Computation of glueball mass using a certain theory

Kohji Suzuki*

kohjisuzuki@yandex.com

Abstract

We compute the mass of glueball to propose a conjecture.

1 Introduction and computation

In order to shed some light on the Yang-Mills existence and mass gap problem , we take up a gluon [1, 2], to which we try applying '(st)ring theory' [3] to compute the mass of glueball . Let m_{g_i} and n_{g_i}, $i = 1, \cdots, 8$, be the mass and number of each kind of gluon constituting a glueball , respectively. Then, the mass of the glueball is

$$n_{g_1} m_{g_1} + \cdots + n_{g_8} m_{g_8}. \tag{1}$$

Since according to [3], $m_{g_i} = 0$ [1] , (1) becomes

$$n_{g_1} \times 0 + \cdots + n_{g_8} \times 0 = 0$$

independently of $n = \sum_{i=1}^{8} n_{g_i}$, total number of gluons .

2 Discussion

It follows from the preceding computation that glueballs are massless. Hence, we have to admit that we are at odds with the so-called Yang-Mills existence and mass gap, in which one tends to assume glueballs to be massive . For better or worse, it seems tempting to propose the following.

* Protein Science Society of Japan

[1] In [3, Fig. 4], keeping self-intersections in photon sphere (PS in the figure) intact is regarded as massless, which means gluon (g in the figure) is massless, though unlike PS, θ fails to equal $\frac{\pi}{2}$. On the other hand, loss of such self-intersection in PS is interpreted as mass acquisition process, which is exemplified by the massive Z boson with no such self-intersections (Z in the figure). *Cf.* [3, Fig. 5], in which mass acquisition model of neutrino is proposed.

CONJECTURE. There is at least one kind of particle the Large Hadron Collider has so far failed to reveal, since its ‘gap’ is greater than 14 TeV $/c^2$. Prove or disprove [2] .

Acknowledgment. We would like to thank the developers of Okular , Pinta , and PostScript for their indirect help, which enabled us to prepare the figure in **Appendix**.

References

[1] Firk, F. W. K., “Introduction to groups, invariants and particles,” Createspace Independent Publishing 2014 p136-137.

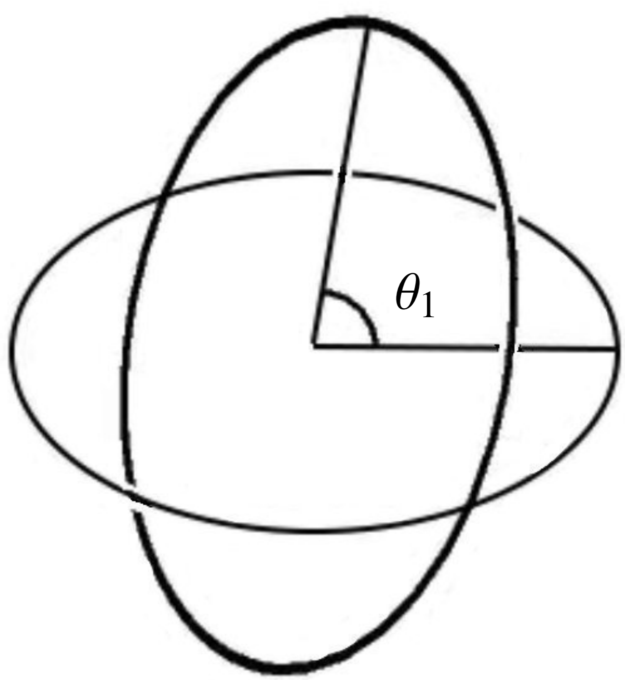
[2] Morris, D., “Quaternions,” Abane & Right 2015 p78.

[3] Suzuki, K., “ ‘(St)ringy’ proof the Poincaré Conjecture,” viXra:1912.0532 [v1] .

3 Appendix

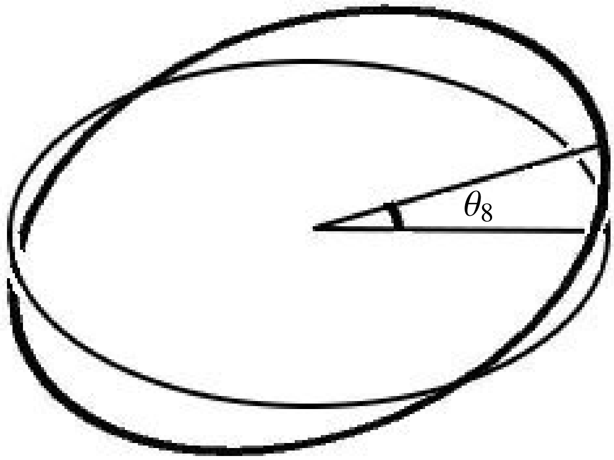
We have assumed that there are eight types of gluons. By the way, what if there are > 8 types of gluons as below?

g_1

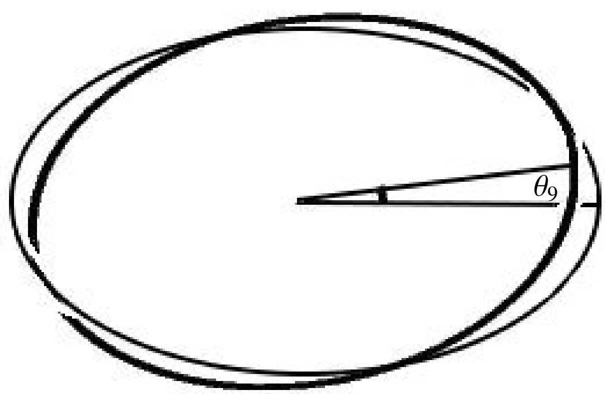


[2] Experimentally or theoretically or both.

g_8



g_9



[3, Fig. 4] adapted to accommodate g_9, an 'extra type' of gluon [3]

As shown in the above figure, we set $\frac{\pi}{2} > \theta_1 > \cdots > \theta_8 > \theta_9 > 0$ [4] to accept and differentiate at least one more kind of gluon . In this case, we simply 're-compute' (1) as follows:

$$n_{g_1} m_{g_1} + \cdots + n_{g_8} m_{g_8} \underbrace{+ n_{g_9} m_{g_9} (+ \cdots)}_{\text{extra term(s)}},$$

which becomes

[3] $g_2, \cdots, g_7$ are omitted for simplicity.

[4] $\theta = \frac{\pi}{2}$ and $= 0$ correspond to PS and Z boson , respectively. *Cf.* [3, Fig. 4].

$$n_{g_1} \times 0 + \cdots + n_{g_8} \times 0 \underbrace{+\, n_{g_9} \times 0 \,(+\cdots)}_{\text{extra term(s)}} = 0,$$

since the mass of 'extra type(s)' of gluon(s) is 0, too [5]. Thus, according to '(st)ring theory', the glueball mass remains 0 even in the presence of such 'extra type(s)'.

[5] See footnote 1.