On the Baryon System in View of Period Doubling

Baryon Decay by 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 (or halvings) in the 3-d part and 4-d part respectively. μ_{ref} is the reference magnetic moment.

Decay Data

Decays	N+M	N	M
Lambda -> p	-2,19	-1,69	-0,50
Lambda -> n	-1,64	-1,64	0,00
Sigma+ -> p	-0,18	0,32	-0,50
Sigma+ -> n	0,36	0,36	0,00
Sigma o -> Lambda	1,39	0,39	1,00
Sigma - -> n	-0,72	0,28	-1,00
Xi o -> Lambda	1,03	0,03	1,00
Xi - -> Lambda	0,09	0,09	0
Omega- -> Lambda	1,72	0,72	1,00
Omega- -> Xi o	0,69	0,69	0,00

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

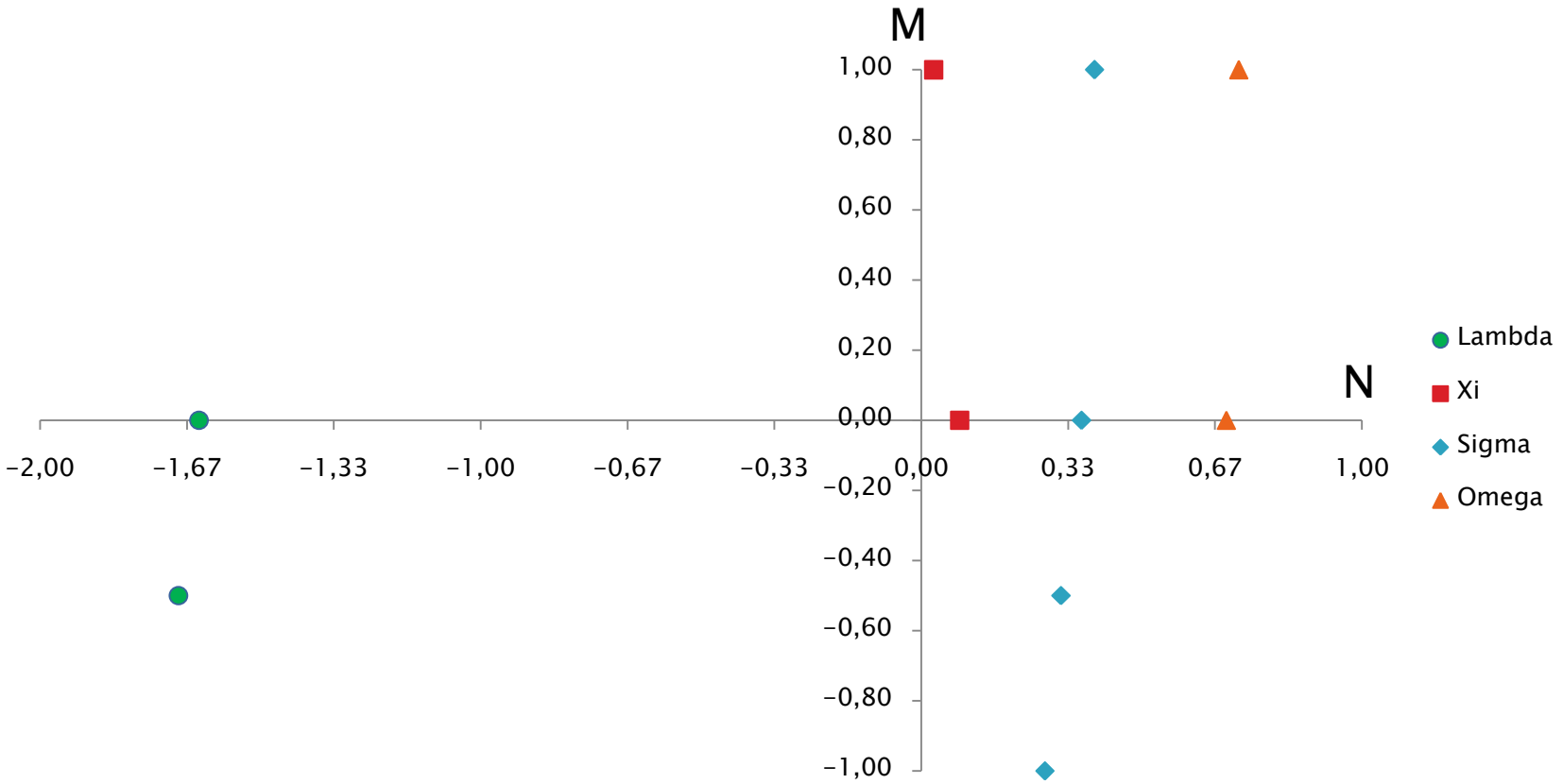
$$N + M = \frac{\ln(\mu_{NM} / \mu_{ref})}{\ln(2)}$$

Calculated using absolute values, reference is end product.

