Highlights

1. This paper presents a novel derivation of the Casimir effect formula for the average vacuum energy density between two perfectly conducting plates.

2. The derivation achieves the same result as the standard approach using zeta-regularization, but without relying on that specific mathematical technique.

3. The paper explores the relationship between the expected vacuum energy and the change in length and position associated with each energy state.

4. It calculates the area element connected to each energy state and relates it to the uncertainty principle.

5. Overall, this work highlights an alternative approach to deriving the Casimir effect and avoids the use of zeta-regularization.