NOW FOR THE MUKHANOV BOO BOO, and what to say about it.

STARTING WITH

Introduction- Mukhanov

Russian physicist V. Mukhanov identified flat space fluctuations as allegedly contributing to future structure formation in the early universe. i.e.

$$\Delta E \Delta T \geq \hbar \qquad (1)$$

We can diagram the situation out as follows via [2] as instead for fluctuations in the early universe , as will be discussed in a metric tensor fluctuation, of the form

$$\left\langle \left(\delta g^{uv}\right)^2 \left(\hat{T}^{uv}\right)^2 \right\rangle \geq \frac{\hbar^2}{V_{Volume}^2} \qquad (2)$$

If one uses the Mukhanov interpretation of Eq (1) we can run up against a problem, especially if we are looking at a multiverse contribution to incoming energy and this along the lines as given by the author in an article in a special edition of Hindawi press

Mukhanov in his discussion with the author claimed that any multiverse contribution to fluctuations of energy would result in a causal barrier being put in place, so as the multiverse contributions to the new universe would lead to a "single universe" rendition of Eq.(1) in terms of a single simple ΔT for a time step.

The author finds this highly unlikely, and instead asks if a single causal barrier makes sense**. Furthermore, the author asks if Eq. (2) in lieu of a multiverse contribution as to δg^{uv} makes sense in terms of a purported causal barrier**, i.e.

$$\begin{aligned}
&\hat{g}^{uv} = \Omega_{uv} g^{uv} \\
&\Omega_{uv}(new - universe) = (\Omega_{uv}{}^{-1} old - universe) \\
&i.e. \\
&\Omega_{uv} \to \Omega_{uv}{}^{-1}(inversion)
\end{aligned} \qquad (3)$$

However, in the multiverse contribution to Eq.(3) above, we would have, that

$$\Omega_{uv}{}^{-1} old - universe \to \frac{1}{N}\sum_{j=1}^{N}\left[\Omega_{uv}{}^{-1}(inversion)\right]_j \qquad (4)$$

This would lead to Eq. (3) being modified to read as

$$\hat{g}^{uv} = \Omega_{uv} g^{uv}$$
$$\rightarrow \frac{1}{N}\sum_{j=1}^{N}\left[\Omega_{uv}^{-1}(inversion)\right]_j g^{uv} \qquad (5)$$

The multiverse contribution to Eq. (2) may the look like'

$$\left\langle \left(\frac{1}{N}\sum_{j=1}^{N}\left[\Omega_{uv}^{-1}(inversion)\right]_j \delta g^{uv} \right)^2 \left(\hat{T}^{uv}\right)^2 \right\rangle \qquad (6)$$
$$\geq \frac{\hbar^2}{V_{Volume}^2}$$

NOW DO THE FOLLOWING

Not an easy answer. I.e. here are the problems, in order

a. g_{uv} & δg_{uv} may or may not exist at the beginning of space-time, before the creation of a Planck's interval of 'length'
b. Does it even make sense as to discuss g_{uv} & δg_{uv} initially? Before a Planck time interval?
c. In a famous example given , there is the idea of an infinite beach, perfectly straight, we can have a wave hitting the beach with an initial angle , infinitely small, say $\delta\theta$ many times smaller than 1 degree in "magnitude"
At the intersection point of where the beach hits the wave, the line of such will travel many times faster than the 'speed of light'. IMO then IS ANY USEFUL INFORMATION EXCHANGED?

NOT NECESSARILY.

d. A relation may exist mathematically speaking. The existence of a relation does not mean, as an example that there is USFUL INFORMATION exchange. IMO

$$\left|\delta g_{uv}\right| \propto 1/\left|\hat{T}_{uv}\right| \qquad (7)$$

One would need funtors of algebraic topology to describe via category theory a relationship formed, prior to the introduction of conditions permitting information exchange .

As I discussed with Stepan, the mistake which Mukhanov made was in assuming a relationship implies necessary and sufficient conditions for information exchange.

NOPE

Algebraic topology and the language of FUNCTORS is necessary to describe the pre set up of a relationship
Now for the connection to QUANTUM MECHANICS.

