Quantum Computer on the Moon

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Abstract:

Quantum computers are affected by noise. The Earth is not an optimal location for a Quantum Computer due to all the dynamic events that occur on the planet. Mother Nature, human activity, Weather Patterns, animals, machinery, waves, and any noun that you can think of somehow is constantly evolving or moving in space and time resulting in a noisy arena for a Quantum Computer. The opposite is true for the Moon. It is a very still place. There are no waterfalls, planes, vehicles, storms, winds, consciousness, or any other noise inducing activity that occurs on the Earth and not on the Moon. Therefor, we can test if superpositions and quantum entanglement lasts longer on the Moon using entangled photons. If photons remain entangled longer or can be entangled at a higher rate than on the Earth, the Moon is a good candidate for a quantum computer. We can test for this using the Double Slit Quantum Eracer experiment. If more photons are entangled and remain entangled on the Moon than with using the same experiment on the Earth, a quantum computer should be built in the Moon. The Far side of the Moon may be an optimal location. We can also test higher rates or longer durations of quantum entanglement using a simpler experiment using a laser emitting photons to a BBO crystal resulting in two entangled photons and two image sensor which may determine if the entangled photons reached the sensors without decohering.

Experiments:

When two photons are entangled, their polarizations are correlated. One photon can have vertical polarization and the other may have a horizontal polarization (or both having the same polarization). If we can determine that these photons remain entangled for a longer duration, or become entangled at a higher rate on the Moon through a BBO crystal, a quantum computer should be built on the Moon as this will translate to a more useful quantum computer on the Moon which is more immune to noise problems.

A pair of photon gets entangled once every 10^-10 photons emitted from a laser which passes through a BBO crystal. If this rate of photon entanglement increases when on the Moon, it may be a good place to set up a quantum computer. If more photons get entangled on the Moon than on the Earth using the same experiment it may mean that it is easier to entangle photons on the Moon due to less collapse inducing noise, which may result in qubits being more easily entangled as well in a quantum computer. If photon entanglement rates increase on the Moon this may also mean it is easier to put qubits in superposition while on the Moon as quantum entanglement and superpositions are closely related.

To test if photons are more easily entangled on the Moon we can construct an experiment with a laser that emits photons to BBO crystal which entangles photons at rare occurrences. These photons frequencies become halved when they become entangled as they split into two, and the photons that do not become entangled remain at the frequencies emitted by the laser. Two paths will be created when the photons are entangled after they leave the BBO crystal. We can send the photon for each path through a light filter that blocks out frequencies above the frequencies of the entangled photon and onto a camera sensor to determine how many photons were entangled at a given time. We can compare data from both sensors to detect the occurrences of photons registered that have half the frequency of the laser and count the coincidences. If each sensor picks up more simultaneously registered photons on the Moon than the same experiment when performed on the Earth, this means the photons had a higher rate of entanglement resulting in optimal conditions for a quantum computer. Higher rates of entanglement means less decoherence of the entangled photons to the system which means entanglement, and even superposition, lasts longer on the Moon.

Using this setup we can send 100000000 photons in a short amount of time and block all non entangled photons and only measure entangled photons due to the use of an optical filter that blocks higher frequency light. Higher frequency light are photons that were not entangled. Lower frequency light means the photons were or are entangled. Usually a photon is entangled every 10^-10 photons that go through the BBO crystal. It is a hope that we can get more photons entangled on the Moon using the BBO crystal due to less noise on the Moon.

We can also place a polarizer in front of each sensor oriented each with the polarization relation the entangled photon pair has. This may block photon pairs that were entangled but decohered and possibly changed polorization as their wave function evolved resulting in a halved frequency remaining without remaining entangled. This may also block many of the entangled photon pairs but some pass through if their orientation is correct to the polariser meaning they are still entangle via there polarization and we want to see if these detected pairs occur more on the Moon than on the Earth. Therefor if there is not much noise without the polarizers, we can skip using the polarizers on the sensors. However if there is alot of noise of decohered infrared photons with polarization of each being random due to decoherence, we can use the polarizer on the sensors instead which will by chance have some entangled photons with the same or perpendicular polarizations depending on the BBO crystal to be detected when the polarizations align of each photon to pass through each polarizer unimpeded. Photons still cohered but not having polarizations aligned to the polarizer may still be counted as cohered photons ifthe intensities of the photons at each sensor increase at the same amount.

We need to detect an Infrared photon at each sensor that increases in unison in signal amplitude at the same time to detect an entangled pair of photons. We can look for certain intensity of amplitudes at each sensor that infer photons passed unimpeded through the polarizer, or dimmer intensities but a same amplitude increase at both sensors if the photons were off axis to the polarizers meaning they still were entangled. Photons that decohered in their polarizations but still are in infrared due to previous entanglement would have differing intensities of amplitude at the same time at each sensor due to the different angles of their polarizations to the axis of each polarizer as their wave functions may have evolved after decohering to the system before reaching the sensors. The Experiment should be shielded from space radiation.

Furthermore, we can use the Double Slit Quantum Eraser experiment to determine if the experiment produces less noise, and or more entangled photons on the Moon. If there is less noise, or more rates of entangled photons on the Moon than with the same experiment on the Earth, the Moon should be considered as a location for the next Quantum Computer. This can be determined by using the coincidence counter in the Quantum Eraser experiment to see how many entangled photons are registered.

Furthermore, any type of quantum experiment may be performed that entangles particles or photons which can be tested both on the Earth and the Moon to see if there is an increase in Entanglement Rates on the Moon.

The far side of the Moon may also be a good location for this test due to less solar radiation and no observations by humans.