Quantum entanglement-like behaviour in a dowsing experiment

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Abstract

Quantum mechanical entanglement-like behaviour has been observed during the investigation of the dowsing effect. Interference fringe patterns, a hallmark of wave behaviour, have been observed when parallel copper tubes are placed on the ground. The fringes can be mapped using right angled dowsing rods. When the tubes are touched together and then replaced in their original position the fringe pattern changes in a manner that suggests that the tubes are "entangled". This change persists until "decoherence" occurs due to environmental interactions or deliberate physical actions.

Polarisers that use a class of materials that have no effect on electromagnetic waves but act as polarisers for dowsing radiation are used to investigate radiation passing between the tubes. The polarisers are used both to screen from interference and to facilitate measurement of the characteristics of the radiation.

Blind testing has suggested (z= 7.19, p=0.000000007%) that dowsing rods can be used to detect changes in interference fringe patterns created by the copper tubes both when they are "entangled" with one another and when they are decoherent. It has also demonstrated (z=5.2, p=0.00003%) that the radiation has a wavelength of 21.1 cm, and is circularly polarized.

The use of non-conventional material for the polarisers strongly indicates that the radiation is likely not electromagnetic in nature and suggests a testable proposition that the radiation that causes the dowsing entanglement effect is one and the same as that which creates entanglement in quantum physics.

Keywords: radiation, quantum, interferometer, polariser, fringes, entanglement, decoherence, dowsing, wavelength.

Introduction

Dowsing refers to the practice of using rods and other tools such as pendulums to locate veins of minerals, underground water sources and other buried structures. The movement of such tools indicates a positive response. Dowsing is an ancient practice that was described by Agricola (1556) and from then until this day has been widely used world wide. Despite its anecdotal success, scientific studies that typically involve practitioners attempting to locate hidden water sources or buried objects under controlled conditions yield mixed results with outcomes often no better than chance. Such results together with the lack of a plausible mechanism explaining how dowsing might work have resulted in dowsing not being taken seriously by the scientific community.

It is useful to examine previous studies so that the results from them can later be examined in the light of the findings from the experiments described here.

In a study by Randi (1979) dowsers were invited to determine which of three buried pipes water was flowing through. Four dowsers were tested with results no better than chance.

In 1982 GTZ, the German corporation for technical cooperation, set up a project to improve the water supply in Sri Lanka. Hans Schroter was the project engineer. He used classical methods to locate potential areas where wells might be dug but these methods were not sufficiently accurate to justify drilling. Schroter then used dowsing techniques to pinpoint precise locations. The project lasted three years and covered an area of 4000 square kilometres and a population of 70,000. Of the 690 boreholes that were drilled only 27 were dry. The project results were published in a report (Schleberger (1986) and GTZ later used Schroter in a number of other successful projects. These results came to the attention of Hans-Deiter Betz, a professor of physics at the Ludwig Maximilians University in Munich who reported on them. (Betz,1995a)

Schroter's abilities led to a major study being set up, part of which was known as the Scheunen experiment. This took place in a two story building and involved 900 tests of 43 people. On the lower floor a pipe was placed at a random position. Dowsers on the upper floor were asked to locate the pipe. Although the overall results were not good, some individual dowsers including Schroter had success rates with a probability of 1 in 1700 of being by chance. (Betz,1995b). The original analysis of the study results was criticised by Enright (1995) who claimed that the overall results could hardly be distinguished from pure chance. The results from the experiment were re-analysed by Suitbert Ertel (1996) from the University of Gottingen. Ertel disagreed with Enright's unfavourable verdict and also noted that some dowsers appeared to respond to systematic alternative positions rather than the actual position of the pipe.

A double-blind dowsing study by Konig et al (1991a, 1991b) was undertaken in Kassel, Germany, under the direction of the German Society for the Scientific Investigation of the Parasciences. Similar to the Randi experiments 30 dowsers attempted to determine whether water was present in buried pipes. Again the results were no better than chance.

Following a survey published in a blog by evolutionary biologist Sally Le Page (2017) it was widely reported in the media that 10 out of 12 water companies in the UK sometimes used dowsing methods to locate underground pipes. The blog quoted some critical responses which expressed the view that there were no scientific studies that proved that the results from dowsing were better than chance.

