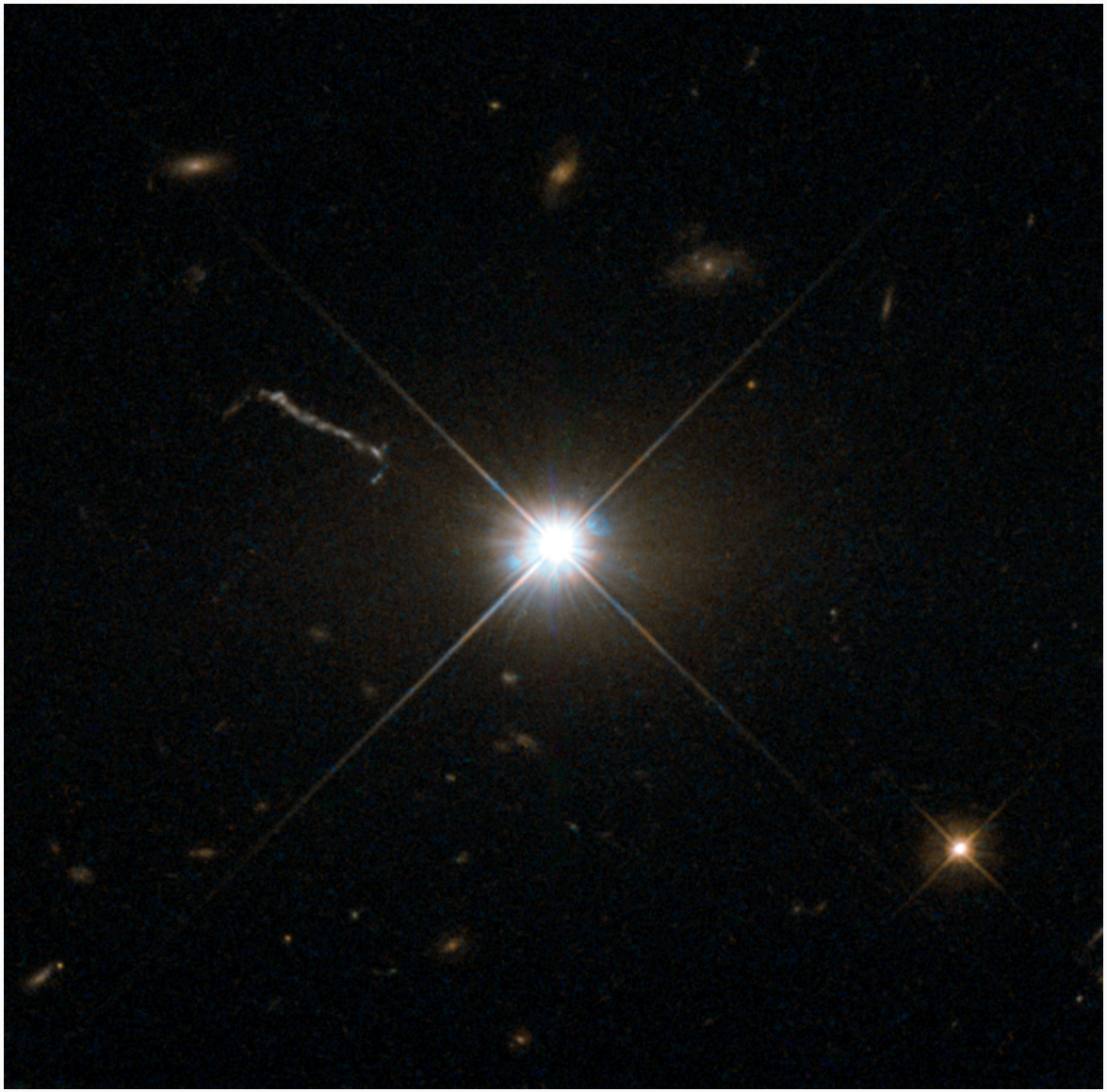
Überlichtgeschwindigkeit in kosmischen Jets

Alexander Helbok

18. Januar 2024

3c273



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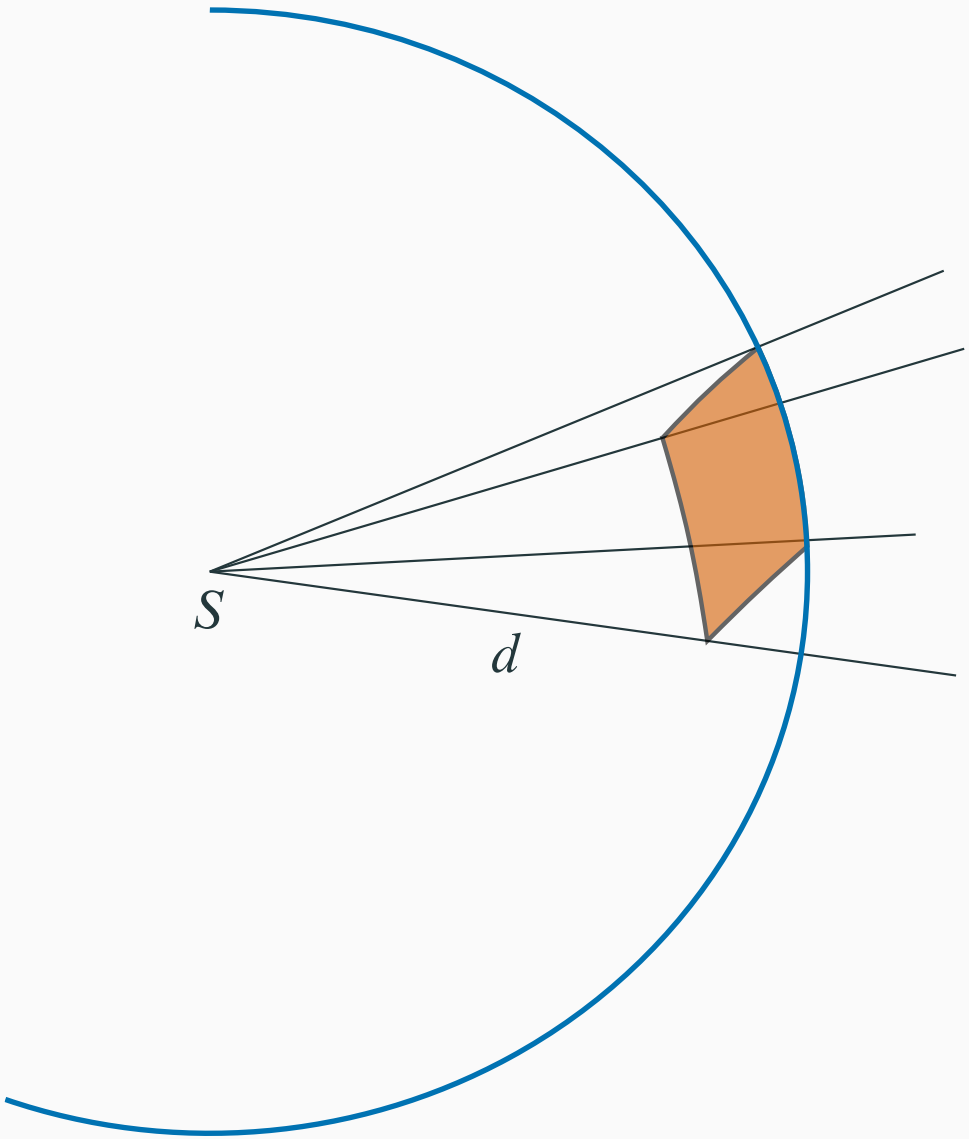
Leuchtkraft von 3c273



