Update June 2022

Hadron and Quark Masses and Magnetic Moments

This quarter the main progress has been in producing estimates for the masses and magnetic moments of the baryons and mesons using Ring Theory principles.

The QCD theory may produce very good results, but does not explain some aspects. An example would be how the 'meson cloud' interpretation manages to always have hadrons with spins that are integer multiples of ½ h.

In Ring Theory, or the Pre-Fermion Hypothesis as described in the paper produced this quarter, that aspect is a fundamental aspect since all the loops in a stack are aligned parallel down the stack axis.

Another aspect is whether there are gluons within hadrons that explain the difference between the high and low energy interpretations of quark masses – either using relativistic or perturbation treatment.

In RT, the loops are always the same size, other than due to relativistic motion, and it is the number of loops in a stack that determine the stack mass.

It is how energetic an incoming particle interacts with the stack that decides whether what is observed is the valence quark without its shielding mesons, or the whole stack. The former requires greater energy than the latter.

Another difference is in what is interpreted as the force carriers in any system. RT proposes that only the partially merged meon pairs transmit all forces, other than direct impact.

The merged pairs form chains attached to the unmerged meons in a loop and the chain rotates with the meons in the loop, passing through the background merged pairs transmitting the mass and charge energies, and feeding back the effect of the background to the loops.

This means that photons and mesons do not transmit forces – they are loops and cannot transmit anything from meons directly. All loops are either just symmetric single loops that can exist within the background or stable overall symmetric stacks of loops that can exist within the background.

The results of the methodology used to estimate the masses and magnetic moments of the hadrons and quarks was that it was around one-sixth as inaccurate as the two best Quark Model methodologies. The latter uses different quark masses and spin-spin coupling factors for the mass and magnetic moment estimates, showing them not to be consistent. The RT methodology uses the same quark masses, coupling factor and stack pion throughout and achieves better accuracy overall that the QM model.

Within the paper the RT definition of matter and anti-matter was used to replace the QM octet, nonet and decuplet for the hadrons. Although the result is not as pleasing to the eye as those standard sets, the three new sets of matter, anti-matter and neutral matter that emerge provide a possible reason for neutral kaons, and other such neutral mesons composed of quark and different anti-quark, to be the source of CP violation.

Mike Lawrence

Maldwyn Centre for Theoretical Physics

18th May 2022