Quantum Gravity Experiments: No Magnetic Effects

Reginald T. Cahill
School of Chemical and Physical Sciences, Flinders University, Australia

A quantum gravity experiment was reported in Cahill, *Progress in Physics*, 2015, v.11(4), 317-320, with the data confirming the generalisation of the Schrödinger equation to include the interaction of the wave function with dynamical space. Dynamical space, via this interaction process, raises and lowers the energy of the electron wave function, which is detected by observing consequent variations in the electron quantum barrier tunnelling rate in reverse-biased Zener diodes. This process has previously been reported and enabled the measurement of the speed of the dynamical space flow, which is consistent with numerous other detection experiments. However Vrba, *Progress in Physics*, 2015, v.11(4), 330, has suggested the various experimental results may have been caused by magnetic field effects, but without any experimental evidence. Here we show experimentally that there is no such magnetic field effect in the Zener Diode Dynamical Space Quantum Detectors.

1 Introduction

In [1] a quantum theory of gravity [2] was directly experimentally tested. This theory explains the gravitational acceleration of matter as caused by the refraction of quantum waves by the time dependence and spatial inhomogeneities of the dynamical space flow. This has been successfully tested against numerous experimental gravitational phenomena [3]. More recently quantum detectors have been developed that directly detected the space flow [5,6]. All these different experimental techniques reveal a turbulent space flow speed from direction RA ∼ 4.5hrs, Dec ∼80°S, with a speed of ∼500km/s, with a 1/f fractal structure.

The dynamical space quantum detectors use reverse biased Zener Diodes, Fig.1. In [1] a new critical experimental test of this quantum theory of gravity, was reported, namely an orientation dependent effect, which directly tests the modified Schrödinger equation [2], which includes the effects of the dynamical space.

However Vrba [7] has suggested that the various effects reported [1,5,6] with the quantum detectors could have been caused by magnetic effects, but without any experimental data to test that conjecture. Here we report a variation of the quantum detectors that demonstrates experimentally the absence of any magnetic induction effects, and thus refuting the conjecture in [7].

2 Quantum Gravity Experiment

Dynamical space is a phenomenon repeatedly detected by a variety of experimental techniques [3], such as light speed anisotropy detected by gas-mode Michelson interferometers, EM speed anisotropy in RF coaxial cables and Doppler shifts from spacecraft Earth-flyby [4]. Light speed anisotropy requires that Maxwell’s EM equations be modified by the replacement of the Euler time derivative:

\[ \frac{\partial}{\partial t} \rightarrow \frac{\partial}{\partial t} + v(r,t) \cdot \nabla \]

where \( v(r,t) \) is the classical field description of the dynamical space velocity, at location and time used by the observer. When using the appropriate and detected space flow velocity for the Sun this results in the observed bending of star light by the Sun. The Schrödinger equation must also be extended...
by using the Euler time derivative [2]:

\[ i\hbar \frac{\partial \psi(r, t)}{\partial t} = -\frac{\hbar^2}{2m} \nabla^2 \psi(r, t) + V(r, t)\psi(r, t) - i\hbar \mathbf{v}(r, t) \cdot \nabla \psi(r, t) \]

(1)

An analogous extension is also necessary in the Dirac equation [8]. The presence of the \(-i\hbar \mathbf{v} \cdot \nabla\) dynamical space term provides a critical test of the emergent quantum gravity theory. For plane wave electrons, \(\psi \sim e^{i(k \cdot r - \omega t)}\), the space interaction term changes the energy of the electrons quantum tunnelling through the Zener Diode quantum barrier, for uniform \(\mathbf{v}\):

\[ E = \hbar \omega \rightarrow \hbar \omega + \hbar \mathbf{k} \cdot \mathbf{v} \]

(2)

This space flow induced energy shift changes the potential energy barrier electron quantum tunnelling amplitudes in a reverse-biased Zener diode. This effect is easily measured by means of the circuit in LHS Fig.1. A critical implication is that the electron tunnelling current must depend on the angle \(\theta\) between \(\mathbf{k}\) and \(\mathbf{v}\), as in \(\mathbf{k} \cdot \mathbf{v} = k \omega \cos(\theta)\), as experimentally demonstrated in [1]. Here we show that the observed current fluctuations significantly occur only when the Zener diodes are present, as in Fig.2, Top. In Fig.2, Bottom, we show that current fluctuations when the diodes in one of the detectors are replaced by a resister \(R_Z\), whose value matches the average reverse-biased diodes resistance. The data shows that the current fluctuations are now considerably reduced, and are Johnson noise [1] in the resister \(R_Z\), and approximately correlated with the collocated Zener diode detector current fluctuations. Were magnetic field inductions responsible, then the current fluctuations, with resistor \(R_Z\) present, in Fig.2, Bottom, would have been essentially the same magnitude or even larger, as now there are no Zener diodes to limit the current flow.

3 Conclusions

The experimental results herein demonstrate that the conjecture [7] that the effects reported in [1, 5, 6] are merely the consequences of a magnetic field induction process is disproven. That effect predicts that the two current fluctuations in Fig.2, Bottom, should have been essentially the same, and this is not experimentally seen. The fundamental results following from these experiments, and agreeing with other experimental data [3, 9] using a variety of experimental techniques, demonstrates that we have a unification of quantum phenomena and gravitational phenomena, and that space is an observable dynamical system, with gravity an emergent quantum effect arising from the refraction of quantum matter waves by inhomogeneities of the observed space flow.

**References**


