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Implications of Dirac's Monopoles for Color Charged Particles of the New Quark Theory

James Saba

jasaba1@juno.com

See comments on article below:

Herein, precise color charge constituents of the muons, pions and nucleons is suggested.

It is fascinating and relevant that Dirac in his extension of quantum wave mechanics was directly led to highly charged particles. It is not so much the concept of monopoles that is considered important (although this may be the case), but that further work on the calculations may directly lead to insight into the hypothesized color charged particles of the previously described new quark theory.

From what I gather from Dirac's work (1) he has hypothesized monopoles with strength of about 70(n) times that of the electron. Such a powerful charge apparently results in an electron (positron) being confined within the pole.

Let us assume that we are really dealing with dipoles with strengths of 140(n) times, and wherein an electron (positron) is confined above or below a particle, in either pole. Interesting this may explain violation of parity in decays such as the neutron.

Figure 1

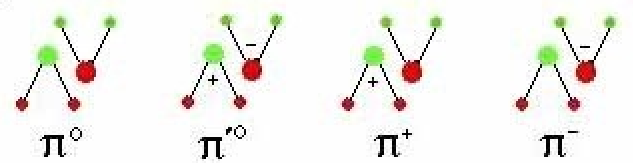


Figure 1 is a cartoon of hypothesized color charge compositions of pions. Each pion is composed of a "quark" and its antiparticle. A quark is composed of two sizes of color charged particles, initially resulting in an electrically neutral particle. While the particle and antiparticle of both sizes are represented by green and red, their distinct size may be associated with distinct kinds of charge, just as their charges are distinct from the charge of the electron and positron.

The relative orientation of the quark and antiquark charged particles is presented as up and down "V"s to facilitate their differentiation, and use in subsequent representation of nucleons. Lines indicate "bonds" within a quark, and the precise interaction between quark and antiquark is not being specified

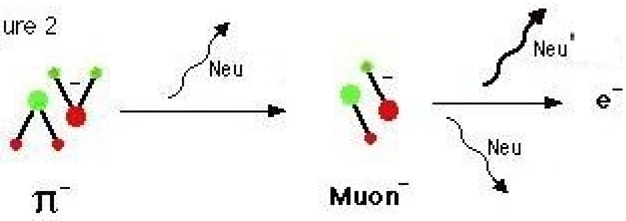
The quark and antiquark are further differentiated by their preferential affinity for either a positron (+) and/or electron (-) respectively.

As these representations relate to prior quark symbolism, the up (u) quark and its antiparticle represent those not associated with an electron or positron. While upon addition of a positron or electron the down (d) quark or its antiparticle is formed.

As energy is proportional to mass, it is not unreasonable to assume charge is also proportional to mass. Let us designate color charged particles as having masses 280e (~140 MeV) and 560e (~280 MeV). Selection of these masses will be important as we move to the nucleons, and in the pion most of their mass being lost due to proximity.

One interesting consequence of proposing the pions as such is that the asymmetry of charged pions may be responsible for their greater stability (2.6 x 10-8 sec vs 8.3 x 10-17 sec for neutral pions). Note also, that if both configurations of neutral pion exist, that pion without an electron-positron pair would be expected to radiate only neutrinos and not gamma rays upon decay.

Figure 2



Also of interest is that the decay of charged pions may explain the creation of two distinct neutrinos as shown in Figure 2 (Click here to see comparable CERN figure). Herein, first one of the smaller color charged particle pairs annihilates creating two neutrinos, one of which is absorbed by the muon giving it momentum. Subsequently, perhaps in two steps, the other charged particle pairs annihilate. Perhaps more than three neutrinos occur.

Figure 3

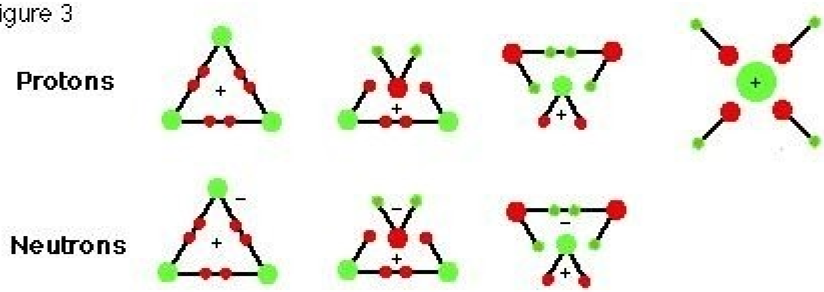


Figure 3 presents numerous potential quark compositions of the proton and neutron. In the interesting last example of the proton a third larger color charge species occurs.

