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To
Prof. RNDr. Ivo Frébort, CSc., Ph.D.
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Erlangen, 15/03/2016

Letter of support for Dr. Jaroslav Řeháček

Dear Professor Frébort,

it is with great pleasure that I write to you in support of Dr. Jaroslav Řeháček's promotion to full professor. I have known and interacted with Dr. Řeháček for many years and we have jointly published six articles in scientific journals in the last four years. It goes without saying that I am fond of the fundamental topics, such as the completeness of quantum measurements, extremal states as well as optical beams and their radial quantum number. More importantly, I got to know Dr. Řeháček well enough that I can judge his scientific performance first hand.

With many of his publications Dr. Řeháček influenced the field of quantum optics and quantum information processing in a decisive way, too numerous that I could do full justice to all the achievements. In the following I will instead focus on a few highlights and I deliberately to from that part of Dr. Řeháček's scientific work in which we did not collaborate.

His analysis of the Zeno-effect and the anti-Zeno-effect in spontaneous parametric down conversion is a remarkable piece of work demonstrating much insight. Soon after the fibre loop detector was proposed as a photon number resolving detector, Dr. Řeháček showed that the non-attenuated distribution measured by the imperfect detector can be reconstructed, which was a surprising achievement. This was then recognized by leading experiments in the field asking him for help and collaboration in this matter. In quantum tomography one can ask the question whether there is a minimum number of measurements, which suffices for reconstruction. Dr. Řeháček was the first to answer this question for a qubit, triggering others to ask the same question for higher dimensional systems. Next, he showed the advantage of using the concept of the Fisher information in quantum metrology if highly non-classical states are involved. In practice, quantum tomography is always based on a finite number of measurements. Deriving a proper estimation error budget is cumbersome. A way towards solving this problem is using the maximum likelihood technique, which was developed at Olomouc. Dr.

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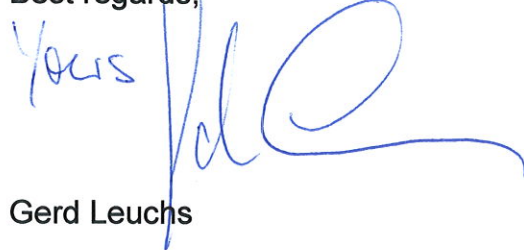91058 Erlangen
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Řeháček's work had important impact on this development. More recently in an ingenious publication he pointed out the quantum aspects of a Shack-Hartmann sensor for determining optical wave fronts, the essential point being that this sensor performs joint measurements on conjugate variables. And last year, Dr. Řeháček addressed the notion of non-separable mode functions and the possibility of demonstrating the violation of a Bell-like inequality in this context, the novel aspect being the quantification by employing the Wigner function.

Dr. Řeháček's oeuvre is impressive. The list of names of the scientists who reached out to him seeking his collaboration reads like a who-is-who in his area of quantum optics. This underlines how highly his great skills and his physical insight and his creativity are valued by his peers. His success is certainly also a result of his high motivation enabling him to work on problems with the necessary perseverance. In short, the combination of great skills and hard work is key to prosperity.

Based on all his scientific achievements, Dr. Řeháček certainly deserves promotion to the rank of full professor. Your Department can be proud having such an excellent scientist on the faculty. I most strongly recommend his promotion.

Best regards,

Gerd Leuchs