

## General Relativity and Quantum Cosmology

# Observational Constraints on the Completeness of Space near Astrophysical Objects

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We consider the observational effects of a deficit angle,  $w$ , in the topology of the solar system and in the 'double pulsar' system PSR J0737-3039A/B. Using observations of the perihelion precession of Mercury, and the gravitational deflection of light due to the Sun, we constrain the magnitude of such a deficit angle in the solar system to be  $2\pi(1-w)$ , with  $0 < (1-w) < 10^{-9}$  at 95% confidence. We calculate the effects of a deficit angle on the periastron advance, geodetic precession rate and inclination angle of the double pulsar system and use the observational data to obtain the constraint  $0 < (1-w) < 2.4 \cdot 10^{-8}$  at 95% confidence. Although this result is weaker than the solar system bound, it is in a very different physical environment, where accumulating data is likely to lead to tighter constraints in the future.

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