



UPPSALA
UNIVERSITET

Molecular Biotechnology Programme

Uppsala University School of Engineering

UPTEC X 10 015		Date of issue 2010-04	
Author Olof Jönsson			
Title (English) Sample delivery effects on the viability of microorganisms for X-ray free electron laser imaging			
Title (Swedish)			
Abstract This report describes the first X-ray Free Electron Laser (FEL) imaging experiments at the Linac Coherent Light Source, at Stanford Linear Accelerator Centre, where a number of diffraction patterns with the highest quality as of today were collected from aerosolized cells, virus particles and protein microcrystals. Also described are a number of methods to evaluate the effects from the sample delivery process on organism integrity and viability. It is shown that <i>Roseobacter</i> and <i>Escherichia coli</i> cells maintain the ability to reproduce, and that <i>Synechococcus elongatus</i> strain 22344 has retained membrane integrity after injection into high vacuum. The possible infectivity loss for the marine virus $\Phi 40:2$ was investigated, but must be further evaluated. Methods to study the transmission efficiency of the sample injector were successfully investigated. The results presented in this report show that FEL imaging has the possibility to image alive and viable cells.			
Keywords X-ray Free Electron Laser Imaging, Viability, Vacuum, Aerodynamic lens stack, Aerosol , <i>Roseobacter</i> , <i>Escherichia coli</i> , <i>Synechococcus elongatus</i> , phage $\Phi 40:2$, Stain			
Supervisors Martin Svenda Department of Cell and Molecular Biology, Molecular Biophysics, Uppsala University			
Scientific reviewer Stefan Bertilsson Department of Ecology and Evolution, Limnology, Uppsala University			
Project name		Sponsors	
Language English		Security	
ISSN 1401-2138		Classification	
Supplementary bibliographical information		Pages 47	
Biology Education Centre Box 592 S-75124 Uppsala		Biomedical Center Tel +46 (0)18 4710000	Husargatan 3 Uppsala Fax +46 (0)18 471 4687