31. Building, testing and using a 3 element radio interferometer

SUPERVISOR(S):

Dr. Michiel Brentjens, MSc. Sander Schouws

Prof. dr. Huib-Jan van Langevelde

CONTACT & ONLINE INFO:

brentjens@astron.nl

Oort461 / schouws@strw.leidenuniv.nl

Oort563 / langevelde@jive.eu

SHORT DESCRIPTION:

Radio interferometry is one of the main tools for modern astronomical research and a good understanding of its fundamental principles is valuable for a career in astronomy. This project offers the unique opportunity to obtain hands-on experience with these fundamentals, starting with the construction of a 3 element interferometer designed using off-the-shelf components, yet sensitive enough to detect extragalactic objects. The interferometer can subsequently be used for a variety of interesting and challenging observations. What makes this project unique is that the student will have the opportunity to work with all aspects of astronomical radio observations, from the design and construction of the radio frequency electronics to data reduction and scientific interpretation.

COMPLEMENTARY INFORMATION: suited as A and A/N-project

32. On-line estimation of extinction and clouds at the Old Observatory

SUPERVISOR(S):

Dr.Remko Stuik, Dr. Mathew Kenworthy

CONTACT & ONLINE INFO:

HL 1116b / stuik@strw.leidenuniv.nl

HL1102 / kenworthy@strw.leidenuniv.nl

SHORT DESCRIPTION:

The old observatory hosts several telescopes, including the student telescope and the newly installed heliostat. Observing in the Netherlands is challenging due to the rapidly changing weather conditions and optimization of the observations requires a good knowledge of the local weather and observing conditions. An all-sky camera was purchased and set-up for integration. Together with a full weather station this needs to be implemented at the old observatory. The tasks include:

1) Installation of the camera (and weather station) at the old observatory.

2) Write software (python) to record and analyze the data from the all-sky camera.

This includes measurements of the transmission and cloud coverage.

3) Publish the results of the all-sky camera on-line on a web-site for all observers to use, including a data archive.

COMPLEMENTARY INFORMATION: suited as A and A/N-project

32. LOFAR Bending in Extended Radio Sources (LOBES)

SUPERVISOR(S):

Dr. Tim Shimwell

Dr. Reinout van Weeren,

Prof. em. George Miley



CONTACT & ONLINE INFO:

O454 / shimwell@strw.leidenuniv.nl

O460 / rvweeren@strw.leidenuniv.nl

O442 / miley@strw.leidenuniv.nl

SHORT DESCRIPTION:

We have recently demonstrated that there is a non-uniformity present in the alignment of LOFAR radio sources in HetDEX. Establishing whether this is due to a physical effect (e.g. preferential alignment of the AGN spin axes with the cosmic filaments in which they originate) or systematic instrumental effects must await analysis of the (50 times larger) complete LOFAR Two-metre Sky Survey.

Meanwhile we wish to carry out a general study of radio source bending using the LOFAR survey data. Since the nineteen seventies there has been considerable evidence that the environment can play an

important role in distorting the morphologies of extragalactic radio sources. First, there was the discovery of tailed radio sources, their association with rich clusters of galaxies and the establishment of a bending sequence in radio structures. Secondly there is the decrease of the radio angular sizes of quasars as a function of redshift, accompanied by an increase in their bending and apparent distortion. Taken together this work demonstrated that the environment can play an important role in determining the morphologies of radios sources, both the high luminosity FRII sources associated with quasars and the low luminosity FRI sources in nearby clusters. Likewise, the morphologies of extended radio sources provide important information about the environment and intergalactic medium in which they are embedded.

Because of the sensitivity of LOFAR to extended steep-spectrum radio structure and its relatively high resolution, LoTTS is a unique dataset for a systematic investigation of radio source morphologies as a function of galaxy environment, redshift and radio luminosity. What is the relative chance of finding tailed galaxies in clusters of various richness compared with the field? What is the average radio source bending as a function of galaxy environment and radio luminosity? These are two of the many important questions that LOBES will tackle. Starting with the HetDEX region and expanding to other areas of LoTTS after optical data become available, we propose to investigate radio source bending as a function of redshift and the proximity of the LOFAR radio sources to clusters and cosmic filaments. We shall eventually expand our studies to investigate whether the proximity of sources to cosmic filaments and clusters is related to their alignments. LOBES is a project that will touch several of the LoTTS working groups, including deep fields, clusters and high redshifts.

COMPLEMENTARY INFORMATION: suited as A-project

32. Looking for PAHs in the Orion Bar Star Forming Regions

SUPERVISOR(S):

Alessandra Candian

CONTACT & ONLINE INFO:

HL529/ candian@strw

SHORT DESCRIPTION:

Molecular Hydrogen (H2) is the most abundant molecule in the Universe;Laboratory and theoretical studies showed that H2 is formed on the surface of interstellar dust grains.

In photodissociation regions -- regions dominated by UV photons -- where dust grains are lacking, Polycyclic Aromatic Hydrocarbon (PAH) molecules can provide the surface where H2 is formed. A smoking signature of this process would be the presence of spectroscopic features related super hydrogenated PAHs (H-PAHs). The goal of this Ba project is to reduce Infrared ground-based

astronomical observations of the Orion Bar star forming region, search for the H-PAH features and analyse their variation as the physical condition of Orion Bar.

OTHER INFORMATION: suited as A-project