UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Experimental Cosmology

2122-1-F5802Q009

Aims

Knowledge of observational evidences and experimental techniques for cosmology.

Contents

Elements of cosmology. Cosmic Microwave Background: history and current status of measurements. The sky at millimeter and submillimeter wavelengths. Physical observables, cosmological parameters and experimental techniques.

Detailed program

- Historical recalls, short review on modern cosmology
- Observational evidence supporting the Big Bang
  - Late time observational probes
  - Cosmic Microwave background
    - ? CMB history, spectrum, primary anisotropies
    - ? CMB polarization
    - ? Primordial gravitational waves and inflation
    - ? CMB statistics
  - CMB Foregrounds
    - ? Galactic synchrotron
    - ? Free free
    - ? Dust (thermal, spinning, grain alignment...), hints on star formation

    ? Point sources (Radio and IR galaxies)
- Observing the microwave sky
    ? Telescopes: current status, different designs, ground, balloon and satellites
    ? Detectors: bolometers, TES, KIDs
    ? Receivers: cryostats, filters, cold optics, lenses, horns,
    ? Experimental techniques: readout, modulators, signal processing, polarimetry
    ? Instrument characterization and calibration
- From CMB maps to cosmological parameters
- Large Scale Structure Observations
    ? Galaxies as probes of the cosmic density field
    ? Gravitational lensing and Cosmic shear, CMB lensing
    ? Galaxy clusters as probes for cosmology, SZ effect
- Cosmic dark ages
    ? Cosmic reionization
    ? Hints on Cosmic star formation history, high redshift galaxies

Prerequisites

Teaching form

2 CFU, frontal teaching, biweekly lectures in English

Textbook and teaching resource

Course slides and notes

B. Ryden, Introduction to Cosmology

S. Serjeant, Observational Cosmology

Articles indicated during lectures

Semester

Second semester

Assessment method

Oral exam (presentation + open questions)

Office hours

Tue. 9:00-10:00 or by appointment