## 8. Interesting Coincidences

Now we come back to our choice of a Higgs field in section 4 entitled "A Consequent Dynamic Bank Stress Test" with the general structure as given in equation (44) and write it down for 3 spatial dimensions:

$$W=\sum_{i=0}^{2}(-1)^{i}\cdot\Phi_{i}\cdot\lambda^{i\cdot 2}=\Phi_{0}-\Phi_{1}\cdot\lambda^{2}+\Phi_{2}\cdot\lambda^{4}. \qquad (48)$$

The material part of the Lagrangian $L_M$ as given in (41) can be written as:

$$L_{M}=\frac{1}{2}\left(g^{\alpha\beta}\lambda_{,\alpha}\lambda_{,\beta}+\Phi_{0}-\Phi_{1}\cdot\lambda^{2}+\Phi_{2}\cdot\lambda^{4}\right);\quad \alpha,\beta=1,2,3. \qquad (49)$$

As already hinted in section 4, this field form is motivated by the theory of nonlinear elasticity [45], where in the case of uniform extension with coordinate shifts of the form $y_i=\lambda*x_i$ (i=1,2,3) the hydrostatic stress $\sigma_H$ can be written as (c.f. [45] pp. 79-):

$$\sigma_{H}=\frac{1}{3}\left(\sigma_{11}+\sigma_{22}+\sigma_{33}\right)=-\Phi\cdot\lambda^{2}+2\cdot\Psi\cdot\lambda^{4}+P. \qquad (50)$$

The symbols $\Phi,\Psi$ and P are standing for the so called elastic potentials of the deformable space connecting the strain tensor with the stresses produced by those strains [45]. As the structure of (50), apart from a constant term P, is exactly the form of the original Higgs or Standard model Higgs field, we here investigate the apparent elastic character of the Standard Higgs model. Considering – at first - the parameter $\Phi\Rightarrow\Phi_k$ as the "spring constant" of space and using the known value of the mass of the Higgs particle with $m_H=2.25*10^{-25}$kg (=125GeV/$c^2$ with c being the speed of light), knowing that $m_{H}=\frac{\sqrt{2\cdot\Phi_{Higgs}}}{c^{2}}$ (with the connection to equation (2) via $\mu\cdot\hbar=\sqrt{\Phi_{Higgs}}\cdot\hbar\approx 87\cdot\mathrm{GeV}$ (as measured by the LHC), $\hbar=\frac{1}{2\pi}\cdot 4.135667516*10^{-15}\mathrm{eV}\cdot\mathrm{s}=\frac{h_{Planck}}{2\pi}$ here denotes the reduced Planck's constant) we obtain a surprisingly simple connection to our elastic parameter $\Phi_k$. At first we set:

$$\Phi_{k}=\pi\frac{F_{Planck}}{L_{Planck}}=\pi\frac{m_{Planck}}{t_{Planck}^{2}}\quad=\quad m_{Planck}\cdot\Phi_{Higgs}. \qquad (51)$$

But we also find

$$\Phi_{k}=\frac{\pi\cdot F_{Planck}}{N_{0}\cdot L_{Planck}}\Rightarrow\quad \mu^{2}=\Phi_{Higgs}=\frac{\pi\cdot L_{Planck}}{\mathrm{Meter}\cdot t_{Planck}^{2}}=\frac{\pi\cdot c^{2}}{N_{0}\cdot L_{Planck}^{2}}\approx(87\mathrm{GeV})^{2}\cdot\hbar^{-2}. \qquad (52)$$

Where the symbols $F_{Planck}$, $m_{Planck}$, $t_{Planck}$, $L_{Planck}$ are giving Planck force, mass, time and length, respectively. The constant $N_0$ gives the number of Planck length on a meter, which is the unit we have used here to define the Planck length.
Comparing this with the effective "spring constant" $k_{sh}$ of a shallow spherical shell (E=Young's modulus, h=wall thickness, R=radius and ν=Poisson's ratio of the shell):

$$k_{sh}=\frac{4\cdot E\cdot h^{2}}{R_{0}\cdot\sqrt{3\cdot\left(1-\nu^{2}\right)}}\quad\equiv\quad\frac{\mathrm{Const}}{2R_{0}}=\frac{\mathrm{Const}}{L_{Planck}}\cdot\pi=\frac{F_{Planck}}{L_{Planck}}\cdot\pi \qquad (53)$$

gives rise to the suspicion that the 3-dimensional space is consisting of spherical shells or 2-spheres (Planck sized Friedmann universes or just "Friedmanns" as suggested by T. Bodan,

c.f. the two books of Bodan entitled “7 Days – Or How to Explain The World to My Dying Child” and “The Eighth Day”) of radii $R_0=L_{Planck}/(2\pi)$. In this case, assuming that light-signal transport is moving along the shell surfaces, the speed of light there should be $\pi/2*c$, because only this gives c equal to Planck length divided by Planck time for an observer within the ordinary space. This means: What we consider a straight line in our continuum in reality would be a set of half circles along which light signals apparently are traveling – of course, this only holds if they are traveling along the shells surfaces.
When adding up all displacements of many such Friedmann-springs aligned along one meter, we would obtain a total displacement of $N_0$ times that one of only one of the “Friedmanns”. Thus, similar to a coil spring we result in a combined spring constant of all the “Friedmanns” given as follows:

$$\begin{array}{l} k_{sh}^{total}=\frac{4\cdot E\cdot h^2}{N_0\cdot R_0\cdot\sqrt{3\cdot\left(1-\nu^2\right)}}\quad\equiv\quad\frac{Const}{N_0\cdot 2\cdot R_0}=\frac{\pi\cdot Const}{N_0\cdot L_{Planck}}=\frac{\pi\cdot F_{Planck}}{N_0\cdot L_{Planck}} \\ \left(\text{coil spring}:\quad k_{spring}=\frac{E\cdot r^4}{8\cdot\left(1+\nu\right)\cdot N_0\cdot R^3}\right) \end{array}, \tag{54}$$

which is exactly the result obtained in (52) when comparing with the LHC-measurements for the Higgs particle detection (for the coil spring the parameters given are $N_0$=number of coils, r=radius of wire, R=medium radius of coils). One explanation for the result of $N_0$ could then be the number of such spheres along the unit chosen for the evaluation. Thus, if choosing other units for length, $N_0$ should always be given as the number of $L_{Planck}$ (given in that unit) summing up to the length of one length unit used for all parameters within the evaluation above, meaning: $N_0$ = 1 length unit /$L_{Planck}$ (given in that length unit).

