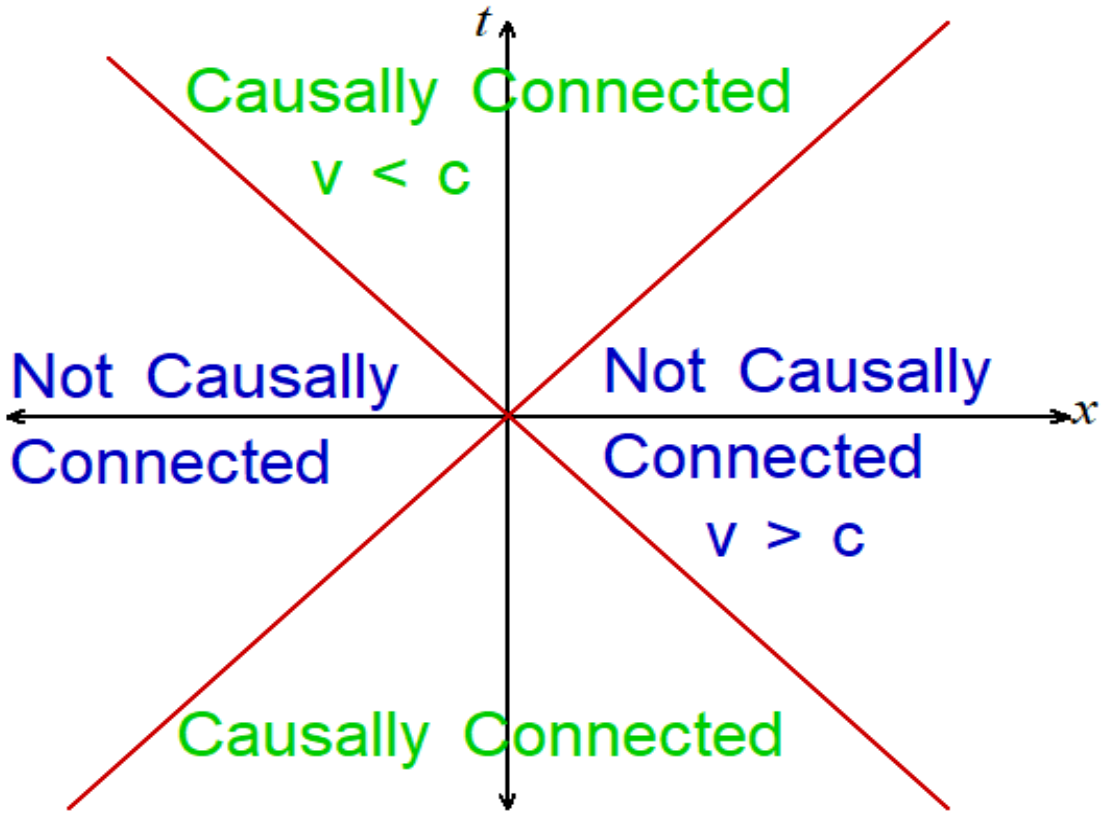
The Unruh Effect

Vikash Kotteeswaran

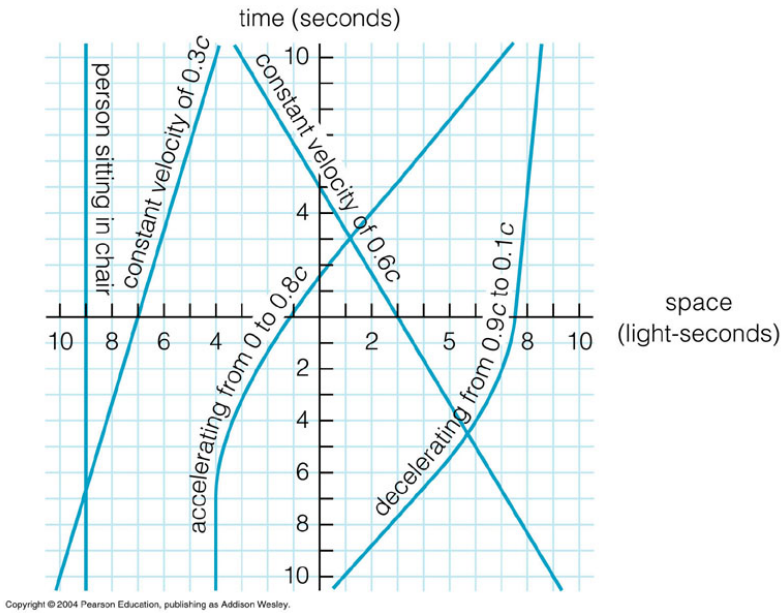
Overview

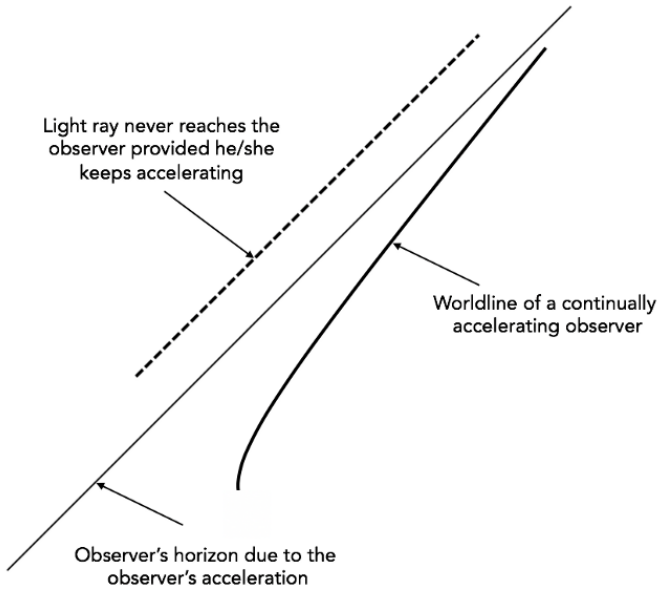
Causal Disconnection



- Two events are causally connected if they can be communicated with themselves at any point of time and the negated is also true.
- Our whole life is a string with infinitely long infinite hairs in spacetime

