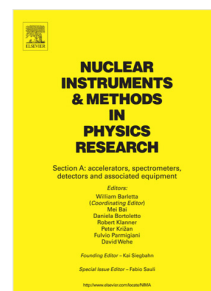


Accepted Manuscript

Advances in instrumentation for gas-phase spectroscopy and diffraction with short-wavelength free electron lasers

Hironobu Fukuzawa, Kiyonobu Nagaya, Kiyoshi Ueda



PII: S0168-9002(18)30352-8
DOI: <https://doi.org/10.1016/j.nima.2018.03.017>
Reference: NIMA 60659

To appear in: *Nuclear Inst. and Methods in Physics Research, A*

Received date: 5 March 2018
Accepted date: 7 March 2018

Please cite this article as: H. Fukuzawa, K. Nagaya, K. Ueda, Advances in instrumentation for gas-phase spectroscopy and diffraction with short-wavelength free electron lasers, *Nuclear Inst. and Methods in Physics Research, A* (2018), <https://doi.org/10.1016/j.nima.2018.03.017>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Advances in instrumentation for gas-phase spectroscopy and diffraction with short-wavelength free electron lasers

Hironobu Fukuzawa^{a,b}, Kiyonobu Nagaya^{b,c}, Kiyoshi Ueda^{a,b,*}

^a*Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Sendai 980-8577, Japan*

^b*RIKEN SPring-8 Center, Kouto 1-1-1, Sayo, Hyogo 679-5148, Japan*

^c*Department of Physics, Kyoto University, Kyoto 606-8502, Japan*

Abstract

Free electron lasers (FELs) deliver intense, coherent, femtosecond laser pulses in a short-wavelength range from extreme ultraviolet to x-rays. They are opening new research fields of studying non-linear multiphoton processes in such short-wavelength regimes and of studying ultrafast electron and structure dynamics in various forms of matter. To investigate such processes and dynamics in gaseous samples, i.e., atoms, molecules and clusters, ion and electron spectroscopies are powerful and indispensable. Furthermore, x-ray free electron lasers allow us to obtain a single-shot x-ray diffraction image of a single nanometer-size particle and to study its femtosecond structure dynamics in a time-resolved manner. Although ion/electron spectroscopies and x-ray diffraction are well established techniques in experiments with conventional light sources, such as laboratory x-ray sources, synchrotron radiation sources and optical-laser-based sources at high repetition rates, we met difficulties and problems to be solved, when we tried use these techniques for experiments with short wavelength FELs at low repetition rates. In this review article, we describe experimental setups and procedures, as well as procedures of the data analysis, which we developed in order to utilize such short-wavelength low-repetition-rate FEL pulses for studying non-linear/multiphoton processes and ultrafast dynamics in gaseous samples and nanometer-size particles.

Keywords: Free electron lasers, Ion momentum spectroscopy, Electron

*Corresponding author

Email address: ueda@tagen.tohoku.ac.jp (Kiyoshi Ueda)

Download English Version:

<https://daneshyari.com/en/article/10156490>

Download Persian Version:

<https://daneshyari.com/article/10156490>

[Daneshyari.com](https://daneshyari.com)