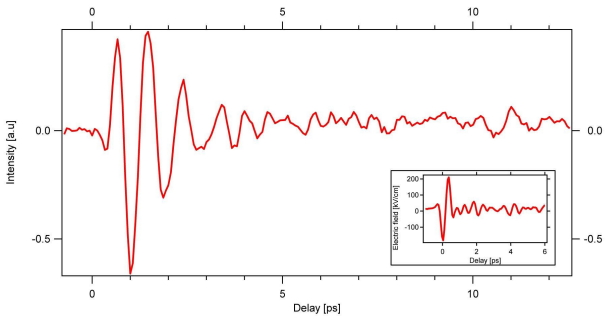

SLS Symposium on

Instrumentation

Tuesday, May 7, 2013

10:00 to 11:45, WBGB/019

10:00 Using terahertz radiation to excite phonon modes in ferroelectrics
S. Grübel, J.A. Johnson, P. Beaud, S.L. Johnson and G. Ingold

10:30 GlobalDiagnostiX – appropriate diagnostic imaging for developing countries
David Haberthür, F. Gassmann, M. Stampanoni

11:00 Coffee

11:15 PRIGo: a novel multi-axis goniometer concept for macromolecular crystallography
Sandro Waltersperger, V. Olieric, M. Salathe, C. Pradervand, E. Panepucci, W. Glettig, C. Schulze-Briese, M. Wang

Using terahertz radiation to excite phonon modes in ferroelectrics.

S. Grübel[1], J.A. Johnson[1], P. Beaud[1], S.L. Johnson[2] and G. Ingold[1]

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Recent advances in generation of terahertz radiation using femtosecond lasers have made it possible to generate broadband terahertz pulses with frequency content in the range from 0.1 to about 5 THz with high peak electric fields. The broad spectrum and the high fields make this source attractive to couple to various low-frequency vibrational modes in crystals, particularly soft phonon modes.

We will present first results using an organic crystal to generate broadband terahertz pulses with peak fields as high as 300 kV/cm. The terahertz pulses were focused onto a 0.5 mm thick crystal of $Sn_2P_2S_6$ which has IR and Raman active phonon modes in the frequency region between 1 Thz and 1.2 Thz. The oscillations from the THz excited coherent phonon modes were detected in the crystal by measuring the change in transient birefringence of optical light traveling trough the crystal.

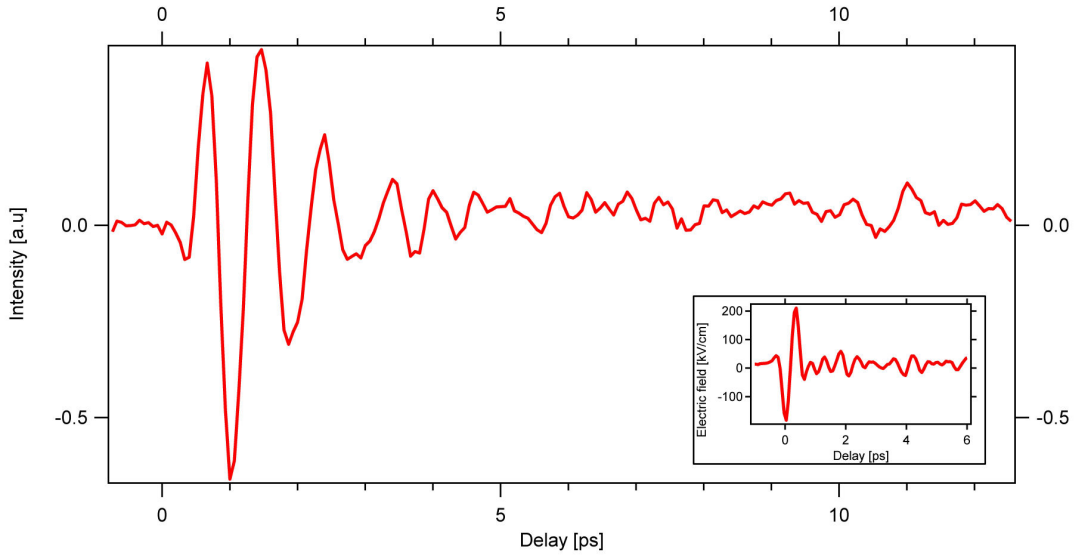


Figure 1: Transient birefringence measurement in $Sn_2P_2S_6$ after excitation with terahertz pulses. The inset shows the shape of a typical terahertz pulse used for this measurement.

