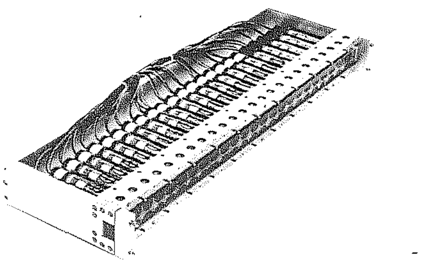
variable; usually they are mounted with a dead zone in between of about 20^0 in 2θ. The whole PSD arrangement can be rotated with an accuracy of 0.01^0 in order to measure the dead zone in a second step.

The specific features of the powder diffractometer equipped with the scintillation PSD are: 1. High efficiency also in the region of shorter wavelengths $1.0 \leq \lambda \leq 1.5$ A, thus (a) using wavelengths in the maximum of the intensity distribution of the thermal reactor spectrum, (b) suffering low $\lambda/2$-contamination due to the rapid decrease of the reactor spectrum to higher energies, (c) having sufficient coverage in reciprocal space for structure analysis also for confined scattering geometry. 2. With $\Delta d/d$-values for the PSD of 1% to 0.1% ($10^0 \leq 2\theta \leq 100^0$) the detector is, in general, not the limiting element in the angular resolution of the diffractometer. 3. High data point density in the diffractograms (e.g. 40 data points per degree 2θ) for a successful application of peak profile analysis methods (Will, G., Jansen, E. and Schäfer, W., (1982) AIP Conf. Proc. No 89, Neutron scattering-1981, 205).



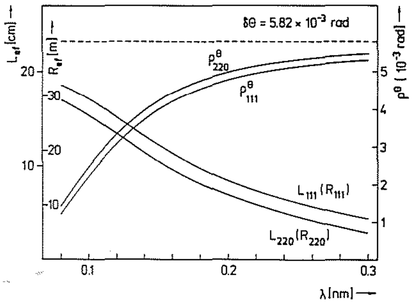
Photograph of one scintillation PSD unit.

13.1–2 A HIGHLY EFFICIENT DOUBLE-CRYSTAL MONOCHROMATOR FOR THERMAL NEUTRONS. By P. Mikula, J. Kulda and B. Chalupa, Nuclear Physics Institute, 250 68 Řež near Prague, Czechoslovakia.

The use of elastically deformed (usually bent) perfect crystals as neutron monochromators has been restricted owing to a rather low "effective mosaicity" $\delta\theta$ in comparison with that of conventional mosaic monochromators. This drawback may be overcome through the employment of a stack bent crystal slices (Rekveldt, Nucl. Instrum. Meth. (1983) 215, 521). Another way of increasing $\delta\theta$ is the use of a bent perfect crystal plate in a strongly asymmetric diffraction geometry. The associated effect of the reflected-beam widening is compensated for by the second bent crystal in the parallel (1,-1) setting in the opposite geometry (Mikula, Kulda, Vrána and Chalupa, J. Appl. Cryst. (1984), in press). Then the double diffracted beam has the same dimensions as the incident polychromatic one. The integrated reflectivity ρ^θ of such a double crystal (DC) system may be written as

$$\rho^\theta = \delta\theta \cdot [r(R)]^2 A(\mu),$$

where $\delta\theta$ is the total change in Bragg angle for the incident beam on the path through the crystal, $r(R)$ is the peak reflectivity (Kulda, Acta Cryst. (1984), in press) for a given radius R and $A(\mu)$ is the attenuation factor depending on the attenuation parameter μ. In case of fully asymmetric geometry when the incident beam enters the crystal through its end face and passes through it along its longest edge, we get $\delta\theta = L/R$, $r(R) = (1 - \exp(-QR))$, $A(\mu) = \exp(-\mu L)$, where L is the length of the crystals. The extremum of the function ρ^θ yields an optimum length L_{ef} in the form $L_{ef} = (\delta\theta/Q)\log(1 + 2Q/(\mu\delta\theta))$. The following figure displays the dependences of ρ^θ, L_{ef} and R_{ef} on the wavelength λ for Si crystal and fixed $\delta\theta$.



The advantages of this DC monochromator based on elastically bent perfect Si crystals may be found in its simplicity, easy control of the effective mosaicity and the integrated reflectivity, low amount of a higher order contamination, low background inherent in all DC monochromators and filtering properties (Freund, Nucl. Instrum. Meth. (1983) 213,495) when preferably rejecting fast neutrons from the incident polychromatic beam. The drawback of this DC monochromator is in the width of the output monochromatic beam (~5 mm) given by the thickness of the crystals. This restriction may be solved by replacing each of the crystals with a packet of several crystal slabs.

The results of preliminary experiments have fully confirmed the theoretical predictions.

13.1–3 A NOVEL LOW TEMPERATURE EULERIAN CRADLE. By F. Elf, W. Schäfer and G. Will, Mineralogisches Institut, Außenstelle in KFA Jülich, Universität Bonn, W.-Germany.

A full-circle Eulerian cradle has been constructed for neutron diffraction measurements on single crystals in the temperature range from liquid helium to room temperature. The whole mechanics of the cradle including the stepping motors of the phi- and chi-rotation is mounted inside the low temperature chamber of a helium cryostat. The positioning accuracy is 0.01 in chi and 0.02 deg in phi. For constant 4 K measurements the liquid helium level is maintained about 2 cm below the crystal thus avoiding the neutron beam passing through the liquid helium.

The inner diameter of the chi-circle is 175 mm. Goniometer heads up to 52 mm height with ACA standard threads can be mounted. The two circles and the worm wheels are made of red brass, produced by centrifugal casting process thus minimizing distortion and anisotropical thermal contraction. The worm shafts are made of beryllium copper bronce and the teeth of the gears are covered with gliding varnish in order to reduce friction. The 2 stepping motors are modified for use in liquid helium. The electrical wires are coated with low temperature resistant and flexible insulation.

The main applications of this low temperature cradle are crystal and magnetic structure investigations with neutrons. The dimensions of the device allow in future the installation of a high pressure cell on the goniometer head position. By modification of the arrounding cryostat this Eulerian cradle may also be used for X-ray structure analysis.