Entfernung über Rotverschiebung

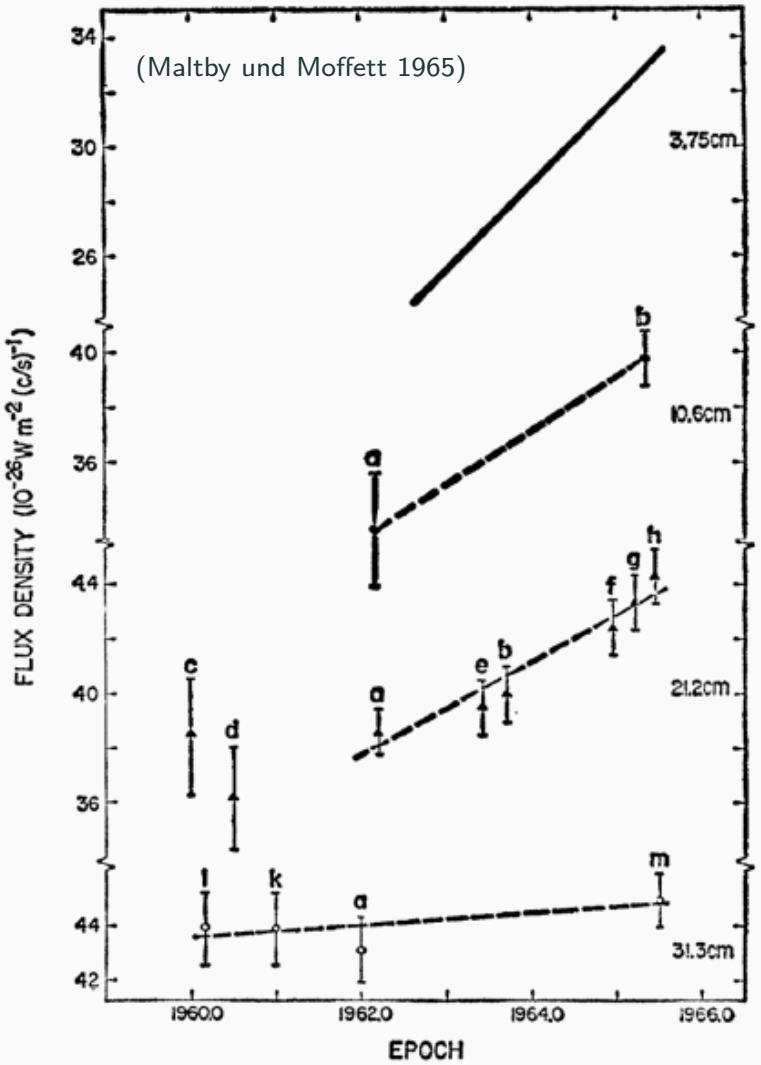
$(z = 0.158)$

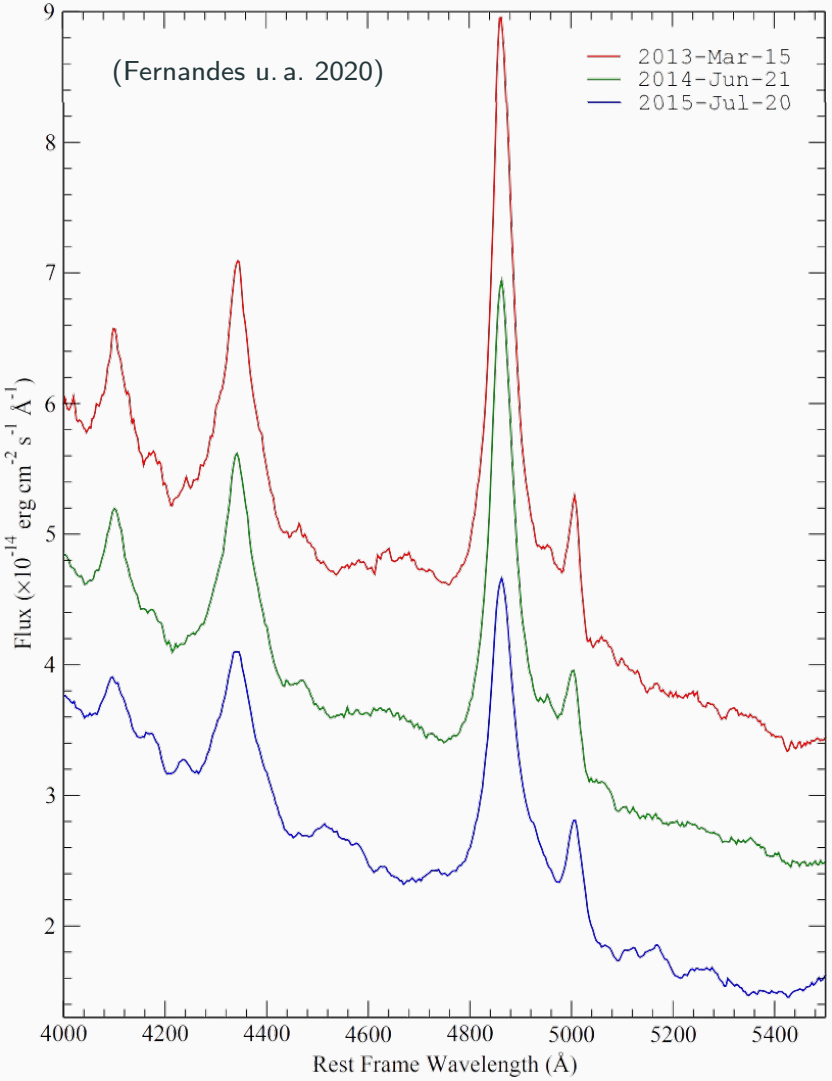
$$L = 4\pi d^2 F$$

Flussmessung im Radiobereich

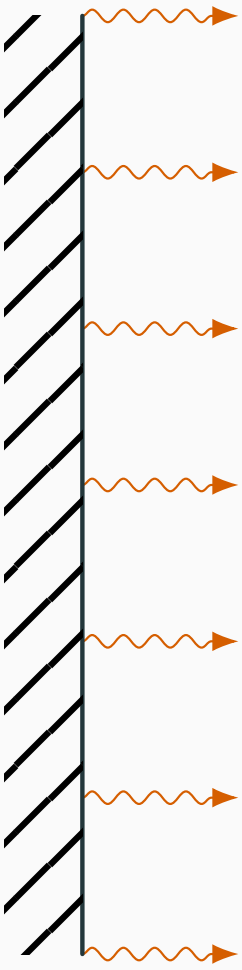
$\Rightarrow$ extrem Hell

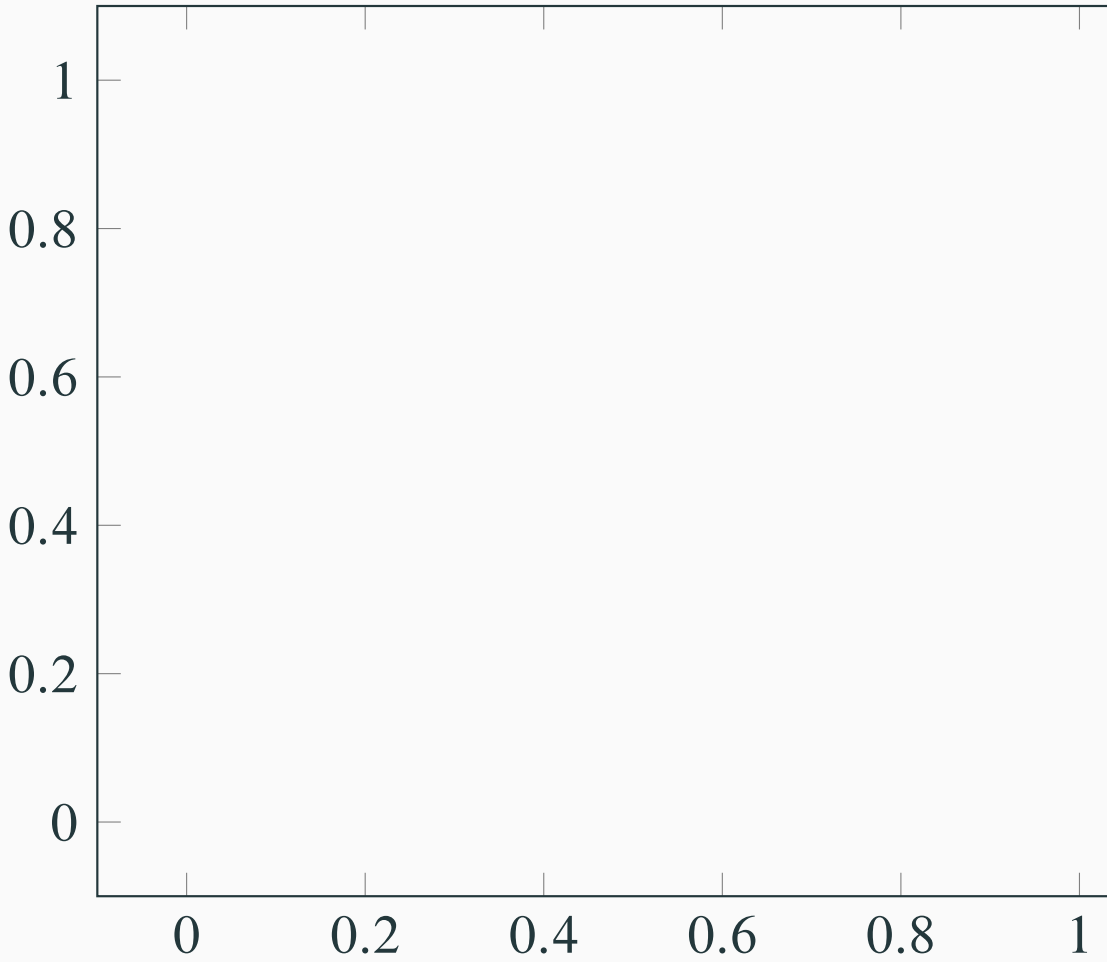
Helligkeitsschwankungen in 3c273



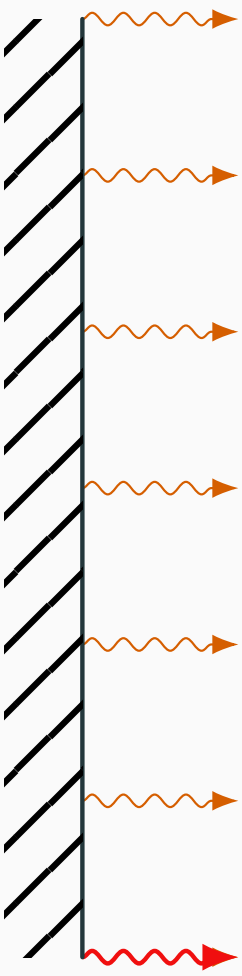


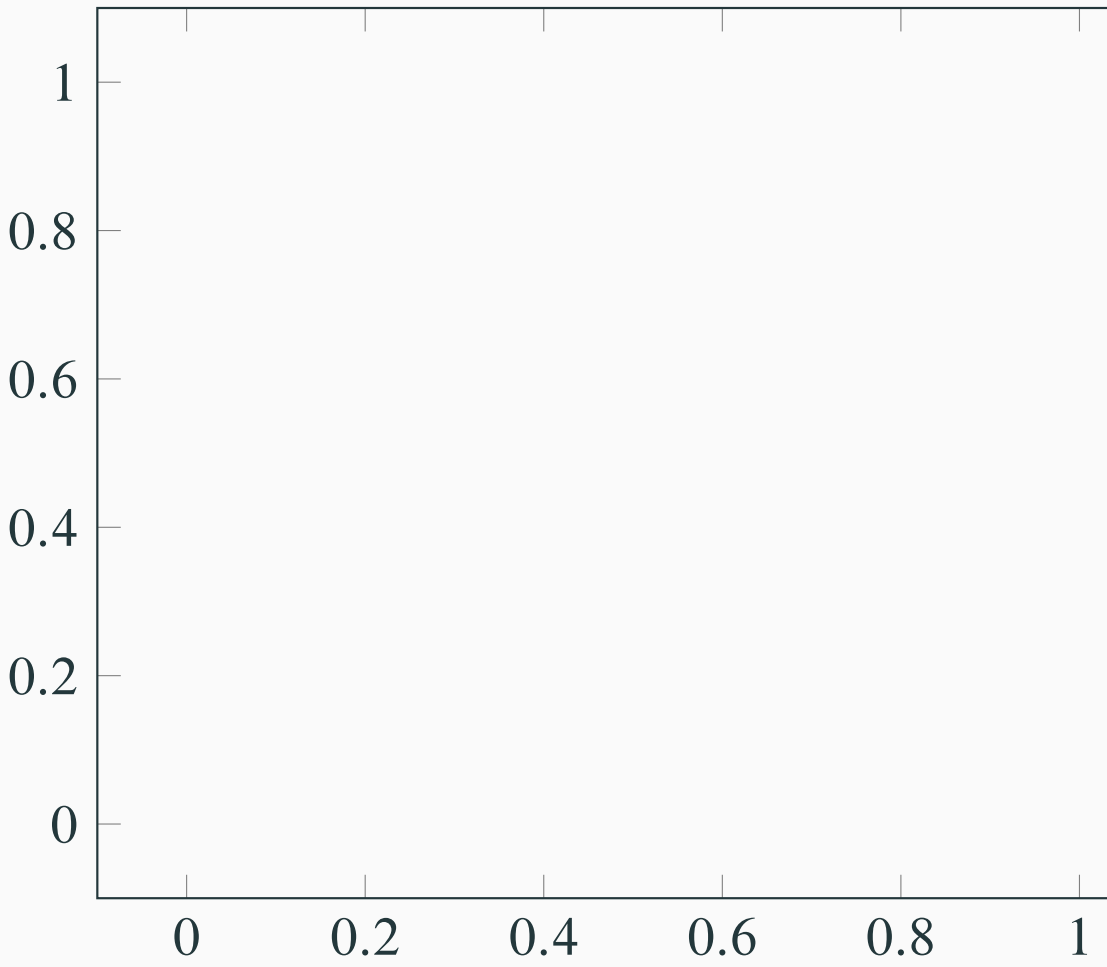
