

# **NGC 4593**

Untertitel (falls nötig)

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June 17, 2025

## **Abstract**

Hier kommt die Zusammenfassung deiner Arbeit.

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# Chapter 1

## Ablauf Notizen

### 1.1 RM of NGC4593

- Intercalibration der Spectra an der Linie O [III]  $\lambda 5006$
- Linienbestimmung im Spektrum
- Ausmessung der Interessanten Linien:
  - $H\alpha$
  - $H\beta$
  - $H\gamma$
  - $H\delta$
  - He I  $\lambda 4471$
  - He I  $\lambda 5015$
  - He I  $\lambda 5875$
  - He I  $\lambda 7065$
  - He II  $\lambda 4685$
  - O I  $\lambda 8446$
- Ausmessung der Continua:
  - Cont1150 (1140 - 1160 Å)
  - Cont4010 (4026 - 4033 Å)
  - Cont4200 (4197 - 4220 Å)
  - Cont4440 (4435 - 4450 Å)

- Cont4765 (4762 - 4774 Å)
  - Cont5100 (5085 - 5112 Å)
  - Cont5600 (5645 - 5653 Å)
  - Cont6045 (6044 - 6057 Å)
  - Cont6110 (6107 - 6129 Å)
  - Cont6880 (6861 - 6900 Å)
  - Cont7390 (7382 - 7405 Å)
  - Cont8015 (8005 - 8031 Å)
  - Cont8900 (8864 - 8955 Å)
- Erstellung von Lichtkurven der Linien und Continua
  - Gewählte Linien zur Darstellung:
    - $H\alpha$
    - $H\beta$
    - $H\gamma$
    - He I  $\lambda 5875$
    - He I  $\lambda 7065$
    - He II  $\lambda 4685$
    - O I  $\lambda 8446$
  - Gewählte Continua zur Darstellung:
    - Cont1150 (1140 - 1160 Å)
    - Cont4010 (4026 - 4033 Å)
    - Cont4440 (4435 - 4450 Å)
    - Cont5100 (5085 - 5112 Å)
    - Cont6110 (6107 - 6129 Å)
    - Cont6880 (6861 - 6900 Å)
    - Cont8015 (8005 - 8031 Å)
    - Cont8900 (8864 - 8955 Å)
  - Auswahl von Cont 1150 und Cont 5100 für die Erstellung der CCFs.

- Bestimmung der Linienprofile von AVG and RMS durch Subtraktion der Pseudocontinua.
- Ausmessung des FWHM von AVG und RMS
- Bestimmung der Centroid Verteilung der CCFs zur Bestimmung des Time Lags
- Bestimmung der BH Masse
- Substraktion der pseudoconts der intercalibrierten Spektren von  $H\alpha$  und  $H\beta$  und Bestimmung des AVG/RMS
- Abzug der narrow line komponenten aus dem AVG (noch nicht fertig)
- Bowen Fluoreszenz überprüfen
- ist wahrscheinlich, aber kann aufgrund der Auflösung nicht nachgewiesen werden
- allerdings korreliert OI deutlich mehr mit LyAlpha bzw. H Beta, als mit dem UV Spektrum
- Bisherige Publikationen nehmen an, das OI nicht variiert und nur durch Photoionisation entsteht. Aber hier variiert OI deutlich



# Chapter 2

## Campaign and Analysis

The Analysis of this campaign bases of the observation campaign of NGC4593 in 2016 by Edward M. Cackett (Edward M Cackett et al. 2018). The observations took place between the 12th of July and the 6th of August with 26 successful observations and was performed with the Hubble Space Telescope (HST) using the Space Telescope Imaging Spectrograph (STIS). The following section will cover important properties of NGC4593 and the 2016 campaign.

### 2.1 NGC4593

NGC4593 is an active galactic nuclei (AGN), classified as an Seyfert 1 Galaxy with a Sb D morphology. It is located at RA = 12:39:39.44, DEC = -05:20:39.03 (2000) and has a of  $z = 0.0083 \pm 0.0005$  This correspond to a distance of about 35.6 MPc (SIMBAD 2025)based on the  $\Lambda$ CDM-Model.

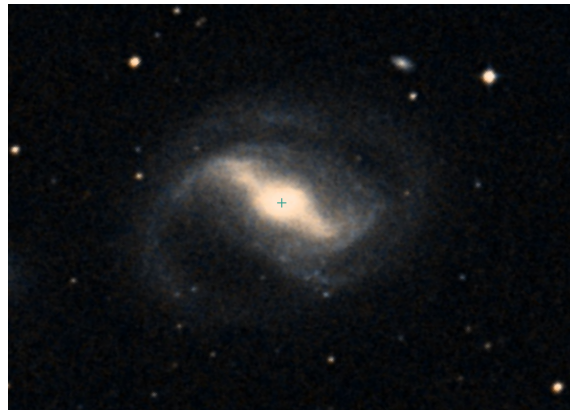


Figure 2.1: A DSS image of NGC4593.

## 2.2 2016 Campaign by E. M. Cackett

E. M. Cackett’s campaign was designed to study wavelength dependent continuum lags. Therefore, the STIS instrument on the Hubble Space Telescope was used with low-resolution gratings to measure a broad range of wavelengths. In each observation, spectra were taken using three different gratings: G140L, G430L, and G750L. These were used together with the  $52'' \times 0.2''$  slit.

The characteristics of the STIS gratings used in this analysis are summarized in Table 2.1.

Table 2.1: Overview of STIS Grating Characteristics (Space Telescope Science Institute 2025)

Grating	Range [Å]	Exp. Time [s]	Res. Power	Dispersion [Å/pixel]
G140L	1119–1715	1234	$\sim 1000$	0.6
G430L	2888–5697	298	$\sim 500 - 1000$	2.73
G750L	5245–10233	288	$\sim 500 - 1000$	4.92

## 2.3 Reverberation Mapping

As the main focus of this work was a reverberation analysis of the broad lines of NGC4593. Reverberation Mapping (RM) bases on the strong correlation between a variable continuum emission  $C(t)$  and the emission line flux  $L(\nu, t)$  (Horne et al. 2021).

# Bibliography

- Cackett, Edward M et al. (2018). “Accretion disk reverberation with Hubble space telescope observations of NGC 4593: evidence for diffuse continuum lags”. In: *The Astrophysical Journal* 857.1, p. 53.
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- SIMBAD (2025). *NGC4593*. URL: <https://simbad.u-strasbg.fr/simbad/sim-id?Ident=NGC4593> (visited on 06/10/2025).
- Space Telescope Science Institute (2025). *STIS Instrument Handbook: Gratings*. URL: <https://hst-docs.stsci.edu/stisihb/chapter-13-spectroscopic-reference-material/13-3-gratings> (visited on 05/12/2025).