A DEEP SPECTRAL SURVEY ON THE 6-METER TELESCOPE

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ABSTRACT. The observational program "Deep spectral survey of the selected sky areas" on the 6-meter telescope is described. Preliminary results for the central part of field SA57 are discussed. The spectrum of a QSO with probable redshift z=3.87 is presented. The number of quasars per sq. degree is estimated to be 470 - 675 to B < 23 mag., which gives the same slope in the increasing number of QSOs with magnitude as in brighter samples.

1. INTRODUCTION

Spectral observations of the selected sky areas are being carried out on many large telescopes using the slitless spectroscopy method. Nowadays this method develops into multislit field spectroscopy, which combines the advantages of slitless spectroscopy to obtain simultaneously a large number of spectra, with those of slit spectroscopy, to investigate the faintest objects (Dimitrov and Baker 1947; Geyer, Hoffmann and Nelles 1979).

The use of such techniques at the 6-meter telescope provides a unique possibility to carry out spectral observations of objects as faint as the direct plate limit (Dodonov 1982), which allows to solve the following problems:

- to study the quasar redshift distribution;
- to search for young galaxies in distant clusters;
- to define exactly the surface density of quasars fainter than 21 mag.;
- to search for protogalaxies and protoquasars predicted by theory.

According to the program "Deep spectral survey of the selected sky areas", observations started in 1982 (Afanas'ev et al. 1984). The field objects were investigated according to the following scheme:

1) Investigations of photometrical characteristics (in B, V, R

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bands), of astrometrical characteristics and also a division of objects into extended and stellar-like.

2) Spectral investigation of all objects at a resolution of 30-40 Å with the multislit spectrograph to obtain the spectra found on the deep direct plates (with limiting magnitude $23^m.5$ - 24^m).

2. QUASARS TO B < 23^m IN SA57

With the multislit spectrograph we study the central part (7' × 7') of the field SA57 ($13^h06^m+29°45'$). The number of objects to B ~ 23^m in this small field is 110. We obtained spectra for 72 objects, from 18^m to 23^m in B, with a spectral resolution 30 Å and spectral coverage 4000-6500 Å. The spectra were obtained at the 6-meter telescope on 14/15.03 and 15/16.03.86 with the multislit spectrograph and a two-dimensional TV-photon counting system (512 × 512 pixels), with 100 and 70 minute exposures.

After reduction procedures (flat field correction, night sky subtraction) we found that we obtained redshifts for more than 30 galaxies and found 10 quasar candidates. From these 10 candidates 7 were detected with a sufficiently high signal/noise ratio to determine their redshifts. The remaining three objects were probably QSOs judging from the energy distribution and faint spectral lines. In our small field there are 6 QSO-candidates from the list of Koo et al., (1985). We observed all but one object from this list; we confirmed two of the three known redshifts and obtained redshifts for the others. In Fig. 1 we present, for example, spectra of a galaxy and a quasar with a probable redshift z=3.87. We estimated the redshift using the emission line at 5920 Å (Lα) and absorption lines between 5000-5900 Å (Lα forest). The spectrum shortward of 5000 Å was destroyed by overlapping. These spectra are not corrected for spectral sensitivity of the device. In the field of 0.0148 sq. degrees we found seven quasars and three QSO-candidates. If we assume that this is not the result of QSO-density fluctuation, we obtain 470 QSOs per sq. degree as a lower limit and 675 QSO per sq. degree as an upper limit. In Fig. 2 we present these data and data from other surveys.

If there are no density fluctuations we can say that faint QSOs increase with the same slope as that found in brighter samples. Spectroscopy for all objects in fields near 1 sq. degree will give better estimates than those presented here. This will be the main task of our observational program at the SAO 6-meter telescope of the Academy of Sciences of the USSR.

