aberration and radiation pressure in the Klein and Poincare' models

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Abstract

Aberration and radiation pressure reflected by a moving mirror are examples of the Klein, one-way Doppler shift, and Poincare', two-way Doppler shift, disc models of hyperbolic geometry, respectively. Aberration, like the Thomas precession, is related to the angular defect, and is a kinematical eect rather than relativistic. At the angle of parallelism, determined by a stationary observer looking at a moving object in the direction normal to its motion, the rotation of the object is related to its Lorentz contraction that an observer sees traveling at the same speed as the object. The origin of the Lorentz contraction is the angular defect, while the angle of parallelism is an asymptotic limit, providing the unique link between circular and hyperbolic functions. The relative velocity provides an upper limit on the angle of incidence with the radiation pressure vanishing at the angle of parallelism. Two-way, second-order Doppler shifts can be used to establish experimentally the existence of an angle of parallelism.

Keywords:	aberration, radiation pressure, hyperbolic geometry, angular defect, angle of parallelism, Klein and Poincare' models
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