The Phase Change dye experiment for WISPs

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Abstract

We describe a simple experiment to look for currents of very low mass particles interacting via some fifth force. We assume some Baryons also interact with this force providing a connection to normal matter. And we also assume that both Fermion and Boson low mass particles are present. In such a case Fermions will more attracted to low density matter while Bosons would be profered at high density. If such particles are present we might detect a current between condensing gases and boiling liquids. An experiment is designed where bye such a current might turn assymetric dye molecules to point in the direction of the current. Such turned dye molecules may then be detected there effect on polarised light. We design such a experiment, and perform it at a desktop scale. We hope future experimenters may perform the experiment to better precision, with other fluids and more professional tolerances than we can provided.

1 Objective

To search for a possible fifth force by detecting a current of said force that may rotate dye molecules. Asymmetric dye molecules may be tilted in the presense of a current. A propondance of dye molecules tilted in one particular direction may then be detected by shining polarized light through a fluid containing the dye.

From the theory of an axial force between neutrino [1] we think it may be possible that a phase change from liquid to gas or its reverse may generate such a current. Condensation may attract low mass particles of boson type. Bosons are any particles of whole integer spin, they obey Bose-Einstein statistics and depending upon the temperature are mainly present at or near the ground state configurations. At gas densities, the particles of matter would be more spread out allowing fermions to be more present in the material at lower densities. Fermion are any particles of half integer spin, and they obey Fermi statistics meaning only one particle can take up any Quantum state in the material. Dense conditions lead to fermions be expelled

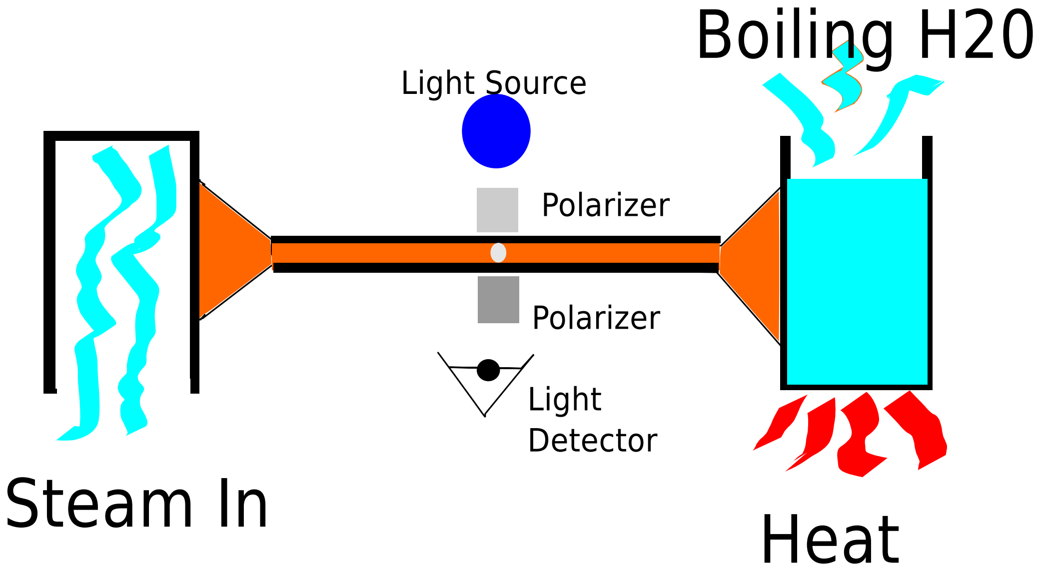

Figure 1: Aparatus for the experiment

from a material, while sparser conditions might attract fermions. The state change of vapourization of a fluid might then expel bosons while attracting fermions. We consider that neutrinos with masses in the range $10^{-3}eV$ to $1eV$, might be fermions attracted to ordinary matter by a fifth force. While the neutrinos supersymmetric partner, the sneutrino with zero spin, or a vneutrino was spin-1, might be bosons attract to ordinary matter by a fifth force.

We thus devise an experiment where we condense water in a metal cup at one side of the apparatus and boli water in another cup are the opposite side of the experiment. We join the two cups with a tube containing an aqueous fluid containing methyl orange dye (See fig. 1) The methyl orange molecule (See figures 5 and 6) is an asymmetric molecule of cylindrical shape much longer than it is wide, and also has hydrogen present at one side of the molecule and oxygen and sodium present at the other side of the molecule. Its shape may be lead to it being tilted in a particular direction by any force or interaction that perfers protons over neutrons or vice versa. Our axial force between neutrinos might then tilt the methyl orange molecule when a current of neutrinos or sneutrinos is present.

