

# How Handle a Higgs-like Particle ?

**See the following email from a prominent European physicist for one aspect of this issue.**

“I find it very weird and unpleasant that the 125 GeV Higgs is being called with all possible circumlocutions, in seminars and papers.

“This leads to sometimes ridiculous statements, and sheds a sense of ‘we have no clue as to what this is’, which does not reflect reality.

“I wonder whether the PDG could authoritatively stop this nonsense, while still maintaining the necessary degree of openness towards its actual origin.

“This could be easily dealt with by giving it a code name. Some simple like H(125) (or 125.5 or 126) would do. This would respect the PDG naming tradition (letter+mass).”

PDG has long called a Higgs by upper case H.

The ultimate issue is that the experiments have not and may not soon announce that this particle is the Higgs.

The PDG “naming scheme” is for hadrons. For hadrons, the lightest particle does not carry a mass, for example,  $\pi$ ,  $\eta$ ,  $\rho$ ,  $\Sigma$ , etc. Higher masses do, including  $\rho(770)$ .

The mass is added in parentheses for mesons that decay strongly. However, for the lightest meson resonances, we omit the mass.

A baryon that decays strongly has its mass as part of its name. Thus  $\rho$ ,  $\Sigma^-$ ,  $\Omega^-$ ,  $\Lambda_c^+$ , etc., but  $\Delta(1232)^0$ ,  $\Sigma(1385)^-$ , etc.

# H(126) ??

I am not aware if rules for non-hadrons, but...

In the absence of a second Higgs, we would not attach a mass to H (and probably not with a second Higgs)

Even for hadrons, the lightest particle does not carry a mass.

Non-hadrons such as W, Z, and tau have not carried a mass.

Of course, we are free to change any rule if there is a good reason. So if discovered, we could make an exception and call it H(126), but...

since it is not at this time identified as a Higgs, the PDG rules are to call it X(126).

There will be no update to the Listings until mid-year 2013, so we would not ordinarily address this issue at this time.

⟨Personal image of the Higgs section in the next edition (K.Hikasa)⟩

## Higgs Bosons (S055) Listings

$H^0$  or  $X^0(126000)$  (New Section) — Naming should be discussed

The properties of this particle are consistent with being the Higgs boson predicted in the Standard Model.

Spin: 0, 2 or higher (spin 1 is excluded by  $\gamma\gamma$ )

Mass:  $126.\pm$

Decay Modes:

$\gamma\gamma$  seen

$ZZ$  seen

...

$\sigma \cdot B$  relative to  $(\sigma \cdot B)_{SM}$

...

## STANDARD MODEL $H^0$ (Higgs Boson) MASS LIMITS

(Existing and new search results: exclusions – stays for a while)

**No decision now.**

**Just a subject for discussion.**