Fluktuationen erklärt





Fluktuationen erklärt





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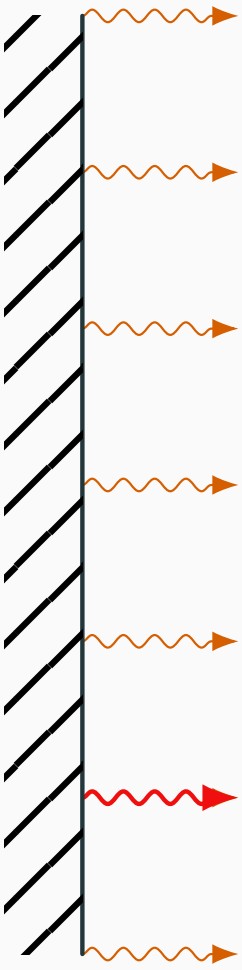

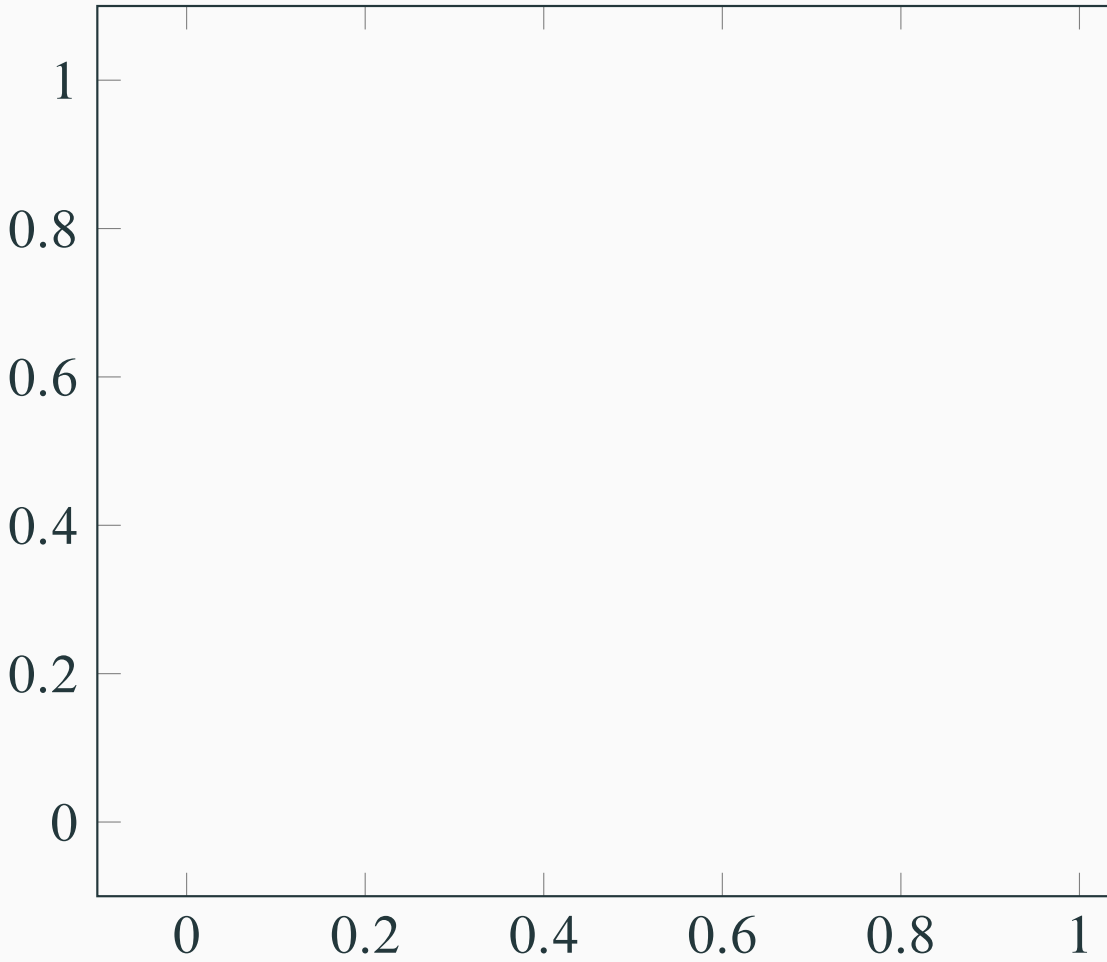

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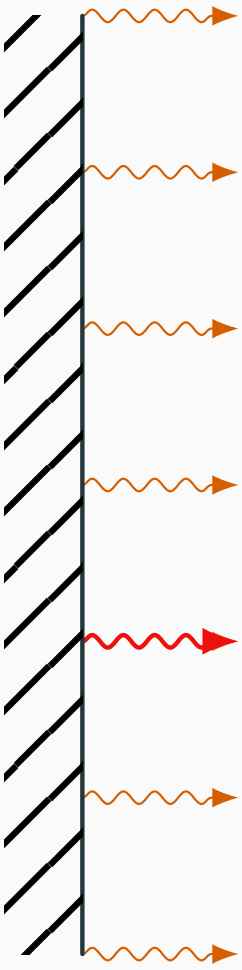

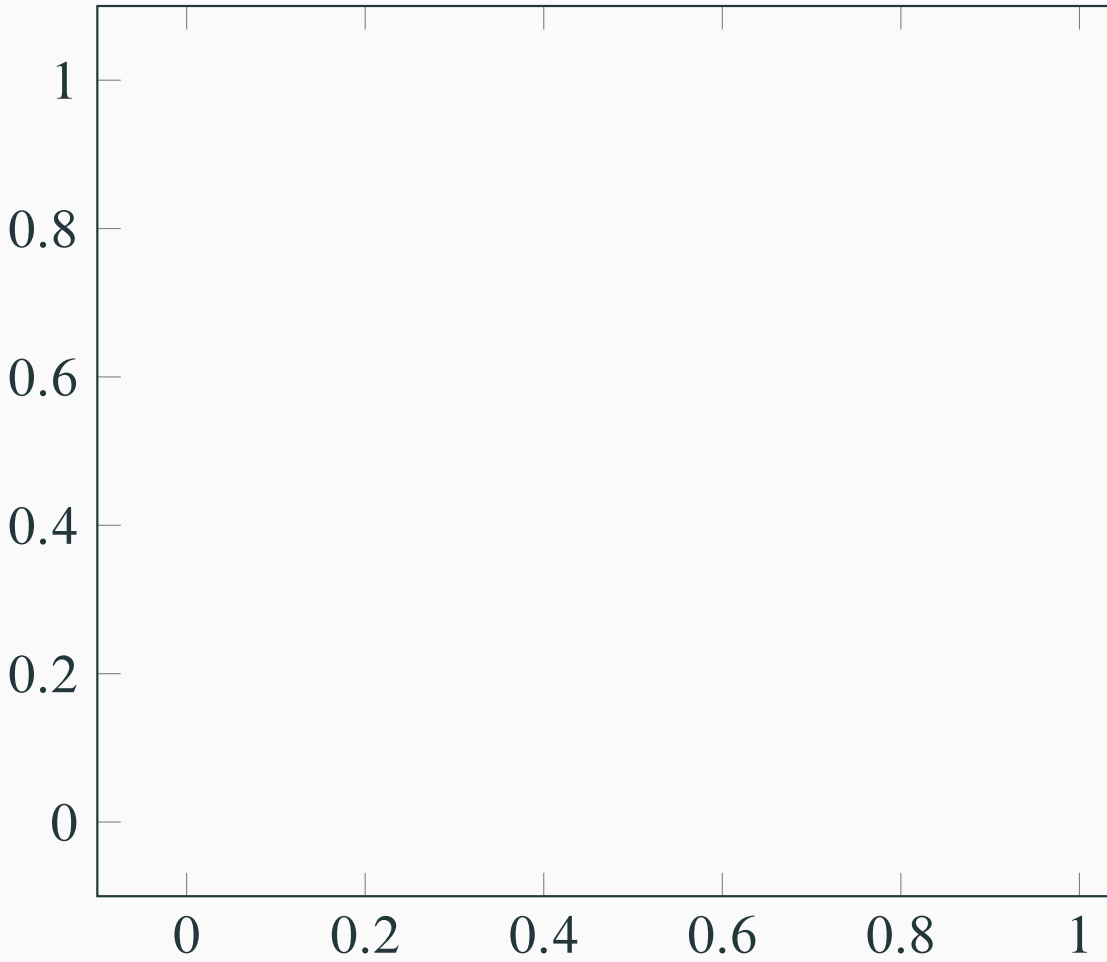

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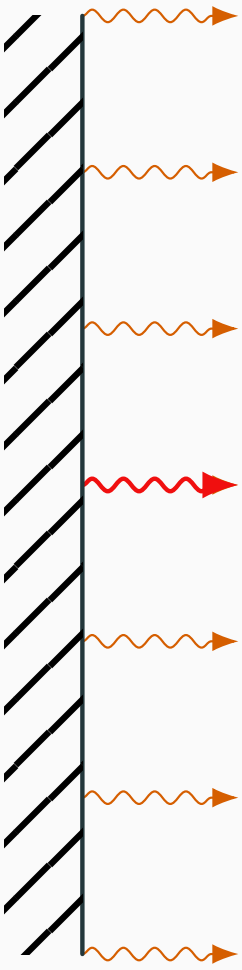

