark and diquarks. Each independent monoquark consists of a proto-quark and 2 gravitons, plus 1 or 2 proto-photons (depending on charge), and a neutral proto-pion (since the quark has net color). Each independent diquark is a structure of a proto-diquark and 2 gravitons, plus 1 or 2 proto-photons, and 2 proto-pions. When 2 or more quarks and/or diquarks are congealed into a nucleus, the proto-photons may be promoted to surround the whole structure. If the structure had net color, the proto-pions would also be promoted. So the nucleus as a whole also has 1 or more photon-like structures consisting of proto-photons and gravitons. The outermost photon-like structure has 3z proto-photons and at least 2 gravitons, where z is the overall charge on the nucleus. The other proto-photons beyond 3z remain with their quarks and diquarks (especially those interior to the nucleus). See also the [sub-shells](Article2-Subshells.htm) article for an analysis of proto-photon energy content. Again each of the proto-photons, proto-quarks, proto-diquarks, proto-pions, and the gravitons have effective mass, velocity, momentum, and occupy a small volume. In the case of a proton, with a diameter of about 1.6 femtometers, the total volume of which is  the proto-matter constituents occupy a total volume of . Like the atom, the proton is mostly empty space. Unlike the atom – which has a dense nucleus – the proton resembles 2 soap bubbles clinging to each other embedded in a larger soap bubble.

Proto-quarks and proto-diquarks have net color: presumably 2 average units (as in the double blue below), in the 2p (for proto-up) or 3p (for proto-down) set of orbits. Each of these look to a slew of s charge bits, with all the s orbits filled before the corresponding p, and often 1 more pair (3p with 4s for instance). Since the amount of angular momentum is independent of the orbital, as for all large values of V, a 2p vector just balances a 3p vector. Reinforcement occurs only when the vectors of angular momentum are separated by 60 degrees, where the outer pair has a vector sum equal to the central vector on average. The outer pair has minimum L where the central vector is at its maximum, while the outer pair has maximum L where the central vector is minimal. This gives a constant L for the proto-quark as a whole. When *l*≠3m+1, this mutual reinforcement does not occur. 3 possible color schemes arise when *l*=1. Nuclei with a color scheme of red and anti-red would not fuse with either of the other color schemes, nor would blue/anti-blue fuse with green/anti-green. When *l*=4, as in the truth quark, 343 “colors” are possible (7 choices for each of the 3 sets, independently: no vector, or a vector θ+60m, where θ which defines a “set” is 0, -20˚ or +20˚, and m is any integer).

Several possible structures can be envisioned for the Proton. The best plausible solution encountered for the proton has a 18 MeV proto-up containing 6 2p color bits, plus 4 charge bits among the 1s and 2s orbits. The matching 42 MeV proto-down has 6 3p and 6 2p color bits, and 6 charge bits among the 1s, 2s, and 3s orbits. The diquark has 2 gravitons, a proto-up, a proto-down, and 2 proto-pions. The up quark has 2 gravitons, a proto-up, and a proto-pion. The proto-pion has infra-photons in the 1s, 2s, and 2p orbits, with the 2p in the 60 degree configuration giving net color.

Radius varies inversely with the amount of Kinetic energy with small changes to the structure of the proto-matter. When there is a significant change to the ratio of up rest energy to diquark rest energy, the balance point often shifts away from the minimum diameter, here at 1.681 fm. Similar solutions can be generated for the Neutron (also with an up/down diquark), and the Deltas (with either an up/up or down/down diquark). It is likely similar solutions can be generated for the other light baryons.

A plausible proto-strange (2p, 3p, and 3d color bits and 1s, 2s, 3s, and 4s charge bits: 30 bits total, the Zinc case) would have a rest energy of about 95MeV. If instead it represents the Argon case (with a full 4p orbit as well), it would have 126 MeV. Similarly the proto-charm with everything in the first described proto-strange plus 4p and 4d color, and 5s charge bits, would have a rest energy of 186 MeV (the Cadmium case). If instead it is the Xenon case (adding a 5p orbit) it is 224 MeV. That implies bottom and top add f orbits (4f and 5f respectively). The bottom could represent Ytterbium (with 70 infra-matter bits), Mercury (with 80) or Radon (with 86). The top would then be among 102, 112, or 118. If the top also adds a 5g sub-shell, which is another 18 bits, there are 136 total. The number of variants rises rapidly as the number and relative short energy distances between the sub-shells multiply. Solutions with multiple spheres require similar size pieces to bind (a ratio of diameters for BCC types less than 2.414214:1). KE is inversely proportionate to diameter, and low L solutions occur when KE is similar in size to rest energy.

From the reported charges on the quarks, the proto-up, proto-charm, and proto-top would have an even number of s orbitals, while the proto-down, proto-strange, and proto-bottom would have an odd. That would make the proto-bottom end with 7s, so it would also have 6p, 5d, and 4f. That is a bit count of 88. From my deduced pattern of orbits, the 8s follows a 5g orbit (preceded by 7p, 6d, and 5f), which makes the bit count 138 for the proto-top. The standard model has the 5g fill after the 8s, just before the 6f.

