

**International Centre for Theory of Quantum Technologies**

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Prof. Dr. habil. Paweł Horodecki

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Professor and group leader at ICTQT, University of Gdańsk

Director of National Quantum Information Centre in Gdańsk

Prof. Martin Kubala, PhD  
Dean of the Faculty of Science  
Palacký University  
17. listopadu 12, 779 00  
Olomouc, Czech Republic

**Letter of recommendation for Assoc. Prof. Karel Lemr, PhD**

Dear Professor Kubala,

I am pleased to write this letter of recommendation for Dr. Karel Lemr for his promotion to full professor. Our scientific paths crossed around 2014, when we were working together, on-line, on the project of universal detection of polarization entanglement which has been successfully concluded in the joint paper [K. Bartkiewicz, P. Horodecki, K. Lemr, A. Miranowicz, K. Życzkowski, Phys. Rev. A **91**, 32315 (2015)]. I met the candidate in person later, in September 2022 during the 22<sup>nd</sup> Polish-Slovak-Czech Optical Conference in Wojanów (Poland). I was impressed by the talk of the candidate and shared *ad hoc* some ideas with him during the discussion after the talk. He immediately recognized the essence of the addressed problem. We started collaboration, during which I participated in group meetings, first of them just at the conference place, later on-line. They were all coordinated by Karel Lemr and I consider him one of the best group leaders I have ever seen in action. As a result of the collaboration we have published a paper together [V. Trávníček, J. Roik, K. Bartkiewicz, A. Černocho, P. Horodecki, K. Lemr, Phys. Rev. Res. **6**, 33056 (2024)]. This collaboration enriched my perspective on the entanglement detection and I believe that the final result opens new path in methodology of entanglement tests.

The candidate has a recognised position in the scientific community as an expert in the field of theoretical and experimental quantum information including especially quantum optical methods. He published already 63 papers in peer-reviewed journals, including such as Phys. Rev. Letters, npj Quantum Information or Phys Rev. X Quantum. His experiments on eavesdropping via optical cloning (Phys. Rev. Lett. (2013)) and, especially, his pioneering experimental demonstration of quantum money (npj quantum information (2017)) have also found their echo in highly recognised popular science journals like New Scientist or Science News. During his career the candidate has contributed to impressive number of fields of quantum information including optical quantum gates, entanglement detection, quantum cloning and its applications, non-demolition quantum measurement, quantum routers, temporal steering, quantum tomography, quantum weak measurement, quantum machine learning or quantum channels. Let me mention a recent paper (Phys. Rev. Lett (2019)) on controlled quantum teleportation which may be considered as a foundational quantum internet primitive or an elegant resource-theoretic approach (PRX Quantum (2022)) to quantify quantumness of quantum channels by the new concept of breaking of quantum steerability. Among the recent results of the candidate I found interesting the quantification of the non-classicality of a single qubit states (in some analogy to the case of continuous variables) published Optics Express (2024).

Karel Lemr collaborated with several top scientist of quantum optics and quantum information fields including Prof. Jens Eisert (Germany), Prof. Thomas Jannewein (Canada), Prof. Adam Miranowicz (Poland) and Prof. Franco Nori (Japan). He was the principal investigator of several scientific grants and he was also involved in academic administrative duties, serving as a member of the senate and, later, as its chair at the Faculty of Science, Palacký University. One of important measures of the scientific maturity is a guidance of PhD students. Remarkably, already 4 researchers have received their PhD degrees under the supervision of the candidate. The promotions of BSc (6) and MSc (4) successfully complete the dossier of the candidate as a scientific mentor. Remarkably, the candidate has also quite extensive experience in teaching physics at high school as well as a rich record of activities popularising physics among nonspecialists.

Summarising, I have no doubts that the candidate, Assoc. Prof. Karel Lemr, a recognised expert in his field of research, has achievements in science, teaching and leadership that made him a fully mature scientist ready for promotion to full professor at the current stage of his career.

Sincerely yours,



Paweł Horodecki