Ontological Fluctuating Lattice Cut Off

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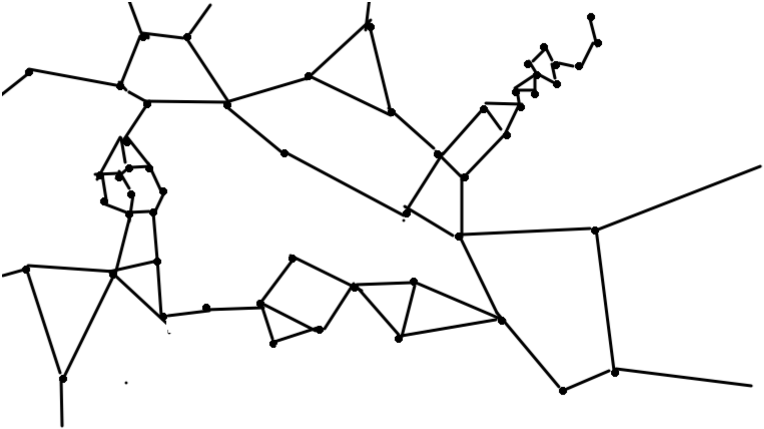
[2]Speaker at the Work Shop “What comes beyond the Standard Models” in Bled.

An irregular lattice with big density differences



Main Philosophy

The main point of our work is to assume that we have a lattice - this shall then be fluctuating in tightness, being somewhere tight, somewhere rough with big links and net holes - and then the various physical energy scales are calculated each of them from some power of the length a of a link. While for a rather narrow distrbution of a variable a say it is so that whatever the power of the variable a you need for your purpose you get about the same value for the effective typical a size,

$$\sqrt[n]{< a^n >} \approx n\text{-independent (for narrow distributions.}$$

However, Galton distribution:

$$P(\ln a) d\ln(a) = \frac{1}{\sqrt{2\pi\sigma}} \exp\left(-\frac{(\ln a - \ln a_0)^2}{2\sigma}\right) d\ln a$$

gives rather

$$\sqrt[n]{< a^n >} = a_0 \exp\left(\frac{n}{2} * \sigma\right). \tag{1}$$

Exceptional case $n = 0$:

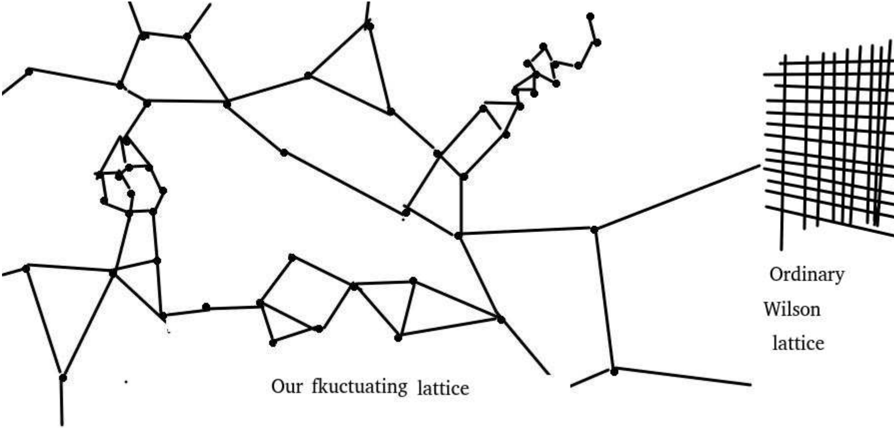
The expression $\sqrt[0]{< a^0 >}$ is not good but we reasonably replace it

$$\sqrt[0]{< a^0 >} \rightarrow \exp(< \ln(a) >) = a_0 \quad (2)$$

$$\text{for our Log Normal.} P(\ln a) d \ln(a) = \frac{1}{\sqrt{2\pi\sigma}} \exp(-\frac{(\ln a - \ln a_0)^2}{2\sigma}) d \ln a \quad (3)$$

$$\text{so again } \sqrt[n]{< a^n >} = a_0 \exp(\frac{n}{2} * \sigma) \quad (4)$$

Comparing Our fluctuating lattice with usual Wilson one



Ontological lattice mean really in Nature existing lattice

Usual non-fluctuating lattice→ Fundamental scale.

Our fluctuating lattice → Several different fundamental scales.

Introductory Examples of Powers of the Link Size to Average

To get an idea of how we may derive the relevant average of a power $< a^n >$ let us for example think of a particle, a string, or a domaine wall being described by action of the Nambu-Goto types

$$\text{Particle action} S_{particle} = C_{particle} \int \sqrt{\frac{dX^\mu}{d\tau} g_{\mu\nu} \frac{dX^\nu}{d\tau}} d\tau \quad (5)$$

$$= C_{particle} \int \sqrt{\dot{X}^2} d\tau \quad (6)$$

$$\text{String action } S_{string} = C_{string} \int d^2\Sigma \sqrt{(\dot{X} \cdot X')^2 - (\dot{X})^2 (X')^2} \quad (7)$$

$$= -\frac{1}{2\pi\alpha'} \int d^2\Sigma \sqrt{(\dot{X} \cdot X')^2 - (\dot{X})^2 (X')^2} \quad (8)$$

Domain wall action

$$\text{Domain wall action } S_{wall} = C_{wall} \int d^3\Sigma \quad (9)$$

$$\sqrt{\det \begin{bmatrix} (\dot{X})^2 & \dot{X}\cdot X' & \dot{X}\cdot X^{(2)} \\ X'\cdot\dot{X} & (X')^2 & X'\cdot X^{(2)} \\ X^{(2)}\cdot\dot{X} & X^{(2)}\cdot X' & (X^{(2)})^2 \end{bmatrix}} \quad (10)$$

