

# Apercal - The Apertif Imaging Surveys data calibration and analysis pipeline



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## Abstract

Apertif (APERture Tile In Focus) is an extensive upgrade to the 50-year-old Westerbork Synthesis Radio Telescope replacing the single-pixel feeds with novel phased-array feeds to dramatically increase the field of view and survey speed of the telescope. Apertif creates 40 individual beams on the sky with 300MHz bandwidth and 24576 channels achieving an instantaneous sky coverage of 6 square degrees with a high frequency resolution. The primary goal of the Apertif Imaging Surveys is to perform a large-area shallow survey (3500 square degrees) and a small-area deep survey (450 square degrees) of neutral atomic hydrogen (up to a redshift of 0.26), radio continuum emission and polarisation in order to investigate galaxy formation, AGN evolution and cluster environments. The scientific goals and instrumental features of Apertif result in a wealth of data (about 5TB per observation) that required the development of Apercal, a dedicated and automated data reduction and analysis pipeline. Apercal makes use of existing tools and parallelisation to improve its performance.

## About Apercal

Based on Python2.7 and uses third-party astronomical software (Astropy, CASA, AOFlagger, Miriad)

Publicly available on github

Pipeline is modular which makes it possible to run modules on their own

Parallelisation is generally done by processing beams in parallel

Fully automated processing of Apertif imaging data possible

Processing done on four nodes of the Happili-cluster each with 48 CPUs, 252 GB memory and 33 TB of disk space.

## Apercal work flow

