And yet they turn

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Abstract

I've always had doubts that elementary particles have a turning moment but no self-rotation. Therefore, a few weeks ago I tried to find out how fast particles, for example protons, actually rotate around themselves if they should actually have a real self-rotation. I looked for suitable data and found some. Using this data, which comes from the particle accelerator CERN, I was able to calculate the frequency of the self-rotation of protons. It is 2072.180437 Hz, so it is unexpectedly low.

Self-rotation of protons

Scientists claim when a proton would have a real self-rotation, it would have a rotation speed greater than the speed of light, therefore it cannot rotate. This claim is mostly listed as an argument for that elementary particles does not really rotate around themselves and is based on calculations that use the spin of protons $h/4\ \pi$ as the starting variable included. But if the quantized spin of elementary particles is limited to a quantized, oversized radius while the speed cuts out from the formula used, then I asked myself, if elementary particles don't have a real rotation, and how fast do protons, for example, rotate around themselves. Around the hypothesis of real self-rotation of protons, I looked for data that enable such a calculation. In the calculations, however, I did not use the spin of protons. And I found some. Namely, in the LHC (Large hadron collider) protons are accelerated to almost the speed of light. The data for this are as follows: In the hadron accelerator in Geneva (CERN), protons are accelerated from 450 GeV pre-acceleration to 7 TeV through 8 cavity resonators from 5.5 MV/m and on the main orbit of the LHC through 154 main magnets in the 8 partial orbits (radius 445 m) of the magnetic flux density of 8.33 Tesla each in a circle, with a defined energy loss due to the synchrotron radiation, which occurs when a particle is accelerated in a synchrotron. The protons are accelerated during each circulation with an energy of 485 keV in the lines of 825 meters between the 8 partial circuits and circulated 11,245 main lanes per second. The pre-acceleration to 450 GeV leads

to a proton speed of 0.999997826c. The time to full velocity in the LHC (0.999999991c) is 1200.99 seconds.

First of all, if the proton rotation speed is < c (speed of light), I considered that the used magnets in the LHC would probably raise this rotation frequency. Magnetic resonance tomography (MRI), which uses magnetic fields to excite the proton spin, provides evidence of this. But to what extent does an external magnetic field increase the intrinsic rotation of the particles? It is known that protons have a small magnetic field. However, the magnetic flux density of such a proton magnetic field has never been measured or calculated.

The next thing I thought about was how such a magnetic field comes about. Given my hypothesis of a real self-rotation, the explanation is relatively simple. The rotating, moving charged particle creates a magnetic field, as do all moving charges. It turned out that the natural rotation frequency f_r increases proportionally to the external magnetic field B_0.

$$\frac{m_p v'^2}{m_p {v_r}^2} = \frac{q r_0 v' B_0}{q r_0 v_r {B_0}'}; \frac{v'}{v_r} = \frac{B_0}{{B_0}'} = \frac{f'}{f_r}$$

m_p is the proton mass, r_0 is the proton radius, q is the proton charge, v_r is the unaffected rotation speed of the protons, ${B_0}'$ is the magnetic flux density of an external magnetic field before a deflection has taken place, f' is the rotation frequency of the protons influenced by the external magnetic field and v' is the rotation speed of the protons influenced by the external magnetic field, which is caused by that the external magnetic field increases the torque on the proton. This fixed ratio of the precession frequency and the external magnetic flux density is the so-called Larmor frequency named after the Irish physicist Joseph Larmor, who was able to show that the angular momentum of a particle is proportional to a magnetic dipole moment around the direction of an externally applied magnetic field B_0.

$$\frac{f'}{B_0} = 42{,}577 \frac{MHz}{T} = konstant$$

(f' is the excited rotation frequency of the protons). In order to determine the unaffected rotational frequency of a proton, I therefore first had to calculate the individual factors by which the natural rotational frequency of a proton increases in the LHC, which, when multiplied together, result in the total factor a. An important factor is the deflection of the protons in the LHC by the main magnets used. Another factor that should not be neglected is the generation of a magnetic field due to the very fast forward motion of the protons (which is a charged particle) in the LHC and in the pre-accelerating sections of the LHC (several synchrotrons that pre-accelerate the protons to an energy of 450 GeV before the protons enter the LHC).

When the proton reaches the end of the linear accelerator, first it does not have a higher intrinsic rotation frequency, since the proton's direction of motion is parallel to the force effect and therefore no magnetic field is induced.

A first factor a_1 arises from the fact that the proton enters from the linear accelerator LINAC2 with a length l of 30 m in the booster, which is no longer linear but circular and build of 4 superimposed tubes with a radius r_B consists of 25 m. Here it experiences a change in angular momentum right at the beginning, because $\Delta F t = \Delta p$.

