Neutron to proton mass difference, parton distribution functions and baryon resonances from dynamics on the Lie group $u(3)$

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Neutron to proton mass difference, parton distribution functions and baryon resonances from dynamics on the Lie group u(3)

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Abstract

We present a hamiltonian structure on the Lie group u(3) to describe the baryon spectrum. The ground state is identified with the proton. From this single-fit we calculate approximately the relative neutron to proton mass shift to within half a percentage of the experimental value. From the same fit we calculate the nucleon and delta resonance spectrum. For specific spin eigenfunctions we calculate the delta to nucleon mass ratio to within one percent.

We derive parton distribution functions. The distributions are generated by projecting the parton state to space via the exterior derivative on u(3). We predict precise neutron-flavour singlets which should be visible in neutron diffusion dissociation experiments or in invariant mass spectra of proton and negative pions in diffractive and in photoproduction on neutrino. The presence of such singlet states distinguishes experimentally the present model from the standard model as does the presence of such singlet states distinguishes experimentally the present model from the standard model as does the presence of such singlet states distinguishes experimentally the present model from the standard model as does the presence of such singlet states distinguishes experimentally the present model from the standard model as does the presence of such singlet states distinguishes experimentally the present model from the standard model as does the positive of such singlet states distinguishes experimentally the present model from the standard model.

The allospatial hypothesis

The Lepianakian in (1) contains off-diagonal derivatives which are represented by the off-diagonal Gell-Mann matrices. We choose three of these to represent spin and group them into \( u(1) \times u(1) \). This interpretation is supported by their commutation relations as body fixed angular momentum. The relation between space and allospac is like the relation in numbers between the dynamical systems and relativity body fixed coordinate systems for the description of rotational degrees of freedom. The remaining three are grouped into \( u(3) \), \( \mathcal{U}(1) \times \mathcal{U}(1) \), which is related to hypercharge and isospin. They cannot achieve the commutation by commuting into the subspace of \( u(3) \). The fully parametrized Lepianakian in polar decomposition reads:

\[
\frac{1}{2m} \left( \frac{\partial}{\partial \theta^a} \right)^2 \left( -\bar{\psi} \gamma^a \gamma^b \psi \right)
\]

The constant term is interpreted as a curvature potential and the offisional term is analogous to the centrifugal term in the usual treatment of the radial wave function for the hydrogen atom.

The potential in (2) is complete Lepianakian equation reads with \( E = -\lambda / \hbar \), \( V = \hbar / \lambda \) and \( \lambda = 2G / \lambda \). The moment of inertia is explained by fourfold periodicity as body fixed angular momentum. The relation between space and allospac is like the relation in numbers between the dynamical systems and relativity body fixed coordinate systems for the description of rotational degrees of freedom.

The model has no fitting parameters except the scale \( \lambda \) which yields for the parton fraction that compares rather well with those of the proton valence quark distributions already in a first order approximation. A kinematic parametrization for the projection gives a natural transition between a confinement domain where the dynamics unfold in the global group space and an asymptotic free domain where the algebraic approximates the group. A prominent ratio between the \( A(123) \) and \( A(312) \) masses has been calculated based on specific D-function. We expect the allospatial energy eigenstates for specific spin and parity via expansions on specific combinations of D-functions. Singlet neutral flavour resonances are predicted above the free charm threshold of \( 2.5G \).

Conclusions

The allospatial Hamiltonian in (1) or (2) may be seen as an effective phenomenology or interpreted more radically in a conceptual interpretation where we see the allospatial Hamiltonian in (1) or (2) may be seen as an effective phenomenology or interpreted more radically in a conceptual interpretation where we see the allospatial Hamiltonian in (1) or (2).

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Appendix A

A rough estimate of the effect of the nuclear force is not included. We interpret three of these to represent spin and group them into \( u(1) \times u(1) \). This interpretation is supported by their commutation relations as body fixed angular momentum. The relation between space and allospac is like the relation in numbers between the dynamical systems and relativity body fixed coordinate systems for the description of rotational degrees of freedom. The remaining three are grouped into \( u(3) \), \( \mathcal{U}(1) \times \mathcal{U}(1) \), which is related to hypercharge and isospin. They cannot achieve the commutation by commuting into the subspace of \( u(3) \). The fully parametrized Lepianakian in polar decomposition reads:

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