

# Lectures on Magnetar

Tuesday, 15 September 2015 - Wednesday, 16 September 2015

LNGS

## Programmme

THERE IS NO CONFERENCE FEE

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**15 September, Tuesday**

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Morning, Pontecorvo Room

9:30-10:30 - R. Tuolla - Soft gamma-repeaters and Anomalous X-ray pulsars (SGRs & AXPs): the observational manifestations of magnetars

10:30-11:30 - A. Bonanno - Introduction to dynamo theory

11:30-12:00 - Break

12:00-13:00 - R. Tuolla - Persistent emission from magnetar sources

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Afternoon, Rossi Room

14:30-16:30 - Round table discussion

**16 September, Wednesday**

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Morning, Pontecorvo Room

9:30-10:30 - A. Bonanno - Stability of magnetic fields in stably stratified stellar interior

10:30-11:30 - R. Tuolla - Transient magnetars, bursts & giant flares

11:30-12:00 - Break

12:00-13:00 - A. Bonanno - The generation of MF in NS

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Afternoon, Pontecorvo Room

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### List of abstracts

#### Roberto Turolla

(Padova University & INFN)

#### **Lecture 1 - Soft gamma-repeaters and Anomalous X-ray pulsars (SGRs & AXPs): the observational manifestations of magnetars**

The observational properties of "magnetar sources" are reviewed. This will cover both the persistent emission at different wavelengths and bursts & flares from SGRs and AXPs. Observational evidences in favor of the magnetar scenario are discussed.

#### **Lecture 2 - Persistent emission from magnetar sources**

The current picture for the persistent X-ray emission of magnetars is presented. Starting from the "twisted magnetosphere" model it is shown how the observed X-ray spectrum can be reproduced and how the comparison of models with data can probe the structure of the star magnetosphere.

#### **Lecture 3 - Transient magnetars, bursts & giant flares**

Emission from magnetars is variable on different timescales, from less than a second for the bursts, to several months for the outbursts which characterize transient sources. The current modeling and the physical mechanisms responsible for these phenomena are reviewed.

#### Alfio Bonanno

(INAF & INFN)

#### **Lecture 1 - Introduction to dynamo theory**

Mean field MHD and the alpha-effect. Models of dynamo mechanisms: alpha-omega and alpha<sup>2</sup>

dynamo. Exact solutions and numerical solutions.

### **Lecture 2 - Stability of magnetic fields in stably stratified stellar interior**

Basic MHD instabilities. Tayler instability. MRI instability. Numerical simulations and experiments.

### **Lecture 3 - The generation of MF in NS**

Basic of proto-NS physics. Dynamo actions in proto-NS. Cooling of isolated NS: the role of magnetic fields and superfluidity.