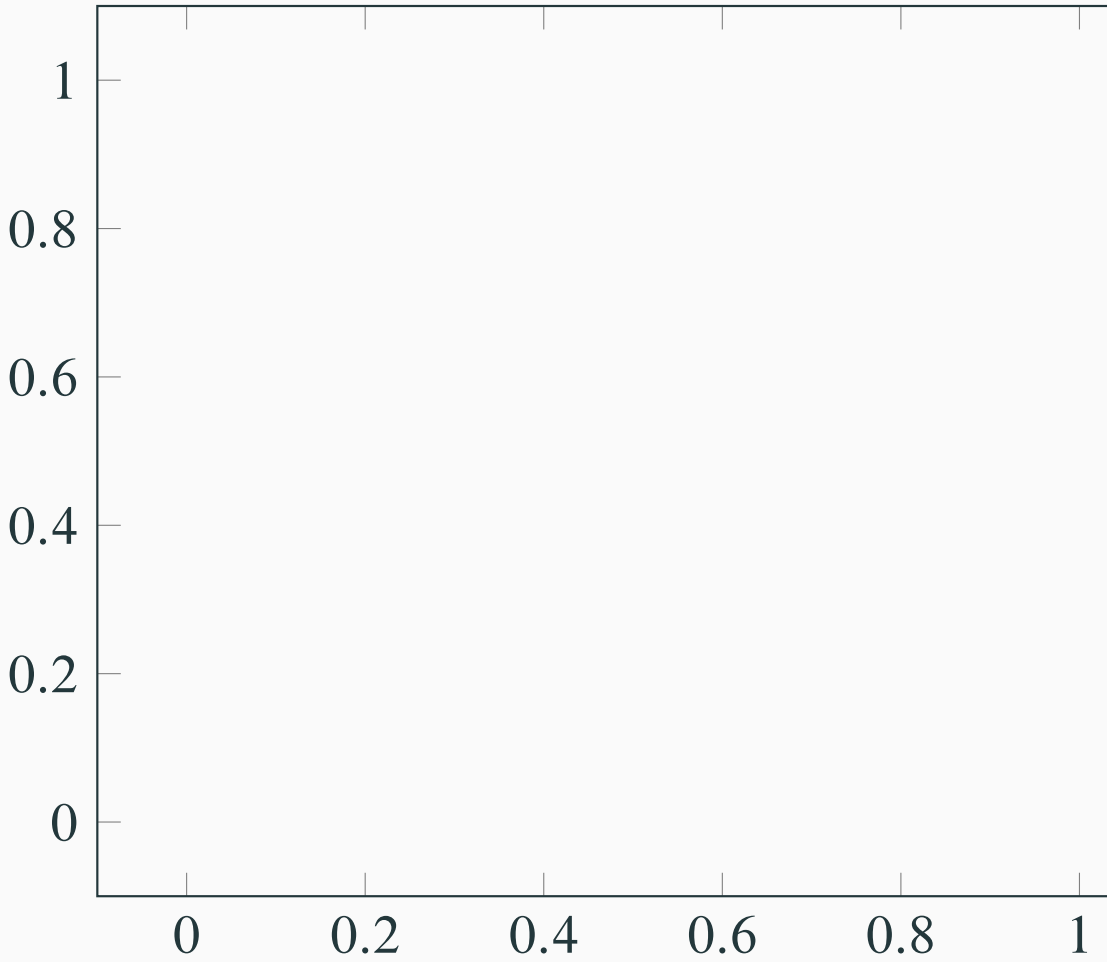

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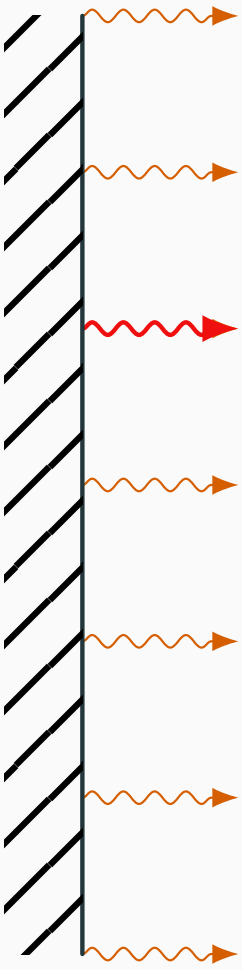

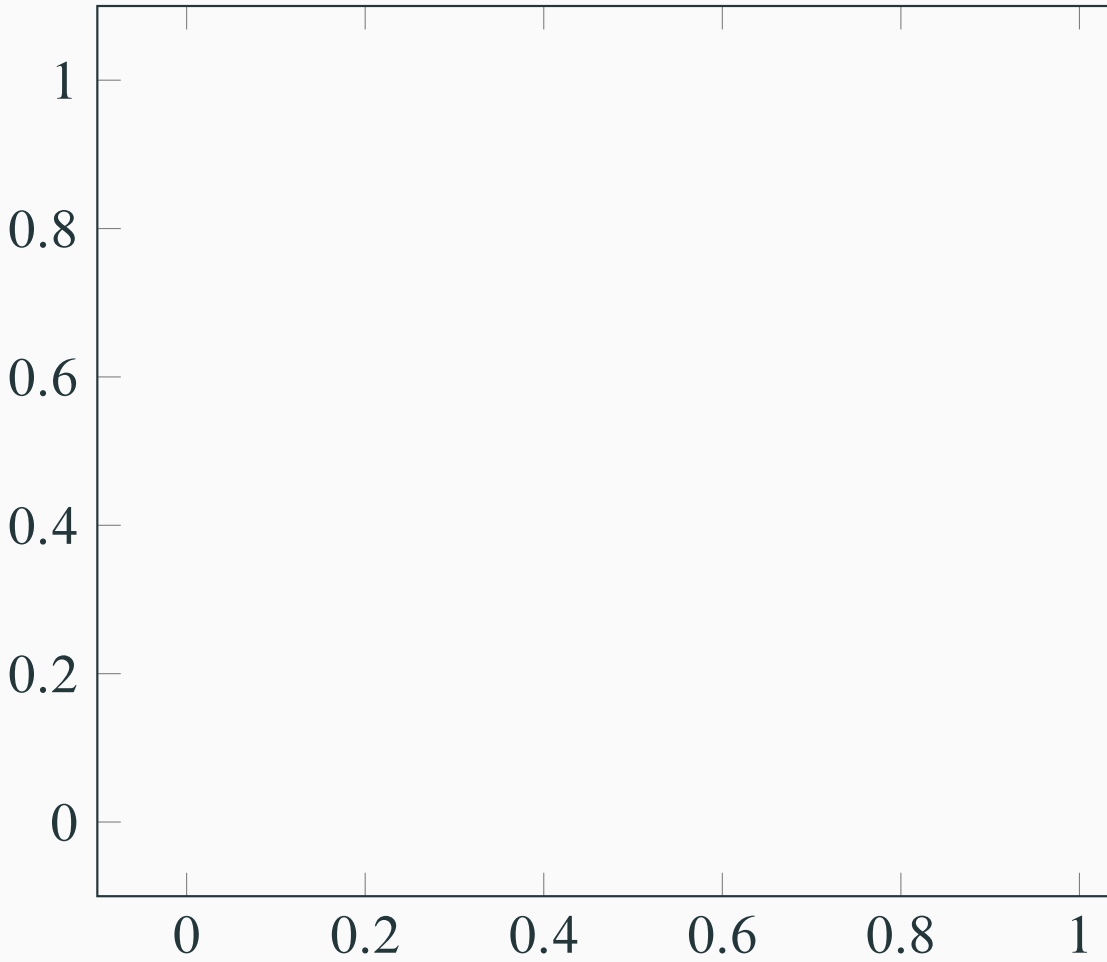

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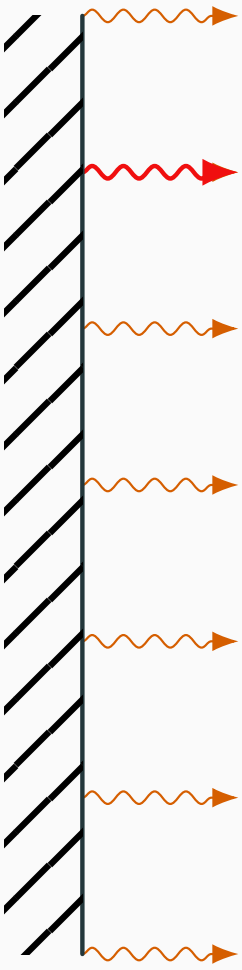

