Summary of Tuesday sessions

Marek Sikora

Kraków, April 2015

Ramesh Narayan:

Similarities and differences between jets in super-Eddington systems vs the better-understood jets in radiatively inefficient ADAFs.

Ioannis Contopoulos:

Observations of the Faraday Rotation Measure in galaxies and extragalactic jets suggest that some kind of battery mechanism must be in action to generate the observed large scale magnetic fields. It was argued that the model based on the Poynting-Robertson effect acting around the inner edge of the accretion disk can account for the origin of such fields.

Yury Lyubarsky:

Basic properties of Poynting dominated jets. The role of the confining medium in collimating the outflow. The intimate connection between the collimation and acceleration. The physical mechanisms responsible for the transformation of the electromagnetic energy into the plasma energy: the role of MHD instabilities and magnetic dissipation..

Iwona Mochoł:

Winds powered by rotating compact objects are usually modelled in the framework of relativistic MHD. However, as the flow expands radially, the plasma density drops with the distance and ultimately, at the critical point the MHD approximation breaks down, allowing new large-amplitude waves to propagate. They have important implications for the energy dissipation in freely expanding jets and in standing shocks, located at large distances from a central source.

Vasily Beskin:

Frequency dependent shifts of radio cores were used to obtain the number density of the jet plasma and to evaluate the multiplicity and Michel magnetization parameter. As a result, it was found that on the parsec scales the plasma carries almost all energy of the jet and that the poloidal magnetic field and particle density are much larger in the center of the jet than near the jet boundary.

Yosuke Mizuno:

The non-destructive kink structure in observed relativistic jets may be related a partially stabilized current-driven kink instability by a radially increasing density structure.
The Kelvin-Helmholtz instability is stabilized by the existence of a magnetized sheath wind even when the jet is super-Alfvenic flow.
The recollimation shock structure can be modified by the presence of the magnetic field, especially a helical magnetic field yields more complex shock and rarefaction substructure.

Denise Gabuzda (Teddy Cheung):

Recent Monte Carlo simulations have shown that Faraday-rotation gradients associated with helical jet B fields can be detected across AGN jets even when the jet width is very small (1/20) of the beam width, and have also improved our understanding of on-source uncertainties in VLBI images. So far, 27 monotonic transverse RM gradients with significance of at least 3sigma have been found, of which 20 are oriented clockwise relative to the jet base and only 7 counter-clockwise. The probability of this arising due to chance is only 1%, but this asymmetry can be understood if the direction of rotation and the direction of the axial (poloidal) up are coupled. This requires an appropriate system of currents and fields in and around the accretion disk + jets - one example is the "Cosmic Battery" described by Yiannis Contopoulos..

Emmanouil Angelakis:

RadioPol project of linear and circular multi-frequency polarisation monitoring of blazars was presented.

Masanori Nakamura:

Discovery of a structural change of a jet in M87 from parabolic to conical geometry was reported. This change coincides with a transition from increasing to decreasing observed proper motions and occurs at around the sphere of the gravitational influence of the BH. In this same region the HST-1 knot is located, where recurrent superluminal knots are ejected..

David Meier:

It appears that in at least most strong AGN jets there is a significant feature/event in the propagation of a super-magetosonic jet: a quasi-stationary (re-)collimation shock. Such a shock appears to convert the pinch-unstable flow into a stable one that continues out to the ~100 kpc lobes.
The reconfinement shock in M87 (HST-1) appears to be responsible for the "jet break". Reconfinement shocks also play an important role in the FRI/II dichotomy.

Robert Laing:

Magnetic fields in kiloparsec scale relativistic jets.

Bia Boccardi:

mm-VLBI study on Cygnus A suggests the presence of transverse stratification of the flow speed, consistent with a spine-sheath structure. The fast and the slow components accelerate on parsec scale, each with a different speed gradient. The jet switches from parabolic to cylindrical in the region where the acceleration appears to cease.

Maxim Lyutikov:

Energy dissipation in relativistic magnetized outflows.

Dimitrios Giannios:

Jets can be launched from small-scale fields generated locally at the accretion disk. Such jets contain field reversals that may power the jet emission through magnetic reconnection. It was demonstrated how magnetic reconnection can account for some basic observed properties of GRBs and blazar jets.

Miguel Aloy:

The interaction between a GRB jet and its progenitor star yields highly variable jet, whose power density spectrum (PDS) depends on the progenitor structure, as well as on the magnetic field.
There is a decrease of the PDS at high frequencies that we relate to the stellar density gradient, particularly close to the stellar surface.
The variability at low frequencies (<~ 5 Hz) can be used as proxy for magnetization.

Asaf Pe'er:

Photospheric emission from highly magnetized outflows in GRBs was considered. It was shown that if GRB outflows are highly magnetized, photon production rate is insufficient to compensate for the acceleration rate. As a result of this photon starvation, the photos that emerge from the photosphere have much higher temperatures than observed. Hence the GRB outflows are unlikely to be highly magnetized.