Concerning neutron decay, it is proposed the emitted neutrino results from a color charge particle spin flip, while the variable energy of the ejected electron is dependent on its obstruction of this neutrino's exit.

A final note concerning the previously proposed particle list. As seen with the nucleon examples various possibilities exist, and almost certainly the list is a first approximation. For example, upon reconsidering the kaon it may be composed of three pions, or perhaps composed of three different sized color charged particles as seen in the last proton example. This said, the proposed rearrangements of baryons, responsible for different fragmentation products, remains a key concept.

Your continued comments and questions are most welcome.

1) Directions in physics : lectures delivered during a visit to Australia and New Zealand in 1975 / P. A. M. Dirac (Wiley, c1978) Pages 40-54

Also see the following relevant papers:

Simplification and Unification of Fundamental Particles. Saba, J Gen Sci J April 30, 2002

Alternative to Direct Proton-Proton Fusion in Deuterium Formation. Saba, J Gen Sci J Oct 16, 2002

A Two Particle System Without Integer Spin. Saba, J Gen Sci J Dec 22, 2004

Email Comments on Article:

Chinese Researcher:

Thank you for your E mail of yesterday. The main question for any new theory is the following: Do you have any new prediction that may be verified experimentally in the near future?

James Saba:
Yes, there should be two kinds of neutral pion, only one of which radiates gammas upon decay. More specifically the neutral pion from the following should not radiate gammas

Lambda --> Neutron + Pion0

While the neutral pion from the following reaction should.

Sigma+ --> Proton + Pion'0

Do you have any information on this?

There may also be two kinds of charged kaons, only one of which radiates gammas upon decay.

Although the theory would survive if this prediction were not true, it is important since it distinguishes the kinds of radiation resulting from annihilation of an electron positron pair verses the annihilations of the hypothesized color charged particles (which are presumed to result only in neutrinos).

Predicting new phenomena is often the most difficult part of a theory, especially in a field such as HEP where thousands of people have worked decades to accumulate vast amounts of data. However there is another value to a good theory, it allows unprecedented relationships among things already known. I believe the new theory has and will accomplish this.

German Theorist

Thanks for your hint on your recent publications. I must say though that most of what you wrote is not at all compatible with particle physics ideas. Most of all, I am missing quantitative statements:

``not unreasonable to assume charge is also proportional to mass'' How do you justify this, can you find spectral support for this assumption?

The stronger decay of the neutral pion as compared to the charged ones is explained by anomaly mediation yielding a 2-photon-vertex. The effective coupling is much larger since it is not W-boson-mass suppressed.

Anyway, it is nice that people have alternative ideas, but they should be rooted in justified assumptions.

James Saba:

Your statements nicely exemplify the gulf often present between the highly precise mathematical minds like yourself the the qualitative minds of the organic chemist/biologist as I.

This is precisely the problem I have, in that I cannot think well in quantitative terms; and is the primary reason I wrote to you and others.

To an organic chemist, a reaction is a sort of equation, and if hundreds of similar equations can be arranged in a form which is consistent, its a very strong statement to that chemist is that there is an underlining order. He seeks to find the simplest form of that order.

I need readily understandable ("visual") reasons for things, such as why the relative masses of the particles are as they are, and the relationships of reagents-products. The relative masses, and the need for a highly charged particle to bind the positron or electron REQUIRES that charge and mass be proportional (regardless of what the exact proportion this is).

Your question with regard to assuming charge is proportional to mass: 'How do you justify this, can you find spectral support for this assumption?" touches upon a point as to why this theory is strange to grasp, and long in coming.

That is, the color charged particles neutralize each other (just as a whole atom is neutral), and their exceptionally powerful charge is not detected spectroscopically. From the distance of orbiting shell electrons, they see the nuclear charge only as the cumulative positive charge from the positrons in the protons.