We place a hole in a metal tube surrounding the glass tube containing the dye, and look to observe any change in polarized light shining through fluiding, in particular when fluids are being boiling or condensed at either side of the apparatus. If we mask the light from a source (blue ideally to be maximally absorbed by the orange dye), by a polarising filter at either side of the hole, we may block out all light except in the case where the light as been absorb preferentially in a direction half way between the polarizing direction of the polarizer. Thus we have a polarizing filter at 45° clockwise at the light source side of the hole, and at 45° anticlockwise at the detector side of the hole. Only if the dye molecules become aligned either horizontally or vertically will light be transmitted by the system (See figure 2). Thus we have devised a system with will only transmit light if the dye molecules are polarized in an particular direction.

2 Theory

The particular fifth force we are investigating is an interaction between neutrinos where left handed and right handed particles have opposite charges. Such forces may be present between particles that do not also have vector (left plus right forces), acting between them [1].

We were lead to the belief in an axial force by the principle that local gauge symmetry leads to forces between particles. Between electrons it is well known that axial current are destroyed either by the dirac mass of the electrons or in the massless case by the quantum anomalies caused by the action of triange fenyman diagrams where vector and axial current are both present. If neutrinos have have majorana style mass matrices and no dirac mass, it is the vector charges between neutrinos which will be non conserved while the axial charges are conserved and possibly force generating. The Triangle Diagrams (Figures 3 and 4), lead to quantum anomalies preventing the same particles from interacting with both vector and axial forces. However nothing prevents a particle interacting with only one of the these, which depends on the type of mass of the particle, majorana mass leads to an axial force, while dirac mass leads to a vector force.

$$\frac{dQ_A}{dt} = \frac{g^2 C}{16\pi^2} E_V \cdot B_V$$

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Having both vector and axial forces in existance allows to explain why the weak force as a definite handedness, it is because it carries both an axial charge and an electric charge, is necessary by charge conservation since it immediate vector bosons, the W particles transmute electrons into neutrinos, the $V - A$ charge on the weak is then forced by the consideration of having both an axial and the vector electromagnetic force. This is a great predictive gain for the theory of the axial force.

We do not know the strength of the axial force, but may estimate it via renormalization of force strength. Assume at very high energies the force strength is equal for all the four forces at low masses it will be screened out by virtual pairs of neutrinos, since the mass of the neutrino is so much

