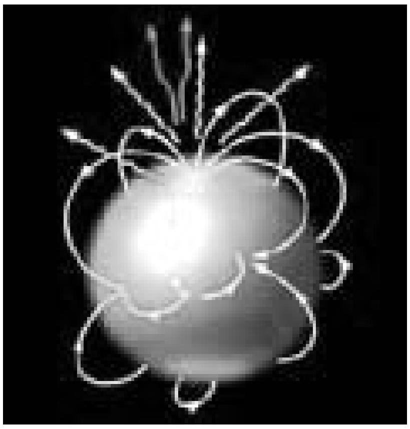
C O L L O Q U I U M   O N

Physics of Neutron Stars



Programme
and
Abstracts

Ioffe Physico-Technical Institute

St. Petersburg, Russia, 25–26 May 1999

ADDENDA

to **Programme and Abstracts**

Programme and Abstracts of *Colloquium on Neutron Star Physics* was published before Colloquium. The aim of these **Addenda**, produced after Colloquium, is to mention several changes which took place after the publication of **Programme and Abstracts**. The present **Addenda** have to be considered as a supplement to **Programme and Abstracts** and can be quoted accordingly in references.

1. The following abstracts must be replaced:
   a) *D.D. Frederiks. The Activity of SGR 1900+14 and SGR 1627-41 from Konus-Wind Observations*
   b) *S.V. Zharikov, V.H. Chavushyan, R. Mújica, and G.G. Valavin. The distance to the millisecond pulsar PSR J1024-0719 and the nature of the pulsar optical counterpart*

2. The following abstracts must be added:
   1) *V.S. Imshennik. Hydrodynamic model of noncentral explosion of collapsing supernovae.* Review talk
   2) *V.N. Komarova. CCD-observations of "middle-aged" pulsars with the 6m telescope.* Poster
   3) *S.B. Popov, M.E. Prokhorov, V.M. Lipunov. Populations of close binaries in galaxies with recent bursts of star formation.* Poster

3. Presentation by *A.N. Timokhin, G.S. Bisnovatyi-Kogan, H.C. Spruit*, announced initially as poster, was given as contributed talk.

4. *A.D. Kuzmin* and *V.M. Lipunov* were unable to attend Colloquium and present their contributions.

5. Chairman of *Session 2* was *E.P. Mazets*.

The corrected and added abstracts are given below. Numeration of pages of the corrected abstracts is the same as in **Programme and Abstracts** to avoid confusion in references. The added abstracts are meant to be placed below the abstracts published in **Programme and Abstracts**, and the pages are numerated accordingly.

The second edition of the booklet is prepared and available through internet http://www.ioffe.rssi.ru/dtastrop.html. It contains corrected and added abstracts, and updated programme

The Activity of SGR 1900+14 and SGR 1627-41 from Konus-Wind Observations

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Results are presented of the observations of the soft gamma repeaters SGR 1900+14 and SGR 1627-41 with the Wind spacecraft during period from May 1998 to January 1999. Individual characteristics of recurrent bursts, such as their time histories, energy spectra, peak fluxes and fluencies, are considered as well as some statistical distributions. The observations of the giant outbursts in SGR 1900+14 (August 27) and SGR 1627-41 (June 18) are analysed. A comparison is made of these two extremely intense events with the well known outburst of SGR 0526-66 (March 5, 1979). The striking similarity between the outbursts on August 27 and March 5 stresses their common but peculiar nature, while the June 18 event seems to be a giant in a sequence of recurrent bursts.

