



**ESRF**

**Experiment title:** Nanosecond time-resolved investigation of photoinduced changes in photoactive yellow protein

**Experiment number:**  
LS540

**Beamline:**

*ID9*

**Date of experiment:**

from: 20 November 1996 to: 1 December 1996

**Date of report:**

26-Feb-96

**Shifts:**

9sb + 8 2/3fill  
shared with  
LS541

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**Received at ESRF:**

**4 MAR. 1997**

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**Report:**

In the LS540 experiment conducted in November 1996 we initiated ns time-resolved pump probe type experiments on crystals of photoactive yellow protein (PYP). The photocycle of PYP is completely reversible so that techniques of signal averaging developed for studies of the photolysis of carbonmonoxy myoglobin (LS427, LS541) could be used with PYP although we needed to accumulate only 10 images on the detector before readout. The PYP crystals were very resistant to X-ray or thermal damage during the experiment so that several highly redundant data sets with a limiting resolution of better than 1.8 Å could be taken from one crystal. Because one intermediate of the PYP photocycle accumulates on the  $\mu$ s time scale and the fast shutter was able to isolate individual X-ray pulses, we collected several data sets using the 2/3 fill mode with the following laser/X-ray delay times : 1.5  $\mu$ s, 8  $\mu$ s, 50  $\mu$ s, 350  $\mu$ s and 1 ms. In 2/3 fill mode the 43 pole hybrid W70 wiggler was operated at a 20. lmm gap without taper (critical energy 20 keV). In single bunch mode we collected data sets with the following laser/X-ray delay times: 1 ns, 5 ns, 10 ns, 25 ns, 59 ns and 422 ns. Here we used W70 and the 71 pole U46 undulator at a gap of 16.2 mm (critical energy = 15.4 keV, fundamental = 1.6keV). In addition, several ground state data sets were collected in 2/3 fill mode at the shortest crystal to detector distance available to determine the maximum limiting resolution of these PYP crystals. One ground state data set explored Laue data collection using the U26 undulator at a gap of 17 mm (fundamental = 11.3 1 keV). Data analysis is in progress.