The Internal Structure of Baryons as a Source of the
Higgs Boson and the Heister Vector Boson with a Mass
of 30 GeV

Sylwester Kornowski

Abstract: Within the Scale-Symmetric Theory (SST), especially within the atom-like
structure of baryons, we described a method that leads to groups of particles each composed
of 4 particles. Such groups consist of the following particles: a quantum of the
electromagnetic field, a vector boson, and two high-mass narrow composite resonances with
low standard deviation both with \( J = 0 \) and \( J = 2 \). Here we show that the Heister vector boson
with a mass of \( 30.4 \pm 1.78 \) GeV is the constituent of such a group. Here as well we reasoned
out why the Higgs-boson signal is relatively strong in comparison with other high-mass scalar
bosons - just there are two, not one, independent phenomena that lead to the mass of Higgs
boson equal to 125.0 GeV.

1. Introduction

In paper [1], within the Scale-Symmetric Theory (SST) [2], we described a method that
leads to groups of particles each composed of 4 particles. A group consists of the following
particles: a quantum of the electromagnetic field, a vector boson, and two high-mass narrow
composite resonances with low standard deviation (it is their feature (!)) both with \( J = 0 \) and \( J = 2 \). Their energy/masses we can calculate from following expressions:

\[
\Delta E \text{ denotes energy of a quantum of the electromagnetic field (EM quantum),} \\
M_o = X \Delta E \text{ is the mass of the vector boson [1] where } X = 19,685.3 \text{ [2A],} \\
8 M_o \text{ and } 64 M_o \text{ are the masses of the two high-mass narrow composite resonances with low standard deviation (~} 1\sigma - 2\sigma) \text{ both with } J = 0 \text{ and } J = 2 \text{ [1].} \\
\Gamma \text{ is the full width of the narrow resonances and vector bosons is defined by following formula [3]: } \Gamma = 2^{1/2} \alpha_{w(proton)} = 0.0265 \text{ i.e. is } 2.65\%.
\]

SST shows that results depend on the integral luminosity for the nucleon-nucleon collisions
[1].

The energy of a quantum of the electromagnetic field can be the electromagnetic mass of a
particle that is \( \alpha_{em} m \), where \( \alpha_{em} = 1 / 137.036 \text{ [2A].} \)

Such groups described within SST [1] are consistent with the LHC data [4], [5], [6].
On the other hand, the successive topological phase transitions of the Higgs field lead to the atom-like structure of baryons [2A]. In the $d = 1$ state of baryons, there is the relativistic neutral or charged pion [2A]. Mass of the relativistic neutral pion is $W_{\text{pion}(o),d=1} = 208.643$ MeV whereas of the charged one is $W_{\text{pion}(\pm,),d=1} = 215.760$ MeV [2A].

2. Higgs boson
Within SST we showed that mass of the Einstein spacetime overlapping with an EM quantum, $\Delta E$, is $f \Delta E$, where $f = 40.363$ [2A]. Electromagnetic energy of electron interacting with proton in the core of nucleons (notice that there is also the charged or neutral pion in the $d = 1$ state) is $\Delta E = 3.097$ MeV. It causes that the Einstein-spacetime condensate related to such EM quanta is $125.0$ GeV and it is the mass of the Higgs boson [2A], [7]. But notice that in the nucleon-nucleon collisions can appear the $W_{\text{pion}(o),d=1} + W_{\text{pion}(\pm,),d=1} = 424.41$ MeV pairs. The electromagnetic mass of such pair is $\alpha_{\text{em}} (W_{\text{pion}(o),d=1} + W_{\text{pion}(\pm,),d=1}) = 3.097$ MeV as well. These two independent phenomena leads to the same Higgs mass – it is the reason that the Higgs-boson signal is much stronger than signals of the other Higgs-like scalar bosons.

3. The Heister vector boson [8] as a constituent of a SST group
Calculate the mean EM mass of the relativistic pions in the $d = 1$ state
$\alpha_{\text{em}} (W_{\text{pion}(o),d=1} + W_{\text{pion}(\pm,),d=1}) / 2 = 1.54851$ MeV. This energy leads to the Heister vector boson which is the constituent of a SST group (Table 1).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Heister vector boson as the constituent of a SST group</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM mass</td>
<td>$\alpha_{\text{em}} (W_{\text{pion}(o),d=1} + W_{\text{pion}(\pm,),d=1}) / 2$</td>
</tr>
<tr>
<td>$J = 1$</td>
<td>1.54851</td>
</tr>
<tr>
<td>$X \cdot \Delta E$ [GeV]</td>
<td>$30.483 \pm 0.808$</td>
</tr>
<tr>
<td>$X = 19,685.3$</td>
<td><strong>The Heister and SST vector boson</strong> [8] and SST</td>
</tr>
<tr>
<td>$J = 0, J = 2$</td>
<td>243.86 ± 6.46</td>
</tr>
<tr>
<td>$8X \cdot \Delta E$ [GeV]</td>
<td><strong>SST prediction</strong> Can overlap with</td>
</tr>
<tr>
<td>$1\sigma - 2\sigma$</td>
<td>$H + Z' \approx 216$</td>
</tr>
<tr>
<td>$J = 0, J = 2$</td>
<td>1950.9 ± 51.7</td>
</tr>
<tr>
<td>$64X \cdot \Delta E$ [GeV]</td>
<td><strong>SST prediction</strong> Very weak signal</td>
</tr>
<tr>
<td>$1\sigma - 2\sigma$</td>
<td></td>
</tr>
</tbody>
</table>

4. Summary
The internal structure of baryons described within SST leads to the strong signal for the Higgs boson (it is due to the two independent phenomena that lead to it) and to the Heister vector boson ($30.40 \pm 1.78$ GeV [8]) in the opposite sign di-muon spectra of $Z$ recorded by the ALEPH experiment at LEP which is the constituent of a SST group described in Table 1.

References
http://vixra.org/abs/1610.0324
[2A]: http://vixra.org/abs/1511.0188 (Particle Physics)  
[2B]: http://vixra.org/abs/1511.0223 (Cosmology)  

http://vixra.org/abs/1503.0212  

https://cds.cern.ch/record/2205245  

https://cds.cern.ch/record/2206154  

https://cds.cern.ch/record/2204926?ln=pl  

http://vixra.org/abs/1310.0094  

[8] Arno Heister (20 October 2016). “Observation of an excess at 30 GeV in the opposite sign di-muon spectra of Z → bb_{anti} + X events recorded by the ALEPH experiment at LEP”  
arXiv:1610.06536v1 [hep-ex]