

SPACE PROPULSION SYMPOSIUM (C4)
 Joint Session on Advanced and Nuclear Power and Propulsion Systems (7-C3.5)

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DEMOCRITOS : NUCLEAR ELECTRIC PROPULSION TO EUROPA AND MARS

Abstract

DEMOCRITOS (Demonstrators for Conversion, Reactor, Radiator And Thrusters for Electric Propulsion Systems) is an international project founded by the European Commission to enable a realization of a mega-watt class electric propulsion spacecraft. The project is a follow-on activity of the successful European-Russian cooperation in the frame of the MEGAHIT (Megawatt Highly Efficient Technologies

for Space Power and Propulsion Systems for Long-duration Exploration Missions) project. The primary focus of the project is the ground demonstration of the core technologies. Furthermore, a preliminary design of the spacecraft including all subsystems shall be developed by utilizing the Concurrent Engineering (CE) process at DLR in Bremen. DEMOCRITOS aims to develop key technologies required for realisation of a number of sophisticated missions in the future. The current baseline spacecraft (S/C) design consists of two modules of 20 tons mass each and shall be assembled in orbit. However, all subsystems shall be developed in modular way (modular building blocks) to enable a realization of a mission dedicated spacecraft in the future. Depending on the mission a number of building blocks which have different functionalities will be assembled in orbit. The reactor shall provide electrical energy of 1MWe to fulfil different mission requirements.

The results of the international DEMOCRITOS project (European Commission funded European Russian consortium members, Brazil as a guest observer and by means of consultancy from ASL, NASA and JAXA) will be highlighted. DEMOCRITOS results are the first version of system and subsystem designs of the International Nuclear Power and Propulsion System (INPPS) flagship towards Jupiter moon Europa and Mars exploration in the second half of the 2020th. Moreover it will be sketched the concepts of the nuclear and ground based demonstrators realization until the middle of the 2020th and the strategic roadmap for technical feasibility, scientific excellence, political acceptance, industrial and public supports.