The distance to the millisecond pulsar PSR J1024-0719 and the nature of the pulsar optical counterpart

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The coordinates of the PSR J1024-0719 pulsar coincide with those for an optical object in the Digital Sky Survey within $\sim$ 0.1". The optical companion is a star-like object with $V = 19.78 \pm 0.02$, $B - V = 1.35 \pm 0.03$, $V - R_c = 0.84 \pm 0.01$, $R_c - I_c = 0.80 \pm 0.02$ as follows from the photometric observations with the 6m telescope BTA SAO RAS. The spectrum of the optical object was obtained with the 2.1 m telescope of the "Guillermo Haro" Observatory in Cananea, Sonora, Mexico, using the Landessternwarte Faint Object Spectrograph and Camera (LFOSC) on 17 April 1999. The color indices and spectrum of the object correspond to a star of K7V spectral class. For an interstellar extinction in this direction $E_{(B-V)} = 0.05$, a distance to the pulsar binary system is 1.9 ± 0.2 pc for a K7V star.

Hydrodynamic model of noncentral explosion of collapsing supernovae

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The non-one-dimensional rotational mechanism of supernova explosion was proposed earlier as the main mechanism of collapsing supernovae of type II (Imshennik, 1992). This mechanism includes hydrodynamic asymmetric explosion model formulated and solved in the two-dimensional approximation. As was shown by Aksenov et al. (1997), at final moment of calculations $t \simeq 0.75$ s the front of a shock wave (SW) reaches the radius $\sim$ 10000 km without SW stagnation or conversion into accreting SW, contrary to another non-one-dimensional mechanism of type II supernovae, the neutrino – convective mechanism (Yanka, Müller, 1996). The features of hydrodynamic motion obtained both by Eulerian Method (PPM) and Lagrangian Method (LM) are in good agreement with each other. The LM calculations with realistic equation of state (Fermi-Dirac statistics for electron-positron gas and iron dissociation-recombination processes in nuclear gas) are also presented. In this case, the mass of synthesized radioactive ^{56}Ni can be estimated in the range (0.040 — 0.055) $M_\odot$. These values are in accord with the mass $M(^{56}Ni) = 0.075 M_\odot$ determined for SN 1987A (Nadyozhin, 1991).

Populations of close binaries in galaxies with recent bursts of star formation

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This paper is a continuation and development of our previous articles (Popov et al., 1997, 1998). We use "Scenario Machine" (Lipunov et al., 1996b) – the population synthesis simulator (for calculations of single binary systems, the program is accessible through internet: **http://xray.sai.msu.su/sciwork/scenario.html** (Nazin et al., 1998) – to calculate evolution of populations of several types of X-ray sources during the first 20 Myrs after a star formation burst.

We examined evolution of 12 types of X-ray sources in close binary systems (both, with neutron stars and with black holes) for different parameters of the initial mass function (IMF) – slopes: $\alpha = 1$, $\alpha = 1.35$ and $\alpha = 2.35$ and upper mass limits: 120 $M_{\odot}$, 60 $M_{\odot}$ and 40 $M_{\odot}$. The results, especially for the sources with black holes, are very sensitive to variations of the IMF, which should be taken into account while fitting parameters of star formation bursts.

The results are applied to several regions of recent star formation in different galaxies: Tol 89, NGC 5253, NGC 3125, He 2-10, NGC 3049. Using known ages and total masses of star formation bursts (Shaerer at al., 1998), we calculate the expected numbers of X-ray sources in close binaries for different parameters of the IMF. Usually, X-ray transient sources consisting of a neutron star and a main sequence star are most abundant, but for very young bursts (of ages less than ≈ 4 Myrs) the sources with black holes may become more abundant.

References

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3. Popov, S.B., Lipunov, V.M., Prokhorov, M.E., & Postnov, K.A., 1997 (astro-ph/9711352)
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CCD-observations of "middle-aged" pulsars with the 6m telescope

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The results of the program for the study of the optical counterparts of pulsars at the 6m telescope of the Special Astrophysical Observatory are presented. The photometric observations of two "middle-aged" pulsars PSR B1951+32 (CTB80) in the R band and PSR J0633+17 (Geminga) in the R and I bands of Cousins system yielded the images of the CTB80 and Geminga fields and magnitude estimates of the objects under investigation and their surroundings.

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