

## Eight Observations That Would Retire This Reading, Each With the Threshold at Which It Counts

**What would end it.** Eight observations, each with the deviation threshold at which it would count and the timeline on which it can be tested. Any one of them, experimentally established, retires the quantum-mechanical reading of the framework. A framework that derives quantum mechanics from a deeper geometry is in permanent danger of being unfalsifiable, because quantum mechanics is correct and any reading that reproduces it inherits its successes for free; reproducing what is already known is not evidence. These eight are the part that can be wrong, and they are written so that no interpretive question has to be settled before one of them can fire. In full: Table 17, p. 259.

| Label  | Observable                  | Deviation threshold                                                                               | Timeline for test                                                                 |
|--------|-----------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| F-QM-1 | Born rule precision         | Systematic dev. at $10^{-15}$ relative level                                                      | Penning-trap $a_e$ at $10^{-14}$ (2028–2030)                                      |
| F-QM-2 | Compact-dim direct evidence | Failure to detect $S_\theta^1$ at $R_\theta \sim 5 \times 10^{-20}$ m (or finding it non-compact) | LHC high-lumi, tabletop Cavendish (2030s)                                         |
| F-QM-3 | Super-Tsirelson CHSH        | $S_{\text{CHSH}} > 2\sqrt{2} + 3\sigma$ in any loophole-free experiment                           | Ongoing                                                                           |
| F-QM-4 | Superluminal signaling      | Any detection of entanglement-mediated classical signaling                                        | Longstanding null                                                                 |
| F-QM-5 | MWI-specific branches       | Direct detection of parallel branches (anomalous revival interference)                            | Not currently accessible                                                          |
| F-QM-6 | Non-GKSL open evolution     | Markovian semigroup that is CPTP but not Lindblad-form                                            | Mathematical impossibility, but fit failures could indicate non-Markovian effects |
| F-QM-7 | Non-Gleason probability     | Additive probability measure $\neq \text{Tr}(\rho\Pi)$ on $\dim \geq 3$                           | Mathematical impossibility                                                        |
| F-QM-8 | Macroscopic coherence       | $10^{20}$ -atom object in coherent superposition for $t \gg \tau_D$                               | Next-generation matter-wave interferometry                                        |