

Recovering the quantum formalism from physically realist axioms

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We present a heuristic derivation of Born's rule and unitary transforms in Quantum Mechanics, from a simple set of axioms built upon a physical phenomenology of quantization [1, 2]. This approach naturally leads to the usual quantum formalism, within a new realistic conceptual framework that is discussed in details. Physically, the structure of Quantum Mechanics appears as a result of the interplay between the quantized number of “modalities” accessible to a quantum system, and the continuum of “contexts” that are required to define these modalities. Mathematically, the Hilbert space structure appears as a consequence of a specific “extra-contextuality” of modalities, closely related to the hypothesis of Gleason's theorem, and consistent with its conclusions.

- [1] A. Auffeves and P. Grangier, *Found. Phys.* 46, 121 (2016); eprint arXiv:1409.2120 [quant-ph] (2014).
- [2] A. Auffeves and P. Grangier, *Sci. Rep.* 7, 43365 (2017); eprint arXiv:1610.06164 [quant-ph] (2016).