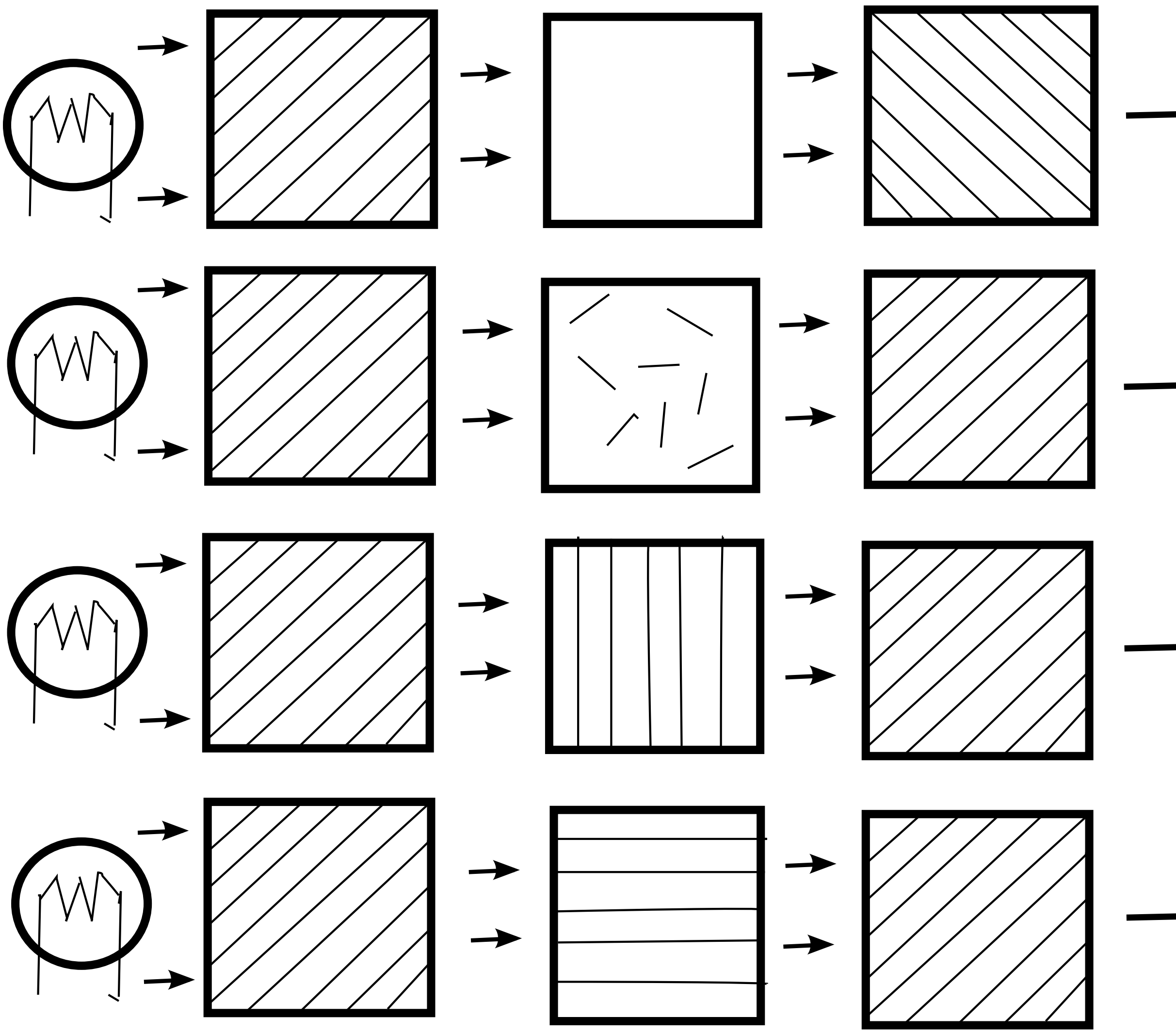

Figure 2: Transmission of light through polarizers, and normal, randomly polarizing and directed polarizing material.

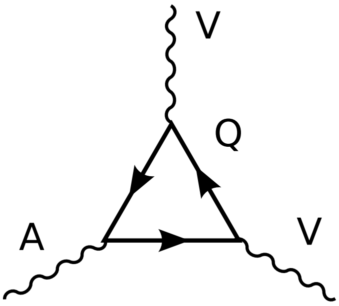

Figure 3: Feynman Diagram with two vector vertices and one axial vertex

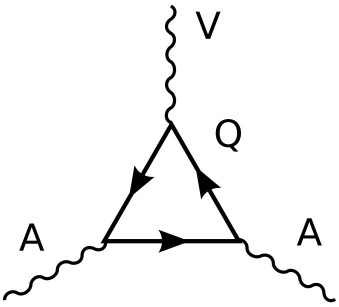

Figure 4: Feynman Diagram with two axial vectices and one vector vertex

less than the mass of other particles, the axial force will be screened more effectively. Adams [1] previously calculated the strength of the axial force to be approximately one sixtith of the electromagnetic force. $\alpha_A = \alpha_{em}/60$. Neutrino have very little mass and thus react very rapidly to any small forces acting upon them this will also lead to thermal plasma screening of the charges on the neutrinos. So we will have an additional debye screening of the axial force, making it very difficult to detect at long ranges.

Neutrinos are fermiions are thus limited by the pauli exclusion principle, only one fermion may be present in any quantum state at any one time, this means that in dense materials the occuption levels may eventually full up until the escape energy for the material is reached at this point no more fermions may be present in the material. These fermi energies may be so large that if baryons also posses a net axial charge, they would not be able to form dense stable chemically bound materials. Thus we are led, if not to abandon the axial force, to posit an additional boson also carrying an axial force charge, which must also be of low mass not to have been previously detected. This boson may be the supersymmetry partner of the neutrino, either with spin 0 or spin 1, a sneutrino or a vneutrino, we do not know the mass of such a particle but propose hat it is low enough to be easier formed in hot stars by particle pair creaction, with a temperature around that of the solar corona temperature 10^4K to 10^6K or $10eV$ to $1keV$. At room temperature such a particle would be fast moving but non relativistic.

If an ordinary material carries a axial charge in the baryons we would need to cancel the charges we a combination of axially charge fermions, neurtinos and bosons, sneutrino and further we prefered type of particle would change with the density of the material. At higher densities bosons would be prefered while at lower densities fermions would be prefered. This might led of a current of sneutrinos and/or neutrinos flowing between areas in which a fluid is condensing to a region where the fluid is boiling. We thus invent an experiment to detect such a current.

