

Brief information about the project

Name of the project	AR19576858 "Manufacture and testing of prototypes of a solid-state pulsed plasma engine for small-sized spacecraft
Relevance	The scientific novelty of the proposed project lies in the creation of a prototype of a solid-state pulsed plasma engine designed to maintain and correct the orbit of small spacecraft and testing in laboratory conditions. All developments within the framework of the proposed project are of scientific, technological and industrial-innovative interest not only for Kazakhstan, but also for the world community, since the development of space technology is a priority in such popular areas as telecommunications and Earth observation, satellite communications, spacecraft, electrical pulse jet engines, etc.
Purpose	Manufacturing and testing prototypes of a small-sized solid-state pulse-plasma engine in laboratory conditions, used for orientation, control and trajectory correction systems of small-sized spacecraft.
Objectives	<ol style="list-style-type: none">1. Development of the design and design of a prototype solid-state pulsed plasma engine to minimize and improve the main characteristics.2. Testing the core elements of a prototype solid-state pulse plasma engine for vacuum compatibility and tightness.3. Development of a standard electronic board for the power and control unit of a prototype solid-state pulse plasma engine.4. Study of the combustion process, structure and dynamics of the pulse engine.5. Experimental study of the traction and energy characteristics of a prototype solid-state pulsed plasma engine.6. Testing, testing operating modes, determining the operating life of a solid-state pulse plasma engine on an automated vacuum stand. Preparation and publication of articles in peer-reviewed scientific journals in accordance with the requirements of competition documentation.
Expected and achieved results	This project will develop the designs and structures of a prototype solid state pulsed plasma engine to minimize and improve the main characteristics; A prototype of a small-sized solid-state pulsed plasma engine with a reliable design and improved design will be developed. The core elements of the prototype solid-state pulse plasma engine will be tested for vacuum compatibility and tightness. The results of testing the key elements of a prototype solid-state

	<p>pulse plasma engine for vacuum compatibility and tightness will be presented.</p> <p>A standard electronic board for the power and control unit of a prototype solid-state pulse plasma engine will be developed; A standard electronic board for the power and control unit will be manufactured with the possibility of autonomous power supply and automation. The combustion process, structure and dynamics of pulsed plasma of a solid-state engine will be experimentally studied. The structural characteristics and dynamics of the pulsed plasma of a solid-state engine will be analyzed using high-speed imaging and probe diagnostics.</p> <p>The traction and energy characteristics of a prototype solid-state pulsed plasma engine will be experimentally studied; The results of experimental studies of the traction and energy characteristics of a solid-state pulsed plasma engine will be presented. Testing, testing of operating modes and determination of the operating life of the solid-state pulse plasma engine will be carried out. The operating modes and determination of the operating life of a solid-state pulsed plasma engine in an automated vacuum will be carried out.</p>
<p>Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles</p>	<ol style="list-style-type: none"> 1. Dosbolaev Merlan Kylyshuly, Candidate of Physical and Mathematical Sciences, Associate professor. 12, G-6630-2013, https://orcid.org/0000-0002-0724-1793, 24337997900. 2. Igibaev Zhanbolat Bakbergenovich, Master of Technical Sciences. 0, CWI-6630-2013, https://orcid.org/0000-0003-2474-1519, 57555345300. 3. Nurusheva Muldir Makhmetkyzy. Master of Technical Sciences. 4. Yertaev Ondasyn Abayuly. Master of Technical Sciences. http://orcid.org/0009-0002-9131-4875
<p>List of publications with links to them</p>	<ol style="list-style-type: none"> 1 Досболаев М.К., Үсенов Е.А. Қатты отынды ионды-плазмалы қозғалтқыштың моделі және оның жұмыс істеу принципін зерттеу // Ашық жүйелер эволюциясының проблемалары журналы. – 2020. – № 22. – Т. 2. – Б. 45-51. 2 Dosbolayev M.K., Tazhen A.B., Ramazanov T.S. Investigation and diagnostics of plasma flows in a pulsed plasma accelerator for experimental modelling of processes in tokamaks // Eurasian Journal of Physics and Functional Materials. – 2021. – Vol. 5(4). –P. 198-210. 3 Dosbolayev M.K., Igibayev Zh.B., Tazhen A.B., Ramazanov T.S. Preliminary Study of the Solid-State Pulsed Plasma Thruster Model with Graphite as a

	<p>Propellant // Plasma Physics Reports. – 2022. – Vol. 48. – No. 3. – P. 263-270. CiteScore 3.1; Процентиль 43.</p> <p>4 Досболаев М.К., Игибаев Ж.Б., Тажен А.Б., Рамазанов Т.С. Предварительное исследование модели твердотельного импульсного плазменного двигателя с графитом в качестве топлива // ФИЗИКА ПЛАЗМЫ. – 2022. – Том 48. – № 3. – Стр. 259-267 (русскаяязычная версия статьи [3]).</p> <p>5 Tazhen A.V., Dosbolayev M.K., Ramazanov T.S. Investigation of self-generated magnetic field and dynamics of a pulsed plasma flow // Plasma Sci. Technol. – 2022. – Vol. 24. – P. 055403 (8pp). CiteScore 2; Процентиль 49.</p> <p>6 Досболаев М.К., Игибаев Ж.Б., Тажен А.Б., Рамазанов Т.С., Усенов Е.А. Твердотельный импульсный плазменный двигатель // Патент РК на полезную модель. – 24.06.2022. №7330.</p> <p>Ж.Б. Игибаев, А.К. Хамзаев, О.А. Ертаев, М.К. Досболаев. Экспериментальное исследование эффективности работы импульсного плазменного двигателя на твердом топливе // Recent Contributions to Physics. №2 (85). 2023. – Стр. 29-35. https://doi.org/10.26577/RCPH.2023.v85.i2.05</p>
Patents	It is planned to file for a patent of the Republic of Kazakhstan