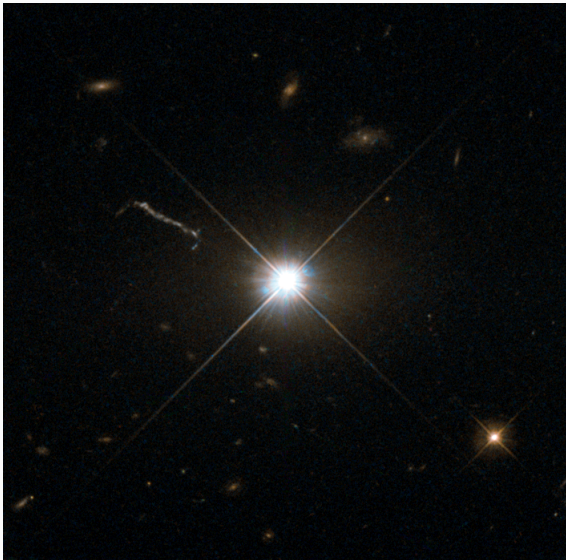


Überlichtgeschwindigkeit in kosmischen Jets

Alexander Helbok

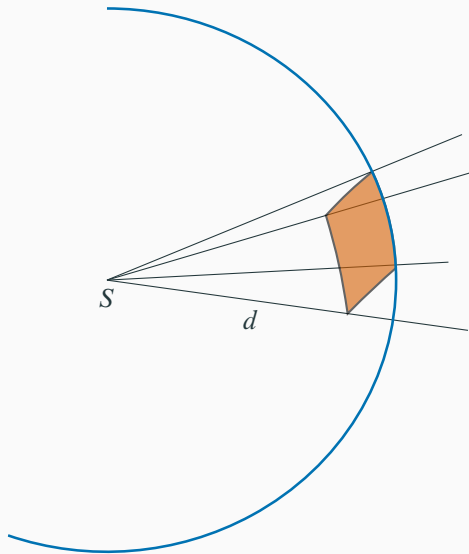
18. Januar 2024

3c273



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Leuchtkraft von 3c273



Entfernung über Rotverschiebung

$$(z = 0.158)$$



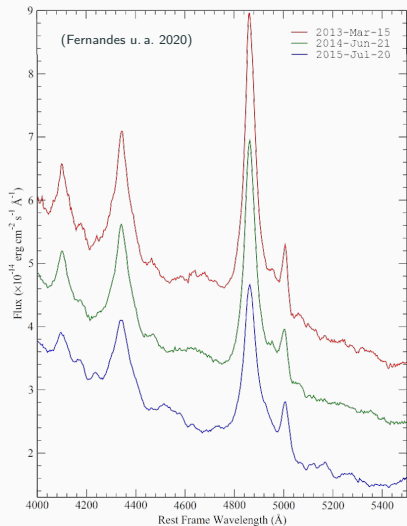
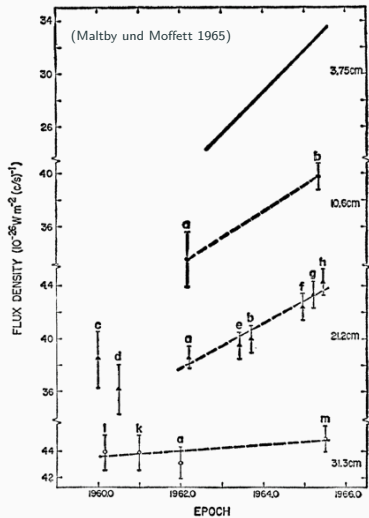
$$L = 4\pi d^2 F$$



