

⇒ Last GRB funny paper discussion comments.

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Two images will be in opposite direction wrt Lens L

$\theta_E =$

Megha Dutt Aravind Bharathi Vallavan Vikram Ramesh

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$$\frac{1}{2} m v_{esc}^2 - \frac{G M M}{R} = 0$$

$$v_{esc} = \sqrt{\frac{2GM}{R}}$$

$$c = \sqrt{\frac{2GM}{R}}$$

$$R = \frac{2GM}{c^2}$$

$R = \frac{2GM}{c^2}$

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$\theta_E = \sqrt{\frac{4GM}{c^2 D_L}}$

$L = \frac{4GM}{c^2}$

$= 2 \times \left[\frac{2GM}{c^2} \right]$

Schwarzschild radius

$\theta_E = \sqrt{\frac{4GM}{c^2 D_L}}$

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Handwritten notes on a tablet screen showing calculations for the Schwarzschild radius and angular size of a black hole.

$R < \sqrt{2} R_s$
 $\theta_E = \sqrt{\frac{2 R_s}{D_L}}$
 $\approx \sqrt{\frac{2 \times 3 \text{ km}}{3 \times 10^{16} \text{ km}}}$
 $\theta_E \approx 10^{-8} \text{ rad.}$

Diagrams showing a black hole (Schwarzschild radius) and a source (S) emitting light that is lensed by the black hole.

$R_s = \frac{2GM}{c^2}$
 Black hole

$$\theta_E = \sqrt{\frac{2 R_s}{D_L}} = \sqrt{\frac{2 \times 3 \text{ km}}{3 \times 10^{16} \text{ km}}} \approx 10^{-8} \text{ rad}$$

Handwritten notes on a tablet screen showing calculations for the magnification factor A and the ratio of image areas A_1/A_2 .

$2.5 \log_{10} \left(\frac{A_1}{A_2} \right) < 0.01 \Rightarrow \log_{10} \left(\frac{A_1}{A_2} \right) < \frac{0.01}{2.5}$
 $\log_{10} \left[\frac{A_1}{A_2} \right] < 2.5 \times 0.01$
 ~ 0.025
 $\frac{A_1}{A_2} \sim 10^{0.025}$
 ~ 1.006
 6%

$\Rightarrow \log_{10} \left(\frac{A_1}{A_2} \right) < \frac{0.01}{2.5}$
 $\frac{A_1}{A_2} \sim 10^{0.004}$
 ~ 1.009
 i.e. 0.9%

Issue of resolution :-

We don't have to resolve the two images of stars/GRB

rather as

$$A(u) = \frac{u^2 + 2}{2u\sqrt{u^2 + 4}}$$



$$u \equiv \frac{\theta}{\theta_E}$$

Hence, A changes from two positions bcoz u changes.