Another, somewhat more satisfying explanation is found when considering the spring constant of a spherical shell as a whole. With a sphere of sufficiently thin walls its spring behavior would be proportional to h/R. In this case the number $N_0$ is just giving the ratio of R to h and we have to set $h/R = 1/N_0$ in our equations. Then we could write for the resulting spring constant of our “Friedmanns”:

$$k_{sh}^{Friedmanns}=\frac{\pi\cdot F_{Planck}}{N_0\cdot L_{Planck}}=\frac{\pi\cdot F_{Planck}}{L_{Planck}}\cdot\frac{h}{R}. \tag{55}$$

Comparison with the classical spherical shell spring constant given as

$$k_{sh}^{sphere}=\frac{4\cdot E\cdot h}{\xi\cdot R\cdot\left(1-\nu^2\right)}\quad\equiv\quad\frac{\pi\cdot F_{Planck}}{N_0\cdot L_{Planck}}=\frac{\pi\cdot F_{Planck}}{L_{Planck}}\cdot k\cdot\frac{h}{R}, \tag{56}$$

leads us to (with a yet unknown constant k, E denoting the 2-dimensional Young’s modulus and the symbol $\xi$ giving a constant, which in many cases is to be found as $\xi\approx\sqrt{10}$ [Landau, Lifschitz, “Lehrbuch der Theoretischen Physik”, Vol. VII]):

$$\frac{4\cdot E}{\xi\cdot\left(1-\nu^2\right)}=k\cdot\frac{\pi\cdot F_{Planck}}{L_{Planck}}. \tag{57}$$

Of course, the same funny result can be obtained, when treating the elastic potentials $\Phi,\Psi$ and P in the dimension of Young’s modulus as done so in [45] and denoting with $S_0$ the surfaces of the little spheres.

$$\Phi = \frac{F_{Planck}}{c^2} \cdot \Phi_{Higgs} = \frac{m_{Planck}}{L_{Planck}} \cdot \Phi_{Higgs}$$

$$\text{and}: \quad \frac{\pi \cdot F_{Planck}}{N_0 \cdot L_{Planck}^2} = \Phi = \frac{F_{Planck}}{N_0 \cdot 4\pi \cdot R_0^2} = \frac{F_{Planck}}{N_0 \cdot S_0} = k \cdot \frac{F_{Planck}}{S_0} \cdot \frac{h}{R_0} \quad . \tag{58}$$

$$\Rightarrow \quad \mu^2 = \Phi_{Higgs} = \pi \frac{L_{Planck}}{Meter \cdot t_{Planck}^2} = \frac{\pi \cdot c^2}{N_0 \cdot L_{Planck}^2} \approx (87 GeV)^2 \cdot \hbar^{-2}$$

It is rather surprising that, taking k near 1, the ratio of one meter to Planck length seems to be almost the same as the thickness of the walls of the Friedmann shells to their radius. However, we should remind ourselves that the elastic response of a spherical shell is also been determined by the internal and external pressure plus the oscillations (thermal and / or quantum mechanical) of the shell. Thus, the result might just be an effective ratio of h/R = $1/N_0$ as found in the evaluations while in reality also the term $\frac{F_{Planck}}{S_0}$ could be contributing to the final and relatively interesting "coincidence" of an effective k*h/R=$L_{Planck}$/meter (with $L_{Planck}$ giving in meter) being found when comparing the LHC-measurements with a nonlinear elastic space approach. Correct evaluation with R= $R_0$=$L_{Planck}/(2\pi)$ and assuming the 2-dimensional Young's modulus in (57) to be E= $F_{Planck}$/ $L_{Planck}$, we obtain from (56):

$$h = \frac{\xi \cdot \left(1 - \nu^2\right) \cdot L_{Planck}}{8 \cdot N_0} , \tag{59}$$

which makes the h, the wall thickness of the spatial spheres, determine the Poisson's ratio of space. Rather interestingly we see that an incompressible space with ν=1/2 would have Friedmann spheres with the thinnest wall thickness.

According to [50] this all just means that our 3-dimensional space is simply made out of all these little 2-spheres and that therefore everything is taking place on surfaces, because, for us, there are only surfaces. But of course, this would be just one possibility to try to explain the funny simplicity of (51).
Another result would be the simple fact that the self-interaction of the Higgs field automatically results from the nonlinear elastic character of this space being an ensemble of sub-Planck-sized 2-spheres, however, as shown by Bodan, with a slightly fractal character. How this also brings about many of the quantum mechanical effects we are observing is also elaborated in the book by Bodan (see T. Bodan, English appendix of "The Eighth Day", original in German as "Der Achte Tag" [50]).
One further interesting finding (coincidence) is the derivation of the spatial stress development and thus, the Higgs field, as a simple extremalizing of surfaces of partially fractal structure. With this and the concept of the little fractal "Friedmanns" not only the universal Higgs mechanism arises from the General Theory of Relativity but also natural, special ensembles of harmonic oscillators and the concept of time [50].