Relatividade Geral,
Ondas Gravitacionais,
Objetos compactos,
Cosmologia,
Teorias alternativas,
etc

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Breve histórico

1990: Doutor pelo IAG/USP

2001: Livre-docência pelo IAG/USP

2002: Pesquisador Associado INPE (concurso público)*

2006: Pesquisador Titular INPE

Mais informações: CV Lattes

*1998 – 2002: Jovem Pesquisador FAPESP – INPE

Ponto de partida ….

$$G_{\mu\nu} \equiv R_{\mu\nu} - \frac{1}{2}\, g_{\mu\nu} R = 8\pi T_{\mu\nu}$$

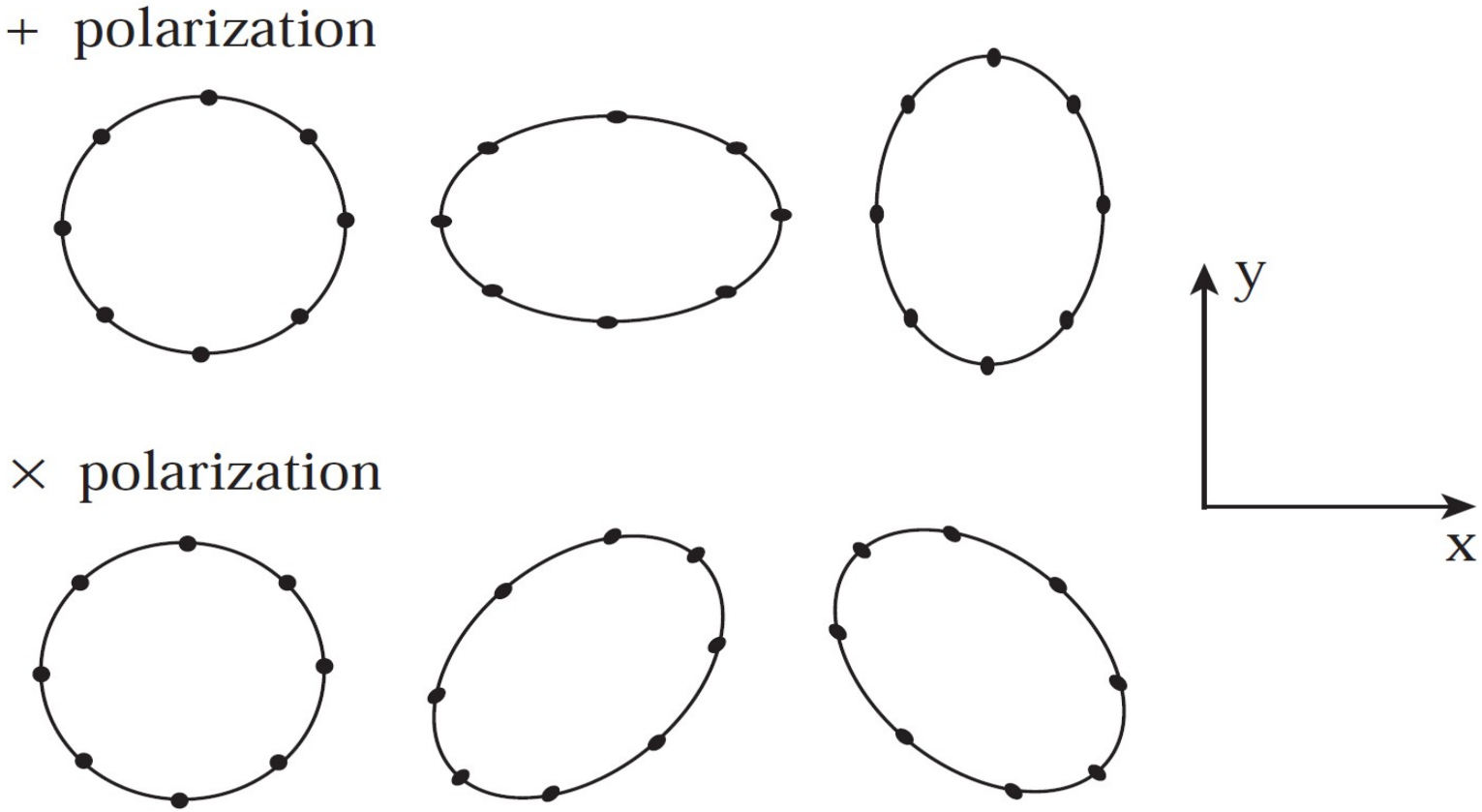
$$ds^2 = g_{\alpha\beta}\, dx^\alpha dx^\beta$$