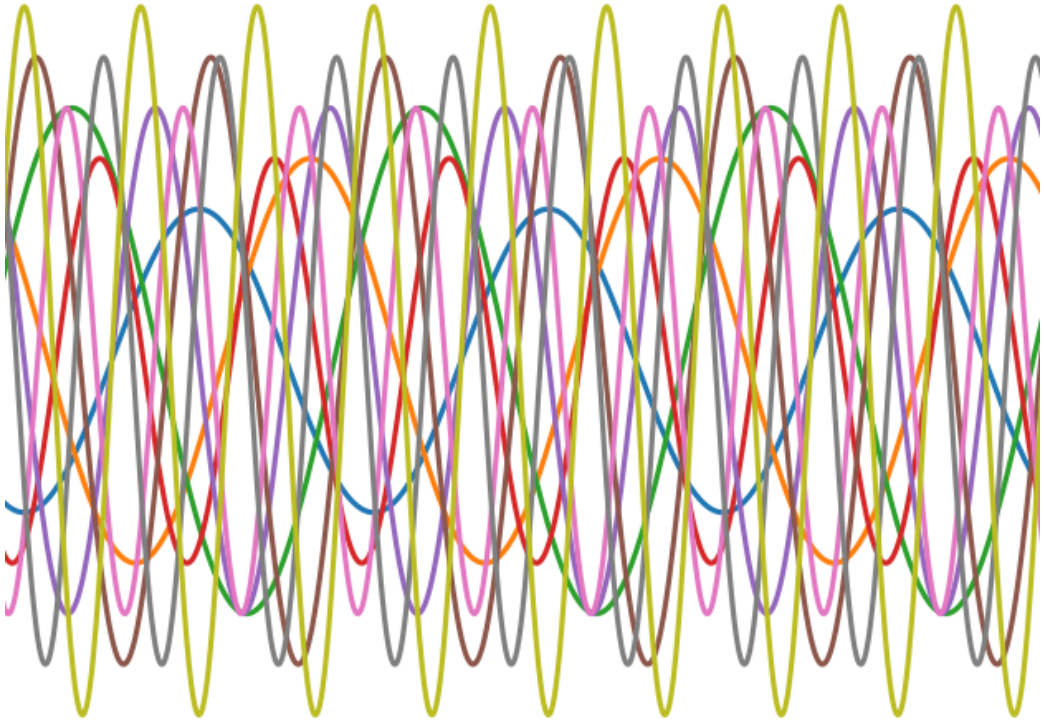
Apparent Event Horizon





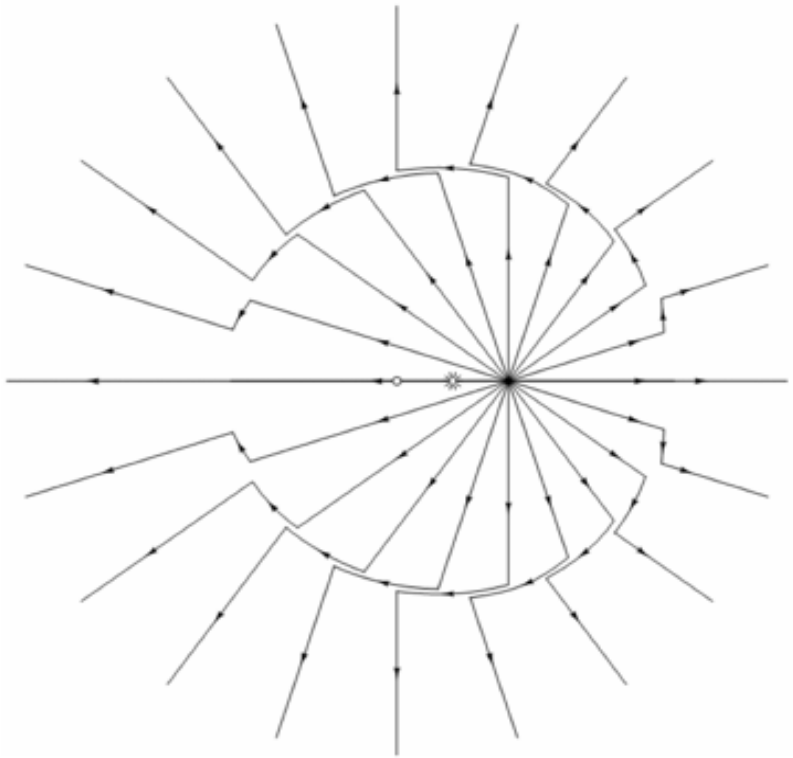
- When a region of spacetime is obscured from the observer, it forms a horizon and the nature of the horizon depends on the nature of the observer and the spacetime.

Accelerating to Ashes



- The apparent horizon that is behind an accelerated observer will radiate particles due to the different modes that doesn't cancel out themselves in the particle fields. The virtual particles in vacuum will become "real"
- As the acceleration increases the amount of unruh radiation also increase although very much low.

Being an Electron



- It is known that electron radiates energy when accelerated through electric field, but what do an observer accelerating with the electron see?
- They would observe the electron radiating the energy absorbed from unruh radiation. !!! Question raised !!!

References

- **The Unruh Effect** - PBS Space Time
- **Horizon Radiation** - PBS Space Time
- **When Quantum Fields Meet Gravity: The Unruh Effect** - Marco Tavora
- **Lessons from the Information Paradox** - Suvrat Raju
- **Simplified derivation of the Hawking-Unruh temperature for an accelerated observer in vacuum** - Paul M. Alsing, Peter W. Milonni