Class on Observation of Neutron Stars

Draft program – S.Mereghetti - 4/12/14

1. Introduction to NS

(basic properties – relevance of their study for astrophysics and for physics – brief history overview – current census and classification)

2. How we study NSs over the whole e.m. spectrum

telescopes and instrumentation (interaction photons/matter , X/gamma detectors)
high-energy imaging techniques (x-ray mirrors, coded masks, pair trackers, atmosph. Cherenkov)
techniques and analysis issues (timing, spectroscopy, background issues, etc..)

3. NSs in X-ray binaries

basic concepts (accretion, Eddington lum., mass function, etc…)
classification (persistent/transient , High/Low mass binaries, etc…)
Overview of evolution

4. High Mass X-ray binaries

pulsations properties (accretion torques, P evolution, equilibrium period, etc..)
spectral properties (accretion column radiation, cyclotron lines, etc..)
newly discovered HMXB classes (SFXTs, highly absorbed, gamma-ray binaries)

5. Low Mass X-ray binaries

classification and properties – type I bursts – QPOs
recycling scenario for ms-PSRs
recent discoveries: TAXPs

6. Radio Pulsars

Radio PSRs (basic properties, P-Pdot diagram, B estimate, etc.)
Multiwavelength observations of rotation-powered PSRs (X-ray thermal/non-thermal, optical, gamma-rays)
Millisecond and binary pulsars

7. other isolated NS

XDINs, CCOs, AXPs, SGRs
Magnetars (properties, bursts and giant flares, models, etc…)
Magneto-thermal evolution and ''unification" of NS population
Relevance for other fields (GRBs, GW, etc..)