$$T^{\alpha\beta} = (\rho + p)\, u^\alpha u^\beta + p\, g^{\alpha\beta}$$

Ondas Gravitacionais

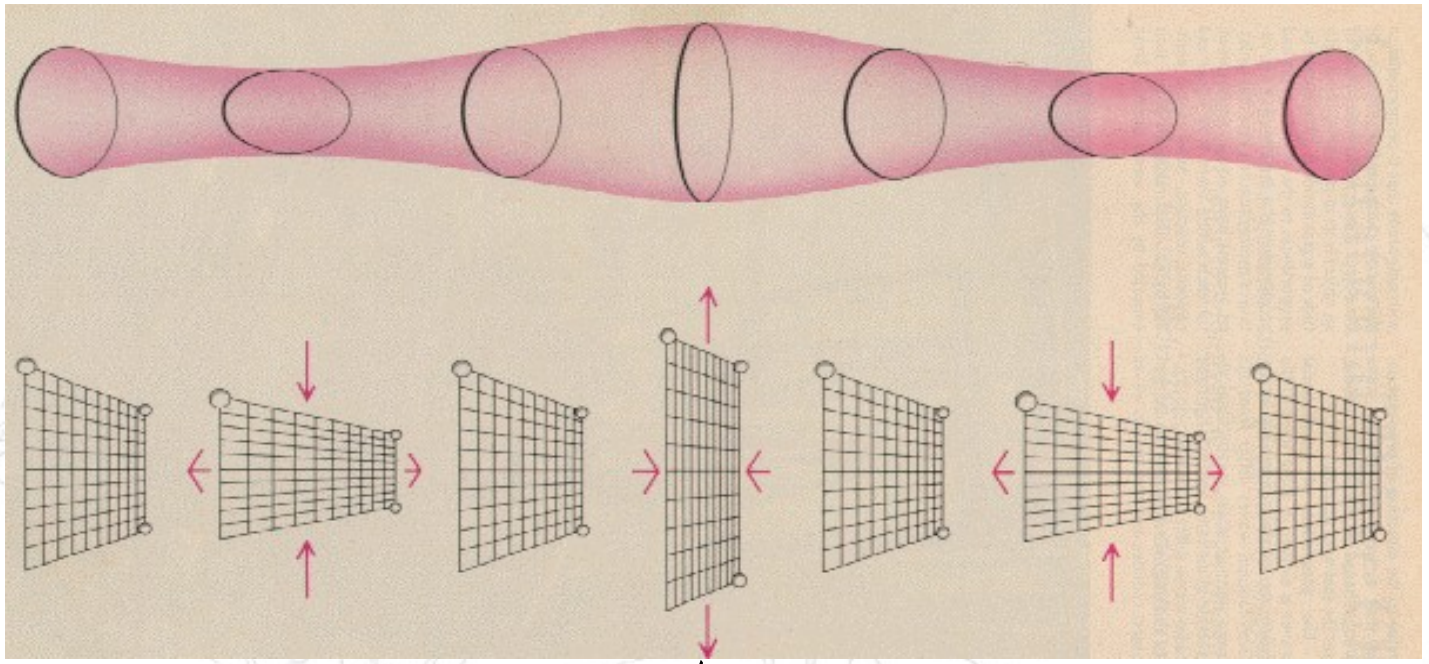
$$g_{\mu\nu} = \eta_{\mu\nu} + h_{\mu\nu} \ , \qquad |h_{\mu\nu}| \ll 1$$

