5.5 MPE-Garching Team (MPE)

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Staff	Name	Degree	Status	%	Work Package
1.	Lowell E. Tacconi-Garman	PhD	computing coordinator	10	1.3, 1.4, 2.5, 3.11
2.	Niranjan Thatte	PhD	staff astronomer	15	1.3, 1.4, 1.6, 2.7
3.	Frank Eisenhauer	PhD	staff astronomer	10	1.2, 2.4
4.	Jürgen Schreiber	PhD	software engineer	20	2.5, 2.8
5.	Matthias Tecza	PhD	postdoc	10	1.3, 1.4, 2.5

Local team description :
The MPE team is based on a very well established astrophysical institute with a long history of excellent scientific research. Within the institute, the NIR/Sub-millimeter group, led by Prof. Dr. Reinhard Genzel and with which the Euro3D participants are associated, has a proven trackrecord for both state-of-the-art instrumental development, as well as world-class multi-wavelength astrophysical research.

The instrumental efforts of the MPE team are manyfold. The group built the world's first near-IR 3D imaging spectrometer, aptly named 3D. 3D, a travelling instrument, was commissioned in 1993 on the Calar Alto 3.5m telescope, and has been in operation ever since. Currently, MPE is working on a series of other 3D instruments. SINFONI, the successor to 3D, consists of a state-of-the-art imaging NIR spectrometer (SPIFFI (MPE)) plus an adaptive optics system (MACAO (ESO)), to be commissioned at the ESO VLT in 2004. FIFI LS, the Field-Imaging Far-Infrared Line Spectrometer for the SOFIA airborne observatory is due to be commissioned in Summer 2004. A third 3D instrument, Herschel-PACS, is a far-infrared imaging photometer and spectrometer instrument for the Herschel Space Observatory, scheduled for launch in February 2007. Other, non-3D instrumentation under development at MPE include CONICA (joint project with MPIA (Heidelberg)), a diffraction-limited near infrared camera for the ESO VLT. LUCIFER is a facility NIR spectrograph for the Large Binocular Telescope located on Mount Graham in Arizona. It is a multi-institute German effort also including the Euro3D partner AIP. Finally, MPE and MPIA together with ESO are developing LGSF, the Laser Guide Star Facility for the ESO VLT. This facility will substantially increase the sky coverage available to, and hence the scientific potential of both CONICA and SINFONI.

As can be seen above, all of the instrumental efforts at MPE involve strong collaborations with one or more partners. In particular, we are working together with ESO on SINFONI, CONICA and the LGSF, with Leiden on SINFONI, and with the IAC on PACS. Working in such partnerships has proven to be enormously productive for MPE and its partners, as will also be the case for Euro3D.

Data from the MPE 3D instrument required special, instrument-specific, reduction and analysis software. These routines, based on the GIPSY data reduction package, were developed completely in-house. As an extension to that work, MPE is also writing ESO Pipeline software for the SINFONI project. Further data analysis software is planned, a portion of which is under the umbrella of Euro3D.

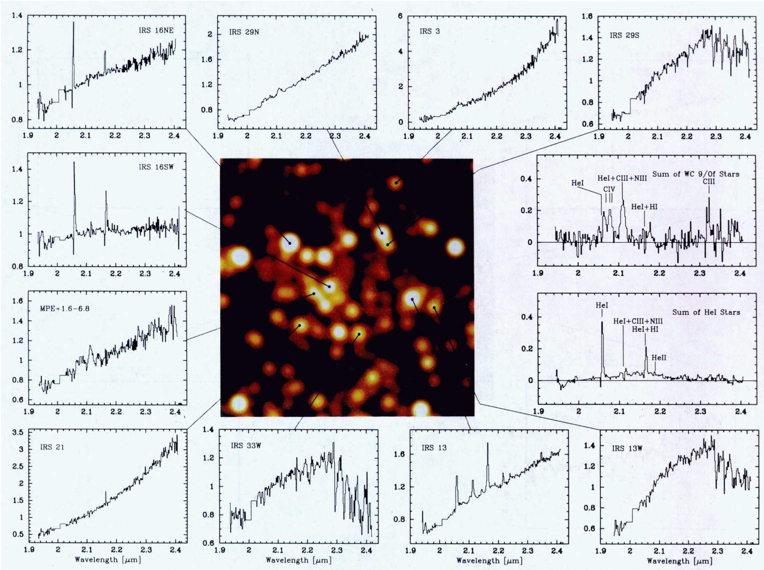
The scientific interests of the MPE group are also varied, and range from detailed studies of the Galactic Center and other galactic nuclei to studies of the nature of star formation in starburst environments to investigations of the nature and evolution of Ultraluminous Infrared Galaxies (ULIRGS) (see http://www.mpe.mpg.de/www_ir/ir_research.html and associated links for more details). All aspects of this work have benefitted from our use of 3D spectroscopy, including, but not limited to, stellar dynamics of the Galactic Center, dynamics of the ULIRG/Merger NGC6240, NIR imaging spectroscopy of star clusters in 'The Antennae' galaxies, a survey of NIR spectroscopic imaging of a large sample of Seyfert galaxies and a detailed study of the nuclear starburst environment of M82. In every one of these major research efforts, students have played pivotal roles, and the end result are six Ph.D. Theses either completed or in preparation.

