Is quantum theory exact? The endeavor for the theory beyond standard quantum mechanics

Report of Contributions

Contribution ID: **0** Type: **not specified**

Registration

Monday, 28 April 2014 09:00 (30 minutes)

Contribution ID: **1** Type: **not specified**

Welcome (Direttore Centro Fermi, Direttore LNF, C. Curceanu. A. Bassi)

Monday, 28 April 2014 09:30 (30 minutes)

Presenters: Dr RIGHINI, Giancarlo (Museo Storico della Fisica e Centro Studi e Ricerche Enrico Fermi); DOSSELLI, Umberto (PD)

Contribution ID: **2** Type: **not specified**

What one should know and remember about Quantum Mechanics

Monday, 28 April 2014 10:00 (45 minutes)

Nature is not strange or mysterious or non understandable. Our modern theories are. Quantum Mechanics is often presented as such and that need not be. The talk addresses young researchers who have not been yet disillusioned that a reasonable physics description of nature is possible.

Presenter: Prof. DUERR, Detlef (Mathematisches Institut LMU)

Contribution ID: **3** Type: **not specified**

Why is not so easy to change Quantum Mechanics and one of the only possible changes is GRW

Monday, 28 April 2014 11:15 (45 minutes)

ABSTRACT
The Quantum Theory (QT) of abstract systems (qubits, fields, ?)has been recently derived from six axioms of pure information-theoretic nature. All these axioms have a strong epistemological connotation, and cannot be easily modified without reducing the practical experimental feasibility and epistemological power of the whole physics. On the other hand, as regards the ?Mechanics? of the theory, a possible way of deriving it is getting Quantum Field Theory (QFT) without assuming Special relativity as emergent from countable quantum system in interaction, under the requirements of homogeneity and isotropy of interactions, thus resorting to a Quantum Cellular Automata as a discrete version of QFT. Lorentz Covariance and QFT emerge in the relativistic regime, corresponding to the observed domain of wave vectors much smaller than the Planck?s one.

What about now GRW? On one side, one can see that it really doesn?t violate the principles of Quantum Theory of abstract systems. On the other hand, one may consider applying it to the QCA version of QFT at the Planck scale. The idea is to re-obtain the usual GRW as emergent at the non-relativistic limit. If this is possible, the bonus is to have as a byproduct hopefully a GRW for QFT and to conquer Lorentz-covariance in the relativistic domain.

In the first part of the talk, I will briefly illustrate the basic framework of an operational probabilistic theory (OPT) along with the six info-theoretical axioms for QT: 1) causality, 2) local discriminability, 3) perfect discriminability, 4) ideal compressibility, 5) purity of composition, 6) purification. All six principles can be motivated epistemologically, with the OPT as a general scientific approach, being its framework an extension of probability theory, which in turn is an extension of logic. The OPT adds the ?connectivity" to the probabilistic description, corresponding to linking events in input-output relations, in the building-up of a ?process? analysis.

In the second part of the talk I will briefly summarize the main results of the QCA framework for QFT, with special focus on the derivation of Dirac and Maxwell free QFT, the Double Special Relativity of Camelia-Smolin-Maguejo covariance in the ultra relativistic regime, and the recovery of Lorentz in the relativistic one, along with other interesting features, such as the bosonic nature of radiation as emergent from a fermionic one at the Planck scale.

I will end stimulating a brainstorm about implementing GRW in the above framework, and recovering the usual GRW as emergent.

Giacomo Mauro D'Ariano Professor of Theoretical Physics Quantum Foundations and Quantum Information

Presenter: D'ARIANO, Giacomo (PV)

Contribution ID: **4** Type: **not specified**

Collapse models: introduction and overview

Monday, 28 April 2014 12:00 (45 minutes)

Abstract: We will introduce models of spontaneous wave function collapse (collapse models) as an alternative to standard quantum theory. The Schroedinger equation is modified by adding nonlinear and stochastic terms, which induce the collapse of the wave function. We will review the general properties of such models, in the light of the most recent results. We will present an overview of where deviations from standard quantum theory - as predicted by these models - are more likely to be observed, highlighting where experimental research is more active.