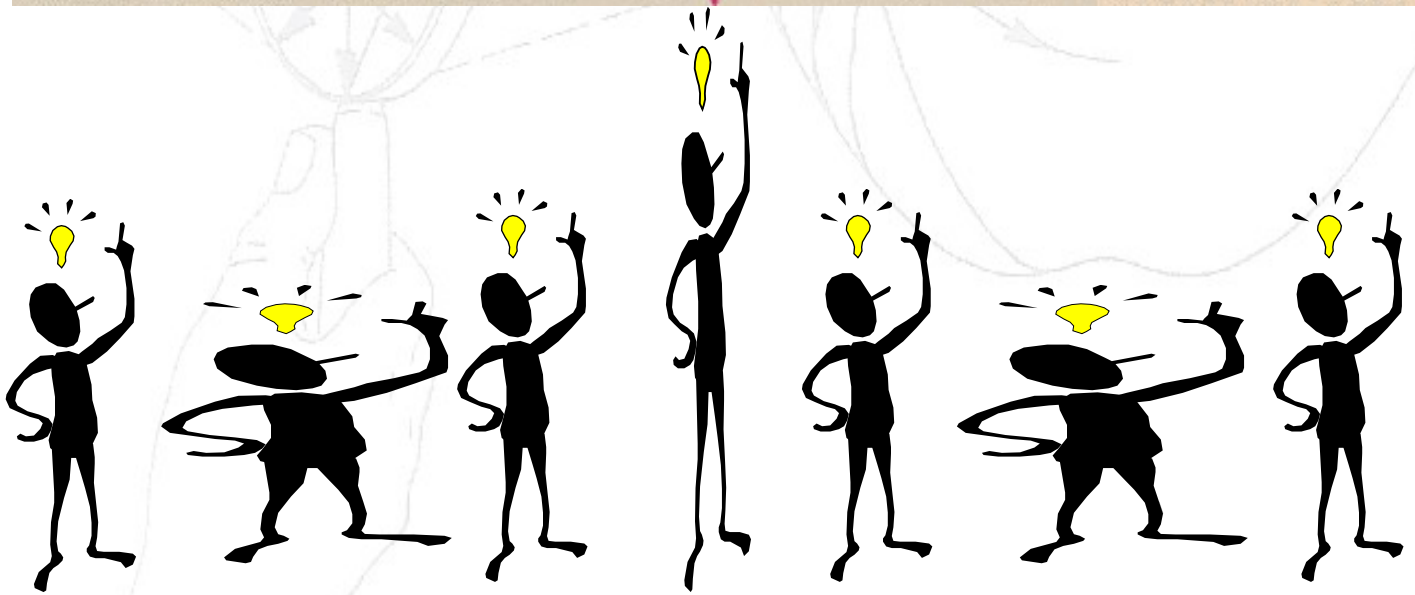
$$\Box \bar{h}_{\mu\nu} = -16\pi T_{\mu\nu}$$



Amplitude da onda: $h = \Delta L/L$

Freqüências das ondas: 10^{-18} Hz a 10^{10} Hz





Relatividade Geral

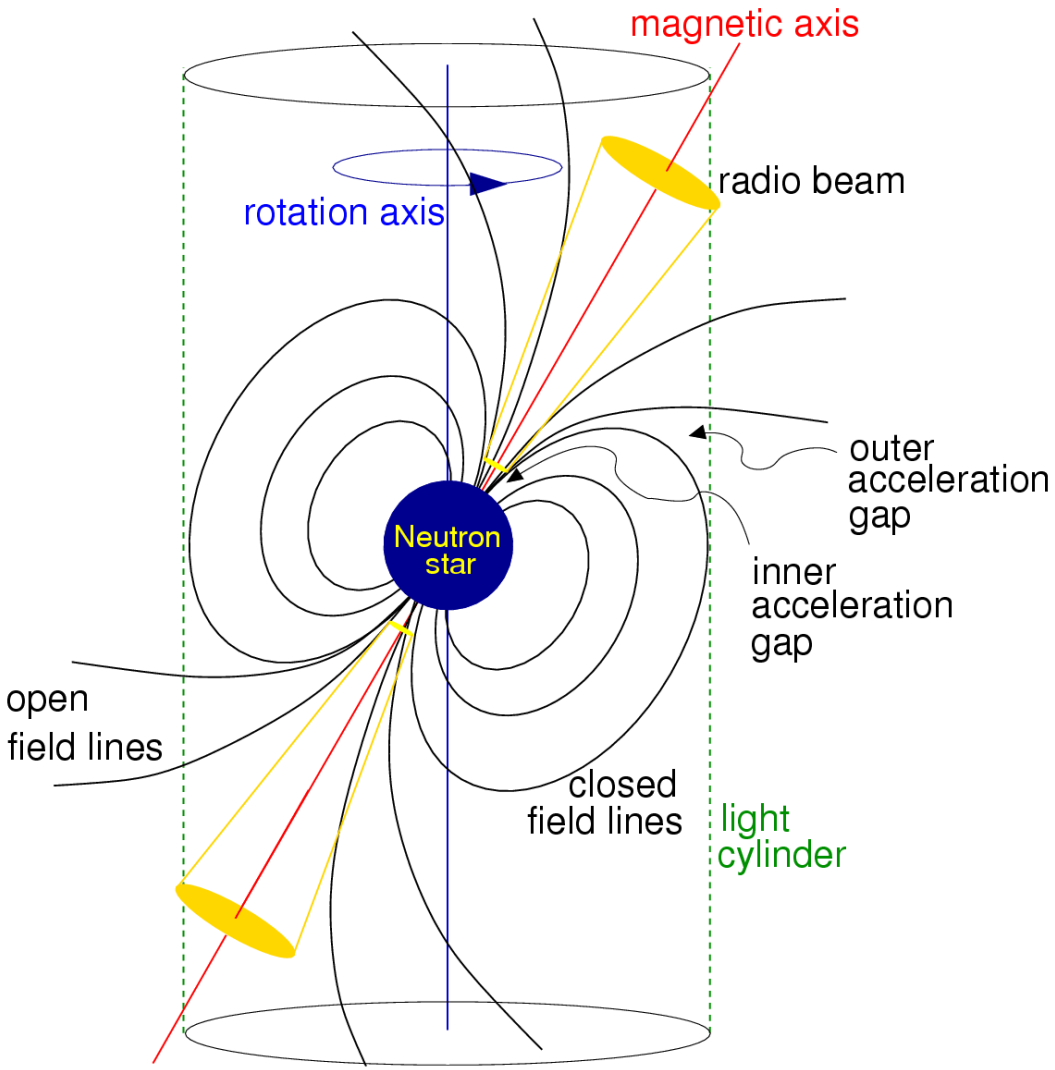
- Fontes de Ondas Gravitacionais
- Detecção de Ondas Gravitacionais
- Objetos compactos
- Relatividade Geral Algébrica e Numérica