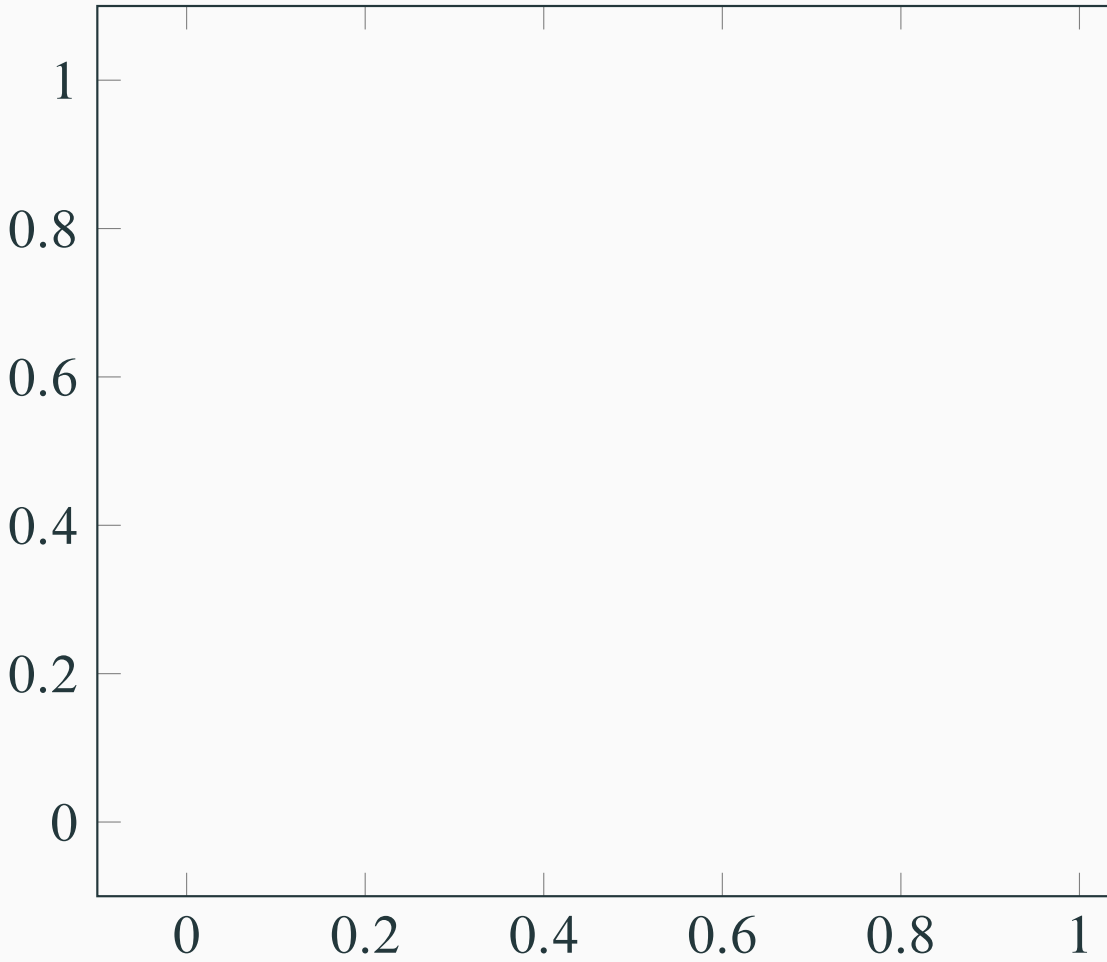

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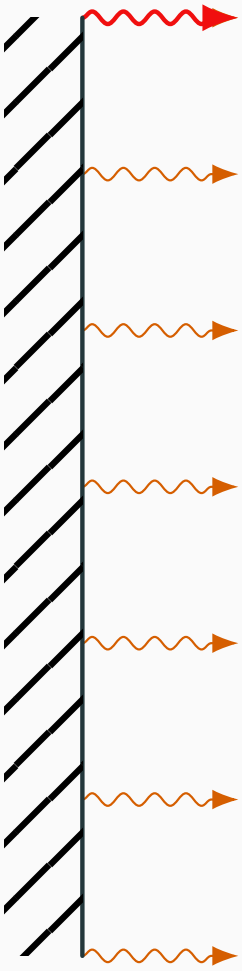
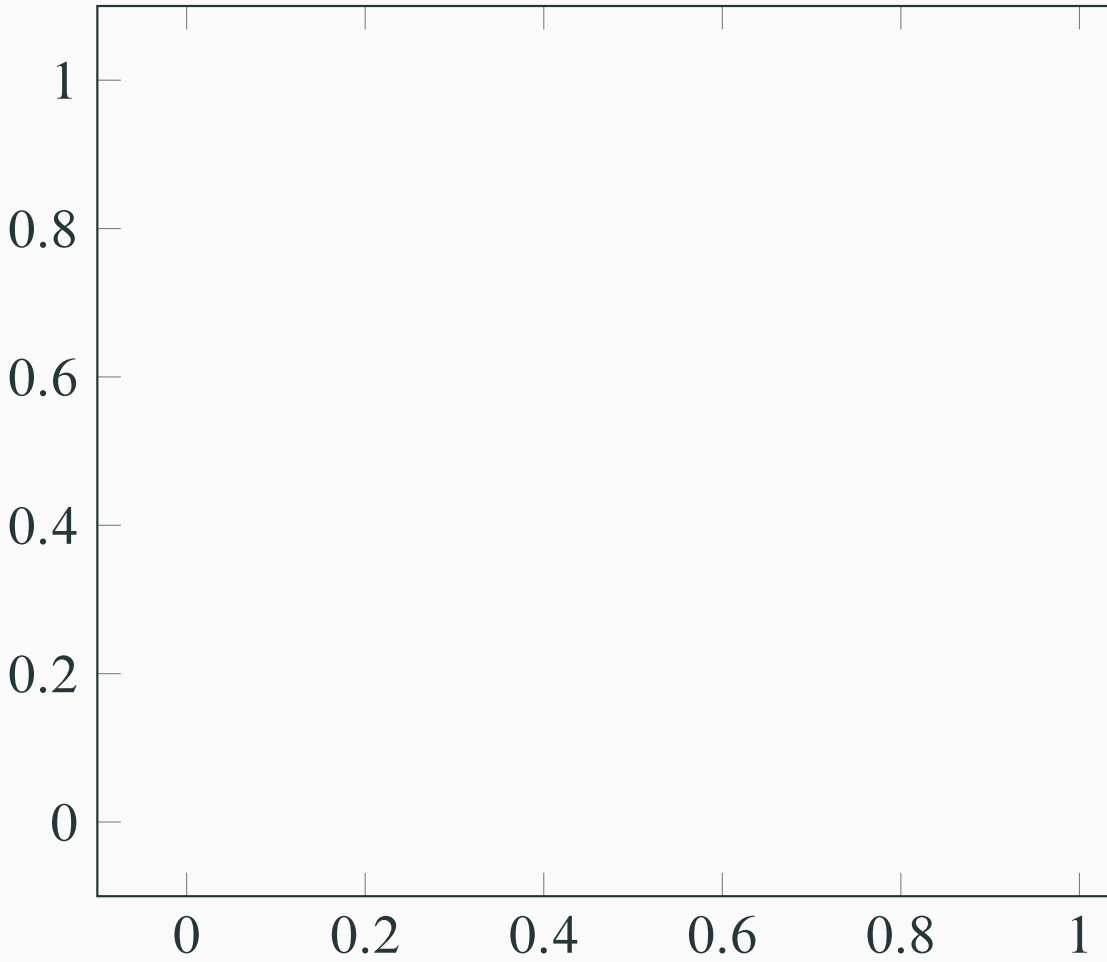
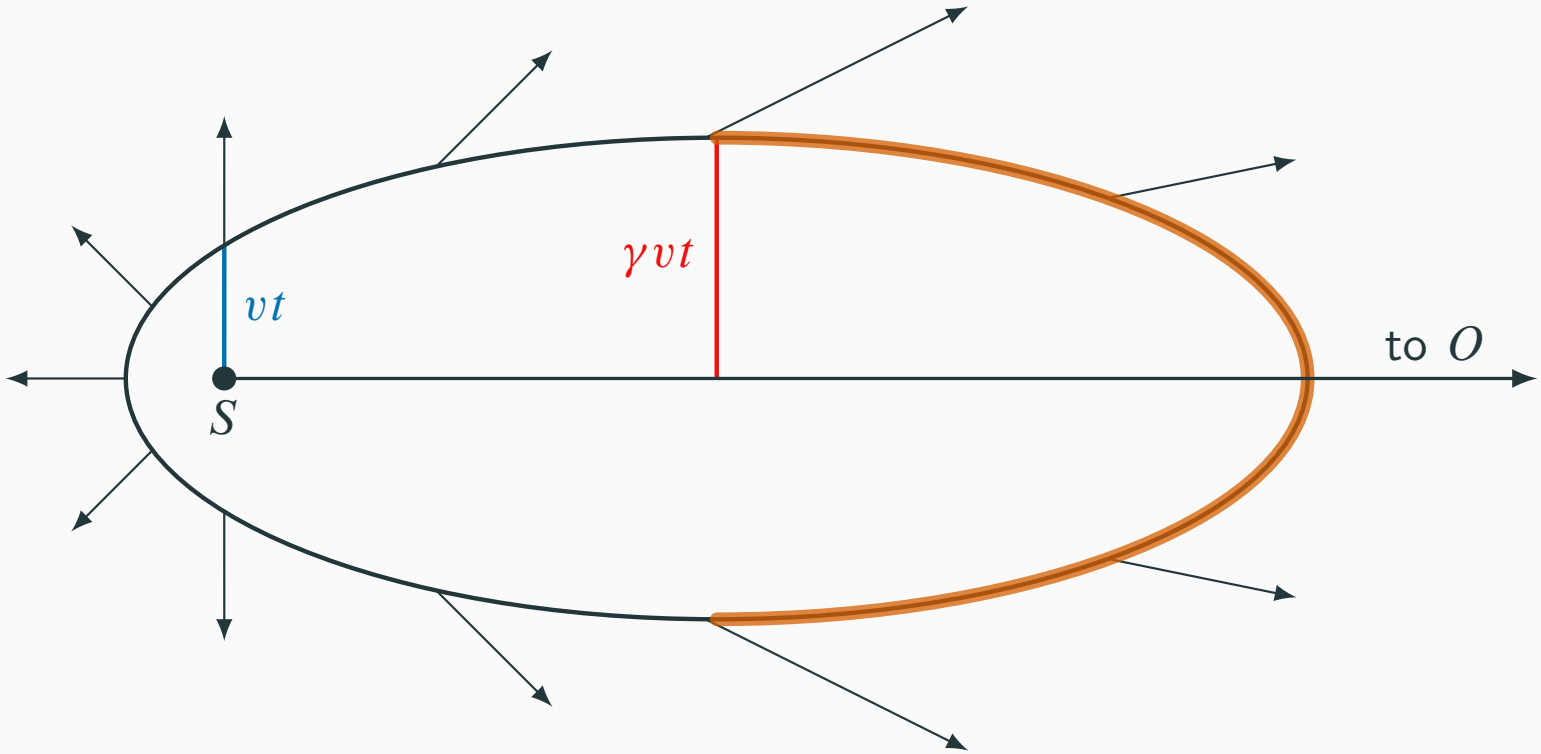