Presenter: BASSI, Angelo (TS)

Contribution ID: **5** Type: **not specified**

Collective motion and chain representation of non Markovian dynamics

Monday, 28 April 2014 14:15 (30 minutes)

Abstract: Open quantum systems are often described by a relevant system linearly coupled to an environment of independent harmonic oscillators. We show that, considering the collective motion of these oscillators, one can give an equivalent description where the environment is modeled by a chain of "collective modes" with first neighbors interaction. Such chain representation allows for a deeper understanding on the short time behavior of non Markovian quantum dynamics.

Presenter: Dr FERIALDI, Luca (LMU München)

Contribution ID: **6** Type: **not specified**

A time-symmetric relativistic model violating Bell's inequality

Monday, 28 April 2014 14:45 (30 minutes)

Abstract

Bell?s theorem manifests a tension between quantum non-locality and relativity by asserting that any realistic account of EPR-type correlations must admit non-local influences between distant events. We want to explore the possibility to mitigate this tension by admitting microscopic interactions that are both advanced and retarded, thus drawing exclusively on the resources of relativistic space-time. We present a simple toy-model demonstrating that such time-symmetric interactions can account for statistical correlations violating the Bell inequalities while avoiding "conspiracies" as well as the commitment to instantaneous (direct space-like) influences. We discuss how the model fits into the framework of Bell?s theorem.

Presenter: Mr LAZAROVICI, Dustin (Ludwig-Maximilians-University Munich)

Contribution ID: **7** Type: **not specified**

Matter-wave interferomemetry with a free-falling nanoparticle

Monday, 28 April 2014 15:15 (30 minutes)

Presenter: Dr BATEMAN, James (University of Southampton)

Contribution ID: **8** Type: **not specified**

A Probe into the Schrodinger-Newton equation

Monday, 28 April 2014 16:10 (30 minutes)

Unification of gravity and quantum theory is still an unattained problem of modern physics. The traditional approach of quantizing the gravitational field
has not yet provided us with a satisfying theory of quantum gravity. A different resolution is to modify quantum dynamics by adding nonlinear terms with gravitational origins. This line of research is highly motivated by semi-classical models of gravity, which bring about Schrodinger-Newton (SN) equation: a deterministic nonlinear Schrodinger equation with Newtonian self-gravity as nonlinearity. We will quantify the regime where SN equation can be distinguished from Schrodinger equation. We also argue that SN equation does not describe the collapse of the wave function, thus one still needs the collapse postulate. Then, we explicitly show that SN equation gives rise to superluminal effects, as expected from any deterministic nonlinear Schrodinger equation. We finally discuss that combining Newtonian nonlinearity with stochastic terms to avoid superluminality and to describe the collapse, as in Diosi-Penrose model, is still problematic.

Presenter: Dr BAHRAMI, Mohammad (research fellow)

Contribution ID: **9** Type: **not specified**

New upper limit for collapse models reduction rate parameter

Monday, 28 April 2014 16:40 (30 minutes)

Our work is concerned with the investigation of the spontaneous emission, form orbital electrons and nuclear protons in Germanium atoms. The spontaneous emission of free electrons was first predicted and quantified by Q. Fu, as a consequence of electrons interaction with the stochastic field introduced in the non-relativistic Continuous Spontaneous Localization models.
An innovative Bayesian analysis was performed, consisting in the fit of the X rays emission spectrum from Germanium atoms, published by the low activity IGEX experiment. A new upper limit was obtained for the mean collapse frequency of the Dynamical Reduction Models: $\lambda \min 2.510 - 18 s - 1$ improving the preceding limit of a factor 20.
The expected emission rate formula was generalized in order to include the contribution of nuclear protons. According to the improved calculation an upper limit: $\lambda \min 8.110 - 20 s - 1$ was obtained for the collapse frequency parameter.