It is assumed here that the period doubling process in the 4-d part is accurate (i.e. *M=0, 1/4, 2/4, 3/4 …*). The corresponding value for *N* has been calculated from the experimental *N+M*-value, and *N* contains the experimental uncertainties and the possibility that the model is bad. *(N,M)* pairs are plotted in the figure (next slide).

If the doubling process takes place on the 3-d part, too, then the calculated N-values should concentrate in |N|=0, 1/3, 2/3, 3/3 … This seems to be so.
(the figure does not change much if the doubling process is assumed accurate in the 3-d side).

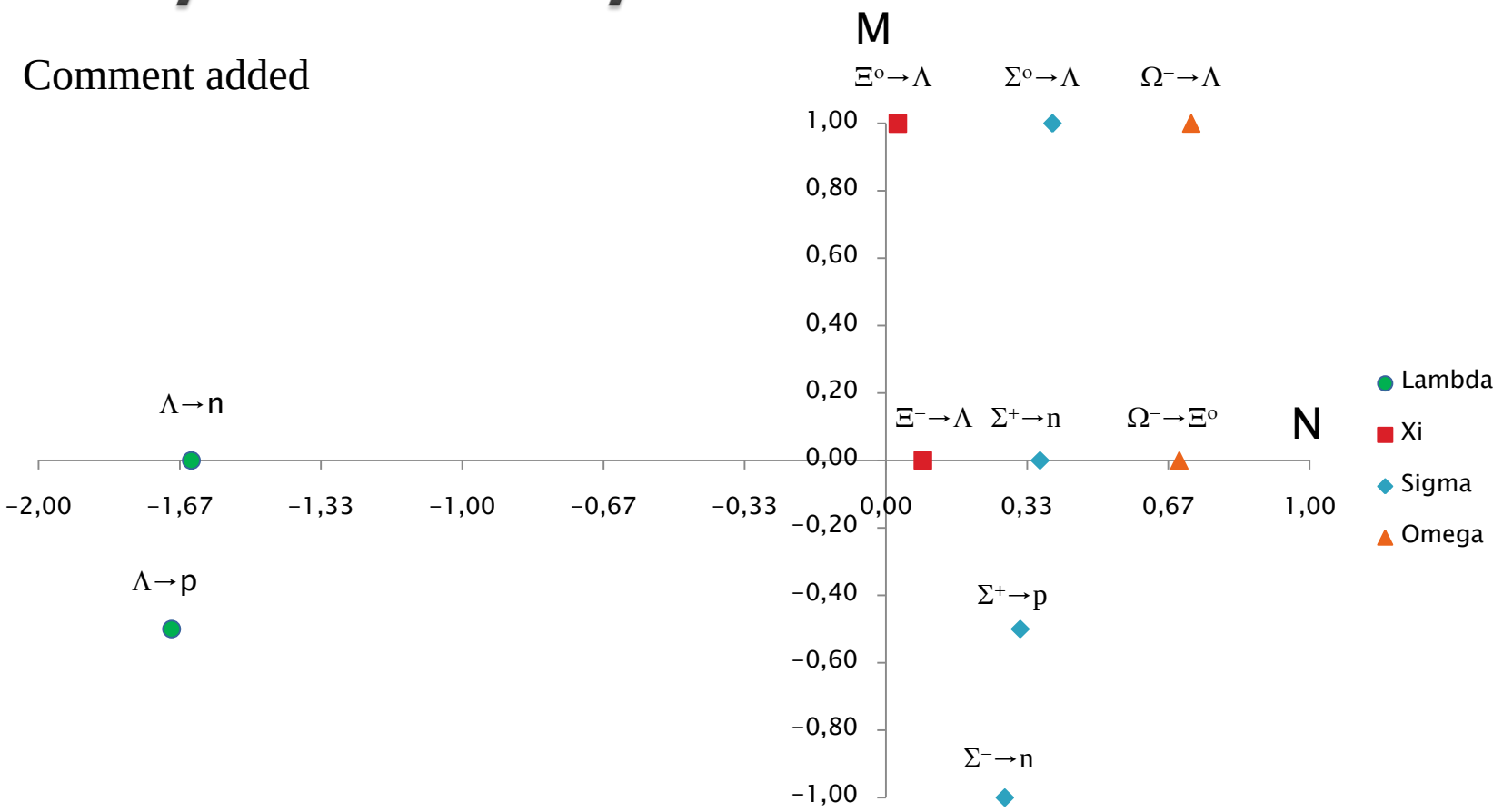
Baryon Decay



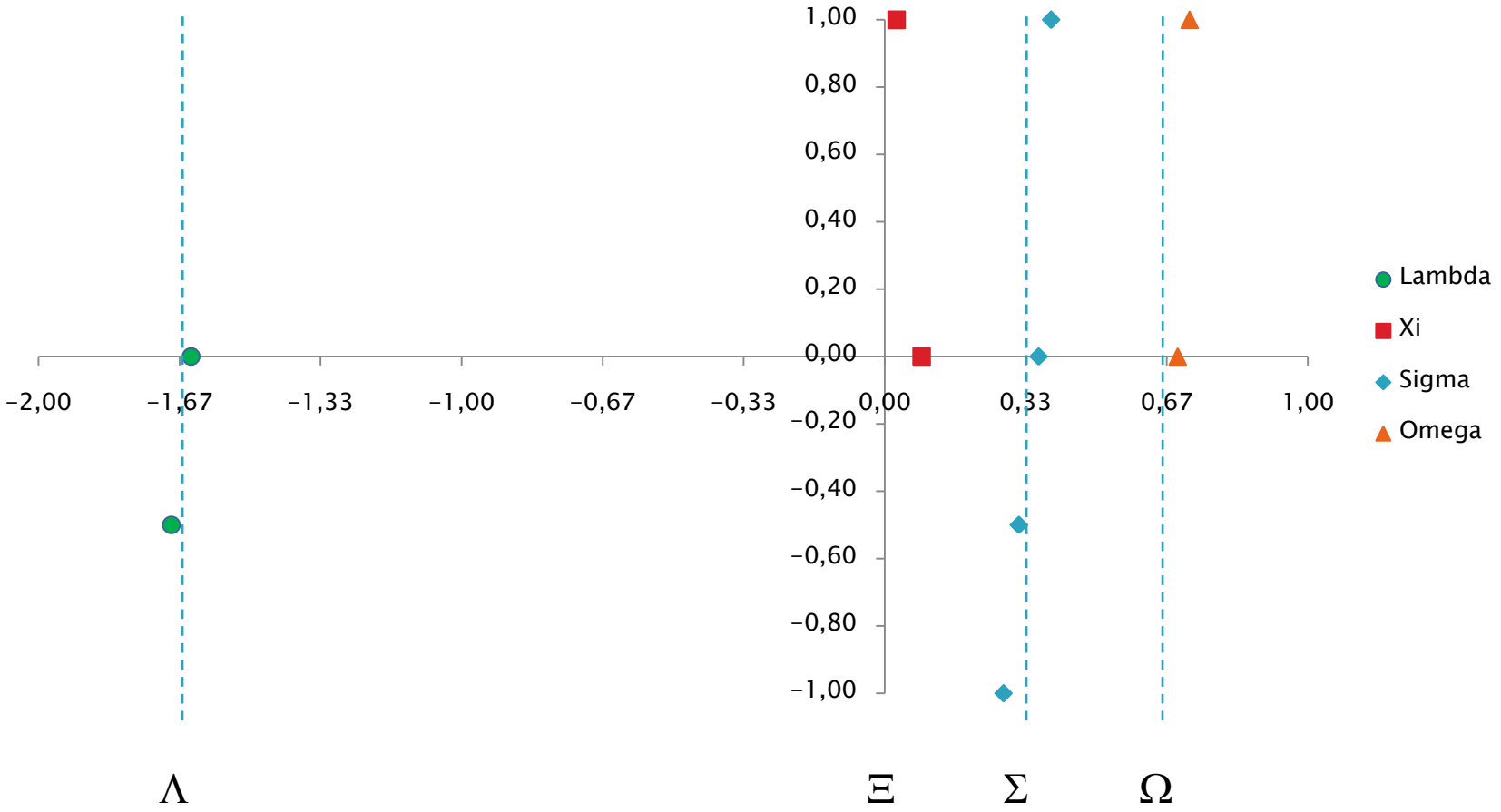
Decay comments on the next slide)

