

Fall 2021 Colloquium

Department of Physics & Astronomy, A&M-Commerce

Nov 4, Thursday, 4-5 PM in Science Building 127

(No refreshment temporarily due to COVID-19)

Astrophysics

White Dwarfs and Neutron Stars: Recent progress

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Dr. Manuel Malheiro: Ph.D. in Physics from the University of Sao Paulo (USP), Brazil, in 1991. Post-doctorate at the University of Maryland, College Park, E.U.A. (1996-1997), and a Senior Research visitor at the Università Degli Studi di Roma "La Sapienza" (2010/11). Professor of Physics since 1992, and since October of 2014 has been allocated as Full Professor at the Physics Department of the Fundamental Science Division at Aeronautics Institute of Technology in São José dos Campos, São Paulo State, Brazil. Dr. Malheiro has research experience in Physics and Astrophysics, encompassing the following subjects: nuclear matter and relativistic nuclear physics, hadronic physics and quarks, hot and dense hadronic and nuclear matter, relativistic astrophysics, pulsar magnetosphere and electromagnetic emission models, massive and magnetic white dwarfs, and more recently in plasma physics regarding ionosphere plasma instabilities.

Abstract

White Dwarfs and Neutron Stars are the very final end of the stars with masses below 30 solar masses. They are very compact with densities much larger than the ones we experience in our lives. White dwarfs and neutron stars are also quantum stars and the last one is a relativistic star where their huge densities curve the space-time around them. Pulsars are normally very magnetic neutron stars that spin very fast with quite a constant periodicity. I will discuss massive, fast, and magnetic white dwarfs recently discovered, and in particular, the first white dwarf-pulsar AR Scorpii found in 2016. The importance of the internal temperature, rotation and General Relativistic (GR) effects for very massive and fast white dwarfs to obtain a correct description will be highlighted. Recently, very massive neutron stars with masses above 2 solar masses were observed, and more accurate neutron star radii measurements were obtained in 2019-2021 by the NICER (Neutron Star Interior Composition Explorer Mission), an International Space Station instrument of NASA. These recent results seem to indicate that neutron stars with 1.4 and 2.1 solar mass have approximately the same radius around 12.5 Km, which implies a more stiff equation of state for the high-density regime of nuclear matter than the majority of the hadronic models predict when extrapolation for this density regime is assumed. Testing extended theories for gravity with compact stars will be presented.