



Contribution ID: 158

Type: Poster

KATANA –Koolstof (Carbon) Atom Tomography with Advanced Nanotechnology for Astronomy

Tuesday, July 23, 2019 6:45 PM (15 minutes)

Intensive submm-wave continuum imaging of the sky has discovered several high-redshift ultra-luminous infrared galaxies (ULIRGs), and follow up spectroscopic measurements have partially resolved their redshift distribution. But much of the dust-obscured galaxy formation in the early universe is traced by much less bright infrared galaxies, which are hard to detect using classical imaging systems. KATANA (Koolstof (Carbon) Atom Tomography with Advanced Nanotechnology for Astronomy) is designed to detect ~100 times more dusty galaxies ever found by measuring their redshift and spatial distribution at once.

KATANA is a 147-pixel imaging spectrometer covering 3×20 GHz of bandwidth around 270 GHz, 340 GHz and 400 GHz with a frequency resolution ($R=F/dF$) of 500. The bandwidth corresponds to sliced redshift ranges of 5.9-6.4, 4.3-4.7, and 3.6-3.8 for the [CII] line. The key technologies of KATANA are: a dual-polarization sensitive broadband antenna, an on-chip planar filter-bank spectrometer, and NbTiN-Al hybrid MKIDs (Microwave Kinetic Inductance Detectors) to readout the spectral channels. It requires 24,000 MKIDs to fully cover the target bandwidth with 147 spatial pixels. Those technologies are currently being developed at SRON/TU Delft for the DESHIMA and MOSAIC projects.

We carried out sensitivity calculation of a [CII] line emitter search with KATANA on the ASTE and APEX telescopes. We also calculated the sensitivity on the LMT and IRAM 30m telescope with a different band configuration of 220 GHz, 270 GHz, and 340 GHz. Combination of its simultaneous broad bandwidth and large number of pixel enables us to explore an unprecedented volume of the universe that even ALMA cannot cover. KATANA has great potential to cut a new window open for studying dust-obscured formation of massive galaxies by even revealing the abundance of high-z luminous infrared galaxies (LIRGs) that have never been found so far by any submm-wave continuum surveys due to their confusion limits.

Less than 5 years of experience since completion of Ph.D

N

Student (Ph.D., M.Sc. or B.Sc.)

N

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Session Classification: Poster session

Track Classification: Low Temperature Detector Applications