



Dipartimento di Fisica  
"G. Occhialini"



# Colloquio di Dipartimento

nell'ambito della scuola di dottorato

Mercoledì, 4 Dicembre 2013

ore 14:30

Edificio U1 – Stanza 06

## **Andrea Possenti**

INAF/Oss. Astronomico di Cagliari

### **Is there a breakdown of General Relativity in strong field regime? Addressing the issue with pulsar observation.**

While General Relativity has passed, magna cum laude, all the potentially lethal tests in the weak gravity regime of the Solar System, it is still an open issue if other theories of gravity may provide a better description of the behavior of the Nature in the extreme physical conditions (i.e. the strong field regime of application of the putative unified theories) holding in the first fractions of second after the Big-Bang.

In this context, some of the so-called recycled pulsars represent a unique tool for setting up falsification experiments. In fact, due to evolutionary reasons and intrinsic properties, some recycled pulsars behave as highly stable clocks and the measurement of the times of arrival of their pulses can provide an accurate determination of their positional, kinematic, spin and, when appropriate, orbital parameters, as well as indications on the properties of their space-time environment. This provides the observational basis for using the pulsars for performing tests of General Relativity and alternate gravity theories in a strong field regime. As an additional bonus, the regular timing of the best pulsar clocks opens the possibility - in the near future - of obtaining a direct detection of gravitational waves in the nanoHz frequency range and comparing some of their fundamental properties with the predictions of General Relativity. The talk will summarize the theoretical and experimental methodologies for performing some of these investigations, and will present the intriguing perspectives of the future experiments on this field of research.

