Session:	**[B3C-5] S5 : Compact Objects, High Energy and Particle Astrophysics**
Date:	August 20, 2014 (Wednesday)
Time:	16:00~17:30
Room:	Room E (Room 107)
Chair:	Gavin Rowell (University of Adelaide)

[B3C-5-1] **16:00~16:15**

The Interaction of Microquasar Jets with a Stellar Wind in High-Mass X-ray Binaries

DooSoo Yoon (University of Wisconsin-Madison, USA) and Sebastian Heinz

Jets powered by high-mass X-ray binaries must traverse the powerful wind from the companion star. We present the first 3D simulations of jet-wind interactions in high-mass X-ray binaries. We show that the wind momentum flux intercepted by the jet can lead to significant bending of the jet. We show that jets propagating through a spherical wind will be bent to an asymptotic angle ψ∞ that differs from the cumulative angle of 180◦ expected for jets propagating through uniform wind, and derive simple expressions for ψ∞ as a function of jet power and wind thrust. The orbital motion of the binary must therefore lead to jet precession on the orbital period, with an opening angle of ψ∞. For known wind parameters, measurements of ψ∞ can be used to constrain the jet power. In the case of Cygnus X-1, the lack of jet precession as a function of orbital phase observed by the VLBA can be used to put a lower limit of Pjet ≥ 2 x 1036 ergs s-1 (α/2°)2 (vjet/0.1c) for reasonable estimates of the wind flux from the O9.7 Iab companion, where α is the half-opening angle of the jet and vjet is the jet velocity. We further discuss the case where the initial jet is inclined relative to the binary orbital axis. We also analyse the case of Cygnus X-3 and show that jet bending is likely negligible unless the jet is significantly less powerful than currently thought.

[B3C-5-2] **16:15~16:30**

The Effect of X-ray Irradiation on the Time Dependent Behavior of Accretion Disks with Stochastic Perturbations

Bari Maqbool (University of Kashmir, India), Ranjeev Misra, and Naseer Iqbal

The UV emission from X-ray binaries, may arise from the outer accretion disk. The structure of the outer disk may be altered due to the presence of X-ray irradiation and we discuss the physical regimes where this may occur and point out certain X-ray binaries where this effect may be important. The long term X-ray variability of these sources is believed to be due stochastic fluctuations in the outer disk, which propagate inwards giving rise to accretion rate variation in the X-ray producing inner regions. Our motivation is to understand the effect of X-ray irradiation in such a scenario. To this end, a time dependent hydrodynamical framework with X-ray irradiation needs to be set up, such that the effect of fluctuations in the outer disk can be studied. We started, following earlier works, to solve for the steady state accretion disk structure taking into account irradiation. To understand the qualitative behavior, we adopt simplistic assumptions that the disk is fully ionized and it is not warped. We then proceed to develop a time dependent hydrodynamic code, which in the absence of perturbations is numerically stable. A sinusoidal perturbation was introduced at different radii, and its effect on the mass accretion rate in the inner disk was computed. The code was carefully studied to verify that the results are invariant to the numerical time steps and radial bins used. While we didn't find any oscillatory or limit cycle behavior due to the X-ray irradiation feedback, our results show irradiation enhances the X-ray variability at time-scales corresponding to the viscous time-scales of the irradiated disk.

[B3C-5-3] **16:30~16:45**

Quantum Interference Effects in Spacetime of Slowly Rotating Compact Objects in Conformal Weyl Gravity

Abdullo Hakimov (Ulugh Beg Astronomical Institute, Uzbekistan)

General relativistic quantum interference effects in the fourth-order theory of slowly rotating conformal Weyl space-time as the phase shift effect and the Sagnac effect of interfering particle in neutron interferometer are considered. Using the covariant Klein-Gordon equation in the nonrelativistic approximation, it is shown that the phase shift in the interference of particles includes the additional potential terms with the weyl parameter. This term can be, in principle, detected by sensitive interferometer and derived results can be further used in experiments to detect the hidden mass which is responsible for the galactic rotation curve. It was found that in the case of the Sagnac effect the influence of weyl parameter is becoming important due to the fact that the angular velocity of the locally non rotating observer must be smaller than one in the Kerr space-time.
Here we study quantum interference effects in particular the phase shift effect in a neutron interferometer and Sagnac effect in conformal Weyl gravity model. It has been shown that the static, spherically symmetric fourth-order conformal Weyl spacetime was converted into the rotational one by using the Newman-Janis algorithm.
We have studied quantum interference effects including e.g. the phase shift and time delay in Sagnac effect in the spacetime of rotating gravitational objects conformal fourth-order Weyl gravitational theory and found that they can be affected by the integration constant of the theory which is responsible for the dark matter in galaxies. Then, we have derived an additional term for the phase shift in a neutron interferometer due to the presence of linear term in slowly rotating metric and studied the feasibility of its detection with the help of interferometer. Here we have estimated lower limit for parameter as using the experimental results on the precise measurement of the gravitational redshift by the interference of matter waves.

[B3C-5-4] **16:45~17:00**

Multi-Observation Identification for Studying the Evolution of Spin-Up Line

Ali Taani (Al-Balqa' Applied University, Jordan)

Observation and analysis of pulsars has proven to be a valuable tool in the comprehension of their nature and physics. These classes of gorgeous objects are extremely important as a test-bed for understanding the magnetic field which consider among the enigmatic issues (see e.g., Bhattacharya & van den Heuvel 1991 for an extended review, Stairs 2004 and Lorimer 2008). Hence the magnetic field strengths at the Neutron Star (NS) surface, derived assuming dipole fields, differ by four orders of magnitude between Millisecond Pulsars (MSPs) and young pulsars. The increased number of objects improves the statistics for some parameters such as spin period and magnetic field, thus helping to: refine existing models, provide an update distribution to the wide variety and natures of population, discuss the various formation scenarios and provide us with constraints that help us improve our understanding of binary evolution. This is the aims of the present paper. To quantitatively describe the evolution and formation of pulsars population diagram, I perform a statistical study that combined different natures of binaries with a compact component, such as, normal pulsars, MSPs, Fermi pulsars, Supernova Remanents (SNRs) Magnetars and High-Mass X-Ray Binaries (HMXBs) that observed in different energy bands. In addition I fit the surface magnetic field and spin period distribution function (so called spin-up line or B - P diagram) of observed sample. I find that pulsars that have evolved through different evolutionary paths reflect distinctive signatures through dissimilar distribution of magnetic field and spin period values during the spin-up phase. The implications of the results are to provide constraints on binary evolution and characteristics of the binary pulsar population. Furthermore, in a steady state there should be a constant flow of pulsars in the B-P diagram from the region where they are born to the region where they die.

Poster Session **17:00~17:30**

Chairs: **Gavin Rowell** (University of Adelaide)

Maurice van Putten (Sejong University)