Reddish (1993) describes how he discovered by accident that placing a length of plastic on the ground over a pipe or under an overhead cable gave rise to a series of dowsing rod deflections orthogonal to the pipe or cable and at equidistant intervals from each other. The deflections suggested that there were interference fringes present, such fringes being a hallmark of wave behaviour. The arrangement was refined, to become a pair of parallel copper tubes 1m long and 60cm apart in a vertical wooden frame. Such an arrangement became known as a dowsing interferometer. Using such interferometers over a period of four years, four investigators obtained repeatable results. (Dodd et al 2002)

Kernbach (2013) describes unconventional research in the former USSR relating to penetrating emission of non-biological origin. Some of this research was reportedly carried out by A. E.Akimov who in 1989 became the head of the centre for non-traditional Technologies, later known as ISTC VENT. Akimov (1991) refers to material having a spin-ordered molecular structure and cites A. Samokhin in 1989 as having carried out preliminary experimental testing of the screening action of polyethylene films. The paper goes on to state that polyethylene films acted as a polariser for the radiation being studied and that such films crossed by orientation of the polymers could act as a shield for the radiation.

In this dowsing study polyethylene and other stretched materials were used to shield experimental apparatus from unwanted external radiation and to make measurements on the unknown radiation passing between the components of an interferometer. MDF and brass were used as construction materials. The appendix describes these materials in more detail.

In 2015 an unexpected result was found when fringe distances were measured for various spacings of copper tubes used in a dowsing interferometer. Figure 1 shows the result with peaks occurring at spacings that are a multiple of 21.1cm. This result was confirmed by measurements made in France by C. M. Humphries (personal communication 2015). There were also hints that circular polarisation may be involved because of the way in which the rods deflected as a dowser rotated on the spot at positions between the normal fringes.

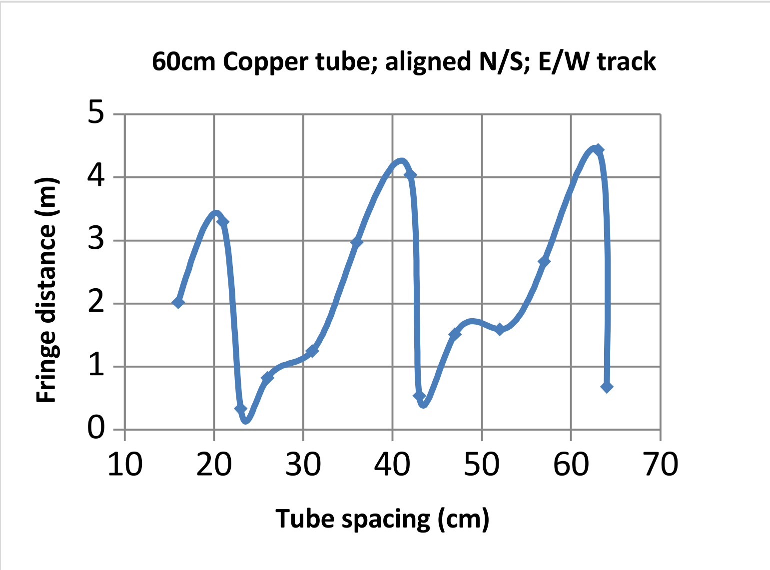

Figure 1: As copper tubes are spaced apart there are peaks of dowsing fringe distance at multiples of 21.1cm.

Another unexpected effect was noticed by the present author when using a dowsing interferometer. Instead of the copper tubes just behaving as two elements of an interferometer they appeared to be connected in some way. When either tube was sharply tapped the fringes collapsed only to re-appear a minute or so later. When the tubes were separated by a distance of a few meters, fringes didn't spontaneously re-appear until they had been touched together and then separated. To explore these related effects, two experiments were devised.

Experiment 1 was carried out in 2024. Instead of sharply tapping the tubes together to cause the fringe to collapse one of the tubes was exposed to a pulsed electromagnet field. This had a similar effect but was experimentally more convenient because it operated silently. The experiment was designed to test the hypothesis that some form of entanglement was taking place between the tubes of a dowsing interferometer and that decoherence could be triggered by exposing one of the tubes to a pulsed electromagnetic field.

Experiment 2 was designed to test the hypothesis that radiation connecting the two tubes in experiment one had a 21.1cm wavelength and was circularly polarised. In order to do this it used polarisers made of rigid perspex, a material that when rolled from a cast sheet is stretched in one direction and has properties similar to the polyethylene film described earlier.