Without a reported energy, the best clue to the lowest energy Negron is the angular momentum. With a structure containing 2 gravitons in 1s orbits, 2 proto-downs in 2s orbits, and a proto-up in a 3s orbit, L=6 small units (spin = ½) means m=3 (where, as above, ). Then a=12, b=15, V (for the proto-up) is 12/15th c, meaning the KE of the proto-up is 2/3rd its “rest” energy of 18 MeV. With a P\* of 9, the overall KE is 3 times the 3s KE, so 36 MeV. The combined energy of this Negron is twice the “rest” energy of the proto-down plus 3 times the “rest” energy of the proto-up or 138 MeV (assuming all the current versions of the various proto-matter structures). The lowest energy gamma it could be expected to absorb is around 40 MeV. As it is by definition stable, and is unaffected by color or charge, it will be a little hard to spot. If instead the spin is 1 (L=12 small units), m=9, V=8/17c, 3s KE=8/15 the rest energy of the proto-up, total KE is 8/5 the rest energy of the proto-up, so 131 MeV total. In either case, the expected concentration ρ is f(1/T) (that is, concentration is inversely related to local Temperature), which is equivalent to the ideal gas law.

As a first approximation, all the proto-matter is equidistant from the center of the structure, but looking more closely the structure looks more like an onion skin. There are several thin layers in contact. The innermost layer is the graviton pair. For spherical cases, these are always in the 1s orbits. This is adjacent to the next layer, which is sometimes the only other layer. When there are 3 or more layers the intermediate layer is pulled inward by the gravitons, and outward by the outer layer.

While all the structures examined here have been spherical, non-spherical orbits are possible for the proto-matter. As the gravitons have to come in pairs (as each has vast amounts of angular momentum), non-spherical orbits occur at higher total energies than similar n spherical orbits. The 1s pair of gravitons can support unlimited proto-matter stacked above. But while a set of d orbits can’t be stacked willy-nilly over a set of p orbits, a single pair of each can stack. That is, a 4d proto-photon (or other proto-matter) can be held above a pair of 2p gravitons (since they have the same eccentricity). This combination requires more energy to add than a 7s proto-photon, so only relatively large structures will include these orbits (especially nuclei). 2 4d’s above 2 2p’s add 14.36 times the energy of a 1s, while 2 7s only add 14 times as much. After that group is in place, a pair of 6f’s can be added for just 13.72 times as much as a 1s. The first solution covering all 6 2p orbits involves the 8g (with 18 slots), which loads a pair after the 9s, and the other 2 pair just before the 12s. Solutions for all orbits with energy equivalent to 36s and below were [calculated](Article2-Subshells.htm), which easily covers more than the 118 known elements.

At the relevant infra-matter scale (), a 1s Graviton would have , the color bit has , the charge bit has , and the infra-photon would have about . The majority opinion indicates the graviton never gets to that small of orbit, bottoming out above  or v ~7.071c. The exact point at which a graviton is able to escape the orbiting proto-matter will need to be determined experimentally.

Thus far the solution space has been under specified. An input of total energy was used to find solutions for the various known particles. In nature energy is a resultant, rather than an input. The actual solution is dependent on the force balance, as well as the energy of the infra-matter and the total angular momentum.

From the work on quantizing gravity, a force balance was found where the rest energy of the proto-matter is about zero. When . That is, as the rest energy approaches zero, the gravitational force approximates the centripetal effect which is always twice the Kinetic energy over the radius. This solution covers the photon and neutrinos. Any structures with significant non zero proto-matter rest energy requires a more complex balance. In general,. K1 is the Kinetic energy of the graviton, K2 is the Kinetic energy of the particle it is attracting, and E0 the relevant particle’s rest energy. Since the graviton follows a form of the Planck equation,  or . Rearranging, . The first term is a constant, which from the centripetal force equation comes to 1. This leaves a residue of . This residue may be from the charge, the color, or the structure having contact with another structure. In many cases, all 3 effects are present – which makes calculation somewhat difficult.

