Thus, X-ray and neutron data allow the polycomplexes structure to be represented as a system of charged surfactant lamellae embedded in an oppositely charged network as is shown in Fig.

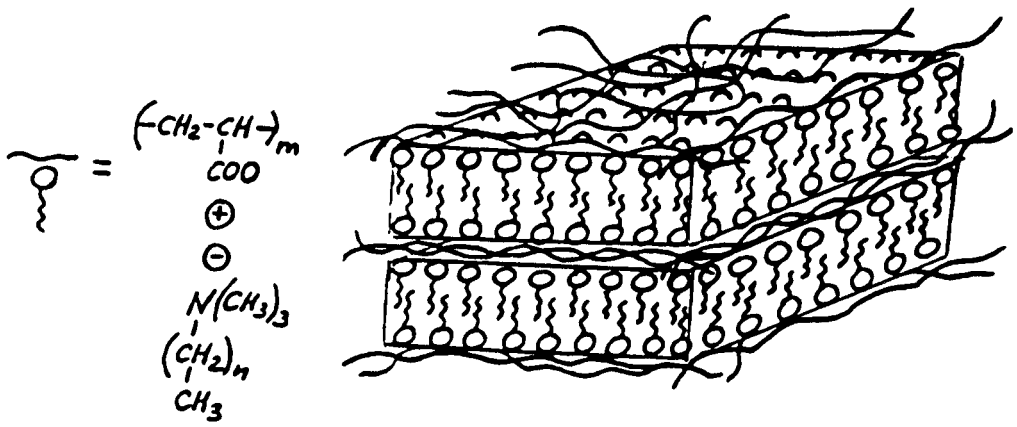

Fig. The structure of PSC

SPECTROMETER FOR STUDYING BROAD MAGNETIC DIPOLE TRANSITIONS IN MAGNETS AND THE HALL CONDUCTIVITY AT MICROWAVE FREQUENCY IN CONDUCTING MATERIALS

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It frequently happens in studying of magnets that an ESR signal is unobservable by traditional ESR spectrometer that used a static field modulation when a resonant transition is broad. Recently this problem has taken on particular interest in connection with the inability to obseve the ESR signal from Cu^{2+} (spin $S = 1/2, 3d^9$ electron configuration) in cuprates – high temperature superconductors and related compounds up to the far paramagnetic range of temperatures of the order of the exchange integral J in the CuO_2-plane [1]. Here we describe the X-band ESR spectometer ($f = 8.54$ GHz) that makes it possible to study broad ESR tpansitions. It has the following main features [2]:

1) A cylindrical two-mode balanced cavity with TE_{111} type of oscillation [3] is used in spectrometer. The static magnetic field H is along the cylinder axis (z-axis). The deep frequency-independent balance between excitation (x-axis) and receiver (y-axis) modes allows one to use in the spectrometer a high power microwave source without its frequency or amplityde noise appearence at the input of the detector. It allows to improve the spectrometer sensitivity ($\chi_{mon} \sim P^{-1/2}$). The detected signal is proportional to x_{yx} – the off-diagonal

element of the magnetic susceptibility tensor. The registered quantity is the rotation of the plane of polarizations of the microwave oscilations in the cavity.