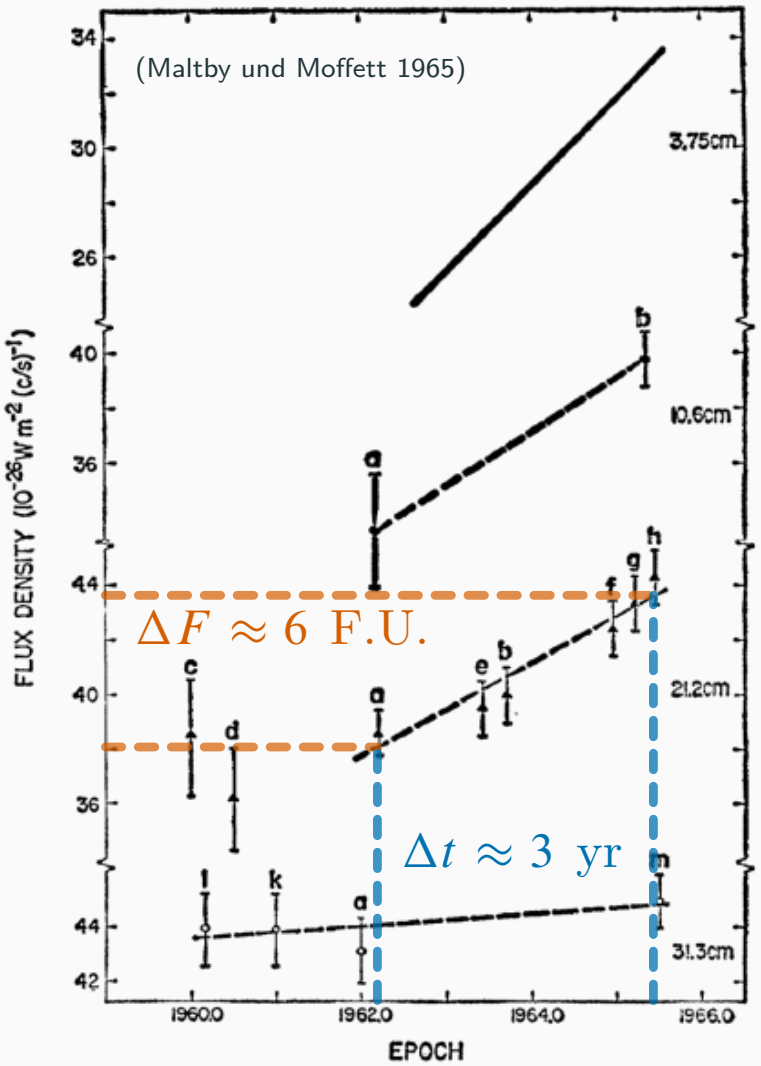
sphärische Expansion $v \ll c$

sphärische Expansion $v \sim c$

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

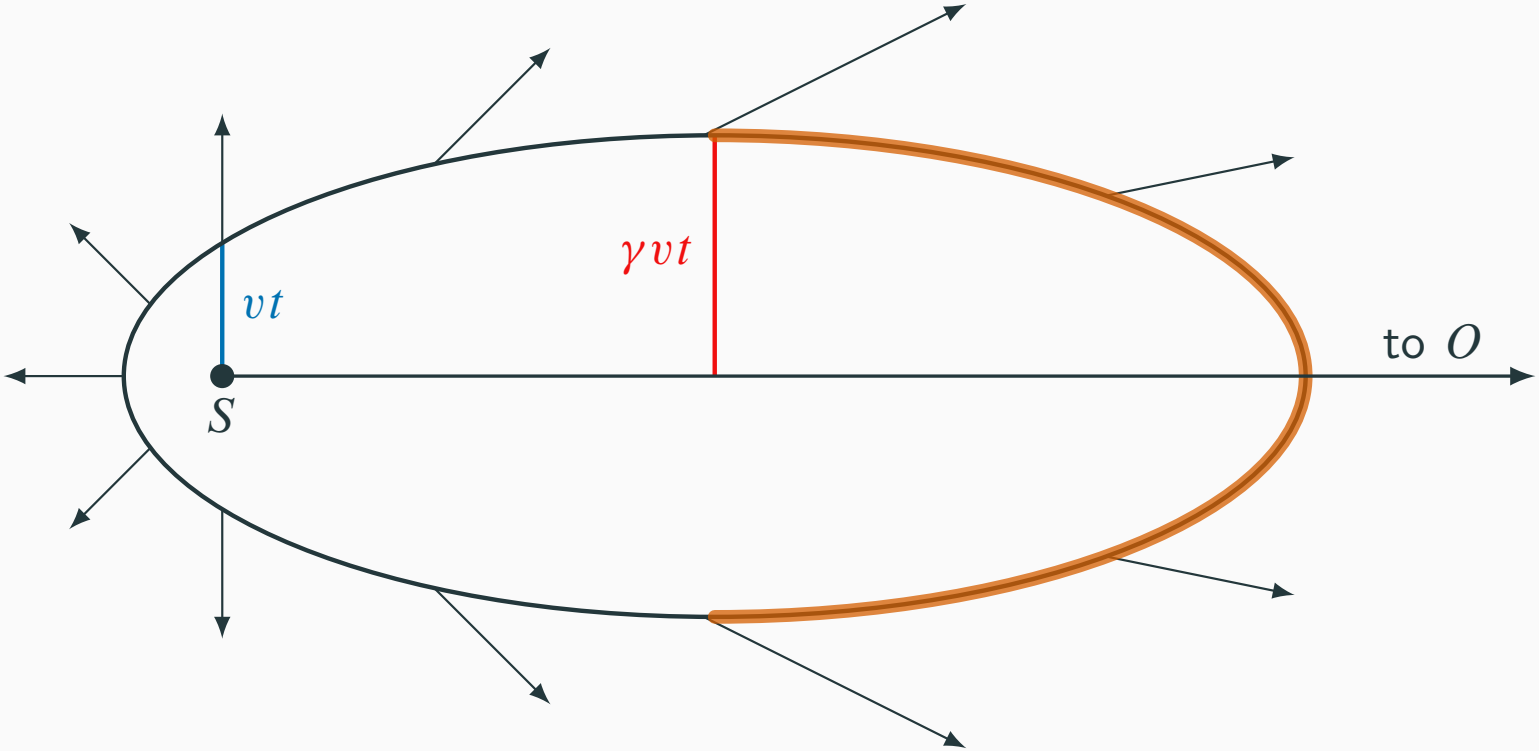


Beobachtung



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

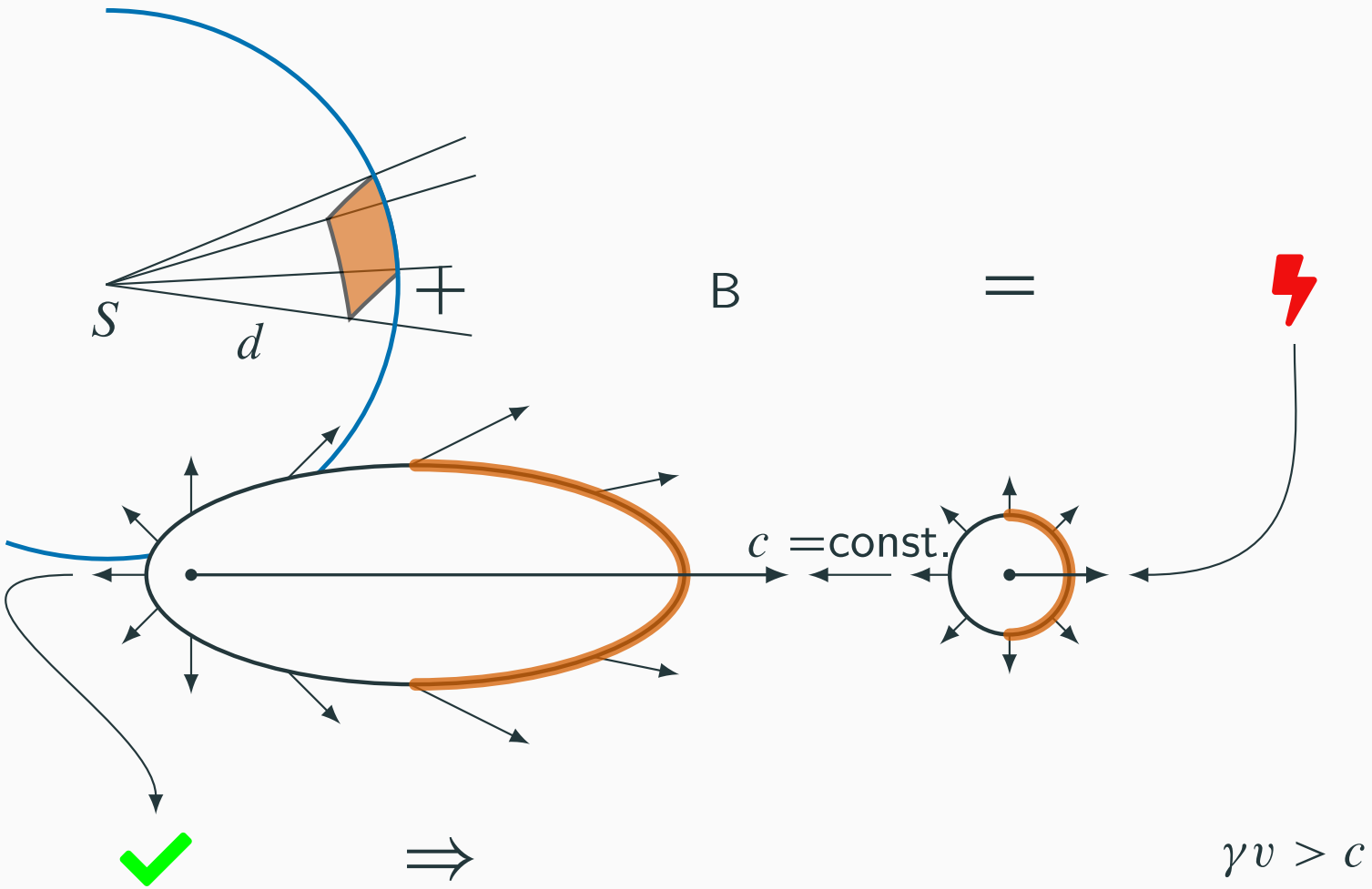
Konsequenz



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

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

Recap

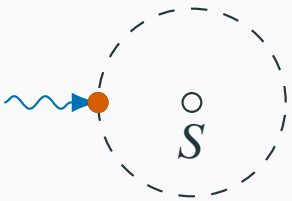


Fragen?