Presenter: Mr PISCICCHIA, Kristian (LNF)

Contribution ID: **10** Type: **not specified**

Local quanta, unitarity inequivalence and vacuum entanglement

Monday, 28 April 2014 17:10 (30 minutes)

LEON, Juan (Instituto de Fisica Fundamental (CSIC))

Creation and annihilation operators adding or subtracting well-defined amounts of energy and momentum to the field canonically describe particles, the elementary excitations of the fields, in QFT. These operators create quanta completely delocalized in space, at odds with the idea of particles as minute subdivisions of matter of finite mass and tiny size. In this talk, I will show how QFT owns the tools to describe localized quanta using the appropriate operators. Fock Space operators in unitarily inequivalent representations describe both subatomic units, those with sharply defined momentum and energy on the one side, and those well localized in space-time on the other. This gives rise to explanations for a multitude of different properties, from the absence of local number operators in the standard formulation to the absence of local projectors for the vacuum state as the raison d'etre for vacuum entanglement.

Presenter: Dr LEON, Juan (Instituto de Física Fundamental (CSIC))

Contribution ID: **11** Type: **not specified**

Test of the superposition principle: matter-waves and beyond

Tuesday, 29 April 2014 09:30 (45 minutes)

Hendrik Ulbricht Physics and Astronomy, University of Southampton, SO17 1BJ, Southampton, UK e-mail: hendrik.ulbricht@soton.ac.ukmailto:hendrik.ulbricht@soton.ac.uk New technological developments allow to explore the quantum properties of very complex systems, bringing the question of whether also macroscopic systems share such features, within experimental reach. The interest in this question is increased by the fact that, on the theory side, many suggest that the quantum superposition principle is not exact, departures from it being the larger, the more macroscopic the system [1]. Testing the superposition principle intrinsically also means to test suggested extensions of quantum theory, so-called collapse models. We will report on three new proposals to experimentally test the superposition principle with nanoparticle interferometry [2], optomechanical devices [3] and by spectroscopic experiments in the frequency domain [4, 5]. We will also report on the status of optical levitation and cooling experiments with nanoparticles in our labs, towards an Earth bound matter-wave interferometer to test the superposition principle for a particle mass of one million amu (atomic mass unit). References [1] Bassi, A., K. Lochan, S. Satin, T.P. Singh, and H. Ulbricht, Models of Wave-function Collapse, Underlying Theories, and Experimental Tests, Rev. Mod. Phys. 85, 471 - 527 (2013). [2] Bateman, J., S. Nimmrichter, K. Hornberger, and H. Ulbricht, Near-field interferometry of a free-falling nanoparticle from a point-like source, arXiv:1312.0500 (2013). [3] Xuereb, A., H. Ulbricht, and M. Paternostro, Optomechanical interface for matter-wave interferometry, Sci. Rep. 3, 3378 (2013). [4] Bahrami, M., A. Bassi, and H. Ulbricht, Testing the quantum superposition principle in the frequency domain, Phys. Rev. A 89, 032127 (2014), [5] Bahrami, M., M. Paternostro, A. Bassi, and H. Ulbricht Non-interferometric Test of Collapse Models in Optomechanical Systems, arXiv:1402.5421 (2014).

Presenter: Dr ULBRICHT, Hendrik (University of Southampton)

Contribution ID: **12** Type: **not specified**

The meaning of the wave function

Tuesday, 29 April 2014 10:15 (45 minutes)

The most puzzling issue in the foundations of quantum mechanics is perhaps that of the status of the wave function of a system in a quantum universe. Is the wave function objective or subjective? Does it represent the physical state of the system or merely our information about the system? And if the former, does it provide a complete description of the system or only a partial description? I shall address these questions mainly from a Bohmian perspective, and shall argue that part of the difficulty in ascertaining the status of the wave function in quantum mechanics arises from the fact that there are two different sorts of wave functions involved.

