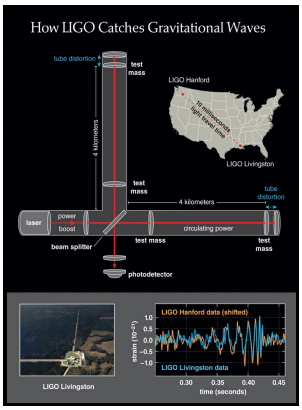
Colliding plane gravitational and fluid waves

- - Phys. Rev. D 98, 084053 (2018)



Description: -
-Colliding plane gravitational and fluid waves
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Such waves are more realistic than plane waves in having a finite but very large transverse size. The first eight chapters offer background, presenting the field equations and discussing some qualitative aspects of their solution.

Gravitational Waves Could Collide Sucking Earth Into a Black Hole

Once the curvature of a ripple gets big enough, it can also appear fairly flat, like waves of parallel lines.

Gravitational Waves Pose a Bizarre New Threat That Could Destroy Earth

The singularity in our solutions occurs in the past and can be identified with the big-bang singularity. These computer programs can represent and time-evolve inhomogeneous cosmologies or gravitational waves or both.

Gravitational Waves Pose a Bizarre New Threat That Could Destroy Earth

We then introduce a new framework for analyzing general colliding plane-wave spacetimes; we give an alternative proof of a theorem due to Tipler implying the existence of singularities in all generic colliding plane-wave solutions; and we discuss the fact that the recently constructed Chandrasekhar-Xanthopoulos colliding plane-wave solutions are not strictly plane symmetric and thus do not satisfy the conditions and the conclusion of Tipler's theorem. For the h 0 case, data from two additional runs are shown with different numbers of particles, demonstrating that here we are essentially in the domain where the grid-based truncation error is dominating the solution error.

On stiff fluids and colliding plane gravitational waves coupled with fluid motions

This paper shows that Killing-Cauchy horizons in plane-symmetric spacetimes are unstable against plane-symmetric perturbations and thence argues that generic spacetimes representing colliding plane waves are likely to have spacelike singularities without Killing-Cauchy horizons. In this paper we consider the problem of whether or under what conditions singularities can be produced by the collision of gravitational waves with finite but very large transverse sizes.

On stiff fluids and colliding plane gravitational waves coupled with fluid motions

They also apply these numerical models to study collisions of gravity waves.

Colliding Plane Waves in Einstein

Figure 1 A spacetime diagram depicting a null-fronted plane wave shaded region traveling in the + x direction. Gravitational waves are invisible ripples in space that travel at the speed of light. The investigation of the Einstein equations, which reduce to a system of ordinary differential equations, requires a qualitative investigation on a two-dimensional phase plane.

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