LETTERS TO PROGRESS IN PHYSICS

Reservations on Cahill's Quantum Gravity Experiment

Anton L. Vrba

Ryde, Isle of Wight, Great Britain. E-mail: vrba@iow.onl

Cahill reports in *Progr. Phys.*, 2015, v.11(4), 317–320 [1] on the correlations of the random noise generated by two Zener diodes, when they are linearly displaced or differently orientated. His conclusions that this could be a detection, and evidence, of quantum gravity variations are exciting, however in my opinion premature.

Semiconductor diodes have provided means for generating noise [2] used in a variety of applications including cryptography, signal jamming, sound masking, and instrument calibration. The diode noise is usually amplified by factors greater than 100 [3] to obtain a signals around the −50 dBm levels, which are of same order magnitude that Cahill reports.

Referring to Cahill's Figure 1, we can observe the internal arrangement of the apparatus consisting of a parallel connected array of five diodes, which are serially connected to the sensing resistor, switch and battery — these components, in that particular arrangement, form an EM-sensing loop having a substantial cross-section. There is no local amplification, and buffering, of the noise signal contrary to Zener-diode based noise generators. Figure 3, presumably, depicts the experimental configurations. In my Fig. 1 (guided by Cahill's Figure 3 right hand side) I reconstructed the experimental electrical circuit diagrams of the inverted arrangement on a common plane formed by the electrical loops defined by the battery, Zener diode and resistor. From this figure it is evident that any EM-induced currents, marked Im, would induce signals, marked Vm. These are of opposite polarity in the inverted apparatus, as Cahill observed.

In my opinion, the experiment needs to be performed with apparatus that reduce the effects of EM-induced interference to a minimum, achieved by a symmetrical arrangement of the diode array around the sensing resistor, as well as a soft steel enclosure to ensure magnetic and electrical shielding. For those wishing to duplicate the experiment, I propose arranging the components as sketched in Fig. 2, with the edition of a decoupling filter, comprising of a resister R1 and the four capacitors marked C, that reduces the effect of induced EM interference in the electrical loop formed by the battery circuit. The noise-signal, generated by the four Zener diodes Z1–4, is detected over R2. All components should be nicely, and compactly, sandwiched between two printed circuit boards to ensure symmetry around the longitudinal axis of R2. An EM-induced current in, say, the loop Z1-C-R2 would be of the same magnitude as induced in R2-C-Z2 and thus canceling across R2.

Submitted on August 23, 2015 / Accepted on August 26, 2015

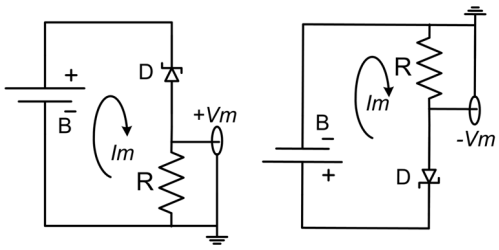

Fig. 1: Inverted Experimental Configuration

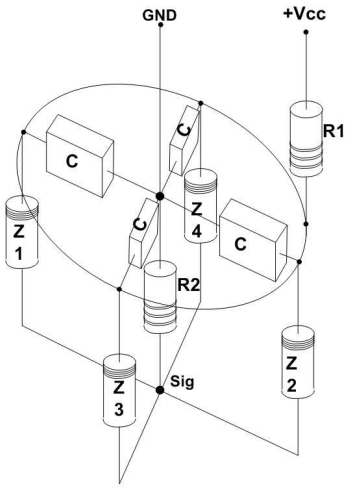

Fig. 2: Proposed Component Arrangement

References

1. Cahill R. T. Quantum gravity experiments. *Progress in Physics*, 2015, v. 11(4), 317–320.
2. Somlo P. I. Zener-diode noise generators. *Electronic Letters*, 1975, v. 11(14), 290.
http://users.cosylab.com/~msekoranja/tmp/04236738.pdf
3. Appl. Note 3469 "Building a Low-Cost White-Noise Generator", Maxim Integrated Products, Inc.
http://www.maximintegrated.com/an3469 accessed 8/25/2015