ESRF	**Experiment title:** Parametric down conversion of x-rays	**Experiment number:** MI311
Beamline: ID18	**Date of Experiment:** from: 26.4.99 to: 4.5.99	**Date of Report:** 26.8.99
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Names and affiliations of applicants (*indicates experimentalists):

B. Adams*, G. Materlik*, D.V. Novikov*,
Hamburger Synchrotronstrahlunglabor HASYLAB am Deutschen Elektronensynchrotron DESY, Notkestr. 85, D-22607 Hamburg
D.M. Mills*,
Advanced Photon Source, Argonne National Laboratory, 9700 South Cass Ave., Argonne, Il., 60439

Report:

The aim of the beamtime was to obtain a quantitative measurement of the conversion cross section for a comparison with the theoretical expectation [1]. The data has not yet been evaluated in detail but an order of magnitude agreement can be seen. Detection of the effect makes use of the facts that the converted photons have about half the energy of the incident photons and that they occur simultaneously.

The setup (shown in fig. 1 of the report on MI-247) was as follows: The beam from ID18, monochromatized to 22keV and cut down to 0.5*0.5mm^2 by slits, was incident on a sample of diamond in (111) Bragg orientation. Two energy resolving detectors of type X-flash by Röntec were arranged on opposite sides of the Bragg refelcted beam, forming angles of ±14.1mrad with the reflected beam. The wavevector matching condition was fulfilled by detuning an angle $\Delta\Theta$ from the Bragg reflex [1].

The pulses from the detectors were fed into energy discrimination circuitry and into a time to digital converter. Thus, energy-discriminated time correlation spectra were taken within which the parametric down conversion appeared as a peak at zero time difference (i.e. coincidence), depending on $\Delta\Theta$. The rest of the time correlation spectrum serves to obtain the statistical event rate due to the non=perfect energy resolution of the detectors.

Fig. 1 shows such a time correlation spectrum, spanning a range of $\pm 10\mu$s, i.e. ca. ± ring periods. The coincidence peak does not occur at zero, but rather at ca. 300ns time difference due to a BNC cable delay introduced into one of the signal chains. The purpose of the delay was to shift the coincidence away from zero where electronic noise might occur (it didn't). The maximum detected event rate was expected for $\Delta\Theta = 2.1 \cdot 10^{-2}$ degrees. Fig. 2 shows a plot of the observed coincidence rate over $\Delta\Theta$. The plot was obtained by integrating the coincidence peak in each of the time correlation spectra and subtracting the statistical background. The maximum rate is one event in 10s.

Fig. 3 shows another way of displaying the data: The coincidence rate is shown over the time difference of events in the detectors and over $\Delta\Theta$.

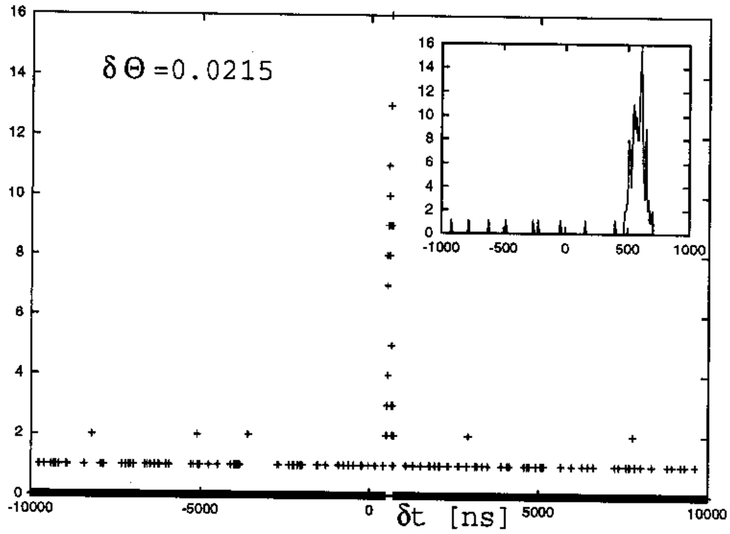

Fig. 1: A time correlation spectrum with coincidence peak. Abscissa in ns.

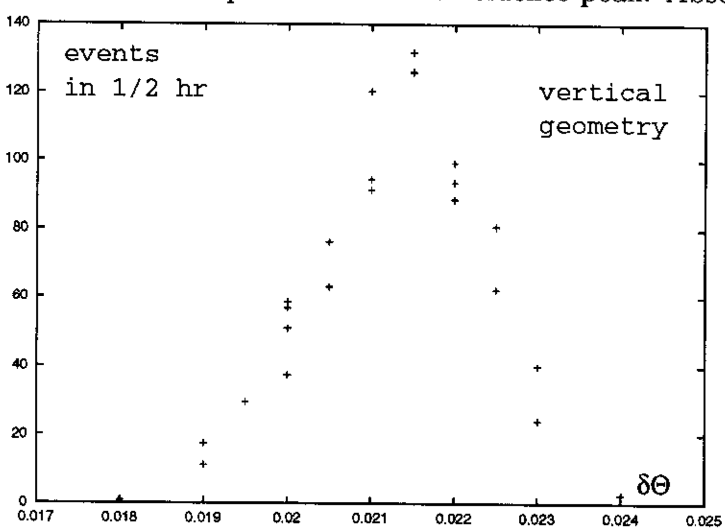

Fig. 2: Coincidence rate over $\Delta\Theta$. Abscissa in degrees.

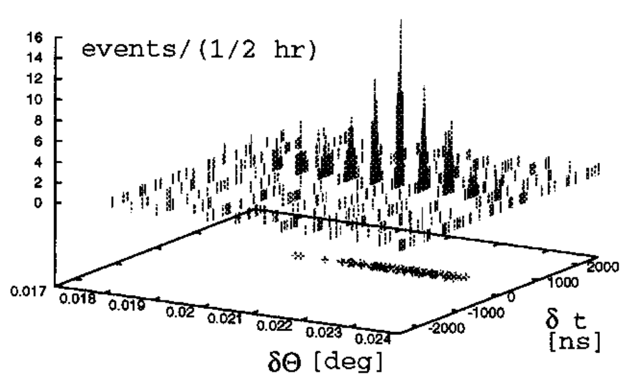

Fig. 3: Coincidence rate over time difference and $\Delta\Theta$.

Reference: B. Adams, P. Fernandez, W.K. Lee, G. Materlik, D.M. Mills, D.V. Novikov, submitted to the J. of Synchrotron Rad. A draft was included as an appendix to the last proposal (now experiment MI-362).