

講義

科目名：Instrumentation

講義主題：Detection of Electromagnetic Waves and Photons From the Universe

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概要： In this lecture, I will help the audience make connections between instrumental studies and astronomical studies through two case studies. The first case is about the detection of cosmic microwave background (CMB) photons using superconducting transition edge detectors. The characteristics of these 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 new stars. The characteristics of the spectral lines convey precise physical and chemical information about the radiating species, thus revealing the mechanism of star formation. Moreover, I will provide an overview of cutting-edge studies on superconducting receivers for radio astronomical observations and the challenges of high-sensitivity, broadband and wide field of view detection of photons and electromagnetic waves.

達成目標： To build connections between instrumental studies and astronomical studies. To gain an overview of the advancing of instrumental studies.

受講要件等： No

履修上の注意： This lecture is biased in the scientific aspect of instrumentation studies rather than the engineering side.

授業計画： 1.5 hours, two sections (incoherent detectors and heterodyne mixers)

参考文献：

1. P. J. T. Peebles and David T. Wilkinson, "The primeval fireball," Scientific American, 1967.
2. K. Rohlfs, T. L. Wilson, Tools of Radio Astronomy, Springer.