

IMAGE FORMATION IN WEAK GRAVITATIONAL LENSING BY COMPACT OBJECTS WITH ELECTRIC CHARGE AND MAGNETIC DIPOLE IN EINSTEIN–MAXWELL AND EINSTEIN–BORN–INFELD THEORY

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In Einstein–Born–Infeld theory the electromagnetic waves do not propagate on metric geodesics, but rather on geodesics of an effective metric [1, 2], affecting gravitational lensing. In an axially symmetric approximate solution of the Einstein–Maxwell system, generated by an object with mass, electric charge (or tidal charge) and magnetic dipole [3], all contributing perturbatively, the Born–Infeld modification appears as another perturbative effect. Following the treatment of [4], we integrate the equations of motion of light rays in the magnetic equatorial plane, deriving the deflection angle, which corrects a result from the literature. Upon substituting the deflection angle into the exact lensing equation, we obtain a lensing polynomial. Then we numerically reproduce the lensing behaviour for the known subcases of mass and tidal charge induced lensing. Finally, we analyse the other subcases of the lensing polynomial, with focus on observable quantities: the ratio of magnifications and difference of image positions. Their different interdependences could observationally set apart lensing objects of different types.

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