



量子信息科技学术研讨会 (2018.9.17-21)

报告

黑洞辐射的暗信息与非热谱

Dark information in Radiation of Black Hole Implied by Non-Thermal Spectrum

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讲者介绍 Biography

孙昌璞，理论物理学家，中国科学院院士，发展中国家科学院院士，中国工程物理研究院研究生院院长，北京计算科学研究中心教授。毕业于东北师范大学本科，于南开大学获博士学位。曾任东北师范大学教授，中科院理论所研究员。获得过国家自然科学基金二等奖和美国 ISI“经典引文奖”等奖励以及全国先进工作者等荣誉称号，多次被评为中科院“优秀导师”，指导的研究生有多人获全国“百篇优秀博士学位论文”、“中国科学院优秀博士论文”和科学院院长特别奖等。他长期从事量子物理、数学物理及量子信息基础理论研究，发表论文 300 余篇。他有不少工作得到国际承认，如 q -变形玻色子工作是国际上本领域开创性工作之一，《科学》评述中国科学发展提及了这个工作。他预言的量子临界系统动力学不稳定效应和人工循环原子结构等得到德国等多个实验证实。他还研究了低维纳米结构中单光子的传输和探测，生命过程中的量子相干效应，如人工光合作用和生物迁徙的量子指南针。最近，他开始探索国家重大需求牵引的基础研究模式创新，并在中国工程物理研究院研究生院的建设中进行实践。

报告摘要 Abstract

The thermal radiation discovered by Hawking implies that the entropy will increase through the Hawking process, which leads to the black hole information paradox. The “lost” information of black hole through the Hawking radiation was recently shown being stored in the correlation among the non-thermally radiated particles. This correlation information, which has not yet been proved locally observable in principle, is named by dark information.

Our finding resolved the paradox: when the constraint of energy conservation is considered, the extremely small black hole radiation spectrum is obviously shown to be not perfectly thermal. This non-thermal radiation spectrum shows stronger correlations — a kind of “dark information”, and thus satisfies the requirement of information conservation. Based on this observation we also studied the influences of dark energy on black hole radiation. We find that the dark energy will effectively lower the Hawking temperature, and thus results in a longer life time for the black hole. It is also discovered that the non-thermal effect of the black hole radiation is enhanced by dark energy so that the dark information of the radiation is increased. Our observation shows that, besides the mechanical effect (e.g., gravitational lensing effect), the dark energy rises the stored dark information, which could be probed by a non-local coincidence measurement.