The force change happens because at the end of LINAC2 and at the beginning in the booster before the deflection through the magnets the force acting on the proton is 2.4 times smaller than the centripetal force created by the magnets in the Booster which is generated on the proton.

$$a_1 = \frac{\frac{m_B {v_B}^2}{r_B}}{\frac{\frac{1}{2} m_B {v_B}^2}{l}} = 2\frac{l}{r_B} = 2{,}4$$

In the synchrotrons (booster, PS and main circuit of the LHCs) the magnetic field of the main magnets and at the same time the magnetic field generated by the high speed, whose magnetic flux density is the same as that in the main magnet and its field lines show in the same direction as the magnetic field of the main magnets. Because in the first case a circular motion in a synchrotron takes place, half the Lande factor must be taken into account for the sum of the two magnetic fields for the first case, since with a charged particle the Larmor frequency from the synchrotron frequency at the same magnetic field differs by half the Lande factor.

$$a_2 = \frac{B_0}{B_B} = 201{,}1006413$$

$$a_3 = \frac{g_2}{2} + 1 = (2{,}7929 + 1) = 3{,}7929$$

B_B is the magnetic flux density at the start of proton acceleration in the circular booster, g_2 is the Lande factor for protons). Another factor arises from the increase of the magnetic moment of the proton, causing the rotation frequency also to increase compared to the magnetic field increase, starting from the booster to the main circulation circuit of the LHC

$$\frac{M_{Sm}}{M_{Bm}} = \frac{\frac{D_0}{B_0}}{\frac{D_B}{B_B}} = \frac{\frac{m_S {v_{Sr}}^2}{r_0} r_0}{\frac{m_B {v_{Br}}^2}{r_0} r_0} \frac{\frac{m_B {v_B}^2}{r_B q v_B}}{\frac{m_S v^2}{rqv}} = \frac{v}{v_B}\frac{r}{r_B} = \frac{f'}{f_{Br}}\frac{r}{r_B} = \frac{f'}{f_{Br}}\frac{r}{l}\frac{l}{r_B} = \frac{f'}{f_{Br}} \cdot 1{,}2 \cdot 93{,}466667$$

m_S is the mass at the end of proton acceleration, m_B is the mass at the beginning of the acceleration in the booster, v is the final velocity, v_B is the initial velocity in the booster, r_B is the radius of the booster, r is the radius of the main circle of the LHC, M_{Sm} is the magnetic Moment of the proton at the end of the acceleration, M_{Bm} is the magnetic moment of the proton at the beginning in the booster, D is the torque of the proton, B_B and B_0 are the magnetic flux density of the external magnetic fields and r_0 is the radius of the proton. Those variables denoted by the index r refer to the intrinsic rotation of the proton. The fact that the factor $f' f_{Br}$ and the factor l/r_B are already included in a_3 and a_1 was taken into account, and the result is

$$a4 = 93.4666667$$

Only the factor a_3 indicates the factor by which the external and the induced magnetic field in the LHC is larger compared to the magnetic field at the beginning of the booster.

$$\frac{f'}{f_B} = \frac{B_0}{B_B} = a_3$$

Finally, one obtains the unaffected self-rotational frequency f_r of a proton, if one considers that the induced rotation frequency increase additionally by the factors independent of the external magnetic field a_1, a_3 and a_4:

$$\frac{f_r}{B_B} = \frac{f'}{a_1 a_3 a_4 B_0} = 42.577 \cdot 10^6\, Hz/T$$

$$f_r = \frac{B_B}{a_1 a_3 a_4}\frac{f'}{B_0} =$$

$$= \frac{42.577 \cdot 10^6\, Hz/T \cdot 4{,}14 \cdot 10^{-2} T}{2 \cdot 3{,}7929 \cdot 93{,}466667} =$$

$$= 2072{,}180437 Hz$$

The natural rotation frequency of a proton is accordingly 2072.180437 Hertz. So the rotation speed, which is calculated using the formula $2\pi fr = 1.13271 \cdot 10{-}11\ m/s$ is much less than the speed of light. As a result, protons turn around themselves, i.e. they have a real self-rotation, contrary to what is generally assumed in today's Standard Model.

As proof of this frequency value, the main thing is that if the centripetal force is equated with the gravitational force and resolved to G by inserting the calculated frequency into the formula

$$G = \frac{4\pi^2 f^2 r^3}{m} = 6{,}7401 \cdot 10^{-11}\, m^3/kgs^2$$

the value of $6{,}7401 \cdot 10^{-11}$ comes out, i.e. the exact value of the gravitational constant G.