Method

Experiment 1

Participants

This was a single blind study with one participant. Following each experimental run the participant was made aware of the state of the random generator that controlled the experiment. The participant wore only garments made of 100% cotton fibres to control for the unwanted polarisation effect of synthetic materials on dowsing fringe measurements and wore no leather shoes or belts that had been found to have similar properties. In addition to this the participant also wore no rings or jewellery to prevent them from interacting with the experimental apparatus.

Apparatus

The physical layout of the experiment is shown in figure 2. Copper tubes 15mm in diameter and 47cm long were used. (neither of these dimensions are critical). The tubes were spaced 15m apart with tube **b** 12m outside the building on the other side of a large window. Tube **a** was inside. This arrangement prevented the measurement area being exposed to wind and weather. Materials used to construct experimental equipment were chosen so that they did not interact with the copper tubes. (see the appendix)

For each experimental run, tubes **a** and **b** had to first be momentarily connected together. To prevent the need to continually go outdoors, a scheme was adopted whereby an uninsulated 0.2mm diameter brass wire was laid a few cm deep in a slit cut in the outdoor soil. One end of the wire was connected to tube **b** and the other end to a 5cm x 5cm brass plate on the outside of a double glazed window. Another plate was mounted on the inside of the window, the pair forming a capacitor with a gap of approximately 20mm between the plates. This arrangement allowed tube **a** to be momentarily connected to **b** by touching it on the inside capacitor plate.

A solenoid with a steel armature was mounted directly behind tube **a**. The solenoid had 3600 turns with 110 ohms resistance. Its energisation of 24 volts DC was controlled by a microcontroller, random generator and remote control. When the controller was triggered it either did nothing or pulsed the solenoid coil with a 6 second sequence of 0.5 seconds on and 0.5 seconds off.

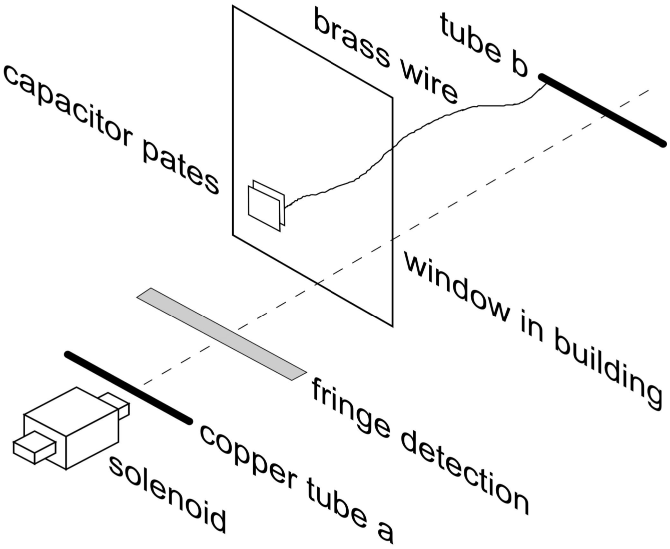

Figure 2: Two copper tubes form a dowsing interferometer. They are entangled by momentarily connecting them together and decohered by a pulsed magnetic field from a solenoid.

Procedure

Control for Chaotic Measurement Conditions. Dowsing fringe measurements were made using a second stand alone interferometer before the start of any experimental runs and subsequently at intervals of approximately 30 minutes thereafter. If measurements from this interferometer were chaotic rather than being stable (believed to be caused by sun radiation effects), experimental runs were abandoned until more favourable conditions prevailed.

Initialisation. At the beginning of each series of runs tube **a** was physically touched to the plate of the capacitor on the inside of the window and then replaced in its original position. If necessary the position of tube **a** was then finely adjusted over approximately a 10cm range so that a fringe could be detected at a convenient position. Following this initialisation the sequence below was carried out for each run.

Experimental Runs.

1. Tube **a** was picked up and touched to the inside plate of the capacitor to entangle it with tube **b.**
2. Dowsing rods were used to check that a fringe could be detected at the expected position.
3. The participant exited the area where the apparatus was located and used the remote control to trigger the random generator system to cause the solenoid to apply a pulse sequence or not to the electromagnet.
4. Dowsing rods were used to determine whether the fringe was still present (**a** and **b** are still entangled) or whether there was no fringe in which case **a** and **b** had become decoherent.
5. The participant's fringe determination was recorded together with the output state of the random generator.
6. The procedure was repeated

Experiment 2

Participants

As in experiment 1 this was single blind study with one participant. Following each experimental run the participant was made aware of the state of the random generator that controlled the experiment. The participant wore only garments made of 100% cotton fibres to control for the unwanted polarisation effect of synthetic materials on dowsing fringe measurements and wore no leather shoes or belts that had been found to have similar properties. In addition to this the participant also wore no rings or jewellery to prevent them from interacting with the experimental apparatus.