3 Variation and Imporvements on the experiment

Any dye molecule which is longer than it is wide and is also asymmetric with respect to proton and neutron distribution might be used to sense an axial current. Methyl Orange has a tadpole like shape, one end of the molecule is heavier than the other, and contains sodium and oxygen while middle and far end of the molecule is hydrocarbon. We find this molecule to be particular attractive to test, but may other such dye molecules could be used.

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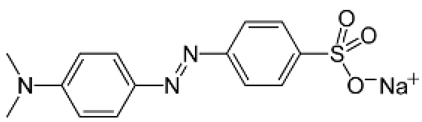

Figure 5: The Chemical Structure of Methyl Orange

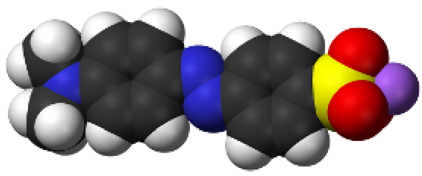

Figure 6: The 3D Structure of Methyl Orange

Getting the best polarizing filter so that the baseline light level are a minimium is also an important factor for the experiment.

The current density depends on rates of boiling and condensing of a fluid, and different fluids may be tried, it may make a difference if the molecule has unpaired protons or unpaired neutrons so, water, helium, nitrogen, deutrium

, tritium and hydrogen may all have different properties when it comes to the axial charge. Reducing the temperature may also aid the current and it effect on molecules.

Until the experiment has been performed on a wide range of fluids with a wide range of dye molecules at high accuracy and at wide range of temperatures and magnetic field, the axial force cannot be falsified, by the neurtino dye phase change experiment. Any detection of a variation in brightness of polarized light passed through the dye molecules might be a detected of a new current, and would be strong evidence for a fifth force since ordinary electrical, acidity and thermal currents are clearly not generated by the experiment.

4 Apparatus

1. Glass tube, pyrex, 20cm long, 6mm external, 4.5mm internal diameter
2. Brass tube, 14 inch long, 13.49nm diameter, 0.355mm thick
3. Polaroid material, Polarizing optical filter
4. 2 polypropylene funnels to attach metal cups
5. 2 stainless steel (chromed) cups 100mm high by 75mm diameter
6. Blue LED 5mm L-53MBC, 50mcd @ 430nm
7. Methyl Orange aqueous solution (5mL of powder in 500mL)

5 Results

We preformed the experiment described, shining the blue LED through the polarizer. Without the Methyl Orange solution some blue light could still pass through the hole, but with the solution in place no light was visible to the naked eye. We firstly boiled water in the right hand receptical, and then started condensing stream in the left hand receptical, with the top of the receptical holding ice to aid the cooling processes.

To begin with we saw no light passing through the hole, but as the stream started condensing we clearly noticed a feint green light through the hole between the polarizing films. We recorded this light and the experiment on video. As the heating continued on the boiling cup, it evidentually melted the glue holding the cup to our funnels joined to our measuring tube. This broke the aparatus setting back repeat trials.

We where most hearten by detecting light being passed by the polarizing filters, which only occurred with both the boiling and condensing we happenning simultaneously. This is what we set out to detect, and is not possible under conventional physics. Are there other possible cauases? We worry that some of the Methyl Orange solution may have escaped the tube before the funnel fell off the cup containing the boiling water, if the solution began leaking earlier then the tube may have been emptied, which would pass blue light through the hole. Other than this we see no way to cause light to passed due to the effects of boiling and condensing water with conventiional physics, leading us to claim the possible existance of our current and its rotational effects on Methyl Orange molecules, as described in our theory section.

6 Conclusion

Having conducted the experiment and gain positive results at first try is a spectacular confirmation of unconventional physics, envolving at least two particles previously unknown to science. It perphaps behoves skeptism at this point. Neverless we would wish for other group to try and replicate the above experiment. The experiment can be done with any fluid and any dye, and at a great range of temperatures. Accurate measurement of the light brightness versus the ammount of fluid boiled or condensed is vital to the confirmation of the experiment, and something we could not manage with our home equipment. We would ask other groups to try to replicate and extend our work onto the best levels of accuracy.

References

[1] B.D.O. Adams 2007, *U(1) Axial as a force between neutrinos* vixra:0907.0005