Relativistische Expansion

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

$t = 0$

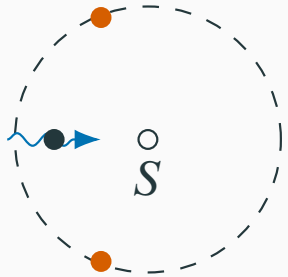


to O

Relativistische Expansion

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

$t = 0.25$

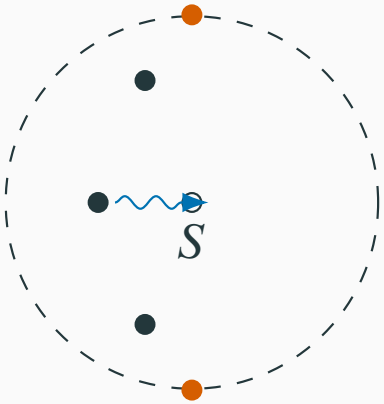


to O

Relativistische Expansion

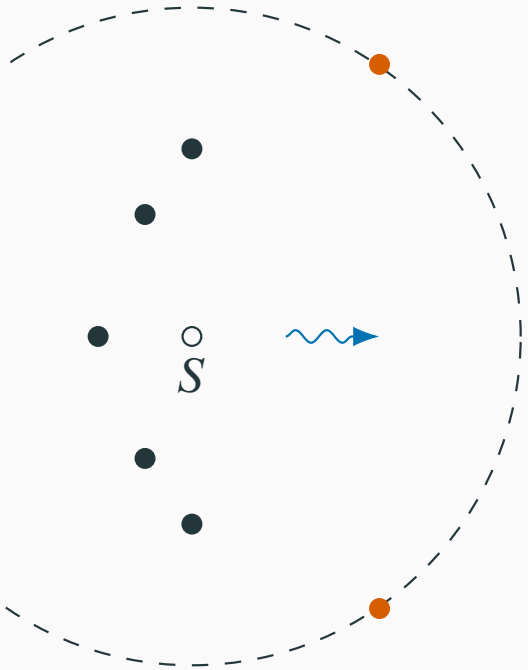
$\beta = 0.835, \ \gamma = 1.82$

$t = 0.59$



to O

Relativistische Expansion

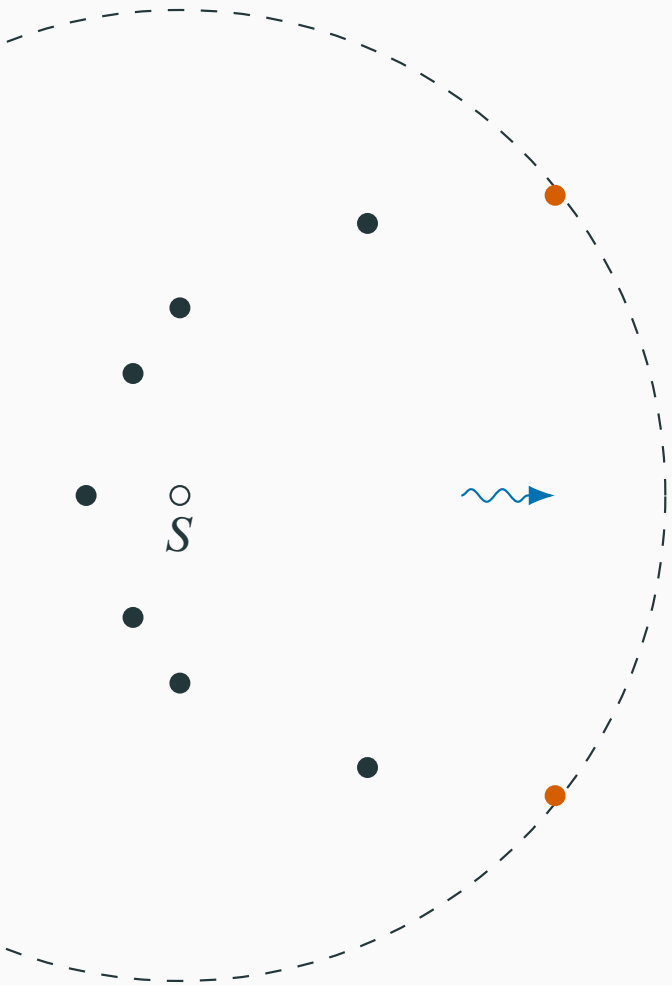


$\beta = 0.835, \ \gamma = 1.82$

$t = 1.5$

to O

Relativistische Expansion