Teorias alternativas à Relatividade Geral

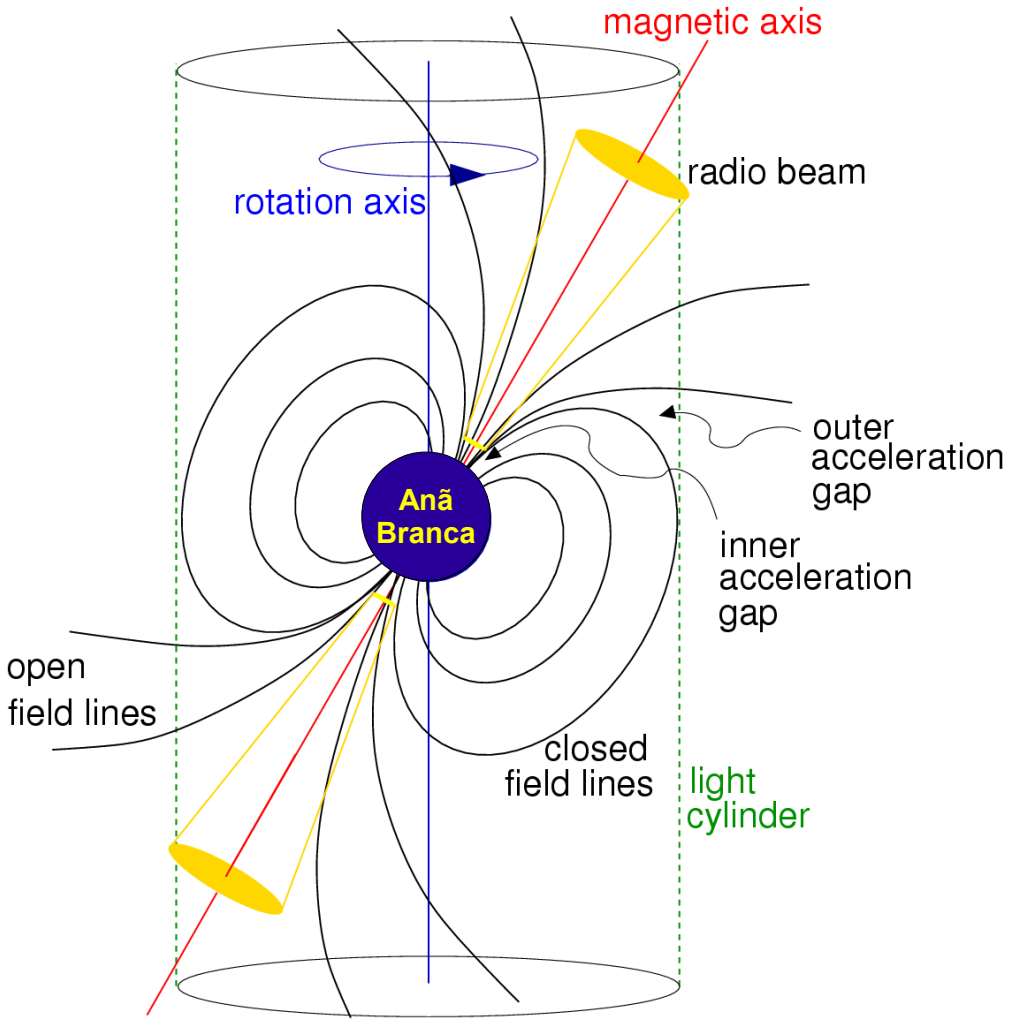
Algumas motivações:

- Expansão acelerada
- Singularidades
- RG não é quantizável

Fontes de Ondas Gravitacionais (OGs)



