

## Quantum Physics

# Quantum complementarity and logical indeterminacy

Caslav Brukner

*(Submitted on 21 Jan 2009 (v1), last revised 8 Jun 2009 (this version, v2))*

Whenever a mathematical proposition to be proved requires more information than it is contained in an axiomatic system, it can neither be proved nor disproved, i.e. it is undecidable, or logically undetermined, within this axiomatic system. I will show that certain mathematical propositions on a d-valent function of a binary argument can be encoded in d-dimensional quantum states of mutually unbiased basis (MUB) sets, and truth values of the propositions can be tested in MUB measurements. I will then show that a proposition is undecidable within the system of axioms encoded in the state, if and only if the measurement associated with the proposition gives completely random outcomes.

Comments: 4 pages, 1 figure, printed version

Subjects: **Quantum Physics (quant-ph)**

Journal reference: Nat. Comp. 8, 1567 (2009).

DOI: [10.1007/s11047-009-9118-z](https://doi.org/10.1007/s11047-009-9118-z)Cite as: [arXiv:0901.3327v2](https://arxiv.org/abs/0901.3327v2) [quant-ph]

## Submission history

From: Caslav Brukner [[view email](#)]**[v1]** Wed, 21 Jan 2009 18:03:08 GMT (57kb)**[v2]** Mon, 8 Jun 2009 10:30:58 GMT (57kb)*[Which authors of this paper are endorsers?](#)*Link back to: [arXiv](#), [form interface](#), [contact](#).

## Download:

- [PDF](#)
- [PostScript](#)
- [Other formats](#)

Current browse context:

**quant-ph**[< prev](#) | [next >](#)[new](#) | [recent](#) | [0901](#)

## References & Citations

- [SLAC-SPIRES HEP](#)  
([refers to](#) | [cited by](#))
- [CiteBase](#)

## Bookmark<sup>(what is this?)</sup>

 [CiteULike logo](#) [Connotea logo](#) [BibSonomy logo](#) [Mendeley logo](#) [Facebook logo](#) [del.icio.us logo](#) [Digg logo](#) [Reddit logo](#)