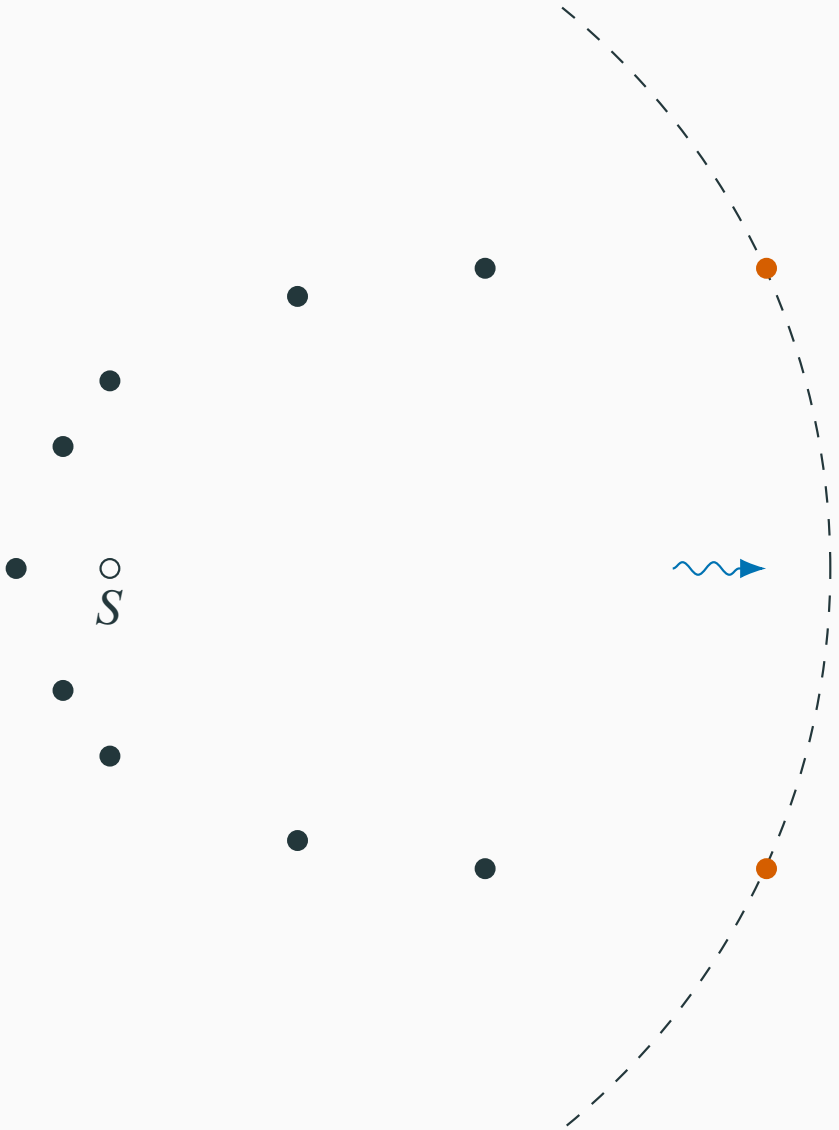


$\beta = 0.835, \ \gamma = 1.82$

$t = 2.5$

to O

Relativistische Expansion

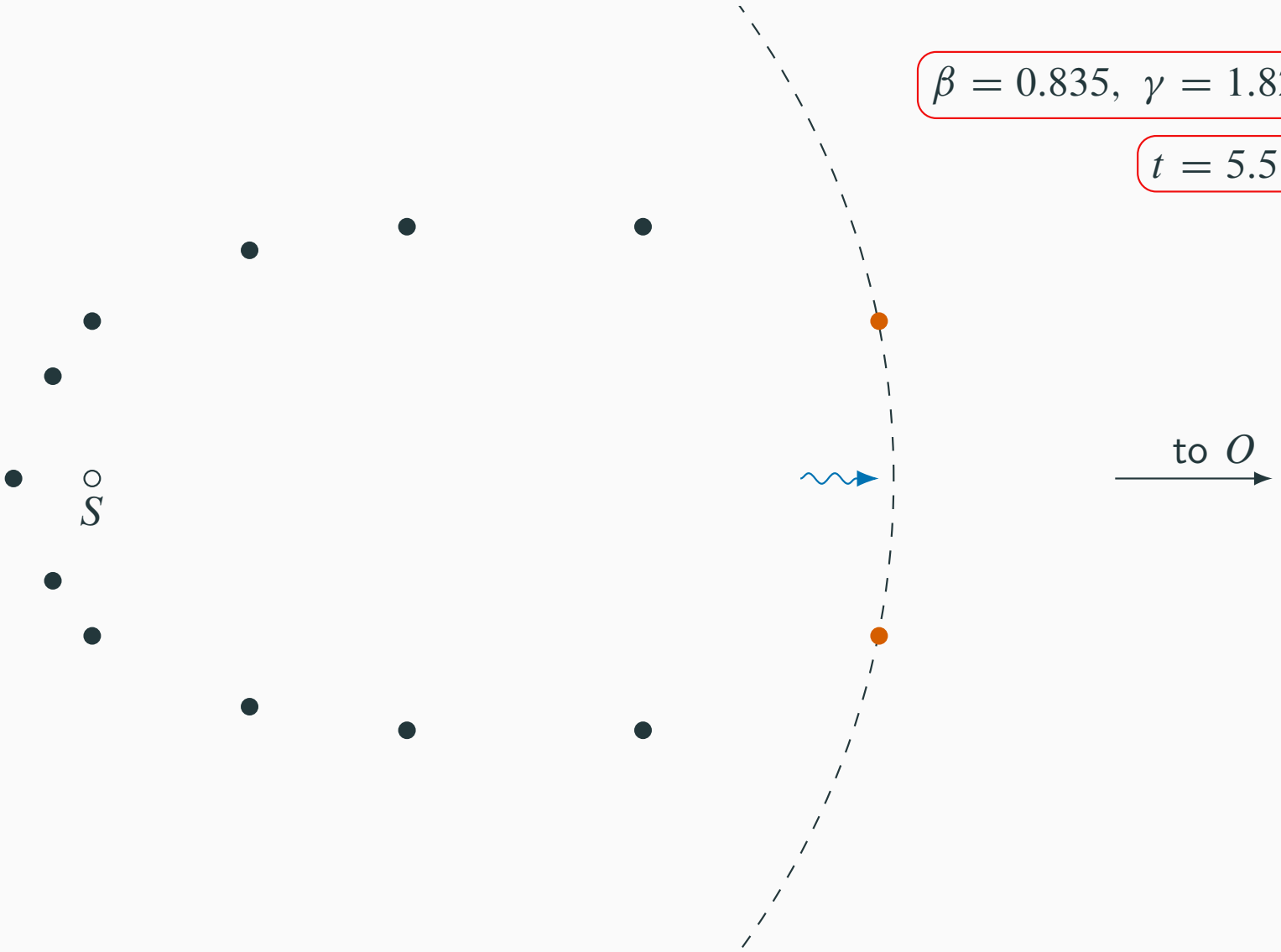


$\beta = 0.835,\ \gamma = 1.82$

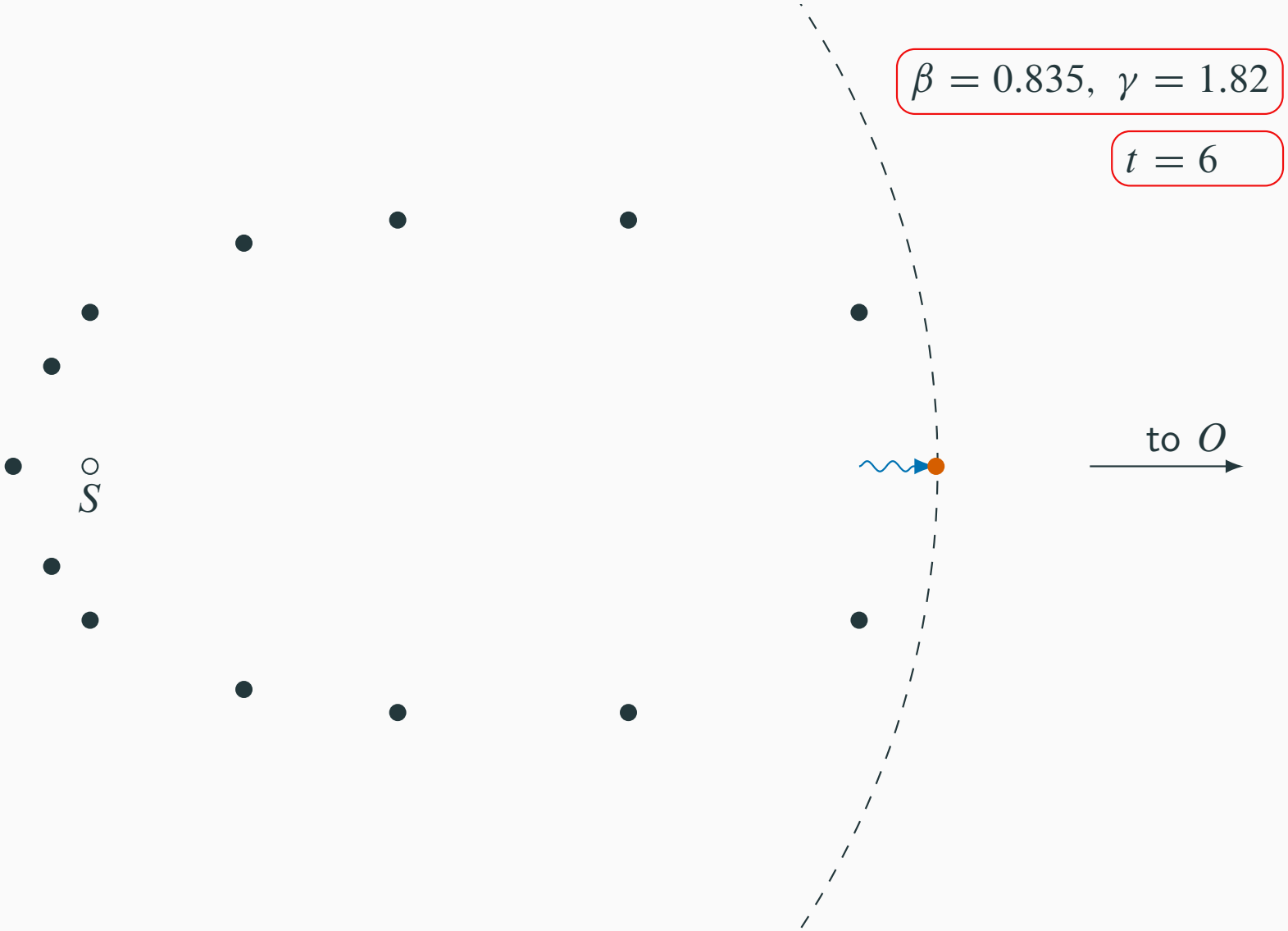
$t = 4$

to O

Relativistische Expansion



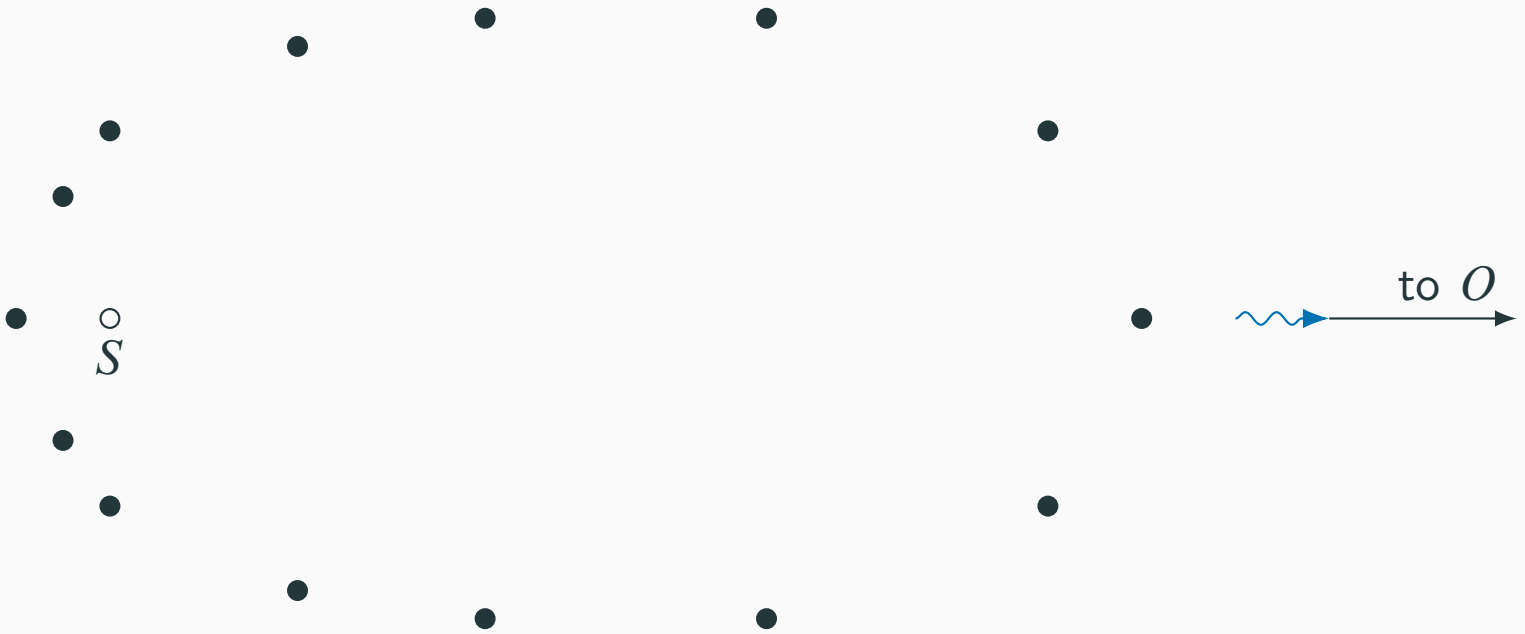
Relativistische Expansion



Relativistische Expansion

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

$t > 6$



Sources i

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.

Sources ii

[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).