Vacuum pulling forces in the dynamical Casimir effect

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Moving objects in the quantum vacuum can experience dissipative forces while real particles are created via the dynamical Casimir effect. If the moving object is in the presence of real particles (a thermal bath for instance), the force due to these real particles in a given side of the object always pushes the object, independently of the movement direction (for example, the real particles in the left of the moving object always pushes the object to the right). On the other hand, we show that the vacuum in a given side of the object pushes it only if the object moves “against” this vacuum. And if the object moves “away from” this vacuum, then it pulls the object.