EUROPEAN SYNCHROTRON RADIATION FACILITY

INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

ESRF

Experiment Report Form

The double page inside this form is to be filled in by all users or groups of users who have had access to beam time for measurements at the ESRF.

Once completed, the report should be submitted electronically to the User Office via the User Portal:

https://wwws.esrf.fr/misapps/SMISWebClient/protected/welcome.do

Reports supporting requests for additional beam time

Reports can be submitted independently of new proposals – it is necessary simply to indicate the number of the report(s) supporting a new proposal on the proposal form.

The Review Committees reserve the right to reject new proposals from groups who have not reported on the use of beam time allocated previously.

Reports on experiments relating to long term projects

Proposers awarded beam time for a long term project are required to submit an interim report at the end of each year, irrespective of the number of shifts of beam time they have used.

Published papers

All users must give proper credit to ESRF staff members and proper mention to ESRF facilities which were essential for the results described in any ensuing publication. Further, they are obliged to send to the Joint ESRF/ ILL library the complete reference and the abstract of all papers appearing in print, and resulting from the use of the ESRF.

Should you wish to make more general comments on the experiment, please note them on the User Evaluation Form, and send both the Report and the Evaluation Form to the User Office.

Deadlines for submission of Experimental Reports

- 1st March for experiments carried out up until June of the previous year;
- 1st September for experiments carried out up until January of the same year.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report, in English.
- include the reference number of the proposal to which the report refers.
- make sure that the text, tables and figures fit into the space available.
- if your work is published or is in press, you may prefer to paste in the abstract, and add full reference details. If the abstract is in a language other than English, please include an English translation.

ESRF	**Experiment title:** Time-resolved WAXS of bacterial photoreceptor protein YF1	**Experiment number**: CH-4301
Beamline: ID09B	**Date of experiment**: from: Jan. 28 2015 to: Feb. 3 2015	**Date of report**:
Shifts: 18	**Local contact(s)**: Gemma Newby (email: gemma.newby@esrf.fr) Federico Zontone (email: zontone@esrf.fr)	*Received at ESRF:*

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Report:

Photoreceptor proteins are found in all kingdoms of life, regulating processes such as growth, flowering or circadian rhythm. Two types of photosensors are the red light sensing phytochromes and the blue light sensing proteins containing a light-oxygen-voltage (LOV) domain.

YF1 is an engineered histidine kinase with a LOV domain responsible for the absorption of blue light [Möglich 2009]. LOV containing photoreceptors are widespread photosensory modules, found in microorganisms as well as plants. The sequence of events, time course and mechanism by which the absorption of the photon affect the activity of the distal effector domain has not been thoroughly understood.

Experiments carried out at ID09B and bioCARS previous to the here reported project had elucidated light induced structural rearrangements in *Deinococcus radiodurans* phytochrome photosensors [Takala 2014], and had yielded data showing the time course of structural rearrangements in full length YF1. This led us to focus on retrieving information for the phytochrome monomer and the isolated LOV domain of YF1.

We succesfully recorded time-resolved WAXS data of the isolated LOV domain of YF1. The data indicate structural rearrangement that structural rearrangements within the LOV domain happen on a sub millisecond timescale. These data are currently being analyzed.

We also recorded time-resolved WAXS data for the phytochrome monomers ranging from 3 us to 30 ms (figure, panel A). The data was decomposed into spectral components and showed a structural evolution on a timescale similar to that of their dimer counterparts (figure, panel B and C). We also analyzed the data structurally to reveal the light induced conformational changes occurring in phytochrome photosensors. In summary the data collected at ID09B clearly indicate that the structural rearrangements within the monomer will occur regardless of the oligomeric state of the protein being a dimer or a monomer, suggesting a minimal requirement for signal transduction. These results are currently being prepared for submission for publication within the close future.

