

Subject : Instrumentation

Title : Detection of Electromagnetic Waves and Photons From the Universe

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Outline :

In this lecture, I will attempt to assist the audiences to build links between instrumental studies and astronomical studies with two case studies. The first case is about the detection of cosmic microwave background (CMB) photons by using superconducting transition edge detectors. The characteristics of CMB photons carry decisive information about the history of early Universe. The second study is about superconducting tunnel junctions as heterodyne detectors, which are used in the detection of spectral line radiation from molecules that form stars. The features of the spectral lines convey precise physical and chemical information about the radiating species, which reveal the mechanism of star formation. Moreover, I will overview the cutting-edge studies on superconducting receivers for radio astronomical observations and the challenges in detection of photons and electromagnetic waves with ultimate sensitivity, broad field of view and high throughput.

Learning objectives :

1. To obtain background information about astronomical instruments.
2. To arouse interests in instrumental development.

Textbooks and references :

K. Rohlfs, T. L. Wilson, *Tools of Radio Astronomy*, Springer.