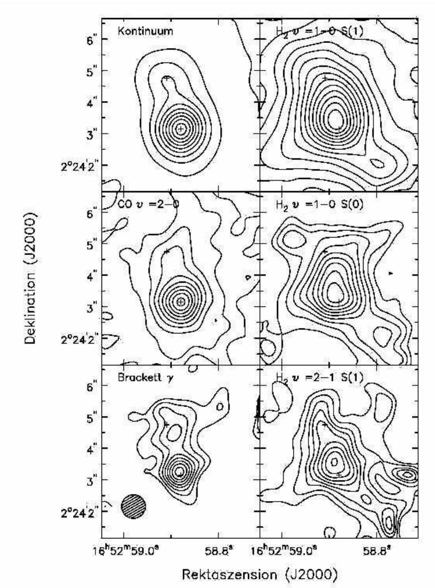
Significant recent publications:

Tecza, M., Genzel, R., Tacconi, L.J., Anders, S., Tacconi-Garman, L.E., and Thatte, N. 2000, "*Stellar Dynamics and the Implications on the Merger Evolution in NGC6240*", ApJ, 537, 178.

Genzel, R., Pichon, C., Eckart, A., Gerhard, O.E., Ott, T. 2000, "*Stellar dynamics in the Galactic Centre: proper motions and anisotropy*", MNRAS, 317, 348.

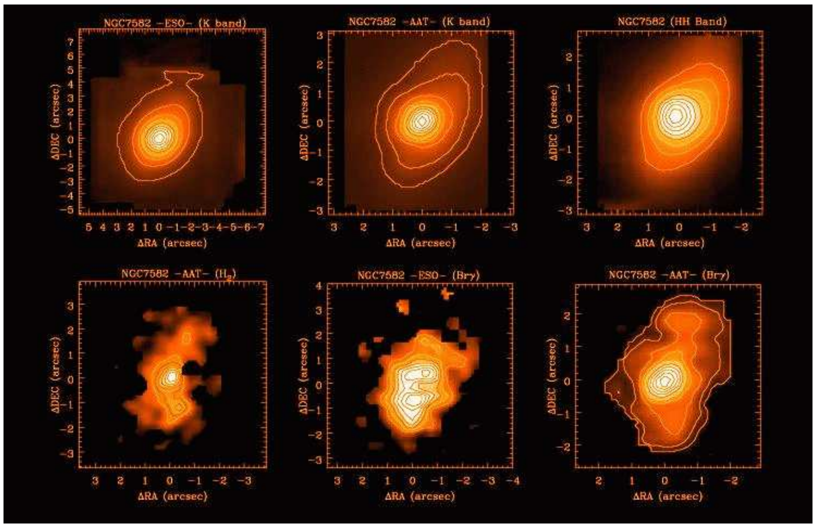
K-band spectra of stars in the Galactic Center, observed using MPE's NIR field imaging spectrograph, 3D. Spectra such as these have been used to determine the mass of the central dark object in our Galaxy. (from Weitzel et al., 1996, A&A Suppl. Ser, 119, 531)





A montage of K-band continuum and spectral line maps of the ultraluminous infrared galaxy NGC6240 made with MPE's 3D instrument. In each panel the two + signs designate the locations of the two nuclei in this merger system. All of this information is contained in a single 3D data cube. (from Tecza, 2000, Ph.D. Thesis, Ludwig-Maximilians-Universitaet, Muenchen)

3D imaging NIR spectroscopy of the Seyfert galaxy NGC7582 made with MPE's 3D instrument. Such data clearly reveals temporal variations in the spatial distribution of emission lines. (from a survey of Seyfert and LINER galaxies in Sosa-Brito, Tacconi-Garman, Lehnert, and Gallimore, 2001, in press).



Note that Weitzel, Tecza, and Sosa-Brito were or are Ph.D. students working solely on field imaging NIR spectroscopy, clearly demonstrating MPE's commitment to training of young scientists in this important astronomical technique.