CONSIGLIO NAZIONALE DELLE RICERCHE
ISTITUTO NAZIONALE DI OTTICA

Florence, December 5th, 2017

To whom it may concern,

It is a pleasure to submit this opponent evaluation for the habilitation thesis of Dr. **Petr Marek**, entitled "*Quantum nonlinearity constructed from individual photons*".

I have known Dr. Marek and his work for several years, and I have always appreciated his talent as a theorist in Quantum Optics. His scientific works are of high relevance, both for fundamental science and for the possible use of quantum resources in future technologies. Indeed, they often provided a precious source of inspiration for my own experimental activity in the field. Therefore, although we never directly collaborated, I am rather familiar with most of the recent scientific activities of Dr. Marek and greatly appreciate them.

The habilitation thesis specifically deals with the realization of optical nonlinearities at the single-photon level by means of measurement-induced operations. After a short general introduction, the main part of the thesis is split into three major topics/chapters. The first concerns noiseless amplification; then, the focus moves towards the implementation of general probabilistic gates for arbitrary state manipulation; finally, the scheme for deterministic gates using nonlinear resource states is discussed.

The topics described in the thesis are definitely very relevant for the Quantum Optics community, and I expect the schemes devised by Dr. Marek to become a solid reference point for further advances in the field.

In all the chapters of the thesis, a main theoretical part is directly accompanied by the description of experimental realizations of the proposed schemes, or of some test examples, that illustrate the concepts and demonstrate their feasibility. The experiments involved the collaboration with some of the most successful international groups dealing with continuous-variable quantum optics. This, together with the several interesting publications of good level and impact resulting from this thesis work, further testifies the quality of Dr. Marek's activity at the forefront of international research.

In conclusion, I think that Dr. Petr Marek is a very good scientist and I have no doubt in recommending him for the habilitation to the academic title of Associated Professor.

Of course, you can contact me for any other information, if required.

Sincerely yours,

Marco Bellini
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