

# 81. Baryon Magnetic Moments

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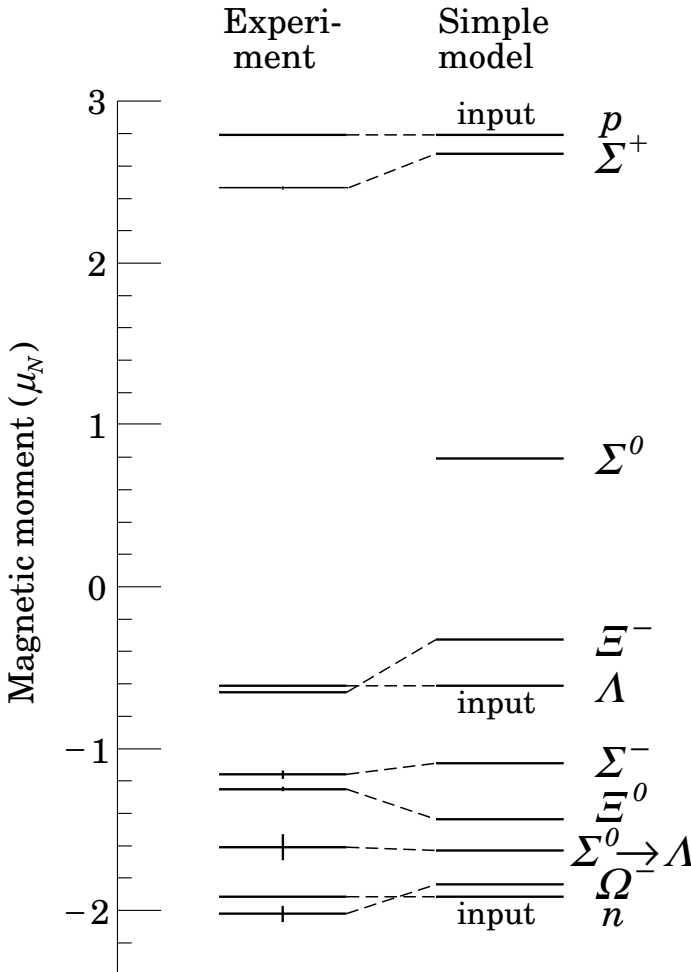
The figure below shows the measured magnetic moments of the stable baryons. It also shows the predictions of the simplest quark model, using the measured  $p$ ,  $n$ , and  $\Lambda$  moments as input. In this model, the moments are [1]

$$\begin{aligned}
 \mu_p &= (4\mu_u - \mu_d)/3 & \mu_n &= (4\mu_d - \mu_u)/3 \\
 \mu_{\Sigma^+} &= (4\mu_u - \mu_s)/3 & \mu_{\Sigma^-} &= (4\mu_d - \mu_s)/3 \\
 \mu_{\Xi^0} &= (4\mu_s - \mu_u)/3 & \mu_{\Xi^-} &= (4\mu_s - \mu_d)/3 \\
 \mu_\Lambda &= \mu_s & \mu_{\Sigma^0} &= (2\mu_u + 2\mu_d - \mu_s)/3 \\
 & & \mu_{\Omega^-} &= 3\mu_s
 \end{aligned}$$

and the  $\Sigma^0 \rightarrow \Lambda$  transition moment is

$$\mu_{\Sigma^0\Lambda} = (\mu_d - \mu_u)/\sqrt{3} .$$

The quark moments that result from this model are  $\mu_u = +1.852 \mu_N$ ,  $\mu_d = -0.972 \mu_N$ , and  $\mu_s = -0.613 \mu_N$ . The corresponding effective quark masses, taking the quarks to be Dirac point particles, where  $\mu = q\hbar/2m$ , are 338, 322, and 510 MeV. As the figure shows, the model gives a good first approximation to the experimental moments. For efforts to make a better model, we refer to the literature [2].



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### References:

1. See, for example, D.H. Perkins, *Introduction to High Energy Physics* (Addison-Wesley, Reading, MA, 1987), or D. Griffiths, *Introduction to Elementary Particles* (Harper & Row, New York, 1987).
2. See, for example, J. Franklin, Phys. Rev. **D29**, 2648 (1984);  
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