

# Workshop on Relativistic Plasma Astrophysics, Purdue University, May 9-11 2022

## Sunday May 8th

5pm – Reception at Maxim Lyutikov’s house, 1200 Kingswood Rd South, West Lafayette, IN 47906

## Monday May 9th, PHYS 223

8:50-9:00 Opening remarks/welcome - Maxim Lyutikov

### The big picture

- 9:00-9:30 – Amitava Bhattacharjee: Relativistic Plasma Astrophysics: Theoretical Perspective (25+5)
- 9:30-10:00 – Sasha Philippov: Relativistic Plasma Astrophysics: Computational Perspective (25+5)
- 10:00-10:30 – Roger Blandford: Relativistic non-Plasma Astrophysics (25+5)
- 10:30-11:00 **Coffee break**

### FRBs and magnetars

- 11:00 - 11:20 Yajie Yuan: FRBs from magnetar bursts
- 11:20 - 11:40 Andrei Beloborodov: Ultrastrong electromagnetic waves and FRBs
- 11:40- 12:00 Maxim Lyutikov: Free electron laser in pulsars and FRBs
- 12:00-12:30 Discussion
- 12:30-1:30 **Lunch**
- 1:30- 1:50 - Sam Grala: On ultrarelativistic motion in strong electromagnetic fields
- 1:50-2:10 - Yiannis Contopoulos: The role of the current sheet in the pulsar magnetosphere
- 2:10- 2:30 - Sergey Cherkis: Topology of Magnetic Flux Tubes in Coupled Binaries
- 2:30-3:00 Discussion

- 3:00-3:30 Coffee break
- 3:30-3:50 Joonas Nattila: Alfven-wave turbulence in the magnetosphere of compact objects
- 3:50- 4:10 Libby Tolman, Dynamics of non-stationary pair discharges in pulsar magnetospheres
- 4:10 - 4:30 Jens Mahlmann: Electromagnetic fireworks - Fast radio bursts from rapid reconnection in the compressed magnetar wind
- 4:30- 4:50 Mikhail Medvedev: On magnetospheric plasma of a magnetar
- 4:50-6:00 Discussion and Poster presentations

**Dinner: McGraw Steakhouse, drinks starting 6pm, sit-down at 7pm**

**Tuesday May 10th, PHYS 223**

### **Experiments**

- 9:00 -9:30 Louise Willingale – Relativistic laboratory astrophysics (25+5)

### **Pulsars**

- 9:30 -10:00 Constantinos Kalapotharakos: Interpreting the Fermi pulsar phenomenology and beyond (25+5)
- 10:00-10:20 Hayk Hakobyan: Energy dissipation and gamma-ray emission in young pulsars.
- 10:20-11:00 **Coffee break**

### **CRs/BHs/Jets**

- 11:00 -11:20 Dmitri Uzdensky: Reconnection-Powered High-Energy Flares from Accreting Black Holes
- 11:20 - 11:40 Noemie Globus: M87: black hole, ergomagnetosphere, ejection disc and jet
- 11:40- 12:00 Amir Levinson: Can intermittent jets in collapsars produce GRBs?
- 12:00-12:30 DISCUSSION
- 12:30-1:30 **Lunch**
- 1:30- 1:50 Benjamin Crinquand: GRPIC simulations of black-hole magnetospheres

- 1:50- 2:10 Anna Chashkina: GRMHD simulations of BH activation by small magnetic loops: formation of striped jet and active coronae
- 2:10-2:30 Bart Ripperda: Black Hole Flares.
- 2:30-3:30 Discussion & Coffee break

### **Shocks/Reconnection/Turbulence**

- 3:30 -3:50 Lorenzo Sironi: Particle injection and acceleration in relativistic reconnection
- 3:40 - 4:10 Greg Werner: Relativistic Reconnection in 3D
- 4:10- 4:30 Vladimir Zhdankin: Relativistic particle energization by turbulence
- 4:30-4:50 Luca Comisso: Radiative Turbulence in Magnetically Dominated Plasmas: Particle Acceleration and Cooling .
- 4:50 - Discussion

**Dinner: on your own**

**Wednesday May 11th, PHYS 223**

### **CRs/BHs/Jets**

- 9:00 -9:20 Anatoly Spitkovsky: Shaken, not stirred: effects of plasma cavitation in relativistic shocks.
- 9:20 - 9:40 Jonathan Zrake: Spreading of relativistic second-type hydrodynamic shocks
- 9:40-10:00 John Mehlhaff: Magnetic Reconnection in Blazar Jets
- 10:00- 10:20 Arno Vanthieghem: The role of plasma instabilities in relativistic radiation mediated shocks
- 10:20-11:00 **Coffee break**
- 11:00 - 11:20 Dimitrios Giannios: Particle acceleration and radiative coolings
- 11:20 - 11:40 Fiuza Frederico: Efficient particle acceleration in kink-unstable relativistic jets .
- 11:40- 12:00 Omer Bromberg: Kink instability and energy dissipation in relativistic magnetized jets
- 12:00-12:30 Discussion
- 12:30-1:30 **Lunch**

- 1:30- 1:50 Andrew MacFadyen: Ellipsars: Ring explosions from flattened stars
- 1:50-2:10 Fabio Bacchini: Particle-in-Cell simulations of the magnetorotational instability
- 2:10-2:30 Alex Chen: Can Magnetic Reconnection Power TeV Flares from M87?
- 2:30 - 3:30 Discussion and coffee break

### **Numerical schemes**

- 3:30- 3:50 Asaf Pe'er: cuHARM: A new GPU-accelerated GRMHD code
- 3:50-5:00 Discussion

### **Posters**

1 Slide, 3 minutes

- Alisa Galishnikova: Simulations of collisionless spherical accretion
- Muni Zhou: Spontaneous magnetization of collisionless plasma.
- Daniel Groseelj: Microphysics of relativistic collisionless electron-ion-positron shocks.
- Navin Sridhar: Comptonization by reconnection plasmoids in black hole coronae
- Aaron Tran: Electron Re-acceleration via Ion Cyclotron Resonance in the Intra-cluster Medium
- Ryan Peterson: Magnetic field amplification by a plasma cavitation instability in relativistic shock precursors.
- Alex Chen: Propagation of a Strong Fast Magnetosonic Wave in the Magnetosphere of a Neutron Star
- Lev Arzamasskiy: Hybrid-PIC Simulations of Dissipation and Instabilities in Collisionless Turbulence
- Pasha Abolmassov: Relativistic Rayleigh-Taylor instability in global jet simulations
- Lia Hankla: Nonthermal electrons in a black hole's plunging region
- Maxim Lyutikov: Faraday Conversion in pair plasma