

**THE ROLE OF VYSIKAYLO SHOCK WAVES OF THE
ELECTRIC FIELD AND PLASMA NOZZLES IN THE
FORMATION OF CUMULATIVE PLASMA CANNON ON
THE PROTECTION OF THE EARTH FROM METEORITES
AND SMALL ASTEROIDS**

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De Broglie reported that particles behave like waves. The author proves that de Broglie waves of free electrons in the plasma tail of meteoroids and asteroids behave like electromagnetic waves in a quantum resonator (laser) and form a beam (jet) of high-energy electrons directed at the meteoroid or asteroid. The jet of high-energy electrons formed in the plasma tail behind the meteoroid or asteroid catches up with it and disperses it by means of a Coulomb explosion (or a series of such explosions) into electrons and simple ions. Based on this idea, we proposed and investigated a new 4D inertial-polarization-quantum cumulative-dissipative Vysikaylo mechanism for fragmentation of meteoroids and small asteroids (self-defense of the Earth from meteoroids) into simple ions and electrons. We have investigated and explained all the main phenomena in the plasma cumulative-dissipative structure of Vysikaylo (limited by Coulomb barriers in the plasma tail behind a meteoroid or asteroid 20 km long). These phenomena are associated with cumulative and dissipative processes of converting the mechanical energy of the entire meteoroid into electrical energy, and then into the energy of meteoroid spray. A special role in the processes of cumulation of electron flows and positive ions in the plasma tail is played by shock waves of the electric field and the formation of plasma nozzles, discovered and studied theoretically and experimentally by the author and co-authors. In this phenomenon, as proven in this work, the virial theorem is fulfilled: half of the Coulomb energy (equal to the kinetic energy of the meteoroid or asteroid) goes to the formation of a beam of high-energy electrons catching up with the meteoroid, and the other half - to the ejection of positive ions along the plasma tail behind the meteoroid, in the direction opposite to the motion of the meteoroid (asteroid). This is how the Vysikaylo gun is formed, firing at a space alien penetrating the atmosphere. As a result of the recoil in such a gun, positive ions are ejected in the direction opposite to the motion of the meteoroid and carry with them air masses with water vapor, which leads to the formation of noctilucent clouds.