UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Cosmic Rays

2122-1-F5802Q013

Aims

Introduce physics of Cosmic Rays and their relevance for Astrophysics, production sources, propagation environments and processes

Contents

Cosmic rays (CR) are described in relation to observations, their composition and properties. Main topics are: origin and astrophysical sources of CR; acceleration processes; interaction with interstellar medium; propagation in the Milky Way; interaction with solar wind; propagation in the heliosphere; interaction with the Earth magnetic field and atmosphere; CR studies in relation to fundamental physics and cosmology.

Detailed program

- Observational properties of Cosmic Rays: spectral intensity, energy density and composition. Main scientific results observing CR, current experimental activities from the ground and in space.
- Origin of CR: acceleration processes, galactic and extragalactic astrophysical sources.
- Interaction of CR with interstellar medium and propagation in the Milky Way: diffusive models and confinement processes, energy loss processes and electromagnetic radiation from CR, spallation processes and secondary component production.
- Interaction with solar wind and solar modulation: solar magnetic activity, solar particle emission, heliosphere.

- Interaction with the Earth magnetic field and atmosphere: radiation belts and geomagnetic cut-off, extensive air showers and observations of highest energy CR.

- Relevance of Cosmic Rays for fundamental physics and cosmology: new physics reserch, Dark Matter, Cosmologic Anti-matter, CRs of extragalactic origin.

Prerequisites

knowledge of the previous courses of physics

Teaching form

front teaching

Textbook and teaching resource

1. Slides and notes of the lectures, provided by the lecturer.

2. Reference textbooks: a) High Energy Astrophysics, M.S. Longair, Cambridge University press, third edition, ISBN 978-0-521-75618-1; b) Space Physics – An introduction, C.T. Russel, J.G. Luhmann, R.J. Strangeway, Cambridge University press, ISBN 978-1-107-09882-4.

Semester

Second semester

Assessment method

Final assessment with score up to 30, by interview consisting of a presentation and a discussion on one of the topics treated in the course, as a student choice.

Office hours

Tentatively every working Monday during the course, from 12:30 pm to 1:30 pm. Otherwise on request. This calendar is depending on the final lectures timetable.