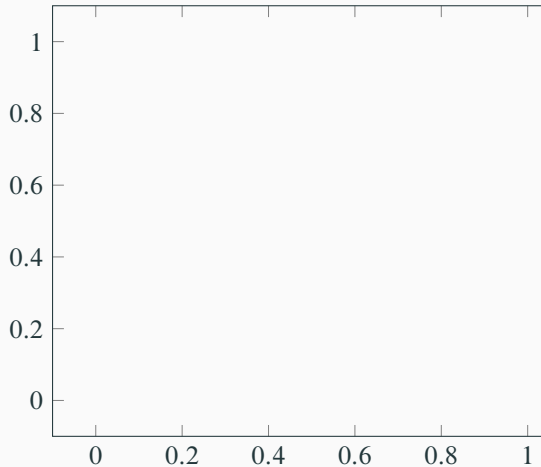
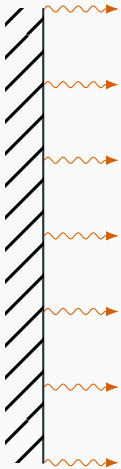
Flussmessung im Radiobereich

⇒ extrem Hell

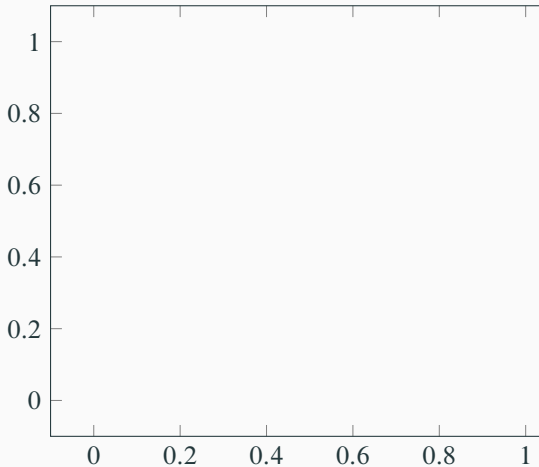
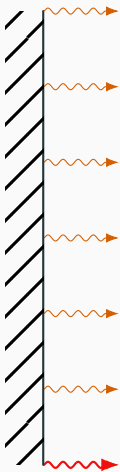
Helligkeitsschwankungen in 3c273



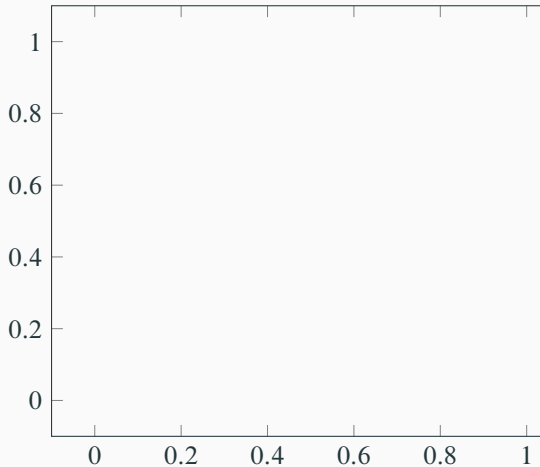
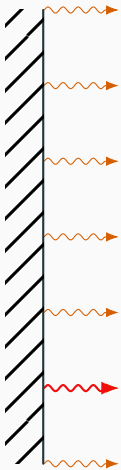
Fluktuationen erklärt



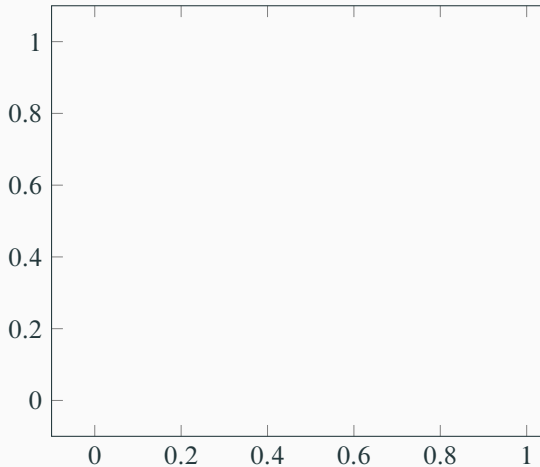
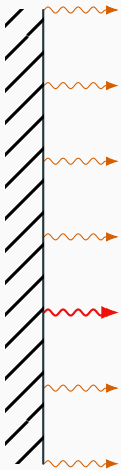
Fluktuationen erklärt



