UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Esperimentazioni di Astrofisica

2223-3-E3001Q058

Aims

1. Introduce instrumentation and techniques for Astrophysics observations;
2. Allow students to get the first experience in sources observation and signal calibration;
3. Perform data analysis on observation and dtermination of physics observables.

Contents

Astronomical sources, techniques and instrumentation used in astrophysics are described for several spectral bands, with particular attention to the microwave band, which will be used during the laboratory activity.
In addition Cosmic Rays an related observational techniques are described.
Students are guided to perform some measurement including: detector characterisation; calibration of observed signals; observation of sky sources.

Detailed program

In the first part astronomical sources and observables are described, among them: Sun, Moon, Galaxy, Cosmic microwave background, Cosmic rays. Techniques and instrumentation used in astrophysics are also described for the several spectral bands, with particular attention to the microwave band used during the laboratory activity. The following items are presented: antennas, telescopes, optics; detectors; photometric and spectroscopic techniques; noise reduction techniques and data analysis.
Students will work in groups of 3-4 people. Each group will follow its own observation program and will pursue a result. Each group will carry on observations of sky sources like: Sun, Moon, Galaxy, Cosmic microwave background, Cosmic rays. Groups are then involved in measurements including: detector characterisation; calibration of observed signals. Each group will analyse data and subtract spurious signals like rf interferences or

atmospheric emission. Finally groups will describe their activity and discuss results in a short report.

Prerequisites

Students are requested to know contents of courses of Physics and Laboratories followed in the previous years. Software skills are helpful for data analysis.

Teaching form

1) Introductory front teaching: 20-24 hours. Remote connection is not planned during lectures.
2) Laboratory experimental training: 72-76 hours. Students presence in laboratory is mandatory.

Textbook and teaching resource

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

2) Software codes and packages for driving instruments and data analysis.

3) Reference textbook: An introduction to radio astronomy, Bernard F. Burke, F. Graham-Smith. - 4. ed. Cambridge University 2019.

Semester

Full year (both semesters).

Assessment method

Final assessment with the usual score up to 30, including:

1) Written report on the activities carried on in laboratory, incuding experimental measurements and data analysis; one report per group.

2) Final interview on the activities carried on in laboratory, on the report and on related topics.

Office hours

Every working Wednesday during the class period, from 12:30 pm to 1:30 pm. Otherwise on request.

Sustainable Development Goals

QUALITY EDUCATION | INDUSTRY, INNOVATION AND INFRASTRUCTURE