Macao Funding Scheme for Key R&D Projects 2024
Application Guideline for Projects of Space Science (Earth's Magnetosphere)

I. Background

Space science is the intersection, entry point and starting point of building a space power and gathering forces to make original and leading scientific and technological breakthroughs. The development of space science is of great significance for China to build an innovative country and achieve high-level self-reliance and self-improvement. The "14th Five-Year Plan" emphasizes "strengthening original and leading scientific and technological research" and "cultivating cutting-edge areas such as aerospace science and technology, implementing forward-looking and strategic major national science and technology projects".

The Macao SAR Government prioritizes enhancing its R&D capabilities in space science and actively participates in developing the national aerospace industry. With the strong support of China and the SAR Government, Macao has participated in developing relevant lunar exploration mission payloads since the launch of the first national lunar exploration project in 2004. In 2018, the Ministry of Science and Technology approved the establishment of the State Key Laboratory of Lunar and Planetary Sciences in Macao to participate in the national Chang'e series and Tianwen series deep space exploration missions. It is committed to researching the origin and evolution of the solar system and its planetary

systems, scientific data research, load R&D, and other related work. In May 2023, the first space science satellite “Macao Science-1” jointly developed by the Chinese mainland and Macao was successfully launched. President Xi Jinping replied with encouragement and congratulations. It is the world’s first scientific satellite for detecting low-latitude geomagnetic fields and space environment, and China’s satellite with the highest detection accuracy of Earth’s magnetic field. The satellite will significantly improve the level of national space magnetic survey technology.

In order to fully exert the leading role of Macao State Key Laboratory in scientific and technological innovation and improve the R&D capability and industrialization level in the field of space science, the Science and Technology Development Fund (FDCT) has proposed this Scheme for Key R&D Projects after taking into opinions and suggestions from Macao’s researchers in relevant fields and seeking expertise from mainland experts. It aims to meet the needs of the country in a planned and step-by-step manner and support Macao’s research in space science and space exploration technology. Therefore, those efforts could contribute to developing China’s space industry.

II. Overall Objectives

Facing the strategic needs of national space exploration, it aims to develop high-precision detection technology for the space radiation environment through the research and application of space physical processes and satellite big data. So monitoring and early warning of near-Earth space radiation environment can be realized. While promoting the innovation

and application of space science and technology, Macao's participation in developing national deep space exploration can be enhanced.

III. Research Field

Research Field: Modeling and detection technology of near-Earth space radiation environment

Based on the detection data of Chinese satellites such as "Macao Science Satellite-1", "FY-3", "FY-4" and "Zhangheng-1", researchers should conduct studies on the energy particles, electromagnetic characteristics and their applications in the near-Earth space environment; the space-time distribution of electrons in the Earth's inner radiation belt, the excitation and propagation characteristics of electromagnetic waves in space and their response to solar explosive activity; and new technologies, methods and concepts of electromagnetic detection in space environment.

Performance indicators:

(1) At least 3 models are established, including the spatial-temporal evolution model of energy particles, the numerical model of electromagnetic wave excitation and propagation in space, and the application model of space environment support.

(2) No less than 2 prototypes of magnetic field or particles in near-Earth space are researched and developed.

(3) No less than 20 SCI papers are published.

(4) At least 3 patents are filed.

(5) The Technology Readiness Level (TRL) shall achieve TRL 5.

IV. Application Requirements

(1) The lead applicant shall be a Macao entity, Macao and Hengqin enterprises are welcome to participate in the project.

(2) A formal cooperation agreement shall be provided if the project is collaborative.

(3) The project duration is 4 years. The maximum application amount for each project is MOP 15 million.

V. Experts Involved in the Formulation of the Guideline

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