# Mesure de $H_0$ avec le quasar lentillé RXJ1131-1231


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**Résumé**


## 1 Introduction

$$c\Delta t_{ij} = D_{\Delta t}\left(\frac{(\theta_i - \beta)^2}{2} - \frac{(\theta_j - \beta)^2}{2} - \psi(\theta_i) + \phi(\theta_j)\right) \tag{1}$$

$$D_{\Delta t} \equiv (1 + z_\ell)\frac{D_\ell D_s}{D_{\ell s}} \propto H_0^{-1} \tag{2}$$

## 2 Théorie

$$\boldsymbol{\nabla}_\theta^2 \psi = 2\kappa(\boldsymbol{\theta}) \tag{3}$$

$$\psi(\boldsymbol{\theta}) = \frac{1}{\pi}\int_{\mathbb{R}^2} \kappa(\boldsymbol{\theta}')\ln\big(\boldsymbol{\theta} - \boldsymbol{\theta}'\big) d^2\boldsymbol{\theta}' \tag{4}$$

$$\kappa(\boldsymbol{\theta}) \equiv \frac{\Sigma(\boldsymbol{\theta})}{\Sigma_{\text{cr}}} \tag{5}$$

$$\Sigma_{\text{cr}} \equiv \frac{c^2}{4\pi G}\frac{D_s}{D_\ell D_{\ell s}} \tag{6}$$

$$\boldsymbol{\beta} = \boldsymbol{\theta} - \boldsymbol{\alpha}(\boldsymbol{\theta}) \tag{7}$$

$$\boldsymbol{\alpha}(\boldsymbol{\theta}) = \frac{1}{\pi}\int_{\mathbb{R}^2} \kappa(\boldsymbol{\theta}')\frac{\boldsymbol{\theta} - \boldsymbol{\theta}^{'}}{|\boldsymbol{\theta} - \boldsymbol{\theta}'|} d^2\boldsymbol{\theta}' \tag{8}$$

$$\kappa(\boldsymbol{\theta}) = \frac{3-n}{2}\left(\frac{\theta_E}{\sqrt{\dfrac{\theta_1^2}{1-e} + \theta_2^2(1-e)}}\right)^{n-1} \tag{9}$$

## 3 Méthodologie

$$\begin{aligned}\log P(\underbrace{\mathbf{d}_{\text{ACS}}}_{\mathcal{D}}\,|\,\underbrace{\theta_E, e, n, \boldsymbol{\gamma}, \eta, \mathbf{s}}_{\mathcal{M}}) \propto &-\frac{1}{2}\sum_{i=1}^{|\mathcal{D}|}\frac{(d_{ACS,i} - d_{\mathcal{M},i})^2}{\sigma_i^2} \\ &-\frac{1}{2}\sum_{i<j}^{4}\frac{(\boldsymbol{\beta}_i - \boldsymbol{\beta}_i)^2}{(d\theta)^2}\end{aligned} \tag{10}$$

$$\begin{aligned}\log P(\Delta t | D_{\Delta t}, \mathcal{M}) \propto &-\frac{1}{2}\sum_i \frac{(\Delta t_i - \Delta t(D_{\Delta t, \mathcal{M}}))^2}{\sigma_{\Delta t}^2} \\ &+ \log P(\mathbf{d}_{ACS}|\mathcal{M})\end{aligned} \tag{11}$$

## 4 Résultats et discussion

## 5 Conclusion