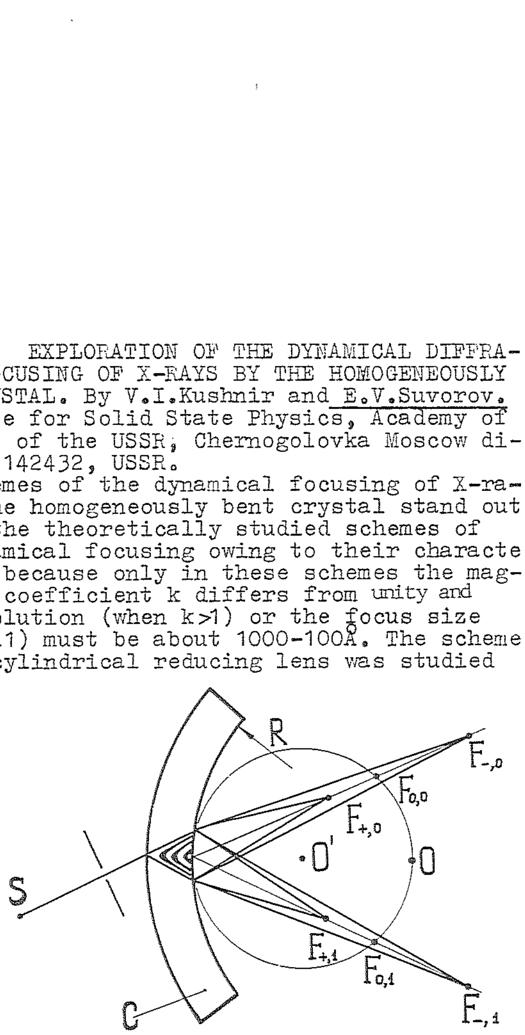
11.5-09 THE DEBYE-WALLER FACTOR DUE TO STATIC DISPLACEMENTS AROUND HYDROGEN IN NIOBIUM. By H. Behr, H. Metzger and J. Peisl, University of Munich, W. Germany

H dissolved in Nb in the high temperature α-phase will decrease the Bragg intensity due to static displacements of the Nb atoms from their average lattice sites (static Debye Waller Factor (DWF)). The relative integrated intensity of Bragg reflections from single crystals NbH_x has been measured. The corresponding static DWF was found to decrease with the concentration ($x < 0.2$ H/Nb) and the order of the reflection, as predicted by theory. For small scattering-vectors the static DWF is primarily determined by the displacements of the Nb atoms closest to the H impurity. Therefore the attenuation of the low order Bragg reflections was used to determine the displacements of these Nb atoms ($u = 0.083 \pm 0.009$ Å). The measurement of the static DWF seems to be a simple and useful method for the determination of displacements close to impurities and other lattice defects.

11.6-01 EXPLORATION OF THE DYNAMICAL DIFFRACTION FOCUSING OF X-RAYS BY THE HOMOGENEOUSLY BENT CRYSTAL. By V.I.Kushnir and E.V.Suvorov. Institute for Solid State Physics, Academy of Sciences of the USSR, Chernogolovka Moscow district, 142432, USSR.

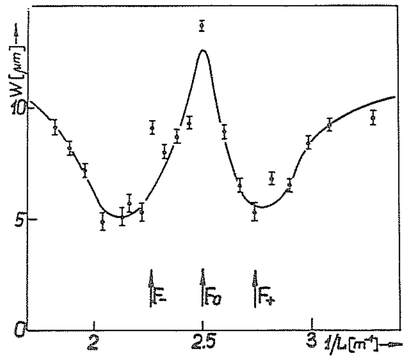
The schemes of the dynamical focusing of X-rays by the homogeneously bent crystal stand out of all the theoretically studied schemes of the dynamical focusing owing to their characteristics because only in these schemes the magnifying coefficient k differs from unity and the resolution (when $k>1$) or the focus size (when $k<1$) must be about 1000-100Å. The scheme of the cylindrical reducing lens was studied (fig.1).



It was shown that the two stationary phase points corresponding to the two types of the Bloch waves in the crystal exist in both the direct and diffracted beams. The focusing condition is as follows:

$$\frac{\cos\theta}{L} - \frac{1}{R} = \pm K(t/\Lambda)\cdot\frac{\chi_h}{2t\cdot\sin^2\theta}$$

where L is the distance from the crystal, R is the bending radius, t is the thickness of the crystal, Λ is the extinction length, χ_h is the Fourier component of the crystal polarizability, θ is the Bragg angle. The computer calculation of the intensity distributions in the focusing region shows that the sharp dynamic focuses F_0 and F_1 must appear near the stationary phase points, but the coefficient $K(t/\Lambda) \sim 1.22-1.27$ must be introduced into the focusing condition to take into account the cylindrical aberration. To avoid the chromatic broadening of the focus, both monochromatization of the radiation and the double-lens achromatic scheme were used. It was established that the diffracted beam is exposed to the dynamical contraction in the two regions near the calculated points to the width of $W \sim 5\mu m$ (fig.2) that is an order less than the Bormann delta base (80 μm).



11.6-02 X-RAY DISLOCATION CONTRAST By E.V.Suvorov, V.L.Indenbom and K.Yu.Mukhin Institute of Solid State Physics, Academy of Sciences of the USSR, 142432 Chernogolovka Moscow district, USSR and Institute of Crystallography, Academy of Sciences of the USSR, Moscow

The diffraction mechanisms forming the X-ray image of the dislocations were studied. It was established that the mechanisms determining the formation of the image in the short-range and long-range dislocation fields have different physical nature. While the geometrical optics turned out to be convenient for the description of the formation of the long-range dislocation field image, the phenomena taking place in the short-range field demand the employment of the Bloch waves diffraction optics terms for their analysis. When exploring the dislocation images it was found that they may be formed due to a great variety of effects such as: interference of the Bloch waves coming along different trajectories, closeness and rarefaction of the beams, tilt of trajectories near the crystal surface, interference of the wave fields of different origin, interbranch scattering, waveguide effects, channeling, reflection and ets. The mechanisms were studied of formation of the votrex-like dislocation image that occures on the high-order reflection topographs. It was found that the image in this case is formed as a result of the "newborn" and "old" wave fields interference and is a specific hologram of the elastic dislocation field obtained on the Bloch waves in the crystal. The experimental topograph, the computer-calculated section topographs and the