**Results**

\subsection{Key Observations}

The simulations revealed the following:

\begin{itemize}

\item Quantum coherence persisted over extended periods, even under external decoherence influences.

\item Fibonacci scaling stabilized coherence dynamics, reducing wave packet dispersion.

\item Cylindrical coordinate simulations showed radial and angular coherence variations, with localized boundary-like behaviors resembling event horizons.

\end{itemize}

\subsection{Visualization of Cylindrical Evolution}

\begin{figure}[H]

\centering

\includegraphics[width=0.8\textwidth]{path\_to\_frame\_from\_animation.png}

\caption{Snapshot from Cylindrical Evolution Animation. This frame captures the temporal evolution of quantum coherence in a cylindrical coordinate system, highlighting boundary-like behaviors.}

\label{fig:cylindrical\_evolution}

\end{figure}

The animation cylindrical\_evolution.mp4 illustrates dynamic quantum state evolution in cylindrical coordinates. Key observations include:

\begin{itemize}

\item Coherence patterns that vary radially and angularly, revealing insights not captured by Cartesian simulations.

\item Emergent boundary-like features aligning with the hypothesis of event horizon analogies in microtubules.

\end{itemize}

\subsection{Impact of Fibonacci Scaling}

\begin{figure}[H]

\centering

\includegraphics[width=0.8\textwidth]{time\_evolution\_quantum\_coherence.png}

\caption{Fibonacci Scaling and Quantum Coherence. This figure shows enhanced stabilization and resonance patterns due to Fibonacci scaling.}

\label{fig:fibonacci\_scaling}

\end{figure}

Fibonacci scaling introduced a stabilizing effect, as shown in Figure~\ref{fig:fibonacci\_scaling}, supporting the hypothesis that universal mathematical patterns influence biological quantum systems.

\subsection{Quantitative Results and Event Horizon Analogies}

Cylindrical simulations revealed boundary-like behaviors, with the scaled event horizon radius visualized in cytokine-mediated simulations.

\begin{figure}[H]

\centering

\includegraphics[width=0.8\textwidth]{Wavefunction\_cytokine\_comsic\_scaledEVH.png}

\caption{Wavefunction Evolution with Cytokine and Cosmic Scaling. The plot overlays the quantum wavefunction with a scaled event horizon radius, visualizing boundary dynamics.}

\label{fig:cytokine\_horizon}

\end{figure}

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