In the new theory their powerful charge is responsible for the strong force, and in the retention of a "saturating" number of nuclear positrons and electrons in proximity.

Perhaps one way we will be able to isolate one of these color charged particles is to use the same technique as we use to dislodge an electron. That is, radiation but this time in the form of neutrinos.

Let me ask a question, if the charge was exactly proportional to the mass, how could we differentiate one these color charged particles from an electron?

Anyway, you are right that is it good that minds as distinct as ours once in a while exchange their point of view.

UK Particle Physicist:

"I tried to read your first paper. Your assumptions are in direct violation of every experimental data about elementary particle physics.

The Standard Model, the theory describing the elementary particles and their interactions, is a very successful theory because every it is in agreement with every experiment conducted so far. It is pointless to try to formulate an alternative to Standard Model.

Quarks are not composite objects. S quark is not a combination of u and d, or anything else. The whole bunch of hadrons is totally explained with the quark model, there is nothing to indicate otherwise. Their interactions are well explained by QCD, again nothing indicates otherwise."

James Saba:

Your statements are put very nicely, and probably represent the concerns of many. Inconsistencies in the current quark model were not considered much in the formulation of new theory, only the sheer beauty of the new theory. Your statement has led me to some interesting observations however. Take for example the pi + P reactions leading to Deltas. What data I have indicates that in the old quark model

pi+(d*u) + P(duu) --> Delta++ (uuu)
pi0(u*u) + P(duu) --> Delta+ (duu)
pi0(du*) + P(duu)--> Delta- (dud)

From these we are led to assume that there is an annihilation of a quark pair, and an interesting thing is that the Delta+ is a proton while the Delta- is really a neutron as defined by the current quark model. Are resonant protons and neutrons known to decay as required? Considering their decay into nucleons and pions further, how does one explain this? Certainly not by internal annihilation Further, consider the decays
Lambda(dus) --> P(duu) + pi-(du*) OR N(dud) + pi0(u*u, or dd*)
Sigma+(uus) --> P(duu) + pi0(uu*) OR N(dud) + pi+(d*u)

How can one readily explain the one particle, the s quark, spontaneously transforms into the following?

s --> d,u,u* OR d,d,d*

Also, it is interesting to note that the Sigma is considerably more massive than the lambda, also the u quark is presumed to be less massive.

I may be a partial to the new theory, but the explanations via it are far clearer in my chemist's mind.

US Experimental Physicist

"Obviously you have put a lot of thought into your ideas and I admire that and I think your message deserves a response. I am an experimental physicist and would like to point out a few things:

- the current standard model in particle physics has been tested extensively by experiments. We have clearly excluded the fact that the proton contains a positron and the neutron contains an electron. This has been done by MANY different experiments, where one scatters electrons, neutrinos or muons from protons/neutrons. The results of those experiments are then used to predict the results of proton-proton and proton-antiproton reactions and they are right on.

- we have also extensively measured what you call the awkward force between quarks, which increases as distance increases. This has been measured experimentally and verified. It is not awkward, but beautiful.

- you seem to have looked at many exclusive reactions, which are predicted by the quark model. However this is not the only basis for the current quark model. The current quark/parton model is much more based upon probing the structure of mesons and baryons with electron and muon beams.

- as far as we can test, the muon (like the electron) has no internal structure) and is pointlike.

- There are other quarks besides the u and d quarks. They have been produced in pairs in electron-positron annihilation and their properties have been measured.

In conclusion I think your model is fascinating and I admire the fact that you have created it. However like many other proposed theories it does not fit the large body of experimental data that has led to the establishment of the current standard model. That model is also incomplete, but at least it describes all existing experimental data. "

James Saba

Thank you for the fine critical response. However, I'm not in the least discouraged since just as the current quark model fits the experimental data extremely well, I feel certain the same sort of thing will happen with the experimental data you mention. It will be the reexamination, reinterpretation, and refinement of this data in light of the new theory that will bring a clearer understanding into the true structure and function. A great, perhaps once in a lifetime, opportunity for courageous prepared minds. For example, QCD might be relatively quickly modified to suite the proposed color charged particles (fittingly termed "Dirons" or "Diracons").