Presenter: Dr ZANGHI, Pierantonio (Dipartimento di Fisica, Università di Genova INFN- Sezione di Genova)

Contribution ID: **13** Type: **not specified**

Time emerging from quantum entanglement: an experimental illustration

Tuesday, 29 April 2014 11:30 (45 minutes)

Time as an emergent property deriving from quantum correlations remains an open and controversial question among physicists. In fact, the ?problem of time? in essence stems from the fact that a canonical quantization of general
relativity yields the Wheeler-DeWitt equation predicting a static state of the universe, contrary to obvious everyday evidence. Page and Wootters speculated that by means of quantum entanglement, a static system may describe an
evolving ?universe? from the point of view of the internal observers. In particular, the entanglement between a ?clock? system and the rest of the universe can yield a stationary state for an (hypothetical) external observer that is able to test
the entanglement vs. abstract coordinate time. The same state will be, instead, evolving for internal observers that test the correlations between the clock and the rest. Thus, time would be an emergent property of subsystems of the universe deriving from their entangled nature. We present an experiment that illustrates Page and Wootters' mechanism of "static" time, and Gambini et al. subsequent refinements, describing how this idea can be naturally embedded into (small) subsystems of the universe, where Page and Wootters? mechanism can be easily studied.
We show how a static, entangled state of two photons can be seen as evolving by an observer that uses one of the two photons as a clock to gauge the time-evolution of the other photon. However, an external observer can show that
the global entangled state does not evolve.

Presenter: Dr GRAMEGNA, marco (INRiM)

Contribution ID: **14** Type: **not specified**

G-related spontaneous collapse in bulk matter

Tuesday, 29 April 2014 12:15 (45 minutes)

Spontaneous collapses are thought to be masked by environmental decoherence. We refine this view and discuss the magnitude of spontaneous collapses under natural circumstances in elastic/hydrodynamic degrees of freedom of bulk matter.

Presenter: Prof. DIOSI, Lajos (Wigner Research Center for Physics)

Contribution ID: **15** Type: **not specified**

Search for Pauli Exclusion Principle violating electrons at LNGS

Tuesday, 29 April 2014 14:30 (30 minutes)

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H. Shi A, S. Bartalucci B, S. Bertolucci C, C. Berucci A ;B, A.M. Bragadireanu B ;D, M. Cargnelli A, A. Clozza B, C. Curceanu B ;D ;E, L. De Paolis B, S. Di Matteo F, A. d'Uzi B, J.-P, Egger G, C. Guaraldo B, M. Iliescu B ;F, T. Ishiwatari A, J. Marton A, M. Laubenstein H, E. Milotti I, D. Pietreanu B ;D, K. Piscicchia E, T. Ponta D, A. Romero Vidal K, E. Sbardella B, A. Scordo B, D.L. Sirghi B ;D, F. Sirghi B ;D, L. Sperandio B, O. Vazquez Doce J, E. Widmann A, J. Zmeskal A

Formulated by Wolfgang Pauli in 1925 [1], the Pauli Exclusion Principle (PEP) has been the foundation for our understanding of all the elds of physics where many-fermion systems are concerned. Since no simple explanation for the principle exists, it remains to be a postulate open to experimental tests, which are dicult as there is no well-established theory to clearly quantify a possible small amount of violation.
However there have been high precision experiments that search for possible small violation of PEP in the framework of Quantum Mechenics. In the rst of such experiments, Ramberg and Snow [2] supplied electric current to a Cu target, and searched for PEP violating atomic transitions of the \fresh" electrons from the current. The result for the non-exsistence of the anomalous X-rays from such transitions then set the upper limit for the probability that PEP can be violated. Following this method, the VIP (VIolation of Pauli Exclusion Principle) experiment improved the sensitivity due to eective background reduction, by performing the measurement at the Gran Sasso underground laboratory (LNGS), and set an upper limit at the level of 10⊠29 [3,4], for the probability that an external electron captured by a Cu atom can de-excite to the 1s state already occupied by two electrons.
In this talk, topics mentioned above will be discussed in detail. The prepartion for our follow-up experiment planned at Gran Sasso[5], aiming to increase the sensitivity by two orders of magnitude, will also be introduced.