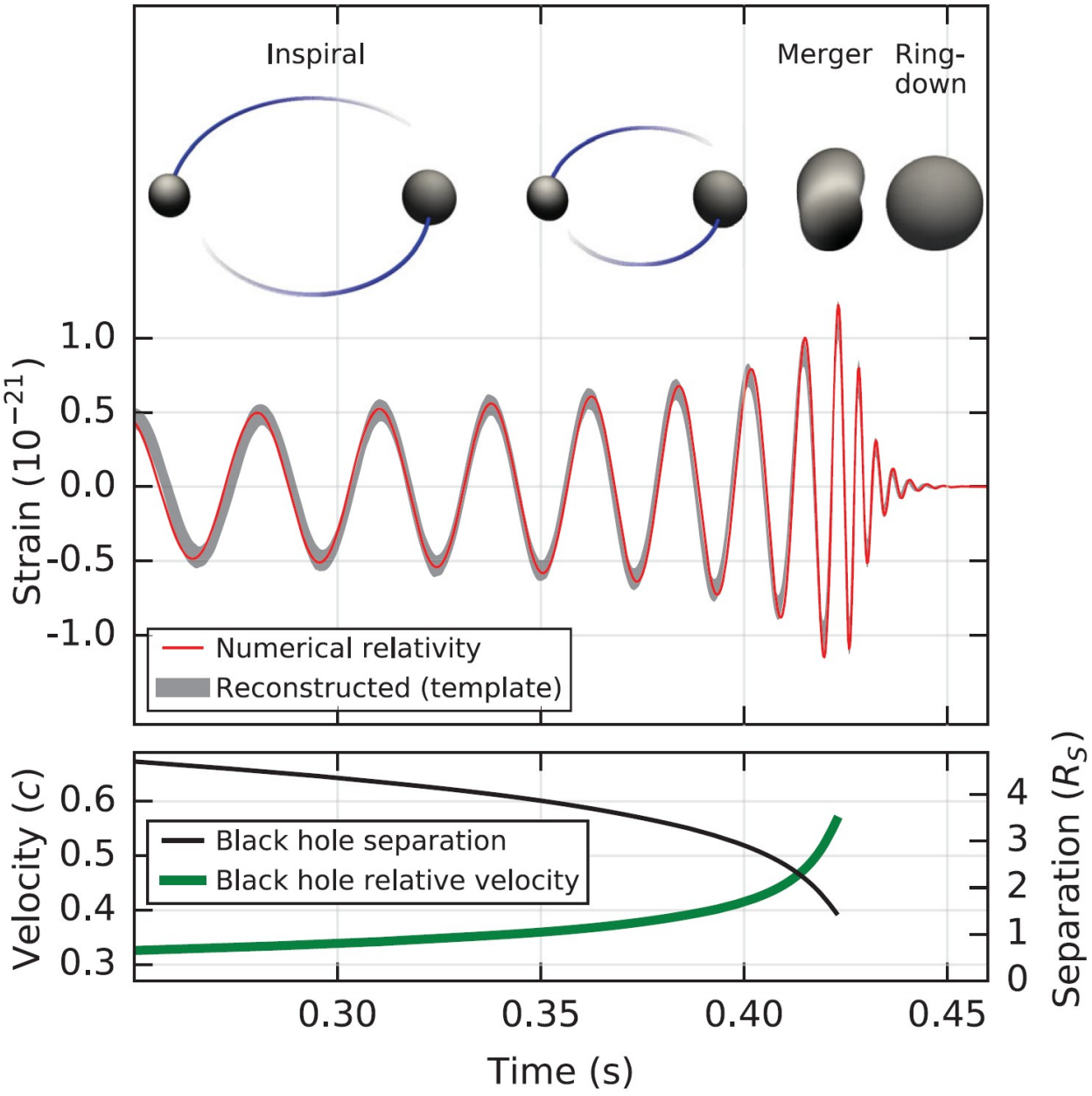
Pulsar = estrela de nêutrons em rotação



?

