5.6 Leiden Team (LEI)

Team Leader	Prof. Tim de Zeeuw
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Staff	Name	Degree	Status	%	Work Package
1.	Tim de Zeeuw	PhD	full professor	25	1.3, 1.4, 3.11
2.	Marijn Franx	PhD	full professor	10	1.6
3.	Peter Katgert	PhD	associate professor	10	1.3, 1.4
4.	Paul van der Werf	PhD	assistant professor	25	1.2, 1.4, 1.6
5.	Yannick Copin	PhD	research fellow	30	1.3, 1.4, 2.1, 2.2, 2.7, 2.8
6.	Sabine Mengel	PhD	research fellow	30	1.2, 1.4
7.	Martin Bureau	PhD	research fellow	50	1.3, 1.4, 2.1, 2.2

Local team description :
The LEI team has built up considerable expertise in the development of 3D spectrographs, related software and scientific utilization. The LEI team has participated in the development of SAURON at the WHT and is involved in OASIS (adaptive optics-assisted 3D spectroscopy) in the context of its move to the WHT. LEI is also involved in the development of SINFONI, an adaptive optics assisted near-infrared 3D spectrograph; this is a collaboration with MPE and ESO, where the role of LEI is in the development of software for adaptive optics and implementation of a large format array for the spectrograph. In addition, several members of the LEI team are involved in the ESA studies for the near-infrared spectrograph for the NGST, both the multi-object spectrograph version and the integral field version.

On the software side, LEI developed the SAURON data-reduction database and pipeline, in order to process in a homogeneous and efficient way the 80 galaxies planned to be observed during the project. A major growth area is the combination of 3D spectroscopy with adaptive optics (e.g., OASIS, SINFONI), yielding diffraction-limited spectrally multiplexed data. In the context of the SINFONI project, LEI is developing specific adaptive-optics oriented software.

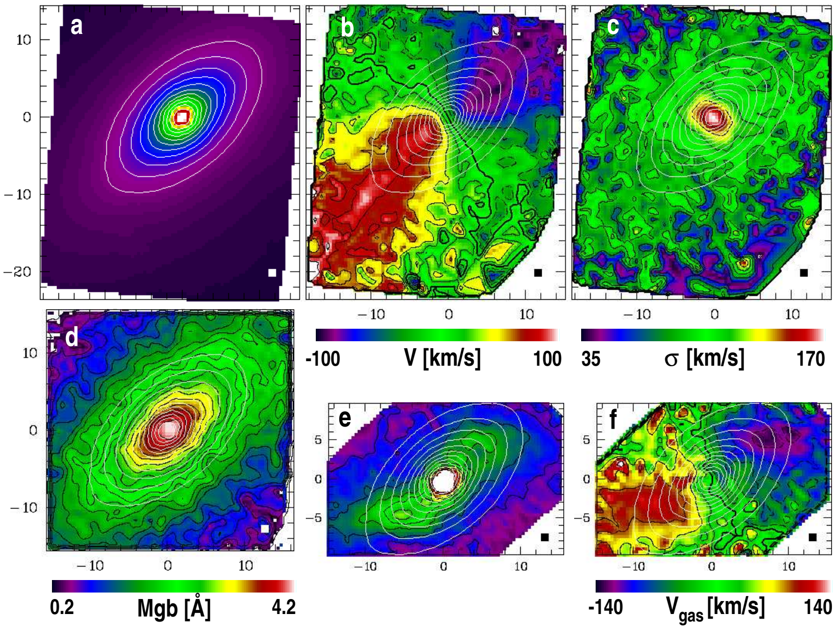
The principal research areas of the LEI team are dynamics of early-type galaxies, starburst galaxies and ultraluminous infrared galaxies, superstarclusters, and high redshift galaxies. In the framework of the SAURON consortium (LEI-LYO-DUR), LEI has led the data-reduction pipeline and the dynamical modeling by use of the Schwarzschild method (superposition of numerical orbits). This approach will profit strongly from the advent of the adaptive-optics assisted instruments OASIS/WHT and SINFONI. Therefore the role of the Leiden team will be geared towards developing integral field spectroscopy in the adaptive optics-assisted regime.

The LEI team consists of permanent staff and postdocs, who focus on the following topics: 1) dynamics of galactic nuclei, analysed with integral field data, and modeling based on the Schwarzschild orbit superposition method; 2) properties of starburst galaxies, ultraluminous infrared galaxies and superstarclusters; 3) properties of high redshift galaxies. All of these topics profit from the integral field approach, and even more so when combined with the high spatial resolution produced by adaptive optics.