When we assume conditions for which we consider, say

$$\left|\delta g_{uv}\right| \xrightarrow[uv \to 0,0]{} \left|\delta g_{00}\right| \,\&\, \left|\hat{T}_{uv}\right| \xrightarrow[uv \to 0,0]{} \left|\hat{T}_{00}\right| \quad (8)$$

We may, in Planck units, where

$$\left|\delta g_{uv}\right| \xrightarrow[uv \to 0,0]{} \left|\delta g_{00}\right| \,\&\, \left|\hat{T}_{uv}\right| \xrightarrow[uv \to 0,0]{} \left|\hat{T}_{00}\right|$$

$$\hbar \doteq l_{planck} \equiv Planck - length \doteq V_{Planck-volume} \doteq 1 \quad (9)$$

So that

$$\left\langle \left(\delta g_{00}\right)^2 \left(\hat{T}_{00}\right)^2 \right\rangle \cong \left(\Delta E\right)^2 \left(\Delta t\right)^2 \geq 1 \Leftrightarrow \left(\Delta E\right)\left(\Delta t\right) \geq 1$$

However, and this is the main point before the Planck TIME and Planck LENGTH are formed in SPACE-TIME

$$\left|\delta g_{uv}\right| \xrightarrow[uv \to 0,0]{} \left|\delta g_{00}\right| \,\&\, \left|\hat{T}_{uv}\right| \xrightarrow[uv \to 0,0]{} \left|\hat{T}_{00}\right| \quad (10)$$

FORM RELATIONS, which only to the formation of Planck Length and Planck time, involve exchange of information, so that only when Planck Length and Planck time are formed, THEN AND ONLY THEN will there be able to write

$$\left\langle \left(\delta g_{00}\right)^2 \left(\hat{T}_{00}\right)^2 \right\rangle \cong \left(\Delta E\right)^2 \left(\Delta t\right)^2 \geq 1 \Leftrightarrow \left(\Delta E\right)\left(\Delta t\right) \geq 1 \quad (11)$$

AND then still, even with this the MUKHANOV supposition is NONSENSE

More on this later. I will go to sleep and bomb this question later today

UP now after a deep brief sleep

The answer is that the formation of space – time is necessary as a condition for

$$\left\langle \left(\delta g_{00}\right)^2 \left(\hat{T}_{00}\right)^2 \right\rangle \cong \left(\Delta E\right)^2 \left(\Delta t\right)^2 \geq 1 \Leftrightarrow \left(\Delta E\right)\left(\Delta t\right) \geq 1$$

I.e. Eq. (11) will NOT hold, prior to this, and that the conditions as outlined earlier, namely

$$|\delta g_{uv}| \xrightarrow[uv \to 0,0]{} |\delta g_{00}| \,\&\, |\hat{T}_{uv}| \xrightarrow[uv \to 0,0]{} |\hat{T}_{00}|$$
$$\hbar \doteq l_{planck} \equiv Planck - length \doteq V_{Planck-volume} \doteq 1$$

Are indeed necessary and sufficient conditions for then obtaining relations, due to FUNCTORS which only at the end emerge after PLANCK TIME to allow for

$\left\langle (\delta g_{00})^2 (\hat{T}_{00})^2 \right\rangle \cong (\Delta E)^2 (\Delta t)^2 \geq 1 \Leftrightarrow (\Delta E)(\Delta t) \geq 1$ after a Planck time interval for the formation of information exchange leading to a physically realizable application of the uncertainty principle.

Prior to a PLANCK TIME INTERVAL

$$|\delta g_{uv}| \propto 1/|\hat{T}_{uv}|$$
$$|\delta g_{uv}| \xrightarrow[uv \to 0,0]{} |\delta g_{00}| \,\&\, |\hat{T}_{uv}| \xrightarrow[uv \to 0,0]{} |\hat{T}_{00}|$$

Are then merely mathematical relations with NO CAUSAL RELATIONS based information exchange.

As to what would happen in a multiverse

$$\left\langle \left(\frac{1}{N} \sum_{j=1}^{N} \left[\Omega_{uv}^{-1}(inversion) \right]_j \delta g^{uv} \right)^2 \left(\hat{T}^{uv} \right)^2 \right\rangle$$
$$\geq 1$$
$$\Leftrightarrow \left| \frac{1}{N} \sum_{j=1}^{N} \left[\Omega_{uv}^{-1}(inversion) \right]_j \delta g^{uv} \right|_{u=0,v=0} \propto \left| \left(\hat{T}^{uv} \right)^{-1} \right|_{u=0,v=0}$$
$$\Leftrightarrow (after - Planck - time)\Delta E \sim 1/(after - Planck - time)\Delta t$$

The second line would occur before Planck time, and the third line would occur after Planck time.

Useless to refer to casual barriers as Mukhanov pre supposed. i.e. the relations set up by Funtors and algebraic topology highly unlikely to imply any information exchange

As I thought of prior to talking to Stepan, Mosakaliuk, Mukhanov was talking NONSENSE.