Apparatus

Two polarisers as shown in figure 3 were used to measure the characteristics of the radiation. The spacing between the polarisers was set to 21.1/4 cm. In operation, any 21.1 cm incoming radiation that passes through polariser **a** will rotate 90 degrees in the gap between **a** and **b** and will be passed through by **b**. If **b** is rotated by 90 degrees so that the stretch directions are parallel, the radiation is blocked.

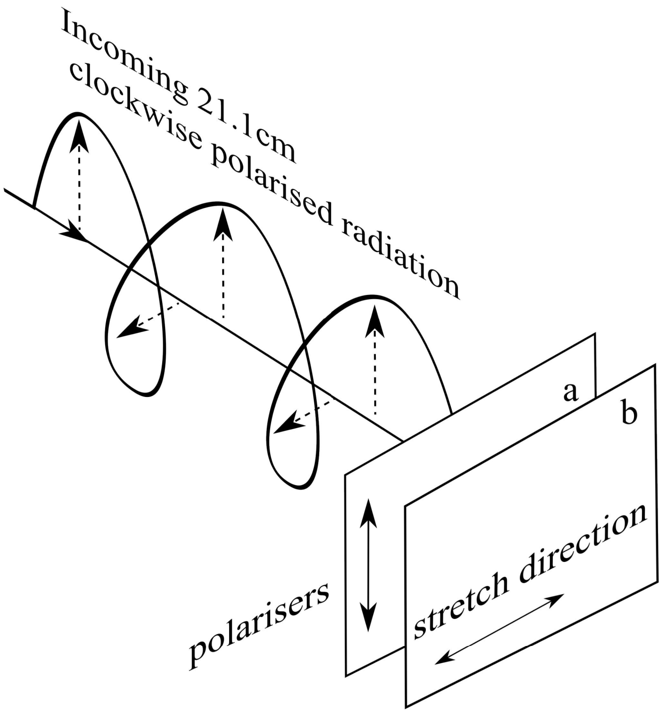

Figure 3: Polarisers pass or block radiation dependent on their relative stretch directions

Figure 4 shows two such polariser pairs arranged one above the other with a gap between them. The top pair had polariser stretch directions orthogonal to one another and the bottom pair parallel to one another.

Three copper tubes **a**, **b** and **c** were aligned on a horizontal plane with tubes **a** and **b** comprising an interferometer. Tube **c** was positioned on the other side of the polariser pairs.

A mechanism comprising an actuator, microcontroller, random generator and remote control was mounted above the polarisers and was screened from them by using a crossed polyethylene screen. When triggered the mechanism was able to move the polarisers vertically so that either the top pair or the bottom pair was randomly moved into the path between interferometer **a-b** and tube **c.**

The equipment was mounted on top of a radiation screen comprising MDF covered with crossed polyethylene to control for the polarisation effect of the floor in the built environment causing persistence effects even when copper tubes had been removed.

A second radiation screen (not shown) was arranged to the east side of the equipment to control for spurious radiation that had been found to come from an easterly direction and interfere with measurements.