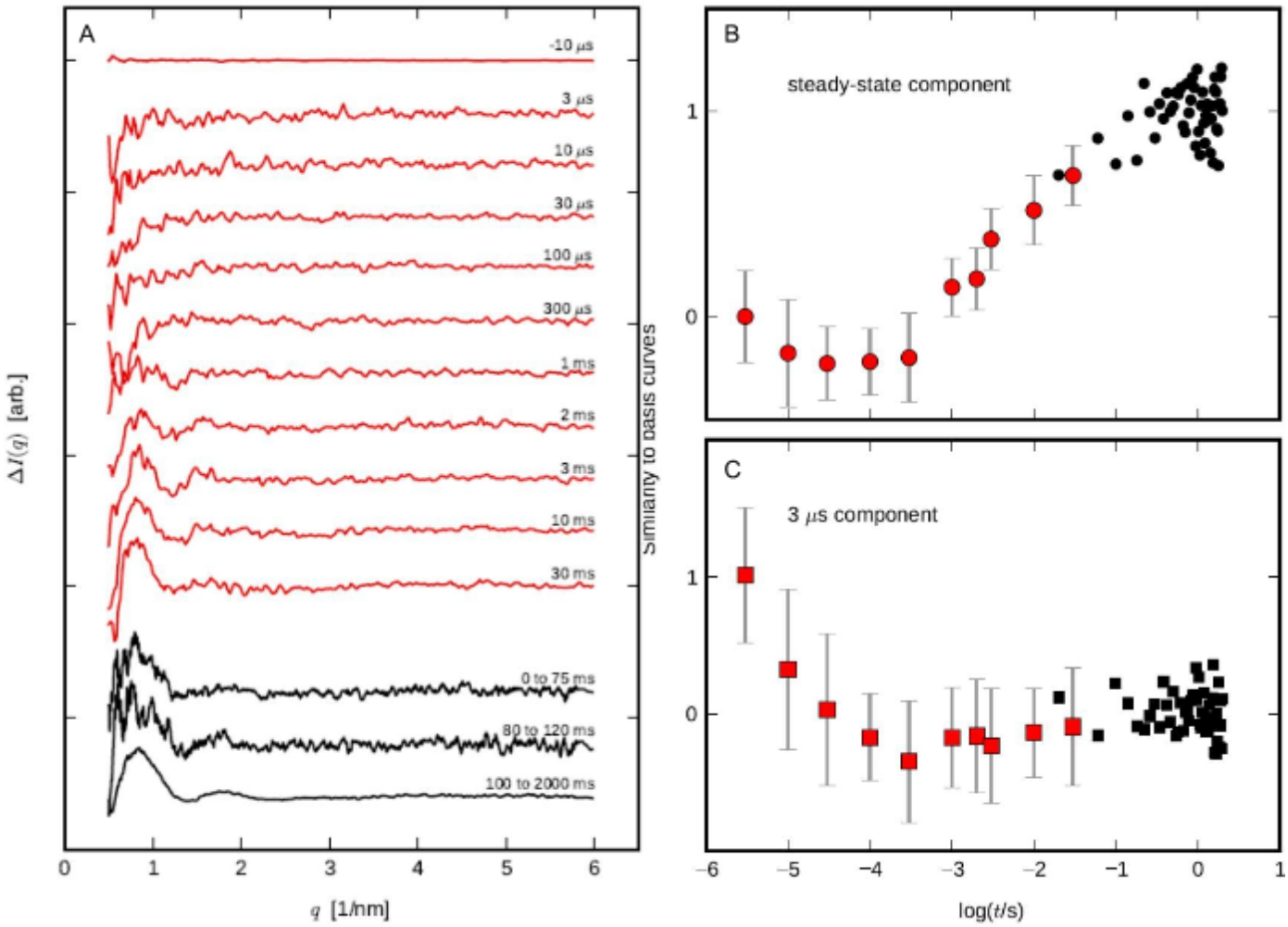

Figure: Time-resolved WAXS data collected at ESRF (red) together with previously collected data at SLS (black) shows the complete evolution of the difference scattering signal, from microseconds to seconds.

Möglich A., et al., *J. Mol. Biol.*, 2009
Takala H., et al., *Nature*, 2014