Here of course these three extended structures are described by repectively 1, 2, and 3 of the parameters say τ, σ, β, the derivatives with respect to which are denoted by respectively $\dot{}, ', and^{(2)}$. So e.g. $d^3\Sigma = d\tau d\sigma d\beta$ and

$$X^{(2)} = \frac{\partial X^\mu}{\partial \beta} \quad (11)$$

$$X' = \frac{\partial X^\mu}{} \quad (12)$$

Our Phantastic Plot: Agreeing Order-of-magnitudewise for 9 Energy scales

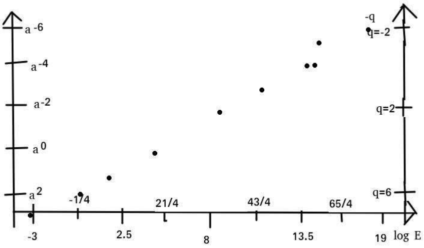
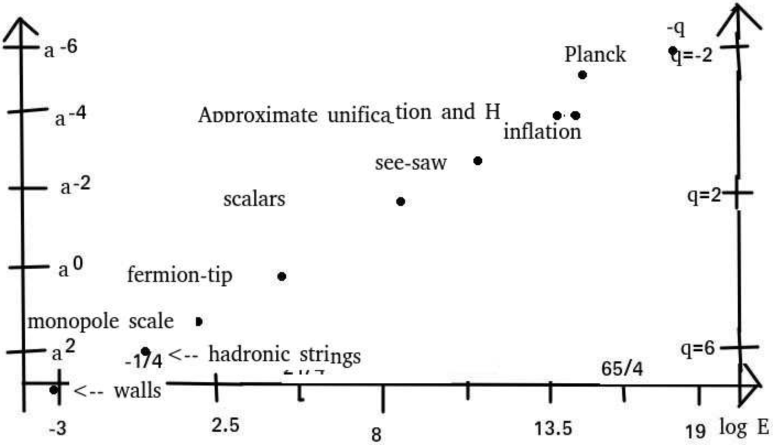


Figure: Plot of the (inverse) power *n*, into which comes the lattice link length *a*, when forming the physical energy scale of energy *E*, versus its logarithm of this energy with basis 10 *log E* using GeV as energy unit

Main Plot a bit bigger and with names



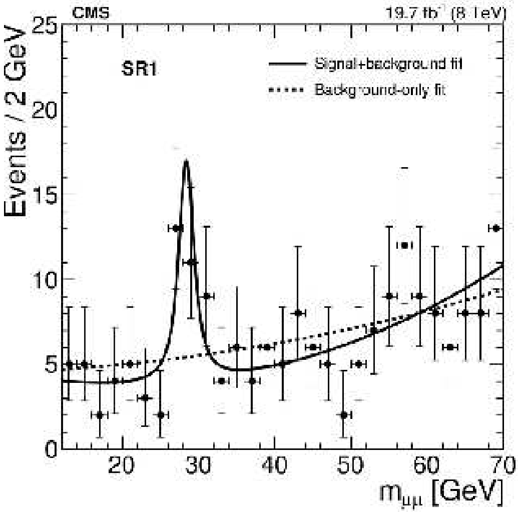
Comments on the Main Plot

- Two cosmological points "$H_{inflation}$" and one related to the energy density in the inflation time (which I did not give a name, but call it $\sqrt[4]{V_{inflation}}$), do not fit quite perfect on the straight line, but not so badly either.
- For Planckscalelused the reduced planck scale with an 8π divided out of the gravitationalconstant G. But this theoretically best suggested.
- Some energy scales are wellknown: "Planck", the cosmological ones, an only approximate SU(5) "unification" scale, The "see-saw" mass scale, the energy scale of hadron physics taken as an approximate "string" theory i.e. α' defining a scale.

Comments continued, Now the speculated scales

- But the rest is my own inventions/speculations:
  "scalars" meaning I speculate that a lot of scalars have their mass and possible vacuum expectation values of this energy order of magnitude;
  "fermion tip" which is the tip or top of an extrapolation of the density of the numbers of standard model fermion masses on a logarith of the mass abscissa;
  "monopoles" a certain dimuon resonance barely observed of mass 27 GeV is speculatively taken as being somehow to monpoles, which though are presumably cofined because of their QCD features;
  "walls" are the domain walls around dark matter in my own and Colin Froggatts darkmatter model, their energy scale is the third root of the wall tension.

Can this Peak in $\mu\bar{\mu}$ be Monole Related?



Abstract

Having shortly reviewed our idea of the grand unified SU(5) being only exact in a classical limit, in a truly existing lattice, an ontological lattice, we go over to putting a series of different physical energy scales such the approximate unification scale for the SU(5) (without any SUSY), the Planck scale, and e.g. the scale of see-saw neutrino masses into a certain plot showing the energy scales on a straght line. This straight line of this plot supposed to result from such an ontological lattice, that fluctuates in link size *a* and lattice density in a very strong way according to a log normal distribution.

Abstract continued

The point is that different energy scales result from the link size of the lattice to different powers, like the averages $< a^n >$, where the power n depends on the type of scale considered. Since the n'th root of the average of the n'th power of the link size in the fluctuationg lattice is very strongly dependent on the power n, because of very huge fluctuations, the different types of physical energy scales can get very different.
With a Galton i.e. log normal distribution of the link size the various energy scales have their logarithms fall into a nice straight line versus the power of the link size, on which they depend.
Our model gives a surprisingly good number for the small deviations of the experimental electron- and muon-anomalous magnetic moment from the pure Standard Model value.