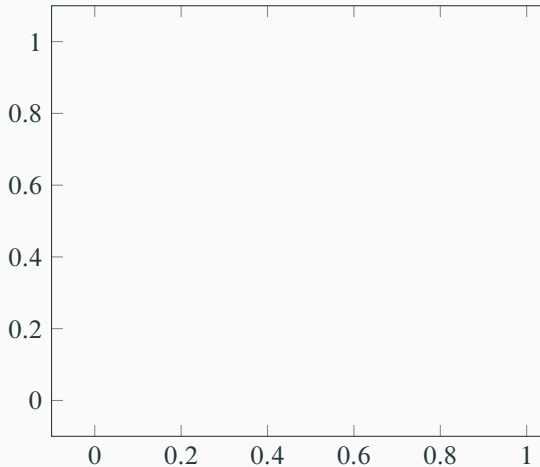
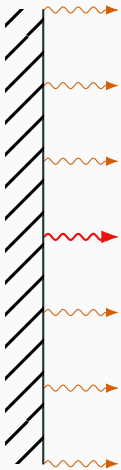
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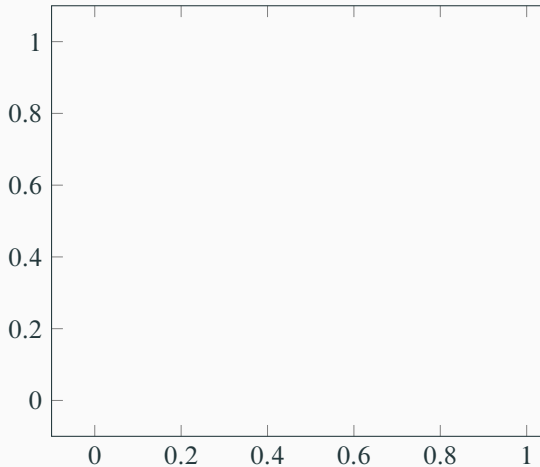
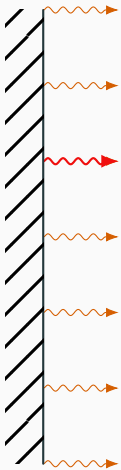
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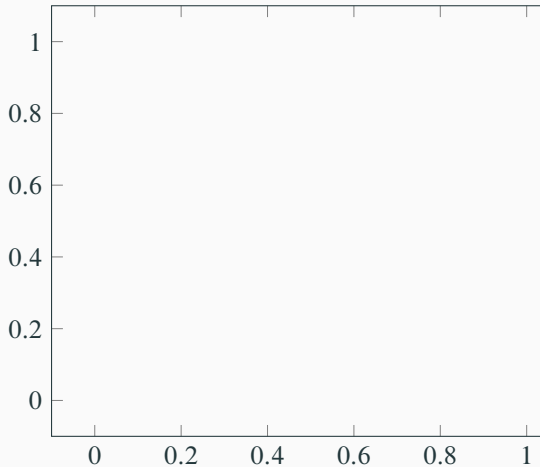
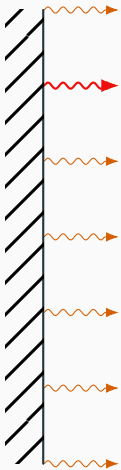
Fluktuationen erklärt



