Comparison of the Spiral Wave on the Fabric and the Gravitational Wave From the Orbiting Binary

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Gravitational waves are caused by fluctuations in the curvature of spacetime from Einstein's general theory of relativity. When black holes or objects with high mass orbit each other or collide, energy is lost in the form of gravitational waves. In some previous studies, this phenomenon has been visualized from waves on a fabric that are generated by the rotation of a roller. However, it is not possible to simulate gravitational waves perfectly because of the discontinuous data collection, the relationship between the rotation speed and the wave speed on the fabric, the manual control of the device pressure, and the consideration of the system's momentum conservation law were not considered. This may result in the waves in these studies being different from the gravitational waves detected from real phenomena. Therefore, the research team wanted to improve the simulation of gravitational waves on a fabric by controlling the motion of the source to be as close as possible to the real phenomenon in the inspiral phase of a compact orbiting binary system, which obeys the law of conservation of angular momentum. By collecting the distance of the wave displacement from a point on the fabric at any time and comparing the data with the strain signal of LIGO from the real phenomenon. The research team found that the characteristics of the frequency and amplitude of the waves on the fabric increased or decreased in the same way as the phenomenon. However, the characteristics were different when considering the size of the change affected by the order of magnitude. Therefore, the improvement of the demonstration can explain the trend of the behavior of gravitational waves from a compact binary system in the inspiral phase.

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