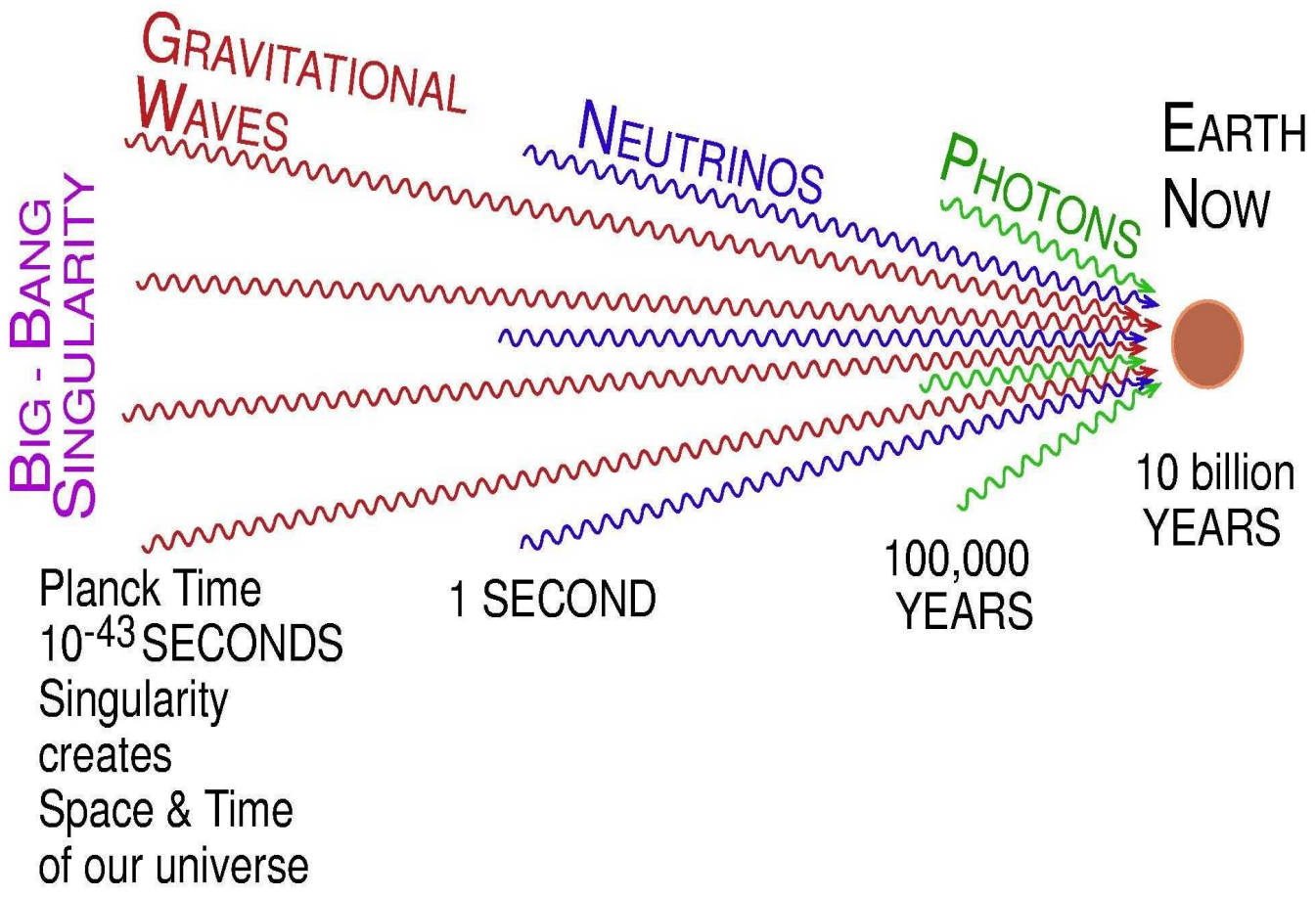
Existem pulsares de anãs brancas?

Perguntem ao Felipe!



(http://journals.aps.org/prl/pdf/10.1103/PhysRevLett.116.061102)

- Big-Bang Birth of Universe



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Regular Article - Theoretical Physics