[1] W. Pauli, Z. Phys. 31, 765(1925);
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[5] J. Marton, et al:, J. Phys.: Conf. Ser. 447, (2013)012070

Presenter: SHI, Hexi (L)

Contribution ID: **16** Type: **not specified**

Matter-wave interferometry with Rb atoms

Wednesday, 30 April 2014 12:00 (30 minutes)

Abstract
Matter-wave interferometry is well understood, and there have been several experimental demonstrations | even with particles as large and complex as molecules. While the centre of mass (COM) motion of such particles is controlled very precisely, internal spin properties can aect the motion if both degrees of freedom are coupled. This can be used in a twofold way: it can map the spin properties onto the COM motion to analyse them, or it can be used to manipulate the COM motion. A far future goal of this coupling can be to show quantum entanglement of external with internal degrees of freedom. We will report on our approach to understanding the details of magnetic coupling of the COM motion of particles to their spin. We nd that the properties of Rb atoms make them a very appropriate test species with which to prototype novel interferometric techniques involving magnetic spin-COM coupling, and we propose some examples of such new techniques and explain how we intend to realise them experimentally. We also analyse and simulate the proposed experiments using a recently developed theoretical formalism that provides an extension of the Wigner function description of matter wave propagation to particles whose internal state strongly infuences their interactions with externally applied elds. Extension of these techniques to much larger particles than atoms opens the door to test the foundations of quantum theory.

Presenter: Mr COOPER, Nathan (University of Southampton)

Contribution ID: **17** Type: **not specified**

Quantum interference experiments with complex molecules

Tuesday, 29 April 2014 15:30 (30 minutes)

Sandra Eibenberger, Joseph Cotter, Xiaxi Cheng, Lukas Mairhofer, Markus Arndt
University of Vienna, Faculty of Physics, VCQ, QuNaBioS, Vienna Austria

Molecular matter-wave interferometry has opened the path to delocalization studies with ever more complex particles.
We report on the current mass record in quantum interference investigations [1,2], and discuss the development of high-mass interference experiments.

We study the importance of internal molecular properties on the coherence in a matter-wave interferometer. Tiny external forces can lead to fringe shifts or dephasing of the molecular density pattern.
Properties such as electric polarizabilities and susceptibilities, electric dipole moments as well as internal molecular dynamics become thus accessible in molecule interferometry [3,4]. Recently, we have implemented the measurement of an absolute molecular absorption cross section in our Kapitza-Dirac-Talbot-Lau interferometer [5]. The recoil imparted on a molecule when it absorbs a single photon from a probe laser beam leads to an effective reduction in the quantum fringe visibility. This allows us to extract the cross section with high accuracy and independent of the molecular beam density.

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[2] S. Gerlich, L. Hackerm?ller, K. Hornberger, A. Stibor, H. Ulbricht, M. Gring, F. Goldfarb, T. Savas, M. M?ri, M. Mayor, and M. Arndt, Nature Phys. 3, 711 ? 715 (2007).
[3] M. Berninger, A. Stefanov, S. Deachapunya, and M. Arndt, Phys. Rev. A 76, 013607 (2007).
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[5] S. Eibenberger, X. Cheng, J.P. Cotter, M. Arndt, arXiv:1402.5307 [quant-ph]

Presenter: Ms EIBENBERGER, Sandra (VCQ, University of Vienna)

Contribution ID: **18** Type: **not specified**

Separable Schmidt modes of a non-separable state

Tuesday, 29 April 2014 16:20 (30 minutes)