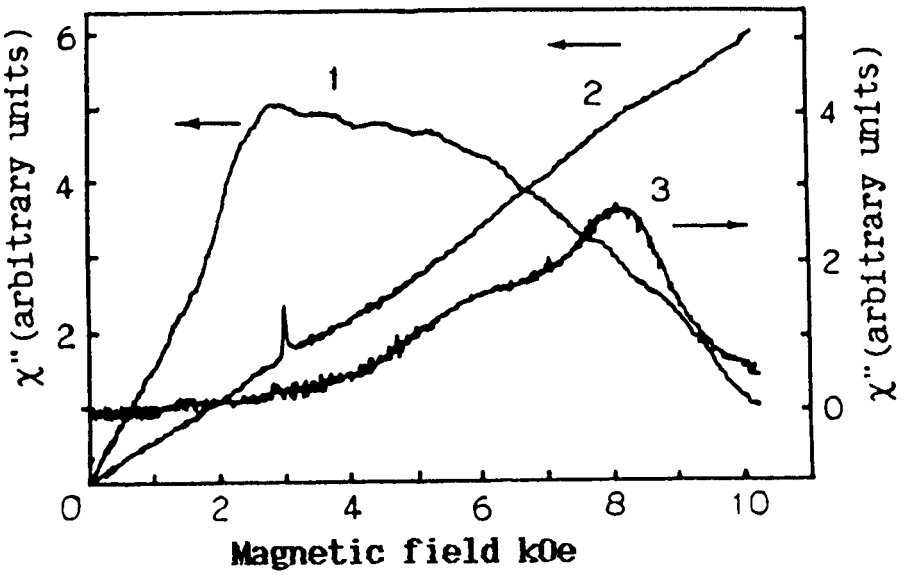

Fig. Response in the plane of the detector as a function of H at room temperature. *1* – polycrystalline CuO (m = 330 mG); *2* – Hall signal from the material of the cavity (Cu). The narrow line here is the signal from the marker – polycrystalline nitroxyl radical (g = 2.0055, ΔH = 60 Oe); *3* – signal from the gaseous O_2 in the cavity

2) The spectrometer uses a periodic, large amplitude sweep of static magnetic field and synchronous signal accumulation. The large H-scan amplitude allows to pass a maximum of an ESR line and so it allows to obtain the maximum signal at every H-scan. In a traditional ESR spectrometer with modulation of static field H the maximum signal is obtained when a modulation amplitude is approximately equal to the half-width of an ESR line. If a line is broad, this condition cannot be satisfied, and the signal fall off condiserably.

Fig.1 shows the examples of broad ESR signals (from polycrystalline CuO –curve 1 and from gaseous oxygen in the cavity – curve 3), which have been obtained on the described spectrometer.

Due to magnetic fields configuration (H is directed along the axis of the cylinder cavity and is perpendicular to microwave field $h(t)$ on the cavity end, where a sample under study is placed, and, consequently, to microwave currents on the cavity ends) the Hall effect in a sample under study (and in a material of cavity) can be a reason of the rotation of the plane of polarization of electromagnetic oscillations in the cavity [2]. The signal which has a linear dependence on static field have to be observed in this case. We have seen such the signal from material of the cavity really (Fig. , curve 2). Thus, the described spectrometer allows one to study transport properties in conducting materials on microwave frequence. To obtain a "pure" Hall-signal from a sample one has to subtract the Hall-signal for the material of the cavity (without sample) from the signal recorded with sample, that is not very complex with help of a signal from marder (Fig.).

Due to using the cavity the Hall-signal will be enganced over that occurring in a waveguide

or in a free space, because the electromagnetic wave will be reflected from the ends of the cavity many times, and the rotation of the plane of polarization will be accumulated.

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HYBRID PHOTODIODES

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The Hybrid PhotoDiode (HPD) is a new kind of photodetectors, having the main advantages of photomultipliers and photodiodes. The interest to them is conditioned by the requirements of the modern high energy physics in high- speed detectors with good energy resolution and the linearity capable to work stablly in strong magnetic fields up to the 4 Tesla.

The HPD is a vacuum device, consisting from a photocathode (PC) and a silicon PIN diode. Photoelectrons emitted from the PC are accelerated by the voltage between the PC and the diode up to several keV. Penetrating through the thin input diode window, photoelectrons produce the electron-hole pairs, which are separated in a field of the reverse biased PIN diode and are collected on the electrodes. Due to the low energy of electron-hole pair in silicon (3,6 eV), the HPD has more than three order internal gain.

The idea of HPD creation was suggested by Abraham J.M. et al in 1966 [1]. However, due to the technological difficulties the first devices of HPD have been manufactured only in the 90th [2,3,4].

At present there are two main versions of HPD distinguished by the way of the photoelectron focusing on the PIN diode surface. In the the case of proximity HPD the photoelecrons from PC directly rich the close located (1–2 mm) PIN diode. In other version the electrons are electrostatically focused from the total surface of PC into the small area of the silicon detector improving the energy resolution but losing the independence on the magnetic field.

In this report the first results on measurements of proximity HPD parameters are presented. Such photodiodes are developed and produced by the PNPI - CSRI "Electron" collaboration.

The photo of HPD is shown in Fig.1. The body of the device is made from a metal and ceramics and represents a cylinder with a diameter of 50 mm and height of 15 mm. The internal structure of the HPD is schematically given in Fig.2.

We used the S-20 multialkali photocathode with a diameter of 23 mm, having the spectral sensitivity in the range of 350-750 nm with maximum sensitivity of 55 mA/ W at 500 nm (Fig.3).