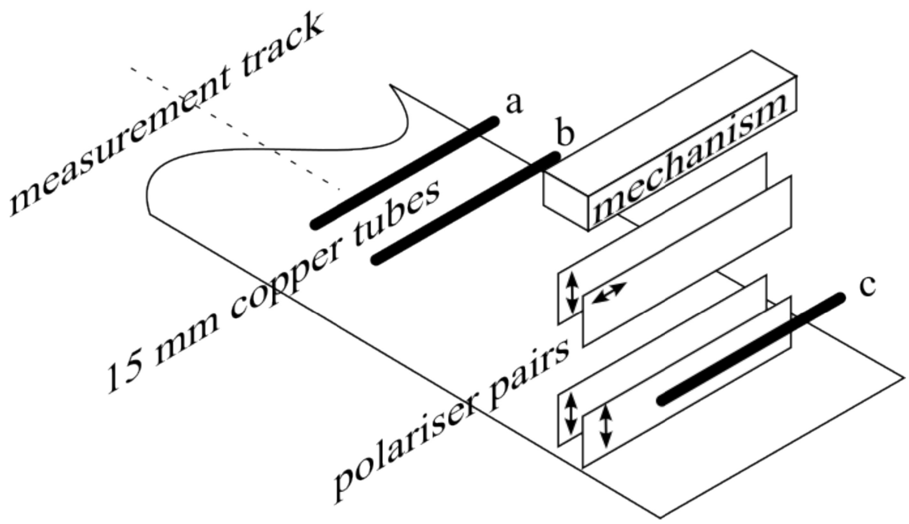

Figure 4: Polariser pairs move up or down to pass or block radiation between tube c and tubes a and b

Procedure

Control for Chaotic Measurement Conditions. Dowsing fringe measurements were made using a second stand alone interferometer before the start of any experimental runs and subsequently at intervals of approximately 30 minutes thereafter. If measurements from this interferometer were chaotic rather than being stable (believed to be caused by sun radiation effects), experimental runs were abandoned until more favourable conditions prevailed.

Equipment Initialisation. To initialise the equipment the following steps were made.

1. With tube **c** removed, the position of the fringe caused by the **a-b** interferometer was marked along the measurement track.
2. The polariser pairs were set to their mid position so that radiation could pass from the **a-b** interferometer through the vertical gap between them to tube **c**.
3. Tube **c** was picked up and touched to **a** and **b** to form an entangled superposition. It was then placed in position as in figure 4.
4. The new position of the fringe along the measurement track was marked. If necessary the distance between the **a-b** interferometer and tube **c** was altered to ensure that the fringe could be distinguished from the previously detected fringe in step 1.
5.

Experimental Runs

1. The polariser pairs were set to the mid position so that the path between tubes **a**, **b** and **c** was uninterrupted.
2. Tube **c** was picked up and touched to **a** and **b** to entangle them. It was then replaced in its original position.
3. The fringe position was checked to make sure that its position corresponded to the entangled state of **a**, **b** and **c** determined during initialisation step 4.
4. The participant exited the area where the apparatus was located and used the remote control to cause either the top or bottom polariser pair to move at random into the beam path between interferometer **a-b** and tube **c**.
5. The participant's determination of the fringe position (whether its position corresponded to an entangled superposition of **a, b** and **c** or not). was recorded together with the output state of the random generator.
6. The procedure was repeated.

Results

These experiments have never been carried out before, accordingly the results should be considered to be preliminary

Experiment 1 tested the hypothesis that some form of entanglement and subsequent decoherence was taking place between the tubes of a dowsing interferometer. There was one participant who took part in 64 trials. Of these, 52 trials (81%) supported the hypothesis, ($z=4$, $p= 0.006\%$) significantly exceeding the expected mean of 50% that would occur under the null hypothesis. Of the 12 trials that did not support the hypothesis, 8 appeared to be caused by spontaneous de-coherence and 4 were situations where the solenoid failed to cause decoherence.

Experiment 2 tested the hypothesis that radiation connecting the two tubes in experiment one had a 21.1cm wavelength and was circularly polarised. One participant took part in 100 trials. Of these, 76 (76%) supported the hypothesis ($z=5.2$, $p=0.00003\%$) exceeding the expected mean of 50% that would occur under the null hypothesis. Of the 24 trials that did not support the hypothesis 8 appeared to be caused by spontaneous decoherence of the copper tubes in the apparatus and 16 were believed to be caused by spontaneous entanglement of parts of the apparatus with objects in the environment.

Taking both experiments and considering the ability of a dowser to detect the entangled state of copper tubes, there were a total of 164 trials. Of these in 128 cases (78%) ($z= 7.19$, $p=0.000000007\%$) the entanglement status of the tubes was correctly detected. This exceeds the expected mean of 50% that would occur by chance.

Discussion

To minimise the potential for external factors to influence the observed effects in experiment 1 and 2, screening was employed to block unwanted external radiation sources. To eliminate unwanted effects of radiation polarisation the participant wore no leather belts or shoes and wore clothing that contained no synthetic fibres. To avoid unwanted interaction with the rods used for dowsing the participant also wore no rings or jewellery. Care was taken during the initialisation phases of the experiments to ensure that the potential positions of dowsing fringes were known and that the main fringes could not be confused with secondary fringes.

