



1222-2022
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UNIVERSITÀ
DEGLI STUDI
DI PADOVA

**PhD course of National Interest in Technologies for
Fundamental Research in Physics and Astrophysics**

Annual report

Name and surname: Remon Sjoerd van Gaalen
Cycle and a.a.: XL Cycle, 2024/2025
Supervisor: Maria Bergomi

- **Research activity carried out during the year**

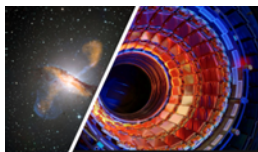
In the first year of this PhD program, my research activities have been focused around the NirvanaVIS instrument, an expansion of the LINC-NIRVANA instrument, adding an imager operating in the visible. Using ground-layer adaptive optics in conjunction with speckle imaging and processing, it will provide near diffraction limited resolution across a wide-field with one of the 8.2m telescopes at the Large Binocular Telescope.

Currently this instrument is in the Assembly, Integration and Testing (AIT) phase, where my responsibilities include the testing of the hardware, as well as working out the science case and preparing commissioning procedures.

A particular focus has been on detector characterization. Which, with the selection of a novel, large format, high speed sCMOS unit, forms an important part of the instrument's distinguishing qualities. This work included both the definition of testing procedures tailored to the requirements of the instrument, performing them in the optics lab, and writing the data processing scripts. With a continuous influx of components (e.g. the scientific filters which are expected to arrive shortly), this effort will continue into the second year. As well as integrated testing, ahead of an expected shipping to the telescope at the end of 2026.

An important part of the commissioning procedures is the characterization of non-common path aberrations. We are developing a procedure for this that takes advantage of the unique architecture of the NirvanaVIS instrument, which I will present at an international AO conference next month.

Alongside this project, contributions to the EKARUS and MATTO facilities are also part of the PhD project. These are multi-conjugate adaptive optics testbenches, with the former operating on-sky at INAF's Copernico telescope and the latter in the labs at INAF-Padova.



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- **List of attended courses and passed exams**

Adaptive Optics for Astronomy [EXAM PASSED]

Radio and Optical Interferometry [ATTENDED]

Astronomical Sites' Characterization (unipd astronomy program) [ATTENDED]

Hands-on Machine Learning with Python (unipd astronomy program)[ATTENDED]

- **List of attended conferences, workshops and schools, with mention of the presented talks**

European Adaptive Optics Summer School

Institute d'Optique, Paris, France

June 2025

- Incl. Poster Presentation: "NirvanaVIS: AO-Assisted Wide Field Speckle Imaging at LBT"

- **List of published papers/proceedings**

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- **Thesis title (even temporary)**

Simulations, analysis, and procedures definition for alignment, test, and calibration of complex Adaptive Optics systems in the framework of the new generation of telescopes and instruments.

Date, 08/09/2025

Signature

Seen, the supervisor