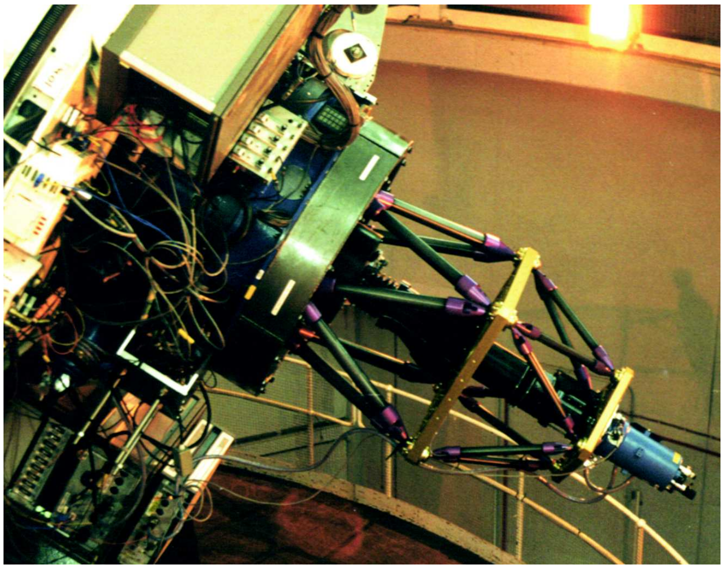
Significant recent publications :

Davies, R. L., Kuntschner, H., Emsellem, E., Bacon, R., Bureau, M., Carollo, C. M., Copin, Y., Miller, B. W., Monnet, G., Peletier, R. F., Verolme, E. K., de Zeeuw, P. T., 2001, ApJL 548, 33. Galaxy Mapping with the SAURON Integral-Field Spectrograph: The Star Formation History of NGC 4365

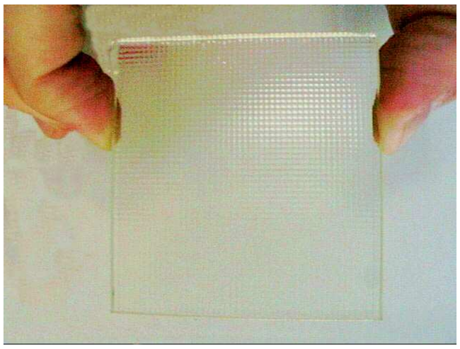
Bacon, R., Emsellem, E., Combes, F., Copin, Y., Monnet, G., Martin, P., 2001, A&A, in press. The M 31 double nucleus probed with OASIS and HST. A natural m=1 mode?



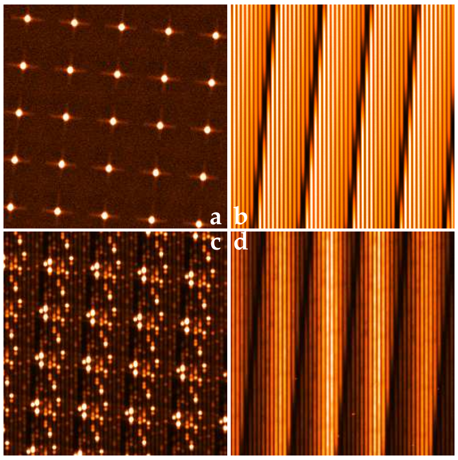
SAURON observations of the E6 galaxy NGC 3377: a) reconstructed total intensity; b) mean velocity V; c) velocity dispersion σ; d) stellar Mgb index; e) gaseous total intensity ([O III] λ5007); f) gas velocity field. Isophotes of the reconstructed image are superimposed on each frame. The small square at the lower right corner of each frame gives the size of the lenslets ($0.''94 \times 0.''94$), and the field shown is $30'' \times 39''$. The stars show a striking rotating disk pattern with the spin axis misaligned about 10° from the photometric minor axis, indicating the galaxy is triaxial. The gas also reveals strong non-axisymmetric structures and motions. The Mgb isophotes follow the continuum light.



SAURON at the Cassegrain port of the WHT during the commissioning run in February 1999.



The SAURON lenslet array is made from two sets of cylindrical barrels of 1.31×70 mm^2 in fused silica. It consists of over 1600 square lenslets, each of which is 1.31 mm on the side.



Examples of SAURON exposures taken during commissioning. Each panel shows only a small part (250×250 pixels) of the entire CCD frame so that details can be seen: a) micropupil image taken with the grism out. Each cross is the diffraction pattern from one square lenslet; b) continuum image using the tungsten lamp; c) neon arc; d) central part of NGC 3377.