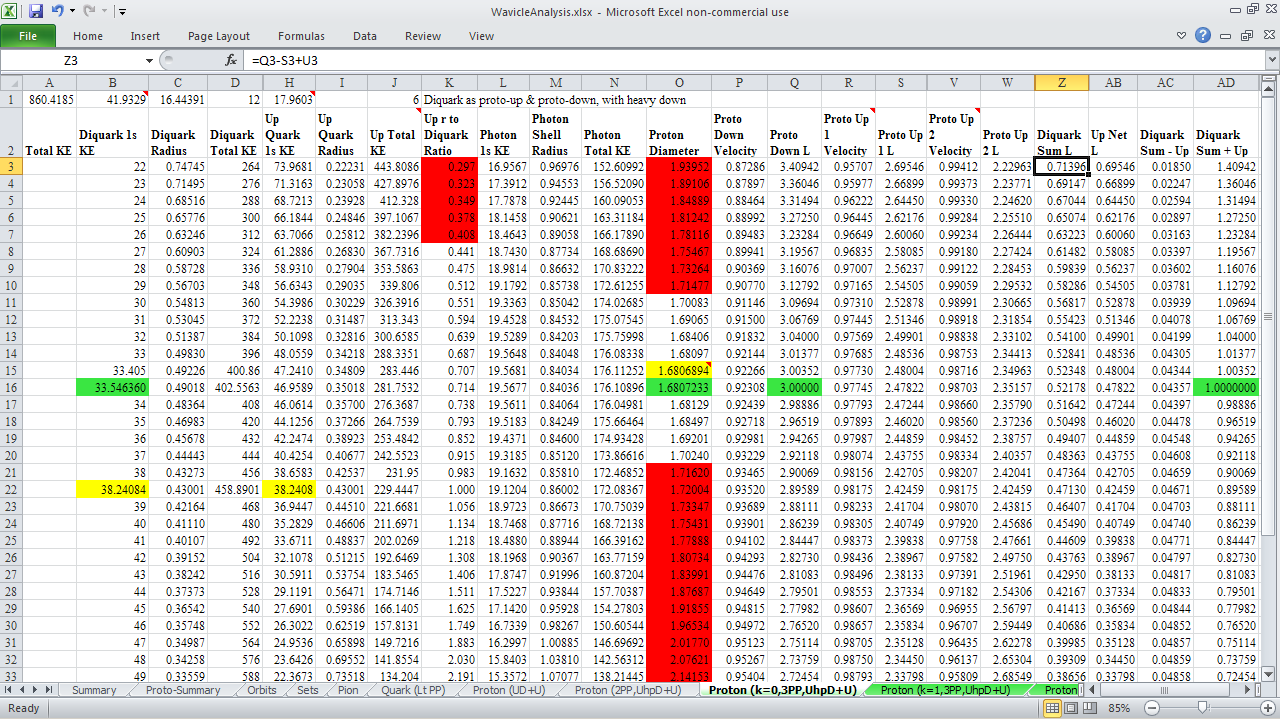
Another loose end: the rest energy of the graviton and its corresponding base frequency. A simplifying assumption would have the graviton tugging the Inframatter every orbit, so the frequency of each would match. This leads to an Lv of the diameter of the overall structure, where we need the circumference. Instead, the graviton can have a period that is an integer fraction of the Inframatter luxon (1/4 for example: so the graviton tugs the proto-matter every fourth time the graviton orbits). Since the proto-matter also contains tachyons, the graviton is repulsed continuously. The s Inframatter luxons have orbits  in circumference, or about . At c, this gives a time of  seconds per cycle, or equivalently a frequency of  cycles per second. From this frequency, the graviton would have a rest energy of  or 3/7 that of the charge tachyons. Taking Þ (the letter ‘thorn’) as the ratio of frequencies between the luxon and the graviton, the rest energy is Þ times this energy. Within the electron, this means the gravitons are moving at Þ \* . Þ is assumed to be a small integer slightly larger than pi, 4 perhaps, but may be a simple rational (7/2, 10/3, etc.). As the frequency of the graviton slowly rises with energy: , where energy varies inversely with velocity: (with the same error term), the orbital size of the Inframatter bits would shrink to match the increased frequency. When the graviton is down to 71c (energy about \*Þ), the difference is 0.01% with the proto-photons infra-matter orbits shrinking to a radius of . At very slow speeds (slow for tachyons, that is), the shrinkage becomes significant.

From the perspective of the tachyon, the neighboring tardyon or luxon occupies an angle θ which is nearly constant for any radius. This is equivalent to saying. (Where lambda sub O is the orbital wavelength or n times lambda – the real wavelength). As above, V is not quite proportionate to r, but the error at the relevant velocities is small. Similarly, from the perspective of the tardyon or luxon, the tachyon fills an angle φ, also nearly constant with changing radius. These angles are a portion of the circumference of the orbit. To trap a tachyon, θ ≥ 2π, but φ can be quite small (even less than the angular width of the tardyon or luxon). It is only in the φ portion of the cycle at which the tachyon tugs inward at the tardyon or luxon.

[Structures](Structures.htm) [Charge Bit Analysis](ChargeBit-Structure.docx) [Spreadsheet with analysis](WavicleAnalysis.xlsx) [Main Page of Website](http://home.comcast.net/~adavidstubbs/Quark/QS-Main.htm)

Illustrations

This ellipse is 4.0000 units wide by 3.7417 units high: the shape of a 2p orbit. The foci are .7071 units right and left of the center. In a Hydrogen-1 atom, the proton is near 1 focus, so the distance to the electron varies from 1.2929 to 2.7071 units, where a unit is the radius of a 1s orbit. Note that the center of mass of the atom is at the focus, not the proton.



Proton as Up/Down diquark comprised of proto-up, proto-down, and 2 proto-pions, plus Up quark as proto-up and proto-pion, plus Photon-like shell with 3 proto-photons. Each sphere also has 2 1s gravitons. Best fit highlighted in green.

Double anti-blue Proto-quark.

Double blue Proto-quark.

White Proto-quark

White Proto -quark