Both experiments 1 and 2 confirm that entanglement like behaviour can occur between copper tubes and that this can be detected to a high degree of confidence. The question arises as to why the results from this study are significantly better than the outcomes of previous studies by Randi (1979), Betz (1995b) and Konig et al (1991a, 1991b). A common feature of these previous experiments was a failure to control the factors that could have adversely affected their results, a failure that is believed to be the outcome of having incomplete knowledge.

There is a discrepancy between the Sri Lanka results of Schroter described by Betz (1995a) in which he was highly successful at detecting potential water sources in uncluttered outdoor environments and the much poorer success rates in experiments indoors and/or that used pipes that could either be physically moved or selectively filled by flowing water .

It appears likely that there were at least two reasons for this. The first is that dowsing appears to involve interference effects (Reddish 1998) with detectable fringes appearing at equal intervals from a main fringe. The second suggested reason is that the pipes became and remained entangled with other pipes and with objects in the built environment, there being no attempt to decohere them before any experimental run. A consequence of such entanglement would be that any measurements made were not related to the position or the fill status of individual pipes but were in fact a measurement of an entangled dowsing superposition. This suggestion is reinforced by the analysis of the Betz (1995b) results by Ertel (1996) who introduced the idea of attractors, these were pipe positions identified by dowsers, the attractors occurring at the actual positions of the pipe and at symmetrical secondary positions.

Experiment 2 confirms the hypothesis that circularly polarised radiation with a wavelength of 21.1cm passes between the copper tubes of the experiment and is in some way responsible for the observed entanglement effect. This is a very surprising result and on the face of it suggests that the radiation is electromagnetic since 21.1cm with a frequency of 1420 MHz. This is well known as hydrogen line radiation that corresponds to a change in the energy state of electrically neutral hydrogen atoms. There is however some doubt about the electromagnetic interpretation

In 2002 dowsing tests were carried out in an electromagnetically screened laboratory at BAe Systems in Edinburgh. These tests concluded that electromagnetic screening had no effect whatsoever. (Dodd et al., 2002). Another fact that negates the electromagnetic interpretation is that the polarisers used in this experiment have a stretched molecular structure that does not appear to have any currently known effect on microwave electromagnetic radiation.

At the time of carrying out the experiments it was believed that excitation radiation from the Sun was necessary in order for the dowsing effect to be observed. At the time of experiment 2 in particular the Sun was at a solar maximum when the magnetic field of the sun was undergoing violent reversals. This caused severe instability problems while carrying out measurements. To control for this, before each series of experimental runs, measurements were made using a separate interferometer to determine whether conditions were stable. It has since been observed that rather than relying on the sun, a laser can be used. Further work is required to study this effect but it holds the promise of using crossed polyethylene to screen the apparatus from the sun and eliminate interference effects.

It is suggested that the 21.1cm radiation associated with the dowsing entanglement effects described in this study is associated with entanglement effects seen in quantum mechanics. This is testable by using the polarising filters as elements in a quantum teleportation or Mach Zender interferometer experiment.

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Appendix

Materials and their properties used in the construction of experiments

The polymer chains in polyethylene film are stretched in a longitudinal direction during the extrusion part of the manufacturing process. It is believed that this creates a molecular-level analogue of the grid of fine wires that is sometimes used as a polariser for electromagnetic radiation. Other materials such as aluminium sheet and perspex whose manufacturing process stretches the material in one direction have similar properties.

It is important in any experiment that the materials used to construct the experimental equipment must not affect any measurements. (Wöst and Wimmer, 1934) reported that there were classes of chemical elements which, when placed together, could not be detected by dowsing rods. They suggested the possibility of producing and using non-radiative combinations of metals. J. Harris (personal communication n.d.) has investigated such combinations and advised that brass, being an alloy of copper and zinc, would be minimally or non-detectable. As a result brass is used for all metalwork in the construction of apparatus.

Where sheet material was needed for the construction of apparatus Medium Density Fibreboard (MDF) was used. The fibres in MDF are randomly dispersed at all angles and do not interact with the copper tubes used in the experiment. It was chosen over natural wood and metal sheet which both have unwanted polarisation properties, wood because of its elongated cell structures, (Zhu and Li, 2024) and metal because sheets of metal are rolled and therefore stretched in one direction and act as polarisers.