Baryon Decay

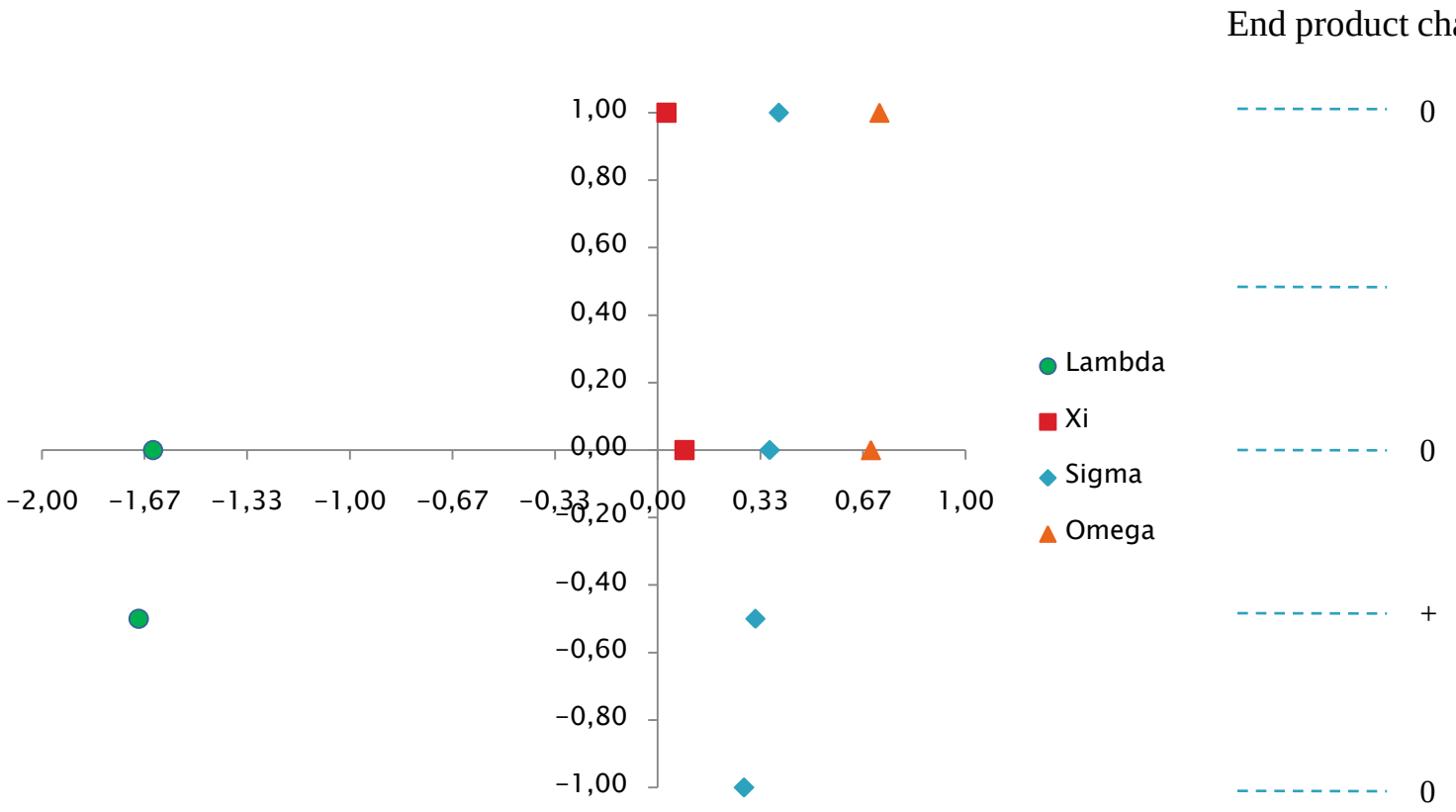
Comment added



Systematic Information



Further Systematic Information



Summary

It was shown in the previous (Aug. 17) seminar that the rest energy of a Baryon can be expressed by

$$E_{NM} = 2^N 2^M E_{ref}$$

Magnetic moments seem to obey the same type of period doubling, which can be expressed by

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

where *N* refers to the 3-d part of the magnetic moment and *M* to the 4-d part.

Thank You!

Appendix

Baryon Magnetic Moments

Baryon Magnetic Moments

Baryon	Magmo
Proton	2,79
Neutron	-1,91
Lambda	-0,613
Sigma +	2,458
Sigma 0	1,61
Sigma -	-1,16
Ksi 0	-1,25
Ksi -	-0,651
Omega -	-2,02

Baryon magnetic moments in nuclear magnetons.
Source: http://pdg.lbl.gov

Previous calculations are carried out using absolute values of the magnetic moments.