A. Avella 1 M. Gramegna 1 A. Shurupov 1 G. Brida 1 M. Chekhova 3, 4 and M. Genovese 1

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3) M. V. Lomonosov Moscow State University, 119992 GSP-2, Moscow, Russia

The development of quantum information protocols is one of the most promising applications of the intrinsic properties of quantum mechanics such as quantum superposition and entanglement [1,2].
Two-photon states entangled in continuous variables such as wavevector or frequency represent a powerful resource for quantum information protocols in higher-dimensional Hilbert spaces [3,4,5,6]. At the same time, there is a problem of addressing separately the corresponding Schmidt modes. For wavevector variables, a single Schmidt mode can be filtered out with the help of a single-mode fibre [7], but no similar procedure exists for the frequencies. This filtering, in principle, can be lossless, which is crucial for experiments with twin-beam squeezing [8–14]. Here we propose a method of engineering two-photon spectral amplitude in such a way that it contains several non-overlapping Schmidt modes, each of which can be filtered losslessly. The method is based on using a pump with a comb-like spectrum, which can be obtained, in particular, by passing a laser beam through a Fabry-Perot interferometer. For the two-photon amplitude to consist of non-overlapping Schmidt modes, the crystal dispersion dependence, the length of the crystal and the width of a single Fabry-Perot transmission peak should satisfy a certain condition. We experimentally demonstrate the control of Schmidt modes structure through these parameters.

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3) C. K. Law, I. A. Walmsley, and J. H. Eberly, Phys. Rev. Lett. 84, 5304 (2000).
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Presenter: Dr AVELLA, Alessio (Istituto Nazionale di Ricerca Metrologica)

Contribution ID: **19** Type: **not specified**

A tripartite quantum state violating the hidden influence constraints

Tuesday, 29 April 2014 16:50 (30 minutes)

The talk will explore the possibility to explain quantum correlations via (possibly) unknown causal influences propagating gradually and continuously at a finite speed v > c. This framework goes beyond quantum theory in the sense that it tries to provide an explanation for Bell inequality violating correlations that remains local and continuous in space and time. In previous work it could be shown that the assumption of superluminal yet finite-speed influences carrying information about the measurements performed in combination with shared randomness leads to correlations that can be exploited for superluminal communication. This was achieved studying the set of possible correlations that are allowed within such a model and comparing them to correlations produced by local measurements on a four-party entangled quantum state. This talk will report on a quantum state that allows for the same conclusion involving only three parties.

It is based on work presented in Phys. Rev. A 88, 022123 (2013).

Presenter: BARNEA, Tomer (Université de Genève)

Contribution ID: **20** Type: **not specified**

MAQRO –macrorealism or quantum physics? A case for space

Tuesday, 29 April 2014 17:20 (30 minutes)

MAQRO is a proposed fundamental science mission to test the foundations of quantum physics. Over the last decades, the technology available in space has reached a level that will soon allow performing quantum experiments in space. Although, space experiments are an expensive and time-consuming business, the technological developnent may soon render space interesting as an environment for experimental tests that would not be possible on Earth. In particular, matter-wave experiments with increasingly massive objects ultimately may require free-fall times that are not achievable in Earth-based experiments. This is the case for MAQRO. In MAQRO, quantum superpositions of nanospheres with a mass up to 10e10 atomic mass units are prepared and then verified by observing the resulting interference patterns. A number of theoretical, "macrorealistic" models predict deviations from quantum physics for such massive test objects. MAQRO will allow for decisive tests of several such models.

Presenter: Dr KALTENBAEK, Rainer (University of Vienna, Vienna Center for Quantum Science and Technology, Faculty of Physics)

Contribution ID: **21** Type: **not specified**

Questioning the foundations of quantum mechanics with systems studied in Particle Physics

Wednesday, 30 April 2014 09:30 (45 minutes)

This talk will give an overview over quantum systems at high energies typically produced at accelerator facilities and discuss what can e learned about the very foundations of quantum theory.

