05.2-04 POLARIZATION DEPENDENCE OF THREE-PHOTON ABSORPTION IN SOLIDS. By A.R. Hassan, Physics Department, Faculty of Science, King Abdul Aziz University, Jeddah, Saudi Arabia.

The polarization dependence of three-photon absorption in solids is developed using the Wigner-Eckart theorem for finite symmetry groups. The expression for the absorption coefficient is separated into two parts: i) The geometrical part, which depends on the polarization vectors of the three photons, ii) The dynamical part, which contains the product of three electron-photon matrix elements. New information can be gained by studying these two parts. An application to TlCl crystal is given and an experimental method is suggested.

05.2-05 EFFECT OF A DISLOCATION ON THE PROCESS OF DOMAIN WALL DISPLACEMENT IN A FERROMAGNET. By L.M.Dedukh, M.V.Indenbom, V.I.Nikitenko and V.K.Vlasko-Vlasov, Institute of Solid State Physics of the Academy of Sciences of the USSR, Chernogolovka, USSR.

The motion of a domain wall in a ferromagnet is influenced strongly by crystal imperfections. Study of the role of crystal defects in the formation of the regularities of domain wall motion is therefore necessary for creation of a systematic theory of the magnetization of real ferromagnets. Among elementary crystal defects affecting domain wall displacement, dislocations are the most important ones whose long-range inhomogeneous field of microstresses produces complicated potential relief for domain wall motion. We wish to report the investigation of the potential relief due to individual dislocations for the domain wall motion in transparent ferrimagnetic single crystals of different types. The domain structure and the dislocations were investigated in plane-polarized light on the basis of the magneto-optical and piezo-optical effects.
The strong dependence of the character of the domain wall-dislocation interaction on the orientation of the dislocation axis (l) with respect to the magnetization vectors (M) in adjacent domains is shown. In particular, it was found that in a multiaxial yttrium-iron garnet the distortion of the shape of the wall during its displacement past a dislocation is practically unobserved when the dislocation is perpendicular to the magnetization in domains. In this case the value of the dislocation-induced barrier for the wall motion is determined by the total force of the interaction of the dislocation stress field with the magnetization in the wall and in the domains. This force can be estimated in the first approximation on the basis of the known Peach-Koehler formula. In gadolinium-iron garnet at temperature close to the compensation point, under conditions of small M values, the peculiarities of the domain wall behaviour near a dislocation have been studied.
It is established that, when the dislocation axis is parallel to the M in domains, the wall is strongly bent around the dislocation according to the acting forces that depend essentially on the mutual placement of the dislocation glide plane and the domain wall. In the case of $l \parallel M$, both the character of the distribution of the forces exerted by the dislocation on individual elements of the domain wall and the wall shape near a dislocation in uniaxial ferrimagnet are investigated experimentally and theoretically.
The influence of external magnetic field on the force of the domain wall-dislocation interaction in uniaxial ferrimagnet has been found. It is shown that the deviation of the direction of applied magnetic field from an easy magnetization axis leads to the significant increase of the coercive force for the 180° domain wall displacement due to the appearance of the magnetostrictive nonequivalence in the adjacent domains. Under these conditions, the behaviour of the wall near an edge, a screw, and a mixed dislocation is studied. Possible reasons for some discrepancies between experimental data and theoretical predictions revealed are discussed.

05.2-06 STUDY OF MECHANISMS LIMITING DOMAIN WALL VELOCITY IN REAL FERRIMAGNETIC CRYSTALS. By V.I.Nikitenko, L.M.Dedukh, V.S.Gornakov, Yu.P.Kabanov and A.A.Polyanskii, Institute of Solid State Physics of the Academy of Sciences of the USSR, Chernogolovka, USSR.

The study of dynamical properties of ferromagnetic domain walls is at present a field of research in which rapid progress is being made, a development stimulated mainly by the potential applicability of bubble domains. As a result of these investigations, discrepancies between experimental and theoretical data have been revealed which can not be explained without taking the real crystal and magnetic structure of a ferromagnet into account. In the present work we report results of an experimental investigation of dynamics of domain walls and Bloch lines in yttrium iron garnet single crystals in connection with the real crystal structure.
The magneto-optical measurements of the mobility and mass of a domain wall have been made on the samples cut in the form of a long tetrahedral prism or a polygonal frame which had a single movable 180° domain wall displacing under the influence of the pulsed magnetic field. It is shown that a domain wall in the yttrium iron garnet is characterized by the effective mass greatly exceeding that computed according to Döring and that the domain wall becomes still more "heavy" with increase of external magnetic field.
For the first time, the effect of Bloch lines arising in a domain wall under the action of the magnetic charges localized in the regions of the intersection of the domain wall with

