explanation

Discrete Reaction Time and the Delayed-Choice Double Slit Experiment

- 1. Nature's Discrete Reaction Time

Imagine that nature doesn't continuously update its state but instead "collapses" or finalizes an outcome in discrete steps—much like the tick of a clock. In our model, this fundamental update—or reaction time—occurs every 0.6 picoseconds (ps), which corresponds roughly to a frequency of 1.7 terahertz (THz). This 0.6 ps interval represents the minimal time nature needs to fully process any change and determine a final, definite state.

- 2. Meaningful Measurements vs. Transient States

• Full Cycle Measurement:

If your measurement window exactly spans 0.6 ps (or an integer multiple of it), you capture the complete collapse. For example, if you measure from 0.0 ps to 0.6 ps, nature has completed one full update cycle; the outcome is clear—either a distinct particle-like behavior or a definitive interference pattern.

• Partial Cycle Measurement:

If the measurement covers only part of the 0.6 ps interval (for instance, from 0.3 ps to 0.9 ps), you only capture part of the transition between states. Such a measurement records only transient, evolving states. The result is ambiguous because the full "collapse" isn't observed, so the data reflects a spectrum of possibilities that may require ad hoc explanations.

- 3. Connection to the Delayed-Choice Double Slit Experiment

In the delayed-choice double slit experiment, the decision to observe which-path information (particle-like behavior) or an interference pattern (wave-like behavior) can be made after the particle passes the slits. However, for the outcome to be fully meaningful, the decision must occur over a complete 0.6 ps update cycle:

• Definitive Outcome: When you allow the full 0.6 ps to elapse, nature completes the update and the measured state becomes final.

• Ambiguous Outcome: If the measurement is made before the interval is complete, you capture only an incomplete, transitional state.

- 4. Summary

The model posits that nature's intrinsic reaction time of 0.6 ps is essential for obtaining an unambiguous outcome. Only when the measurement window spans the entire 0.6 ps interval can you be sure that the state you observe is final. Measurements over shorter intervals capture only the process of change, leading to ambiguous outcomes that reflect a range of transient states rather than a definitive result. This idea offers a new perspective on experimental outcomes, particularly in experiments like the delayed-choice double slit experiment, where the timing of measurement is crucial.