Term paper on

"No-Go-Theorems in Quantum Theory"

Winter term 2022/23

(Thomas Filk, Andreas Woitzik)

Since the beginning of quantum theory the indeterminism of this theory has been a fundamental issue: Is this indeterminism intrinsic (ontic) or just a lack of knowledge (epistemic)? Can quantum states at least in principle be refined in such a way that the measured values of observables are dispersion free? Do hidden variables exist, which determine the measured values of observables?

This term paper seminar will investigate the main arguments, which have been put forward that such an extension of quantum theory is not possible. Because extensions with hidden variables exist (e.g. Bohmian mechanics), the main focus of these "no-go"-theorems is on the exact conditions under which such extensions are not possible. The following is a list of subjects (those with an asterix * have priority; the other subjects can be replaced, if participants have suitable suggestions).

The term paper presentations will take place Tuesdays, 2 pm, in seminar room I. There will be a general introductory session on Wednesday, October 19th, at 16:30 in HS I. Up to now the references and literature are only by keywords; a detailed list of the relevant literature will follow.

The first four subjects (von Neumann, No-Go in the beginning, EPR, and Gleason) can be "booked" by email (if you are interested, just send me an email). All other subjects will be assigned in the introductory session on October 19th.

"John von Neumann": *
„No-Go theorems in the beginning of quantum mechanics"
"Einstein-Podolsky-Rosen": *
„Gleason's Theorem": *
"Bell inequalities": *
„Kochen-Specker Theorem": *
„CHSH inequality and Alain Aspect": *
„Greenberger-Horne-Zeilinger" *
„Hardy's Paradox":
„Jauch-Piron Theorem":
„The Peres-Mermin magic square"
„PBR (Pusey – Barrett – Rudolph)"
"Leggett-Garg inequalities"
„Birkhoff-von Neumann theorem"
"Quantum Logic and the no-go theorem of Giuntini"