the sample surface on the wall mobility is shown experimentally. The influence of the potential barriers due to individual dislocations on the values of the dynamical domain wall parameters measured is investigated. It is shown that the experimentally revealed nonlinear dependence of domain wall mobility on the magnitude of magnetic field may not only be of a gyroscopic nature but of a dissipative nature as well and may reflect the change in the mechanism of energy transfer from the moving wall to a magnon subsystem with growth of magnetic field.
For the first time, results are presented of the direct experimental investigation of dynamics of Bloch lines. The magneto-optical method for measuring a single Bloch line displacement along the domain wall separating domains with antiparallel orientation of the magnetization lying in the (110) or (112) platelet plane is worked out.
The resonance of Bloch lines displacements in sinusoidal magnetic field has been revealed, the free oscillations of a Bloch line are studied. The effective mass and the mobility of a Bloch line are measured. It is shown that free and forced Bloch line oscillations are nonlinear due to the inhomogeneity of the crystal structure of the ferrimagnet.
The phenomenon of the Bloch lines generation under the action of the sinusoidal magnetic field, at certain values of its amplitude and frequency, has been found. It turned out that an important role in the generation and in the annihilation of Bloch lines is played by the surface and volume crystal imperfections.

05.2-07 SPIN-REORIENTATIONAL PHASE TRANSITION IN THE DISLOCATION MICROSTRESS FIELD. By L.M.Dedukh, M.V.Indenbom, V.I.Nikitenko and V.K.Vlasko-Vlasov, Institute of Solid State Physics of the Academy of Sciences of the USSR, Chernogolovka, USSR.

As it was shown by recent investigations the magnetization of magnetics posessing several magnetic sublattices can be provided not only by usual mechanisms of domain wall displacement and of magnetic momenta rotation but by spin-reorientational phase transition (SRPT) also. Experiments revealed that it is impossible to explain the processes of the formation of various collinear and canted phases in real ferrimagnetic crystals without taking into account the lattice defects. However until now there were no works in which the influence of the defects on the SRPT had been researched. In present communication the results are reported of the first experimental study of the features of magnetic field-induced SRPT which are connected with individual dislocations.It is shown that dislocations cause the shift of the phase transition lines and the expansion of the temperature intervals of the existence of appropriate phases. Moreover, they produce some radical changes in phase transition character.
The investigation was carried out on gadolinium iron garnet (GIG) plates at temperatures (T) near the compensation point (T_c). Dislocations in GIG plates were revealed in polarized light by virtue of piezobirefringence. Magnetic phases were identified by Faraday and Cotton-Mouton effects.
As a result of the study, it was established that dislocations are the centers of nucleation of incollinear phase domains during the transition into canted state and that collinear phases arise at them when the reverse transition goes. The initial form of incollinear phase domains near a dislocation corresponds to the character of the local magnetic anisotropy due to dislocation microstress field. Moreover, the rise of domains of magnetic phase different from those peculiar for the chosen geometry of SRPT in perfect crystal is revealed at dislocations.
The interaction of dislocations with domain walls of new type - boundaries between canted and collinear phases is studied. It is found that these domain walls widen noticeably in the dislocation elastic field turning into new phase domains. Their pinning at the defect and following jumps influence considerably the kinetics of SRPT proceeding. From observations of the rise and growth of domains of different magnetic phases, the SRPT diagrams for crystal regions deformed by the dislocation and for regions remote from it are built. The dislocation shifts phase transition lines by several degrees in temperature resulting in both the earlier beginning of SRPT near the defect when T approaches T_c and in its late finishing at the dislocation also when T removes from T_c. The analysis of results received and the comparison of measured shift of phase transition lines with the estimations made in the frames of current theories indicates the principal role of local magnetic anisotropy induced by microstresses in the formation of SRPT peculiarities near a dislocation.

05.2-08 HYDROTHERMAL SYNTHESIS, CRYSTAL STRUCTURE AND MAGNETIC PROPERTIES OF $Cs_2FeF_5 \cdot H_2O$. By N.V.Belov, N.I.Golovastikov, A.N.Ivashenko, B.Ya.Kotjuzhanskii, O.K.Melnikov, V.N. Phylippov. Institute of Crystallography, Academy of Sciences, 117333, Moscow, USSR

Hydrothermal crystallization in the system $CsF-FeF_3-H_2O$ was investigated. The experiments were performed in steel autoclaves in the temperature range 470-580 K at pressures about 1000 at. It was found that the phase $Cs_2FeF_5 \cdot H_2O$ only exists at concentrations 30 mass% CsF or higher in the temperature range investigated. The crystals of this phase are colorless or weak green and have the dimensions to 6x6x8 mm. The structure of grown crystals (D_{2h}^{17} = Cmcm) and the unit cell dimensions (a = 10.361, b = 8.266, c = 8.401 $\pm$ 0.003 Å) were determined by X-rays . The static and resonance measurements performed at T = 1.2 - 300 K have shown that the investigated crystal transforms at T_N = 2.4 $\pm$ 0.1 K from paramagnetic to antiferromagnetic phase with magnetic anisotropy of "easy axis" type. The susceptibility was determined in antiferromagnetic phase, $X_1(1.8\ K) = 0.32\ mole^{-1}$ $\pm$10%.