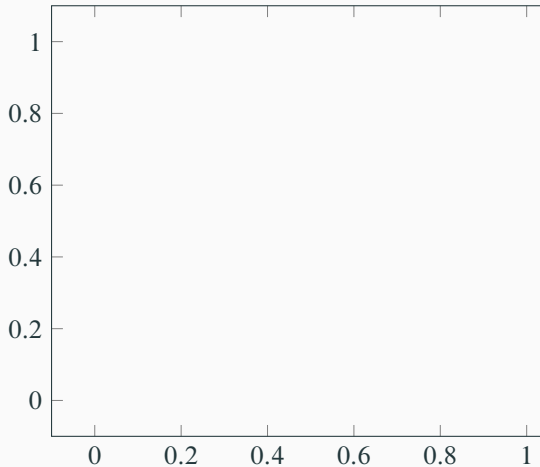
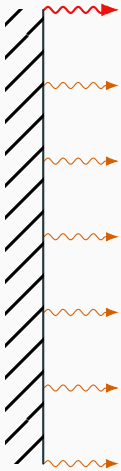
Fluktuationen erklärt



Fluktuationen erklärt



Fluktuationen erklärt



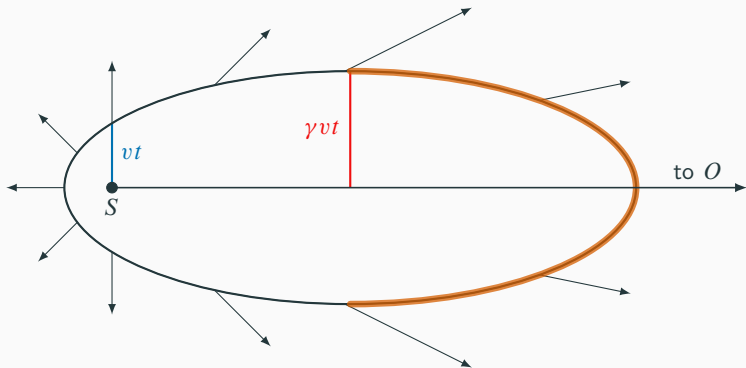
sphärische Expansion $v \ll c$



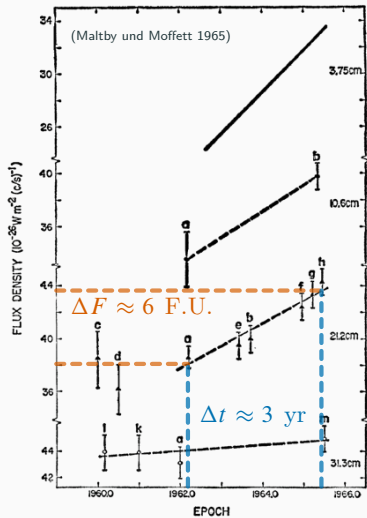
sphärische Expansion $v \sim c$

$$\gamma = \frac{1}{\sqrt{1-\beta^2}}$$

$$\beta = \frac{v}{c}$$

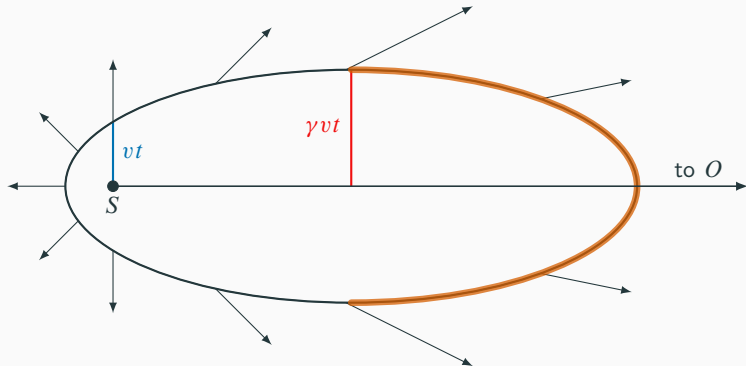


Beobachtung



$$F \propto \frac{v}{R} = 2 \frac{vt}{R}$$

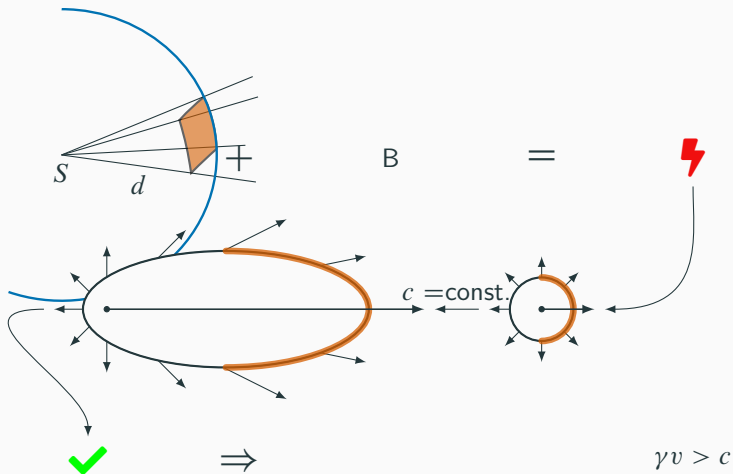
Konsequenz



$$\beta = \frac{v}{c} \in [0; 1]$$

$$\gamma = \frac{1}{\sqrt{1-\beta^2}} \in [1, \infty) \Rightarrow \gamma v > c \text{ möglich!}$$

Recap



Fragen?

Relativistische Expansion

$$\beta = 0.835, \gamma = 1.82$$

$$t = 0$$



to O

A horizontal arrow pointing to the right, indicating the direction of observation or measurement.

