2022-11-23

Retour sur la propagation d'onde gravitationnelles

$$\boxed{\Box \bar{h}_{ik} = -16 T_{ik}}$$

$$\partial_i \partial^i \psi \equiv \Box \psi - \rho(x)$$

$$\Psi(x) = \frac{1}{4\pi} \int \mathrm{d}^3 r \frac{\rho(\overbrace{t - |r - r'|}^{t'}, \mathbf{r})}{|r - r'|}$$

$$\bar{h}_{ik} = -4 \int \mathrm{d}^3 r' \frac{T_{ik}(t', \mathbf{r})}{|\mathbf{r} - \mathbf{r}'|}$$

Fonction de Green :

$$\Box G(x) = \delta(x)$$

$$\psi(x) = \int \mathrm{d}^4 y (x - y) \rho(y)$$

$$\Box \psi(x) = \int \mathrm{d}^4 y \Box_x G(x - y) \rho(y)$$

$$\boxed{G(x) = \frac{\delta(t - |\mathbf{r}|)}{4\pi |\mathbf{r}|}}$$

Rayonnement d'on objet binaire

$$\mathbf{r}_A = (a \cos \Omega t, a \sin \Omega t, 0)$$

$$\mathbf{r}_B = -\mathbf{r}_A$$

$$\Omega = \sqrt{\frac{M}{4a^2}}$$

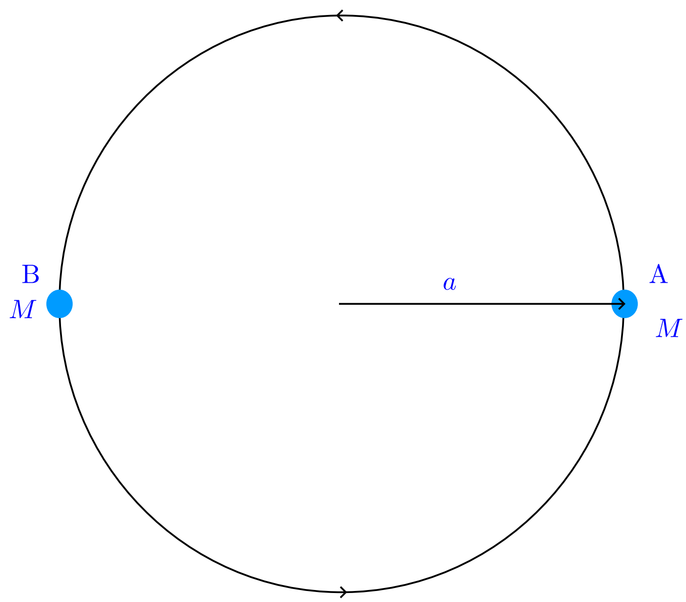

FIGURE 1 – objet binaire

$$I^{ab} = \sum_{\alpha} m_\alpha x_\alpha^a x_\alpha^b = 2M x_A^a x_A^b = 2M_a \begin{bmatrix} \cos^2 \Omega t & \cos \Omega t \sin \Omega t & 0 \\ \cos \Omega t \sin \Omega t & \sin^2 \Omega t & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\bar{h}^{ab} = \frac{8M_{a^2}\Omega^2}{r} \left. \begin{bmatrix} \cos 2\Omega t' & \sin 2\Omega t' & 0 \\ \sin 2\Omega t' - \cos 2\Omega t' & 0 & \\ 0 & 0 & 0 \end{bmatrix} \right|_{t'=t-r}$$

$$\bar{h}^{ij}(t) = \frac{8Ma^2\Omega^2}{r} \operatorname{Re}\left[\left(e_1^{ij} - i e_2^{ij} \right) e^{2i\Omega(t-t')} \right]$$