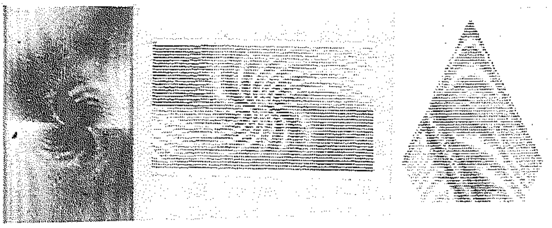
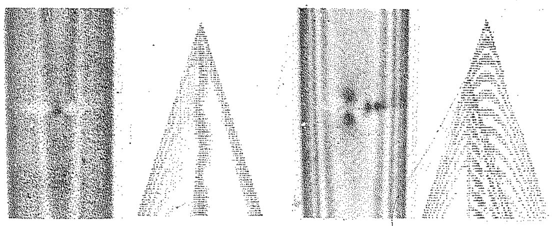
distribution of the wave field in the scattering plane are shown on fig.I.



It was experimentally revealed that the short-range dislocation field may develop the properties of a semiopaque mirror and even a waveguide. The topographs and correspondent computer-calculated intensity distributions illustrating the waveguide effect and the reflection of the Bloch waves from the short-range dislocation field are shown on fig.2.



11.6-03 POLARIZATION STATES OF THE DYNAMICALLY DIFFRACTED X-RAYS IN THE LAUE CASE.

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Polarization states of the dynamically diffracted X-rays were analysed in the Laue-case 220 reflection of Si. As the σ state and the π state components of the electric vector of diffracted X-rays have different wavelengths in crystals, the phase difference between the two coherent components is produced depending on the crystal thickness. Accordingly the elliptically polarized X-rays or the rotation of the electric vector is expected for the linearly polarized incident beam. Using the conventional X-ray sources (Cu Kα) and the grooved Ge monochromator, the linearly polarized and horizontal X-ray beam was produced with the electric vector inclined at 45° to the horizontal plane. The X-ray beam had the σ and π components for the 220 Laue-case reflection of Si with the horizontal plane of incidence. The polarization states of the 220 reflection beam were analysed using the 333 reflection of Ge. The analysis was done mainly for the crystals about 55, 79 and 96 μm thick respectively.

The experimental results suggested the polarization state, which was due to the phase difference of about π, $3/2\ \pi$ and 2π respectively between the σ state and the π state waves, corresponding to the above three cases of thickness. As there are four coherent waves with different absorption coefficients the resultant electric vector is not simple as in the optical case. It must be also considered in the interference that the shape of the intrinsic rocking curve is different for the two polarization states respectively.

11.6-04 NONLINEAR TRANSFORMATION OF RADIATION FREQUENCY ACCOMPANIED BY DIFFRACTION IN CRYSTALS.

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Nonlinear transformation of electromagnetic radiation frequency in crystal is theoretically investigated. It is shown that essential enhancement of the nonlinear frequency transformation occurs if it is accompanied by diffraction of the generated radiation in the crystal.

The phase-matched second-and higher-harmonic generation is examined in detail for the case of the harmonic diffraction in the plane-parallel crystal plate. It is found that the nonlinear frequency transformation enhancement occurs for the case of Bragg diffraction and is due to an unusual dependence of the harmonic intensity on the sample thickness L. Instead of the common L^2, dependence of the harmonic intensity may be proportional to L^4 if the diffraction takes place. At the maximum of enhancement the harmonic intensity is $(FL/\lambda)^2$ times higher than in absence of diffraction, where λ is the harmonic wavelength, F is dimensionless structure amplitude of the relevant reflection, which for X-rays is typically $\sim IO^{-5}$.

This maximum may be achieved if the frequency of the phase-matched generated harmonic coincides with the edge of strong diffraction scattering (Edge of stop band). The value of the possible enhancement of the frequency transformation is reduced as $/\lambda-\lambda e/^{-1}$ if the harmonic wavelength λ (or the direction of its propagation) departs from the stop band edge λe and the enhancement vanishes if the corresponding departure (relative wave length change or angular decline) is greater than F.

It is noted that a special relation between the dielectric frequency dispersion d, F and the Bragg angle θ must be fulfilled for the maximum enhancement (e.g. for $\theta=\pi/_2$; the corresponding relation is $F \simeq d$).

The above enhancement relates to monochromatic waves, because the harmonic intensity oscillates with change of wavelength (or propagation direction) and the enhancement corresponds to the oscillation maxima which are divided by the intervals $\Delta\lambda/\lambda \sim F^{-1}.(\lambda/L)^2$. This is the reason why the full strength of enhancement may be observed for well monochromatized and collimated beams. The averaging over the harmonic frequency line width and angular divergence of the beam reduces the observable enhancement. If the frequency line width $\Delta\lambda/\lambda \geqslant F^{-1}(\lambda/L)^2$ the averaged over line width intensity of the harmonic $I\alpha$ is given by the expression $I\alpha = Io(F\lambda e|\lambda-\lambda e|^{-1})^{1/2}$, where Io is the intensity of harmonic being generated in absence of diffraction.

The perspectives of an experimental observation of the nonlinear frequency transformation enhancement are discussed. As the most favorable the structures with large scale periodicity are named (e.g. cholesteric liquid crystals, incommensurate crystal structures and so on) for which the enhancement effect may be investigated by means of now available sources of coherent radiation.