On the Baryon System in View of Period Doubling

Baryon Magnetic Moments

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Introduction

In the period doubling model the magnetic moment μ of a particle is described by a 3-d part and a 4-d part independently (same way as with energy).

Both parts are subject to period doubling (due to nonlinearity).

The magnetic moment μ_{NM} of a particle can be expressed by

$$\mu_{NM} = 2^N 2^M \mu_{ref}$$

where N (=integer/3) and M (=integer/4) represent doublings in the 3-d part and 4-d part respectively. μ_{ref} is the reference magnetic moment.

Magnetic Moment Data

Particle	μ (Am^2)
Proton	1,41E-26
Neutron	9,66E-27
Lambda	3,10E-27
Sigma+	1,24E-26
Sigma o	8,13E-27
Sigma-	5,86E-27
Xi o	6,31E-27
Xi -	3,29E-27
Omega -	1,02E-26

Baryon magnetic moments (absolute values converted from nuclear magnetons into SI-units).
Source: http://pdg.lbl.gov

Magnetic Moment Structures

μ_{NM}	μ (Am^2)	N+M	N	M
p	1,41E-26	65,001	65,001	0,000
p-n	4,44E-27	63,335	63,335	0,000
2p-Lambda	2,51E-26	65,833	65,333	0,500
2p-Sigma+	1,58E-26	65,164	64,664	0,500
2p-Sigma-	2,24E-26	65,665	65,665	0,000
2n-Sigma o	1,12E-26	64,667	64,667	0,000
4p-Xi o	5,01E-26	66,830	66,330	0,500
4p-Xi -	5,31E-26	66,914	66,664	0,250
(4p-Xi o) -Omega -	3,99E-26	66,501	66,001	0,500

$$\mu_{NM} = 2^N 2^M \mu_{ref}$$

$$N + M = \frac{\ln(\mu_{NM} / \mu_{ref})}{\ln(2)}$$

Values are calculated using absolute μ values, reference is the radial Planck magnetic moment [1] $\mu_{ref} = \mu_{orad} = 3.8208 \cdot 10^{-46}$ Am^2.

p-n means μ_p-μ_n, others correspondingly.

Doubling on the electromagnetic side (*M*=integer/4) has been assumed accurate and *N* has been calculated from the experimental *N*+*M*. Note that *N* (integer/3) agrees very closely with model values (decimals 0, 1/3 and 2/3).

[1] Ari Lehto, On the Planck Scale and Properties of Matter, Nonlinear Dynamics, Volume 55, Number 3, 279-298, February, 2009

Baryon Magnetic Moment Structures

Proton, Neutron and Lambda

$$\mu_{NM} = 2^N 2^M \mu_{ref}$$

$$\frac{\mu_p}{\mu_{orad}} = 2^{65.00} \cdot 2^{0.00} = 2^{\frac{65+65+65}{3}} \cdot 2^{\frac{0+0+0+0}{4}}$$

Shape: (65,65,65;0,0,0,0)

$$\frac{\mu_n}{\mu_{orad}} = 2^{65.00} \cdot 2^{0.00} - 2^{65.33} \cdot 2^{0.00}$$

$$\frac{\mu_\Lambda}{\mu_{orad}} = 2^{66.00} \cdot 2^{0.00} - 2^{65.33} \cdot 2^{0.50}$$

Shapes: (66,66,66;0,0,0,0)
and (65,65,66;0,0,1,1)

Baryon Magnetic Moment Structures

Sigma

$$\frac{\mu_{\Sigma^+}}{\mu_{orad}} = 2^{66.00} \cdot 2^{0.00} - 2^{64.66} \cdot 2^{0.50}$$

$$\frac{\mu_{\Sigma^o}}{\mu_{orad}} = 2^{66.00} \cdot 2^{0.00} - 2^{64.33} \cdot 2^{0.00} - 2^{64.66} \cdot 2^{0.00}$$

$$\frac{\mu_{\Sigma^-}}{\mu_{orad}} = 2^{66.00} \cdot 2^{0.00} - 2^{65.66} \cdot 2^{0.00}$$

Baryon Magnetic Moment Structures

Xi and Omega minus

$$\frac{\mu_{\Xi^o}}{\mu_{orad}} = 2^{67.00} \cdot 2^{0.00} - 2^{66.33} \cdot 2^{0.50}$$

$$\frac{\mu_{\Xi^-}}{\mu_{orad}} = 2^{67.00} \cdot 2^{0.00} - 2^{66.66} \cdot 2^{0.25}$$

$$\frac{\mu_{\Omega^-}}{\mu_{orad}} = 2^{66.33} \cdot 2^{0.50} - 2^{66.00} \cdot 2^{0.50}$$

Summary

Period doubling generates a series of growing magnetic moments from the Planck magnetic moment.

The baryon magnetic moments seem to be simple combinations of these magnetic moments.

The geometric shape of the 3-d and 4-d parts can be deduced from the *N* and *M* values.

Thank You!