The Double-Slit Experiment in Event-Density (ED) Terms

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This note explains the double-slit experiment using the Event-Density framework. It's meant as a clear, architectural summary for GitHub — not a formal paper.

1. What "goes through both slits" in ED?

In ED, **nothing physical** ever goes through both slits.
What propagates is:

- a **low-event-density participation field**,
- which gives the system the **capacity** to explore multiple causal channels,
- without splitting, branching, or duplicating anything.

Key idea:
A low-ED system has enough participation bandwidth to occupy multiple channels simultaneously.

This is the ED analogue of "superposition," minus the ontological weirdness.

2. Why does interference appear?

Because the participation field remains **coherent** across the available channels.

A low-ED system:

- maintains global coordination across channels,
- so the channels are **not independent**,
- and constructive/destructive participation emerges naturally.

Interference = the participation field's structure at the detection plane.

No waves.
No particles splitting.
No many-worlds.

Just one system exploring multiple channels coherently.

3. What collapses the pattern?

Collapse occurs when the system's event-density **crosses the threshold**.

A high-ED system:

- cannot maintain multi-channel participation,
- and is forced into **single-channel commitment**.

This is the ED quantum-classical transition:
binary, structural, and physical — not epistemic.

4. What counts as "which-path information"?

In ED, "which-path information" is not about knowledge.

It's about **event-density injection**.

Any interaction that:

- raises the system's ED above the threshold, or
- couples it to a high-ED environment,

forces single-channel participation.

Interference disappears when the system can no longer support multi-channel participation.

5. Why does a single particle build up an interference pattern?

Each low-ED particle:

- explores multiple channels,
- with a coherent participation field,
- and collapses to one channel at detection.

The pattern is the **statistical imprint** of the participation distribution.

Each detection = one commitment.
Many detections = the pattern.

6. What about delayed-choice experiments?

ED handles this without paradox.

- The participation field stays multi-channel until the ED threshold is crossed.
- The timing of the threshold-crossing interaction determines whether interference survives.

No retrocausality.
No time tricks.

Just structural conditions on participation.

7.. Channels vs. Pattern

A common misunderstanding is to equate channels with the bright/dark stripes.

ED makes the distinction clean:
Channels = possible participation paths

These include:

- slit A
- slit B
- micro-geometric sub-paths
- downstream propagation channels

Channels exist **before** the pattern.

Pattern = participation distribution at the detector

- Bright regions → high participation density
- Dark regions → destructive participation (near zero)

So the correct mapping is:
Channels → participation distribution → pattern
not the other way around.

Bright fringes = high-strength channels

A bright fringe corresponds to:

- constructive participation,
- reinforcement of the participation field,
- higher probability of commitment.

Dark fringes correspond to channels where participation cancels.

8. The ED Advantage

This framing avoids:

- wave-particle duality
- particles "being in two places"
- epistemic collapse
- many-worlds branching
- retrocausal paradoxes

Instead, ED gives:

- low-ED systems with multi-channel participation
- coherent participation fields
- constructive/destructive participation
- a physical threshold for collapse
- single-channel commitment
- one classical world