Presenter: Dr HIESMAYR, Beatrix (University of Vienna)

Contribution ID: **22** Type: **not specified**

Integrated quantum photonics

Wednesday, 30 April 2014 10:15 (45 minutes)

Presenter: Dr SCIARRINO, FABIO (Dipartimento di fisica)

Contribution ID: **23** Type: **not specified**

Quantisation of Gravity or Gravitisation of Quantum Mechanics? - Meanings of semi-classical gravity, the Schroedinger-Newton equation, and experimental tests

Wednesday, 30 April 2014 11:30 (30 minutes)

That gravity has to be quantised is usually considered an accepted truth among most physicists. However, there is virtually no conclusive evidence for this. The most obvious way to merge Quantum Mechanics with fundamentally classical gravity is provided by semi-classical gravity. For non-relativistic quantum systems this approach yields the Schr?dinger-Newton equation, a non-linear, non-local equation for the dynamics of the wave-function. We will review the arguments for and against this approach, and discuss its consequences and prospects for experimental tests.

Presenter: GROSSARDT, Andre (University of Trieste)

Contribution ID: **24** Type: **not specified**

Quantum non-contextuality as a generalization of quantum theory

Tuesday, 29 April 2014 15:00 (30 minutes)

Abstract: Quantum theory allows sets of probabilities between spacelike separated parties that cannot be recovered from a local (realistic) theory as it is shown by violations of Bell's inequalities. The violation of Bell's inequalities is equivalent with proving that there does not exist a joint probability distribution for all the different (unrealised) alternatives. The non-existence of a joint probability distribution implies that the outcomes are contextual. Inspired by path integral formulations of quantum theory, we define a generalisation of the non-contextuality condition that includes all correlations that quantum theory predicts. The condition is the existence of a joint strongly positive quantum measure. This leads to the Q^{1+AB} condition of the NPA hierarchy. Interestingly, the set of probabilities allowed by this condition are more than those allowed by quantum theory, coincide with the "almost quantum correlations" conjectured as the set of real correlations by Navascues et al (2014) and satisfies all the known information theoretic physical principles that have been proposed (such as Non-trivial communication complexity, Local Orthogonality, etc). Therefore, this extension of quantum theory appears natural both from histories perspective and from quantum information perspective.

- F. Dowker, J. Henson and P. Wallden, New J. Phys. (in press) arxiv:1311.6287.

Presenter: Dr WALLDEN, Petros (Heriot-Watt University)

Contribution ID: **25** Type: **not specified**

Dissipative extension of the Ghirardi-Rimini-Weber collapse model

Wednesday, 30 April 2014 12:30 (30 minutes)

In this talk, I present a possible extension of the GRW collapse model [1,2], which avoids the infinite growth of the energy of the system. New jump operators are introduced, while the other defining features of the model are left unchanged. The jump operators correspond to the Fourier transform of the Lindblad operators of a model for collisional decoherence [3] and they depend on the momentum of the system. The resulting dissipative evolution is described in detail, with emphasis on the exponential relaxation to a finite asymptotic value of the energy, common to other collapse models with dissipation [4]. The trajectories of the model are investigated, as well, verifying the occurrence of position and momentum localization. Finally, the amplification mechanism is discussed and it is shown that the center of mass of a macroscopic rigid body behaves for all the practical purposes according to classical mechanics.

[1] G.C. Ghirardi, A. Rimini, and T. Weber, Phys. Rev. D 34, 470 (1986)

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Presenter: SMIRNE, Andrea (TS)

Contribution ID: **26** Type: **not specified**

Closure, conclusions

Wednesday, 30 April 2014 13:00 (20 minutes)

Contribution ID: **27** Type: **not specified**

Quantum mechanics in the Bohmian view

Presenter: OCHNER, Hannah

Contribution ID: **28** Type: **not specified**

Collapse models parameters: theoretical overview

Presenter: Mr GASBARRI, Giulio (University of Trieste)