

IAF SPACE PROPULSION SYMPOSIUM (C4)
Disruptive Propulsion Concepts for Enabling New Missions (9)

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QUANTUM PROPULSION FOR INTERSTELLAR TRAVEL: ANALYSIS AND EXPLORATION OF
KEY CHALLENGES

Abstract

Quantum propulsion is a promising space travel concept that proposes using quantum mechanics principles to propel spacecraft through space at high speeds. Traditional propulsion systems have serious limitations in covering long distances at high speeds. Advances in quantum propulsion technology could revolutionize space travel, allowing spacecraft to travel at unprecedented speeds. Quantum propulsion technology is based on the principles of quantum mechanics and uses technologies such as the quantum vacuum thruster and emdrive (electromagnetic drive) to generate thrust without traditional propellants. These methods offer advantages such as increased speed and efficiency, which can reduce driving time, cost and fuel consumption. Two potential methods of quantum propulsion are quantum vacuum thruster and emdrive. The previous technique would use the Casimir effect, which describes the attraction between two closely spaced metal plates in a vacuum due to electromagnetic field fluctuations. By manipulating these fluctuations, thrust can be created to propel the spacecraft forward. The latest technology, emdrive, creates a unidirectional force by bouncing microwaves in a conical chamber, resulting in conservation of momentum and forward motion. Despite the technical challenges, quantum energy technology has enormous potential for space exploration and travel. However, the biggest hurdle is developing safe and efficient quantum energy systems that can be integrated into the hardware and software of existing spacecraft while also addressing issues such as radiation exposure and equipment failure. In conclusion, although quantum energy technology is still in its experimental stages, it holds great promise for the future of space exploration and travel. Developing reliable and efficient quantum energy systems that integrate with existing technology will require significant investment and research, but the potential benefits of this technology make it an area of research that cannot be ignored. With continued research and development, quantum technology could revolutionize space travel and open new avenues for exploration and discovery.