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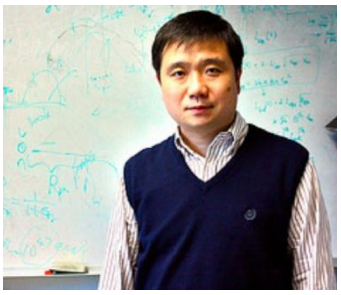
Fast radio bursts: mysterious transients and implications

Bing Zhang (university of neveda)



Dr. Bing Zhang is a theoretical astrophysicist. He is a full professor in astrophysics of University of Nevada, Las Vegas (UNLV), and a Cheung Kong Visiting Chair professor of Peking University. After getting his PhD from Peking University in 1997, he worked at NASA Goddard Space Flight Center and Pennsylvania State University as a postdoctoral research associate before joining UNLV faculty in 2004. His research focuses on understanding the underlying physics of the high energy universe, including systems containing black holes of different scales and neutron stars of different species, relativistic jets launched from these systems as well as their interaction with the ambient medium. Most of his research papers are dedicated to understanding gamma-ray bursts (GRBs), the most luminous explosions in the universe, but his publications also cover a wide range of topics in astrophysics, including gamma-ray and radio pulsars, magnetars, fast radio bursts, active galactic nuclei, tidal disruption events, white dwarfs, neutrinos and cosmic ray physics, electromagnetic counterparts of gravitational wave sources, dark matter, strange quark stars, planetary collisions, etc. He has published over 240 refereed papers with more than 13000 citations, and is one of the most cited authors in the field of GRBs.

Abstract

The discovery of fast radio bursts (FRBs) opens an exciting new field in transient astrophysics. Similar to late 1960's when gamma-ray bursts (GRBs) were first discovered, this field now is full of speculations, with number of models exceeding number of bursts. I will review the observational properties of FRBs and issues of the proposed models, and argue that FRBs are best interpreted as implosions of supra-massive neutron stars after loosing centrifugal support. I propose that a small fraction of FRBs could be physically associated with some GRBs, and could be detected 10^2-10^4 seconds after the triggers of some GRBs. I will describe current status of searching for such associations. Assuming the putative associations could be real, I will discuss the profound implications of such associations for several fields in astrophysics, including the physical mechanisms of FRBs, GRBs, neutron star equation-of-state, cosmology, and cosmography. Finally, I will discuss some predictions of FRB afterglows, and possible observational strategies to detect them.