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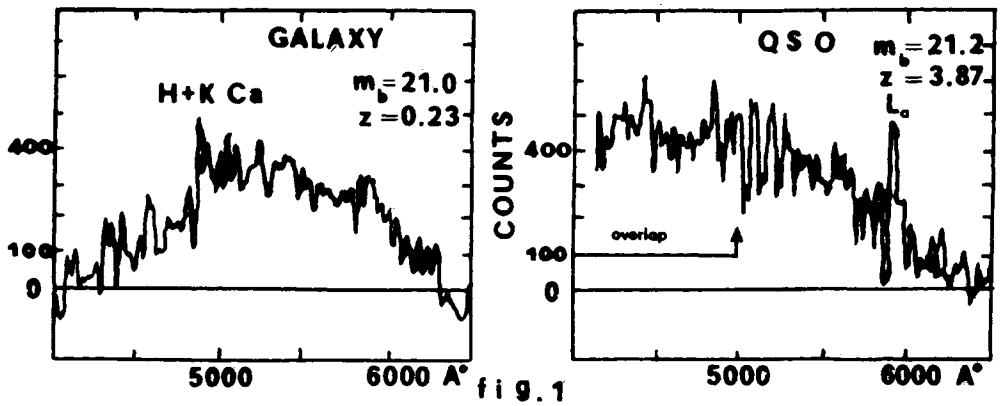

fig.1

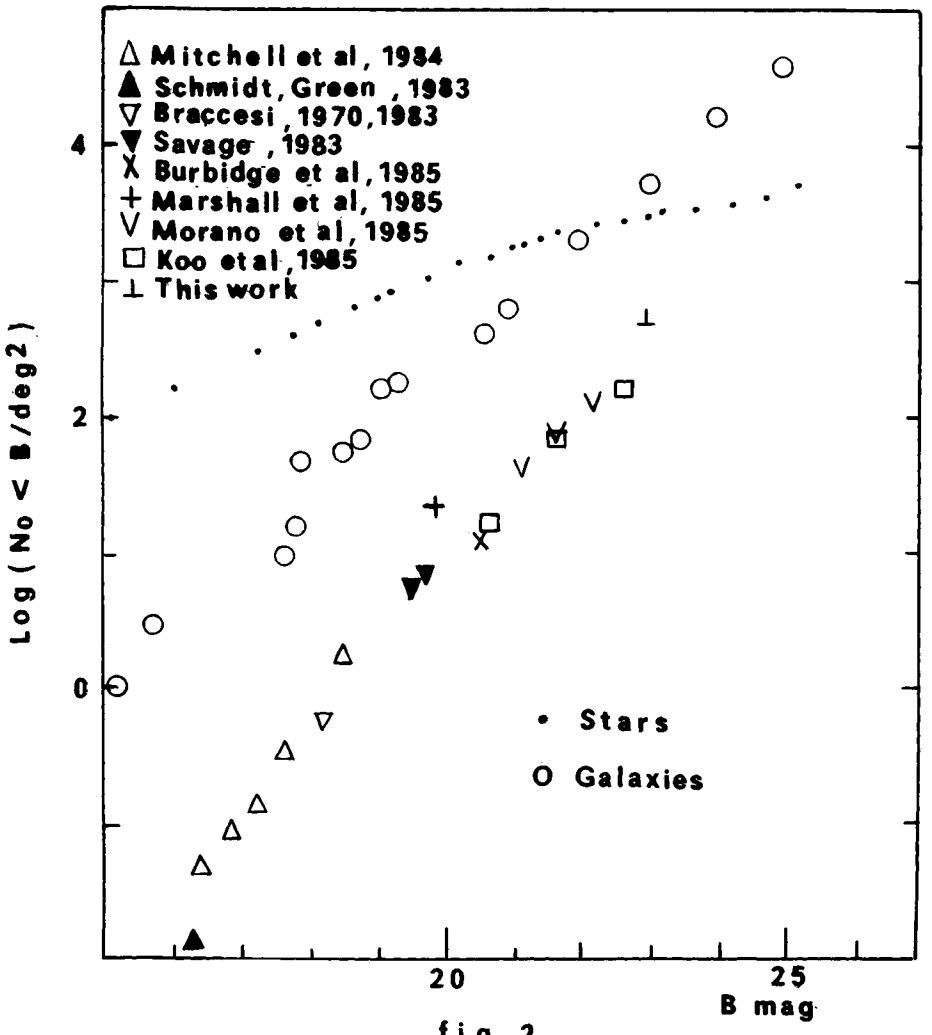

fig.2

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