Relativistische Expansion

$$\beta = 0.835, \gamma = 1.82$$

$$t = 0.25$$

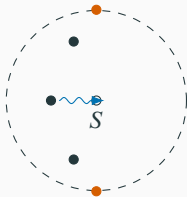


to O


Relativistische Expansion

$$\beta = 0.835, \gamma = 1.82$$

$$t = 0.59$$



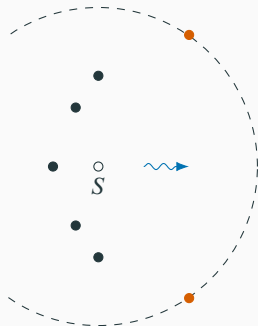
to O



Relativistische Expansion

$$\beta = 0.835, \gamma = 1.82$$

$$t = 1.5$$



to O

Relativistische Expansion

$$\beta = 0.835, \gamma = 1.82$$

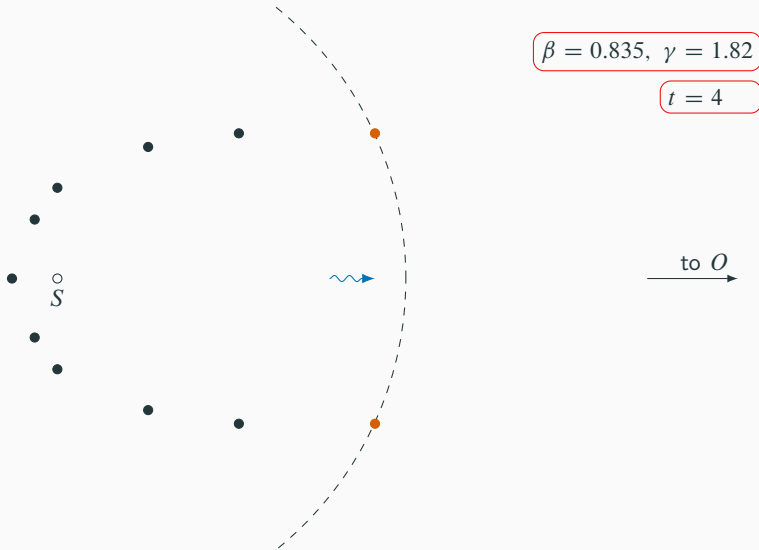
$$t = 2.5$$

to O

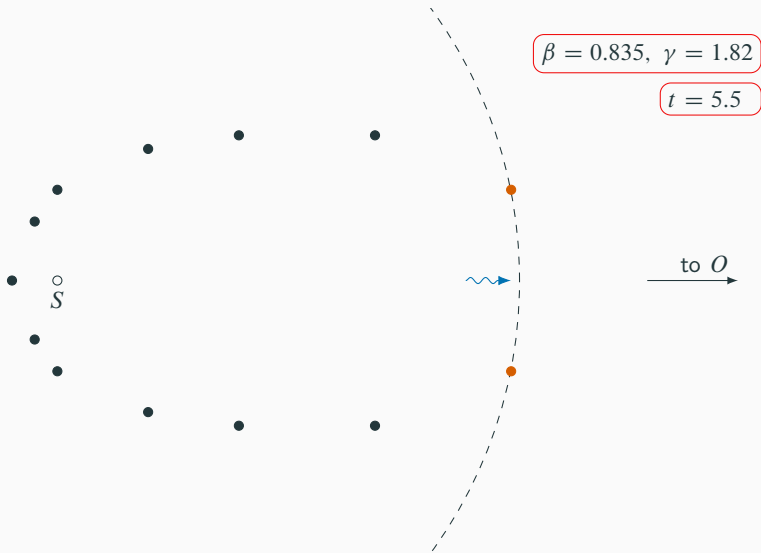


The diagram illustrates a relativistic expansion. A dashed circle represents the boundary of a region. Inside this circle, there are several black dots representing particles. A central point is labeled S with a small circle above it. A blue wavy arrow points from the center towards the right edge of the circle. Two orange dots are located on the right side of the dashed circle, one near the top and one near the bottom. To the right of the circle, there is a horizontal arrow pointing to the right, labeled 'to O '.

