



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Introduction to Experimental Cosmology

86R-XXXVI-IEC

Aims

Knowledge of observational evidences and experimental techniques for cosmology.

Contents

Elements of cosmology. Cosmic Microwave Background: history and current status of measurements. Physical observables, cosmological parameters and experimental techniques.

Detailed program

I will give a primer on the experimental methods that led us to the current understanding of the Universe at large scales through the Cosmic Micro-wave Background observations, including the physics and the measurements of the foreground signals, in particular the ones coming from our own Galaxy. The course will focus on the most recent results, also describing the projects and technologies involved in the quest for the discovery of the Inflationary Gravitational Waves as imprints in the Cosmic Microwave Back-ground polarization patterns. The lessons will focus on:

- Historical recalls and modern cosmology
- Observational evidences 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...)
 - ? 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

Prerequisites

Teaching form

1 CFU, 10 hours, language: English.

Textbook and teaching resource

- Notes from the teacher
- Introduction to Cosmology - Ryden, B

Semester

II semestre

Assessment method

Oral exam

Office hours

Mon-Fri 10:00 - 19:00
