QPAD Game

This game is a nice educational puzzle when you have lots of spare time. It can bring you deep insight in the standard model.

In order to know which elementary particle types exist, a small game suffices. The game takes the presumption that all massive elementary particle types can be identified by an ordered pair of sign flavors of a quaternionic probability amplitude distribution (QPAD). A quaternion offers two sign selections; a conjugation that changes the sign of three imaginary base vectors and a reflection that changes the sign of a single base vector. The sign selection stays constant throughout the whole QPAD. For a QPAD this means that four different sign flavors exist.
The coordinates that are used as parameters of the QPAD also form a quaternionic distribution (QD). For a flat coordinate system the value of the distribution equals the parameter. If the coordinate system is curved, then the values of this QPAD can show that deviation. This QD is taken as a reference for comparing sign flavors. Two sign selections have an isotropic sign status. The others are anisotropic. The conjugation and the reflection each cause a switch of the handedness of the quaternion product.

Equation of motion

Now look at the quaternionic format of the equation of free motion of elementary particles.

$$\nabla\psi^{x} = m\,\psi^{y}$$

∇ is the quaternionic nabla operator.
ψ^{x} acts as the wave function of the particle.
m is the coupling factor
ψ^{y} is the coupled QPAD sign flavor.
both ψ^{x} and ψ^{y} are sign flavors of the same base QPAD ψ°.
The ordered pair $\{\psi^{x}, \psi^{y}\}$ represents a category of elementary particle types.

For antiparticles you must conjugate all participating fields and the nabla operator. Photons and gluons have zero coupling factor.

Rules

When ψ^{y} is isotropic (zero or all three base vectors are switched), then the particle is a fermion, otherwise it is a boson.
If the coupling takes place between two field sign flavors with different handedness, then the corresponding particle is charged. The charge depends on the number and direction of the base vectors that differ. The count for each difference is $\pm\frac{1}{3}e$.

The game

The game is: Find the particle types: electron, neutrino, down quark, W bosons, Z boson. (The procedure does not discriminate the generations). The up-quark is not in the list. According to the rules it is not elementary. It is impossible to generate elementary particles with charge $\pm\frac{2}{3}e$.

Solution

The solutions is explained in: http://www.crypts-of-physics.eu/Quaternionic_continuity_equation_for_charges.pdf
However, you can discover it yourself. It is fairly easy.

The most intriguing fact is that the coupling factor m can be computed from the fields $\{\psi^x, \psi^y\}$.
So, **no Higgs** is involved there!

The properties that characterize the coupling event are sources of secondary fields. These fields are known as physical fields.