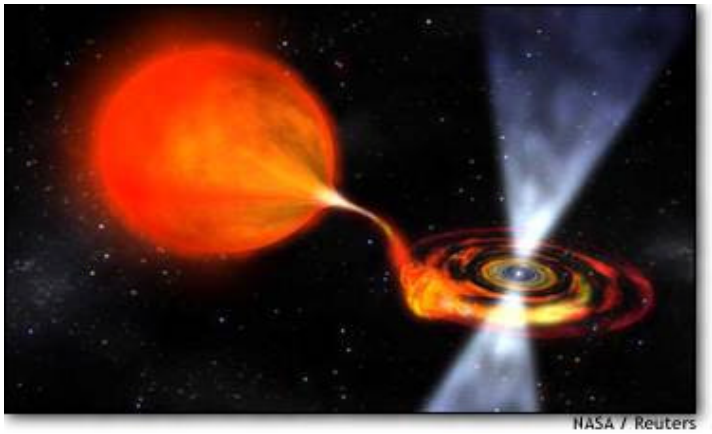

NASA / Reuters

An artist's conception shows a rapidly spinning star, at right, pulling material from a larger reddish star at left. The spinning star emits pulses of radiation like a cosmic searchlight.

Spinning stars hit cosmic speed limit

Space-time ripples may keep pulsars from ripping apart

By Deborah Zabarenko

REUTERS

WASHINGTON, July 2 — Reckless pulsars — spinning searchlights in space — might tear themselves apart if they whirled too fast, but ripples in the cosmic fabric first predicted by Albert Einstein may set a celestial speed limit.

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THAT LIMIT is still extremely high, about 760 revolutions per second, astronomers said Wednesday. But scientists figure some of the fastest pulsars could technically go two or three times that speed. Unfortunately, they would inevitably disintegrate if they did.

What stops them is the phenomenon predicted by Einstein's theory of relativity — the rippling of the fabric of space and time. Known to scientists as gravitational radiation, these ripples are a bit like waves on an ocean and are produced by massive objects in motion. They have never been directly detected.

Pulsars qualify as such massive moving objects, since they contain the mass of the sun packed into a sphere about 10 miles in diameter, scientists said at a briefing at NASA headquarters. Their findings were published in Thursday's issue of the journal Nature.

Created when a star explodes, most pulsars start spinning perhaps 30 times a second and slow down over millions of years. But a dense pulsar can waltz in space with a companion star, siphoning material from its companion, which makes it spin much faster, up to hundreds of times a second.

Scientists used NASA's Rossi X-ray Timing Explorer satellite — designed to observe fast-moving, high-energy objects in space — to monitor 11 dense pulsars in Earth's cosmic neighborhood. Those pulsars were all several thousand light-years away. A light-year is about 6 trillion miles, the distance light travels in a year.

The satellite kept track of the pulsars' spin rate by watching for thermonuclear explosions on their surfaces. Those blasts last only a few seconds but give off bursts of X-ray light and flicker in a distinctive way that lets

astronomers figure out how fast the pulsars are twirling.

None of the 11 spun faster than 619 times per second, Deepto Chakrabarty of the Massachusetts Institute of Technology said at the briefing. Scientists' statistical analysis of the 11 pulsars led them to conclude their top speed must be below 760 revolutions per second.

The faster a pulsar spins, some scientists believe, the more gravitational radiation it might release, and as that happens, the pulsar's spherical shape is ever so slightly deformed. That deformity might act as a brake on the pulsar's spin rate.

The gravitational waves emitted by the deformed pulsars may eventually be detected by earthly instruments of the Laser Interferometer Gravitational-Wave Observatory, Barry Barish of the California Institute of Technology said at the briefing.

"As the gravitational wave comes to me or my instrument, it actually has the effect of stretching space a little bit in one direction and squashing it in another direction," Barish said. "It goes back and forth between stretching and squashing at the rate of several hundred times a second."

That distortion is extremely small, measuring only a very small fraction of an atom, Barish said.

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