A POLARIMETRIC INVESTIGATION OF UNUSUAL STELLAR OBJECTS FROM THE BURAKAN SURVEYS. FIRST RESULTS.

V.D. Bychkov[1], S.P. Tapia[2]
[1] SAO RAS, Niznij Arkhyz, 357147 Russia
[2] Linkoln Lab. of MIT, Massachusetts, USA

ABSTRACT We are present the first resalts for new polarimetry investigate the unusual stellar objects from Burakan Surveys.

Key words: Stars: polarimetry, white dwarfs, magnetic field.

We propose to investigate the nature of unusual stellar objects found in the First and Second Burakan Surveys with polarimetry of their optical flux. Polarimetry detects any preference in the orientation of the electromagnetic waves and provides concrete clues on the intrinsic emission mechanisms. Application of this technique in the past, to other surveys, has revealed new classes of stellar objects. Examples are magnetic cataclysmic binaries and Quasars without a gaseous envelope. The proposed observations will be conducted at the prime focus of the Russian 6-meter telescope of the Special Astrophysical Observatory (SAO) with polarimeters. Potentially this investigation could increase by one fifth to one quarter the known sample of magnetic cataclysmic binaries and magnetic white dwarf stars. As it happens with most surveys, there is a finite probability of discovering a completely new class of stellar object.

Even from the start of the Burakans Surveys (First Burakan Survey - Markarian, 1967 and Second Burakan Survey - Markarian, Lipovetsky, 1983) it was clear that many blue objects were not exactly galaxies. When a low resolution objective spectra could not be associated with any type of a stellar object known, or galaxy type, or Quasar, it was included in a list of unusual objects. Astronomers know that most advances in this discipline have started from detailed studies of unusual objects.

The objective of this project is to investigate the degree of linear and circular polarization in the optical region of a significant sample of the unusual objects found in the Burakan Survey. Stellar radiation with polarization above 7observed flux or any time variations of the polarization are reliable indicators of intrinsic stellar effects: the polarization originates in the emission mechanisms taking place at or near the stellar surface. In some cataclysmic binaries, some white dwarf stars and most Quasars without a gaseous envelope =C4 also known as BL Lacertae objects or Blazars=C4 the emission mechanisms are tightly constrained by strong magnetic fields. In the magnetic regions of cataclysmic binaries or on the surface of white dwarf stars, radiation is dominated by cyclotron emission: electrons spiral in the magnetic fields, of several million to a few tens of million Gauss, with speeds clearly lower than the speed of light. In Blazars the observed radiation is consistent with synchrotron emission where electrons move at speeds comparable to the speed of light.

According to our current understanding of stellar evolution cataclysmic binaries and white dwarfs are near the end of stellar life. Models of cataclysmic variables consistent with the observed polarization variations disclose complicated magnetic and gravitational interactions involving transfer of matter between the components (Tapia, 1977; Remillard et al, 1991). Generally found in X-ray surveys, about 24 magnetic cataclysmic binaries are known and only 16 have been studied with moderate detail. Isolated magnetic white dwarfs are clearly rotating stars with a frozen dipo-

lar magnetic field. The observed variations of linear and circular polarization are caused by misalignment between the dipole and rotation axes (Bychkov et al.,1991). There are more than 20 isolated magnetic white dwarfs known.

So far we observed 3 objects only for this programm. These objects have unusual spectra and were preliminarily attributed to unusual white dwarfs. A linear polarization of emission was not detected for the object SBS1619+606. The second object SBS1622+587 showed the linear polarization in V filter of Jonson's photometrical system, and the third object SBS1657+584 showed the polarization in the violet side of spectrum (U filter of Jonson's photometrical system). See the table. The objects have been polarimetrically investigated for the first time. The obtained results will help to explain the unusual shape of the spectrum that could be a convincing argument in favor of strong magnetic fields on the surface of these objects. This programm only started now and we have a small number of observational results, but it is seen now that the main direction of research has been chosen correctly, since for two of three objects a positive result has been obtained - the polarization of their radiation has been found.

Acknowledgements. This material is based upon work supported by the U.S. Civilian Research and Development Foundation under Award No.RP2-151/96.

Table 1:

JD 2450+	P	σ (P)	θ	Filter	Exp. min.
		SBS 1619+606			
634.254	.361	.357	133.5	R	3
		SBS 1622+587			
634.294	1.031	.997	51.5	U	2
634.297	.474	.401	112.6	B	3
634.302	1.642	.279	37.9	V	3
		SBS 1657+584			
634.267	4.366	1.084	158.2	U	3
634.270	.245	.410	150.0	B	2
634.274	.281	.129	120.0	V	3
634.279	.899	.313	42.1	R	3
634.282	.411	.400	118.0	I	3

References

Bychkov V.D., Fabrika S.N., Shtol V.G.: 1991, *Sov.Astr.Letters* **17**, 43.

Markarian B.E.: 1967, *Astrofizika* **3**, 55.

Markarian B.E., Lipovetsky V.A., Stepanian J.A.: 1983, *Astrofizika* **19**, 29.

Remillard R.A., Stroozas B.A., Tapia S., Silver S.: 1991, *Ap. J.* **379**, 715.

Tapia S.: 1977, *Ap. J. Letters* **212**, L125.