

## **Reviewer report of the doctoral thesis**

**Author of the doctoral thesis:** Petra Vahalová

**Title of the thesis:** Ultra-weak photon emission from biological samples

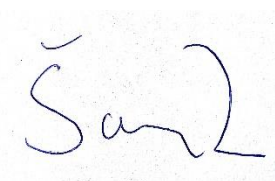
**Reviewer:** Radek Šachl

The present dissertation attempts to introduce the readers to the largely unexplored field of ultra-weak photon emission of biological samples. A concise introduction to the subject is followed by a cleverly placed review published in *Progress in Biophysics and Molecular Biology*, which thoroughly summarizes the State-of-the-Art of the field. PV is the first author of this publication. The actual results of the dissertation are summarized in the following two publications. In the first of these, published in *Scientific Reports*, PV, the first author on this publication, investigated the effect of external conditions such as pH, temperature and anti-oxidant concentration on yeast bioluminescence induced by the presence of reactive oxidizing species (ROS). In this publication, the authors were able to show that the intensity of bioluminescence is directly proportional to the concentration of ROS. The intensity of luminescence can thus be used as a quantitative measure on the amount of ROS in cells. In the second first-authored publication of PV published in *Sensors and Actuators: B chemical*, this work was then extended to study the effect of electric field on the oxidation of the model protein bovine serum albumin (BSA) in phosphate buffer. In this pioneering work, the authors were able to show that electrical pulses can generate reactive radicals that in turn oxidize BSA. The authors realized that the result of this oxidation depends on the type of electrode chosen. Apparently, this publication opens the doors to many interesting follow-up studies. The whole dissertation is concluded with a short summary of the results and an appended chapter published by Springer on methods for enhancing biological luminescence.

In my opinion, both publications of PV rank to the pioneering works in the field, having a great potential to gain considerable scientific interest in near future. In summary, PV has succeeded in not only introducing weak bioluminescence, a relatively new biophysical field, to the general scientific community in a clear and understandable manner but has also demonstrated through the execution of experiments that the detection of weak photon emission holds great promise in the detection of oxidative processes occurring in living organisms.

I have no serious comments to make on the present dissertation and look forward to discussing the results of this dissertation in more detail during the defence.

In conclusion, I recommend the present dissertation for defence without any doubts and congratulate Petra Vahalová on this achievement.



Radek Šachl

In Prague, 10th of July 2023