Gravitational waves from pulsars in the context of magnetic ellipticity

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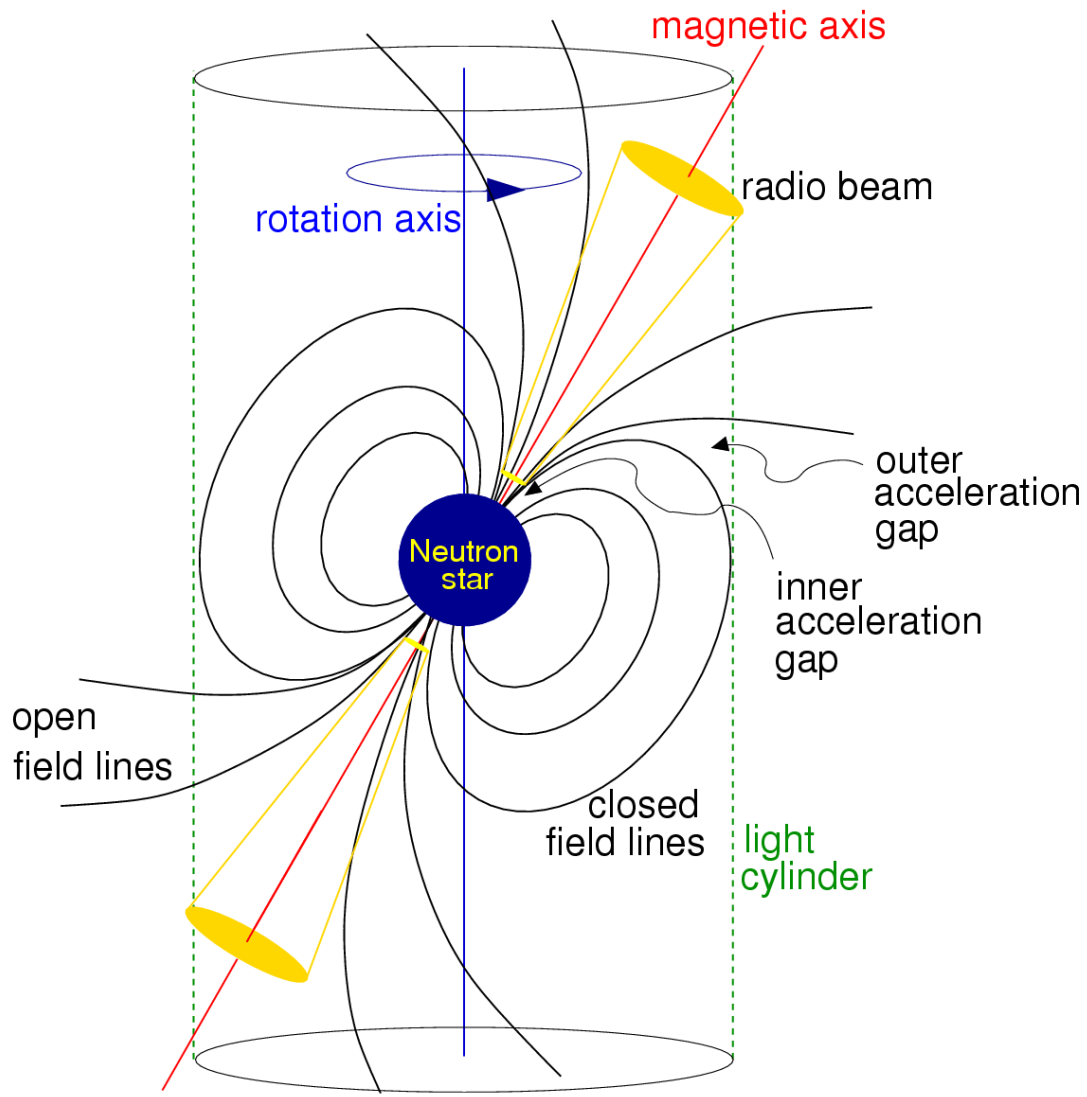
Abstract In one of our previous articles we have considered the role of a time dependent magnetic ellipticity on the pulsars' braking indices and on the putative gravitational waves these objects can emit. Since only nine of more than 2000 known pulsars have accurately measured braking indices, it is of interest to extend this study to all known pulsars, in particular as regards gravitational wave generation. To do so, as shown in our previous article, we need to know some pulsars' observable quantities such as: periods and their time derivatives, and estimated distances to the Earth. Moreover, we also need to know the pulsars' masses and radii, for which we are adopting current fiducial values. Our results show that the gravitational wave amplitude is at best $h \sim 10^{-28}$. This leads to a pessimistic prospect for the detection of gravitational waves generated by these pulsars, even for Advanced LIGO and Advanced Virgo, and the planned Einstein Telescope, if the ellipticity has a magnetic origin.



A Samantha entrou no time ...

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Primordial gravitational waves in running vacuum cosmologies