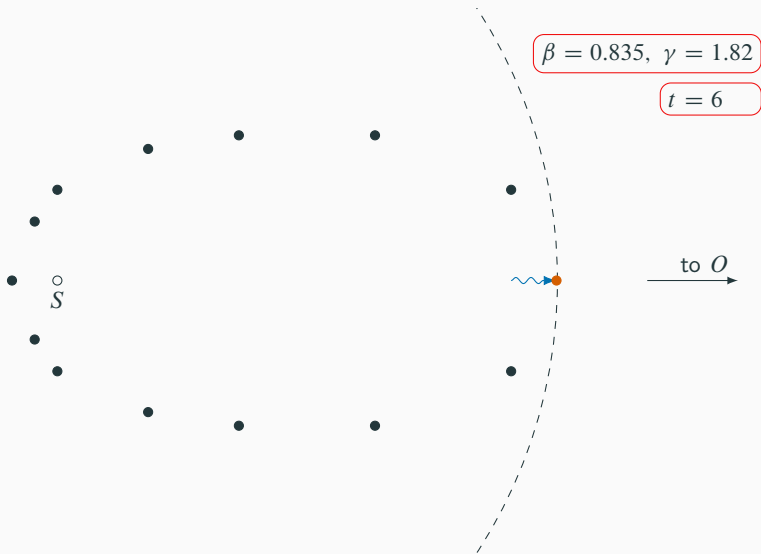
Relativistische Expansion



Relativistische Expansion



Relativistische Expansion



Relativistische Expansion

$$\beta = 0.835, \gamma = 1.82$$

$$t > 6$$



Literatur

- [1] P. Maltby und A. T. Moffett. „**Spectrum of the Intensity Variations in 3C 273B**“. In: *Science* 150.3692 (1965), S. 63–64. ISSN: 00368075, 10959203. URL: <http://www.jstor.org/stable/1717963> (besucht am 28.12.2023).

- [2] S. Fernandes u. a. „**Multiwavelength analysis of the variability of the blazar 3C 273**“. In: *Monthly Notices of the Royal Astronomical Society* 497.2 (Juli 2020), S. 2066–2077. ISSN: 1365-2966. URL: <http://dx.doi.org/10.1093/mnras/staa2013>.

- [3] A. R. Whitney u. a. „**Quasars Revisited: Rapid Time Variations Observed Via Very-Long-Baseline Interferometry**“. In: *Science* 173.3993 (1971), S. 225–230. ISSN: 00368075, 10959203. URL: <http://www.jstor.org/stable/1732675> (besucht am 07.01.2024).