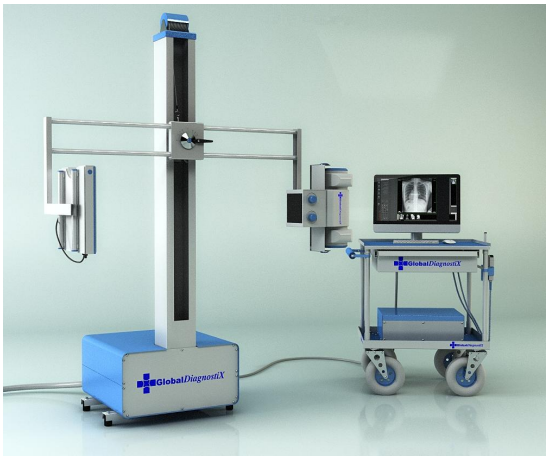
GlobalDiagnostiX – appropriate diagnostic imaging for developing countries

David Haberthür* Fritz Gassmann† Beat Henrich‡
Marco Stampanoni§

Approximately 4 billion people—about two-thirds of the world population—do not have access to diagnostic imaging. First world countries try to solve this problem by donating old radiological equipment to hospitals in need. But, according to the WHO, "about 70 % of the more complex devices do not function when they reach their destination" [1]. The GlobalDiagnostiX alliance wants to solve this problem by not donating equipment, but by developing an adapted medical radiology system to be deployed to district hospitals.

As part of this alliance, we want to challenge existing systems for generating and detecting x-rays for the medical domain. In the process we face the challenge of developing a diagnostic system which targets a tenfold reduction in the total cost of ownership as compared to existing solutions, and is adapted to the context of developing countries without compromising on performance and quality.

We currently focus on frugal engineering approaches to generate human radiographies. In the talk we will present the issues of building a detector based on these premises and present data from our first experiments.



Artists rendering of the envisioned system

References

[1] First WHO Global Forum on Medical Devices: context, outcomes, and future actions. Technical report, WHO, 2011. URL `http://www.who.int/medical_devices/gfmd_report_final.pdf`.

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PRIGo: a novel multi-axis goniometer concept for macromolecular crystallography

Sandro Waltersperger[1], Vincent Olieric[1], Marco Salathe[1], Claude Pradervand[1], Ezequiel Panepucci[1], Wayne Glettig[2], Clemens Schulze-Briese[3], Meitian Wang[1]

[1]Paul Scherrer Institute, [2]Centre Suisse d'Electronique et Microtechnique SA, [3]DECTRIS Ltd.

PRIGo (Parallel Robotics Inspired Goniometer) represents a new goniometer concept for macromolecular crystallography (MX) and offers an alternative to the kappa goniometer and Eulerian cradle used at MX beamlines. Traditional multi-axis goniometers suffer from limited angular ranges, inconvenient dimensions, limited accuracy and self shadowing. The PRIGo design minimizes these limitations and simultaneously maximizes the accessible crystal orientations[1)].

PRIGo was installed at the beamline X06DA at the beginning of 2012 and in permanent usage since. Using this new goniometer our users were able to exploit the full potential of their samples and allowed a new set of experiments to be performed. Experiments like high redundancy low dose data collection together with precisely reoriented crystals enabled the users to better exploit the anomalous signals in SAD/MAD phasing experiments by capturing Bijvoet pairs on the same image or by taking the advantage of the anisotropy of the anomalous signal. Furthermore, PRIGo facilitates the sample reorientation to align long cell axis and selection of the optimal part of the crystal as well as multi-pass data collection to obtain true redundancy and better absorption correction.

Technical details of the design, longterm performance and applications as well as an outlook on the PRIGo project will be presented.

1) W. Glettig et al.; PRIGo: Parallel Robotics Inspired Goniometer for Protein Crystallography; 9th euspen International Conference, San Sebastian, Spain, 2009