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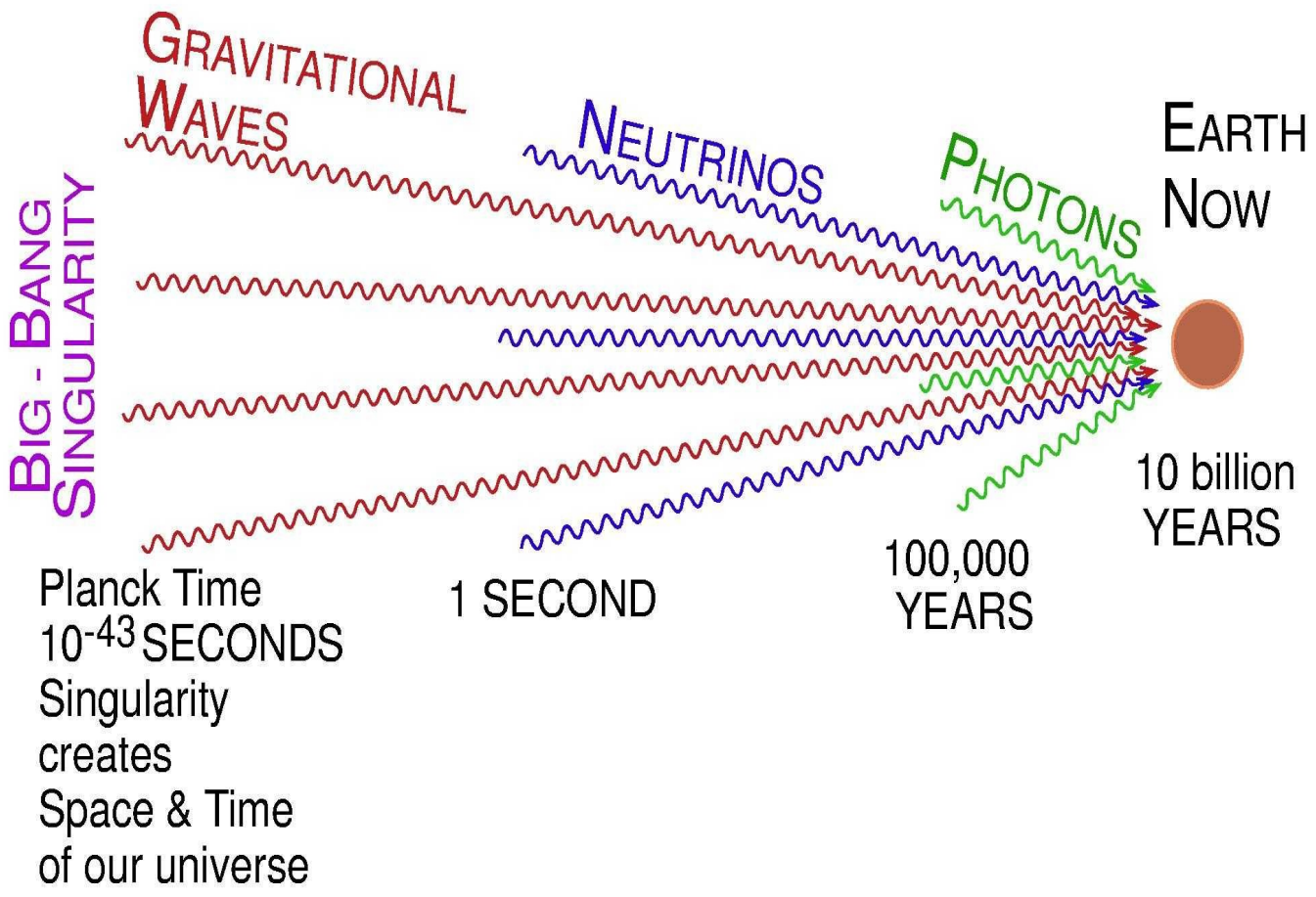
ABSTRACT

We investigate the cosmological production of gravitational waves in a nonsingular flat cosmology powered by a "running vacuum" energy density described by $\rho_\Lambda \equiv \rho_\Lambda(H)$, a phenomenological expression potentially linked with the renormalization group approach in quantum field theory in curved spacetimes. The model can be interpreted as a particular case of the class recently discussed by Perico et al. (2013) [25] which is termed complete in the sense that the cosmic evolution occurs between two extreme de Sitter stages (early and late time de Sitter phases). The gravitational wave equation is derived and its time-dependent part numerically integrated since the primordial de Sitter stage. The generated spectrum of gravitons is also compared with the standard calculations where an abrupt transition, from the early de Sitter to the radiation phase, is usually assumed. It is found that the stochastic background of gravitons is very similar to the one predicted by the cosmic concordance model plus inflation except at higher frequencies ($\nu \gtrsim 100$ kHz). This remarkable signature of a "running vacuum" cosmology combined with the proposed high frequency gravitational wave detectors and measurements of the CMB polarization (B-modes) may provide a new window to confront more conventional models of inflation.

- Big-Bang Birth of Universe



Trabalhos desenvolvidos e em desenvolvimento …

- Relatividade Geral Algébrica e Numérica na formulação 2+2 (ex-estudante: Carlos Eduardo)

- gLISA: uma alternativa ao (e)LISA
  (c/ Massimo Tinto e Márcio Alves)

Trabalhos desenvolvidos e em desenvolvimento …

- Pulsars NS: OGs etc (Samantha, Jaziel e César)
- Pulsars WD: OGs (Felipe e Jaziel)
- AE Aqr (c/ Cláudia et al)
- Fundos de OGs em cosmologias com decaimento do vácuo (Márcio Alves e José Ademir Lima)
- Fundos de OGs de origem cosmológica em teorias alternativas (Mariana (PhD) e Márcio Alves)
- Etc ….

FIM